Multi-wavelength Observation of PKS 2142-758

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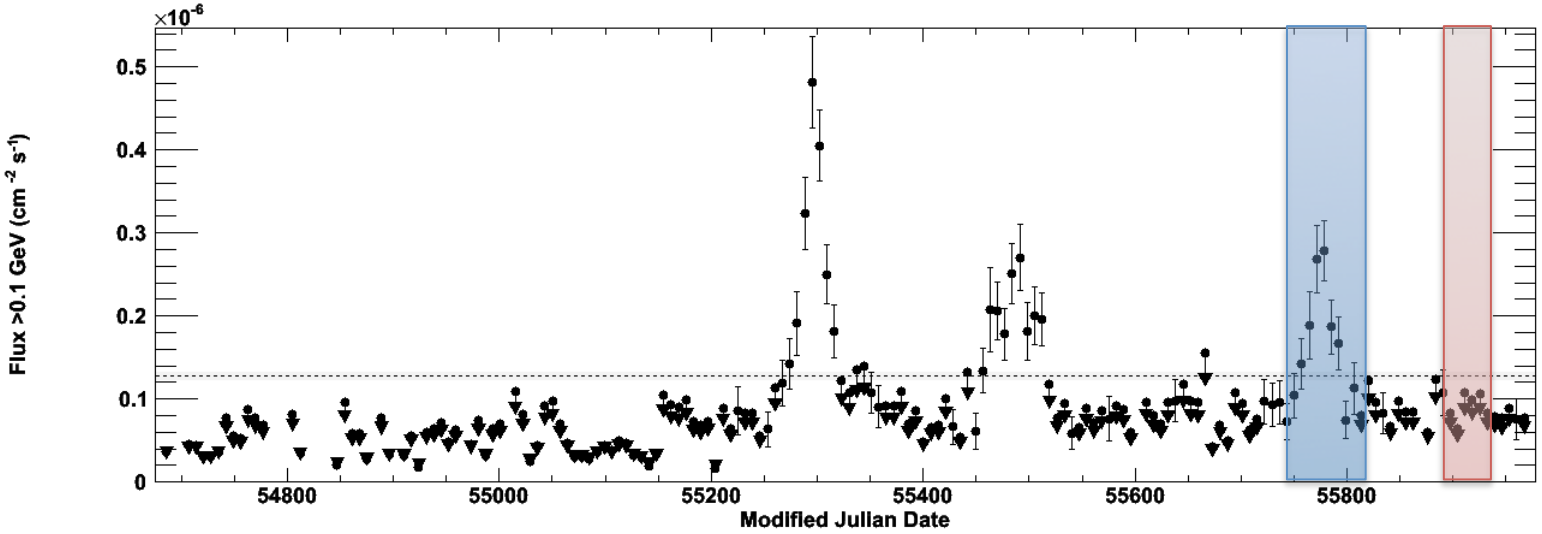
PKS 2142-758

- Flat Spectrum Radio Quasar
- Redshift Z=1.139
- 2FGL J2147.4-7534
- Not detected by EGRET
- Not one of the most powerful Fermi detected Blazars

Fermi light curve and observing campaigns



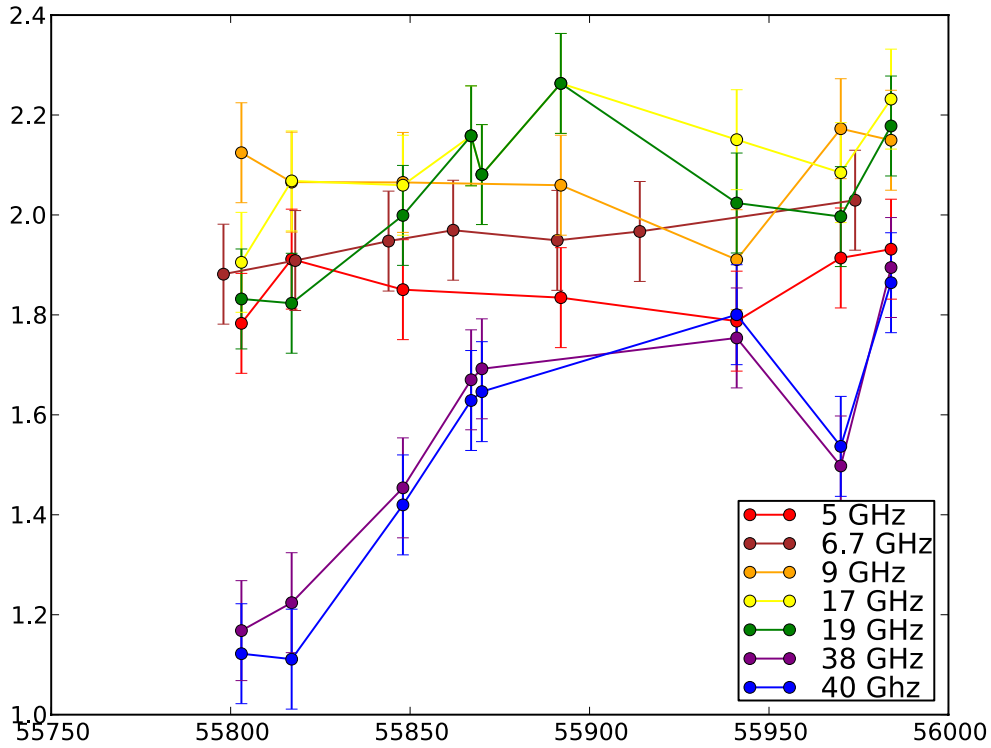
- Gamma Ray light curve in the 200 MeV – 300 GeV energy range. Analysis performed using a 10 degree ROI, Pass 7 data, 100 degree Zenith angle cut and Version 09_27 of the science tools

- Multi-frequency campaigns took place during the gamma ray active state in August of 2011 (blue region) and and the quiescent period in December-January (red region) of 2011

Instruments Involved

- Australian Telescope Compact Array (ATCA) 5-40 GHz
- Ceduna Radio Telescope 6.7 GHz
- Infrared K and J band Rapid Eye Mount (REM) telescope
- Swift ultra violet optical telescope (UVOT)/ and X-ray telescope (XRT)
- Fermi Large area telescope LAT

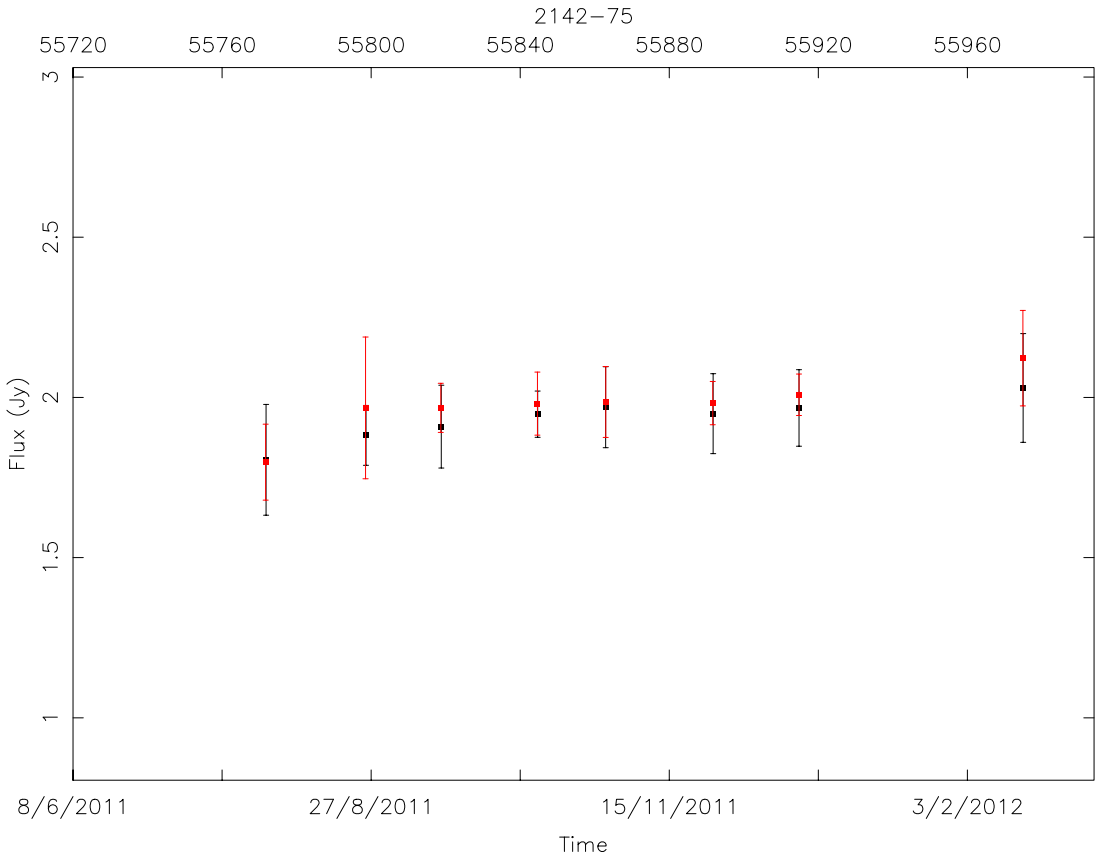
ATCA Monitoring Campaign



- ATCA has observed the source with cadence of ~3 weeks since August 30th.
- Note the rise in flux density at 38 and 40 Ghz
- Conservative error bars

Ceduna

- The source exhibits no significant variability at 6.7 GHz between the active and quiescent gamma ray period



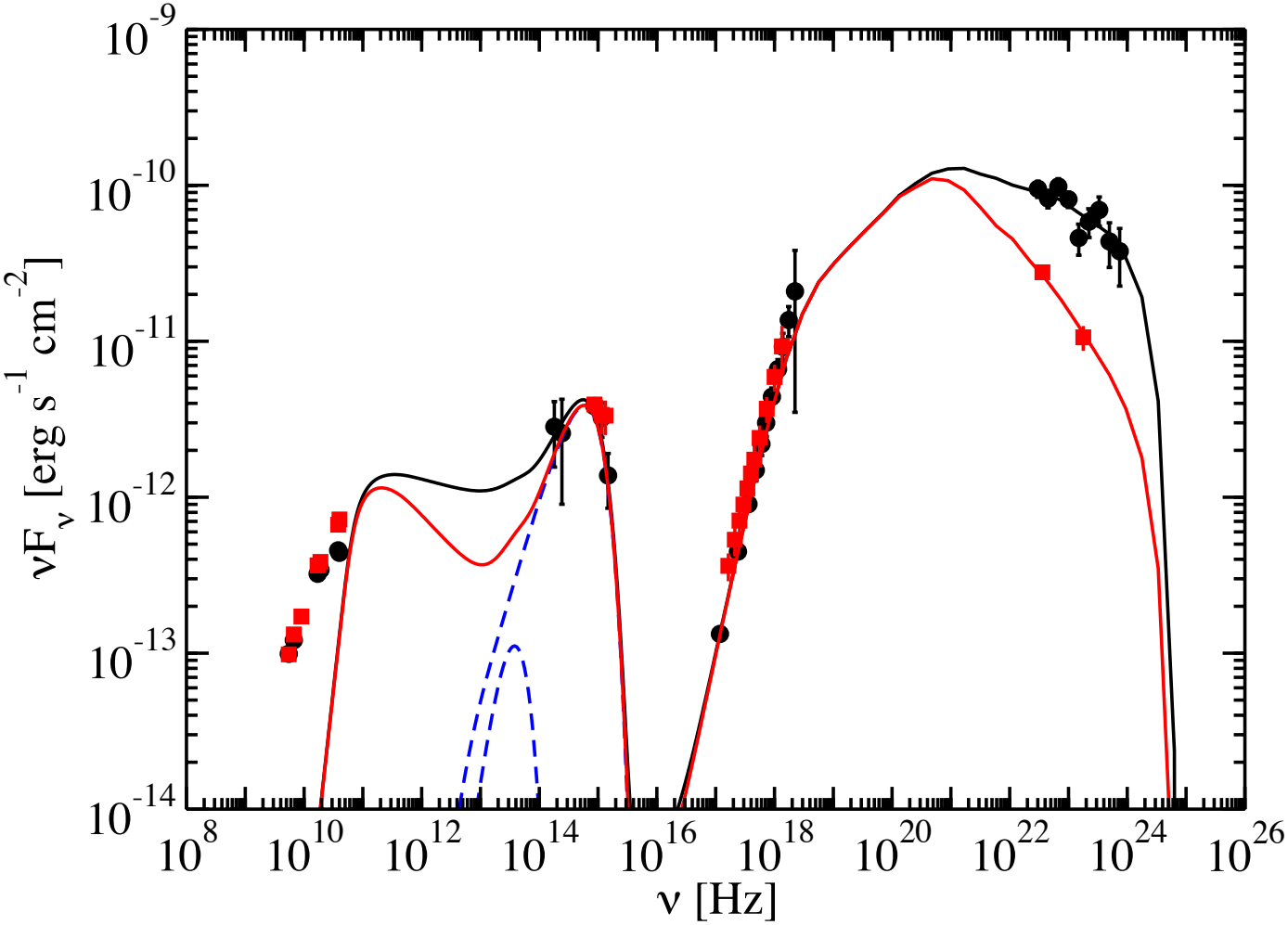
REM

- REM observed during the active period only on August 10, 2011 recording magnitudes of 15.07 at J band and 14.92 at H band. Each of these observation have large uncertainties on the order of ~50%.

Swift UVOT/XRT

- No significant change is observed at UVOT frequencies
- X-ray emission is modeled with a simple absorbed power law
- The XRT measured only a slight change in the X-ray spectral index from 1.3 +/- 0.1 during the active state to 1.5 +/- 0.1 during the quiet state

Spectral Energy Distribution



SED Model

- One zone leptonic model involving synchrotron self Compton (SSC) and external Compton (EC) scattering to explain the high energy emission component
- Synchrotron and accretion disk emission to explain the low energy component

SED Parameters During Quiet State

Doppler Factor = 30
Magnetic Field = 0.3 G
Gamma Ray variability time scale = 5e5 sec
Minimum Electron Lorentz Factor = 6
Break in Lorentz factor = 1e2
Max Lorentz factor = 7e3
Low energy spectral index = 2.2
High energy spectral index = 3.8
Radius of emission region= 2.1e17 cm
Jet Power in particles = 2.0e45 erg/s
Jet Power in magnetic field = 2.7e46 erg/s
Temperature of the dust torus = 1e3 K
Radius of dust torus = 9.7e18 cm
Luminosity of dust torus = 1.1e45 erg/s
Black hole mass = 5e9 M_solar
Luminosity of the disk = 2.9e46 erg/s
eta = 1/12 Eddington ratio
Inner radius of accreation disk/R_g = 6
Outer radius of accreation disk/R_g = 1e4

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Jet Power in particles = 2.2e45 erg/s
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Preliminary Conclusions

- The Gamma ray emission from this source is harder during the active state
- Jet power in electrons increases slightly during the active state
- The lack of variability between the two gamma ray states at UV frequencies shows that UV optical emission has to be produced by the accretion disk
- For this source we assume SSC is negligible (below 10^-14 erg/cm^2/sec) and EC is the primary method by which gamma rays are produced.

Future Work

- VLBI observations will give us apparent motions and put further constraints on the Doppler factor and magnetic field both of which are poorly constrained at the moment.
- Observations at sub millimeter frequencies might help to constrain the low energy tail of the SED (ALMA proposal in the works).