



## **Status of crab cavity test in SPS**

G.Vandoni on behalf of WP4

32<sup>nd</sup> HL-LHC TCC, 29<sup>th</sup> June 2017

# Outline

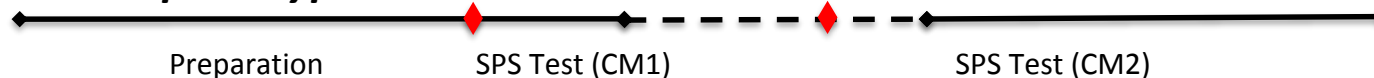
- Overview of the SPS program scopes
- Master Schedule
- Status: cavities, cryomodule, SPS
- YETS in SPS
- SM18 tests, plan and rationale
- Conclusions

# Scope of the SPS CC programme

- Assemble 2 prototype cryomodules, DQW and RFD
- Fully qualify in SM18 for safety and performance
- Prove feasibility in SPS proton beam

- Qualification; SM18 and SPS
- Prepare industrialization

## SPS prototype beam tests



## LHC pre-series

(2 Industrial Dressed Cavities)



## LHC series production & Installation (8 CMs)



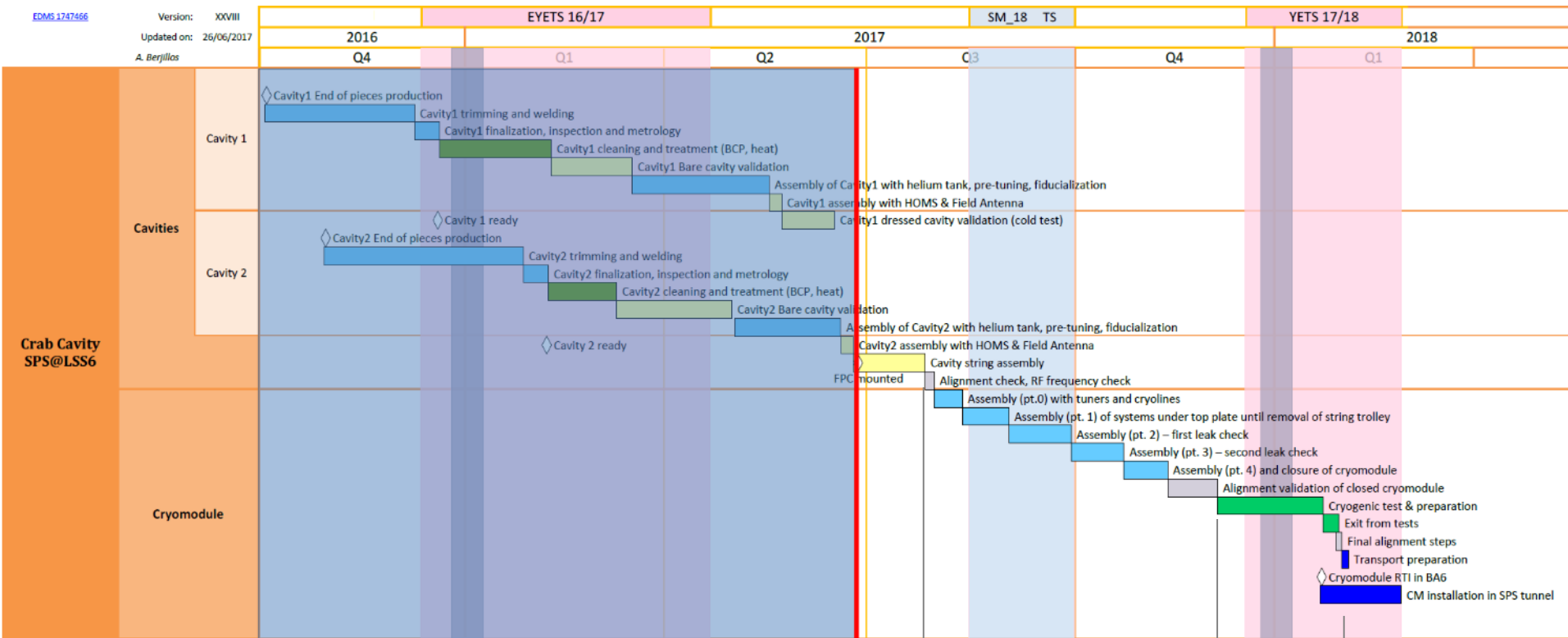
# Master schedule, DQW cryomodule

EDMS 1247466

Version: XXVIII

Updated on: 26/06/2017

A. Berjillos



[Master Schedule rev\_XXVII]

String  
assembly start:  
23/06

String  
assembled:  
25/07

CM assembled  
in SM18: 4/12

CM ready for SM18  
cooldown 15/12

CM ready for  
installation BA6:  
31/01

String assembly started



# Status Cryomodule

## [CAVITY #1]

Bare cavity successfully tested, beyond specification

Dressed cavity tests affected by a superfluid He leak (disappearing at  $T > T_\lambda$ )

**Superleak review Friday 30<sup>th</sup> June with experts**

RF Test ongoing at 2.5K

Next step: warmup, FPC installation in clean room

## [CAVITY #2]

Bare cavity successfully tested, beyond specification

Cavity dressed in He tank + HOM couplers and pick-up

**No dressed cavity test foreseen in Master schedule**

## [CRYOMODULE]

Pieces arriving, “portique” assembled in SM18

Vacuum vessel leak check today

String chariot assembled, valves installed on it



# SM18 assembly area



Assembly area ready for assembly of cryomodule, dedicated « portique » erected in front of the ISO5 clean room

# Status SPS

## [TRANSFER TABLE]

Underground visit by contractor in TS#2  
Installation sequence being worked out

## [RF POWER]

IOTs installed in BA6  
Test charge installed in TS#2 for commissioning

## [LLRF]

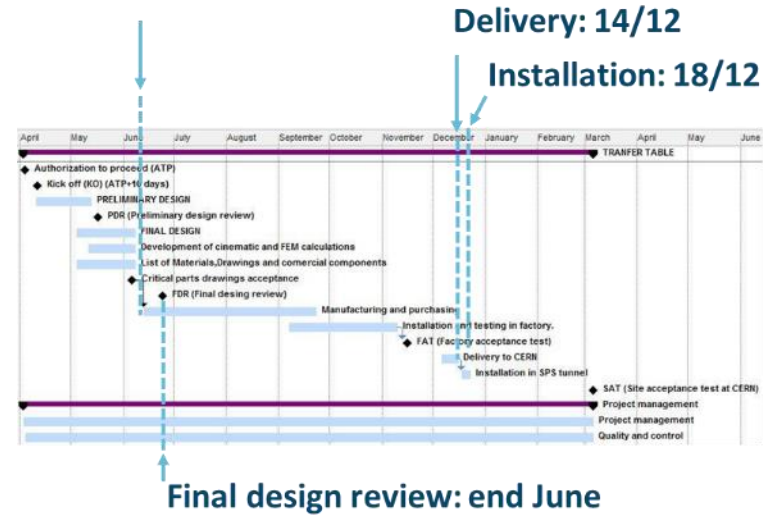
Faraday cage supplier identified

## [CRYOGENICS]

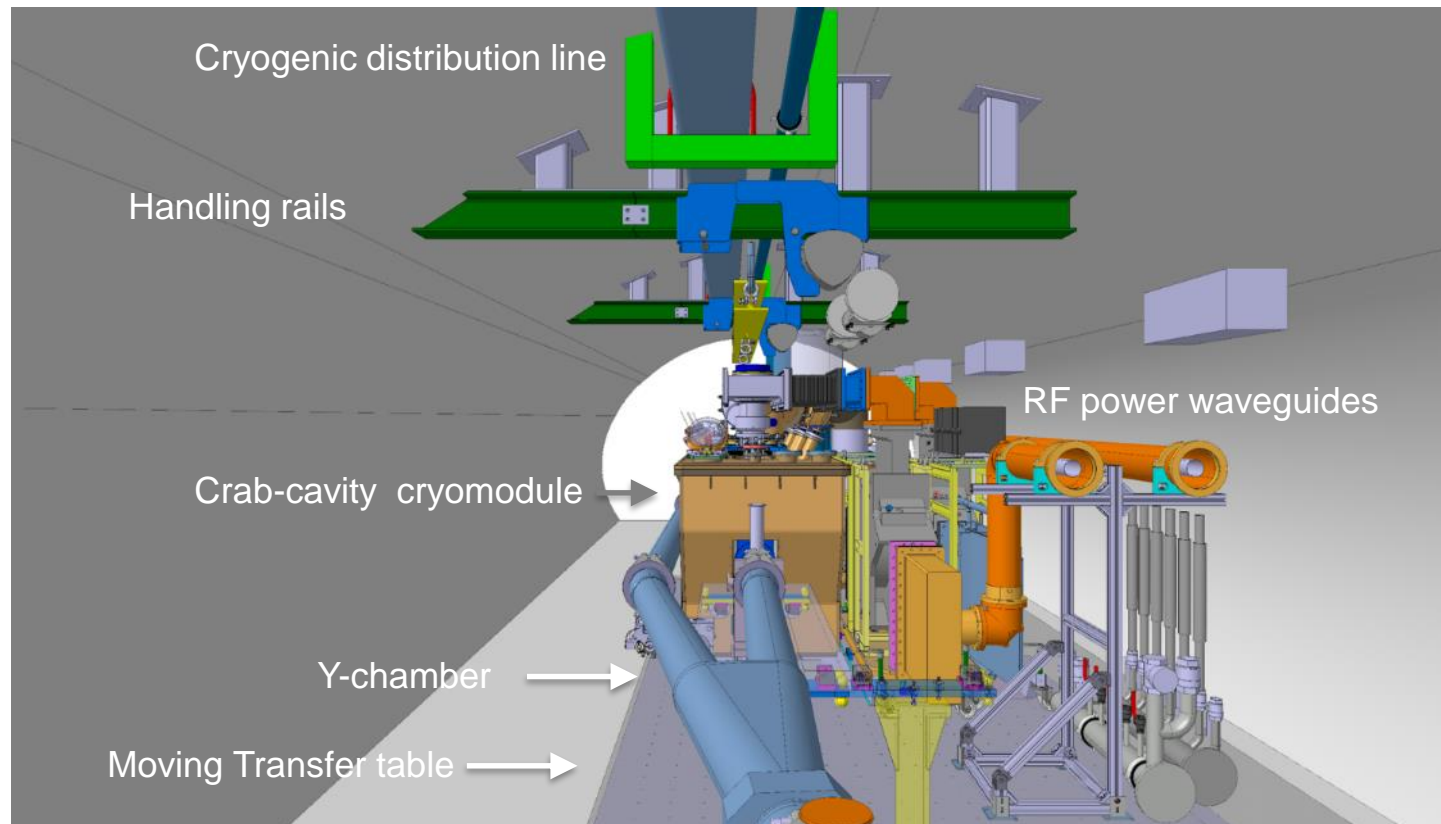
Helium buffer tanks transported to BA6, waiting for the new concrete slab  
Underground visit by refrigeration contractor in TS#2

## [INFRASTRUCTURE]

Connectors and cable routing continues in TS#2  
Water manifold removal for intermediate storage in BA6

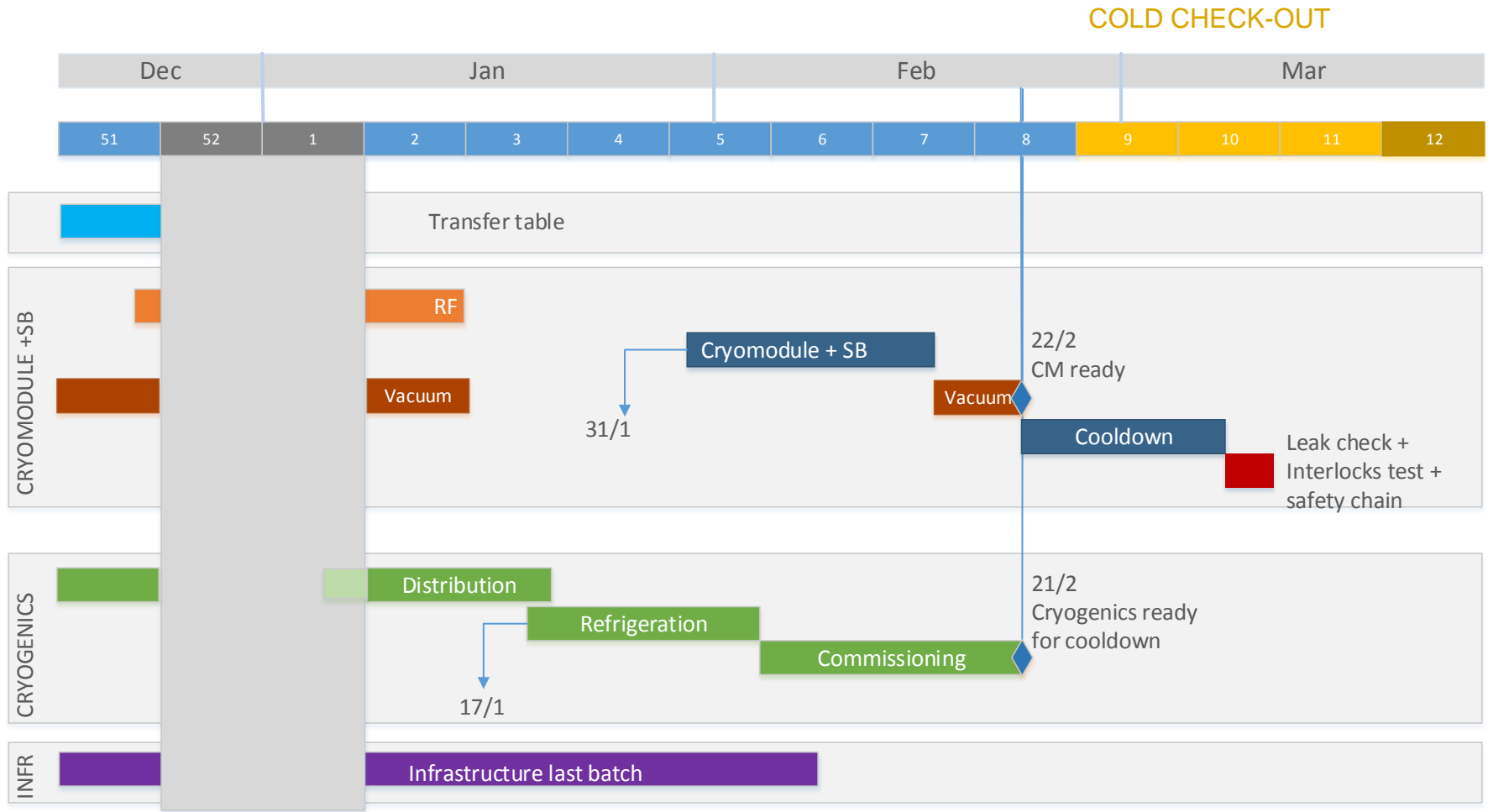


# SPS Crab-cavity test stand





# YETS Scheme



CRITICAL PATH: Refrigeration, Cryomodule

Earliest cooldown of the cryomodule in SPS : 21<sup>st</sup> Feb (after cryo commissioning)

# SM18 Cryomodule Tests

## [SAFETY]

Pressure test at ambient temperature (at max allowable pressure)

**Cryogenic design** validation

Failure of **vacuum** components at cold

RF safety: no need for tests (EIS in SPS)

mandatory for  
cooldown clearance

## [OPERATIONABILITY]

**Instrumentation** check & commissioning

Static heat load: can we cool down the cryomodule to 2K?

**Beam** and **Insulation vacuum** validation at cold

FSI monitoring system (check with BCAMs) and suspension system functionality

Check pre-adjusted cavity position after contraction, readjust position at warm if needed

Do we need SM18 **cooldown** before going in SPS?

- Not for safety.
- Not if we can clear the tunnel in 6 days (warmup, disconnection, removal)
- However, big logistical constraints in SPS versus dedicated assembly infrastructure in SM18

# SM18 (RF) Cryomodule Tests

## [RF VALIDATION]

Coupling measurement **at warm** (low RF power, check no coupling)

Frequency shift tracking during cooldown (low RF power)

Check of RF instrumentation

**Tuner validation, mechanical**

**Tuner validation, with frequency response (low RF power)**

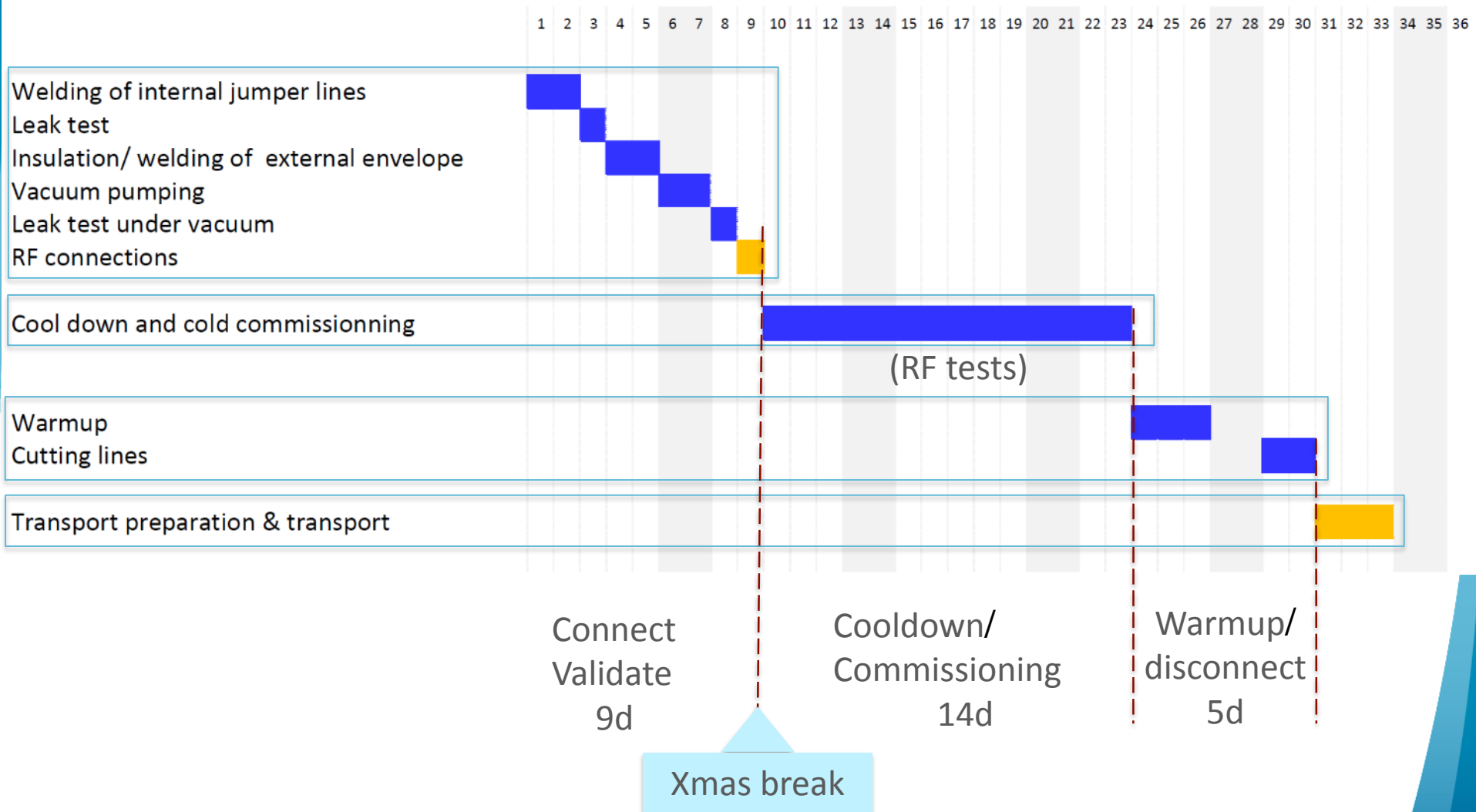
HOM spectrum between the two cavities at warm, cooldown and cold (low RF power)

**Initial RF conditioning is foreseen to be done in SM18 with 1 kW amplifier**

Do we need SM18 RF tests before going in SPS?

- Desirable but not mandatory
- Proper RF qualification usually requires more time than available in planning

# SM18 M7 Bunker tests



# Conclusion

**[YETS]** No request for YETS extension

Dressed cavity#1 test results are critical for the overall planning of the project

September milestone to re-evaluate baseline schedule

Alternative scenarios being prepared to ensure proton beam test of the cryomodule in SPS in 2018.

## **[SM18 TESTS]**

Essential validation tests of a complex object

Safety tests at warm required for cooldown clearance in SPS

SM18 is the assembly premise: dedicated infrastructure and tools are here

- Easier fixing of small issues
- Only location for larger repairs

Need 6 days to get the CM out of the SPS



***Thank you***

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