Frank Zimmermann
for the WP4 coordinators

EuCARD - WP4 Meeting, RAL, 13 April '10
accelerator landscape

major events in 2009-13

LHC turn on & first physics results
FAIR & XFEL construction
major LHC upgrade (LINAC4)
decisions on LHC upgrades
decision on future Linear Collider
FLASH & CTF-3 exploitation

a truly exciting time
ACCNET
Accelerator Science Networks

Coordination & Management
coordinated by
Walter Scandale, IN2P3; Alessandro Variola, LAL; Peter Spiller, GSI; Frank Zimmermann, CERN

EUROLUMI
accelerators & colliders
performance
coordinated by
Frank Zimmermann, CERN
Ezio Todesco, CERN

RFTECH
sc & nc rf technologies
coordinated by
Jean-Marie de Conto, UJF
Mariusz Grecki, DESY
Wolfgang Weingarten, CERN
AccNet Motivation

“The two legs of accelerator technology (magnets and acceleration) need significant progress and a reduction of their development time (now decades).

The challenges are beyond what a single lab can do. An optimal use of public resources and a minimum ecological impact will be more and more important. New ideas are needed.

ACCNET networks offer a platform for listening and discussing accelerator R&D issues across specialties and beyond daily occupations, to favor the emergence of creative ideas.”

Jean-Pierre Koutchouk, 25.11.2008
EUROLUMI brings together experts in beam dynamics, magnets, collimation & RF

FAIR

CERN complex upgrade

LHC IR & beam parameter upgrade

+ medical accelerators

+ plasma acceleration

LHC injector upgrade
EUROLUMI themes

**LHC IR upgrade:** IR magnet technology; heat deposition & shielding; magnet lifetime; performance reach; ...

**LHC beam parameter upgrade:** beam generation, beam stability; beam-beam performance & compensation; crab cavities; luminosity leveling; machine protection; collimation upgrade; crab waists; intensity limits ...

**FAIR:** beam losses; space-charge effects; vacuum; aperture; ramping issues; ...

**CERN complex upgrade:** SPS electron-cloud mitigation; impedance effects; intensity limits; beam manipulation; PS booster upgrade; SPL; ...

**LHC energy upgrade:** beam dynamics, magnets, ...

**Applications for society:** medical accelerators

**Advanced techniques:** plasma acceleration, crystal tools
RFTECH brings together RF experts from different labs, proton & electron accelerators, CLIC and ILC,...; encompasses all aspects of RF technology, e.g. klystron development, RF power distribution system, cavity design, and low-level RF system, for linear accelerators, storage rings, and associated research infrastructures, including transversely deflecting (crab) cavities and financial aspects such as costing tools.
RFTECH themes

**low level RF**: maintain RF phase (0.03 deg) & amplitude (0.03%); minimize power; built-in diagnostics; reliability; operability; reproducibility; maintainability; good understanding; development of LLRF costing tools based on SysML model; ...

**cavity design**: maximize gradient; minimize breakdown; optimize efficiency; minimize cost; minimize impedance; accelerating cavities; coupler design; PETS; compact crab cavities; ....

**high power RF**: power distribution system; design integration; costing tools; ...

**SRF test infrastructures**: establish multi-purpose state-of-the-art network of equipment for R&D and test of SRF cavities and cryo-modules within 2 years; future projects - required equipment - project descriptions
ACCNET tools

- annual workshops
- topical meetings and mini-workshops
- capability of inviting or exchanging experts over periods of typically a week to a month
- exploratory studies & collaborations
- opportunities for students
- unique place of discussion with users

→ exchange of ideas and expertise aimed identifying the most promising strategies and technologies
ACCNET is a catalyzer!

Other related EU initiatives:
- SLHC-PP
- ILC-PP

LHC experiments

US programs + US labs

European labs & universities

Other pan-European research ventures

Russian labs

Japanese labs
- KEK
- J-PARC...

X-FEL & FAIR users?
The participation is open inside and outside the consortium. A large number of institutes participate in ACCNET activities.
work organization

• **1 major workshop for EUROLUMI per year**
• **1 major workshop for RFTECH per year**
• possibility of additional *topical mini-workshops*
• possibility of *joint EUROLUMI+RFTECH mini-workshops* on topics of common interest (either by machine [SPL, LHC+injector RF upgrade, LHC crab cavities, GSI rf systems]; or by topic [RF phase and amplitude jitter, timing stabilization, beam loading compensation, flat bunches, controlled noise injection,...])

• **1 ACCNET steering meeting / year**
  (ACCNET+EUROLUMI+RFTECH coordinators)
AccNet 1st-year achievements

- (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
- AccNet mailing lists
- contact persons from all participating institutes for both networks
- man power and budget plans
- scope expansion to plasma acceleration and medical accelerators
- AccNet-EuroLumi mini-Workshop on Crystal Collimation, Nov. ‘09
- AccNet-EuroLumi working meeting on proton driven plasma acceleration, PPA’09, Dec. 2009
- AccNet Co-Sponsored Workshop on "Physics for Health in Europe", Feb. 2010
AccNet dissemination

• two articles in 2\textsuperscript{nd} EuCARD newsletter (on LHC-CC09 + AccNet & on concept of proton plasma acceleration)
• one article in CERN Courier Feb. 2010 (on PPA’09 workshop)
• two seminar talks at DESY and University of Heidelberg
• CERN Academic Training lecture series on LHC upgrade
• presentations at ATLAS upgrade week and to LHCC
• presentations at Chamonix’2010 LHC Performance Workshop and to LHC Upgrade Task Force

EuCARD AccNet documents

• about 20 in total, including
  - 2 journal articles
  - 9 conference presentations
  - 1 PhD thesis
  - 1 master thesis
AccNet deliverables


The completed deliverables are publicly available from the web link [http://cern.ch/EuCARD/about/results/deliverables/](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 the 2nd EuCARD Steering Committee meeting in November 2009 at Frascati.

M.4.2.1:
– Instead of a general annual EuroLumi workshop, 4 topical mini-workshops have been 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, PPA’09
– first major EuroLumi workshop in fall 2010

M.4.3.1:
– Annual RFTECH workshop was held on 29 March 2010
AccNet expenses

per diem for **Mexican CINVESTAV visitor** H. Maury (2 months)

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

travel support of **expert** David Seebacher for AEC’09

travel support for **crystal experts** (A. Taratin, S. Dabagov)

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

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

travel costs for **2nd SC mtg** and EuCARD annual meeting

**others** ?
AccNet web site

Accelerator Science Networks
EuroLumi and RFTech

Coordinated by W. Scandale and F. Zimmermann (Coordinated Accelerator R&D in Europe)

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

Main Objectives  Network Structure  Activity Reports  WP4 Collaboration Workspace  Job Opportunities  Workshops  Literature and Presentations  Links

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"
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EuroLumi exchanges & joint studies

Mexican summer student Humberto Maury (CINVESTAV)
- e-cloud simulations for LHC upgrade scenarios

US-LARP physicist Chandra Bhat (FNAL)
- generation & stability of long flat bunches for LHC

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

Russian and European experts A. Taratin (JINR Dubna), S. Dabagov (INFN-LNF) – crystal collimation
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
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

and SPS Upgrade Study Team
http://paf-spsu.web.cern.ch/paf-spsu/

41 participants
AccNet mini-workshop on crystal collimation
9-10 November ’09, ~20 participants

http://indico.cern.ch/conferenceDisplay.py?confId=71773

topics:
SPS MDs: beam set up, detectors, data analysis, simulations, halo cleaning
Tevatron T980 for 2009-10
Tests and test beams: IHEP activities, crystal measurements, MVR, compact TPC at H8, nuclear interaction, RP2 status
Future of UA9
AccNet workshop on *proton driven plasma acceleration* “PPA09”
17-18 December ’09, 24 participants

http://indico.cern.ch/conferenceDisplay.py?confId=74552

Feb 24, 2010

*Workshop pushes proton-driven plasma wakefield acceleration*
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 several SPL collaboration meetings

http://indico.cern.ch/conferenceDisplay.py?confId=63935
First Annual RFTech Meeting
DESY, 29 March 2010

https://indico.desy.de/conferenceDisplay.py?confId=2831

17 participants (DESY, CERN, TUD, UROS, ASTeC, LPSC, UJF, ESS, U London, TUL, UG, SINS) organized by M. Grecki, J.-M. De Conto, W. Weingarten & DESY

Spiral-2 couplers, SPI simulations & measurements, FLASH full beam loading, LHC LLRF, xTCA, high reliability digital system, HIE ISOLDE cavity & test cryostat, TUD SRF test stand, LHC crab cavities, RF costing tools, SRF test & R&D infrastructure
AccNet plans for 2010

**future AccNet workshops**
- Topical workshop on **LHC energy upgrade**, Sept. or Oct. 2010
  - magnets for arcs and insertions, cryogenics, and vacuum pipe
- “**EuroLumi 2010**”, November or December 2010
  - LHC limitations, LHC luminosity upgrade, LHC energy upgrade, SPS upgrade, PS Booster upgrade, FAIR challenges
- Mini workshop on **LHC crab cavities**, end of 2010
- **Plasma acceleration** workshop
- **Crystal collimation** mini-workshop
- brainstorming meeting on **medical accelerators**

**major reviews of LHC upgrade scenarios**
- beam parameters, magnet parameters, collimation limits
- luminosity evolution
- injector upgrade path
- energy upgrade
- intensity & luminosity limitations
comments, questions, proposals?