

# Introduction

## **Machine Availability and Reliability Panel (MARP)**

**R. Schmidt**

- Rüdiger: Introduction
- Ben: Availability Working Group and Accelerator Fault Tracker – Status & Plans 2017
- Jan: Follow-up meeting of the Availability Workshop meetings
- Johannes: Collaborations and Training

Event in INDICO will be created, summary of the meeting will be written



## Availability in view of operation at 7 TeV ...and in general

R.Schmidt  
Chamonix 2016

Input from: A.Apollonio, G.Arduini, B.Auchmann, F.Bordry, S.Deleval, J.Gutle, G.Ferlin, J.M.Jimenez, A.Siemko, H.Thiesen, E.Todesco, W.Vigano, M.Zerlaut



- The first training session on availability and reliability will be evaluated, the curriculum will be adapted, and other training sessions should be organised
- Up to today, most of the work on availability was done by students and fellows, supervised part-time by non-experts – needs continuity

• To keep the overview of all activities, to ensure coherence and to prevent competing activities is challenging

**A Staff position for an expert on accelerator availability is required**

[Minutes MPPr 2012 \(EDMS\)](#)

[Minutes MPPr 2011](#)

[Minutes MPPr 2010](#)

[MPP Data 2010](#)

[MP Comm. & Tracking](#)

[LHC MP Operation](#)

[LHC Comm. Documents](#)

[SPS MP Operation](#)

[BLM Threshold WG](#)

[Reliability SubWG](#)

[MP Commissioning SubWG](#)

MPWG minutes archive:

[2005-2008](#)

[2001-2004](#)



## SPS and LHC +Linac4 Machine Protection Panel



**Chair :**

**[D. Wollmann \(TE/MPE\)](#) , [J. Wenninger \(BE/OP\)](#)**

**Scientific secretary :**

**[M. Valette \(TE/MPE\)](#)**





## A Proposal for Availability & Reliability

# Machine Availability and Reliability Panel (MARP)

J. Gutleber, R. Schmidt

Input from: **A.Apollonio**, J.M.Jimenez, A.Siemko, **L.Ponce**,  
**C.Roderick**, **B.Todd**, **J.Uythoven**, M.Zerlauth

- What is required?
- What is currently being done?
- Who are the (main) actors?
  
- Proposal for an organised approach

- **“Cost effective operation”**: Maximum integrated performance in given time (e.g. integrated luminosity)
- **Reliability**: Machine **Protection Systems** need to be designed with **high reliability in mind** – this must be demonstrated
  - LHC machine protection systems (LBDS, Interlocks, BLM system, magnet protection system – extensive studies on their reliability since >15 years)
  - Other CERN accelerators: in particular beam dumping systems
- **Availability**: Accelerators need to operate with acceptable availability (requires reliable subsystems and efficient operation, minimising turnaround time and minimising dead time is of key importance)
  - LHC as flagship operating machine
  - Pre-accelerators (circular and linear, including Linac4)
  - Challenge for future accelerators

- How can we keep the LHC availability observed this year ?
- Can we operate safely the accelerators (machine protection) ?
- Can the “cost-effectiveness” of operation be improved?
- Is reliability of HL-LHC technical designs/realization adequate to achieve the nominal Integrated Luminosity (availability) ?
- Is Linac4 going to be as reliable as Linac2 ?
- Can post-LHC accelerator infrastructures be realized with adequate availability?
- How to balance maintenance and repair costs with high availability?
- How to propagate high-level availability requirements to technical systems?



- Accelerator Fault Tracking (mainly BE-OP, TE-EPC and TE-MPE) and Accelerator Fault Tracker tool (BE/CO)
- Studies on availability in project work-packages (e.g. WP 7 for HL-LHC, WP for FCC and work package for CLIC)
- FCC Reliability, Availability, Maintainability studies
  - Model LHC accelerator complex + injectors + tech. infrastructures
  - Integration of continuous monitoring of the accelerator operation to derive good quality information for Monte-Carlo simulation
  - Sector wide training and Book of Knowledge creation
- Availability studies related to the LINAC4 availability run

- Extend the 'Accelerator Fault Tracking' from LHC to injectors
- Model and simulate the LHC + Injector chain operation with high confidence to quantify expected performance for different accelerators under different operation scenarios
- Training + creation of durable network across CERN teams
- Coherent guidelines and methods ("Book of Knowledge")
- Common services and infrastructures (hardware, test stands, software, analytics, ...)
- Implementation of the outcome of studies - ensuring continuity
- Studies
  - For future machines
  - For efficiency improvement of operation
- Collaborations
  - What collaborations exist?
  - How to efficiently work together?

Many **activities on availability** are across machines / projects

- RAMS training (2/year, 4 years, Uni-STUTT, T-Uni-T, Ramentor)
- FCC (model, simulation, analytics) – 3 FTE
- CLIC / Linac4 (modelling, simulation) – 1.5 FTE
- Machine and magnet protection (electronics, SW, HW) – 2.5 FTE (HL-LHC)
- Accelerator Fault Tracking – 2 FTE (in several groups)
- Power converters – 1.2 FTE
- Beam Instrumentation – 1.2 FTE
- Beam Transfer – 1 FTE (until recently)
- Technical infrastructure (EN) – 1.2 FTE
- Operation – “task force” activity on AFT for injectors

Mostly fellows, PhD students and Technical students

## FCC collaborations (engaged resources)

- University Stuttgart (KE 3046/ATS)
- Technical University Tampere (EDMS 1390679 & KE 3331)
- Ramentor (Finnish company, KE 3357/ATS)
- TU Delft (KN2914/BE)
- Heidelberg Ion Therapy facility (ARIES H2020 Grant Agreement)
- University of Vienna (data integration)

## Linac4 collaborations (engaged resources)

- Myrte (H2020 Grant Agreement 662186)

## Existing contacts

- University Stuttgart
- Empresarios Agrupados (Spanish company)
- ESS Lund
- TU Munich (Robotics and Embedded Systems/CPS)
- ZHAW Zürich

- Goals:
  - **Develop and maintain a consistent and coherent approach** to reliability and availability activities across department and group boundaries and across different systems
  - Core team analyses, develops and proposes strategies that can be implemented in dedicated teams according to priority and needs
- Scope:
  - Existing accelerators and infrastructures, projects and studies at CERN
- Working mode:
  - Provide forums for information exchange
  - **Consensus based** conclusions
  - Creation of limited-duration activity groups
  - Meets regularly with agenda + minutes (about monthly?)
  - Reports to appropriate committees / projects

- Andrea Apollonio
- Oliver Brüning
- Johannes Gutleber
- Laurette Ponce
- Rüdiger Schmidt (during the initial phase)
- Luigi Serio
- Ben Todd
- Jan Uythoven

....up to the core team to further detail work and composition

to ensure continuity, membership reviewed on yearly basis to adapt to scope and evolving environment

ATSMB endorsed the proposed approach

- Interim chair and organiser (secretary) to be nominated
- Interim chair calls for a constituting panel meeting(s)
- Panel repeats scope, tasks, composition in minutes