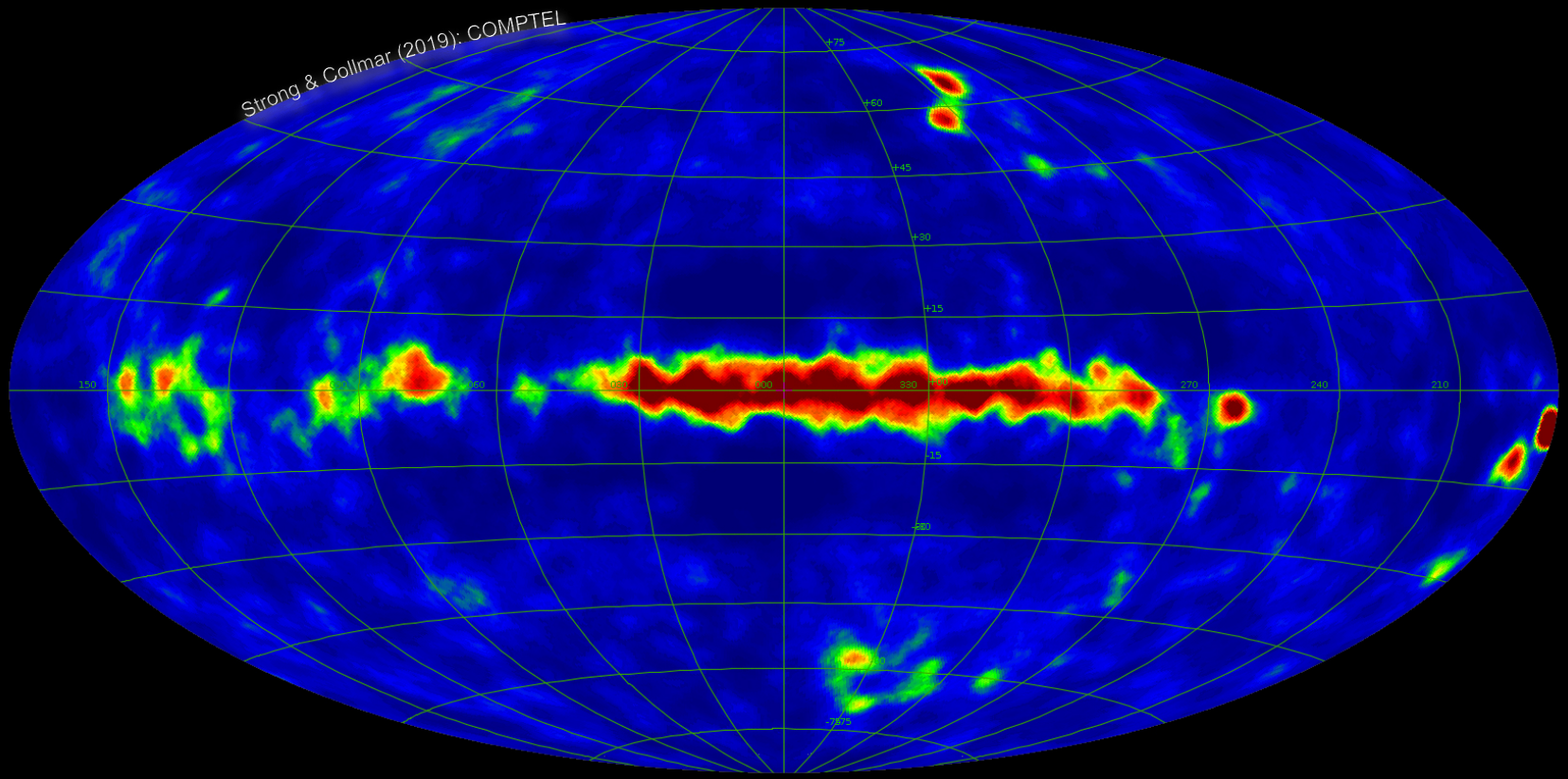
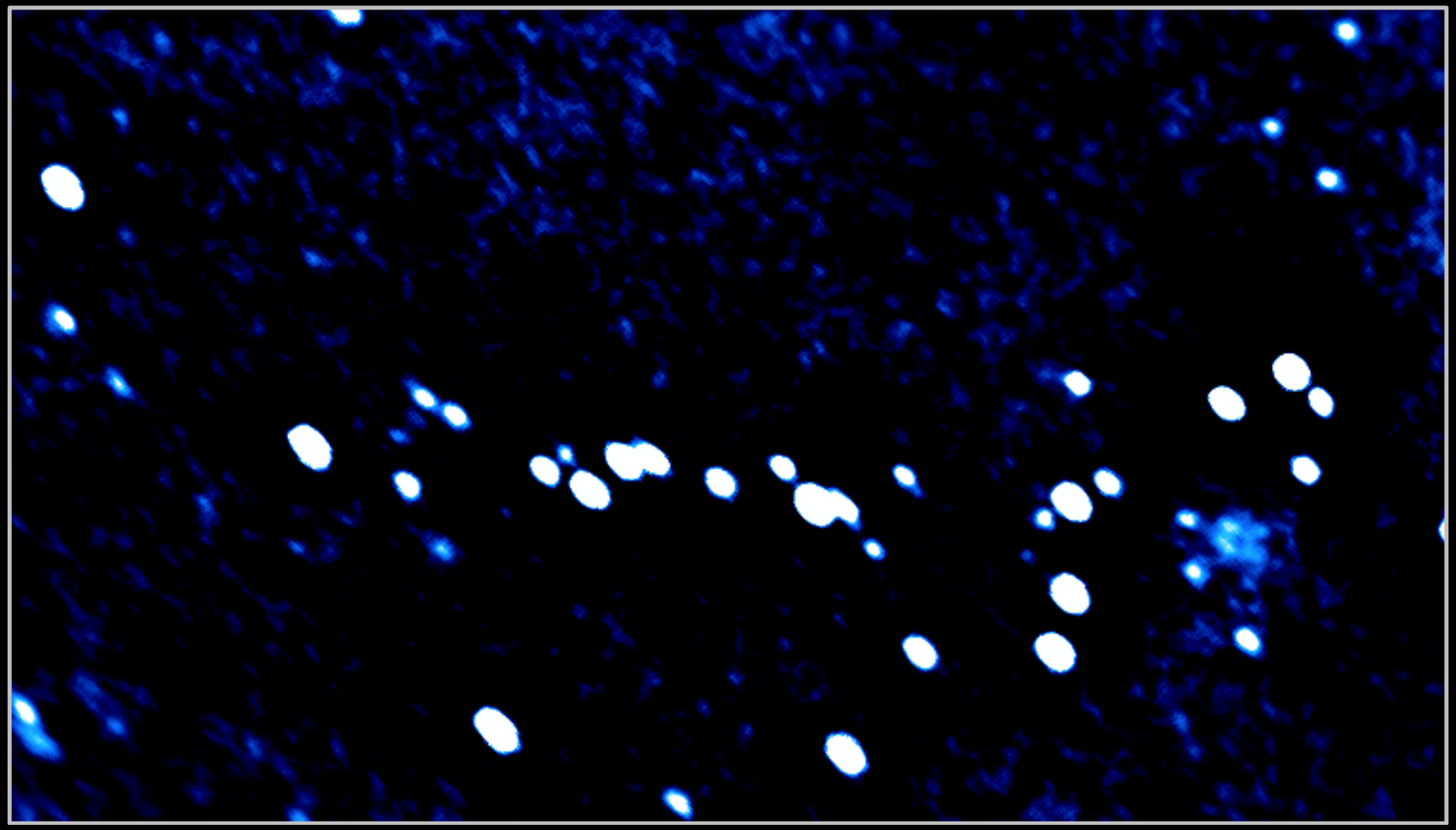
The GECCO Mission and its Science

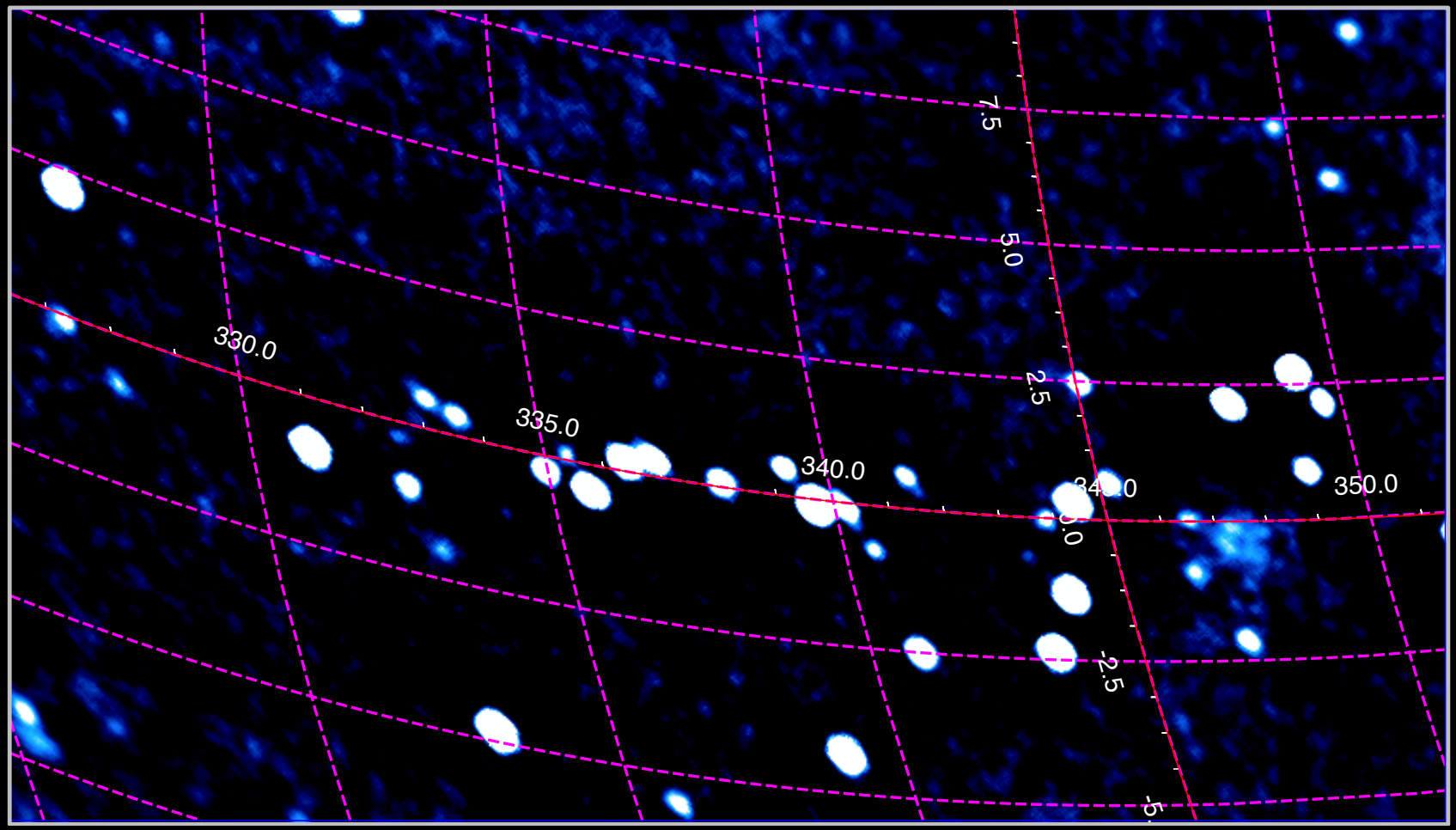


Eugenio Bottacini
for The GECCO Team

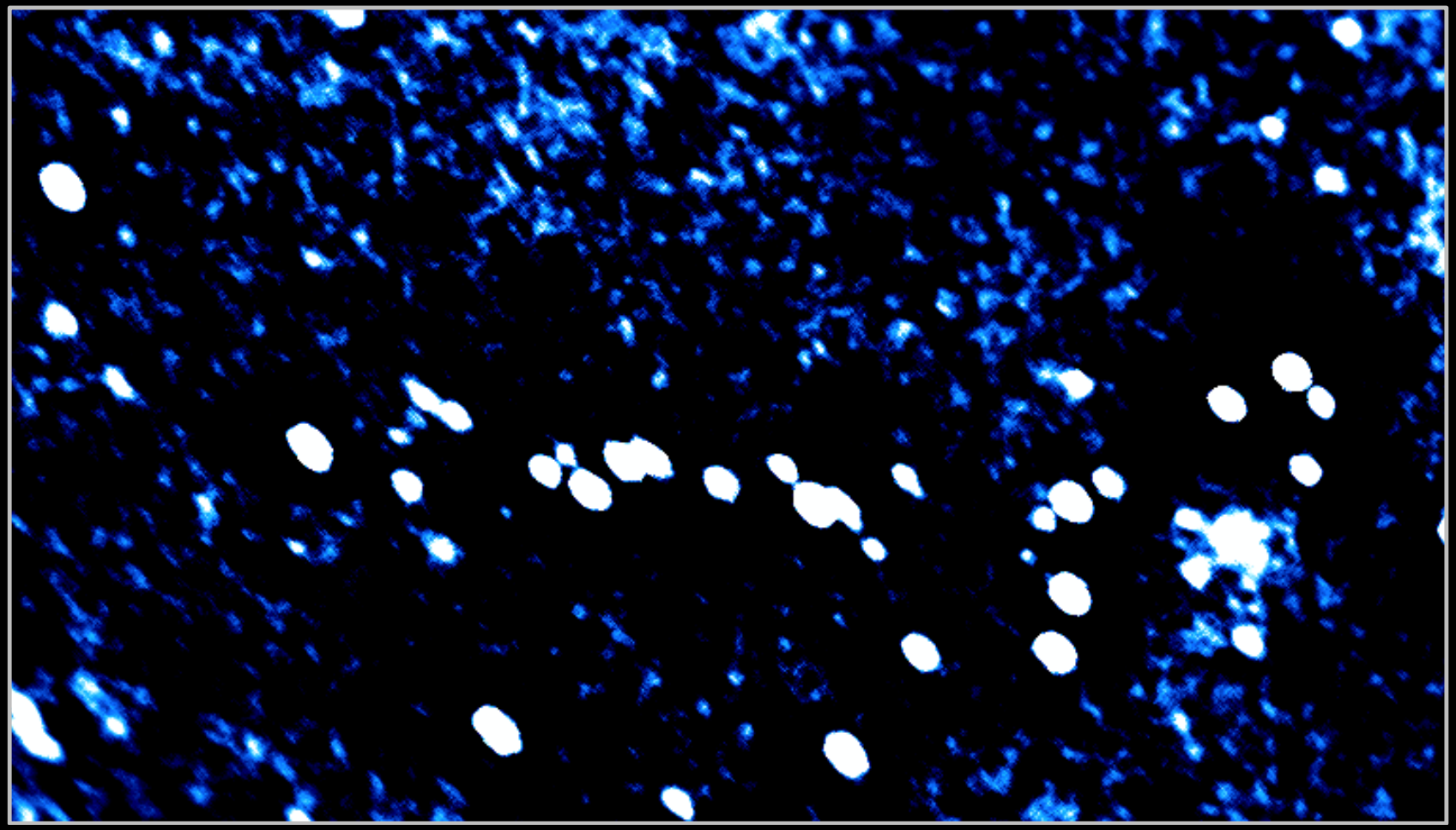
based on Orlando, Bottacini, Moiseev et al. (2022), JCAP, 7, 36



The Galactic Plane at 22 arcmin resolution

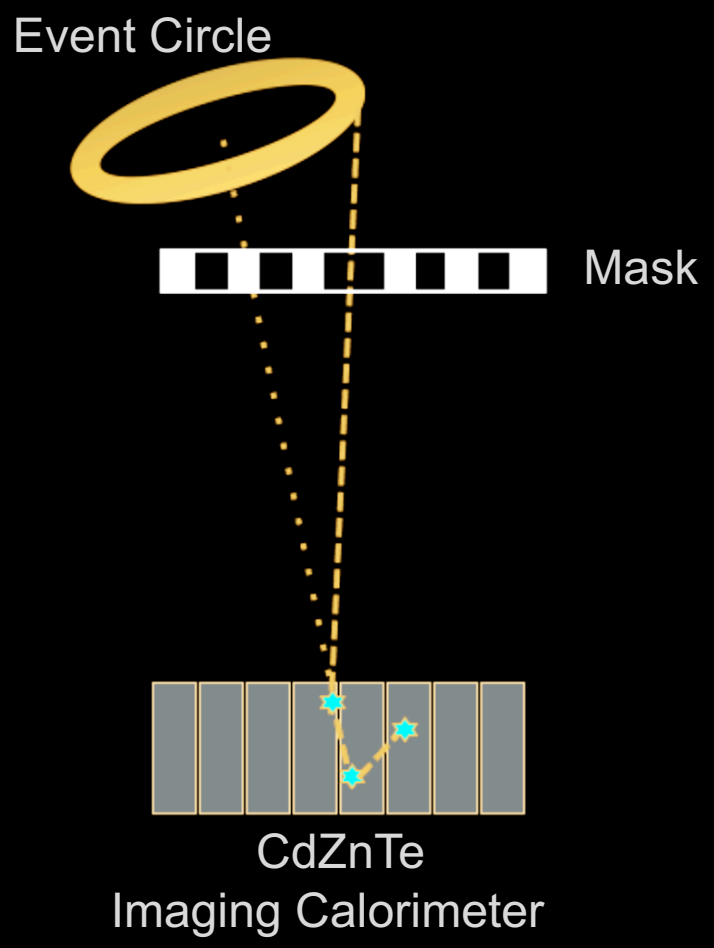


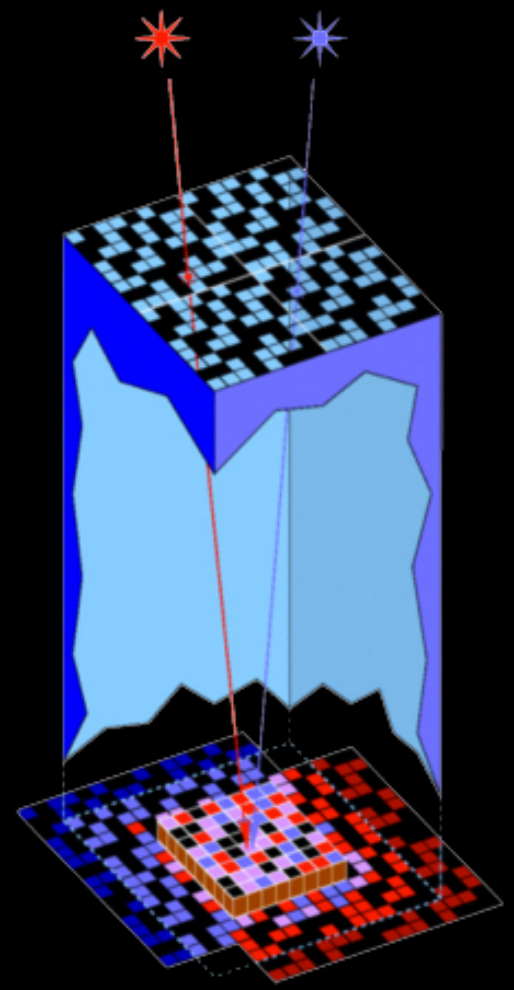
Resolution of the order of degrees misses most sources



Downside of Coded-Mask Telescopes: the Background

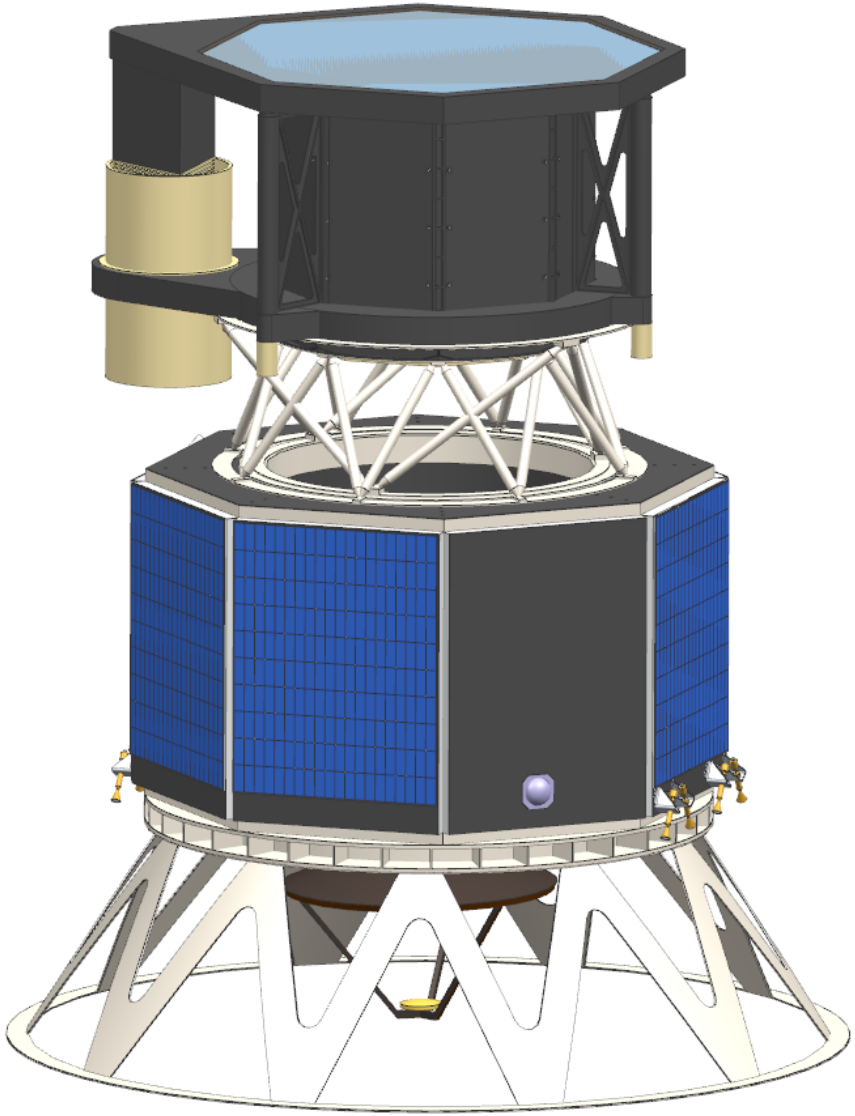
GECCO: Compton Telescope + Coded-Mask Telescope





Compton reconstruction is used to bring the coded-mask background under control

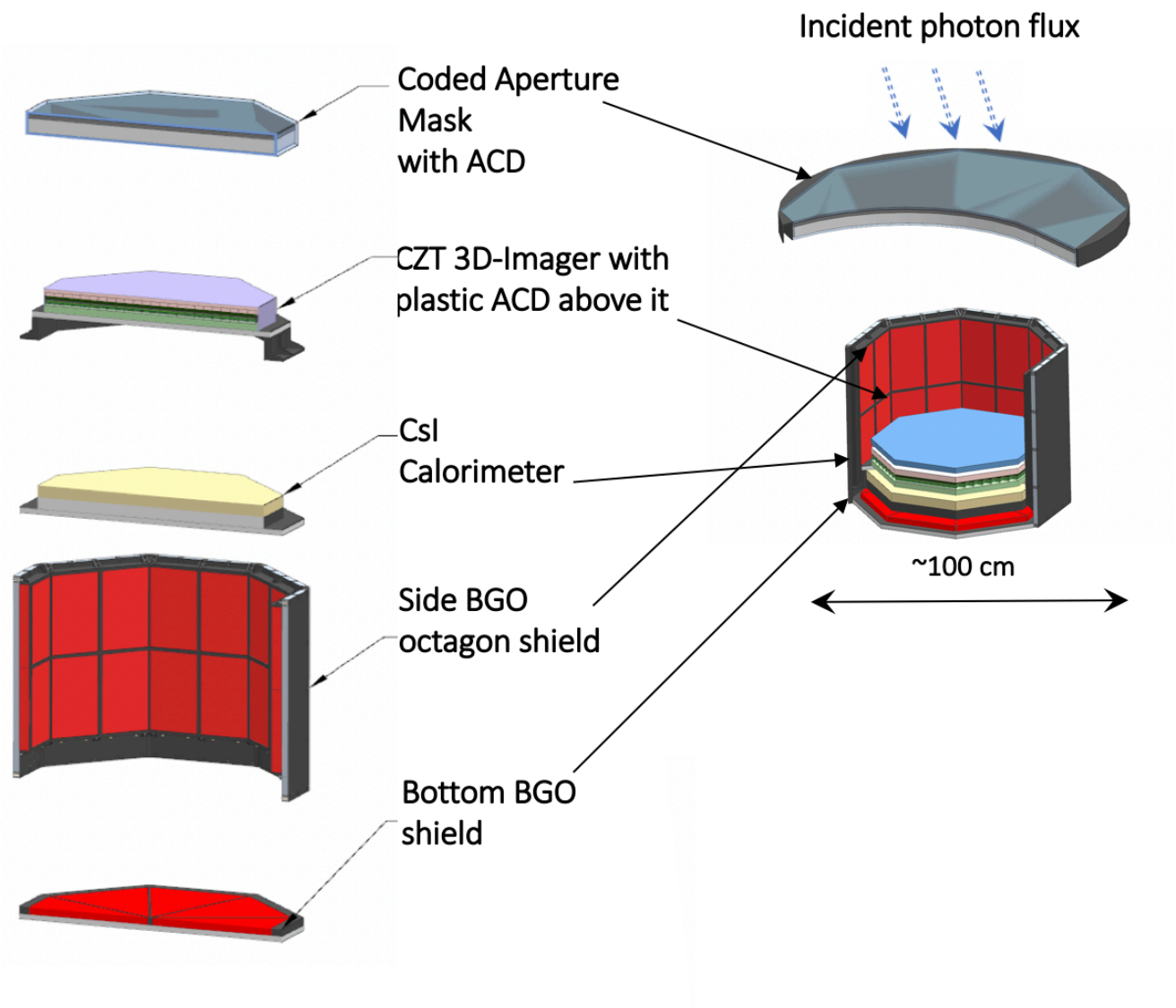
GECCO



Deployable Mask: 20m

Allows for 0.5 arcmin angular resolution

GECCO



- ACD: Anticoicidence detector (plastic scintillator) protects from CRs

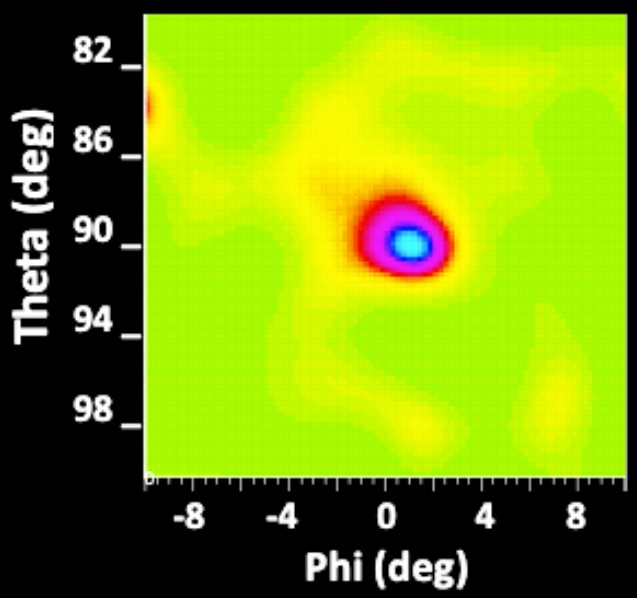
- CZT pixel detector: is a stand-alone Compton Telescope & position sensitive detector for Coded-Mask Telescope

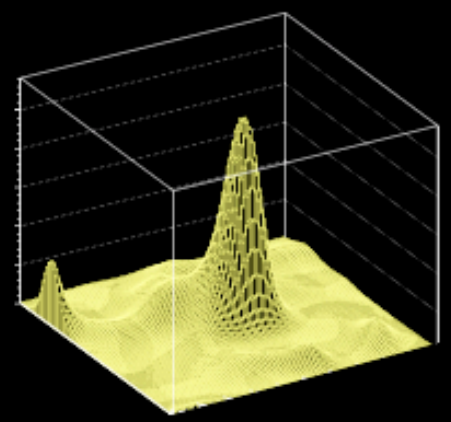
- CsI: measures escaping photons from CZT

- BGO: absorbs background photons and vetoes production of bkg photons by CRs

Compton Mode:

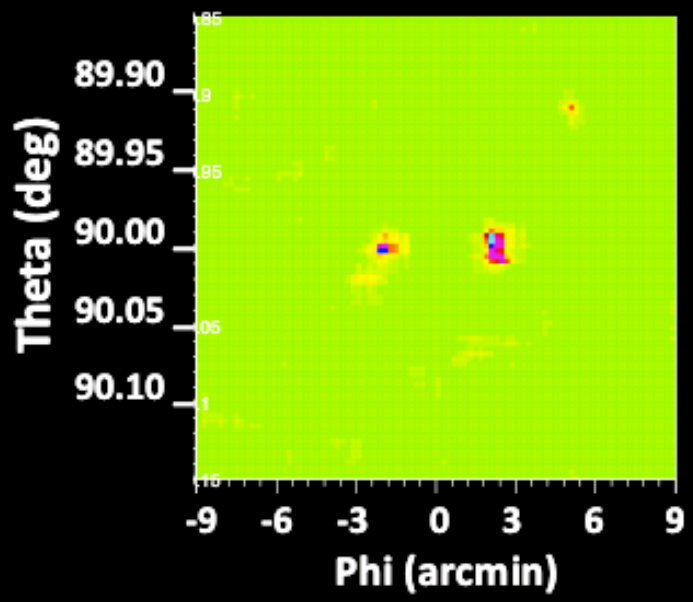
1 source resolve
in detector plane

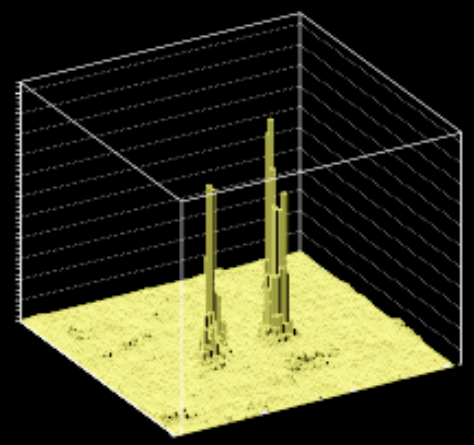




Mask Mode:

2 sources resolved
in detector plane

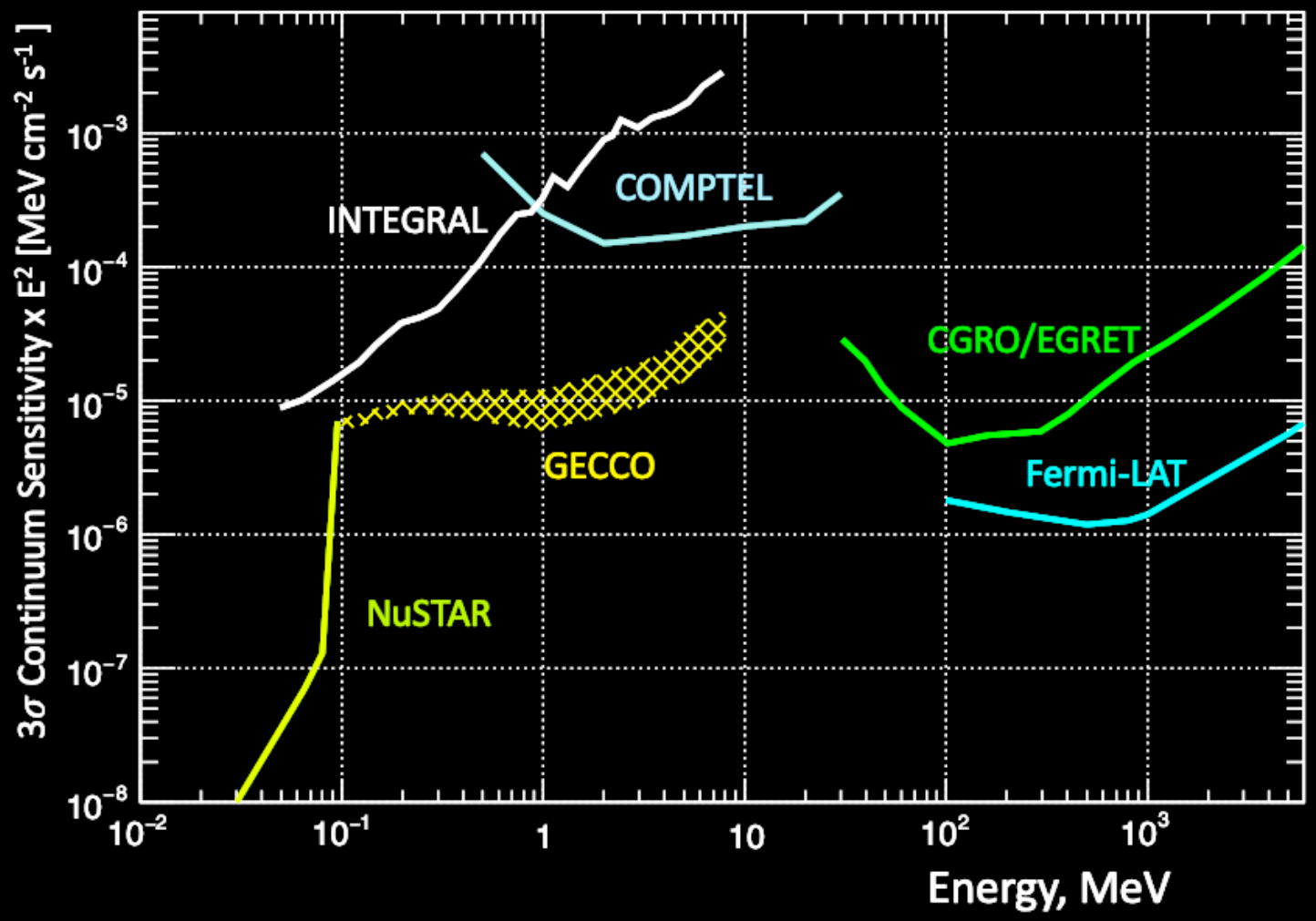




GECCO's Expected Performance

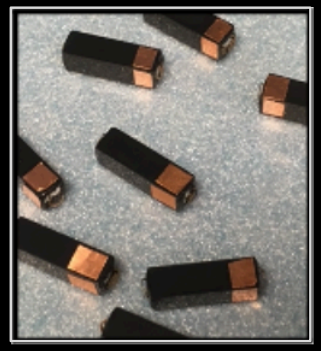
	Analysis Mode	FoV	Angular Resolution	A_{eff} (cm^2)
Stowed Mask	Coded Mask	60º × 60º	20 arcmin	2500
Deployed Mask	Coded Mask	4º × 4º	0.5 arcmin	400
	Compton	**60º × 60º**	**4º – 8º**	**400-800**

GECCO Sensitivity:
for deployed position of mask and 10^6 s exposure time



GECCO: The Status

CdZnTe Module

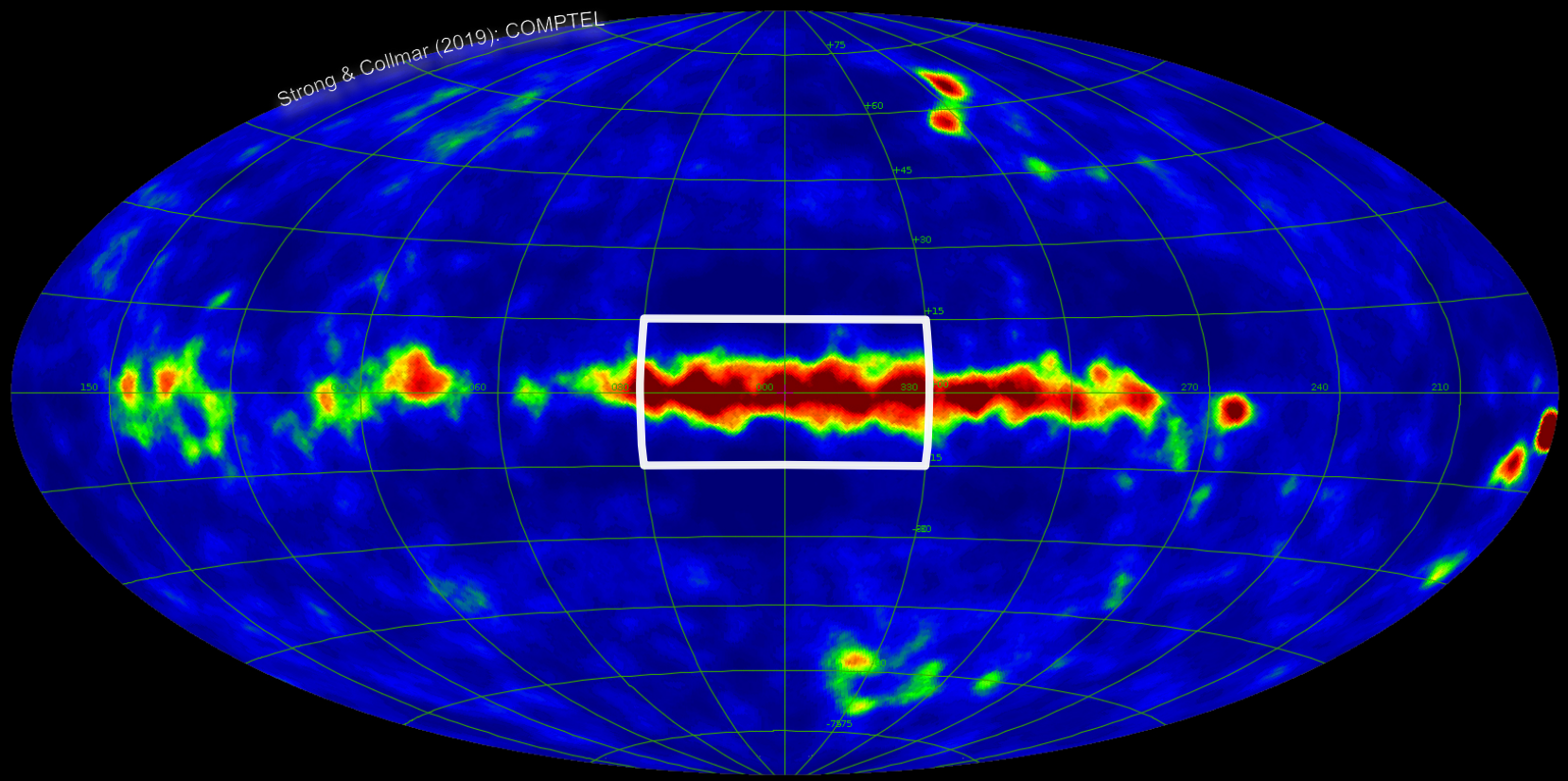


CdZnTe Imaging Calori-meter Prototype on Mother-board

Beam Test at NSRL/BNL during pandemic

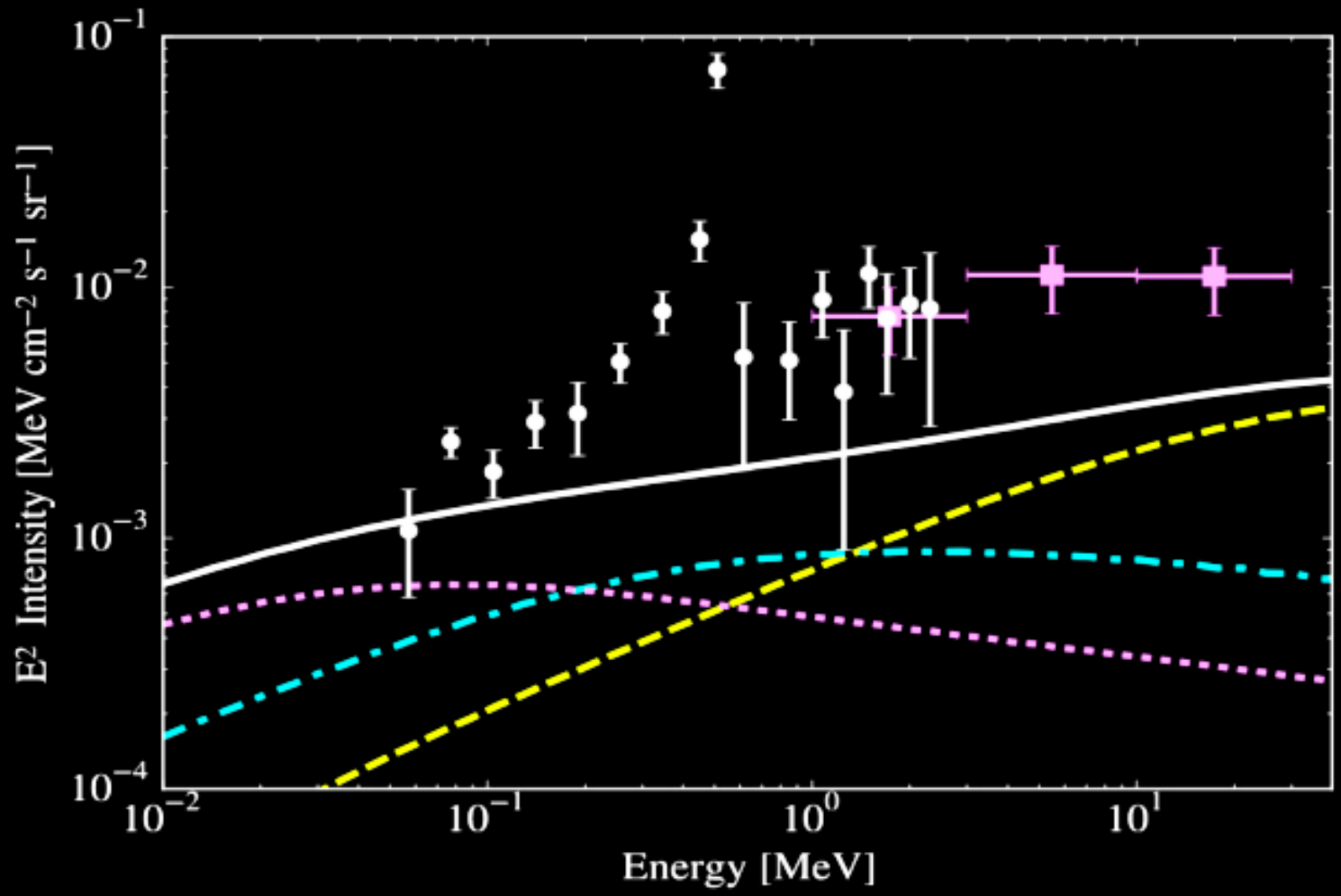
Science with GECCO

Galactic Plane is home to interesting science and new physics (e.g. Fermi/eRosita Bubbles, Dark Matter particles, 511 keV emission). We need to tell true diffuse emssion from unresolved sources apart.



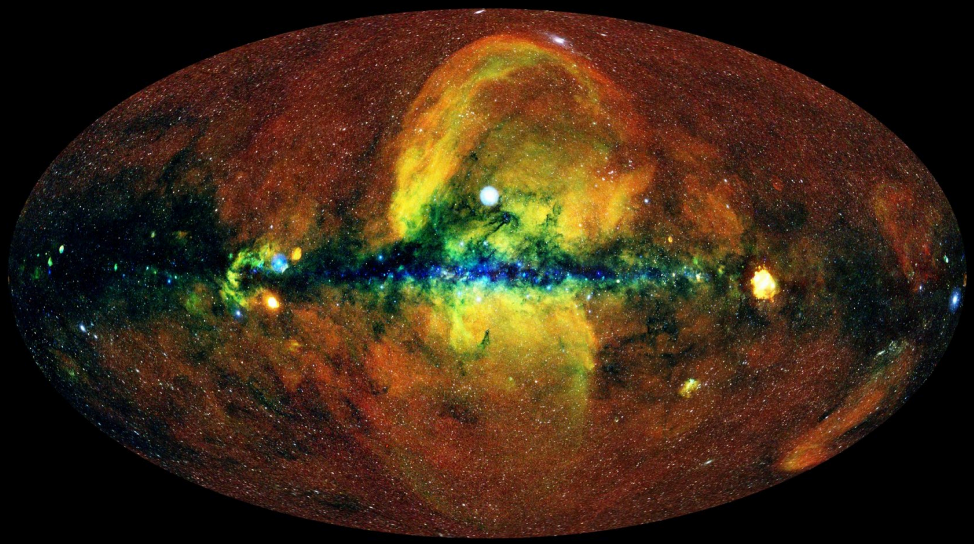
Diffuse Emission vs Point Sources

(511 keV, DM particles)

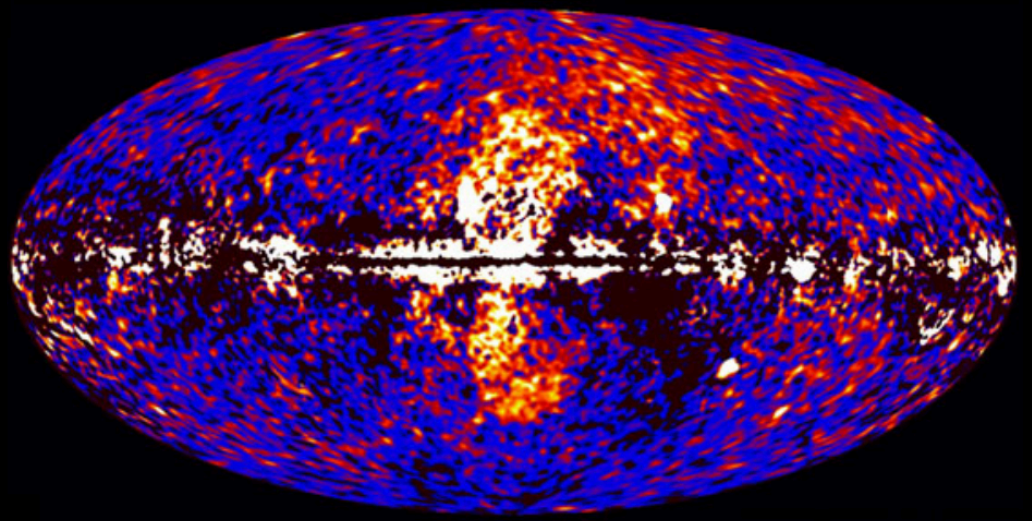


Orlando, E. 2018

Fermi Bubbles: spectral measurement

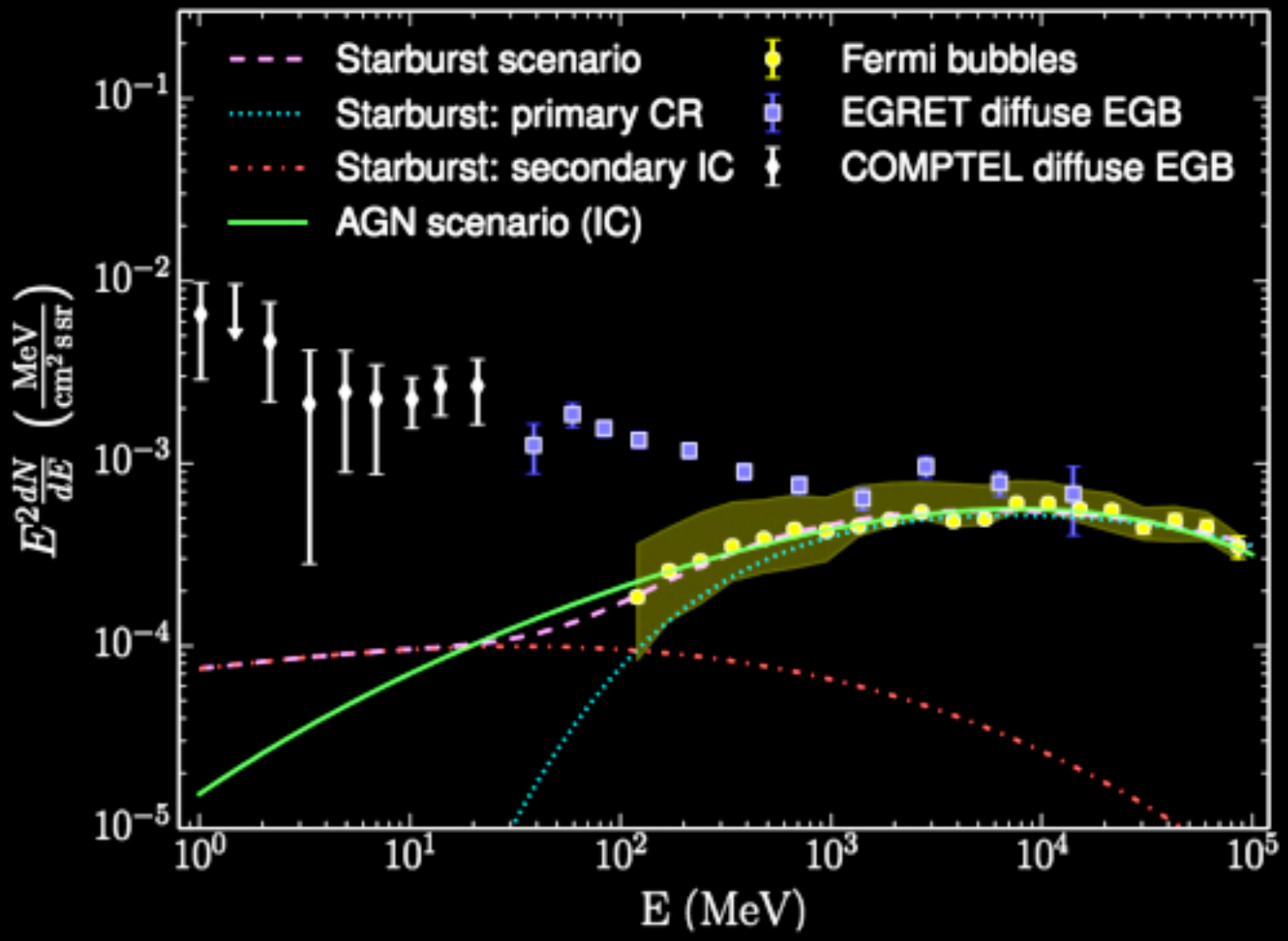


Predehl et al. 2020



Su et al. 2010

Fermi Bubbles: spectral measurement



De Angelis et al. 2018

Take-Home Message

GECCO Specs:

- 0.5 arc min angular resolution
- Diffuse emission detection (background suppression)

GECCO Science:

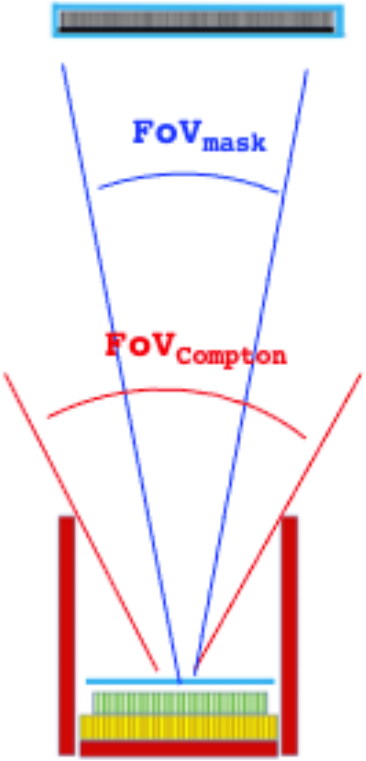
- Galactic Center Region
- Fermi / e-Rosita Bubbles
- Dark Matter
- 511 keV
- Trasients

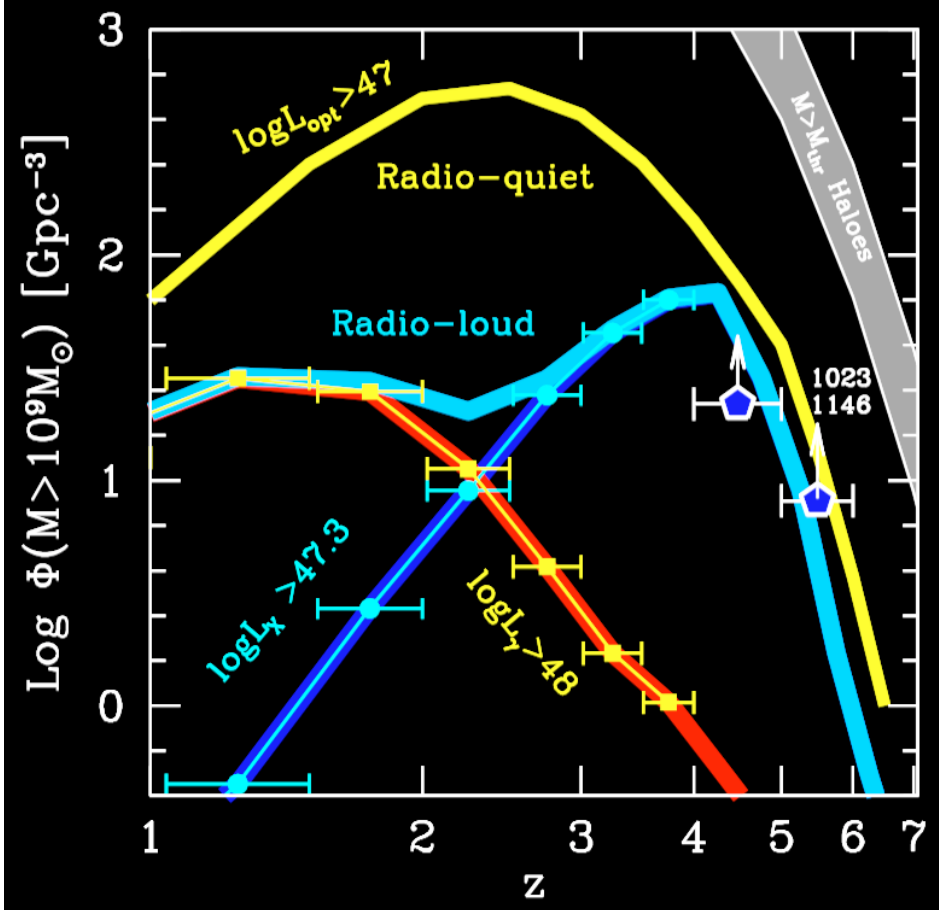
Orlando, Bottacini, Moiseev et al.(2022), JCAP, 7, 36

Thank You to
The GECCO Collaboration

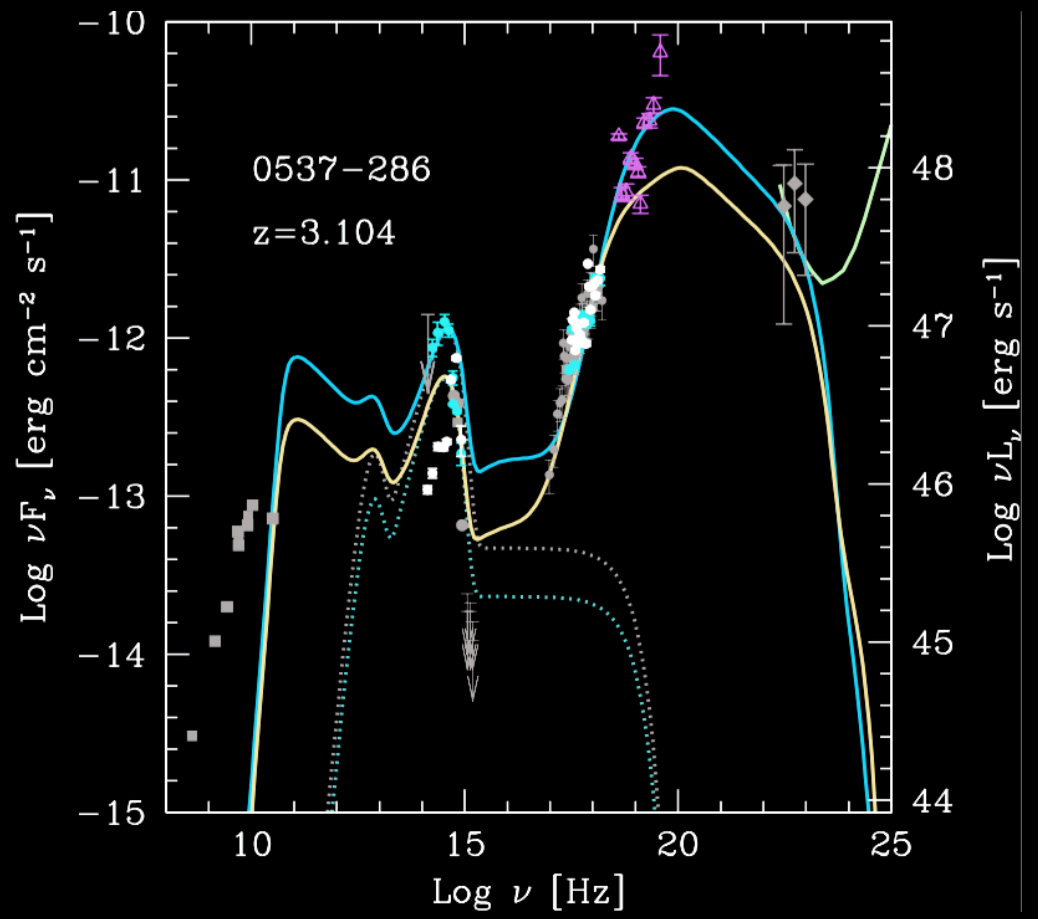
D.M. Asner[1], M.G. Baring[2], P.F. Bloser[3], A.E. Bolotnikov[1], E. Bottacini[4,5], T. Brandt[6], N. Cannady[7,8], G.A. Carini[1], W. Collmar[9], A. Coogan[10], G. DeNolfo[6], S. Digel[11], V. Eberle[9], T. Enßlin[9], I. Grenier[12], A. Harding[3], D. Hartmann[13], S. Hermann[1], D. Kazanas[6], M. Kerr[14], R. Krivonos[15], P. Laurent[12], F. Longo[16], J.W. Mitchell[6], A.A. Moiseev[8,17,*], L. Morrison[19], A. Morselli[18], I.V. Moskalenko[5], R.F. Mushotzky[17], M. Negro[7,8], E. Orlando[5,16], Stefano Profumo[19], M. Sasaki[8,17], C.R. Shrader[8,20], G.K. Skinner[21], F. Stecker[6], A.W. Strong[9], S. Sturner[7,8], P. Shawhan[17], L. Smith[17], H. Tajima[22], D. Thompson[6], J. Tomsick[23], Z. Wadiasingh[24], R. Woolf[14], E. Yates[17], K.-P. Ziock[25], A. Zoglauer[23]

back up

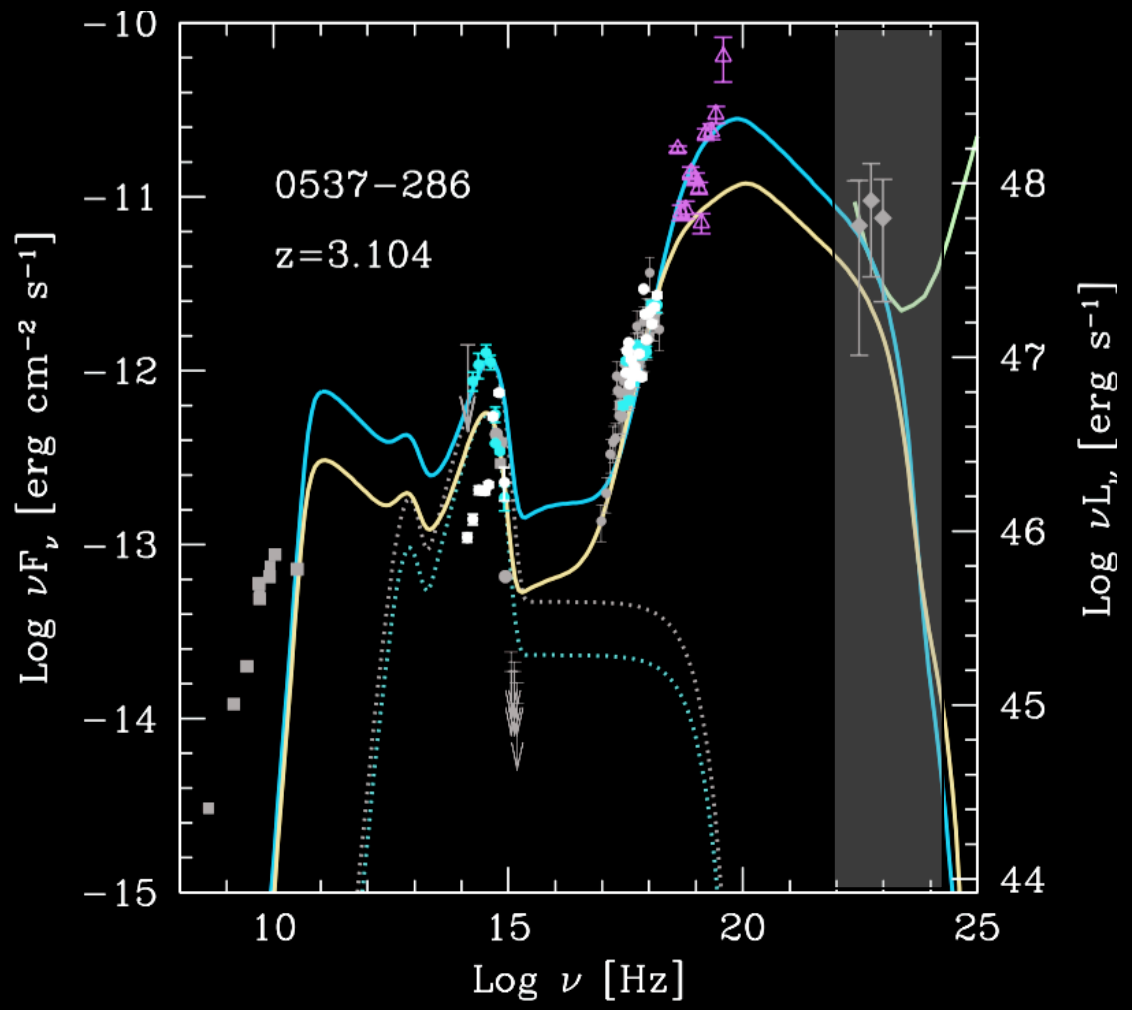




Ghisellini, G. 2015

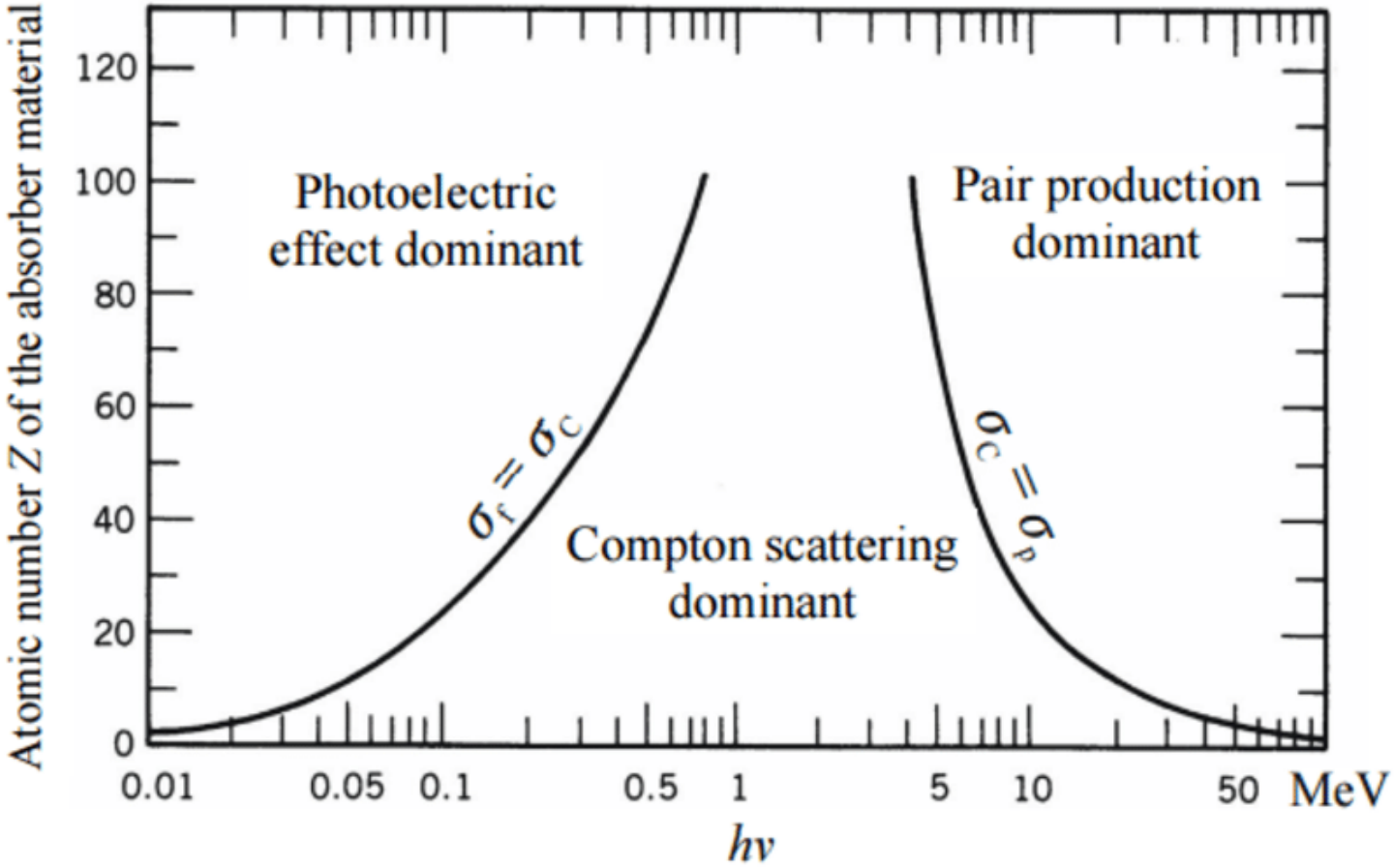


Bottacini et al. 2010

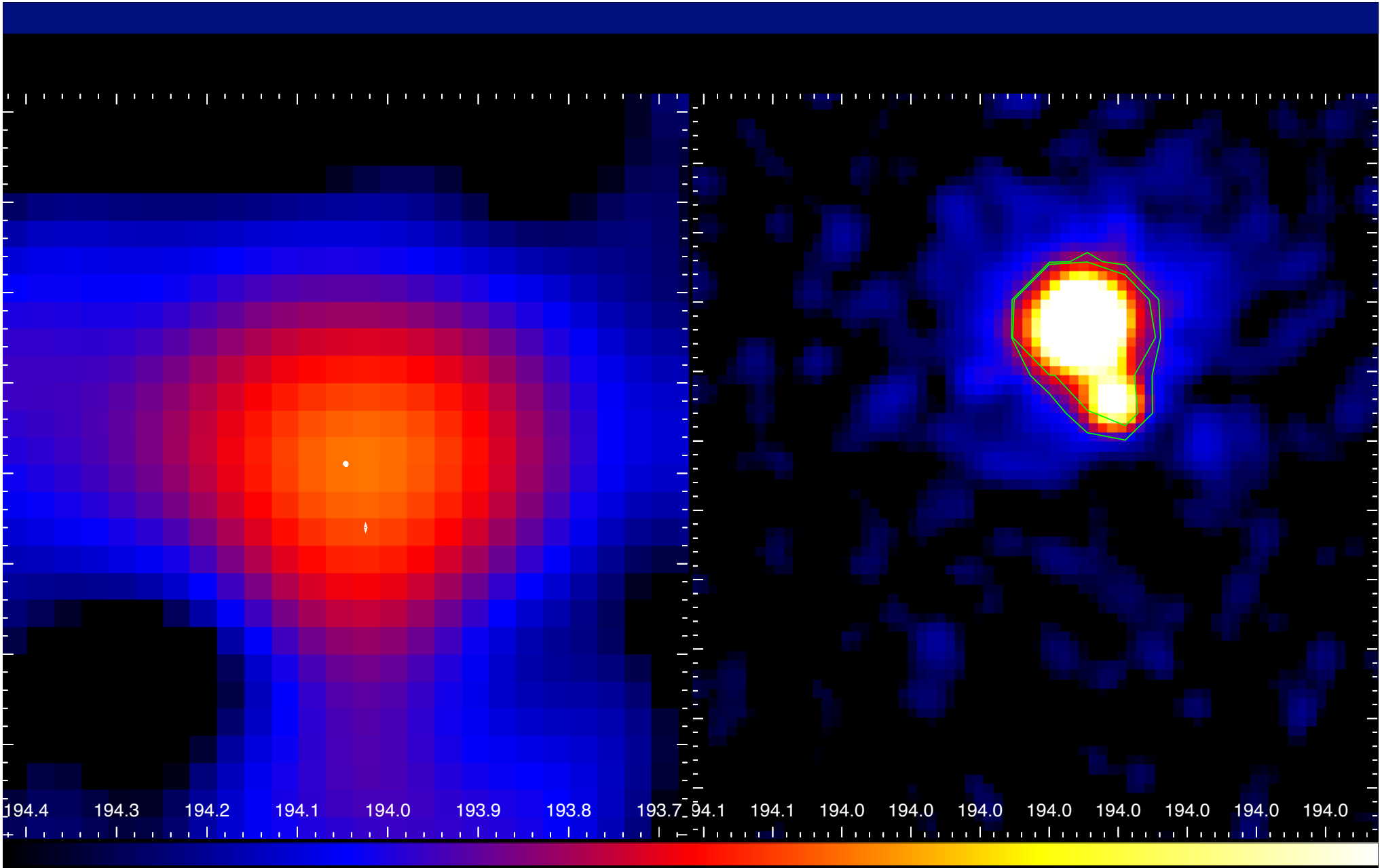


Bottacini et al. 2010

back up



Evans R.D., 1955, The Atomic Nucleus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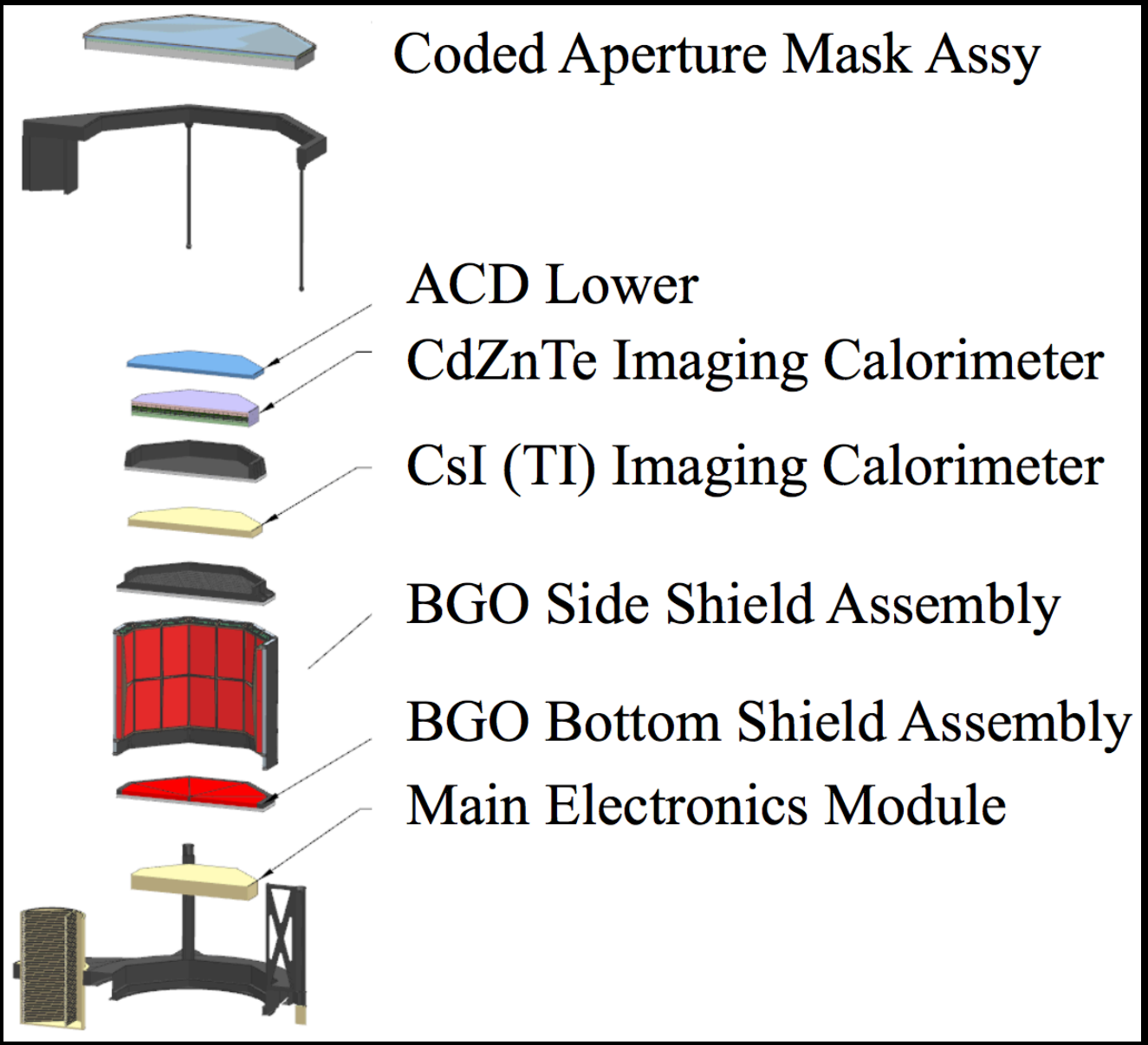
Coded Aperture Mask Assy
ACD Lower
CdZnTe Imaging Calorimeter
CsI (TI) Imaging Calorimeter
BGO Side Shield Assembly
BGO Bottom Shield Assembly
Main Electronics Module