

**Государственная Обсерватория ТЮБИТАК (Анталья, Турция)
Здесь на высоте 2500 метров установлен телескоп РТТ-150**



The main telescope is 1.5-m optical telescope AZT-22 manufactured in S-Petersburg in 1995 by Kazan University order and installed at the TÜBİTAK National Observatory in the framework of a joint Agreement signed in 1995 and extended in 2014 till 2028.

Joint Russian-Turkish telescope RTT-150

– International project with the partnership :

- Kazan Federal University and Tatarstan Academy of Sciences (Kazan)**
- Space Research Institute of Russian Academy of Sciences (Moscow)**
- TUBITAK National Observatory (Antalya, Turkey) and Turkish University**

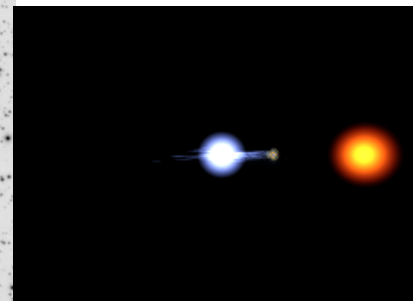
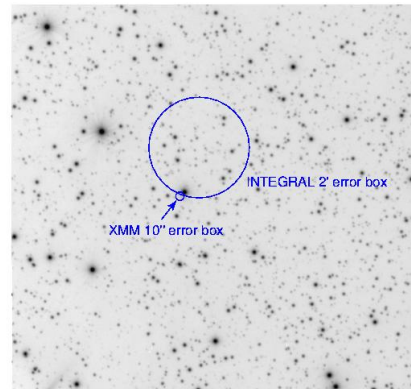
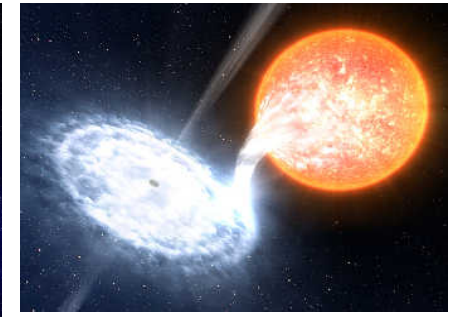
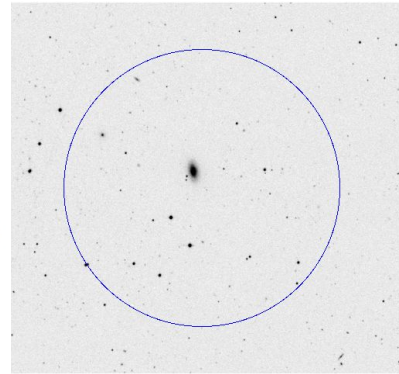
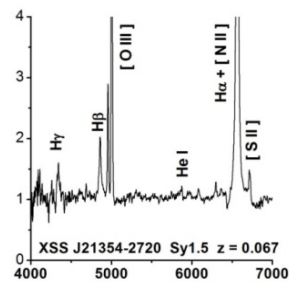
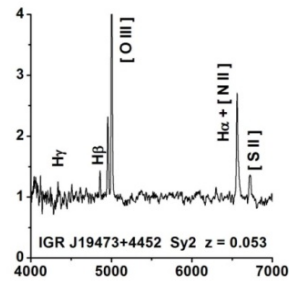
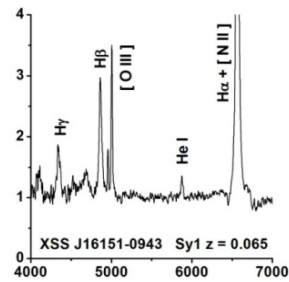
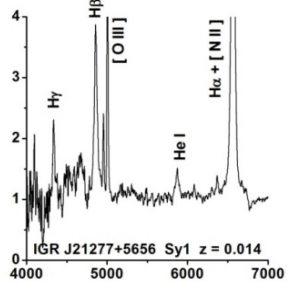
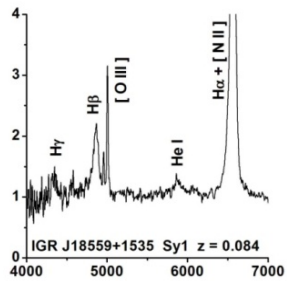
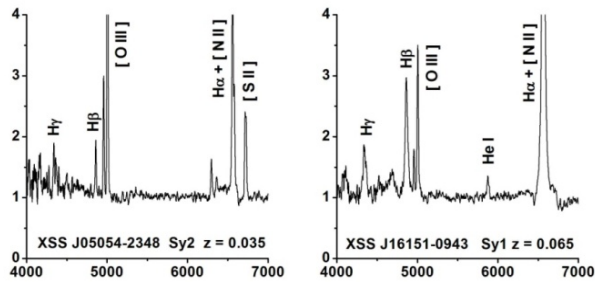


Partners of RTT-150 project jointly created an automated system for remote telescope control, set of modern scientific equipments, including high sensitive CCD photometers, high and low resolution spectrometers, allowing to study objects of different physical nature in the Universe.

The main scientific task of RTT-150 – optical identification of X-ray sources discovered and detected by space Observatories. SRG 2019 +



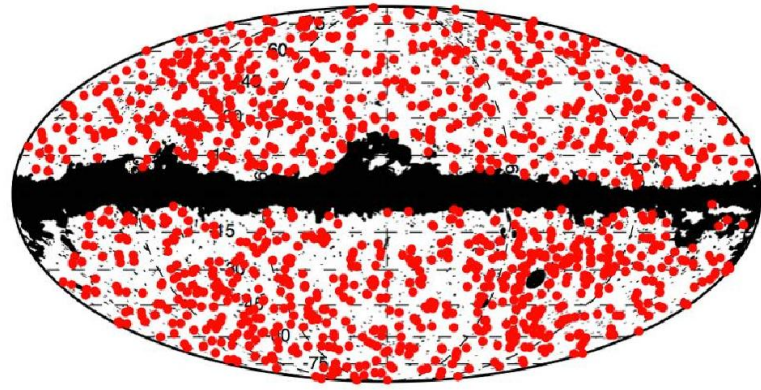
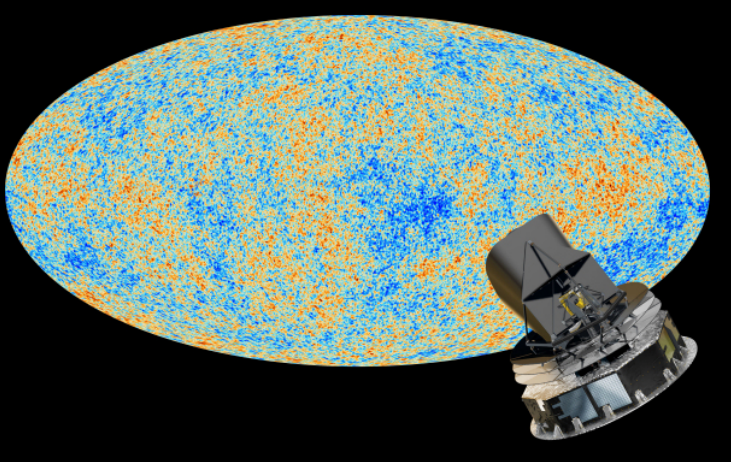
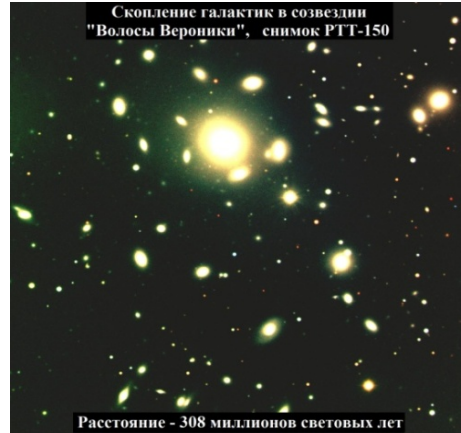
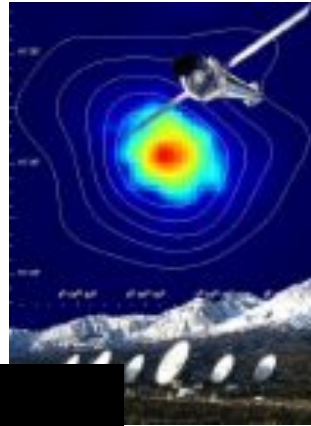
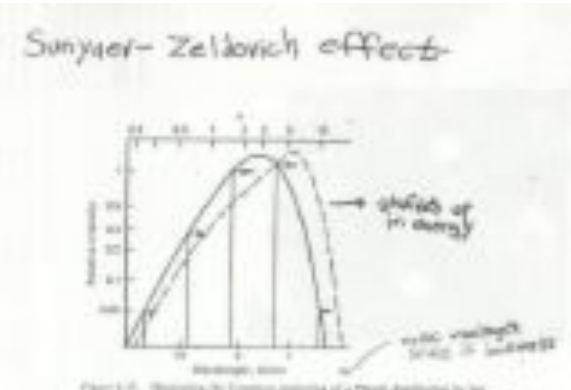
By using RTT-150 facilities KFU and IKI scientists have performed optical identifications and classifications new unic hard X-ray sources detected by INTEGRAL satellite – among them - close binary systems with **white dwarfs, neutron stars, black holes, and also Active Galaxy Nuclei**
 Results are published in a series of papers in 2005 - 2017



Длина волны, А

PLANCK space mission has detected 1600 clusters of galaxies (candidate to clusters of galaxies) based on Sunyaev – Zeldovich effect

1200 objects are known clusters, but 400 clusters are new ones. Optical telescopes are needed to identify them.

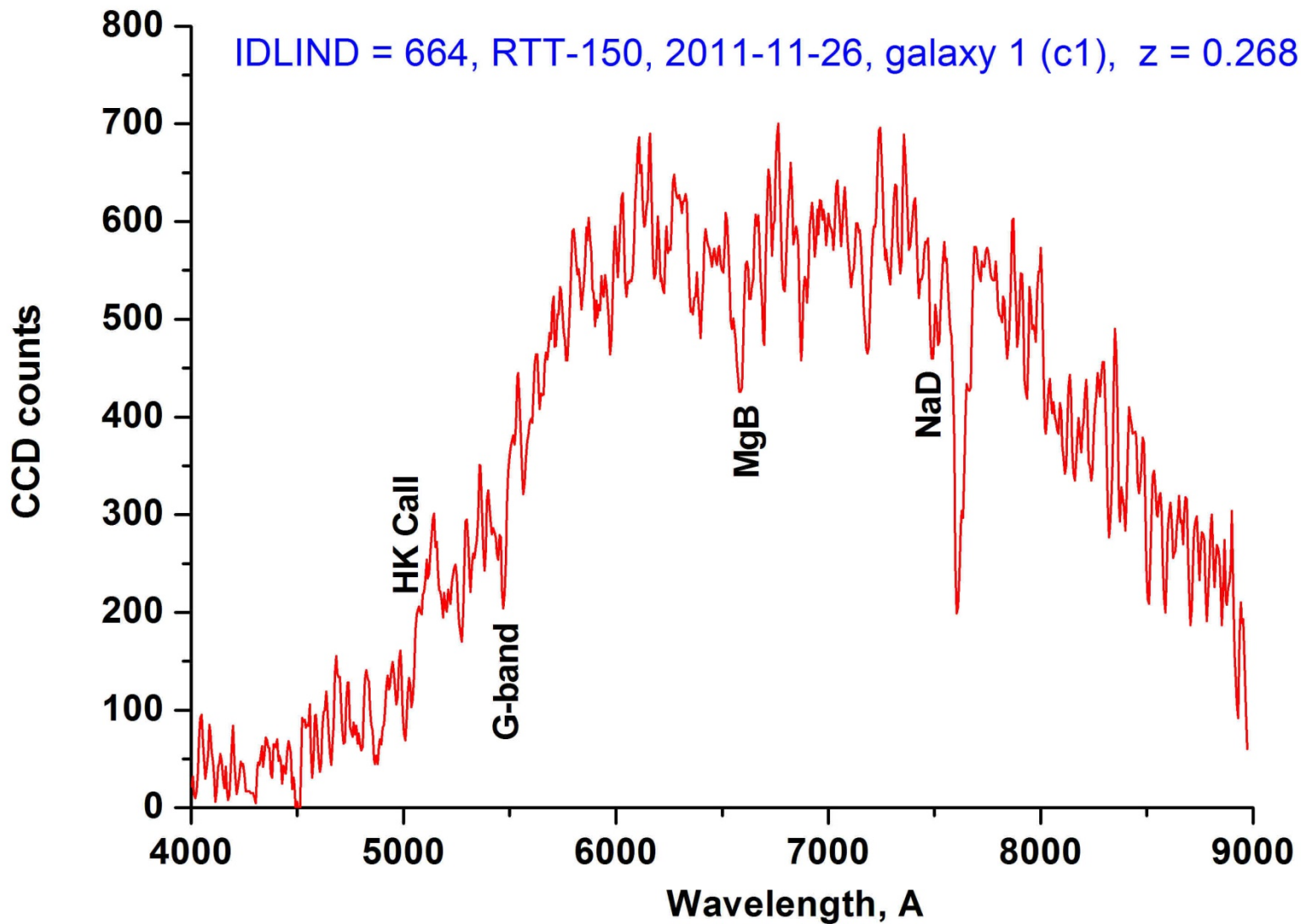


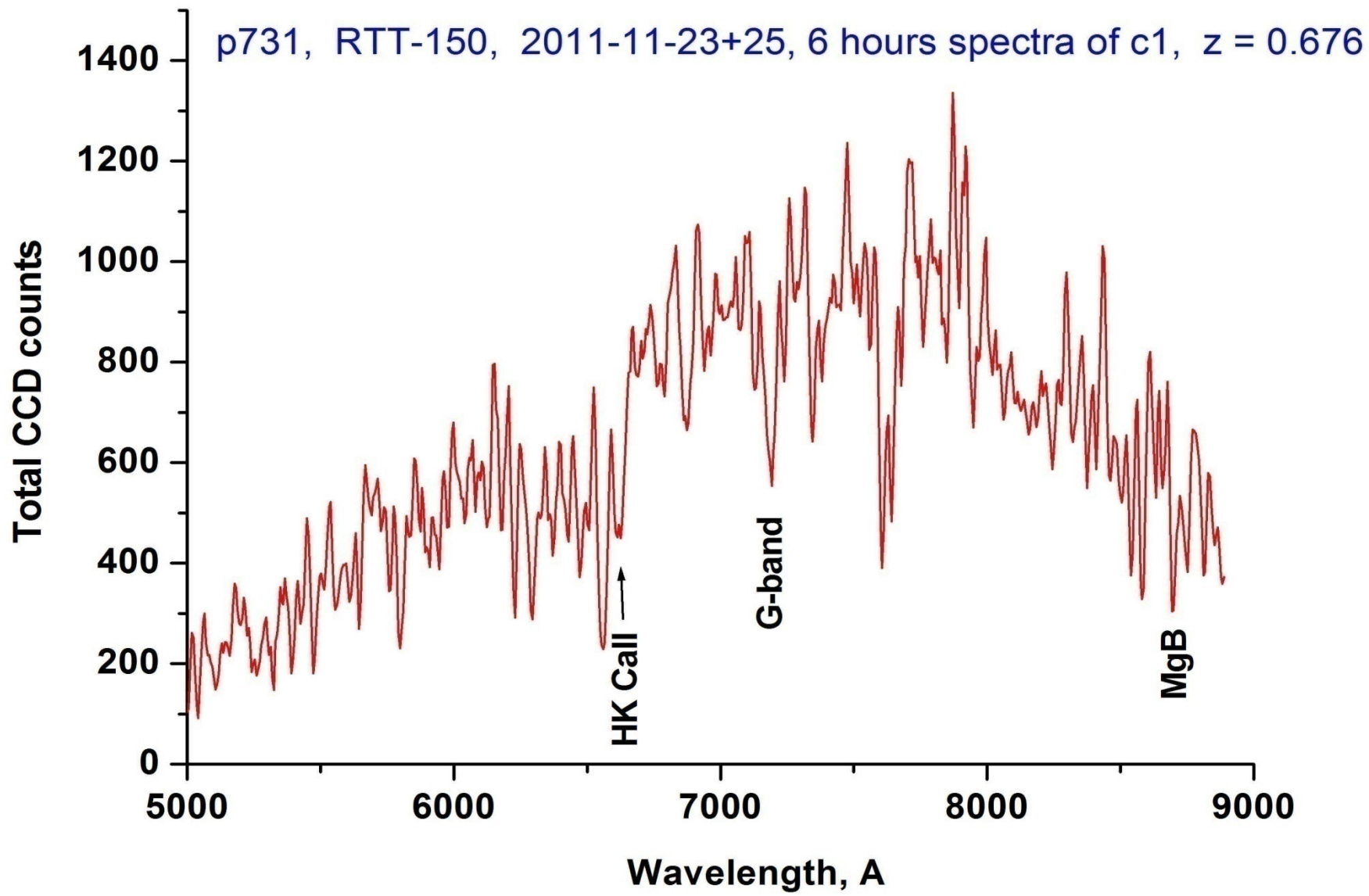
Optical identifications of clusters by Russian telescopes: RTT-150 and 6-m BTA 50 new galaxy clusters have been identified in $z = 0.1 - 0.8$ range in 120 fields.

Examples of identified clusters at $z \sim 0.4-0.7$



FIG. 2.— Pseudocolor ($g'r'i'$, RTT150) images of Planck clusters, with color map adjusted to emphasize red sequence of galaxies in the center of clusters. Upper left: G098.24-41.15, $z = 0.436$; upper right: G100.18-29.68, $z = 0.485$; lower left: G138.11+42.03, $z = 0.496$; lower right: G209.80+10.23, $z = 0.677$.





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**Astronomy
&
Astrophysics**

***Planck* intermediate results. XXVI. Optical identification and redshifts of *Planck* clusters with the RTT150 telescope**

Planck Collaboration: P. A. R. Ade⁷⁸, N. Aghanim⁵³, M. Arnaud⁶⁶, M. Ashdown^{63,7}, J. Aumont⁵³, C. Baccigalupi⁷⁷, A. J. Banday^{85,11}, R. B. Barreiro⁵⁹, R. Barrena⁵⁸, N. Bartolo^{29,60}, E. Battaner^{86,87}, K. Benabed^{54,84}, A. Benoit-Lévy^{23,54,84}, J.-P. Bernard^{85,11}, M. Bersanelli^{32,47}, P. Bielewicz^{85,11,77}, I. Bikmaev^{19,2}, H. Böhringer⁷¹, A. Bonaldi⁶², L. Bonavera⁵⁹, J. R. Bond¹⁰, J. Borrill^{14,80}, F. R. Bouchet^{54,84}, R. Burenin^{79,73,*},

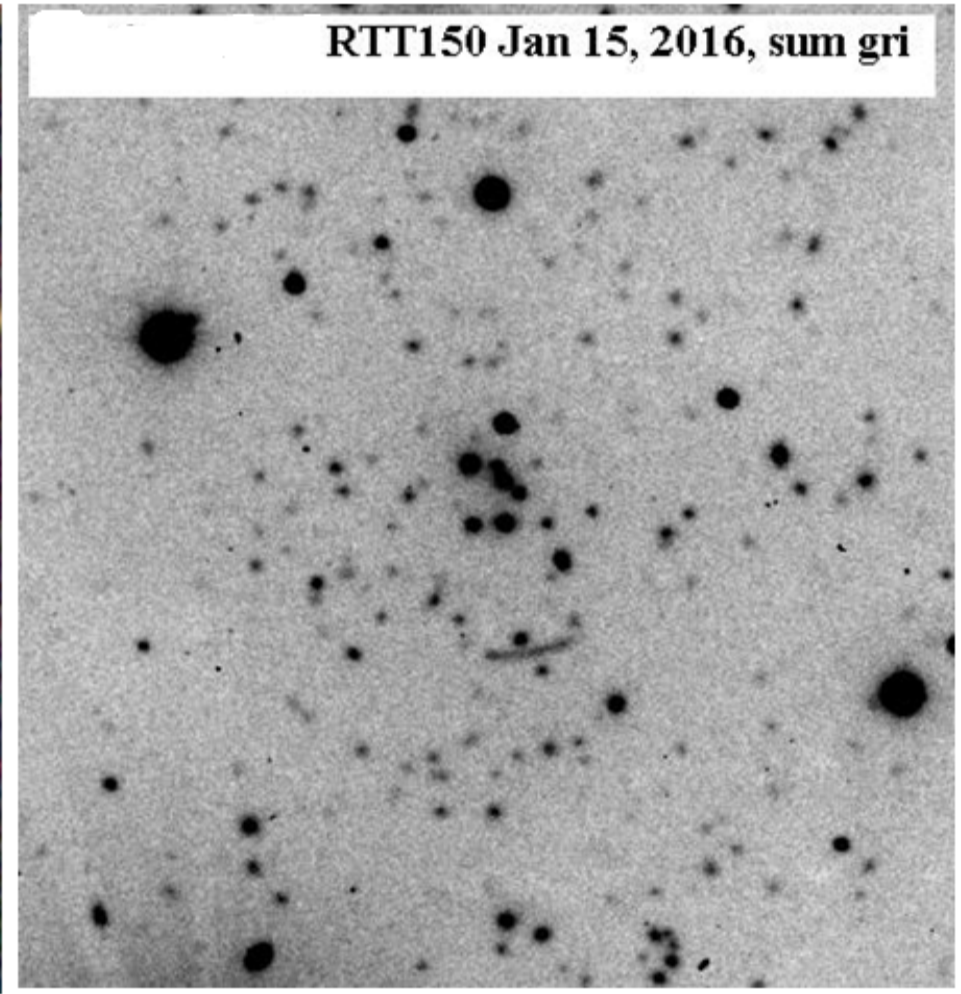
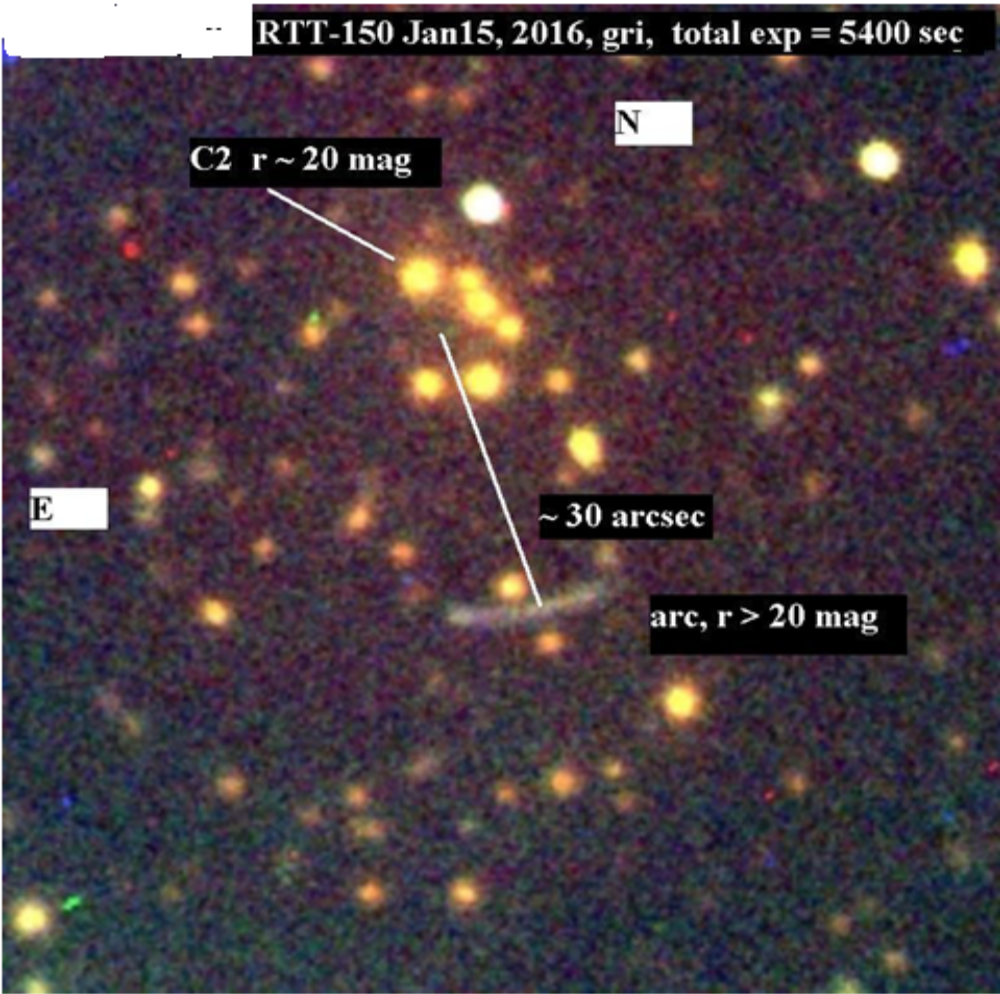
A&A 581, A14 (2015)
DOI: [10.1051/0004-6361/201525787](https://doi.org/10.1051/0004-6361/201525787)
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**Astronomy
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Astrophysics**

***Planck* 2013 results. XXXII. The updated *Planck* catalogue of Sunyaev-Zeldovich sources[★]**

Planck Collaboration: P. A. R. Ade⁹⁹, N. Aghanim^{68**}, C. Armitage-Caplan¹⁰⁴, M. Arnaud⁸¹, M. Ashdown^{78,7}, F. Atrio-Barandela²¹, J. Aumont⁶⁸, H. Aussel⁸¹, C. Baccigalupi⁹⁷, A. J. Banday^{110,11}, R. B. Barreiro⁷⁵, R. Barrena⁷⁴, M. Bartelmann^{108,87}, J. G. Bartlett^{1,76}, E. Battaner¹¹³, K. Benabed^{69,107}, A. Benoît⁶⁶, A. Benoit-Lévy^{29,69,107}, J.-P. Bernard^{110,11}, M. Bersanelli^{41,58}, P. Bielewicz^{110,11,97}, I. Bikmaev^{24,3}, J. Bobin⁸¹, J. J. Bock^{76,12}, H. Böhringer⁸⁸, A. Bonaldi⁷⁷, J. R. Bond¹⁰, J. Borrill^{16,101}, F. R. Bouchet^{69,107}, M. Bridges^{78,7,72}, M. Bucher¹, R. Burenin^{100,91}, C. Burigana^{57,39}, R. C. Butler⁵⁷, J.-F. Cardoso^{82,1,69}, P. Carvalho⁷, A. Catalano^{83,80}, A. Challinor^{72,78,13}, A. Chamballu^{81,18,68},

**New gravitational lens detected in the direction PLANCK cluster at $z = 0.55$
30 arcsec long arc is the distorted image of the distant galaxy behind cluster at $z > 1$**



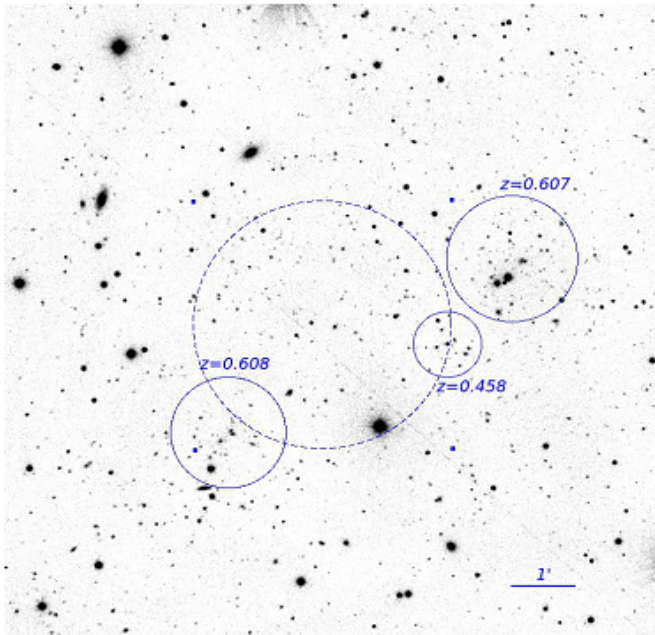


Fig. 12. PSZ1 G070.91+49.26 RTT150 i' -band image centred on the *Planck* SZ source coordinates, dashed $2'$ radius circle shows approximate *Planck* SZ source coordinates uncertainty. In addition to a double cluster at $z \approx 0.61$, there is a smaller foreground cluster at $z \approx 0.46$ (shown with solid circles).

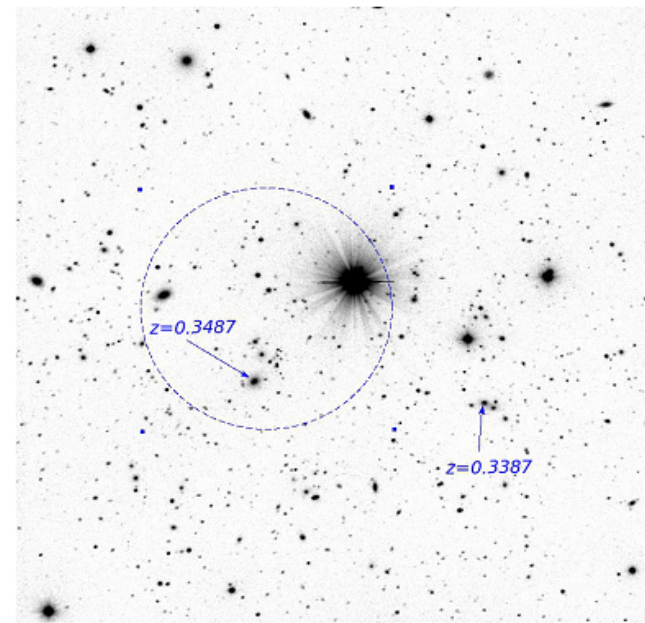
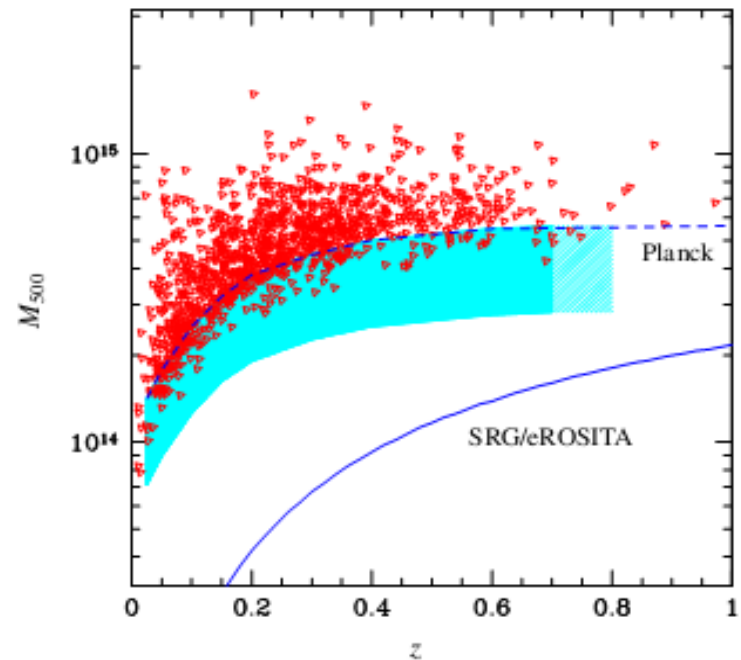
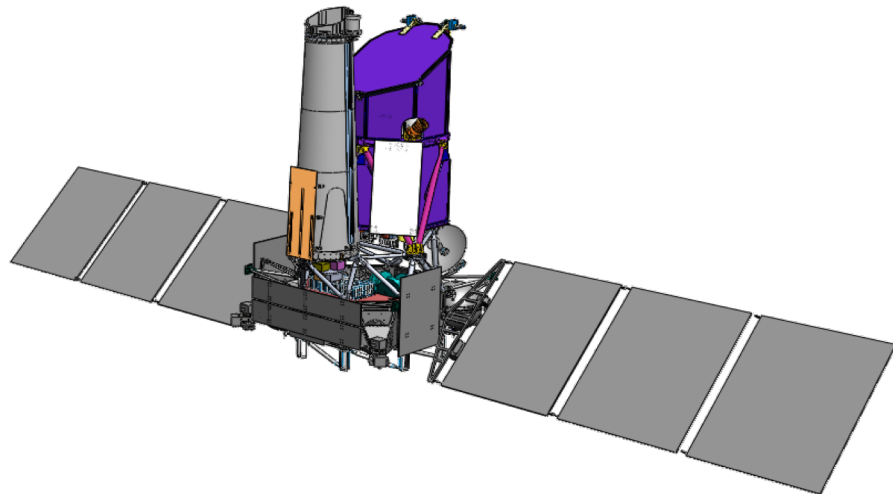
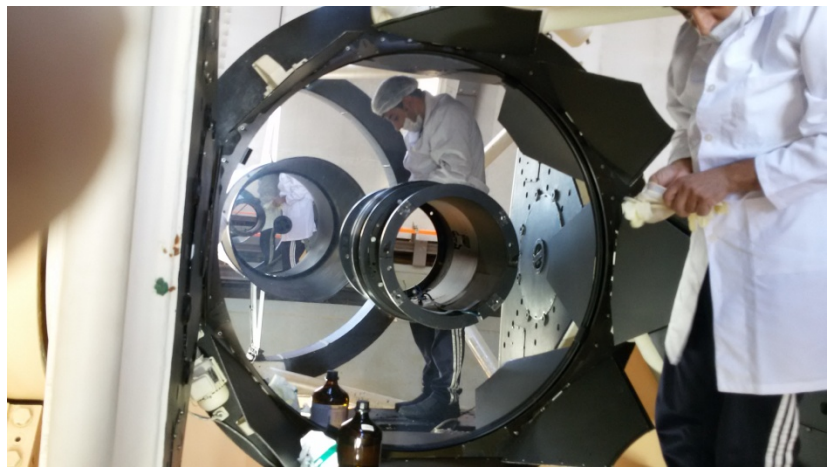
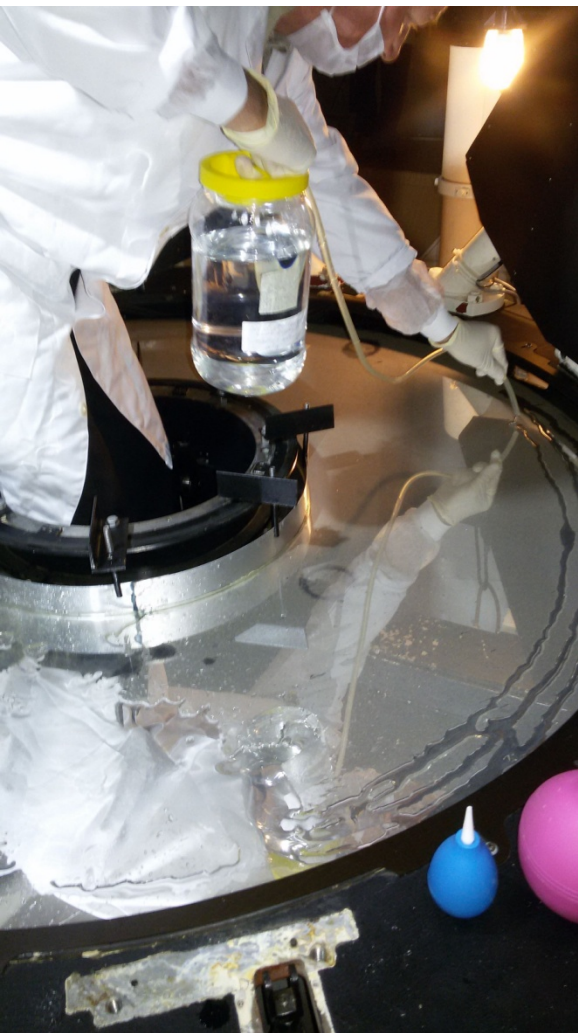


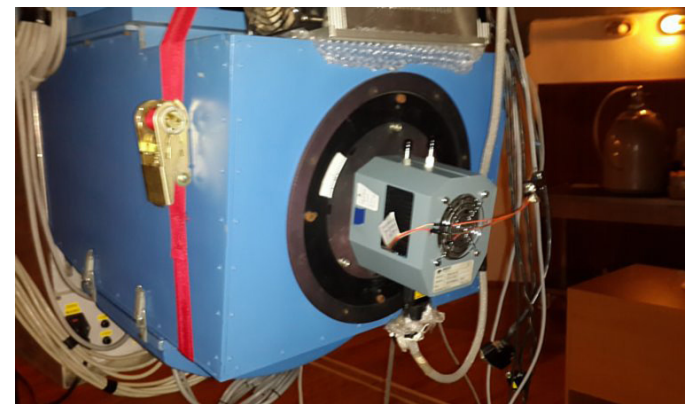
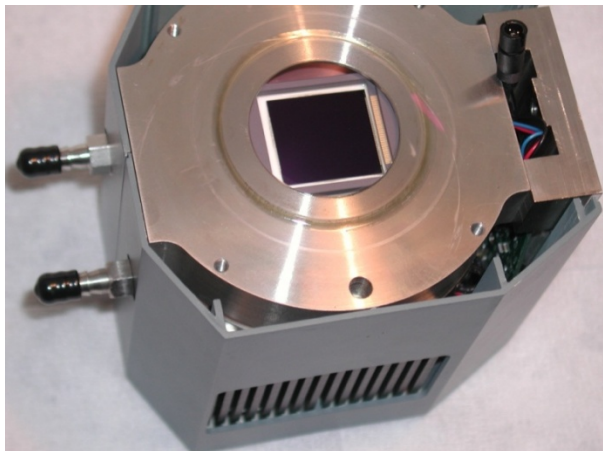
Fig. 13. PSZ1 G092.27-55.73 RTT150 i' -band image, dashed circle ($2'$ radius) shows the location of *Planck* SZ source. Two cD galaxies and their redshifts are shown.



Помывка зеркал РТТ-150 в 2018 году, КФУ (CAO) + ТЮГ (ESO)

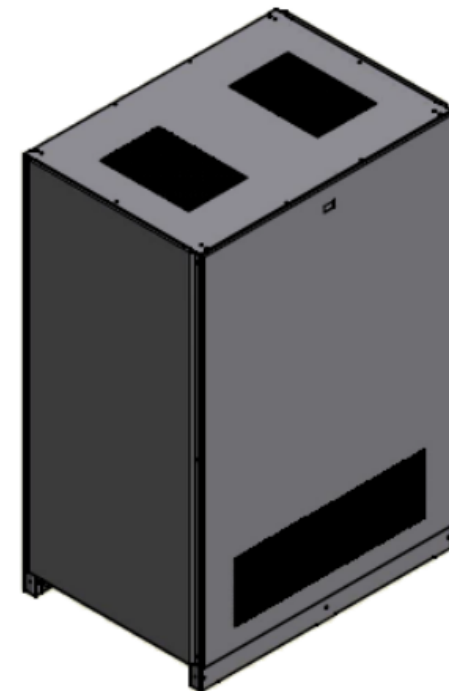
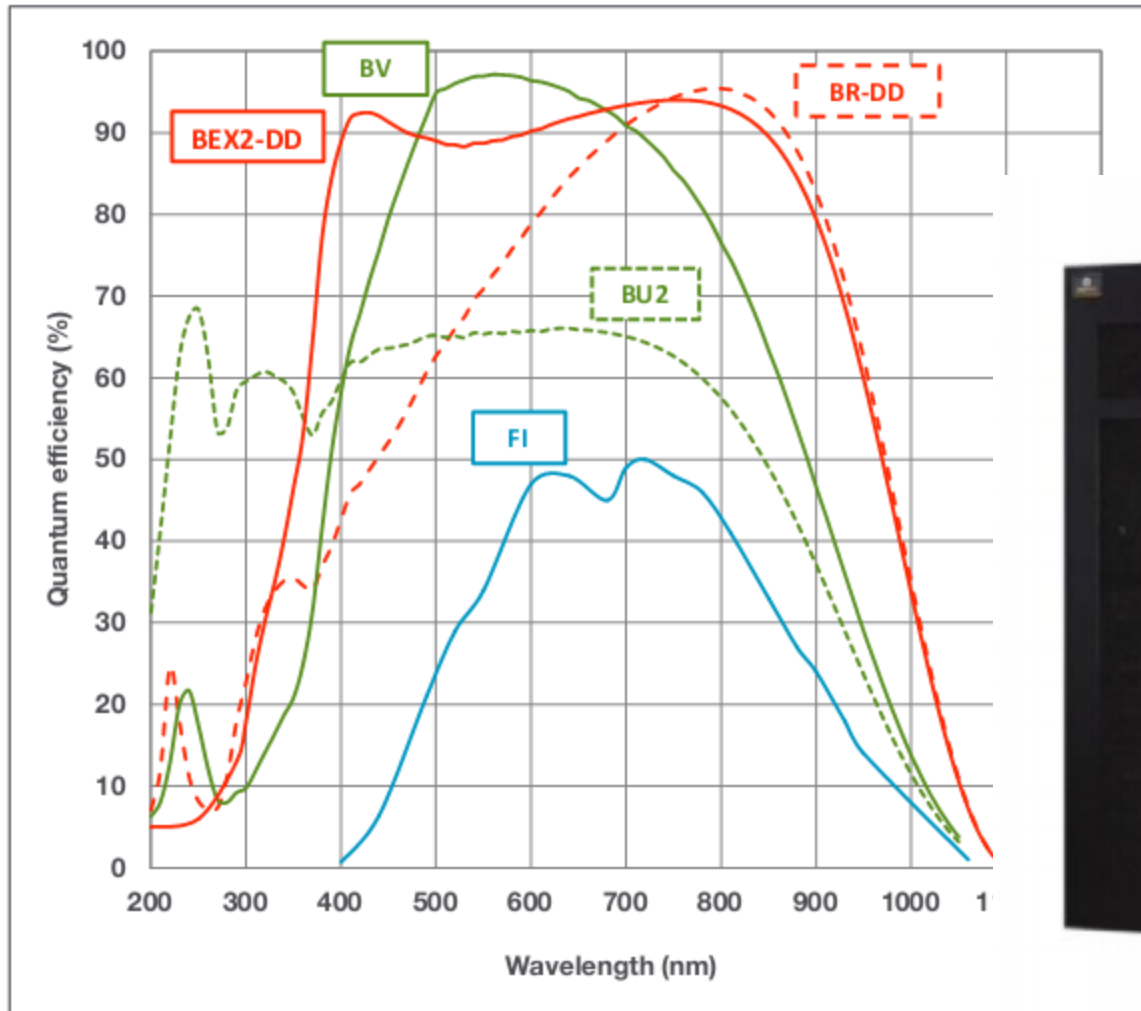


ANDOR CCDs are main light detectors at RTT-150

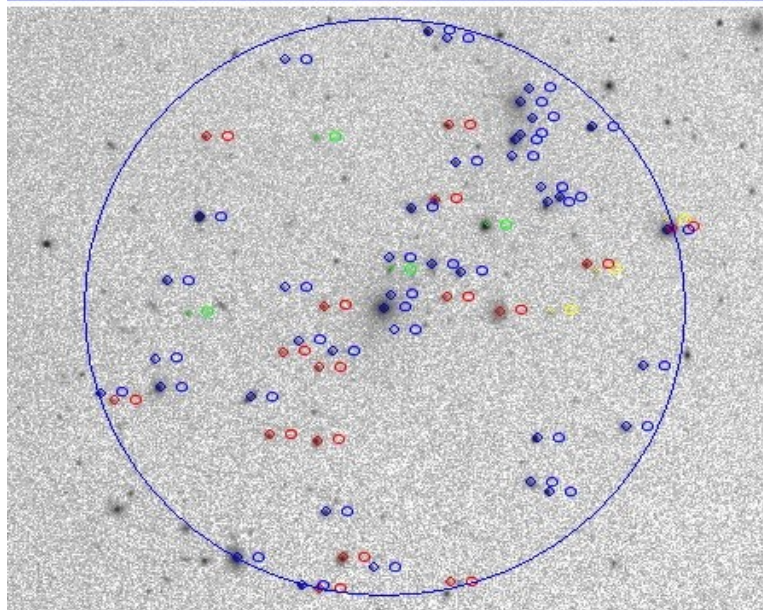
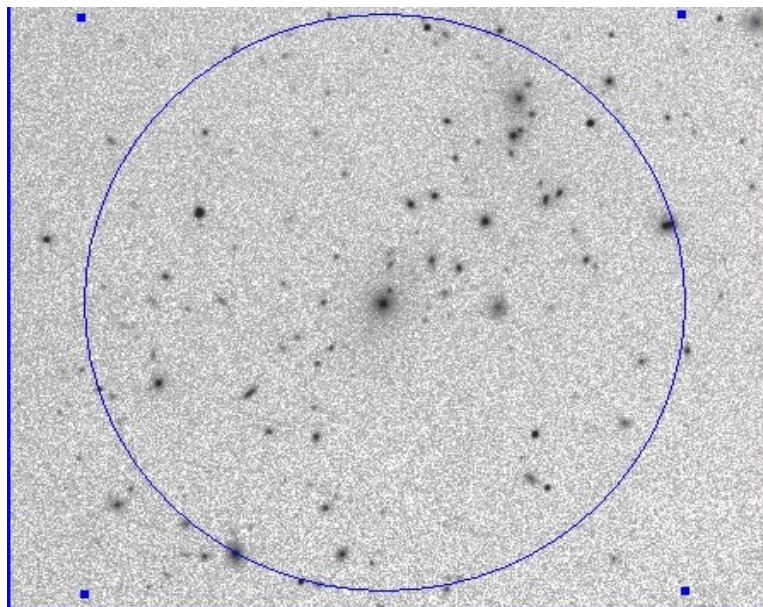


Новая матрица ANDOR и UPS на 40 kVA

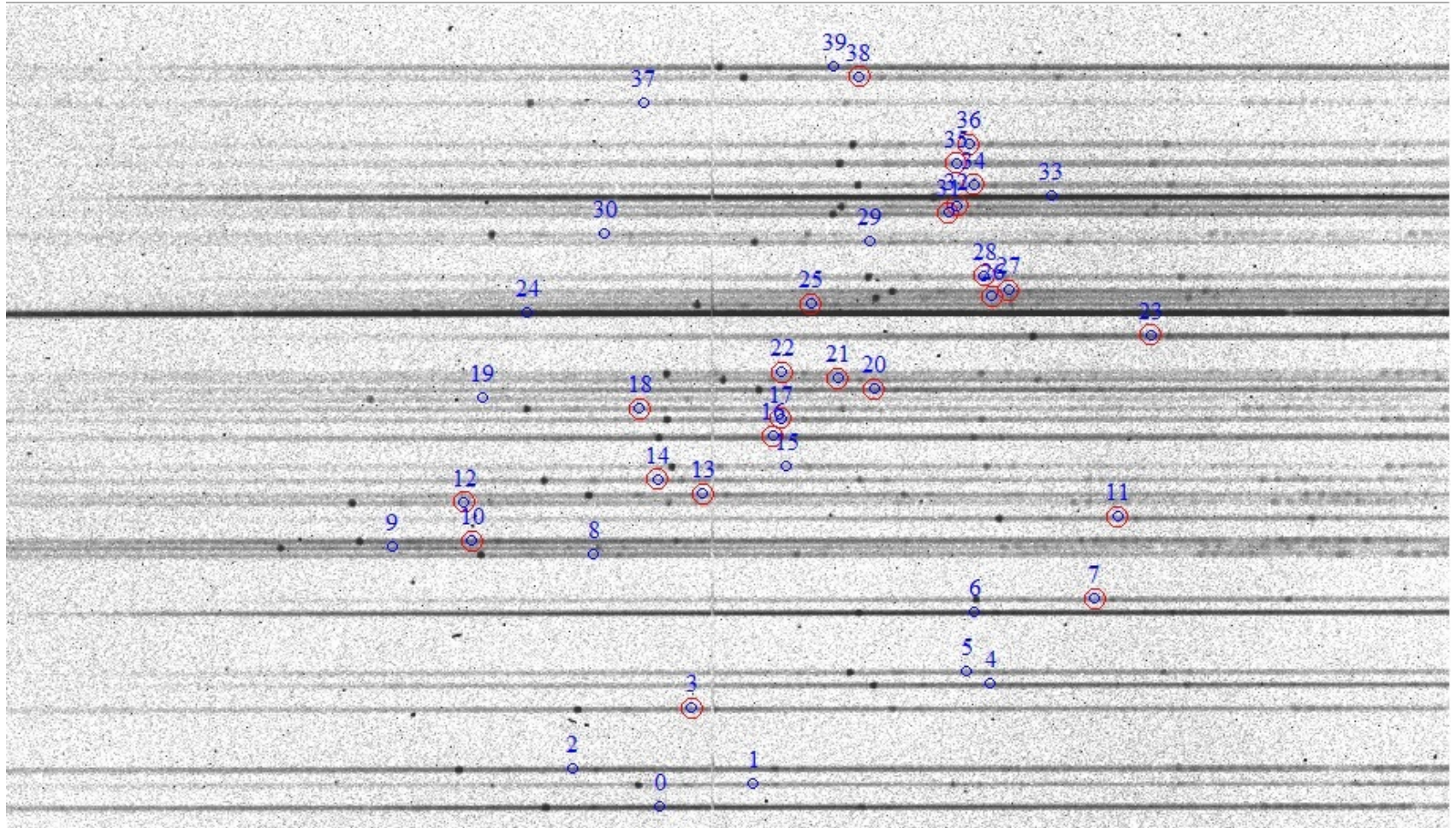
Quantum Efficiency Curves ¹¹



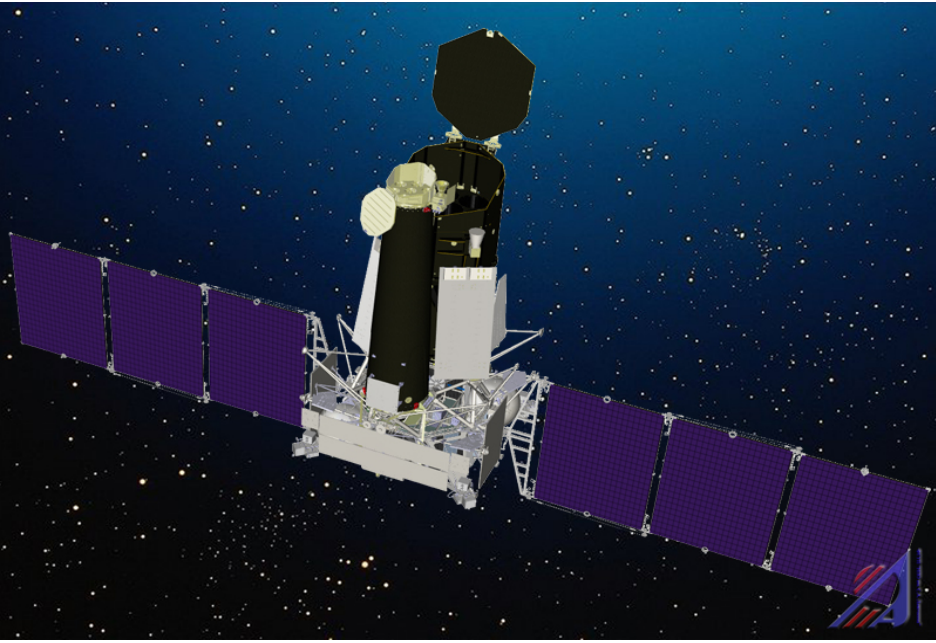
Многощелевая спектроскопия Abell 1914, $z=0.128$



Abell 1914, Gr15, 30 min, 40 holes



Scientific cooperation with the future X-ray missions - Russian-German International project - "Spectrum-Roentgen-Gamma" orbital Observatory, 2019 + Big data + Catalogues + ground based telescopes will play important role in the task of optical identifications of SRG X-Ray sources



SRG will detect in 1-30 KeV range much of X-Ray sources – close binary systems (1-2 mln), AGNs (3- 4 mln) , clusters of galaxies (100000).

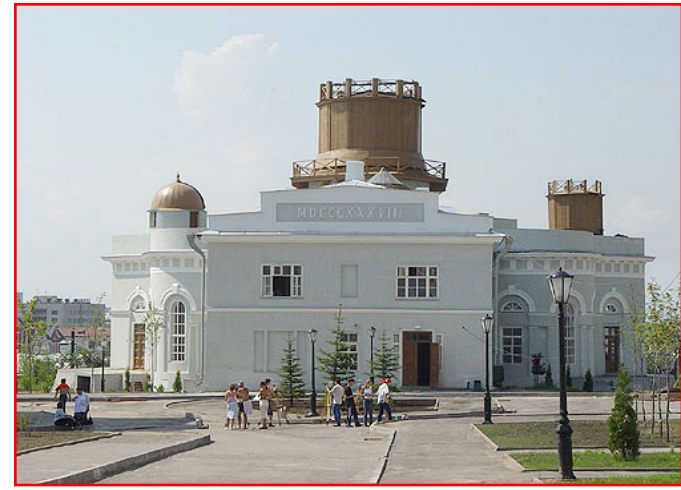
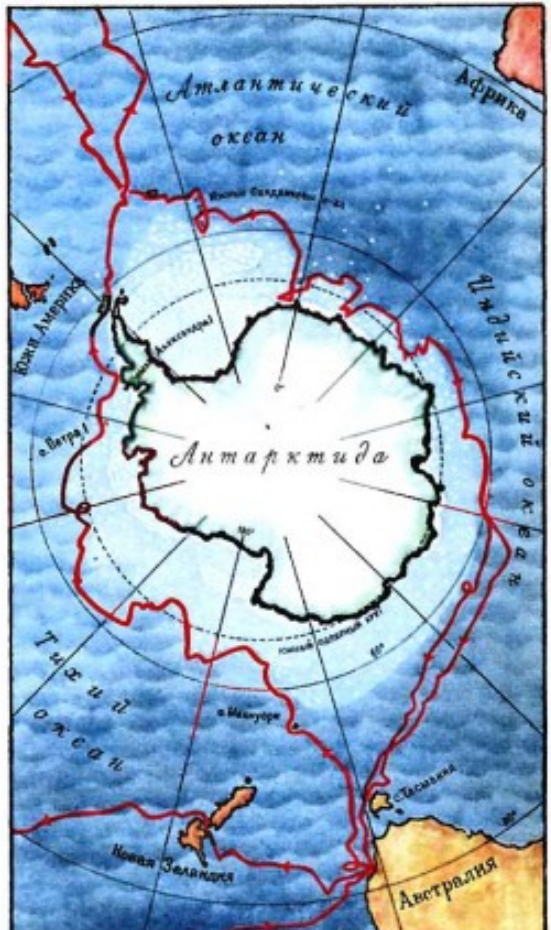
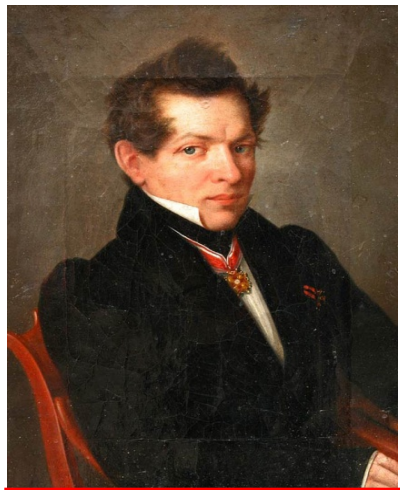
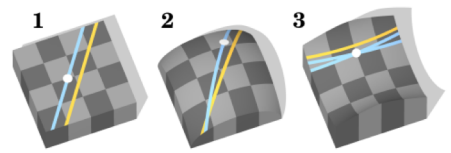
RTT-150 will realize ground support observations in optical range of X-ray sources detected and discovered by SRG telescopes - ART-XC and e-Rosita.

Астрономические исследования – одно из приоритетных направлений в Казанском университете с момента его создания в 1804 году. Кафедра астрономии создана в 1810 году (**Проф. И.Литтров**).

Николай Иванович Лобачевский – создатель неевклидовой геометрии (1829) - основы космологии

Иван Михайлович Симонов – один из первооткрывателей Антарктиды (1820), - 69 о 21 ‘ (25’)

Оба они – первые выпускники кафедры астрономии Казанского университета и основатели Городской астрономической Обсерватории (1838), оба – ректоры Казанского университета



С наступающим Новым Годом !

