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Neutrinos from the milky way

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Neutrinos From the Milky Way

1. A neutrino telescope on the Northern Hemisphere will have a better chance of observing the neutrino flux from cosmic ray interactions with interstellar matter than one on the Southern Hemisphere.

CHAPTER 2.

2. The main difficulty of reconstructing the muon direction from the timing information of Čerenkov light is the non-linearity of the problem. By using a grid of predefined directions this problem can be overcome and some particle identification can be achieved at the same time.

CHAPTER 4.

3. Thanks to the rotation of the Earth, it is straightforward to create systematically equivalent background regions.

CHAPTER 5.

4. The limit set by the AMANDA-II experiment is quantitatively better, but scientifically less meaningful than the limit set in this dissertation.

CHAPTER 5.

5. The IceCube experiment has observed a cosmic neutrino flux with a significance of more than 5σ , which is enough to claim a discovery, but surprisingly not enough to assess its origin.

M.G. Aartsen et al. *Phys. Rev. Lett.*, 113(101101), 2014.

6. Rather than assuming a single power-law energy spectrum for the full sky, a distinction should be made between Galactic and extragalactic contributions to the cosmic neutrino flux.

M.G. Aartsen et al. *Phys. Rev. D*, 91(022001), 2015.

7. Although the cosmic neutrino flux has been discovered in the ice of the South Pole, the origin of the flux can better be determined in the water of the Mediterranean Sea.

A. Margiotta. *Geosci. Instrum. Method. Data Syst.*, 2:35–40, 2013.

8. In a sky-map produced by a next-generation neutrino telescope, the Milky Way will be clearly distinguishable.

M. Spurio. *Phys. Rev. D*, 90(103004), 2014.

9. A unique aspect of neutrino detection is that it allows for the study of completely different topics in science.
10. Even when optimising a set of parameters does not quantitatively improve the sensitivity of an analysis, the optimisation could still be meaningful.

Leiden, May 12th 2015
Erwin Visser