EVLA Memo 94
L/S/C Converter Plate Phase Stability Test II

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Abstract

In reference to EVLA Memo 92, an inaccuracy in acquiring the phase detector constant resulted in erroneous phase shift values. Using the correct phase detector constant with original measured voltages in the phase angle formula produced within-specification phase shifts. The voltages recorded from the second temperature chamber test and used in the phase angle formula generated better results. At an IF of 8 GHz, phase shifts of 11° and 9°, for a change in temperature (Δtemperature) from 9°C to 19°C, and from 19°C to 29°C, respectively, were realized for the initial test. For the same IF, in the second test, a 1° phase shift and 5° phase shift for the same lower and upper Δtemperatures, respectively, were obtained. The corrected procedure and improved results will be discussed in this memo.

Introduction

The maximum phase shift specification for a frequency of 8 GHz per 10° C Δtemperature, as noted previously in EVLA Memo 92, was satisfied for both 10° C increase and decrease from 19° C in the initial temperature chamber test. The discrepancy found in the first test was corrected while conducting the phase detector constant measurement for the second temperature chamber test. The initial phase detector constant (peak voltage, V_P) was acquired inaccurately due to a misread power measurement leading to the Mini-Circuits Level 7 mixer. Power levels at the mixer were not at the +9 dB reference level for the temperature chamber test, resulting in the 'out-of-spec.' results. For the second phase detector constant measurement, the +9 dB reference power level was measured at both LO and RF mixer inputs. The new resulting phase detector constant was found to be .22, a change of +.03 from the initial.

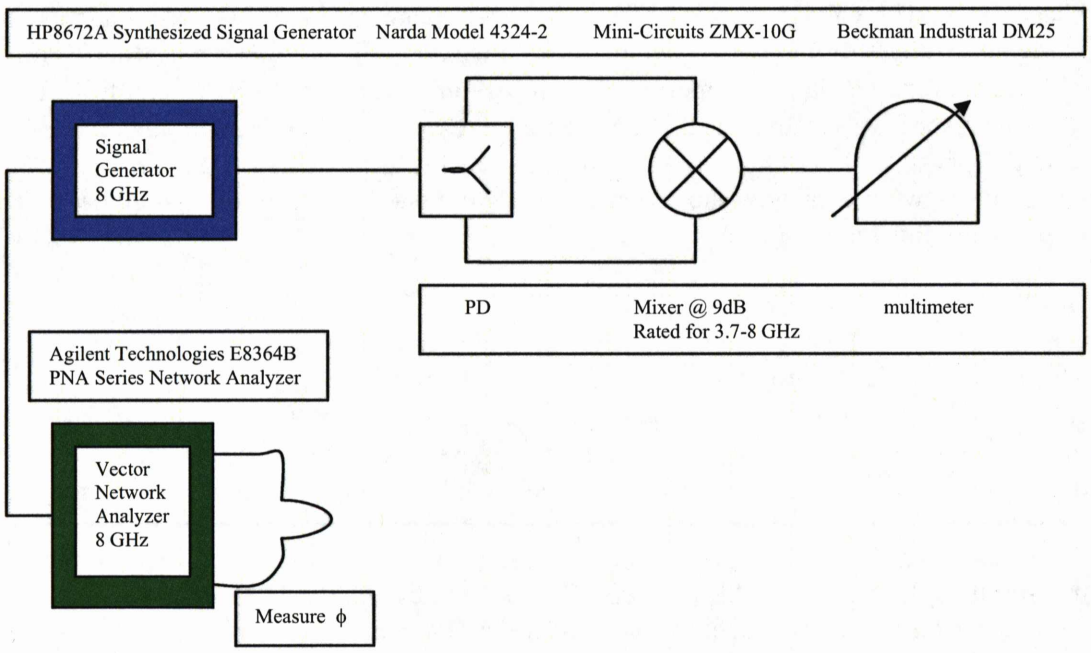
One other incongruity in the initial test occurred during the temperature chamber test. The holes (cable entry/exit holes) in the wall of the temperature chamber, itself, for the cables to and from the L/S/C converter plates were not insulated. During the second temperature chamber test, cable entry/exit holes were insulated well.

Methods

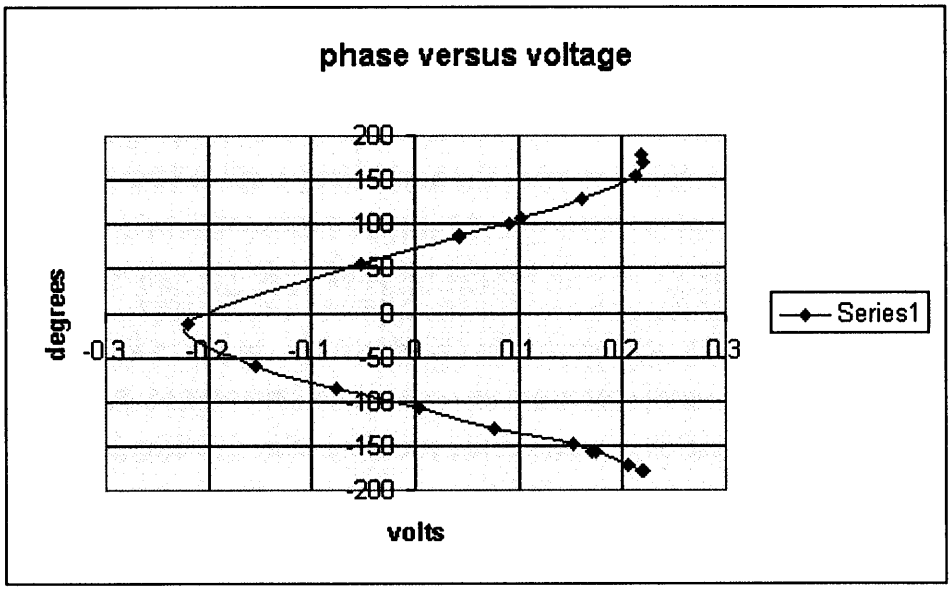
The same methods as those described in EVLA Memo 92 were repeated here except that extra attention was given to ensure +9 dB was present at the mixer inputs from the RF signal generator. Setup #1 measured results were improved. Temperature chamber tests were the same except that the time was lengthened for stability and chamber holes were insulated.

Equipment used included: Several barrels and bullets, a Minibend-2.5 cable, ESM-03, -05, and Tensolite-04, -06 cables, copper air-dielectric spline line (copper RF cables) for the "varied" chamber signal connections and 2 Storm cables for the constant chamber signal connections, foam insulation pads, 3 power supplies for the amplifiers, 2 Mini-Circuits ZRON-8G amplifiers rated for 2-8 GHz, attenuators varying from 1 to 10 dB, an HP E4418B EPM Series power meter, plus components noted in setups 1 & 2.

Setup #1

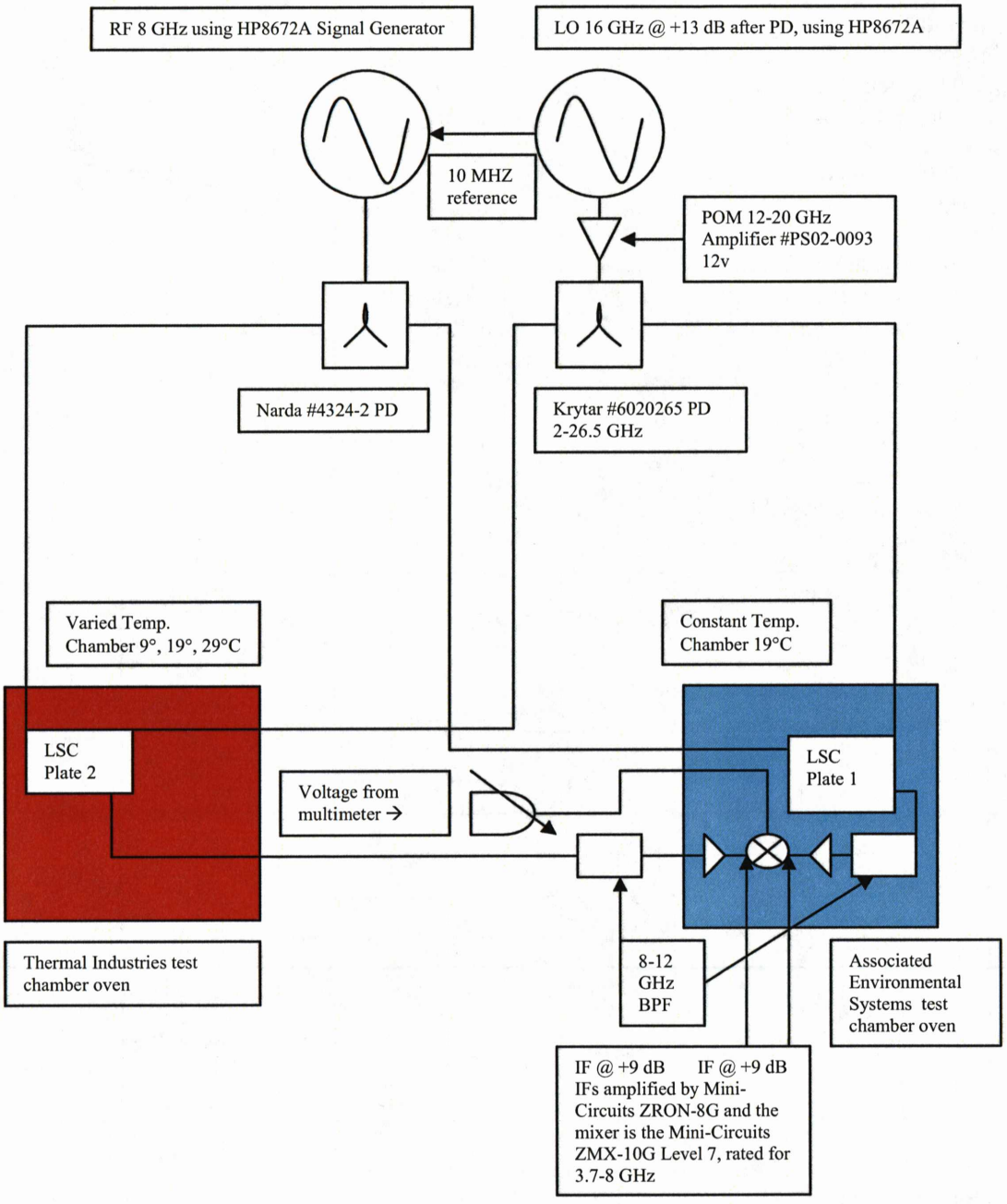


Description	voltage (v)	phase angle (degrees)
nwbllt/tnslt-004/bllt/esm-03	0.218	179
nwbllt/esm-03/xcrssbllt/brrl/bllt/brrl	0.221	169.7
esm-03/xcrssbllt	0.213	155
nwbllt/tnslt-004/xcrssbllt/mb-2.5	0.161	129
brrl/bllt/tnslt-004/xcrssbllt	0.101	108
nwbllt/tnslt-004/xcrssbllt/brrl/bllt/brrl	0.09	101
nwbllt/tnslt-004/xcrssbllt/esm-05	0.042	87
tnslt-004/xcrssbllt	0.043	85
nwbllt/tnslt-004/xcrssbllt/esm-03	-0.051	56
nwbllt/mb-2.5/bllt/brrl	-0.221	-12
nwbllt/brrl/bllt/brrl	-0.154	-60
nwbllt/esm-03/bllt/brrl	-0.076	-85
brrl/bllt/mb-2.5/xcrssbllt	0.003	-107
mb-2.5/xcrssbllt	0.075	-131
brrl/bllt/esm-05/xcrssbllt	0.152	-149
nwbllt/esm-05/xcrssbllt/brrl/bllt/brrl	0.171	-157
brrl/bllt/brrl/xcrssbllt	0.174	-157
esm-05/xcrssbllt	0.205	-171
brrl/bllt/esm-03/xcrssbllt	0.22	-178
brrl/xcrssbllt	0.218	-179



phase constant is .22

Setup #2



From setup #2, the measured voltages were used to find the upper temperature phase shift and the lower temperature phase shift. Below are the following initial measurements and the follow-up measurements: