The Disk Wind Contribution to the Gamma-Ray emission from the nearby Seyfert Galaxy GRS 1734-292

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Introduction

- **The origin of gamma-rays from Seyfert galaxies is unknown** although starbursts (e.g., [1]), weak jets (e.g., [2]), and active galactic nucleus (AGN) disk winds (e.g., [3]) have been proposed.
- The starburst and jet activities in the gamma-ray-detected Seyfert galaxy GRS 1734-292 are weak [4]
- We construct a leptohadronic emission model for an AGN disk wind and apply it to GRS 1734-292.
- *Can an AGN disk wind be the origin of the gamma-ray emission?*

Leptohadronic emission model (Figure 1)

1. An AGN disk wind interacts with ambient gas and generates shocked ambient medium (SAM) and shocked wind (SW) regions [5][6].
2. At the shock fronts, charged particles are accelerated (diffusive shock acceleration, e.g., [7]).
3. The accelerated particles (cosmic rays, CRs) emit multi-messengers (e.g., photons, neutrinos) through synchrotron, external Compton (EC), pp interactions, photopion production ($p\gamma$), and Bethe-Heitler process.

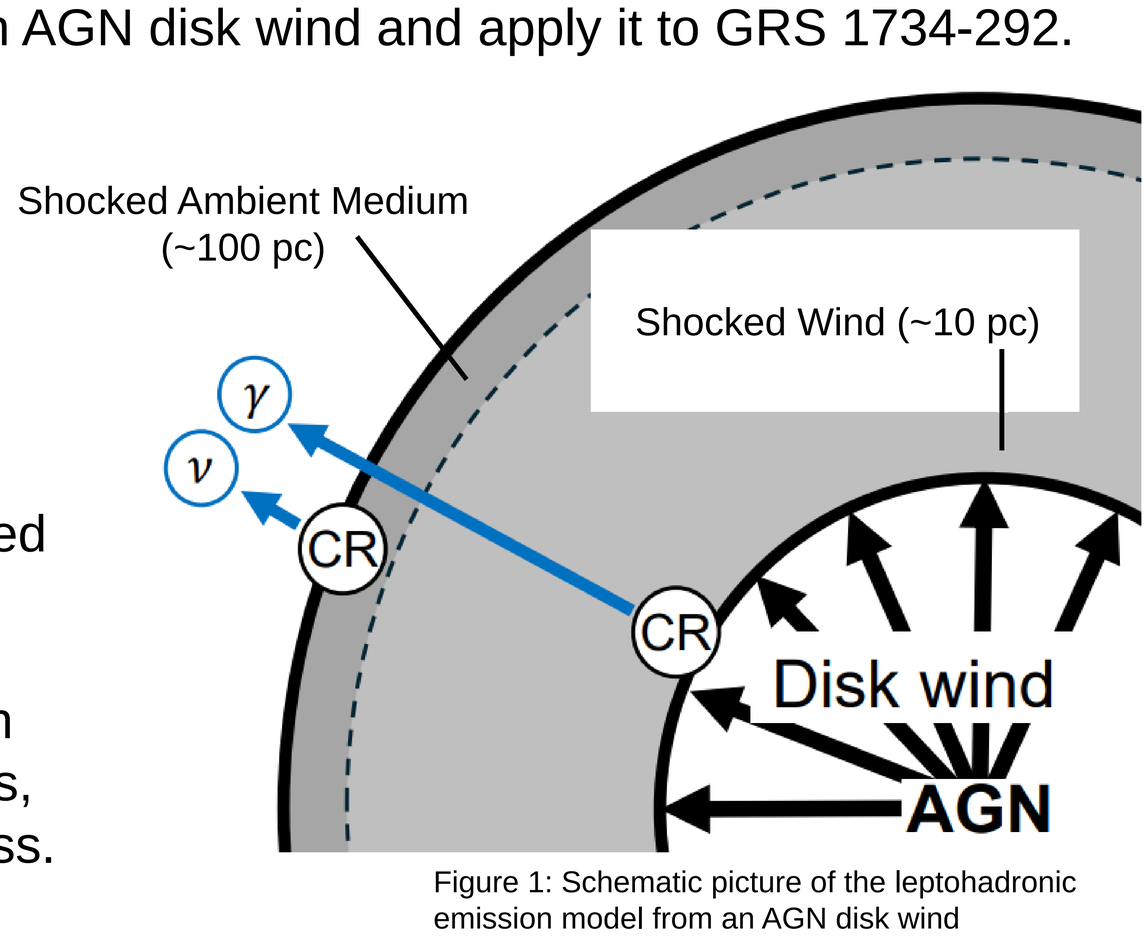
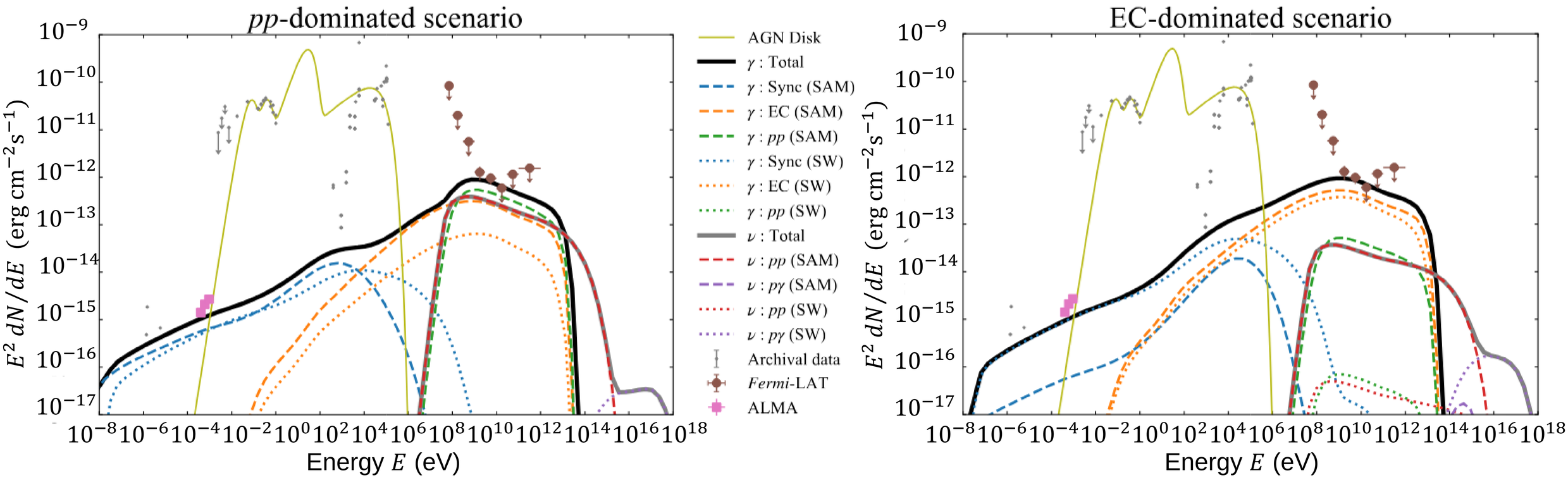


Figure 1: Schematic picture of the leptohadronic emission model from an AGN disk wind

Application of the model to GRS 1734-292 (Figure 2)

- Two scenarios (parameter choices) can roughly reproduce the observed GeV gamma-ray data.
- In the pp-dominated scenario, pp interactions set the GeV gamma-ray emission properties.
- In the EC-dominated scenario, EC sets the GeV gamma-ray emission properties.



↑ Figure 2: Spectral energy distributions of GRS 1734-292 for the pp-dominated scenario (left) and EC dominated scenario (right).

Discussion

- Future TeV gamma-ray telescopes (e.g., CTA and SWGO) could detect GRS 1734-292 and test our model (Figure 3).
- The future TeV neutrino telescope TRIDENT might be able to detect GRS 1734-292 and distinguish between the pp-dominated or EC-dominated scenarios.

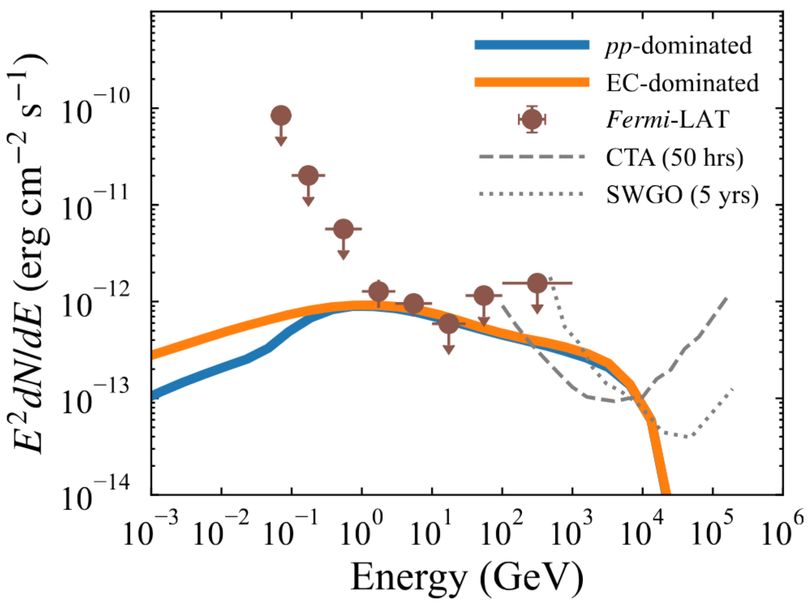


Figure 3: Same as Figure 2 but showing the 10^{-3} – 10^{6} GeV range

Summary

- We built a leptohadronic emission model for an AGN disk wind.
- The origin of the gamma-ray emission from GRS 1734-292 can be an AGN disk wind.
- Future multi-messenger observations have the potential to detect GRS 1734-292.

References: [1] Lenain et al. 2010, A&A, 524, A72; [2] Inoue and Khangulyan 2023, Publ. Astron. Soc. Jap., 75, L33; [3] Lamastra et al. 2016, A&A, 596, A68; [4] Michiyama et al. 2024, ApJ, 965, 68; [5] Nims et al. 2015, MNRAS, 447, 3612; [6]Yamada et al. 2024, ApJ, 968, 116; [7] Drury 1983, Reports on Progress in Physics, 46, 973