Updates of the study of the aerogel uniformity on the basis of Test Beam data

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- Short summary of the results presented in last meeting of Oct. 8 at CERN: uniformity estimation on the basis of the runs of scan. The study is feasible only for Nov 1.03 and Matsu 1.03, but not for Nov 1.05
- A second method for estimating photon yield and velocity (see C. Delgado talk) uniformity, valid for all the radiators: we consider a single run and study the uniformity in the region around the beam vertex
- Some implications of radiator homogeneity with the charge resolution

CERN meeting Conclusions

Summary of some parameters relative to He

- Radiator Matsu. 1.03 and Novos. 1.03 have very similar photon yield and thus similar results
- Radiator Novos. 1.05 has a higher photon yield and better charge resolution
- The uniformity has been estimated on the basis of the runs of scan. For nov 1.05 the tile uniformity has not been proved

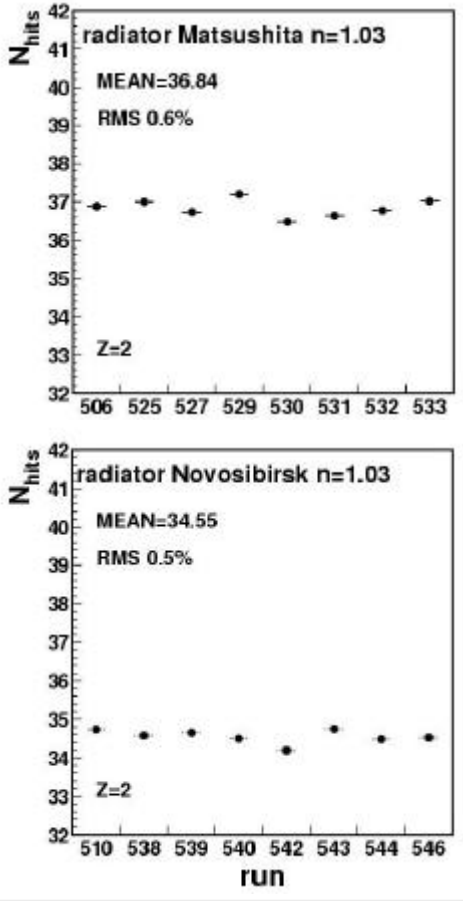
Agl	N_{hits}	s(Z)	Uniformity
CIN 1.03	34.55 34.20	0.184 0.183	0.5%
MNN 1.03	36.84 37.12	0.180 0.178	0.6%
CIN 1.05	47.10 47.25	0.155 0.155	?

Black data, blue MC

Charge uniformity (review)

- To estimate the aerogel uniformity we plot the mean number of hits for the He sample in each run
- The tile of Agl Novos. 1.05 too small (5 cm side) to prove the uniformity

	Num of hits	uniformity
Matsu. 1.03	36.84±0.08	0.6%
Novos 1.03	34.55±0.06	0.5%



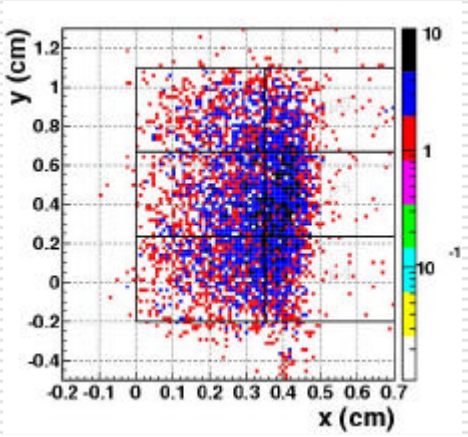
Charge uniformity on 3 different spatial scales

- 1- runs of scan 2-3 cm
  - Dedicated runs, high statistics ☺
  - Systematic error of setup due to external intervention between runs, tile positioning ☹
  - Radiator Nov 1.05 tile too small, photon loss at radiator border ☹
- 2- runs with extended beam 0.5 cm
  - Same run, same tile position ☺
  - but less statistics ☹
- 3- runs with ‘point-like’ beam
  - Same situation than runs with extended beam. Useful to investigate possible no-uniformity at small (<1mm) scale

Runs of radiator Novos n=1.03 and n=1.05 with an extended beam

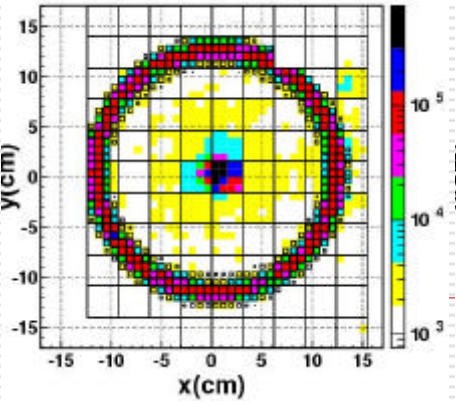
- Novos 1.03 run has rings fully contained: ph. Yield uniformity is estimated with the number of hits in the ring
- For Novos 1.05 run part of the ring is not contained: ph yield computed from the reconstructed charge

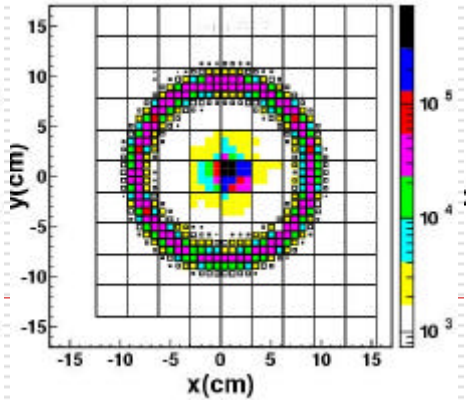
- Beam section about 0.7x1.2 cm^2

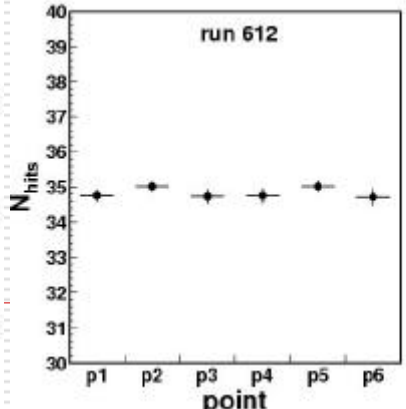


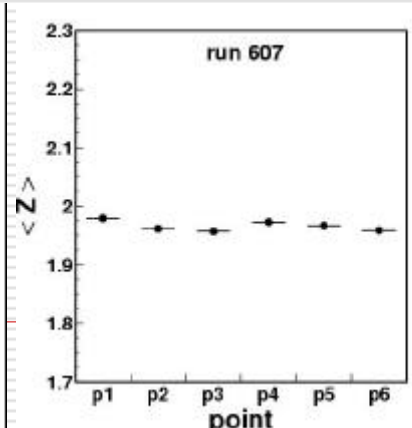
ph yield uniformity%:

Nov. 1.03	0.37± 0.05
Nov. 1.05	0.80± 0.10



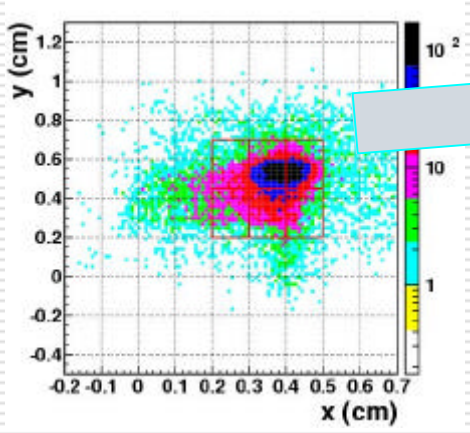


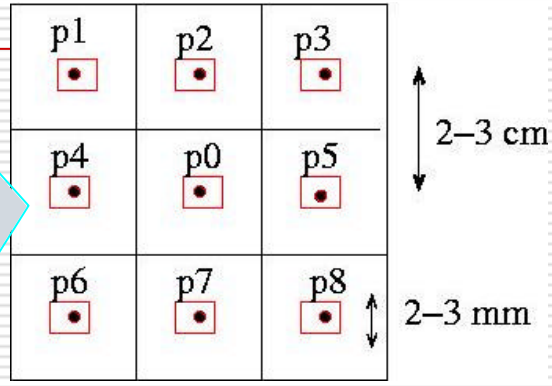




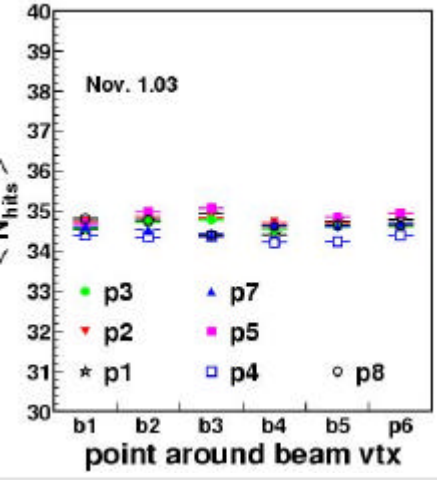
Point-like beam runs

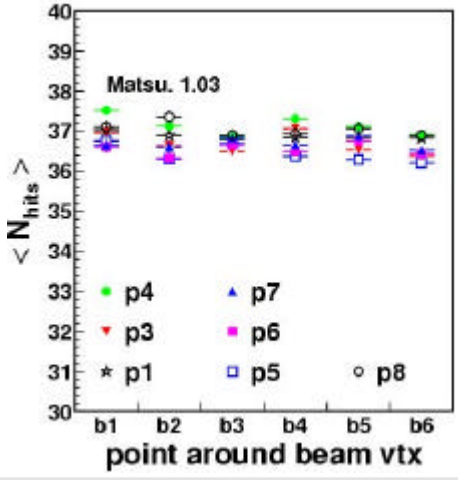
- The beam section using the STD track determination is 0.3x0.5 cm^2
- For each run, we scan 6 points in the area around the beam vertex, b1,b2..b6

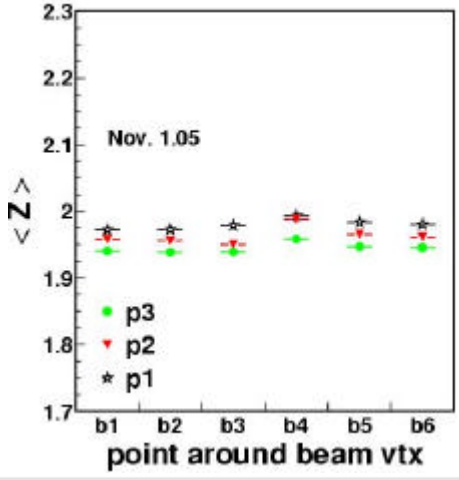




Results:





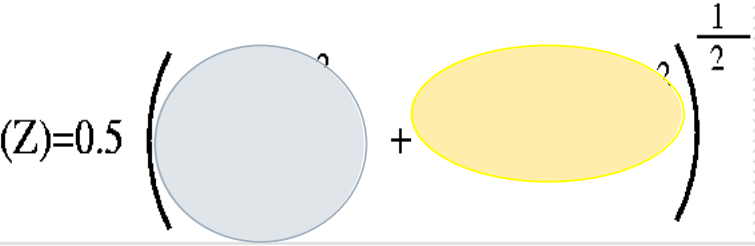


Ph yield uniformity %

Nov. 1.03	0.32± 0.04
Matsu 1.03	0.45± 0.15
Nov. 1.05	<0.88 0.22

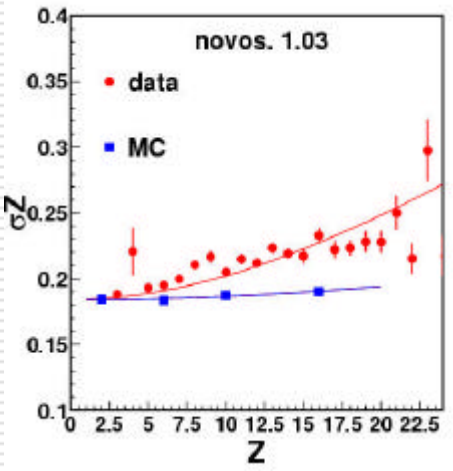
Charge resolution for the 3 radiators: data vs MC and fit with a 2 parameter function

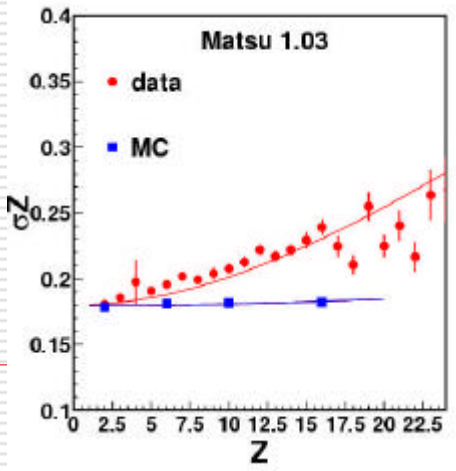
- The charge resolution is fitted with a curve computed as the propagated error on Z

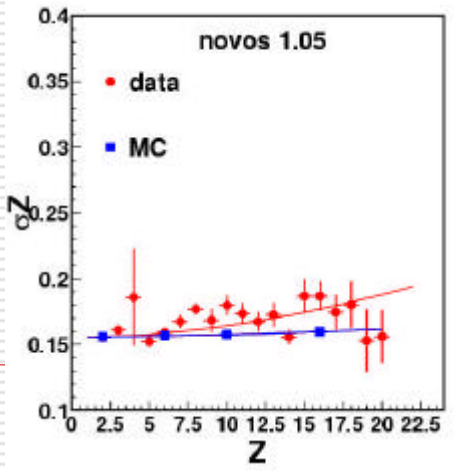


1 term: depends on the s.p.e. resolution, on the Nexp and is the leading term at low Z

2 term: depends on the possible systematic errors in the charge reconstruction (i.e. radiator non-homogeneities) and it increases with Z.







Charge resolution: results of the fit

- The term due to the s.p.e. resolution has the same value in data and MC.

rom TB calibration s/Q = 59%

The term due to the systematic error of the reconstruction is larger in data than in MC

Possible causes:

- Radiator no homogenity
- Periodical drift of Gains
- Any other effect which is correlated for all the channels

	SPE res. (%)	Err(Nexp) (%)
Nov 1.03	64.6±0.3 64.3±1.2	1.67±0.04 0.62±0.09
Mnn 1.03	64.3±0.4 64.0±1.0	1.80±0.04 0.42±0.11
Nov 1.05	60.9±0.8 61.8±1.1	1.06±0.10 0.42±0.09

Black: data, red: MC

conclusions

- The aerogel uniformity has been tested with 3 methods, on 3 spatial scales
- All the radiators have a uniformity better than 1%
- The charge resolution in data and MC has been compared and fitted with a 2 parameter function. The comparison with the MC, points out that in the data resolution deteriorates faster, due to a systematic error on ph yield determination.
- Radiator unhomogeneity could be the cause of this difference between data and MC