NPS Calorimeter Prototype current status

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1 Prototype construction

The Prototype was assembled by the middle of July, just before Arshak's leave. It was checked for light tightness, both with photodiode and PMT inside. A few light leaks were found and stopped.

This assembling is for testing purposes, just to check possible problems. It includes copper box, the GMS splitter, a plate to hold curing LEDs and GMS fiber outputs, 9 wrapped SICCAS crystals, PMTs and dividers per crystal, cabling and various support structures. In this test assembly only 4 curing LEDs are mounted. PMTs and crystals are in dry contact (no grease). Nor the PMTs are μ-metal shielded.

The assembly was checked with light from LED fed into the splitter. PMT signals in all the channels were observed on a scope.

2 Crystal radiation and tests

The $3\times3\times16$ cm^3 crystal was radiated by an additional 122 krad dose. Transmittance measurements in transverse direction have been conducted at 20 points as previously, at distances ranging from 2 mm to 150 mm from the radiated edge (Fig. 1). Significant point-to-point variation was seen (Fig. 2).

Comparisons with measurements before radiation are in progress (Figs. 3 and 4).

3 Accuracy of transmittance measurements

A series of measurements are in progress in order to estimate uncertainties on the measured transmittances. Scans of transmittance are taken at same

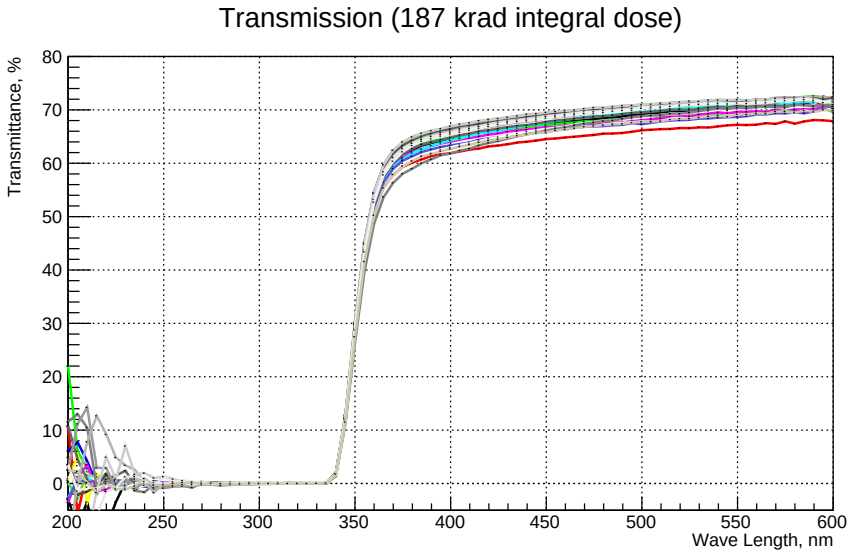

Figure 1: Transmittance of the crystal after 187 krad accumulated dose of radiation, as measured at different distances from the radiated end, in transverse direction.

point several times, and mean values and RMS values from distributions are evaluated. Each measurement includes positioning of the crystal before light beam, measurement of background signal from PMT, a reference scan (crystal moved out) and a sample scan (crystal in). Snapshots of analyses are shown in figs. 5 and 6.

4 Plans for 2 weeks ahead:

1. Finalize transmittance accuracy estimates;
2. Repeat transmittance measurements at a longitudinal position consistent with measurements before radiation and after 65 krad radiation;
3. If decided switch to radiation tests with a SICCAS crystal, then:
   - Measure transmittance of SICCAS 01 crystal in transverse and longitudinal directions;
   - Give it to RadCon for 100 krad dose radiation.

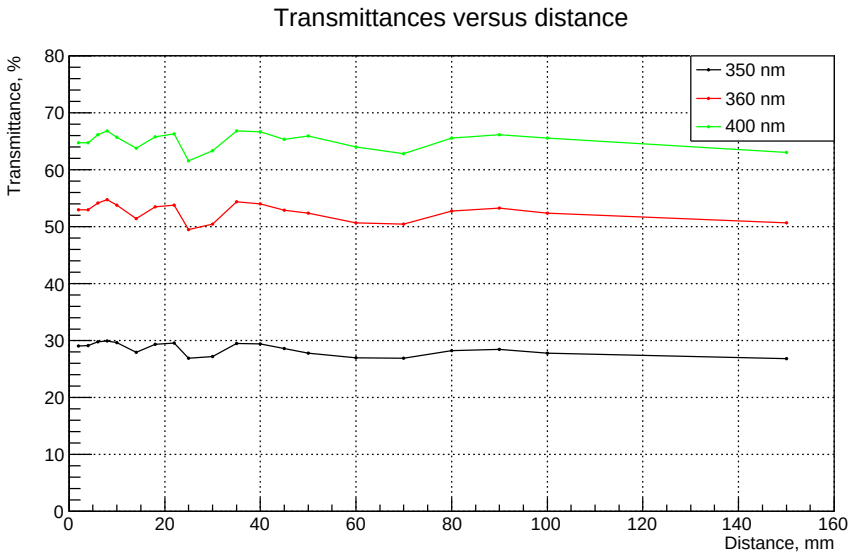

Figure 2: Transmittance of the crystal after 187 krad accumulated radiation dose versus distance from the radiated edge, as measured with light of different wavelengths.

4. Prepare and start Prototype cosmic tests.

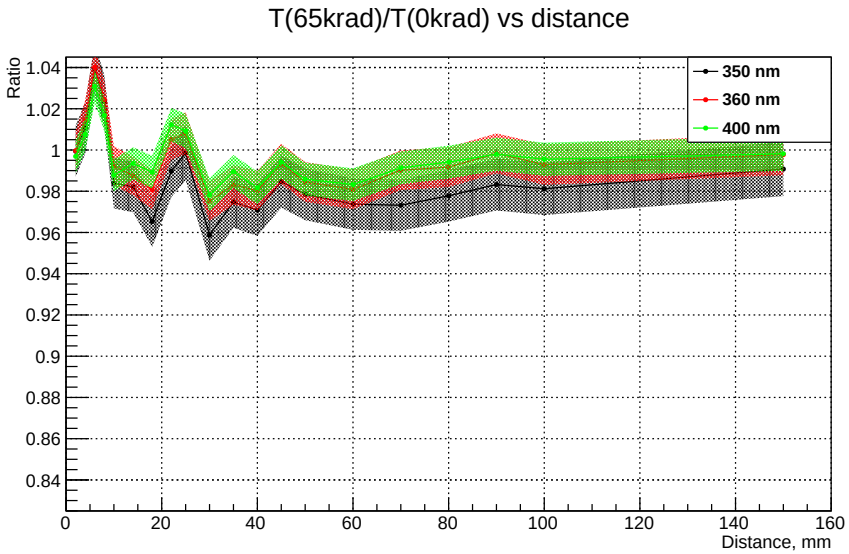

Figure 3: Ratio of transmittances after 65 krad radiation and before radiation. Note: the error bands are not final yet.

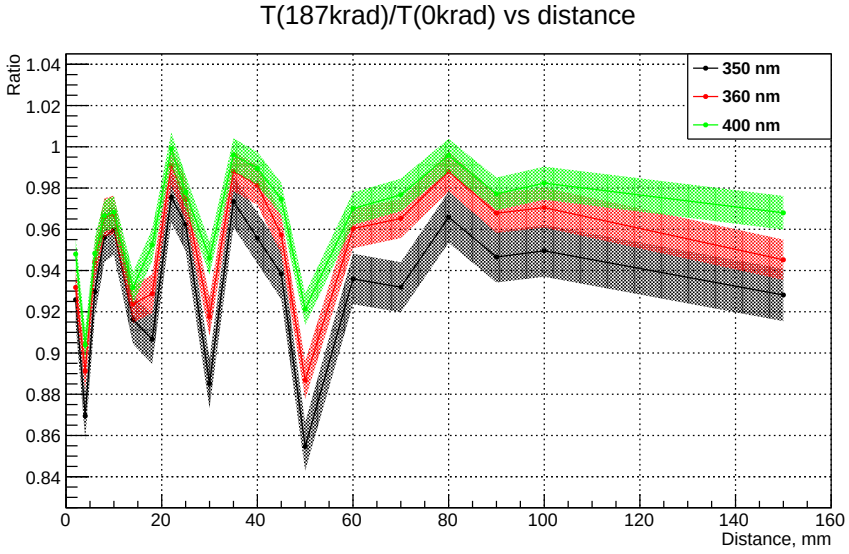

Figure 4: Ratio of transmittances after 187 krad integral radiation and before radiation. Note: the data are not final yet.

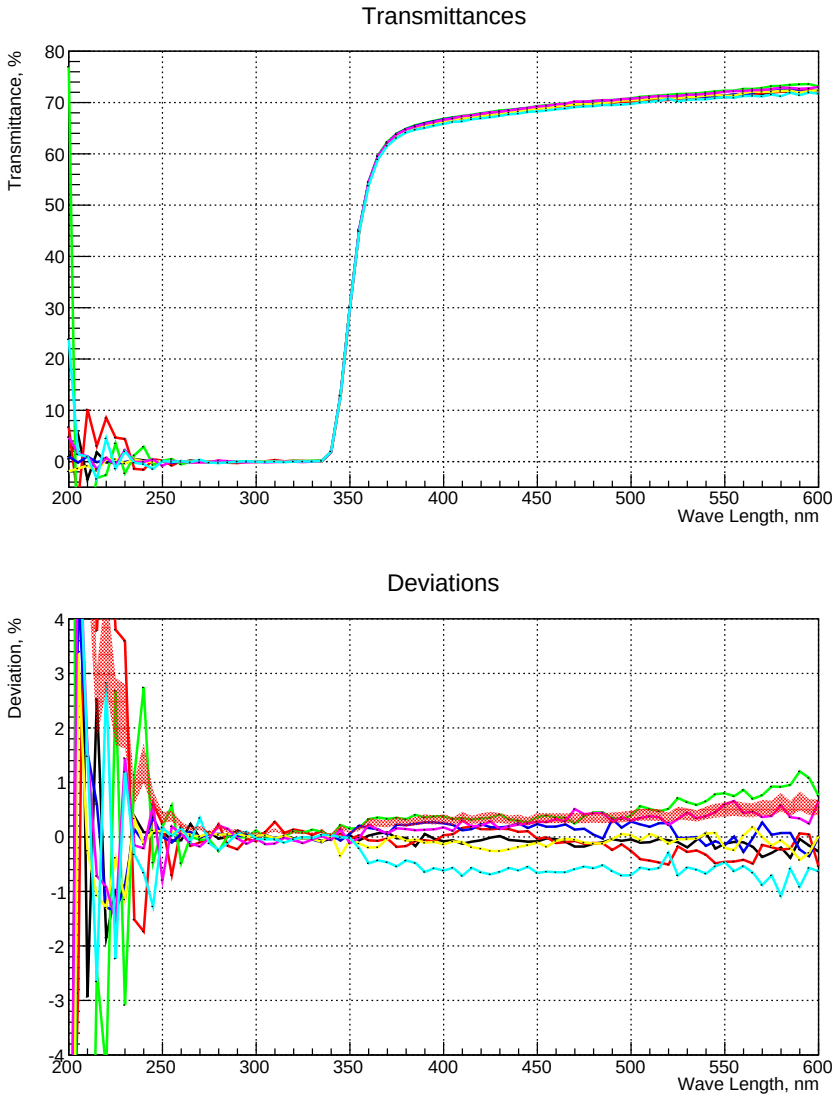

Figure 5: Top: Transmittance of the crystal at 10 mm from edge, measured several times. Bottom: Deviations of the measured transmittances from mean value (solid lines). The red shaded area denotes RMS of distribution of the measured transmittances and uncertainty on it ("error of error").

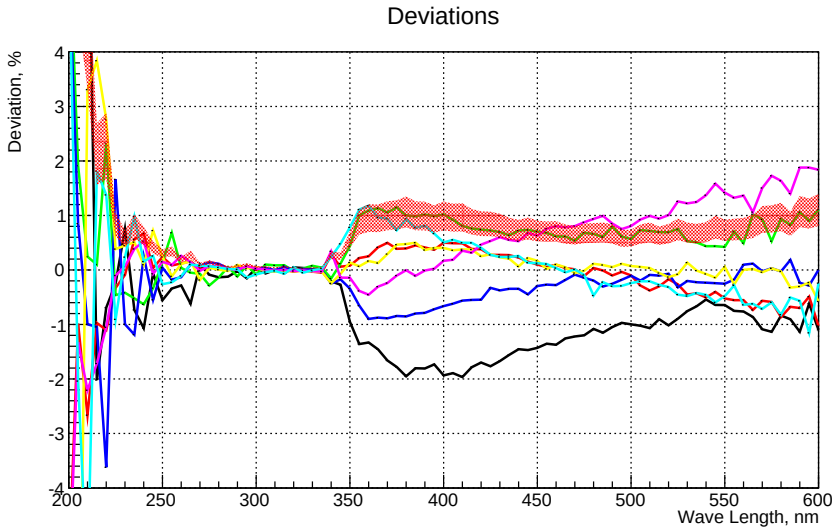

Figure 6: Same as in fig. 5, bottom panel, but for distance of 50 mm from the edge of crystal.