# Three CsI Reference Crystals


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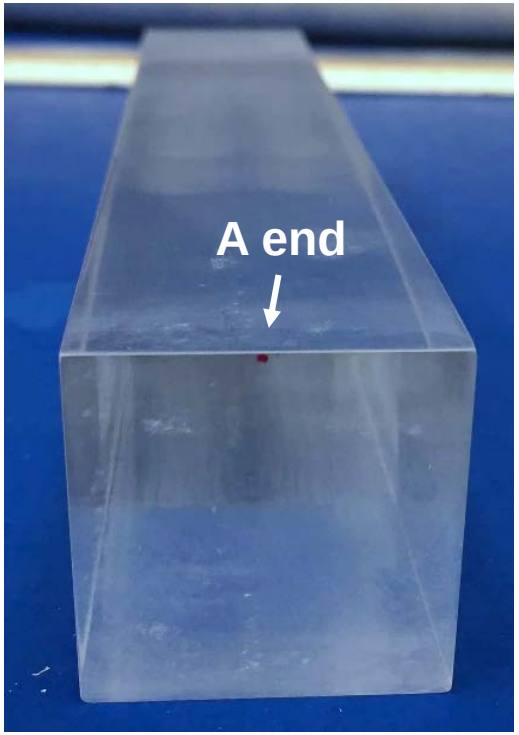
# Introduction

- Mu2e specification for CsI crystals was defined in early August. A total of 72 crystals from three vendors were characterized at Fermilab, Frascati and Caltech.
- Three additional reference crystals one each from Amcrys, Saint-Gobain and SICCAS are also characterized at Caltech.
- Reported today is the QA result for three reference samples.

# References from Three Vendors

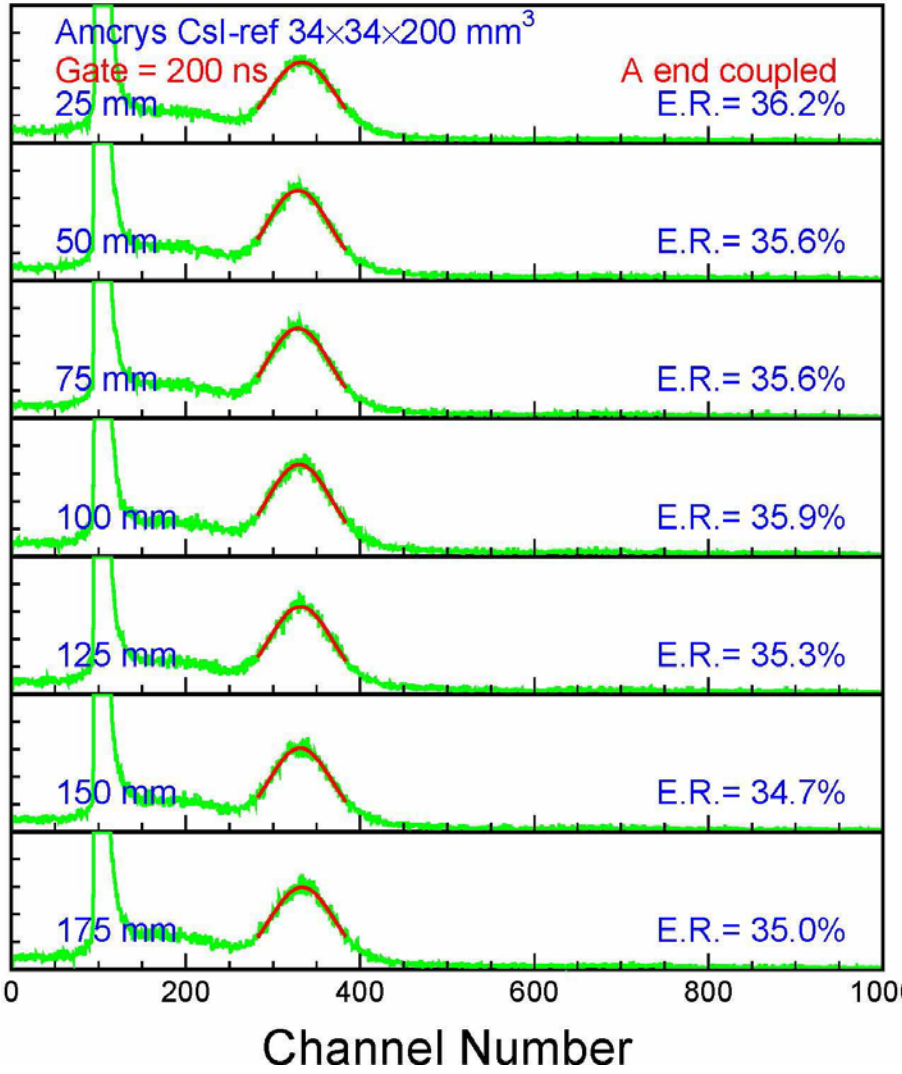



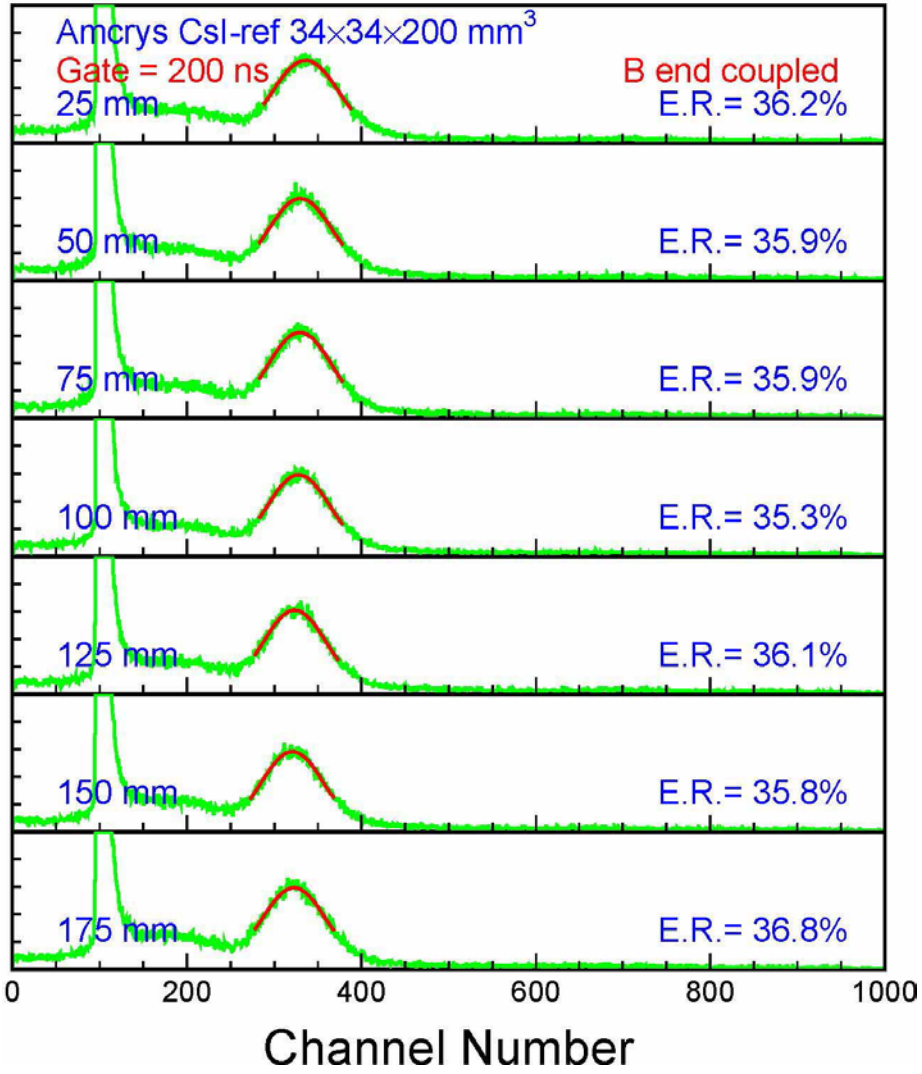

| ID | Dimension ($mm^3$) | Polishing |
|---|---|---|
| Amcrys CsI-ref | 34×34×200 | All faces |
| Saint-Gobain CsI-ref | 34×34×200 | All faces |
| SIC CsI-ref | 34×34×200 | All faces |

Properties measured at room temperature : PHS, LO & decay kinetics

# PHS Amcrys CsI-ref: 200 ns

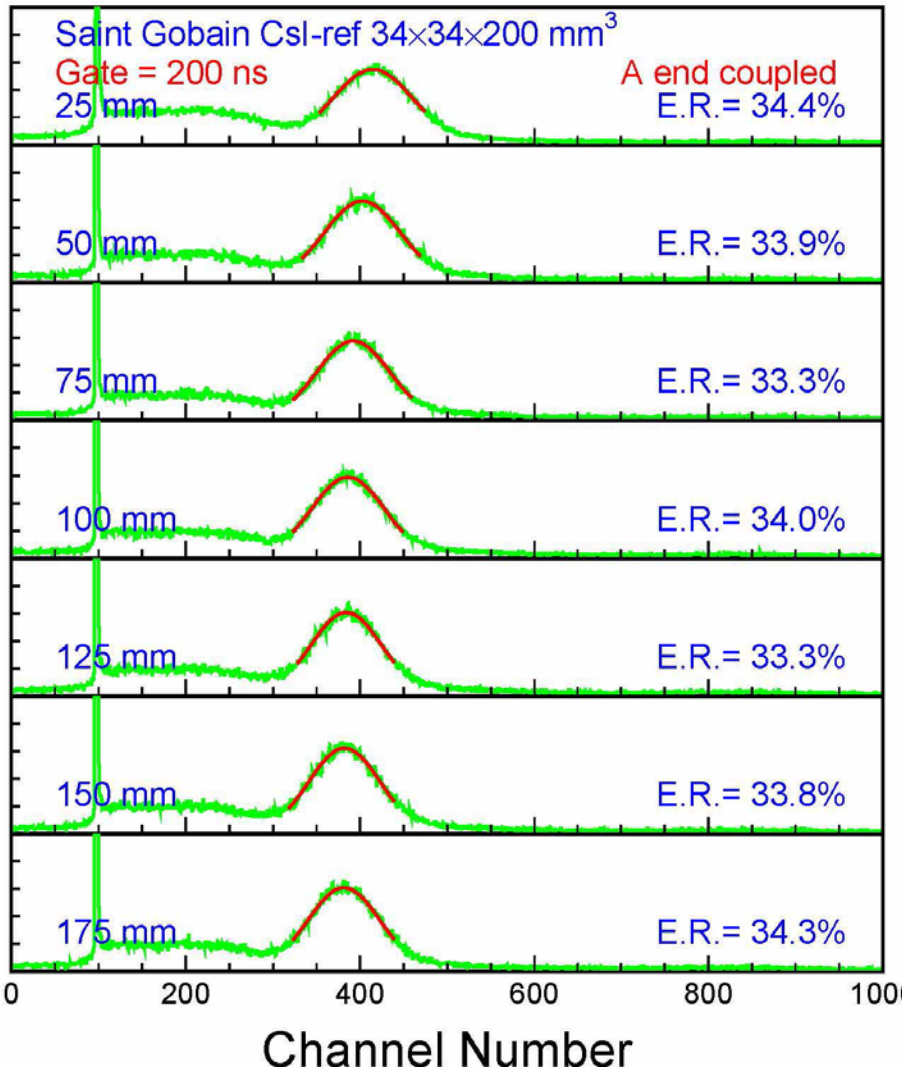
Excellent energy resolution and uniformity

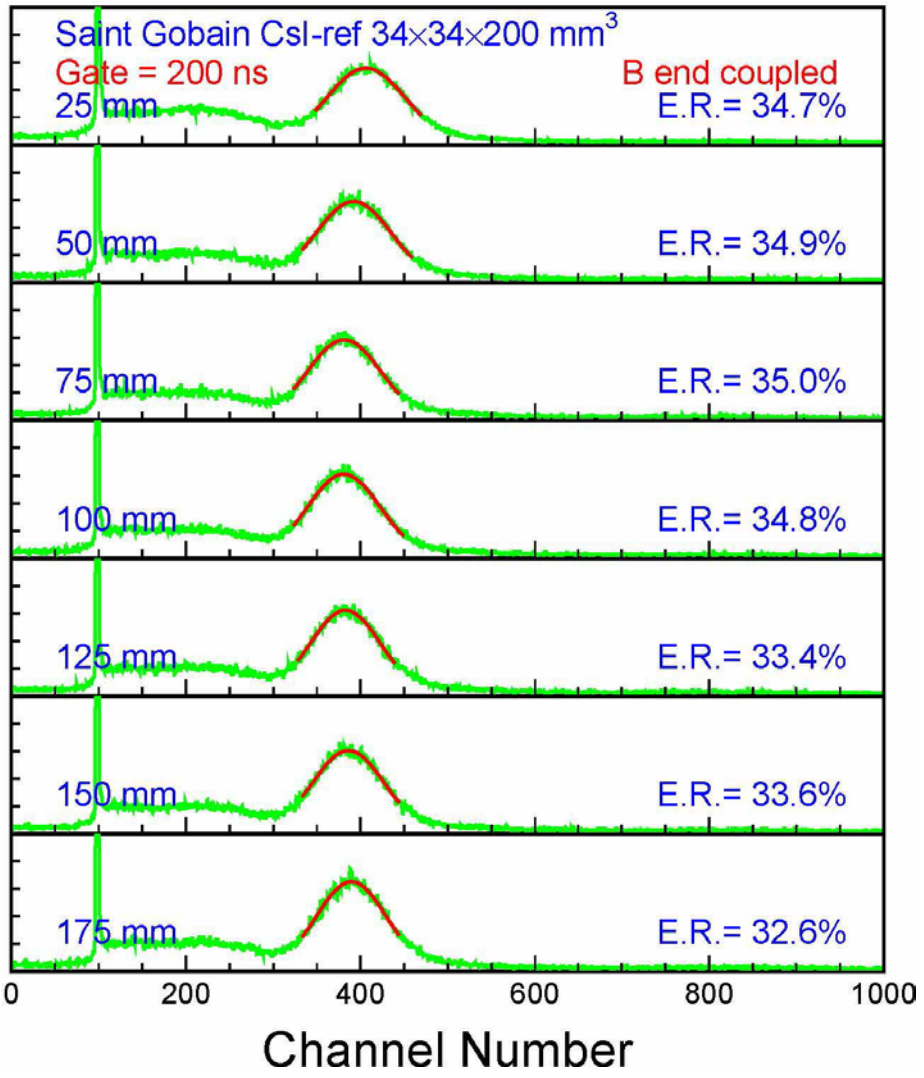


# PHS Saint-Gobain CsI-ref: 200 ns

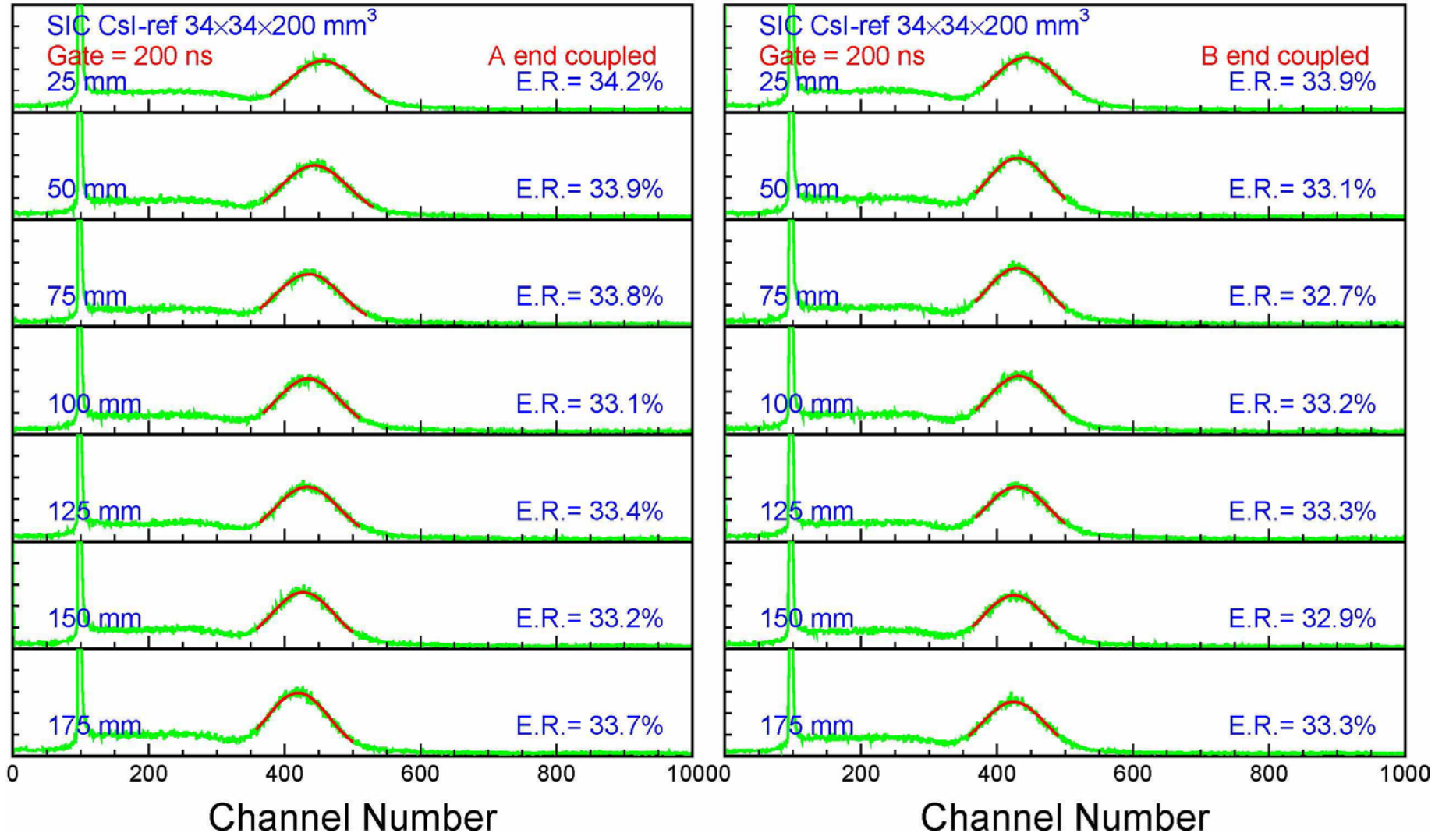
Excellent energy resolution and uniformity



# PHS SIC CsI-ref: 200 ns

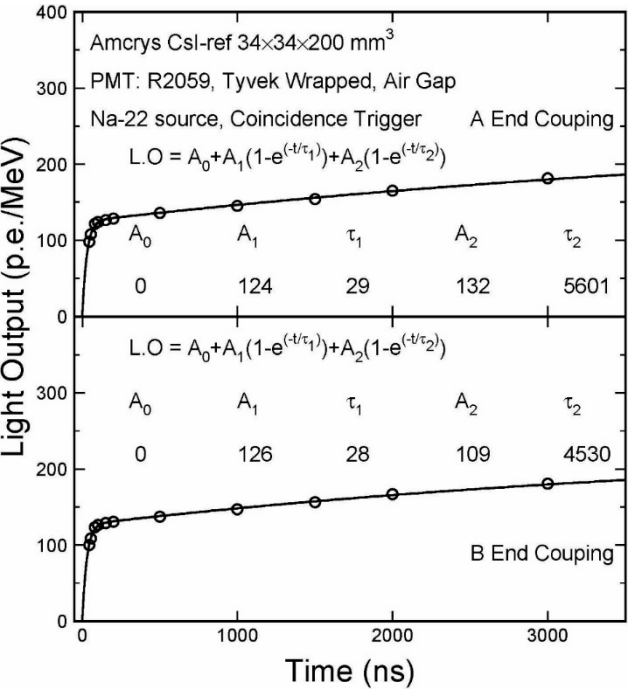
Excellent energy resolution and uniformity

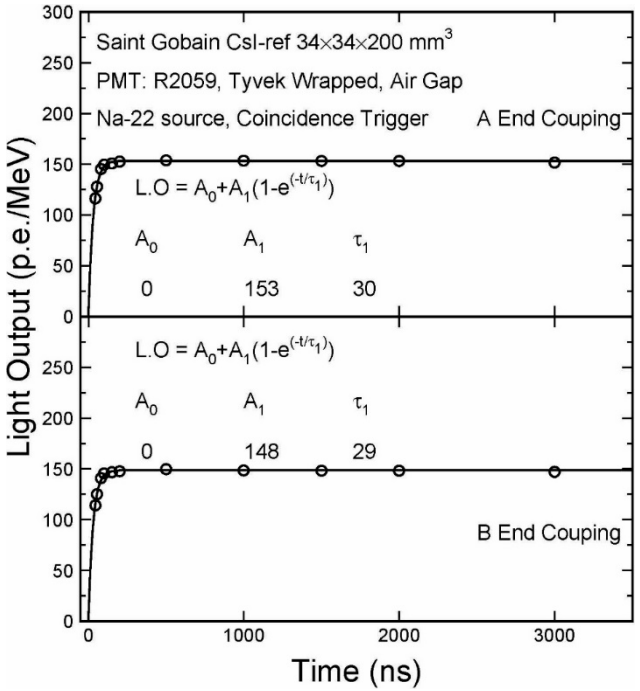


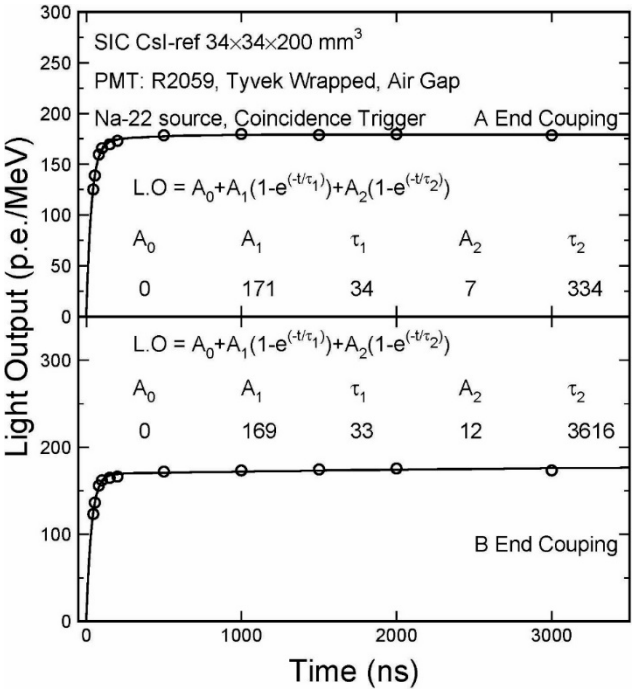
# LO and Decay Kinetics

## Measured at 25 mm from the PMT

Significant slow component observed in Amcrys CsI-ref

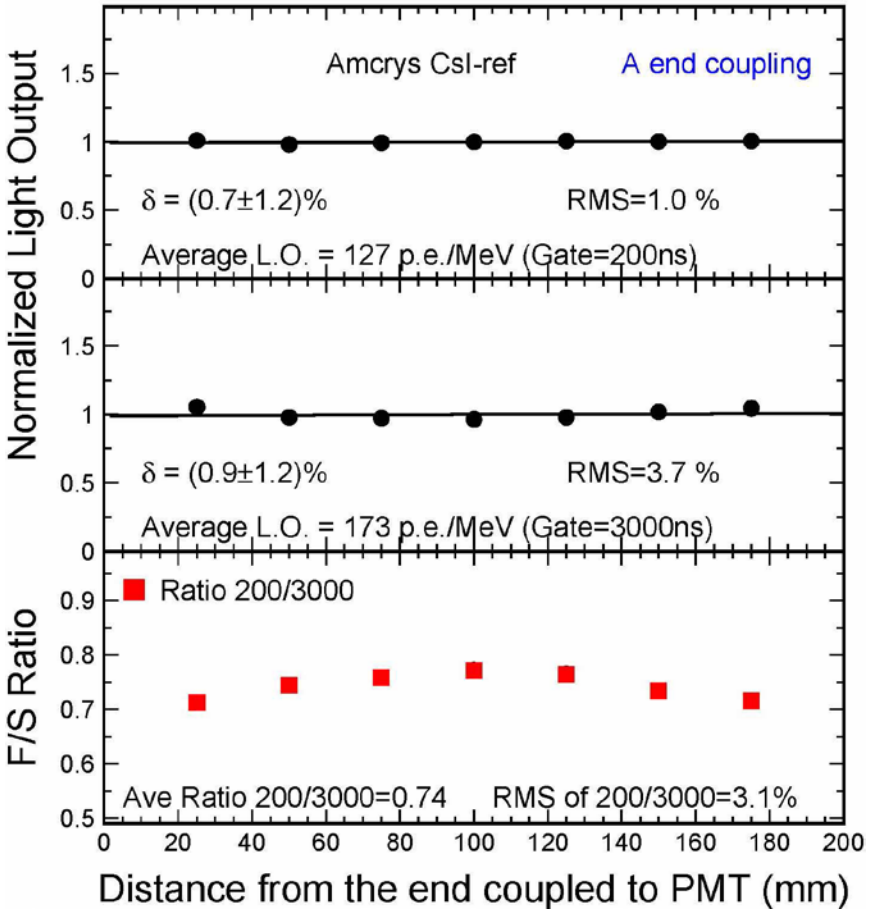


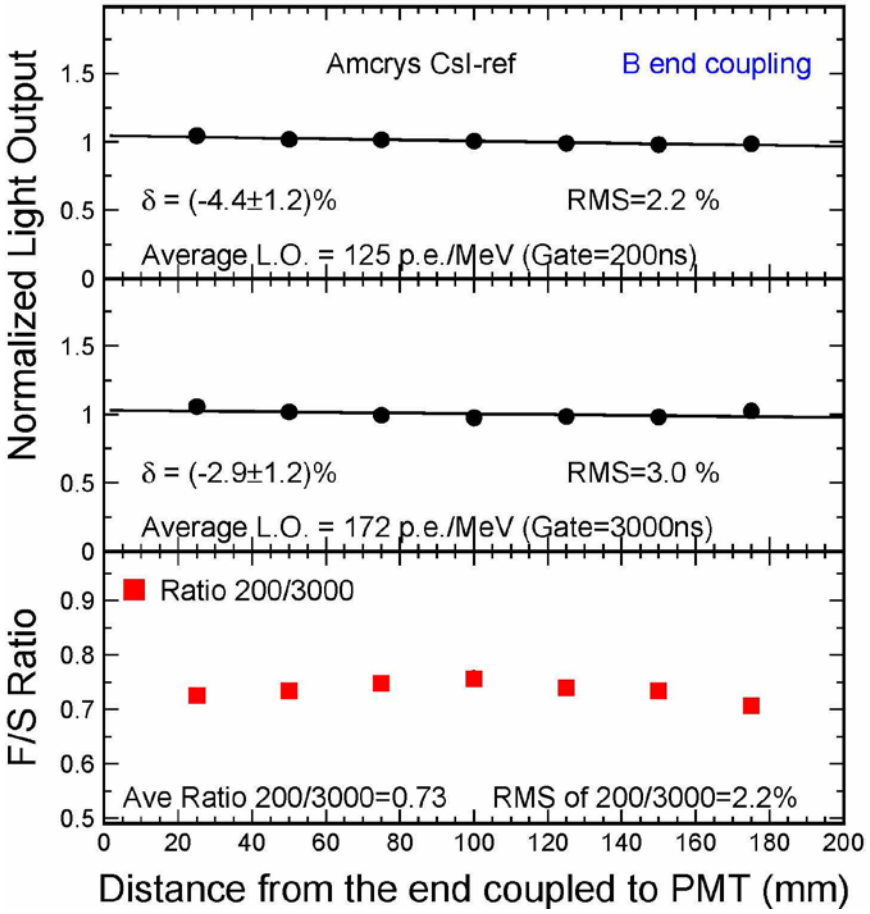



# Light Response Uniformity
# Amcrys CsI-ref

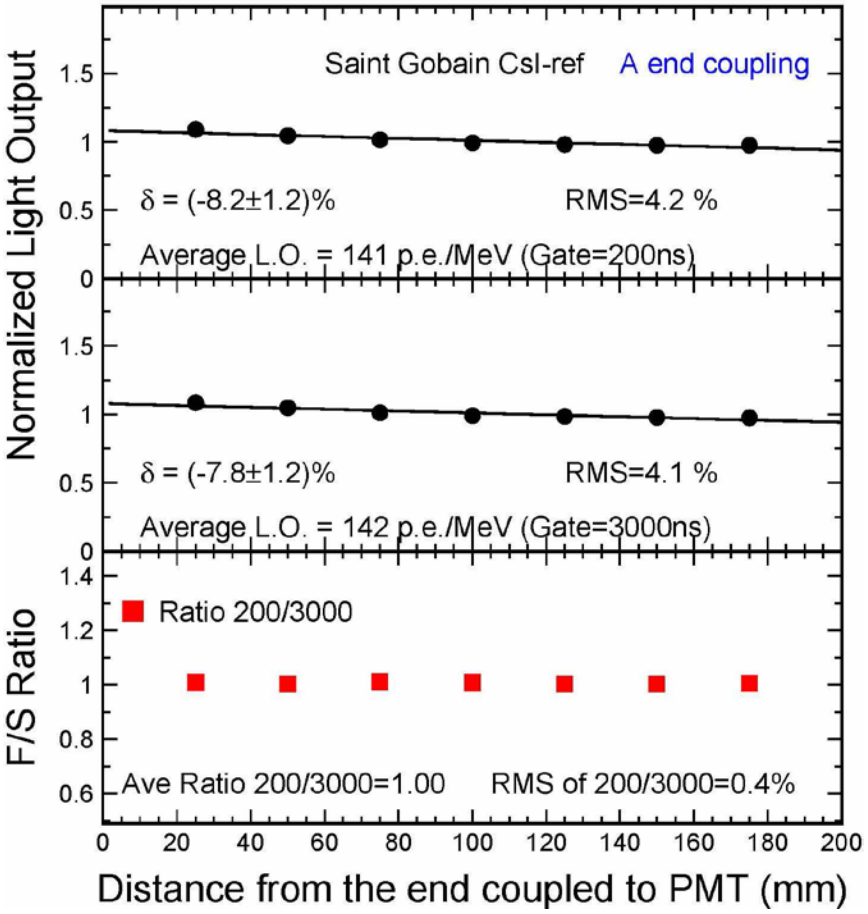
Excellent light response uniformity and poor F/T ratio

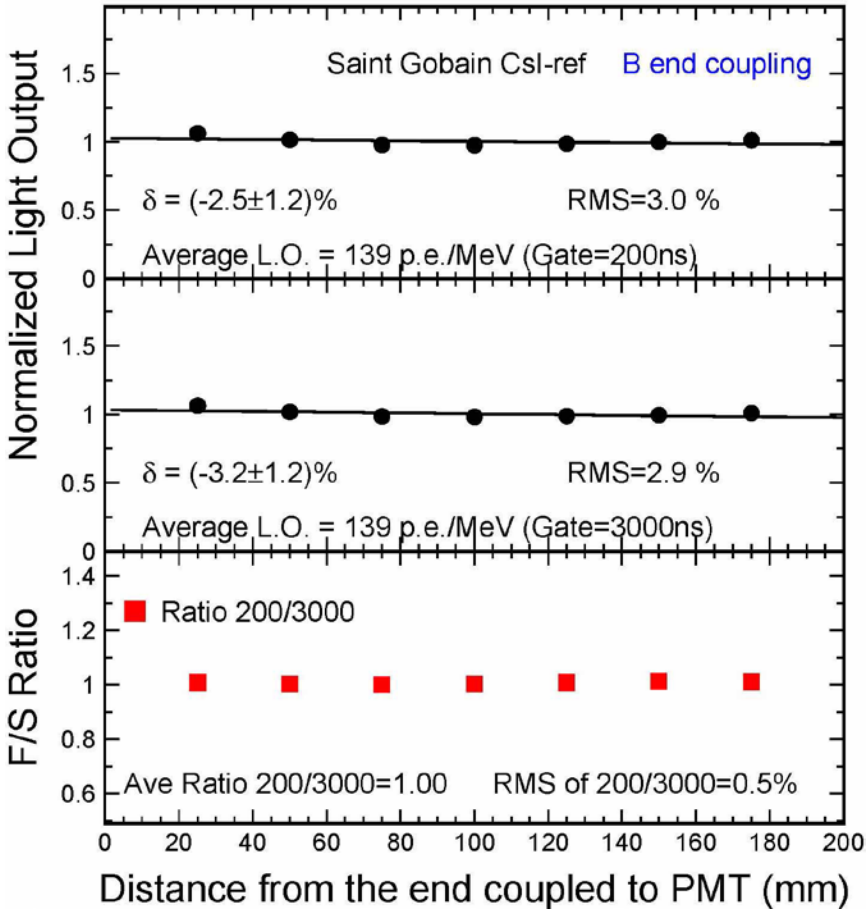


# Light Response Uniformity
# Saint Gobain CsI-ref

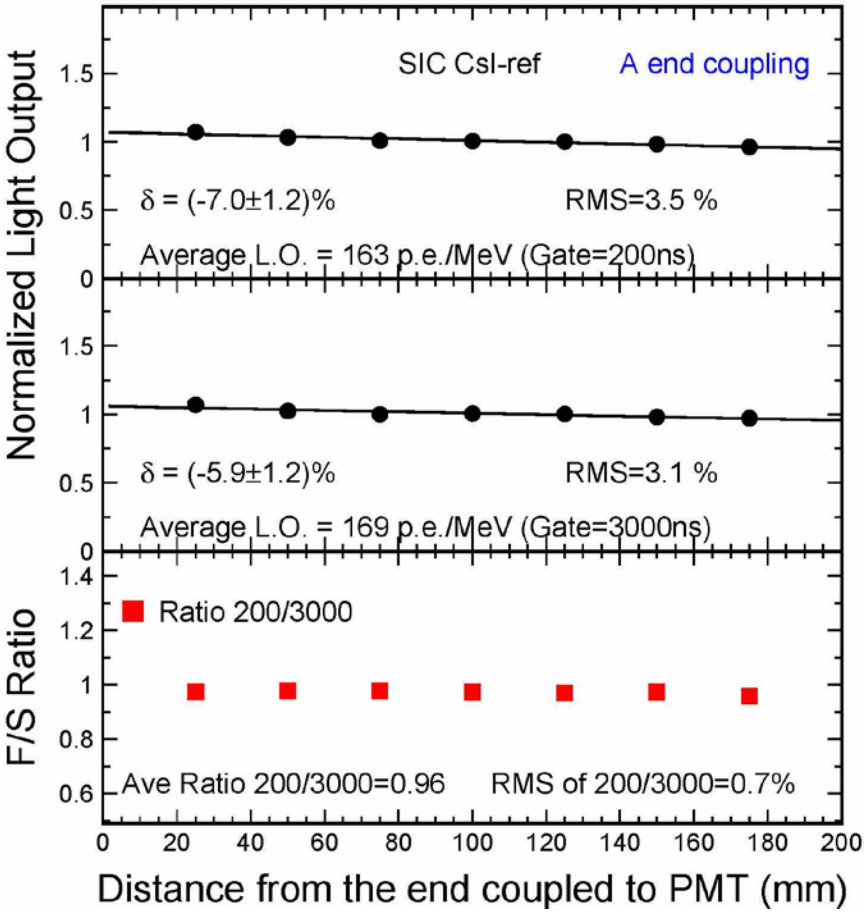
Excellent light response uniformity and F/T ratio

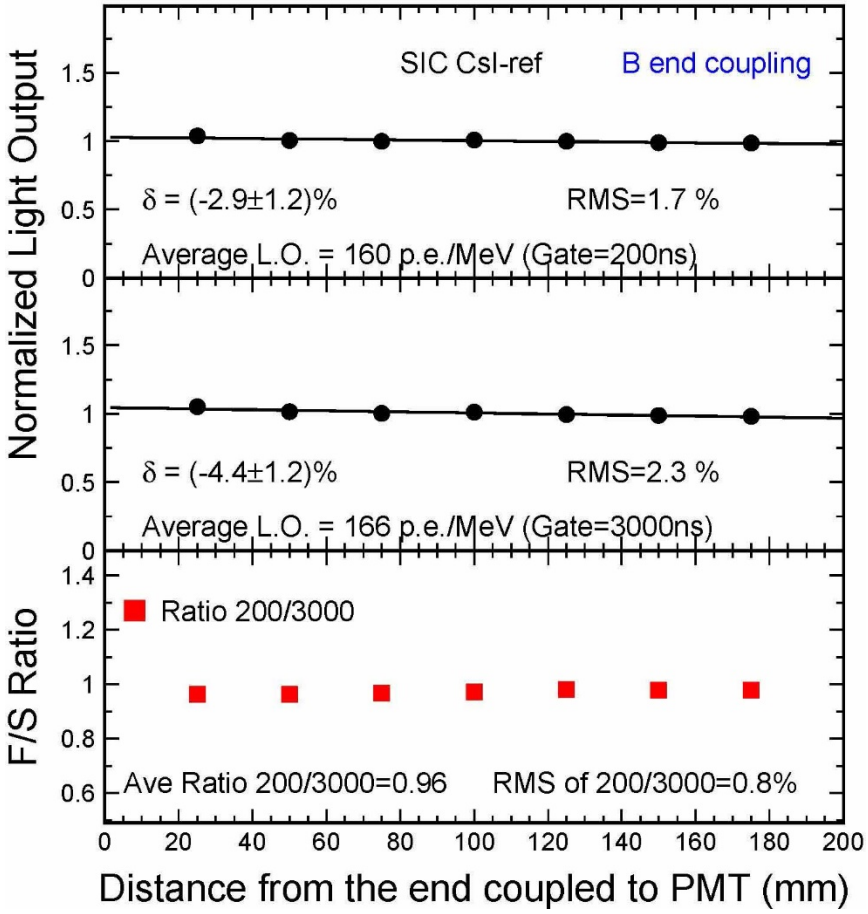


# Light Response Uniformity SIC CsI-ref

Excellent light response uniformity and F/T ratio



# Reference Samples from 3 Vendors

| ID | Dimension ($mm^3$) | Coupling end | Basic Scintillation Performance ($^{22}$Na γ source placed at 25 mm from coupling end) | | | | | | Light Response Uniformity (Ave and RMS/Ave) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 200 ns ER (%) | 200 ns LO (p.e./MeV) | 3000 ns LO (p.e./MeV) | LO(200)/ LO(3000) | Fit LO F+S (p.e./MeV) | Decay (ns) | LO (200) | LO (3000) | LO(200)/ LO(3000) |
| Amcrys CsI-ref | 34×34×200 | A | 36.2 | 129 | 181 | **71.3%** | 124+132 | 29/ 5601 | 127 (1.0%) | 173 (3.7%) | 0.74 (3.1%) |
| | | B | 36.2 | 131 | 181 | **72.4%** | 126+109 | 28/ 4530 | 125 (2.2%) | 172 (3.0%) | 0.73 (2.2%) |
| Saint Gobain CsI-ref | 34×34×200 | A | 34.4 | 152 | 153 | 99.3% | 153 | 30 | 141 (4.2%) | 142 (4.1%) | 1.00 (0.4%) |
| | | B | 34.7 | 148 | 148 | 100% | 148 | 29 | 139 (3.0%) | 139 (2.9%) | 1.00 (0.5%) |
| SIC CsI-ref | 34×34×200 | A | 34.2 | 173 | 179 | 96.6% | 171+7 | 34/ 334 | 163 (3.5%) | 169 (3.1%) | 0.96 (0.7%) |
| | | B | 33.9 | 166 | 173 | 96.0% | 169+12 | 33/ 3616 | 160 (1.7%) | 166 (2.3%) | 0.96 (0.8%) |
| Specification | | | **<45** | **>100** | | **>75** | | | **<5%** | | |

# Summary

- Three reference CsI crystals show performance much better than the specifications with only one issue in the F/T ratio for the Amcrys reference sample.

- The Saint-Gobain and SIC references have already been shipped back. The Amcrys reference is on the way back today.