

---

---

# Very High Energy Gamma-rays Astronomy in ENIGMASS: The “ASTRO-COSMO” Post-Doc

---

---

G. LAMANNA, P. SERPICO

ENIGMASS  
11 October 2012



E-MAIL

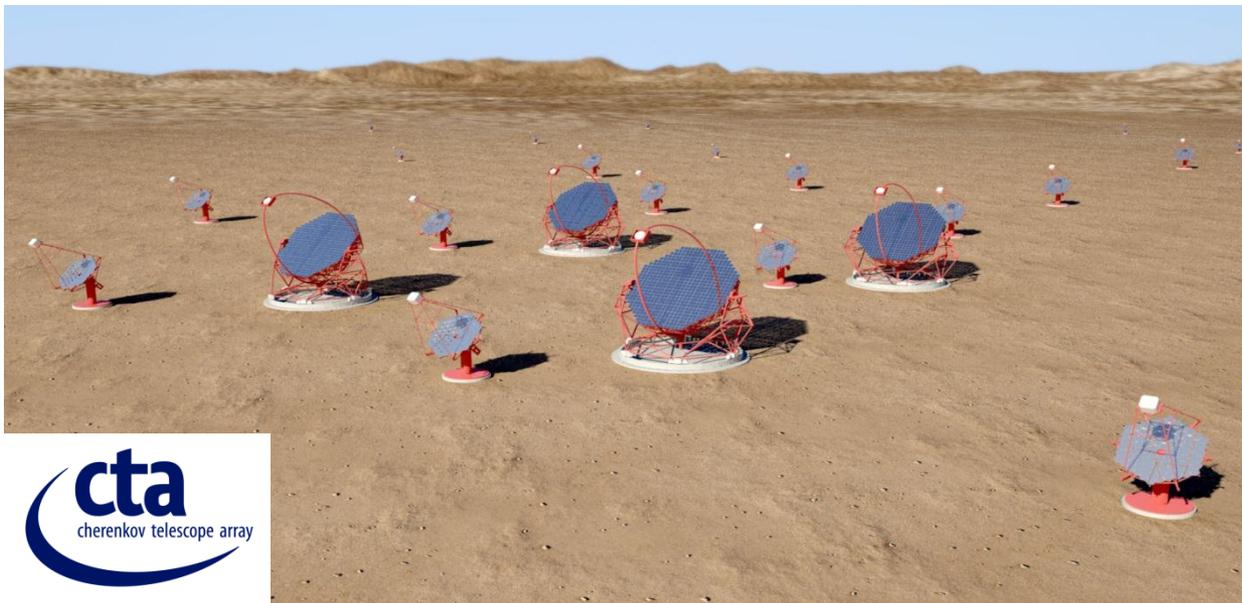
Le 9/18/2012 12:31 PM, Serge Kox a écrit :

...

...

« Quelques éléments de jugement, outre bien sûr la **qualité de la Science**, qui seront : les **aspects collaboratifs** entre laboratoires, **l'impact et la visibilité** de ce postdoc dans le projet global, l'**adéquation** avec le projet du LABEX, la **maturité** de la demande (avancement du projet global, identification d'un bon candidat) ...

Amicalement  
Serge »



**H.E.S.S.** was awarded  
in 2006 the **Descartes Prize of the European Commission** - the highest recognition  
for collaborative research  
and in 2010 the prestigious **Rossi Prize of the American Astronomical Society**.

H.E.S.S. was ranked the **10th most influential observatory worldwide**, joining the  
ranks with the Hubble Space Telescope or the telescopes of the European Southern  
Observatory ESO in Chile.

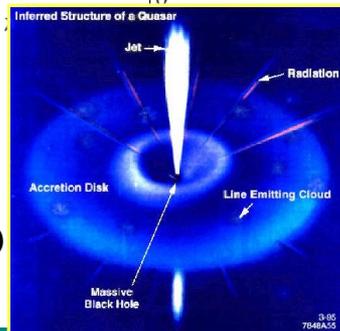
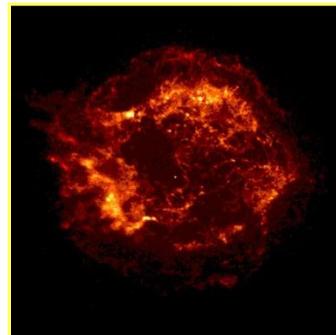
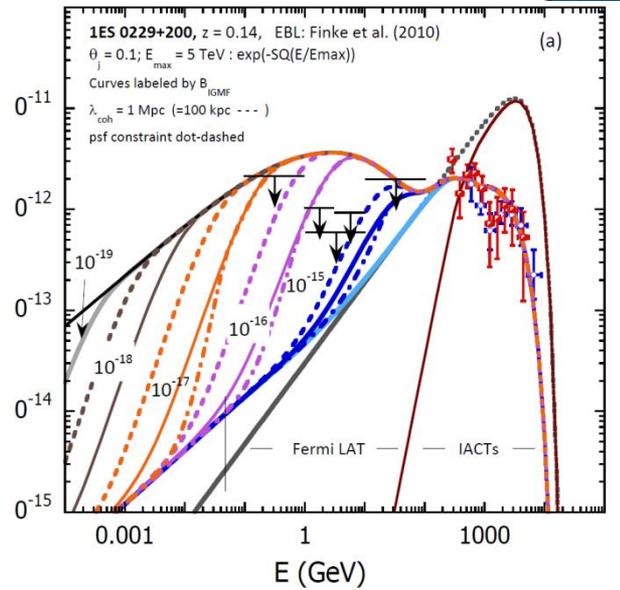
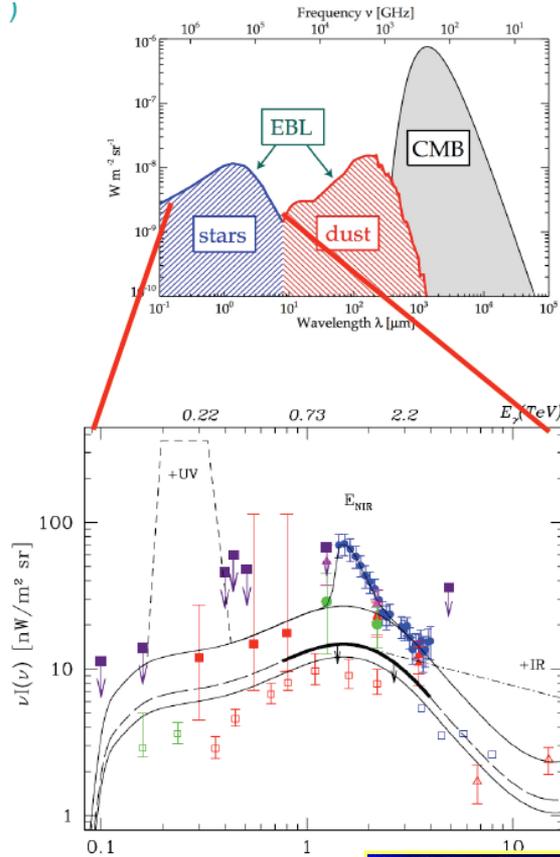
**September 2012 marks the 10th anniversary of the  
inauguration of the first H.E.S.S. telescope**

**And the inauguration of the new H.E.S.S. II telescope  
(which has started the first physics data taking THIS WEEK !)**

In particular the research activities will consist of a coherent combination of data analysis of the H.E.S.S. experiment (currently in its phase 2 exploring the tens of GeV energy domain by means of the fifth 30 m dish large telescope), related phenomenological/theoretical studies and exploring/suggesting new scientific perspectives offered by the advent of the first gamma-ray observatory CTA.

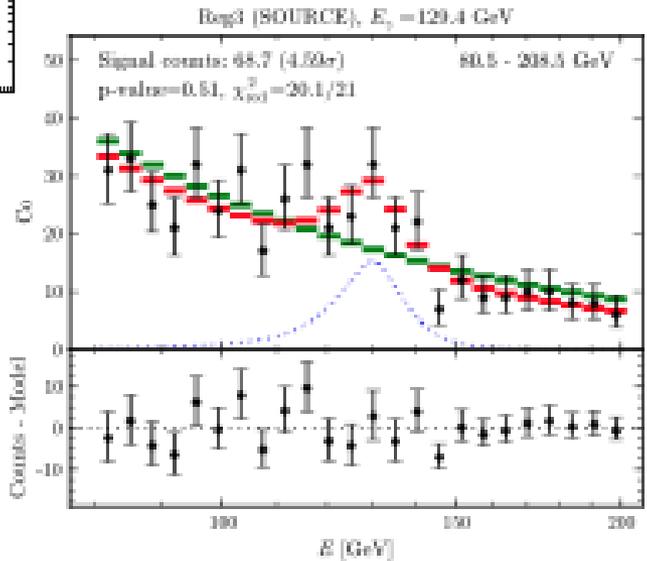
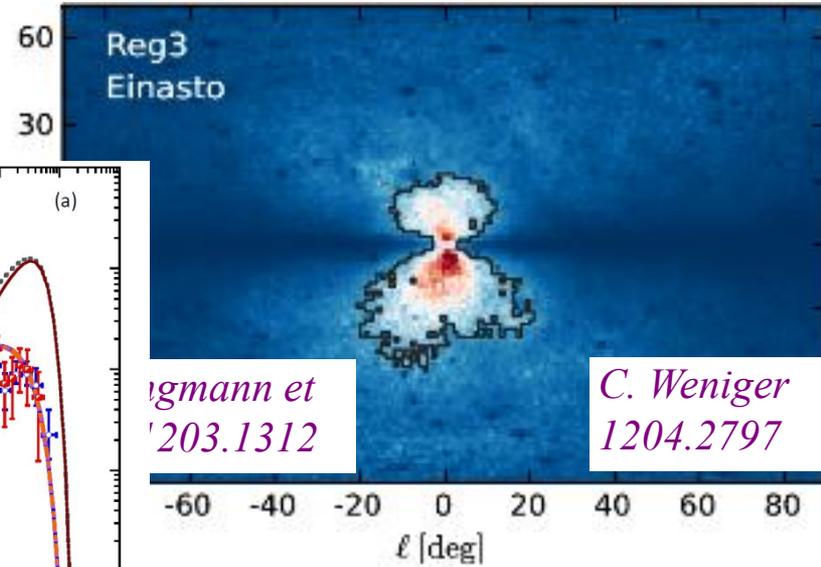
The main topics which are matter of study of the “Astro- $\gamma$ -Enigmass” group and on which the successful candidate is called to play a key role are:

- 1) Indirect dark matter search towards potential targets: the center of our galaxy, dwarf galaxies, globular clusters. The potential of the new HESS-II instrument for line-like spectral features (from dark matter or recently proposed “astrophysical impostors”) may be explored.
- 2) Fundamental physics through gamma emissions from galactic and extragalactic sources: signatures of Lorentz invariance violation.
- 3) Active Galactic Nuclei physics: both on the phenomenology of acceleration processes therein and population studies for indirect constraints of the extragalactic background light extent and energy distribution.
- 4) Diffuse GeV-TeV gamma-ray galactic emission: towards a phenomenological interpretation of the measurements in respect of classical origin (i.e. cosmic-ray astrophysics), exotic contributions (i.e. dark matter) and new astrophysical contributions (i.e. the new population of gamma-ray unknown “dark sources”).



$$v = c(1 - \xi(E/E_p))$$

$$v = c(1 - \zeta(E/E_p)^2)$$



*C. Weniger*  
1204.2797

Les sujets de recherche ici mentionnés sont déjà  
présents dans le projet ENIGMASS (Fiche B)

Voir GL talk  
ENIGMASS-PostDoc @ LPSC 30/5/2012

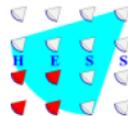
---

**De HESS à CTA**  
(Astrophysique, cosmologie et physique fondamentale)

---

Giovanni Lamanna

*LAPP - Laboratoire d'Annecy-le-Vieux de Physique des Particules,  
Université de Savoie, CNRS/IN2P3, Annecy-le-Vieux, France*



Grenoble  
30 May 2012



- *Aspects scientifiques (quel sera l'impact escompté de ce postdoc, quel lien avec les objectifs scientifiques du LABEx):*

All scientific cases and the topics presented in the postdoctoral offer as part of the “Astro- $\gamma$ -Enigmass” are also clearly stated in the Enigmass proposal official document.

In a 4-5 years' timescale, we envisage the following "modular" program: start from existing competences to strengthen exchanges between LAPTh and LAPP. At present, the major overlap is in the area of indirect dark matter searches. A closer look to interesting targets/results (an example being provided by the new limits from globular clusters) may likely lead to a common publication. The postdoc will have a key role of connection between the two laboratories in a very short time scale.

Other specific resources (one PhD student) focusing on data analyses in the context of different phenomenological models (along the lines of the joint thesis project submitted by Lamanna and Serpico in 2011) would of course speed up this early synergy and have a more significant impact in terms of publications already at this stage.

In a second stage (medium-term) the large amount of data from HESS-II, with a scientific output only limited by the manpower available for the analysis will guarantee a clear boost of productivity and visibility of the proposed activities.

As a third stage, in parallel, we plan to conduct a "survey" to select one or a couple of "strategic" subjects, for which one can expect a major impact of CTA. These would be the topics on which to develop specific competences towards the foreseen observatory-like mode of functioning of CTA (this includes also familiarization with the expected procedures, tools, etc.). We have tentatively identified as possible driving topic the realm of extragalactic sources (Mostly Blazars/AGN) for which CTA will eventually permit: i) population studies; ii) detailed spectral measurements for the brightest objects; iii) increasing the statistics of objects in the "quiet state" emission (as opposed to flaring transients). This information will allow on one side to acquire a strong diagnostic potential for their "gamma-ray engine"; on the other side, it will allow to use these sources as more reliable tools to infer properties of the extragalactic medium through which gamma rays propagate. Two such examples are the Extragalactic Background Light (which is an indirect probe of the cosmologically interesting star formation history) and the Extragalactic Magnetic Fields, on which interesting constraints have been presented e.g. from Fermi data based on the presence/absence of "a gamma ray halo" around the source. The magnitude (from femto- to nano-Gauss) and origin (astrophysical or cosmological?) of these fields is still largely unknown. Yet another exciting possibility is the discovery of new, unsuspected classes of VHE-bright sources, so-called "dark accelerators", whose existence---while speculative---could be one of the possible rewards of a large-scale "survey" campaign which is possible with CTA.

La maturité de la demande est basée sur la:

- Maturité de l' équipe HESS/CTA du LAPP dans l'analyse des données et dans les réflexions sur la combinaison entre Astrophysique, Cosmologie et Physique fondamentale dans CTA et dans ENIGMASS.
- Maturité de la collaboration avec le LAPTH sur des sujets consolidés: Dark Matter, fond diffus gamma...
- Préparation de la demande d'association scientifique de P. Serpico aux collaborations HESS et CTA, donc aux demandes d'observations spécifiques.
- Demande de bourse de Thèse ENIGMASS en cotutelle (LAPP+LAPTH/GL+PS).
- Travaux d'analyse HESS 1 en cours au LAPP sur Dark Matter et coopération envisagée avec le LAPTH dans la rédaction des publications
- ANR Dark Matter déjà existantes qui nous associe (LAPP+LAPTH/GL+PS).

*Le projet de coopération et coordination (LAPP+LAPTH/GL+PS) sur de thèmes de recherche d'intérêt commun est à mont du LABEX....*

*(Le Consortium CTA compte >25 pays et > 1000 scientifiques.*

*Divers bons candidats PostDoc au sein de HESS et CTA... Experim./Theoret. )*

- *Aspects collaboratifs entre équipes du LABEx (comment ce projet renforcera les synergies entre équipes et laboratoires du LABEx) :*

About one year after the postdoc/CDD and a student has joined the group (during which we expect that attention will be focused on the above aspects) we envisage to start specific phenomenological analyses on an innovative subject resulting from the mentioned survey. In the following couple of years, the goal is to develop the kind of competences and new core expertise that will enable the “Astro- $\gamma$ -Enigmass” to become a well-recognized team in one or several subjects of study of CTA; the support of the hosting laboratories is expected to lead to at least one new permanent staff member at the end of this phase. In the long term, the measure of success of our initiative could be measured by a regular stream of accepted observational programs at the CTA observatory, with the consequential impact on publications.