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The shape of a pulsar radio beam: fan beams, not the nested cones.

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The knowledge of radio emission geometry is crucial for interpreting their gamma-ray profiles, and for establishing the orientation of their tilted magnetic field. I will review the continually increasing evidence against the most popular (nested cone) radio beam geometry. It will be shown that several features of pulse profiles, which have normally been considered as signatures of the nested cones, can in fact be readily interpreted through a system of fan beams. These include some properties of the radius-to-frequency mapping as well as the special-relativistic lag of the core component in multicomponent profiles. A new statistical probe of beam shape will be introduced, based on the ratio of component separations observed in M and Q profiles. This method is independent of the parameters that determine the scale of the beam (emission altitude, frequency, rotation period, dipole tilt) while it retains the sensitivity to the beam shape. When applied to the Q and M pulse profiles, the method reinforces the problems of the conal geometry and favours the azimuthally-structured beam (a system of fan beams). The non-conal geometry has consequences for the gamma-ray profile modelling.

Author: Dr DYKS, Jaroslaw (Nicolaus Copernicus Astronomical Center)

Presenter: Dr DYKS, Jaroslaw (Nicolaus Copernicus Astronomical Center)

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