

# The very faint X-ray transient Swift J174610–290018 at the Galactic center

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## ABSTRACT

**Context.** Very faint X-ray transients (VFXTs) are a class of X-ray binary systems that exhibit occasional outbursts with peak X-ray luminosities ( $L_X \lesssim 10^{36}$  erg s<sup>-1</sup>) much lower than those of typical X-ray transients. On 22 February 2024, during its daily Galactic center monitoring, *Swift*-XRT detected a VFXT 7 arcmin from Sgr A\*, dubbing it Swift J174610–290018.

**Aims.** We aim to characterize the outburst that occurred in 2024 and a second, distinct outburst in 2025 to understand the nature and accretion flow properties of this new VFXT.

**Methods.** *Swift*-XRT light curves were used to constrain the duration of the two events. We carried out X-ray spectral analysis, exploiting *XMM-Newton* and *NuSTAR* data. We used *Chandra* and *XMM-Newton* observations from the last 25 years to constrain the quiescent luminosity of the source and to compare the two most recent outbursts with previous detections of the source.

**Results.** During the 2024 outburst, which lasted about 50 days, the source reached a luminosity in the 2–10 keV band ( $L_{2-10}$ ) of  $\approx 1.2 \times 10^{35}$  erg s<sup>-1</sup> (assuming it is located at the Galactic center, i.e., at a distance of 8.2 kpc). The 2025 outburst is shorter (about 5 days) and reached  $L_{2-10} \approx 9 \times 10^{34}$  erg s<sup>-1</sup>. The spectral features of the source include an excess at 6.5–7 keV, which can be associated either with a single reflection line or with the ionized Fe XXV and XXVI lines. The same source was identified in both the *XMM-Newton* and *Chandra* catalogs of point sources (known as 4XMM J174610.7–290020 and 2CXO J174610.7–290019). During previous detections the source displayed luminosity levels ranging from  $L_{2-10} \approx 2 \times 10^{32}$  to  $L_{2-10} \approx 3 \times 10^{33}$  erg s<sup>-1</sup> between 2000 and 2010. Moreover, it exhibited a potential type I X-ray burst in 2004.

**Conclusions.** The analysis of the outbursts and the potential type I burst strongly suggests that the VFXT Swift J174610–290018 is a neutron star low-mass X-ray binary. The source can be described as being an accretion disk corona source (as has been recently proposed by an XRISM/Xtend analysis). This scenario explains the overall low luminosity of this transient and the peculiar iron lines in the spectrum.

**Key words.** Galaxy: center – X-rays: binaries – X-rays: bursts

## 1. Introduction

The Galactic center (GC), being one of the most crowded and frequently observed regions of the Milky Way, has enabled the discovery of a few dozen X-ray transients (Watson et al. 1981; Pavlinsky et al. 1994; Sidoli et al. 1999, 2001; Sakano et al. 2002;

Muno et al. 2003, 2005, 2009; Wijnands et al. 2006; Kuulkers et al. 2007; Ponti et al. 2015; Degenaar et al. 2012, 2015; Mori et al. 2021). Many of those sources are X-ray binaries that spend most of their time in quiescence with X-ray luminosities ( $L_X$ ) of  $\lesssim 10^{33}$  erg s<sup>-1</sup> but occasionally show outbursts with peaks of  $\sim 10^{37} - 10^{39}$  erg s<sup>-1</sup> (Degenaar et al. 2012). A population of hundreds of X-ray binaries is believed to lie in the central parsec

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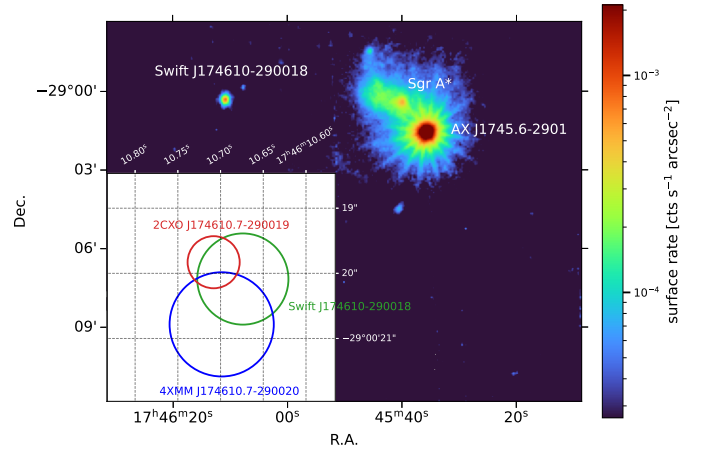
of the Milky Way (Muno et al. 2005; Hailey et al. 2018; Mori et al. 2021). Some of the X-ray transients exhibit peak luminosities considerably lower than those of typical X-ray binaries ( $L_X \lesssim 10^{36}$  erg s $^{-1}$ ). These are usually referred to as very faint X-ray transients (VFXTs; Wijnands et al. 2006, 2015).

A few dozen VFXTs have been detected in the Galaxy, and about a dozen in the GC (Muno et al. 2005; Degenaar et al. 2012; Bahramian & Degenaar 2023). The overabundance of these objects at the GC is probably due to an observation bias. Indeed, the GC is the most frequently observed region of the Milky Way in the X-ray band. Almost every year, observations of the GC are performed with *Chandra* and *XMM-Newton* (from 2000); *NuSTAR* (from 2012); and recently with the *Einstein Probe* (EP). Moreover, since 2006, the Swift X-Ray Telescope (*Swift-XRT*) has performed short ( $\sim 1$  ks) observations of the GC almost daily<sup>1</sup>, which allows the detection of transients down to  $L_X \approx 10^{34}$  erg s $^{-1}$  in the inner 15 arcmin of the Galaxy (Degenaar et al. 2015).

Given their typical low fluxes, the number of VFXTs that have been studied in detail is still modest; therefore, there is no clear, coherent picture yet of the demographics of this population. While the majority of VFXTs present outbursts that last for a few weeks (Degenaar et al. 2015), a few persistent and quasi-persistent VFXTs have been detected (Bahramian & Degenaar 2023). The VFXT class is heterogeneous, comprising sources of different natures. While a small fraction of VFXTs can be intrinsically bright, appearing faint due to inclination effects (King & Wijnands 2006), most VFXTs are thought to be low-mass X-ray binaries (LMXBs) accreting at a low rate, thus explaining their relatively low luminosity (Wijnands et al. 2006; Degenaar et al. 2015). Almost half of the studied VFXTs have been confirmed as LMXBs in which the compact object is a neutron star (NS) via the detection of type I X-ray bursts<sup>2</sup> or coherent pulsations at the NS spin period; in a few cases, the binary system involves a black hole (Bahramian & Degenaar 2023).

Various mechanisms have been introduced to explain the relatively low accretion rates of VFXTs. In the NS-LMXB case, a sufficiently strong magnetic field may quench the accretion flow via the magnetic propeller effect (Degenaar et al. 2014, 2017; Heinke et al. 2015; van den Eijnden et al. 2018). Alternatively, the low luminosity may be the result of a small accretion disk. This scenario would occur if the compact object accretes from a hydrogen-depleted or planetary companion in very compact orbits (King & Wijnands 2006; Hameury & Lasota 2016), such as ultra-compact X-ray binaries. Studying new VFXTs can reveal interesting subtypes of LMXBs, of which only a modest number have been discovered to date – thereby tracing an accretion regime that is still relatively unexplored.

High-mass X-ray binaries (HMXBs) with X-ray luminosities ( $L_X$ ) of  $\lesssim 10^{36}$  erg s $^{-1}$ , can also belong to the VFXT class (Wijnands et al. 2006; Mandel et al. 2025). In this case, the compact object is typically accreting from the wind of the companion and an accretion disk might not be present. Moreover, accreting white dwarf cataclysmic variables (CVs) can contribute to the faint end of the VFXT population (Hofmann et al. 2018). In addition to binary systems, magnetars that have typical quiescent luminosities ( $L_X$ ) of  $\sim 10^{33}$  erg s $^{-1}$  (Mereghetti et al. 2015) can also undergo faint outbursts consistent with VFXTs fluxes



**Fig. 1.** EPIC-pn image in the 2–10 keV band of the GC, obtained from the five *XMM-Newton* observations taken in the spring of 2024. Swift J174610–290018 is located 6.7 arcmin east of Sgr A\*. The eclipsing NS-LMXB AX J1745–2901 (Maeda et al. 1996) was active during the *XMM-Newton* observations and is the brightest source in the field. The inset displays the position uncertainties ( $1\sigma$ ) of the 2024 transient (green circle) and the known X-ray source reported in the 4XMM-DR14 and CSC 2.1 catalogs.

(Coti Zelati et al. 2018); they make up a small fraction of the VFXT population.

In this work we studied the outburst of an X-ray transient that was discovered by the *Swift-XRT* telescope on 22 February 2024 (Reynolds et al. 2024) during the daily monitoring of the GC (Degenaar et al. 2015). The source, named Swift J174610–290018, was proposed as a new VFXT. The transient is located 6.7 arcmin east of Sgr A\* (Fig. 1), corresponding to a projected distance of 16 pc at 8.2 kpc (GRAVITY Collaboration 2019), with an initial reported unabsorbed flux in the 2–10 keV band ( $F_{2-10}$ ) of  $(6.1 \pm 2.4) \times 10^{-12}$  erg cm $^{-2}$  s $^{-1}$ , corresponding to a luminosity ( $L_{2-10}$ ) of  $\approx 5 \times 10^{34}$  erg s $^{-1}$  at the GC distance (Reynolds et al. 2024). The outburst was also observed with *XMM-Newton*, *NuSTAR*, and EP. *Swift-XRT* monitoring has shown that the source returned to quiescence at the beginning of April 2024 (Degenaar et al. 2024).

This transient was also observed on 26 February 2024 by the X-Ray Imaging and Spectroscopy Mission (XRISM) with the XTend instrument (the imaging camera); it showed a peculiar spectrum consistent with a NS-LMXB in addition to ionized iron lines (Fe XXV and Fe XXVI) at  $\sim 7$  keV (Yoshimoto et al. 2025). The authors dubbed the source XRISM J174610.8–290021 and proposed it to be an accretion disk corona source (White & Holt 1982; Dove et al. 1997; Iaria et al. 2013) in which the direct emission from the NS-LMXB is blocked by the thick accretion flow, as the system is oriented edge-on. The observed flux is then the radiation-scattered by the ionized plasma that surrounds the accretion flow (the accretion disk corona).

Grefenstette et al. (2025) report a re-brightening of the same source, serendipitously observed with *NuSTAR* on 4 April 2025, with a spectrum and flux similar to those of the 2024 outburst. The source remained detectable in subsequent *NuSTAR* observations over the following few days, before returning to quiescence (Degenaar et al. 2025).

The article is organized as follows: in Sect. 2 we illustrate the dataset used in this study. In Sect. 3 we characterize the outburst that occurred in 2024. Section 4 describes the outburst observed in 2025, and an archival search revealing previous detections

<sup>1</sup> Due to the Sun position, the GC is not observable between the end of November and the beginning of February.

<sup>2</sup> Type I bursts are thermonuclear flashes on the surface of an accreting NS in a LMXB, caused by unstable burning of accumulated hydrogen and/or helium (Lewin et al. 1993; Strohmayer & Bildsten 2003).

**Table 1.** Log of the observations used for spectral analysis in this article.

Telescope	Instrument (mode)	Obs. ID	Observation start [UTC]	Exposure [s]	Notes
<i>XMM-Newton</i>	EPIC-pn (Full Frame)	0202670701	2004-08-31T03:37:41	135237 (69150)	type I burst?
		0944580601	2024-03-26T03:21:28	29800 (9500)	2024 outburst
		0944580701	2024-03-27T01:59:32	46200 (29300)	2024 outburst
		0944580801	2024-03-28T04:34:56	25800 (7200)	2024 outburst
		0944580501	2024-03-29T06:10:10	26400 (23000)	2024 outburst
		0932392301	2024-04-04T00:39:35	55682 (40300)	2024 outburst
<i>NuSTAR</i>	FPMA - FPMB	30902013002	2024-04-04 05:13:22	20395	2024 outburst
	FPMA - FPMB	31002004002	2025-04-04T10:35:06	17654	2025 outburst
	FPMA - FPMB	31002004004	2025-04-06T04:03:49	18946	2025 outburst
	FPMA - FPMB	31002004006	2025-04-07T03:59:28	24843	2025 outburst
	FPMA - FPMB	31002004008	2025-04-09T03:49:52	18905	2025 outburst
<i>Einstein Probe</i>	FXT-A	11911337728	2024-03-27T23:02:08	31584	2024 outburst
	FXT-B			31589	

**Notes.** For *XMM-Newton*, the exposure reported in parentheses is the one after filtering for flaring particle background.

of the source is addressed in Sect. 5. In Sect. 6 we discuss the observational results.

## 2. X-ray observations

A summary of the *XMM-Newton*, *NuSTAR*, and *Einstein Probe* observations used for X-ray spectral analysis in this work is provided in Table 1. The details for each telescope – in addition to *Swift*-XRT and *Chandra* – are presented below.

### 2.1. *Swift*

We used *Swift*-XRT data of the GC monitoring campaign (Degenaar et al. 2015) to create the light curves of the 2024 and 2025 outbursts. To this end, we used obsIDs 00096991167–00097302020 performed between 9 February and 21 April 2024, and obsIDs 00097302236–00097302245 performed between 2 and 11 April 2025. All observations were taken in photon counting mode and exposure times ranged from 0.70 to 1.21 ks. The raw *Swift*-XRT data were processed with the XRTPIPELINE using standard quality cuts and event grades 0–12. Light curves were created by extracting source events with XSELECT using a 18-arcsecond circular region centered on the source position.

### 2.2. *XMM-Newton*

The outburst of the source is detected in five observations of the GC taken in the Spring of 2024 by *XMM-Newton* (Jansen et al. 2001). We reprocessed the raw data using the standard pipelines in the Scientific Analysis System of *XMM-Newton* (SAS 21.0), using the last release of the current calibration files as of April 2024. Given the higher effective area of EPIC-pn (Strüder et al. 2001) compared to the MOS (Turner et al. 2001), we used only the first camera in our analysis. We filtered the event list for high particle background by creating light curves of the entire CCD, in the 10–12 keV band, with a 100 s time bin. We then defined good time intervals as the periods in which the count rate is below 0.4 cts s<sup>-1</sup>.

The spectra and light curves are extracted on a circular region of radius 12 arcsec. Background, unless otherwise

specified, is accumulated in a nearby (RA, Dec= 17h46m03.43s, –29°00′28.6″) circular region of 50 arcsec radius, where no point sources are evident. Spectra are collected from the filtered events list, with events selected using the SAS `evselect` task with the expression "(FLAG==0) && (PATTERN<=4)". Light curves, instead, are computed from the event list, after the barycentric correction has been applied, not filtered for high particle background, to exploit the largest exposure available, using the SAS tool `evselect`. The expression in this case is "#XMMEA\_EP && (PATTERN<=4)". Light curves are corrected for vignetting, and background subtracted with the task `epiclccorr`.

For the spectral analysis, best-fit parameters and related uncertainties are computed via Bayesian parameter estimation using Bayesian X-ray analysis (BXA; Buchner et al. 2014) for PyXspec (Arnaud 1996, based on Xspec version 12.13.0). Instead of subtracting the background, we modeled it, in the region indicated before, with a phenomenological model in Xspec: `tbabs*(apec+apec+gauss+gauss)+pow`. The two Gaussian lines account for the Fe K $\alpha$  (6.4 keV) line associated with molecular clouds in the region (Stel et al. 2025), and the Cu K $\alpha$  (8.0 keV) line is due to the internal “quiescent” background of the CCD<sup>3</sup>.

#### 2.2.1. Source position

Given the source’s count rate, its relative position on the CCD can be determined with a statistical uncertainty of approximately 0.1–0.2 arcsec. However, the overall positional uncertainty is dominated by the systematic error in *XMM-Newton* absolute astrometry. To account for this, we retrieved the astrometrically corrected source coordinates from the Pipeline Processing System products for each observation, and performed a fit to determine the RA, Dec, and associated positional uncertainty, assuming Gaussian errors. The best position of the source is RA, Dec = (17h46m10.68s, –29°00′20.1″) with a 0.7 arcsec uncertainty (1 $\sigma$ ). The position is fully consistent with the source 4XMM J174610.7–290020, as reported in the *XMM-Newton*

<sup>3</sup> See [https://xmm-tools.cosmos.esa.int/external/xmm\\_user\\_support/documentation/uhb/epicintbkgd.html](https://xmm-tools.cosmos.esa.int/external/xmm_user_support/documentation/uhb/epicintbkgd.html)

**Table 2.** Potential NIR counterparts from the GALACTICNUCLEUS catalog.

Ra [deg]	Dec [deg]	$\delta$ [arcsec]	$K_s$ mag	$H$ mag	$H - K$ mag
266.54445	-29.00553	0.20	16.80	–	–
266.54459	-29.00574	0.67	15.43	17.84	2.41
266.54434	-29.00578	0.86	16.53	–	–
266.54417	-29.00547	1.06	14.44	16.85	2.41

**Notes.**  $\delta$  is the angular separation between the NIR source and Swift J174610–290018. For all the NIR sources the uncertainty on RA and Dec is of the mas order, while the error on the magnitudes is typically 0.01 mag.

Serendipitous Source Catalogue (4XMM-DR14; Webb et al. 2020). In Fig. 1 we show the  $1\sigma$  uncertainty of the source analyzed in this work (green circle) and the *XMM-Newton* source reported in the catalog. 4XMM J174610.7–290020 was previously detected in four *XMM-Newton* observations taken in 2000 and 2004. Given the consistent position, the fact that both sources are heavily absorbed and show similar spectral lines (Pastor-Marazuela et al. 2020), it is likely that they are the same source, observed in two different intensity states. For the remainder of this work, we consider them to be the same source.

### 2.2.2. NIR counterpart

We searched for a near-infrared (NIR) counterpart in the GALACTICNUCLEUS catalog (Nogueras-Lara et al. 2021). Within 1.5 arcsec of the best source position reported before, there are 4 NIR sources (we excluded one foreground) from the GALACTICNUCLEUS catalog. Table 2 reports the separation of the sources, their  $K_s$  band magnitude, and, when available, the  $H$  band magnitude.

Given the limitations of current NIR surveys, which are largely incomplete at  $K_s \sim 16$ th mag due to crowding in the dense GC region, detecting an unevolved low-mass donor star is highly improbable. We therefore consider it likely that none of the four NIR sources listed above is the true NIR counterpart to Swift J174610–290018.

### 2.3. Chandra

There are no *Chandra* (Weisskopf et al. 2000) observations that cover the outburst in 2024. However, the same source is also reported in the *Chandra* Source Catalog (CSC 2.1, Evans et al. 2024) with identifier 2CXO J174610.7–290019; as CXOU J174610.8–290019 in the *Chandra* catalog of the GC (Muno et al. 2009) and in the Ultradeep *Chandra* Catalog (Zhu et al. 2018, source n. 3596). According to the CSC 2.1, there are 11 observations between 1999 and 2024 in which the source has been detected with a significance  $>3^4$  in the ACIS-I 2.0–7.0 keV band.

### 2.4. NuSTAR

*NuSTAR* (Harrison et al. 2013) detected the source during the late stages of the 2024 outburst. However, given the relatively low flux, the *NuSTAR* analysis does not add a significant contribution to the *XMM-Newton* observations of the outburst. On

<sup>4</sup> The significance is the ratio of the photon flux measurement to its average error; see [cxc.cfa.harvard.edu/csc/columns/significance.html](https://cxc.cfa.harvard.edu/csc/columns/significance.html) for details.

the other hand, the 2025 outburst was detected in four *NuSTAR* observations. We collected the spectra of the source in a circular region of radius 20 arcsec, centered on the source. The background is accumulated in a 70 arcsec circular region at the coordinates: RA, Dec: (17h46m07.8s,  $-29^\circ 01' 53.3''$ ). When analyzing the *NuSTAR* spectra, we fit the two modules FPMA and FPMB simultaneously, including a global multiplicative constant to account for cross-calibration uncertainties between the two instruments. We verified that the two spectra are overall consistent within a factor of 10% in all observations.

### 2.5. Einstein Probe (EP)

The *Einstein Probe* detected the outburst of this source in late March 2024 during a performance verification observation of the GC, using the Follow-up X-ray Telescope (FXT) with an exposure time of  $\sim 31.6$  ks. EP-FXT comprises two co-aligned modules (FXT-A and FXT-B) in the 0.3–10 keV band, and the observation data of these two modules are processed using the FXT data analysis software (fxtsoftware v1.10).

## 3. 2024 outburst

### 3.1. Light curves

The left panel of Fig. 2 displays the light curve obtained during the outburst of the source in 2024. The count rate of the various instruments is converted to a 2–10 keV flux using *webpimms*<sup>5</sup>, assuming a spectral model of an absorbed, power law with a photon index  $\Gamma = 2$ , and  $N_H = 2 \times 10^{23} \text{ cm}^{-2}$  (see Sect. 3.2). The duration of the outburst is  $\sim 50$  days. A gap in the *Swift*-XRT light curve is due to the fact that the satellite was in safe-mode from 15-03-2024 to 03-04-2024, for an issue related to the gyroscopes.

The 2–10 keV light curves of the five *XMM-Newton* observations performed in spring 2024 are shown in Fig. 3 (blue), binned to 800 s. The last light curve, taken roughly six days after the others, exhibits a count rate reduced by a factor of about 4 compared to the previous four observations. All five light curves show some variability. To test whether the variability is statistically significant, we calculated the  $\chi^2$  with respect to the weighted mean of each observation. The results are shown in Table 3. In the same table, we report the ratio of the standard deviation and the weighted mean. Overall, the flux is fluctuating within 25–50% of its mean value. The hardness ratio<sup>6</sup> between the 5–10 and 2–5 keV light curves shown in Fig. 3 does not provide significant evidence of spectral variations.

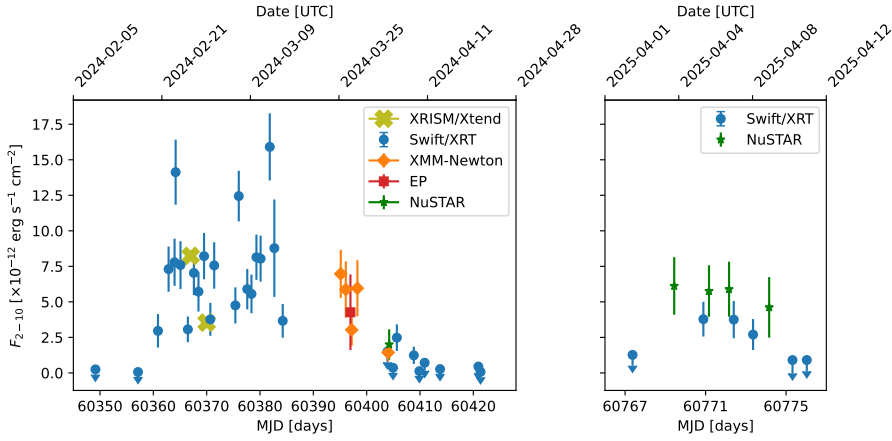
We looked for periodicity of the emission in the 2–10 keV band by computing the Lomb-Scargle periodogram (Lomb 1976; Scargle 1982) in the frequency range  $4 \times 10^{-5}$ – $10^{-1}$  Hz. The periodogram of the longest *XMM-Newton* observation (ID. 0944580701, 2024-03-27) is shown as an example in Fig. 4; the other periodograms have similar shapes. Yoshimoto et al. (2025) found a potential hint of periodicity of  $\approx 1537$  s, which we do not observe in the *XMM-Newton* data.

### 3.2. Spectral analysis

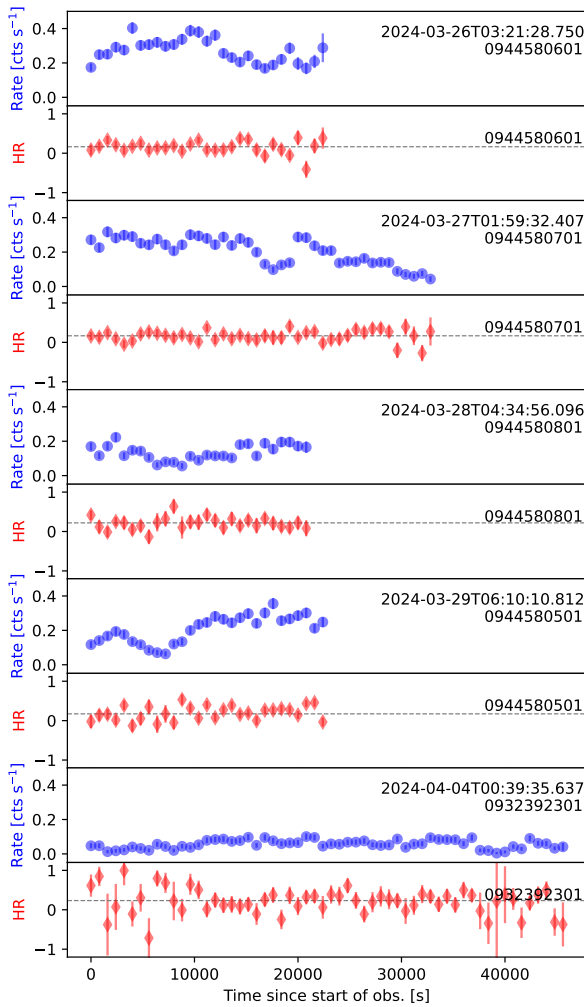
Figure 5 displays the EPIC-pn spectrum of the longest *XMM-Newton* observation (27 March 2024). The spectra of the

<sup>5</sup> <https://heasarc.gsfc.nasa.gov/cgi-bin/Tools/w3pimms/w3pimms.pl>

<sup>6</sup> The hardness ratio (HR) is defined by  $(H - S)/(H + S)$ , where  $H$  and  $S$  are the count rates in the hard (5–10 keV) and soft (2–5 keV) bands, respectively.



**Fig. 2.** Light curve of the outburst in 2024 (left) and 2025 (right).  $F_{2-10}$  is the 2–10 keV flux corrected for absorption, and it is computed assuming an absorbed power law spectrum, with  $N_{\text{H}} = 2 \times 10^{23} \text{ cm}^{-2}$  and  $\Gamma = 2$ . The two XRISM data points were computed from the count rates reported in Yoshimoto et al. (2025), assuming the same spectral model.



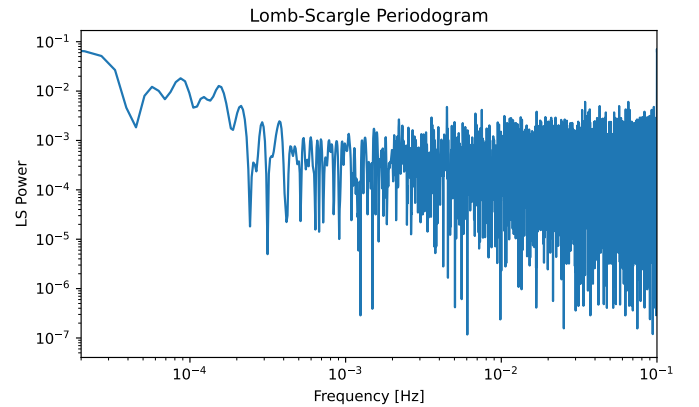
**Fig. 3.** *XMM-Newton* EPIC-pn light curves of the 2024 outburst (blue data) in the 2–10 keV band. Below each light curve, red data points are the hardness ratio computed from the light curves in the 2–5 and 5–10 keV energy bands. The dashed gray line is the median hardness ratio for each observation.

other four *XMM-Newton* observations, and the EP observations, present a similar shape. The spectrum is characterized by an excess at  $\sim 7$  keV. The most prominent emission lines in this region are the highly ionized iron lines Fe XXV ( $\approx 6.7$  keV) and Fe XXVI ( $\approx 6.97$  keV).

**Table 3.** Timing analysis of the five *XMM-Newton* observations.

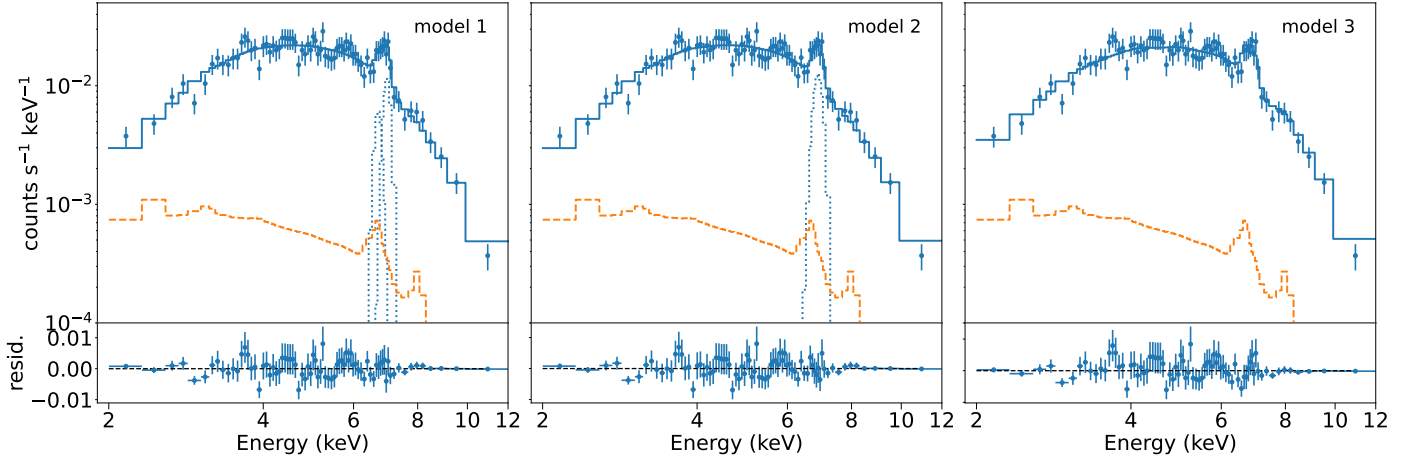
Date	$\chi^2$ (n. data)	$\sigma/\text{mean}$
2024-03-26	138 (29)	0.26
2024-03-27	548 (42)	0.46
2024-03-28	114 (27)	0.37
2024-03-29	354 (29)	0.45
2024-04-04	238 (58)	0.55

**Notes.** The second column lists the  $\chi^2$  relative to a fit using the weighted mean as a constant; in parenthesis is the number of data points.



**Fig. 4.** Lomb-Scargle periodogram of *XMM-Newton* obs. 0944580701 (27 March 2024). The other observations show a similar behavior.

Since the five *XMM-Newton* light curves exhibit different fluxes, and to maintain full generality, we fit each observation independently. As a first model (“model 1”), we implemented an X-ray-halo-scattered, absorbed power law with two Gaussian lines corresponding to the Fe XXV and Fe XXVI lines (`fgcdust*tbabs*(powerlaw+gaussian+gaussian)` in Xspec). The X-ray halo scattered model (`fgcdust`) is described in Jin et al. (2017, 2018). This model is adopted since the source, as we will show, is heavily absorbed and in the projected direction of the GC; it is therefore likely a few kiloparsecs from the observer. This particular dust scattering model accounts for the dust material in the spiral arms of the Milky Way. We assumed abundances from Wilms et al. (2000), and cross section from Verner et al. (1996). The best parameters, along with their uncertainties, are reported in Table 4, while the spectrum is displayed



**Fig. 5.** *XMM-Newton* EPIC-pn spectrum of the source (blue) accumulated in Obs. 0944580701, with the three models discussed in Sect. 3.2. The spectra accumulated in the other four *XMM-Newton* observations present similar shapes. Model 1 is an absorbed power law with the Fe XXV (6.7 keV) and Fe XXVI (6.97 keV) lines (dotted lines), while model 2 includes a single reflection line. Model 3 is ionized thermal plasma component (apec). The dashed orange line is the modeled background contribution.

**Table 4.** Best-fit parameters and associated uncertainties ( $1\sigma$ ) for the five *XMM-Newton* spectra extracted during the 2024 outburst.

	Parameter	2024-03-26	2024-03-27	2024-03-28	2024-03-29	2024-04-04
	$N_{\text{H}}$ [ $\times 10^{22}$ cm $^{-2}$ ]	$19 \pm 2$	$18 \pm 2$	$17 \pm 4$	$19 \pm 1$	$14 \pm 2$
	$\Gamma$	$2.1 \pm 0.2$	$2.2 \pm 0.2$	$2.2 \pm 0.2$	$1.9^{+0.2}_{-0.1}$	$1.7 \pm 0.2$
	log norm. [ph/keV/cm $^2$ /s]	$-2.4 \pm 0.2$	$-2.6 \pm 0.1$	$-2.7 \pm 0.3$	$-2.7 \pm 0.1$	$-3.5 \pm 0.2$
model 1	log $F_{6.7}$ [ph/cm $^2$ /s]	$-5.1^{+0.2}_{-0.4}$	$-5.3^{+0.2}_{-0.3}$	$<-4.9^*$	$<-5.3^*$	$-5.4 \pm 0.1$
	log $F_{6.97}$ flux [ph/cm $^2$ /s]	$-4.9 \pm 0.2$	$-4.9 \pm 0.2$	$-5.0^{+0.2}_{-0.3}$	$-5.0 \pm 0.1$	$-5.5 \pm 0.2$
model 2	E [keV]	$6.84 \pm 0.09$	$6.89 \pm 0.03$	$6.82^{+0.06}_{-0.08}$	$6.95 \pm 0.06$	$6.82^{+0.06}_{-0.05}$
	$\sigma$ [eV]	$<300^*$	$<130^*$	$<200^*$	$<220^*$	$<250^*$
	log $F_{\text{line}}$ [ph/cm $^2$ /s]	$-4.7 \pm 0.2$	$-4.79^{+0.08}_{-0.09}$	$-4.7 \pm 0.2$	$-4.9^{+0.1}_{-0.2}$	$-5.1 \pm 0.1$
	$\Delta \text{AIC}_{2-1}$	4.1	1.7	1.3	4.4	3.8
	$F_{2-10}$ [ $\times 10^{-12}$ erg s $^{-1}$ cm $^{-2}$ ]	$8.8^{+1.1}_{-0.9}$	$5.6^{+0.5}_{-0.4}$	$4.6^{+0.9}_{-0.7}$	$6.4^{+0.5}_{-0.4}$	$1.6^{+0.2}_{-0.1}$

**Notes.** Model 1 includes the Fe XXV and Fe XXVI lines, while model 2 a single reflection line.  $F_{2-10}$  is the de-absorbed flux in the 2–10 keV band, assuming model 1. \*: upper limit. We report the 84<sup>th</sup> percentile of the posterior.

in the left panel of Fig. 5. The source appears heavily absorbed with a column density typical of the sources located at the GC ( $N_{\text{H}} \sim 10^{23}$  cm $^{-2}$ , Baganoff et al. 2003). The photon index is consistent with  $\Gamma \simeq 2$ . The Fe XXVI line is the most prominent of the two iron lines and is consistently detected; while on two occasions we were able to only measure an upper limit for the flux of the Fe XXV line (see Table 4).

As an alternative model, since the Fe XXV and XXVI lines are not resolved (see Fig. 5), we substituted the two ionized lines with a single line, allowing a non-null width (“model 2”; second panel in Fig. 5). This is the case of a single reflection line from the accretion disk (Fabian et al. 1989). Table 4 reports the fit result. Neither the  $N_{\text{H}}$  nor  $\Gamma$  parameters were affected when switching from a model with two lines to that with a single one. The energy of the line is found to be 6.8–6.9 keV, whereas the fit returns an upper limit on the width of  $\simeq 200$ –300 eV. The flux of the line is overall consistent among the first four observations, with a slight decrease in the last one. In the same table, we report the difference of the Akaike information criterion (AIC) between model 2 and model 1. The model with the two ionized

lines is slightly preferred, but the single reflection line cannot be ruled out.

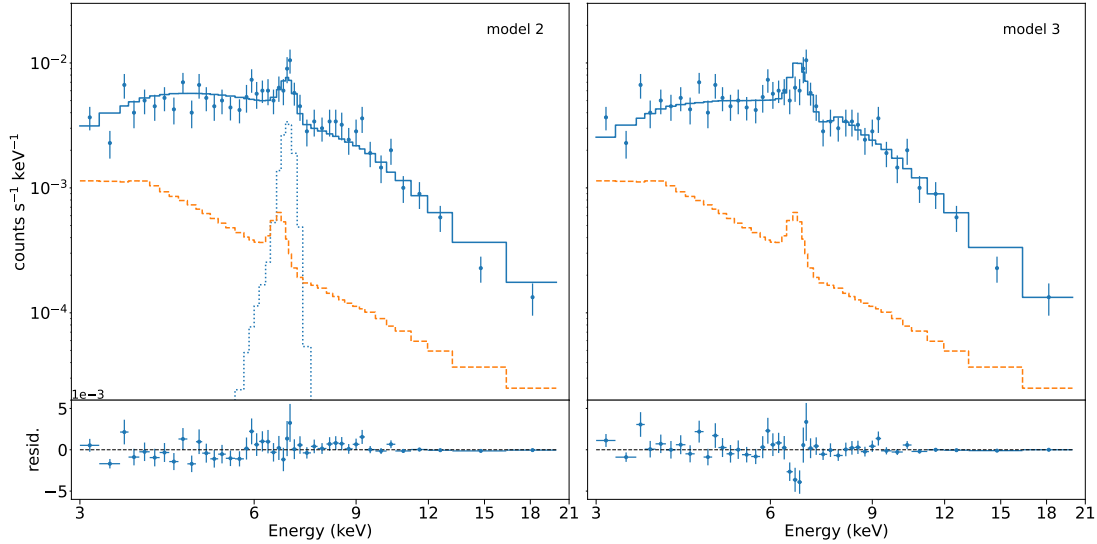
Given the previous results, we attempted a fit of the spectrum with a collisionally ionized diffuse gas<sup>7</sup> (fgcdust\*tbabs\*apec in Xspec; “model 3”). Details of this fit are displayed in Table 5, and the spectrum is shown in the right panel of Fig. 5. The measured absorption column density is lower than the one inferred in the previous fits. The estimated temperature, which is set by the energy of the ionized iron lines and the continuum shape, is  $kT \sim 12$  keV. In the table, we report the difference between the AIC of model 3 and model 1. Apart from the observation taken on 4 April 2024, there is no clear preference between the two models.

Overall, during the five *XMM-Newton* observations, the source flux in the 2–10 keV band, corrected for absorption, is  $F_{2-10} = (2-9) \times 10^{-12}$  erg s $^{-1}$  cm $^{-2}$ , depending on the spectral

<sup>7</sup> A description of the apec model is available at <http://atomdb.org/>

**Table 5.** Same as Table 4 but with an apec model instead of a power law model.

	Parameter	2024-03-26	2024-03-27	2024-03-28	2024-03-29	2024-04-04
model 3	$N_{\text{H}}$ [ $\times 10^{22}$ cm $^{-2}$ ]	$14.7 \pm 1.0$	$14.1^{+0.7}_{-0.6}$	$14 \pm 2$	$16.6 \pm 0.8$	$14.5 \pm 1.4$
	$kT$ apec [keV]	$12^{+3}_{-2}$	$12^{+2}_{-1}$	$10^{+4}_{-2}$	$16 \pm 3$	$10^{+2}_{-1}$
	norm. [ $\times 10^{-3}$ cm $^{-5}$ ]	$5.3 \pm 0.3$	$3.5 \pm 0.2$	$3.0 \pm 0.3$	$4.1 \pm 0.2$	$1.20^{+0.09}_{-0.08}$
	$F_{2-10}$ [ $\times 10^{-12}$ erg s $^{-1}$ cm $^{-2}$ ]	$7.2^{+0.3}_{-0.4}$	$4.7^{+0.1}_{-0.2}$	$3.9 \pm 0.3$	$5.6 \pm 0.2$	$1.59 \pm 0.08$
	$\Delta \text{AIC}_{3-1}$	-2.5	2.1	-2.7	-1.6	-5.2


**Fig. 6.** *NuSTAR* FPMB spectrum of the source (blue) accumulated in Obs. 31002004006, with the two models discussed in Sect. 4. Model 2 includes a single reflection line (dotted line) with a power law continuum. Model 3 is an ionized thermal plasma component (apec). The dashed orange line is the background contribution.

model and of the observation date. *Swift*/XRT monitoring suggests that the source faded into the background level around the beginning of April 2024 (see Fig. 2).

#### 4. Re-brightening of 2025

On 4 April 2025, *NuSTAR* serendipitously detected a re-brightening of the source (Grefenstette et al. 2025). The new outburst was confirmed the following day by *Swift*-XRT. The light curve of this second outburst is displayed in the right panel of Fig. 2. The source is clearly detected between 4 and 9 April 2025 in four *NuSTAR* and three *Swift*-XRT observations. The source was not detected by *Swift*-XRT on 2 April 2025, and in the days after 10 April 2025. Therefore, the duration of this second outburst is significantly shorter than the 2024 event, elapsing only  $\approx 5$  days.

We collected the spectrum during the four *NuSTAR* observations in which the transient was detected, and performed the fit in the 3–20 keV band. Given that the *NuSTAR* spectral resolution is lower than *XMM-Newton*, we fit only the model 2 and model 3, without attempting to distinguish between a single or a combination of two iron lines. Figure 6 shows the *NuSTAR* FPMB spectrum taken on 7 April 2025 (ID. 31002004006), along with the two models. The best-fit parameters are reported in Table 6. To allow a direct comparison between the parameters of the 2024 outburst, and since *NuSTAR* is not sensitive below 3 keV, we fixed the column density to the best values found in the previous outburst. Overall, the spectrum appears softer when compared

with the 2024 outburst (Tables 4 and 5). If fitted with a power law, the photon index is close to  $\Gamma \approx 3$ , while fitted with an apec component, the temperature is  $kT \approx 5$ –6 keV. The normalization of the Fe line is consistent between the two outbursts. The AIC difference clearly shows a preference for model 2 (power law + line). The apec model, on the other hand, struggles to reproduce simultaneously the iron lines and the continuum.

#### 5. Past outbursts and detections

In Fig. 7 we present the light curve of the source from 2000 onward, compiled using archived observations from *Chandra*. Upper limits (blue data points) and detections (orange) are retrieved from the CSC 2.1. The conversion from count rate to a flux is performed with the same model used in Fig. 2 ( $N_{\text{H}} = 2 \times 10^{23}$  cm $^{-2}$  and  $\Gamma = 2$ ). For graphical purposes, consecutive observations that are within 120 days are merged. The mean flux is shown in cases of detection, while only the more stringent upper limit is shown in cases of non-detection. The source has been detected by *Chandra* a few times, with a 2–10 keV flux within  $2 \times 10^{-14}$  erg s $^{-1}$  cm $^{-2}$  and  $4 \times 10^{-13}$  erg s $^{-1}$  cm $^{-2}$ . The reported upper limits indicate a quiescence flux  $F_{2-10} \leq 3 \times 10^{-15}$  erg s $^{-1}$  cm $^{-2}$ .

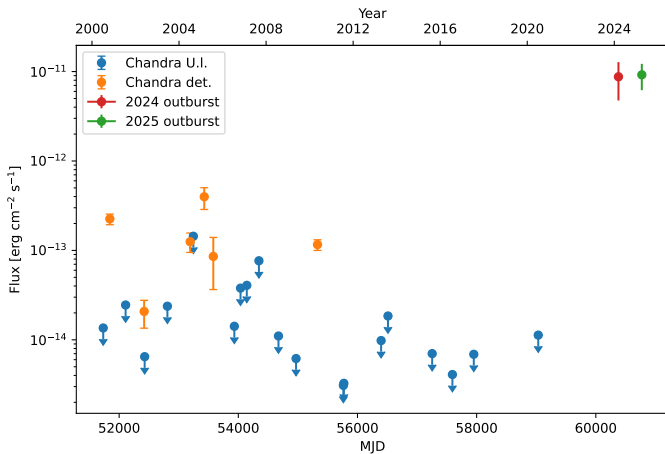
##### 5.1. Potential type I burst

During an *XMM-Newton* observation performed on 31 August 2004 (ID n. 0202670701), in which the source was detected

**Table 6.** Best spectral fit parameters of the 2025 outburst, observed with *NuSTAR*.

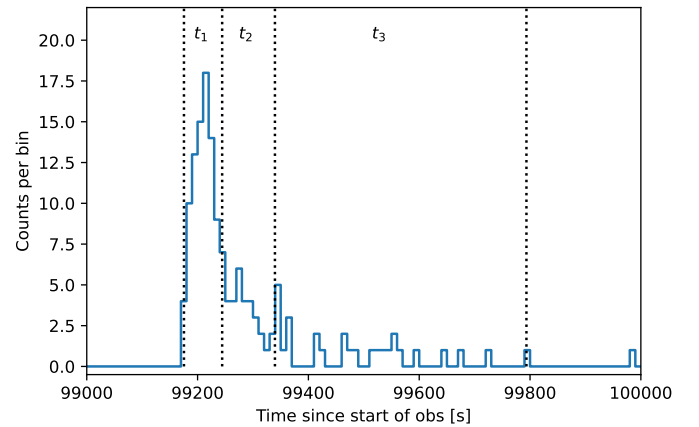
	Parameter	2025-04-04	2025-04-06	2025-04-07	2025-04-09
model 2	$N_{\text{H}}$ [ $\times 10^{22}$ cm $^{-2}$ ]	18 $^{\dagger}$	18 $^{\dagger}$	18 $^{\dagger}$	18 $^{\dagger}$
	$\Gamma$	3.14 $\pm$ 0.09	3.05 $\pm$ 0.08	2.89 $^{+0.07}_{-0.08}$	2.89 $^{+0.10}_{-0.09}$
	log norm. [ph/keV/cm $^2$ /s]	-1.48 $^{+0.08}_{-0.07}$	-1.55 $\pm$ 0.07	-1.72 $^{+0.06}_{-0.07}$	-1.79 $^{+0.09}_{-0.08}$
	E [keV]	6.84 $\pm$ 0.09	6.67 $^{+0.13}_{-0.11}$	6.87 $\pm$ 0.05	6.74 $\pm$ 0.12
	$\sigma$ [eV]	50 $^{\dagger}$	50 $^{\dagger}$	50 $^{\dagger}$	50 $^{\dagger}$
	log $F_{\text{line}}$ [ph/cm $^2$ /s]	-4.8 $^{+0.2}_{-0.4}$	-4.8 $^{+0.2}_{-0.6}$	-4.54 $^{+0.09}_{-0.10}$	-4.9 $^{+0.2}_{-0.6}$
	const	1.08 $\pm$ 0.07	1.14 $\pm$ 0.07	1.08 $\pm$ 0.06	1.08 $\pm$ 0.08
	$F_{2-10}$ [ $\times 10^{-11}$ erg s $^{-1}$ cm $^{-2}$ ]	1.8 $\pm$ 0.1	1.7 $\pm$ 0.1	1.5 $\pm$ 0.1	1.2 $\pm$ 0.1
model 3	$N_{\text{H}}$ [ $\times 10^{22}$ cm $^{-2}$ ]	15 $^{\dagger}$	15 $^{\dagger}$	15 $^{\dagger}$	15 $^{\dagger}$
	$kT$ apec [keV]	5.1 $^{+0.4}_{-0.3}$	5.3 $^{+0.4}_{-0.3}$	6.1 $\pm$ 0.4	6.3 $^{+0.6}_{-0.5}$
	norm. [ $\times 10^{-3}$ cm $^{-5}$ ]	10.7 $^{+1}_{-0.9}$	10.0 $^{+0.9}_{-0.7}$	8.5 $\pm$ 0.6	6.8 $\pm$ 0.6
	const	1.08 $^{+0.07}_{-0.06}$	1.14 $^{+0.08}_{-0.07}$	1.08 $\pm$ 0.06	1.09 $\pm$ 0.08
	$F_{2-10}$ [ $\times 10^{-11}$ erg s $^{-1}$ cm $^{-2}$ ]	1.08 $\pm$ 0.06	1.08 $\pm$ 0.06	0.95 $\pm$ 0.05	0.76 $\pm$ 0.05
	$\Delta$ AIC $_{3-2}$	-33	-32	-11	-18

Notes.  $^{\dagger}$  Fixed.


**Fig. 7.** Long-term light curve of the source studied in this work.

along the whole observations, the light curve of the source displayed a potential type I burst (Pastor-Marazuela et al. 2020). Figure 8 displays the histogram of the events (bin-size of 10 s) during the burst. To determine the duration of the burst, we performed a Bayesian-block decomposition (Scargle et al. 2013) on the EPIC pn unfiltered event list associated with the source. We used the `bayesian_blocks` function from the Python package `Astropy`, assuming  $p0 = 0.01$ , where  $p0$  gives the false alarm probability, which is used to compute the prior. The burst is clearly identified for a total duration of 523 s. The duration is longer than typical X-ray type I bursts (from a few seconds to about a minute, Galloway et al. 2008), but consistent with “intermediate-duration bursts” that last a few to tens of minutes (Alizai et al. 2023). The peak of the burst is reached after  $\approx 40$  s.

We integrated the spectrum during the flare interval in the same region as before. We estimated the background by accumulating a spectrum in the same position, before the start of the burst feature. We chose a phenomenological model for


**Fig. 8.** *XMM-Newton* EPIC-pn (full frame mode) light curve of the 2004 flare in the 2–10 keV band. The temporal bin-size is 10 s. The dotted vertical lines separate the three intervals used for the time-resolved spectral analysis.

the background (instrumental and pre-burst emission) consisting of an absorbed thermal plasma component, with a power law and a 6.4 keV line (`tbabs*(apec+pow+gauss)` in Xspec). The model for the burst is an absorbed black body emission (`fgcdust*tbabs*bbbodyrad` in Xspec). The spectrum, with the associated fit, is shown in Fig. 9. The derived temperature is  $kT = 2.8^{+1.4}_{-0.7}$  keV, for an absorption column density of  $N_{\text{H}} = (7 \pm 5) \times 10^{22}$  cm $^{-2}$ . The mean de-absorbed flux in the 2–10 keV band is  $F_{2-10} = 1.9^{+0.3}_{-0.2} \times 10^{-11}$  erg s $^{-1}$  cm $^{-2}$ . For a given distance ( $d$ ), the normalization of the black body spectrum can be converted to the source radius ( $R$ ) as

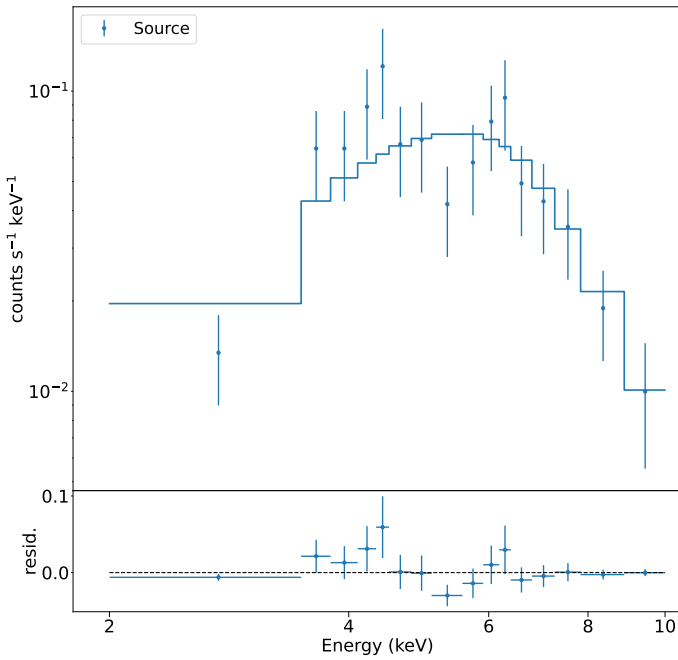
$$R = 0.2^{+0.1}_{-0.07} \times \frac{d}{8.2 \text{ kpc}} \quad [\text{km}]. \quad (1)$$

To search for any spectral softening during the burst, we divided it into three intervals highlighted in Fig. 8. We then fit

**Table 7.** Best-fit parameters for the potential type I burst.

Parameter	Total	$t_1$	$t_2$	$t_3$
Duration [s]	523	69	95	359
$N_H$ [ $\times 10^{22}$ cm $^{-2}$ ]	$7 \pm 5$	$7^\dagger$	$7^\dagger$	$7^\dagger$
$kT$ [keV]	$2.8^{+1.4}_{-0.7}$	$4.0^b$	$2.6^{+1.5}_{-0.7}$	$1.2^{+0.3}_{-0.2}$
log norm [keV]	$-1.2 \pm 0.4$	$-1.2^{+0.3}_{-0.2}$	$-1.0^{+0.4}_{-0.5}$	$-0.7 \pm 0.4$
$F_{2-10}$ [ $\times 10^{-11}$ erg s $^{-1}$ cm $^{-2}$ ]	$1.9^{+0.3}_{-0.2}$	$9 \pm 1$	$2.4^{+0.6}_{-0.4}$	$0.40 \pm 0.08$

**Notes.**  $^\dagger$ : fixed.  $^b$ : lower limit. We report the 16th percentile of the posterior.



**Fig. 9.** *XMM-Newton* EPIC-pn spectrum of the potential type I burst that occurred in 2004. The model is an absorbed black body (see Table 7).

the spectrum in each interval; the best parameters are reported in Table 7. A softening of the spectrum is identified, consistent with the typical behavior of type I X-ray bursts. To verify that the spectrum is not excessively affected by the pile-up effect during the  $t_1$  interval, we performed the analysis again, selecting only single-pattern events (“PATTERN==0” in the SAS `evselect` function). The results are consistent within the statistical uncertainties.

Type I bursts that reach Eddington luminosity can be exploited as standard candles to determine the distance to the NS-LMXB. This kind of type I burst presents photospheric radius expansion and has a bolometric peak luminosity ( $L_{\text{bol}}$ ) of  $\approx 3.8 \times 10^{38}$  erg s $^{-1}$  (Kuulkers et al. 2003). The burst of 2004, for which there is no evidence of photospheric radius expansion, is much fainter. The peak lies within the  $t_1$  interval, as shown in Fig. 8, and the count rate of the peak is about twice the mean count rate measured during  $t_1$ . Assuming that the source is located at the GC (distance of 8.2 kpc), the luminosity in the 2–10 keV band during  $t_1$  is  $L_{2-10} = (7 \pm 1) \times 10^{35}$  erg s $^{-1}$ , which translates into a bolometric peak luminosity of  $L_{\text{bol}} \sim 10^{37}$  erg s $^{-1}$ , computed in the energy range 0.1–100 keV.

## 6. Discussion

Swift J174610–290018 underwent two distinct outbursts in the last two years. Assuming that the source is located at the GC, the fluxes reported in Sects. 3 and 4 translates into a luminosity of  $L_{2-10} \simeq (1-12) \times 10^{34}$  erg s $^{-1}$  and  $L_{2-10} \simeq (6-9) \times 10^{34}$  erg s $^{-1}$  for the 2024 and 2025 outburst, respectively. These two outbursts are the brightest ever recorded for this source; therefore, the transient belongs to the VFXT class. The same source was detected in the past at lower fluxes by *Chandra* and *XMM-Newton*. The flux in the previous detections is in the range  $F_{2-10} \simeq (0.2-4) \times 10^{-13}$  erg cm $^{-2}$  s $^{-1}$  (see Fig. 7), corresponding to a luminosity  $L_{2-10} \simeq (0.2-3) \times 10^{33}$  erg s $^{-1}$ , assuming the source is located at the GC. Upper limits instead indicates a quiescence luminosity of  $L_{2-10} \leq 2 \times 10^{31}$  erg s $^{-1}$ . Our spectral analysis of the 2024 outburst is in agreement with the results of Yoshimoto et al. (2025). When fitted with the same model (apex or power law continuum), the parameters are consistent (i.e.,  $kT \sim 12$  keV and  $\Gamma \sim 2$ ), showing that there is no sign of spectral evolution during the outburst.

Establishing the nature of this source is not straightforward. The spectrum is characterized by a spectral slope of  $\Gamma \sim 2-3$ , which is common for VFXT that are NS-LMXBs (Degenaar & Wijnands 2009; Wijnands et al. 2015). Our analysis does not answer whether the iron complex emission is due to a single reflection line or the sum of ionized Fe XXV and Fe XXVI lines. In any case, iron lines are unusual for VFXTs, which are NS-LMXBs, with only a few cases being observed (van den Eijnden et al. 2018; Del Santo et al. 2007). For example, van den Eijnden et al. (2018) reported for the VFXT IGR J17062–6143 the presence of a reflection iron line in the spectrum, which could arise in the case of an ultra-compact X-ray binary or a magnetically truncated disk.

The study of the potential type I burst, is a strong indication of the NS-LMXB nature of the source. Indeed, the flare observed in 2004 shows several key features typical of type I bursts: the light curve (a fast rise followed by an exponential decay), the spectral shape (a blackbody with a temperature of a few keV), and the spectral softening during the burst (Galloway et al. 2008; Degenaar et al. 2018). Nevertheless, the duration of a few hundred seconds is longer than typical type I bursts, and falls in the intermediate-duration bursts class. Those bursts are related to NS-LMXB accreting below the Eddington limit (i.e.,  $< 0.03 \dot{M}_{\text{Edd}}$ ), and present a recurrence time of months to years rather than the hours to days of regular bursts (Alizai et al. 2023).

A coherent explanation of these features can be achieved assuming that this particular VFXT is an accretion disk corona source, as proposed by Yoshimoto et al. (2025). In this scenario the NS-LMXB is seen almost edge on, and the radiation from the

source is blocked by the thick accretion disk. The only observed flux is the emission scattered by the accretion disk corona, while the iron lines are due to the ionized plasma. In this case, both the outburst and the type I burst are intrinsically brighter, but only the fainter, scattered emission is observed. In principle, if the NS-LMXB system is viewed almost edge-on, as proposed in this scenario, eclipses should be periodically visible in the light curve. The lack of detected eclipses may be due to the limited exposure time of the observations. In addition, the accretion disk corona can be larger than the line of sight obscured by the donor passage. For instance, for a NS-LMXB, with NS of  $1.4 M_{\odot}$ , and donor star of mass  $0.5 M_{\odot}$ , the Roche lobes are respectively  $R_{L1} \approx 0.8 R_{\odot}$  and  $R_{L2} \approx 0.5 R_{\odot}$  (Eggleton 1983). Assuming that the extension of the accretion disk corona is roughly the circularization radius ( $\approx 0.8 R_{L1}$ ), the donor star radius is less than it. Therefore, the passage of the donor star never entirely obscures the extended source. Alternatively, since the type I burst implies that the source is a NS-LMXB, the lack of eclipses or dips would imply that the system is not observed edge-on and, therefore, that the source and the type I burst are intrinsically faint. The iron complex excess can then be a reflection disk line.

Other physical scenarios can explain part of the characteristics of this source, but struggle to reproduce all of them coherently. For example, HMXBs are another class of sources that exhibit ionized iron lines due to wind-fed accretion. HMXBs with X-ray luminosities comparable to those observed during the outburst of the last two years are known (Lutovinov et al. 2013; Mandel et al. 2025). However, it remains challenging to explain the burst feature with a softening tail that occurred during the *XMM-Newton* observations of 2004.

CVs also present a thermal spectrum with strong ionized iron lines. In particular, the observed X-ray luminosity can be reached by an intermediate polar (IP). IPs are magnetic CVs that have unsynchronized orbits. The white dwarf's magnetic field strength is  $B \sim (0.1-10) \times 10^6$  G; between polars ( $B \sim (10-300) \times 10^6$  G), and nonmagnetic CVs ( $B \lesssim 10^5$  G). However, IPs are usually persistent and more luminous ( $L_{2-10} \sim \times 10^{33}$  erg s $^{-1}$ ; Mukai 2017; Xu et al. 2019); therefore, they cannot explain the observed broad variability of about 3 orders of magnitude and a quiescent luminosity of  $< 2 \times 10^{31}$  erg s $^{-1}$ . In principle, a white dwarf can experience such luminosity variations in the case of a nova<sup>8</sup> (Mukai 2017). This scenario has been recently proposed by Hua & Li (2025). However, even if the two events observed in 2024 and 2025 were indeed novae, the rapid flare (type I burst like) observed in 2004 remains difficult to explain, strongly suggesting that the source is a NS-LMXB.

Regarding the search for a NIR counterpart, it is inconclusive, as low mass main-sequence stars are practically non detectable because of source confusion at faint magnitudes. Regarding the four NIR sources that lie within the positional uncertainty of Swift J174610–290018, using the extinction value of each source reported in Noguerras-Lara et al. (2021) and assuming a distance of 8.2 kpc, the absolute  $K$ -magnitude of the four sources is in the range between  $M_K \approx -2.7$  and  $M_K \approx -0.5$ . These magnitudes are typical of giants (see Noguerras-Lara et al. 2021 for details), or type-B stars (Mandel et al. 2025). The X-ray analysis suggests that the source is a NS-LMXB; therefore, the NIR counterpart is likely undetected.

If the low luminosity observed during the 2024 and 2025 events results from the accretion disk corona scenario, then Swift J174610–290018 would be classified as a VFXT due to its

inclination rather than to a low accretion rate. However, as Fig. 7 shows, previous detections at fluxes 1–3 orders of magnitude lower suggest that the source also experienced phases of reduced accretion. For example, during the 2004 type I burst, immediately preceding the flare, the source was nearly two orders of magnitude fainter than during the 2024 and 2025 outbursts. The low accretion state in that period may therefore explain the unusually long duration of that type I burst (Alizai et al. 2023).

## 7. Conclusions

We analyzed the two distinct outbursts of the GC VFXT Swift J174610–290018 (also known as XRISM J174610.8–290021) that occurred in 2024 and 2025. These represent the brightest outbursts ever observed from this source; they lasted approximately 50 and 5 days, respectively, with a typical X-ray luminosity in the 2–10 keV band ( $L_{2-10}$ ) of  $\approx (1-12) \times 10^{34}$  erg s $^{-1}$ . In both events, the source exhibited spectra characterized by a strong iron complex. An accretion disk corona, as proposed by Yoshimoto et al. (2025), can account for the transient's low luminosity and its spectral shape. We studied a short flare from the same source that occurred in 2004, which shows the characteristics of type I X-ray bursts, thereby confirming its NS-LMXB nature. Although the accretion disk corona scenario can account for the relatively low luminosity of the recent outbursts, the source has previously been observed at luminosities up to three orders of magnitude lower, indicating intrinsically fainter outbursts and a broad variability in its accretion behavior.

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<sup>8</sup> A nova is a thermonuclear runaway of H-rich material on the surface of a white dwarf.

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