Thermal tests of an ATA amplifier and fiberoptic link

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Figures 1 and 2 below show thermal tests of a prototype ATA 'post amplifier module' done in September 2002. For this amplifier the gain increased at low frequencies (< 6 GHz) and decreased at high frequencies (> 6 GHz) as the temperature increased. At 3 GHz the temperature coefficient was ~ 0.4%/C.

Figure 3 shows a thermal test of the phase shift through an ATA fiberoptic link. The observed phase change of 0.15°/C at 3 GHz is entirely attributable to the ~3 m of singlemode fiber inside the test chamber, for which the thermal coefficient of delay is typically 10^{-5}/C. There is no evidence of a phase shift from the laser or photodiode. No tests of the amplitude stability of the fiberoptic link were made.

Remember – past performance is not necessarily indicative of future results.

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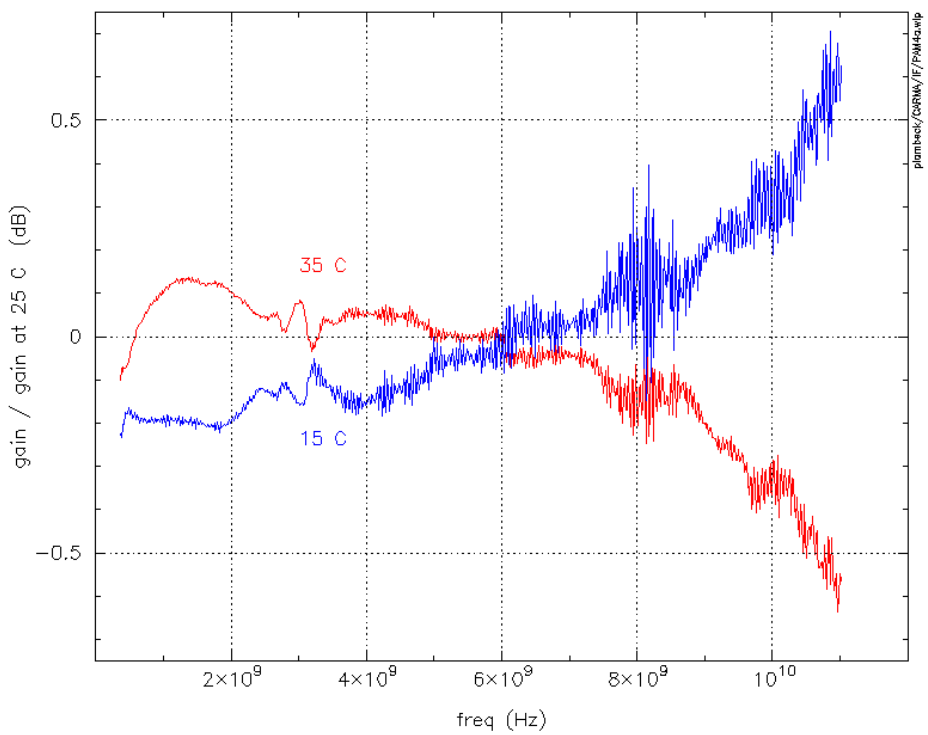

Figure 1. Gain change at 15 C and 35 C, relative to the gain at 25 C, for the prototype amplifier module. The thermal coefficient is frequency-dependent. The noisy appearance at higher frequencies is attributable to a poor output match on this prototype amplifier; the standing wave pattern this induces on the output cable shifts slightly as the cable changes temperature.

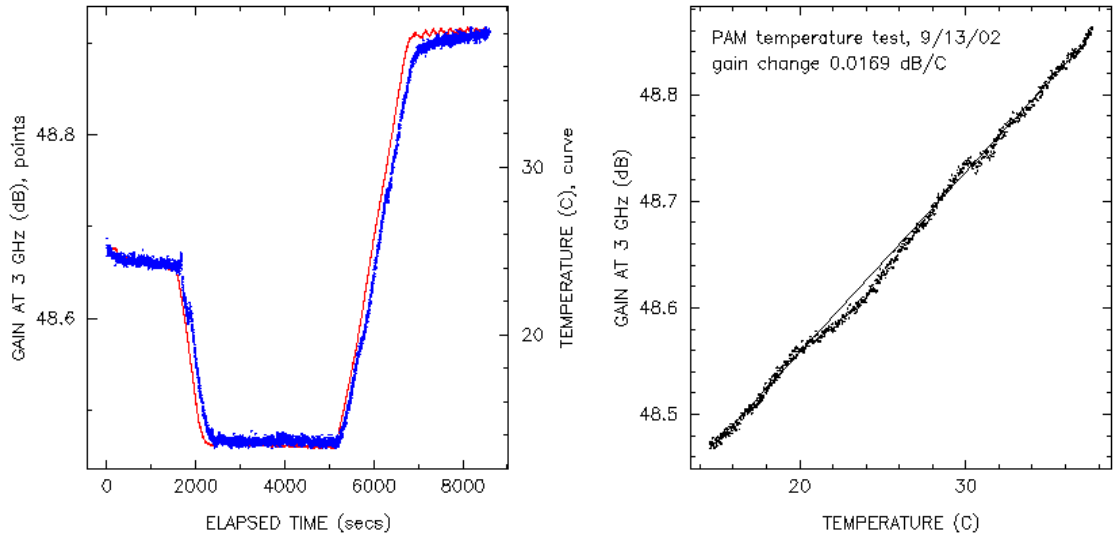

Figure 2. Thermal test of the prototype ATA amplifier at 3 GHz. Left panel shows the gain (blue) and temperature (red) vs. time. Right panel shows the gain vs. temperature for the data near 6000 seconds in the left hand plot.

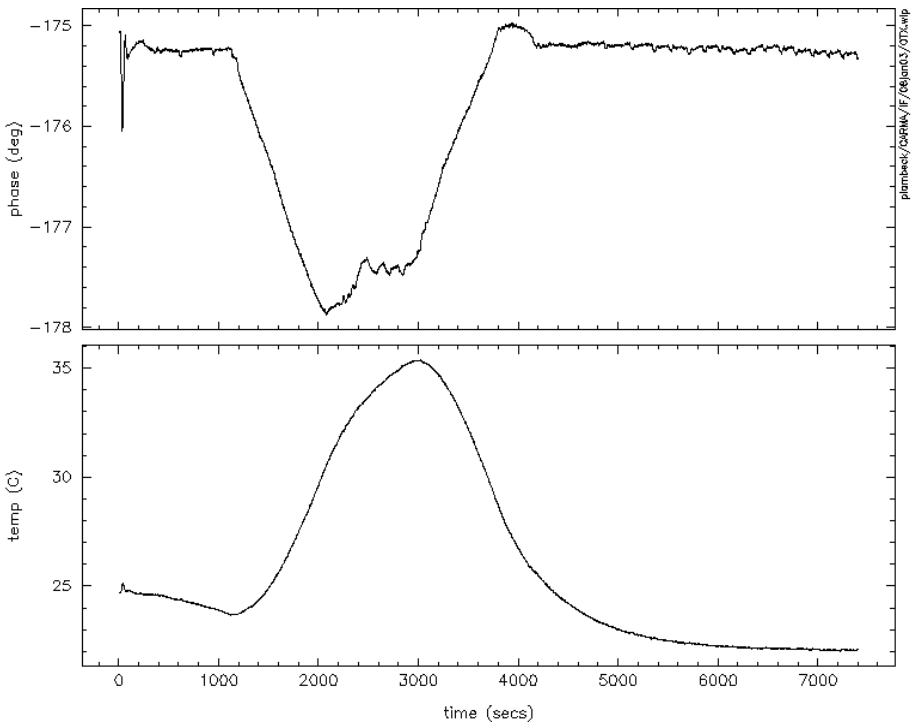

Figure 3. Thermal test of a fiber link (NEC laser NX8560LJ-CC s/n 0228Q002, Discovery photodiode DSC50S s/n 500213). Top panel shows the phase at 3 GHz, bottom panel shows the temperature of the heat sink on which the laser and photodiode were mounted. The phase closely tracks the air temperature in the chamber, not the heat sink temperature, demonstrating that the phase shifts originate in the ~3 m of singlemode fiber in the chamber, not in the laser or photodiode.