

Infrastructure status and plans at CERN¹⁾

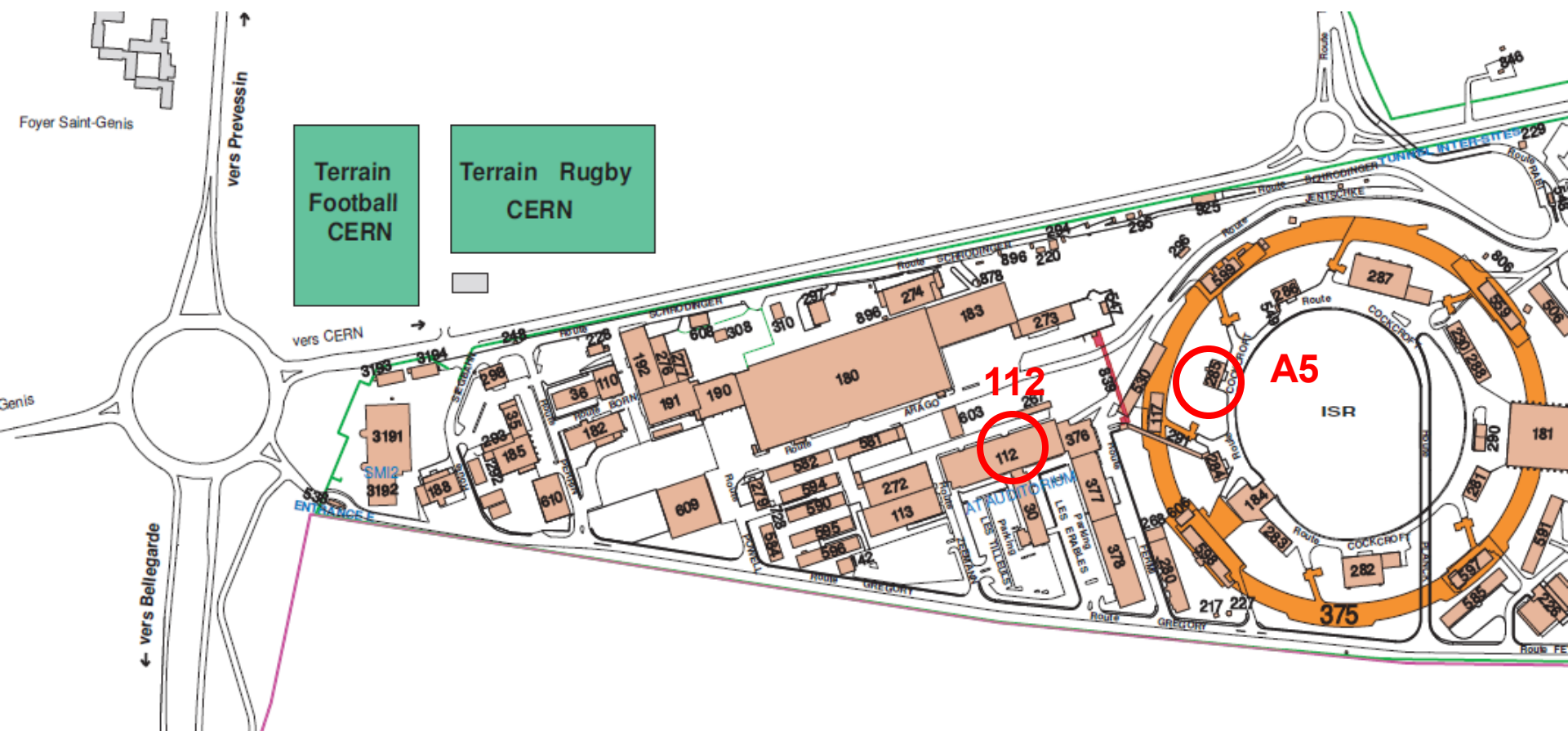
W. Weingarten/CERN

- 1) Most of the slides are based on a talk given by O. Brunner at the 4th ESS-SPL collaboration meeting
<http://indico.cern.ch/conferenceTimeTable.py?confId=82809#20100630.detailed>

Outline

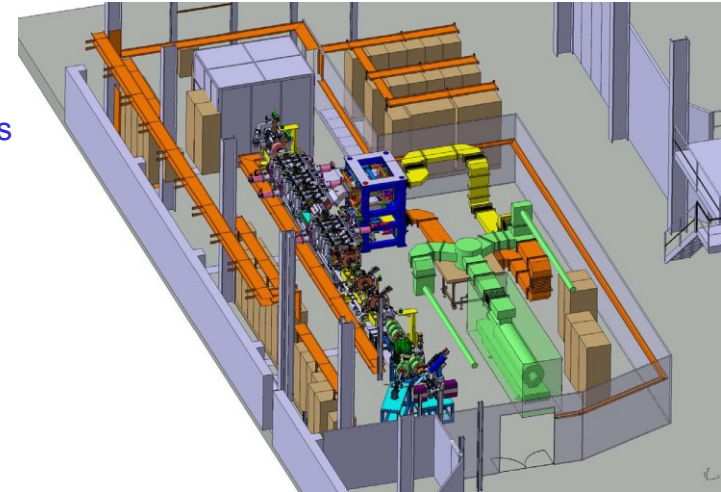
- RF premises at CERN
- RF available infrastructure
- High power and SC RF activities
- SCRF premises at SM18
- Conclusion

RF – premises 2



RF - available infrastructure ¹

- Building A5:
 - LHC & Linac4 High Voltage
 - Klystron modulators, fast protection systems, klystron HV tanks
 - 100kV, 15mA power supply
- Building 112:
 - LHC & Linac4 High Power RF
 - Tests of klystrons, circulators, WG, HV equipment, controls
 - LHC power coupler tests
 - 100kV, 20A power supply, Linac 2Hz modulator
- Building 152:
 - Linac4 3MeV test station
 - Tests of Linac4 3MeV section (in 2011) + some L4 RF structures (2010 ->?)
 - Complete Linac4 2Hz power station (modulator, klystron,...)
- Building 252:
 - SC cavities coating & clean rooms
 - LHC, HIE Isolde, SPL
 - Nb deposition system for HIE Isolde cavities (system for LHC cavities to be re-installed)
 - Low pressure ultra pure water rinsing (max 10 bars)
 - Two clean room (class 10000, 100)
- Building 118 (vacuum group):
 - Chemical treatments
 - LHC, HIE ISOLDE, SPL + many other activities
 - EP station
 - High pressure ultra pure water rinsing (100 bars)



RF - available infrastructure 2



• Building SM18:

- Cavity/cryomodule assembly
- Two 15m clean rooms (class1000/10) + access zone
- One 4 meter high clean room (class100)
- Four vertical cryostats
- Two bunkers
- High RF power zone
- Main control room
- Cryogenic system
 - Limited availability (LHe to be shared with other SM18 activities -> LHC magnets)
 - LHe distribution line will be replaced in 2011



High power and SC RF activities ¹

High power RF

- LHC
 - 400MHz, 330kW CW, 16 power stations in LHC + 2 test stations
- Linac4
 - 352MHz, 1.3/2.8 MW, 19 future power stations + 3 test stations
- CLIC&CTF3
 - 3GHz, 45 MW, 1.5GHz, 25 MW, 13 power stations + 1 place
 - 12GHz, 50MW, 1 test station
- LEP RF equipment tests for external requests
 - 352MHz
- SPL test stand
 - 704 MHz, $\approx$ 1MW, 50 Hz, 1 future test stand
- Crab cavities
 - Under study..

High power and SC RF activities 2

- SC cavities & Cryomodules
 - LHC
 - 4 cryomodules in LHC, 1 spare + 1 spare cavity
 - 3+2 spare cavities to be built & tested (2011-2012)
 - HIE ISOLDE
 - 32 cavities to be built & tested
 - 5 cryomodules to be assembled & tested
 - SPL
 - 4 cavities to be built & tested
 - 1 cryomodule to be assembled & tested
 - CLIC & CTF3 structures
 - RF structure assembly in clean rooms

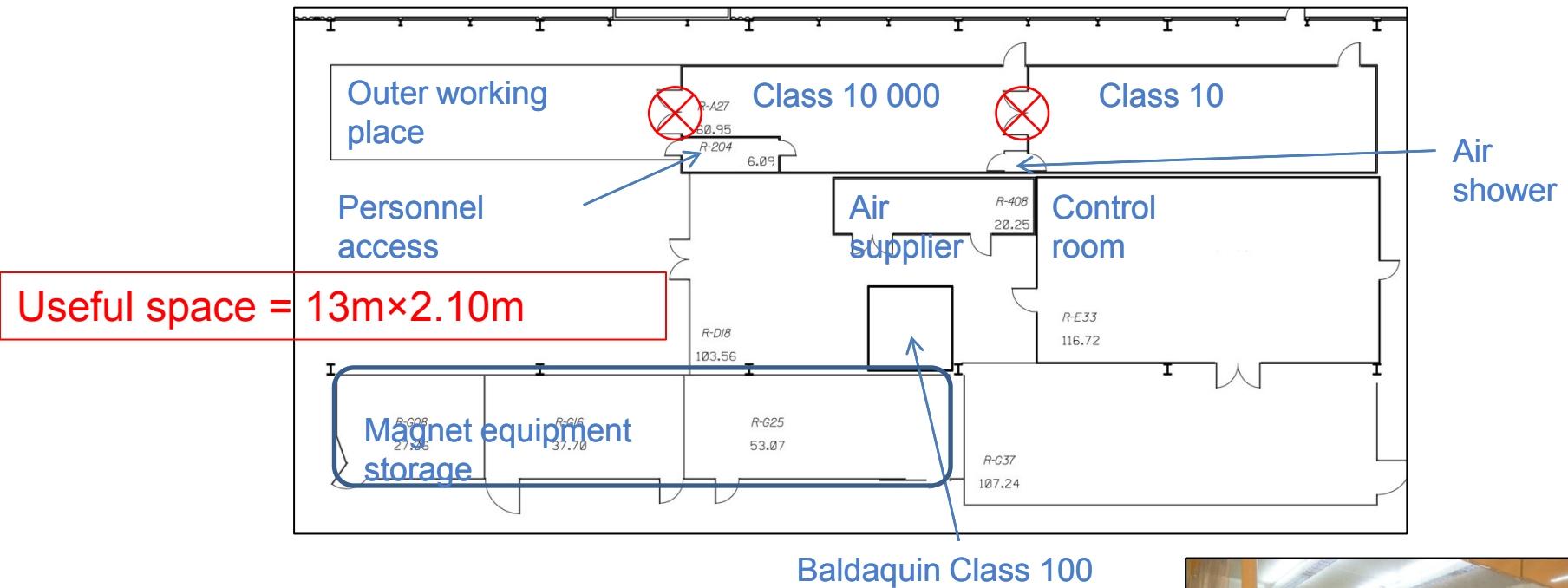
SCRF premises at SM18

*General parameters for **vertical cryostats/bunkers/cryoplant** for
SCRF cavity/cryo-module tests*

General parameter	V3	V4	V5	V6	Bunker A	Bunker B
Size (depth/diam) [m]	4/1.1	2.5/1.1	4/1.1	4/1.1	13 m useful length	13 m useful length
RF frequency [MHz]	704	400 - 1200	100	400	352 – 704	101 - 400
Typical temperature range [K]	2.0 – 4.5	2.0 – 4.5	4.5	4.5	2.0 - 4.5	4.5
Nominal installed RF power	300 W	200 – 400 W	600 W	300 W	300 W CW – 1 MW pulsed	300 W – 300 kW
Max. lHe production @ 4.5 K [g/s] with shared utility	≤ 30 g/s (600 W cooling capacity as liquefier)					
Capacity of pumping unit at 30 mbar [g/s]	18 (36 with 2 pumping units)					
Cooling capacity at cryostat @ 2.1 K, 42 mbar	15 g/s (330 W) liquefier operation					

In red: to be refurbished

SCRF premises at SM18: Existing clean room facility



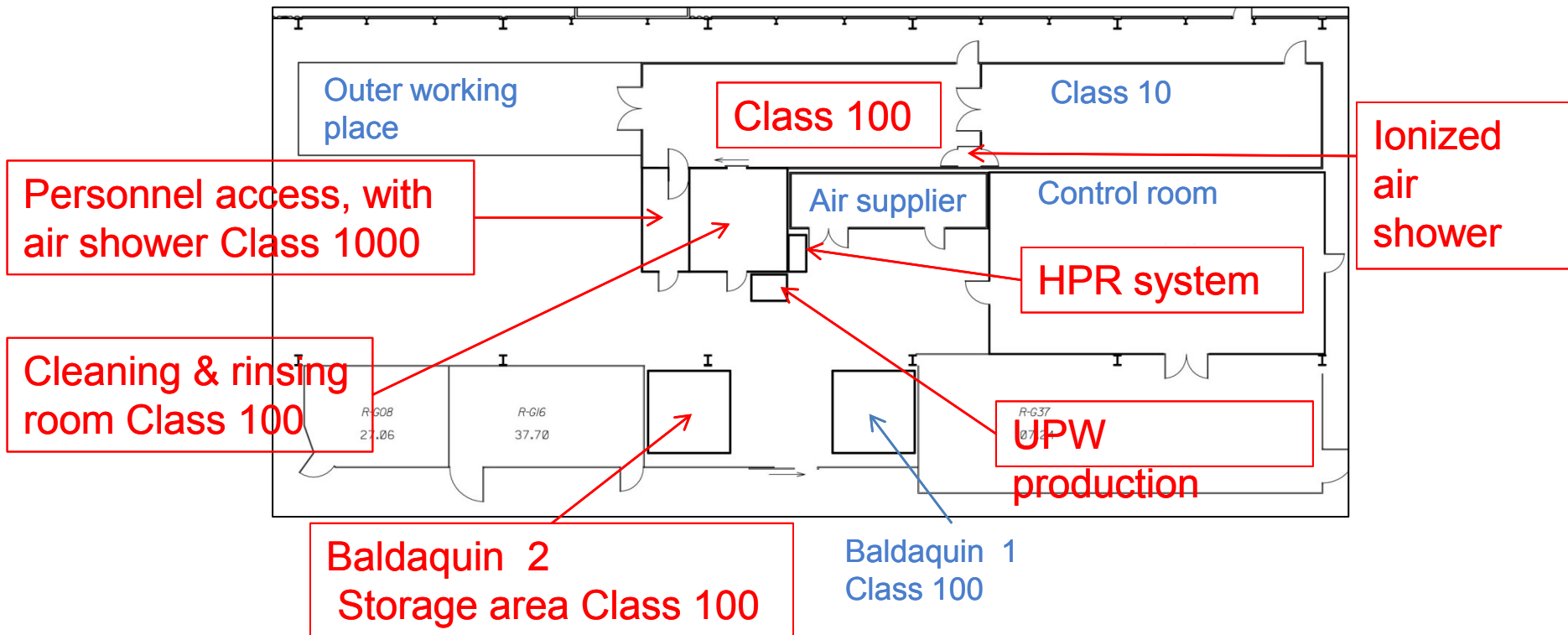
What is missing for high gradient resonators?

- High Pressure Rinsing (HPR)
- Ultra Pure Water (UPW)
- Clean space dedicated to the cleaning operations
- Better cleanliness
- More space



Slide courtesy J. Chambrillon

SCRF premises at SM18: Upgrade proposal clean room facility



In red: to be refurbished

Class	Price per m ² (€)
100	6 000 to 10 000
1000	4 000 to 8 000

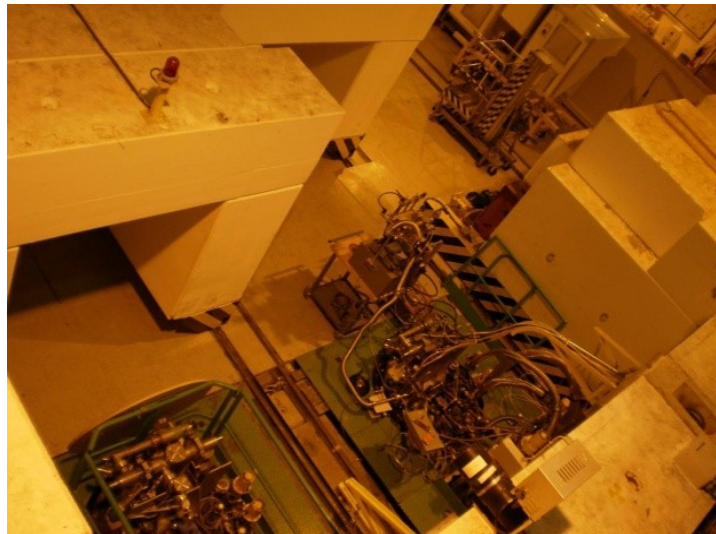
Slide courtesy J. Chambrillon

SCRF premises at SM18: **SPL cryomodule – cavities - assembly**

- Will profit from all existing infrastructure
 - Clean rooms
 - UP water rinsing stations
 - EP station
- SM18 clean rooms not fully compliant with SPL cryomodule assembly requirements
 - Must be equipped with:
 - Dressing zone (class100)
 - UP water rinsing zone(class 100) – main couplers, HOM couplers,...
 - Existing 15 m class 10 room shall be equipped with vacuum leak detection and other equipment
 - J. Chambrillon, Cleanroom refurbishment in SM18 within the SPL project frame, feasibility study, sLHC Project Note 0026, 2011-01-24

SCRF premises at SM18: **SPL cryomodule – Cavity tests**

- SM 18 is equipped with four vertical cryostats
 - LHC cavities (4.2K) – operational
 - HIE Isolde cavities (4.2K) – operational
 - Quadrupole resonator for sample tests (2K) – operational
 - SPL cavities (2K) – availability: summer 2011
- One fellow works on SC cavities diagnostic tools
 - Temperature & X-ray mapping (not yet started)
 - He II second sound development (test station in CERN Cryolab)



SCRF premises at SM18: **SPL – high power tests** ¹

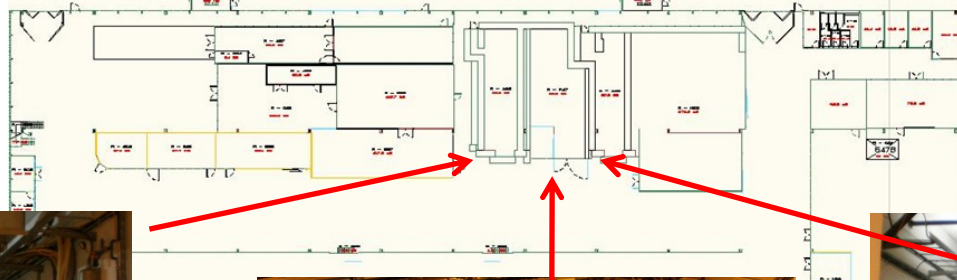
- Two bunkers in SM18:

- Bunker A :

- will be modified for 2K operation (2011) /control system to be completely renewed
 - will be modified for the Linac4 RF structure tests (2011 -> end 2012)
 - ready for SPL cryomodule tests in 2013

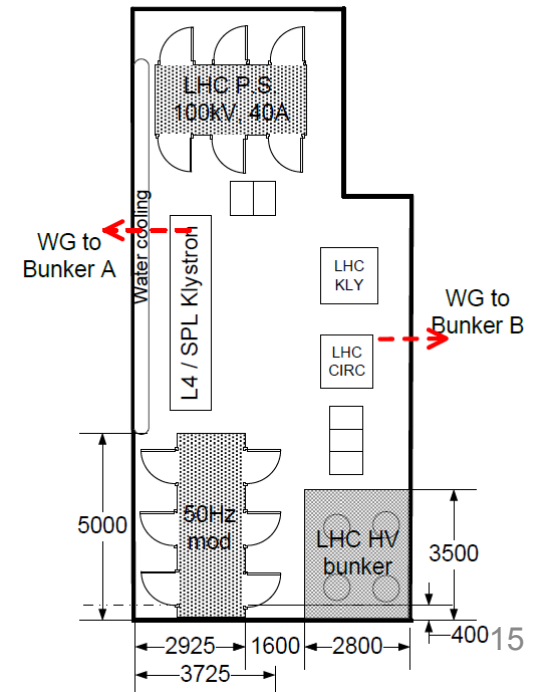
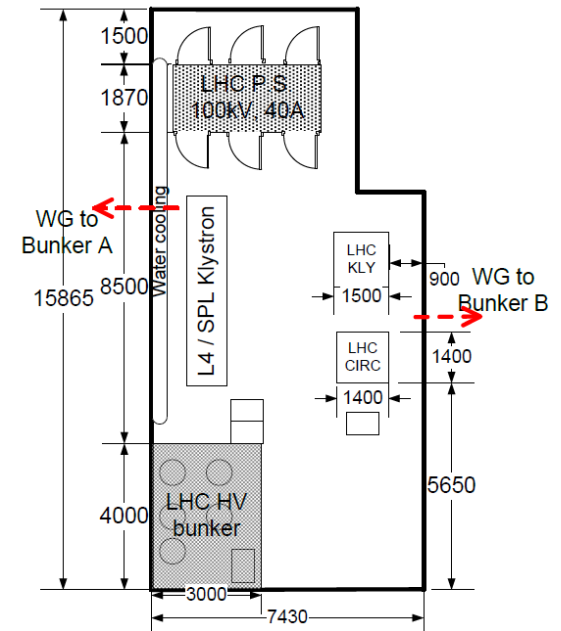
- Bunker B:

- operational
 - priority: LHC cryomodules
 - HIE Isolde cryomodule tests (2012/14)



SCRF premises at SM18: SPL – high power test

- Bottleneck is the High RF power zone:
 - Very crowded area:
 - 100kV, 40A Power Converter
 - LHC high RF power
 - LHC HV bunker
 - 352MHz 1.3MW klystron (Linac4 tests)
 - No real extension possible
- Upgrade towards Linac4 / SPL tests:
 - Move LHC HV bunker to free space for pulsed modulator
 - 2011: installation of a 2Hz Linac 4 type modulator
 - Asap: integration of 50Hz modulator – **footprint??**
 - Specify & order high power components
 - 704MHz, 1MW klystron (specs 90% completed)
 - **Interface with modulator not defined!**
 - Circulator & RF load (specs to be done)
 - WG components (specs to be done)
 - Specify & built control system
 - ready early 2011 for L4 tests



Conclusions

- Several projects going on in parallel
 - Existing infrastructure: good starting point
 - Objective is to get the best share of the existing infrastructures between activities/projects
- Upgrade of infrastructures is ongoing, in particular for the SPL cryo-module
 - High pressure UP water rinsing
 - Electro-polishing station (new)
 - Cavity vertical test stations, diagnostic tools
 - SM18 IHe distribution line to be changed (2 K operation, reduction of static losses)
 - SM18 clean room upgrade necessary
- SPL cryo-module high power tests
 - Bunker A in SM18 requires hardware modification to host SPL high power tests
 - 50Hz modulator size under study
 - Will profit from preparation work done for Linac 4
 - Specification documents for 704 MHz high power equipment in preparation