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VLA ELECTRONICS MEMO. 227

A PROPOSAL TO (ALMOST) DOUBLE VLA CONTINUUM BANDWIDTH

(from present effective 180 MHz to 320 MHz)

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The existing VLA Correletor has twice the number of multipliers than are needed for continuum operation. B. Clark (VLA Electronics Memo. 148) pointed out more than 20 years back that these can be used to double the effective VLA bandwidth from nominal 200 MHz to 400 MHz in continuum operation by replacing present 50 MHz quadrature networks in the Samplers by 100 MHz quadrature networks, and combining all four (cos1*cos2, cos1*sin2, sin1*sin2, and sin1*cos2) multiplier products to post hoc calculate full complex correlation (while still sampling at 100 MHz rate).

This requires doubling the bandwidth of the four 50 MHz signals to four 100 MHz signals going to the Samplers and modifying the quadrature networks in the Samplers. In 1975 it was felt that the IF/waveguide system can not support four 100 MHz bandwidth signals. I feel that with the present IF/waveguide system we can provide four 80 MHz bandwidth signals to the Samplers. The interaction between adjacent IFs can be kept low by using different phase switching Walsh functions for adjacent IFs.

This will increase effective VLA continuum bandwidth from present 180 MHz (4*45 MHz) to 320 MHz (4*80 MHz). It will require following modifications:

1. Additional 1025/80 MHz bandpass filter in the F7 Module in bandwidth code 4 position (will require four filters per antenna).
2. Replace existing 60 MHz bandwidth IF bandpass filters in IF Offset (F8) Module by 85 MHz bandwidth filters.
3. Require two seperate Walsh functions, one for phase switching AC signals and second for BD signals. Phase switching could still be applied in Fringe Generators (L7s).
4. Add BPFs of 1250-1500 MHz and 1500-1750 MHz before first mixers in Baseband Converter (T3) Modules. This is optional.
5. Replace 125/50 and 225/50 MHz bandpass filters by 85 MHz bandwidth bandpass filters.
6. In T3 modules bypass 50 MHz LPFs or replace them with 85 MHz BPFs.
7. Bypass T4 Module/ Use external filter position in T4 for this bandwidth.
8. Replace 70 MHz LPFs at the Screen room interface/bypass them.
9. Modify quadrature networks in Samplers to get quadrature upto 80 MHz.

It appears that most other components are broadband to support 80 MHz bandwidth operation, but we need to carry out tests and ensure that it works or find out what other changes are necessary to achieve this. Very approximately cost of parts/components for the above modifications is about $6k per antenna, assuming that the Sampler quadrature networks can be modified by replacing the inductors and capacitors by suitable new values.

These modifications can be made without affecting current operation. It will also need some online software changes (e.g. Two sets of Walsh functions for each antenna, Combining all four multiplier outputs to generate complex correlation, etc.) to achieve increased bandwidth.