Review of second SL manuscript

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1 Singles measurements

1.1 Tritium data

The paper presents a convincing case of excess Tritium productions when cavitation is induced in cold Deuterated Acetone; The methods and procedures in collecting these data have been independently reviewed by a relevant ORNL expert in the field.

1.2 Neutron and Gamma production

The paper also presents data which show excess of nuclear radiation (neutron/gammas) production when cavitation is induced in cold Deuterated Acetone.

1.3 Interpretation

The question is then what is the source of this excess.

I can envision two sources:

1) Tritium and neutrons are produced in D+D reactions when the bubbles collapse.

2) Nuclear reactions in the liquid bombarded by intense neutron beams (for example: Deuteron recoils slowed down in the liquid may interact with another Deuteron, the capture of slower neutrons recoiling from the Parafine wall used for shielding.

Authors differentiate between these mechanism by doing several "control experiment" concluding that the excess is seen only when they cavitate cold Deuterated Acetone. Their conclusion is that it must be the first option listed above since it happens only when cold Deuterated Acetone is cavitated.

The difficulty is that this is all based on comparing singles rates in experiments done separately, a very hard case to make. In order to establish a 4% difference in integrated yield one needs to establish the irradiation rate, length of time the measurements went on, instrument response to rates, etc. All these need to be determined to better then 2% in aggregate for the quoted difference to be meaningful. This is a tall order!. In private discussions the authors presented their measurements of variation in neutron yield form the PNG (better then 0.17% in most cases). Their measurements did not last very long 100 to 300 seconds they must fold in estimates of error in time intervals recorded (which again in followup discussion were accurate to 0.1statistical uncertainty of their excess neutron counts with theses uncertainties they could get a real measure of how significant their difference is indeed.

What adds most credence to their observation is that they made many repeated measurements and all had consistent results. Barring some systematic error due to difference in instrument response, I think the singles data are interesting and valid.

2 The coincidence measurements

The authors in figure 5 in their paper show the time dependence of nuclear radiation reaching the scintillation detector and the light signal reaching the light detector (see Fig. 1)

A 4-6μsecond long "nuclear" flash occurs immediately once the PNG is triggered. There is also a light flash during that initial period. This light flash make up for the liquid that is an inefficient scintillator or from radiation hitting the light detector electrodes. In their coincidence measurements the authors see a consistent difference in n-gamma coincidences when cavitation is on or off. See Fig. 2.

These coincidences are significant, but they do not go beyond the single data to differentiate between the two possible contributors to the excess radiation yield. The coincidences are recorded without any information of time relative to the PNG burst. Looking at figure 2 one can see that even without cavitation the coincidence data is distributed around zero time difference between light and nuclear radiation detection as expected. The width is about 4-6μseconds which corresponds to the width of the high intensity flash from the PNG and they are could be mostly random. The same is true for the counts with cavitation on. They could be due to random or real coincidence between radiation and light coming from the initial flash

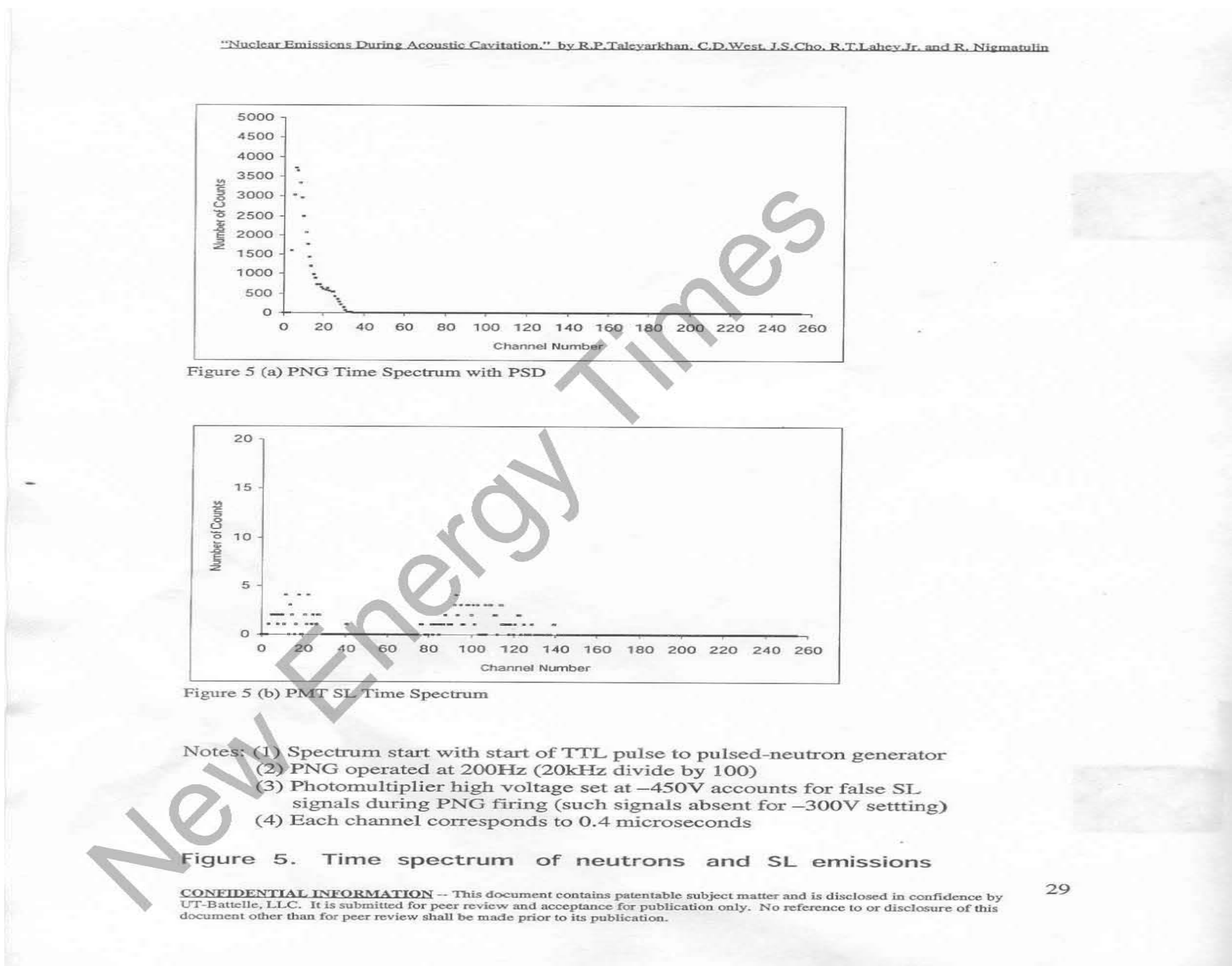

Figure 5 (a) PNG Time Spectrum with PSD

Figure 5 (b) PMT SL Time Spectrum

Notes: (1) Spectrum start with start of TTL pulse to pulsed-neutron generator
(2) PNG operated at 200Hz (20kHz divide by 100)
(3) Photomultiplier high voltage set at –450V accounts for false SL signals during PNG firing (such signals absent for –300V settting)
(4) Each channel corresponds to 0.4 microseconds

Figure 5. Time spectrum of neutrons and SL emissions

Figure 1: Figure 5 from the manuscript

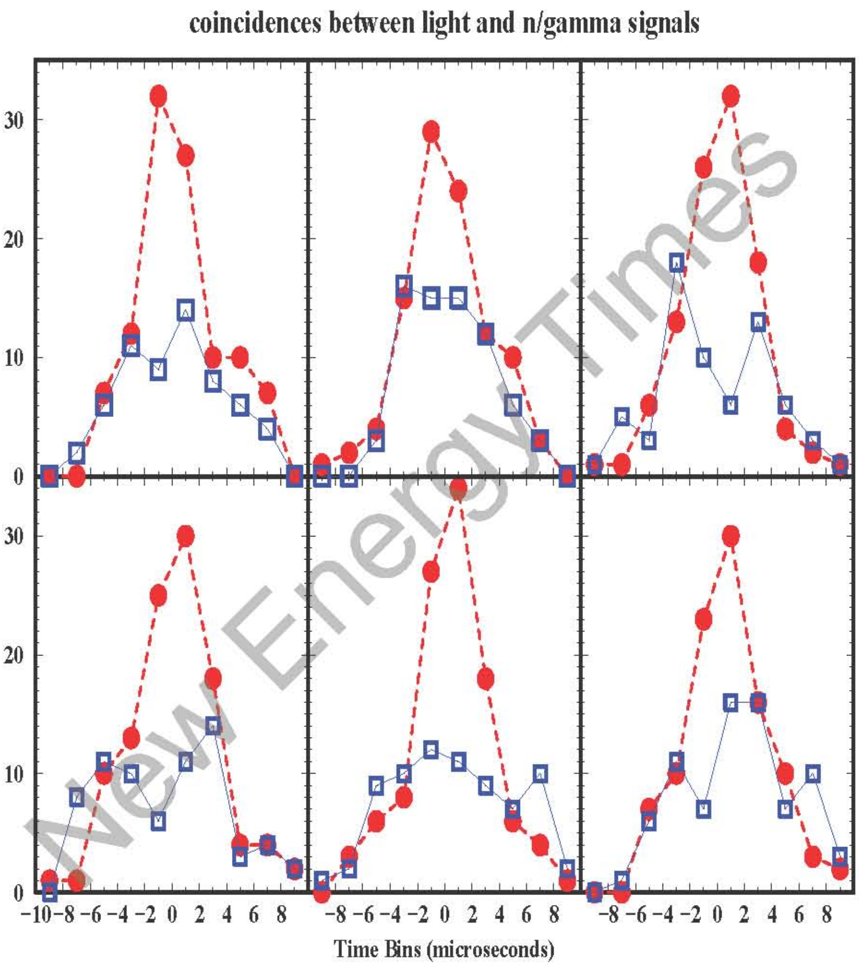

Figure 2: Coincidences between n-gamma and light measured with and without cavitation in Deuterated Acetone

or from light appearing later. If we could differentiate between the signals that appear in coincidence with the initial light flush or the later light flashes associated with bubble collapse, some 60-70 μseconds later, that would be more telling about the origin of the extra n-gamma yields. Unfortunately the only experiment done to look at these coincidences came up negative. The coincidences behaved like random coincidences, they were at the rate expected for random coincidences and did not show any clustering around zero.

In summary the coincidence data that the authors present are consistent with their singles finding but do not go beyond that to prove any new evidence that will shed light on that mechanism.

3 Conclusion and other comments

I think the authors are definitely entitled to present their interpretation. I, for example, can not come up with a credible mechanism that can explains why we have this excess only when they cavitate cold Deuterated Acetone, except for the D-D fusion events during implosion collapse as suggested by the authors but other reader may well do. The authors should point out, in their paper, that a proper coincidence experiment, which tries to associate the nuclear radiation with light coming from bubble collapse, which occurs about 60μseconds after the PNG burst, is needed for further proof of their assertion/model.

I have some other comments about the presentation, most of which I relayed to the authors but will include them here for the record.

1) Since questions about the statistical significance of their data are sure to arise I think that presenting their repeated measurements will enhance the presentation. A figure similar to Fig. 2 shown here, can replace figures 9 and 11a in their paper. A similar figure showing results with N-Acetone and warmer Deuterated Acetone will also help. Any time small difference are seen in several short experiment similar presentation or analysis is necessary, either by histogramming different results or presenting an average and standard deviation of their measured differences.

2) The cutoff I get for 2.5MeV neutrons is about channel 30 (in figure 3.4b) rather then the 40 used by the authors. This does not affect the conclusion that the lower part of the spectrum shows a difference whereas the higher end does not. But this will effect the amount of projected excess neutron yield calculated (it should be smaller!).

3) It is essential that spectra shown in figures 3 and 5 have some infor-

mation about the exposure time needed to obtain these data. This will help the reader estimate rates.