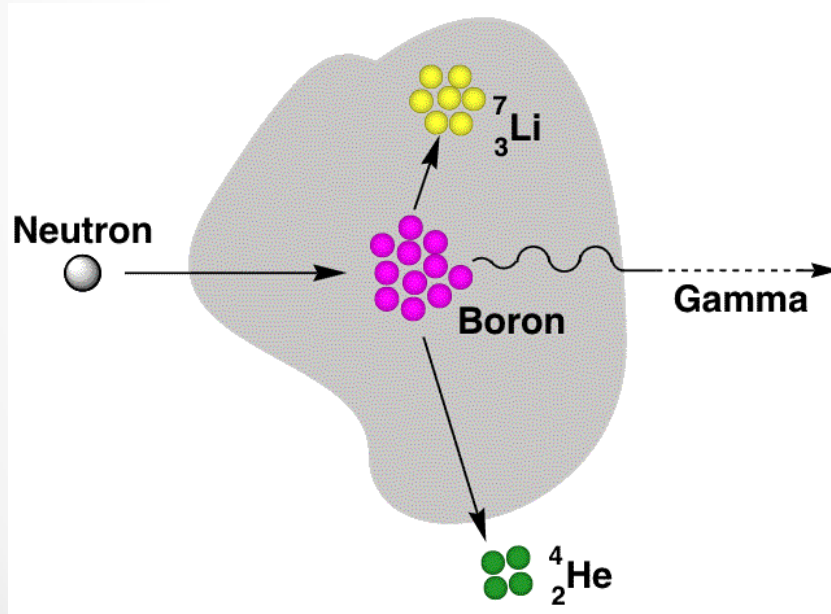




Aza Eleni – ESR1



2nd ARDENT Workshop
October 2013, Milano

About me

1. Studied in the National Technical University of Athens (NTUA), Greece

2. PhD student in the Aristotle University of Thessaloniki (AUTH)

3. Recruited in August 2012, CERN

4. Development of a neutron spectrometer



Training Courses

Attended

1. Radiological Protection Training (CERN)
 2. Particle Therapy using Proton and Ion Beams (CERN)
 3. Designing Effective Websites (CERN)
 4. GEM detector assembling (Frascati, Italy)
 5. 13th FLUKA course (Paris)
 6. French course level 1 (CERN)
- } Academic

Planned

1. Experimental Techniques in Nuclear & Particle Physics (IEEE 2013)
2. Writing of professional documents (CERN) – **Just started!**
3. International School of Trigger & Data Acquisition ISOTDAQ2014

Conferences

Attended

1. EURADOS AM2013 (Barcelona)
2. NEUDOS12 (Aix-en-Provence, France)

Planned

1. IEEE 2013 (Seoul)

Secondment

Attended

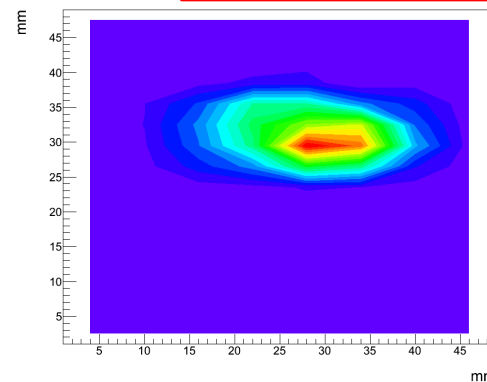
1. Politecnico di Milano for 2 weeks, FLUKA simulations

Experimental Activities

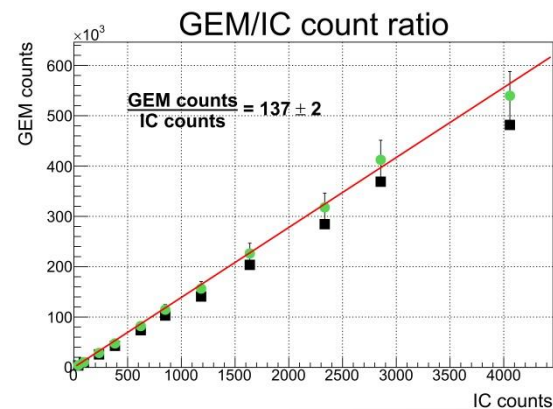
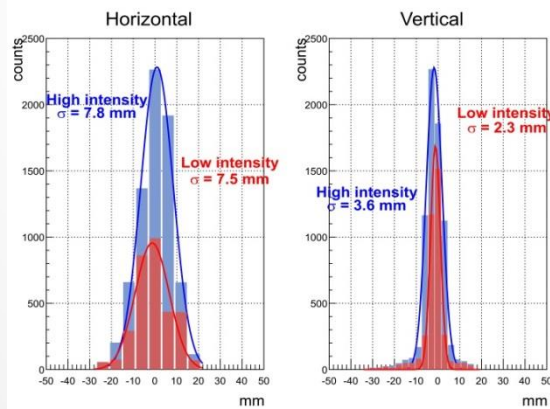
1. Measurements at the CERF facility with GEM, CERN

1.1 Triple GEM with Al cathode as a beam monitor

Poster will be presented in IEEE
Paper ready to be submitted to a journal

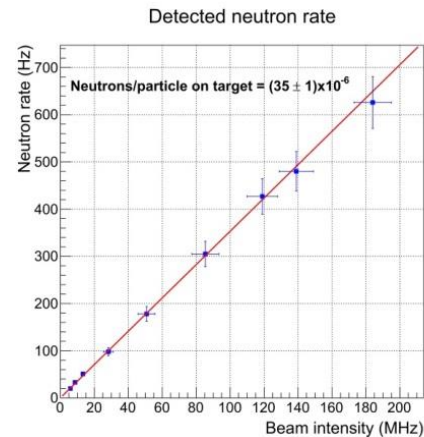
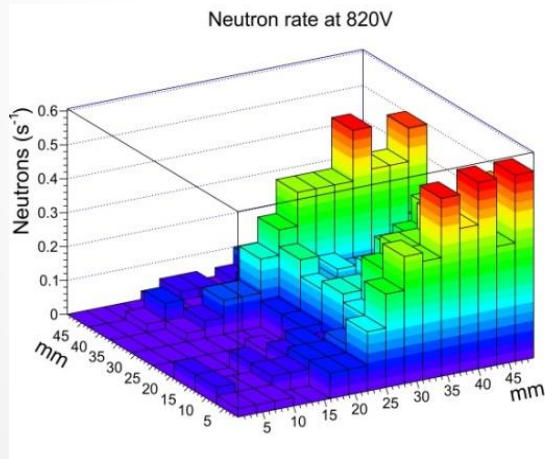
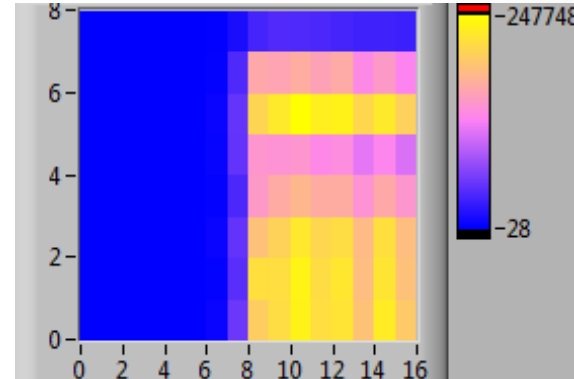
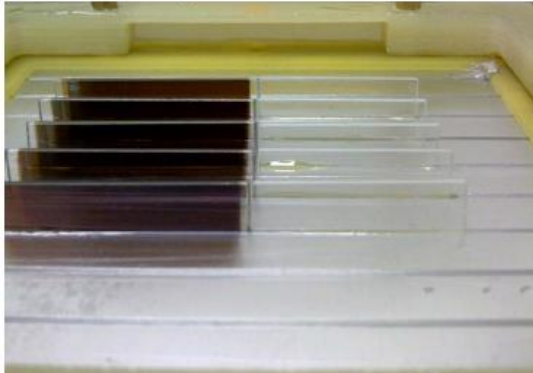


$0.6 \pm 0.1\%$
efficiency



Experimental Activities

1.2 Triple GEM with Boron converter for slow neutrons in position 2



Analysis complete
Paper under discussion

Experimental Activities

2. Measurements with detectors in pulsed fields

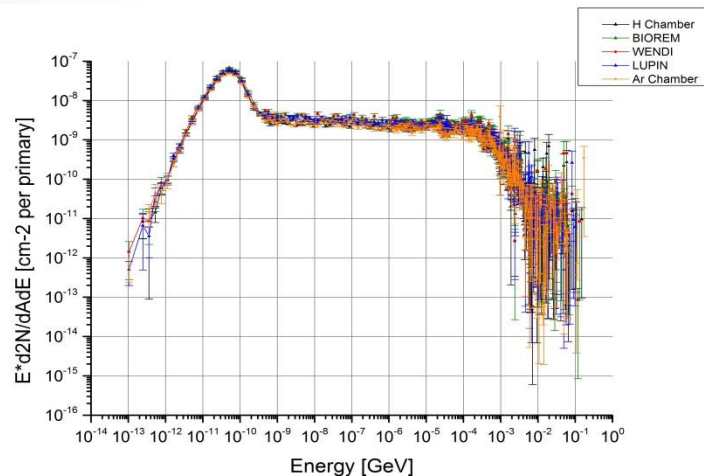
2.1 HiRadMat facility, end of TA7 tunnel (CERN)

Intercomparison of detectors

- i. ionization chambers & rem counters routinely employed in the CERN radiation monitoring system
- ii. LUPIN prototype



Neutron spectrum simulated with FLUKA

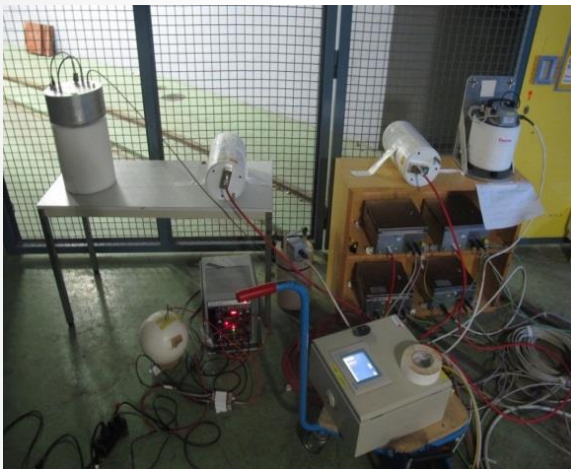


Paper under review from
Radiation Measurements journal

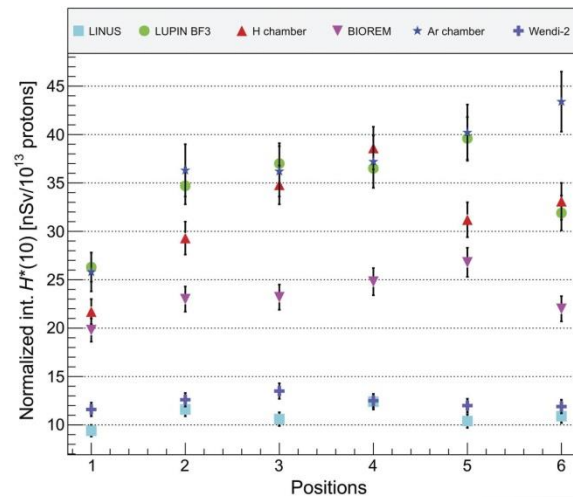
Experimental Activities

2. Measurements with detectors in pulsed fields

2.2 At the beginning of PS tunnel (CERN)



Intercomparison campaign in 2011 & 2012,
at the beginning of the access tunnel



Presented in NEUDOS12

Published from Radiation Protection

Dosimetry journal

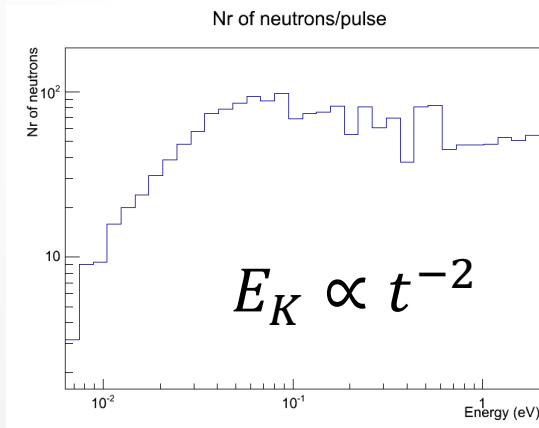
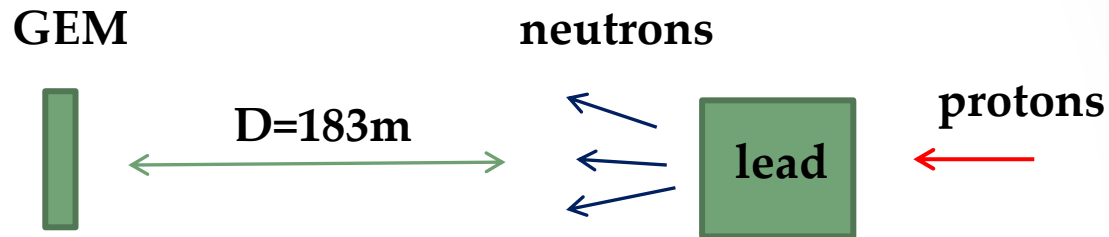
“Comparison of the performance of different instruments in the stray neutron field around the CERN Proton Synchrotron”, Radiation Protection Dosimetry (2013), pp. 1–6

Experimental Activities

3. Analysis of data acquired at the n_TOF facility with GEM (CERN)

Triple GEM detector with Boron converter for slow neutrons

Calculation of neutron energy spectrum from time-of-flight

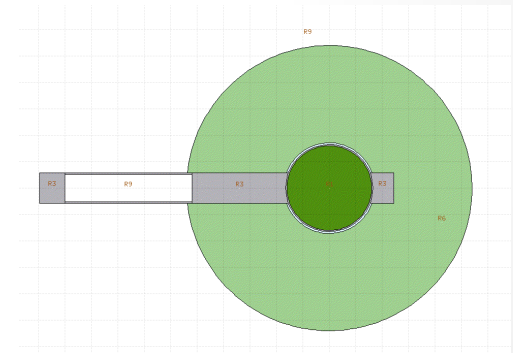
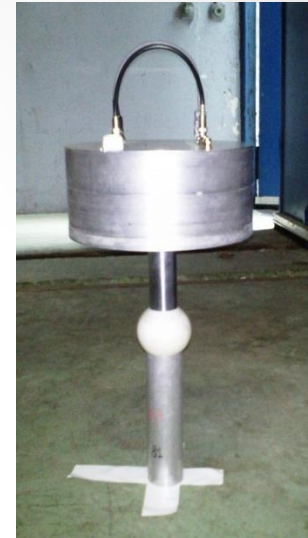
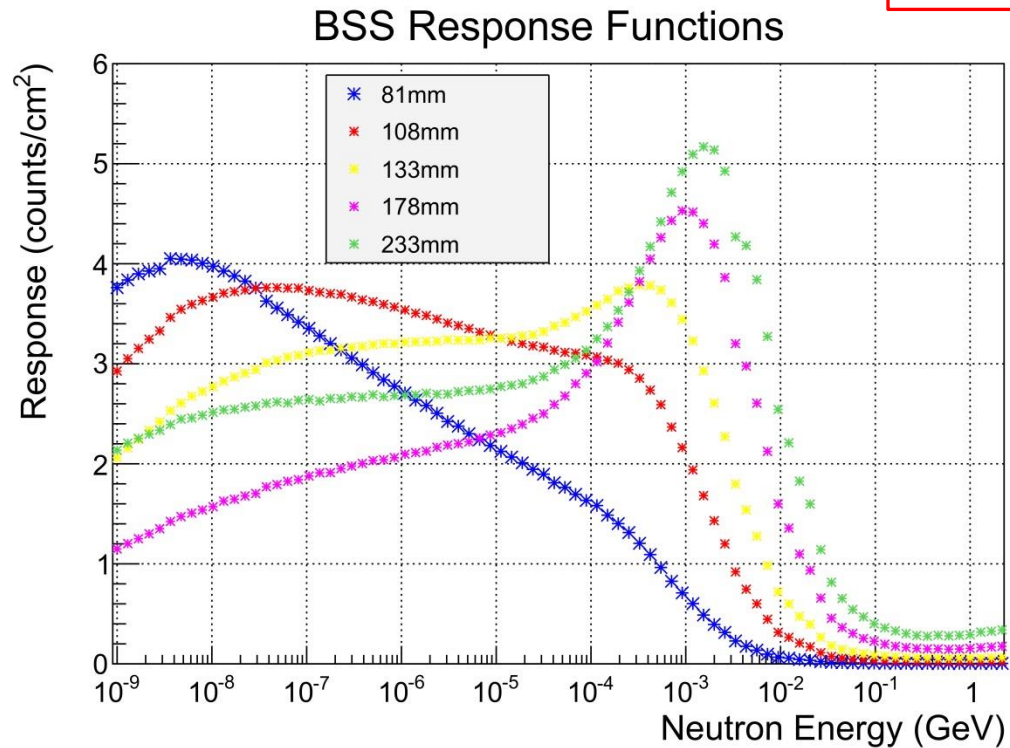


Oral presentation will be given in IEEE by S. Puddu
Paper under discussion

4. Measurements with BSS at the beginning of PS tunnel

Response functions calculated with FLUKA

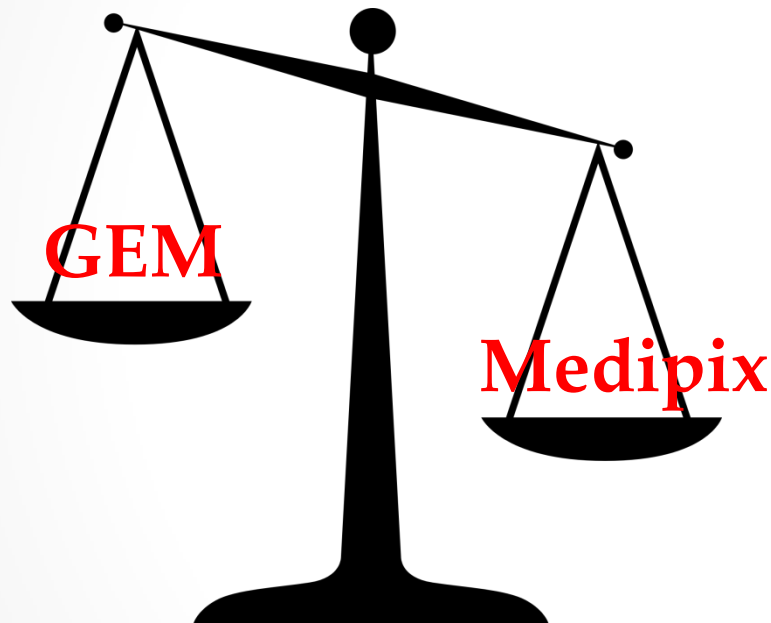
Current work



Neutron Spectrometer

Neutron moderator + converter + detector

Future work



Moderators:

- Polyethylene
- Polystyrene
- PMMA

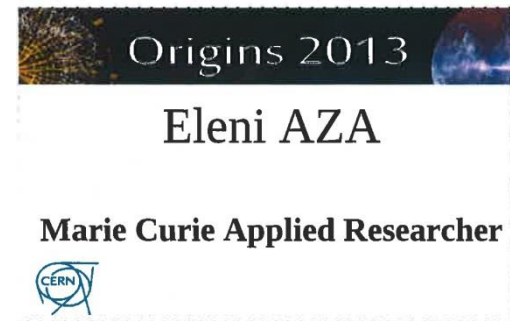
Converters:

- B-10
- Gd

Study in progress

Outreach Activities

1. Meeting with EU Commissioner (CERN)
2. Origins 2013 - Speed-dating (mostly scientific!) (CERN)
3. Open days 2013 (CERN)



Thank you!

Additional slides

BSS Response Function

$$R = \frac{\Delta x \cdot \sigma \cdot N_{\text{density}}}{F_u} = \frac{\Delta x \cdot \sigma \cdot \rho_{\text{He}} \cdot \frac{N_A}{A} \text{ cm} \cdot \text{cm}^2 \cdot \frac{\text{g}}{\text{cm}^3} \cdot \frac{\text{mol}^{-1}}{\text{g/mol}}}{F_u \text{ cm}^2} = \text{cm}^{-2}$$

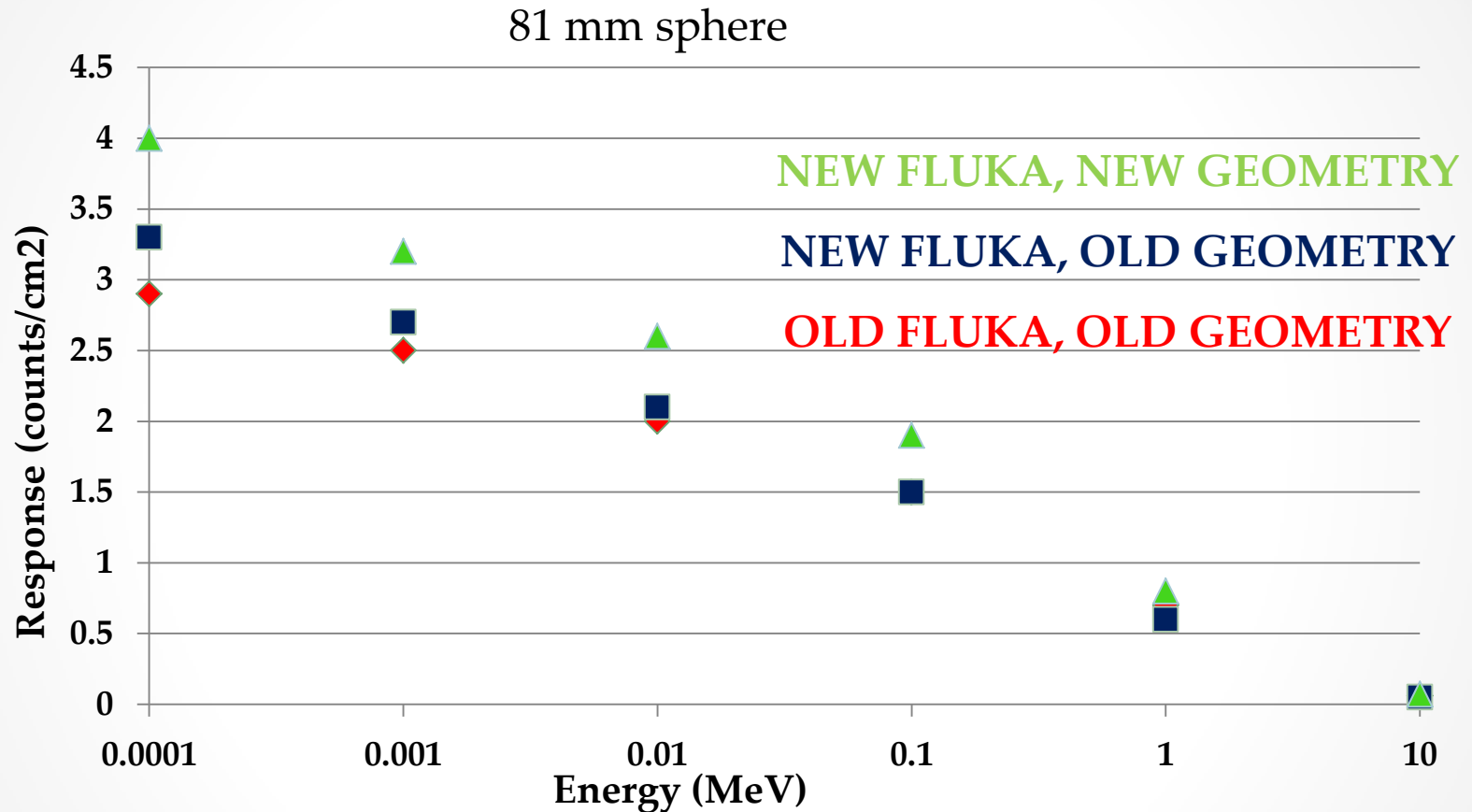
- Δx : track length of neutrons inside He-Kr tube – **calculated with FLUKA**
- σ : cross-section for respective neutron energy inside He-Kr tube
- F_u : primary neutron fluence on the sphere

The product $\Delta x \cdot \sigma$ has been calculated for every energy bin of the low-energy neutron library for neutrons inside the He-Kr tube

$$\sigma(v) = \frac{\sigma_0 \cdot v_0}{v} = \sigma_0 \cdot v_0 \cdot \sqrt{\frac{m}{2E}} = \sigma_0 \cdot \sqrt{\frac{2E_{\text{th}}}{m}} \cdot \sqrt{\frac{m}{2E}} = \sigma_0 \cdot \sqrt{\frac{0.025\text{eV}}{E(\text{eV})}}$$

where E (eV) is the mean energy of each energy bin, formula valid up to 10 MeV

Comparison with older simulation



Neutron Energy Spectrum n_TOF

Total number of neutrons detected (194 bunches)

