

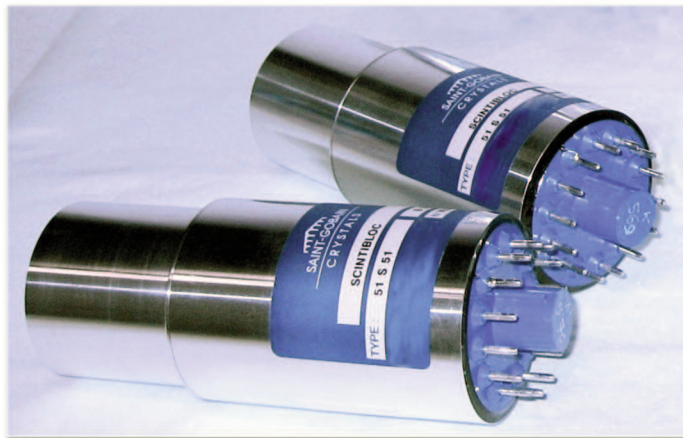
New Generation Inorganic Scintillators:

- High Light output, and fast decay time output pulse.
- Better energy resolution and stability than NaI(Tl).
- Higher maximum throughput at high input count rates.

Lanthanum Bromide, or LaBr₃(Ce), sometimes simply (and incorrectly) referred to as “LaBr”, is one of the new generation of inorganic scintillation gamma-ray detectors. LaBr detectors exhibit improved resolution and faster light decay time.

When used with the latest ORTEC digital electronics, these detectors provide improved resolution, pulse shape, and temperature stability compared to NaI(Tl) types. As a convenience to our customers, ORTEC is pleased to offer various LaBr detector models.

Crystals sizes for the spectroscopy systems range from 1 x 1-in. to 3 x 3-in.



Improved Resolution and Efficiency

As shown in Figure 1, LaBr provides better resolution performance over NaI(Tl) systems by approximately a factor of 2. Note that neither the NaI(Tl) detectors nor the lanthanum bromide detectors can approach the resolution of a HPGe detector.

The efficiency for LaBr is about 1.3 times that of NaI(Tl) for the same volume and the decay time constant is slightly more than 10% of the NaI detector decay time (see Table 1). On the basis of photoelectron yield, LaBr has higher efficiency and temperature stability than NaI(Tl).

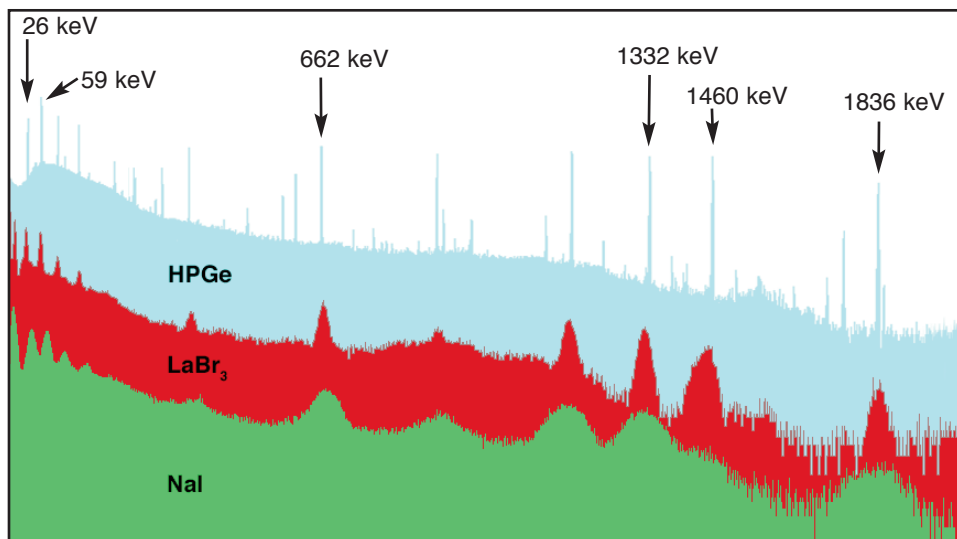


Figure 1. Comparison for LaBr₃(Ce), NaI(Tl), and HPGe spectra.

High Count Rate Compatibility

Lanthanum bromide detectors can operate over wide dynamic ranges of count rate with little variation in energy resolution.

Figures 2 and 3 show high rate performance of a LaBr detector with an ORTEC digiBASE.

The digiBASE shows minimal resolution degradation over a wide range of count rates.

| Table 1. Comparison of Critical Parameter for Lanthanum Bromide | | | | |
|---|-------------------------|----------------|-------------------------------------|---------------------------|
| Detector Type | Resolution @662 keV (%) | Density (g/cc) | Photoelectron Yield Relative to NaI | Primary Decay Time (μsec) |
| LaBr ₃ (Ce) | 2.8–4.0 | 5.29 | 130 | 0.026 |
| NaI(Tl) | 7 | 3.7 | 100 | 0.230 |
| HPGe | 0.2 (1.3 keV) | 5.35 | N/A | N/A |

Lanthanum Bromide

Scintillation Detectors

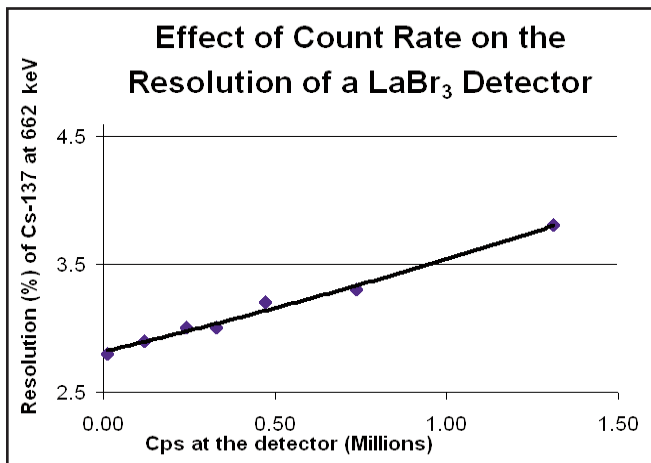


Figure 2.

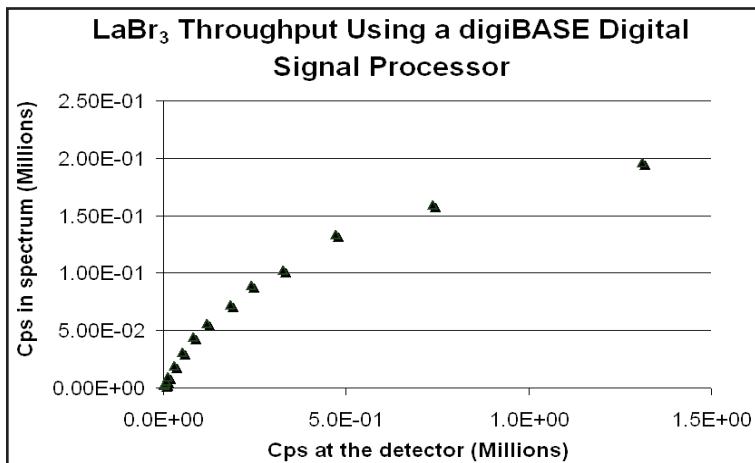


Figure 3.

Spectroscopy Electronics for LaBr

Lanthanum bromide crystals are generally supplied ready mounted on a PMT in the form of an integrated assembly. Many options are available to develop a complete spectroscopy system.

| Electronics | PMT Base/Preamp | Amplifier | MCB | HVPS | Comments |
|--|--|--|---------------------------|--|---|
| digiBASE or digiBASE-E | Included in digiBASE and digiBASE-E | Included in digiBASE and digiBASE-E | digiBASE or digiBASE-E | Included in digiBASE and digiBASE-E | Simplest system — requires computer. |
| digiDART or digiDART-LF with DIM-296 | Included in digiDART-296 and DD-LF-296 | Included in digiDART-296 and DD-LF-296 | digiDART-296 or DD-LF-296 | Included in digiDART-296 and DD-LF-296 | Portable applications with or without computer. |
| NIM solution with 296 ScintiPack PMT Base HVPS | 296 | NIM amplifier* | MCB** | Included in PMT Base | Requires NIM BIN/PWR and computer. Energy and timing can be simultaneous. |
| NIM solution with 276 Preamp PMT Base | 276 | NIM amplifier* | MCB** | 556 | Requires NIM BIN/PWR and computer. Energy and timing can be simultaneous. |
| NIM solution with 266 PMT Base and 113 Preamp | 266 and 113 | NIM amplifier* | MCB** | 556 | Requires computer. Energy and timing can be simultaneous. |

*Choice of NIM amplifier: 855, 575A, 570, 590A, 671, 672, 572A.

**Choice of MCB: EASY-MCA-2k, EASY-MCA-8k, 919E, 926-M-USB, 921E, 920E.

Lanthanum Bromide

Scintillation Detectors

Dimensions and Weights

| Model | Base OD | PMT OD | Detector Housing OD | Detector Housing Length | Overall Length | Net Weight | Shipping Weight |
|--------------|-------------------|-------------------|---------------------|-------------------------|------------------------------|------------|-----------------|
| LABR-1X1 | 57 mm 2.2 in | 44.5 mm 1.8 in | 30.4 mm 1.2 in | 26.1 mm 1.0 in | 143 mm 5.6 in + pins | ~.06 lb | 5 lb |
| LABR-1.5X1.5 | 58.7 mm 2.3 in | 58.7 mm 2.3 in | 43.1 mm 1.7 in | 39 mm 1.5 in | 151.5 mm 6.0 in + pins | ~1 lb | 5 lb |
| LABR-2X2 | 58.7 mm 2.3 in | 58.7 mm 2.3 in | 55.8 mm 2.2 in | 51.5 mm 2.0 in | 164 mm 6.5 in + pins | ~1.5 lb | 5 lb |
| LABR-3X3 | 58.7 mm 2.3 in | 58.7 mm 2.3 in | 82.5 mm 3.2 in | 157 mm 6.2 in | 194 mm 7.6 in + pins | ~2 lb | 5 lb |

Ordering Information

| Model | Description |
|--------------|--|
| LABR-1X1 | LaBr ₃ (Ce) scintillation detector, 1 x 1-in. crystal with 1.5-in. diameter 14-pin PMT; resolution 3.5% guaranteed. St. Gobain Part No. 2-4-7174. |
| LABR-1.5X1.5 | LaBr ₃ (Ce) scintillation detector, 1.5 x 1.5-in. crystal with 2-in. diameter 14-pin PMT; resolution 3.0% target. St. Gobain Part No. 2-4-6115. |
| LABR-2X2 | LaBr ₃ (Ce) scintillation detector, 2 x 2-in. crystal with 2-in. diameter 14-pin PMT; resolution 3.5% target. St. Gobain Part No. 2-4-6288. |
| LABR-3X3 | LaBr ₃ (Ce) scintillation detector, 3 x 3-in. crystal with 3-in. diameter 14-pin PMT; resolution 3.5% target. St. Gobain Part No. 2-4-7175. |

Lanthanum Bromide Scintillation Detectors

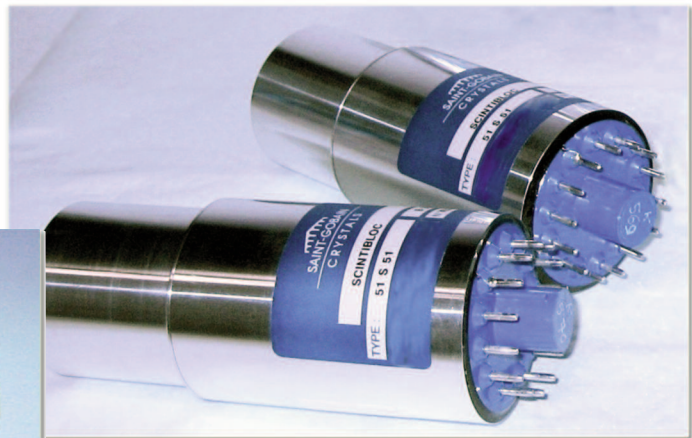


digiDART-LF Portable MCA

digiBASE PMT Base

digiBASE-E PMT Base

296 PMT Base



Specifications subject to change
051613

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