# Development of the monitoring software for the JEDI polarimeter (JePo) optimisation at COSY

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Aspects of Symmetry

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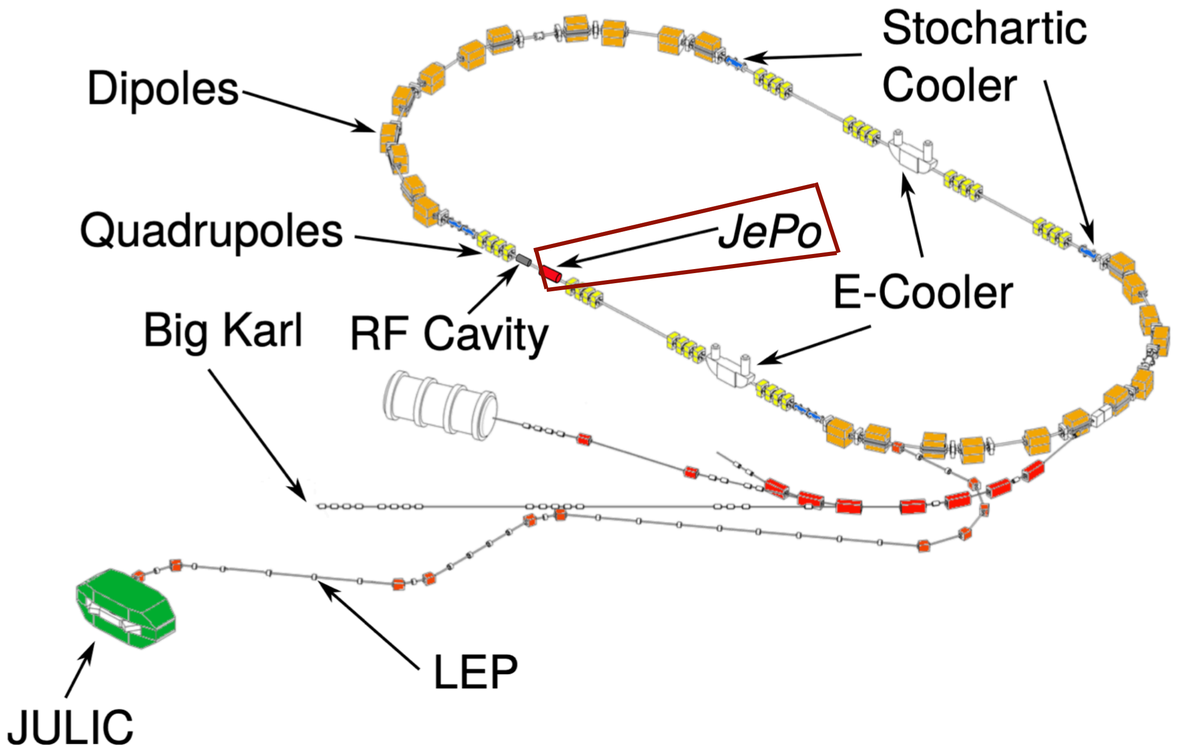
JEDI

JÜLICH Forschungszentrum

# Instrumentation

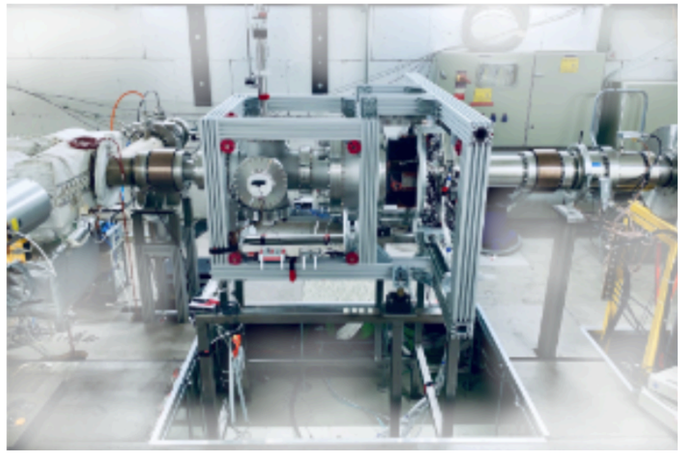
- COSY accelerator
  - Circumference - 183m
  - Momentum (Deuterons) - 0.97GeV/c

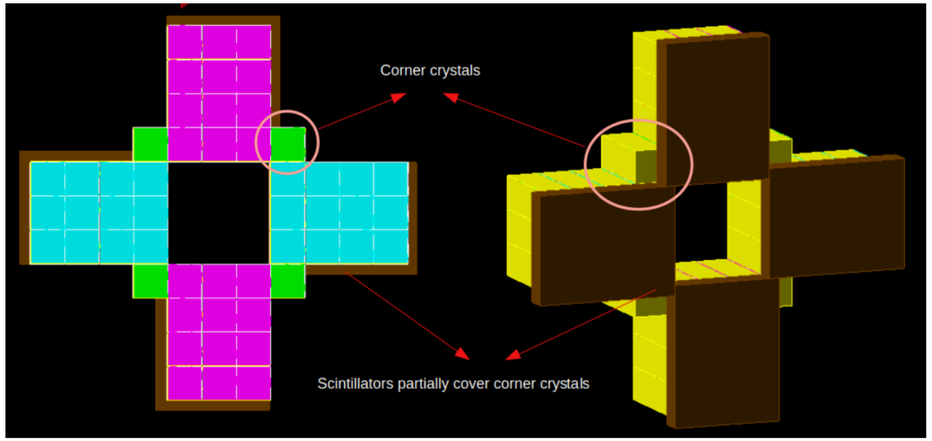
- JEDI Collaboration & EDM



# JEDI Polarimeter - JePo

- Typical beam momenta ~1GeV/c
- Based On:
  - SiPM
  - LYSO Crystals
- Target - Carbon





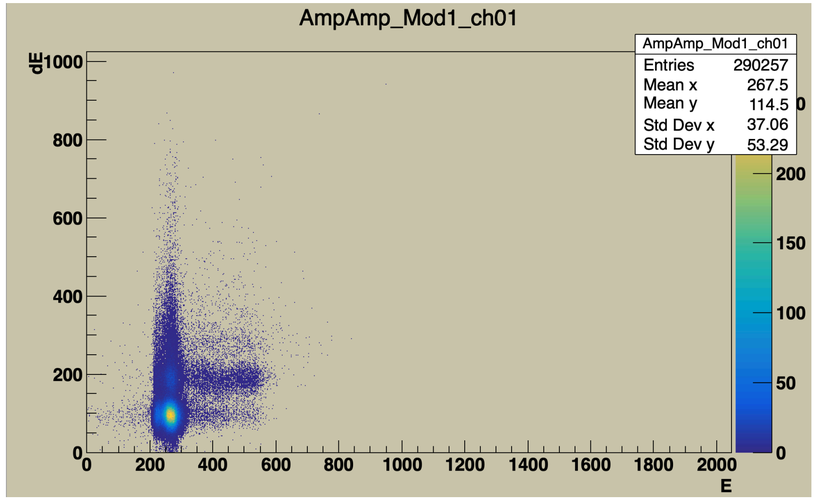
# Motivation

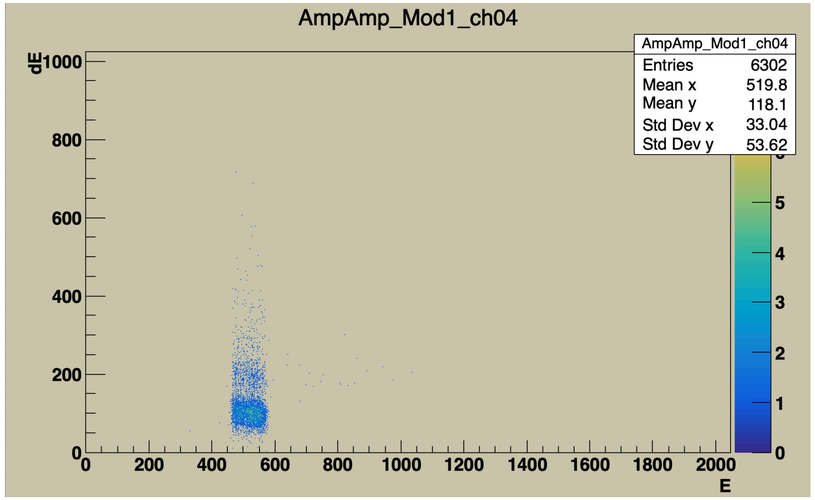
- SiPM & LYSO Drawbacks
  - Thermal Noise
  - Dark Noise
  - Other
- Calibration as a Solution

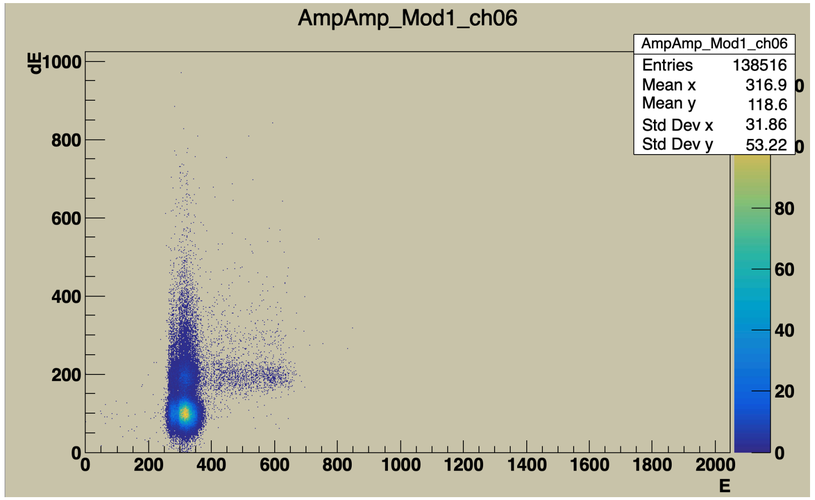
# Calibration Plan

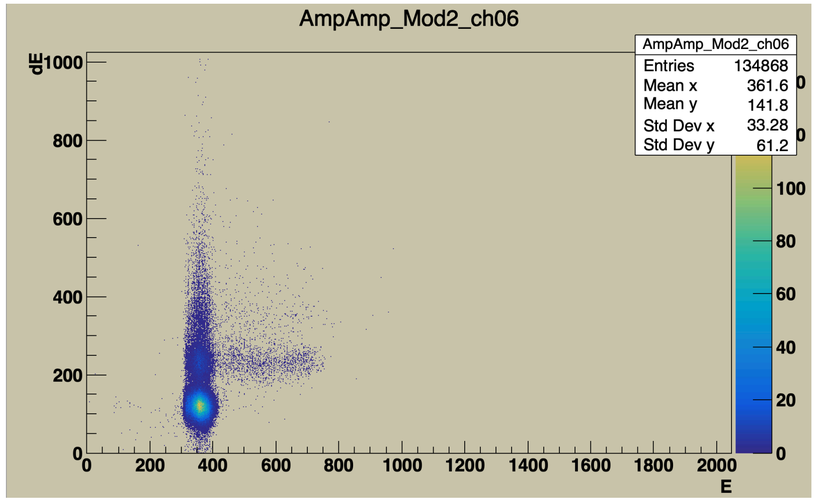
- Read E/dE 2D Histograms data for every module and channel
- Filter Histogram Data
- Get Results
- Analyse Results
- Get Calibration Coefficients

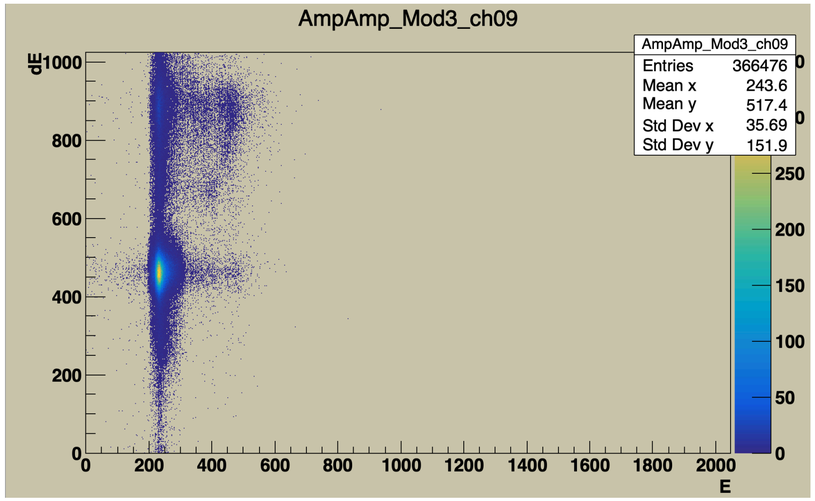
# Reading Raw 2D Histogram

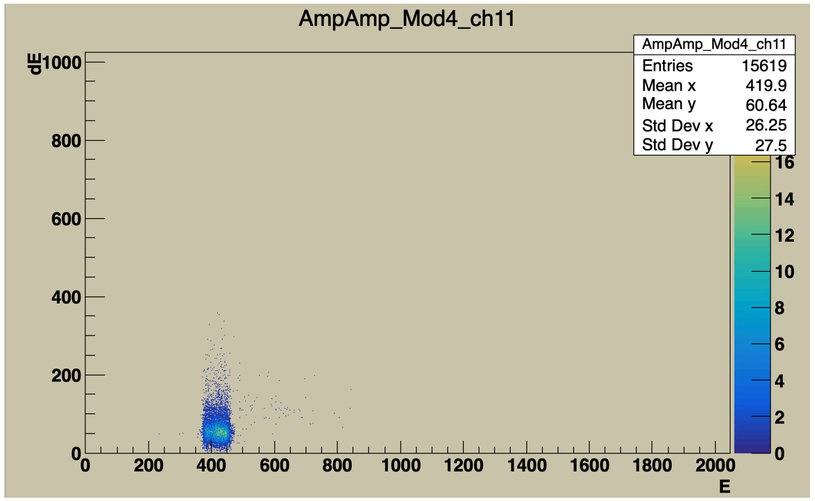


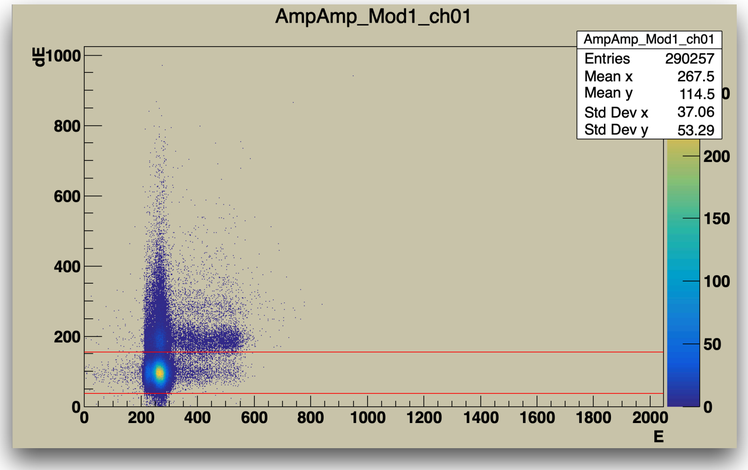



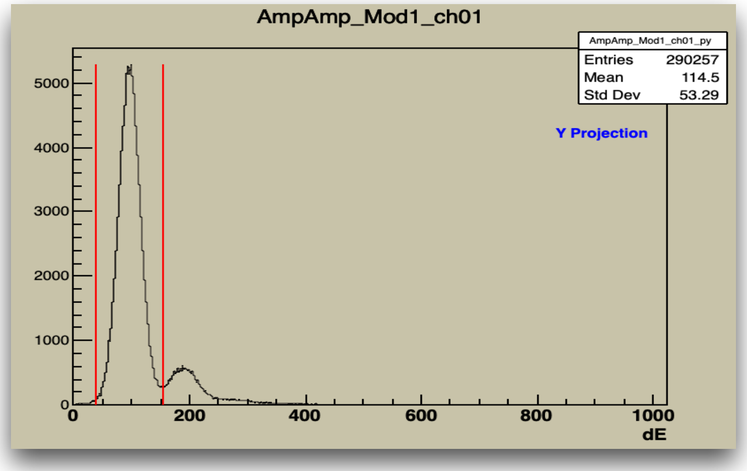



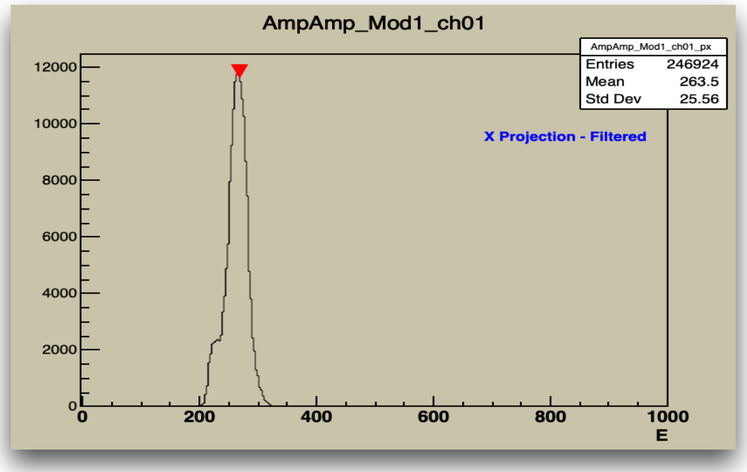



# Filtering

- Projection on dE axis
- Fit Gaussian
- Get 3 sigma region
- Filter additional data
- Projection on E axis

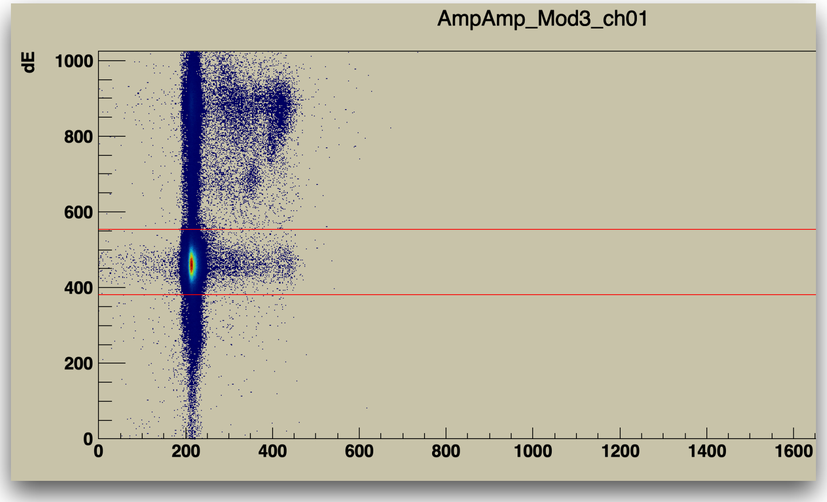


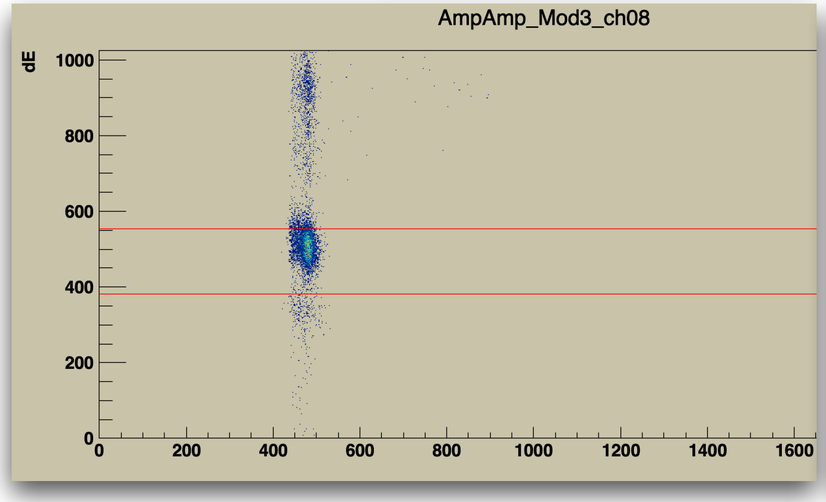



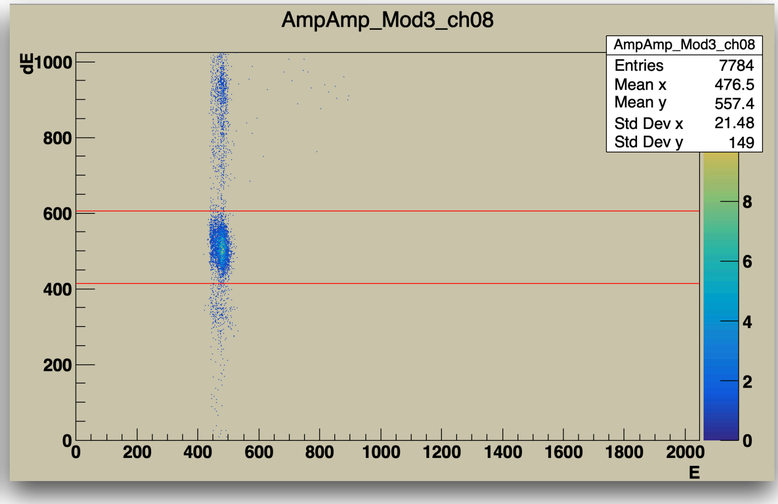
# Chanel position issue

- Channel’s Data Difference inside the module

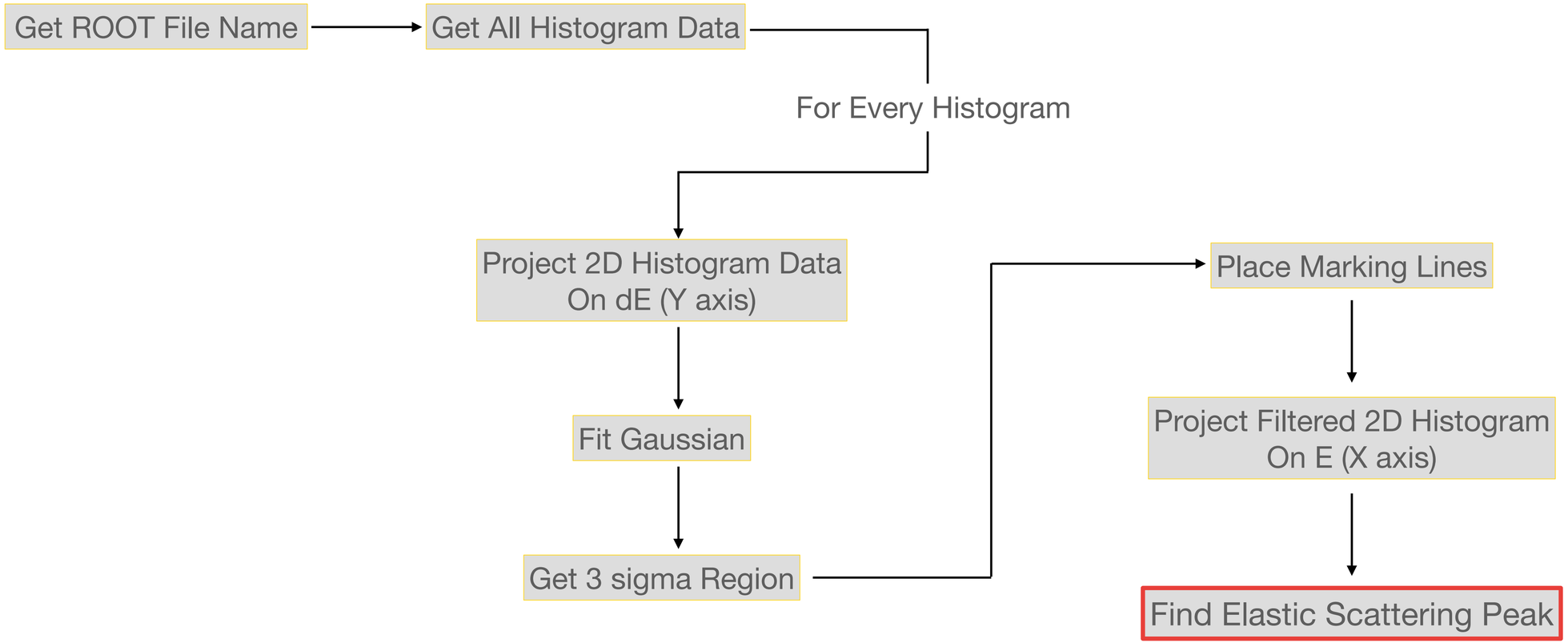



- Necessity to analyse every Chanel for filtering

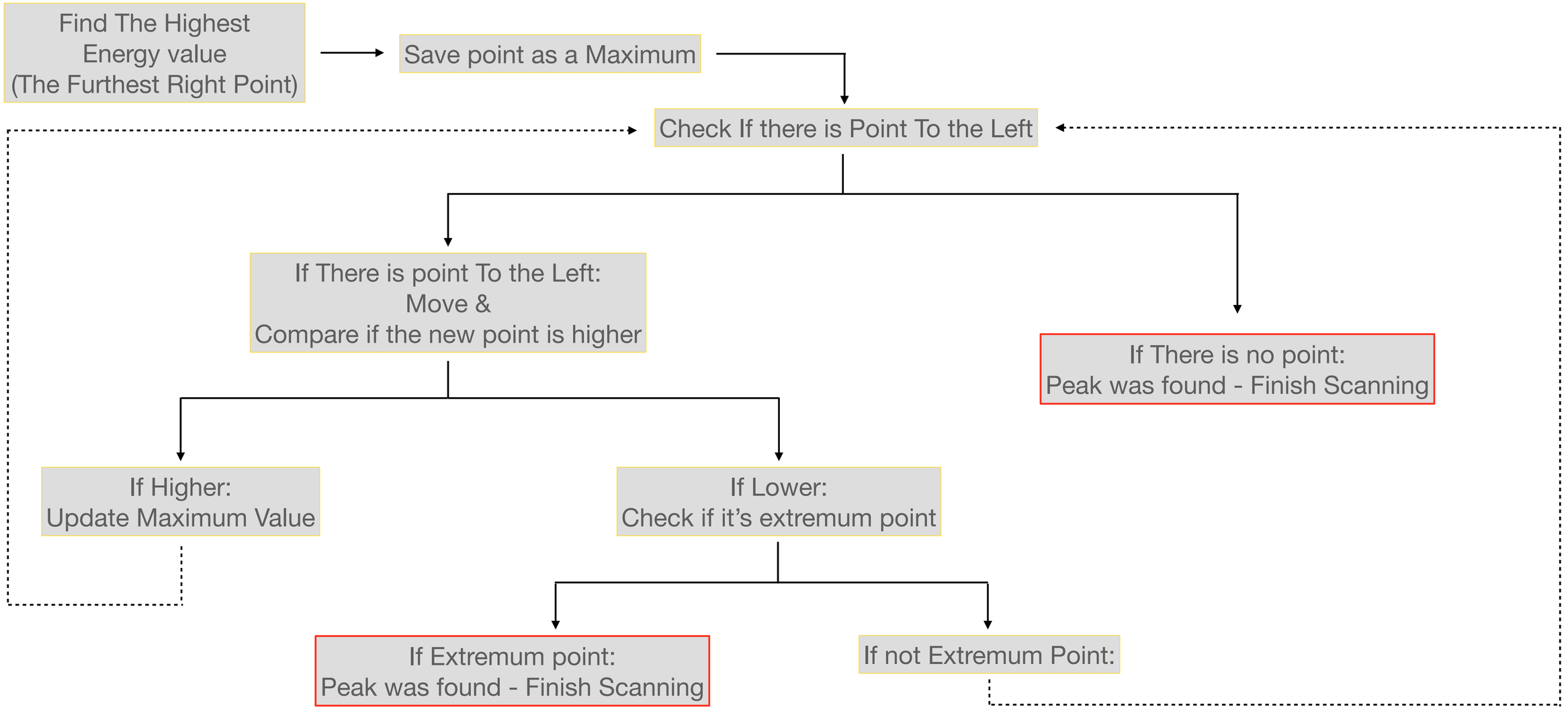


# General Scheme of The Filtering



# Peak Finding Algorithm



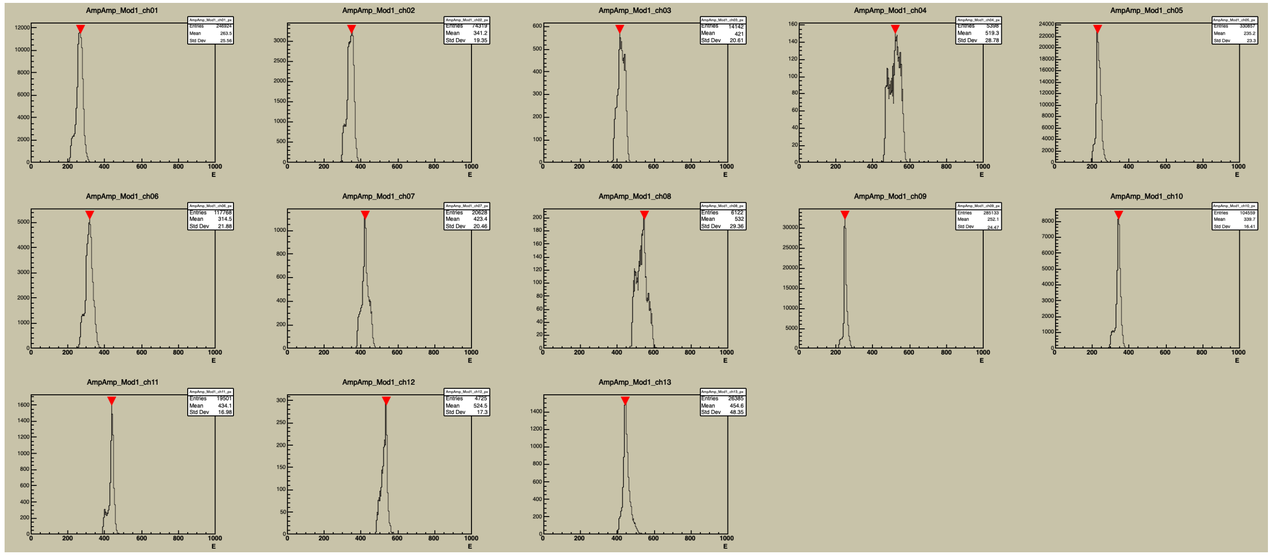
# Generated Calibration File

- Generates .txt file with Run Number Name
- Data is Grouped by Modules
- File is stored in the same directory, where the ROOT Macros is run

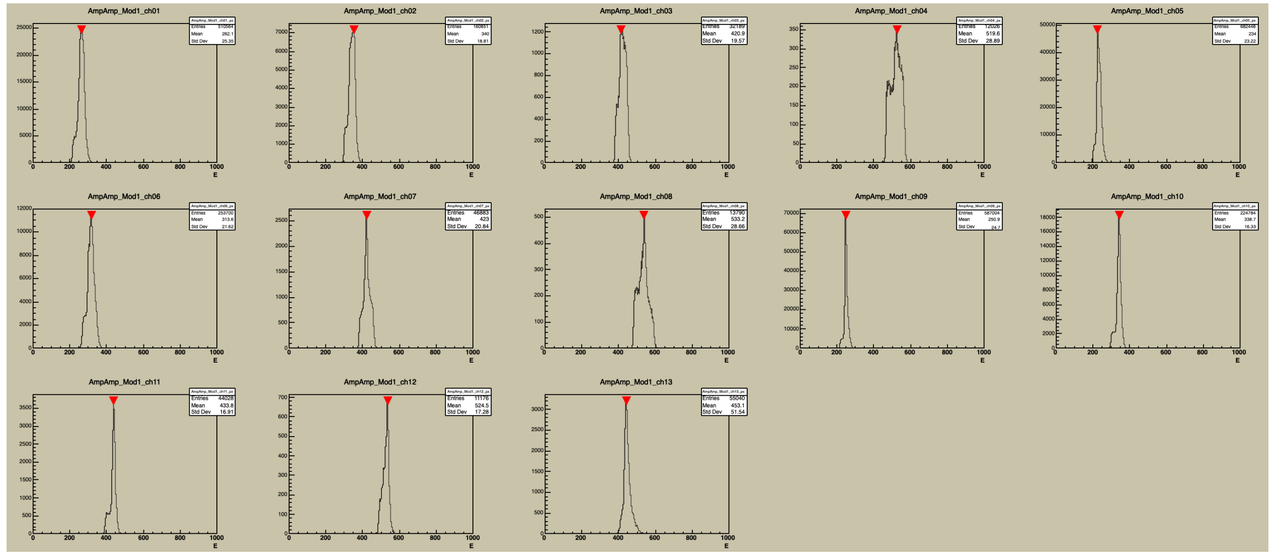

```
Module 1, Channel 1  - 11881
Module 1, Channel 2  - 3291
Module 1, Channel 3  - 588
Module 1, Channel 4  - 155
Module 1, Channel 5  - 23236
Module 1, Channel 6  - 5283
Module 1, Channel 7  - 1129
Module 1, Channel 8  - 204
Module 1, Channel 9  - 33274
Module 1, Channel 10 - 8384
Module 1, Channel 11 - 1648
Module 1, Channel 12 - 299
Module 1, Channel 13 - 1523

Module 2, Channel 1  - 32512
Module 2, Channel 2  - 11030
Module 2, Channel 3  - 1704
Module 2, Channel 4  - 416
Module 2, Channel 5  - 19509
Module 2, Channel 6  - 5514
Module 2, Channel 7  - 1098
Module 2, Channel 8  - 306
Module 2, Channel 9  - 12669
Module 2, Channel 10 - 2872
Module 2, Channel 11 - 562
Module 2, Channel 12 - 207
Module 2, Channel 13 - 1018
```

# Peak Recognition Consistency

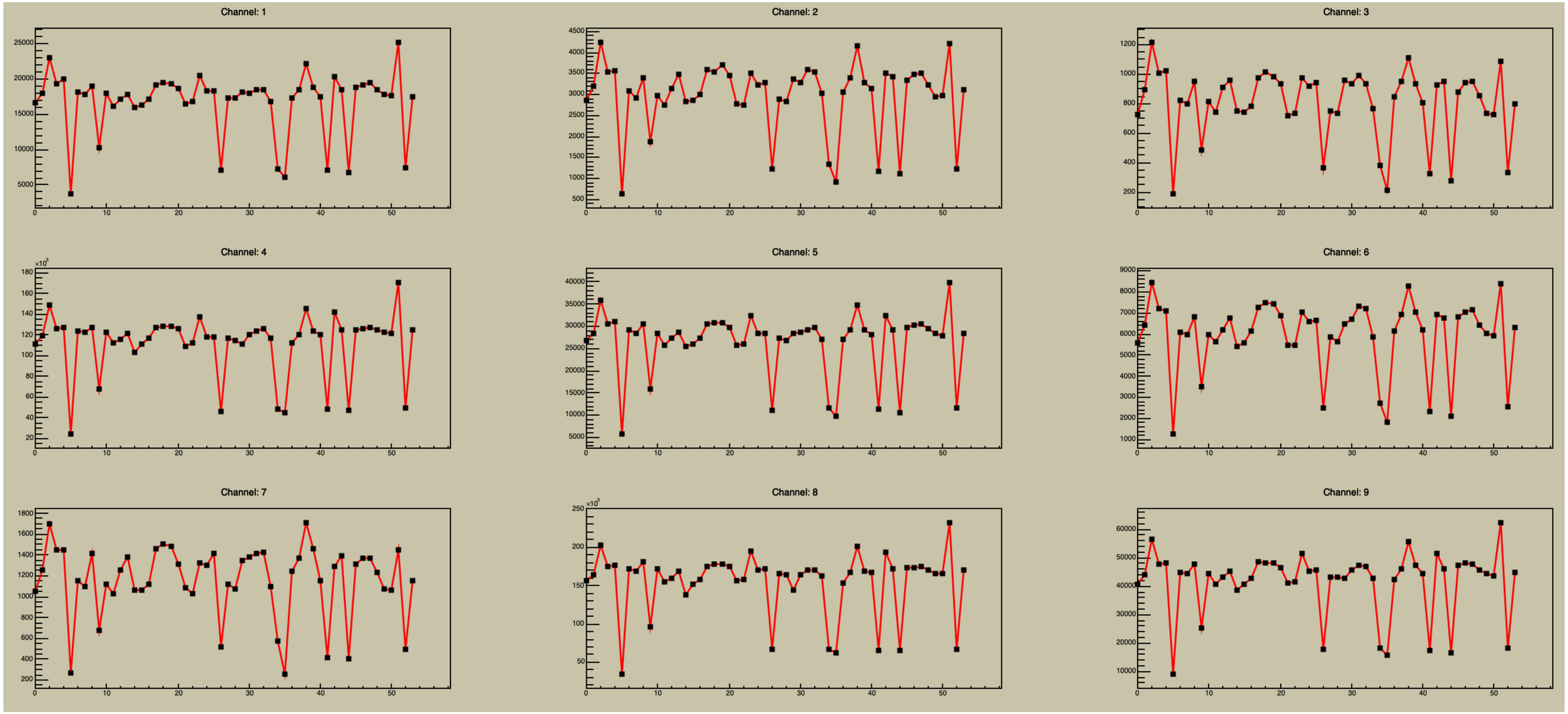
Run 5803



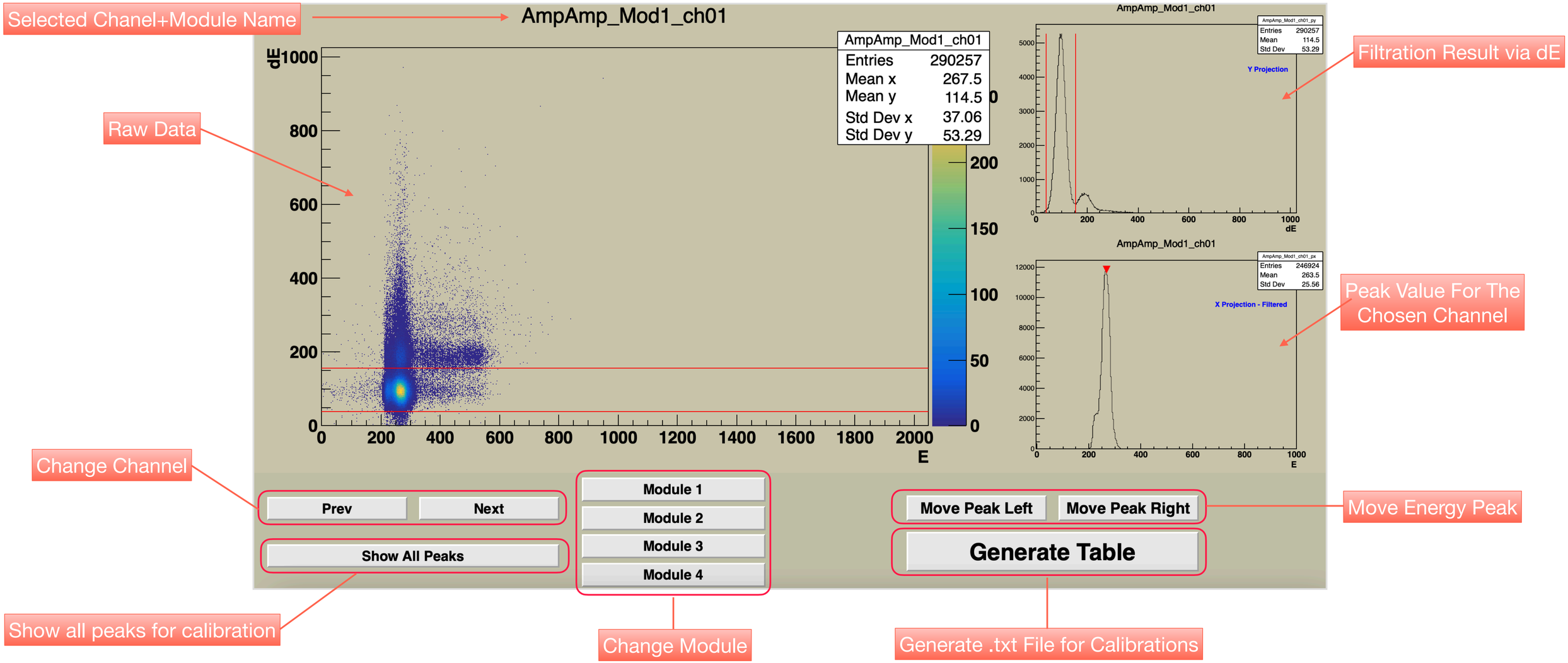

Run 5804



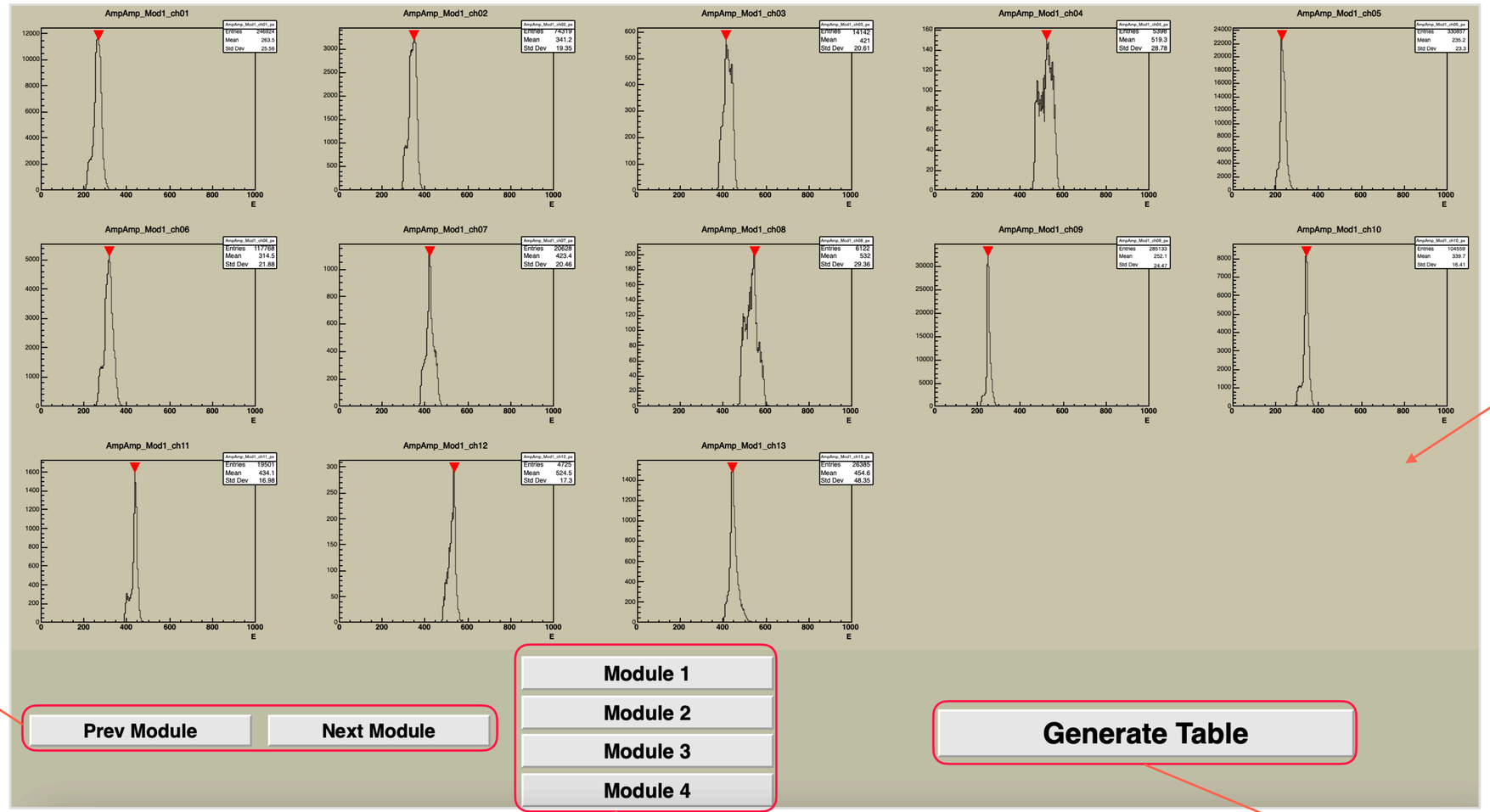
# Calibration Results Over Runs



# User Interface: 1



# User Interface: 2



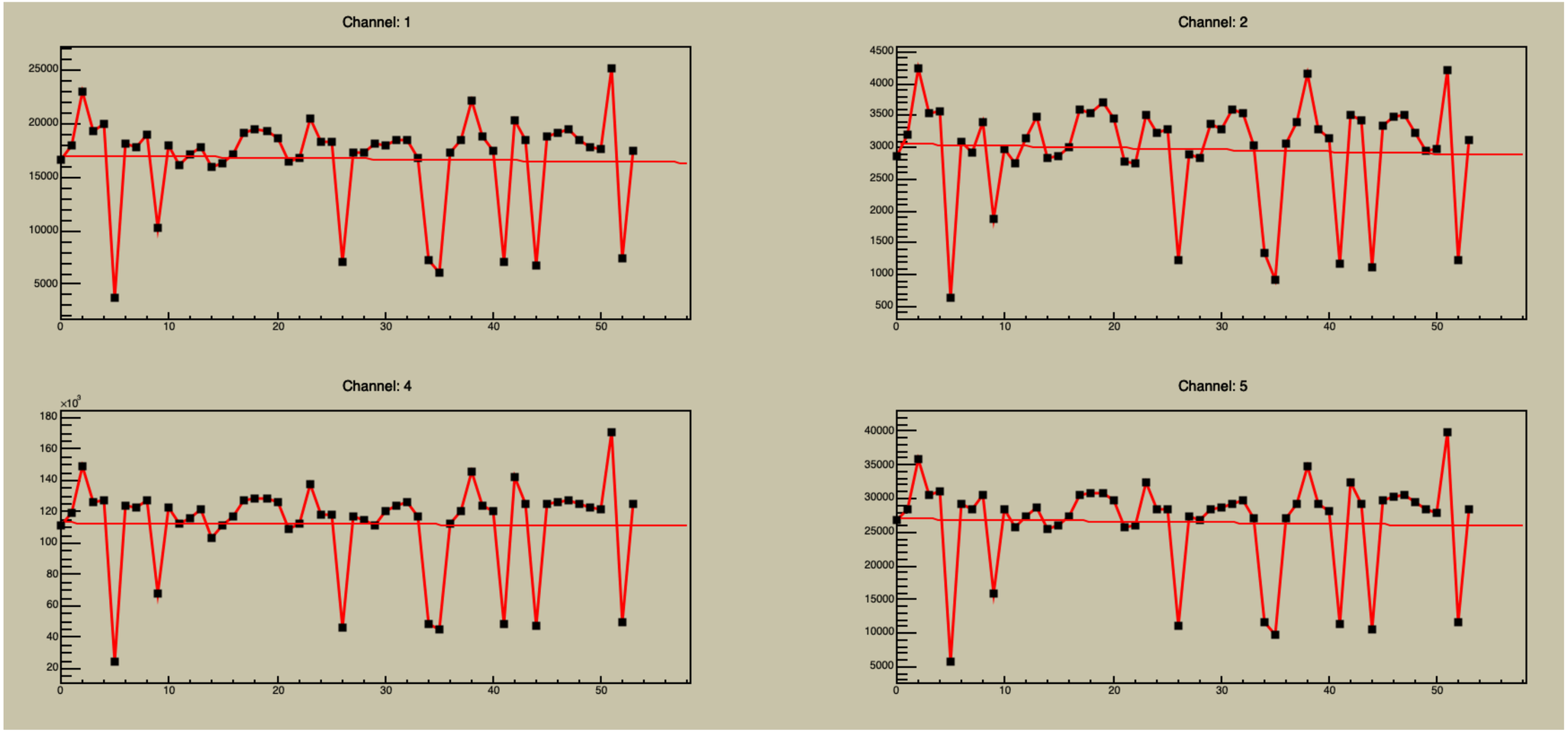

Peak Values For Chosen Module

Change Module

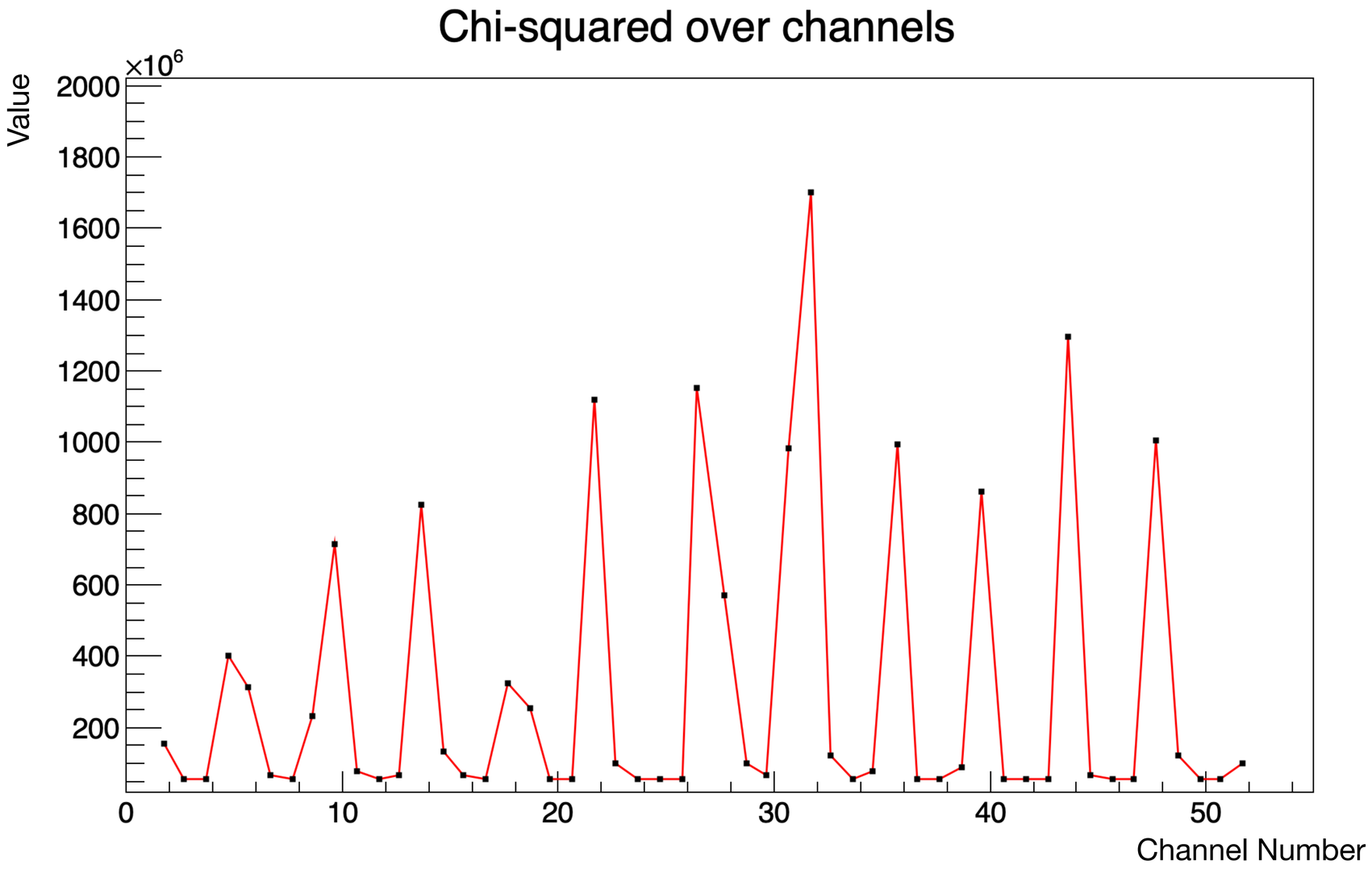
Change Module

Generate .txt File for Calibrations

# Linear Fit

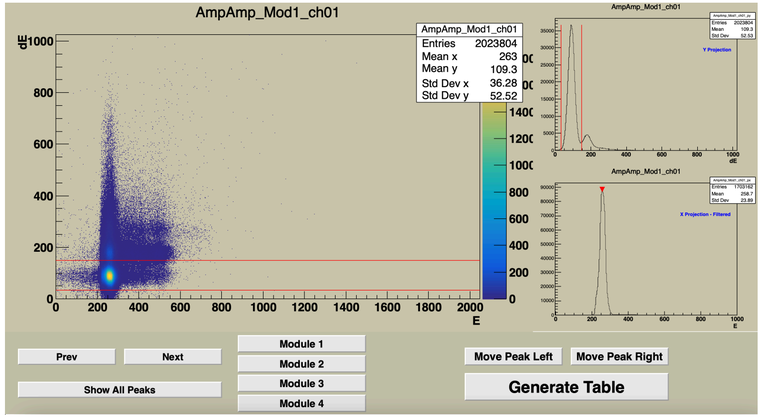


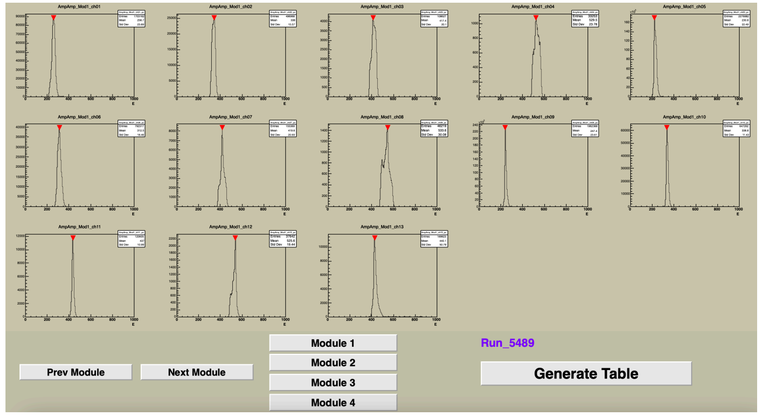
# Chi-Squared Analysis



# Results

- Optimisation Software has been developed
- Software algorithm proofed to be success



# Thank You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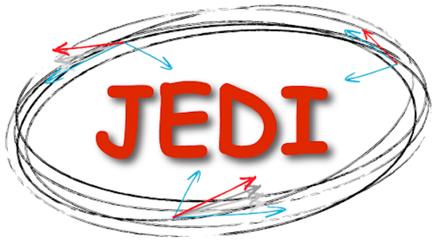
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