ATLAS Note

May 28, 2015

LUCID plots for approval.

The LUCID Group

Abstract

The note contains luminosity figures obtained from 13 TeV data recorded during a commissioning run in May of 2015.

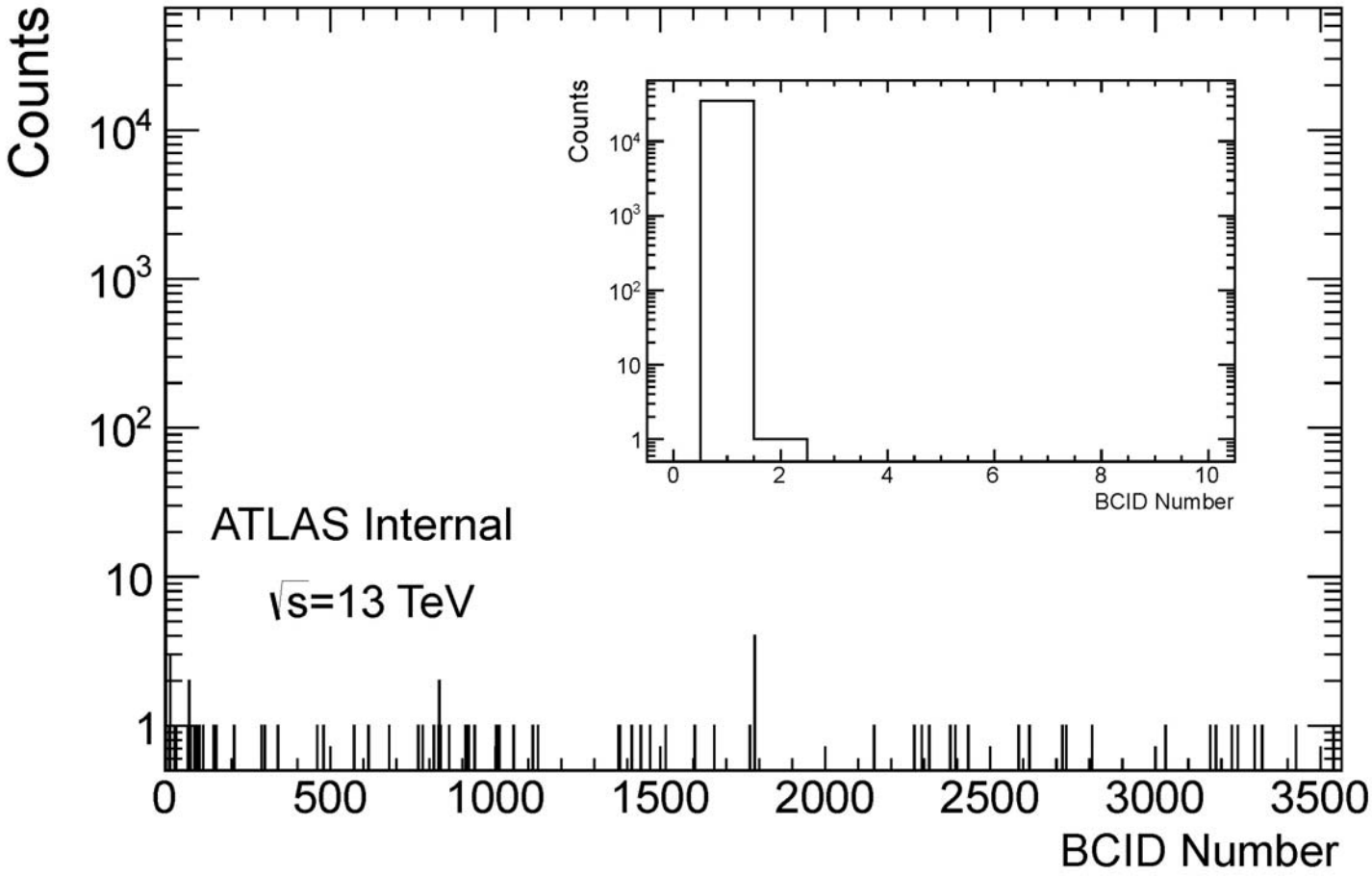

Figure 1 *– The measured number of OR-events by the LUCID fiber detector as a function of the bunch crossing number during one luminosity block in a fill with 13 TeV collisions recorded on the 21th of May 2015. The collisions were in the first bunch crossing and the inset plot shows that most of the counts are indeed recorded for the first BCID.*

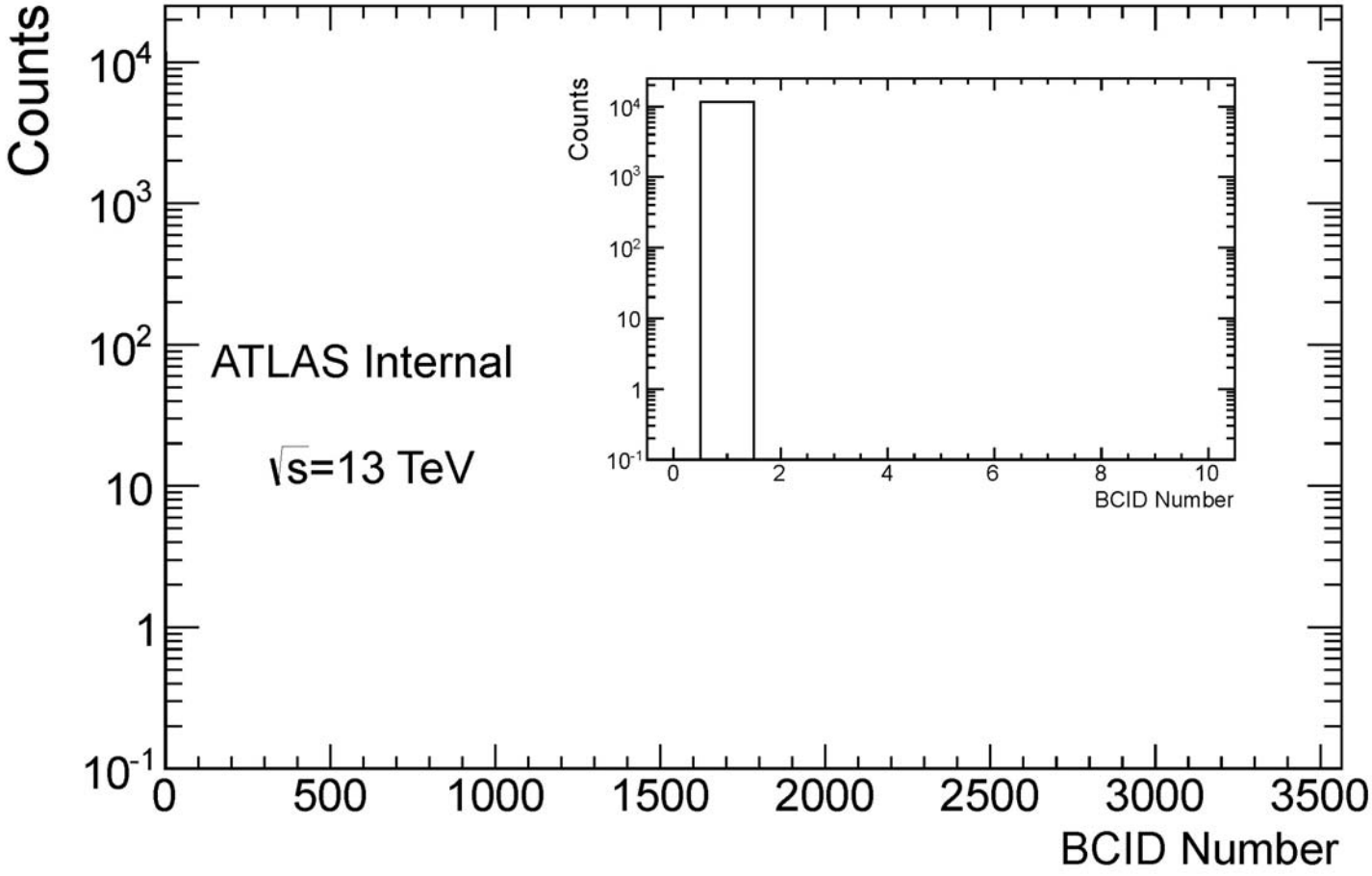

Figure 2 *– The measured number of AND-events by the LUCID fiber detector as a function of the bunch crossing number during one luminosity block in a fill with 13 TeV collisions recorded on the 21th of May 2015. The collisions were in the first bunch crossing and the inset plot shows that most of the counts are indeed recorded for the first BCID. This plot has not a single count except for BCID = 1 and this demonstrates how the AND requirement rejects background events and how LUCID is able to measure collisions within a single 25 ns time window.*

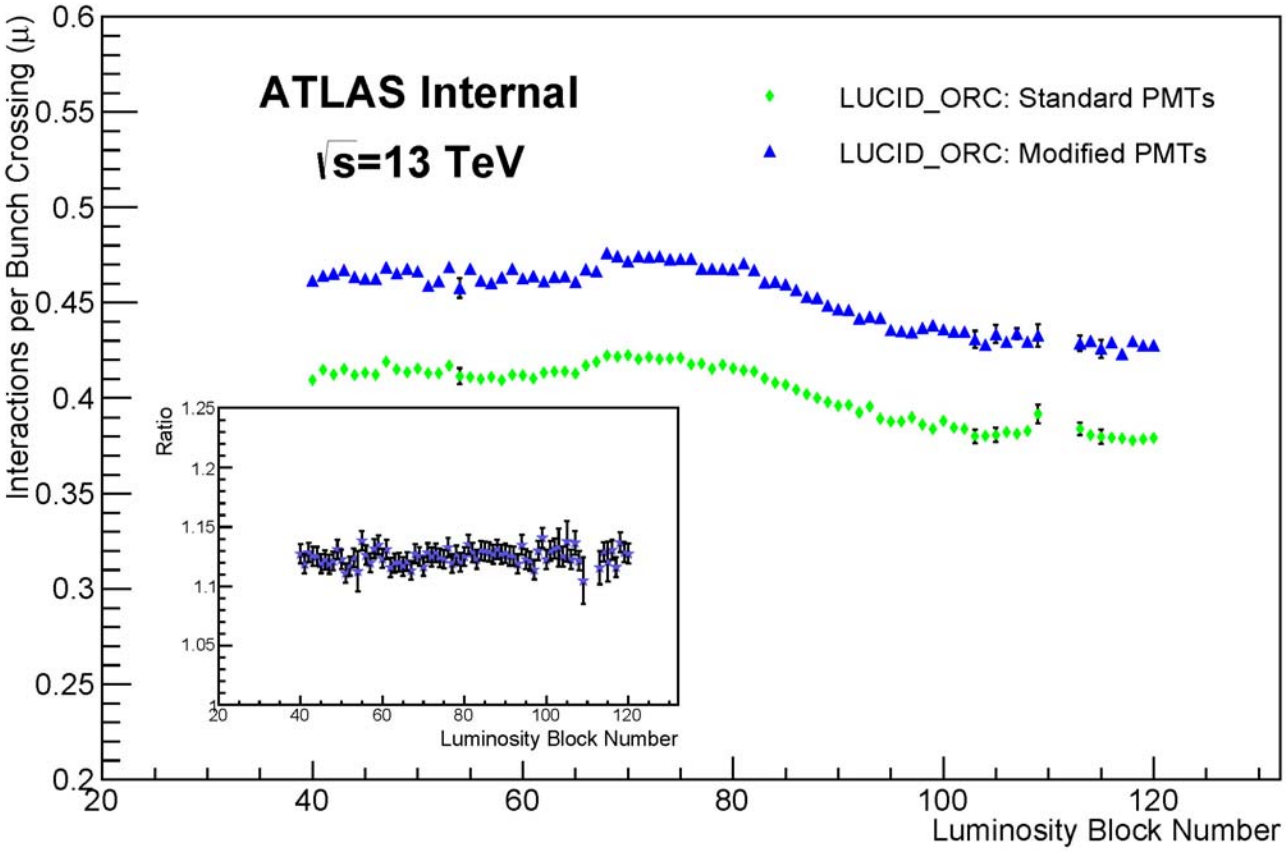

Figure 3 *– The average number of pp-interactions per bunch crossing (mu) measured by LUCID as a function of the luminosity block in a 13 TeV commissioning run recorded on the 21th of May 2015. The mu value was measured by 4 standard Hamamatsu R760 photomultipliers in OR-mode on side C of ATLAS as well as by 4 modified photomultipliers. These modified photomultipliers have a thin aluminium ring between the quartz window and the photocathode in order to reduce the acceptance. The inset plot shows the ratio of the mu values measured by the two detectors. The calibration was obtained from a GEANT Monte Carlo simulation of LUCID in ATLAS and the measured mu for the detector with modified photomultipliers agreed to within 12% with the mu measured with the detector using standard photomultipliers. This difference between two Monte Carlo calibrations in a commissioning run like this is in line with previous experience where Monte Carlo calibrations typically has not achieved a precision better than 20%. All errors in the plot are statistical only.*

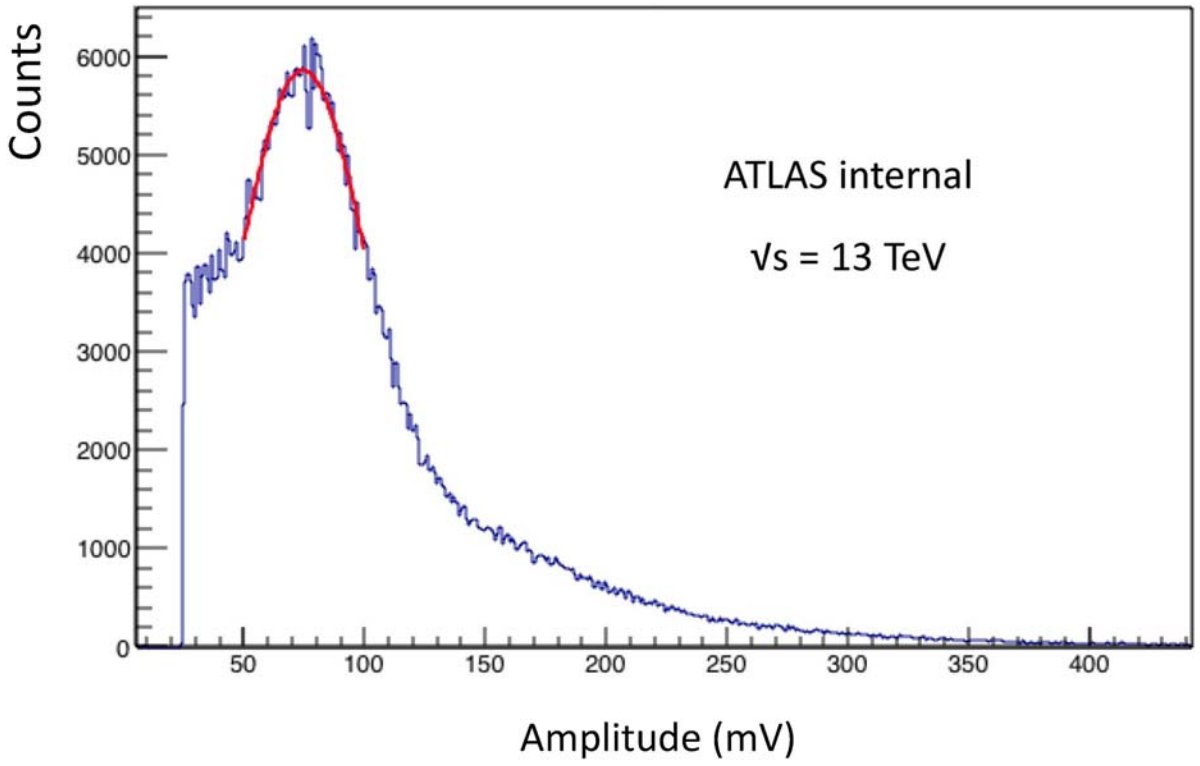

Figure 4 *– The pulseheight distribution from one photomultiplier in the LUCID detector during a 13 TeV run recorded on the 21th of May 2015. The Cerenkov light created in the quartz window of the photomultiplier produces a clear peak in the amplitude distribution that has been fitted by a Gaussian distribution (in red). Only signals above a threshold defining a particle hit are plotted in the figure.*