H.E.S.S. observations of the Large Magellanic Cloud

Nukri Komin*, Okkie de Jager†, Yves A. Gallant‡, James A. Hinton§ and Vincent Marandon¶ for the H.E.S.S. collaboration

*CEA/Irfu/SPP, Centre de Saclay, Gif-sur-Yvette, France
†Unit for Space Physics, North-West University, Potchefstroom, South Africa
‡LPTA, Université Montpellier 2, CNRS/IN2P3, Montpellier, France
§School of Physics & Astronomy, University of Leeds, UK
¶APC, CNRS, Université Paris 7, Paris Cedex 13, France

***Abstract*. The Large Magellanic Cloud (LMC) is a satellite galaxy of the Milky Way at a distance of 48 kpc. Despite its distance it is an interesting target for TeV gamma-ray observations: it harbours the very young supernova remnant SN 1987A, the pulsar with the largest known spin-down power, PSR J0537−6910, and the recently detected gamma-ray source 0FGL J0538.4−6856. The part of the LMC containing these objects has been observed regularly with the H.E.S.S. telescopes since 2003. In this talk we present interesting recent results and put them into a multi-wavelength context.**

***Keywords*: VHE gamma-rays, H.E.S.S., LMC**

I. Introduction

The Large Magellanic Cloud (LMC) is a satellite galaxy of the Milky Way at a distance of 48 kpc [1], with an apparent extension of about 10° and an inclination angle of 31° [2]. It harbours several interesting sources, known to be possible gamma-ray emitters.

SN 1987A is a very young (22 years) supernova remnant, and the closest in recent history. Very High Energy (VHE) gamma ray emission from hadronic interactions is expected to be seen at the current epoch [3]. No gamma-ray emission has been detected so far from SN 1987A [4], [5].

In the survey of the Milky Way a number of Pulsar Wind Nebulae (PWNe) have been detected, and a connection between the spin-down luminosity of the powering pulsar and the gamma-ray flux of its nebula could be established [6]. PSR J0537−6910 is the pulsar with the largest known spin-down power, $\dot{E} = 4.9 \cdot 10^{38}\mathrm{erg/s}$. It is located in the LMC and gamma-ray emission from Inverse Compton scattering can be expected, but is not detected so far [5].

MeV and GeV gamma-ray emission from the direction of the LMC has been recently detected with the *Fermi* telescope [7], but due to its large error circle no firm conclusion on its counterpart can be drawn.

Despite the distance of the LMC, which requires deep exposures, the observation of gamma-ray sources in the LMC has several advantages: The distance as an important ingredient in modelisation and interpretation is rather precisely known, and the angular separation of the sources is small, allowing the observation if several objects within one pointing. H.E.S.S. observations of the LMC may lead to the discovery of VHE gamma-ray emission from Galactic type objects in an extra-Galactic environment.

II. H.E.S.S. Observations

The High Energy Stereoscopic System (H.E.S.S.) is a system of four Imaging Cherenkov Telescopes. It can reconstruct the photon's arrival direction with an angular resolution of better than 0.1° and its energy with a resolution of $\approx 20\%$. The field of view with a diameter of 5° is ideal for the observation of extended sources and surveys. The sensitivity of H.E.S.S. allows a 5σ detection of a source with flux of about 1% of the flux of the Crab nebula within 50 h [8].

A part of the LMC, the field of view containing SN 1987A, has been observed with a H.E.S.S. on a yearly basis since 2003. The entire data set has an exposure of about 40 h. Due to the large zenith angle of the observations the energy threshold is at 500 GeV, slightly higher than for typical H.E.S.S. observations.

III. Results

At the conference we present our recent results of the H.E.S.S. observations and put the findings into a multi-wavelength context.

References

[1] L. M. Macri *et al.* , 2006, ApJ, 652, 1133-1149.
[2] S. Nikolaev *et al.* , 2004, ApJ, 601, 260-276.
[3] E.G. Berezhko and L.T. Ksenofontov, ApJ, 650: L59-L62, 2006.
[4] G. Rowell *et al.* , for the H.E.S.S. collaboration 2nd Int. Symp. on High Energy Gamma Ray Astronomy, Heidelberg, 2004, APS Conf. Proc. 745, p. 299.
[5] R. Enomoto *et al.* , 2007, ApJ, 671, 1939-1943.
[6] S. Carrigan *et al.* , for the H.E.S.S. Collaboration, Proceedings of the 30th ICRC, Merida, Mexico, arXiv:0709.4094v1.
[7] A.A. Abdo *et al.* , Fermi collaboration, arXiv:0902.1340v1.
[8] J. A. Hinton for the HESS Collaboration, New Astronomy Reviews 48, Issues 5-6, April 2004, Pages 331-337.