FSRQ AND THE GAMMA-RAY BACKGROUND

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The contribution of Flat Spectrum Radio Quasars (FSRQ) to the γ-ray background (GRB) is modeled. FSRQ are known to make a substantial contribution to the hard (E>100 MeV) background. The so called "MeV bump", however, cannot be accounted for in terms of this class of sources even taking into account the newly discovered class of FSRQ with a broad band spectrum sharply peaked in the MeV range ("MeV blazars"). This is in agreement with the recent results obtained by Kappadath et al. (1995) using COMPTEL data.

The most important discovery of the CGRO EGRET in the field of the extragalactic astronomy is the detection of high energy γ-rays (E>100 MeV) from active galaxies. At present (Thompson et al. 1995) some 50 sources have been identified, the majority with FSRQ while about ten are classified as BL Lac objects. The purpose of this work is to estimate the contribution from FSRQ to the GRB using the available γ-ray properties recently discovered by CGRO COMPTEL and EGRET observations coupled with the available informations at radio and X-ray wavelenghts. The values H_0=50 km s^{-1} Mpc^{-1} and q_0=0 have been used.

Our model for the synthesis of the overall GRB is anchored to the X-ray emission properties of FSRQ at 1 keV. The parameters for the broad band X- and γ-ray spectrum and cosmological evolution of FSRQ have been chosen in order to obtain a good fit to the overall set of observational constraints. All the assumed parameters are consistent, within the errors, with those suggested by the present available observations.

The adopted local emissivity at 1 keV is of 9.7×10^{19} W Hz^{-1} Gpc^{-3}. For a typical FSRQ the spectrum can be represented by a broken power law with α_x=0.5, α_γ=1.2 and a break energy at 7 MeV, while for the "MeV blazars" the mean spectrum has α_x=0, α_γ=2 and a break energy at 2.5 MeV. The evolution is parameterised as a power law such that the luminosity $L(z)=L(0)\times(1+z)^{\beta}$. We have adopted β=3, an evolution cut-off

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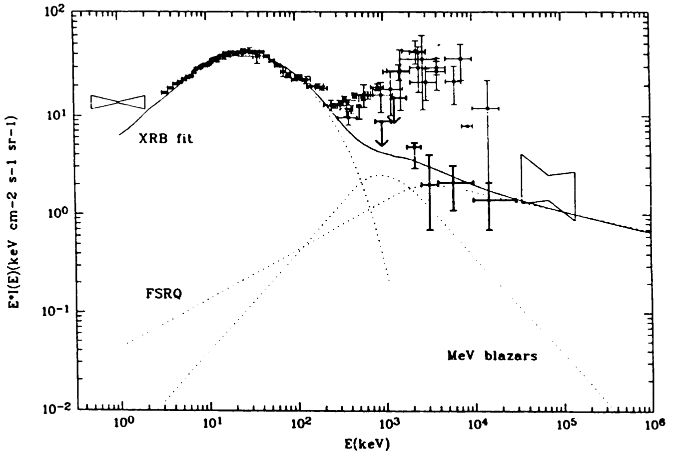

at a redshift z_{cut}=2.5 and then a constant emissivity up to z_{max}=5. The predicted background intensity in the energy range 1 keV – 1 GeV has been computed assuming that 95% of the local emissivity at 1 keV is due to the FSRQ and the remaining 5% to the "MeV blazars". This ratio reflects the fact that only a few "MeV blazars" have been discovered by COMPTEL compared with the roughly 40 FSRQ in the EGRET band. Our results are shown in the figure. Compared with a selection of data on the X- and γ-ray backgrounds, the solid line is the sum of three distinct contributions (dashed lines): the fit to the X-ray background obtained with the AGN model of Comastri et al. (1995),the FSRQ and the "MeV blazars" contributions to the GRB derived in the present model. The thick error bars in the Mev region represents the recent results obtained by COMPTEL (Kappadath et al. 1995). The contribution of FSRQ to the GRB (>100 MeV) is $\simeq$70%.

In order to make full use of the available data we have made an attempt to predict a Log N – Log S relationship and a redshift distribution and compare them with those obtained with EGRET. We have found consistency with the observations by adopting a γ-ray luminosity function directly derived from the radio one via the strict correlation between radio and γ-ray luminosities of EGRET FSRQ. Source variability and our lack of knowledge about the EGRET sky-coverage makes a strict comparison difficult.

As a general conclusion it appears that various classes of AGN are able to account for most of the extragalactic background radiations observed over the very wide energy interval from about 1 keV to tens of GeV.

References

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