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## TOPS: a new class of fast plastic scintillators

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Organic plastic scintillators are largely exploited for fast time detectors thanks to their short scintillation time wrt inorganic crystals. Plastic scintillators are cheap to produce, light and easy to manipulate (standard mechanical workshop can handle the cutting, polishing, etc..). The nowadays best (faster) plastic scintillators are EJ-232 (Eljen Technology) and BC-422 (Saint Gobain) with a rise time of 350 ps, a decay time of 1.6 ns and a pulse width of 1.3 ns. To improve the performances of time detectors the development of faster scintillators can give a crucial contribution, in this framework a collaboration between the physics, engineering, and chemistry groups of University "Sapienza" of Rome and CREF started the TOPS project, focused on the development of a new class of organic scintillators. Comparing the light output and the time properties of the samples with minimum ionizing particles, a selection of the most promising TOPS scintillators has been investigated and characterized (redout with commercial PMTs - Hamamatsu H10721-20). The performance achieved with TOPS samples are extremely promising: a time resolution improvement from 10 up to 35% with respect to the EJ-232 commercial scintillator has been demonstrated. In addition, an increase of light output has been obtained for all samples with a consequent potential improvement in energy resolution measurements of a factor up to 35%.

### Primary experiment

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