R04b Cosmic Infrared Background Requires Rapid Evolution in Cosmic Star Formation History

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We constructed a model of infrared and sub-mm (hereafter IR) galaxy number count and estimated history of the IR luminosity density. In order to construct the model, we first compiled the spectral energy distribution (SED) of galaxies at infrared and sub-mm wavelengths obtained by *ISO*, SCUBA, and other facilities, and derived average SEDs for various galaxy luminosity. Then, using the local luminosity function (Soifer et al. 1987), we studied the required galaxy evolutionary history statistically. We treated the evolutionary change of galaxy luminosities as a stepwise nonparametric form, in order to explore the most suitable evolutionary history which satisfies the constraint from Cosmic Infrared Background (CIRB).

An order of magnitude increase of luminosity at redshift $z = 0.75 - 1.0$ was found in IR-60 μm luminosity density evolution. We need such a sudden rise of IR luminosity density to reproduce the very high CIRB intensity at ~ 150 μm reported by Hauser et al. (1998). The peak of the IR luminosity density is located at $z \sim 1$. We note that too large evolutionary factor at high z would produce the excess of the value reported by Fixsen et al. (1998) around 1 mm. The evolutionary patterns required from CIRB also satisfy the constraints from observations of galaxy number counts obtained by *IRAS*, *ISO* and SCUBA. The rapid evolution of IR luminosity density required from CIRB well reproduces the very steep slope of galaxy number count obtained by *ISO* (Kawara et al. 2000).