SEVENTH FRAMEWORK PROGRAMME
Marie Curie Actions
People
International Research Staff Exchange Scheme

Annex I - "Description of Work"

DESCRIPTION OF WORK

PART A

1. *Grant agreement* details

Full Title: "Europe Egypt Network for Particle Physics"

Acronym: "EENP2"

Proposal Number: 318922

Scientific Panel: Physics

Grant Agreement Number: PIRSES-GA-2012-318922

Duration of the project: months 48

Project start date: 01-January -2013

2. List of participants (*beneficiaries* and *partner /organisations)*

Partner Number	Partner name	Partner short name	Country
1 *Beneficiary* 1	Politecnico di Bari, Physics Physics Department "M. Merlin"	POLIBA	IT
2 *Beneficiary* 2	Ecole Polytechnique , Leprince-Ringuet Laboratory (LLR)	ECOLE	FR
3 Partner 3	Helwan University, Physics Department	HELWAN	EG
4 Partner 4	Cairo University, Computer Engineering Dept.	CAIRO	EG
5 Partner 5	Ain Shams University, Physics Department	AINSHAM	EG

3. Project summary

We propose an exchange programme to promote the scientific collaboration in particle physics and related technologies between a network of Egyptian Universities and EU Member States Academic Institutions which have already established innovative transfer of knowledge towards Egypt. The main objectives of the joint exchange programme are:

- the reinforcement of the Europe-Egypt scientific collaboration. In particular in past years both France and Italy have funded initiatives in the field of particle physics and related technologies to boost Egyptian interest and personnel training. The present proposition intends to further improve the collaboration by especially allowing long term visits of young and senior Egyptian scientists to perform advanced research on fundamental particle physics in the framework of worldwide large collaborations. Moreover the programme would offer the possibility to second EU researchers to Egypt to originate advanced research activities, advice on the development of the local infrastructures and monitor the success of the transfer of knowledge;

- the establishment of an important scientific collaboration between Italy and France on advanced physics concepts and technologies. Although some researchers of the EU Academic Institutions involved in the proposal have already collaborated through the CERN experimental physics program, the possibility of building up an independent common research program would boost enormously the joint research capability. It should be mentioned that the researches involved in these EU institutions can impact with impressive expertise on the activities relevant for this proposal. Their collaboration could therefore have an important European long term impact on the progress of the physics concepts and technologies hereby discussed.

PART B

4. Quality of the Exchange Programme

4.1 Objectives and relevance of the joint exchange programme

The scientific objective of the proposal would be focused on particle physics research and related technologies. Both European partners are active in the Compact Muon Solenoid (CMS) experiment at the Centre European for Nuclear Research (CERN) for the study of very high energy proton-proton collisions. In this context the next few years will be crucial for the search and possibly discovery of the Higgs boson whose existence would provide a definitive evidence of the validity of the so called Standard Model (SM). Also different SuperSymmetric models have been developed which foresee the existence of new particles. The future studies will be able to validate or to discard the SM and possibly highlight the validation of other different models.

A relevant development in theoretical and phenomenological studies on high energy physics concepts has been achieved in Egypt in recent years. Many Egyptian researchers are internationally acknowledged to have contributed substantially to the up to date models for the interpretation of sub-nuclear fundamental properties of the matter. The possibility to consolidate through the present programme a long term collaboration between these researchers and the European partners is appealing and deserve attention in view of the reciprocal scientific benefits that can arise. In this context, while Egyptian researchers will be more focused on innovative phenomenological models, EU researchers could approach alternative data analysis of large CERN experiments using such novel models. This research activity will differentiate from the standard CERN CMS official pipeline (which is subject to different schedule and priorities) and it would therefore have an independent validity.

The challenge for new epochal discoveries thorough the data analysis of these large experiments implies the usage of innovative software technologies based on distributed computing and advanced particle detection techniques. High energy physicists from the European partners involved in this proposition have pioneered the research in these fields by achieving important developments which have been then successfully propagate to applied science and social life applications. The France-Italy collaboration under the umbrella of the present programme could aim at frontiers research achievements in the field of innovative algorithms for new physics search in data analysis and new computing and software applications for large data sets. Such dedicated bilateral collaboration could result in a reinforced and long term partnership largely beyond the present scheme (CMS collaboration).

On the other hands, the state of art on these technologies in Egypt is still significantly behind the European standard. It is important to note however that the commitment of the scientific community in Egypt remains intact after the political developments during the year 2011. No budget cut has been observed and the participation to international collaboration is secured. Since the development of new concepts and the consolidation of knowledge in these applied fields is essential to cope with future challenges in science and promote social innovation, a consistent part of the programme will be therefore devoted to the development of these technologies and to the relative transfer of knowledge toward Egypt. The European partners could play a decisive role in the process of innovation of the Egyptian academy by sharing expertise and management capabilities for the training of local researchers and the development of applied science infrastructural laboratories.
The consolidation of a scientific collaboration between Europe and Egypt through the present proposal would therefore achieve a twofold objective:

- to reinforce the research capability of European Institutions by hosting qualified Egyptian scientists;
- to develop an Egyptian scientific network and train expertise to consolidate locally basic science research infrastructures and related technological applications.

The involvement of the Egyptian community into a well established European research context would initiate young scientists to the field and would consolidate their knowledge in view of possible participation to future upgrades of CERN experiments. The maturation of expertise in the above described fields and the setting-up of laboratory infrastructures would also trigger the interest towards more general technological applications. The possibility of handling advanced detector technologies can facilitate research application in the field of medical diagnostic which heavily relays on those concepts. Furthermore, GRID computer technologies have a wide range of applications and offer an important reference for innovation.

4.2. Work Packages
The programme will cover a period of 48 months and will consist of 4 Work Packages:

Table 1: List of Work Packages

WP	Title	Beneficiary/ Participant	Start month	End month
1	New particles search	ECOLE POLIBA AINSHAM	4	44
2	Detector development	POLIBA HELWAN	4	44
3	GRID computer application	POLIBA ECOLE CAIRO	4	44
4	Coordination, dissemination and training	HELWAN ECOLE POLIBA CAIRO AINSHAM	1	48

Work Package number n° 1

Work Package n° 1	**Title:** New particles search
Beneficiary/Participant: ECOLE, POLIBA, AINSHAM	
Start date or starting event: Month 4	
Objective Objective of WP *"New particles search"* is to perform reconstruction, analysis and simulation of collision events produced in CMS. The research work will concentrate on two main subjects, already studied since several years by some participants. (1) In the Standard Model (SM), the origin of the mass of particles is believed to be the "Higgs mechanism" which predicts the existence of Higgs particles. The mass of these particles is in a range attainable by the present energy and luminosity of the Large Hadron Collider (LHC). After two years of successful operation in 2010/2011, the LHC has already restricted significantly the mass range of existence of a possible Higgs boson. Next two years will be crucial to assess a possible discovery or a possible exclusion confirmation in the observable LHC mass range. New analysis algorithms and massive simulations are needed to this aim. (2) Nevertheless, the SM does not unify electroweak and strong interaction, it does not include gravitation, and it is not satisfactory when extrapolated to energies higher than the electroweak symmetry breaking scale. New ideas are thus needed and their physical manifestations are expected at the LHC. The best-motivated extension is SuperSymmetry, for which a large variety of models exist. Investigating the phenomenology of some of them, which predict either new heavy particles or observable deviation from the SM and comparing to the available data, is one objective of the network. New particles, such as heavy vector bosons, predicted by the extension of the SM to higher	

symmetry groups, may also appear experimentally. These particles could also exist if there are extra dimensions of space-time. For example, the largely quoted Randall-Sundrum theory would solve the problem of hierarchy between the strength of the gravitation compared to the other interactions.

Description of the work

Task 1.1: *Search for Higgs particles*
In most of the relevant Higgs particle mass region, the decay channel to ZZ* and finally to four leptons (electrons or muons) provides an opportunity for early discovery or the setting of exclusion limits. The search in this channel consists of identification and reconstruction of four electrons and/or two electrons and two muons and suppression of the backgrounds, among which the continuum ZZ* production is the most important. Electrons and muons transverse momenta are between 5 and 100 GeV/c. The reconstruction of electrons is more demanding at low energy due to the electron bremsstrahlung effect in the tracker material; in this case emphasis on the development and optimization of specific reconstruction algorithms is required.

Task 1.2: *Search for heavy new particles beyond the SM*
This search consists of finding peaks in the electron and positron pair spectrum over a continuous background. In this channel, the energies of the electrons range from several tens GeV to more than 2 TeV. Specific methods of calibration, selection and reconstruction are needed. This is already in progress, together with the implementation of a method to deal with saturation of the calorimeter. The background is predicted to be low but, due to the small number of expected events, a powerful statistical analysis is required.

Task 1.3: *Set up of a CMS center for data analysis at AINSHAM*
The set up of a local Egyptian center for CMS data analysis is one of the main objectives. In parallel with the training of young scientists, an effort to develop new infrastructures in Egypt is necessary to create an autonomous research context and boost the activity by offering new opportunities to students. AINSAM has already some experience and some basic software infrastructure. Under the advice and help of researchers from POLIBA and ECOLE, one expects the AINSHAM group to consolidate the expertise and to improve the software /hardware capabilities for future involvement in advanced analysis of the CMS data.

Deliverables

D 1.1: *Mass spectrum of ZZ* decaying into four leptons*
Statistical significance of the discovery/exclusion of the Higgs in the mass range 120-160 GeV/c^2 will be obtained. Precise estimation of the backgrounds by simulation and using data is necessary.

D 1.2: *Mass spectrum of electron pairs at high mass (above the Z)*
Statistical significance of the discovery/exclusion of new bosons in the highest reachable mass range will be evaluated. A precise estimation of the background is needed.

D 1.3: *CMS center for data analysis operational in Egypt*
Set the software infrastructures and establish expertises for the running independent advances CMS analysis in Egypt.

Secondments

POLIBA: ER1 to AINSHAM for Task 1.3, delivering D 1.3 at month 44 ECOLE : ER2 to AINSHAM for Task 1.3, delivering D 1.3 at month 44 AINSHAM: ESR1 to ECOLE for Task 1.1, delivering D 1.1 at month 16 AINSHAM: ESR2 to POLIBA for Task 1.1, delivering D 1.1 at month 16 AINSHAM : ESR3 to ECOLE for Task 1.2, delivering D 1.2 at month 36 AINSHAM : ESR4 to POLIBA for Task 1.2, delivering D 1.2 at month 36

Work Package number n° 2

Work Package n° 2	**Title:** Detector development
Beneficiary/Participant : POLIBA, HELWAN	
Start date or starting event: Month 4	

Objective

In the WP "*Detector development*" the study of innovate particle detectors to cope with future high background experiments will be addressed both for gaseous and silicon technologies. Gaseous and silicon detector technologies for particle identification have been widely employed in many experiments at CERN now successfully in operation, as ATLAS and CMS.

While a detailed plan of upgrade to cope with future improvement of the Large Hadron Collider (LHC) performance has already been planned, important R&D is still necessary to bring the detector technology at the required level of sustainability for this challenge. In the context of CMS, where some of researchers submitting this proposal are involved, the future completion of the forward part of the muon system and the design of a new central detector, will offer the possibility to apply advanced and up-to-date technologies. To this aim, new gaseous detectors such as a high rate Multi Gap Resistive Plate Chambers (MRPC) and Gamma Electron Multipliers (GEM) and new silicon structures capable to operate in high background environment and sustain high dose will characterized and tested. The possibility for the Egyptian researchers to join the study would facilitate their approach to nuclear methods and techniques in advanced laboratories and would enable them to improve basic knowledge in particle identification.

Emphasis will also be given to the development of an Egyptian gas-detector lab infrastructure for the consolidation of knowledge, training of young scientists and boosting autonomous research developments in Egypt.

Description of the work

Task 2.1: *New gaseous detectors for high rate environment*

In view of the future upgrade of experiments at the Large Hadron Collider, researcher from POLIBA and HELWAN will jointly study the development of new gaseous detectors capable to sustain high rate of the order of few kHz/cm^2 and still responding with high spatial precision and good time resolution. In this context the researchers at POLIBA are involved in the study of the new promising technologies like high rate MRPC and GEM. It is proposed that the Egyptian researchers take part in this frontier activity contributing preliminary to the assembly of small prototypes at POLIBA. After the establishment of a HELWAN laboratory facility, part of the work related to the study of the performance will be done in Egypt. This will be a unique opportunity for researchers from Egypt to learn gaseous detector assembly and test procedures.

Task 2.2: *New high radiation tolerance silicon detectors*
POLIBA is leading an R&D campaign in order to identify the baseline silicon technology for future particle physics detectors. Many test structures, each other different in substrate type and geometry, will be electrically characterized, before and after irradiation with neutron and protons, in terms of capacitance and resistance. Functional measurements with IR laser and beta sources will be performed. At POLIBA a specific test set-up for measurements of charge collection efficiency and signal to noise ratio is in operation. In particular the setup consists of a climatic chamber where the detectors can be housed together with scintillators and β sources for the efficiency studies. Aim is to improve radiation tolerance of detectors by an order of magnitude with respect to the actual technology. It is proposed that the Egyptian researchers take part in this activity at POLIBA contributing to the characterization measurements of the prototypes.

Task 2.3: *Set up of a gas-detector laboratory at HELWAN*
The set up of a local Egyptian laboratory for gas detector development and characterization is one of the main objectives. In parallel with the training of young scientists, an effort to develop new infrastructures in Egypt is necessary to create an autonomous research context and boost the activity by offering new opportunities to students and technical personnel. HELWAN has already some experience and some basic equipments. Under the advice and help of researchers from POLIBA, one expects the Helwan group to establish and commission all the hardware and software infrastructures needed for the assembly, test and performance study of gaseous detectors. Moreover the spread of scientific culture in the field of detector physics should be pursued by appropriate initiatives.

Deliverables
D 2.1: *Assembly and test of MRPC/GEM detectors*
This deliver foresees the assembly and beam-test measurements of large size MRPC/GEM prototypes to be proposed for the future detectors upgrade at CERN. The study of the detector performance in an LHC similar background environment will be pursued and completed.

D 2.2: *Characterization of high radiation tolerant silicon detectors*
This delivery should foresee the passive characterization and the beam-test measurements of new radiation tolerant silicon detector prototypes. The study of the detector performance in an LHC similar background environment will be pursued and completed.

D 2.3: *Detector laboratory infrastructure at Helwan*
This delivery foresees the completion of a gas-detector laboratory infrastructure in Egypt for the study of gaseous detectors. Also the training of proper personnel for the running of the laboratory will be achieved.

Secondments
POLIBA: ER3 to HELWAN for Task 2.3, delivering D 2.3 at month 44
POLIBA: TECH1 to HELWAN for Task 2.3, delivering D 2.3 at month 44
HELWAN: ESR5 to POLIBA for Task 2.1, delivering D 2.1 at month 15
HELWAN: ESR6 to POLIBA for Task 2.1, delivering D 2.1 at month 15
HELWAN: ESR7 to POLIBA for Task 2.2, delivering D 2.2 at month 35
HELWAN: ESR8 to POLIBA for Task 2.2, delivering D 2.2 at month 35

Work Package number n° 3

Work Package n°3	**Title:** GRID Computer application
Beneficiary/Participant: POLIBA, ECOLE, CAIRO	
Start date or starting event: Month 4	

Objective

Objective of this WP is the setting up of an European and Mediterranean distributed computing infrastructure and relevant connected manpower expertise to fulfill the requirement of several scientific communities. In particular the European institutions will build a federated infrastructure that could provide a transparent way of processing data across sites.

The consolidation of the GRID infrastructure at the Egyptian sites in order to be able to fully support both CMS analysis and a larger scientific community (ie. biomedical and computational chemistry) in compliance with the WLCG standards is also one of the scope of the present project.

Within this activity, it will be also possible to develop and implement an end-user oriented monitoring system. This tool will allow the users to monitor the submitted jobs and have detailed information about their status and discriminate between system failures and users application related failures. A storage infrastructure will be implemented and tested. It will be based on new models of data access that are recently arising in scientific community. Through this infrastructure the users will be able to access files stored in all the sites of the network with a single and simple endpoint without the need of knowing the real location. The final goal is to make the usage of the computing infrastructure as easy as possible also for scientific users with poor experience in computing.

Description of the work

Task 3.1: *Development of a GRID job monitoring system*

The main objective is to develop and put in production a system that collect all the relevant information concerning a job. This system will help the user to know the status, possible failures and other useful information of the submitted jobs. The system will include a modern web interface to show all the details and help the users to speed up the analysis by acknowledging online possible failures.

Task 3.2: *Data management and access for interactive users*

The main objective is to deploy and put in production a data access infrastructure to allow the final user to read data using CMSSW framework and ROOT analysis macros without knowing where the data are hosted. The infrastructure will provide to the users a single endpoint to index the files available on all the sites. The client connection is then automatically redirected to the server that really hosts the file. This service will allow an easier interaction between the end users and the CMS data infrastructure, since read-out and process of data interactively from a single desktop or laptop is possible. The infrastructure will be based on protocols like *xroot* and will provide a federation of site that will exploit the computational and storage resources of each participating sites.

Task 3.3: *GRID infrastructure consolidation in Egypt*

GRID implementation is a part of the project aiming to establish computing tools in each Egyptian university site by proper installation of hardware and software resources. A TIER2 main center will be established at CAIRO to serve as open access to other Egyptian universities and research institutes. HELWAN and AINSHAM will provide local facilities to access and use the TIER2 in CAIRO. The task will also cover the deploying of the GRID infrastructure based on the *EMI*

middleware over the Egyptian sites that will participate to the project. As first step, a computing element to allow GRID job submission to each cluster and a storage manager shall be installed. The Egyptian researchers will gain experience in installing, configuring and managing a typical GRID site supporting CMS Virtual Organization, including the services needed to deal with official data transfers. They will also gain experience in managing several tools needed to transfer data, submit jobs etc, in order to be able to become the first line of support for their local users.

Deliverables
D 3.1: *Transfer advanced GRID concepts and technologies to Egyptian researchers*
Train young Egyptian researchers to improve their GRID knowledge and set up basic infrastructure

D 3.2: *Release of a production level GRID job monitoring system and data access system*
The final version of the monitoring system will be implemented and released. The data management and access system will be finalized and in production.

D 3.3: *Egyptian Sites in production*
All the Egyptian sites will have GRID infrastructure ready for the use by CMS end users.

Secondments
POLIBA: TECH2 to CAIRO for Task 3.3, delivering D 3.3 at month 44
ECOLE: ER4 to CAIRO for Task 3.3, delivering D 3.3 at month 44
CAIRO: ESR9 to ECOLE for Task 3.1, delivering D 3.1 at month 12
CAIRO: ESR10 to POLIBA for Task 3.1, delivering D 3.1 at month 12
CAIRO: ESR11 to POLIBA for Task 3.2, delivering D 3.2 at month 36
CAIRO: ESR12 to ECOLE for Task 3.2, delivering D 3.2 at month 36

Work Package number n° 4

Work Package n°4	**Title:** Coordination, training and dissemination
Beneficiary/Participant: POLIBA, ECOLE, CAIRO, HELWAN, AINSHAM	
Start date or starting event: First meeting of the Supervisory Board at month 1	

Objective
This work package deals with the coordination of the project to enhance the collaboration between the project participants, the training program through different mechanisms and the dissemination of the knowledge. The aim is to raise awareness of the achieved results.

Description of the work
Task 4.1: *Coordination*
The coordination will be pursued by implementing a proper management structure to steer the project. Being the network quite small, such structure should be light, fast reacting in case of problems but open to all institutions contribution. A website will be developed in order to increase the flow of information, advertise network training activities and catch networking opportunities within participants. The network partners are expected to attend monthly virtual web conferences organized to allow for regular status updates of participants. EENP2 will benefit from the virtual

collaboration tools INDICO and EVO successfully developed at CERN for conference scheduling and worldwide connections.
A kick-off meeting, few intermediate consolidation meetings and a concluding conference-like meeting will be organized. For each WP, additional independent and autonomous meetings should be organized by the respective coordinators to steer the research work.

Task 4.2: *Training*
The seconded ESR will be embedded in well organized research groups. They will be assigned to a supervisor from the host partner depending upon the WP and the task. In addition a co-supervisor from the home institute will be required, to ensure that the research activity is proper finalized to the scope the and the future development trend in the home lab. The Egyptian ESR will participate to the CMS collaboration events, joint conference and workshop similarly to the European colleagues. They will gain experience in the field of experimental physics by developing particle detector systems and software tools for data analysis. They will also become used to work in international teams and have experience in reviewing and critically analyzing research ideas and results.
The Egyptian ER involved in the program will develop skills in project management and scientific planning by spending appropriate stages at the European partners Institutions. An important aspect of the training program would consist in making available new knowledge and new technologies at a large group of students and young researchers in Egypt. To this purpose, seminars, lessons and tutorials will be given in Egypt by European ERs. Also European ERs and technical staff will spend short visiting period in the Egyptian University to train local staff and help in setting up the hardware and software infrastructures.

Task 4.3: *Dissemination*
Throughout the program, all relevant material will be shared among participants of the consortium. The training program's results will be disseminated through publications, during and after the end of the project. Partners will also collaborate to produce publications (research papers, technical reports articles, presentations, etc) related to the research program. During the project the up-to-date results will be shared in various seminars and workshops.
A "High Energy Physics school" subdivided into different editions along the project lifetime will be promoted. Purpose is to introduce physics and technology to scientists and students coming possibly from the entire north Africa area.
An EENP2 website will serve dissemination purposes and internal communication and information exchange between the network partners and outside. The website will be created and maintained by the Coordinator. When suitable, the researchers will release publications to disseminate information about remarkable milestones achieved. At the end of the project there will be a final conference where all the achieved results will be disseminated. This would provide a good interface to enable researchers to present their work and promote their activity for exploiting career opportunities.

Deliverables
D 4.1: *Collaboration meetings*
A kick-off meeting, intermediate collaboration meetings and a final concluding conference will be organized.

D 4.2: *Academic lectures and specialized courses*
Series of academic lectures in Egyptian universities will be scheduled. A school on "High Energy Physics and related technologies" subdivided in three editions along the project period will be organized.

D 4.3: *Publications and conference reports*

The production and submission to international journal of the results will be finalized, as well as submission to international conferences and preparation of reports.

Secondments

POLIBA: MANAG2 to HELWAN for Task 4.1, delivering D 4.1 at months 30, 44, 48
POLIBA: ER7 to CAIRO for Task 4.2/4.3, delivering D 4.1/4.2 at months 4, 16, 24,30, 44, 48
ECOLE: ER8 to CAIRO for Task 4.2/4.3, delivering D 4.1/4.2 at months 4, 16, 24,30, 44, 48
ECOLE: MANAG3 to AINSHAM for Task 4.1, delivering D 4.1 at months 4, 16, 24
HELWAN: ER6 to POLIBA for Task 4.1/4.2, delivering D 4.1/4.2 at months 6, 12, 21, 27, 36, 42
CAIRO: ER5 to ECOLE for Task 4.1/4.2, delivering D 4.1/4.2 at months 12, 21, 36, 42
AINSHAM: MANAG1 to ECOLE for Task 4.1, delivering D 4.1 at months 12, 36

For the secondments we define the following categories:

- EU to EG: secondments of European ERs/ESRs to Egypt
- EG to EU: secondments of Egyptian ERs/ESRs to Europe

A summary view of the total months-man per category is given in table 2. A total of 155 months-man are foreseen.

Table 2: Summary of secondments per WP

WP	EU to EG	EG to EU
WP1	12 months	28 months
WP2	12 months	37 months
WP3	12 months	24 months
WP4	18 months	12 months
Total WPs	54 months	101 months

The unbalance in the "EU to EG" category versus the "EG to EU" one reflects the large emphasis assigned by the project to the training of Egyptian researchers. One of the main purposes is to enable Egyptian scientists to catch most advanced concepts and technologies in high energy physics and to transfer/apply them at their home labs. While Egyptian secondments for WP2 are concentrated at POLIBA, the ones for WP1 and WP3 are distributed between POLIBA and ECOLE. Almost equal opportunities are assigned to CAIRO, HELWAN and AINSHAM to involve their researchers in the WP's activities in accordance with the defined responsibilities.
In the context of WP4 (coordination, training and dissemination) the Egyptian partners have been allocated few months to allow ERs to visit the European Institutes, join the research activities, supervise the ESRs activities and collaborate to steer the project. At the same time, few months-man are intended to be used by POLIBA and ECOLE researchers for training activities in Egypt, for scientific contacts and for the project management.

Table 3: List of Milestones

List and schedule of milestones					
Milestone n°.	**Milestone name**	**WPs n°'.**	**Lead *Beneficiary*/ organisation short name**	**Delivery date**	***Comments***
1	Completion of training phase for GRID technologies	3	BARI	Month #12	End of training of the site administrator involved into the project
2	First small size MRPC and GEM prototypes validated	2	BARI	Month #15	Study performance with cosmic rays of first small size MRPC and GEM prototypes
3	Sensitivity results for SM Higgs decaying into four leptons	1	POLIBA	Month #16	Comparison data and MC; discovery potential or exclusion limits for the Higgs search
4	First "High Energy Physics School" in Egypt"	4	CAIRO	Month #16	Organisation of the first school in Egypt to disseminate knowledge
5	Completion of high statistics analysis for SM Higgs in four lepton	1	ECOLE	Months #24	Analysis for the SM Higgs boson completed
6	Advancement for GRID infrastructure in Egypt	3	CAIRO	Month #24	At least one Egyptian site with a GRID infrastructure in production
7	Advancement on infra-structure preparation for the gas lab at HELWAN	2	HELWAN	Month #24	Installation of power system and gas system for gaseous detector operation
8	"Middle Term" workshop and status report	4	ALL	Month #24	Organisation of a "Middle Term" workshop and preparation of a status report document
9	Second "High Energy Physics School" in Egypt"	4	HELWAN	Month #30	Organisation of the second school in Egypt to disseminate knowledge
9	First prototype silicon detector validated	2	BARI	Month #35	Study response of silicon prototype detector

10	Mass spectrum of electron pairs at high mass (above the Z)	1	AINSHAM	Month #36	Statistical significance of the discovery/exclusion of new bosons in the highest reachable mass range
11	Release of a pre-production level monitoring and storage GRID services	3	ECOLE	Month #36	First test release of the monitoring service and the remote storage access
12	CMS center for data analysis operational in Egypt	1	AINSHAM	Month #44	Software infrastructures and expertises for the running independent advances CMS analysis in Egypt.
13	Completion of HELWAN infrastructure and test of large size MRPC/GEM	2	HELWAN	Month #44	HELWAN gas lab ready and fully functioning. Validation with cosmic rays of the large size gas detector.
14	Federation of the GRID sites	3	CAIRO	Month #44	The data and computing resource of each site are federated into a single logical instance
15	Third "High Energy Physics School" in Egypt"	4	AINSHAM	Month #44	Organisation of the third second school in Egypt to disseminate knowledge
16	Concluding conference		ALL	Month #48	Organisation of the final meeting to be organized as a conference

Table 4: detailed schedule of secondments

Partecipant number	Origin Partner	Origin Country	Host Partner	Host Country	Seconded Type	Duration (Months)	First year	Second year	Third year	Fourth year
1	POLIBA	IT	HELWAN	EG	TECH1	6				
1	POLIBA	IT	HELWAN	EG	ER3	6				
1	POLIBA	IT	HELWAN	EG	MANAG2	3				
1	POLIBA	IT	CAIRO	EG	TECH2	6				
1	POLIBA	IT	CAIRO	EG	ER7	6				
1	POLIBA	IT	AINSHAN	EG	ER1	6				
2	ECOLE	FR	CAIRO	EG	ER4	6				
2	ECOLE	FR	CAIRO	EG	ER8	6				
2	ECOLE	FR	AINSHAN	EG	ER2	6				
2	ECOLE	FR	AINSHAM	EG	MANAG3	3				
3	HELWAN	EG	POLIBA	IT	ESR5	10				
3	HELWAN	EG	POLIBA	IT	ESR6	10				
3	HELWAN	EG	POLIBA	IT	ESR7	8				
3	HELWAN	EG	POLIBA	IT	ESR8	9				
3	HELWAN	EG	POLIBA	IT	ER6	6				
4	CAIRO	EG	POLIBA	IT	ESR10	6				
4	CAIRO	EG	POLIBA	IT	ESR11	6				
4	CAIRO	EG	ECOLE	FR	ESR9	6				
4	CAIRO	EG	ECOLE	FR	ESR12	6				
4	CAIRO	EG	ECOLE	FR	ER5	4				
5	AINSHAN	EG	POLIBA	IT	ESR4	6				
5	AINSHAN	EG	POLIBA	IT	ESR2	8				
5	AINSHAN	EG	ECOLE	FR	ESR3	6				
5	AINSHAM	EG	ECOLE	FR	ESR1	8				
5	AINSHAN	EG	ECOLE	FR	MANAG1	2				

5. Project management

5.1 Network organization and management structure

The EENP2 is coordinated by the Network Coordinator (NC) of POLIBA.

A Supervisory Board (SB) will be set up, composed as:

- two members from EU institutions;
- three members from Egyptian Institutions;
- the network coordinator as ex-officio member.

Each institution (POLIBA, ECOLE, HELWAN, CAIRO) shall provide nomination of a representative to the SB. During the first meeting the SB members will appoint a Chairman. The SB meetings will be organized and chaired by the Chairman. The SB shall support, monitor and follow-up the programs. It approves the Consortium Agreement and its possible amendments, the Work Package documents and all other documents and reports to be submitted to Research Executive Agency (REA). The consent of SB is also required for possible changes in the appointments of the Network Coordinator and others responsible for the project. The SB shall meet regularly. The first meeting will be held at the beginning of the project for setting up required organs, to inform Partners and to confirm nominated responsible persons.
The SB organizes annual meetings to evaluate the scientific and technical quality and refine the plans accordingly. A mid-term project review is conducted to monitor the scientific and technical quality of the project.
The SB will be in charge for the preparation of all the official reports to REA and for any other official contact which might be necessary with REA through the Network Coordinator. An end of the project, SB meeting will report on the assessment and dissemination of the knowledge transfer results. The final report is prepared by the Supervisory Board as well as the Network Coordinator.
The Executive Committee (EC) will be the network's managerial board. It consists of the Network Coordinator (NC), who is the chair of this board, the Work Package leaders and the Chair of the SB (ex-officio). Team leaders and deputies will be nominated by the SB after consultation with the other members of the Institutions. Each WP leader will autonomously call for meetings in the respective field of research and will coordinate the activity. He will report at the periodic EC meeting about progress and difficulties.

The EC is in charge of the scientific and the overall training program and acts as the initiator of all activities of the network. The EC shall meet every three months (we will make full exploitation of remote connection facilities for virtual meetings) to review and steer the scientific and administrative work undertaken in the course of the research projects. In particular, the EC shall provides follow-up to SB on organizational tasks and provide suggestions for change on the Network policies and procedures where appropriate.

The EC will properly monitor the milestone achievements and will submit to the SB written reports for each of them. The EC will also be in charge for the organization of collaboration and review meetings according to the list in table 5.

Table 5: collaboration and review meetings

Name	Host partner	Schedule	Comment
Kick- off meeting	EGYPT	Month 4	Set up the collaboration strategies for the research activities
1° Consolidation meeting	POLIBA	Month 12	Monitor the network effectiveness and review research start-up
"Middle Term" workshop and status report	EGYPT	Month 24	"Middle Term" workshop for extensive review of the network activities and preparation of a status report document
2° Consolidation meeting	ECOLE	Month 36	Review of the network activities and results. Review of the milestones achievements
Conference and concluding collaboration meeting	EGYPT	Month 48	General conference to disseminate results and concluding meeting

Finally, the SB and EC will jointly discuss and approve the organization of the planned "High Energy Physics School". The SB will be in charge of setting up an International Advisory Board proposing outstanding scientists in the field who could help in defining the scientific scope of the initiative. The EC will be more focused on the local organization and will ensure the proper balance of the WP activities in the schedule of lectures.

A project web page will be implemented to facilitate the flow of information. The main page will make available all the information about the network institutions and the staff members. Also the calendar of meeting and other information relevant for the project will be on-line. At next level, WP working pages will be available to share relevant scientific documentation. While the main page will be maintained by the Network Coordinators, the WP pages will be maintained by the WP leaders.

5.2 Financial management

The budget provided by REA to the project will be initially transferred through POLIBA central administration to the Physic Department M. Merlin where the Network Coordinator is affiliated. The full administrative management will be under the responsibility of the local "Direttore Amministrativo" or its delegate at the Physics Department. He will play the role of Resource Manager (RM) of the project. Any expenditure or budget transfer will be subject to the set of rules implemented by the Italian Ministry of Research and Education for the management of research funds. Part of the budget (according to the provisional table of secondments) will be then transferred to the Leprince-Ringuet Laboratory at ECOLE where a deputy Resources Manager (Deputy RM) will be appointed. Here expenditures will be accounted according to rule issued by the French Ministry of Research and Education.

The RM and the deputy RM will be officially appointed during the first SB meeting. The RM will operate in close contact with the Network Coordinated whose approval will be due for any transaction or expenditure. Every 12 months an expenditure report and a provisional estimated expenditure for the following 12 months will be submitted by the RM to the Network Coordinator who will post it on the web page and transmit to the SB for discussion and approval.

Since the main scope of the project is to make available funds for secondments, a proper provisional schedule will be prepared every 12 months by the Network Coordinator in consultation with the WP leaders. The yearly budged assessment, as previously discussed will, of course, take into account this schedule as input.

Long term secondments from EGYPT to POLIBA and ECOLE will be financially accounted as individual contracts subject to the present regulations for temporary research contracts. The standard protocol applied by the Physics Department M. Merlin at POLIBA and by the Leprince-Ringuet Laboratory at ECOLE, in compliance with the present Italian and French Government regulations, will be followed in issuing these contracts. Travel expenses, when due, will be embedded in the contract.

For short visit from EGYPT to POLIBA and ECOLE (maximum 1 month) travel and living expenses will be reimbursed on a "per diem" base, always following present regulation and guidelines for allowance treatment defined by the Italian and French Ministry for Research and Education.

Secondment and short visit from POLIBA and ECOLE to EGYPT will always be on a "per diem" base.

5.3 Secondment strategy

A secondment schedule will be prepared every 12 months by the Network Coordinator in consultation with the WP leaders and approved by the EC. For each secondment, a detailed research plan shall be proposed and a supervisor at the host institution has to be defined. Also a co-supervisor from the home institute shall be nominated. The final schedule will then be transmitted to the RM for the preparation of the financial plan. After the final approval by the SB, the secondment plan become effective.

Secondment at POLIBA

While financial issues concerning the preparation of the contract will be under the supervision of administrative staff at the Physics Department, welcome assistance will be given to the seconded researchers by a special help desk at the POLIBA "international relation office". The researcher will be accompanied through the essential initial procedures for formal registration with local police authorities, for health assistance registration and for opening a bank account. The help desk will also propose a list of partners hotels and residences for accommodation.

Secondment at ECOLE

While financial issues concerning the preparation of the contract will be under the supervision of administrative staff at the Leprince-Ringuet Laboratory, welcome assistance will be given to the seconded researchers by a special help desk at the ECOLE "international relation office" and the dedicated team in charge of UE contracts. The researcher will be accompanied through the essential initial procedures for formal registration with local police authorities, for health assistance registration and for opening a bank account. The help desk will also propose a list of partners hotels and residences for accommodation.

Secondment at CAIRO

CAIRO has one of the greatest guest houses around Cairo which will be available to any research visitor and assist him/her in his/her trip as well as in his/her staying. A visitor will have assistance

from the airport to the guest house as well as during his staying to the training/research centers. In addition, other hotels will be suggested and visitors will be guided during the registration and driving to such hotels. Moreover, CAIRO has one of the biggest conference halls with special rate; thus, it will be possible to host an international conference during the dissemination phase. CAIRO will help in the local organization and visitors' accommodation as well. CAIRO University is easily accessed by public transportation (subway).

Secondment at HELWAN
Seconded researchers at HELWAN will get benefits of all the facilities at the university campus, this including the residence in the guest house with full accommodations, access to PCs and library, using of wireless internet connections, sport activities and health services. The reception desk of "International Projects Management Unit" will provide the help to the seconded researchers. HELWAN university is easily accessed by public transportation (subway).

Secondment at AINSHAM
Secondments will get benefits of all the facilities at the university campus. Also the "office of foreign affairs" will help in the local organization and visitors' accommodation as well.
AINSHAM has a guest houses in the central of Cairo which will be available to any research visitor and assist him/her in his/her trip as well as in his/her staying. A visitor will have assistance from the airport to the guest house as well as during his staying to the training/research centers. In addition, other hotels will be suggested and visitors will be guided during the registration and driving to such hotels. AINSHAM University is easily accessed by public transportation (subway).

5.4 Intellectual property
The main intellectual products will be essentially publications and reports on international journals. Preliminary, an Author List with all the members of the EENP2 network engaged in the WPs activities and in the management and coordination should be established and approved by the SB. This list shall be used as reference for all the products submitted to journals by the network. In order to exploit at best the opportunity given to young researchers to promote their work and to boost their career assessment, we propose that, for each product, the first author and the "corresponding author" should the researcher mostly proactive in the elaboration of the experiment activity and in the paper preparation. Also presentation of results to international conference will be promoted for young researches, so that their name would appear in the proceeding. In this case, the name of the speaker should only be followed by the wording "on behalf of EENP2 collaboration".

Each product prepared by a member of the network will be preliminarily submitted to the EC who shall then evaluate it and give feedback. If needed, some external referees could be appointed. The EC shall interact with the corresponding author, propose modification and eventually approve it for submission.

If during secondment period, the researchers is involved in cross border activities between EEPN2 and other collaborations (CMS collaboration could be a clear case) such that he could also be entitled to be a co-author of additional papers not in the framework of EENP2, he should ask formal approval to the SB (through its chair) for signing it.

6 Impact

Expected impact to the scientific area, for the ERA and collaboration with the Third country partner organisations

ECOLE and POLIBA are two schools of excellence in the field of basic, applied and engineering science. So far only limited contacts between single scientists have been active. To our knowledge this is the first time an attempt is taking place to organize a long term relevant collaboration between the two institutions on a wide spectrum of research activities. In case of success, this would set the seed for future even larger synergies in more applied fields.

Also both countries have a Mediterranean scientific policy attitude which was unfortunately developed on separated and independent frameworks. The geographical position of POLIBA would offer a unique possibility of exploiting the already consolidated links in a new synergic European scientific approach toward the north African countries.

Europe has been for more than one decade the leader in the scientific domain of particle physics, also thanks to the new operating Large Hadrons Collider (LHC). EENP2 would contribute to exploit this unique instrument by training young researchers in basic science and some advanced technological topics. Sophisticated computing and handling of very large amounts of data, as well as employment of high technological instruments, are fast developing sector in academic research, in public or semi public sector (medicine) and in private companies.

The EENP2 project has a mixed composition, with founding Member States and neighbouring countries, within a reasonable and manageable size network; it therefore represents a good opportunity to enhance the influence of Europe in its closest geographical environment. The experience of the participants in a very large international collaboration is a way to facilitate comparison and bringing together the different academic systems in Europe and in neighbouring countries.

In a situation of fast and important change of prospects toward new solid cultural and scientific developments, the presence of European established scientific institutions to accompany Egyptian Academy and validate internationally their efforts could be a relevant boosting and stabilization factor in the Egyptian evolution. To this aim, it is important to recall that some Egyptian scientists collaborating at this project are promoting the new international “Zewail City of Science and Technology”. This is a not-for-profit, independent Egyptian institution of learning, research and innovation. The concept of Zewail City was proposed in 1999. After many delays in its establishment, an Egyptian Cabinet of Ministers' decree on May 11, 2011 finally approved the project, which was labeled as a National Project of Scientific Renaissance.

The future affiliation to the new center of many of the Egyptian scientists signing this proposal, would give large emphasis to the EENP2 network and would put the EU institutions in a very favorable frame for a long term relevant collaboration with one of the future outstanding Egyptian scientific institutions.

Collaboration exists already since 2005 between Egyptian Universities (HELWAN, AINSHAM and CAIRO) and ECOLE. It is funded by the bilateral exchange programs IMHOTEP and PICS and concerns the experienced researchers quoted in parts B of this proposal. Funds are not available every year and only allows for short visits, of the order of two weeks. Collaboration exists also since 2008 between Egyptian Universities and POLIBA. It is mostly thanks to these preliminary scientific contacts that the network of Egyptian universities was first presented and then officially accepted as a full member by the CMS experiment.

EENP2 will further consolidate the collaboration with Egypt in a robust and clear context and would reinforce the Egyptian challenges to successfully promote access to international collaborations and

long term scientific partnerships with Europe.
The middle-term target is to promote the official candidacy of Egypt to become full member of CERN and to have the possibility to participate in the existing experiments of the European laboratory. This would be a commitment to participate to this research for the foreseen duration of the LHC, at least 15 years.

The active participation of Egypt to EENP2 could represent a strong reference for a positive outcome of this process. Furthermore, Egypt has a leading role in the North Africa Mediterranean area for culture and science. EENP2 could represent a seed for further extension of the collaboration, through Egypt, to other countries of the area. Such extension has been already initiated by opening the preceding schools in Egypt to students from South Mediterranean countries.

PART C

8. Overall Maximum Community Contribution

Table 6: Indicative Budget

A3.1: Budget

Project Number [1]	318922	Project Acronym [2]	EENP2

One Form per Project

Participant number in this project	Participant short name	Country	Number seconded researchers month	Total EU Contribution (€)
1	POLIBA	Italy	102	193,800.00
2	ECOLE	France	53	100,700.00
TOTAL (€)			155	294,500.00

Table 7: Indicative Secondments

A3.2: Indicative Secondments

Project Number [1]	318922	Project Acronym [2]	EENP2

One Form per Project

Participant number in this project	Participant short name	Country	Amount of staff	Number seconded researchers month total	% Total	EU Contribution (€)
1	POLIBA	Italy	21	33	35 %	62,700.00
2	ECOLE	France	15	21	25 %	39,900.00
3	HELWAN	Egypt	10	43	17 %	81,700.00
4	CAIRO	Egypt	8	28	13 %	53,200.00
5	AINSHAM	Egypt	6	30	10 %	57,000.00
TOTAL EU/AC Participant		2	36	54	60 %	102,600.00
TOTAL Third Country Participant		3	24	101	40 %	191,900.00
TOTAL		5	60	155	100 %	294,500.00

9. Grant agreement reporting

REPORT PERIOD	SCIENTIFIC MID-TERM REVIEW REPORT* DUE AT MONTH	PERIODIC REPORTS** DUE AT MONTH	FINAL REPORT DUE AT MONTH
1	12	24	
2	**36**	**48**	**48**

* According to Articles III.4 of the Annex III of the grant agreement, the beneficiary shall submit for each reporting period a mid -term interim progress report.

** According to Article 4 of the grant agreement, they include the activity and management reports and the financial statement (Form C).

The Union support of Marie Curie Actions will be referenced in publications, conference papers, presentations and posters in connection with this project. This will include the sentence “This research was supported by a Marie Curie International Research Staff Exchange Scheme Fellowship within the 7th European Community Framework Programme”, as well as, if relevant, the EU and Marie Curie logos.

ENDPAGE

PEOPLE
MARIE CURIE ACTIONS

International Research Staff Exchange Scheme
Call: FP7-PEOPLE-2012 IRSES

Annex I

“EENP2”