



FLUORESCENCE LYMAN-ALPHA STRATOSPHERIC HYGROMETER (FLASH): APPLICATION ON METEOROLOGICAL BALLOONS, LONG DURATION BALLOONS AND UNMANNED AERIAL VEHICLES.

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Fluorescent method of measure

Stratospheric hygrometer *FLASH* (FLuorescent Airborne Stratospheric Hygrometer) uses a fluorescent technique based on the reaction of water molecule dissociation when exposed to radiation of wavelength λ = 121.6 nm (L_a is hydrogen emission) with the formation of excited OH radicals and subsequent reemission in a wavelength range between 306 and 325 nm. For measurements in the upper troposphere and lower stratosphere the intensity of fluorescent emission is directly proportional to water vapor mixing ratio.

quartz lens







Rocket application of FLASH:

In 1970 – 80 was flying to the 60-80 km by rockets. Descent by parachute from the top of trajectory. The weight of FLASH was 5 kg. Sealed housing special designed for rocket application. Last campaign Hygrosonde-2 on 16/12/2001 (Khaplanov M.)









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Meteo balloon application of FLASH-B:



Measurement range	0.51000 ppmv
Detection limit	0.1 ppmv
Measurement cycle length	1 sec
Integration time	1 - 4 sec
Vertical resolution	~ 50 m (descent in UTLS)
Measurement precision	5 %
Total uncertainty	<10 % (1 <i>0</i>)
Power consumption	0.5 – 1 W
Height range	350 5 mBar
Weight	0.5 kg







Calibration facility







Results of flights:







Stratospheric M55-Geophysica aircraft application:

Flash-M55: Weight 25 kg 1200mm x D30mm Power 100 W Automatic Data logging 3 days











M55-Geophysica aircraft FLASH data:









Tropospheric YAK42-Roshydromet application:



The Yak-42D plane laboratory "Roshydromet" made in 2013 year **Max.Speed:** 810 km/h **Range:** 4,000 km **Service seiling:** 9,600 m

- 1 closing inlet;
- 2 heaters; 3 connectors;
- 4 airplane wall;
- 7- control unit;
- 8,11 pressure sensor;
- 9- vacuum pump;
- 12 flow controller;
- 13 temperature sensor;
- 14,16 power supply;
- 15 chamber; 17 optics;
- 18 UV lamp;
- 20 FLASH;





Tropospheric YAK42-Roshydromet FLASH data:









Long Duration CNES balloon and FLASH:

Balloon was flown 2 weeks at altitude 17-18 km FLASH works at night time only, 15 min per hour









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Long Duration CNES balloon FLASH data:









Long Duration PoGoLite balloon and FLASH:





FLASH FOW is 40 deg must be placed between maximum Solar Elevation Angle (SEA) and balloon in order to avoid over exposure reflected light.



Launch site: Esrange Space Center

Launch date:July 2013Mass/kg:~2 tonsBalloon size:1,2 Mm³Height:~39 kmDuration:~15 daysTargets:the Crab (nebula andpulsar) and Cygnus X-1







Long Duration PoGoLite balloon FLASH set up:

At daytime the FLASH looks to the Sun direction, as a Polarimeter. There is over exposure condition. At night time they turn back. There measuring cond.









PoGoLite FLASH data:













Unmanned Aerial Vehicles (UAV) aplication:







1941

Unmanned Aerial Vehicles (UAV) result:





Summary:



- Is born for missile applications, FLASH hygrometer has been modified for a variety of platforms:
- Very light weight version for rubber meteo ballons for night flights;
- Small gondola for stratosphere aircraft M55 fixing under wing;
- Big rack module for tropospheric airborne laboratory YAK42-Roshydromet;
- He has been modied for stratospheric long-duration CNES and SSC Esrange balloons;
- FLASH was adapted for use onboard Unmanned Aerial Vehicles (UAV);

Nearest future:

- FLASH adapting for use with balloon
- and GPS-guided paraglide.

