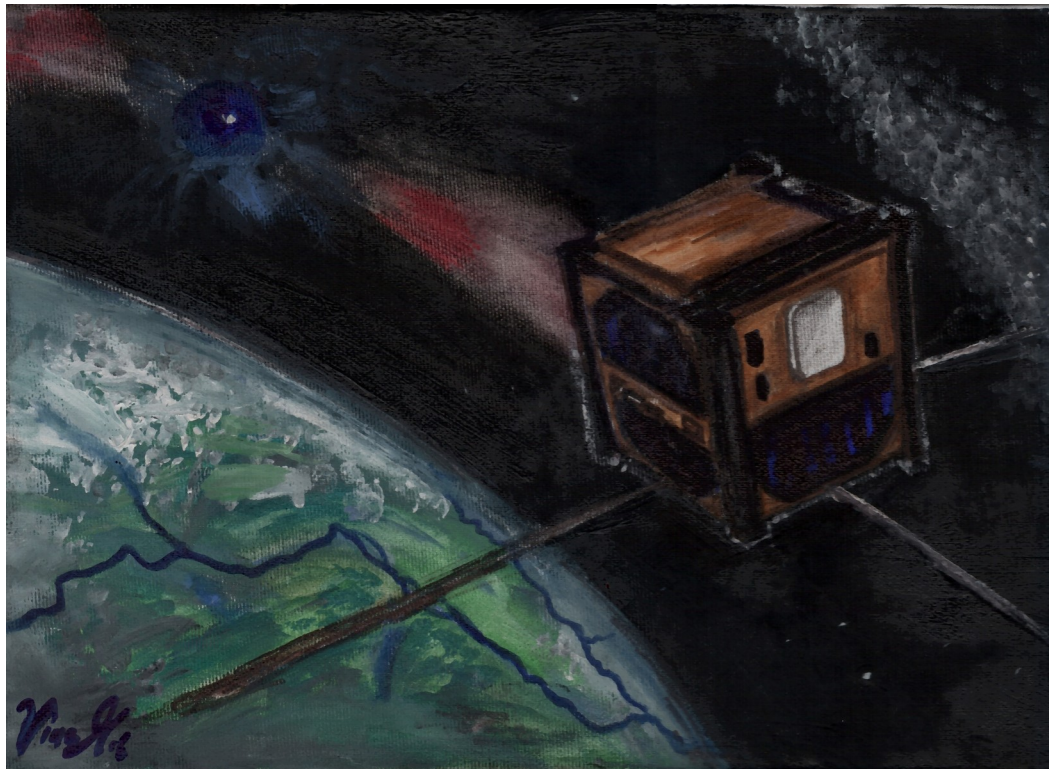# GRBAlpha Status

Jakub Řípa

Masaryk University
ripa.jakub@gmail.com

Norbert Werner, Masanori Ohno, András Pál, László Mészáros, Gábor Galgóczi, Norbert Tarcai, Zsolt Frei, László Kiss, Yasushi Fukazawa, Tsunefumi Mizuno, Hiromitsu Takahashi, Nagomi Uchida, Kento Torigoe, Naoyoshi Hirade, Kengo Hirose, Syohei Hisadomi, Kazuhiro Nakazawa, Hirokazu Odaka, Teruaki Enoto, Yuto Ichinohe, Jakub Kapuš, Robert László, Martin Koleda, Vladimír Dániel, Petr Svoboda, Milan Junas, Juraj Dudáš, Martin, Topinka, Filip Munz, Filip Hroch

GRBnanosat telecon, Jan 6th 2021
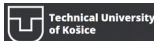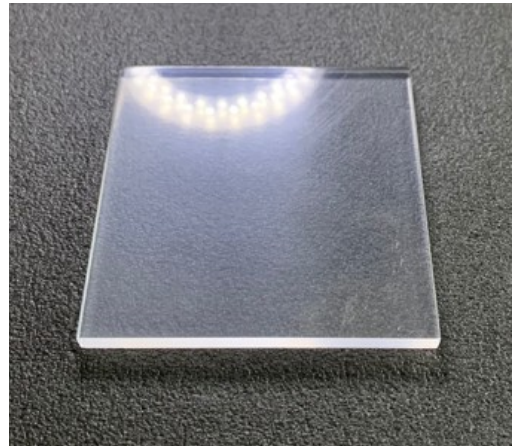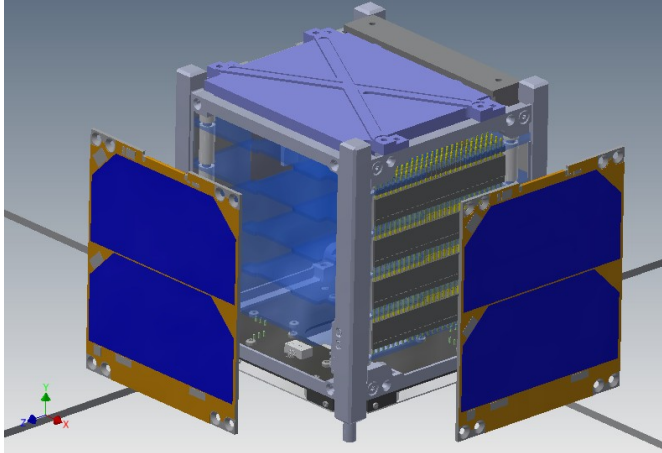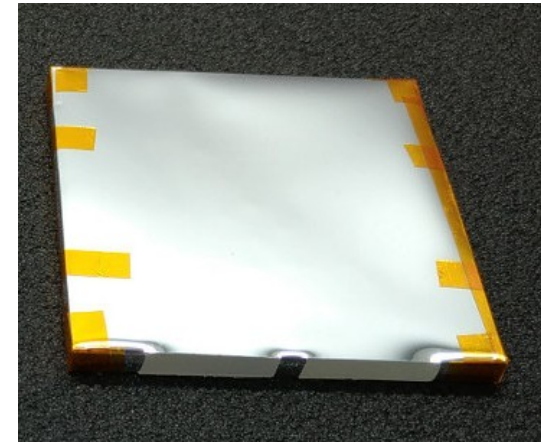
GRBALPHA

- 1-U platform, technological pathfinder to future constellation
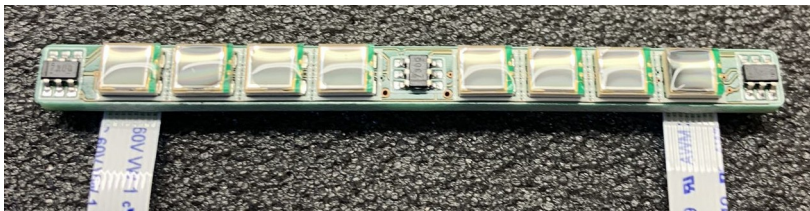- Detector placed on one side enclosed by 1 mm Al casing
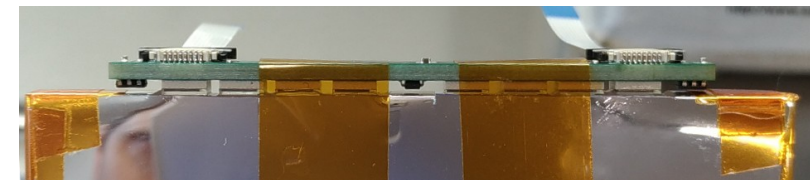
Pál+ 2020

CsI(Tl) scintillator

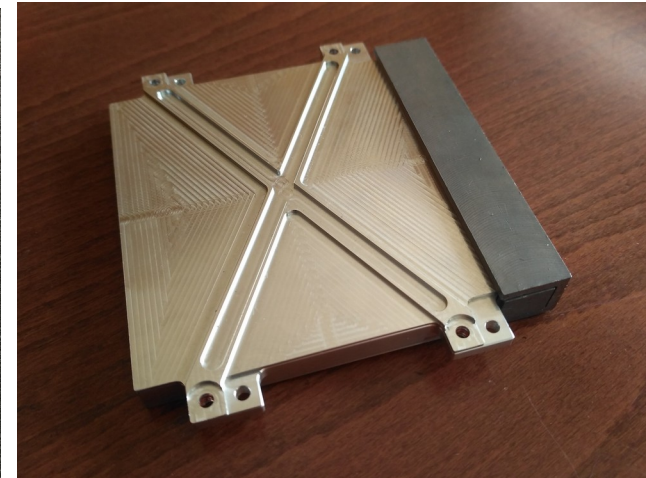Wrapped in Enhanced Specular Reflector (ESR)

2 readout channels of 4 MPPCs (S13360-3050 PE) by Hamamatsu

MPPCs are coupled with crystal by optical glue DOWSIL93-500

DuPont Tedlar TCC15BL3 wrapping

Pb-Sb alloy shield to reduce degradation of MPPCs by protons

LAUNCH

https://grbalpha.konkoly.hu
www.spacemanic.com/news/grbalpha-satellite-to-launch-from-baikonur/

- After delivery to Moscow it was integrated into the deployer in the facility of GK Launch Services
- Launched from Baikonur by Soyuz-2.1a rocket with the Fregat upper stage to 550 km SSO on **March 22, 2021**
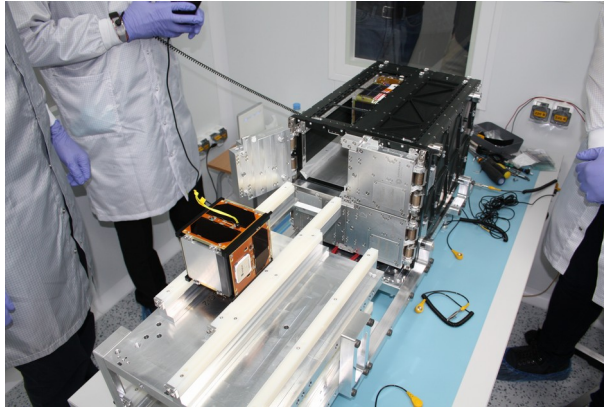
GRBAlpha integrated into deployer

Soyuz painted in unusual white/blue colors like Yuri Gagarin's Vostok 1

38 satellites from 18 countries launched at one time

Main satellite was Korean CAS-500

BACKGROUND MONITORING:
4-ORBITS BACKGROUND

- Count rate for E>~34 keV = ~200-250 cnt/s at latitude ~37°
- Geant4 simulations (Galgóczi+ 2021) for CAMELOT after scaling to GRBAlpha's detector size predicts background rate outside SAA and polar regions 180 cnt/s (for E>20 keV), but activation was not included
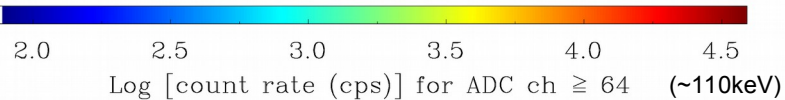- Measured background and simulation result agrees within a factor of 2
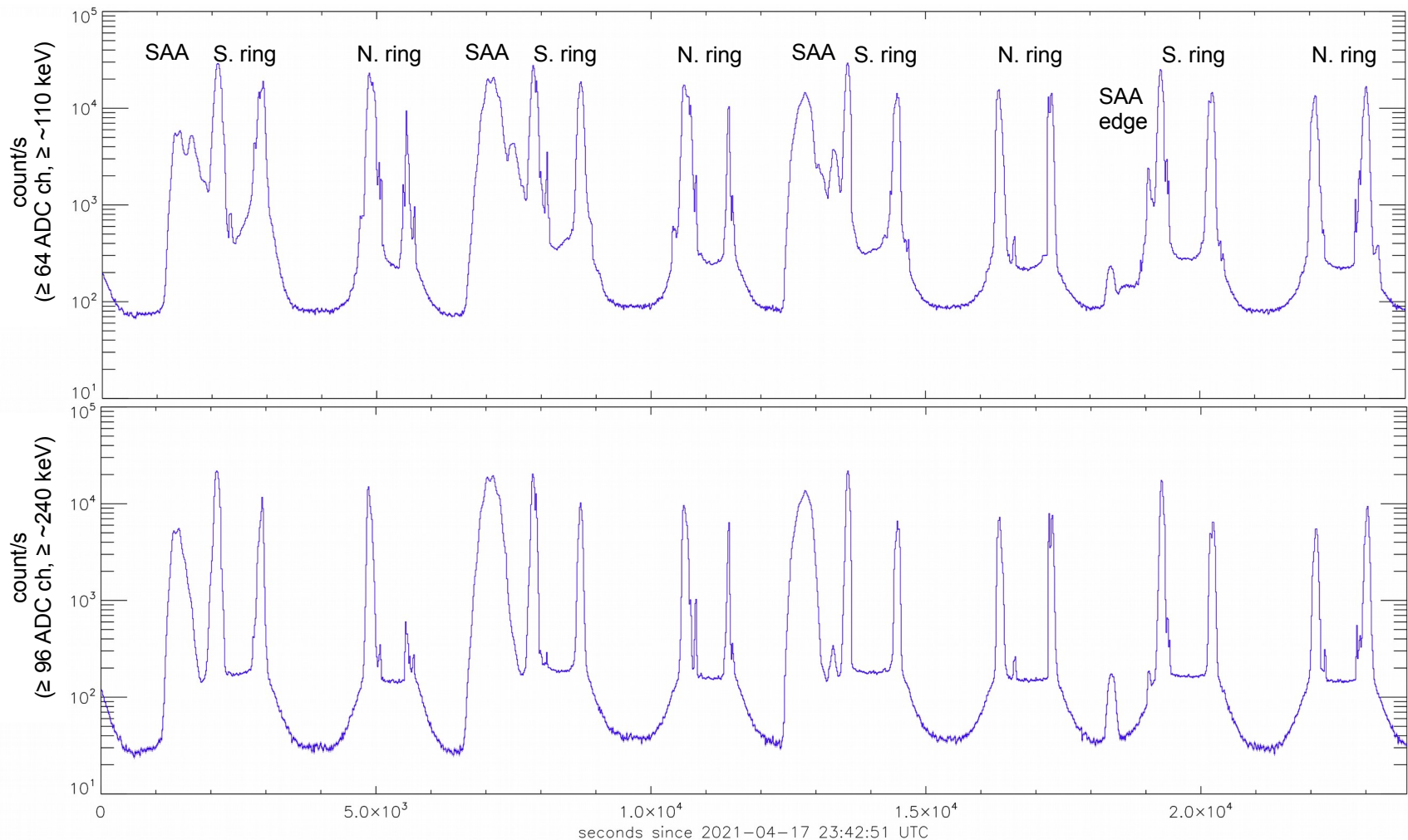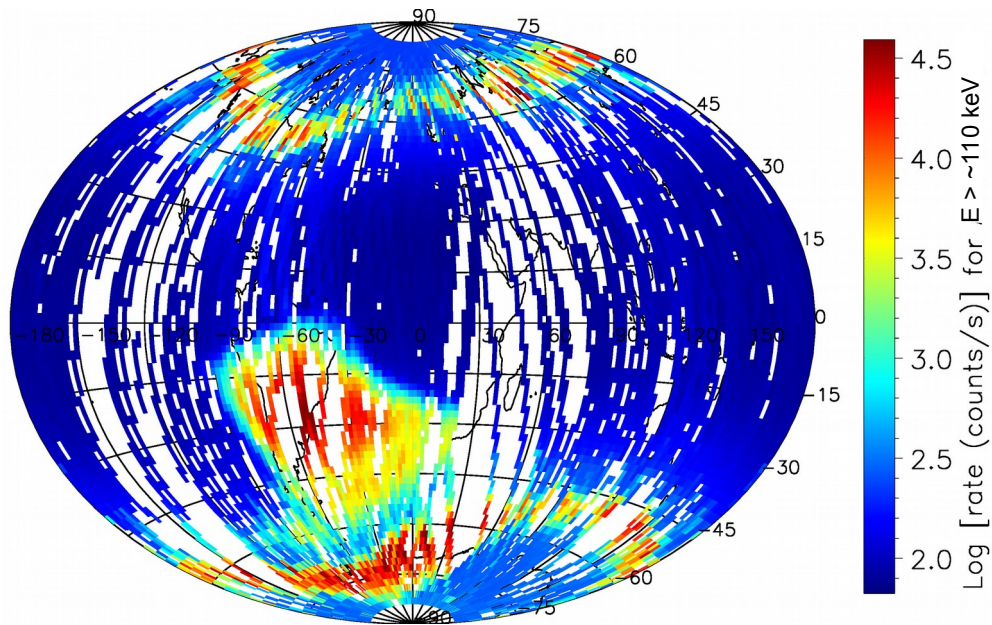
- satellite tracks (averaged flux when overlap) with 1s, 4s and 15s time resolution background measurements
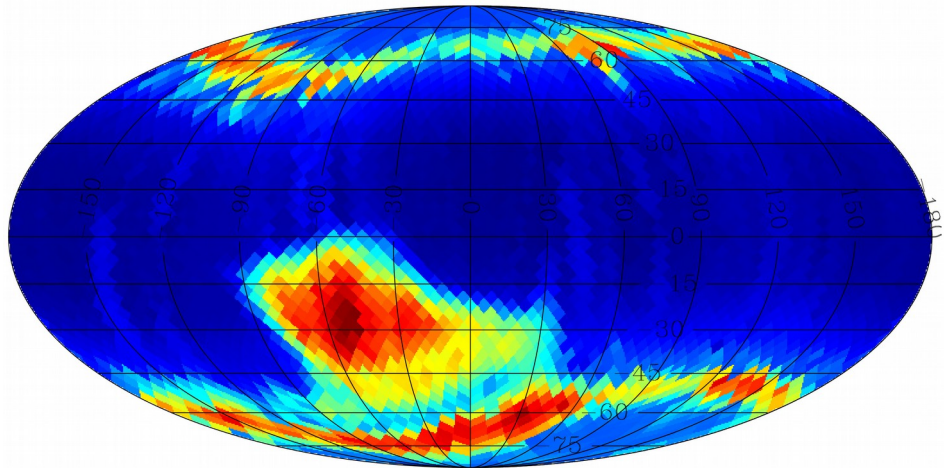
- interpolation of measurements plotted with HEALPix tesselation

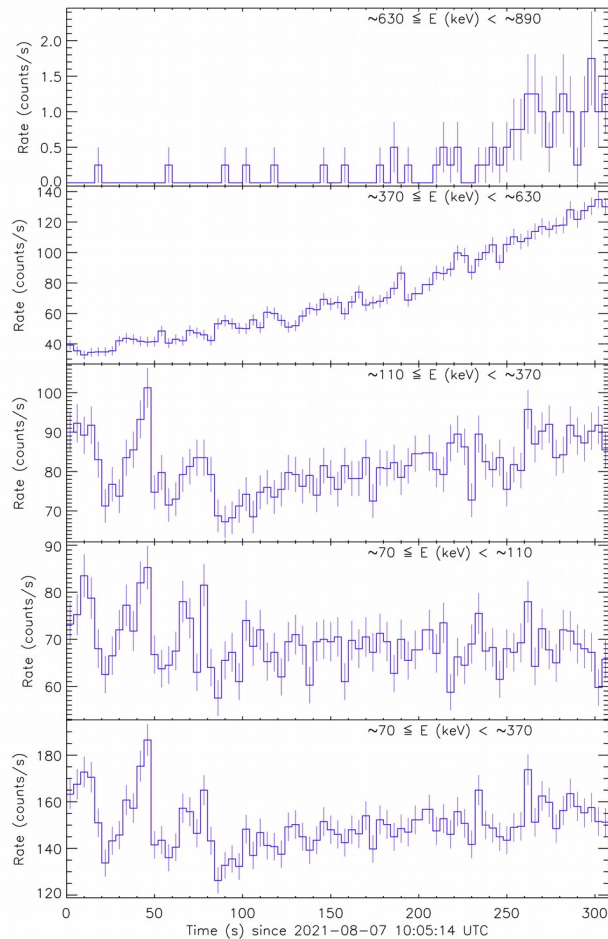- plan is to use such a map on board to control data taking and in future possibly to control the rate trigger

- Full channel spectra is measured at the first timing of each observation to monitor the detector gain and noise performance
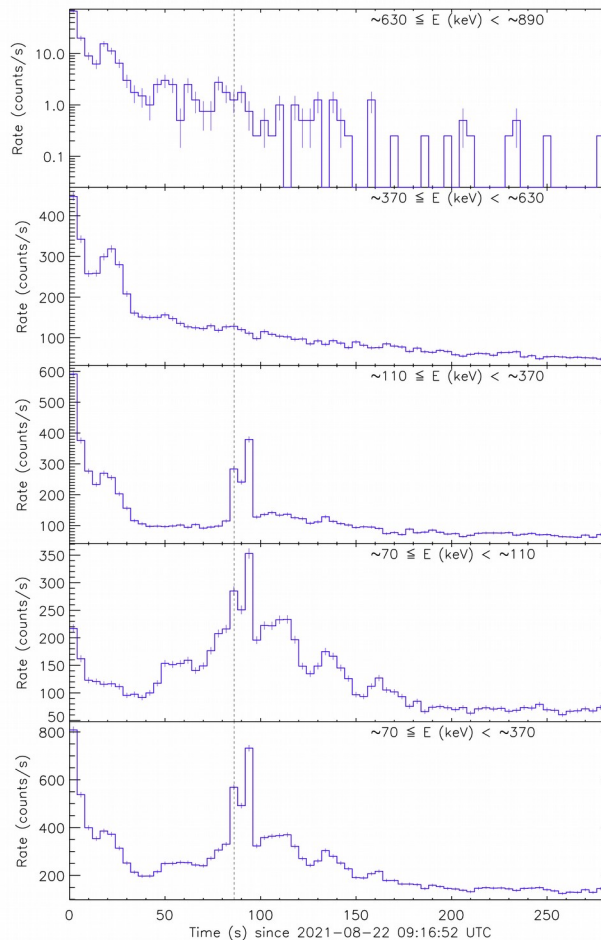

Credit: Masanori Ohno

PRELIMINARY
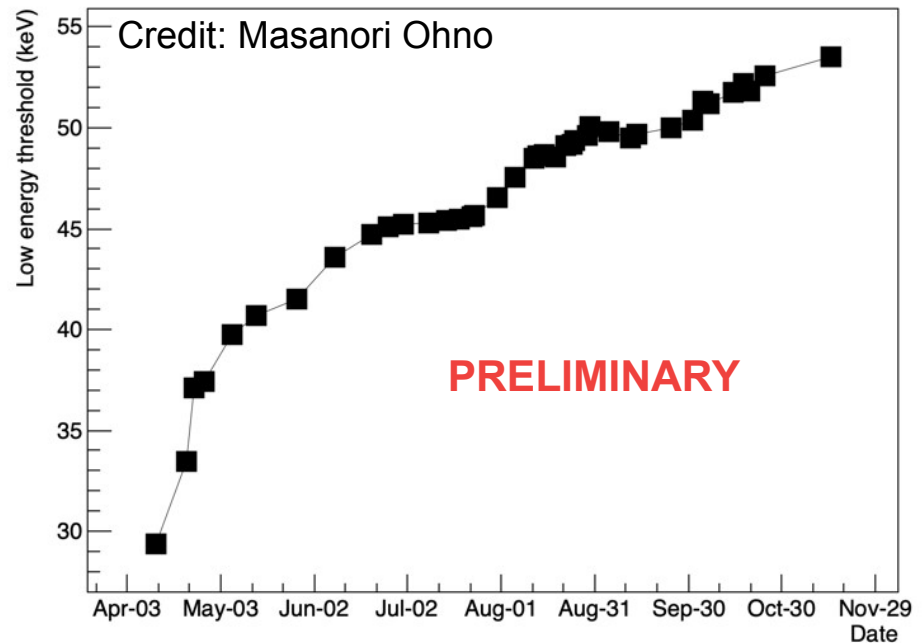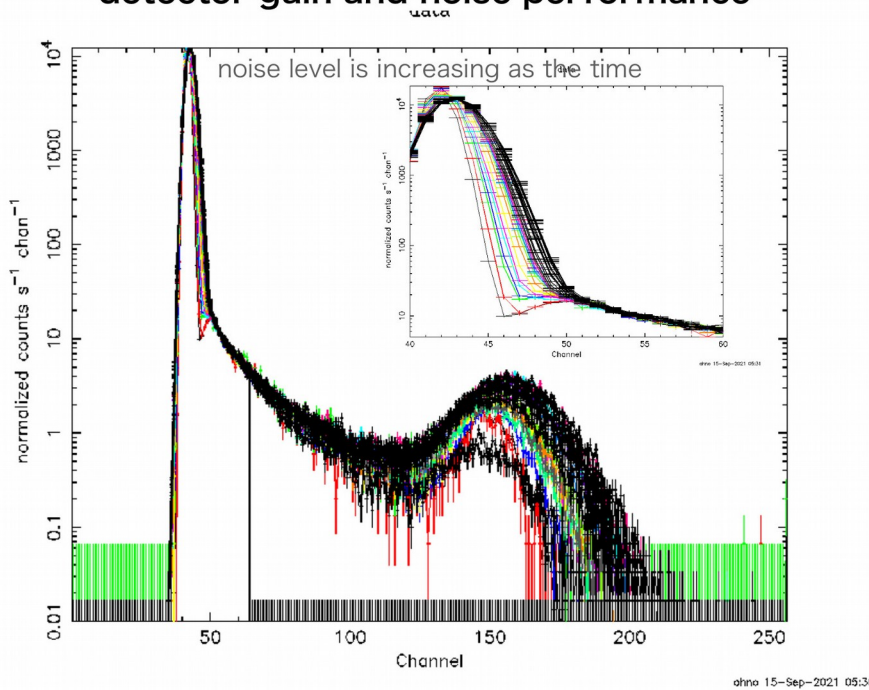
- The noise performance of the MPPC is still degrading due to the radiation damage by the trapped protons
- Expected by the ground beam experiment but the trend is not so simple with the exposure time
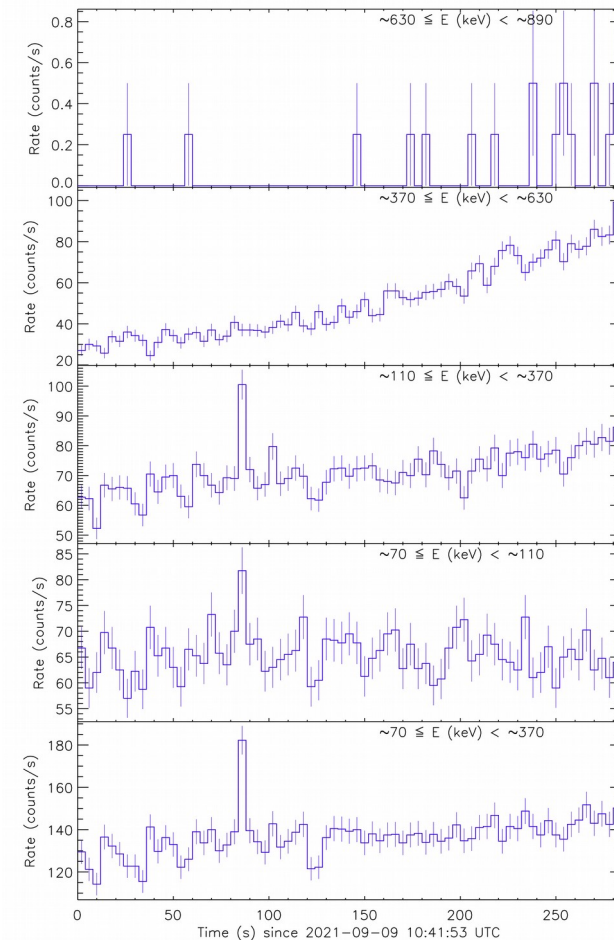- Continuous monitoring would be interesting

GRB 210807A
GCN 30624
**long GRB,
we have high resolution
spectrum**
SNR≈8

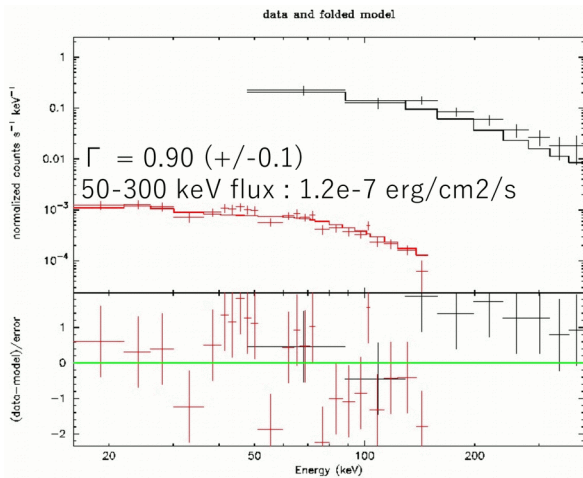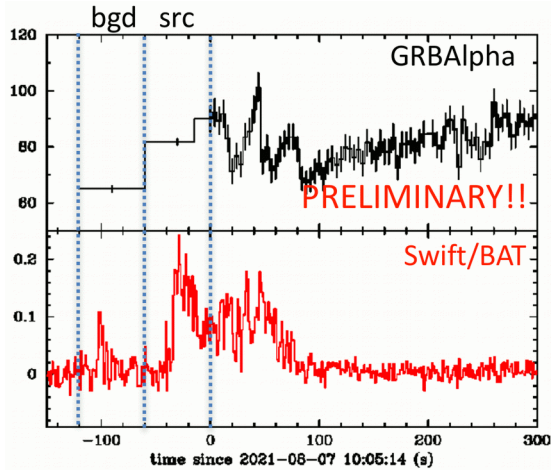**GRB 210822A**
GCN 30697
**at z=1.736, light travel time 10 Gyr,
CubeSats can observe such distant
universe !**
SNR≈45

GRB 210909A
GCN 30840
short GRB !
SNR ≈ 9

GRB 210807A
GCN 30624
**long GRB,
we have high resolution
spectrum**
SNR≈8

GRB 210822A
GCN 30697
**at z=1.736, light travel time 10 Gyr,
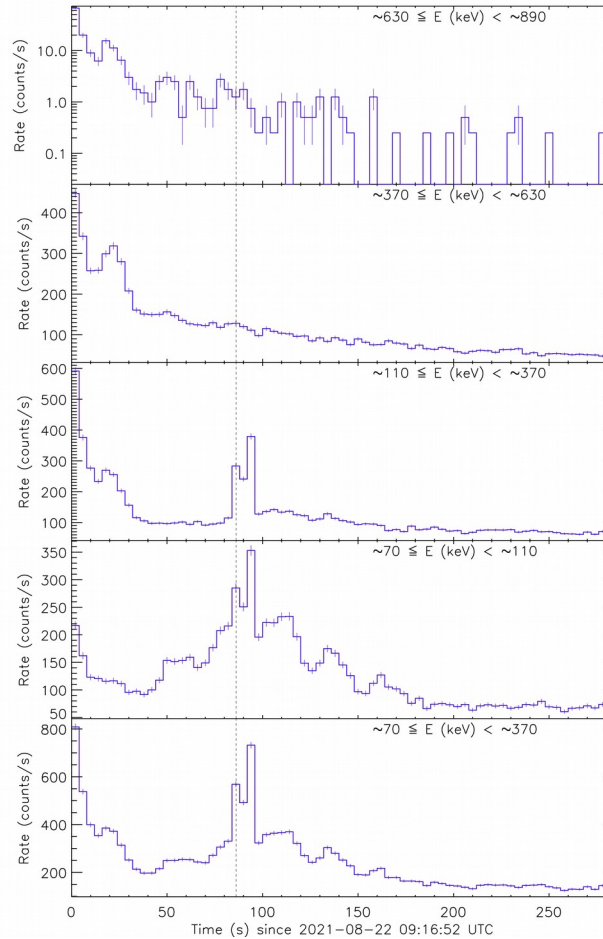CubeSats can observe such distant
universe !**
SNR≈45

GRB 210909A
GCN 30840
short GRB !
SNR ≈ 9

GRB 211018A
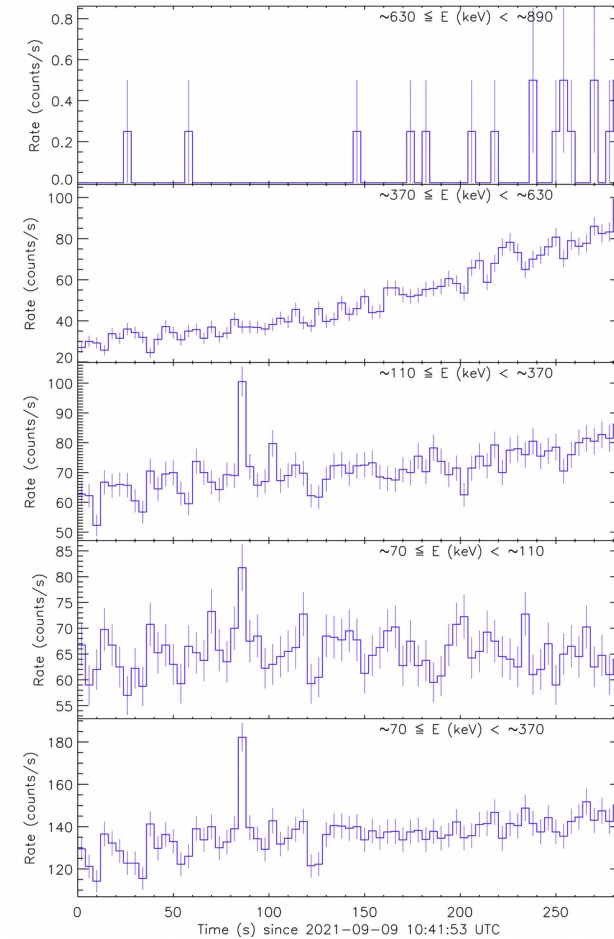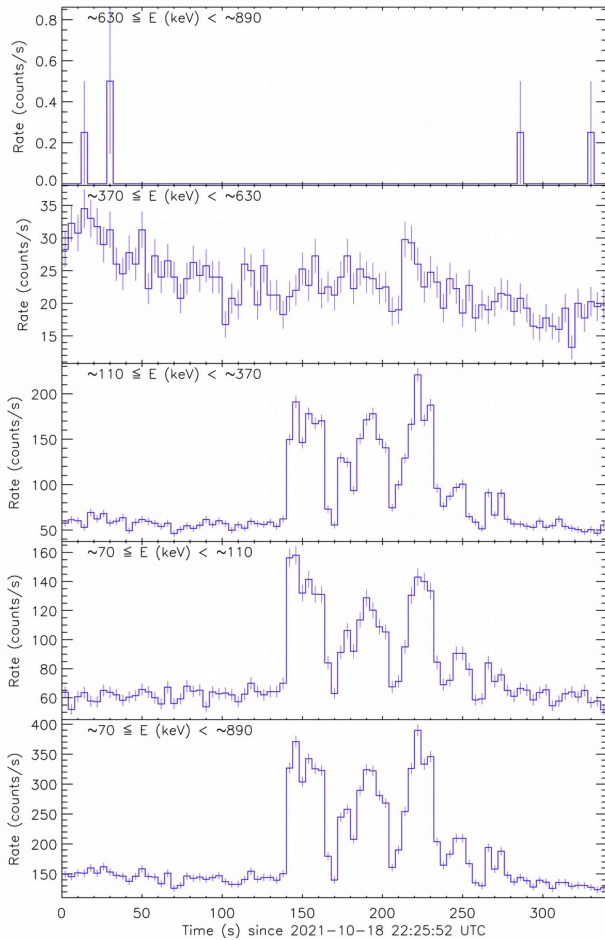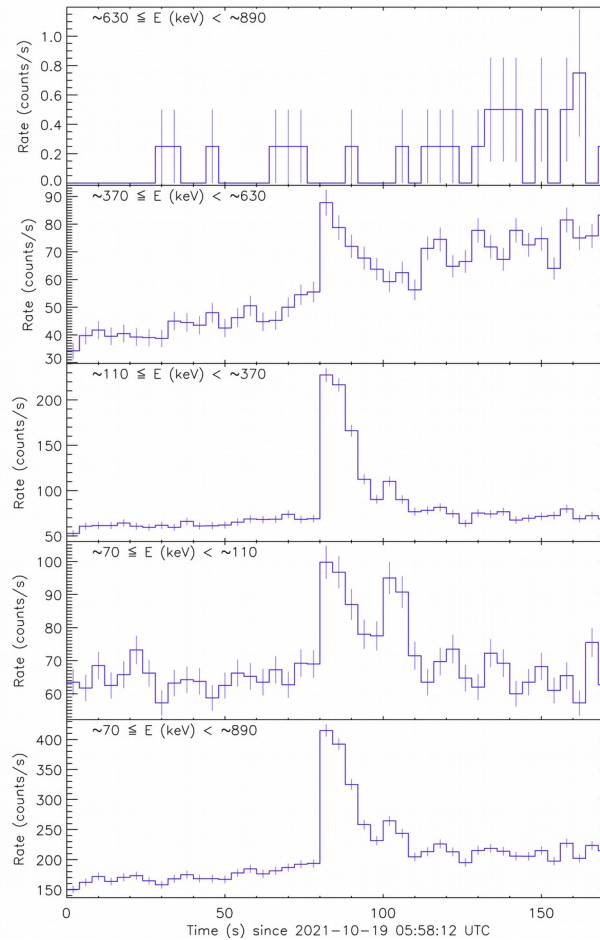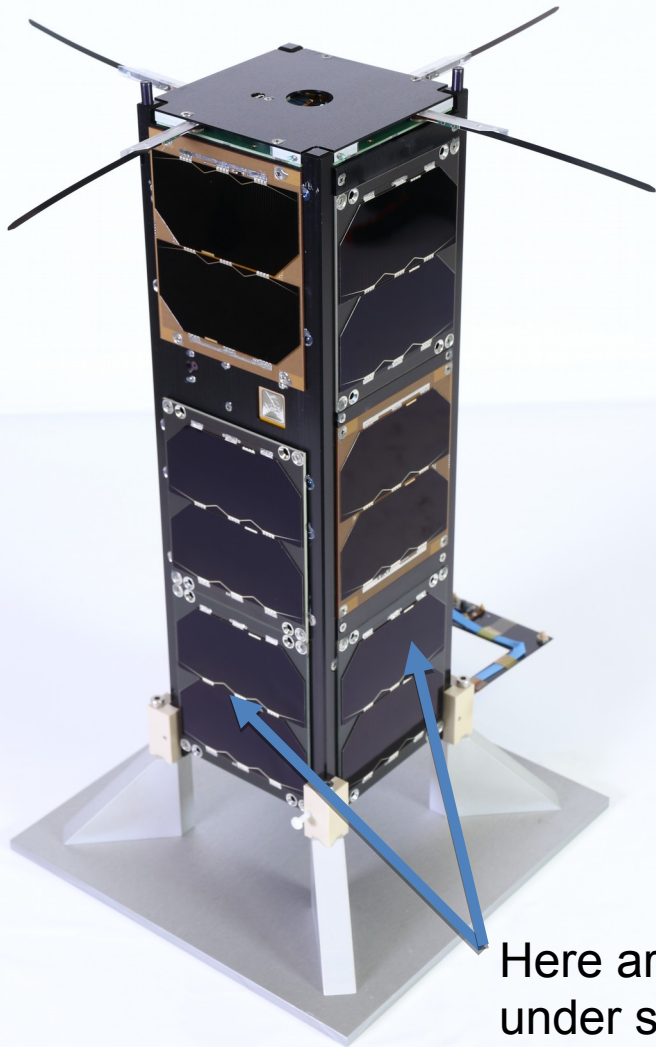GCN 30945
SNR≈46

GRB 211019A
GCN 30946
SNR≈39

- Demonstration that nano-satellites can host payloads sensitive enough to routinely detect GRBs !

These two long GRBs were detected within 8 hours

VZLUSAT-2:
WITH TWO GRB DETECTORS

Here are our detectors under solar panels

- VZLUSAT-2 is a technology mission with Earth observing cameras as primary payload developed by The Czech Aerospace Research Centre

- Two detectors (75x75x5mm^3) as a secondary payload

- The detector concept, the MPPCs and electronics are the same as on GRBAlpha

- Launch to 500-600 km SSO by Falcon 9 is scheduled for Jan 13, 2022

Weight: 2 x 280 + 50 g   Power: 0.7 W