

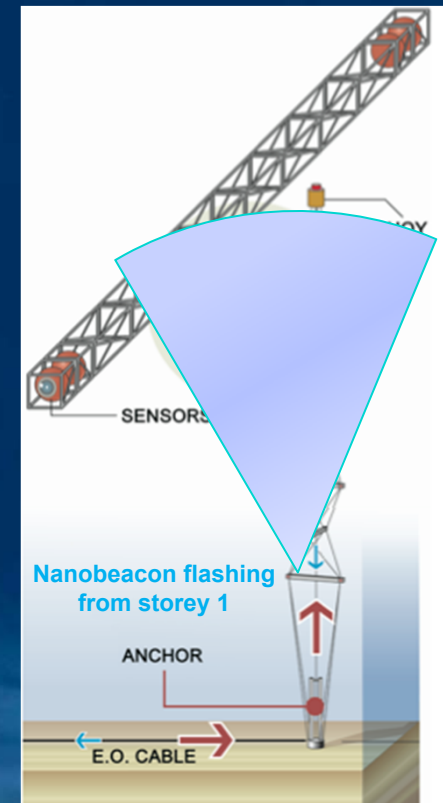
Time calibration

- **New impulse from Genova (Christhope Hugon) and Valencia (Javier Barrios)**
- **Mailing list set up: km3-timcal@lists.infn.it
(if you want to join, you are welcome)**
- **Nanobeacon analysis started (next slides)**
- **Task sharing (indicative):**
 - **Valencia will focus on time calibration with nanobeacons**
 - **Genova will focus on water quality investigations with the nanobeacons**
 - **(Laser beacon and internal LED pulsers to be rediscussed)**



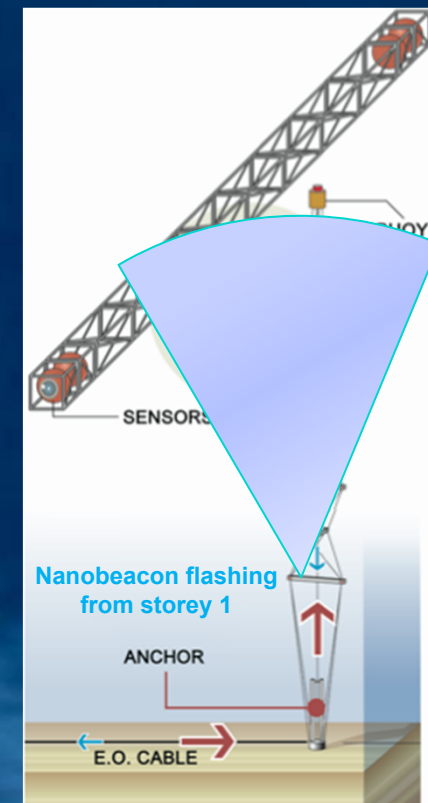
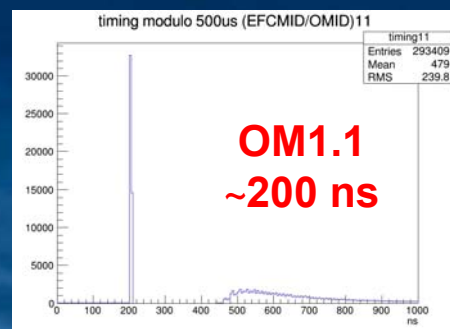
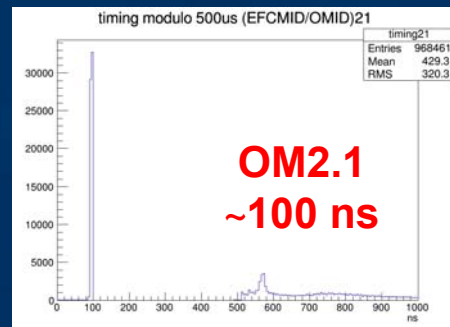
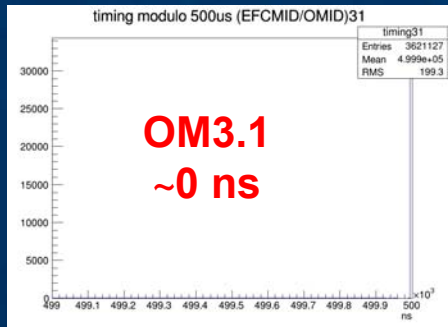
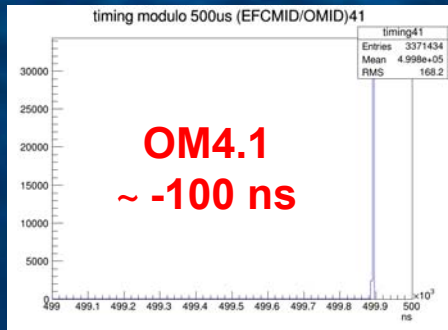
Time calibration with nanobeacons

- The problem: each PMT is like a watch, which performs good time measurements, but with an individual offset – the time offsets being due to propagation delays over the cables, electronics latency, PMT transit-time (remark: typical time offset difference between consecutive storeys ~290 ns)
- The solution: check the time of detection of hits induced by a common light source
- The recipe: study the histogram of the detection times of the hits in the 500 μ s time window (flashing frequency: 2 kHz)
- Remark: the time measurements are affected by the time offsets as well as by the propagation time of light in water (~190 ns between consecutive storeys)



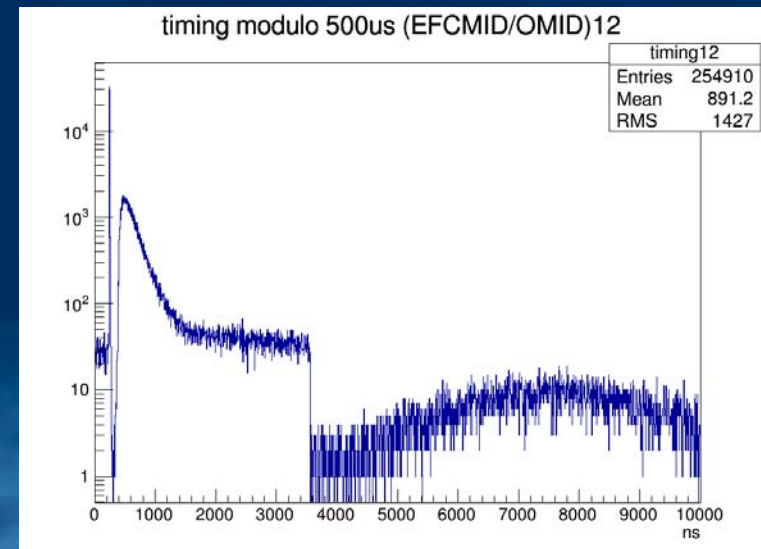
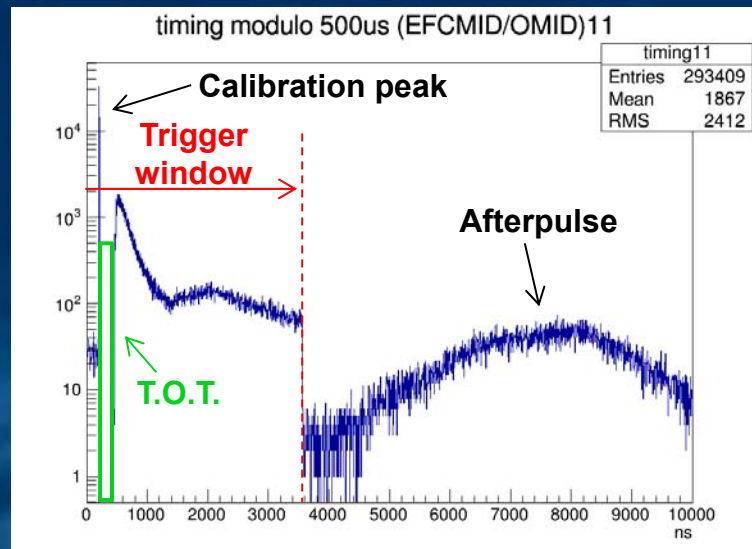
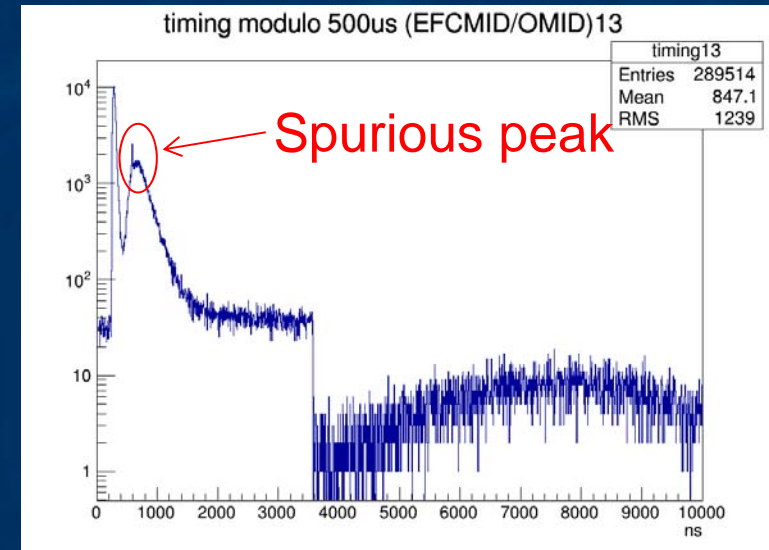
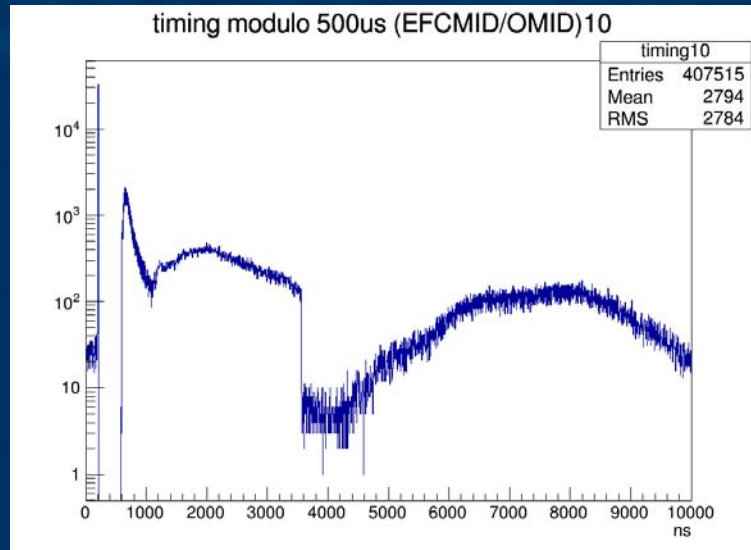
Data analysis – general remarks

- Calibration peaks clearly identified (and understood)
- High-resolution time measurements (based on waveform reconstruction) needed for time offset determination
- Investigation of some structures in these plots ongoing (see next slides)

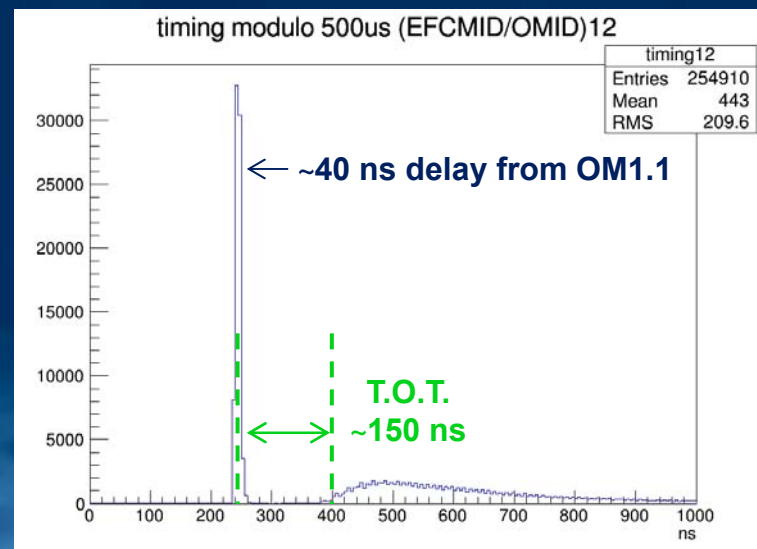
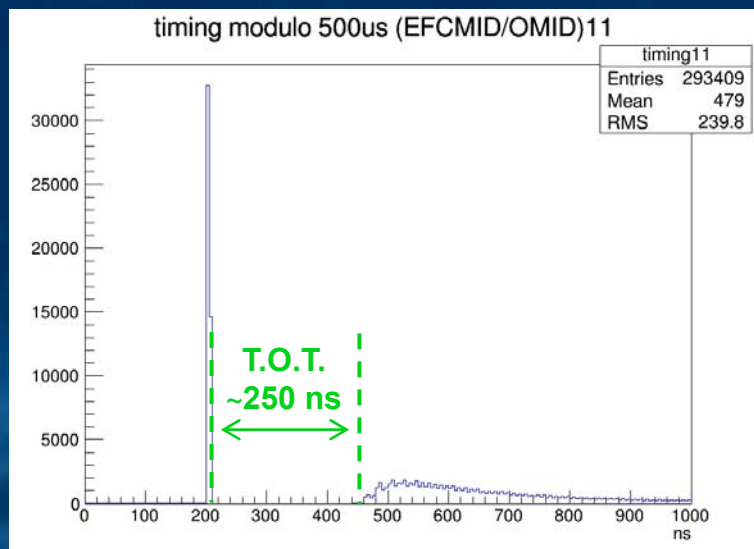
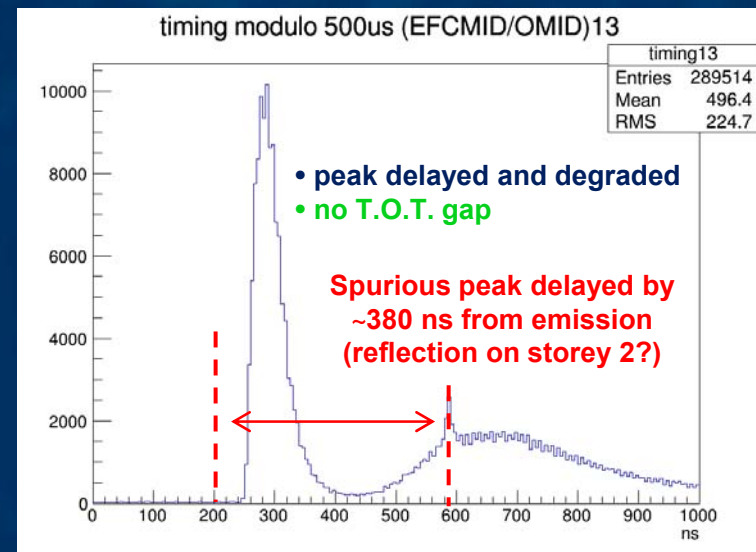
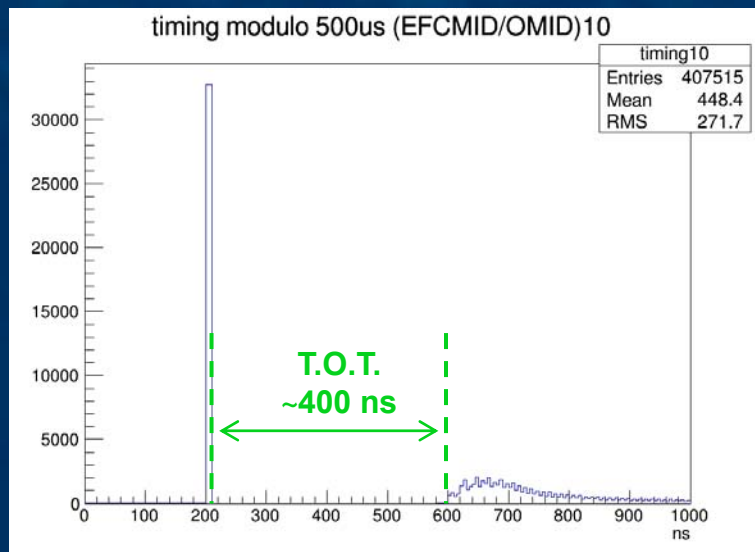


A look at storey 1

- Detection times of OM1.2 and OM1.3 delayed due to propagation time of light
- OM1.3 disadvantaged

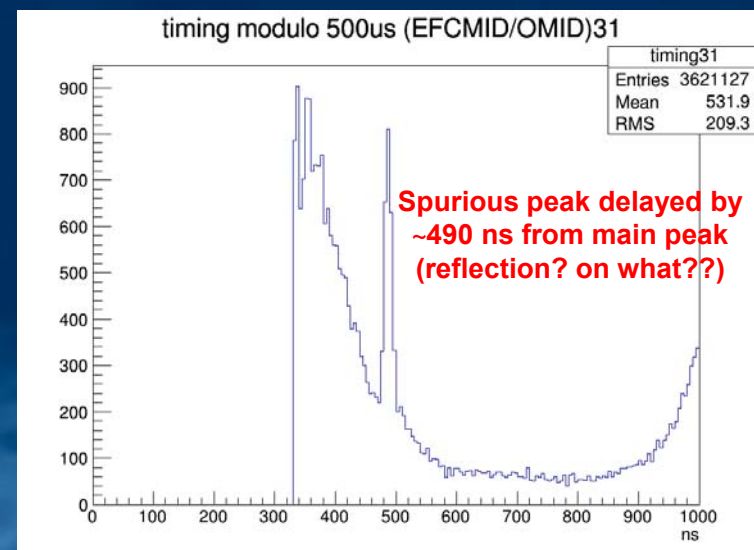
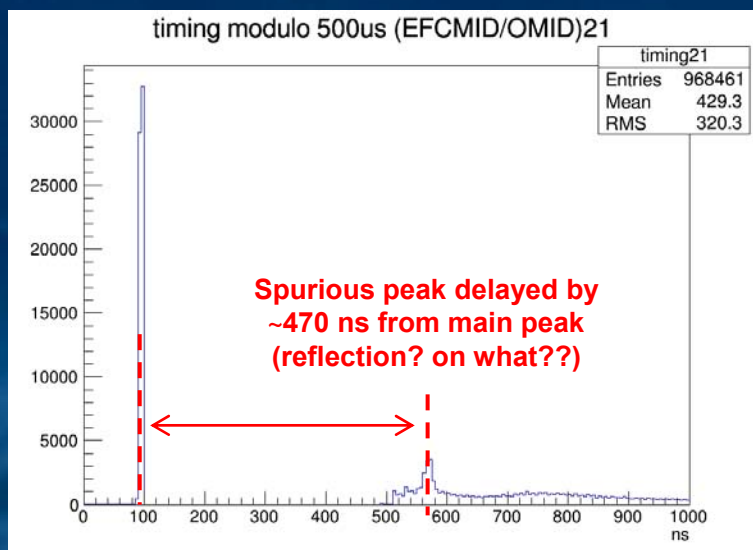
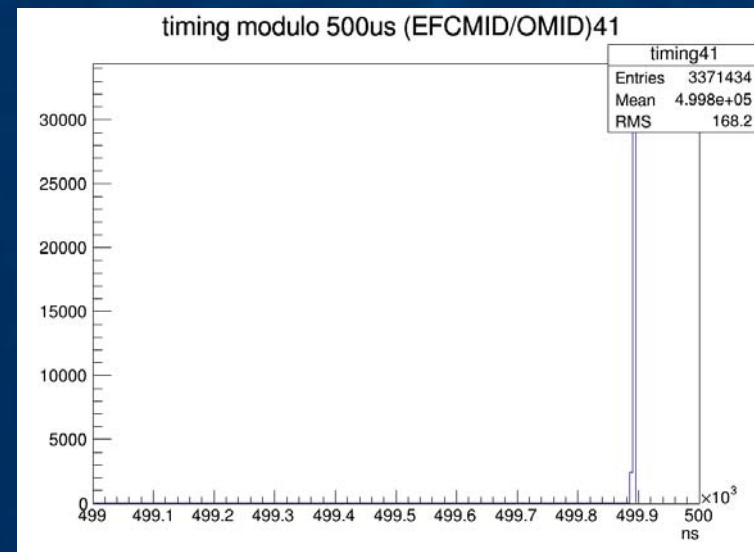
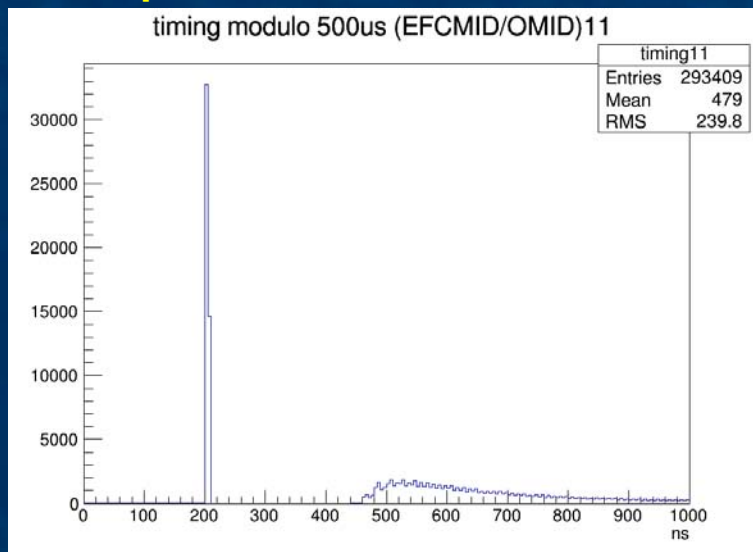


Zooming in on storey 1



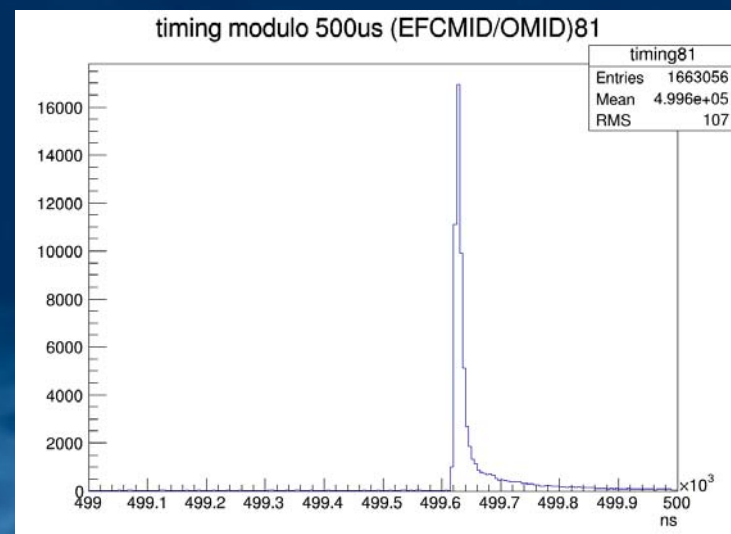
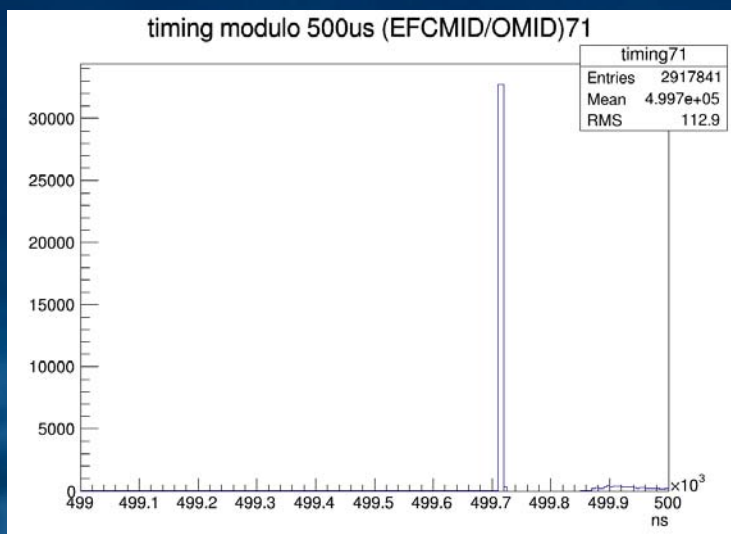
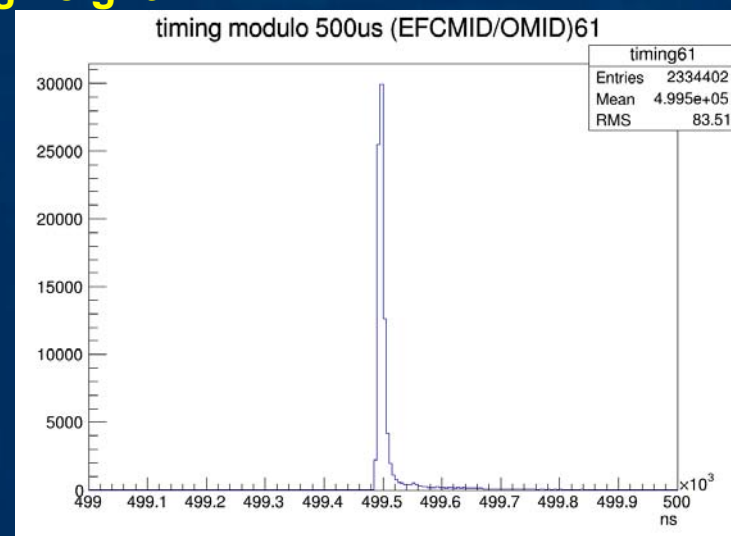
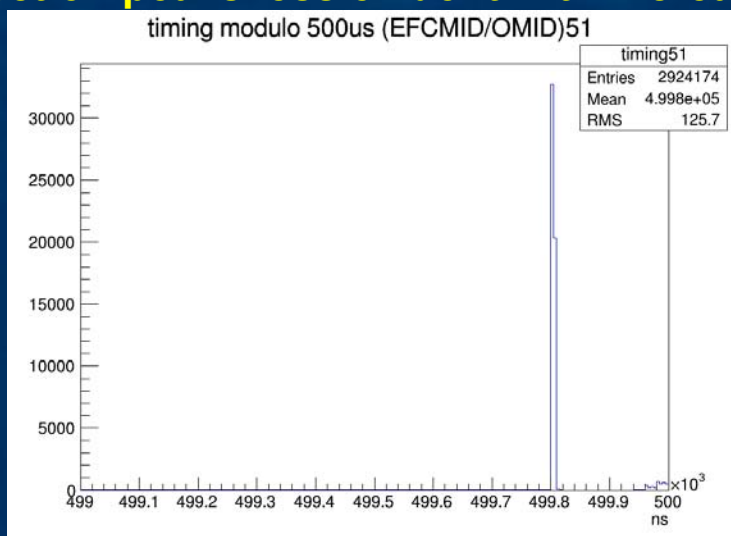
Calibration of bottom storeys

- Nice resolution up to storey 4
- Reflection peaks??



Calibration of top storeys

- Resolution degrades for top storeys (probably ok for time calibration and GOOD for water quality measurements)
- Reflection peaks less evident with increasing height



Conclusions

- **Encouraging results so far**
 - nanobeacons work
 - data can be understood
 - some features of the time distribution under investigation (probably no implication for time calibration and water quality investigations)
- **Waveform reconstruction required for high-resolution analysis (people working on it)**
- **Efforts ongoing in Genova and Valencia (VERY GOOD!) – if anybody wants to join, you are welcome!!**

