EUROPEAN COMMISSION
RESEARCH EXECUTIVE AGENCY

Marie Skłodowska-Curie Research and Innovation Staff Exchange
Project Officer

Brussels, 13/03/2019
REA A3/AJOH

NOTE FOR THE FILE

Subject: **Request for amendment 1: Consortium Request as from 01/07/2018**
Grant Agreement H2020-RISE-2016 734303
Project Acronym: NEWS

Project start date: 01/07/2017
Duration: 48 months
Amendment proposal:

- Consortium Request as from 01/07/2018
- AT3 – addition of a new beneficiary: NONE
- AT21 - Changes of Annex 1 (description of the action)
- AT31 - Change of Annex 2 (estimated budget of the action): NONE

Details:

- **New partner:**
  - University of Missouri (UMI) (Columbia, US) PIC 985250438
  - Massachusetts Institute of Technology (MIT) (Cambridge, US) PIC 998096827
  - Tomsk Polytechnic University (TPU) (Tomsk, RUSSIA) PIC 997438488
  - Iowa State University (Ames, ISU) (US) PIC 998804733
  - Hiroshima University (HIU) (Hiroshima, Japan) PIC 927755531
  - Texas A&M University (TAM) (College Station, US) PIC 983374458
  - The University of Hong Kong (HKU) (Hong Kong, China) PIC 997352934
  - Jefferson Science Associates LLC (JSA) (Washington, US) PIC 906947770

- **New beneficiaries: NONE**

Justification and details of changes to the secondments:

University of Missouri (UMI). The expertise of the LIGO group at MUST led by Prof. Marco Cavaglia will be an important asset for the development of the objectives related to WP2 "Gravitational Wave Physics". The initial contribution will be related to the development of innovative data analysis techniques based on machine learning which will be applied to detector characterization and used within the context of the LIGO and Virgo experiments. The study of the noise using machine learning and deep learning is promising in terms of de-noising the data received by the interferometers, thus improving their sensitivity and boosting their capability of low-latency detection and localization. The MUST contribution will be mainly related to the detector characterization aimed at the gravitational wave localization. This will bring an important piece of expertise in light of the quick alerts sent to the astronomical community thus allowing and improving the electromagnetic follow-up and multimessenger science.
Massachusetts Institute of Technology (MIT). LIGO is a joint project operated by CALTECH and MIT and MIT hosts some of the world leaders in the study of the performances and capabilities of third generation interferometric gravitational wave detectors which is the objective of WP3 "Gravitational Wave Detectors". In particular, this will be crucial to study the black hole and neutron star populations observed by third generation interferometers. We believe that interaction with MIT faculties will greatly benefit the development of new methods for the multi-messenger inference of the properties of coalescing binaries observed by third generation instruments.
Tomsk Polytechnic University (TPU). TPU has strong competences in vacuum plasma treatment techniques and a well-established and tight collaboration with POLIMI. In particular, the Department of Experimental Physics of TPU develops innovative magnetron sputtering

(MS) sources for the deposition of metals, alloys and compounds at very high rate (100 nm/s - for Al, Cu). The target is solid at high temperature or even liquid. Hot target magnetron sputtering (HT MS) has been studied for deposition of metallic coatings and magnetic material. Target erosion results both from sputtering and evaporation (sublimation). Target temperatures higher than the Curie point result in transition from ferromagnetic to paramagnetic state. This leads to higher efficiency of sputtering of magnetic materials. Target temperature can be an important feature for reactive deposition. 1. Sub-oxide forming on target can be sublimated at elevated temperature. Productivity is several times higher (2-7) in comparison with classical sputtering. 2. Target heating results in lower hysteresis. Erosion of target surface by sublimation results in less covering of target by dielectric layers. 3. Formation of stoichiometric coatings with high rates has been demonstrated.
The aim of the secondments is to test the possibility to produce metallic films by MS (or HT MS) and to carry out electron beam melting to produce surface alloys of niobium and tin. A niobium substrate or a niobium film on copper substrate will be coated with a layer of tin, by PVD or alternatively by electroplating. Once the Nb / Cu or Cu / Nb / Sn system are obtained, they will be subjected to electron beam bombardment. In this way Nb and Sn should mix together to obtain the desired stoichiometry. The purpose of this treatment is to obtain a Nb3Sn film in a totally unexplored way, with a potential improvement in manufacturing time. The effect of the process parameters (thickness of deposited films, energy and number of pulses) and of any post-thermal treatments on the characteristics of the obtained films (phases and superconductive behaviour) will be studied.
Ames Laboratory at Iowa State University (ISU). ALISU is a National Laboratory of the US Department of Energy operated by and located in the campus of the Iowa State University (ISU), in Ames, Iowa. For over 70 years this laboratory has partnered with Iowa State University. The Ames Laboratory is one of the world-leading research laboratories in the discovery, design and synthesis of new materials, mainly addressed to materials with novel and controlled functionalities, physical and chemical properties, which is important for WP8 "Superconductors for Particle Detectors". In this laboratory Enrico Fermi met Frank Spedding (in 1942), who agreed to set up and direct the chemical research and development program about separation and purification of ^{235}U to accompany the Manhattan Project.
The works performed by late prof. Karl A. Gschneidner in the study of the rare-earth metals and rare-earth based alloys, and of their applications, constitute a huge milestone in this research field. Responsive systems, where a small change of an extrinsic thermodynamic variable, such as temperature, pressure, or magnetic field, triggers an intrinsic phase change, have both fundamental and technological significance. Alloys and compounds that exhibit strong field-, temperature-, or pressure-controlled reactions, tunable by chemistry, crystallography, and processing, provide broad benefits to energy-related applications, such as sensors and smart materials, and materials for energy conversion, generation, and utilization devices. Responsive materials, therefore, have the potential to make transformative changes that can be used also to help meet future energy demands. Conventional (and strong) stimuli are temperature and pressure, but a magnetic field is weak and often an underappreciated trigger, whose role in initiating strong changes in solids is much less understood. Knowledge of the mechanisms delivering minor-stimulus driven phase change that is then followed by a major perturbation of properties is crucial for guiding the discovery of new materials, and is the focus of this research. Our goal is to uncover the underlying electronic, atomic and microscopic interactions that result in an extraordinarily strong coupling of the magnetic and crystal lattices in chosen model systems representing rare earth-based intermetallic materials. Development and validation of phenomenological models of transformations that range from magneto-volume to magnetic-martensitic is one of our prime objectives. We study materials showing specifically clear or compelling examples (or combinations) of superconductivity, strongly correlated electrons, quantum criticality, and exotic, bulk magnetism. For example, part of our effort will focus on the understanding and control of FeAs–based superconductors as well as searching for other examples of novel, or high temperature, superconductivity. This work will be leveraged via highly collaborative interactions between UNIGE and ALISU and other universities and labs throughout the world. Experiment and theory will be implemented synergistically. The experimental work will consist of new materials development and crystal growth, combined with detailed and advanced measurements of microscopic, thermodynamic, transport, and spectroscopic properties, as well as electronic structure, at extremes of pressure, temperature, magnetic field and resolution. The theoretical work will focus on modeling transport, thermodynamic and spectroscopic properties using world–leading, phenomenological approaches to superconductors and modern quantum many–body theory.
Hiroshima University (HIU). HIU is deeply involved in Fermi-LAT data analysis (WP4) and the development of X-ray polarimetry techniques for astrophysical measurements (WP5). For WP4, secondments at HIU will be dedicated mostly to the study of astrophysical transient sources, such as gamma-ray bursts and the electromagnetic counterpart of gravitational wave

events, with a focus on timing/spectral analyses of Fermi-LAT data. For WP5, we will concentrate on the development of detectors for measurements of X-ray polarisation. HIU has a strong history of development of instruments aswell as interpretation of results, for example in the PoGO+ mission. The collaboration with HIU will primarily focus on instrumentation for the planned X(L)-Calibur balloon mission for hard X-ray polarimetricobservations. X(L)-Calibur balloon is planned for launch from Sweden in a few years, and the detector is currently being developed. In particular, we will focus on the study of scintillator characteristics and readout performed with silicon photo-multipliers (SiPM). The SiPM are key components of the experiment, and it will be crucial to perform a campaign of tests of these devices. This research activity will be fundamental also for future X-ray polarimeters, such as the SPHiNX small satellite mission currently in preparation in Sweden. The Swedish groups will also perform theoretical studies of emission mechanisms to make more accurate predictions by making use also fo the polerimetry measurements performed by SPHiNX.

Texas A&M University (TAM). The nature of dark matter is one of the main open questions in astrophysics, and the group at Stockholm University (OCK) has made significant contributions using Fermi-LAT analysis of dwarf spheroidal galaxies, leading to new upper limits and reducing the parameter space for models. However, to fully utilize the capabilities of Fermi-LAT, new analysis techniques need to be developed. In this work, collaboration with Texas A&M University (TAM) will be very beneficial and significantly strengthen the efforts of both groups. Dwarf spheroidal satellite galaxies of the Milky Way are considered ideal targets where to search for traces of dark matter annihilation in the nearby Universe. In collaborating with Texas A&M University (TAM), we will update the search for dark matter in dwarf spheroidal galaxies with the Fermi-LAT. In particular, we will focus on the so-called J-factor which gives a normalisation of the predicted signal from dark matter annihilation, and is thus essential to Fermi-LAT analysis. We will exploit all available Fermi-LAT data and develop novel data analysis techniques in order to build a physical model for the velocity distribution of stars orbiting within dwarf satellites galaxies. This will allow more reliable determination of the J-factors, and therefore increase the power of the Fermi-LAT analysis. The project will therefore lead to novel constraints on the particle properties of dark matter (or detection).

The University of Hong Kong (HKU). Including the Laboratory for Space Research (LSR) of the University of Hong Kong will contribute to bring in skills and competences that will be very valuable in the context of the multimessenger analysis of cosmic sources. In particular, the expertise of the group led by Dr. Saz Parkinson in multiwavelength analysis of high-energy sources will be very useful in exploring future science cases for the next generation of gravitational wave interferometers (WP2 and WP3), with particular attention to the emission from neutron stars and pulsars in a multiwavelength and multimessenger context. The expertise of Dr. Saz Parkinson and colleagues, including LSR members Dr. Stephen Ng, Dr. Meng Su, will also be useful for the gamma-ray and x-ray emission of sources detected by Fermi-LAT (WP4).

Jefferson Science Associates LLC (JLAB). JSA manages the Jefferson Laboratory (JLAB) for the US Department of Energy Office of Science. JLAB is a multi-purpose United States National Laboratory conducting scientific research in a wide range of subjects in fundamental science and technology. JLAB hosts a unique particle accelerator, known as the Continuous Electron Beam Accelerator Facility (CEBAF), able to deliver high polarized electron beam to four experimental Halls, for fixed-target experiments with worldwide record luminosities ranging from 10E35 upt to 10E38 cm-2s-1. The focus is to probe the basic building blocks of known and alleged matter, whether orinary, exotic, neutron or dark. JLAB hosts experimental and theoretical research relating to Dark Matter searches, Astrophysics, Nuclear and Hadronic Physics, ad associated technology developments in the field of accelerators, detectors and computing. JLAB will be mostly involved in the development of advanced superconducting technology for particle accelerators (WP7).

Specific changes to the secondments

There will be some minor reshuffling of the months secondments among Beneficiaries which in some cases will need more months of secondments, and in some cases will not be able to do all the originally assigned months of secondments. Some months of secondments will have a change of destination to the new Partners in US and Japan.

Maximum EU contribution remains unchanged: 1566000€ (100% of total cost).
Number of secondments eligible for funding remains unchanged (348 fellow months).

This duly motivated request for amendment is to be processed as soon as possible.

Summary of changes to secondment plan

Organisations (sending)	Secondment totals per organisation in grant agreement	Changes with amendment
1. UNIPI	27	18 (-9)
2. UNINA	14	8 (-6)
3. UNIGE	41	27 (-14)
4. EGO	4	11 (+7)
5. CNRS	7	14 (+7)
6. INFN	133	160 (+27)
7. OCK	24	16 (-8)
8. HOG	6	2 (-4)
Grand Total	348	348