

***9th US/Russian
Space Surveillance Workshop***

*Krestovaya Pad
Listvyanka, Russia*

27-30 August 2012

P. Kenneth Seidelmann
General Chair

Kyle T. Alfriend
US Chair

Stanislav Veniaminov
Russian Chair

9th US/Russian Space Surveillance Workshop

Development of a More Complete Catalog

Over the past 18 years, a series of eight Space Surveillance Workshops have been held between the US and Russia. These have focused on sharing information about how each nation has undertaken the task of space surveillance. We have all gained great insight and appreciation of how each has approached the same basic problem of satellite observation, cataloging, and characterization.

In this workshop we focus on the challenge posed by what are known as “cube sats”. These satellites are typically 10 cm or smaller in size and have become increasingly popular for experimenters because of the opportunity for an inexpensive ride share launch. Because of their small size, such satellites may not be readily tracked and cataloged.

Areas of discussion include:

1. Tracking and characterization.
2. Early orbit determination and UCT processing.
3. Cataloging and catalog maintenance.

SCHEDULE

Monday, 27 August

09:00 - 09:30 Opening Remarks
09:30 - 12:50 Session 1
12:50 - 14:00 Lunch
14:00 - 17:10 Session 2
18:00 - Reception

Tuesday, 28 August

09:00 - 12:10 Session 3
12:10 - 12:50 Session 4
12:50 - 14:00 Lunch
14:00 - 16:00 Session 4
16:00 Excursion: Visit to the ISTPh site

Wednesday, 29 August

09:00 - 12:50 Session 5
12:50 - 14:00 Lunch
14:00 - Excursion

Thursday, 30 August

09:00 - 12:10 Session 6
12:10 - 12:50 Session 7
12:50 - 14:00 Lunch
14:00 - 16:00 Session 7 (cont)
16:00 - 17:00 Closing Remarks
18:00 - Closing Banquet

Opening Remarks

Stanislav Veniaminov, Russia Chair

Terry Alfriend - US Chair

Kenneth Seidelmann, General Chair

Session 1 Optical Systems 1¹ ***9:30 - 12:20, Monday 27 August*** ***Chair Tamara Payne***

- S1.1 **Results of Quality Assessment Tasks of the Optical-Electronic Complex Using Complex Instrumentation Background and Astroclimatic Conditions**
D.S. Chirov and V.M. Grigoroshenko
- S1.2 **Optical Surveys for Space Debris in MEO**
T. Schildknecht, A. Vananti, J. Herzog, A. Hinze, H. Krag, T. Flohrer
- S1.3 **On the Problems of Wide Field Image Processing**
I. S. Guseva
- S1.4 **Towards Solving the Asteroid/Comet Impact Hazard Problem: Necessity of Implementation in the (Inter)National Space Situation Awareness**
B. Shustov
- S1.5 **50th Anniversary of Russian Space Surveillance System**
A.I. Nazarenko

Session 2 Orbit Determination and Prediction 1 ***14:00 – 17:10, Monday 27 August*** ***Chair Ryan Russell***

- S2.1 **Guaranteed Approach for Orbit Determination With Limited Error Measurements**
Z. N. Khutorovsky, A.S. Samotokhin, S. A. Sukhanov and K.T. Alfriend
- S2.2 **Bounds on Range and Range Rate for Optical Tracking of Satellites**
P.W. Schumacher
- S2.3 **Comparison of Various Approaches for Reentry Prediction**
A.I. Nazarenko and V.S. Yurasov

¹ Presenter name is in bold

S2.4 **Radar Measurement Errors and Small Debris Density Effects on Orbit Prediction**
D.W. Walsh

Session 3 ***Space Surveillance Systems Support 1***
09:00 - 12:20, Tuesday 28 August
Chair ***D. Chirov***

S3.1 **On the Incorrectness of Application of the Fourier Harmonic Analysis for Revealing Latent Periodicities in Signals and Processes and On a Widespread Delusion While Analyzing Optical and Radar Signatures**
O. Aksenov and S. Veniaminov

S3.2 **Density Variations During the Entire Space Age as Determined From Satellite Drag Measurements**
S. H. Knowles

S3.3 **Implementation of Real-Time Monitoring and Warning of Near-Earth Space Dangerous Events by Roscosmos**
I. Oleynikov and V. Ivanov

S3.4 **Tracking of Phobos-Grunt Mission in Low Earth Orbit**
A.S. Samotokhin, A. G. Tuchin, S.A. Sukhanov, Z.N. Khutorovsky and A.V. Rykin

Session 4 ***Optical Systems 2***
12:10 – 16:30, Tuesday 28 August
Chair ***T. Schildknecht***

S4.1 **Space Object Observation Using Optical Sensors within the SPIRIT/CORONAS-F and THESIS/CORONAS-PHOTON Experiments**
S.V. Kuzin, A.S. Ulyanov, S.V. Shestov, S.A. Bogachev, G.F. Karabadjak

S4.2 **Analytical Analysis of Photometry of Three-axis Stabilized Geosynchronous Satellites**
T.E. Payne and N.T.Shine

S4.3 **Altay Optic-laser Center Capability to Satellites Emergencies Estimation**
V. P. Aleshin, E.A. Grishin, V.D. Shargorodsky, D.D. Novgorodtsev

S4.4 **Barrier Detection of Celestial Bodies**

S.E. Zdor, **V.I. Kolin'ko** and V.I. Yatskevich

Session 5 Small Objects & Collision/Conjunction Assessment
9:00 - 11:40, Wednesday 29 August
Chair Z. Khutorovsky

- S5.1 **Collision Probability for Space Objects with Non-Gaussian Uncertainty Distributions**
V, Vittaldev and **R.P. Russell**
- S5.2 **On Smaller Debris of Orbital Collisions**
S.A. Meshcheryakov
- S5.3 **The CubeSat Challenge: A Review of CubeSat Dependencies and Requirements for Space Tracking Systems**
D.D. Garber
- S5.4 **Model Study of the Possibilities of Space Debris Cataloging**
A. I. Nazarenko
- S5.5 **Methods and Algorithms of Contour Analysis of Optical and IR Images**
V. Lavrov, R. Luchkin, O. Nemykin, M. Prokhorov, Yu. Ryndin, S. Sukhanov
- S5.6 **Observations of Near-Earth Space Objects at Sayan Observatory, Opportunities and Perspectives**
V.Tergoev, Yu. Karavaev, E. Klunko, V.Goryashin, I. Korobtsev, M. Mishina, T. Tsukker, M. Esclevich ,

Session 6 Space Surveillance Systems Support 2
9:00 - 12:10, Thursday 30 August
Chair A. Nazarenko

- S6.1 **UTC Timekeeping in the Future**
P.K. Seidelmann and J. H. Seago
- S6.2 **Investigations of Radioactive Contamination of Near-Earth Space**
N. Bakhtigaraev, M. Anikeeva, K. Boyarchuk, S. Kuzin, S. Ulin, and V.Chazov
- S6.3 **Tailoring the Observation Scenarios and Data Processing Techniques for Supporting Conjunction Event Assessments**

T. Flohrer, B. Bastida Virgili, H. Krag, H. Klinkrad, K. Merz, T. Schildknecht and S. Lemmens

S6.4 **On The Issue of Predicting the Solar Activity Cycle 24 Evolution**
S.A. Yazev

Session 7 Orbit Determination and Prediction 2
12:10 - 15:20, Thursday 30 August

Chair P. Schumacher

S7.1 **Once Again on the Actuality of International Cooperation in**
Space Surveillance
A. Chervonov, S. Veniaminov, and V. Pirozhnik

S7.2 **Methods of Accounting For Environmental Effects on Operations**
of Space Surveillance and Remote Sensing by the Earth Facilities
Yu. Tretyakov and V. Treckin

S7.3 **Orbit Determination of Satellite Formations**
K.T. Alfried

Closing Remarks

Stanislav Veniaminov, Russian Chair

Terry Alfried, US Chair

Kenneth Seidelmann, General Chair