НАУЧНО-ИССЛЕДОВАТЕЛЬСКИЙ ИНСТИТУТ ЯДЕРНОЙ ФИЗИКИ ИМЕНИ Д.В. СКОБЕЛЬЦЫНА
МОСКОВСКОГО ГОСУДАРСТВЕННОГО УНИВЕРСИТЕТА ИМЕНИ М.В. ЛОМОНОСОВА

SiriusSat1, 2

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Budapesht, 13.09.2018

Background for SiriusSat's

SINP MSU offered to run a space **mission** for space particles detection and registration **for the space weather monitoring**

Mission subjects:

- Particles from the Earth radiation belts
- Charged particles distribution over LEO

Research relevance:

- Current particle distribution model validation
- LEO radiation monitoring
- The space weather forecast

SPUTNIX took on the role of **industrial partner** in spacecraft development

Hardware:

- Orbicraft Pro SXC1 kits

Engineering:

- Tutorials and classes for students
- Assembly and verification assistance
- Software and firmware examples

SiriusSat-1 mission: Mission and launch

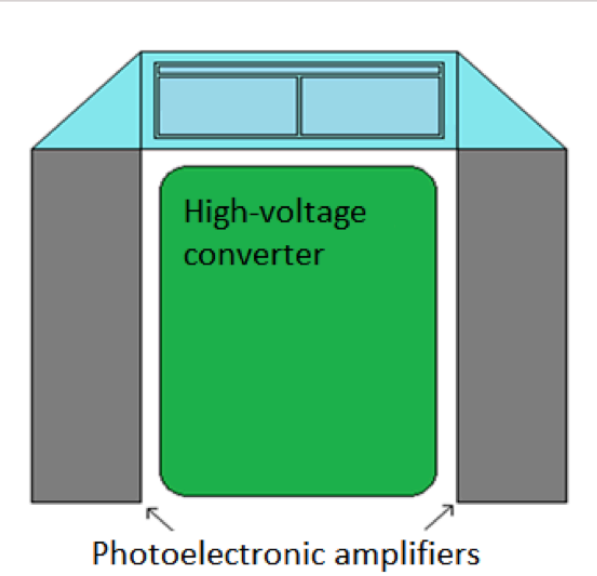
1. Free educational launch with Roscosmos in 2017

2. Participant of RKK Energy “Radioscaf” program 2018

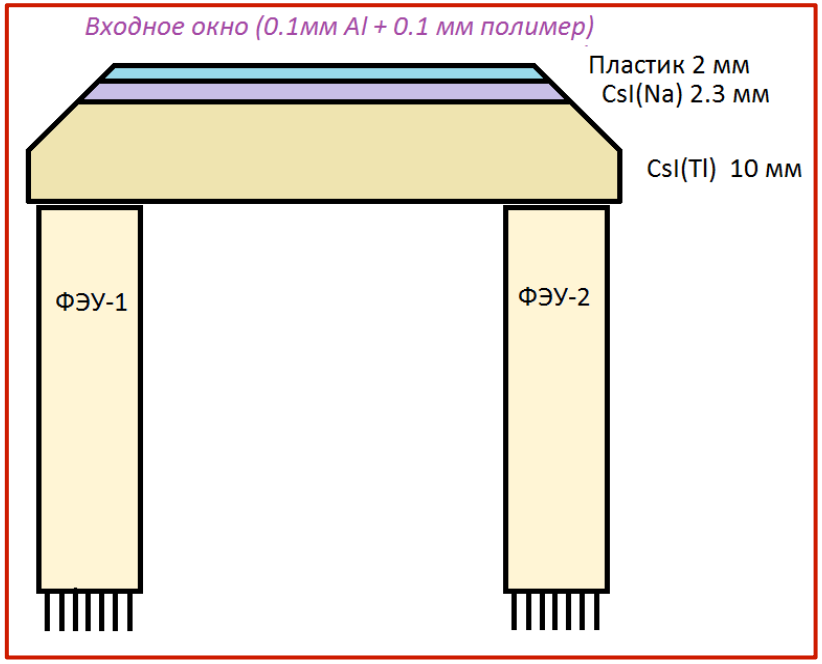
3. Launch to ISS ~~on May 2018~~ with Soyuz rocket
In July 2018

4. Cosmonauts to throw the Sirius Sat out of their home in autumn 2018

CubeSat compatible particle detector

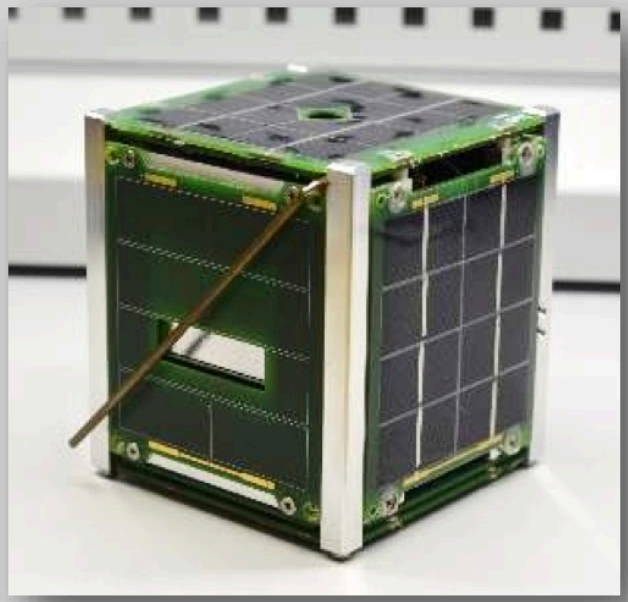


Weight	196 g
Power consumption	0.59 W
Count speed	50 us
Interface	CAN; USART
Dimensions	98 x 96 x 14 mm
Particle energy	Protons: 1-100 MeV Electrons: 0.1-40 MeV Gamma-quants: 0.03-2 MeV



Phosfitch type detector

Groups of Sirius students participated
In the satellite and detector development
One group started 2017, and other group
Joined the project in 2018.
This why the name of satellite is SiriusSat



SiriusSat-1 satellite

Weight	0.95 kg
Dimensions	CubeSat 1U
Radio	435 MHz
Stabilization system	Electromagnetic coils
Active lifetime	6 month

СИРИУС
ОБРАЗОВАТЕЛЬНЫЙ ЦЕНТР

Educational center SIRIUS – organization, facilities

НИИЯФ МГУ

SINP MSU – payload idea and design.

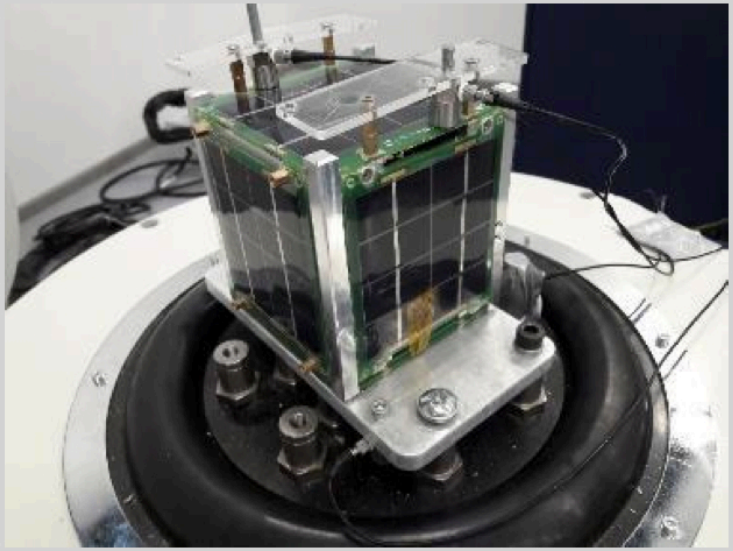
SX

SPUTNIX –CubeSat kit and system engineering

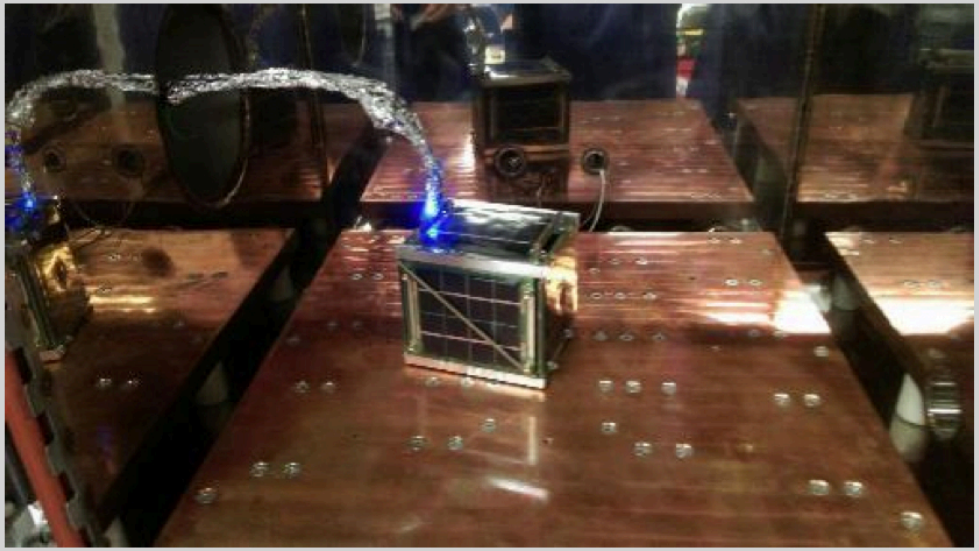
Two groups of bright and talented students with their leaders working on satellite systems and payload

Some tests

Vibration



Vacuum and temperature



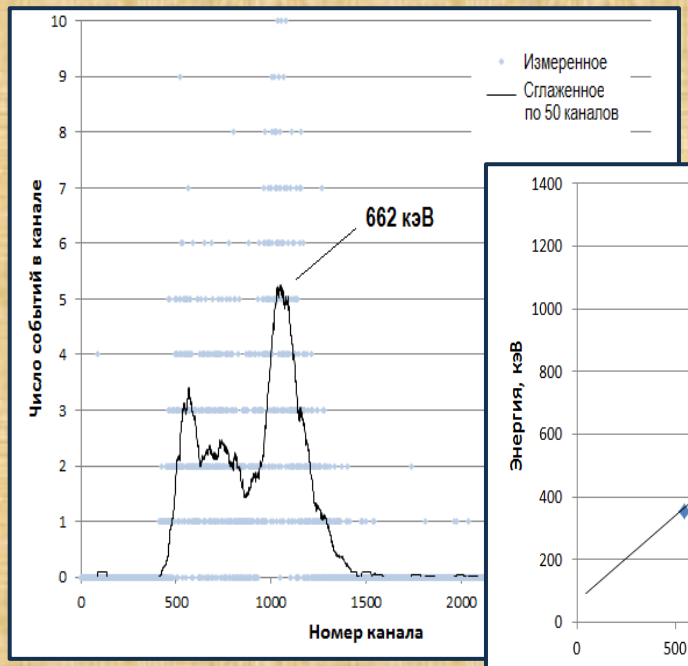
Final packaging of SiriusSat’s

Detector parameters

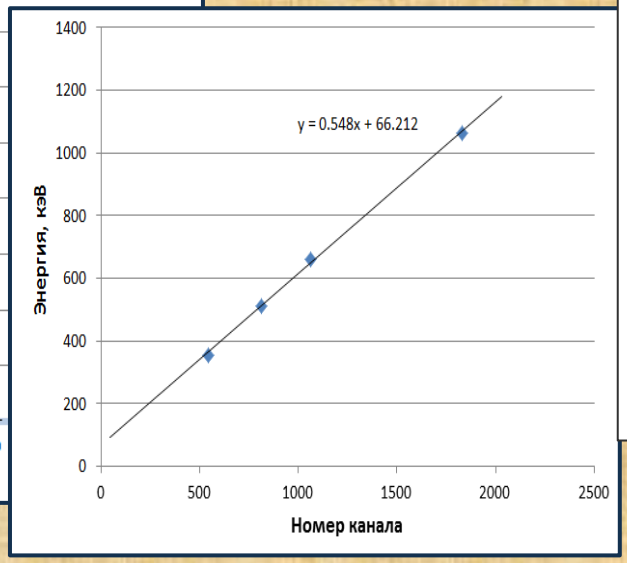
Registered particles	Gamma s, electrons
Detectable energy deposition	0.3 – 3 MeV
Effective area	4 cm^2
Dynamical range:	
Monitoring of the total rate	0-10000 cm^{-2}
Spectral-timing analysis	0-100 cm^{-2}
Time resolution	20 мcs
Dimensions	95x89x22 mm^3
Mass	240 g
Voltage	8 V
Energy consumption	0.65 vatt
Energy consumption of digital electronics	0.1 vatt

Detector calibration

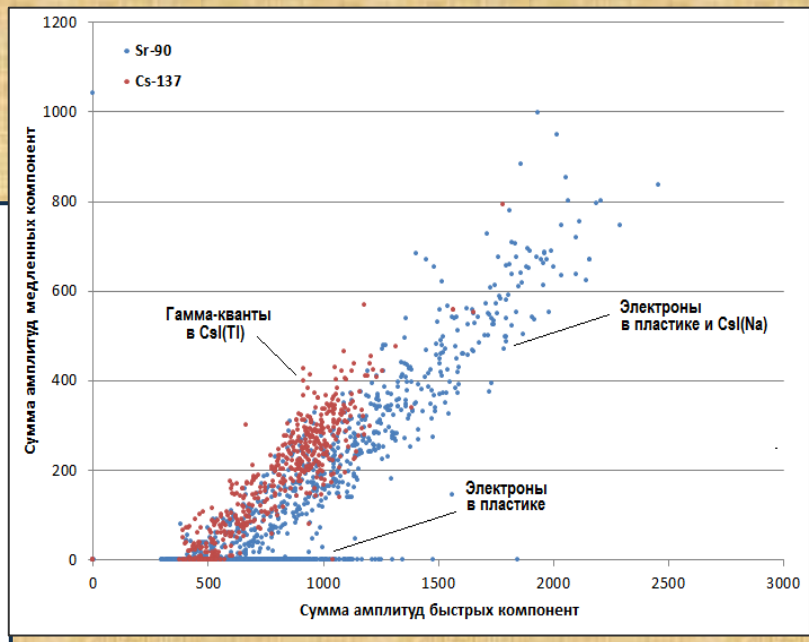
Made in SINP MSU using standard r/a isotopes emitting gammas like ^{137}Cs, ^{22}Na, ^{133}Ba, and beta-particles emitting ^{90}Sr.



Energy spectrum of 137Cs (calibration).



Energy calibration for CsI(Tl)



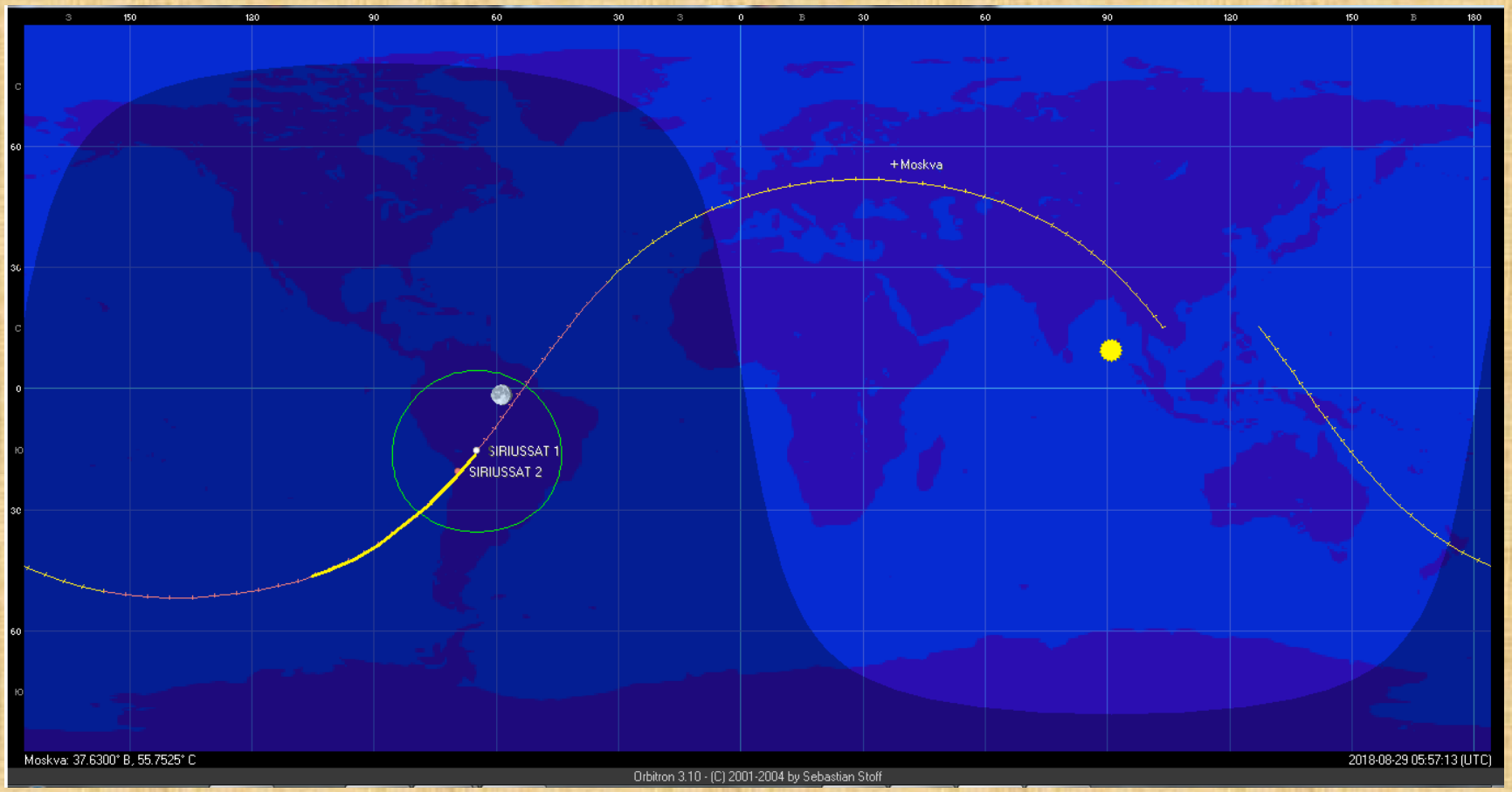
2D diagram for r/a sources of electrons and photons.

July 2018 launch of Progress with SiriusSat's on-board

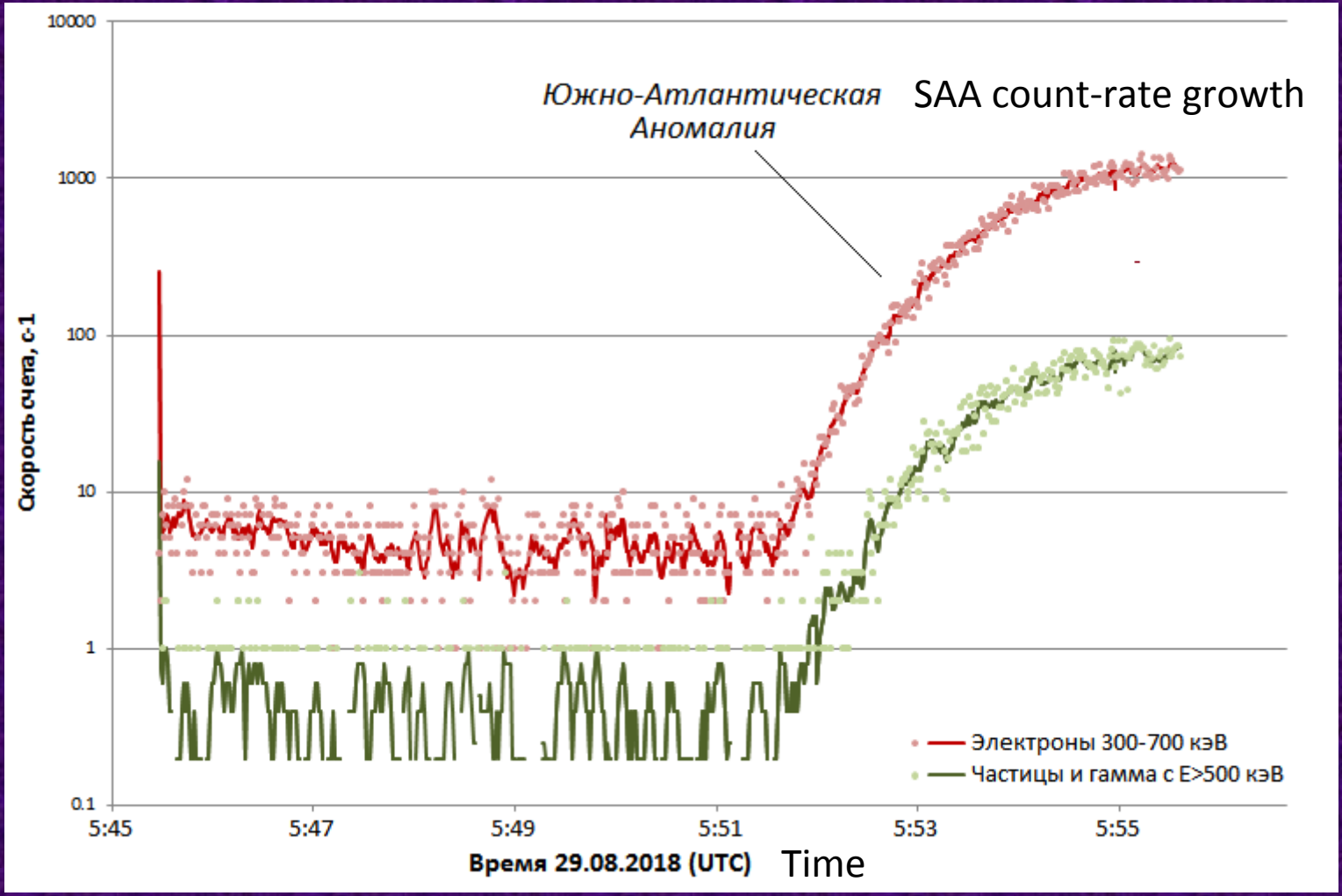
SiriusSat1 is free-flying

Operations with SiriusSat during Flight Test period:

- Controll of satellite rotation
- Collecting the payload data for one orbit



The first flight data obtained from the payload of SiriusSat-1 on 28.08.2018



One orbit count-rate variation