

Status of the SLHC-PP

Roland Garoby
7 February, 2011

Outline

1. Introduction

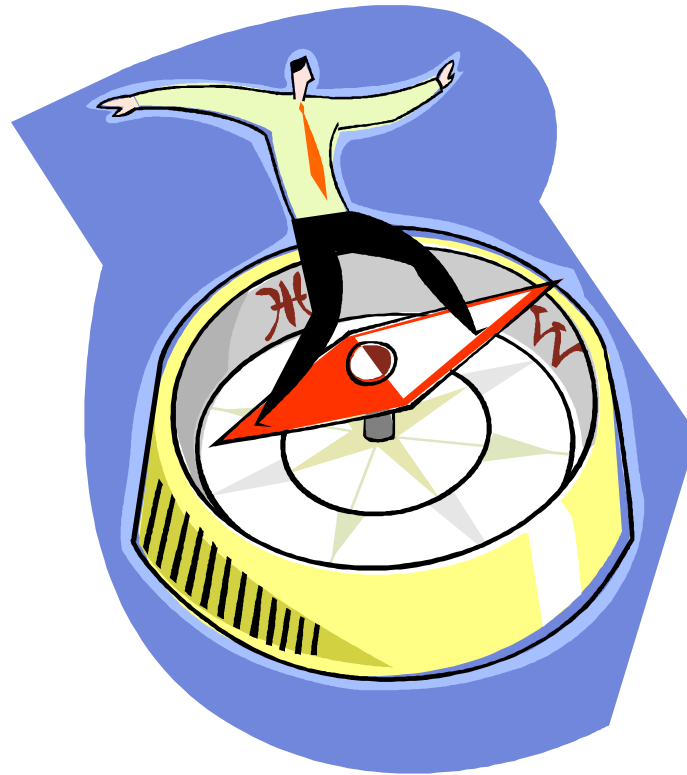
- New Scientific Strategy
- Last news from LHC...
- SLHC-PP in the new context

2. SLHC-PP milestones & deliverables ...

3. Annual meeting: goals and schedule

1. Introduction

<http://cern.ch/SLHC-PP>



New Scientific Strategy (1/2)

<http://cern.ch/SLHC-PP>

- **Based on the experience gained diagnosing and repairing the LHC in 2008 and 2009 the following decisions have been taken in 2010 and formalized in the Medium Term Plan 2011-2016:**
- ⇒ LHC will operate until ~2030. Experiments expect to accumulate ~3000 fb⁻¹,
- ⇒ During its last decade of operation, the LHC shall aim at a useful average luminosity of $5 \cdot 10^{34}$ Hz/cm²,
- ⇒ The High Luminosity upgrade of the LHC itself (new IRs with new magnets) shall be implemented a few years before 2020,
- ⇒ The injectors shall be adapted to meet reliably the performance required by the High Luminosity LHC for as long as it operates (2030),
- ⇒ The baseline solution for the injectors is to consolidate and upgrade the existing accelerators (including Linac4) and the construction of new injectors (LP-SPL + PS2) is a back-up plan.

New Scientific Strategy (2/2)

<http://cern.ch/SLHC-PP>

- **Two projects have been created on January 1, 2011 for studying and implementing the High Luminosity Upgrade:**

⇒ **“HL-LHC” for the LHC itself**

“This new study combines all work related to the provision of a peak luminosity of five times the design luminosity of the LHC (i.e. $5 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$) and with an enhanced luminosity lifetime by “luminosity leveling””.

⇒ **“LHC Injectors Upgrade” (LIU) for the injectors**

“The LHC Injectors Upgrade should plan for delivering reliably to the LHC the beams required for reaching the goals of the HL-LHC. This includes LINAC4, the PS booster, the PS, the SPS, as well as the heavy ion chain.”

- **R and D for a Super conducting Proton Linac is pursued in view of a potential proton driver for a neutrino facility**

News from LHC (1/3)

(from LHC Performance Workshop 2011)

<http://indico.cern.ch/conferenceOtherViews.py?view=standalone&id=103957>

The LHC has performed remarkably well

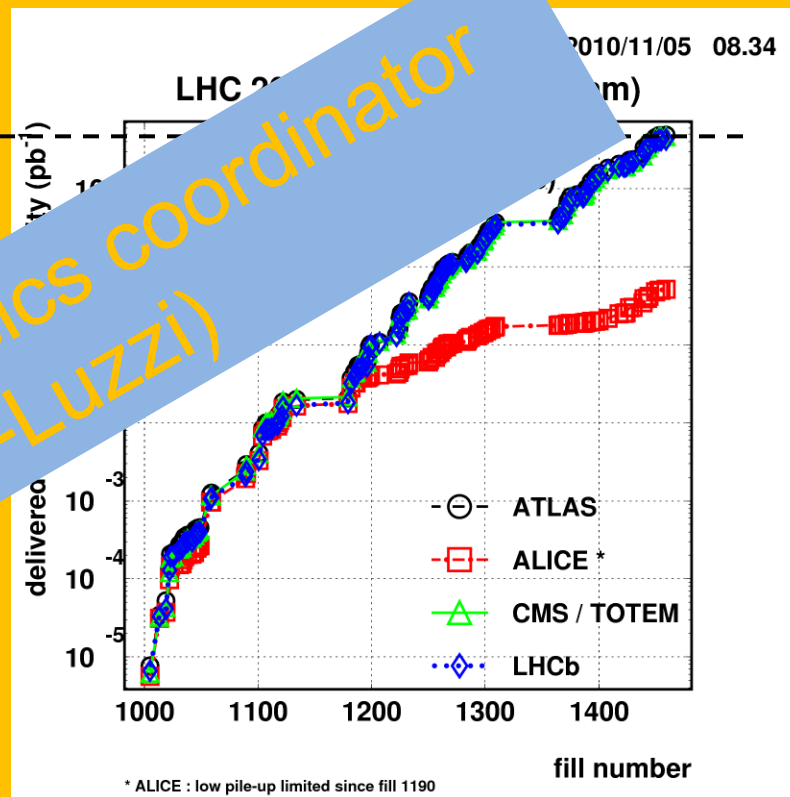
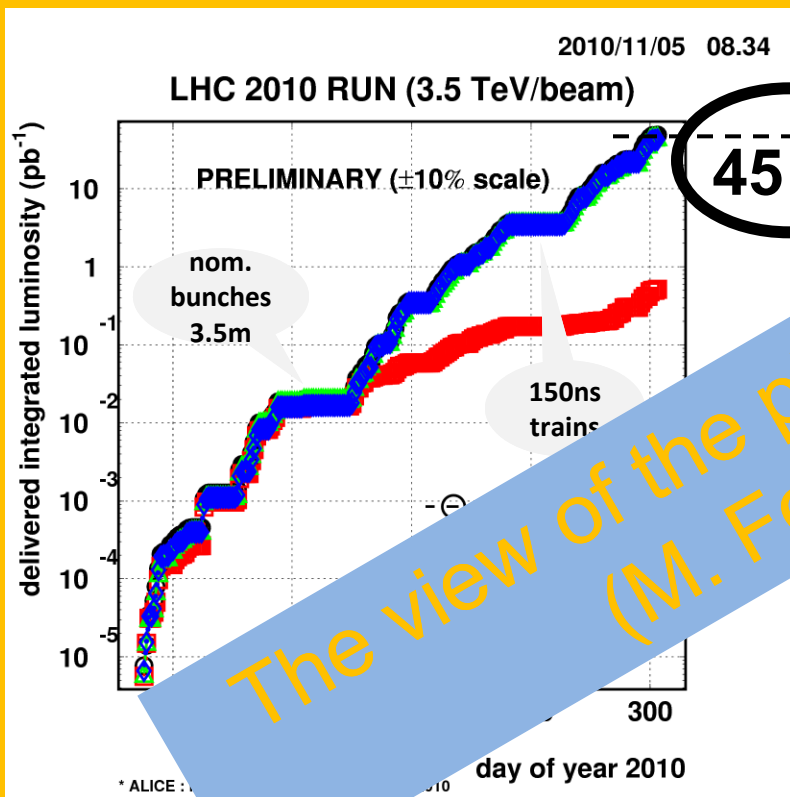
- “Come a phenomenally long way in 9 months”
- Notable feature - remarkable performance after just a year
 - It hasn't come for free
 - It's been years in the making
 - Devil is, as always, in the details
- Possible to get more detailed for all systems
- 2011 summary of what's been learnt this year
- What's coming incoming:
 - CERN, R2E...
- We'll be bringing up Ralph's stored energy plot
 - LET'S TRY NOT TO BREAK IT!"

The view of the accelerator team:
 Conclusions of Evian workshop
 (M. Lamont)

News from LHC (2/3)

<http://cern.ch/SLHC-PP>

2010 integrated luminosity log scale (protons)



The view of the physics coordinator
(M. Ferro-Luzzi)

=> Need for **several tens of pb⁻¹** before one can speak of a physics start in 2011!

News from LHC (3/3)

<http://cern.ch/SLHC-PP>

(from LHC Performance Workshop 2011)

<http://indico.cern.ch/conferenceOtherViews.py?view=standard&confId=103957>

Decisions after Chamonix2011 (endorsed by MAC)

- The LHC will run for physics in 2012*
- Beam energy will stay at 3.5 TeV in 2011. It could be increased depending upon systematic measurements using the « Thermal Amplifier » technique during the technical stop 2011-2012.*
- Integrated luminosity in 2011: between 1 and 4 fb⁻¹*
- Integrated luminosity until end 2012: between 5 and 10 fb⁻¹*
- First Long Shutdown (LSD1): 2013-2014 (part of...)*
- Second Long Shutdown (LSD2): 2017- ?*

Explanations
by M. Lamont
at 11h00

SLHC-PP in the new context

<http://cern.ch/SLHC-PP>

- **The SLHC-PP has been adapted to the new Scientific Strategy with the agreement of the EC officer**
 - ⇒ **Described in the annual report 2010**
http://info-slhc-pp.web.cern.ch/info-SLHC-PP/DOCUMENTS/Milestone%20Deiverable%20Reports/SLHC-PP_Annual%20Report2010.pdf

- **The work accomplished during the SLHC-PP will boost the implementation of the LHC Luminosity Upgrade:**
 - ⇒ **WP2 with adapted management tools**
 - ⇒ **WP3 and 4 for the basis of collaborations which will implement the upgrade of ATLAS and CMS**
 - ⇒ **WP5 for the analysis of radio protection issues in accelerators and detectors and contribution to Linac4**
 - ⇒ **WP6 for demonstrating the potential of NbTi technology for use in the future IRs**
 - ⇒ **WP7 for the development of critical competence in H⁻ source to be used for Linac4 and the analysis of field stabilization and RF distribution in the LP-SPL**
 - ⇒ **WP8 for the demonstration of power schemes for the upgraded central detectors.**

2. SLHC-PP milestones & deliverables

<http://cern.ch/SLHC-PP>

Period April 08 – December 10





Milestones (until end of the project)

<http://cern.ch/SLHC-PP>

1st year of the project

Number	Milestone title	Delivery month	Comment	Link
1.1	Kick-off meeting	M03	Presentations on SLHC-PP web site	Agenda
6.1	Qualification of magnet components	M08	Qualification document published	Report
3.1	Schedule for the R&D phase	M09	Schedule document	Report
6.2	Basic Magnet design	M10	Magnet design report	Report
1.2	First Annual SLHC-PP Meeting	M12	Presentations on SLHC-PP web site	Agenda
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	Meeting with stakeholders in accelerator and experiments, to define an agreement on design parameters	Report

2nd year of the project

Number	Milestone title	Delivery month	Comment	Link
7.1	List of required improvements for the design of the high duty factor plasma generator to function at a high duty factor	M14	Report approved by partners	Report
2.1	Financial management system (initial version)	M18	Initial version released	Report
4.1	Upgrade Project Scope defined	M18	Report published	Report
6.3	Complete cold mass design	M18	Design Report published	Report (in EDMS)
6.4	Complete cryomagnet design	M22	Design Report published	Template
1.3	Second Annual SLHC-PP Meeting	M24	Presentations on SLHC-PP web site	Agenda
2.2	EVM software (initial version)	M24 > M26	Initial version released	Report (in EDMS)
3.2	Upgrade project structures adapted to the implementation phase	M24	Documented as WEB structure	Report

Action required!

3rd year of the project

Action required!

Number	Milestone title	Delivery month	Comment	Link
6.6	Electrical test of collared coil	M28	Test report published	Word Template
6.7	Cold test of corrector magnets	M28	Test report published	Word Template
1.4	Third Annual Meeting and Final Project Review	M36	Presentations on SLHC-PP web site	

Deliverables - 1st year

<http://cern.ch/SLHC-PP>

Number	Deliverable title	Nature	Delivery month	Link
1.2.1	SLHC-PP web-site operational (intranet + public pages)	O	M03	Report
3.1.1	Project management structure and review office for R&D phase in place	O, R	M06	Report
2.2.1	Functioning collaboration communication structure	O	M12	Report
2.2.2	Project web site linked to the technical databases: Machine layout database, hardware baseline database, project notes and reports	O	M12	Report
4.1.1	Project Structures for construction of systems and sub-systems	O, R	M12	Report
4.2.1	Personnel and working practices of the Technical Coordination unit in place	O, R	M12	Report
6.1	Basic design of the triplet	R	M12	Report <u>1</u> & <u>2</u>
7.1.1	Finite element thermal study of the Linac 4 design source at the final duty factor	R	M12	Report
7.2.1	In depth characterisation of the two tuners plus cavities developed in the frame of the "HIPPI" JRA , FP6 (tuner/cavity characteristics)	R	M12 > M22	Word Template
8.1.1	Evaluation report on DC-DC conversion technologies	R	M12	Report
8.2.1	Evaluation report on generic serial powering studies and specification of serial powering components	R	M12	Report

Action required!

Deliverables - 2nd year

<http://cern.ch/SLHC-PP>

Number	Deliverable title	Nature	Delivery month	Link
1.1.1	Periodic Report (progress of work + use of resources + financial statement)	R	M14	Report
4.2.2	Key structural requirements (information repository, tools, coordination framework, safety and quality systems, integration office) and scheduling and reporting mechanisms in place	O, R	M18	Report
7.1.2	Design of a high duty factor plasma generator	R	M18	Report
7.2.2	Design of RF system architecture including modelling of RF components, simulation of the RF system and simulation of beam dynamics of the full LINAC; RF system and high power modulator specifications	R	M18 > M27	Template
3.2.1	Document the technical scope of the upgrade including an initial cost-estimate	R	M24	Report
5.1.1	Validation of simulation tools with measurements at LHC	R	M24	Report
5.1.2	Estimation of radiation and activation levels for critical areas of the experiments at SLHC	R	M24 > M26	Report (in EDMS)
5.2.1	Estimation of radiation and activation levels for critical areas of SLHC and its injectors	R	M24	Report
8.2.2	Custom serial powering circuitry and evaluation of generic high-current serial powering ASIC	P,R	M24	Report

Action required!

Deliverables - 3rd year (1)

<http://cern.ch/SLHC-PP>

Number	Deliverable title	Nature	Delivery month	Link
1.1.2	Periodic Report (progress of work + use of resources + financial statement)	R	M26	Report
6.3.1	Construction corrector magnet package	P	M26	Word Template
2.1.1	Common fund, Financial Management System (software) and user requirements and user guide document	O	M30	Word Template
2.1.2	Quality Assurance plan for the implementation phase	R	M30	Word Template
7.1.3	Construction of the plasma generator and sub-systems (e.g. 2Hz RF generator, hydrogen gas injection and pumping)	D	M30	Report
7.2.3	Production of a prototype electronic system and other elements for a full system demonstration; Definition of demonstration procedure	P	M30	Word Template
8.1.2	Prototypes and viability report	P, R	M30	Report
3.2.2	Schedule for the upgraded detector parts and for the S-ATLAS installation	R	M32	Word Template
6.2.1*	Construction of 2 instrumented collar packs	D	M32	Template
6.2.2*	Assessment of the collaring procedure and definition of final coli size	D	M33	
2.1.3	Earned Value management system (software) with user requirements and user guide document	O	M36	
3.1.2	Establish the initial Memorandum of Understanding for the upgrade	R	M36	
3.1.3	Develop detailed cost books for the upgrade including the installation phase	R	M36	

Actions required !

Deliverables - 3rd year (2)

<http://cern.ch/SLHC-PP>

To be provided by March 31

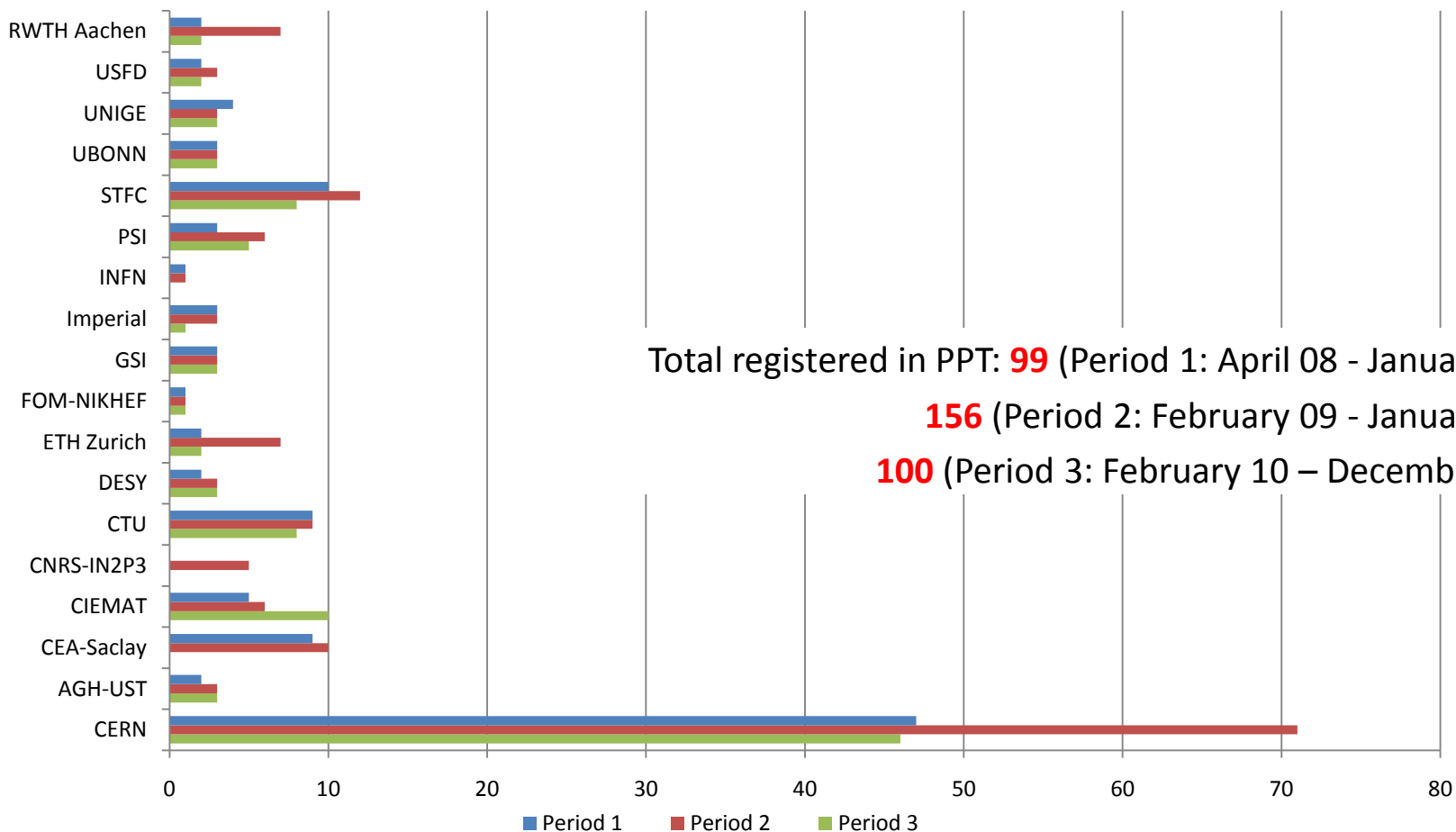
3.2.3	Technical documentation, drawing and CAD information for the existing experiment and the upgraded elements	R	M36	
4.1.2	Cost book and MoU	R	M36	
4.2.3	Pilot design and schedule	R	M36	
5.3.1	Impact Study (dose activated material)	R	M36	from
6.1.2	Complete Interaction Region	R	M36	
6.3.2*	Assembly of a 2m	D	M36	
7.1.4	Plasma generation	R	M36	
7.2.4	Full test and validation	D	M36	
8.1.3	Integration in full-scale	D	M36	
8.2.3	Full-scale super-magnets	D	M36	
1.1.3	Periodic Report (progress of work + use of resources + financial statement)	R	M38	
1.1.4	Final report	R	M38	



SLHC-PP Membership

<http://cern.ch/SLHC-PP>

Members per Beneficiary

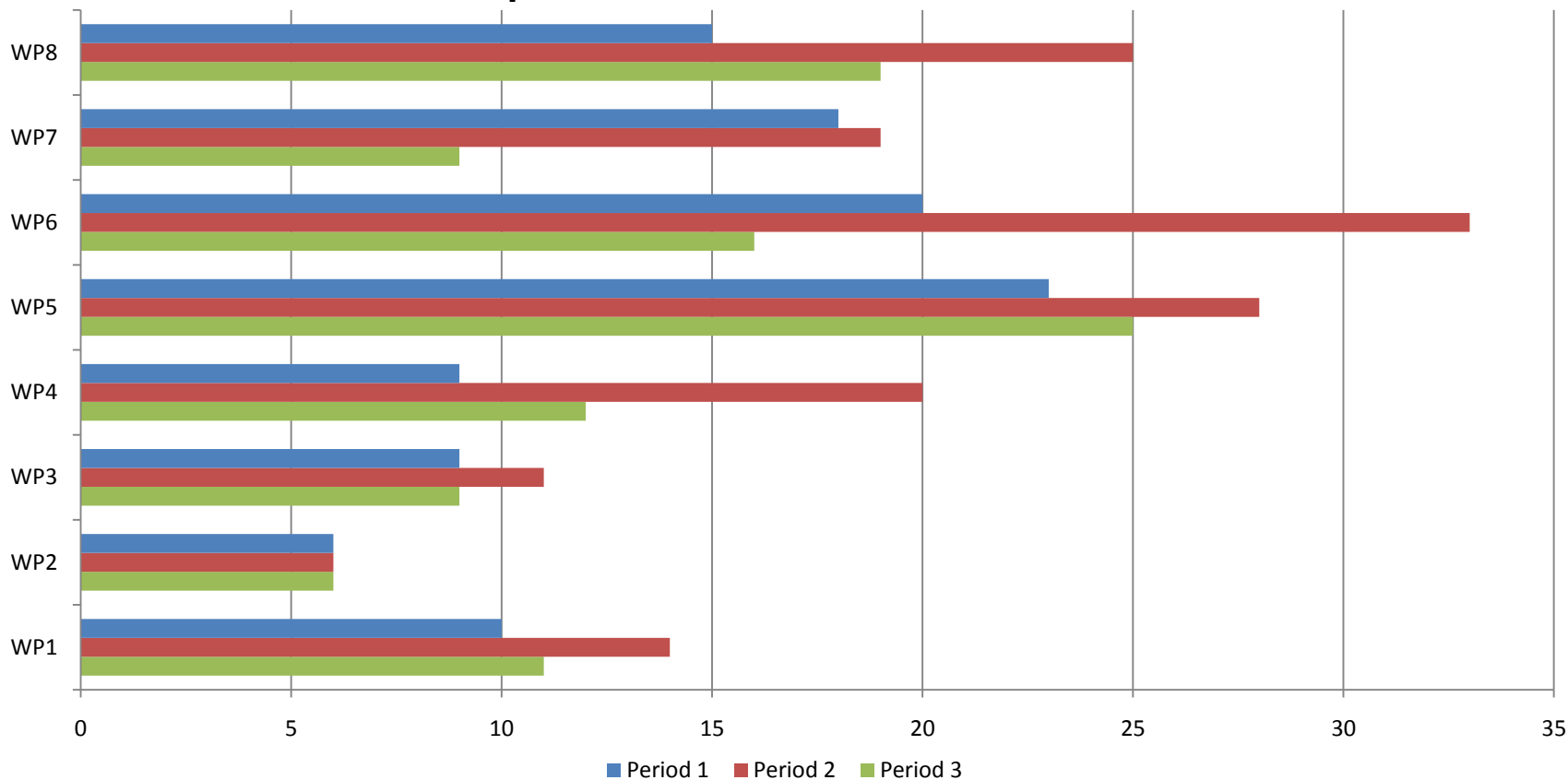


SLHC-PP Membership

<http://cern.ch/SLHC-PP>

Total registered in PPT: **99** (Period 1: April 08 - January 09)
156 (Period 2: February 09 - January 10)
107 (Period 3: February 10 - December 10)

Members per WP



Personnel Expenses April 08 – Dec 10

PM from Worked Hours
reported in PPT (33 months)

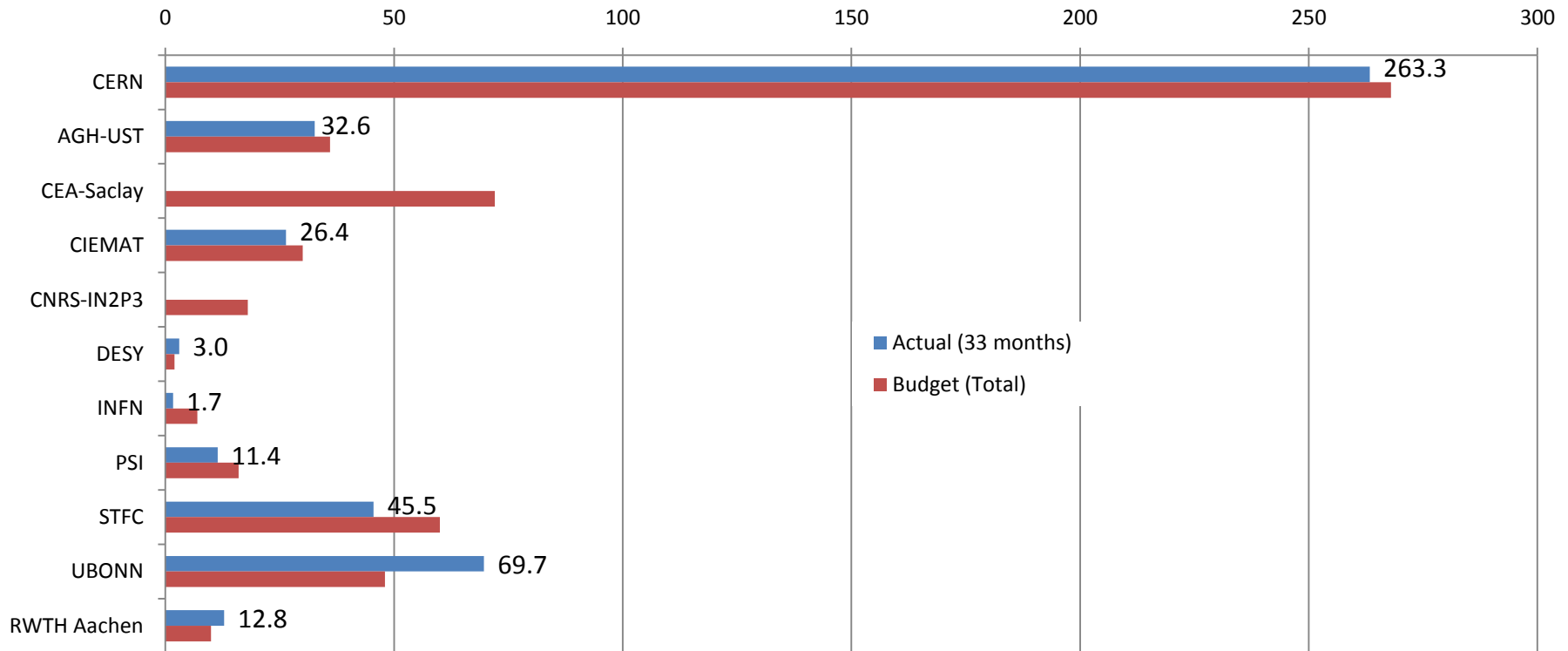
WP	P-M	P-M reported/ P-M budgeted for 33 months	P-M reported / P-M budgeted for whole Project
1	55	123%	113%
2	36	77%	70%
3	95	101%	93%
4	106	129%	118%
5	152	143%	131%
6	103	58%	53%
7	122	73%	67%
8	242	137%	125%
SUM	911	102%	93%

Full SLHC-PP project has 976 PM in Annex-I

PM for RTD Activities (WP 6 ,7, 8)

April 08 – Dec 10

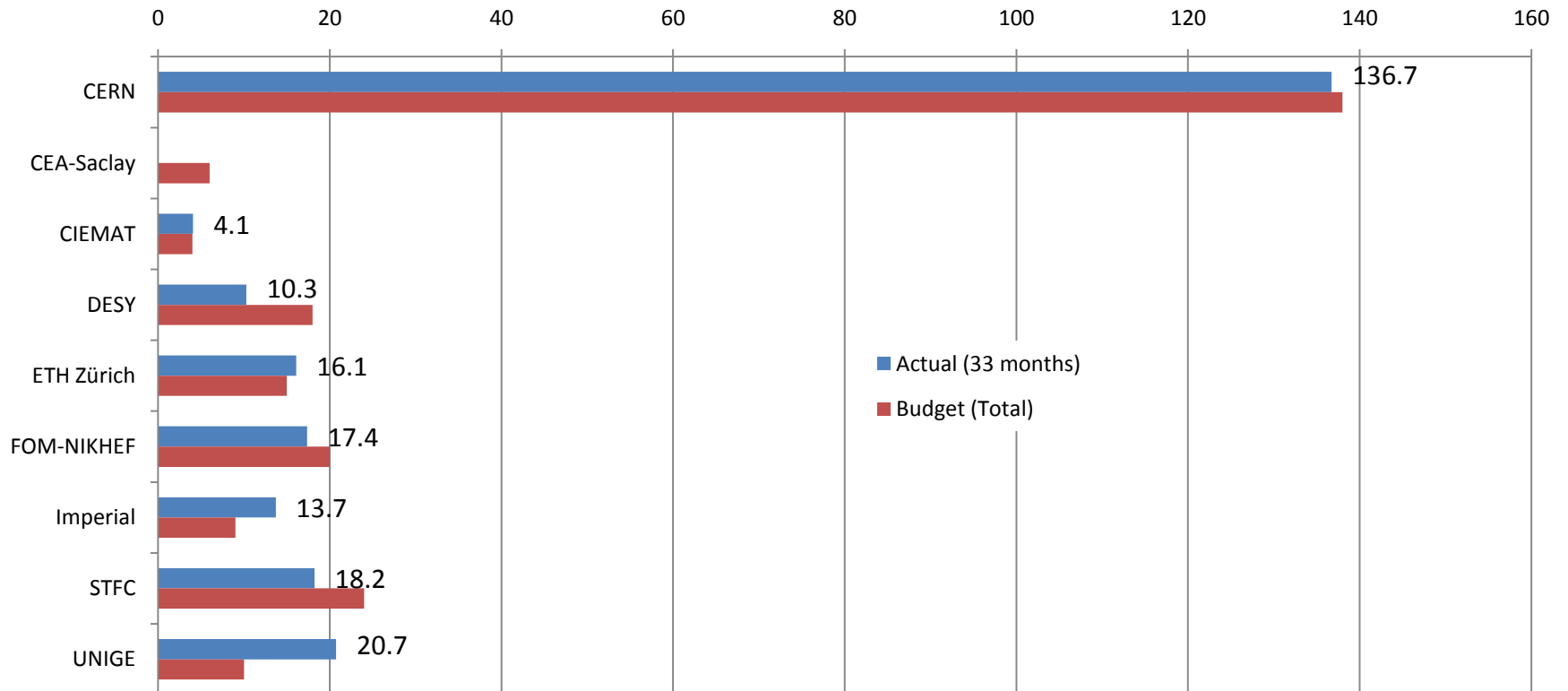
<http://cern.ch/SLHC-PP>



PM for Coordination Activities (WP 2, 3, 4)

April 08 – Dec 10

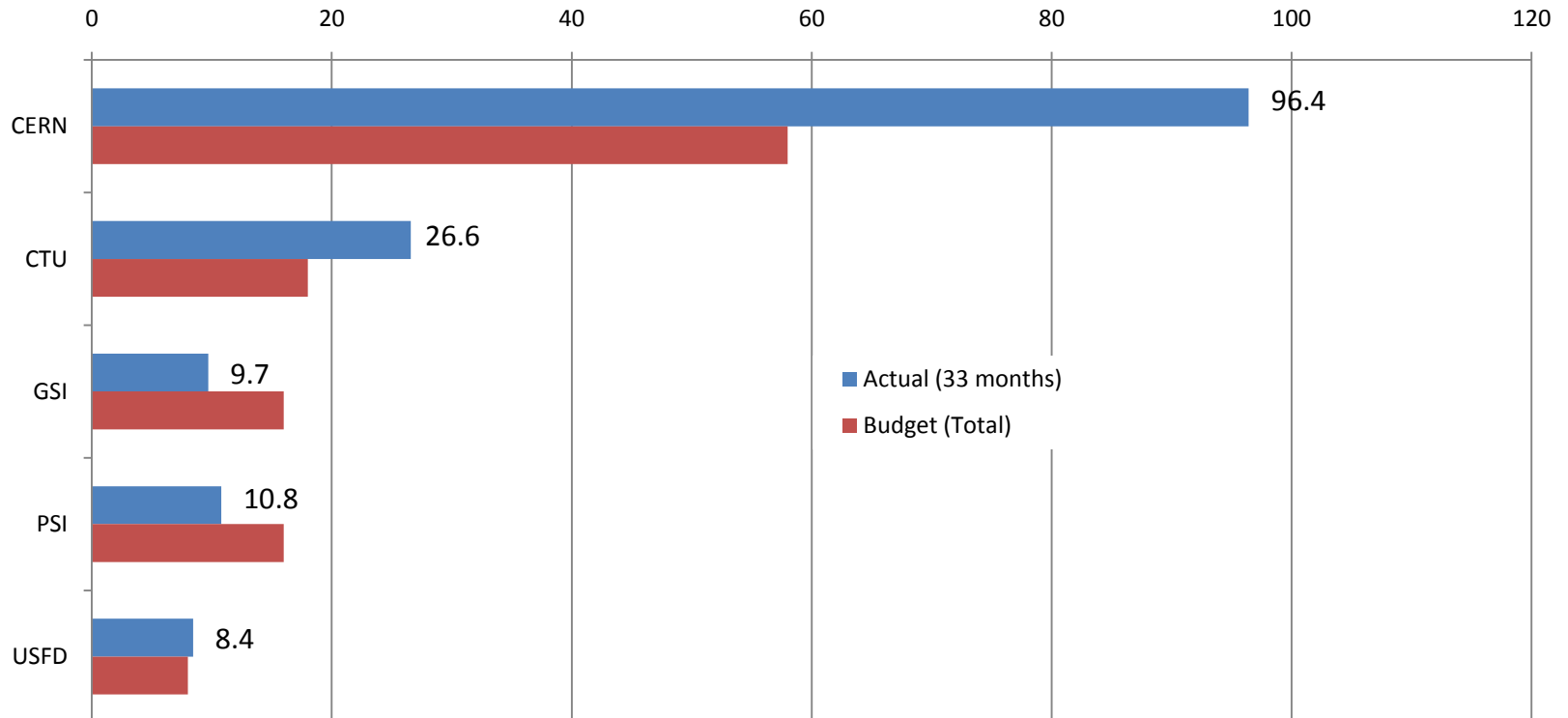
<http://cern.ch/SLHC-PP>



PM for Support Activities (WP5)

April 08 – Dec 10

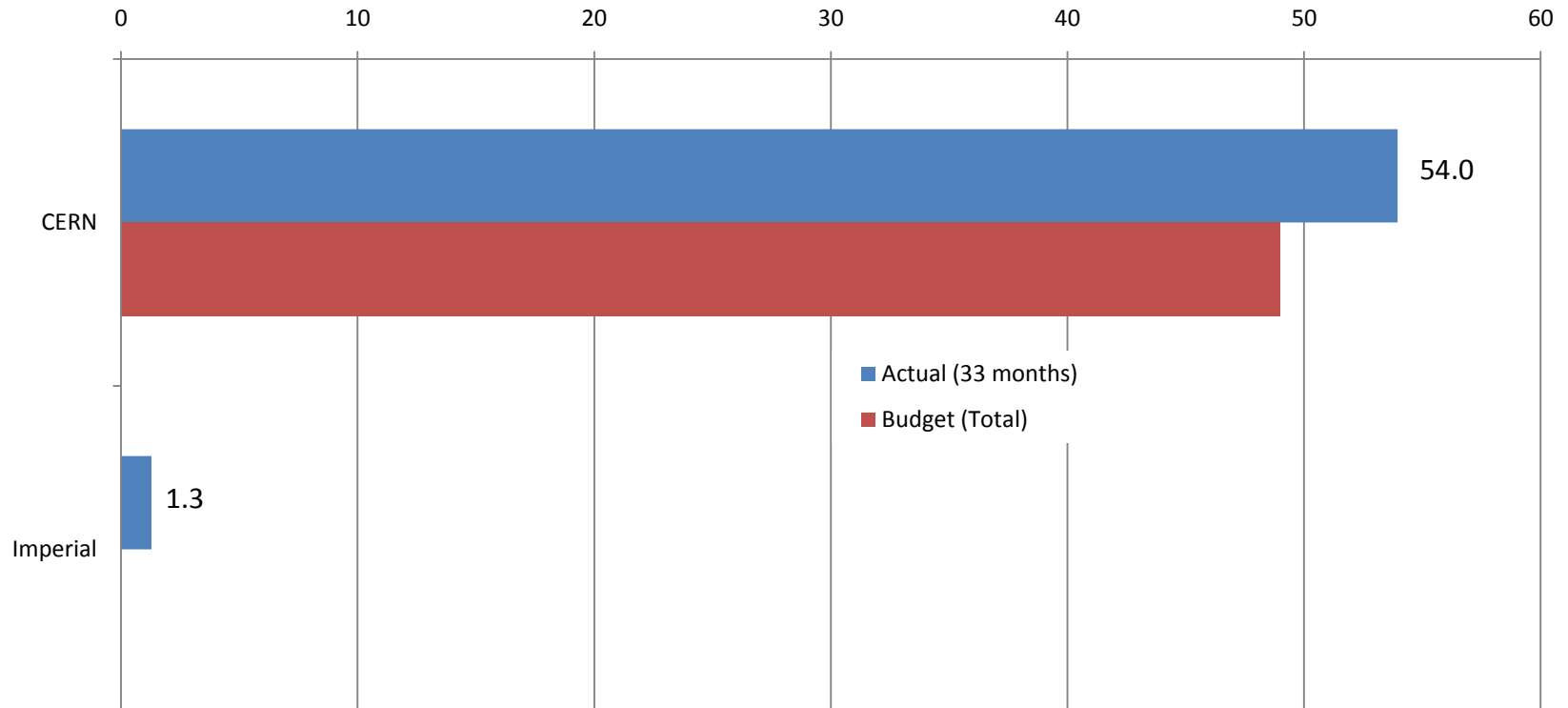
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PM for Management Activities (WP1)

April 08 – Dec 10

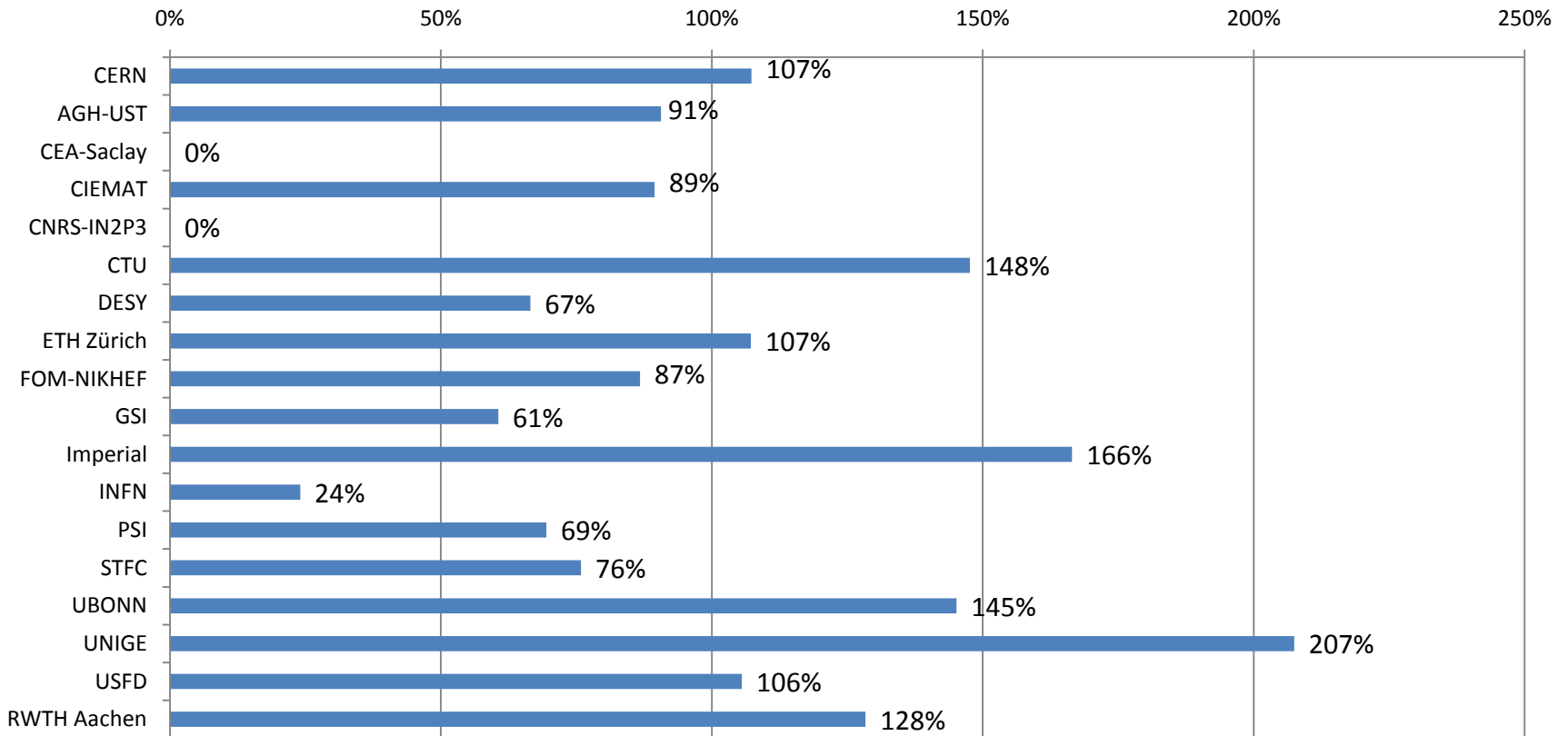
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PM / Partner

Actual (33m) / Budget (3 y)

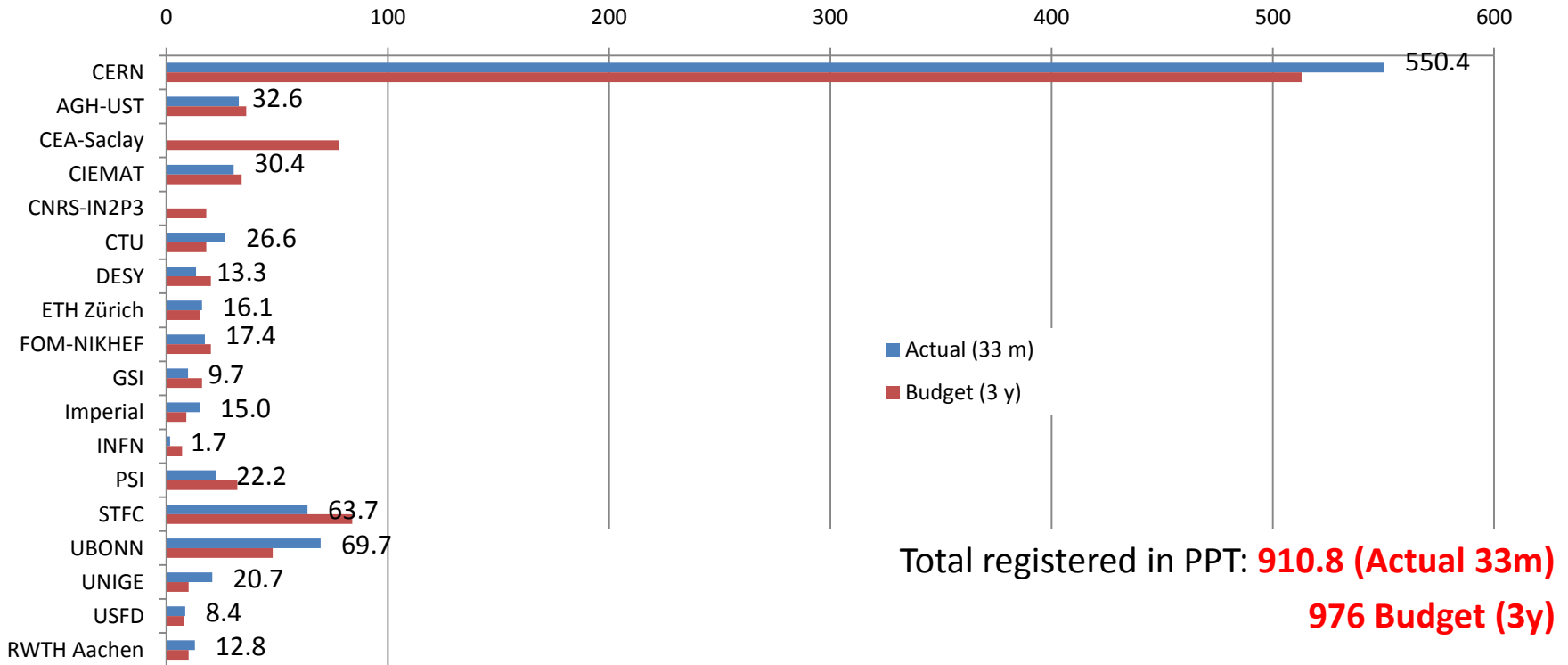
<http://cern.ch/SLHC-PP>



PM / Partner

Budget (3 y) VS Actual (33 m)

<http://cern.ch/SLHC-PP>



3. Annual meeting

<http://cern.ch/SLHC-PP>

- Goals:
 - Report progress and plans for conclusion
 - Prepare for the third annual and the final report **S**
 - Announce public SLHC outreach event on March 8 at CERN

3. Annual meeting (day 1)

<http://cern.ch/SLHC-PP>

Monday 7, February 2011

09:00 - 10:50 Plenary Session

09:00 **Welcome** 10'

09:10 **Physics perspectives with the High Luminosity LHC** 30'

09:40 **Particle Physics at Irfu (CEA-Saclay)** 25'

10:05 **Accelerator activities at Irfu (CEA-Saclay)** 25'

10:30 **Overall status of SLHC-PP** 20'

10:50 - 11:05 Coffee Break

11:05 - 12:30 Plenary Session

11:05 **LHC status and plans for 2011** 25'

11:30 **ATLAS results in 2010 and perspective in 2011** 30'

12:00 **CMS results in 2010 and perspective for 2011** 30'

12:30 - 14:00 Lunch Break

14:00 - 18:00 Parallel Sessions: WPs

14:00 **WP3** 1h00'

14:00 **WP6** 1h00'

15:00 **WP2** 1h00'

15:00 **WP4** 1h00'

16:00 - 16:15 Coffee Break

16:15 - 17:15 Parallel Sessions: WPs

16:15 **WP7** 1h00'

16:15 **WP8** 1h00'

17:15 - 18:00 Plenary Session on WP5 (Radioprotection and safety issues for accelerators and experiments)

17:15 **TBD** 45'

18:00 - 19:00 Governing Board *Institutional representatives*

3. Annual meeting (day 2)

<http://cern.ch/SLHC-PP>

Tuesday 8, February 2011

- 09:00 - 10:15 Plenary Session
- 09:00 **LIU Project** 20'
 - 09:20 **HL-LHC project (including introduction to Hi-Lumi Design Study)** 20'
 - 09:40 **Preparation of the final report and book closing** 20'
 - 10:00 **Final status of WP2: Coordination for the SLHC accelerator implementation** 15'
- 10:15 - 10:30 Coffee Break
- 10:30 - 12:30 Plenary Session: Final status of WPs
- 10:30 **Final status of WP3: Coordination of S-ATLAS experiment implementation** 30'
 - 11:00 **Final status for WP4: Coordination for the CMS2 experiment implementation** 30'
 - 11:30 **Final status of WP5: Radiation protection and safety issues for accelerator and experiments** 30'
 - 12:00 **Final status of WP6: Development of Nb-Ti quadrupole magnet prototype** 30'
- 12:30 - 14:00 Lunch Break
- 14:00 - 15:15 Plenary Session: Final status of WPs and Conclusions
- 14:00 **Final status of WP7: Development of critical components for the injectors** 30'
 - 14:30 **Final status of WP8: Tracking detector power distribution** 30'
 - 15:00 **SLHC-PP public event in 2011 and Conclusions** 15'

+ visit of CEA installations for those who registered

**I wish you a lively and
productive meeting!**