**Thermal Equilibrium Properties**

I’ll just cut and paste from the Stat mech folder [we’re in Natural Gaussian units].

**Average Energy**

So the energy per unit volume, per unit wavelength, was just:



Integrating over all wavelengths, we find the total energy density:



where kB is Boltzman’s constant. We can translate this expression to SI units. We’re missing factors of ℏ, 4πε­0, and μ0/4π. The last two probably occur in combinations of c = 1/√(μ0ε0). Presently, in SI units, the RHS of that equation is energy4. And to convert the RHS of that equation to energy density, we can divide by ℏ3c3. So in SI, this should be:

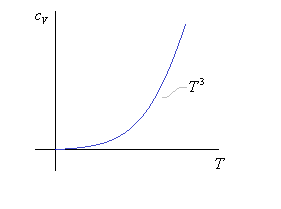


**Specific Heat**

We’ll recall that we got a T3 law for the specific heat – it’s just ∂u/∂T anyway:



(kB is Boltzman’s constant, and again, need to divide by c3ℏ3 to convert to SI)



**Pressure**

Might recall we found P = u/3. And this worked out to:



(again divide by ℏ3c3 to convert to SI)

**Radiancy**

Also have the radiancy, S(λ) = u(λ)c, which is the power emitted per unit area/per unit wavelength.



(to convert to SI, ωk = k would be ℏkc in SI units) Well, actually the radiancy is R = S/4 for reasons elaborated on in the Stat Mech file. So we have:



Integrating the radiancy over all wavelengths gives the intensity:



Can see that we need to divide σ by ℏ3c2 to make the RHS come out to SI units of power/area, so the Stefan-Boltzman constant, in SI, is given by:

