年终总结

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List

1. Calculate the differential spectrum

2. Calculate the astrophysical factor

3. Multiwavelength analysis of Dark Matter annihilation

differential flux

◆ Flux from DM annihilation in a galaxy system

$$\frac{d\phi_\gamma}{dE_\gamma} = \phi_J^{PP}(E_\gamma) \times J(\Delta\Omega)$$

Particle Physics

$$\phi_J^{PP} = \frac{<\sigma\upsilon>}{8\pi} \frac{1}{M_\chi^2} \sum_f BR_f \frac{dN_\gamma}{dE_\gamma}$$

Astrophysical Factor

$$J_{ann.} = \iint \rho_{DM}^2(\vec{l})\, dl d\Omega$$

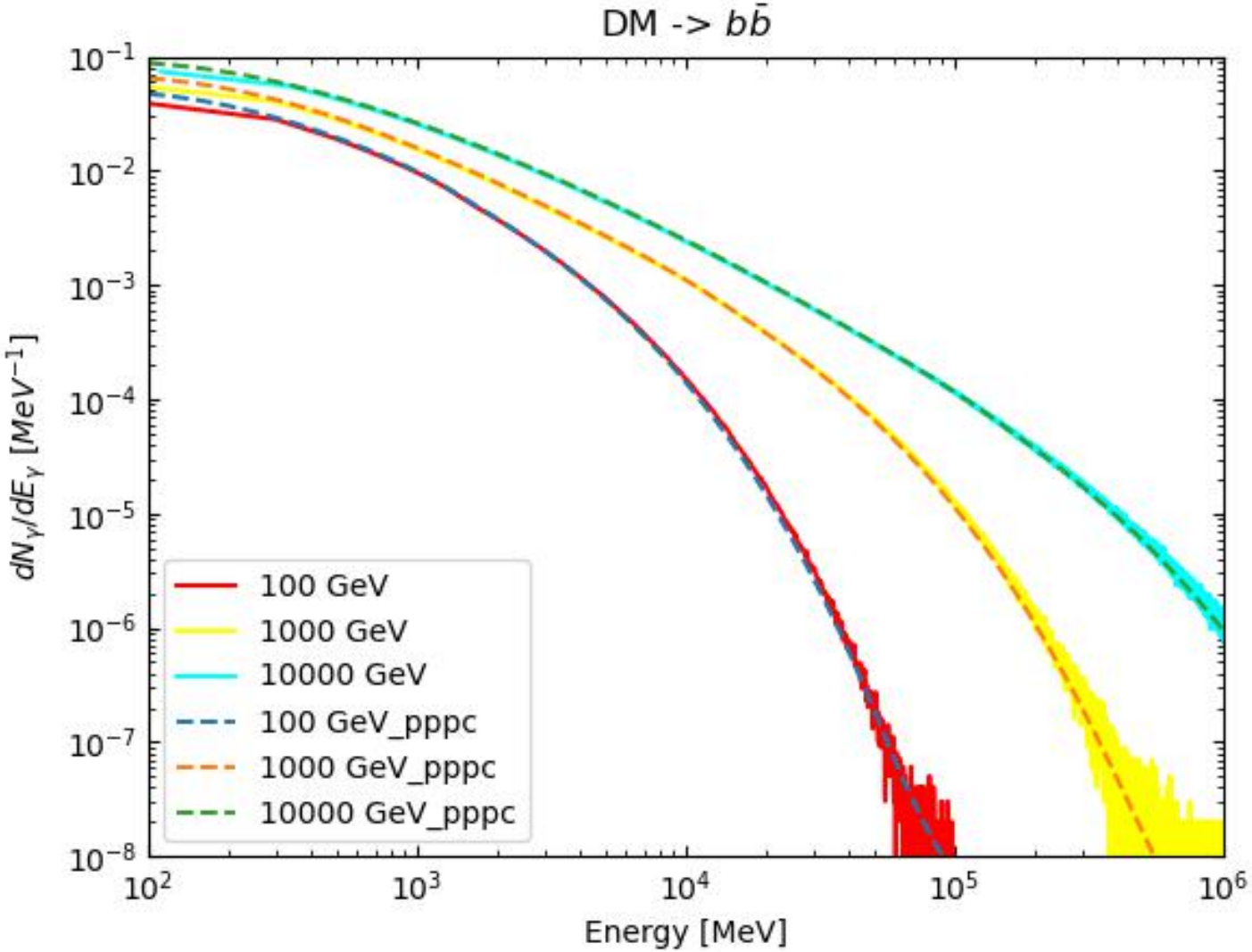
particle physics

$$\phi_J^{PP} = \frac{<\sigma\upsilon>}{8\pi} \frac{1}{M_\chi^2} \sum_f BR_f \frac{dN_\gamma}{dE_\gamma}$$

PYTHIA

PPPC 4 DM ID

differential spectrum



astrophysical factor

$$J_{ann.} = \int\int \rho_{DM}^2(\vec{l})\, dl d\Omega$$

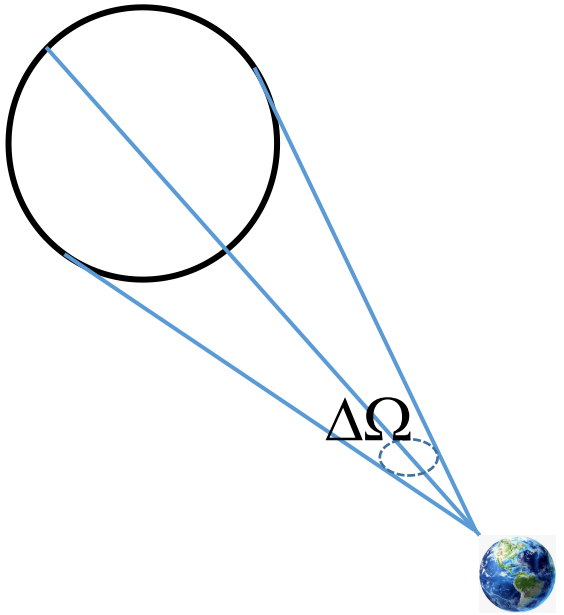
Collisionless Boltzmann equation → Jeans equation → $\sigma_r \propto \rho_{DM}^2$

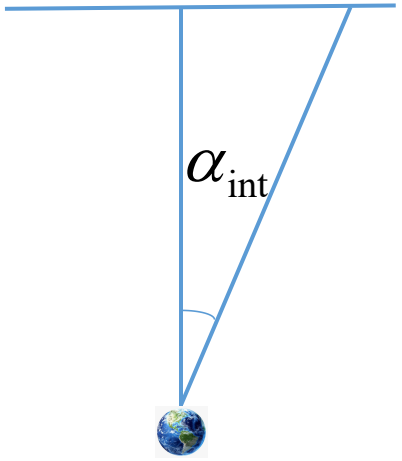
CLUMPY

Integration Angle

- Astrophysical factor is a function of solid angle

$$J = J(\Delta\Omega)$$

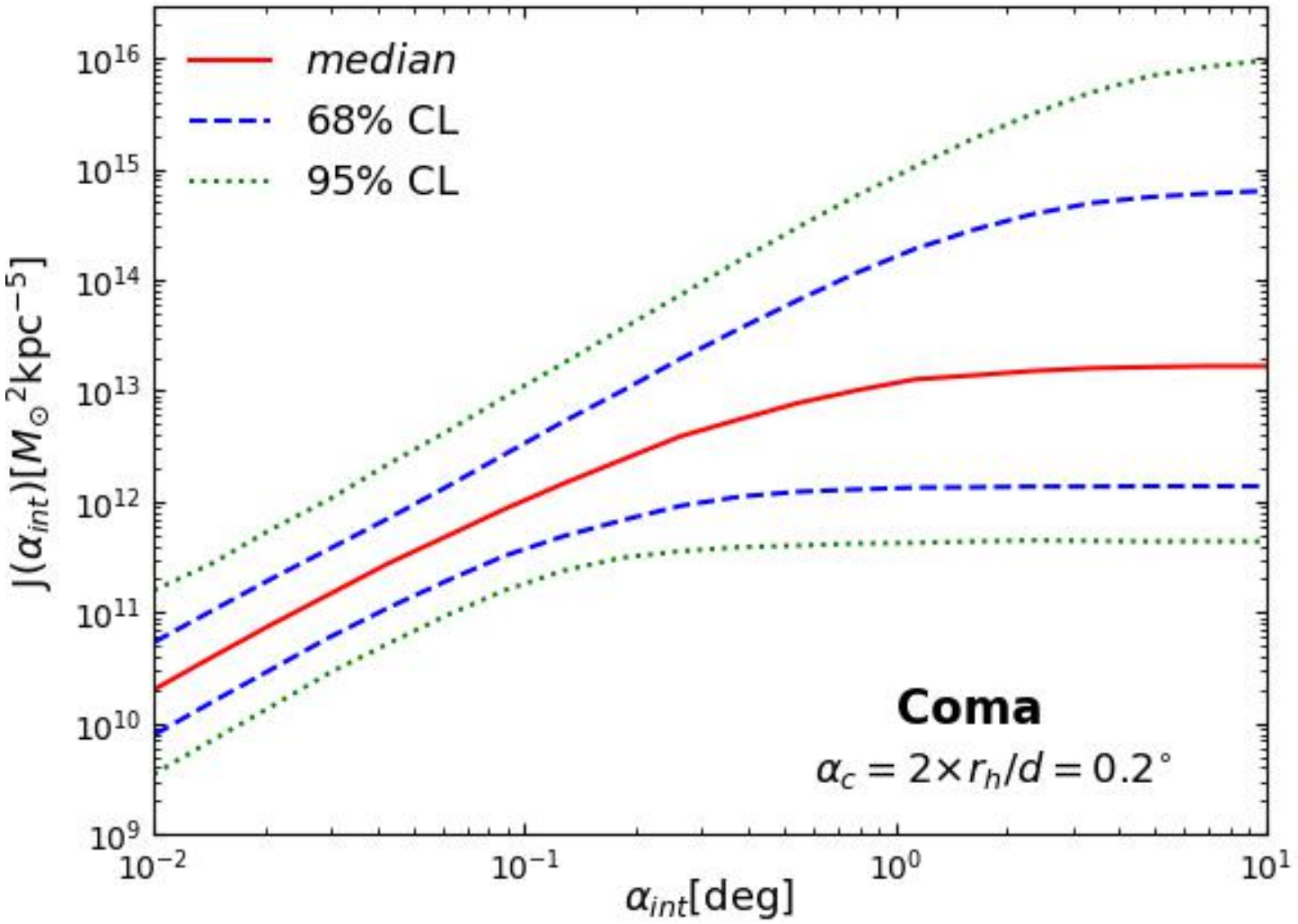




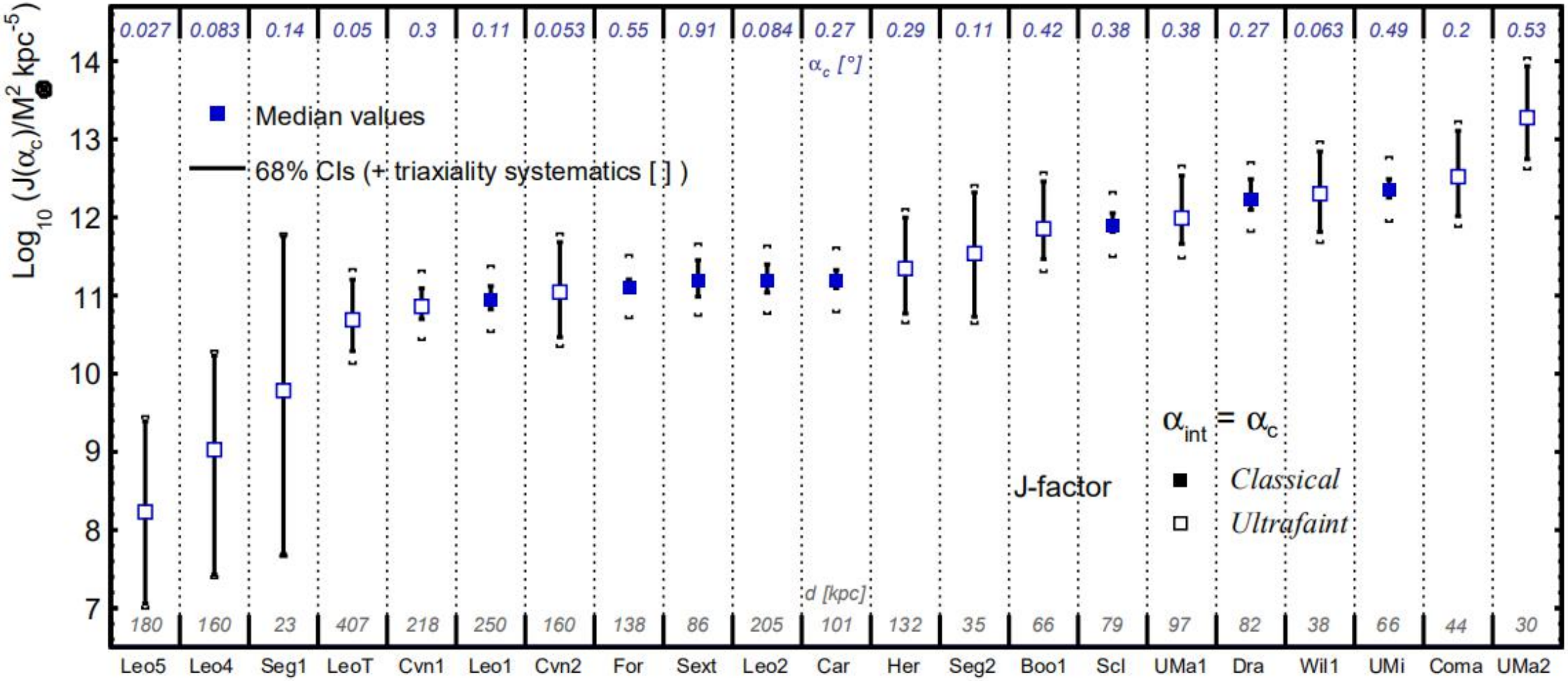
- Integration angle

$$\Delta\Omega = 2\pi \times [1 - \cos(\alpha_{\mathrm{int}})]$$

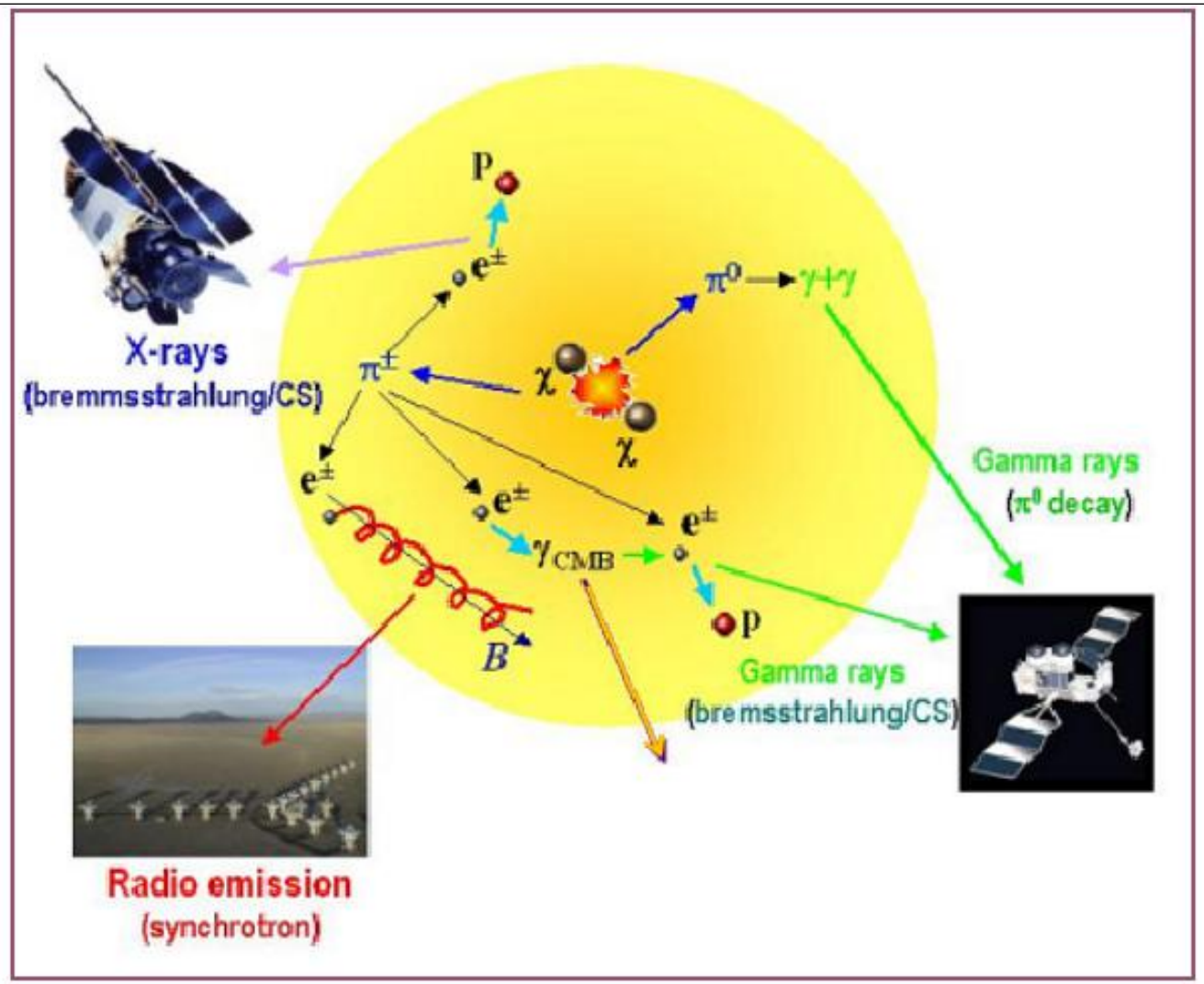
J factor (Coma Berenices)



Ranking the dwarfs with J factor



multiwavelength



三 diffusion equation

球对称扩散方程（有限空间）

$$\frac{\partial}{\partial t}\frac{\partial n_e}{\partial E} = \nabla[D(E,r)\nabla\frac{\partial n_e}{\partial E}] + [b(E,r)\frac{\partial n_e}{\partial E}] + Q(E,r)$$

$$D(E,r) = D_0 E^{\gamma}$$

$$Q(E,r) = \frac{<\sigma\upsilon>\rho_{\chi}^2(r)}{2M_{\chi}^2}\sum_f BR_f \frac{dN}{dE_{inj}}$$

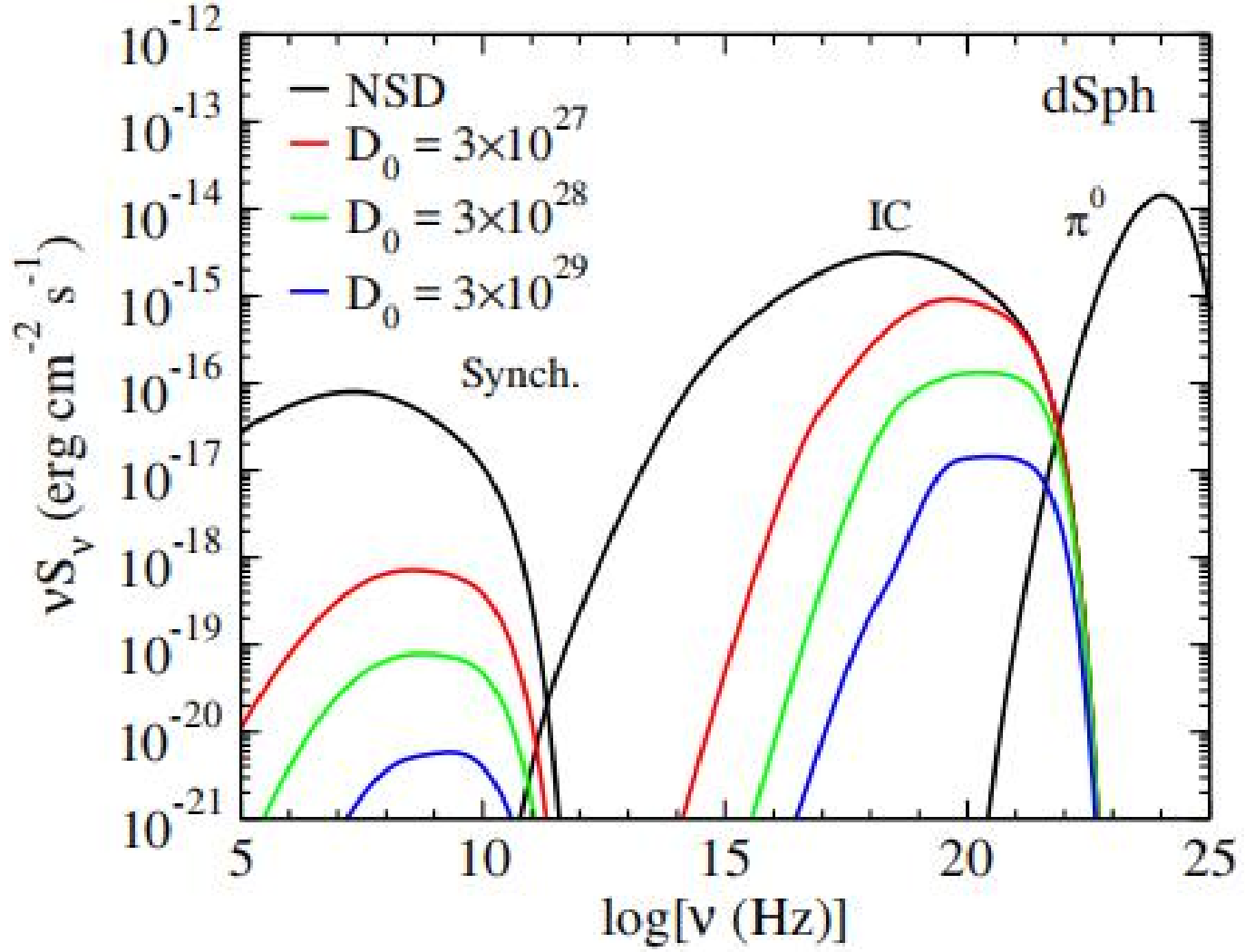
$$b(E,r) = b_{IC}(E) + b_{Synch.}(E,r) + b_{Coul.}(E) + b_{Brem.}(E)$$

$B_{mag.}$ ➡ Synchrotron

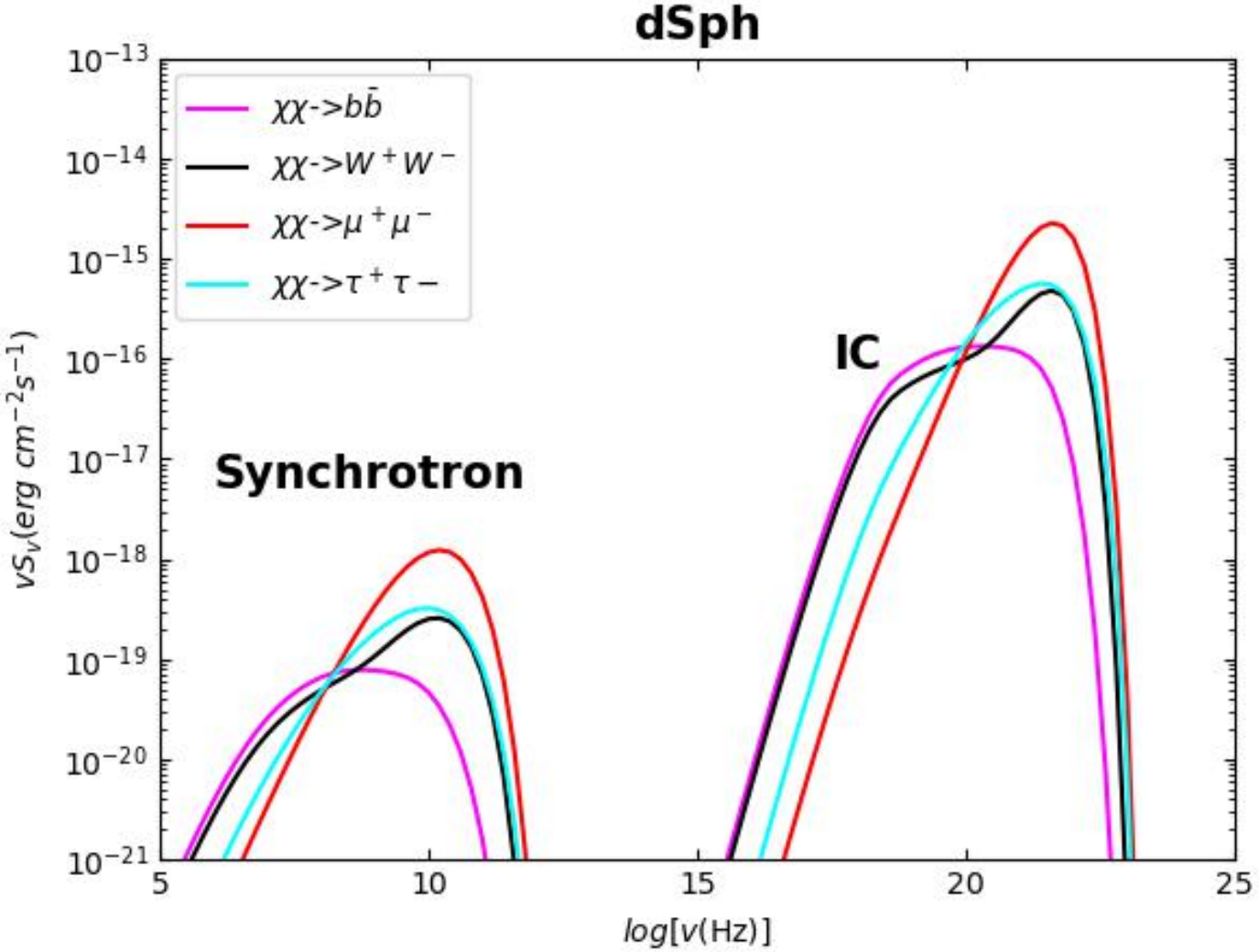
Inverse Compton scattering

RX-DMFIT

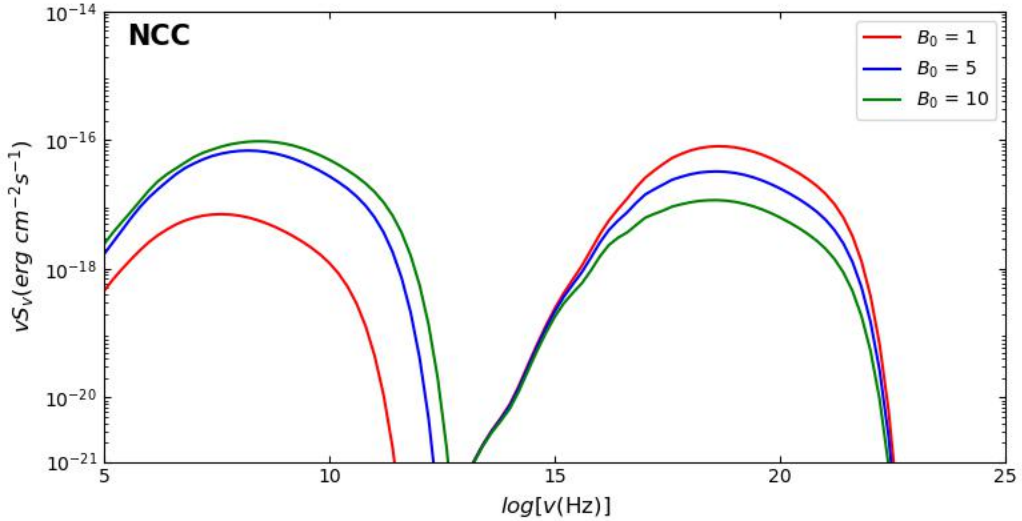
dwarf: diffusion

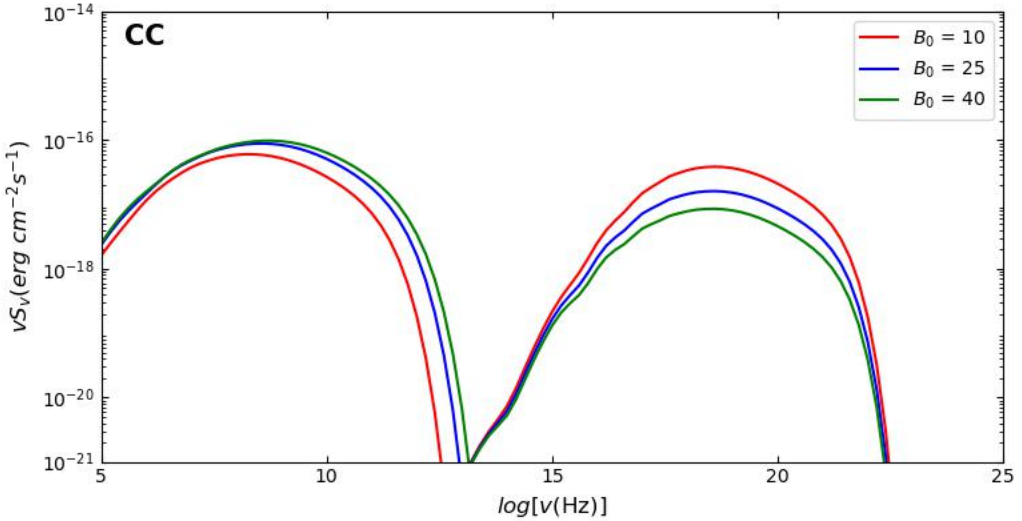


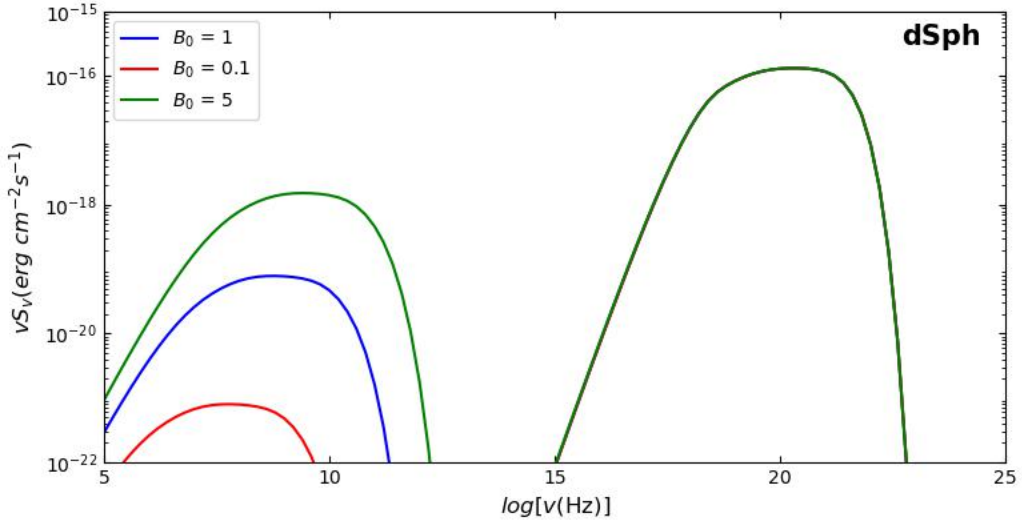
dwarf: annihilation channel

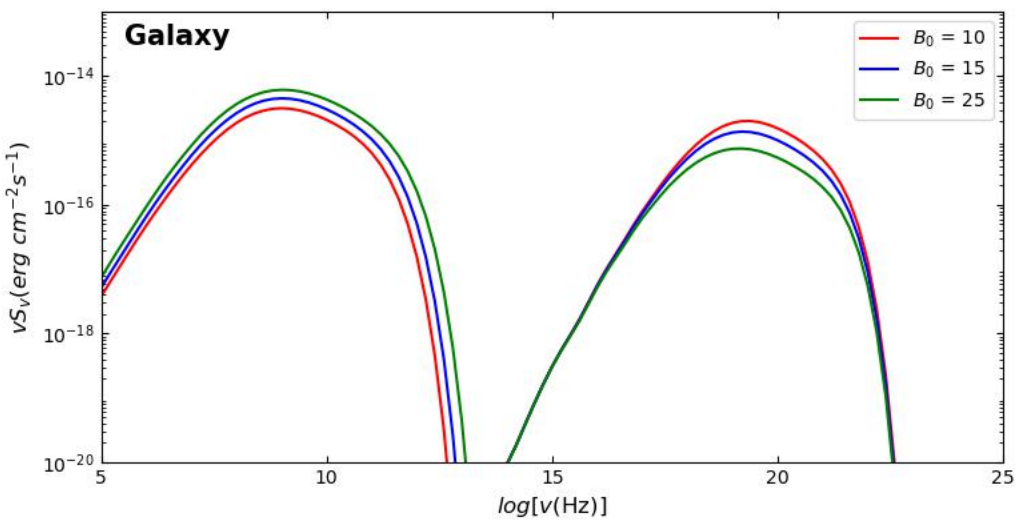


magnetic field









upper limits

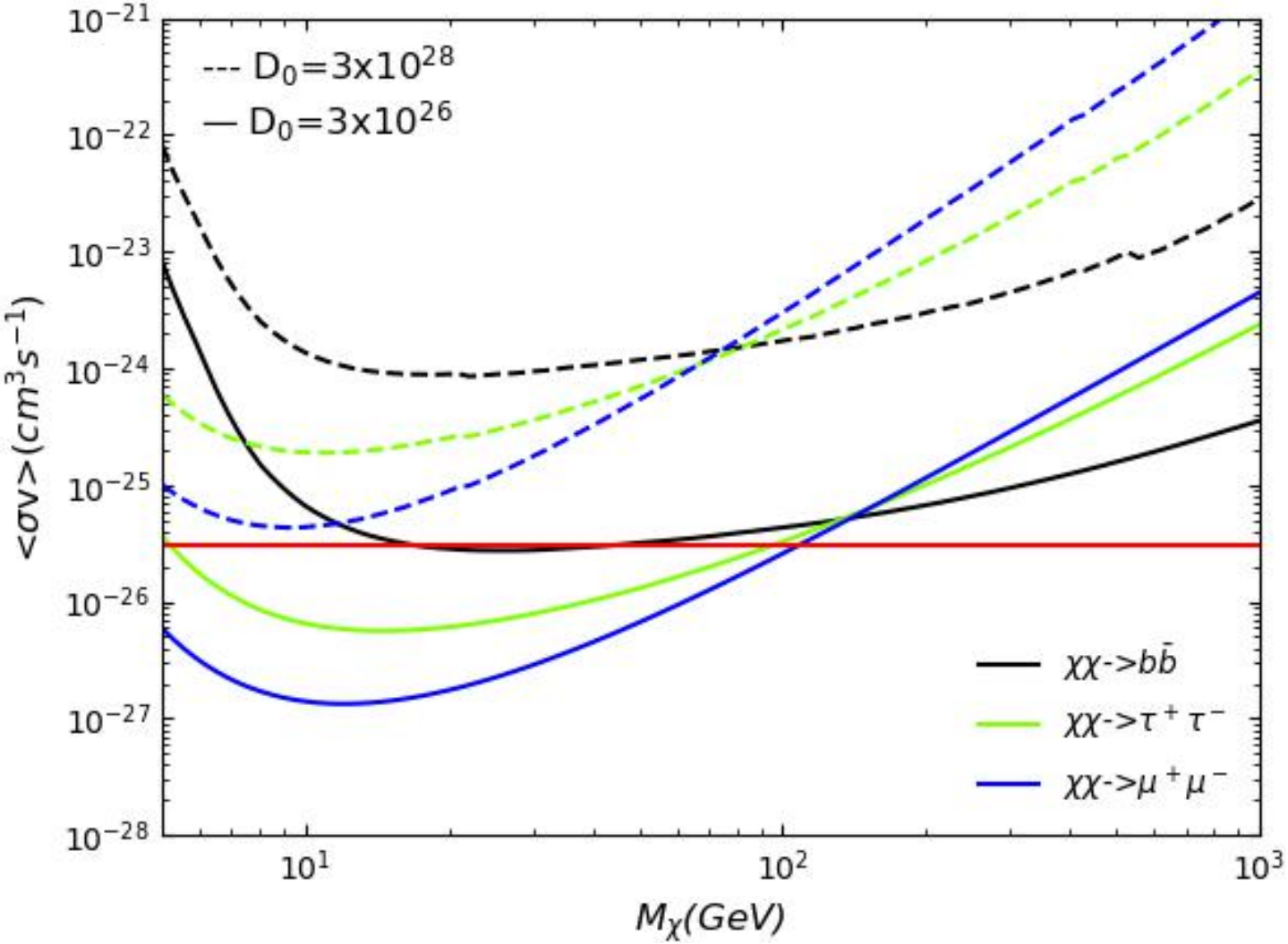
DarkSUSY provides the electron\positron injection spectrum, RX-DMFIT calculates the emissivity and flux with provided properties of the astrophysical system.

$$S\chi(v) = \frac{<\sigma\upsilon>}{M_{\chi}^{2}} S_{cal.}(M\chi, v)$$

with an observed upper limit flux density

$$<\sigma\upsilon> = M_{\chi}^{2} \frac{S_{obs.}(v)}{S_{cal.}(M\chi, v)}$$

constraint(1.4GHz, GBT, Segue I)



future

1. FAST data analysis

2. WIMP and Axion