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Magnetic Reconnection of Super-Strong Magnetic Fields in Magnetar Magnetospheres[1] DMITRI UZDENSKY, Princeton University/CMSO — Magnetic reconnection in magnetar magnetospheres, sometimes invoked to explain SGR giant flares, involves magnetic fields exceeding 10^{14} Gauss. When this magnetic energy is released, the energy density is so high that electron-positron pairs are inevitably created in copious quantities. The pairs make the reconnection layer optically thick to Thomson scattering, thereby trapping γ-photons. The plasma pressure inside the layer is then dominated by radiation with a temperature $aT^4 \sim B_0^2/8\pi$. Since the timescale for radiation diffusion across the layer is still shorter than the global (along the layer) Alfven transit time, the effects of radiative cooling on the thermodynamics of the layer need to be included. In addition, the high pair density makes the reconnection layer highly collisional, essentially independent of the upstream plasma density. This makes various collisionless effects negligible, so that resistive MHD (with both Spitzer and Compton resistivity) applies, suggesting a slow, Sweet-Parker-like reconnection rate.

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