Update on Forward "pixilated" TOF

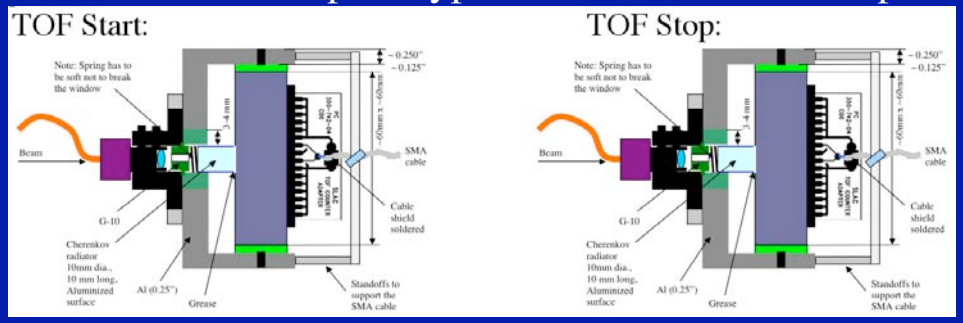
J. Va'vra, SLAC

Wave catcher chip tests in SLAC setup

Dominique Breton, Jihane Maalmi, Eric Delagnes, and J. Va'vra

Chip developed in Orsay By D. Breton

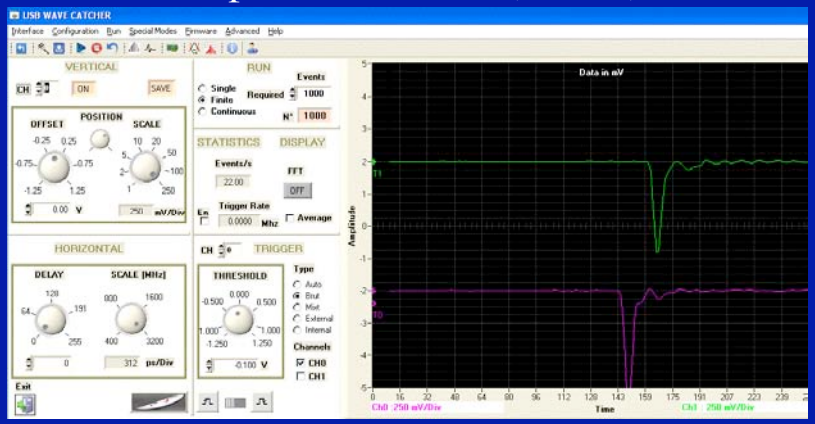
"Pixilated" TOF prototype in the PiLas laser setup:



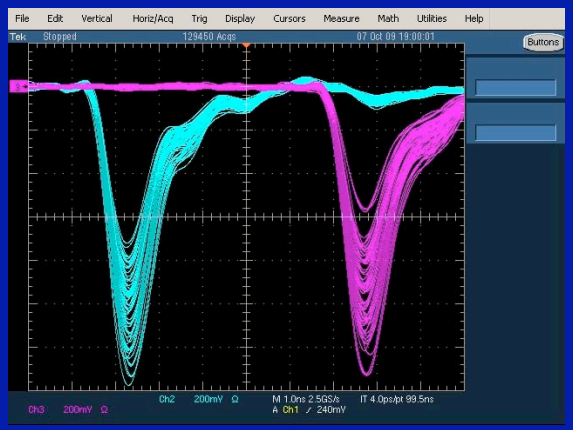
Two Photonis MCP-PMTs with 10μm holes, operating at low gain of 2-3x10^5, but with ~40 pe's. (conditions reported earlier at previous workshops)

Jihane & Dominique with my MAC:

On line scope-like monitor (Jihane):



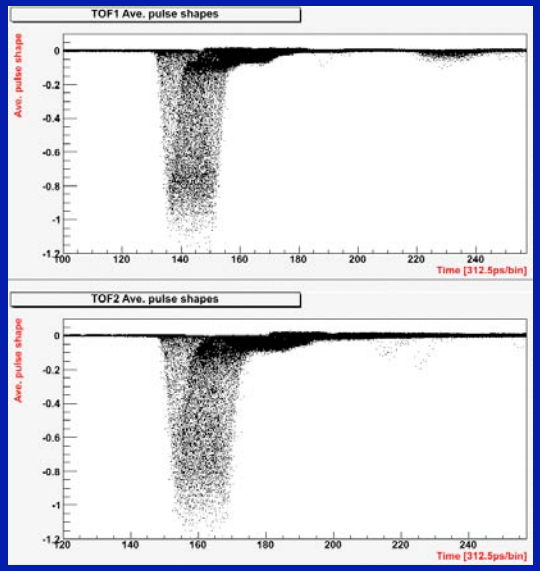
Tektronix scope (1 GHz BW):



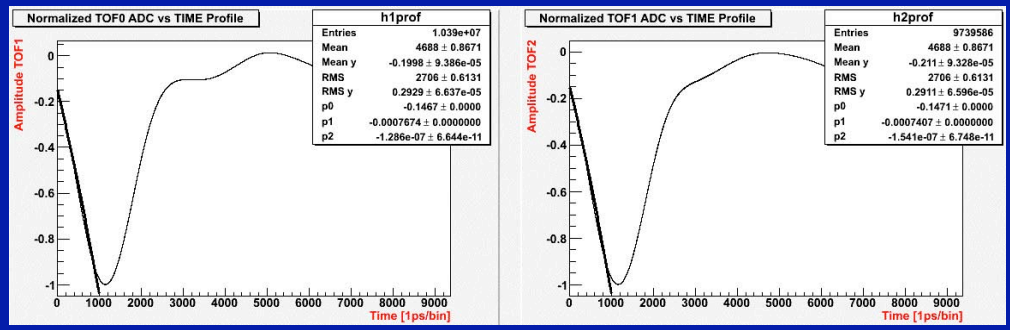
Example of analysis with the Wave catcher chip

J. Va'vra

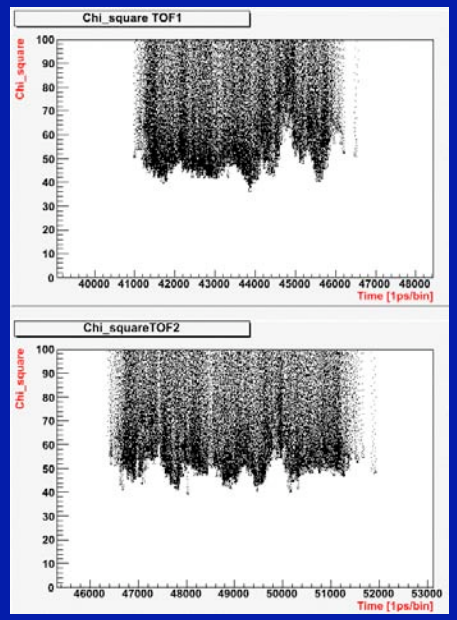
Raw pulses (312.5 ps/bin):



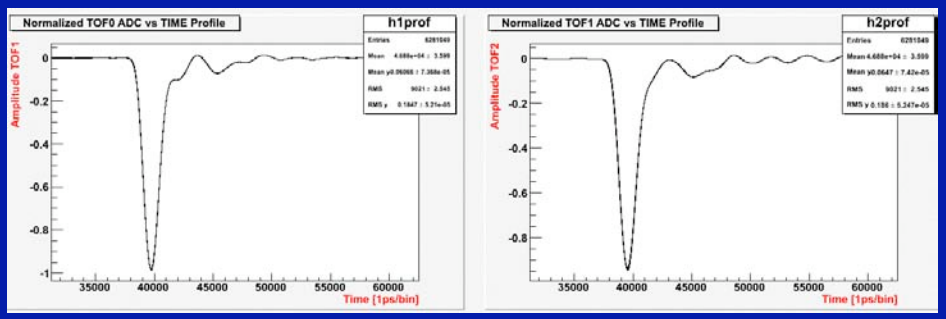
Quadratic fit to leading edge:



χ^2- minima for each pulse:



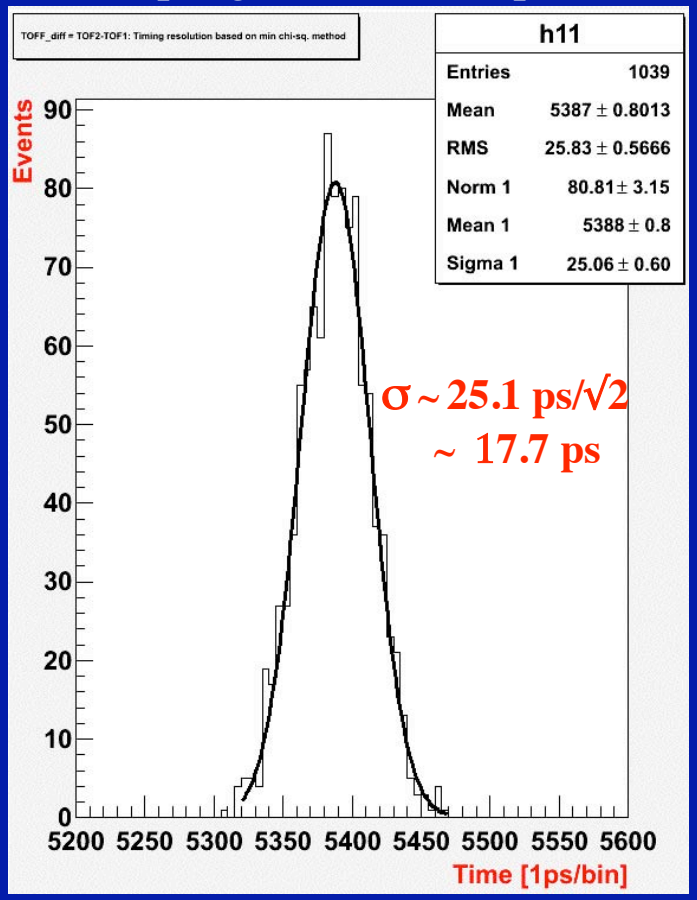
Average normalized pulses from spline interpolation to 1ps/bin:



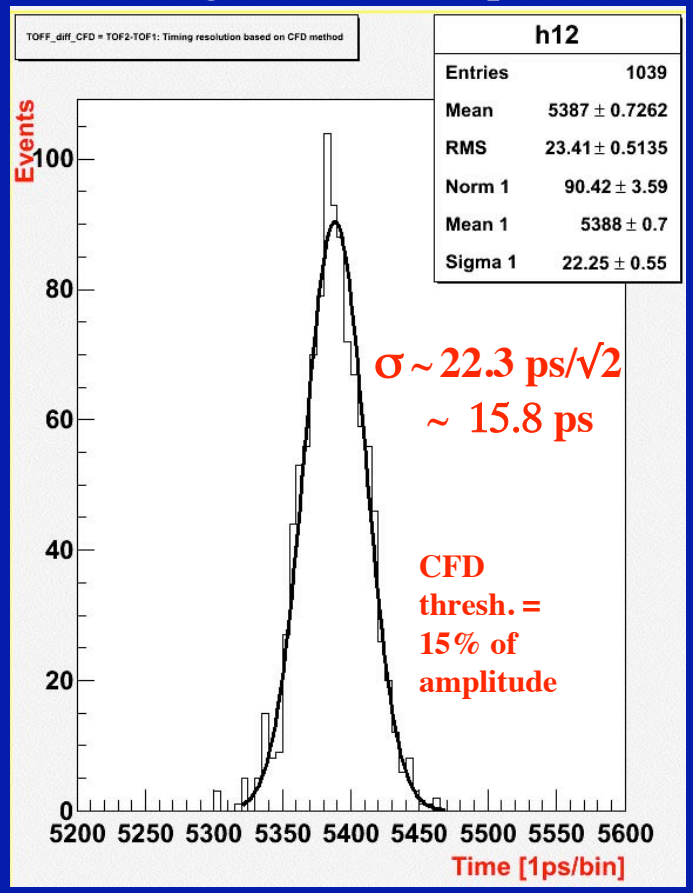
Example of two results with the wave catcher

J. Va'vra

Chi-sq. algorithm with 1ps-bins:



CFD algorithm with 1ps-bins:



- Result is comparable to the best results with other electronics.

Another simulation in parallel

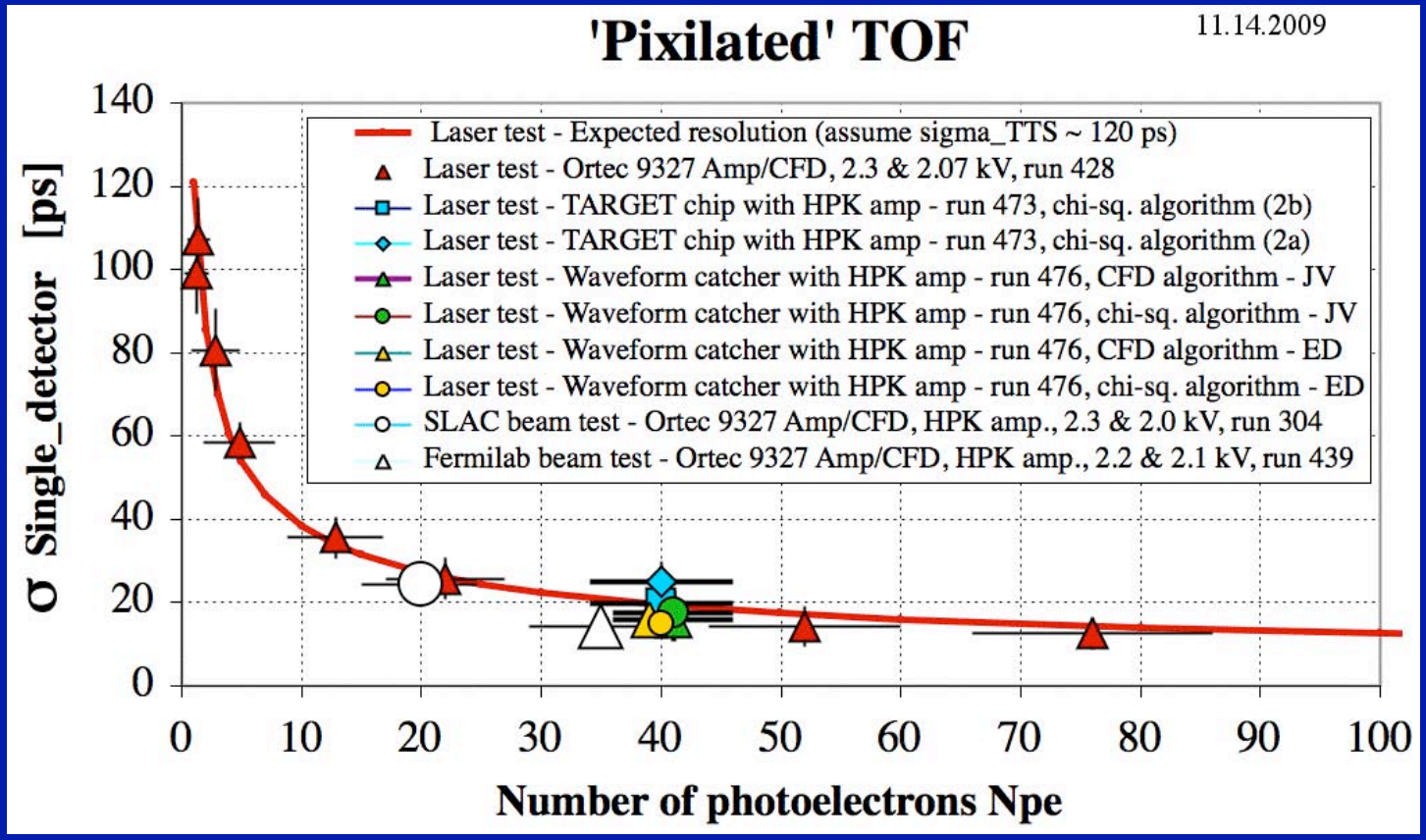
Eric Delagnes, Saclay

- Also tried to make the spline interpolation with 10 ps and 1ps steps. The improvement going to 1 ps step is very small (1ps rms improvement)
- CFD: varied the fraction => the time resolution is flat with this parameter. The best one is for F=0.23 => obtained σ =16 ps rms (single detector)
- Implemented also something very similar to my chi^2 algorithm. For this algorithm, I noticed that there is a clear optimum, if I use only the very early part of the signal (the part comprised between 10 to ~40% of the pulse amplitude). In this case, the resolution is a little better (15ps rms) than for CFD.

Summary of all results with TOF prototype

Low gain operation of 2-3x10^4

Npe ~30-40



- **Laser test results are very consistent to the SLAC & Fermilab beam test results.**
- **CFD/ADC electronics is giving a very similar results to the waveform digitizing electronics with either Waveform Catcher chip (Orsay) or Target chip (Hawaii).**
- **SLAC beam test had smaller number of photoelectrons due to poor radiator coating.**
- **Analysis of the Target chip data still preliminary - working on dT calibration.**