



# HV tuning update

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Nikhef KM3NeT group meeting

2020/03/13

# Recap

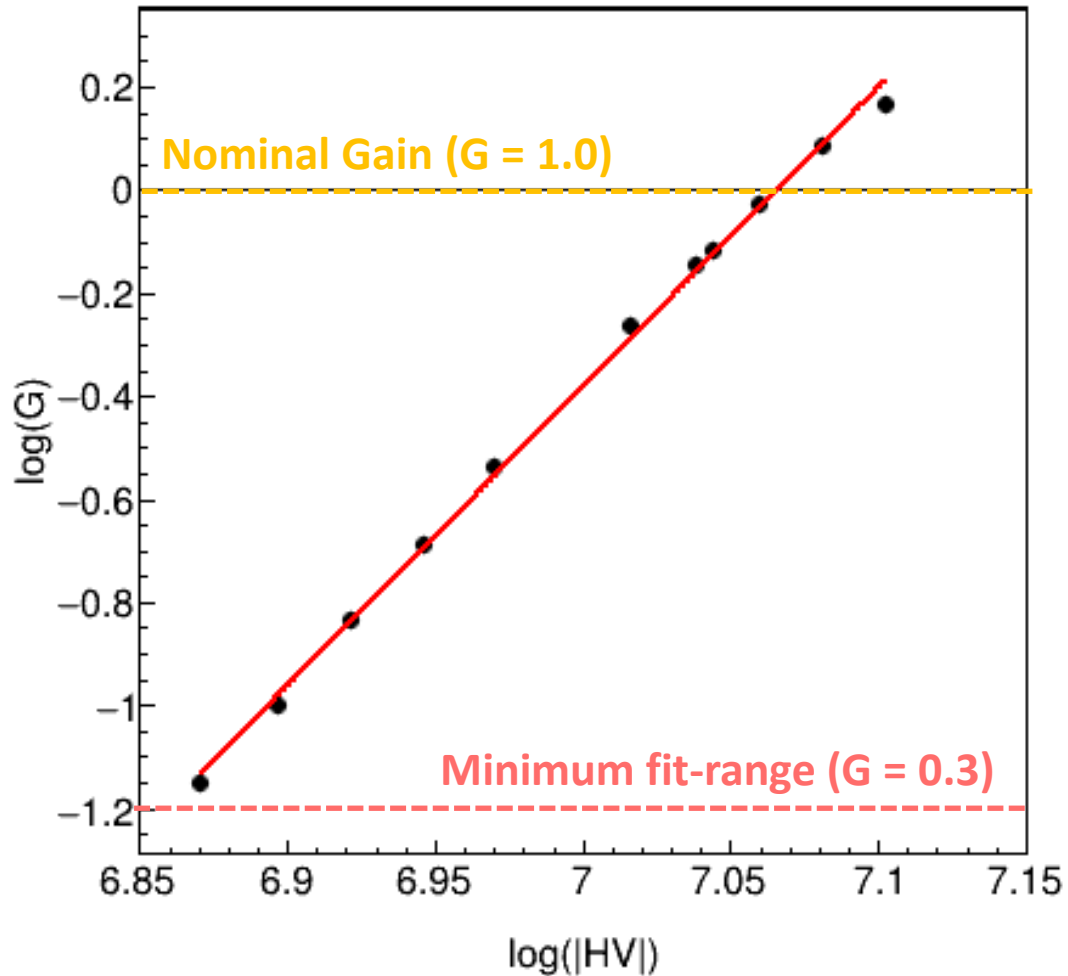


- Move to HV-tuning procedure based on gain-estimates
  - Motivated by theory (see [doxygen](#)):

$$G = A \cdot V^{kN}$$

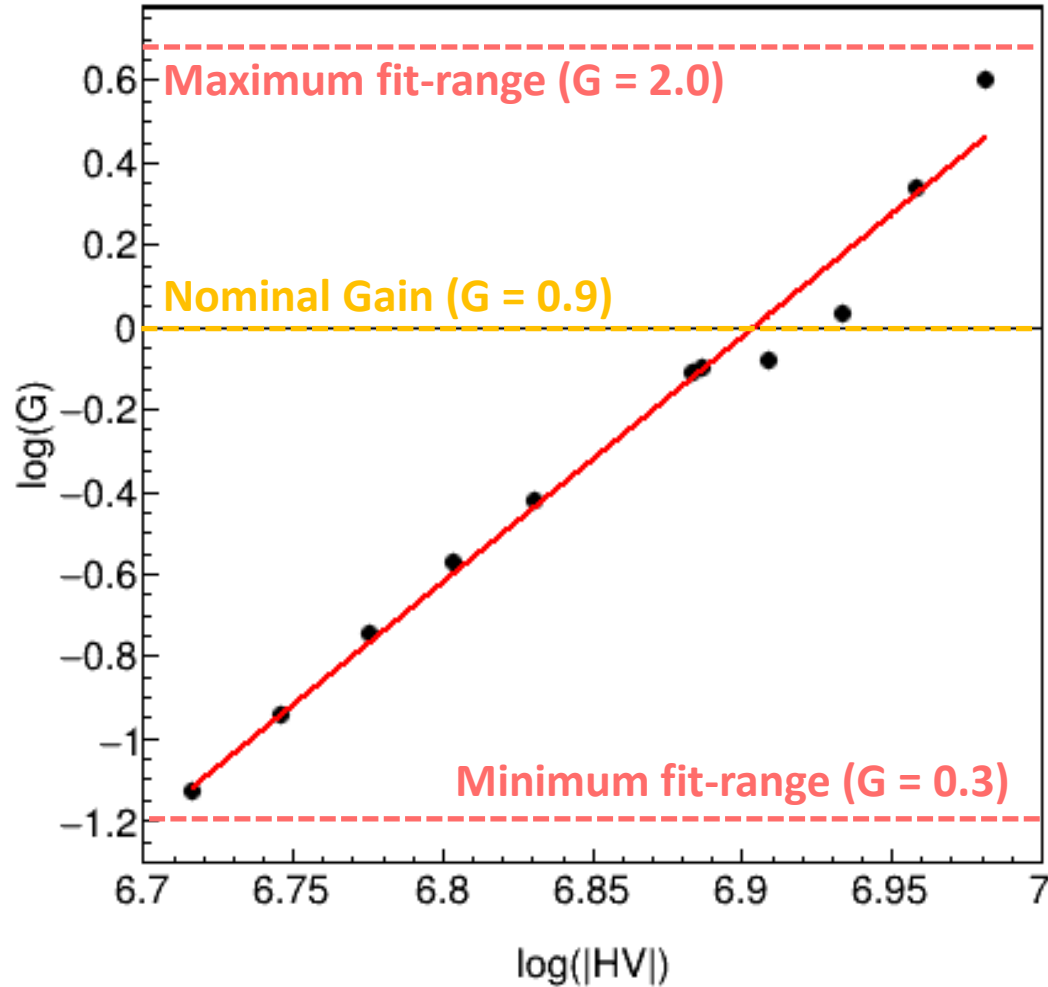
- Implementation through fit or interpolation of linearized data
  - Extract high-voltage settings from database
  - Extract gain-estimates from JFitToT output
- Outliers in gain-estimates need to be inspected
- Database integration via Json

## KM3NeT preliminary



- HV-fitting routine is being implemented in JFitHV (updates in Jpp git branch [fitToT full spectrum](#))
  - DB-interfacing has been implemented
  - Automatically retrieves (HV,G)-data for all PMTs in user-specified list of data-files
- Initial results are promising
  - Clear linear behavior on log-log scale for most PMTs
- A couple of issues

## KM3NeT preliminary



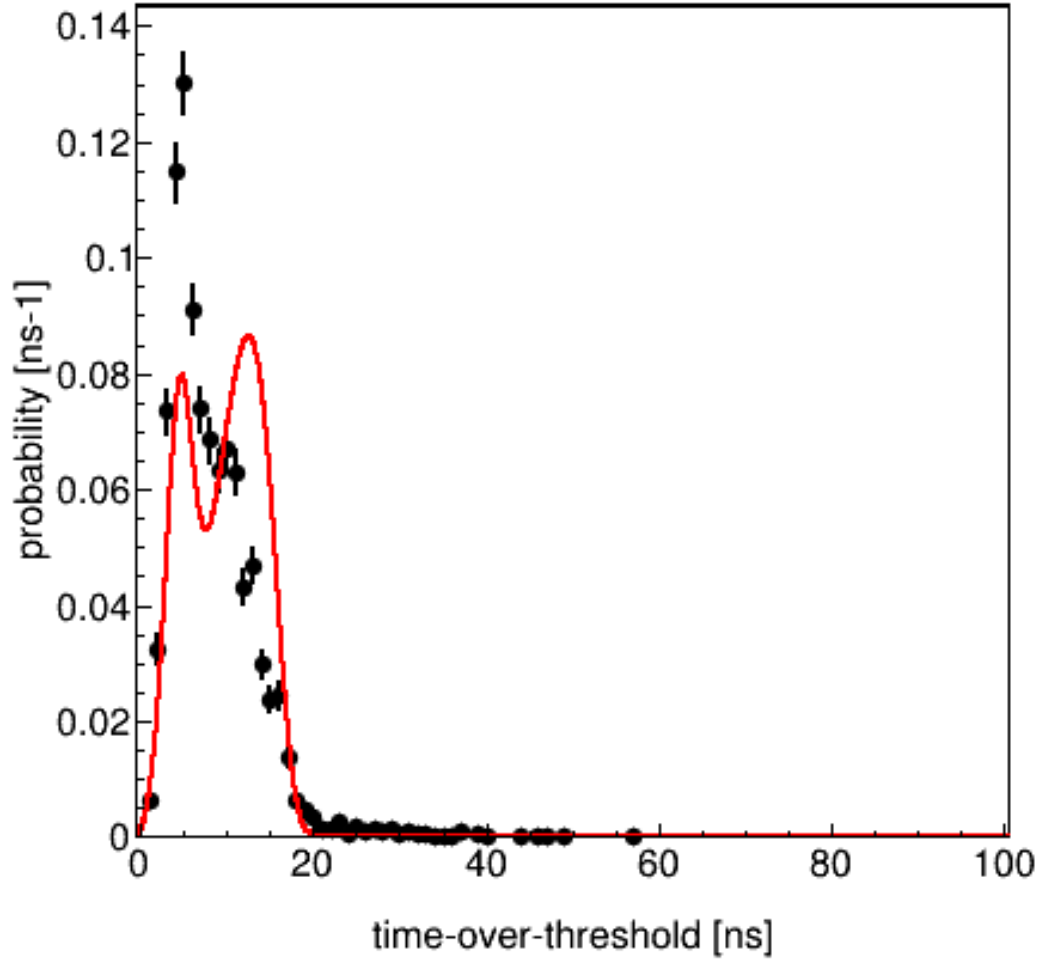
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  - DB-interfacing has been implemented
  - Automatically retrieves (HV,G)-data for all PMTs in user-specified list of data-files
- Initial results are promising
  - Clear linear behavior on log-log scale for most PMTs
- A couple of issues
  - Deviation from linear behavior at high or low  $|HV|$  for some PMTs
  - Fit-range bounds for gain-estimate in JFitToT

# ToT-fits for increasing HV

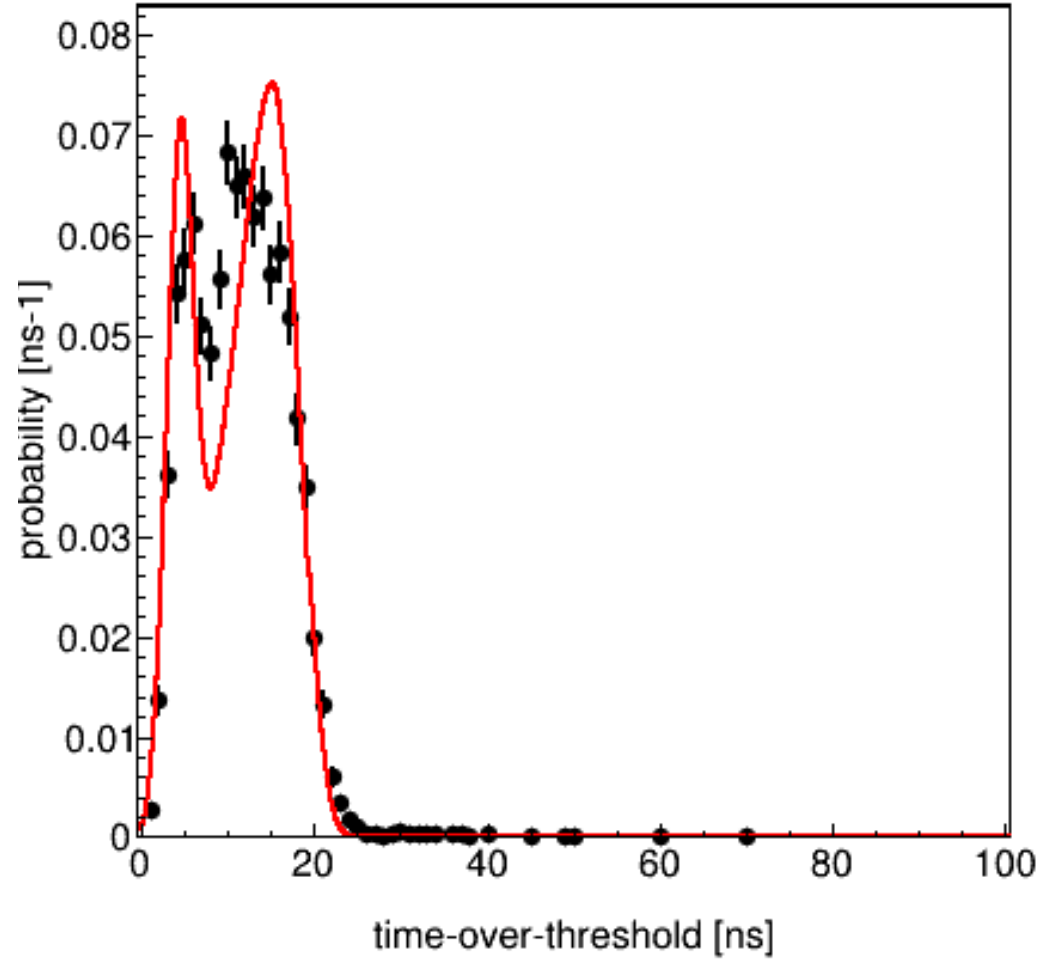
N.B: These are animated gif files



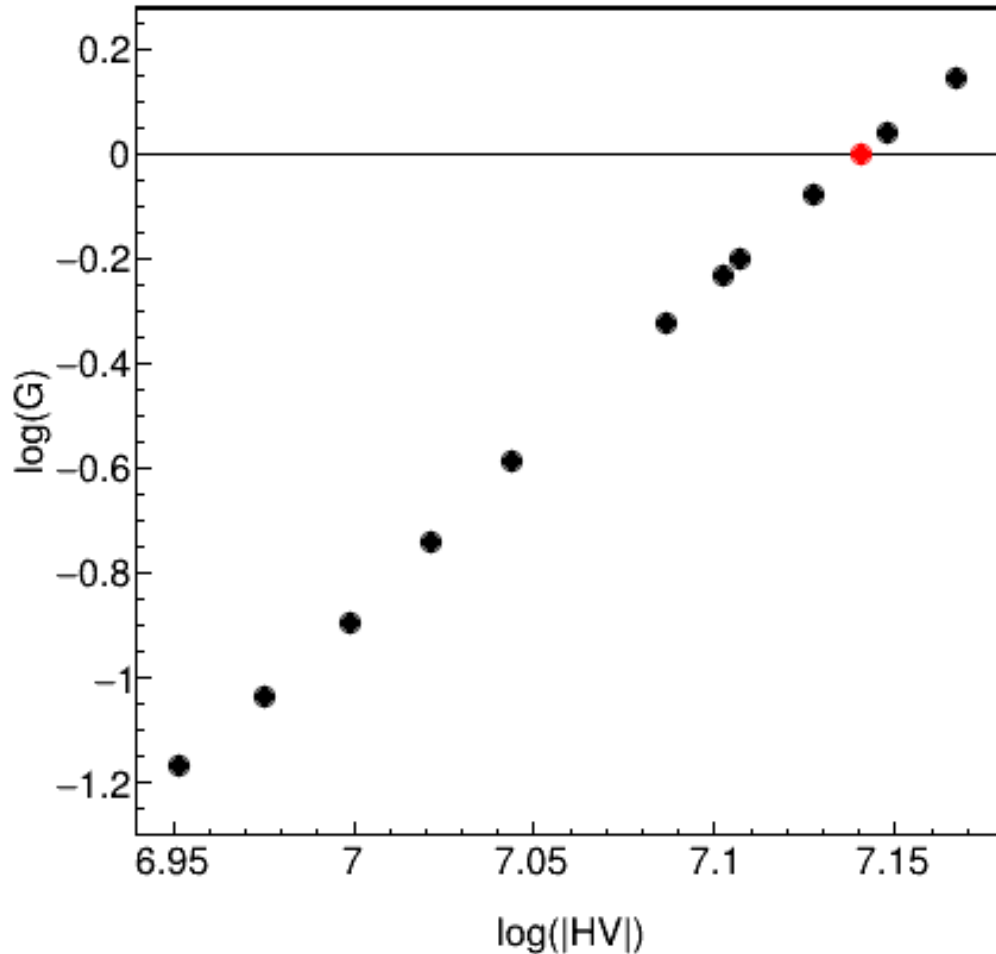
KM3NeT preliminary



KM3NeT preliminary



## KM3NeT preliminary



Making the ToT-fit work for all possible HV-settings is asking too much...

- For the specific purpose of HV-tuning, set fit-range to region surrounding ToT-distribution peak

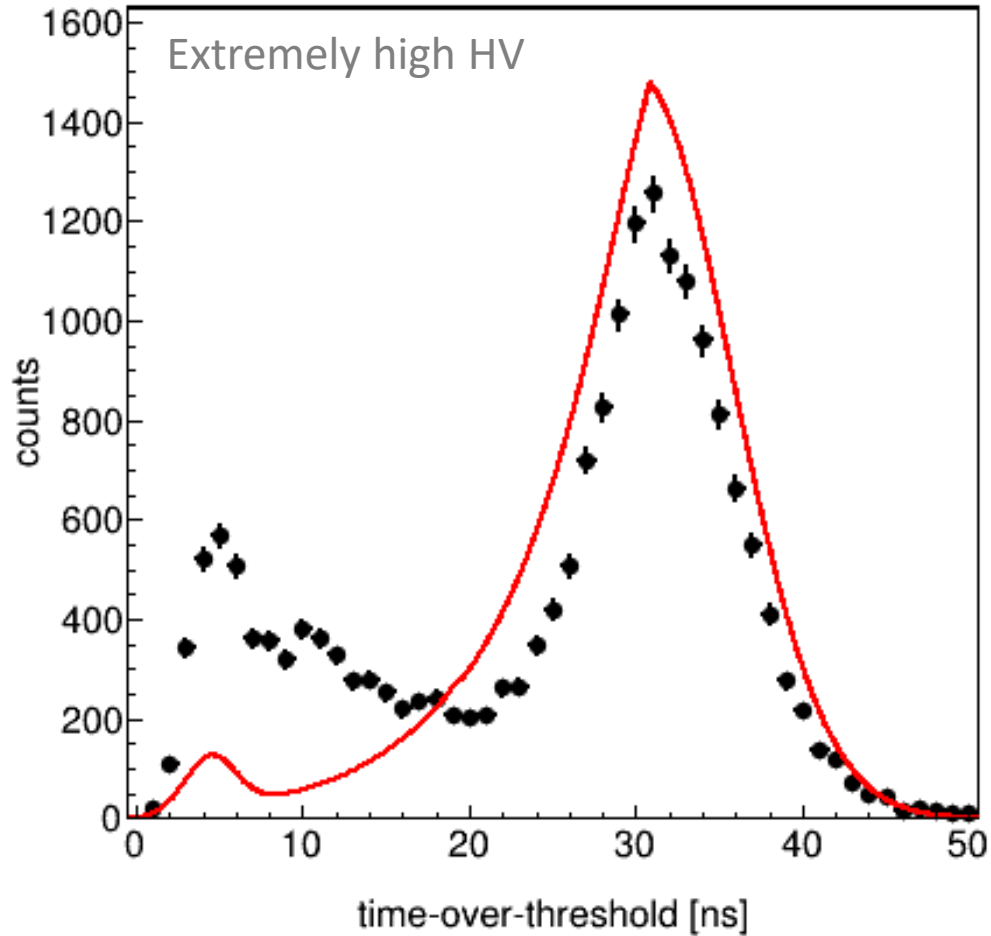
The datapoints directly surrounding the optimal gain (= 1.0) tell the most about the optimal high voltage setting

- Switch to linear interpolation/extrapolation

# Remaining anomalous ToT-fits



## KM3NeT preliminary

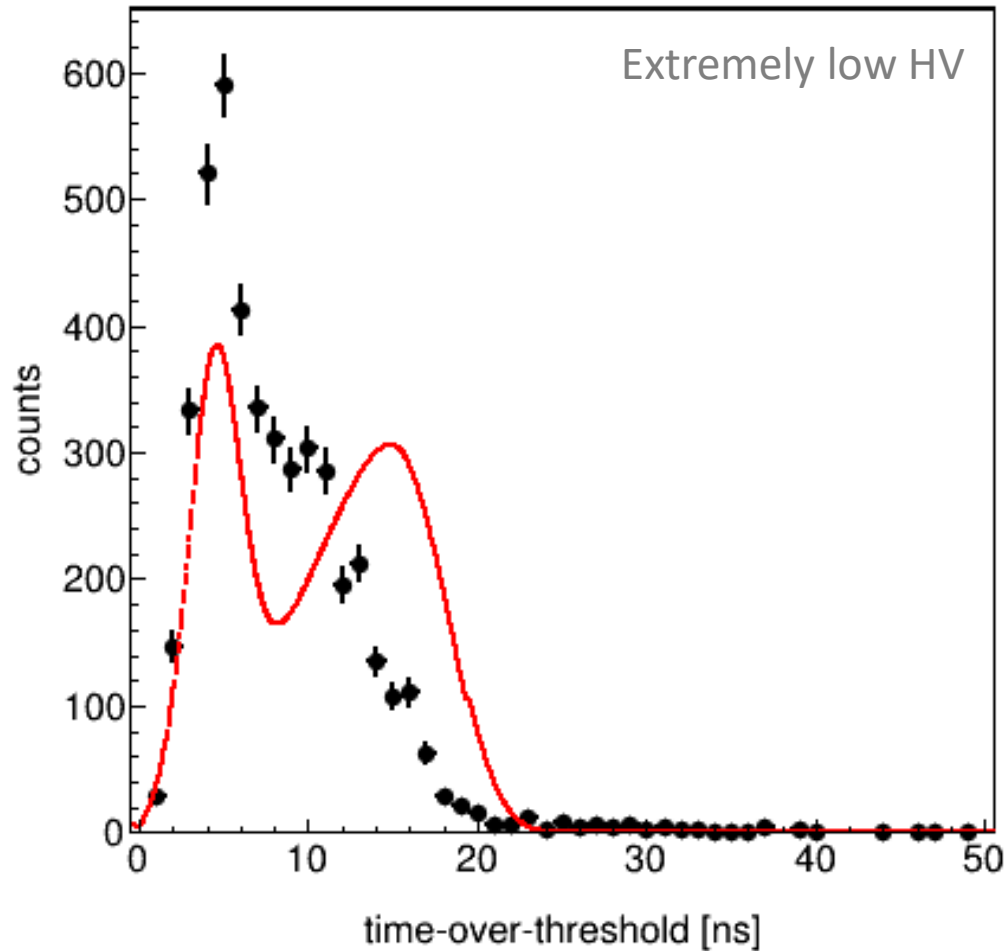


- Thresholdband and PunderAmplified too low to account for large peak at 5ns
- Large secondary contribution at 10ns
- Normalization does not account for large relative fraction of 5ns- and 10ns-peak counts
  - Causes fit to unduly scale down model contribution by increasing its spread

# Remaining anomalous ToT-fits



KM3NeT preliminary



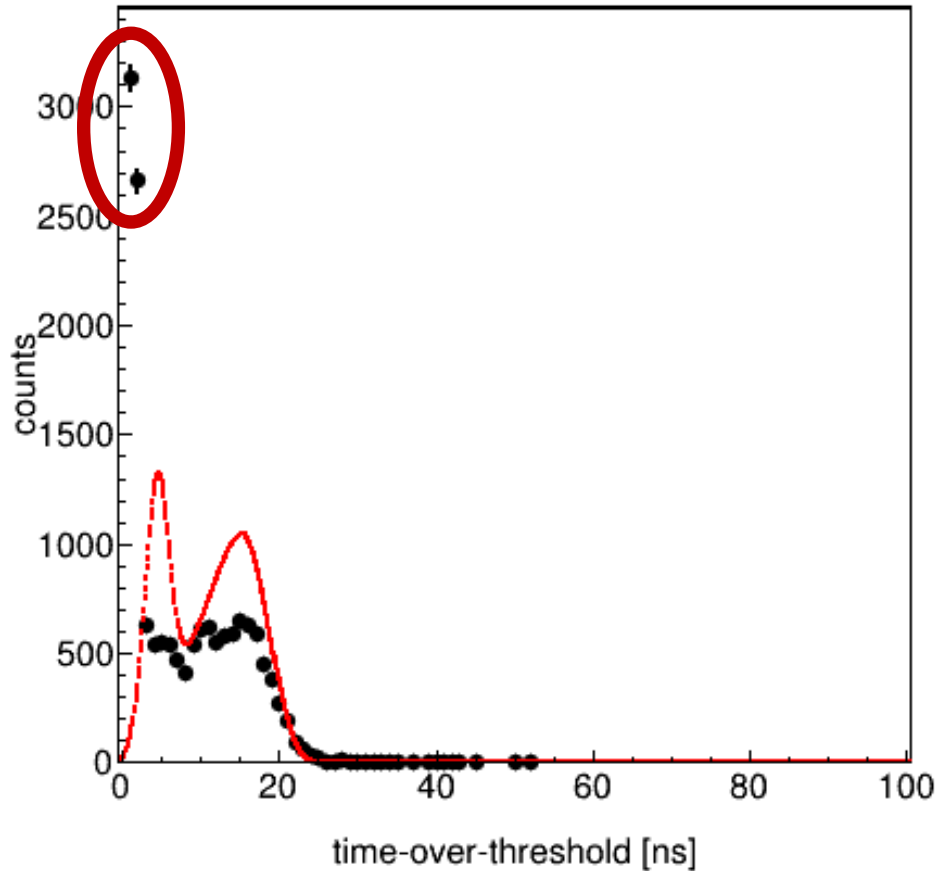
- Thresholdband and PunderAmplified too low to account for large peak at 5ns
- Model contribution nearly indistinguishable from 10ns-peak contribution



# Remaining anomalous ToT-fits



KM3NeT preliminary



- Discovered one PMT (808483678.5) with anomaly in first and second bin
- Output from JCalibrateToT
  - Some artefact in the triggering?

# Planning



1. Set up a bash script to automatically extract the gain-estimates and find the optimal HVs using a set of user-specified raw data files
  - Prognosis: ✓
2. Implement DB-integration (via JSon)
  - Prognosis: today/tomorrow
3. Document remaining anomalous ToT-fits on ELOG and git
  - Prognosis: today
4. Analyze results with recent (L0-)data using the provided bash script
  - Prognosis: weekend/start of next week
5. Adjust `TIME_OVER_THRESHOLD_NS` to optimal gain-setting
  - Prognosis: tomorrow/weekend (non-critical)

