Epic-Crystal

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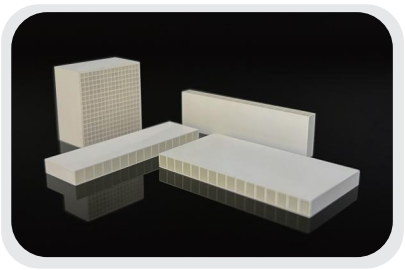
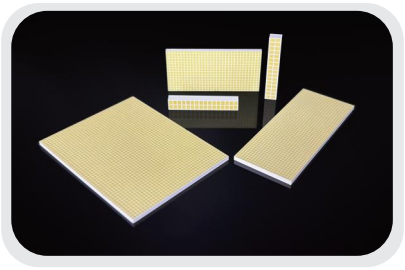
# Scintillation arrays





Epic Crystal design and produce a variety of scintillation crystal arrays, which can be used in the CT scanning(medical/security/industrial), nuclear medical application(SPECT/PET), X ray flash radiography, none-destructive testing and various research application.

The main materials can be fabricated included the CsI(Tl), LYSO(Ce), $CdWO_4$, GAGG(Ce), BGO and GOS ceramic. These arrays can be designed into linear or 2 dimensional(2D) configurations, individual pixels can be as small as 0.5mm even lower depending on the specific scintillation materials and the required thickness. The separator/reflector we generally applied is Barium Sulfate($BaSO_4$), Titanium Dioxide($TiO_2$) and Enhanced Specular Reflector(ESR,3M), others is available based on request.

Scintillation Properties of materials and their array parameters

| Material | CsI(Tl) | LYSO(Ce) | GAGG(Ce) | $CdWO_4$ | BGO | GOS |
|---|---|---|---|---|---|---|
| Primary Decay time(ns) | 1,020 | 42 | 88 | 12,700 | 317 | 3,000 |
| Light output(Photons/Mev) | 60,000 | 29,000 | 50,000 | 13,000 | 8,500 | 25,000 |
| Wavelength of maximum length(nm) | 550 | 420 | 540 | 475 | 480 | 510 |
| Afterglow | 0.5-5%@6 ms | 0.1%@6 ms | 0.1%@3 ms | 0.1%@3 ms | 0.005%@3 ms | 0.1%@3 ms |
| Array configurations | Linear&2D | Linear&2D | Linear&2D | Linear&2D | Linear&2D | Linear&2D |
| Reflector/separator | $TiO_2$ | $BaSO_4$ ESR | $BaSO_4$ ESR | $TiO_2$ | $BaSO_4$ ESR | $TiO_2$ |
| Pixel size(Min) | 0.3x0.3 mm | 0.5x0.5 mm | 0.5x0.5 mm | 1.0x1.0 mm | 0.3x0.3 mm | 0.5x0.5 mm |
| Gap(Min) | 0.10 mm | 0.08 mm | 0.08 mm | 0.10 mm | 0.08 mm | 0.10 mm |

Guidelines are hard numbers and can be others depend on specific design

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# Design parameters

**Material:** Type of scintillation crystals.

**Pixel size:** The X and Y dimensions of each scintillator pixel.

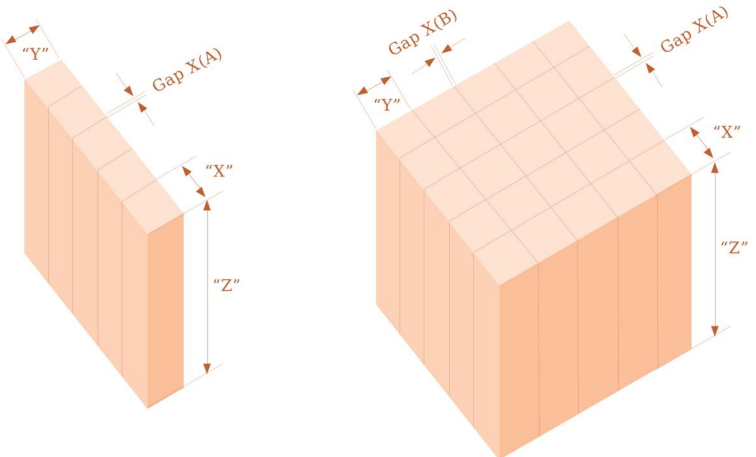
**Separator/reflector type and thickness:** The type of reflector between the crystal pixel and its overall thickness, Gap(G).

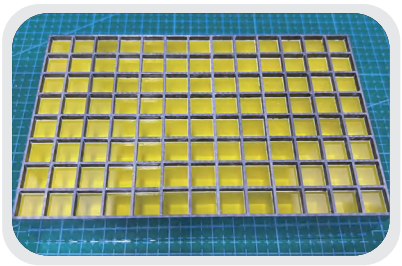
**Pitch:** The distance between the center of one element to the center of an adjacent element, X+G or Y+G.

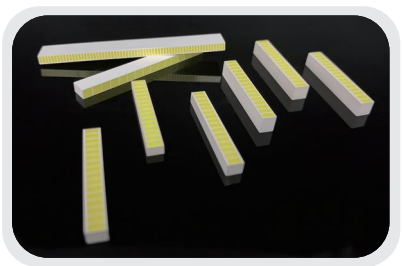
**Radiation thickness:** This is the Z dimension and specifies the thickness of the array in the direction of incoming radiation.

**Back reflector thickness:** Usually a white reflector is applied to the radiation entrance side of the array to reflect the light back into the pixel so it can be directed to the light sensor.

**Material adjacent to the end pixels:** The end crystals need a special reflector thickness or other treatment, e.g., to keep a constant pitch from array to array if they will be joined together in application.





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