

Radiation Sensors

6S6P1.5VD

SCINTILLATION DETECTOR

USER'S MANUAL

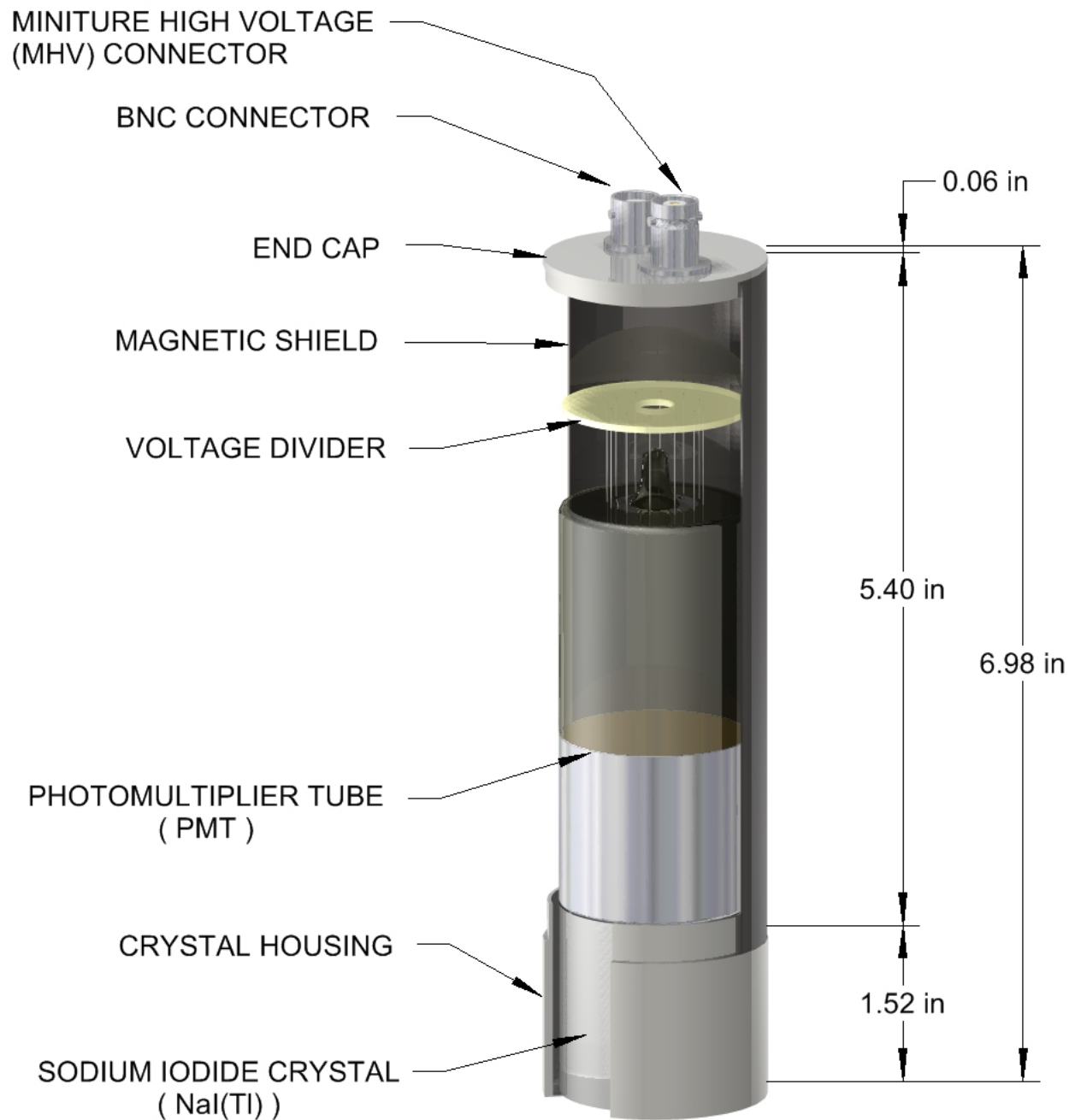
SUMMARY

The 6S6P1.5VD scintillation detector has been designed to be a versatile and convenient X-ray and Gamma Ray detector for many applications. Its size is small enough to be useful for the low and moderate photon energies of low energy sources yet is also useful at much higher energies. This detector incorporates a built in voltage divider to allow simple and convenient operation. There are only two connectors, the taller Miniature High Voltage (MHV) connector for positive high voltage input, and the shorter BNC connector for signal output to a preamplifier or a multichannel analyzer. The X-ray photon entrance window is especially thin for a detector of this size so that X-ray photons as low as 30 KeV can be detected with reasonable counting efficiency.

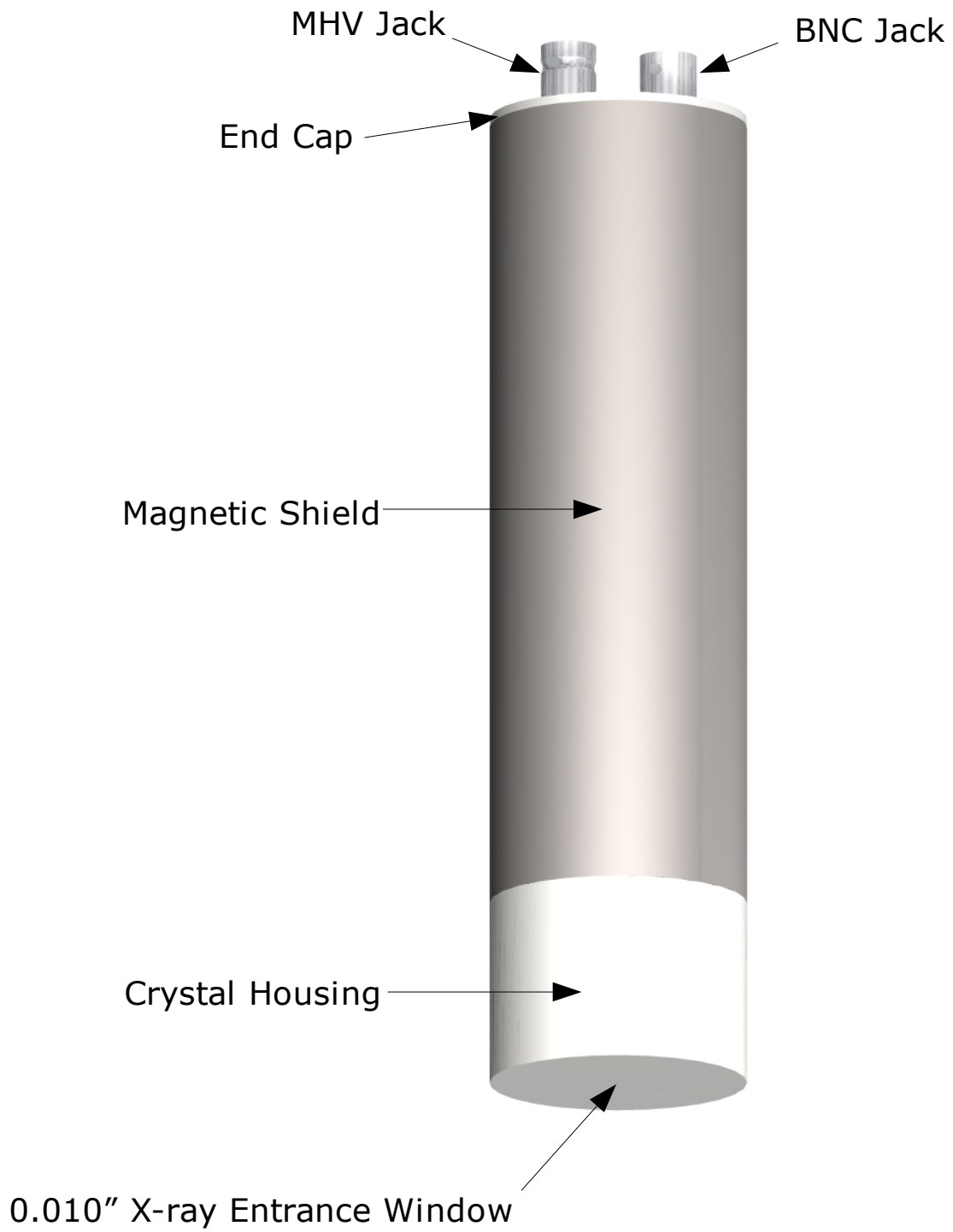
CONSTRUCTION

The 6S6P1.5VD scintillation detector is a positive high voltage detector employing a 1.5 inch 10 stage Photomultiplier Tube (PMT) mated to a 1.5" X 1.5" NaI(Tl) cylindrical scintillation crystal. A voltage divider is attached to the PMT inside the housing. The voltage divider ground is connected to the end cap which is electrically connected to the outer housing and magnetic shield of the detector. The high voltage is brought through to a MHV jack on the top of the detector to accept high voltage from a MHV cable. A BNC jack on the top of the detector is wired to the signal output of the voltage divider. The 6S6P1.5VD detector is 7.6 inches long to the end of the MHV jack by 1.75 inches in diameter and has one MHV jack and one BNC jack on the top of the unit.

6S6P1.5VD SCINTILLATION DETECTOR ASSEMBLY DIAGRAM



6S6P1.5VD SCINTILLATION DETECTOR EXTERNAL DIAGRAM



SPECIFICATIONS:

- Operating temperature: Standard laboratory temperatures
- Input voltage: MHV jack on top of detector
 - High voltage input maximum: +1000V MAX
 - High voltage input typical: +625V to +800V
- Output signal: BNC jack on top of detector
 - Voltage divider signal output at the BNC jack is designed for input to a charge sensitive preamp.
 - To use a voltage sensitive preamp to read the signal, the preamp must have a high resistance input resistor, or a BNC 'T' connector should be used with a high impedance resistor between the signal connector and ground.
 - Typical resistor values: 300K Ω to 1M Ω . Higher resistance values within a voltage preamp are normally acceptable.

SCINTILLATION DETECTION:

The X-ray entrance window of the 6S6P1.5VD is exceptionally thin at about 10 thousandths of an inch (0.010") to allow for X-ray photons as low as 30 KeV to be detected with reasonable counting efficiency.

While the 6S6P1.5VD detector is a full spectrum detector, counting efficiencies for low energy sources below 50 KeV fall off due to some of the X-rays being absorbed by the thin aluminum entrance window, and counting efficiencies for high energy gamma rays above 1 MeV fall off because of crystal dimensions.

The Pulse Height Energy Resolution of the 6S6P1.5VD detector should be 8.5% or less using 662 KeV photons from ¹³⁷Cs gamma source.

Pulse Height Energy Resolution is calculated by dividing the Full-Width at Half-Maximum, or FWHM energy (channel) of the spectrum from a multichannel analyzer by the Centroid energy (channel) of the spectrum.

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