

Status of the ATLAS Forward Physics (AFP) Project

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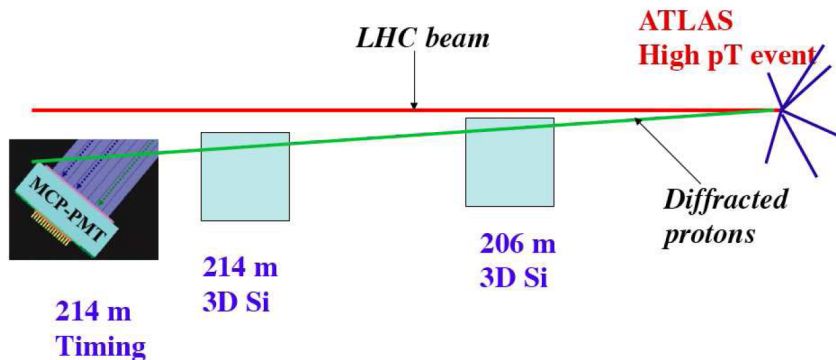
Palacky University

on behalf of the ATLAS Forward Detectors group

Diffraction 2012 Workshop, Puerto del Carmen, Lanzarote
15. 9. 2012

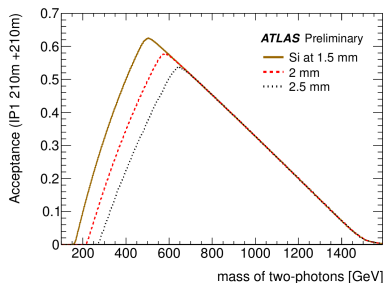
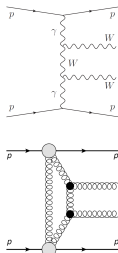
Introduction

- AFP plans to add set of detectors on both sides of the ATLAS forward region, around 210 m from the IP
- The goal is to detect protons outgoing from diffractive processes
- Designed to operate with high pile up
- Standard high luminosity LHC runs (contrary to ALFA)



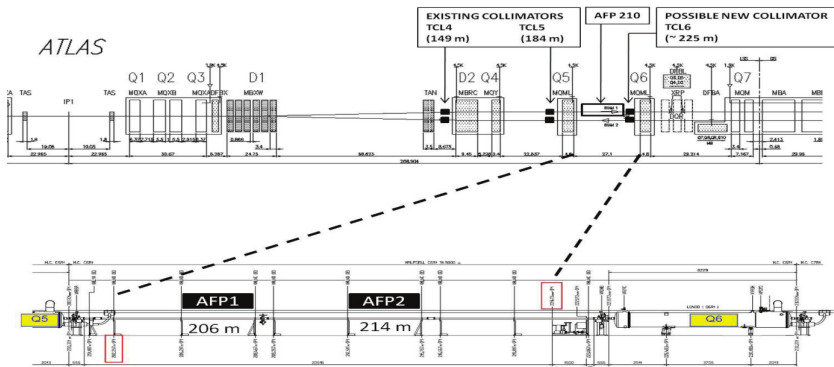
Physics goals

- Quartic anomalous coupling
- Exclusive production
 - magnetic monopoles, Kaluza-Klein resonances, jets, SUSY,...
- Details — talks of M. Taševský and C. Royon, ATLAS Lol Phase-I Upgrade (CERN LHCC-2011-012, LHCC-I-020)

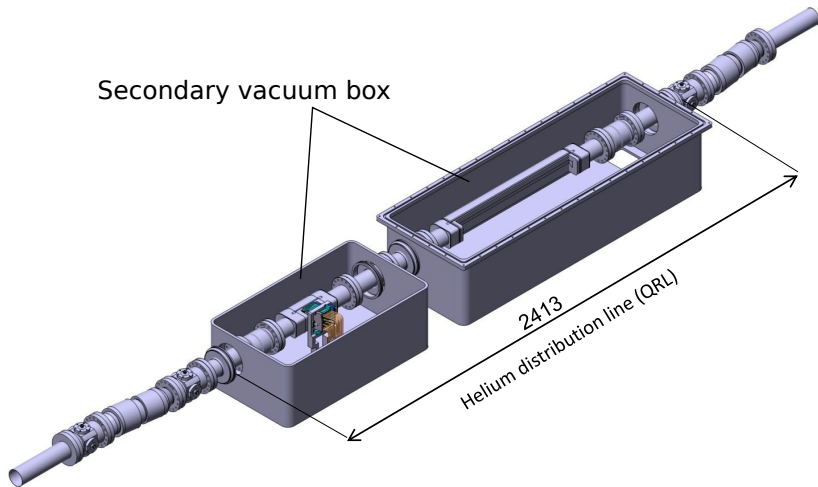


Overview

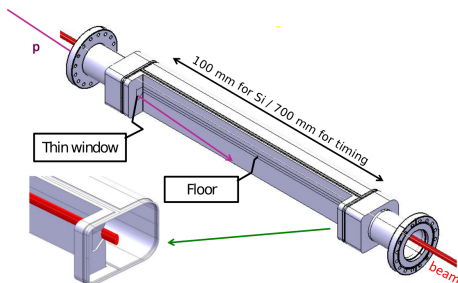
- AFP consists of 2 stations fitted with detectors on each side of the forward region of ATLAS:
 - At 206 m, the silicon tracking detector
 - At 214 m, the silicon tracking detector + time of flight detector



Overview – AFP2



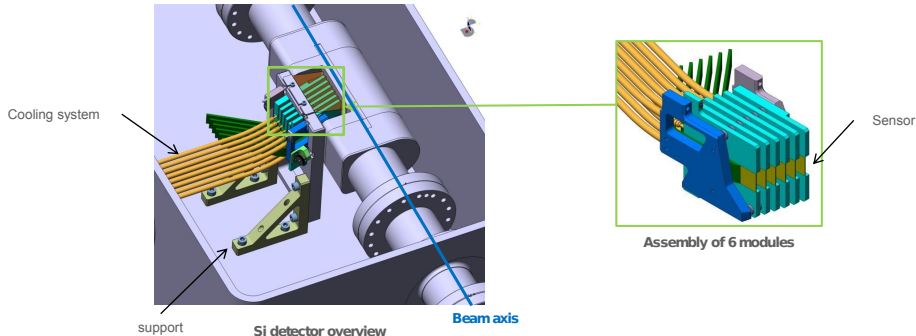
Hamburg Beam Pipe



- A detector housing designed to allow detector installation in limited space
- Horizontal movement, allowed by moving whole beam pipe on moving table
- Beam pipe wall is very thin (less than $300 \mu\text{m}$) in area of so called "floor" and "window" to minimize material between the beam and a detector

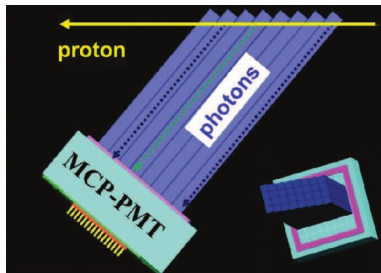
Tracking Detectors

- Six layers of 3D pixel sensors with FE-I4 as the readout chip
- Phase-0 — sensor developed for the IBL — radiation hard, thin edge (less than $100\ \mu\text{m}$ dead zone), resolution — $10\ \mu\text{m}$ horizontal, $30\ \mu\text{m}$ vertical, angular resolution $1\ \mu\text{rad}$
- Phase-I — edgeless 3D sensors



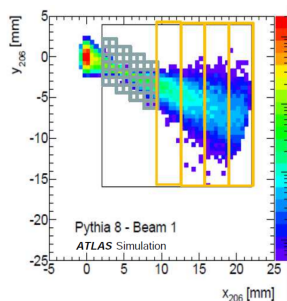
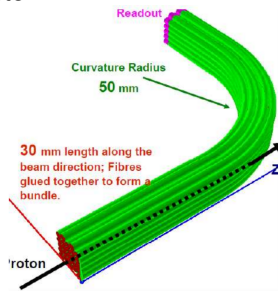
Time of Flight Detectors — Phase 0

- Needed to reduce background coming from pile up
- QUARTIC detectors with resolution of 10–20 ps
- Difference of time of flight of incoming protons determines primary vertex (10 ps \sim 3 mm)
- To achieve required time resolution, the detector consists of 4x8 quartz bars \rightarrow 8 measurements per detector with 30–40 ps resolution each

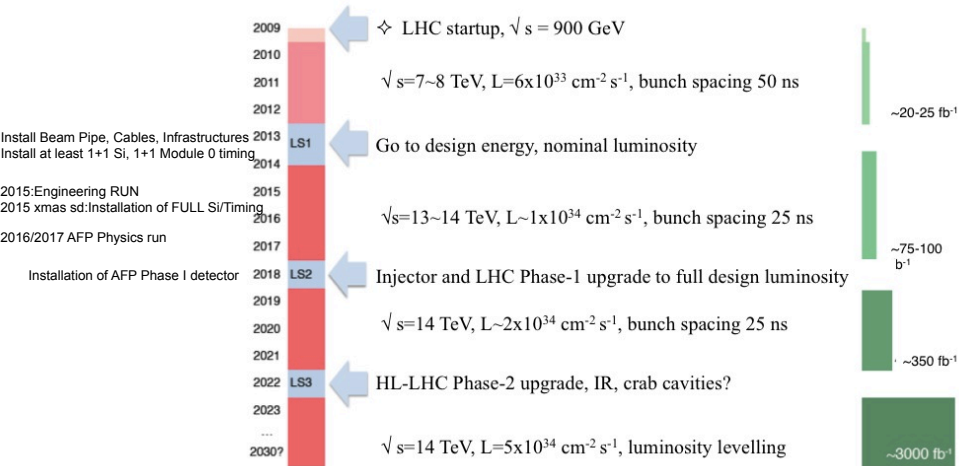


Time of Flight Detectors — Phase I

- Need for better space resolution due to more incoming protons
- Several possibilities are being considered:
 - QUARTIC with quartz fibers instead of bars
 - MicroMegas
 - CVD Diamond detector
 - Avalanche Photo-Diode
 - Si-Pm detector
 - SAMPIC



AFP Installation Timeline



Summary

- AFP shall add set of detectors in the ATLAS forward region around 210 m from the IP meant to detect protons from diffractive processes
- Detectors are to be fitted in Hamburg beam pipe — a compact movable detector housing
- AFP consists of 2 sets of 3D pixel detectors and 1 set of QUARTIC time of flight detectors on each side of the forward region
- AFP is now under approval with possible installation at the end of 2013/beginning of 2014
- Countries involved: **Canada** (Alberta, Toronto), **Czech Republic** (Prague (FzU ASCR, CTU), Olomouc), **France** (Saclay), **Italy** (Bologna, Genova, Milano, Lecce, Trento, Cosenza), **Norway** (Oslo, Bergen), **Poland** (Cracow (AGN, PAN)), **Portugal** (Lisbon), **Spain** (Barcelona), **Switzerland**(Geneva, CERN), **United Kingdom** (Glasgow), **USA** (Arlington, New Mexico, SLAC, Oklahoma, Ohio, Stony Brook, Washington, Albany)

Thank you for your attention