
Accelerator Reliability Workshop

Grenoble 4th-6th February ESRF

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LHC-ICP



March 2002



MPWG
March 8th 2002

Accelerator Reliability Workshop
Grenoble 4th-6th February. ESRF

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ARW Participants

- **2.5 days without parallel sessions.**
- **85 participants. 37 lectures (4 from CERN).**
- **Institutes, projects and companies:**
 - ESRF
 - CEA
 - JLAB
 - PSI
 - SRS Daresbury lab
 - ESA
 - Spring 8
 - TERA
 - SNS
 - IBA
 - ...

ARW Main Topics

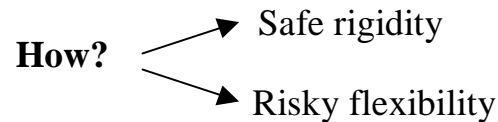
- **The accelerator as a subsystem:**
 - Medical accelerators.
 - X-ray sources.
 - Accelerator driven system (ADS). Spallation sources.
- **Research accelerator reliability:**
 - Reliability Statistics.
 - Maintainability: Inspection and Repairs.
 - Data storage and processing.
 - Spare part policy.
- **Accelerator subsystem reliability:**
 - Powering.
 - RF cavities.
- **General issues:**
 - Radiation Damage.
 - Water cooling.
 - Experience from current accelerators.



Highlights

- **Philosophy:**

- Change of accelerator goals: 60's – E & I → Nowadays – Reliability.
- Reliability integrated in the early design:



- **Terminology:**

- UBI → Unscheduled Beam Stop.
- RAMI → Reliability, availability, maintainability, inspectability.

- **Design Phase:**

- Failure prediction, maintainability policy:
 - General agreement about convenience of analytic methods vs. MC.
 - Fault tree analysis as down as possible (above all for safety systems).
 - Reliability data from as many sources as possible. Mainly: MIL-HDBK, SRDF (EdF), RDF93.

- Maintenance must be optimized from the design:

- Common tools for the whole lab.
- Integration of security constraints.
- Reliable directory of accelerator components.

Maintenance
Management system.

i.e. Ganim.
France.

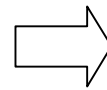
Highlights.

- **Reliability during operation:**

- Main part of the workshop → Performance of existing accelerators.

- Availability of the different machines:

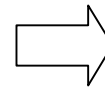
- High power cyclotron, PSI → 4000 – 5500 h/y.
- X-rays, ELETTRA → 5000 h/y.
- ESRF → 180 downtime hours / y.
- ESS → 5500 h/y.
- ...



**Performance
database**

- Weak parts of the existing machines:

- Radiofrequency.
- Powering (importance of long and short trips)
- Water



**Pareto
Diagrams**

- **Reliability Improvement:**

- Product assurance (i.e. ESA ECSS)

- Preventive maintenance:

- RISK! → maintenance is not synonymous of improvement.
- Activities under supervision → i.e. Work Request System (Argonne)



**Maintenance
Management**

- Proposal of a common database for accelerator reliability professionals.

References

- **Workshop slides:**

<http://www.esrf.fr/conferences/ARW/index.htm>

- **Future workshops:**

**Workshop on accelerator operation WAO (Japan)
March 2003**

**Third International Workshop on the Utilisation and
Reliability of high Power Proton Accelerators.
Santa Fe, 12-16 May 2002.**

Second ARW.... CERN?