

Overview of ITN Advanced Radiation Dosimetry European Network Training initiative (ARDENT)

Mid-Term review

Marco Silari (CERN)

on behalf of the ARDENT consortium



ARDENT

February 2012 – January 2016



Advanced **R**adiation **D**osimetry **E**uropean **N**etwork **T**raining initiative

Marie Curie Initial Training Network under EU FP7 – 4 M€

(7 ->) **8 Full Partners** and (5->) 6 Associate Partners

Coordinator: CERN, Scientist-in-Charge: Dr. M. Silari

CERN (coordinator), Switzerland

AIT Vienna, Austria

CTU - IAEPR Prague, Czech Republic

IBA Dosimetry, Schwarzenbruck, Germany

Jablotron, Jablonec nad Nisou, Czech Republic

MI.AM, Piacenza, Italy

Politecnico of Milano, Italy

Seibersdorf Laboratories, Austria

INFN Legnaro National Laboratories, Italy

ST Microelectronics, Italy

University of Erlangen, Germany

University of Houston, USA

University of Ontario, Canada

University of Wollongong, Australia





ARDENT



8 full partners: 3 research institutions, 2 academic, 3 industry
6 associate partners: 1 research institution, 4 academic, 1 industry

- Originally 12 partners (7 full and 5 associate)
- Development of radiation sensors and dosimeters moved from AIT to Seibersdorf Laboratories (SL) after ARDENT starting date
- AIT group split between AIT and SL, SL joined as 8th full partner
- One ESR with AIT and one ESR with SL
- Revised Grant Agreement entered into force on 1st January 2013 (retroactive)
- On 1st January 2013 LNL-INFN joined ARDENT as 6th associate partner because of its expertise in microdosimetry



Development of advanced instrumentation for radiation monitoring



Three technologies

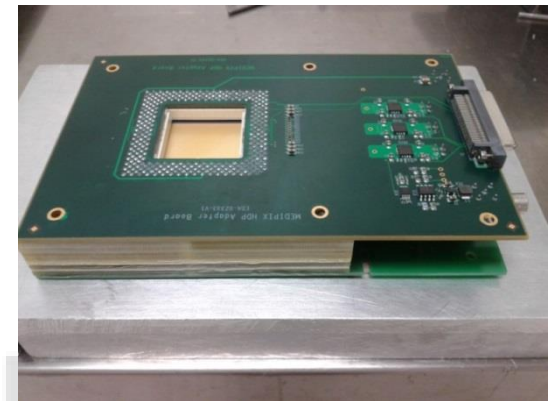
- gas detectors [gas electron multipliers (GEM), tissue equivalent proportional counters (TEPC), ionization chambers]
- solid state detectors [Medipix, silicon micro-dosimeters]
- track detector techniques [CR-39]

Main objectives

- Radiation dosimetry
- Micro- (and maybe sub-micro-) dosimetry
- Neutron spectrometry

Applications

- Characterization of radiation fields at particle accelerators
- Characterization of radiation fields on-board aircrafts and in space
- Assessment of secondary dose to RT patient
- Measurement of properties of clinical hadron beams





Recruitment



- 15 Early Stage Researchers (ESR)
 - 4 at CERN, Geneva
 - 1 at AIT, Vienna
 - 3 at CTU, Prague
 - 2 at IBA Dosimetry, Schwarzenbruck
 - 1 at Jablotron, Jablonec nad Nisou (100 km from Prague)
 - 1 at MI.AM, Fabiano di Rivergaro (near Piacenza)
 - 2 at the Politecnico, Milano
 - 1 at Seibersdorf Laboratories, Seibersdorf
- All ESRs are enrolled in a PhD program



Recruitment



- All positions advertised network-wide (ARDENT website, CERN's e-recruitment system, Euraxess, LinkedIn, Facebook, Twitter, the Institute of Physics and the Institute of Engineering and Technology, local advertisement)
- All ESR applications handled via the CERN ERT tool
- 87 applications received, of which 74 were eligible for consideration for recruitment with at least one of the beneficiaries
- Publication started in February 2012 for 6 weeks initially, positions left open on CERN's e-recruitment system until June
- Applications re-opened for a few weeks in November 2012



Recruitment



- Almost 28% of the candidates were from females, with nearly 27% (4/15) females appointed
- Selection of candidates done by the respective institutes
 - Selection process documented
 - Researchers recruited under employment contract
- Applications not limited to the EU countries (mobility criteria), selected candidates are:
 - 9 European
 - Germany, Greece (2), Italy (3), Slovakia, Sweden, U.K.
 - 6 non-European
 - Australia (2), Colombia, India (2), Mauritius



Recruitment



- All contracts started within the first 12 months, except 2 (SL, CTU)
- SL and CTU plan to use the remaining man-month funding for these positions (6 and 8 man-months, respectively) for short-term contracts on ESR5- and ESR7-related subjects
- No major problems with the other positions, only some delays due to administrative / VISA issues for some of the non-EU ESRs

ARDENT



Work Packages



- Seven Work Packages
 - WP1: gas detectors
 - WP2: solid state detectors
 - WP3: track detectors
 - WP4: instrument inter-comparison
 - WP5: training
 - Individual training programs
 - Network-wide training
 - WP6: dissemination and outreach
 - WP7: ITN management



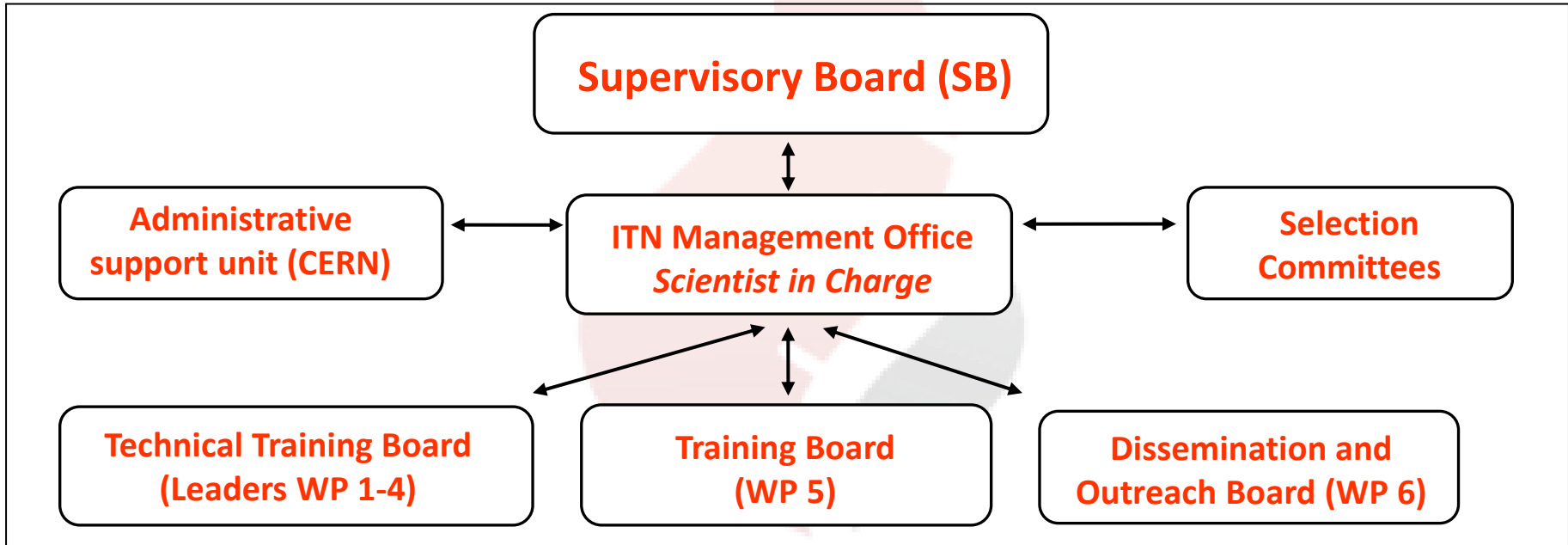
Work Packages



ESR	Individual Research project	Link with WPs	Host Institute	Fellow months
ESR 1	Development of compact neutron spectrometer	1, 2, 4, 5, 6	CERN	36
ESR 2	Dosimetry in mixed fields with Medipix and RP training	2, 4, 5, 6	CERN	36
ESR 3	Dosimetry in mixed fields with GEM and TEPC	1, 4, 5, 6	CERN	36
ESR 4	Medical applications of Si detectors	2, 4, 5, 6	CERN	36
ESR 5	Characterisation of TEPC for space and medical applications	1, 4, 5, 6	SL	36
ESR 6	Evaluation of advanced detectors for dosimetry in phantoms	2, 4, 5, 6	AIT	36
ESR 7	Development of radiation-hard radiation field monitor	2, 4, 5, 6	CTU	36
ESR 8	Application of Medipix detectors for medicine and radiation safety	2, 4, 5, 6	CTU	36
ESR 9	Optimization of mixed-field data evaluation	2, 4, 5, 6	CTU	36
ESR 10	Development of detector system for medical Quality Assurance	2, 4, 5, 6	IBA	36
ESR 11	2D Ionization chamber array for clinical applications	1, 4, 5, 6	IBA	36
ESR 12	Development of Medipix-based radiation monitoring system	2, 4, 5, 6	Jablotron	36
ESR 13	Neutron dosimetry and spectrometry with CR-39	3, 4, 5, 6	MI.AM	36
ESR 14	Solid state microdosimetry, low-pressure TEPCs	2, 4, 5, 6	POLIMI	36
ESR 15	CR-39 and active detector for pulsed neutron fields	1, 3, 4, 5, 6	POLIMI	36



ARDENT management structure



↓
Technical WPs

- **WP1: gas detectors**
- **WP2: solid state detectors**
- **WP3: track detectors**
- **WP4: instrument inter-comparison**

Each board meets 4 times/year

- three video conferences
- one in-person at the workshops
- agenda / minutes



ARDENT management structure



- **Supervisory Board:** representatives from each partner and ESRs
- **Technical Training Board:** four technical WP leaders
 - monitors the progress of the technical WPs (milestones/deliverables)
- **Training Board:** one representative from each full partner
 - checks that each ESR follows his/her training programme
- **Dissemination and Outreach Board:** 7 members
 - promotes and monitors the dissemination and outreach activities
- **ITN Management Office:** scientist-in-charge + chairs of the TTB, TB and DOB
 - reports to the Supervisory Board, in charge of the overall management of the network programme



Website



On-line since 1st February 2012 (thanks to AIT!), mostly public:

- the project scope and organizational structure
- the ESRs personal pages
- the outreach and dissemination results
- the program of the various workshops and training courses; all documentation including slides of the lectures is freely accessible worldwide
- information on the involvement and collaboration with other projects
- a list of the international conferences and courses of interest to ARDENT activities



Website



Password-protected member area for official documents
(needs CERN external account):

- Grant Agreement and its annexes
- Consortium Agreement
- Documents related to the project deliverables
- Minutes of the board meetings and of other relevant meetings
- Some documents of confidential nature
(e.g. containing proprietary information of private partners)



Communication



Mailing lists

- General ARDENT mailing list
- SB mailing list
- ITN MO mailing list
- TB mailing list
- TTB mailing list
- DOB mailing list
- ESRs mailing list (networking!)



Training



- Individual PhD-specific training program
- Hands-on / experimental work
- ARDENT training courses within the annual workshops
- Courses and schools
- Conferences
- Complementary training (e.g. language, business and administration)
- International conferences (many!) – just one example:
 - Workshop “New Detector Technologies in Radiation Dosimetry and its Applications”, IEEE NSS/MIC conference, Seoul, Korea, October 2013 / Chairs M. Silari and A. Rosenfeld





Training - tracking



- CDP review by the Training Board
 - Scientific goals / training / complementary training / outreach
- Activity table (coordinator)
 - Training (achieved and planned)
 - Experimental activities
 - Conferences and workshops attended
 - Presentations at conferences/workshops/scientific meetings
 - Outreach activities
 - Scientific publications
 - Secondments (achieved and planned)
- Web site



Network-wide events (so far)



- Project kick-off meeting, CERN, 8 May 2012
- ARDENT-CNAO workshop, Pavia, 19 October 2012
- 1st annual ARDENT workshop, Vienna, November 2012
 - training course on radiation dosimetry
 - visit to MedAustron
- Mid-Term review preparatory meeting , CERN, 13 June 2013,
 - visit to ATLAS and to the 600 MeV synchrocyclotron
- 2nd annual ARDENT workshop, Politecnico of Milan, October 2013
 - training course on experimental microdosimetry
 - full-day outreach event (POLIMI 150° anniversary)



Annual workshops



Lead institution / location	Objectives	Deliverables	Participants	Month
AIT/Vienna	Training course on dosimetry Visit to MedAustron	1 st Workshop and training course	All	10
POLIMI/ Milano	Training course on experimental microdosimetry Mid-Term review	2 nd Workshop and training course	All	22
IBA/ Schwarzenbruck	Topic of the course to be decided	3 rd Workshop and training course	All	34
CTU/Prague	Topic of the course to be decided	4 th Workshop and training course	All	46

Kickoff meeting held at CERN on month 3



Deliverables / Milestones



No significant deviations in the work program as compared to Annex I

All deliverables “delivered”

All milestones met, except slight delay in:

- M5 - comparison of detector technologies (WP1)
- M6 - choice of detector technology (WP1, WP2)

WP1: Description of work - GEM detector technology for neutron spectrometry, dosimetry and microdosimetry; TEPC to determine absorbed dose and dose equivalent in complex radiation fields; miniaturized version of a TEPC for use in cancer radiation therapy; neutron detectors based on proportional counters for operation in mixed and pulsed radiation fields; novel ionization chamber detector array for the measurement of absorbed dose from photon, electron and proton radiation

WP2: Description of work - Medipix technology for neutron spectrometry, dosimetry and for characterising therapeutic ion beams; universal portable mixed-field radiation detector for environmental monitoring based on Medipix; Medipix/Timepix based hand-held public security radiation detector; single photon detection system for QA of radiological imaging systems; silicon detectors and instrumentation for microdosimetry; Medipix technology in medical imaging for cancer treatment planning



Deliverables / Milestones



Slight modifications or extensions in the work plans of some ESRs

ESR1: expanded to include extensive hands-on training on neutron spectrometry

ESR4: enlarged to include dosimetry and microdosimetry with Medipix / GEMPIX

ESR5: added radiation effects to electronics

ESR6: includes evaluation of advanced detectors in a moving phantom for dose validation in radiation therapy (revised Annex I)

ESR7: more accent on data analysis and on further radiation hardness studies

ESR12: expanded to include the development of a GM counter-based prototype

ESR14: extended to design and construction of low-pressure TEPC



WP4 activities



Organisation of transnational, network-wide experimental activities involving more than one ESR

Measurements planned at:

- LNL-INFN, Legnaro, Italy
- LNS-INFN, Catania, Italy
- CNAO, Pavia, Italy
- PSI, Villigen, Switzerland
- Maybe HIT, Heidelberg, Germany
- Maybe HIMAC, Chiba, Japan



Outreach activities



- A documentary on ARDENT activities with the participation of all ESRs is in preparation
- Two ESRs participated in the Researchers' night on 27 September at CERN
- Three ESRs gave a demonstration of some ARDENT activities during the CERN Open Days on 28 and 29 September
- ESR13, ESR14 and ESR15 are involved in a project organized with an Italian high school, giving introductory lectures on radioactivity and radiation protection and a practical demonstration of radon measurements with track detectors





Outreach activities



And of course...

**POLIMI Outreach Day
16 October 2013**

ARD



POLITECNICO DI MILANO






Contacts:
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Marco Silari, CERN, Ginevra, Svizzera: marco.silari@cern.ch

Misurare le radiazioni: un aspetto fondamentale nella pratica medica, industriale, nella ricerca e nel progresso aerospaziale

Nell'ambito delle celebrazioni per il 150° anniversario del Politecnico di Milano sarà possibile ascoltare la testimonianza di quindici giovani ricercatori, provenienti da diversi Paesi (Italia, Inghilterra, Australia, Svezia, Colombia, Mauritius, Giocia, Germania, Slovacchia, India) che, grazie al Progetto ARDENT Marie Curie ITN (finanziato dall'Unione Europea), studiano nuovi strumenti per misurare le radiazioni per applicazioni mediche, industriali, nella ricerca e nello spazio.

I giovani ricercatori del progetto ARDENT - Advanced Radiation Dosimetry European Network Training Initiative - spiegheranno personalmente la loro ricerca e illustreranno le possibilità offerte dall'Università e dall'Unione Europea per accedere a questa carriera.

Raccosteranno come, nel corso di questa affascinante esperienza, studiano lo sviluppo di nuovi rivelatori, ossia di strumenti di misura delle radiazioni sempre più accurati, per poter migliorare i trattamenti dei pazienti e limitare i rischi di danno alla salute degli astronauti e alla strumentazione elettronica nelle missioni spaziali.

Nella stessa occasione sarà possibile visitare l'area espositiva, dove verranno mostrati i rivelatori sviluppati nell'ambito del progetto.

PROGRAMMA

9:30 Salotti di benvenuto

9:45 Il programma ARDENT della Unione Europea (Marco Silari, CERN e coordinatore del Progetto ARDENT)

10:30 ARDENT per tutti (Silvio Padella, ricercatore ARDENT al CERN)

11:00 - 12:30 Incontri con i ricercatori ARDENT e dimostrazione delle attività di ricerca

14:30 ARDENT per tutti (Silvio Padella, ricercatore ARDENT al CERN)

15:00 - 16:30 Incontri con i ricercatori ARDENT e dimostrazione delle attività di ricerca

Mercoledì 16 ottobre 2013 ore 9.30
Politecnico di Milano
Aula De Donato



Dissemination



Invited lecture at the *9th International Workshop on Ionizing Radiation Monitoring*
November 30th - December 1st, 2013, Oarai / Ibaraki, Japan

International Organizing Committee of the 9th International Workshop
on Ionizing Radiation Monitoring

October 9, 2013

To: Dr. Marco SILARI
Senior physicist
CERN

INVITATION

to
the 9th International Workshop on Ionizing Radiation Monitoring
November 30th – December 1st, 2013, Oarai / Ibaraki, Japan

Dear Dr. Marco SILARI,

We are pleased to invite you as a special lecturer to the 9th International Workshop on Ionizing Radiation Monitoring from November 30 till December 1, 2013 in Oarai / Ibaraki.

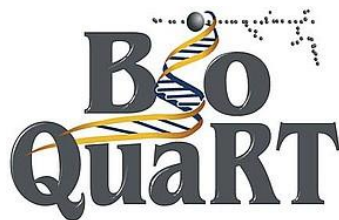
As to accommodation and traveling expenses in Japan, we shall reserve and bear the expenses for all hotels and traveling tickets from November 29 until December 4 in addition to the air fare from and to your country.

We look forward to seeing you and making fruitful discussion with you during the workshop.

Sincerely yours,

Prof. Dr. Takayoshi YAMAMOTO
Chairman of the International Organizing Committee
The 9th International Workshop on Ionizing Radiation Monitoring
(Professor Emeritus of Osaka University)

*Highlights from the Advanced Radiation Dosimetry
European Network Training initiative (ARDENT)*
**BioQuaRT Satellite Workshop at the 12th NEUDOS
Conference, 7th June 2013, Aix-en-Provence**





Category 3 budget status



Institute	N. of ESRs	Months	ESR-months 1 Feb 2012 - 30 Sept 2013	% expenditure over total 1 Feb 2012 - 31 Jan 2016	% at Mid-term → 30 Sept 2013
CERN	4	144	57.0	45%	114%
AIT	1	36	9.5	23%	89%
CTU	3	108	19.5	20%	110%
IBA	2	72	15.5	21%	96%
Jablotron	1	36	12.0	26%	77%
MI.AM	1	36	9.5	34%	129%
POLIMI	2	72	25.0	21%	60%
SL	1	36	2.0	2%	41%
Total	15	540	150	27%	98%


Category 3: 1800 € per researcher/month



Sponsorships and partnerships



- Support to “local” PhD students
- Participation in training course at the 1st (Vienna) and 2nd (Milano) annual ARDENT workshops open to outside students (14 extra-ARDENT students attending the training course on experimental microdosimetry on 17-18 October 2013)

-  Biologically weighted quantities in radiotherapy

-  European Radiation Dosimetry Group

-  **fondazione CNAO**
Centro Nazionale di Adroterapia Oncologica per il trattamento dei tumori



Sponsorships and partnerships



AFRICAN SCHOOL OF FUNDAMENTAL PHYSICS AND ITS APPLICATIONS

July 15-Aug 04, 2012

KNUST, Kumasi, Ghana

africanschoolofphysics.web.cern.ch/AfricanSchoolOfPhysics/

In connection to APS2012, a dedicated Grid School will follow on August 6-8, 2012



African School of Physics
Stellenbosch (SA) –August 2010

African School of Physics 2012
Kumasi, Ghana – July 2012

African School of Physics 2014
Dakar, Senegal, August 2014



AFRICAN SCHOOL OF FUNDAMENTAL PHYSICS AND ITS APPLICATIONS

University Cheikh Anta Diop
Dakar, Senegal
August 3-23, 2014



Application: ASP2014-Registration@cern.ch
Deadline: Open for application from **Dec 1st, 2013 to March 1st, 2014**. Partial or full support to cover participation costs may be requested on the application form. Please provide a CV and a motivation letter with your application.
Contact: Asp2014-loc@cern.ch
Website: <http://www.africanschoolofphysics.org/>

- Physics Topics:**
- Theoretical Particle Physics
 - Experimental Subatomic Physics
 - Accelerators and Technology
 - Grid and Computing

For more details visit the website.



International Organizing Committee:
B. Acharya (ICTP), K. Assamagan (BNL), C. Darve (FNAL), S. Muozna (CPPM), J. Ellis (King's College & CERN, CH)

International Advisory Committee:
E. Auge (CNRS-IN2P3), V. Breton (CNRS-IN2P3), J. Cleymans (UCT), S. Connell (UJ), C. Diop (CEA), T. Ekelof (UJ), E. G. Ferreiro (USC), H. Gordon (BNL), J. Govaerts (UCL), N. Holtkamp (SLAC), Y. K. Kim (FNAL), G. Margaritondo (EPFL), B. Masara (SAIP), H. Montgomery (TJNAF), B. Mueller (BNL), F. Quevedo (ICTP), V. Rivasseau (U of Paris-Sud XI), L. Rivkin (PSI), E. Tsesmelis (CERN), T. Vickey (Wits), Z. Vlakazi (Themba LABS)

Local Organizing Committee:
O. Ki (UCAD), S. B. L. Amar (UCAD), M. Biaye (UCAD), D. Boye (UCAD), N. Boye-Faye (UCAD), M. Faye (UCAD), Y. Gning (UCAD), F. K. Gueye (UCAD), D. Kobor (UZ), A. Ndiaye (UGB), A. Taya (UCAD), C. Thiandourme (UCAD), A. Wague (UCAD)



Application:
ASP2012-registration@cern.ch

Deadline:
Open for application from Dec 1, 2011 until March 1, 2012

Partial or full support to cover participation costs may be requested on the application form, please also provide a CV and a letter of motivation.

Contact:
ASP2012-loc@cern.ch

- Physics Topics:**
- Foundations of Nuclear and Particle Physics
 - Standard Model of Particle Physics
 - Beyond The Standard Model
 - Astro-Particle Physics
 - Experimental Sub-Atomic Physics
 - Heavy Ion Physics
 - Nuclear and Particle Physics
 - Particle Detectors
 - HEP Computing
 - Accelerators and Technology
 - Instrumentation
 - Beam Optics
 - Particle Accelerators
 - Medical Applications
 - Light Sources
 - Laser
 - Energetics
 - Transfer of Technology
 - GRID Computing
 - Application in Particle Physics Experiments

- International Organizing Committee:**
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K. Assamagan (BNL, USA)
C. Darve (FNAL, USA)
S. Muozna (CPPM, Marseille, FR)
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B. Agyei-Tuffour (University of Ghana, Ghana)
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P. Anusua-Yireku (KNUST, Kumasi)
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B. O. K. Nwuneli-Suanoboh (University of Ghana, Ghana)
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S. Vizer (BNL, USA)
Z. Vlakazi (Themba LABS, SA)
H. Voss (CERN, CH)



← ARDENT →





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- All ESRs for their enthusiasm, commitment and hard work