Sintez telescope modernization

Nazarov S.V

2021

History

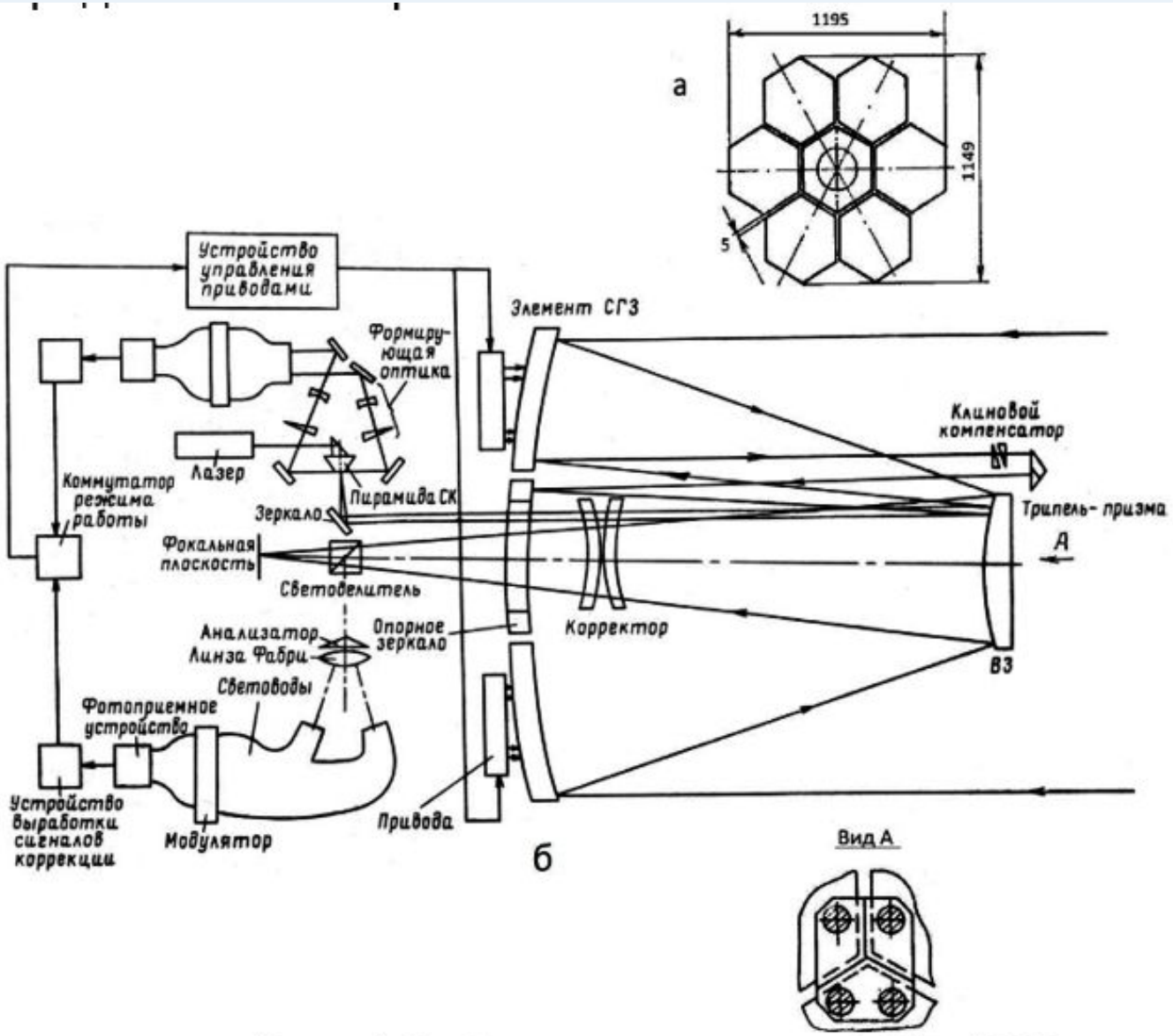
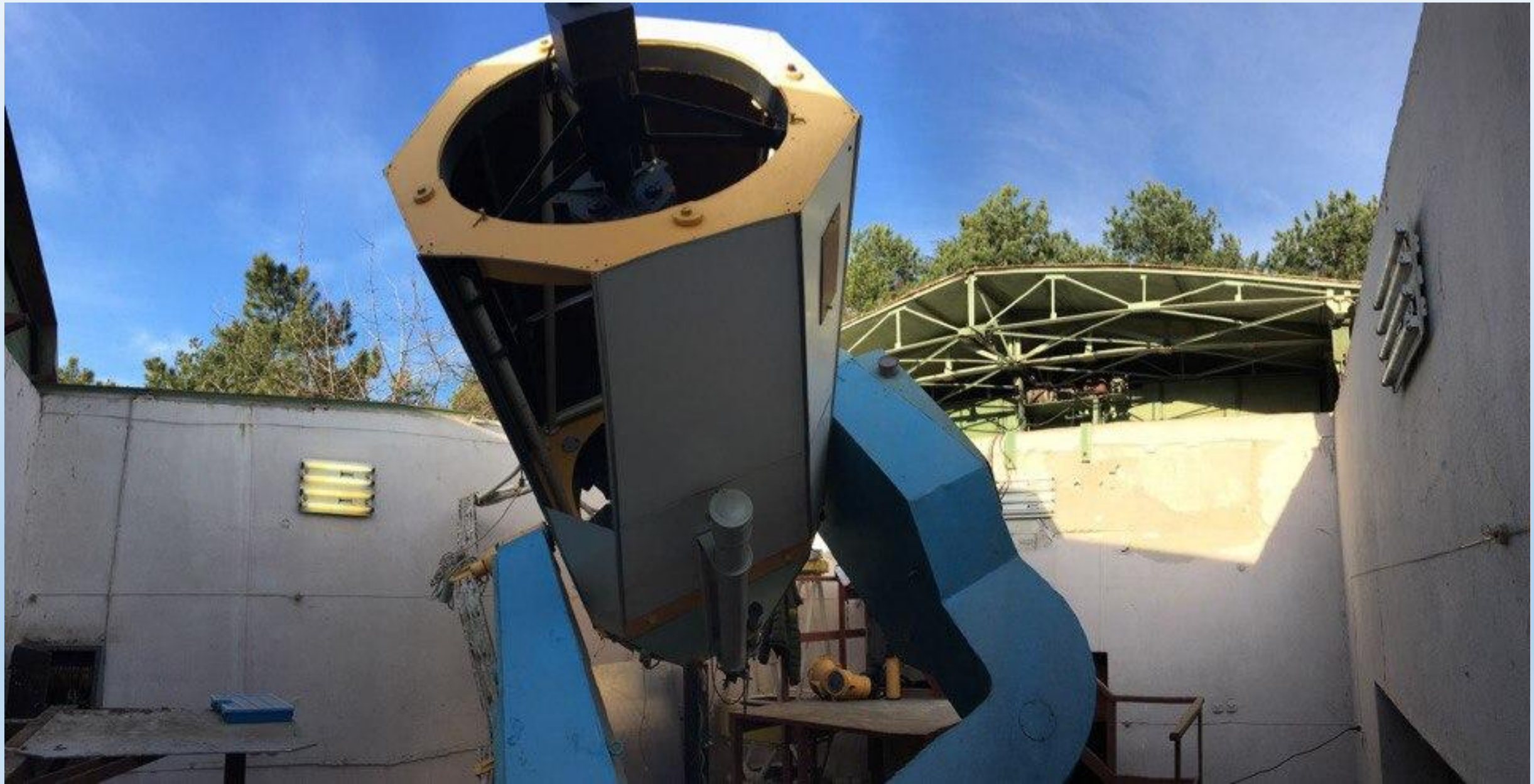
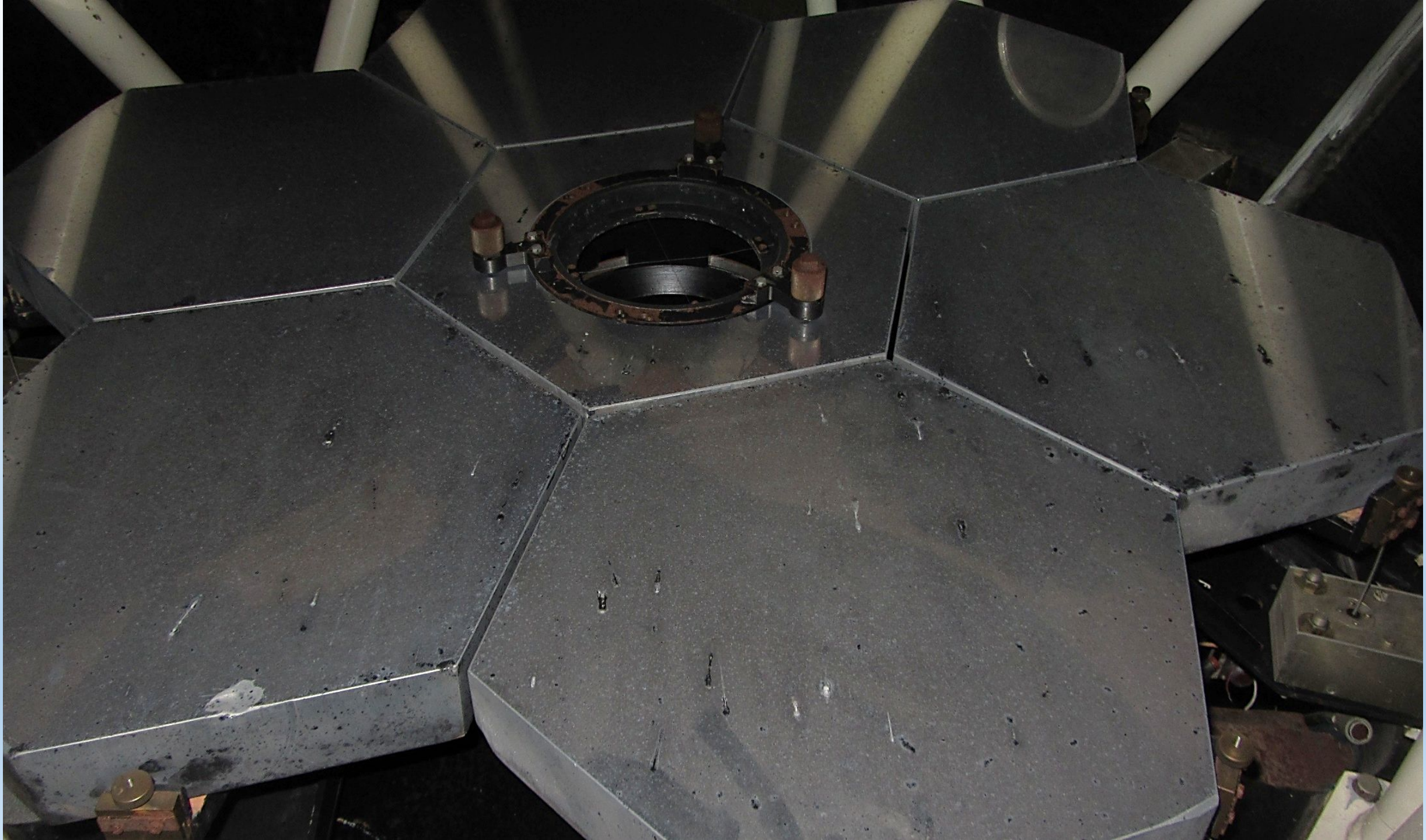


Рис. 1.6. Схема телескопа АСТ-1200





MODERNIZATION

Scientific tasks

- AGN photometry
- Stars photometry
- GRB photometry
- Exoplanets transits photometry
- Search and monitoring programs

Applied tasks

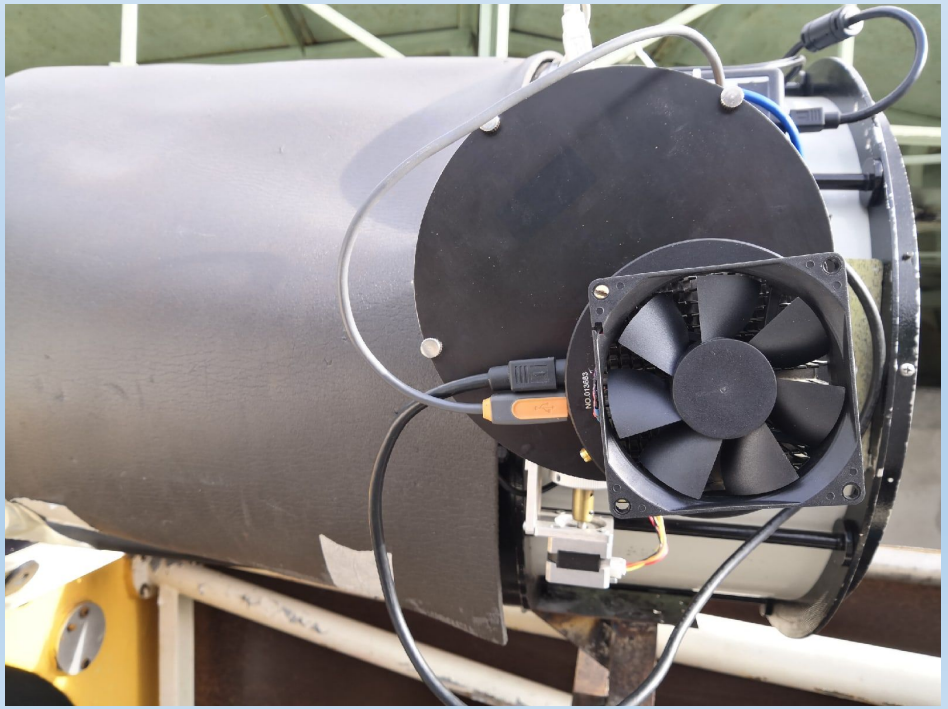
- New devices testing
- Creation of remote and automatic control systems
- Web-based control system creation

Common parameters

- New main mirror diameter about 1m
- Focal distance 3m
- Field of view about 1-2 deg
- Limiting magnitude:
- White light 21-23m
- Photometry in filters 20m
- Spectral observations 15-18m

Small telescope

- Newton reflector 350mm/1765, guide 50/183mm
- Main camera QHY9 guide camera QHY5L-II M
- electric focus
- Filter wheel 7x1.25” C-B-V-R-I-OIII-Ha



WEB-control

Телескоп "Синтез"

РУЧНОЕ УПРАВЛЕНИЕ КОМПЛЕКСОМ АППАРАТУРЫ

СТАТУС ОБОРУДОВАНИЯ

СЕРВЕР Alpaca/INDI ASP.NET 1.1-272 СВЯЗЬ: 1.000
Погода: Приемлимо **Воздух:** 12.3° 99% **Небо:** -4.7°
Ошибка: Все данные приняты

КРЫША Овен v1.18 СВЯЗЬ: 1.000
Состояние: Открыто Сила ВКЛ
Входы: 0x0 **Выходы:** 0x0 **Рег:** 0x41 0x3

ТЕЛЕСКОП Ra:2.1-657, Dec:2.1-657 СВЯЗЬ: 1.000
Часовое ведение: ВКЛ
Парковка: Распаркован
JNow: Ra=05h47m52.0s , Dec=00°05'15.1"
Земля: Ha=-01h56m56.4s , Dec=00°05'15.1"

[КАМ1] [КАМ2] [ВОСТОК] [ВСЁНЕБО]

ОТЛАДОЧНЫЙ РЕЖИМ | УПРАВЛЕНИЕ ТЕЛЕСКОПОМ

Крыша + телескоп	Открыть	Закрыть	Стоп	Парковка
Крыша отдельно	Открыть	Закрыть	Стоп	
Питание монтировки	Вкл	Откл	Разблокиро...	
Питание аппаратуры	Вкл	Откл	Перезапуск	

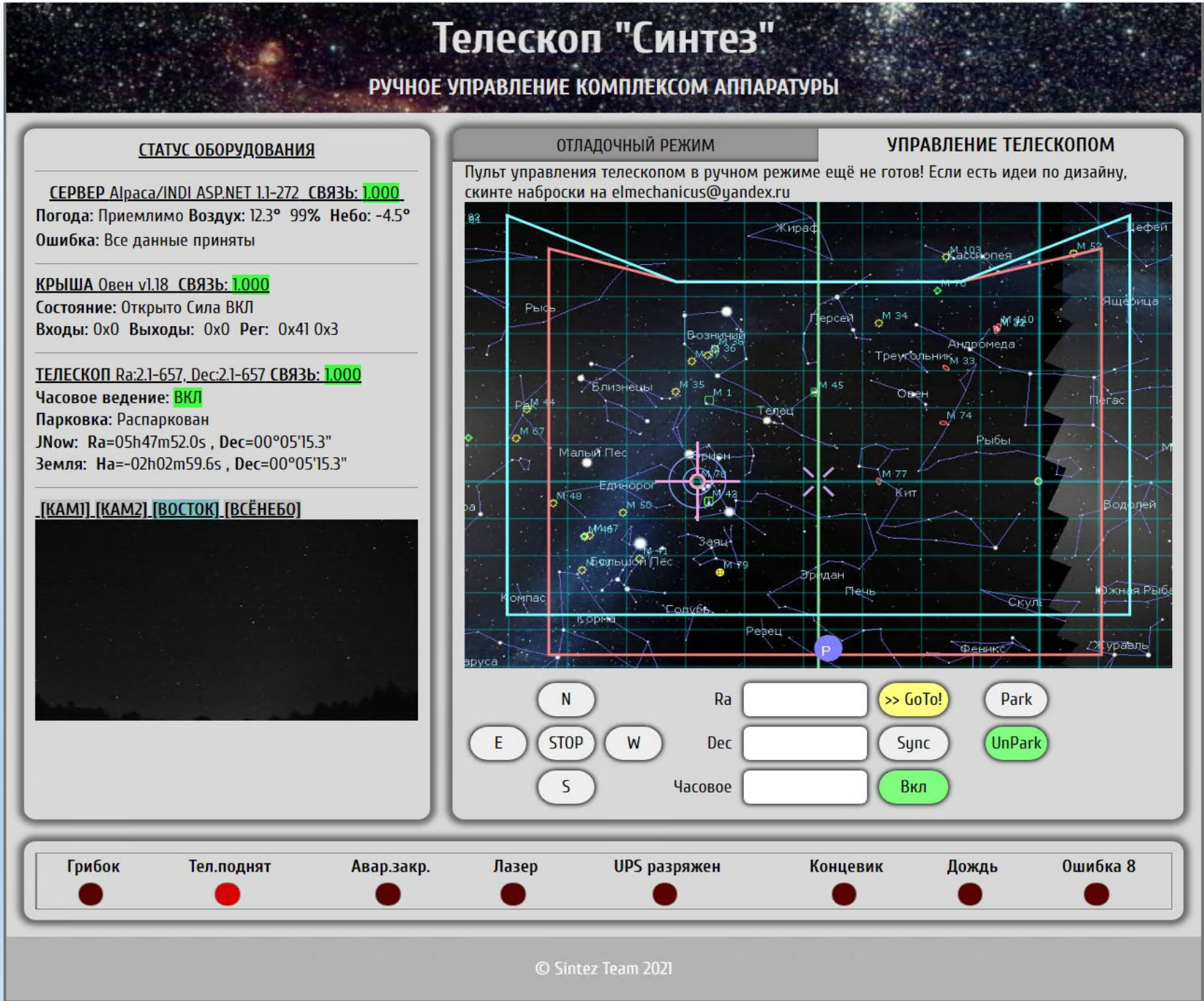
ПРОЧИЕ КОМАНДЫ

Освещение главное	Вкл	Откл
Подсветка	Вкл	Откл
Датчик осадков	Откл	Вкл

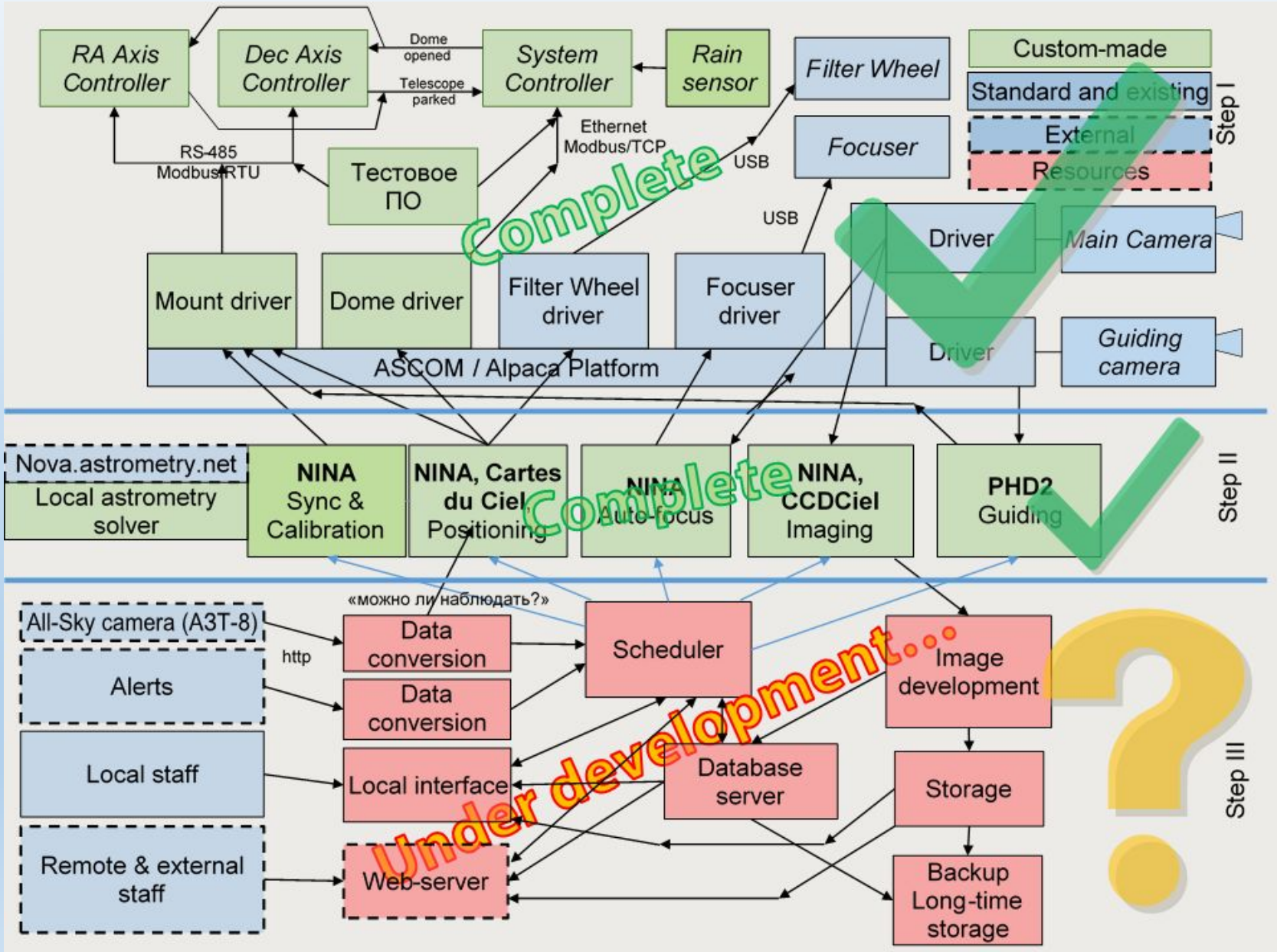
Грибок	Тел.поднят	Авар.закр.	Лазер	UPS разряжен	Концевик	Дождь	Ошибка 8
●	●	●	●	●	●	●	●

WEB-control

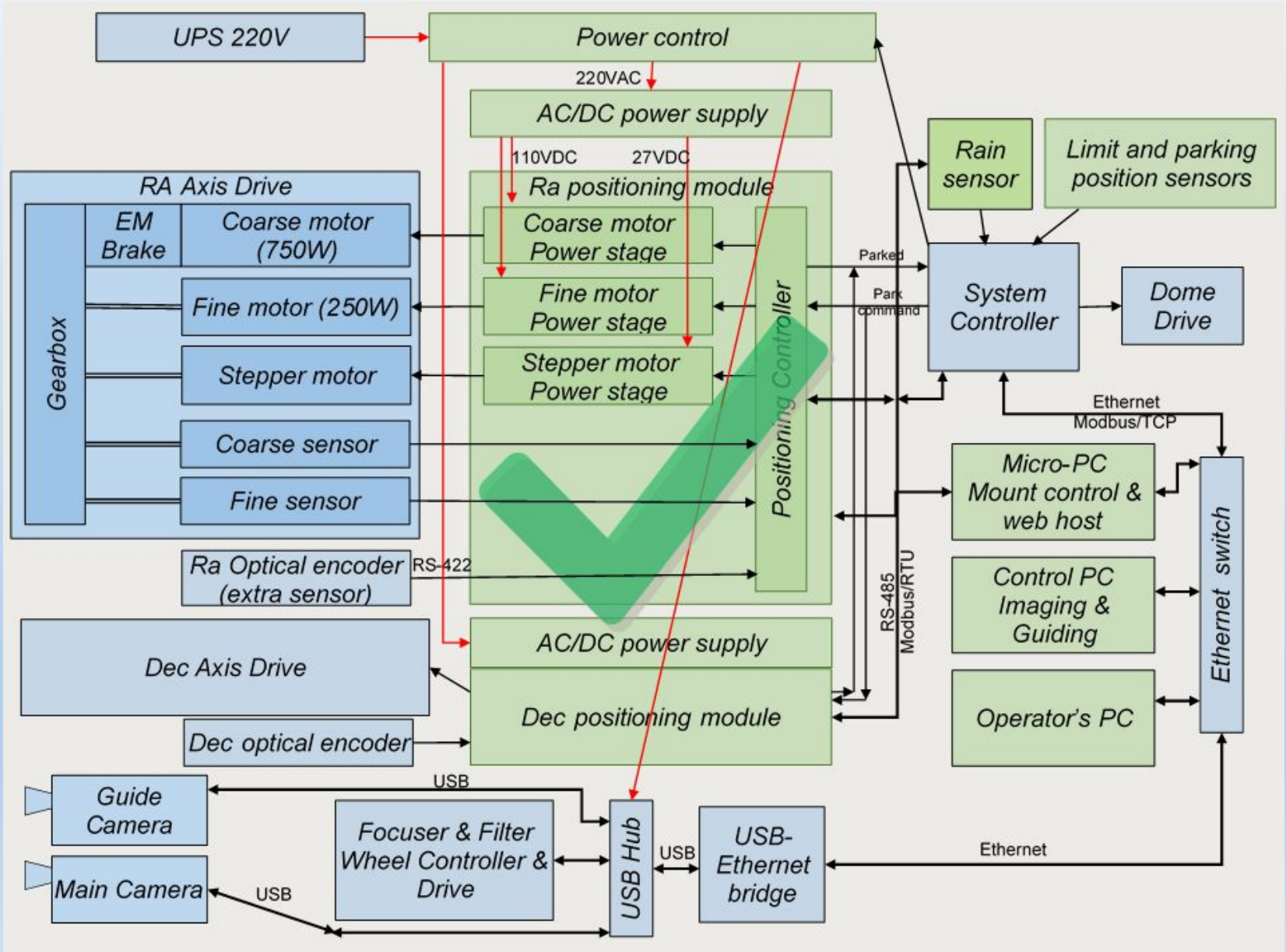
http://sintez.alex13.ru



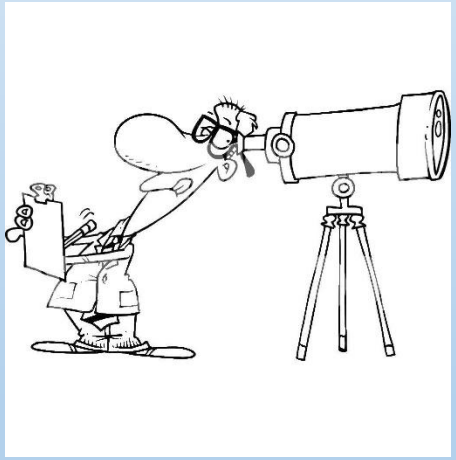
Control system



Control system



OBSERVATIONS



As we observe with a telescope

- Open the roof and power on the mount (manual)
- Unpark the telescope and point to the object (NINA automatic)
- Astrometry of the first frame (NINA automatic).
- Synchronization of the telescope with the obtained coordinates (NINA automatic)
- Sharp pointing to the object (NINA automatic)
- Turn on autoguide (PhD2 automatic)
- Get the series of frames of the object (NINA automatic)
- Point the telescope to the next object (NINA automatic)
- Park telescope and warm camera (NINA automatic)
- Close the roof (industrial controller OVEN)

First light

December 2020

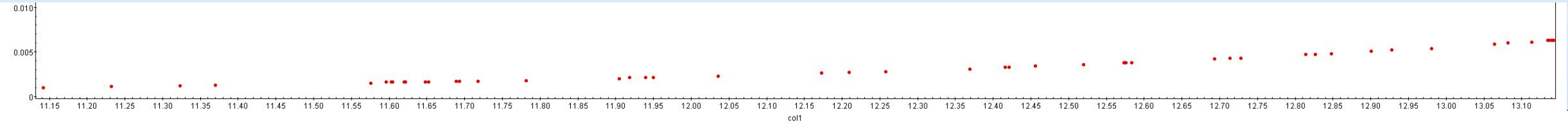
350/1767mm
Camera QHY-9S M

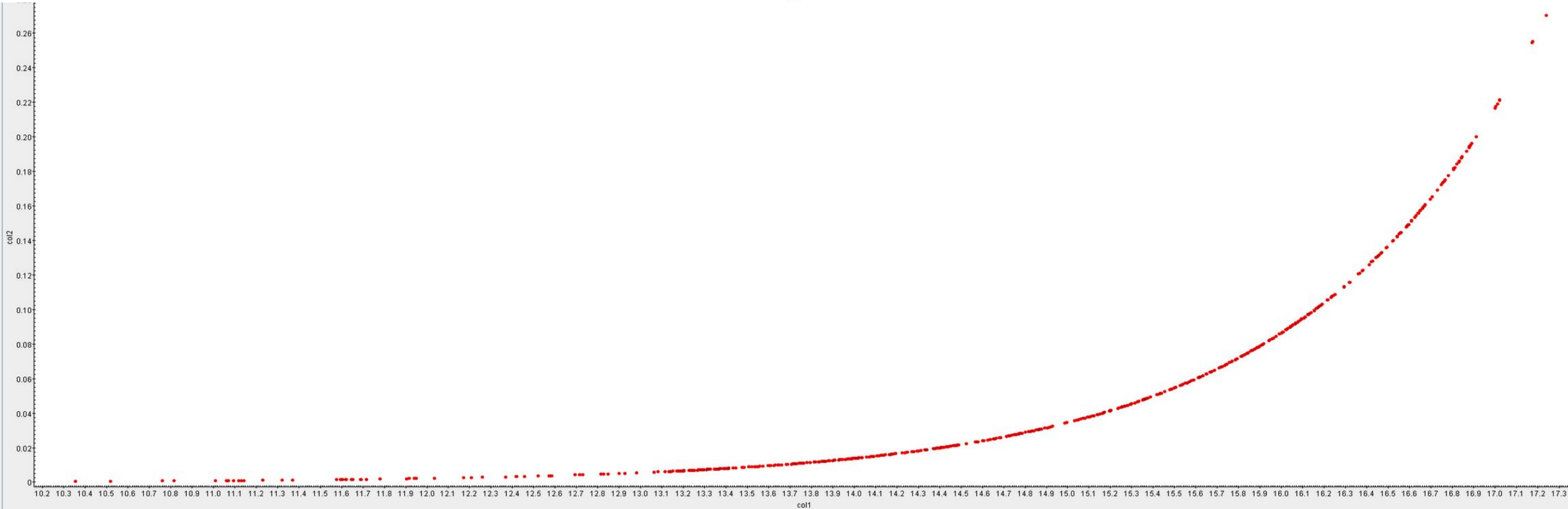
Resolution 0,63”/px

Photometric error

may 2021

350/1767mm
Camera QHY-9S M
Filter B, 60s

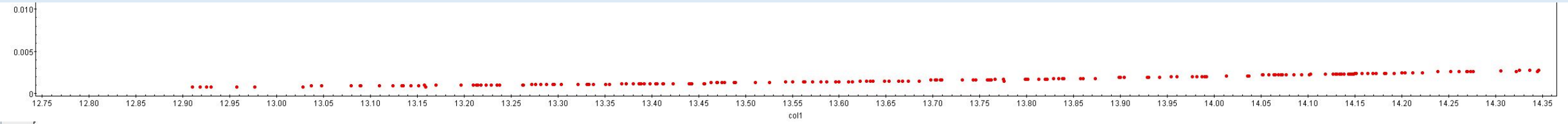


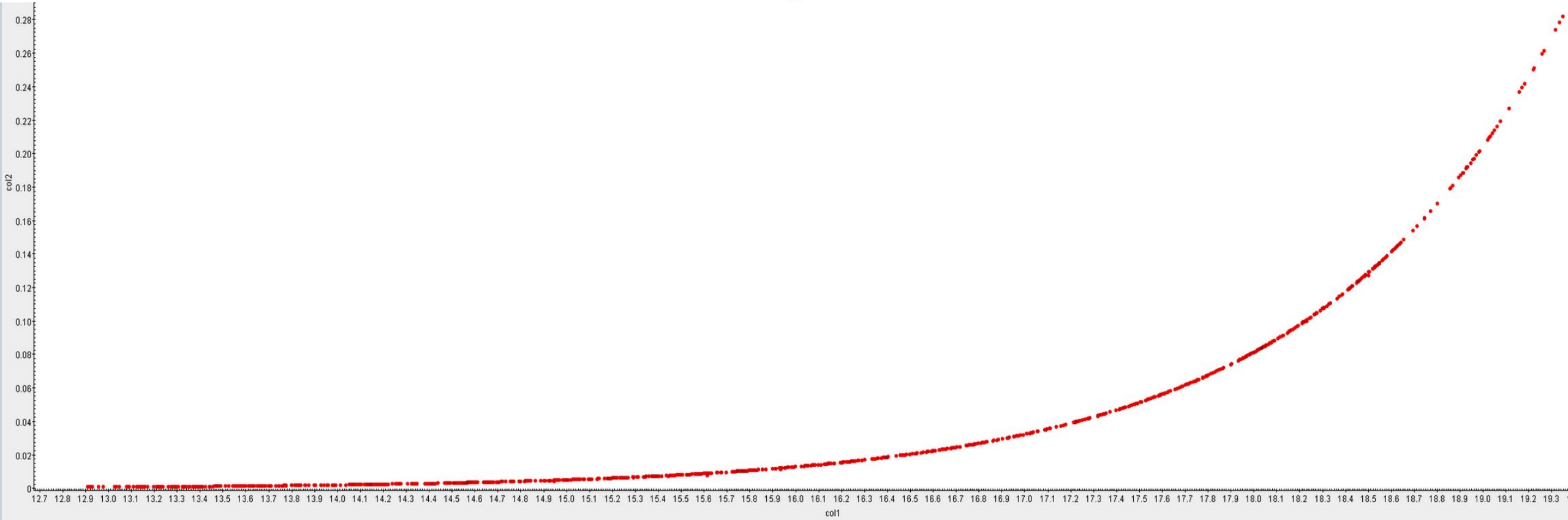


Photometric error

may 2021

350/1767mm
Camera QHY-9S M
Filter V, 600s

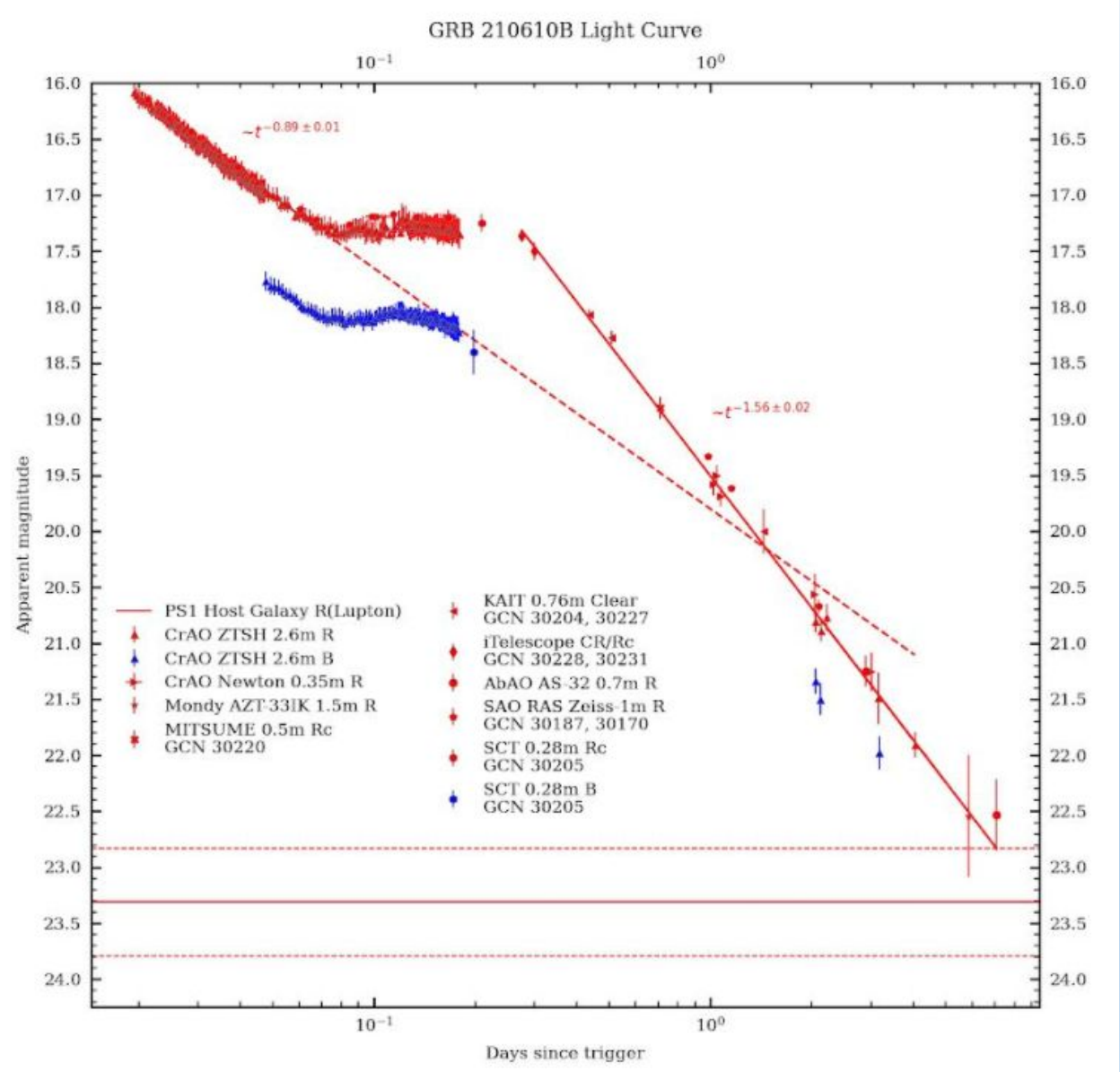




GRB 210610B

Date	UT-start	t-T0	Exp	Filter	OT	Err	UL(3sig)	Obs.	Telescope
2021-06-10	22:07:10	0.10293	5*300	R	17.20	0.03	20.5	CrAO	Newton-0.35
2021-06-10	22:41:13	0.12658	5*300	R	17.28	0.08	21.1	CrAO	Newton-0.35
2021-06-10	23:06:26	0.14409	5*300	R	17.28	0.06	21.1	CrAO	Newton-0.35
2021-06-10	23:31:38	0.16159	5*300	R	17.29	0.06	21.1	CrAO	Newton-0.35
2021-06-11	20:22:38	1.02165	8*300	R	19.58	0.10	21.2	CrAO	Newton-0.35
2021-06-11	20:50:32	1.04103	6*300	R	19.50	0.09	21.2	CrAO	Newton-0.35
2021-06-11	21:33:21	1.07077	17*300	R	19.69	0.09	21.5	CrAO	Newton-0.35
2021-06-12	20:39:03	2.03479	14*300	R	20.57	0.189	21.5	CrAO	Newton-0.35
2021-06-13	19:38:28	3.02571	20*300	R	21.26	0.173	21.8	CrAO	Newton-0.35

GRB 210610B

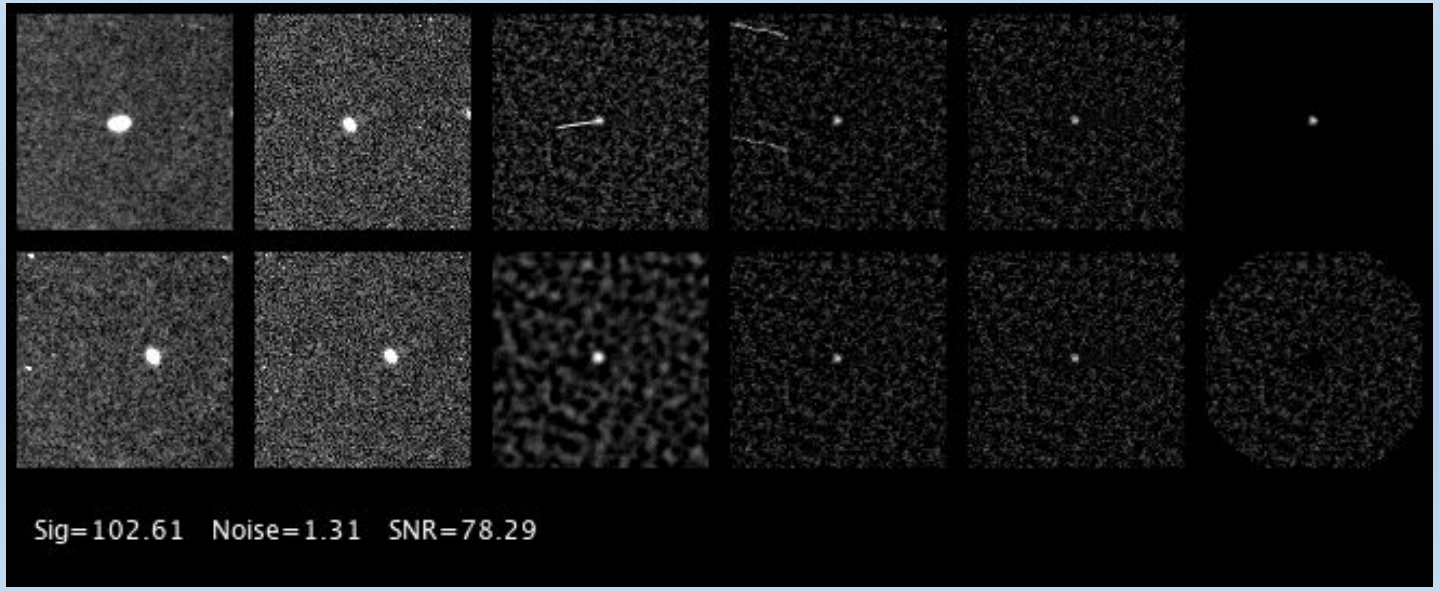

GRB 210610B Light Curve
Apparent magnitude
Days since trigger
$\sim t^{-0.89 \pm 0.01}$
$\sim t^{-1.56 \pm 0.02}$
PS1 Host Galaxy R(Lupton)
CrAO ZTSH 2.6m R
CrAO ZTSH 2.6m B
CrAO Newton 0.35m R
Mondy AZT-33IK 1.5m R
MITSUME 0.5m Rc
GCN 30220
KAIT 0.76m Clear
GCN 30204, 30227
iTelescope CR/Rc
GCN 30228, 30231
AbAO AS-32 0.7m R
SAO RAS Zeiss-1m R
GCN 30187, 30170
SCT 0.28m Rc
GCN 30205
SCT 0.28m B
GCN 30205

Astrometric monitoring

- Our first science aim in autumn 2020 was astrometric monitoring Uranus and Neptune satellites together with Pulkovo observatory. Main camera is QHY-9 with sensor KAF 8300M, pixel size 5.4 mkm, scale 630 mas/pix, field of view 35×26’, typical exposure 45 sec. Total number of observations is 170 for Neptune and 500 for Uranus (october - december 2020).
- Limiting magnitude was 19m, astrometric errors not more 50mas.

New asteroid discovery

- On the night of march 11-12, 2021 we observe the antisolar point (opposite sun point). Exposures about 300 sec, unfiltered, bin 2x.
- Image processing: MaxlmDl, IzmCCD, Mathlab. 10 known objects found and one unknown.
- We get new frames of march 15, send astrometry to MPC and get the registration of the new asteroid 2021 EP5.



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COD 095
CON S. Nazarov
CON [astrotourist@gmail.com]
OBS S. Nazarov
MEA A. Chernyshov, A. Novichonok
TEL 0.35-m f/5 reflector + CCD
NET Gaia DR2

SZ00001	KC2021 03 11.94301	11 30 15.15 +03 10 20.6	20.5 G 095
SZ00001	KC2021 03 11.98224	11 30 12.65 +03 10 21.7	21.0 G 095
SZ00001	KC2021 03 11.99348	11 30 11.82 +03 10 20.2	20.1 G 095
SZ00001	KC2021 03 14.84883	11 27 07.57 +03 09 20.6	095
SZ00001	KC2021 03 14.86288	11 27 06.69 +03 09 19.7	20.5 G 095
SZ00001	KC2021 03 14.87694	11 27 05.71 +03 09 19.4	20.3 G 095
SZ00001	KC2021 03 15.02841	11 26 55.68 +03 09 16.9	20.2 G 095

Asteroid discovery soft

Calibration (dark, flat, bias applying)

Astrometric solution (local astrometry.net solver)

Images alignment (rotation, offset, polynomial transform)

Background fitering (median and sigma-clipping)

Stacking. Fast-moving object removing (satellites and so). Good image of stars as a result.

Removing stars (from stacking pass) from all images

Partial averaging (if there are too many images to process in one time)

Calculation many sums of all images with different offsets. Offset adjusting. Determining possible asteroid-candidates.

Selection of brightest candidates. Calculating SNR, Coordinates, Speed. Summing images with calculated offset.

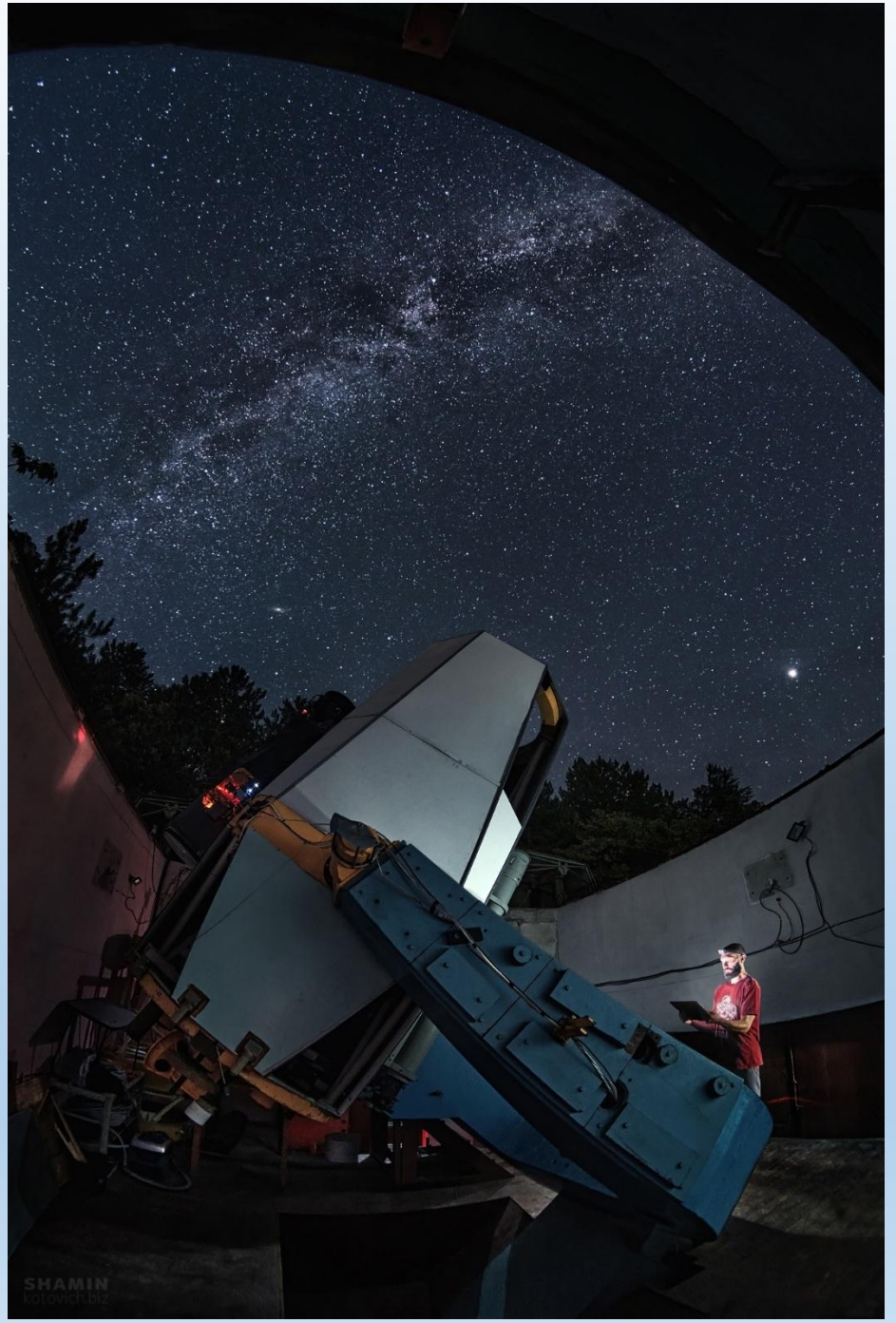
Known objects identification. Exporting results.

AGN observations

- In summer 2021 we started monitoring of BL Lac together with SPbSU. Total number of frames >900 (august - september 2021)

Our results

1. Mount, roof and sensors restored
2. 350mm telescope put into operation
3. Control system created
4. Photometric errors are defined
5. Scientific observations organized
6. Unknown asteroid discoveried



Our results

1. Mount, roof and sensors restored
2. 350mm telescope put into operation
3. Control system created
4. Photometric errors are defined
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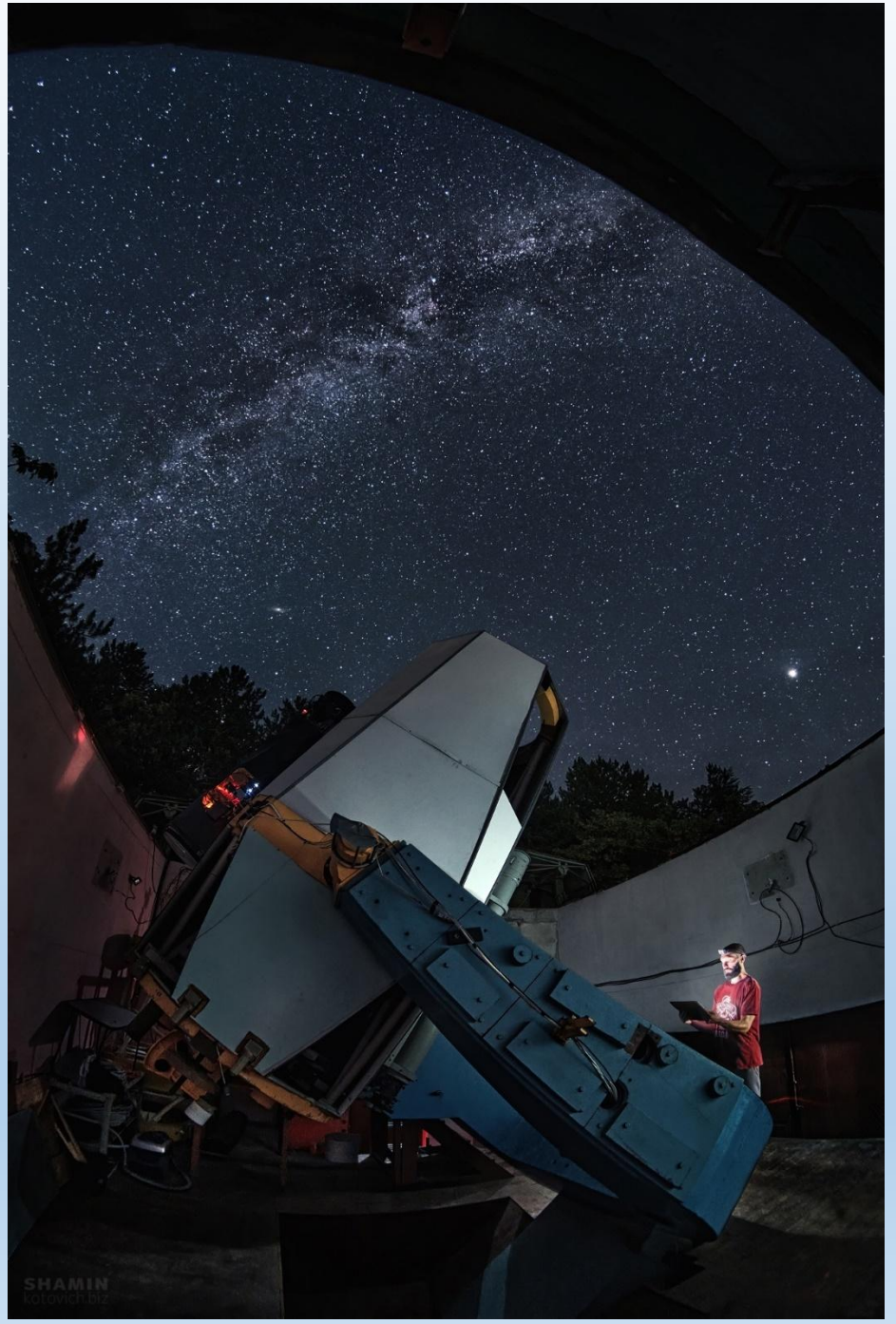
Our plans

1. Full automation of the observations
2. Web-based telescope control
3. New camera and 2” filters
4. Manufacturing and installation of a meter main mirror



Thank you!

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Harchenko Alex
Krivenko Sasha

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