

Detector entrance windows

The density and thickness of the detector entrance window determines the transmission of the radiation. In the figure below the transmission of a range of standard detector windows is presented from which can be determined the optimum window thickness for your application.

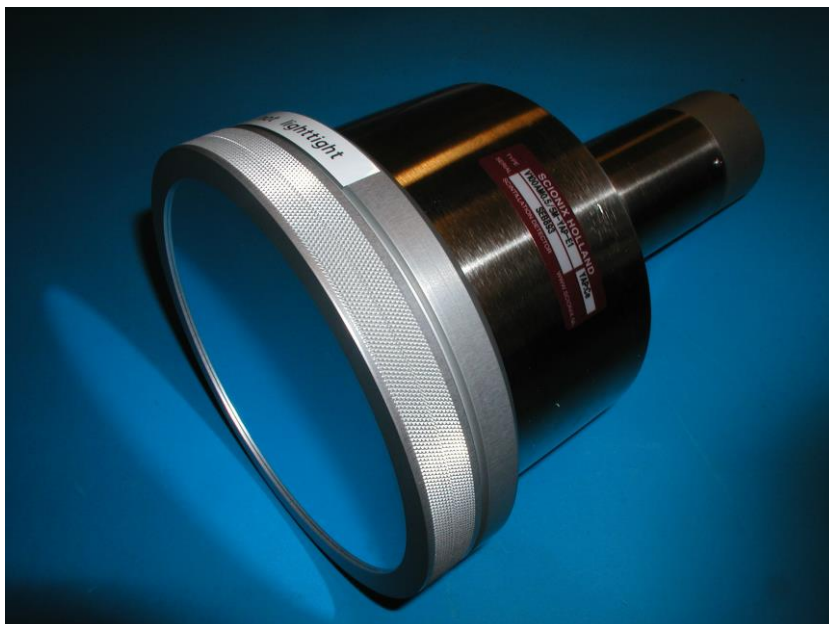
For higher energy gamma rays > 300 keV, the absorption of a mm thick entrance window can be neglected and the choice for the window material is dictated by practical considerations.

For low energy X-rays this choice is more critical. The thinnest aluminum windows normally used, have a thickness of $25 - 30 \mu\text{m}$. Windows of this thickness can be used down to X-ray energies of 10 keV. Below this energy, 0.2 or 0.3 mm thick Beryllium is required. The additional advantage of a Be window over a thin aluminum window is that its less fragile.

For the detection of low energy electrons (beta particles), a thin aluminized (light tight) mylar window is used. Mylar windows however, can only be applied for non-hygroscopic scintillation materials, such as CaF_2 (Eu) and $\text{YAP}(\text{Ce})$. Standard thicknesses are 25 or $100 \mu\text{m}$.

For the detection of alpha particles or heavy ions, a windowless detector (used in absolute dark, e.g. a vacuum vessel) or a very thin aluminized mylar window is used (typical thickness $2 \mu\text{m}$). Some crystals such as $\text{YAP}(\text{Ce})$ and $\text{CaF}_2(\text{Ce})$ are suitable to be coated with several hundred nanometers of evaporated aluminum for the detection of very low energy beta particles (e.g. from Tritium).

This window detector can be equipped with a kapton (polyimide) protection foil.



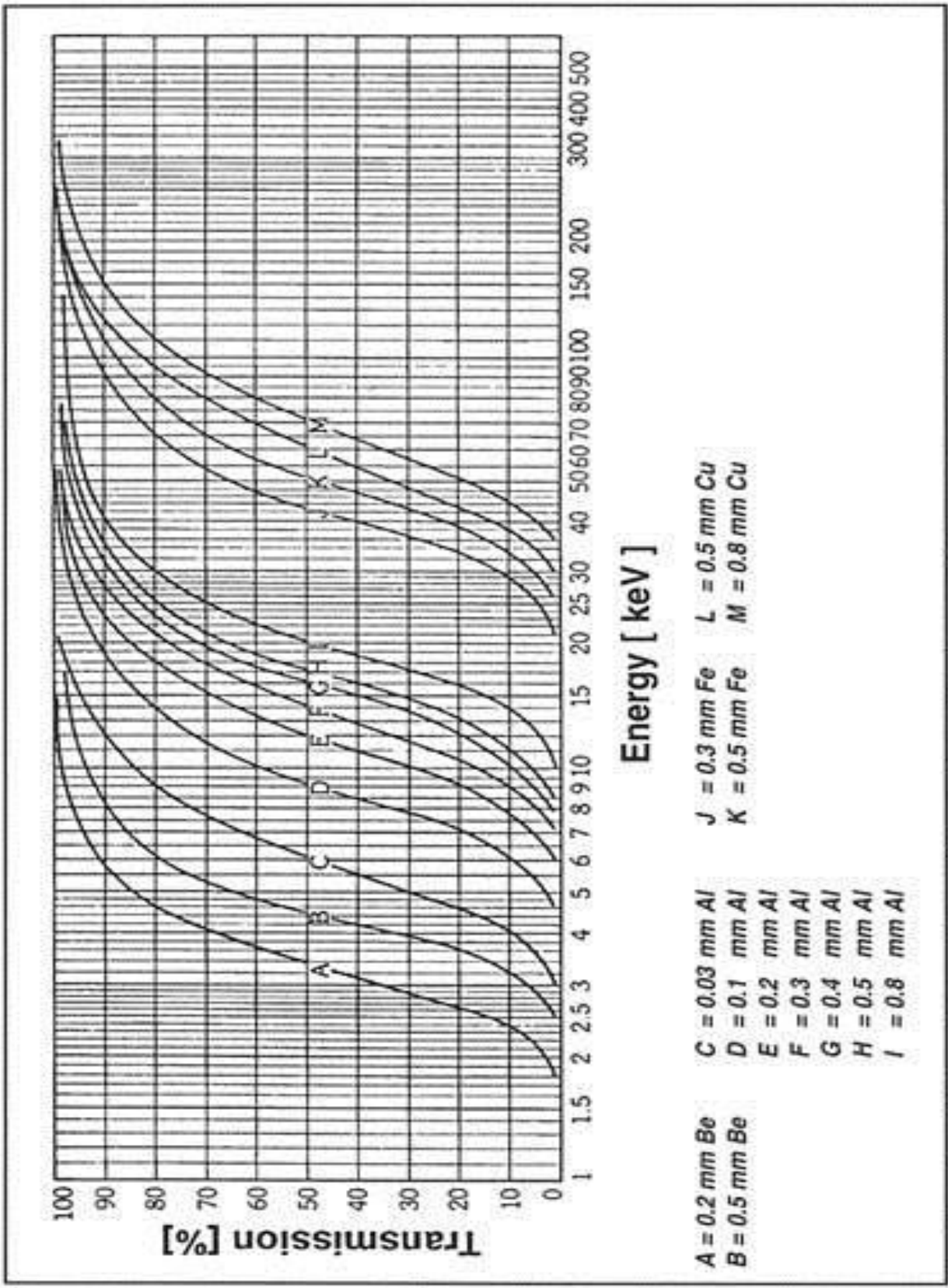


Fig. 5.3 Parallel beam transmission of frequently used entrance windows.

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