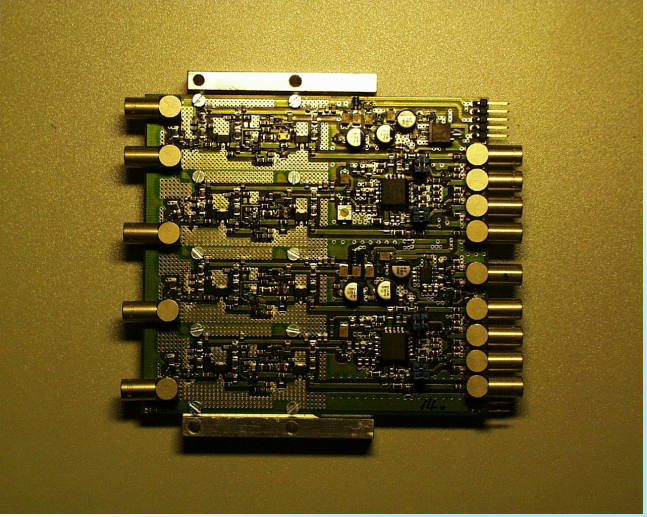
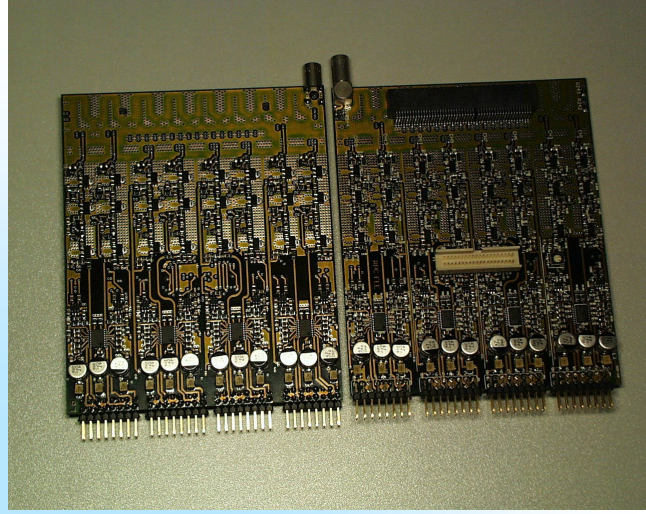
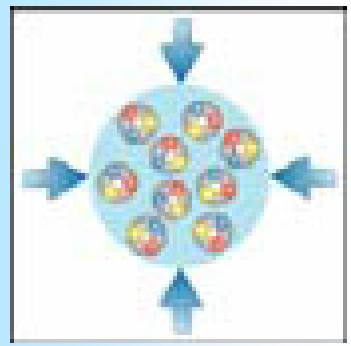




FEE1

FEE2

Progress in RPC-FEE development



Mircea Ciobanu

First FAIR FEE Workshop

October 11-13, 2005

GSI,Darmstadt

FEE status (March 2005)
(CBM collaboration meeting
March 9-12, 2005)

1. For the actual design, the connection with the RPC detector is a critical point. The 16 coaxial lines must be impedance matched to detector and FEE ends to prevent reflections.
2. With 1 detector (32 channels) or 2 detectors (64 channels) the beam tests have confirmed a stable and reliable work of the whole system. With 5 detectors (160 channels), the November 2004 FOPI beam tests have shown a system instability and now we work to fix this problem.

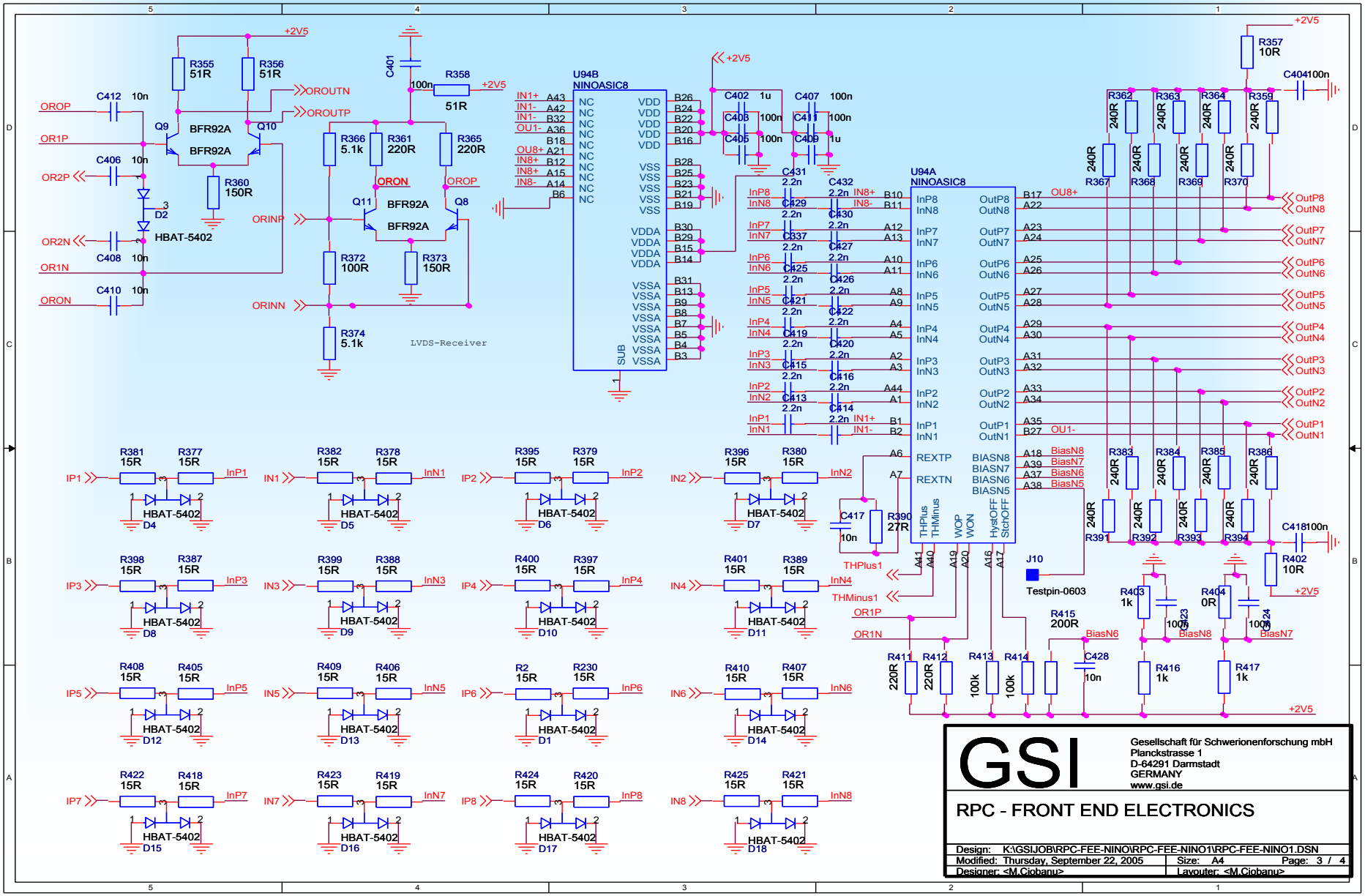
CAN BE USED A PRIVATE CHIP?

3.The actual level of performances is obtained with discrete elements and the critical parts are IC top on the Market: MAXIM9601(500ps comp),GALI -S66(Advanced Silicon Techn.), DC-3GHz Amp., 2.7dB NF, 20dB Gain.
4. It is very promising the DIFFERENTIAL pick-up of the signal and the use of an 110 Ohms cheap flat cable – Major Changes in Input stage of FEE.
5. Very attractive and effective: The test of NINO chip for ToF-ALICE.

FEE status (October 2005)

- 1. The tests of 160 channels (1 RPC super module) during a FOPI beam test in August 2005 have shown that the system stability has been improved.
- 2. The "crash" in two FEE-plates, caused by a HV sparks in the detector, which destroyed all "first cell amplifiers" (32 pcs) imposes a special attention for the improvement of the input protection efficiency.
- 3. A new RPC-FEE PCB has been designed, around the NINO chip, for comparative tests with our actual solution.
- 4. In simulations we try to predict the dependence of time resolution on different detector parameters (signal amplitude,rise time, fall time) or FEE parameters (noise, amplifier bandwidth, gain, threshold level).

RPC-FEE_NINO



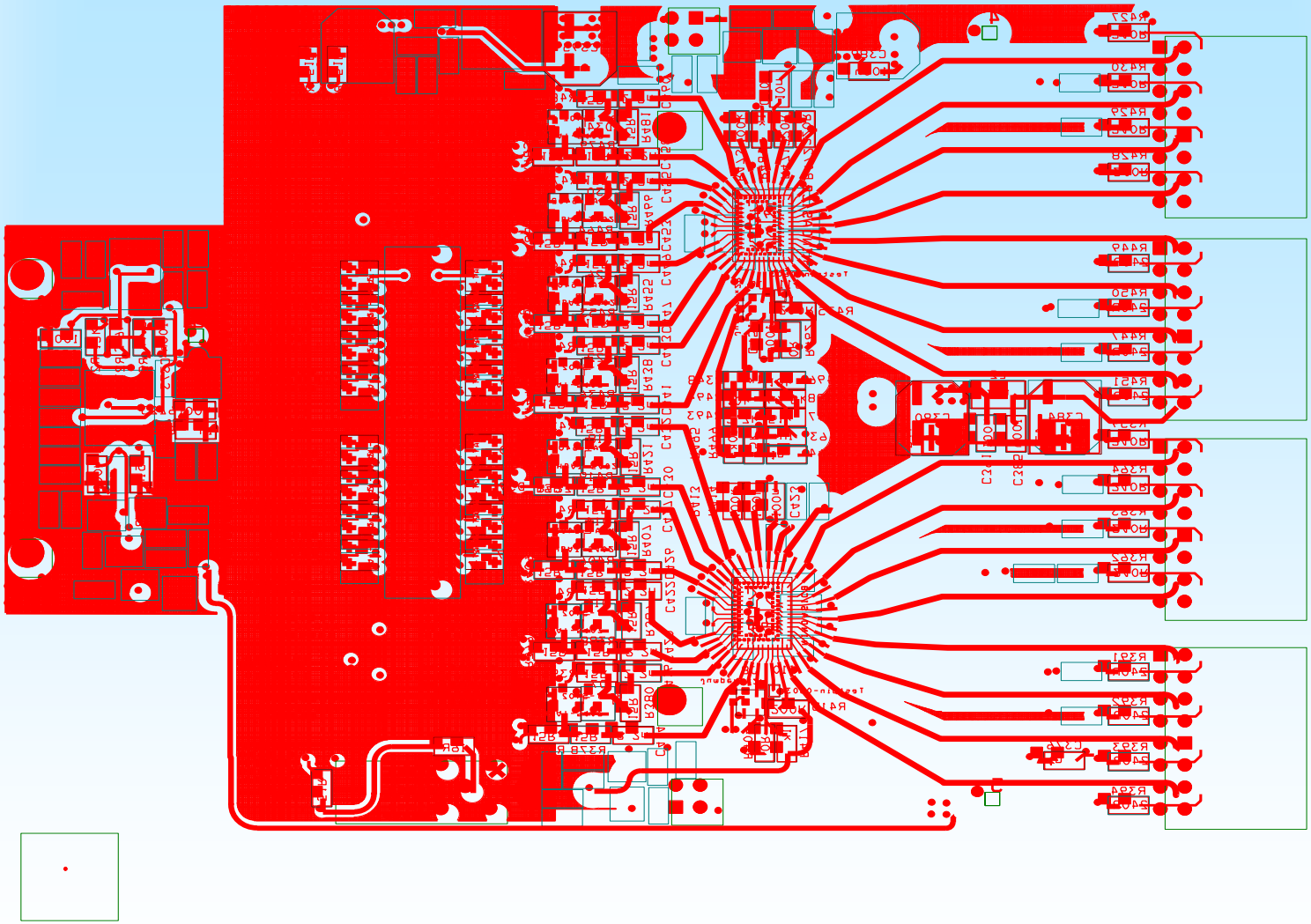
GSI

Gesellschaft für Schwerionenforschung mbH
Planckstrasse 1
D-64291 Darmstadt
GERMANY
www.gsi.de

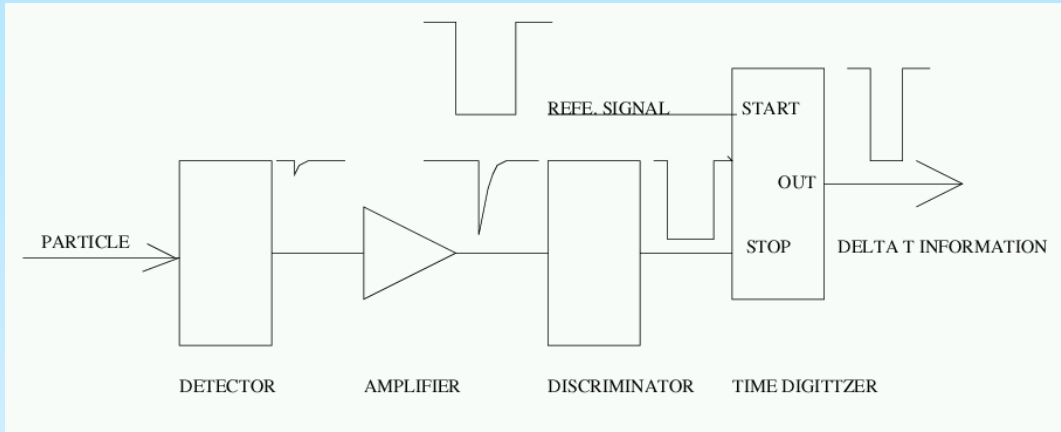
RPC - FRONT END ELECTRONICS

Design: K:\GSIJOB\RPC-FEE-NINO\RPC-FEE-NINO1\RPC-FEE-NINO1.DSN	
Modified: Thursday, September 22, 2005	Size: A4 Page: 3 / 4
Designer: <M.Ciobanu>	Layouter: <M.Ciobanu>

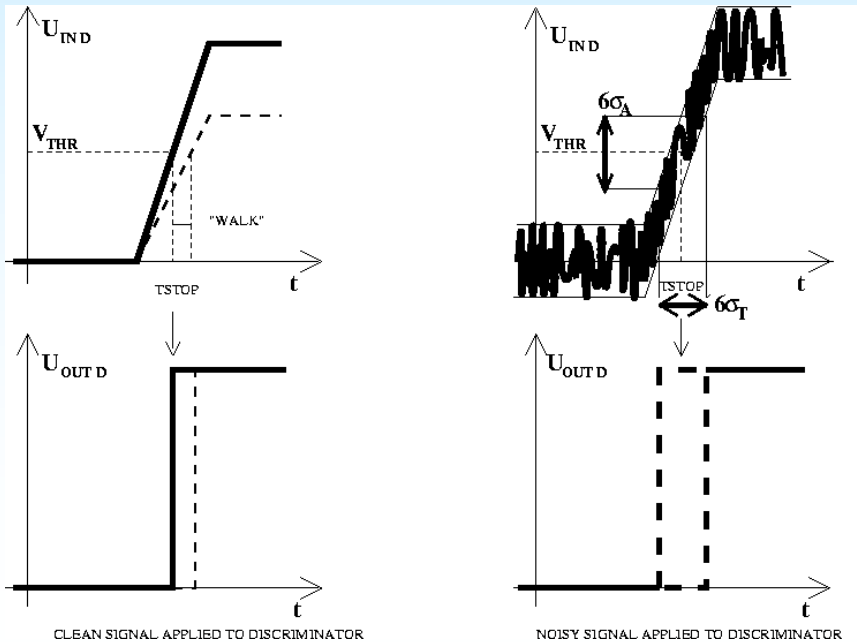
RPC-FEE_NINO



Basic components of a Timing Channel



Typical Errors



" WALK "

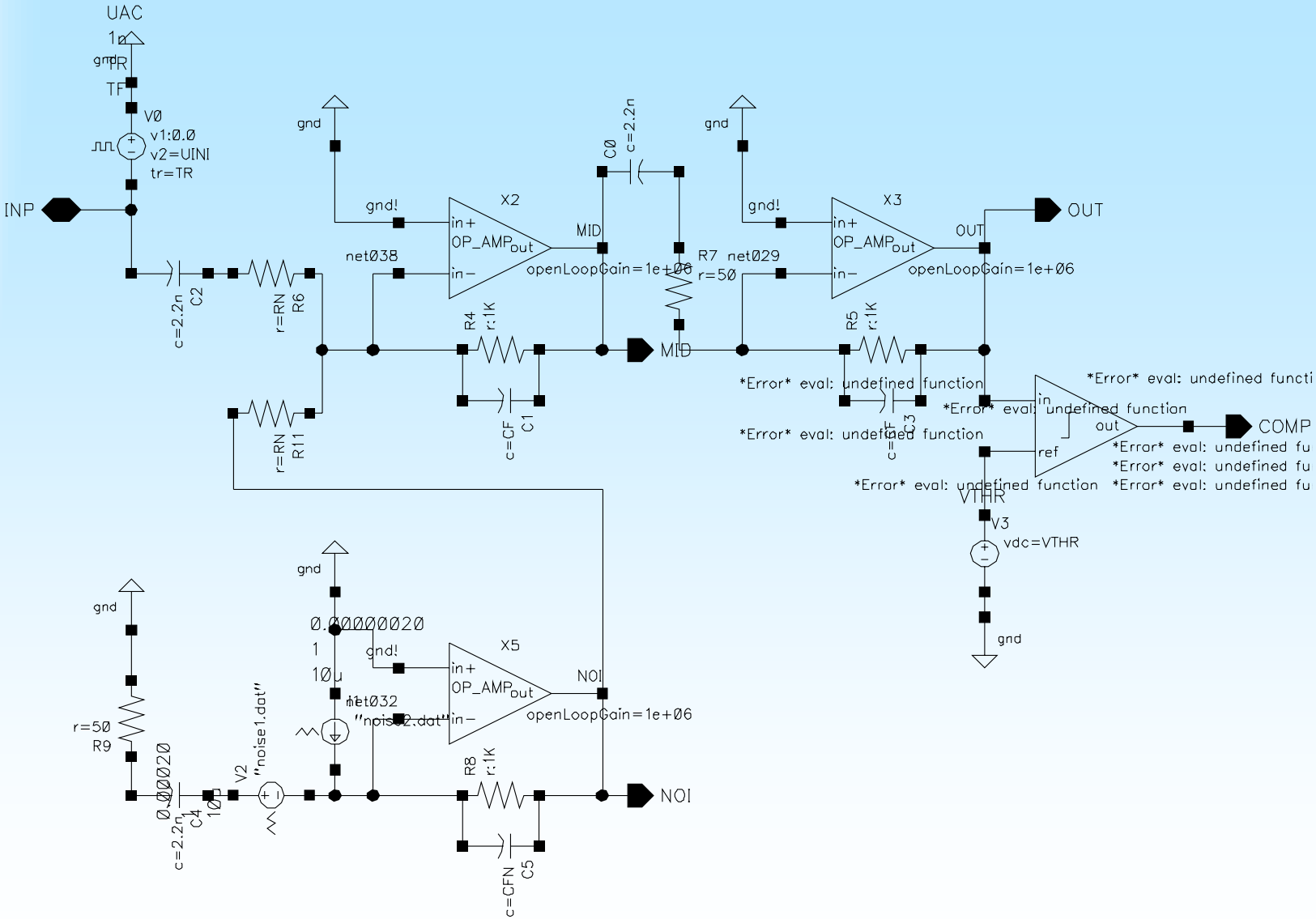
" JITTER"

$$\sigma_t = \frac{\sigma_n}{\left.\frac{dV}{dt}\right|_{V_{THR}}}$$

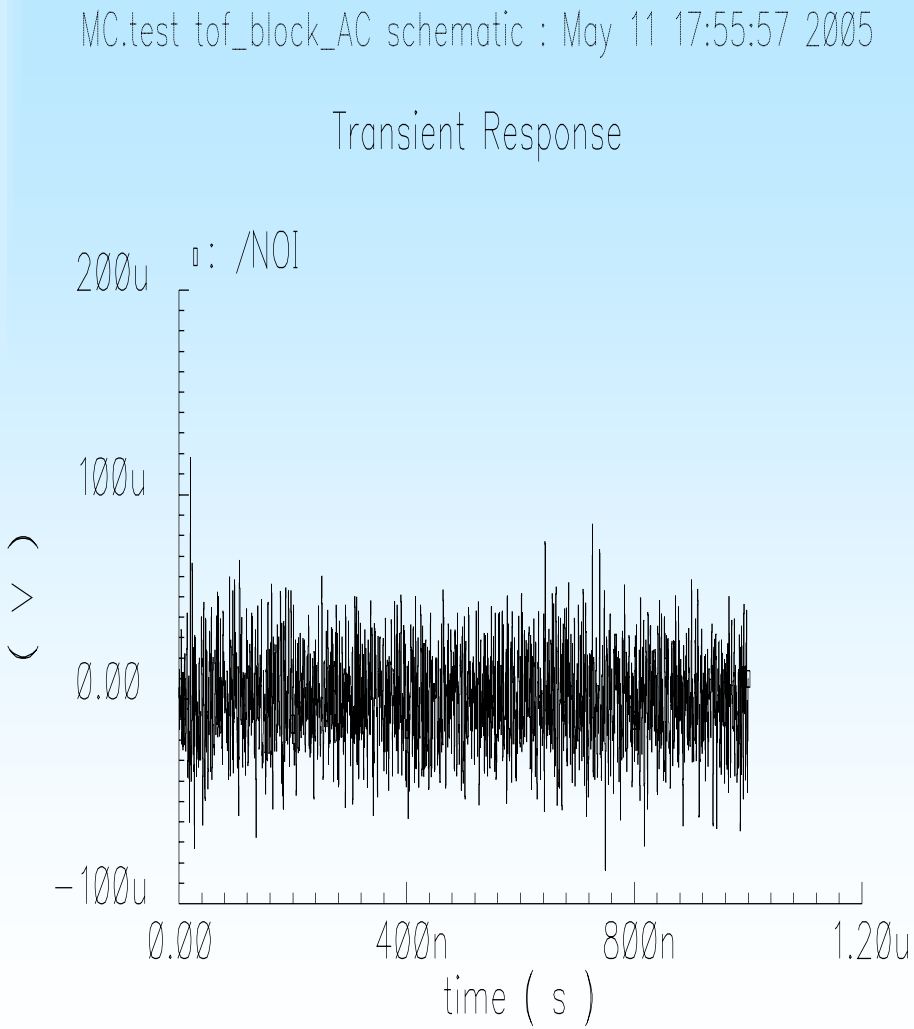
$$\sigma_t = \frac{\sigma_n}{\left.\frac{dV}{dt}\right|_{V_{THR}}} + \delta t$$

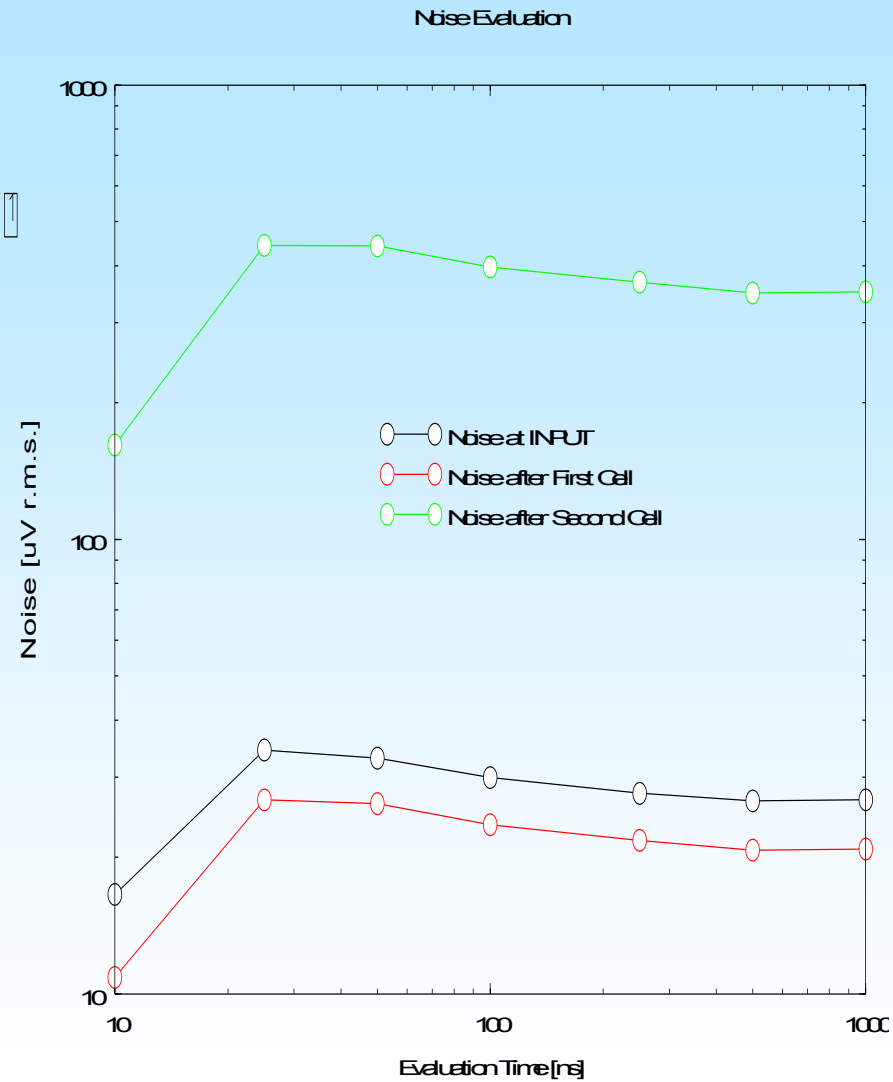
$$\sigma_t \approx \frac{\sqrt{t_c}}{V_o}\sqrt{\frac{t_c}{t_{ra}} + \frac{t_{ra}}{t_c}}$$

Simulation set-up

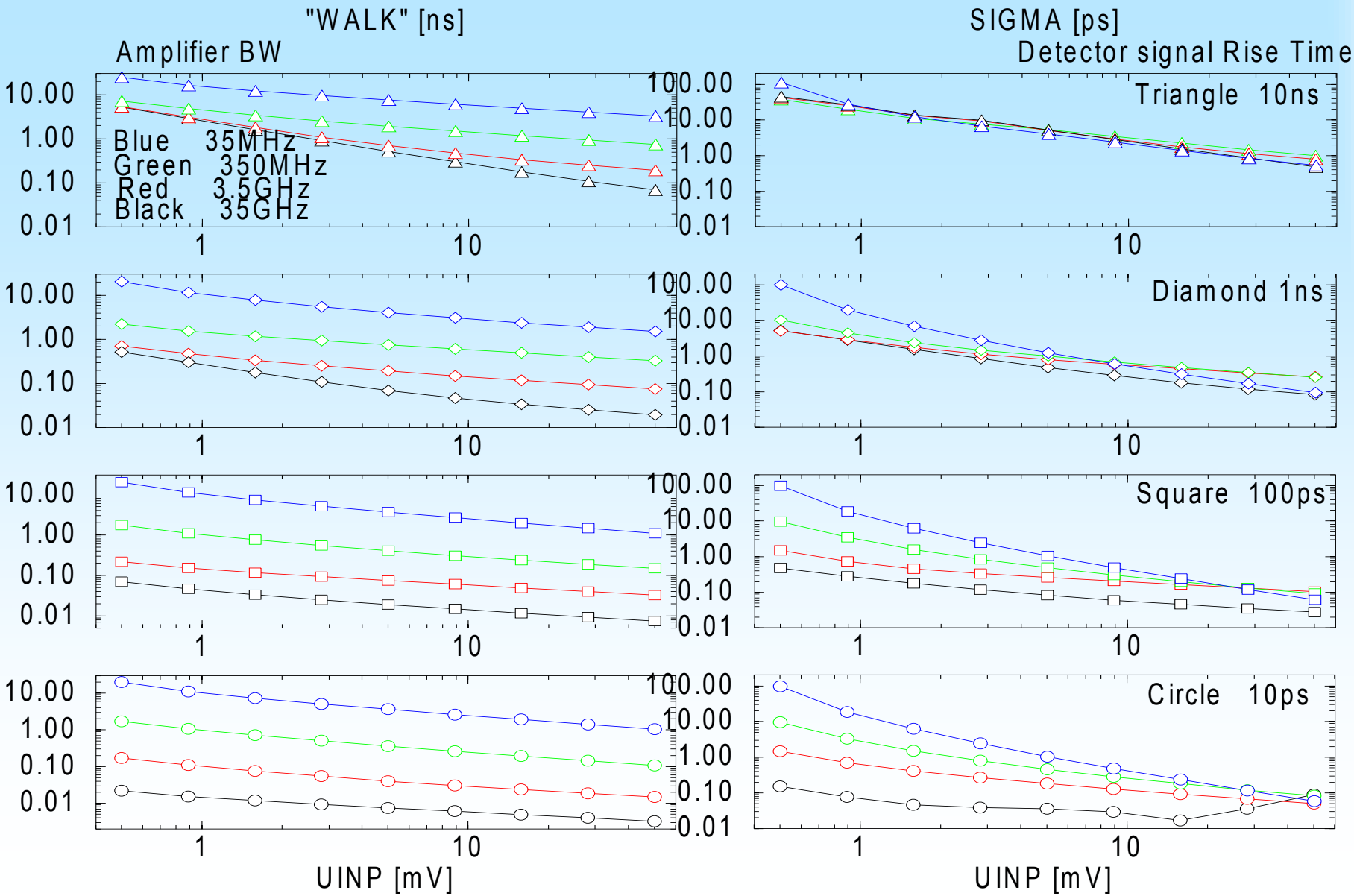


Noise File

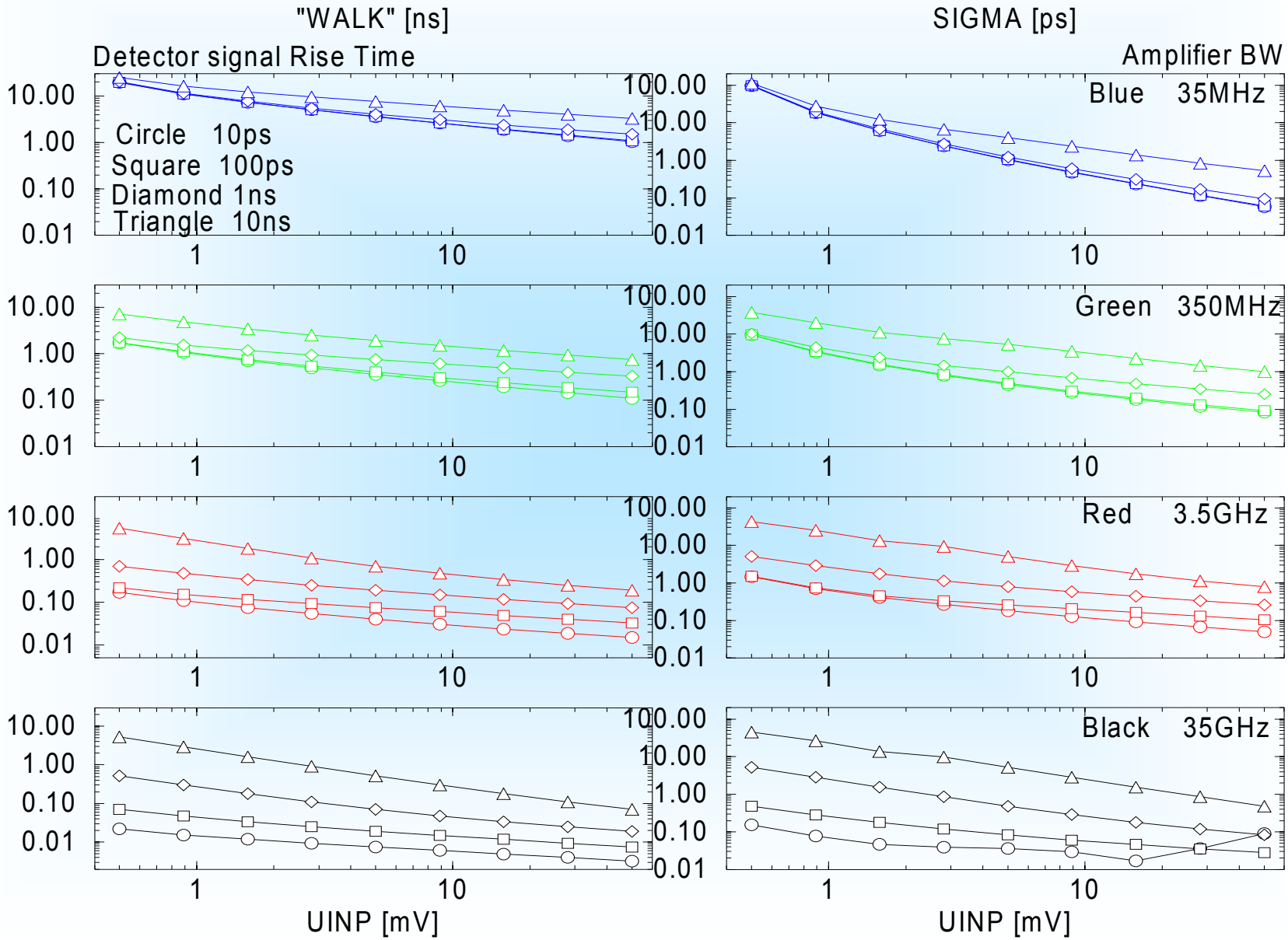

MC.test tof_block_AC schematic : May 11 17:55:57 2005
Transient Response
: /NOI
200u
100u
0.00
-100u
(V)
0.00
400n
800n
1.20u
time (s)


Noise Evaluation
1000
100
10
Noise [uV r.m.s.]
Noise at INPUT
Noise after First Cell
Noise after Second Cell
10
100
1000
Evaluation Time [ns]

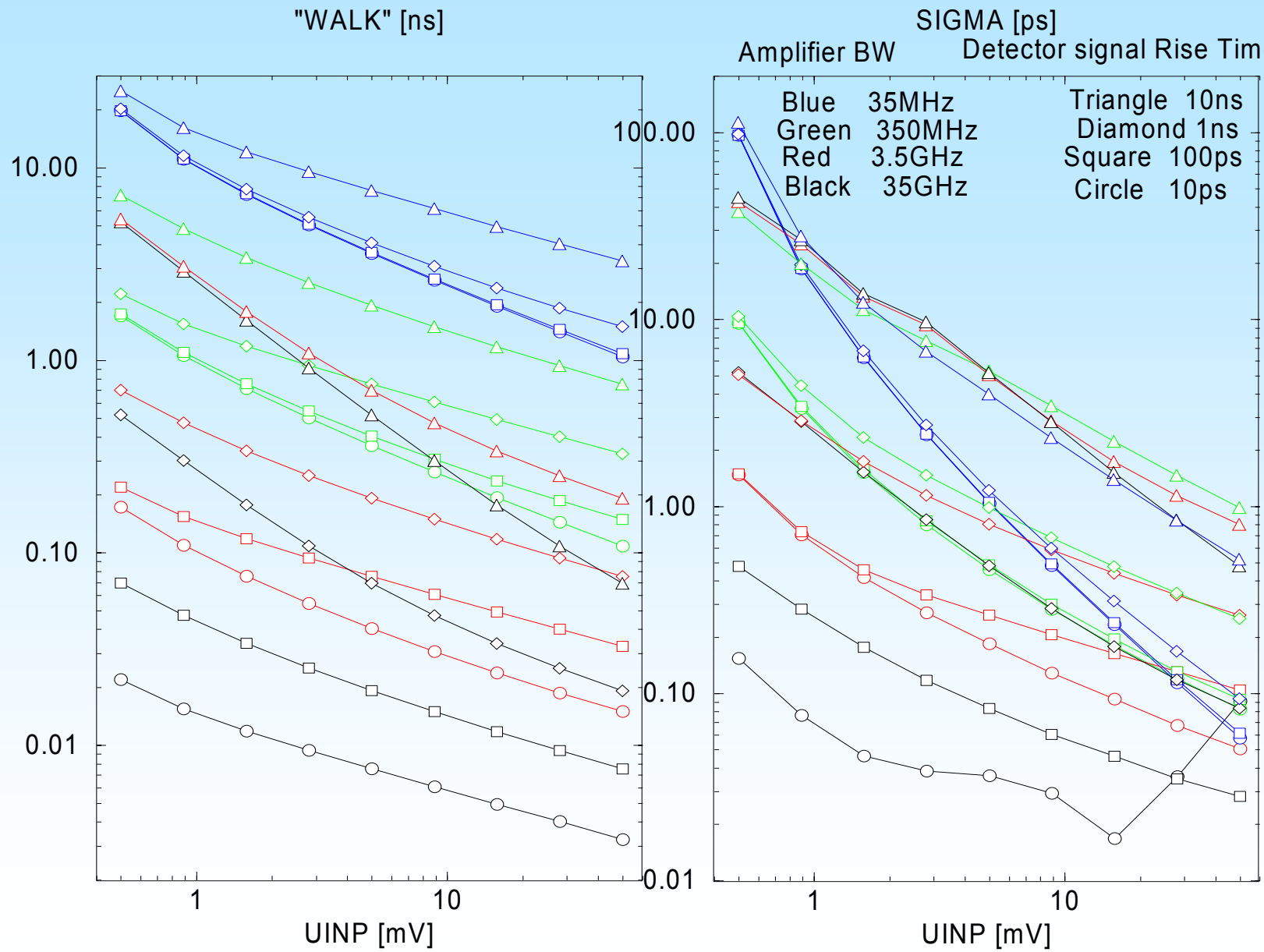
"Walk" and Sigma versus: UINP, Amplifier BW, Detector Rise Time
Detector signal is Step with variable Rise Time, Noise=3uV, THR=100mV



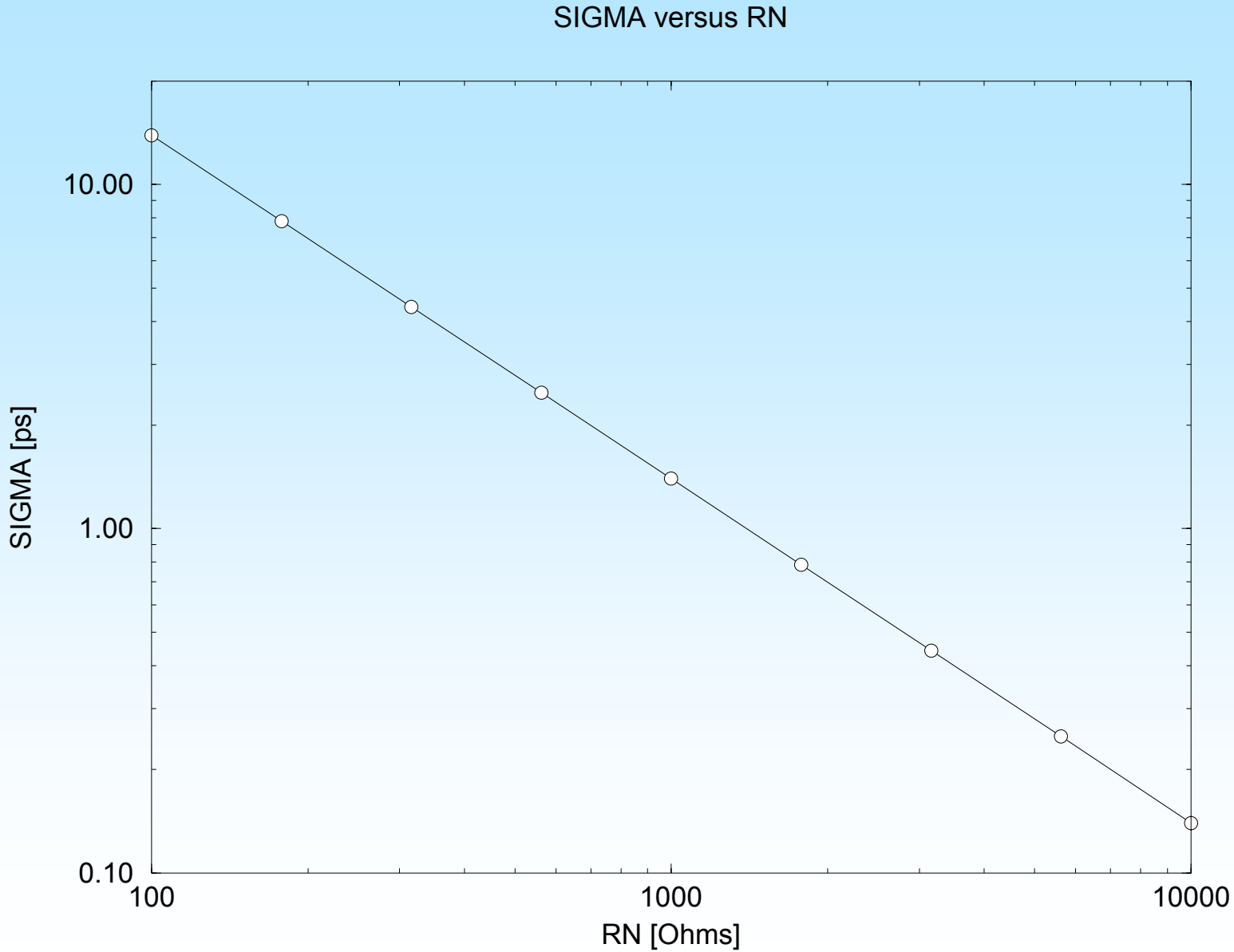
"Walk" and Sigma versus: UINP, Amplifier BW, Noise=3uV
Detector Rise Time Detector signal is Step with variable Rise Time



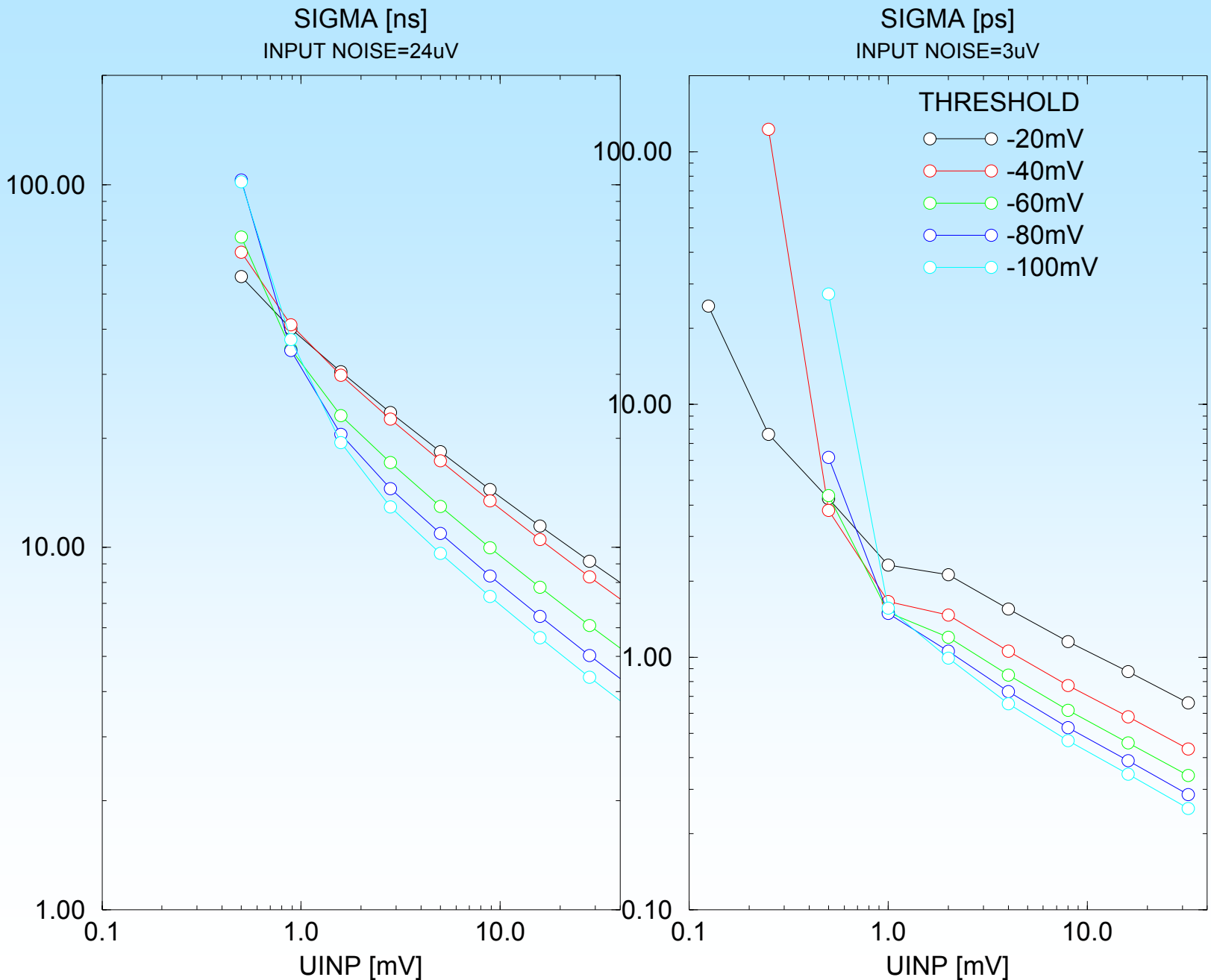
"Walk" and Sigma versus: UINP, Amplifier BW, Detector Rise Time



Sigma depend linear to Noise

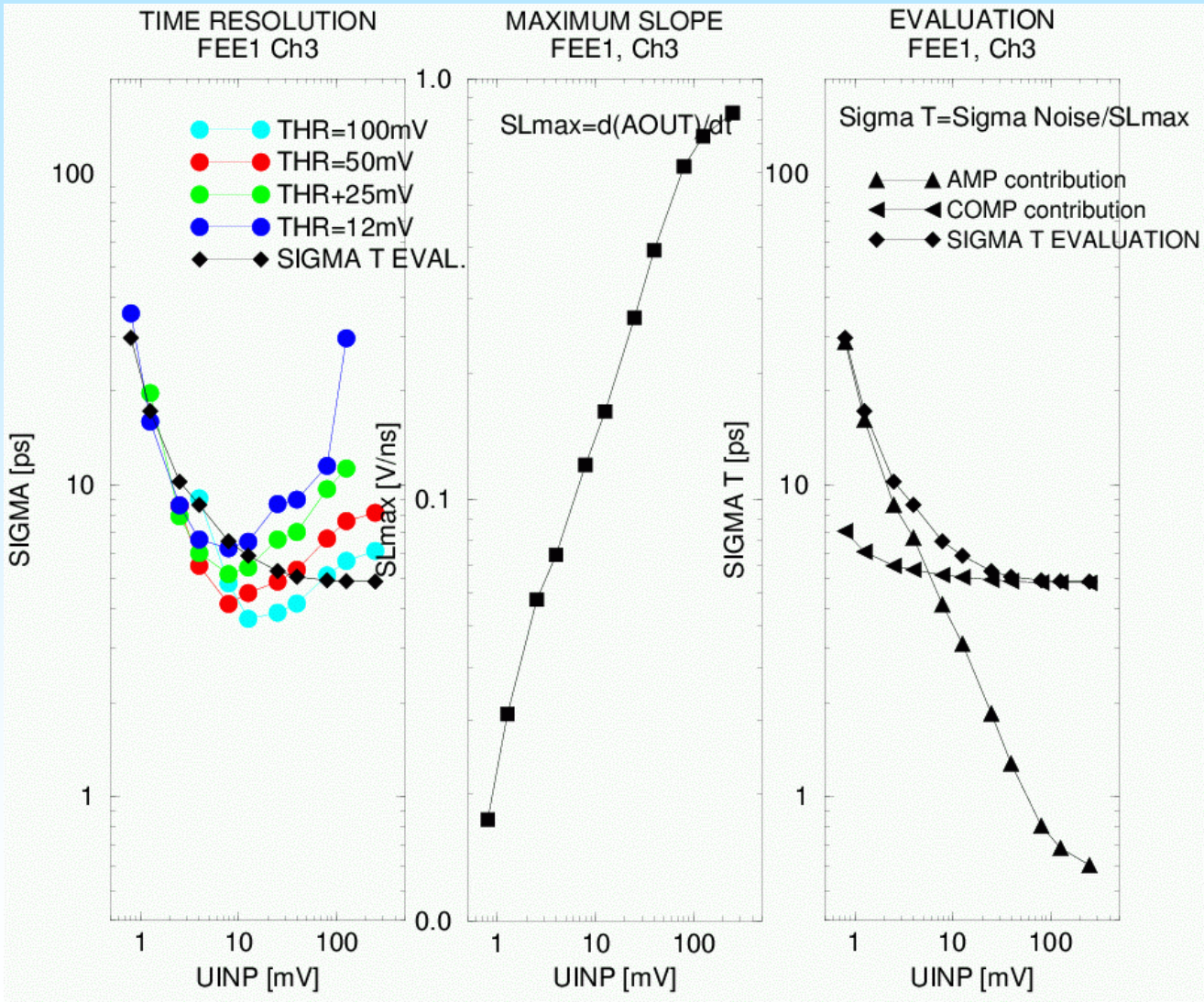


Sigma versus UINP and THRESHOLD for two Noise values

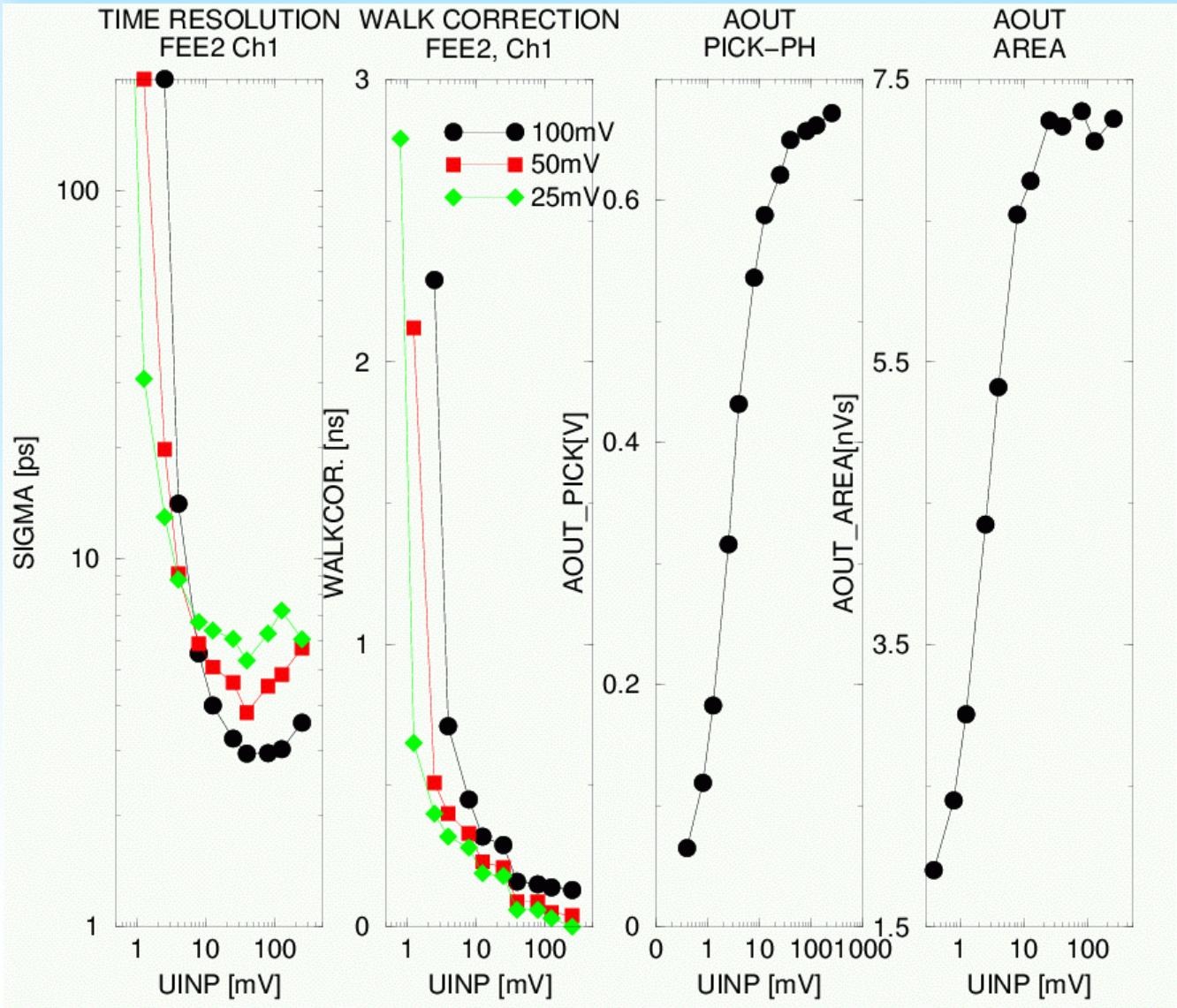


FEE1 TIME RESOLUTION

Low Gain, different Thresholds

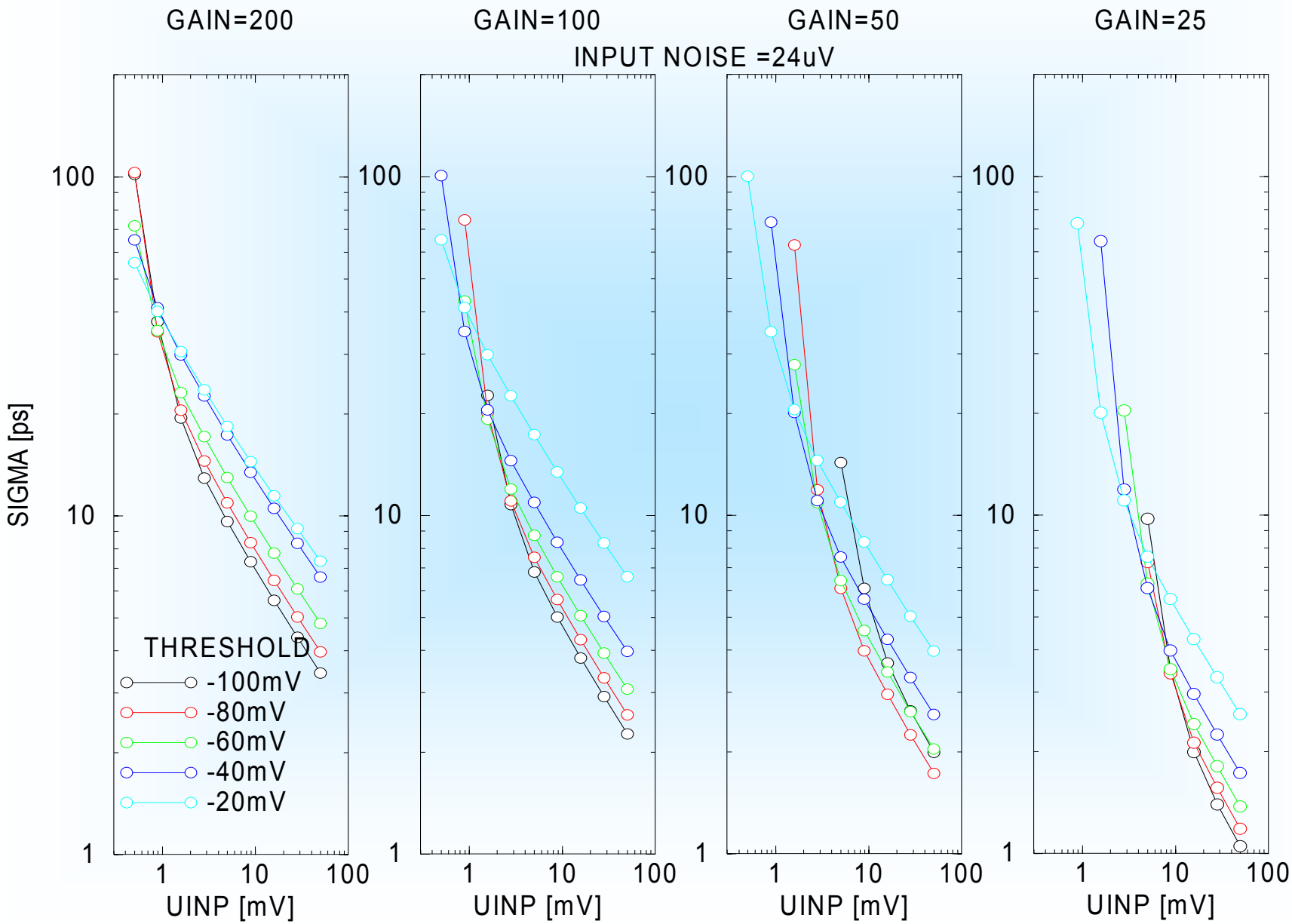


FEE2 TIME RESOLUTION

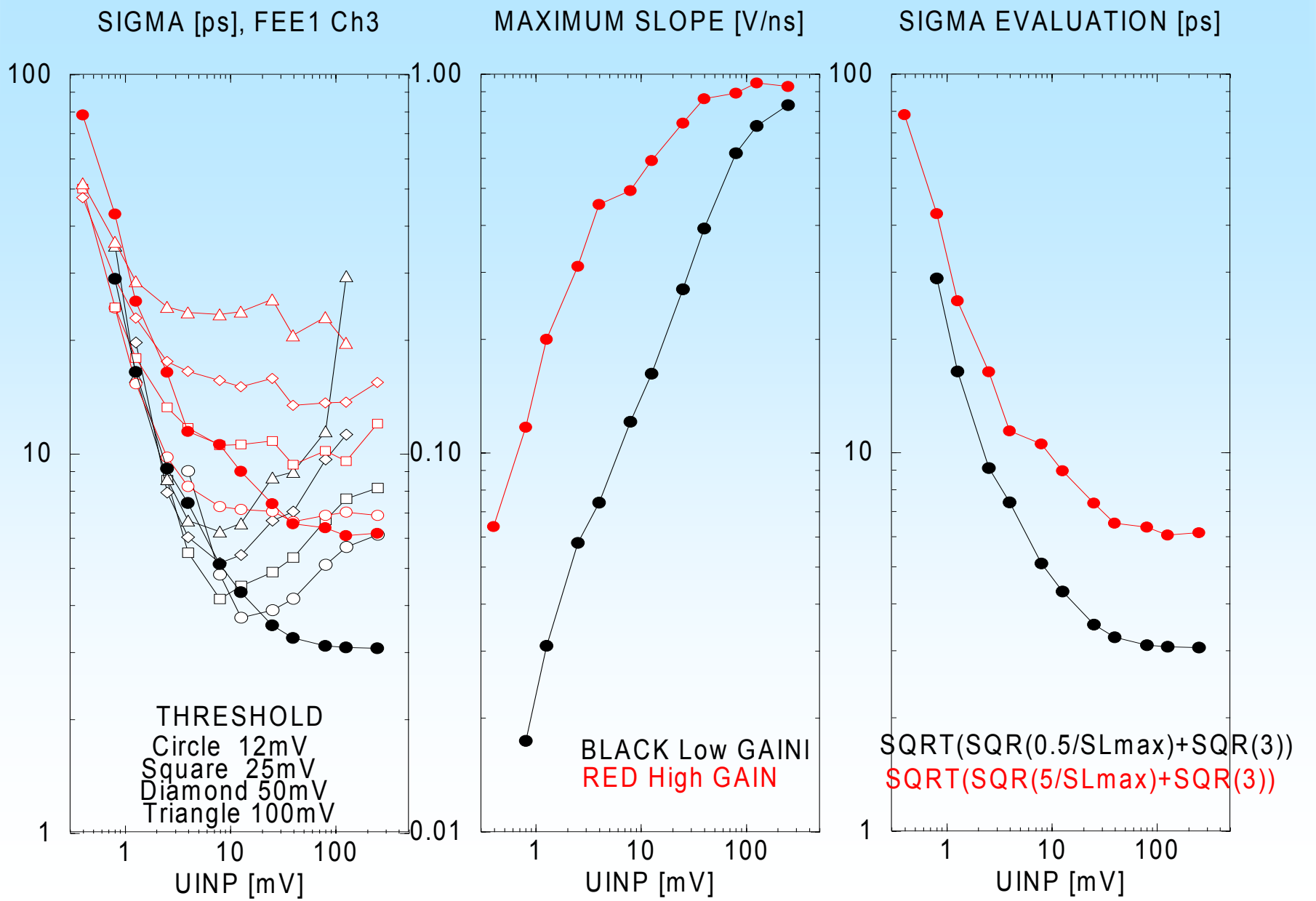


different Thresholds

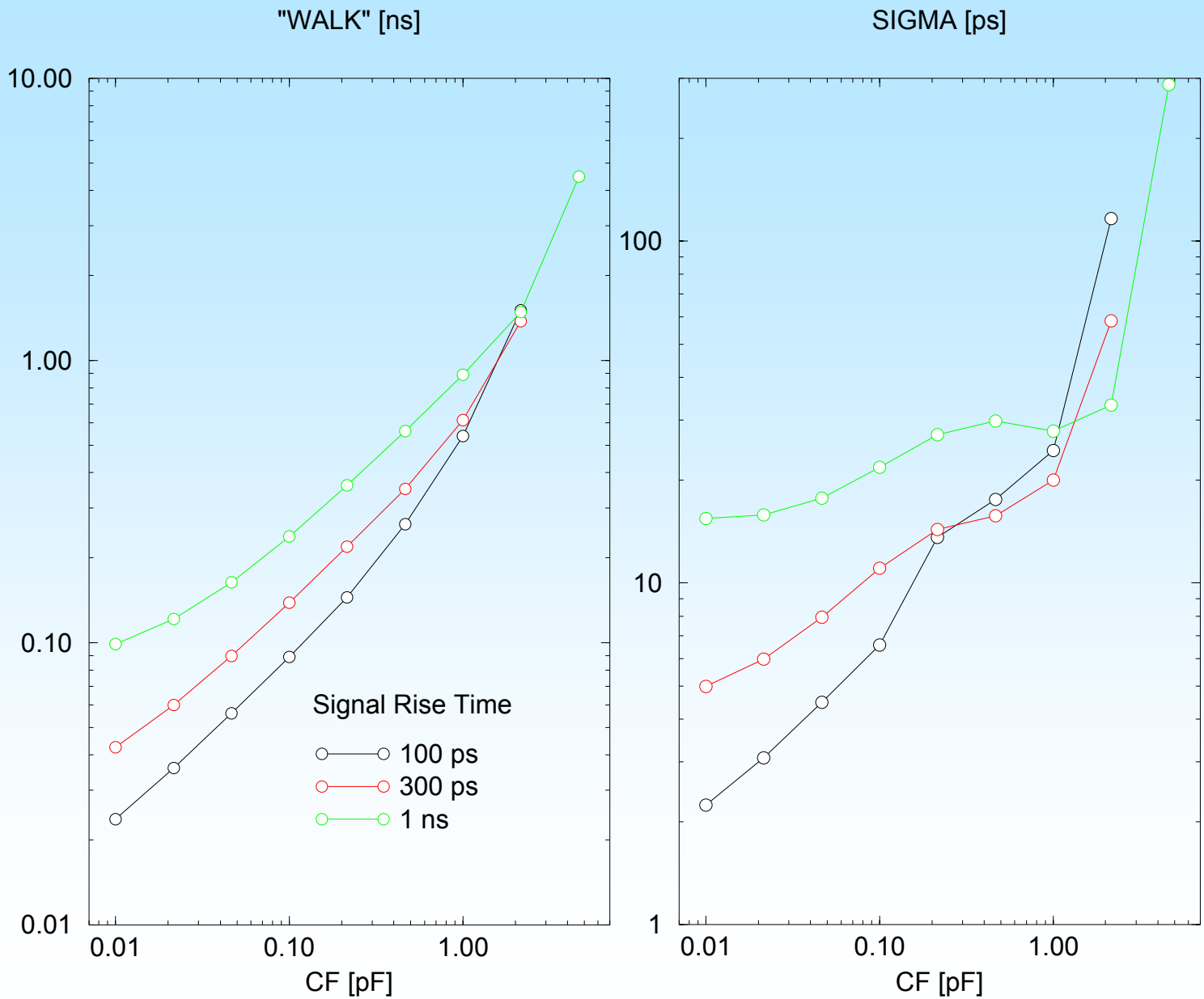
Sigma versus UINP, THRESHOLD and GAIN



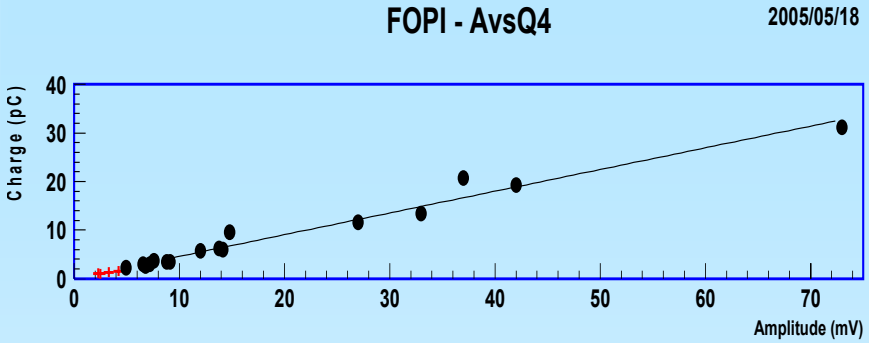
Sigma versus UINP, THRESHOLD and GAIN

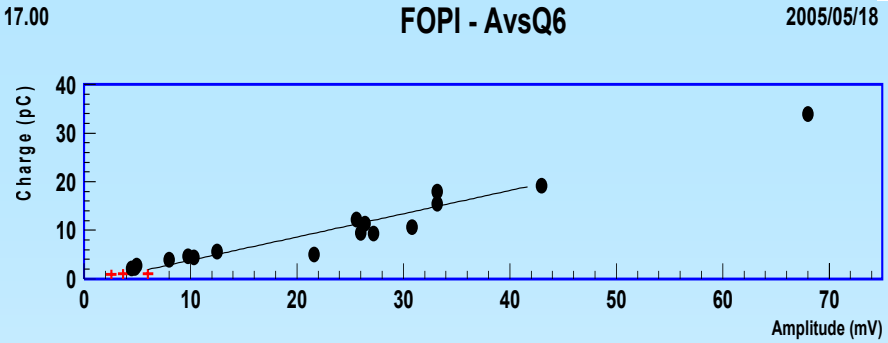


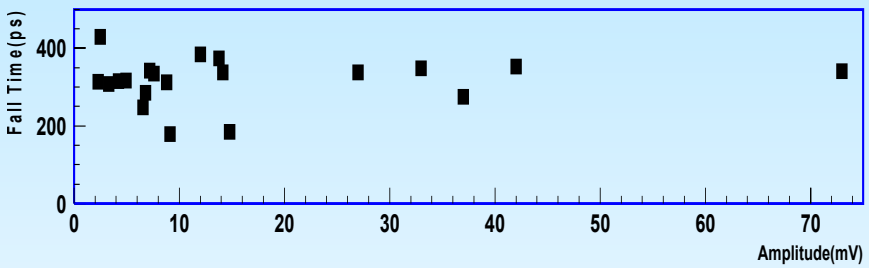
Dependence to BW and Signal Rise Time

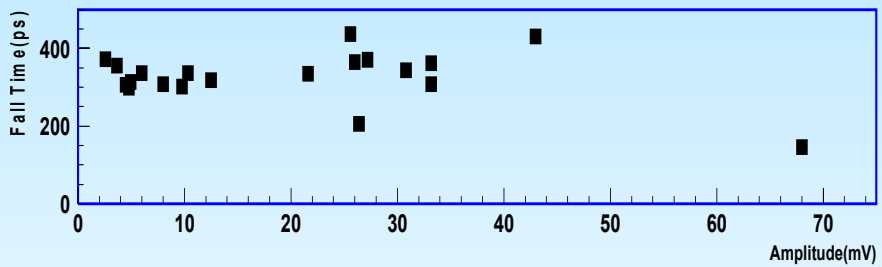


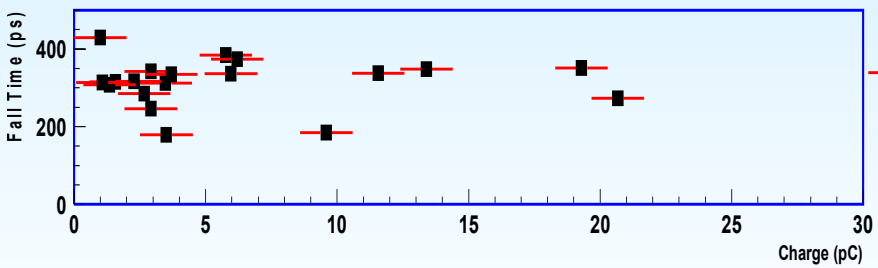
Measurements

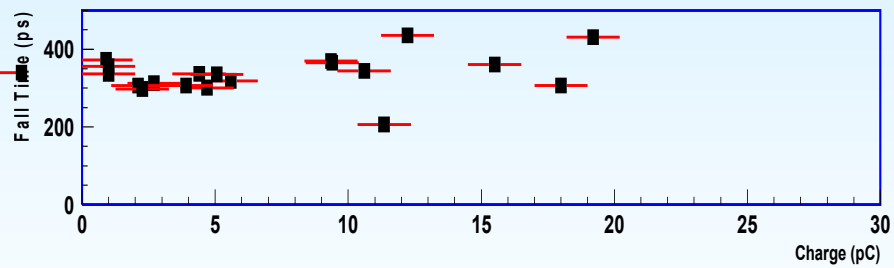


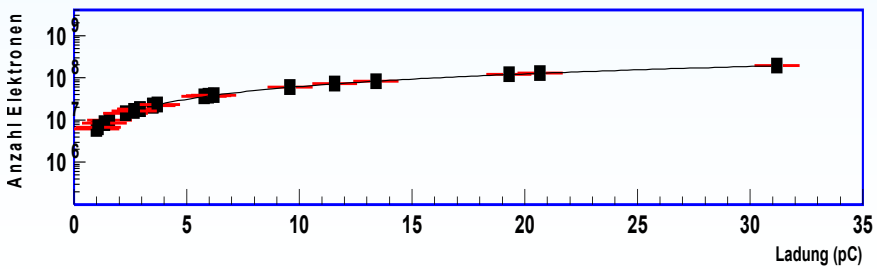


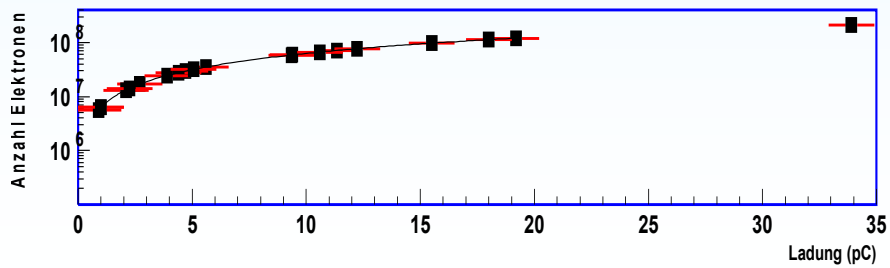




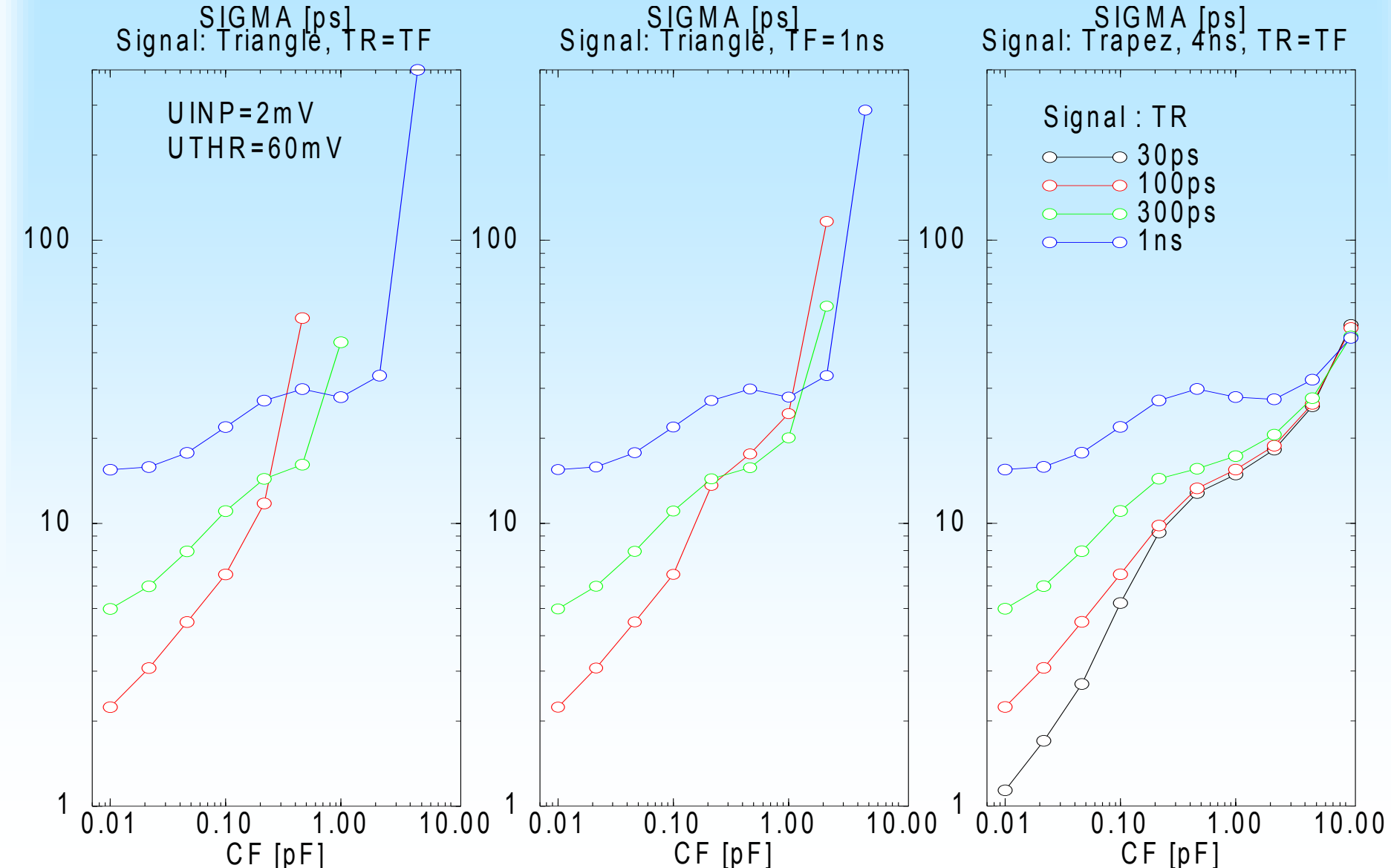


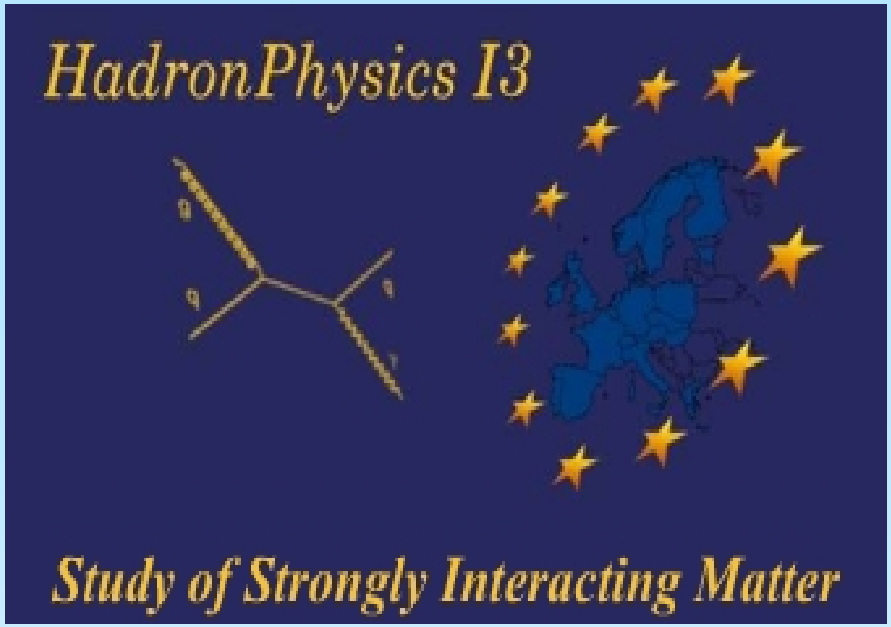






Comparative Dependence to BW and Signal Rise Time for : Resistive Plate Chamber, PC and SC Diamonds





We acknowledge the support of the European Community-Research Infrastructure Activity under the FP6 "Structuring the European Research Area" programme (HadronPhysics,contract number RII3-CT-2004-506078).