



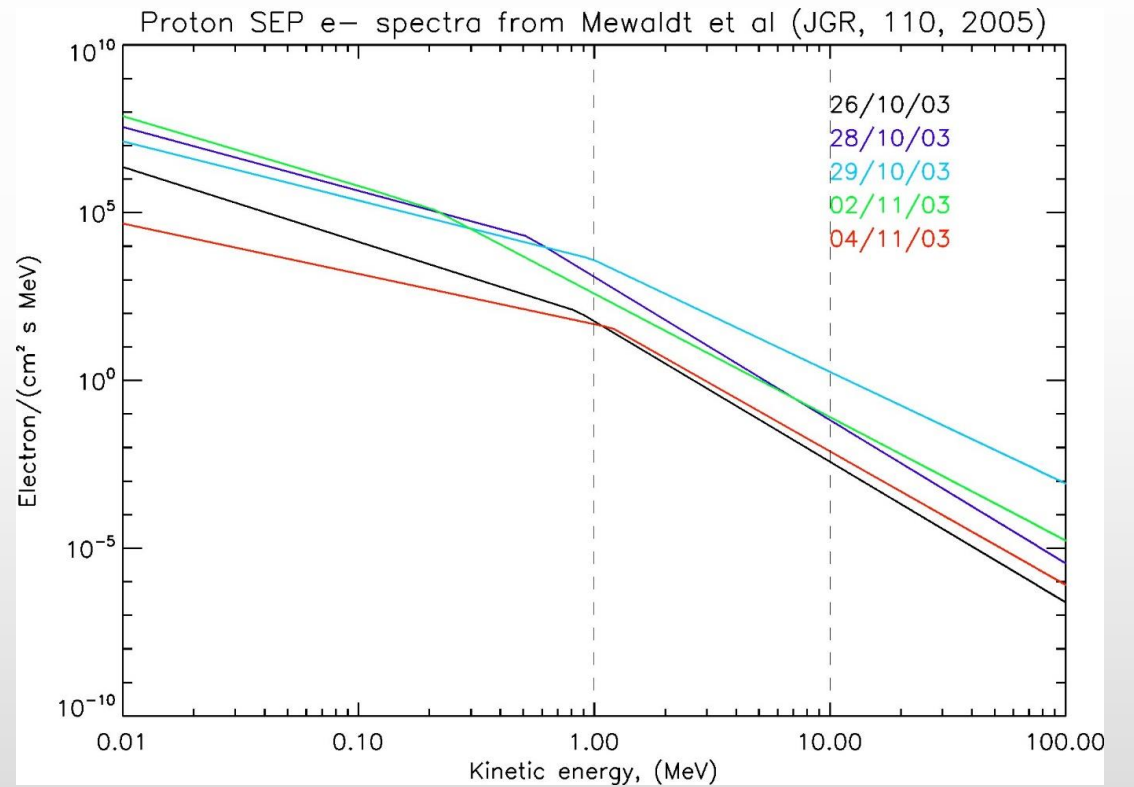
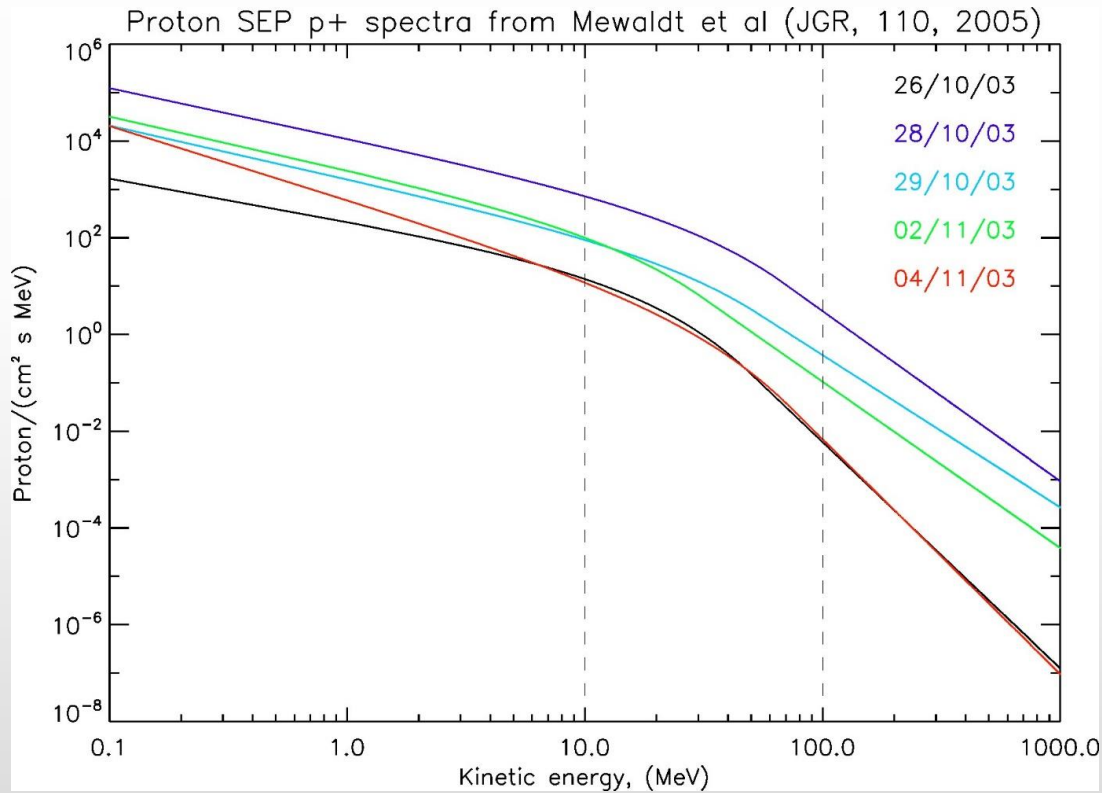
Turchin's regularization for satellite detector



Task

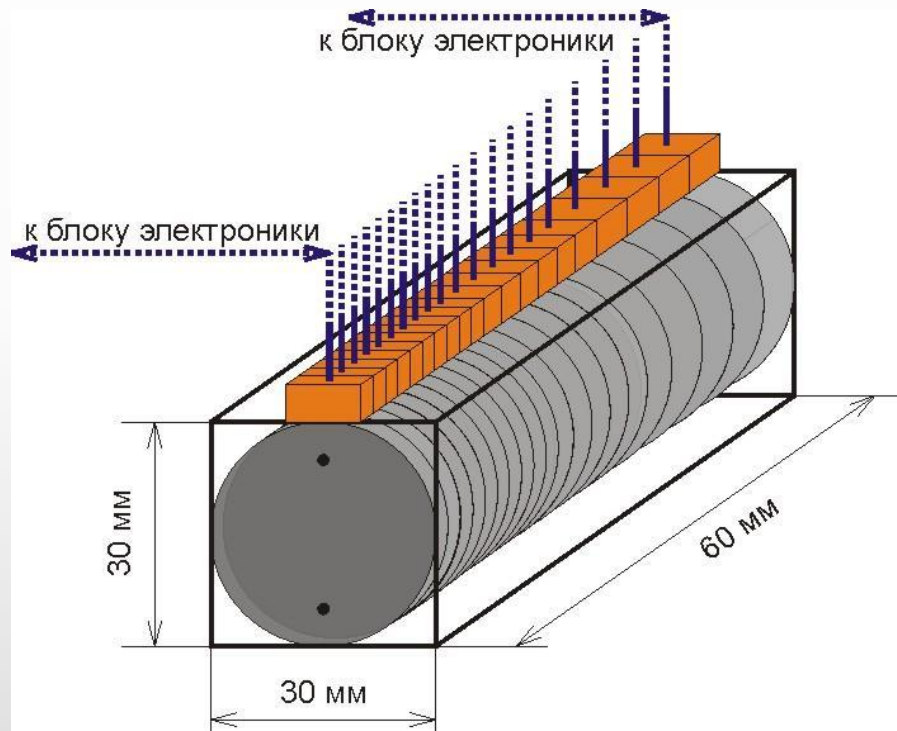
- Measure energy spectrum for solar protons (up to 100 MeV) and electrons (up to 10 MeV) with precision of few % on a satellite.
 - Limit the weight of the satellite and power consumption.
 - Limit bandwidth needed to transfer the data.
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NPM Spectra





The device



20-30 scintillator disks with SiPM detectors.

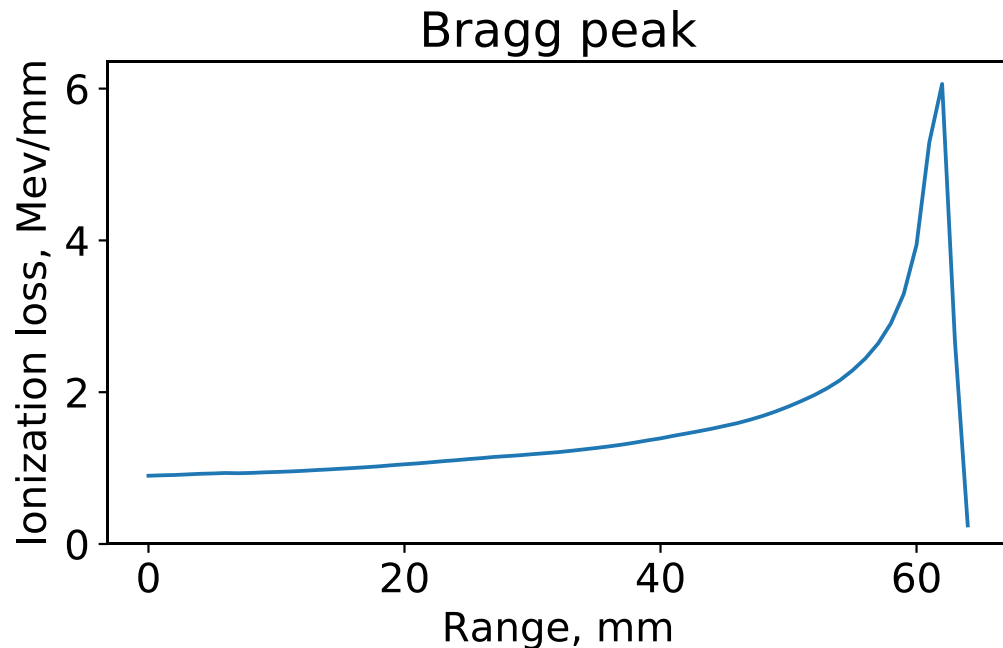
Width is varied from 5 mm for “rear” part to 1 mm for “front” part.

Two regimes for measurement:

- In differential regime all events are evaluated independently
- In integral regime, light yield from different events is summed up



Energy loss vs depth

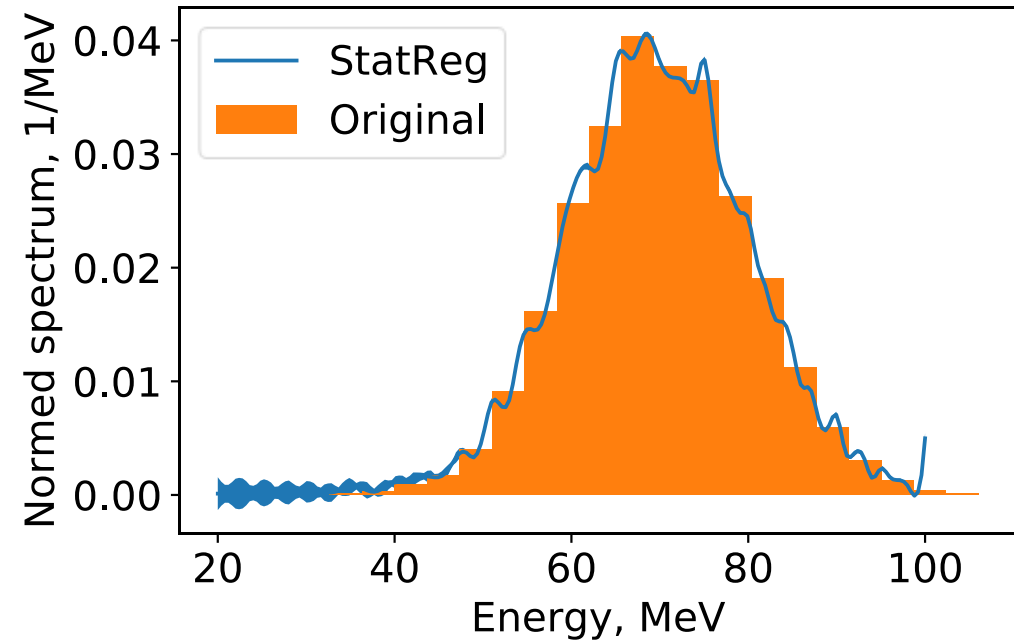
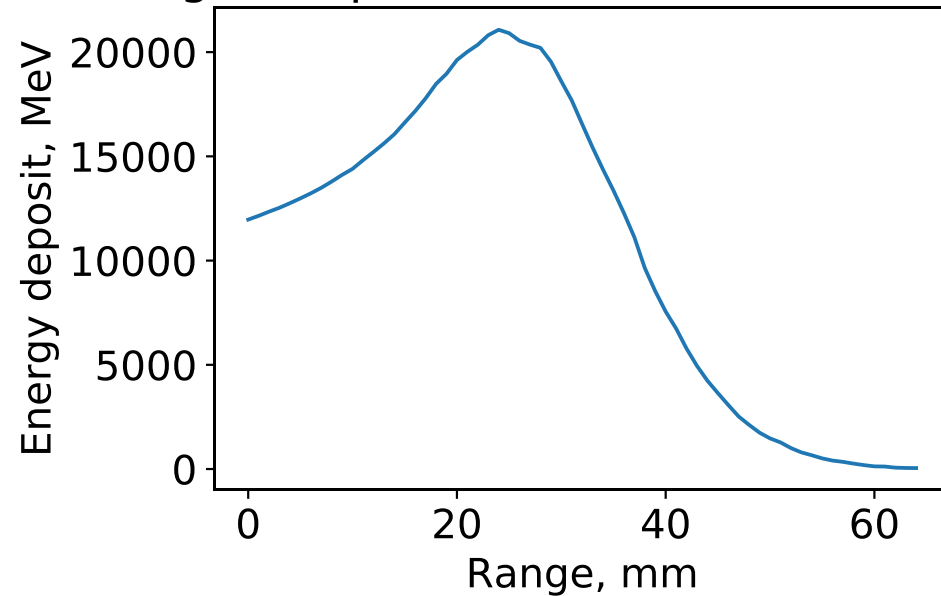


- The Bragg peak allows to establish the energy of incoming proton with sensitivity up to 5%.
- The feature of electron spectrum is wider, but still could be used for energy estimation.



Regularization to the rescue

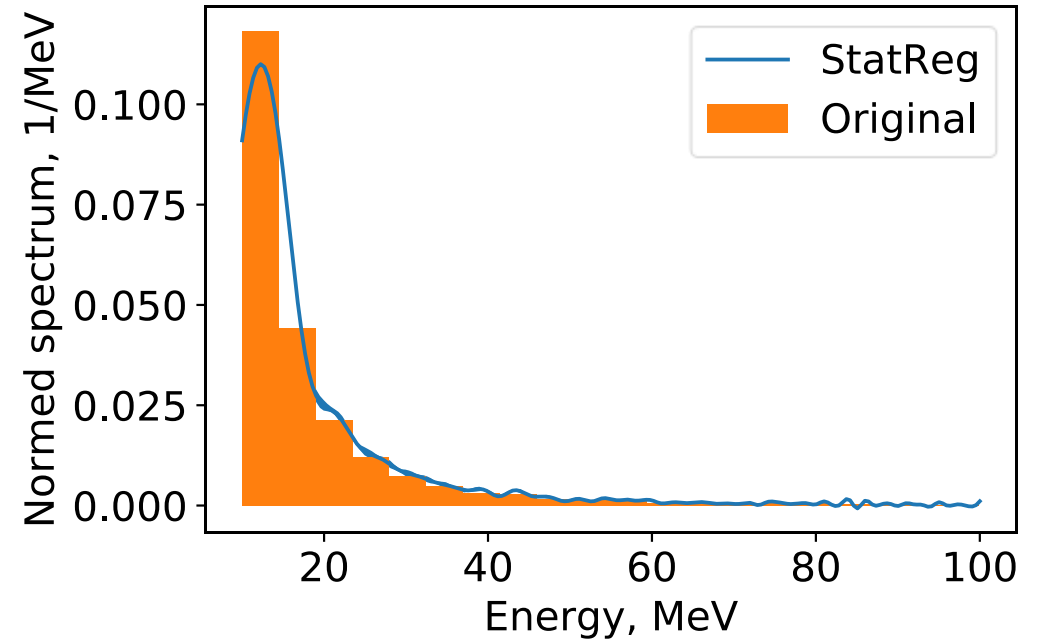
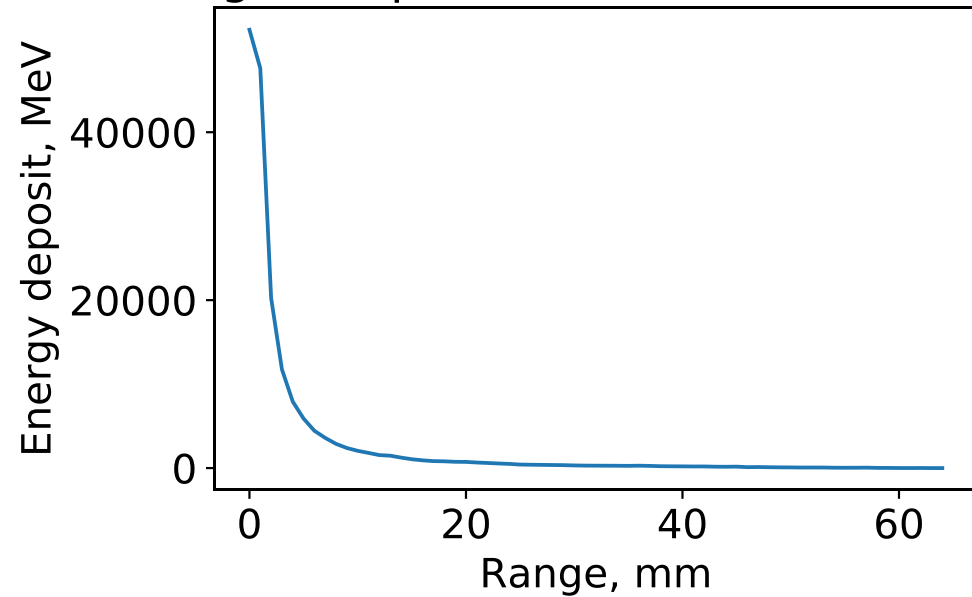
Integral deposit in detector: Gauss beam





Power spectrum

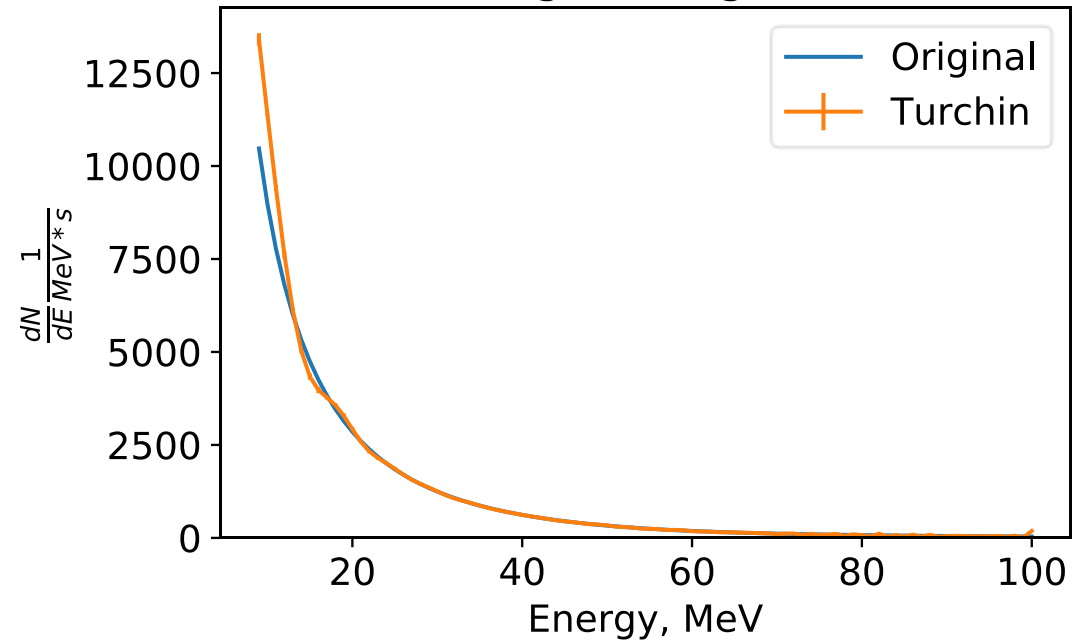
Integral deposit in detector: Power low





Realistic spectrum

Processing in integral mode





Conclusion

- Turchin's regularization allows to statistically evaluate the spectrum of protons and electrons with precision up to 2-5%.
 - The precision is like the one of differential approach.
 - Performance of the regularization must be optimized, but in any case, it allows to limit the bandwidth.

 - Scintillator detectors with integral regime could be used in accelerator experiments (beam dump, etc.).
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