SUPPLEMENTARY INFORMATION

I. Estimates for the Rate of Sub-energetic GRBs: To estimate the rate of sub-energetic events similar to GRB980425 ($d = 36.1$ Mpc) and XRF060218 ($d = 145$ Mpc), we consider only the satellite instruments with precise localization capability: BeppoSAX Wide Field Cameras (WFC), High Energy Transient Explorer 2 (HETE-2) Wide Field X-ray Monitor (WXM), and Swift Burst Alert Telescope (BAT). Inclusion of INTEGRAL would not significantly affect our results due to its low GRB detection rate. For these three instruments we adopt the detection threshold curves calculated by Band (2003, ApJ, 588, 945; 2006, ApJ, 644, 378) in units of peak photon flux per second ($F_{\text{peak}}$; 1-1000 keV) as a function of the $\nu F_{\nu}$ spectral peak energy, $E_{\text{peak}}$. We assume the shape of the prompt emission spectrum is fit by a broken power-law (Band et al. 1993, ApJ, 413, 281) such that $F_{\nu} \propto \nu^\alpha$ ($F_{\nu} \propto \nu^\beta$) for $h \nu < E_{\text{peak}}$ ($h \nu > E_{\text{peak}}$). Using the observed spectral parameters ($F_{\text{peak}}, E_{\text{peak}}, \alpha, \beta$) we calculate the sensitivity of each instrument to each of the two events.

For GRB980425, $F_{\text{peak}} \approx 3 \times 10^{-7}$ erg cm$^{-2}$ s$^{-1}$ (24-1820 keV; Galama et al. 1998, Nature, 395, 670) $E_{\text{peak}} \approx 160$ keV, $\alpha \approx -0.27$ and $\beta \approx -2$ (Jimenez, Band & Piran 2001, ApJ, 561, 171). Extrapolating to the 1-1000 keV band, we find that the peak photon flux is $F_{\nu} \propto \nu^\alpha$ ($F_{\nu} \propto \nu^\beta$) for $h \nu < E_{\text{peak}}$ ($h \nu > E_{\text{peak}}$). Using the observed spectral parameters ($F_{\text{peak}}, E_{\text{peak}}, \alpha, \beta$) we calculate the sensitivity of each instrument to each of the two events.

Next we estimate the effective monitoring time, $T_m$ of each of the missions assuming their sky coverage, $S$ and operation time, $T$. For the two Wide Field Cameras $S = 2 \times 0.123 = 0.246$ sr (Band, 2003, ApJ, 588, 945) and $T = 4$ yrs, and for WXM $S = 0.806$ sr and $T = 3$ yrs (Guetta et al., 2004, ApJ, 615, L73). For BAT, $S = 2$ sr and $T = 1$ yr (S. Barthelmy, private communication). Thus we find monitoring times, $T_m = (T/4\pi)S$, of 0.08 (WFC), 0.19 (WXM), and 0.16 (BAT) yrs.

We estimate the sensitivity of these instruments to each of the events as $T_m \times V$; here $V$ is the volume to which each event could be detected. Adopting the larger of the two sensitivities for each instrument we find $3.8 \times 10^{-3}$ (WFC), $1.2 \times 10^{-3}$ (WXM) and $3.7 \times 10^{-3}$ (BAT) Mpc.
(BAT) Gpc$^3$ yr. Summing the sensitivities, we find that the rate of sub-energetic events is \(230^{+490}_{-190}\) Gpc$^{-3}$ yr$^{-1}$ where the errors are dominated by the 90% Poisson statistics for two detections (Gehrels, 1986, ApJ, 303, 336).

II. Estimates for the rate of Type Ibc supernovae like GRB 980425 and XRF 060218:

To estimate the rate of SNe Ibc with strong, early radio emission comparable to that observed for sub-energetic bursts we only consider the 75 events (out of 144 optically-selected local SNe Ibc) with 3σ upper limits fainter than the observed GRB 980425 and XRF 060218 light-curves at that same epoch. We then assume various values for the true fraction of SNe Ibc with radio emission comparable (or higher) to that of XRF 060218 and GRB 980425 and determine the probability of finding null-detections for all 75 events for each assumed fraction. Larger fractions are ruled out with higher confidence. At 90% confidence, we rule out the scenario where \(\gtrsim 3\%\) of SNe Ibc are as radio bright as XRF 060218 and GRB 980425. Adopting the local rate of SNe Ibc, \(9^{+3}_{-5} \times 10^{-3}\) Gpc$^{-3}$ yr$^{-1}$, as measured by Cappellaro et al. (1999, Astr. Astrophysics, 351, 459) and Dahlen et al. (2004, ApJ, 613, 189), we conclude that the volumetric rate of events like GRB 980425 and XRF 060218 is less than 3% of the local SNe Ibc sample, or \(\lesssim 300\) Gpc$^{-3}$ yr$^{-1}$.

Repeating this analysis for the subset of broad-lined SNe Ibc, we find that at 90% confidence we can rule out the scenario where \(\gtrsim 30\%\) of local, optically selected BL SNe Ibc produce radio emission similar to that observed for GRB 980425 and XRF 060218.