The upgrade of the ATLAS Luminosity detector (LUCID) for HL-HLC

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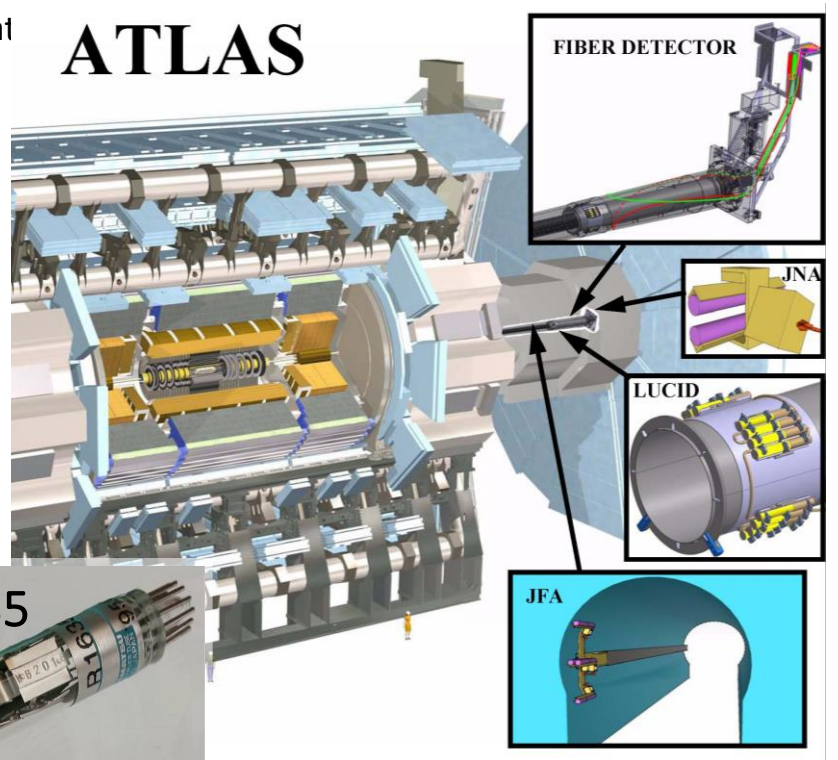

LUCID is and has been the main ATLAS Luminosity monitor: the only detector that can measure luminosity for individual bunch crossings, online, in any LHC L range.

- *Total Run 2 offline luminosity measured with a 1.7% uncertainty and a better than 1% stability over time.*
- *Main systematic:* ***VDM calibration***

HL-LHC imposes harsher conditions and requirements. Solutions:

- New smaller or modified PMT's (R1635)
  - Reduced saturation for better uncertainties
- New PMT positioning, further from the beam-pipe (JF detector)
  - Further reduces saturation, lowers current and total dose, allows for quick replacement
- An improved fiber detector with a new calibration system
  - Low current, low irradiation, fiber degradation monitored

The prototypes for these solutions are under test in ATLAS and lab.

- All PMT's are now instrumented with 207Bi sources to keep their gains constant.
- The Fiber degradation was tested in a gamma irradiation campaign using 6 LED wavelengths, showing potential losses in the UV range.
- A monitoring system in the prototype detector uses 6 wavelengths to calculate a Luminosity correction factor.