Marie Skłodowska-Curie Actions

Research and Innovation Staff Exchange (RISE)
Call: H2020-MSCA-RISE-2015

PART B

"RanDalf"

Research and Development for a future Lepton Facility

Contents

1 Summary

Copy the abstract from Part A

2 Excellence

Background

Progress in particle physics relies on accelerators and on the availability of experimental techniques to exploit the accelerators. The international community has unambiguously stated that a very strong scientific case exists for an electron positron collider. Europe, Asia and the Americas have all put the design, building and operation of such a collider high on their lists of priorities. Several projects are being pursued, with the goal of reaching high enough energies to study in detail the mechanism of electroweak symmetry breaking, study the standard model, and search for signs of new physics. Of these designs only linear colliders promise to reach an energy high enough to fully study the Higgs, the heaviest known particle, and to be able to reach sensitivities in the search for new physics which is comparable and complementary to that of the LHC.

Experiments at such cutting edge colliders are challenging. Experiments need to be able to measure the events precisely, to study in detail the decay products, and to survive in the environment of a collider. These experiments rely on cutting edge technologies, and, in many cases, on technological solutions which are well beyond those currently readily available.

Over the years significant R&D has been done to advance the state of the experimental art. This has already resulted in significant progress in the area. The work is done internationally, in loose collaborations and, sometimes, in unrelated efforts.

With the initiative of the Japanese particle physics community to bring a linear collider to Japan, as an international project, an international coherent action is needed to advance the technologies to a point that detectors for such a facility can be proposed. Strong efforts exist in all three regions of the world, Asia, the Americas, and Europe. We propose to build up and intensify the links between the European partners in this endeavor, at the center of the Asian activities, in Japan, and the center of the American activities, at SLAC, by the buildup of an exchange network between these partners.

The goal of this will be to reinforce and strengthen the links between the regions in the field of detector development and science at future electron-positron colliders. The program should strengthen the link, help to initiate new and common projects, and enable researchers from the regions to mutually gain access to the know how and the facilities available in the different regions.

The program will be organized along three major lines:

1. Development of novel and cutting edge technologies needed for modern detectors. Highly integrated, highly granular detector systems are a key ingredient in this.
   - Coordinate the development of modern detector technologies
   - Improve the communication and exchange of information on technological developments

- Ease access to industrial capacities in the different countries through local interfaces between the industrial players and members of the consortium

2. Investigations of the scientific case of a linear collider. The scientific case for a linear collider is broadly agreed upon. However detailed studies are needed to understand the exact reach of the proposed experiment, and how the physics will drive the optimization of the detectors and the collider.
3. Software and data handling are big challenges for modern, complex experiments. A common interface and a flexible software package is a key for a successful international organization of the scientific preparation and eventual exploitation of any major facility.

In addition special emphasis will be given to communicate and disseminate the actions and the results to a broader public. A central management team will coordinate the activities, and ensure a smooth and focused execution of the program.

These actions mesh very well with the overall strategy for particle physics in Europe, but also internationally. The recent round of strategy updates clearly established that a linear collider is a high priority of the field, surpassed only by the exploitation and upgrade of the LHC. The strategies also clearly acknowledge that any new project in particle physics will need to be international in nature and scope, to succeed. The next update of the particle physics strategy scheduled in Europe for 2018 will be closely connected to the developments in Japan, and the development of the program for particle physics in Japan and the rest of the world.

The goal of this proposal therefore is to reinforce the connections for future detector developments in Europe, Japan and the United States, and establish a sound a solid basis for a common strategy and the development of technologies and personell.

This overall aim can be broken down into scientific/technical progress, institutional and strategic goals, and personnel development and training:

1) Optimisation of common efforts to boost future detector projects that are part of the European and Japanese roadmaps by the following means:
   - Exchange expertise in key technical and organisational areas;
   - Enhance communication and common efforts on developing high-priority projects;
   - Increase information flow, logistics and knowledge exchange among their partners.
   - Ease the access to industrial partners crossing regional boundaries
2) Identification of collaboration potential and optimisation of project planning:
   - Identify skills, expertise, and technologies for application in project development;
   - Improve efficiency of resource usage, including personnel and expertise;
   - Share and develop experience on global partnerships for realising frontier projects.
3) “Familiarisation”, including:
   - The scientific, industrial and academic landscapes;
   - Working philosophy and methodology;
   - Culture and languages;
   - Personnel contacts.

The RanDalf participants are renowned laboratories in Europe, Japan and the US, that lead in advanced projects on detectors for particle physics. They have a clear goal of engaging in novel and improved pursuit of these projects. We propose to expand our collaborative efforts in the areas outlined below by adding significant staff exchanges in order to move from a model of separately coordinated efforts in the regions, to integrated knowledge transfer and joint project development. This is only possible with a significantly increased presence of staff from one region at the premises of the other region.

2.1 Quality, innovative aspects and credibility of the research

Detector technology is a key asset for modern science. In particle physics the detectors are an integral part of any collider facility, and are crucial for the success of the project. The complexity and cost of the large scale experiments at collider facilities make long range planning essential. The international natures of the projects make close international collaboration a necessity. This proposal should improve both access to modern technology and international collaboration.

The subject of the proposal is technologies which should improve the capabilities of future detectors significantly. Japan and Europe have traditionally collaborated strongly in the area of detector development. Strong links exist since the 1960ies, when groups from Tokyo university joined experiments at DESY. The exchange however has been dominated by visits of Japanese researchers in Europe, and only to a lesser extent, by visits of researcher from Europe to Japan. With this proposal we like to change this fundamentally, and increase significantly the connections between the two regions, and, in particular, the participation of European researchers in projects in Japan.

Scientifically the work is strongly focused on increasing the granularity of the detector systems, to provide more and better information on the events, and to utilize novel and cutting edge commercial and non-commercial sensor developments. The activities are embedded in a study to intensify the study of the physics anticipated at these future facilities, and a study to coordinate and advance the computing tools needed to work with these detectors. Building on the already international projects like CLIC or ILC the quality of international collaboration in this will be significantly deepening by enabling researcher, in particular young researchers, to integrate longer research stays at partner institutions in Japan and the US.

Table 4: Work Package List

Work package No	Work Package Description	Activity Type	Number of person months involved	Start month	End Month
1	Management, Communication and Outrech	Management and Dissemination		1	48
2	Development of technologies for modern detectors in particle physics at future electron positron colliders	Research		1	48
3	Investigate and develop possible physics scenarios which will have an impact	Research		1	48

	on the design on future lepton colliders				
4	Software tools and data handling	Research		1	48

2.1.1 Specific objectives and the relevance of the research and innovation project to the scope of the call and in relation to the "state of art".

Detector development is done by many groups and institutions. The following table provides some background material to explain the state of the art of the different projects pursued within the proposal, and to relate the planned activities to existing ones.

Project	State of Art	Goals

2.1.2 Methodological approach highlighting the types of research and innovation activities proposed and their originality.

The work proposed for this project is concerned with the development of novel technologies and technological solutions for modern detectors in particle physics, in computing, and in the science we want to do in the next phase of this research field.

WP2 has to do with the actual development of novel technologies. It is driven by the requirements defined for an electron positon collider at an energy of at least 500 GeV. This has a strong impact on the design of the tracking part of the detector, as well as on the calorimeters. In consequence topics of the proposal are the development of a novel type of time projection chamber, the development of semi-conductor tracking systems matched to this novel detector, and the realization of a calorimeter of extreme granularity needed to fully reconstruct the events produced at a linear collider. It is strongly defined by the common interest of both European and overseas researchers, and, in particular, the strategy of the Japanese scientists to realize the linear collider as an international project in Japan.It will connect strongly to the ongoing effort in Japan on advanced tracking detectors, and calorimeters.

WP3 is designed to study the scientific case for this collider in some detail. This is important because these studies define the performance of the detector systems which are being designed in WP2, and they are important, because they define more clearly the scientific goals and contributions this new collider facility will make.

WP4 is concerned with the tools needed to handle the data from such a new facility. This requires computing facilities, which can cope with the data, but also the development of algorithms and computing tools to be able to analyze and understand the data at the required level of precision. The final goal of the work package is the development of a coherent suite of tools which can be used in the study of future facilities.

The extended stays of scientific personnel in the host countries, in particular in Japan, will intensify the collaboration on and coordination of these goals. It will develop an integrated approach to tackle these projects, and to move ahead coherently. It will thus introduce in the topic of detector developments a level of coordination and coherence which has not been present so far.

In addition to the scientific work packages **WP1** deals with the management of the project, but also with communication and dissemination aspects of the work.

2.1.3 Inter/multidisciplinary types of knowledge involved, if applicable.

Detectors in particle physics rely on a broad range of knowledge. A modern detector requires cutting edge knowledge on sensors, on readouts, on analogue and digital electronics, on software and computing. The design and optimization of detector require a close interaction between the scientific goals of the facility, for which the detector is designed, with the science of the detector components. Last but not the least these detectors are complex and large installations, and they require sophisticated and advanced engineering to be build and operated successfully. The complex projects in the end can only be executed successfully if proper communication tools are in place, and propose methods are available to share documents and procedures.

It is the intention to cover all these different areas though secondment of personnel. Experts on the different technologies will work with experts on the same technologies at the host laboratories, and develop a common understanding.

From a European perspective the exchange with Japan is of particular interest to allow and ease access for European researchers to the existing high-tech companies in Japan, which are in many cases world leading in the area of sensor development.

2.2 Clarity and quality of knowledge sharing among the participants in light of the research and innovation objectives

The proposal wants to develop inter-regional collaboration at different levels. Secondments of personnel build a lasting and deep collaboration between the partners. The increased cooperation lead to an increased level of strategic coordination and alignment between the regions. Lastly, involving seconded personnel in communication and outreach activities increases their visibility, and in general advertises the role of science as an international ambassador for peace and fruitful collaboration among different countries and regions.

A key role in this is played by the common research projects, which are described as part of the WP2-WP4 descriptions. Seconded personnel will be fully integrated into the receiving institutions. They will become full members of the research groups in the receiving laboratories. Local staff will be available to help them integrate into the new environment. Support will be given to provide housing and lower the threshold for people to spent longer periods at the receiving institution.

In addition to the knowledge sharing in common projects, the project will organize a number of dedicated events to increase the level of communication and interchange. A prominent project will be the establishment of a common school on the physics and the experiments at a future electron positron collider, geared towards an audience of graduate student researchers. The big laboratories DESY and KEK organize an extended training program in which members from RanDalf can participate.

2.2.1 Approach and methodology used for knowledge sharing.

2.3 Quality of the interaction between the participating organisations

We propose to organize a number of events which will be designed to increase the level of communication between the partners of the project.

- We will organize regular meetings of the members of the project, to report on the progress and to discuss the overall orientation of the project. These meetings might be attached to the regular meetings of the linear collider community.
- The workpackages will organize dedicated topical meetings, as required, to advance the projects.
- We foresee an initial kickoff meeting of the project after approval, to plan the work.

Close to the end of the project, we will organize a follow-up workshop to take stock of the work done within the project, to illuminate the advancements made, and to discuss the future.

2.3.1 Contribution of each participant in the activities planned, including the participants' interactions in terms of content and expertise provided to reach the project’s objectives.

2.3.2 Justification of the main networking activities.

3 Impact

3.1 Enhancing research- and innovation-related human resources, skills, and working conditions to realise the potential of individuals and to provide new career perspectives

3.1.1 The project contribution to realising the potential of individuals and to providing new skills and career perspectives.

3.2 To develop new and lasting research collaborations, to achieve transfer of knowledge between research institutions and to improve research and innovation potential at the European and global levels

3.2.1 Development of new and lasting research collaborations resulting from the intersectoral and/or international secondments and the networking activities implemented.

3.2.2 Self-sustainability of the partnership after the end of the project

3.2.3 Contribution of the project to the improvement of the research and innovation potential within Europe and/or worldwide.

3.3 Effectiveness of the proposed measures for communication and results dissemination

3.3.1 Dissemination strategy - targeted at scientists, potential users and to the wider research and innovation community - to achieve the potential impact of the project.

3.3.2 Communication strategy, outreach plan and the activities envisaged to engage the public.

3.3.3 Expected impact of the proposed measures.

3.3.4 Intellectual property rights aspects (if applicable) and exploitation of results.

4 Implementation

4.1 Overall coherence and effectiveness of the work plan, including appropriateness of the allocation of tasks and resources

RanDaLF comprises four work packages. The first one concentrates on the management of the action, training and the communication of the results among the participant Institutions. The other three focus on the scientific and technological challenges described in B2 which cover detector R&D, performance, physics studies and data handling for a future Linear Collider Facility. This programme addresses specifically the coherence of the ambitious worldwide effort for a future Linear Collider and fits perfectly well into the strategy processes recently developed for accelerator Particle Physics in Europe, Japan and US. These three work packages meet the technological state-of-the-art for detector and physics studies, and tackle specific questions that need to be solved in the coming years for the realization of such a facility. Results obtained under this grant will play a highly relevant role in the discussion of the next upgrade of the European strategy for Particle Physics.

The participants in each work package are leading institutes in their countries in the area of Particle Physics and are presently involved in the overall projects of the field. This fact ensures the coherence of RanDaLF within the global effort. The effectiveness is increased by the fact that a significant number of ER will be seconded to Japan and to US so as to strengthen ties on the managerial and strategic levels.

The individual tasks address key items, where the partners will bring their unique expertise to bear and will mutually benefit from the planned staff exchanges. Each work package has well-defined deliverables and commensurate resources, as outlined in Table B4. The secondments have been planned by the European project leaders and our Japanese and US partners so as to achieve the goals.

Note that the actual R&D work is embedded in a global worldwide programme, which includes other countries like China. The direct involvement with US and Japan supports a strong European role in their future projects and continues to seed fruitful collaboration in both directions.

RanDaLF will promote the secondment of young, as well as female researchers without applying positive discrimination.

4.1.1 Consistency and adequacy of the work plan and the activities proposed to reach the project objectives.

4.1.2 Credibility and feasibility of the project through the activities proposed

4.1.3 Gender aspects in the planning of the activities

Table 5 Work Package 1 Description

Work Package Number	1
Work Package Title	Management, Outreach, Communication
Activity Type	Management
Participant Short Name	
Person Month per Participant	
Objectives	
Description of work	
Deliverables	

Table 6 Work Package 2 Description

Work Package Number	2
Work Package Title	Development of new Technologies for Experimants at Future Electron Postiron Colliders
Activity Type	Research
Participant Short Name	
Person Month per Participant	
Objectives	
Description of work	
Deliverables	

Table 7 Work Package 3 Description

Work Package Number	3			
Work Package Title	Science at Future Electron Positron Colliders			
Activity Type	Research			
Participant Short Name	CNRS	DESY	MPG	CSIC
Person Month per Participant	19	8	6	16

Participant Short Name	UCAM	CEA	VINCA	
Person Month per Participant	????	10	????	
Participant Short Name	KEK	UoT	Tohoku	
Person Month per Participant				

Objectives

1. Provide significant contributions to a coherent strategy in particle physics for the next 10-20 years (e+e- linear collider, LHC, Belle-II) with focus on the ILC physics potential and its window of opportunity in the next years. **This workpackage will lead the input of the Linear Collider community to the European Strategy in 2018/19**
2. Give guidance to the final layout of the LC detectors and LC machine
3. Systematic analysis of the interplay between precision measurements and extensions of the standard model of particle physics
4. Estimation of experimental and theoretical systematic errors for results of measurements at linear electron-positron colliders

Description of work:

A future e^+e^- collider at the TeV Scale will profoundly influence our image of the nature and the laws by which it is governed. Currently, two concepts, both linear colliders (LC) that can reach the TeV scale are under discussion: the International Linear Collider (ILC) with \sqrt{s} up to 1 TeV and the Compact Linear Collider (CLIC) with \sqrt{s} up to 3 TeV.

The work proposed in this package will lead to the foundation of a international forum to scrutinise the physics programme of a LC where the communication with other projects will be explicitly fostered. All tasks of this work package will lead to important input to the European Strategy in 2018/19. Many of the results will also be of high relevance for circular e+e- projects.

Expert groups, from theory and experiment, in Europe and the institutes KEK, SLAC and the universities of Tokyo and Tohoku in the partner countries will be brought together for an efficient production of new results by joint hands-on work during the research stays, which goes significantly beyond exchanging seperately produced results e.g. at conferences.

In particular the turn-around cycle between the collaborating theorerical and experimental groups will speed up considerably, which is crucial in order to provide timely input for the European strategy and to react quickly on new results from the LHC or other experiments (flavour, direct/indirect detection etc).

Task 3.1 The LC in the global landscape: New results that are expected in the next decade from other experiments will naturally have an impact on the LC programme. The task will regularly review the incoming results of experiments such as LHC (CERN), SuperKEKB (KEK), Cosmology projects and upcoming g-2 experiments (FNAL). Their impact on the LC physics case and its relation to the physics case of other future projects, in particular circular e^+e^- colliders, will be evaluated. The most efficient way to achieve this goal are topical workshops over about four weeks each, hosted by SLAC, DESY,CERN and KEK. Central to these workshops is the application of tools such as MADGRAPH, WHIZARD, Fittino, SFitter etc, which requires close interaction between developers, phenomenologist and experimentalists.

Task 3.2 Continuous update of LC physics programme This task will update the LC physics program as necessary and propose priorities for the data taking at a Linear Collider, taking into account the results from task 3.1 and relevant results from WP2. In particular the need to go highest energies will be evaluated. As a concrete example the task will update the running scenarios for the International Linear Collider ILC in view of results from LHC 13/14 TeV. *JL: gilt das nicht fuer alle tasks? -> habe ich nach oben geschrieben*This task will lead the input to the European Strategy in 2018/19

Task 3.3 Precision measurements and BSM physics landscape: A linear e^+e^- collider will challenge the Standard Model at Quantum Level and resolve even tiny deviations from Standard Model predictions caused by loop effects. These measurements will pave the way for discoveries at the LC itself or in other projects. The task will work out in a comprehensive manner the consequences of the LC results to our future understanding of the universe. This task will have close links to the WP1 in charge for dissemination and outreach. *Do we need to keep this task? JL: YES!*

Task 3.4 Theory requirements to fully exploit LC physics potential (Higher order calculations etc.) *Processes at e^+e^- machines are governed by electroweak interactions that can be described by perturbative field theoretical calculations. For many processes as e.g. top pair production the perturbation series is only known up to next-to-leading order with uncertainties of sometimes several percent.* The task is to quantify the magnitude of higher order electroweak corrections and to identify the largest contributions to these corrections as a premise to calculate them in the next ten years. Residual theoreretical uncertainties will have to be very well known for a complete picture of the physics potential of any e+e- machine. The GRACE Group at KEK currently runs the most advanced computer programme on this subject.

Task 3.5 Impact on LC detector and machine design We will ensure that physics goals will be formulated with realistic ideas of technological capabilities in mind. This includes the realistic estimation of systematic errors provoked by the detector instrumentation. The task implies a cooperation with WP4 on the development of software tools. An example is the vertex reconstruction developed by Japanese groups but of which European groups are the prime 'users'.

Deliverables *(do these need to match the tasks one-by-one? If yes, needs rephrasing):*

D 3.1 Working-level collaborations between European and non-European partners in the area of LC physics case studies, manifest eg in several joined publications in peer-reviewed journals (Month 12 – 48) *(Is this really a deliverable? Sounds a bit fuzzy)*

D 3.2 Wiki and svn server to support exchange of information and tools *(could be promoted to WP 1? Wiki: LCC page? Svn server: DESY svn server?)* (Month 18) *(Deliverable or Milestone?)*

D 3.3 Updated recommendations for ILC running options (Month 18) *(Deliverable or Milestone?)*

D 3.4 Contributing document to the European Strategy 2018 (Month 24)

D 3.5 Formulation of detector design update in view of newest results (Month 24)

D 3.6 Review paper of the Linear Collider Physics potential taking into account LHC 13/14 TeV and other relevant results (Month 48)

Table 8 Work Package 4 Description

Work Package Number	4			
Work Package Title	Advanced Software Development			
Activity Type	Research and Training			
Participant Short Name	DESY	CERN	UCAM	
Person Month per Participant	14	6	4	

Objectives

1. Strengthen the communication and collaboration between participating institutes on the development and usage of advanced software tools for Future Electron Positron Colliders.
2. Development and improvement of advanced software tools and algorithms for event generation, simulation and reconstruction.
3. Training of junior scientists in application and development of advanced software tools.

Description of work:

The Linear Collider community has in recent years developed a suite of commonly used software tools. These are developed and maintained to a large extend by the participating institutes, together with KEK and SLAC. Regular visits of scientists are necessary in order to further improve these tools and strengthen the collaboration and knowledge transfer.

Task 4.1 Generator Tools: Improve the description of beamstrahlung and Initial State Radiation (ISR) in Whizard for lepton colliders. This is needed for precision physics analyses as well as for understanding the expected machine-induced backgrounds. In particular the work will focus on improving the treatment of polarized beamstrahlung spectra, the description of the ISR recoil, the matching between the equivalent photon approximation and the exact matrix element calculation and QED shower simulations. The Universities of Siegen and Würzburg will contribute as associated partners to this task.

Task 4.2 Simulation Tools: The linear collider community has recently adopted a new detector geometry description, DD4hep, that has been developed in the 7th framework AIDA project. The CLIC and ILD detector concepts are currently developing new flexible simulation models for optimizing the detector layout and performance. The accuracy and physics performance of these detector models will be validated with suitable physics benchmarks. Extended visits of junior scientists will ensure the necessary training of the physicists to use these new models for large Monte Carlo productions and physics analyses.

Task 4.3 Tracking Tools: A new common tracking toolkit, developed partly in the AIDA project is going to be used in the ILD and CLIC reconstruction software. These tools will be improved and extended to be applicable also for non-homogeneous magnetic fields. This will allow studying the effects on the track finding efficiencies and fitting performance in the presence of large field inhomogeneities of up to 10%, as currently envisaged in the magnet designs for ILD and CLIC. A possible adaptation of the tracking tools to the SiD detector concept will be investigated. Both subtasks require extended stays at SLAC and KEK of the DESY tracking experts.

Task 4.4 PFA Tools: The PandoraPFA particle flow toolkit is used by all Linear Collider detector concept groups as well as by future neutrino experiments. PandoraPFA is highly flexible and provides a large set of sophisticated algorithms for reconstruction of particle showers in highly granular calorimeters. In order to have the optimal performance for a given detector concept and layout, an automated procedure for calibration and tuning of the PFA algorithms will be developed in close collaboration with the reconstruction experts of CLIC, ILD and SiD.

Deliverables
D 4.1 (M44) Final report on Generator Tools activities and achievements.
D 4.2 (M44) Final report on Simulation Tools activities and achievements.
D 4.3 (M38) Running version of track fitting tools in non-homogeneous fields, applied to the CLIC and ILD track reconstruction software.
D 4.4 (M24) PFA Tools calibration and tuning tools with documentation.

Deliverabel No.	Deliverabel Name	Work Package No.	Lead Participant Short Name	Nature	Dissemination Level	Delivery Month

4.2 Appropriateness of the management structure and procedures, including quality management and risk management

4.2.1 Project organisation and management structure, including the financial management strategy, as well as the progress monitoring mechanisms put in place.

Management will be the object of a dedicated work package which will be led by the Scientific Coordinator (SC) and one Project Manager (PM). Prof. XXXX. The PM will be appointed at the start of the project. A Supervisory Board (SB) formed from one representative of each participating group and partner organisation will oversee the staff exchange program. The chairperson of the SB will be elected by the SB at the start of the project. The project management will interface directly with the project managements of the Linear Collider Collaboration, AIDA2020, etc..

Project management structure

The detailed work plan and schedule of the staff exchange programme will be presented and validated during the kick-off meeting. It will include the secondments of the ER and ESR, from the technical point of view as well as the plans for training, dissemination and outreach. The tasks with associated milestones and deliverables will be monitored during the project. WP leaders will inform the Management Team (MT) if any changes to the objectives. The role and responsibilities of each body is described in the table below.

	Membership and organization	Role
Supervisory Board	The Scientific Coordinator The Project Manager One representative from each participating group The chairperson of the SB The SB will meet at the kick-off meeting and in follow-up meetings every year (four meetings in total)	Approve and oversee implementation of the staff exchange programme for scientific, technical and complementary skills and knowledge Monitor and evaluate overall progress of the research and innovation project Ensure best Transfer of Knowledge practice among the partners Approve the work plan and the exploitation plan
Management Team	The Scientific Coordinator The Project Coordinators The WP leaders	Communicate to/from the partners Organize and prepare documentation for the SB meetings, incl. scientific reports on achievements Communicate and report to the European Commission Coordinate of the staff exchange programme Prepare the research plan, incl. milestones and deliverables, and the exploitation plan
Work packages	WP leaders. Each WP will have regular meetings.	Manage the WP research programme Manage and follow-up the progress of the individual research and innovation projects Oversee the integration of the seconded researchers into the host organisations Disseminate best practices and results

Financial management

The coordinator site (DESY) has the overall responsibility for financial management. DESY has longstanding experience in management of Marie Curie projects under FP6 and FP7. A specialized unit in the Human Resources (HR) Department coordinates all administrative and financial processes from project proposal to recruitment to production of annual reports, in close liaison with the Finance Department and the Internal Audit and EU offices in order to observe strict compliance with EC reporting standards. DESY also has a Legal Service which is available to give advice as required. The dedicated DESY-EU budget planning group will prepare a consolidated overview of the budgetary situation on the basis of the input of the partners.

Members Supervisory Board

Work Package leaders

1	
2	
3	
4	

Decision-making procedure

Executive decisions will be taken by the MT. Any changes in the staff exchange programme will have to be approved by the SB. Where such changes may have impact on the contractual obligations of the project, the prior agreement of the EC Project Officer in charge will be sought. Should disputes arise, the person in charge of the specific project, with input from the seconded researcher and the supervisor will intervene to try and solve disputes amicably. In cases where such amicable settlements were to fail, disputes will be settled by the Management Team whenever possible. When such resolution is not possible the matter will be raised to the SB. The gender balance will be insured at the level of decision-making within the project.

Communication strategy

The publication rules will be considered an integral part of the Partnership Agreement and the PM will be the responsible for making all necessary arrangements for review and/or amendments to it. The objective of the organisation and communication structure is to obtain maximum transparency for all the partners concerning the technical and overall project status. All information (meeting minutes, progress reports, relevant publications, etc.) will be communicated to the PM, who assumes the responsibility for directing this information to the associated partners as appropriate. Communication between the seconded researchers and the partners in each Work Package will be coordinated by the WP leader. Frequent online-meetings will be encouraged.

4.2.2 Risks that might endanger reaching the project's objectives and the contingency plans to be put in place should risk occur.

Risk management will be monitored throughout the project by each WP leader. The mitigation of technical and scientific risks is based on proven methodologies, the involvement of participants with the relevant expertise, and the setting of well-defined goals and deliverables on a realistic timescale. Any failure or delay in one WP or task will not have a "no-go" impact on the entire project. The WP leaders will lead risk resolution attempts and will be responsible for consulting the MT, and if needed the SB and the EU Project Officer, if any significant changes to the project are likely.

Current group activities are reasonably well supported through local and international projects where the overall risks for major strategy changes by the hosts are small. Groups have local support through their national agencies and recently a European project AIDA2020 has also been awarded. The largest risk in this project is the uncertainty relating to the political decision for hosting the ILC. While RanDaLF in itself may be extra motivation to foster a Japanese decision to proceed with ILC, the ILC is of a magnitude that will necessitate complex considerations which reach far beyond questions of scientific excellence. In the event of a Japanese government's negative decision on ILC part-way into RanDaLF, the activities would focus more on generic aspects and on specific aspects relevant for CLIC. In general the activities would continue and be of continued value investigating and making the case for a future e+e- Linear Facility, a goal for the next upgrade of the European Strategy for Particles Physics.

4.3 Appropriateness of the institutional environment (infrastructure)

4.3.1 Availability of the expertise and human resources, to carry out the proposed research project.

The goal of this exchange programme of XXX European, four Japanese partners and one IS partners is to equip the seconded researchers and their organisations with a wide-ranging expertise in advanced accelerator engineering and a broad set of general, transferable skills. The staff exchange planning is shown in A???. As can be seen the totals add up to ?? from Europe to Japan, and ??? man-months from Japan to Europe. **ADD numbers tomorrow**

Table with names (to be done).

in year 1
During the first year of the staff exchange programme the following ERs and ESRs will be seconded:

	Early-Stage Researchers (ESR)	Experienced Researchers (ER)	Host

4.3.1.1 *Transfer of Knowledge*

Within this project several distinct measures are planned to secure the transfer of knowledge among the partners:

- Joint research and innovation projects on the design, R&D and prototyping of future accelerator facilities;
- Scientific and complementary (such as language) training programmes;
- Learning by experience during staff exchanges and informal meetings of project participants;
- Presentation of results in academic courses, lectures, workshops, seminars, conferences (as well as through the internet by webinars, e-learning courses etc.);
- Networking activities to reach a larger research community and the industry;
- Development of a joint research project pipeline.

Transfer of knowledge activities are expected to take place in both directions (Europe-Japan) and as well as in two dimensions (internal-external):

1. The researchers will bring along knowledge from their home organisation and will transfer this knowledge to the host organisation.
2. After returning to their home organisations, these researchers will bring along newly gained knowledge from their host organisation and will spread this knowledge further. Each seconded person will provide a final report on the stay. The more experienced researchers will manage the transfer and implementation of knowledge.
3. The newly recruited experienced researchers will transfer their specific knowledge to the host organisation and will acquire new knowledge at the host organisation during the project.

In addition, special measures will be taken to further optimize transfer of knowledge: a kick-off meeting with all partners will be held at the beginning of the project, presentation by the researchers at the host institute to the widest possible audience, topical workshops as described in B2.3, scientific publications and presentations at conferences (B3.3.1).

4.3.1.2 *Expertise in training and supervision*

The experts participating in this programme largely constitute the world experts in their respective fields. RanDaLF thus brings together a solid core of scientists that are expected to achieve the goals over the foreseen period. Considerable staff are available at all the research organisations to support this endeavour. In particular, an ILC Office has recently been established at KEK to coordinate activities. Partners foresee the inclusion of dedicated offices at CERN and KEK to support this project both in Europe and Japan. Such a CERN office should be able to understand and support the needs of the European partners and to act as a bridge to Japan. Both KEK and CERN have considerable experience in facilitating the exchange of staff.

All partners in this project provide excellent R&D environments, ranging from sophisticated on-site facilities and computer networking to a legal and administrative framework that can effectively coordinate and facilitate collaboration on this scale. All have experience in training researchers and have extensive experience in hosting Marie Curie Fellows. DESY has coordinated XXX Marie Curie projects in FP6 and XXX in FP7. The consortium also has extensive experience with a long-lasting research partnership between Europe and Japan.

An existing collaboration on the basis of the detector concepts (ILD, SiD and CLICdp) has been operative since many years among all regions, Europe, Japan and US. The detector R&D Collaborations (CALICE, LCTPC, FCAL, etc..) are also existing collaborative structures which have developing new technologies for a future Linear Collider and in which the proponenet groups have been working together. There exists a French-Japanese framework

framework for exchange and collaboration in HEP and applications, which will serve as a bridge for the foster this cooperation among the rest of European countries. The combined resources made available by both the European as the Japanese partners should guarantee an outstanding training environment for the ERs and ESRs for both physics studies and detector R&D.

4.3.1.3 *Linear Collider School for Physics and Detector R&D*

A topical school on physics aspects and detector technological advances specific for Linear Colliders will be organized every two years. There will be an opportunity for younger researchers to give talks and present their research in poster sessions. This will also allow the young scientists to establish links among themselves connecting the three regions.

4.3.1.4 *Facilities and support*

All seconded researchers will be given access to the necessary office equipment to function efficiently (desk, computer, internet access, libraries etc.). The ESRs will receive some extra attention at their host organisation overseas. They will have the opportunity to receive additional training at the international LC school, the CERN accelerator schools or in local training and network events in Japan, such as the joint international Asia-Europe-Russia-America Accelerator School, Asian Europe Pacific School of High-Energy Physics and the Japan Accelerator Society Annual Meeting. Researchers will have access to the necessary research infrastructure, according to the requirements of their research tasks and in line with the appropriate access rights. All seconded researchers will be given an introductory programme by each host which will include meetings with relevant persons and support with local administrative matters and daily life issues.

4.3.1.5 *Integration and return mechanisms*

ESRs will often require remote guidance/supervision by a more experienced researcher from their home organisation during their stay at the host. The supervisor will ensure a continuous information flow between the home department and the exchanged researcher. Steps for a successful preparation of return of exchanged staff and sustainable transfer of knowledge into the home organisation include: 1) information about the ideas and needs of the returnees (collecting information by dialogue, visits, questionnaires) 2) specific integration measures depend on the specific needs of the researcher (coaching, team building) 3) defining and complying with timescales for reintegration measures, and 4) guarantee of adequate infrastructure and managerial support.

After their return, the seconded staff will still act as 'liaisons' officer with the former hosts. In an internal workshop the researcher will present project results and new methods, and will describe his/her experiences. The progress of reintegration and its effects will be documented and will be used as a knowledge base for future exchange projects. Hence, integration and return mechanisms will contribute to the strategic objective of building long-term and sustainable partnerships between Europe and Japan, research organisations and specific teams, that keeps to collaborate and exchange after the end of this project.

4.3.2 Description of the necessary infrastructures and any major items of technical equipment (if required) relevant to the proposed project.

4.4 Competences, experience and complementarity of the participating organisations and institutional commitment

DESY is one of the world-leading institutes for high-energy physics, accelerator physics and research with photons. It has operated the largest ever ep-collider HERA and is currently constructing the European XFEL, which employs the superconducting RF technology foreseen for the ILC. DESY is strongly engaged in the two large LHC experiments. Superconducting RF has matured at DESY for applications in high-current accelerators and in particular the European XFEL. DESY has advanced laboratory infrastructure for development of SRF components and quality assessment. DESY is the technological home of SRF technology and operates an extensive EDMS to support the on-going construction of the European XFEL, which uses the same technology. Since many years DESY has played a central role in the design of detectors for a linear collider. DESY is strongly involved in the ILC detector concepts, with R&D activities primarily on TPC and HCAL technologies, in physics studies, and in the development of the machine – detector interface at the ILC.

4.4.1 Adequacy of the partnership to carry out the project explaining how participants' synergies and complementarities will be exploited.

5 References

6 Participating Organisations

Table 9: Data for non-academic beneficiaries

Name	Location of research apremises	Type of R&I activities	No or full time emplyees	No of emplyees in R&I	Web Site	Annual Tunrover (approx.. in EUR)

Beneficiary (Organisations in EU MS/ AC) Legal Name	
General Decription	
Role of Profile of key people	
Key facilities, infrastructures and equipment	
Independent research premises	
Previous involvement in research and innovation projects	
Current involvement in research and innovation projects	
Publications and/ or research/ innovation products	

Partner (Organisations in TC) Legal Name	
General Decription	
Role of Profile of key people	
Key facilities, infrastructures and equipment	
Independent research premises	
Previous involvement in research and innovation projects	
Current involvement in research and innovation projects	
Publications and/ or research/ innovation products	

7 Ethics Issues