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RESEARCH ARTICLE

020819 AND 021211: TWO DARK GRBS.

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Abstract

Context:- Dark gamma-ray bursts (GRBs) are sources with a low optical-to-X-ray flux ratio β_{ox} = 0.5. Proposed explanations for this darkness are: a) the GRB is at high redshift b) dust in the GRB host galaxy absorbs the optical/NIR flux c) GRBs have an intrinsically faint afterglow emission.
Aims:- We study two dark GRBs, namely, GRB020819 and GRB021211. These sources are bright in the X-rays, but no optical/NIR afterglow has been detected for either source, despite the efforts of several follow-up campaigns that have been performed soon after the GRB explosion.
Method:- We will analysis host properties and reason behind the darkness from the literature.
Conclusion:- High redshift and dust extinction can be a reason behind the darkness of GRBs, but deeper and faster observations can make us to find optical afterglows.

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Introduction:-

Optical transients are shown by about 50% of well-localized GRBs, successive to the prompt gamma-ray emission, whereas in 90% of cases X-ray counterpart is present. Late and shallow observations could be the reason behind lack of OTs in some cases. Fynbo et al. in 2001 and Berger et al. in 2002 argued that dim and/ or rapid decaying transients could lead to dark GRBs. In time when the satellites, telescopes got better, it was brought to light by the scientist that some GRBs have weaker optical afterglow (Reichart & Yost 2001; Ghisellini et al. 2000; Lazzati et al. 2002).

Then scientist started searching reason behind it and came up with reasons like GRBs are similar but dark GRBs has dusty molecular cloud in their line of sight, that causes the absorption or host of dark GRBs must have high redshift then the normal bright ones (Fruchter 1999)

Goal of this paper is distinguish between various scenarios, including dust extinction, star formation rate and redshift of two dark GRBs. In §2 we present the analysis the data available in literature of the afterglow and we show the results, whose implications are discussed in §3.

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The Dataset:-

Dark grb 020819:-

GRB 020819 was detected by High Energy Transient Explorer 2 (HETE- 2) satellite on 2002 August 19.623 UT. It was a long-soft burst with T_{90} ~20 seconds and a peak brightness of ~5 crab (Vanderspek et al. 2002). The host galaxy of 020819 was at z = 0.41, with a chance coincidence probability of 0.8% (Jakobsson et al. 2005).

The spectroscopy of the host indicates very high star-formation-rate (SFR) of 23.6 $M_{\odot}$/yr (Levesque et al. 2010) corresponding to a specific SFR (SFR / stellar mass) of 0.94 per Gyr^{-1} using our best-fit stellar mass 1010.4 $M_{\odot}$. This specific SFR is higher than the median specific SFR ~0.8 Gyr^{-1} of long GRB host galaxies (Savaglio et al. 2009). These properties mark the host galaxy of GRB 020819 as a galaxy with dusty, intense star-formation, distinguished from the currently known GRB host population.

Dark GRB 021211:-

GRB 021211 was detected by High Energy Transient Explorer (HETE) satellite on 2002 December $11^h18^m34^s.03$ UT. (Crew et al. 2003). The burst was long with T_{90} ~ 2.3 seconds at higher energies (85 – 400 keV) but a longer duration of about 8.5 seconds at lower energies (5 -10 keV). It had a fluence of 1 and 2 μerg/cm^2 in the energy bands of 7 – 30 keV and 30 – 400 keV respectively. This shows that GRB021211 is and X-ray rich burst (Crew et al. 2003). The redshift of the host of GRB 021211 z = 1.004±0.002 Della Valle et al. (2003).

The interesting point to know is that host of GRB 021211 has highest ever reported star formation rate ~ 825 $M_{\odot}$/yr. So this host can be placed in ultraluminous infrared galaxies. (Michalowski et al. 2012).

The star formation rate (SFR) for the GRB 021211 host of ~ 825 M☉ yr−1 , the highest ever reported for a GRB host, places it in the category of ultraluminous infrared galaxies.

Discussion:-

By going through the literature well, the reason for optical darkness of GRB 021211 is not only high redshift and presence of extinction in the host but due to optical afterglow is much fainter than those observed to date (Crew et al. 2003). So GRB 021211 can be put in “not so dark” type of GRBs.

While for GRB 020819 the reason of absence of optical afterglow is presence of dust extinction, As GRB 020819 has very low redshift.

The study suggests that to detect Optical afterglows of such type of GRBs deeper and faster follow-ups observations are required. So in future, we may say that there is nothing like dark GRBs.

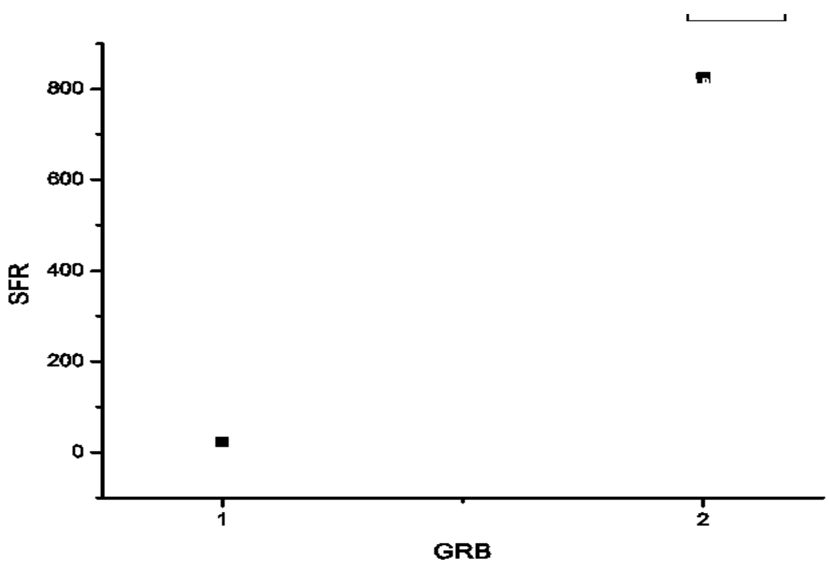

Figure 1:-

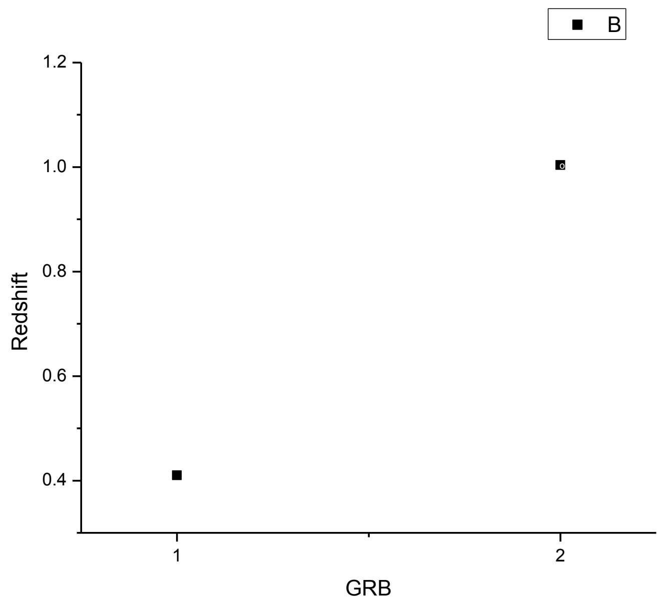

Figure 2:-

Fig 1 shows a graphical relation between SFR of Dark GRB 020819 and 021211. And in Fig 2 relation between Redshift and Dark GRB is shown. In both the figure GRB 1 represents 020819 and GRB 2 represents 021211.

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