R&D Resources and Capabilities:

Figure 1: A high repitiiton reate (1 kHz) linac is shown in the left most picture. The middle picture shows the counting room equiped with singnal processing electronics and the MPA data acquisition system are shown. The far right histogram is a time of flight spectrum from the photodisintegration of the deuteron showing the gamma flash (peak on the left) and the candidate neutron signal. The hatched histogram illustrates how the neutron peak is greatly reduced when the target is H_2O instead of D_2O.

The research and development resources to support this proposal include an in house electron accelerator, several particle detector systems, and signal processing electronics. The linac shown in Fig. 1 is capable of accelerating electrons up to energies of 16 MeV. Electrons are transported in pulse trains having a minimum width of 25 ns and a maximum repetition rate of 1 kHz. The accelerator can produce 80 mA peak currents which can intersect a radiator target to produce bremsstrahlung photons. The bremsstrahlung photons enter an experimental cell through a collimator configured to select off axis polarized photons. A target, in the experimental cell, is positioned in the path of the polarized photons.

Particle detection systems are placed at predetermined locations in the experimental cell to measure the final state particles coming from the target. The authors of this proposal performed a previous experiment using two neutron sensitive scintillators place at 90 degrees to the incident photon beam and in the same plane as a 20 cm long target of heavy water (D_2O). A NaI crystal optically coupled to a photomultiplier tube (PMT) was placed off the beamline axis at the end of the experimental cell to monitor the incident photon flux. The photomultiplier signals were amplified by Ortec Model 672 amplifiers and discriminated using a CAEN constant fraction discriminator model N842. The NaI detector output was sent directly to a sampling ADC manufactured by FAST [2] while the neutron detector outputs were send to a time to amplitude converter (ORTEC 567, 566). The TAC output is proportional to the neutron time of flight and was measured with the ADCs manufactured by FAST [2]. A data acquisition system based on MPA-3 [1] recorded the measurements for analysis. Fig. 1 shows a sample Time of Flight (ToF) spectrum from the neutron sensitive detectors. The spectrum illustrates the ability of the set up to identify particles with flight times consistent with photons and distinguish them from particles with flight times consis-

tent with neutrons.

References

[1] Fast ComTec GmbH, Grünwalder Weg 28a, D-82041 Oberhaching Germany

[2] http://www.fastcomtec.com/products/product-lines/nim-modules/7070.html

[3] http://www.ortec-online.com/electronics/tac/567.htm

[4] http://www.ortec-online.com/electronics/amp/672.htm