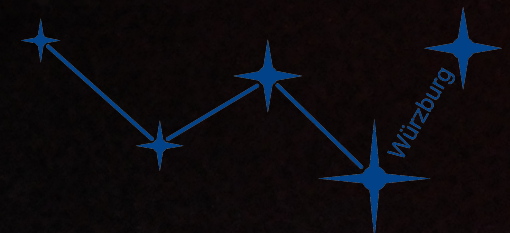


Longterm Monitoring of Bright TeV Blazars with FACT



Daniela Dorner for the FACT collaboration



First G-APD Cherenkov Telescope

Major Goals

Longterm monitoring of
bright TeV Blazars

- => Flare alerts to other
telescopes
- => Flare studies of AGN
- => MWL studies

Proof of principle
G-APDs in Cherenkov
Telescopes



First G-APD Cherenkov Telescope

- 2200 m asl, Observatorio Roque de los Muchachos, La Palma, Spain
- Refurbished HEGRA CT3
- Mirror area 9.5 m²

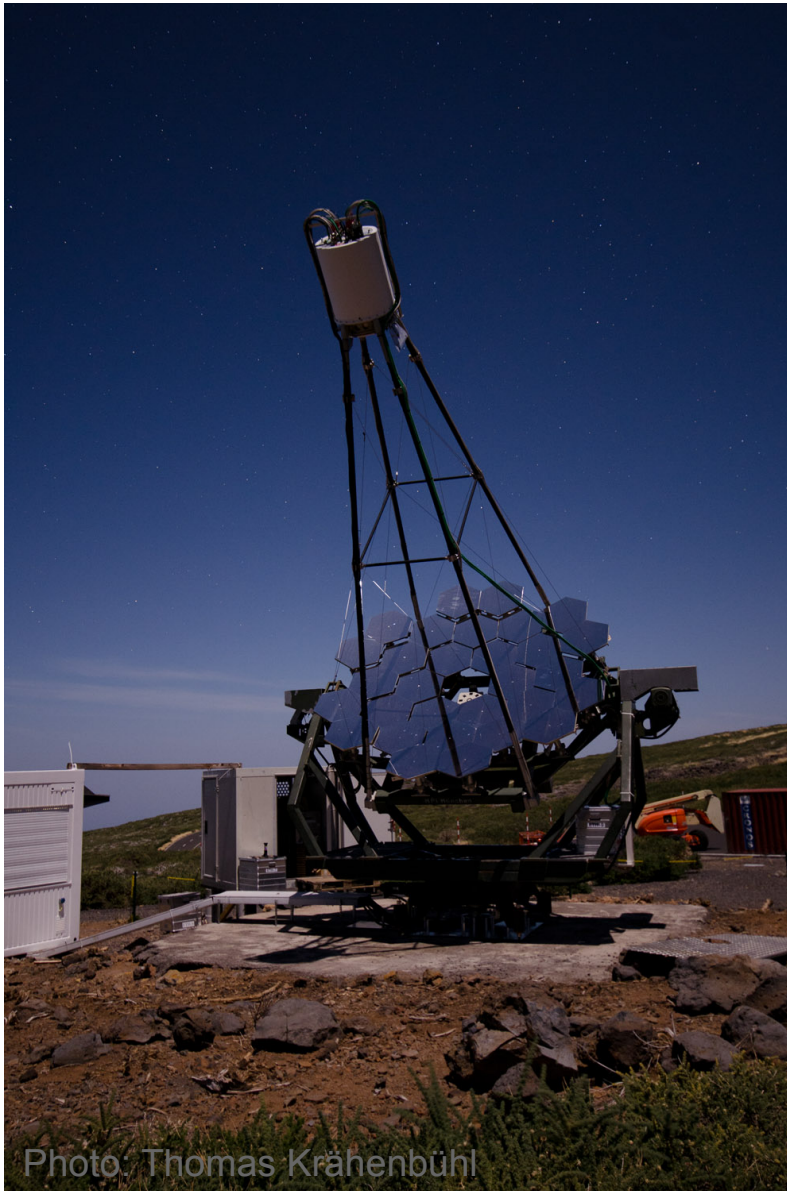
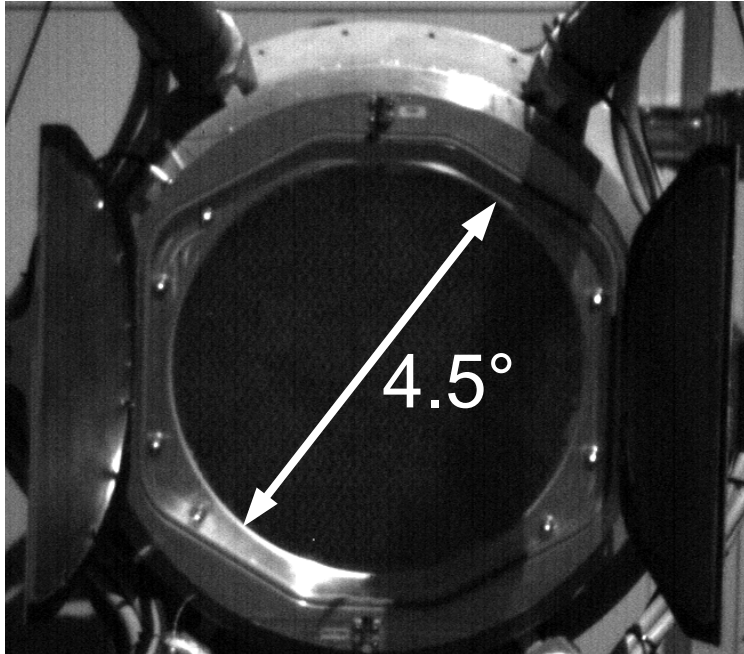
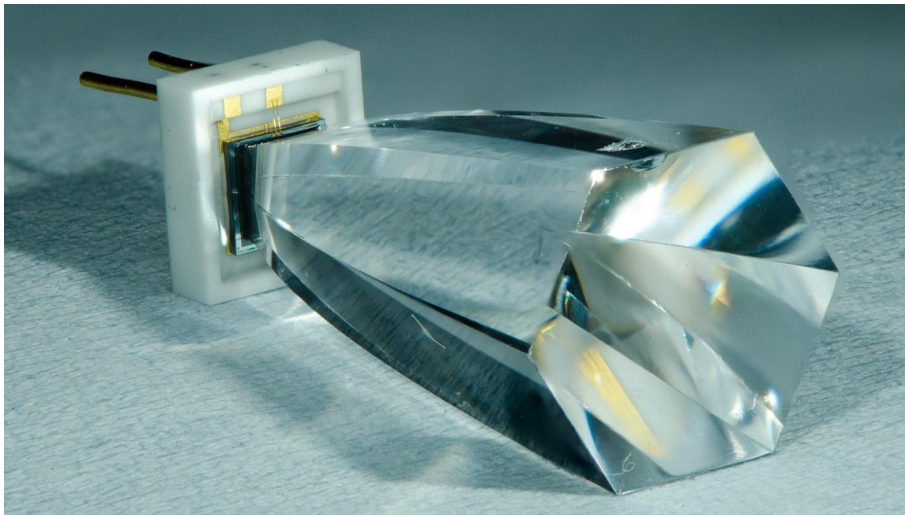


Photo: Thomas Krähenbühl

First G-APD Cherenkov Telescope

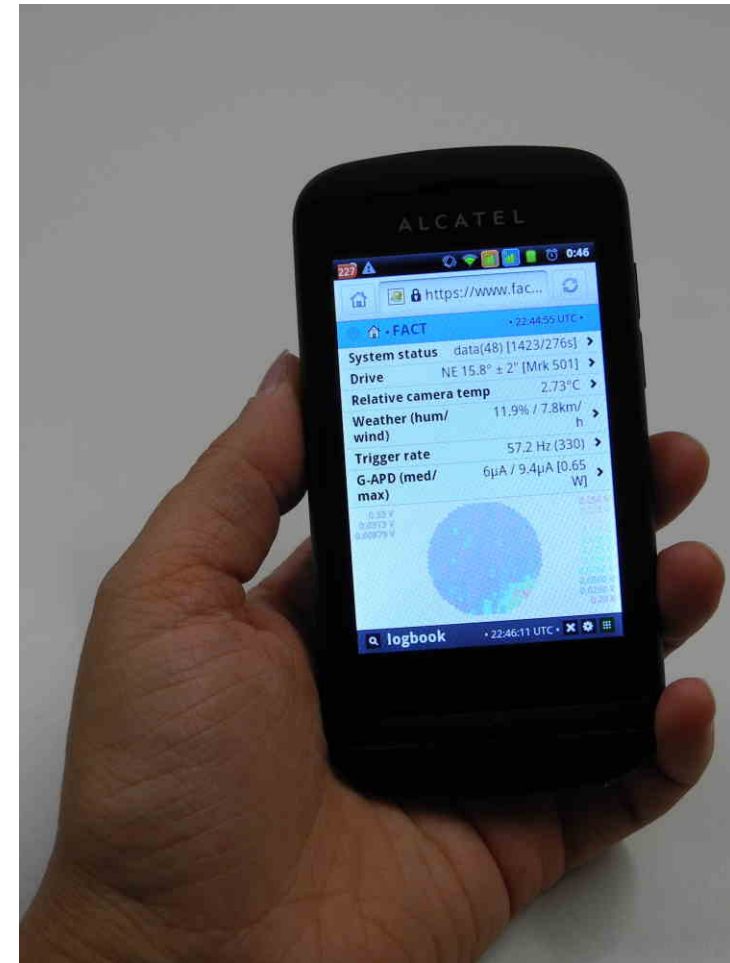
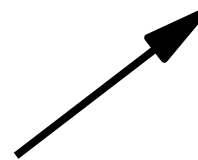
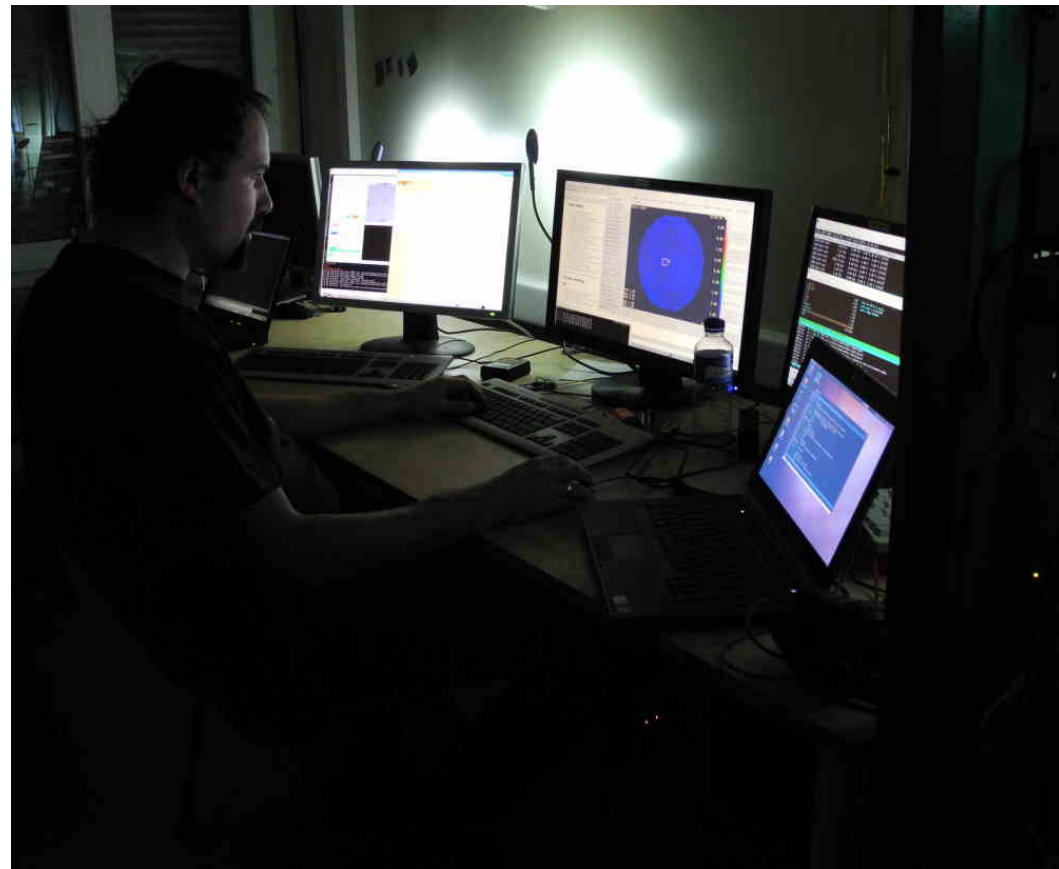


- 2200 m asl, Observatorio Roque de los Muchachos, La Palma, Spain
- Refurbished HEGRA CT3
- Mirror area 9.5 m²
- G-APD camera
 - Field of view: 4.5°
 - 1440 pixels (0.11° each)
 - Plexiglas cones
 - Integrated electronics



Status

- Remote operation



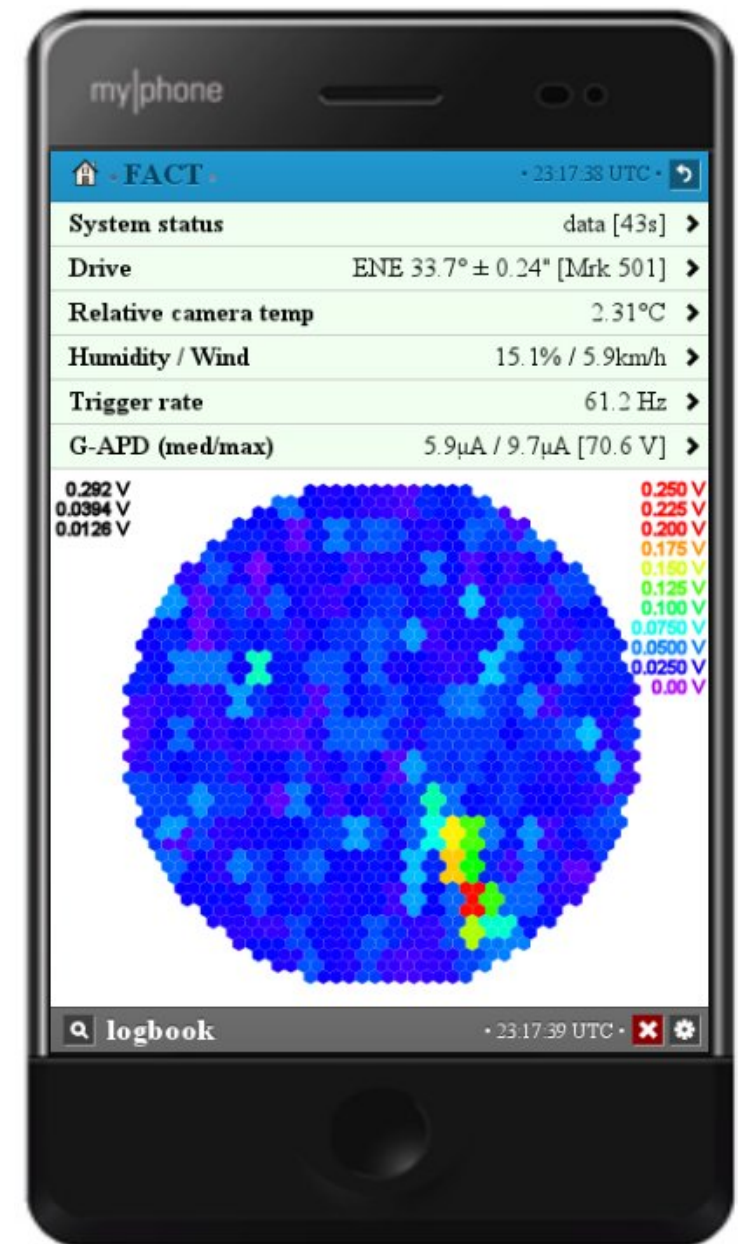
<http://www.fact-project.org/smartfact>

Status

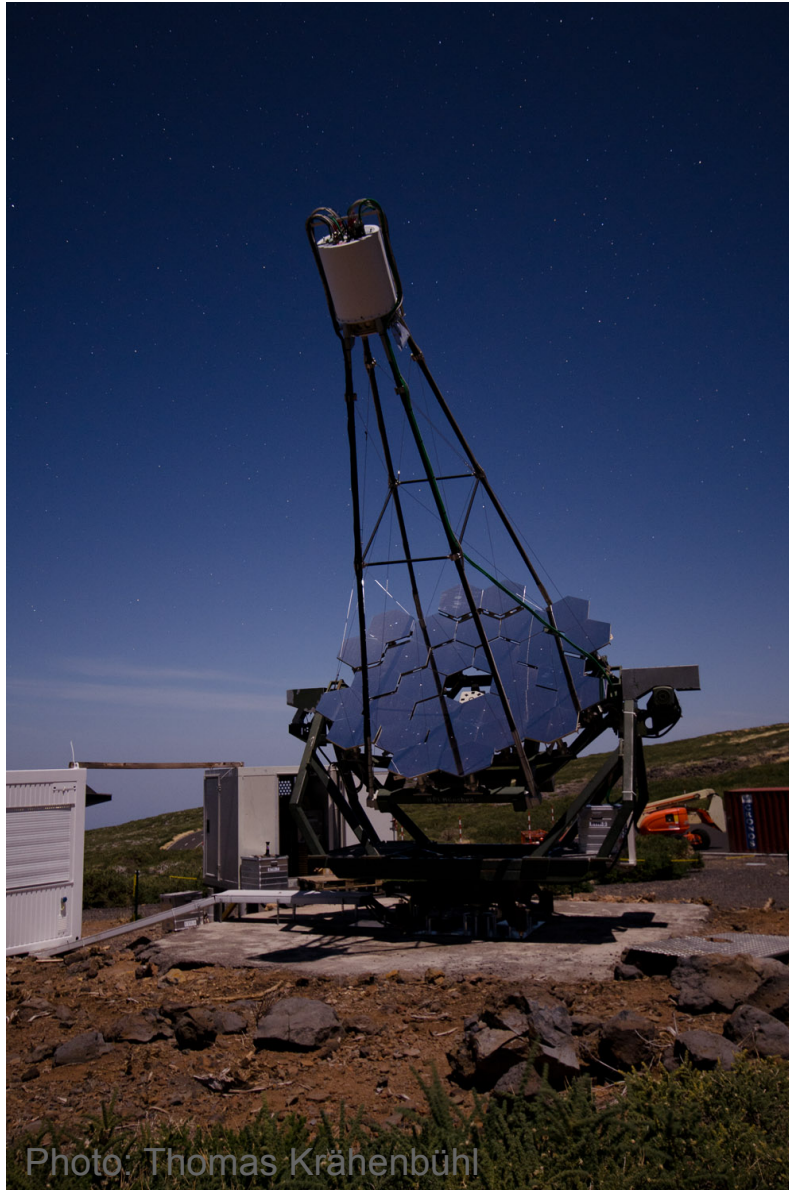
- Remote operation
- More details

Design and operation of FACT – the first G-APD Cherenkov telescope

H Anderhub et al 2013 JINST 8 P06008

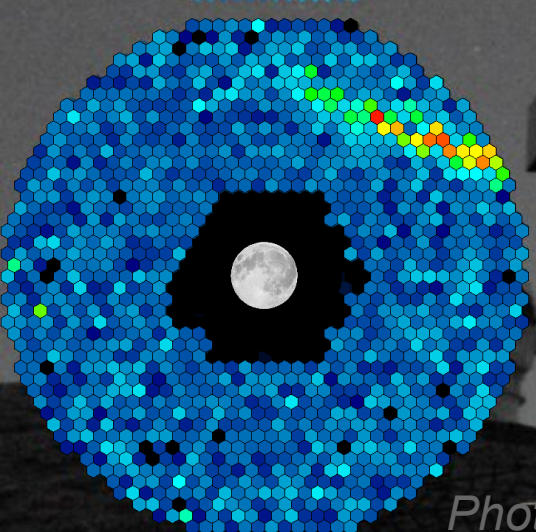
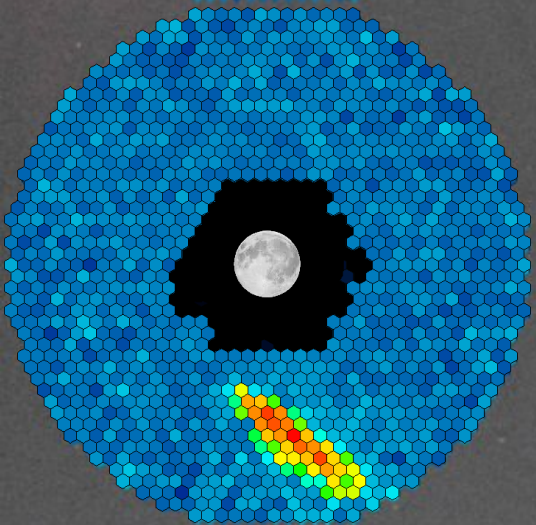
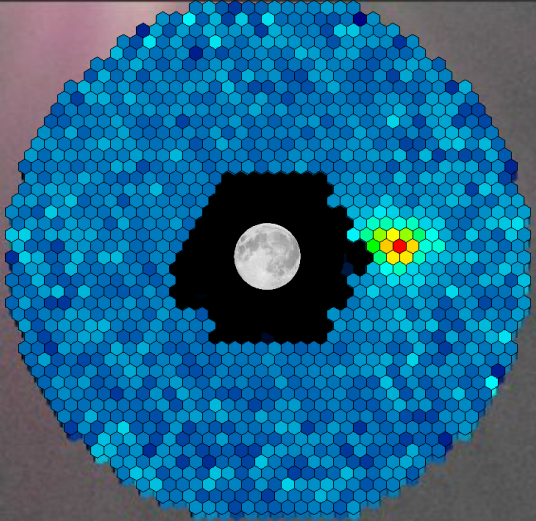


Status



- Operation since Oct. 2011:
→ Final proof: G-APDs in Cherenkov telescopes work
- Observations of bright TeV Blazars like Mrk421, Mrk501
 - Monitoring ongoing
 - Participation in MWL campaigns
 - Flare alerts

Photo: Thomas Krähenbühl



Showers images recorded pointing to full blue moon (June 2013)

Photos: D. Dorner, T. Krähenbühl

G-APDs – the Revolution in Cherenkov Astronomy



- Robust and stable
=> Stable telescope performance
- Observations during strong moon light
=> Larger duty cycle
=> More complete data sample

Ideal for Monitoring

Photo: Daniela Dorner

Quick Look Analysis

- Fast processing on site: Excess rate curves
- Results in almost real time
 - => Flare alerts to other telescopes
- Not including:
 - Correction for dependence of threshold on zenith distance and ambient light
 - Detailed data check

<http://www.fact-project.org/monitoring>

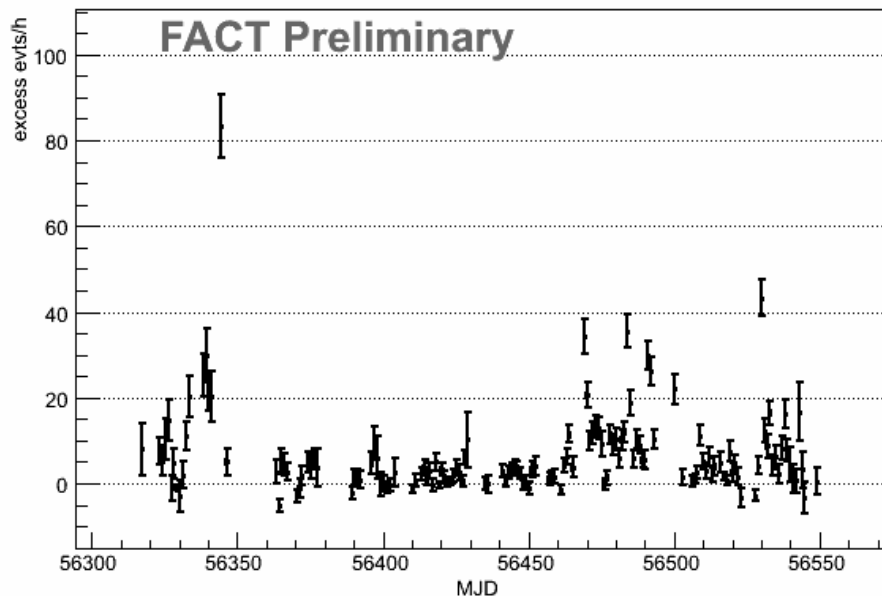
http://www.fact-project.org/monitoring

FACT Quick Look Analysis

Select date 2013 09 15 source Mrk 501
Select time binning 1night and range all Reset

Displaying 'excess rate vs mjd' for Mrk 501 for the night 2013/09/15.

Excess Rate vs MJD



REMARKS:

- These are the results of a **fast quick look analysis** on site, i.e. they are **preliminary**.
- The quick look analysis includes all data, i.e. no data selection done.
- The shown curves are not fluxes but **excess rates** (number of excess events per effective ontime), i.e. a dependence on trigger threshold and zenith distance of the observation is expected for zenith distance larger than 40 degree and very strong moon light.
- The curves are provided with 20 min binning and nightly binning.
- In case, you need further details about the data or a different binning, please do not hesitate to contact us.
- Time range 'all' refers to all data since 12.12.2012. For older data, please contact us.

Please cite this webpage and the [FACT design paper](#) when using information from this webpage or any FACT data.

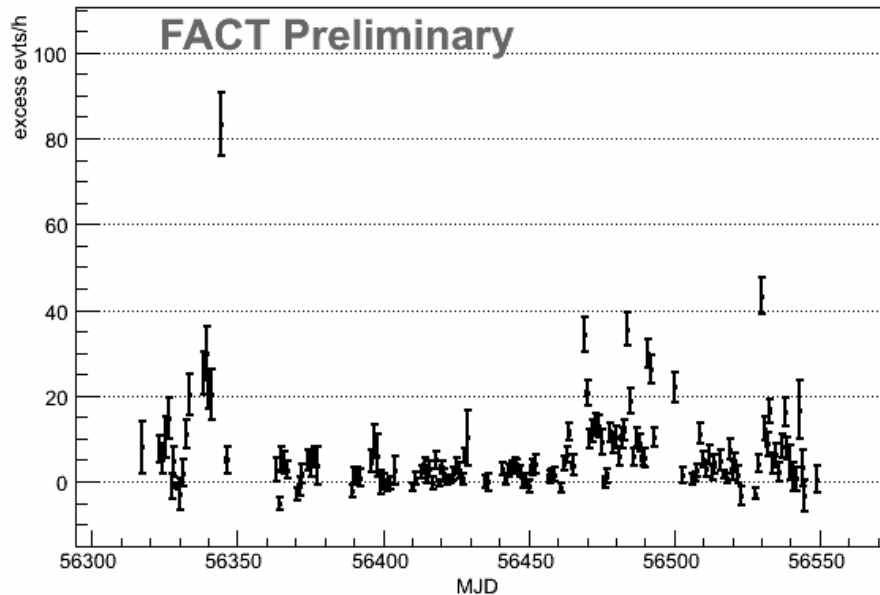
Reference FACT Design Paper: H. Anderhub et al. JINST 8 P6008 [ADS open access](#)

Contact: Daniela Dorner dorner@astro.uni-wuerzburg.de.

Select date 2013 09 15 source Mrk 501
Select time binning 1night and range all Reset

Displaying 'excess rate vs mjd' for Mrk 501 for the night 2013/09/15.

Excess Rate vs MJD



Select
→ date
→ time range
→ source
→ binning

REMARKS:

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Contact: Daniela Dorner dorner@astro.uni-wuerzburg.de.

More Detailed Analysis

Data Selection

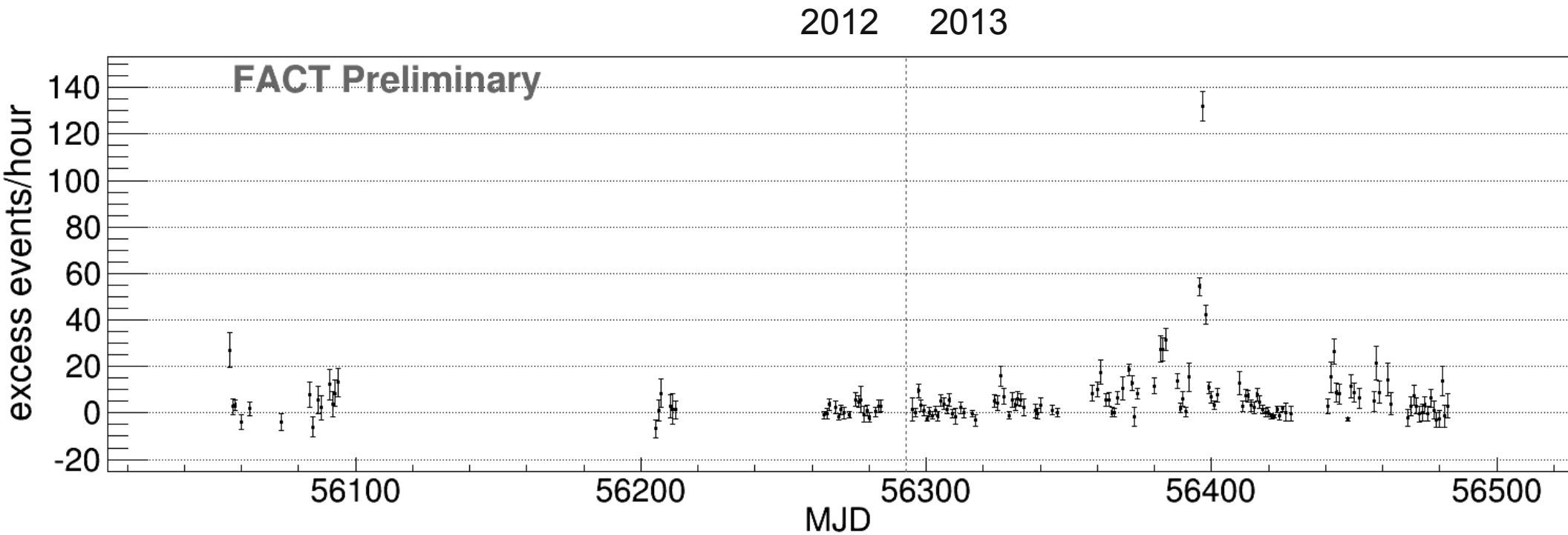
- Runs with bad quality excluded
(selection based on background rate)
- Nights with less than 20 minutes ontime excluded
- Data with technical problems excluded
- Data from complete zenith distance range and with all light conditions

Result: Excess Rate Curves

- Excess rate: excess-events / ontime
- Nightly binning
- Dependence of excess rate on zenith distance and ambient light
→ so far no correction applied
- Small influence of zenith distance on excess rate for zenith distance $< 40^\circ$ in current analysis
- Majority of data taken at zenith distance $< 45^\circ$

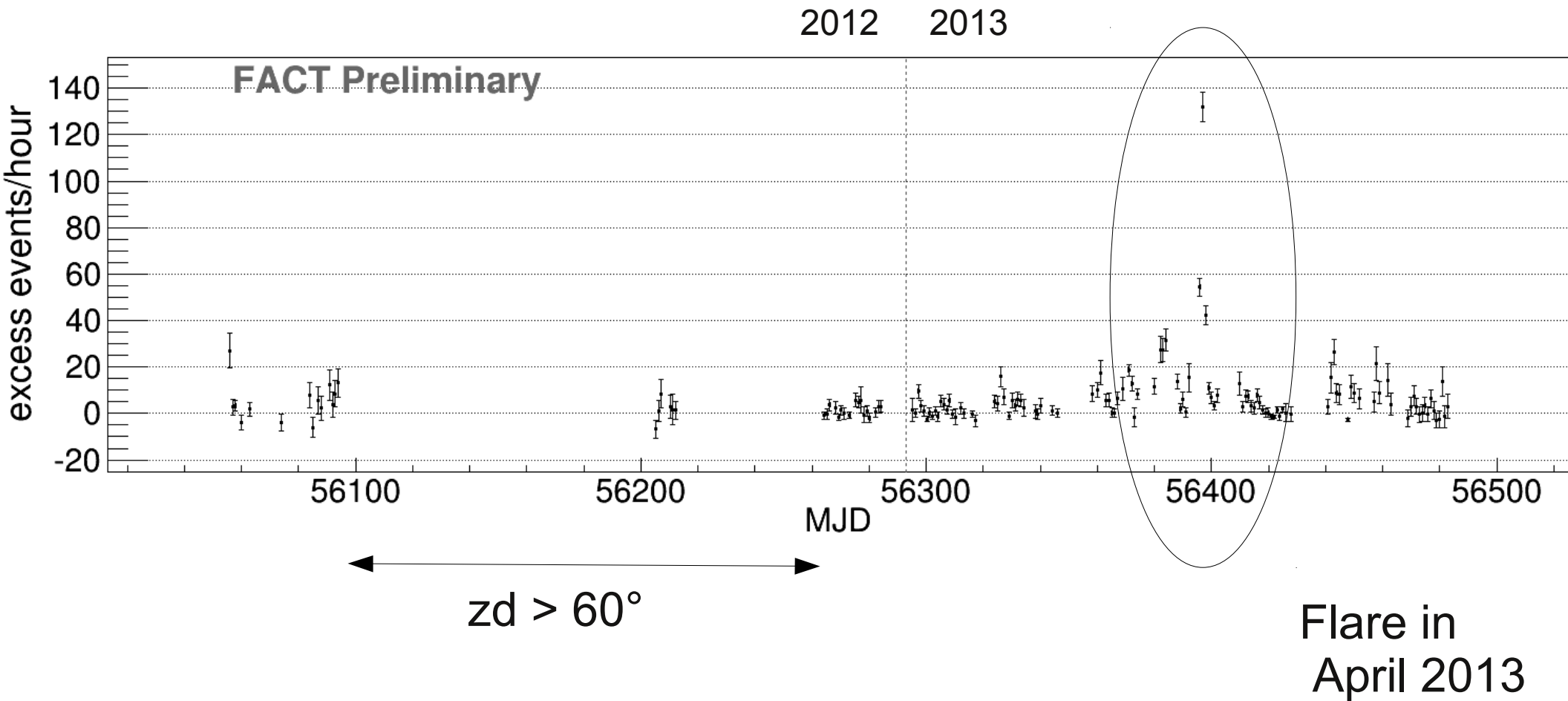
Excess Rate Curve Mrk421

May 2012 – Now



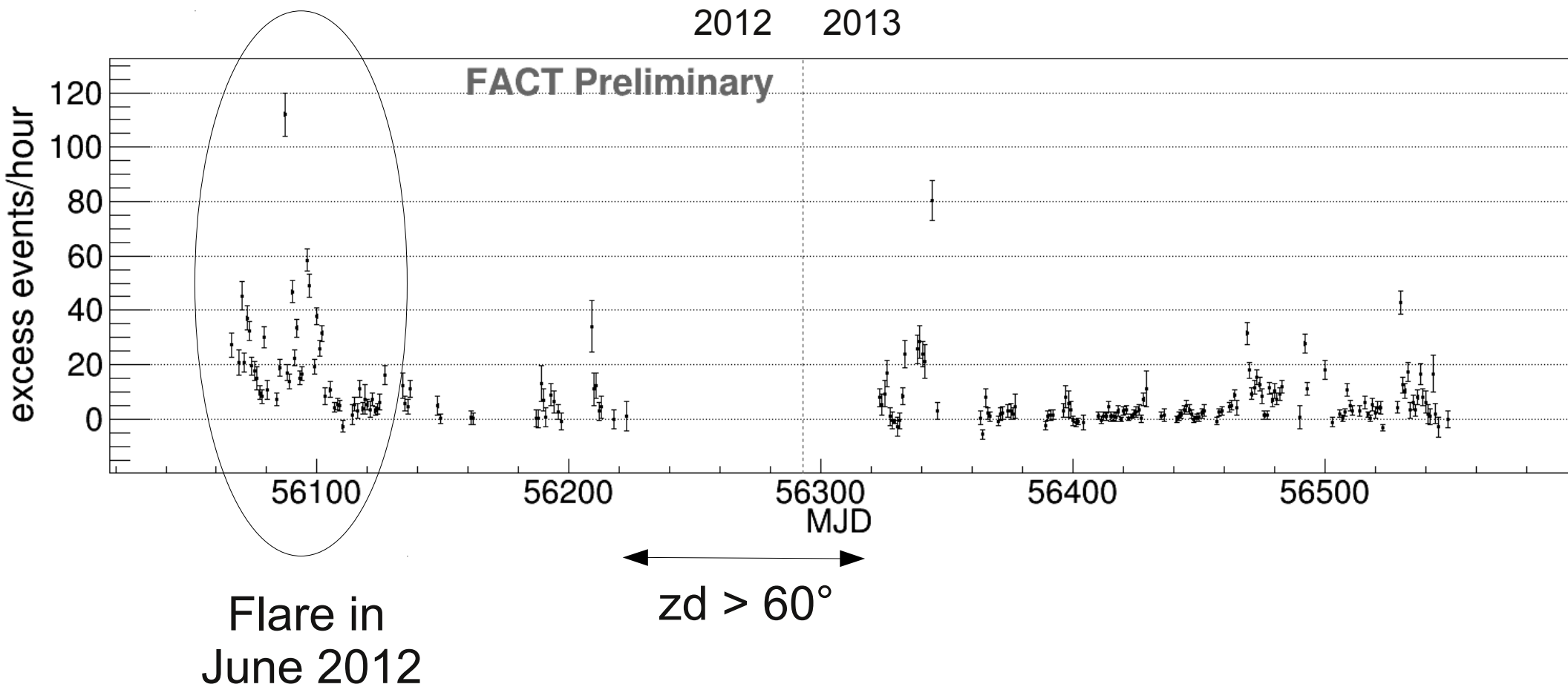
Excess Rate Curve Mrk421

May 2012 – Now



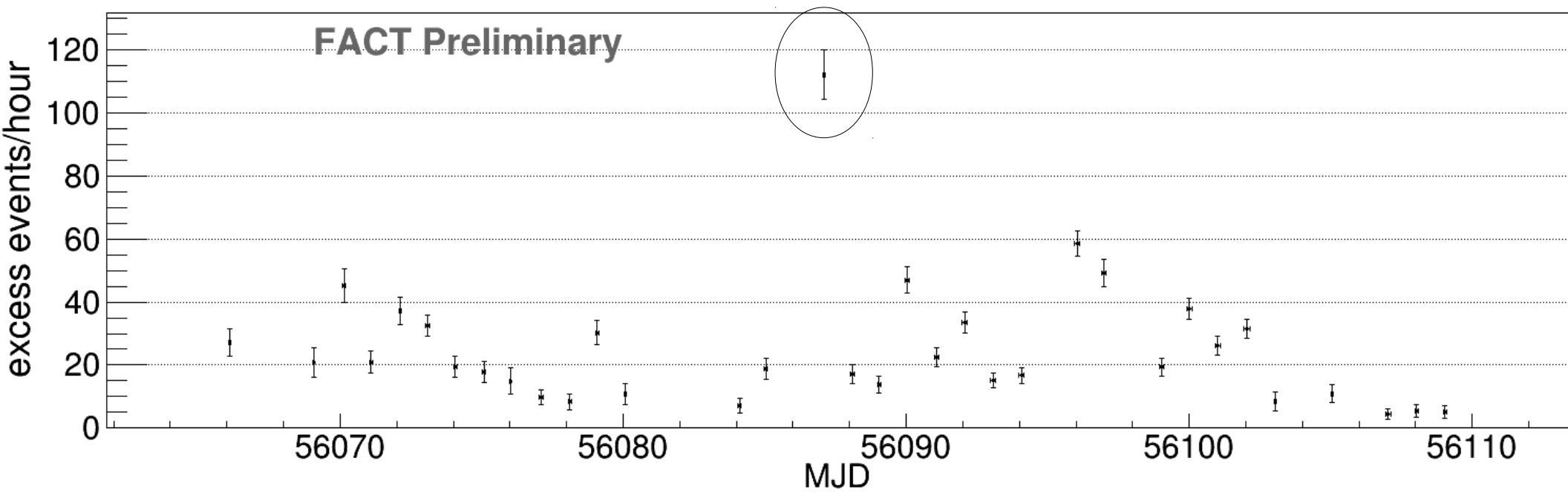
Excess Rate Curve Mrk501

May 2012 – Now



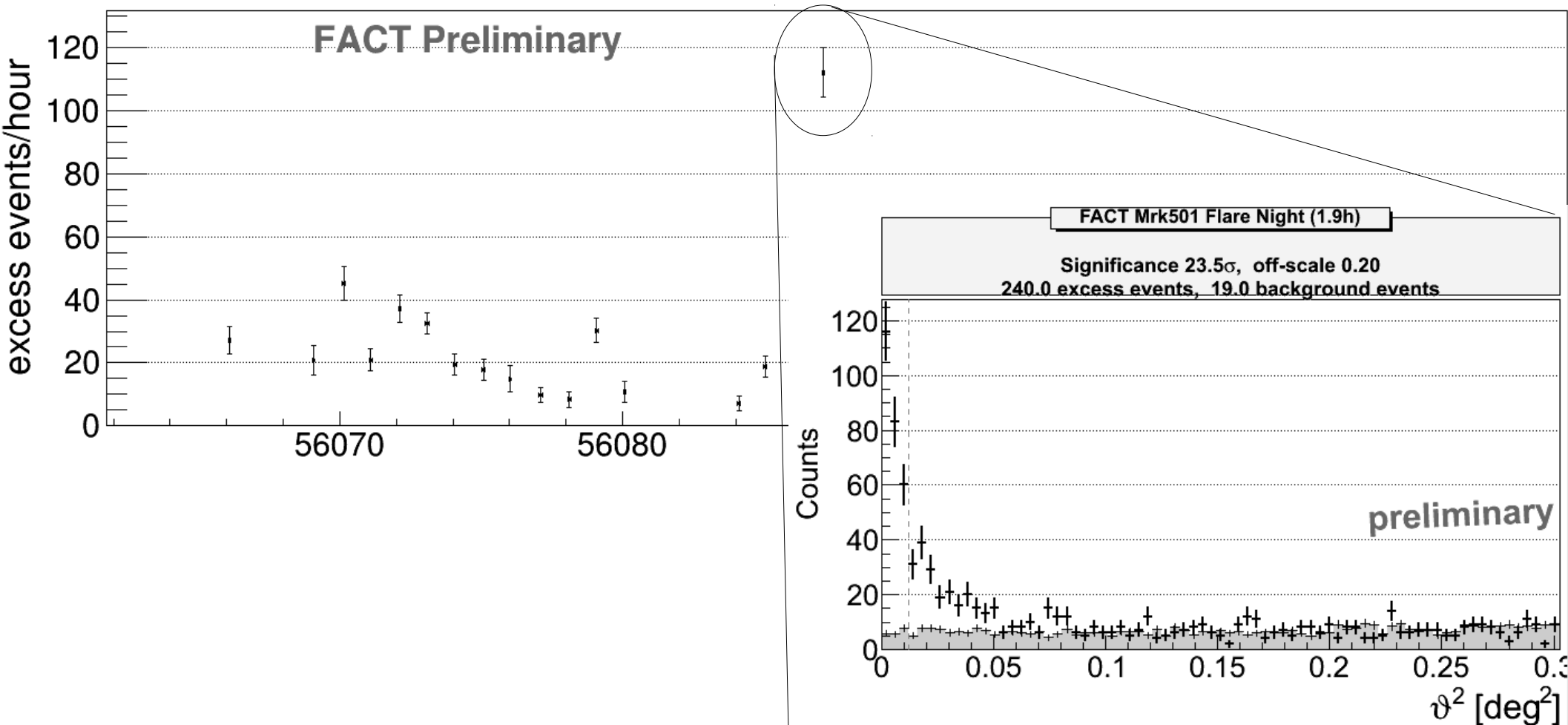
Excess Rate Curve Mrk501

18.5.-30.6.2012



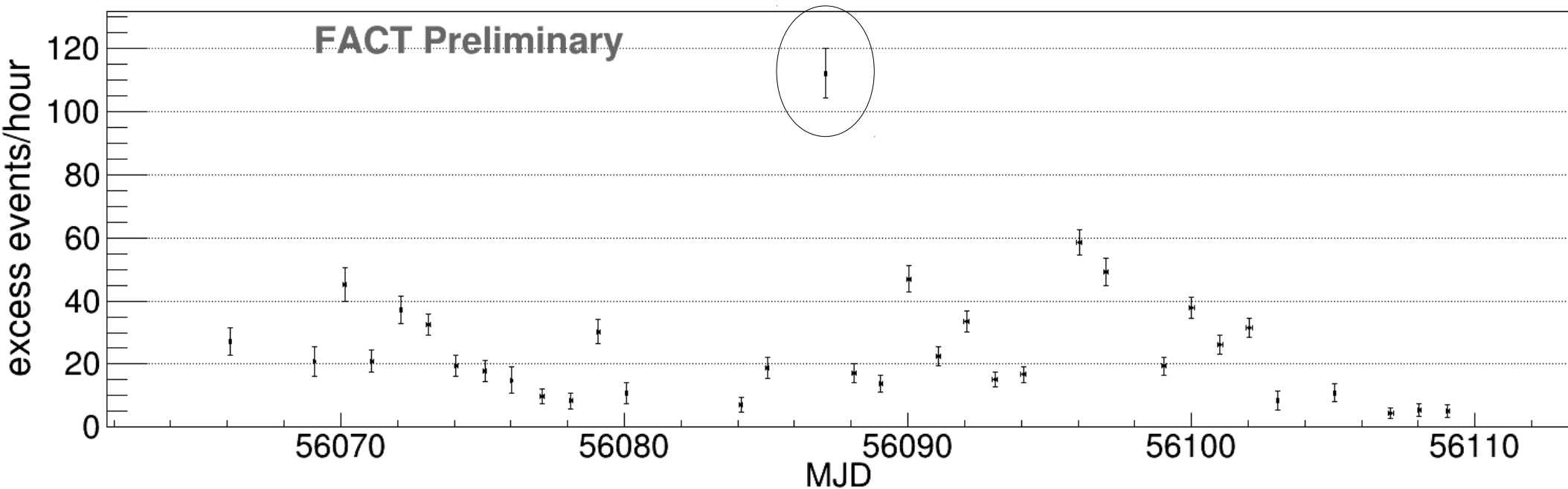
Excess Rate Curve Mrk501

18.5.-30.6.2012



Excess Rate Curve Mrk501

18.5.-30.6.2012

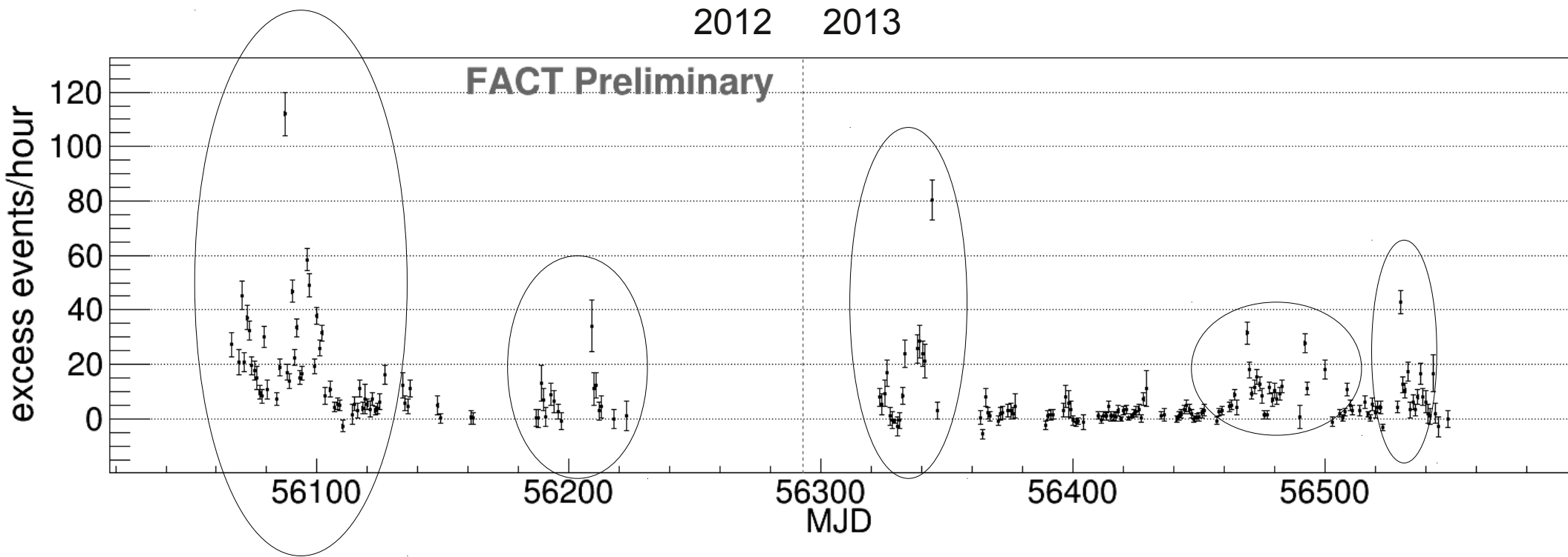


> 5 sigma in 5 minutes

Increase in excess rate by factor 6

Excess Rate Curve Mrk501

May 2012 – Now



Several flaring activities within 2 years

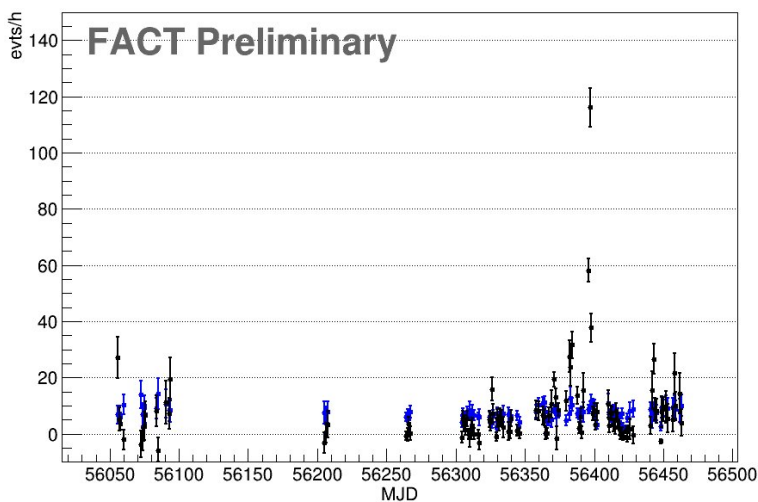
Conclusions & Outlook

- Two years of successful operation so far
- Remote/Automatic operation
- Monitoring ongoing
- Detected several major outbursts

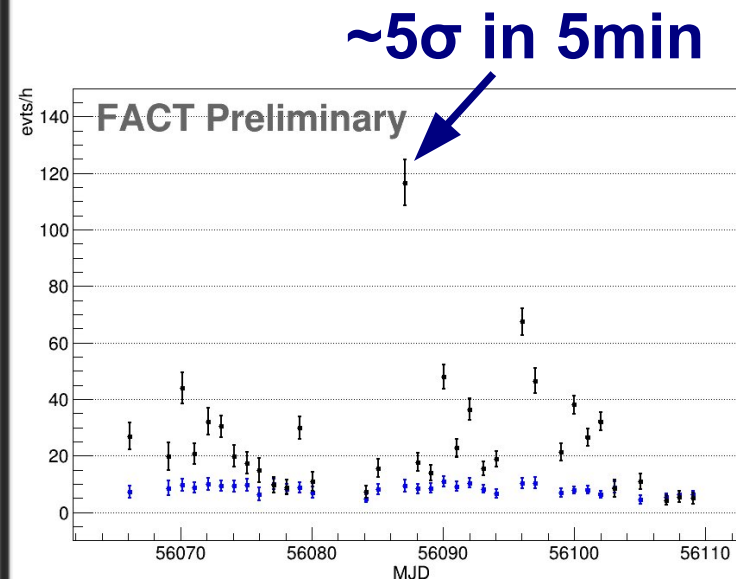
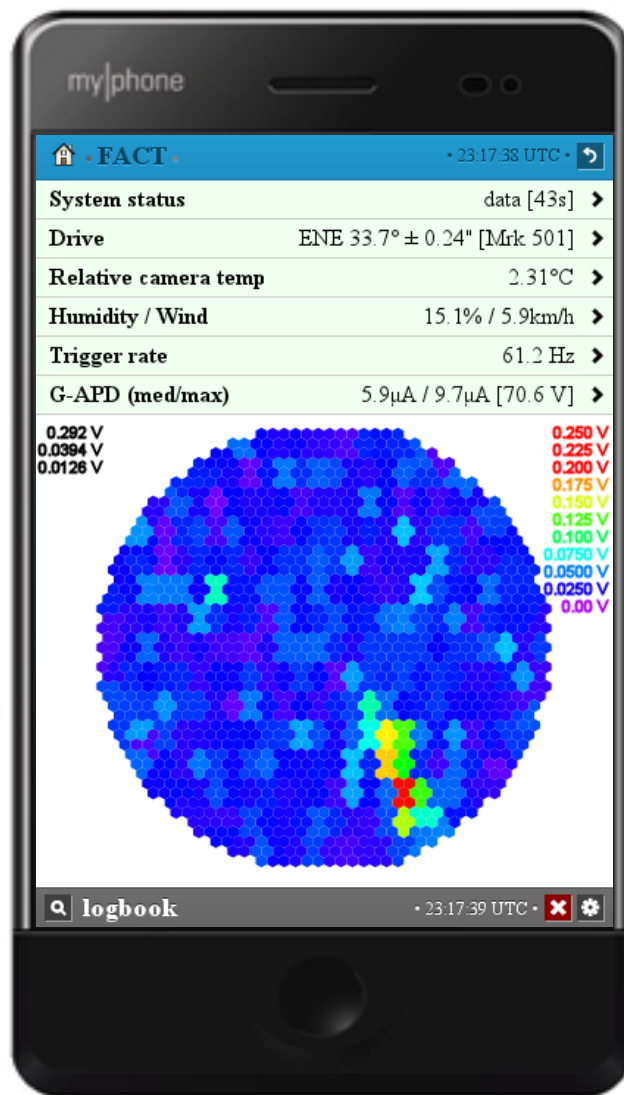
- Fast quick look analysis
- Flare alerts to other telescopes
- Robotic operation

You are invited to join us during monitoring!

<http://www.fact-project.org/smartfact>



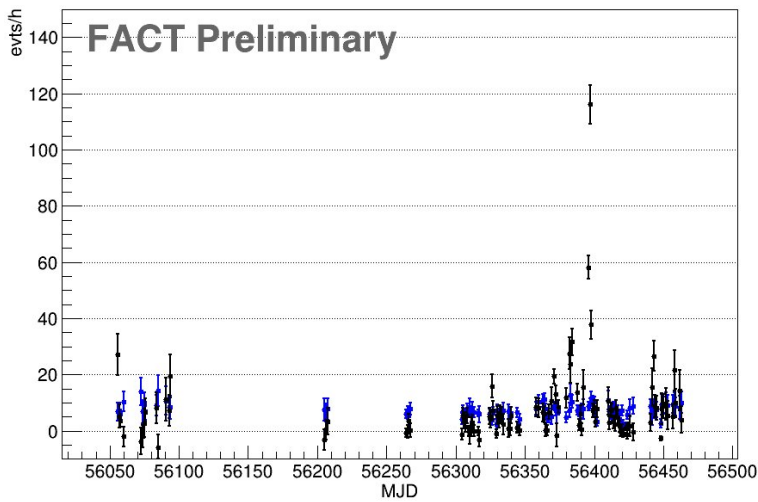
2 years monitoring



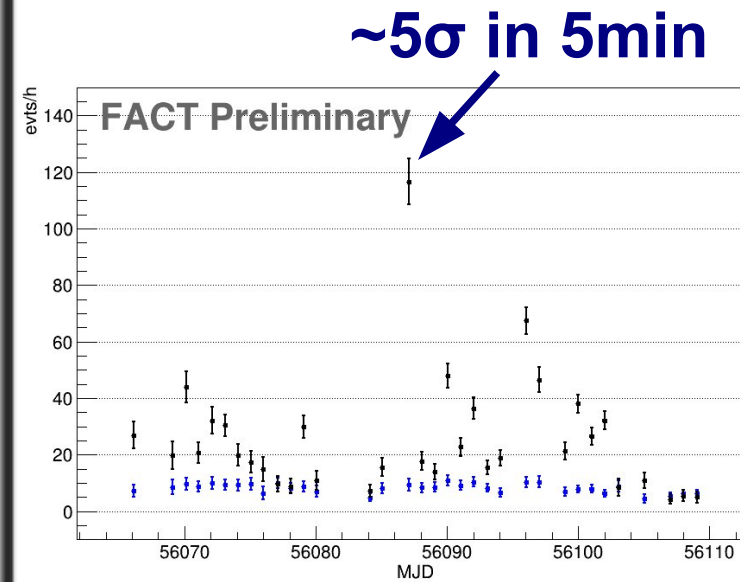
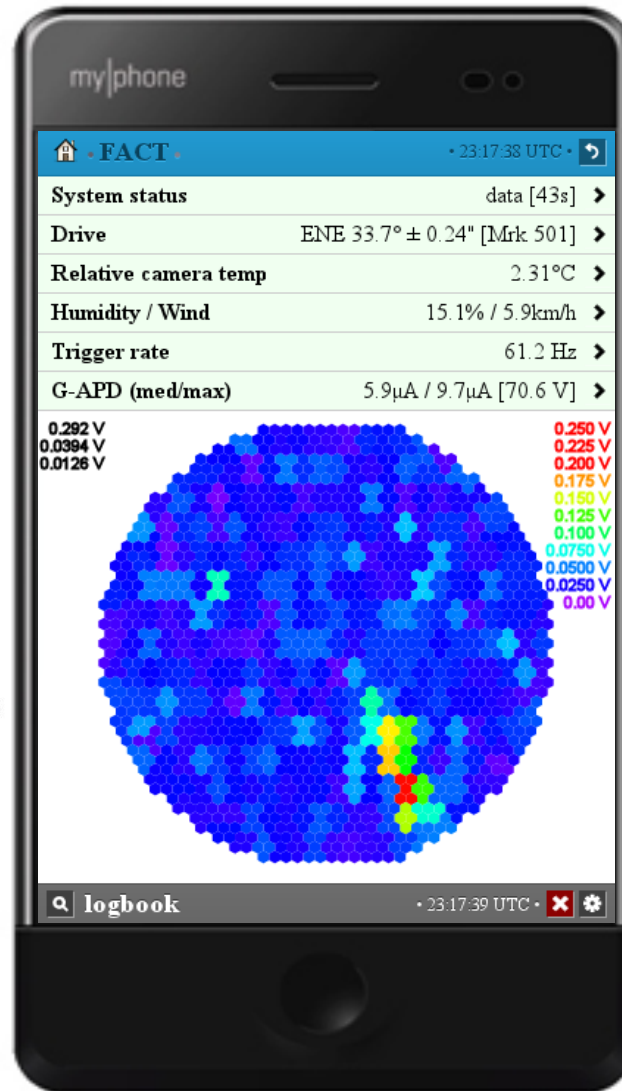
[JINST 8(2013) P06008]

Check out our monitoring results!

<http://www.fact-project.org/monitoring>



2 years monitoring



[JINST 8(2013) P06008]