

# Re-cap on EAM & AFT Integration

- Started out ~1 year ago
- Discussed integration requirements with CRG, CV, EL, TIOC, AFT, EAM & RAWG
- Motivations:
  - Less workload – avoiding double bookkeeping & reviewing
  - Added value from combining information of both databases
    - Beam impact in AFT, equipment code from EAM,...
  - Opportunity to homogenize data recording and build common tools for data analysis/KPI definition

First proposal from CRG:

The screenshot shows the 'EAM Logbook' interface for a log entry titled 'Log 119461'. The main content is divided into several sections:

- Base Log Details:** Includes fields for Description (Quench 3118), Nature (Fault), Subtype (User failure), Source (Beep), and Status (A - Active). It also shows metadata like Created By (JPEWS), Date Created (28-Apr-2024 19:12), Updated By (NVALETTE), Date Updated (29-Apr-2024 02:27), Event Start Date (28-Aug-2024 17:01), and Event End Date (dd-mm-yyyy hh:mm).
- EVENT DETAILS:** Contains a rich text editor with the following text: "Quench 3118 during LHC RAMPDOWN: TTmax - 25.95K. PTmax - 17.45bar. Current - 8973A. At 17h30, BE phoned to discuss Cell 3118's neighbouring Cell 33L8, which has a pierced bayonet. 33L8\_CV910 comment states that there is 'Liquid in bayonet when valve passes 11-12%'. After discussion with BE, the decision was made to cool Cell 33L8 through conduction with outer Cells 31R7 / 31L8 and keep OHL at 11%." The text is annotated with a yellow box and a blue callout.
- CRYO Position Capture:** Includes fields for Site (Q08L - LHC P8) and Subsystem (QAB\_SECT\_78 - Sector 7-8), both highlighted with a blue box and a callout.

"Editable by CRG sh...  
the time the link with...  
active

Read from AFT once  
linked?

"Always editable by CRG shifter"

"Populating AFT" (i...  
comment in the Acti...  
the AFT event)

Do not track in AFT

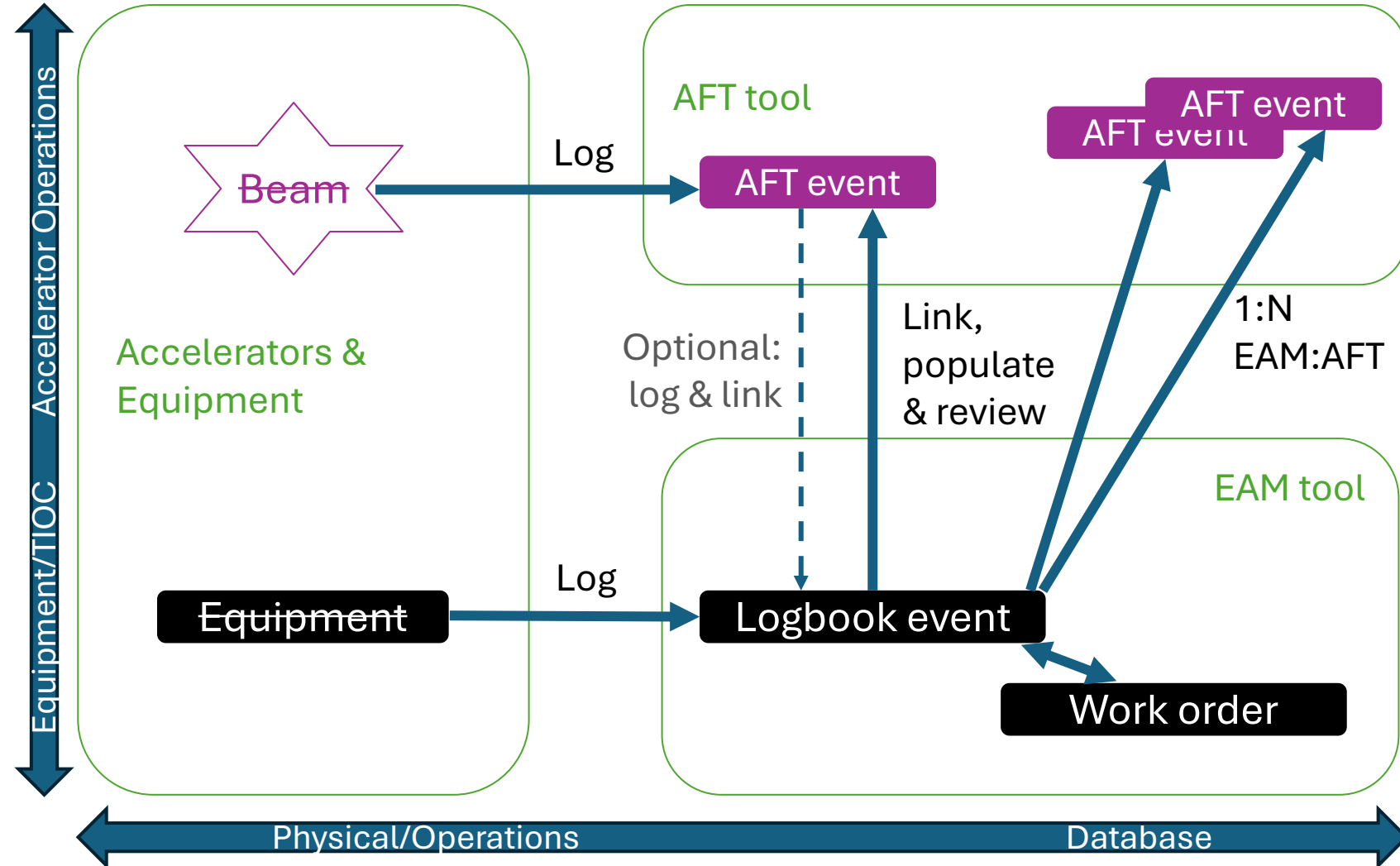
"Populated from AFT...  
by the CRG shifter

Do not track in EAM

To be removed from the CRG logbook  
(useless)

# Vision

- AFT owns operations impact data
- EAM owns equipment fault data
- 1:N link - 1 EAM log links N AFT events
  - useful for infrastructures
- Linking primarily from EAM logbook to AFT events.  
 Link is key - basis for:
  - Combining data
  - Populating AFT/EAM
  - Auto-review
- High degree of automation



# What is available for 2025? Linking Plug-In

## Allows efficient linking from EAM to AFT:

- Systems pre-filtered for each logbook & by time
- Time filter can be fine-tuned
- Search results ordered by start time
- Generates link on both EAM & AFT & prevents double linking

Can be deployed to production version of logbooks already!

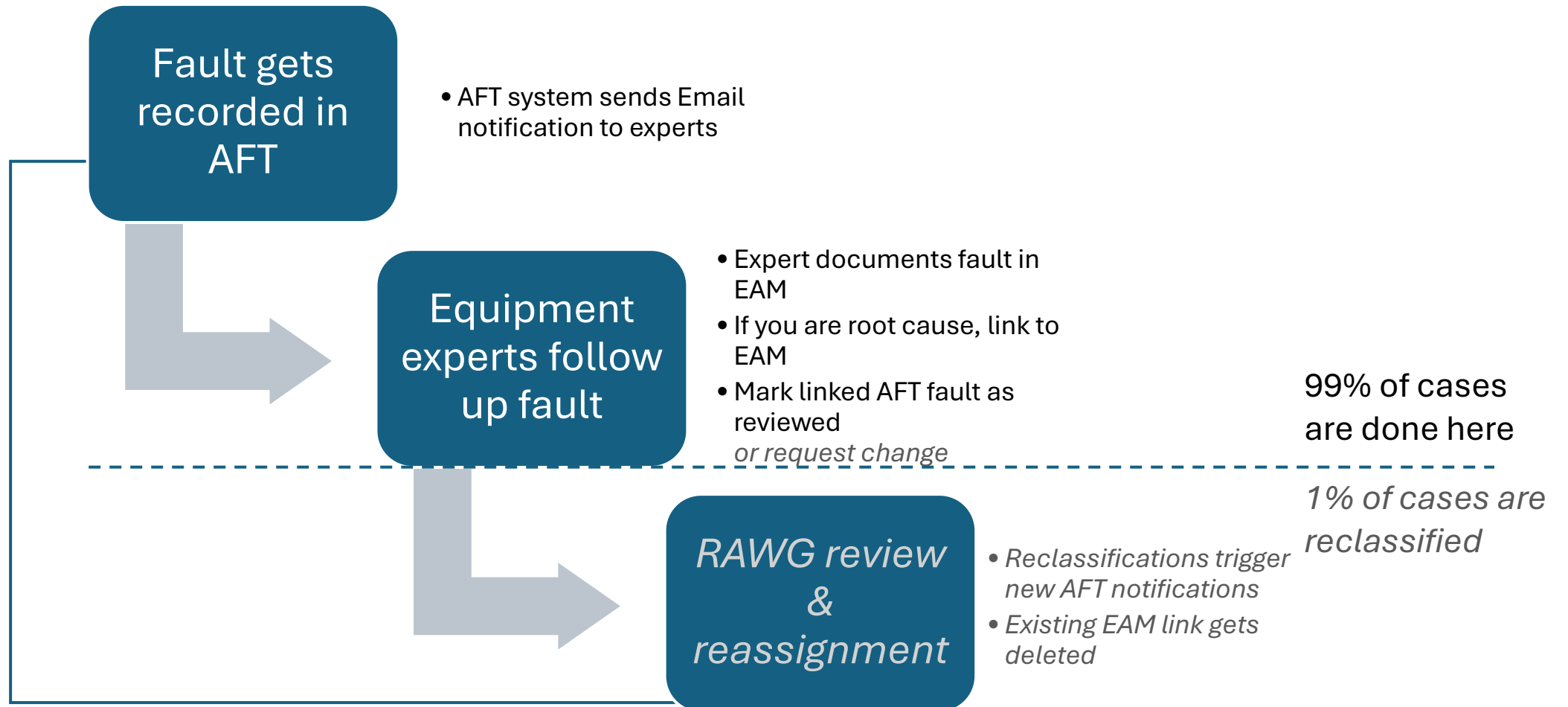
The screenshot displays the EAM Logbook interface. The top navigation bar is green and contains the text 'EAM Logbook', a menu icon, '+ New log', and 'CRG Logbook LHC'. Below this is a toolbar with icons for 'Log 122051', 'SAVE', '+ NEW', 'DELETE', 'RELOAD', 'EMAIL', 'PRINT', 'CLONE', 'HISTORY', and 'GENERATE URL'. The main content area is divided into two panels. The left panel, titled 'Base Log Details', shows a log entry with the following information: Description: 'Water Heater EH3280\_1\_10kW NOT OK (31Q1)'; Nature: 'Fault'; Subtype: 'Power failure'; Source: 'Beep'; Status: 'A - Active'; Created By: 'JPEWS'; Date Created: '12-Nov-2024 18:32'; Updated By: 'MCOMBE'; Date Updated: '14-Nov-2024 07:18'; Event Start Date: '12-Sep-2023 18:00'; Event End Date: 'dd-mmm-yyyy hh:mm'; and an 'Intervention' checkbox. The right panel, titled 'AFT Link', is highlighted with an orange border and contains a search box with the value '901412', an 'AFT Fault' input field, and a 'Margin of error (minutes)' field set to '5'. Below this is a table with the following data:

Accelerator	System	Fault Description	State	Start Time	End Time	Duration
ELENA	Injector Complex » No Beam » AD	circuit breaker of module 3 down Injection kicker did not stand pulsing with 5 out of 6 modules Expert intervention to restart module 3	OP_ENDED	13/09/2023 02:00:27	13/09/2023 04:46:15	2h 45m 48s
AD	Injection Systems » Kickers	circuit breaker of module 3 down Injection kicker did not stand pulsing with 5 out of 6 modules Expert intervention to restart module 3	OP_ENDED	13/09/2023 02:00:27	13/09/2023 04:46:15	2h 45m 48s
LHC	Power Converters	QPS trigger on RQT13...7B1 due to bad current regulation in the power converter module.	OP_ENDED	13/09/2023 01:11:23	13/09/2023 02:44:28	1h 33m 5s

# DEMO & Workflow

<https://testeamlogbook.cern.ch/LBQLHC/log2/122051>

[AFT – Fault details \(1107322\)](#)



# What could be the next steps?

## Auto-Review

- Consider an EAM 'claimed' AFT fault to toggle automatically reviewed
- Would save manual step

## Auto-Log

- AFT to publish pre-filled logbook events to EAM
  - 1:N relationship problematic for infrastructures across machines
- Would save manual step

## Auto-Populate

- Idea remains to separate information between EAM (equipment) & AFT (beam) instead of duplicating
- Nevertheless, certain fields useful in both EAM & AFT. E.g.
  - EAM description as comment into AFT - done
  - Functional position/equipment code
  - Sub-systems
  - System specific properties (*implemented by group*) – e.g. CRG timestamps, EN-EL glitch dip/swell & duration

# Why not implemented yet?

## Clarification of data modification rights and rules

- AFT APIs need to grant different rights to different EAM logbooks
  - Avoids EAM integration of system X modifying AFT log of system Y
- AFT API extensions to access review state and change requests
- How to handle links under reassignment of fault from system X to system Y?
  - Not considering all edge cases can have big impact when tool is operational

## Resource allocation

- AFT tool essentially feature frozen
- Currently, no development resources allocated

## Request Fault Modification

Start Time


18-05-2023 16:30:00

OP End Time

18-05-2023 17:42:31

System

Magnets » Auxiliary Magnets

Remember that as a system expert, you can modify the sub-system yourself by clicking on  next to the current system.

Description

T9 quadrupole magnet

Additional Explanation

It was a magnet problem.

✕ Cancel

✓ Send Request

# Next steps

- RAWG, EAM & AFT team to
  - Narrow down next integration steps (roles & rules)
  - Look for resources
- EAM logbook users have linking plug-in available for 2025 operation
  - Please share your experience and feedback – [eam.support@cern.ch](mailto:eam.support@cern.ch)
  - Review of added value mid-2025





# Auto-document & review

## Auto-Review

- With link made, experts would still need to go to AFT and toggle review state
- We could consider an EAM 'claimed' AFT fault to toggle automatically reviewed
  - Would need to be set from EAM side, cause logic on AFT level could not distinguish between properly linked fault and 'someone' just adding EAM link for info

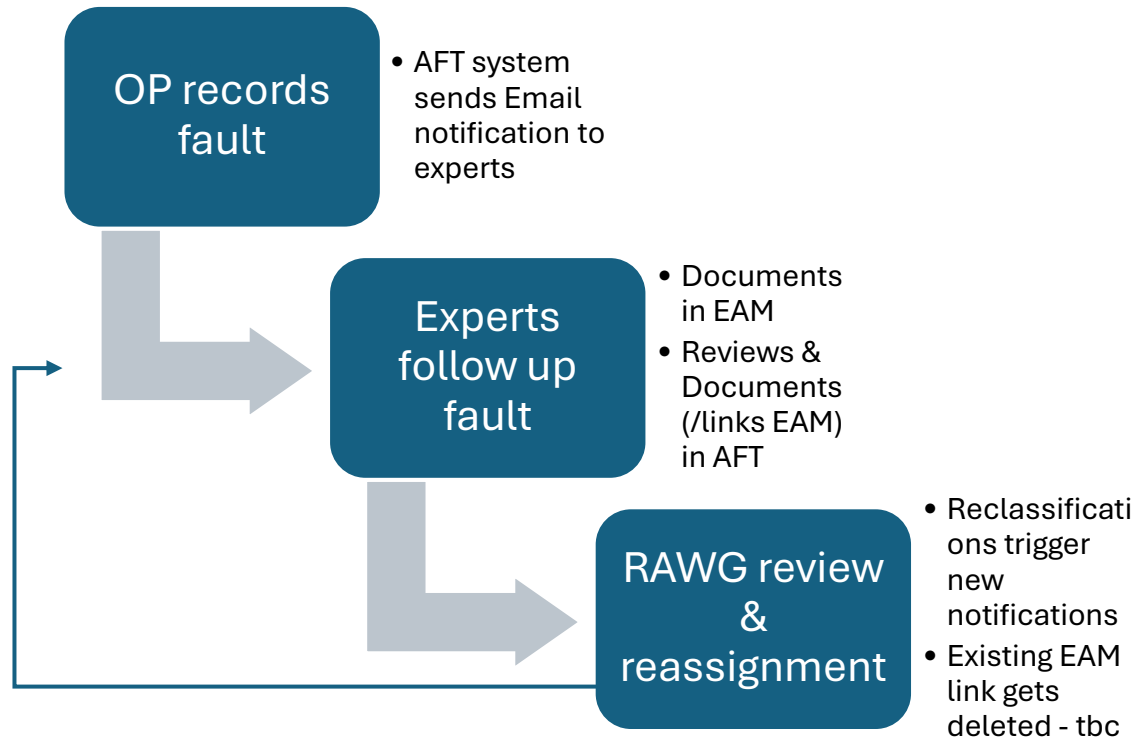
## Auto-Document

- Idea remains to separate information between EAM & AFT instead of duplicating
- Nevertheless, certain fields worth in both EAM & AFT. E.g.
  - EAM description as comment into AFT
  - Functional position/equipment code
  - System (if breakdowns equal between AFT & EAM)
  - System specific properties (if group implements this) – e.g. CRG timestamps, EN-EL glitch dip/swell & duration

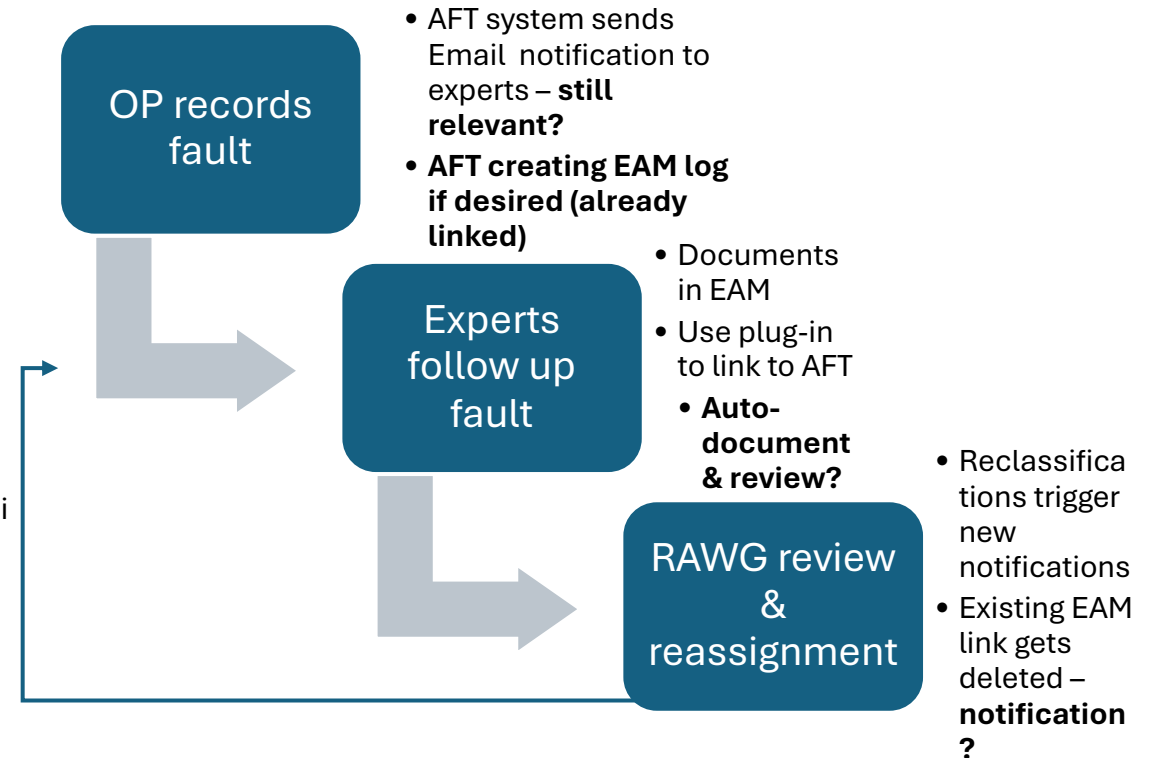
Have to watch out for access rights! Current linking plug-in has full write access to database (CV could claim CRG fault etc.)

# Workflows with and without plug-in (experts' point of view)

## Currently



## With EAM/AFT integration



# Plug-in to link to AFT

## Feedback received

- Lionel (CRG)
  - It does not take into account the Site/Subsystem/equipment : for instance, in the LHC logbook, we may have the following Accelerators: LHC, ELENA, PS, AD, EA, etc.
  - For the LHC Cryogenic logbook, we have all systems: Injector Complex, Radio Frequency, etc.
  - It looks like the margin of error takes into account the start date and the end date as well.
  - The same AFT id can be recorded multiple time whenever the logbook is saved.
- Jesper (TIOC)
  - Limit the list of AFT events to those within the same time frame. Perhaps with the possibility to manually expand the list - **done**
  - Group the list by machine, then order by start time ?
  - Remove from the list the ones you have already attached
  - Perhaps add more description when the AFT is attached. You see only the ID now, perhaps it could be useful to see also the description from the AFT inside EAM? - **next slide**

## What could we propose?

- System filter for each logbook
  - Egroup based
    - Long-term: integration with IT egroups - grabber
  - Mapping (how to maintain? Put reference on start page of eam logbook & send yearly reminder)
- Ordering search results - done
- Avoid double linking - easy
- Fine-tuning of duration - unclear

# Next steps

- Aim to finish features of linking-plug-in as discussed and make equipment groups aware so they can use it for 2025 operation
- Features as discussed are
  - Only show relevant AFT systems in each EAM logbook (mapping attached – note that it is sufficient to filter by top level system)
  - Avoid double linking
  - Add failure description to linked AFT faults
  - add EAM description as comment to AFT fault
- Make equipment groups aware
  - I will invite for meeting in about a month from now
  - I will update the proposal & workflow taking into account your comments
  - We may iterate upon that before the meeting with the equipment groups
- The linking plug in functionality will remain limited for now (resources) as
  - Auto-document/complete AFT fault information requires handling of access rights of EAM plug-in
  - Auto-review action requires extension of AFT API on top of that
  - Writing AFT logs to EAM requires updating of current work order creation & discussion on how to handle AFT fault updates etc.