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Mercury gamma-ray and neutron spectrometer (MGNS) for exploration of Mercury subsurface composition onboard ESA BepiColombo mission

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The Mercury Gamma-ray and Neutron Spectrometer (MGNS) has been proposed and selected for the payload of the ESA Mercury Planetary Orbiter of the BepiColombo mission, as the instrument for study of the elemental composition of the Mercury surface. For detection gamma-ray and neutron flux, the nuclear experiment on Bepi-Colombo includes MGNS instrument, which consist of both the gamma-ray spectrometer part for detection of gamma-ray lines and the neutron spectrometer part for measurement of the neutron leakage spectral flux density. To test know theoretical models of Mercury composition, MGNS will provide the data for the set of gamma-ray lines, which are necessary and sufficient to discriminate between the models. Neutron data are known to be very sensitive for detection of hydrogen within heavy soil-forming elements. Mapping measurements of neutrons and 2.2 MeV line will allow us to study the content of hydrogen on the surface of Mercury. There are three natural radioactive elements, K, Th and U, which contents in the celestial bodies soil characterizes the physical condition of their formation in the protoplanetary cloud. The data from GRS segment will allow comparing Mercury with Earth, Moon and Mars.

At present, the nuclear instrument MGNS is under development for implementation on the MPO of BepiColombo mission, as contribution of Federal Space Agency of Russia to this ESA project. It will be able to provide observational data for mapping of soil composition of Mercury and testing possible hydrogen/water deposits at cold traps around the planetary poles.