Keldysh Institute of Applied Mathematics of Russian Academy of Sciences

2. The results of scientific research on completed space missions obtained by Russian scientists in 2014-2015

Small spacecraft MKA-FKI (PN2)

Execution of trajectory and flight navigation support for small spacecraft for fundamental space research (MKA-FKI) MKA-FKI (PN2). 8 July, 2014 from Baikonur was launched Soyuz-2.1b rocket with booster “Fregat” and spacecraft **RELEK**, developed by NPO SA Lavochkin. Spacecraft was launched into sun-synchronous orbit (Fig. 1).

This small spacecraft designed to study high-altitude electrical discharges, and atmospheric phenomena. On board of spacecraft was installed scientific instruments designed by the Skobeltsyn Institute of Nuclear Physics MSU and PN Lebedev Physics Institute of RAS.

KIAM was served ballistics navigation support: processing of airborne and ground-based trajectory measurements, the determination and prediction of spacecraft motion parameters, calculation of target designation to ground command-measurement point in Bear lakes, ballistic calculation of solid teams. On board the MKA-FKI (PN2) was installed navigation equipment development OJSC “MKB “Kompas”. Radio engineering coherent measurement of slant range for the MKA-FKI (PN2) received by IPM by stations located near Bear Lakes.

On 4 December, 2014 at the RAS Council on Space decided to rename MKA-FKI (PN2) to “Vernov” in honor of outstading soviet scientist S. Vernov. Unfortunately, 10 December 2014 communication with the spacecraft has been lost.

KIAM's methods and algorithms to determine and predict motion parameters for airborne and ground-based trajectory measurements allow for the forecast of the spacecraft for one day with an accuracy of 5 m in the radial direction and normal to the plane of the orbit, as well as 90 m transversal. The proposed methods and algorithms will be used for high-precision determination of the motion prediction and scientific satellites for Earth remote sensing.

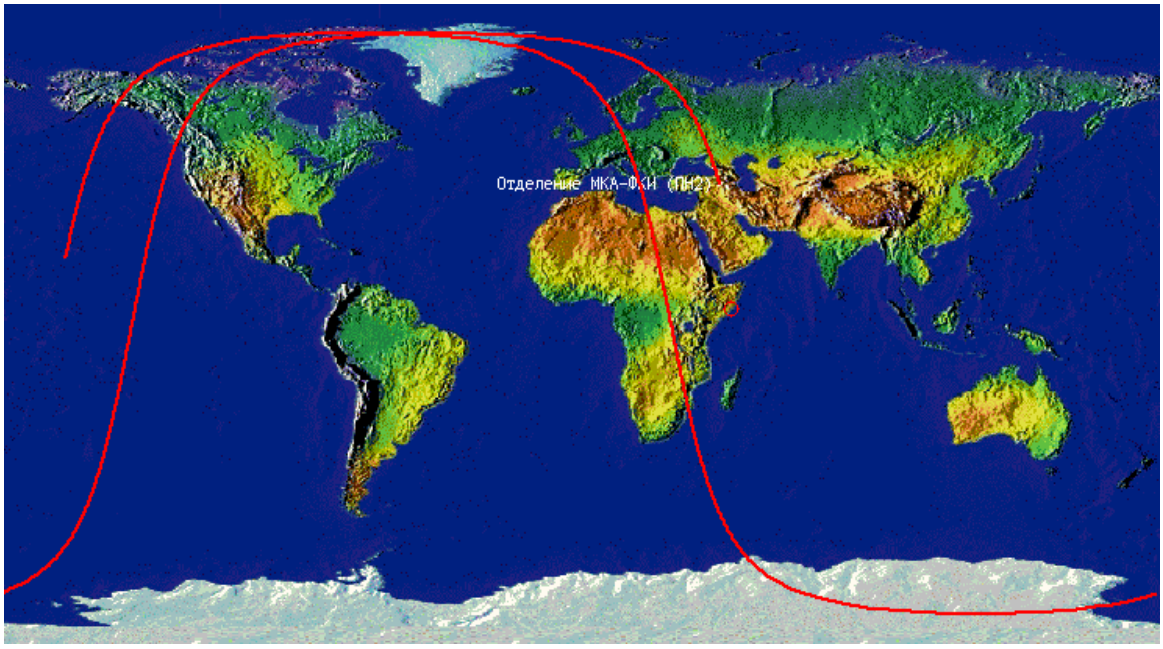

Fig.1. The "MKA-FKI PN2" trajectory

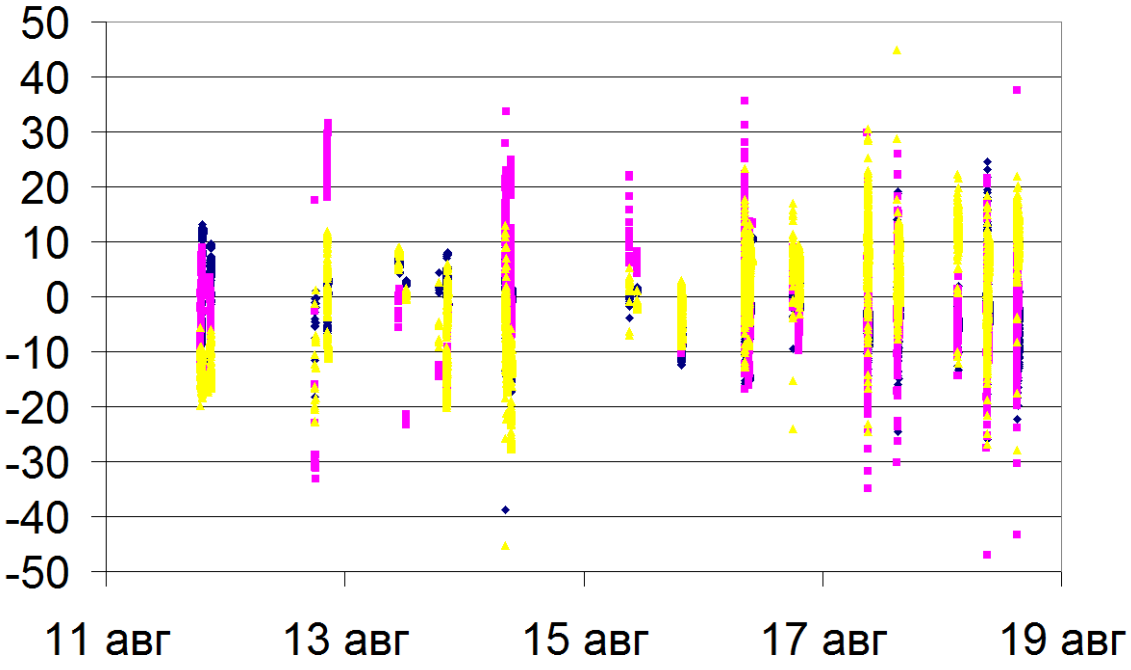

Fig.2. Residual discrepancies on the components of the vector position, m

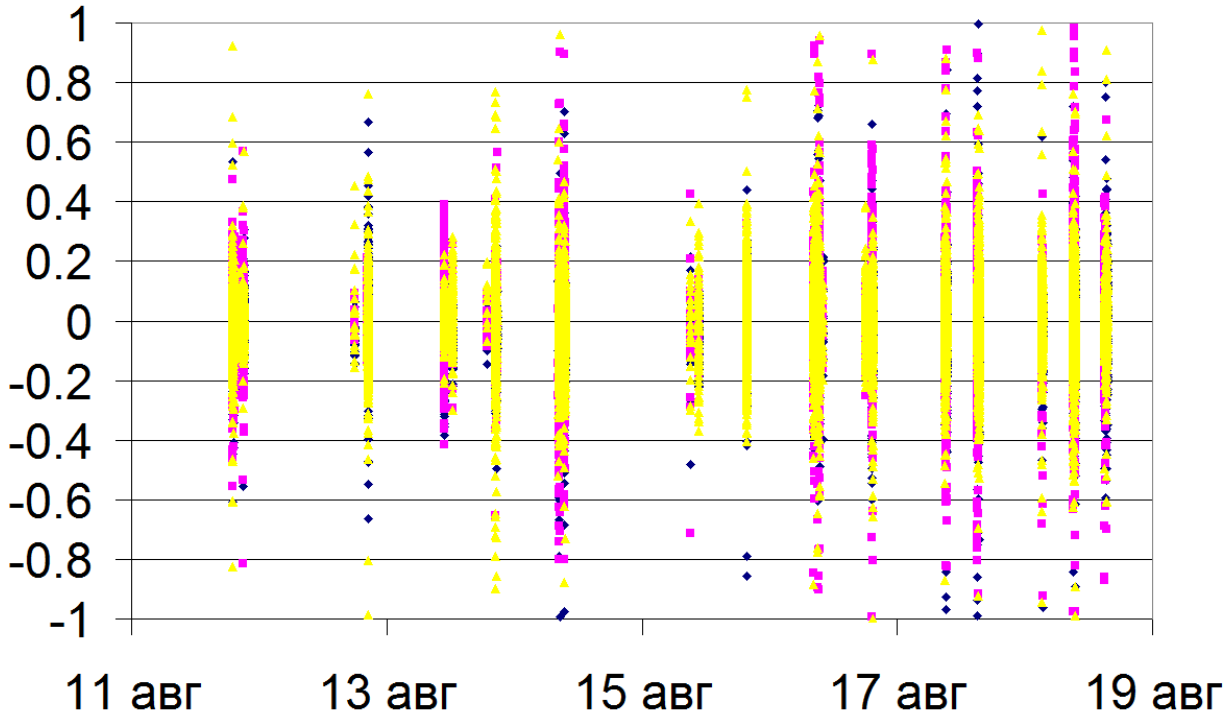

Fig.3. Residual discrepancies on the components of the velocity vector position, m/s

The results of the work published in: http://www.kiam1.rssi.ru/index.php?id=prj&cnt=mka.