NIMROD

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The NIMROD detector system as described in several previous reports[1,2] has been completed and was used in three significant runs in the past 6 months.

The final shipment of CsI crystals was delivered in the middle of the year. Typical CsI crystals are wrapped with teflon tape in order to prevent light leaks. We investigated the use of Tyvec paper for this purpose. We found the resolution of the crystals wrapped with one layer of Tyvec to be the same as the resolution of crystals wrapped with three layers of teflon tape. Since Tyvec was very difficult to work with on these crystals given the angles of the edges, we elected to use teflon tape for this purpose. All crystals were therefore carefully wrapped with three layers of teflon tape. In addition we wrapped each crystal with one layer of 10μm thick doubly sided aluminized mylar to prevent light transmission between neighboring crystals. Photomultiplier tubes were glued with BC-610 epoxy directly on the back of the crystals. All crystals were then carefully assembled into the various rings.

A significant effort was made to construct the ionization chambers in a manner such that they would fit into the very close confines of the mechanical structure. The ionization chamber vessels were constructed by gluing together G-10 pieces machined to very close tolerances. Once constructed, the anode wires were strung through the center with a spacing of 4mm. Single sided 1.4μm aluminized mylar was used for the windows which were grounded to serve as the cathode. The aluminized side of the mylar was placed to face the inside of the detector and was grounded by gluing the mylar to the IC ribs using double sided conducting tape. The mylar was glued to the exterior walls of the IC's using Clear RTV Silicone Adhesive Sealant.

The IC's were pressurized with 40 torr of Perfluropropane (C_3F_8) operating at a voltage of 150V.

The performance of the different NIMROD components is shown in various figures in another report[4] which describes the experiments we performed. In the various plots we see the exceptional performance of the various components of the detector system. The typical fast vs slow plot shown in figure 1 shows excellent pdt ^{3}He, ^{4}He resolution. Figure 2, the plot of ΔE(Si) vs E(CsI), shows the isotope separation achieved for the IMF's. The Be "hole" is clearly seen and there is, in fact, isotopic identification up to Z=10. Figure 5 shows the correlation of charged particle multiplicity with neutron multiplicity for the

47 MeV/u ^{64}Zn + ^{92}Mo system. We observe an evolution where neutron multiplicity increases faster than charged particle multiplicity for the low multiplicities implying that neutrons compete effectively with charged particle emission at low excitation energies. As the excitation energy increases as indicated by higher neutron multiplicities, the correlation of neutron multiplicity with charged particle multiplicity begins to flatten indicating that charged particle emission competes more effectively at higher excitation energies.

This combination of neutron information and the very complete charged particle information provided by the charged particle array provides a powerful tool for the wide variety of experiments envisioned for studying nuclear matter at the limits of stability.

References

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2. N. Marie *et. al.*, *Progress in Research*, 1997-1998, p V-19.
3. G. Prete, private communication.
4. T. Keutgen, *et. al.*, This report.