

GRB Analysis Plans Geneva

Merlin Kole, Neal Gauvin, Nicolas Produit
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Part 1

- First paper discusses 5 GRBs
- We measured many more
- Do we have more candidates to analyze?

Part 2

- Can we improve our analysis?
- Developing new tools
- Final goal to produce standard analysis tools for high energy polarization

Measured GRBs

- 161129A
- 161203A
- 161205A
- 161207A
- 161207B
- 161210A
- 161212A
- 161217B
- 161217C
- 161218A
- 161218B
- 161219B
- 161228A
- 161228B
- 161228C
- 161229A
- 161230A
- 170101A
- 170101B
- 170102A
- 170105A
- 170109A
- 170212A
- 170114A
- 170114B
- 170120A
- 170121A
- 170124A
- 170127C
- 170130A
- 170131A
- 170202B
- 170206A
- 170206C
- 170207A
- 170208C
- 170210A
- 170219A
- 170220A
- 170328B
- 170305A
- 170306B
- 170309A
- 170317A
- 170320A
- 170325B

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- 161129A
- 161203A
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- 170306B
- 170309A
- 170317A
- 170320A
- 170325B

Analyzed in first paper:

- fluence $> 0.5 \times 10^{-5}$ erg/cm²
- theta < 45 deg.
- decent position and spectral measurement by other instrument

Measured GRBs

- 161129A
- 161203A

- 170114A
- 170114B

- 170320A
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- 161212A

- 170127C

- 161217C
- 161218A
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- 170219A
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- 161229A
- 170101A
- 170101B
- 170102A

- 170305A
- 170306B

Many GRBs we know are too weak to analyze...

Measured GRBs

- 161129A
- 161203A

- 170114A
- 170114B

- 170325B

- 161212A

- 170127C

- 161217C
- 161218A

- 170202B
- 170206A

- 161228A
- 161228B

- 170206C

- 161229A

- 170208C
- 170210A

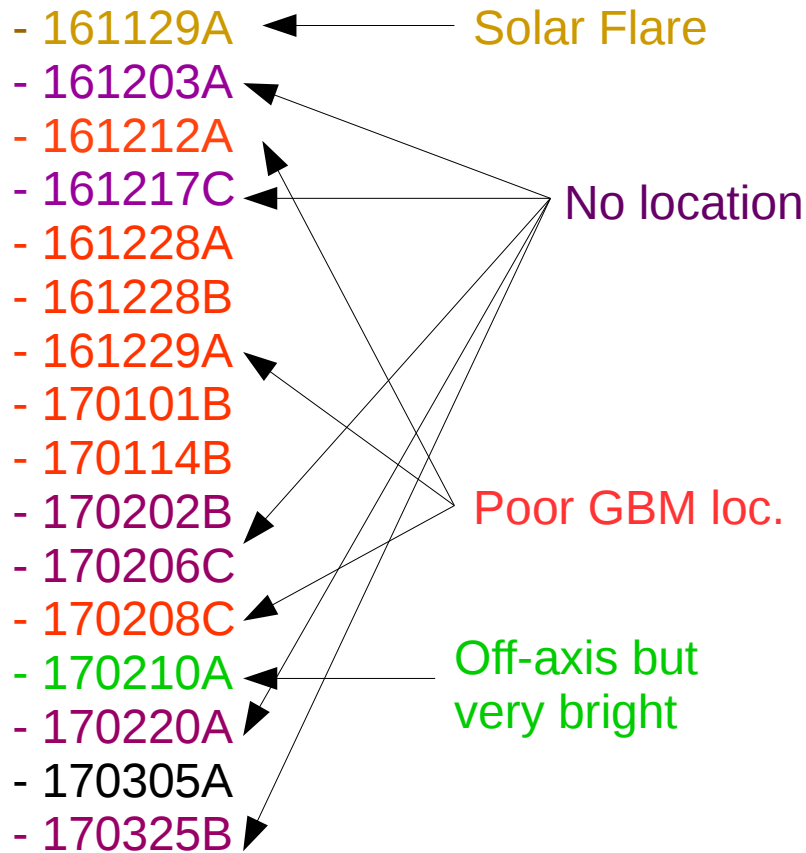
- 170101A
- 170101B
- 170102A

- 170220A
- 170305A

Some others have a good location measurement, so we know they are too far off-axis

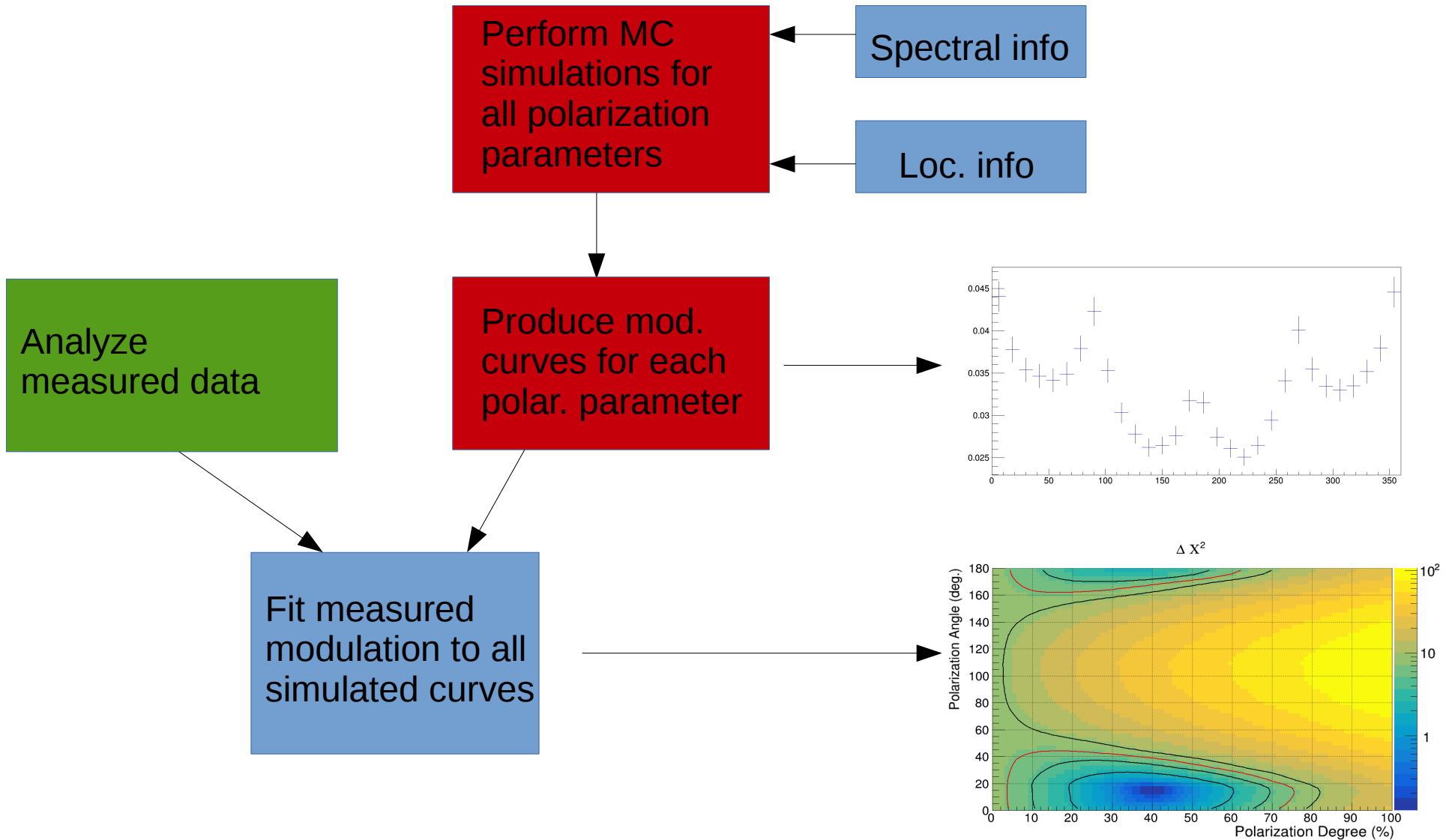
GRB Analysis Plans Geneva

So we have quite some more to analyze!



- All these GRBs have a reasonable amount of events allowing for constraining measurements
- Some have no location at all, some we have only a poor location by GBM
- Some have no spectral information
- For many we can use BALROG to get better positions
- For all we can get a spectrum, either using our data or in collaboration with the other detecting instrument

Old analysis POLAR



Old analysis POLAR

Perform MC simulations for all polarization parameters

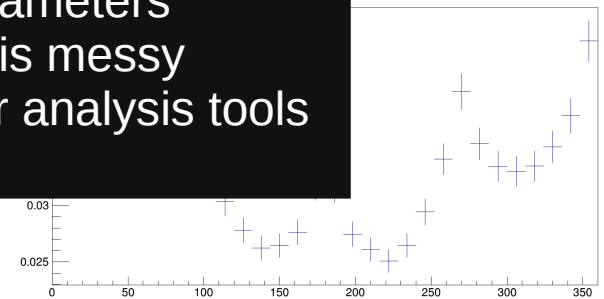
Spectral info

Loc. info

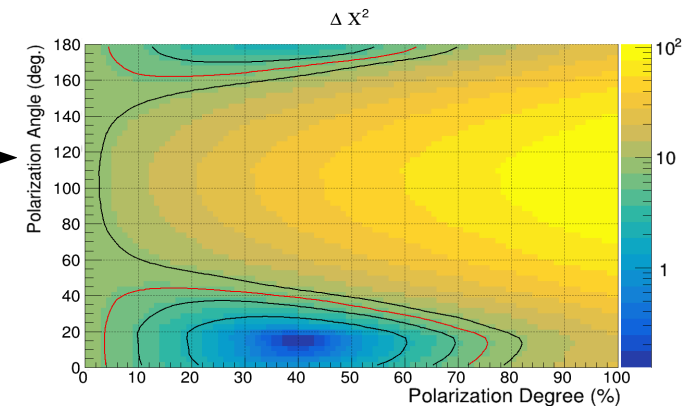
Problems:

- produces response only valid for the given input parameters
- adding systematic errors from the input parameters is messy
- requires continuous access to the MC as well as our analysis tools
- only applicable to our data

Anal
mea



Fit measured modulation to all simulated curves



Standardizing high energy polarimetry

The idea:

Anyone with access to the data and an interest in doing basic polarization analysis can do this within a few hours

Problem 1: User needs access to all of our tools

Solution: We provide all the data, fully processed, in a well understandable standardized data format

*requires data to be public

Current status:

- All our data is processed (~1 TB)
- For each event the user has a time, energy, scattering angle and dead time
- Similar to standard info required for spectral analysis
- Data is not public yet
- More info later this afternoon!

Standardizing high energy polarimetry

The idea:

Anyone with access to the data and an interest in doing basic polarization analysis can do this within a few hours

Problem 2: User needs access to MC simulations

Solution: We produce a response file for the instrument in a standard format.

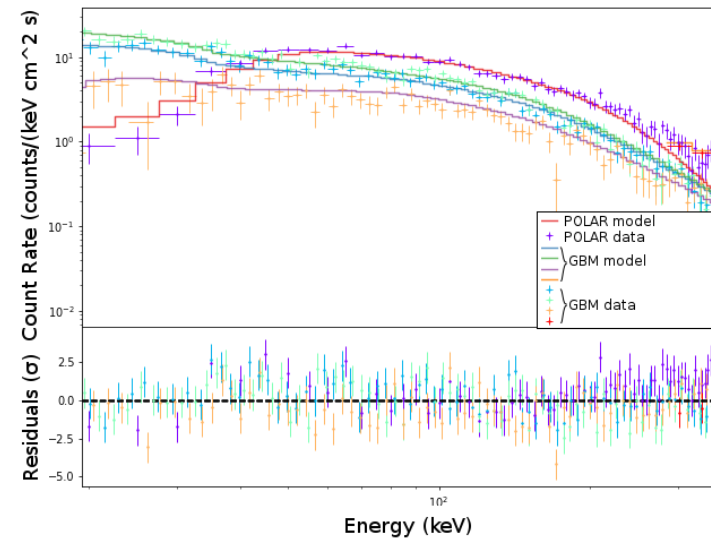
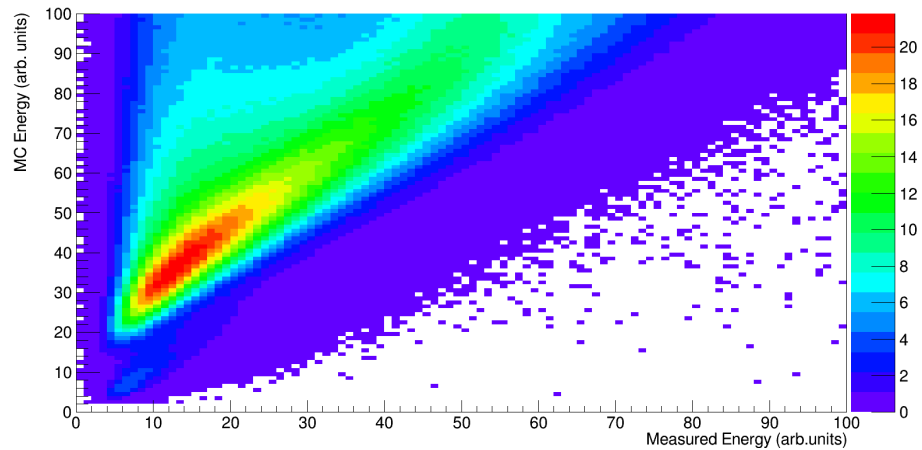
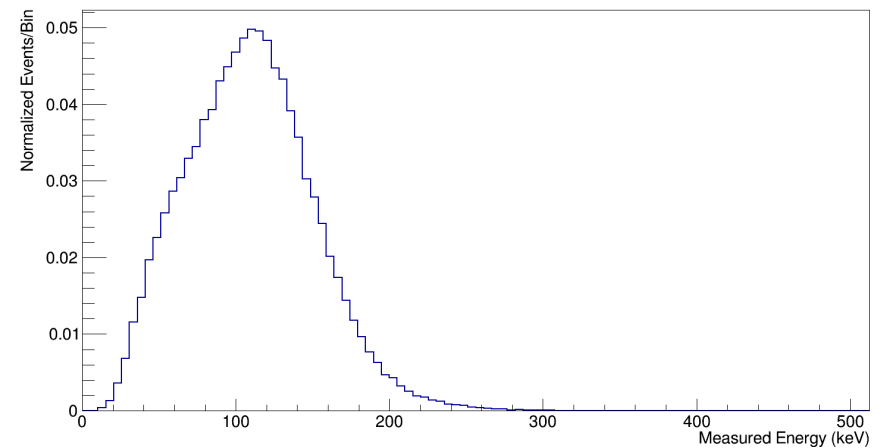
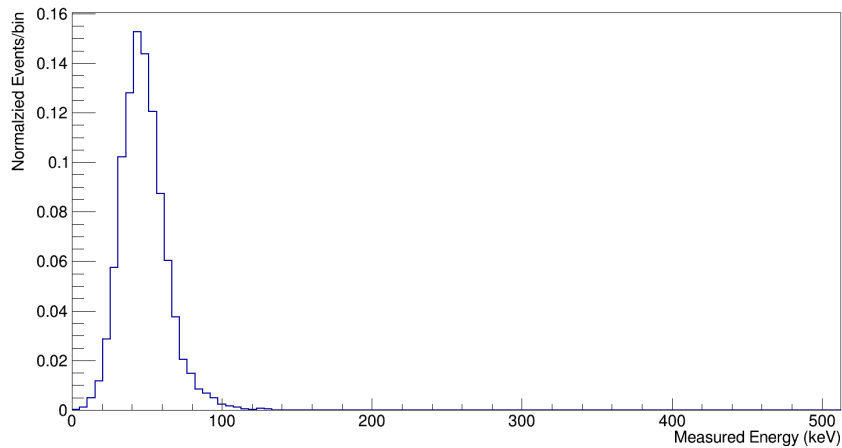
Current status:

- Similar to spectral studies our spectral response is produced in a FITS format
- ARF and RMF idea
- For polarization no such standard is defined, we will try to do that this afternoon.
- Started production but loads of simulation time still required

Building the response

Same logic as making an energy response:

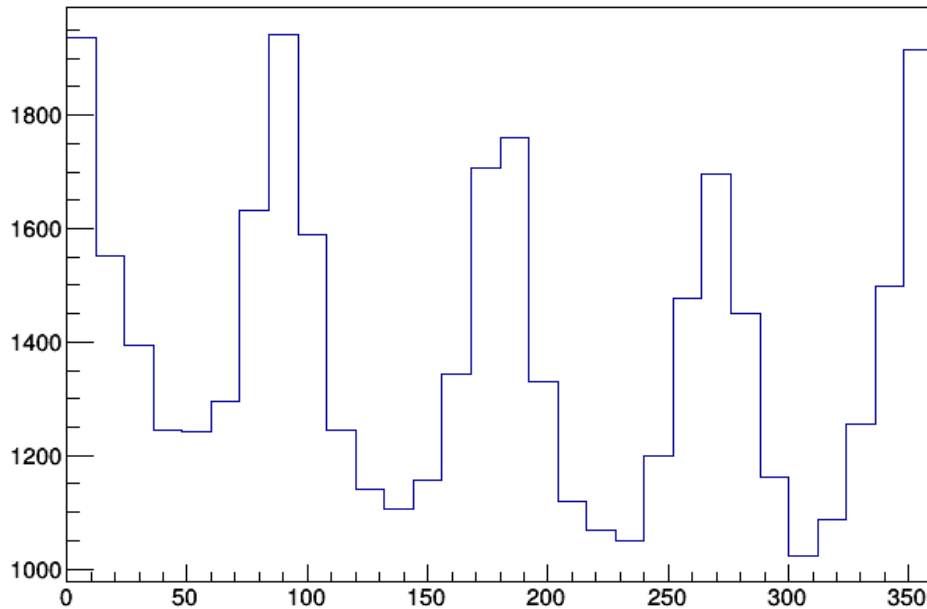
- Perform MC with mono-energetic beam
- Get the effective area and measured energy spectrum
- Repeat for many energies to produce ARF and RMF



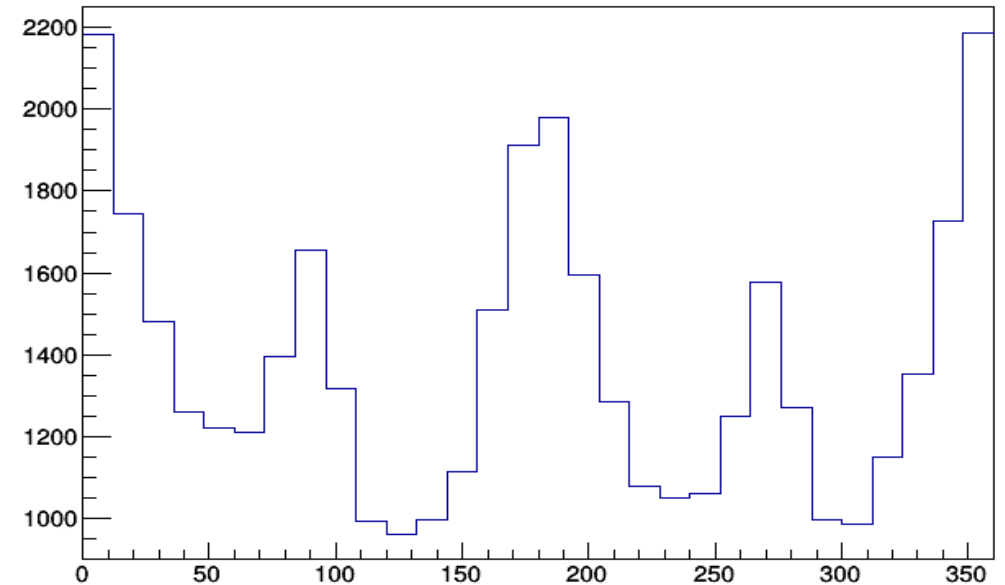
Repeat with Polarization

Same logic as making an energy response:

- Perform MC with mono-energetic beam for different polarization parameters
- Repeat for all polarizations, energies
- Allows to produce the modulation curve for each possible incoming spectrum and set of polarization parameters



800 keV, theta = 27 deg, phi = 0 deg, P = 0%



800 keV, theta = 27 deg, phi = 0 deg, P = 100%, Pi = 90 deg.

Standardizing high energy polarimetry

The idea:

Anyone with access to the data and an interest in doing basic polarization analysis can do this within a few hours

Problem 3: There are no simple tools (like xspec) available for polarimetry

Solution: We make one...

Current status:

- A well tested 3ML based idea is there
- Details this afternoon
- Basic idea: user gives data, selects signal and background period, relevant response file is downloaded → spectrum and polarization likelihood distributions are produced.
- Important feature: joint analysis with GBM data possible

Conclusion

- These tools would make analysis more transparent and easy to check
- Allow those without a detailed knowledge of the instrument to perform polarization analysis
- Removes the need for each analysis team to reinvent the wheel regarding tools/statistics etc.
- Allows for joint polarization analysis in the future