Detector Module Assembly for the PAM

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Specifications

- **Frequency:** 0.5–20 GHz
- **Impedance:** 50 Ω

Schematic

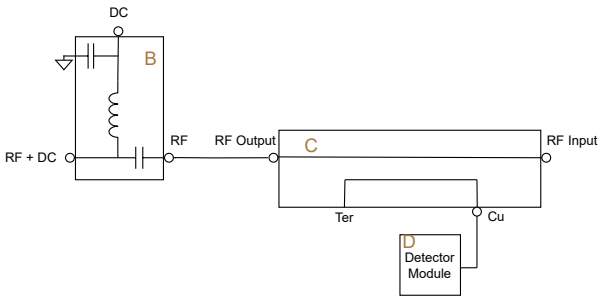

Figure 1: Detector Module Assembly schematic.

Inputs

- **RFin:** Sine Wave Generator
- **+5V:** Positive supply voltage (+5 V @ 1.6 mA)
- **GND**

Outputs

- **Det:** Output for power measurement

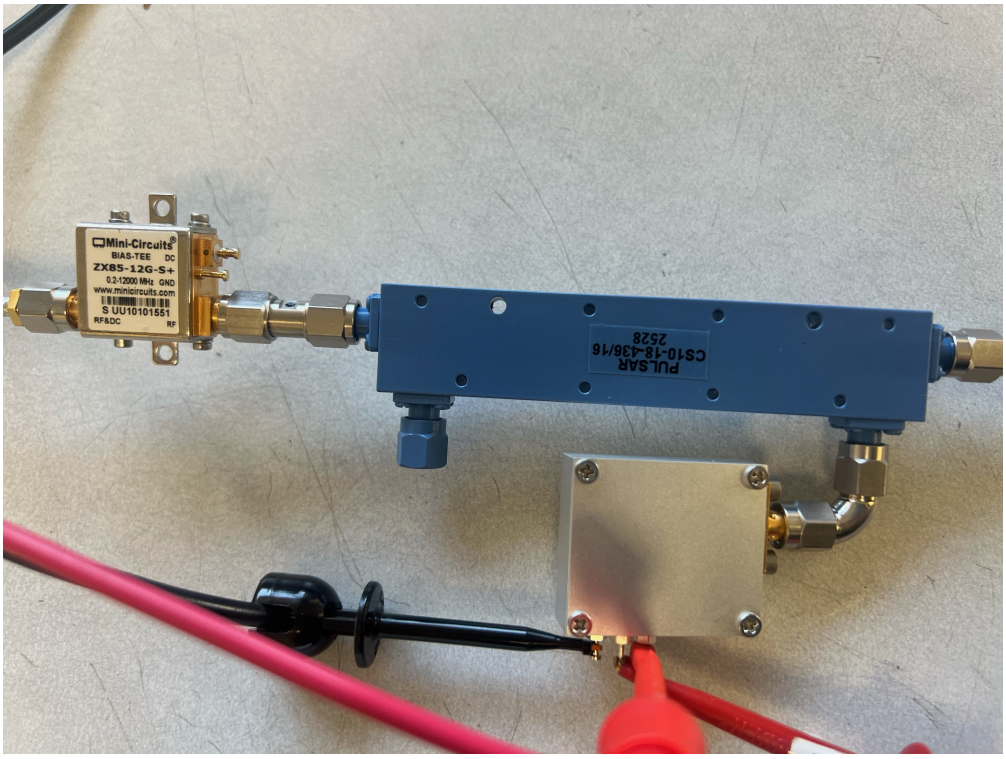

Figure 2:

Components

- 1 – Bias Tee (`ZX85-12G-S+`); B
- 1 – Fairview Microwave Radius RA SMA Male-to-Male Adapter with Passivated Stainless Steel Body (`FMAD1196`)
- 1 – AtlanTecRF Bi-directional Coupler (`A4238-10`); C
- 1 – SMA Male-to-Male Adapter
- 1 – Detector Module; D

S-Parameters

S-parameter measurements of Detector Module 1 were conducted using a Vector Network Analyzer (VNA), model `N5230C`.

The Bias Tee only goes up to 12 GHz, which may be the cause for the dip around 14.5 GHz. **Purchase new bias tees with higher frequency range?**

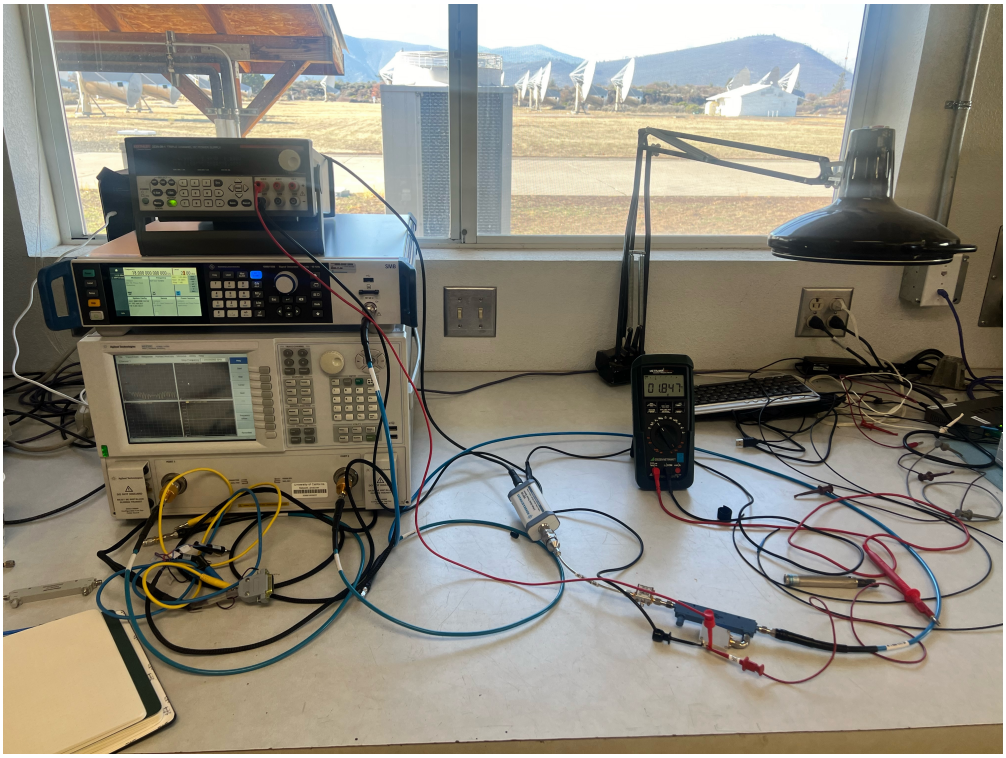

Figure 3:

Measurement Setup

A signal generator (`SMB100B`) was used to apply an RF input at fixed frequencies (1, 5, 10, 15, and 18 GHz) with varying power levels from –33 dB to approximately 23 dB.

- The diode power sensor (`NRP18S 3-Path`) is capable of measuring up to 18 GHz, which limited the measurement range even though the signal generator supports up to 20 GHz.
- The diode power sensor was connected to the bias tee via an Atlantic Microwave cable (`ASF1-005-520002-S4S4`).
- The signal generator was connected to the detector module with a 14-inch SMA cable (`ABC-CA18-SMSM-2.0M AtlanTec RF`).
- Power levels were increased in 1 dB steps, and the corresponding detector output voltages were recorded using a multimeter.
- A power supply (`2230-30-01 Triple Channel DC Power Supply`) provided the +5 V to the detector module.
- The voltmeter was connected to the `DET` pin of the detector module.
- Ground connections were shared between the power supply, the detector module, and the voltmeter.

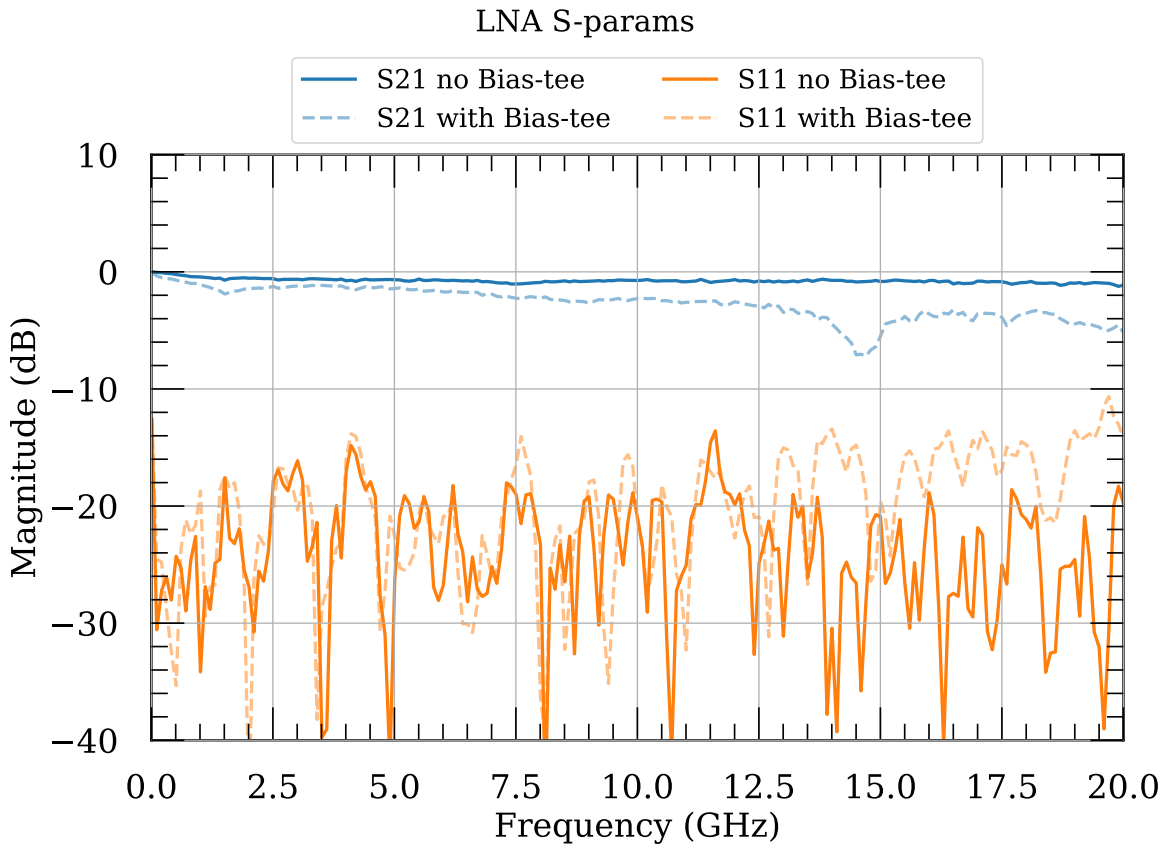

Figure 4: S-parameter measurements of the Detector Module Assembly, with and without the Bias-Tee.

Voltage-to-Power Curve

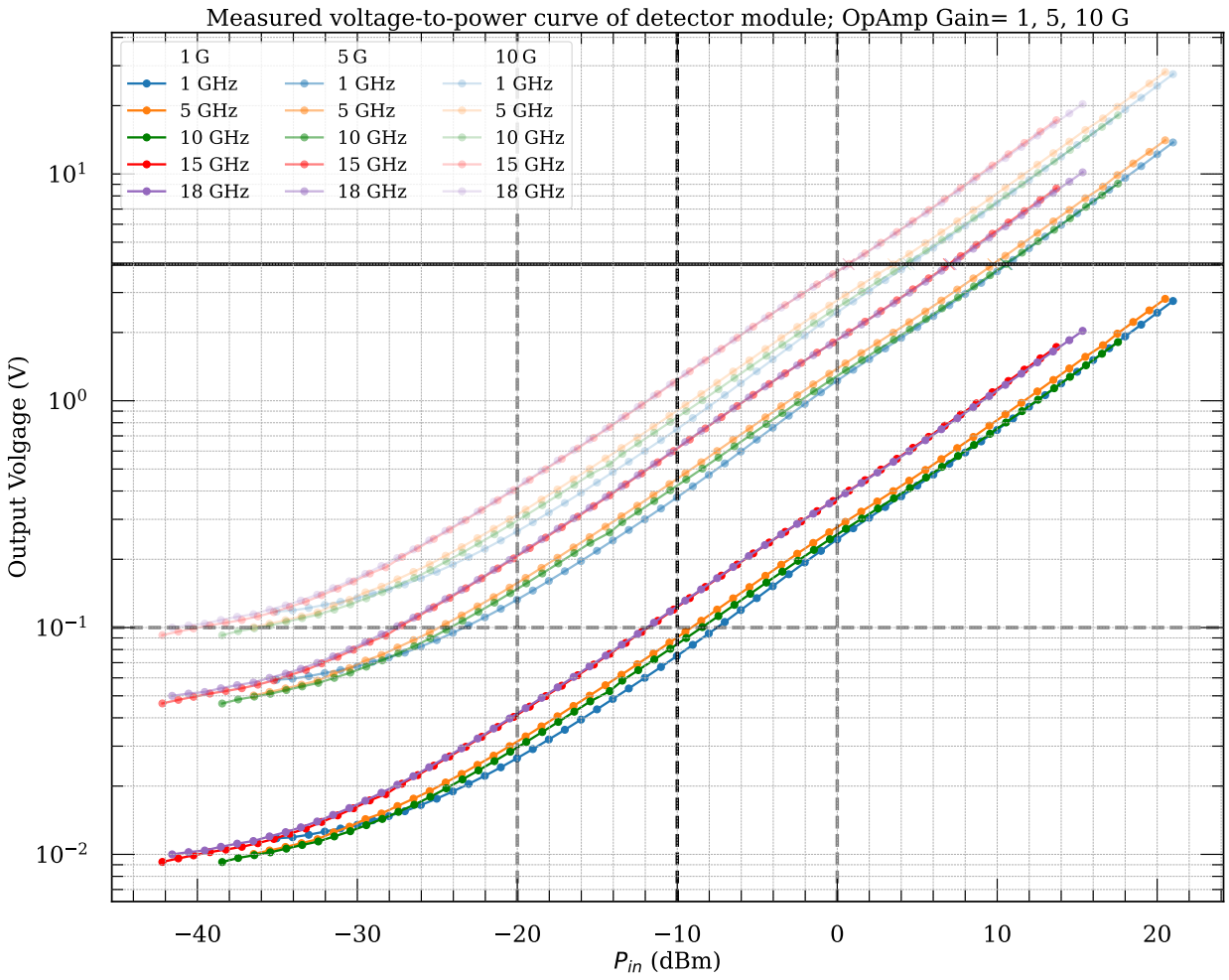

Figure 5: Voltage-to-Power Measurement Curve

Table 1: Detector voltage crossing points at 4 V for different frequencies and amplifier gains

Frequency	**Gain**	**4 V Crossing (dBm)**
1 GHz	1x	No crossing
5 GHz	1x	No crossing
10 GHz	1x	No crossing
15 GHz	1x	No crossing
18 GHz	1x	No crossing
1 GHz	5x	10.60
5 GHz	5x	9.76
10 GHz	5x	10.53
15 GHz	5x	6.98
18 GHz	5x	7.09
1 GHz	10x	4.49
5 GHz	10x	3.52
10 GHz	10x	4.24
15 GHz	10x	0.70
18 GHz	10x	0.72