Hardware status and commissionning

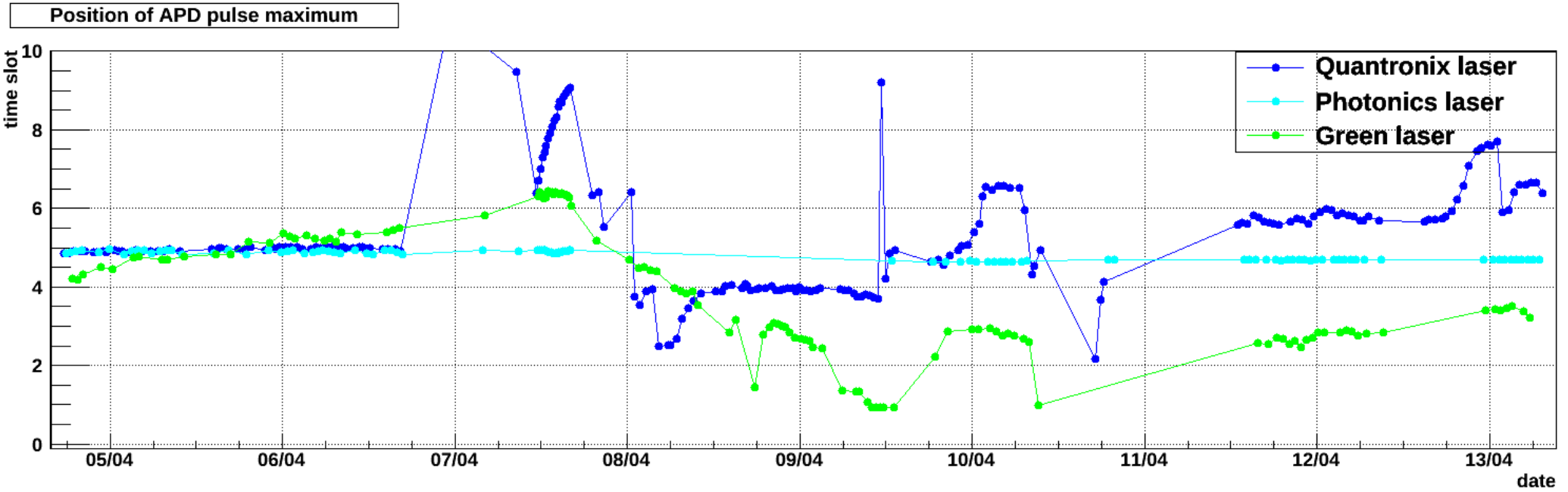
- 2 new lasers installed and being commissioned
  - Laser-Compact green laser : installation march 12-16
  - Photonics blue laser : installation march 19-23
- 2 Quantronix lasers revised
  - Both as “good” as end of 2011
- New PIN installed to monitor the laser pulses
  - Hammamatsu SN5973 in parallel with DET10 used in 2011

Calibration sequence in 2012

- **Light sources:**
  - **Quantronics blue laser** **440 nm** **EB+EE**
  - **Photonics blue laser** **447 nm** **EB+EE**
  - **Laser-Compact green laser** **527 nm** **EB+EE**
  - **Quantronics (?) red laser** **800 nm** **EB**
  - **Blue LED** **455 nm** **EE**
  - **Orange LED** **617 nm** **EE**

Lasers stability (1/3)

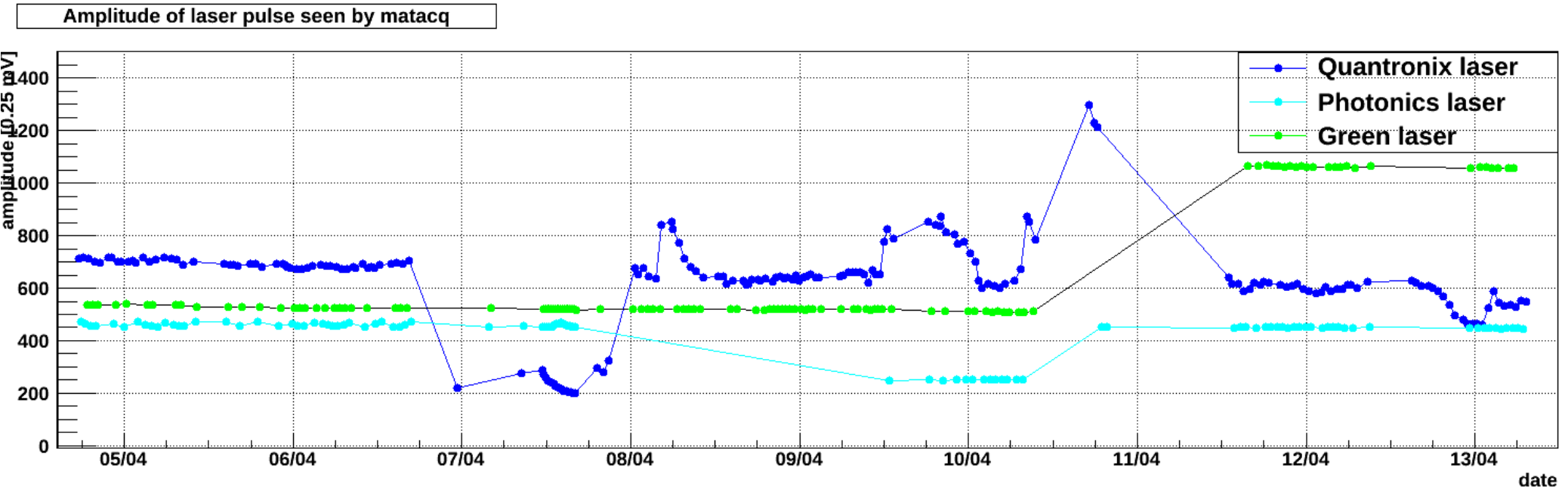
- **Timing**



- **Photonics extremely stable**
- **Quantronix and green drifting**
  - ► **Timing remote control of green laser not yet implemented**

Lasers stability (2/3)

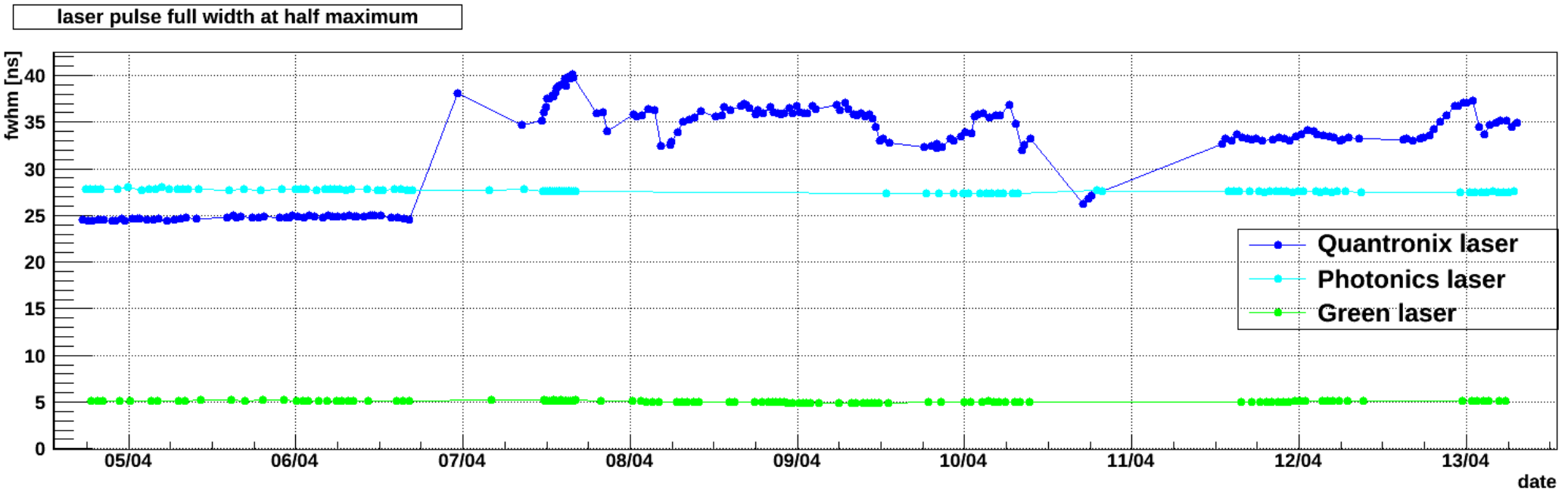
- **Amplitude**



- **Photonics and green extremely stable**
  - ► **Amplitude changes only when attenuators are moved**
- **Quantronix unstable**

Lasers stability (3/3)

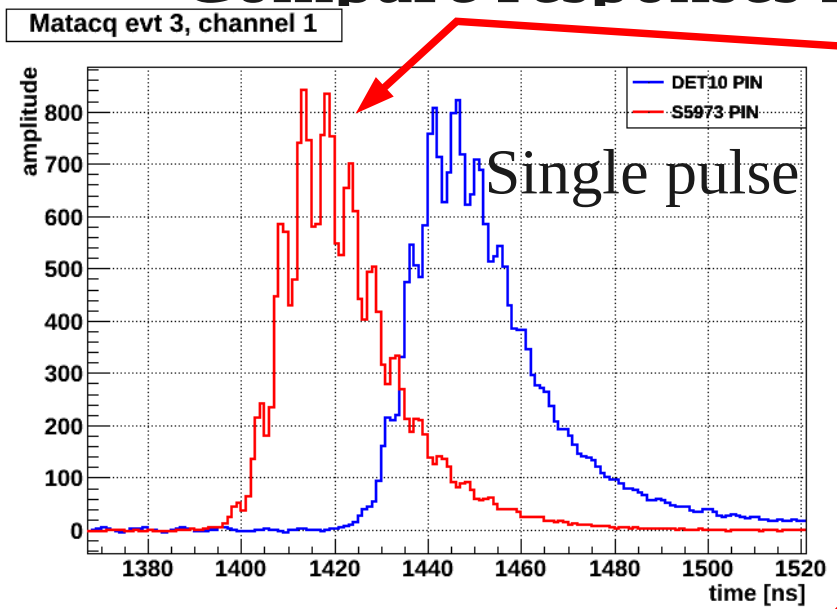
- **Pulse width**



- **Photonics and green extremely stable**
  - ► **Amplitude changes only when attenuators are moved**
- **Quantronix unstable**

PIN performances : DET10 vs S5973

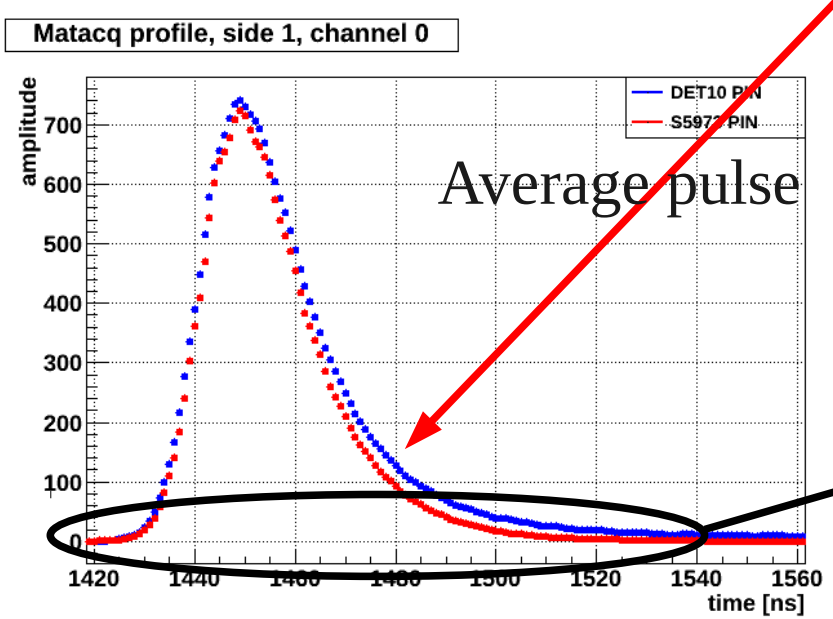
- **Compare responses in blue (Quantronix)**

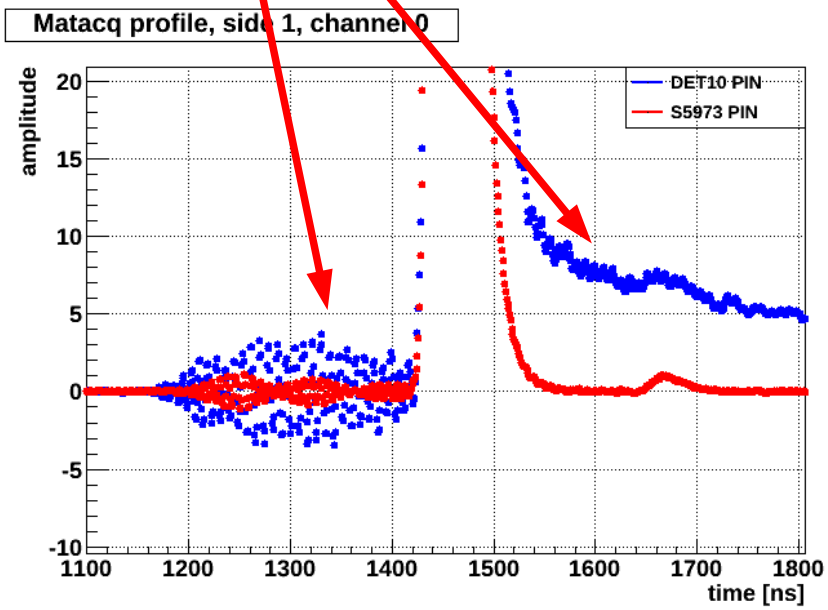


Faster response (more details)

Shorter tail

Less noise





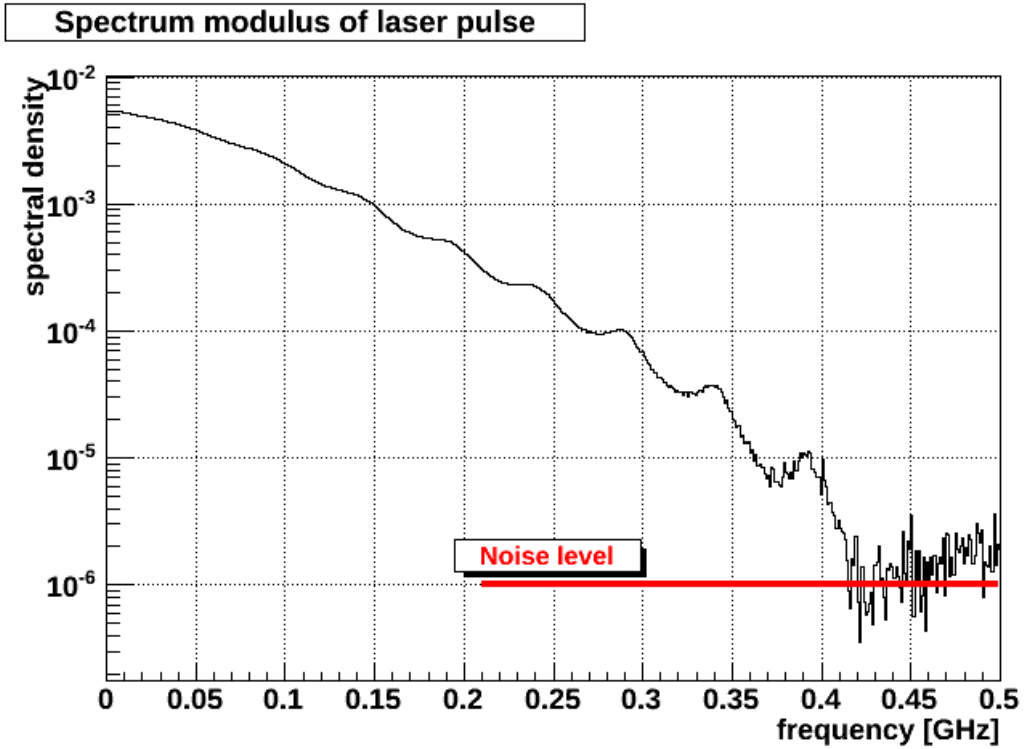
Monitoring Working

Remeasure Transfert Functions (SPR)

- **Use Green laser with new PIN**
  - **Short pulse (~5 ns) – closer to Dirac pulse**
  - **Use new PIN – Faster response**
- **Assumption :**
  - **APD = laser * $SPR_{electronics}$ * SPR_{fiber} * SPR_{sphere} = laser * SPR_{eff}**
    - ▶ **SPR_{fiber} and SPR_{sphere} independent of light source and crystal**
  - **Use deconvolution technics**
    - ▶ **FFT(SPR_{eff})=FFT(APD)/FFT(laser) + tricks**
- **Control :**
  - **Use SPR_{eff}^{527} to reconstruct the APD signal in blue**

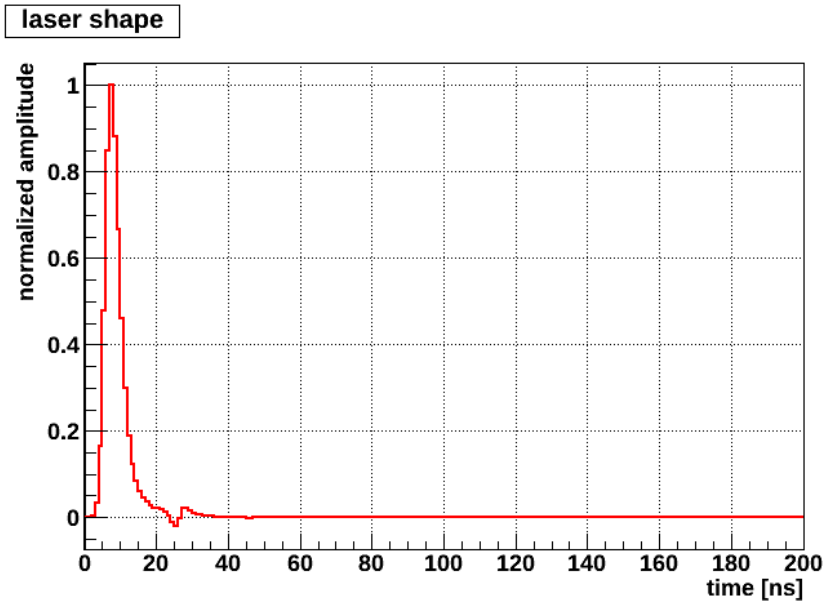
Deconvolution (1/2)

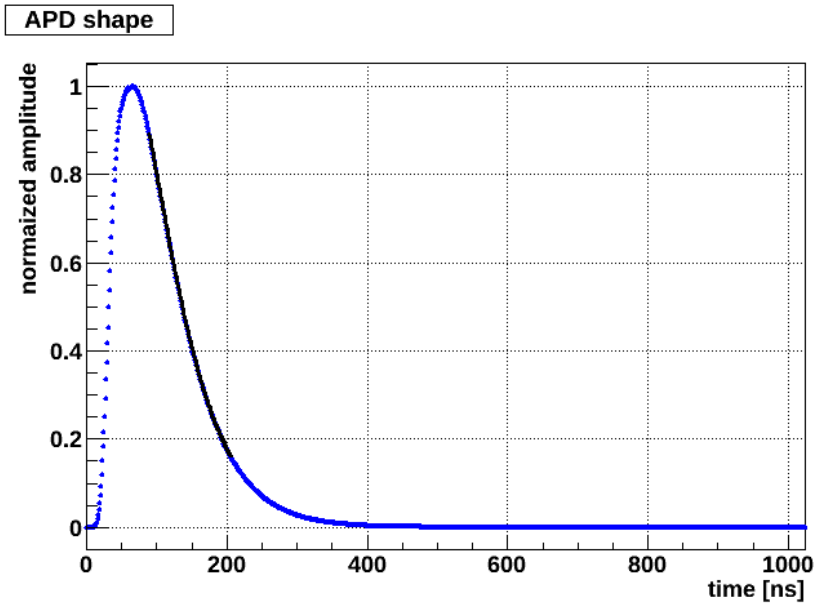
- $spr(t) = FT^{-1}[FT(apd_{true}(t))/FT(laser_{true}(t))]$
  $= FT^{-1}[APD_{true}(f)/LAS_{true}(f)]$
  - $laser_{meas}(t)=laser_{true}(t)+noise(t)$
    - Find best estimate of $laser_{true}(t)$
  - $LAS_{meas}(f) = LAS_{true}(f)+N_{white}(f)$ at first approximation



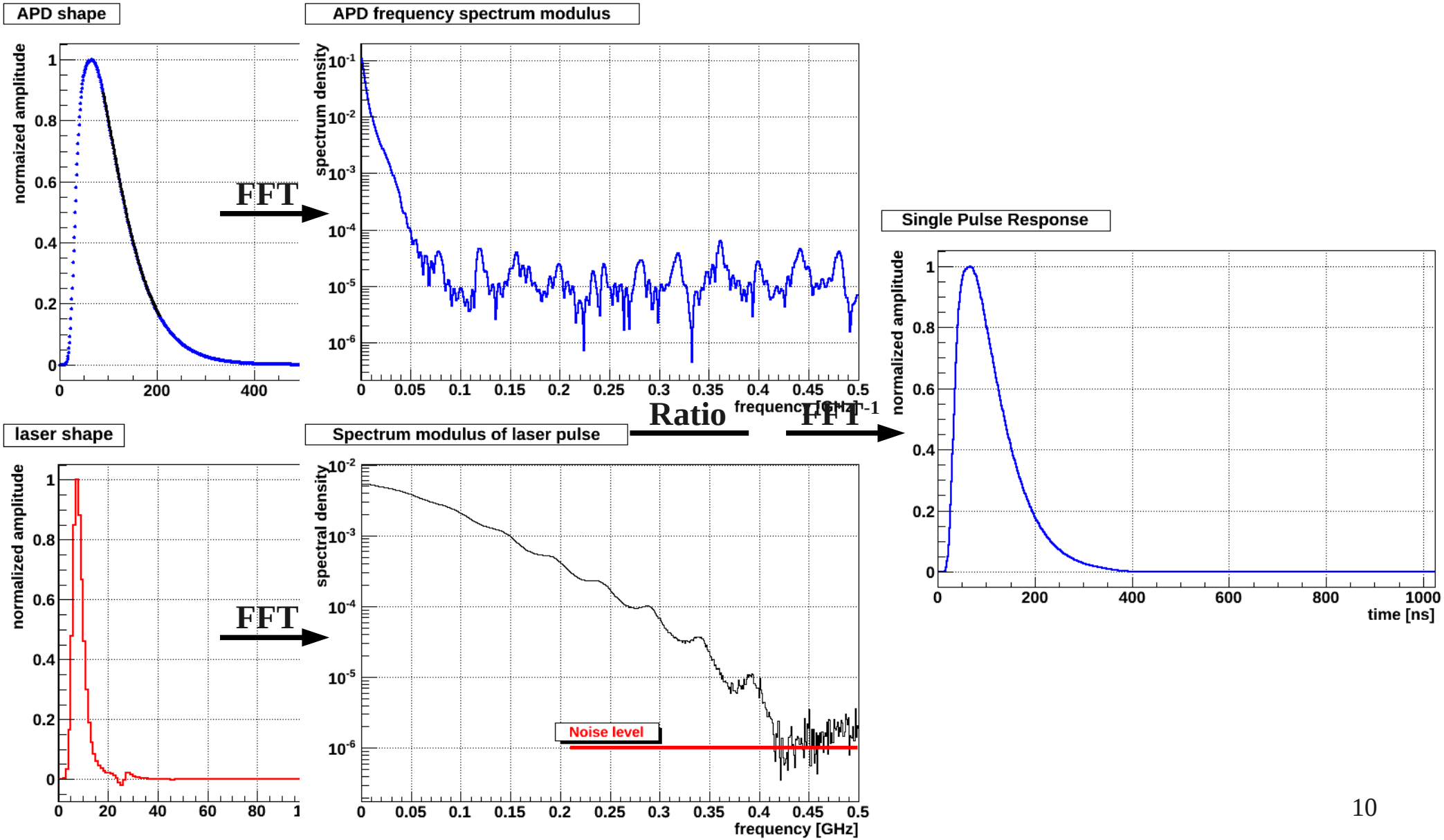
Deconvolution(2/2)

- $spr(t) = FT^{-1}[APD_{meas}(f)/(LAS_{meas}(f)+\varepsilon)$
  - $\varepsilon=10^{-6}$
- Laser and APD/VPT signals extended to 1024 samples
  - Reproduction of last samples for laser
  - t/τ*exp(-t/τ) extrapolation for APD and VPT signals



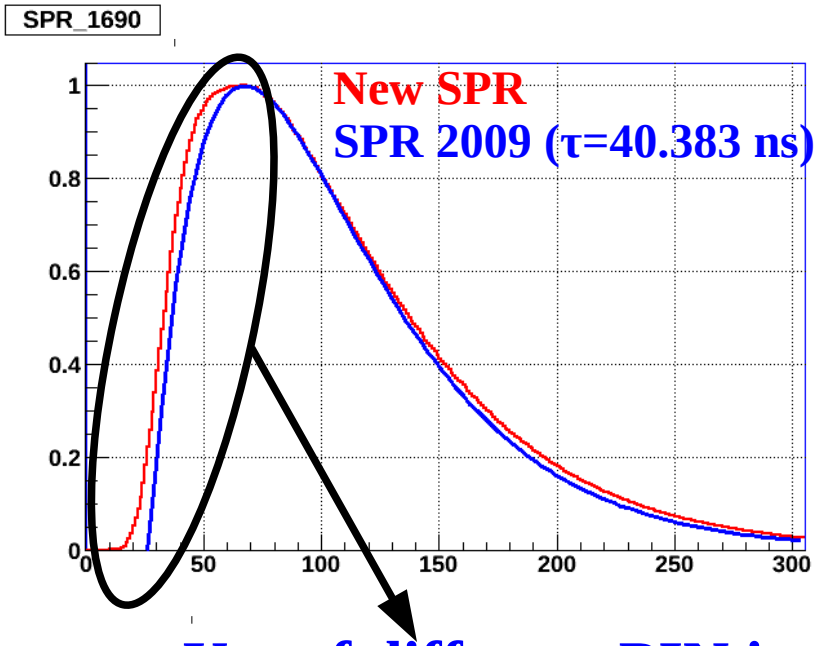


Getting SPR's

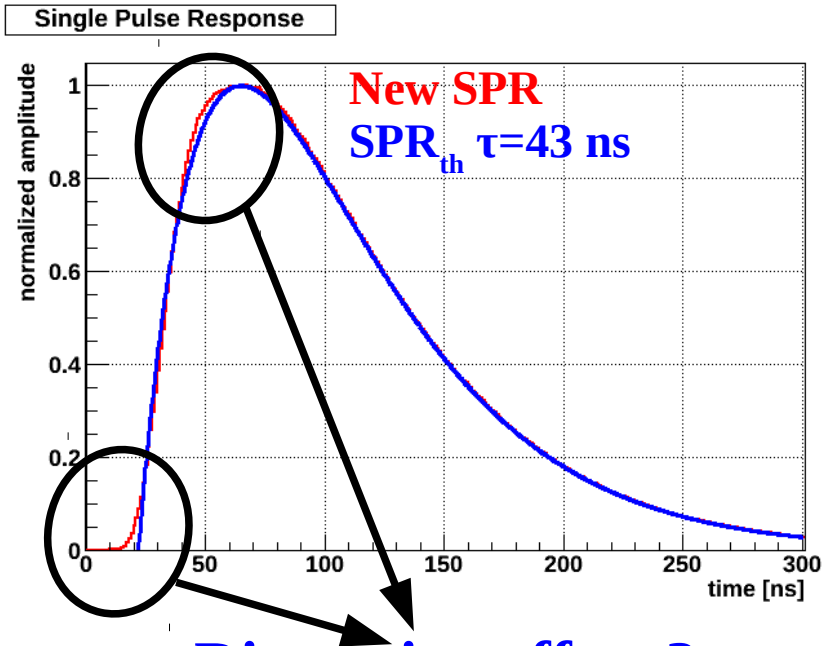


Comparison with expectations

- **Electronic supposed to be a RC-CR amplifier**
  - **spr(t) = t/τ*exp(-t/τ)**
  - **Measured in 2009, used in 2010 and 2011 in production**



Use of different PIN in 2009

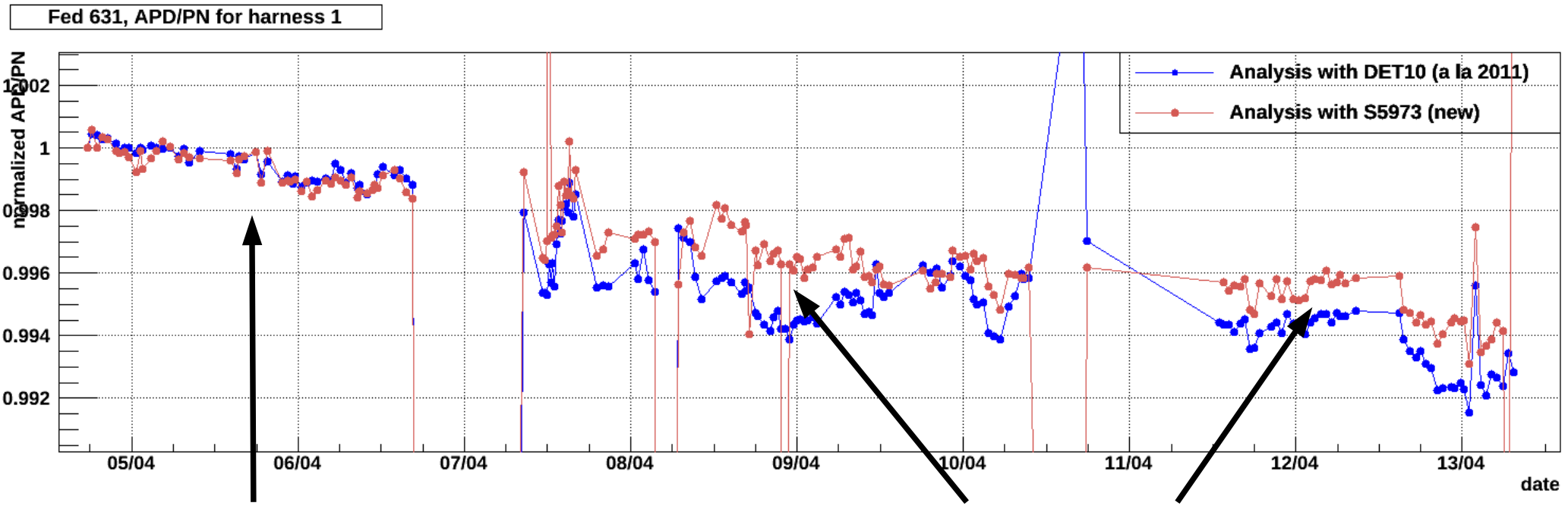


Dispersion effect ?

- **43 ns is what was measured in lab by Mark Raymond (2004 ?)**

Application to laser analysis

- **Compare apd/pn for both analysis (DET10 vs S5973)**
  - **DET10 : Splitter and linearity corrections**
  - **S5973 : linearity corrections**

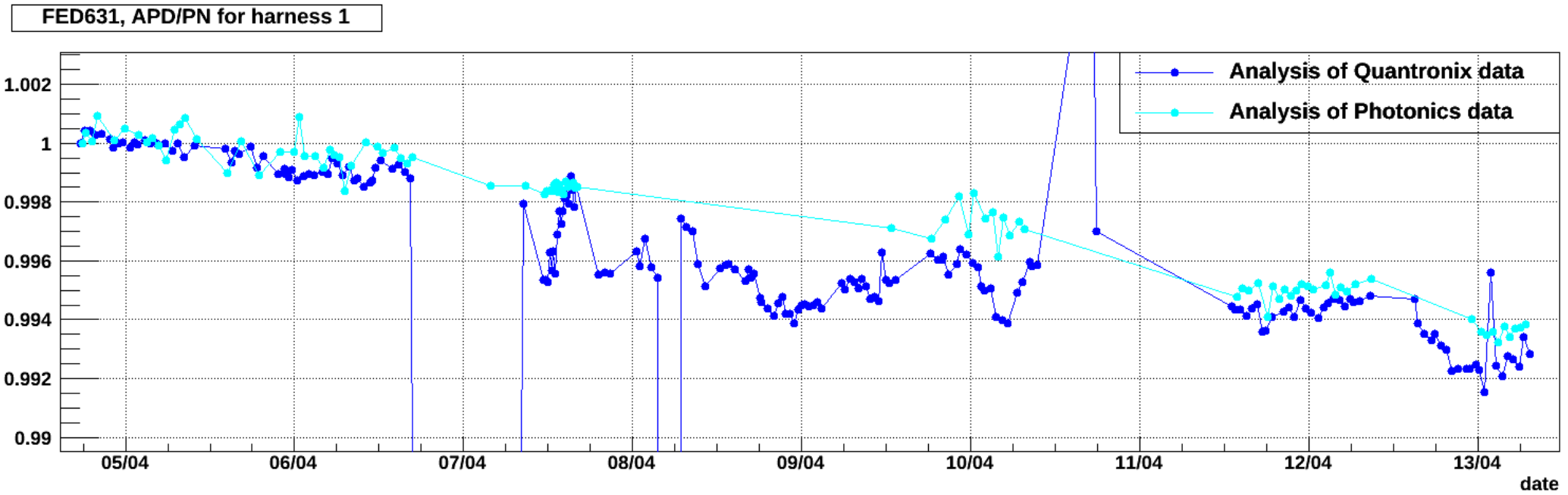


Same results for stable operation

Splitter correction underestimated ?
(15 ns change in FWHM)

Compare lasers responses

- **Compare apd/pn for both blue lasers**
  - **Analysis with DET10 (a la 2011)**



  - **Photonics response seems more “noisy”**
    - ► **To be understood**
  - **Photonics validates analysis with S5973**

Todo

- **Look at reliability of Photonics on long term**
- **Stabilize Photonics analysis**
  - **Understand point-to-point fluctuations**
- **Validate analysis with PIN2 on long term**
  - ▶ **Swap analysis (DET10 ↔ S5973) during next TS ?**
- **Recalibrate linearity response**
  - ▶ **Motorized log attenuator mounted on green laser.**
    - **1 turn in 36 secs**
  - ▶ **Can do the linearity scan with sequence of ~4000 events with attenuator turning.**
  - ▶ **~1 minute per monitoring region**
  - ▶ **Full scan of ECAL in less than 100 minutes**