

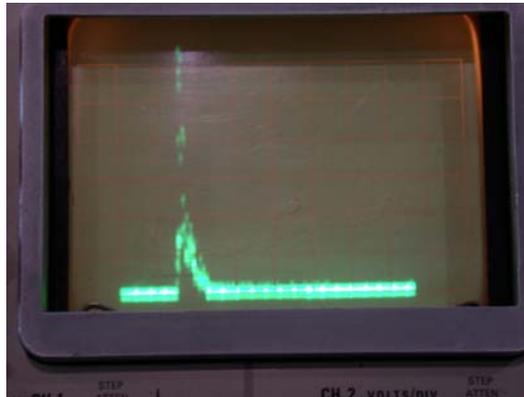
Van de Graff Spectra

Gary Godfrey
Feb 25, 2003

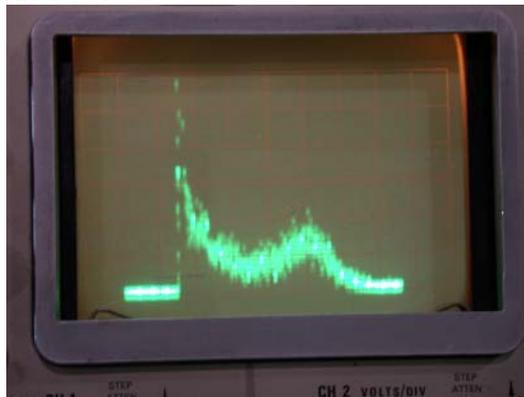
The following are digital camera pictures of a scope readout of a LeCroy QVT. All runs are for 100 sec. When the Van de Graff is on, it is set at $I_{\text{column}}=50-60 \text{ uA}$ (500-600 KeV), $I_{\text{beam}}=80 \text{ uA}$, and Pressure= 2×10^{-5} torr. Except as noted, the QVT is 1024 channels in x and 512 counts max in y. Except as noted, the spectra are for the sum of 9 BGO xtals (3 x 3 array), the scope vertical is 50 mv/cm, the Cs137 (.66 MeV) band gives 10 mV on the I/H fast out (calib amp ON), and there is a 20 dB atten from the I/H output to the QVT Q input. The discriminator for scaler counting of the I/H fast out is set at -100 mV (6.6 MeV).

The BGO crystals are 2.0 x 2.0 cm on their ends. A 3 xtal x 3 xtal array is being summed. The perpendicular distance from the front face of the center BGO crystal is 7.0 cm to the center of the stainless steel of the target cup. A minimum ionizing particle leaves 8.9 MeV/cm in BGO.

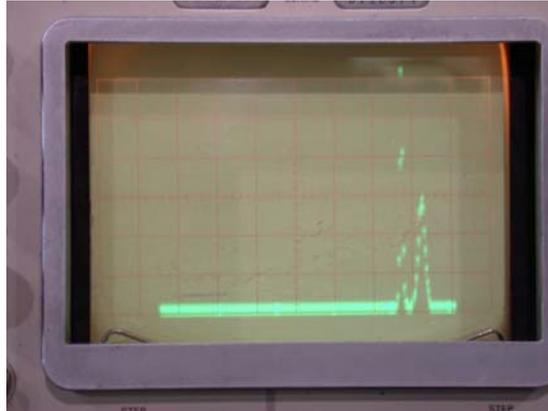
1) (LiSpectra_1.jpg) No Cs¹³⁷ and VG is OFF. Scaler=440/100 sec. The noise pedestal is in ~chan 205.



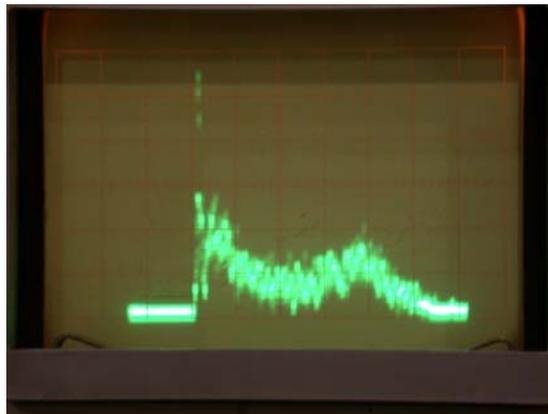
2) (LiSpectra_2.jpg) VG is ON. Scaler=6359/100 sec. The noise pedestal is in ~chan 205 and the peak is in chan 700.



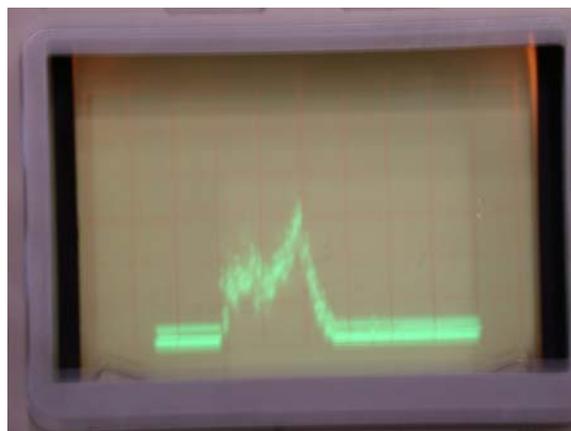
3) (LiSpectra_5) Cs^{137} source taped to VG target. VG is OFF. The QVT is displaying $\frac{1}{4}$ of memory to expand the scale and 8K counts full scale. The noise pedestal is in ~chan 205 and the Cs^{137} peak is in chan 225.



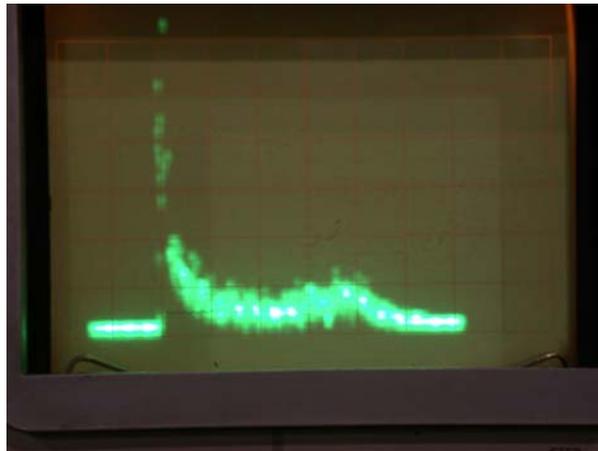
4) (LiSpectra_6) The BGO array is at -45 deg wrt the beam axis. The VG is ON. Scaler=5929/100 sec.



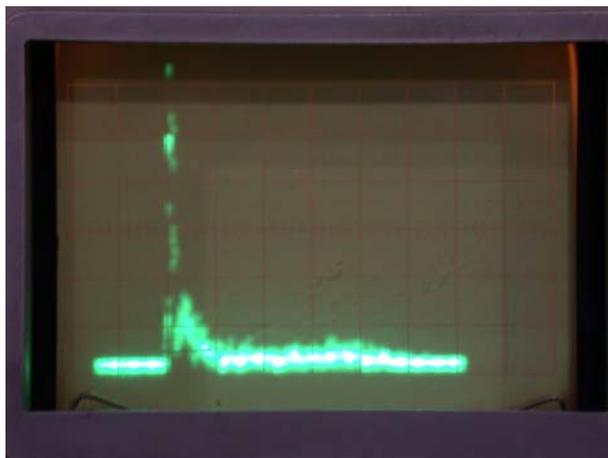
5) (LiSpectra_7) The BGO array is still at -45 deg, and 6 db atten has been added to the 20 db that is present on the QVT input. Notice that there are no higher energy peaks. Scaler=6226/100 sec. The noise pedestal is in ~chan 200 and the peak is in ~chan 450.



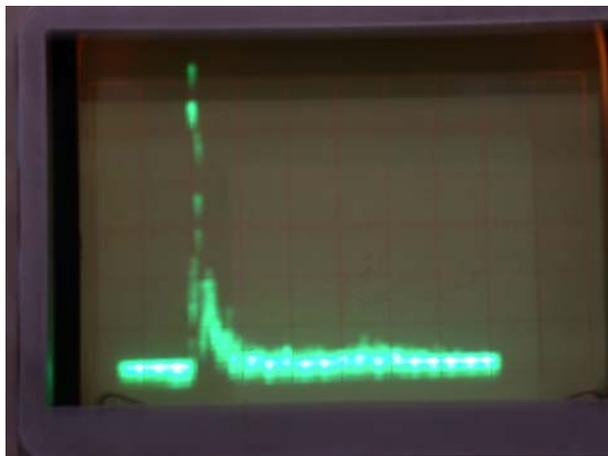
6) (LiSpectra_8) $I_{\text{column}}=30 \text{ uA}$ (300 KeV). This should be below the energy necessary to produce the 17.6 MeV gamma. Scaler= $3466/100 \text{ sec}$.



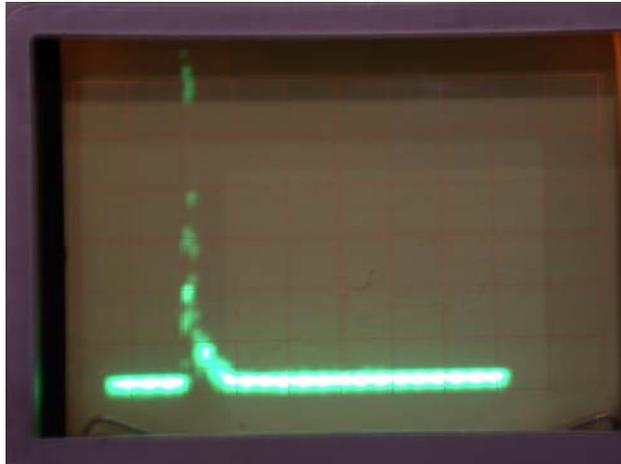
7) (LiSpectra_9) $I_{\text{column}}=20 \text{ uA}$ (200 KeV). This should be below the energy necessary to produce the 17.6 MeV gamma. Scaler= $1376/100 \text{ sec}$.



8) (LiSpectra_10) $I_{\text{column}}=10 \text{ uA}$ (100 KeV). This should be below the energy necessary to produce the 17.6 MeV gamma. Scaler= $1050/100 \text{ sec}$



9) (LiSpectra_11) $I_{\text{column}}=0$ uA (0 KeV) but VG is ON.



10) The energy of the peak is $.66 \cdot (700-205)/(225-205)=16.3$ MeV (pretty close to 17.6 MeV considering that an error in the pedestal for Cs^{137} has a big effect).

11) The Li target emits approximately isotropically as indicated by the 0 deg rate (64 ± 1 Hz) and 45 deg rate (59 ± 1 Hz) being the same.

Approx 4π steradian rate= $62 \cdot (4 \cdot \pi \cdot 7.0^2)/(6.0 \cdot 6.0)= 1060$ Hz