

## **Institute of Astronomy of the Russian Academy of Sciences**

### **4. Information about Scientific Projects of the Federal Space Program of the Russian Federation with are at the Development (Working out) Stage**

## **World Space Observatory Ultraviolet**

### **Core Program of WSO-UV includes**

1. The determination of the diffuse baryonic content in the Universe and its chemical evolution. The main topics will be the investigation of baryonic content in warm and hot Inter Galactic Matter, of damped Lyman-alpha systems, the role of starbursts and the formation of galaxies.
2. The physics of accretion and outflows: stars, black holes, and all those objects dominated by accretion mechanisms. The efficiency and time scales of the phenomena will be studied, together with the role of the radiation pressure and the disk instabilities.
3. The study of the formation and evolution of the Milky Way. The Milky Way history could be tracked through observations complementary to those obtained by the GAIA mission.
4. Extrasolar planetary atmospheres and astrochemistry in presence of strong UV radiation fields.

### **Instruments**

The WSO--UV will be the only 2-meters class mission in the after--HST epoch that will guarantee access to UV wavelength domain (115-310 nm). WSO-UV is a

third mission of the SPEKTR (spectrum) series of the Russian Federal Space Program together with Spektr-R (on orbit since 2011) and Spectr-RG (with Russian ART-XC and e-Rosita payloads, launch date is 2017). All missions of the Spektr series should use the same platform NAVIGATOR.

The observatory includes a 170 cm aperture telescope capable of high-resolution spectroscopy and long slit low-resolution spectroscopy with the WUVS (WSO-UV Spectrographs) instrument; moreover UV imaging will be available with the Field Camera Unit (FCU) instrument. WSO-UV will be operating in high Earth orbit (geosynchronous with inclination of 14 degrees) for five+five years. Spain is a major partner to the project providing detectors for FCU and software and support for the science operations.

The telescope T-170M is a Ritchey-Chrétien with a F/10 focal ratio and a corrected field of view of 0.5 degrees. The WSO-UV telescope feeds in its focal plane two main instruments: unit of spectrographs WUVS, and field camera unit FCU, as well as Fine Guidance System (FGS).

The WSO--UV spectrographs (WUVS) consists of a set of three instruments:

The far UV high resolution spectrograph that will permit to carry out echellé spectroscopy with resolution about 50000 in the 115—176 nm range.

The near UV high resolution spectrograph to carry out echellé spectroscopy with resolution about 50 000 in the 174—310 nm range.

The Long Slit Spectrograph that will provide low resolution ( $R=1000$ ), long slit spectroscopy in the 115—305 nm range. The spatial resolution will be 0.5 arcsec.

The Imaging instrument, Field Camera Unit, will be an important part of the WSO-UV instrumentation. It is the first UV imager to be flown to high Earth orbit, above the Earth geocorona. FCU has two channels:

The Far Ultraviolet channel: working in the range 115–175 nm.

The Near Ultraviolet channel: covering wavelengths in the 170–310 nm interval.

### **Expected results**

The WSO-UV project is an efficient multipurpose orbital observatory for high and low resolution spectroscopy, high sensitivity imaging and slitless spectroscopy in the ultraviolet. The imaging instrument FCU onboard WSO-UV will be the first UV camera to be flown to a geosynchronous orbit. The WUVS spectrographs will deliver spectroscopic performance on a range of astronomical sources, combining high sensitivity, low background and high resolution at FUV and NUV wavelengths.

The observatory is planned to operate for at least five years and perhaps longer. WSO-UV will be launched in 2021. WSO-UV will open new opportunities in planetary science, stellar astrophysics, extragalactic astronomy and cosmology.

The brief outline of the current state of the Project may consist of few phrases. Funding in Russia is guaranteed. There is no critical technical problems in implementation the project. International cooperation is established.

Some organizational problems (induced by known sanctions against Russia and problems with funding in Spain) moved the launch date to 2021. Up to date information on the WSO–UV mission can be found on the official web site: <http://wso-uv.org>.

### **References:**

1. Shustov, B., Gómez de Castro, A.I., Sachkov, M., et al., "WSO - UV progress and expectations" *Astrophys. Space Sci.* 354, 155-161 (2014)
2. Sachkov, M., Sachkov, M., Shustov, B., & Gómez de Castro, A.I., "Instrumentation of the WSO-UV project. DOI 10.1117/12.2055513" *Proc. SPIE* 9144, 914402 (2014)