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on Behalf of the ATLAS Collaboration

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25th International Workshop on
Deep-Inelastic Scattering and Related
Topics
### ATLAS Forward Detectors

<table>
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<tr>
<th>LUCID</th>
<th>Zero Degree Calorimeter</th>
<th>Absolute Luminosity For ATLAS</th>
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<tbody>
<tr>
<td>17 m</td>
<td>140 m</td>
<td>240 m</td>
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- **ATLAS Forward Proton**  
  210 m

- four horizontal roman pots
- detectors dedicated to the measurement of diffractively scattered protons
stations placed at 205 m and 217 m away from the nominal interaction point
acceptance in
$$\xi = (E - E')/E \approx (0.025, 0.1)$$
near stations equipped with 3D pixel tracking detectors
far stations additionally house time-of-flight counters
Tracking Detectors

- 4 layers of 3D pixel detectors in each station
- $336 \times 80$ pixels of $50 \times 250 \, \mu m^2$
- Pixel modules are similar to the ones used in IBL with proven radiation hardness
- Detectors are tilted by $14^\circ$ with respect to the horizontal direction
- Measure the forward proton track needed to reconstruct its kinematics
Time-of-Flight Counters

- 4 × 4 Quartz LBars
- time resolution aiming at 10 ps
- vertex position resolution of about \( \sigma_z = 2.1 \text{ mm} \)
- design efficiency not smaller than 90 %
- fast enough to provide trigger signal
- pile-up background reduction
- necessary in standard runs with high pile-up
AFP in 2016 — Installation

- two stations installed on one side ATLAS
- tracking detectors installed in the stations
- passed LHC qualification
- DAQ system integrated with ATLAS
- trigger system integrated with ATLAS
AFP in 2016 — Data Taking

- commissioning runs with various positions of the detectors
- smooth operations
- two dedicated physics runs with low pile-up ($\mu \approx 0.03$ and $\mu \approx 0.3$)
- collected integrated luminosity $\mathcal{L} \approx 500\,nb^{-1}$
in most events 2 hits are observed in each plane
very good correlation of hits between two planes (first and second)
relatively high cross section

- single proton detectable in AFP

- AFP provides access to so far non-measurable quantities like

\[ \xi = \frac{(E - E')}{E} \quad \text{or} \quad t = \left( \mathbf{P} - \mathbf{P}' \right)^2 \]

Presently Studied

- inclusive single diffractive dissociation

- diffractive dijet production
AFP in 2017

- two remaining stations installation
- tracking detectors installation
- time-of-flight counters installation in the far stations
- LHC qualification
- timing detectors triggers integration with ATLAS
- data acquisition in special runs
- data acquisition in standard runs
2017 Physics Program — Central Diffraction

- low pile-up runs for studies of high cross-section processes
- standard runs for small cross-section processes studies
- double proton tag allows direct observation of central diffraction
- access to full event kinematics

Considered Analyses

- central diffractive jets production
- exclusive dijet production
- photon induced processes
- single diffractive production of $W$ or $Z$
## Summary

### 2016
- successful installation and operation
- collected good data with $\mathcal{L} \approx 500 \text{nb}^{-1}$ for studies of single diffraction
- data analyses are already in progress

### 2017
- installation of the remaining two stations and time-of-flight counters
- data acquisition in standard runs with high pile-up as well as in dedicated runs
- studies focused on central diffraction
Thank You for Your Attention!