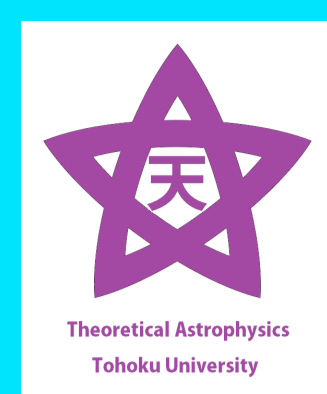


High-Energy Gamma-Rays from Magnetically Arrested Disks in Nearby Radio Galaxies



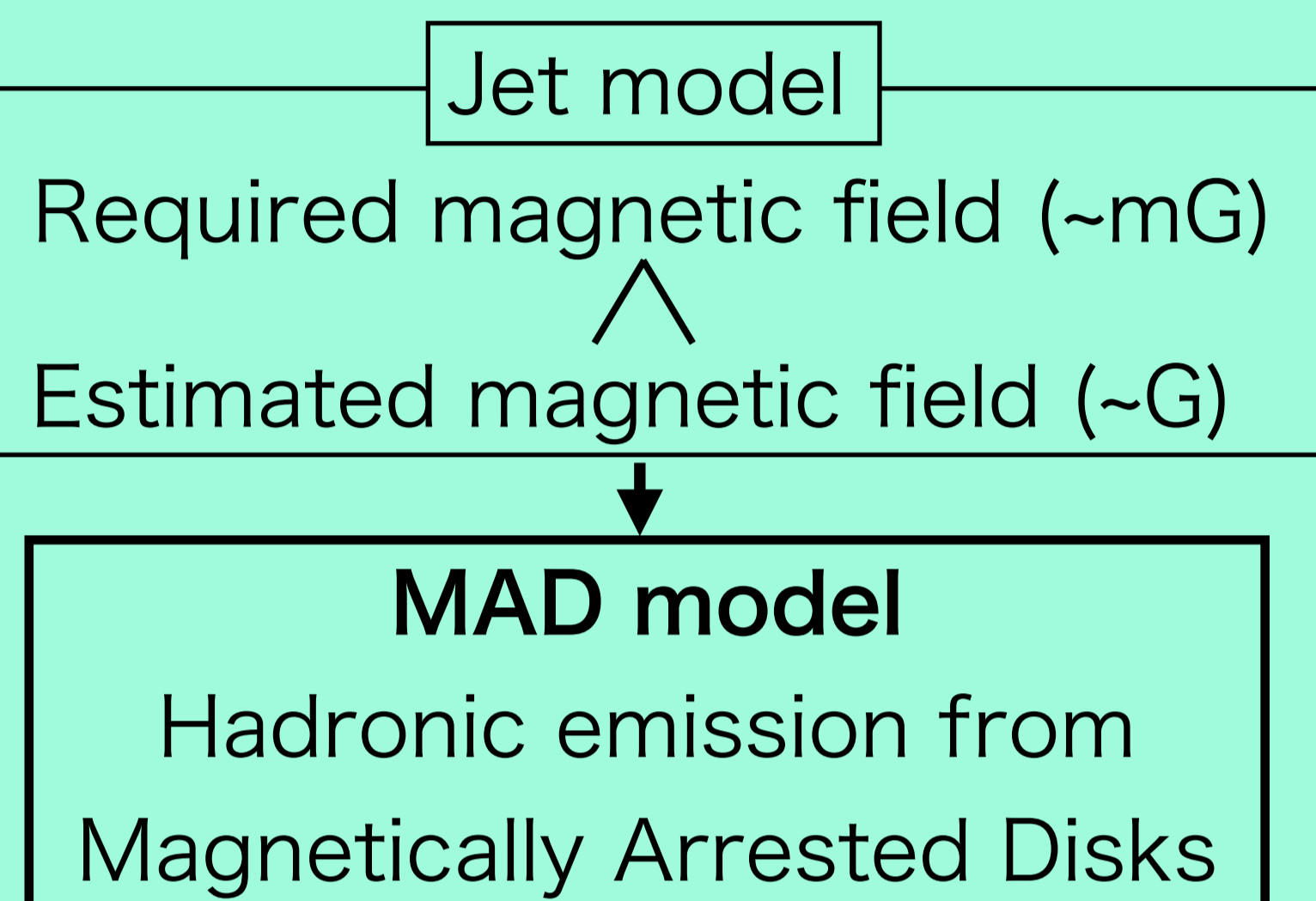
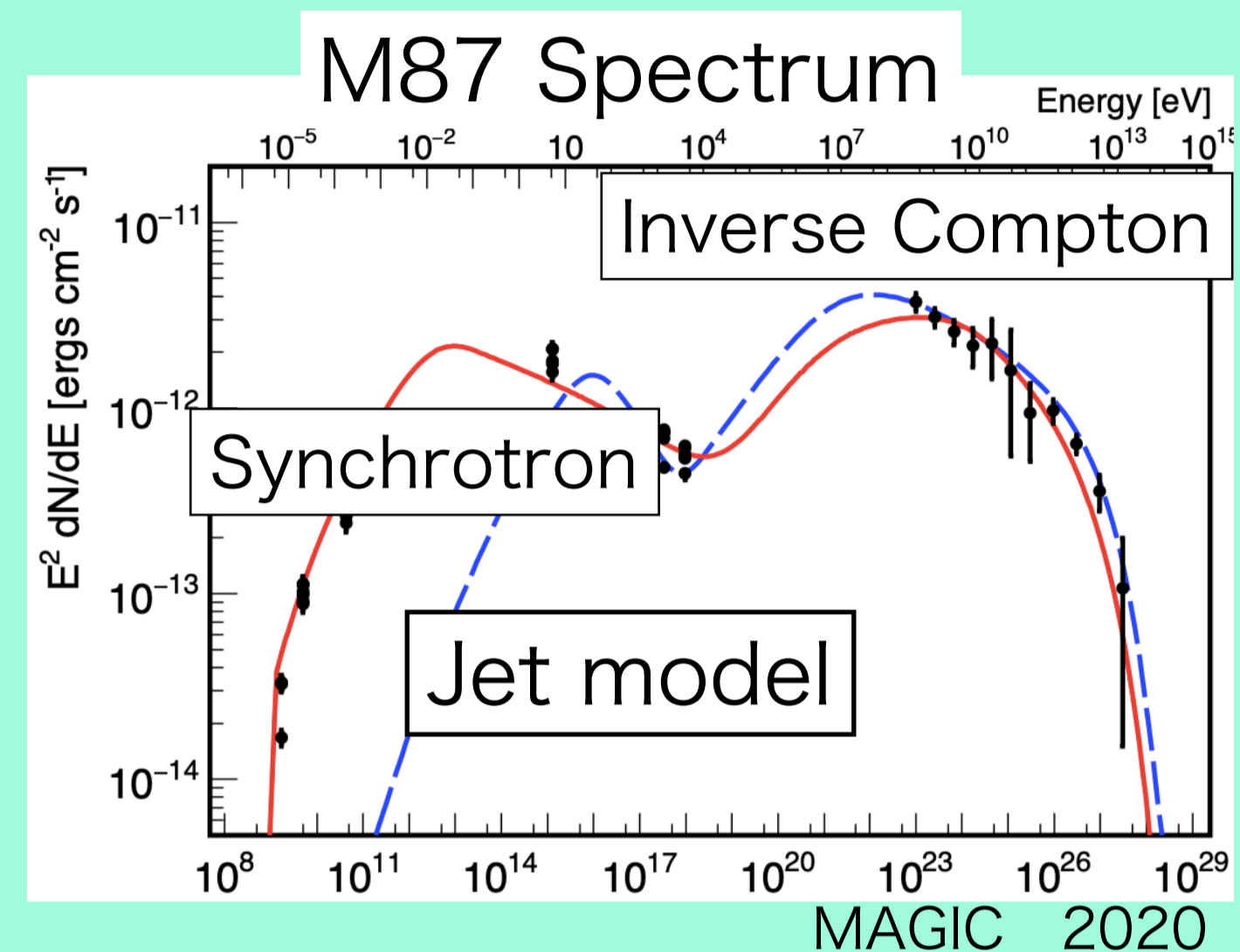
Riku Kuze (Tohoku Univ), Shigeo S. Kimura (Tohoku Univ.), and Kenji Toma (Tohoku Univ.)

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r.kuze@astr.tohoku.ac.jp



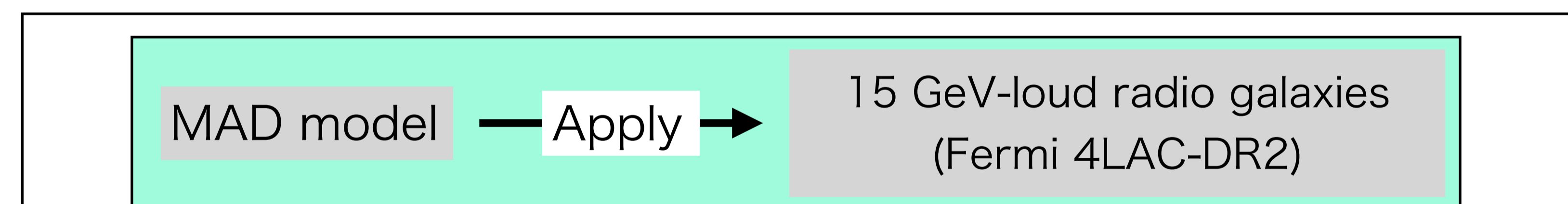
Objective

The gamma-ray radiation mechanism from radio galaxies is unknown.



We investigate the characteristics of the objects that can be explained by the MAD model.
We also apply the MAD model to Sgr A*.

Method



MAD model

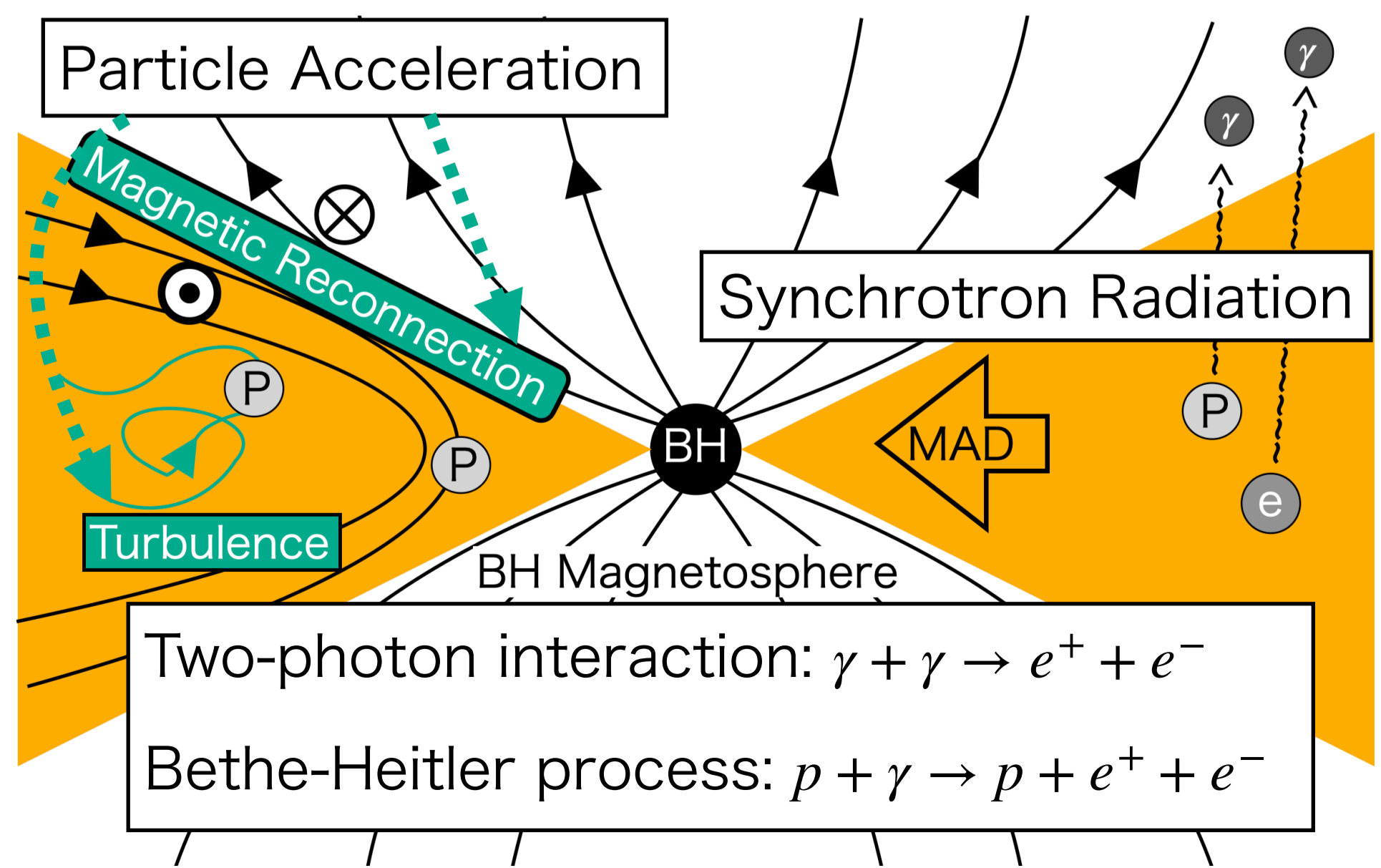
Broadband photons are produced by the synchrotron radiation

Particle Species

- (i) Thermal electron
- (ii) Primary electron
- (iii) Primary proton
- (iv) $\gamma + \gamma \rightarrow e^+ + e^-$
- (v) $p + \gamma \rightarrow p + e^+ + e^-$

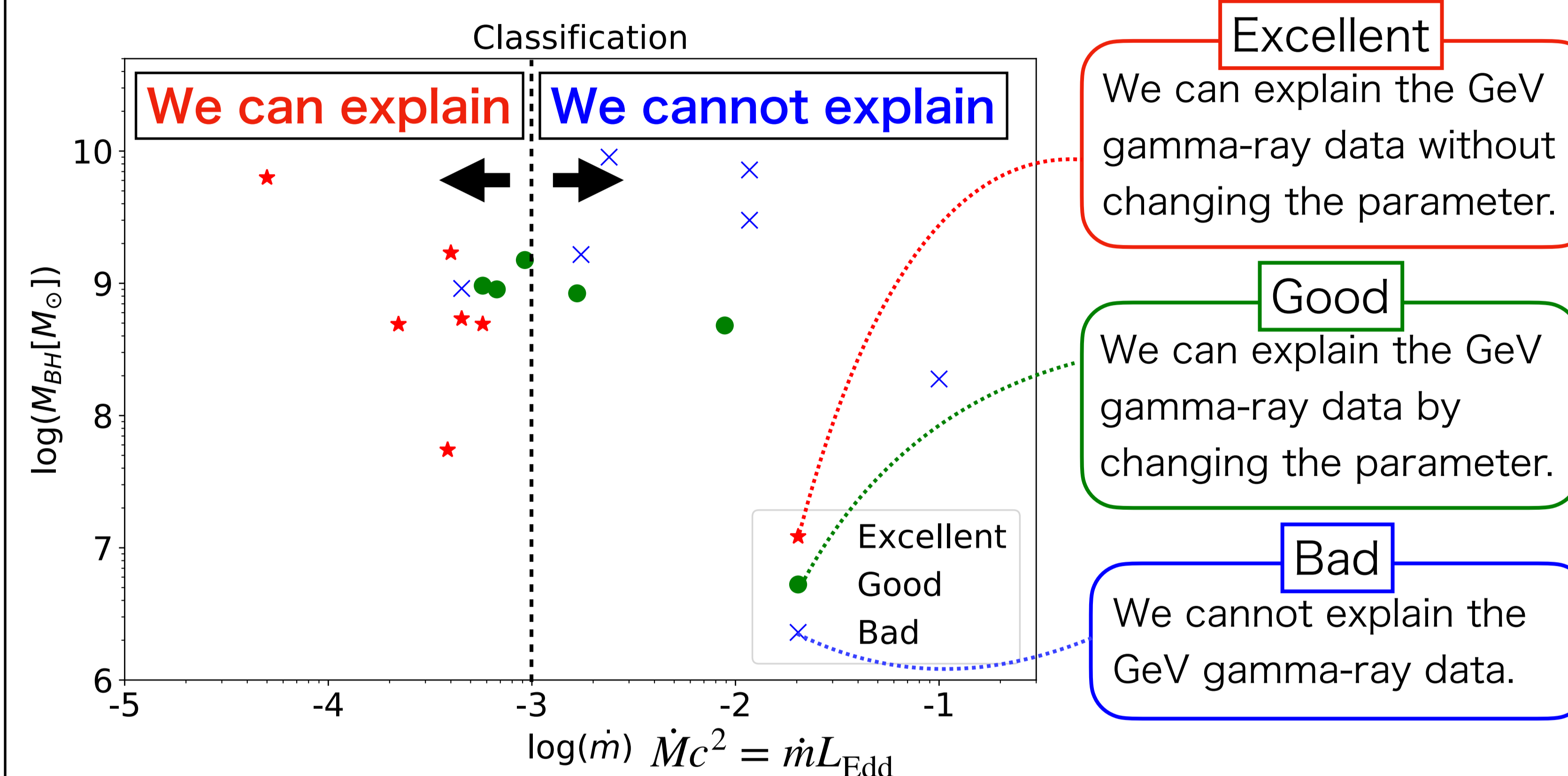
Basic Equation

$$\frac{d}{dE_i} \left(\frac{N_{E_i} E_i}{t_{cool}} \right) = \dot{N}_{E_i, inj} - \frac{N_{E_i}}{t_{esc}}$$



Results

We classify the results into three; Excellent, Good, and Bad



Excellent

We can explain the GeV gamma-ray data without changing the parameter.

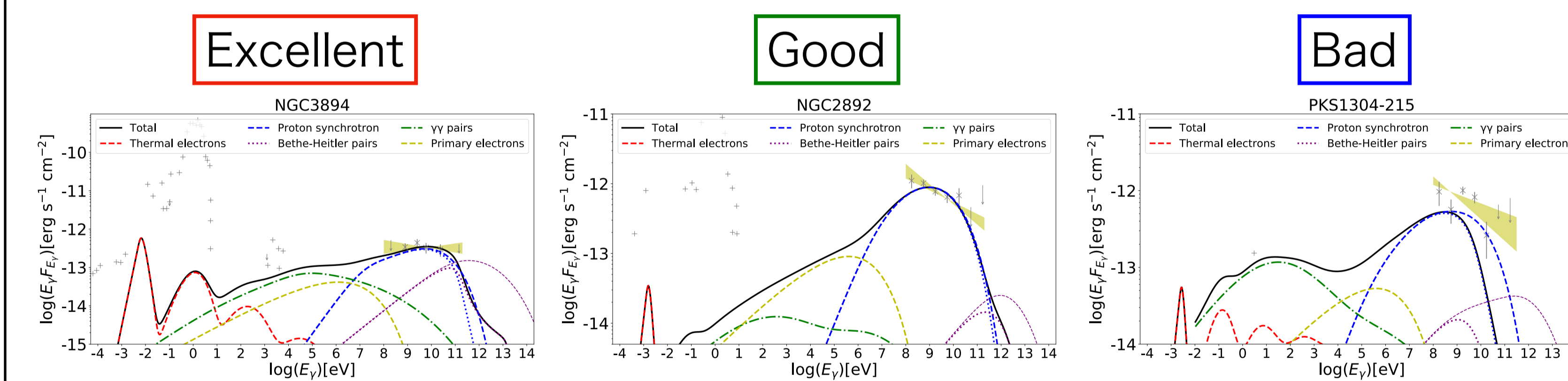
Good

We can explain the GeV gamma-ray data by changing the parameter.

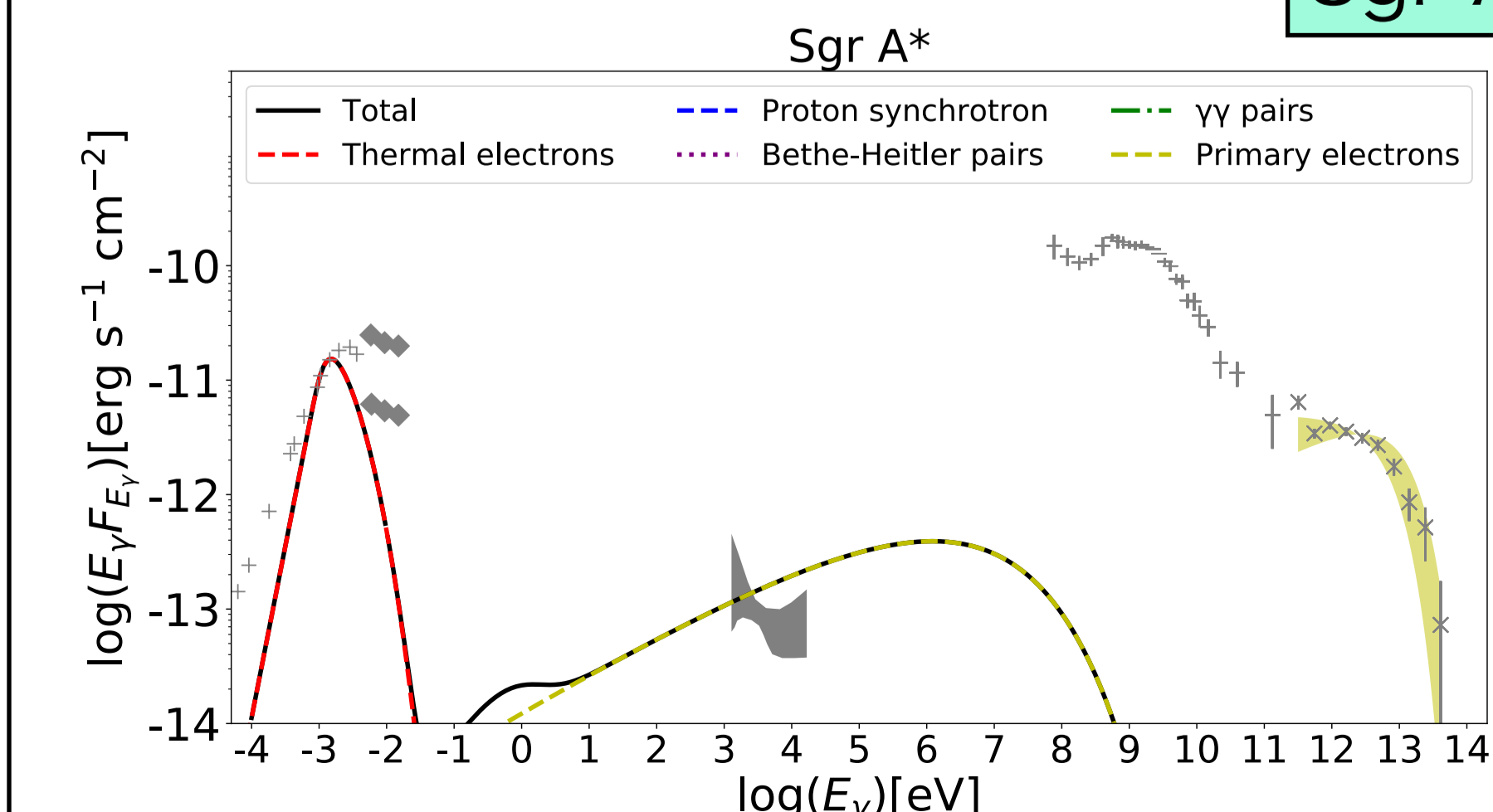
Bad

We cannot explain the GeV gamma-ray data.

Examples of Broadband Spectrum



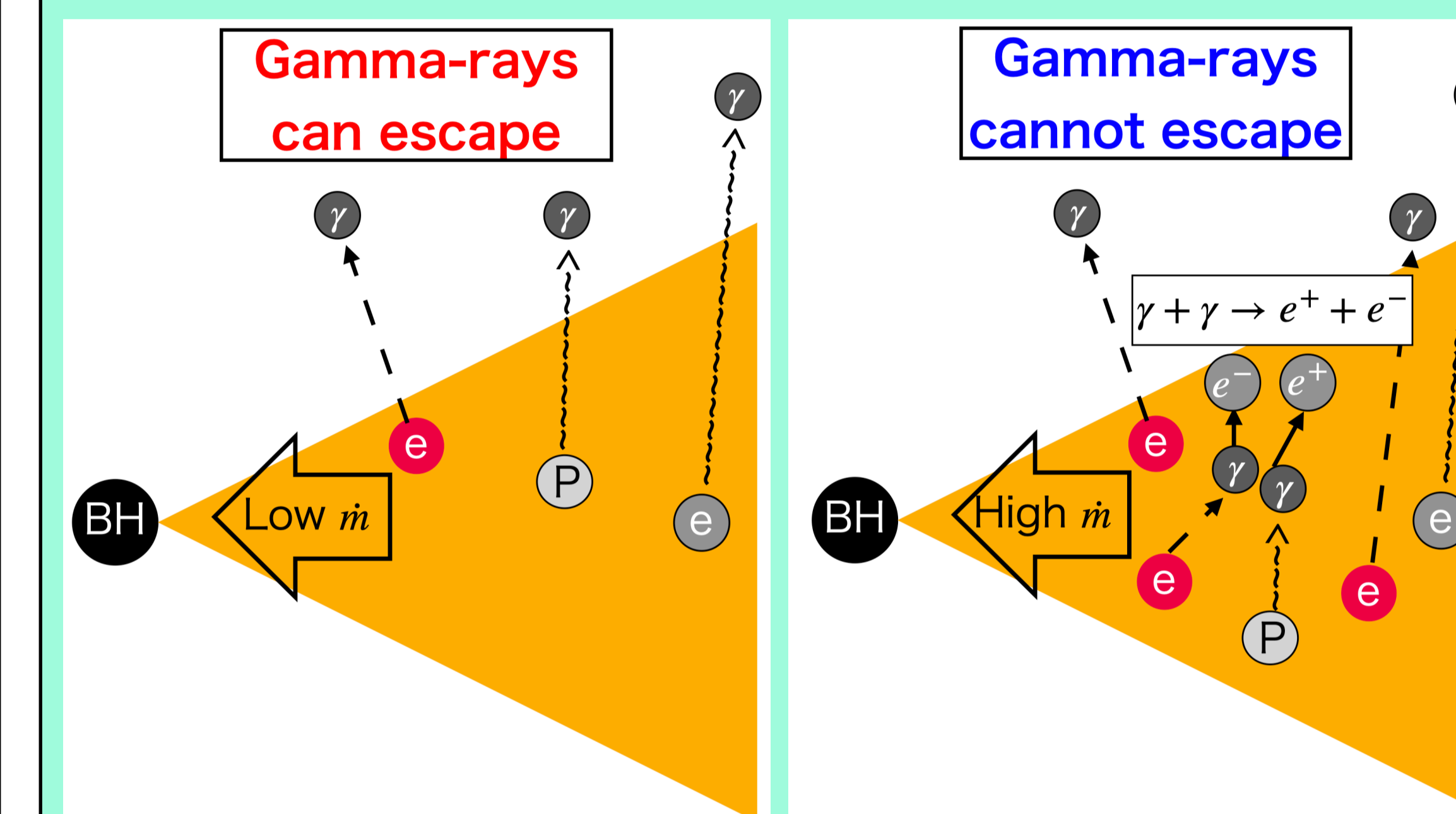
Sgr A*



The accretion rate is too low to explain the GeV-TeV gamma-ray data.

Conclusion

We can explain the gamma-ray data by the MAD model if the accretion rate is lower than 0.1% of the Eddington rate.



The sources of the GeV-TeV gamma-rays observed at the Galactic center are other objects in the Galactic center.

Too low $\dot{m} \dots t_{syn} \gg t_{esc} \rightarrow$ Radiative Inefficient

Reference

Riku Kuze, Shigeo S. Kimura, and Kenji Toma.,
arXiv 2205.09565
<https://arxiv.org/abs/2205.09565>