E-Configuration

Rick Perley
What, and Why?

• A super-dense, compact configuration with maximum spacing ~ 250 meters.
  – Resolution ~2.0’ at 20cm, 4.5” at 7mm.
• Halfway between GBT and D-configuration resolution.
• Three times larger beam => 10 times higher surface brightness sensitivity than ‘D’-config.
• Provides faster, more accurate imaging than a tapered D-configuration.
A (Small) Part of Phase II

• Originally was a component of Phase I EVLA.
• Dropped due to budget cap and development/design issues.
• Retained within Phase II as a (minor) component of the expansion.
• Concept has generally been well supported as a potential stand-alone proposal.
Performance

- The following table shows 1-hour 1-σ performance.

<table>
<thead>
<tr>
<th>Band</th>
<th>Res’n</th>
<th>CPSS</th>
<th>Confusion</th>
<th>CBTS</th>
<th>LPSS</th>
<th>LBTS</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>arcsec</td>
<td>µJy</td>
<td>µJy/beam</td>
<td>µK</td>
<td>mJy</td>
<td>mK</td>
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<tr>
<td>L</td>
<td>120</td>
<td>6.2</td>
<td>610</td>
<td>135</td>
<td>1.8</td>
<td>37</td>
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<tr>
<td>S</td>
<td>60</td>
<td>3.0</td>
<td>93</td>
<td>64</td>
<td>1.1</td>
<td>23</td>
</tr>
<tr>
<td>C</td>
<td>30</td>
<td>2.3</td>
<td>14</td>
<td>50</td>
<td>.85</td>
<td>18</td>
</tr>
<tr>
<td>X</td>
<td>19</td>
<td>2.8</td>
<td>4.0</td>
<td>60</td>
<td>.78</td>
<td>16</td>
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<tr>
<td>Ku</td>
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<td>1.4</td>
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<td>3.2</td>
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<tr>
<td>Q</td>
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<td>6.9</td>
<td>.082</td>
<td>140</td>
<td>1.1</td>
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</table>

CPSS: Continuum Point Source Sensitivity
CBTS: Continuum Brightness Temperature Sensitivity
LPSS: Line Point Source Sensitivity (1km/sec)
LBTS: Line Brightness Temperature Sensitivity
Science

- Large-Angle Low-Brightness Surveyor
- Commonly used in mosaic mode, often in conjunction with GBT, or other single dish.
- Quoted applications (from Phase II proposal):
  - Imaging S-Z in galaxy clusters.
  - HI and non-thermal imaging of nearby galaxies, Galactic chimneys, and shells.
  - Mapping of Zeeman splitting of HI, molecular, and RR lines.
  - Imaging comet emission, SNR, ISM, thermal emission lines
  - Imaging of diffuse synchrotron emission from particle acceleration sites throughout the universe.
Some Design Details

• Game is to get the antennas as close together as possible, but also to prevent excessive shadowing.
• Two configurations proposed.

Red: Existing Stations
Blue: New Stations

Blue: Existing plus E-config.
Red: Additional for E-30
UV-coverage

- Comparison of D with E: 1 hour at $\delta = 60$.
- More uniform coverage, more different spacings mean faster, better imaging.
Fidelity

- A much better imager than D-configuration, especially when combined with GBT data.
Cost, and Schedule

- Guy Sanzione has updated costs (2007) (in $K)

<table>
<thead>
<tr>
<th></th>
<th>Basic E</th>
<th>E-30 addit.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering &amp; Consulting</td>
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<td>Track</td>
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<tr>
<td><strong>Total</strong></td>
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<td><strong>1376</strong></td>
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</table>
Some Closing Points

• Zero Technical Risk.
  – This is a ‘can’t fail’ project. It’s all about civil engineering.
  – Can be done in parallel with EVLA construction.

• The surveying and imaging capabilities are provided for all bands at once!
  – The major cost – feeds and receivers – are already there.

• Interferometry is the best way to get high-fidelity imaging.
  – Can’t compete with GBT’s brightness sensitivity, but can do far better in dynamic range, and in overall cost. There is broad support for this in the community.

• Many possible partners – some (e.g., Karl Menten) with money.

• May be a window of opportunity available now
  – Part of an EVLA development fund
  – Possible cost reductions with putative recession?