VHE gamma-rays from the other side of the Milky-Way: SNR G349.7+0.2

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Abstract: G349.7+0.2 is a Supernova Remnant (SNR) interacting with a molecular cloud, located at the edge of our galaxy ($\sim$ 22 kpc). The very high energy (TeV) γ-ray emission of G349.7+0.2 has been detected by H.E.S.S. for the first time. We present the results and place them into a multi-wavelength context to interpret the γ-ray emission.

Keywords: Supernova remnant, Molecular cloud, VHE gamma rays, H.E.S.S., cosmic rays, SNR G349.7+0.2

1 Introduction

SNRs are usually suspected to accelerate most of Galactic cosmic rays (CR) detected on Earth. The main issue is to determine the origin of the very high energy (VHE) γ rays produced in the assumed CR acceleration places. Indeed these photons may arise from leptonic processes such as inverse compton and bremsstrahlung radiation, or from hadronic interactions producing γ rays via neutral pion-decay. The latter, directly tracing accelerated protons, would provide invaluable probes of CR acceleration in SNRs. The presence of high matter density near CR accelerators increase the target for hadronic collisions making them brighter in the HE/VHE domains.

In some case a supernova occurs while its progenitor is in a molecular cloud neighborhood. This proximity leads rapidly to a strong interaction between the dense cloud and the expanding shock wave. Such interactions can be directly detected through OH Masers at 1720 MHz [1].

A pion-decay signature in the HE γ rays of two SNRs interacting with a molecular cloud have been detected using Fermi-LAT data [2]. New detections of these objects would provide a better understanding of the CR acceleration mechanisms.

2 SNR G349.7+0.2

G349.7+0.2 is a young SNR ($\sim$ 2800 years [3]), located in the Galactic plane at the edge of the milky-way ($\sim$ 22 kpc [4]).

A radio diffuse emission observed by the VLA, reveals the structure of the expanding ejecta [5]. In addition a Chandra observation shows high correlation between X-rays and the radio map [6]. Given its large distance, G349.7+0.2 is one of the three brightest SNRs at these wavelength. Strong interactions between the SNR and a 10^4 $M_\odot$ molecular cloud is revealed by OH masers (1720 MHz) [4] close to the SNR center direction and correlated to high ^{12}C0 $J = 2-1$ emission [7]. A GeV emission has been detected by the Fermi-LAT instrument toward the position of the SNR [8]. Thus G349.7+0.2 is a good candidate to probe the CR acceleration.

3 H.E.S.S. Observations

The detection of VHE γ rays (TeV) consists in the observation of cherenkov radiation produced by secondary particles during their interaction with the atmosphere.

H.E.S.S. (High Energy Stereoscopic System) is an array of Imaging Atmospheric Cherenkov Telescopes (IACTs) located in the Khomas Highland in Namibia, 1800 m above sea level, H.E.S.S. began operation in 2003.

The H.E.S.S. collaboration observed G349.7+0.2 between 2008 and 2009. We also used available data in which this SNR is in the telescopes large field of view ($\sim 5^\circ$) taken during observations of its complex neighborhood (RX J1713.7-3946 [9]...) and Galactic scan (2004-2012). More than 110h of data are available with high range of zenith angles and offsets.

We shall present at the conference the results of the G349.7+0.2 H.E.S.S. observations. We report on the detection of the most distant Galactic SNR ever observed by H.E.S.S. and we present a multi-wavelength interpretation of its nonthermal emission.

4 Acknowledgement

Acknowledgement: please see standard acknowledgement in H.E.S.S. papers, not reproduced here due to lack of space.

References

[1] P. Lockett, E. Gauthier and M. Elitzur, ApJ 521 (1999) 235-241.
[2] M. Ackermann et al., Science 339, 807 (2013)
[3] P. Slane et al., ApJ 580 (2002) 904-908.
[4] D. A. Frail et al., AJ (1996) 111, 1651.
[5] C. L. Brogan et al., ApJ 537 (2000) 875-890.
[6] J. S. Lazendic et al., ApJ 618 (2005) 733-743.
[7] G. Dubner et al., A&A 426 (2004) 201-212
[8] D. Castro & P. Slane, ApJ 717 (2010) 372-378
[9] F. Aharonian et al., A&A 531, C1 (2011).