

# Bulk Comptonization spectra in powerful blazars

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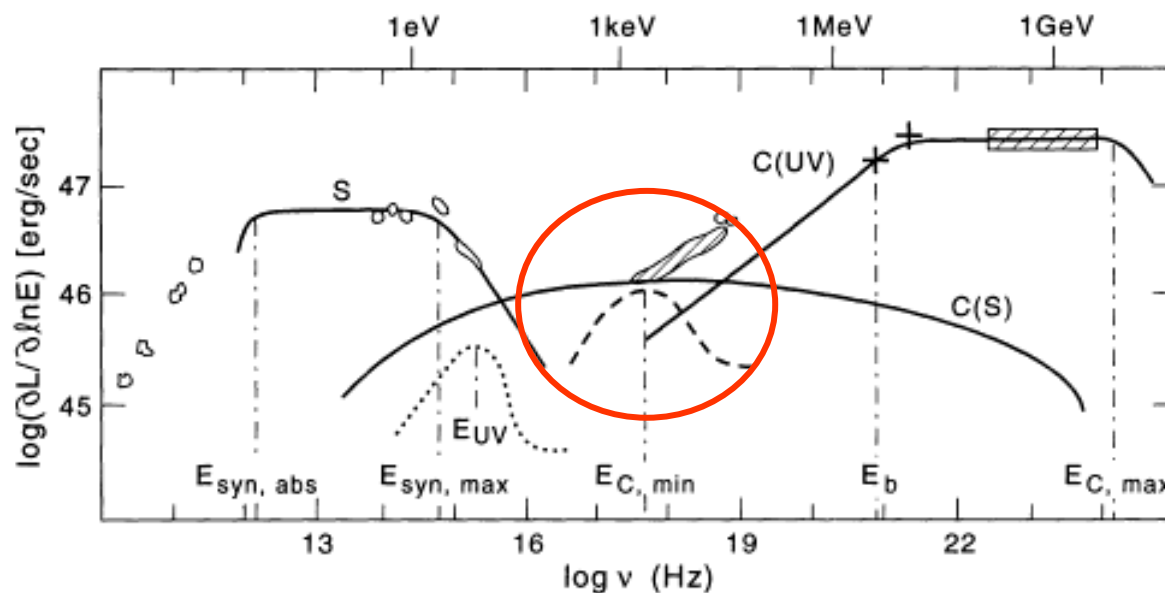


FIG. 1.—Spectrum of 3C 279. Solid lines mark the model spectrum components: (S): synchrotron radiation; C(S): Comptonized synchrotron radiation; and C(UV): Comptonized diffuse UV radiation. In addition, the central UV radiation spectrum is shown (dotted line), along with a possible component due to Comptonization of diffuse UV radiation by cold electrons in the jet (dashed line). Observations are depicted from the following sources: Makino et al. (1989) for the radio–X-ray range, during high states; Hermsen et al. (1993) for soft gamma-ray measurements from Comptel (crosses); and Hartman et al. (1992) for hard gamma-ray measurements from EGRET. The model parameters are specified in the text.

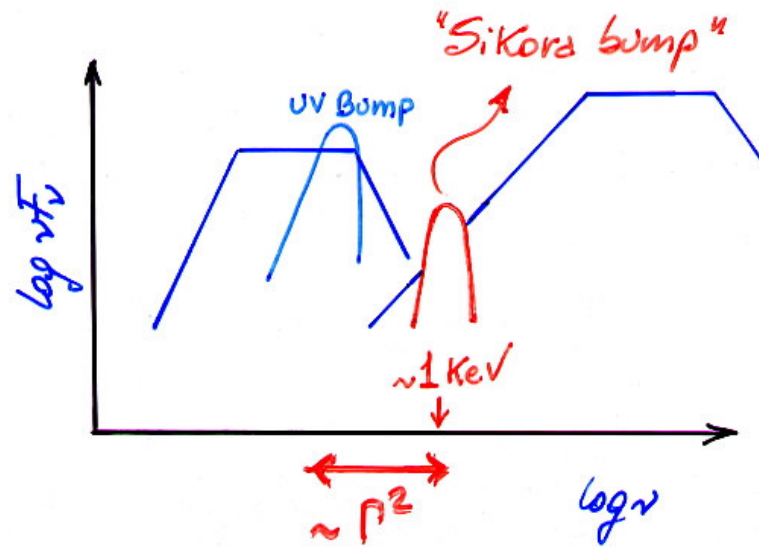
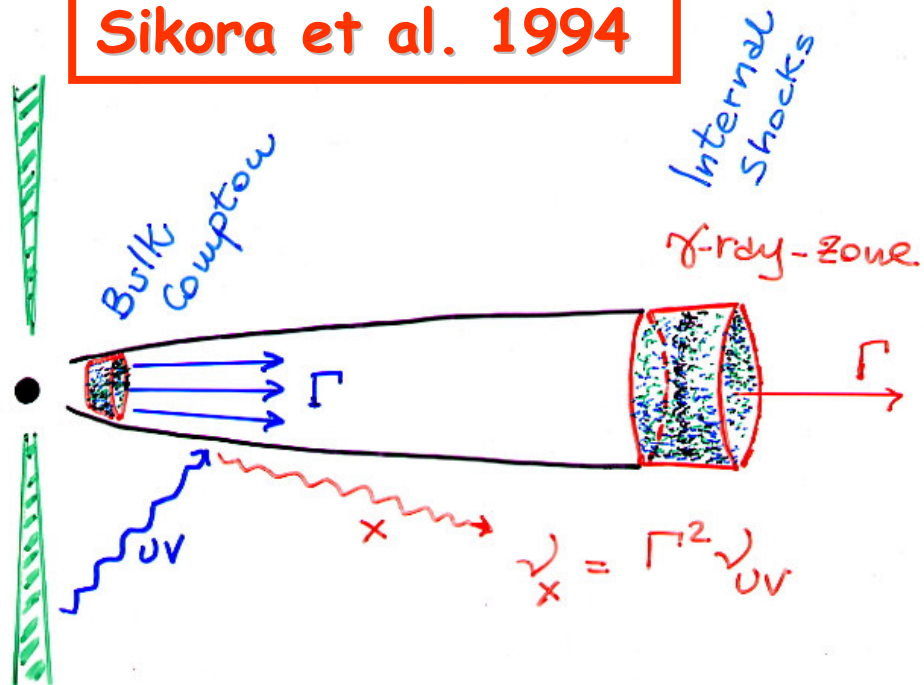
detail for spherical homogeneous sources by Rees (1967) and Jones, O’Dell, & Stein (1974). These models were later incorporated into the relativistic jet scenario (e.g., Königl 1981; Marscher & Gear 1985; Ghisellini & Maraschi 1989). SSC models have the elegant feature that the synchrotron photons are both produced and Comptonized by the same population of relativistic electrons. However, fitting an SSC model to observed blazar spectra is difficult (Bloom & Marscher 1993; Maraschi et al. 1992).

An alternative hypothesis is that the high-energy spectrum results not from the SSC mechanism, but from Comp-

regions of the jet at distances  $\geq 10^{17}$  cm, i.e., well outside the source of the radiation (see, e.g., Maraschi et al. 1992). At such distances the plasma in the jet, flowing at relativistic speeds, sees the radiation of the central source strongly redshifted. In order for this radiation to dominate over the local synchrotron radiation field, extremely weak magnetic fields are required.

To ameliorate this problem, Blandford (1993) and Sikora, Begelman, & Rees (1993) proposed that the dominant contribution to the energy density, as measured in the comoving frame of the radiating plasma, comes from scattered or reprocessed portions of the central source radiation, rather than

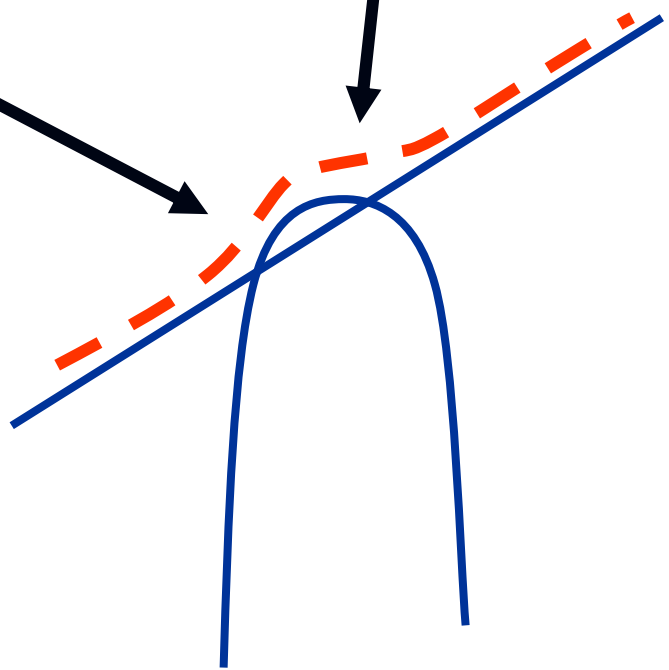
# Sikora et al. 1994



Log  $vFv$

Flattening wrt  
power law

Steepening wrt  
power law



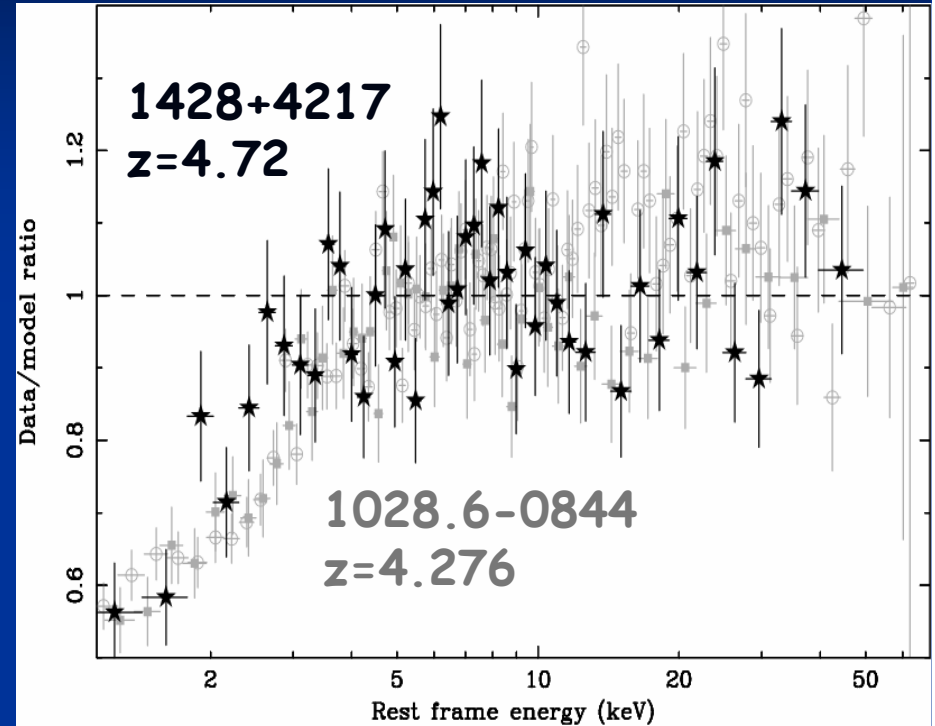
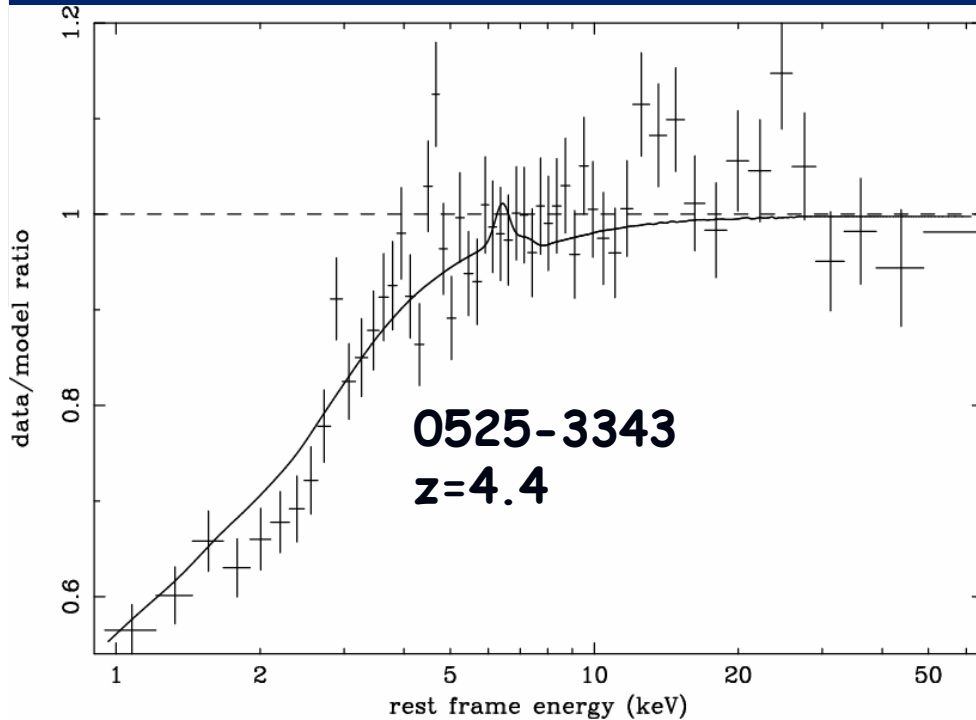
Log  $v$

**Importance:**

**Discriminating between Poynting flux or matter dominated jets**

**Info on  $\Gamma$**

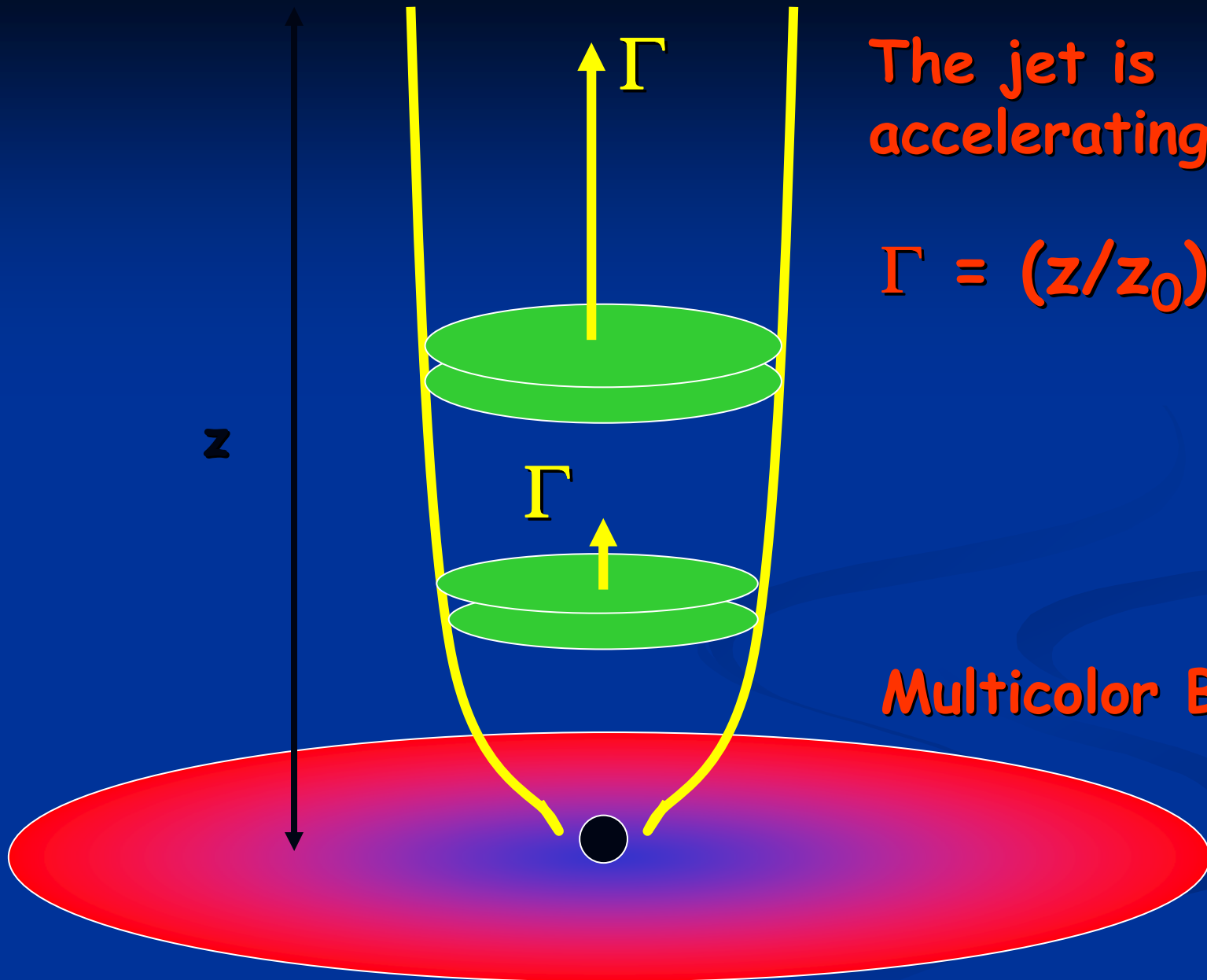
# Soft X-ray flattening



Worsley et al. 2004

Yuan et al. 2005

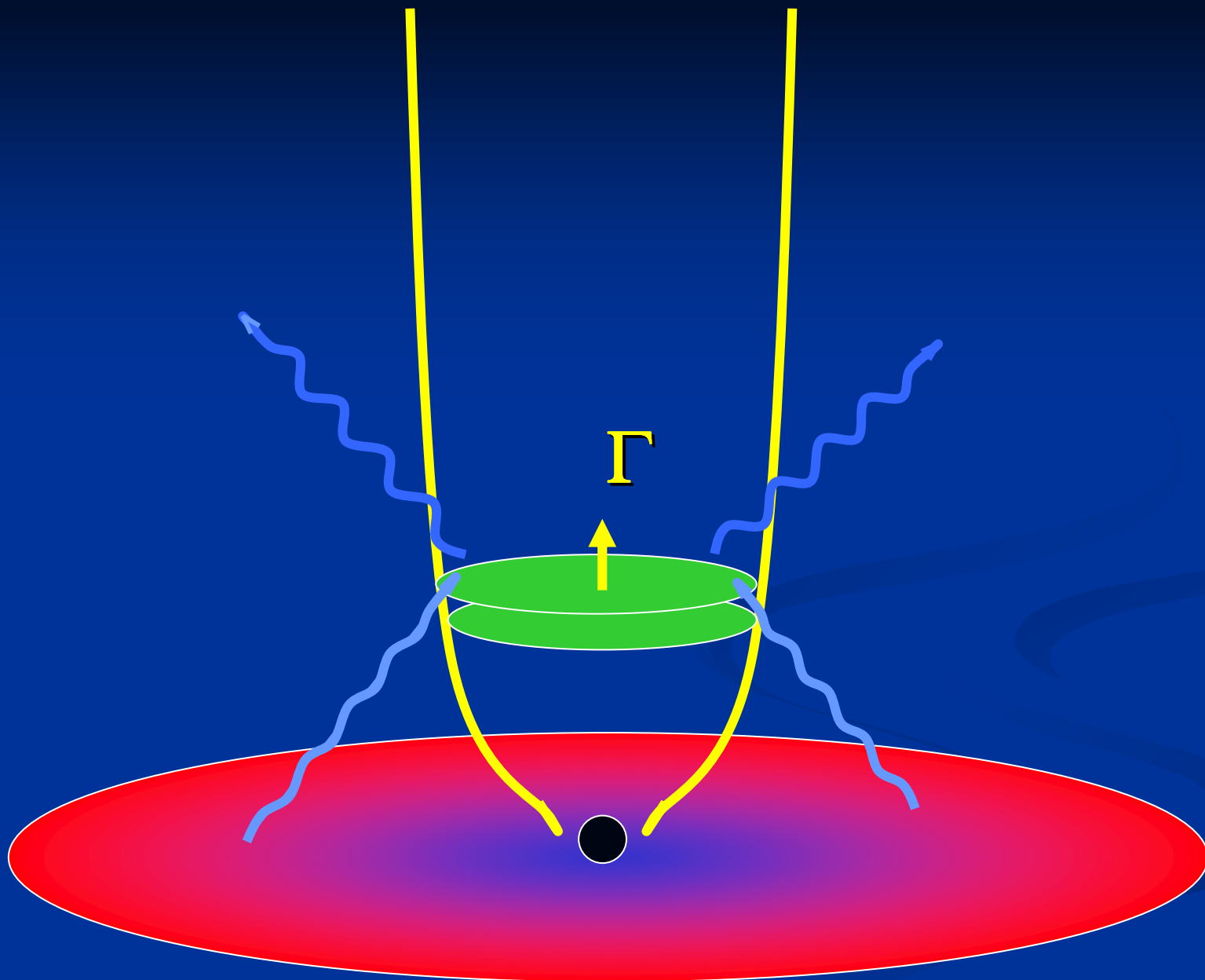
Interpreted as due to absorption (larger at high  $z$ ?)



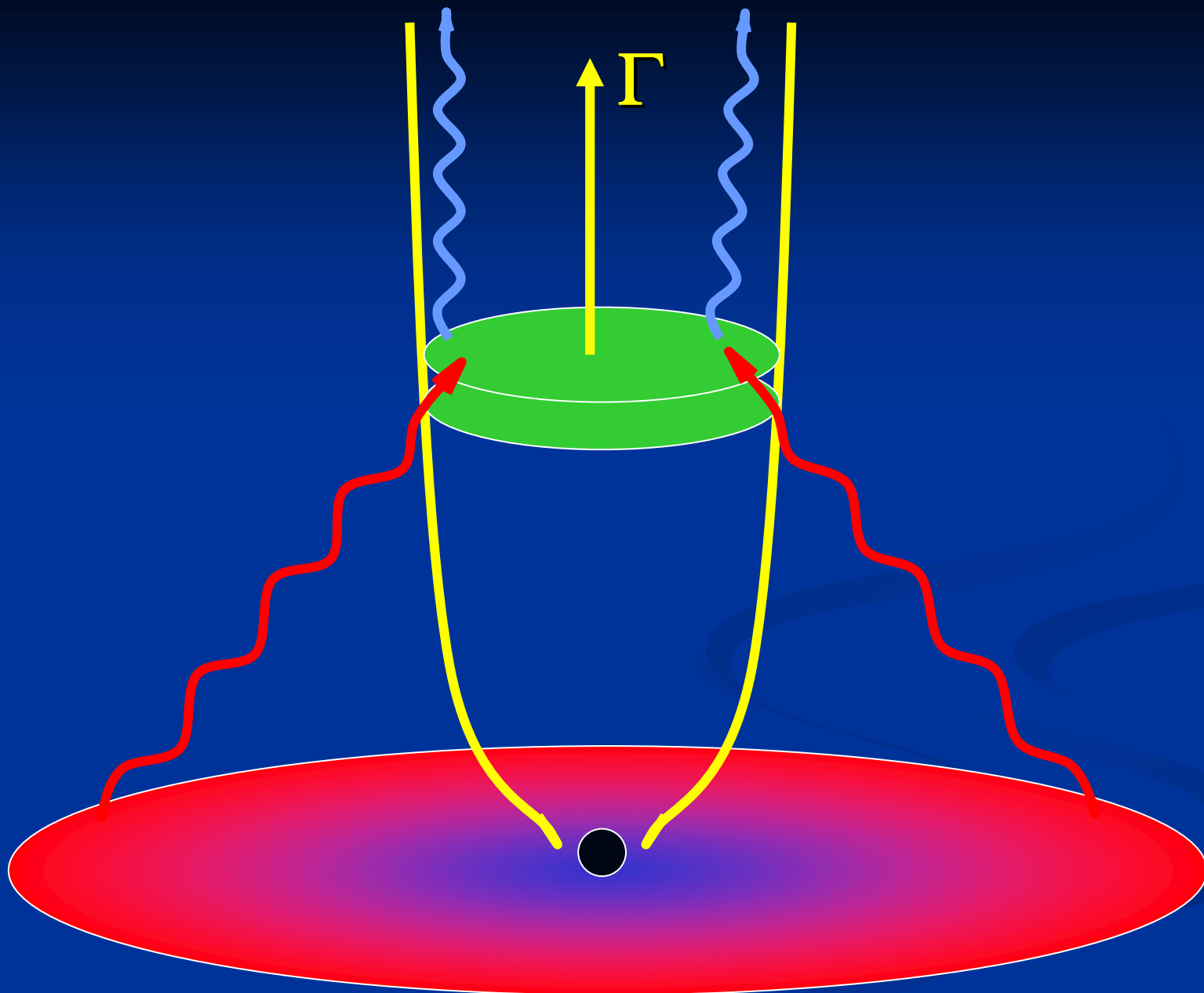
The jet is accelerating:

$$\Gamma = (z/z_0)^a$$

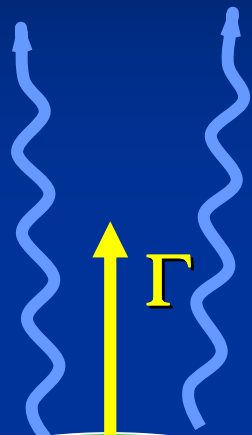
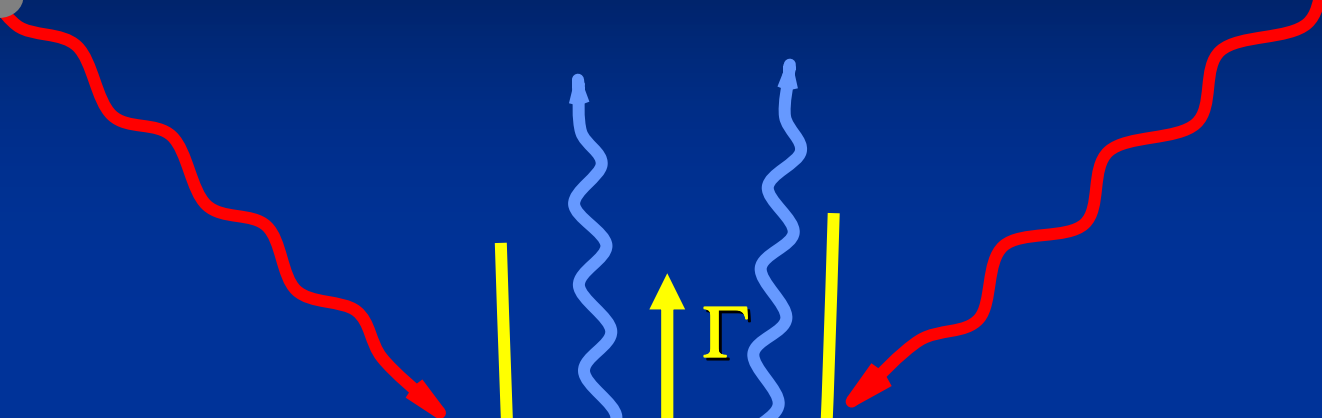
Multicolor BB



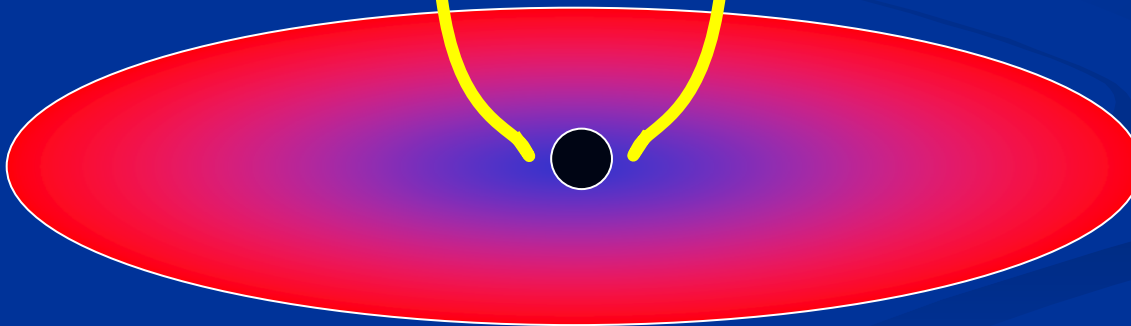


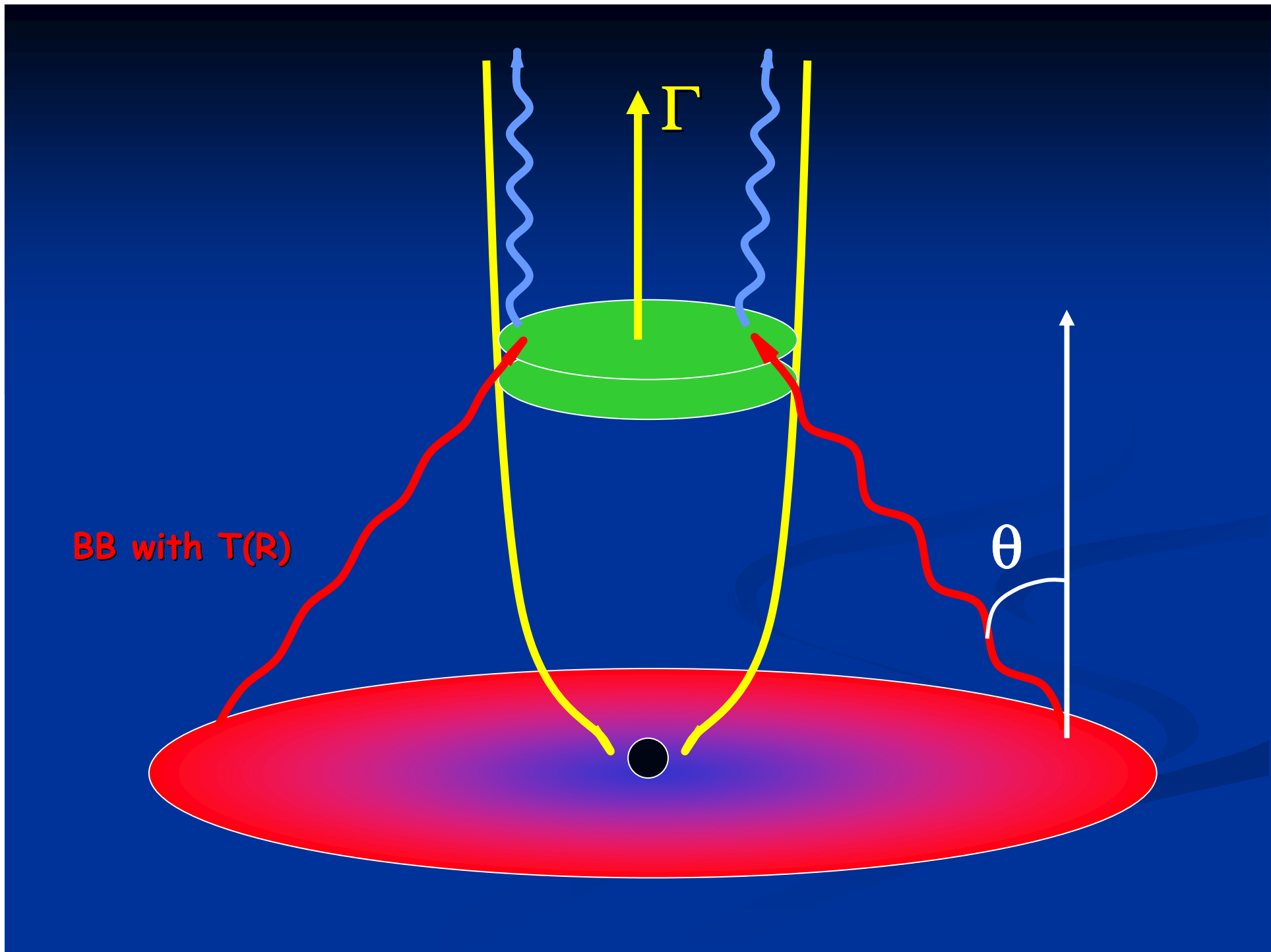


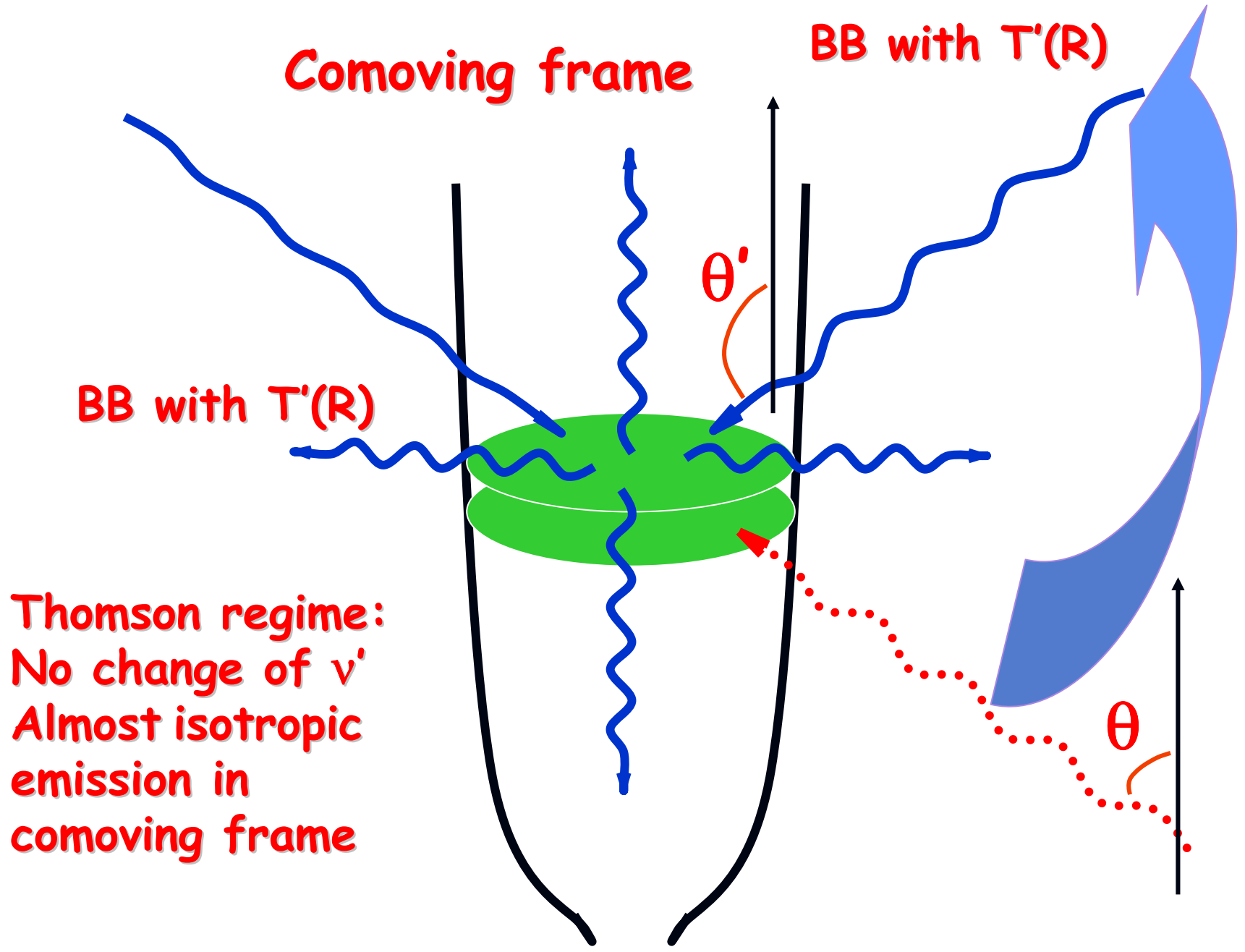
BLR

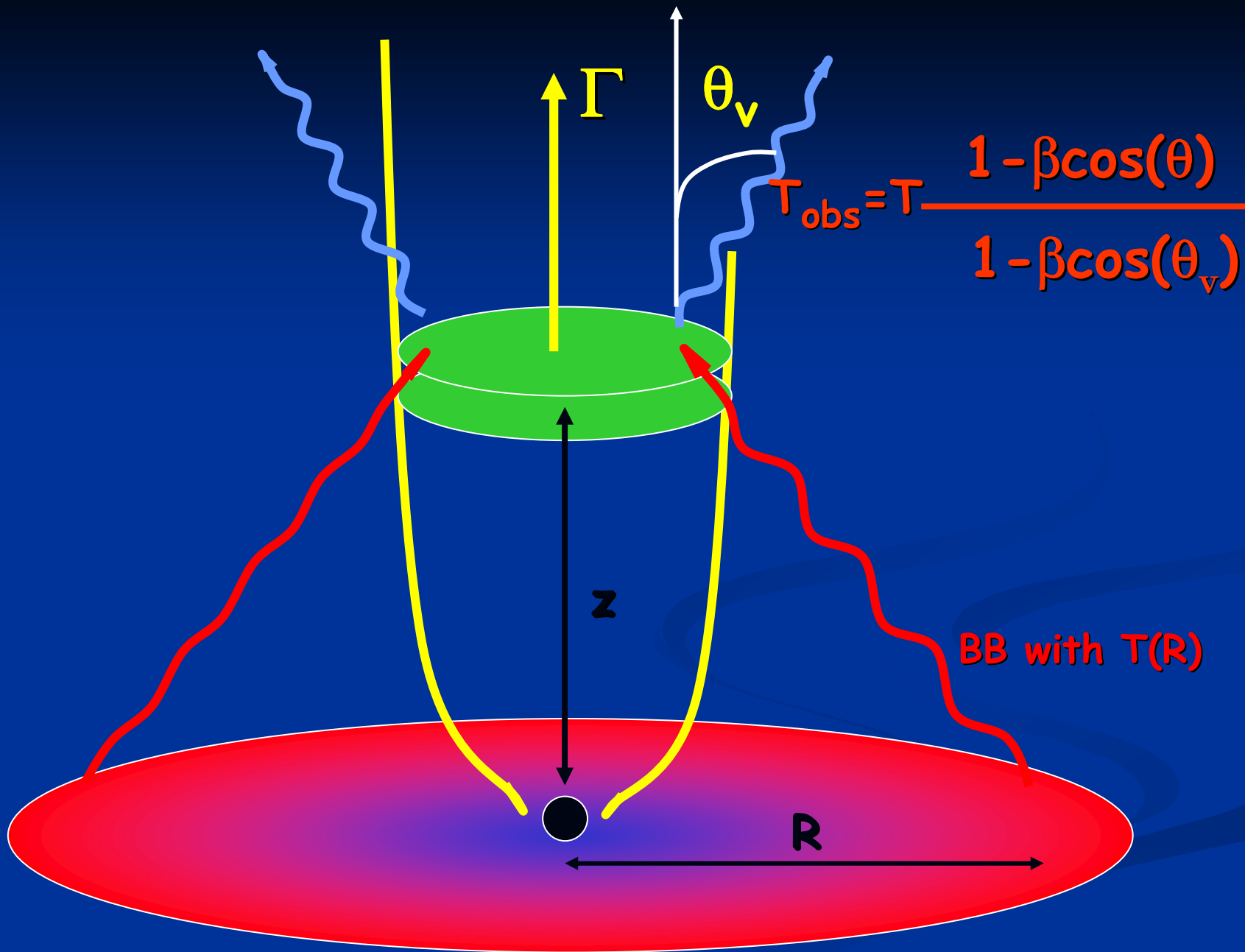


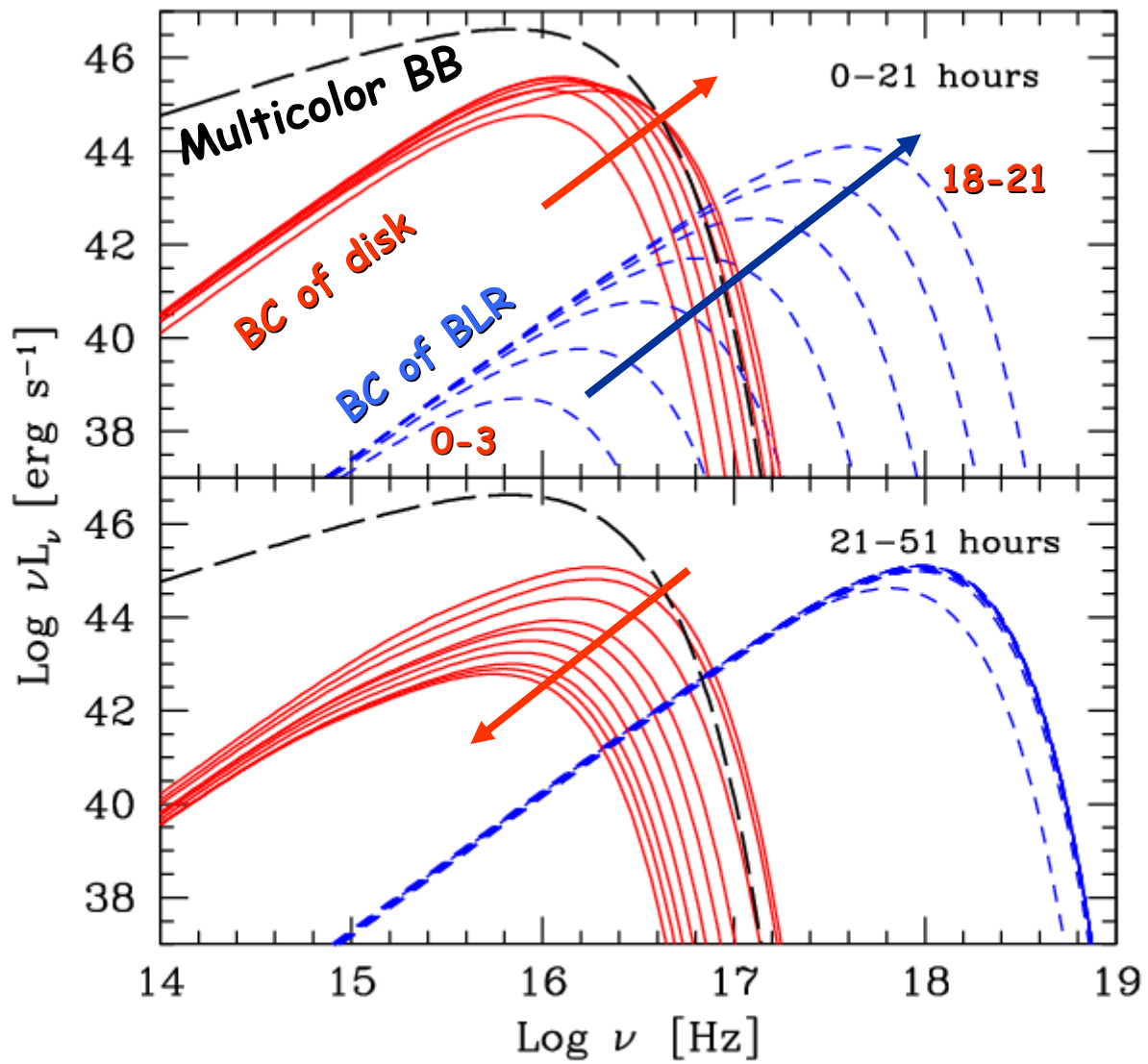
$\Gamma$

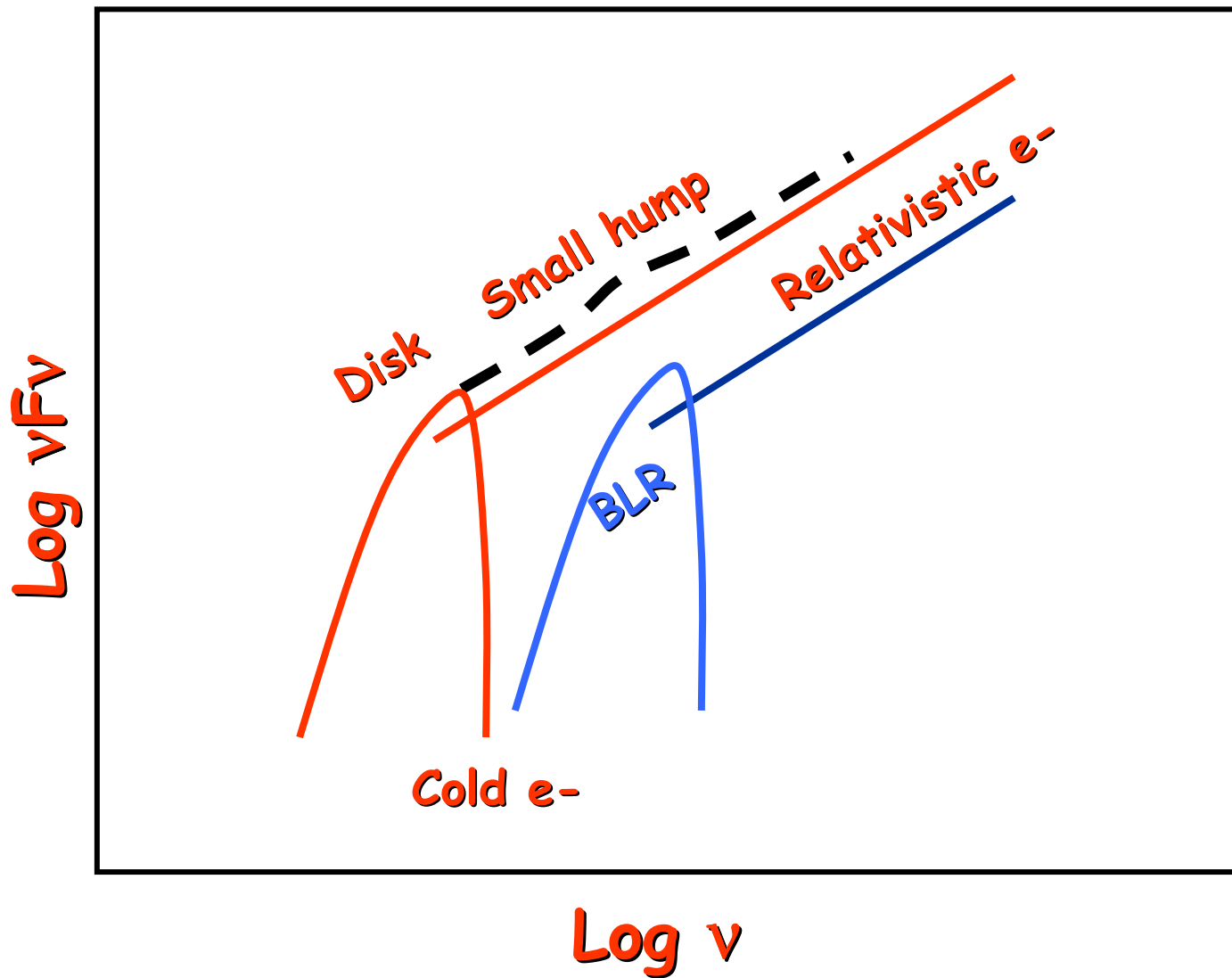


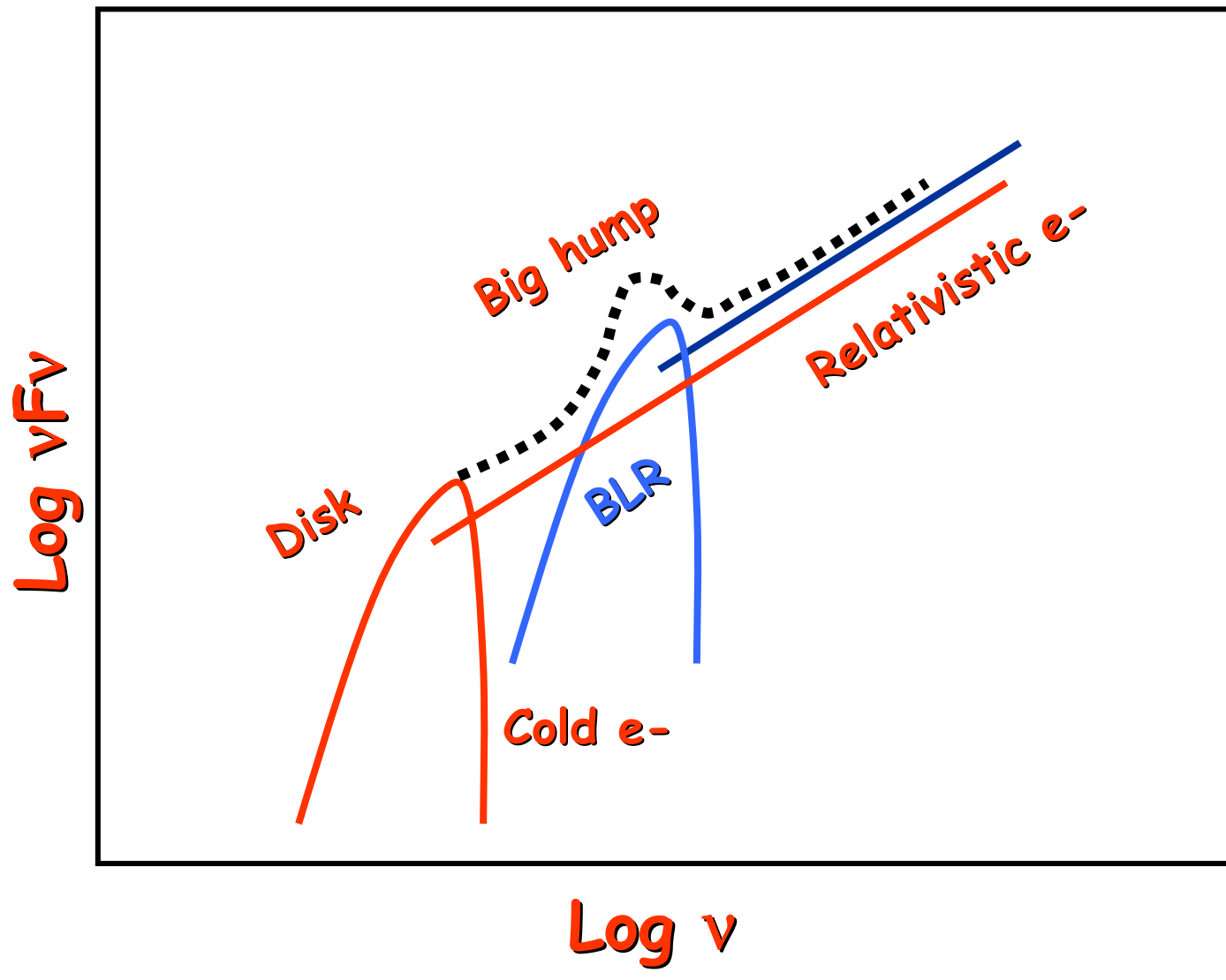




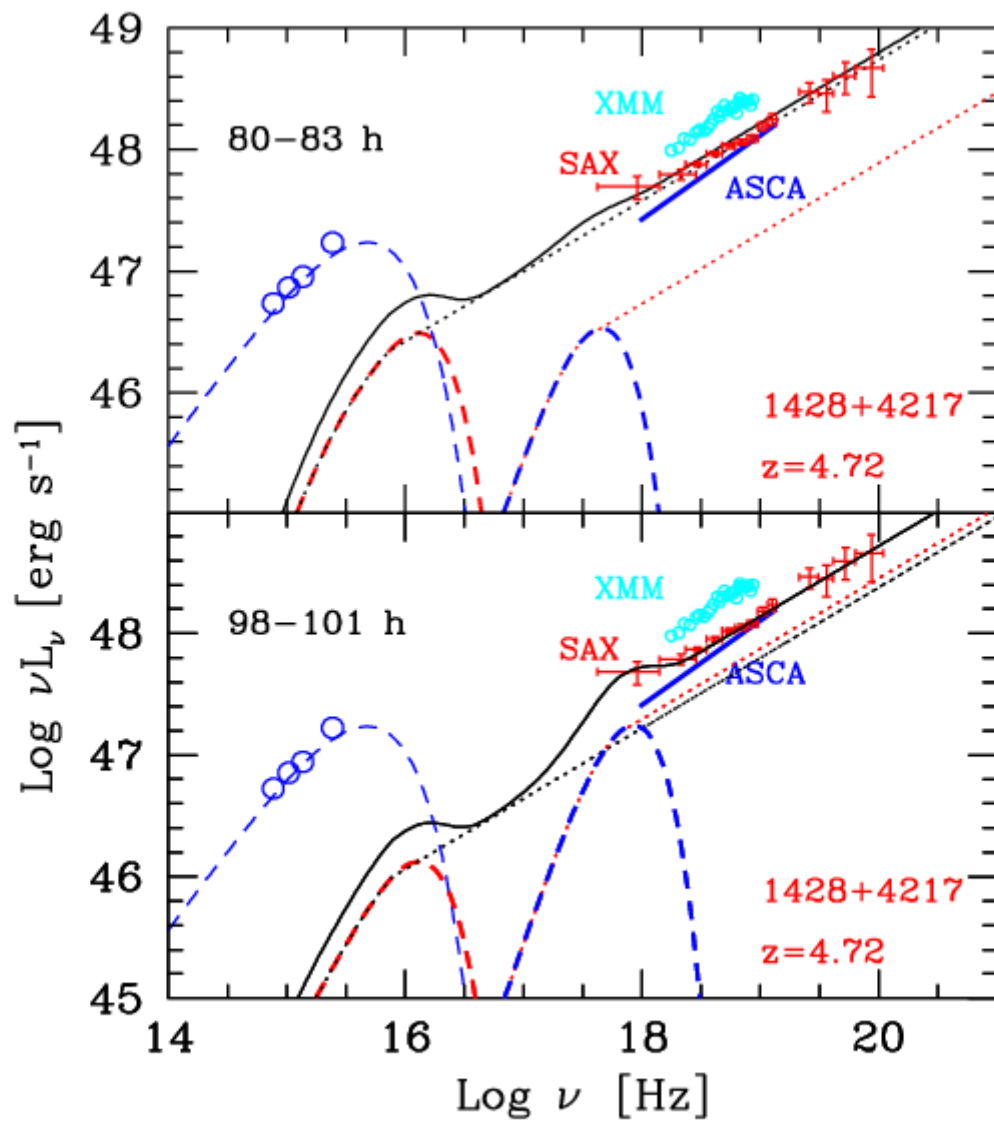




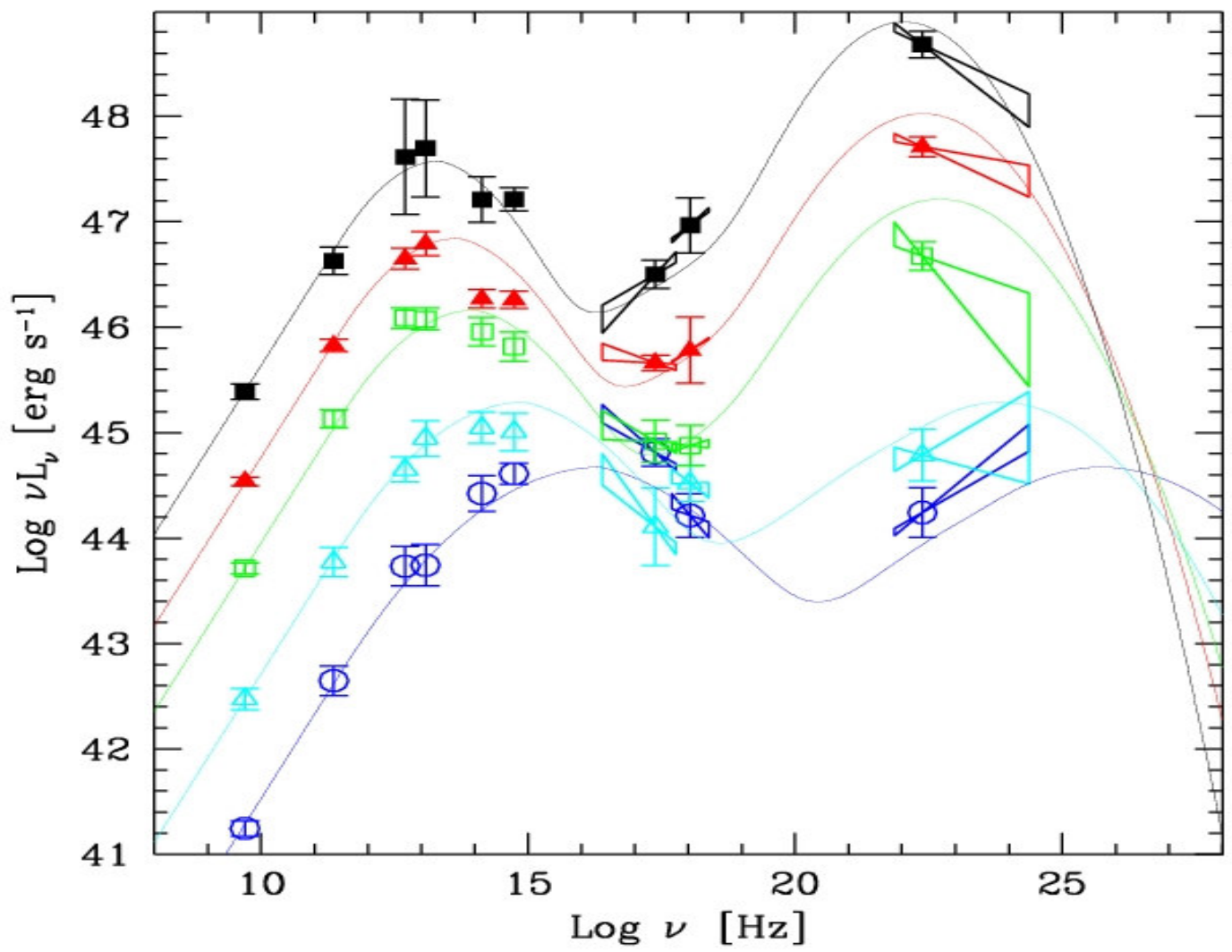








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- 2.
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# Contribution of disk only

