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## ORANGE: advances in optically readout GEM structure

GEM-based detectors have had a noticeable development in last years and have successfully been employed in different fields from High Energy Physics to imaging applications. Light production associated to the electron multiplication allows to perform an optical readout of these devices. The big progress achieved in CMOS-based photosensors make possible to develop a high sensitivity, high granularity and low noise readout.

First results obtained with a triple-GEM structure filled with a CF<sub>4</sub> rich gas mixture (He/CF<sub>4</sub> 60/40) and readout by means of a 4 mega-pixel CMOS sensor with noise level lesser than 2 photons per pixel were shown in the Barcelona ATTRACT event:

- about 1000 photons per minimum ionising particle track;
- 80 photons per primary electron;
- a space resolution of about 70  $\mu\text{m}$ ;

Since then a lot of new measurements were performed. The light yield was measured as a function of the GEM gain, the particle distance in the drift gap and the particle energy. It resulted that the performance are very stable as a function of the particle position in the drift gap and that a resolution of about 15% in the energy released is obtained. A first attempt of combining light and charge readout, in order to get time resolved measurement gave very promising results.

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