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High Intensity Light Pulses for Photo-detector Testing

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Beamline(s): U3B

Introduction: The BRAHMS collaboration at RHIC used the visible photons from the VUV ring to test fast photo-multiplier tubes for saturation effects due to high rate and/or high intensity.

Methods and Materials: Two phototubes were mounted in the light-tight optical detector box on the U3B beamline . The first, used for calibration purposes, could tolerate instantaneous output currents of 100 mA and still produce charge outputs that were linear with the photon input. The second, a 3/4 inch diameter Hamamatsu H610 tube used extensively in BRAHMS, had a 5% non-linearity in its output response for output currents of 8 mA. Since the manufacturer did not measure the width of the input signal, the 150 picosecond wide input from the light source was the closest we could find to the actual signal experienced by the H610 under running conditions at RHIC. The VUV ring's intensity was reduced to 1 bunch at about 20 milli-amps and the beam was heavily filtered with neutral density filters to vary the beam intensity.

Conclusions: The 5.8MHz repetition rate was higher than desired, but a chopper wheel was used to reduce the average rate. However, the slow chopper used still gave too much average power. Future uses of this beam might want to add faster chopping or shuttering capability to remove the 5.8 MHz limitation on the pulse trains obtained with the chopper.