EUROPEAN NETWORK
14th EVN Symposium &
Users Meeting
Granada, October 8-11 2018

Unravelling pulsar scattering through VLBI

Dana Simard and Ue-Li Pen

The scattering of pulsar emission by cold plasma throughout the interstellar medium complicates precise timing measurements and limits the use of pulsars as probes of fundamental physics. In simple cases, the scattering can be attributed to a single screen localized along the line-of-sight to the pulsar, and VLBI can take advantage of the fact that the spatial flux distribution is due to scattering of coherent pulsar emission to measure the distance to the scattering screen and the distribution of images on the screen. However, in many cases the scattering environment is more complex, and many screens with different orientations and distances contribute. I will review how VLBI can be used to map single screens before discussing how we can separate screens by combining visibilities with cross-correlations of autocorrelations. I will show how this technique can improve our interpretation of VLBI observations of PSR B0329+54, known to be affected by at least 4 scattering screens. Characterizing these scattering structures opens windows to unravelling the nature of these compact lenses in the ISM, which may be related to small-scale magnetic structures, removing the effects of scattering from pulsar timing observations, and using the coherent scattered images to obtain unprecedented spatial precision at the pulsar itself.