Fault Tracking
For CERN’s Accelerator Complex
In Run 3

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Points for Discussion Today

1. Fault registration and review process in Run 3

2. Reporting strategy to management (LMC/IEFC)

3. Meetings of AWG
All access requires a login via CERN Single Sign On. Your role dictates what you can do inside AFT. Roles use RBAC (Role Based Access Control).

**Main Roles:**

- **AWG Members** (Availability Working Group) & **Machine Supervisors**: *power users*, responsible for overall data quality, arbitrating between operators and equipment groups, producing periodic reports.
- **Operators**: responsible for initial data entry / edition.
- **System Experts**: responsible for validating and completing data for faults assigned to their system(s).
- **Other users**: have read access, are able to comment etc.
Fault Registration Workflow in Run 2

LHC:
- AWG core team reviews the faults (since 2015), no involvement of LHC coordinators
- Report in LMC after each TS + ATS note + end of the year summary and ATS note

Injectors:
- AWG core team + machine supervisors review the faults (since 2017), weekly meetings
- Report in IEFC after each TS + ATS note @ end of the year
Fault Registration Workflow in Run 3

- OP crew registers faults
- AWG core (+ machine supervisors) reviews faults
- System experts review faults

- LHC OP eLogbook
- SPS OP
- PS OP
- PSB OP
- Linac OP eLogbook

New logbook, AFT interface directly used to register faults from OP

Keep same approach in Run 3 for fault review & reporting?

Generate automatic reports from AFT? Any showstoppers?
Operators used existing E-Logbook Tool

AFT Web application will be used in Run 3
Fault Categories

Possible update of AFT categories

- So far based on historical categories from the logbook, top-level quite well established, result of long discussions
- Trade-off between level of detail desired by OP and system experts → only parts of the tree can be exposed to OP, but the tree can go as deep as requested by experts for their needs

More granularity? Please provide feedback

- Ideally: track non-blocking faults, also during commissioning/shutdowns – possible via AFT + link to INFOR EAM
- Useful in case of requests for failure mode analysis, expected to be more and more relevant going forward (e.g. for consolidation forms)
- Has to be backwards compatible – conversion to eventual new format to be provided by experts

Update mailing lists for experts? Please provide feedback
Example for Machine Interlocks

Present categories

• Machine Interlocks
• → Hardware
• → Controller

New categories (proposal)

• Machine Interlocks
• → Beam Interlock System
  • → Hardware
  • → Controller
• → FMCM
• → WIC
• → PIC
• → SMP

3 levels, it can be decided which ones to be exposed to OP

(question to AFT team: how to manage this considering the new link from the logbook?)
Discussion

Workflow in Run3

• Keep the same as Run2?
• Homogenize approach between injectors/LHC?
  • Involve all machine supervisors/coordinators
  • Presentations in LMC/IEFC @TS + end-of-the-year report
• Register non-blocking faults, track also system reliability?
  • Important in view of future requests for consolidation and reliability studies

Possible update of AFT categories + expert mailing lists

• Please provide feedback

More meetings of AWG

• More and more managed automatically by AFT
• If needed, discussions before reporting to LMC/IEFC?
Conclusions 1/2

- **Workflow for fault registration and review in Run3:**
  1. Faults impacting on machine operation will be registered by OP via the AFT (new!)
  2. AWG core team + machine supervisors will be in charge of the review of the faults. Experts will be as usual able to comment and propose modifications via AFT.
  3. Dedicated meetings will be organized weekly with machine supervisors for global review and synchronization across all machines. Participation of someone representing LHC was agreed, to be verified who this person will be (LHC coordinators or someone from LHC OP)
  4. It is highly recommended to **track also non-blocking faults** (i.e. those transparent for operation) in Run3. This should be done directly by system experts. This is part of a global effort to improve our system reliability tracking and will be requested in the future for **quantitative consolidation risk assessments**.
  5. **Fault tracking will officially restart in Week 20 of 2020**, i.e. with Linac4 operation
Conclusions 2/2

• **Reporting strategy:**
  • 1. It was agreed to report to LMC/IEFC after each technical stop + once the end of the year (presentation + written report, *automatically generated via AFT*).
  • 2. It was agreed to investigate an automatic tool which would generate the report and diagrams and store them as an EDMS document with revision tracking.

• **AFT fault categories and mailing lists:**
  • 1. A review of the categories, possibly including more granularity, is recommended. System experts should provide their input on this (*).
  • 2. If expert mailing lists for fault review need to be updated, please just let us know.

• **AWG meetings:**
  • The general consensus is that there's no need to meet before reporting to LMC/IEFC, as everything is managed automatically via AFT.
Thanks for your attention!