VSC Follow-up meeting 6th of July 2020

LHC Machine
Experimental Beam Vacuum Project

On behalf of the experimental team
Josef Sestak

Installation schedule – main activities

LHC Experimental Vacuum - UX activities

	July						
Week	M	T	W	T	F	S	S
27			1	2	3	4	5
28	6	7	8	9	10	11	12
29	13	14	15	16	17	18	19
30	20	21	22	23	24	25	26
31	27	28	29	30	31		

	August						
Week	M	T	W	T	F	S	S
31						1	2
32	3	4	5	6	7	8	9
33	10	11	12	13	14	15	16
34	17	18	19	20	21	22	23
35	24	25	26	27	28	29	30
36	31						

	September						
Week	M	T	W	T	F	S	S
36		1	2	3	4	5	6
37	7	8	9	10	11	12	13
38	14	15	16	17	18	19	20
39	21	22	23	24	25	26	27
40	28	29	30				

	October						
Week	M	T	W	T	F	S	S
40				1	2	3	4
41	5	6	7	8	9	10	11
42	12	13	14	15	16	17	18
43	19	20	21	22	23	24	25
44	26	27	28	29	30	31	

Schedule for 2020 activities is still drifting.

LHCb UX85 activities

ALICE UX25 activities

Week 32 – SMOG2 installation;

From week 33 – VELO vacuum system reinstallation and control system tests (possible whole Q4);

Week 38 – 40 – ALICE IP2. X MECA;
Week 40 – 41 – Bake-out of the IP2.X; A1R2.X; Neon venting after BO.

Week 43 – ALICE post-mechanical activities.

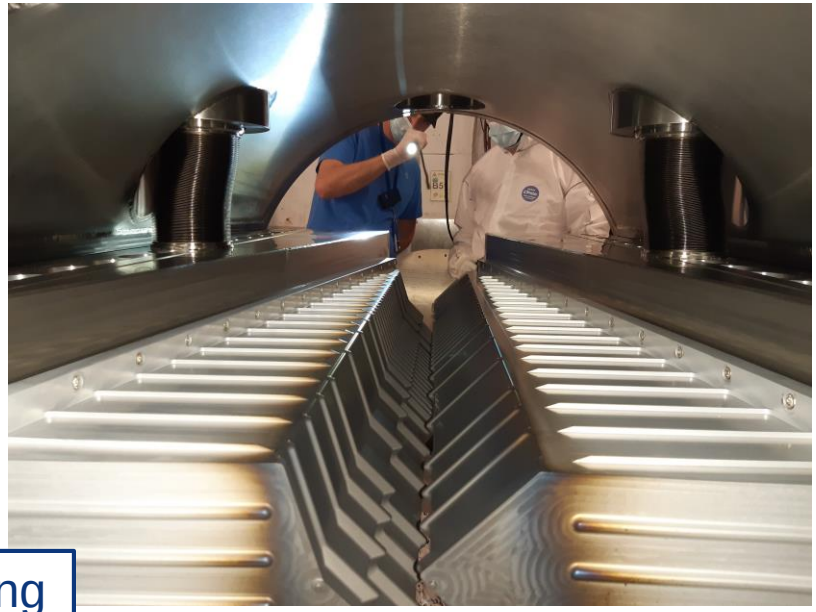
Installation schedule – ATLAS & CMS

- **ATLAS** – waiting SW-C installation update (more information by beginning of October).
  - Side A installation – by Q1/2021;
  - Side C installation – by Q3 – Q4/2021;

- **CMS** – foreseen installation slot starts by 1st half of February 2021.
  - Removal of the old forward regions by November 2020 (TBC);

Activities from the past two weeks (UX)

- **LHCb experiment**
  - Removal of the operational supports inside the dipole.
  - Assistance with post-installation cleaning of the dust from RF foils (performed by Nikhef).



Dust-size particles from the installation tooling

Activities from the past two weeks (Lab)

- Preparation for the etching operation before the NEG coating (applicable for End-Cap and HF-CT2 chambers).
- Tooling for circulation etching being prepared by BVO.

Surface marks observed on local parts of both HF-CT2 and End-cap chambers (etching mandatory)

Etching of 1st HF-CT by week 30 – then NEG coating

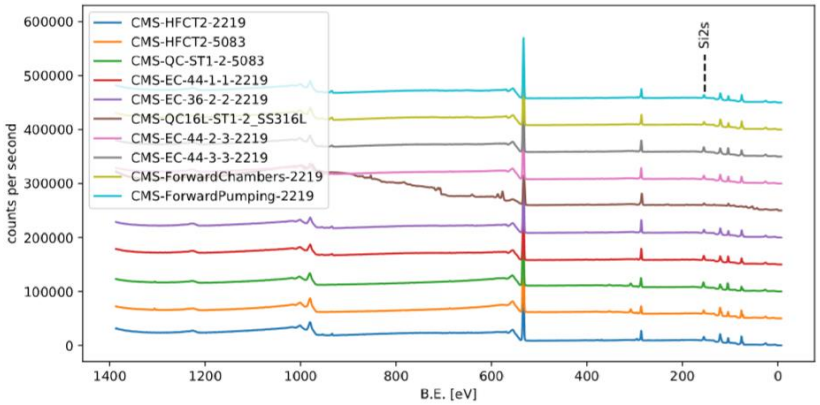
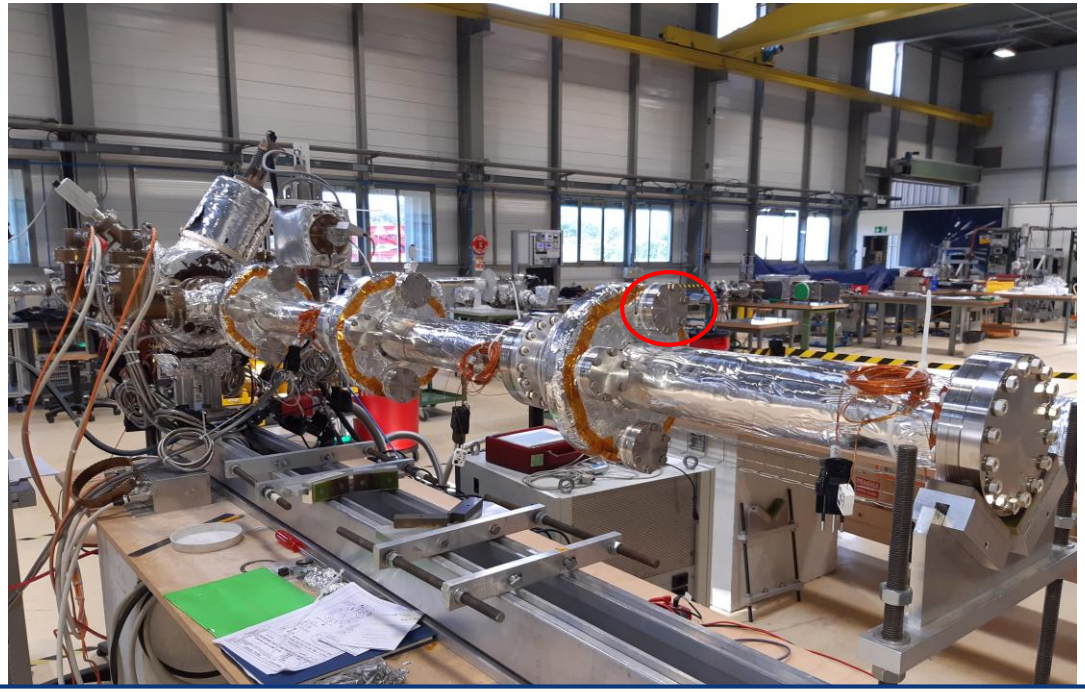


Figure 1: survey spectra for all samples, indicating Si peak at 153eV binding Energy

XPS on witness samples shows presence of Silicon (Si) on the surface ≈ 10%

Activities from the past two weeks (Lab)

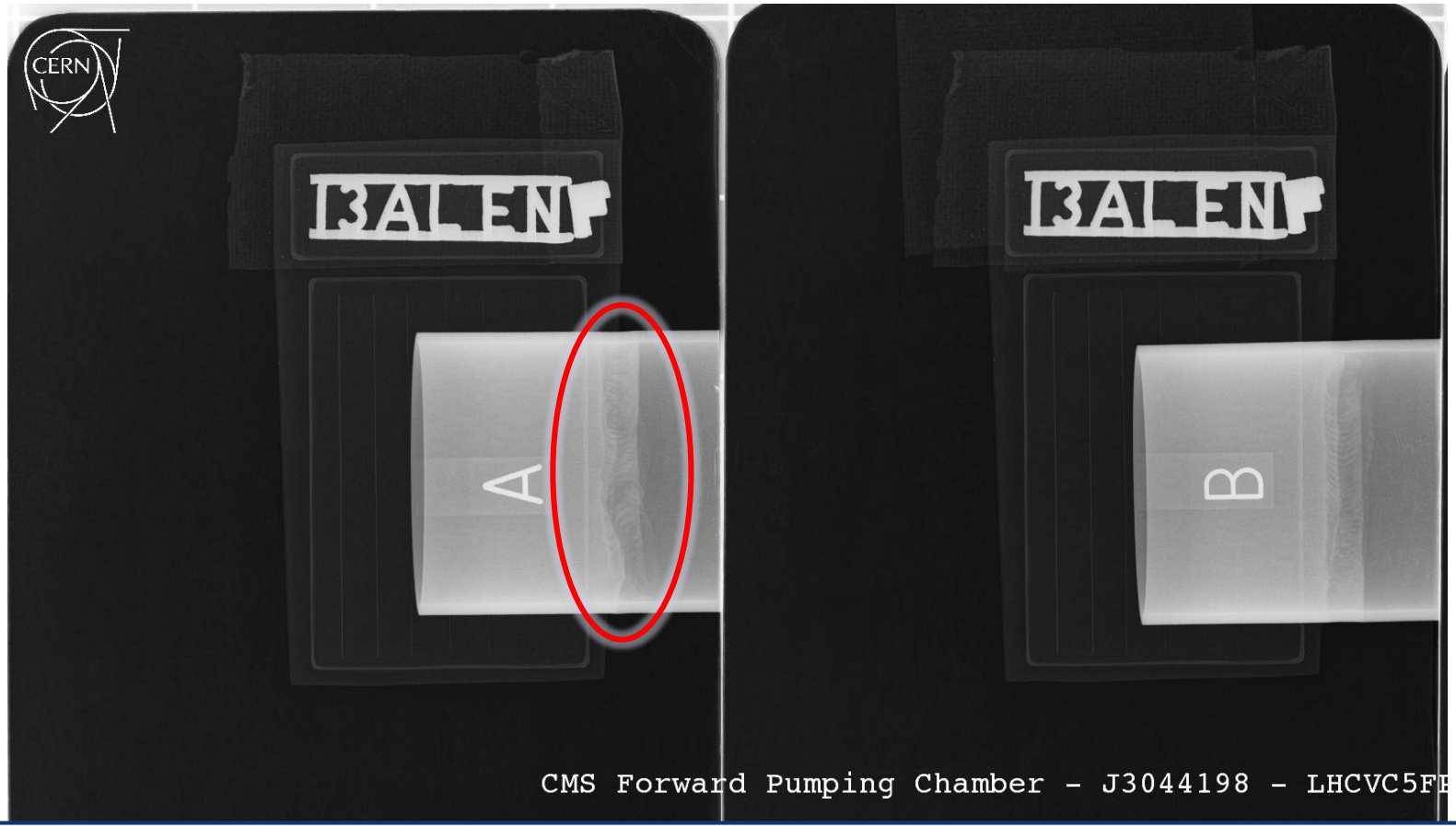
- Vacuum acceptance tests of the CMS Forward pumping chambers.



Non-conformity

Leak 1e-8 mbar·l·s^{-1} observed on the weld between the CF40 bimetallic flange and body of the chamber. Two chambers OK – continuing for the test.

Activities from the past two weeks (Lab)



Weld was not repaired during the production however probably experienced problem with arc stability (intermediate leak detection did not revealed the issue)
Reparation ongoing – EN MME (AP) – chamber will be likely spare one.

Activities from the past two weeks (Lab)

- **CMS central chamber** – NEG coated
  - Endoscopy after the NEG coating

Non-conformity

Inspection after NEG coating showed a discoloration on a light mark observed before NEG coating (≈ 2m inside on the Beryllium part) – **no peel-off**.

  - NEG acceptance test ongoing – **followed by another endoscopy**;

Activities for next two weeks

- **UX activities**
  - Installation of the sector valve in RB26 (ALICE);

- **Lab activities**
  - **CMS Central chamber**
    - Complete the NEG acceptance
    - Additional endoscopy and metrology
  - Acceptance and NEG coating of 2x Forward Pumping
  - Acceptance and NEG coating of LHCb short transition
  - Preparation of the etching operations for EC & HF-CT2

Thank you for your attention and help

Table 1: Atomic concentration on the surface of Al 2219 samples

Name	Cu2p	Si2s	K2p	C1s	O1s	Al2s	Ag3d
CMS-HFCT2-2219	0.5	9.1	0.3	12.7	43.8	33.5	0.1
CMS-EC-44-1-1-2219	0.6	12.8	0.2	17.3	43.3	25.8	0.0
CMS-EC-36-2-2-2219	0.9	9.0	0.0	19.4	40.5	30.1	0.1
CMS-EC-44-2-3-2219	0.3	10.0	0.0	16.7	44.5	28.3	0.1
CMS-EC-44-3-3-2219	0.6	12.8	0.0	17.9	43.3	25.3	0.0
CMS-ForwardChambers-2219	1.1	8.2	0.0	15.5	41.5	33.6	0.0
CMS-ForwardPumping-2219	1.1	8.6	0.2	15.1	43.3	31.8	0.0

Table 2: Atomic concentration on the surface of Al 5083 samples

Name	Si2s	K2p	C1s	O1s	Al2s	Mg1s
CMS-HFCT2-5083	8.3	0.2	11.1	45.1	34.7	0.6
CMS-QC-ST1-2-5083	14.6	0.2	15.8	46.0	23.0	0.4

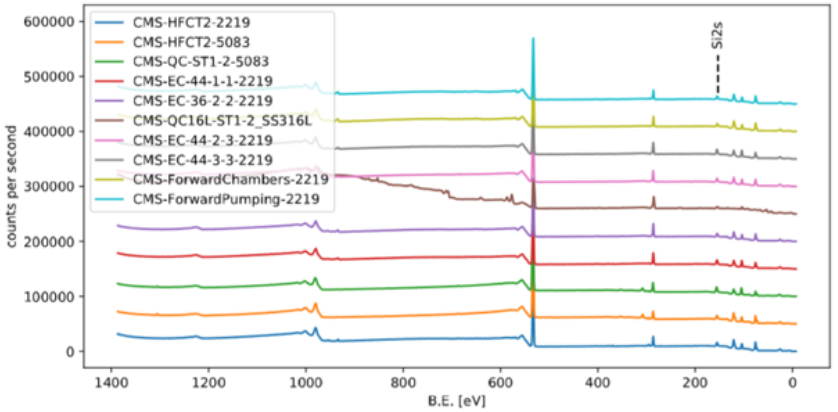


Figure 1: survey spectra for all samples, indicating Si peak at 153eV binding Energy

2.1 Surface for UHV applications: for a surface of a component which is used in an environment at pressures below 10^{-9} mbar. The surface can be designed to be exposed to static vacuum or can be irradiated by radiation produced by a charged beam in an accelerator (Electron cloud, synchrotron radiation, ionic bombardment).

Undesired element	effect
C	outgassing, radiation induced outgassing
Zn	contamination due to high vapour pressure
Cd	contamination due to high vapour pressure
Cl, F, S	corrosion
Na, K, Ca	Salts absorbing H_2O (often residues of a bad rinsing)
Others specific for the application	

2.4 Substrate for thin films: for thin films deposited by galvanic process or sputtering or evaporation.

Undesired element	effect
C	Causes bad adhesion
B	phase of BN, causes bad adhesion
N	Confirms the presence of BN if B is present, but is negligible without B
Others specific for the application	

Codification of cleanliness level SOP-AS-01