Nuclear Activity in Galaxies Across Cosmic Time
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Design and development of a two-dish interferometer

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Abstract. The angular resolution and the sensitivity of a parabolic dish telescope increase with the diameter of its aperture at a given frequency. This implies that as the telescope gets larger, its resolution becomes better. However, constructing telescopes of ever increasing size is prohibitive for both technical and financial reasons. This problem is solved by using an interferometer which consists of two or more separate telescopes that combine their signals offering a resolution equivalent to the largest separation distance between the telescopes. In this work, the electric field variations from two telescopes will be obtained. The voltage signals from the two telescopes will be coherently combined in order to derive the structure of the target source of radio emission. This combination will be done by a cross-correlator, which multiplies and averages the voltage outputs V1 and V2 of the two dishes. A major challenge to be addressed in this work is to design an instrument capable of making professional-type radio astronomy measurement in a local interference environment. In this regard, the investigative part of this work will verify whether it is possible to achieve a high sensitivity enough to detect some cosmic sources where the presence of man-made interference and cost adversely influences the system. The design of an interferometer will be presented and implemented. It may also serve as a demonstrator for engineering students to gain a working knowledge of radio interferometry.

Keywords. telescopes: radio; radio: interferometry.