

Studies of galactic masers in RadioAstron space VLBI mission

A.M. Sobolev and RadioAstron maser team

Observations of the masers in the RadioAstron (RA) mission yielded detections of fringes for a number of sources in both H₂O and OH maser transitions. Several sources display numerous ultra-compact details. This proves that implementation of the space VLBI technique for maser studies is possible technically and is not always prevented by the interstellar scattering, maser beaming and other effects related to formation, transfer and detection of the cosmic maser emission.

The sharpest “direct” linear resolution $<4.e11$ cm was achieved in observations of the maser in Orion.

RA detected the smallest structures ever observed in a Galactic maser. Analysis of the data $>2.e14$ K, and the line widths are 0.5 km/s. Most of the flux density (~ 90 per cent) is contained in a halo of diameter 1 mas. We discuss possible interpretations for the compact structure.

Very compact features with angular sizes not exceeding about 20 – 60 micro-arcseconds represent only a few per cent of the maser flux registered with the single-dish instruments. Estimates of the brightness temperatures of the ultra-compact features provide the values ranging from $1.e14$ to $1.e16$ K. We discuss possible nature of the ultra-compact structures which can appear due to the saturation effects, presence of the strong ultra-compact source on background and existence of the long correlation paths, e.g. turbulent velocity correlations.