



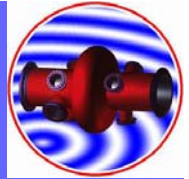
# Remarks on the assembly & test of a fully equipped cryomodule in SM18 SC Test Stand

P. Maesen

SPL Collaboration meeting, 11-12 Dec' 08



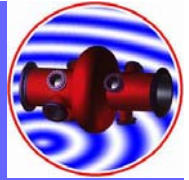
# Content



- SM18 Presentation
- Assembly in clean room
- Horizontal Bunkers
- Vacuum connection & leak detection
- Low power measurements
- Conditioning up to max field
- Plan for future



# SM18 Presentation



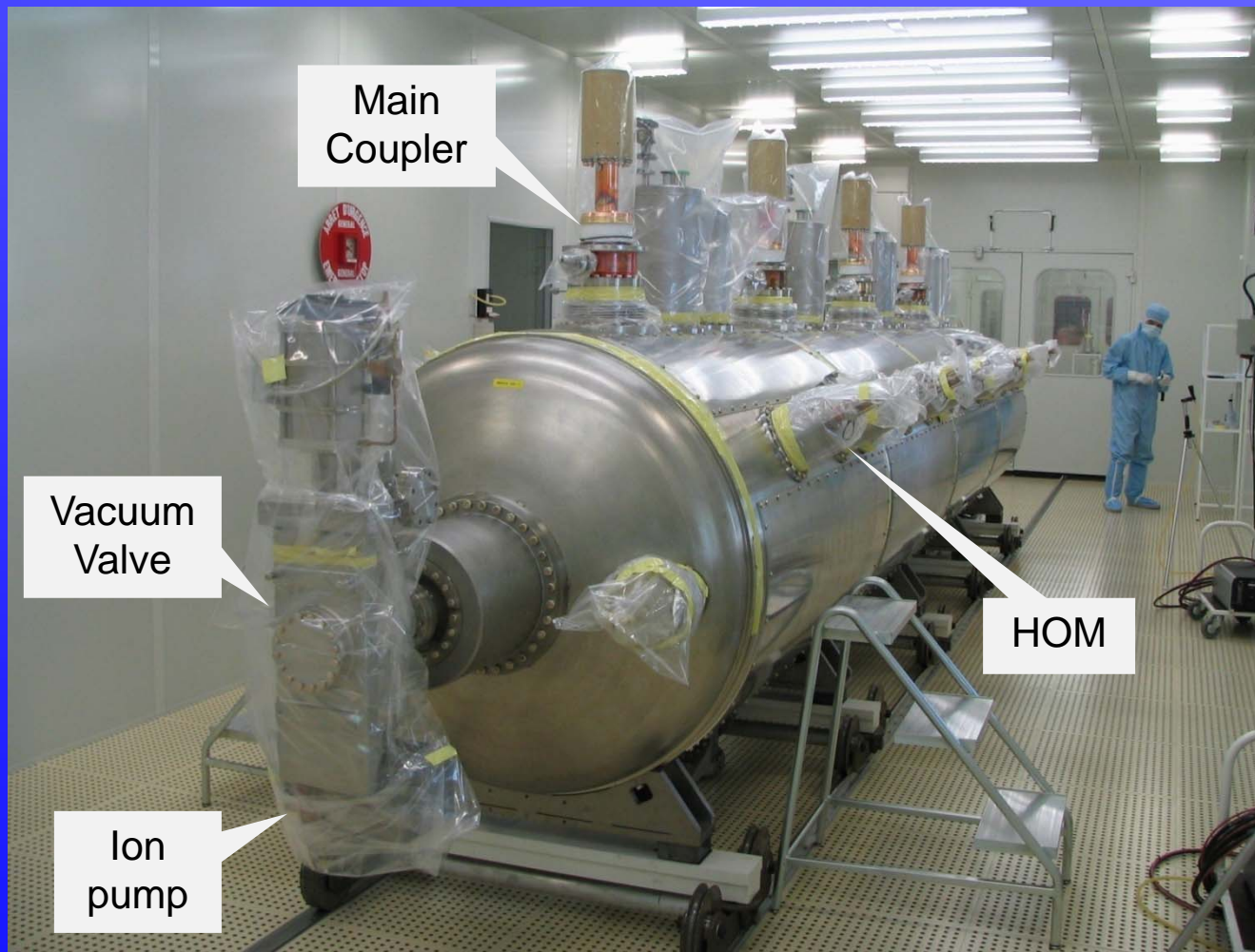
- 2 x 15 meters grey-white room with rail
- 1 canopy for pieces conditioning
- 2 horizontal radiation-safe bunkers
  - First one fed by 352 MHz 300kW cw klystron
  - Second one fed by 400 MHz 300kW cw klystron
  - But :
    - Demineralized water capacity a bit short for parallel operation
    - Not equipped for 2 Kelvin
    - Limited Cryogen availability



# Assembly in clean room

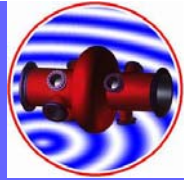


- 30 meters long in 2 x 15 meters Class 1000 then 10

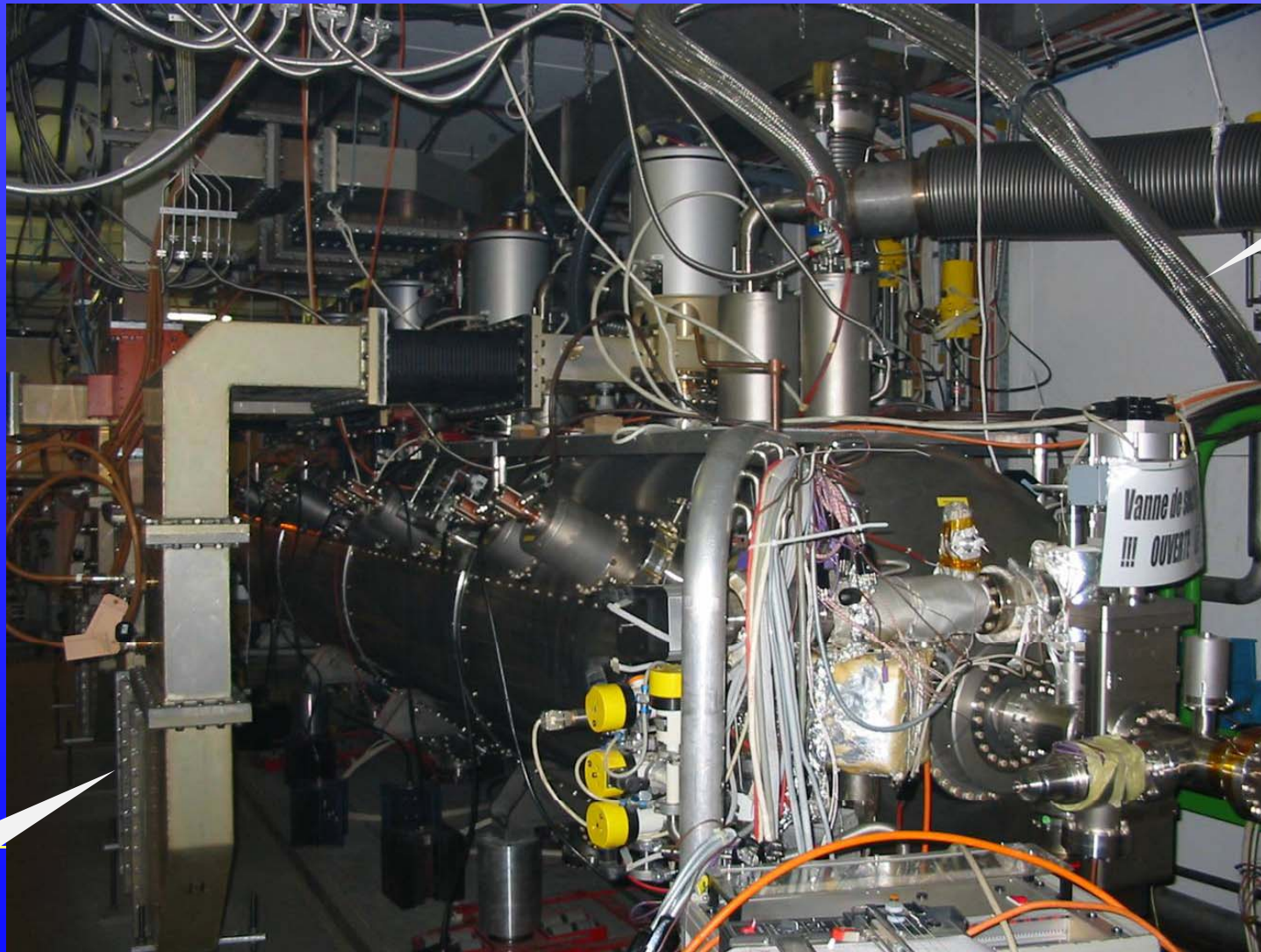




# Horizontal Bunkers



- Transfer of modules to radiation safe bunker
- Connections with cryogenic lines, RF, controls, e- stoppers



RF From  
Klystron

He gas  
return

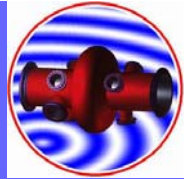
Electron  
Stopper

Wave  
Guide

Vanne de  
!!! OUVERT



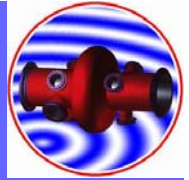
# Vacuum connection & leak detection



- As for the vertical test great care for the vacuum manipulations is mandatory !
  - Low speed oil free pumping system
  - Each operation in clean room followed by pumping and leak detection
  - Penning gauge near coupler



# Low power measurements



- Loaded Q, tuning range, HOMs measurements
- Antenna calibration
- And before power feeding
- Dedicated Interlocks installation & full check
  - *Main couplers very sensible !*
  - Remember : in case of ceramic break down, pollution of the whole module to be dismantled !
  - Fast RF shut off with vacuum increase, arc detection, He pressure raise, RP alarm, RF zone access etc.



# Conditioning up to max field



**Read and Display**

**Pulse**

Power [kW] vs Time samples (depend on the pulse length) [Ig Pulse]

Voltage [mV] vs Time samples (depend on pulse length) [Accelerating Voltage Pulse]

**PULSE SETTINGS**

Start Pulse Length: US\_200

End Pulse Length: CW

**SETTINGS**

Envelope Rise Time, Envelope Flat top, Envelope Fall Time

Min Power: 5, Start Power: 50, End Power: 240

Voltage Limit, Vacuum limit, Vacuum Gain, Vacuum Offset

Pulse Tail Delay [uS]

**RF SETTINGS**

Set RF1: Central Frequency [Hz] 1: 4.00702E+8, Sweep Range [Hz] 1: 5000, Sweep Frequency [Hz] 1: 9, Output Level [dB] 1: 0

Set RF2: Central Frequency [Hz] 2: 4E+8, Sweep Range [Hz] 2: 1E+6, Sweep Frequency [Hz] 2: 10, Output Level [dB] 2: -20

**SWAP STATUS**

RF ON, 80MHz PLL, Faults, RF Ext Veto, VME-BP Veto, RF Soft Veto, RF Saturation, Configuration

**DDS STATUS**

RF ON, Env Ramp Run, Env Ramp UP, Lock LO, Lock125MHz, Lock50MHz, RFON Disable, IRQ Error, Vac > Limit, Vac Veto

**Device**

ALLCondDDS5B1

FESA Error: Successful

Last power loop #: 3

Wait Hours: 5

Pulse Length: 30m [S]

Current Power: 240k [W]

Time: 2/8/2008 8:58:53 AM

Refresh Settings

START, PAUSE, STOP, QUIT

**Envelope**

Vacuum log10 vs Time pulses (20ms) [Vacuum Maximum Envelope]

**Field & power**

Power [kW] vs Time pulses (20ms) [Envelope Ig & Acceleration Voltage]

**Vacuum & attenuation**

Vacuum log10[trpa] vs Time envelope count [Vacuum Maximum long]

**Long Term**





# Plan for Future



- 400 MHz test stand must be kept in good shape for the LHC life time !
- The 352 MHz cw will be modified into pulse mode for Linac 4 purpose
- Needed 700 MHz pulsed klystron (as documented in FP7 proposal Dec2007 ), it should operate in parallel feeding one of the bunker -> to be discussed
- Challenge for up to date field performance