**Magnetic Susceptibility**

We’ll take a look at the electric, magnetic susceptibility, such as it is in a non-interacting file.

**Magnetic Susceptibility Definitions**

Same considerations go here. Our electric spins can have a response to an external magnetic field. But we’ll presume that they cannot interact with each other. So like above, there is no feed-back response yet. We’ll save that consideration for the e-e interaction file. Still, the feedback response is really small anyay, at least for typical metals. Definitely not for ferromagnetic materials. So we have the current induced by the magnetization,



We can take the Fourier transform of both sides,



Normally, we’d be definining,



And we still do. This definition doesn’t really presume interacting dipoles. For instance, the magnetization of a single dipole would still have to saturate, which phenomenologically wouldn’t happen if M were simply proportional to B. Then it could grow without bound as B does. Taking the Fourier transform. We have:



Then using,



And plugging this equation into the 1st we have:



and so,



**Appendix**

Should consider converting these susceptibilities back to SI. Well, basically you have to get χirr, reconvert it to ‘true’ fake Gaussian units by multiplying by 4π, and then do the unit analysis of multiplying it by factors of (4πε0)p(μ0/4π)q(ℏ)r (since we’ll be using fake Gaussian + Natural units). Well turns out we just need to multiply χirr, *overall*, by (4πε0)-1. Can see example in Non-equilibrium folder/Lindhard Properties.