New Active Galactic Nuclei Detected by the ART-XC and eROSITA Telescopes Onboard the SRG Observatory during an All-Sky X-ray Survey

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Abstract—We present the results of our identification of 17 X-ray sources detected in the 4–12 keV energy range by the Mikhail Pavlinsky ART-XC telescope during the first year of the SRG all-sky survey. Three of them have been discovered by the ART-XC telescopes, while the remaining ones have already been known previously as X-ray sources, but their nature has remained unknown. We took optical spectra for nine sources located in the northern sky (δ > -20°) with the 1.6-m AZT-33IK telescope at the Sayan Observatory (the Institute of Solar—Terrestrial Physics, the Siberian Branch of the Russian Academy of Sciences) and the 1.5-m Russian—Turkish telescope at the TÜBITAK National Observatory. For the remaining objects we have analyzed the archival optical spectra taken during the 6dF survey. All of the investigated objects have turned out to be Seyfert galaxies (eight of type 1, seven of type 2, and two of intermediate type 1.8) at redshifts up to z ≈ 0.15. Based on data from the eROSITA and ART-XC telescopes onboard the SRG observatory, we have obtained X-ray spectra in the energy range 0.2–20 keV for eight sources. A significant intrinsic absorption (N_H > 10^{22} cm^{-2}) has been detected in three of them, with two of them being probably strongly absorbed (N_H ∼ 10^{23} cm^{-2}). This paper is a continuation of the series of publications on the optical identification of active galactic nuclei detected by the ART-XC telescope.

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INTRODUCTION

The Spectrum–Roentgen–Gamma (SRG) orbital observatory (Sunyaev et al. 2021) has conducted an all-sky X-ray survey since December 12, 2019. A total of eight surveys, each with a duration of six months, are planned to be conducted. There are two telescopes with grazing-incidence X-ray optics onboard the SRG observatory: eROSITA (Predehl et al. 2021) and Mikhail Pavlinsky ART-XC (Pavlinsky et al. 2021a) operating in the 0.2–8 and 4–30 keV energy bands, respectively.

The second SRG sky survey was completed on December 15, 2020. The first catalog of sources detected in the 4–12 keV energy band by the ART-XC telescope was produced from the sum of the two surveys (Pavlinsky et al. 2021b). This catalog was correlated with: (1) the catalogs of sources detected in previous X-ray sky surveys, (2) the preliminary catalog of sources detected on the half of the celestial sphere 0° < |l| < 180°¹ in the soft X-ray energy band during the first three SRG/eROSITA all-sky surveys, and (3) the catalogs of astrophysical objects in other wavelength ranges. As a result, a list of objects discovered by the ART-XC telescope and previously known X-ray sources confirmed with the ART-XC telescope, whose nature remained unknown or poorly

¹Russian scientists are responsible for processing the eROSITA data in this part of the sky.
studied, was compiled. Most of these objects were also detected by the eROSITA telescope onboard the SRG observatory. Spectroscopic observations are carried out at ground-based optical telescopes to establish the nature of these objects.

In this paper we present the results of our identification of nine sources from the first ART-XC catalog of sources using observations with the 1.6-m AZT-33IK telescope at the Sayan Observatory (the Institute of Solar—Terrestrial Physics, the Siberian Branch of the Russian Academy of Sciences) and the 1.5-m Russian—Turkish telescope (RTT-150) at the TÜBITAK National Observatory. These objects, located in the northern sky, have turned out to be active galactic nuclei (AGNs). We also present the results of our identification of eight ART-XC sources in the southern sky based on the available archival data from the spectroscopic 6dF survey, which have also turned out to be AGNs. In addition, we constructed broadband (0.2–20 keV) X-ray spectra for eight northern objects (with coordinates in the range $0^\circ < |l| < 180^\circ$) from the eROSITA and ART-XC data during the first three half-year sky surveys. Using these spectra, we have managed to reveal a significant intrinsic absorption in several objects. This paper continues the series of publications on the identification of new AGNs and cataclysmic variables from the SRG/ART-XC all-sky survey begun in Zaznobin et al. (2021a, 2021b).

The presented luminosity estimates are based on the model of a flat Universe with parameters $H_0 = 70$ and $\Omega_m = 0.3$.

**THE SAMPLE OF OBJECTS**

The sample of 17 objects being studied was selected from the catalog of X-ray sources detected by the ART-XC telescope during the first year of its all-sky survey (December 12, 2019–December 15, 2020) (Pavlinsky et al. 2021b). We considered only point sources from this catalog. According to the catalog production criterion, all such sources were detected at a significance level of no less than 4.82 standard deviations in the 4–12 keV energy band. Based on the ART-XC data, we measured the positions of the sources in the sky with an accuracy better than $30''$. For eight sources from this sample located in the sky region $0^\circ < |l| < 180^\circ$ there are also SRG/eROSITA data at our disposal, which allowed broadband X-ray spectra for these objects to be constructed from the set of eROSITA and ART-XC data. The eROSITA data for the remaining nine sources belong to the German SRG/eROSITA consortium and are not considered here.

For 9 of the 17 X-ray sources located in the northern sky ($\delta > -20^\circ$) we took optical spectra. For the remaining eight sources located in the southern sky we analyzed the available archival data from the spectroscopic 6dF survey of galaxies (Jones et al. 2004). For all objects Tables 1 and 2 give: the coordinates of the source from the ART-XC and eROSITA data (if available), the coordinates of the putative optical counterpart, the distance between the positions of the X-ray source and the optical counterpart, and the X-ray flux in the 4–12 keV energy band.

**X-RAY OBSERVATIONS**

At present, all of the sources from the sample have been observed during the first three SRG all-sky surveys. Using the combined eROSITA and ART-XC data from these surveys, we constructed the spectra of eight sample sources located in the sky region $0^\circ < |l| < 180^\circ$ in the energy range from 0.2 to 20 keV. The variability of the objects was not investigated.

The ART-XC X-ray spectra were obtained with the ARTPRODUCTS v0.9 software (Pavlinsky et al. 2021a) using the calibration files of version 20200401. The data from all seven ART-XC modules were combined. The spectra of the sources were extracted in a region of radius $120''$ in three energy bands: 4–8, 8–12, and 12–20 keV.

The eROSITA data were processed with the calibration and data processing system created and maintained at the Space Research Institute of the Russian Academy of Sciences that was constructed using the elements of the eSASS (eROSITA Science Analysis Software System) package and the software developed by the science group on the X-ray catalog of the Russian eROSITA consortium. We extracted the source spectra in a circle of radius $R = 60''$ and the background spectra in a ring with the inner radius $R_{\text{in}} = 120''$ and the outer radius $R_{\text{out}} = 300''$ around the source. If other sources fell into the background region, then they were excluded with the radius $R = 40''$. The spectra were extracted from the data of all seven ART-XC modules in the energy range 0.2–9.0 keV. When fitting the spectra, the data were binned in such a way that there were at least three counts in each energy channel.

Among the 17 sources from the ART-XC catalog selected for our studies, eight are located on the half of the sky on which the Russian eROSITA consortium is responsible for processing the eROSITA data. All of the sources are detected by the eROSITA telescope in both soft (0.3–2.2 keV) and hard (4–9 keV) energy bands, except for SRGA J025234.3+431004 that is reliably ($\geq 5\sigma$) detected only at energies $\geq 2.2$ keV. The eROSITA images of all eight sources in the
Table 1. The X-ray sources for which the observations at the AZT-33IK and RTT-150 telescopes were carried out

| No. | ART-XC source     | eROSITA coordinates | Optical coordinates | $r_A$ | $r_e$ | $F_A^{1-12} \times 10^{-12}$ | Discovered by |
|-----|-------------------|---------------------|---------------------|-------|-------|----------------------------|--------------|
| 1   | SRGA J025234.3+431004 | 43.14170 +43.16740 | 3.5′′ | 2.7+2.4−1.8 | Swift |
| 2   | SRGA J062627.2+072734 | 96.61250 +7.45806 | 5.8′′ | 1.7+3.6−2.3 | ROSAT |
| 3   | SRGA J070636.4+635109 | 106.64528 +63.84891 | 16.8′′ | 1.4′′ | 5.4+3.6−2.6 | SRG |
| 4   | SRGA J092021.6+860249 | 140.06973 +86.05012 | 12.5′′ | 2.3′′ | 5.1+2.5−2.0 | ROSAT |
| 5   | SRGA J195702.4+615036 | 299.25991 +61.84267 | 1.0′′ | 0.4′′ | 3.4+1.4−1.2 | ROSAT |
| 6   | SRGA J221913.2+362014 | 334.81076 +36.33471 | 16.3′′ | 4.4′′ | 5.4+3.0−2.3 | SRG |
| 7   | SRGA J223714.9+402939 | 339.31426 +40.49534 | 9.1′′ | 1.5′′ | 5.0+2.9−2.3 | ROSAT |
| 8   | SRGA J232037.8+482329 | 350.16453 +48.39126 | 16.2′′ | 1.0′′ | 1.6+2.0−1.5 | ROSAT |
| 9   | SRGA J235250.6−170449 | 358.21433 −17.07735 | 16.6′′ | 1.4′′ | 6.6+4.0−3.0 | Swift |

Column 1: the ordinal number source in the sample being studied. Column 2: the source name in the ART-XC catalog (the coordinates of the X-ray sources used in the names are given for epoch J2000.0). Columns 3 and 4: the coordinates of the source from the eROSITA data. Columns 5 and 6: the coordinates of the putative optical counterpart. Column 7: the distance between the positions of the ART-XC source and the optical counterpart. Column 8: the distance between the positions of the eROSITA source and the optical counterpart. Column 9: the X-ray flux in the 4–12 keV energy band based on data from the first two ART-XC sky surveys (Pavlinsky et al. 2021b), in units of $10^{-12}$ erg s$^{-1}$ cm$^{-2}$. Column 10: the X-ray observatory that detected the source for the first time. The eROSITA coordinates are not given for SRGA J025234.3+431004 due to its insufficiently significant detection by the eROSITA telescope and for SRGA J062627.2+072734 due to its location on the half of the sky $180° < |l| < 360°$, on which German scientists are responsible for processing the eROSITA data.

Table 2. The X-ray sources for which archival 6dF data are available

| No. | ART-XC source     | Optical coordinates | $r_A$ | $F_A^{1-12} \times 10^{-12}$ | Discovered by |
|-----|-------------------|---------------------|-------|----------------------------|--------------|
| 10  | SRGA J030838.1−552041 | 47.15875 −55.34472 | 4.0′′ | 4.8±1.9−1.5 | SRG |
| 11  | SRGA J052959.8−340157 | 82.49669 −34.03293 | 7.5′′ | 4.6±2.0−1.7 | XMM-Newton |
| 12  | SRGA J055053.7−621457 | 87.72339 −62.24863 | 2.2′′ | 1.4±0.5 | ROSAT |
| 13  | SRGA J060241.1−595152 | 90.67472 −59.86456 | 6.3′′ | 2.5±0.9−0.8 | XMM-Newton |
| 14  | SRGA J061322.9−290027 | 93.35120 −29.00633 | 19.0′′ | 12.4±3.9−3.2 | ROSAT |
| 15  | SRGA J063324.9−561424 | 98.36091 −56.23914 | 14.8′′ | 3.4±1.4−1.2 | ROSAT |
| 16  | SRGA J064421.5−662620 | 101.09111 −66.43886 | 2.2′′ | 0.6±0.5 | ROSAT |
| 17  | SRGA J072823.5−440823 | 112.09742 −44.14005 | 1.6′′ | 4.6±2.5−1.9 | ROSAT |

The contents of the columns are analogous to those in Table 1. The sources are located on the half of the sky $180° < |l| < 360°$ and, therefore, no information on the eROSITA data is given.
Our spectral analysis was performed jointly using the ART-XC and eROSITA data. The spectra were fitted in the energy range 0.2–20 keV with the XSPEC v12.11.0n software (Arnaud 1996). The $W$-statistic, a modified $C$-statistic (Cash 1979), in which the Poisson background around the source is taken into account was used for model fitting.

A preliminary version of the response matrix, which was prepared based on the observations of the Crab Nebula and its pulsar, was used in our spectral analysis of the ART-XC data. To investigate the relative calibration of the ART-XC and eROSITA telescopes, we chose comparatively bright sources from our sample and fitted simultaneously their spectra by power laws with absorptions. At the same time, a cross-calibration constant was added. It was fixed at unity for eROSITA and assumed to be the same for all sources for ART-XC. We obtained a value of 1.3 for this constant and the corresponding 90% confidence interval (1.0–1.7). Since the value of the cross-calibration constant is compatible with unity, we concluded that its introduction is not required. Note that the work to refine the ART-XC response matrix continues, and a value of the cross-calibration constant different from unity may be required in analyzing the data of succeeding releases.

The X-ray radiation from AGNs can experience absorption in the gas–dust torus around the supermassive black hole (SMBH) and in the interstellar medium of the host galaxy. One of the goals of our study was to estimate the gas column density $N_H$ inside the objects being investigated. To describe the X-ray spectra, we used the standard (for AGN research) model of a power-law continuum with a low-energy cutoff as a result of photoabsorption in the Galaxy and the object itself. At energies below 2 keV an excess of X-ray emission (soft excess), whose nature is debated (see, e.g., Boissay et al. 2016), is often observed in the X-ray spectra of AGNs. Given the comparatively small number of photons in the spectra being studied here, we used a simple phenomenological model of blackbody radiation with a fixed temperature $kT = 0.1$ keV to describe the soft component in the spectrum. Thus, we used two models in XSPEC:

$$\text{phabs}(\text{zphabs}(\text{cflux powerlaw})),$$

$$\text{phabs}(\text{zphabs}(\text{cflux powerlaw}) + \text{blackbody}),$$

where $\text{phabs}$ is the absorption in the Galaxy from HI4PI data (Bekhti et al. 2016), $\text{zphabs}$ is the absorption at the redshift $z$ of a given AGN (measured from HI4PI data (Bekhti et al. 2016), $\text{cflux powerlaw}$ is the power-law continuum component.}

Fig. 1. eROSITA images for the eight sources located on the half of the sky processed by the Russian eROSITA consortium in the 0.3–2.2 (left), 2.2–6.0 (center), and 4.0–9.0 (right) keV energy bands. The image size is $5' \times 5'$. The circles mark the positions of the sources detected by eROSITA at a confidence level higher than 3σ. The ART-XC positions of the sources being discussed here are indicated by the black cross.
the object’s optical spectrum), \( cflux \) is the convolution model that normalizes the power-law component in flux in the 4–12 keV energy band (the absorption-corrected flux is determined in this way).

To compare the qualities of the fits between these two models, we used the Akaike information criterion (Akaike 1974) \( AIC = 2k + cstat \), where \( k \) is the number of free model parameters and \( cstat \) is the value of the likelihood function \( -2 \log L_{\text{max}} \) (Cash 1979). If AIC decreased by 5 or more when adding the blackbody component (this corresponds to the fact that the realization probability of the first model is no more than 8% of the realization probability of the second one), then preference was given to the two-component model.

The spectral fitting results are presented in Table 3. The 90\% confidence intervals of the parameters are given. The X-ray spectra themselves are presented below in the subsections devoted to the individual sources (Figs. 2–10). Some of the eROSITA spectra were rebinned for better visual perception. For three sources (SRGA J025234.3+431004, SRGA J221913.2+362014, and SRGA J235250.6–170449), in which our spectral analysis revealed an intrinsic absorption, we also show the two-dimensional regions of spectral slopes \( \Gamma \) and absorption column densities.

When analyzing Figs. 2–10, it can be noticed that the observed flux in the first ART-XC energy channel in the spectra for seven of the eight sources exceeds the value predicted by the model. In some cases, this excess is considerable and statistically significant. Part of the observed discrepancy between the ART-XC data and the model is probably associated with the Eddington bias, which stems from the fact that the sources have a low significance in the ART-XC data and are near the detection threshold. The drawbacks of the current ART-XC calibration, which will be removed in succeeding data releases, can also contribute noticeably to the observed discrepancy. In the context of interpreting the results of our joint spectral analysis of the eROSITA and ART-XC data presented here, it should be emphasized that the integral response of the ART-XC telescope in the 4–20 keV energy band was calibrated based on the Crab observations reasonably well and reproduces its flux with an accuracy \( \sim 20\% \), which allows these data to be used to analyze the broadband spectra. We should also take into account the fact that for most of

### Table 3. X-ray spectral parameters

| ART-XC source                  | \( N_H^{MW} \) | \( N_H \)  | \( \Gamma \)  | \( F_{PL}^{4−12} \) | \( A_{BB} \times 10^{-6} \) | \( cstat \) (dof) | AIC |
|-------------------------------|---------------|------------|-------------|---------------------|-----------------------|----------------|-----|
| **PHA(ZPAH CFLUX PL) model**  |               |            |            |                     |                       |                 |     |
| SRGA J025234.3+431004         | 1.0           | 78_{-41}^{+391} | 0.6_{-1.3}^{+1.4} | 2.4_{-1.2}^{+1.9}  | 12 (10)               | 31.6           |     |
| SRGA J070636.4+635109         | 0.4           | <0.2       | 1.1_{-0.2}^{+0.2} | 1.9_{-0.7}^{+0.9}  | 68 (53)               | 173.8          |     |
| SRGA J092021.6+860249         | 0.5           | <0.2       | 2.2_{-0.2}^{+0.1} | 1.0_{-0.2}^{+0.2}  | 230 (212)             | 654            |     |
| SRGA J195702.4+615036         | 0.7           | <0.3       | 1.7_{-0.1}^{+0.1} | 2.3_{-0.4}^{+0.5}  | 289 (283)             | 854.9          |     |
| SRGA J221913.2+362014         | 1.0           | 80_{-41}^{+53} | 1.8_{-0.9}^{+1.0} | 2.2_{-0.9}^{+1.2}  | 19 (14)               | 47             |     |
| SRGA J223714.9+402939         | 1.2           | <0.6       | 1.4_{-0.1}^{+0.1} | 5.2_{-0.9}^{+1.1}  | 183 (189)             | 560.9          |     |
| SRGA J232037.8+482329         | 1.3           | <0.4       | 1.5_{-0.2}^{+0.2} | 1.4_{-0.4}^{+0.5}  | 119 (92)              | 302.5          |     |
| SRGA J235250.6–170449         | 0.2           | 1.7_{-0.6}^{+0.7} | 1.3_{-0.2}^{+0.2} | 6.0_{-1.7}^{+2.1}  | 94 (120)              | 333.7          |     |
| **PHA(ZPAH CFLUX PL + BB) model** |             |            |            |                     |                       |                 |     |
| SRGA J070636.4+635109         | 0.4           | <4.8       | 1.0_{-0.4}^{+0.5} | 2.3_{-1}^{+1.5}   | 3.1_{-2.1}^{+1.5}     | 61 (52)        | 165.4 |
| SRGA J223714.9+402939         | 1.2           | 2.3_{-1.5}^{+1.6} | 1.7_{-0.3}^{+0.3} | 4.1_{-1.2}^{+1.5}  | 14.1_{-7.4}^{+5.6}   | 177 (189)      | 554.5 |

\( N_H^{MW} \) and \( N_H \) are the gas column densities in the Milky Way Galaxy and the object, respectively, in units of \( 10^{21} \text{ cm}^{-2} \); \( F_{PL}^{4−12} \) is the absorption-corrected flux in the 4–12 keV energy band created by the power-law component, in units of \( 10^{-12} \text{ erg s}^{-1} \text{ cm}^{-2} \); \( A_{BB} \) is the normalization of the blackbody component.
the sources the spectral parameters are largely determined by the eROSITa data with a higher statistical significance.

OPTICAL OBSERVATIONS

Our spectroscopy for the northern-sky ($\delta > -20^\circ$) objects was performed at the RTT-150 telescope using the TFOSC$^3$ spectrograph and at the AZT-33IK telescope using the low- and medium-resolution ADAM spectrograph (Afanasiev et al. 2016; Burenin et al. 2016) (see the log of observations in Table 4). We used long slits of width $2''$ and $3''$ at the ADAM spectrograph and of $2''$ at the TFOSC spectrograph. The slit center was brought into coincidence with the central region of the observed galaxy. After each exposure, the object’s position was shifted along the slit by $10''-15''$ in a random direction upward or downward using a photoguide. The optical observations were performed at a seeing better than $2.5''$.

Transmitting diffraction grating no. 15 with the spectral range 3700–8700 Å providing a spectral resolution of 12 Å was used at the TFOSC spectrograph as a dispersive element. This grating allows bright Balmer lines to be obtained in the spectral images for galaxies up to $z = 0.32$. The spectrograph slit position angle is $90^\circ$. Before and after obtaining the series of spectroscopic images for each object, we obtained the images of a lamp with a continuum spectrum and the line spectrum of a Fe–Ar lamp.

We used volume phase holographic gratings (VPHG), 600 lines per millimeter, to take the spectra at the ADAM spectrograph. As a dispersive element we used VPHG600G for the spectral range 3650–7250 Å with a resolution of 8.6 Å for a $2''$ slit and 12.9 Å for a $3''$ slit and VPHG600R for the spectral range 6460–10 050 Å with a resolution of 18.3 Å for a $3''$ slit. When using VPHG600R, we set the OS11 filter, which removes the second interference order from the image. A thick e2v CCD30-11 array produced by the deep depletion technology is installed.
RESULTS OF OBSERVATIONS

Here we discuss the results of our observations of the northern-sky objects. The emission lines were fitted by a Gaussian to determine such parameters as the line center, full width at half maximum \( FWHM_{\text{mes}} \), flux, and equivalent width \( EW \). The spectral continuum was fitted by a polynomial whose order depended on the spectral shape. The \( FWHM \) of the Balmer lines was corrected for the spectral resolution of the instrument:

\[
FWHM = \sqrt{FWHM_{\text{mes}}^2 - FWHM_{\text{res}}^2},
\]

where \( FWHM_{\text{res}} \) was determined for each dispersive element and each slit as the \( FWHM \) of the lines in the calibration lamp spectrum. The \( FWHMs \) of the narrow lines are consistent with the instrumental broadening \( FWHM_{\text{res}} \) and, therefore, the values of \( FWHM \) are not given for them in Tables 5–13.

Standard criteria (Osterbrock 1981; Véron-Cetty et al. 2001) were used to classify the Seyfert galaxies. The measurement errors of the emission line parameters are given at the 68% confidence level.

The confidence level of the redshift was determined as the error of the mean of the narrow-line redshifts.

**SRGA J025234.3+431004**

This source was discovered in the Swift/BAT hard X-ray sky survey (PBC J0252.3+4309 =
SRGA J070636.4+635109

Fig. 4. Results of the observations of SRGA J070636.4+635109. Top left: the pointing picture. The blue circumference indicates the ART-XC source position error circle, with a radius of 30′′; the red circumference indicates the 98% eROSITA position error circle. The arrow indicates the object for which an optical spectrum was taken. Top right: the X-ray spectrum from the ART-XC (red) and eROSITA (black) data and the best-fit model (see Table 3). The arrows indicate the 2σ upper limits. The measurement-to-model ratio is shown on the lower panel of the X-ray spectrum. Bottom: the optical spectrum, the main emission lines are indicated.

SWIFT J0252.3+4312) (Cusumano et al. 2010; Oh et al. 2018). There is the edge-on galaxy LEDA 90641 with the infrared color $W_1 - W_2 = 0.77$ that points to the probable presence of an active galactic nucleus in the ART-XT position error circle. According to the SIMBAD astronomical database, the galaxy’s redshift is $z = 0.0518$.

The galaxy’s spectrum (Fig. 2, Table 5) exhibits narrow H$\beta$, [O III]λ4959, [O III]λ5007, [N II]λ6548, H$\alpha$, [N II]λ6584, and sulfur doublet lines, from which the redshift can be refined: $z = 0.05123 \pm 0.00024$. By its position on the BPT diagram (log([O III]λ5007/H$\beta$) = 1.01 ± 0.11 and log([N II]λ6584/H$\alpha$) = −0.24 ± 0.04), the object can be attributed to Seyfert galaxies, while the absence of broad line components implies that this is Sy2.

SRGA J062627.2+072734

This source was discovered during the ROSAT all-sky survey (2RXS J062625.8+072733). It is also present in the catalog of sources of the Swift/BAT hard X-ray survey (SWIFT J0626.6+0729) (Oh et al. 2018). The object is on the half of the sky $180 < |l| < 360^\circ$, on which we have no eROSITA data at our disposal. There is the galaxy LEDA 136513 (Fig. 3) with an infrared color typical for AGNs ($W_1 - W_2 = 0.86$) in the ART-XT position error circle.

The galaxy’s optical spectrum (Fig. 3, Table 6) exhibits the H$\alpha$ and H$\beta$ emission lines with intense broad components as well as narrow forbidden [O III]λ4959, [O III]λ5007, [N II]λ6548, [N II]λ6584, and sulfur doublet lines. The redshift is determined from these lines: $z = 0.04254 \pm 0.00013$. The ratios log([O III]λ5007/H$\beta$) > 1.01 and log([N II]λ6584/H$\alpha$) = −0.03 ± 0.08 measured for the narrow H$\alpha$ and H$\beta$ components are typical for AGNs, while the presence of broad H$\alpha$ and H$\beta$ components with fluxes higher than those in the narrow components by an order of magnitude allows this object to be attributed to Seyfert 1 galaxies (Sy1).
Fig. 5. Same as Fig. 4, but for SRGA J092021.6+860249.

Fig. 6. Same as Fig. 4, but for SRGA J195702.4+615036.
Fig. 7. Same as Fig. 2, but for SRGA J221913.2+362014. The red circumference in the pointing picture indicates the 98% eROSITA source position error circle. The optical spectrum is shown on the two lower panels: the spectrum taken with VPGH600G (left) and the spectrum taken with VPHG600R (right).

Fig. 8. Same as Fig. 4, but for SRGA J223714.9+402939.
Fig. 9. Same as Fig. 4, but for SRGA J232037.8+482329.

Fig. 10. Same as Fig. 2, but for SRGA J235250.6−170449. The red circumference in the pointing picture indicates the 98% eROSITA source position error circle.
Table 4. Log of optical observations

| ART-XC source           | Date         | Grism      | Slit | Exposure time, s | Telescope     |
|-------------------------|--------------|------------|------|-----------------|---------------|
| SRGA J025234.3+431004   | Sep. 29, 2021| VPHG600G   | 2″   | 3 × 300         | AZT-33IK      |
| SRGA J062627.2+07234    | Nov. 5, 2021 | G15        | 2″   | 8 × 600         | RTT-150       |
| SRGA J070636.4+635109   | May 13, 2021 | VPHG600G   | 2″   | 7 × 200         | AZT-33IK      |
| SRGA J092021.6+860249   | Oct. 31, 2021| VPHG600G   | 2″   | 4 × 300         | AZT-33IK      |
| SRGA J195702.4+615036   | May 12, 2021 | G15        | 2″   | 5 × 600         | RTT-150       |
| SRGA J221913.2+362014   | Oct. 31, 2021| VPHG600G   | 3″   | 3 × 600         | AZT-33IK      |
|                         | Oct. 31, 2021| VPHG600R   | 3″   | 3 × 600         | AZT-33IK      |
| SRGA J223714.9+402939   | May 13, 2021 | VPHG600G   | 3″   | 3 × 200         | AZT-33IK      |
| SRGA J232037.8+482329   | Nov. 5, 2021 | G15        | 2″   | 4 × 120         | RTT-150       |
| SRGA J235250.6−170449   | Sep. 11, 2021| VPHG600G   | 2″   | 4 × 300         | AZT-33IK      |

Table 5. Spectral features of SRGA J025234.3+431004

| Line          | Wavelength, Å | Flux, 10^{-15} erg s^{-1} cm^{-2} | Eq. width, Å | FWHM, 10^{2} km s^{-1} |
|---------------|---------------|-----------------------------------|--------------|------------------------|
| Hβ            | 5109          | 1.8 ± 0.5                          | −11.5 ± 3.0  | −                      |
| [O III]λ4959  | 5212          | 6.8 ± 0.5                          | −44 ± 3      | −                      |
| [O III]λ5007  | 5262          | 17.8 ± 0.1                         | −117 ± 4     | −                      |
| [N II]λ6548   | 6884          | 1.2 ± 0.3                          | −5.9 ± 1.4   | −                      |
| Hα            | 6900          | 9.3 ± 0.4                          | −46 ± 2      | −                      |
| [N II]λ6584   | 6923          | 5.3 ± 0.4                          | −27 ± 2      | −                      |
| [S II]λ6718   | 7061          | 2.6 ± 0.5                          | −13.2 ± 2.6  | −                      |
| [S II]λ6732   | 7075          | 3.2 ± 0.6                          | −16.0 ± 3.1  | −                      |

SRGA J070636.4+635109

This X-ray source was discovered by the ART-XC telescope onboard the SRG observatory during the first year of its all-sky survey (Pavlinsky et al. 2021b). It was also detected by the INTEGRAL gamma-ray observatory during a long-term hard X-ray all-sky survey (for a review, see Krivonos et al. 2021) on the maps of the galaxy M 81 (Mereminskiy et al., in preparation) with a flux of (8.6 ± 2.0) × 10^{-12} erg × s^{-1} cm^{-2} in the 17–60 keV energy band. There is the galaxy UGC 3660 at z = 0.0143 (according to SIMBAD) in the ART-XC position error circle refined based on the eROSITA data (Fig. 4) with which the radio source NVSS J070632+635101 (Condon et al. 1998) can also be associated.

The galaxy’s spectrum (Fig. 4, Table 7) exhibits narrow [O III]λ4959, [O III]λ5007, [N II]λ6548, Hα, [N II]λ6584, and sulfur doublet emission lines; a broad Hα component is seen. At the same time, the Hβ line is not detected. The spectrum also exhibits the G, Mg I, and NaD absorption lines of the Fraunhofer series. The object’s redshift measured from the lines is z = 0.01404 ± 0.00019.
Table 6. Spectral features of SRGA J062627.2+072734

| Line           | Wavelength, Å | Flux, 10^{-15} erg s^{-1} cm^{-2} | Eq. width, Å | FWHM, 10^2 km s^{-1} |
|----------------|---------------|-----------------------------------|--------------|----------------------|
| Hβ, narrow     | 5077          | <0.3                              | >−2.5        | –                    |
| Hβ, broad      | 5077          | 7.9 ± 0.5                         | −64 ± 4      | 54 ± 4               |
| [O III]6584    | 5173          | 1.3 ± 0.2                         | −10.1 ± 1.3  | –                    |
| [O III]5007    | 5224          | 3.2 ± 0.2                         | −24 ± 1      | –                    |
| [S II]6548     | 6826          | 1.9 ± 0.3                         | −10.4 ± 1.6  | –                    |
| Hα, broad      | 6841          | 55 ± 1                            | −297 ± 5     | 53 ± 1               |
| Hα, narrow     | 6841          | 2.5 ± 0.3                         | −13.2 ± 1.6  | –                    |
| [N II]6584     | 6859          | 2.3 ± 0.3                         | −12.2 ± 1.6  | –                    |
| [S II]6718     | 7002          | 0.5 ± 0.2                         | −2.7 ± 1.0   | –                    |
| [S II]6732     | 7017          | 0.5 ± 0.2                         | −2.8 ± 0.8   | –                    |

Table 7. Spectral features of SRGA J070636.4+635109

| Line           | Wavelength, Å | Flux, 10^{-15} erg s^{-1} cm^{-2} | Eq. width, Å | FWHM, 10^2 km s^{-1} |
|----------------|---------------|-----------------------------------|--------------|----------------------|
| Hβ             | 4930          | <1.1                              | >−0.5        | –                    |
| [O III]6584    | 5027          | 2.4 ± 0.8                         | −1.2 ± 0.4   | –                    |
| [O III]5007    | 5076          | 4.9 ± 0.9                         | −2.4 ± 0.4   | –                    |
| [N II]6548     | 6640          | 2.5 ± 0.6                         | −1.0 ± 0.2   | –                    |
| Hα             | 6657          | 4.4 ± 0.7                         | −1.8 ± 0.3   | –                    |
| Hα, broad      | 6657          | 68 ± 5                            | −28 ± 2      | 61 ± 4               |
| [N II]6584     | 6676          | 11.4 ± 0.1                        | −4.7 ± 0.3   | –                    |
| [S II]6718     | 6811          | 2.5 ± 0.5                         | −1.0 ± 0.2   | –                    |
| [S II]6732     | 6826          | 4.0 ± 0.7                         | −1.6 ± 0.3   | –                    |

By its position on the BPT diagram (log([O III]5007/Hβ) > 0.65 and log([N II]6584/Hα) = 0.42 ± 0.07), the object can be attributed to Seyfert or LINER galaxies. However, the presence of a broad Hα component and the absence of Hβ allow the object to be classified as a Seyfert 1.8 galaxy (Sy1.8).

SRGA J092021.6+860249

This source was discovered during the ROSAT all-sky survey (2RXS J092015.8+860253). There is the galaxy LEDA 2790304 with an infrared color typical for AGNs (W1 − W2 = 0.64) in the eROSITA position error circle (Fig. 5). The radio source NVSS J091958+860300 is also associated with it.

The optical spectrum (Fig. 5, Table 8) exhibits the Balmer Hα, Hβ, and Hγ emission lines with broad components, narrow forbidden [O III]6584, [O III]5007, [N II]6584, [S II]6718, [S II]6732 lines, and the G absorption line. The measured redshift of the object is z = 0.05286 ± 0.00013. The narrow-line flux ratios log([O III]5007/Hβ) = 0.9 ± 0.2 and log([N II]6584/Hα) > 0.01 are typical for
Table 8. Spectral features of SRGA J09201.6+860249

| Line            | Wavelength, Å | Flux, 10^{-14} erg s^{-1} cm^{-2} | Eq. width, Å | FWHM, 10^2 km s^{-1} |
|-----------------|---------------|-----------------------------------|--------------|----------------------|
| Hγ, narrow      | 4581          | <0.2                              | > -1.6       | −                    |
| Hγ, broad       | 4581          | 1.8 ± 0.4                         | -14.3 ± 3.0  | 32 ± 7               |
| Hβ, narrow      | 5121          | 0.2 ± 0.1                         | -1.1 ± 0.5   | −                    |
| Hβ, broad       | 5121          | 4.2 ± 0.2                         | -30 ± 2      | 28 ± 2               |
| [O III]λ4959    | 5222          | 0.4 ± 0.1                         | -2.8 ± 0.5   | −                    |
| [O III]λ5007    | 5272          | 1.3 ± 0.1                         | -9.0 ± 0.4   | −                    |
| [N II]λ6548     | 6894          | <0.7                              | > -4.3       | −                    |
| Hα, narrow      | 6910          | <1.5                              | > -9.9       | −                    |
| Hα, broad       | 6910          | 10.5 ± 1.6                        | -70 ± 11     | 14.9 ± 0.6           |
| [N II]λ6584     | 6931          | 2.1 ± 0.6                         | -13.8 ± 3.8  | −                    |
| [S II]λ6718     | 7072          | 0.19 ± 0.04                       | -1.5 ± 0.3   | −                    |
| [S II]λ6732     | 7086          | 0.16 ± 0.03                       | -1.2 ± 0.3   | −                    |

Table 9. Spectral features of SRGA J19570.4+615036

| Line            | Wavelength, Å | Flux, 10^{-14} erg s^{-1} cm^{-2} | Eq. width, Å | FWHM, 10^2 km s^{-1} |
|-----------------|---------------|-----------------------------------|--------------|----------------------|
| Hβ, narrow      | 5146          | 0.7 ± 0.3                         | -1.7 ± 0.7   | −                    |
| Hβ, broad       | 5146          | 5.0 ± 0.7                         | -12.5 ± 1.7  | 35 ± 5               |
| [O III]λ4959    | 5249          | 5.5 ± 0.3                         | -13.7 ± 0.6  | −                    |
| [O III]λ5007    | 5299          | 14.5 ± 0.2                        | -36 ± 1      | −                    |
| [O I]λ6300      | 6671          | 1.2 ± 0.1                         | -2.9 ± 0.3   | −                    |
| [N II]λ6548     | 6935          | 2.2 ± 0.7                         | -5.5 ± 1.7   | −                    |
| Hα, narrow      | 6950          | 3.9 ± 1.0                         | -10.0 ± 2.5  | −                    |
| Hα, broad       | 6950          | 36 ± 3                            | -92 ± 6      | 27 ± 2               |
| [N II]λ6584     | 6970          | 6.9 ± 0.8                         | -17.6 ± 2.2  | −                    |
| [S II]λ6718     | 7111          | 2.2 ± 0.3                         | -5.8 ± 0.7   | −                    |
| [S II]λ6732     | 7126          | 2.0 ± 0.3                         | -5.4 ± 0.7   | −                    |

AGNs, while the presence of broad Hα, Hβ, and Hγ components allows the object to be classified as Sy1.

SRGA J195702.4+615036

This source was discovered during the ROSAT all-sky survey (2RXS J195702.4+615038). There is the galaxy LEDA 2625686 with an infrared color typical for AGNs (W1 − W2 = 0.65) in the eROSITA position error circle (Fig. 6).

The galaxy’s spectrum (Fig. 6, Table 9) exhibits the Hα and Hβ emission lines with broad components, the forbidden [O III]λ4959, [O III]λ5007, [O I]λ6300, [S II]λ6718, [S II]λ6732 lines, and the Fraunhofer Mg I absorption line. The measured redshift of the object is $z = 0.05857 ± 0.00014$. The
Table 10. Spectral features of SRGA J221913.2+362014

| Line       | Wavelength, Å | Flux, $10^{-15}$ erg s$^{-1}$ cm$^{-2}$ | Eq. width, Å | FWHM, $10^2$ km s$^{-1}$ |
|------------|---------------|----------------------------------------|--------------|--------------------------|
| H$\beta$  | 5572          | 2.9 ± 0.2                              | −23 ± 2      | −                        |
| [O III]$\lambda$4959 | 5686          | 17.2 ± 0.3                              | −135 ± 2     | −                        |
| [O III]$\lambda$5007 | 5741          | 51 ± 1                                 | −403 ± 2     | −                        |
| [O I]$\lambda$6300 | 7225          | 1.5 ± 0.2                              | −13.8 ± 2.2  | −                        |
| [N II]$\lambda$6548 | 7505          | 0.2 ± 0.1                              | −12.4 ± 2.7  | −                        |
| H$\alpha$ | 7526          | 18.0 ± 0.8                              | −132 ± 8     | −                        |
| [N II]$\lambda$6584 | 7550          | 4.7 ± 0.3                              | −35 ± 4      | −                        |
| [S II]$\lambda$6718 | 7702          | 5.0 ± 0.9                              | −56 ± 10     | −                        |
| [S II]$\lambda$6732 | 7722          | 2.3 ± 0.9                              | −26 ± 10     | −                        |

Table 11. Spectral features of SRGA J223714.9+402939

| Line             | Wavelength, Å | Flux, $10^{-15}$ erg s$^{-1}$ cm$^{-2}$ | Eq. width Å | FWHM, $10^2$ km s$^{-1}$ |
|------------------|---------------|----------------------------------------|-------------|--------------------------|
| H$\beta$, narrow | 5144          | <0.2                                    | >−4.6       | −                        |
| H$\beta$, broad  | 5144          | 6.8 ± 0.7                               | −73 ± 8     | 161 ± 18                 |
| [O III]$\lambda$4959 | 5247          | 0.9 ± 0.1                              | −9.5 ± 1.3  | −                        |
| [O III]$\lambda$5007 | 5298          | 2.9 ± 0.1                              | −31 ± 2     | −                        |
| [O I]$\lambda$6300 | 6668          | 0.30 ± 0.07                            | −2.8 ± 0.7  | −                        |
| [N II]$\lambda$6548 | 6929          | 0.6 ± 0.1                              | −5.3 ± 1.0  | 5.4*                     |
| H$\alpha$, narrow | 6945          | 1.7 ± 0.1                              | −15.5 ± 1.1 | −                        |
| H$\alpha$, broad  | 6945          | 17.5 ± 1.0                             | −164 ± 9    | 97 ± 5                   |
| [N II]$\lambda$6584 | 6967          | 1.8 ± 0.1                              | −16.7 ± 1.2 | −                        |
| [S II]$\lambda$6718 | 7109          | 0.5 ± 0.1                              | −4.5 ± 0.6  | −                        |
| [S II]$\lambda$6732 | 7124          | 0.5 ± 0.1                              | −4.8 ± 0.6  | −                        |

* The value of the parameter was fixed when fitting the line.

There is the optical–infrared–radio source NVSS J221914+362011 = WISEA J221914.50+362010.5 with an infrared color typical for AGNs ($W1 − W2 = 1.2$) in the ART-XC position error circle refined based on the eROSITA data (Fig. 4).

The optical spectrum (Fig. 7, Table 10) exhibits many forbidden neutral and ionized oxygen, sulfur, neon emission lines and narrow Balmer H$\alpha$, H$\beta$, and H$\gamma$ emission lines. The measured redshift is $z = 0.14667 ± 0.00003$. By its position on the BPT diagram ($\log([O III]λ5007/H$β$) = 1.25 ± 0.04$}

SRGA J221913.2+362014

This X-ray source was discovered by the ART-XC telescope onboard the SRG observatory during the first year of its all-sky survey (Pavlinsky et al. 2021b).

The value of the parameter was fixed when fitting the line.

There is the optical–infrared–radio source NVSS J221914+362011 = WISEA J221914.50+362010.5 with an infrared color typical for AGNs ($W1 − W2 = 1.2$) in the ART-XC position error circle refined based on the eROSITA data (Fig. 4).

The optical spectrum (Fig. 7, Table 10) exhibits many forbidden neutral and ionized oxygen, sulfur, neon emission lines and narrow Balmer H$\alpha$, H$\beta$, and H$\gamma$ emission lines. The measured redshift is $z = 0.14667 ± 0.00003$. By its position on the BPT diagram ($\log([O III]λ5007/H$β$) = 1.25 ± 0.04$).
Table 12. Spectral features of SRGA J232037.8+482329

| Line     | Wavelength, Å | Flux, $10^{-15}$ erg s$^{-1}$ cm$^{-2}$ | Eq. width, Å | FWHM, $10^2$ km s$^{-1}$ |
|----------|---------------|----------------------------------------|--------------|--------------------------|
| Hβ       | 5062          | 1.1 ± 0.4                              | −1.2 ± 0.5   | −                        |
| [O III]λ4959 | 5164       | 5.1 ± 0.5                              | −5.6 ± 0.5   | −                        |
| [O III]λ5007 | 5213       | 11.5 ± 0.5                             | −12.7 ± 0.6  | −                        |
| [O I]λ6300 | 6563          | 2.9 ± 0.4                              | −3.2 ± 0.4   | −                        |
| [N II]λ6548 | 6819        | 4.4 ± 0.3                              | −5.0 ± 0.4   | −                        |
| Hα       | 6836          | 11.2 ± 0.4                             | −12.9 ± 0.5  | −                        |
| [N II]λ6584 | 6857        | 9.8 ± 0.4                              | −11.4 ± 0.4  | −                        |
| [S II]λ6718 | 6997        | 3.1 ± 0.3                              | −3.8 ± 0.4   | −                        |
| [S II]λ6732 | 7012        | 2.8 ± 0.3                              | −3.5 ± 0.4   | −                        |

Table 13. Spectral features of SRGA J235250.6−170449

| Line     | Wavelength, Å | Flux, $10^{-15}$ erg s$^{-1}$ cm$^{-2}$ | Eq. width, Å | FWHM, $10^2$ km s$^{-1}$ |
|----------|---------------|----------------------------------------|--------------|--------------------------|
| Hβ, narrow | 5129       | 3.5 ± 0.5                                | −4.4 ± 0.6   | −                        |
| Hβ, broad | 5129        | 67 ± 3                                  | −85 ± 4      | 112 ± 5                  |
| [O III]λ4959 | 5231       | 7.6 ± 0.5                              | −9.6 ± 0.7   | −                        |
| [O III]λ5007 | 5282       | 19.0 ± 0.5                              | −24 ± 1      | −                        |
| [O I]λ6302 | 6648        | 3.9 ± 0.6                              | −4.7 ± 0.7   | −                        |
| [N II]λ6548 | 6909        | 1.1 ± 0.7                              | −1.4 ± 1.0   | −                        |
| Hα, narrow | 6925        | 15.2 ± 0.8                              | −20 ± 1      | −                        |
| Hα, broad | 6925        | 368 ± 4                                | −493 ± 6     | 93 ± 2                   |
| [N II]λ6584 | 6946        | 1.3 ± 0.6                              | −1.7 ± 0.9   | −                        |
| [S II]λ6718 | 7089        | 2.0 ± 0.7                              | −2.8 ± 0.9   | −                        |
| [S II]λ6732 | 7105        | 2.5 ± 0.6                              | −3.6 ± 0.9   | −                        |

and log([N II]λ6584/Hα) = −0.58 ± 0.04), the object can be attributed to Seyfert galaxies, while the absence of broad Balmer line components implies that this is Sy2.

**SRGA J223714.9+402939**

This source was discovered during pointed ROSAT observations (1WGA J2237.2+4029) (White et al. 2000). There is the galaxy LEDA 5060459 with an infrared color typical for AGNs ($W1 − W2 = 0.73$) in the eROSITA position error circle (Fig. 8). According to SIMBAD, the galaxy’s redshift is $z = 0.0580$. The optical spectrum (Fig. 8, Table 11) exhibits forbidden oxygen and sulfur emission lines as well as the Hα and Hβ emission lines with broad components. The refined redshift of the object is $z = 0.05818 ± 0.00011$. By its position on the BPT diagram ($\log([\text{O III}]λ5007/\text{Hβ}) > 1.14$ and $\log([\text{N II}]λ6584/\text{Hα}) = 0.03 ± 0.04$), the object can be attributed to Seyfert galaxies, while the presence of broad Hα and Hβ components, the flux in which is much greater than that in the narrow ones, allows the object to be classified as Sy1.
Fig. 11. Optical images in the $i$ filter from the SkyMapper survey (Keller et al. 2007) around eight ART-XC X-ray sources in the southern sky. The blue circumference indicates the ART-XC position error circle, with a radius of 30″. The arrow indicates the galaxies for which a spectrum was taken in the 6dF survey.

**SRGA J232037.8+482329**

This source was discovered during the ROSAT all-sky survey (2RXS J232039.7+482317). There is the galaxy LEDA 2316409 at $z = 0.04150$ (according to SIMBAD) in the eROSITA position error circle, with which the radio source NVSS J232039+482326 is associated.

The galaxy’s spectrum (Fig. 9, Table 12) exhibits forbidden oxygen and sulfur lines, narrow Hα and Hβ emission lines, and the Fraunhofer Mg I
absorption line. The refined redshift of the galaxy is \( z = 0.04197 \pm 0.00017 \). By its position on the BPT diagram (\( \log([\text{O III}]\lambda 5007/H\beta) = 1.03 \pm 0.17 \) and \( \log([\text{N II}]\lambda 6584/H\alpha) = -0.06 \pm 0.02 \)) and the absence of broad H\( \alpha \) and H\( \beta \) components, the object can be classified as Sy2.

**SRGA J235250.6−170449**

This source was discovered in the Swift/BAT hard X-ray sky survey (Oh et al. 2018). There is the galaxy 2MASS J23525142−1704372 in the eROSITA position error circle (Fig. 10), whose infrared color (\( W1 − W2 = 0.54 \)) suggests the presence of an AGN.

The galaxy’s spectrum (Fig. 10, Table 13) exhibits many forbidden oxygen, sulfur, nitrogen emission lines and the Balmer H\( \alpha \), H\( \beta \), and H\( \gamma \) emission lines, the first two of which have intense broad components; the Fraunhofer Mg I and NaD absorption lines are also seen. The measured redshift of the object is \( z = 0.05502 \pm 0.00012 \). Although the object cannot be unambiguously attributed to Seyfert galaxies by its position on the BPT diagram (\( \log([\text{O III}]\lambda 5007/H\beta) = 0.74 \pm 0.06 \) and \( \log([\text{N II}]\lambda 6584/H\alpha) = -1.07 \pm 0.22 \)), the presence of intense broad components in the H\( \alpha \) and H\( \beta \) emission lines allows it to be classified as Sy1.

**Southern-Sky Objects**

The eight ART-XC southern-sky (\( \delta > -20^\circ \)) objects are identified with galaxies (Fig. 11), for which there are the spectra taken during the 6dF survey (Jones et al. 2004, 2009). One of these X-ray sources (SRGA J030838.1−552041) associated with the galaxy LEDA 410289 was discovered by the ART-XC telescope onboard the SRG observatory (Pavlinsky et al. 2021b), two (SRGA J052959.8−340157 = XMMSL2 J052958.9−340159 = LEDA 668116 and SRGA J060241.1−595152 = XMMSL2 J060241.6−595149 = LEDA 178859) were detected for the first time during the XMM–Newton slew survey (the XMM–Newton Survey Science Center 2018), and the remaining five (SRGA J055053.7−621457 = 2RXS J055054.2−621454 = LEDA 178653, SRGA J061322.9−290027 = 2RXS J061324.1−290029 = LEDA 734640, SRGA J063324.9−561424 = 2RXS J063324.6−561427 = LEDA 148903, SRGA J064215.5−662620 = 2RXS J064222.7−662623 = 2MASS J0644217−6626199, SRGA J072823.5−440823 = 2RXS J072822.3−440821 = 2MASS J07282238−4408241) were discovered during the ROSAT all-sky survey (Boller et al. 2016). All of the listed galaxies are characterized by an infrared color typical for Seyfert galaxies (\( W1 − W2 \) from 0.5 to 1.0).

The 6dF survey was conducted at the UKST 1.2-m Schmidt telescope using a multi-fiber spectrograph with a 5.7" field of view equipped with two low-resolution (\( R \approx 1000 \)) gratings with overlapping spectral ranges. The range 4000–7500 \( \AA \) was completely covered. The spectra taken during the survey were not flux-calibrated and are presented in counts, which does not allow the absolute fluxes in emission lines to be measured. However, these data can be used to estimate the line equivalent widths and the ratios of the fluxes in the pairs of closely spaced lines (H\( \beta \), [O III]\( \lambda 5007 \)) and ([N II]\( \lambda 6584 \), H\( \alpha \)), which are used to classify the AGNs by the BPT diagram.

Tables 14, 15 present the emission-line characteristics for the objects from our sample determined based on the 6dF spectra. The errors are given at the 68\% confidence level. The line FWHMs were corrected for the instrumental broadening of 5.75 \( \AA \). The redshifts of the objects were taken from the 6dF catalog (Jones et al. 2009).

**PROPERTIES OF THE DETECTED AGNs**

Tables 16 and 17 present basic properties of the AGNs that we managed to identify in this paper: the redshift, the optical type, and the X-ray luminosity \( L_X \) in the 4–12 keV energy band.

We found the X-ray luminosity based on the 4–12 keV flux (see Tables 1 and 2) from the catalog of X-ray sources (Pavlinsky et al. 2021b) in the first year of the SRG/ART-XC survey and the photometric distance to the object calculated from its redshift. The presented values of \( L_X \) disregard the \( k \)-corrections and were not corrected for absorption on the line of sight.

All of the objects being discussed turned out to be nearby Seyfert galaxies with luminosities \( L_X \sim 3 \times 10^{43}–3 \times 10^{44} \) erg s\(^{-1} \) and fall into the region of Seyfert galaxies on the standard BPT diagram (Fig. 12) of [O III]5007/H\( \beta \) and [N II]6584/H\( \alpha \) flux ratios. Although the sources SRGA J070636.4+635109 and SRGA J235250.6−170449 are at the boundary of this region, the presence of broad Balmer line components in the spectra of these galaxies unambiguously suggests that these are Seyfert 1 galaxies.

In Fig. 13 the slope of the power-law continuum \( \Gamma \) is plotted against the intrinsic absorption column density \( N_H \) for the eight objects from our sample.

\(^{6}\)http://www-wfau.roe.ac.uk/6dFGS/
Table 14. Spectral features of the objects from the 6dF survey

| Line          | Eq. width, Å | FWHM, $10^2$ km s$^{-1}$ | Line          | Eq. width, Å | FWHM, $10^2$ km s$^{-1}$ |
|---------------|-------------|--------------------------|---------------|-------------|--------------------------|
| SRGA J030838.1–552041 |              |                          |               |             |                          |
| Hβ           | −3.2 ± 1.3  | 2.8 ± 1.1                | Hβ           | −3.1 ± 1.2  | 4.1 ± 1.5                |
| [O III]λ4959 | −12.6 ± 4.0 | 3.5 ± 1.1                | [O III]λ4959 | −8.2 ± 2.8  | 5.6 ± 1.3                |
| [O III]λ5007 | −41 ± 7     | 3.5 ± 0.3                | [O III]λ5007 | −25 ± 5     | 5.1 ± 0.5                |
| [N II]λ6548  | −4.3$^{+3.0}_{-2.4}$ | 3.5 ± 1.3                |               |             |                          |
| Hα           | −18.6 ± 2.0 | 4.2 ± 0.4                | [N II]λ6548  | −7.9 ± 2.4  | 6.1 ± 0.8                |
| [S II]λ6718  | −5.0 ± 1.6  | 4.1 ± 1.7                | [S II]λ6748  | −5.4$^{+1.6}_{-3.0}$ | 5.4 ± 2.1            |
| [S II]λ6732  | −4.6 ± 1.6  | 3.9 ± 1.7                |               |             |                          |
| SRGA J052959.8–340157 |              |                          | SRGA J061322.9–290027 |              |                          |
| [O II]λ3727  | −16.6 ± 4.9 | 5.8 ± 0.9                |               |             |                          |
| Hβ           | −4.6 ± 1.8  | 6.0 ± 1.7                | [O III]λ4959 | −7.8$^{+3.6}_{-5.4}$ | 3.0 ± 1.2            |
| [O III]λ4959 | −21 ± 4     | 6.9 ± 0.6                | [O III]λ5007 | −29$^{+10}_{-27}$ | 3.0 ± 1.2            |
| [O III]λ5007 | −65 ± 9     | 6.3 ± 0.6                | [N II]λ6548  | −11.8 ± 3.8 | 4.2 ± 1.4                |
| [N II]λ6548  | −4.1 ± 0.9  | 6.3 ± 0.3                | Hα           | −23$^{+6}_{-16}$ | 4.2 ± 1.4            |
| Hα, narrow   | −20.6 ± 0.9 | 6.3 ± 0.3                | [N II]λ6584  | −15.3 ± 4.9 | 4.2 ± 1.4                |
| Hα, broad    | −62 ± 5     | 72 ± 6                   | SRGA J064421.5–662620 |              |                          |
| [N II]λ6584  | −16.2 ± 0.9 | 6.3 ± 0.3                | Hγ           | −2.9 ± 0.9  | 3.7 ± 1.7                |
| SRGA J055053.7–621457 |              |                          |               |             |                          |
| Hδ, broad    | −17.5 ± 1.9 | 32 ± 4                   | Hδ, narrow   | −5.2 ± 1.4  | 2.9 ± 1.6                |
| Hγ, broad    | −16.2 ± 1.2 | 22 ± 2                   | Hδ, broad    | −35 ± 2     | 58 ± 4                  |
| Hβ, narrow   | <1.9        | –                        | [O III]λ4959 | −8.6 ± 1.8  | 4.0 ± 0.9                |
| Hβ, broad    | −38 ± 2     | 24 ± 2                   | [O III]λ5007 | −31 ± 6     | 4.7 ± 0.8                |
| [O III]λ4959 | −6.3 ± 2.2  | 6.7 ± 1.6                | Hα, narrow   | −22 ± 1     | 2.8 ± 0.2                |
| [O III]λ5007 | −21 ± 2     | 6.7 ± 0.6                | Hα, broad    | −130 ± 4    | 40 ± 2                  |
| Hα, narrow   | −6.4 ± 2.8  | 5.6 ± 0.8                | [N II]λ6584  | −12.2 ± 0.8 | 2.8 ± 0.2                |
| Hα, broad    | −90 ± 5     | 20 ± 1                   | SRGA J072823.5–440823 |              |                          |
| [N II]λ6584  | −12.8 ± 2.4 | 5.5 ± 0.8                | Hγ, broad    | −24 ± 2     | 32 ± 3                  |
| SRGA J060241.1–595152 |              |                          | Hβ, narrow   | <1.4        | –                      |
| Hβ           | −6.7 ± 2.3  | 3.1 ± 0.8                | Hβ, broad    | −55 ± 2     | 34 ± 2                  |
| [O III]λ4959 | −14.0 ± 3.7 | 4.4 ± 0.5                | [O III]λ4959 | −4.7$^{+1.1}_{-3.4}$ | 4.6 ± 1.6            |
| [O III]λ5007 | −49 ± 11    | 3.7 ± 0.4                | [O III]λ5007 | −20$^{+4}_{-6}$  | 4.3 ± 0.9                |
| Hα           | −19$^{+9}_{-18}$ | 4.9 ± 1.7                | Hα, narrow   | −12.5 ± 2.7 | 5.0 ± 0.8                |
| [N II]λ6584  | −14$^{+7}_{-14}$ | 4.9 ± 1.7                | Hα, broad    | −210 ± 5    | 30 ± 1                  |
|               |             |                          | [N II]λ6584  | −5.4 ± 1.8  | 5.0 ± 0.8                |
The luminosity in the observed 4–12 keV energy band in units of erg s\(^{-1}\) uncorrected for absorption. The error corresponds to the 68% confidence interval.

**Table 15.** Emission-line flux ratios for the objects from the 6dF survey

| Object                  | log\([\text{O III} \lambda 5007/\text{H\beta}]\) | log\([\text{N II} \lambda 6584/\text{H\alpha}]\) |
|-------------------------|-----------------------------------------------|-----------------------------------------------|
| SRGA J030838.1–552041   | 1.05 ± 0.12                                   | −0.11 ± 0.07                                  |
| SRGA J052959.8–340157   | 1.09 ± 0.07                                   | −0.11 ± 0.03                                  |
| SRGA J055053.7–621457   | >1.11                                         | 0.30 ± 0.21                                   |
| SRGA J060241.1–595152   | 0.89 ± 0.13                                   | −0.15 ± 0.37                                  |
| SRGA J061322.9–290027   | 0.96 ± 0.15                                   | 0.09 ± 0.08                                   |
| SRGA J063324.9–561424   | >0.87                                         | −0.19 ± 0.24                                  |
| SRGA J064421.5–662620   | 0.85 ± 0.04                                   | −0.26 ± 0.03                                  |
| SRGA J072823.5–440823   | >1.14                                         | −0.37 ± 0.17                                  |

**Table 16.** Properties of the AGNs whose spectra were taken at the AZT-33IK and RTT-150 telescopes

| Object                  | Optical type | z               | log \(L_X\)\(^1\) |
|-------------------------|--------------|-----------------|-------------------|
| SRGA J025234.3+431004   | Sy2          | 0.05125 ± 0.00024 | 43.0 ± 0.4       |
| SRGA J062627.2+072734   | Sy1          | 0.04254 ± 0.00013 | 43.0 ± 0.4       |
| SRGA J070636.4+635109   | Sy1.8        | 0.01404 ± 0.00019 | 42.4 ± 0.3       |
| SRGA J092021.6+860249   | Sy1          | 0.05286 ± 0.00013 | 43.5 ± 0.2       |
| SRGA J195702.4+615036   | Sy1          | 0.05857 ± 0.00014 | 43.4 ± 0.2       |
| SRGA J221913.2+362014   | Sy2          | 0.14667 ± 0.00003 | 44.4 ± 0.2       |
| SRGA J223714.9+402939   | Sy1          | 0.05818 ± 0.00011 | 43.6 ± 0.3       |
| SRGA J232037.8+482329   | Sy2          | 0.04197 ± 0.00017 | 42.8 ± 0.4       |
| SRGA J235250.6–170449   | Sy1          | 0.05502 ± 0.00012 | 43.7 ± 0.3       |

\(^1\) The luminosity in the observed 4–12 keV energy band in units of erg s\(^{-1}\) uncorrected for absorption. The error corresponds to the 68% confidence interval.

**Table 17.** Properties of the AGNs whose spectra were taken during the 6dF survey

| Object                  | Optical type | \(z\)\(^1\) | log \(L_X\)\(^2\) |
|-------------------------|--------------|-------------|-------------------|
| SRGA J030838.1–552041   | Sy2          | 0.07791     | 43.8 ± 0.2       |
| SRGA J052959.8–340157   | Sy1.8        | 0.07900     | 43.8 ± 0.2       |
| SRGA J055053.7–621457   | Sy1          | 0.05875     | 43.0 ± 0.2       |
| SRGA J060241.1–595152   | Sy2          | 0.10051     | 43.8 ± 0.2       |
| SRGA J061322.9–290027   | Sy2          | 0.07051     | 44.1 ± 0.1       |
| SRGA J063324.9–561424   | Sy2          | 0.04784     | 43.2 ± 0.2       |
| SRGA J064421.5–662620   | Sy1          | 0.07843     | 42.9 ± 0.4       |
| SRGA J072823.5–440823   | Sy1          | 0.08171     | 43.8 ± 0.2       |

\(^1\) The values were taken from the catalog of redshifts of the 6dF survey.

\(^2\) The luminosity in the observed 4–12 keV energy band in units of erg s\(^{-1}\) uncorrected for absorption. The error corresponds to the 68% confidence interval, without the error in \(z\).
Fig. 12. Locations of the AGNs being investigated on the BPT diagram (Baldwin et al. 1981) constructed from SDSS data (release 7, SDSS Collaboration 2009). The confidence intervals of the flux ratios are presented on the diagram. The arrow indicates the 2σ lower limits. The demarcation lines between different classes of galaxies were taken from Kauffmann et al. (2003)—the solid line, Kewley et al. (2001)—the dotted line, and Schawinski et al. (2007)—the dashed line. The sources are marked by the numbers from Tables 1 and 2.

Fig. 13. Slope of the X-ray power-law continuum versus intrinsic absorption column density for the eight AGNs investigated based on the ART-XC and eROSITA data (see Table 3). The arrows indicate the 90% upper limits. The sources are indicated by the numbers from Table 1.

for which the X-ray spectra from the ART-XC and eROSITA data were analyzed. Most of the derived slopes agree within the error limits with $\Gamma \sim 1.5-2$, which is typical for AGNs.

CONCLUSIONS

Using the observations carried out at the AZT-33IK and RTT-150 telescopes and the archival spectroscopic data from the 6dF survey, we managed to identify 17 new AGNs among the X-ray sources detected during the first year of the SRG/ART-XC all-sky survey. All of them turned out to be nearby Seyfert galaxies (eight Sy1, two Sy1.8, and seven Sy2) at redshifts from $z = 0.014$ to 0.147.

For eight objects located on the half of the sky $0^\circ < l < 180^\circ$, we constructed broadband (0.2–20 keV) X-ray spectra based on data from the ART-XC and eROSITA telescopes onboard the SRG observatory. An intrinsic absorption was revealed in the spectra of three of these objects, with two of them (the Seyfert 2 galaxies SRGA J025234.3+431004 and SRGA J221913.2+362014) being strongly absorbed ($N_H \sim 10^{23}$ cm$^{-2}$) and the third one (Sy1 SRGA J235250.6–70449) being characterized by a relatively weak absorption ($N_H \sim 10^{22}$ cm$^{-2}$). Note that the strongly absorbed source SRGA J025234.3+431004 is associated with an edge-on galaxy (LEDA 90641). Therefore, absorption can arise in this case not only in the gas–dust torus around the supermassive black hole, but also in the interstellar medium of the galaxy.

The SRG all-sky survey continues. It is expected that by the end of the four-year-long survey the ART-XC telescope will detect $\sim$5000 sources in the 4–12 keV energy band, mostly AGNs at low redshifts (Pavlinsky et al. 2021b), including many previously unknown ones. As was demonstrated in this paper and the previous paper from this series (Zaznobin et al. 2021a), the problem of identifying new AGNs from the SRG/ART-XC survey can be efficiently solved with 1.5-m optical telescopes.

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7http://ckp-rf.ru/ckp/3056/
with the participation of the Deutsches Zentrum für Luft- und Raumfahrt (DLR). The SRG spacecraft was designed, built, launched, and is operated by the Lavochkin Association and its subcontractors. The science data are downlinked via the Deep Space Network Antennae in Bear Lakes, Ussuriysk, and Baykonur, funded by Roskosmos. The eROSITA X-ray telescope was built by a consortium of German Institutes led by MPE, and supported by DLR. The eROSITA data used in this work were processed using the eSASS software developed by the German eROSITA consortium and the proprietary data reduction and analysis software developed by the Russian eROSITA Consortium.

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