

ALPHA SELF-ABSORPTION EVALUATION IN A RADIOMETRIC FILTER MATERIAL FOR THE NATURAL RANGE OF ALPHA ENERGY (5-9 MEV)

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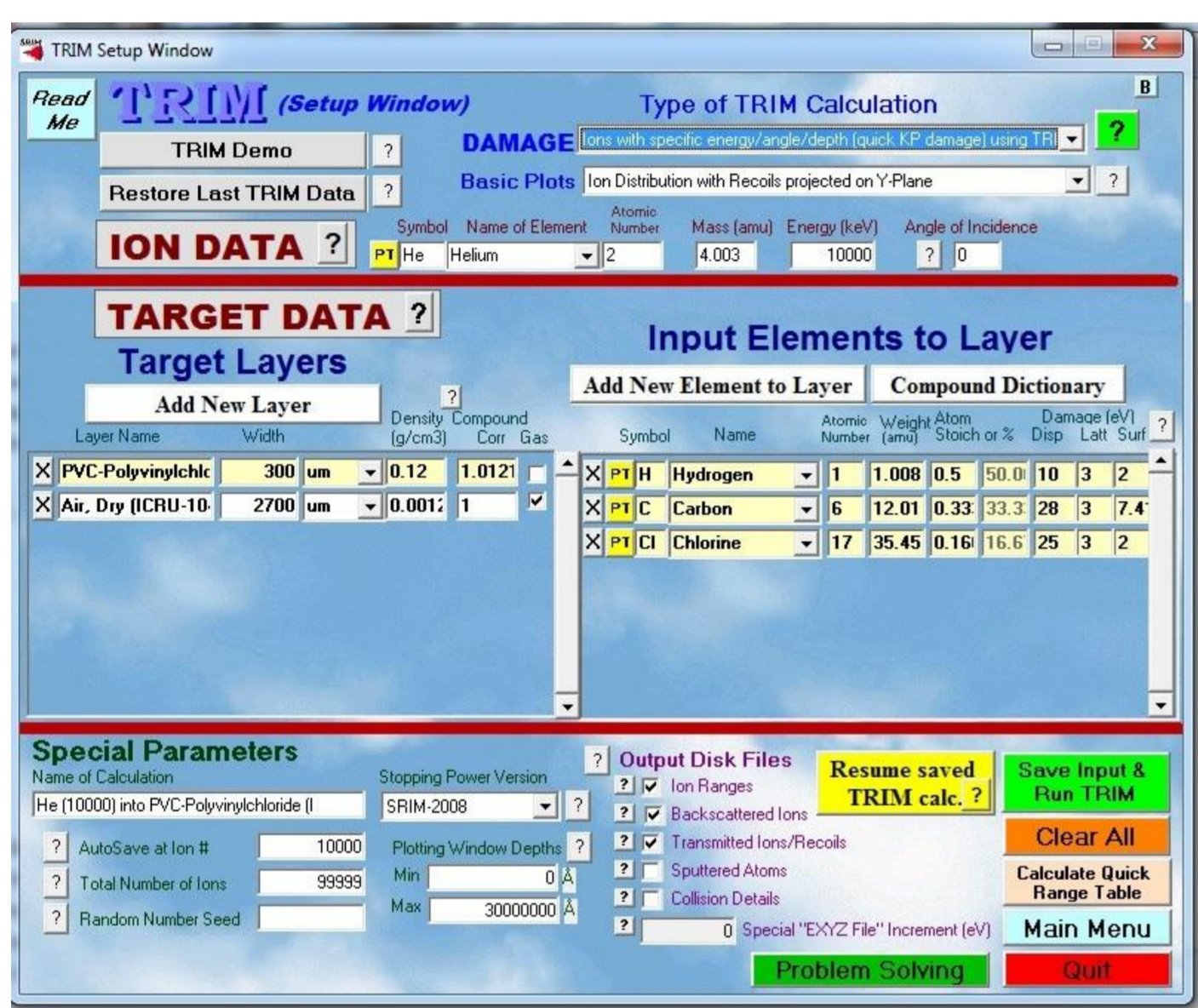
Goal

The purpose of this work is using SRIM software package to simulate the penetration of alpha particles into the material of radiometric filters to estimate the effect of alpha particle self-absorption in alpha radiometric measurements, especially in the range of natural alpha energy (Radon and Thoron, 5-9 MeV).

METHOD

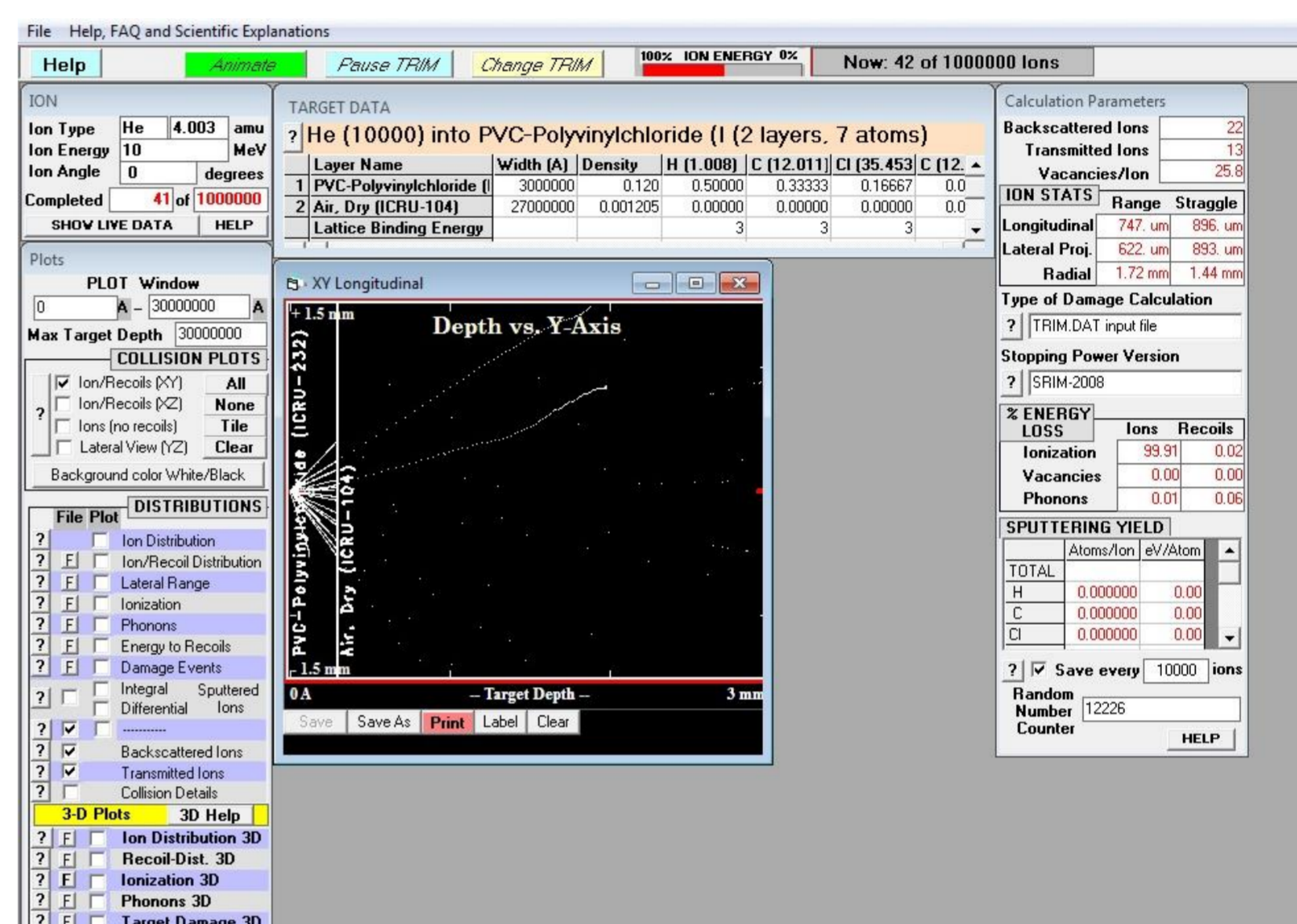
SRIM software package, The Stopping and Range of Ions in Matter (SRIM) is a software package that allows to calculate the parameters of the ions interaction with target material using a Monte Carlo method based on a quantum mechanical treatment of ion-atom collisions.

PROCESSING



AFA-RSP-20 filter

Alpha-radiometry



RESULTS

Ion Distribution

Ion Range = 276. um Skewness = 3.758
Straggle = 470. um Kurtosis = 17.062

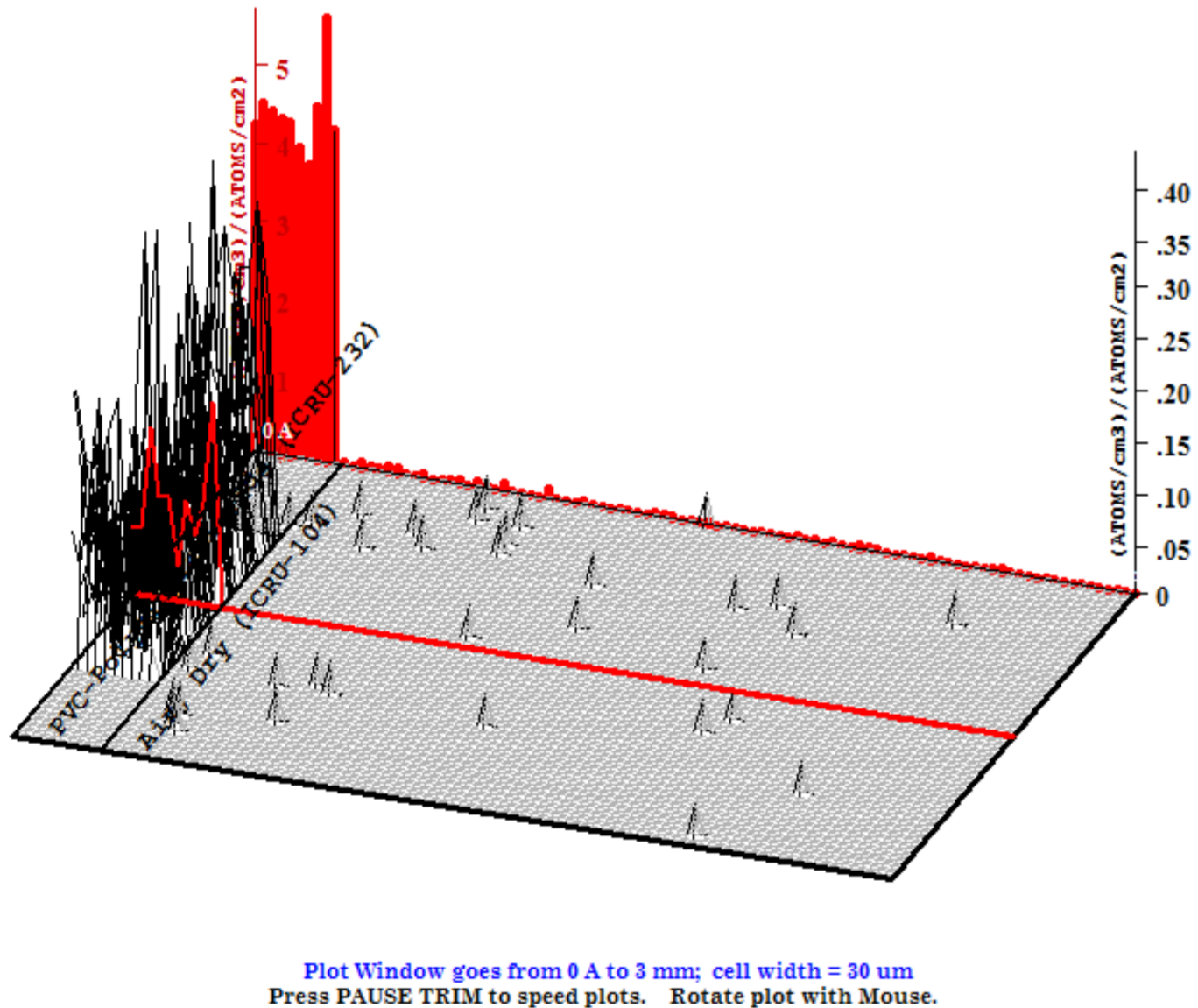
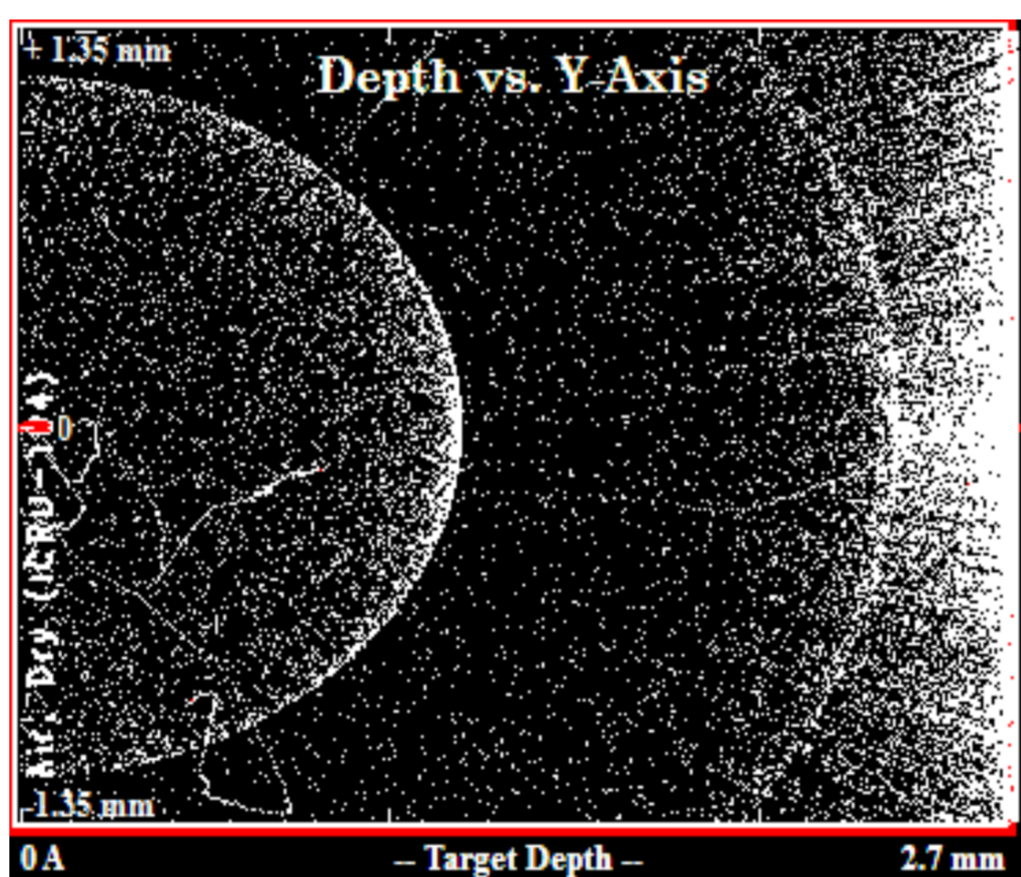
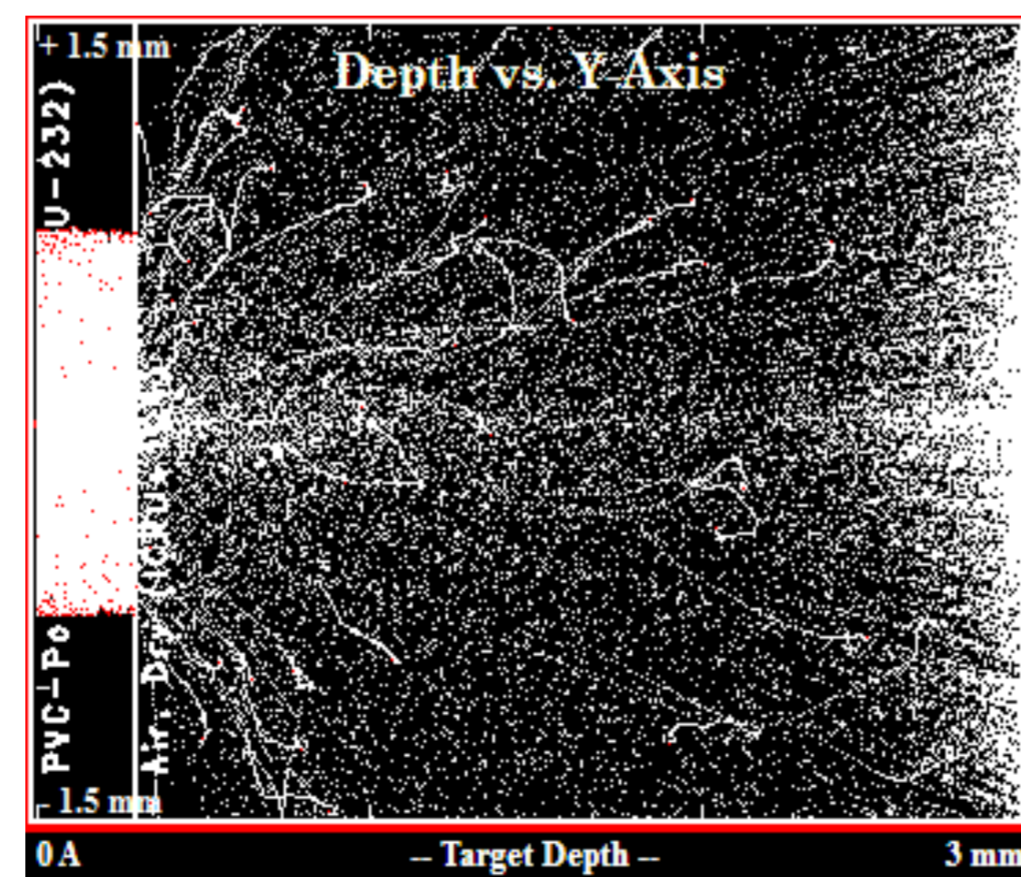


Figure. Ion distribution of the Alpha particle in the material of radiometric filter AFA-RSP-20 (PVC) and in the dry air space tell alpha radiometry detector at energy 7.78 MeV.



Alpha particles in dry air



Alpha particles in dry air and material at energy 7.78 MeV filter

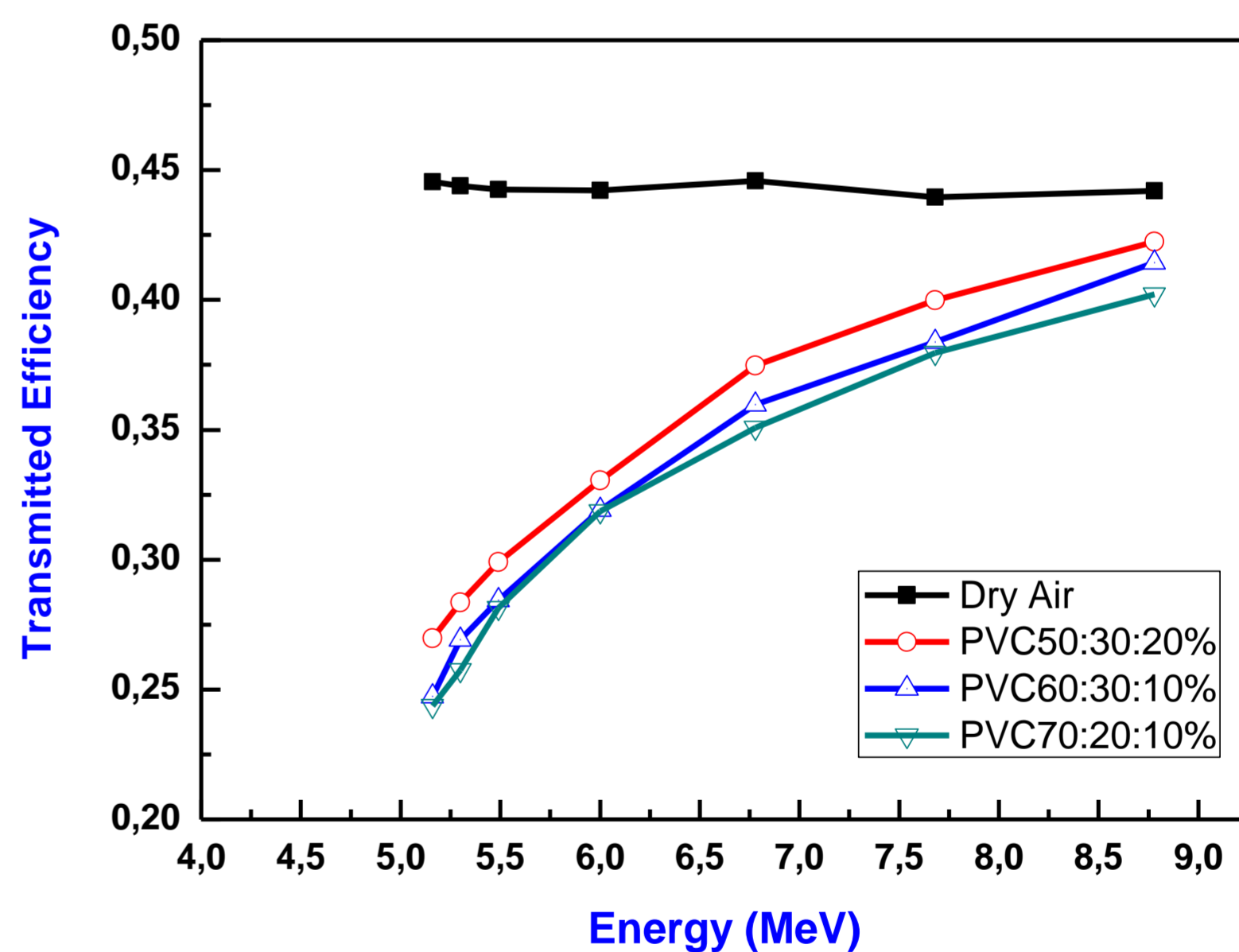


Figure. Transmitted efficiency of the Alpha particle in the dry air and in the material of radiometric filter AFA-RSP-20 (PVC) at different alpha distribution inside the filter material .

✓ The transmitted efficiencies of alpha particles with energy of known radioactive sources from 5 to 9 MeV (²³⁹Pu, ²¹⁰Po, ²⁴¹Am, ²¹⁸Po, ²¹⁶Po, ²¹⁴Po and ²¹²Po) are simulated.

CONCLUSIONS

✓ The penetration of alpha particles in a radiometric analytical filter is simulated.

- ✓ At energy of **Pu-239** (5,16 MeV) the loss inside filter materials nearly 20 % and decrease to 5% For **Po-212** (8,78 MeV).
- ✓ For radon (**Po-218 and Po-214**) the energy loss in the filter material is 15 % and 10% respectively.
- ✓ This correction must be taken into account for accurate radioactivity estimation in filters.