
Investigation on the Light Output Stability for Mu2e Undoped CsI Crystals

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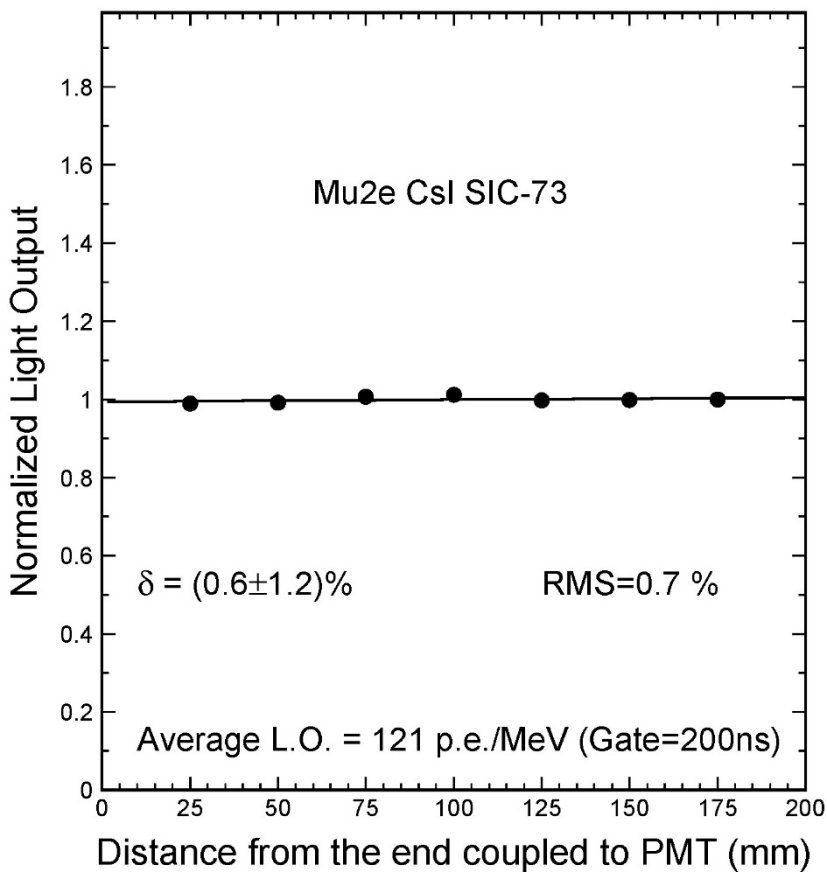
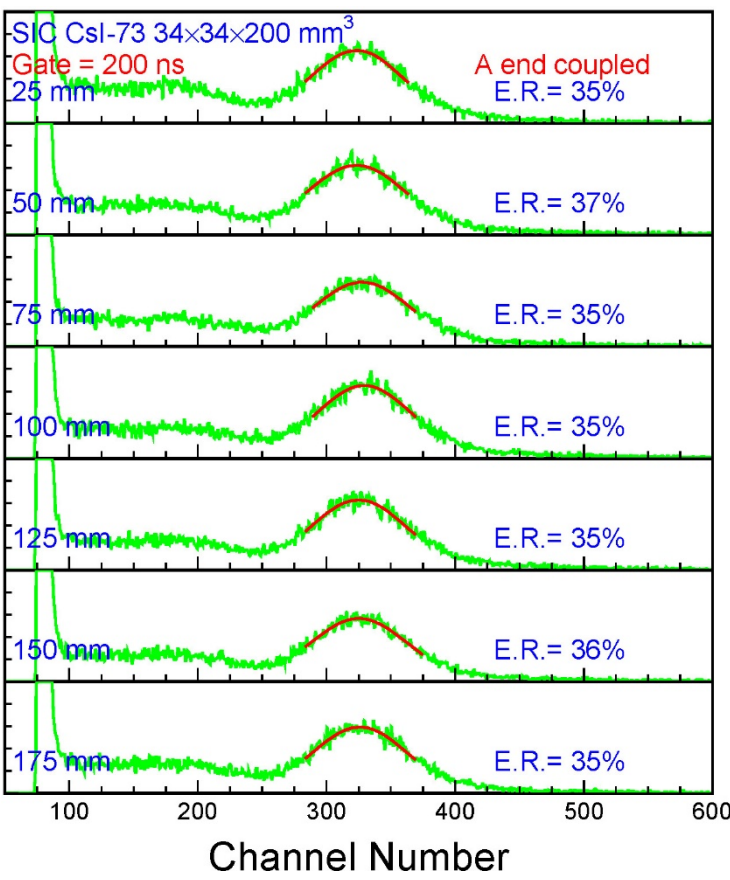
California Institute of Technology

December 12, 2018

Measured on
10/15/18

Undoped CsI Crystal C0073

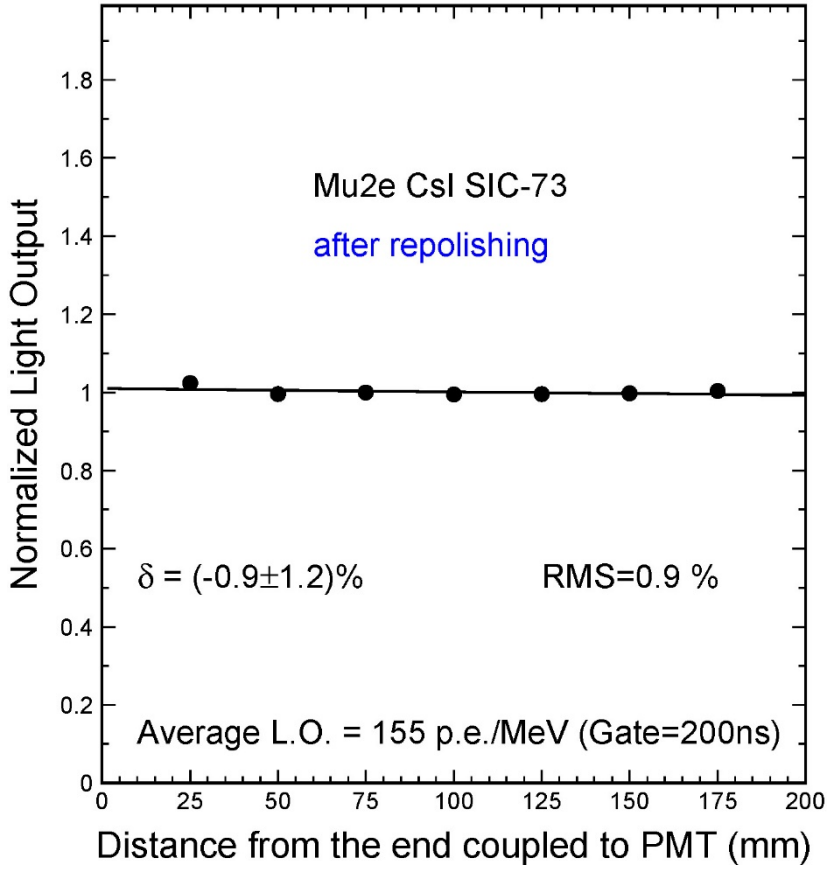
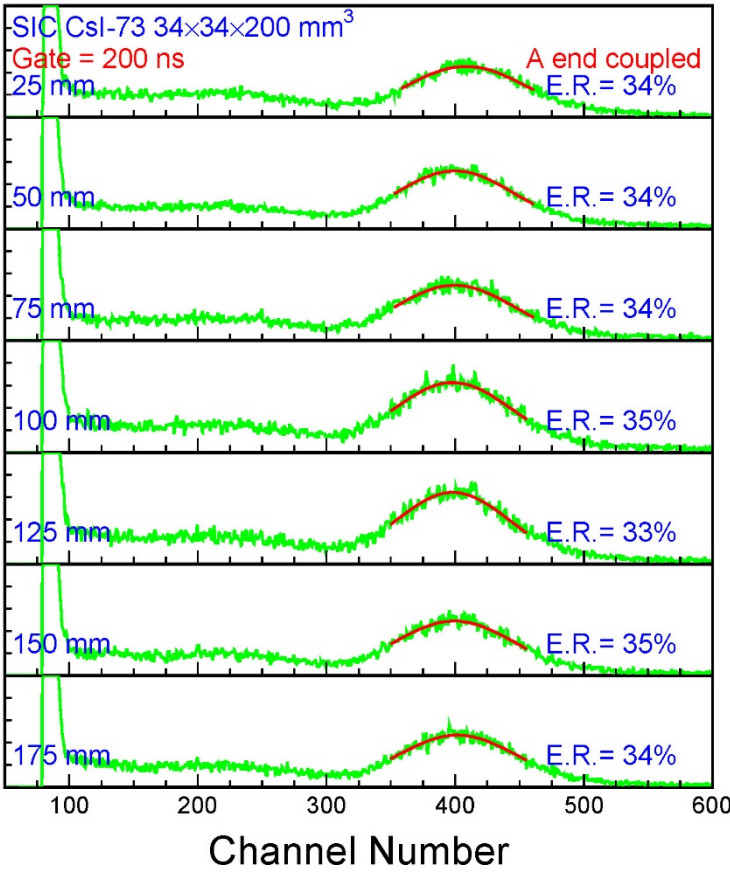
Crystal ID	Batch Number	Coupling end	L.O. (p.e./MeV)	E.R. (%)	F/T (%)	LRU (%)
C0073	SIC-2016a21	A	121	35	94	0.7



Measured on
11/27/18
after re-polishing

Undoped CsI Crystal C0073

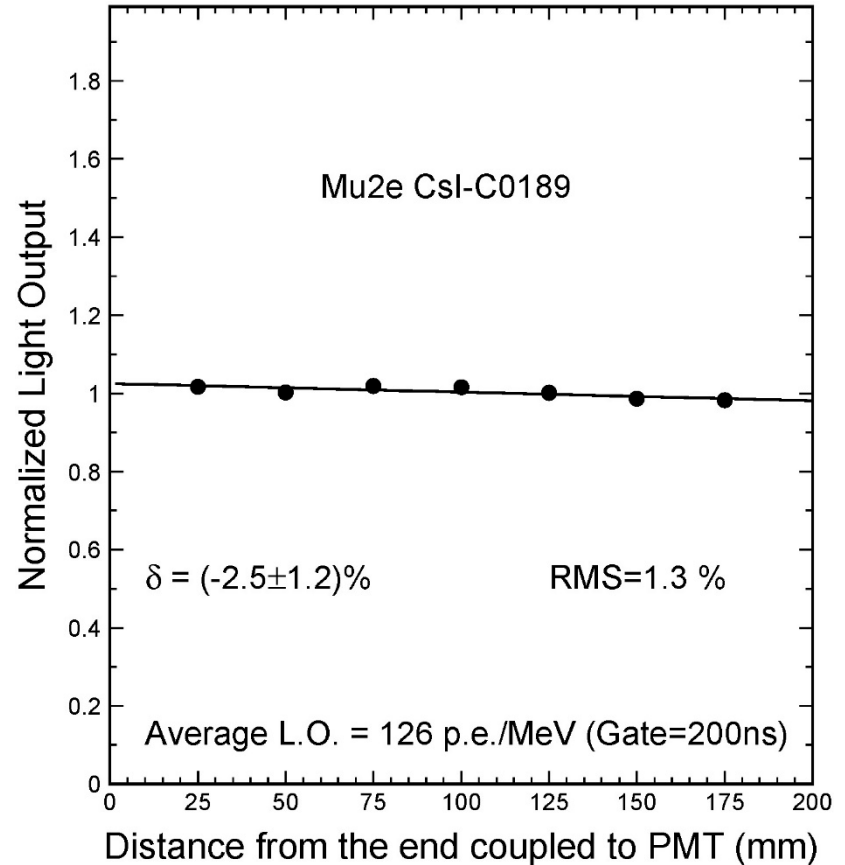
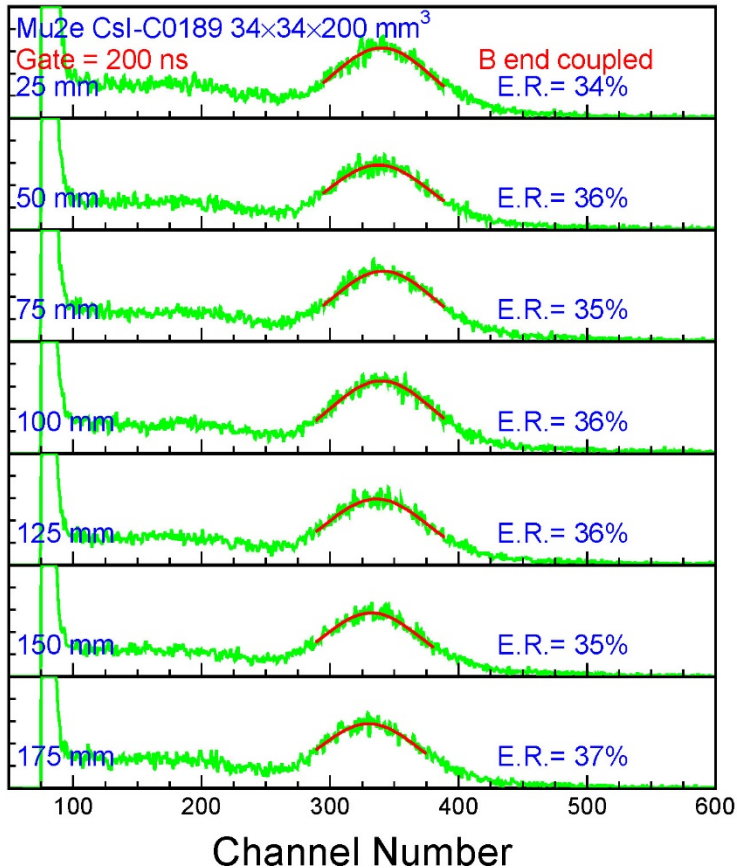
Crystal ID	Batch Number	Coupling end	L.O. (p.e./MeV)	E.R. (%)	F/T (%)	LRU (%)
C0073	SIC-2016a21	A	155	34	93	0.9



Measured
on 10/12/18

Undoped CsI Crystal C0189

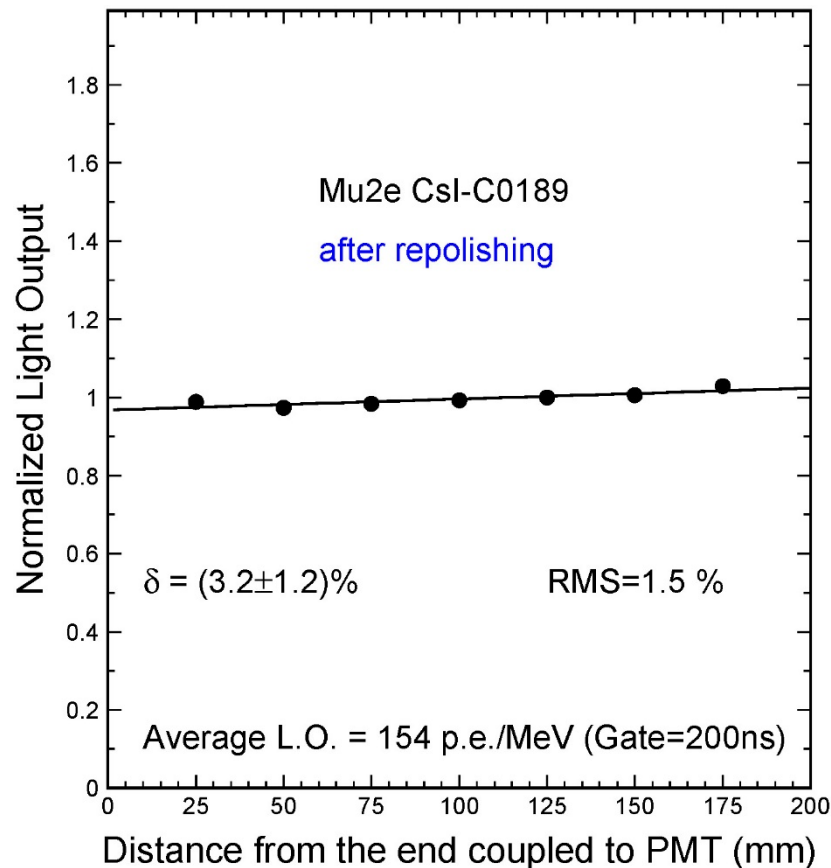
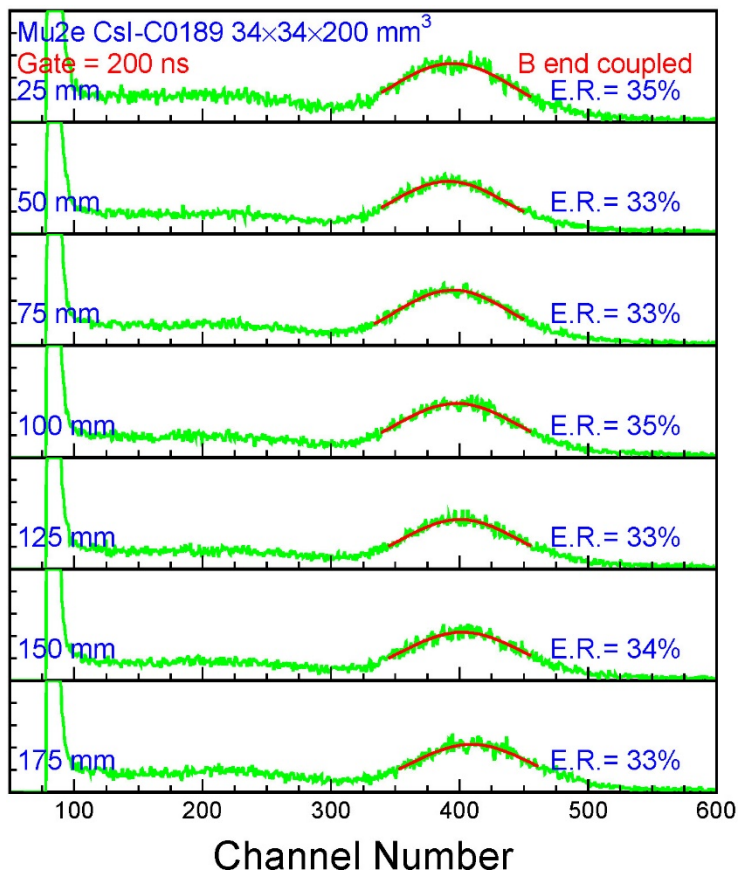
Crystal ID	Batch Number	Coupling end	L.O. (p.e./MeV)	E.R. (%)	F/T (%)	LRU (%)
C0189	SIC-039	B	126	36	90	1.3



Measured on
11/27/18
after re-polishing

Undoped CsI Crystal C0189

Crystal ID	Batch Number	Coupling end	L.O. (p.e./MeV)	E.R. (%)	F/T (%)	LRU (%)
C0189	SIC-039	B	154	34	89	1.5



Summary for Mu2e Undoped CsI Crystals

Crystal ID	Batch Number	Coupling end	L.O. (p.e./MeV)	E.R. (%)	F/T (%)	LRU (%)	Date	Comment
C0060	SG-A11804	A	136	35	98	2.0	1/4/17	
			97	34	99	2.5	4/19/17	100 krad IR
			98	35	98	2.3	1/5/18	
			96	35	97	2.8	7/25/18	
C0073	SIC-2016a21	A	176	32	95	0.7	1/2/17	
			146	34	94	1.1	9/11/18	Hygroscopic?
			119	36	91	0.9	9/21/18	1st handling
			121	35	94	0.7	10/15/18	2nd handling
			155 (+28%)	34	93	0.9	11/27/18	after repolishing
C0137	SG-A13298	A	110	36	97	2.0	9/26/18	1st handling
			111	36	97	2.7	10/12/18	2nd handling
C0189	SIC-039	B	126	36	90	1.3	10/12/18	1st handling
			154 (+22%)	34	89	1.5	11/27/18	after repolishing

Summary

- Significant lower light output was observed in Mu2e CsI crystals after the 1st handling, but not the 2nd handling.
- Two crystals were sent back to SIC for re-polishing. About 25% improvement in light output is observed, which seems due to improved light collection efficiency via total reflection. Care should be taken in handling.
- Light output of CsI-C0073 after re-polishing is still lower than as-received, indicating possible additional degradation during the 1 year storage at Caltech.
- Re-polishing two S-G CsI crystals would tell us if this is vendor dependent.