EVLA IF/LO

EVLA “LOW BAND” CONVERTERS
For 4/P/L/S/C and Ku Bands
<table>
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<th>Module</th>
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<td>L301</td>
<td>4/P-Band Converter</td>
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<td>L320?</td>
<td>Phase Cal (PCAL) Generator</td>
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## Converter Frequencies

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<th>RF</th>
<th>1st IF</th>
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<tr>
<td><strong>L301</strong> (L)</td>
<td>(4) 73 – 75 MHz</td>
<td>1097–1099 MHz</td>
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<tr>
<td><strong>L302</strong> (X)</td>
<td>(P) 308–348 MHz</td>
<td>1332–1372 MHz</td>
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<td>(L) 1 – 2 GHz</td>
<td>12–11 GHz</td>
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<td><strong>L302</strong> (X)</td>
<td>(S) 2 – 4 GHz</td>
<td>11 – 9 GHz</td>
</tr>
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<td>(C) 4 – 8 GHz</td>
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Low Band Converters
RF/IF Signal Flow

- 74 MHz
- 327 MHz
- L-BAND
- C-BAND
- S-BAND
- Ku BAND

4/P BAND CONVERTER

L/C/S BAND CONVERTER

Ku BAND CONVERTER

X/Ka/Q BAND FRONT ENDS

BASE BAND CONVERTERS

IF A, B, C, D
Low Band Converters
Monitor/Control

4/P BAND CONVERTER

L/C/S BAND CONVERTER

Ku BAND CONVERTER

CONVERTER INTERFACE MODULE L310 (MIB)

MONITOR/CONTROL SYSTEM

74 MHz
327 MHz
L-BAND
C-BAND
S-BAND
Ku BAND

COMMANDS:
- Solar Attenuators

MONITOR POINTS:
- Solar Attenuators
- Module Serial No.
- Total Power Detectors for LO & IF (?) levels
- Power Supply voltages

MONITOR POINTS:
- /g167 Solar Attenuators
- /g167 Module Serial No.
- /g167 Total Power Detectors for LO & IF (?) levels
- /g167 Power Supply voltages
L301 4/P-Band Converter

4-Band Specs

- **Input Frequency:** 74 MHz (73-75 MHz)
- **Bandwidth:** 2 MHz *Narrow Band*
- **Input Power:** -35 dBm/2 MHz
  -62 dBm/GHz
- **P1dB of Converter:** +12 dBm
- **Headroom:** ~74 dB
L301 4/P-Band Converter

4-Band Specs

- LO: 1024 MHz @ +3dBm
- IF Frequency: 1097-1099 MHz
- **Narrow Band**
- IF Output Power: -47 dBm/GHz
  (To be compatible with L-Band Converter input)
- IF flatness: <<1 dB/2 MHz
- IF-IF Isolation: >65 dB
L301 4/P-Band Converter

P-Band Specs

- Input Frequency: 308-348 MHz
- Bandwidth: 40 MHz *Narrow Band*
- Input Power: -35 dBm/40 MHz
  -50 dBm/GHz
- P1dB of Converter: +12 dBm
- Headroom: ~62 dB
L301 4/P-Band Converter

P-Band Specs

• LO: 1024 MHz @ +3dBm
• IF Frequency: 1332-1372 MHz

Narrow Band
• IF Output Power: -47 dBm/GHz
  (To be compatible with L-Band Converter input)
• IF flatness: <1 dB/40 MHz
• IF-IF Isolation: >65 dB
L301 4/P-Band Converter
RF-LO-IF Elements

<table>
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<tr>
<th>LO:</th>
<th>1024 MHz</th>
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<td>RF:</td>
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74 MHz RF

2LO Images
2RF Images

0 GHz P-BAND 1 LO 2 LO 3
L301 4/P-Band Converter
Design Notes

• 2-wide module (high RF connector count)
• Surface mount components on a PCB (filters are thru-hole devices), mounted in RFI enclosures within the module
• Coaxial components: Solar attenuators and additional LO reject filters (if req’d)
• Simultaneous 4- and P-Band observing
L301 4/P-Band Converter

Design Notes

• Amplifiers are new GAL-series high-isolation (>20dB) DC-8 GHz SMC devices, inexpensive.
• IF bandpass from high-pass and low-pass filters for better flatness and roll-off; 50% the cost of a 1-2 GHz BPF, and to customize BW if req’d.
L302 L/S/C-Band Converter

Specs

- Input Frequency: 1 – 8 GHz
  \[(L, S \text{ or } C\text{-Band singly})\]
- Input powers:
  - L-Band: -46 dBm/GHz
  - S-Band: -51 dBm/GHz
  - C-Band: -50 dBm/GHz
- P1dB of converter: +10 dBm
  (Miteq JN2 amplifiers)
- Headroom: >60 dB
L302 L/S/C-Band Converter Specs

- LO Frequencies: 13 (L/S) & 16 (C) GHz
- LO Power: +3dBm (+14 available)
- IF Frequencies: 12-11 GHz (L-Band) (inverted)
  11-9 GHz (S-Band)
  12-8 GHz (C-Band)
- Output IF Power: -51 dBm/GHz
- IF Flatness: <1 dB/200 MHz
L302 L/S/C-Band Converter

Design Notes

• 2-wide module (high RF connector count)
• Most components are coaxial (SMA’s)
• No front panel controls or monitors for RFI
• Coordinating with FE lab for selection of COTS amplifiers/isolators for cost savings
• Provision for solar attenuators if required
• Single band selected by external switches
L303 Ku-Band Converter Specs

- Input Frequency: 12-18 GHz
  - > 12-16 GHz (Ku-LO)
  - > 14-18 GHz (Ku-HI)
- Input powers: -71 dBm/GHz Transition
  -50 dBm/GHz Final
- P1dB of converter: +5 dBm (JN4 amplifiers)
- Headroom: >55 dB Final
L303 Ku-Band Converter

Specs

- **LO Frequencies:**
  - 12 x2= 24 GHz  \((Ku-LO)\)
  - 13 x2= 26 GHz  \((Ku-HI)\)

- **IF Frequencies:**
  - 12- 8 GHz  \((Ku-LO)\)
  - 12- 8 GHz  \((Ku-HI)\)

- **Output IF Power:** -51 dBm/GHz

- **IF Flatness:** <1 dB/200 MHz
L303 Ku-Band Converter
Design Notes

• **Transition Phase:** L303 2-wide module
• **Final Phase:** on-receiver converter plate
• All components are coaxial (no waveguide)
• Coordinating with FE lab for selection of COTS amplifiers/isolators for cost savings
• RF connectors 2mm (?) on back panel
• Includes Solar Attenuator assembly if req’d
L303 Ku-Band Converter

Transition Phase

- Uses existing VLA Ku front end (Dewar)
- Bypass existing 14 GHz mixer, use output of RF LNA directly (-77dBm)
- Add 20dB amplifier to Ku FE at Dewar
- Heliax run from Dewar to L303 converter
- L303 converter built as 2-wide VLA module
L303 Ku-Band Converter

Final Phase

- Uses new Ku front end (VLBA style)
- L303 module will be dismantled and reassembled as an on-receiver converter plate
- Amplifiers and Heliax runs removed
- Amplifier gains adjusted to maintain -51 dBm/GHz X-band output
L310 Converter Interface Module

- Will contain monitor and control functions of the L301, L302 and L303 Converters.
- Monitor/control requirements are very light, requiring only one MIB; mostly analog
- MIB in interface module reduces digital and processor RFI in the converter modules.
- Design pending MIB specifications.
CROCK

I’M SICK OF THE DESERT!
I’M SICK OF HEAT!
I HATE SAND!

I WANT TO GO
SOMEPLACE NEW!

WHERE DID
YOU SEND HIM?

NO PROBLEM,
TROOPER MOSKOS

NEW MEXICO

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