LaBr3(Ce) SPECT Application

Saint-Gobain Crystal's $LaBr_3$(Ce) detectors have unique properties well suited for application in organ specific and small animal nuclear medicine procedures.

Higher Light Output –
$LaBr_3$(Ce) provides 65% more light than NaI(Tl).

Better Energy Resolution –
The high light output and excep-tional linearity of B-380 translate to expected energy resolutions of less than 6.5% at 140 keV versus about 9% for NaI(Tl). This may aid some types of dual isotope studies.

Thinner Detectors –
The higher density of $LaBr_3$:Ce allows 8.6mm of material to match the detection efficiency of 9.5mm (3/8") of NaI(Tl).

Better Spatial Resolution –
The high light output and thin detector characteristics combine to give superior intrinsic spatial resolution. In compact imagers with position sensitive photomultiplier (PSPMT) light sensors and special collimators, an intrinsic spatial reso-lution of 1mm has been demonstrated. (See Pani reference in Figure 2.)

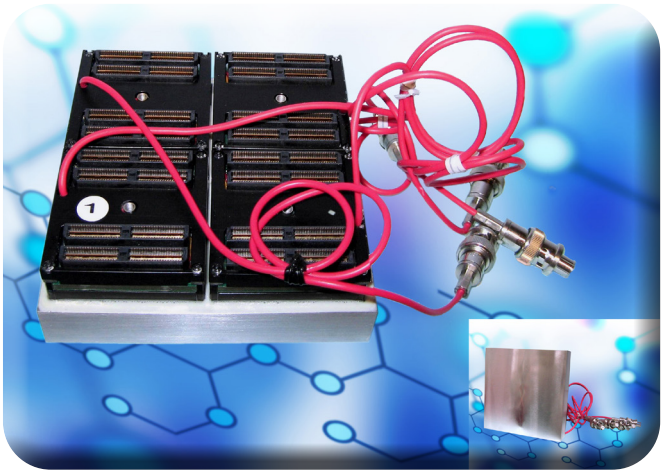

Figure 1. Unit pictured has 10x10cm² LaBr3:Ce crystal.

High Rate –
The short decay time of $LaBr_3$(Ce), more than 15 times shorter than NaI(Tl), allows system count rates well over one million cps with proper choice and design of the electronics.

Availability –
Single plate imagers up to 10cm x 10cm are available on a prototype basis.

Compact Imager –
Photo Courtesy of Professor R. Welch, College of William & Mary.

$LaBr_3$(Ce) Properties	
Density [g/cm³]	5.08
Melting point [K]	1116
Thermal expansion coefficient [10^{-6}/°C]	8 along C-axis
Cleavage plane	<100>
Hygroscopic	yes
Wavelength of emission max [nm]	380
Refractive index @ emission max.	~1.9
Primary decay time [μs]	0.016
Light yield [photons/keVγ]	63
Photoelectron yield [% of NaI(Tl)] (for γ-rays)	165

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LaBr3:Ce
SPECT Application

Properties Comparison –

Scintillation Material	$LaBr_3(Ce)$	NaI(Tl)	CsI(Tl)
Light Yield(photons/keVγ)	63	38	54
1/e Decay Time (ns)	16	250	1000
Wavelength of Maximum Emission (nm)	380	415	550
Density g/cm^3	5.08	3.67	4.51
Hygroscopic	Yes	Yes	Slightly

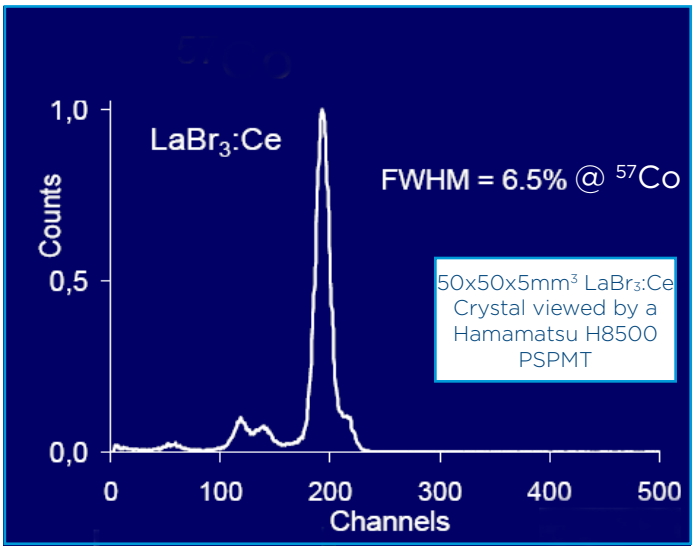

Figure 2. ^{57}Co spectrum courtesy of Roberto Pani presented to the 3rd International Conference on Imaging Technologies in Biomedical Sciences, Milos Island, Greece, 25-28 September 2005 in a special session on "Advances in functional breast imaging by compact and dedicated imagers." The full presentation is available on our web site.

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