Space Weather Activities in Ukraine
Winter 2011 Report

Aleksei Parnowski

Space Research Institute, Kyiv, Ukraine
In brief

– Space weather (SWx) related missions launched in 2011:
  1. “Sich-2” EO S/C with “Potential” experiment was launched on August 17.
  2. “Spektr-R” S/C with “Plasma-F” experiment was launched on July 18.
  3. “Chibis-M” S/C was delivered to the ISS on November 2.
  4. “Phobos-Grunt” S/C was unsuccessfully launched on November 8.

– Planned SWx related missions:
  1. “Environment” instrument suite will be delivered to the ISS in 2012
  2. “Microsat” S/C with “Ionosat-Micro” experiment is scheduled for 2013
  3. “Resonance” S/C constellation is scheduled for 2014
  4. The launch of “Ionosat” S/C constellation is scheduled for 2015-2017

– The KIV magnetic observatory was certified by Intermagnet in May 2011
– 2 FP7 SWx projects with Ukrainian participation started in 2011
– 7 SWx meetings were held in Ukraine in 2011
– At least 5 SWx meetings will be held in Ukraine in 2012
Sich-2/Potential (status report)

Launch: 2011-08-17 0712 UTC from Yasny (OREN)
Designators: SCN 37794, NSSDC ID 2011-044G
Orbit: $T = 98.64$, $684 \times 703$ km, $I = 98.25$, RCS = 0.856
Launcher: Dnepr-1; Spacecraft: MS-2-8, mass: 176 kg
Current status: Fully operational since 2011-10-10
News releases (currently only in Russian, sorry) are available at the website of the Laboratory of Satellite Near Space Exploration: http://nearspace.ikd.kiev.ua/
### Sich-2/Potential

The main goals are to develop new ways of space environment diagnostics, to test new instruments in space, and to study SWx effects on spacecraft.

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Measured value</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particle density analyzer DN-DE</td>
<td>Pressure: $10^{-8} \div 10^{-2}$ Pa</td>
<td>Dimensions:</td>
</tr>
<tr>
<td></td>
<td>Neutral part. density: $10^4 \div 10^{10}$ cm$^{-3}$</td>
<td>DN: 134×130×100 mm</td>
</tr>
<tr>
<td></td>
<td>Charged part. density: $10^3 \div 10^{11}$ cm$^{-3}$</td>
<td>DE: $\varnothing$ 35×289 mm</td>
</tr>
<tr>
<td></td>
<td>Electron temperature: 0.1 $\div$ 1500 eV</td>
<td>Power: &lt; 2 W</td>
</tr>
<tr>
<td>Electric probe LEMI-502 (EZ)</td>
<td>Electric potential: DC $\div$ 100 kHz</td>
<td>Weight: 2.23 kg</td>
</tr>
<tr>
<td></td>
<td>Noise at 2 kHz: 1 uV/Hz$^{1/2}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dynamic range: 120 dB</td>
<td></td>
</tr>
<tr>
<td>Flux-gate magnetometer LEMI-016 (2 independent</td>
<td>Magnetic field: DC $\div$ 12 Hz (3-axis, 16-bit)                             Power: &lt; 0.25 W</td>
<td></td>
</tr>
<tr>
<td>magnetometers)</td>
<td>Measurement range: $\pm 65000$ nT</td>
<td>Weight: 1.2 kg</td>
</tr>
<tr>
<td></td>
<td>Max diff. of mag. and mech. axes: $\pm 5$ arcmin                             Dim.: 138×80.5×92.5 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maximum zero drift: $\leq 50$ nT</td>
<td>Temp. range: -40..+80 C</td>
</tr>
<tr>
<td></td>
<td>Transformation coefficient error: &lt; 0.1%</td>
<td>Max shock load: 300 g</td>
</tr>
<tr>
<td></td>
<td>Temperature drift: $&lt; 1.5$ nT/C</td>
<td></td>
</tr>
<tr>
<td>Electronics unit (including SSNI)</td>
<td>Storage: 16 GB</td>
<td>Dim.: 98x212x188 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power: &lt; 8 W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Weight: 3 $\pm$ 0.15 kg</td>
</tr>
</tbody>
</table>
Sich-2/Potential (instrument location)
Sich-2/Potential (onboard computer)

Onboard computer (SSNI)

- ARM-9200T architecture with 32-bit CPU (200 MIPS)
- 3 unified input ports, 50 Mbps per port, up to 32 devices per port, bit control
- 4 spacecraft interface ports (sync and async modes)
- 4 GB storage
- Max power: < 4 W
- CPU: 21.5x160x186 mm, < 0.95 kg

- MB: 175x126 mm, < 0.5 kg
- interface chip (installed on the devices): 9x24x46 mm, 0.022 kg per device
Sich-2/Potential (raw data)
SWx FP7 projects

- **Pl:** Universität Göttingen (Volker Bothmer)
- **Goal:** Development of the European space weather alert and forecasting system
- **Timeline:** March 2011 – February 2014
- **Ukrainian partners:** SRI NASU & NSAU

Problem-oriented processing and database creation for ionosphere exploration (POPDAT), EC-GA № 263240, [http://popdat.org/](http://popdat.org/)
- **Pl:** Technische Universität Berlin (Klaus Brieß)
- **Goal:** Creation of the ionospheric wave processes database
- **Timeline:** June 2011 – June 2013
- **Ukrainian partners:** SRI NASU & NSAU with L’viv Centre
SWx meetings in Ukraine in 2011

- 18th Young Scientists' Conference on Astronomy and Space Physics, 2-7 May 2011, Kyiv National University, http://ysc.kiev.ua/ (English language only)
SWx meetings in Ukraine in 2012

- Remote radio sounding of the ionosphere (ION-2012), April 2011 (TBC), Institute of the ionosphere, Kharkiv, http://iion.org.ua/ (Russian language only)
- 19th Young Scientists' Conference on Astronomy and Space Physics, 23-28 April 2012, Kyiv National University, http://ysc.kiev.ua/
- External and internal sources of ULF waves in the terrestrial magnetosphere, 15-17 May 2012, Space Research Institute, Kyiv (by invitation only)
- Astronomy and Space Physics in Taras Shevchenko National University of Kyiv, 22-25 May 2012 (TBC), Kyiv National University
- 12th Ukrainian Conference on Space Research, 3-7 September 2012, National Space Centre, Yevpatoria
- Physics of the Sun and solar-terrestrial relations, 10-15 September 2012 (TBC), Crimean Astrophysical Observatory, Nauchny, http://solar.crao.crimea.ua/
Thank you for attention!

Space Research Institute of NASU & NSAU [http://www.ikd.kiev.ua/]
- Space Plasma Department [http://plasma.ikd.kiev.ua/]
- Laboratory for Satellite Near Space Exploration [http://nearspace.ikd.kiev.ua/]
- L’viv Center [http://www.isr.lviv.ua/]

Main Astronomical Observatory [http://mao.kiev.ua/]
Kyiv National University [http://univ.kiev.ua/]
- Astronomical Observatory [http://www.observ.univ.kiev.ua/]
- Chairs of Astronomy and Space Physics [http://space.univ.kiev.ua/]

Radioastronomical Institute [http://ri.kharkov.ua/]
Kharkiv National University [http://univer.kharkov.ua/]
- Space Research Sector [http://src.univer.kharkov.ua/]
- Faculty of Radiophysics [http://www-radiophys.univer.kharkov.ua/]

Institute of the Ionosphere [http://www.iion.org.ua/]
Crimean Astrophysical Observatory [http://www.crao.crimea.ua/]
- Solar Physics Laboratory [http://solar.crao.crimea.ua/]

Institute of Technical Mechanics NASU & NSAU [http://www.itm.dp.ua/]