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# Conclusions on UPS powering test and procedure

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Acknowledgements: V. Chareyre, M. Zerlauth

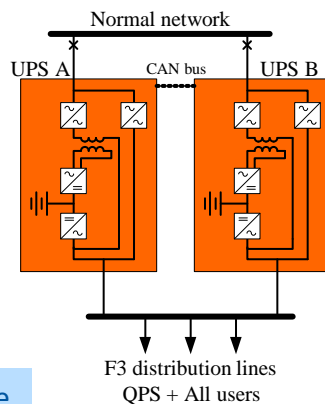
# Outline

- Motivation and areas affected by the tests
- Sequence of tests and schedule
- Preparation and impact on users
- Conclusions

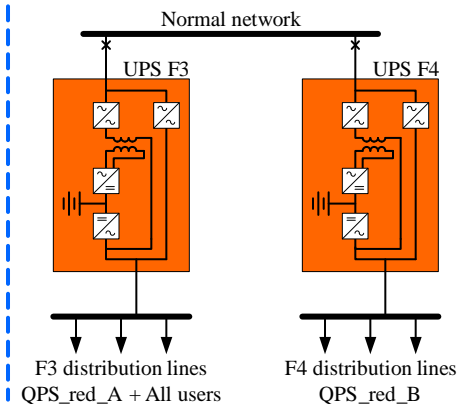
# Motivation

- Machine Protection Systems depend on **UPS power to maintain protection and diagnostics functions** during power outages and perturbations
- UPS power was **reconfigured after 2008 incident to guarantee truly redundant powering** (F3/F4 lines in tunnel for e.g. QPS, additional power from other IP side in even points,...)
- Separation came with **degradation of availability and maintainability**
- LS1 campaign used by EN/EL to consolidate situation and restore dependable powering -> MPP presentation V.Chareyre May 2013

*RE alcoves and LHC odd points  
Before 2009*

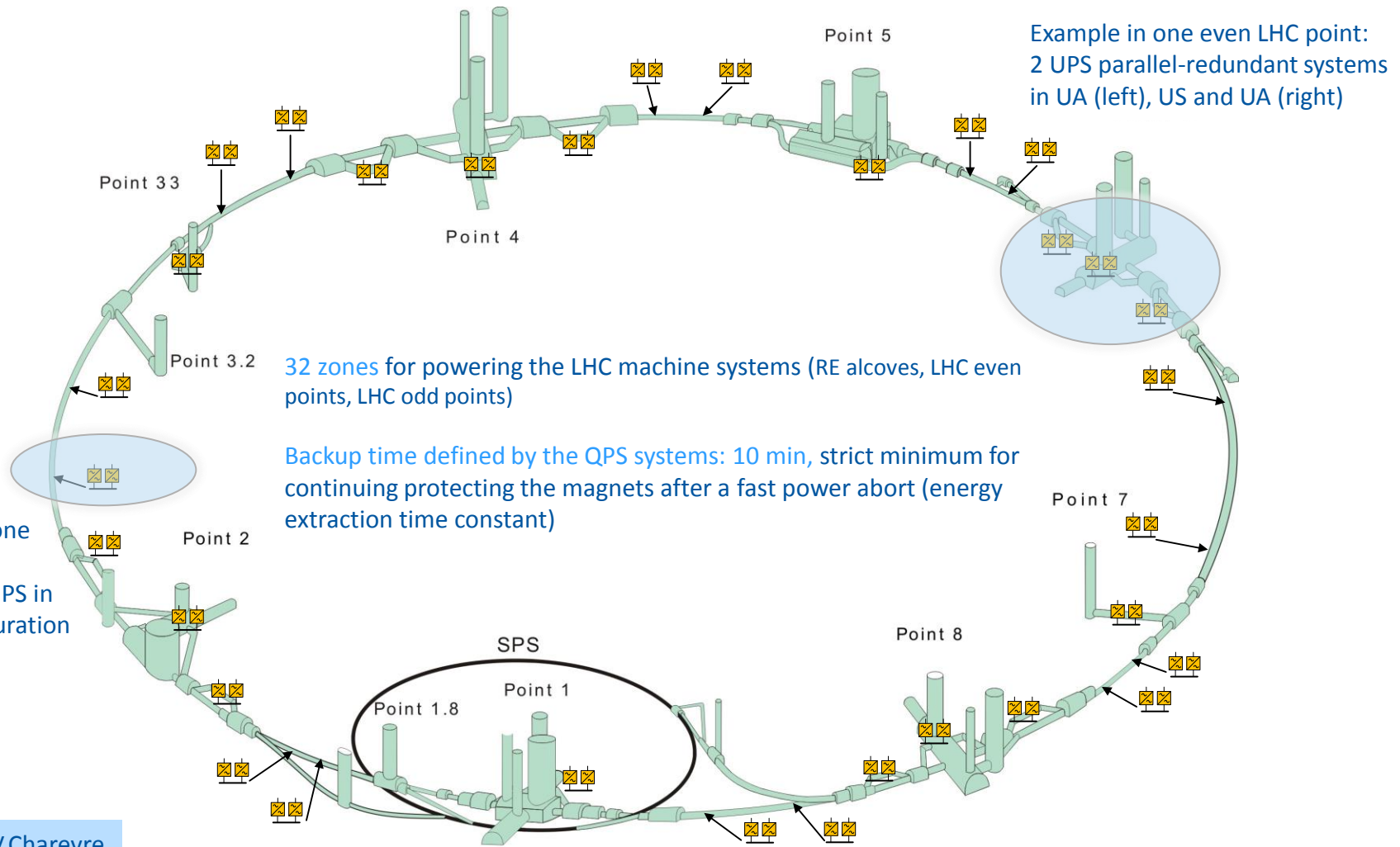


*From 2009 till LS1*



Courtesy V.Chareyre

# Underground areas affected



Courtesy V.Chareyre

# Sequence of tests (per zone)

**t= 00h00m** => The switchboard feeding F4 line is switched off

- Check of the equipment by the owners

**t= 00h10m** => The switchboard feeding F4 line is powered back on

**t= 00h20m** => The switchboard feeding F3 line is switched off

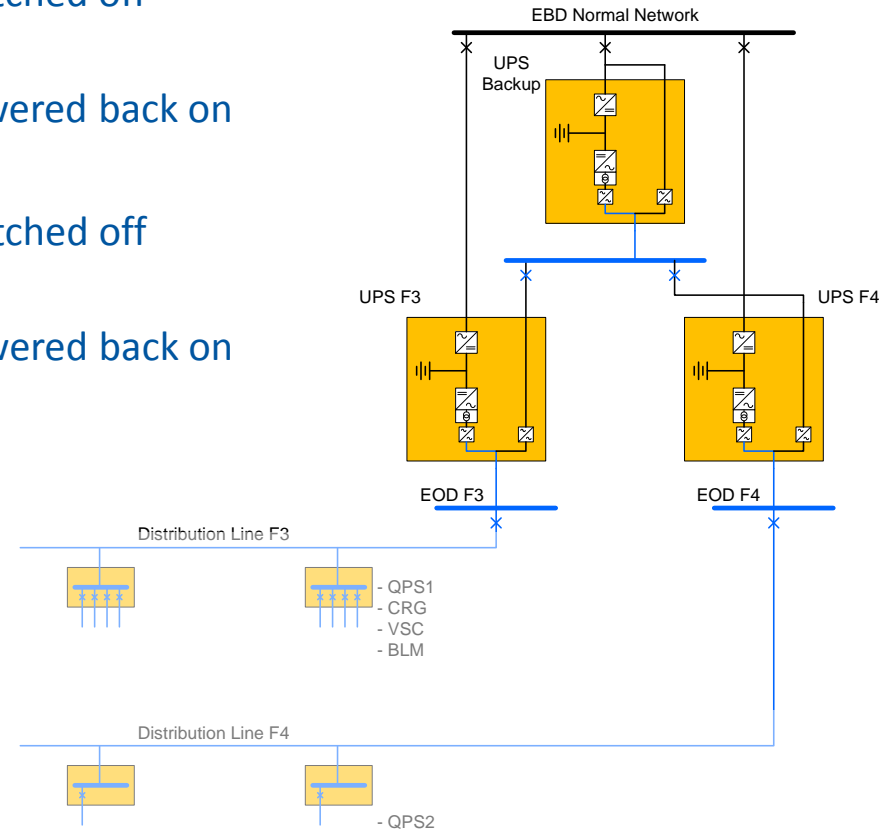
- Check of the equipment by the owners

**t= 00h30m** => The switchboard feeding F3 line is powered back on

**Following a request from LBDS team:**

**During type test** => Both F3 and F4 lines will be switched off at the same time

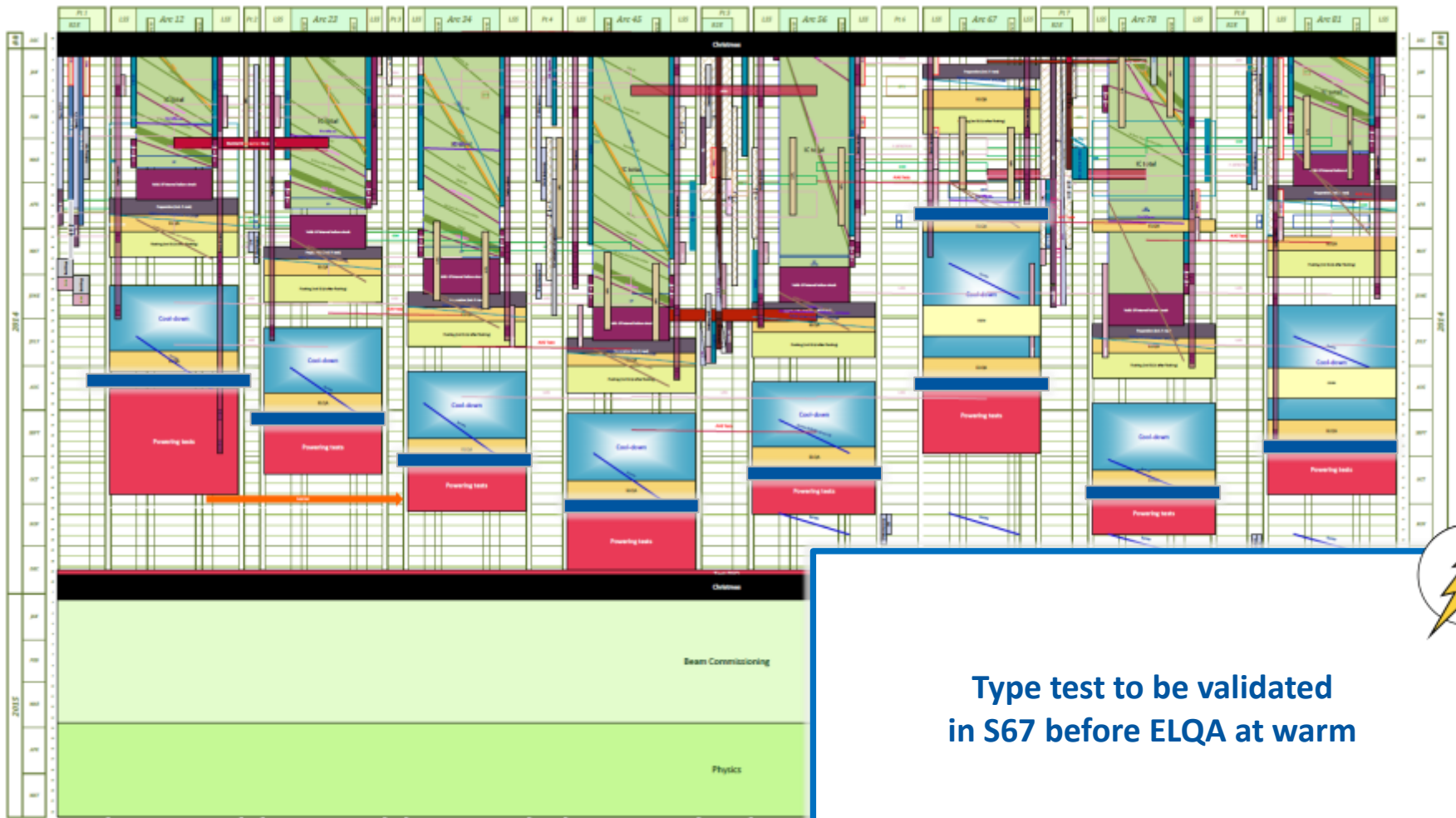
IT star-point rack is transferred back to its initial power supply coming from the UPS F3



**Note:**

- No operation on the UPS systems
- PIC will not be triggered!

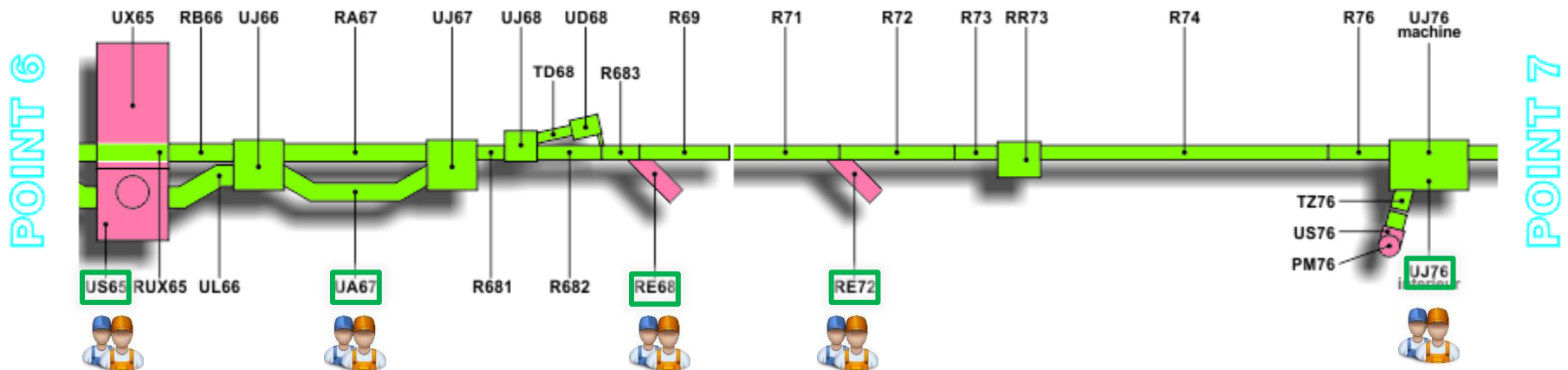
# Proposed schedule



Type test to be validated  
in S67 before ELQA at warm

# Type test before cool down

- **Validation of the UPS test procedure** before cool down
- **Sector 67** (covering US65, UA67, RE68, RE72, UJ76)
- Test foreseen in **week 17** (mid-end April before cool down)
- Test type **during LBDS dry-run would have an impact on cool down**
- **Impact on cryogenics equipment** (redundant 24V powering for controls and instrumentation only in even points [US])
- Several zones could be tested in parallel (2xEN-EL experts per zone)



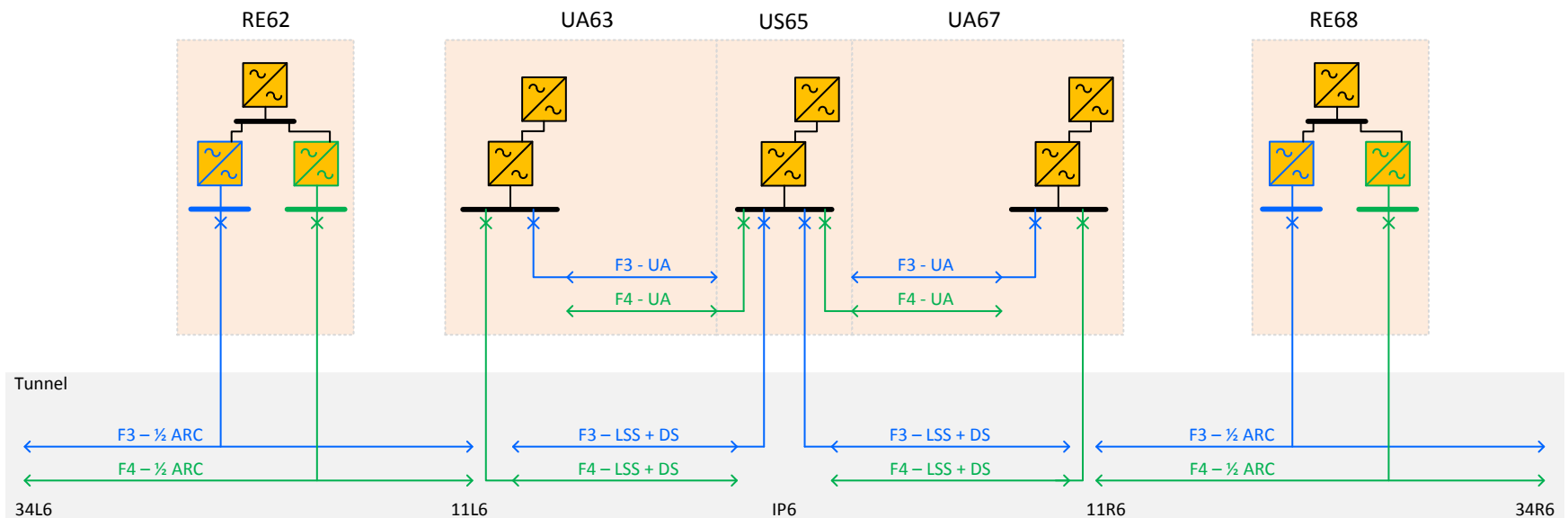
# Preparation for the test

- **IT star-points** will be transferred **to secured network**
- IT star-points per area: **1 per RE, 3 per UA, 1 per US**
- **Up to 2 days** for preparing/removing secondary power supplies before/after tests
- **Preparation works should be transparent for the users** (of course they cannot count on the star-points during 2 days)
- Could be done **in parallel with ELQA activities**



# Impact on cryogenics

- **Cryogenics:**
  - Cryogenic system in **idle mode** to minimize the impact of tests
  - Cryogenic conditions **will be restored in 24h**
  - **Instrumentation and control system fed by redundant UPS in US** (UPS machine and UPS cryo provide redundant 24V UPS after LS1)
  - Special care has to be taken in order to **minimize the impact on cool/down of adjacent sectors**



# Impact on users

- **GSM:**
  - They are on secured network and should **not be affected by the tests**
  - Useful for coordination with CCC
- **Powering Interlock System (PIC):**
  - Hardwired interlocks between PIC and UPS **will not be triggered!!**
  - Tests should be compatible with **powering tests on adjacent sectors**
- **Quench Protection System (QPS):**
  - **Quench heater power supplies** need to be powered
  - **WorldFip repeaters** on UPS F3 line will be **off during power cut**
- **Power converters (PC):**
  - Check behaviour as the PIC will not trigger a Fast Power Abort

# Safety measures

- Access to areas concerned **will be restricted to people involved in tests** (EN-EL...)
- Tests will **not impact personnel safety equipment** (ODH, fire detection, access, lifts...), they will remain operational
- Tests will be **integrated in the official LHC planning** and announced in advance

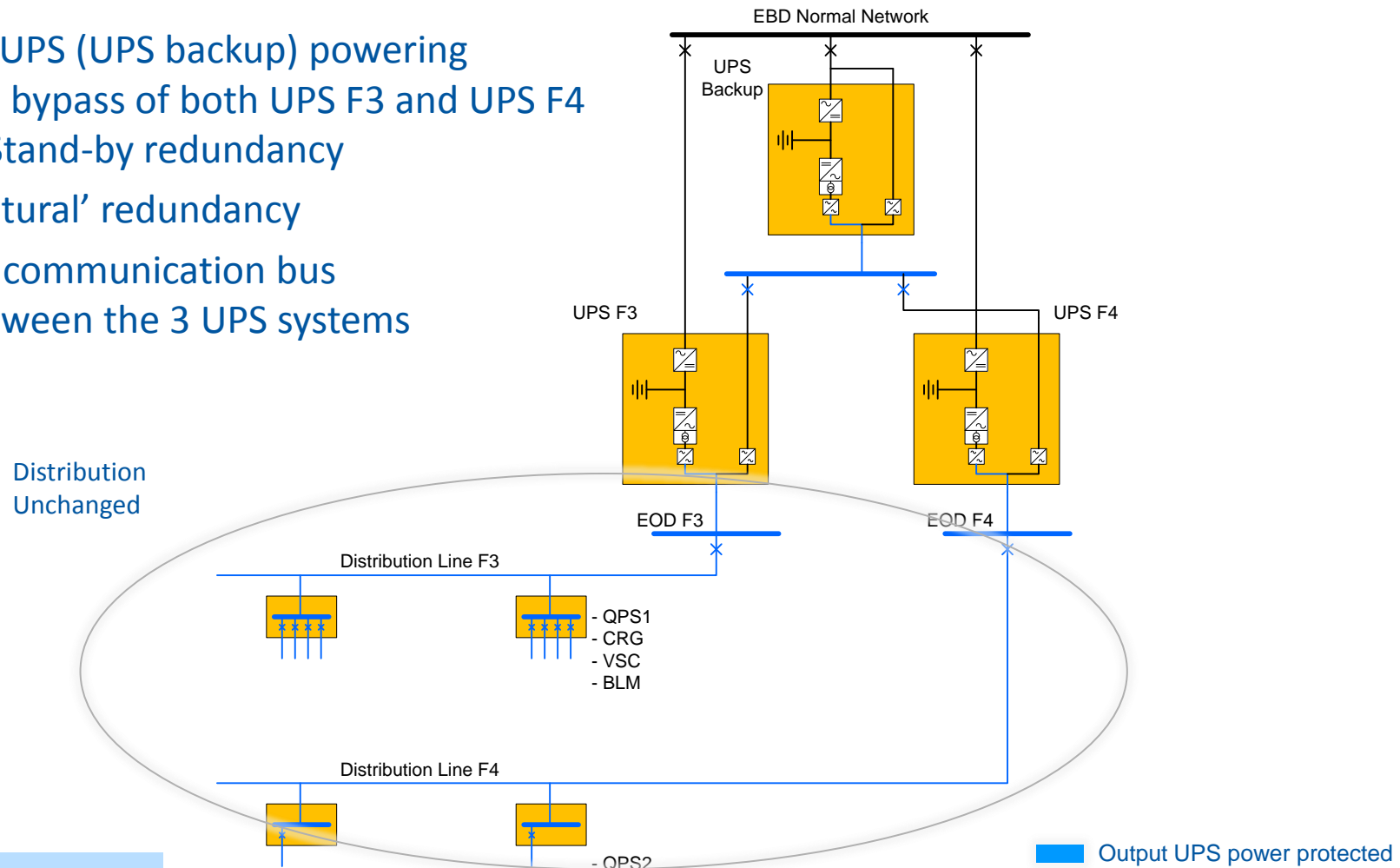
# Conclusions

- Test proposal has been **approved by the LS1 Committee (LSC)**
- Final dates for tests will be fixed in the official LHC planning
- **Test procedure will be released in EDMS** for approval (mid March)
- Test type to validate the test procedure and better understanding of system dependencies during test
- **ECR describing UPS consolidation works during LS1** (Action: V.Chareyre)

Thanks for your attention

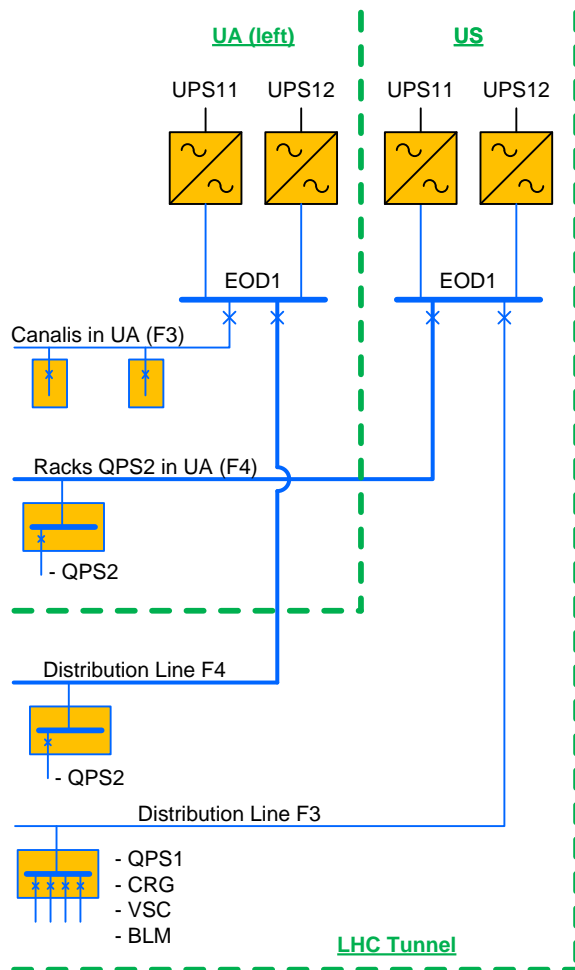
# New UPS configuration in alcoves and odd points

- 3<sup>rd</sup> UPS (UPS backup) powering the bypass of both UPS F3 and UPS F4 = Stand-by redundancy
- 'Natural' redundancy
- No communication bus between the 3 UPS systems



Courtesy V.Chareyre

# UPS configuration in UA and US zones



- UPS configuration not changed
- UPS system replacement one-to-one
- In case of failure of one UPS system in a redundant UPS configuration:
  - Stop of the faulty UPS system
  - **Automatic transfer of the full load to the remaining UPS system**
  - F3 and F4 distribution lines fully protected

■ Output UPS power protected

Courtesy V.Chareyre