Astrophysical Masers:
Unlocking the Mysteries of the Universe
Proceedings IAU Symposium No. 336, 2017
A. Tarchi, M.J. Reid & P. Castangia, eds.

doi:10.1017/S1743921317011498

Full polarization analysis of OH masers at 18-cm toward W49 A star forming region

K. Asanok[1,2], B. Hutawarakorn Kramer[1,3], S. Etoka[4], M. Gray[4], A. M. S. Richards[4], N. Gasiprong[5] and N. Naochang[2]

[1]National Astronomical Research Institute of Thailand, 260 Moo 4, Tambol Donkaew, Amphur Maerim, Chiang Mai, 50180, Thailand
email: kitiyanee@narit.or.th

[2]Department of Physics, Faculty of Science, Khon Kaen University, Khon Kaen, 40002, Thailand

[3]Max-Planck-Institut für Radioastronomie, Auf dem Hügel 69, 53121 Bonn, Germany
email: bkramer@mpifr-bonn.mpg.de

[4]Jodrell Bank Center for Astrophysics, School of Physics and Astronomy, The University of Manchester, Alan Turing Building, Oxford Road, Manchester, M13 9PL, United Kingdom
email: sandra.etoka@manchester.ac.uk, malcolm.gray@manchester.ac.uk, a.m.s.richards@manchester.ac.uk

[5]Department of Physics, Faculty of Science, Ubon Ratchathani University, Ubon Ratchathani, 34190, Thailand
email: ngasiprong@yahoo.com

Abstract. W49 A is a star-forming region (SFR) found in the constellation of Aquila. It contains 3 active regions: W49 North (W49 N), W49 South West (W49 SW) and W49 South (W49 S). We present preliminary results from two epochs (e-)MERLIN observations of all ground-state OH masers towards the star-forming region (SFR) complex W49 A. The first epoch of observations was done in full-polarization mode with MERLIN in 2005 while the second epoch was obtained only in dual circular polarization during the test observations of the upgraded e-MERLIN in 2013. The overall maser spatial distributions in both epochs are in good agreement. We found several new high velocity maser features up to +34 km s^{-1} and −28 km s^{-1}. The magnetic field strengths are between 1.1 to 10.8 mG. All three sources show evidence of magnetic field reversal.

Keywords. masers, ISM: HII regions, ISM:kinematics and dynamics, ISM:magnetic fields, ISM:molecules, stars: formation

Summary of the results

W49 A is a star-forming region (SFR) complex, containing 3 active regions: W49 North (W49 N), W49 South West (W49 SW) and W49 South (W49 S). The spatial distribution of all four ground-state (1612, 1665, 1667 and 1720 MHz) OH masers in W49 N, W49 S and W49 SW, observed with e-MERLIN in 2013, is shown in Figure 1. The overall spatial distribution of the masers is in good agreement with the previous MERLIN observation in 2005 and the VLA observation in 1991 by Argon *et al.* (2000). The enhanced sensitivity and wider velocity coverage of the e-MERLIN dataset, allowed us to detect new sites of maser emission in all transitions and regions, in particular, masers features up to +34 km s^{-1} and −28 km s^{-1} are found in W49 N and W49 S.

Here, we only report the magnetic field and polarization information of the 1612-MHz, 1665-MHz (only in W49 SW) and 1720-MHz transitions observed in full-polarization mode with MERLIN in epoch 2005. The magnetic field strength ranges from 1.1 mG (in W49 S) to 10.8 mG (in W49 N). All three sources show evidence of magnetic field reversal. W49 SW has the highest percentage of linear polarization (up to 40 %) while

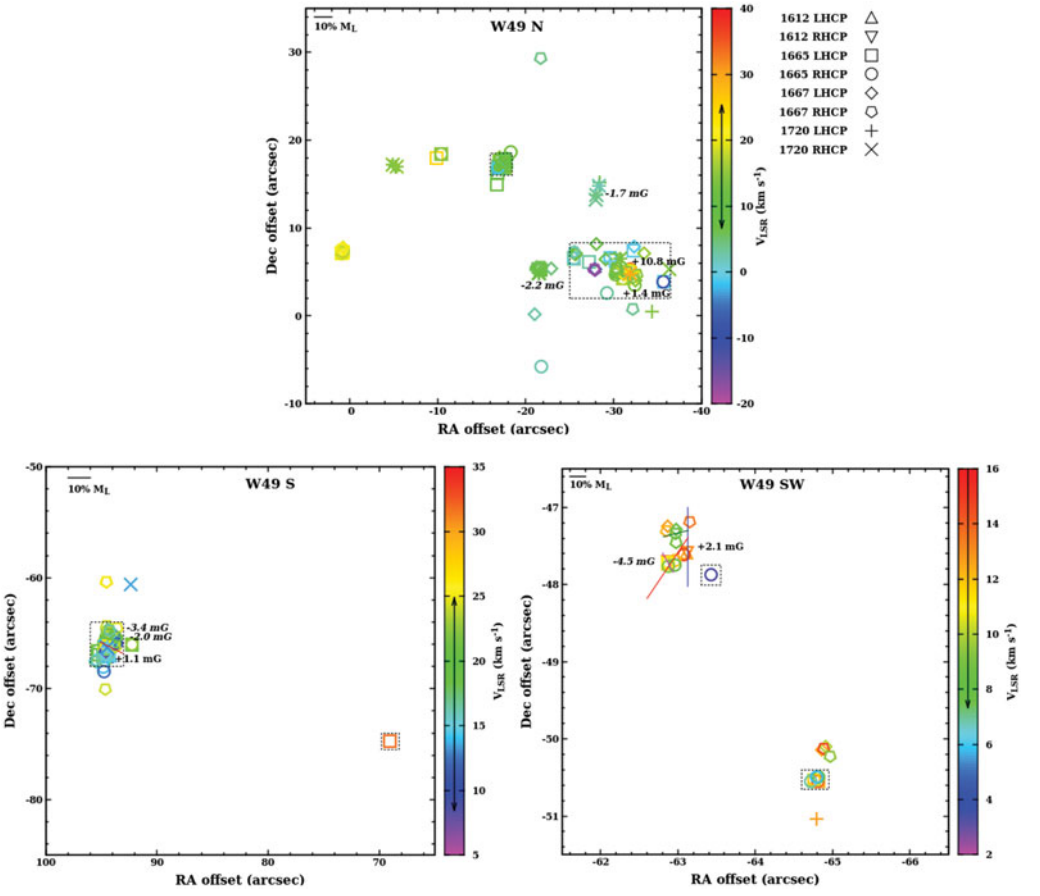

Figure 1. Positions and velocities of all four ground-state OH masers in W49 A from e-MERLIN observations in 2013. The positions are offset from (0,0) at R.A.(J2000)=19h 10m 15.308s, Dec.(J2000)=+09°06′08.″4822. The dash line boxes indicates the location where new maser features were detected. A vertical arrow in the color bar indicates the velocity range covered in Argon *et al.* (2000). The linear polarization vectors and magnetic field strengths obtained from MERLIN (2005). The plus and minus signs indicate whether the direction of the magnetic field is toward (−) or away (+) from us (see the online version for the color figure).

W49 N has the lowest (less than 10 %). Further detailed studies (e.g. comparison of Zeeman measurements in all transitions in both epochs and interpretation of the physical condition of each sources) will be reported in Asanok *et al.* (in prep.).

Reference

Argon, A. L., Reid, M. J., & Menten, K. M. 2000, *ApJ.S.*, 29, 159

https://doi.org/10.1017/S1743921317011498 Published online by Cambridge University Press