HGT D in ATLAS: Simulation study of $t_0$ calibration for HL-LHC

Motivation

HL-LHC challenges:
- Pileup $< \mu >$ > 200
- Stochastic pileup jets

To encounter the HL-LHC challenges, the High-Granularity Timing Detector (HGTD) is a new detector proposed to resolve the temporal spread of a bunch crossing:
- Forward region, $2.4 < \eta < 4.0$
- Timing resolution from 30-50 ps per track
- Use timing to resolve the vertices equally in $z$, but distributed in time

Objectives

- Introduce $t_0$ calibration.
- How to compute calibration constants.
- Results.

Why do we need $t_0$ calibration?

- The time of arrival of a hit measured in HGTD ($t_{\text{hits}}$) will be different between pads due to electronics contributions:
  - Flex, IpGBT, FELIX, ...
- The different jitter contributions have been parametrized using MC samples.

$t_0$ calibration methodology

- The calibration constants are calculated at regular intervals of events as the arithmetic mean of $t_{\text{hits}}$ distributions.
- $t_{\text{calib}} = t_0 = t_{\text{hits}} - < t_{\text{hits}} >$
  where:
  - $< t_{\text{hits}} >$ = calibration constant

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