Investigation of long-term data from the MAGIC Telescopes using database-driven automation tools

Cyrus Walther *on behalf of the MAGIC Collaboration*

2026-09-03

TU Dortmund University | SFB1491 - Cosmic Interacting Matters

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MAGIC Telescopes - The Major Atmospheric Gamma Imaging Cherenkov Telescopes

Credit: MPP

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- Stereoscopic observation of the nothern hemisphere through the MAGIC Telescopes since 2009

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What was observed? - The Source

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Credit: E. Slawik/NOIRLab/NSF/AURA/M. Zamani/J. Hevelius/
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The Source - 1ES1959+650

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Name	1ES1959+650
Object	Active Galactic Nucleus
Type	BL Lac Object
Gal Lon	98.00°
Gal Lat	17.67°
Low Flux	< 0.2 Crab Units
High Flux	> 2.5 Crab Units

One of the brightest blazars in the northern hemisphere

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FACT and MAGIC measure an increased gamma-ray flux from the HBL 1ES 1959+650

ATel #9203; *A. Biland (ETH Zurich), R. Mirzoyan (Max-Planck-Institute for Physics) on behalf of the FACT and MAGIC Collaborations*
on *1 Jul 2016; 18:08 UT*
Credential Certification: Daniela Dorner (dorner@astro.uni-wuerzburg.de) [1]

Observations of increased very-high-energy gamma-ray emission from 1ES1959+650 with the MAGIC telescopes

ATel #16939; *David Paneque (Max Planck Institute for Physics), Axel Arbet-Engels (Max Planck Institute for Physics), Giacomo Bonnoli (INAF) and Jayant Abhir (ETH Zurich) , on behalf of the MAGIC collaboration*
on *9 Dec 2024; 18:27 UT*
Credential Certification: David Paneque (dpaneque@mppmu.mpg.de) [2]

[1] The Astronomer's Telegram #9203, 01/07/2016

[2] The Astronomer's Telegram #16939, 09/12/2024

1ES1959+650 - Dataset

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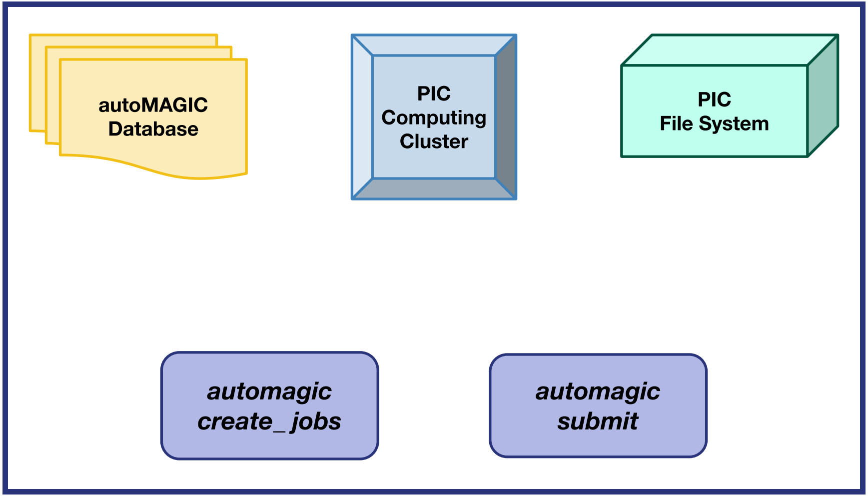

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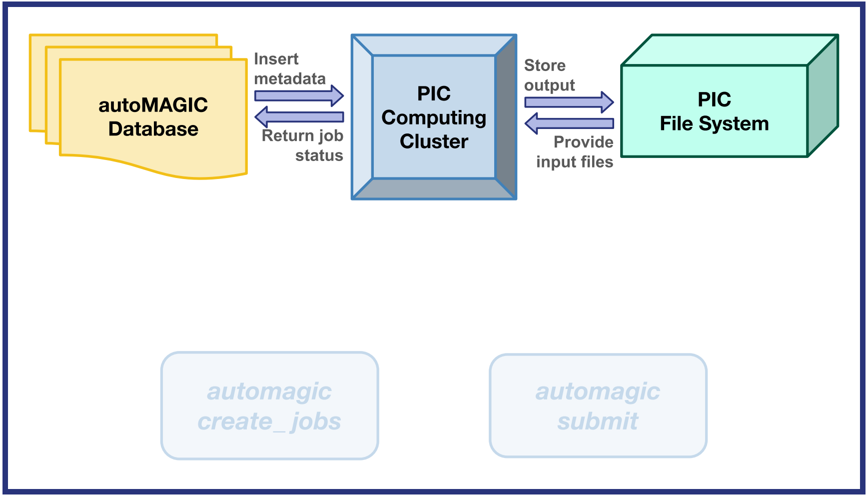

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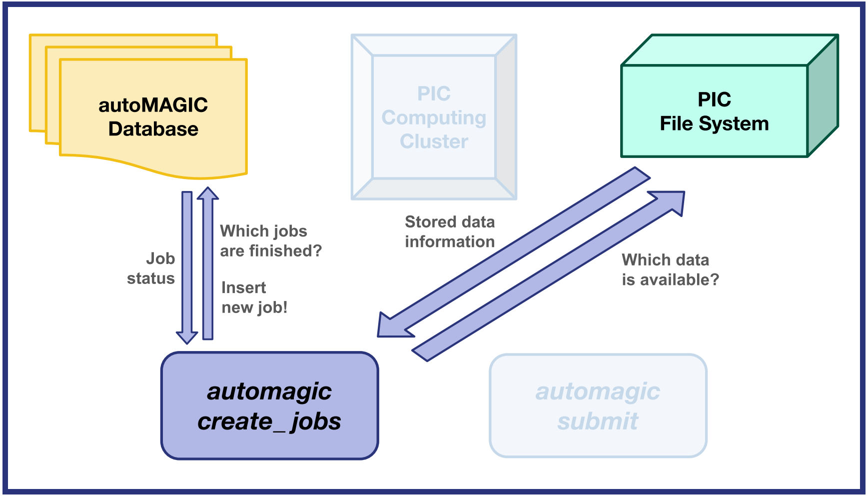

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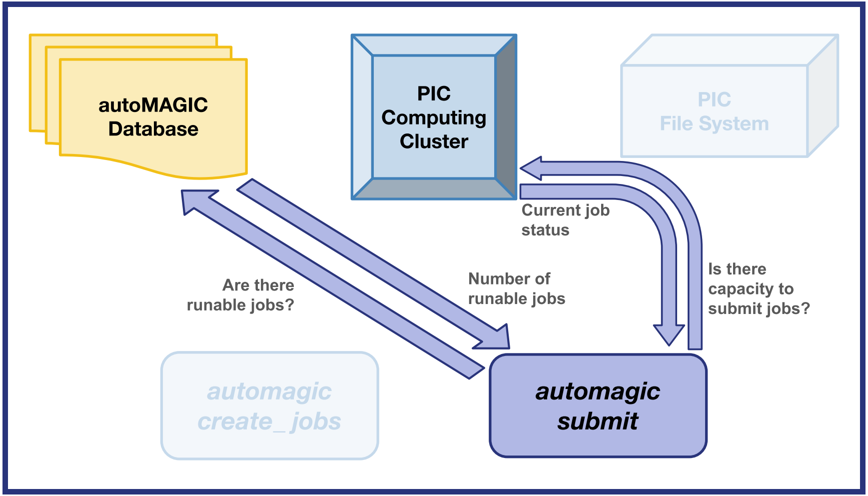

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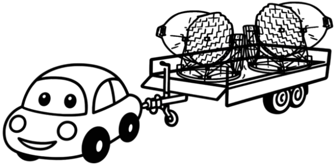
5. Metadata of the analysis can be saved for long-term storage, given its limited file size



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Investigation - Hands-on Lightcurve

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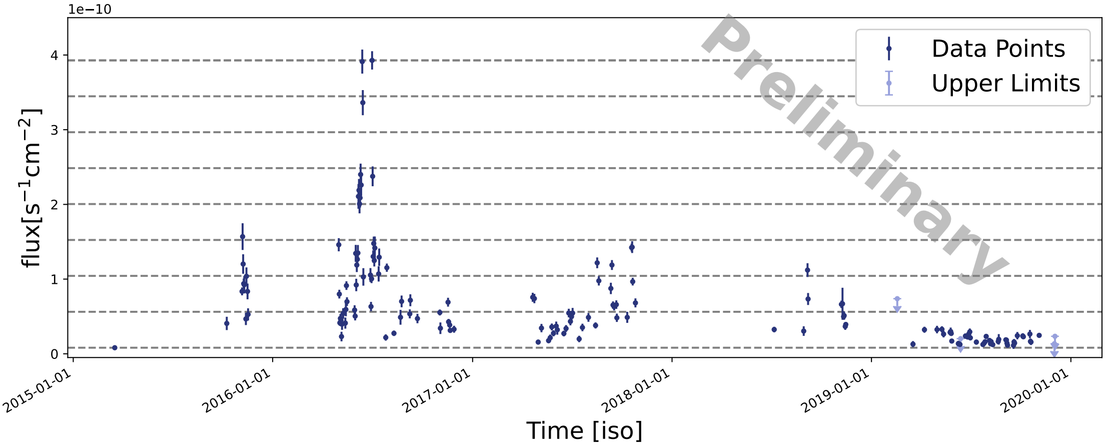

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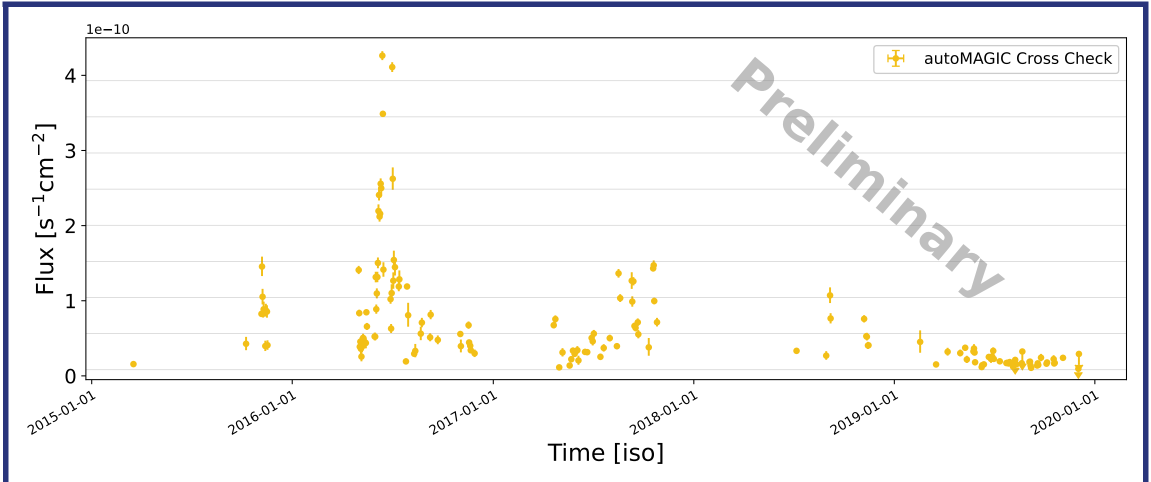

Investigation - Lightcurve Comparison

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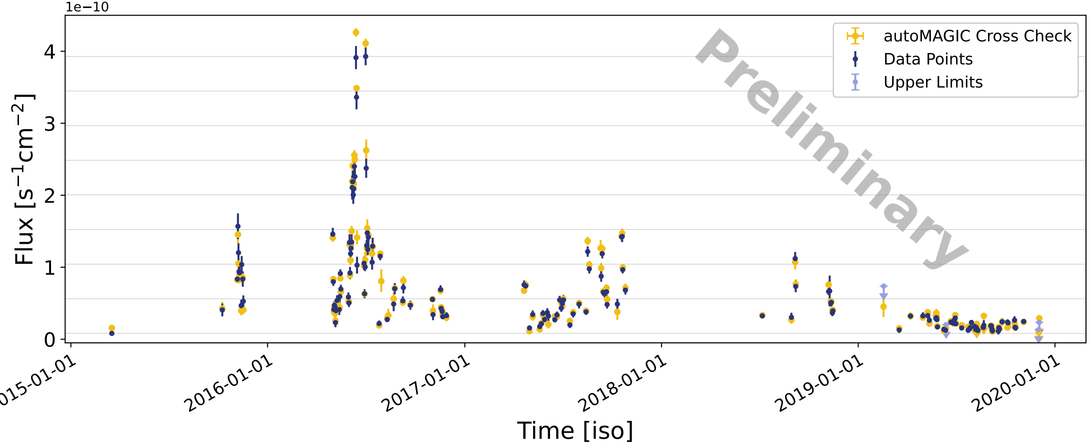

Investigation - Flux Bin Histogram

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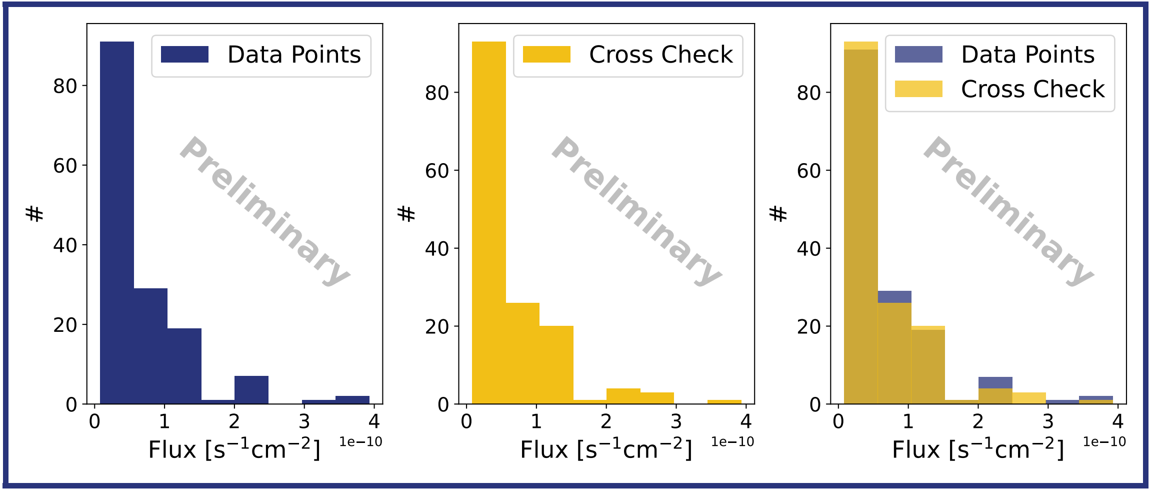

Investigation - Hands-on / autoMAGIC Ratio

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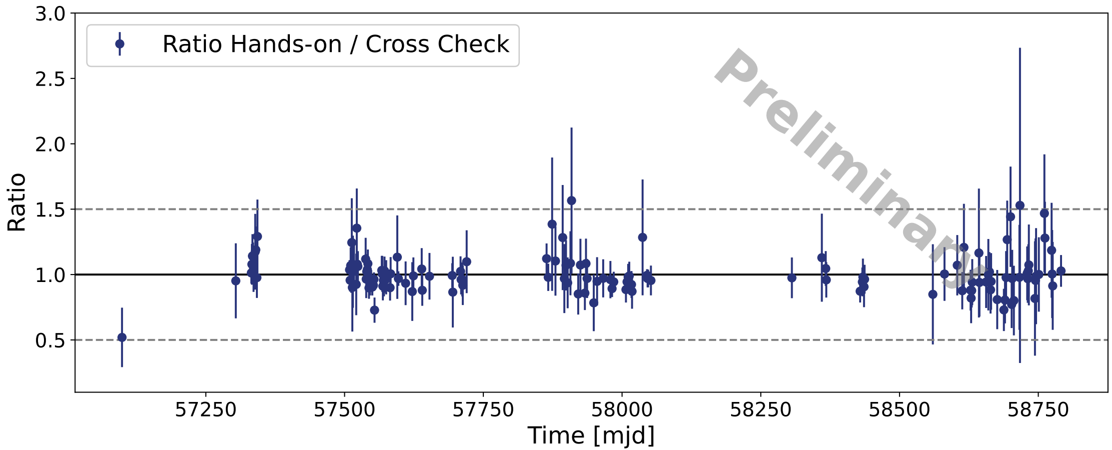

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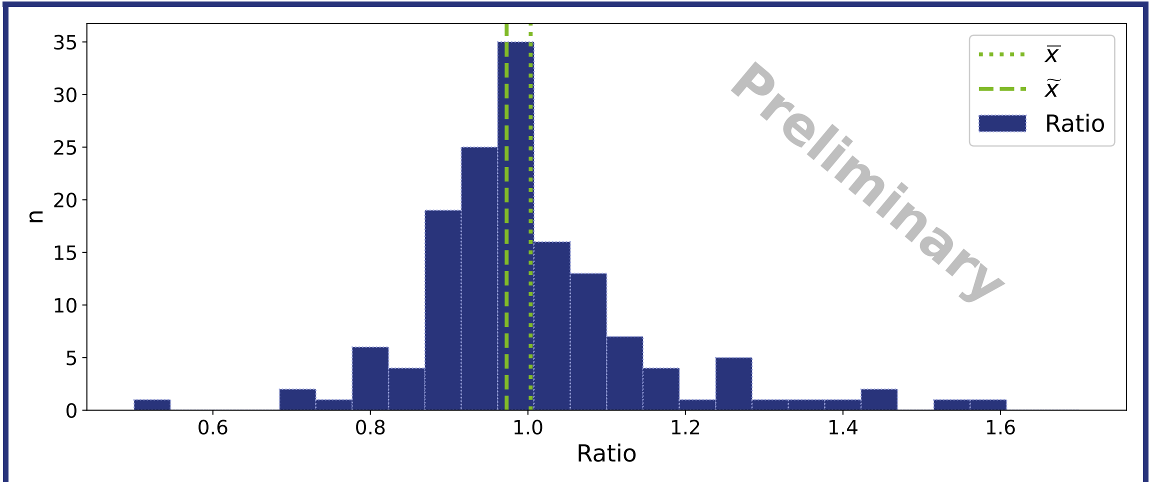

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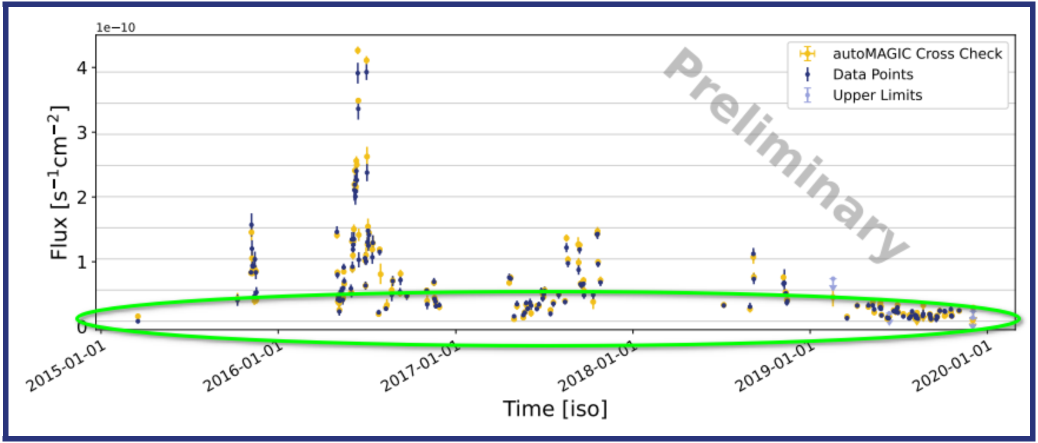

⇒ Search for ratio outliers in the lowest flux bin of the light curve

Investigation - Cut Hands-on / autoMAGIC Ratio

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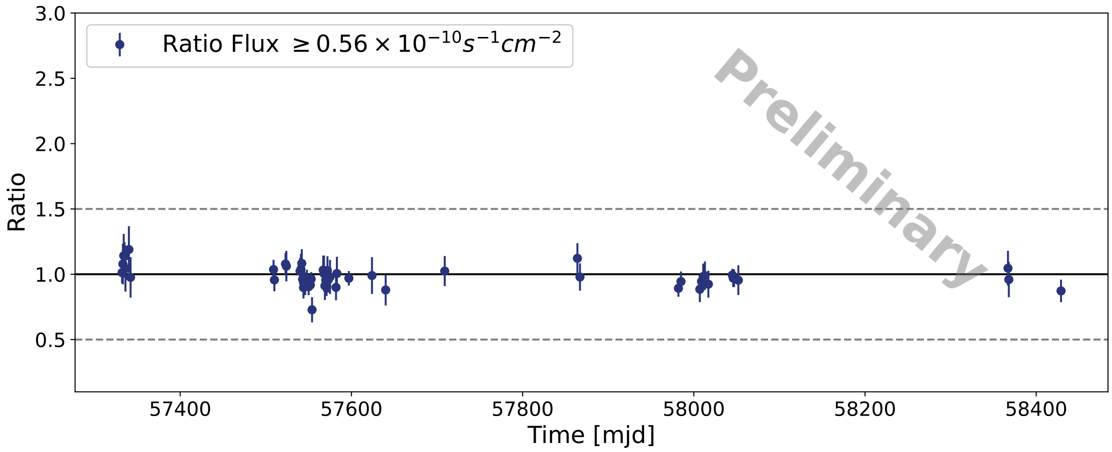

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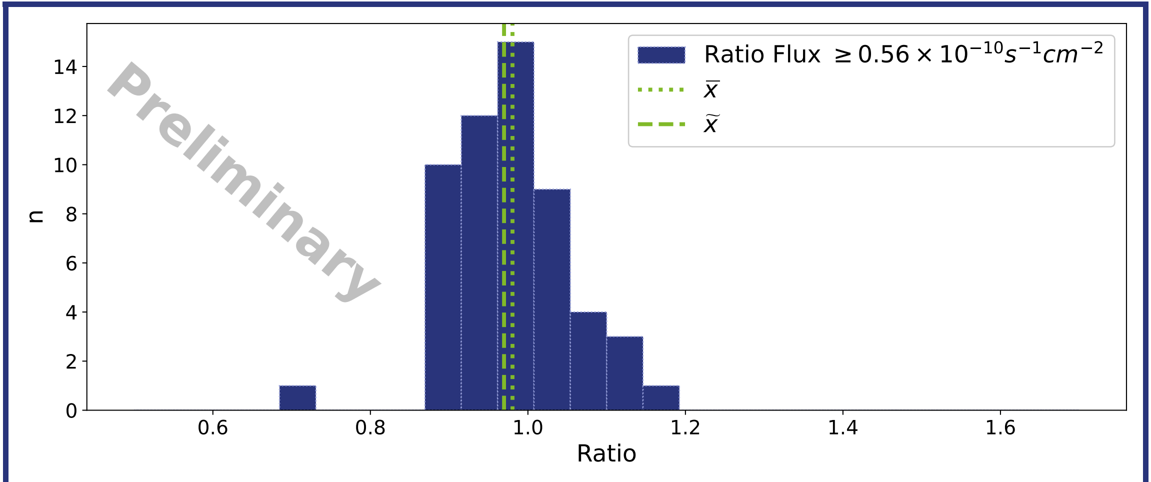

Wrap-up - 1ES1959+650 autoMAGIC Cross Check

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- Investigation of the HBL blazar 1ES1959+650 in the time range of 2015 to 2019

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- The cross check finds no bias toward any direction and can underline the hands-on analysis within the systematic uncertainties of 20%
- Analysis provides a consistent view of the highly variable emission of 1ES1959+650 over a long-term period and builds a groundwork to understand the characteristics of these variable source states

Thank you

Adj. - Credit: E. Slawik/NOIRLab/NSF/AURA/M. Zamani/
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for your attention!