CSC spatial resolution with GIF++ testbeam data (update)

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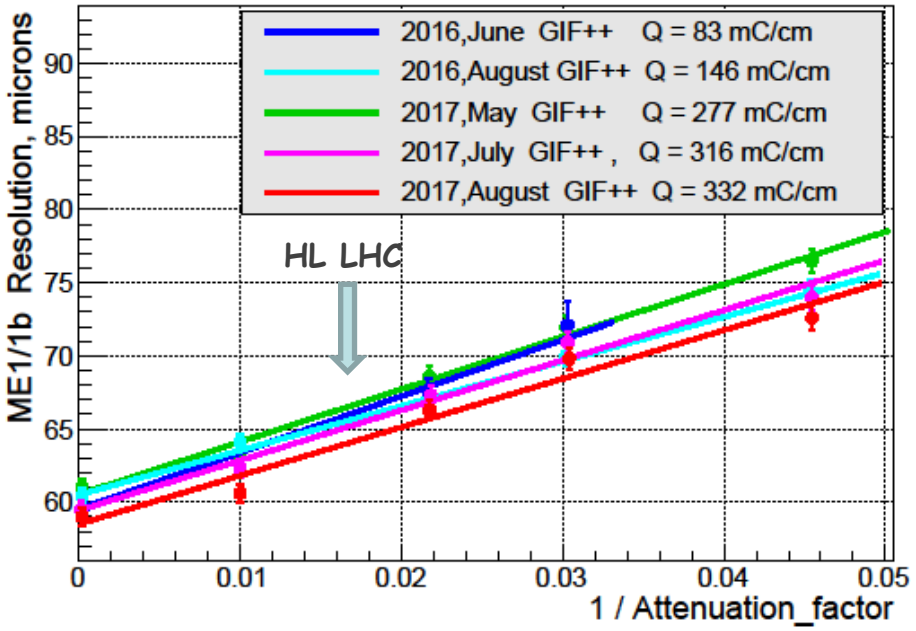
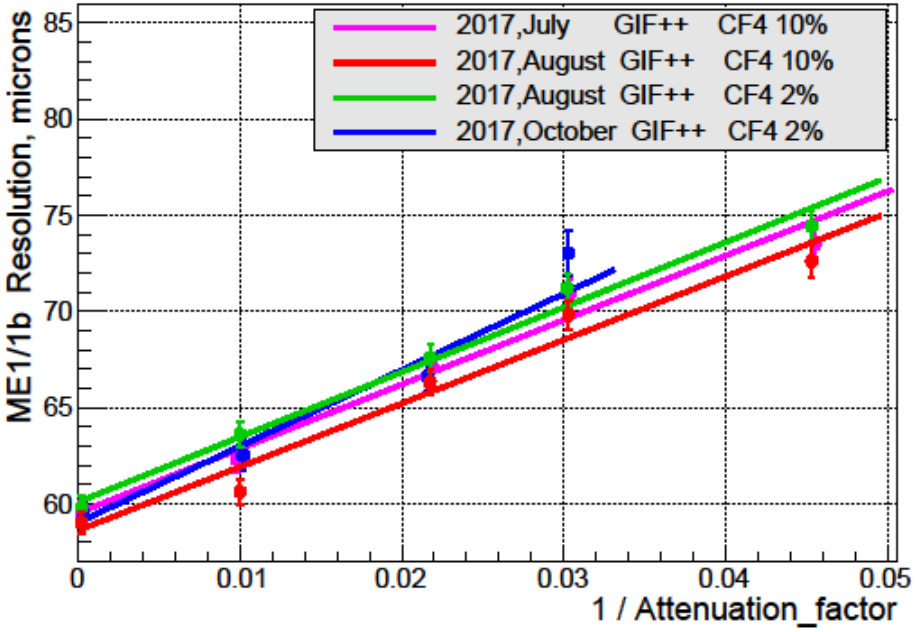
GIF++ ME11b Resolution test40, HV0

Resolution vs inversed Attenuation factor

CF4 10%



CF4 10% & 2%

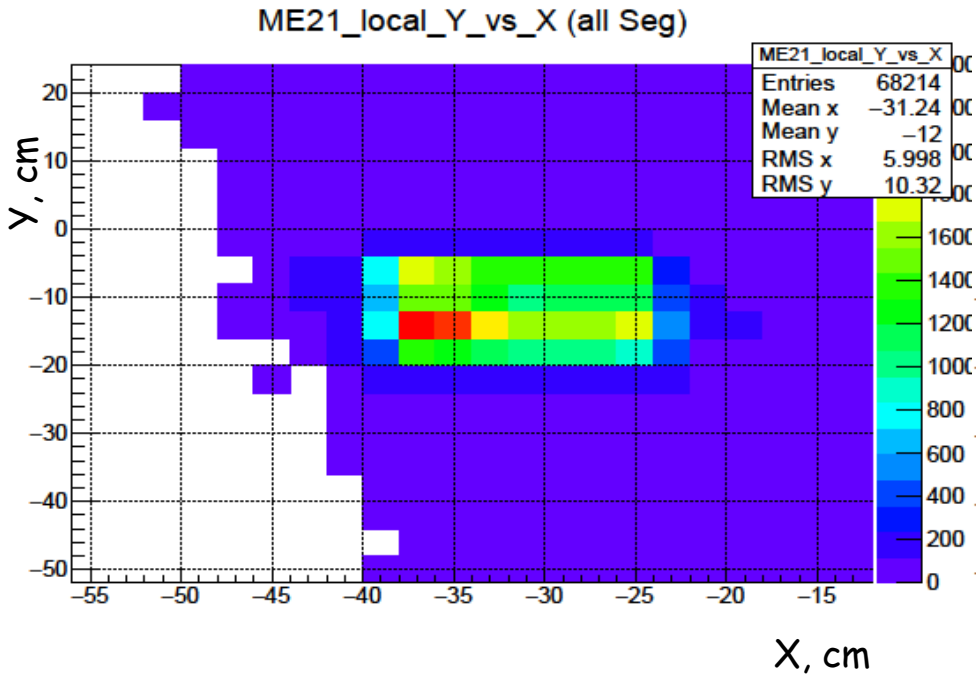


Spatial resolution calculation:

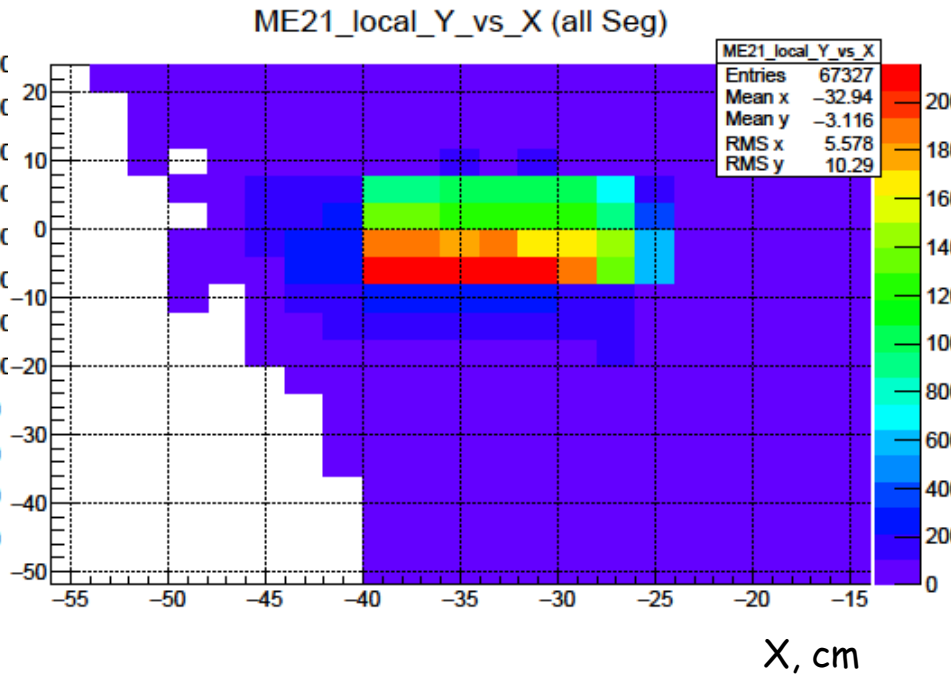
A single layer spatial resolution is defined as a residual between the measured strip coordinate and predicted track coordinate in the layer calculated from the track-segment fit -> $1/\sigma^2(\text{Station}) = 6/\sigma^2(\text{layer})$

GIF++ ME21 Beam Profile for Different Periods

May'17



August'17



Average strip width: 10.7 mm 11.2 mm

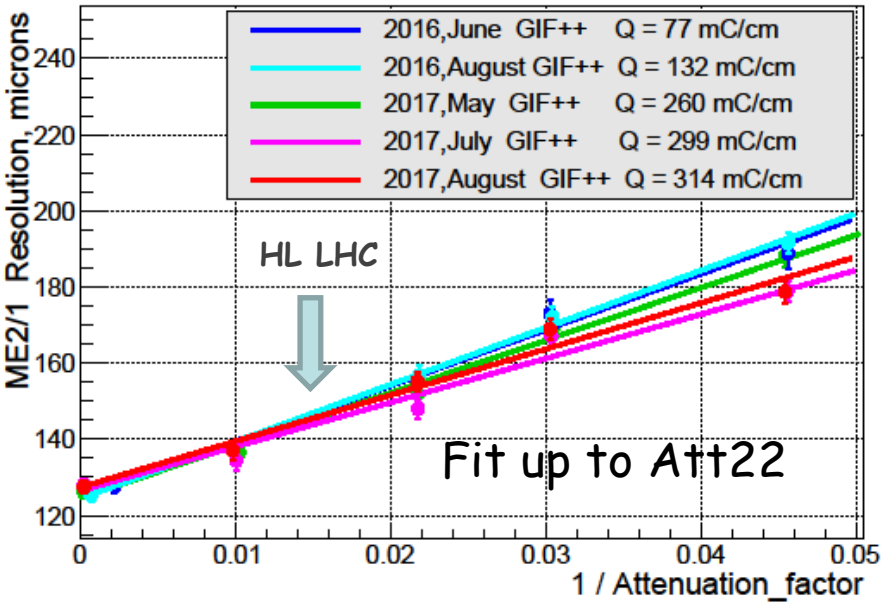
Resolution [mm] = Residual[StripUnits]*Aver.StripWidth[mm]

Beam profile in agreement with Bhargav M.J. report March, 20

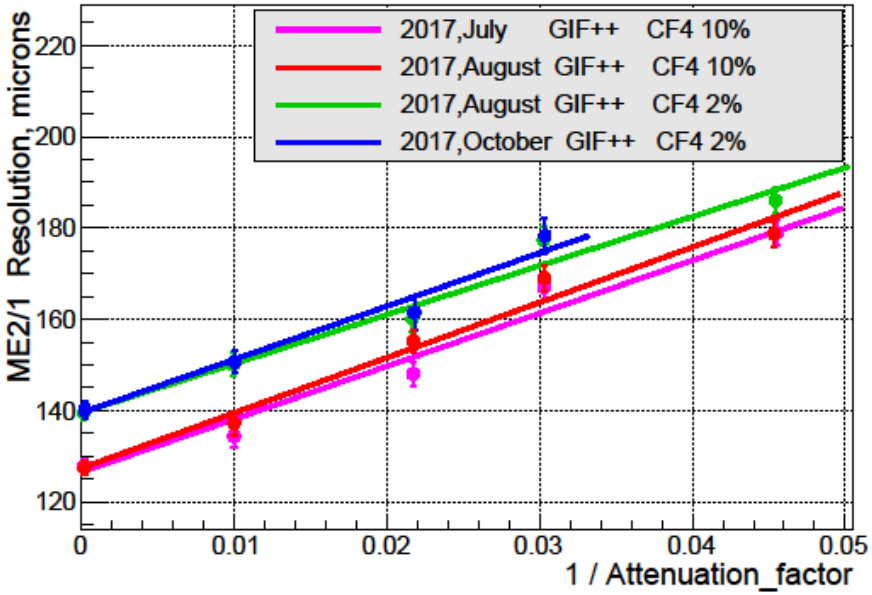
GIF++ ME21 Resolution test40, HV0

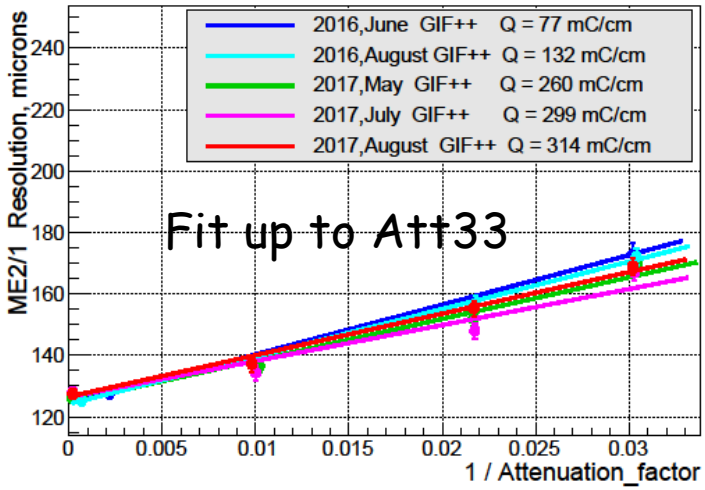
Resolution vs inversed Attenuation factor

CF4 10%



CF4 10% & 2%





$$1/\sigma^2(\text{Station}) = 3/\sigma_1^2 + 3/\sigma_2^2$$

Conclusions

- There is no spatial resolution degradation for both CSCs operating with CMS nominal gas mixture with accumulated charge up to the value corresponding to ~2 HL LHC periods;
- CSC resolution degradation operating at HL LHC conditions is:
  - ME11b ~10-12%;
  - ME21 ~13-15%.
- Slight degradation in ME21 resolution for 2% CF4 gas mixture is under investigation.

Back up

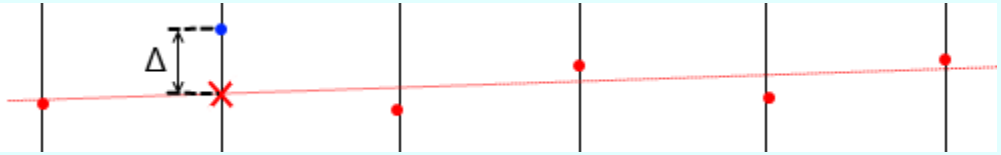
GIF++ Test Beams 1,3 and 4. Filter scans: Pressure and Current in CSCs

Att. Factor	TB-1 May-2017			TB-3 August-2017			TB-4 October-2017		
	Pmbar	$<I_{ME1/1}>$ μA	$<I_{ME2/1}>$ μA	Pmbar	$<I_{ME1/1}>$ μA	$<I_{ME2/1}>$ μA	Pmbar	$<I_{ME1/1}>$ μA	$<I_{ME2/1}>$ μA
460*							968	1.5	0.85
220*							968	2.9	1.6
100*	951	6.5	4.1	962	5.6	3.1	966	5.6	3.1
69*	950	9.2	5.6	962	8.7	5.2			
46*	949	11.6	7.0	962	11.0	6.5	968	11.0	6.3
33*	950	18.0	10.8	962	17.1	9.5	968	16.9	9.6
22*	951	23.3	14.1	962	21.6	12.4			
15*	951		21.8						

Spatial Resolution & Efficiency

Spatial resolution calculation:

- Only 6 & 5-point segments are considered;
- For each layer with hit a straight line fit is applied excluding the current layer and the residual (Δ) between the measured strip coordinate and the predicted track coordinate from fit is used for resolution calculation.



- hit used for fit
- hit excluded from fit
- predicted track coordinate