Cryogenic PAF Development

Progress Report

PAF Workshop
Provo, UT
May 3-5, 2010
Roger Norrod
Cryogenic PAF

• BYU/NRAO targeting noise and efficiency competitive with best single-beam receivers. i.e. 18K, 70% at L-band.

• At Green Bank, construction of cryostat for 19 element L-band PAF underway.
PAF Cryostat

With blank-off covers for leak check
April 27

Model Drawing
24 X 21 X 8 in.
61 X 53 X 20 cm.
Dual LNA and Thermal Transition

Pair of two-channel LNAs with integrated low-loss coaxial lines for transition from 15 to 300K, vacuum seal, and antenna base interface.


NXP SiGe transistors.
Surface mount components.
Thin-wall SS tubular coax.
Quartz beads for vacuum seal and center conductor heat sink.

Est. input coax heat load 150 mW / chan.
Bias power 17 mW / chan.

14 of 20 assembled, 8 tested cold.
LNA Measured Performance

Noise Y-factor measured with LN2 cold load at room temperature SMA connector.
LNA Measured Performance

Dual LNA S11
8 Amps, 16 Channels Shown

S11 (dB)
Frequency (MHz)
LNA Measured Performance

SN6-Y Noise vs. Physical Temperature

SN6-Y Noise vs. Physical Temp
At 1660 MHz

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Dipole Ohmic Losses

1. Measured LNA/Rx with coaxial hot/cold load.
2. Attached dipole and measured using ambient load and sky.
3. Corrected for scatter, galactic plane, etc. (Tsky = 7.5K)
## Achievable Tsys?

<table>
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<th>Contributor</th>
<th>Noise</th>
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<td>Receiver</td>
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<td>Dipole Losses</td>
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<td>Mutual Coupling</td>
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<td>Spillover</td>
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<td>CMB and Atm</td>
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**Total 22 K**
Next

- Install LNA/TT assemblies.
- Cooldown, measure cooling capacity.
- Mount in FEB.
- Sky noise tests.
- Antenna (20m) tests.