**Introduction.**

The location in FSRQs in which GeV emission is produced is an open question. In leptonic scenarios, GeV radiation is most likely emitted via inverse Compton scattering of photons in the broad-line region (BLR) or in the molecular torus (MT), called external Compton (EC) scattering. We have developed a diagnostic criterion to determine in which of these two locations GeV emission is produced for a given SED. We term this criterion the “seed factor” (SF). Multimwavelength emission from the BLR and the MT both produce characteristic values of the seed factor.

- **Figure 1:** Blazar diagram showing distances of MT and BLR.

**Derivation.**

The peak energies (in units of electron rest mass energy) of synchrotron and external Compton scattering are, respectively,

\[ \epsilon_{\text{syn}} = \frac{B^2}{\gamma m_e c^2} \]  \hspace{1cm} (1)

\[ \epsilon_{\text{ec}} = \frac{1}{\gamma^2} \frac{m_e c^2}{E_{\gamma,\text{BLR}}} \]  \hspace{1cm} (2)

where \( \epsilon_0 \) is the characteristic energy of the external seed photons.

Eqn. 2 is valid if the electron scattering takes place in the Thompson regime. Scattering is in the Thompson regime if \( \frac{\epsilon_0}{m_e c^2} \lesssim 1 \). The highest energy possible for external seed photons are UV emission-line photons which have \( \epsilon_0 \approx 10^{24} \) eV. Thus scattering is in Thompson regime if \( \epsilon_{\text{ec}} \lesssim 10^{24} \) Hz. Which is generally true, since for powerful blazars \( \epsilon_{\text{ec}} \approx 10^{25} \) Hz.

Dividing Eqn. 2 by Eqn. 1 and solving for \( \frac{B}{\gamma} \),

\[ \frac{B}{\gamma} = \frac{\epsilon_{\text{ec}}}{\epsilon_{\text{syn}}} \]  \hspace{1cm} (3)

To create a diagnostic based solely on observables, we now consider the Compton dominance. This is,

\[ \frac{\epsilon_{\text{ec}}}{\epsilon_{\text{syn}}} = \frac{\delta F_{\text{BLR}}}{\delta F_{\text{MT}}} \]  \hspace{1cm} (4)

Solving for \( \frac{B}{\gamma} \) and equating to Eq. 3, we find,

\[ \epsilon_{\text{ec}} = \frac{3.2 \times 10^3 \gamma^2}{\delta F_{\text{BLR}}} \]  \hspace{1cm} (5)

where \( \delta F_{\text{BLR}} \) is the Compton dominance in units of 10, \( \epsilon_{\text{ec}} \) is the synchrotron peak in units of \( 10^{13} \) Hz, and \( \epsilon_{\text{syn}} \) is the EC peak in units of \( 10^{24} \) Hz. It is Eqn. 6 which we term the seed factor.

Reverberation mapping of radio quiet finds that \( R_{\text{BLR}} \approx 10^{17} \) Hz [1]. Assuming this holds for powerful blazars and that \( \delta F_{\text{BLR}} \approx 0.1 \) [2]. \( \epsilon_{\text{ec}} = 2.6 \times 10^2 \) erg cm\(^{-3} \). The BLR SED can be approximated by a blackbody (BB) with peak at \( \epsilon_0 \approx 3 \times 10^{-3} \) [3]. Thus \( \delta F_{\text{BLR}} \approx 5.5 \times 10^{17} \) G.

In the MT, reverberation mapping [4,5] and NIR interferometric studies [6] of radio quiet sources find \( R_{\text{MT}} \approx 10^{17} \) Hz. Adopting \( \epsilon_0 = 5.7 \times 10^{-3} \) (a BB of \( T = 1200 \) K) and \( \delta F_{\text{MT}} \approx 0.4 \) [7] we obtain \( \delta F_{\text{MT}} \approx 4 \times 10^{17} \) G.

**Preliminary Work.**

We have derived the SF for four samples (Arsioli+ (2018) [8], MOJAVE [9], LBAS [10], DSSB [11]). A histogram of all the SFs from these samples can be seen in Fig. 2. A histogram for the MOJAVE sample can be seen in Fig. 4. The MOJAVE sample has been singled out due to the completeness of the MOJAVE sample.

**References.**

9. Lister et al. 2009 AJ 137.3718L
10. Abdo et al. 2010 ApJ 716 30A

**Acknowledgements.**

This work is supported by NASA/Fermi Grant #00011640.