

Russian Participation in the International LWS Initiative

L.Zelenyi

Space Research Institute, Moscow

With contributions from:

A.Petrukovich (IKI)

V.Oraevsky (IZMIRAN)

V.Kuznetsov (IZMIRAN)

G.Tamkovich (IKI)

M.Mogilevsky (IKI)

M.Panasyuk (MSU)

Yu.Kotov (MEPhI)

G.Zastenker (IKI)

Russian Federal Space Program (Scientific & Applied)

CORONAS-F (2001)

CORONAS-PHOTON (2006)

Missions under investigation

RESONANCE, INTERHELIOPROBE, ROY

Other activity

Small payloads

INTERBALL-PROGNOZ

CORONAS-F

**Institute of Terrestrial Magnetism, Ionosphere and Radio Wave
Propagation (IZMIRAN)**

Date of the launch 31 July 2001

Solar imagery, solar seismology,
UV and X ray spectroscopy,
SCL

Spacecraft mass	2260 kg
Payload	395 kg
Orbit	548/500 km
Orbital period	95 min
Inclination	82.5°
Currently	70 Mbytes data per day

<http://coronas.izmiran.rssi.ru>



Radiation & Radiation belt Experiments and Data



Skobeltsyn Nuclear Physics Institute, Moscow State University

Current Experiments:

- International Space Station (R-16, SRC, Scorpion)
- Coronas-F
- Express
- Meteor
- Molniya 3K

Previous experiments and databases:

- LASRE (MIR Station, Coronas-I, Cosmos-1686)
- GLONASS, Meteor, Molniya.
- Geosynchronous data: Electro, Gorizont, Express, GALS.

<http://alpha.sinp.msu.ru/dataintr.html>

<http://www.coronas.ru>

CORONAS-PHOTON

launch 2006

Moscow Engineering Physics Institute

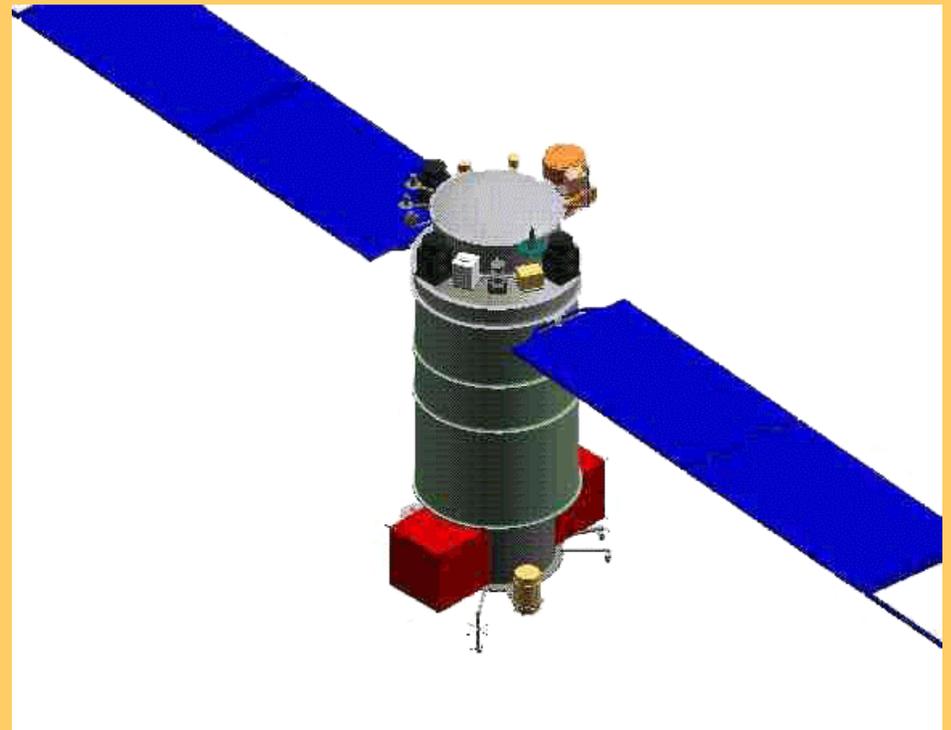
Solar imaging and spectroscopy in UV, X, γ ranges

Orbit:

Circular 500 ± 10 km

Inclination 82.5°

<http://astro.mephi.ru> (in russian)



CORONAS-PHOTON payload summary

Instrument	Measured radiation	Organizations
High energy radiation spectrometer NATALYA-2M	Gamma-rays spectroscopy 0.3 – 2000MeV; Neutrons 20 – 300MeV	MEPhI
Low energy gamma-ray spectrometer RT – 2	Hard X-ray spectroscopy: 15–150 keV; Spectrometry 100 – 2000keV	TATA, India
Hard X-ray polarimeter PENGUIN	Soft X-ray radiation 1 – 10keV Hard-X-ray polarization 20 – 150keV X-ray & g-ray spectroscopy 0.15 – 5MeV	Ioffe Institute MEPhI
Fast X-ray monitor FXM	Hard X-ray with msec resolution 20–500keV	MEPhI
Solar flare and cosmic gamma-burst spectrometer Konus-RF	Hard X-ray & gamma-ray spectroscopy with high temporal resolution 0.10 – 12MeV	Ioffe Institute
X-ray Telescope TESIS	Disk imaging: 171-182, 290-320, 8.418-8.423Å	Lebedev Institute
EUV and Soft X-ray monitor EUV-PHOKA	Full disk radiation: $\lambda < 10\text{nm}$, 17 – 25, 30 – 35, 50 – 65, 50 – 65, 121.6 nm, visual	MEPhI; AI, Potsdam
Energetic particle telescope ELECTRON-5-PESKA	e: 0.2 – 2MeV; p: 1.0 – 150MeV; α : 1.5 – 50 MeV/nuc; Z <26: 2.0 – 50MeV/nuc	SINP MSU; Un. de Alkala, Madrid
Energetic particle telescope STEP-F	e: 0.15–10 MeV; p: 4.0–62 MeV; α : 15–245 MeV	Kharkov State University



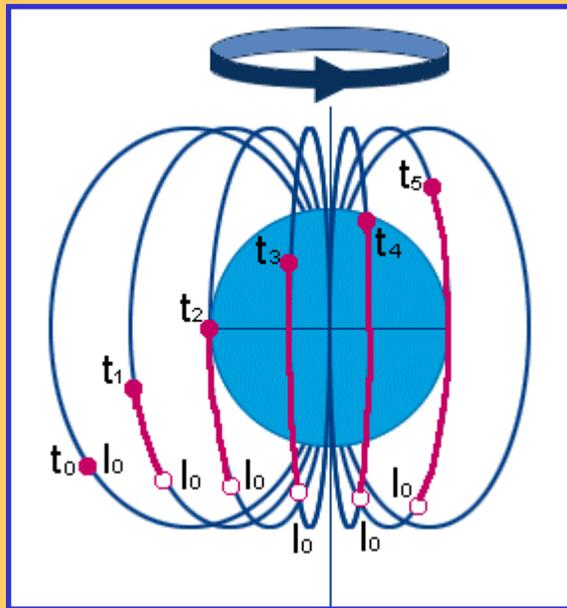
RESONANCE

Investigation of wave-particle interactions and plasma dynamics in the inner magnetosphere

Space Research Institute (IKI), Moscow

Institute of Applied Physics (IPF) N. Novgorod

ULF radio interferometry: National Space Agency, Ukraine



Magnetosynchronous orbit

Orbit:

Apogee: ~30 000 km,

Perigee: ~ 1 800 km,

Inclination: + and - 63.4° (two S/C)

Estimated corotation duration

is up to 3 hours for passive experiments

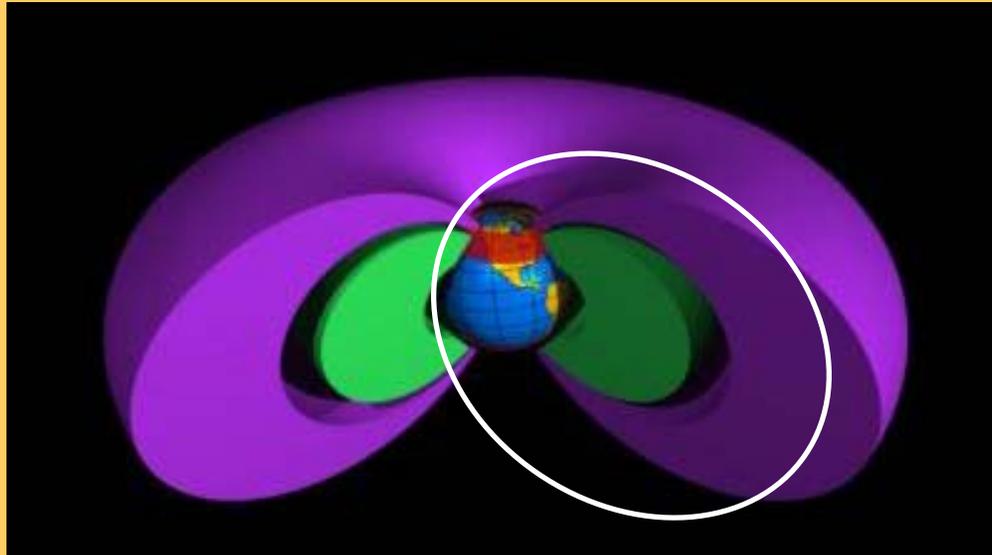
<http://bird.iki.rssi.ru/Resonance>

RESONANCE



Magnetospheric science and space weather-related investigations:

- Ring current and outer radiation belt
- Plasmasphere
- Mid-altitude auroral zone and polar cap

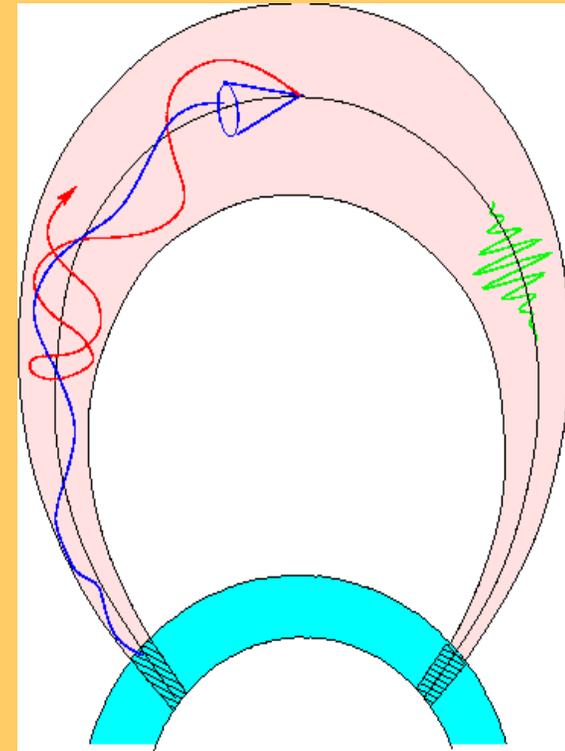


RESONANCE

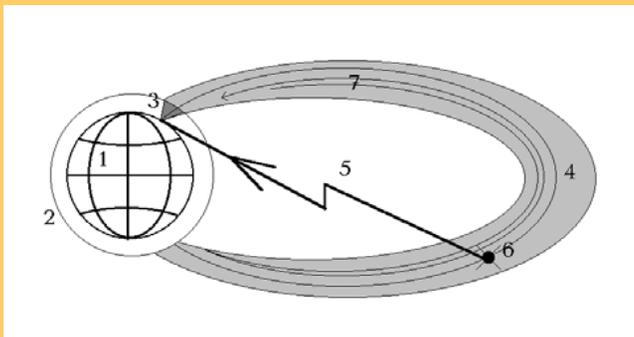


A Special task: magnetospheric cyclotron maser observations
and active experiment

- Excitation of waves,
- Modification of precipitation
- Modification of reflection index at the footprints



Experiment with a ground based heating facility:



Controlled positive or negative feedback will be added to the natural magnetospheric oscillator

INTERHELIOPROBE: heliospheric mission with perihelion 30 Rs

SOLAR INSTRUMENTATION

- Optical telescope
- Magnetograph
- X-ray imager-spectrometer
- Coronagraph

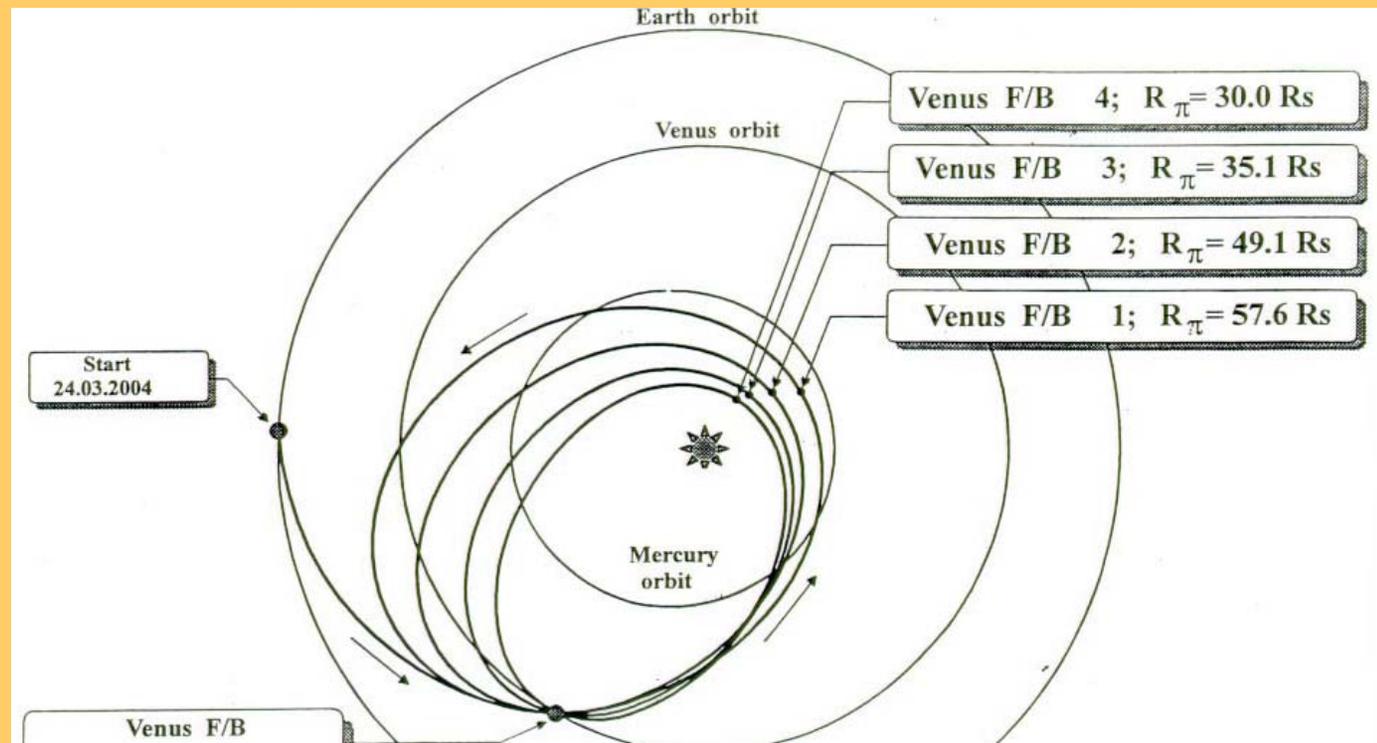
HELIOSPHERIC INSTRUMENTATION

- Solar wind ion, electron analyzer
- dust analyzer
- Magnetic, wave and radio instrument
- Energetic particle telescope
- Neutron detector

Payload 50-60 kg

Launch +5 years

**Joint IZMIRAN
& IKI project**

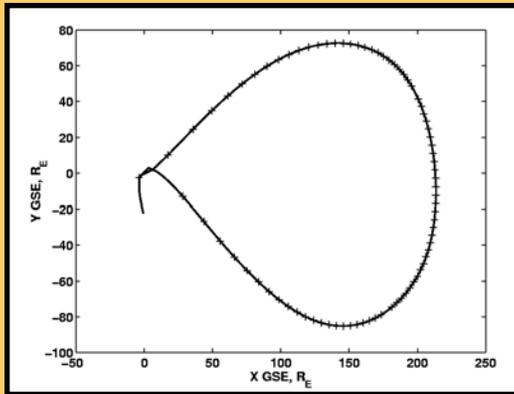


INTERBALL-PROGNOZ

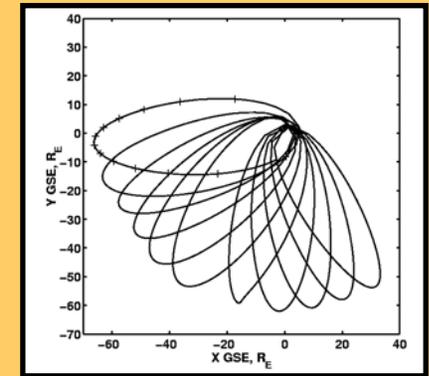
launch 2006-2007?

High-apogee S/C for magnetospheric, solar wind and solar radiation measurements

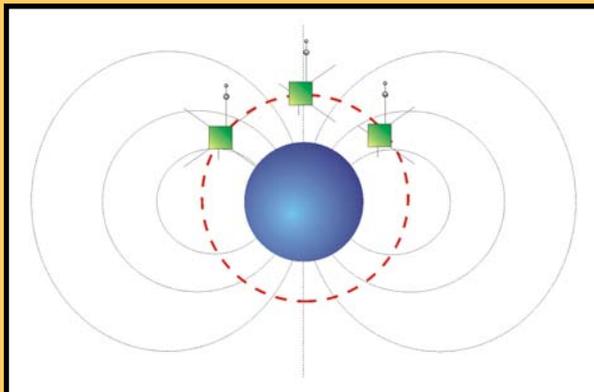
a joint Russian-Brasilian project ?



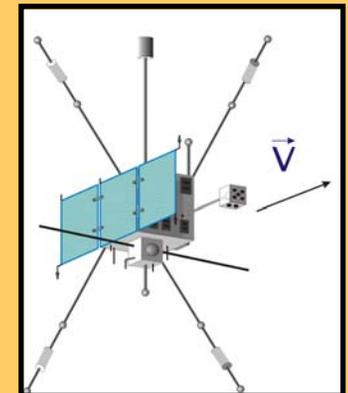
L1 halo orbit and
later elliptic orbit with
apogee
400,000 km



Ukrainian participation with Ionospheric S/C



3 micro-sats (50 kg payload)
sun-synchronous dawn-dusk
circular orbit 600-700 km



<http://www.iki.rssi.ru/interballp>

ROY

Fundamental plasma phenomena studies with:

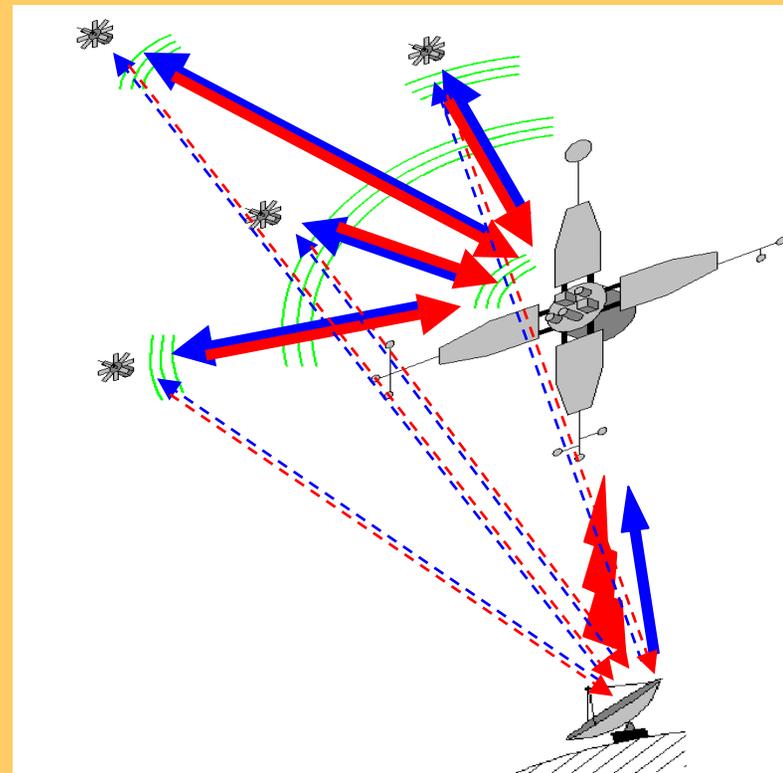
- In-situ multi-point measurements
- Remote scanning by radio-tomography at spatial scales $\sim 10 - 300$ km

Apogee 75 000 - 100 000 km

Perigee 10 000 - 12 000 km

Inclination 62.8°

<http://bird.iki.rssi.ru/ROY>



Obstanovka (“Environment”): Experiment on ISS

Space Research Institute

- Magnetic and electric wave measurements
- Magnetic field vector
- Langmuir probe
- Plasma wave spectrometer
- Electron correlator

Participating countries:

Russia, Ukraine, Poland,
Bulgaria, UK, Hungary

Launch year 2005



Russian ground based measurements

Digital magnetometer network restored

Arctic and Antarctic geomagnetic measurements

AARI <http://www.aari.nw.ru>

~ 10 lower latitude stations contributing to world databases

SPIDR or <http://www.wdcb.ru>

Other stations: IMAGE geomagnetic , Meridian 210

Optical observations in Kola peninsula

Ionosondes in Norilsk, Tiksi, Irkutsk <http://www.iszf.irk.ru>

Solar optical and radio observations in Caucasus and Irkutsk

www.sao.ru & www.iszf.irk.ru

Real-time Russian Resources in INTERNET

IZMIRAN **Moscow geomagnetic, Cosmic rays, Forecast**
<http://forecast.izmiran.rssi.ru>

ISTP/Irkutsk **Geomagnetic, Solar images, Ionosphere**
<http://www.iszf.irk.ru> & <http://magnit.istp.net.ru/ogmo/patron>

AARI **Arctic and Antarctic geomagnetic**
<http://www.aari.nw.ru/clgmi/geophys/index.htm>

RosHydroMet **generic space weather forecast** www.geospace.ru

IKI RAN **Space weather forecast using real-time solar wind**
<http://www.iki.rssi.ru/forecast>

Survey of russian space weather related sources
<http://alpha.npi.msu.su/RSWI/rswi.html>