# CSC Spatial Resolution with 2018 data

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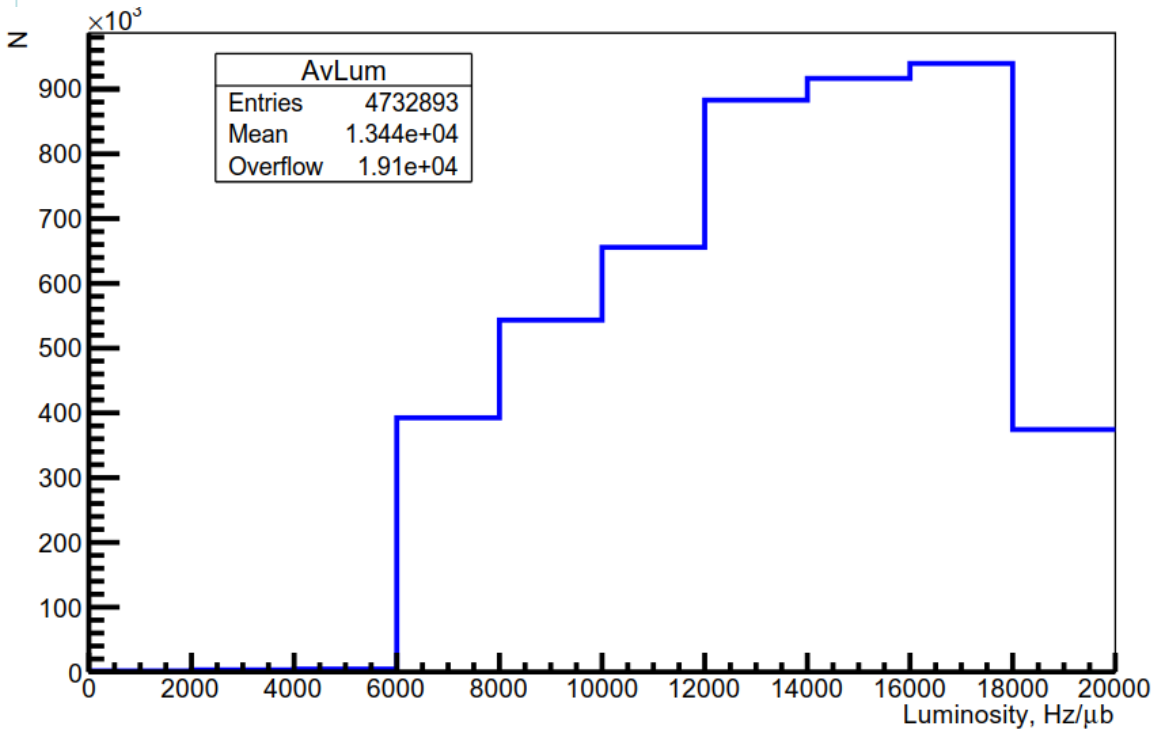
# CMS Runs / Luminosity p-p collisions 2018A

**CMS p-p Runs Before MD1 May-2018**

2440b-2556b, β*=0.3m, <n> = 59, Lpeak 1.8-2×e34cm-2sec-1

| | | | | |
|---|---|---|---|---|
| Fill | 6642 | 315721 | 2018.05.05 04:54 - 09:04 | 207pb-1 |
| Fill | 6643 | 315741 | 2018.05.05 11:44 - 12:23 | 24pb-1 |
| Fill | 6645 | 315764 | 2018.05.05 15:33 - 17:39 | 112pb-1 |
| Fill | 6646 | 315770 | 2018.05.06 02:04 - 04:17 | 119pb-1 |
| Fill | 6648 | 315784 | 2018.05.06 10:55 - 12:13 | 67pb-1 |
| | | 315785 | 2018.05.06 12:22 - 14:21 | 103pb-1 |
| | | 315787 | 2018.05.06 14:57 - 17:57 | 122pb-1 |
| | | 315790 | 2018.05.06 18:11 - 00:14 | 168pb-1 (Linit~1e34cm-2sec-1) |
| Fill | 6650 | 315800 | 2018.05.07 06:39 - 10:52 | 209pb-1 |
| | | 315801 | 2018.05.07 10:56 - 13:14 | 95pb-1 |
| Fill | 6654 | 315840 | 2018.05.07 21:06 - 04:39 | 344pb-1 |
| Fill | 6659 | 315973 | 2018.05.08 23:17 - 05:13 | 275pb-1 |
| Fill | 6662 | 316058 | 2018.05.09 20:30 - 23:08 | 133pb-1 |
| | | 316059 | 2018.05.09 23:09 - 02:50 | 163pb-1 |
| | | 316060 | 2018.05.10 02:52 - 08:56 | 188pb-1 |
| Fill | 6663 | 316082 | 2018.05.10 12:31 - 15:19 | 138pb-1 |
| Fill | 6666 | 316110 | 2018.05.10 21:21 - 22:43 | 79pb-1 |
| | | 316114 | 2018.05.10 23:42 - 10:23 | 351pb-1 (Linit~1.4e34cm-2sec-1) |
| Fill | 6672 | 316153 | 2018.05.11 17:02 - 22:07 | 246pb-1 |
| Fill | 6674 | 316187 | 2018.05.12 03:17 - 16:45 | 509pb-1 |
| Fill | 6675 | 316199 | 2018.05.12 18:41 - 02:27 | 388pb-1 |
| | | 316201 | 2018.05.13 02:35 - 05:49 | 106pb-1 (Linit~1.1e34cm-2sec-1) |
| | | 316202 | 2018.05.13 05:52 - 08:34 | 74pb-1 (Linit~0.8e34cm-2sec-1) |
| Fill | 6677 | 316216 | 2018.05.13 11:47 - 14:56 | 172pb-1 |
| | | 316217 | 2018.05.13 15:03 - 16:47 | 85pb-1 |
| | | 316218 | 2018.05.13 16:51 - 23:30 | 237pb-1 (Linit~1.3e34cm-2sec-1) |
| | | 316219 | 2018.05.13 23:32 - 01:27 | 48pb-1 |



# CSC Spatial Resolution: selection

**Select good quality segment/muon track for spatial resolution measurement:**

- segments matched to global muons with P > 10 GeV
- 6 hits on a track segment
- Track-segment $\chi^2$ (2D) criteria
- Cut on large angles dx/dz (local coordinates):

  | dx/dz | < 0.25 for ME11

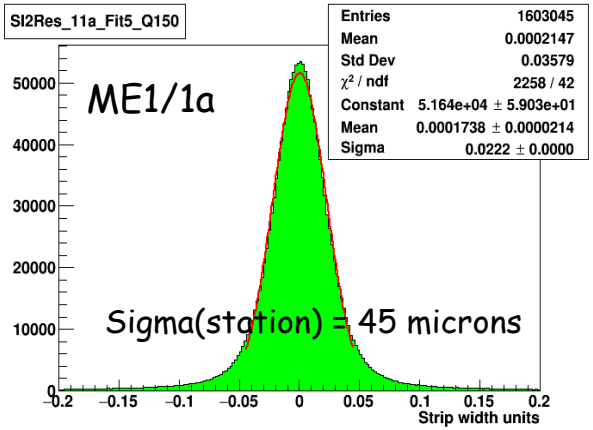
  | dx/dz | < 0.2 for all other stations
- Track-segment $\chi^2$ (strips) criteria
- Sum of charges for 3 strips and 3 time slices:

  $150 < Q_{3x3} < 4000$ ADCs for ME1/1 station

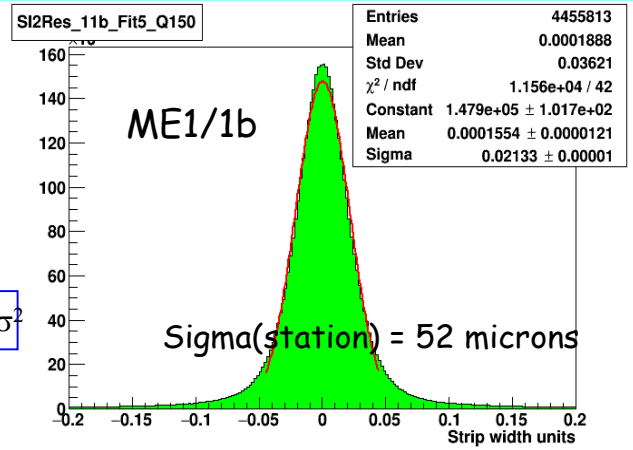
  $150 < Q_{3x3} < 2000$ ADCs for all other stations

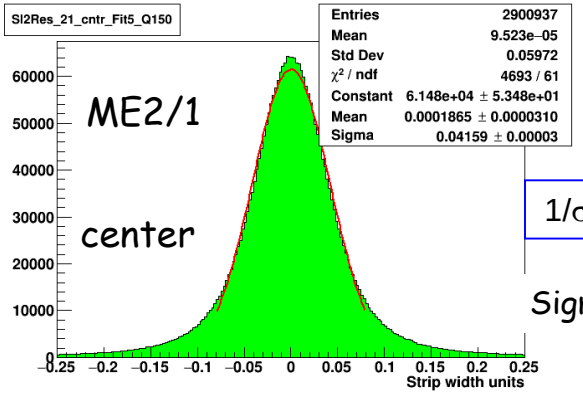
Sofware: CMSSW_10_1_5
Dataset: /SingleMuon/Run2018A-ZMu-PromptReco-v1/RAW-RECO

# Spatial Resolution: results with 2018A collision data



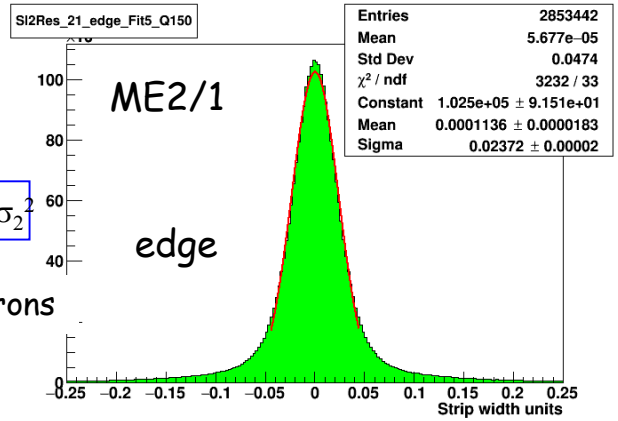

$1/\sigma^2\,(\text{Station}) = 6/\sigma^2$

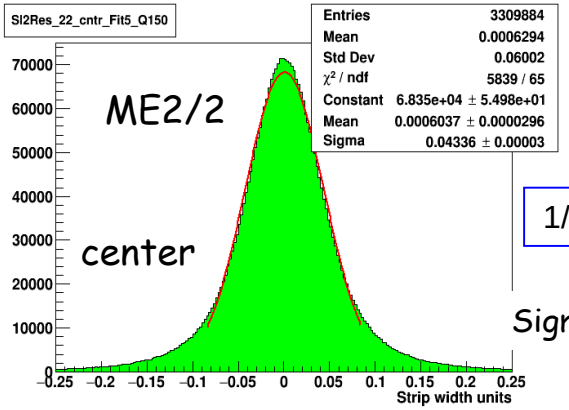



$1/\sigma^2\,(\text{Station}) = 3/\sigma_1^2 + 3/\sigma_2^2$

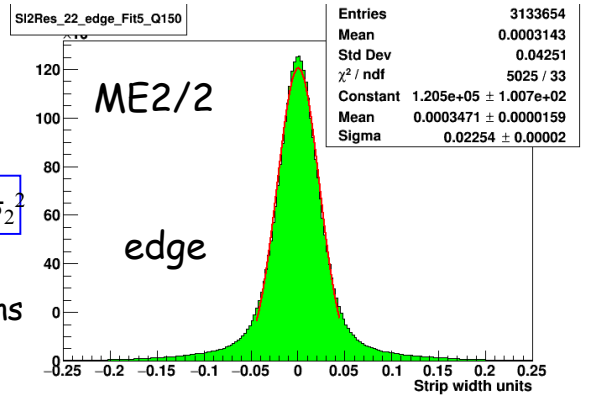
Sigma(station) = 133 microns




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

Sigma(station) = 141 microns

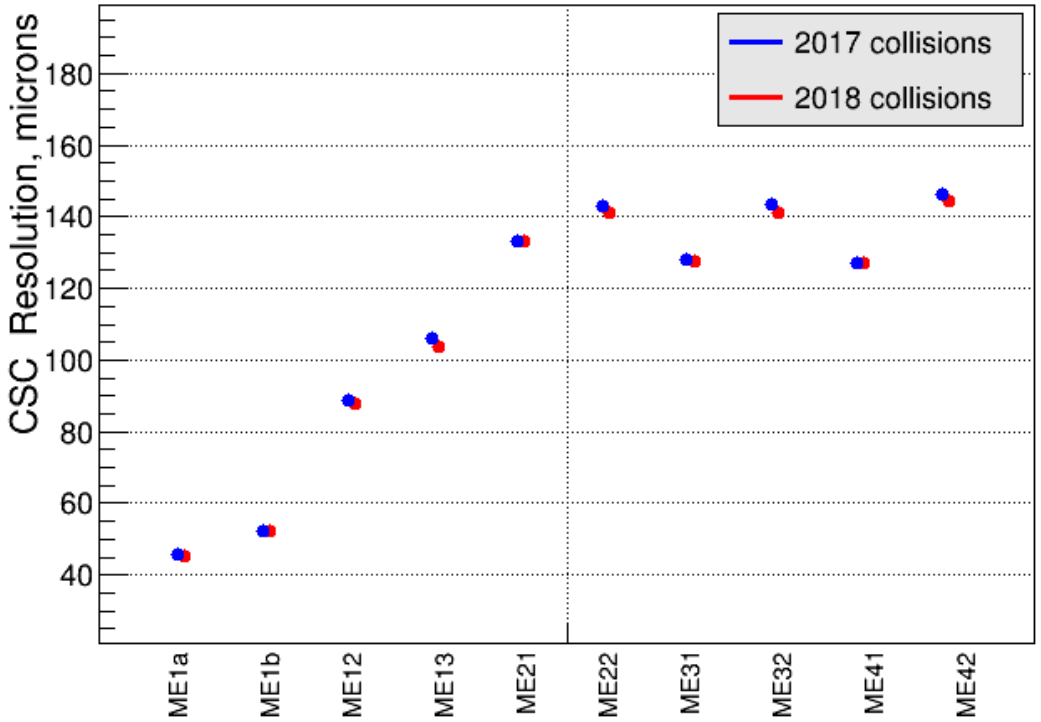


# CSC Spatial Resolution 2017-2018

**Spatial resolution per station (μm):**

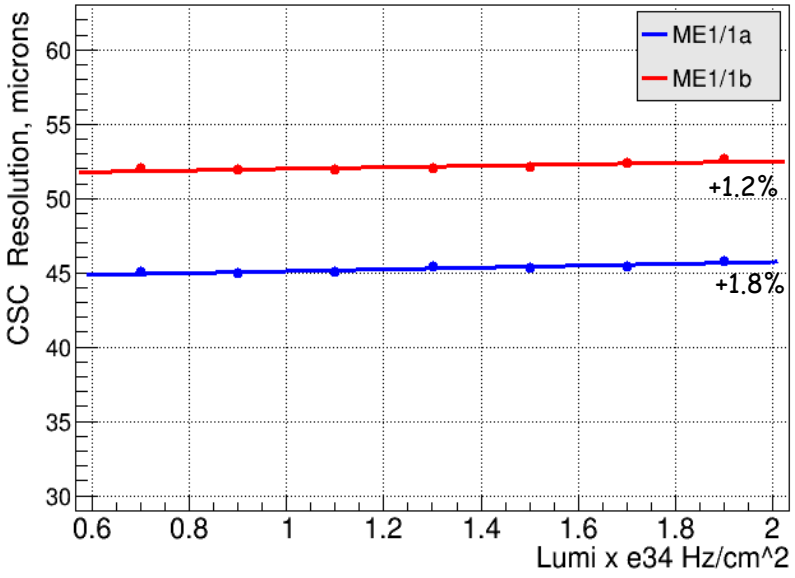
Values are normalized to atm.pressure 965 mbar

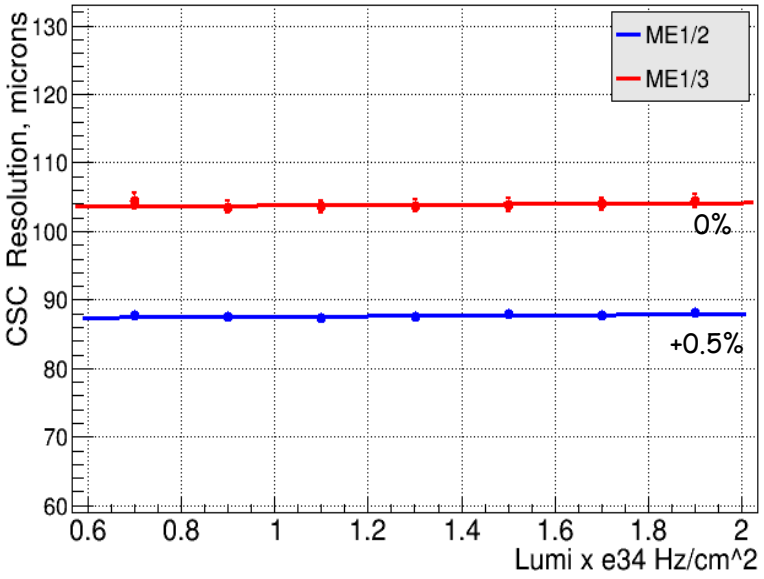
| Station | Collision dataset | |
|---|---|---|
| | Run2 | |
| | 2017C,F | 2018A |
| | ZMu | ZMu |
| ME1/1a | 46 | 45 |
| ME1/1b | 53 | 52 |
| ME1/2 | 89 | 88 |
| ME1/3 | 106 | 105 |
| ME2/1 | 133 | 133 |
| ME2/2 | 143 | 141 |
| ME3/1 | 128 | 127 |
| ME3/2 | 143 | 141 |
| ME4/1 | 127 | 127 |
| ME4/2 | 146 | 145 |

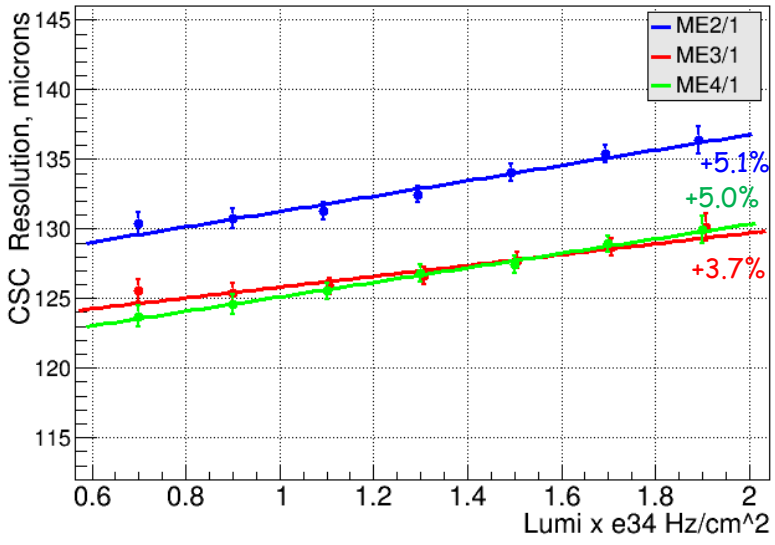


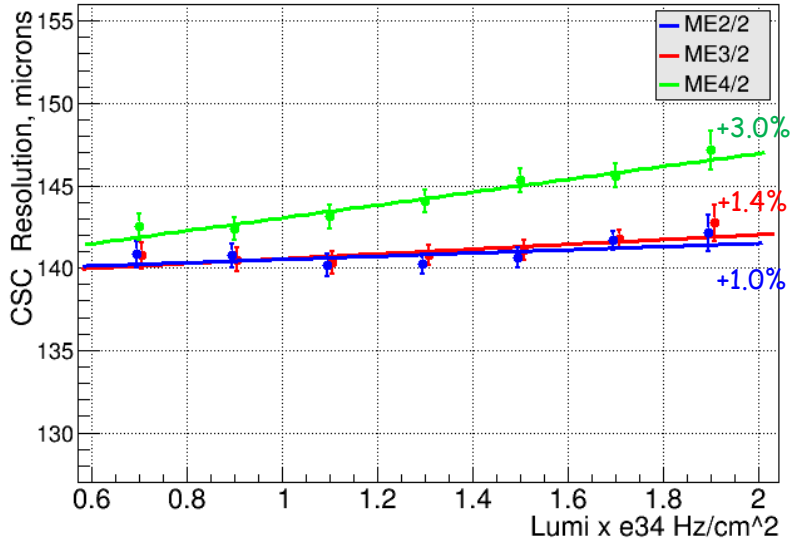

Results 2017/2018 are in good agreement

# CSC Spatial Resolution vs LUMI 2018



# Conclusions

- 2018 Spatial Resolution results are in a good agreement with 2017 data
- The minor Spatial Resolution degradation vs Lumi in the range (0.6-2.0) e34 Hz/cm2 is observed.

# Backup Slides

# Spatial Resolution

## Spatial resolution calculation:

- Only 6 -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