



QDS Input Patch Panels

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Outline

- **QDS Patch Panels Overview**

- Motivation / Functionalities

- Mirror all signals coming from IFS connector 1:1 to “ELQA” port
- Map signals from several IFS boxes to the respective UQDS systems (one cable per UQDS)

- Basic design

- Metal plate/PCB/Metal plate sandwich with PCB mounted Harting connectors
- ELQA ports accessible from front side of rack
- Signal shuffling on PCB

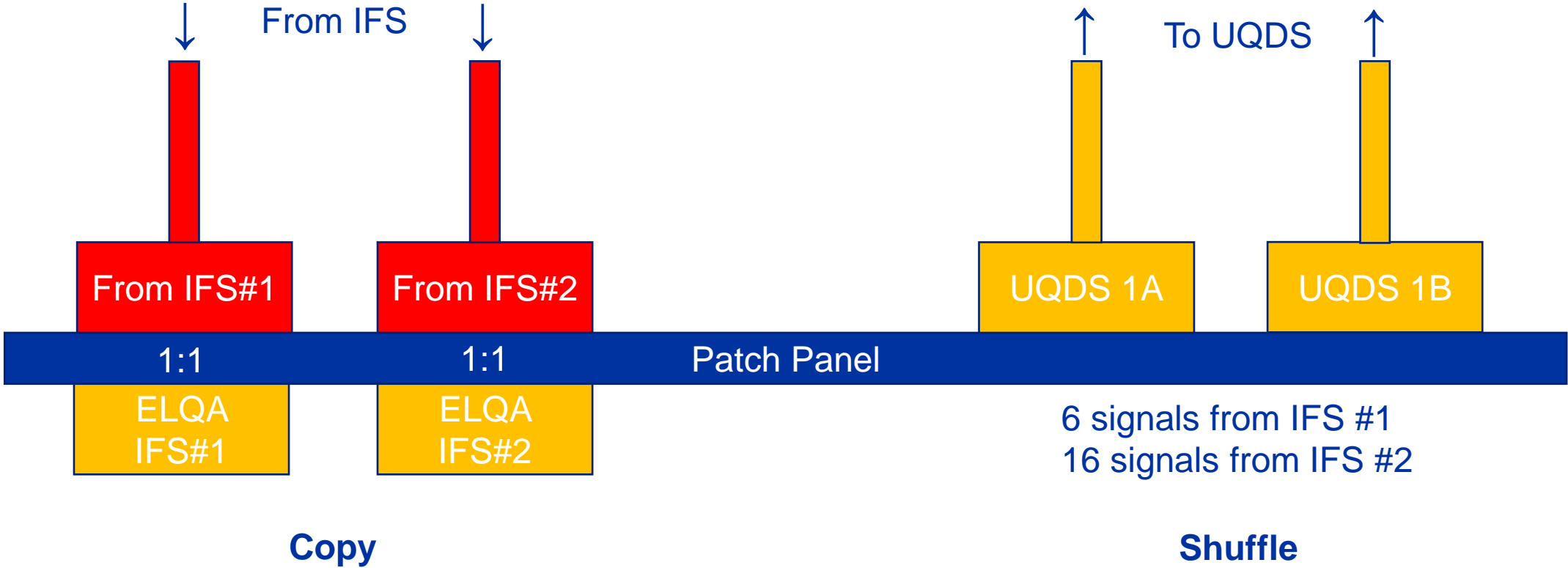
- Documentation

- IFS cable pinout is 1:1 as documented in IFS by Giorgio
- Signal Mapping: Spreadsheet Document (similar to IFS spreadsheets) per Patch Panel and patch panel PCB schematic

QDS Patch Panels

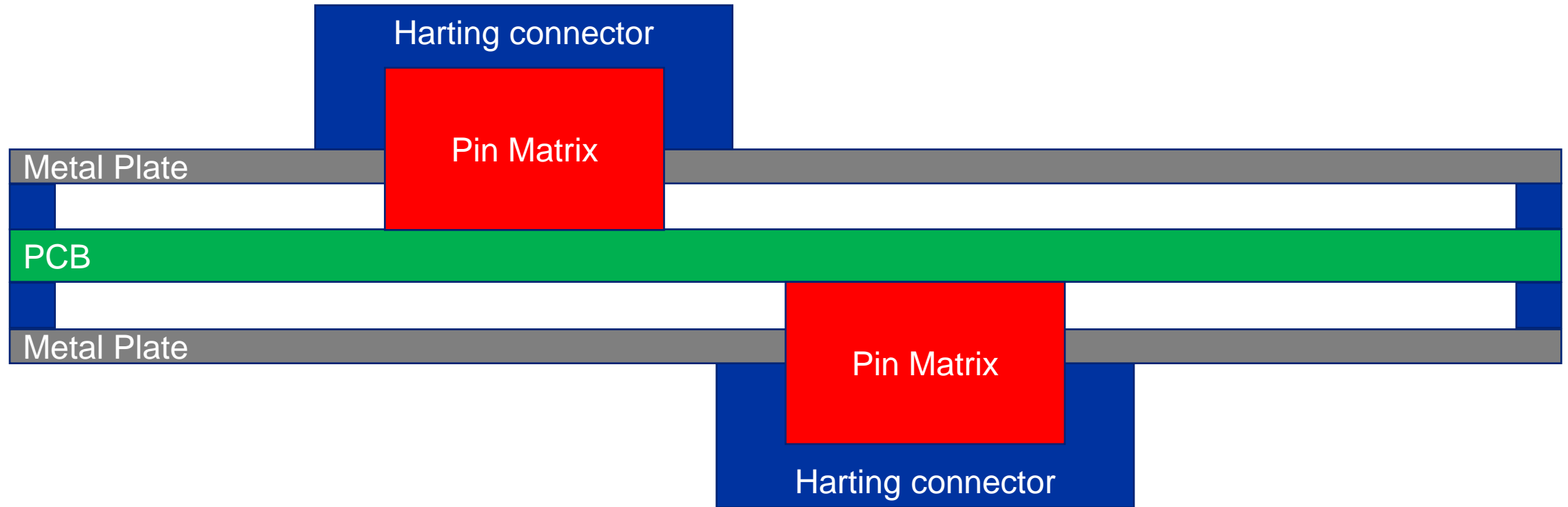
- **Contrary to previous installations, signals from IFS boxes have to be distributed to multiple different crates**
- **IFS boxes which are directly attached to the cold masses are located in zones with very high radiation load → difficult access**
- **To enable convenient access of ELQA to the voltage taps of the magnets without disconnecting UQDS each connector is cloned**
- **For each UQDS cluster (1 rack) a dedicated patch panel is used to regroup the signals from the IFS boxes (up to 7) to the target UQDS boxes (up to 9)**
- **Signals not used by QDS are also routed on patch panels to allow access by ELQA**

Patch panel example



- Signals from two IFS boxes are copied 1:1 to ELQA patch panel connector
- Signals from two IFS boxes are redistributed to one pair of UQDS

Basic Design

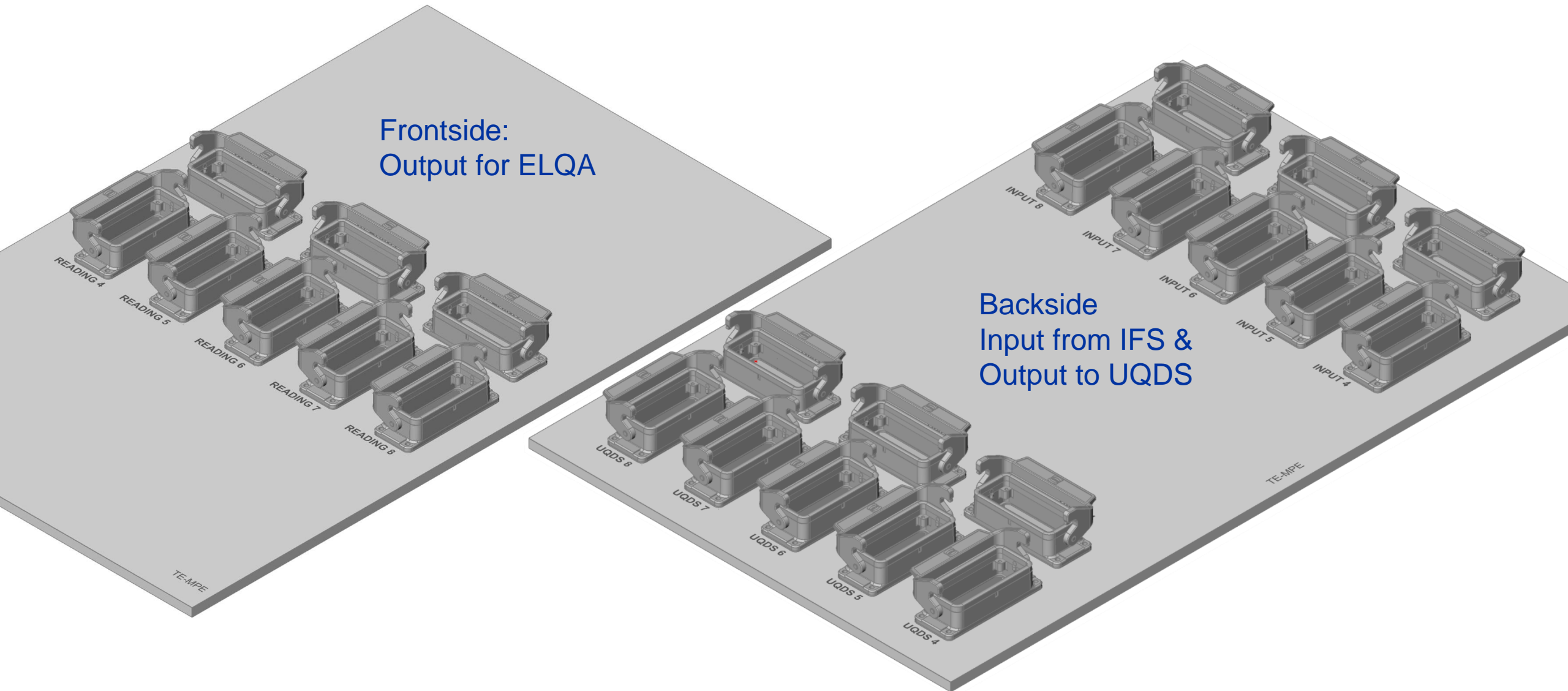


- **Metal Plate / PCB / Metal Plate sandwich**
- **Harting connectors directly soldered to PCB**

Patch panel types

- **The main patch panel to each UQDS cluster is unique per IP side**
- **Currently we plan 5 unique Patch-Panels for Quench detection + 1 for PDSU**
- **The largest of these will connect 7 incoming cables to 7 ELQA ports and has 9 outgoing connectors for UQDS**
- **For Superconducting link, a generic, smaller PP design with 6 connectors (2 incoming, 2 ELQA copies & 2 UQDS connectors) is sufficient**
- **For All SC link protection units, a total of 4 generic panels are required per IP side**

Implementation example:



ELQA procedures and intervention

- **ELQA ports carry life magnet signals, and access to UR is possible with circuits powered.**
- **A dedicated procedure by ELQA has to be drafted to ensure that the protective covers on the ELQA ports are put in place after each intervention**
- **ELQA connectors, as on IFS use Female pins to reduce the risk of actually touching signals on magnet potential**
- **Connectors from IFS as well as to UQDS are mounted on the back side of the patch-panel which further reduces the exposure**
- **In general QDS will trigger if inputs are left open. This avoids that connectors are left disconnected accidentally**

ELQA interventions to replace broken Vtaps

- **In case of problems with voltage taps, ELQA is usually intervening directly on the IFS box**
- **The area around IP1 and IP5 will be too radioactive to directly access the IFS boxes**
- **All interventions have to be performed at the level of the QDS rack on the patch panels**
- **The patch panels are based on a PCB which means interventions on signal wires will be different than in IFS box**
- **To implement usual tasks such as “bridging” a broken Vtap, a cable patch has to be inserted between incoming cable from IFS and PP**

Documentation

- **IFS connector is fully documented in EDMS**
- **ELQA “copy” uses identical connector and pinout → IFS documentation applies**
- **Shuffling part of patch panel will be documented in a similar way as the IFS documents**
- **This table acts then as entry to the PCB schematic which will be stored the same way as all the other PCBs in EDMS (EDA-xxxxx)**
- **All fixed connections per PP type facilitate spares management and reproduction of a damaged PP should be easy.**
- **Due to low cost of PCB, even 100% spares could be ordered (re-ordering of a PCB from design files is also easily possible)**

Summary

- **The principal design of the QDS patch panels is established**
- **Prototype is in development and should be ready by end of the year**
- **PCB based panel avoids a lot of issues created by classical wire based patch boxes**
- **Documentation is straight forward thanks to the PCB workflow (EDA-Number etc.)**
- **String will be used as a final evaluation of the design**



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