TITANS
Nucleo Milenio

DEPARTAMENTO de ASTRONOMIA UNIVERSIDAD DE CONCEPCIÓN

Signatures of jets and accretion for the EHT

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Goal: Studying accretion and jets for further AGN with the ng-EHT

Tool: Advection-dominated accretion flow (ADAF) models for low-luminosity AGN from Yuan & Narayan (2014)

Applied to: Cen A, M84, ,NGC 4594, NGC 3998, NGC 4278

Model constraints via spectral data from radio to X-ray frequencies

Full paper: Bandyopadhyay et al. (2019), MNRAS, 490, 4606

Potential to explore sources with different properties

Source	$log(M_{BH}/M_{\odot})$	Distance (Mpc)	$\theta_{\rm Ring}$ (μas)	Eddington Ratio ($L_{Bol}/L_{\rm Edd}$)
NGC 5128 (Cen A)	7.7	3.8	1.5	5.0×10^{-4}
NGC 4374 (M84)	8.9	17.1	4.8	5.0×10^{-6}
NGC 4594 (Sombrero, M 104)	8.5	9.1	3.6	1.5×10^{-6}
NGC 3998	8.9	13.1	6.2	1.0×10^{-4}
NGC 4278	8.6	14.9	2.7	5.0×10^{-6}

Potential to probe accretion at different Eddington ratios as well as absolute accretion rates!

Bandyopadhyay et al. (2019)

The ADAF model

$$\dot{M}(R) = \dot{M}(R_{tr}) \quad \left(\frac{R}{R_{\rm tr}}\right)^{s} \quad = 4\pi\rho R H|v|. \qquad (1)$$

$$v\frac{dv}{dR} - \Omega^2 R = -\Omega_K^2 R \quad - \quad \frac{1}{\rho}\frac{d}{dR}(\rho c_s^2). \qquad (2)$$

$$\frac{d\Omega}{dR} \quad = \quad \frac{v\Omega_K(\Omega R^2 - j)}{\alpha R^2 c_s^2}. \qquad (3)$$

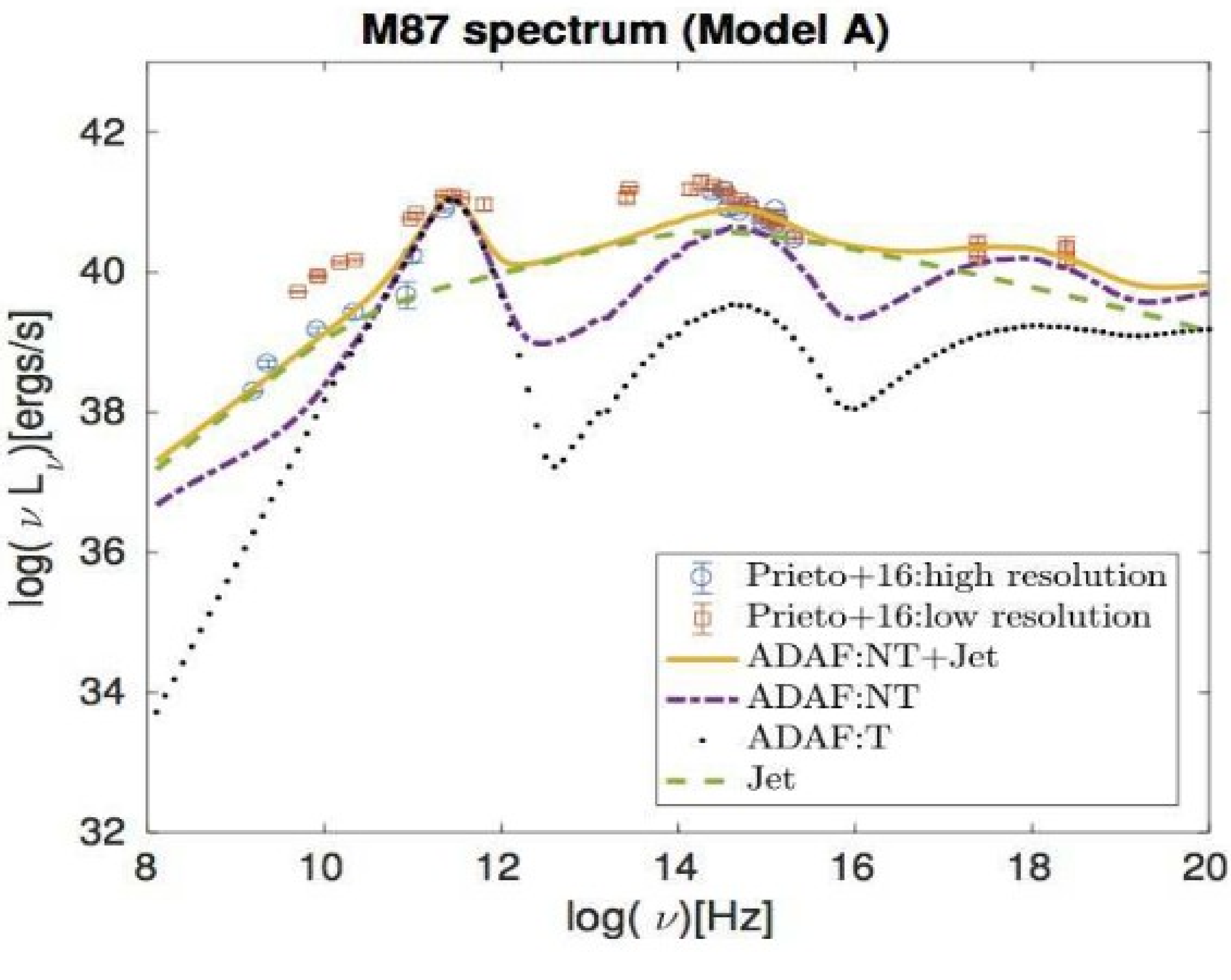
$$\rho v\left(\frac{de_i}{dR} - \frac{p_i}{\rho^2}\frac{d\rho}{dR}\right) \quad = \quad (1-\delta)q^{+} - q^{ie}.$$

$$\rho v\left(\frac{de_e}{dR} - \frac{p_e}{\rho^2}\frac{d\rho}{dR}\right) \quad = \quad \delta q^{+} + q^{ie} - q^{-}. \qquad (4)$$

Yuan et al. (2005);
Yuan & Narayan (2014)

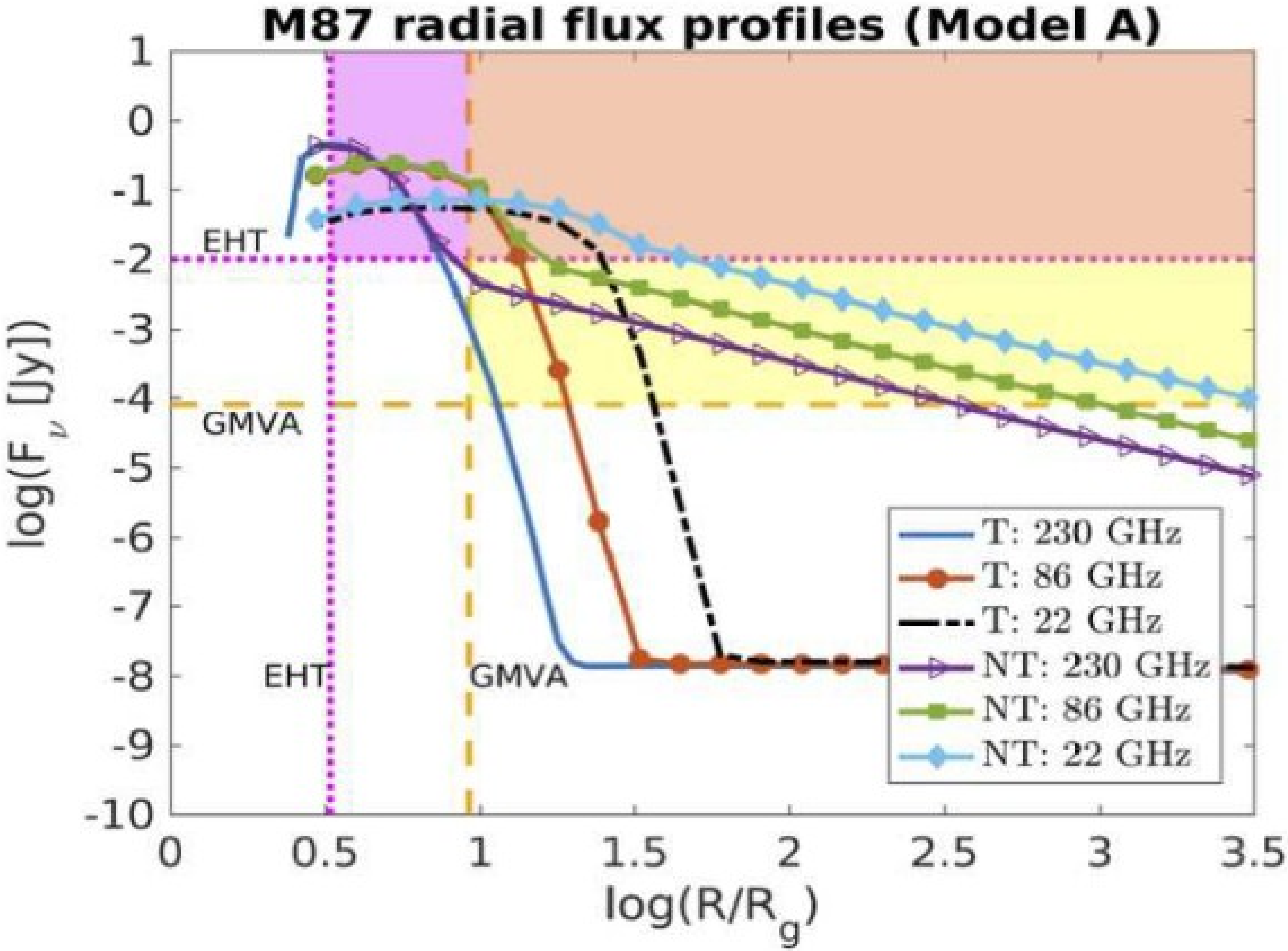
SED calculated considering synchrotron emission, bremsstrahlung and inverse Compton scattering. Simple jet model following Spada et al. (2001) assuming mass loss rate, electron power-law distribution and bulk Lorentz factor.

Results for M87



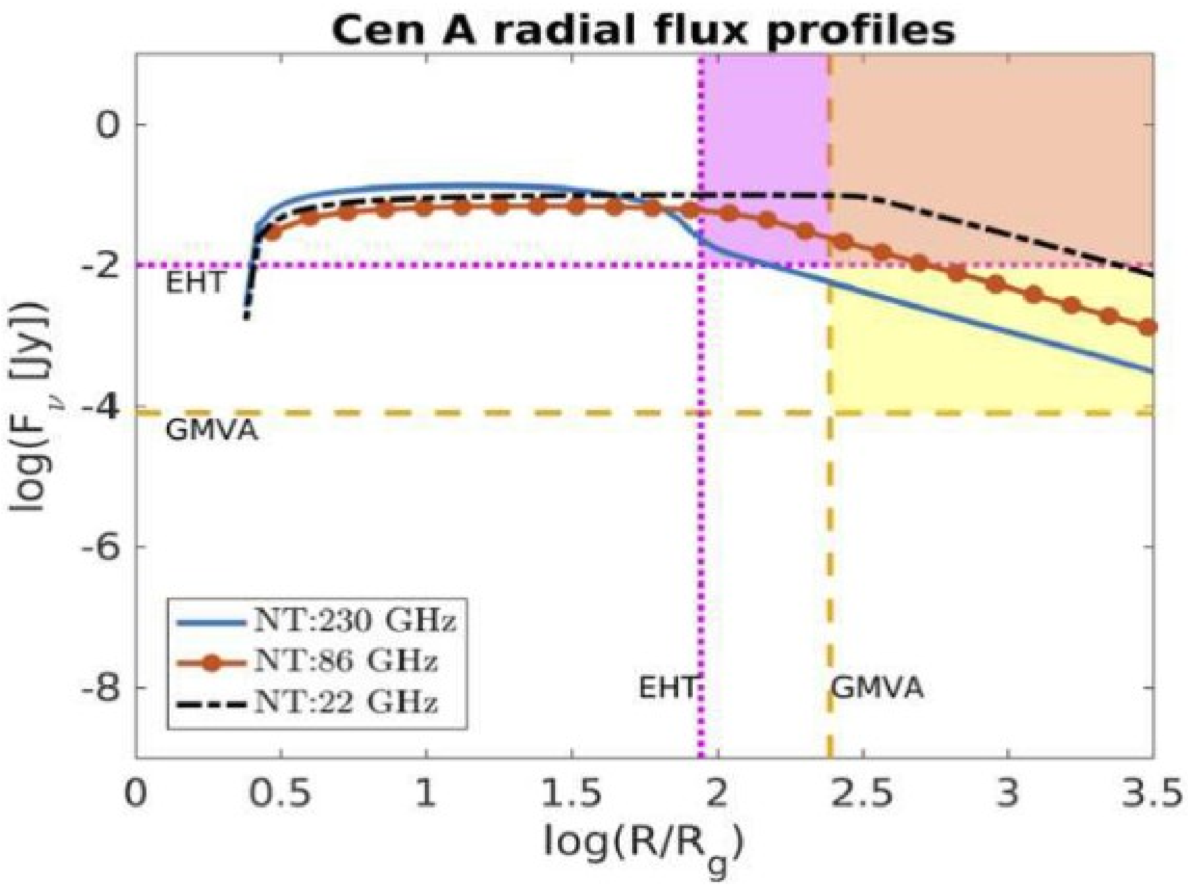
Bandyopadhyay et al. (2019)

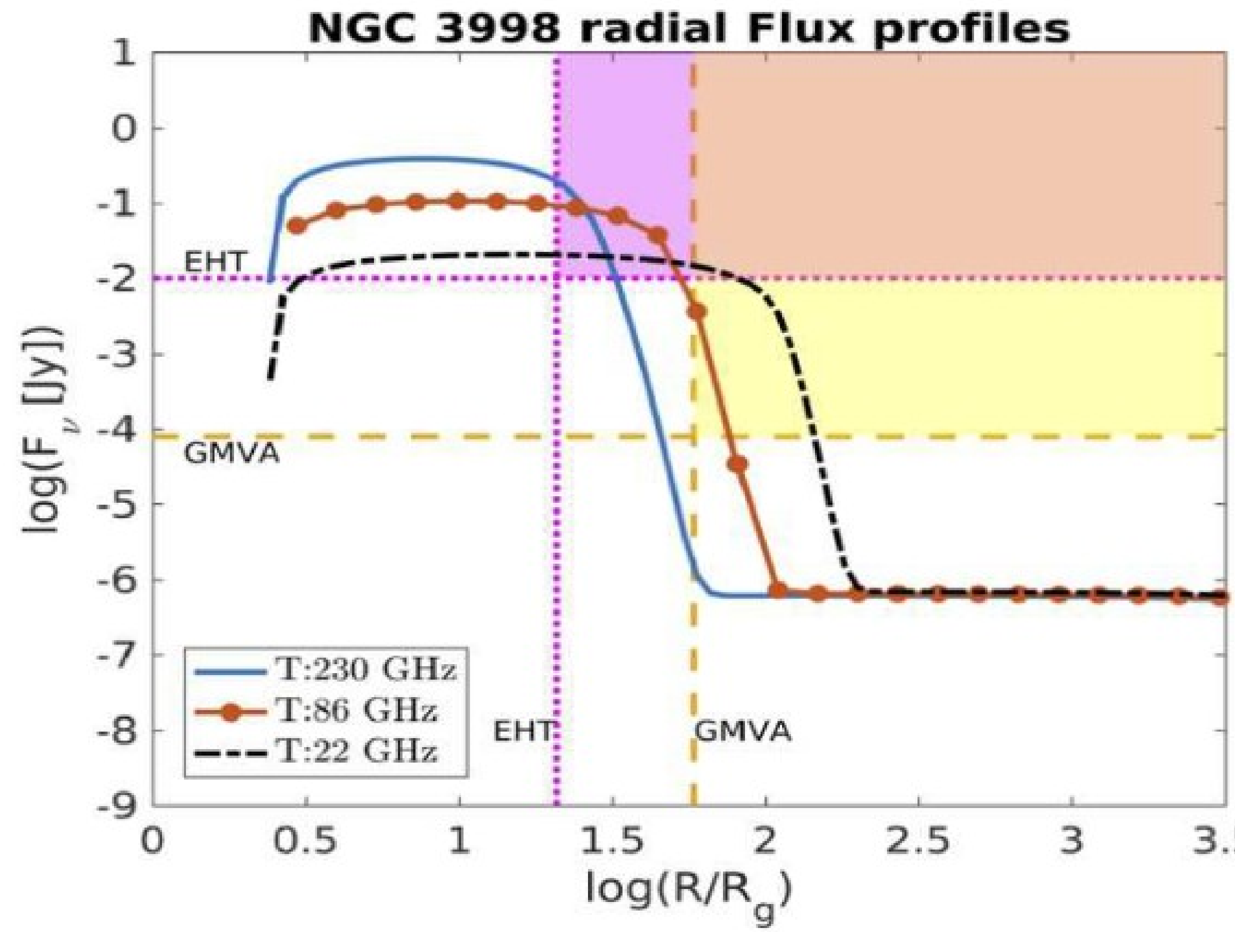
Derived radial flux profile



Bandyopadhyay et al. (2019)

Short summary of results (1)

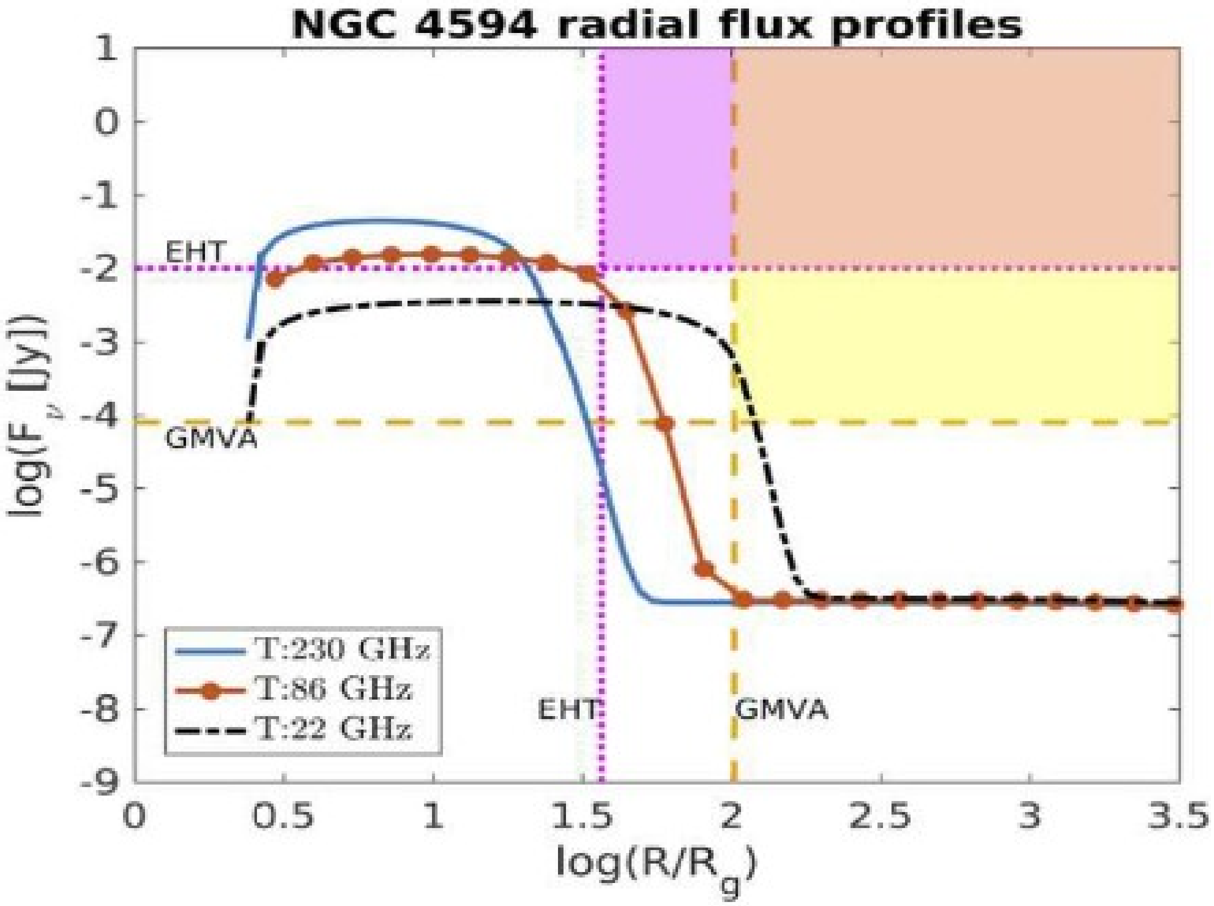


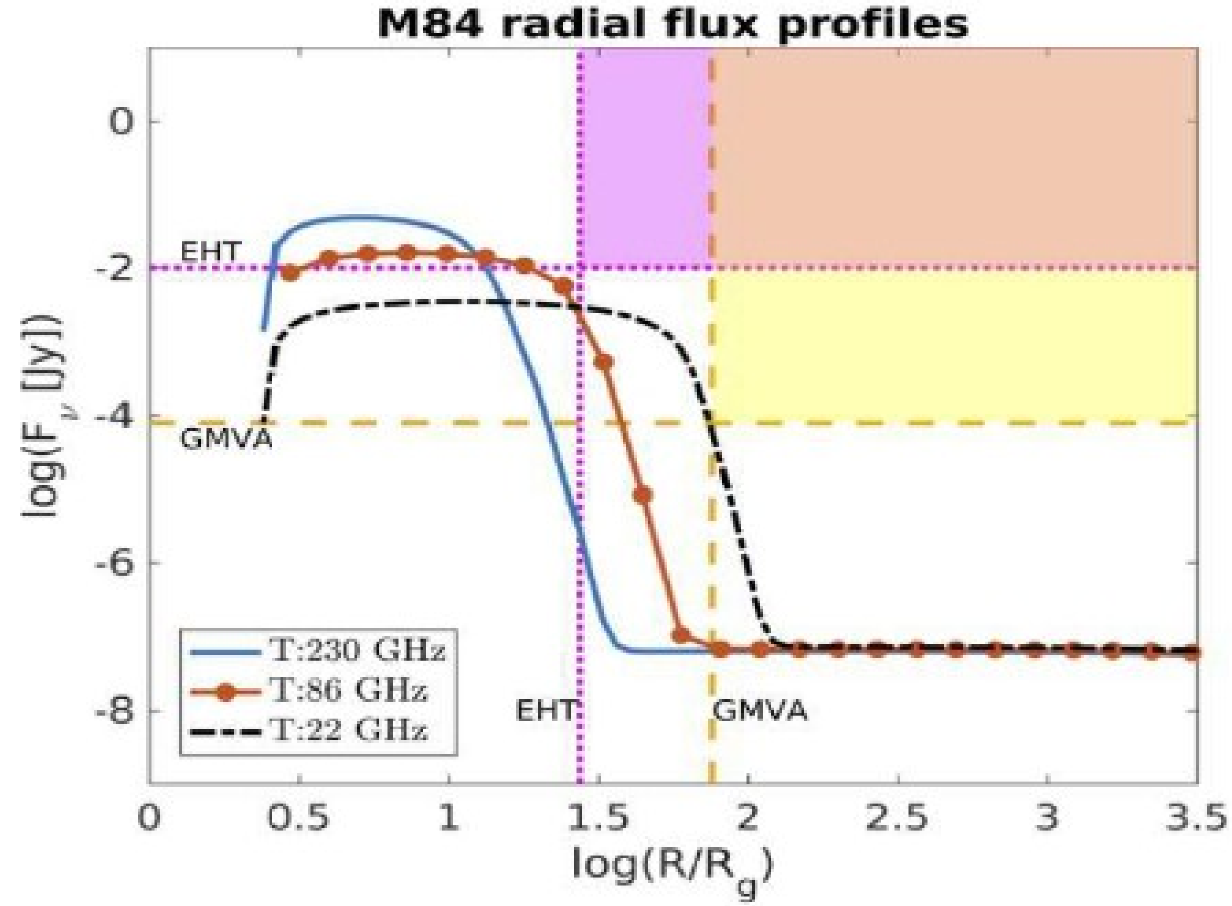


Source	Resolvable (EHT)	Detectable (EHT)
Cen A	Yes	Only a part of the outer region
M84	Partially	No
NGC 4594	Partially	No
NGC 3998	Yes	Yes
NGC 4278	Outer regions	No

Bandyopadhyay et al. (2019)

Short summary of results (2)





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Bandyopadhyay et al. (2019)