Result of 36 2021BTL LYSO Bars before Hadron Irradiation

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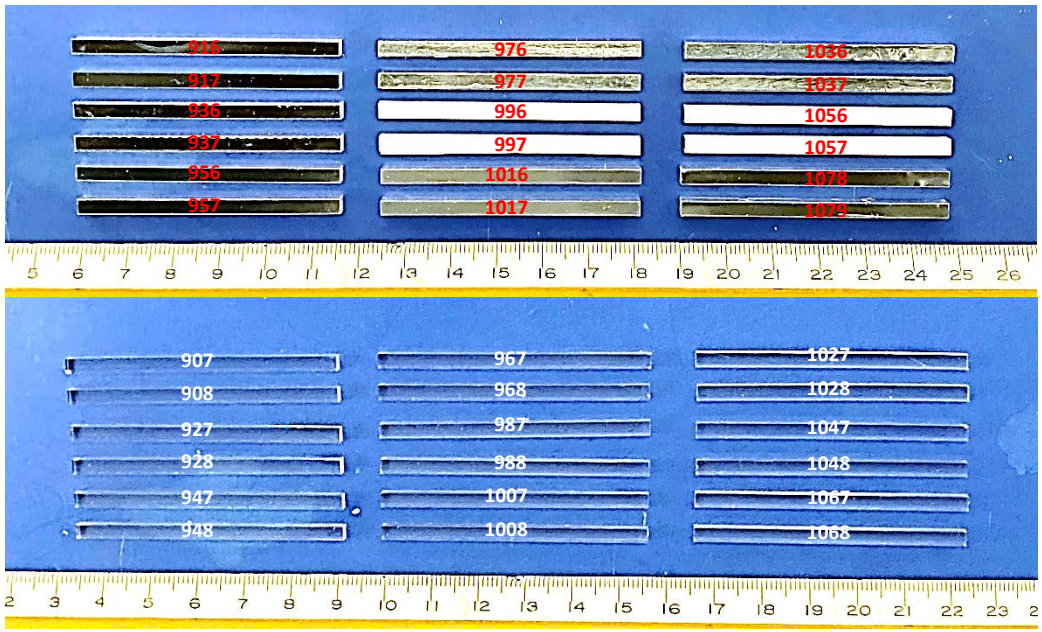
36 BTL LYSO Bars with/o ESR



ID	Dimension (mm^3)	#	Polishing
BTL LYSO-907~1079	3.00×3.12×56.3	36	All faces
All samples received on April 6th, 2021 (Tuesday)			

Experiments

Properties measured at room temperature : Longitudinal Transmittance (LT), Light Output (LO) & Decay Time (τ)

Cross Link of Sample IDs

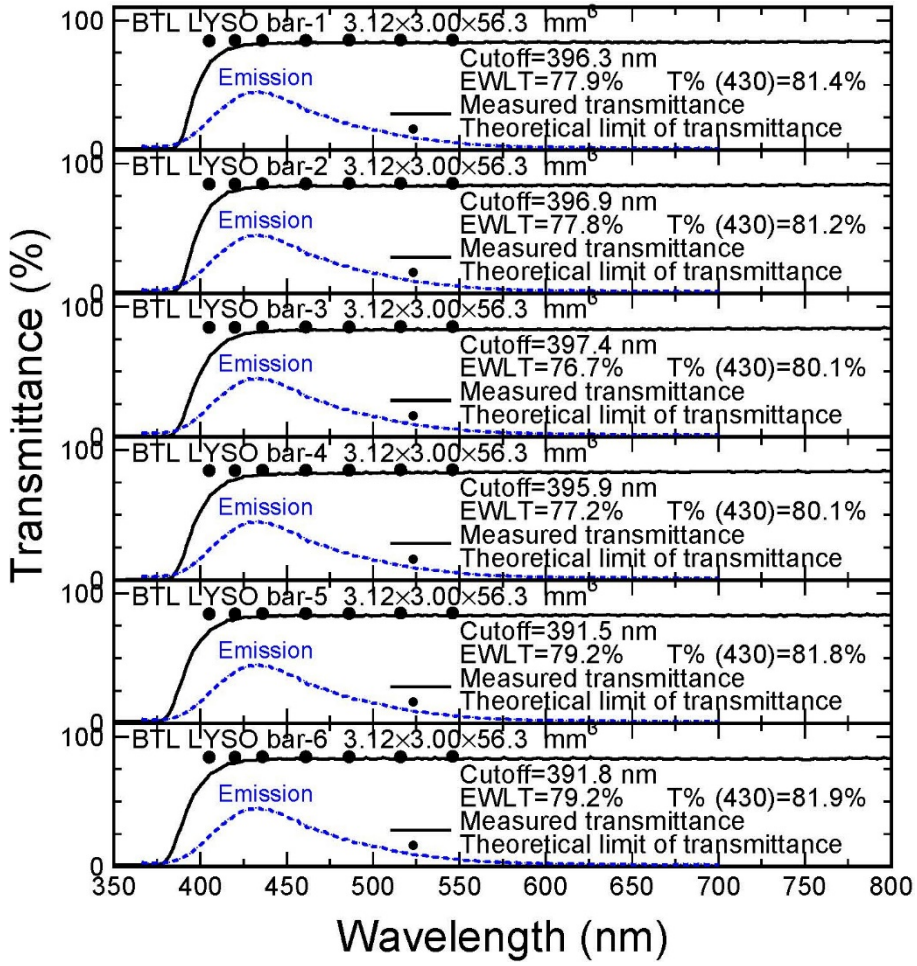
18 samples each went to ITA/Lowell for proton/neutron irradiation

Caltech ID	Barcode	Vendor	Test
1	907	1	Proton
2	908	1	Neutron
3	927	8	Proton
4	928	8	Neutron
5	947	5	Proton
6	948	5	Neutron
7	967	10	Proton
8	968	10	Neutron
9	987	3	Proton
10	988	3	Neutron
11	1007	9	Proton
12	1008	9	Neutron
13	1027	6	Proton
14	1028	6	Neutron
15	1047	4	Proton
16	1048	4	Neutron
17	1067	2	Proton
18	1068	2	Neutron

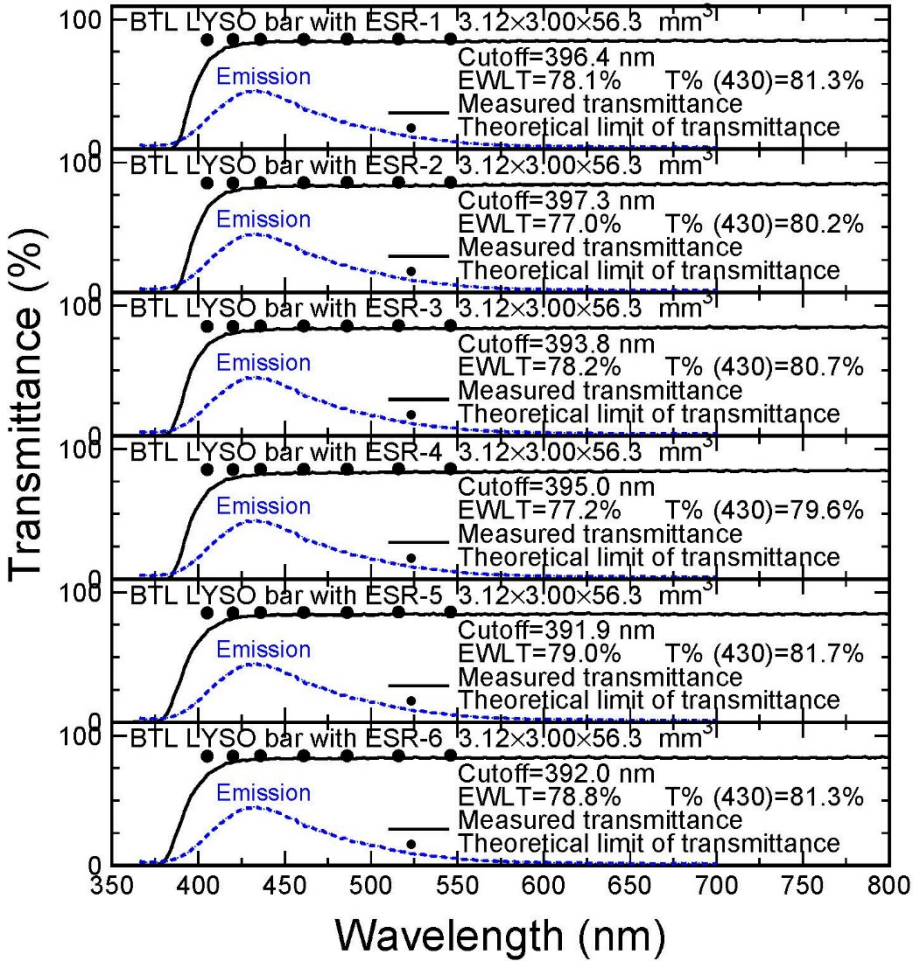
Caltech ID	Barcode	Vendor	Test
ESR 1	916	1	Proton
ESR 2	917	1	Neutron
ESR 3	936	8	Proton
ESR 4	937	8	Neutron
ESR 5	956	5	Proton
ESR 6	957	5	Neutron
ESR 7	976	10	Proton
ESR 8	977	10	Neutron
ESR 9	996	3	Proton
ESR 10	997	3	Neutron
ESR 11	1016	9	Proton
ESR 12	1017	9	Neutron
ESR 13	1036	6	Proton
ESR 14	1037	6	Neutron
ESR 15	1056	4	Proton
ESR 16	1057	4	Neutron
ESR 17	1078	2	Proton
ESR 18	1079	2	Neutron

Longitudinal Transmittance (I)

Radio-luminescence weighted LT and LT@430 nm



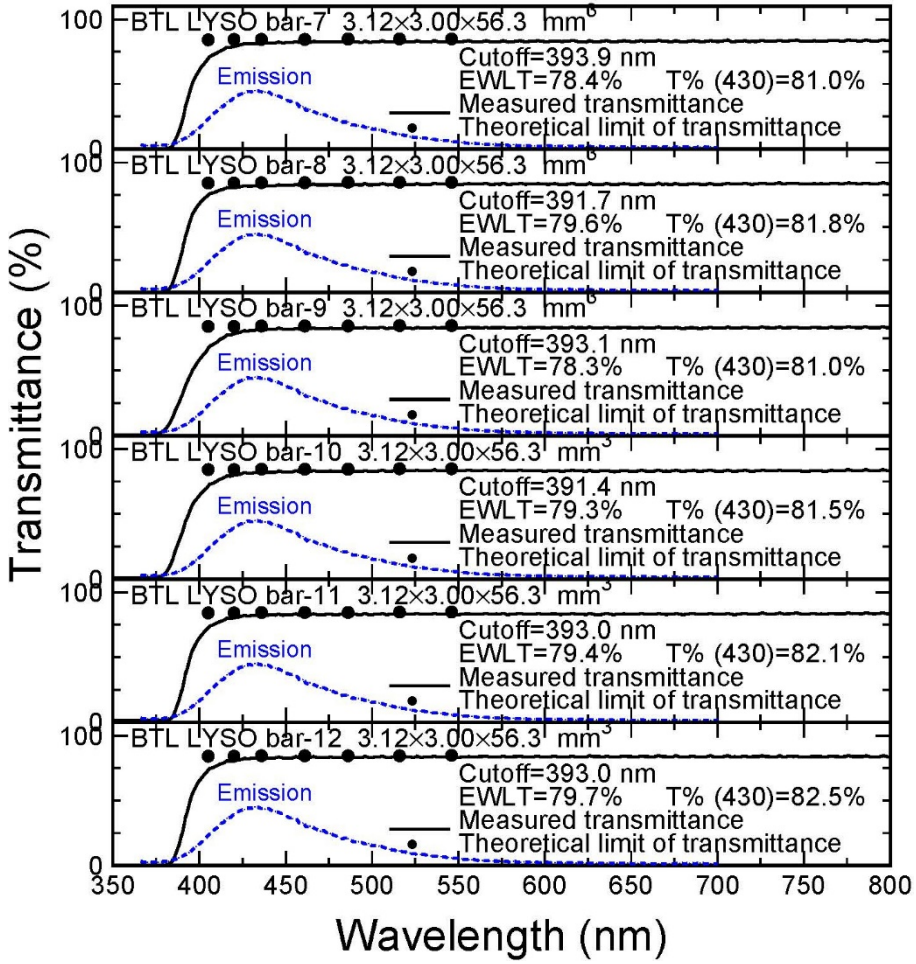
Unwrapped Samples



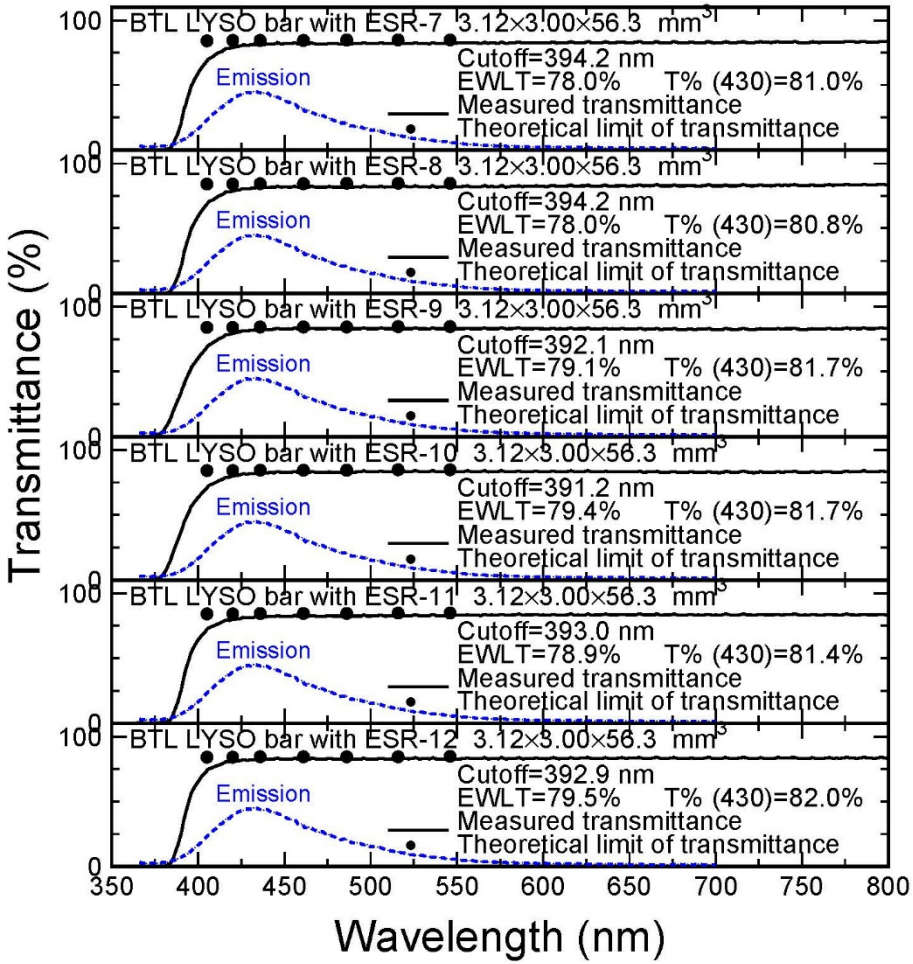
ESR Wrapped Samples

Longitudinal Transmittance (II)

Radio-luminescence weighted LT and LT@430 nm



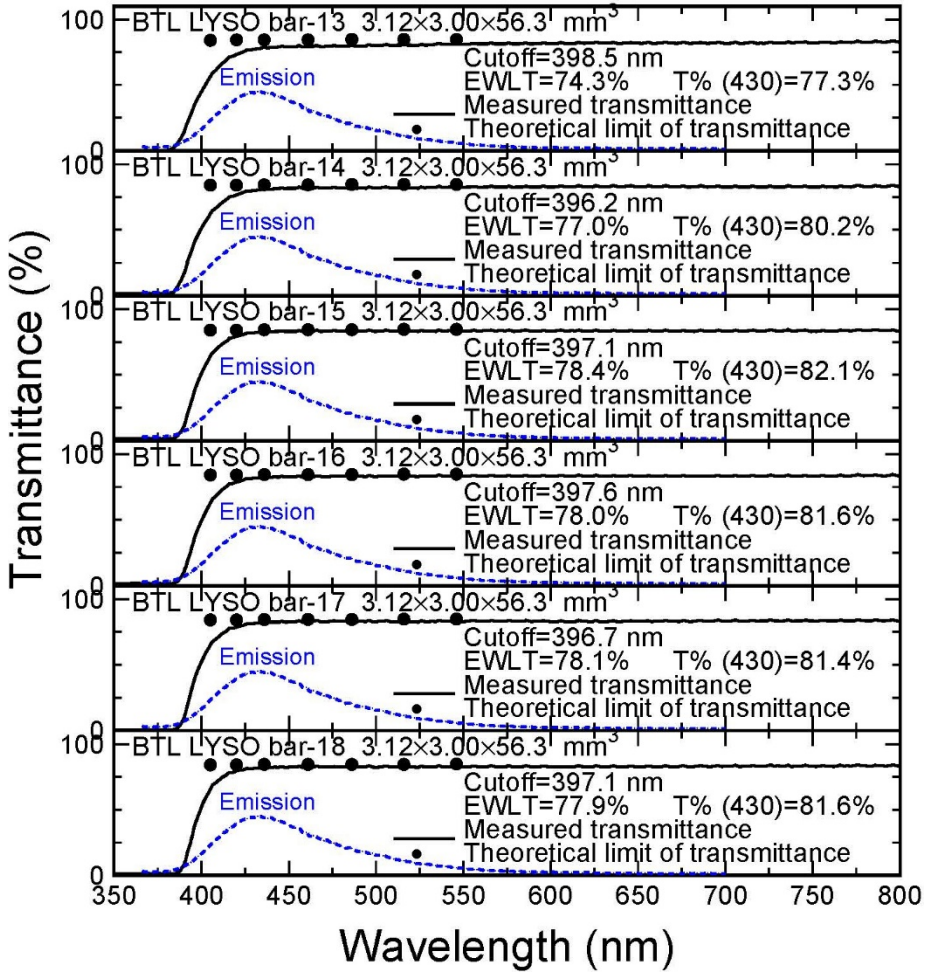
Unwrapped Samples



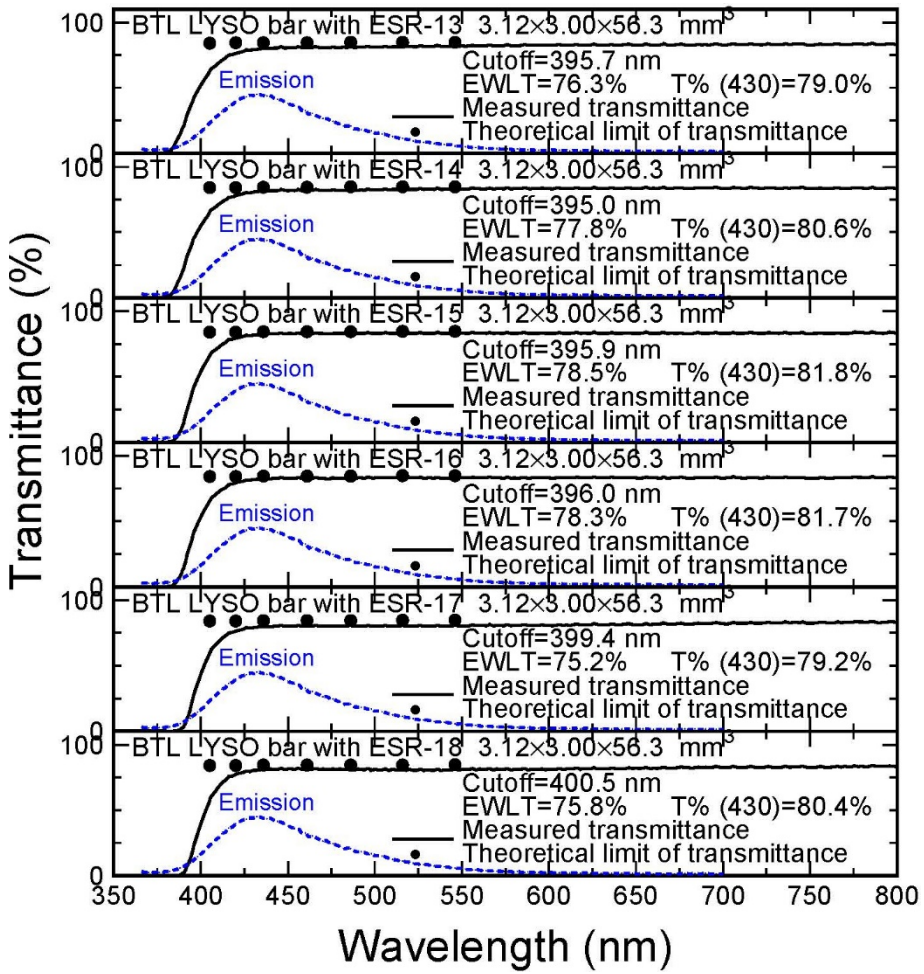
ESR Wrapped Samples

Longitudinal Transmittance (III)

Radio-luminescence weighted LT and LT@430 nm



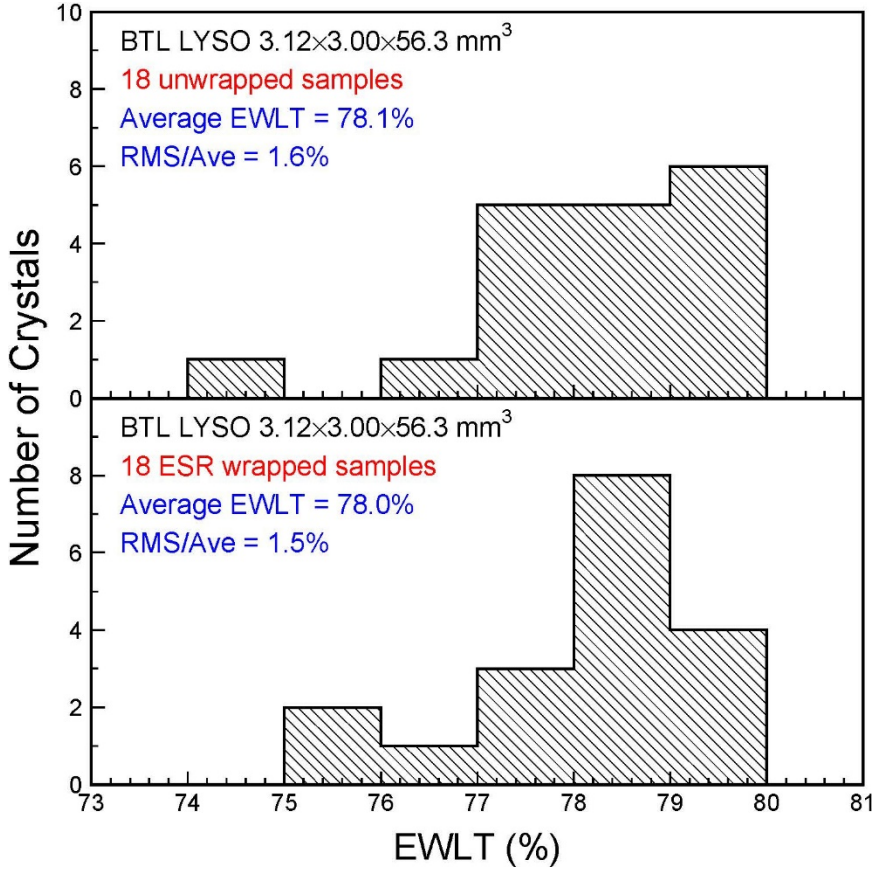
Unwrapped Samples

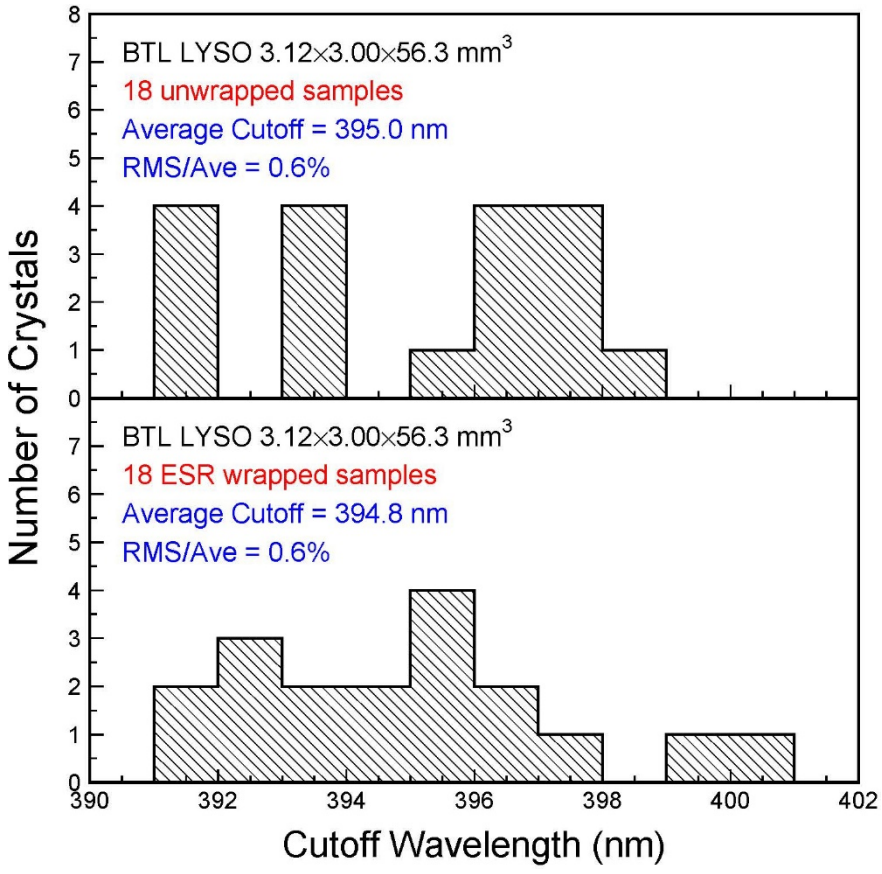


ESR Wrapped Samples

Summary: EWLT & Cutoff Wavelength

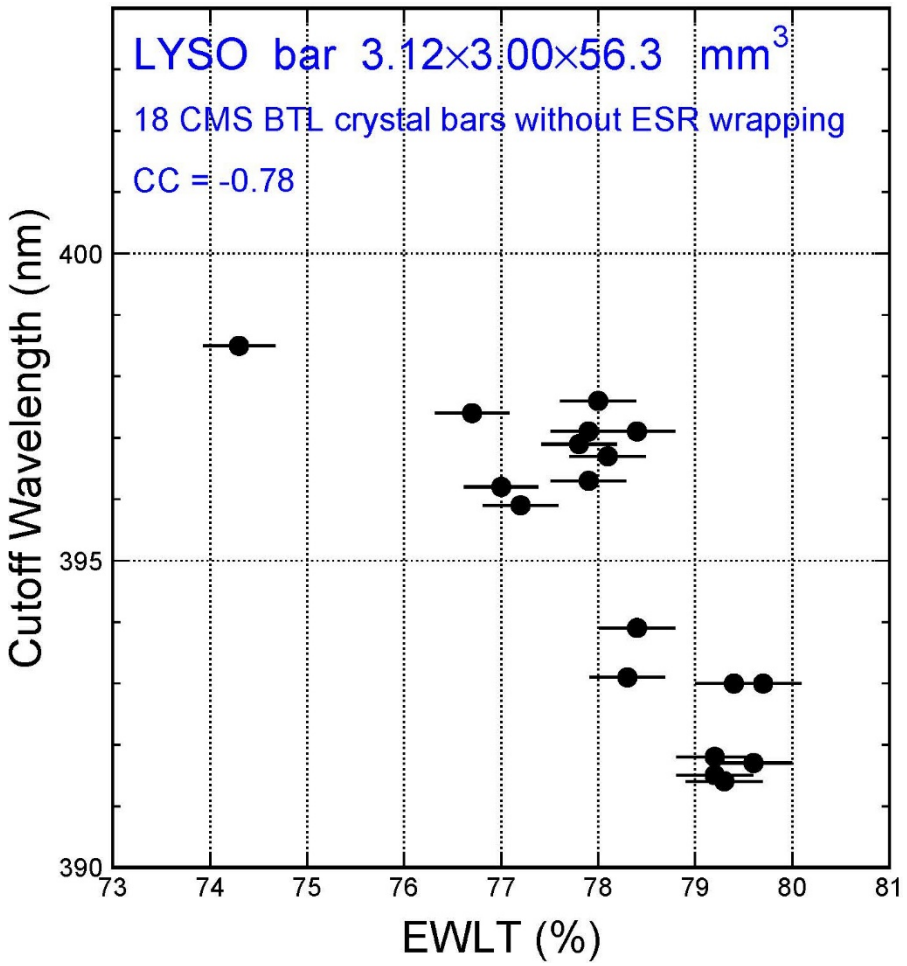
Consistent result for samples with/o ESR



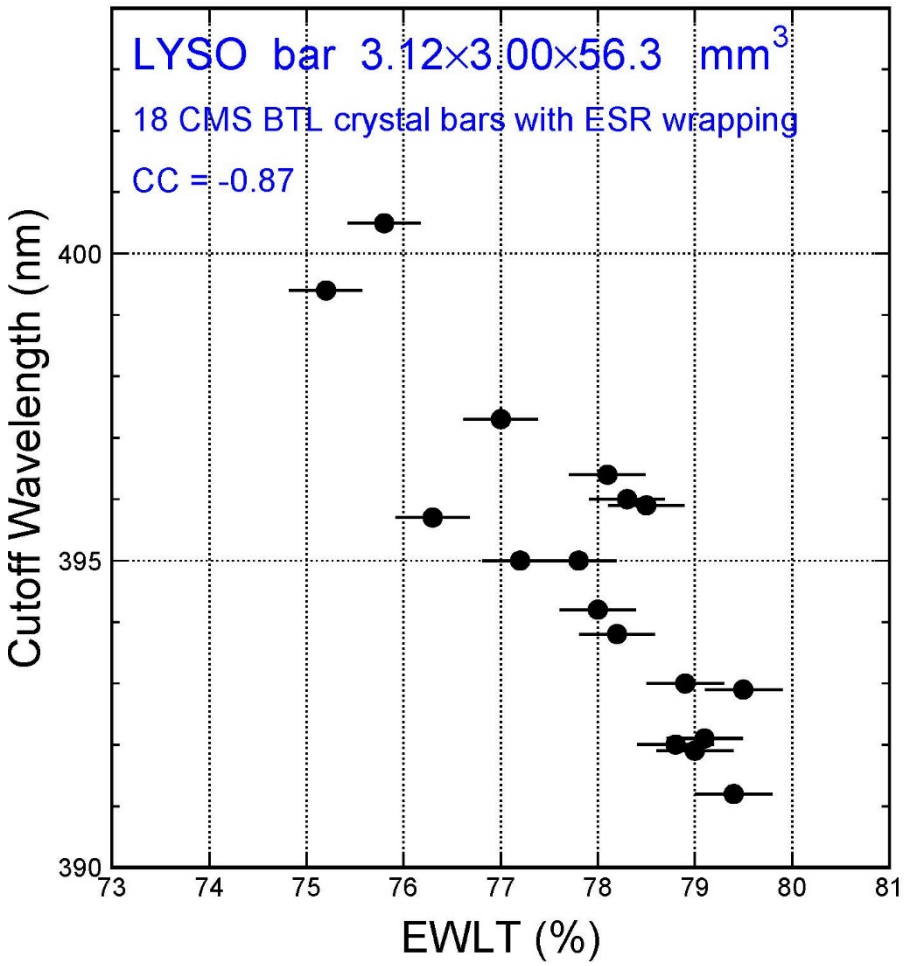


EWLT vs Cutoff Wavelength

Good correlation observed between EWLT and cutoff wavelength



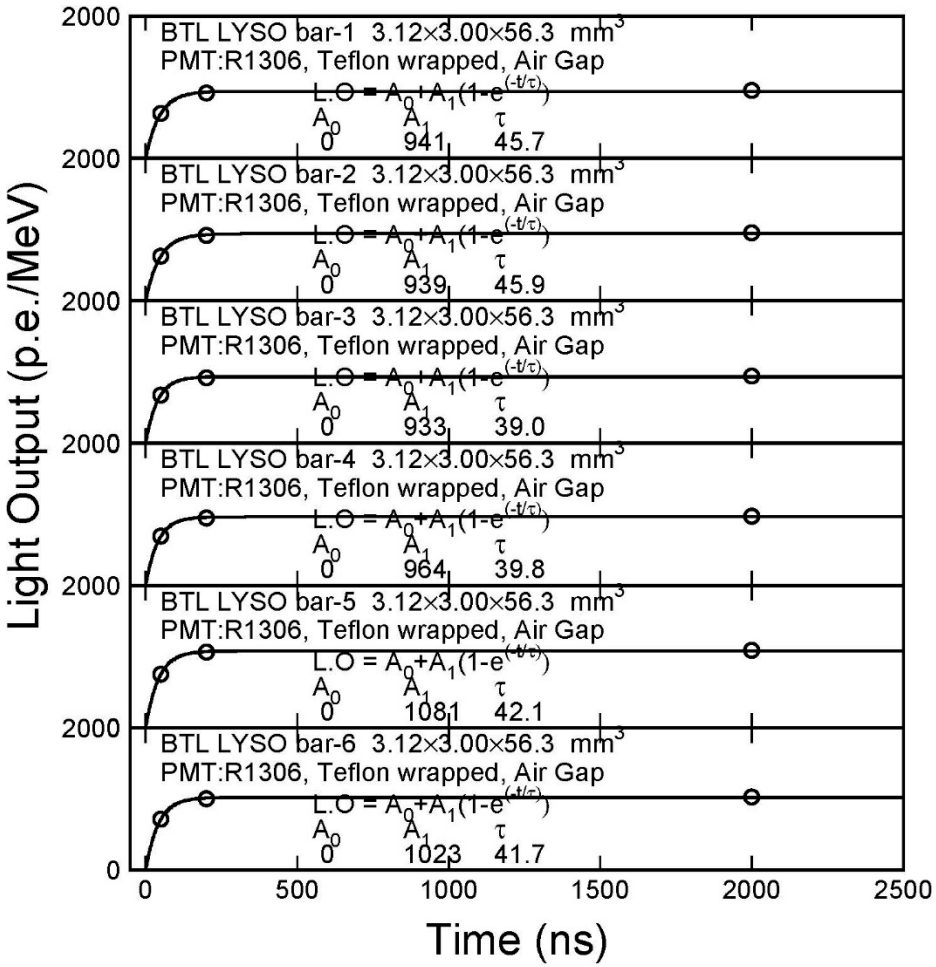
Unwrapped Samples



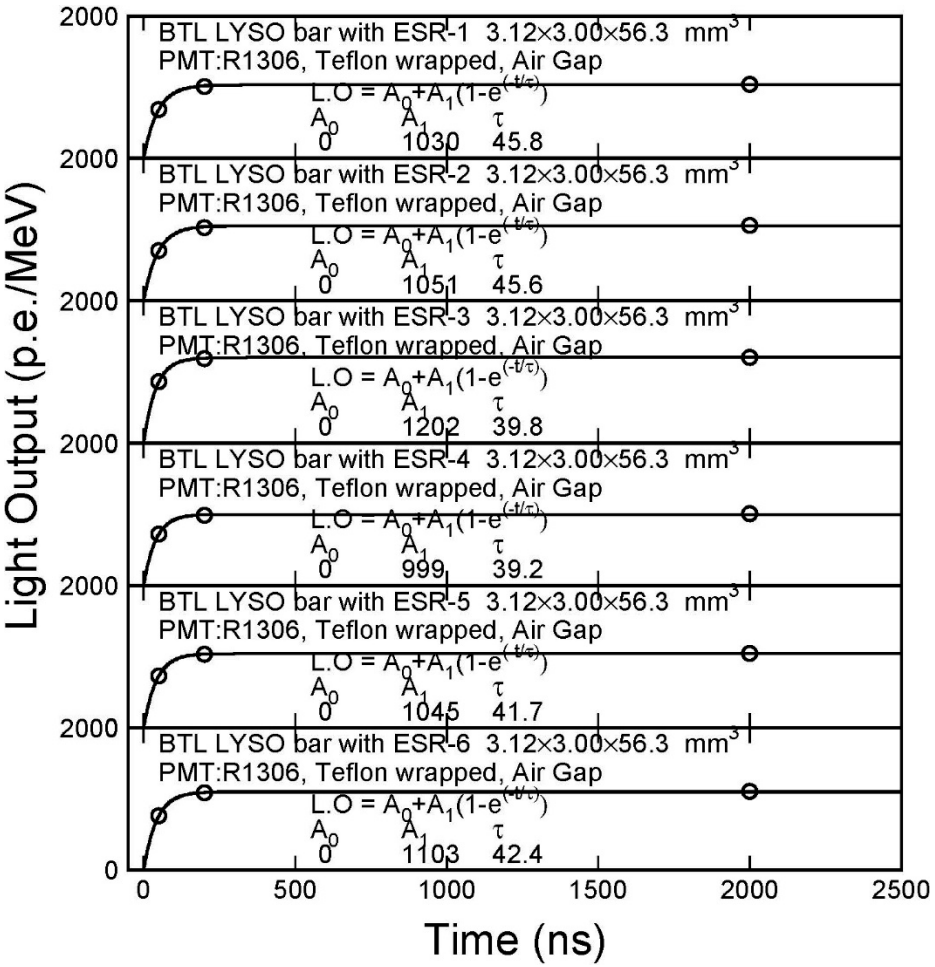
ESR Wrapped Samples

Light Output & Decay Time (I)

Samples with Teflon block or ESR film wrapping, and air gap coupled to R1306 PMT triggered by a Na-22 source at crystal center



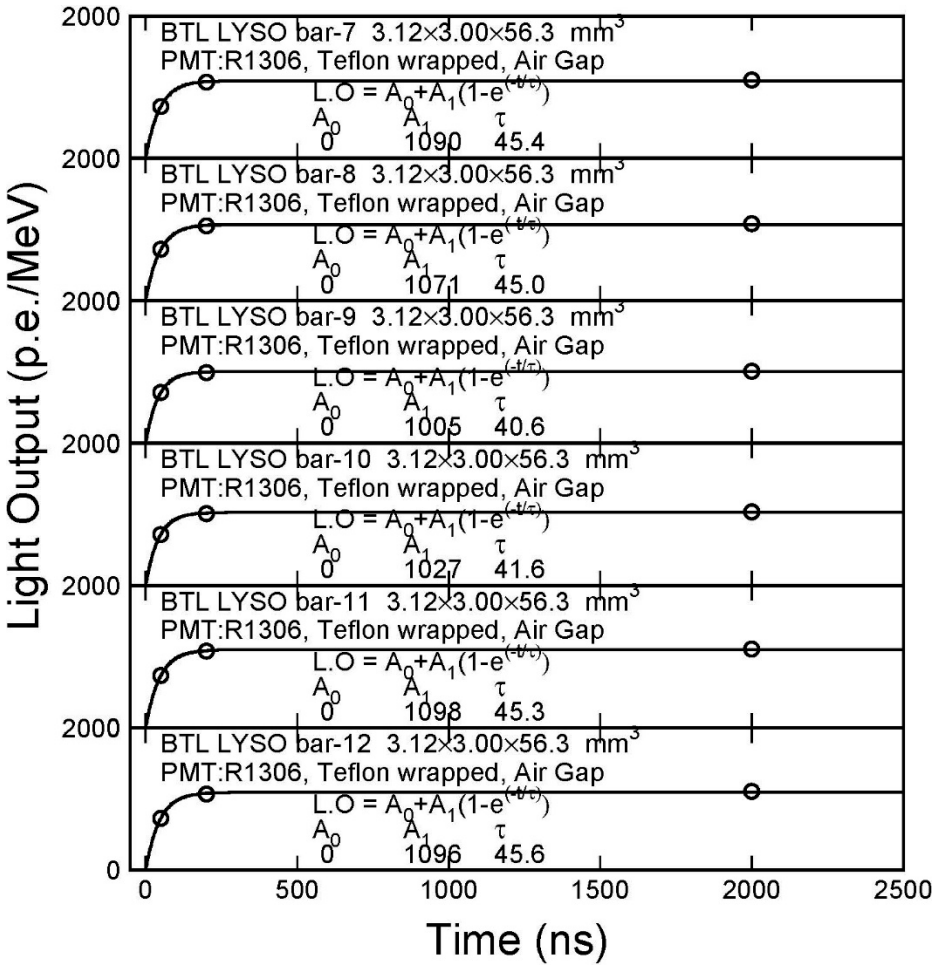
Teflon Wrapped Samples



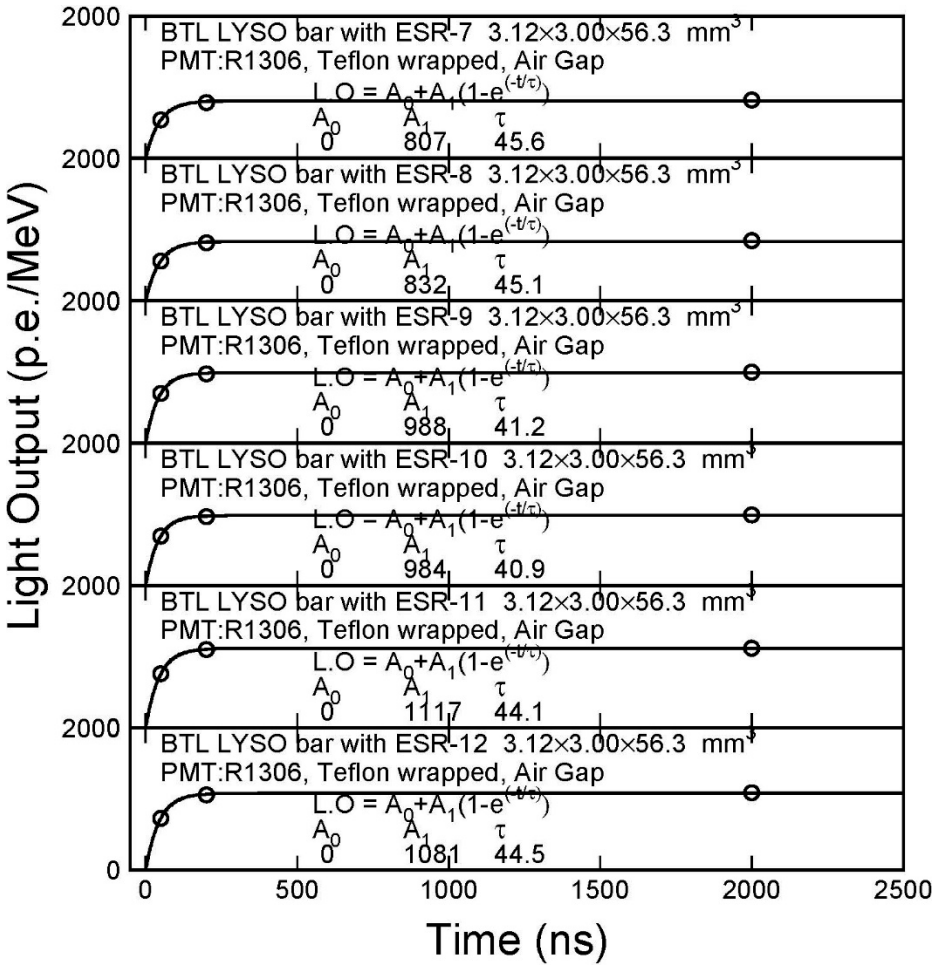
ESR Wrapped Samples

Light Output & Decay Time (II)

Samples with Teflon block or ESR film wrapping, and air gap coupled to R1306 PMT triggered by a Na-22 source at crystal center



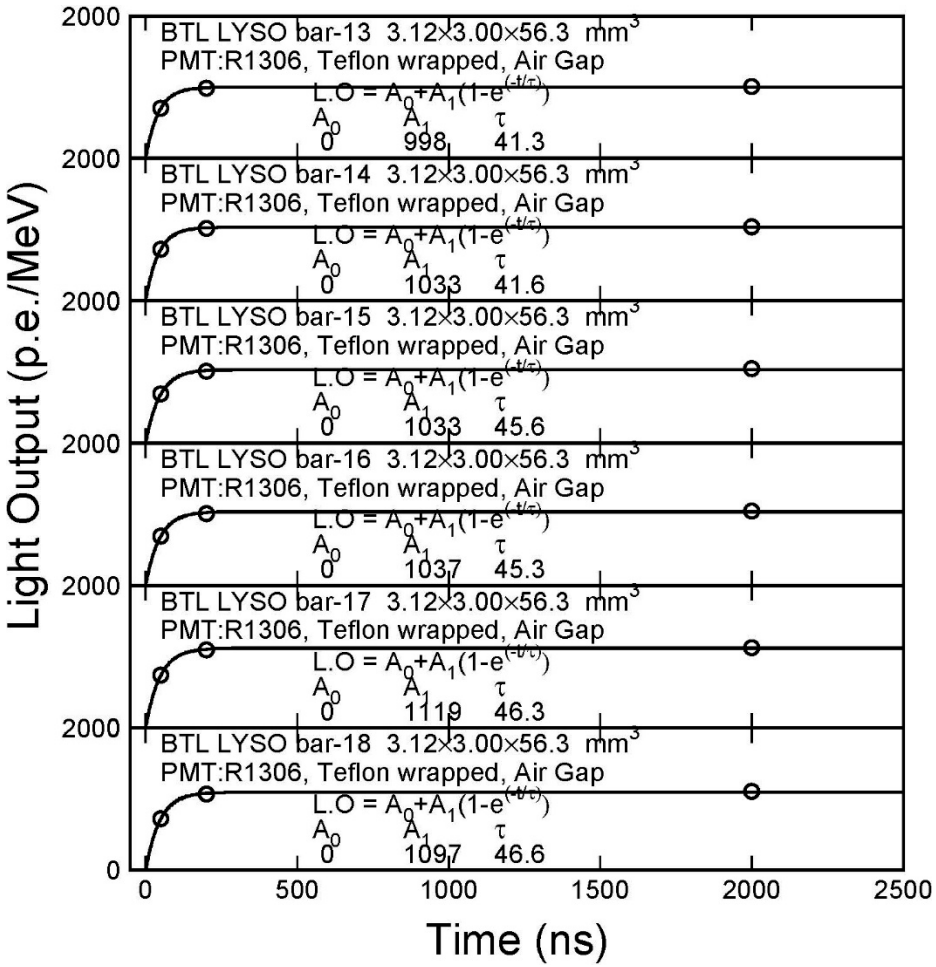
Teflon Wrapped Samples



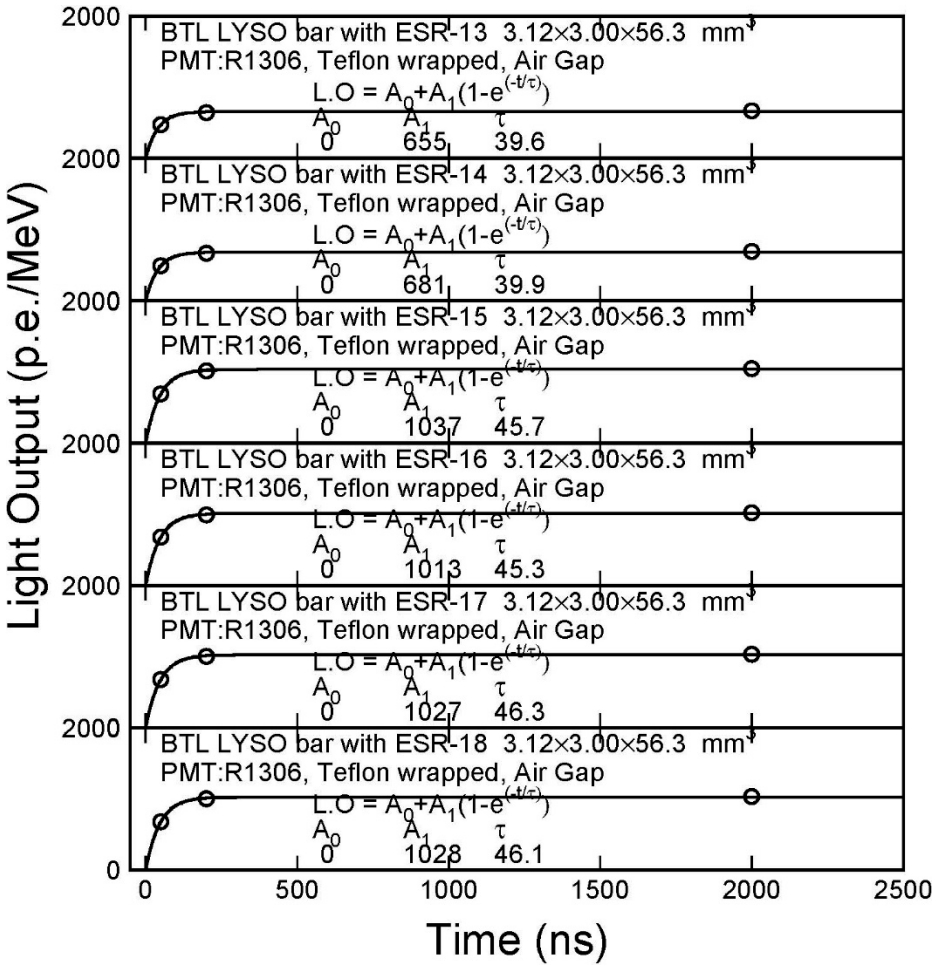
ESR Wrapped Samples

Light Output & Decay Time (III)

Samples with Teflon block or ESR film wrapping, and air gap coupled to R1306 PMT triggered by a Na-22 source at crystal center

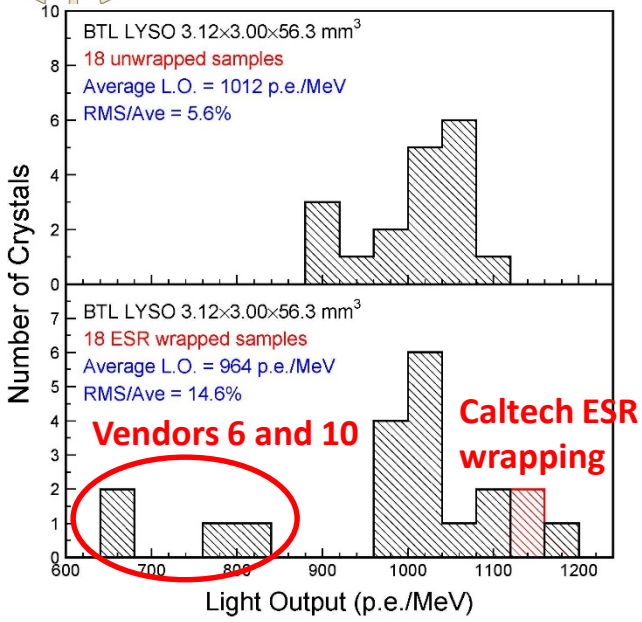


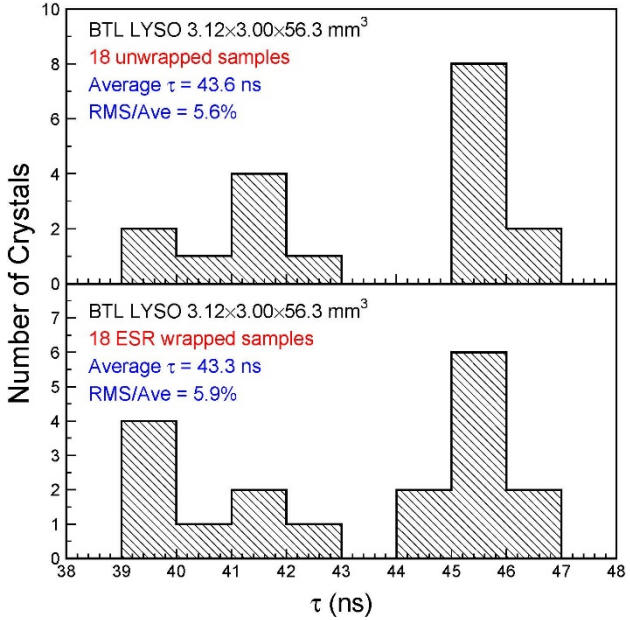
Teflon Wrapped Samples

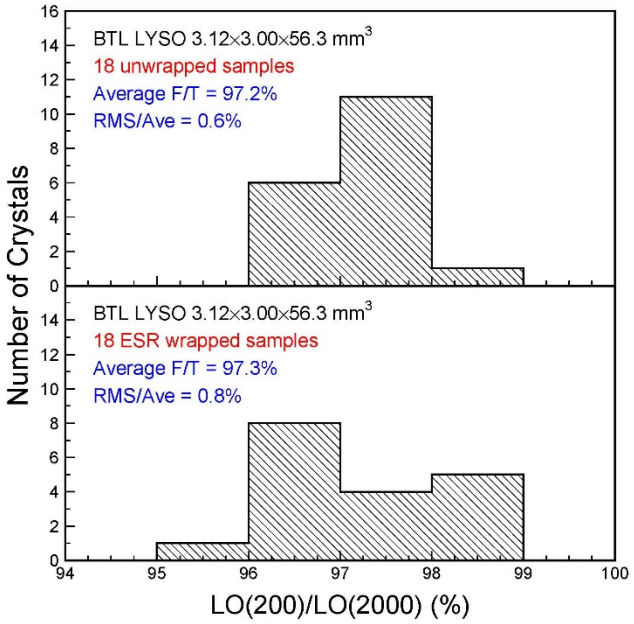


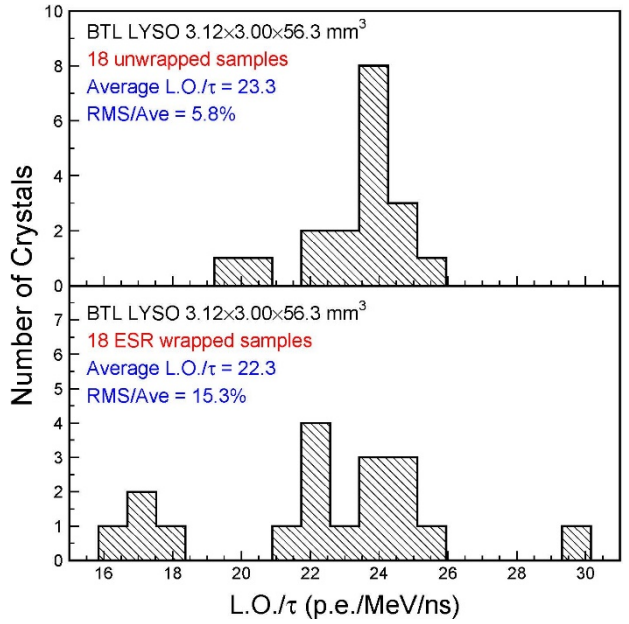
ESR Wrapped Samples

Summary: LO, τ, F/T, and LO/τ







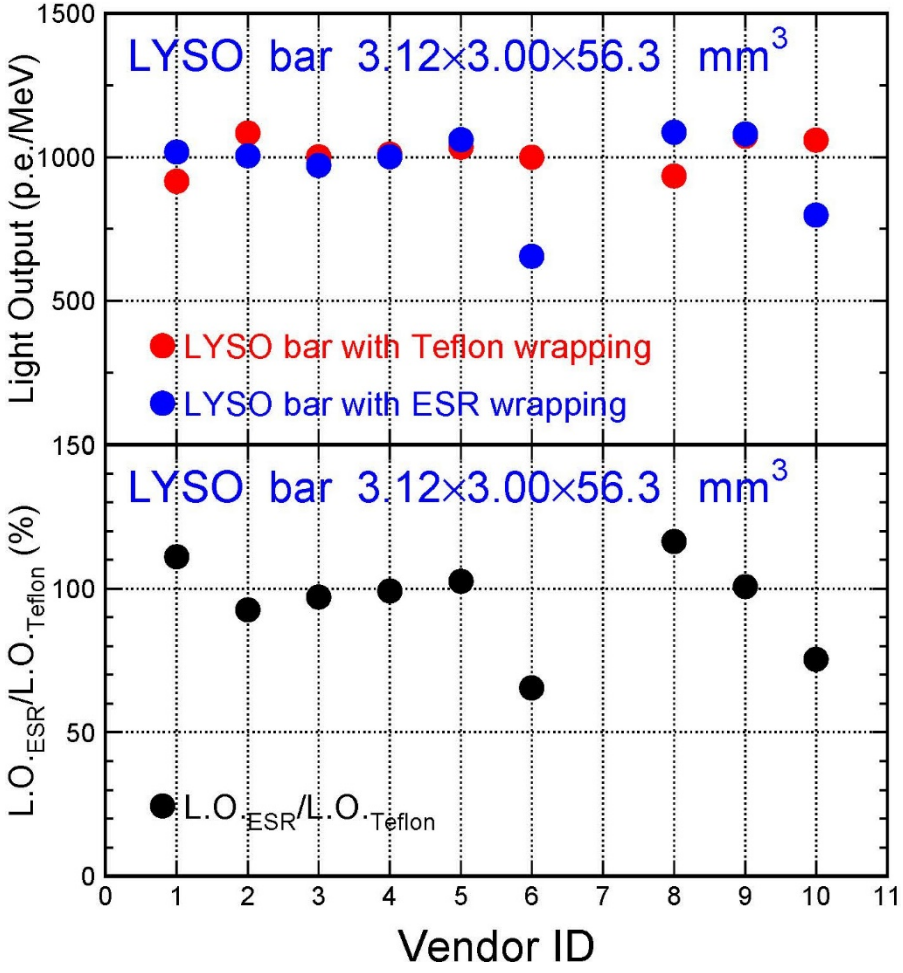


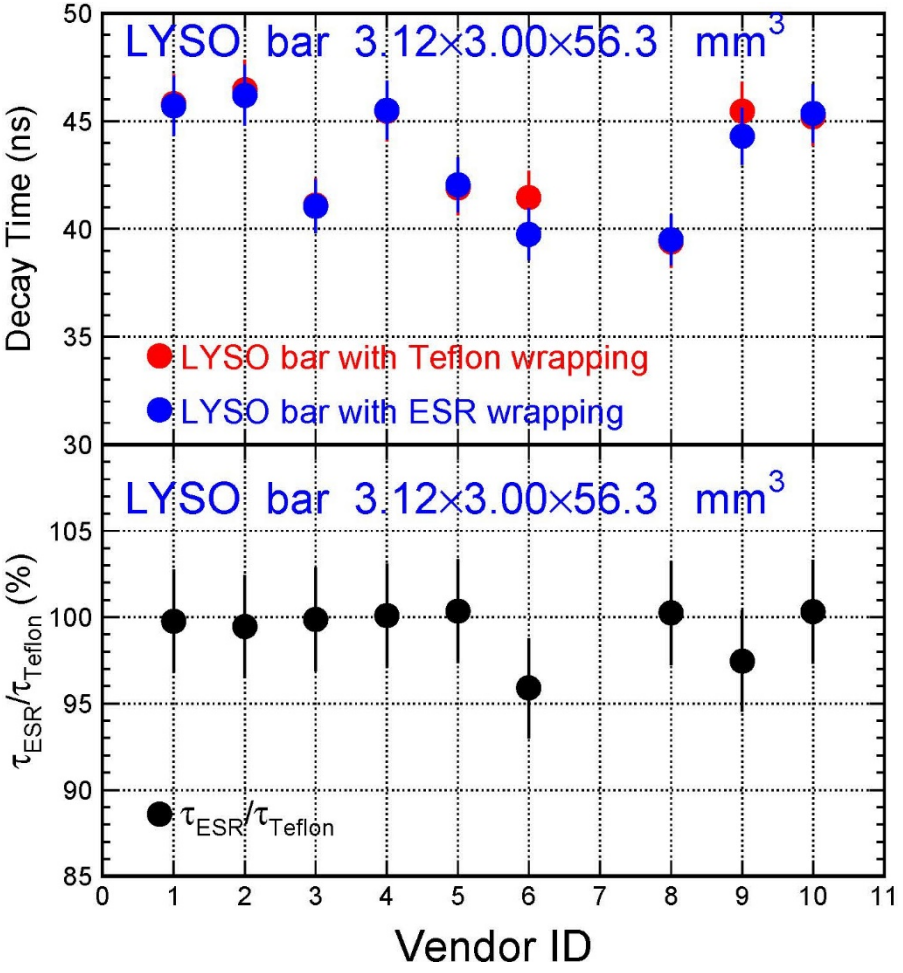
Significant lower LO and thus LO/τ are observed for ESR wrapped samples from the vendors 6 and 10.

After rewrapping with 3M ESR, two bare samples from the vendors 6 and 10 show consistent LO with others, indicating poor quality of the original ESR wrapping.

Comparison: Light Output and τ

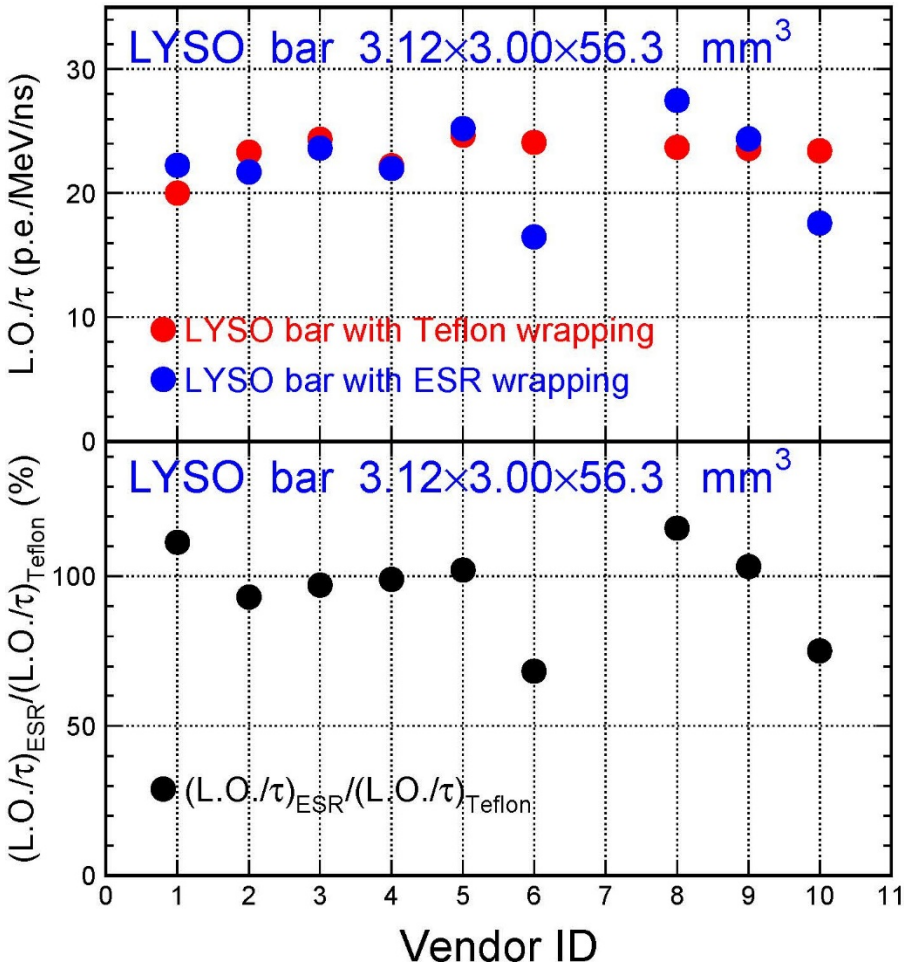
Vendor 6 and 10 show low LO with their ESR wrapping

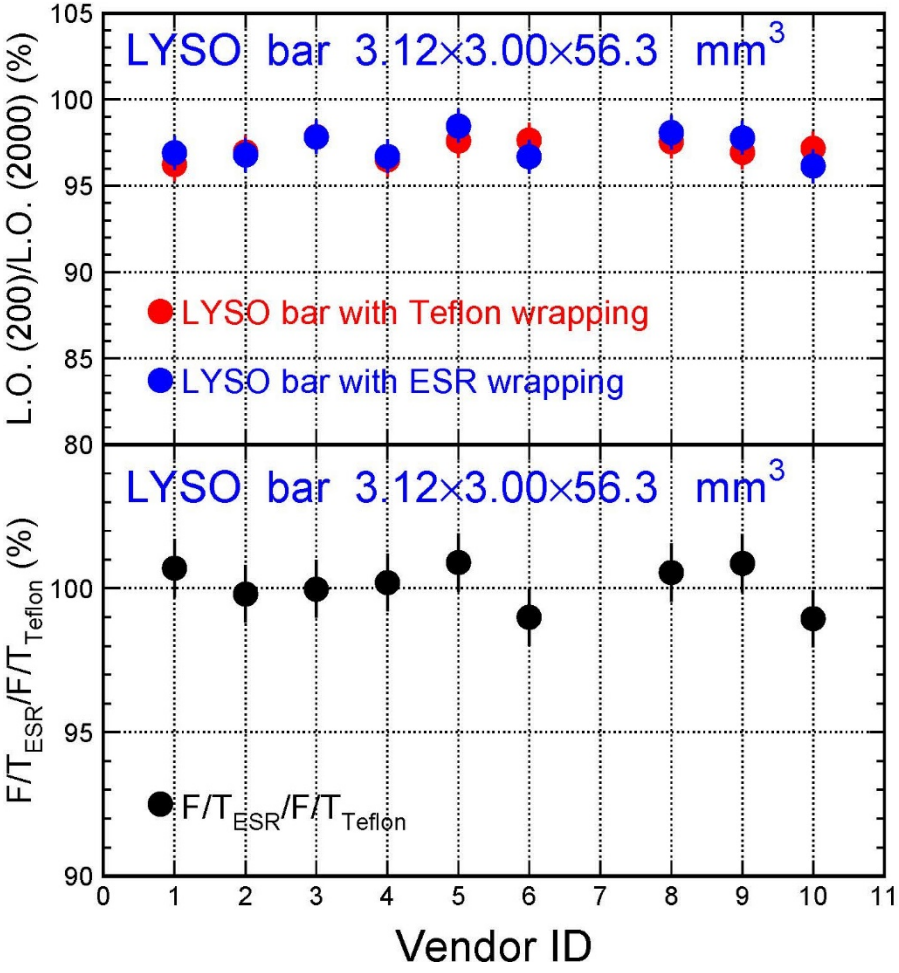




Comparison: LO/τ and F/T Ratio

Vendor 6 and 10 show low LO/τ with their ESR wrapping





Summary

LT, LO, F/T and τ are measured for thirty six 2021 BTL LYSO bars with/o ESR wrapping.

Consistent EWLT, LO, τ, and LO/τ values of 78.1%/78.0%, 1012/964 p.e./MeV, 43.6/43.3 ns, and 23.3/22.3 are observed for Teflon/ESR wrapped LYSO bars.

ESR wrapped samples from the vendors 6 and 10 show lower LO. Rewrapping two bare samples with 3M ESR film brings back their LO, indicating poor wrapping quality.

Hadron damage tests are under way with eighteen LYSO bars of with/o ESR wrapping each for TF:n at Lowell and TF:p at Fermilab ITA.

Acknowledgements: DOE HEP Award DE-SC0011925