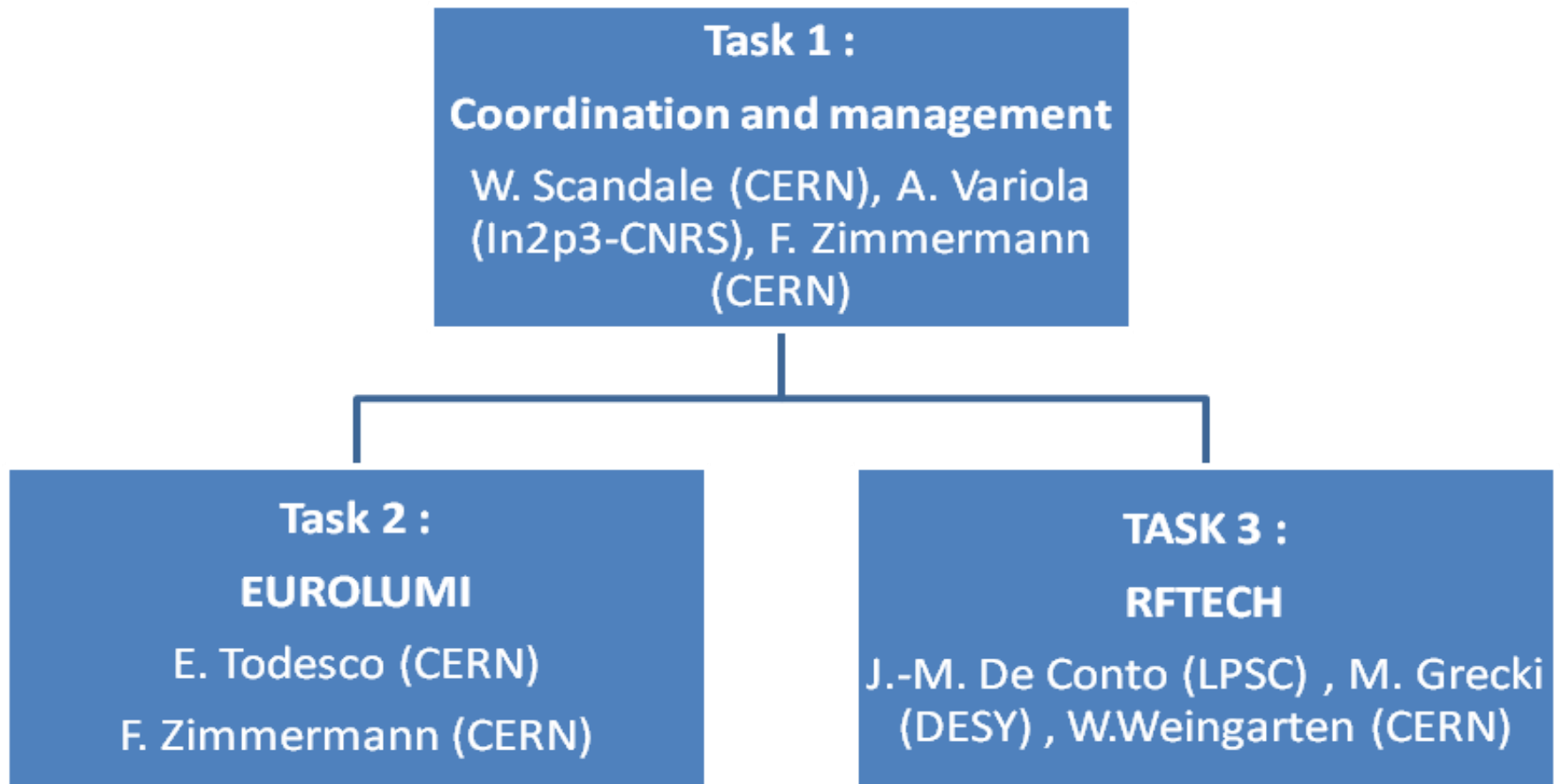


EuCARD WP4 Accelerator Networks

Walter Scandale, Alessandro Variola,
Frank Zimmermann

EuCARD Steering Committee Meeting
Frascati, 4 November 2009

network structure



tasks & participants

Task 1. AccNet Coordination and communication

oversee and coordinate the [EuroLumi](#) and [RFTECH](#) networks; ensure the consistency of WP work according to the project plan; organization of AccNet internal steering meetings; reporting to project management; organization of activity workshops with participants from inside and outside consortium

Task 2. EuroLumi

European forum for discussing *performance limitations of high-intensity high-brightness accelerators*, with emphasis on hadron facilities help analyze and optimize proposed upgrades; also explore advanced future schemes such as proton driven plasma acceleration and medical applications of accelerators; coordinate and integrate activities of accelerator and particle physics communities towards *realizing full potential of LHC*, by means of [LHC luminosity upgrades](#) and *new or enhanced LHC injectors*; also support the *SIS* upgrade and the [FAIR](#) project at [GSI](#) ; interface to US-LARP -

institutes with interest: BINP (RU), BNL (USA), Bologna U (IT), CERN (International Organization), CI (UK), CINVESTAV (Mexico), CNRS-LAL (FR), CNRS-LPSC (FRS), CSIC-IFIC (ES), DESY (DE) , FNAL (USA), GSI (DE), IHEP (RU), INFN-LNF (IT), INFN-NA (IT), JINR (RU), KEK (JP), RCC KI (RU), LBNL (USA), MPP (DE), RHUL (UK), Sannio University (IT), SLAC (USA), STFC (UK), TEMF (DE), Texas A&M (USA), TU Berlin (DE), UJF (FR), UOM (M), UPSA (SE).

Task 3. RFTECH:

coordinate and integrate the European development of RF technology for future particle accelerators; all aspects of RF technology, e.g. klystron development, RF power distribution system, cavity design, and low-level RF system, for linear accelerators and storage rings, including transversely deflecting (crab) cavities and financial aspects such as costing tools -

institutes with interest:: BNL (USA), CEA-DSM (FR), CERN (International Organization), CI (UK), CNRS-LPNHEP (FR), CNRS-LPSC (FR), DESY (DE) , FNAL (USA), GSI (DE), INFN -LNF (IT), JLAB (USA), KEK (JP), LBNL (USA), IFJ PAN (PO), SLAC (USA), STFC (UK), TEMF (DE), THALES (FR), TSDA (DE), TU Berlin (DE), TUL (PO), UJF (FR), UOM (M), UPSA (SE), UROS (DE), WUT (PO).

AccNet achievements & issues

- (invited) **talks at PAC 2009, EPS HEP2009 & LLRF09** conferences
- **AccNet workshop on LHC crab cavities**, LHC-CC09, September 2009
- **AccNet-EuroLumi workshop on anti-e-cloud coatings**, AEC'09, Oct '09
- **AccNet web site at LAL**, including possibility of editorial access
- **AccNet mailing lists**
- **contact persons** from all participating institutes for both networks
- **man power and budget plans** (preliminary)
- new **contacts with plasma acceleration and medical accelerators**

AccNet dissemination

- two **articles in 2nd EuCARD newsletter** (LHC-CC09+AccNet & proton plasma acceleration)
- two **seminar talks** at DESY and University of Heidelberg
- CERN **Academic Training lecture series on LHC upgrade**

AccNet outstanding issues

- **publication of EuCARD documents, man power changes, payments,**
- **reimbursement procedures and rules, especially for external experts**

AccNet deliverables

D.4.1.1 - Continually updated AccNet web site

<http://accnet.lal.in2p3.fr/>)

D.4.2.1 - A continually updated EuroLumi web site

(<http://accnet.lal.in2p3.fr/Tasks/Eurolumi/>)

D.4.3.1 - A continually updated EuroLumi web site

(<http://accnet.lal.in2p3.fr/Tasks/Rftech/>)

The AccNet web sites are documented in a report

<https://edms.cern.ch/file/1001866/4/EuCARD-Del-D4.1.1-D4.2.1-D4.3.1-1001866-v3.0.pdf>

The completed deliverables are publicly available from the web link

<http://cern.ch/EuCARD/about/results/deliverables/> .

AccNet milestones

M.4.1.1

- 1st **RFTech videoconference steering meeting** 30 March
- **general AccNet Steering meeting** during this 2nd EuCARD Steering Committee meeting in November 2009 at Frascati.

M4.2.1:

- Instead of a general annual EuroLumi workshop, **3-5 topical mini-workshops** are being organized and supported during this first year (high efficiency of topical workshops; minimum interference with LHC consolidation and re-commissioning): **LHC-CC09, AEC'09, CrystalCollimation'09, medical applications, proton plasma acceleration**
- **first major EuroLumi workshop in spring or fall 2010**

M4.3.1:

- Annual **RFTECH workshop. Deadline March 2010** (month 12).

AccNet man power

- originally 1 person-month / year / coordinator
(12 person months for CERN)
- CERN man power cut to 11 person-months during the proposal iteration
- integration of SRF test facilities (addt'l coordinator)
at CERN rematching of budget and FTE
(~2% of FTE per coordinating task)
- Grant Agreement Annex I:
CERN 11 p-m, CNRS 4 p-m, DESY 3.6 p-m, UJF 5.6 p-m
(4-5 coord.'s, 1 coord., 1 coord., 1 coord.)
- RFTech total coordinating manpower: 60 h (3 institutes)
(of which 16 h for CERN)

AccNet man power

Period: 1.04.2009 - 30.09.2009

Task 1 of WP 4

	man-power used
CERN	40% (0.60 of 1.52 person-months)
CNRS	100%? (of 0.50 person-months)
DESY	61% (of 0.45 person-months)
UJF	61% (of 0.70 person-months)

numbers in IR should be revised
I do not understand how the CERN budget numbers add up?!

AccNet expenses

per diem for **Mexican summer student** H. Maury (2 months)

travel support of **CCAB member** Georg Hoffstaetter
for LHC-CC09

travel support of **visiting expert** David Seebacher for AEC'09

moderate **support for** LHC-CC09 and AEC'09 **workshops**

travel expenses for 4 persons (DESY, WUT) attending **LLRF'09**

travel costs of coordinators for attending **2nd SC mtg.**

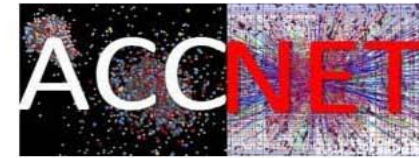
have all these actually been charged to AccNet budget(s)?

(my impression is no ...)

AccNet web site



**Accelerator Science
Networks**
EuroLumi and RFTech



Coordinated by [W. Scandale](#)

AccNet is a Networking Activity (WP4) in the framework of [EuCARD](#)

[A. Variola](#) and [F. Zimmermann](#) (*Coordinated Accelerator R&D in Europe*)

Main Objectives	Network Structure	Activity Reports	WP4 Collaboration Workspace	Job Opportunities	Workshops	Literature and Presentations	Links
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Notice: this site is under construction. Please accept our apologies for its incompleteness and yet missing information.

created & maintained
by Bernard Mouton,
Serge Du, J. Yuan, and
Alessandro Variola (LAL)

AccNet is composed of two sub tasks

EuroLumi	RFTech
--------------------------	------------------------

updated by
Frank Zimmermann
(CERN)

Hot News

- 9-10 November 2009 EuCARD-AccNet-EuroLumi mini-Workshop on Crystal Collimation, at CERN - **NEW!**
- 2-4 February 2010 AccNet Co-Sponsored Workshop on "Physics for Health in Europe", CERN - **NEW!**
- spring 2010 topical workshop on plasma acceleration - **NEW!**
- spring or fall 2010 AccNet-EuroLumi workshop on LHC upgrade paths - **NEW!**

AccNet Articles in EuCARD Newsletter no 2 (September 2009):

[Start by probing the crab cavities](#)
[Breaking news for Proton "Surfatrons"](#)

AccNet deliverables - documentation

“

Authored by B. Mouton
Edited by B. Mouton
and K. Kahle
Reviewed by A. Variola
Approved by Steering
Committee

“



Grant Agreement No: 227579

EuCARD

European Coordination for Accelerator Research and Development
Seventh Framework Programme, Capacities Specific Programme, Research Infrastructures,
Combination of Collaborative Project and Coordination and Support Action

DELIVERABLE REPORT

CONTINUALLY UPDATED ACCNET, EUROLUMI AND RFTECH WEB SITES

DELIVERABLE: D4.1.1, D4.2.1, D4.3.1

Document identifier:	EuCARD-Del-D4.1.1-D4.2.1-D4.3.1-1001866-v1.0
Due date of deliverable:	End of Month 2 (May 2009)
Report release date:	xx/xx/2009
Work package:	WP4: Accelerator Science Networks EuroLumi and RFTech
Lead beneficiary:	CERN, CNRS
Document status:	Draft

Abstract:

The ACCNET web site <http://accnet.lal.in2p3.fr/> has been implemented. At the same time the two tasks EuroLumi and RFTech web pages have been integrated in the ACCNET site. This brief report describes these web sites, their scope and their structure.

AccNet list of contacts

Participating institutes

- [BNL](#) (EUROLUMI)
- [CEA-DSM](#) (RFTECH)
- [CERN](#) (EUROLUMI, RFTECH)
- [CI](#) (EUROLUMI, RFTECH)
- [CNRS-LAL](#) (EUROLUMI, RFTECH)
- [CNRS-LPSC](#) (EUROLUMI)
- [CSIC-IFIC](#) (EUROLUMI)
- [DESY](#) (EUROLUMI, RFTECH)
- [FNAL](#) (EUROLUMI)
- [GSI](#) (EUROLUMI, RFTECH)
- [INFN-LNF](#) (EUROLUMI, RFTECH)
- [INFN-NA](#) (EUROLUMI)
- [KEK](#) (EUROLUMI, RFTECH)
- [LBNL](#) (EUROLUMI)
- [MPP](#) (EUROLUMI)
- [TMF](#) (EUROLUMI, RFTECH)
- [TSDA](#) (RFTECH)
- [TUBE](#) (EUROLUMI, RFTECH)
- [UJF](#) (EUROLUMI, RFTECH)
- [UOM](#) (EUROLUMI)
- [UPSA](#) (EUROLUMI, RFTECH)
- UROS (RFTECH)
- [USAN](#) (EUROLUMI)

Linkpersons

BNL

- Rama Calaga, Wolfram Fischer, Steve Peggs, Angelika Drees,

CEA-DSM

- Romuald Duperrier,

CERN

- Walter Scandale, Ezio Todesco, Luca Bottura, Wolfgang Weingarten, Maurizio Vretenar, Frank Zimmermann,

CI

- Swapan Chattopadhyay, Peter McIntosh,

CNRS-LAL

- Bernard Mouton, Alessandro Variola,

CNRS-LPSC

- Maud Baylac

CSIC-IFIC

- Angeles Faus Golfe,

DESY

- Mariusz Grecki, Helmut Mais, Stefan Simrock,

FNAL

- Chandra Bhat, Tanaji Sen, Vladimir Shiltsev, Alexander Valishev,

GSI

- Oliver Boine-Frankenheim, Peter Huelsmann,

INFN-LNF

- Marica Biagini, Andrea Ghigo, Luigi Palumbo, Bruno Spataro,

INFN-NA

- Vittorio Vaccaro,

KEK

- Kazuhito Ohmi,

LBNL

- Miguel Furman,

MPP

- Allen Caldwell, Guoxing Xia,

TMF

- Wolfgang F.O. Müller, Thomas Weiland,

TSDA

- Ralf Eichhorn,

TUBE

- Warner Bruns, Heino Henke,

UJF

- Jean-Marie De Conto,

UOM

- Nicholas Sammut,

UPSA

- Tord Ekelof,

UROS

- Hans-Walter Glock, Ulla van Rienen,

USAN

- Stefania Petracca

EuroLumi exchanges & joint studies

Mexican summer student Humberto Maury (CINVESTAV)

- **e-cloud simulations for LHC upgrade scenarios**

US-LARP physicist Chandra Bhat (FNAL)

- **generation and stability of long flat bunches for LPA upgrade**

US-LARP physicist Rama Calaga (BNL)

- **LHC crab cavities**

Austrian physicist David Seebacher (TU Graz & U. Vienna)

- **impedance of anti-e-cloud coatings**

US expert Georg Hoffstaetter

- **LHC crab cavities**

German experts Allen Caldwell, Guoxing Xia (MPI Munich)

- **proton-driven plasma acceleration**

LHC-CC09 workshop

LHC Crab Cavity Workshop,
jointly organized by CERN,
EuCARD-ACCNET, US-LARP,
KEK, & Daresbury
Lab/Cockcroft Institute
CERN, 16-18 September 2009



~50 participants, LHC Crab Cavity Advisory Board established



CC-AB recommendations

- ✓ **KEKB success** → “foolish” not to pursue crab cavities for LHC
- ✓ **Demonstration experiments to focus on differences between electrons and protons** (e.g. effect of crab-cavity noise with beam-beam, impedance, beam loading) and on reliability & machine protection which are critical for LHC; beam test with **(KEKB?) crab cavity in another proton machine (SPS?)** useful and sufficient
- ✓ Future R&D focus: **compact cavities**
- ✓ **Modifications of Interaction Region 4** during the 2013/14 shutdown
- ✓ Crab cavity infrastructure **to be kept in mind for all other LHC upgrades**
- ✓ **Possible show-stopper: machine protection** - effect of cavity trip; another issue is **impedance**

*official statement from CERN management on LHC crab cavities
creation of task force for crab cavity prototype test in SPS*

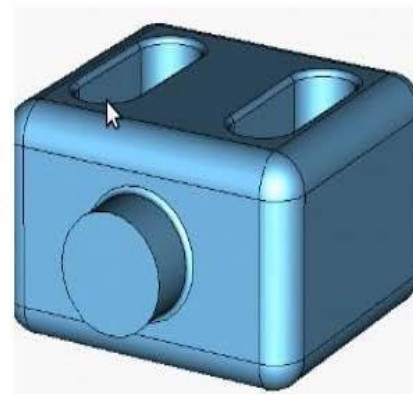
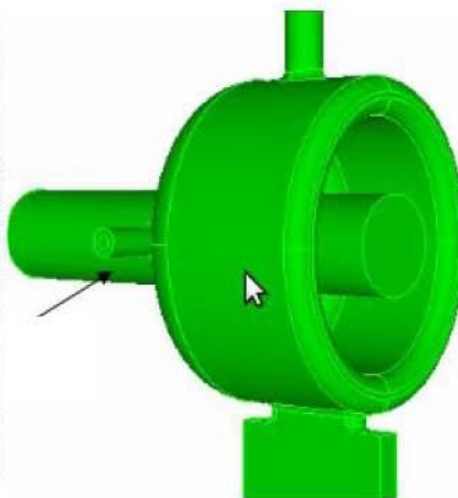
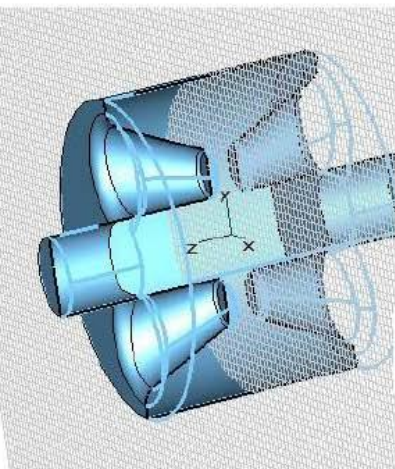
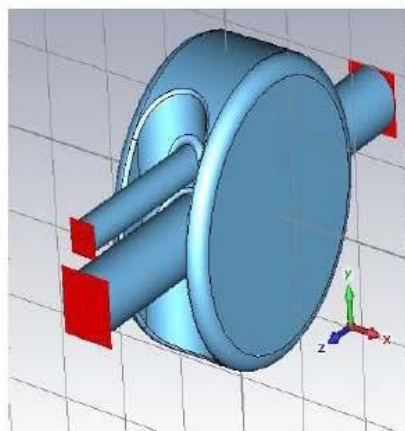
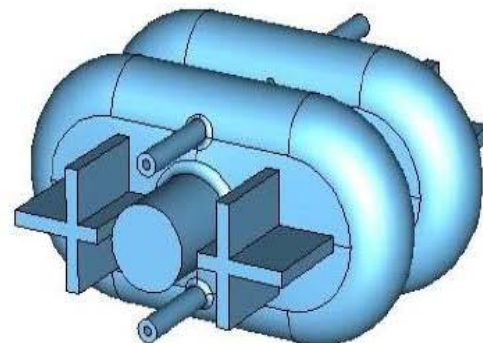
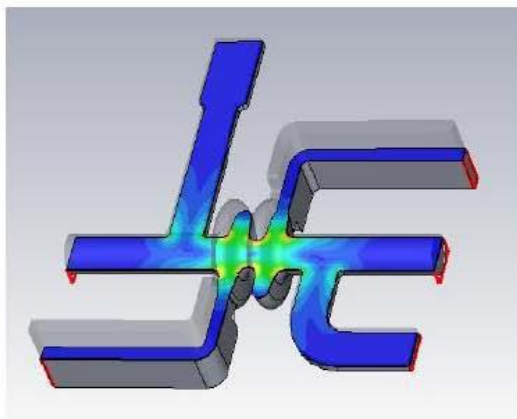
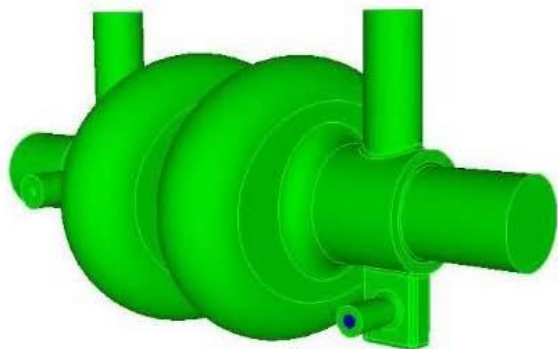
CERN statement on LHC crab cavities issued after AccNet LHC-CC09 workshop

Statements on Crab Cavities from CERN

(Steve Myers, Director of Accelerators and Technology)

1. Following the success of KEKB, CERN must pursue the use of crab cavities for the LHC, since the potential luminosity increase is significant.
2. A final crab-cavity implementation for the LHC has not yet been settled. Both “local” and “global” crabbing schemes are still under consideration for the LHC upgrade phase II. Future R & D should focus on compact cavities which are suitable for both schemes.
3. One possible show-stopper has been highlighted: machine protection, which is critical for LHC. The effect of fast cavity changes needs to be looked at with high priority. Mitigation schemes such as raising the Q value of the cavity to $\sim 10^6$ (from $\sim 10^5$ at KEK) will be studied.
4. Another important issue is the impedance. Since the LHC revolution frequency changes during acceleration, the detuning of the cavity may be more difficult than was the case for KEKB, and other measures (like strong damping of the dipole mode) need to be examined.
5. High reliability of the crab cavities is essential; the trip rate should be low enough not to perturb LHC beam operation.
6. Validation cavity tests in the LHC itself are not deemed essential. It is considered plausible to install a new system in the LHC without having tested a prototype in the LHC beforehand. As in all new colliders, this has been done with many other components.
7. Demonstration experiments should focus on the differences between electrons and protons (e.g. effect of crab-cavity noise with beam-beam tune spread; impedance; beam loading) and on reliability & machine protection which are critical for the LHC.
8. A beam test with a KEKB crab cavity in another proton machine is considered useful, meaningful and sufficient (for deciding on a full crab-cavity implementation in LHC) if it addresses the differences between protons and electrons.
9. Possible modifications of LHC Interaction Region 4 during the 2013/14 shutdown should be studied to evaluate the feasibility of installing and testing crab-cavity prototypes, and of accommodating a possible global crab-cavity scheme.
10. The timing of the crab-cavity implementation should be matched to the short and long-term goals and to the overall CERN schedule, and be in phase with the experiment upgrades.
11. **The crab-cavity infrastructure should be included in all other LHC upgrades scenarios.**
12. **Crab cavities can increase the LHC luminosity without an accompanying increase in beam intensity, thereby avoiding negative side effects associated with high intensity and high stored beam energy. This opinion has been endorsed by the general-purpose high-luminosity experiments.**

CC designs presented at LHC-CC09



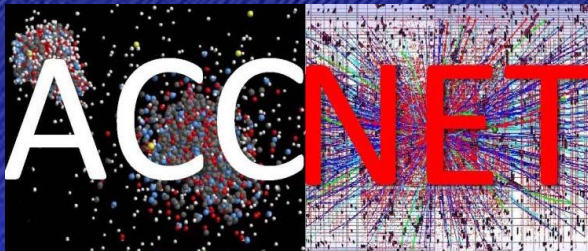
AEC'09 workshop on Anti e-Cloud Coatings

<http://indico.cern.ch/conferenceDisplay.py?confId=62873>

organized by EuCARD-AccNet-EuroLumi



<http://eucard.web.cern.ch/EuCARD/index.html>



<http://accnet.lal.in2p3.fr/>

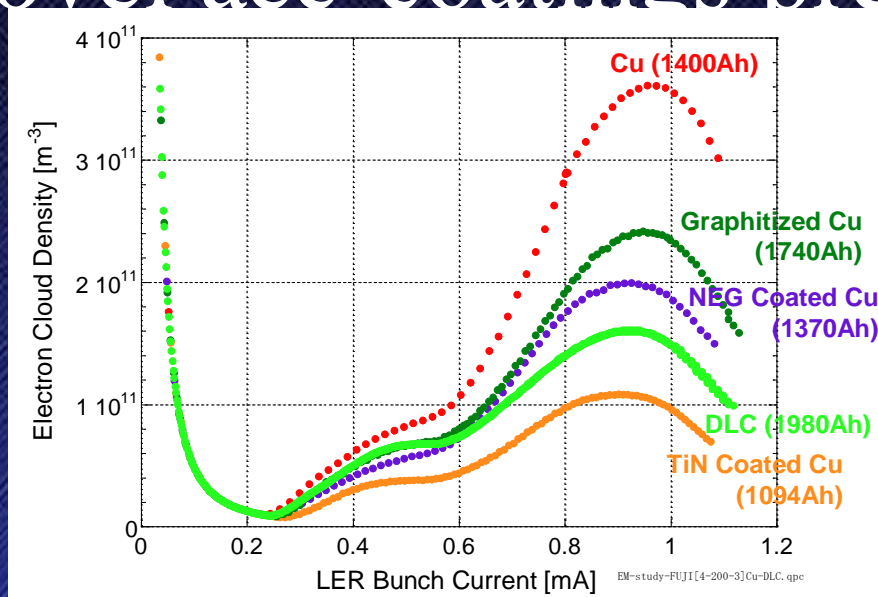


and SPS Upgrade Study Team

<http://paf-spsu.web.cern.ch/paf-spsu/>



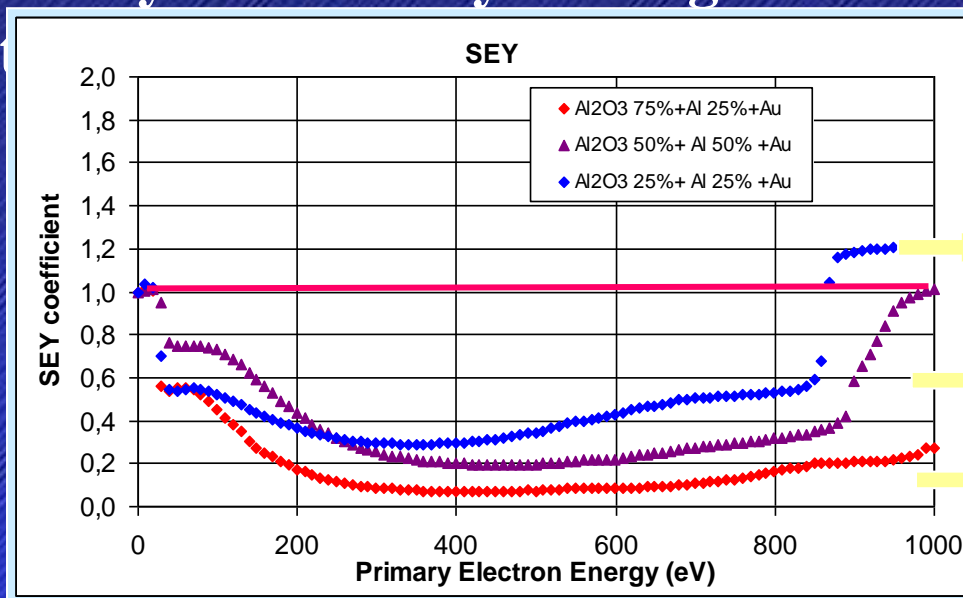
novel aec-coatings presented at AEC'09



diamond-like carbon (DLC)

S. Kato
(KEK)

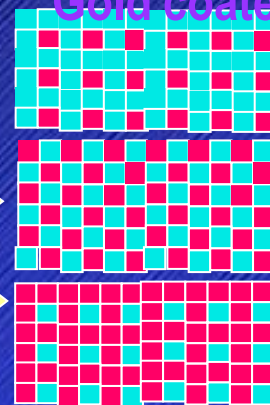
extremely low SEY by coating with insulating micro-particles



Al particle

Al₂O₃ particle

Gold coated



Surface top view

I. Montero
ICM-CSIC
(ESA research)

RFTech activities

joint organization of **LHC-CC09** together with EuroLumi

sLHC upgrade studies for Superconducting Proton Linac:

- established **contacts to European and worldwide experts on SRF**
- created **international working group on SRF cavities and accessories**

Members: CERN, CNRS-IPN-Orsay, CEA-Saclay (France), BNL (USA), TRIUMF (Canada), and University of Rostock (Germany)

This working group participated in two SPL collaboration meetings. 3rd meeting is scheduled for November 2009

<http://indico.cern.ch/conferenceDisplay.py?confId=63935>

AccNet publications

F. Zimmermann, CERN, “[CERN Upgrade Plans for the LHC and Its Injectors](#)” ,
Proceedings EPS HEP2009 Krakow 17 July 2009

C. Bhat, FNAL; F. Caspers, H. Damerau, S. Hancock, E. Mahner, F. Zimmermann,
CERN, “[Stabilizing Effect of a Double-Harmonic RF System in the CERN PS](#)”, PAC'09
Vancouver

R. Calaga, R. De-Maria, BNL; R. Assmann, J. Barranco, F. Caspers, E. Ciapala, T.
Linnecar, E. Metral, Y. Sun, R. Tomas, J. Tuckmantel, T. Weiler, F. Zimmermann, CERN;
N. Solyak, V. Yakovlev, FNAL; Y. Funakoshi, N. Kota, O. Yukioishi, A. Morita, Y. Morita,
KEK; G. Burt, Lancaster U; J. Qiang, LBNL; P .A. McIntosh, DL/ASTeC); A. Seryi,
Z. Li, L. Xiao, SLAC, “[Status of LHC Crab Cavity Simulations and Beam Studies](#)” ,
PAC'09 Vancouver

Y.-P. Sun, F. Zimmermann, R. Tomas, “[Tune Shift Due to Crossing Collision and Crab
Collision](#)”, PAC'09 Vancouver

Y.-P. Sun, R. Assmann, J. Barranco, R. Tomas, T. Weiler, F. Zimmermann, CERN; R.
Calaga, BNL; A. Morita, KEK, “[Study with One Local Crab Cavity at IR4 for LHC](#)”, PAC'09
Vancouver

J.P. Koutchouk, F. Zimmermann, “[LHC Upgrade Scenarios](#)” , PAC'09 Vancouver

AccNet in EuCARD Newsletter no. 2

F. Zimmermann, K. Kahle, CERN, [“Start by probing the crab cavities”](#)

A. Caldwell, G. Xia, MPI München; K. Lotov, BINP; A. Pukhov, Heinrich-Heine-Universität Düsseldorf; R. Aßmann, K. Kahle, F. Zimmermann, CERN, [“Breaking news for Proton "Surfatrons"”](#)

Start by probing the crab cavities



Frank Zimmermann talks about how the AccNet Accelerator Networking activities have begun with the recent crab cavities workshop at CERN. [Read more >>](#)

Breaking news for Proton "Surfatrons"

Exciting and promising findings published by Allen Caldwell and others call for a demonstration experiment for proton driven plasma wakefield acceleration. [Read more >>](#)



AccNet plans for next ~6 months

future workshops

- AccNet **mini-workshop on crystal collimation**, 2nd week of Nov.'09
- RFTech participation in 3rd **SPL meeting**
- workshop on contributions from the high-energy physics community to **medical accelerator developments**, Feb.'10
- organization of the **first RFTech workshop in 1st quarter 2010**
- workshop on **plasma acceleration** in spring 2010
- **major EuroLumi workshop** on LHC upgrade spring or fall 2010
- contributions to **CERN Chamonix'10 workshop** (3 sessions on the LHC upgrade)

major reviews of LHC upgrade scenarios

- beam parameters, magnet parameters, collimation limits
- luminosity evolution
- injector upgrade paths

AccNet conclusions

AccNet start was excellent

EuroLumi has big impact on LHC upgrade

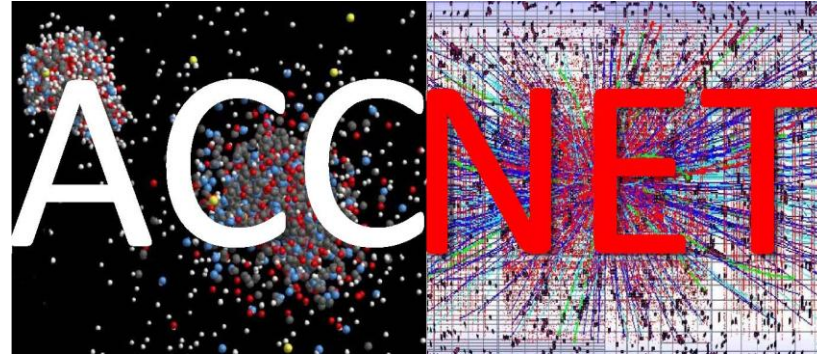
Crab Cavity Advisory Board,
endorsement of LHC crab cavities,
task force preparing SPS tests,
LPA scenario, e-cloud impact,
revision of LHC upgrade plans

RFTech approaching cruising speed

AccNet is breaking new grounds

medical accelerators
plasma acceleration,...

some organizational matters to be settled



makes a difference

*for accelerators in Europe
and across the globe*