A DIFFERENT KIND OF BURST FROM INFRARED/X-RAY BURSTER LILLER I/MXB 1730-333

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Abstract

Double enhancement or brust of entirely different kind observed in K band from the source Liller I/MXB 1730 - 333 is reported.

The infrared bursts in H band (1.65 μm) observed from the source Liller I/MXB 1730-333 (Liller 1977) have already been reported by us (Kulkarni et al. 1979). The said observation was made on the night of 4-5 April 1979 between 2100 to 0010 hrs. UT on the 1—m telescope at Kavalur. Very briefly, the occurrence of a burst was non periodic, its rise time was ~ 2 sec and fall time ~ 30 sec. Peak magnitude of the burst in H band (1.65 μm) was ~ 1 magnitude lower than the steady emission from the source of about 7.5 observed magnitude. In 0.3 μm spectral interval at 1.65 μm the luminosity at the peak was about 10^{37} erges sec^{-1} and the total energy in the burst was approximately 10^{38} ergs assuming a distance of 10 kpc to the object (Lewin 1979). Fig. 1 (a) gives typical two bursts observed on 4th April 1979 at $23^h\ 45^m\ 06^s$ and $23^h\ 47^m\ 50^s$ UT. The X-ray bursts from the above source had started in early March 1979 (Marshall 1979). The data of last 3 years show that this X-ray source, once starts bursting, continues to burst for a few weeks. Though there were no simultaneous measurements on the night of 4-5 April 1979 of X-ray bursts with the infrared bursts, properties of the infrared bursts (Kulkarni et al. 1979) indicate that very likely they might be originating from the same source giving X-ray bursts. We shall assume therefore in the present communication that the flux in the infrared burst is given by the same source producing X-ray bursts.

We had already indications in the first week of April 1979 that the source was approaching the end of its activity in its present active period (March-April 1979) as we obtained only six bursts during 2½ hours of observations on 4-5 April.

However, we decided to continue to observe MXB 1730-333 from 15th to 23rd April 1979 in the hope of recording some more bursts with the same experimental equipment described elsewhere (Kulkarni et el. 1979). We chose one band (H or K) for continuous recording of flux of the above IR burster Liller I; however, observations in J (1.2 μm), H (1.65 μm) and K (2.2 μm) bands on standard stars were made to determine steady flux levels in absolute units from this source. An aperture of 20 arc sec at the focal plane and a throw of about 20 arc ec was used on the vibrating tertiary mirror to chop the source and the sky alternately. It was found that this source did give continuous steady flux in the above bands during our observing period. Nearby blank sky (chopping between sky and sky) was observed for several minutes to

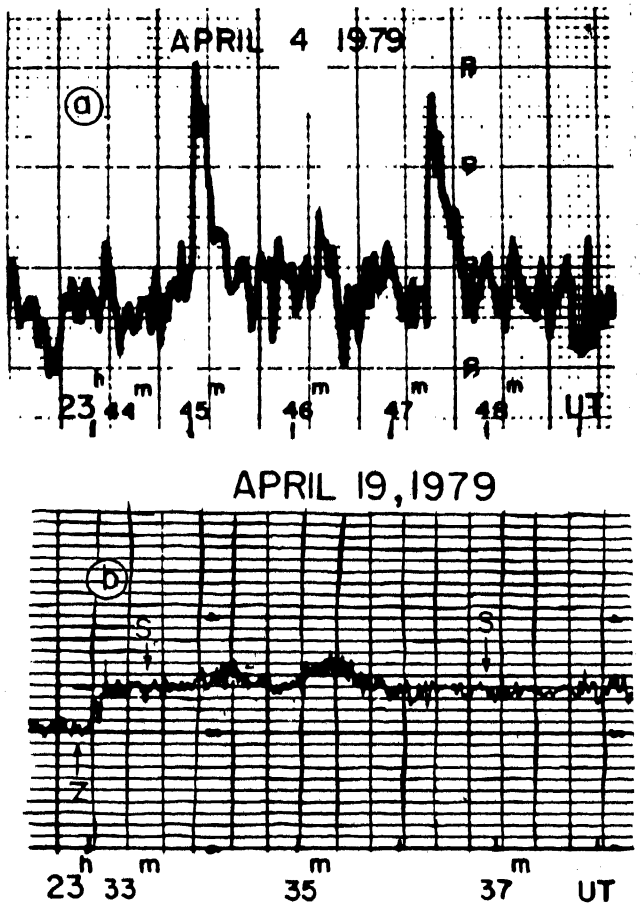

Fig. 1. (a) Two typical bursts in H band from Liller I/MXB 1730-333 source. (b) A different kind of enhancement (burst ?) in K band from Liller I/MXB 1730-333. The zero (Z) and steady flux (S) levels may be noted.

TABLE 1

Two infrared bursts in K band from Liller I/M XB 1730-333 source.

Burst	Time of occurrence of peak U.T.	Duration	$\triangle m_K$	Energy in the burst in 0.6 μm band width
1	$23^h34^m20^s$	$\sim$ 30 s	0.4 ± 0.1	1.39×10^{38} ergs
2	$23^h35^m20^s$	$\sim$ 46 s	0.6 ± 0.1	3.13×1^{038} ergs

make sure that there was no spurious signal and the signal from the source was real.

During eight nights (15th-23rd April 1979) we had about 10.5 hrs. of total observation. Neither type I nor type II bursts (Lewin 1979) similar to X-ray bursts were recorded. However, on one occasion we observed a double enhancement (" burst " ?) of entirely different character in the K band in about one minute. We have made sure through several tests that the recorded burst was genuine.

Figure 1(b) shows the record of the burst as well as steady flux levels before and after the burst. The zero level Z (when no flux is allowed to fall on the detector) is also shown. Several star calibrations were taken on the same night from which the energy in the steady flux and in the bursts was determined. The steady flux level calculated from different standard stars agreed to within 0.1 magnitude in the K band. Table 1 gives the para-meters of the two observed bursts. A correction of $A_K = 1.1$ due to interstellar extinction (Kleinmann et al. 1976) for Liller I has been applied. $\triangle m_K$ is the difference in K magnitude between the steady flux level and the peak of the burst. The energy in the burst is estimated by integrating the area under the burst and assuming a distance of 10 kpc to the object (Lewin 1979).

It may be noted that the present observed burst is quite unusual where the shape of the burst is approximately Gaussian, the rise time and the fall time being almost identical which is half of the total duration shown in Table 1. Also it is interesting to note that the energies and durations of the double enhancement reported here are about same as the bursts observed by us on 4-5 April 1979 (Kulkarni et al. 1979) while their recorded shapes are entirely different (See Fig. 1).

This being a single observation no other properties of this type could be given. The underlined mechanism for generation of this type of burst is not clear.

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