

Hardware implications of IR upgrade: TAN, TAS & forward detectors

Anne Laure Perrot
on behalf of EN/MEF

Special thanks to

F. Butin, I. Efthymiopoulos, S. Evrard, F. Galleazi, D. Lacarrere

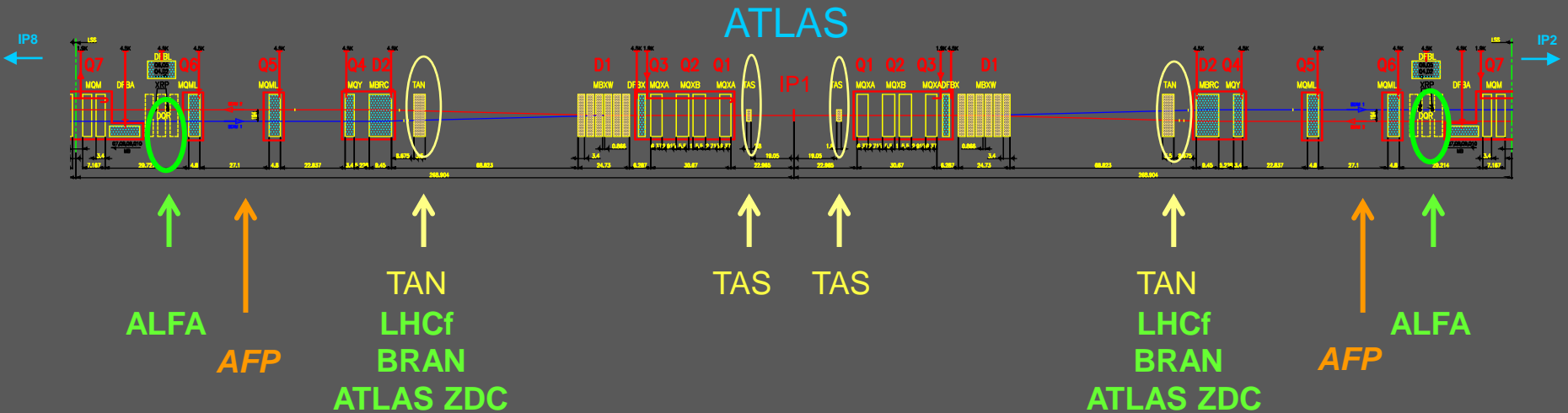
EN/MEF in charge of these elements

Contents

1. Locations of TAS, TAN & forward detectors at the end of LS1
 1. TAS
 2. TAN
 3. LHC forward detectors

Locations of TAS, TAN and forward detectors

LSS1 – end of LS1

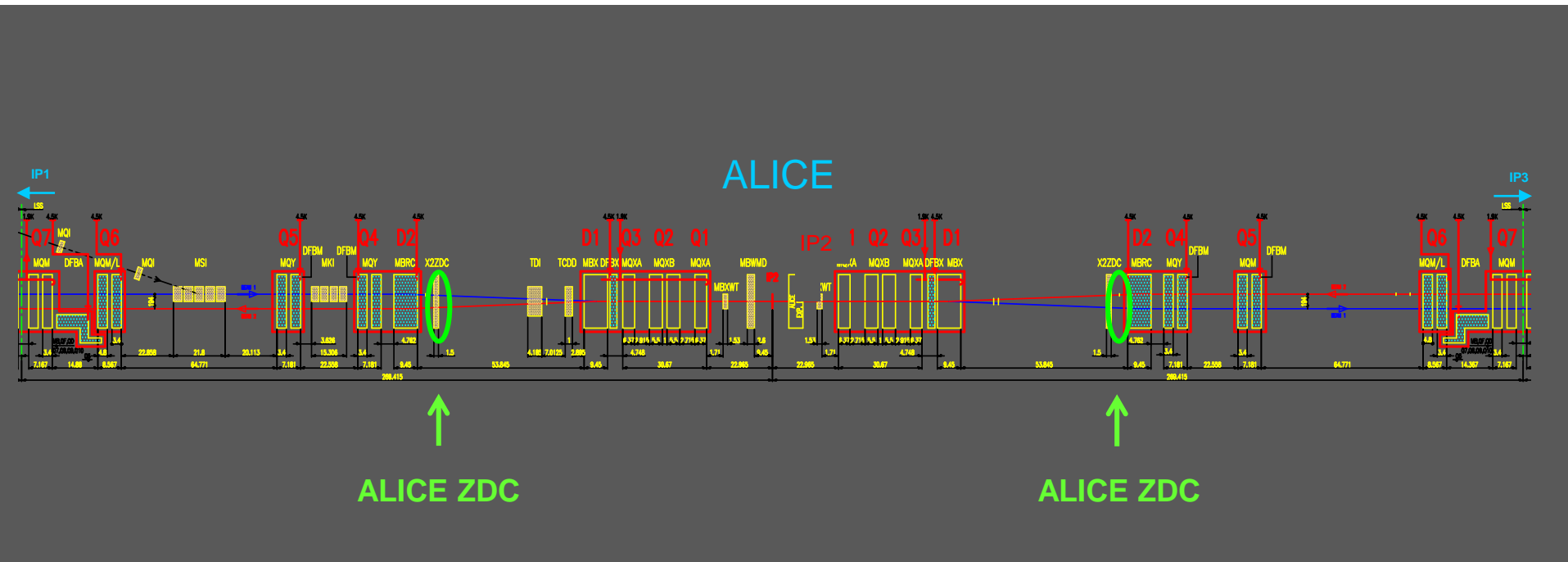


■ Forward detectors - installed

■ Forward detectors under study – installation foreseen during Xmas break 2015-2016

Locations of TAS, TAN and forward detectors

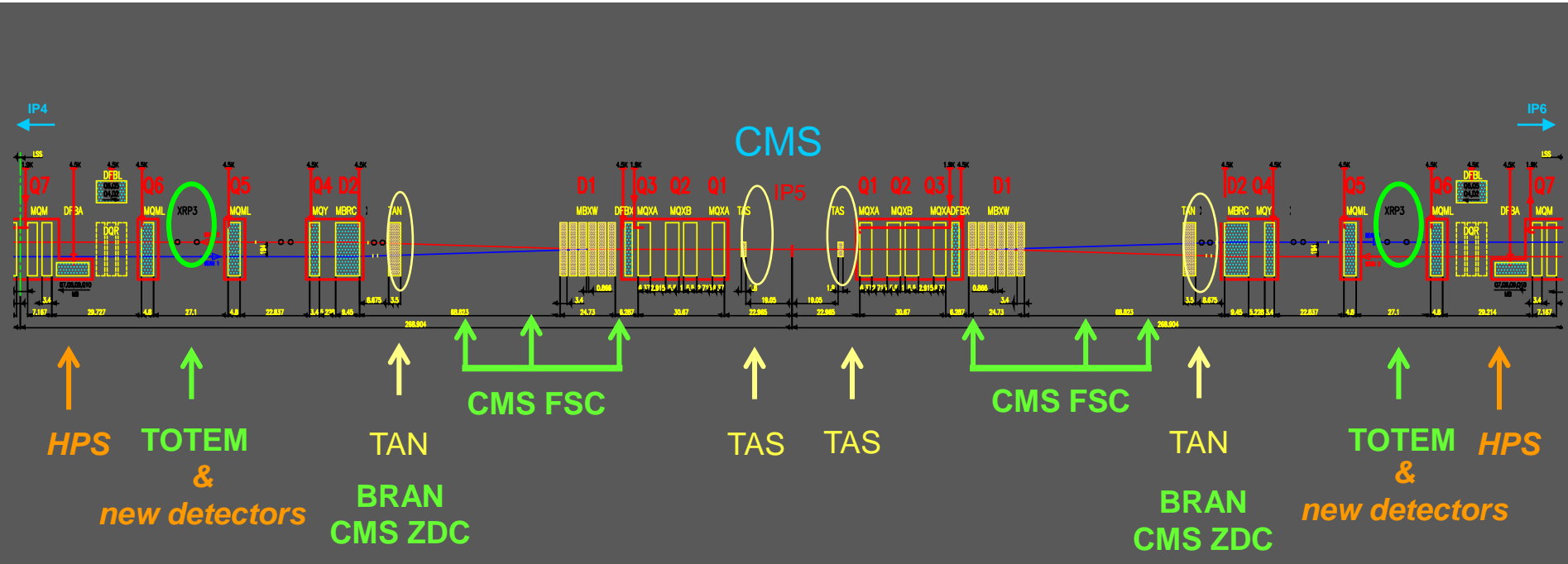
LSS2 – end of LS1



■ Forward detectors - installed

Locations of TAS, TAN and forward detectors

LSS5 – end of LS1



- █ Forward detectors - installed
- █ Forward detectors under study

TAS (Target Absorbers Secondaries)

Purpose

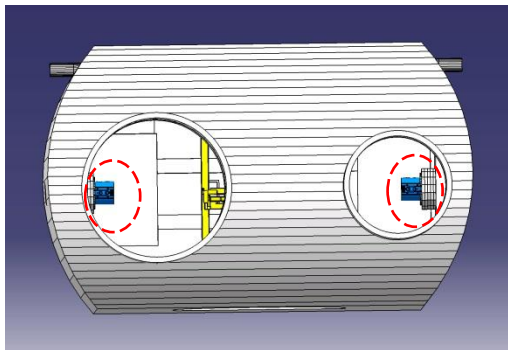
- Front quadrupoles absorbers around IPs 1/5
Protect Q1,2,3 from debris (prevent them from quenching)
- Protect the inner tracking elements of ATLAS and CMS detectors from loss of beam particles in the IRs
- Forward shielding around TAS to protect ATLAS & CMS detectors from particles leaving the TAS (backscattering /activation)
- TAS designed to be an integral part of the forward shielding of ATLAS and CMS

Technical specificities

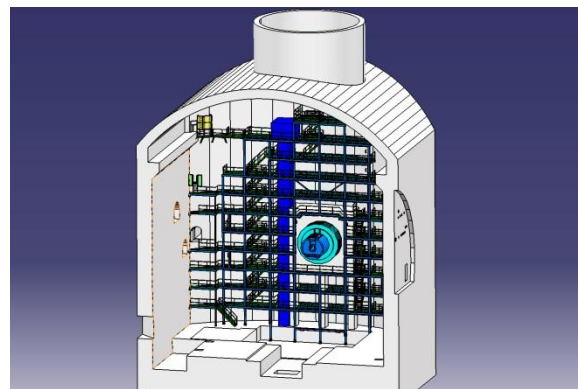
- Copper absorbers, 3.2 tons, internal beam tube, adjustable supports and alignment rods;
- In situ vacuum bake-out (strip heaters/ internal thermocouples)
- Cooling system (water) to ensure internal max beam tube temperature below 75 C
- Technical requirements: see edms 101559

TAS - ATLAS

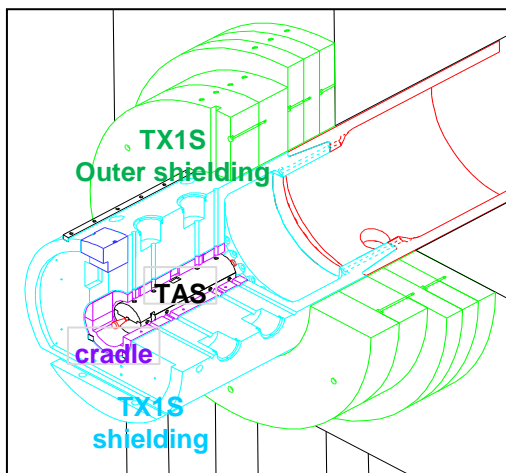
Location: inside TX1S shielding



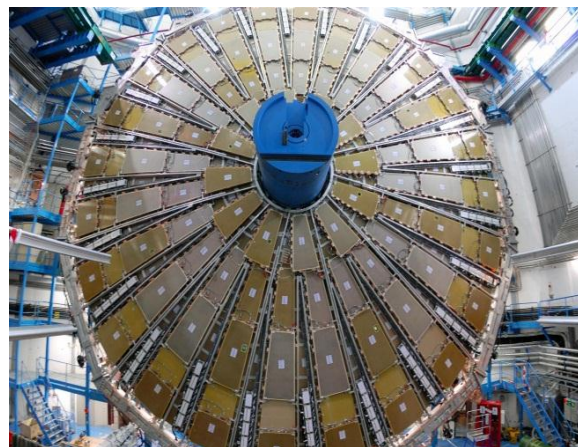
UX15 cavern – top view



UX15 cavern



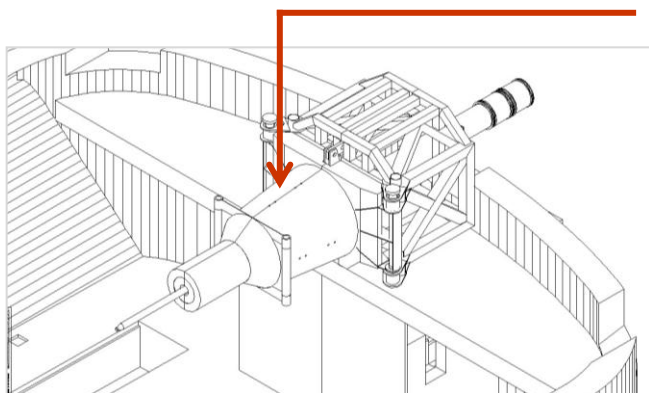
TX1S – internal view



TAS and TX1S – installation sequence

TAS – CMS

Location: inside the Fixed Iron Nose

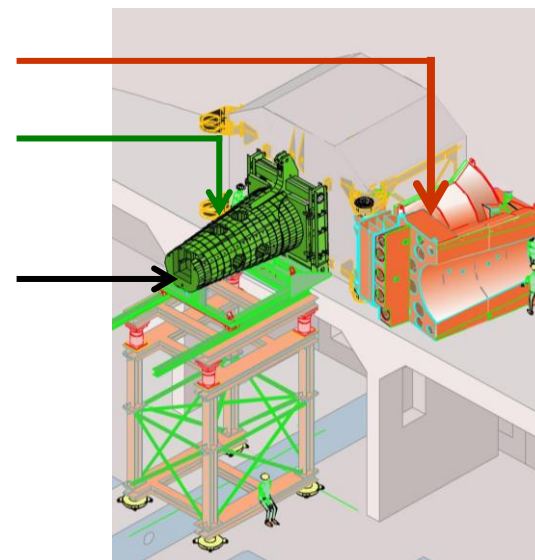


UX55 cavern – TAS surrounding
Rotating shielding closed

Rotating Shielding

Fixed Iron Nose
(FIN)

TAS
inside FIN



UX55 cavern – TAS surrounding
Rotating shielding open

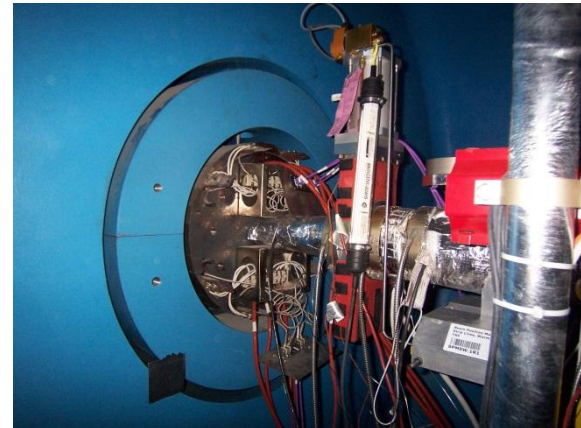


TAS and FIN – installation sequences

TAS – ATLAS & CMS

Technical issues for removal

- RP issues (ALARA)
- ATLAS TAS + cradle / CMS TAS + FIN
Weight of each assembly is 10 Tons
➔ handling issues
- Services removal (heating/cooling/survey)
- Preliminary study by EN/MEF-EBE (F. Butin) (see edms:1254919)
- Exit via LHC tunnel:
 - might be considered in Pt1 but inner triplets to be dismantled first
 - not considered for Pt5 (tunnel vs cavern scenari – ALARA consideration)
- Exit via PX shaft (to be coordinated with ATLAS & CMS coordination team)



TSX1 shielding - view from LSS1 side

TAN (Target Absorbers Neutrals)

Purpose & technical specificities

- Absorbers to protect the SC dipoles D2 and the outer triplet quads (prevent them from quenching)
- Four around LHC (one on each side of IP1/5, @ 140m)
- Steel and marble, internal beam tube 'y-chamber', 29 tons,
- In situ vacuum bake-out (strip heaters/ internal thermocouples)

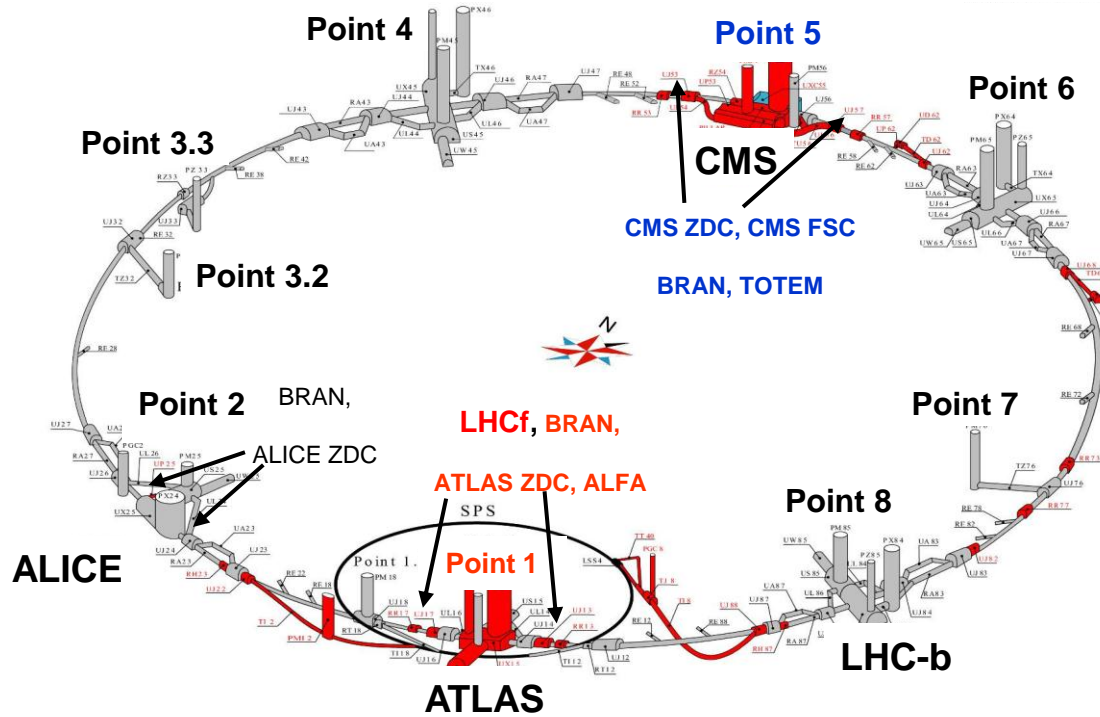


TAN – LSS1/5

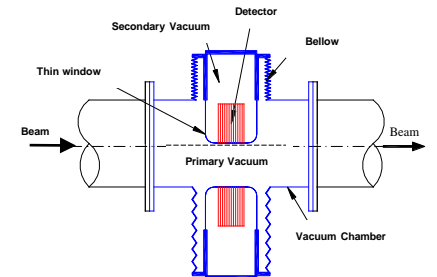
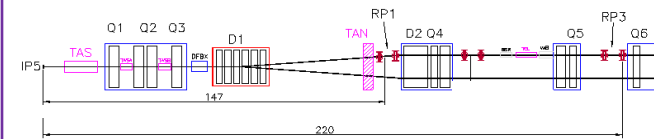
Technical issues for removal

- RP issues (ALARA)
- Weight, dimension → handling issues
- **TAN study group (since July 2012)**
 - Monthly meeting to study the issues linked to the TANs removal and define handling procedure for removal/displacement
 - Participants: EN/HE, RP, EN/MEF
 - Chairman: S. Evrard (EN/MEF-EBE)

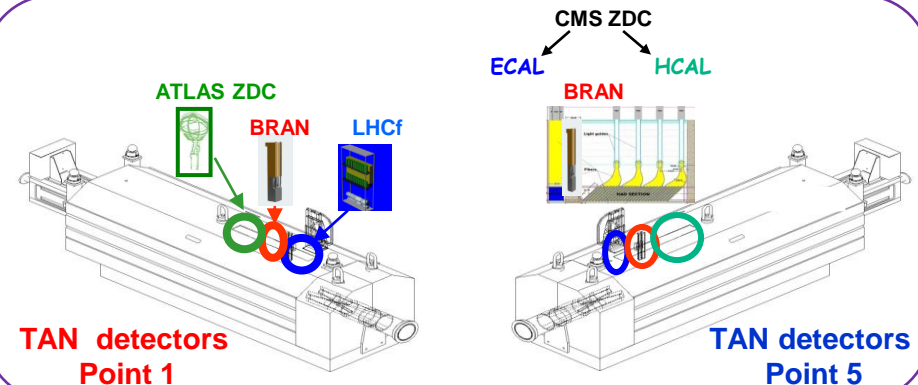
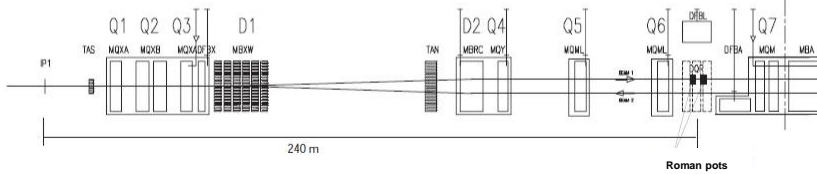
LHC forward detectors



TOTEM Roman Pots around IP5



ATLAS Roman Pots (ALFA) around IP1



TAN detectors Point 1

TAN detectors Point 5

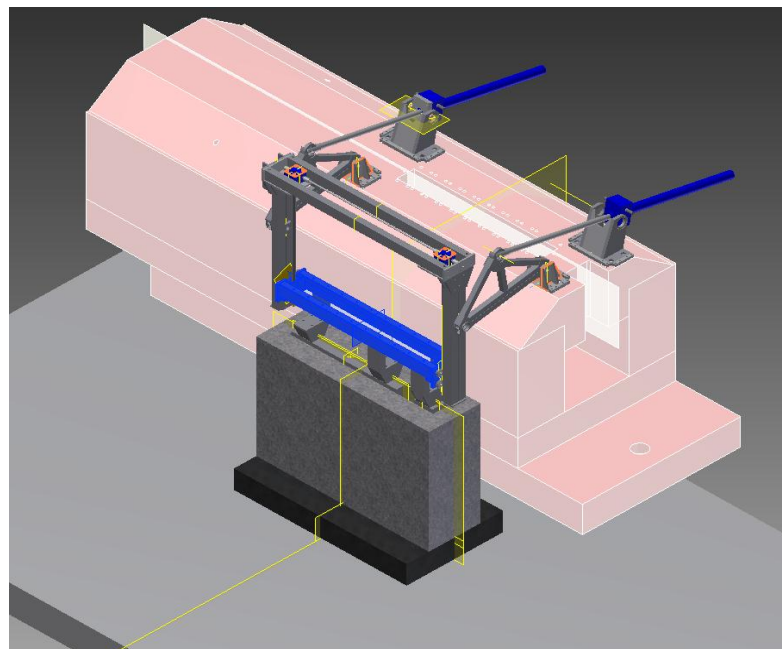
LHC forward detectors in TAN



Removal procedure



**Point 1 remote handling system
Installed in March 2009**



**Point 5 remote handling system
Under construction
Installation foreseen during LS1**

LHC forward detectors in TAN

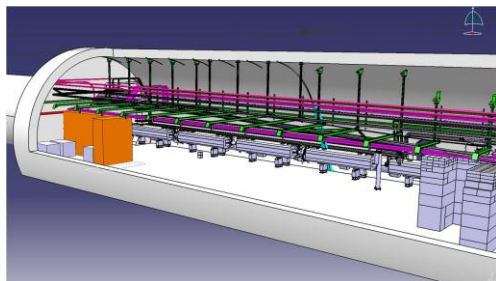


Underground storage

- Dedicated sarcophagi for forward detectors transport and storage



- Storage bunkers in UJs around Pts1/5



- If needed transport to surface via PMs

Removal issues

- Detectors in secondary vacuum
- Pots in primary vacuum break the vacuum to remove the pots
- Associate local services to be removed
- RP issues to be considered
- Removal of TOTEM 147 m station during LS1

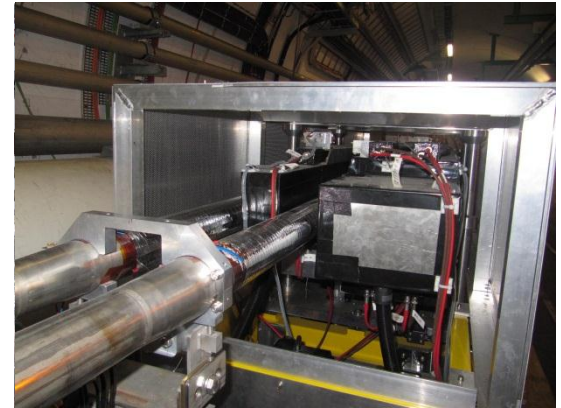


LHC forward detectors – ALICE ZDC

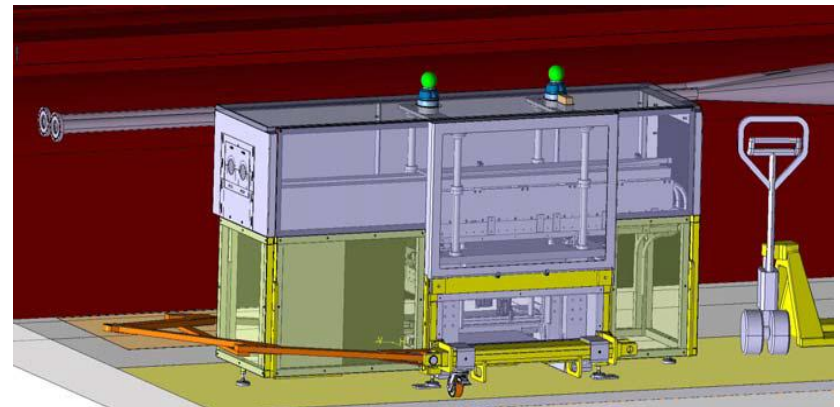


Removal procedure

- ZDC detectors installed on a movable platform
- Designed to allow removal without breaking vacuum
- First full temporary removal during LS1



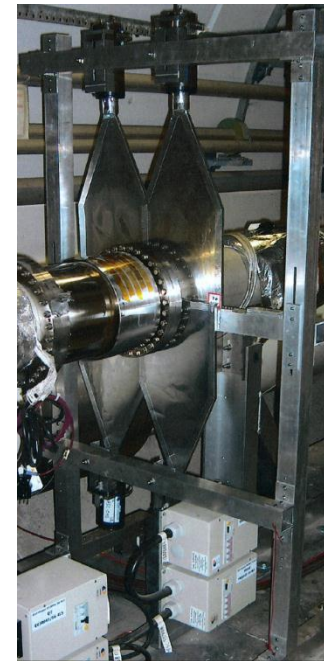
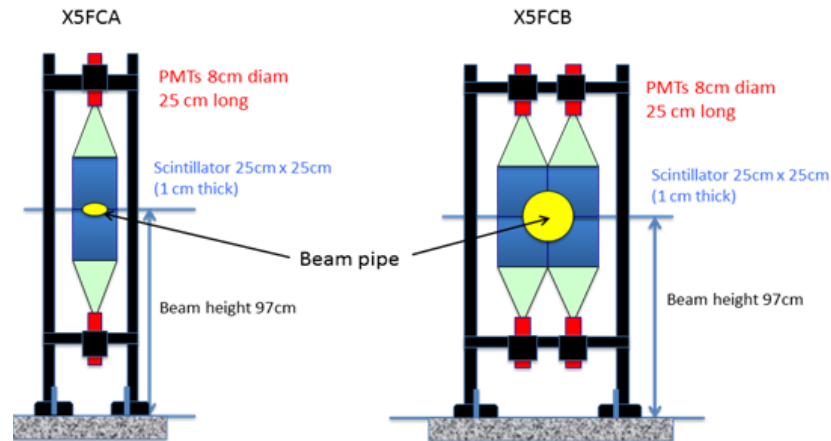
ALICE ZDC platform & detectors



ALICE ZDC platform & detectors

Removal procedure

- Scintillators located around the beam pipe
- No special issues foreseen



CMS FSC station 3

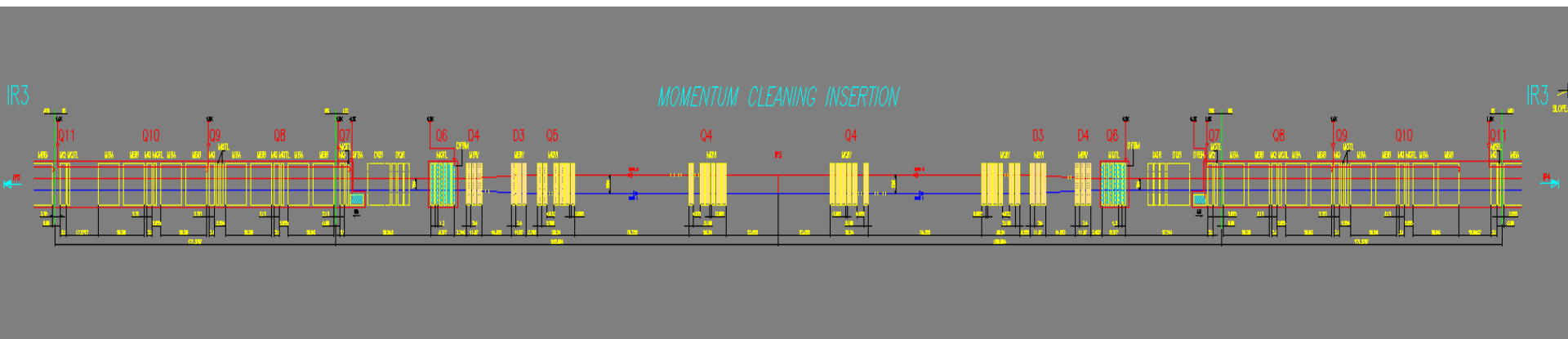
Summary

- TAS, TAN, Forward Detectors in LSS: location at the end of LS1 & technical specificities
- Review the technical issues to remove TAS, TAN, FD
- TAN removal: study group chaired by EN/MEF- EBE since July 2012
- TAS removal: preliminary study by EN/MEF - EBE
- Forward detectors removal: studies by LTEX working group chaired by EN/MEF- LE

Addendum

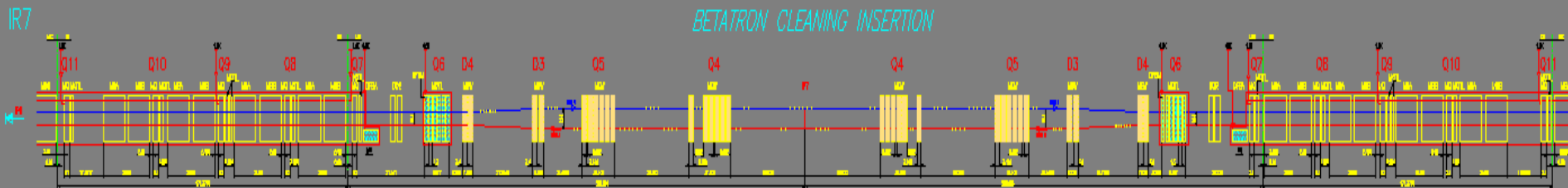
LSS layout at the end of LS1

LSS3



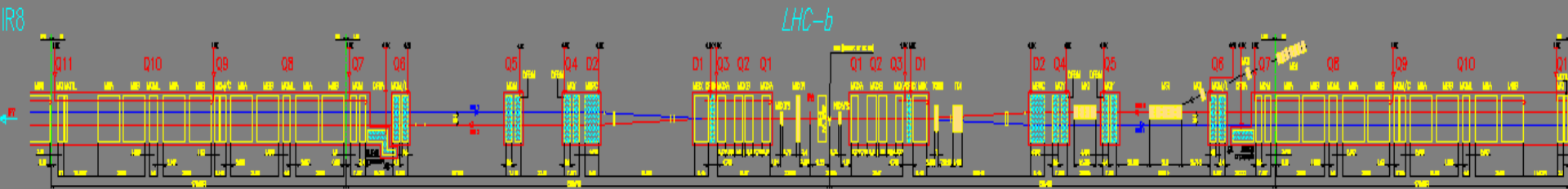
LSS layout at the end of LS1

LSS7

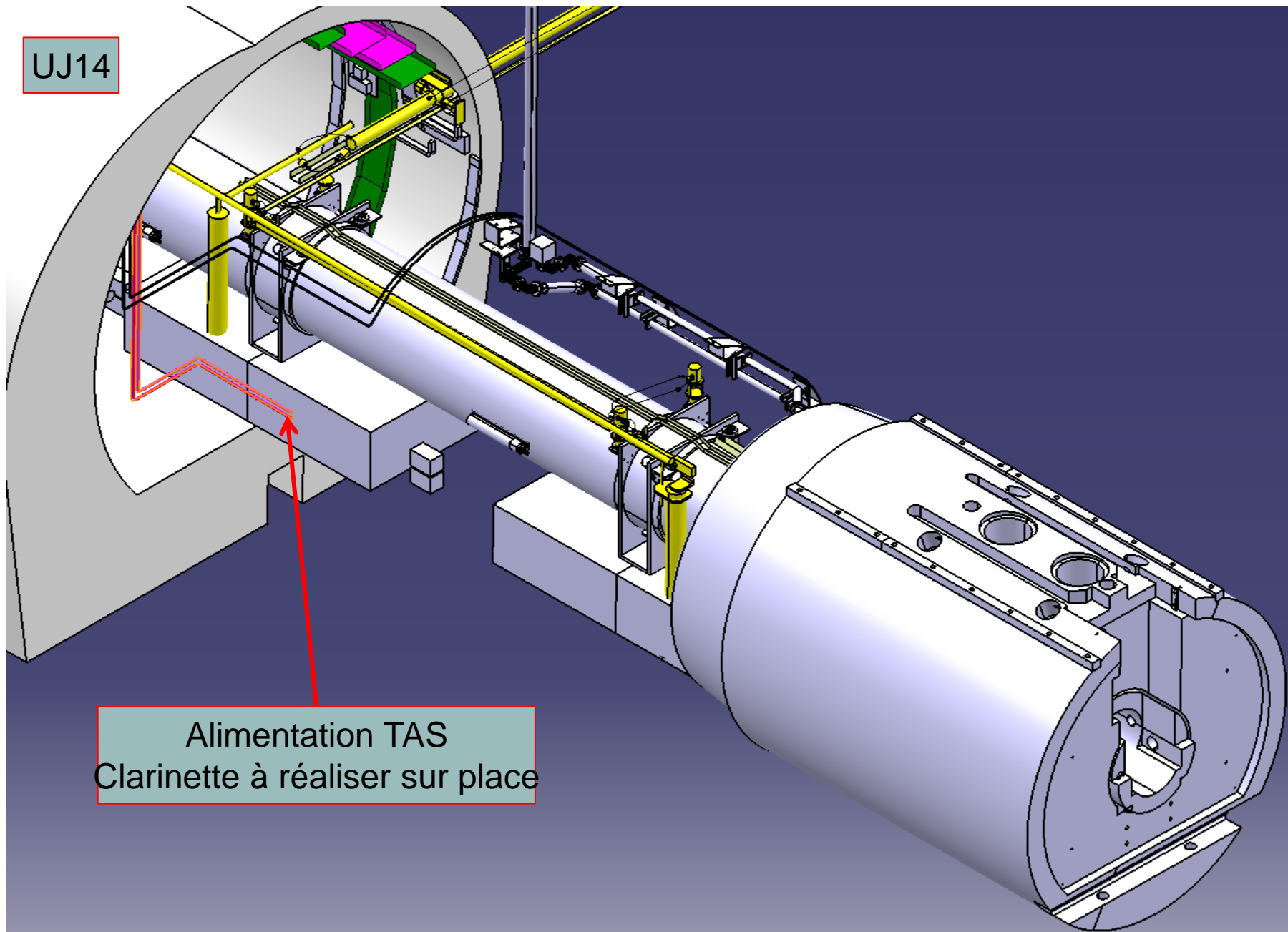


LSS layout at the end of LS1

LSS8



UJ14



Alimentation TAS
Clarinettes à réaliser sur place