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Curtin University of Technology

The University of Western Australia
Achieving International Excellence

ICRAR is a partnership between Curtin University of Technology and The University of Western Australia

AAVs – Deployment Considerations

ICRAR team

Progress meeting, Oct 22-23 2012 Medicina, Italy

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Agenda

Enclosures & Infrastructure

Layout logistics

Planning & Preparation

Design for Deployment

Enclosures

MWA "White Box"

- Available & ready to use
- RF shielding tested & accepted
- Limited size
  - 14u Crate size, but 280mm deep
  - ~1KW max internal power use (for thermal reasons)
  - 4pr Fiber + mains power available, DC mower module can be used with mods (takes up 2u)
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COTS Rack enclosure

- "half-rack" ~A$ 4000 (15u x 750mm deep)
- Steel, decent shielding
- May not be weather-tight as delivered
- Penetrations & cooling design required (+$$)
- Larger/smaller sizes similarly priced

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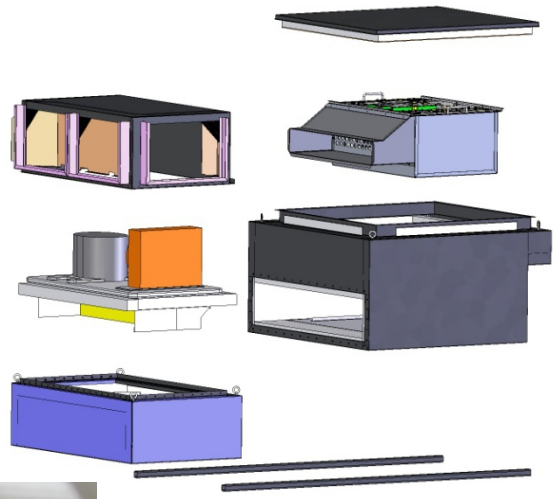

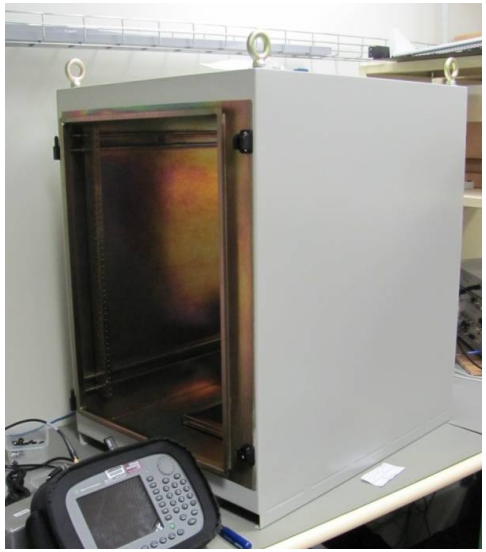

MWA Infrastructure

("Telstra hut")

http://www.facebook.com/Murchison.Widefield.Array

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Typical terrain

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MWA receivers on their pads

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Core area tiles

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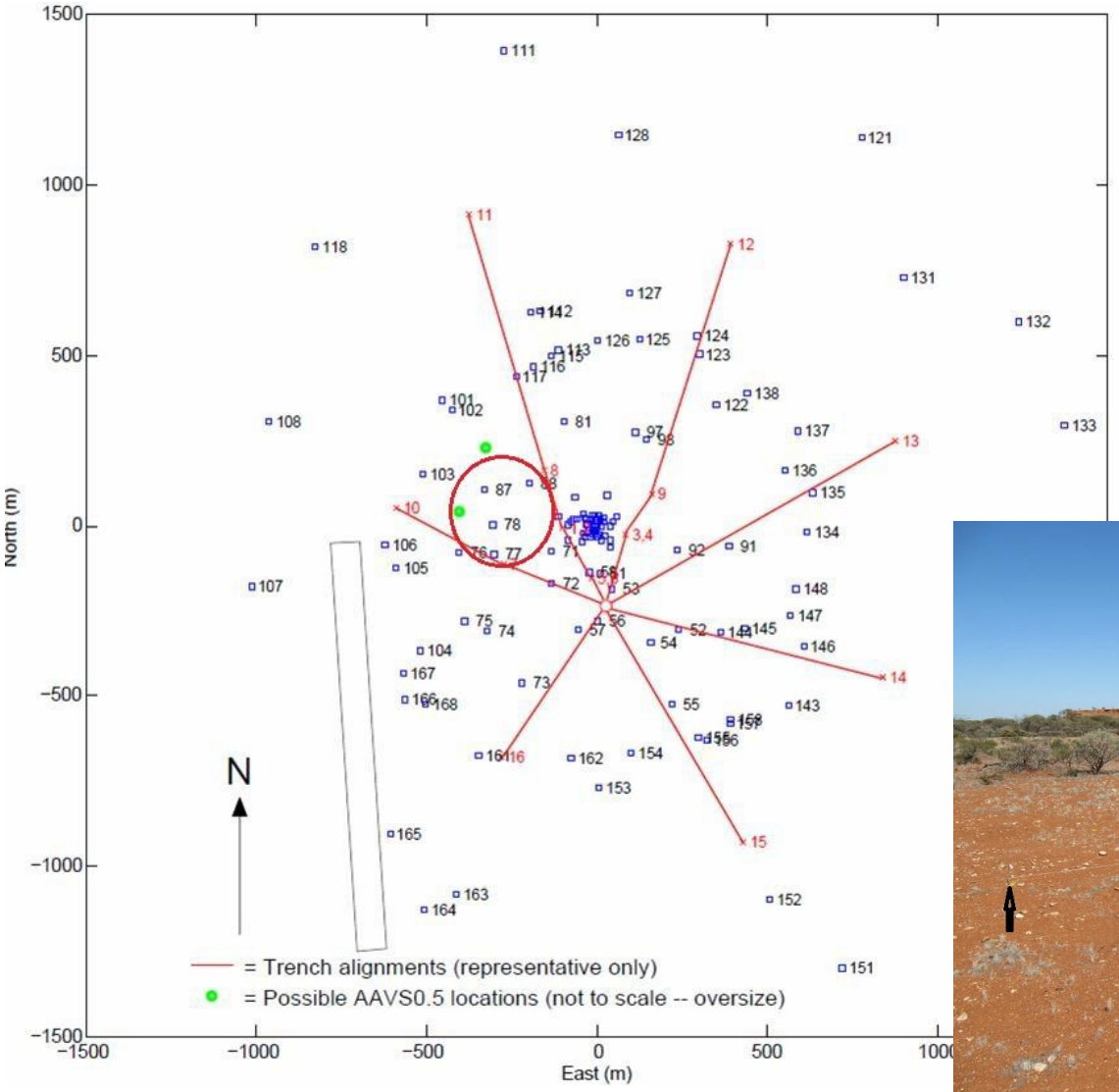
Selected AAVs0.5 location



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AAVS0.5 Deployment

- 16 dipole elements

- Phase 1 (~6m elapsed time)
  - Production
  - Shipping & haulage
  - Site Prep –
    - Survey
    - Drilling
    - Hole prep & posts
    - Element Assembly
- Phase 2 (2013 ….)
    - Cabling
    - Rx & back-end installation
    - Monitor, control, data capture verification
    - -> Measurements

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Site prep costs

- Drilling - $10K, 1 – 2 days
- Manpower – 2.5 people, 2 - 4day+ trips
- Materials (tools, posts, safety gear, vehicle rental, accomodation…)
- Time
  - Survey - 2-5min/location, + reference locations
  - Hole prep up to 1hr / hole
  - Antenna assy – 1hr/antenna?
  - ….

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Drilling

MWA Ground screens (new)

Mesh sheets are 3.15mm wire, a bit over 20kg per sheet, three sheets per tile.
128T works out to about 9 tonnes of mesh

(The old screens were 4mm dia wire, “tie-wired” together)

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Comparisons

LWA - ~256 antennas

- Locate/Survey ~300 pts over a ~100x100m area
- Located 256 elements + associated infrastructure
- “student army” ~2wks
- Professional recheck - 1wk

MWA (128 Tiles)

- 128 Tiles over a 1.5km area (2 pts/tile) = 3days
- Rx + trench locs ½ day, 2 times
- Other:
  - GPR survey ~ $80K
  - $ trenching ….

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Scaling..

- Say we're 2x as good as LWA.
  - > 600pts / week, 5 teams (1-2 people)
  - = 3000 locs /week
- @ 100,000 elements, == 30 weeks
- = possibly 6.6 man-years, $1.3million?
- And this is only the locations!
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Some Conclusions:

- Logistics costs of antenna deployment could be very high for any individually-located element design
- Even repeated but internally random stations will require each element to be located
- Adding a ground plane could reduce the deployment costs dramatically:
  - No ground penetrations required
  - No sensitivity to underlying geology
  - Significant reduction in element location survey costs
    - Especially for regular element layouts
- Any realistic SKA design will have to be extremely modular and maximize early signal aggregation
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