

# Installation Workshop LS2

## Detector Safety System

# DSS

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## Safety system

Protects equipment by taking automatic actions:

*electrical switch off, close valves, extinguisher system triggering, inform others PLC...*

+ informs people 24/24h (auto. phone call, SMS, mail)

in case of abnormal situation:

*Smoke detection, overheat, water leak detection, humidity too high, flow stop...*

Not to be mistaken with ECS: **Monitoring and Control** (safety level different)

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# reliable

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PLC with Redundant CPUs, redundant Power supplies on UPS.

Common system for the 4 LHC Experiments , common piquet (EP/DT) for internal 'hardware' problem

DSS runs 24/24h - **365/365d** since 2005 ! → *only 2 major failures in 13y (1 in LHCb, 1 in CMS)*

# useful

In principle, you do not need DSS !



Many 'abnormal' situations detected in LHCb in the past

- electronic On without cooling (during commissioning, maintenance)
- water leaks detected
- stop of gas, cooling detector...
- smoke detected



Capacitor starting to burn  
switched off by DSS

# Input / Output

## sensors 'direct connection to PLC' possibilities

- Digital → closed contact to provide (opening triggers an alarm)
  - ex: Thermo switch
  - Flow switch
  - Pressure switch
  - From other PLC (Smoke detection, cooling detector...)
- Pt100 → temperature (low or high thresholds trigger an alarm)
- Analog → 4-20 mA or 0-10V (low or high thresholds trigger an alarm)
  - ex: Humidity
  - Pressure

## A Water leak system already integrated in DSS (gives dry contacts)

- Probe or +/- 'sensitive' cable to connect

## Output → simple relay (opening to take action)

- Interfaced already with main electrical distribution (ex: switch off racks in D3)
- main Water circuit valves
- interlock for HV (ex: Caen HV)



# Fire extinguishers systems as part of DSS

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- **Rack CO2 bottles**
  - to exchange in LS2 (date expired)
  - efficient only if rack very well closed (not always the case)
  - could cause accident in case of involuntary opening (asphyxiation, skin burn)
  - reinstall or not ? for which rack ? → equipment owners to decide
- **OT Water Mist** system: no need anymore (Scifi compliant with safety rules)  
→ will be removed
- **D1+D2 Online Water Mist** system → no decision to dismount them in LS2



# Requirements for LS2

- RICH: additional temperature sensors (to clarify)
- Few inputs foreseen for new CO2 Cooling plants (Velo/UT)
- no other requests so far

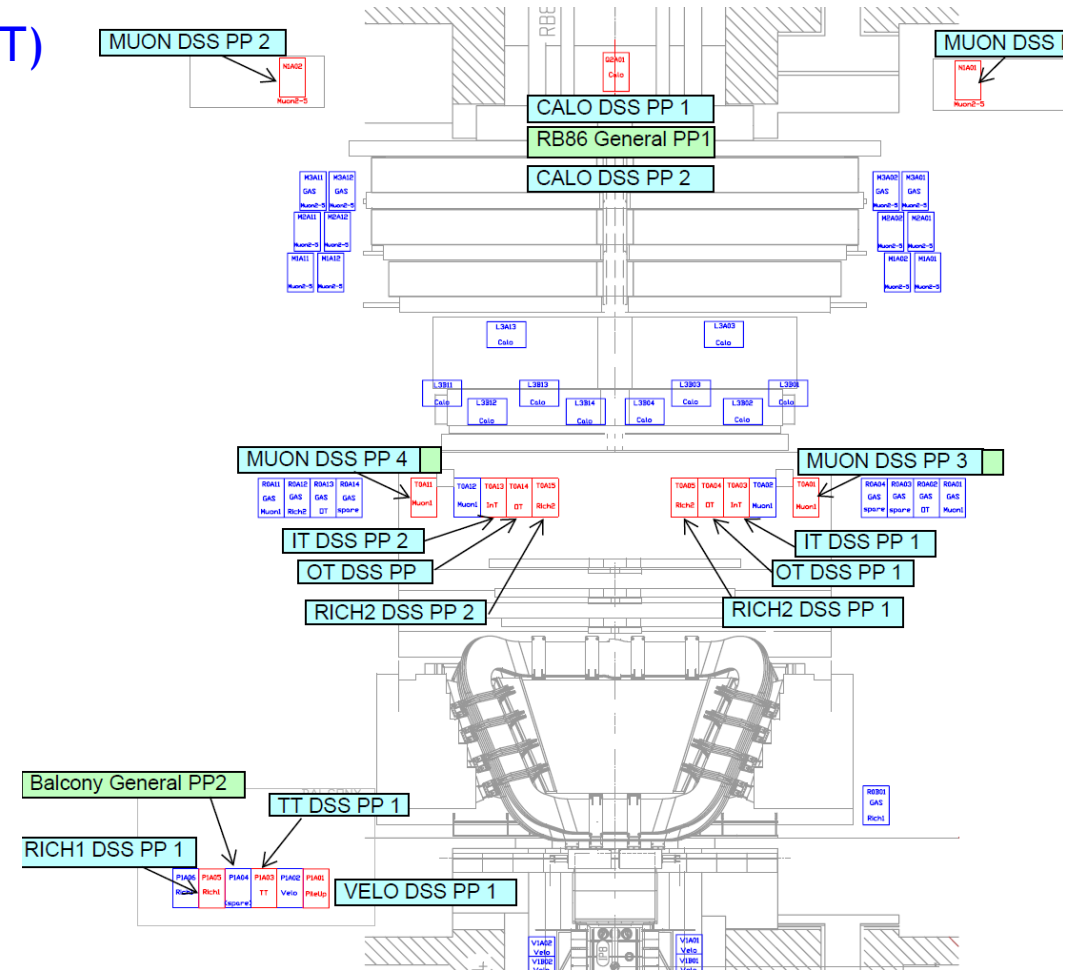
Connection quantity limited in DSS Patch Panels in Detector side

Last dead line for requirements: October 2018

And preferable before, if 'DSS hardware' modification needed → Long distance cables to install, Patch Panels to built, space to find



Connections available / PP:  
27 pairs for Inputs (3 cables)  
9 pairs for Output (1 cable)



18 Patch Panels installed in the sub-detector racks

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## Conclusion

- DSS reliable and useful since 2005
  - Each Project Leader must define the need for his detector
  - Risk analysis, sensors needs, action Matrix → to define as soon as possible [Sub-Detectors]
  - Existing documentations → to update (*EDMS* *OT* , *MUON* , *Velo* , *TT* , *IT* , *Rich* , *Calo* )
  - Sensors + short ‘on detector cables’ → to install/modify [Sub-detectors]
  - New ‘long distance cables’ and Patch Panels → to install ?? [Cabling team]
  - cabling (PP side or PLC side) → to modify [Cabling Team]
  - Matrix to reprogram [Laurent]
  - Tests during LS2 [Sub-detectors + Laurent]
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