Sources of Photons: Thermal Regime

Initially (in the QGP) the basic processes are still

$$q + \bar{q} \to \gamma + g \qquad\qquad g + q \to \gamma + q$$

but now governed by thermal q and g distributions.

- Direct photons from Compton-scattering carry information on the original quark/antiquark momenta
- Gluons may equilibrate much faster (0.2-0.5 fm/c) than quarks (1 fm/c), at higher temperatures

If the phase transition is **first order**, the systems stays at a well-defined T_c for a long time.

- Does this have an effect on (relative) rates of γ from the two phases? ("*The hadron gas shines just as brightly as GQP*")
- Will N_γ go with a higher than first power of $N_{charged}$?

After hadronization there is a substantial photon source from processes like $\pi^+ + \pi^- \to \gamma + \rho^0$

- Similar to hard scattering, the γ spectrum now follows the hadron distributions with $T \sim T_{had}$
- Possible modifications of spectra by rapid expansion

About 10^7 fm/c later final state **meson decays** produce an enormous flash of photons (this is the real problem in a photon experiment)

- To measure photons at a ratio γ/π^0 below 10% is **very** difficult in any heavy ion experiment

Neutral DCC-s (if they exist) produce a strong photon signal at very low momenta (in the 70-150 MeV/c range).