

DIRECT MEASUREMENT OF LASER AHEAD ANGLES FROM THE ARTEMIS GEOSTATIONARY SATELLITE THROUGH CLOUD

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During several years the ground telescope system we developed for laser communication experiments with the geostationary satellite ARTEMIS of ESA. The orbit plane of ARTEMIS satellite has inclination angle to the Earth's equator plane and the system of precise tracking of the satellite was realized by using calculated time resolved coordinates of the satellite. The laser communication experiments with the satellite were performed. Some laser experiments were performed in cloudy conditions. A splitting of the images of the laser spot was observed in some images from the laser beacon of the satellite received through thin clouds in directions of declination and right ascension. The splitting along declination may be interpreted as laser scattering and refraction in the atmosphere. The splitting in some images along directions of right ascension is equivalent to the calculated ahead angles for the satellite (approximately 2"). A small part of laser beam was observed in ahead points in direction of the velocity vector where the satellite would be after time of propagation of the laser light to the telescope. These observed results are in accordance with the theory of relativity for aberration of light during transition from immovable to movable coordinate systems. The conditions of atmosphere in ahead points important to know for laser ranging, communication from ground stations to satellites and deep space missions. The observed results open ways for investigations and development of systems for ahead angle compensation during of ground to space laser communications through atmosphere.