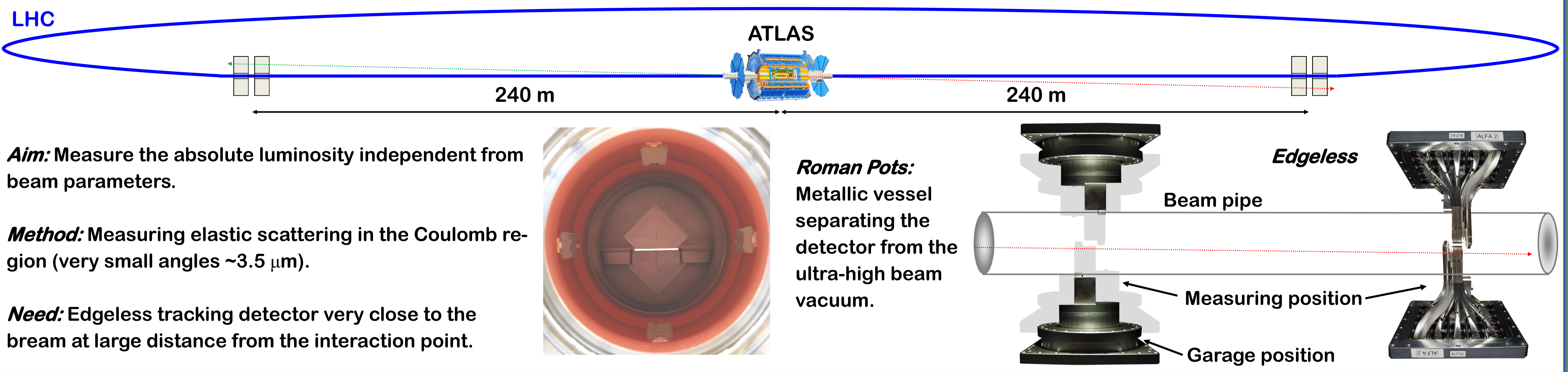


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Luminosity determination from elastic scattering



The ALFA detector system

Edgeless tracking detector: Scintillating fibers has been chosen which are fully active already at $\sim 20 \mu\text{m}$ 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 out by photomultipliers (Hamamatsu R7400P and R9880U-110) are used for triggering.

Fiber staggering: To improve detector resolution the aluminized squared scintillating fibers (Kuraray SCSF-78, S-type, $0.5 \times 0.5 \text{ mm}^2$) are arranged in staggered layers given an overall detector resolution of $\sim 30 \mu\text{m}$. There are a total of 1460 fibers in each of the 8 detectors.

Multi-Anode PhotoMultiplier Tube readout: The scintillating fibers are readout by 64 channel MAPMTs (Hamamatsu R7600-00-M64) centered by shims.

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.

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.

1 photoelectron position

Position of 1 PE mean (ADC counts) vs MAPMT channels. Before equalization (red) and After equalization (blue) are shown. The equalized distribution is much narrower and centered around 1000 ADC counts.

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.

Average light yield in one detector layer

Light yield in photo electrons vs Fiber number. Data points for different cut fibers are shown with their respective averages and standard deviations.

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 $\sim 30 \mu\text{m}$ DAG (graphite) layer.

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.

U projection, RP4

Fiber number vs Layer number. Shows a track with a MAPMT crosstalk candidate.

V projection, RP4

Fiber number vs Layer number. Shows a track with a MAPMT crosstalk candidate.

ATLAS preliminary $\sqrt{s} = 7 \text{ TeV}$, 2011 data

ALFA track map in garage position showing event density in the x-y plane.