



FREND neutron telescope for mapping the Martian water with fine spatial resolution

Igor Mitrofanov, Alexey Malakhov, Maxim Mokrousov, Dmitry Golovin, Fedor Fedosov, Alexandr Kozyrev, Denis Lisov, Maxim Litvak, Sergey Nikiforov, Anton Sanin, Vlad Tret'yakov, and Andrey Vostrukhin
Institute for Space Research, Profsojuznaja str. 84/32, Moscow, Russia (imitrofa@space.ru)

The concept of Fine Resolution Exploration Neutron Detector (FREND) is presented, as the Russian contributed instrument for the first element of ESA ExoMars mission, the TGO. FREND is the neutron collimated telescope, which is capable to measure the prompt neutron radiation of Mars from the 400 km orbit with the spatial resolution of about 40 km. The flux of epithermal neutrons is known to depend on the content of water in the shallow subsurface about 1 meter, so such measurements could allow to study the ground water distribution with fine spatial resolution over the entire martian surface from 70 degrees of the north latitude down to 70 degree of the south latitude. The resolution of tens of km is necessary to characterize the particular relief features on the surface by the content of water in the soil. Such mapping data should resolve the water distribution within the Gale crater, which is necessary to explain the paradoxical difference between the estimated contents of water in this crater, as about 5% by HEND on the Mars Odyssey and the ground data about 2 -3 % by DAN on the Curiosity. Also, the FREND mapping data of the ground water should be useful for the landing site selection of future Mars rovers, such as ExoMars or Mars 2020.