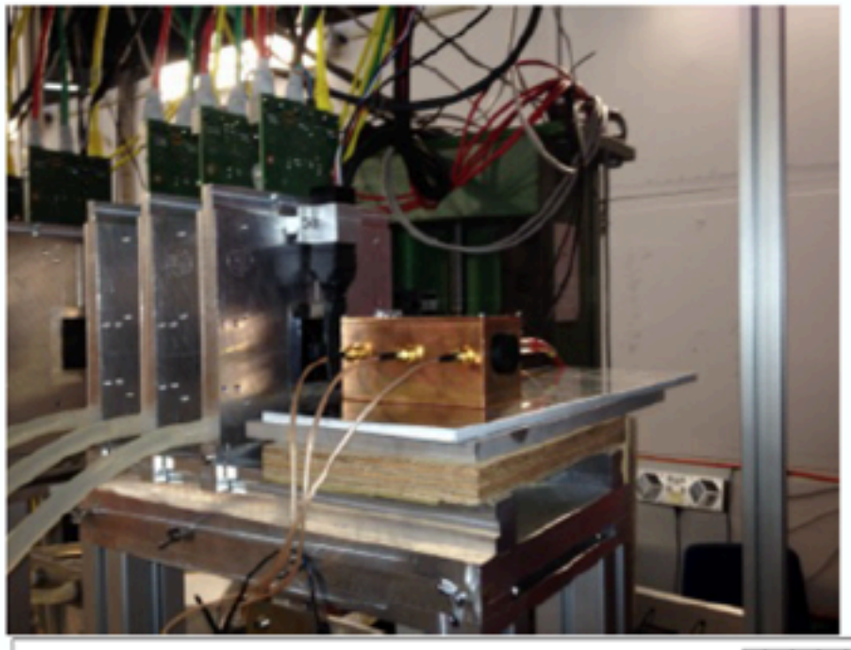
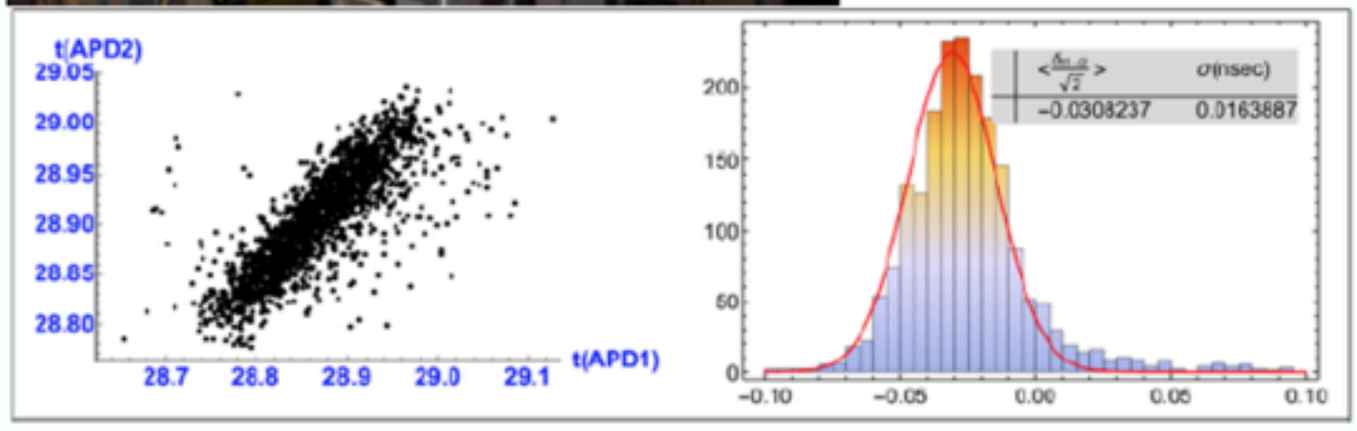
R&D on Timing Technologies for Pielup Mitigation(2)

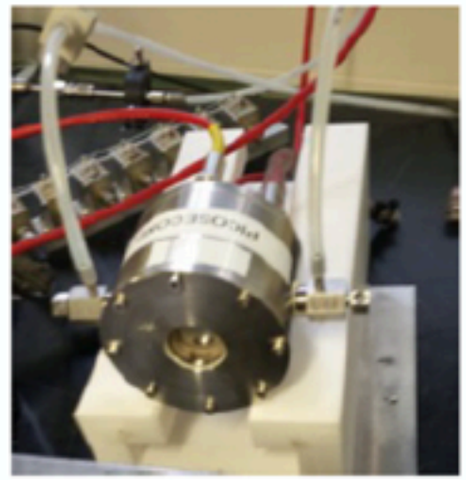
Sebastian White, Princeton Univ. Jan.28, 2015

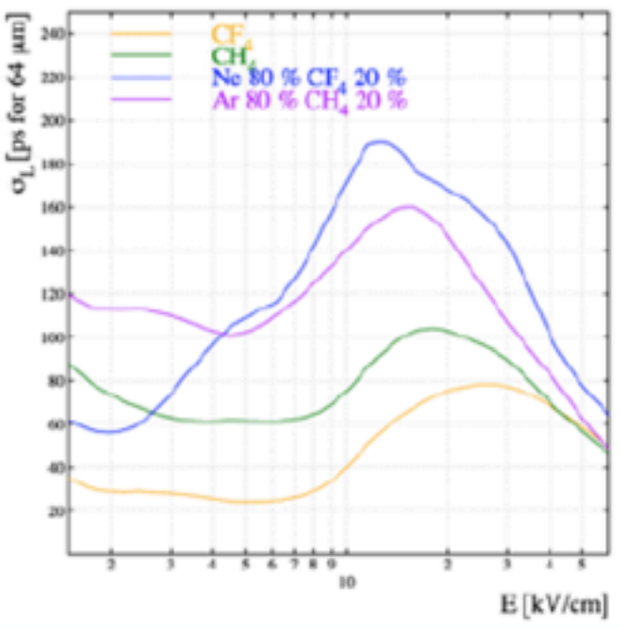
Si technology





MPGD technology





Update from presentation on Nov. 19, 2014

- new round of rad exposure completed @CERN (we plan to reach few*10^14 neq/cm^2 doses in next months).

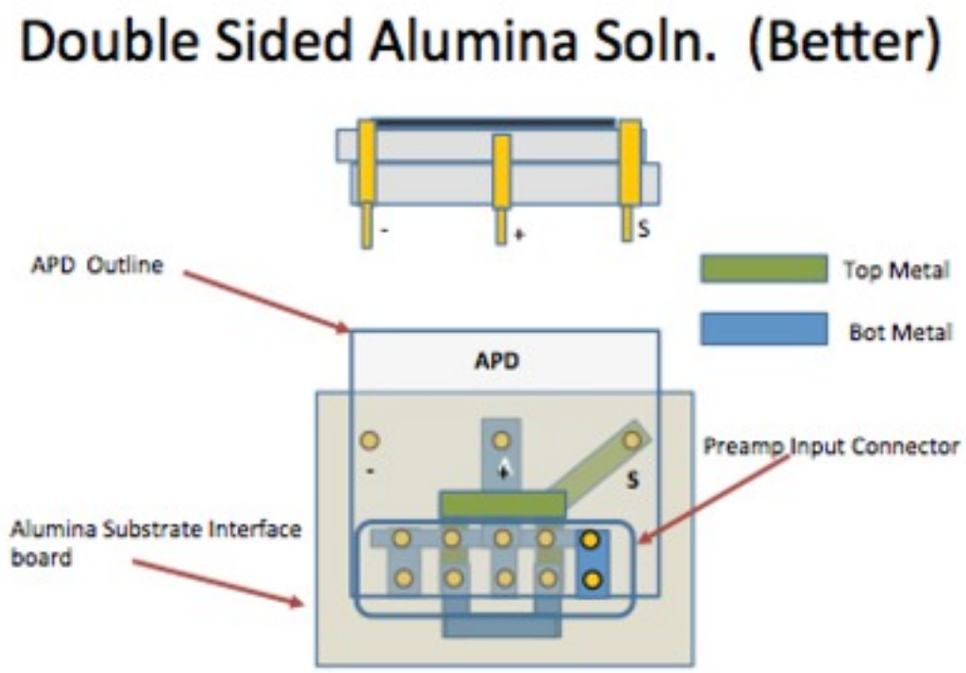
Set-1951-End-2014	Michael MOLL	Richard Farrell and Sebastian White samples	[no number]	Low:	Storage at < 20ø C	7	1.00E+13	2961	-	-	-	-
Set-1950-End-2014		Richard Farrell and Sebastian White samples	[no number]	Low:	Storage at < 20ø C	7	8.00E+13	2963	-	-	-	-

- this has become topical because Santa Cruz(US) LGAD showed low rad tolerance (gain degradation). We think we have better tolerance because of fundamental technology difference (ie Ga vs. B implant).

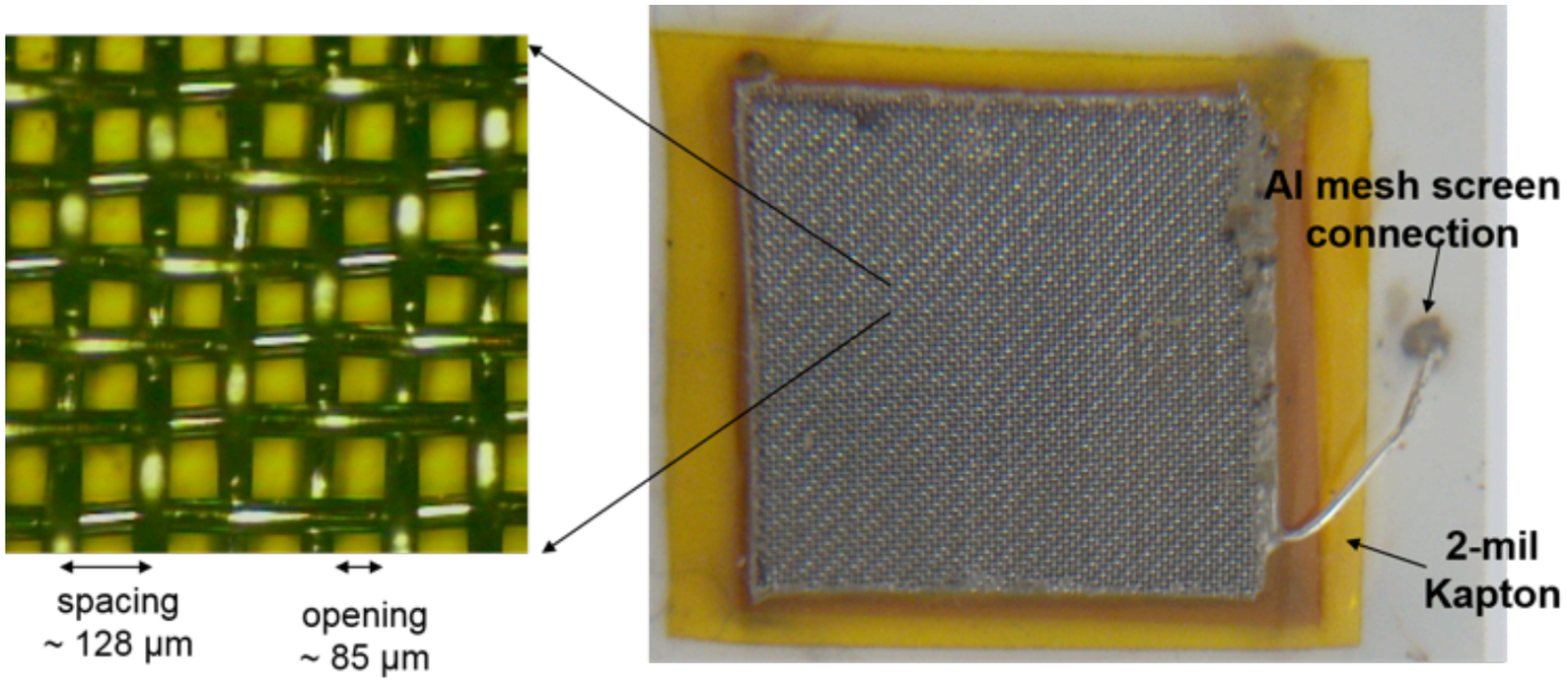
- I am working in both RD50 &RD51 groups with CERN support over next 6 months. In CERN RD51 group we are likely to make significant progress on APD timing.

- following work with E. Delagnes, using SAMPIC, which gave<10 picosecond time jitter at 1 MIP eq. (see below- 10 times better than LGAD and 9 times better than Diamond) we are focusing on modeling and basic characterization

Examples:

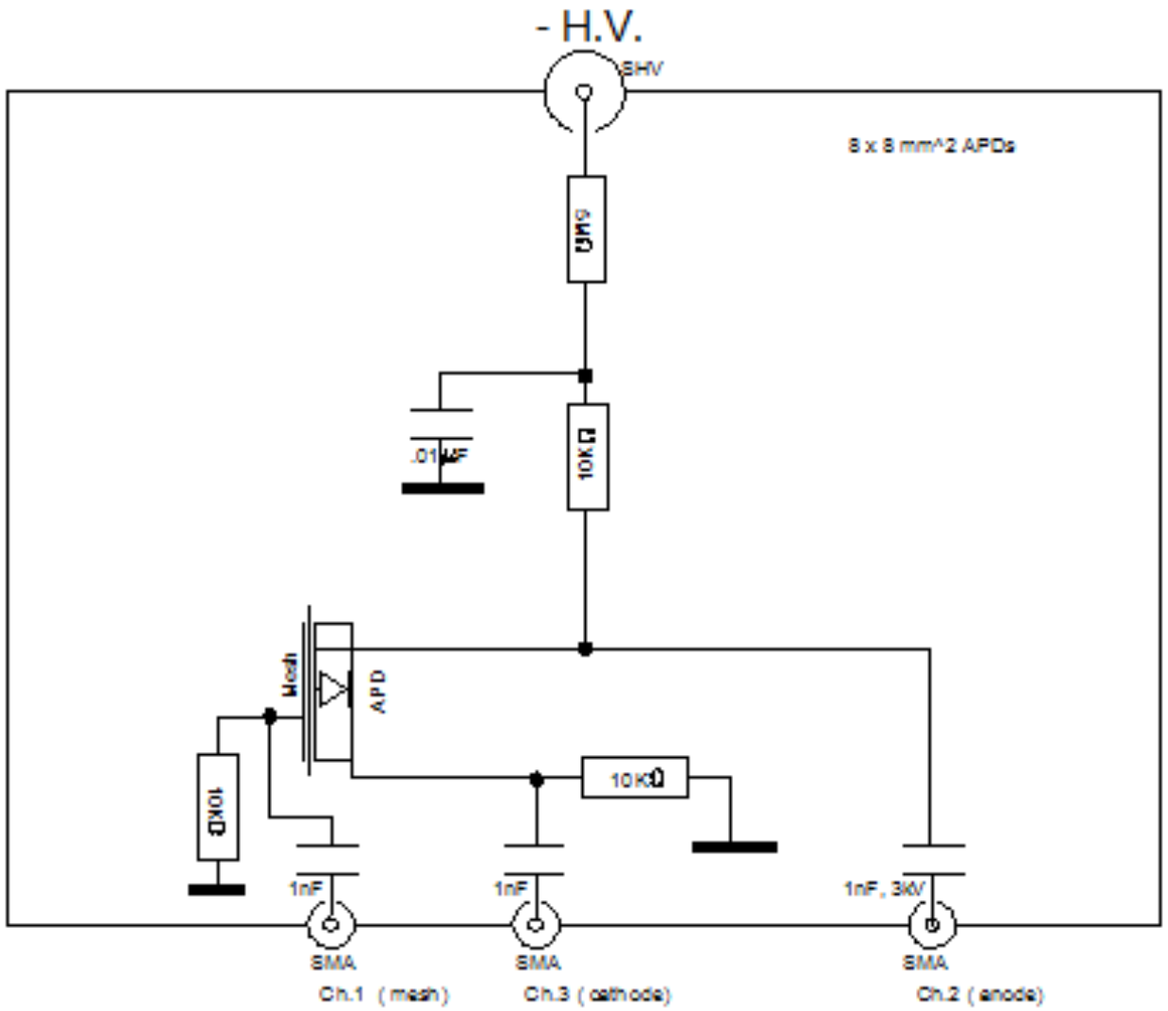


work with RMD to develop new packaging (1st stage)



also improved mesh fab (working with Rui)

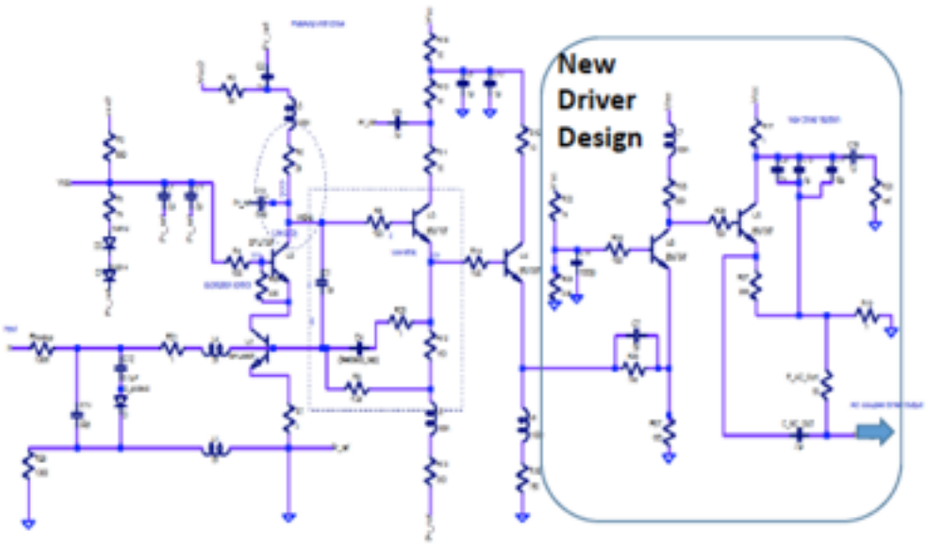
also systematic measurement of all terminals, vs. position, etc. to develop improved modeling

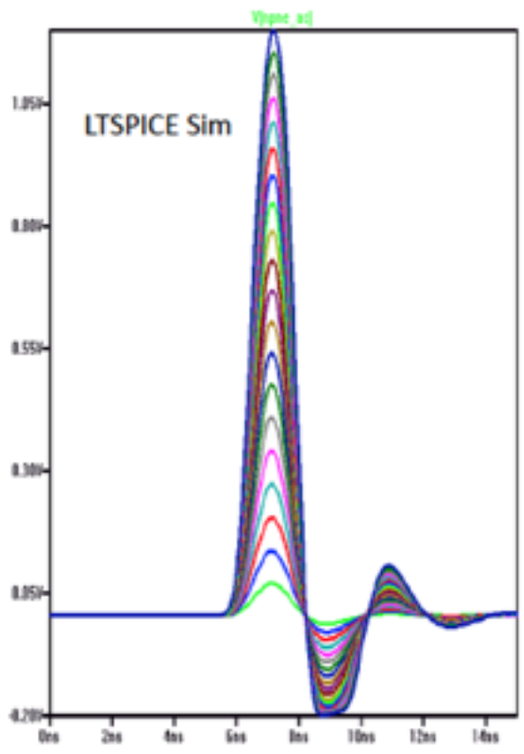


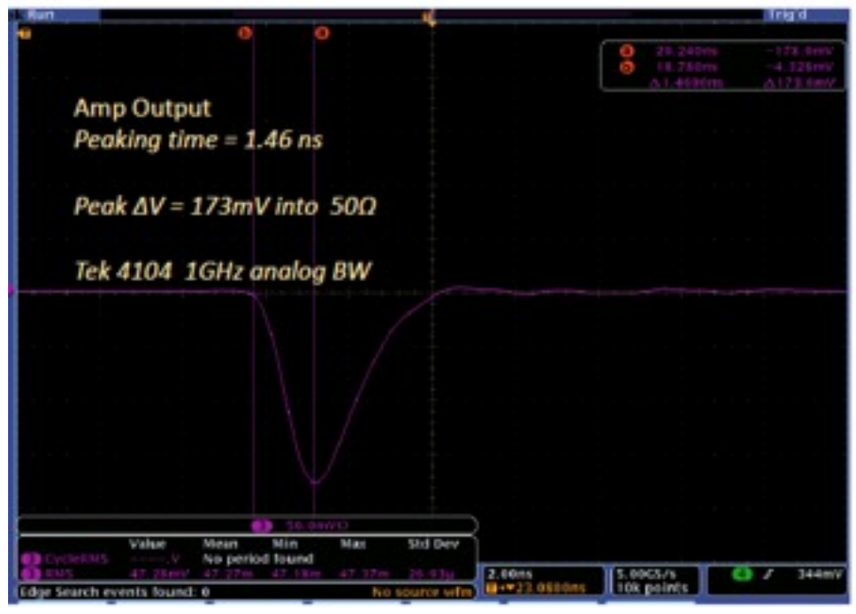
most previous results from mesh readout only

Progress on new Transimpedance Amp

Fast-amp with new driver

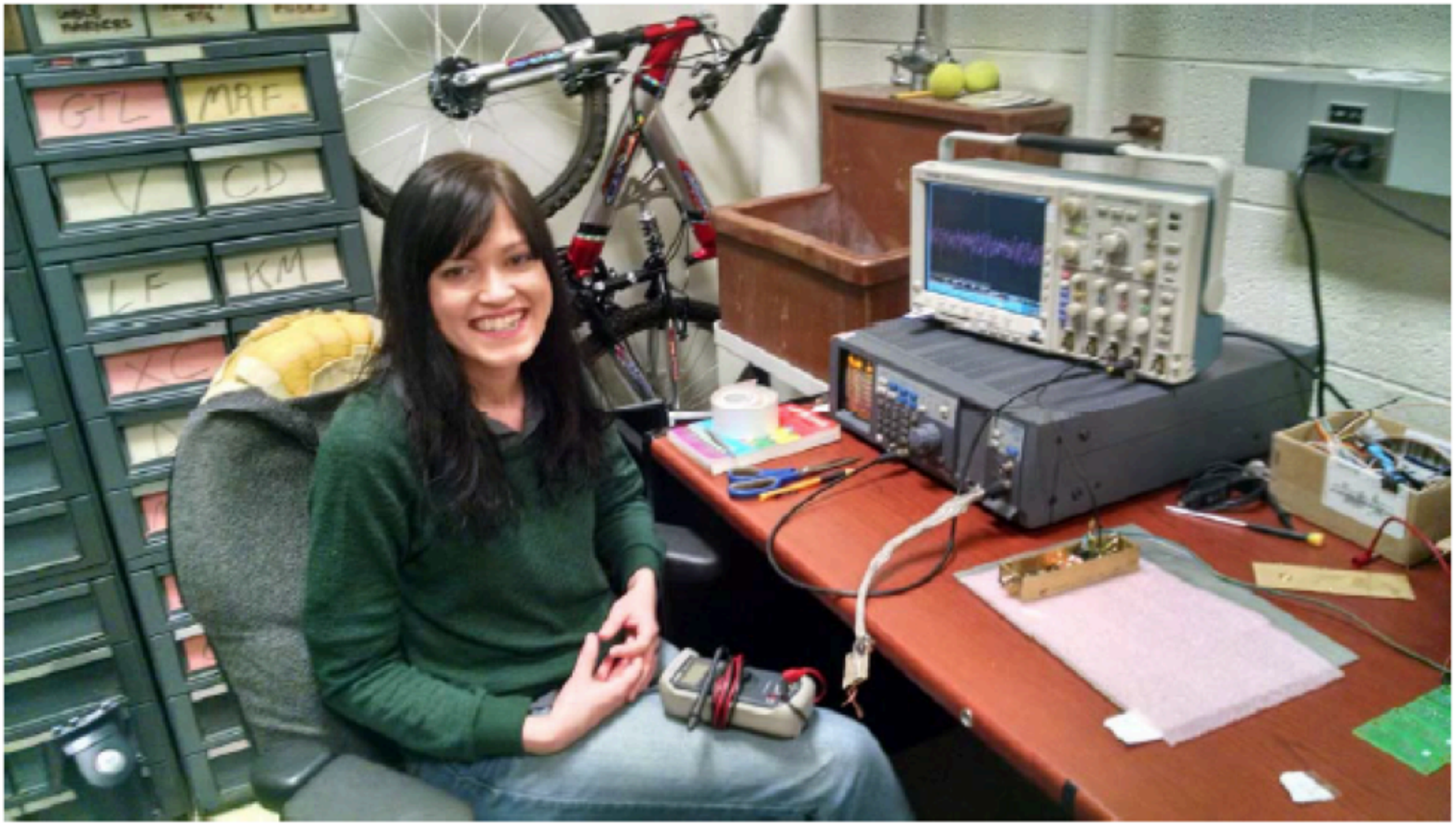






real response
to test pulse

Lots of Help from Susan Fowler.



Progress on Digitization

- I worked with Eric Delagnes at CERN in November and Saclay in December using our APD device
- very nice collaboration with excellent results (<10 psec at 1 MIP)

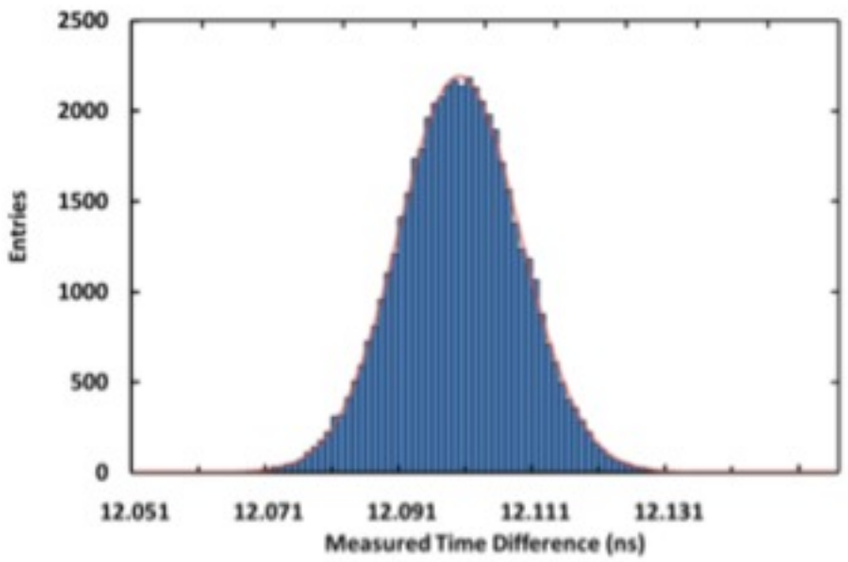


Figure 4: Distribution of Time difference between pulser and detector signals (+ Gaussian fit in red) for amplified detector signal amplitude of 600mV. The standard deviation is 12 ps RMS.

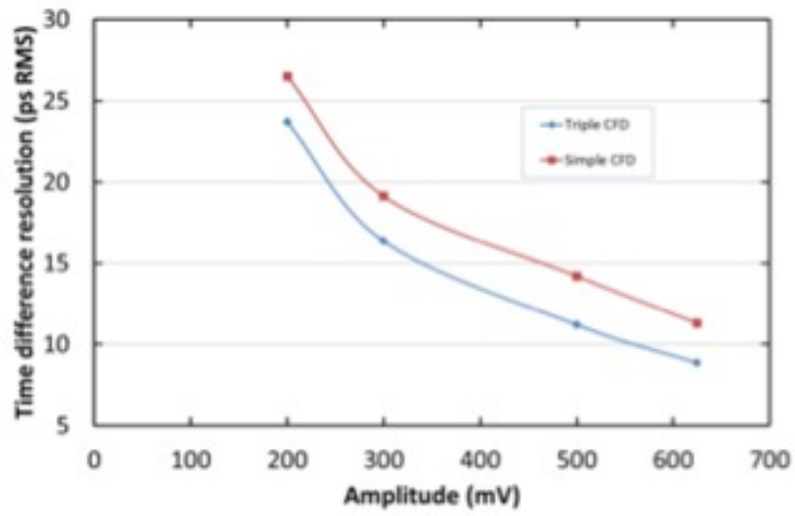
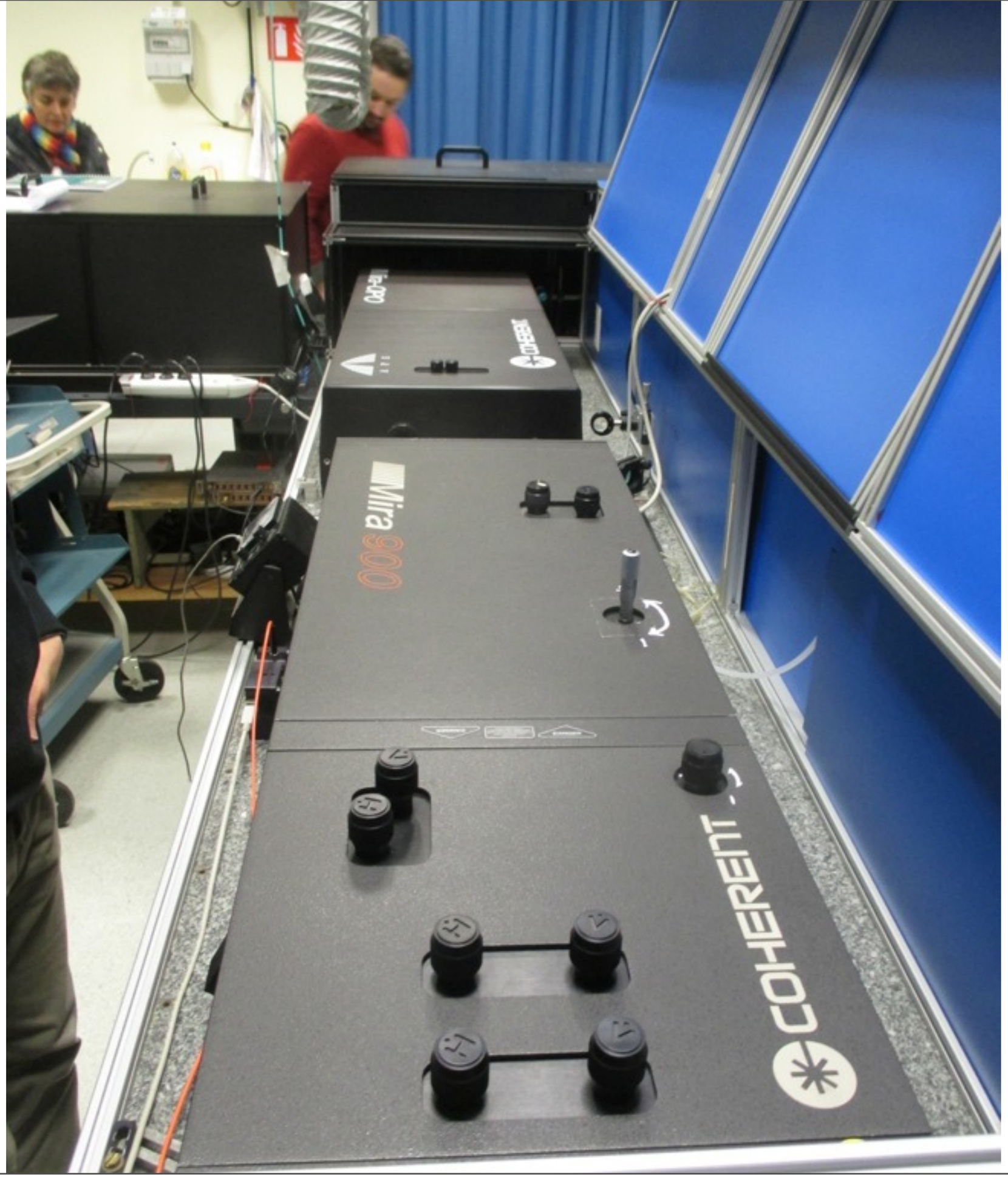


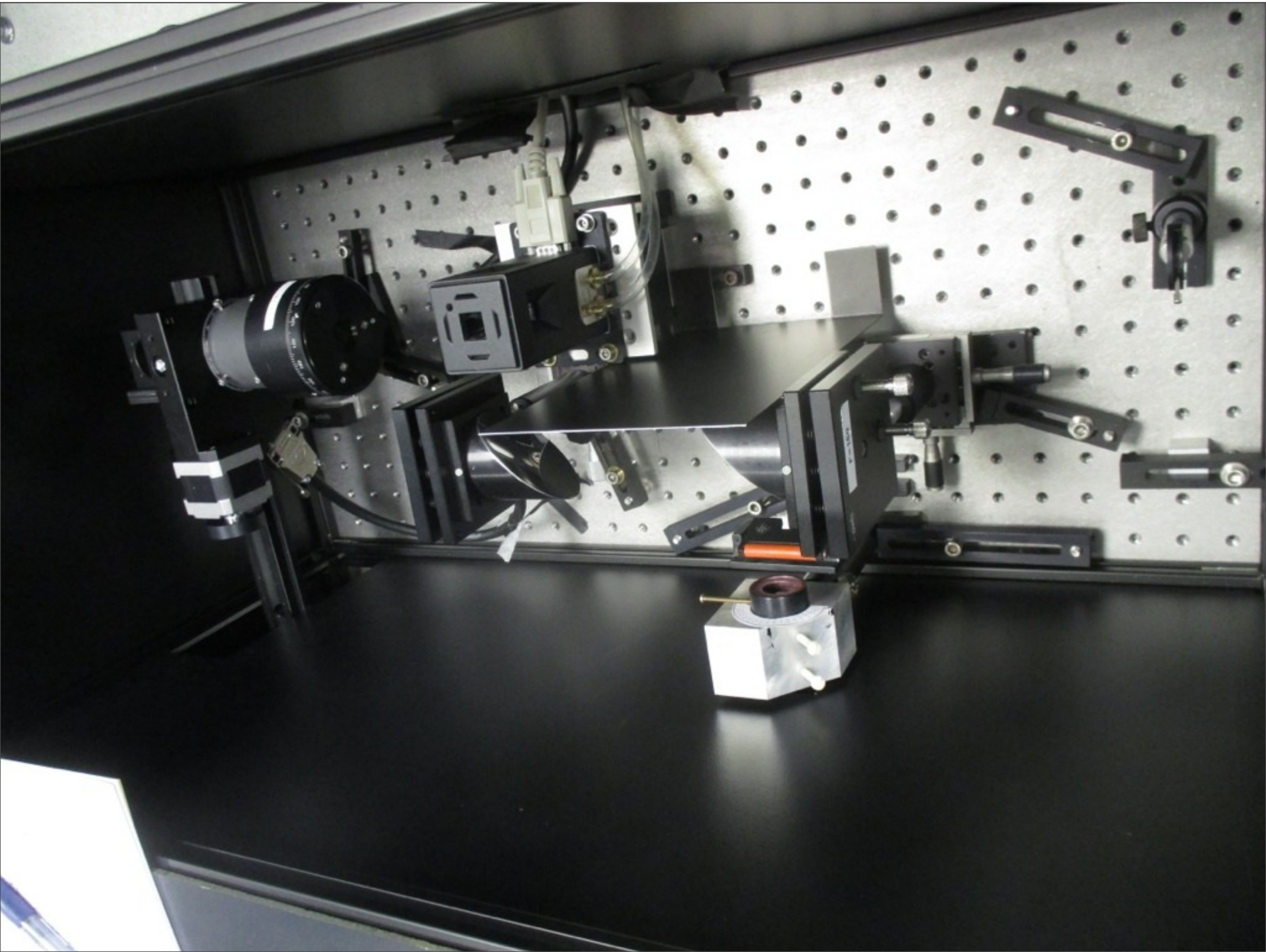
Figure 7: Standard deviation of the time difference between pulse and trigger as a function of pulse amplitude. The red curve is for timings extracted by a simple CFD algorithm whereas they are extracted by the "triple CFD" algorithm on the blue curve

Discussion with Thomas Gustavsson, IRAMIS-Saclay

S. White w. Thomas and Esther, Jan 23 2014

- there will be a follow up meeting in coming week
- his setup, which we plan to use based on a TiS laser(800nm)
- with various techniques (OPO,etc) available to get to wavelengths down to ~250nm.
- rep rate is high (~76 MHz)
- pulse energy is high (~1 nJ)
- pulse length ~ 0.1-0.2 psec.
- fast start signal provided by Si PD w. 200 psec risetime
- we can locate on optical bench
- they have simple waveform digitizer electronics and we should probably start with theirs and move on.


Mira 900
COHERENT



follow up

- we have had discussions with RMD about customizing this technology for PPS requirements
- suggest we go into detail at a future meeting.