

Dark Matter Searches in Dwarf Spheroidal Galaxies with CTA — UPDATE 2019 Oct 22

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Classical Dwarf spheroidal galaxies: promising targets for DM detection





Dwarf Spheroidal Galaxies: Growing number of known targets



2019 Oct 22 update



- In-house calculation of astrophysical factors for DM annihilation and decay in dSphs
 - Optimal candidates selected after Jeans analysis with CLUMPY v3.0.1: Draco I (classical N), Coma Berenicis (ultra-faint N), Sculptor (classical S), Reticulum II (ultrafaint S)
 - 2D maps of J/D-factors computed up to 10^o f.o.v. for both cuspy (Einasto) and cored (Burkert) DM density profiles







 α_{int} [deg]

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 Clumpy input data: surface brightness profile + kinematics of member stars of dSphs

surface brightness fitted by projecting
3D Zhao-Hernquist luminosity profiles
on 2D literature data

$$\Sigma^{*}(R) = 2 \int_{R}^{+\infty} \rho^{*}(r) \frac{r dr}{\sqrt{r^{2} - R^{2}}}$$
$$\rho^{*}(r) = \frac{\rho_{s}^{*}}{\left(\frac{r}{r_{s}^{*}}\right)^{\gamma^{*}} \left[1 + \left(\frac{r}{r_{s}^{*}}\right)^{\alpha^{*}}\right]^{\frac{\beta^{*} - \gamma^{*}}{\alpha^{*}}}}$$

results are profile quantities (scale luminosity density, scale radius, exponents) to be passed to CLUMPY as fixed parameters



Two classes of dSphs: classical and ultra-faints;

stellar memberships for classical dSphs + Seg 1 estimated through an EM algorithm (Walker+ 2009) with confidence cut at P > 0.95;

binary (0/1) stellar membership for 0 ultra-faint dSphs taken from the literature for each target;

Membership for Seg 1 at risk 0 of contamination by highvelocity stars!



2019 Oct 22 update

- Prospects on detection of DM signals in dSph halos with CTA
 - 100-h observations simulated for each individual targets with CTOOLS v1.6.2
 - Signal analysis in 4 SM channels ($b\overline{b}, \tau^+\tau^-$, $\mu^+\mu^-$, Z^0Z^0) with average 50-h IRFs at small Z.A. from Prod3b-v1 (North z20 average 50h and South z20 average 50h)
 - Analysis setup fully compliant with the DMEP document on DM searches with CTA
- Status of the KSP paper
 - Manuscript writing in progress (slowed down by applications for working positions, and even by a theft of computers!)
 - Deadline for completion: before December 2019 (to be respected)



10-26

10

 10^{-2}

Coma Berenices, channels, t=100h

bĐ



103

m_{DM} (GeV)

104

105

