Polarization detection in NGC 3079 at 22cm



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OUTLINE :

- Detail about the galaxy and the observation.
- Calibration and imaging problems.
- Peeling.
- RM Synthesis and polarization detections.
- Conclusions and future work.

Details of NGC 3079

- Edge-on spiral galaxy
- Galactic longitude: 157.81°; galactic latitude: 48.36°
- Located at a distance of 20 Mpc

Specifications of the observations

- Observed with the WSRT at 22cm
- 8 IFs, each IF comprised of 64 channels and a bandwidth per IF of 20 MHz
- Data originally published in the SINGS survey (Braun et al. 2007) only in total intensity (Stokes I). In this work the uncalibrated data was retrieved from the WSRT archive and re-reduced.

Calibration and imaging problems



- Ruhr-Universität Bochum
- Channel by channel calibration for high DR purposes.
- Identify residual RFI in individual channels.

- Strong off-axis source shows rings.
- Spikes due to ionospheric effects
- Dynamic range can be improved

Result of calibrating ch. By ch.



Calibration and imaging problems: in total intensity solved with Peeling



 Remove strong off-axis sources by solving for its gains independently.



Comparison of ch. by ch. calibration with image from SINGS survey (Braun et al. 2007)



 Extended radio halo in the direction of the nuclear superbubble (see below).

Lowest contour level in both images ~ 0.21 mJy (3σ). Red contours from the SINGS, and black contours are from this work. Beam size of 17" x 14.5"



RM Synthesis and polarization detections

• Avoids bandwidth depolarization.



RM Synthesis. Low S/N polarization can be recovered.

Traditional RM fitting.

RM Synthesis of 3C138



sonomisches

- RM = -2.1 rad/m² (Cotton et al. 1997)
- Faraday Depth = -2.7 rad/m² (by fitting a parabola to the peak)



Faraday cube of NGC 3079





- Localized polarization regions.
- Extended polarized emission towards the west?



Faraday spectrum along one line of sight in Region 2





Polarization detection in the nuclear superbubble ?

H-alpha image from the HST



Other polarization detections







Smoothing I, Q and U with a bigger beam and producing an RM cube



- All line of sights above 3σ have only one component in their Faraday spectra.
- Beam size of 51" x 43.5"



Conclusions and future work:

- De-rotate the polarization vectors from the Faraday cube to obtain the intrinsic polarization (Q and U proper values) along each line of side in the galaxy .
- Use RM-Cleaning due to the presence of more than two components in some Faraday spectra.
- Investigate the polarization detection along the line of sight of the nuclear supperbubble