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## Silica Aerogel Cherenkov Counter for beta decay measurements

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A prototype to detect the highest energy fraction of electrons emitted by beta decays based on Cherenkov radiation in silica aerogel has been realized in order to be used in nuclear astrophysics target activation experiments and environmental radioactive pollution survey. The prototype detects the high end-point of beta radiation: silica aerogel with refractive index of 1.056 corresponding to electrons threshold of 1 MeV was chosen. Silica aerogels have refractive index from 1.01 to 1.09, are materials transparent in the visible 380-780 nm and their low density ( $\rho=0.10 - 0.35 \text{ g/cm}^3$ ) results in a reduced absorption of gammas and a longer path on which beta particles radiate Cherenkov photons. Very good background reduction has been achieved. Background reduction relies not only on the threshold energy but also on the shape analysis of the Cherenkov pulse which strongly depends on charge ionization density. The counter has been tested with a  $^{90}\text{Sr}$ - $^{90}\text{Y}$  beta source ( $E_{\text{max}}= 2.27 \text{ MeV}$ ,  $t_{1/2}=64 \text{ h}$  for  $^{90}\text{Y}$ ,  $E_{\text{max}}=0.546 \text{ MeV}$ ,  $t_{1/2}=28.5 \text{ yr}$  for  $^{90}\text{Sr}$ ) and it can measure down to an activity of 1 Bq of  $^{90}\text{Y}$ . Because the ratio  $^{90}\text{Y}/^{90}\text{Sr}$  is known, the activity of  $^{90}\text{Sr}$  (under the threshold) could be computed.  $^{90}\text{Sr}$  is a pure beta emitter as well as its daughter  $^{90}\text{Y}$  and this method is used to evaluate  $^{90}\text{Sr}$  activity in groundwater and soil samples.  $^{90}\text{Sr}$  is highly toxic because it can be exchanged with calcium in the bones structures, it could be spread in the environment by nuclear power plants and it cannot be detected by gamma techniques. Background reduction is achieved without decreasing too much the efficiency that would result in the increase of the cross sections uncertainties for nuclear astrophysics experiments. We plan to use the counter also in target activation measurements to study the cross section of two reactions of astrophysics interest:  $^8\text{Be}(d, 2p)^9\text{Li}$  and  $^7\text{Li}(d,p)^8\text{Li}$ . In both case the final products are beta emitters with electrons end-point energy of 13 around MeV.

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poster

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**Classification de Session:** Poster Session 2 (Summary)

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