

SPACE SYSTEMS SYMPOSIUM (D1)
System Engineering - Methods, Processes and Tools (2) (6)

Author: Ms. Tatyana V. Labutkina
Dnepropetrovsk National University named after Oles' Gonchar, Ukraine, tvlabut@ukr.net

Prof. Olexandr Petrenko
Dnipropetrovsk National University, Ukraine, dnu.petrenko@gmail.com

Mr. Vladimir Belikov
Dniepropetrovsk National University, Ukraine, vvbel@ukr.net

Mr. Dmitriy Pestov
Dnipropetrovsk National University named after Oles Gonchar, Ukraine, tvlabut@ukr.net

KINEMATIC MODELS OF COMMUNICATION LINES "SPACE VEHICLE –SPACE VEHICLE" AND
"SPACE VEHICLE – SURFACE STATION – SPACE VEHICLE" FOR DESIGNING SATELLITE
SYSTEMS

Abstract

Promising are satellite systems with inter-satellite communication lines (including those between satellites on orbits of different heights). Designing of such systems includes analysis of current kinematic parameters of communication lines "vehicle-vehicle", "surface station-vehicle" at different locations of the communicating objects at the initiation of communication. These parameters are distance between communicating objects and directions of communication lines.

At the stages of designing of satellite systems usage of generalized mathematical models can be useful. Such models have been developed for analysis of kinematics of lines "spacecraft-spacecraft" and "surface station-spacecraft".

In modeling the line "spacecraft-spacecraft" the angle between their orbital planes is calculated. For the set initial locations of the vehicles relative to the crossing line of their orbital planes, change of location of one of them is determined, required kinematic parameters are determined.

In modeling the line "surface station-spacecraft" the orbital segment above the local horizon of a surface station and its location relative to the surface station are determined. Change of location of the spacecraft on the visible part of its orbit is modeled, the required kinematic parameters are determined.

The proposed models are the foundation of the model of a joint line "surface station-spacecraft" to "spacecraft-spacecraft".

With the use of the proposed models perspective concepts of satellite communication networks have been investigated.