Direct Photon Calorimeters: **FEE and DAQ**

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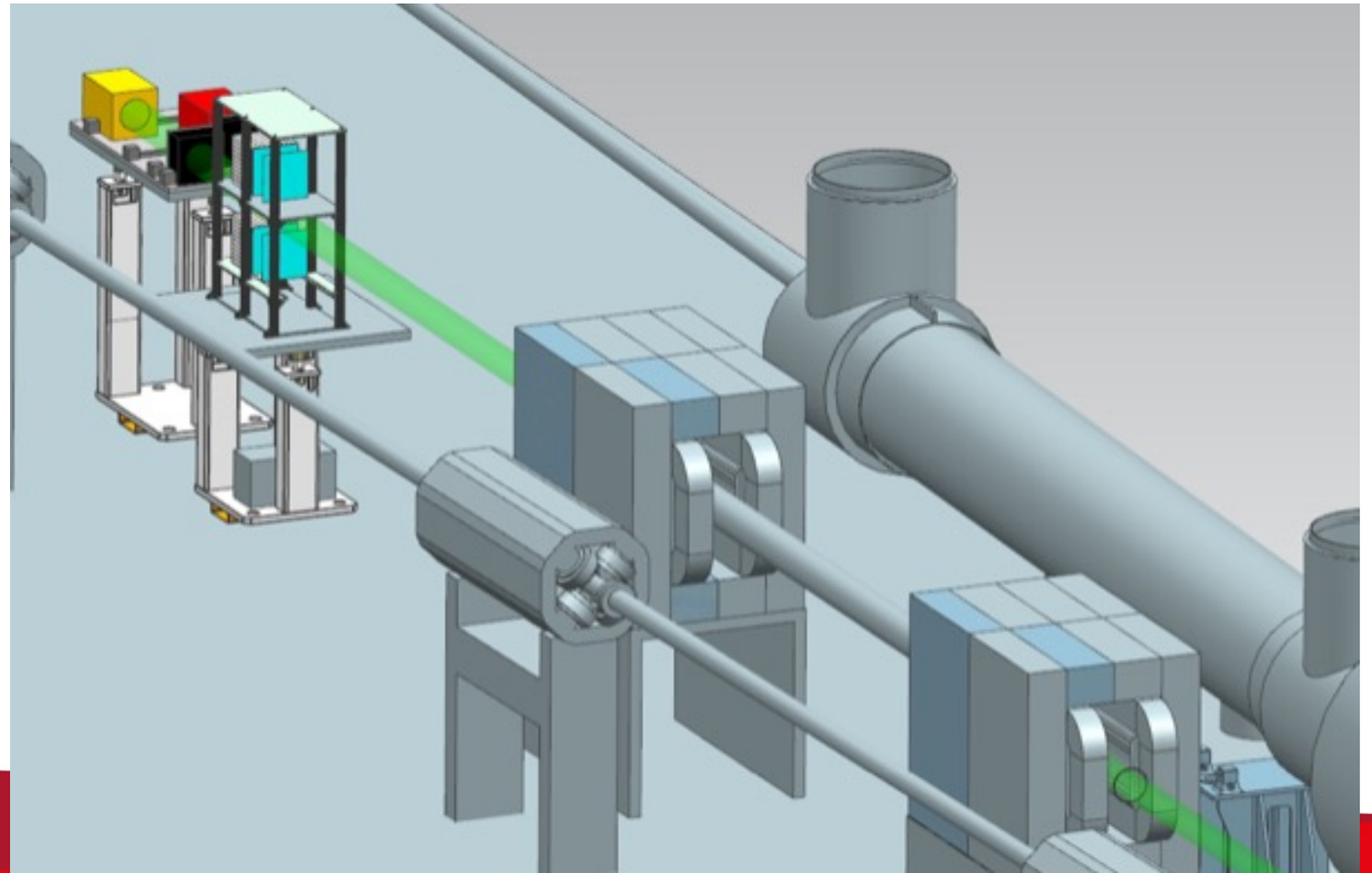

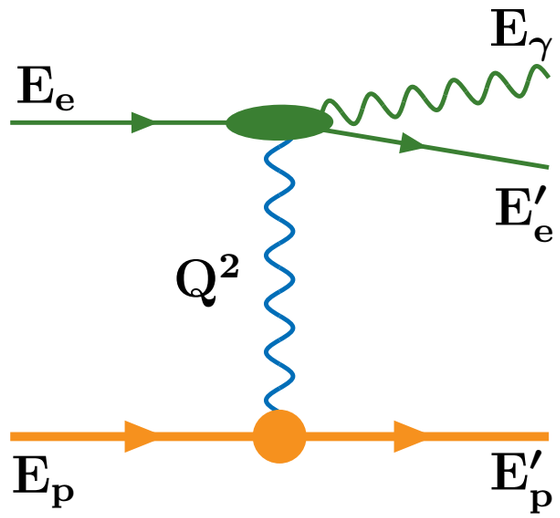

Calorimeter baselines

1. **Tungsten SciFi** direct photon calorimeter will capitalize on fECAL developments ⇒ 4×4 configuration of fECAL towers with 10×10 readout cell configuration using SiPM (100 channels to digitize) with expected resolution of 12%/√E ⇒ to be used at low/medium luminosity and for reference/calibration runs

2. **Copper QFi** direct photon calorimeter will be developed/built in collaboration with CTU/Prague colleagues – its tentative configuration: 1.5 mm diam. quartz fibers spaced by 2.5 mm ⇒ same 10×10 readout configuration with SiPM (100 channels to digitize) ⇒ to be used at nominal luminosity

+ **SR monitor**: 16 hor. + 12 ver. quartz “fingers” with SiPM readout (28 channels to digitize)

FEE

228 readout channel signals (128 at a time) will be digitized with **200 MHz sampling rate with 10-bit resolution,** using custom-made boards with flash ADC. These cards will be streaming out **ALL** data @256 Gb/s

Note: same cards can be used for FEE of low-Q^2 calorimeters for medium to high luminosity running, when their channel occupancy becomes close to 100%

Working example: JLab FADC250 16-channel VME boards with 250 MHz sampling rate and up to 12-bit resolution ⇒

LED pulsers

We will have channel-to-channel calibration monitoring systems:

1. **Fast LED pulsers** will produce ~1 ns light pulses distributed via quartz fibers to every channel – fibers glued to light guides

2. **All** 100 (+ 28 for SR monitors) will be continuously flashed – at couple of empty bunch crossings

3. **All LED calibration data will be streamed out** along with data from all other bunch crossings

Stored data

Downstream, we will immediately start to histogram (and reconstruct) the data – first ideas:

- Distributions of reconstructed photon energy for **each bunch-X** ⇒ 1160 histograms
- Store raw ADC distributions for **each channel** (x 2) and **each bunch-X** ⇒ 256 x 1160 histograms