### Calibration, testing, commissioning and first data of ALFA at LHC

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**Luminosity determination from elastic scattering**

**Aim:** Measure the absolute luminosity independent from beam parameters.

**Method:** Measuring elastic scattering in the Coulomb region (very small angles ~3.5°).

**Need:** Edgeless tracking detector very close to the beam at large distance from the interaction point.

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**The ALFA detector system**

- **Edgeless tracking detector:** Scintillating fibers has been chosen which are fully active already at ~20 μm from the cut edge. The fiber are positioned in a U-V configuration with 64 fibers in each layer.

- **Triggering:** Dedicated 3 mm scintillating tiles readout by photomultipliers (Hamamatsu R7400P and R9880U-110) are used for triggering.

- **Fiber staggering:** To improve detector resolution the aluminized squared scintillating fibers (Kuraray SCF-78, S-type, 0.5 x 0.5 mm²) are arranged in staggered layers given an overall detector resolution of ~30 μm. There are a total of 1460 fibers in each of the 8 detectors.

- **MAROC 2 chip:** 64 channel amplification and discrimination + optional charge readout.

- **Front-End electronics:** One board voltage divider + active board with FPGA and MAROC 2 chip.

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**Gain equalization**

The gain of MAPMT channels differs up to a factor 3 and in addition the gain varies about a factor 2 from one MAPMT to another. The position of the 1 photoelectron (PE) is therefore measured using low intensity pulsed LED light. Amplification in the MAROC 2 chip was applied to equalize all channels.

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**Test with cosmic particles**

The detectors with full Front-End electronics was tested with cosmic particles before installation and the light yield of each scintillating fiber determined.

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**Fiber crosstalk - blackening of Roman Pot window**

Test beam data showed much higher than expected fiber crosstalk. Laboratory tests could traced the additional fiber crosstalk back to reflections on the Roman Pot window. Before installation in LHC the Roman Pot window was therefore blackened with ~30 μm DAG (graphite) layer.

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**First data from LHC**

All detectors have been installed in the LHC tunnel left and right of ATLAS and the very first data for commissioning have been taking. Left is shown a track in a detector (chosen as it has indication MAPMT crosstalk, which is expected at low level) and right a track map taking with the detector in garage position.