

A SINGLE SOURCE FOR GALACTIC COSMIC RAYS IN THE $10^9 - 10^{18.5}$ EV RANGE?

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A novel interpretation of the “knee” in the cosmic ray spectrum at energies $E \gtrsim 10^{15.5}$ eV has been put forward recently. According to this interpretation, the “knee” is due to “new physics”, i.e. a channel in the high energy (\gtrsim TeV in the CM) proton interactions beyond those associated with the Standard Model of Weak–EM interactions. This new channel gives rise to products which do not trigger the air shower detectors (e.g. neutrinos); this missing energy results in an underestimate of the primary cosmic ray energy which leads subsequently to an apparent break in the inferred spectrum. Using gluon fusion to model the cross section of the novel channel one can provide a good fit to the cosmic ray spectrum from $\sim 10^9 - 10^{18.5}$ eV with a *single* power i.e. a spectrum of the form $E^{-\gamma} e^{-E/E_0}$ ($\gamma \simeq 2.7$, $E_0 \simeq 10^{18.5}$ eV). Taken at face value, this interpretation along with the spectral fits, besides its ramifications to the physics of fundamental interactions, implies a galactic cosmic ray source that is able to produce spectra of the above form. This source must be very different from those hitherto considered to account for the cosmic ray spectra (i.e. SN remnants). We examine the various possibilities for such sources within our galaxy. We conclude with the black hole at the galactic center as one of the leading contenders.