MAGIC and Multi-Frequency Observations of three HBLs in 2008

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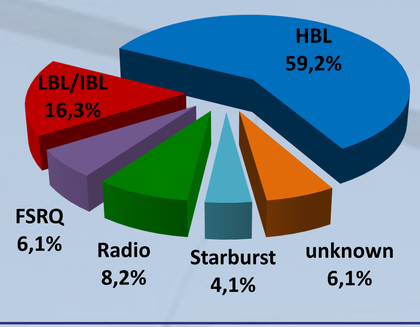
Blazars – State of the Art

- dominating the extragalactic sky at High and Very High Energies (HE/VHE)
- Spectral Energy Distribution (SED) ranging from radio up to TeV energies
- strong variability in flux as well as in spectral shape on all timescales
- only 40 Blazars detected at VHE up to now
- simultaneous multi-frequency measurements of the whole SED available for only about a dozen Blazars



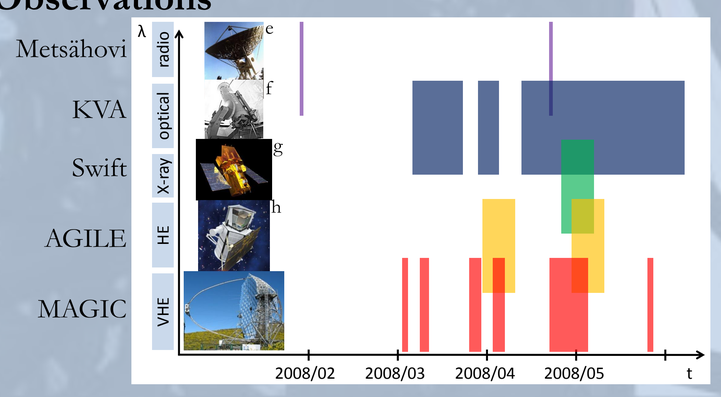
Fundamental Questions

- Blazar classification and evolution
- contribution to the Cosmic Ray background
- emission physics: emitting particle species, radiation mechanism, emission region type and location, ...
- Blazar variability: origin and physics of variability, Blazar duty cycle, inter-band correlation patterns, ...

1ES 1011+49.6

- one of the farthest VHE sources (z = 0.212)
- discovered at VHE by MAGIC in 2007[a]
- discovery following an optical trigger
- first TeV multi-frequency campaign on this object

Observations



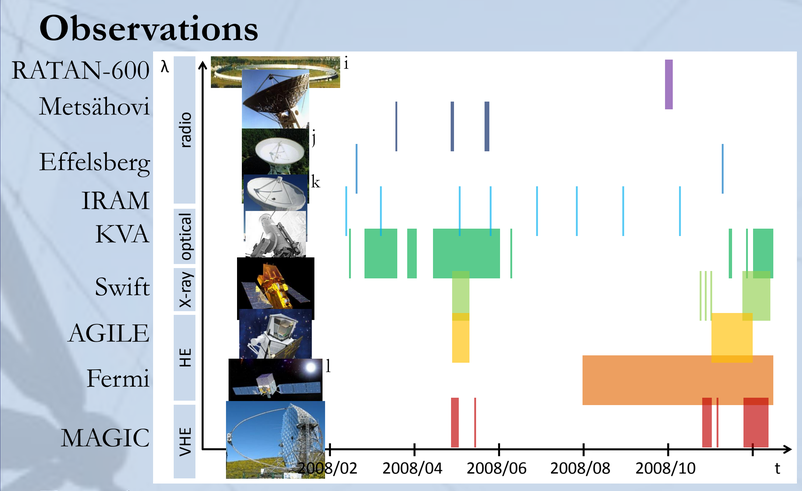
Results

no detection by Metsähovi or AGILE during the campaign

Mrk 180

- nearby (z = 0.046)
- discovered at VHE by MAGIC in 2006[b]
- discovery following an optical trigger
- first TeV multi-frequency campaign on this object

Observations



Results

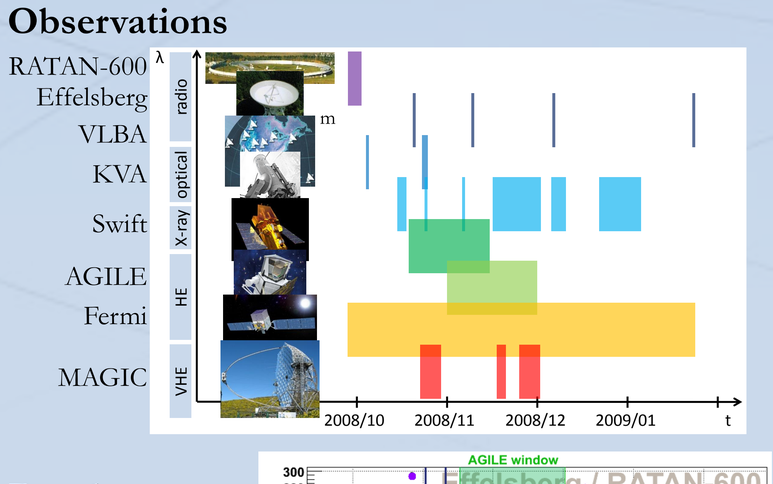
LAT 1-year Catalog public LC

no detection by Metsähovi or AGILE during the campaign

1ES 2344+51.4

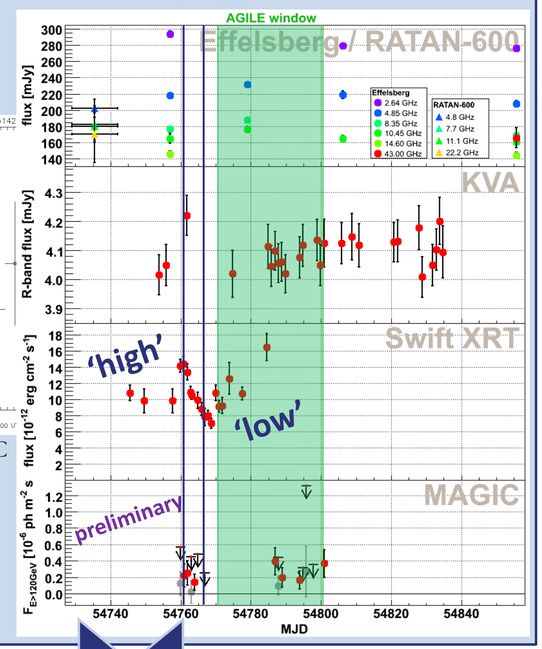
- nearby (z = 0.044)
- 3rd source detected at VHE (Whipple '98[c])
- despite that, only one multi-frequency campaign including VHE data reported until now[d]

Observations



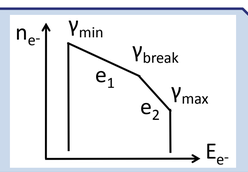
Results

LAT 1-year Catalog public LC



no detection by AGILE during the campaign

Applying a leptonic one-zone Synchrotron Self-Compton (SSC) (Maraschi & Tavecchio[n]) as well as a self-consistent two-zone SSC model (Weidinger & Spanier[o]) basic model parameters (where the electron parameters are derived self-consistently in Weidinger & Spanier):
Doppler factor **δ**, magnetic field **B,** source radius **R**, electron spectral indices $\mathbf{e_1}$ and $\mathbf{e_2}$, Lorentz factors $\boldsymbol{\gamma_{min}}$, $\boldsymbol{\gamma_{max}}$, $\boldsymbol{\gamma_{break}}$, electron density **K**



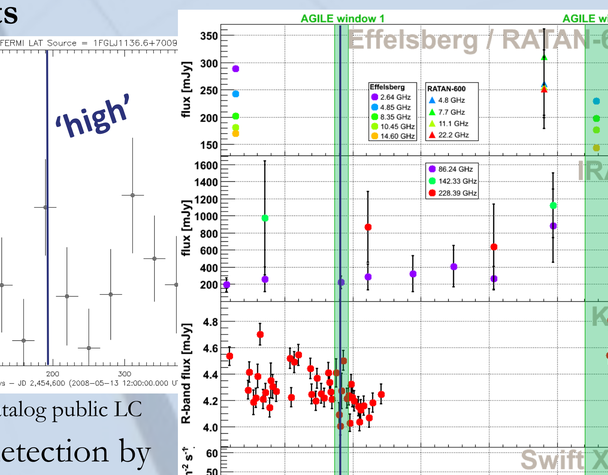
simultaneous MWL SEDs of the high and low state nights including preliminary modelling

VHE data points de-absorbed using Kneiske & Dole[p]

First Conclusions

- first successful TeV multi-frequency campaign
- flux variability present in optical as well as X-rays, but uncorrelated; VHE flux consistent with being constant, apart from 1 point with slightly higher flux
- well described by standard models and parameters

simultaneous MWL SEDs of the high and low state nights including preliminary modelling



VHE data points de-absorbed using Kneiske & Dole[p]

First Conclusions

- first successful TeV multi-frequency campaign
- possibly correlated multi-frequency variability
- shift of the synchrotron peak in high state (> 5 keV)
  ➡ extreme Blazar candidate
- single-zone model does not fit the high state

simultaneous MWL SEDs of the high and low state nights including preliminary modelling

VHE data points de-absorbed using Kneiske & Dole[p]

First Conclusions

- significant flux variability at radio, optical and X-rays
- flux at VHE consistent with being constant
- fluxes at all frequencies but radio among the lowest ever measured
- well described by standard models and parameters

Bibliography

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[o]Weidinger, M., & Spanier, F., 2010, A&A 515, 18
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