Universidad Autónoma de Madrid

Instituto de Física Teórica UAM-CSIC

MULTIDARK
Multimessenger Approach for Dark Matter Detection

GAMMA-RAY DM SEARCHES CIRCA 2026:
STATUS AND FUTURE PROSPECTS

Miguel A. Sánchez-Conde

Departamento de Física Teórica & Instituto de Física Teórica IFT UAM/CSIC
Universidad Autónoma de Madrid

miguel.sanchezconde@uam.es

Visible matter is just the tip of the iceberg

Credit: Hubble Ultra Deep Field – NASA

Observational evidence of dark matter (DM)

Galactic scales

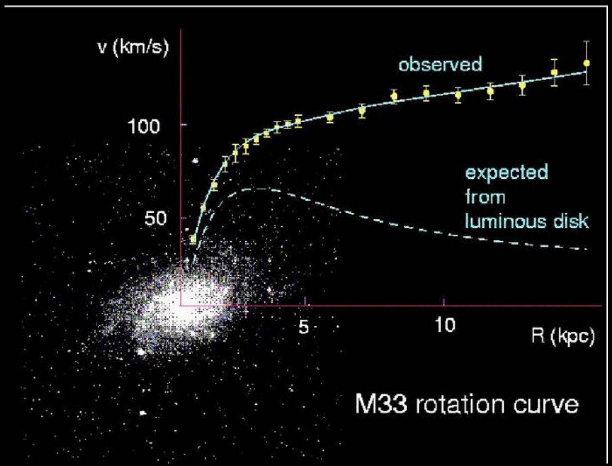
a) Rotation curves of spirals
b) Weak lensing
c) Velocity dispersions of satellite galaxies
d) Velocity dispersions in dSphs

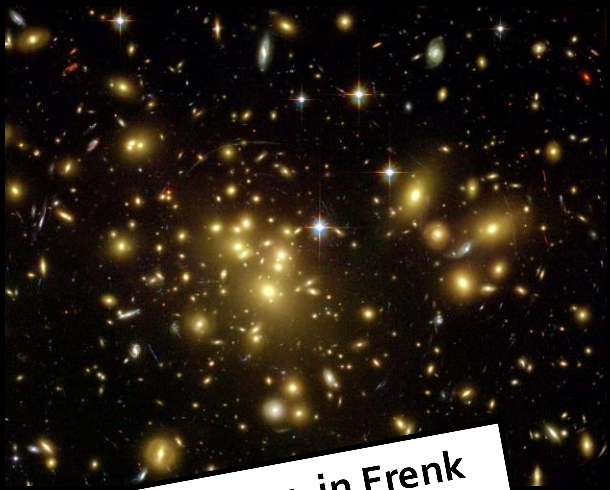
Galaxy clusters scales

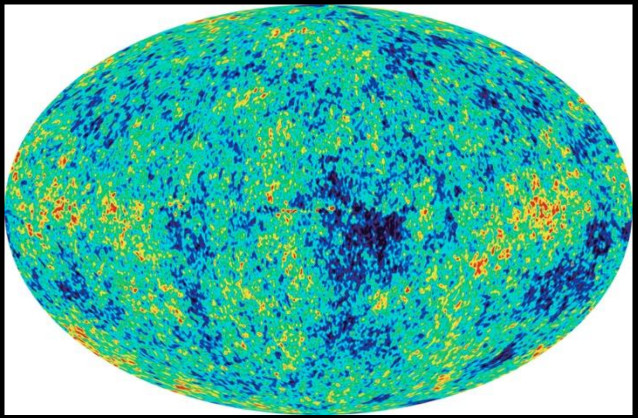
a) Velocity dispersions of individual galaxies
b) Strong and weak lensing
c) Peculiar velocity flows
d) X-ray emission

Cosmological scales

a) CMB anisotropies
b) Growth of structure
c) LSS distribution
d) BAOs
e) SZ effect







More e.g. in Frenk and Tutusaus's talks

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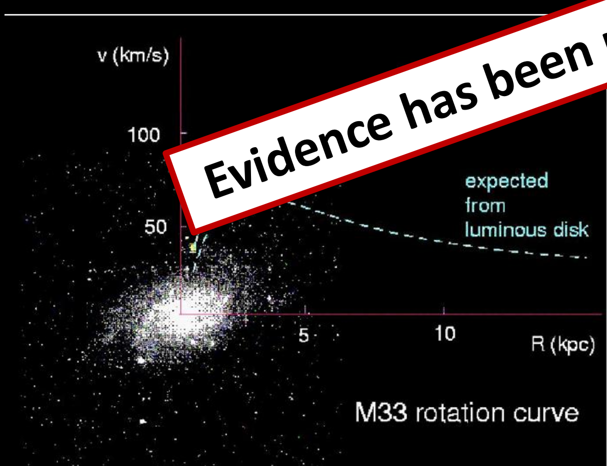
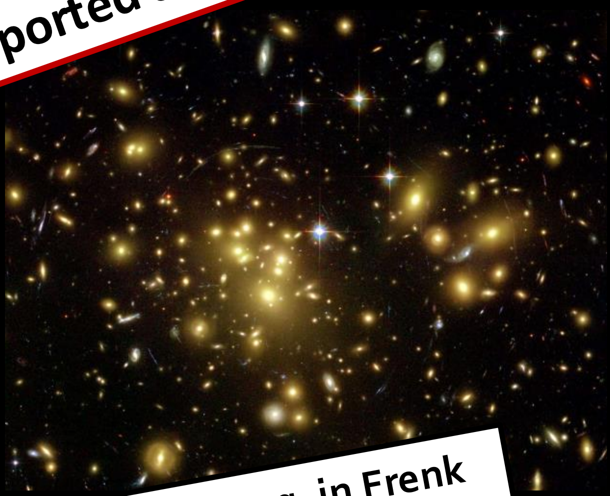
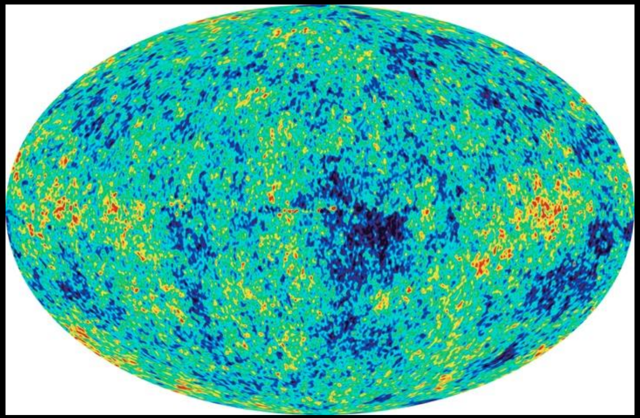
Evidence has been reported at all scales, but is only astrophysical as of today.







More e.g. in Frenk and Tutusaus's talks

What could the DM be made of?

Most of the matter in the Universe must be in the form of **non-baryonic DM.**

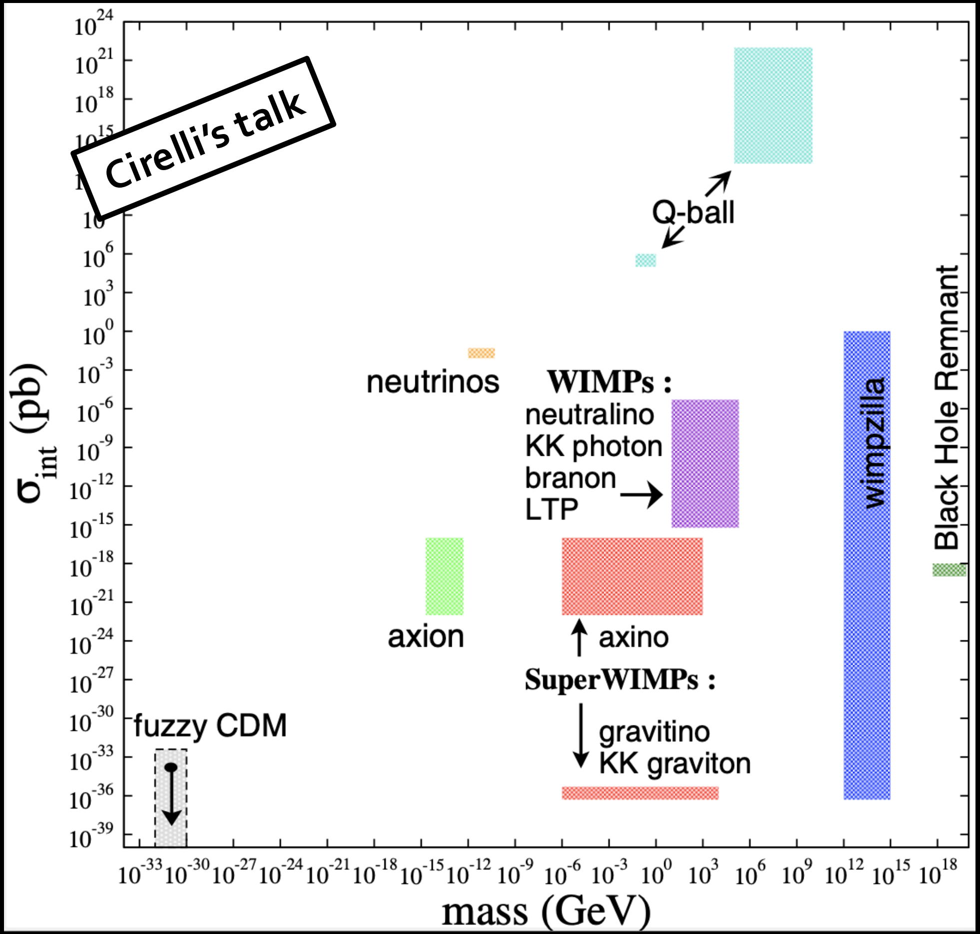
Requisites:

1) Non-baryonic.
2) No electromagnetic interactions.
3) Stable or very long-lived.
4) Cold (for structure formation).
5) Reproduce the observed relic abundance.

- No viable candidate in the Standard Model

  The neutrino, the only non-baryonic DM candidate known to exist, is excluded.

- Huge plethora of possible candidates beyond the Standard Model



[DMSAG 2007; Baer+14; Conrad+17]

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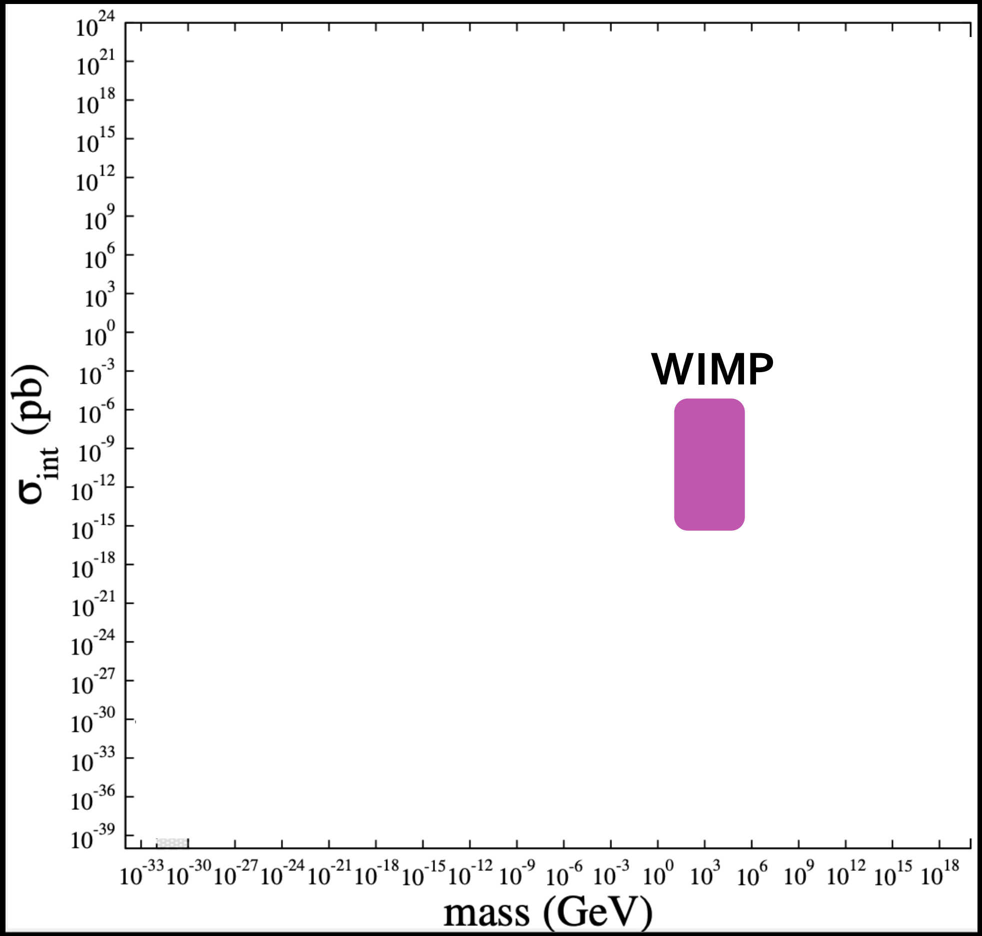
THIS TALK

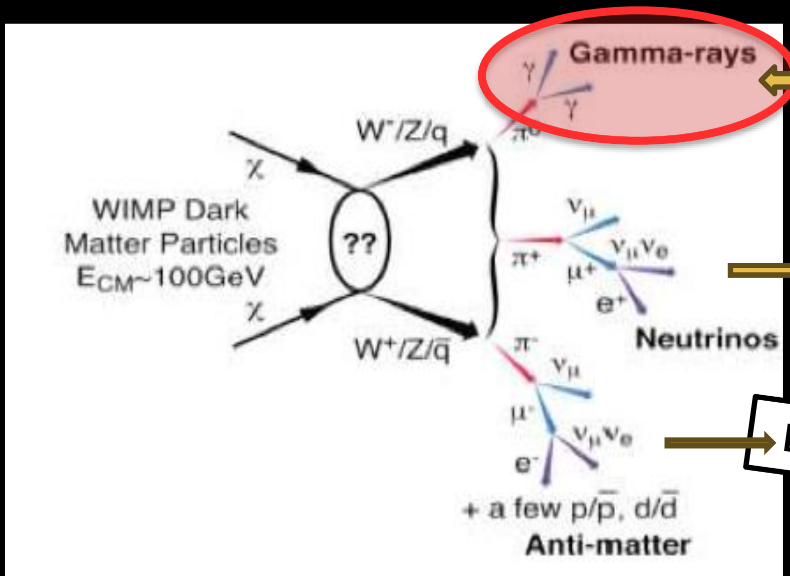


Hypothetical massive (GeV-TeV) particle,
that interacts weakly (and gravitationally!),
and naturally explains DM via thermal freeze-out.

[DMSAG 2007; Baer+14; Conrad+17]

‘Indirect’ WIMP searches via gamma rays

If dark matter (DM) is made of WIMPs→ annihilations (and decays) in gamma rays



THIS TALK!

Zornoza’s talk

De la Torre’s talk

Fermi LAT
[>2008]

LHAASO
[>2023]

MAGIC
[>2003]

HESS
[>2002]

VERITAS
[>2006]

HAWC
[>2015]

The WIMP-induced gamma-ray (annihilation) flux

$$F(E_\gamma > E_{th}, \Psi_0) = J(\Psi_0) \times f_{PP}\left(E_\gamma > E_{th}\right)$$

photons cm^{-2} s^{-1}

Astrophysics

Particle physics

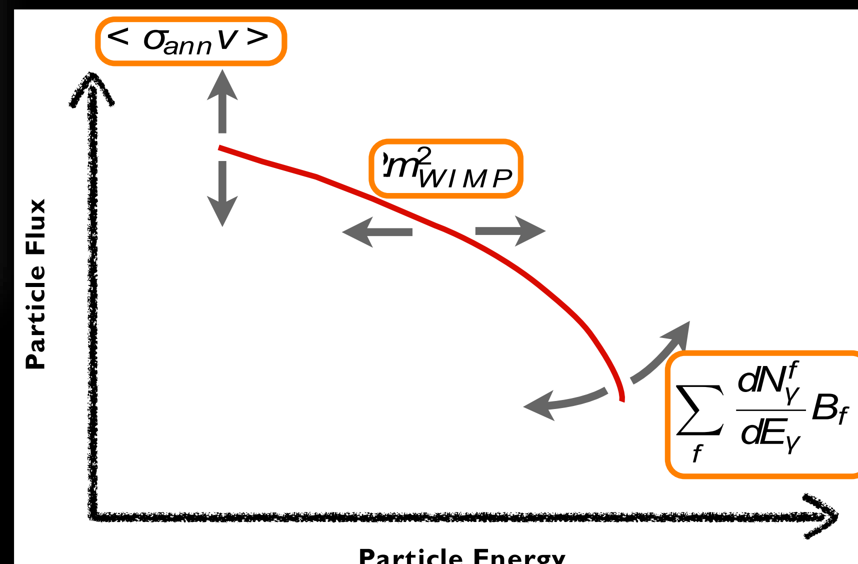
l.o.s. integration of the squared DM density

$$J(\Psi_0) = \frac{1}{4\pi}\int_{\Delta\Omega} d\Omega \int_{l.o.s.} \rho_{DM}^2[r(\lambda)]\,d\lambda$$

"J-factor"

$$f_{PP} \propto \sum_f \frac{dN_\gamma^f}{dE_\gamma} B_f \frac{\langle \sigma v \rangle}{m_\chi^2}$$

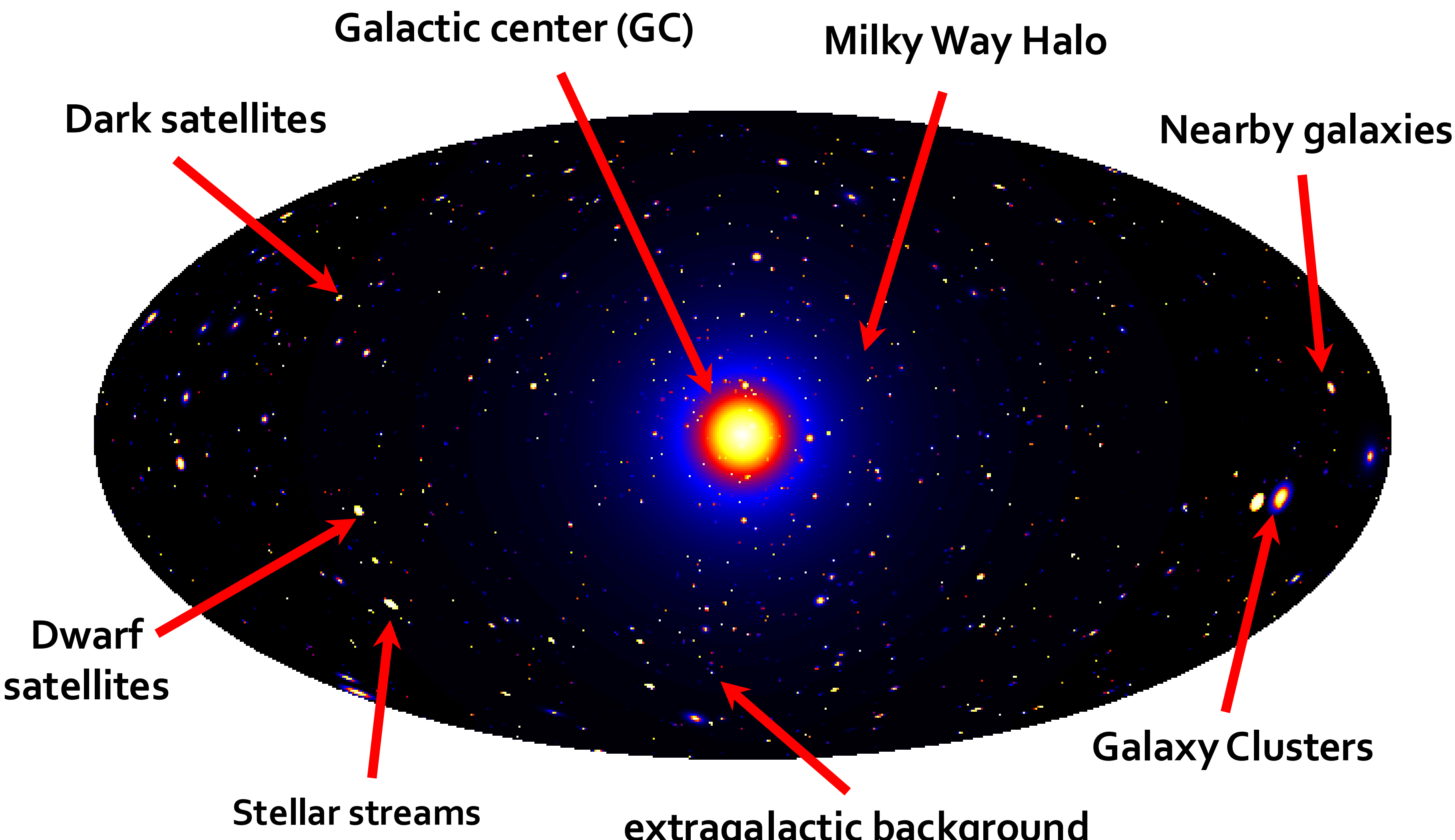
- N_γ : ph / annihilation
- $<\sigma v>$: cross section
- m_χ: WIMP mass
- b_f : branching ratio



Where to search? E.g.:

- Galactic center
- Dwarf spheroidal galaxies
- Local galaxy clusters
- Nearby galàxies
- Etc

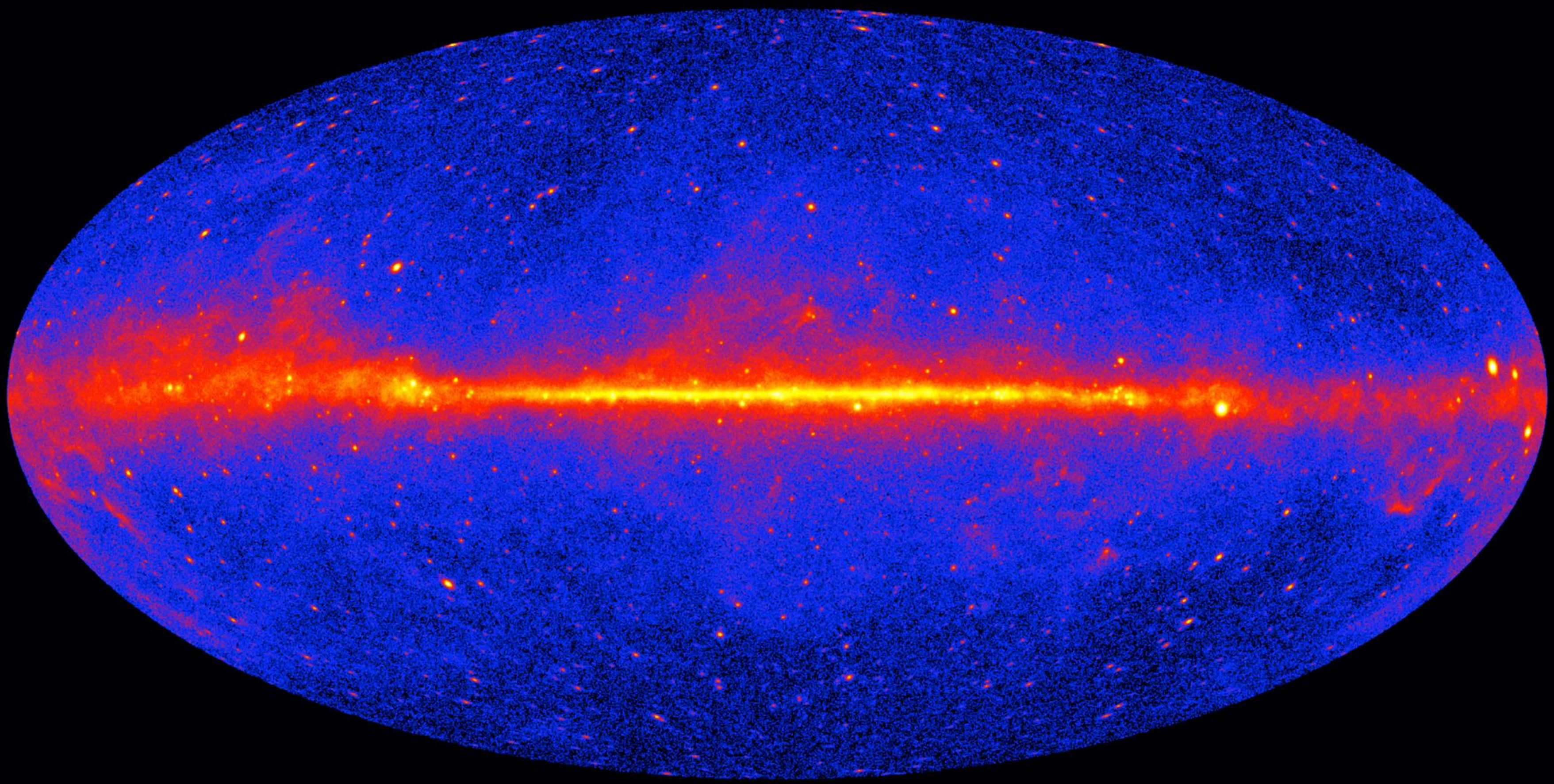
DM targets and signal predictions



DM-only simulation (Pieri+09)

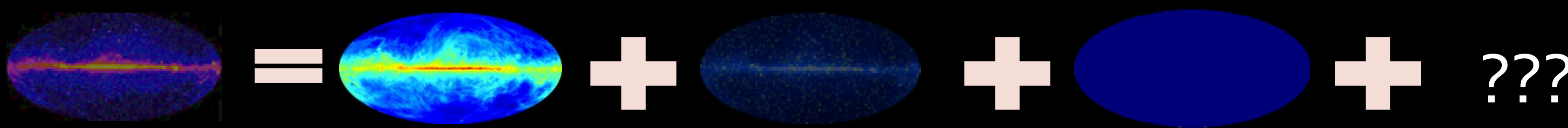
The gamma-ray sky

as seen by Fermi LAT above 1 GeV



https://fermi.gsfc.nasa.gov/

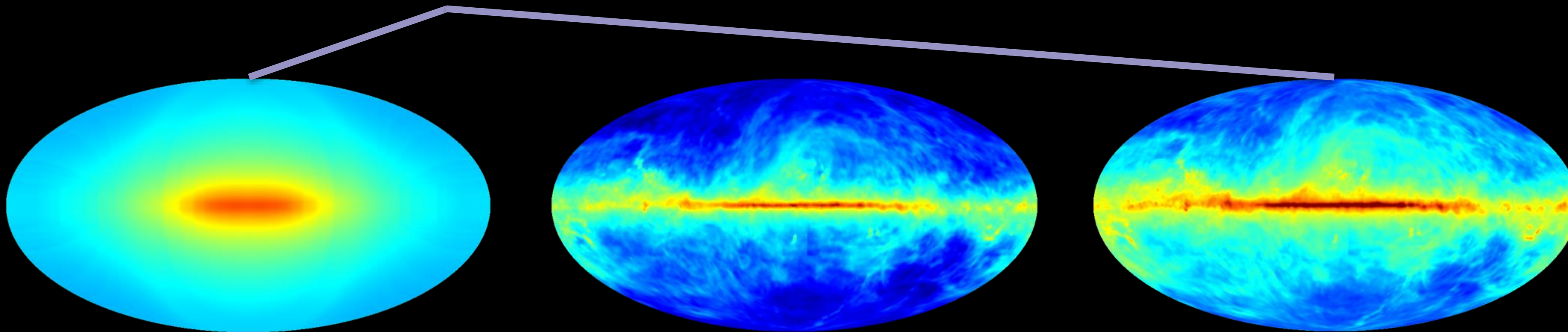
The complexity of the gamma-ray sky



Galactic

Point Sources

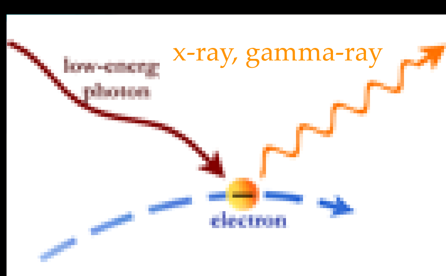
Isotropic

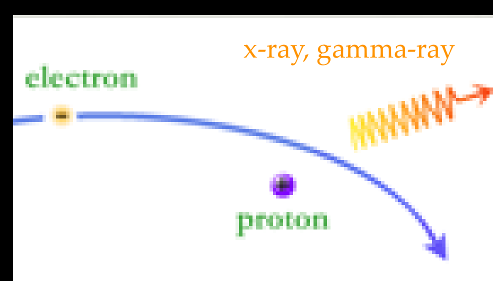


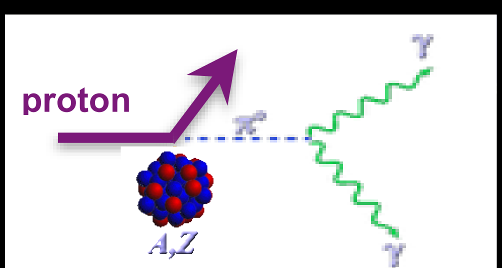
Inverse Compton

Bremsstrahlung

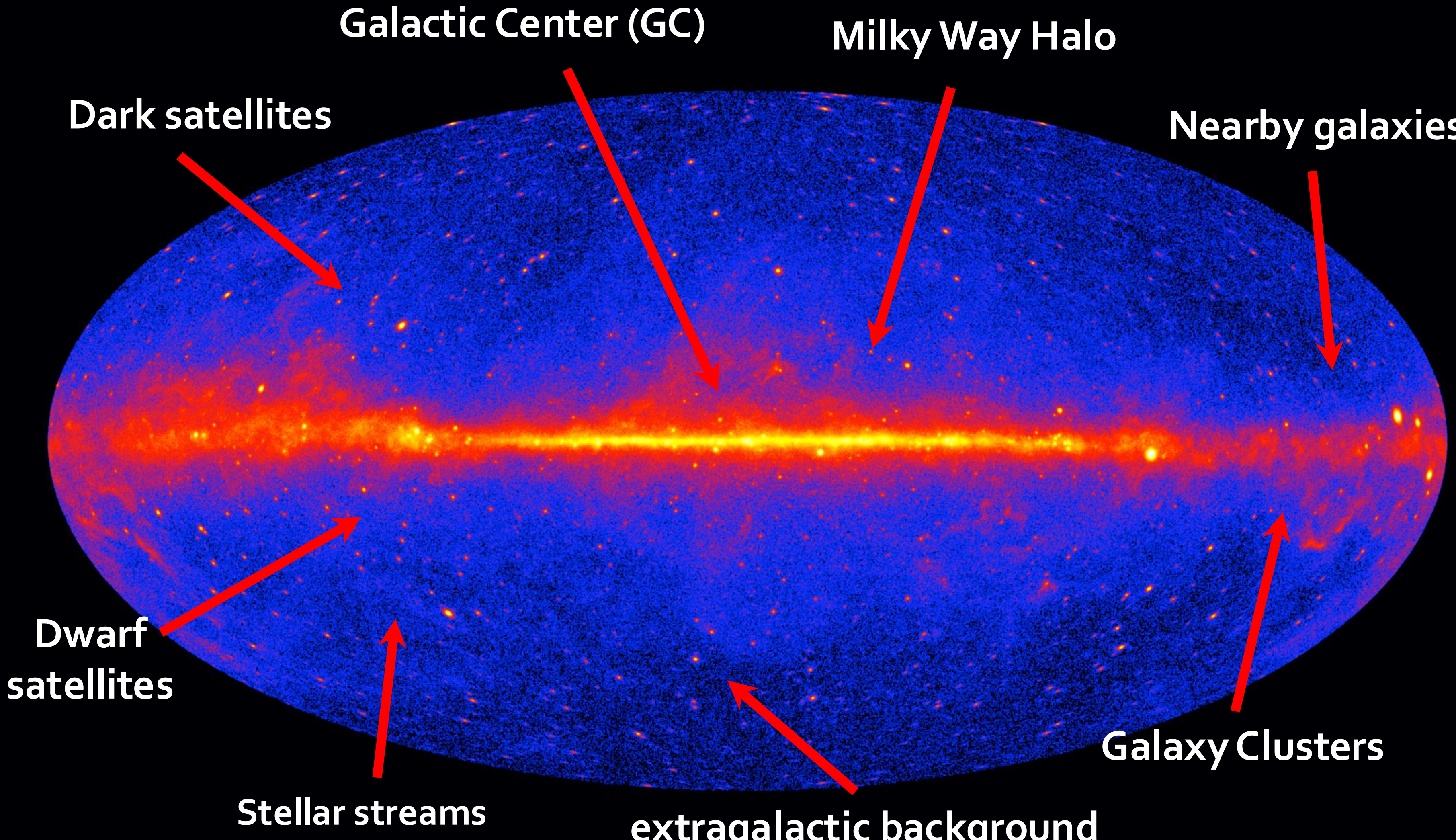
π^0 decay







Astrophysical vs DM-induced signals



https://fermi.gsfc.nasa.gov/

Need to disentangle dark matter annihilations from 'conventional' astrophysics.

Crucial to understand the astrophysical processes in great detail.

γ-ray DM searches today

No unambiguous signals found.

(Several hints/claims in the past though.)

MAIN BATTLEGROUNDS

A personal selection of recent highlights

[GALACTIC CENTER, DWARF GALAXIES, and others beasts]

'GeV excess' (GCE) in the GC

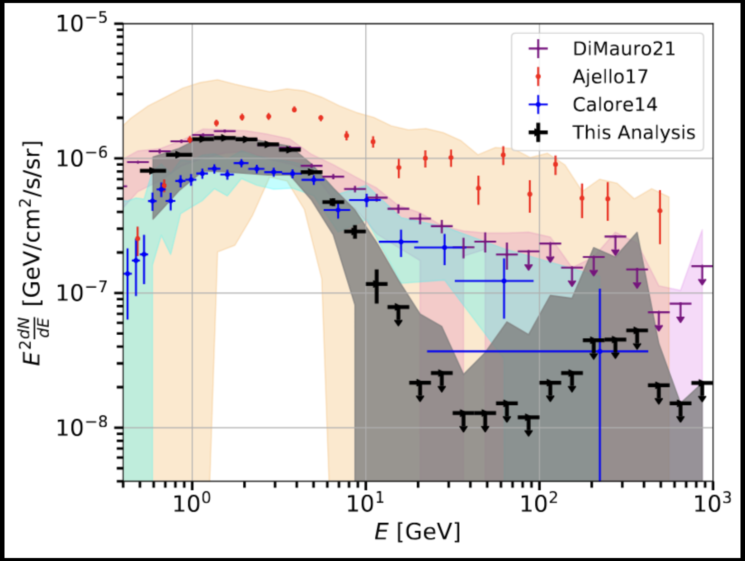
(e.g., Goodenough & Hooper 09, 11; Gordon+13; Daylan+14, Abazajian+14, Calore+14; Gordon & Macías 14, Ajello+16, Ackermann+17; di Mauro+21;26)

The excess is real and statistically significant. No debate.

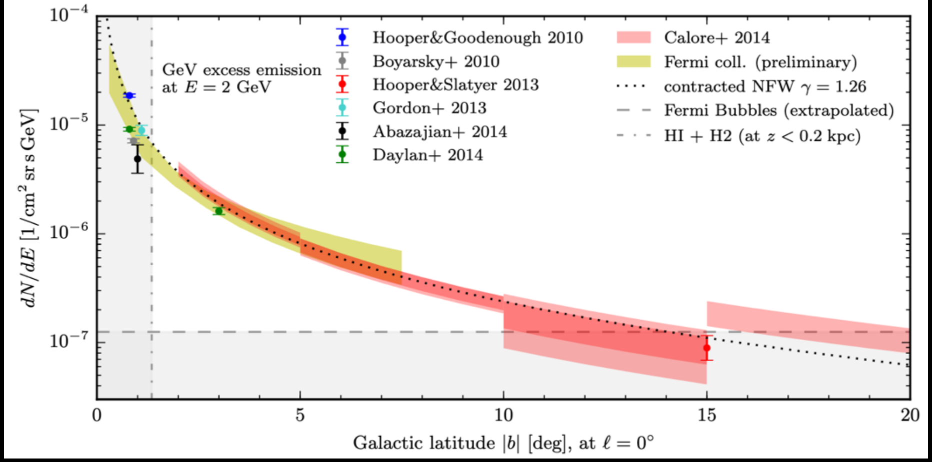
- Observed consistently in Fermi-LAT data for >15 years.
- Bright, spatially extended gamma-ray excess above standard diffuse models.
- Robust to variations of the diffuse models (its existence, not its details).
- Interpretation difficult due to complicated astrophysical fore/backgrounds.

Spectrum peaks at ~3 GeV, falls off at higher energies, O(50-100 GeV).

Spatially very extended (10-20°, ~kpc scale), centered on the GC, nearly spherical.



[di Mauro 2026]



[Calore+14]

GCE *ca.* 2026: the debate

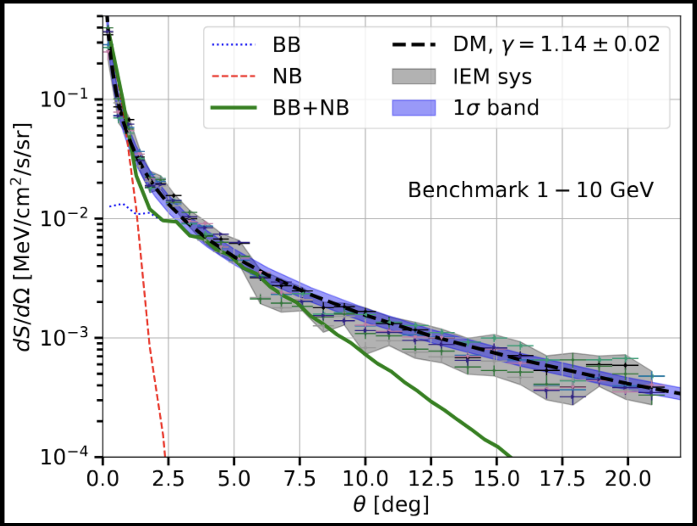
(e.g., Bartels+18; Macias+18; Buschmann+20; Leane&Slatyer 20; di Mauro+21;26; Zhong+24; Song+24; Malyshev+25; Ramírez+25; Holst&Hooper 25)

Excess is robust. Precise properties are not.

- Morphology: spherical vs bulge-like; central battleground today.
- Granularity: Point-source vs smooth emission.
- Systematics: Role of diffuse background systematics.
- Interpretation: DM vs Millisecond Pulsars (MSPs) vs mixed scenario.

DM ANNIHILATION

- gNFW, $\gamma \sim 1.1 - 1.3$.
- Approx. half the thermal cross section.
- 10-100 GeV WIMPs.

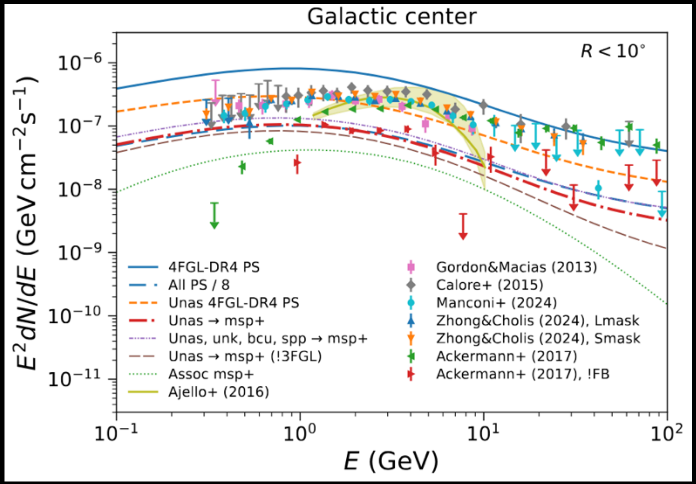


[di Mauro 26]

MSPs

- Unresolved MSPs can reproduce spectrum, spatial extension, source-count statistics.
- Required number may be too large, O(10^3).
- Luminosity function suggests some tension.

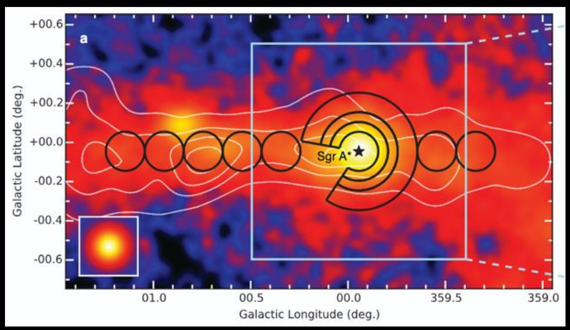
[Malyshev 25]



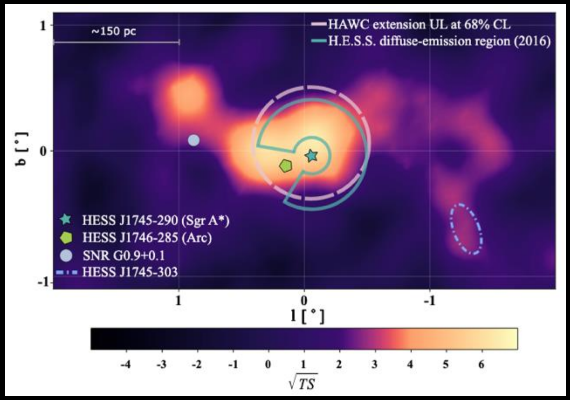
The GC region @TeV-PeV energies

FACTS

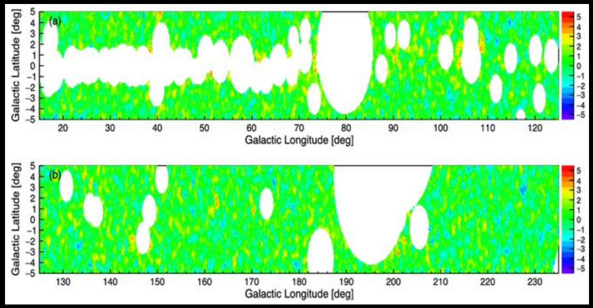
- TeV regime: central bright source coincident with Sgr A* (HESS J1745-290) and diffuse emission along Galactic ridge.
- PeV regime: diffuse Galactic emission up to ~1 PeV and many sub-PeV sources.



HESS @ 0.2-40 TeV
[Abramowski+16]



HAWC @ 1-100+ TeV
[Albert+24]



LHAASO @ 0.5TeV - PeV
[Cao+23]

DEBATE

- Precise origin of the >10 TeV central emission (hadronic vs leptonic).
  - DM not preferred: only viable in tuned DM models and spike-enhanced scenarios.
- Existence and shape of potential DM spikes (e.g. Zuriaga-Puig+23).
- Possible DM contribution to PeV diffuse emission (DM not required but gives constraints)

The Fermi-LAT GCE has transitioned
from a discovery problem to a degeneracy problem.

In 2026, the limiting factor is not statistics
but our ability to model the inner Galaxy.

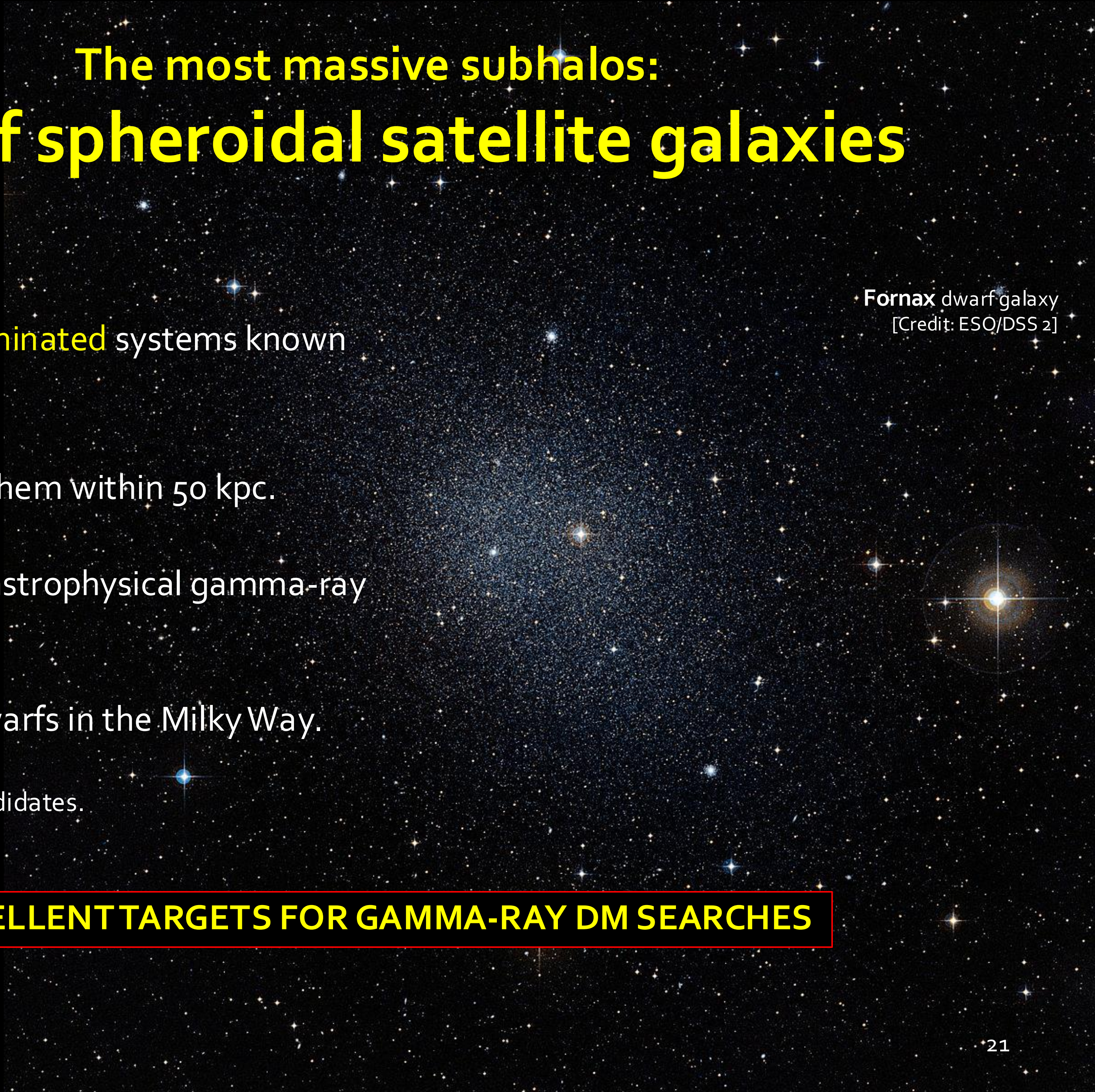
The GC is a complicated place.

Can other targets provide an independent test of the GeV excess as being due to DM?

The most massive subhalos:
Dwarf spheroidal satellite galaxies

- The most DM dominated systems known in the Universe.
- Close: several of them within 50 kpc.
- Free from bright astrophysical gamma-ray sources.
- ~60 confirmed dwarfs in the Milky Way. More on the way!
  - 80-100 more candidates.

EXCELLENT TARGETS FOR GAMMA-RAY DM SEARCHES



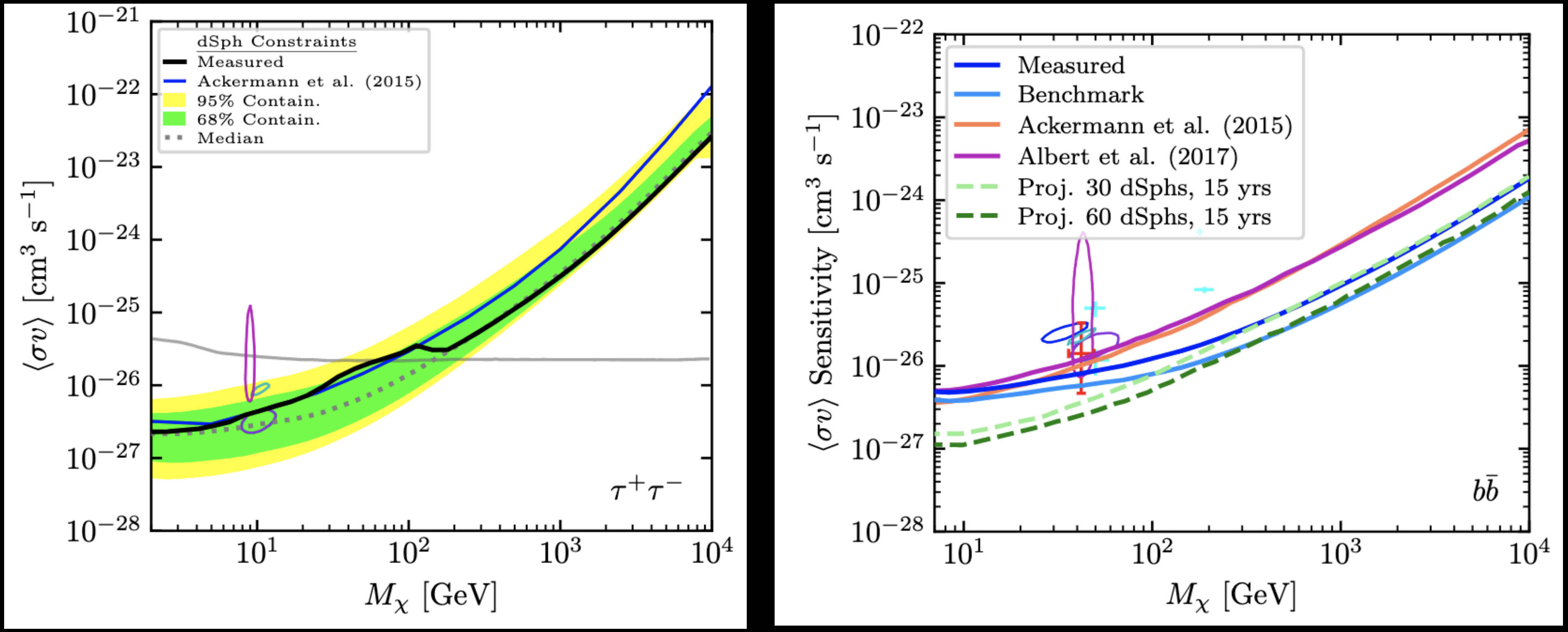
Fornax dwarf galaxy
[Credit: ESO/DSS 2]

Fermi-LAT 'legacy' dwarf DM analysis

[McDaniel et al. (2024) – arXiv:2311.04982; PRD 109 (2024) 063024]

- No signal found in the direction of ~50 dwarfs.
  → Most significant excesses are < 1σ (global).
- DM limits exclude thermal WIMPs below ~100 GeV (depending on channel).

→ Dwarfs as a test of the GCE



[McDaniel+24]

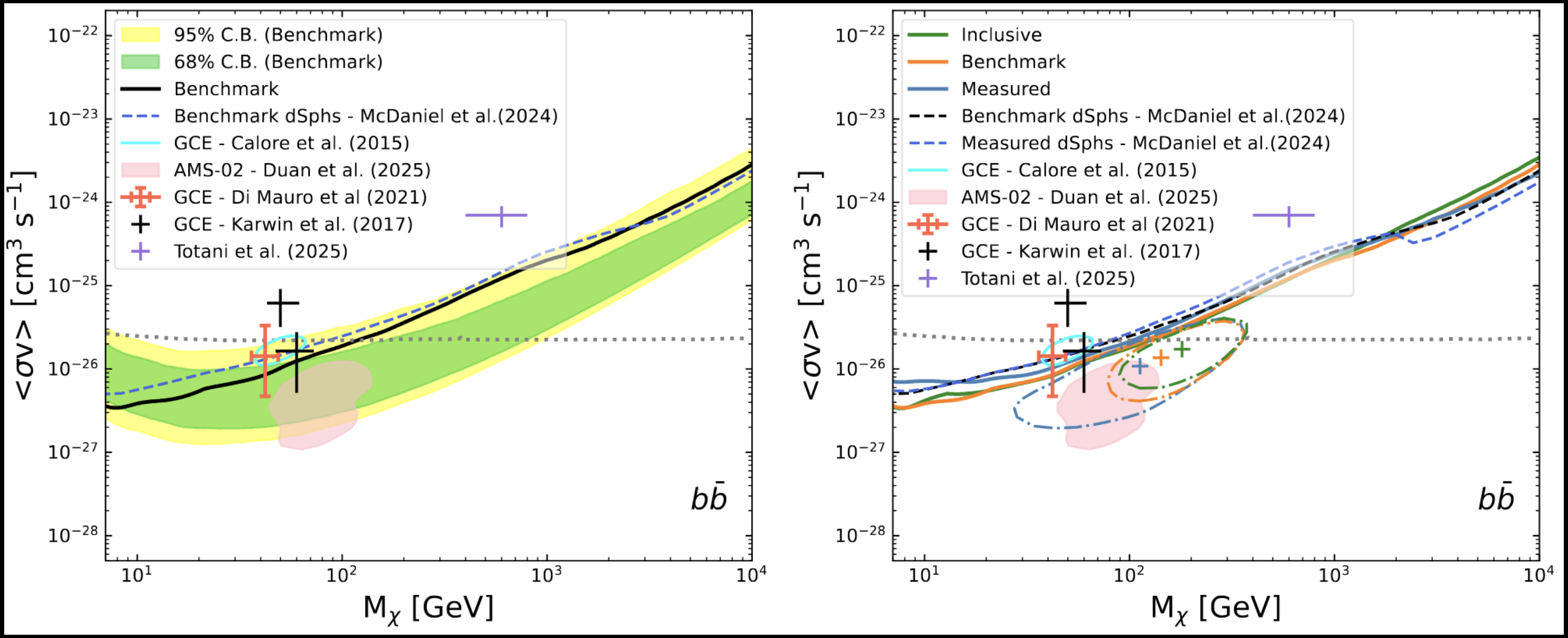
‘Legacy’ dwarf analysis reloaded

[Circiello et al. (2026) – arXiv:2605.25586; ApJL accepted]

Circiello’s talk

- No gamma-ray signal found for same sample in McDaniel+24 with 2 more years.
- Stricter data analysis cuts, better modelling of the region of interest.
- Most significant excess increases to ~ 1.6σ (global) for the Benchmark dwarf sample.

→ Most robust and competitive LAT DM limits so far.

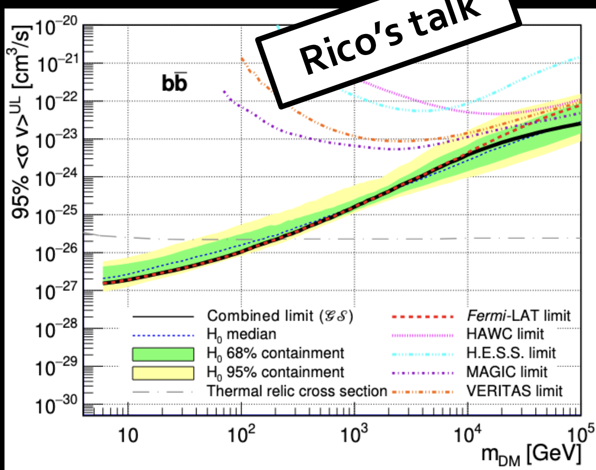


[Circiello+26]

Dwarfs at TeV-PeV energies

No detections, no hints reported.

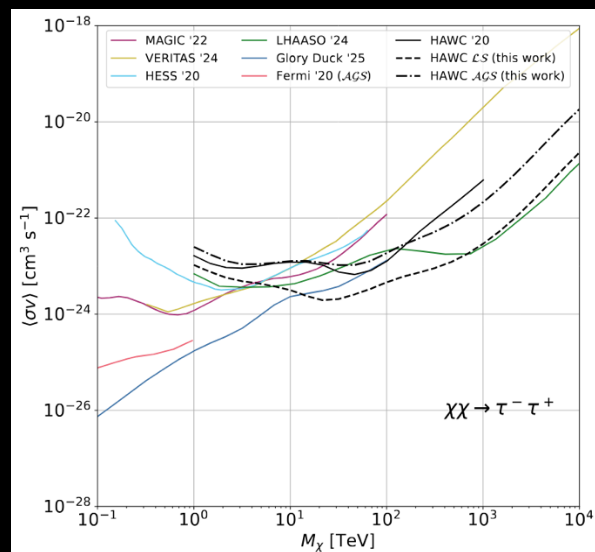
LAT+IACTs+HAWC



[Abdollahi+26, arXiv:2508.20229]

Combined likelihood analysis.
Best limits up to 10-100 TeV,
depending on channel.

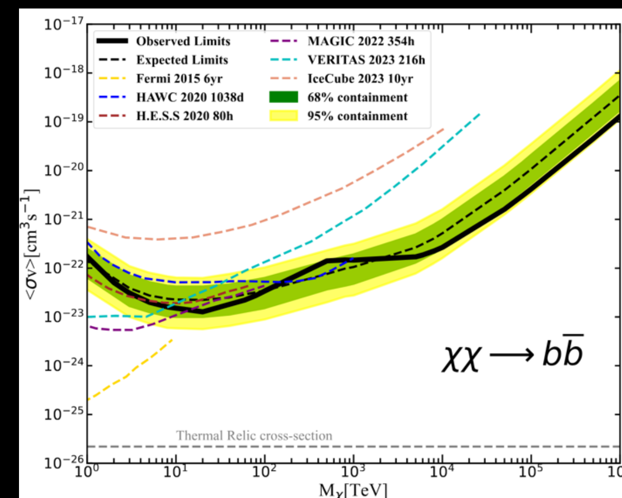
HAWC



[Albert+26 – arXiv:2602.05955]

17 dwarfs, 3070 days of data.
Best limits >10-100 TeV,
depending on channel.

LHAASO

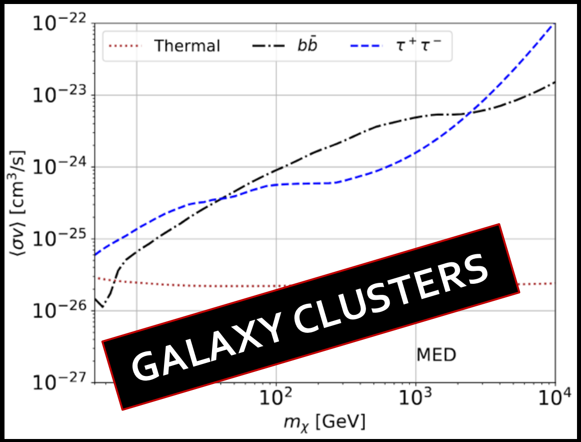


[Cao+24 – arXiv:2406.08698]

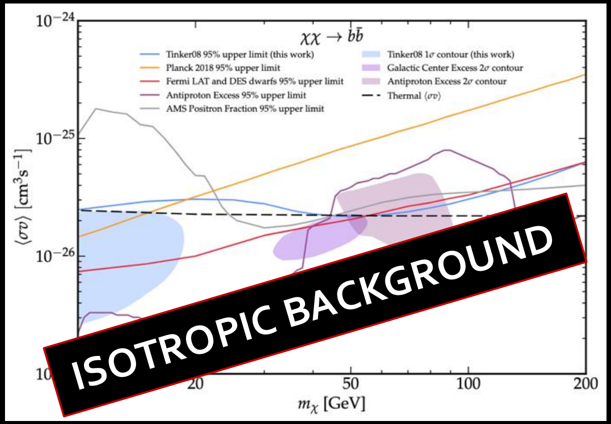
16 dwarfs, 700 days of data,
extends the search up to the EeV

OTHER RECENT KEY RESULTS:

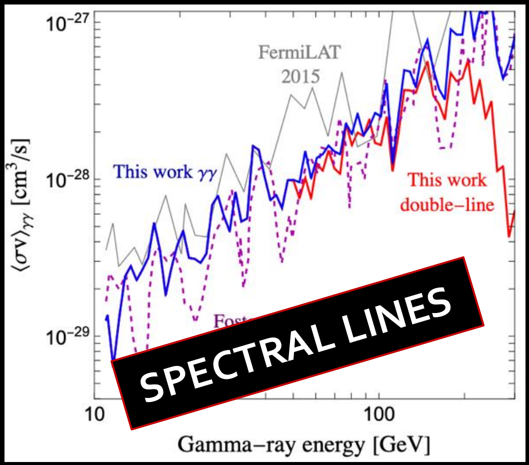
LAT results beyond GC and dwarfs



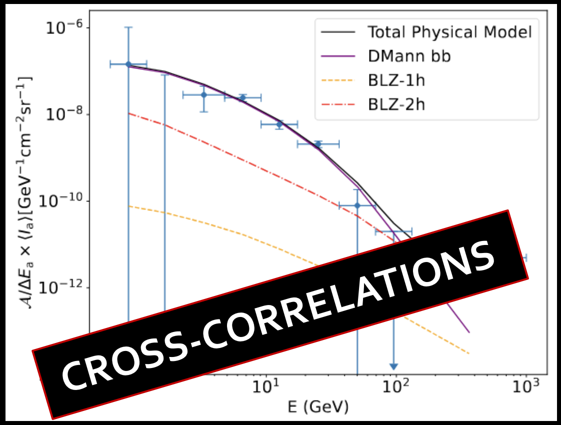
[di Mauro+23]



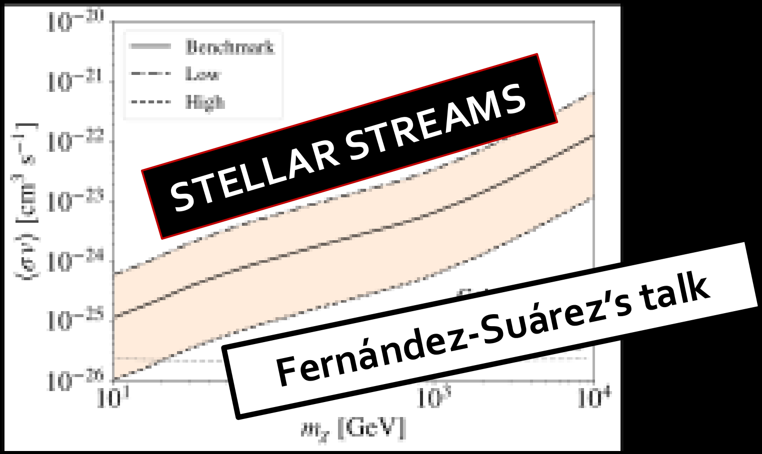
[Cholis+24]



[De la Torre Luque+24]



[Thakore+25]



[Fernández-Suárez+25]

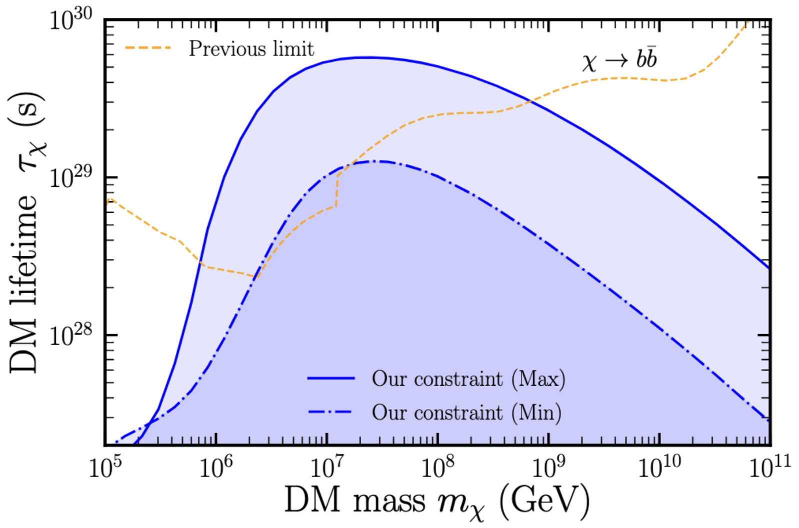
OTHER RECENT KEY RESULTS:

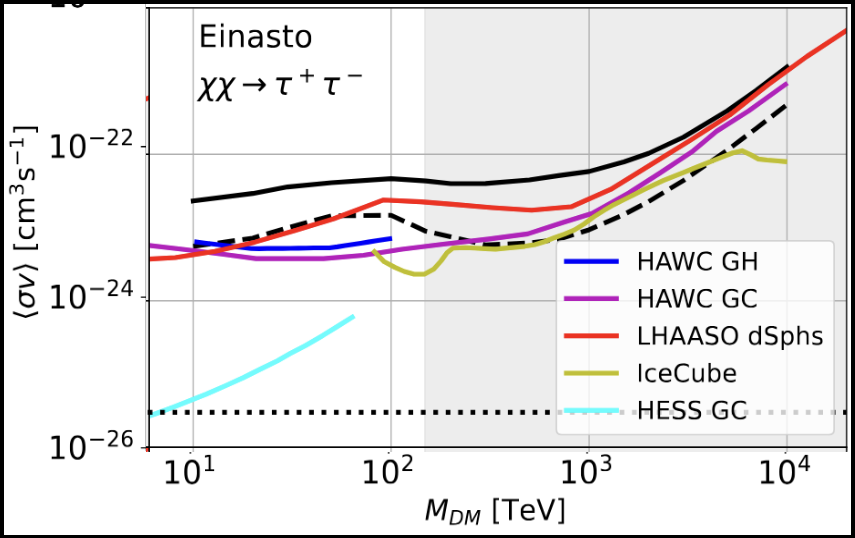
Constraints on heavy DM

Diffuse gammas the leading probe of ultra-heavy DM (annihilation and decay).

LHAASO Galactic diffuse → high-mass end (PeV-EeV).
HAWC Galactic halo → intermediate (multi-TeV-PeV).
HESS GC region → low end (TeV).

[Boehm+25; arXiv:2509.07982]
Use LHAASO Galactic plane data
Include prompt + IC + extragal cascades + absorption



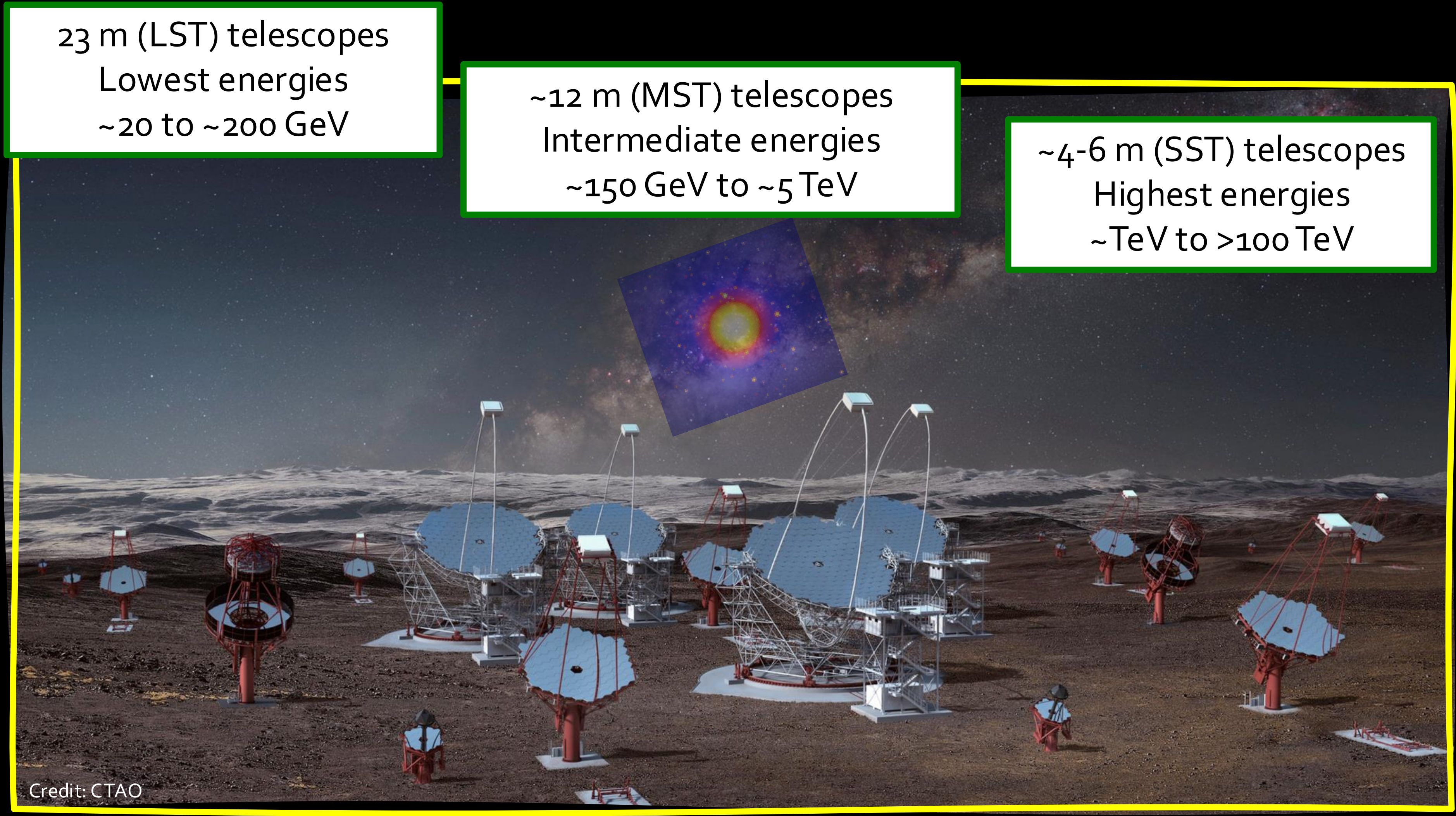


[Rocamora+25; arXiv:2509.09609]
Use HAWC and LHAASO diffuse data
Include prompt + IC + absorption

(See also Abdalla+22; Cao+22; Albert+23; Alfaro+25)

How to make **further progress**?

The imminent future:
Cherenkov Telescope Array Observatory (CTAO)



The imminent future:
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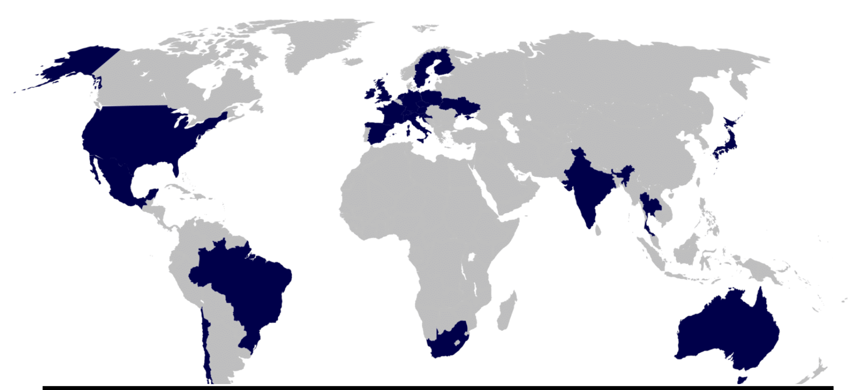
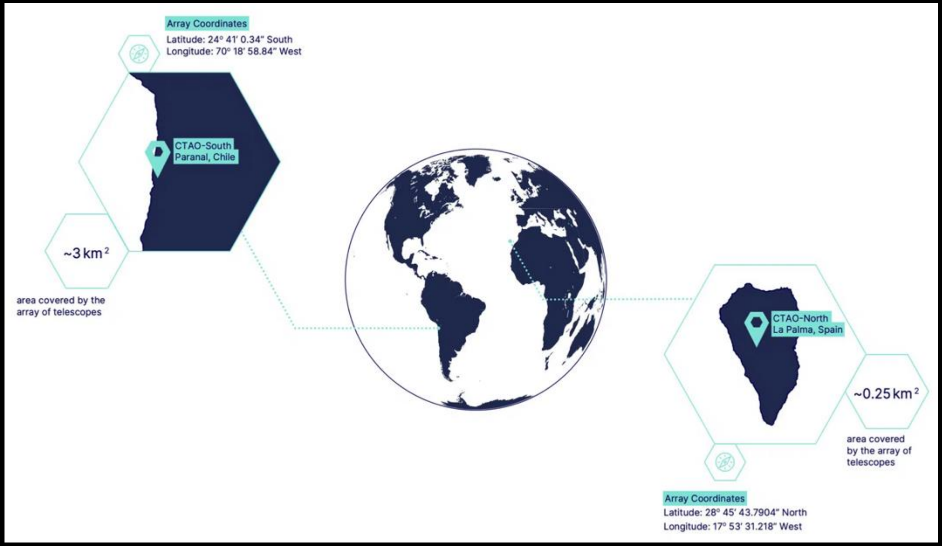
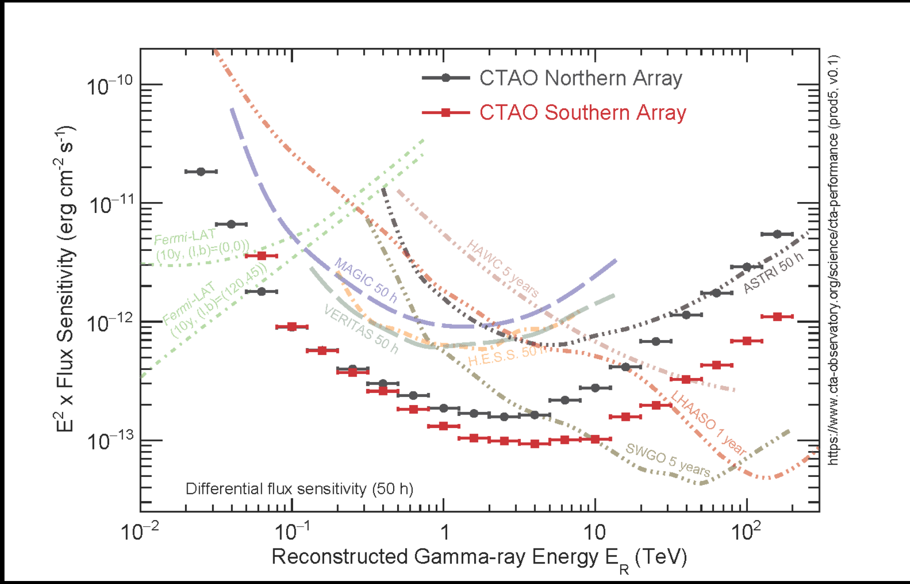
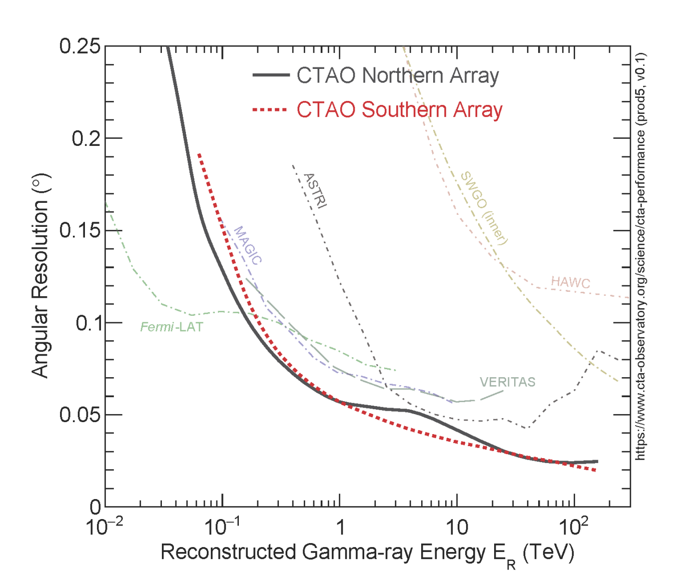


The CTAO Consortium includes ~1,800 members from more than 150 institutes in 25 countries.



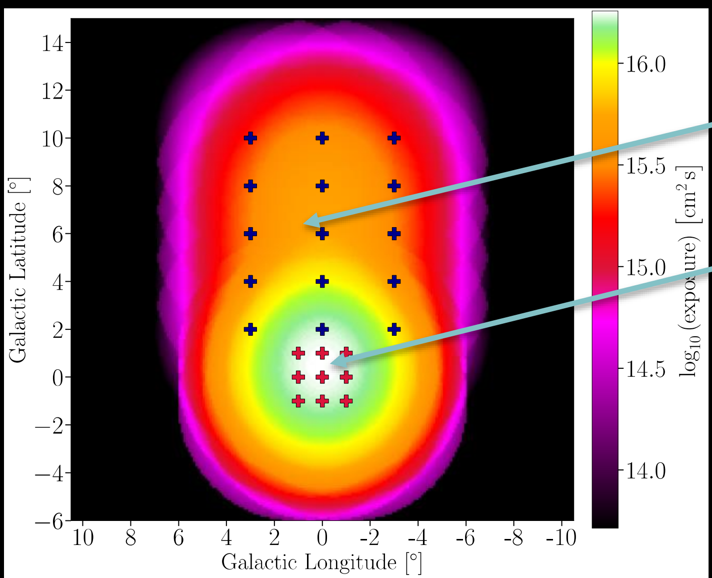




The GC with CTAO

CTAO will turn the GC from a DM discovery target into a **consistency test** for DM.

- Spectral discrimination between DM and astro (e.g. Abe+25): cutoffs, potential lines…
- Morphology: cuspy DM profile vs. astro ridge emission.
- Multi-TeV DM: drastic increase in sensitivity > 1 TeV to probe specific DM models.

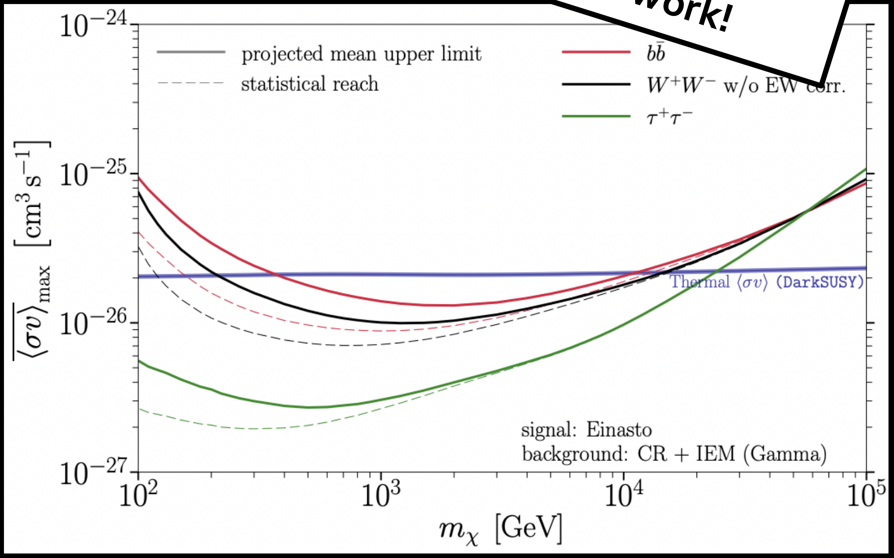


Extended survey: additional 300 hours

Galactic center survey: 525 hours in 10 years

[Acharyya+21]

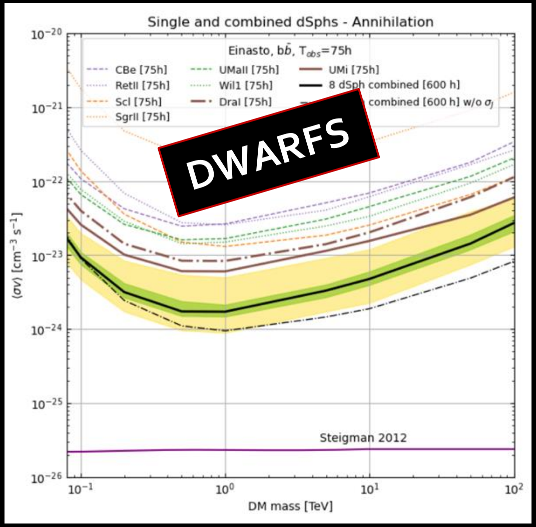
See also Zuriaga-Puig's talk for new work!



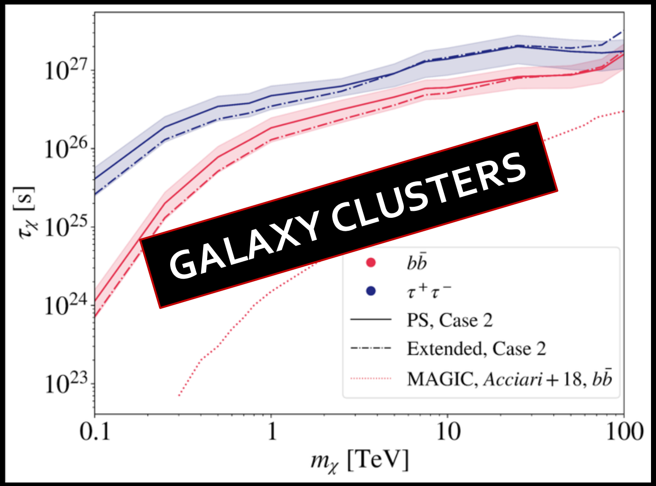
CTAO DM predictions including treatment of systematic uncertaintites and astrophysical backgrounds

... but not only the GC !

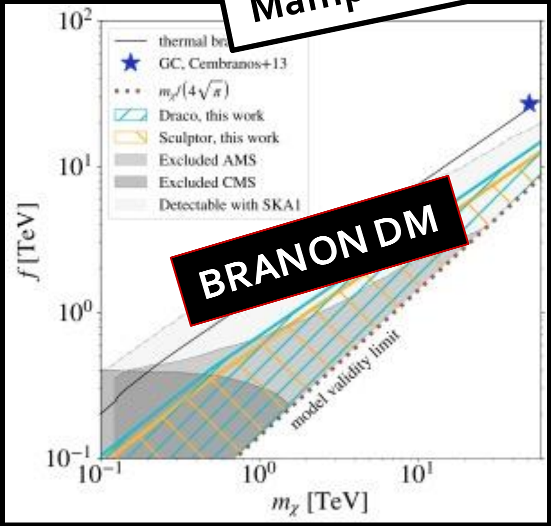
See also Mamprim's talk



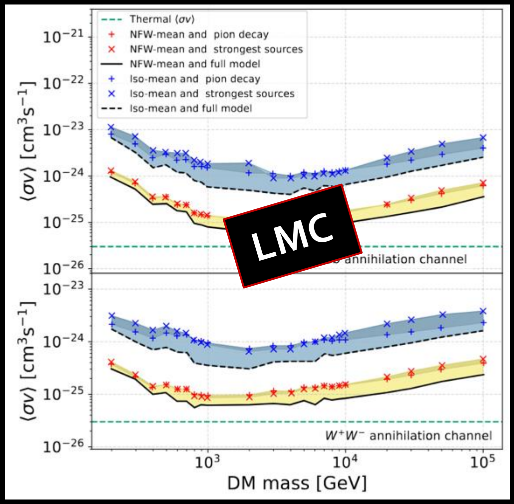
[Abe+25]



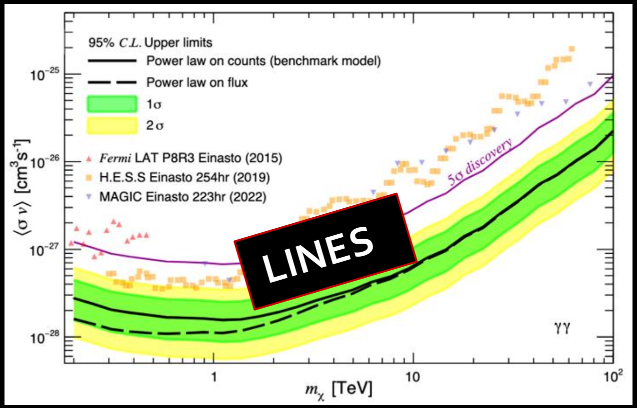
[Pérez-Romero+22]



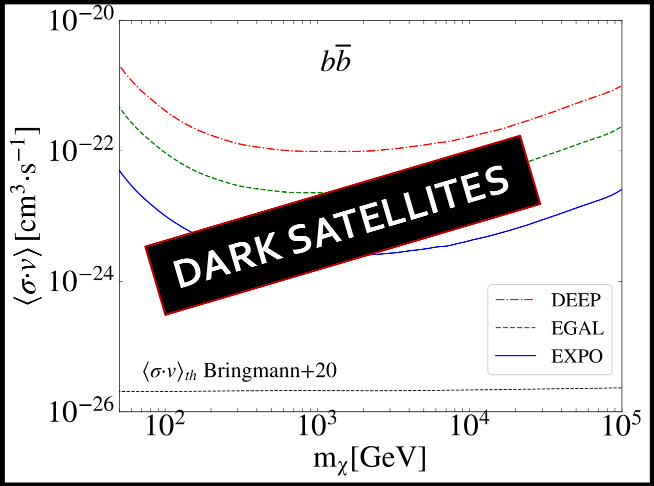
[Aguirre-Santaella+22]



[Acharya+23]



[Abe+24]



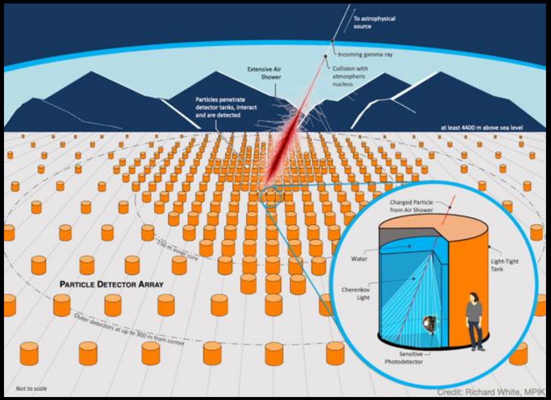
[Coronado-Blázquez+21]

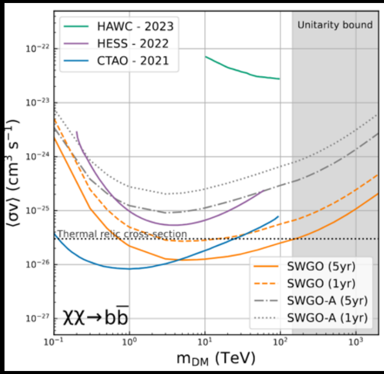
CTAO… and friends

Wide-field VHE detectors (SWGO, next-gen HAWC and LHAASO).

Will dominate constraints at the highest DM masses and for extended DM emission.

SWGO
[Abreu+25; arXiv:2506.01786]





MeV-GeV missions (COSI, AMEGO-X, newASTROGAM..)

Will fill the MeV gap, allowing to probe light DM and secondary emissions from heavy DM.

Launch in 2027.
[Tomsick+23; arXiv:2308.12362]

newASTROGAM
Closing the MeV gap

NASA proposal
[Caputo+22; arXiv:2208.04990]

ESA proposal
[Berge+25; arXiv:2507.08133]

STATUS & PROSPECTS ca. 2026

TODAY

Different targets observed, different DM scenarios explored.

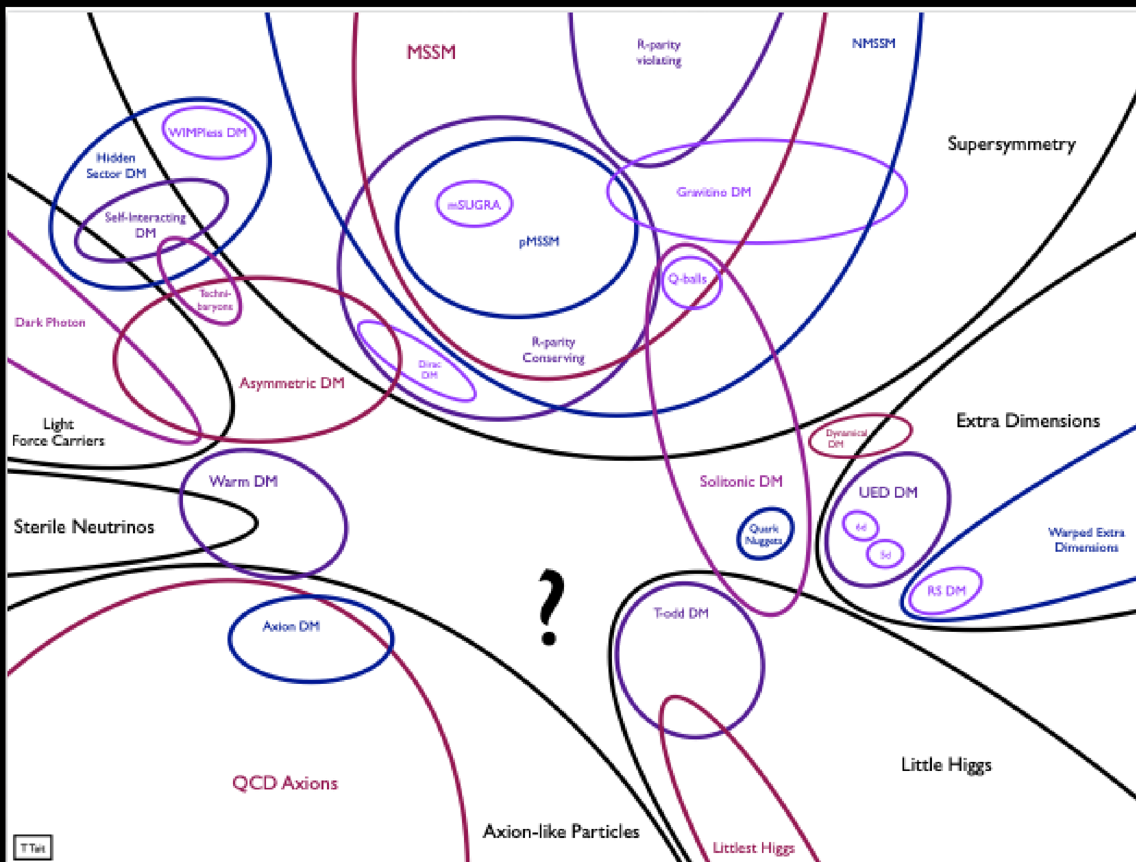
- ✓ No WIMP signals (unambiguously) detected.
- ✓ The GCE is robust. Its precise properties are not.
- ✓ Fermi LAT dwarfs rule out thermal WIMPs below ~100 GeV.
- ✓ Ground-based telescopes dominate the TeV-PeV DM mass range.
- ✓ Thermal >TeV WIMPs unexplored.
- ✓ Lots of archival data available!

TOMORROW

- Fermi + CTAO to fully test vanilla WIMP (GeV-TeV) within a few years.
- New instruments in the MeV and TeV-PeV to expand the search.
- Fully exploit complementarity and MW/MM across experiments.
- New targets and new data-driven analysis methods (e.g. ML).
- Improvements from a better modelling as important as new instruments.
- Field is moving from individual targets to 'fields'.

Disclaimer: many other particle DM models…

(this talk was just a tiny part of the full story)



Credit: Tim Tait

Some of these models also leave imprints in the gamma-ray sky!

(e.g. **ALPs, PBHs**)

See e.g. talks by:
Cirelli
Mirizzi
van Bibber
Kühnel

Critical to **keep the diversity** of astrophysical targets, experiments, messengers, DM particle candidates.

Universidad Autónoma de Madrid

Instituto de Física Teórica UAM-CSIC

MULTIDARK
Multimessenger Approach for Dark Matter Detection

Thanks!

Miguel A. Sánchez-Conde

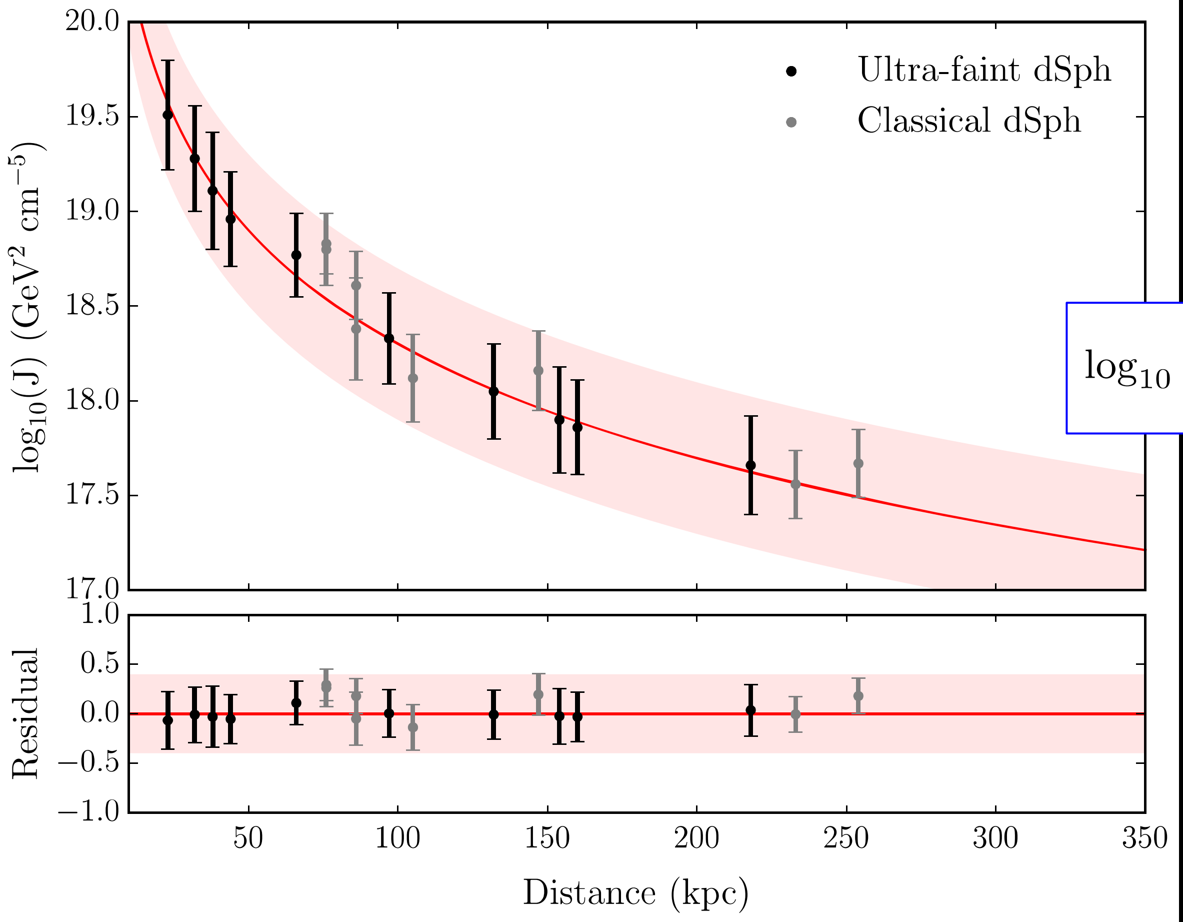
miguel.sanchezconde@uam.es

https://projects.ift.uam-csic.es/damasco/

Dwarf Galaxies' J-Factors

"J-factor" of MW dwarf satellite galaxies inferred from:

- l.o.s. velocity dispersion profiles
- DM density profile (e.g. NFW)



Drlica-Wagner+15

Parametrization based on current knowledge of J-factors

$$\log_{10}\left(\frac{J_{\mathrm{pred}}}{J_0}\right) = -2\log_{10}\left(\frac{D}{100\,\mathrm{kpc}}\right)$$

with $J_0 = 18.1\ \mathrm{GeV}^2\mathrm{cm}^{-5}$

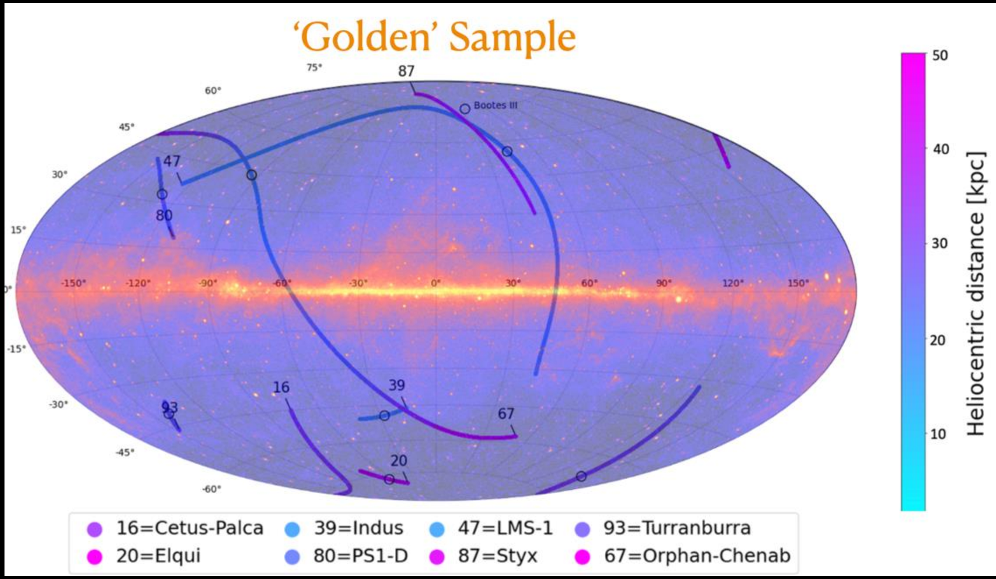
[Albert+17]

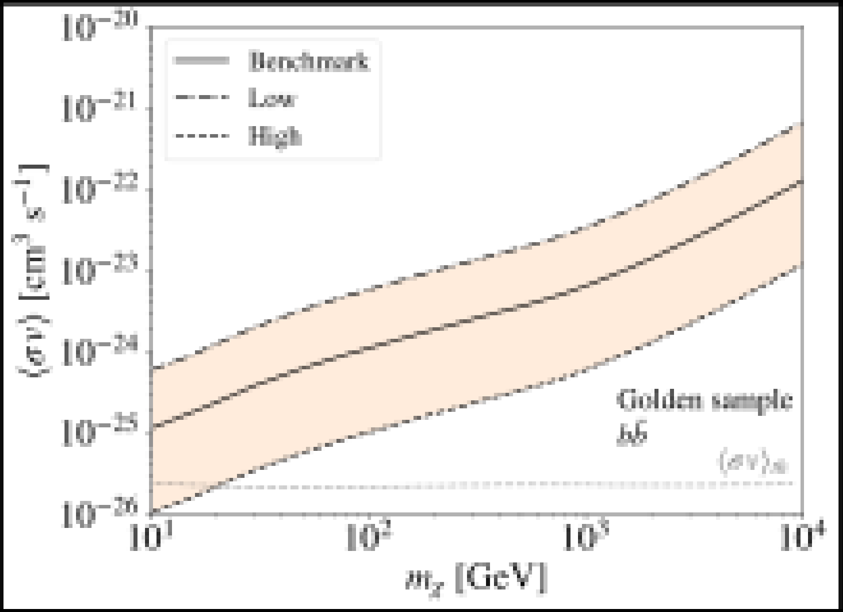
OTHER RECENT KEY RESULTS:

Fermi-LAT DM search in stellar streams

[Fernández-Suárez & MASC – arXiv:2502.15656; JCAP 09 (2025) 003]

- Remnants of globular clusters or dwarf galaxies heavily stripped by tidal forces.
- Those with dwarfs as progenitors should still contain a significant amount of DM today.
- Search for DM signals in LAT data from a selected sample of O(10) streams.
- Competitive DM constraints for different assumptions of the DM remnant (i.e. M/L ratios).

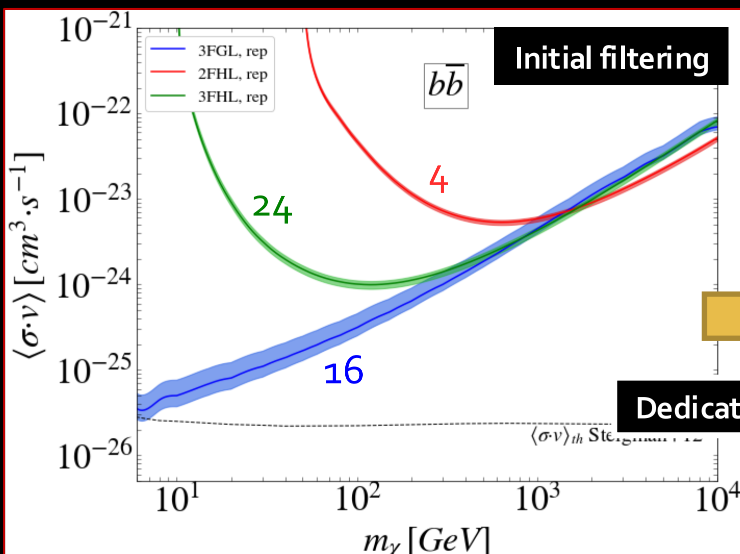




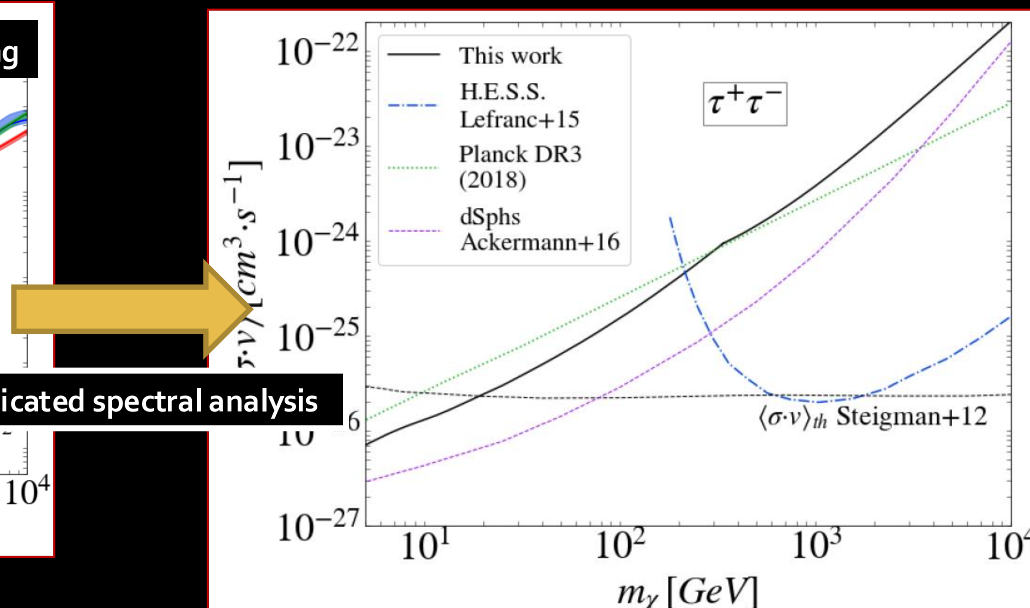
Dark satellite search in Fermi-LAT catalogs

[Coronado-Blázquez, MASC, et al. (2019 a,b) – arXiv:1906.11896; 1910.14429]
[Coronado-Blázquez, MASC, et al. (2023) – arXiv:2204.00267]

- List of O(10) VIP candidates in the 2FGL+2FHL+ 3FGL Fermi LAT catalogs.
- Dedicated spectral analysis of best DM subhalo candidates → improved constraints
- DM limits competitive with other targets, reach thermal cross section.
- Actual sensitivity of Fermi LAT to extended DM signals worsen the limits by a factor ~2-3.
- 4FGL-DR4 search ongoing (Valenciano-Ruano & MASC, in prep.)



[Coronado-Blázquez, MASC+19 – 1906.11896]

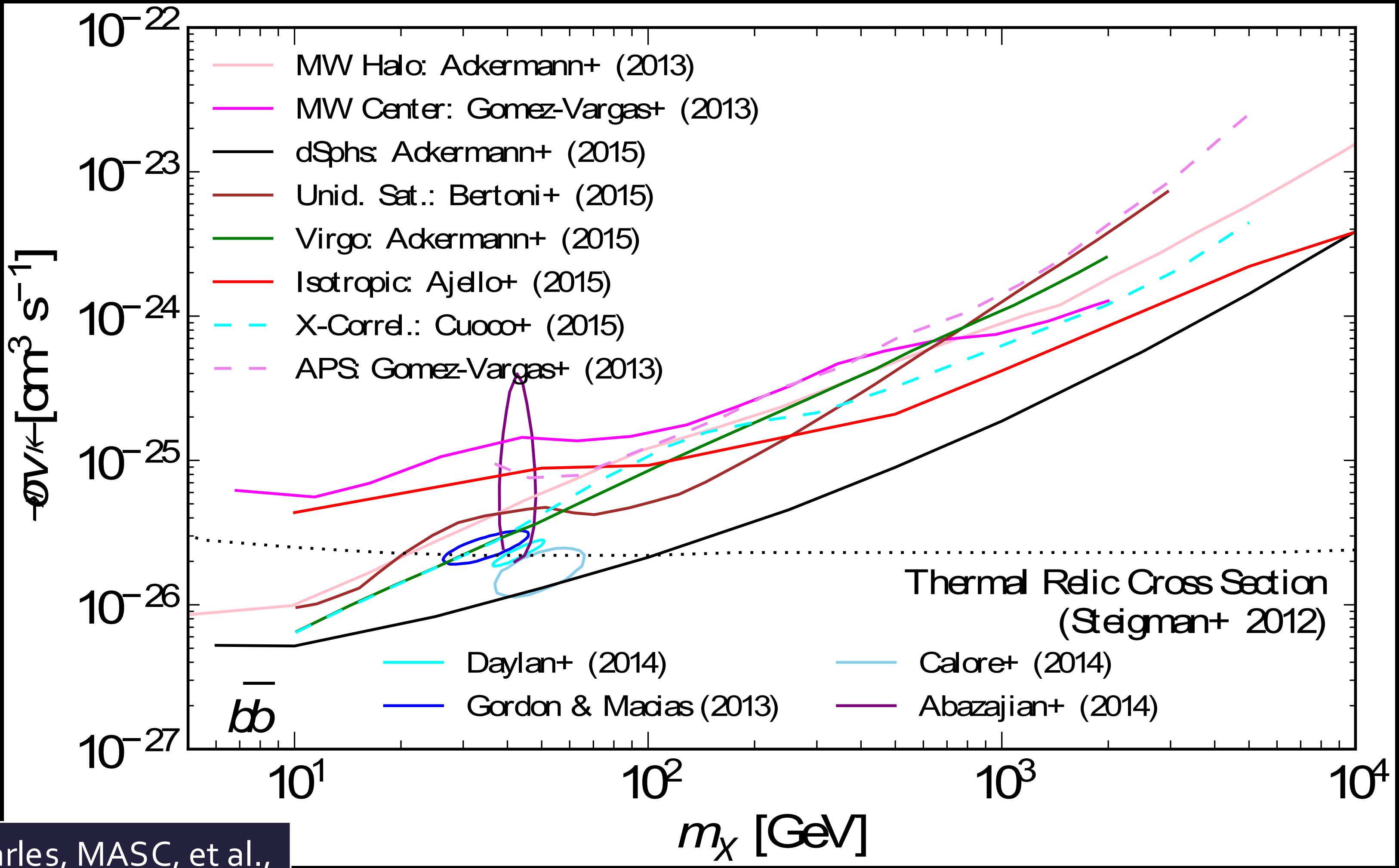


[Coronado-Blázquez, MASC+19b – 1910.14429]

Also: Tasitsiomi&Olinto 02; Pieri+05; Kuhlen+07; Springel+08; Anderson+10; Brun+11; Belikov+12; Ackermann+12; Zechlin+12;+13; Berlin&Hooper 13; Mirabal+16; Hooper+16; Bertoni+16; Schoonenberg+16; Calore+17; Abeysekara+19

Fermi-LAT : a lot of DM targets explored so far

[many DM limits and some signal hints]



Charles, MASC, et al., [1605.02016]

IACTs : a lot of DM targets explored so far

[many DM limits]

Dwarf galaxies, GC halo, dark satellites, local galaxies, galaxy clusters…

Table 8.1 – continued from previous page

Target	Year	Time [h]	IACT	Limit	Ref.
Segue 1	2008 – 2009	29.4	MAGIC‡	Ann.	Aleksić et al. (2011)
	2010 – 2011	(47.8)	VERITAS	A.+D.	Aliu et al. (2012)
	2010 – 2013	(92.0)		Ann.	Arc (20
	2010 – 2013	157.9	MAGIC	A.+D.	Ale
				Ann.	Ahn
	2010 – 2018	184	VERITAS	–	Kel
Boötes 1	2009	14.3	VERITAS	Ann.	Acc
		(14.0)		Ann.	Arc (20
Coma Berenices	2010 – 2013	(8.6)	H.E.S.S.	Ann.	Abr
	2010 – 2013	10.9		Ann.	Abd
	< 2018	37	VERITAS	–	Kel
	2018	50.2	MAGIC	Ann.	Mag
Fornax	2010	6.0	H.E.S.S.	Ann.	Abr
				Ann.	Abd
Ursa Major II	2014 – 2016	94.8	MAGIC	Ann.	Ahn
Triangulum II*	2014 – 2016	62.4	MAGIC	Ann.	Acc
	< 2018	181	VERITAS	–	Kel
Segue II	< 2018	19	VERITAS	–	Kel
Canes Ven I	< 2018	14	VERITAS	–	Kel
Canes Ven II	< 2018	14	VERITAS	–	Kel
Hercules	< 2018	13	VERITAS	–	Kel
Sextans	< 2018	13	VERITAS	–	Kel
Draco II	< 2018	10	VERITAS	–	Kel
Leo I	< 2018	7	VERITAS	–	Kel
Leo II	< 2018	16	VERITAS	–	Kel
Leo IV	< 2018	3	VERITAS	–	Kel
Leo V	< 2018	3	VERITAS	–	Kel
Reticulum II	2017 – 2018	18.3	H.E.S.S.†	Ann.	Abd
Tucana II	2017 – 2018	16.4	H.E.S.S.†	Ann.	Abd
Tucana III*	2017 – 2018	23.6	H.E.S.S.†	Ann.	Abd
Tucana IV*	2017 – 2018	12.4	H.E.S.S.†	Ann.	Abd
Grus II*	2018	11.3	H.E.S.S.†	Ann.	Abd
Dark satellites					
1FGL J2347.3+0710	2010	8.3	MAGIC	–	Nie
1FGL J0338.8+1313	2010-2011	10.7	MAGIC	–	Nie
2FGL J0545.6+6018	2013-2015	8.5	VERITAS	Ann.	Nie
2FGL J1115.0-0701	2013-2015	13.8	VERITAS	Ann.	Nie
H3FHL J0929.2-4110	2018-2019	7.8	H.E.S.S.†	Ann.	Abd
3FHL J1915.2-1323	2018 – 2019	3.0	H.E.S.S.†	Ann.	Abdallah et al. (2021a)
3FHL J2030.2-5037	2018 – 2019	8.8	H.E.S.S.†	Ann.	Abdallah et al. (2021a)
3FHL J2104.5+2117	2018 – 2019	5.5	H.E.S.S.†	Ann.	Abdallah et al. (2021a)

Table 8.1 – Continued on next page

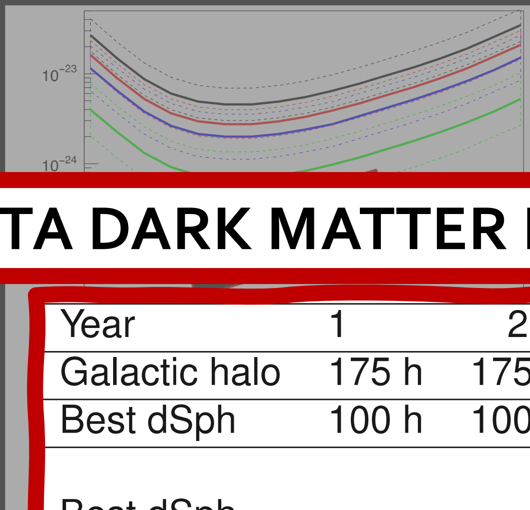
Table 8.1 – continued from previous page

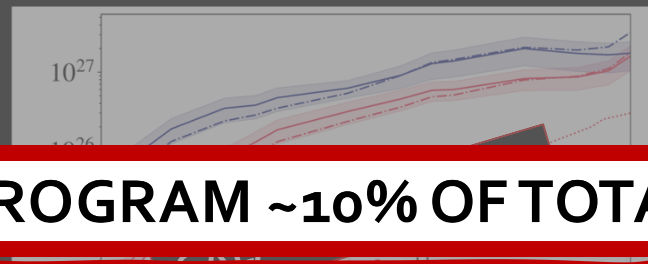
Target	Year	Time [h]	IACT	Limit	Ref.
Intermediate Mass Black Holes					
Galactic Plane Survey	2004 – 2007	400	H.E.S.S.	Ann.	Aharon
	2005 – 2006	25	MAGIC‡	Ann.	Doro et
Globular Clusters					
M15	2002	0.2	Whipple	Ann.	Wood e
	2006 – 2007	15.2	H.E.S.S.	Ann.	Abramo
NGC 6388	2008 – 2009	27.2	H.E.S.S.	Ann.	Abramo
Other galaxies					
M33	2002 – 2004	7.9	Whipple	Ann.	Wood e
M32	2004	6.9	Whipple	Ann.	Wood e
WLM	2018	18.2	H.E.S.S.†	Ann.	Abdalla
Galaxy Clusters					
Abell 2029	2003 – 2004	6.1	Whipple	–	Perkins
Perseus (Abell 426)	2004 – 2005	13.5	Whipple	–	Perkins
	2008	24.4	MAGIC‡	Ann.	Aleksić
	2009 – 2017	202.2	MAGIC	Decay	Acciari
Fornax (Abell S0373)	2005	14.5	H.E.S.S.	Ann.	Abramo
Coma (Abell 1656)	2008	18.6	VERITAS	Ann.	Arlen e
Line searches					
MW Inner Halo	2004 – 2008	(112)	H.E.S.S.	Ann.	Abramo (2013c)
	2014	15.2	H.E.S.S.†	Ann.	Abdalla
	2004 – 2014	(254)	H.E.S.S.	Ann.	Abdalla
	2013 – 2019	204	MAGIC	Ann.	Inada e
Segue 1 dSph	2010 – 2013	(157.9)	MAGIC	A.+D.	Aleksić
Five dSph galaxies	2006 – 2012	(137.1)	H.E.S.S.	Ann.	Abdalla
Five dSph galaxies	2007 – 2013	(229.8)	VERITAS	Ann.	Archam (2017)
WLM	2018	(18.2)	H.E.S.S.†	Ann.	Abdalla
Charged particles					
All-electron	2004 – 2007	239	H.E.S.S.	–	Aharon 2009b)
	2009 – 2012	296	VERITAS	–	Archer
	2009 – 2010	14	MAGIC	–	Borla T
Moon shadow	2010 – 2011	20	MAGIC	–	Colin et
	2014	1.2	VERITAS	–	Bird et al. (2016)

Target	Year	Time [h]	IACT	Limit	Ref.
The Milky Way central region & halo					
MW Centre	2004	(48.7)	H.E.S.S.	Ann.	Aharonian et al. (2006)
MW Inner Halo	2004 – 2008	(112)	H.E.S.S.	Ann.	Abramowski et al. (2011)
	2010	9.1		Ann.	Abramowski et al. (2015)
	2004 – 2014	254		Ann.	Abdallah et al. (2016)
	2014 – 2020	546	H.E.S.S.†	Ann.	Montanari et al. (2021)
MW Outer Halo	2018	10	MAGIC	Decay	Ninci et al. (2019)
Dwarf Satellite Galaxies					
Draco	2003	7.4	Whipple	Ann.	Wood et al. (2008)
	2007	7.8	MAGIC‡	Ann.	Albert et al. (2008b)
	2007	(18.4)	VERITAS	Ann.	Acciari et al. (2010)
	2007 – 2013	(49.8)		Ann.	Archambault et al. (2017)
	2007 – 2018	114		–	Kelley-Hoskins (2018)
	2018	52.6	MAGIC	Ann.	Maggio et al. (2021)
Ursa Minor	2003	7.9	Whipple	Ann.	Wood et al. (2008)
	2007	(18.9)	VERITAS	Ann.	Acciari et al. (2010)
	2007 – 2013	(60.4)		Ann.	Archambault et al. (2017)
	2007 – 2018	161		–	Kelley-Hoskins (2018)
Sagittarius	2006	(11.0)	H.E.S.S.	Ann.	Aharonian et al. (2008)
	2006 – 2012	90		Ann.	Abramowski et al. (2014)
	2006 – 2012	(85.5)		Ann.	Abdalla et al. (2018a)
Canis Major	2006	9.6	H.E.S.S.	Ann.	Aharonian et al. (2009a)
Willman 1	2007 – 2008	13.7	VERITAS	Ann.	Acciari et al. (2010)
		(13.6)		Ann.	Archambault et al. (2017)
	2008	15.5	MAGIC‡	Ann.	Aliu et al. (2009)
Sculptor	2008	(11.8)	H.E.S.S.	Ann.	Abramowski et al. (2011)
				Ann.	Abdalla et al. (2018a)
	2008 – 2009	12.5		Ann.	Abramowski et al. (2014)
Carina	2008 – 2009	(14.8)	H.E.S.S.	Ann.	Abramowski et al. (2011)
	2008 – 2009	(12.7)		Ann.	Abramowski et al. (2014)
	2008 – 2010	22.9		Ann.	Abdalla et al. (2018a)

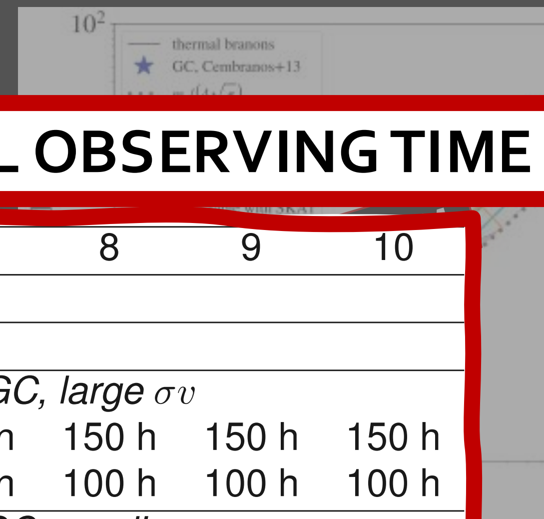
[Doro, MASC, Hütten – 2111.01198]

… but not only the GC !





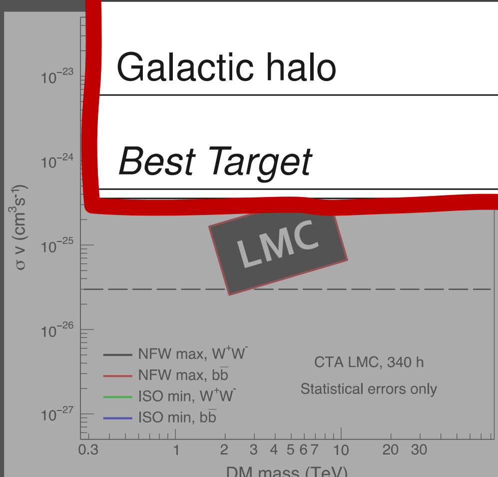
[Aguirre-Santaella+22]



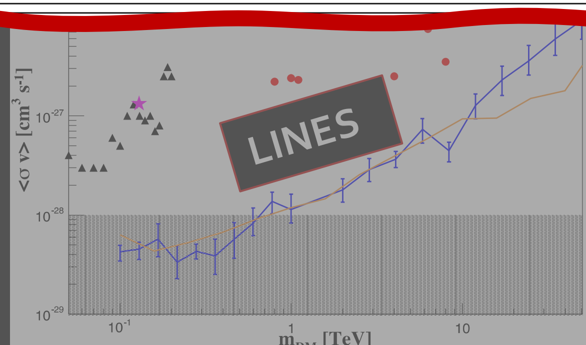
CTA DARK MATTER PROGRAM ~10% OF TOTAL OBSERVING TIME

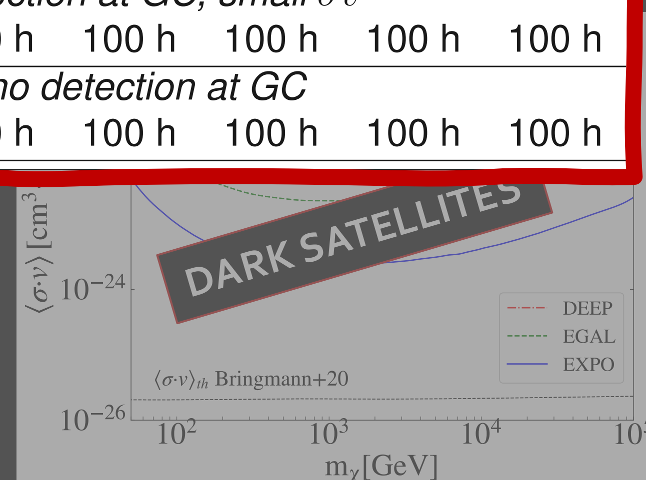
Year	1	2	3	4	5	6	7	8	9	10
Galactic halo	175 h	175 h	175 h							
Best dSph	100 h	100 h	100 h							
				in case of detection at GC, large σv						
Best dSph				150 h	150 h	150 h	150 h	150 h	150 h	150 h
Galactic halo				100 h	100 h	100 h	100 h	100 h	100 h	100 h
				in case of detection at GC, small σv						
Galactic halo				100 h	100 h	100 h	100 h	100 h	100 h	100 h
				in case of no detection at GC						
Best Target				100 h	100 h	100 h	100 h	100 h	100 h	100 h

[Ach



[Acharya+17]





[Coronado-Blázquez+21]