# Milky Way Research

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**Key Science Drivers for NMA**

Astrometry (distances and proper motions):

Targets: Pulsars & Compact Objects, Masers, Galactic Center

Advantages: $\theta_{res}$ 10× VLA; $\sigma_S$ 10× VLBA

Science Impact: 3-D Galactic map of objects, SMBH kinematics

Polarization and Magnetic Fields:

Targets: Masers (Zeeman), Pulsars (RM), SNR (low-freq spectra)

Advantages: Scattered OH (resolved on VLBA); high-res at low-freq

Science Impact: 3-D Galactic map of B-field; SNR B-field

Smale Scale Structures in ISM:

Targets: Extended masers (eg, $CH_3OH$), HI, E.G & Pulsars (DM)

Advantages: intermediate (between VLA & VLBA) angular scales

Science Impact: Explore magneto-ionic and neutral micro-structures of ISM

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## Should We Build the NMA?

Compared to eMerlin:

- Better latitude for inner Galaxy
- (u,v)-coverage at high sensitivity much better
- One instrument covering all size scales

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**Is 8 New Antennas + PT/LA About Right?**

Yes, but consider not using LA (VLBA scheduling reasons)

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## What is the Maximum Frequency/Trade for Collecting Area?

86 GHz for VLBA compatibility

Frequency coverage should not be traded for collecting area.

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## How Important is Stand-Alone NMA Operation?

Secondary in importance:

Will be used mostly (70-100%) with VLA and/or VLBA

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### What Field of View is Required?

As large as possible:

- Astrometry (finding in-beam reference sources)
- Full primary beam imaging
- Similar primary beam as VLA (compatibility)

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**Ranked Relative Importance of:**

1) Get NMA done a.s.a.p. (traditional 25-m dishes)

2) Develop new technology for EVLA-II (eg, more collecting area)

3) Develop new technology as a step towards SKA

Above priority about right: closer to 1) than 2)

Compatibility with VLA/VLBA essential

But, keep options open where possible

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## How Far Should We Go Integrating with VLA/VLBA?

All the way!

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## What Are the Key Science Drivers for E-configuration?

Brightness sensitivity with good imaging:

- Synchrotron Emission
- Recombination Lines
- HI

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## Should We Build the E-configuratoin?

Yes, it is well worth it.

The $2M (300m/15 new pad design)

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### How Important is Shadowing?

Important for Galactic Center & other low Dec sources

Solution seems to be the (no-extra-cost) EnD-configuration

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## What Frequency Range is Required?

Same as VLA/VLBA

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## What Are the Key Science Drivers for Low Frequencies?

Low-frequency recombination lines

Super-nova modeling

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## Improved Low Frequency Capability/What Frequencies?

Probably keep as is (don't risk degrading high-freq performance)

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## How Does EVLA Fit in Grand Scheme?

"Single Radio Telescope" covering all angular scales

Staged transition $\rightarrow$ eVLA in 2010 ($10\times$ improved) $\rightarrow$ SKA in 2020 ($100\times$ improved)

LOFAR covers frequencies below about 300 MHz

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## What Should Be Returned/Added to Phase I?

E-configuration at $2M

Incorporation of LA in VLA via fiber