Laser Alignment System for Track-based Alignment

CRAFT09: Investigation of Beam Profile Fits

(Study on preliminary data from CRAFT09, thanks Bruno & Adrian!)

Kolja Kaschube, January 26, 2010

Reminder: LAS and Beam Model

40 infrared laser beams

- 16 in each TEC, nine disks → 9 hits/beam
- 8 Alignment Tubes, five disks per TEC, six hits each in TIB and TOB → 22 hits/beam
- total: *464 hits*
- 30 hits overlapping in TEC/ATs → *434 modules hit*

Parametrization

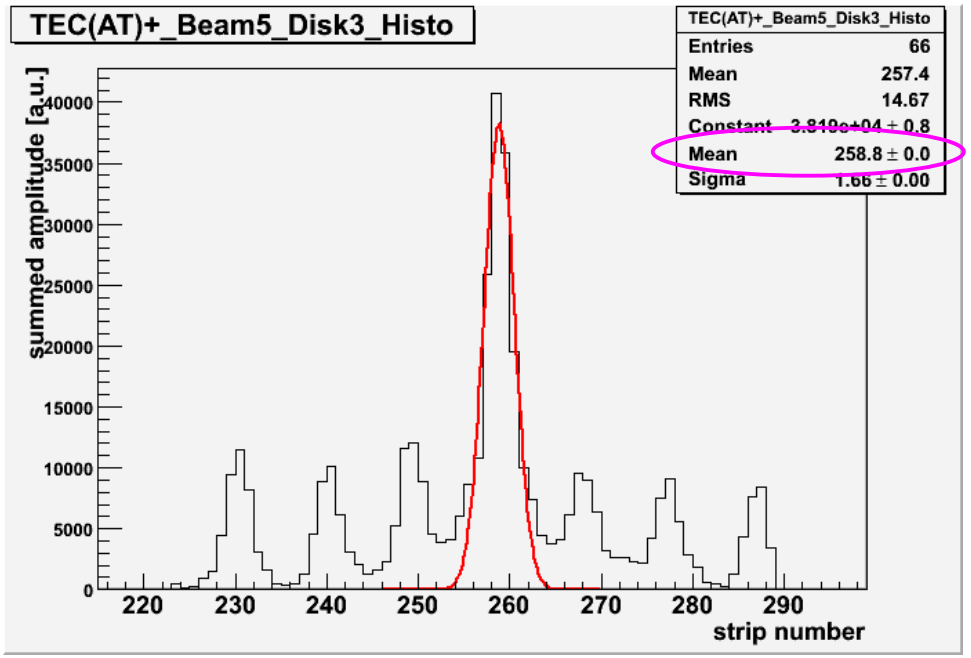
- TECs: slope, offset, Beam Splitter angle
- ATs: slope, offset, Beam Splitter angle, AT rotation angle (2 per beam)

Geometries/Data

- CRAFT08: Overlapping beams not used (31 beams complete), CRAFT0831X_V4
- CRAFT09: All beams used, CRAFT09_R2_V2
- CMSSW_3_2_4 (for both)

LAS Beam Profile Fits

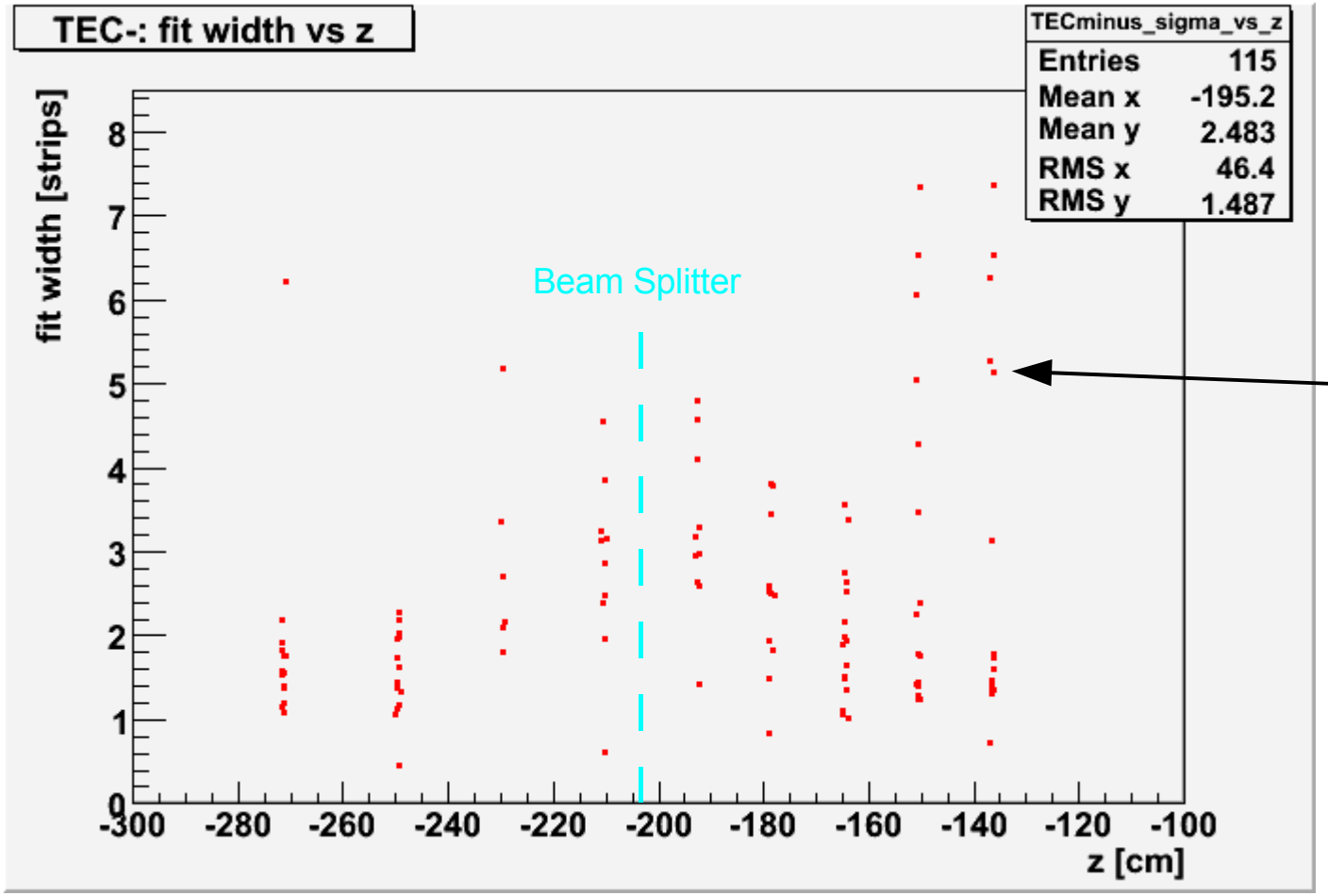
- LAS Beams operate at five intensities
- 200 shots per module and intensity for good signal-to-noise ratio
- summed amplitudes are used to determine beam position on module
- Gaussian is fitted to highest peak in profile histogram
- mean of Gaussian is deemed an LAS hit



strip number

Fit Width vs Module Position (z): TECminus

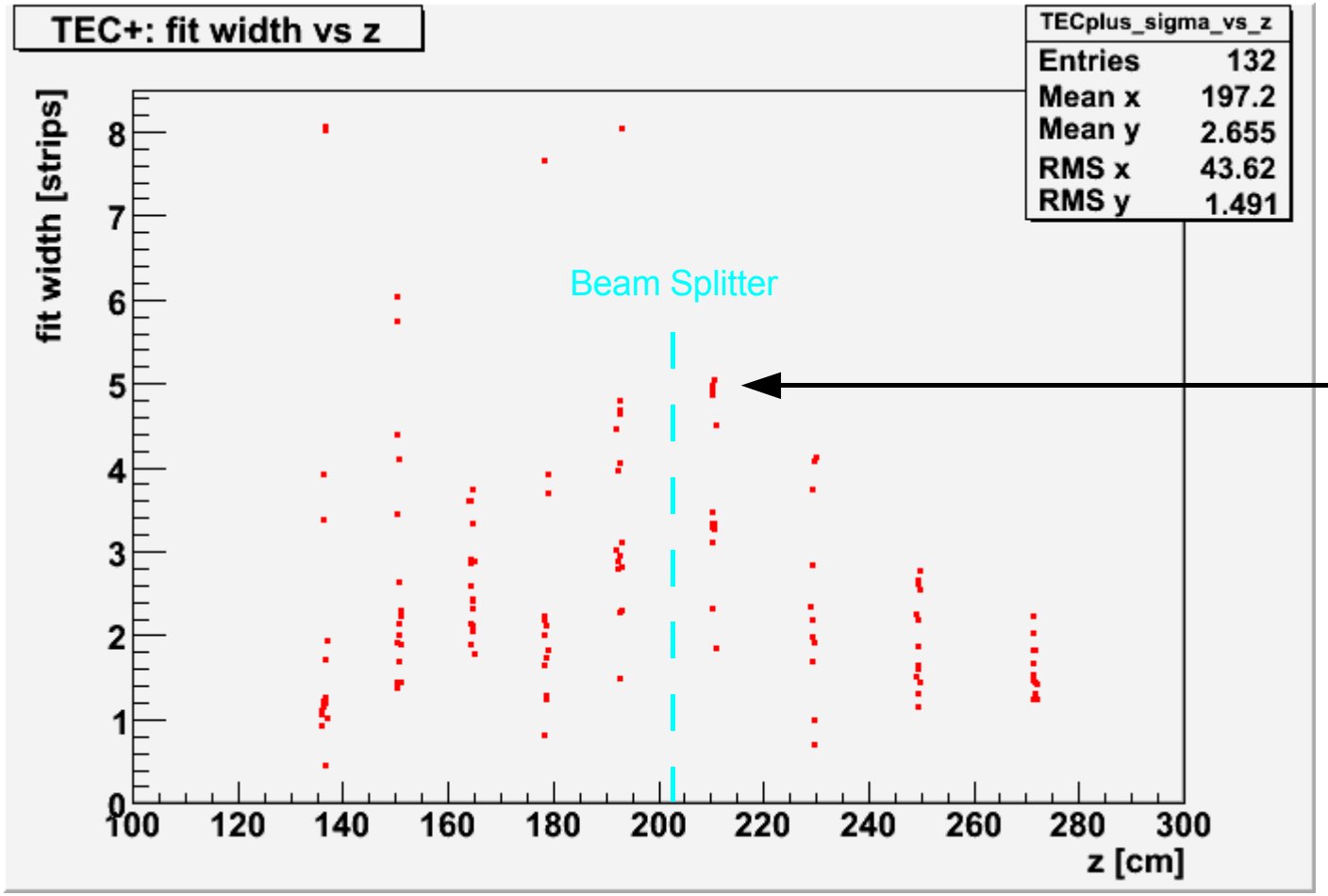
- width is limited to [0.5, 8.0] in fitting code



profile shown on slide 7

Fit Width vs Module Position (z): TECplus

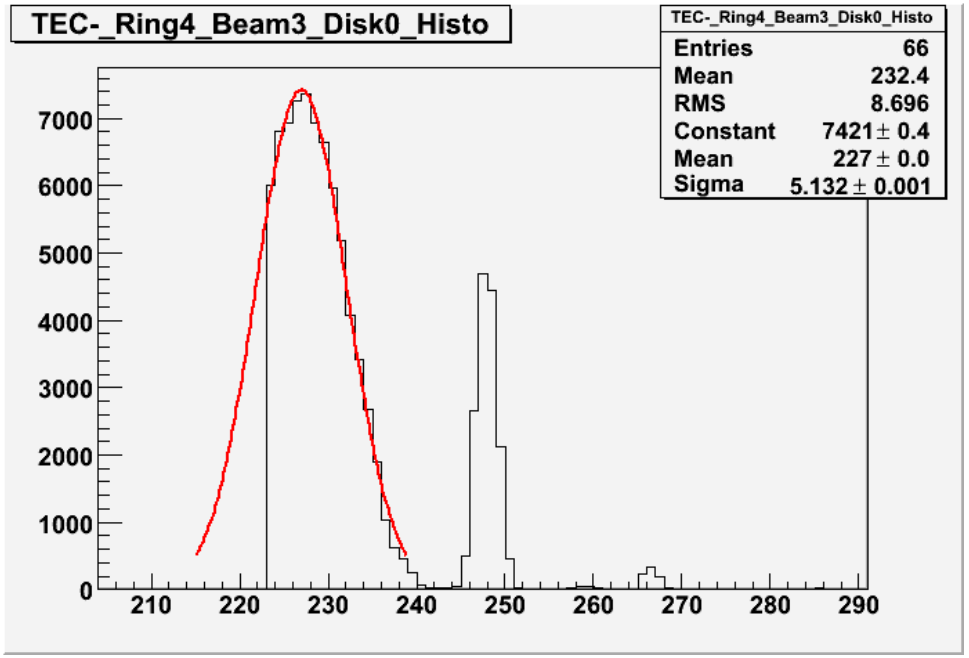
- width is limited to [0.5, 8.0] in fitting code



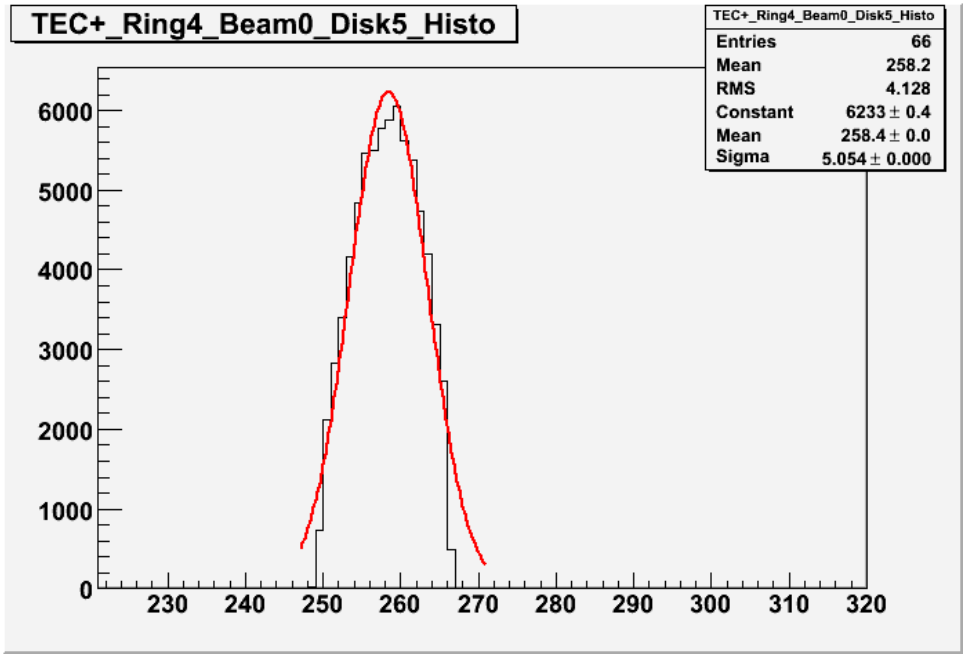
profile shown on slide 7

Single Module Fits

- width is limited to [0.5, 8.0] in fitting code



Disk 1: Diffraction pattern expected

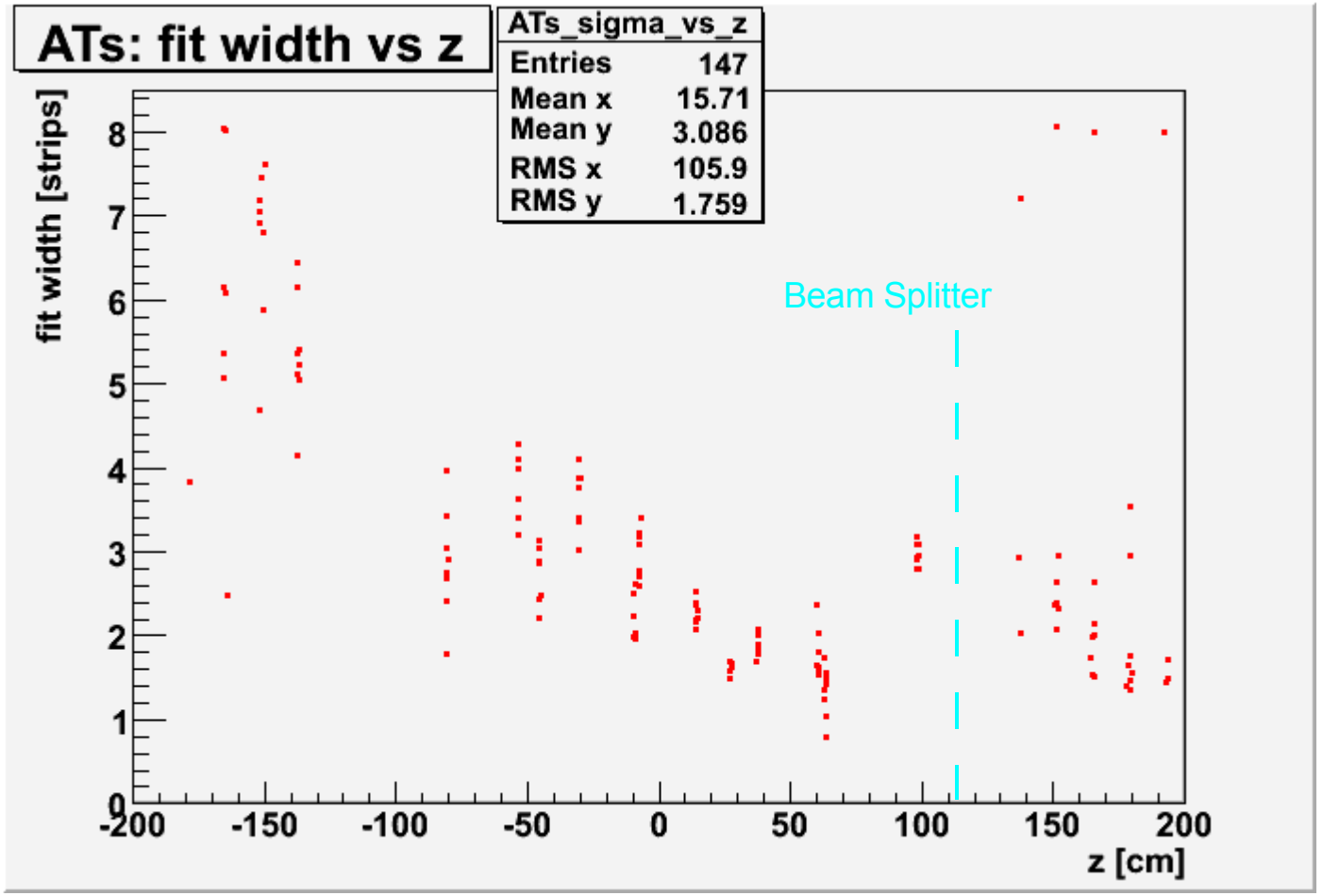


Disk 6: next to Beam Splitter, wide peak

→ ***Good Fits?***

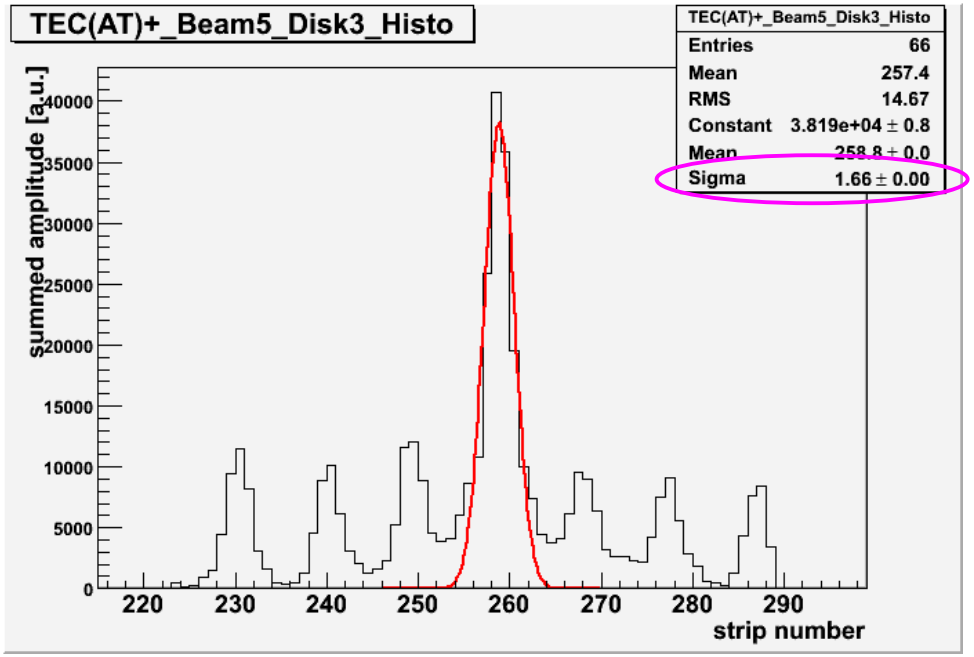
Fit Width vs Module Position (z): Alignment Tubes

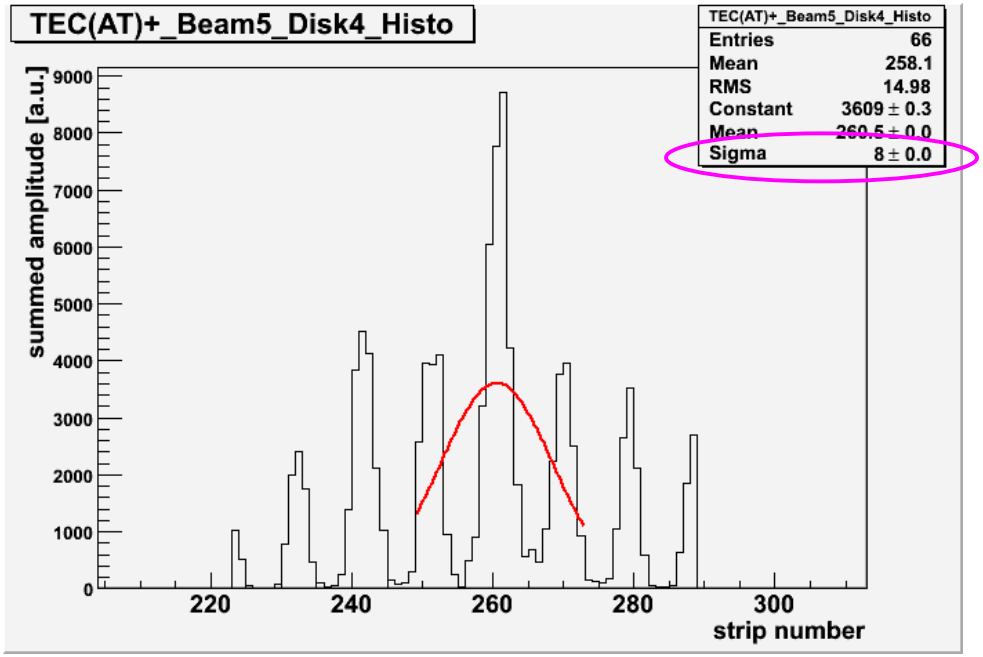
- width is limited to [0.5, 8.0] in fitting code

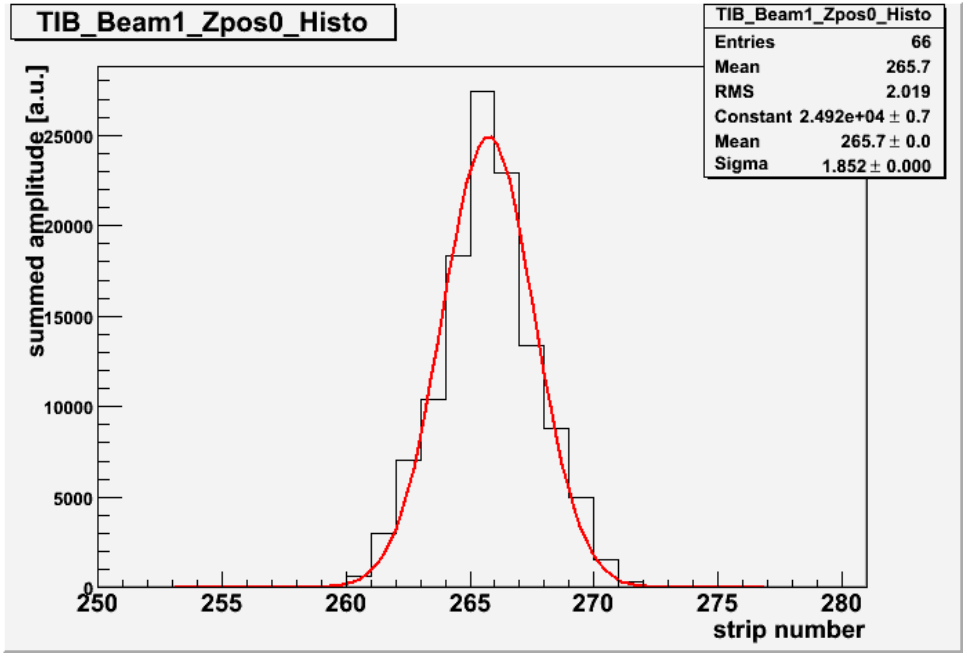


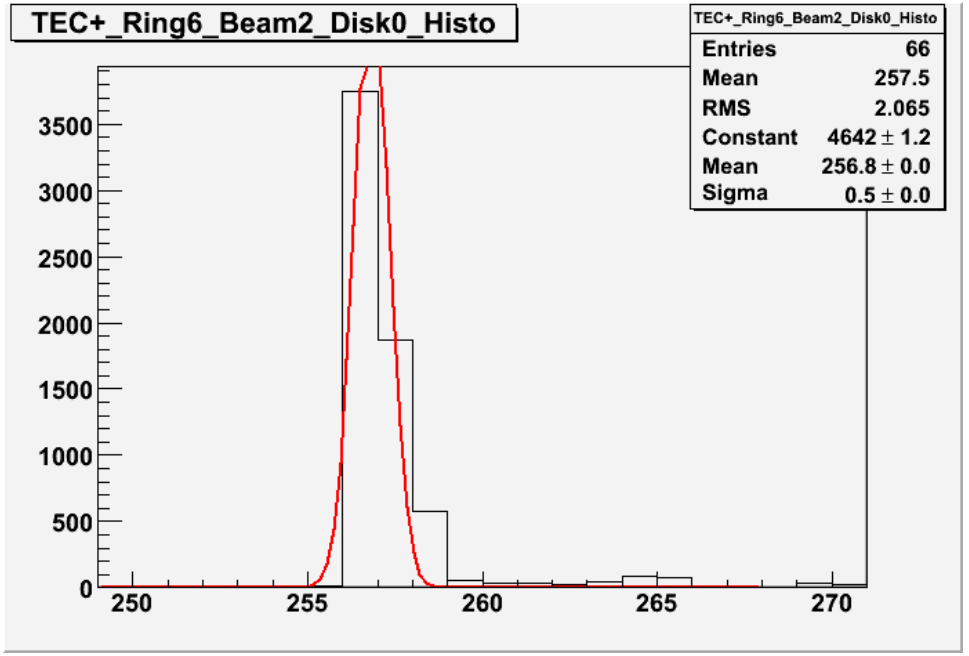
Single Module Fits

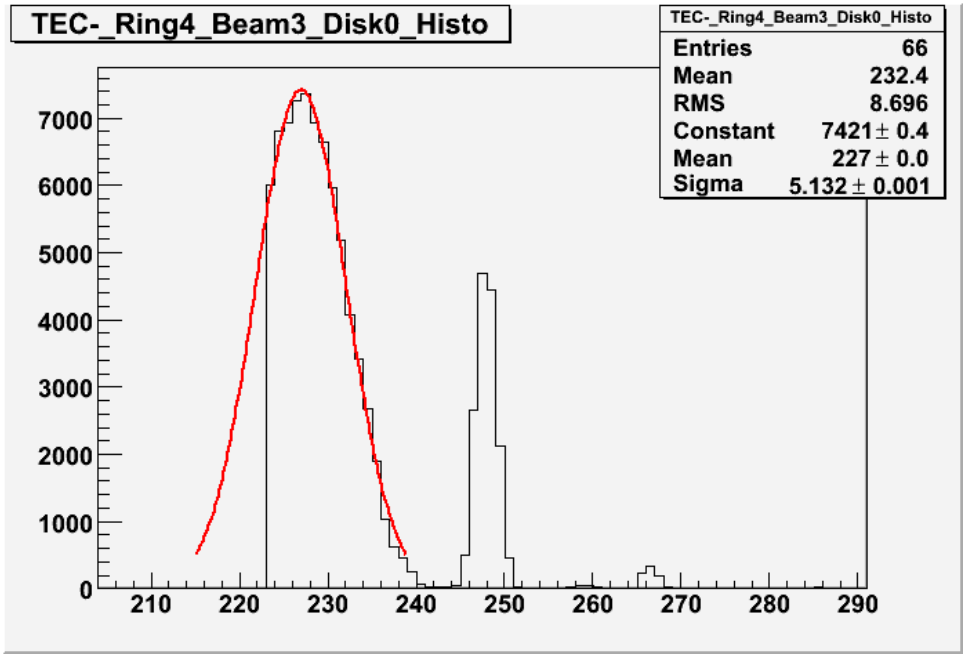
- width is limited to [0.5, 8.0] in fitting code
- example: good fit & bad fit on neighboring disks

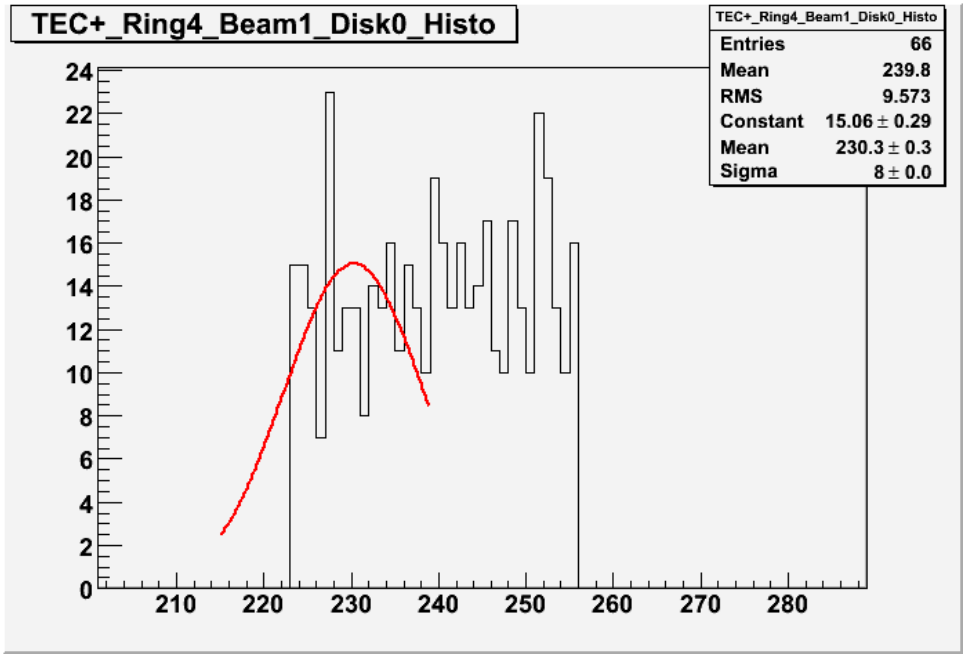





TIB_Beam1_Zpos0_Histo
TIB_Beam1_Zpos0_Histo
Entries 66
Mean 265.7
RMS 2.019
Constant 2.492e+04 ± 0.7
Mean 265.7 ± 0.0
Sigma 1.852 ± 0.000
summed amplitude [a.u.]
strip number


TEC+_Ring6_Beam2_Disk0_Histo
TEC+_Ring6_Beam2_Disk0_Histo
Entries 66
Mean 257.5
RMS 2.065
Constant 4642 ± 1.2
Mean 256.8 ± 0.0
Sigma 0.5 ± 0.0


TEC-_Ring4_Beam3_Disk0_Histo
TEC-_Ring4_Beam3_Disk0_Histo
Entries 66
Mean 232.4
RMS 8.696
Constant 7421 ± 0.4
Mean 227 ± 0.0
Sigma 5.132 ± 0.001


TEC+_Ring4_Beam1_Disk0_Histo
TEC+_Ring4_Beam1_Disk0_Histo
Entries 66
Mean 239.8
RMS 9.573
Constant 15.06 ± 0.29
Mean 230.3 ± 0.3
Sigma 8 ± 0.0