

**First Mediterranean Thematic Workshop on Advanced Molecular Brain  
Imaging with Compact High Performance MRI-Compatible PET and SPECT  
Imagers –Potential for a Paradigm Shift**

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## **Cherenkov radiation in medical imaging**

*Thursday 30 August 2012 09:50 (25 minutes)*

**Abstract:** Charged particles traversing a medium at a speed exceeding the speed of light in this medium will emit Cerenkov radiation. In biological soft tissues the contents of water ranges from 70% in the brain to 90% in lungs. With the index of refraction of water (1.33) the Cerenkov energy threshold is 260 KeV. Scintillating crystals used as radiation detectors in SPECT and PET scanners have a much higher index of refraction and therefore a lower Cerenkov energy threshold:

Crystal Refraction index Cerenkov energy threshold (KeV)

NaI :Tl 1.85 96

CsI:Tl 1.80 104

LSO:Ce 1.82 101

LaBr<sub>3</sub>:Ce 1.88 92

LuAP:Ce 1.95 84

This talk will illustrate how the Cerenkov emission produced by b+ or b- radioisotopes in the human body can be used as a new imaging modality. But it will also discuss under which condition the Cerenkov photons emitted by the recoil electrons during the g conversion process in the detecting medium can be exploited to improve the timing resolution of PET scanners.

**Presenter:** Dr LECOQ, P.

**Session Classification:** Scintillators and Cherenkov light detectors