

Meeting Subject	MARP #34 – 21.04.2021	EDMS N°2566313 v3
Meeting Purpose	Discussion on Electronics Reliability Plans across Accelerator Technology Sector with BE/CEM	
Meeting Date / Place	21 st April 2021, 15:00 – 16:00 / Zoom	
Organizer + Attendees*	A. Apollonio + S. Danzeca, A. Masi, L. Serio, J. Serrano, R. Steerenberg, B. Todd, J. Uythoven, M. Zerlauth.	
Absent / apologies*	T. Cartier-Michaud (excused)	

* People receiving these minutes

Subject:

1. Review previous meeting minutes [AA]
2. Discussion on reliability in electronics across the Accelerator Technology Sector [AA, BT]

Review Previous Meeting Minutes [AA]:

No members raised comments from the previous meeting minutes.

Discussion on reliability in electronics across the Accelerator Technology Sector [AA, BT]

A. Apollonio introduced the topic by explaining a sub-objective of the MARP mandate: to *promote methods for reliability in the design of electronics across the accelerator sector*. The objective being to discuss the various approaches foreseen to identify synergies and shared plans across the ATS, and to understand the plans from BE/CEM with regards to this.

A. Masi explained that as a significant part of CERN's electronics design and procurement passes through BE/CEM/EPR, it is planned to build a competence in reliable design in that section. **A. Masi** said that, currently, reliability appears not to be taken account in each stage of a project, it appears to be limited by resources: if a central team and competence could be established in BE/CEM/EPR, it would be well placed to improve the global level of electronics reliability and common approaches with ideally most controls projects and designs following similar processes. The exact definition of this work is on-going, and consultations are on-going with stake holders to understand what form this could take. A request for extra manpower related to this is intended to be made in the BE medium term plan.

Reliability Laboratory

B. Todd asked about the reliability laboratory, which was planned; in previous discussions, it had been noted that a central lab could be made available for high accelerated lifecycle testing (HALT) and/or highly accelerated stress screening (HASS). **A. Masi** confirmed that this was the plan, **S. Danzeca** explained that this kind of laboratory exists in the EP department but does not have dedicated manpower. **A. Masi** confirmed, and explained that **M. Brugger** has asked for assistance, via a centralised service for the test of cabling and connector infrastructure. The laboratory is in the process of being set up to respond to this also. This effort is always collaborative and is ready to have other participants join.

Test Electronics

B. Todd asked about plans for providing test electronics, e.g. in EPC several people create test equipment, it is challenging to maintain in the long term, often created by researchers rather than staff. **B. Todd** explained that ideally, some low-level test equipment could be outsourced to a central service rather than being done in each group. **S. Danzeca and A. Masi** explained that this was an active discussion, two needs had been identified;

1. Providing user friendly test frameworks
2. Providing a user test for series production.

This discussion is on-going and groups are being contacted. **S. Danzeca** explained that the LabView section, led by **O. Oyvind** (BE/CEM/MTA) was investigating the expansion of a proof-of-concept Production Test System (PTS) based on PXI chassis.

Centralisation vs Distributed Reliability Efforts

Concerning the strategy of reliability design, **J. Uythoven** outlined key areas where centralisation has issues: e.g. knowledge persistence. The work is done largely by researchers, knowledge and skills tend to leave with the departure of these temporary personnel. To be effective, researchers generally must be closely coupled to the equipment which is being studied to understand the context in which it is being used. A split should be made of the tasks that lend themselves well to centralisation, versus those that need to be done closely linked to the equipment group concerned. **M. Zerlauth** agreed, explaining a need to distinguish between *analysis* and *support for analysis*: finding the balance between the group and sector levels. Some low-level testing, and central support such as laboratories lends themselves well to centralisation, however a more complete functional test, may be too diverse to centralise and might not be achievable with a small team. **J. Serrano** explained that one method to address this issue is to reduce diversity at the lower level, on one hand this reduces the range of solutions which would need to be analysed, on the other hand this would free up time for the system experts, giving more opportunity for time to be sent on quality assurance. **J. Uythoven** remarked that profiles are different for the people involved, it is impractical to have reliability design experts in each group, on the other hand designers should understand the basics of reliability engineering and should be able to go to central place for assistance.

Field Reliability Data

J. Serrano continued to explain that another area where there is a cross-sector interest concerns the capture of field data. **I. Kozsar** (BE/CEM/IN) is mandated to work on this for the BE/CEM group connecting operations data and reliability data, using INFOR (e.g., between databases for fault tracking and interventions). **A. Apollonio** agreed and said that the extraction of information about field reliability is a long-term objective, explaining that different groups at CERN are approaching the data capture with different tools, so it is difficult to find generic solutions/workflows.

Guidelines & Standards

A. Masi explained another aspect is the lack of guidelines for reliability at the project level. A good example of how this could be managed would be the creation of an assurance document, as is done for the Radiation Hardness Assurance document, which is now a pre-requisite of the Engineering Change Request, one could consider a similar need exists for reliable electronics design. **A. Apollonio** agreed and explained a related issue is the selection of standards and guidelines people should use and how they should be applied; An evaluation and comparison is needed. **S. Danzeca** noted that his team already started looking into guidelines and the state of art on concerning production of electronics and was attempting to create a list of the related standards used historically. Some discrepancies had already been observed. **B. Todd** noted that in EPC it has been identified that the electronics fabrication standards or routing standards (IPC-like) were not consistently applied from project down to board in some historic work, this could be a linked issue.

Committees to Follow Up the work on Reliable Design

A. Masi explained that pragmatism was needed between the application of guidelines and the work of contributors, a committee should be identified that can follow up these issues. Two candidates are the MARP and Electronics Open Forum. **J. Uythoven** noted that the MARP is not a working group, however it organises working groups. A relevant one is the Reliability and Availability Studies Working Group (RASWG) which is better placed to address this issue; however, it is missing some attendees to have a complete overview. **Various members** agreed and noted that this could be followed up.

Added after the meeting:

RASWG homepage: <https://indico.cern.ch/category/9071/>

RASWG scientific secretary: [Lukas Felsberger \(lukas.felsberger@cern.ch\)](mailto:Lukas.Felsberger@cern.ch)

Enforcing Reliable Design

J. Serrano noted that reliability needs to be considered, but the level of engagement on the topic is very project specific, a possibility is to follow the safety model, where ideas must be presented and agreed by a third party before the project can continue. **M. Zerlauth** explained that reliability, protection, and personnel safety are similar methodologies, but have different impacts, one should be cautious when mixing the domains. **J. Serrano** agreed, adding that having the obligation to passing the work through a person / body would already add some weight to the work on reliability. **A. Apollonio** agreed, saying that perhaps it could be a small team rather than a single person. A good side effect of this would be that every project would then have a reliability chapter case. **J. Uythoven** commented that perhaps the RASWG could play a role in this. **A. Apollonio** agreed and suggested revising the current invitation list to the RASWG to include more colleagues from relevant groups (e.g. BE/CEM). **B. Todd** noted that whatever choice is made, it must take administrative burden into account, which is currently rising across the sector, and work on reliability should not be seen as an impediment.

AOB:

A. Apollonio explained that **H. Boukabache** (HSE) has proposed training on formal property verification of VHDL / Verilog, this would be 3 or 4 days, ~€4500 per participant. **J. Serrano** and **A. Masi** noted that the cost per participant should be negotiated further. **A. Apollonio** agreed, suggesting that the course be advertised, and when potential attendee numbers are known, to give feedback and ask for a new price negotiation.

Meeting Actions:

Action 1 (not MARP specific): organise a discussion with SY/EPC/CCE and BE/CEM/EPR about testers [SD]

Action 2: Discuss ideas raised for the role of RASWG [JU]

Action 3: Advertise the training [all]

AOB:

None

Next Meeting:

to be planned by **T. Cartier-Michaud**.