

# ROSCOSMOS Agency Report

## 36<sup>th</sup> CEOS WGCV Plenary

### 13-17 May 2013, Shanghai, China



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«Research Center for Earth Operative Monitoring»  
Joint-Stock Company «Russian Space Systems»



# PURPOSE AND MAIN TASKS OF DEVELOPING THE SYSTEM FOR GROUND-TRUTH OBSERVATIONS VALIDATION



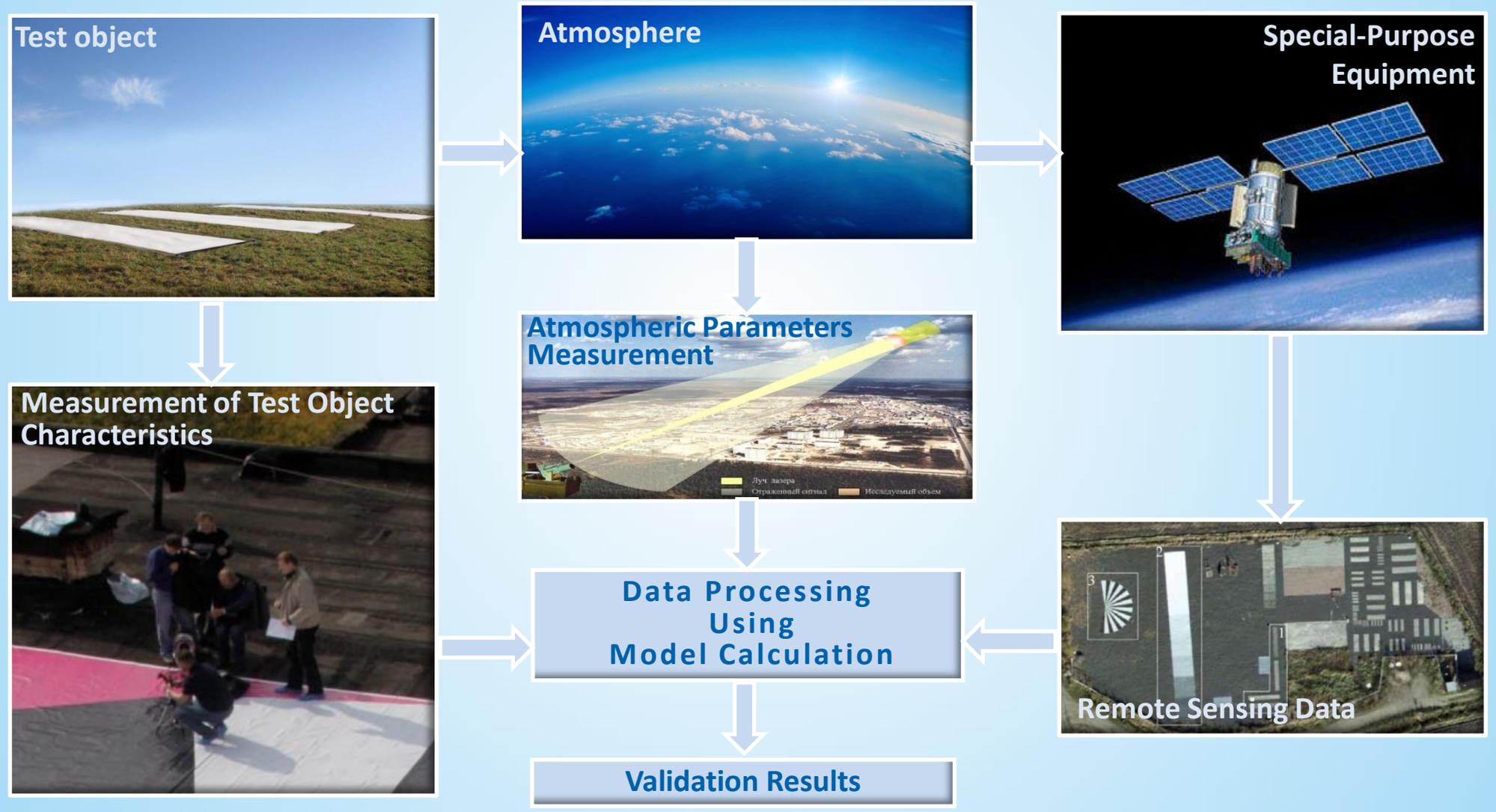
**Purpose is to improve the performance of the Earth remote sensing space complexes (RSSC)**

## Main Tasks

- **Testing of RSSC operation results compliance with the requirements imposed;**
- **In-flight monitoring of main remote sensing systems' operation stability and preparation of correcting data for their calibration and adjustment;**
- **Provision of certification for RSSC observations by different quality indicators.**



# GENERALIZED ALGORITHM OF PERFORMING THE ACTIVITIES FOR ADDRESSING VALIDATION TASKS





**Measuring Complexes**

**Test Sites**

**Methodical Base of Satellite and Ground-Based Observations**

**Hard- And Software Complex For Data Processing And Analysis**

# DETERMINATION OF SPATIAL FREQUENCY RESPONSE USING GROUND TARGET COMPLEX



Parameters determining the standardized conditions of imagery:

- Height;
- Angle of roll;
- Sun elevation;
- Test-object contrast;
- Earth' surface albedo, and etc.



Receiving Facilities

Ground-based Test Measurements



Determination of Linear Resolution on Ground

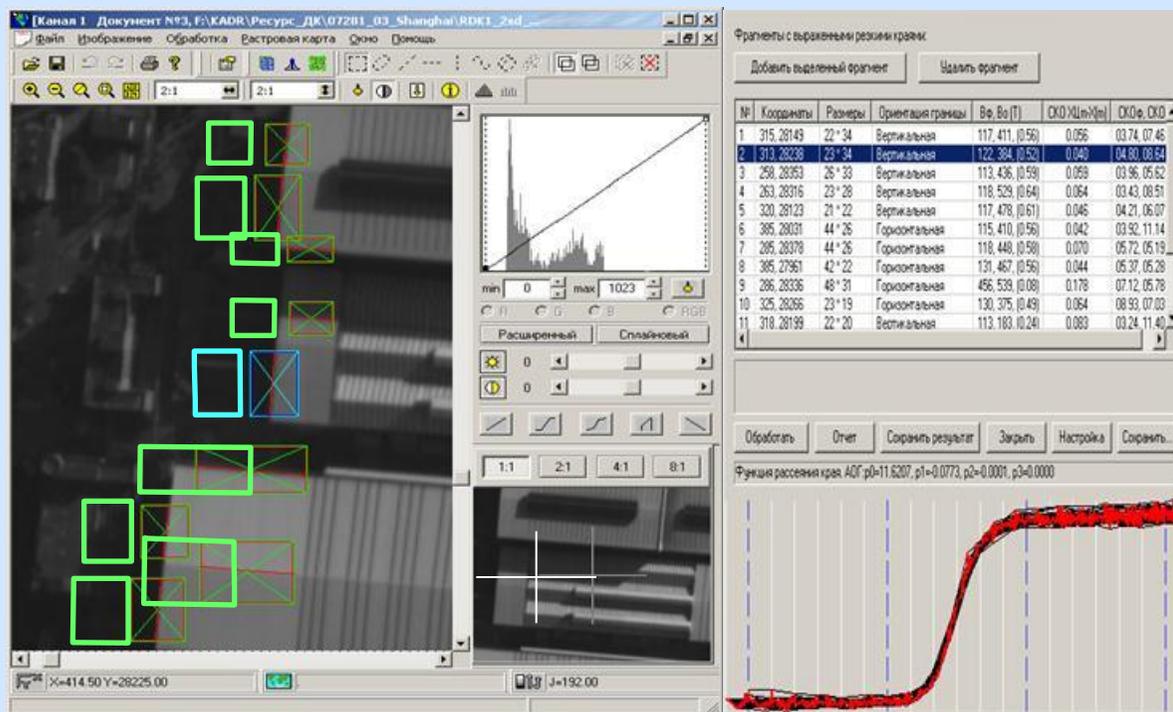
Decoding Results



# MONITORING OF SPATIAL FREQUENCY RESPONSE USING TEST-OBJECTS OF THE “SHARP EDGE” TYPE



## Automatic Search and Scanning of Test-Objects, Processing of the Results Obtained



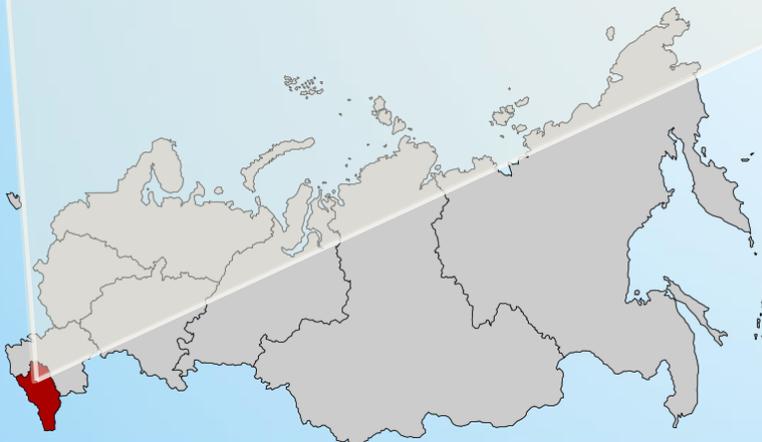
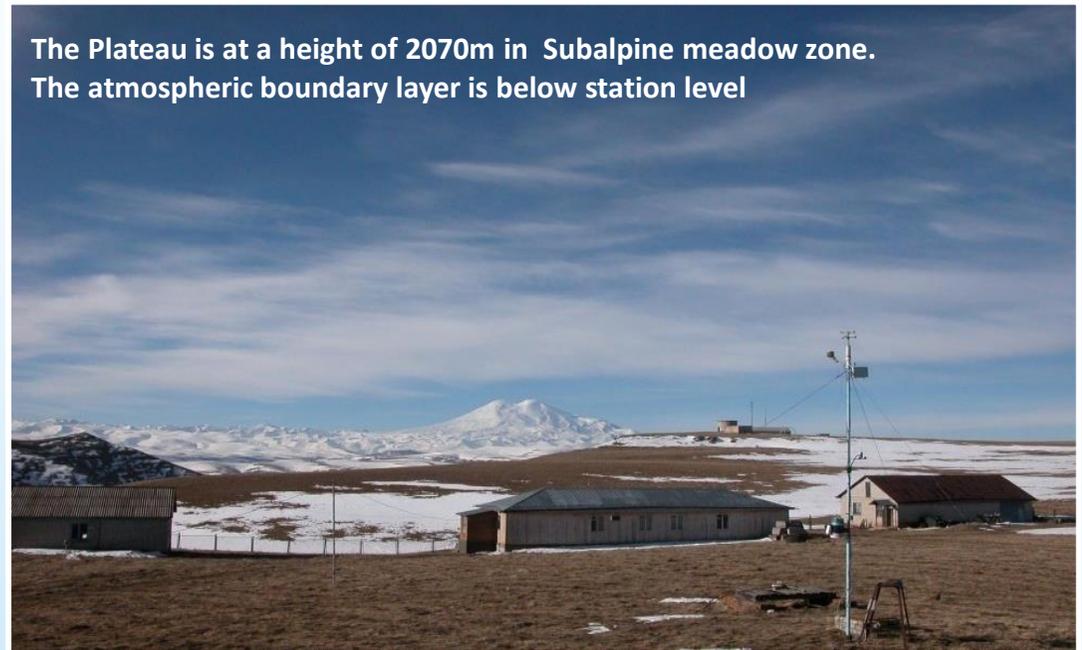
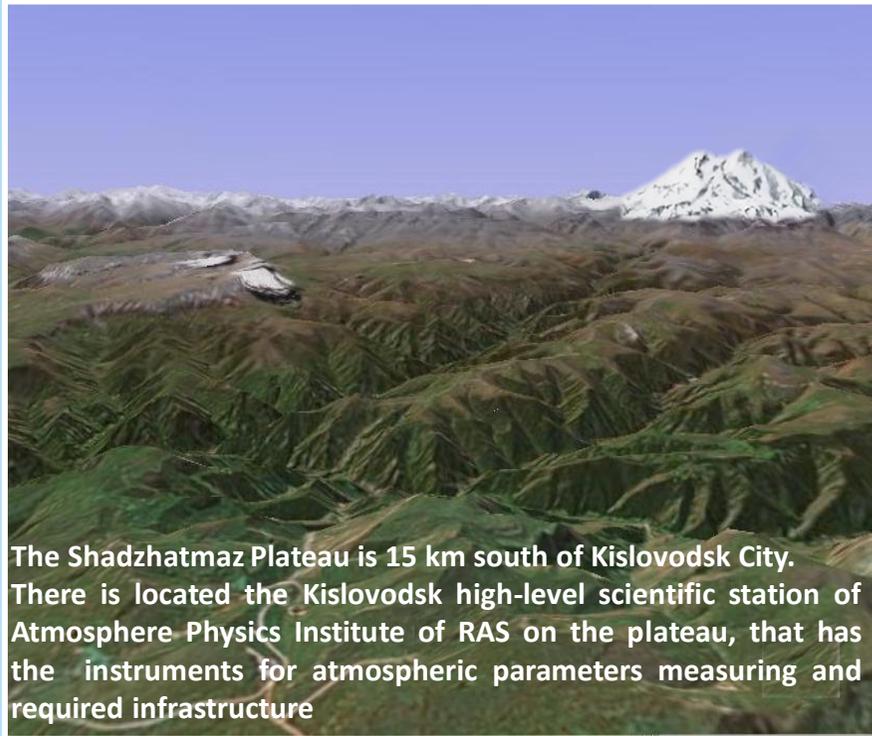
Selected areas of “sharp edge” image scanning

Summation and processing of transition functions

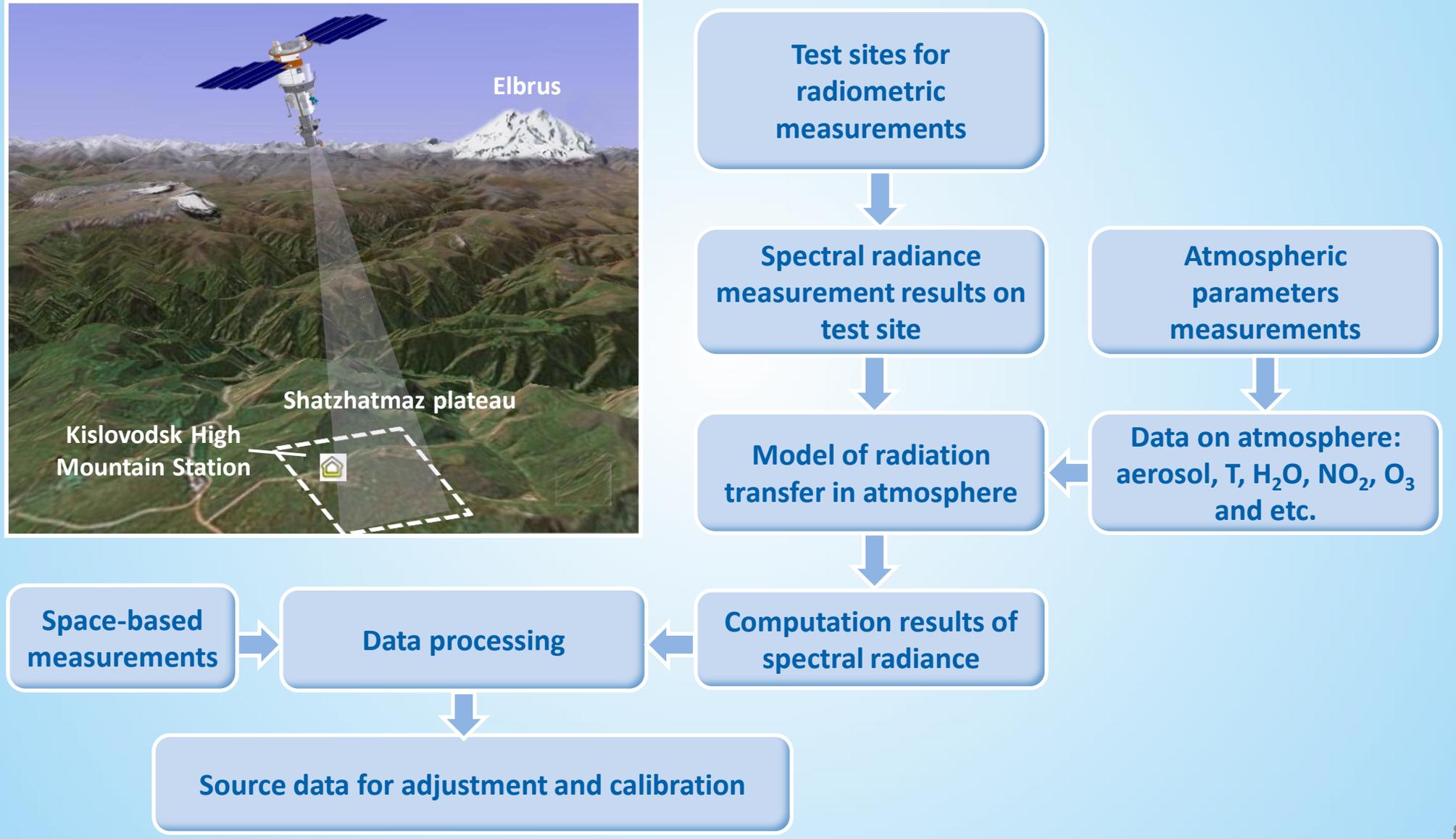
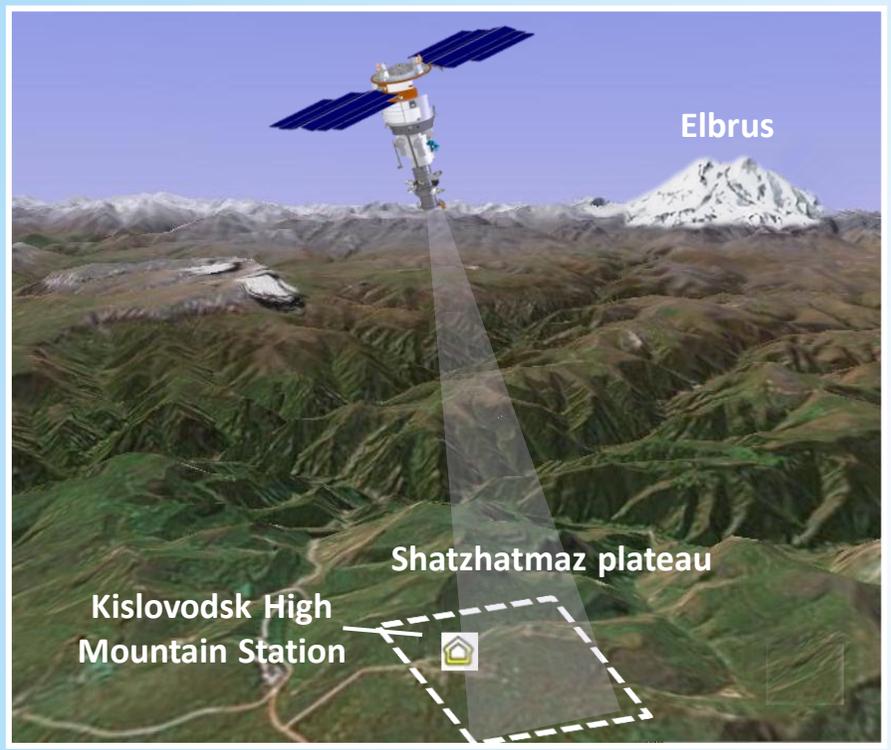
## Image Characteristics

- *The dependence of contrast transfer coefficient on spatial frequency*
- *Lighting Response*
- *Image noise level and signal-to-noise ratio at the given spatial frequency*
- *Linear resolution on ground etc.*

# HIGH-LEVEL TEST SITE FOR MONITORING RADIOMETRIC CHARACTERISTICS OF VISIBLE AND NEAR IR RSSC TARGET EQUIPMENT



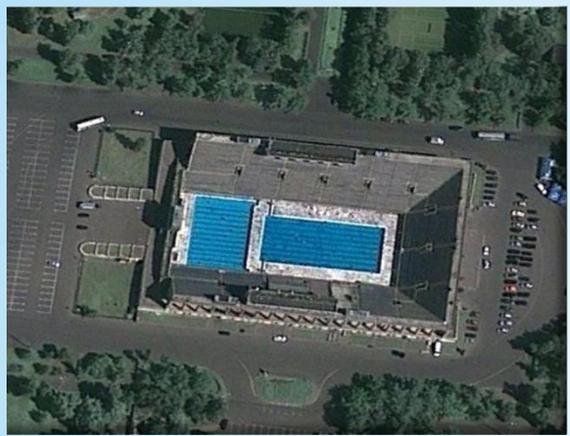
# HIGH-LEVEL TEST SITE FOR MONITORING RADIOMETRIC CHARACTERISTICS OF VISIBLE AND NEAR IR RSSC TARGET EQUIPMENT



# MOSCOW TEST SITE



# MOSCOW TEST SITE



# Portable pneumatic radial test-object



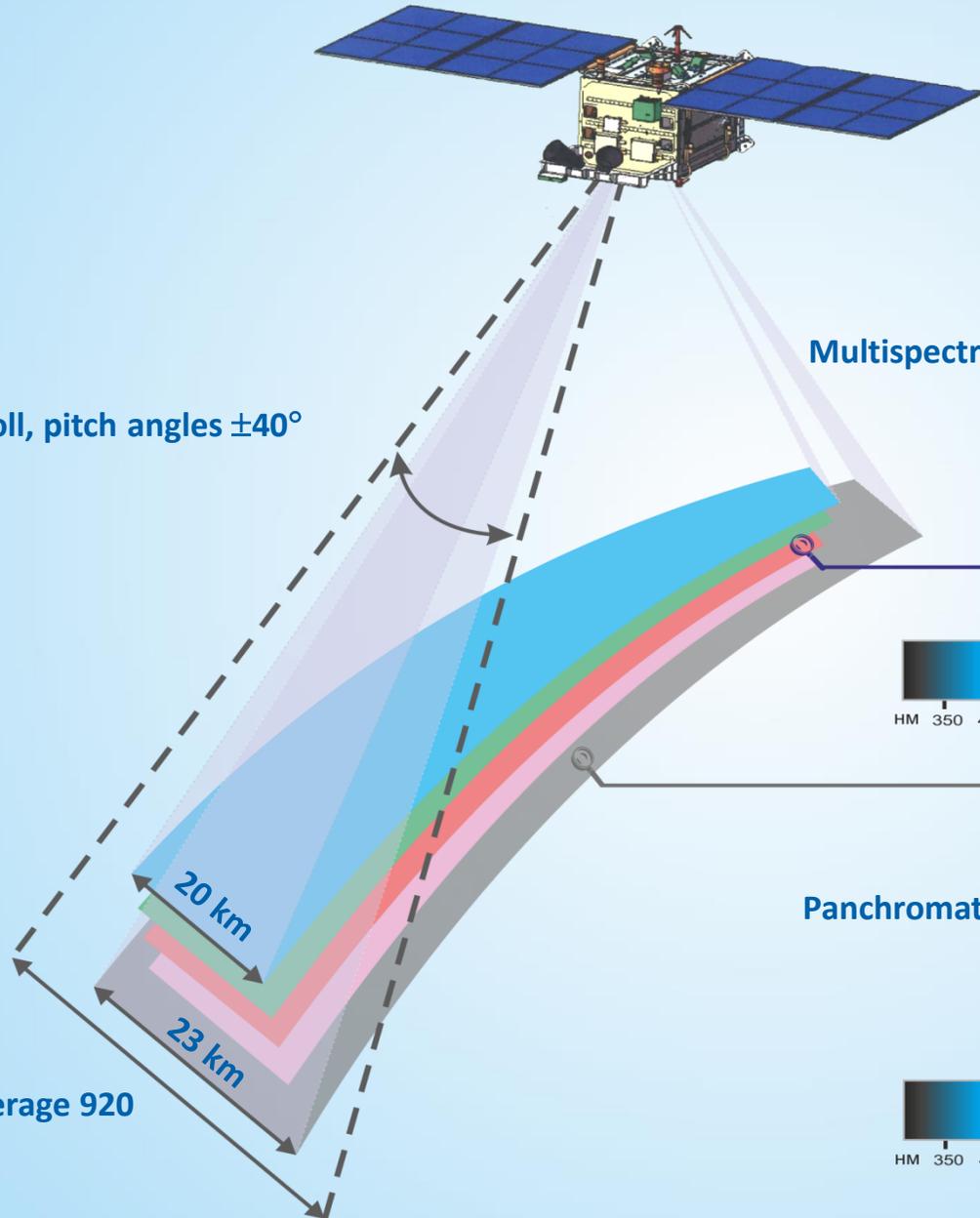
# Kanopus-V №1

Launch date: 2012

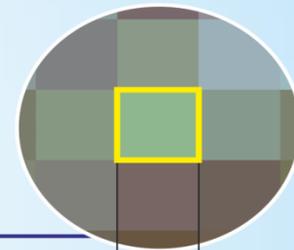
Orbit: Sun-synchronous  
H=510 km

Max roll, pitch angles  $\pm 40^\circ$

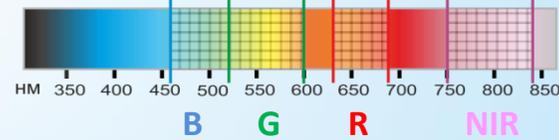
Swath coverage 920 km



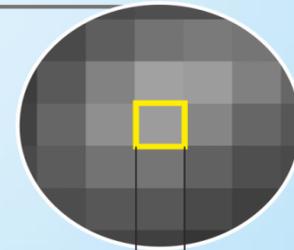
Multispectral Imaging System



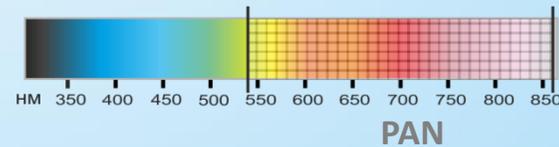
12 m



Panchromatic Imaging System



2,7 m



# Resurs-P

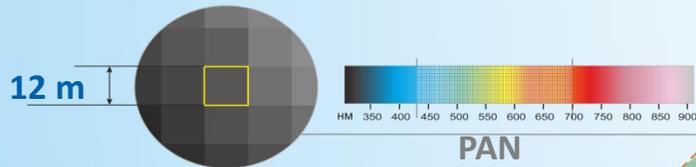
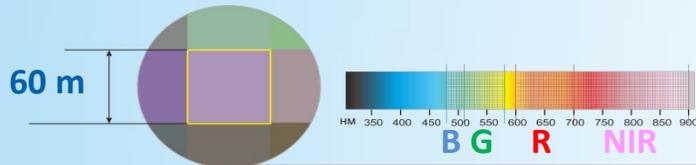
Launch date : 2013

Orbit: Sun-synchronous  
H=475 km

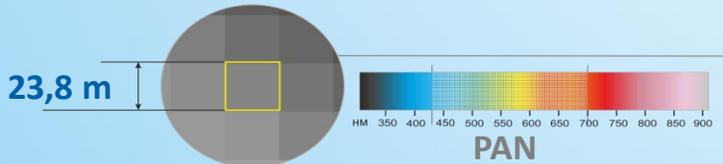
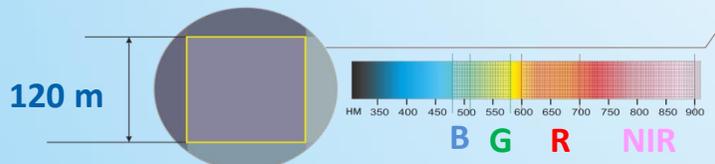
Swath coverage 950 km

Wide-swath imaging

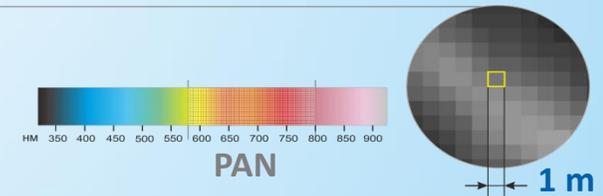
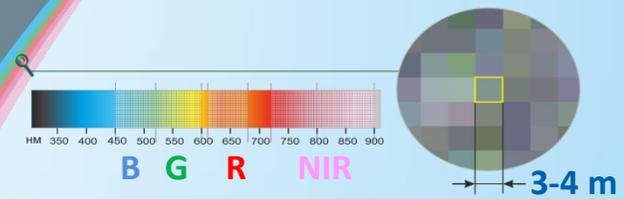
High resolution



Medium resolution



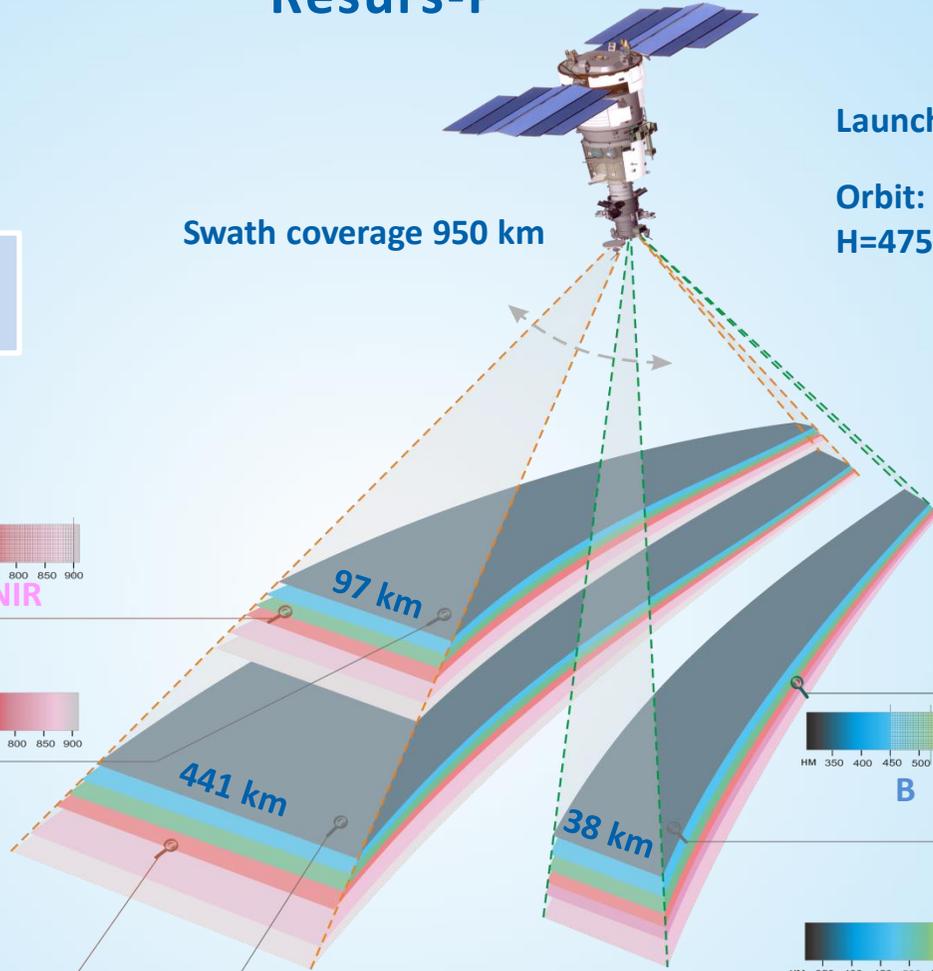
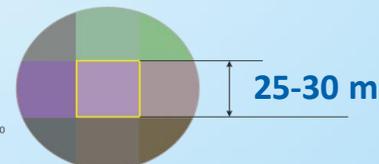
High resolution imaging



Hyperspectral imaging

Swath width 25 km

96 spectral ranges  
Spectral resolution 5-10 nm



# Obzor-O constellation

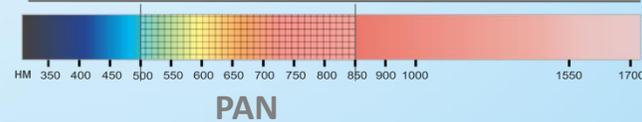
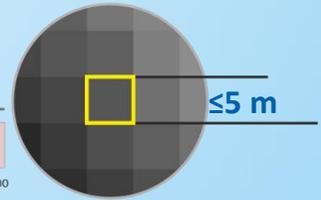
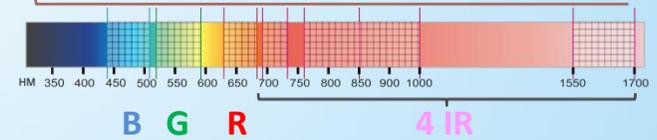
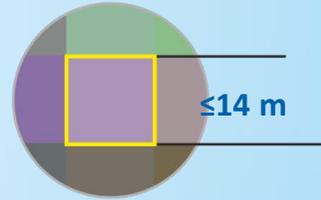
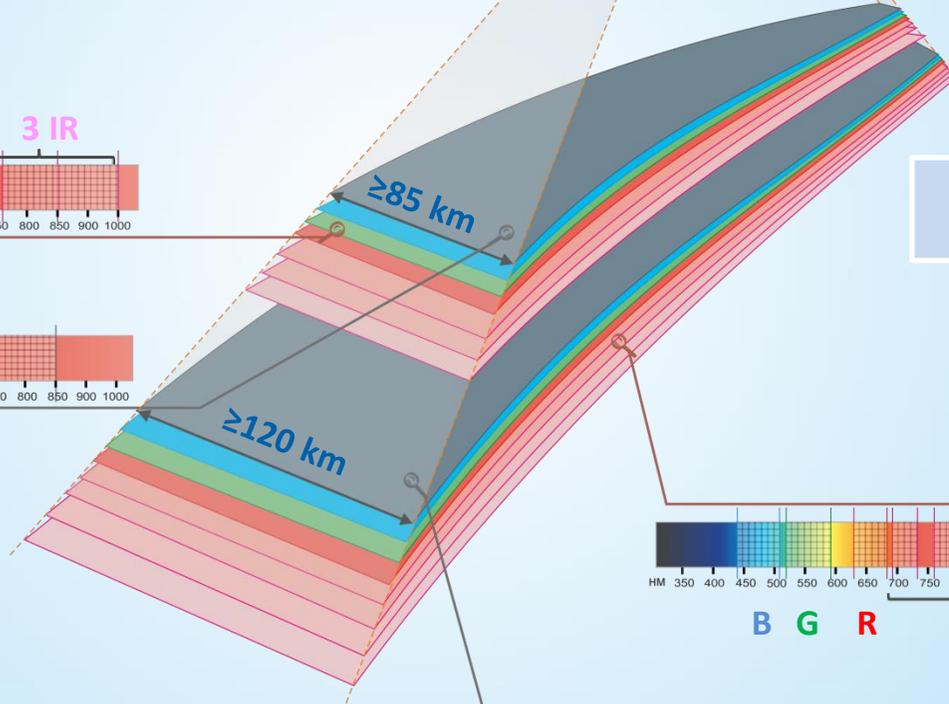
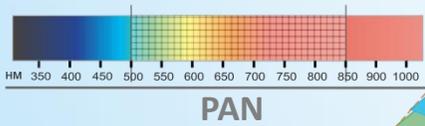
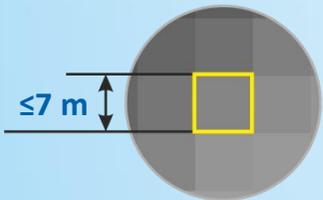
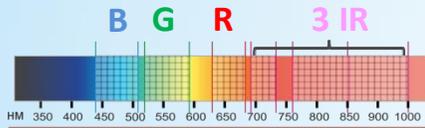
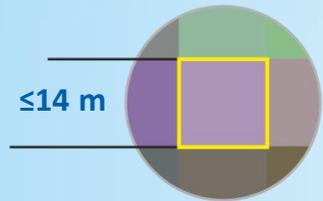


Launch date :  
 1 phase – 2015, 2017  
 2 phase – 2018, 2019

Orbit: Sun-synchronous  
 H=700 km

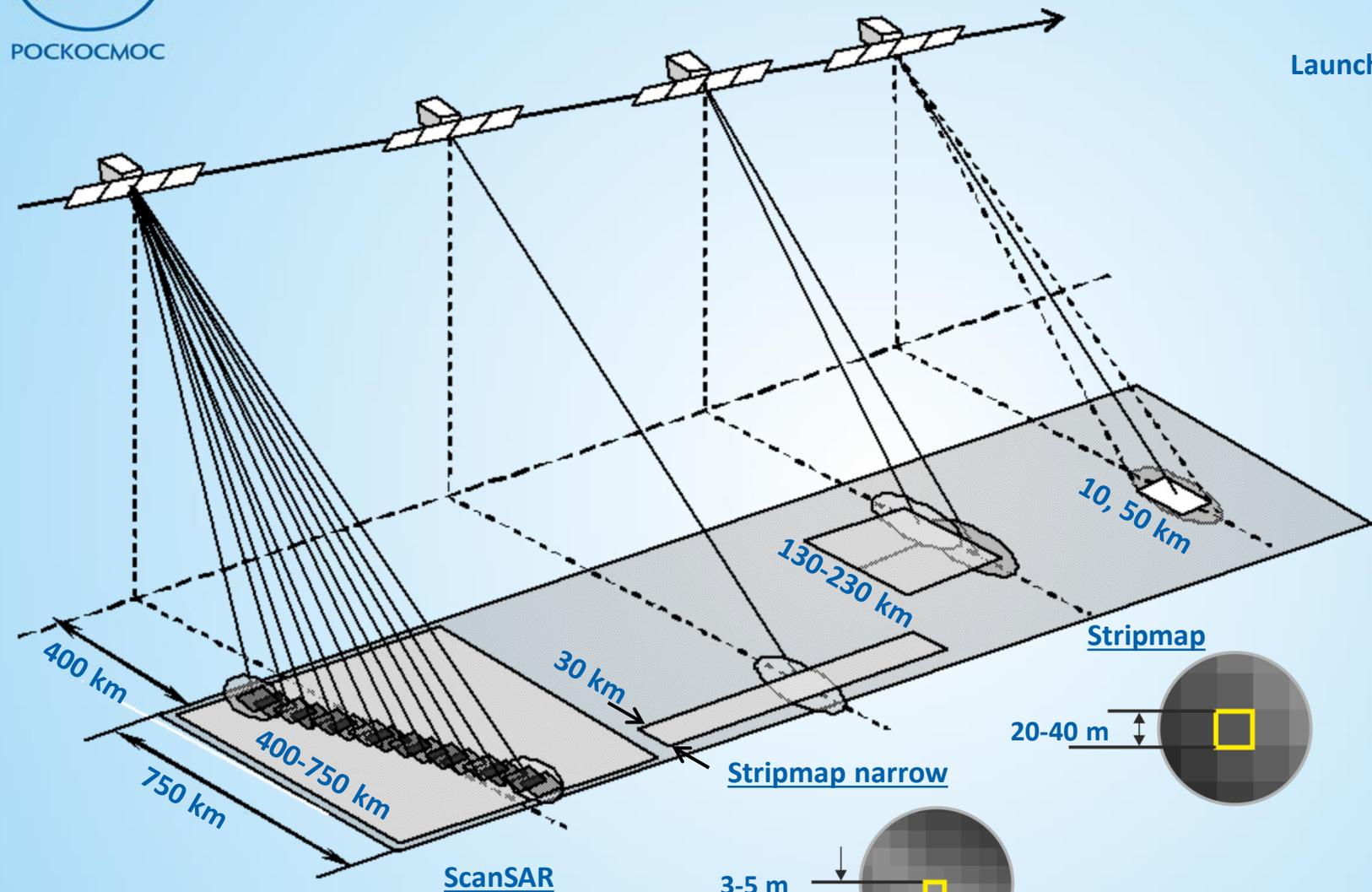
1 phase: Obzor-O №1, №2

2 phase: Obzor-O №3, №4

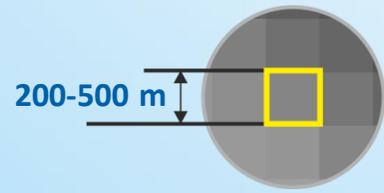
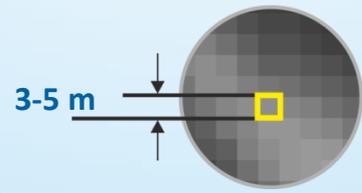
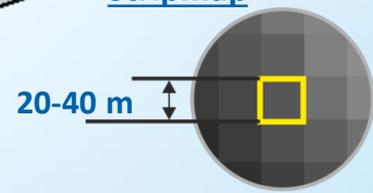
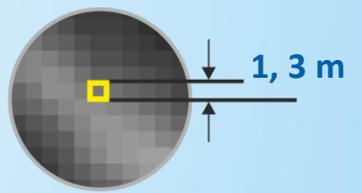


# Obzor-R

Launch date: 2015

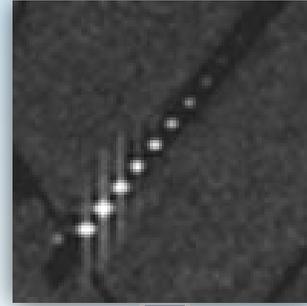
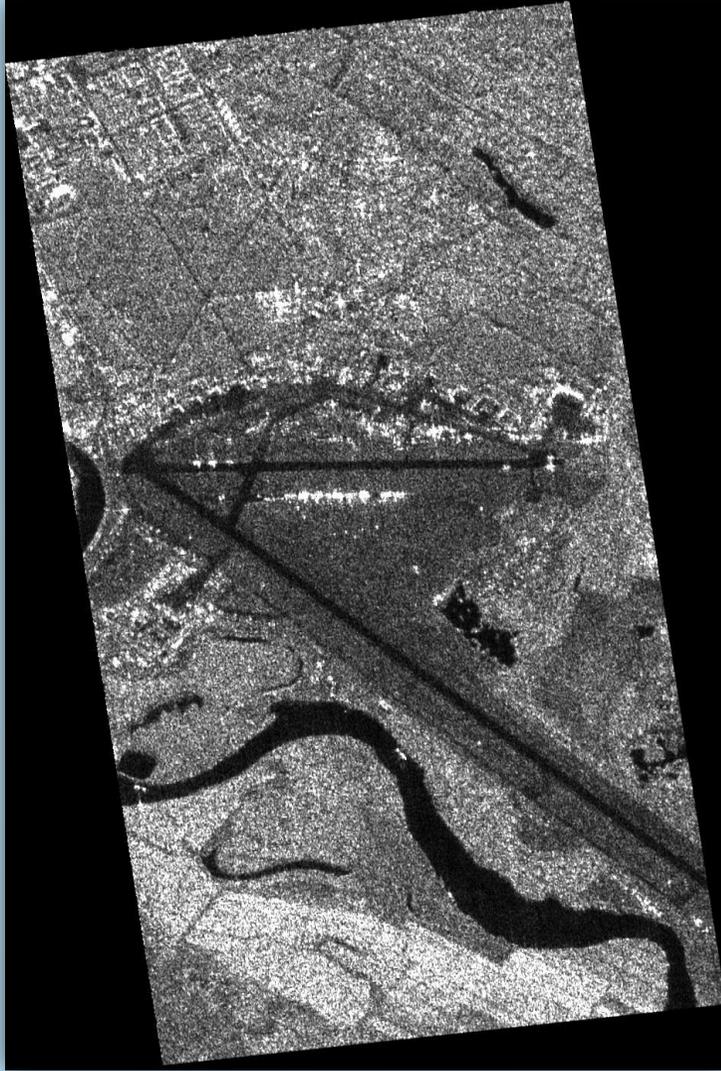


SpotLight,  
Ultra-fine

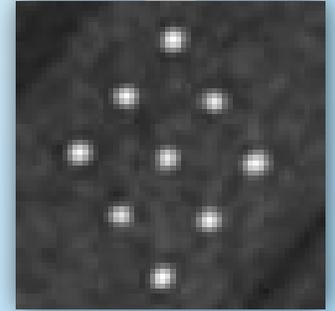


HH/HV/VH/VV – all modes,  
HH+HV/VV+VH – all modes (except SpotLight)

# SAR Test site



**Test objects for amplitude linearity, dynamic range and spatial resolution characteristic control**



***Thank you for your attention!***

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