Maxwell Juttner

For both blackbody and SSC we compile a Maxwell Juttner distribution from equation \ref{eqn:juttner} in terms of \gamma\_{min} and \gamma\_{max}. We then sample Lorentz factor and convert this into a velocity to input in the Monte Carlo simulation. The velocity is given by equation \ref{eqn:velocity}

\begin{equation} \label{eqn:velocity}

v\_{samp} = c\*\sqrt{1 – \frac{1}{gamma\_{samp}}^2

\end{equation}

Verification Compton y and <$\gamma^2$:

The Maxwell Juttner distribution accounts for relativistic velocities as well as non-relativistic. In the corona we expect an extremely relativistic velocity distribution in the hard state of the jet \cite{bright} and a large y-parameter, greater than one. For both the blackbody and SSC the y-parameter was greater than one, implying that the photons gained a non-negligible amount of energy in the rest frame of the corona. \cite{lightmann}

Double checking in terms of energy:

Y &= \frac{\detla E}{E\_0} &= <$\gamma^2$>

In the relativistic case. <$\gamma^2$> is of order 10^{4-6}. In figure THE ONE FOR SYNCH AND THE MC PLOTS. The peak frequencies lie at 10^X and 10^Y Hz respectively. implying <$\gamma^2$> = NUMBER

CHECK IF NUMBER IS ORDER 10^4-6

VSSA:

Checking the peak of synchrotron self-absorption figure {fig:SSA} and comparing to BROADBAND PAPER who report $\nu\_{ssa}= 10^{14} Hz$ we note our peak SSA is of order $10^{16} $Hz, two order of magnitude off. The most significant contribution to the shift I can account for is the power law index. We assume for synchrotron radiation is fixed at p=4 for an optically thick corona. However, \cite{rodi} models a best fit for an optically thin jet at p=2.1. So, the difference come fundamentally from out assumptions.

Cyclotron:

For non-relativistic emission we calculate the spectrum in terms of the Larmor frequency

\nu\_l &= \gamma^2\frac{qB/m\_ec}

Where the Lorentz factor is between 1.1 and 2.0 for cyclotron emission \cite{bhjet}

SSC: Input jet spectrum

To create a photon spectrum from our corona. We create a photon density distribution following chapter 7 in \cite{Lightmann}. From the intensity of the corona, we create a probability density function for photon frequency. The distribution is provided in figure \ref{fig:{VEDE}. From the sample the energy of the photons is simply $E= h\nu$. We pass this as an array along with our Maxwell juttner distribution into the monte Carlo simulation to create our spectrum for SSC.

IC:

We treat the photons from the accretion disk as a blackbody with constant KT and collide with electrons in the corona with a Maxwell-juttner distribution. The photons follow a Planck distribution straight from the tutorial, and parametrized in terms of “KT\_e”. We obtain values for this from literature \cite{Chakraborty} as 150KeV. Additionally we obtain the height of the corona at 8r\_g. and KT\_{seed} as 0.3KeV