

Appendix H – Distortion of the Pulse Shape Discrimination Spectrum¹³⁴

In their August, 2007 submission to the Inquiry Committee Taleyarkhan et al. suggest that the distortion seen in their September 19, 2003 PSD spectrum is due to cross-talk between the PSD module and the acoustic drive of their PZT. They suggest that the same distortion is seen in the PSD spectrum of Camara et al. PRL **98**, 064301(2007). Camara et al. use the ratio of the tail area under a pulse to the total area under a pulse for their PSD. The spectrum with the acoustic drive on is shown below. Recall that Camara et al. induce nucleation with a PNG. This figure is simply cut from the electronic pdf file when the figure was expanded to fill a laptop screen. In this type of two-dimensional plot each dot is one event, and once dots are too dense it is not possible to judge accurately the density of dots. At any given pulse height only a qualitative statement can be made about the quality of the PSD separation. The neutrons and gammas clearly merge at a pulse height of 400 keVee. There is better separation at higher pulse heights. A quantitative analysis would require the original data.

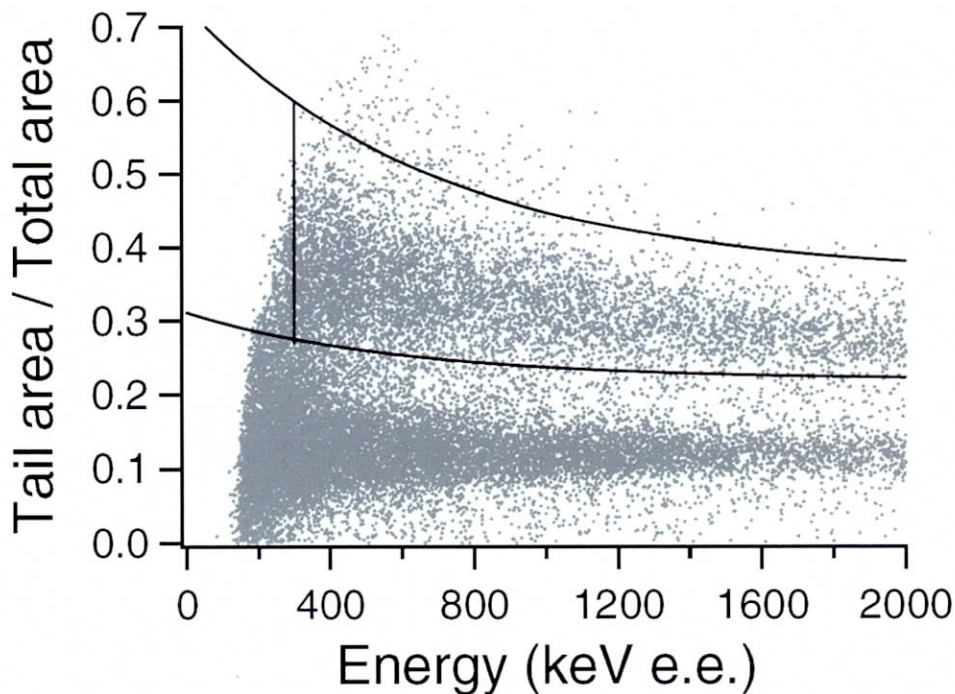


Figure 1 PSD spectrum with acoustic power on from Camara et al. PRL **98**,064301(2007)

¹³⁴ We acknowledge up front that some portion of our examination may itself be in error. However, we offer the following analysis as an example of the scientific process – something not well implemented in much of the material we have received.

The PSD spectrum from an AmBe source is shown in Figure 2. This figure is simply cut from the doc file when the doc was expanded to fill a laptop screen. A dot is small in this figure, but it is clear that the neutrons and gammas are much better separated. The major difference between the two spectra is that at a given pulse height the valley between the neutron and gamma regions is much more distinct in the spectrum from the source.

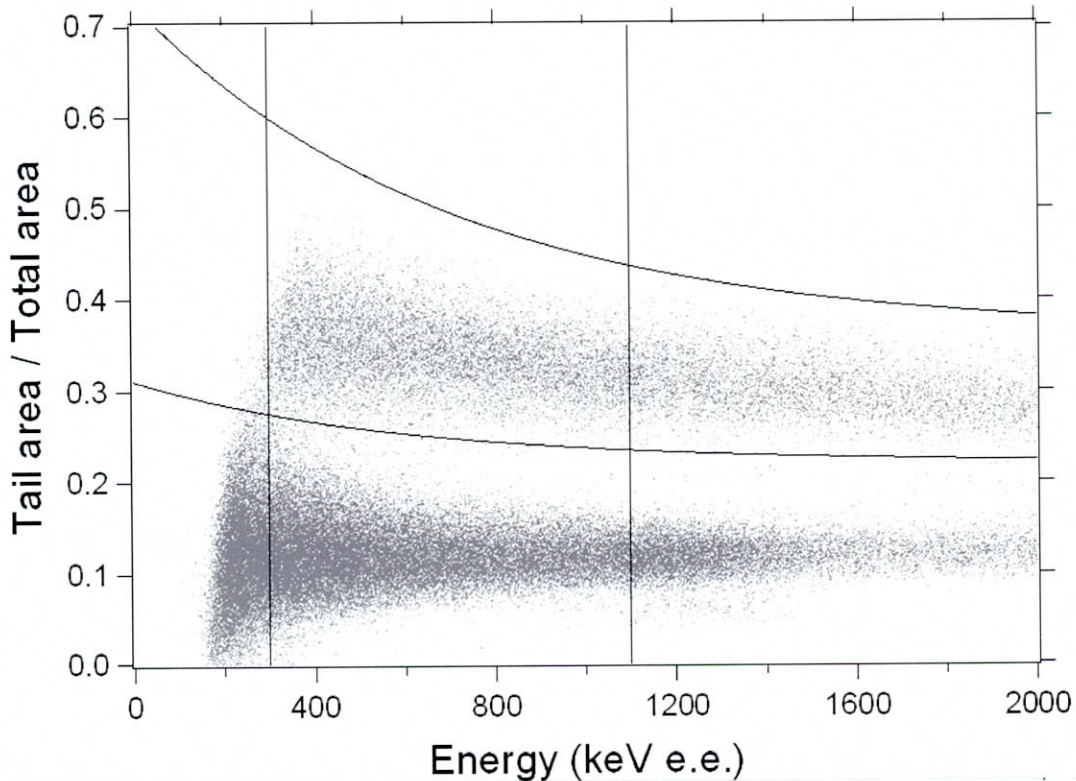


Figure 2 PSD spectrum from AmBe source from PRL98, 064301(2007)

A filling-in-of-the-valley is not the distortion seen in the September 19, 2003 PSD spectrum of Professor Taleyarkhan. The distortion is a prominent peak, see Figure 3. Moreover, the PSD spectrum with cavitation on shows the distortion, but the PSD spectrum with cavitation off does not show the distortion.

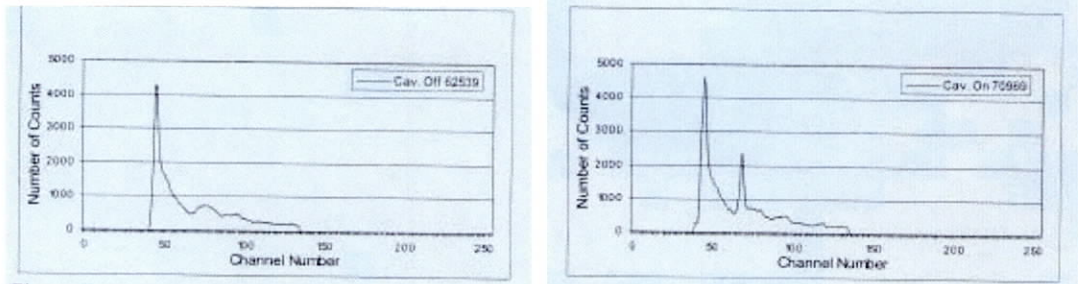


Figure 3 Cavitation off (left) and cavitation on (right) PSD spectra obtained on September 19, 2003 by Professor Taleyarkhan. The acoustic drive is powered in both cases. The frequency of the drive is shifted by ~5%. Could there be pick-up at one frequency but not the other frequency? It does not seem likely.

These are one-dimensional spectra. In a two-dimensional spectrum the peak would appear as a prominent grouping of dots arranged along a horizontal line. The spectrum from Camara et al., Figure 1, does not show such a grouping. Thus, it is not clear that Taleyarkhan et al. have identified the source of the distortion in their spectrum. The comparison to the data of Camara et al. is not convincing.