

Timing Performance of A-PIC at High Rate

F. García¹, E. Oliveri², H. Müller²

¹Helsinki Institute of Physics - University of Helsinki

²GDD lab - CERN

OUTLINE

1. INTRODUCTION to the SETUP
2. MEASUREMENT SCHEME AND A-PIC
3. INTENSITY SCAN FROM 50 KHz- 3MHz
4. OUTLOOK

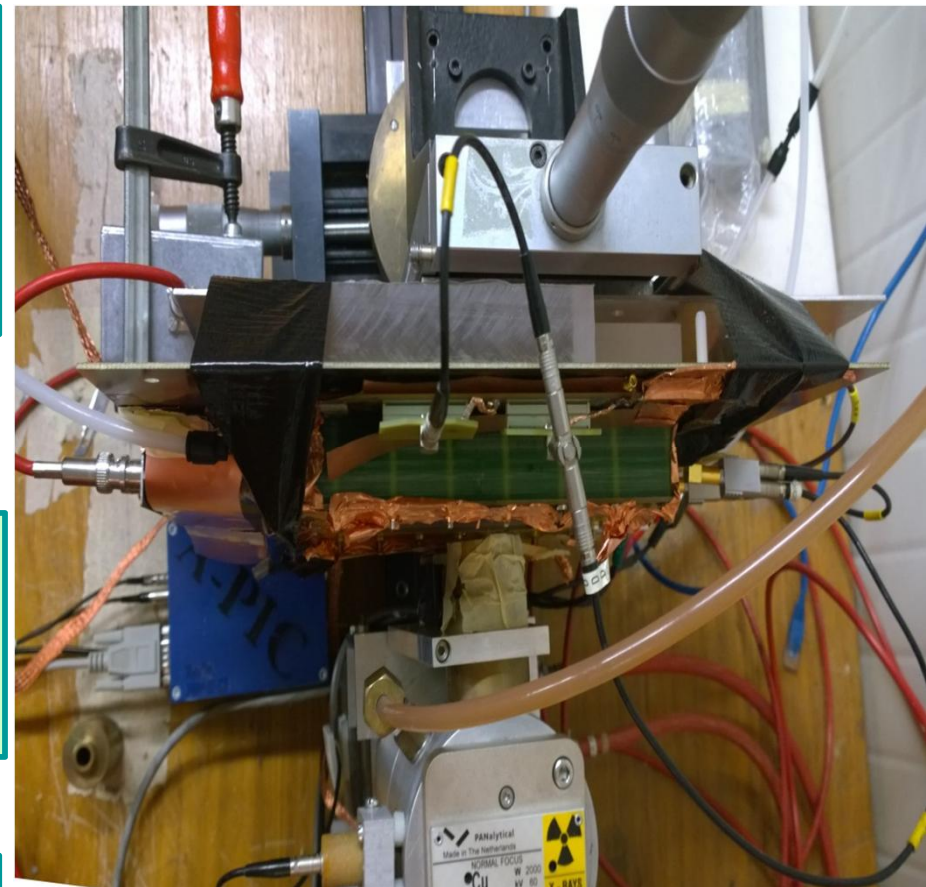
INTRODUCTION to the SETUP



Triple GEM detector:
Area: $10 \times 10 \text{ cm}^2$
Gain: 10^4
Gas Mixture: ArCO₂ (70/30)
 $h_{\text{primaries}} = 293e^-$

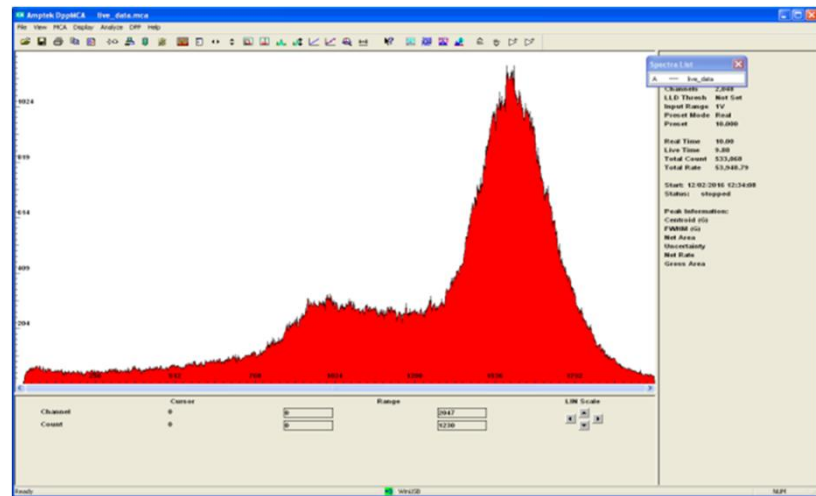
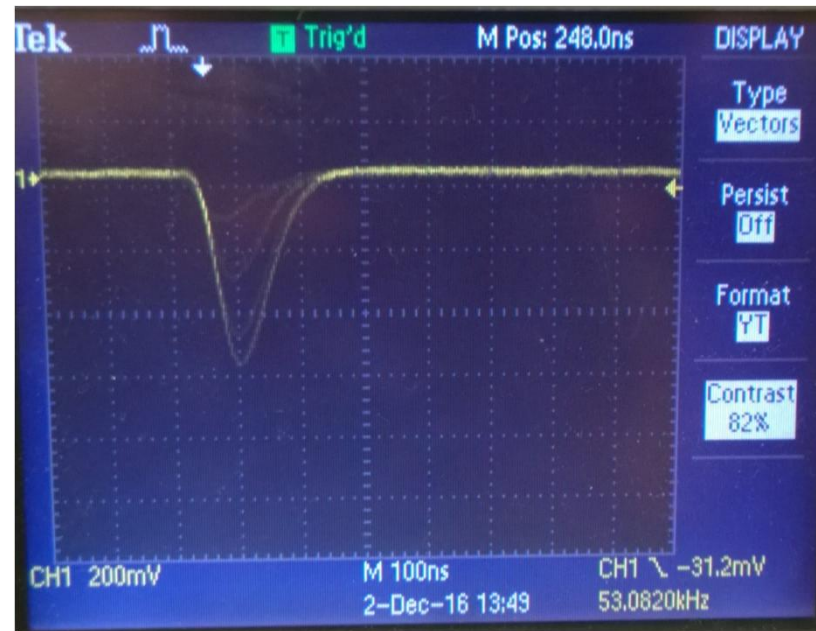
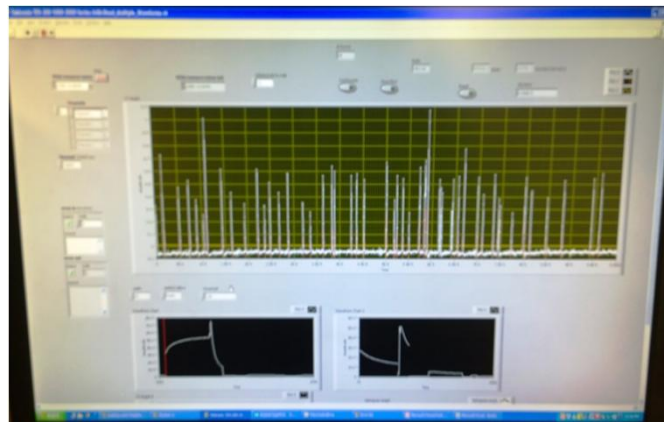
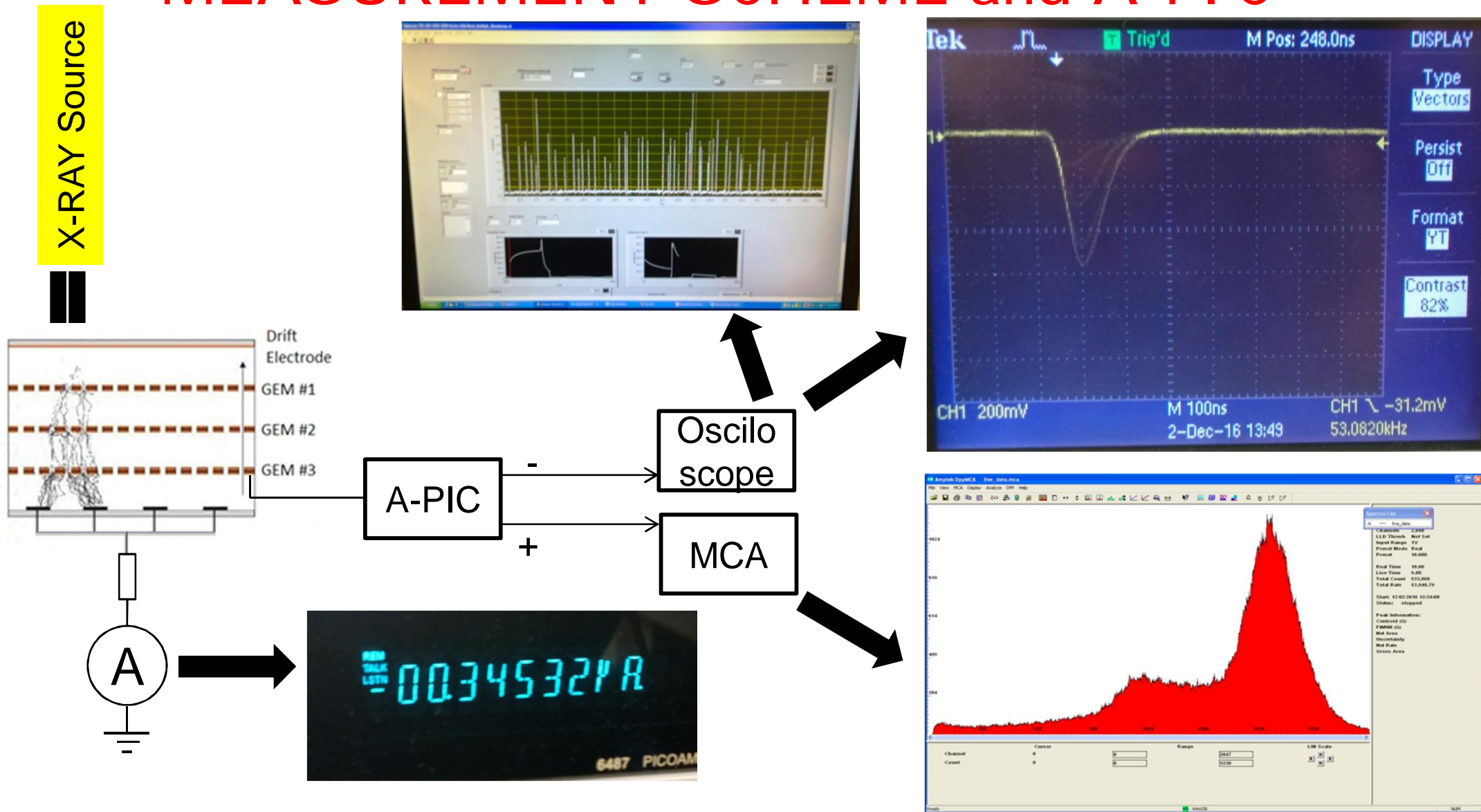
Collimator:
Diameter: 1.6 mm
Area: 8.04 mm^2
Fluence: $3.5 \cdot 10^3 - 3 \cdot 10^6 / \text{mm}^2$

X-ray Tube:
Anode: Cu
HV: 16 kV
Current: up to 3 mA



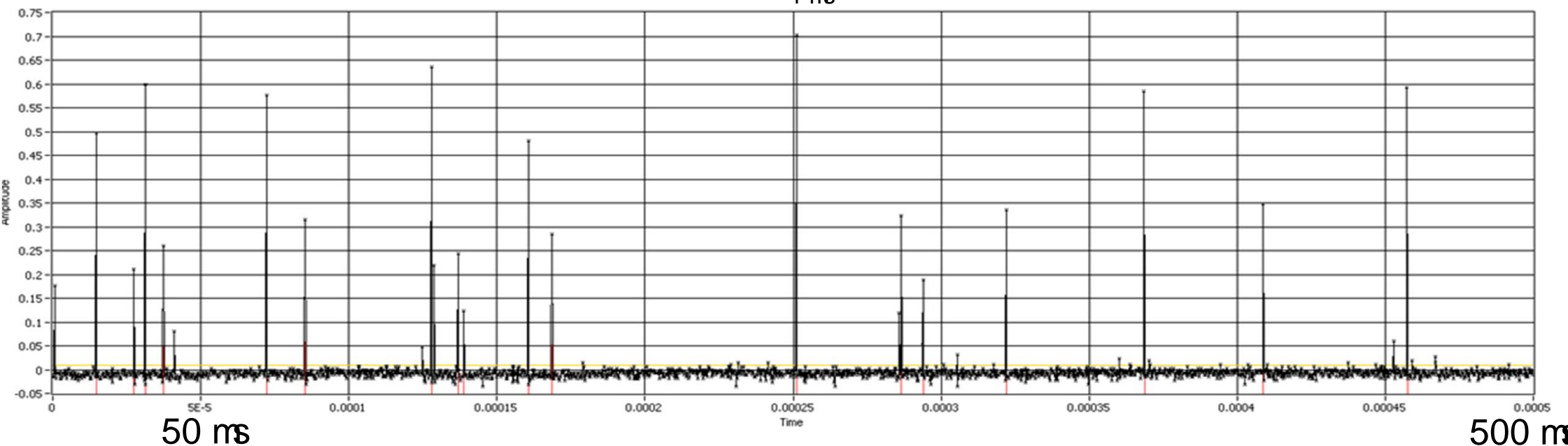
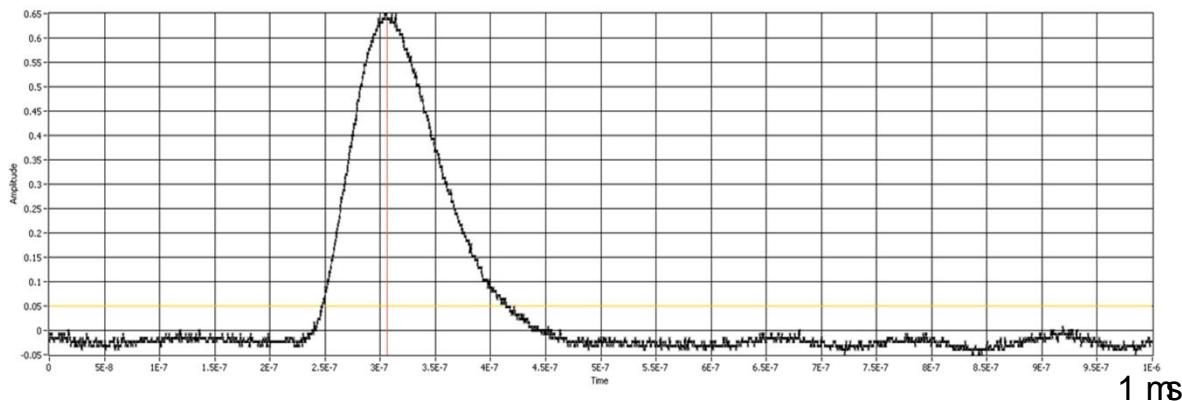
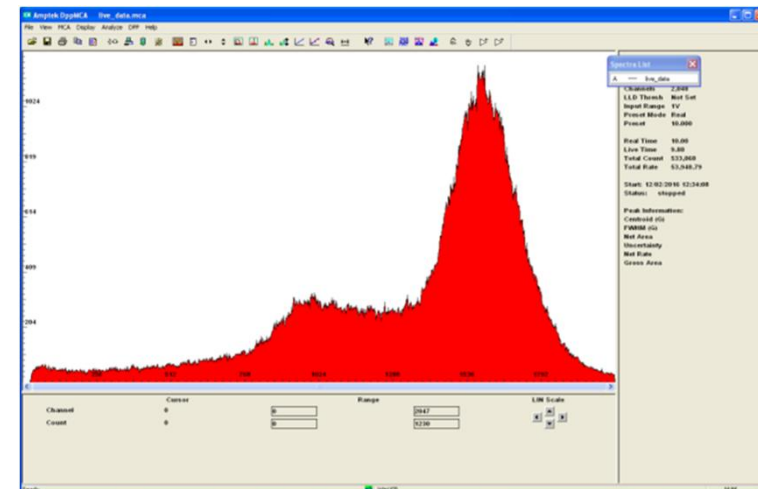
A-PIC:
 t_{rise} : 30 ns
Full Width: 150 ns
Gain: ?

MEASUREMENT SCHEME and A-PIC



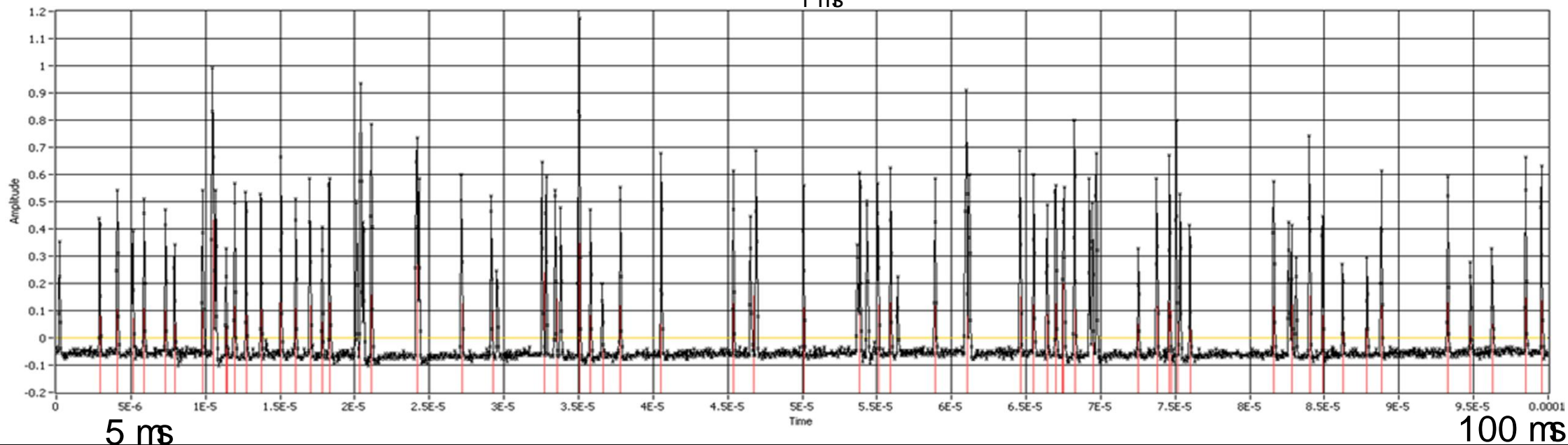
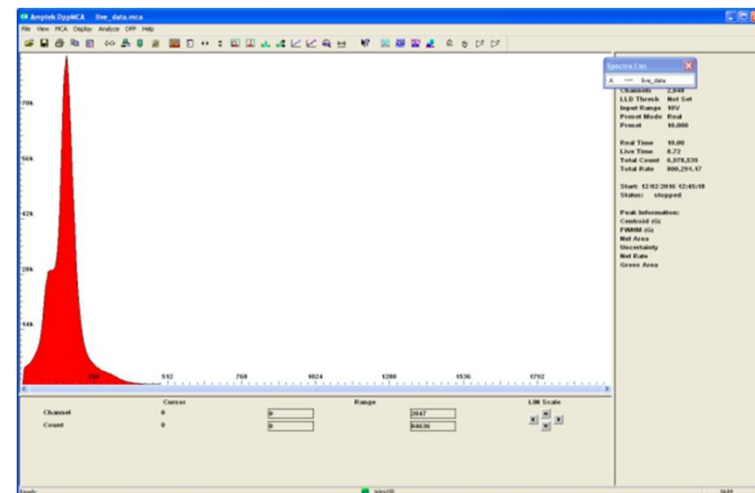
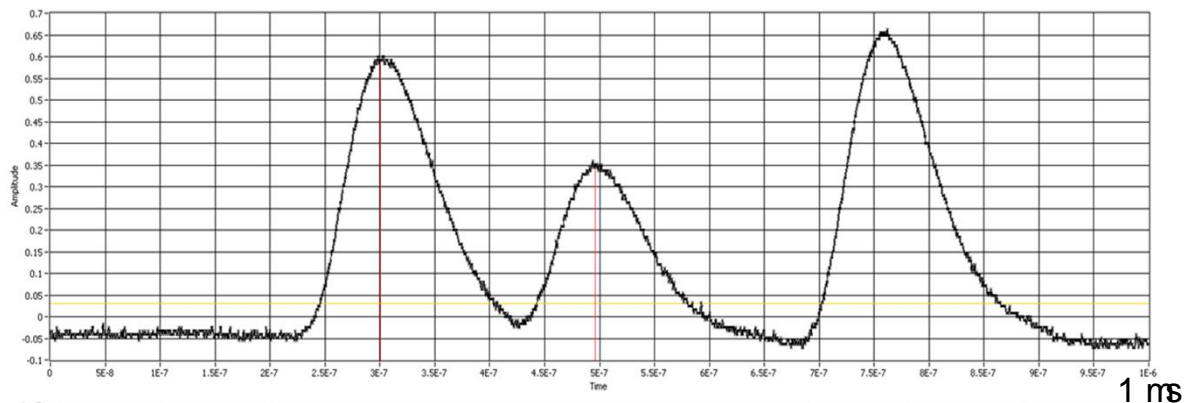
INTENSITY SCAN from 50 KHz - 3MHz

Fluence: $50 \cdot 10^3 \text{ g/mm}^2$



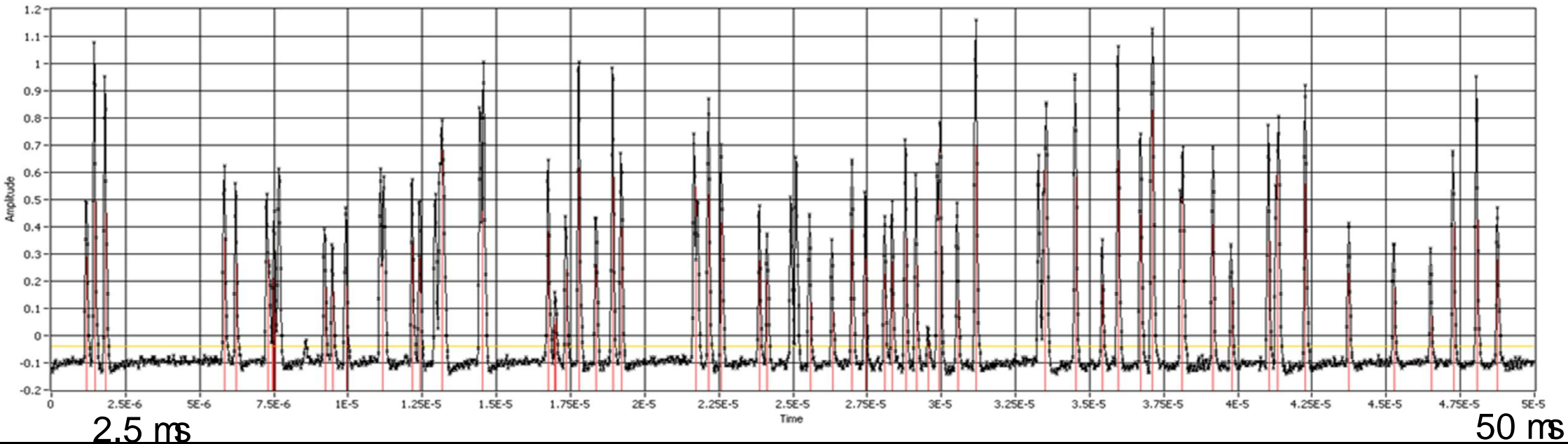
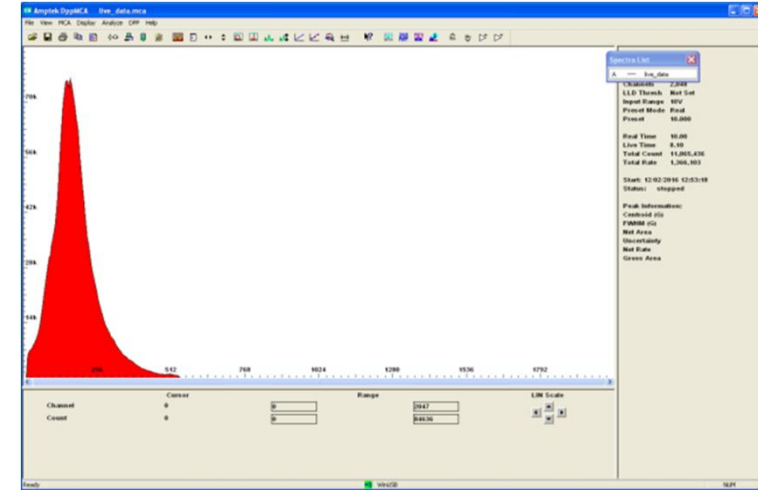
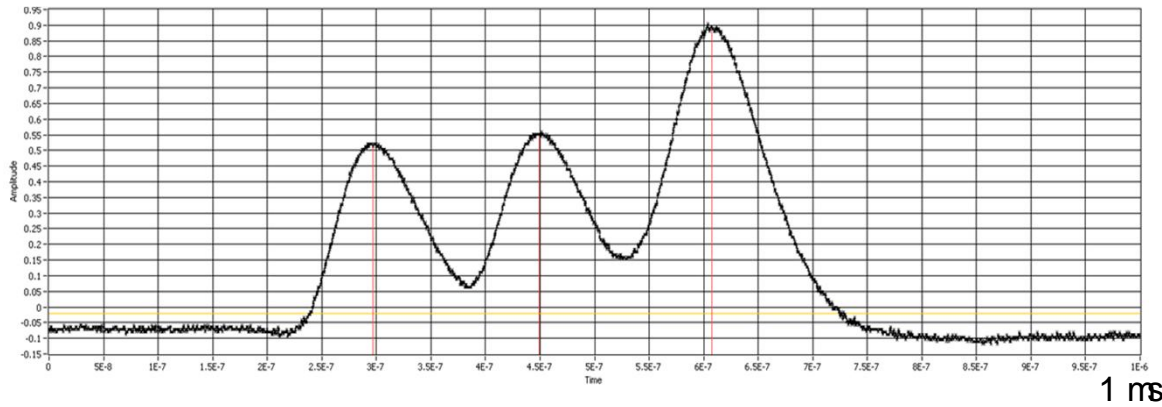
INTENSITY SCAN from 50 KHz - 3MHz

Fluence: $500 \cdot 10^3 \text{ g/mm}^2$



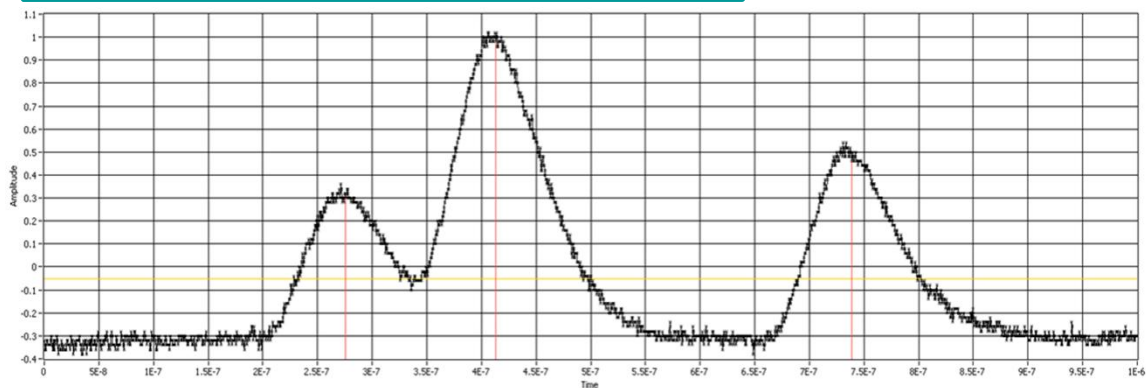
INTENSITY SCAN from 50 KHz - 3MHz

Fluence: $1 \cdot 10^6 \text{ g/mm}^2$

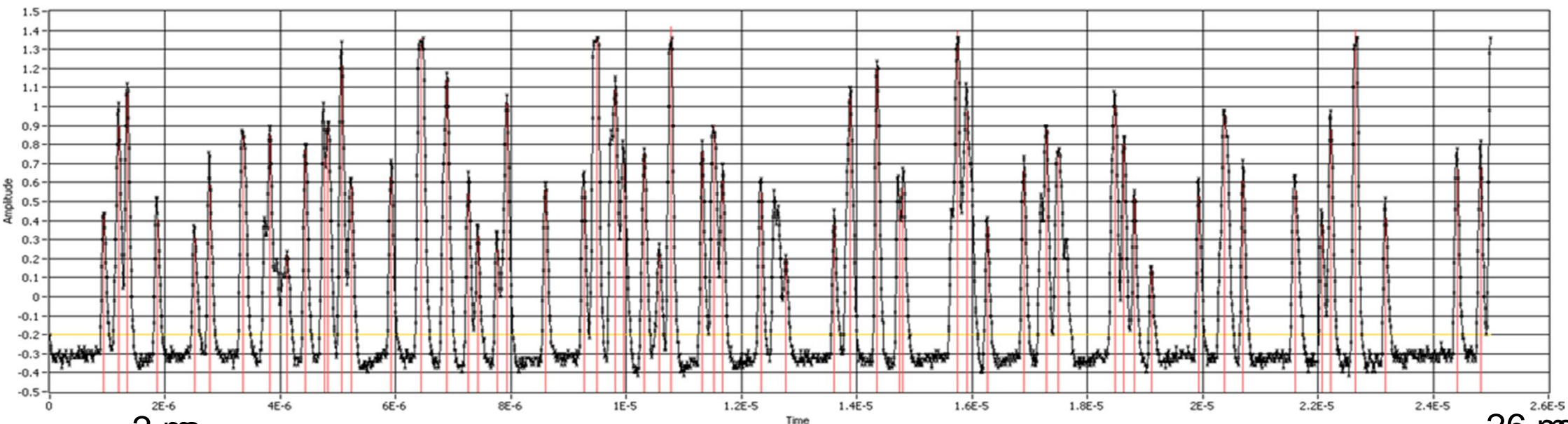
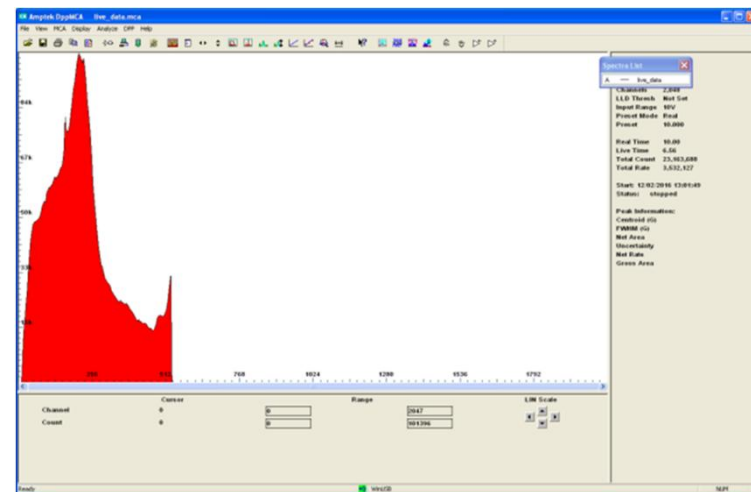


INTENSITY SCAN from 50 KHz - 3MHz

Fluence: $2 \cdot 10^6 \text{ g/mm}^2$



1 ms

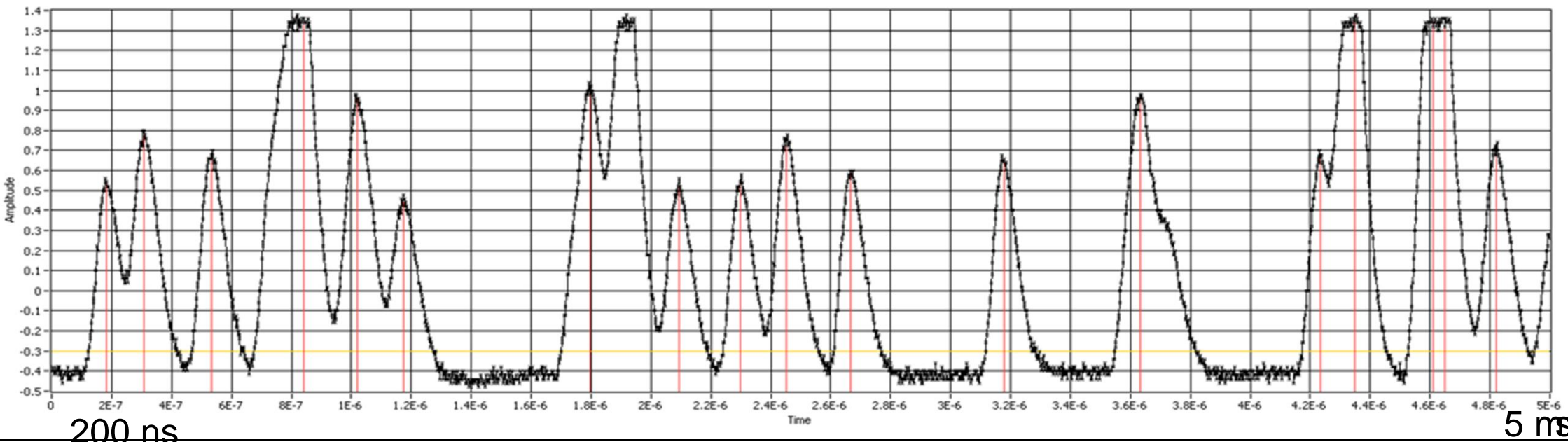
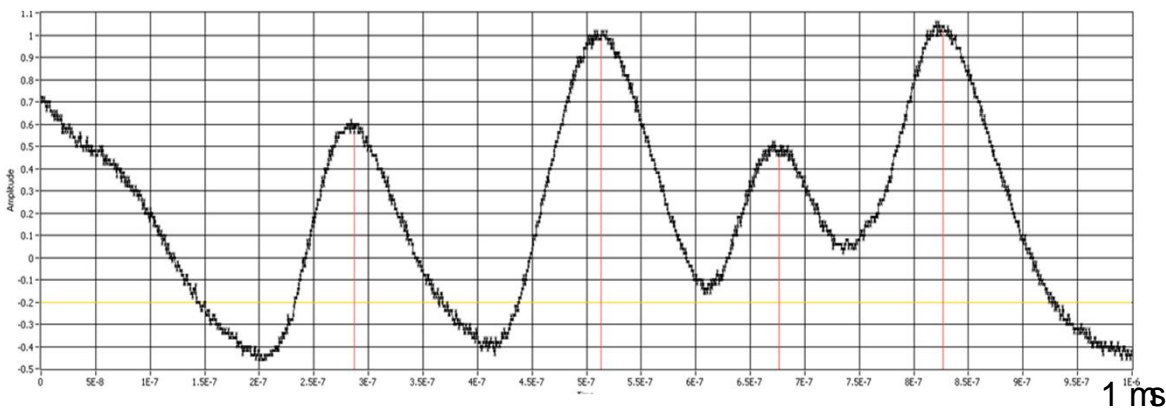
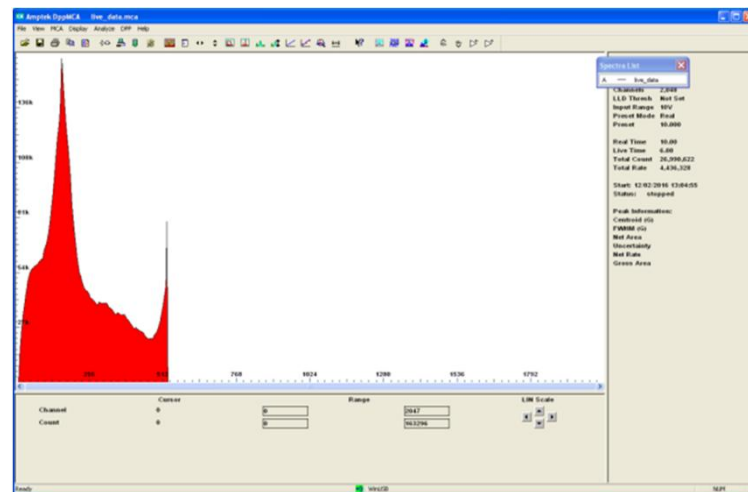


2 ms

26 ms

INTENSITY SCAN from 50 KHz - 3MHz

Fluence: $3 \cdot 10^6 \text{ g/mm}^2$



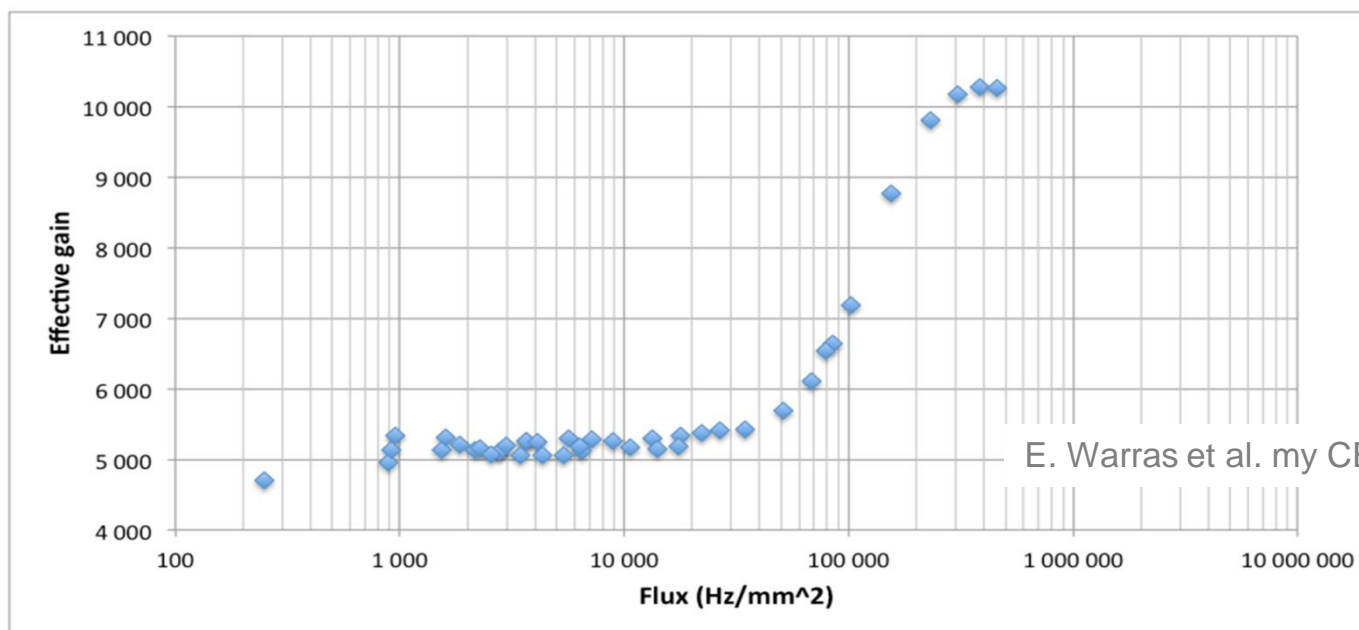
OUTLOOK

1. Detailed study of its Linearity at low/High rate
2. Saturation effects
3. Sparks resistance
4. Baseline shift possible mitigations

BACKUP SLIDES

Gain dependency on rate (1/2)

- Used a collimator to know the size of the area that was radiated
- Starting gain 5000, measured up to 500 kHz/mm²



E. Warras et al. my CERN summer student 2014

BACKUP SLIDES

Gain dependency on rate (2/2)

- Then starting gain 2000, measured up to 10 MHz/mm²

