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

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Aspects of Symmetry
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

1. Get ROOT File Name
2. Get All Histogram Data
3. For Every Histogram:
   - Project 2D Histogram Data On dE (Y axis)
   - Fit Gaussian
   - Get 3 sigma Region
   - Place Marking Lines
   - Project Filtered 2D Histogram On E (X axis)
   - Find Elastic Scattering Peak

Aspects Of Symmetry
Peak Finding Algorithm

1. Find The Highest Energy value (The Furthest Right Point)
2. Save point as a Maximum
3. Check If there is Point To the Left
   - If There is point To the Left: Move & Compare if the new point is higher
     - If Higher: Update Maximum Value
     - If Lower: Check if it's extremum point
       - If Extremum point: Peak was found - Finish Scanning
       - If not Extremum Point:
         - If There is no point: Peak was found - Finish Scanning
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
Peak Recognition Consistency

Run 5803

Run 5804
Calibration Results Over Runs

Aspects Of Symmetry
User Interface: 1

Selected Channel+Module Name

Raw Data

Change Channel

Show all peaks for calibration

Module 1
Module 2
Module 3
Module 4

Change Module

Move Peak Left
Move Peak Right

Generate .txt File for Calibrations

Filtration Result via dE

Peak Value For The Chosen Channel

Move Energy Peak

Aspects Of Symmetry
User Interface: 2

Aspects Of Symmetry

Peak Values For Chosen Module

Generate .txt File for Calibrations
Results

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