

MPAGS Astrophysical Techniques

Lecture 4 - Interferometry

Grant Kennedy

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Please email Grant (@warwick.ac.uk) your answers by Wednesday 20 November 2019. There is no mark associated with the assignment, as the aim is that you engage with the topic. We will just keep note of whether you attempted these questions.

1. What is the (1d) visibility of a star as a function of baseline (assume a uniform disk, without limb darkening). What is the significance of the first 'null'? Practically, how might one measure the diameter of a star (e.g. with CHARA)?
2. What astrophysical source was being observed in the sparse aperture masking example from Cheetham+16, and what is the reasoning for this conclusion?
3. How does a synthesised image change if you remove the short baselines? the long baselines? How might one use this behaviour to explore an interferometric dataset?
4. What does the Fourier Transform of a large uniform source imply for planning observations with ALMA? What should the observing strategy be?
5. Explain why the dirty beam can be obtained by either the inverse Fourier Transform of the uv coverage, or by adding up the fringes from all individual baselines.
6. Use the ALMA OST (<http://almaost.jb.man.ac.uk/>) to plan an observing strategy for a continuum observation of one of the OST source models (e.g. M51). Assume the default declination (-35°), a frequency of 350GHz, 7.5GHz bandwidth, Stokes I, and 3rd octile PWV. What is the best Cycle 6 configuration to use to extract the spatial information? How long should the integration be? (bearing in mind that approved programs are rarely longer than ~ 10 h). Send your answer as a brief description of your approach to figuring this out, and a link to a simulation output page.