

## Gamma ray emission and particle acceleration in galaxy clusters

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The presence of non-thermal components in galaxy clusters, like relativistic electrons and magnetic fields, is demonstrated by radio observations that detect large scale synchrotron emission from the inter-galactic-medium of a fraction of massive clusters. On the other hand present observations can provide only upper limits to the energy content of relativistic protons.

GLAST has the potential to detect gamma-rays from the decay of pi-0 in galaxy clusters measuring for the first time the energy density and distribution of relativistic protons in the inter-galactic medium, while important constraints at higher energies may come from observations with Cherenkov arrays.

We discuss model expectations of non-thermal spectrum of galaxy clusters in the most general case in which relativistic electrons, protons and the generated secondary particles are embedded in a turbulent inter-galactic-medium.

In this scenario gamma rays are produced from the central Mpc-scale regions by pi-0 decay from long living relativistic protons, while radio (synchrotron) and hard X-rays (IC) are emitted from relativistic electrons re-accelerated by turbulence during cluster mergers.

We show that the combination of gamma-ray and radio observations will allow a leap forward in our understanding of the origin of relativistic particles and of the physics of particle acceleration mechanisms in galaxy clusters.

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