

Optimization of micro columnar CsI:Tl scintillators for X-ray medical imaging applications

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X-ray detector market faces an annual growth of about 5% due to technological advancement, ageing of the population and the increasing use of medical imaging. Trixell, founded in 1997, was one of the first producers to propose digital flat panels for medical radiology. In its detectors, the X-ray detection is indirect and the scintillating function is given by a microcolumnar CsI:Tl layer. In this paper, the radiological context is first described. Trixell was able to keep up with the fast growth of the market and to meet the requirements of the market and the customer needs; the corresponding capacity increase enables Trixell to be among the world leaders in its domain. An important effort of research and development is still maintained by the company, in particular for the scintillator material, to facilitate the design of products of higher performance and consolidate its leader place. Depending on the application of the digital flat panel developed, the required characteristics of the scintillator can be very different in terms of light output, X-ray absorption and resolution (characterized by Modulation Transfer Function MTF). A specific bench was developed in Trixell to measure the performance of these scintillators independently of the photodiode array which converts visible light in electronic signal in the detector. The research and development work is illustrated in a second part with a presentation of a study on the compromise between the MTF and the sensitivity of CsI:Tl layers deposited on optical fibers. The thickness of the scintillating layers produced in Trixell for this study varies between 250 μ m and 1 mm, and their properties are measured with three X-ray different spectra: RQA1, RQA5 and RQA9, which correspond to the range of applications of detectors in X-ray imaging applications.

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