

# Discovery and identification of two gamma-ray blazars at low galactic latitude with VERITAS

MANEL ERRANDO for the VERITAS collaboration

Department of Physics & Astronomy, Barnard College, Columbia University, 3009 Broadway, New York, NY 10027, USA  
Columbia Astrophysics Laboratory, Columbia University, 550 West 120th Street, New York, NY 10027, USA

**SUMMARY** Since the launch of the *Fermi* satellite, ground-based gamma-ray telescopes operating at the 100 GeV to several TeV energy range have observed several objects selected by the properties observed by *Fermi*-LAT. We present the results from VERITAS observations of two unidentified gamma-ray sources at low galactic latitude: IFGL J0521.7+2114 and IFGL J0648.8+1516.

**RESULTS** These two *Fermi* unidentified sources were detected at  $E > 100$  GeV with VERITAS and identified as blazars behind the galactic plane through follow-up optical spectroscopy.

## LOW-LATITUDE BLAZARS

- A number of unidentified gamma-ray sources at low galactic latitudes are expected to be blazars behind the Galactic Plane [1].
- These objects are difficult to identify because optical extinction, diffuse radio emission and galactic point-like sources make the characterization of blazars at low galactic latitudes difficult. Blazar catalogs often avoid the Galaxy partially or entirely.
- VHE gamma-ray telescopes like VERITAS are a good tool for the identification of blazars at low galactic latitude, through the localization enabled by their good angular resolution and their high sensitivity to flux variability.

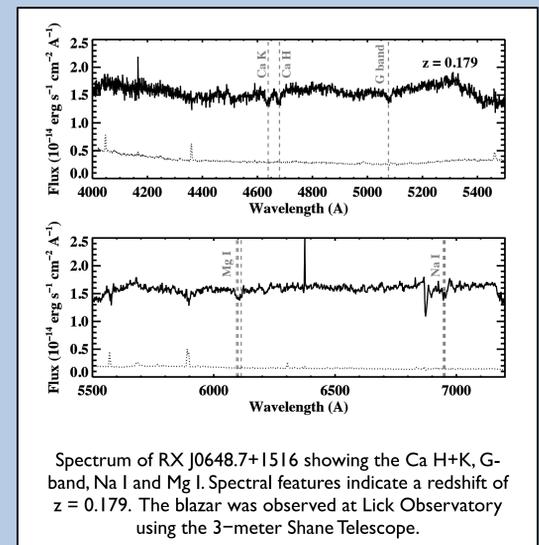
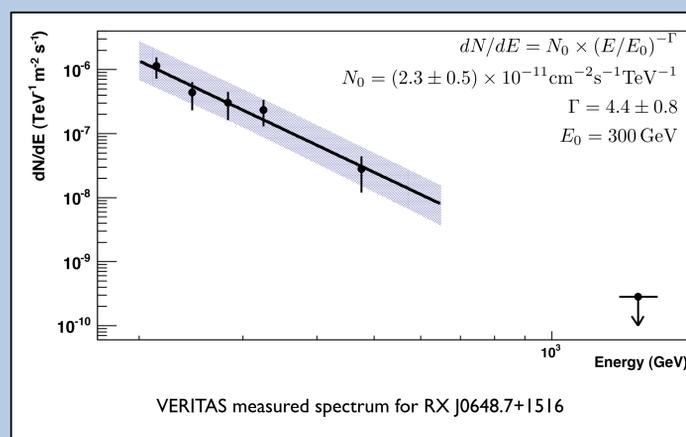
### VER J0521+211

- Unidentified radio, X-ray and GeV source (RGB J0521.8+2112, IFGL J0521.7+2114)  $9^\circ$  off the plane and  $3^\circ$  from Crab Nebula.
- VHE candidate since a cluster of  $E > 50$  GeV photons seen by *Fermi*-LAT was identified at the source position.

### RX J0648.7+1516

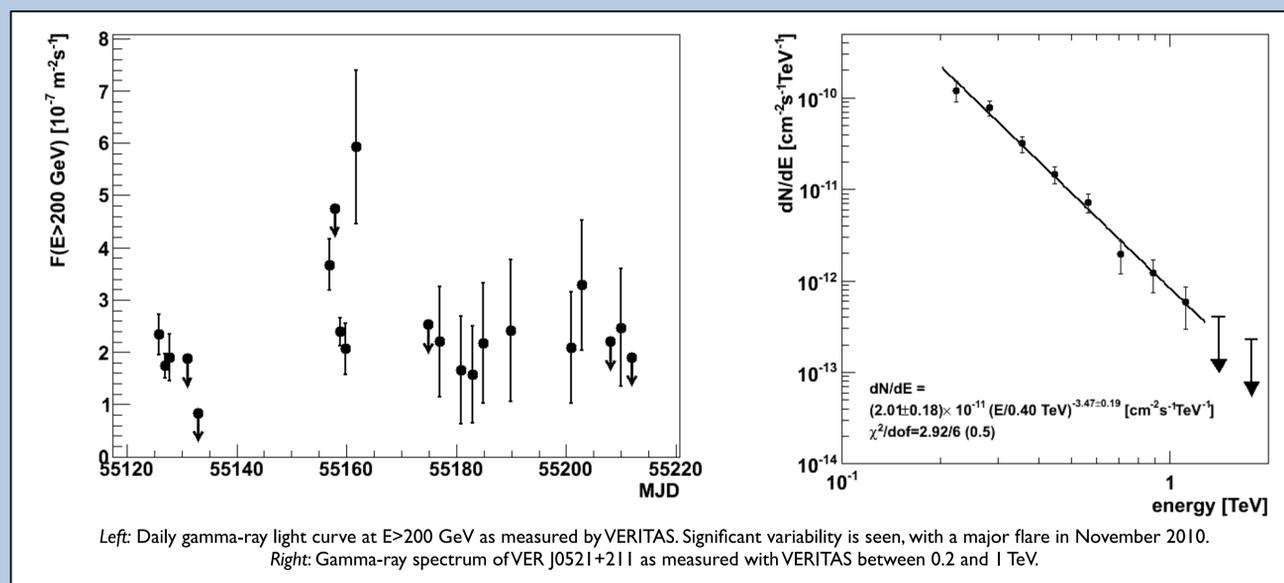
- Unidentified radio, X-ray and GeV source (RGB J0648+152, IFGL J0648.8+1516) located  $6^\circ$  off the plane.
- Selected as a VHE candidate by the *Fermi*-LAT collaboration because of a cluster of high energy photons.

## RX J0648.7+1516



- RX J0648.7+1516 was observed for 19 h of quality-selected live time in March 4 - April 15 2010.
- A gamma-ray excess is seen with significance of 5.3 standard deviations. The measured gamma-ray flux is  $\sim 2\%$  of the Crab Nebula flux [2].
- No significant variability is found in the VERITAS data.
- Follow-up optical spectroscopy was performed at the Shane 3m telescope at Lick Observatory. The obtained results reveal a continuum dominated spectrum typical of BL Lac-type blazars. The observed absorption lines are compatible with a redshift of 0.179.

## VER J0521+211



- VER J0521+211 was observed with VERITAS for 15 h of quality-selected live time in October 2009 - January 2010.
- A gamma-ray excess is seen with significance of 15.6 standard deviations, with an integral flux averaging  $\sim 5\%$  of the Crab Nebula flux [3]. The position of the gamma-ray excess is compatible with RGB J0521.8+2112.
- VER J0521+211 is found to be significantly variable in the VHE gamma-ray band [4].
- Follow-up optical spectroscopy (MMT and MDM) revealed a continuum dominated spectrum typical from BL Lac-type blazars where no absorption lines could be identified for a redshift determination.

## CONCLUSIONS

- VERITAS discovered and characterized the VHE gamma-ray emission of two new sources at low galactic latitude: VER J0521+211 and RX J0648.7+1516.
- These objects were previously unidentified sources in radio, X-ray and GeV bands.
- Follow-up optical spectroscopy allowed the identification of the two new sources as BL Lac-type blazars. A redshift of 0.179 for RX J0648.7+1516 was also derived from these measurements.
- VERITAS angular resolution allows a better source localization, and the improved VERITAS sensitivity makes it possible to detect significant flux variability on VER J0521+211, further supporting the blazar identification.
- VERITAS will continue observations of unidentified gamma-ray sources to characterize them and identify their nature.

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## REFERENCES

- [1] Abdo, A. et al. 2010 ApJ 715, 429
- [2] Ong, R. 2010 ATel 2486
- [3] Ong, R. 2009 ATel 2260
- [4] Ong, R. 2009 ATel 2309



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