

NPS Calorimeter Prototype

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1 Cristal radiation and tests

1. Transmittance measurements of the 3 small PbWO crystals after 60 krad aggregate radiation revealed no sign of degradation. The small crystals were merely ~ 1.5 cm thick, thus it was difficult to detect radiation damage effects. Hence decided to switch to a bigger crystal.
2. A $3 \times 3 \times 18$ cm³ crystal was radiated from one end (longitudinally), for 64 krad (Fig. 1). Measured transmittance in transverse direction, through 3 cm thickness, at a number of points from 2 mm to 150 mm distance from the radiated end. Found no change above the measurement errors (Fig. 2). Gave the crystal to RadCon for another 100 krad to radiate.

<u>Dose Goal(R)</u>	<u>Dose Rate(R/HR)</u>	<u>Current Dose(R)</u>	<u>Time Remaining</u>	
60000	257	64181.467	0:00:00	
	Dose Remaining:	0.000		
<u>Start Time</u>	<u>Stop Time</u>	<u>Time Lapse</u>	<u>Total Time</u>	<u>Dose</u>
6/13/14 15:54	6/17/14 14:21	94:27:00	94:27:00	24273.650
6/17/14 14:28	6/18/14 12:22	21:54:00	116:21:00	29901.950
6/18/14 14:40	6/19/14 9:11	18:31:00	134:52:00	34660.733
6/19/14 10:18	6/19/14 14:13	3:55:00	138:47:00	35667.317
6/19/14 16:08	6/20/14 12:11	20:03:00	158:50:00	40820.167
6/20/14 15:22	6/24/14 10:16	90:54:00	249:44:00	64181.467

Figure 1: Exempt from RadCon sheet on the crystal radiation.

2 Prototype construction

1. Wrapped 10 SICCAS crystals in 25 μ m aluminized Mylar and black Tedlar films (Fig 3).

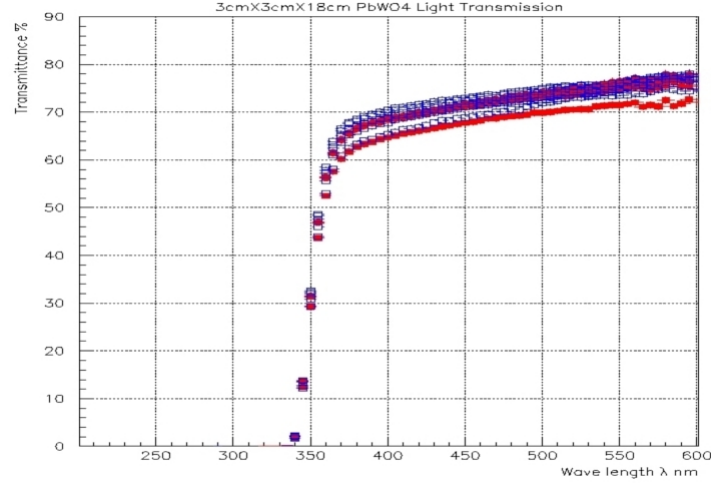


Figure 2: Transmittance of $3 \times 3 \times 18 \text{ cm}^3$ PbWO crystal before (red filled symbols) and after (blue hollow symbols) 64 krad radiation, measured at different distances from the radiated end of crystal.

2. Practiced on assembling of optical splitter for the GMS system from $125 \mu\text{m}$ fibers and a 1 mm ST type fiber connector (Fig 4). Made 3 versions. The channel-to-channel uniformity of light output and attenuation is tested in black box with blue and green LEDs. For the 2 first versions, the channel-to channel difference was up to ~ 10 times. For the 1-st version, average signal attenuation per channel was 163 times (22 dB) for green light, and 608 times (28 dB) for blue light (measured with Hamamatsu R4125 PMT).

The 2-nd splitter was measured with blue light. Per channel attenuation was 376 times (26 dB) when measured with PMT, and 248 times (24 dB) with photodiode.

In the last, 3-rd version channel-to-channel variation is ~ 5 times.

3. Various details of the assembly have been machined.
4. A test assembling is in progress ... (Fig. 5).

3 Current plans:

1. Measure transmittance of the 18 cm crystal after 100 krad radiation;



Figure 3: Wripped SICCAS crystal.

2. Check light tightness of the Prototype box (with photodiode inside);
3. Make a preliminary assembly of the Prototype;
4. Test the Prototype assembly by operating GMS, also with cosmics.



Figure 4: The latest variant of splitter.



Figure 5: Preliminary assembling of the Prototype.