The middle aged SNRs W44: most likely reacceleration.

Supernova remnants (SNRs) are thought to be the primary sources of Cosmic Rays (CRs) in the Galaxy. In the last few years, the wealth of gamma-ray data from GeV and TeV instruments has provided important information about the high-energy particles'content of these objects, allowing us to make progress in assessing their role as CR accelerators. In particular, the spectrum of the gamma-ray emission below E=200 MeV, detected by AGILE and Fermi-LAT in the two middle aged Supernova Remnants (SNRs) W44 and IC443, has been taken as a proof of CR acceleration in these sources. In fact, the only firm conclusion that one can derive from the low energy spectrum of these sources is that CRs are present in the environment of these remnants. Assessing whether the emitting particles are freshly accelerated or rather reaccelerated from the galactic pool is not as straightforward. Making this discrimination in the case of SNR W44 is the purpose of this work. Using the latest Voyager 1 data to estimate the galactic electrons', protons' and Helium distributions, we compute the radio and gamma-ray emission from pre-existing CRs after reacceleration and compression at the SNR blast wave. We show that this component can explain alone the radio and gamma-ray data and that the source spectrum can be very well reproduced by the galactic CR distribution derived from Voyager 1, without any additional spectral feature, except for a high energy cut-off related to the finite time for particle reacceleration. Our study provides an upper limit on the efficiency of W44 as a source of fresh CRs. This upper limit turns out to be very low, as one would expect for a middle aged source with a slow blast wave.