

## SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

**Action number: CA18108**

**STSM title: Development of multimessenger observing strategies for gamma-ray and neutrino experiments**

**STSM start and end date: 18/02/2020 to 25/02/2020**

**Grantee name: Dijana Dominis Prester**

### PURPOSE OF THE STSM:

This STSM is aimed to be focused on the two main goals:

- a) Development of the multimessenger observing strategies for coordinated detections of astrophysical phenomena emitting gamma-rays and neutrinos.
- b) Planning of the outreach activities with emphasis on the attracting young women into the field of multimessenger astrophysics.

The following objectives of CA18108 stated in the MOU are addressed through this STSM:

- Coordination and combination of expertise of different European research groups belonging to communities relevant to the identification of a signature of quantum gravity in the physics of cosmic messengers.
- Development of new strategies and optimization of the existing ones for performing studies of quantum-gravity effects in the different cosmic messengers.
- Joining the experimental communities working with different cosmic messengers in order to promote combined analyses and a multi-messenger approach to the phenomenology of quantum gravity.
- Strengthening the field of quantum gravity phenomenology by supporting and providing opportunities for recognition and visibility to researchers from COST ITCs and researchers from the underrepresented gender in the field.
- Dissemination of the results to the general public, school pupils, university students, and in particular, young women that could pursue a scientific career, as well as to scientists from other disciplines.

### DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

During the STSM in Valencia, only preliminary activities that are aimed to lead towards the fulfilment of the CA18108 Action goals, could have been carried out, due to the short duration of the stay (8 days in total, out of them 4 working days, as 2 full days had to be spent on travel which was possible only on Tuesdays). Given that the 1st conference of CA10108 took place in Granada two weeks after this STSM, the work was continued after the STSM and during the conference, through interaction between D. Dominis Prester and M. Tortola, and the other Action participants.

M. Tortola and D. Dominis Prester discussed short-term and long term activities, planned for the 2nd year of the Action, and their continuation during the 3rd and 4th year. The planned activities were discussed also with the other members of the group in Valencia, and after the STSM, D. Dominis Prester discussed it with the group members at the University of Rijeka.

a) D. Dominis Prester gave a public seminar talk at IFIC on 20 March 2020 "Gamma-ray Telescopes MAGIC and CTA: The Multimessenger Challenge". In the talk, multiwavelength and multimessenger observing strategies for observations in VHE gamma-rays using telescopes MAGIC and CTA and other instruments were discussed, some of the published highlight results presented, with the focus on the studies led by the members of the astroparticle group at the University of Rijeka. Observing strategies of MAGIC and CTA, including characterization of the atmosphere were discussed, and potential applications of LIDARs for environmental studies. The system of MAGIC observing proposals was presented to the audience, with guidelines for applications for the MAGIC observing time, which are recently encouraged by external scientists. In the discussion after the seminar talk, the ideas for the continuation of the existing studies, and the possible new studies, were discussed with the audience.

b) D. Dominis Prester and M. Tortola discussed plans for outreach and gender activities including design of clothes and other outreach gadgets, using the official logo of CA18108, and further abstract visual representations of electromagnetic waves and other physical phenomena addressed by CA18108. The idea was presented by both of them later at the Conference in Granada in the session for outreach activities, and discussed during the conference with the other Action participants.

#### **DESCRIPTION OF THE MAIN RESULTS OBTAINED**

a) The goal of joining the experimental communities working with different cosmic messengers (gamma-rays and neutrinos) was successfully accomplished between the neutrino group at IFIC and Valencia and the gamma-ray group at the University of Rijeka. Future visits, STSMs and dedicated workshops focused especially on doctoral students were discussed between M. Tortola and D. Dominis Prester. Applications by external scientists for observing time of the MAGIC telescopes has been advertised and encouraged. We expect that it will help joining the complementary expertise of the IFIC in Valencia and University of Rijeka, and in particular motivate future multimessenger studies using photons and neutrinos.

b) During the STSM, practical ideas for the new gender and outreach activities for the 2nd year of CA18108 were developed, and sketches for the outreach gadgets using the Action official logo produced. The idea of a new section for Women in physics within CA18108 discussed, and the T-Shirts with appropriate logo for this section sketched.

Further outreach activities to be carried on during the 2nd year were also elaborated, including presenting of the individual researchers and groups active in CA18108 through social media, public talks, TV, radio, newspapers and internet portals.

At the conference in Granada, these ideas were further discussed with the other Action members. The rough work plan for the 2nd year has been produced, and is currently under development in more details. A new working group for the Outreach design has been established (led by D. Dominis Prester), within the framework of the Outreach group led by the SCM of CA18108 M. Tortola.

#### **FUTURE COLLABORATIONS (if applicable)**

As explained, this STSM was aimed to be just a starting point for long-term activities which are important for the fulfillment of the objectives of CA18108. Therefore, we expect as outcomes future collaborations on the both main goals of this STSM:

- Applications for observing time of the MAGIC telescopes focused on multimessenger studies
- Workshops and mini-schools for doctoral students, focused on the calibration of different instruments in the multimessenger approach
- Outreach activities through social networks, public talks, and appearances in public media
- Joint activities on the design of clothes and other gadgets for the promotion of CA18108 and the related activities

- Gender activities focused on school pupils and students of physics (where women are currently strongly underrepresented), aimed towards raising of interest of young women to study physics
- Online meetings and discussions

**IMPORTANT NOTE:**

Due to the recent outbreak of COVID-19 pandemic, and the corresponding measures enforced by the COST starting on 13 March 2020 (the last day of the CA18108 conference in Granada), some of the activities discussed can suffer from delays, or will be when possible carried out online, instead through activities involving travels and face-to-face interaction. However, both D. Dominis Prester and M. Tortola are very satisfied with the fact that it was possible to carry out this STSM just shortly before these new measures were enforced, as now we are continuing our activities discussed during the STSM while working from our homes. In addition, we believe that in these difficult times for the global community, the activities addressed in this STSM, in particular networking of scientific communities through different online tools, and public outreach with positive messages, will contribute from our side in helping the global community to overcome the current crisis.