EVLA LO/IF SYSTEM

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SYSTEM REQUIREMENTS

• LO Phase Stability
• Phase Noise
• Deviation from linear phase
• Amplitude flatness and stability
• Fringe tracking
• Phase switching
LO/IF SYSTEM

LO Phase Stability
Short term: <0.5pS RMS for times <1s
Long term: Linear Slope over 30min <1.4ps
    Peak to peak phase deviations over 30min <1.4ps -linear slope
Phase shift with pointing change:
    <.7ps over whole sky
    <.07ps per degree of slew for short slews at elevations under 60 degrees
## LO/IF SYSTEM

### Phase noise

Current systems 5MHz clean up oscillator specs vs new 512MHz

<table>
<thead>
<tr>
<th>OFFSET Hz</th>
<th>OLD RATIO dBC</th>
<th>NEW RATIO dBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-100 (-60)</td>
<td>-74</td>
</tr>
<tr>
<td>100</td>
<td>-145 (-105)</td>
<td>-105</td>
</tr>
<tr>
<td>1000</td>
<td>-165 (-125)</td>
<td>-135</td>
</tr>
</tbody>
</table>

Designing with low noise YIGS
LO/IF SYSTEM

Deviation from linear phase, amplitude flatness, and amplitude stability

Still working on specification
LO/IF SYSTEM

Fringe rotation and phase switching

Not needed for new correlator
But is needed for the transition phase of the project.
LO/IF SYSTEM

SYSTEM COMPONENTS

• Central reference system
• First LO system
• Second LO system
• Antenna reference system
• IF system
LO/IF SYSTEM

- Samplers
- Transition hardware
- Round trip phase measurement
- Other components
Central Ref Sys

Generates and distributes all the references required by the system.

19.2Hz will be used for the transition period and changed after all the new hardware is on line.
References generated

512MHz, 128MHz, 256MHz, 32MHz,
19.2Hz, 5MHz. And low freq timing signals
1ST LO SYSTEM

1st LO Synthesizer
Freq range 12 to 20 GHz
Step size 512MHz+/-DDS
Freq offsets provided by the DDS
Fringe rotation and phase switching provided by the DDS
2ND LO SYSTEM

2nd LO Synthesizer
Freq range 10.8 to 14.8 GHz
Step size 128MHz+/-DDS
Freq offsets provided by the DDS
Fringe rotation and phase switching provided by the DDS
ANT REF SYSTEM

Generates and distributes all the references required by the antenna

References

128MHz, 256MHz, 512MHz, 1024MHz, 2048MHz, 4096MHz, 19.2Hz, 9.6Hz, and low freq timing signals
The IF system is to provide the path for the IFs from the front end to the correlator. It consists of frequency converters, switches and samplers.
IF SYSTEM

- 4 converters required
- 2 up converters
- 2 down converters
- 1st IF 8 to 12 GHz
- 2nd IF is either 2 to 4 or 1 to 2 GHz
IF SYSTEM

• Mechanical switches required to switch between front ends and to switch the 1st LO between converters/front ends
BASEBAND CONVERTER

• Baseband converter splits IFs into two 2 to 4 GHz sub IFs or
• Provides one 1 to 2 GHz IF for high resolution sampling
• Provides total power detection on each IF
SAMPLERS

• Eight wide band 3 bit samplers provided with 4096MHz clock for harmonic sampling
• Four high resolution 8 bit samplers provided with 2048MHz clock for harmonic sampling
TRANSITION HARDWARE

- Hardware is provided to make the new antennas compatible with the old correlator.
- Hardware consists of decimator, FIR filter, and an 8 bit D to A converter.
ROUND TRIP PHASE

• Round trip phase measurement will be provided

• 512MHz sent to antenna and
  Put through clean up loop then sent back and compared with an offset 512MHz
ROUND TRIP PHASE

- Measurement of phase is necessary due to temperature effects on fiber
- Measurement may also be required due to mechanical stretching of fiber by antenna movement
OTHER COMPONENTS

• Other components that are required are the T4 IF filter and the T5 baseband driver. These are required for the transition only.