

Individual External Collaborator Project Proposal

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WG(s) involved in the project:

The working groups which are primarily involved in this project are the interstellar-medium ISM/SNR WG. Additionally, if we consider that our Galaxy is the closest of the nearby galaxies, then also the nearby galaxies WG will be involved in this project.

Scientific Project description (up to two pages, all included):

The Galactic Center outflow: an eROSITA_DE EC proposal

State of the art: Recent deep and very deep X-ray observations of the central few square degrees of the Milky Way have confirmed the existence of an outflow of hot (X-ray emitting) plasma connecting the central parsecs around Sgr A* to the base of the Fermi bubbles (Ponti et al. 2015; 2019). We observe that the hot outflow extends beyond the edge of our most extended X-ray map.

Long term aims: To determine the full extent of the Galactic center outflow and its impact on the surroundings, I propose to use the eROSITA data, in order to connect the deep and ultra-deep XMM and Chandra surveys of the central degrees with the more extended eROSITA data. The most recent X-ray observations indicate that the outflow feeds the Fermi bubbles, therefore it is likely to have an extension as large as the bubbles themselves.

I ask access to the eROSITA data on a strip of ~10 degrees west of Sgr A*, in order to understand the connection between the part of the outflow that we already imaged with XMM and Chandra with the rest of the Fermi bubbles.

5-months project: To improve our understanding of the outflow from the Milky Way center, I have submitted an ERC Consolidator project (involving also the analysis of eROSITA data), which has passed the first selection (Step 1), therefore I have been invited to an interview on October 1st. To demonstrate the feasibility of such project, I propose to: i) help the eROSITA background team to establish the in-flight level of

the X-ray background at (or along the way to) L2; ii) to compare it with the ones of other X-ray missions; iii) given the observed level of background, revisit the potential of eROSITA for characterising X-ray diffuse emission; iv) eventually, create an image (no need to publish such image) of diffuse X-ray emission as observed by eROSITA.

Output: Some of these activities will provide publishable results, that, due to their importance, will be lead by collaboration members. However, I ask the possibility to show and discuss some of these results during the interview for the ERC (October 1st).

1-year project: In case the ERC Consolidator project will be accepted, I request access to a strip extending from $l=359.44$ to 348 deg (i.e. west of Sgr A*) and $b=+-8$ deg (Galactic coordinates). I plan to investigate the connection between the central outflow, observed within the central 2-4 degrees with the extended emission on the 10 degrees scale.

Output: I expect this work to lead to at least one refereed publication. If successful, such study can be extended to the coverage of the entire Fermi bubbles (in collaboration with A. Strong et al.) and eventually (in the future) even at higher Galactic latitudes.

Added value: As a contribution to the eROSITA consortium, I can offer my experience on X-ray emission from the Galactic center accumulated thanks to the analysis of all XMM and Chandra deep and very deep scans of the central few degrees.

Over the past years, my team and I have developed software specific to the creation of spectra and images of large X-ray surveys as well as analysis of diffuse X-ray emission. During the duration of this EC eROSITA proposal, I will investigate the implementation and optimisation of such software for the analysis of eROSITA data.

List of Potential Collaborators within eROSITA_DE:

M. Freyberg, A. Strong, M. Sasaki, F. Haberl, C. Maitra.

Additional potential collaborators: A. Merloni, W. Becker, P. Predehl.

Expected Outcome

The first outcome will be a contribution to the assessment of the “in-orbit” X-ray background observed by eROSITA. This will be important to provide a final assessment of the potential of eROSITA to detect and characterise diffuse X-ray emission as well as the outflow of hot plains from the Galactic center.

If the ERC proposal will be successful, on a longer time-scale, I expect at least one refereed publication from this project.

Expected duration of the project

This project will last at least until December 2019, when the outcome of the ERC project will be published. If the ERC project will be accepted, I will continue this project for the foreseen year. Afterwards, I will apply each year for an extension of such project, until completion of the ERC project (which has a 5 years duration).