Homogeneity studies of CVD diamonds using TCT

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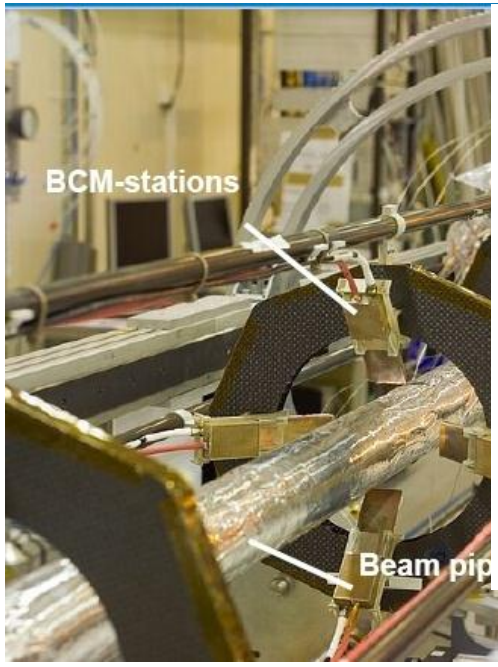
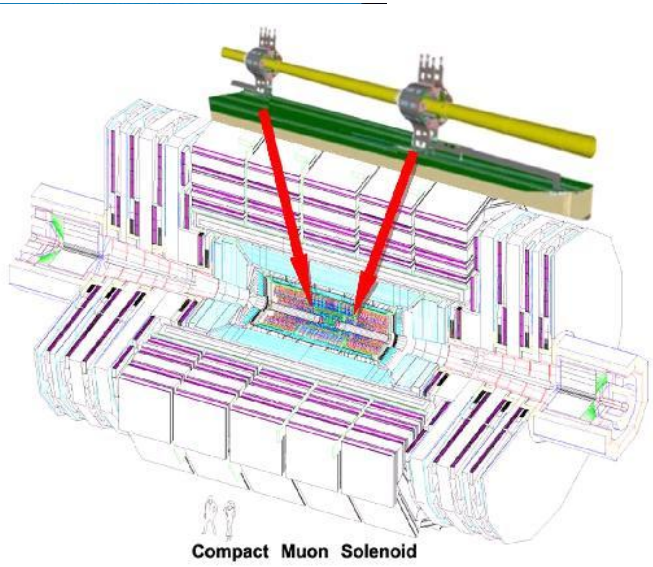
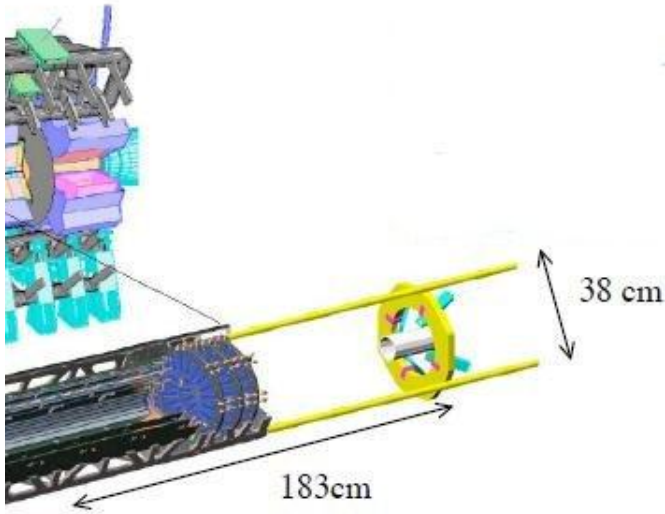
CVD Diamond

Chemical-vapor deposition diamond is one of the strongest candidates for material for radiation hard particle detectors.



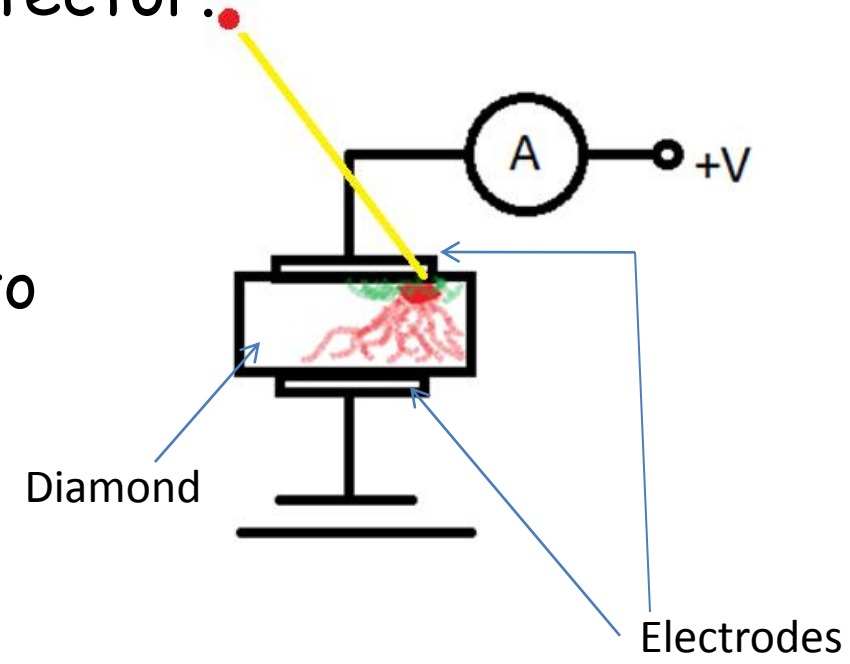




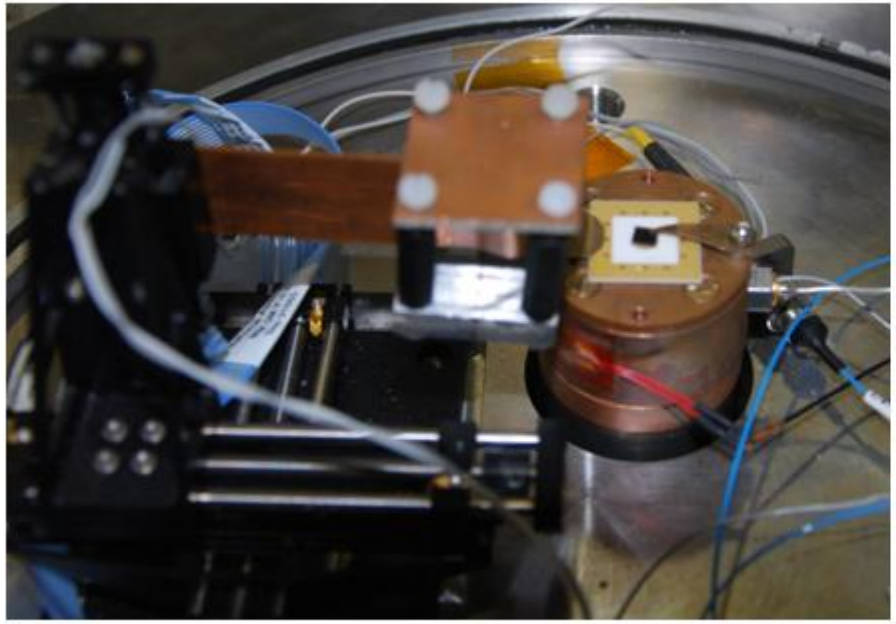
TCT

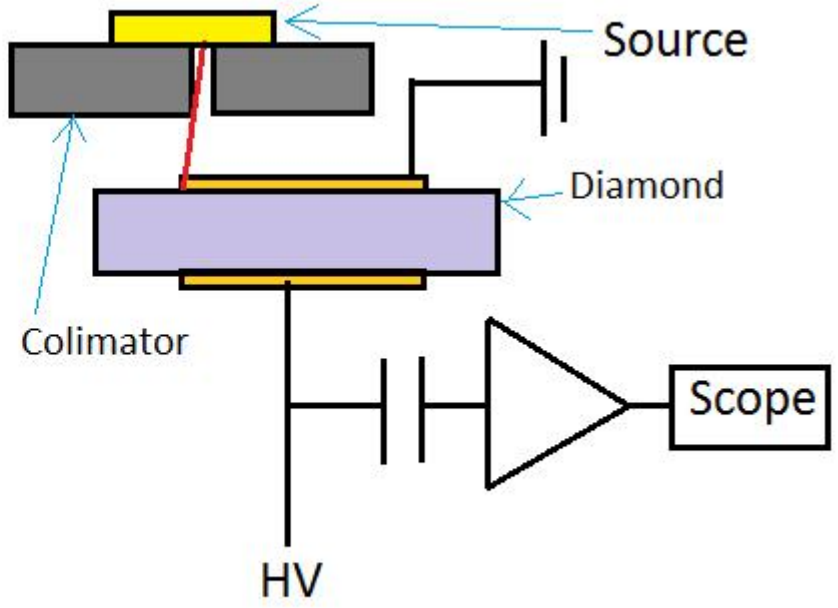
- Transient-current technique(TCT) is based on direct measurement of the current pulse shape on the eletrodes of the detector.

- Assumptions:
  - Charge injected close to electrode
  - Uniform field



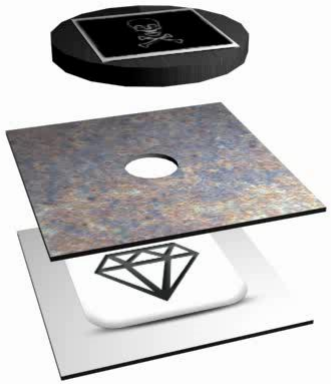
Setup

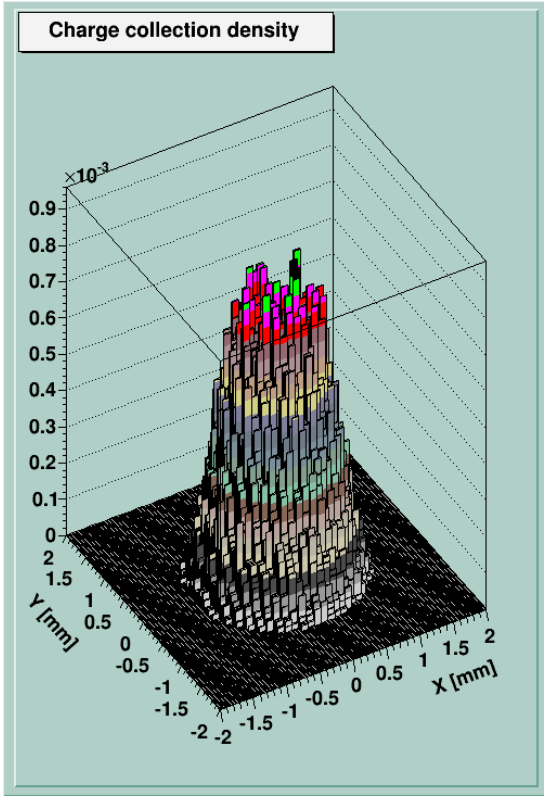


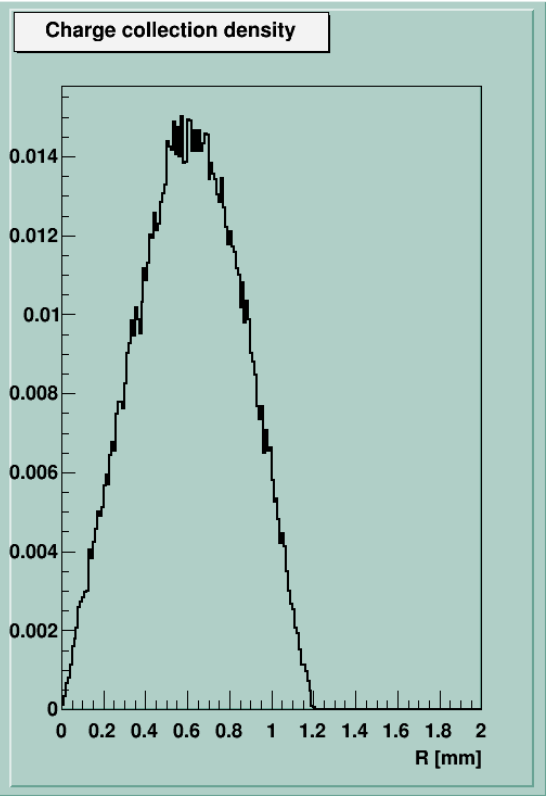


Monte Carlo Simulations

- Monte Carlo simulations were performed to study the spread of particles on the diamond.

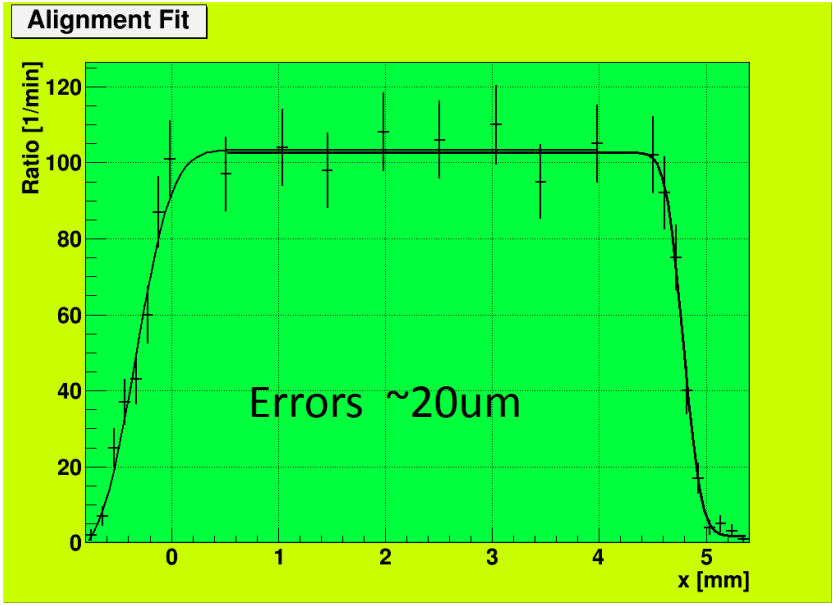






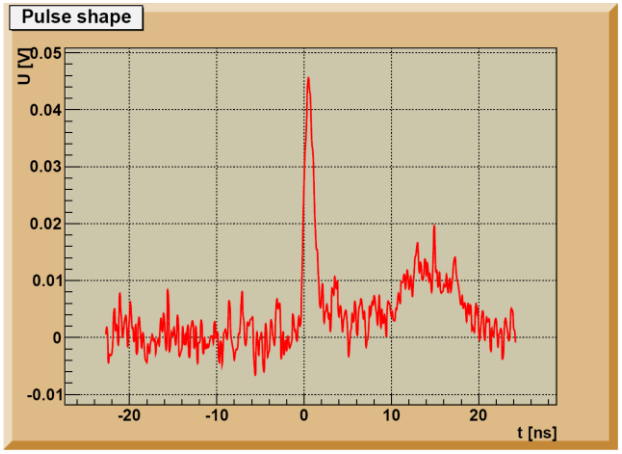
Alignment

- By scanning the surface of diamond and measuring the rate alignment was performed.

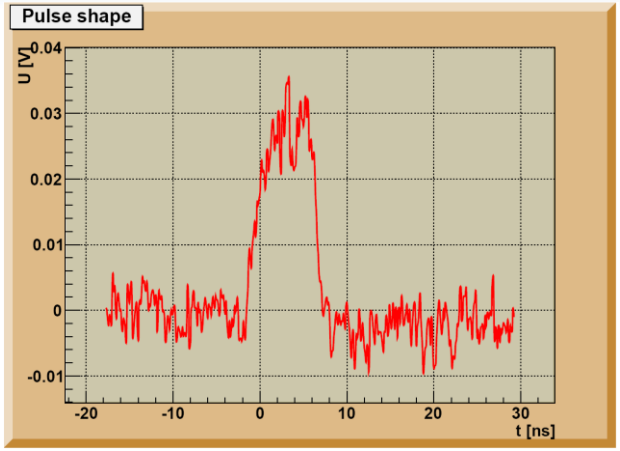


Results

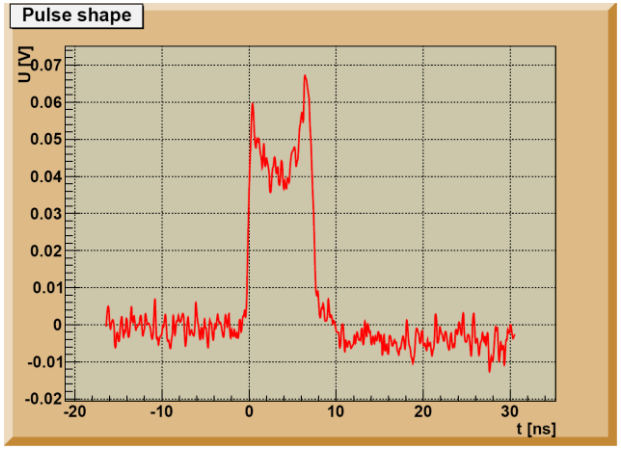
Peak Signal



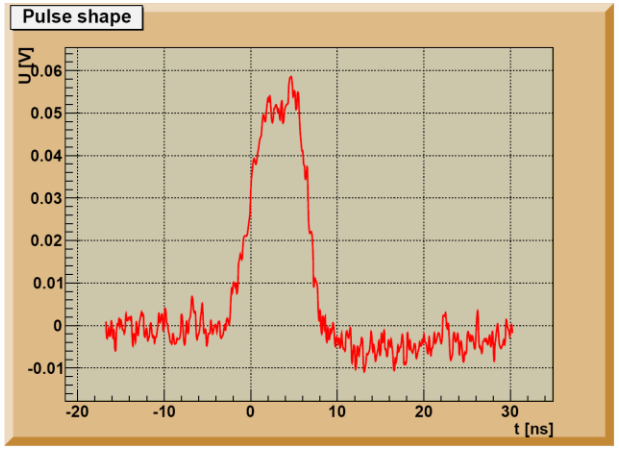
LowSignal



Moon Signal

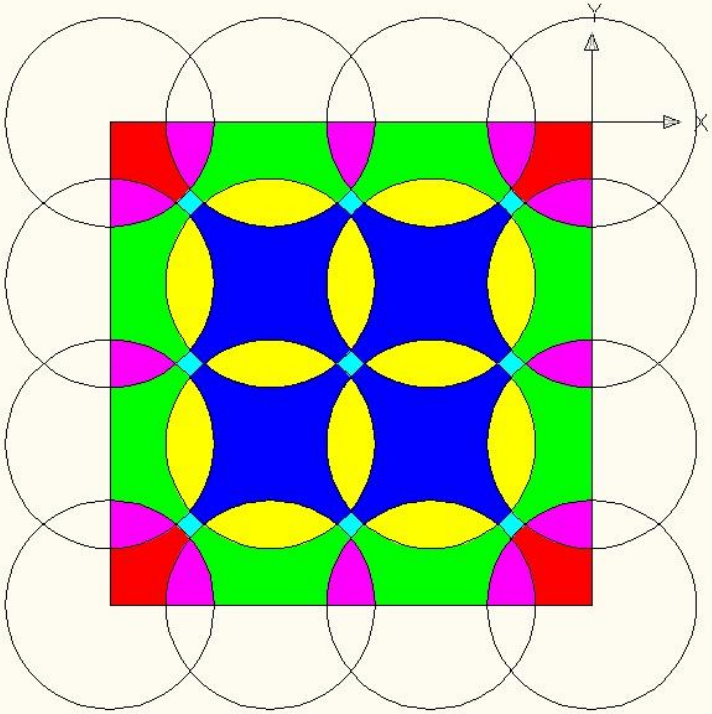


Normal Signal



Irradiated area

- From MC simulations was concluded that circle of radius 1,02mm will contain 95% of collected particles.



2.4991 mm^2
1.0615 mm^2
0.3062 mm^2
0.1531 mm^2
0.4542 mm^2
0.0179 mm^2

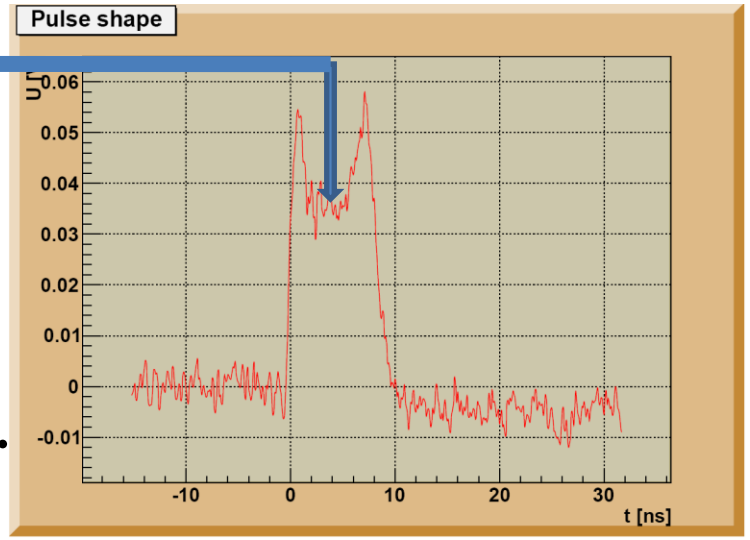
Overlap=24.95%

Selection

For selection following variables were used:

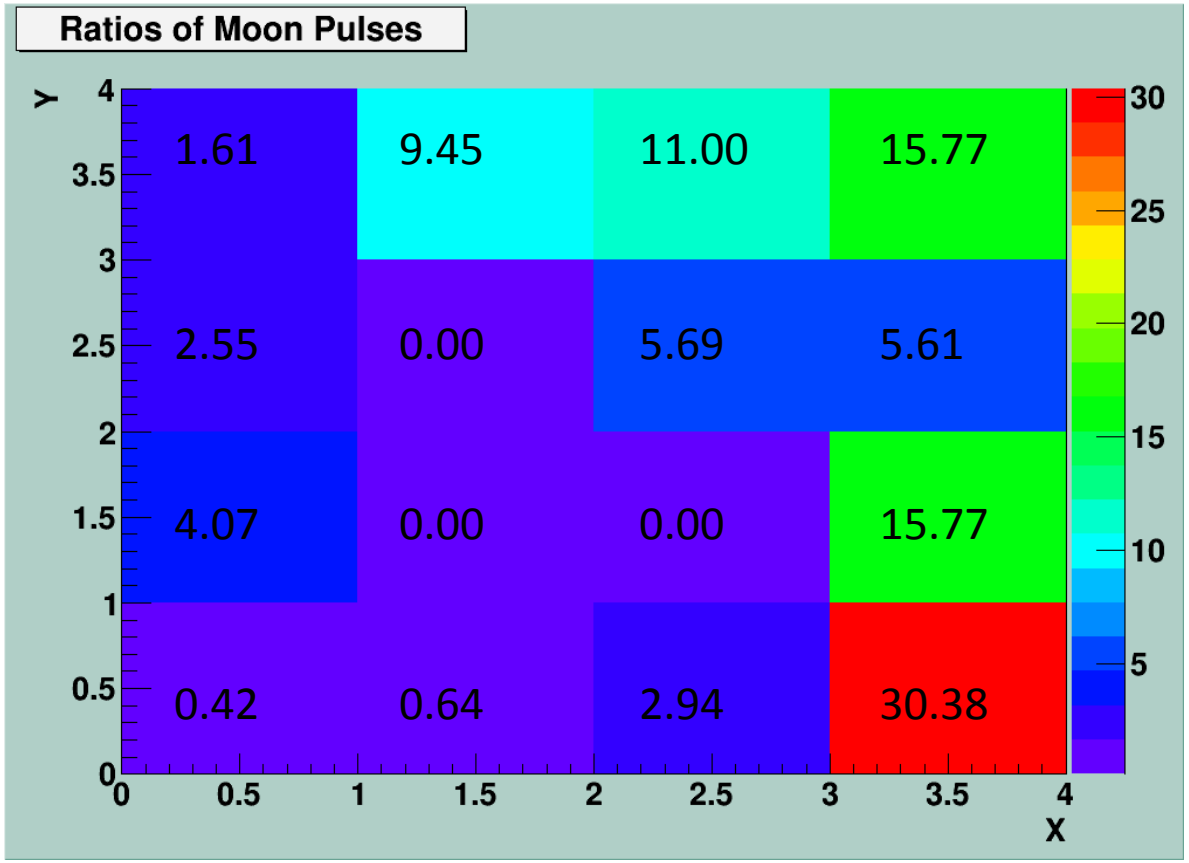
- signal amplitude,
- signal to noise ratio
- width of the signa;
- rms of baseline
- local minimum of the signal

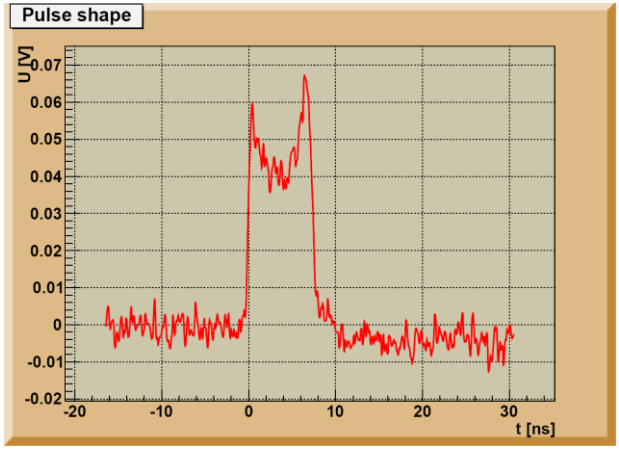
Special script calculates and applies cuts on collected data. Results are saved in ntuple file.



Results for Moon shape

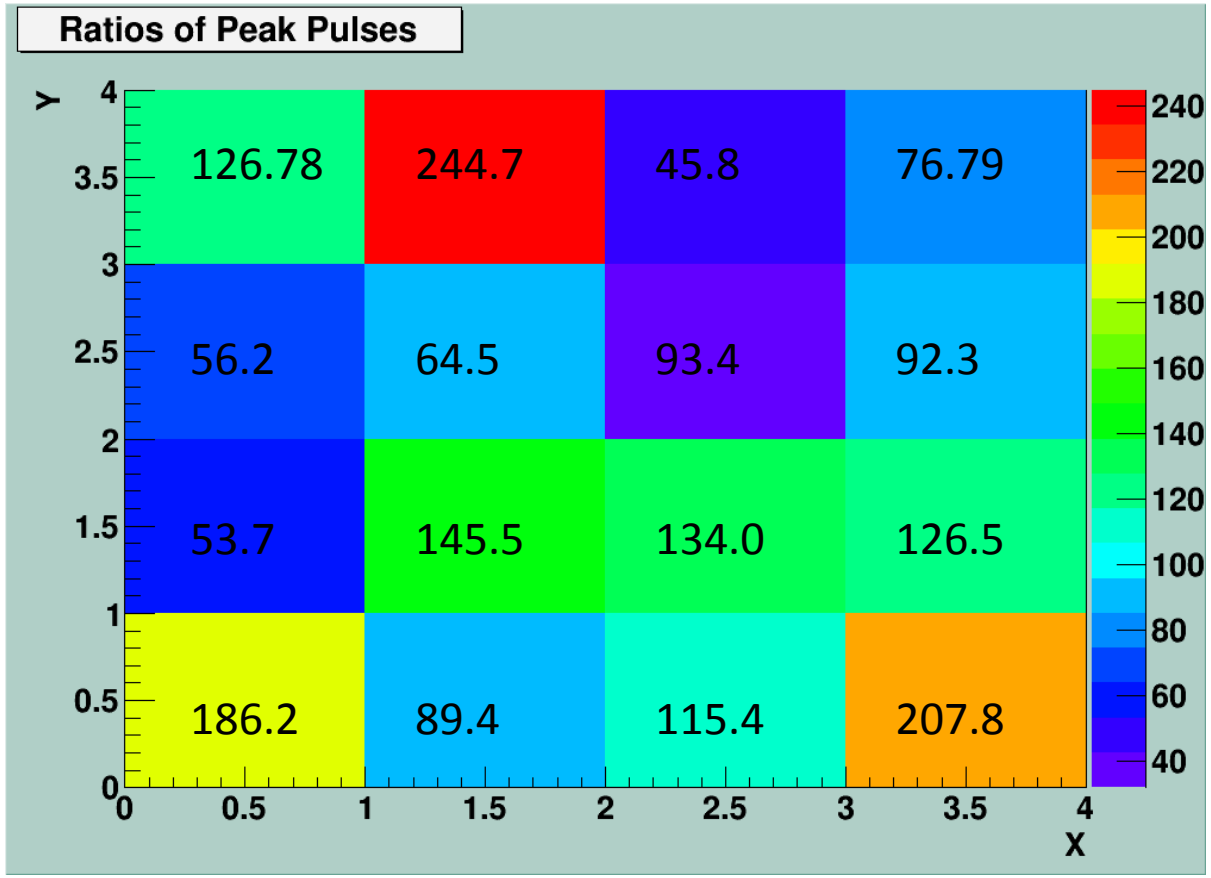
Normalized to 100 normal events

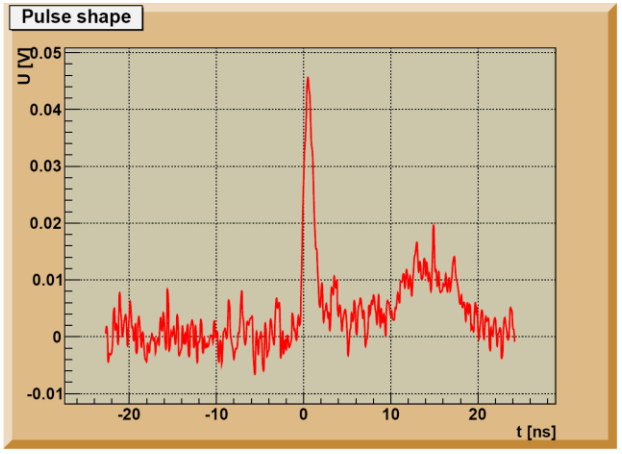




Results for peak shape

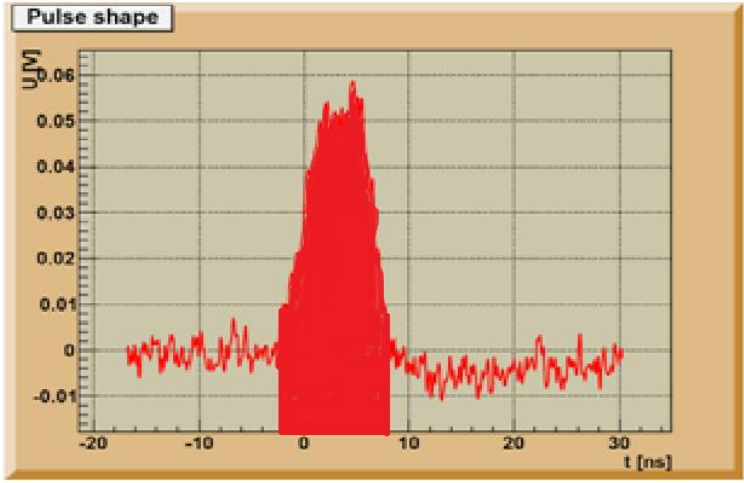
Normalized to 100 normal events





Charge deposition

42.8 fC	41.2 fC	43.8 fC	45.2 fC
43.7 fC	42.0 fC	43.9 fC	44.3 fC
43.7 fC	41.2 fC	42.3 fC	42.2 fC
38.5 fC	40.3 fC	42.7 fC	42.3 fC



Summary

- Analysed data aren't consistent
- Update of xy table
- Higher statistics
- Smaller collimator

"I had the dream about meaningful employment again last night."

Thank you for your attention

BACKUP SLIDES