Minutes of EVLA Transition Plan Meeting, 27 July, 2001

P.Napier

Agenda:
(1) Transition Phase block diagram (J.Jackson)
(2) A draft Transition Phase plan and schedule (P. Napier)
(3) Questions and discussion (All)

Transition Phase block diagram
J. Jackson's vugraphs are shown below:

Slide 1

Transition Issues

- EVLA Ant → VLA Correlator
  - Need to convert EVLA IF's to drive VLA BBC
  - Need A/D and D/A conversion in path for fiber
  - Issues
    - Timing differences between fiber & waveguide
      - Hopefully dealt with using Pie-Town hardware
    - A/D - D/A conversion artifacts
    - Can we get D/A's at these frequencies??
    - Where in IF chain do we digitize??
    - What additional LO/IF/Digitizer hardware is required and how much will it cost??

Slide 2

Transition Issues

- VLA Ant → Widar Correlator
  - Options:
    - Sample VLA Base band with EVLA Digitizers
    - Sample VLA IF's with EVLA digitizers
    - Digitally Process (somehow) the data from the existing VLA digitizers

Slide 3

Transition Issues

- Correlator
  - Need VLA and WIDAR Correlators Operational Simultaneously
    - WIDAR does not fit existing screen room
    - Need to power and cool **both** correlators
  - VLA and EVLA antennas feed VLA Correlator
  - Do VLA antennas need to feed WIDAR??

Slide 4

Transition Issues

- VLA receivers - L, C or X Band IF's
  - Need to convert L & C IF's to X-Band (8-12)
- 74MHz and P-Band
  - Need Fringe Rotation for VLA correlator
  - Could direct convert for WIDAR correlator

A draft Transition Phase plan and schedule
The draft transition plan presented by P. Napier is shown below

Draft EVLA Transition Plan

P.Napier, 2001-Jul-27

Date	Activity
Aug 02	Start installing fiber on array. No antennas connected.
Apr 03	Choose EVLA Test Antenna near array center. Install new IF/LO/FO system. Test with new prototype M/C system. Some new and some old front-ends. Not available for observing.
Jul 03	Start interferometry tests between EVLA Test Antenna and VLA.
Oct 03	Freeze electronics design. Start electronics production.
Mar 04	Start installation of new IF/LO/FO system on antennas at 7 antennas/year. Full M/C capabilities available. EVLA antennas available for observing. Start installation of highest priority new front-ends.
Jul 06	Start installation of new correlator in new correlator room at VLA.
Jul 07	Start test observations with new correlator using EVLA antennas. 22 EVLA antennas available.
Jan 08	New correlator operational. Old correlator shut down.
Mar 08	Last antenna converted to EVLA design.
May 10	Last new receiver installed.

Questions concerning EVLA Transition Plan.

The major questions discussed at the meeting are shown below together with the conclusions of the discussion (in bold).

Note:
"VLA antennas" means antennas with the existing IF/LO system communicating through the waveguide.
"EVLA antennas" means antennas with the new IF/LO system communicating through fiber optics.

(1) During the EVLA Transition Phase we plan to support the following compatibilities:
(a) VLA antennas into the old correlator
(b) EVLA antennas into the old correlator
(c) EVLA antennas into the new correlator
We do not currently plan to support:
(d) VLA antennas into the new correlator
Is this acceptable?
There does not appear to be any strong reason for providing this capability.

(2) Compatibility 1(b) above will be achieved using an additional narrow band multi-bit digitizer and reconstituting the analog IF in the control building. It has been suggested that this multi-bit capability also be made available in the new correlator. Is this necessary? How many per polarization and what tuning flexibility is required for these multi-bit digitizers?
There is a strong desire to have a narrow band, multibit capability for the lower frequency (S Band and below) bands. This capability should have the same flexibility of use as the wide band digitizer system. The capability will be included in the baseline design and costed.

(3) We currently hope to be able to operate both old and new correlators in parallel at the same time, but have little idea yet of the complexity and cost of doing this. How important is it to achieve this goal?
There does not seem to be a strong reason to achieve this goal and it would add considerable unnecessary complexity to achieve it. For example, the old correlator requires Walsh function phase switching for its correct operation whereas the new correlator uses LO offsets instead of Walsh switching. The course timing accuracy of the Walsh switching, which is acceptable in the old correlator because of the waveguide blanking periods, would not be acceptable in the new correlator. It appears to be adequate to simply make it simple and fast to switch between the correlators.

(4) It is not currently planned to have both old and new IF/LO systems running on antennas. Is this needed, perhaps on one antenna for test purposes?
Concern was expressed by the astronomers that the performance of VLA and EVLA antennas would be sufficiently different (for example in the area of closure errors) so that observations with a mixture of both kinds of antennas would be seriously compromised. A fallback plan is required in the event that this situation occurs. The option to keep both IF/LO systems running in parallel will be preserved as long as possible.

(5) During the transition phase EVLA antennas will have a mixture of both old and new front-ends installed. Is the plan for compatibility between old front-ends and the new IF/LO system adequate?
During the discussion it became apparent that there is not yet a well-thought-out plan for making the old receivers compatible with the new IF/LO system. A significant complication is the desire to remove the old A rack when a converted from VLA to EVLA design. More work is needed on this issue.

(6) Will the Pie Town link delay system on the old correlator handle EVLA antennas from which the IF data arrives late (glass vs free space propagation)?

The Pie Town delay system clearly has sufficient range and resolution to handle the EVLA antennas. The only question is whether there is enough time during data invalid to both run self-test and fill the delay lines with data. This is only an issue for the end antennas in A array and should not affect observations significantly.

(7) EVLA antennas will require fringe rotation to be compatible with the old correlator. Are the plans for this adequate?
The DDS on the EVLA second LO will have sufficient range and accuracy to provide the necessary fringe rotation rates.

(8) Will the current transition plan result in problems for the ongoing VLA long duration survey projects?
The answer to this is almost certainly yes. As well as the increased number of antennas that will be removed from observing after April 2003, it is likely that there will be subtle differences in the performance of VLA and EVLA antennas because of the different ways in which the baseband signals are generated at the old correlator input.

(9) Do we need 2 EVLA Test Antennas?
It appears desirable to have at least two test antennas. This desire must be balanced against the increase in antennas unavailable for observing.

(10) Questions we haven't thought of yet - there must be many.
No additional Phase I issues were raised.