Future KONUS experiments

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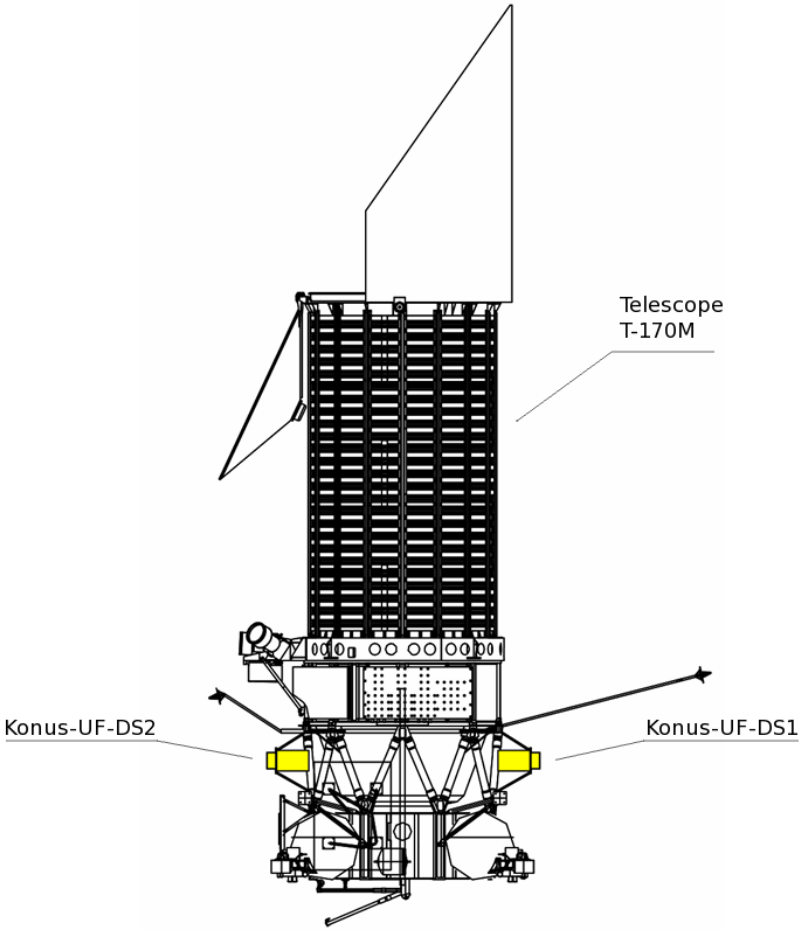
Konus-UF onboard the World Space Observatory-Ultraviolet (WSO-UV)

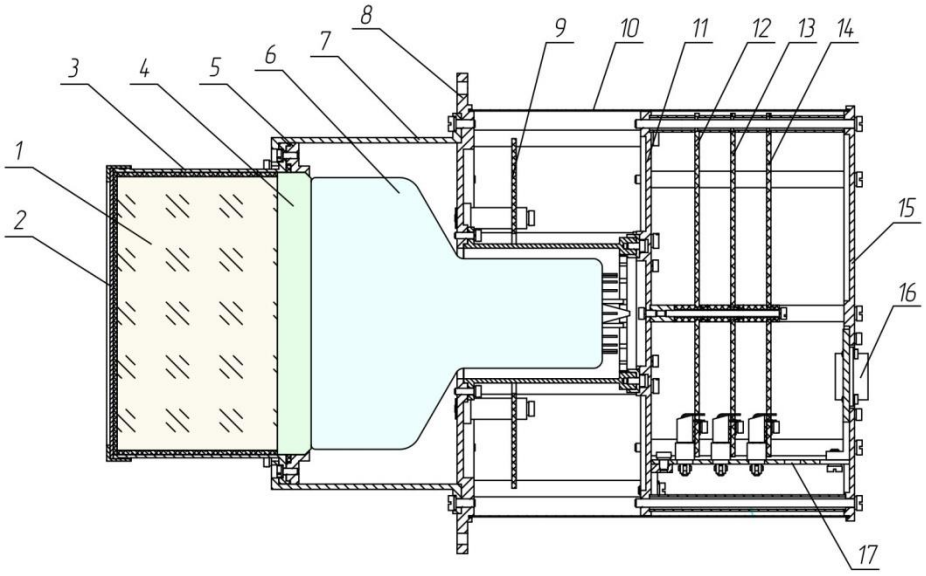


http://www.wso-uv.org/wso-uv2/

- The aim of the WSO-UV mission is to study the Universe in the 115-310 nm range
- The primary instrument is a 170-cm telescope (equipped with high- and low-resolution spectrometers, long-slit spectrometer, and camera for high-quality UV and optical imaging).
- Launch: 2019-2020
- Geosynchronous orbit (R≅42000 km) with an inclination of 51.6 deg

- Konus-UF consists of two identical detector units: Konus-UF-DS1 and Konus-UF-DS2
- NaI(Tl) D=13 cm, H=7.5 cm, Be entrance window

Konus-UF

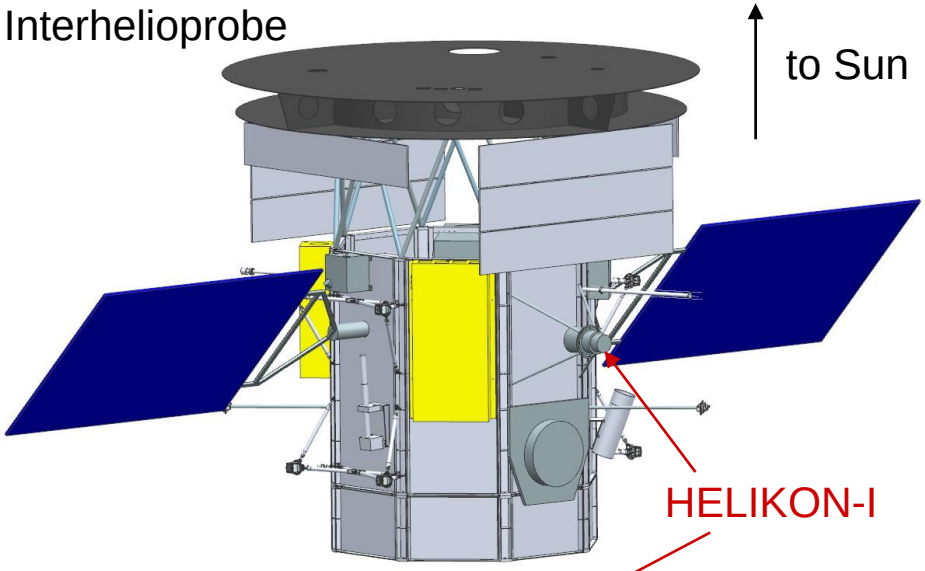


Konus-UF detector unit: 1 – NaI(Tl) crystal (D=13 cm, H=7.5 cm), 2 – beryllium entrance window, 3- aluminium housing, 4 – lead glass, 6 – photomultiplier, 12, 13, 14 – electronic boards.

Energy range	10 keV – 16 MeV
FoV	$2\times2\pi = 4\pi$
Energy resolution (FWHM)	7.5% at 662 keV
Dead time per event	3 μs
Eff. area	~100-160 cm^2
Sensitivity	~1×10^{-7} erg cm^{-2}
Data	~100 Mb/day
Weight	24 kg
Power consumption	<10 W

Goals: observations of GRBs, SGR bursts, solar flares and other transient phenomena

HELIKON-I onboard the Interhelioprobe



- Mission Concept:

Multi-wavelength solar observations at short distances from the Sun (up to 60RS)

Out-of-ecliptic solar observations (up to 30°) and observations of the Sun's opposite side

- Lunch: ~2020-2021
- Orbit:

Perihelion: 60-70 R_{Sun} (~0.3 AU)

Aphelion: 250-260 R_{sun} (~1.2 AU)

Inclination: up to 30° to the ecliptic.

- HELIKON-I:

Single NaI(Tl) or $LaBr_3$(Ce) detector:

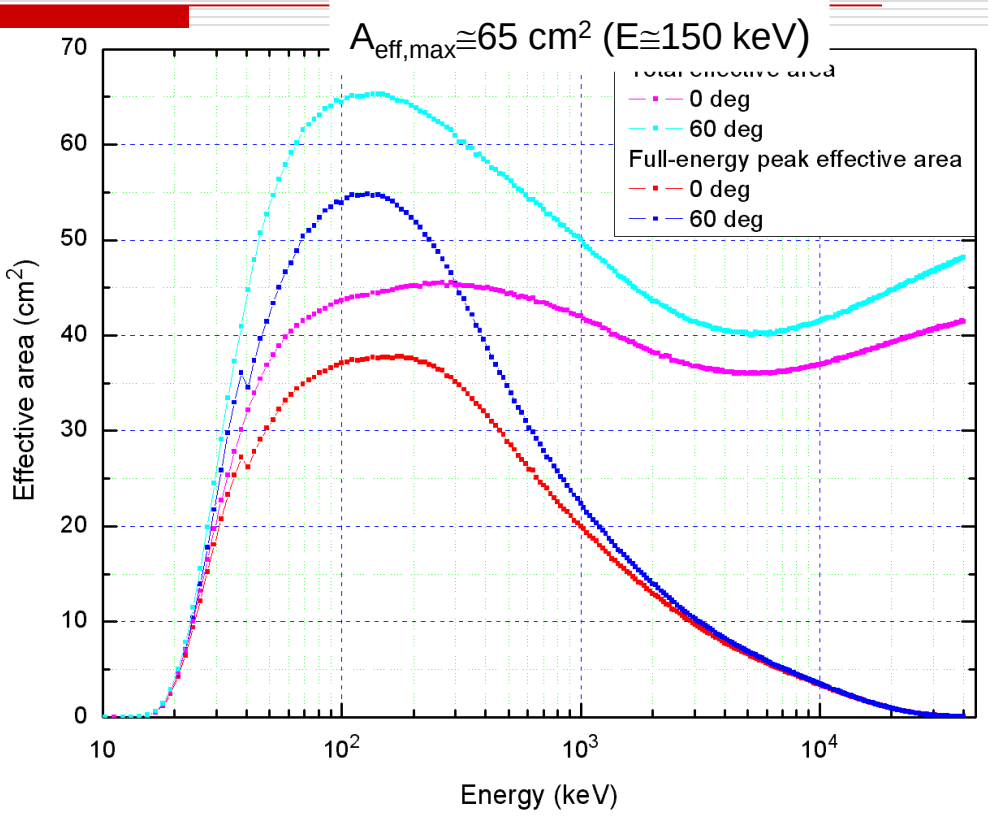
NaI(Tl) (D=13 cm, H=7.5 cm) – similar to Konus-UF

$LaBr_3$(Ce) (D=7.6 cm, H=7.6 cm)

http://www.izmiran.rssi.ru/projects/space/INTERHELIOPROBE/

HELIKON-I ($LaBr_3$)

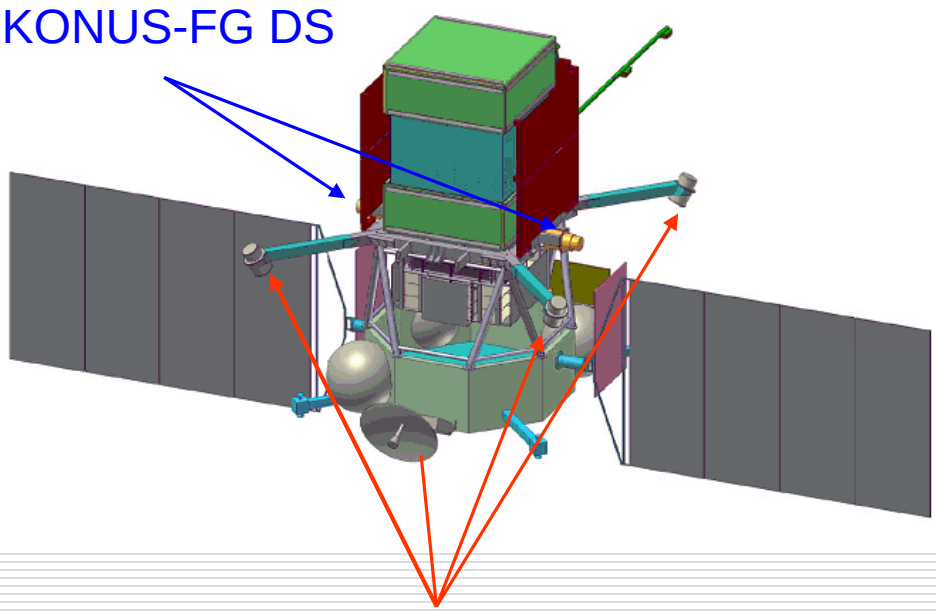
	NaI(Tl)	$LaBr_3$(Ce)
ρ (g cm^{-3})	3.67	5.29
Light output (LO) (photons/keV)	≅40	≅68
Decay time (ns)	230 (1500: 9% of LO)	~20
Energy resolution (FWHM) (at 662 keV)	7-8%	3%



Goals: studying solar flares (by measurements of the 'tail' of the thermal component, non-thermal component and gamma-ray lines: annihilation line, nuclear lines), GRBs, SGR bursts, and other transient phenomena

$LaBr_3$(Ce) D=7.6 cm H=7.6 cm, Al housing

KONUS-FG onboard GAMMA-400



http://gamma400.lebedev.ru

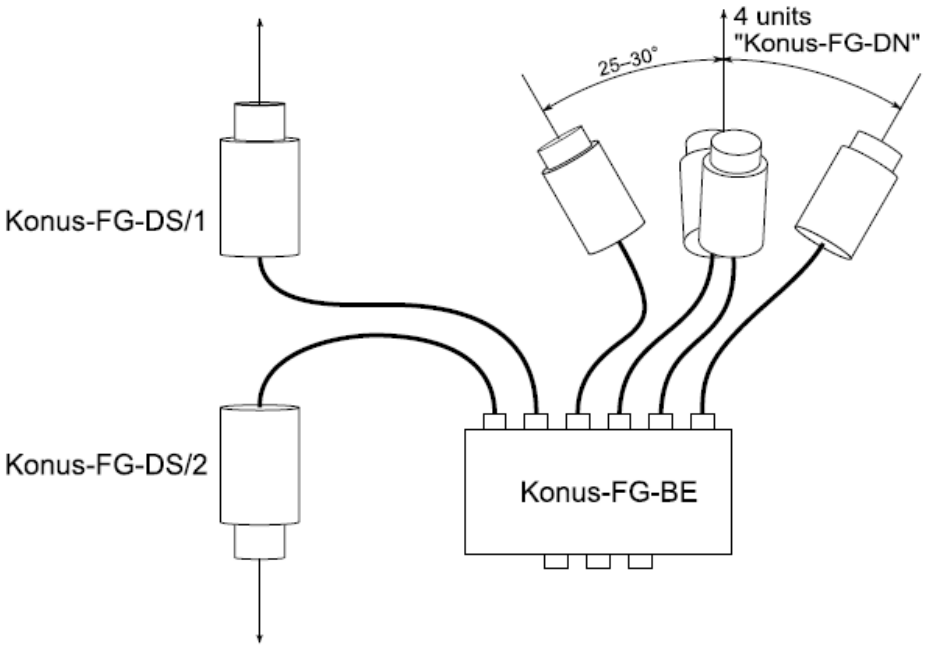
- GAMMA-400 (Gamma Astronomical Multifunctional Modular Apparatus) – the main instrument pair-conversion γ-ray telescope (100 MeV – 3 TeV)
- Launch: ~2020-2022
- High elliptical orbit: an apogee is 300000 km, a perigee is 500 km, orbital period is 7 days, an inclination angle is 51.8 deg
- KONUS-FG: 4 DN detectors and 2 DS detectors

DN: NaI(Tl) D=13 cm, H=1.5 cm (lead shield)

DS: NaI(Tl) D=13 cm, H=7.5 cm - similar to Konus-UF

Be entrance window

Konus-FG



Goals: observations AND AUTONOMOUS LOCALIZATION of GRBs, SGR bursts, solar flares and other transient phenomena

4 DN detectors (D=13 cm, H=1.5cm) – autonomous localization system	
Energy range	10 keV – 1 MeV
FoV	$0.7\times2\pi$ (4.4 sr)
Loc. accuracy	down to ~1 deg
Weight (4 det.)	24 kg
2 DS detectors (D=13 cm, H=13cm) – spectroscopic, similar to Konus-UF	
Energy range	10 keV – 16 MeV
FoV	$2\times2\pi = 4\pi$
Eff. area	~100-160 cm^2
Sensitivity	~1×10^{-7} erg cm^{-2}

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What is new?

- Not new: omnidirectional scintillation detectors, moderate effective area (~100 cm^2), moderate energy resolution (≅7.5% at 662 keV), wide energy range (~10 keV – 16 MeV)
- Electronics:
  - Better, faster signal processing
  - Much larger amount of the data can be accumulated and transmitted to the ground
- That enables sophisticated trigger algorithms and much more detailed measurements of trigger events and background

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Summary

- There can be several KONUS experiments in operation in ~2018-2025
- In interplanetary space they will serve as continuous monitors of hard X-ray and gamma-ray transients in a wide energy range ~10 keV – 16 MeV with a sensitivity down to ~1×10^{-7} erg cm^{-2}
- Flying at distances up to 900 light seconds they will be basic vertexes of Interplanetary Network (IPN)
- Operating simultaneously they will constitute their own independent IPN and provide reliable measurements of temporal and spectral features in GRBs, SGR bursts and other transients