







SOCIETÀ ITALIANA DI FISICA Italian Physical Society

TESTING ASTROPHYSICAL MODELS TO DESCRIBE ULTRA-HIGH-ENERGY COSMIC RAYS SPECTRUM AND COMPOSITION

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A. Condorelli, 106° SIF Conference

OUTLINE

- 1. Motivation
- 2. An astrophysical model to explain the "ankle"
- 3. Application to StarBurst Galaxies.
- 4. Future perspectives





POSSIBLE EXPLANATION OF THE ANKLE FEATURE

- $\Box \quad If we assume only proton spectrum \rightarrow feature of the propagation;$
- □ Transition point between galactic and extragalactic cosmic rays;
- Two extragalactic components;
- ☐ Source mechanism;

A BENCHMARK MODEL



Consider a system in which the accelerator (also referred to as the source) is embedded in an environment in which the cosmic rays are confined for some time by magnetic fields while interacting with the ambient radiation field.



A BENCHMARK MODEL



The lower the energy, the more time the nuclei have to interact before escaping, leading to a hardening of the spectrum and lightening of the composition of nuclei escaping the region surrounding the source.

Interaction time





APPLICATION TO STARBURST GALAXIES





Source propagation in a Starburst galaxy:

Taking M82 as reference scenario;
 Detailed treatment of diffusive and advective processes;
 The photon field can be represented by two black bodies;
 Spallation processes are neglected



E.Peretti, P.Blasi, F.Aharonian, G.Morlino. arXiv:1812.01996v2



IMPROVEMENTS AND FUTURE PERSPECTIVES

Source model propagation in a Starburst Galaxy : M82;
Exploring the parameter space in order to describe data above the ankle;
Cosmogenic and source neutrino fluxes for each configuration;
Including galactic component;

Including spallation process;
 Finding a good agreement for mass composition data.

THANKS FOR YOUR ATTENTION!