

# THCOBRA detector performance in mixtures of Kr/Xe mixtures

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The application of THCOBRA based detectors for X-ray imaging has been studied. The optimization of detector performance is intrinsically related with the study of the gas mixture capable of providing the better image quality. When operating in gas flow mode with a gas mixture of Ne/CH<sub>4</sub> (95/5), a charge gain of 10<sup>4</sup> was achieved, together with an energy resolution of about 22% (@ 8 keV), and a spatial resolution close to 1.2 mm (for about 4 keV) were achieved [1]. For pure Kr, in a sealed detector, the achieved energy resolution was 23% (@ 5.9 keV) and the spatial resolution was 650 μm (for 16.5 keV) [2], allowing to improve detector performance when compared with its operation in Ne/CH<sub>4</sub> [3, 4]. In this work, detector performance in terms of charge gain, energy and spatial resolutions were studied, for different gas mixtures of Kr and Xe, namely 98/2, 95/5, 90/10 and 85/15. Results will be presented and compared with the previously achieved.

[1] L. F. N. D. Carramate, A. L. M. Silva, C. D. R. Azevedo, D. S. Covita and J. F. C. A. Veloso, THCOBRA X-ray imaging detector operating in Ne/CH<sub>4</sub>, J. Instrum. 10, (2015) P01003.

[2] L. F. N. D. Carramate, A. L. M. Silva, C. D. R. Azevedo, I. Fortes, S. G. Monteiro, S. Sousa, F. M. Ribeiro, S. De Francesco, D. S. Covita, et al., THCOBRA X-ray imaging detector operating in pure Kr, J. Instrum. 12, (2017) T05003.

[3] M. J. Berger, J. H. Hubbell, S. M. Seltzer, J. Chang, J. S. Coursey, R. Sukumar, D. S. Zucker and K. Olsen, XCOM: Photon Cross Sections Database, (2011) <http://www.nist.gov/pml/data/xcom/index.cfm>.

[4] C. D. R. Azevedo, S. Biagi, R. Veenhof, P. M. Correia, A. L. M. Silva, L. F. N. D. Carramate and J. F. C. A. Veloso, Position resolution limits in pure noble gaseous detectors for X-ray energies from 1 to 60 keV, Phys. Lett. B 741, (2015) 272.

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