Cleanroom refurbishment in SM18

Upgrade for the SPL high gradient resonators

Reminders:

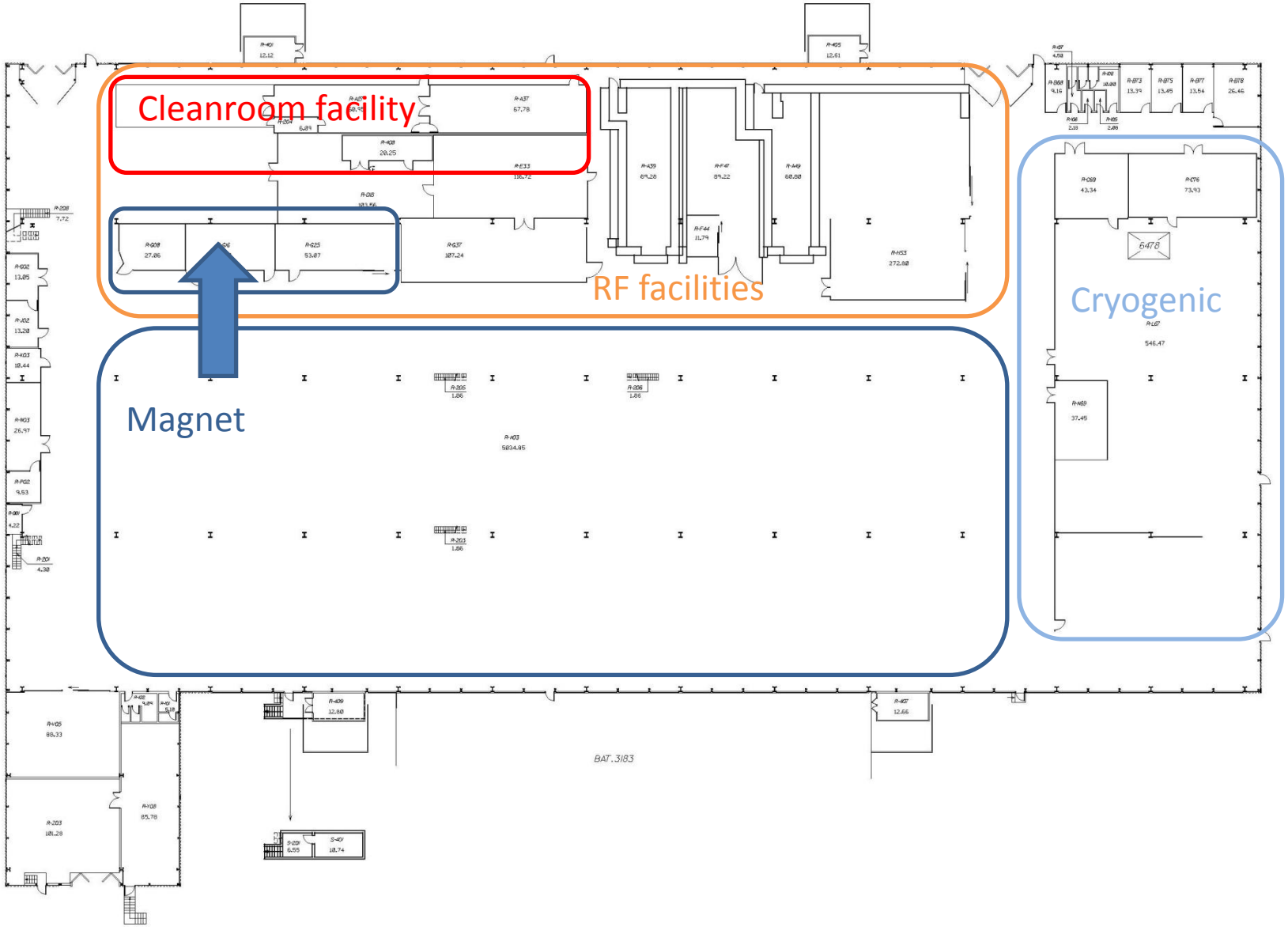
- Why?:
  - Cleanliness becomes very important for gradient > 20 Mv/m

- Upgrade based on coupler experts recommendations (March 2010)[(1)]:
  - Get the needed infrastructure into one location
  - Class10 / ISO 4 is a must for gradient >25MV/m
  - SM18 facility has the best potential for high gradient component manufacturing

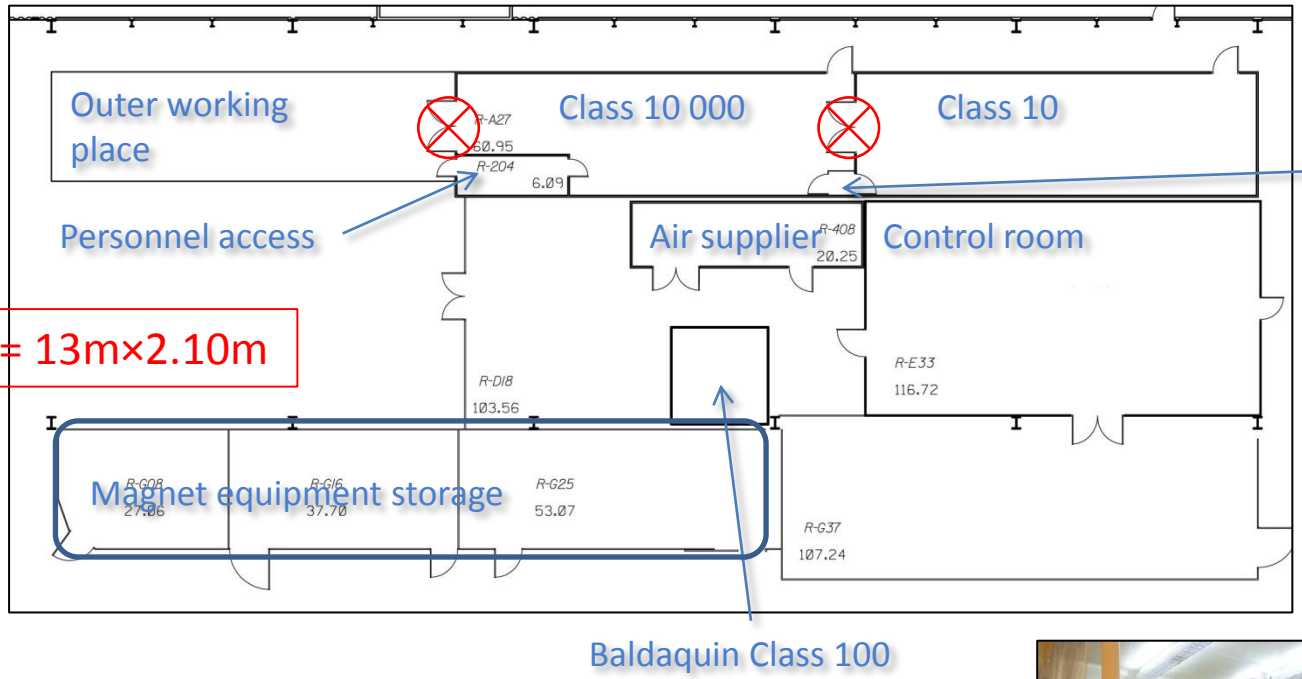
- Visit of CEA-Saclay and DESY cleanroom facilities

(1): E. Montesinos, SPL Main power Coupler (SPL-MC) Cleanroom requirements, May 17th, 2010

Existing facility at SM18



Existing facility at SM18



What is missing for high gradient resonators?

-High Pressure Rinsing (HPR)

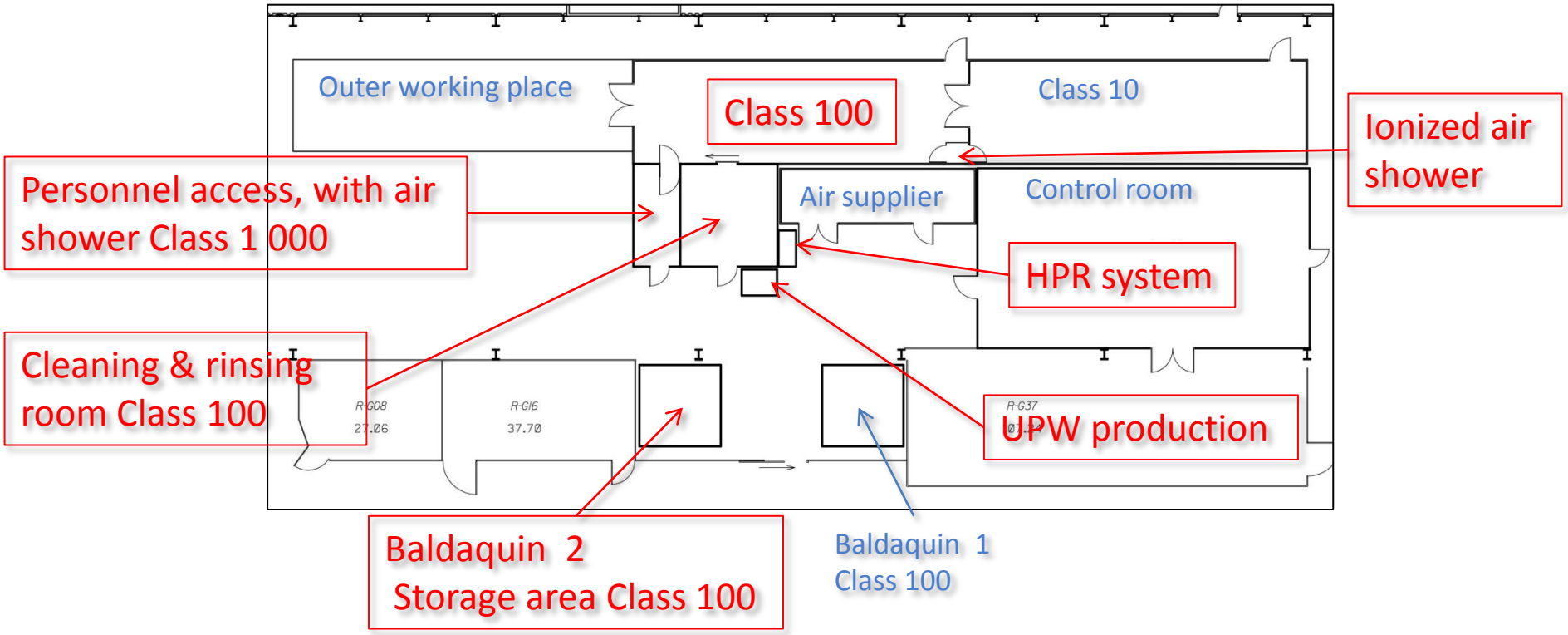
-Ultra Pure Water (UPW)

-Clean space dedicated to the cleaning operations

-Better cleanliness

-More space

Upgrade proposal



Class	Price per m² (€)
100	6 000 to 10 000
1000	4 000 to 8 000

Ultra Pure Water (HPW)

- UPW, new machine with monitoring of the water quality [1,2,3]
  - Particle counting
  - Water resistivity (>18 MΩ.cm)
  - Total organic carbon measurement (TOC < 60 ppb)
  - Bacteria analysis
  - Expensive equipment

(1): Quality control at the TTF-Cleanroom infrastructure for cavity-processing , N. Krupka, T. Ebeling, K. Escherich, A. Matheisen, Morales Zimmermann, B. Petersen, D. Reschke, N. Steinhau-Kuehl, F. Zhu

(2): Clean-room facilities for high gradient resonator preparation, K.Escherich, A.Matheisen, N.Krupka, B.Petersen, M.Schmökel, contribution to the SRF2005, Ithaca, New-York, USA

(3): Quality control update of the cleanroom for superconducting multi cell cavities at DESY N. Krupka, K. Escherich, M. Habermann, K. Harries, A. Matheisen, B. Petersen, contribution to the SRF2005, Ithaca, New-York, USA

High Pressure Rinsing (HPR)

- HPR: nozzle moving through a rotating cavity
  - Collaboration with DESY [4] is welcome (but XFEL remains priority)
  - New HPR in Brookhaven and Saclay
  - Expensive equipment

DESY's HP rinsing system

- Control done at outlet used as cleanliness indicator:

- Water resistivity
- TOC measurement
- Particle counting (limited by bubbles in water)
- Analysis of a filter at water outlet under microscope (2h long by analysis, up to 6 analyss per cavity)

(4): A new high pressure rinsing system established at DESY, A. Matheisen, K. E scherich, R. B andelmann, H. M . Zimmermann, N. K rupka,DESY

Comments:

- 1st step: Cleanroom upgrade + HPR + UPW

  => 90% of the total refurbishment cost

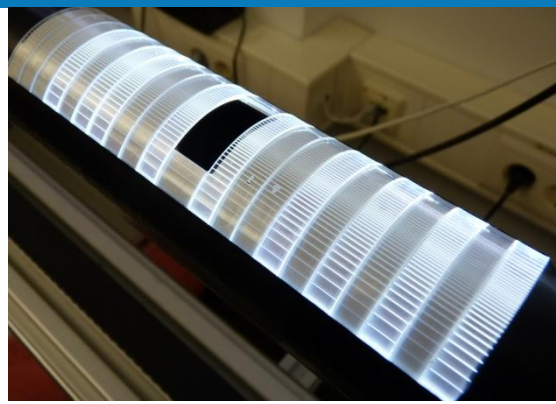
- If we obtain good results with CERN' HPR on SPL prototype

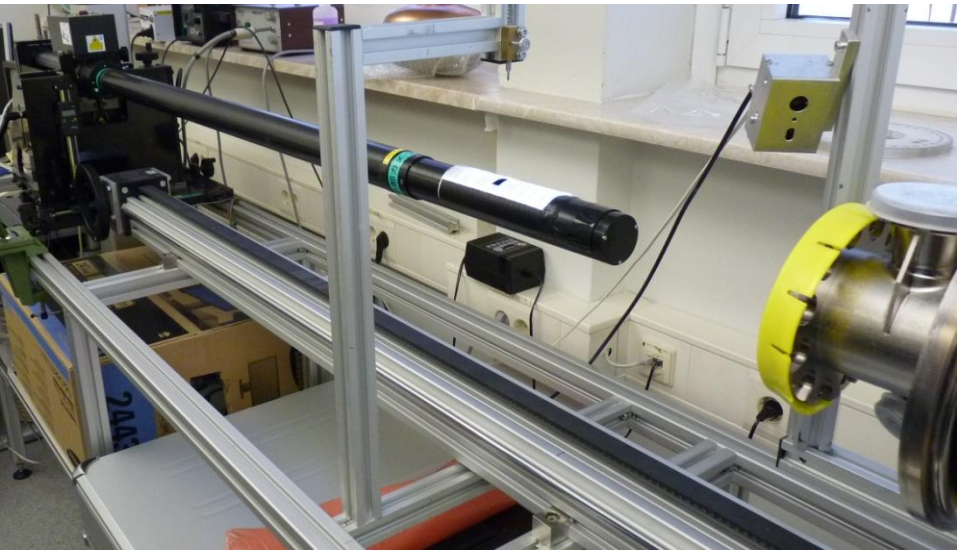
  $\Rightarrow$New HPR can be postponed

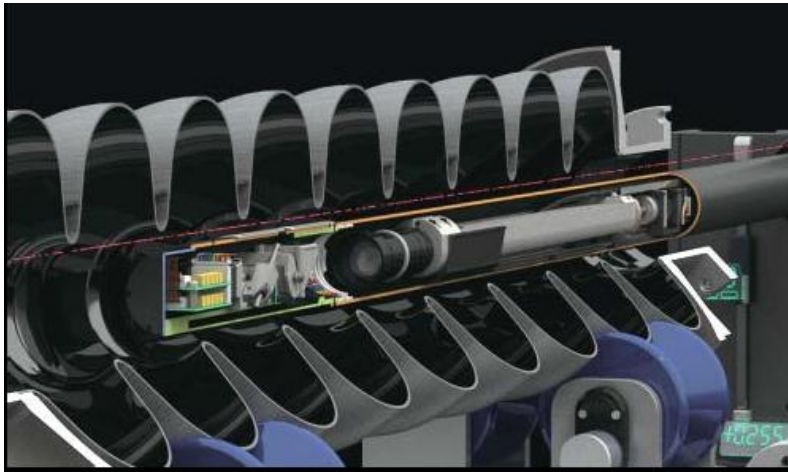
  $\Rightarrow$ 1st step cost drops to 58% of the total refurbishment cost

Optical inspection of cavities

- Developed at KEK/Kyoto [5]:
  - Study cavity surface defects
  - In use at DESY (under improvement)







Kyoto cavity inspection system

(5): Review of optical inspection method and results, K. Watanabe, KEK, Ibaraki, Janpan

Additional equipment

Equipments	Comments
Air monitoring system / Particle counter	Control air quality, online monitoring
Temperature & humidity sensors	Permanent control
O_2 monitoring system	Survey of the O_2 level, online monitoring
Fog generator	Study and check air flow movement(6)
Ultrasound cleaning bath	Removal of dust
Air tight boxes & cabinets	Long term storage of clean component, have to be in stainless steel
Primary & secondary vacuum pumps	Oil free
Leak detection system	He test

Flow pattern at power coupler port at DESY (argon overlay flow from cavity switched on)

(6): Quality control at the TTF-Cleanroom infrastructure for cavity-processing, N. Krupka, T. Ebeling, K. Escherich, A. Matheisen, Morales Zimmermann, B. Petersen, D. Reschke, N. Steinhau-Kuehl, F. Zhu

Acknowledgments:

Colleagues from CERN

Berry Stéphane, CEA-Saclay

Aderhold Sebastian, DESY

Schlander Felix, DESY

The end

Thank you for your attention

Reminders:

Cleaner

ISO 14644	0,1 µm	0,2 µm	0,3 µm	0,5 µm	US FED STD 209E
ISO 1	10	2	0	0	
ISO 2	100	24	10	4	
ISO 3	1,000	237	102	35	Class 1
ISO 4	10,000	2,370	1,020	352	Class 10
ISO 5	100,000	23,700	10,200	3,520	Class 100
ISO 6	1,000,000	237,000	102,000	35,200	Class 1000