Southern Local Group Dwarf Irregulars with KAT-7

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Outline

- Background
- Motivation
- Observations & Results
- On going work
- Conclusion
Background

Why the Local Group of galaxies?

~10 million light years across

~54 galaxies

Dwarfs most abundant
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Types of dwarf galaxies & why are they interesting.

Dwarf galaxies

Late type

Dwarf Irregular galaxies
Gas rich, star formation, gas kinematics.

Early type

Dwarf spheroidal/dwarf elliptical
Little/no gas, little/no star formation, stellar kinematics.
Types of dwarf galaxies & why are they interesting.

Dwarf galaxies

Late type

Dwarf spheroidal/dwarf elliptical
- Little/no gas, little/no star formation, stellar kinematics.

Dwarf Irregular galaxies
- Gas rich, star formation, gas kinematics.

- Proximity, study in greater details
- Little studied, extremely faint long integration
- Simple structure, without dominant bulges, spiral arms.
Background

What can we learn from HI observation? –previous results

Low column density extended HI envelopes: $< 5$ time optical disk
**superb for studying large scale kinematics**

**Estimate the actual mass of galaxies**

NGC 3741 HI diameter = 8.3 times Holmberg radius (A.Begum et al, 2005, GMRT)

DDO 154 6 times Holmberg radius, extended rotation curve (Carignan et al, 1998)
Background

What can we learn from HI observations? – previous results

Environment of extended HI disks

**disrupted HI disks**

NGC 4449 complex network of streamers that represents the remains of an HI disk disrupted by an encounter with another galaxy (VLA) (Hunter et al, 1998)

**quiescent disks smooth extensions**

KK 246, large, quiescent disks that are simply smooth extensions (K. Krechel et al, 2011, VLA)

- Most of these observations are high resolution or single dish. What new idea does this study bring?
Motivation

**Unique array in southern hemisphere**

**KAT-7 compact low temperature (Tsys ~26K) (sensitive to large scale low surface brightness emission.**
Motivation

why this project?

**Unique array in southern hemisphere**

**KAT-7 compact low temperature (Tsys ~26K) (sensitive to large scale low surface brightness emission.**

*Search for extended HI envelopes (undetected by array such as VLA and ATCA.**

*Derive global parameters such as HI distribution and kinematics.**

*Study the environment of low density gas

KAT-7 array
Observations & results

NGC6822 with KAT-7

- Three pointing mosaic. ~35 hour per pointing after flagging
- ~3 mJy/beam rms in 2.56 kms\(^2\) channel
- 23 % more flux than ATCA
  (2440 ±200 Jy.kms\(^2\) , comparable with single dish)
- HI mass 1.3 x 10\(^8\) M\(\odot\)
Observations & results

NGC6822 with KAT-7

HI column density on DSS image. Lowest contour $1 \times 10^{19}$ cm$^2$. Order of magnitude than ATCA ($10^{20}$ cm$^2$)
NGC6822 with KAT-7

- RC derived using GIPSY task ROTCUR from velocity field map.
- RC agrees with ATCA data.
- KAT-7 extends 500 arcsec more than ATCA.
Observations & results

NGC6822 with KAT-7

- NGC6822 DM dominated
- DM ISO model produces observed rotation curve with $M/L=0.2$
- NFW not physical only fits with $M/L = 0$. 
- NGC6822 is cored not cuspy DM halo.
Ongoing work

Sextans A & B – KAT-7

- ~ 60 hours on source
- Synthesized beam 277” x 204 “
- Noise level 3.4 mJy/beam
- Flux 181 Jy.km/s

- ~ 51 hours on source
- Synthesized beam 255“ x 191”
- Noise level 4 mJy/beam
- Flux 105 Jy.km/s
Ongoing work

WLM & IC1613 -GBT

- ~14 hours observation
- noise in line free channel 20 mK
- Integrated flux 333 Jy.km/s

- ~14 hours observation
- noise in line free channels 13mK
- Integrated flux 566 Jy.km/s
Conclusion

- HI studies in dwarf irregulars gives rich information about galaxy kinematics and distribution.

- Capabilities of KAT-7 gives us an opportunity to detect large scale extended HI as we wait for up coming pathfinders

- NGC6822, we detect ~23 % more flux than ATCA with rotation curve going out 500 arcsec more than ATCA.

- GBT sensitivity allows us to detect the presence of low column density regions.