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Bistatic P-band SAR for spacecraft AIST-2

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Remote sensing space-crafts allow observing the earth's surface in different bands of the electromagnetic spectrum. Radar satellites used today X, C, S, and L bands of frequencies. Interest increased in the use of space synthetic aperture radar (SAR) P band to monitor subsurface, hidden objects, geological mapping, measuring the biomass of vegetation and other applications. The purpose of the conducted experiments per "AIST-2D", successfully launched in April 2016 from the cosmodrome "Vostochny", it consists in finalizing of the technology of radar surveillance of the earth's surface in P band. Onboard equipment of the SAR is the multimode impact transmitter, which ensures the wide range of stable signals at the carrier frequency 435 MHz, in the strip to 6 (30) MHz the possibility of reconstruction from 1 to 30 MHz. Types of the signals are: The sequence of square pulses, the sequence of chirp, the sequence of the phase-keyed signals and coded M-sequences. Onboard transmitting antenna is Yagi antenna, polarization–linear, the antenna gain- 5 dB. Ground-based stationary equipment is two-channel tuned radio receiver (to 110 dB) with digital registration of quadrature components at the frequency to 200MHz and subsequent digital processing of signals. The ground-based receiving antenna reflected channel is stack of two Yagi antennas, antenna polarization–circular, the antenna gain of the reflected channel–20 dB, straight–9 dB. Onboard equipment bistatic of the radar with the synthesized aperture, which works in the P- band to 01.11.2016, could not be switched into the mode of regular work. The analysis of causes for failure and the search for the versions of the start of transmitter continue.

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The flyby anomaly in need of new physics

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The central task of dynamical astronomy is to obtain solutions for equations of satellite motion. This analytic methodology employs Newtonian dynamics with gravitational fields that pulls on matter to get it going. After 100 years the inception of the general theory of relativity (GTR) by Einstein, a cornerstone of modern physics, even accomplished theories might have difficulty explaining a certain class of astronomical phenomena, in particular, small astrometric anomalies. At the end of the 19th century, astronomers discovered that the perihelion of Mercury was slowly advancing in a way that could not be explained by Newtonian physics. As it turned out, this small anomaly in Mercury's orbit has found an explanation in GTR. We may point four classes of astrometric anomalies: The flyby anomaly, addressed in this work; the slow increase of the astronomical unit (AU), approximately the distance from the Earth to the Sun; the pioneer anomaly, which is now a solved puzzle and; the increase in the eccentricity of the Moon's orbit. The flyby anomaly has been a puzzling issue, addressed in the present work and by other numerous authors. We suggest a possible theoretical explanation for the physical process underlying the unexpected orbital-energy change observed during close planetary flybys based on the new concept of topological torsion current (TTC). This approach is along the line of non-standard physical models used to explain the anomalous velocity increase by means of torsion gravity, the majority based on the Ehlers-Pirani-Schild program of constructive axiomatization of the geometric structure of space time. Our theoretical framework is classical and shows that there is an asymmetry when a spacecraft approaches a planet in pro-grade or retro-grade direction, but the anomaly is occurring only in retro-grade direction.

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