ELECTROMAGNETIC RADIATION FROM MATTER UNDER EXTREME CONDITIONS*

Simon Turbide†, Charles Gale
McGill University

The production of real and virtual photons in relativistic heavy-ion collisions is studied. Low-p_T photons, dominated by hadron gas contributions, are evaluated within a massive Yang-Mills approach, where p_T denotes the photon's momentum transverse to the collision axis. Earlier calculations are reexamined with additional constraints, including new production channels and form-factors. The intermediate to high-p_T region is dominated by the physics of jets. A treatment, complete to leading-order in the strong coupling, is used to calculate the energy lost by the jets in the strongly interacting medium. This approach is convolved with a physical description of the initial spatial distribution of jets and with an expansion of the emission zone. The role played by jet-medium interactions is highlighted, showing that they dominate in the range $2 < p_T < 4$ GeV, at the Relativistic Heavy Ion Collider (RHIC). This mechanism has an important impact on both the total photon yield and the photon elliptic flow. The results are compared to experimental measurements of photons from PHENIX. The good agreement, along with the importance of the quark-gluon plasma (QGP) processes, strongly suggests the formation of a QGP phase at RHIC.

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† *simon.turbide@mail.mcgill.ca:*