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SRG Orbital Observatory: X-Ray map of the Universe with a million accreting supermassive black holes

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SRG with German (eRosita) and Russian (ART-XC) X-Ray telescopes was launched by RosKosmos on July 13th of 2019 from Baikonur. During the flight to the L2 point of the Sun-Earth system, SRG performed calibrations and long duration Performance Verification (PV) observations of a dozen of targets and deep fields. Starting in the middle of December 2019, the SRG scanned the whole sky three times. During these scans, SRG discovered two and a half million point X-Ray sources: mainly AGNs and QSOs, stars with hot and bright coronae, and 40 thousand clusters of galaxies. There is a competition and synergy with the search for clusters of galaxies by Atacama Cosmology and the South Pole Telescopes sensitive in the microwave spectral band. We see X-Rays from hundreds of stars accompanied by exoplanets. SRG provided the X-Ray map of the whole sky in hard and soft bands, the last is now the best among existing. It reveals a lot of information about the distribution of absorbing cold gas in the Milky Way and provides a beautiful image of the North Polar Spur and similar bright emitting eRosita Bubble on the Southern side from the Central Part of the Galaxy. I will describe the Observatory plans for the future and demonstrate several results from the PV phase observations. The huge samples of the X-ray selected quasars at the redshifts up to $z=6.2$ and clusters of galaxies will be used for well-known cosmological tests and detailed study of the growth of the large scale structure of the Universe during and after reionization. SRG/eRosita is discovering every day several extragalactic objects which increased or decreased their brightness more than 10 times during half of the year after the previous scan of the same strip on the sky. A significant part of these objects has observational properties similar to the Tidal Disruption Events. ART-XC discovered a lot of bright galactic and extragalactic transients.

Author: Prof. SUNYAEV, Rashid

Presenter: Prof. SUNYAEV, Rashid

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