ATLAS considerations

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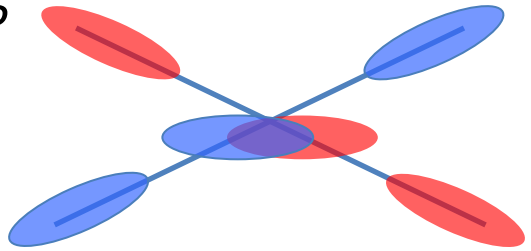
Beam spot considerations (>LS3)

- Our working assumption (simulation) for the beam spot is based on the operating values (CERN-ATS-2012-236)
  - *Beam spot spread (1 σ) x,y,z (mm) = 0.012,0.012,75*
  - *25 ns, leveling scheme, $<\mu>$ ~ 140, crab cavities*



- The beam spot length in z of 75 mm determines the size of our innermost detector layer and the density of primary vertices. We assume a minimal detector length of two times the beam spot
  - *Full coverage to $|\eta| < 2.5$ (so far) within ± 150 mm*
  - *Our requirements: the beam spot length in z has to be > 50 mm to avoid higher density of primary vertices, but not too far from 75 mm to contain costs of the silicon-based innermost layer*

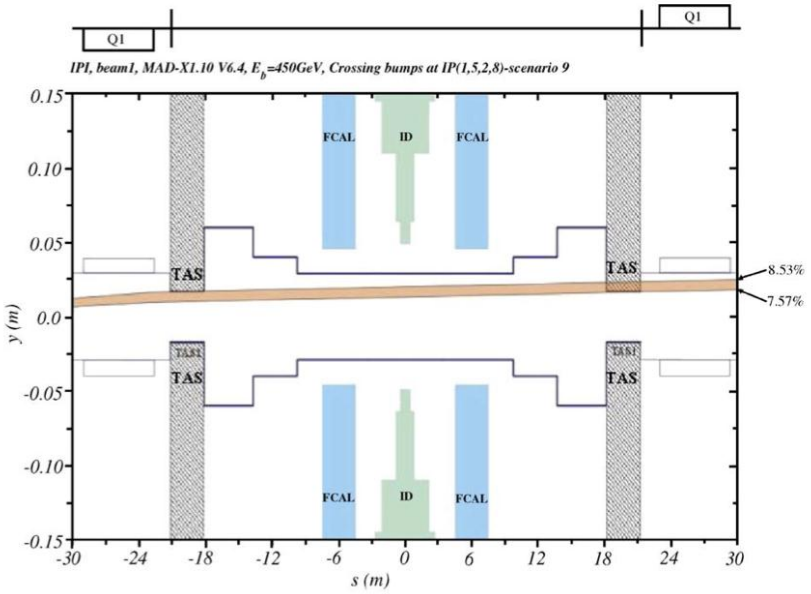
TAS optimization (>LS3)

- Not clear anymore the role of the TAS (protects the machine or protects the experiment, or both?)
- With the new high field triplets, a new aperture/layout of the TAS collimator will be necessary → ***new TAS***
- How relevant it will be to have the ATLAS central beam pipe still in the shadow of the TAS aperture ?

  - *All this is fundamental for ATLAS in order to define the final inner beam pipe diameter*
  - *Clear advantage to physics to bring the first pixel layer as near as possible to IP*

Failure scenario consideration

- The modified optics, aperture of the TAS, new triplets, crab cavities, any change around IR1
  - Need to have an evaluation of the failures scenario as done in the past (LHC project NOTE 335)
- The innermost detector layer will need to be at 30-40 mm from the interaction point
  - As in the past we expect that a flux of ~ 10^{10} p/cm^2 would result in a high occupancy (O(10^{15}) charge carriers) causing too high digital activities in our front-end chips, inducing mis-configurations
  - Higher fluxes may affect the input front-end capacitors and damage permanently the detector region



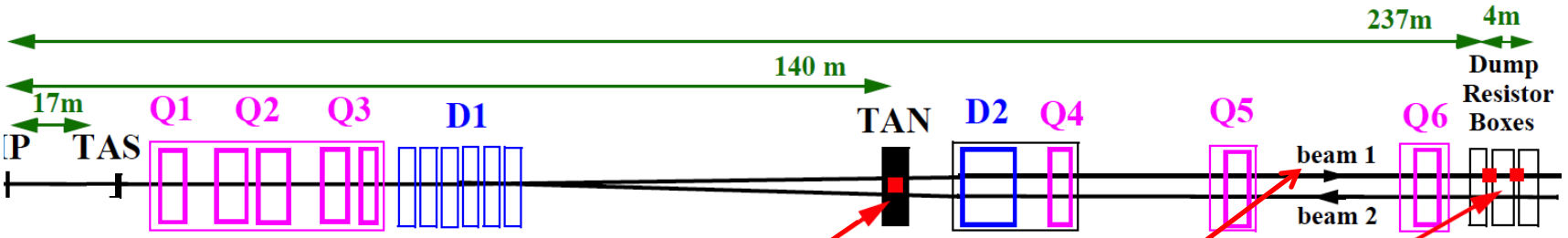
Example failure scenario:
D1 wrong settings at injection

TAS optimization summary

ATLAS requires to :

- recalculate and identify all possible failure scenarios, where the beam might go very near or hit to the beam pipes
- estimate once more the beam associated backgrounds, transported at the front face of the cavern wall. ATLAS will then transport it inside the detector and evaluate the consequences (noise, fake tracks, trigger rates, …)
- re-optimize the effectiveness of the forward shielding with the new TAS (ATLAS)
- understand the implication to the overall schedule and to other LS3 activities of a new TAS installation
- good occasion, if not done before, to clean up the beam area just downstream of the TAS (today it is a mess!)

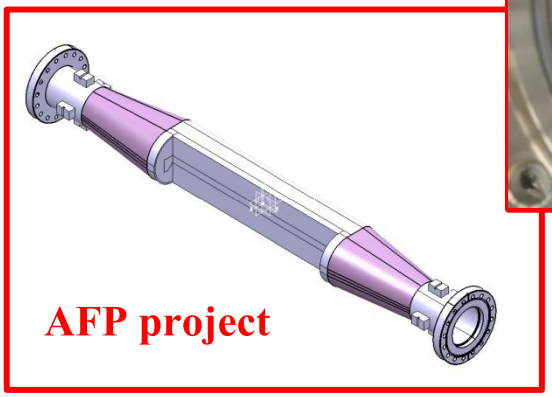
ATLAS Forward Detectors in the LHC tunnel



ZDC

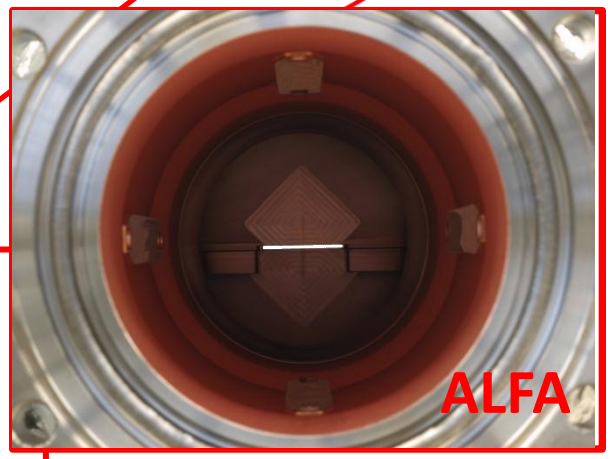
HI runs

Trigger
Centrality determination
Luminosity monitoring



pp runs

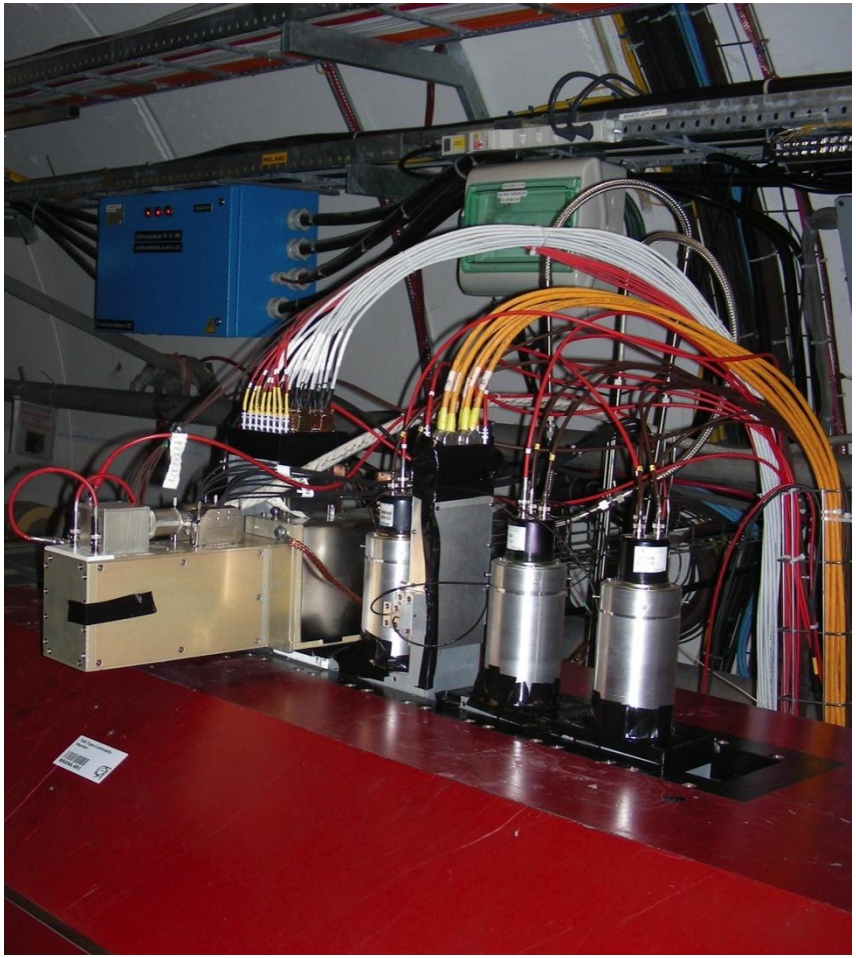
Diffraction
Forward Physics
(new)



pp runs β*>2000 m

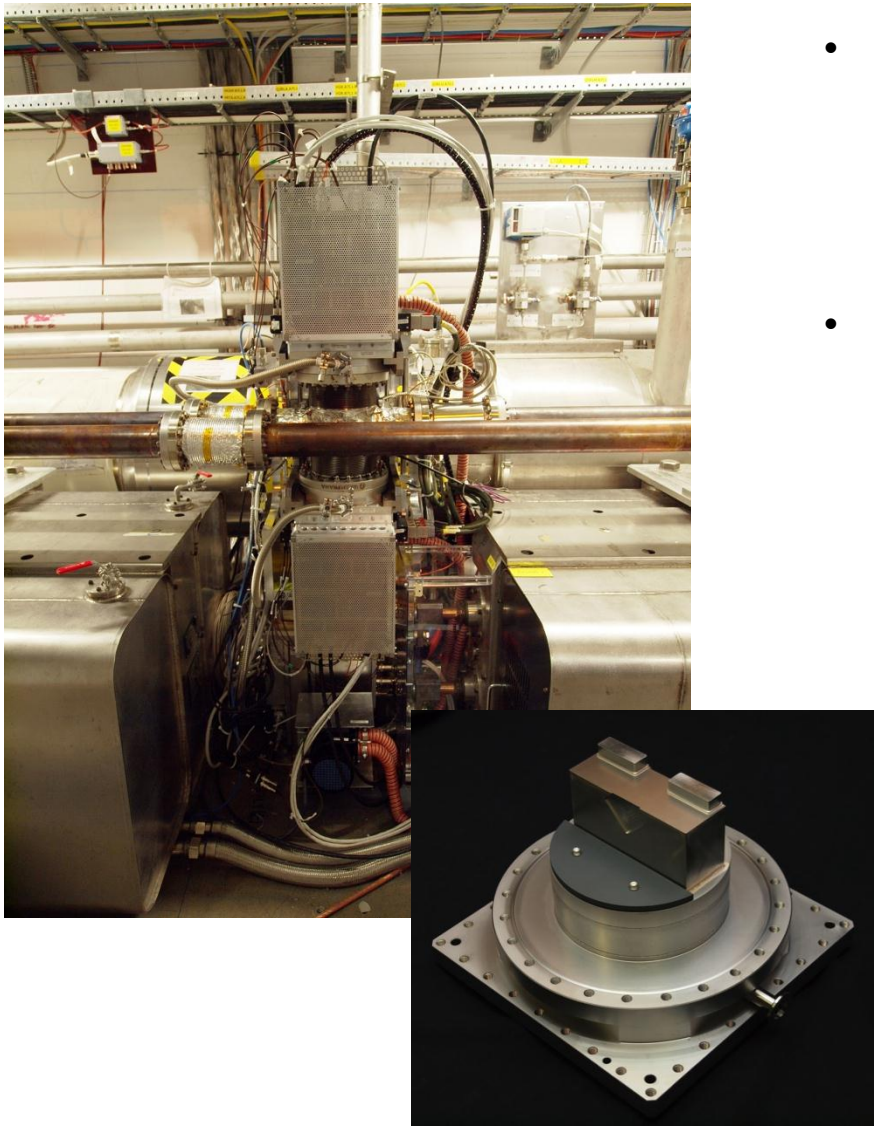
Absolute luminosity
Total cross section

ZDC



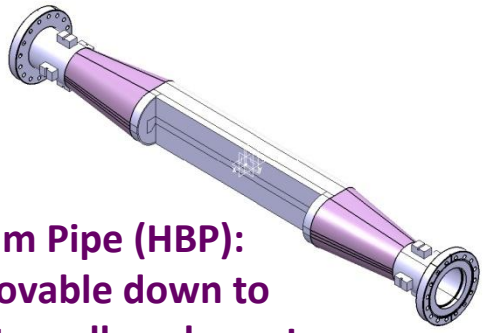
- The actual ZDC detector needs to be installed for every HI run at the end of the pp run in a zone that will be more and more radioactive
- **Impact on the LS1:** minimal
- **Operation after LS1:** The ZDC will be present as long as HI runs are scheduled at the LHC

ALFA



- **Activities during LS1:**
  - install cooling for the Roman Pot in order to cope with beam induced heating. A few cables need to be laid down from the ALFA location to USA15
- **Operation after LS1:**
  - 2 or 3 short fills at β*>2000 m to fulfill the approved physics program (we assume the quadrupole cables, needed to achieve high β*, will be installed in the LS1 as discussed during the 150th LMC)
  - The approved physics program is supposed to end before the LS2. However, ALFA might be used for additional physics studies beyond the approved physics program if requested

The AFP Project



Hamburg Beam Pipe (HBP):
Beam pipe movable down to
10 σ to detect small angle protons

- Activities during LS1:
  - install infrastructure (ECR in preparation) :
    - dummy beam pipe to be removed when inserting the HBP
    - cables and eventually cable trays
    - additional points for local reference of network survey
- Activities during winter shutdown 2015-2016:
  - install HBP and detectors
- Operation after LS1:
  - Data taking from 2016 until LS3

N.B. ATLAS is interested in looking at the possibility of extending AFP to 420 m (it implies a modification of the actual connection cryostat)

Forward detectors summary

- Forward detectors will be used for physics until LS3 . Standard maintenance work and upgrade projects should be expected during the next years
- ATLAS is aware of the LSS1 layout change during LS3:
  - Future physics results will show if forward detectors are needed beyond LS3 or not
  - If needed, ATLAS will adapt to the new layout and so would like to be kept informed of all changes