

# PROJECT PERIODIC REPORT

**Grant Agreement number: 212114**

**Project acronym: SLHC-PP**

**Project title: SLHC-PP Preparatory Phase of the Large Hadron Collider Upgrade**

**Funding Scheme: Combination of CP & CSA**

**Date of latest version of Annex I against which the assessment will be made: December 16, 2008**

**Periodic report:**                    1<sup>st</sup>     2<sup>nd</sup>     3<sup>rd</sup>     4<sup>th</sup>

**Period covered:**                    from **April 2008**            to **March 2009**

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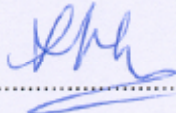
## Declaration by the project coordinator

I, as co-ordinator of this project and in line with my obligations as stated in Article II.2.3 of the Grant Agreement declare that:

- The attached periodic report represents an accurate description of the work carried out in this project for this reporting period;
- The project (tick as appropriate):
  - has fully achieved its objectives and technical goals for the period;
  - has achieved most of its objectives and technical goals for the period with relatively minor deviations<sup>1</sup>;**
  - has failed to achieve critical objectives and/or is not at all on schedule.
- The public Website is up to date, if applicable.
- To my best knowledge, the financial statements which are being submitted as part of this report are in line with the actual work carried out and are consistent with the report on the resources used for the project (section 3.6) and if applicable with the certificate on financial statement.
- All beneficiaries, in particular non-profit public bodies, secondary and higher education establishments, research organisations and SMEs, have declared to have verified their legal status. Any changes have been reported under section 5 (Project Management) in accordance with Article II.3.f of the Grant Agreement.

Name of Coordinator: Lyndon Evans

Date: 18 / 05 / 09

Signature of Coordinator: 

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**1** If either of these boxes is ticked, the report should reflect these and any remedial actions taken.

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## List of Acronyms

ATLAS	A Toroidal LHC ApparatuS, general-purpose detector at the LHC
CARE-HHH	Coordinated Accelerator Research in Europe – High-energy High-intensity hadron beams
CMOS	Complementary Metal-Oxide-Semiconductor
CMS	Compact Muon Solenoid, a general-purpose detector at the LHC
CMS2	the CMS experiment upgrade for sLHC
DSP	Digital Signal Processor
EVM	Earned Value Management, IT-based management tool
FEA	Finite Element Analysis
FLUKA	FLUtuierende KAScade, Monte-Carlo code for particle transport
FPGA	Field-Programmable Gate Array
HIPPI	High Intensity Proton Pulsed Injector, sub-project of CARE
LARP	LHC Accelerator Research Program, USA
LHC	Large Hadron Collider
Linac4	Linear accelerator, first injector within the sLHC injector chain
LLRF	Low Level Radio Frequency
LPSPL	Low Power Super Proton Linac, second injector within the sLHC injector chain
PS2	Proton Synchrotron 2, third injector within the sLHC injector chain
RF	Radio Frequency
S-ATLAS	the ATLAS experiment upgrade for sLHC
SNS	Spallation Neutron Source, at Oakridge USA
SPL	Super Proton Linac, future high-intensity stage of the LPSPL
SPS	Super Proton Synchrotron, highest energy injector within the sLHC injector chain
VME	Virtual Machine Environment, a mainframe computer operating system

# 1. Publishable Summary

The preparatory phase project for the Large Hadron Collider luminosity upgrade (sLHC) has made an excellent start. This was possible because the EU-funded SLHC-PP project was well synchronised with the overall availability of new funding and start-up of various sLHC-related activities.

In a nutshell SLHC-PP (<http://cern.ch/SLHC-PP/>) is the EU-funded Preparatory Phase project of the LHC-upgrade. It comprises Management, Coordinating, Support and Technical activities arranged in 8 work packages.



Work Package	Description
WP1	SLHC-PP Project Management
WP2	Coordination for the SLHC accelerator implementation
WP3	Coordination for the S-ATLAS experiment implementation
WP4	Coordination for the CMS2 experiment implementation
WP5	Radiation protection and safety issues for accelerator and experiments
WP6	Development of Nb-Ti quadrupole magnet prototype
WP7	Development of critical components for the injectors
WP8	Tracking detector power distribution

The Coordinating activities within SLHC-PP (WP2, WP3, WP4) play a central role for the organisation of the new accelerator- and detector-upgrade collaborations, putting in place project structures and collaboration management tools, ultimately aiming for agreements on work-sharing and funding for the implementation phase. Support activities (WP5) address priority safety issues in the radiation protection domain. The Technical developments address the construction of prototypes of Nb-Ti high-field magnets with large aperture (WP6), the study of a new H<sup>-</sup> ion source as well as field stabilization in superconducting accelerating structures (WP7), and novel tracking detector power distribution (WP8). The SLHC-PP project runs in parallel with an extensive sLHC-oriented R&D program, with important contributions from laboratories and universities world-wide. CERN is responsible for the overall management of the project (WP1). The SLHC-PP project started on April 1<sup>st</sup> 2008 for a project duration of 3 years.

In its present layout, the LHC will produce proton-proton collisions at a centre-of-mass energy of 14 TeV and a luminosity of up to  $10^{34} \text{ cm}^{-2}\text{s}^{-1}$ . The sLHC project aims at a tenfold luminosity increase for 14 TeV proton-proton collisions, through the successive implementation of several new elements and technical improvements. These comprise: major replacements of several accelerators within the LHC proton injector chain, upgrades of the LHC interaction regions, and upgrades of the general-purpose experiments ATLAS and CMS.

The sLHC accelerator project currently comprises two construction projects: a new Linac4 injector and new inner triplet focusing elements for the ATLAS and CMS interaction regions. The accelerator project also comprises three project preparation studies: new LPSPL and PS2 injectors and the SPS upgrade. The construction projects are due to be completed in 2014 (Phase-I), while the project preparation studies are due to lead to approval for construction by 2012 and completion by 2018 (Phase-II). The upgrades of the experiments follow the accelerator upgrade phases closely. For Phase-I the most inner tracking layers will be complemented or replaced and staged elements of the muon detectors will be completed. For Phase-II many detector elements will be replaced in order to effectively measure rare physics events in the presence of an overall

interaction rate of up to 400 events per beam crossing. The full inner detectors will be replaced, as well as several detector elements in the forward region, trigger and front-end electronics.

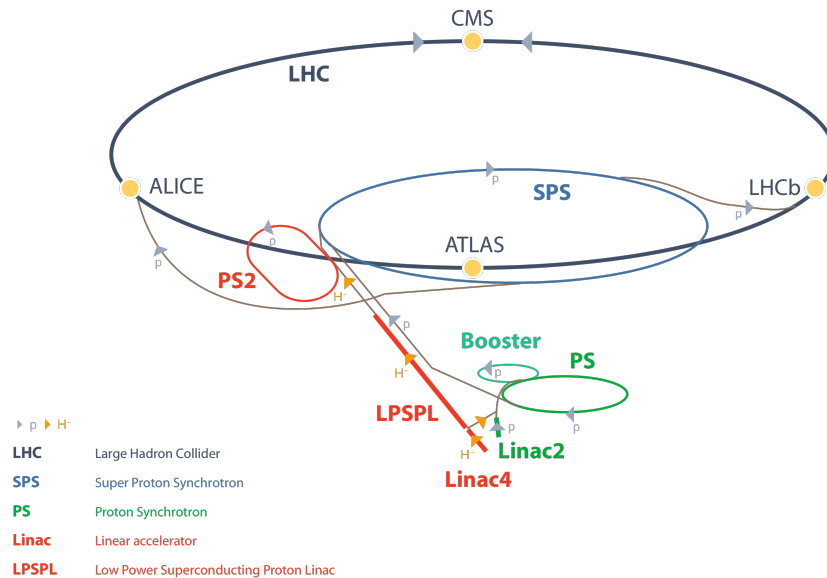


Fig.1 The LHC and its injectors. Within the sLHC project, the three present injectors (drawn in green) will be replaced by new injectors (drawn in red).

## Summary of the overall 3-year project objectives and activities carried out in the first year:

### WP1, SLHC-PP project management:

Besides the normal EU project management tasks, WP1 also covers the important issue of dissemination of information.

Tools have been put in place for the internal SLHC-PP project follow-up, and the web site is fully operational. SLHC-PP had a successful kick-off meeting in April 2008. In addition to the internal SLHC-PP project-related presentations and discussions, a half-day public event was organised in order to inform the particle physics community on the scope and status of the sLHC project. The event was very well attended and very effectively met its objective to give a kick-off start to the sLHC project as a whole. A second public event was organised at the occasion of the first annual meeting in February 2009. At this event, detailed information was given on the five accelerator sub-projects and on the current plans for the experiment upgrades. Work is ongoing to establish an sLHC outreach web site for the general public.

### WP2, Coordination for the sLHC accelerator implementation:

The coordination of the world-wide accelerator efforts towards sLHC implies to set up links with collaborating institutes and to firmly establish common project management tools and procedures amongst all partners. The aim of WP2 is to set up project management structures using modern tools for tracking project progress, budget follow-up and planning. The communication between the sLHC partners is streamlined in workshops, meetings and web-based dissemination tools.

During the first year of SLHC-PP, the scope of the overall sLHC accelerator project has been defined better. It is divided into 5 sub-projects (Linac4, Inner Triplet Phase-I, LPSPL, PS2, SPS upgrade) with the scientific backing of two networks: CARE-HHH (FP6) and EuCARD-AccNet (FP7). Among the sub-projects, Linac4 and Inner Triplet Phase-I have started construction in 2008, while the other three projects have been defined as development projects for Phase-II of the upgrade. Phase-II aims for a formal approval in 2012, with construction starting in 2013. All 5 projects have an organisational structure in place, involving CERN together with many partners. Both Phase-I construction projects are fully defined within the Earned Value Management system. The EVM informatics tool was further development, using the lessons learnt from its use for the

LHC construction. Contributions from outside institutes were defined and the collaboration contracts established.

**WP3, Coordination for the S-ATLAS experiment implementation:**

The SLHC experiment upgrades S-ATLAS and CMS2 are technically and financially well defined projects with a clear interface to the existing collaborations ATLAS and CMS. This is mandatory to allow significant numbers of new members to join for the sLHC phase. This will also permit existing members to take on precise technical tasks related to the sLHC experiment construction beyond their current responsibilities in the present LHC experiments. Following ATLAS and CMS experience, the aim of WP3 and WP4 is to set up sound management frameworks and centralised technical coordination during the preparatory phase. In addition, as part of the SLHC-PP objectives central project offices are put in place to ensure the coherent integration of all sub-projects through establishing central repositories, cost books and schedules.

During the first year of sLHC the management structures and review office for the ATLAS upgrade have been established and become fully operational. The work has been focused on establishing a common schedule with the LHC and CMS upgrade projects, and defining the scope of the ATLAS upgrade projects. The Upgrade Steering and Project Office teams have met regularly and, through reviews and project evaluation, have narrowed down the technical options pursued. The upgrade schedule is being developed and will be further refined in the coming months. Several upgrade workshops have been arranged, the largest being the tracker upgrade workshop early November 2008 at NIKHEF(Amsterdam) with 180 participants.

**WP4, Coordination for the CMS2 experiment implementation:**

The activities for WP4 during the first year have been focused around creating a management structure for the CMS Upgrade project as well as defining the scope of activities to be included in the project. The new upgrade management team has met regularly throughout the year. A workshop was held in May 2008 to discuss and agree on the scope and timescales of the upgrade projects. This workshop was attended by more than 100 CMS members. A second workshop was held in November 2008 to discuss and agree on the detailed work plan for the early upgrade projects, and to present results on some of the more challenging research topics for the later upgrade activities. The project office was successfully put in place.

**WP5, Radiation protection and safety issues for accelerator and experiments:**

Increasing the luminosity of the LHC will mean that the radiation levels in both the accelerator and experiments will increase substantially. To this aim the questions of the prompt dose rates, material activation, production and disposal of radioactive waste, radiation impact studies and of the control of the dose to personnel are addressed in WP5.

As a first step the first LHC data will be used to validate the simulation codes for the calculation and activation in the detectors. To prepare this task, the ATLAS and CMS numerical models were updated to comprise the "as built" (as opposed to "as planned") detectors simulated in the standard FLUKA Monte-Carlo code. Various types of radiation monitoring detectors have been installed in crucial locations in an around the detectors. Although no LHC collisions have taken place yet, some first signals have been detected in the pixel monitors showing stray radiation backgrounds at the occasion of the LHC injection tests.

Concerning the radiation issues in the sLHC accelerator complex, parameters have been collected from the various sLHC sub-projects (see WP2 above). Particular attention has gone into the various beam-loss points (collimators, injection and ejection points, beam dumps). These core parameters have been laid down in a document. Specific radiation studies have been carried out for Linac4 and its beam injection into the current Booster, as well as for the 50 GeV PS2 machine.

**WP6, Development of Nb-Ti quadrupole magnet prototype:**

For the upgrade of the high luminosity insertions the SLHC-PP project will address the development of superconducting quadrupole magnets of advanced design to replace the existing

ones. The core objectives of WP6 are to produce the design of the quadrupole magnets and adjacent correctors, as well as to construct a 1-metre long model, followed by a full-length prototype. During the first year of the project the magnetic parameters of the quadrupole assembly have been fixed, a survey of materials and components has been carried out and an isolation scheme has been developed. The basic design of the triplet has been completed and conceptual studies of the correctors have advanced well. Preparation work for the construction of the short model has started at CERN by designing, procuring, installing and commissioning the basic tooling that do not require the magnet designed to be finalized. These tools are presses, curing moulds,... Although the project objectives for the first year have been met successfully, the project now suffers from lack of expert manpower. This is due to the repair activities following the September 2008 incident in the LHC. This will undoubtedly lead to delays for the upcoming WP6 deliverables and milestones.

#### **WP7, Development of critical components for the injectors:**

The foreseen H<sup>-</sup> linear injectors (Linac4 and LPSPL) set difficult technical challenges in the context of the CERN operating environment. Among others these concern the H<sup>-</sup> ion source, which has to provide a very bright beam with a high duty cycle and a long life-time and the beam energy stability, which has to allow for the required density of particles in order to achieve the bunch intensity of the sLHC bunches. To this aim, the objectives of WP7 concern the development of a high-power negative hydrogen ion source, and the control of the RF power in the superconducting cavities.

During the first year of the project, the Linac4 ion source is now assembled at the test stand, and several measurement techniques have been elaborated including a method and circuit for tuning and measuring the RF and techniques have been put in place to allow for the benchmarking of critical source parameters. Hydrogen pressure modelling and measurements have taken place at DESY and the 3D magnetic field distributions around the source have been modelled. Furthermore, work has started on the plasma test laboratory. The low level RF task comprises three main parts: the characterization of two cavity-tuning ensembles (developed under the FP6 programme by INFN Milano and CEA-Saclay), the simulation of the RF low level system, and the building of prototype electronics to implement the control algorithms and validate the low level RF system design. The detailed preparations for the tests stands at CEA-Saclay and CERN have progressed well. For the characterization of the cavities, the SLHC-PP project draws heavily on the availability of equipment developed under FP6. There has been a delay in the delivery of the cavities, pushing the characterization deliverable back by some 10 months from M12 to M22. The simulation of the low level RF system has started. Good progress has been made with the prototype electronics. Therefore, despite the 10-month delay in the characterization result, the overall schedule towards the final WP7 deliverables is not compromised.

#### **WP8, Tracking detector power distribution:**

The present LHC experiments have revealed severe difficulties in providing power to the complex inner tracking detectors. The objectives of WP8 aim at solving these difficulties by developing new on-detector powering schemes based on DC-DC conversion and serial powering, compatible with the operation in strong magnetic fields and under high radiation conditions.

The DC-DC conversion activities in the first year included the investigation and simulation of different buck converter topologies, systematic characterization of "high" voltage radiation-hard transistors, development of a first gain-4 buck converter design and development of a two-stage DC-DC powering scheme. Design studies of related integrated charge-pumps are in progress. RWTH Aachen has become a new participant of WP8 and has already compared the performance of different DC-DC converters in a system (CMS petals). The serial powering activities of the first year included the assembly and characterization of silicon supermodules with commercial serial powering regulators, AC coupling studies, simulation and prototyping of different protection schemes and the development of several application-specific serial powering circuitry blocks as well as the development of a supermodule serial powering scheme. Results for both schemes look promising and the corresponding evaluation reports have been published.



## 2. Project objectives for the period

The SLHC-PP project started in April 2008 for a period of three years. It is the preparatory phase project for sLHC, the high-luminosity upgrade of CERN's Large Hadron Collider. The sLHC project includes the upgrade of specific elements of the LHC accelerator, major upgrades in the accelerator injector complex, as well as upgrades to the two high-luminosity experiments ATLAS and CMS. The project will result in a tenfold increase of the LHC luminosity. The EU-funded SLHC-PP project comprises Management, Coordination, Support and Technical activities for both the accelerator and the experiments.

There are three Coordinating work packages, covering the accelerator (WP2) and the experiments ATLAS (WP3) and CMS (WP4). For all three coordinating work packages, the principal objective of the first year was to put the organisational structures, communication structures and technical databases in place in order to allow a maximum of participants to contribute to the respective projects in a coherent way. For the accelerator in particular this meant defining the upgrade project in terms of a number of sub-projects for both the Phase-I and Phase-II upgrades and setting up the organisational structure for each of the 5 resulting sub-projects. In addition the setting-up of web pages and technical databases and the developments of advanced project management tools were part of the objectives for the first year. For the experiments the coordination objectives for the first year included setting-up the upgrade managerial structures, including the substructures, review bodies and the technical project office or technical coordination unit. In addition, initiating the process of better defining the scope of the experiment's upgrade projects through the organisation of upgrade workshops was part of the objectives.

There is one Support work package (WP5) that covers both the accelerator and the experiments. This work package covers priority safety items in the domain of radiation protection. The main objective for the first year was to get an overview of the accelerator and experiment's upgrade projects and define the critical areas with a potential radiological impact on personnel, equipment and environment. The compilation of a report on the critical parameters and potential design constraints was due at the end of the first year. In addition, the preparation of simulation tools and radiation measurements were part of the work in order to prepare deliverables for the second year.

There are three Technical work packages. WP6 covers the design and construction of a Nb-Ti quadrupole magnet prototype for the final focus of the LHC beam in the high-luminosity interaction regions. The main objectives of WP6 for the first year were to define the core magnetic parameters of the design, to qualify the essential components and to produce the basic design of the focusing triplet comprising the quadrupole and its associated corrector magnets. WP7 covers the study of a new H<sup>-</sup> ion source for the Linac4 and LPSPL injectors as well as field stabilisation in the LPSPL superconducting accelerating structures. Concerning the H<sup>-</sup> source, the main objective for the first year was the completion of the finite element studies of the H<sup>-</sup> source, covering in particular the thermal behaviour at the final duty factor. The preparation of the design requirements document (due for M14) and the preparations for the design of the source (due for M18) were also part of the objectives. Concerning the RF field stabilisation task, the main objective for the first year was the characterisation of two tuner cavities developed under CARE-HIPPI (FP6 project). The preparations for the simulation and design of the RF system (due for M18) were also part of the objective. Technical WP8 concerns the development of novel on-detector power distribution techniques for the inner trackers of the experiment upgrades. The main objectives for the first year were the evaluation of several radiation-hard and magnetic field tolerant DC-DC conversion techniques and the evaluation of serial powering techniques.

The Management work package (WP1) covers the overall management of the SLHC-PP project and the dissemination of information on the project. The main objectives for the first year were to set up effective management and communication tools for the EU-funded project. In particular this involved the organisation of the kick-off meeting and the first annual meeting, the setting-up of the

web-based information repository and a project progress-tracking tool allowing for the effective monitoring of the contractual and financial follow-up of the project.

### 3. Work progress and achievements during the period

#### 3.1 Progress within the individual work packages

##### **Work Package 2: Coordination for the sLHC accelerator implementation**

As a first step, the sLHC project was better defined and the sub-projects started up.

##### **Overall sLHC:**

During the first year the composition of the sLHC accelerator project was further defined. The project is composed of 2 sLHC construction projects, 3 sLHC project preparation studies and one sLHC luminosity upgrade network. The setting up of the quality control plan for the sLHC was started at the end of 2008. A version of EVM optimised for sLHC was produced (starting from the LHC version of EVM) in the first months and is operational.

##### **sLHC construction projects:**

###### **- Linac4**

The description of the work in terms of work-packages is finalized, the complete project is entered in the E(arned) V(alue) M(angement) system at CERN and a hardware baseline is defined (see: <http://linac4.web.cern.ch/linac4/> ). Linac4 is foreseen to be used for physics beams in 2014.

###### **- Inner Triplet phase-I**

The description of the work in terms of work-packages is finalized, the complete project is entered in the E(arned) V(alue) M(angement) system at CERN and a hardware baseline is defined (see: <http://slhc-irp1.web.cern.ch/sLHC-IRP1/> ). The installation is foreseen for the shutdown period of 2014.

##### **Three sLHC project preparation studies:**

Apart from CERN core teams the study projects are very actively anchored in the CARE-HHH (FP6) and EuCARD-AccNet (FP7) networks.

###### **- LPSPL**

The LPSPL study comprises a LPSPL collaboration with formal collaboration agreements with 5 partners and agreements with 6 other partners are in a negotiation stage (see <https://twiki.cern.ch/twiki/bin/view/SPL/SplWeb> ). A CERN core study team is in place. A decision by the CERN Council for constructing LPSPL is foreseen for 2012.

###### **- PS2**

The PS2 study project is making fast progress to define the basic machine parameters (see <https://paf-ps2.web.cern.ch/paf-ps2/> ). A CERN core team is working on the definition and since the end of 2008 a USA team of the LARP collaboration is joining into the effort. A decision by the CERN Council for constructing PS2 is foreseen for 2012.

###### **- SPS upgrade**

This study is still primarily based at CERN with strong support from the networks (see <http://paf-spsu.web.cern.ch/paf-spsu/> ). The study team will produce a SPS upgrade project proposal by 2011.

##### **One sLHC luminosity upgrade network:**

The study group was part of the CARE-HHH network (<http://care-hhh.web.cern.ch/care-hhh/>) and will continue in the EuCARD EuroLumi network (<https://eucard.web.cern.ch/EuCARD/> ).

All aspects of the sLHC are subject to study by the EuroLumi network. The studies cover the existing sub-projects but also potential upgrade issues inside the LHC itself that are not (yet) a sub-project. The network is also in close contact with other programs like LARP in the USA.

The network functions as a breeding ground for ideas to improve the LHC luminosity and to branch off sub-projects once sufficiently matured.

### Task 2.1

Activities in the first year for this task were:

The release of a new version of the CERN E(arned) V(alue) M(anagement) system which is now in used for Linac4 and Inner Triplet Phase-I. The setting-up of a quality management system is in progress. Both systems are further developments of the ones used for the LHC construction.

### Task 2.2

The web sites of the sLHC project and the sub-projects were developed and are in place. Especially the sites for the construction projects are fully developed with access to the hardware definitions and the full documentation of the sub-projects. For the construction projects and one of the study projects collaboration agreements are in place with many European and non-European partners.

As the work for the sLHC structure started already several months before the formal start of SLHC-PP, the resources during the first year were partly taken from the core CERN budget within the sub-projects themselves and partly from SLHC-PP. The consolidation of the management tools and the further development of the sLHC project will need the WP2 resources in the next 2 years.

## **Work Package 3: Coordination for the S-ATLAS experiment implementation**

The implementation phase of the present ATLAS LHC experiment, as carried out by the Collaborating Institutes, was based on:

- Letter of Intent (LoI) followed later by Technical Design Reports;
- Cost Books for the proposed construction, assembly and installation work, based on an agreed overall schedule;
- Memorandum of Understanding (MoU) for the experiment, through which the specific work and deliverables for each Funding Agency (FA) were defined;
- Payment in a Common Fund allowing the construction of major experimental infrastructures, which were beyond the funding capabilities of single institutes.

The main aim of this WP is to set up a structure to address these issues in a co-ordinated way for the ATLAS upgrade, S-ATLAS.

### Task 3.1

Establish a managerial structure (called Upgrade Management Board) taking responsibility for setting up the formal framework for the experiment construction consortium, including the preparatory phase. This structure will take responsibility for the preparation of Cost Books, Reviewing Processes, and Collaboration Agreements.

Such an organization has been set up, led by one of the members of this WP, and its interaction with the Upgrade Project Office is defined. The upgrade review office is also established, led by a member of this WP, and it is active in reviewing the planned and ongoing R&D projects. An initial schedule is also established. These two deliverables/milestones were passed during the first year. Preparation of the project cost books and Memorandum of Understanding for the Phase-I upgrade is well underway, while the similar documents for Phase-II are planned for end 2010.

Overall this task is therefore progressing well, and there are no deviations from the original plan.

### Task 3.2

The Project Office ensures a consistent information structure related to the technical infrastructures and tools of the upgrade experiment. It is central in the definition of installation scenarios and scheduling. While individual laboratories or groups of laboratories perform R&D activities on individual detectors and components, the Project Office checks the compatibility of the R&D projects with the global technical framework.

The upgrade Project Office is operational carrying out the tasks mentioned above. The composition is now being changed adapting to the future project structures for the Phase-I and Phase-II

upgrade projects. The progress of the technical work is monitored on a monthly basis and regular workshops are held where the status and further plans are reviewed. Work has started in earnest preparing detailed technical documents for both Phase-I and Phase-II of the upgrade projects, including a description of the organization and schedule for the project. Preparing these documents and the main project structures for the upgrade will be the main working area for the project office the coming year. In parallel the project will prepare information covering technical WEB interfaces, databases, drawing and CAD documentation and technical documentation. This task is also progressing well, and there are no deviations from the original plan.

#### **Work Package 4: Coordination for the CMS2 experiment implementation**

The present CMS detector organisation functions with each sub-detector independently organised as a collection of the institutes involved in the construction and operation of the sub-detector. The sub-detectors report to the CMS Management through their project managers represented in the CMS Management Board. Each sub-detector is responsible for managing its own resources.

The CMS detector will need to undergo substantial changes in each of its systems in order to cope with the increased luminosity proposed by the sLHC project. Each of the sub-detectors has a different set of upgrade requirements for the two upgrade phases. The Upgrade Project structure (task 4.1) was created in order to manage the process of defining the scope and requirements of the CMS upgrades in each phase. The Upgrade Project oversees the activities related to upgrades. The organisational structure of the Upgrade Project follows the model of the current CMS structure, albeit with some adaptations.

A Project structure for the CMS upgrades has been defined and is now fully operational. The structure includes links to each of the sub-detector upgrade projects. The CMS Management Board and the CMS Collaboration Board approved this structure in 2008. Within this structure each sub-detector in CMS has created an upgrade structure for their systems concerned. Representatives from each of the sub-detectors report to the upgrade project management board. The Upgrade Management Board (UMB) also contains links to the CMS Technical Coordination, Resource Management, Computing and Physics. An Upgrade Peer Review Panel has been created to examine R&D proposals, and determine if they are aligned with the needs of the Upgrade Project. The chair of this panel reports to the UMB. The Upgrades Management Board meets regularly and has responsibility for the studies to determine the upgrade scope.

The Upgrade Management Board (see organigram in deliverable report 4.1.1) meets monthly to discuss the overall upgrade issues for CMS. It monitors the progress in each of the sub-detectors, and looks at issues related to multiple sub-detectors. The Upgrade Technical Coordinator, and the Electronics Coordinator represent the CMS Technical Coordination Unit. The Upgrade Resources Manager oversees the financial issues. There are also links with the Physics Coordination and the Software Coordination.

The R&D required for the upgrades is reviewed by an Upgrade Peer Review Panel. This board receives proposals, verifies if they are well matched to the upgrade programme of CMS, and reports to the Upgrade Management Board where a decision is taken on whether to endorse the proposals.

Workshops where the proposed scope of the upgrades and the status of R&D in each sub-detectors is discussed and reviewed have been held at six monthly intervals. Work plans for the following six months are also agreed. At the occasion of the 2008 upgrade workshops substantial progress has been made in defining the scope of the upgrade project.

The Technical Coordination Unit (task 4.2) organises all technical aspects of the upgrade. This includes the integration of any new or upgraded component into CMS, the integration of any

necessary changes in the experiment's infrastructure and allocation and administration of laboratory space for components to be assembled at CERN. The organisational structure and the reporting lines of Technical Coordination Unit for the upgrade are the same as for the construction of the original detector as this structure has proven to work efficiently. All changes of the CMS detector after the end of the current 2008/2009 shutdown are regarded as upgrades and will be part of the upgrade project.

Particularly important for any upgrade are all aspects of integrating new components into a running detector. The Integration Office plays a key role in this process, as it is responsible for the mechanical integration and assembly procedures. During the entire approval process the Integration Office together with the Technical Coordination has regular engineering meetings with the proponents to ensure a smooth integration of the upgraded components. Of similar importance are the integration of new electronics and new infrastructure into the running experiment. The Electronics Coordination will take care that old and new components work together.

The Integration Office provides engineering support for necessary infrastructure changes and for assembly tools. The Integration Office therefore collects, verifies and validates models of all components of the current components and of the new components for the upgrade. They will be integrated into the large CMS equipment database comprising all parts of the detector.

During the first year of SLHC-PP the Technical Coordination Unit and Integration Office have successfully been put in place. These offices are fully staffed and the working practices have been put in place.

## **Work Package 5: Radiation protection and safety issues for accelerator and experiments**

### Task 5.1 Experiment Radiation & Activation:

This task foresees to perform simulation calculations for activation and radiation in the detectors and adjacent regions.

In order to ensure the reliability of computer simulation results from Monte-Carlo programmes, it has been decided that, as a first step, a validation of the simulations with various active and passive radiation detectors would be undertaken at LHC. The contract partners selected a number of specific radiation monitors and installed them at suitable locations in the experiments ATLAS and CMS. (A suitable location provides an "interesting" radiation field while being easily accessible during shutdown to access the detector) Detectors comprise various active radiation monitors based on bulk semiconductor-, scintillator- or Pixel-technology and passive detectors such as thermoluminescence (TL) detectors, Alanin or radiophosphorous luminescent (RPL) glass detectors.

(CERN, USFD, CTU, PSI)

In parallel, the numerical models of the two experiments CMS and ATLAS were updated. While until now all predictive radiation transport simulations were performed with numerical models "as planned", it is now the time to implement the "as built" state in the models. In addition, all previous simulations for ATLAS were performed with a computer code in which the partners have no technical competence and it has been decided to rewrite the model for the FLUKA Monte-Carlo code. In order to produce versatile numerical models which will be flexible enough to also accommodate design changes for sLHC without rewriting the whole "geometry" from scratch, modern techniques using geometrical and material databases were set up and used.

(CERN, USFD)

The updated numerical models allowed making predictions of detector responses assuming LHC luminosities during the first year of operation. Unfortunately, after an incident, LHC has been stopped after only 10 days of operation in 2008. No collisions have been performed, and most of

the radiation detectors have not given any exploitable signal. A noteworthy exception are the Pixel detectors from CTU which were showing promising signals already from stray radiation background of beam loss in the LHC tunnel upstream of the ATLAS experiment.

Due to the particular schedule of the LHC in 2009 and 2010, in which no shut-down is foreseen at the end of 2009, it can already be foreseen that deliverable 5.1.2 "Estimation of radiation and activation levels for critical areas of the experiments at sLHC" will be delayed beyond M24 of the project. While the simulation calculations will be ready by that date, the validation of the codes will only be partially complete and a final statement cannot be made.

#### Task 5.2 Accelerator Radiation & Activation:

This task foresees simulation calculations for activation and radiation in critical regions of the sLHC and its injectors. Here, validation is of less importance as the employed Monte-Carlo code FLUKA is well tested and benchmarked at energies up to 450 GeV, the maximum proton energy in the last part of the injector chain, the Super Proton Synchrotron (SPS).

Instead, sLHC will require a renewed injector chain, comprising Linac4 (160 MeV). A low-power superconducting proton linac (LPSPL) or a rapid cycling synchrotron (RCS) (4 GeV), a successor of the venerable Proton Synchrotron PS, dubbed PS2 (50 GeV) and finally an upgraded SPS. At present, only broad conceptual designs for the accelerators LPSPL and PS2 are available. As they will not only serve the sLHC with proton beams but also a new fixed-target physics programme at CERN, they will have a significantly higher beam intensity than the present injectors and therefore a higher potential for beam loss. The present moment is the right moment to evaluate if beam loss in these accelerators could lead to unacceptable situations for the radiation protection of personnel, public or environment.

The first step in this evaluation consists in a collection of the foreseen operational parameters of the future injectors (mainly, beam energy, particles per accelerator pulse and long-term average beam current and, in order to estimate prompt dose rates, activation of materials and residual dose rates). This is complemented by a compilation of foreseeable beam-loss points such as collimators, injection- and ejection regions and beam-dumps. It is anticipated that at these locations activation by the beam and thus dose rates will be the highest. Because of its importance, this collection of parameters has been declared a Milestone of the project, due M12. An internal report has been compiled and edited.

(CERN)

The design of one of the injectors, PS2, is presently in the phase where the location of various beam-intercepting devices has to be determined. As a function of the dose rate for personnel during access to the accelerator, some general guidelines can be given. In a simulation study it turned out that the injection beam dump of PS2 can be built in such a way that a dose rate level of 50 microSv/h at its surface can be maintained. This allows to place it in the accelerator vault, avoiding the construction of a remote beam dump alcove with a more complicated beam line. The next items to be analysed are the injection region of PS2 and its collimators.

(GSI)

Similar studies as for the PS2 have been initiated for the injection of Linac4 beam into the existing PS Booster (PSB).

(CERN)

#### **Work Package 6: Development of Nb-Ti quadrupole magnet prototype**

The activities in work package 6 have globally well advanced during the first year of the project. Although the project objectives for the first year have been met successfully, the project now suffers from lack of expert manpower. This is due to the repair activities following the September

2008 incident in the LHC. The work in the partner institutes has also been partially slowed down because of the lack of definition of design parameters by CERN. Altogether this will undoubtedly lead to delays for the upcoming WP6 deliverables and milestones.

#### Task 6.1: Design of advanced Nb-Ti superconducting quadrupole

At the beginning of the year the structure of the collaboration was set up for this task and the work has been concentrated at CERN in order to study the possible optics of the final insertion, taking into account the feasible hardware options. In order to save time and money, it was decided to explore possible low- $\beta$  quadrupole magnet cross sections using the LHC Main Dipole Nb-Ti superconducting cable. The parameter space has been widely explored identifying an aperture of 120 mm as the best technical solution. With such an aperture, and using the above mentioned cable, the outcome is a magnet with a gradient of 118 T/m with about 20% margin to quench on the load line.

For milestone 6.1 the project has concentrated mainly on 2 study lines:

- 1) Verification that material and components available at CERN (stored at the end of the LHC magnet production) could be used to produce the new generation of insertion quadrupoles. Available quantities and characteristics of superconducting cables, low permeability stainless steel and of low carbon steel have been scrutinised. No showstoppers have been found in using the superconducting cable. For the low permeability steel an order of 700 tonnes of this material has been placed to supplement the stock.
- 2) Study of a possible new porous insulation scheme. This development has targeted the possibility of using known insulating material (polyimide tapes) in an innovative way in order to provide a better cooling of the cable. A detailed campaign of tests has been performed, as described in the milestone 6.1 document, showing an improvement of the heat exchange up to a factor of 4. These results also show that the improved heat transfer capacity is not dramatically reduced when the cable stack is loaded with high compressive forces. These results will be documented in 2 articles to be presented at the MT21 conference in China in October 2009 ("Heat Transfer of an Enhanced Cable Insulation Scheme for the Superconducting Magnets of the LHC Luminosity Upgrade" Pier Paolo Granieri, Paolo Fessia, David Richter, Davide Tommasini; "Electrical and Mechanical Performance of an Enhanced Cable Insulation Scheme for the Superconducting Magnets of the LHC Luminosity Upgrade", Paolo Fessia, Pier Paolo Granieri, Sebastien Luzieux, Davide Tommasini, Alexandre Gerardin, Michael Guinchard, Stefano Sgobba).

The project team has then worked on the following items:

- 1) 2D Magnetic design. This activity has led to optimising a magnet cross section that has been at the moment fixed as reference. The harmonic field-error table has been built and possible construction alternatives and their impact on the design has been studied (i.e. the position of the heat exchanger).
- 2) 3D magnetic design: this work has provided a first design of the coil heads of the non connection side demonstrating that it is possible to build heads without additional peak field enhancement.
- 3) Protection: possible protection schemes with quench heaters, multiple quench heaters, and dump resistors have been studied. The solution with large quench heaters (covering about 11 turns of the outer layer) and the dump resistor looks to be the more suitable, because in this configuration the 2 systems provide full redundancy.
- 4) Mechanical design: CERN has carried out the initial computation in order to define the collar thickness and the key positioning. As a result of this work, a 35 mm thick steel collar has been retained as the preferred solution for the mechanical structure. The collar is "self standing" meaning that all the magnetic and assembly forces are kept by the collar itself eliminating the coupling with other mechanical elements. This feature allows reducing costs and avoids manufacturing difficulties. CEA has then revised the analysis with a more detailed FEA model. The computation has shown that the collar dimensioning was correct and the model is being used to compare different structural solutions.



Points 1 and 2 are described in detail in the document provided as milestone 6.2: "Electromagnetic design of the 120 mm aperture quadrupole for the LHC phase one upgrade", F. Borgnolutti, P. Fessia and E. Todesco.

The task also includes the design and development of the corrector magnet models, with the following results for the first year:

### **Correctors:**

In the proposed triplet layout the corrector magnets are grouped in a dedicated cryo-assembly, corrector package, located between the Q3 and D1. This corrector package contains a horizontal and a vertical orbit corrector (MCXB), a skew quadrupole (MQSX), and a sextupole (MCSX) operating at 1.9 K. The specification of the higher order corrector types will be based on the field quality estimates for the low-beta quadrupoles and the D1 dipole, presently in discussion. The complete corrector package is expected to occupy a longitudinal space of 5 to 7 m and the magnet aperture shall be larger or equal to that of the low-beta quadrupoles, presently set to a diameter of 120 mm. The FLUKA studies suggest that a significant reduction of the energy deposition could be achieved by enlarging the corrector aperture beyond that of the quadrupoles and further reduction could be obtained by adding shielding between the beam tube and the coils. Therefore, at this point an aperture diameter of 140 mm has been chosen for all the correctors.

The Phase-I upgrade will require four corrector packages and one or two spare assemblies. The plan is to first build and test a model magnet of each type followed by a prototype magnet that can be integrated into a prototype cold-mass. The design and fabrication of the model magnets is shared between CERN, CIEMAT and STFC. CERN is responsible for the detailed design and fabrication of the MCXB. STFC will design and build the MQSX model magnet and CIEMAT will design and build the MCXS model magnet, according to the Engineering Specification provided by CERN.

The design activity of the corrector magnets has followed the evolution of the parameter space and the optics requirements. In the first phase we explored the concepts based on scaling up the presently installed correctors in the LHC that would re-use as much as possible the existing powering infrastructure. The conceptual magnetic and mechanical designs were presented in the interaction region upgrade review in July 2008.

Since the review and the incident in sector 3-4 of the LHC machine, the design activity of the correctors has been significantly reduced. In addition, the main parameters of the higher order correctors has been a subject of optics studies and it was confirmed in March 2009, that the integrated strength of the MQSX (40 T) is compatible with the present requirements, but the MCXS shall be two times stronger. The final number of the orbit correctors and their location in the Inner Triplet is still being studied and results are expected around June this year. It is likely that an additional pair of weaker MCXB magnets (2.0 Tm) will be required in-between the Q2a and Q2b magnets.

### **MCBX:**

The nested dipole correctors based on epoxy-impregnated coil are not considered appropriate for the Phase-I performance goals and alternative solutions using Rutherford-type cables are being investigated. Besides helium transparency, this type of coil should also profit from larger temperature margin offered by the 1.9 K cooling. The operating current has been chosen to be around 2.5 kA and new 3 kA power converters are being designed at CERN.

This design is based on 18-strand cable, which will be produced at CERN using the available 270 km stock of LHC strand #5. This quantity would comfortably cover the development and prototyping work, as well as the need for the series magnets. The suggested cable insulation makes use of the existing stock at CERN and is composed of two layers of 25  $\mu\text{m}$  polyamide wrapped with no overlap followed by 55  $\mu\text{m}$  b-stage polyamide layer. A first trial length of the cable has been successfully produced and some 100 m are being made for the insulation trials and the mechanical characterization of the coil stacks.

The preliminary quench calculations indicate that an external resistor of 0.16  $\Omega$  would ensure a safe operation of these individually powered magnets and no additional quench heater circuits would be necessary.

The mechanical structure is based on a stand-alone collar structure, where the collars shall be rigid enough to sustain the magnetic forces. Finite element analysis is underway to determine the collar dimensions and the inner diameter of the iron laminations. The outer diameter of the yoke of 550 mm is in line with the low-beta quadrupole and these cold-masses shall share the same location and the diameter of the hole reserved for heat exchanger. The collared coils are aligned in the yoke through 4 keys following the same concept as the LHC insertion quadrupoles. The helium vessel is made of two welded stainless steel half cylinders of 10 mm thickness. The coil fabrication tooling has been designed and a price enquiry has been carried out to minimize the lead-time once the magnet design will be finalized.

#### **MQSX:**

The present skew quadrupole concept is based on a small 15-strand Rutherford-type cable using the same strand as for the MCXB, and operating at around 1.5 kA. The magnetic design optimization is in progress and will be followed by the FEA of the mechanical structure. The tooling for the cabling trials have been ordered and first lengths are expected in May 2009.

#### **MCXS:**

The MCXS sextupole shall correct for the systematic b3 from the D1 dipoles. CIEMAT has made the first conceptual magnetic design of a super-ferric MCXS that was updated in March 2009 to meet the new optics requirements. The epoxy-impregnated race-track coils are wound with single wire to operate the magnet at low current in the range of 120 to 150 A.

#### Task deliverable:

##### Deliverable 6.1.1

- a) The basic design of the triplet is resumed in the report: "Conceptual Design of the LHC Interaction Region Upgrade : Phase-I", LHC-PROJECT-Report-1163.
- b) "Pré-étude mécanique du quadripôle destiné aux futurs Triplets NbTi", M. Segreti, CEA.

#### Task 6.2 Construction and testing of short models:

At CEA and CERN the activities related to the construction and testing of the quadrupole short model have started by installing and commissioning the necessary tooling. At CERN detailed studies for the coils' winding and curing tooling have been performed according to the known parameters. All components that depend on the final cable distribution are in stand by while the rest of the tooling is being procured. The cable insulating machine has been installed at CERN and modified in order to make it suitable for the new insulation scheme. The insulation machine is presently under commissioning.

#### Task 6.3 Construction and testing of a full-scale prototype:

This activity has not yet started because it shall follow the previous two. The only institute working within this framework is CNRS which has started defining the main parameters of the future cryostat. As the interface conditions between the magnet cold mass and the cryostat are fixed, the work can be pursued in parallel. This task has thus suffered somewhat less from the delays accumulated due to the LHC sector 3-4 incident.

### **Work Package 7: Development of critical components for the injectors**

#### Task 7.1

Task 7.1 aims to develop towards a high power negative hydrogen ion source for a future Superconducting Proton Linac (SPL) at CERN. Specifically, the plasma generator of a 2MHz RF ion source should be studied to run at high average power, and the design and construction of such a plasma generator take place.

#### *Summary of progress*

**Linac-4 Ion-source:** The Linac4 ion-source is a copy of the non-caesiated DESY volume H<sup>-</sup> ion-source; it is now assembled in CERN's 3MeV test stand and successfully passed the vacuum tests. The source is ready for safety and sub-systems functionality tests; it is aimed to start plasma ignition in June 2009. This is an important success as major inputs to the LPSPL plasma chamber simulation and design will result from measurements on the Linac4 ion-source.

**MHz RF-amplifier:** The measurement technique of the RF coupling is being discussed and tested with dummy loads and with the Linac4 ion-source body. A method and circuit for tuning and measuring the RF-coupling is defined, and will be tested with the source when the matching components are assembled with the source.

**Measurement techniques:** The engineering of a high power high duty factor plasma chamber requires thermometric measurement to benchmark the heat flow simulation. Furthermore, plasma properties needs to be assessed, for this purpose, optical spectrometry of the Linac4 ion-source's plasma will be performed and later used to benchmark the LPSPL plasma chamber spectrometric results.

**Thermal modelling:** The Linac4 ion-source was modelled and the cw heat flow at equilibrium for conditions corresponding to nominal operation of Linac4 and LPSPL were simulated via finite element method with the ANSYS and ANSYS workbench software packages. Its main outcomes are summarized in the "significant results" section, and in the deliverable report 7.1.1. Collaboration visits between CERN and STFC helped to define parameters for the modelling.

**Modelling of H<sub>2</sub> pressure measurement of the DESY H<sup>-</sup> ion-source:** The DESY ion-source relies on a pulsed H<sub>2</sub> gas injection. The increase in duty factor constrains the gas injection and is a key input to the dimensioning of the vacuum system and to the H<sub>2</sub> injection. Typical time constant of the injection were measured by J. Peters at DESY, and fitted to a simple effusion model.

**Modelling of magnetic field:** The 3D-Magnetic field distribution of the Linac4 ion-source was measured and simulated with the OPERA software package.

**SPL-plasma Chamber test stand:** The 50 m<sup>2</sup> laboratory is available since February 2009. It is being refurbished and equipped with the necessary ancillary equipment (demineralised water, electrical power and gas distribution). The specification of the electrical power requirements for the sub systems of the LPSPL plasma chamber test stand is completed and installation will start soon.

#### *Significant results*

Thermal modelling: The Linac-4 ion-source is an assembly of close to a hundred pieces; more than 50 pieces made of 13 different materials are included in the thermal simulation of its plasma chamber. The heat sources accounted for are the ignition electron gun and the RF-heated Hydrogen-plasma. The heat transfers included in the simulation were thermal radiation, conduction and convection (outside the vacuum region). The plasma-heat source was approximated as a rotation ellipsoid black body centred in the plasma chamber and the antenna coils. The temperature of the radiating body was chosen to match the radiated power to the average RF-power of the considered scenarios (Linac4 and LPSPL).

Within the limits of the uncertainty induced by this hypothesis, the simulation shows that:

- The magnet cage temperature is at the limit of the material already at the Linac-4 nominal operation.
- If the Linac-4 plasma chamber would be operated under LPSPL nominal average power, most pieces would fail; water cooling is mandatory and will be inspired from the SNS RF caesiated ion source cooling system.
- The main ceramic chamber and most insulating materials should be replaced by high conductivity ceramics (i.e. Aluminium-nitride)
- The collar is a critical element requiring further development to keep its temperature at a lower value for high duty factor operation.

- Assessment of the heat diffusion barriers between two pressed pieces requires direct measurement to benchmark the simulation
- RF-plasma coupling, Plasma and extraction of ions and electrons requires dedicated simulation and benchmarking experiments.

#### *Deviations from Annex I*

No deviation from Annex 1 in terms of results.

#### *Statement use of resources and deviations*

During the first year, and despite the 5 month delay necessary to hire a fellow, a very effective and focused effort on the heat simulation allowed meeting the deliverable's deadline; however, a small shift in the spending profile occurred.

#### *Corrective actions*

A strong effort is being launched between January and March 2009 to ensure that the spending profile will be back on tracks by the end of the second year of the project.

#### Task 7.2

##### *Summary of progress*

Task 7.2 comprises R&D and prototyping work for a low-level RF system to stabilize the RF field in pulsed superconducting low beta ( $v/c$ ) accelerating structures such as required for a future superconducting H-linac at CERN [1]. The task can be viewed as being split into three main parts, firstly the characterization of two cavity-tuning ensembles at an RF frequency of 704 MHz, having been developed under the FP6 program by INFN Milano and CEA Saclay [2], secondly a simulation part aimed at modelling the RF low level system, and thirdly the building of prototype electronics to implement the control algorithms and validate the low level RF system design. Progress and results of 2008 have been reported and documented at the annual meeting in February 2009 [3].

##### *Significant results*

During the year 2008 good progress was made with the preparations of the tests. In advance of these tests in the horizontal cryostat at CEA Saclay the field flatness of the INFN cavity was checked at INFN after integration with the final helium tank and magnetic shielding necessary for the horizontal testing. The field flatness of 10% measured is acceptable for the further tests. Following additional checks at INFN the INFN cavity will be shipped to CEA Saclay for the high power testing and tuner characterization. At CEA Saclay the parts for the final tuning system for the CEA cavity have been received and are being assembled. The power couplers that have been developed under the FP6 program are an essential part for high power testing. They have originally been designed for a power of 1 MW and must be operated up to 230 kW forward power for the tests with the two prototype cavities. Conditioning of the couplers in transmission mode is progressing well. The couplers have reached 1.2 MW peak power with a 10% duty cycle on the test stand, limited by the RF power source capabilities. The conditioning in full reflection mode is now underway.

The prototype electronics used is based on the LHC LLRF (RF frequency of 400.8 MHz) system [4] and has been modified to work at 704 MHz [5]. A dummy cavity was used to prove that the set-up is capable to acquire forward and reflected RF power as well as the cavity field in a synchronous way as required to calculate the Lorentz-Force detuning, and also regulate the cavity field. A fourth channel can be used to measure the klystron forward power in amplitude and phase for an optional klystron loop. The hardware for the test set-up is ready and is now being complemented by a software interface running on a stand-alone computer in order to make it portable for the tests at CEA Saclay. The test set-up with the combined computational power achieved by the VME front-end computer, a DSP on the tuning VME module and an FPGA make it sufficiently versatile to adapt to any practically useful control algorithm that we may want to use later in the project. Thus, de-facto, part of the milestone M30 ("Production of prototype electronic system") has already been achieved – the hardware development part. The soft- and FPGA firmware part will be further developed and optimized during the project towards the full system validation.

An Existing Matlab simulation was modified at CEA Saclay for simulations on the 704 MHz cavity LLRF systems and first results are encouraging [7]. Further work needs a decision on the topology of the LLRF systems and the control algorithms. Concerning these algorithms and the topologies, contacts were established with two leading facilities in this field, (DESY and SNS) who already operate super conducting linacs. Information was gathered for the RF system layout which was discussed and presented at the LPSPL collaboration meeting at CERN in December 2008 and provided the necessary input for the RF system layout variants that need to be considered for simulations.

#### *Deviations from Annex I*

The project planning foresaw as a first deliverable (M12) the in depth characterization of the cavity and tuning systems. Achievement of this deliverable draws heavily on the results and the availability of equipment developed under the FP6 program.

Following the annual meeting in February 2009 it was pointed out to project management that proper achievement of this first deliverable is feasible within 12 months counting from February 2009, in order to have the cavity, coupler and tuner available, (developed under the HIPPI-FP6). A further 6 months were required to properly integrate all parts into the horizontal test stand at CEA Saclay and then 3 months per cavity for testing, and then analyse and report on the results. According to this new schedule cold testing would be scheduled from September 2009 to February 2010, and M12 would move by 10 months to become M22.

The low level RF simulation work has begun, but its continuation requires the recruitment of additional personnel. There has been a long delay in finding a suitable candidate (under the CERN fellow programme).

The good progress with the low level electronics work towards milestone M30 makes us confident that despite delays in achieving milestone M12, the overall schedule will be met provided resources can be found to work on the simulation part.

#### *Statement use of resources and deviations*

Due to delays in hiring personnel as CERN fellows, some budget has been transferred to:

- Material - for the future production of electronics.
- Travel - in order to survey the low level rf control installations for superconducting Linacs at other laboratories (SNS, Oak Ridge and DESY, Hamburg).

#### *Corrective actions*

A suitable candidate will be sought at the forthcoming CERN fellow committee (the budget is foreseen in the task), and it will be drawn on the expertise at CEA Saclay in order to complete the LLRF simulations.

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## **Work Package 8: Tracking detector power distribution**

### Task 8.1

The objectives of task 8.1 have been fully reached and the project is well within the schedule.

Important R&D steps for the development of custom radiation-hard DC-DC converters during this funding period are listed below and are described in much more detail in the deliverable report:

- After a literature survey of converter topologies suitable for our application, the most promising step-down architectures have been evaluated in detail and compared in terms of efficiency, complexity and the required number of components.
- As a result of this study, a power distribution scheme based on two conversion stages has been identified as the best compromise. A first simple buck converter providing power to a full detector module is followed by switching capacitor converters embedded in the detector readout ASICs.
- Due to the large magnetic field in sLHC trackers, the inductor necessary for the simple buck converter has to be coreless (air-core). 3-D simulations were used to study the electromagnetic noise emission from coreless inductors of different designs. Shielding of the emitted field appears to be required.
- Two specialized measurement stations have been set up (one at CERN and one at RTWH Aachen) to characterize the input/output conducted noise from DC-DC converter prototypes. They already proved to be a crucial development tool and helped decrease the conducted noise of converter prototypes by more than one order of magnitude.
- The system-level implications of converter noise have been investigated with spare detector modules/systems of the LHC generation. The final performance and noise immunity depend on the detailed system implementation, which must be optimized. The available detector modules/systems will be further exploited to guide the design of new systems and converter prototypes.
- A first prototype of a divide-by-two switching capacitor converter suitable for on-chip integration in a future readout ASIC has been designed in a 0.25  $\mu\text{m}$  CMOS technology. Design choices (size of the transistors, switching frequency, capacitances) have been guided by an analytical model that has been developed.

During the first year, we focussed on the study and comparison of suitable converter topologies and the development of infrastructure tools: specialized characterization stations, full-detector systems for integration studies and 3-D simulation tools. With these tools and first prototypes being in place, the project has now excellent foundations to build on.

### Task 8.2

The objectives of task 8.2 have been fully reached and the project is well within the schedule.

Important R&D steps for the development of custom radiation-hard Serial Powering Systems during this funding period are listed below and are described in much more detail in the deliverable report:

- Several serial powering systems, in particular a 6-module silicon strip stave and a 30-module stave were operated and characterized. The staves could be run reliably and with good electrical performance. The serial powering electronics of these staves was based on commercial discrete components and is thus not suitable for sLHC.

- First prototypes of custom serial powering circuitry have been designed and delivered. This will allow us to test several alternative serial powering architectures for strips and pixel detectors. The arrival of these chips is slightly ahead of schedule, which is most welcome since we anticipate that several iterations in different technologies will be required before the final solution will be found.
- A grounding and shielding scheme for a serially powered short strip supermodule has been developed. A system architecture for a serially powered ATLAS short strip supermodule has been proposed. The architecture covers all elements relevant for serial powering and beyond (AC coupling of signals; powering of readout-chips, module controller chips, supermodule controller chips and optical links; protection schemes and slow-control).
- Different schemes to generate analog and digital voltage for the anticipated final readout-chips in 130 nm CMOS technology were identified. For the final readout chips analog voltage exceeds digital voltage (1.2 V analog vs. 0.9 V digital), while for the current electronics digital voltage is larger than analog. The efficiencies of the above schemes have been identified and first design studies have started.
- The interruption of the current loop through a fault condition must be avoided since it would imply the loss of all modules on a stave. Several protection schemes have been investigated, prototyped and simulated. There is general convergence on the desirable features of the protection system. A first custom test chip is being designed.
- There are no commercial-constant current sources with the features required for serial powering at the sLHC. A first constant current source has been specified, designed and assembled by a collaborator, and been tested. Performance is satisfactory and a second optimized prototype is being specified.

The most valuable progress has been the much increased understanding of the system properties of silicon strip supermodules, albeit based on commercial electronics. This includes the successful performance of supermodules with the chosen grounding and shielding scheme and the operation of supermodules from a single HV line and in a multi-drop AC coupling. Another highlight is the arrival of the first functional custom electronics for both pixel and strip detector systems. The detailed characterization and implementation in supermodules of these prototypes will provide extremely valuable guidance for the next generation of prototypes.

### **3.2 Overall personnel effort in the first year:**

A summary table presenting the budgeted resources for the whole project, as they appear in 'Annex I – Description of Work', and the use of resources as declared for Period 1 is shown below. The last column shows in addition the calculated percentage of use of resources in year 1 versus the amount budgeted for the whole duration of the project (3 years). A value around 30% is expected for Period 1 and this is shown for most beneficiaries. GSI (beneficiary 10) shows for the time being a smaller value than the average 30% because their main contribution to SLHC-PP was foreseen to rise from Period 2. CTU (beneficiary 6) is involved in WP5 and increased the team working on the SLHC-PP project compared to the original planning. The main reason was to exploit efficiently the time till the LHC startup to upgrade parts of ATLAS-MPX network, which are dedicated to on-line measurements of neutron background within and around the ATLAS experiment and around LHC itself. CTU has also contributed significantly to the construction of a similar network of five devices (CMS-MPX) installed in CMS experiment. The resources reported by UNIGE (beneficiary 16) represent a significant increase compared to the initial budget. UNIGE has been very active in the initial phase of the WP3 project due to two reasons: a strong involvement in ATLAS Inner Detector Planning generally and second, leading a review process for the future performance of the innermost layers of ATLAS and defining the plans for improving them. CIEMAT (beneficiary 4) is involved in WP2 and WP6. Their involvement in WP2 will start later in the project. The work for WP6 has been partially slowed down because of the lack of definition of the MCXS design parameters, as the final optics are not completely fixed. This activity is expected to raise in the second year the project.

Beneficiary	Management		Coordination								Support		RTD								TOTAL		%
	WP1		WP2		WP3		WP4		Sum		WP5		WP6		WP7		WP8		Sum		Budget	Actual	%
	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	%
1 CERN	49	17.4	38	3.3	52	5.0	48	16.6	138		58	16.1	72	23.4	148	24.4	48	20.1	268		513	126	25%
2 AGH-UST																	36	7.4	36		36	7	21%
3 CEA-Saclay			6	0.0					6				49	16.2	23	15.8			72		78	32	41%
4 CIEMAT			4	0.0					4				30	5.5					30		34	6	16%
5 CNRS-IN2P3													18	4.1					18		18	4	23%
6 CTU										18	13.8										18	14	77%
7 DESY						18	1.2		18						2	3.0			2		20	4	21%
8 ETH Zürich							15	6.3	15								0				15	6	42%
9 FOM-NIKHEF					20	6.4			20												20	6	32%
10 GSI										16	1.2										16	1	8%
11 Imperial							9	3.6	9												9	4	40%
12 INFN														7	1.7				7		7	2	24%
13 PSI										16	0.1						16	4.2	16		32	4	14%
14 STFC			4	1.0	20	6.5			24				24	2.8	1	0.6	35	15.0	60		84	26	31%
15 UBONN																	48	23.1	48		48	23	48%
16 UNIGE					10	6.4			10												10	6	64%
17 USFD										8	2.9										8	3	36%
18 RWTH Aachen																10	2.3	10			10	2	23%
<b>TOTAL P-M</b>	<b>49</b>	<b>17.4</b>	<b>52</b>	<b>4.2</b>	<b>102</b>	<b>24.4</b>	<b>90</b>	<b>27.7</b>	<b>244</b>	<b>0</b>	<b>116</b>	<b>34.1</b>	<b>193</b>	<b>52</b>	<b>181</b>	<b>45.5</b>	<b>193</b>	<b>72</b>	<b>567</b>	<b>0</b>	<b>976</b>	<b>277.4</b>	<b>28%</b>

Summary of personnel efforts (person-month) per beneficiary and per WP for the 1<sup>st</sup> year (actual) as compared to the foreseen effort for the full 3 year duration of the project (budget).



## 4. Deliverables and milestones tables

### Deliverables (excluding the periodic and final reports)

Reports of all deliverables are available at the url <http://cern.ch/SLHC-PP/MILESTONES.htm>

<b>TABLE 1. DELIVERABLES2</b>									
Del. no.	Deliverable name	WP no.	Lead participant	Nature	Dissemination level	Due delivery date from Annex I	Delivered Yes/No	Actual / Forecast delivery date	Comments
1.2.1	SLHC-PP web-site operational (intranet + public pages)	1	CERN	O	Public	M03	Yes		
3.1.1	Project management structure and review office for R&D phase in place	3	CERN	O, R	Public	M06	Yes		
2.2.1	Functioning collaboration communication structure	2	CERN	O	Public	M12	Yes		
2.2.2	Project web site linked to the technical databases: Machine layout database, hardware baseline database, project notes and reports	2	CERN	O	Public	M12	Yes		
4.1.1	Project Structures for construction of systems and sub-systems	4	CERN	O, R	Public	M12	Yes		
4.2.1	Personnel and working practices of the Technical Coordination unit in place	4	CERN	O, R	Public	M12	Yes		

**2** For Security Projects the template for the deliverables list in Annex A1 has to be used.

6.1.1	Basic design of the triplet	6	CERN	R	Public	M12	Yes		
7.1.1	Finite element thermal study of the Linac 4 design source at the final duty factor	7	CERN	R	Public	M12	Yes		
7.2.1	In depth characterisation of the two tuners plus cavities developed in the frame of the "HIPPI" JRA , FP6 (tuner/cavity characteristics)	7	CERN	R	Public	M12	No	M22	Delayed due to late delivery of input material from HIPPI programme (Framework Programme 6)
8.1.1	Evaluation report on DC-DC conversion technologies	8	SFTC	R	Public	M12	Yes		
8.2.1	Evaluation report on generic serial powering studies and specification of serial powering components	8	SFTC	R	Public	M12	Yes		

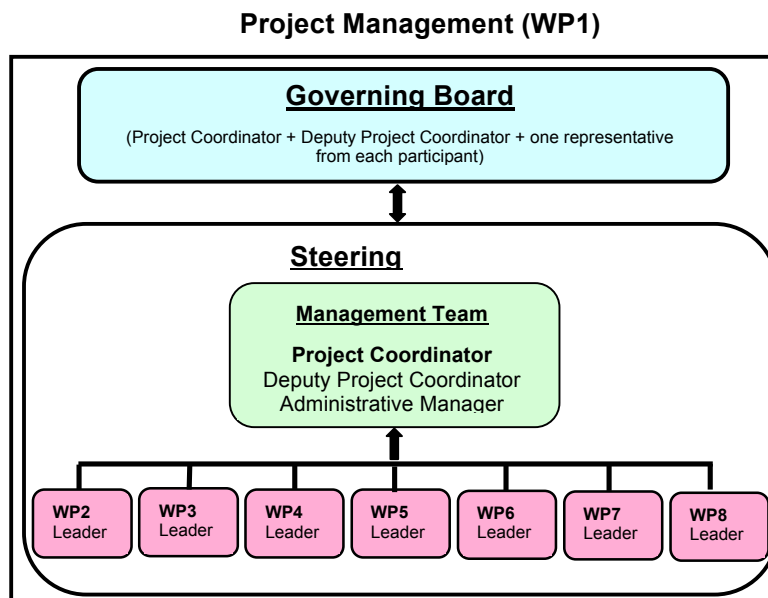
## Milestones

Reports of all milestones are available at the url <http://cern.ch/SLHC-PP/MILESTONES.htm>

<b>TABLE 2. MILESTONES</b>					
<b>Milestone no.</b>	<b>Milestone name</b>	<b>Due achievement date from Annex I</b>	<b>Achieved Yes/No</b>	<b>Actual / Forecast achievement date</b>	<b>Comments</b>
1.1	Kick-off meeting	M03	Yes		
6.1	Qualification of magnet components	M08	Yes		
3.1	Schedule for the R&D phase	M09	Yes		
6.2	Basic Magnet design	M10	Yes		
1.2	First Annual SLHC-PP Meeting	M12	Yes		
5.1	Compilation and evaluation of design parameters and details relevant for the assessment of radiological impact; Identification of critical parameters and potential design constraints	M12	Yes		

## 5. Project management

The SLHC-PP project management and work package coordination have been successfully implemented through the management structure shown in the Figure below; the responsibilities of each body have been explained in 'Annex I - Description of Work'.



The management team consists of the Project Coordinator, Deputy Project Coordinator, and Administrative Manager. The Team profits from administrative assistance for their various activities. During the first year of the SLHC-PP project, those activities included:

- Administration of the community financial contribution regarding its allocation between beneficiaries and activities. Payments were done without delay upon receipt of EC funds at CERN and bank data of each beneficiary were made available. Most payments were carried out with value date June 6<sup>th</sup> 2008.
- Keeping the records of the Community financial contribution paid to each beneficiary.
- Preparing and maintaining the Consortium Agreement. The Agreement was distributed on February 25<sup>th</sup> 2008 and consequently signed by all parties.
- Monitoring of the compliance of the beneficiaries with their obligations under the Grant Agreement, by monitoring their expenditure of resources and work progress.
- Reviewing the deliverables and milestones reports to verify consistency with the project tasks before transmitting them to the Commission. Reports have been made available to the Commission project officer by email on due date and made public on the SLHC-PP web pages <http://cern.ch/SLHC-PP/MILESTONES.htm>.
- Organizing the SLHC-PP kick off meeting at CERN on the 8-9 April 2008. The overall programme, contributions to all sessions, and participants are available at the url <http://indico.cern.ch/event/29254>. The meeting included the organization of a public kick-off event attended by more than 300 people. The public sLHC R&D kick-off event was organized as part of the SLHC-PP project start-up and intended to inform the particle physics community about the SLHC project in general: its physics motivation, the status of the LHC accelerator and injector upgrade plans, and the LHC detector upgrade plan.
- Organizing the First SLHC-PP Annual meeting at CERN on the 25-26 February 2009. The Annual Meeting assembled all participating institutes to discuss the scientific program with emphasis on results of the first year of the project and ideas and plans for the second year

of the project. The workshop was open to everyone interested in the international R&D effort towards the LHC luminosity upgrade. The overall programme, contributions to all sessions, and participants are available at the url <http://indico.cern.ch/event/49777>. The meeting included the organization of a public event with the aim of informing the particle physics community about the current status of preparation work for the future LHC luminosity upgrade. The presentations provided an overview of the various accelerator sub-projects, the physics potential and the experiment upgrade plans. More than 200 people in CERN's main auditorium attended the event and simultaneous transmission of the meeting was broadcasted.

- Organizing the long-term storage of all SLHC-PP documentation based on the Engineering and Data Management System of CERN (EDMS). The following url is the entry point to the system: <https://edms.cern.ch/nav/CERN-0000072367>. EDMS ensures that documentation for the project is safeguarded, organized, verified and remains retrievable on a long-term basis.
- Development and maintenance of the project web site. The web site was created in October 2007, after the successful submission of the SLHC-PP Proposal to the European Commission. The site has evolved into an essential facility for disseminating information and managing the SLHC-PP project. Currently the site is divided in 3 major sub-units: the project pages (<http://cern.ch/SLHC-PP>), the password-protected internal pages (<https://cern.ch/SLHC-PP/Internal>) and a set of pages targeting the general public (<http://cern.ch/slhcpp/>).
- Development of the Project Progress Tracking (PPT) IT tool that keeps record of timesheets for all beneficiaries. The tool permits to monitor reported hours for all beneficiaries on a monthly basis and it is used to monitor work progress. PPT also handles the so-called internal cost claims that serve to prepare the final Forms C for the Commission.
- Organizing the work related to the SLHC-PP Annual Report.
- Releasing an administration guide for the project describing the reporting needs during the course of the project and specific procedures for SLHC-PP.
- Three Steering Group meetings were organized at CERN in the following dates: April 3<sup>rd</sup> 2008, July 3<sup>rd</sup> 2008 and November 24<sup>th</sup> 2008. Discussions, actions and major decision were minuted and transmitted by the Coordinator to all Steering Committee members for their approval.
- Two Governing Board meetings were organized at CERN in the following dates: April 8<sup>th</sup> 2008 and February 25<sup>th</sup> 2009. Discussions, actions and major decision were minuted and transmitted by the Coordinator to all Governing Board members for their approval.
- Launching an amendment to the Grant Agreement to include RWTH Aachen as beneficiary number 18 of SLHC-PP. RWTH Aachen contributes to the development of novel DC-DC powering schemes for tracking detectors (work package 8, task 8.1). The Commission on 30/01/09 approved the amendment and Aachen became party to the SLHC-PP project with retroactive effect as from 01/12/08. In total RWTH Aachen deploys 100 k€ for this work, including 10 person-months of personnel resources. The additional work carried out by Aachen will strengthen the overall quality of the deliverables of work package 8. The total estimated SLHC-PP project cost has increased by 100 k€ to 15,671 k€. The total cost for the Commission will remain unchanged as CERN reallocated 25 k€ of its EU funds to RWTH Aachen.

### **Co-ordination activities:**

WP3: Coordination for the S-ATLAS experiment implementation

In WP3 there are regular ATLAS wide meetings to follow up the project. These meetings are organised by participants in WP3 but include 10-15 people in the ATLAS project office and upgrade steering group. Twice a year the entire project is reviewed in a week long meeting series, including more than 100 talks and more than 200 participants. Included in these meetings are several studies related to WP5 and 8 of SLHC-PP, and usually there is also a presentation about the sLHC accelerator project. Furthermore, there are regular review meetings where the ATLAS and CMS upgrade projects are reviewed together (WP3 and WP4) and also progress on the machine is

presented (WP2). During these meetings there are also progress reports on the Inner Triplet projects and Linac4, (WP6 and WP7).

**WP5: Radiation protection and safety issues for accelerator and experiments**

Within WP5 we try to foster co-operation between ATLAS, CMS and the CERN Accelerator Sector in matters of radiation monitoring, with the main purpose of validating Monte-Carlo simulations of the radiation environment in LHC and making predictions for sLHC. There are obvious synergies and the participants can exchange knowledge and experience and avoid doubling the work of each other.

During the annual meeting we had a special working meeting on radiation monitoring in ATLAS and CMS, and in April 2009 I will have a common discussion between Accelerator Sector and ATLAS on monitoring with passive radiation detectors.

**WP7: Development of critical components for the injectors**

WP7 has organized meetings between partners in order to specify and co-ordinate the required work to meet the objectives, and report results. These include a series of seminars at CERN with input from DESY, and meetings at STFC with representatives from CERN, for ideas relating to the ion source, and reporting of gas measurements, as well as thermal modelling techniques. For low level RF control, representatives from CERN have travelled to CEA-Saclay in order to specify the measurement techniques, which will be required.

**WP8: Tracking detector power distribution**

Power distribution to the SLHC tracking detectors is a critical challenge, and R&D on this topic has to progress efficiently and at high pace to avoid becoming a show stopper for the detectors. WP8 has turned out to be an extremely helpful forum to progress these goals. Apart from formal WP8 SLHC-PP meetings, the WP8 partners have been meeting very frequently in informal working meetings throughout the year. There is a close and productive working relation between the DC-DC cluster (CERN, Aachen and PSI), the serial powering cluster (Bonn, Cracow, RAL), between the labs (CERN and RAL) and the group as a whole. This is reflected in achieving fully and sometimes surpassing the deliverable goals for the first funding period.

WP8 has strong links to the international power distribution working groups within the experiments ATLAS and CMS, coordinates with them, and influences other tracker upgrade related activities. The fact that WP8 is composed of both ATLAS and CMS partners has made it a unique platform for communication between experiments, which has helped advance power distribution R&D greatly. The WP8 members have been very active in organizing and participating in conferences e.g. TWEPP 2009 and ACES 2009, which again, helped raise the awareness of powering issues and increased the pace of this R&D.

**Deviations of planned milestones and deliverables:**

The only deviation of deliverables and milestones was that of deliverable 7.2.1. This is a purely technical deviation and despite the 10-month delay in the characterization result, the overall schedule towards the final WP7 deliverables is not compromised. For more information please see the text for WP7 in Section 3.1 of this report.

**List of project meetings, dates and venues:**

<b>Project Meeting</b>	<b>Date</b>	<b>Location</b>
<b><u>Internal Meetings</u></b>		
SLHC-PP kick-off meeting	8-9 April 2008	CERN, Geneva
SLHC-PP, the high-luminosity upgrade (R&D kick-off event) – public meeting	9 April 2008	CERN, Geneva
Use of the Linac4 ion-source installed at CERN's 3 MeV test stand for benchmarking	June 2008	CERN, Geneva

the engineering and simulations of the SPL plasma Chamber		
Seminars on the DESY ion-source by J. Peters	August 2008	CERN, Geneva
Software packages VORPAL and KOBRA	December 2008	CERN, Geneva
RF-measurement system for Linac4	December 2008	CERN, Geneva
Thermal Modelling of Ion Sources	February 2009	STFC, Abingdon, UK
“Aspects of radiation protection in the "super"-experiments based on CMS and ATLAS”	25 February 2009	CERN, Geneva
SLHC-PP Annual Meeting	25-26 February 2009	CERN, Geneva
SLHC-PP, the high-luminosity upgrade – (public event)	26 February 2009	CERN, Geneva
<b><u>Other Meetings organised with SLHC-PP participation</u></b>		
ATLAS upgrade project office meeting	April 2008	CERN, Geneva
International Power working group meeting	April 2008	CERN, Geneva
Internal review: Status of analysis of SPL RF frequencies and cooling temperature	30 April 2008	CERN, Geneva
CMS Upgrade Workshop	May 2008	CERN, Geneva
Internal review on PS2 lattice and RF options	29 May 2008	CERN, Geneva
ATLAS upgrade project office meeting	June 2008	CERN, Geneva
2MHz RF H- ion source for Linac4 at CERN, and upgrade for SPL.	August 2008	CERN, Geneva
ATLAS upgrade project office meeting	September 2008	CERN, Geneva
Topical Workshop on Electronics for Particle Physics	September 2008	Naxos, Greece
ATLAS Inner Detector Upgrade week	November 2008	NIKHEF, the Netherlands
CMS Upgrade Meeting	November 2008	Fermilab, USA
Meeting CERN-Saclay for WP 7.1	5-6 November 2008	Saclay, CEA,
Meeting CERN-DESY on RF and LLRF layout @ DESY	23-25 November 2008	DESY, Hamburg
CARE-HHH Workshop HHH-2008: Scenarios for the LHC upgrade and FAIR	24-25 November 2008	Chavannes-de-Bogis, CH
ATLAS upgrade project office meeting	December 2008	CERN, Geneva
SPL RF Collaboration Meeting	December 2008	CERN, Geneva
1st SPL Collaboration Meeting	11-12 December 2008	CERN, Geneva
Study to move the DESY source to CERN	January 2009	DESY, Hamburg
Review on PS Booster with Linac4	15 January 2009	CERN, Geneva
ATLAS Upgrade week	February 2009	CERN, Geneva
ATLAS upgrade project office meeting	February 2009	CERN, Geneva
Use of FLUKA in CMS Radiation Studies	9 February 2009	CERN, Geneva
Common ATLAS CMS Electronics Workshop for sLHC	March 2009	CERN, Geneva
Meeting CERN-SNS (LLRF system design and setting-up with beam in SC Linac)	1-13 March 2009	Knoxville, Tennessee, USA
HHH-2008 Follow Up Meeting	24 March 2009	CERN, Geneva
ATLAS upgrade project office meeting	April 2009	CERN, Geneva
CMS Upgrades Management Board	Monthly	CERN, Geneva

## Dissemination Activities:

<b>Dissemination Type</b>	<b>Reference (1)</b>
Publications (notes, theses, etc)	<i>J. Sammet, 'System Test Measurements with a DC-DC Conversion Powering Scheme for the CMS Tracker at SLHC', Diploma Thesis, RWTH Aachen University, 2008</i>
Int. Conference/Workshop presentation/poster	<i>G. de Rijk, sLHC, nouveaux triplets, nouveaux injecteurs, 9èmes Journées de Cryogénie et de Supraconductivité, AUSSOIS 25-27 March 2009</i>
Int. Conference/Workshop presentation/poster	<i>L. Evans, SLHC Accelerator and Injector Upgrades, SLHC-PP kick-off meeting, CERN 9 April 2008</i>
Int. Conference/Workshop presentation/poster	<i>L. Evans, Upgrade scenario for the LHC complex, CARE-HHH-AMT WAMSDO 2008, CERN 19 May 2008</i>
Int. Conference/Workshop presentation/poster	<i>L. Evans, Machine Upgrade Plans, CMS sLHC Upgrade Workshop, CERN 21 May 2008</i>
Int. Conference/Workshop presentation/poster	<i>L. Evans, Status and upgrade plan of LHC, 2008 CHIPP Annual Plenary Meeting, EPFL Lausanne 8 September 2008</i>
Int. Conference/Workshop presentation/poster	<i>L. Evans, Upgrade scenario for the LHC complex, 9th ICFA Seminar, SLAC 29 October 2008</i>
Int. Conference/Workshop presentation/poster	<i>L. Evans, LHC status and future plans, From the LHC to a future collider (Theory Workshop), CERN 10 February 2009</i>
Int. Conference/Workshop presentation/poster	<i>L. Evans, sLHC The High Luminosity Upgrade, 2nd SLHC-PP annual meeting, CERN 26 February 2009</i>
Int. Conference/Workshop presentation/poster	<i>L. Evans, LHC status and CERN plans, Les Rencontres de Physique de la Vallée d'Aoste, La Thuile 5 March 2009</i>
Int. Conference/Workshop presentation/poster	<i>Hessey, Overview and electronics needs of ATLAS and CMS high luminosity upgrade, Electronics for Particle Physics, Naxos, September 2008</i>
Int. Conference/Workshop presentation/poster	<i>Hessey, ATLAS and CMS Detector Upgrades for sLHC, LHC physics 2008, Split, September. 2008</i>
Int. Conference/Workshop presentation/poster	<i>Stapnes, October 2008, Upgrade of the LHC detectors for sLHC, ICFA seminar Stanford, October 2008</i>
Int. Conference Paper	<i>S.Michelis et al., 'Air core inductors study for DC/DC power supply in harsh radiation environment', NEWCAS-TAISA 2008, Montreal, Canada, June 22-25 2008</i>
Int. Conference Paper	<i>S.Michelis et al., 'Feedback loop conception methodology for step-down continuous switching DC/DC converter', NEWCAS-TAISA 2008, Montreal, Canada, June 22-25 2008</i>
Int. Conference Paper	<i>P.W. Phillips et al., 'Serial Powering of Silicon Strip Modules for the ATLAS Tracker Upgrade', TWEPP, 2008</i>
Int. Conference Paper	<i>G. Villani, 'Serial Powering of Silicon Strip Modules for the ATLAS Tracker Upgrade', 11th Topical Seminar on Innovative Particle and Radiation Detectors (IPRD08), 2008</i>
Int. Conference Paper	<i>M. Weber et al., 'Performance of large, serially powered, integrated silicon tracking elements for the sLHC', IEEE NSS, 2008</i>
Int. Conference Paper	<i>S.Michelis et al., 'Custom DC-DC converters for distributing power in sLHC trackers', TWEPP, 2008</i>
Int. Conference Paper	<i>G.Blanchot et al., 'Noise susceptibility measurements of front-end electronics systems', TWEPP, 2008</i>
Int. Conference Paper	<i>C.Fuentes et al., 'Characterization of the noise properties of DC to DC converters for the sLHC', TWEPP, 2008</i>
Int. Conference Paper	<i>S.Michelis et al., 'A prototype ASIC buck converter for LHC upgrades', TWEPP, 2008</i>
Int. Conference Paper	<i>K. Klein et al., 'System Tests with DC-DC Converters for the CMS Silicon Strip Tracker at sLHC', TWEPP, 2008</i>
Int. Conference Paper	<i>J. Kaplon et al., 'The ABCN front-end chip for ATLAS Inner Detector Upgrade', TWEPP 2008</i>



Int. Conference Paper	<i>M. Karagounis, 'Development of FE-I4 pixel readout IC', TWEPP, Naxos, 2008.</i>
Workshops	<i>J. Matheson, 'Serial power architecture', ATLAS Tracker Upgrade Workshop, 2008</i>
Workshops	<i>M. Weber et al., 'Power summary', ATLAS Tracker Upgrade Workshop, 2008</i>
Workshops	<i>P.W. Phillips, 'Serial powering system architecture' ACES, 2009</i>
Workshops	<i>F.Faccio, 'Power distribution with custom DC-DC converters', ATLAS Tracker Upgrade Workshop, 2008</i>
Workshops	<i>G.Blanchot, 'System implementation of a power distribution scheme based on DC-DC converters', ACES, 2009</i>
Workshops	<i>S.Michelis, 'Buck DC-DC design and implementation', ACES, 2009</i>
Workshops	<i>K. Klein, 'R&amp;D on sLHC at 1. Physikalisches Institut B, RWTH Aachen University', FSP-CMS Workshop, Aachen, 2008</i>
Workshops	<i>L. Feld, 'Novel Powering Schemes for sLHC Tracking Detectors', IEEE NSS, Special Focus Workshop 'Detector Developments for the sLHC', 2008</i>
Workshops	<i>K. Klein, 'Novel Powering Schemes for the CMS Tracker at sLHC', 2nd Helmholtz Alliance Workshop, Aachen, 2008</i>
Workshops	<i>W. Karpinski et al., 'Development and System Tests of DC-DC Converters for the CMS sLHC Tracker', ACES, 2009</i>
Workshops	<i>J. Sammet et al., 'Systemtest-Messungen mit DC-DC Konvertern', DPG Fruehjahrstagung (Annual Meeting of the German Physical Society), 2009</i>
Workshops	<i>R. Jussen et al., 'Stoerfestigkeitsmessung und EMV-Analyse einer neuartigen Spannungsversorgung des CMS-Siliziumstreifentrackers fuer den Super-LHC', DPG Fruehjahrstagung (Annual Meeting of the German Physical Society), 2009</i>
Workshops	<i>J. Merz et al., 'Simulation und Optimierung des Material-Budgets fuer den CMS-Spurdetektor am sLHC', DPG Fruehjahrstagung (Annual Meeting of the German Physical Society), 2009</i>
Workshops	<i>W. Dabrowski, 'Serial powering circuitry in the ABC-Next and FE-I4 chips', ACES 2009</i>
Workshops	<i>W. Dabrowski, 'Integrated DC-DC converters and SP in ABC-Next (130 nm)', ATLAS Upgrade Week, CERN, February 2009</i>
Workshops	<i>L. Gonella, 'Serial power development in Bonn', ATLAS Tracker Upgrade Workshop, Nikhef, 2008</i>
Workshops	<i>M. Karagounis, 'Integrated serial powering circuitry for FE-I4', ATLAS Tracker Upgrade Workshop, Nikhef, 2008.</i>
Workshops	<i>A. Eyring, 'By-pass control for serial powering', ATLAS Tracker Upgrade Workshop, Nikhef, 2008</i>
Workshops	<i>A. Eyring, 'Serial powering protection - focus pixel', ATLAS Upgrade Week, CERN, February 2009</i>
Workshops	<i>M. Karagounis, 'Shunt regulator design in FE-I4 (Shuldo), ATLAS Upgrade Week, CERN, February 2009</i>
Workshops	<i>M. Karagounis, 'Versorgungsschemen des Frontend-Chips im ATLAS Pixeldetektor für den Insertable b-layer und super-LHC', DPG Fruehjahrstagung (Annual Meeting of the German Physical Society), 2009</i>
Workshops	<i>L. Gonella, 'The ATLAS Pixel Stave Emulator for Serial Powering', DPG Fruehjahrstagung (Annual Meeting of the German Physical Society), 2009</i>
Workshops	<i>B. Meier, 'Embedded switched capacitors DC-DC ', ACES, 2009</i>
Workshops	<i>L. Linssen, 'Projets de recherche et développement au CERN, 8-Sep-2008, Journées du LAPP et LAPTH, Morzine</i>
Posters	<i>Richard Holt et al., 'Serial powering protection for Inner Detector modules', ACES, 2009</i>
Newspaper article	<i>L. Evans, L. Linssen, "The Super-LHC is on the starting blocks", July/August 2008 edition of the CERN Courier <a href="http://cerncourier.com/cws/article/cern/34932">http://cerncourier.com/cws/article/cern/34932</a></i>

## 6. Explanation of the use of the resources

### 1. CERN

<b>Table 3.1 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 1 FOR THE PERIOD</b>		
<b>WP1 - SLHC-PP Project Management</b>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	172847.53	Total of 17.4 Person-Month working in the management of the Project: 6.5 PM correspond to activities performed by the SLHC-PP management team (Project coordinator, Deputy Coordinator and Administrative Manager). Rest corresponds to personnel in the SLHC-PP project office: follow up of project expenditures, general administrative tasks and dissemination of information for the Consortium.
Subcontracting	0.00	
Travel Costs	0.00	
Consumables		
Reception expenses	2383.45	Participation to the cost of the dinner held at the Common ATLAS CMS Electronics Workshop for SLHC ( <a href="http://aces.web.cern.ch/aces/">http://aces.web.cern.ch/aces/</a> )
Durable Equipment	0.00	
Remaining Costs	1538.23	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	176769.21	
<b>WP2 - Coordination for the SLHC accelerator implementation</b>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	36400.53	Real cost of 3.3. Person-Month of a CERN physicist leading the activities in this work package.
Subcontracting	0.00	
Travel Costs	0.00	
Consumables	0.00	
Durable Equipment	0.00	
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	36400.53	
<b>WP3 - Coordination of S-ATLAS experiment implementation</b>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	56041.67	Cost of 5 Person-Months (1 engineer part-time) dedicated to WP3 at CERN.
Subcontracting	0.00	
Travel Costs	0.00	
Consumables	0.00	
Durable Equipment	0.00	
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	56041.67	
<b>WP4 - Coordination of CMS2 experiment implementation</b>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	120936.77	Cost of 16.6 Person-Month working in WP4 activities at CERN. Since July 08 one person works full time for the project (~ 9 PM).
Subcontracting	0.00	
Travel Costs		
Travel to Copenhagen	3265.40	Travel of two members of the CERN team to participate in a conference on CO2 cooling organized by the International Institute of Refrigeration in Copenhagen.

<b>Travel to Yalta</b>	1502.71	Travel to Yalta of a member of WP4 at CERN to present the CMS Tracker Upgrade plans at the International Conference "New trends in High Energy Physics".
	1782.27	Participation and presentation of WP4 activities of 3 members of WP4 in the CMS Upgrade Workshop in Fermilab, Chicago.
<b>Consumables</b>		
<b>Durable Equipment</b>		
<b>Mass flow controller Rheonik</b>	4913.58	Construction of a "demonstrator setup" for the use of CO <sub>2</sub> cooling in the CMS upgraded tracker.
<b>Informatics equipment</b>	6326.63	Purchase of three computers (design, simulation, DB activities)
<b>Remaining Costs</b>	7786.76	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	146514.12	
<b>WP5 - Radiation protection and safety issues for accelerator and experiments</b>		
<b>Item Description</b>	<b>Actual direct eligible costs (€)</b>	<b>Explanation</b>
<b>Personnel cost</b>	74239.08	Cost of 16.1 Person-month working in WP5 tasks at CERN.
<b>Subcontracting</b>	0.00	
<b>Travel Costs</b>	0.00	
<b>Consumables</b>	0.00	
<b>Durable Equipment</b>	0.00	
<b>Remaining Costs</b>	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	74239.08	
<b>WP6 - Development of Nb-Ti quadrupole magnet prototype</b>		
<b>Item Description</b>	<b>Actual direct eligible costs (€)</b>	<b>Explanation</b>
<b>Personnel cost</b>	168743.74	Cost of 23.4 Person-Months working at CERN in WP6 activities. This amount includes 5.2 PM of CERN staff leading the work package.
<b>Subcontracting</b>	0.00	
<b>Travel Costs</b>		
<b>Travel France</b>	270.74	Travel of a member of WP6 to discuss technical work with the partner CNRS.
<b>Travel France</b>	303.75	Travel of the WP6 leader to discuss with the other partners in the work package, CEA and CNRS, the WP7 technical activities.
<b>Consumables</b>		
<b>Qualification of tubes</b>	2942.82	Test to qualify the tube G11. Program of qualification of material for end spacers pieces.
<b>Durable Equipment</b>		
<b>Bobinot Apical</b>	597.87	Purchase of insulation material for the new superconducting cable insulation scheme.
<b>Remaining Costs</b>	2071.43	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	174930.35	
<b>WP7 - Development of critical components for the injectors</b>		
<b>Item Description</b>	<b>Actual direct eligible costs (€)</b>	<b>Explanation</b>
<b>Personnel cost</b>	164895.52	Cost of 24.4 Person-Months working in WP7 RTD activities at CERN.
<b>Subcontracting</b>	0.00	
<b>Travel Costs</b>		
<b>Travel to DESY (DE)</b>	2086.14	Travel expenses of Mr. Hofle and Mr. Valuch, members of WP7 at CERN, due to visit to DESY, Hamburg, Germany. CERN-DESY discussion on low level pulsed RF systems for superconducting electron linacs, in particular RF system layout and tuner.
<b>Travel to Oak Nat.Lab (US)</b>	1216.74	Part of travel expenses of Mr. Molendijk and Mr. Baudrenghien, members of WP7 at CERN, to Oak Ridge National Lab, TN, USA. CERN-ORNL discussions on the present state of the art low level RF systems for the SNS superconducting linear accelerator.
<b>Consumables</b>	0.00	
<b>Durable Equipment</b>		
<b>H-piezo Valve</b>	1709.10	Purchase of gas injection valves for the prototype plasma generator

Remaining Costs	3954.95	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	173862.45	
<b>WP8 - Tracking detector power distribution</b>		
<b>Item Description</b>	<b>Actual direct eligible costs (€)</b>	<b>Explanation</b>
Personnel cost	143382.23	Real cost of 20.1 Person-Months working in WP8 activities at CERN.
Subcontracting	0.00	
Travel Costs	0.00	
Consumables		
Design review	1027.72	DC-DC converter design review.
Durable Equipment		
ASIC Prototype	11841.72	Prototype ASIC in AMIS MPW.
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	156251.67	

## 2. AGH-UST

<b>Table 3.2 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 2 FOR THE PERIOD</b>		
<b>WP8 - Tracking detector power distribution</b>		
<b>Item Description</b>	<b>Actual direct eligible costs (€)</b>	<b>Explanation</b>
Personnel cost	18407.35	7.44 Person-Month total, of which 2.82 correspond to a physicist working on Task 8.2 and 4.62 Person-Month to an engineer working on Task 8.2.
Subcontracting	0.00	
Travel Costs		
Travel W. Dabrowski	664.00	24.11-28.11.2008, CERN, consulting of the serial powering design.
Travel W. Dabrowski	639.66	23.03-2.03.2009, CERN, ATLAS Upgrade Week.
Travel M. Dwuznik	940.76	22.03-1.04.2009, CERN, ATLAS Upgrade Week, NIDAQ development.
Travel W. Dabrowski	709.56	2.03-4.03.2009, CERN, ACES Workshop.
Consumables		
I/O card	483.61	Equipment for set-up used to evaluate the serial powering scheme in ABCN.
Six bench power supplies	2944.39	Equipment for set-up used to evaluate the serial powering scheme in ABCN.
Durable Equipment		
Remaining Costs	337.67	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	25127.38	

## 3. CEA-Saclay

<b>Table 3.3 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 3 FOR THE PERIOD</b>		
<b>WP6 - Development of Nb-Ti quadrupole magnet prototype</b>		
<b>Item Description</b>	<b>Actual direct eligible costs (€)</b>	<b>Explanation</b>
Personnel cost	78,340.13	CEA staff (10.2 Person-Month) + 6 months temporary contract engineer
Subcontracting	0.00	
Travel Costs		
Travel to CERN	1,566.32	Participation to CNI-PP-SLHC annual meeting (feb. 2009) - 4 persons

Consumables	0.00	No costs charged up to date.
Durable Equipment	0.00	No costs charged up to date.
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	79,906.45	
<b>WP7 - Development of critical components for the injectors</b>		
<b>Item Description</b>	<b>Actual direct eligible costs (€)</b>	<b>Explanation</b>
Personnel cost	90,767.29	CEA staff (15.8 Person-Month).
Subcontracting	0.00	
Travel Costs		
Travels to CERN	805.14	Participation to CNI-PP-SLHC annual meeting (feb. 2009) - 2 persons.
Consumables		
Components	267.52	Electronic cards and material.
Durable Equipment	0.00	No costs charged up to date.
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	91,839.95	

#### 4. CIEMAT

<b>Table 3.4 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 4 FOR THE PERIOD</b>		
<b>WP2 - Coordination of the SLHC accelerator implementation</b>		
<b>Item Description</b>	<b>Actual direct eligible costs (€)</b>	<b>Explanation</b>
Personnel cost	0.00	The involvement of CIEMAT in WP2 activities has not yet started.
Subcontracting	0.00	
Travel Costs	0.00	As above.
Consumables	0.00	As above.
Durable Equipment	0.00	As above.
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	0	
<b>WP6 - Development of Nb-Ti quadrupole magnet prototype</b>		
<b>Item Description</b>	<b>Actual direct eligible costs (€)</b>	<b>Explanation</b>
Personnel cost	24232.20	Cost of 5.82 Person-Months (all engineers) dedicated to activities in WP6.
Subcontracting	0.00	
Travel Costs	0.00	No costs up to date.
Consumables	0.00	No costs up to date.
Durable Equipment	0.00	No costs up to date.
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	24232.20	

## 5. CNRS-IN2P3

<b>Table 3.5 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 5 FOR THE PERIOD</b>		
<i>WP6 - Development of Nb-Ti quadrupole magnet prototype</i>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	18342.43	Salaries of 5 engineers and 1 researcher
Subcontracting	0.00	
Travel Costs	828.06	3 trips at CERN
Consumables	0.00	
Durable Equipment	0.00	
Remaining Costs		
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	<b>19170.49</b>	

## 6. CTU

<b>Table 3.6 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 6 FOR THE PERIOD</b>		
<i>WP5 - Radiation protection and safety issues for accelerator and experiments</i>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	18475.68	Cost of 11.11 Person-Months: 9,83 PM of physicists, 1,28 PM of engineers. Total PM is higher compared to project proposal due to an increase of the CTU team.
Subcontracting	0.00	
Travel Costs		
Travels	1890.46	Travels costs related to ATLAS-MPX network installation and to project meetings.
Consumables		
Production of components	1629.78	Production of prototypes of ATLAS-MPX USB R/O based devices installed in ATLAS
Durable Equipment	0.00	
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	<b>21995.92</b>	

## 7. DESY

<b>Table 3.7 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 7 FOR THE PERIOD</b>		
<i>WP4 - Coordination of CMS2 experiment implementation</i>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	0.00	One person of DESY worked and contributed to SLHC-PP WP4. Costs have not been claimed in the FORM C of the first year due to delays in book keeping.
Subcontracting	0.00	
Travel Costs		
Travel to CERN	1316.31	Travels to CERN, WP4 meetings.
Consumables	0.00	
Durable Equipment	0.00	
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	<b>1316.31</b>	

		<b>WP7 - Development of critical components for the injectors</b>
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	0.00	One person of DESY worked and contributed to SLHC-PP WP7. Costs have not been claimed in the FORM C of the first year due to delays in book keeping.
Subcontracting	0.00	
Travel Costs	0.00	
Consumables	0.00	
Durable Equipment	0.00	
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	<b>0.00</b>	

## 8. ETH-Zürich

<b>Table 3.8 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 8 FOR THE PERIOD</b>		
		<b>WP4 - Coordination of the CMS2 experiment implementation</b>
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	125800.00	Cost of 6.3 Person-Months (leading physicist and engineer) involved in WP4 tasks.
Subcontracting	0.00	
Travel Costs	0.00	
Consumables	0.00	
Durable Equipment	0.00	
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	<b>125800.00</b>	

## 9. FOM-NIKHEF

<b>Table 3.9 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 9 FOR THE PERIOD</b>		
		<b>WP3 - Coordination of the S-ATLAS experiment implementation</b>
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	56310.54	Cost of a 6.4 Person-Month of a physicist leading WP3 at FOM-NIKHEF.
Subcontracting	0.00	
Travel Costs		
Accommodation	10807.20	Cost of accommodation at CERN of the physicist leading WP3 activities at FOM-NIKHEF for attendance to working meetings and conferences.
Travel CERN	11770.29	Flights and per diem at CERN.
Conferences	3261.58	Presentation of the ATLAS Upgrade project at 2 major international conferences.
Consumables		
Durable Equipment		
Remaining Costs	1955.91	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	<b>84105.52</b>	

10. GSI

<b>Table 3.10 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 10 FOR THE PERIOD</b>		
<i>WP5 - Radiation protection and safety issues for accelerator and experiments</i>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	8317.28	Cost of 1.4 Person-Month
Subcontracting	0.00	
Travel Costs		
	846.02	Travels to CERN - Geneva, SLHC-PP meetings
	1000.00	Travel to Erice (Italy)
	671.31	Other travel related costs
Consumables	0.00	
Durable Equipment	0.00	
Remaining Direct Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	<b>10834.61</b>	

11. Imperial

<b>Table 3.11 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 11 FOR THE PERIOD</b>		
<i>WP4 - Coordination of the CMS2 experiment implementation</i>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	26072.70	These costs were incurred due to Jordan Nash's role as Project Leader for Work package 4. Total Person-Months corresponds to ~4, around 30% of a possible 100%.
Subcontracting	0.00	
Travel Costs		
Travel to CERN	1790.14	This costs were incurred for travelling to CERN for meetings
Travel to CERN	895.08	This costs were incurred for travelling to CERN meetings
Consumables	0.00	
Durable Equipment	0.00	
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	<b>28757.92</b>	

12. INFN

<b>Table 3.12 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 12 FOR THE PERIOD</b>		
<i>WP7 - Development of critical components for the injectors</i>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	24485.15	5.4 Total PM, 4.2 Researchers, 1.2 Technicians, in different salary levels on WP7.2.
Subcontracting	0.00	
Travel Costs		
Kick-off Meeting at CERN	417.80	Participation to kick-off meeting at CERN (P. Pierini)
Consumables	0.00	



Durable Equipment	0.00	
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	<b>24902.95</b>	

### 13. PSI

<b>Table 3.13 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 13 FOR THE PERIOD</b>		
<b>WP5 - Radiation protection and safety issues for accelerator and experiments</b>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	1474.38	Real cost of 0.1 Person-Month of the leading scientist in WP5.
Subcontracting	0.00	
Travel Costs	0.00	
Consumables	0.00	
Durable Equipment	0.00	
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	<b>1474.38</b>	
<b>WP8 - Tracking detector power distribution</b>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	32410.96	Cost of 1.06 Person-Month Leading Scientist and 2.1 Person-Month of scientist working in WP8 technical work.
Subcontracting	0.00	
Travel Costs	0.00	
Consumables	0.00	
Durable Equipment	0.00	
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	<b>32410.96</b>	

### 14. STFC

<b>Table 3.14 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 14 FOR THE PERIOD</b>		
<b>WP2 - Coordination for the SLHC accelerator implementation</b>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	2559.91	Cost of 0.56 Person-Month
Subcontracting	0.00	
Travel Costs	0.00	
Consumables	0.00	
Durable Equipment	0.00	
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	<b>2559.91</b>	
<b>WP3 - Coordination of S-ATLAS experiment implementation</b>		

Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	19217.24	Cost of 3 Person-Month
Subcontracting	0.00	
Travel Costs	0.00	
Consumables	0.00	
Durable Equipment	0.00	
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	19217.24	
<b>WP6 - Development of Nb-Ti quadrupole magnet prototype</b>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	8645.86	1.93 Person-Month
Subcontracting	0.00	
Travel Costs		
Travel CERN	97.42	CERN meeting may 2008 (travel)
Travel Y	15.21	Accomodation G. Northing
Consumables	0.00	
Durable Equipment	0.00	
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	8758.49	
<b>WP7 - Development of critical components for the injectors</b>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	1082.17	0.2 Person-Month
Subcontracting	0.00	
Travel Costs	0.00	
Consumables	0.00	
Durable Equipment	0.00	
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	1082.17	
<b>WP8 - Tracking detector power distribution</b>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	75972.71	15 Person-Month
Subcontracting	0.00	0
Travel Costs		
Travel	412.77	Accommodation expenses for Mr Thomas Tic
Travel	895.92	Other Travel expenses
Consumables		
Spi chip	10446.14	Spi chip, this is the first prototype of a main deliverable
SP electronics	1572.60	Custom SP electronics
Durable Equipment	0.00	N/A
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	89300.14	

15. UBONN

<b>Table 3.15 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 15 FOR THE PERIOD</b>		
<i>WP8 - Tracking detector power distribution</i>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	107638.03	23.05 PM (Markus Cristinziani, Andreas Eyring, Laura Gonella)
Subcontracting	0.00	
Travel Costs		
Travel to Nikhef	908.00	Andreas Eyring AHLUTW NIKHEF 12.2008
Travel to CERN	560.00	Markus Cristinziani CERN, SLHC-PP FP7 meeting 4.2008
Consumables	0.00	
Durable Equipment	0.00	
Remaining Costs	808.13	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	<b>109914.16</b>	

16. UNIGE

<b>Table 3.16 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 16 FOR THE PERIOD</b>		
<i>WP3 - Coordination of the S-ATLAS experiment implementation</i>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	50460.12	Cost of 6.4 Person-Months working for WP3 at UNIGE. The persons associated to the project are 1 physicist, 1 applied physicist and 1 mechanical engineer.
Subcontracting	0.00	
Travel Costs	0.00	No travel costs charged to date
Consumables	0.00	No consumable costs charged to date
Durable Equipment	0.00	No durable costs charged to date
Remaining Costs	0.00	
<b>TOTAL DIRECT COSTS AS CLAIMED IN FORM C</b>	<b>50460.12</b>	

17. USFD

<b>Table 3.17 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 17 FOR THE PERIOD</b>		
<i>WP5 - Radiation protection and safety issues for accelerator and experiments</i>		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	10820.40	A Total 2.85 PM Work was carried out by Ludovic Nicholas (PM 1.77) and Ian Dawson (PM 1.08) on the "Simulation of experiment radiation backgrounds at the LHC and LHC, and preparations for measurements at the LHC for comparison with the predictions, which will feed back into assessing and improving the simulation tools."
Subcontracting	0.00	
Travel Costs		
Travel to CERN	215.97	Travel costs of flights and transport (to and from airport) for Ludovic Nicholas to travel to Geneva to work on Atlas Radiation Background Simulations.
Consumables	0.00	
Durable Equipment	0.00	
Remaining Costs	0.00	

TOTAL DIRECT COSTS AS CLAIMED IN FORM C	11036.37
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18. RWTH-Aachen

Table 3.18 PERSONNEL, SUBCONTRACTING AND OTHER MAJOR COST ITEMS FOR BENEFICIARY 18 FOR THE PERIOD		
WP8 - Tracking detector power distribution		
Item Description	Actual direct eligible costs (€)	Explanation
Personnel cost	9850.41	Cost of 2.3 Person-Months working in task 8.1 of which 1.62 M for an engineer and 0.65 PM for a physicist.
Subcontracting	0.00	
Travel Costs	0.00	
Consumables	0.00	
Durable Equipment	0.00	
Remaining Costs	0.00	
TOTAL DIRECT COSTS AS CLAIMED IN FORM C	9850.41	

## **7. Financial statements – Form C and Summary financial report**

This section contains financial statements from each beneficiary together with a summary financial report that consolidates the claimed Community contribution of all the beneficiaries in an aggregate form, based on the information provided in Form C (Annex VI) by each beneficiary. Original signed copies have been submitted by mail to the European Commission.

# 1. CERN

## FP7 - Grant Agreement - Annex VI - Combination of Collaborative Project and Coordination and Support Action

Form C - Financial Statement (to be filled in by each beneficiary)			
Project nr	212114	Funding scheme	Combination of Collaborative Project and Coordination and Support Action
Project Acronym	SLHC-PP		
Period from	1/04/2008	Is this an adjustment to a previous statement ?	No
To	31/03/2009		
Legal Name	European Organisation for Nuclear Research	Participant Identity Code	999988133
Organisation short Name	CERN	Beneficiary nr	1
Funding % for RTD activities (A)	75	If flat rate for indirect costs, specify %	60

### 1- Declaration of eligible costs/lump sum/flat rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs	477,021.49	213,378.97	74,239.08	172,847.53	0.00	937,487.07
Subcontracting	0.00	0.00	0.00	0.00	0.00	0.00
Other direct costs	28,022.98	25,577.35	0.00	3,921.68	0.00	57,522.01
Indirect costs *	303,026.68	143,373.79	44,543.45	106,061.53	0.00	597,005.45
Access Costs						0.00
Lump sum/flat rate/scale of unit declared						0.00
<b>Total</b>	<b>808,071.15</b>	<b>382,330.11</b>	<b>118,782.53</b>	<b>282,830.74</b>	<b>0.00</b>	<b>1,592,014.53</b>
Maximum EC contribution	606,053.36	255,683.26	79,435.82	282,830.74	0.00	1,224,003.18
Requested EC contribution						1,224,003.18

\* Indirect costs relating to  
 - "Coordination" and "Support" activities are reimbursed up to a maximum of 7% of the direct eligible costs relating to these activities excluding the direct eligible costs for subcontracting and the costs of resources made available by third parties which are not used on the premises of the beneficiary.  
 - "RTD", "Management" and "other" activities are reimbursed in accordance with the various options foreseen in Article II.15.2 a), b) and c) of the grant agreement.

### 2- Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art. II.17 of the grant agreement ?

NO

If yes, please mention the amount (in €)

### 3- Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art. II.19 ?

YES

If yes, please mention the amount (in €)

6908.83

### 4. Certificate on the methodology

Do you declare average personnel costs according to Art. II.14.1 ?

NO

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art. II.4.4 ?

NO

Name of the auditor

Cost of the certificate (in €), if charged under this project

### 5- Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art. II.4.4 ?

YES

Name of the auditor

Cost of the certificate (in €)

0.00

### 6- Beneficiary's declaration on its honour



We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and Article 7 (special clauses) of the grant agreement;

- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art. II.17 of the grant agreement;

- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art. II.19 of the grant agreement ;

- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement
	DR FLORIAN SONNEMANN
	Date & signature 18.05.09 

2. AGH-UST

FP7 - Grant Agreement - Annex VI - Combination of Collaborative Project and Coordination and Support Action

Form C - Financial Statement (to be filled in by each beneficiary)

Project nr	212114	Funding scheme	Combination of Collaborative Project and Coordination and Support Action
Project Acronym	SLHC-PP		
Period from	01-Apr-2008	Is this an adjustment to a previous statement?	No
To	31-Mar-2009		
Legal Name	AGH University of Science and Technology	Participant Identity Code	999844573
Organisation short Name	AGH-UST	Beneficiary nr	2
Funding % for RTD activities (A)	75%	If flat rate for indirect costs, specify %	60%

1 - Declaration of eligible costs/lump sum/flat-rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs	18 407,35					18 407,35
Subcontracting						0,00
Other direct costs	6 720,03					6 720,03
Indirect costs	15 076,43					15 076,43
Lump sum/flat-rate/scale of unit declared						
Total	40 203,81	0,00	0,00	0,00		40 203,81
Maximum EC contribution	30 152,86	0,00	0,00	0,00		30 152,86
Requested EC contribution						30 152,86

2 - Declaration of receipts

Do you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art. II.17 of the grant agreement?  
If yes, please mention the amount (in €)

No

3 - Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)  
Did the pre-financing you received generate any interest according to Art. II.19?  
If yes, please mention the amount (in €)

No

4 - Certificate on the methodology

Do you declare average personnel costs according to Art. II.14.1?  
Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art. II.4.4?

No  
No

Name of the auditor	Cost of the certificate (in €), if charged under this project
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5. Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art. II.4.4?



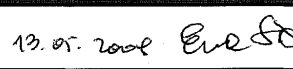
No

Name of the auditor	Cost of the certificate (in €)
---------------------	--------------------------------

6 - Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and Article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art. II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art. II.19 of the grant agreement;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement	
	Person responsible for the work: Władysław Dąbrowski	Duly authorised Financial Officer: Ewa Słobodzian
	Date & signature 13/05/09 	Date & signature 13.05.2009 

### 3. CEA-Saclay

**FP7 - Grant Agreement - Annex VI - Combination of Collaborative Project and Coordination and Support Action**

Form C - Financial Statement (to be filled in by each beneficiary)

<b>Project nr</b>	212114	<b>Funding scheme</b>	Combination of Collaborative Project and Coordination and Support Action
<b>Project Acronym</b>	SLHC-PP		
<b>Period from</b>	01/04/2008	<b>Is this an adjustment to a previous statement ?</b>	NO
<b>To</b>	31/03/2009		
<b>Legal Name</b>	Commissariat à l'Énergie Atomique	<b>Participant Identity Code</b>	999992401
<b>Organisation short Name</b>	CEA	<b>Beneficiary nr</b>	3
<b>Funding % for RTD activities (A)</b>	75%	<b>If flat rate for indirect costs, specify %</b>	63%

**1- Declaration of eligible costs/lump sum/flat rate/scale of unit (in €)**

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
<b>Personnel costs</b>	€ 169 107,42					€ 169 107,42
<b>Subcontracting</b>						€ -
<b>Other direct costs</b>	€ 2 638,98					€ 2 638,98
<b>Indirect costs *</b>	€ 106 537,67	€ -	€ -	€ -	€ -	€ 106 537,67
<b>Access Costs</b>						
<b>Lump sum/flat rate/scale of unit declared</b>						
<b>Total</b>	€ 278 284,07	€ -	€ -	€ -	€ -	€ 278 284,07
<b>Maximum EC contribution</b>	€ 208 713,06					€ 208 713,06
<b>Requested EC contribution</b>						€ 208 713,06

\* Indirect costs relating to:  
 - "Coordination" and "Support" activities are reimbursed up to a maximum of 7% of the direct eligible costs relating to these activities excluding the direct eligible costs for subcontracting and the costs of resources made available by third parties which are not used on the premises of the beneficiary.  
 - "RTD", "Management" and "Other" activities are reimbursed in accordance with the various options foreseen in Article 11.15.2 a), b) and c) of the grant agreement.

**2- Declaration of receipts**

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art. II.17 of the grant agreement ? NO  
 If yes, please mention the amount (in €)

**3- Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)**

Did the pre-financing you received generate any interest according to Art. II.19 ? NO  
 If yes, please mention the amount (in €)

**4- Certificate on the methodology**

Do you declare average personnel costs according to Art. II.14.1 ? YES  
 Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art. II.4.4 ? NO

**Name of the auditor** **Cost of the certificate (in €), if charged under this project**

**5- Certificate on the financial statements**


Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art. II.4.4 ? NO

**Name of the auditor** **Cost of the certificate (in €)**

**6- Beneficiary's declaration on its honour**

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and Article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art. II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art. II.19 of the grant agreement ;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

<b>Beneficiary's Stamp</b>	<b>Name of the Person(s) Authorised to sign this Financial Statement</b>	
	Jean-Michel RIFFLET	Nathalie JUDAS
	<b>Date &amp; signature</b>	
	12/05/09	12/05/09



#### 4. CIEMAT

FP7 - Grant Agreement - Annex VI - Combination of Collaborative Project and Coordination and Support Action

Form C - Financial Statement (to be filled in by each beneficiary)			
Project nr	212114	Funding scheme	Combination of Collaborative Project and Coordination and Support Action
Project Acronym	SLHC-PP		
Period from	01-Apr-2008	Is this an adjustment to a previous statement?	No
To	31-Mar-2009		
Legal Name	Centro de Investigaciones Energéticas, Medioambientales	Participant Identity Code	999614877
Organisation short Name	CIEMAT	Beneficiary nr	4
Funding % for RTD activities (A)	75%	If flat rate for indirect costs, specify %	

1 - Declaration of eligible costs/lump sum/flat-rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs	24,232.20					24,232.20
Subcontracting						0.00
Other direct costs						0.00
Indirect costs	26,413.10					26,413.10
Lump sum/flat-rate/scale of unit declared						
<b>Total</b>	50,645.30	0.00	0.00	0.00	0.00	50,645.30
Maximum EC contribution	37,983.97	0.00	0.00	0.00	0.00	37,983.97
Requested EC contribution						37,983.97

2 - Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art.II.17 of the grant agreement?  
If yes, please mention the amount (in €)

No

3 - Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art.II.19?  
If yes, please mention the amount (in €)

Yes/No

4 - Certificate on the methodology

Do you declare average personnel costs according to Art. II.14.1?

Yes

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art. II.4.4?

No

Name of the auditor

Cost of the certificate (in €), if charged under this project

5 - Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art. II.4.4?

Yes

Name of the auditor

Cost of the certificate (in €)

6 - Beneficiary's declaration on its honour



We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and Article 7 (special clauses) of the grant agreement;

- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art. II.17 of the grant agreement;

- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art. II.19 of the grant agreement;

- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement
	ANA COLLADOS MARTÍN-POSADILLO
	Date & signature 12/05/09 

## 5. CNRS

### FP7 - Grant Agreement - Annex VI - Collaborative Project

Form C - Financial Statement (to be filled in by each beneficiary)					
<b>Project nr</b>	212114	<b>Funding Scheme</b>	Combination of Collaborative Project and Coordination and Support Action		
<b>Project Acronym</b>	SLHC PP				
<b>Period from</b>	01-04-2008	<b>Is this an adjustment to a previous statement ?</b>	NO		
<b>To</b>	31-03-2009				
<b>Legal Name</b>	Centre National de la Recherche Scientifique	<b>Participant Identity Code</b>	999997930		
<b>Organisation short Name</b>	CNRS	<b>Beneficiary nr</b>	5		
<b>Funding % for RTD activities (A)</b>	75%	<b>If flat rate for indirect costs, specify %</b>	60%		
<b>1- Declaration of eligible costs/lump sum/flat-rate/scale of unit (in €)</b>					
	<b>Type of Activity</b>				
	<b>RTD (A)</b>	<b>Demonstration (B)</b>	<b>Management (C)</b>	<b>Other (D)</b>	<b>TOTAL (A+B+C+D)</b>
<b>Personnel costs</b>	18,342.43				18,342.43
<b>Subcontracting</b>	-				-
<b>Other direct costs</b>	828.06				828.06
<b>Indirect costs</b>	11,502.29				11,502.29
<b>Lump sums/flat-rate/scale of unit declared</b>					-
<b>Total</b>	30,672.78	-	-	-	30,672.78
<b>Maximum EC contribution</b>	23,004.59	-	-	-	23,004.59
<b>Requested EC contribution</b>					23,004.59
<b>2- Declaration of receipts</b>					
Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art.II.17 of the grant agreement ?				No	
<b>If yes, please mention the amount (in €)</b>					
<b>3- Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)</b>					
Did the pre-financing you received generate any interest according to Art. II.19 ?				No	
<b>If yes, please mention the amount (in €)</b>					
<b>4. Certificate on the methodology</b>					
Do you declare average personnel costs according to Art. II.14.1 ?				yes	
Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art. II.4.4 ?				No	
<b>Name of the Auditor</b>		<b>Cost of the certificate (in €) if charged under this project</b>			
<b>5- Certificate on the financial statements</b>					
Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art.II.4.4 ?				No	
<b>Name of the Auditor</b>		<b>Cost of the certificate (in €)</b>			
<b>6- Beneficiary's declaration on its honour</b>					
<b>We declare on our honour that:</b>					
- The costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and Article 7 (special clauses) of the grant agreement;					
- The receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art. II.17 of the grant agreement;					
- The interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art. II.19 of the grant agreement ;					
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives					
<b>Beneficiary's Stamp</b>	<b>Name of the person(s) Authorised to sign this Financial Statement</b>				
	Gilles SENTISE				
	Date & signature				

6. CTU

FP7 - Grant Agreement - Annex VI - Combination of Collaborative Project and Coordination and Support Action

Form C - Financial Statement (to be filled in by each beneficiary)

Project nr	212114	Funding scheme	Combination of Collaborative Project and Coordination and Support Action
Project Acronym	SLHC-PP		
Period from	01-Apr-2008	Is this an adjustment to a previous statement?	No
To	31-Mar-2009		
Legal Name	Czech Technical University	Participant Identity Code	999848744
Organisation short Name	CTU	Beneficiary nr	6
Funding % for RTD activities (A)	75%	If flat rate for indirect costs, specify %	60%

1 - Declaration of eligible costs/lump sum/flat-rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs			18 475,68			18 475,68
Subcontracting						0,00
Other direct costs			3 520,24			3 520,24
Indirect costs			13 197,55			13 197,55
Lump sum/flat-rate/scale of unit declared						
<b>Total</b>	0,00	0,00	35 193,47	0,00		35 193,47
Maximum EC contribution	0,00	0,00	23 435,63	0,00		23 435,63
Requested EC contribution						23 435,63

2 - Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art. II.17 of the grant agreement?

No

If yes, please mention the amount (in €)

3 - Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art. II.19?

No

If yes, please mention the amount (in €)

4 - Certificate on the methodology

Do you declare average personnel costs according to Art. II.14.1?

No

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art. II.4.4?

No

Name of the auditor		Cost of the certificate (in €), if charged under this project	
---------------------	--	---	--

5. Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art. II.4.4?

No

Name of the auditor		Cost of the certificate (in €)	
---------------------	--	--------------------------------	--

6 - Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and Article 7 (special clauses) of the grant agreement;

- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art. II.17 of the grant agreement;

- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art. II.19 of the grant agreement;

- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement
	Prof. Ing. Václav Havlíček, CSc.
	Date & signature
	13.05.2009 for: Havlíček

7. DESY

FP7 - Grant Agreement - Annex VI - Combination of CP & CSA

Form C - Financial Statement (to be filled in by each beneficiary)			
Project nr.	212114	Funding scheme	Combination of CP & CSA
Project Acronym	SLHC-PP		
Period from	01/04/2008	Is this an adjustment to a previous statement?	No
To	31/03/2009		
Legal Name	STIFTUNG DEUTSCHES ELEKTRONEN-SYNCHROTRON DESY	Participant Identity Code	
Organisation short Name	DESY	Beneficiary nr.	7
Funding % for RTD activities (A)	75.00	If flat rate for indirect costs, specify %	60.00 %

1. Declaration of eligible costs/lump sum/flat-rate/scale of unit (in €)

	Type of Activity					Total (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs	0.00	0.00	0.00	0.00	0.00	0.00
Subcontracting	0.00	0.00	0.00	0.00	0.00	0.00
Other direct costs	0.00	1,316.31	0.00	0.00	0.00	1,316.31
Indirect costs *	0.00	789.79	0.00	0.00	0.00	789.79
Access costs			0.00			0.00
Lump sums/flat rate/scale of unit declared	0.00	0.00	0.00	0.00	0.00	0.00
<b>Total</b>	<b>0.00</b>	<b>2,106.10</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>2,106.10</b>
Maximum EC contribution	0.00	1,408.45	0.00	0.00	0.00	1,408.45
Requested EC contribution						1,408.45

\* Indirect costs relating to:  
 - "Coordination" and "Support" activities are reimbursed up to a maximum of 7% of the direct eligible costs relating to these activities excluding the direct eligible costs for subcontracting and the costs of resources made available by third parties which are not used on the premises of the beneficiary.  
 - "RTD", "Management" and "Other" activities are reimbursed in accordance with the various options forseen in Article II.15.2 a), b) and c) of the grant agreement.

2. Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art.II.17 of the grant agreement?  
 If yes, please mention the amount (in €)

No

3. Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art.II.19?  
 If yes, please mention the amount (in €)

No

4. Certificate on the methodology

Do you declare average personnel costs according to Art.II.14.1?  
 Is there a certificate on the methodology provided by an independant auditor and accepted by the Commission according to Art.II.4.4?

No

No

Name of the auditor	Cost of the certificate (in €), if charged under this project
---------------------	---

5. Certificate on the financial statements

Is there a certificate on the financial statements provided by an independant auditor attached to this financial statement according to Art.II.4.4?

No

Name of the auditor	Cost of the certificate (in €)
---------------------	--------------------------------

6. Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art.II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art.II.19 of the grant agreement;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement
	Prof. Dr. Joachim Mnich, Christian Sauer
	Date & signature
	27/05/2009

Deutsches Elektronen-Synchrotron  
 Ein Forschungszentrum der Helmholtz-Gemeinschaft  
 Notkestraße 85 | 22607 Hamburg | Tel. 040 8998-0



## 8. ETH Zurich

### FP7 - Grant Agreement - Annex VI - Combination of Collaborative Project and Coordination and Support Action

#### Form C - Financial Statement (to be filled in by each beneficiary)

Project nr	212114	Funding scheme	Combination of Collaborative Project and Coordination and Support Action
Project Acronym	SLHC-PP		
Period from	01-Apr-2008	Is this an adjustment to a previous statement?	Yes/No
To	31-Mar-2009		
Legal Name	Eidgenössische Technische Hochschule Zürich	Participant Identity Code	999979015
Organisation short Name	ETH Zurich	Beneficiary nr	8
Funding % for RTD activities (A)	75%	If flat rate for indirect costs, specify %	60%

#### 1 - Declaration of eligible costs/lump sum/flat-rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs		125'800.00				125'800.00
Subcontracting						0.00
Other direct costs						0.00
Indirect costs		75'480.00				75'480.00
Lump sum/flat-rate/scale of unit declared						
<b>Total</b>	0.00	201'280.00	0.00	0.00		201'280.00
Maximum EC contribution	0.00	134'606.00	0.00	0.00		134'606.00
Requested EC contribution						0.00

#### 2 - Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art.II.17 of the grant agreement?

If yes, please mention the amount (in €)

No

#### 3 - Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art.II.19?

If yes, please mention the amount (in €)

No

#### 4 - Certificate on the methodology

Do you declare average personnel costs according to Art. II.14.1?

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art. II.4.4?

No

No

Name of the auditor		Cost of the certificate (in €), if charged under this project	
---------------------	--	---	--

#### 5. Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art. II.4.4?


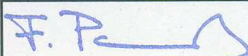

No

Name of the auditor		Cost of the certificate (in €)	
---------------------	--	--------------------------------	--

#### 6 - Beneficiary's declaration on its honour

##### We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and Article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art. II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art. II.19 of the grant agreement;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement	
	Professor F. Pauss	Sabine Meens
	Date & signature	
		
	26.05.2009	

## 9. FOM-NIKHEF

### FP7 - Grant Agreement - Annex VI - Combination of Collaborative Project and Coordination and Support Action

Form C - Financial Statement (to be filled in by each beneficiary)			
Project nr	212114	Funding scheme	Combination of Collaborative Project and Coordination and Support Action
Project Acronym	SLHC-PP		
Period from	01-Apr-2008	Is this an adjustment to a previous statement?	no
To	31-Mar-2009		
Legal Name	Stichting voor Fundamenteel Onderzoek der Materie	Participant Identity Code	999624092
Organisation short Name	FOM-NIKHEF	Beneficiary nr	9
Funding % for RTD activities (A)	75%	If flat rate for indirect costs, specify %	60%

#### 1 - Declaration of eligible costs/lump sum/flat-rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs		56.310,54				56.310,54
Subcontracting						0,00
Other direct costs		27.794,98				27.794,98
Indirect costs		50.463,31				50.463,31
Lump sum/flat-rate/scale of unit declared						
<b>Total</b>	0,00	134.568,83	0,00	0,00		134.568,83
Maximum EC contribution	0,00	89.992,91	0,00	0,00		89.992,91
Requested EC contribution						89.992,91

#### 2 - Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art. II.17 of the grant agreement?

no
----

If yes, please mention the amount (in €)

#### 3 - Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art. II.19?

no
----

If yes, please mention the amount (in €)

#### 4 - Certificate on the methodology

Do you declare average personnel costs according to Art. II.14.1?

no
----

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art. II.4.4?

no
----

Name of the auditor	Cost of the certificate (in €), if charged under this project
---------------------	---

#### 5 - Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art. II.4.4?

no
----

Name of the auditor	Cost of the certificate (in €)
---------------------	--------------------------------

#### 6 - Beneficiary's declaration on its honour



##### We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and Article 7 (special clauses) of the grant agreement;

- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art. II.17 of the grant agreement;

- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art. II.19 of the grant agreement;

- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement
 Science Park 105 P.O. Box 41882 1009 DB AMSTERDAM	A. F. VAN RÏN
	Date & signature
	14/5/09 

10. GSI

FP7 - Grant Agreement - Annex VI - Combination of Collaborative Project and Coordination and Support Action

Form C - Financial Statement (to be filled in by each beneficiary)			
Project nr	212114	Funding scheme	Combination of Collaborative Project and Coordination and Support Action
Project Acronym	SLHC-PP		
Period from	01-Apr-2008	Is this an adjustment to a previous statement?	Yes
To	31-Mar-2009		
Legal Name	Gesellschaft für Schwerionenforschung	Participant Identity Code	999995214
Organisation short Name	GSI	Beneficiary nr	10
Funding % for RTD activities (A)	75%	If flat rate for indirect costs, specify %	

1 - Declaration of eligible costs/lump sum/flat-rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs			8,317.28			8,317.28
Subcontracting			0.00			0.00
Other direct costs			2,517.33			2,517.33
Indirect costs			1,413.94			1,413.94
Lump sum/flat-rate/scale of unit declared						
Total	0.00	0.00	12,248.55	0.00		12,248.55
Maximum EC contribution	0.00	0.00	11,593.03	0.00		11,593.03
Requested EC contribution						11,593.03

2 - Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art. II.17 of the grant agreement?  
If yes, please mention the amount (in €)

No

3 - Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art. II.19?  
If yes, please mention the amount (in €)

4 - Certificate on the methodology

Do you declare average personnel costs according to Art. II.14.17

No

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art. II.4.4?

No

Name of the auditor		Cost of the certificate (in €), if charged under this project	
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5 - Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art. II.4.4?


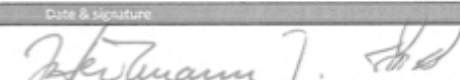
No

Name of the auditor		Cost of the certificate (in €)	
---------------------	--	--------------------------------	--

6 - Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and Article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art. II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art. II.19 of the grant agreement;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement	
	Dr. Johannes Heilmann	
	Date & signature	
	13.05.2009	

# 11. Imperial

## FP7 - Grant Agreement - Annex VI - Combination of Collaborative Project and Coordination and Support Action

### Form C - Financial Statement (to be filled in by each beneficiary)

Project nr	212114	Funding scheme	Combination of Collaborative Project and Coordination and Support Action
Project Acronym	SLHC-PP		
Period from	01-Apr-2008	Is this an adjustment to a previous statement?	No
To	31-Mar-2009		
Legal Name	Imperial College London	Participant Identity Code	999993468
Organisation short Name	Imperial	Beneficiary nr	11
Funding % for RTD activities (A)	75%	If flat rate for indirect costs, specify %	60%

#### 1 - Declaration of eligible costs/lump sum/flat-rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs		26,072.70				26,072.70
Subcontracting						0.00
Other direct costs		2,685.22				2,685.22
Indirect costs		17,254.75				17,254.75
Lump sum/flat-rate/scale of unit declared						
<b>Total</b>	0.00	46,012.67	0.00	0.00		46,012.67
Maximum EC contribution	0.00	30,770.97	0.00	0.00		30,770.97
Requested EC contribution						30,770.97

#### 2 - Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art. II.17 of the grant agreement?  
If yes, please mention the amount (in €)

No

#### 3 - Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art. II.19?  
If yes, please mention the amount (in €)

No

#### 4 - Certificate on the methodology

Do you declare average personnel costs according to Art. II.14.1?

No

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art. II.4.4?

No

Name of the auditor

Cost of the certificate (in €), if charged under this project

#### 5 - Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art. II.4.4?

No

Name of the auditor

Cost of the certificate (in €)

#### 6 - Beneficiary's declaration on its honour

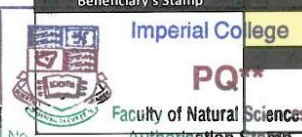
##### We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and Article 7 (special clauses) of the grant agreement;

- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art. II.17 of the grant agreement;

- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art. II.19 of the grant agreement;

- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement
	MR. PAUL STANGER Date & signature 8/5/2009 P Stanger



12. INFN

FP7 - Grant Agreement - Annex VI - Combination of Collaborative Project and Coordination and Support Action

Form C - Financial Statement (to be filled in by each beneficiary)			
Project nr	212114	Funding scheme	Combination of Collaborative Project and Coordination and Support Action
Project Acronym	SLHC-PP		
Period from	01-Apr-2008	Is this an adjustment to a previous statement?	No
To	31-Mar-2009		
Legal Name	Istituto Nazionale di Fisica Nucleare	Participant Identity Code	99992789
Organisation short Name	INFN	Beneficiary nr	12
Funding % for RTD activities (A)	75%	If flat rate for indirect costs, specify %	60%

1 - Declaration of eligible costs/lump sum/flat-rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs	24.485,15					24.485,15
Subcontracting	0,00					0,00
Other direct costs	417,80					417,80
Indirect costs	14.941,77					14.941,77
Lump sum/flat-rate/scale of unit declared						
<b>Total</b>	<b>39.844,72</b>	<b>0,00</b>	<b>0,00</b>	<b>0,00</b>	<b>0,00</b>	<b>39.844,72</b>
Maximum EC contribution	29.883,54	0,00	0,00	0,00		29.883,54
Requested EC contribution						15.000,00

2 - Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art. II.17 of the grant agreement?  
If yes, please mention the amount (in €)

No
----

3 - Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art. II.19?  
If yes, please mention the amount (in €)

No
----

4 - Certificate on the methodology

Do you declare average personnel costs according to Art. II.14.1?

No
----

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art. II.4.4?

No
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Name of the auditor		Cost of the certificate (in €), if charged under this project	
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5 - Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art. II.4.4?


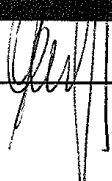

No
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Name of the auditor		Cost of the certificate (in €)	
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6 - Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and Article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art. II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art. II.19 of the grant agreement;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement	
	Dr. Angela Campanale	Dr. Paolo Pierini
	Date & signature	
		13/05/2009 

13. PSI

FP7 - Grant Agreement - Annex VI - Combination of Collaborative Project and Coordination and Support Action

Form C - Financial Statement (to be filled in by each beneficiary)			
Project nr	212114	Funding scheme	Combination of Collaborative Project and Coordination and Support Action
Project Acronym	SLHC-PP		
Period from	01-Apr-2008	Is this an adjustment to a previous statement?	No
To	31-Mar-2009		
Legal Name	Paul Scherrer Institut	Participant Identity Code	999994923
Organisation short Name	PSI	Beneficiary nr	13
Funding % for RTD activities (A)	75%	If flat rate for indirect costs, specify %	20%

1 - Declaration of eligible costs/lump sum/flat-rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs	32'410.96		1'474.38			33'885.34
Subcontracting						0.00
Other direct costs						0.00
Indirect costs	6'482.19		294.88			6'777.07
Lump sum/flat-rate/scale of unit declared						
<b>Total</b>	<b>38'893.15</b>	<b>0.00</b>	<b>1'769.26</b>	<b>0.00</b>		<b>40'662.41</b>
<b>Maximum EC contribution</b>	<b>29'169.86</b>	<b>0.00</b>	<b>1'577.59</b>	<b>0.00</b>		<b>30'747.45</b>
<b>Requested EC contribution</b>						<b>30'747.45</b>

2 - Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art.11.17 of the grant agreement?  
If yes, please mention the amount (in €)

No

3 - Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art.11.19?  
If yes, please mention the amount (in €)

No

4 - Certificate on the methodology

Do you declare average personnel costs according to Art. 11.14.1?  
Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art. 11.4.4?

No  
No

Name of the auditor		Cost of the certificate (in €), if charged under this project	
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5 - Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art. 11.4.4?


No

Name of the auditor		Cost of the certificate (in €)	
---------------------	--	--------------------------------	--

6 - Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles 11.14 and 11.15 of the grant agreement, and, if relevant, Annex III and Article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art. 11.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art. 11.19 of the grant agreement;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement
 PAUL SCHERRER INSTITUT 5232 Villigen PSI, Schweiz	Wernli Christian Date & signature 27.5.09 / [Signature]

14. STFC

FP7 - Grant Agreement - Annex VI - Combination of Collaborative Project and Coordination and Support Action

Form C - Financial Statement (to be filled in by each beneficiary)			
Project nr	212114	Funding scheme	Combination of Collaborative Project and Coordination and Support Action
Project Acronym	SLHC-PP		
Period from	01/04/2008	Is this an adjustment to a previous statement ?	No
To	31/03/2009		
Legal Name	Science and Technology Facilities Council	Participant Identity Code	999980179
Organisation short Name	STFC	Beneficiary nr	14
Funding % for RTD activities (A)	75	If flat rate for indirect costs, specify %	0%

1- Declaration of eligible costs/lump sum/flat rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs	85700.75	21777.15				107477.90
Subcontracting	0	0.00				0.00
Other direct costs	13440.06	0.00				13440.06
Indirect costs *	89985.79	22866.01				112851.80
Access Costs						0.00
Lump sum/flat rate/scale of unit declared						0.00
<b>Total</b>	<b>189126.60</b>	<b>44643.16</b>				<b>233769.76</b>
	141844.95	23301.55				165146.50
<b>Requested EC contribution</b>	<b>66478.26</b>	<b>9873.50</b>				<b>76351.76</b>

\* Indirect costs relating to:  
 - "Coordination" and "Support" activities are reimbursed up to a maximum of 7% of the direct eligible costs relating to these activities excluding the direct eligible costs for subcontracting and the costs of resources made available by third parties which are not used on the premises of the beneficiary.  
 - "RTD", "Management" and "other" activities are reimbursed in accordance with the various options foreseen in Article II.15.2 a), b) and c) of the grant agreement.

2- Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art.II.17 of the grant agreement ?

If yes, please mention the amount (in €)

No

3- Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art. II.19 ?

If yes, please mention the amount (in €)

No

4. Certificate on the methodology

Do you declare average personnel costs according to Art. II.14.1 ?

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art. II.4.4 ?

Yes/No

No

Name of the auditor

Cost of the certificate (in €), if charged under this project

5- Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art.II.4.4 ?

No

Name of the auditor

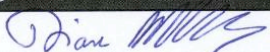
Cost of the certificate (in €)

6- Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and Article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art.II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art. II.19 of the grant agreement ;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission or by the Court of Auditors and/or their authorised representatives.

SCIENCE AND TECHNOLOGY FACILITIES COUNCIL  
 Rutherford Appleton Laboratory  
 Harwell Science and Innovation Campus  
 Chilton  
 Didcot  
 Oxfordshire  
 OX11 0QX

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement
	Mrs Diane Rabbetts
	Date & signature
	27-May-09 

15. UBONN

FP7 - Grant Agreement - Annex VI - Combination of Collaborative Project and Coordination and Support Action

Form C - Financial Statement (to be filled in by each beneficiary)

<b>Project nr</b>	212114	<b>Funding scheme</b>	Combination of Collaborative Project and Coordination and Support Action
<b>Project Acronym</b>	SLHC-PP		
<b>Period from</b>	01-Apr-2008	<b>Is this an adjustment to a previous statement?</b>	No
<b>To</b>	31-Mar-2009		
<b>Legal Name</b>	Rheinische Friedrich-Wilhelms-Universität Bonn	<b>Participant Identity Code</b>	999980276
<b>Organisation short Name</b>	UBONN	<b>Beneficiary nr</b>	15
<b>Funding % for RTD activities (A)</b>	75%	<b>If flat rate for indirect costs, specify %</b>	60%

1 - Declaration of eligible costs/lump sum/flat-rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs	107.638,03					107.638,03
Subcontracting	0,00					0,00
Other direct costs	2.276,13					2.276,13
Indirect costs	65.948,50					65.948,50
Lump sum/flat-rate/scale of unit declared						
<b>Total</b>	175.862,66	0,00	0,00	0,00		175.862,66
<b>Maximum EC contribution</b>	131.896,99	0,00	0,00	0,00		131.896,99
<b>Requested EC contribution</b>						131.896,99

2 - Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art.II.17 of the grant agreement?

If yes, please mention the amount (in €)

No

3 - Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art.II.19?

If yes, please mention the amount (in €)

No

4 - Certificate on the methodology

Do you declare average personnel costs according to Art. II.14.1?

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art. II.4.4?

No

No

<b>Name of the auditor</b>		<b>Cost of the certificate (in €), if charged under this project</b>	
----------------------------	--	--	--

5. Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art. II.4.4?

Yes/No

<b>Name of the auditor</b>		<b>Cost of the certificate (in €)</b>	
----------------------------	--	---------------------------------------	--

6 - Beneficiary's declaration on its honour

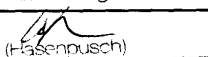
We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and Article 7 (special clauses) of the grant agreement;

- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art. II.17 of the grant agreement;

- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art. II.19 of the grant agreement;

- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

<b>Beneficiary's Stamp</b>	<b>Name of the Person(s) Authorised to sign this Financial Statement</b>	
	Daniela Hasenpusch (Financial Officer)	
	27.03.2009	Date & signature Friedrich-Wilhelms-Universität Der Kanzler im Auftrag  (Hasenpusch)

16. UNIGE

FP7 - Grant Agreement - Annex VI - Combination of Collaborative Project and Coordination and Support Action

Form C - Financial Statement (to be filled in by each beneficiary)

Project nr	212114	Funding scheme	Combination of Collaborative Project and Coordination and Support Action
Project Acronym	SLHC-PP		
Period from	01-Apr-2008	Is this an adjustment to a previous statement?	No
To	31-Mar-2009		
Legal Name	Université de Genève	Participant Identity Code	999974650
Organisation short Name	UNIGE	Beneficiary nr	16
Funding % for RTD activities (A)	75%	If flat rate for indirect costs, specify %	60%

1 - Declaration of eligible costs/lump sum/flat-rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs		50'460.12				50'460.12
Subcontracting						0.00
Other direct costs						0.00
Indirect costs		30'276.07				30'276.07
Lump sum/flat-rate/scale of unit declared						
<b>Total</b>	0.00	80'736.19	0.00	0.00		80'736.19
Maximum EC contribution	0.00	53'992.33	0.00	0.00		53'992.33
Requested EC contribution						53'992.33

2 - Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art. II.17 of the grant agreement?  
If yes, please mention the amount (in €)

No

3 - Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art. II.19?  
If yes, please mention the amount (in €)

4 - Certificate on the methodology

Do you declare average personnel costs according to Art. II.14.1?  
Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art. II.4.4?

No

Name of the auditor		Cost of the certificate (in €), if charged under this project	
---------------------	--	---	--

5 - Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art. II.4.4?

No

Name of the auditor		Cost of the certificate (in €)	
---------------------	--	--------------------------------	--

6 - Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and Article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art. II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art. II.19 of the grant agreement;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement	
	Prof. Allan G. CLARK	Henri WACONGNE
	Date & signature	
	14/5/09 AS	11.05.09 HW

DÉPARTEMENT DE PHYSIQUE  
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1211 GENÈVE

17. USFD

FP7 - Grant Agreement - Annex VI - Combination of Collaborative Project and Coordination and Support Action

Form C - Financial Statement (to be filled in by each beneficiary)			
<b>Project nr</b>	212114	<b>Funding scheme</b>	Combination of Collaborative Project and Coordination and Support Action
<b>Project Acronym</b>	SLHC-PP		
<b>Period from</b>	01-Apr-2008	<b>Is this an adjustment to a previous statement?</b>	No
<b>To</b>	31-Mar-2009		
<b>Legal Name</b>	University of Sheffield	<b>Participant Identity Code</b>	999976881
<b>Organisation short Name</b>	USFD	<b>Beneficiary nr</b>	17
<b>Funding % for RTD activities (A)</b>	75%	<b>If flat rate for indirect costs, specify %</b>	60%

1 - Declaration of eligible costs/lump sum/flat-rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs			10,820.40			10,820.40
Subcontracting						0.00
Other direct costs			215.97			215.97
Indirect costs			6,621.82			6,621.82
Lump sum/flat-rate/scale of unit declared						
<b>Total</b>	0.00	0.00	17,658.19	0.00		17,658.19
<b>Maximum EC contribution</b>	0.00	0.00	11,808.92	0.00		11,808.92
<b>Requested EC contribution</b>						11,808.92

2 - Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art. II.17 of the grant agreement?  
If yes, please mention the amount (in €)

No

3 - Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art. II.19?  
If yes, please mention the amount (in €)

Yes/No

4 - Certificate on the methodology

Do you declare average personnel costs according to Art. II.14.1?

NO

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art. II.4.4?

NO

<b>Name of the auditor</b>		<b>Cost of the certificate (in €), if charged under this project</b>	
----------------------------	--	--	--

5 - Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art. II.4.4?



No

<b>Name of the auditor</b>		<b>Cost of the certificate (in €)</b>	
----------------------------	--	---------------------------------------	--

6 - Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and Article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art. II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art. II.19 of the grant agreement;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

<b>Beneficiary's Stamp</b>	<b>Name of the Person(s) Authorised to sign this Financial Statement</b>
	MISS J WATSON
	Date & signature 8/5/09 

# 18. RWTH – Aachen

## FP7 - Grant Agreement - Annex VI - Combination of Collaborative Project and Coordination and Support Action

Form C - Financial Statement (to be filled in by each beneficiary)			
Project nr	212114	Funding scheme	Combination of Collaborative Project and Coordination and Support Action
Project Acronym	SLHC-PP		
Period from	01-Apr-2008	Is this an adjustment to a previous statement?	No
To	31-Mar-2009		
Legal Name	Rheinisch-Westfälische Technische Hochschule Aachen	Participant Identity Code	999983962
Organisation short Name	RWTH Aachen	Beneficiary nr	18
Funding % for RTD activities (A)	75%	If flat rate for indirect costs, specify %	60%

### 1 - Declaration of eligible costs/lump sum/flat-rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs	9.850,41					9.850,41
Subcontracting	0,00					0,00
Other direct costs	0,00					0,00
Indirect costs	5.910,24					5.910,24
Lump sum/flat-rate/scale of unit declared						
<b>Total</b>	<b>15.760,65</b>	<b>0,00</b>	<b>0,00</b>	<b>0,00</b>	<b>0,00</b>	<b>15.760,65</b>
<b>Maximum EC contribution</b>	<b>11.820,49</b>	<b>0,00</b>	<b>0,00</b>	<b>0,00</b>	<b>0,00</b>	<b>11.820,49</b>
<b>Requested EC contribution</b>						<b>11.820,49</b>

### 2 - Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art. II.17 of the grant agreement?  
If yes, please mention the amount (in €)

No

### 3 - Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art. II.19?  
If yes, please mention the amount (in €)

No

### 4 - Certificate on the methodology

Do you declare average personnel costs according to Art. II.14.1?  
Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art. II.4.4?

No

No

Name of the auditor

Cost of the certificate (in €), if charged under this project

### 5 - Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art. II.4.4?

No


Name of the auditor

Cost of the certificate (in €)

### 6 - Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and Article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art. II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art. II.19 of the grant agreement;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement
 <p>Der Rektor der Rheinisch-Westfälischen Technischen Hochschule Aachen</p>	<p>Stephanie Carl</p> <p>Date &amp; signature</p> <p>Für den Rektor, Der Kanzler im Auftrag</p> <p>22.05.09</p>

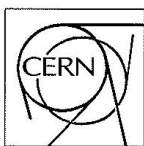
## SLHC-PP Summary Financial Report, Period1 - Combination of Collaborative Project and Coordination and Support Action

Funding echome		CP + CSA	Type of activity											Total (A)+(B)+(C)+(D)+(E)		Receipts	Interest	Requested EC Contribution
Beneficiary n°	If 3rd Party, linked to beneficiary	Adjustment (Yes/No)	Organisation Short Name	RTD (A)		Coordination (B)		Support (C)		Management (D)		Other (E)		Total	Max EC Contribution	Receipts	Interest	Requested EC Contribution
				Total	Max EC Contribution	Total	Max EC Contribution	Total	Max EC Contribution	Total	Max EC Contribution	Total	Max EC Contribution					
1		NO	CERN	808,071.15	606,053.36	382,330.11	255,683.26	118,782.53	79,435.82	282,830.74	282,830.74	0.00	0.00	1,592,014.53	1,224,003.18	0.00	6908.83	1,224,003.18
2		NO	AGH-UST	40,203.81	30,152.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40,203.81	30,152.86	0.00		30,152.86
3		NO	CEA	278,284.07	208,713.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	278,284.07	208,713.05	0.00		208,713.05
4		NO	CIEMAT	50,645.30	37,983.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50,645.30	37,983.98	0.00		37,983.98
5		NO	CNRS IN2P3	30,672.78	23,004.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30,672.78	23,004.59	0.00		23,004.59
6		NO	CTU	0.00	0.00	0.00	0.00	35,193.47	23,535.63	0.00	0.00	0.00	0.00	35,193.47	23,535.63	0.00		23,535.63
7		NO	DESY	0.00	0.00	2,106.10	1,408.45	0.00	0.00	0.00	0.00	0.00	0.00	2,106.10	1,408.45	0.00		1,408.45
8		NO	ETHZ	0.00	0.00	201,280.00	134,606.00	0.00	0.00	0.00	0.00	0.00	0.00	201,280.00	134,606.00	0.00		0.00
9		NO	FOM-NIKHEF	0.00	0.00	134,568.83	89,992.91	0.00	0.00	0.00	0.00	0.00	0.00	134,568.83	89,992.91	0.00		89,992.91
10		NO	GSI	0.00	0.00	0.00	0.00	12,248.55	11,593.03	0.00	0.00	0.00	0.00	12,248.55	11,593.03	0.00		11,593.03
11		NO	IMPERIAL	0.00	0.00	46,012.67	30,770.97	0.00	0.00	0.00	0.00	0.00	0.00	46,012.67	30,770.97	0.00		30,770.97
12		NO	INFN	39,844.72	29,883.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	39,844.72	29,883.54	0.00		15,000.00
13		NO	PSI	38,893.15	29,169.86	0.00	0.00	1,769.26	1,577.59	0.00	0.00	0.00	0.00	40,662.41	30,747.45	0.00		30,747.45
14		NO	STFC	189,126.60	141,844.95	44,643.16	23,301.55	0.00	0.00	0.00	0.00	0.00	0.00	233,769.76	165,146.50	0.00		76,351.76
15		NO	UBONN	175,862.66	131,896.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	175,862.66	131,896.99	0.00		131,896.99
16		NO	UNIGE	0.00	0.00	80,736.19	53,992.33	0.00	0.00	0.00	0.00	0.00	0.00	80,736.19	53,992.33	0.00		53,992.33
17		NO	USFD	0.00	0.00	0.00	0.00	17,658.19	11,808.92	0.00	0.00	0.00	0.00	17,658.19	11,808.92	0.00		11,808.92
18		NO	RWTH AACHEN	15,760.65	11,820.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15,760.65	11,820.49	0.00		11,820.49
<b>TOTAL</b>				<b>1,667,364.89</b>	<b>1,250,523.67</b>	<b>891,677.06</b>	<b>589,755.47</b>	<b>185,652.00</b>	<b>127,950.99</b>	<b>282,830.74</b>	<b>282,830.74</b>	<b>0.00</b>	<b>0.00</b>	<b>3,027,524.69</b>	<b>2,251,060.87</b>	<b>0.00</b>		<b>2,012,776.60</b>
Requested EC contribution for the reporting period (In €)														<b>2,012,776.60</b>				



## 8. Certificates

<b>Beneficiary</b>	<b>Organisation short name</b>	<b>Certificate on the financial statements provided? yes / no</b>	<b>Any useful comment, in particular if a certificate is not provided</b>
1	CERN	Yes	Report Attached CERN's Internal Audit Service
2	AGH-UST	No	Expenditure threshold not reached
3	CEA-Saclay	No	Expenditure threshold not reached
4	CIEMAT	No	Expenditure threshold not reached
5	CNRS-IN2P3	No	Expenditure threshold not reached
6	CTU	No	Expenditure threshold not reached
7	DESY	No	Expenditure threshold not reached
8	ETH Zürich	No	Expenditure threshold not reached
9	FOM-NIKHEF	No	Expenditure threshold not reached
10	GSI	No	Expenditure threshold not reached
11	Imperial	No	Expenditure threshold not reached
12	INFN	No	Expenditure threshold not reached
13	PSI	No	Expenditure threshold not reached
14	STFC	No	Expenditure threshold not reached
15	UBONN	No	Expenditure threshold not reached
16	UNIGE	No	Expenditure threshold not reached
17	USFD	No	Expenditure threshold not reached
18	RWTH - Aachen	No	Expenditure threshold not reached



ORGANISATION EUROPÉENNE POUR LA RECHERCHE NUCLÉAIRE  
EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

Laboratoire Européen pour la Physique des Particules  
European Laboratory for Particle Physics

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Notre référence/Our reference: DSU-AU/09-40

15 May 2009

In accordance with our contract dated 22<sup>nd</sup> April 2009 with CERN “the Beneficiary” and the terms of reference attached thereto (appended to this Report), we provide our Independent Report of Factual Findings (“the Report”), as specified below.

### Objective

We, CERN’s Internal Audit Service, established in 1211 Geneva 23, Switzerland, represented for signature of this report by Bertrand Salami, Internal Auditor, have performed agreed upon procedures regarding the cost declared in the Financial Statement<sup>1</sup> of CERN hereinafter referred to as the Beneficiary, to which this Report is attached, and which is to be presented to the Commission of the European Communities under grant agreement Preparatory Phase of the Large Hadron Collider Upgrade, SLHC-PP, 212114, for the following period:

P1: 1 April 2008 - 31 March 2009.

This engagement involved performing certain specified procedures, the results of which the European Commission uses to draw conclusions as to the eligibility of the costs claimed.

### Scope of Work

Our engagement was carried out in accordance with:

- the terms of reference appended to this Report and;
- International Standard on Related Services (‘ISRS’) 4400 *Engagements to perform Agreed-upon Procedures regarding Financial Information* as promulgated by the International Federation of Accountants (‘IFAC’);
- the *Code of Ethics for Professional Accountants* issued by the IFAC. Although ISRS 4400 provides that independence is not a requirement for agreed-upon procedures engagements, the European Commission requires that the Auditor also complies with the independence requirements of the *Code of Ethics for Professional Accountants*;

As requested, we have only performed the procedures set out in the terms of reference for this engagement and we have reported our factual findings on those procedures in the table appended to this Report.

<sup>1</sup> Financial Statement in this context refers solely to Form C – Annex VI by which the Beneficiary claims costs under the Grant Agreement.

The scope of these agreed upon procedures has been determined solely by the European Commission and the procedures were performed solely to assist the European Commission in evaluating whether the costs claimed by the Beneficiary in the accompanying Financial Statement has been claimed in accordance with the Grant Agreement. The Auditor is not responsible for the suitability and appropriateness of these procedures.

Because the procedures performed by us did not constitute either an audit or a review made in accordance with International Standards on Auditing or International Standards on Review Engagements, we do not express any assurance on the Financial Statements.

Had we performed additional procedures or had we performed an audit or review of the Financial Statements of the Beneficiary in accordance with International Standards on Auditing, other matters might have come to our attention that would have been reported to you.

#### **Sources of Information**

The Report sets out information provided to us by the management of the Beneficiary in response to specific questions or as obtained and extracted from the Beneficiary's information and accounting systems.

#### **Factual Findings**

The above mentioned Financial Statement per Activity was examined and all procedures specified in the appended table for our engagement were carried out. On the basis of the results of these procedures, we found:

All documentation and accounting information to enable us to carry out these procedures has been provided to us by the Beneficiary. Except as indicated below, no exceptions were noted.

#### **Exceptions**

There were no exceptions noted

#### **Use of this Report**

This Report is solely for the purpose set forth in the above objective.

This Report is prepared solely for the confidential use of the Beneficiary and the European Commission and solely for the purpose of submission to the European Commission in connection with the requirements as set out in Article II.4.4 of the Grant Agreement. This Report may not be relied upon by the Beneficiary or by the European Commission for any other purpose, nor may it be distributed to any other parties. The European Commission may only disclose this Report to others who have regulatory rights of access to it, in particular the European Anti Fraud Office and the European Court of Auditors.

This Report relates only to the Financial Statement specified above and does not extend to any other financial statements of the Beneficiary.

No conflict of interest exists between the Auditor and the Beneficiary in establishing this Report. The fee paid to the Auditor for providing the Report was € zero.

We look forward to discussing our Report with you and would be pleased to provide any further information or assistance which may be required.



*CERN's Internal Audit*  
*Bertrand Salami, Internal Auditor*

**Procedures performed by the Auditor**

The Auditor designs and carries out his work in accordance with the objective and scope of this engagement and the procedures to be performed as specified below. When performing these procedures the Auditor may apply techniques such as inquiry and analysis, (re)computation, comparison, other clerical accuracy checks, observation, inspection of records and documents, inspection of assets and obtaining confirmations or any others deemed necessary in carrying out these procedures.

The European Commission reserves the right to issue guidance together with example definitions and findings to guide the Auditor in the nature and presentation of the facts to be ascertained. The European Commission reserves the right to vary the procedures by written notification to the Beneficiary. The procedures to be performed are listed as follows:

Procedures	Standard factual finding and basis for exception reporting
<p><b>Personnel Costs</b></p>	
<p>1. Recalculate hourly personnel and overhead rates for personnel (full coverage if less than 20 employees, otherwise a sample of minimum 20, or 20% of employees, whichever is the greater), indicate the number of productive hours used and hourly rates. Where sampling is used, selection should be random with a view to producing a representative sample.                      'Productive hours' represent the (average) number of hours made available by the employee in a year after the deduction of holiday, sick leave and other entitlements. This calculation should be provided by the Beneficiary.                      [if average costs are used, a separate independent report is required on the methodology]</p>	<p>For each employee in the sample of 21, the Auditor obtained the personnel costs (salary and employer's costs) from the payroll system together with the productive hours from the time records of each employee.                       For each employee selected, the Auditor recomputed the hourly rate by dividing the actual personnel costs by the actual productive hours, which was then compared to the hourly rate charged by the Beneficiary.                       No exceptions were noted.                       The average number of productive hours for the employees selected was 1753.</p>
<p>2. For the same selection examine and describe time recording of employees (paper/ computer, daily/weekly/monthly, signed, authorized).</p>	<p>Employees recorded their time on a monthly basis using a computer based-system. The time-records selected were authorized and signed by the project manager or other superior.</p>
<p>3. Employment status and employment conditions of personnel.                      The Auditor should obtain the employment contracts of the employees selected and compare with the standard employment contract used by the Beneficiary. Differences which are not foreseen by the Grant Agreement should be noted as exceptions.</p>	<p>For the employees selected, the Auditor inspected their employment contracts and found that they were:                      – directly hired by the Beneficiary in accordance with its national legislation,                      – under the sole technical supervision and responsibility of the latter, and                      – remunerated in accordance with the normal practices of the Beneficiary.</p>
<p>4. Use of average personnel costs</p>	<p>Procedure 4 is not applicable</p>
<p><b>Subcontracting</b></p>	
<p>5. Obtain a written description from the Beneficiary regarding 3<sup>rd</sup> party resources used and compare with Annex 1 to the Grant Agreement.</p>	<p>Procedure 5 is not applicable as there were no subcontracting costs.</p>
<p>6. Inspect documents and obtain confirmations that subcontracts are awarded according to a procedure including an analysis of</p>	<p>Procedure 6 is not applicable as there were no subcontracting costs.</p>

Procedures	Standard factual finding and basis for exception reporting
<p>best value for money (best price-quality ratio), transparency and equal treatment. Full coverage if less than 20 items, otherwise a sample of minimum 20, or 20% of the items, whichever is the greater.</p> <p><b>Other Direct Costs</b></p> <p>7. Allocation of equipment subject to depreciation is correctly identified and allocated to the project. Full coverage if less than 20 items, otherwise a sample of minimum 20, or 20% of the items, whichever is the greater.</p>	<p>The Auditor traced the equipment charged to the project to the accounting records and the underlying invoices. The Beneficiary has documented the link with the project on the invoice and purchase documentation, and, where relevant, the project accounting. The asset value was agreed to the invoice and no VAT or other identifiable indirect taxes were charged. The depreciation method used to charge the equipment to the project was compared to the Beneficiary's normal accounting policy and found to be the same.</p>
<p>8. Travel costs correctly identified and allocated to the project (and in line with Beneficiary's normal policy for non-EC work regarding first-class travel, etc.) Full coverage if less than 20 items, otherwise a sample of minimum 20, or 20% of the items, whichever is the greater. The Beneficiary should provide written evidence of its normal policy for travel costs (e.g. use of first class tickets) to enable the Auditor to compare the travel charged with this policy.</p>	<p>The Auditor inspected the sample and found that the Beneficiary had allocated travel costs to the project by marking of invoices and purchase orders with the project reference, resulting in traceable allocation in the project accounts. The costs charged were compared to the invoices and found to be the same. No VAT or other identifiable indirect taxes were charged.</p>
<p>9. Consumables correctly identified and allocated to the project. Full coverage if less than 20 items, otherwise a sample of minimum 20, or 20% of the items, whichever is the greater.</p>	<p>The Auditor inspected the sample and found that the Beneficiary had allocated consumable costs to the project by marking of invoices and purchase orders with the project reference, resulting in traceable allocation in the project accounts. The costs charged were compared to the invoices and found to be the same. No VAT or other identifiable indirect taxes were charged.</p>
<p><b>Indirect costs</b></p> <p>10. Obtain and review a detailed breakdown of Indirect costs (reconciled to the financial accounts) and confirm that the following costs are not present:</p> <ul style="list-style-type: none"> <li>a) identifiable indirect taxes including value added tax,</li> <li>b) duties,</li> <li>c) interest owed,</li> <li>d) provisions for possible future losses or charges,</li> <li>e) exchange losses, cost related to return on capital,</li> <li>f) costs declared or incurred, or reimbursed in respect of another Community project,</li> <li>g) debt and debt service charges, excessive or reckless expenditure<sup>2</sup>.</li> </ul>	<p>Procedure 10 is not applicable as the project benefits from a transitional flat rate.</p>

<sup>2</sup> Excessive or reckless expenditure as defined in guidance note to be issued by the Commission in 2007.

Procedures	Standard factual finding and basis for exception reporting
<p>11. Assess use of a simplified method of calculation of overheads at the level of the legal entity. The Beneficiary may use a simplified method of calculation (either due to the lack of analytical accounting or legal requirement to use a form of cash-based accounting). This does not permit the use of a generalized estimate, or the use of a 'standard' rate that is not derived from the financial accounts of the period in question. Thus the rate (but not the methodology) should be updated for each accounting period.</p>	<p>Procedure 11 is not applicable as the project benefits from a transitional flat rate.</p>
<p>12. Inspect and compare exchange rates into Euros.</p>	<p>The Auditor compared the exchange rates used for conversion with the applicable official exchange rates established by the European Communities and the Beneficiary used:</p> <ul style="list-style-type: none"> <li>• the rate applicable on the first day of the month following the end of reporting period</li> </ul>
<p>13. Identification of receipts. The Beneficiary is obliged to deduct from its claim any receipts related to the project (income from events, rebates from suppliers, etc.)</p>	<p>The Auditor examined the relevant project accounts and obtained representations from the Beneficiary that the amounts listed represent a complete record of the sources of income connected with the project. The amount included in the claim regarding receipts is the same as the amount recorded in the project accounting</p>
<p>14. Identification of interest yielded on pre-financing. The Beneficiary, when it is the coordinator of the project, is obliged to declare interest yielded on pre-financing</p>	<p>The Auditor compared the relevant project accounts with the interest shown in the bank statements and found them to be the same.</p>