

GEM Event Display and Tracking Code

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UVa GEM Setup

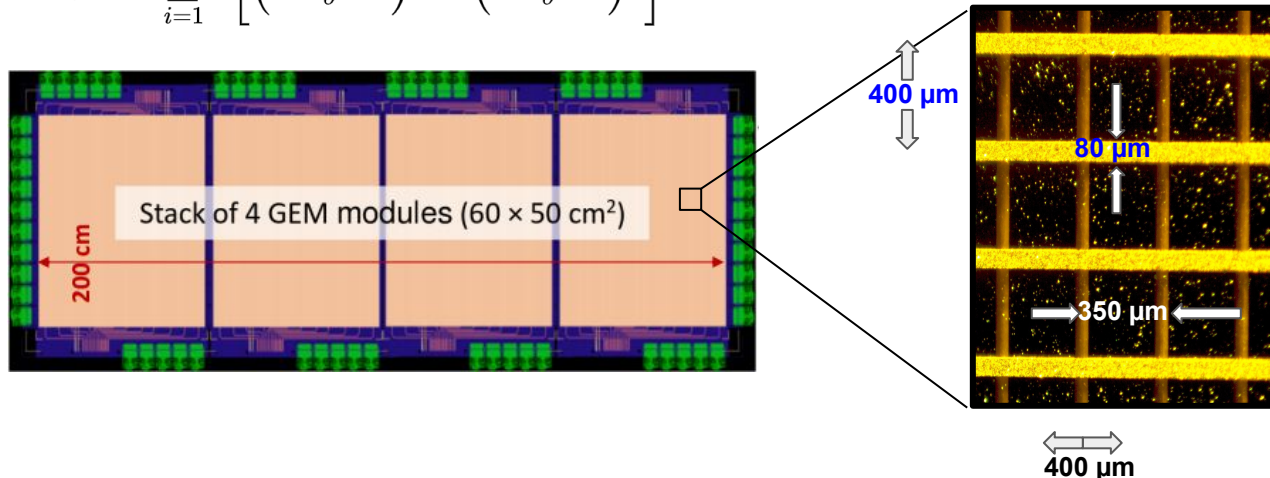
- Can hold up to 5 GEM layers.
- Each layer has 4 GEM modules.
- No dead space between modules in layer.



Clusters and Track Finding

- Nearby strips with hits are combined and weighted by ADC to form a cluster.
- Cluster combinations are then considered to find tracks meeting χ^2 criteria.
- Tracks with hits in more layers are favored.

$$\chi^2 = \sum_{i=1}^{N=\text{Hits}} \left[\left(\frac{x_{\text{hit}} - x_{\text{track}}}{\sigma} \right)^2 + \left(\frac{y_{\text{hit}} - y_{\text{track}}}{\sigma} \right)^2 \right]$$




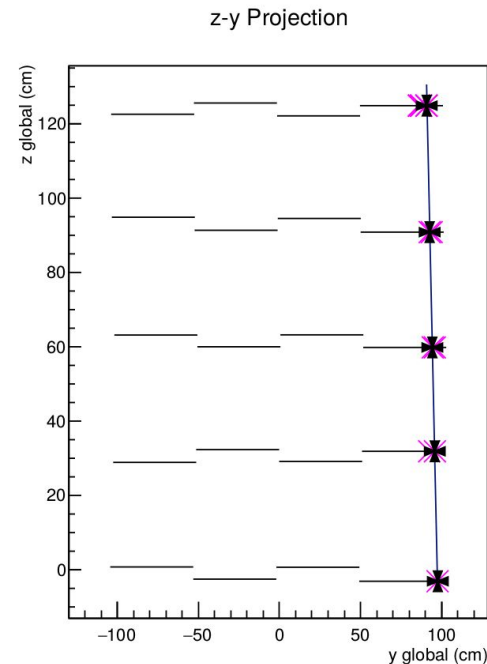
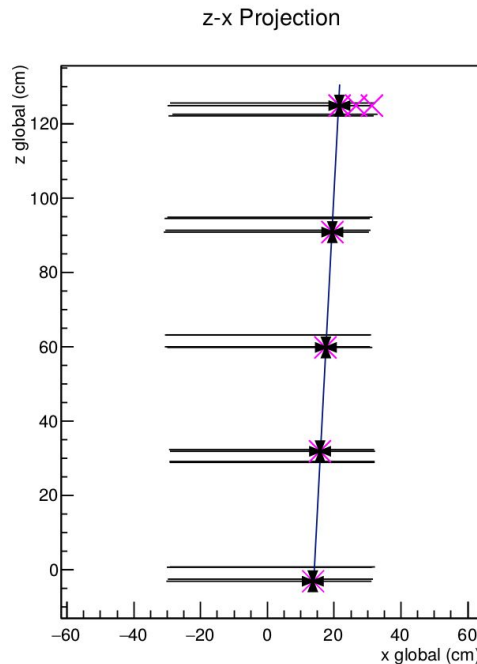
Event Display Functionality

- Added event display to already existing tracking code made by Andrew.
- Creates plots solely using input configuration file.
- No assumptions on modules $\#$ /position/strip orientation etc.
- Includes option to print first 100 events to a PDF.

https://github.com/ajpuckett/SBSGEM_standalone

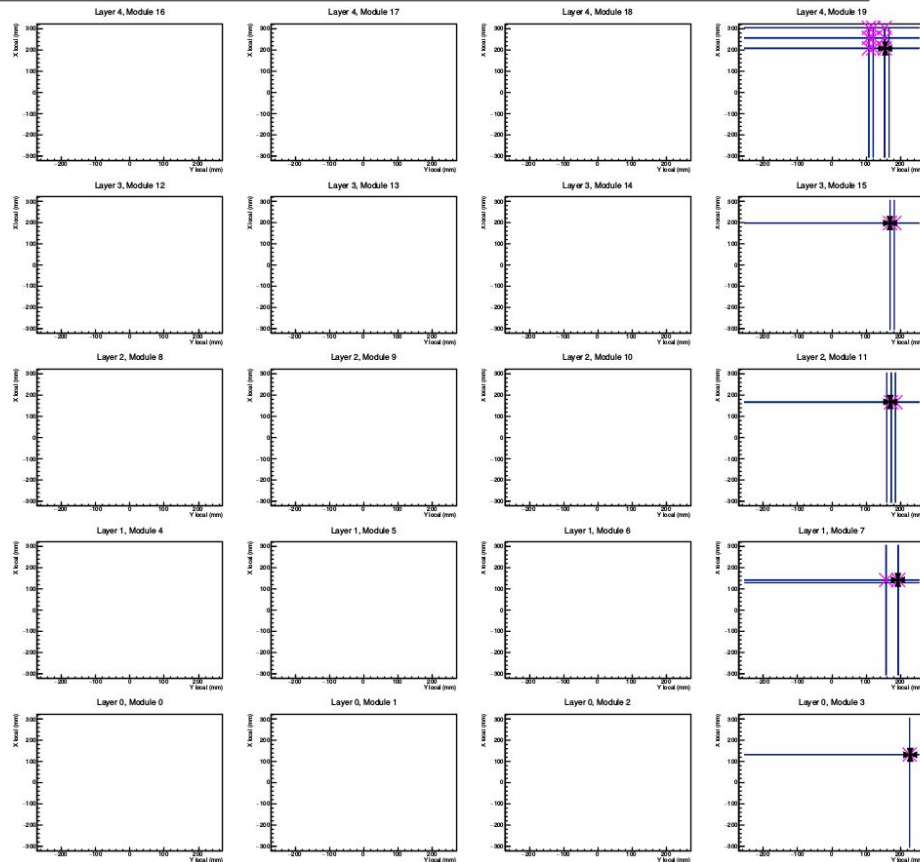
Event Display Side View

- Pink X represents cluster hits in module.
- Black line represents track found in event.
- Black “+” represents track position in module.
- Multiple tracks will iterate through different “+” shaped markers. 



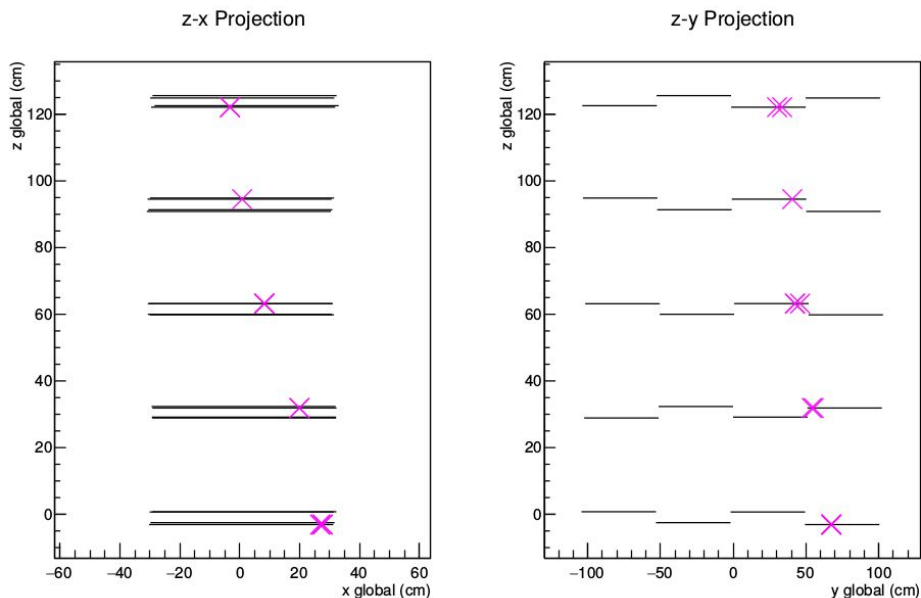
Event Display Top View

- Rows represent different layers.
- Same markers as side view.
- x-y strips fired are shown as colored lines.
- Lines will change color with different ADC values.



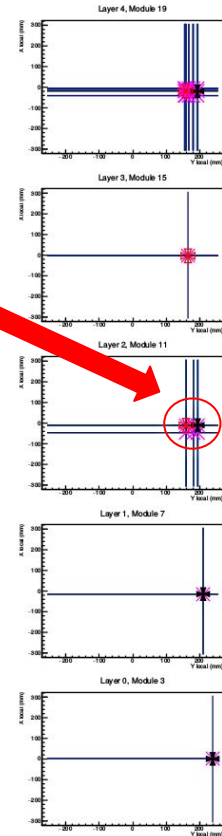
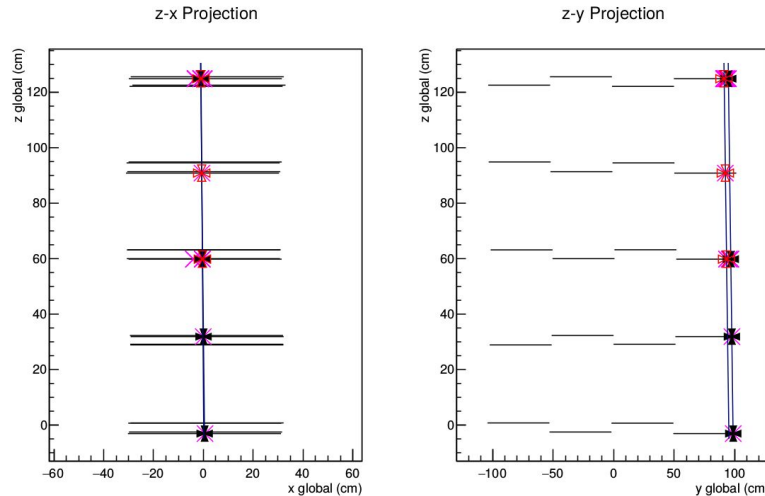
More Event Display Examples

- Hits in event not able to form a straight line.



Diagnosing Tracking Issues

- Many multi-track events found instead of one track.
- Here we see clusters near each other get put in different tracks.
- Limit how close new tracks can be to other tracks.



Conclusion

- Event display option added to GEM tracking code.
- Useful for diagnosing issues with GEMs or tracking code itself.
- Works for any GEM setup.
- Needs to be cleaned up a bit for aspect ratio and strip ADC color.