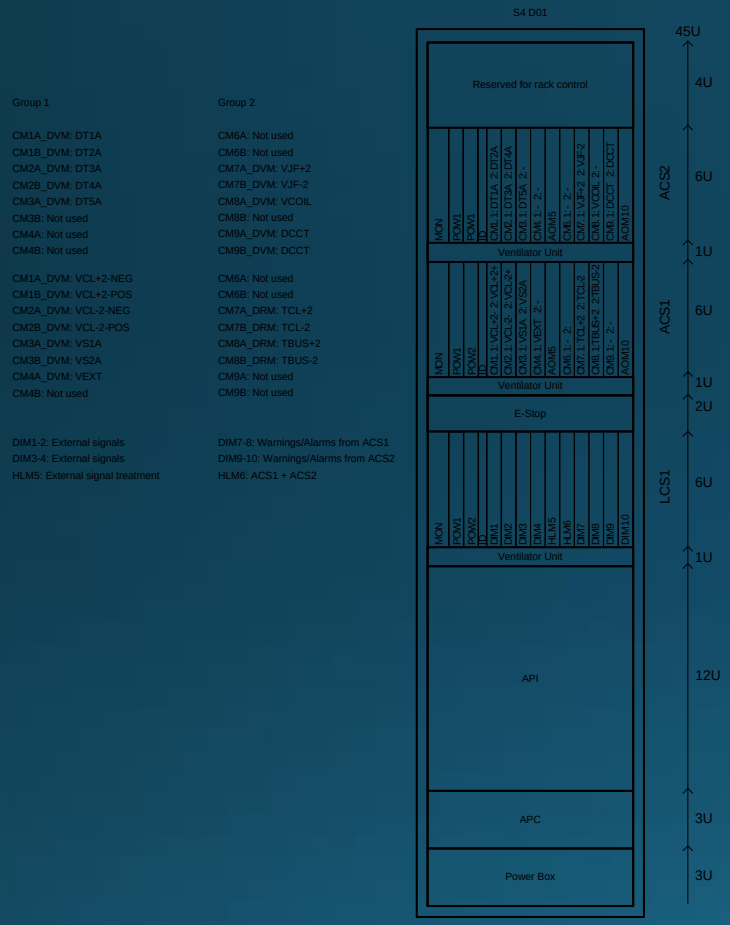
Sylvain Ravat PH/DT-DI

MSS Beam Dump

MSS - Upgrade to MSS2

- Magnet Safety System (MSS) is used for all LHC experiments
- MSS re-designed to MSS2: **NI cRIO FPGA platform** to replace obsolete fuse programmable based FPGA
  - MSS2 tested on COMPASS Magnet in April-May 2014
- Upgrade to MSS2 during LS1 only for :
  - Alice Solenoid and Dipole
  - LHCb Dipole
  - Atlas Central Solenoid (MSSa)
- Keep current MSS for :
  - CMS Solenoid (MSSa and MSSb)
  - Atlas Toroids (MSSa and MSSb)
  - Atlas Central Solenoid (MSSb)

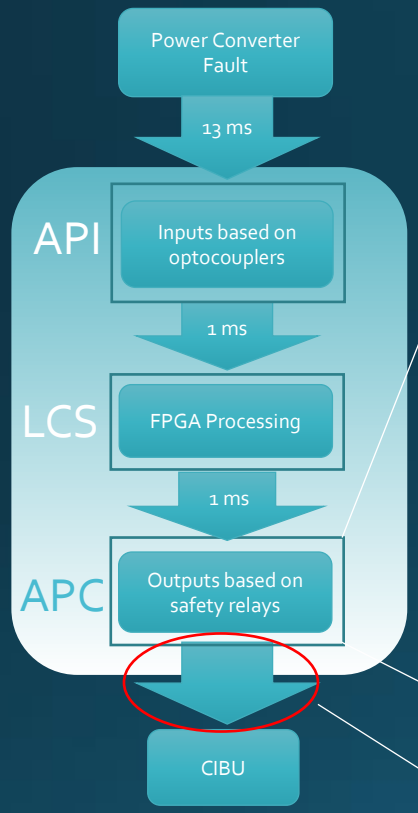
MSS rack structure



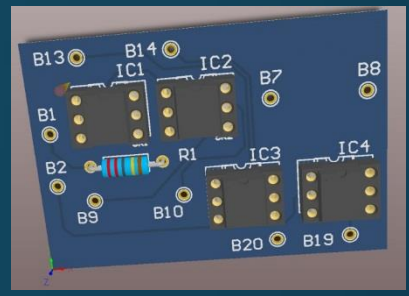
CMS MSSA rack

- MSS Rack is composed of 4 types of crates:
  - API : concentrates MSS Digital and Analog signals and distribute it to ACS and LCS crates.
  - ACS : receives, treats analog signals and sends results as digital signals to LCS crates,
  - LCS : receives digital signals from API and ACS, an FGPA will combine these signals and take actions to protect the magnets,
  - APC : sends FPGA orders to dependent system such as magnet power supply, cryogenic plant, quench heaters, beam dump…

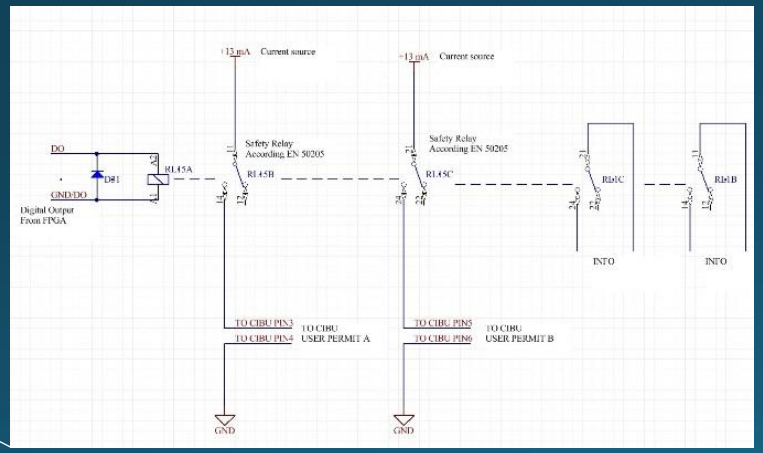
MSS behaviour - APC Modification



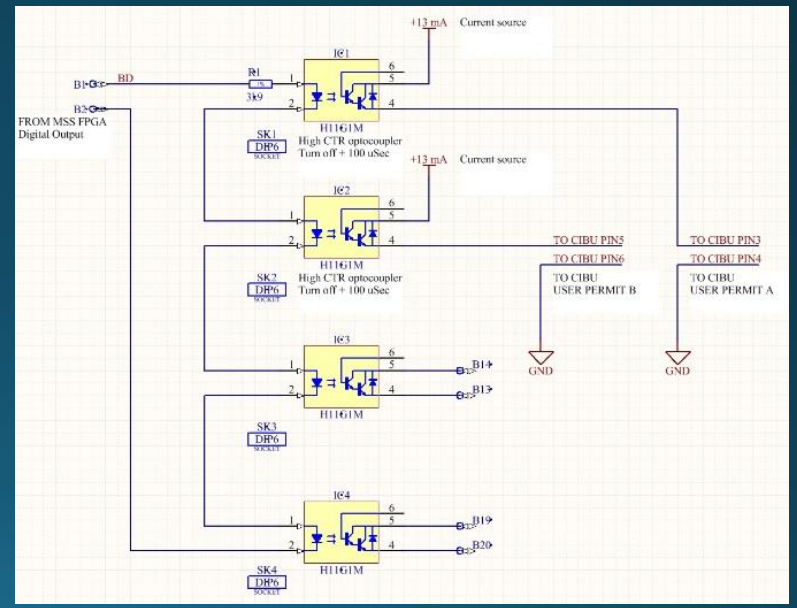
APC crate



Optocoupler patch to replace relays

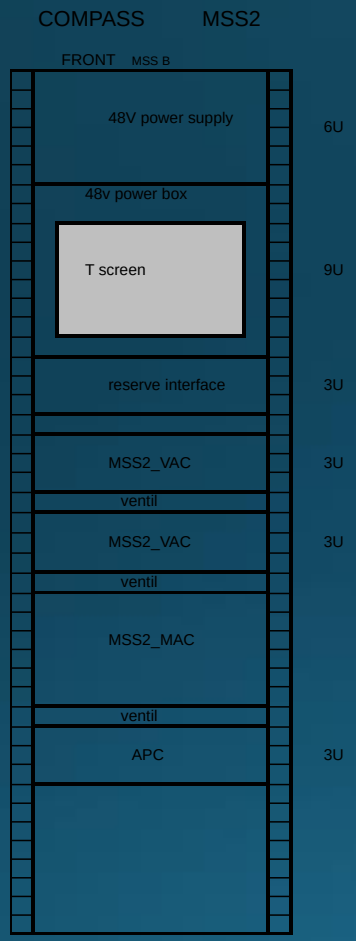


Transition time = 15ms



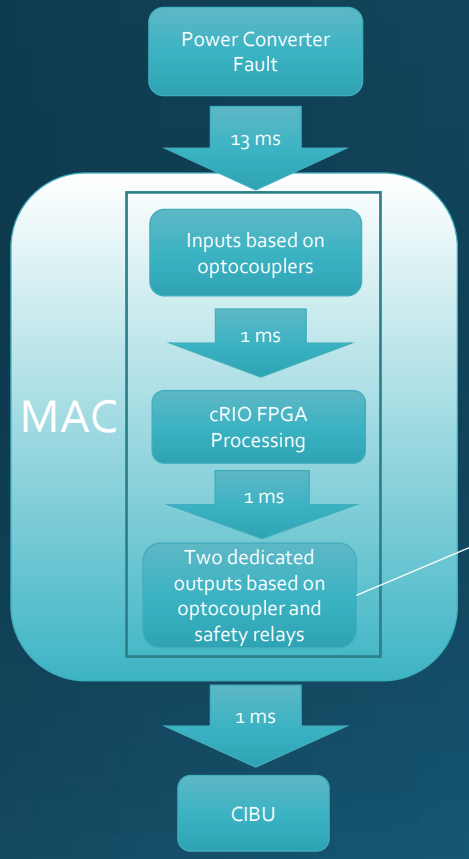
Transition time = 1ms

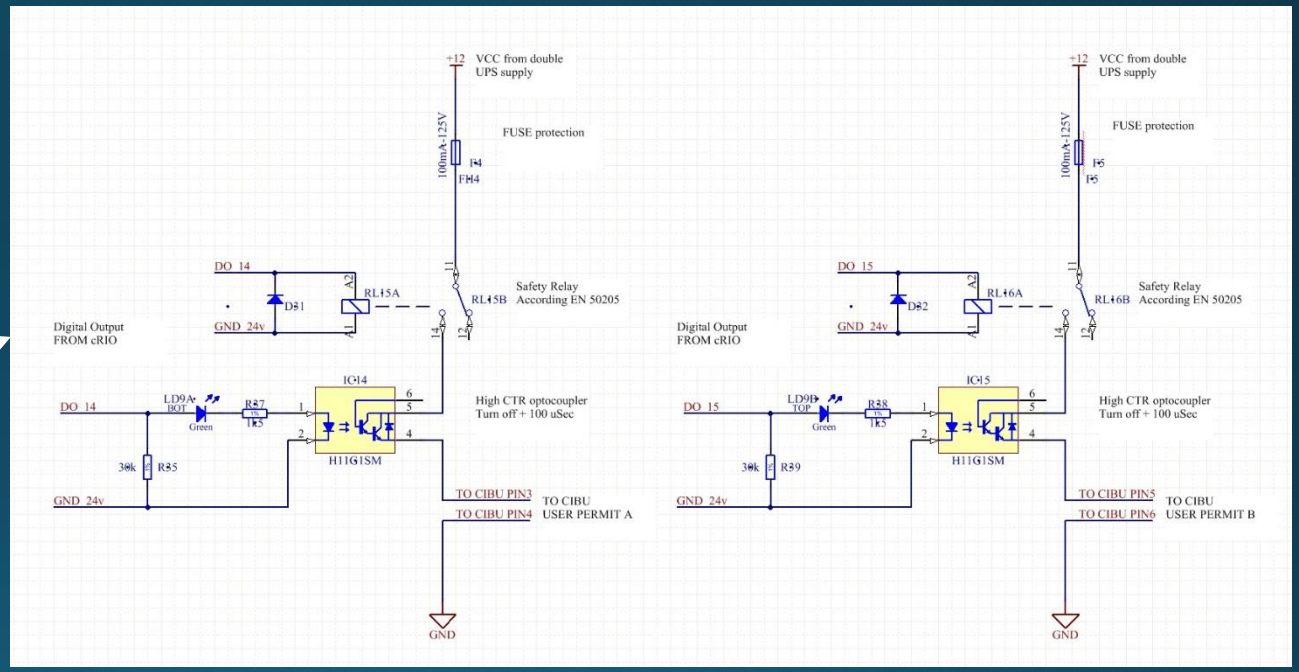
MSS2 rack structure



- Similar Structure as MSS
- VAC module: Versatile Analogue Chassis, Analogue 3U chassis containing 8 analogue modules (2 or 4 channels)
- MAC module: Main Chassis, Principal 6U chassis of the MSS2 system; contains CRIO controller, interfaces and redundant power supplies, Integration of MSS APC functionalities.

MSS2 APC


Power Converter Fault
13 ms
MAC
Inputs based on optocouplers
1 ms
cRIO FPGA Processing
1 ms
Two dedicated outputs based on optocoupler and safety relays
1 ms
CIBU


+12
VCC from double UPS supply
FUSE protection
100mA-125V
FH4
DO_14
D81
RL15A
RL15B
Safety Relay According EN 50205
Digital Output FROM cRIO
GND_24v
IC14
High CTR optocoupler Turn off + 100 uSec
H11G1SM
TO CIBU PIN3
TO CIBU PIN4
TO CIBU USER PERMIT A
GND
DO_15
D82
RL16A
RL16B
IC15
TO CIBU PIN5
TO CIBU PIN6
TO CIBU USER PERMIT B

Conclusion

- Transition time to trigger a beam dump reduced to ~3ms
- Both solution will be tested and validated with a CIBU in our lab in collaboration with Christophe Martin (TE-MPE-EP)
- Beam Dump will be implemented for :
  - Alice Dipole and Solenoid
  - Lhcb Dipole
  - Atlas Central Solenoid (MSSa and MSSb)
  - CMS Solenoid (MSSa and MSSb)