Exploring the mm-to-cm Spectral Energy Distribution of nearby spirals

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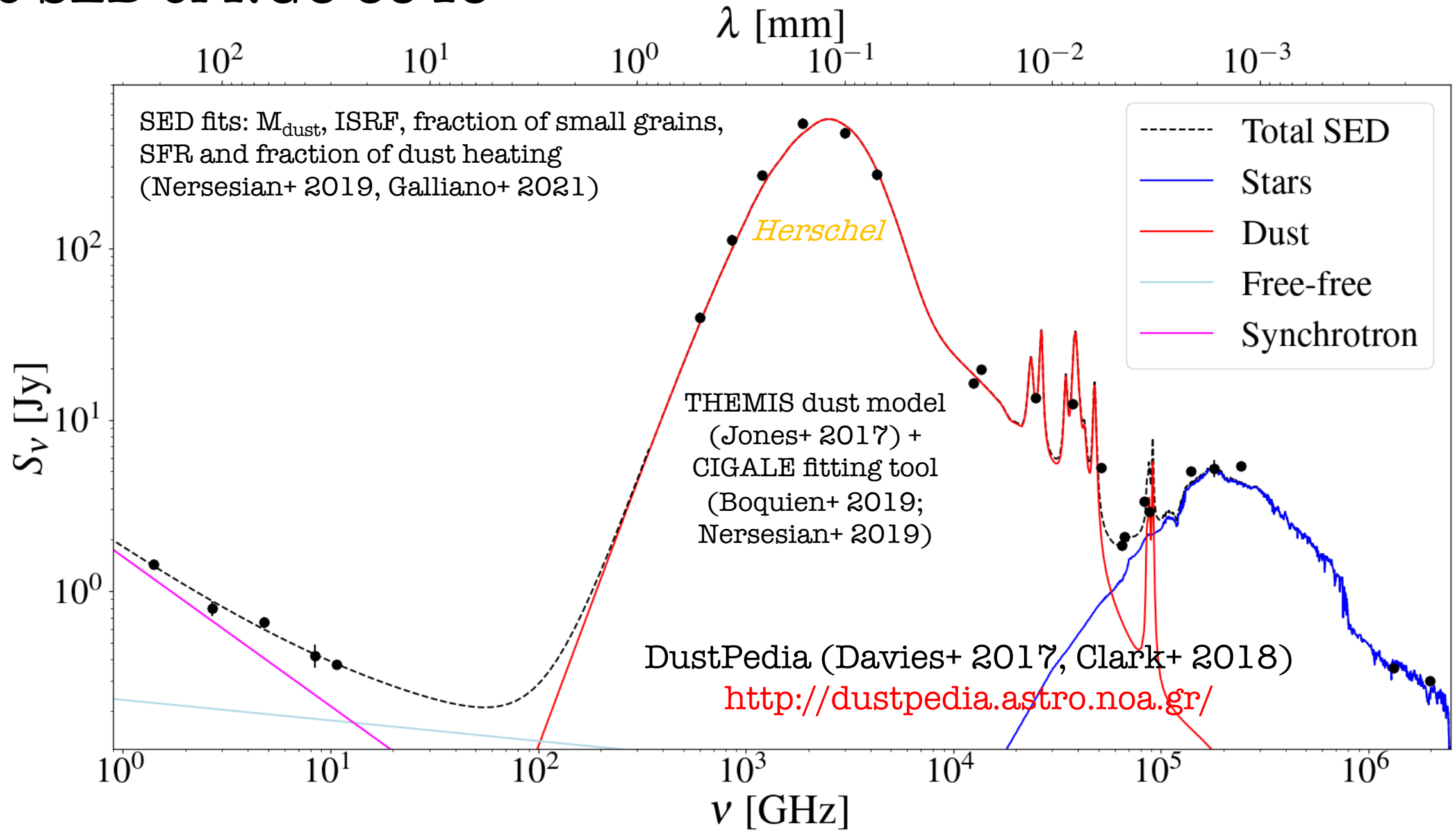
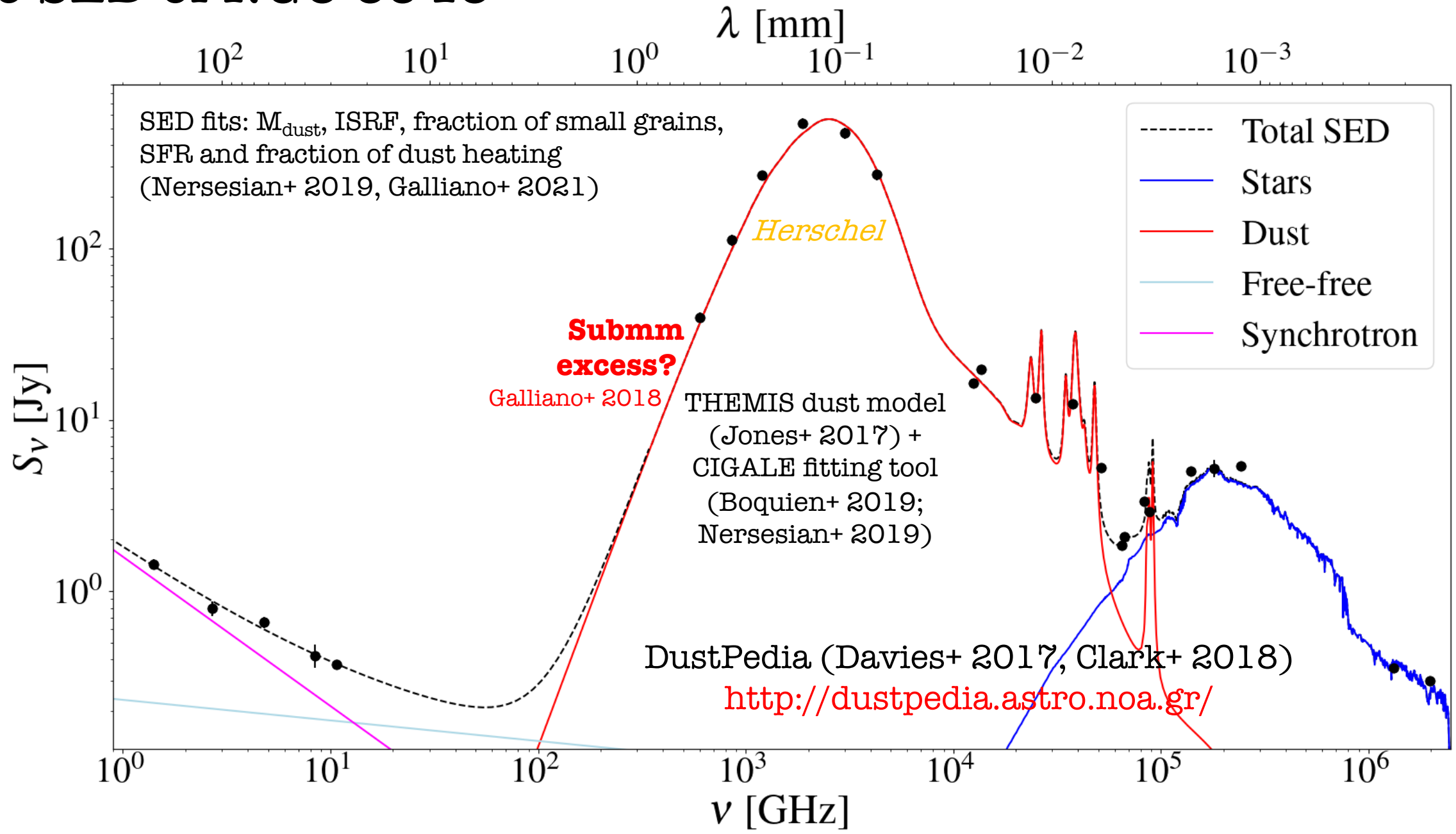
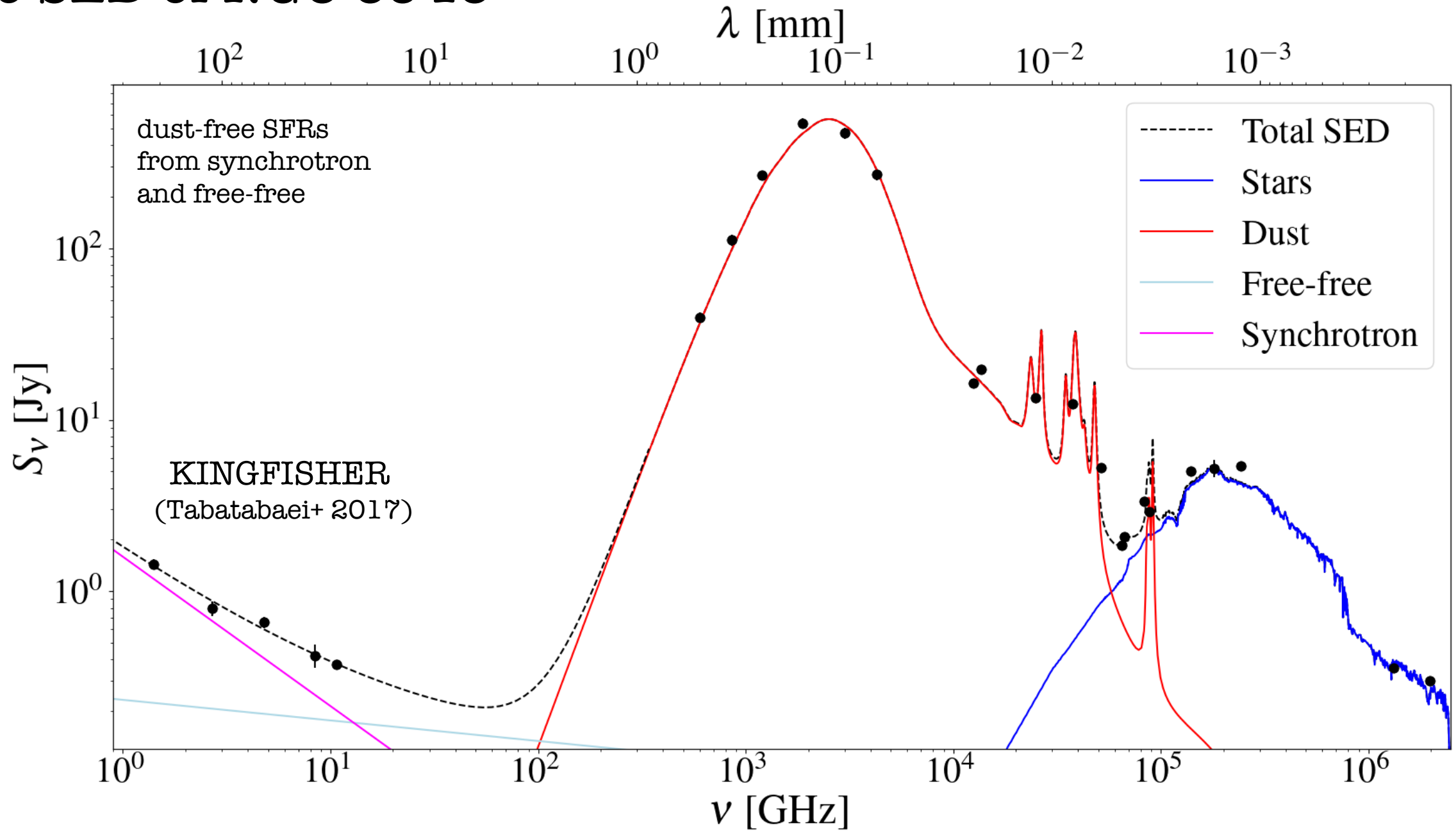
The SED of NGC 6946



The SED of NGC 6946



The SED of NGC 6946



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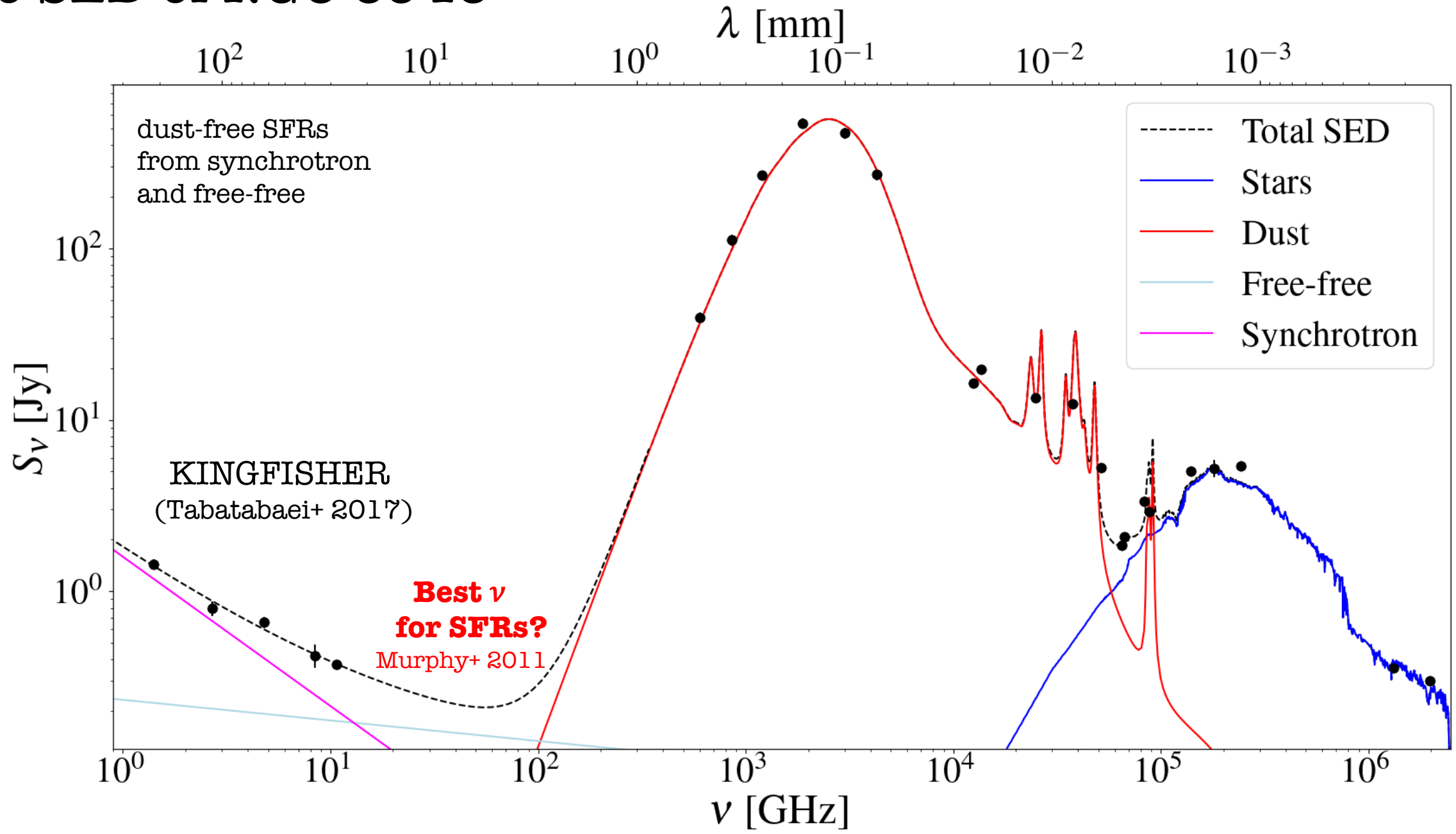

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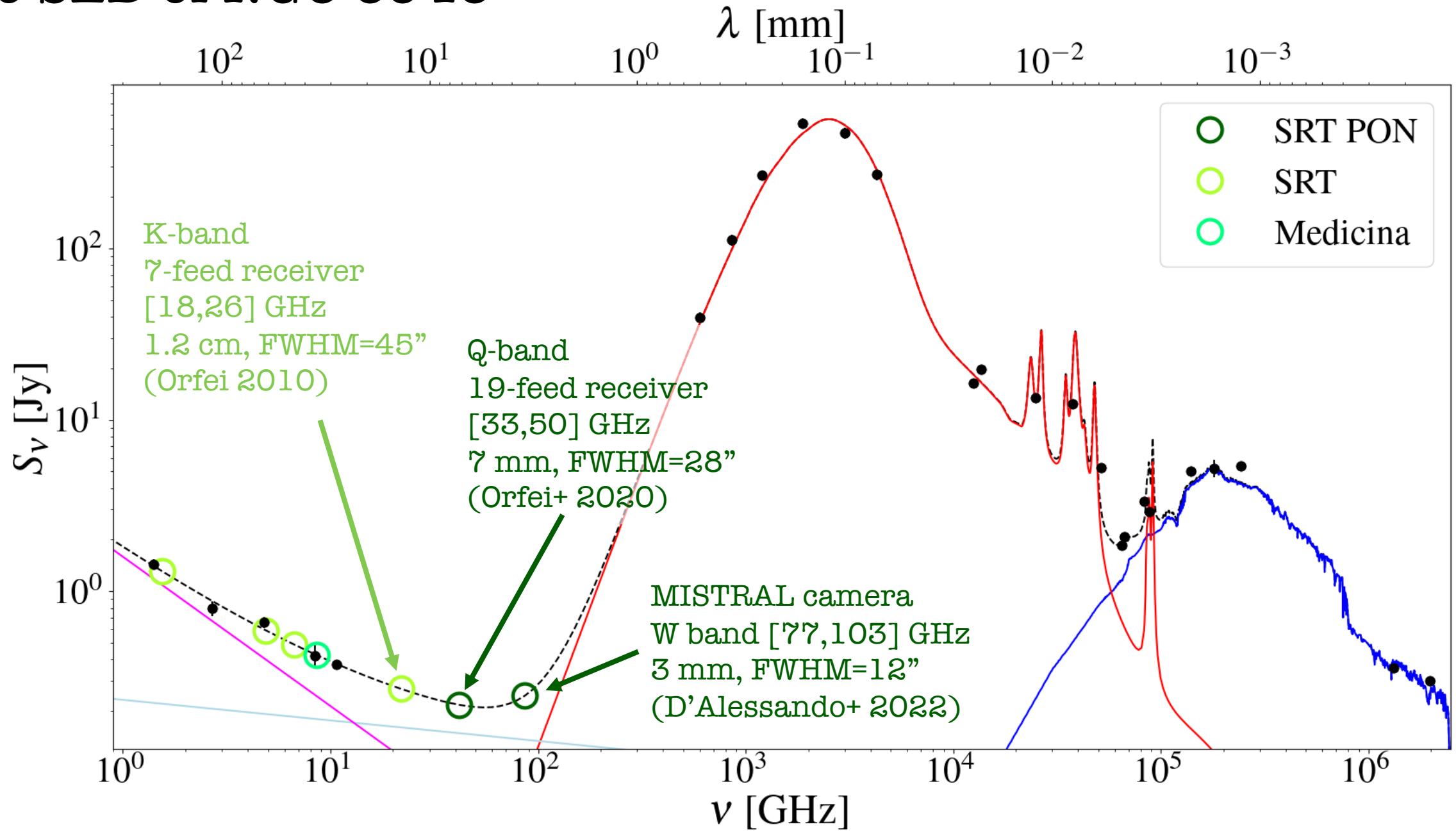


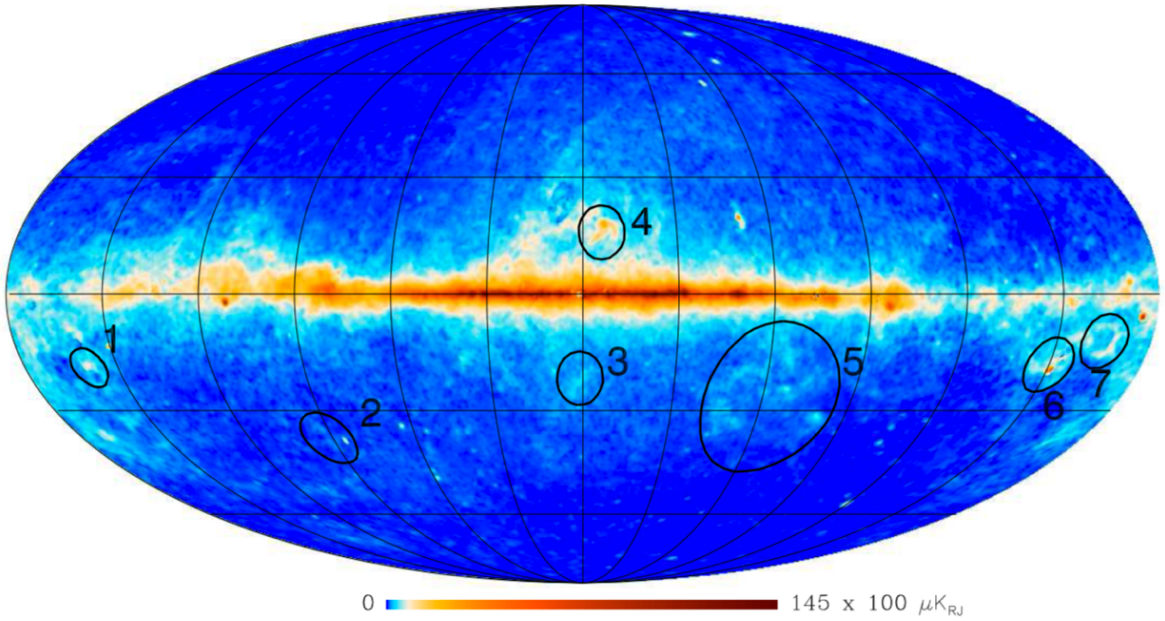
Anomalous Microwave Emission (AME)

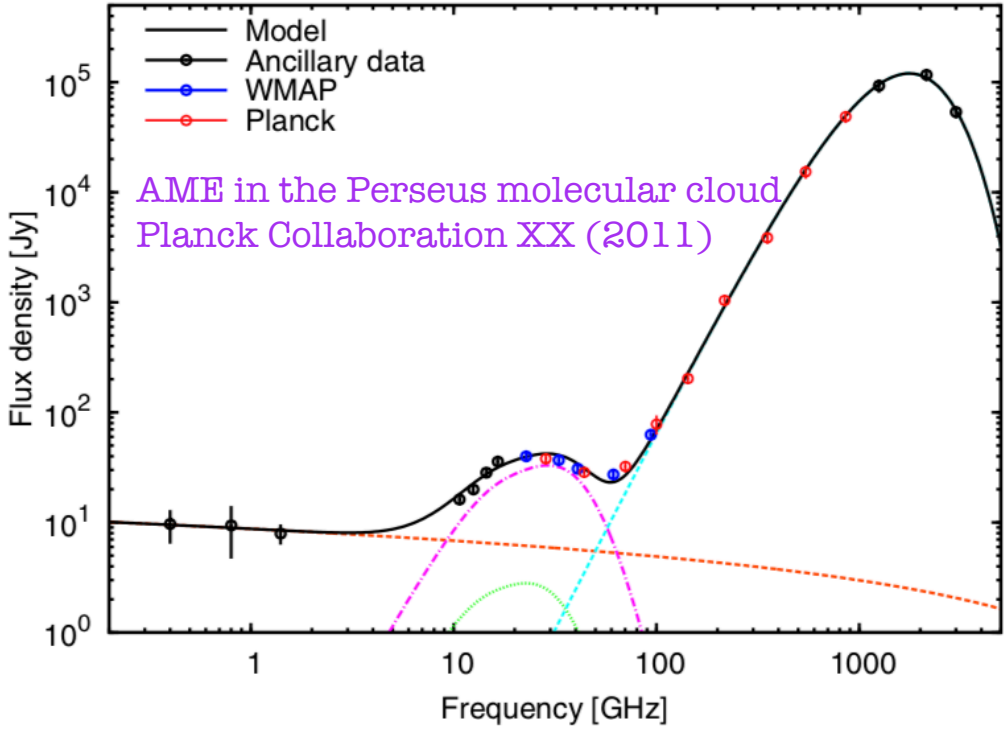
Emission at 30 GHz in the Milky Way, in excess of synchrotron, free-free and dust emission.

AME correlates with dust emission at larger frequencies

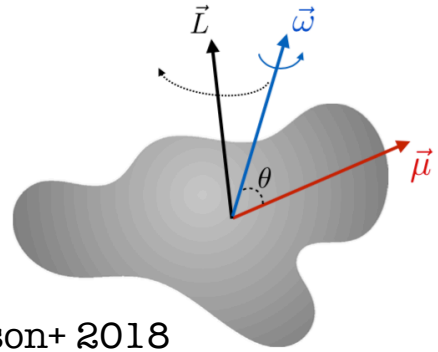
Detected in various environments

AME all-sky map at 23 GHz
Planck Collaboration Int. XXII (2015)





Spinning grains with an electric dipole

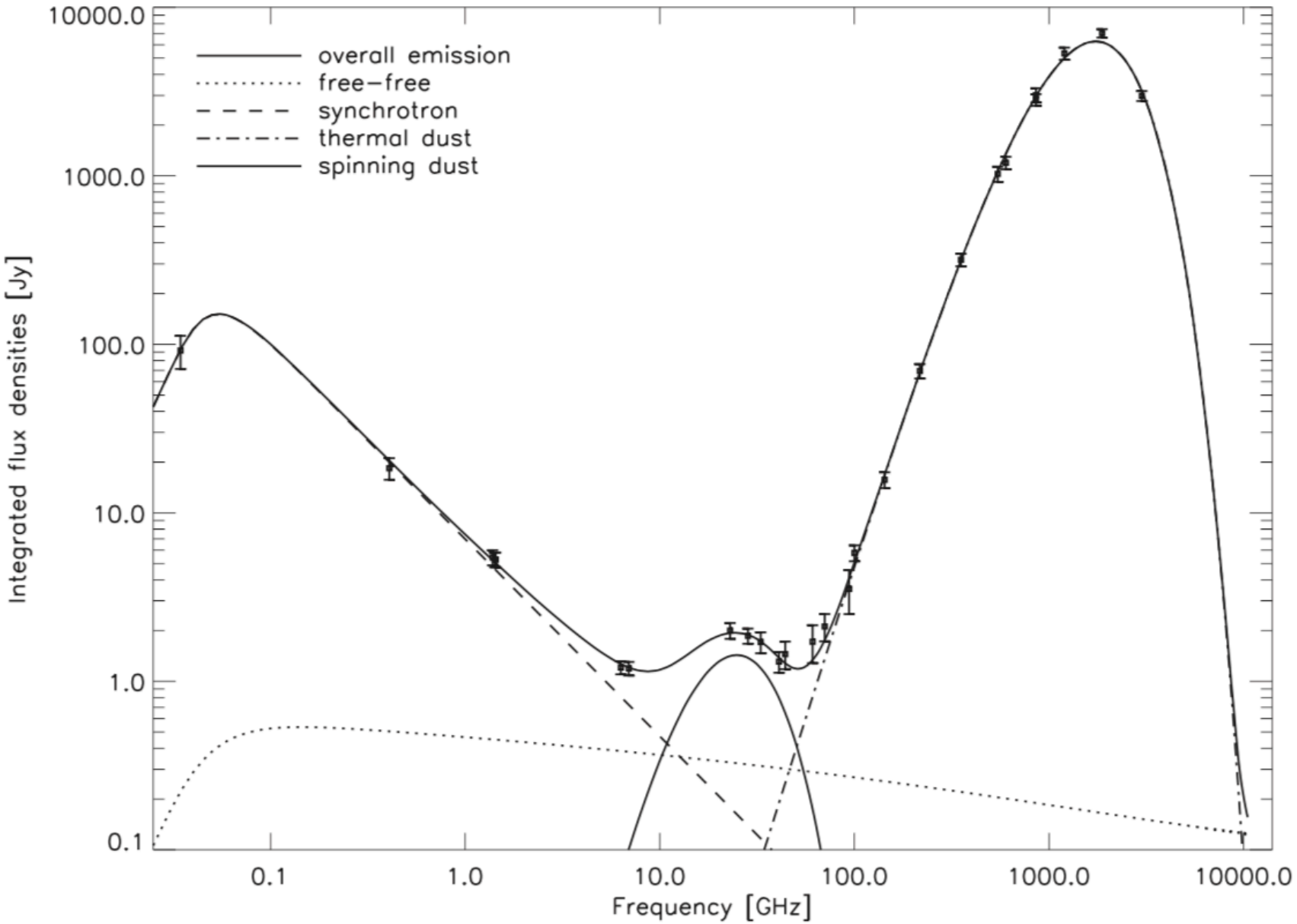


Dickinson+ 2018

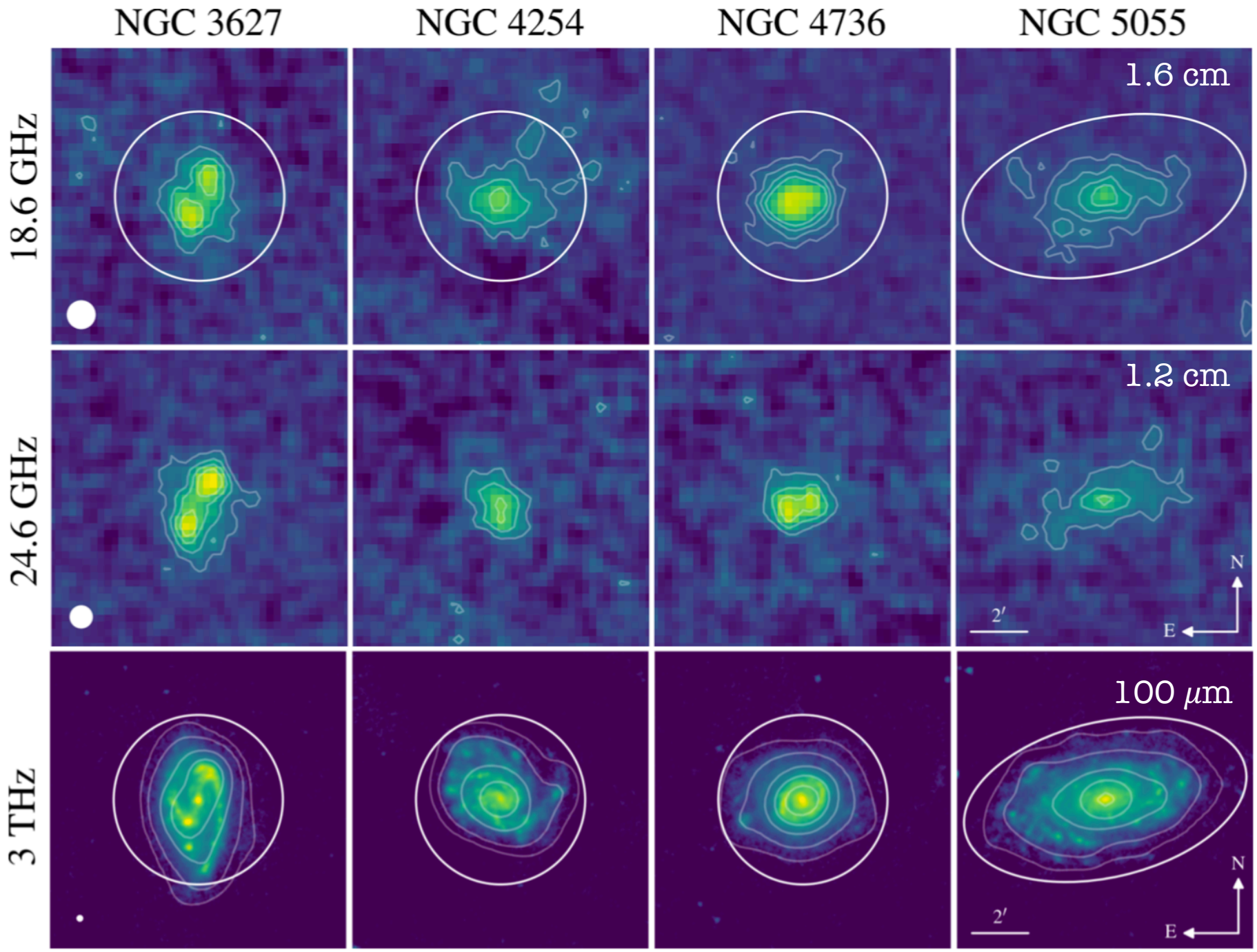
$\nu = \omega/2\pi \simeq 30$ GHz ➡ $a \lesssim 1$ nm

AME in the global SED of M31

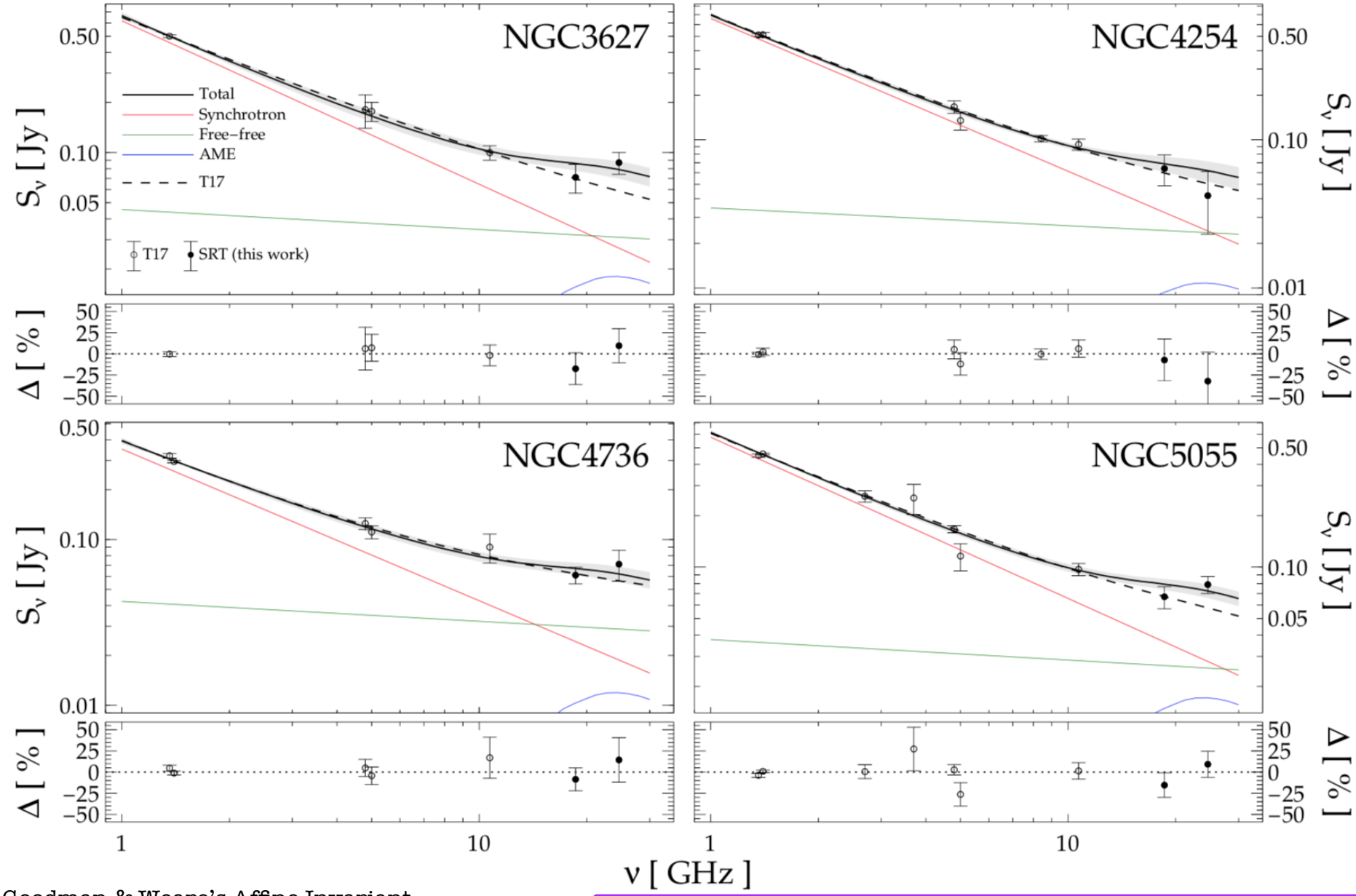
Battistelli+ 2019



K-band observations with SRT
(Bianchi+ 2022)



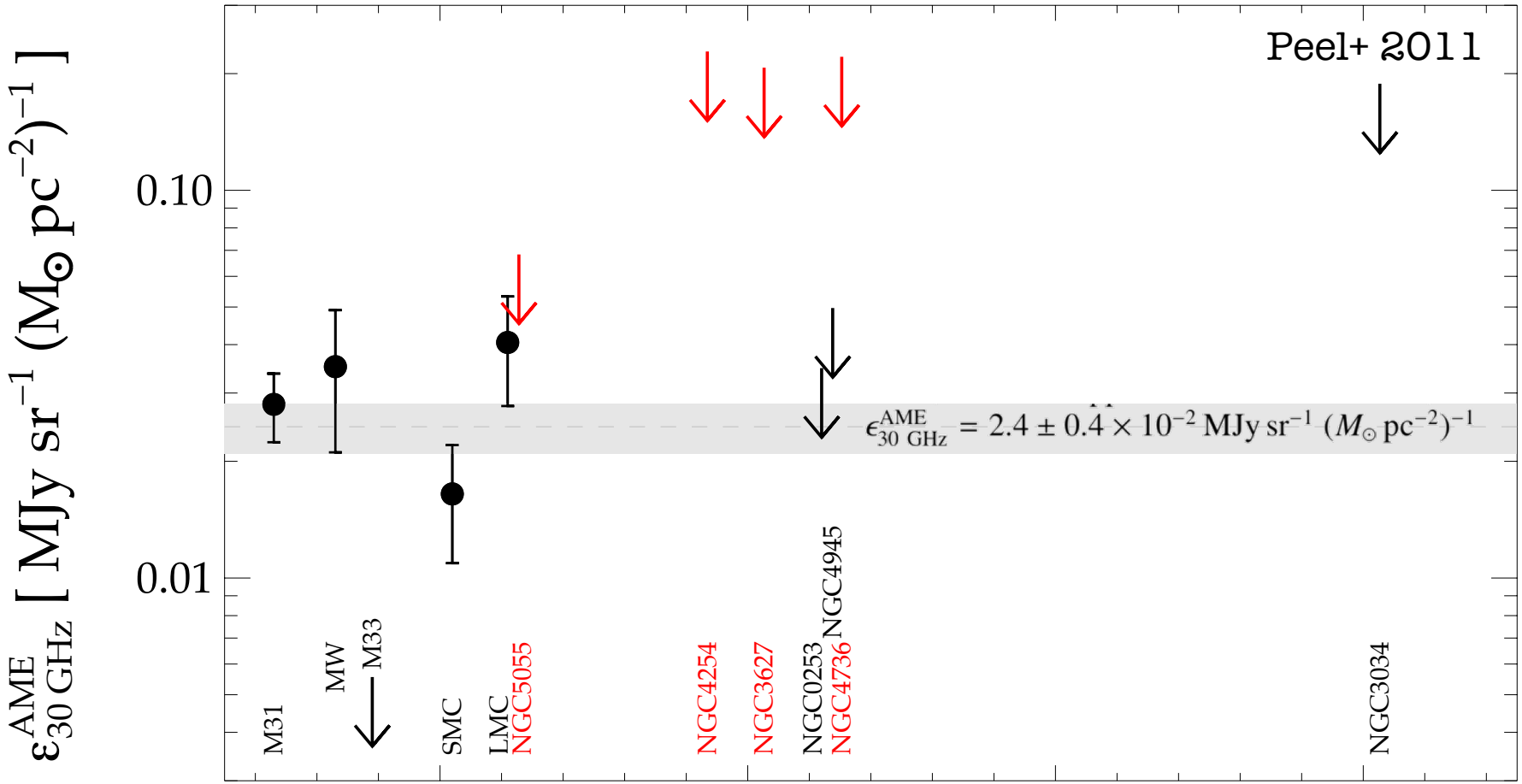
Fit



Goodman & Weare's Affine Invariant
Markov chain Monte Carlo (MCMC)
Ensemble sampler
(emcee; Foreman-Mackey+ 2013)

$$S_\nu = S^{\mathrm{sy}}_{5\ \mathrm{GHz}} \times \left(\frac{\nu}{5\ \mathrm{GHz}}\right)^{-\alpha} + S^{\mathrm{ff}}_{5\ \mathrm{GHz}} \times \left(\frac{\nu}{5\ \mathrm{GHz}}\right)^{-0.12} + S^{\mathrm{AME}}_{\nu}$$

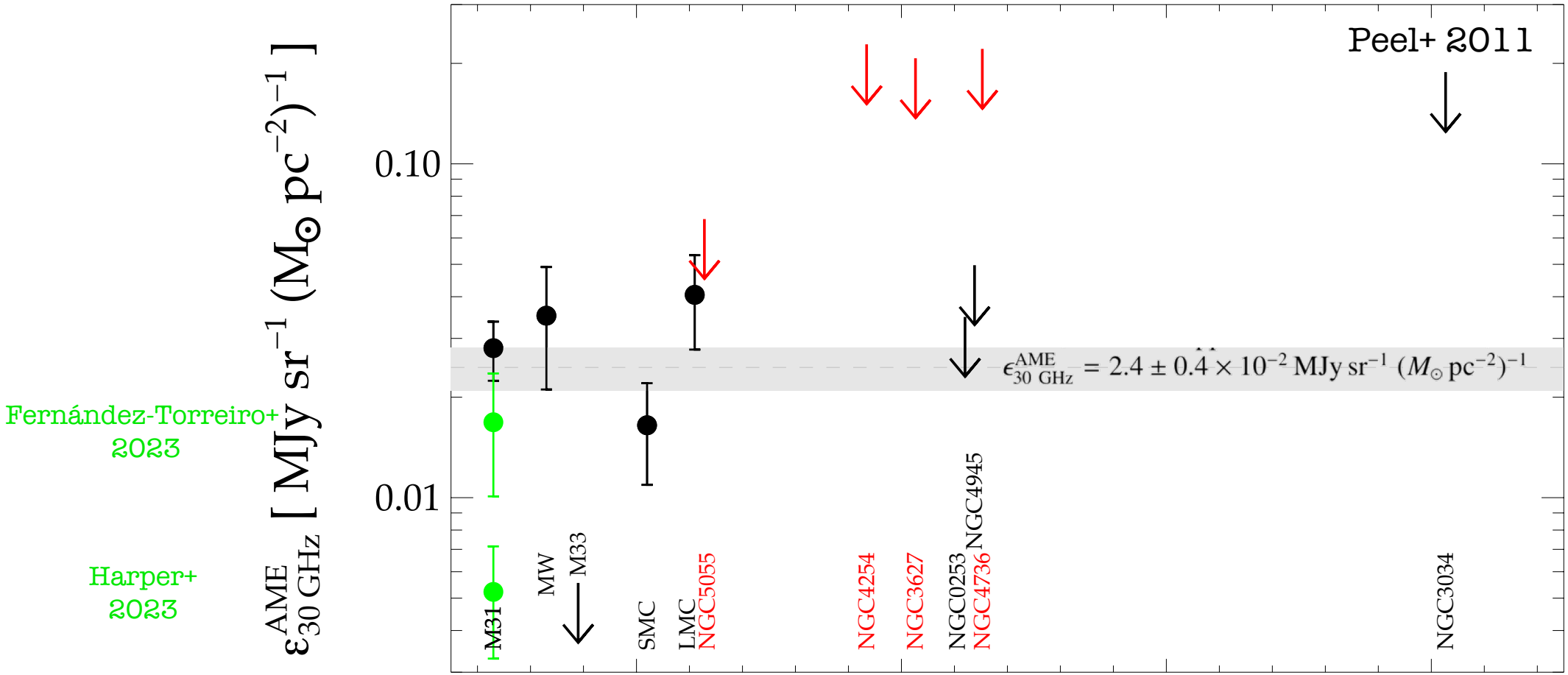
AME emissivity



$$\epsilon^{\rm AME}_{30\ \rm GHz} = \frac{S^{\rm AME}_{30\ \rm GHz}}{M_{\rm d}/D^2}$$

Surface brightness per dust mass surface density

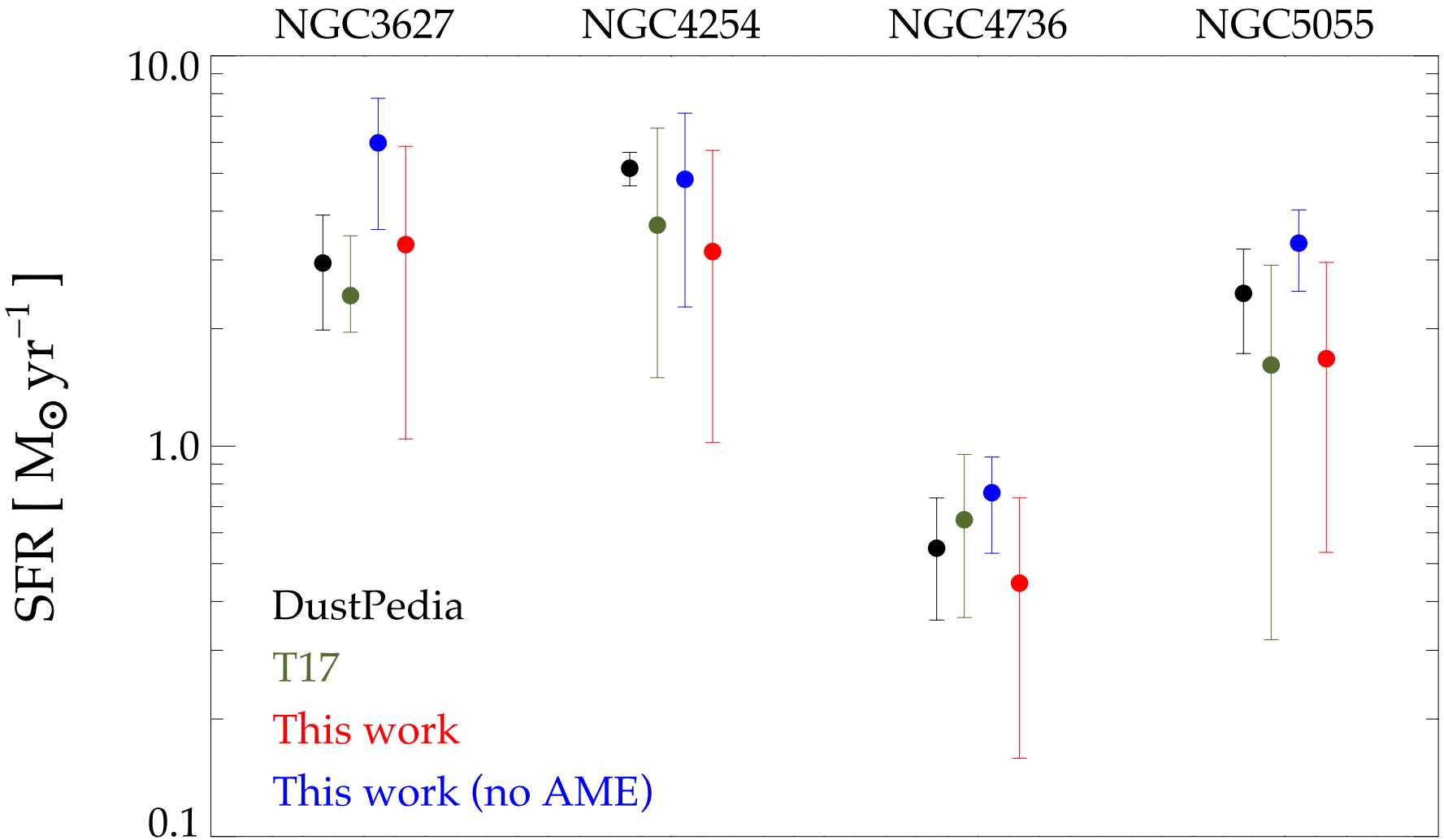
AME emissivity



$$\epsilon^{\rm AME}_{30\ \rm GHz} = \frac{S^{\rm AME}_{30\ \rm GHz}}{M_{\rm d}/D^2}$$

Surface brightness per dust mass surface density

$S^{\rm ff}_{5\ \rm GHz} \rightarrow$ SFR



$$\left(\frac{\rm SFR}{\rm M_\odot\ yr^{-1}}\right) = 1.11 \times 10^{-37} \left(\frac{\nu L_{5\ \rm GHz}}{\rm ergs^{-1}}\right)$$

(Murphy+ 2011; Tabatabaei+ 2017)

Conclusions

- Need for a full coverage of the 20-100 GHz gap in the SED: it will be possible when the SRT will be operational again.

- Resolved maps in the K, Q and W band will allow to study possible variations of the SED (and its components, like AME) within a galaxy

- What can we reasonably achieved at SRT with the PON instruments?

About 10 galaxies in 300h in Q and W

Demanding, but within large, multy term, programs

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