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Multi-frequency insight into Cosmic Ray Electron transport in spiral galaxy NGC 6946

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I will present new radio observations of an angularly large, grand-design spiral galaxy NGC 6946 obtained with the LOFAR interferometer at a central frequency of 0.138 GHz. Observations of galaxies at low radio frequencies with high resolution make it possible to study the transport of low-energy CREs at scales smaller than 1 kpc. I aim to investigate the transport of low-energy CREs in the face-on spiral galaxy NGC 6946 in comparison with transport of CREs at higher radio frequencies. I exploit Herschel 100μm and radio data at higher frequencies to show transition of radio – FIR correlation between arm and inter-arms regions at five radio frequencies. The linear relation in arm regions at high radio frequencies become nonlinear at 0.138 GHZ (0.88±0.05). Whereas in the inter-arm area the values of the relation flatten from 0.6 for frequencies higher to 0.49±0.06 at 0.138 GHz. In order to explain our results we constucted the model of CREs transport via diffusion and streaming. Our final results show that streaming is more probable transport in NGC6946 than diffusion which is unexpected. I will also show brief summary of other LOFAR results about nearby galaxies and my future plans.