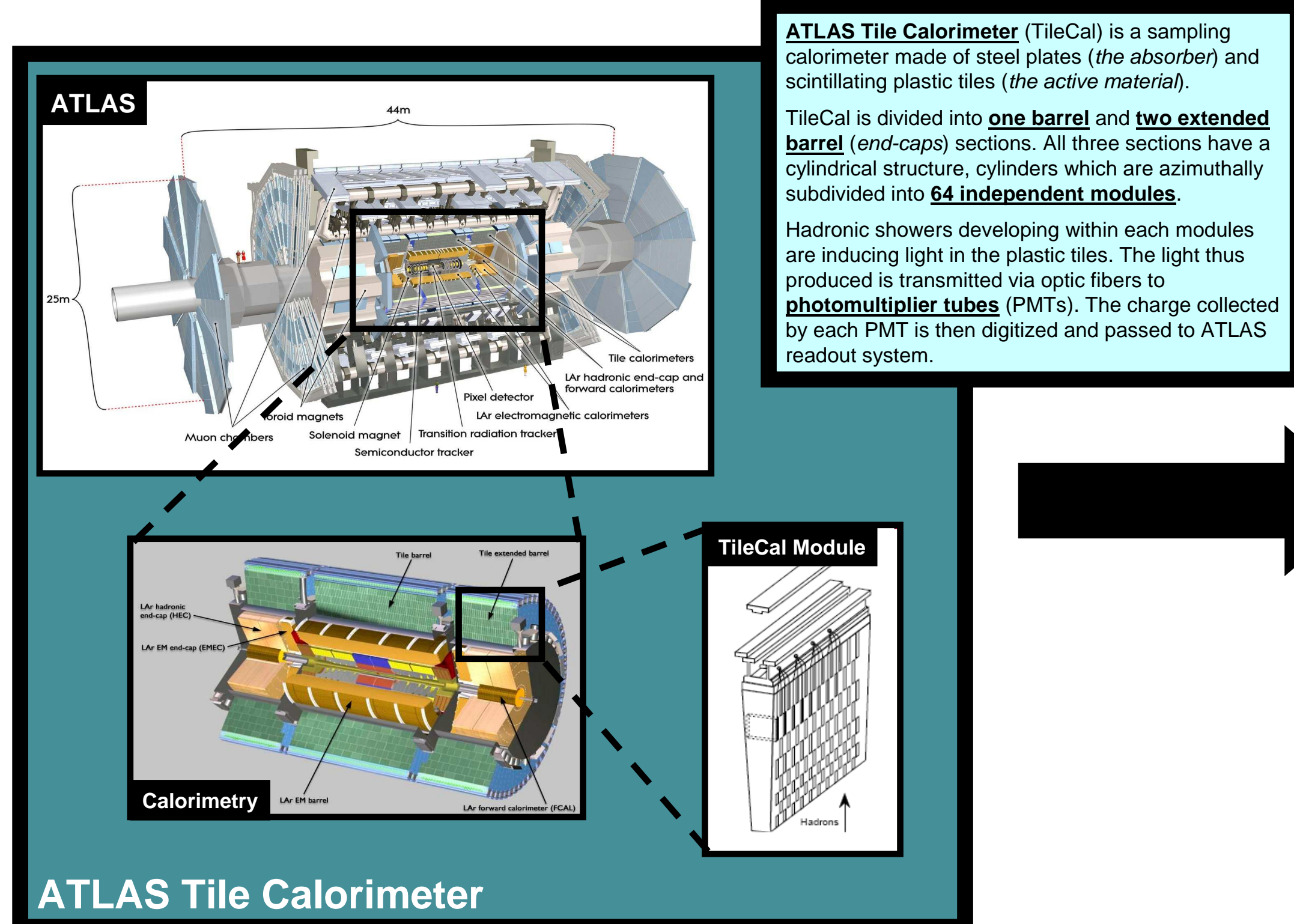




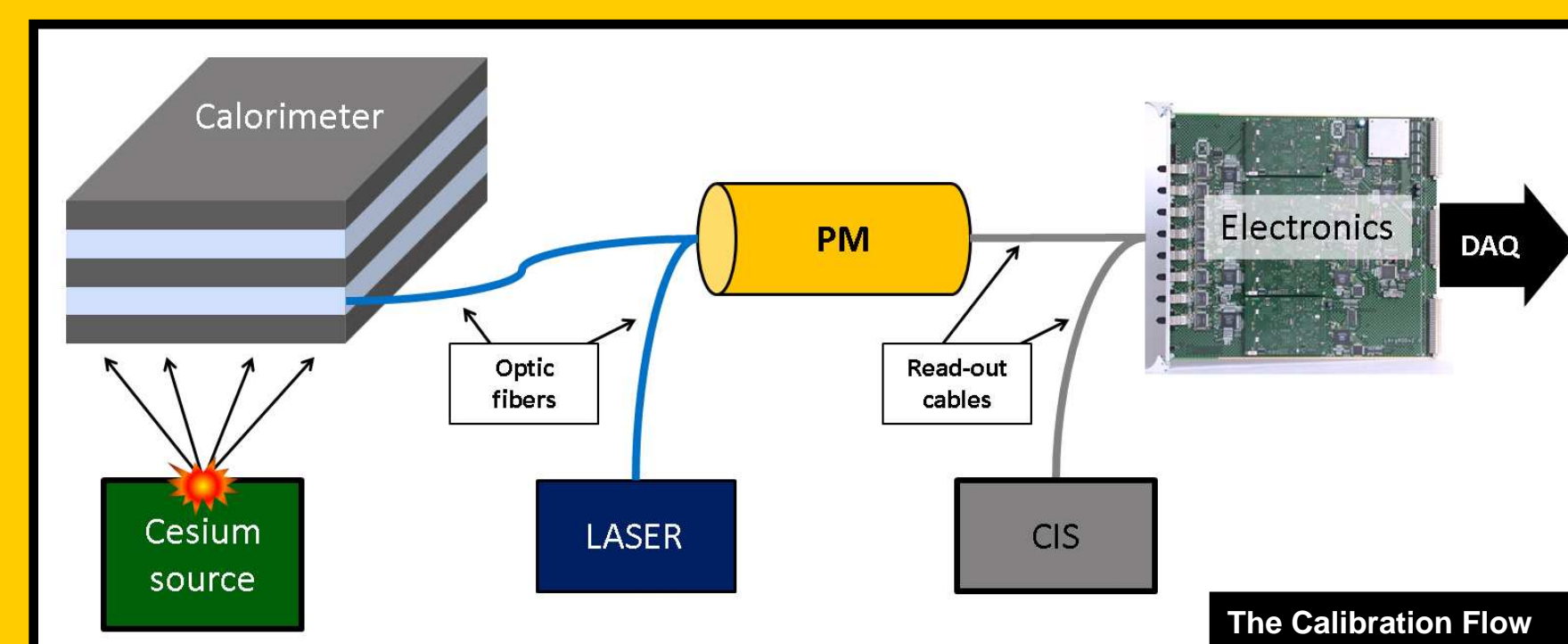
LASER Monitoring System for the ATLAS Tile Calorimeter

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The context



TileCal Calibration Principle

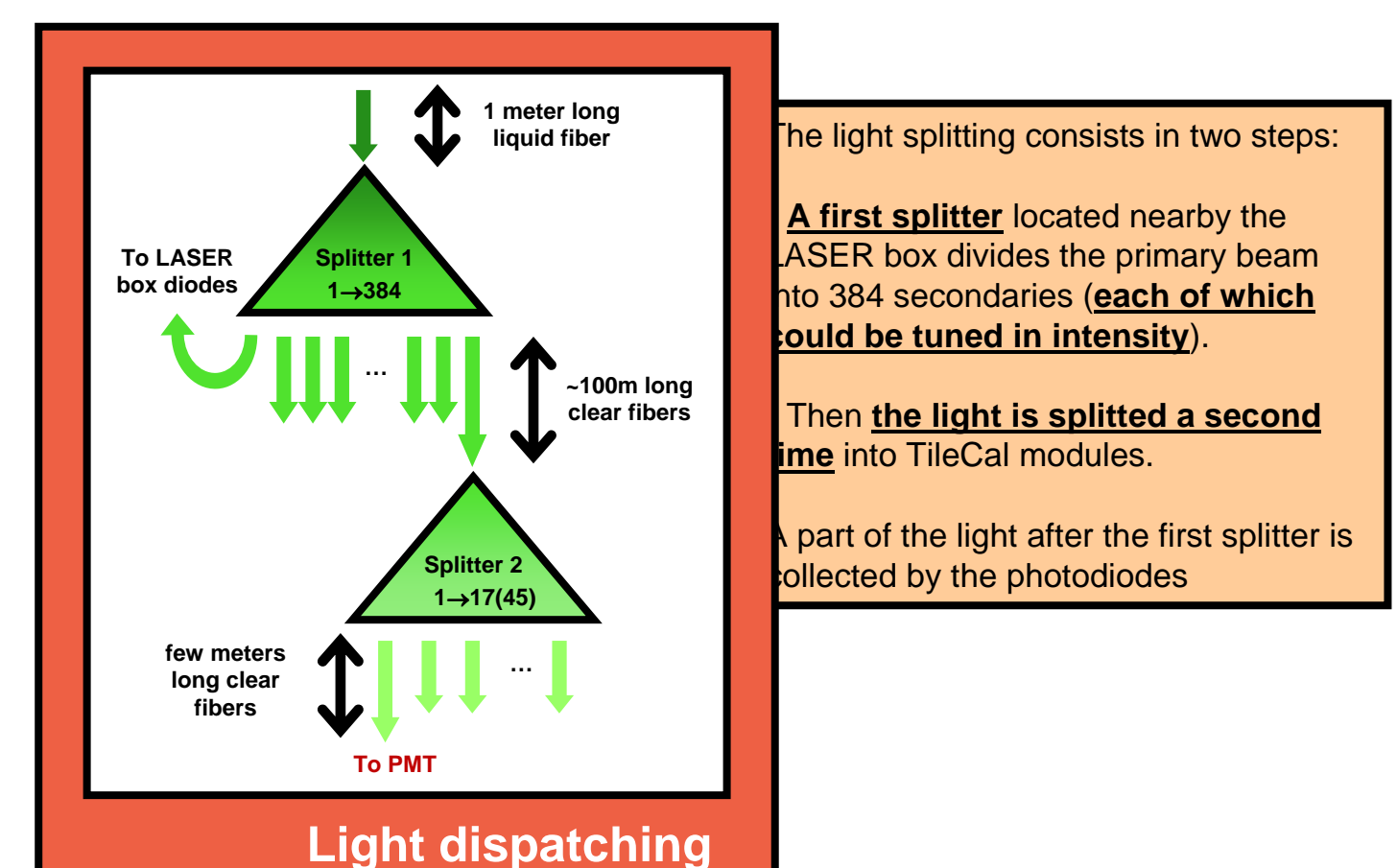
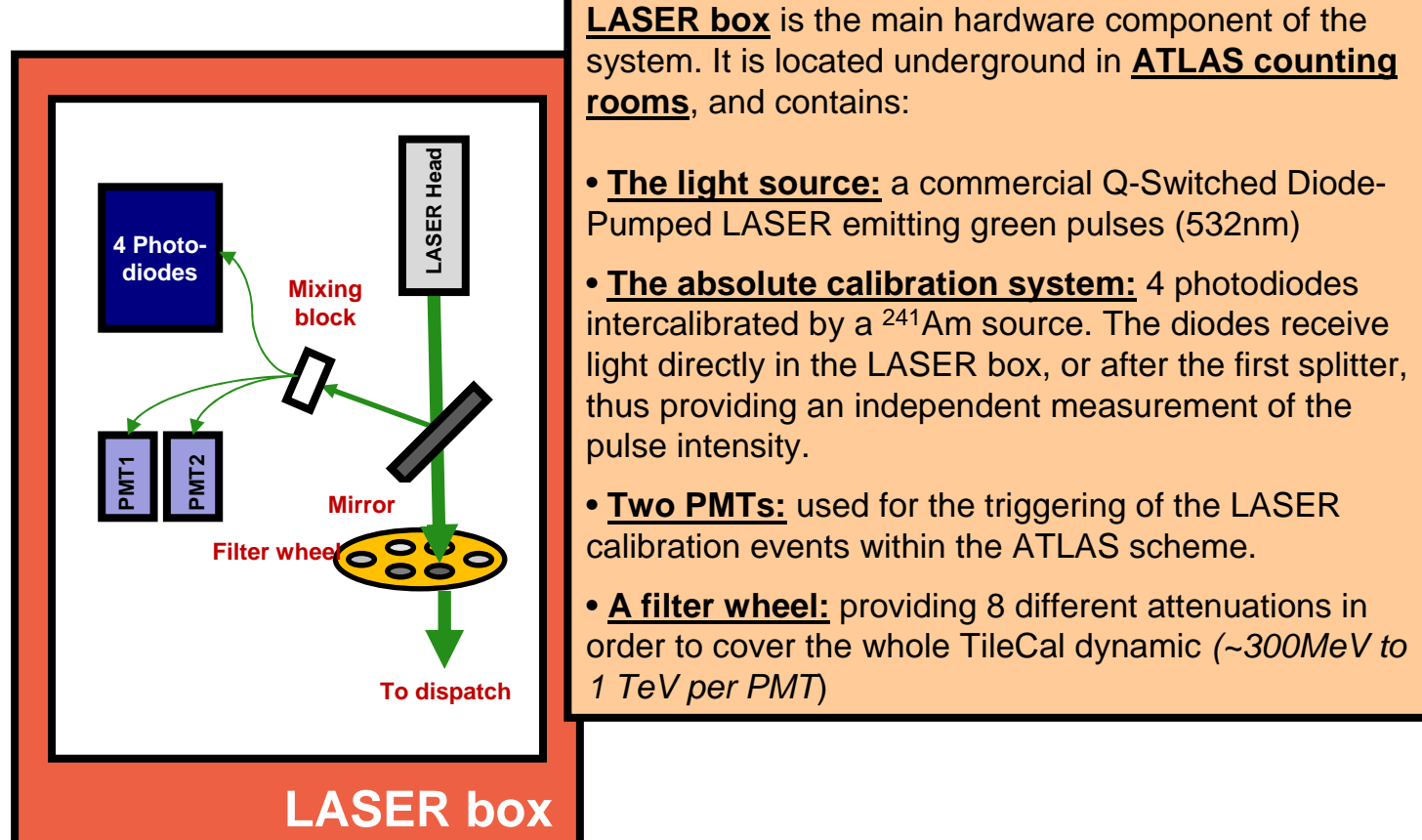
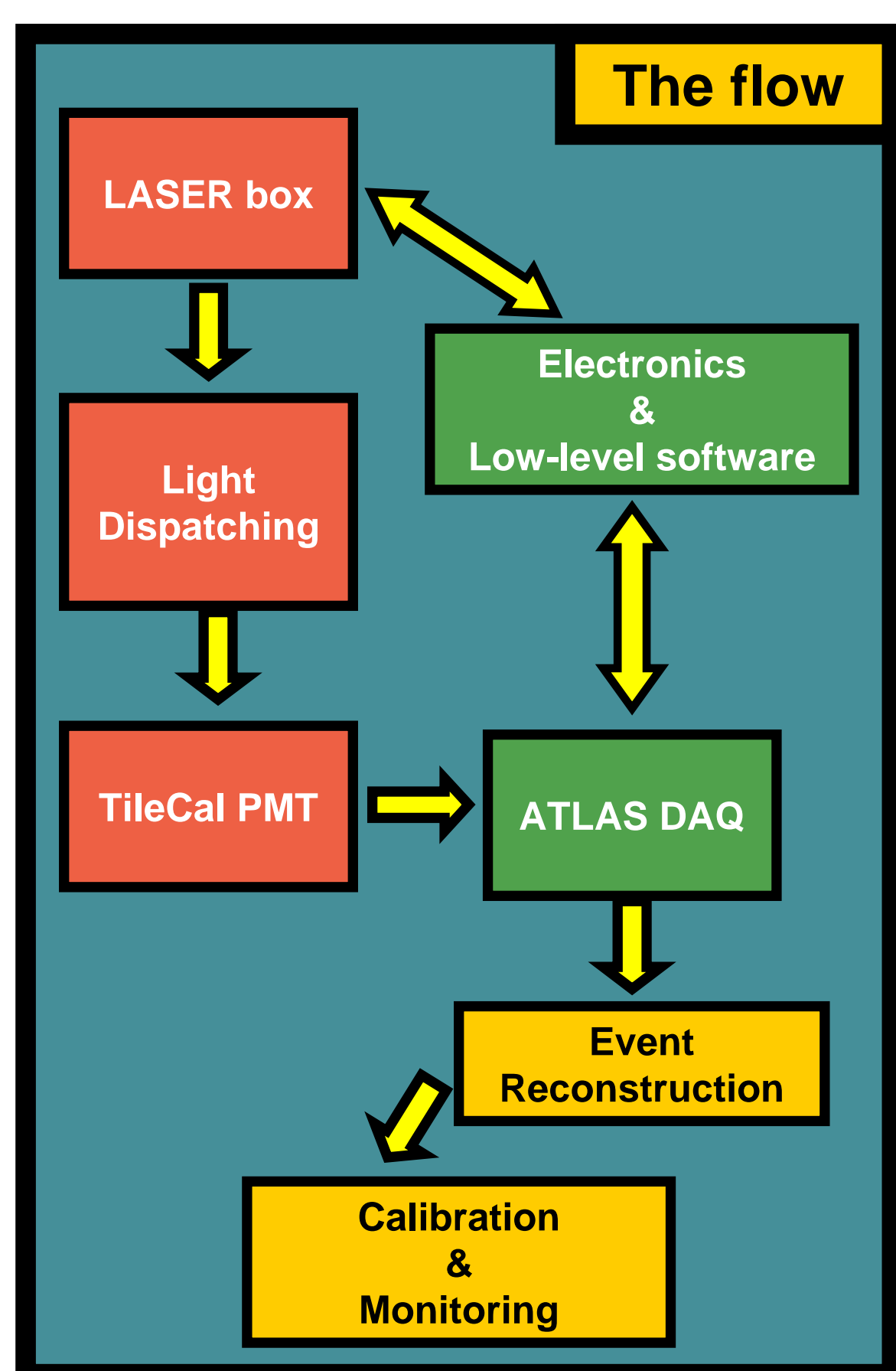


LASER system is one of the three **hardware calibration system** of the TileCal, which are providing a calibration of the full hardware chain, from active modules to the read-out electronic. The two other systems are:

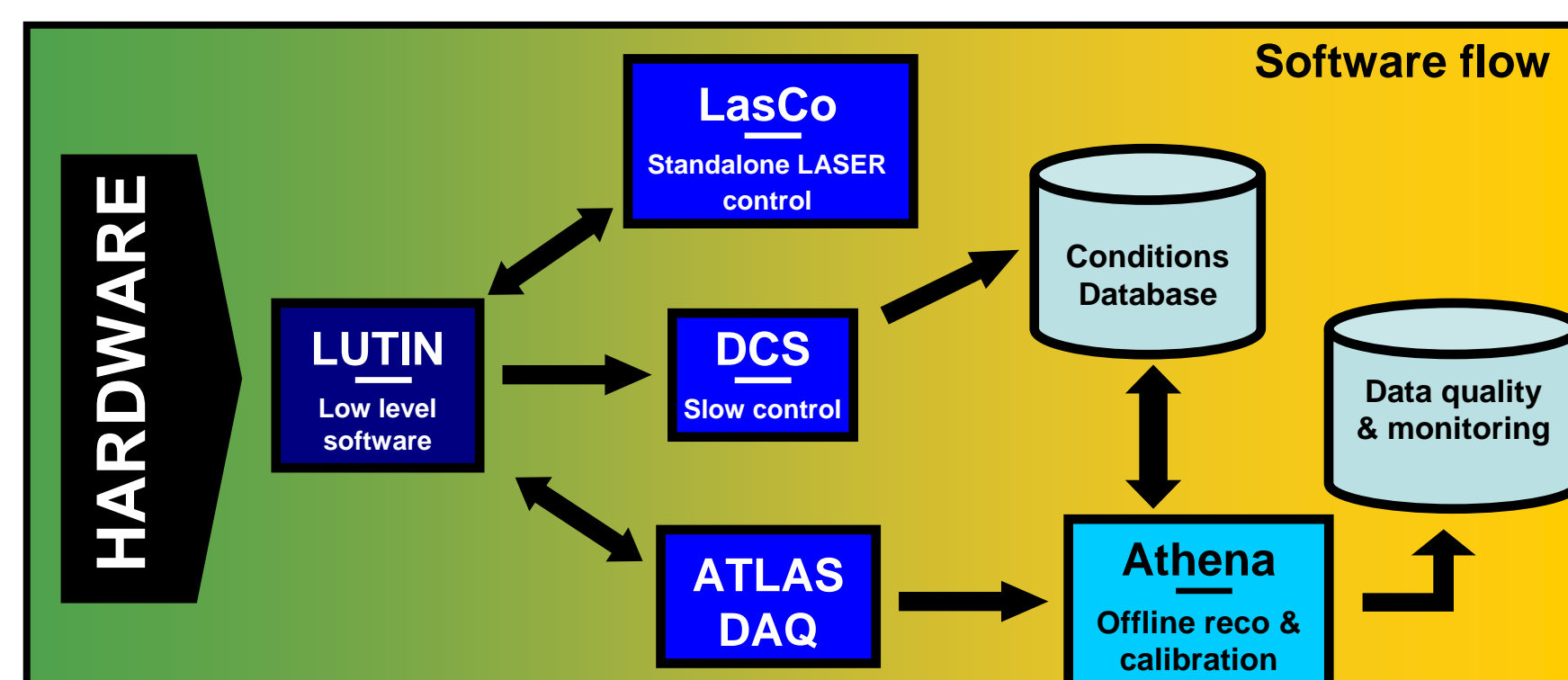
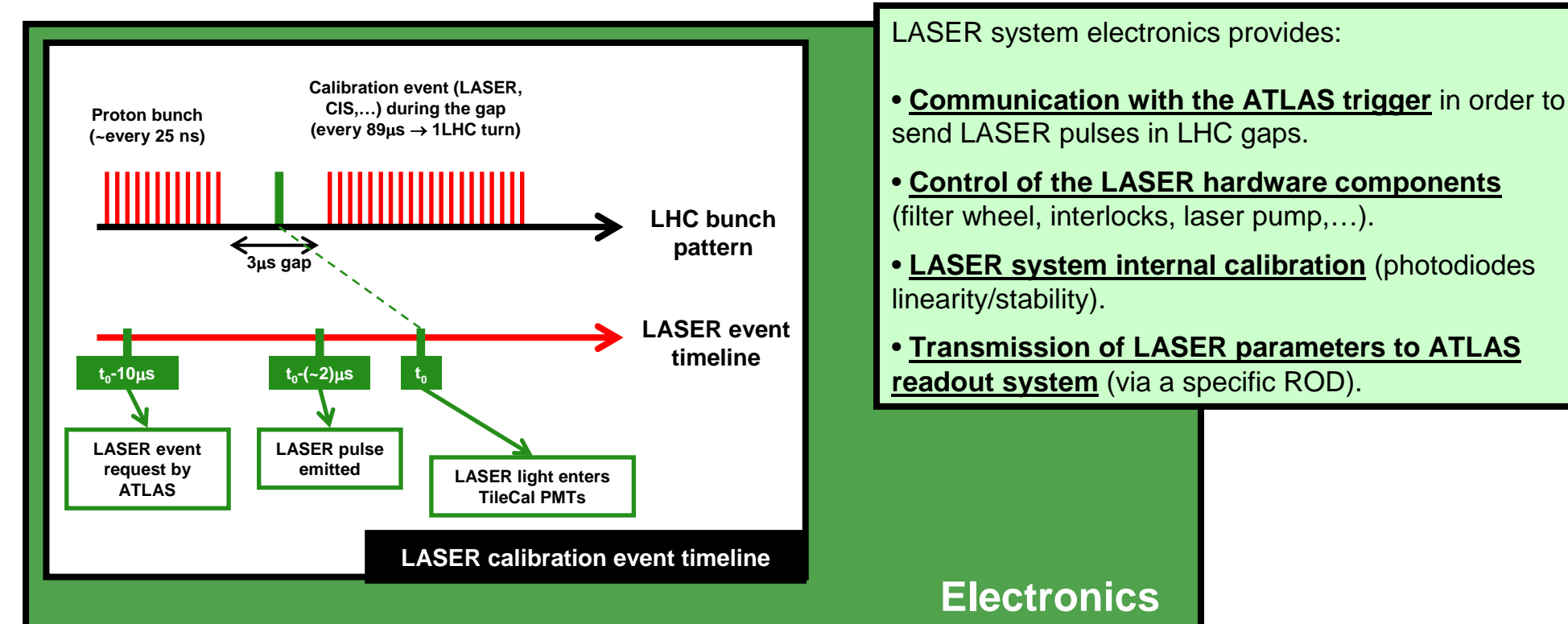
- **Cesium (Cs)**: a ^{137}Cs source is moved into the calorimeter modules. The light thus produced is collected and measured for each cell, thus leading to the comparison of each cell response. **Cs system provides a calibration of the full chain**.
- **Charge Injection System (CIS)**: impulses of known intensity are pulsed into the readout electronic chain. It leads to a precise estimation of the electronic noise and linearity. **CIS calibrates the end of the chain**.

The **LASER system** provides information concerning the PMTs stability and linearity. LASER light is pulsed via optic fibers through the PMTs. As the LASER light intensity sent is well known and calibrated, it is possible to monitor PMTs stability and linearity.

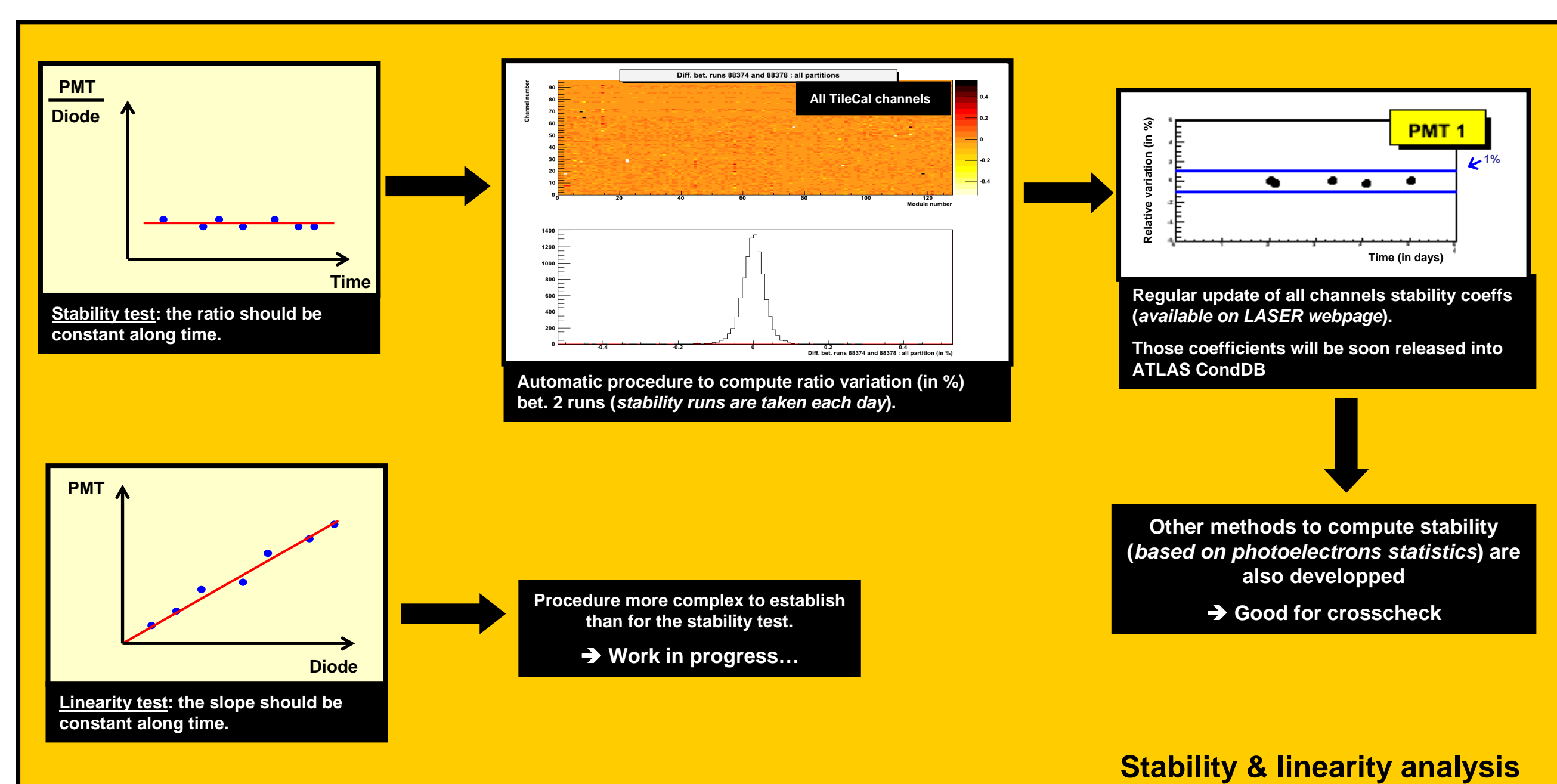
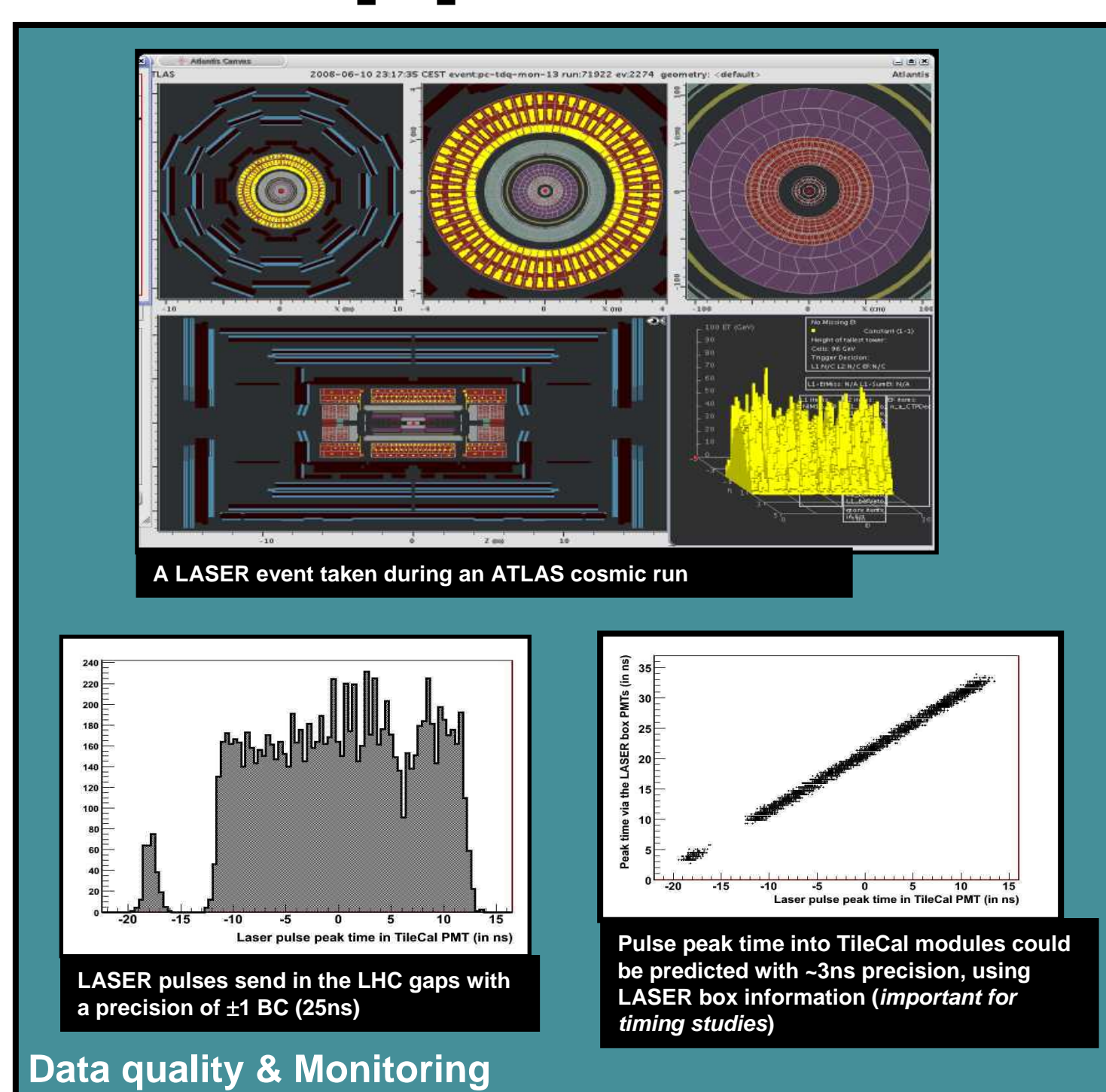
Using the three systems altogether, it is possible to know precisely, when a problem occurs, what is the source of this problem.



System description



Results & applications



...and many other applications...

- In parallel to those studies, LASER system has been (and still is) extensively used for **TileCal timing**, **Calorimeter trigger debugging**, ...
- LASER system has already been a very useful tool for ATLAS commissioning...

→ More information: <http://atlas-tile-laser.web.cern.ch>

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