Test-beam data analysis

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31.05.2023

Plan of the presentation

Motivation

We were trying to understand nature of bump below Landau-Gauss MPV in GaAs sensors (not seen in Calice sensors).

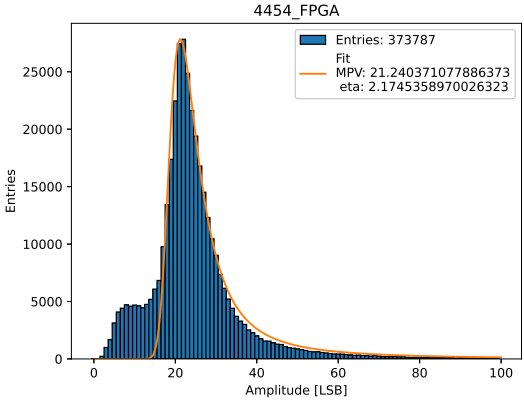


Fig. 1: Distribution of hits amplitude in Anton 1 sensor

GaAs vs Calice

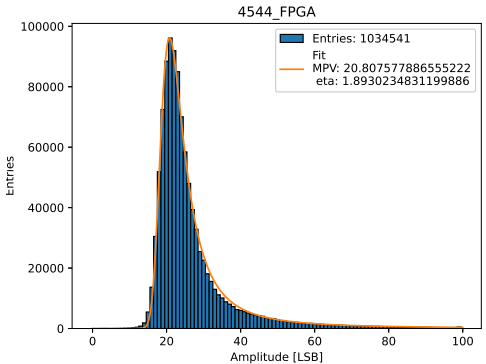


Fig. 2: Distribution of hits amplitude in Calice 74 sensor

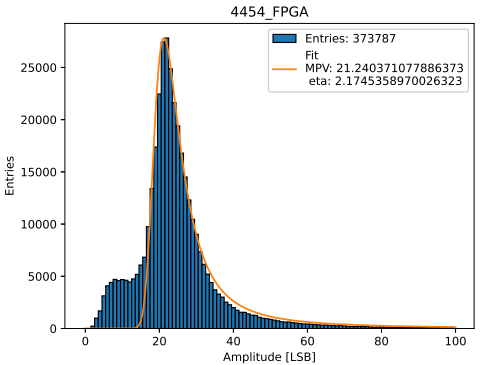
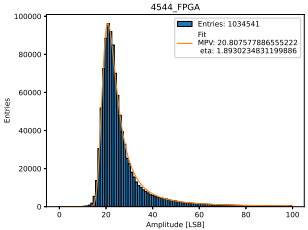


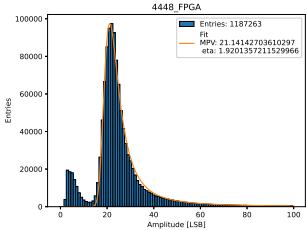
Fig. 3: Distribution of hits amplitude in Anton 1 sensor

GaAs vs Calice

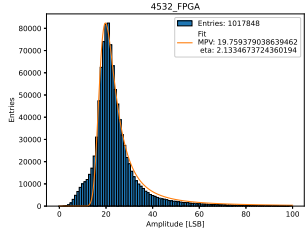
In Anton 1 and Yan 1 sensors there are bumps below Landu-Gauss MPV (in Yan 1 much less than Anton 1).



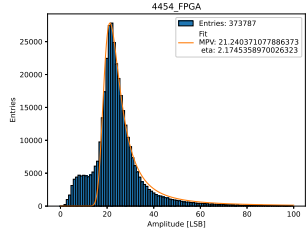
(a) Calice 74



(b) Calice 75



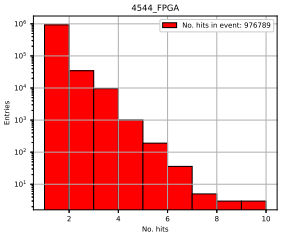
(c) Yan 1



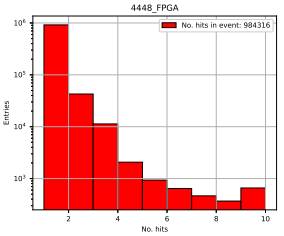
(d) Anton 1

GaAs vs Calice

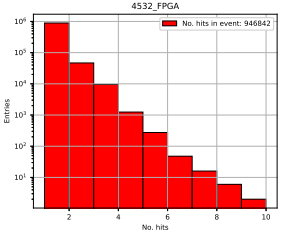
In Anton 1 and Yan 1 sensors number of hits in event distribution decreases a little bit slower than in Calice sensors.



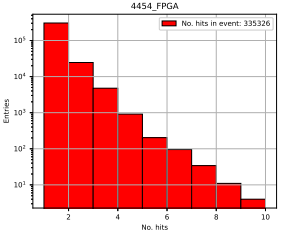
(a) Calice 74



(b) Calice 75



(c) Yan 1



(d) Anton 1

GaAs vs Calice

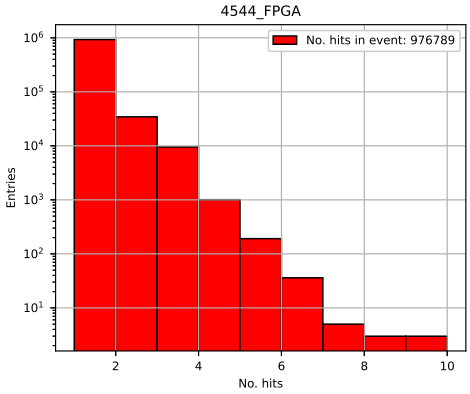


Fig. 6: Calice 74 run 4544

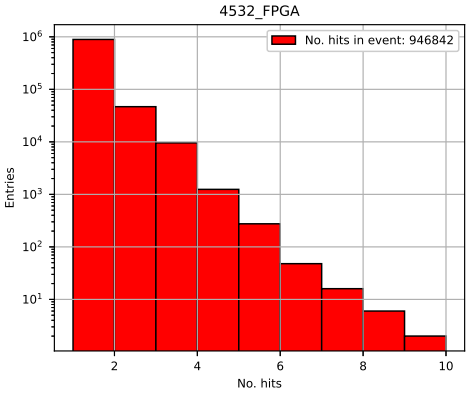
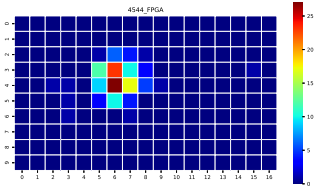


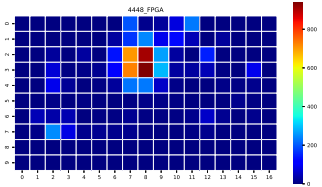
Fig. 7: Yan 1 run 4532

GaAs vs Calice

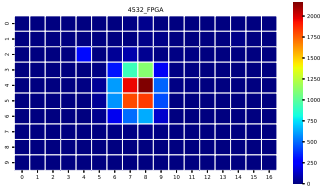
Spatial distribution of hits from 2-hit events doesn't shows difference between this four sensors.



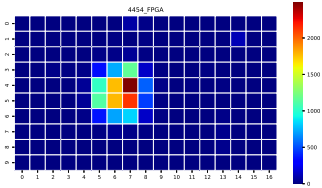
(a) Calice 74



(b) Calice 75



(c) Yan 1



(d) Anton 1

Analysis of geometry

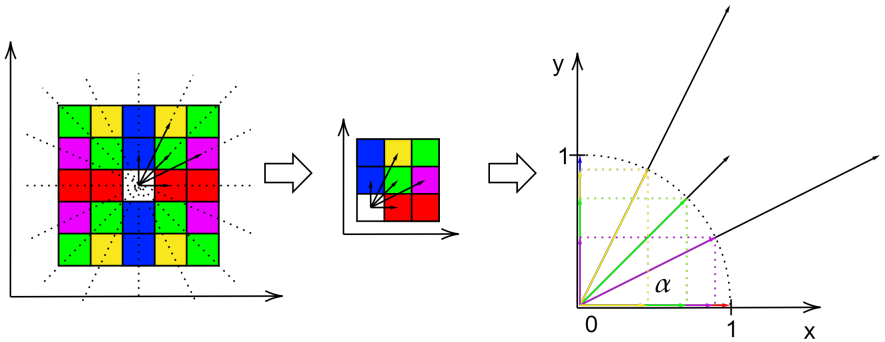


Fig. 9: Geometry explanation

Analysis of spatial configurations of 2-hit events

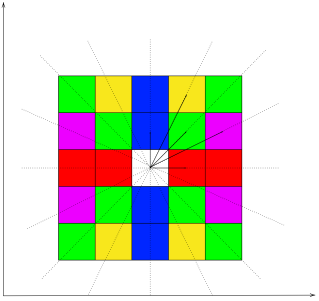


Fig. 10: Pad geometry

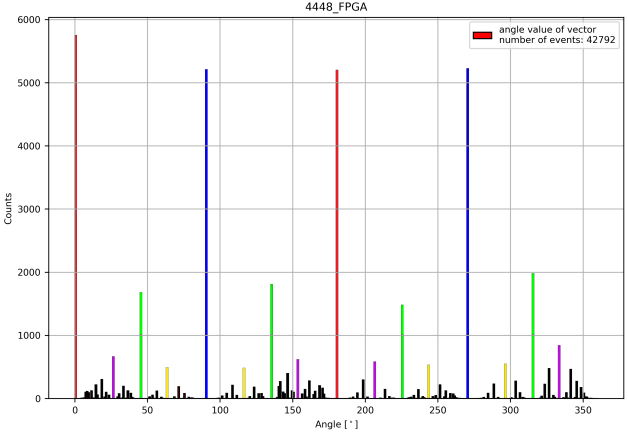


Fig. 11: Calice 75 run 4448

Analysis of hits geometry

Two ways to display information about angle

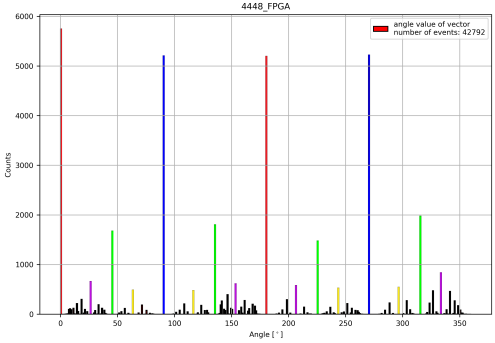


Fig. 12: Calice 75 run 4448

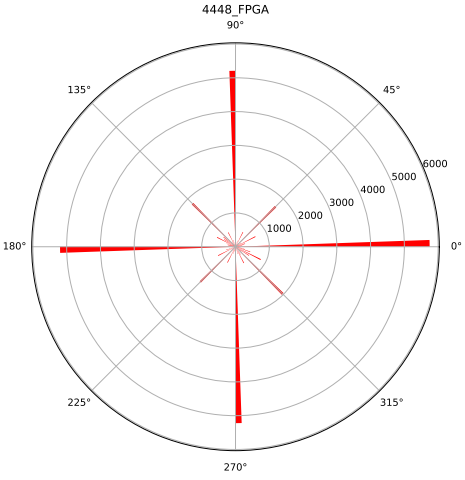
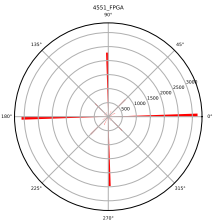


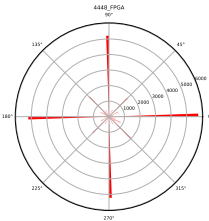
Fig. 13: Calice 75 run 4448

Anisotropy

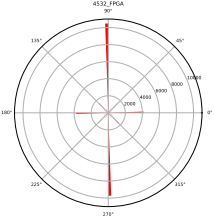
In GaAs sensors, we can clearly see the anisotropy on the y axis - axis of trace direction.



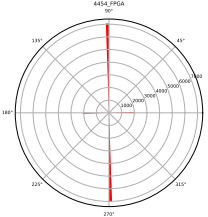
(a) Calice 74



(b) Calice 75



(c) Yan 1



(d) Anton 1

Sensors

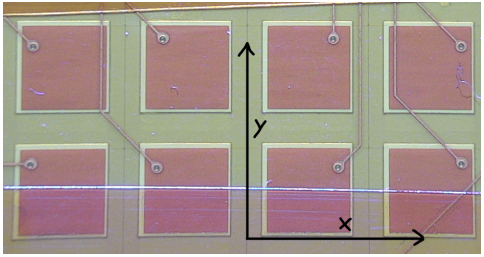


Fig. 15: Calice 74

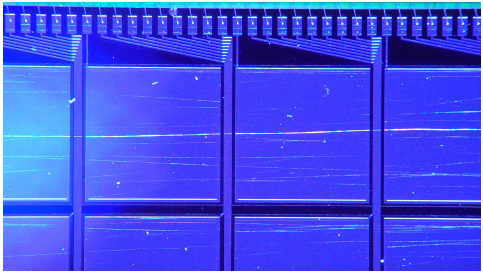


Fig. 16: Anton 1

Anisotropy

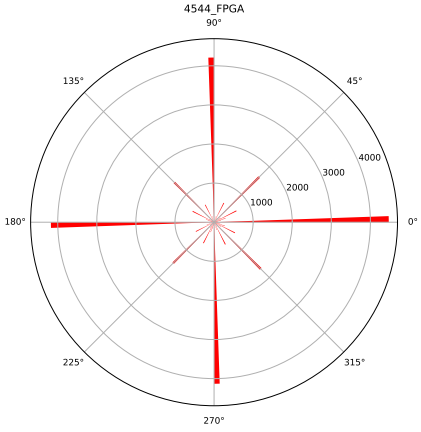


Fig. 17: Calice 74 run 4544

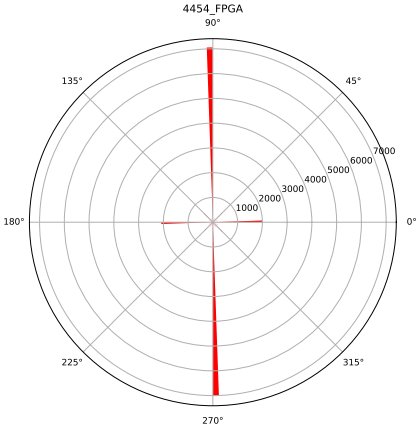


Fig. 18: Anton 1 run 4454

Amplitude of 2 hits events

A fraction of the distribution of sum amplitudes in event comes from two different particles. Can we explain why there are so many (3 $\pm$1%) of them?

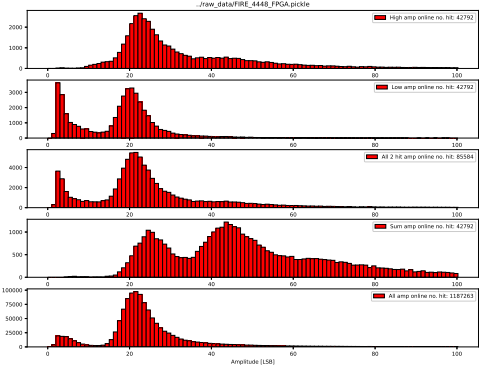


Fig. 19: Calice 75 run 4448

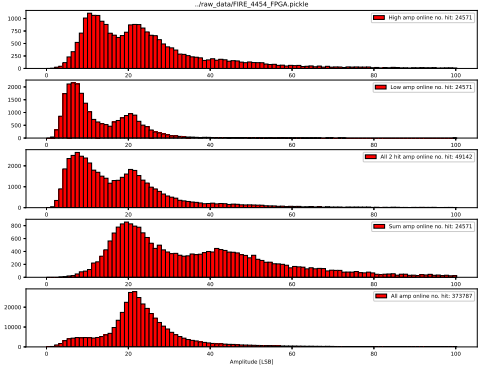
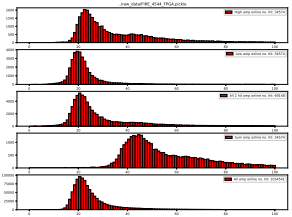


Fig. 20: Anton 1 run 4454

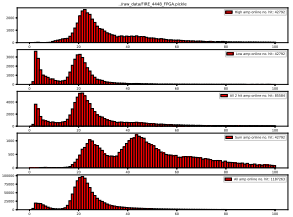
Amplitude of 2 hits events

In Anton 1 and Yan 1 sensors there are clearly visible differences in sum of amplitudes in event. Does big fraction of one particle 2-hit events come from:

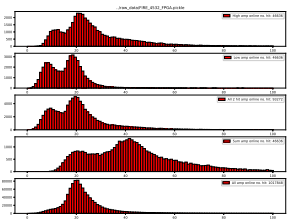
- charge sharing?
- cross-talk?



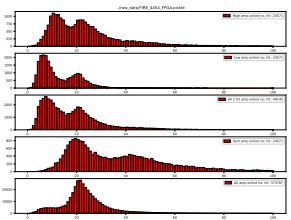
(a) Calice 74



(b) Calice 75



(c) Yan 1



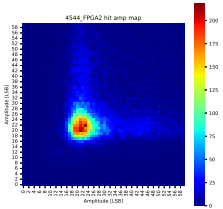
(d) Anton 1

Separation of 2 hits events types

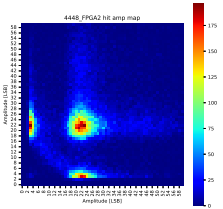
In Anton 1 and Yan 1 sensors there are clearly visible differences in sum of amplitudes in event. Does big fraction of one particle 2-hit events come from:

- charge sharing?
- cross-talk?

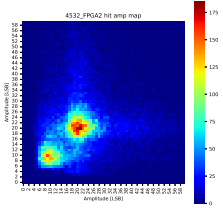
How can we explain this distribution?



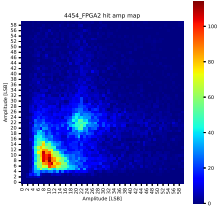
(a) Calice 74



(b) Calice 75



(c) Yan 1



(d) Anton 1

Amplitude of 2 hits events

By making this separation, we are trying to observe 1-particle events and 2-particle events in 2-hit events.

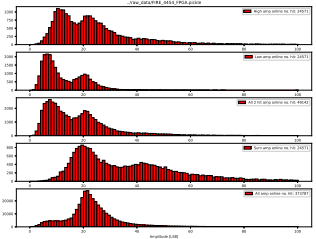


Fig. 23: Anton 1 run 4454

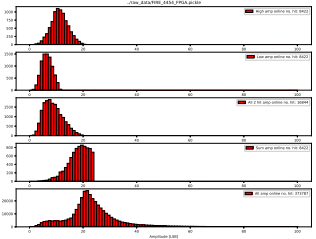


Fig. 24: Anton 1 run 4454 amplitude sum below 25

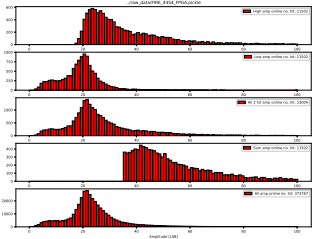


Fig. 25: Anton 1 run 4454 amplitude sum above 35

Amplitude of 2 hits events

By making this separation, we are trying to observe 1-particle events and 2-particle events in 2-hit events.

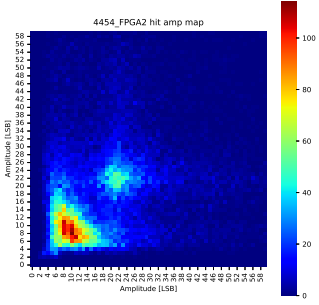


Fig. 26: Anton 1 run 4454

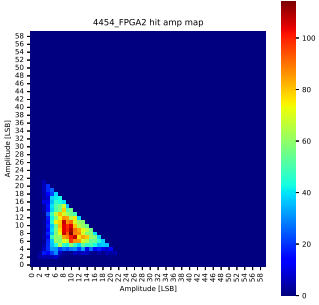


Fig. 27: Anton 1 run 4454 amplitude sum below 25

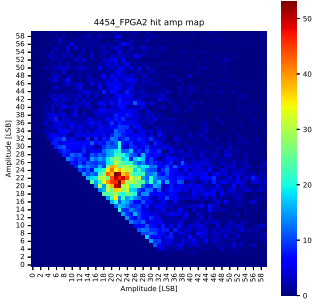


Fig. 28: Anton 1 run 4454 amplitude sum above 35

Angle after separation Anton 1

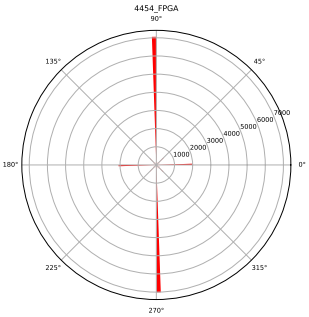


Fig. 29: Anton 1 run 4454

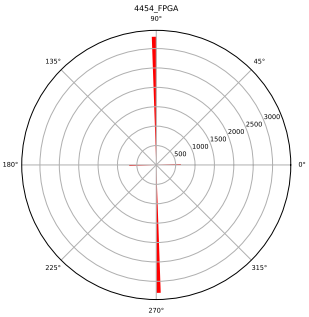


Fig. 30: Anton 1 run 4454 amplitude sum below 25

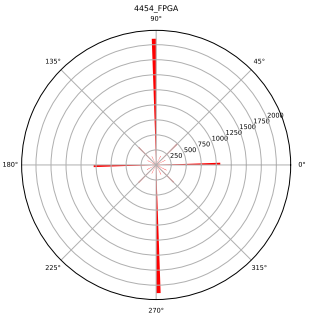


Fig. 31: Anton 1 run 4454 amplitude sum above 35

Angle after separation Yan 1

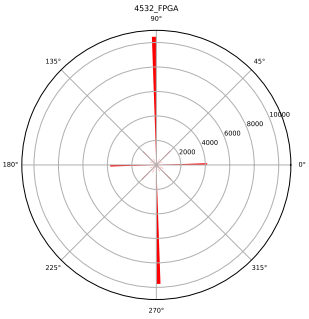


Fig. 32: Yan 1 run 4532

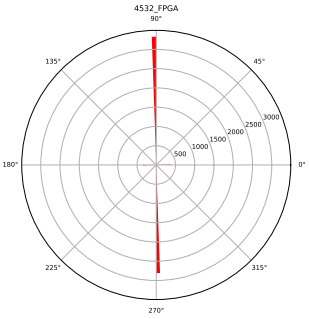


Fig. 33: Yan 1 run 4532 amplitude sum below 25

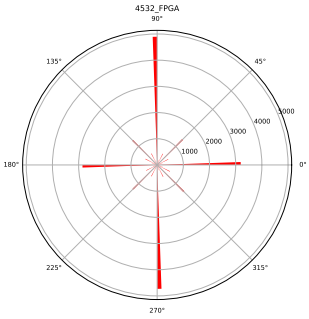


Fig. 34: Yan 1 run 4532 amplitude sum above 35

Angle after separation Calice 74

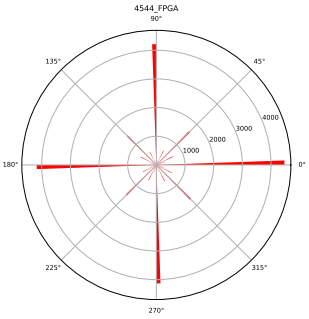


Fig. 35: Calice 74 run 4544

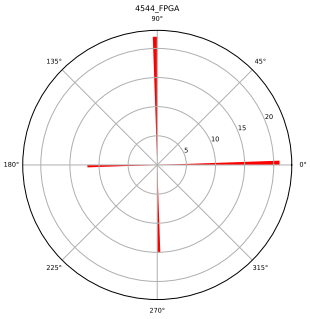


Fig. 36: Calice 74 run 4544 amplitude sum below 25

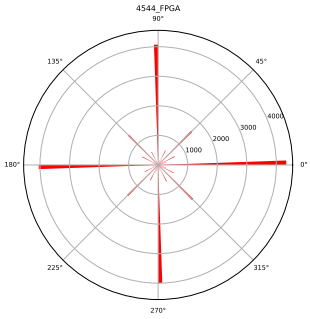


Fig. 37: Calice 74 run 4544 amplitude sum above 35

Angle after separation Calice 75

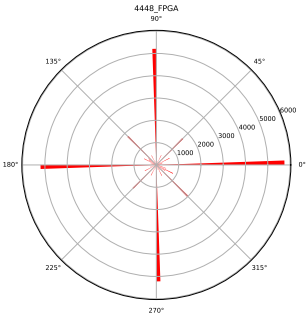


Fig. 38: Calice 75 run 4448

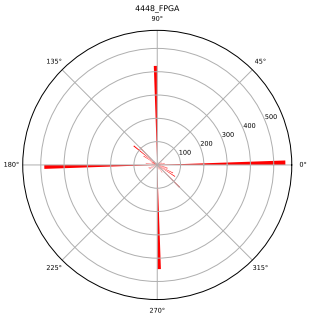


Fig. 39: Calice 75 run 4448 amplitude sum below 25

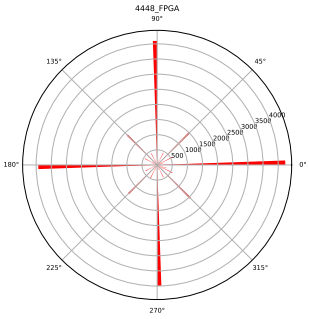


Fig. 40: Calice 75 run 4448 amplitude sum above 35

Conclusions

- 2-hit 2-particle events (why this occur so often 3 $\pm$1% ?)
- In GaAs sensors there is clearly visible anisotropy in 2-hit 1-particle events along y-axis same direction as trace in sensor. Cross-talk?
- In GaAs sensors in 2-hit 1-particle events amplitude is equally shared between hits. Charge sharing?

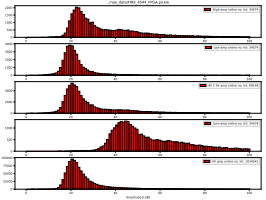


Fig. 41: Calice 74

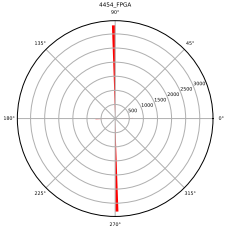


Fig. 42: Anton 1 run 4454 anisotropy

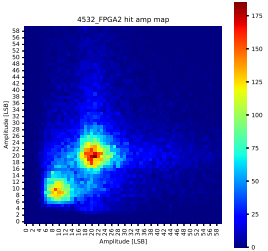


Fig. 43: Yan 1 run 4532 amplitude map

Thank you for attention