PHOTO-HADRONIC PAIR CREATION IN MAGNETOSHPERIC CURRENT SHEETS OF ACCRETING BLACK HOLES

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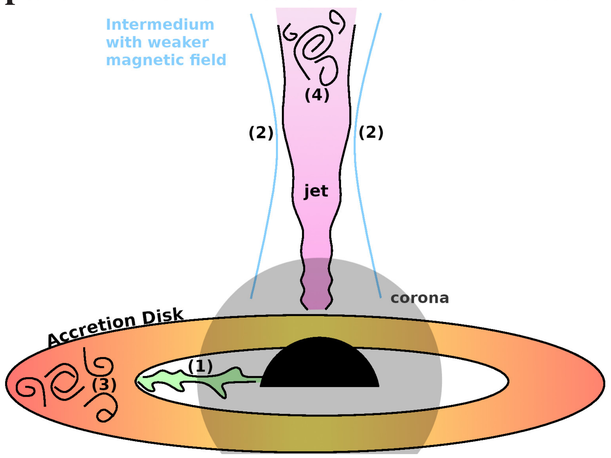
Do the $e^{\pm}$ pairs generated by proton-photon interactions play an important part in the formation of the corona?



Motivated by observational data and Particle-In-Cell simulations, we set up a model describing the corona:

Spherical corona with radius of R$\sim$ a few r_g

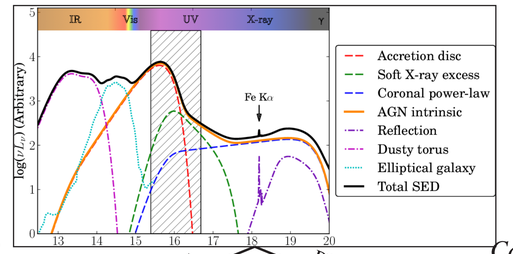
Broken PL proton energy density distribution, with $u_p = \eta_p u_B$

PL photon energy density distribution, with $u_X = \eta_X u_B$

Magnetic field energy density: $u_B = B^2/8\pi$ with $B = \left(L_X/\eta_X c \beta_{rec} R^2\right)^1$

Numerical Leptohadronic Code Used: *ATHEνA*

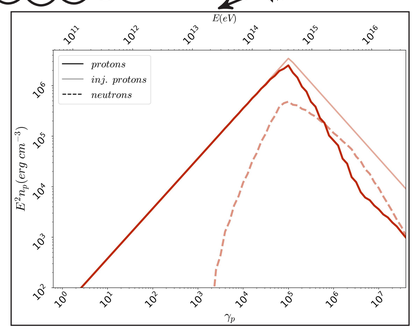
$$\sigma_p = \frac{B^2}{4\pi n_{p,cold} m_p c^2}$$

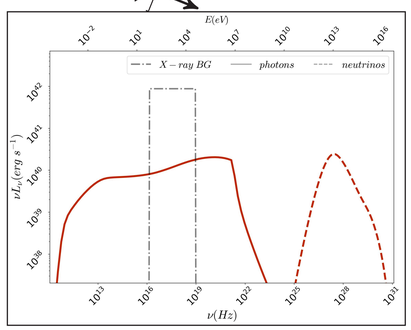


Collinson+, 2016

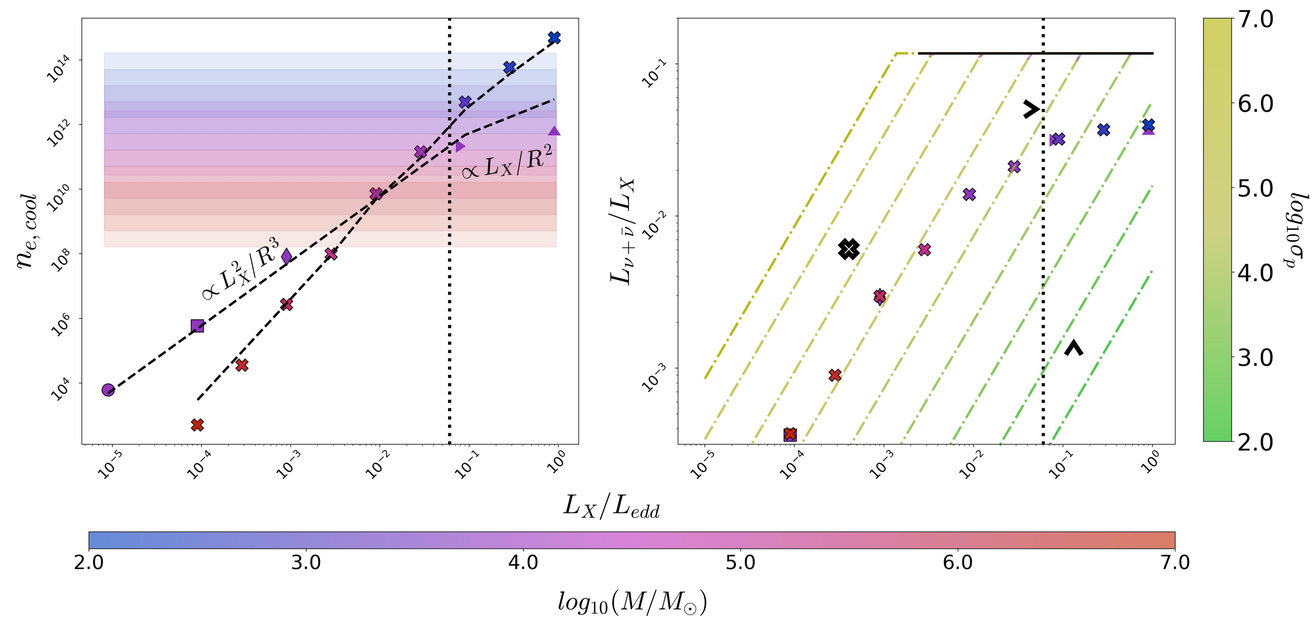
BPL p^+ energy dist. w/ peak at $\gamma_p = \sigma_p$

PL X-ray photon dist. $E \in [100eV, 100keV]$





WE FIND...



CONTACT INFORMATION

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1. An analytical formula describing the total cool pair number density ($n_{e,cool}$) produced by photomeson and Bethe-Heitler interactions that is verified by numerical simulations:
   - $n_{e,cool} \propto L_X^2/R^3$ for $L_X \ll L_{Edd}$
   - $n_{e,cool} \propto L_X/R^2$ else
2. Such pairs are a dominant component in the corona environment when the fraction corona luminosity (L_X) over the Eddington one is >0.01.
3. The fraction of the neutrino luminosity (L_ν) produced is proportional to L_X/L_{Edd} (Eddington ratio) when the Eddington ratio is less than 0.01 but becomes almost 0.1 otherv

Thank You!