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# Update on LYSO Crystals

**Ren-Yuan Zhu**

**California Institute of Technology**

December 1, 2009

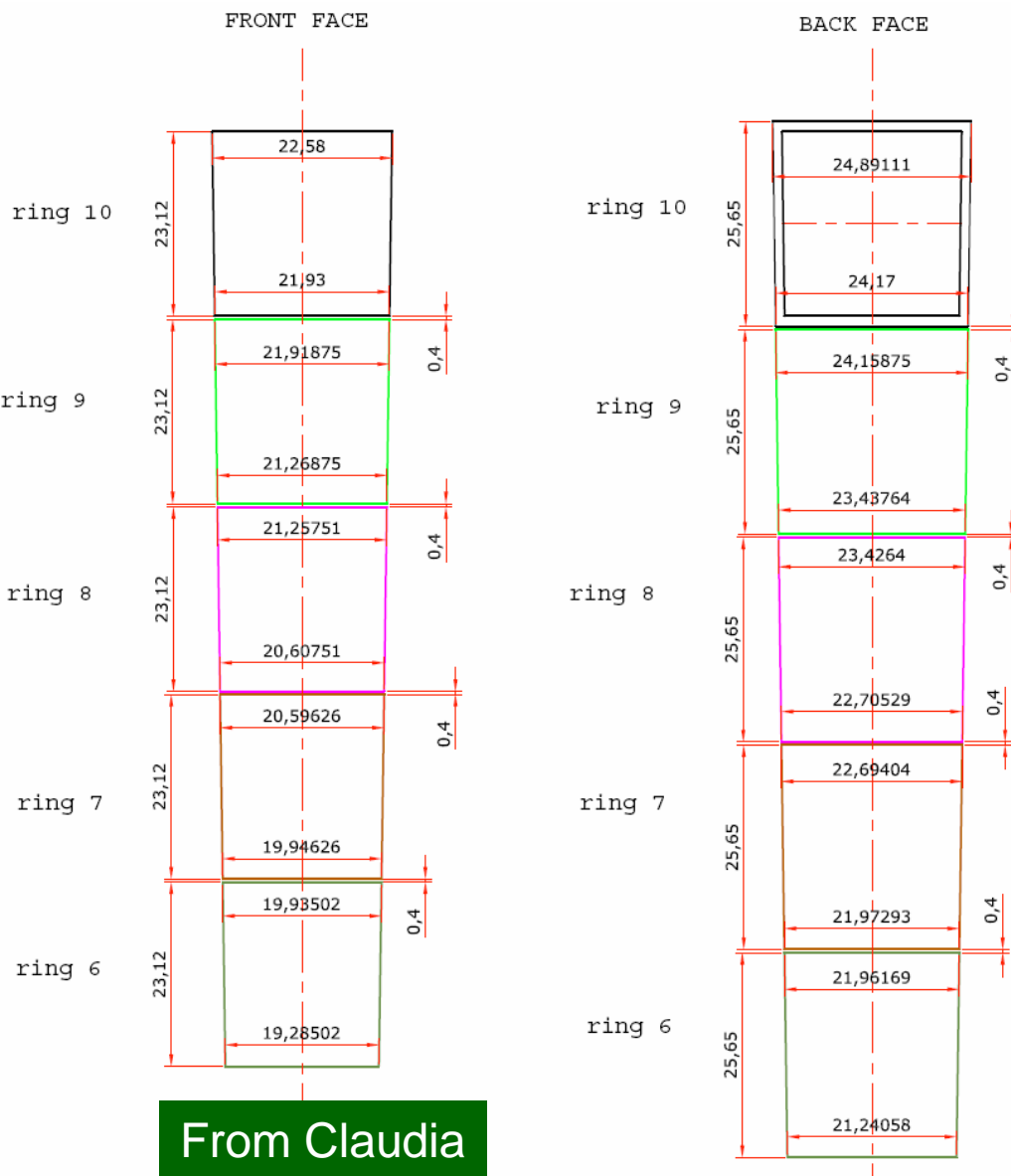


# Outline

- **Two LYSO crystals of type 8 were ordered from SIPAT in November. Their performance will be checked before ordering the other 11.**
- **Crystal specifications for mass production will be defined after checking these test beam samples. Test benches are needed for the following measurements:**
  - **Dimension;**
  - **FWHM resolution and Light output.**



# Crystal Dimension & Volume



Type	V2 (cm <sup>3</sup> )	Price2/Xtal
Ring 10	\$114.37	\$4,574.92
Ring 9	\$110.97	\$4,438.99
Ring 8	\$107.58	\$4,303.05
Ring 7	\$104.15	\$4,166.09
Ring 6	\$100.75	\$4,030.16
<b>Total</b>	<b>2689.15</b>	<b>\$107,566.01</b>

A total of thirteen LYSO crystals are to be ordered: 3, 5 and 5 for the type 8, 9 and 10 respectively. Two type 8 have been ordered from SIPAT at an agreed price of \$40/cc.



# SIPAT Quotation for Beam Test Crystals



## SIPAT QUATATION

Sichuan Institute of Piezoelectric and Acousto-optic Technology  
 14 Huayuan Road Nanping  
 P.O. Box 2513  
 Chongqing, P.R.China  
 Phone: +86-23-62900664  
 Fax: +86-23-62805284  
 E-mail: crystal@sipat.com

Quoted By: Daxue wang  
 Phone: (023) 62900664  
 Fax: (023) 62805284  
 E-mail: [crystal@sipat.com](mailto:crystal@sipat.com)

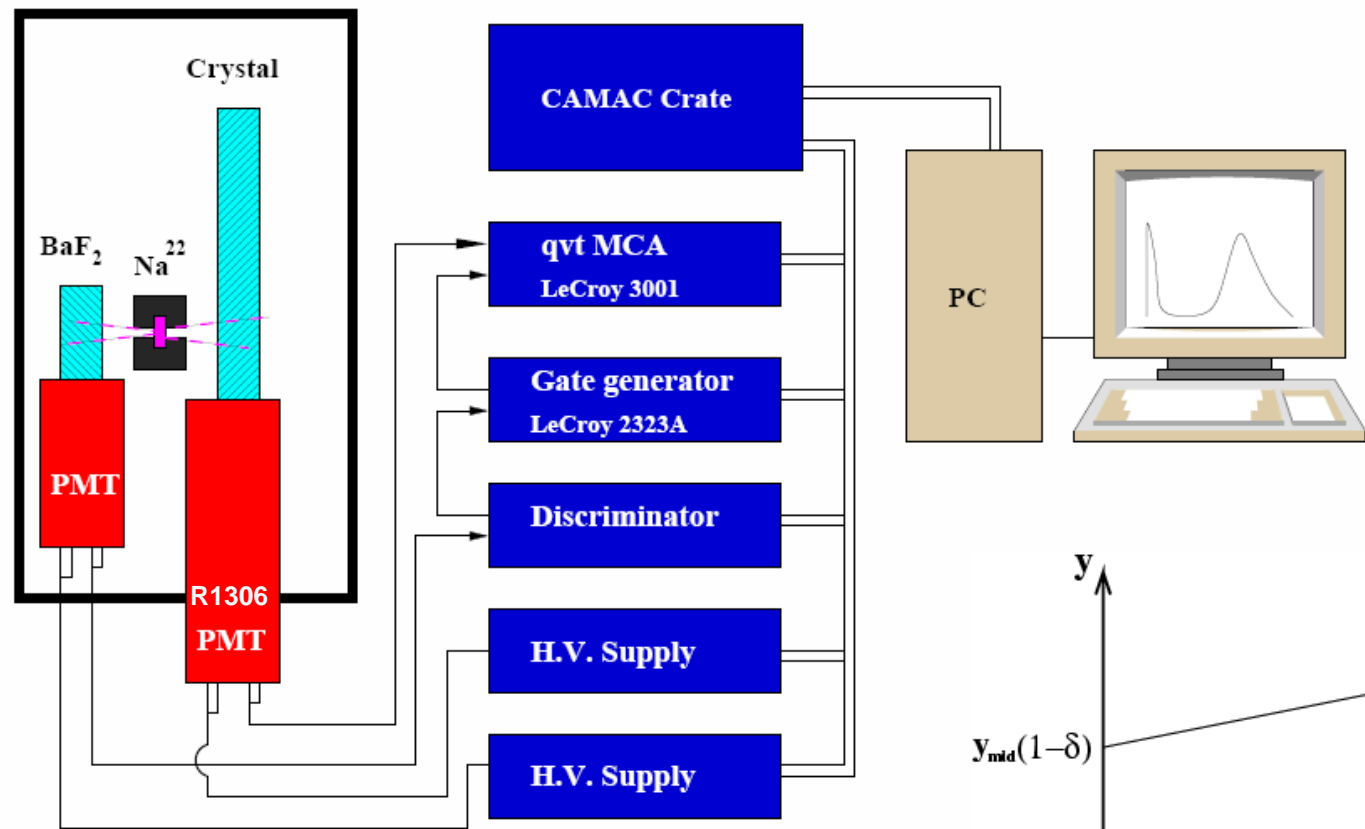
To: Dr. Ren-yuan Zhu Date: 20/11/2009  
 California Institute of Technology Number: SIPAT0903  
 256-48 HEP, Caltech  
 Pasadena, CA-LA 91125  
 US  
 Phone: (626) 395-6661 Type: Price Quotation  
 Fax: (626) 795-3951 Terms: Net 30  
 Ship Via: Best Method  
 F.O.B.: Chongqing, China  
 Delivery: See below

Subject: Quote: S0902

Line Item	Product Name	QTY	Unit Price	Total Cost	Delivery
1	1) Crystal type: LYSO:Ce 2) Dimensions: truncated pyramid, type 8 according to the drawing with tolerance: +0.000 / -0.100 mm and chamfer: 0.3 mm 3) Surface quality: all six faces optical polished. 4) Bulk quality (visual inspection): transparent, colorless, bubble free, inclusions free, homogeneous. 5) FWHM resolution of 511 keV gamma-ray peak: < 12.5% measured with R1306 PMT and grease at 7 points 2 cm apart evenly distributed along the crystal.	2pcs	\$4302.00	\$8604.00	The end of Dec.

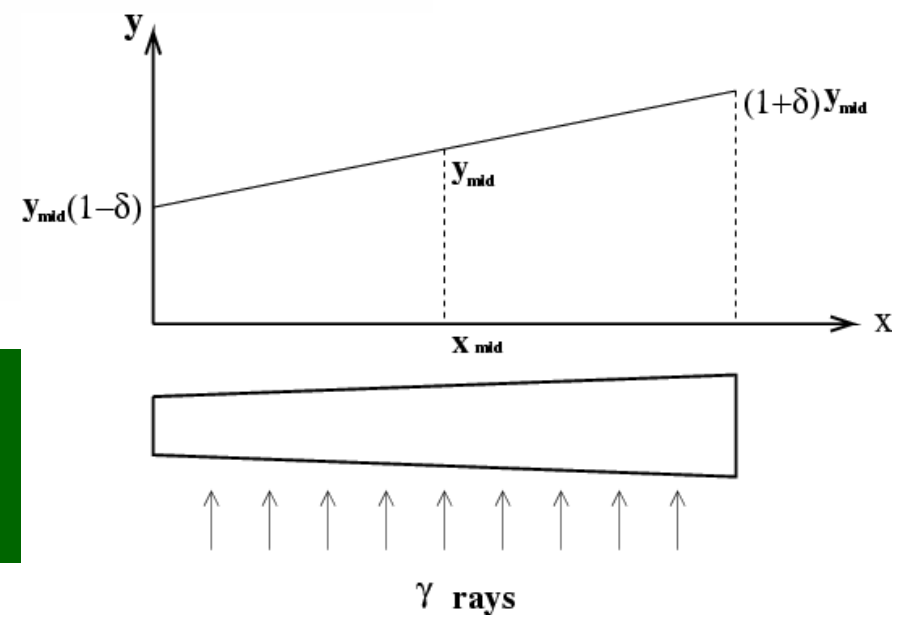
- Two LYSO crystals of type 8 were ordered in November.
- Delivery is expected at the end of December.
- Preliminary Spec:
  - Dimension: +0/-0.1 mm
  - FWHM resolution: < 12.5% for 0.511 MeV  $\gamma$ -rays measured by a Hamamatsu R1306 with DC-200 coupling.
  - Light output will be required to be more than a percentage of a small candle with air-gap.

# Light Output & FWHM Measurement



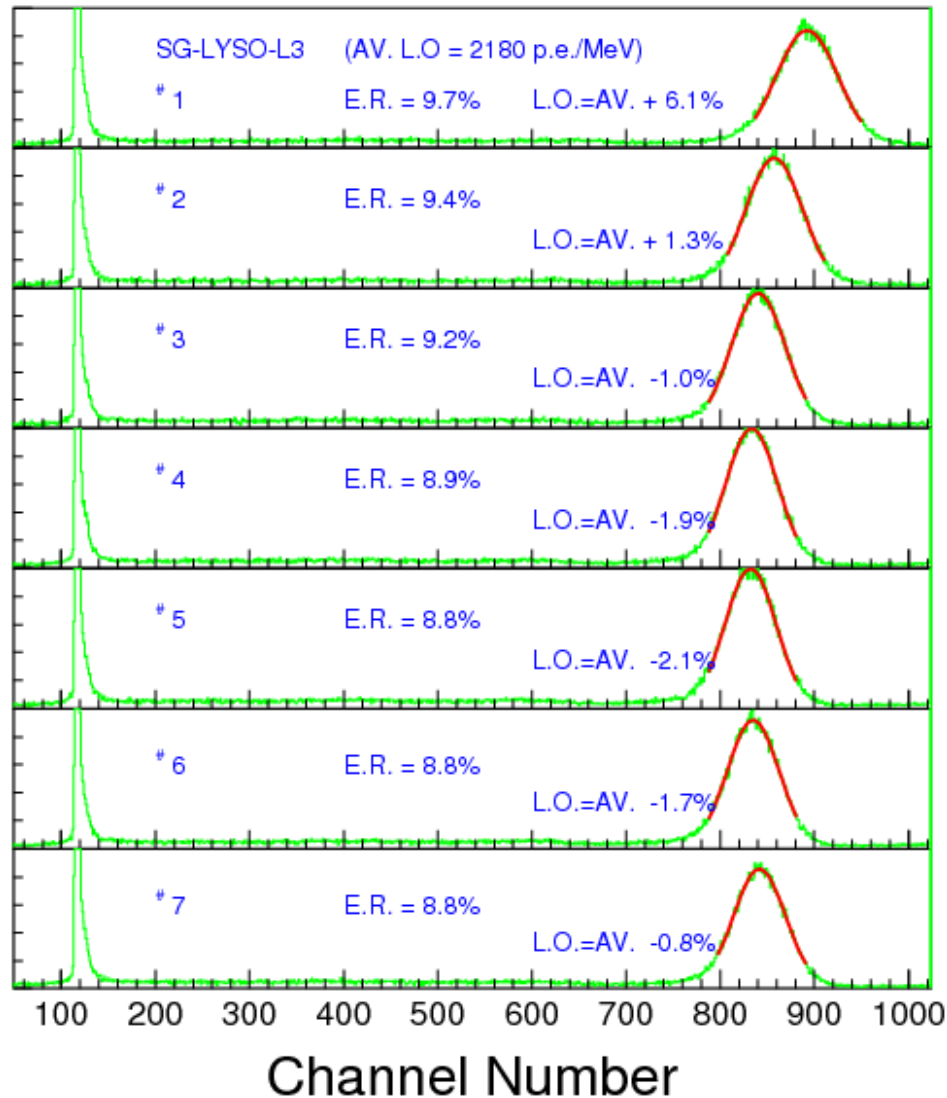
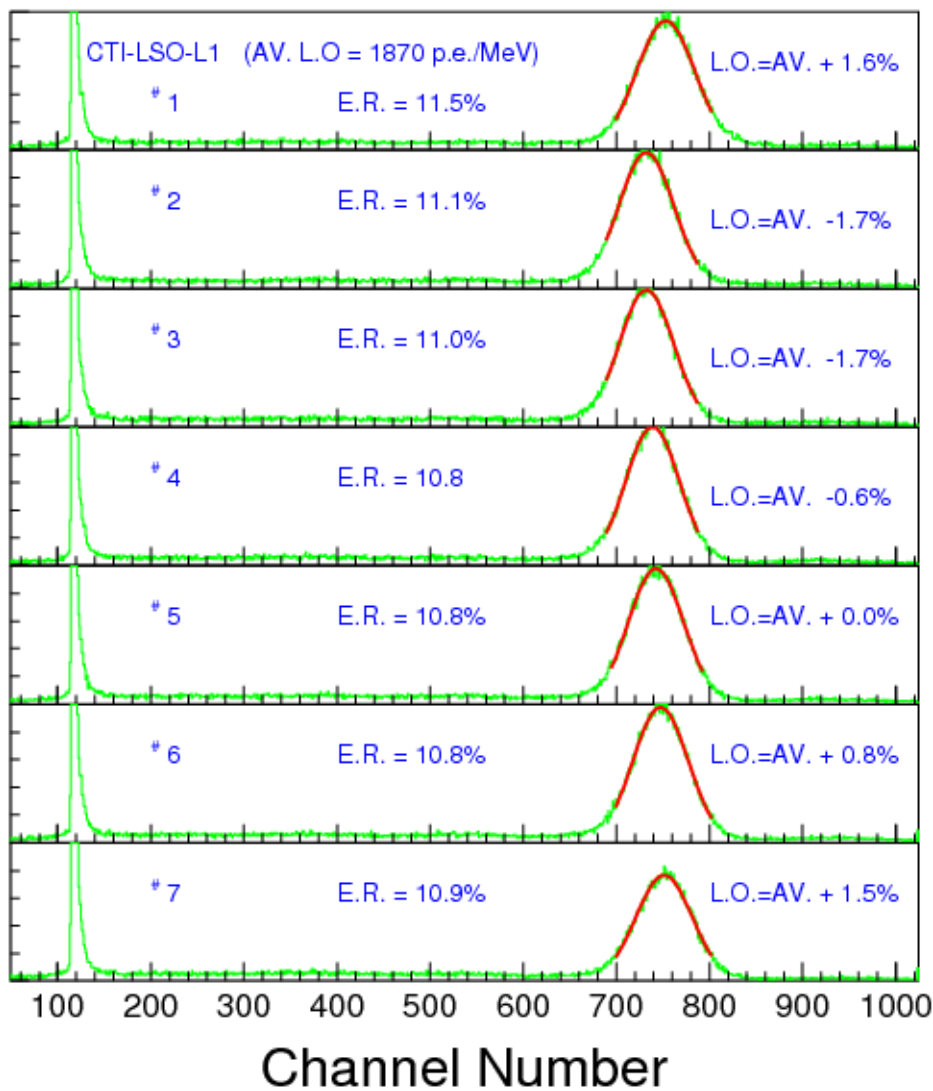
Two layers of Tyvek wrap  
 ID (seed) coupled to PMT  
 Hamamatsu R1306 PMT  
 1200 V for air gap  
 1050V for DC-200  
 200 ns integration gate  
 Coincidence trigger from a Na-22 source

A test bench for the light output and FWHM resolution measurement at seven points along the crystal.



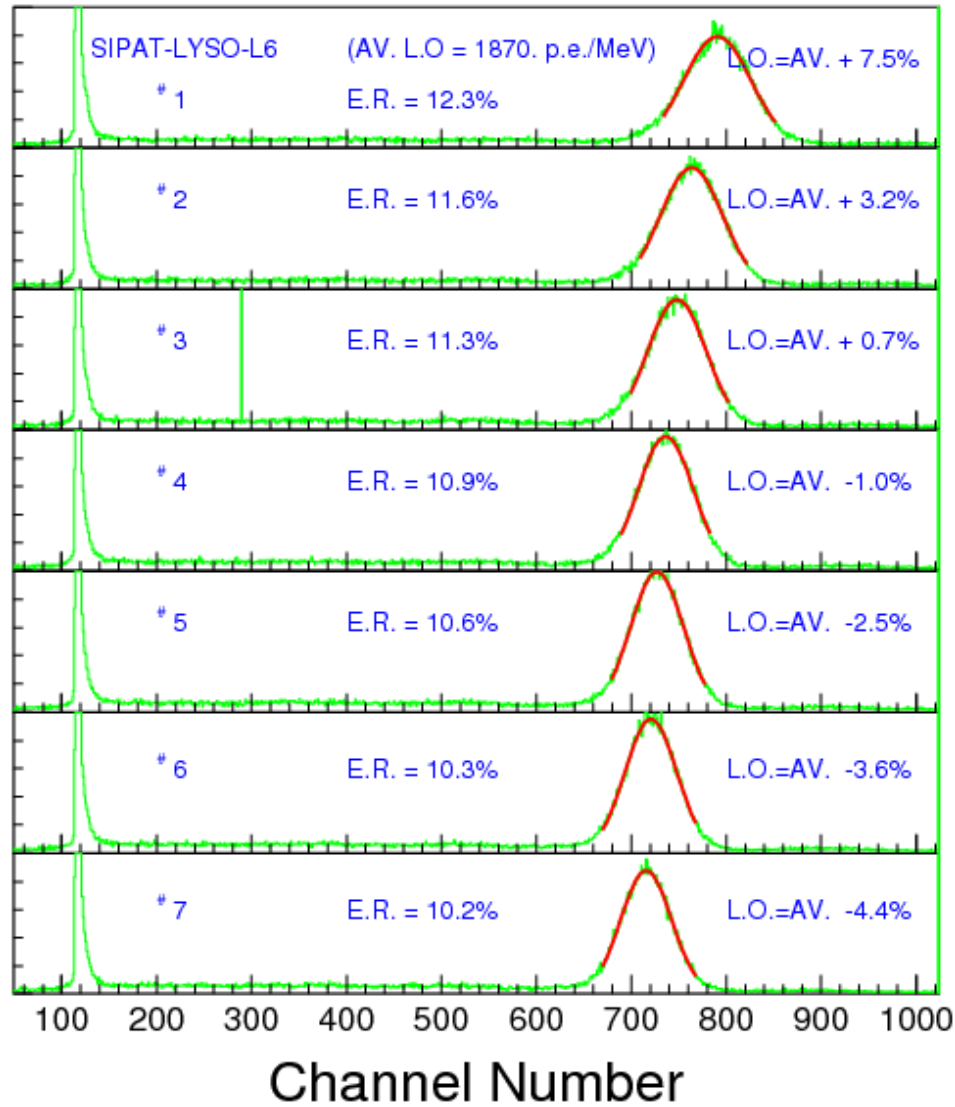
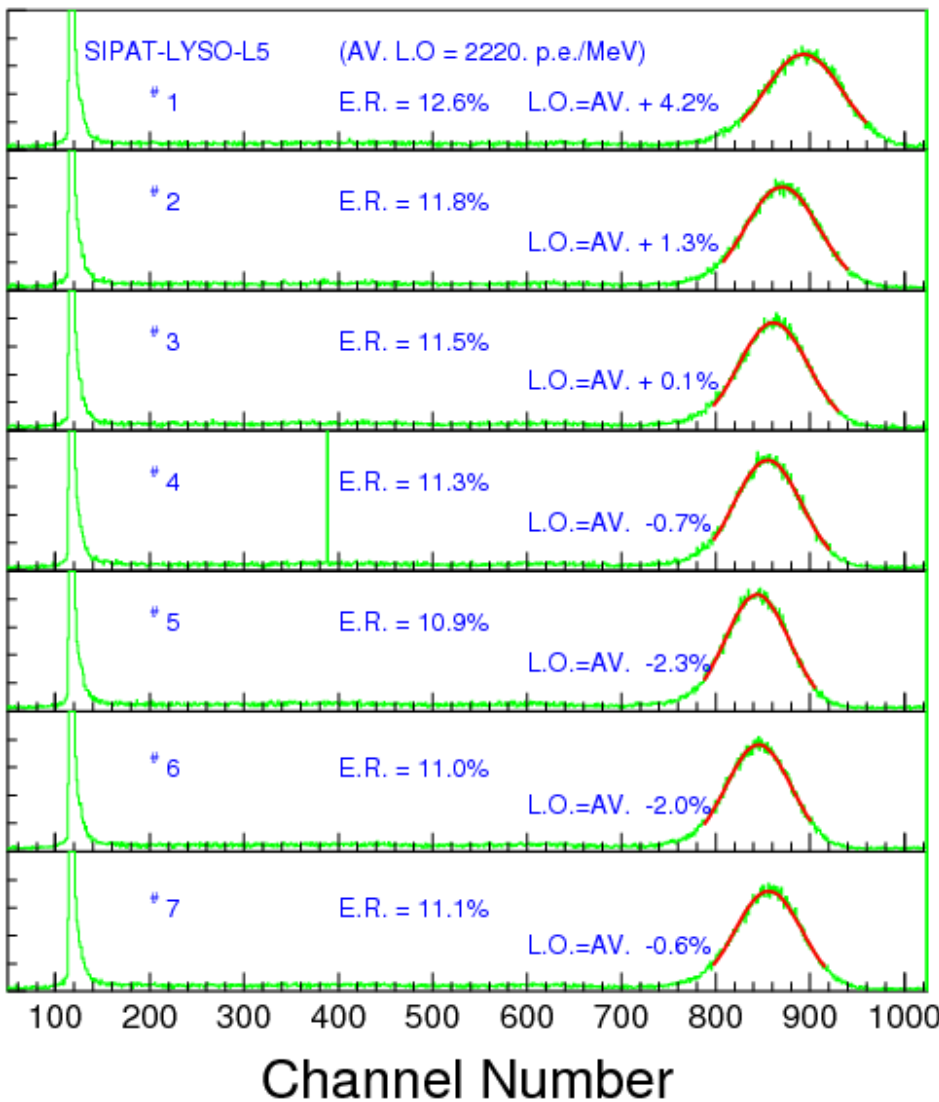


# CTI-1 & SG-3: DC-200 Coupling





# SIPAT-5 & 6: DC-200 Coupling





# Summary of the FWHM Resolution



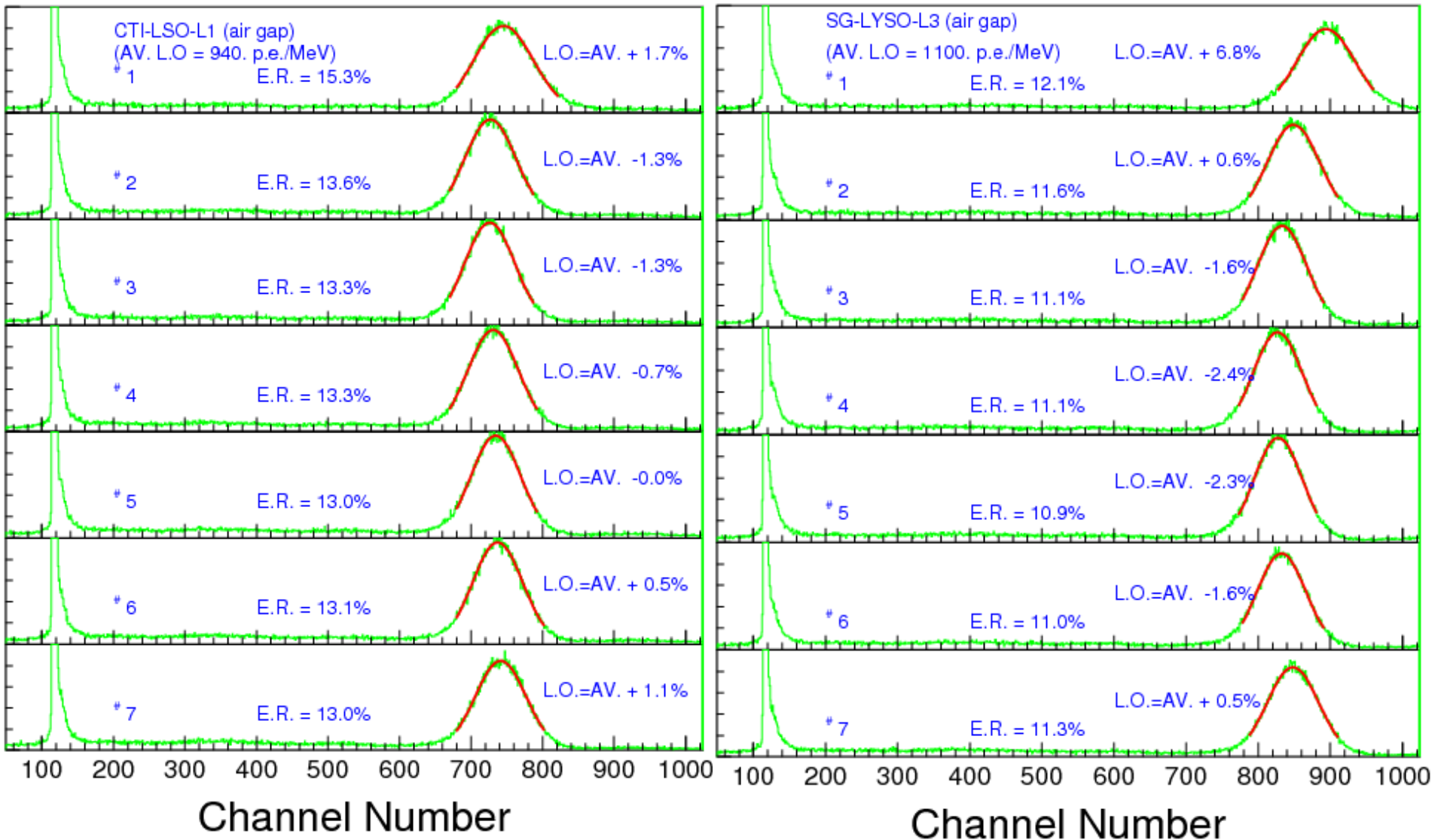
With Dow-Corning 200 Fluid Coupling: < 12.5%

Sample ID	E.R. (DOW Corning 200 fluid coupling) @ different points (%)							Mean value (%)
	1	2	3	4	5	6	7	
CTI-1	11.5	11.1	11.0	10.8	10.8	10.8	10.9	11.0
SG-3	9.7	9.4	9.2	8.9	8.8	8.8	8.8	9.1
SIPAT-1	13.2	12.5	12.3	12.1	12.3	12.4	12.4	12.5
SIPAT-5	12.6	11.8	11.5	11.3	10.9	11.0	11.1	11.5
SIPAT-6	12.3	11.6	11.3	10.9	10.6	10.3	10.2	11.1



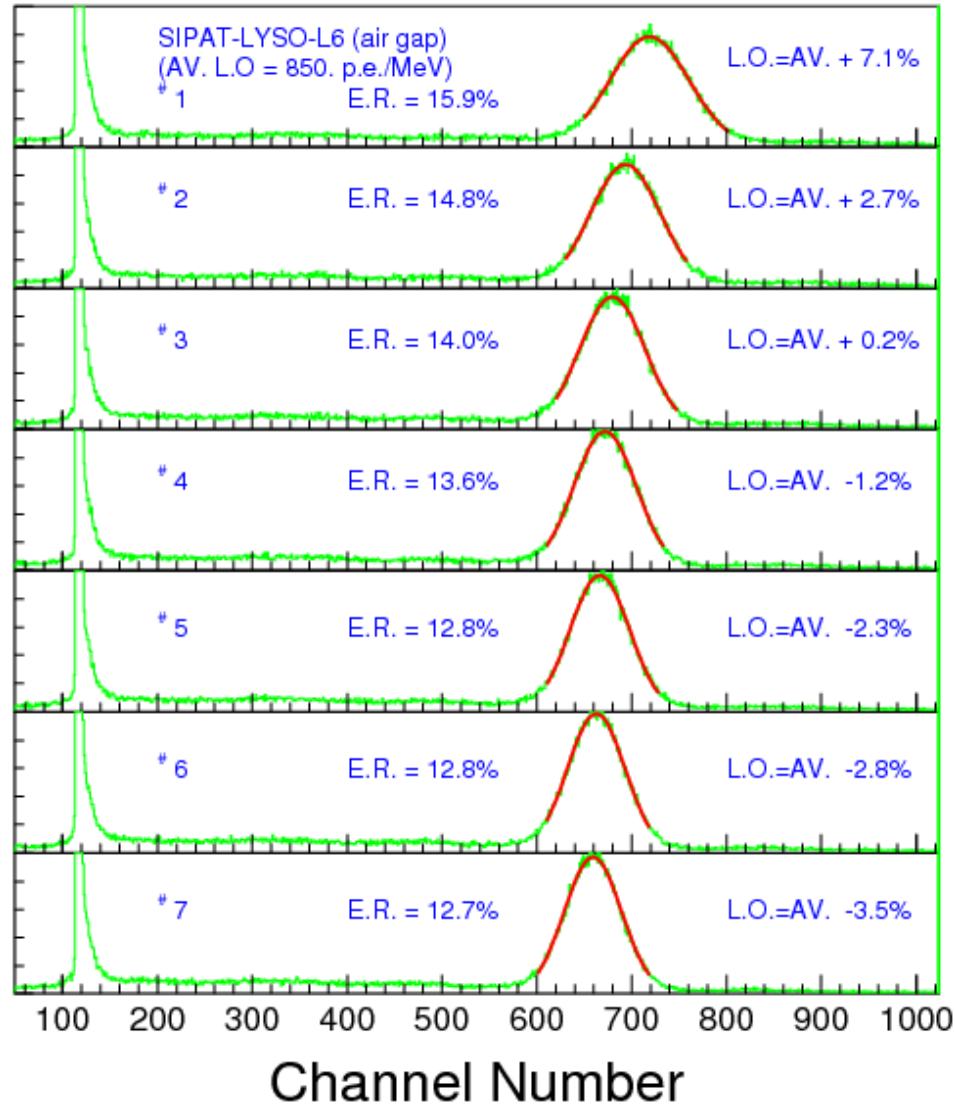
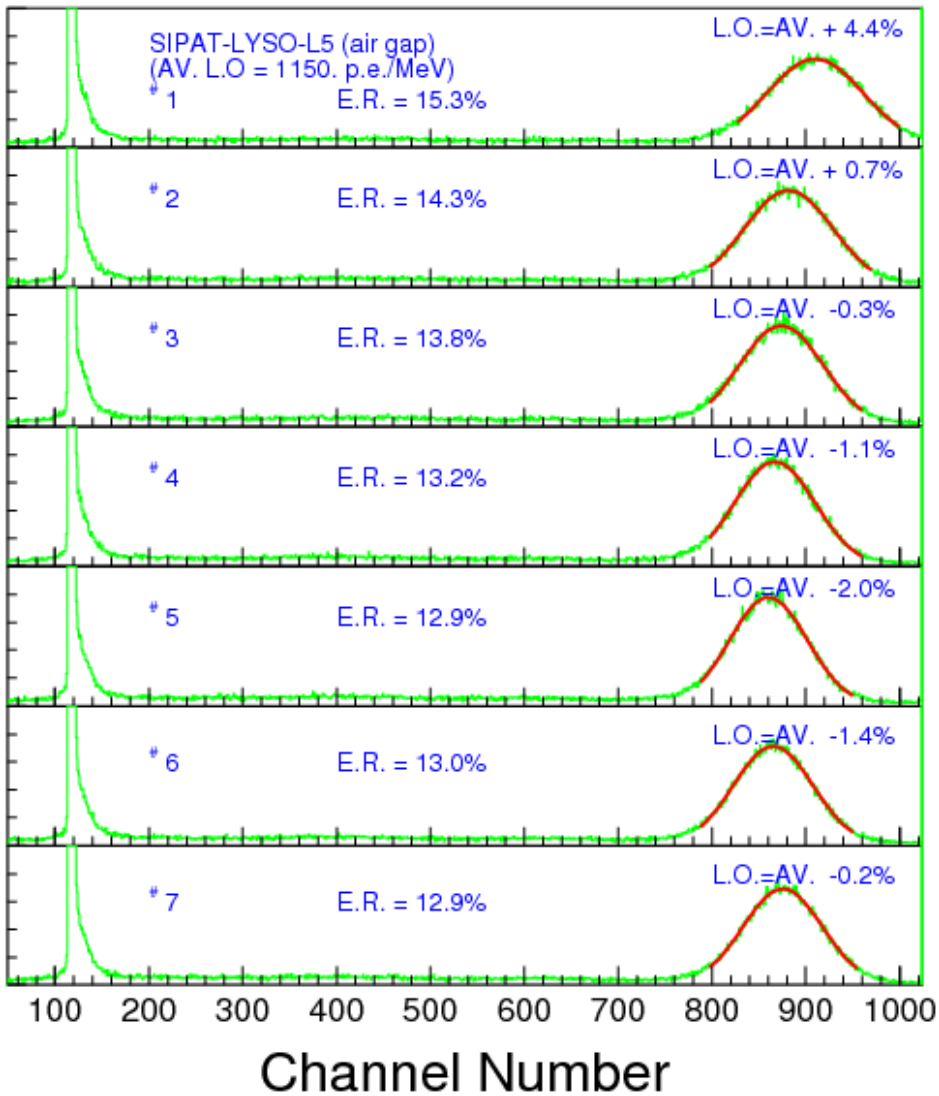


# CTI-1 & SG-3: Air-Gap Coupling





# SIPAT-5 & 6: Air-Gap Coupling





# Summary of the FWHM Resolution



With Air-Gap Coupling: <15%

Sample ID	E.R. (air gap) @ different points (%)							Mean value (%)
	1	2	3	4	5	6	7	
CTI-1	15.3	13.6	13.3	13.3	13.0	13.1	13.0	13.5
SG-3	12.1	11.6	11.1	11.1	10.9	11.0	11.3	11.3
SIPAT-1	14.8	14.6	14.4	14.7	14.3	14.0	13.7	14.4
SIPAT-5	15.3	14.3	13.8	13.2	12.9	13.0	12.9	13.6
SIPAT-6	15.9	14.8	14.0	13.6	12.8	12.8	12.7	13.8