RMS FOCAL PLANE DETECTOR — POSITION SENSITIVE AVALANCHE COUNTER

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The Position Sensitive Avalanche Counter (PSAC) has performed well as the focal plane detector of the RMS. In order to improve the performance of the detector by smoothing the electric fields, the spacing of the wires in each plane has been reduced from 2 to 1 mm. Two adjacent wires feed each 2 μs tap of the 20 ns delay chips.

An interesting phenonomenon has been observed at highly localized count rates. As shown in the figure below, “Holes” appear in the position spectrum. The missing counts are believed to be caused by slow electron recovery of the gas in this localized area resulting in a lower signal strength. In most cases, although the anode signals remain above their 50 mV discriminator threshold, the position signals fall below their 10 mV discriminator threshold. If the high countrate is allowed to persist, the PSAC will spark causing a visible coating of material on the wires – most probably deposits of cracked isobutane by-products. The wires can be cleaned by rubbing with a soft sponge moistened with alcohol. The detector can then be reused with no loss in performance. In other efforts to correct for this phenomenon we have tried to run at different pressures (usual operating pressure is 3-4 Torr) and increased the gas flow in the detector. Different pressures did not appear to help although a higher gas-flow (doubled our previous rate) of approximately 0.45 Torr-liter-per-second has improved stability.

We are planning to try an Ar+CO_2 gas mixture which has been reported[4] to behave better under heavy bombardment. In addition, we have proposed to construct a large area micro-channel plate plus thin-foil detector system for high-counting rate applications.

References

[1] Oak Ridge Institute of Science and Education, Oak Ridge, TN.
[2] Oak Ridge National Laboratory, Oak Ridge, TN.
[3] Joint Institute for Heavy Ion Research, Oak Ridge, Tn.
[4] IEEE Proceedings, Toronto, 1998.

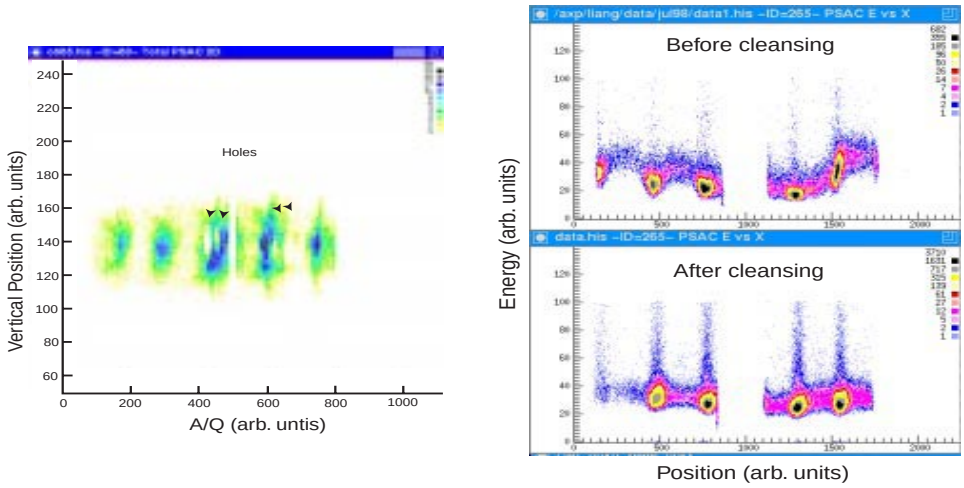

Figure 1: The two dimensional spectrum of the focal plane of the RMS with “holes” is on the left. Energy vs position spectra (taken with the Enge spectrometer) are on the left. Note the non-uniform energy gains as a function of position. Cleansing the wires can make these planes useable again.