streaming

Streaming MC directly to reconstruction…
yes it's easier but….

a. no performance gain (disk I/O negligible).

b. Reco has to be blind to MC.

c. I/O tests (TT, banks, timing)

d. Need ability to keep hits to compare MC response to data.

reconstructing…

Try. Every. Framework.

“Try”: write hits (TEXT file ok), use framework to reconstruct hits.

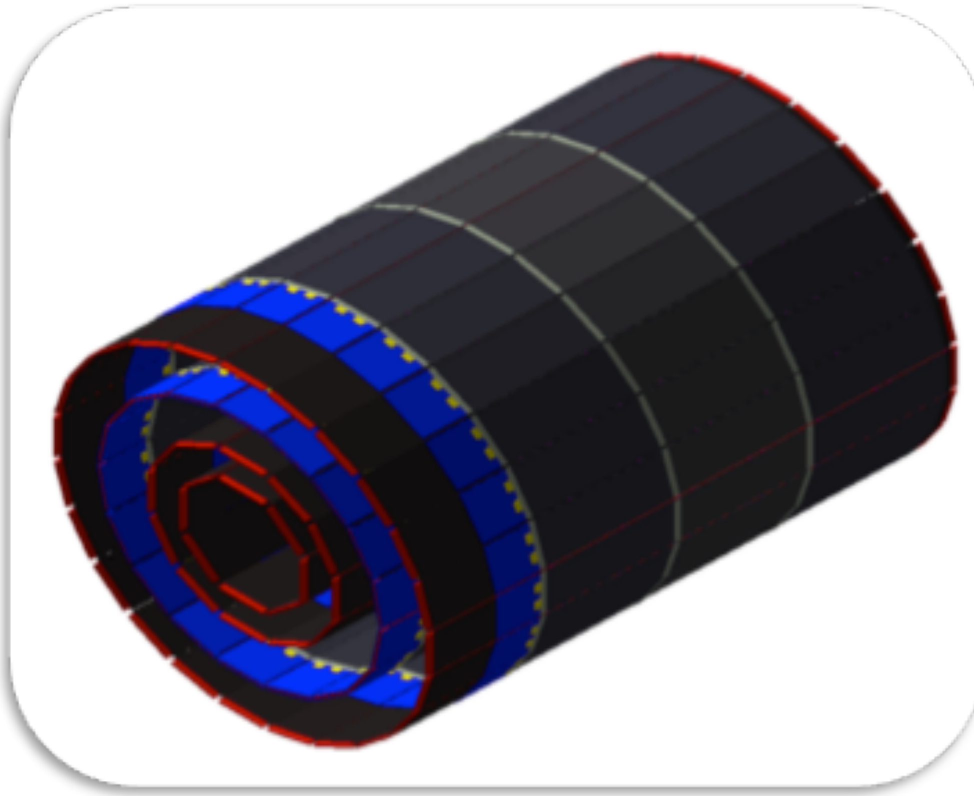
Do not decide on a framework before trying.

Software Teams (CLAS12)

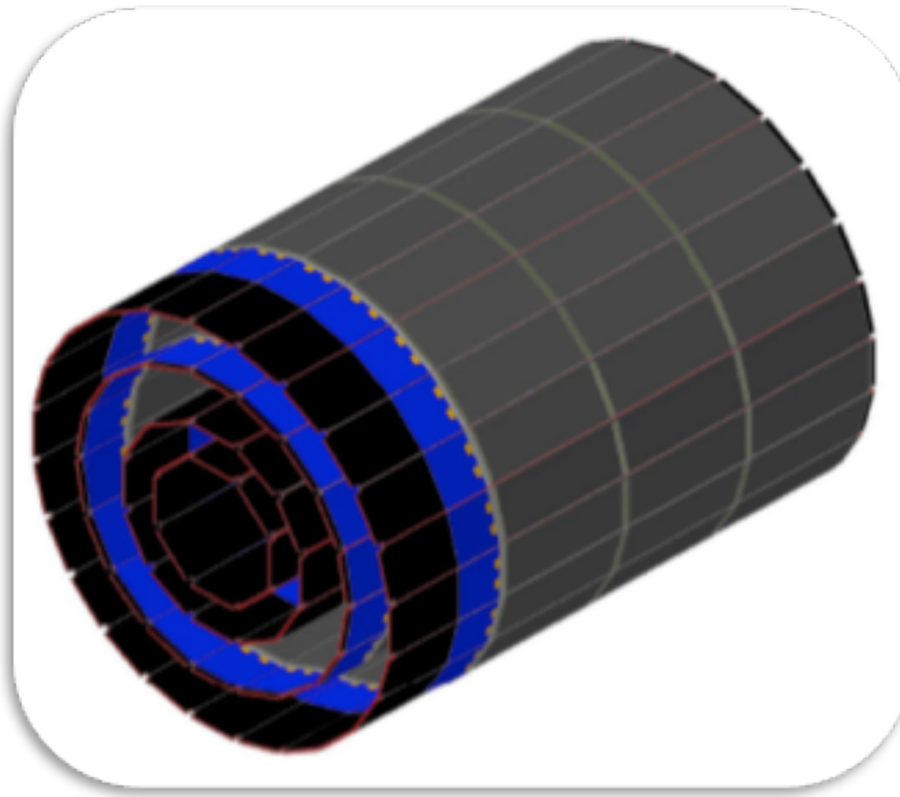
Detector	Sensitivity
BST	M. Ungaro, A. Yegneswaran, Y. Gotra, V. Zieger, J. Roger, G. Gilfoyle
Micromegas	S. Procureu, G. Charles, F. Sabatie, G. Fredric.
CTOF	M. Ungaro, V. Baturin, D. Carman, K. Adhikari,
CND	S. Niccolai, D. Sokhan, A. Biselli
HTCC	Y. Sharabian, N. Harrison, A. Puckett, N. Markov
DC	M. Mestayer, Y. Prok, J. Goetz
LTCC	M. Ungaro, A. Vlassov
FTOF	D. Carman, G. Gilfoyle, A. Kim
PCAL	M. Wood, A. Piaseczny, J. Sikorsky, C. Smith
EC	C. Smith, G. Gilfoyle, G. Gavalian, L. Allison
RICH	M. Contalbrigo, L. Pappalardo, N. Baltzzell, A. Ahmed, S. Pisano, F. Benmokthar
FT	R. Devita, M. Battaglieri, A. Celentano

Background Rates, Scalers - example 1 (SVT)

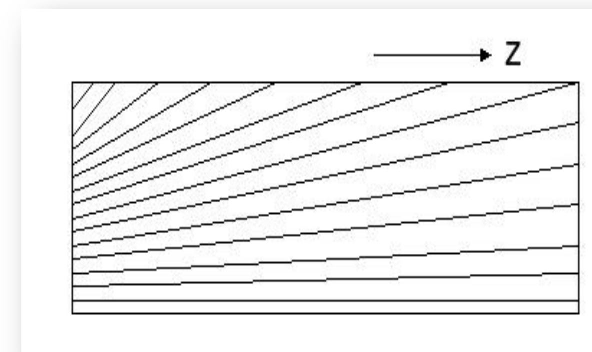
Geant4



Eng. Design



Exaggerated Strips Layout



SVT:

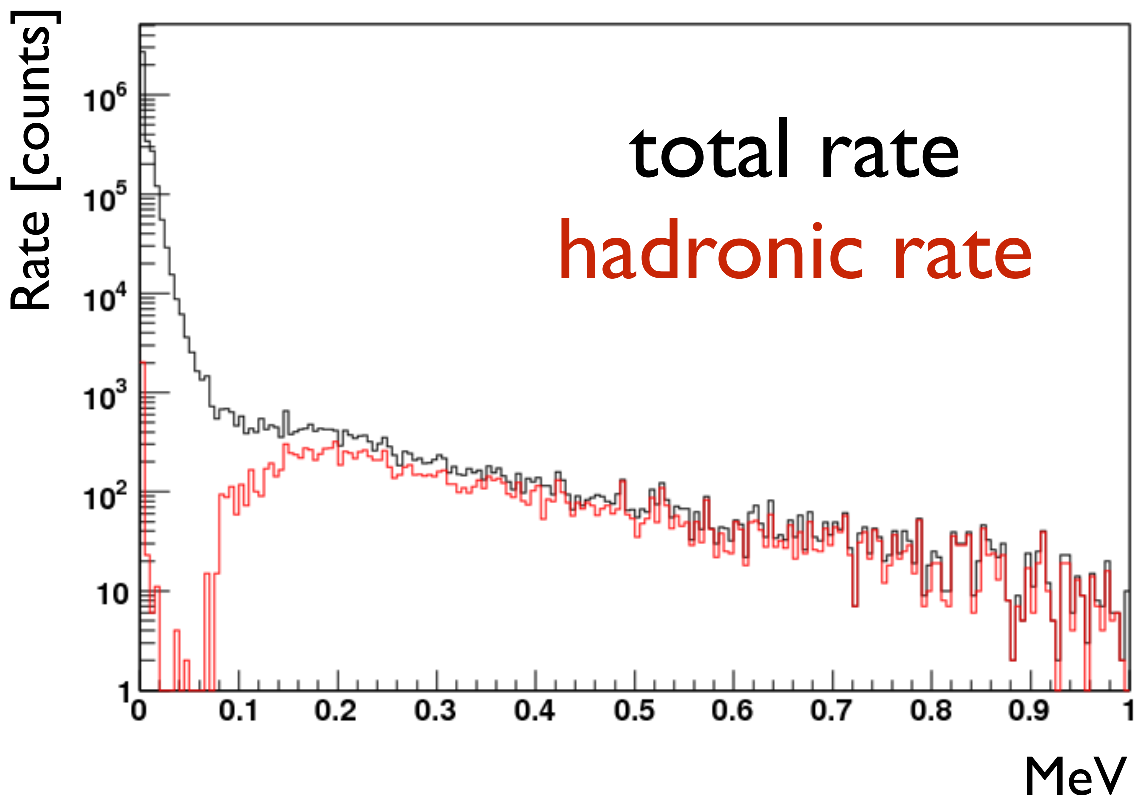
Geometry: each module has sevel layers of materials. Includes bus cables, support structure, even glue. 17K channels.

Sensitivity: 3/4 regions, 2 layers/region, 3 modules/layer, 256 variable angle strips. Charge sharing. electronic noise, lorentz angle. 132 ns Time window

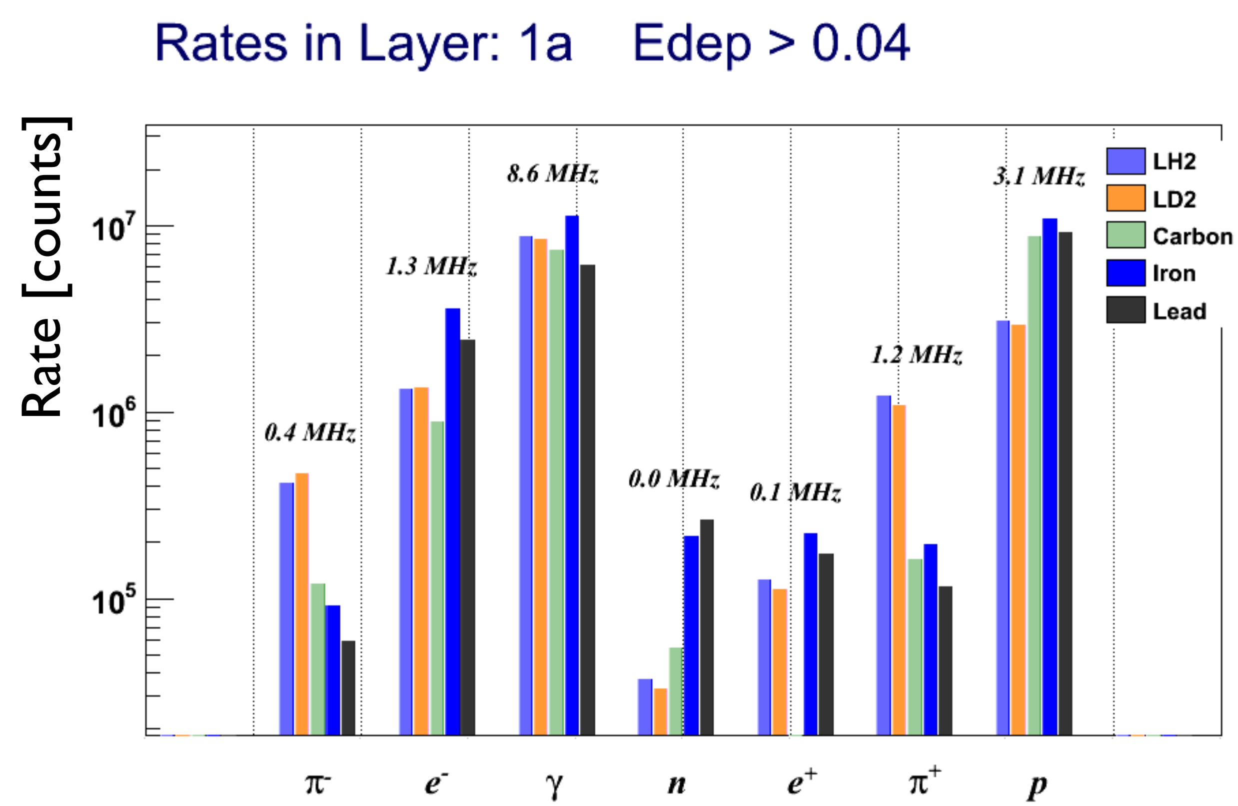
Digitization: 3 bit ADC, region/layer/strip. Detailed comparison with cosmic data. MC, RECO, calibration

Background Rates, Scalers - example 1 (SVT)

Energy Deposited (Threshold Study)



Rates / particles / energy deposited / target



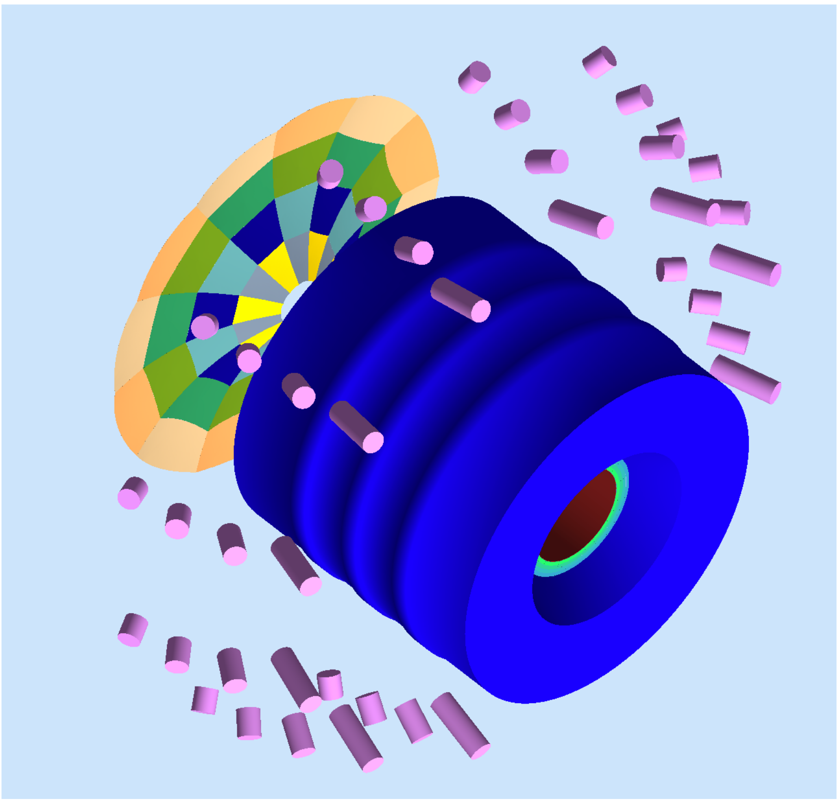
	EM	Hadronic	Total
1a	57.68	2.588	60.27
1b	43.29	2.124	45.41
2a	50.82	3.685	54.51
2b	41.91	3.162	45.07
3a	44.59	4.813	49.4
3b	38.04	4.354	42.4
4a	32.74	3.383	36.12
4b	28.83	3.862	32.69

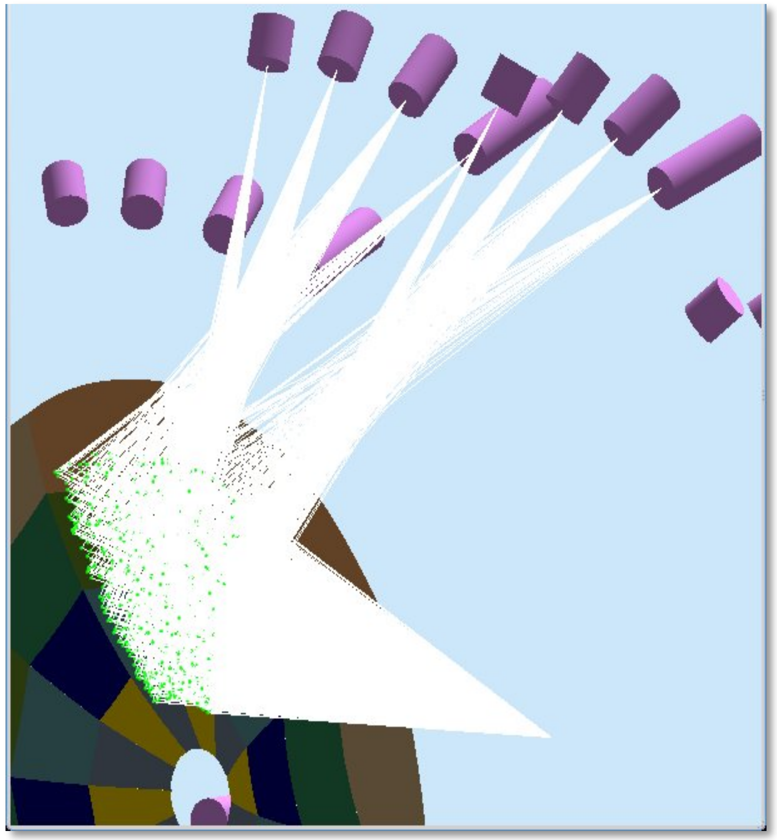
Edep > 20 KeV, Rate in MHz

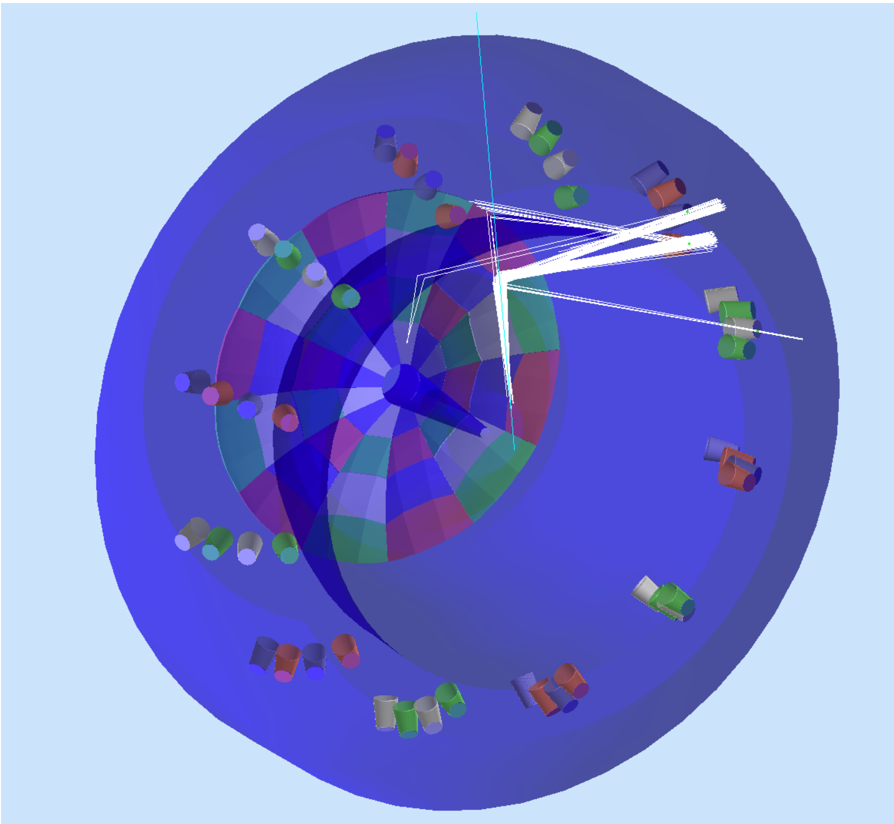
target	GeV/s	GeV/(s cm2)	mrad/s	mrad/(scm2)	rad/year	rad/(year cm2)
lh2	20325	15.054	6.244	0.00462	196939	145
ld2	20332	15.060	6.247	0.00462	197013	145
C	32220	23.865	9.899	0.00733	312193	231
Fe	52182	38.650	16.032	0.01187	505612	374
Pb	66000	48.885	20.278	0.01501	639498	473

(what's shown here would correspond to random trigger in clas12)

Background Rates, Scalers - example IV (HTCC)



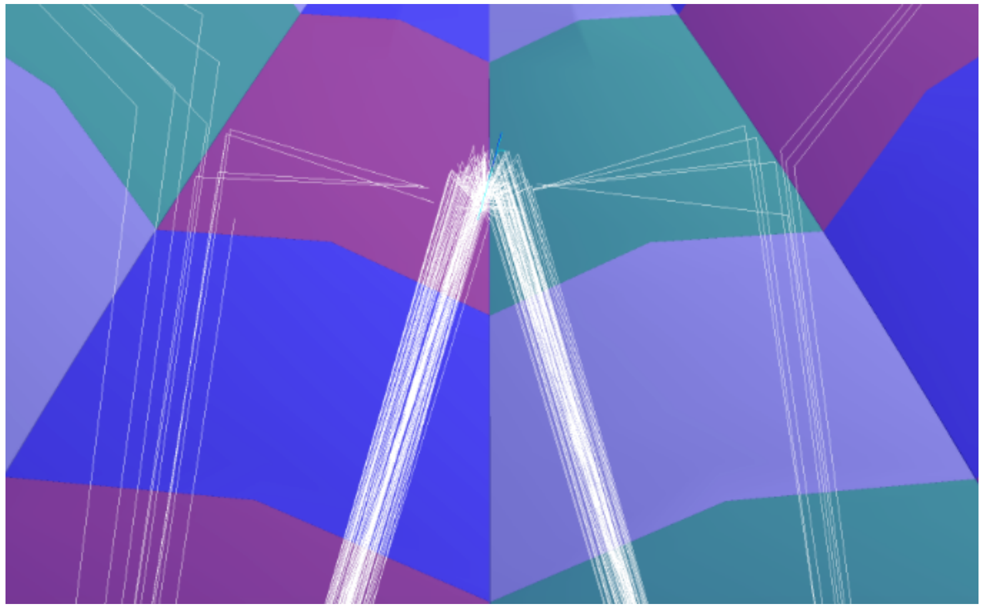




HTCC:

Sensitivity: 12 sectors, 4 layers. Wavelength-dependent PMT q.e., gas and mirror refraction indexes

Digitization: 13 bit FADC, region/layer/strip, Voltage vs time signal, trigger simulation, cluster reconstruction



CLAS12 simulations

Detector	Sensitivity	Digitization
BST	3/4 regions, 2 layers/region, 3 modules/layer, 256 variable angle strips. Charge sharing. electronic noise.	3 bit ADC, region/layer/strip
Micromegas	3/4 regions, 2 layers/region, 3 tiles/layer, 1000 strips/tile. Charge sharing. Lorentz angle.	12 bit ADC, region/layer/tile/strip
CTOF	58 scintillators, PMT q.e., attenuation length, effective velocity	region/paddle ADC TDC
CND	3/4 layers, 48 scintillators each, PMT q.e., attenuation length, effective velocity, birks effect, paddle resolution	region/layer/paddle ADC TDC
HTCC	12 sectors, 4 layers. Wavelength-dependent PMT q.e., gas and mirror refraction indexes	sector/layer, PMT, nphe
DC	3 region, 2 superlayers/region, 6 layers/SL. DOCA, drift velocity, cell resolution	sector/region/SL/layer/wire, TDC
LTCC	6 sectors, 2 regions, 18 PMT / region. Wavelength-dependent PMT q.e., gas and mirror refraction indexes	sector/region, PMT, nphe
FTOF	6 sectors, 3 panels, 5/23/62 paddles/panel, left right PMT	sector, panel, ADC TDC
PCAL	15 layers, u,v,w views, 24 scintillator/view, attenuation length, effective velocity, PMT gain, nphe/charge	sector/stack/view/PMT ADC TDC
EC	39 layers, u,v,w views, 36 scintillator/view, attenuation length, effective velocity, PMT gain, nphe/charge	sector/stack/view/PMT ADC TDC
RICH	Wavelength-dependent PMT q.e., gas and mirror refraction indexes, multi-channel PMT	PMT, ADC, TDC
FT	Light Yield for PbW04, APD q.e, gain, noise	PMT, ADC, TDC

20 years CLAS experience:

Detectors are very complex. Lead team of several people for each detector system should be the software responsible:

- geometry, tests, misalignments
- calibration
- databases constants
- data structure
- digitization
- reconstruction

The software frameworks should allow for these teams to independently build and test their own MC geometry, calibration interface, database constants, etc.

This was a "prime directive" when writing GEMC software framework, and should be prime directive for any complex detector