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Experimental determination of photometric characteristics
of the BLITS-M satellite

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JSC «Research and production corporation «Precision systems and instruments»



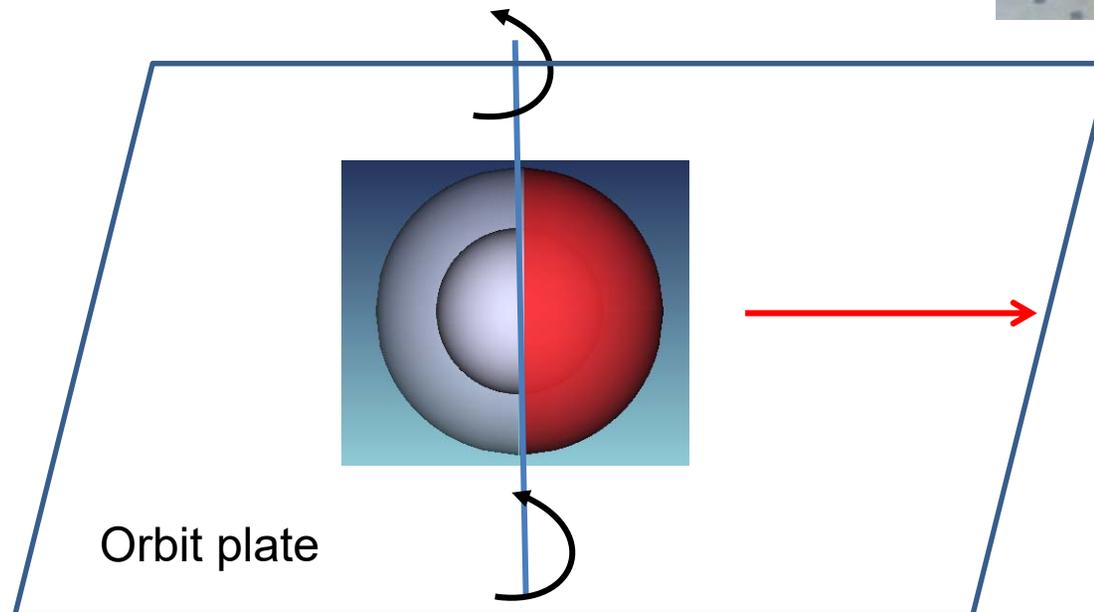


BLITS-M satellite

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The BLITS-M spacecraft is a retroreflector spherical system for the fundamental geodesic support of the GLONASS system

BLITS-M consists of a spherical lens and two meniscus, one of which has an interference mirror coating.

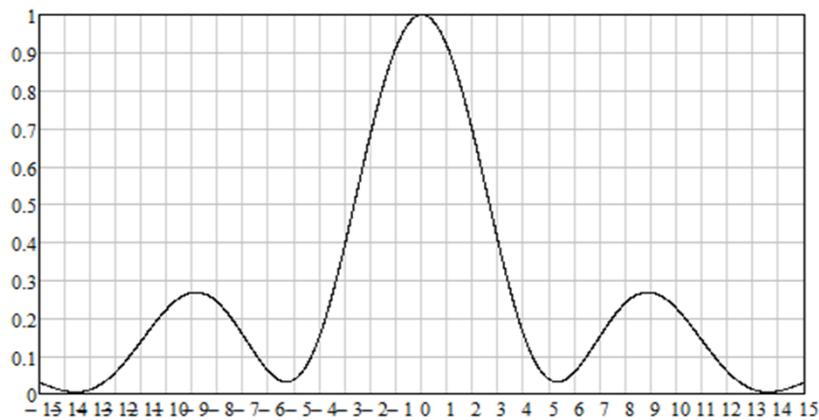
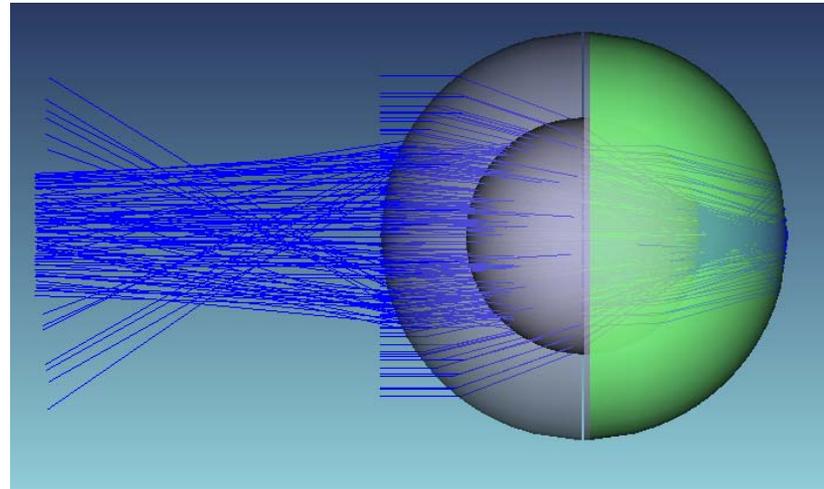




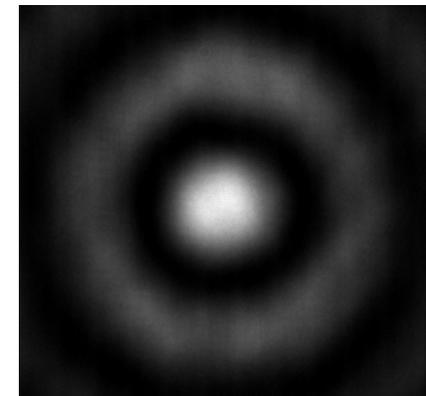
Far-field diffraction pattern of BLITS-M

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Ray tracing



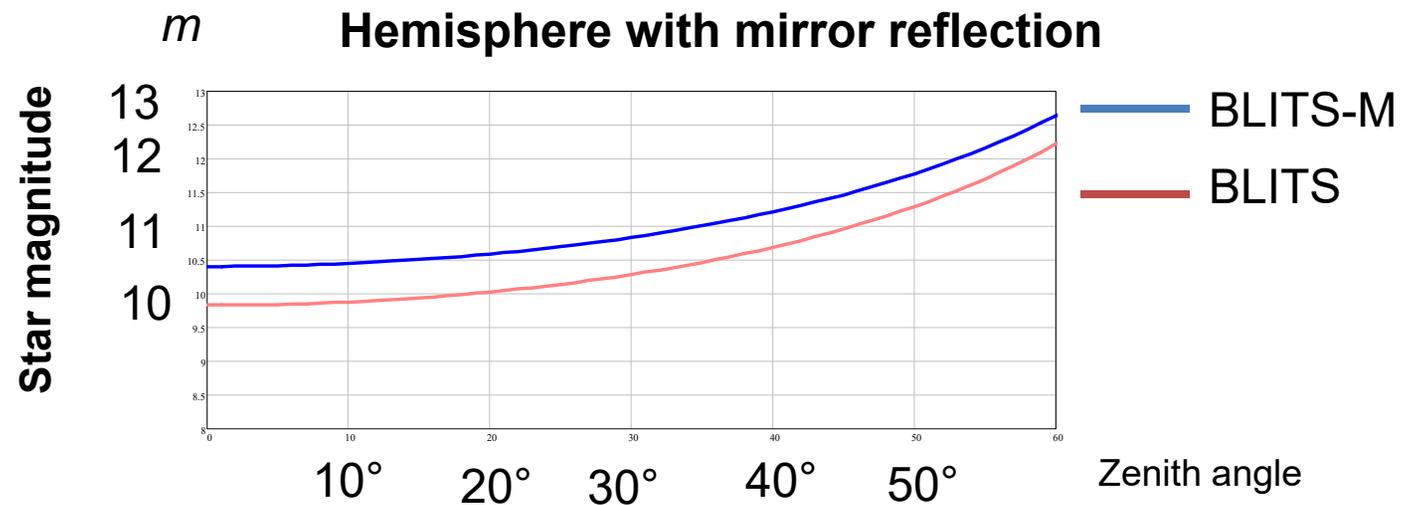
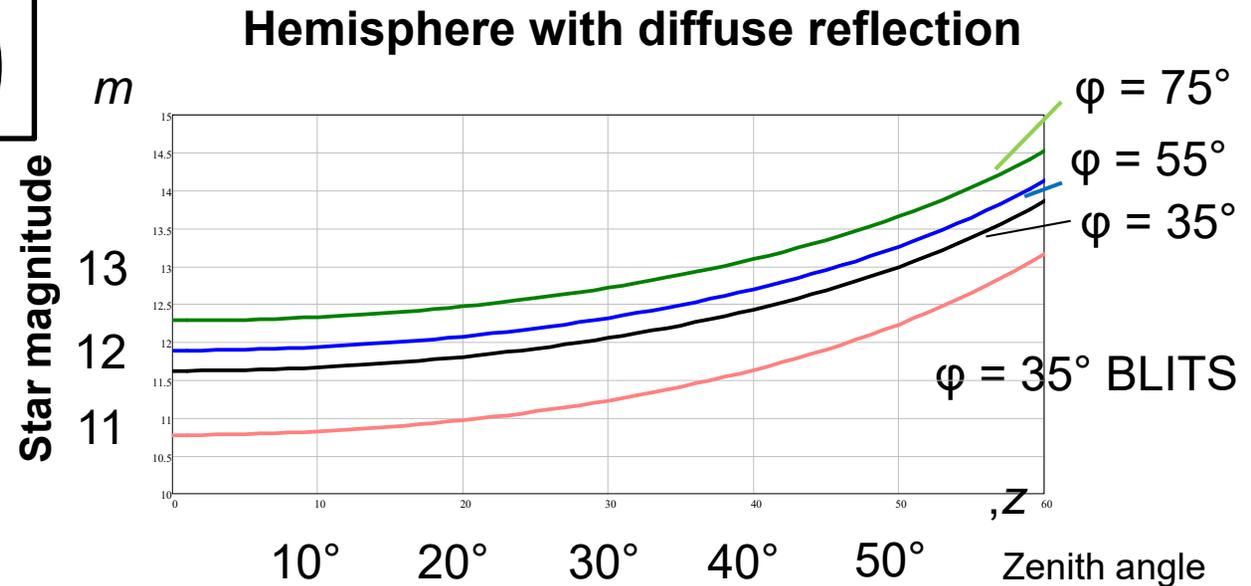
2 4 6 8 10 arc second





Calculation of star magnitude taking into account orbital altitude (850 km and 1500 km)

$$m = m_0 - 2.512 \lg \left(\frac{E}{E_0} \right)$$





Star magnitude of BLITS

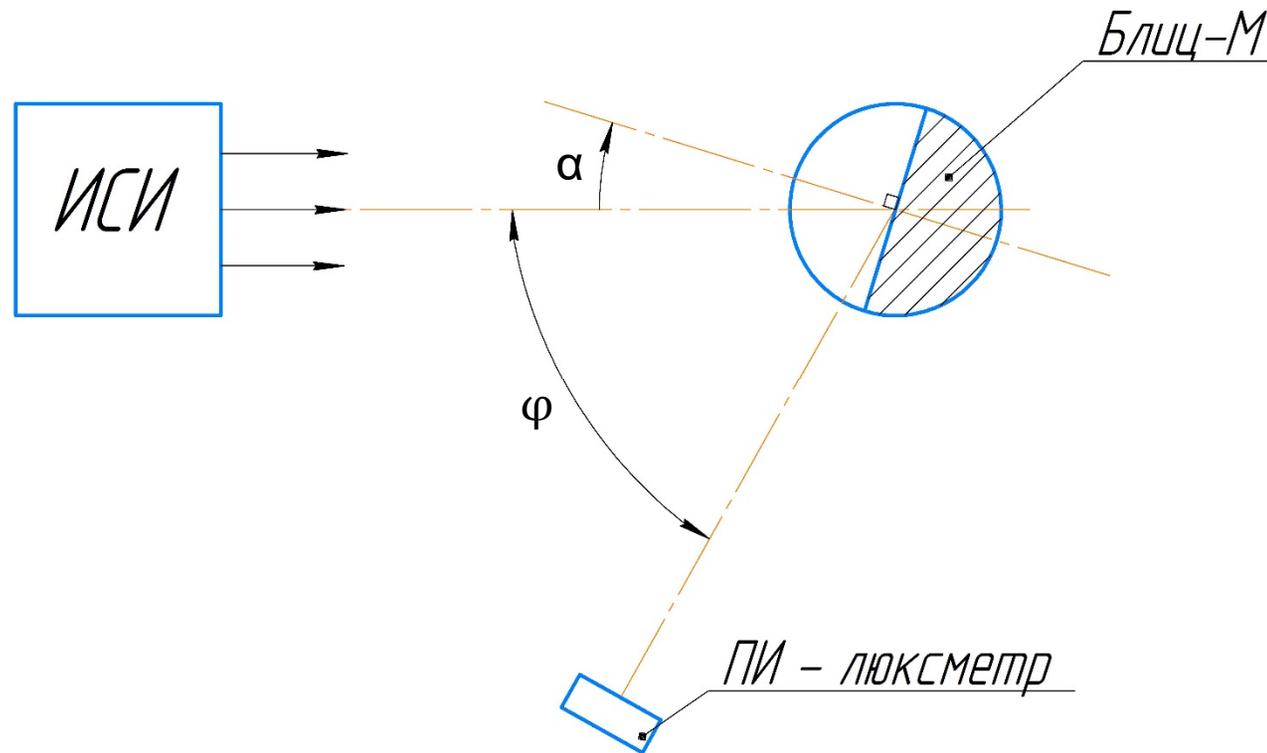


Time



Measurement scheme of star magnitude

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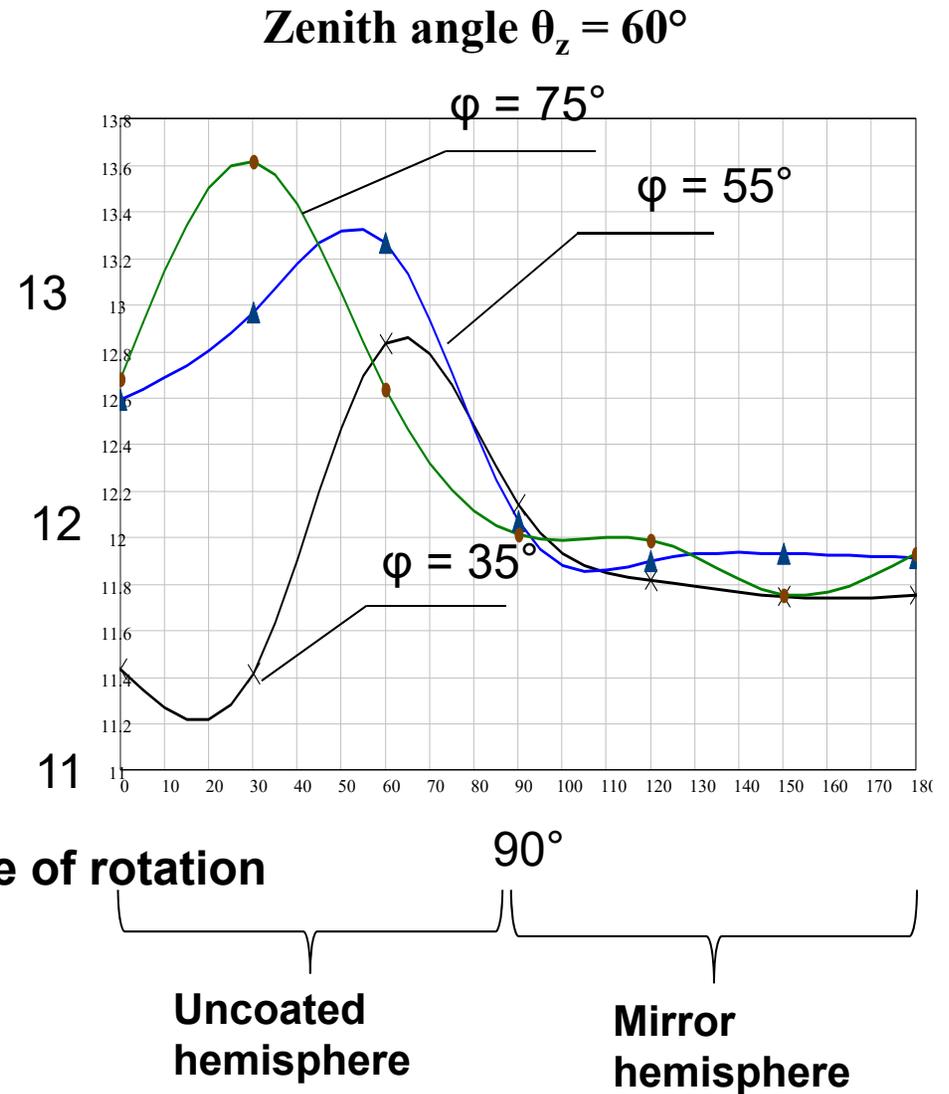
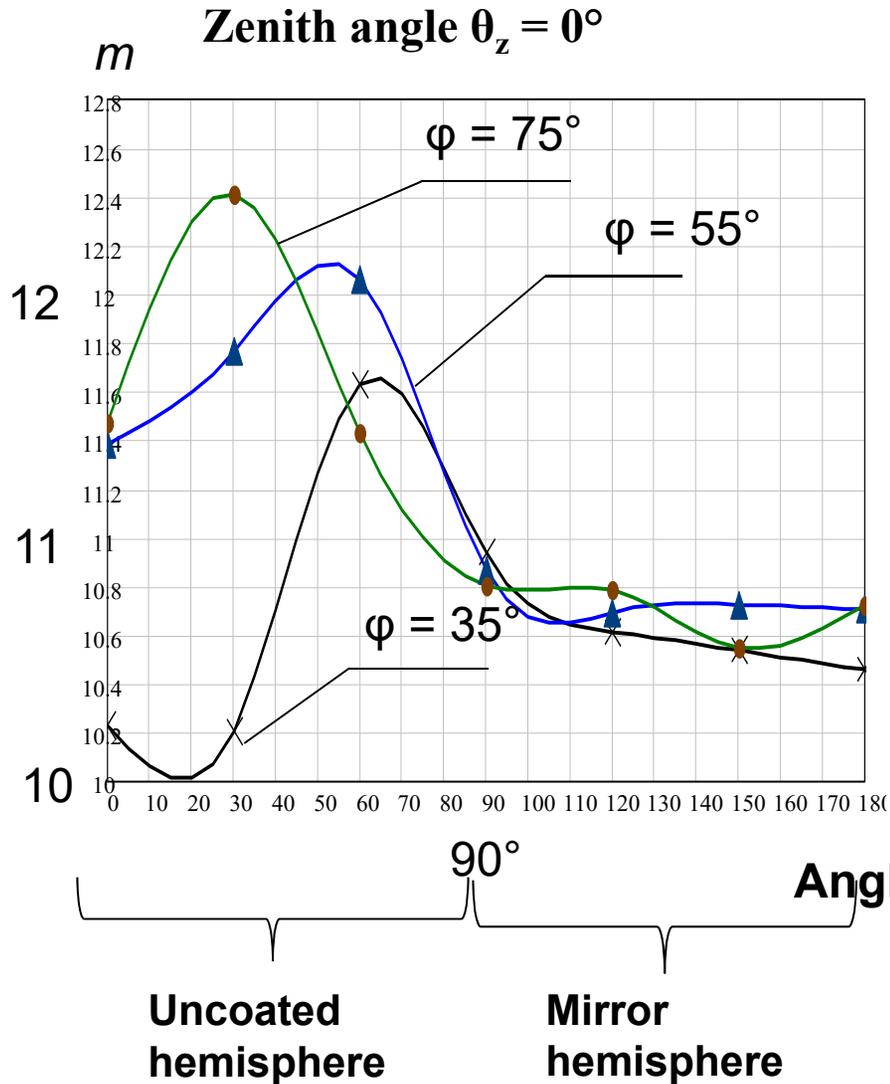
ИСИ – solar simulator; ПИ – radiation receiver (luxmeter); φ – phase angle; α – the angle of rotation of the object, defined between the normal to the interface and the direction to the ИСИ.



Results of laboratory measurements of star magnitude of BLITS

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Star magnitude



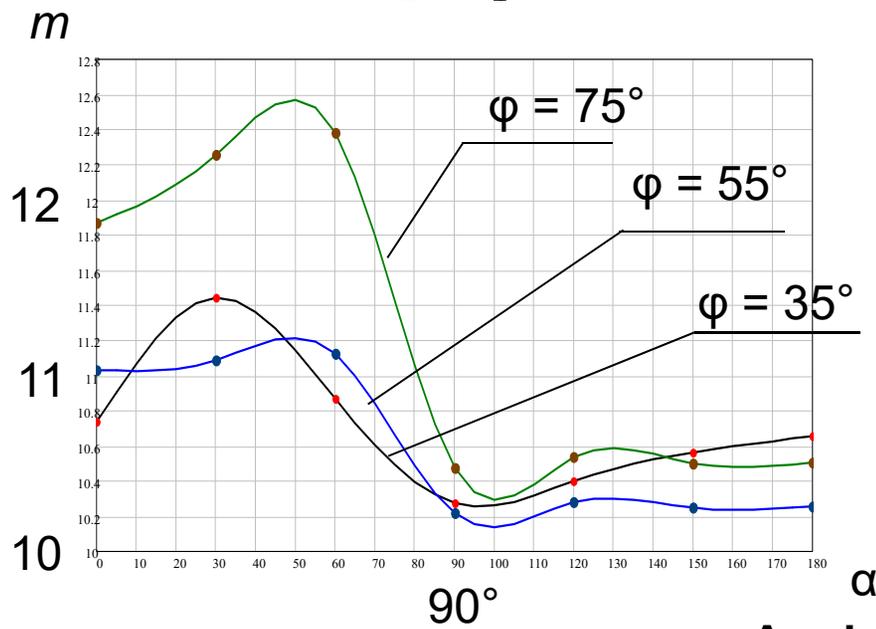


Results of laboratory measurements of star magnitude of BLITS-M

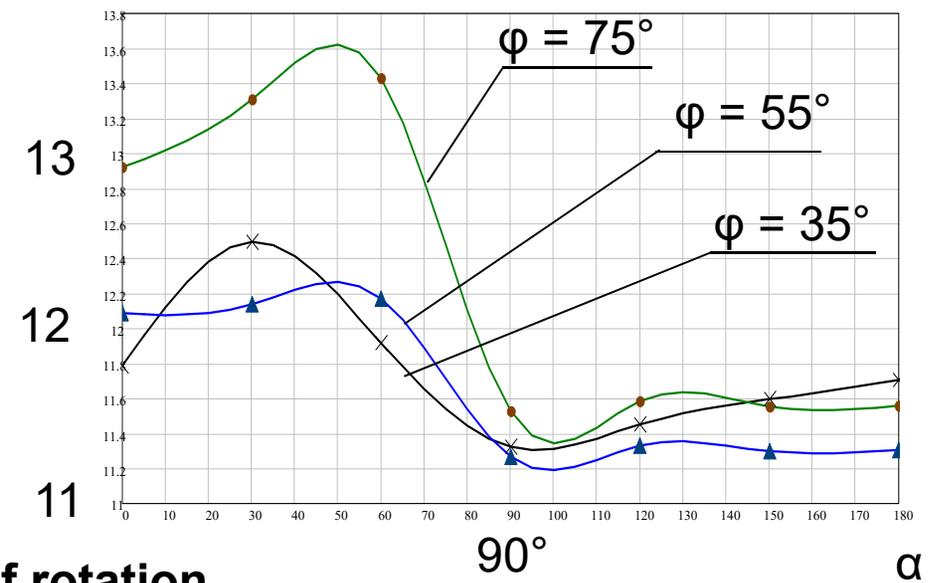
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Star magnitude

Zenith angle $\theta_z = 0^\circ$



Zenith angle $\theta_z = 60^\circ$



Uncoated hemisphere

Mirror hemisphere

Uncoated hemisphere

Mirror hemisphere



1. The star magnitude at the point of observation, due to the reflection of solar radiation from the hemisphere with an interference mirror coating, does not depend on the phase angle and the rotation of the satellite around its axis. The range of magnitude, depending on the zenith angle, is from $10,5^m$ to $11,5^m$.
2. The star magnitude at the observation point, due to the incidence of solar radiation on the transmissive (uncoated) hemisphere, depends on the phase angle and the rotation angle of the satellite around its axis. The magnitude in this case varies from $10,8^m$ to $12,6^m$ at zenith angle $z = 0^\circ$ and from $11,8^m$ to $13,8^m$ at $z = 60^\circ$.

As a result, we expect that there will be no major problems with the detection of the BLITS-M.



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Thank you for your attention!



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