The LBW CAL Switch chassis was pulled from the dome on Friday 4 April 2008 in order to investigate a complaint that newly-figured CAL values disagreed with earlier values by large amounts, in some cases by 3 dB or so. This discrepancy was frequency dependent, with the largest differences seen near the high end of the band.

Our concern was that one or more RF components in the chassis was acting up, most likely a switch or a flaky connection, and tests were performed to see if there was any evidence of abnormal behavior of the RF components in the box.

Unfortunately, in his enthusiasm, the investigator (me) did not think to make measurements prior to performing a round of going around and tightening all the RF connectors. But a fair number of the connectors were slightly looser than proper torque, and two or three were seriously loose.

The tests whose results are shown in the following pages were performed by connecting a 3-port VNA to the CAL chassis. VNA port one was connected in place of one or the other of the two noise sources, VNA port 2 was connected to the 'A' CAL out, and VNA port 3 was connected to the 'B' CAL out.

Calibrated VNA data was stored in CitiFile (.cti) format, under filenames which give indications of the CAL level (H or L), which noise source (A or B) was being "replaced" by the VNA signal, and which CAL mode (0, 1, 2, or 3) was selected (per the following table):

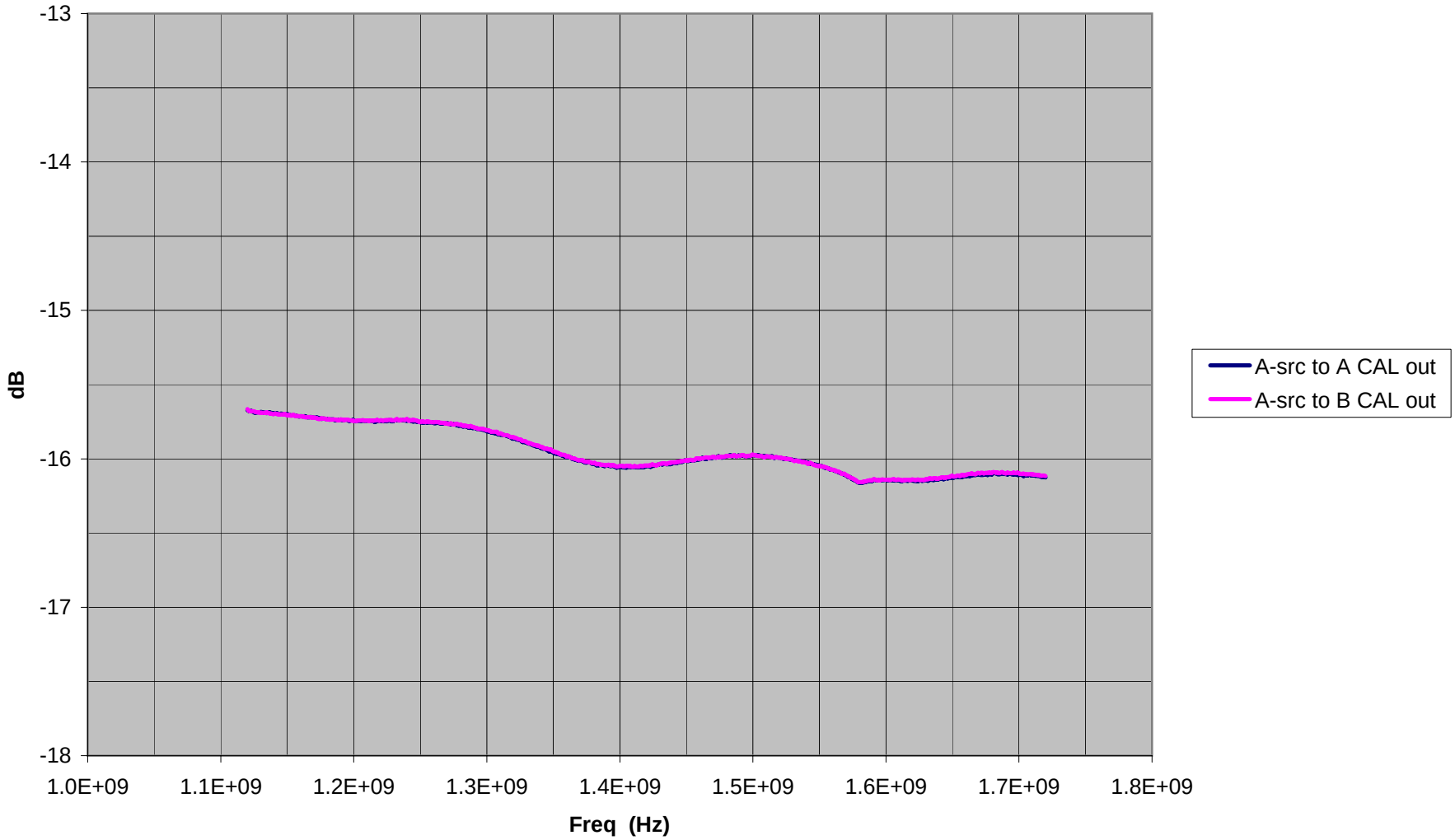
Cal mode	Description
0	CORR
1	XCAL
2	CAL
3	90 deg

For example, the file 'LA2.cti' contains data with the low CAL level selected and the VNA substituting for noise source 'A', in mode 2 (just plain 'CAL'). In this mode the A noise source feeds the CAL A output, and the B source feeds the CAL B output. So in this particular file the A output is active and the B output has nothing on it.

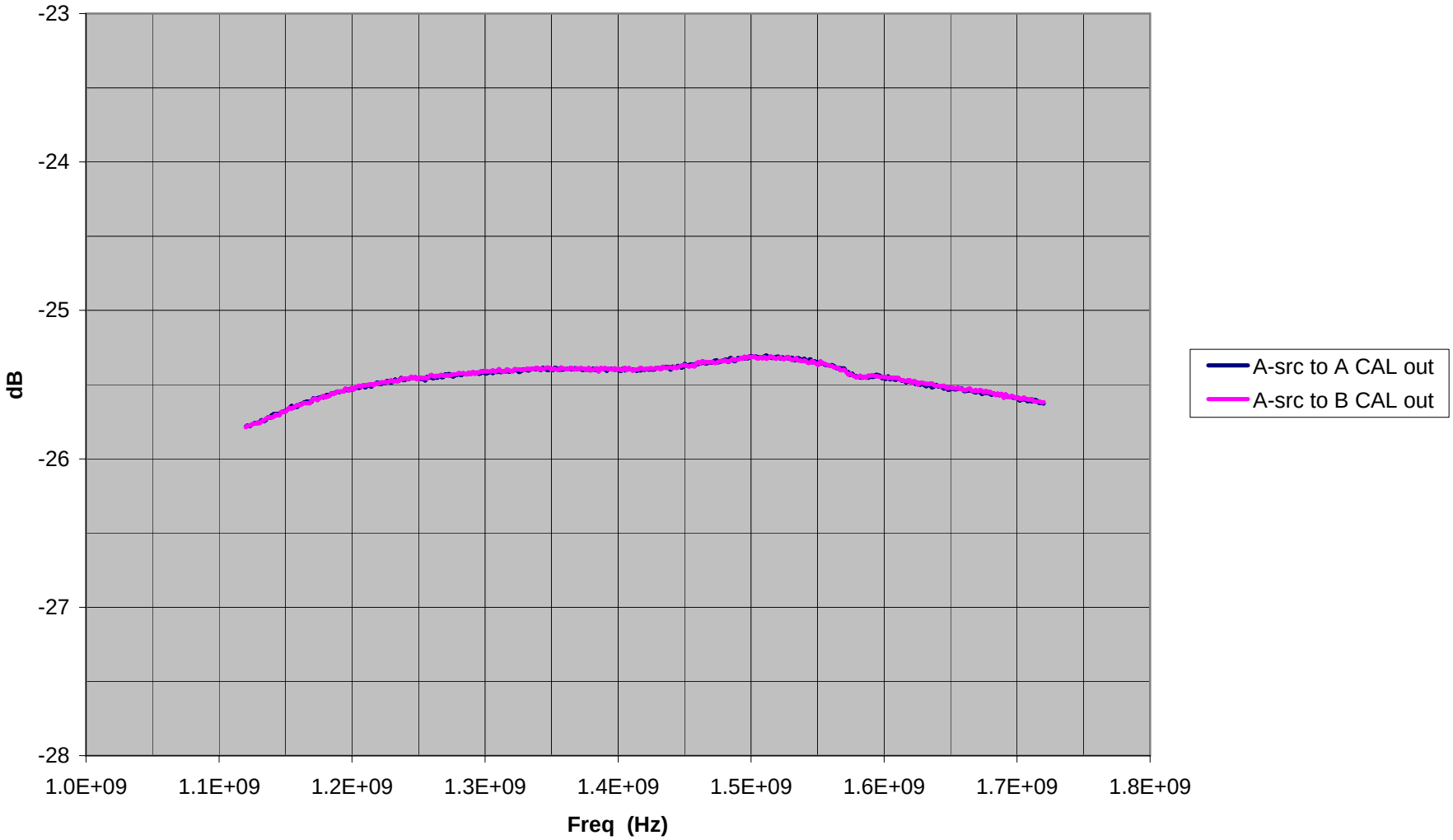
The data from the CitiFiles was copied into various spreadsheets and the relevant calculations and plots were done in the spreadsheets. Finally the plots were printed in PDF form and assembled into the document you are now reading.

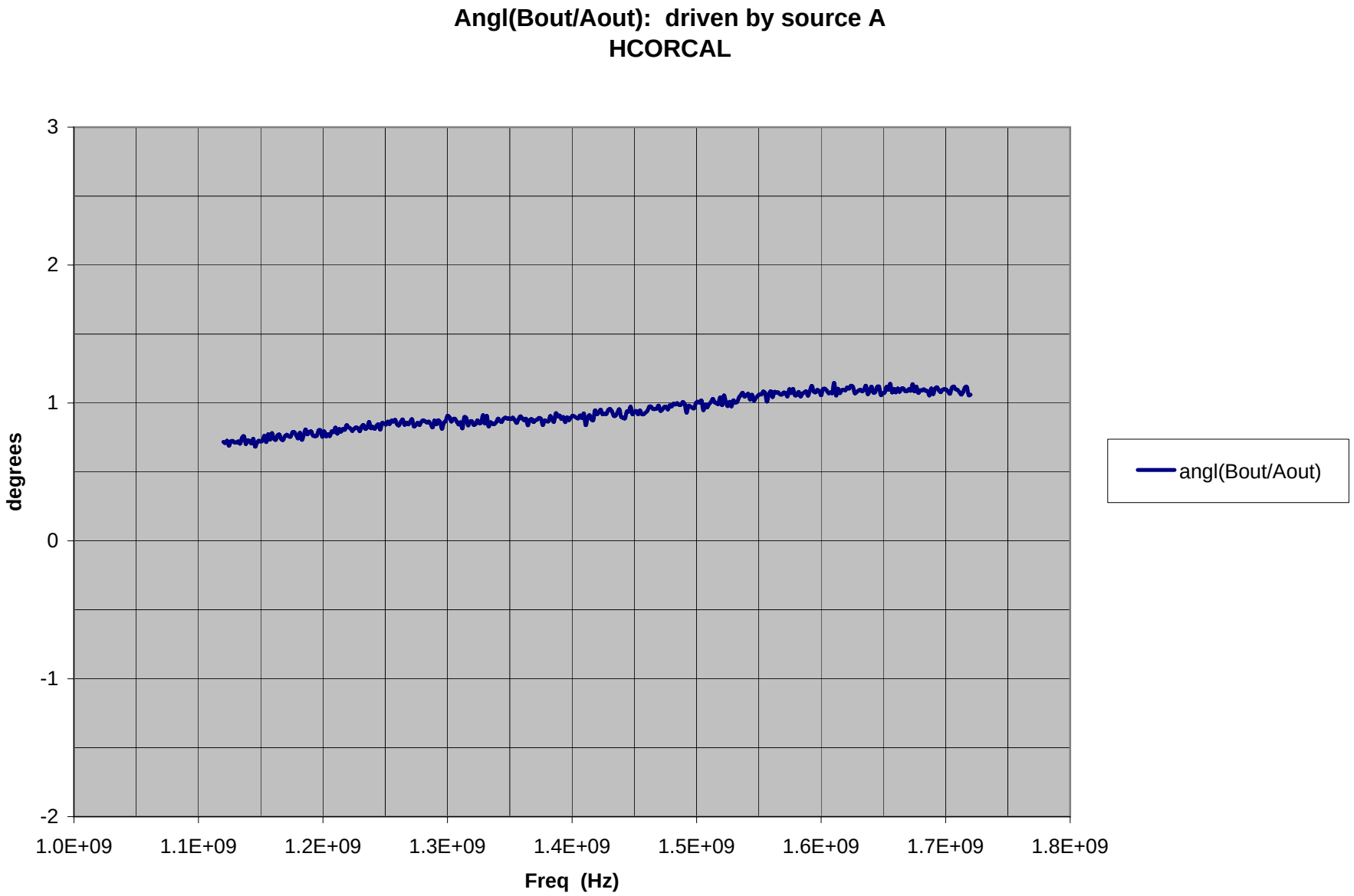
CONCLUSION:
It appears that nothing bad is going on beyond ordinary RF component tolerances.

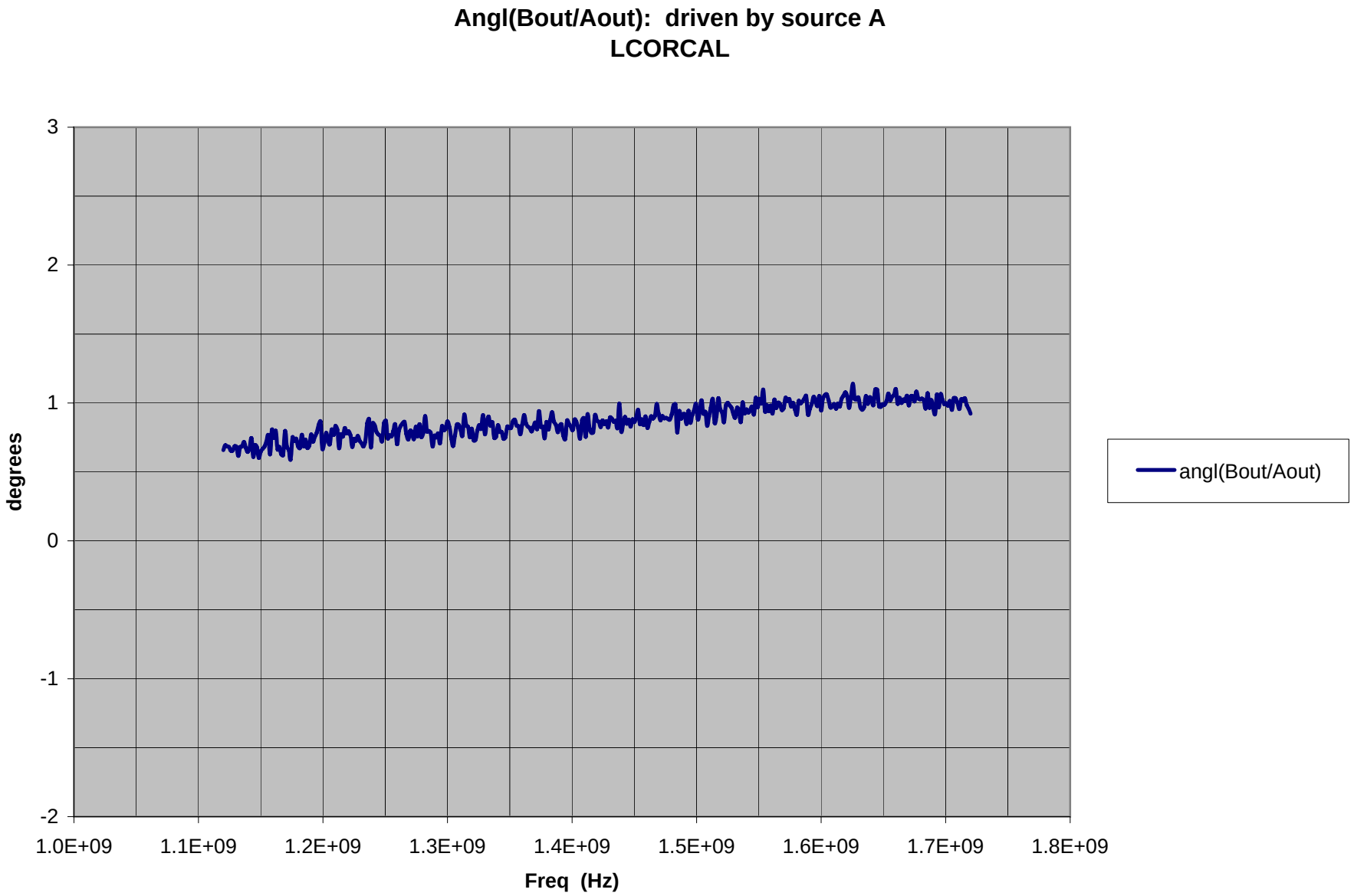
Transmission from Noise source A, to A & B CAL outputs
HCORCAL



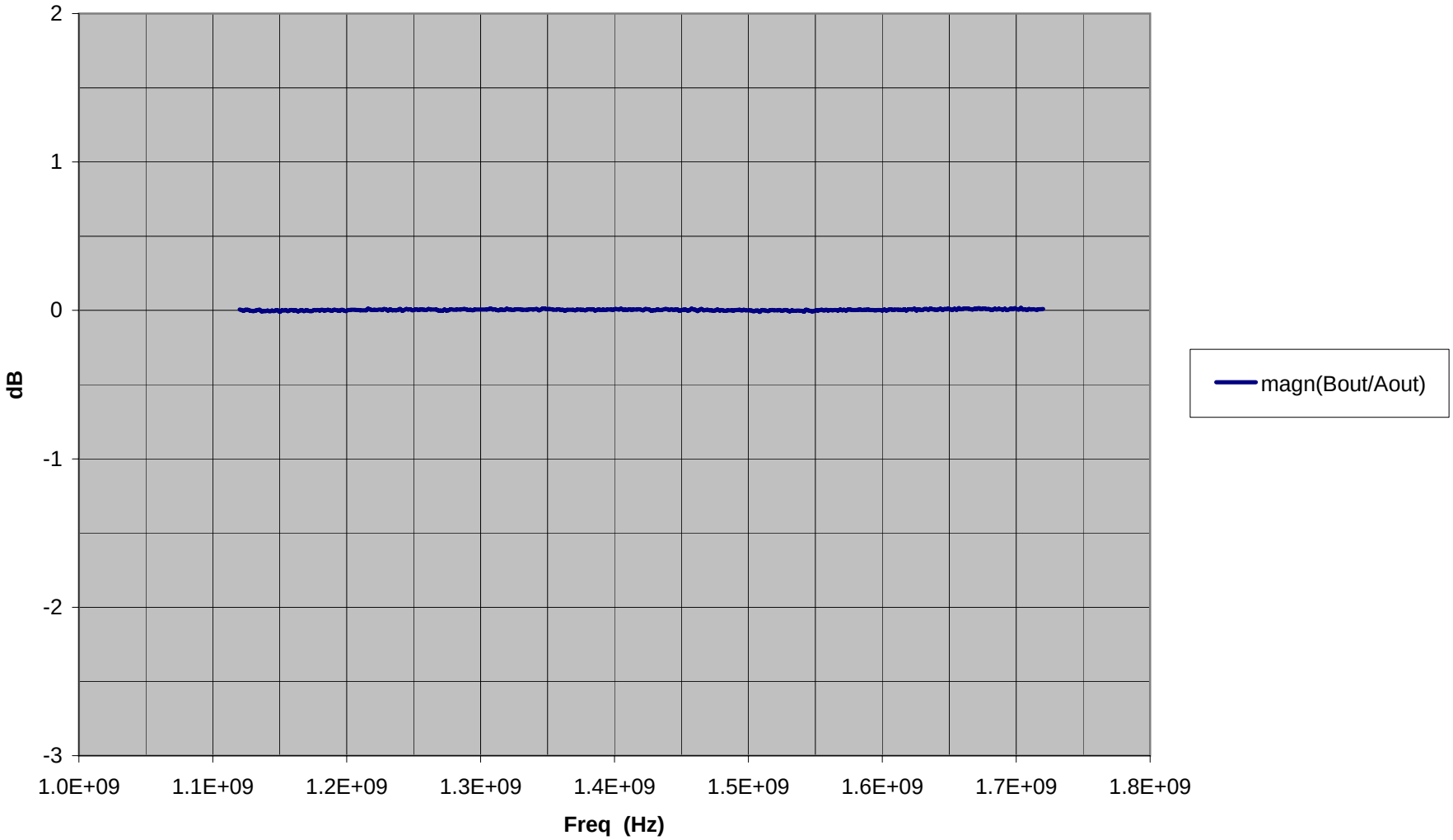
Transmission from Noise source A, to A & B CAL outputs
LCORCAL

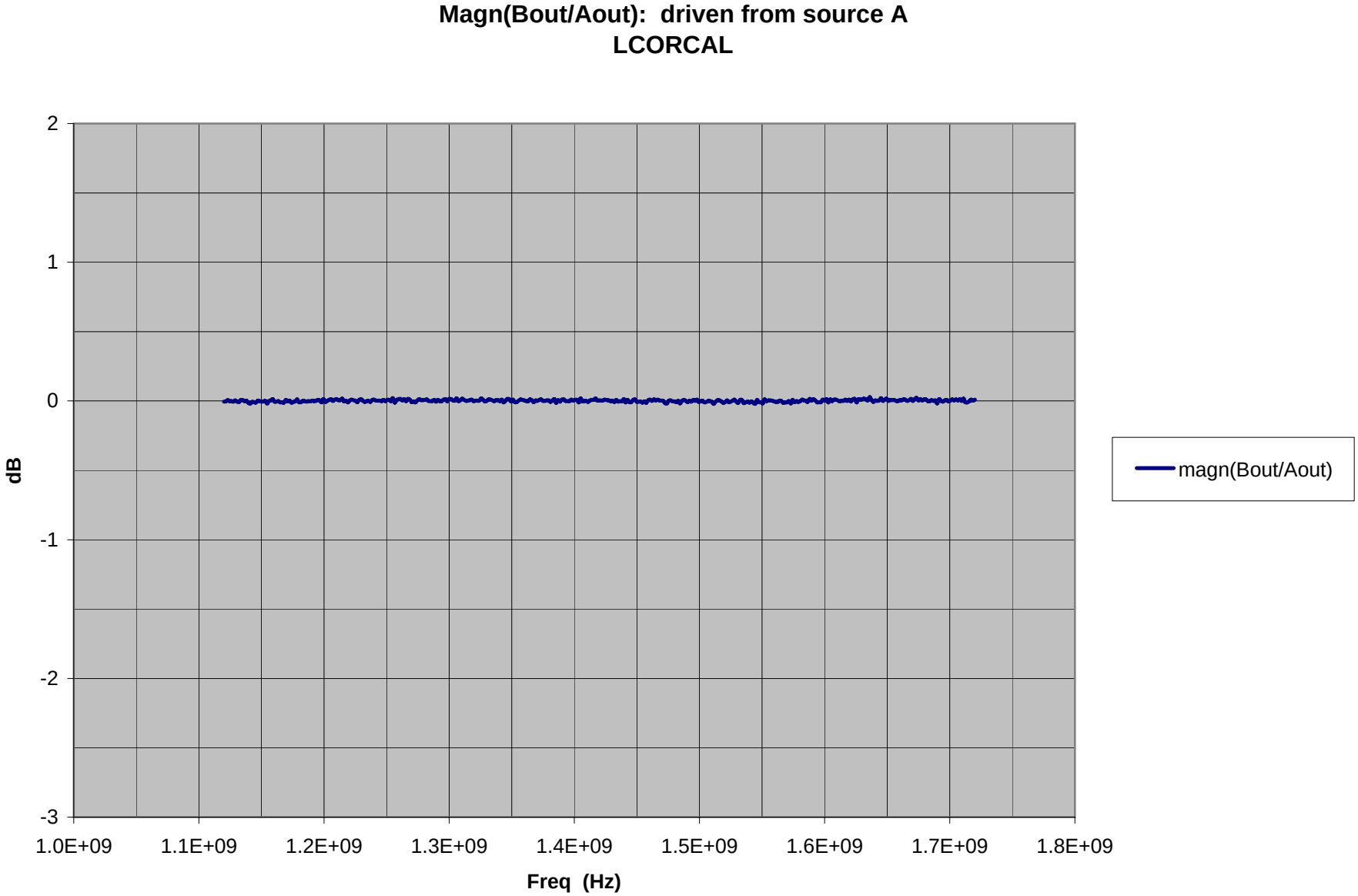



Angl(Bout/Aout): driven by source A
HCORCAL
3
2
1
0
-1
-2
degrees
1.0E+09
1.1E+09
1.2E+09
1.3E+09
1.4E+09
1.5E+09
1.6E+09
1.7E+09
1.8E+09
Freq (Hz)
angl(Bout/Aout)

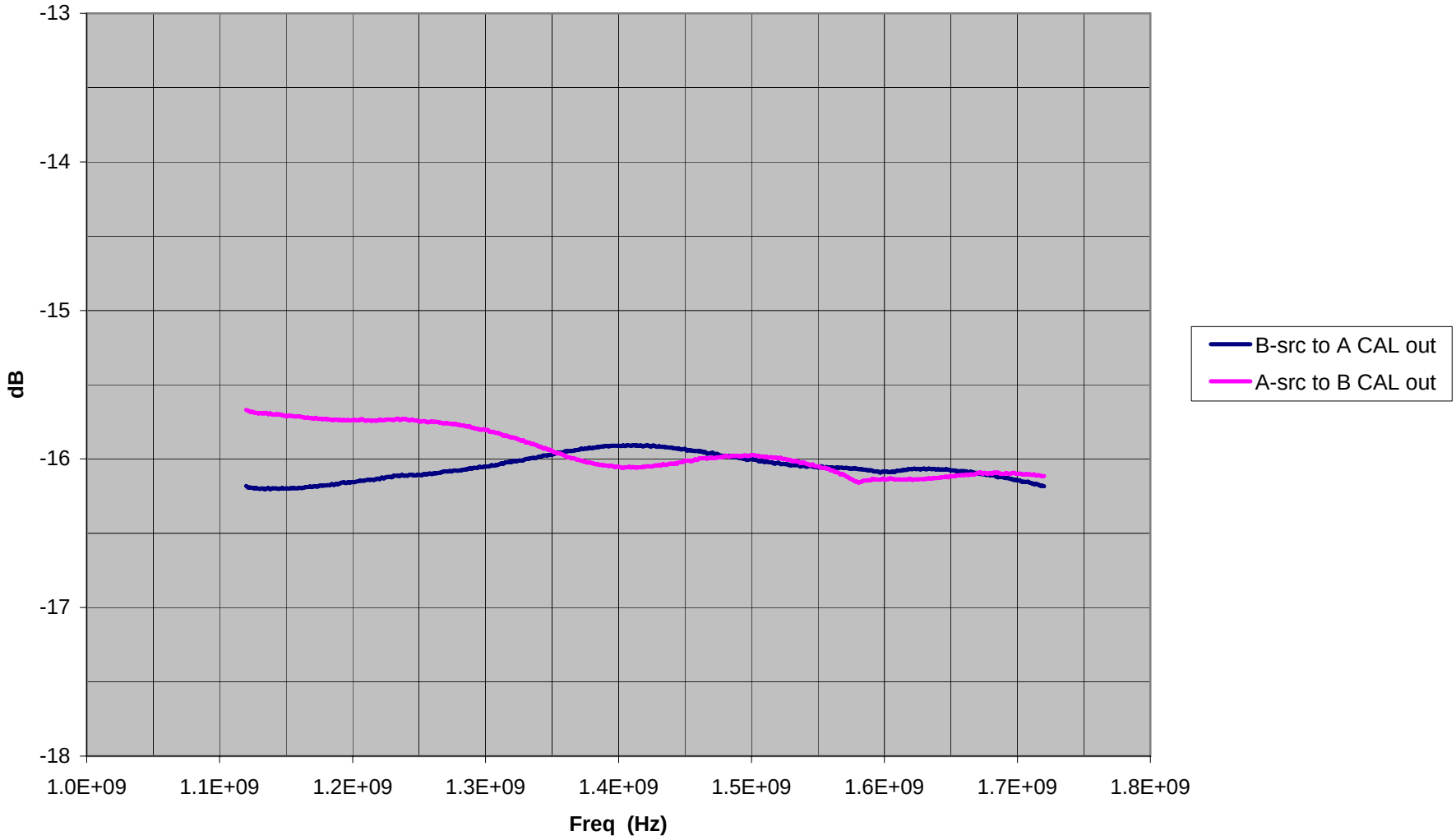

Angl(Bout/Aout): driven by source A
LCORCAL
3
2
1
0
-1
-2
degrees
1.0E+09
1.1E+09
1.2E+09
1.3E+09
1.4E+09
1.5E+09
1.6E+09
1.7E+09
1.8E+09
Freq (Hz)
angl(Bout/Aout)

Magn(Bout/Aout): driven from source A
HCORCAL

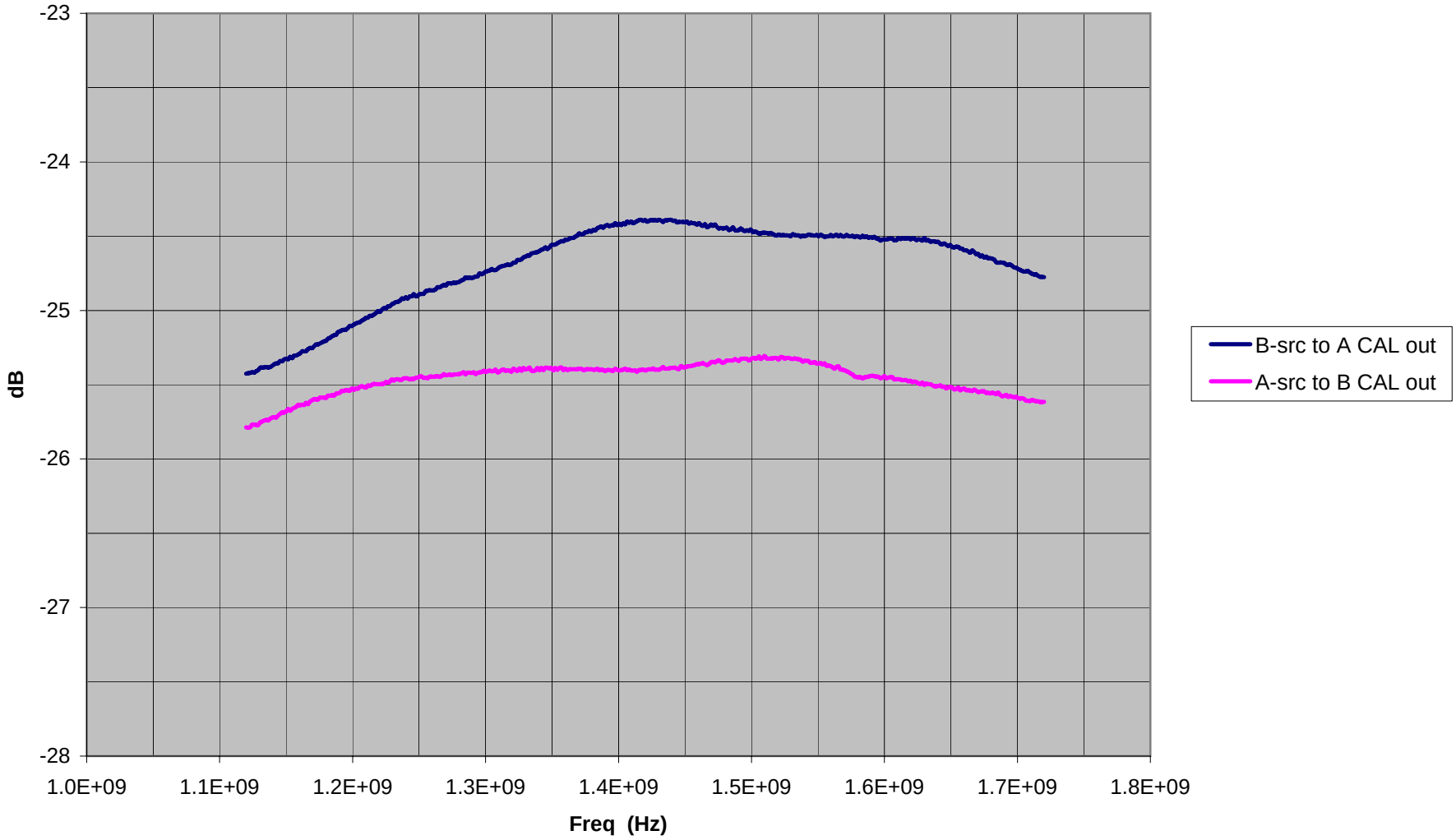



Magn(Bout/Aout): driven from source A
LCORCAL
2
1
0
-1
-2
-3
dB
1.0E+09
1.1E+09
1.2E+09
1.3E+09
1.4E+09
1.5E+09
1.6E+09
1.7E+09
1.8E+09
Freq (Hz)
magn(Bout/Aout)

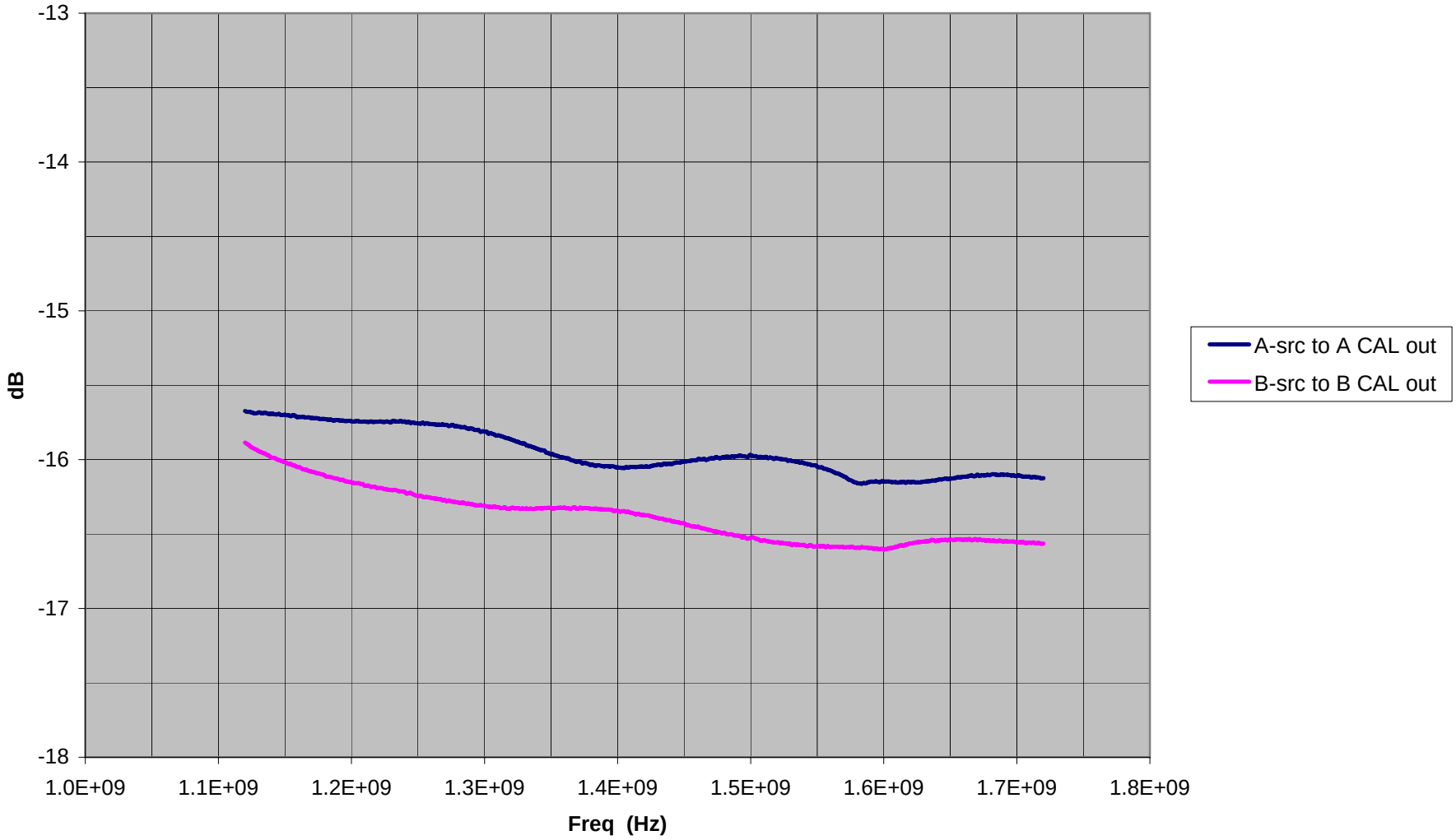
Transmission from B & A Noise sources, to A & B CAL outputs respectively
HXCAL



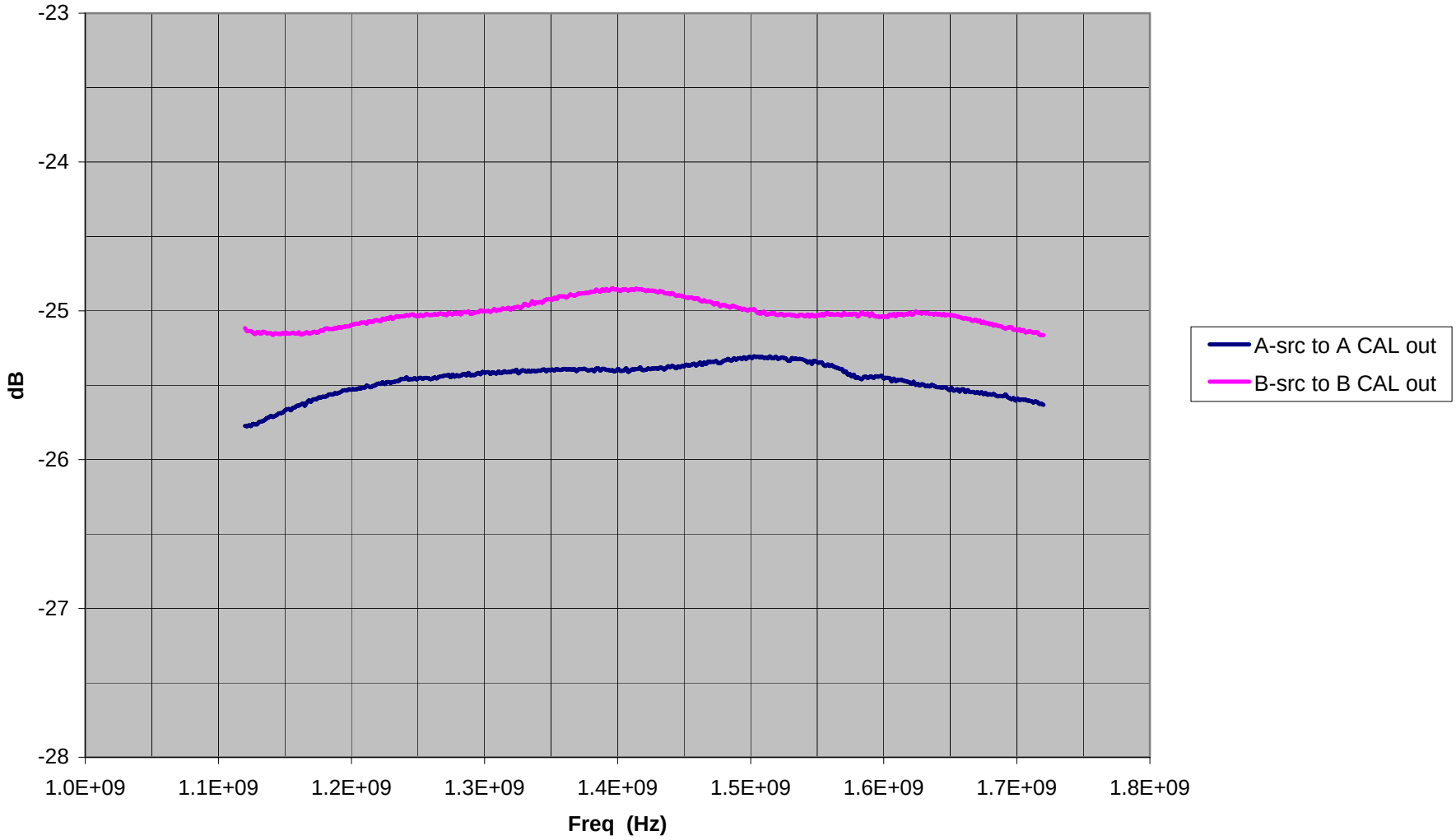
Transmission from B & A Noise sources, to A & B CAL outputs respectively
LXCAL

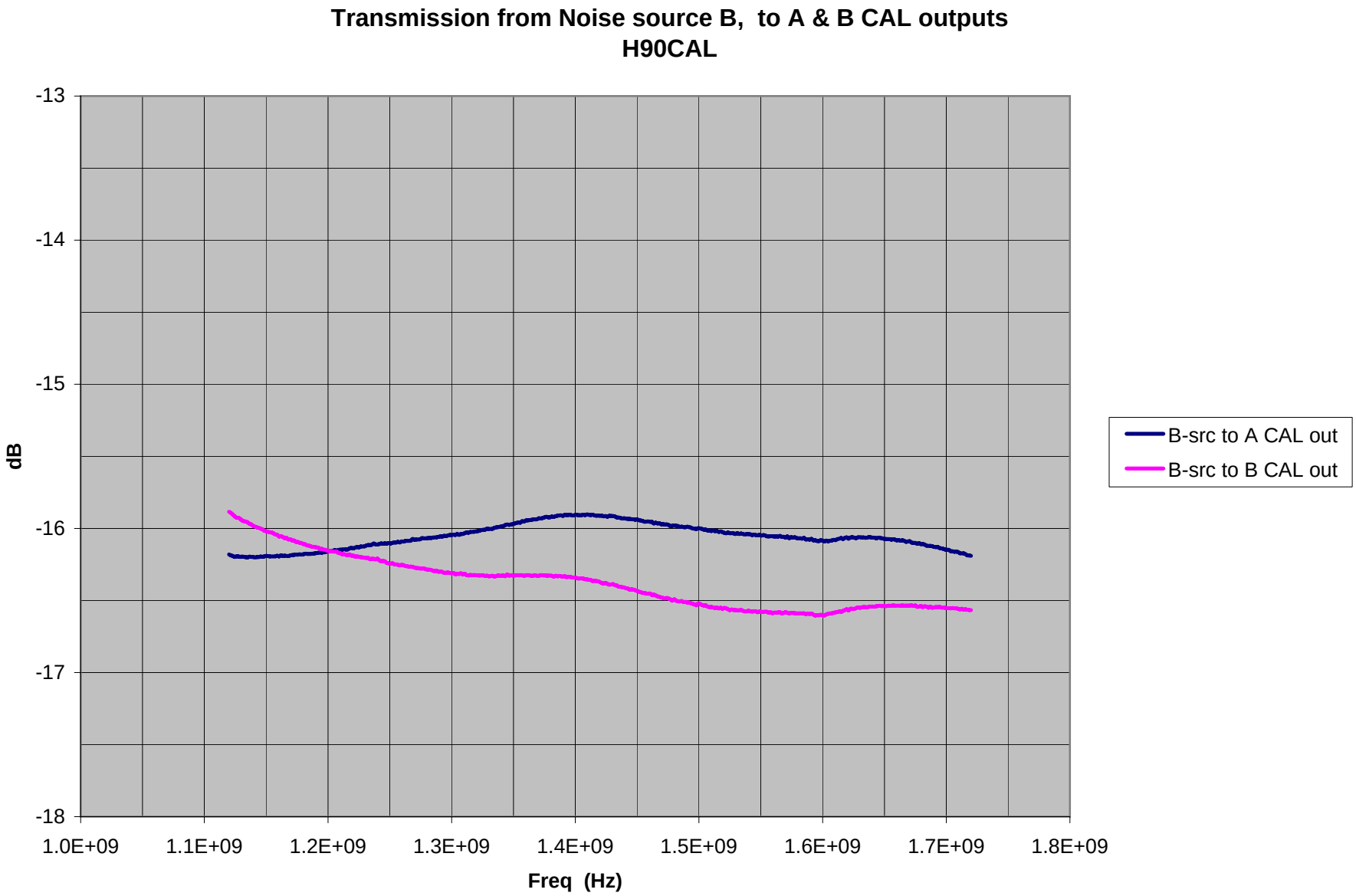


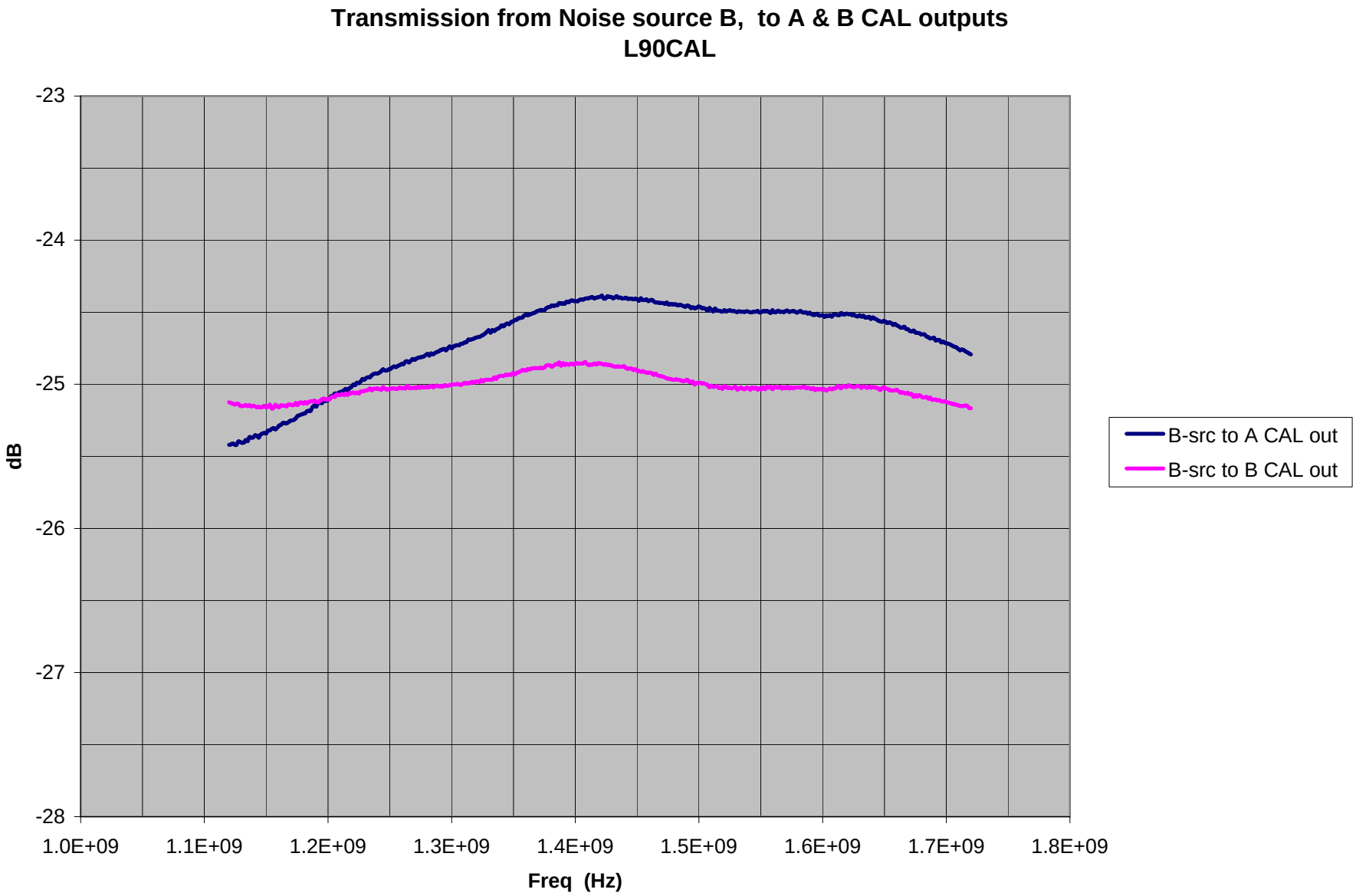
Transmission from A & B Noise sources, to A & B CAL outputs respectively
HCAL

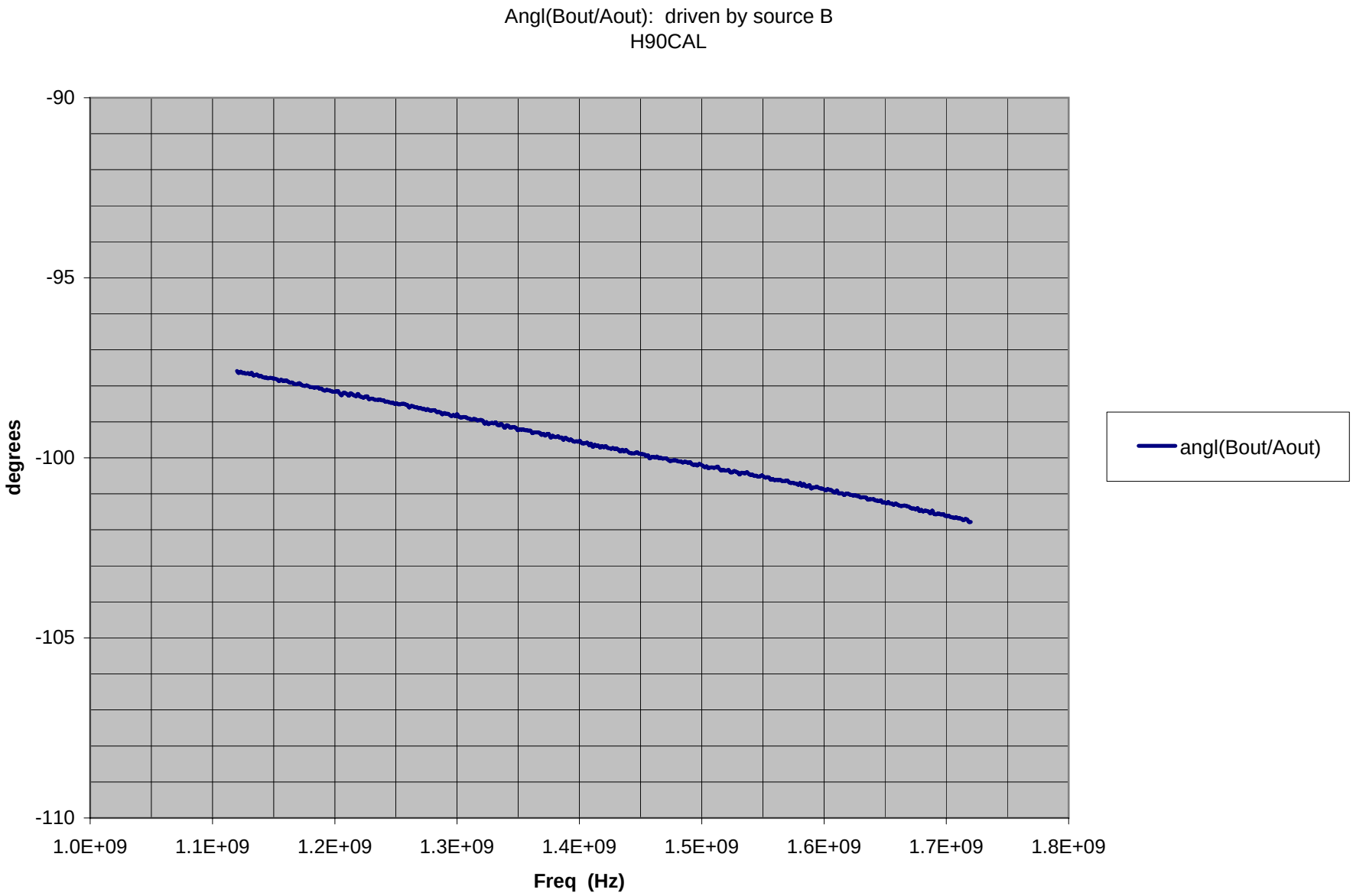


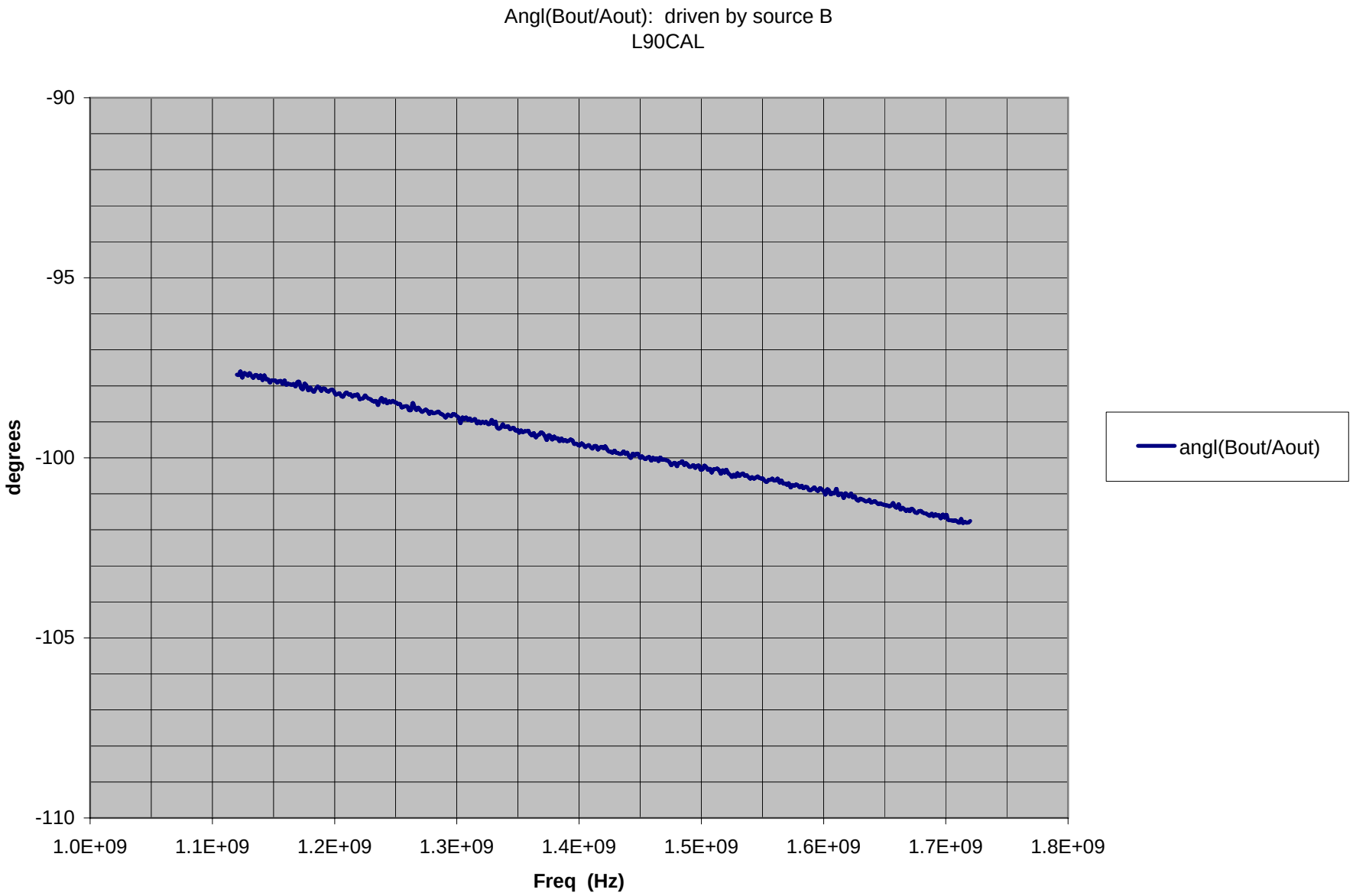
Transmission from A & B Noise sources, to A & B CAL outputs respectively
HCAL

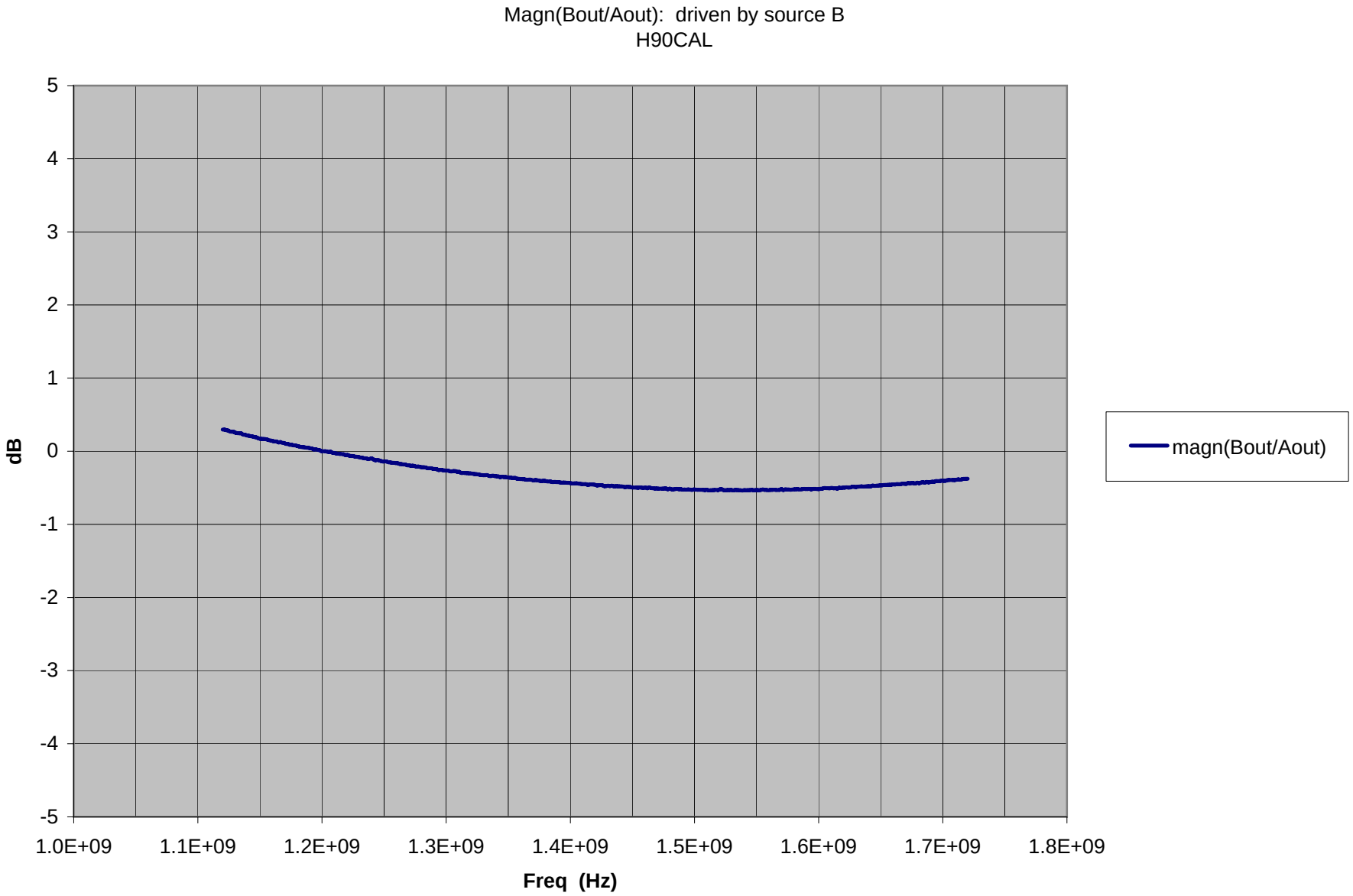


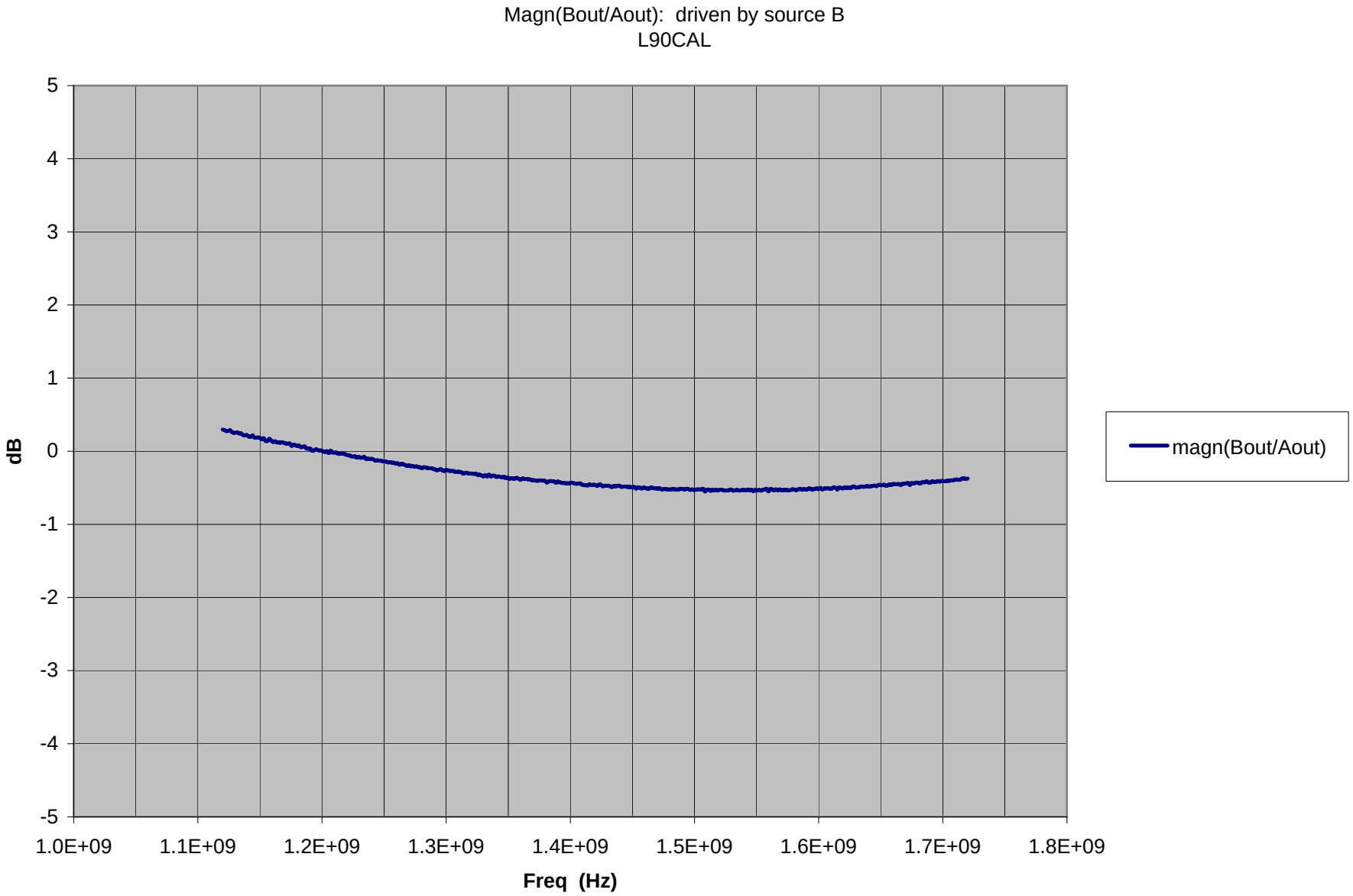

Transmission from Noise source B, to A & B CAL outputs
H90CAL
-13
-14
-15
-16
-17
-18
dB
1.0E+09
1.1E+09
1.2E+09
1.3E+09
1.4E+09
1.5E+09
1.6E+09
1.7E+09
1.8E+09
Freq (Hz)
B-src to A CAL out
B-src to B CAL out

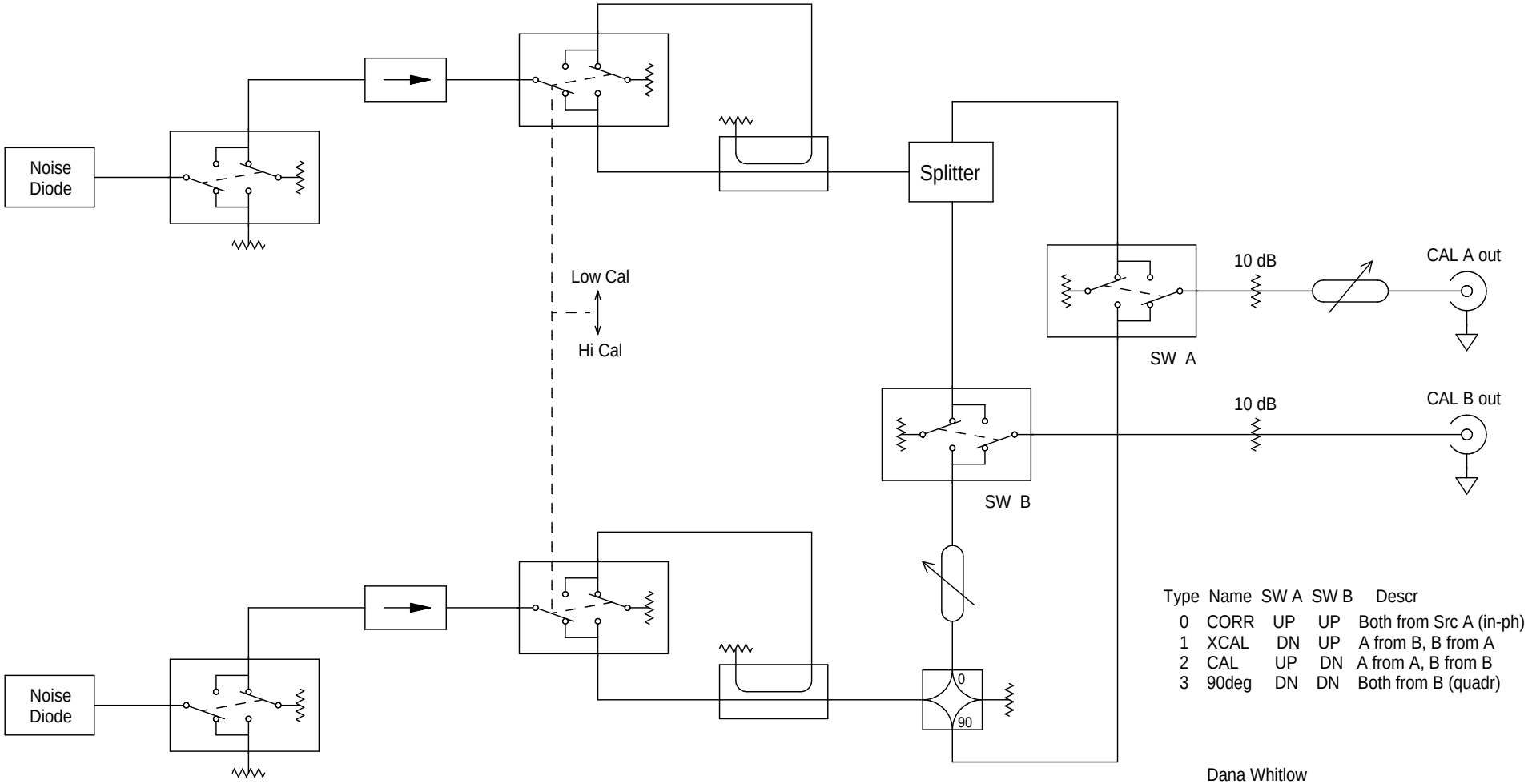

Transmission from Noise source B, to A & B CAL outputs
L90CAL
-23
-24
-25
-26
-27
-28
dB
1.0E+09
1.1E+09
1.2E+09
1.3E+09
1.4E+09
1.5E+09
1.6E+09
1.7E+09
1.8E+09
Freq (Hz)
B-src to A CAL out
B-src to B CAL out


Angl(Bout/Aout): driven by source B
H90CAL
-90
-95
-100
-105
-110
degrees
1.0E+09
1.1E+09
1.2E+09
1.3E+09
1.4E+09
1.5E+09
1.6E+09
1.7E+09
1.8E+09
Freq (Hz)
angl(Bout/Aout)


Angl(Bout/Aout): driven by source B
L90CAL
-90
-95
-100
-105
-110
degrees
1.0E+09
1.1E+09
1.2E+09
1.3E+09
1.4E+09
1.5E+09
1.6E+09
1.7E+09
1.8E+09
Freq (Hz)
angl(Bout/Aout)


Magn(Bout/Aout): driven by source B
H90CAL
5
4
3
2
1
0
-1
-2
-3
-4
-5
dB
1.0E+09
1.1E+09
1.2E+09
1.3E+09
1.4E+09
1.5E+09
1.6E+09
1.7E+09
1.8E+09
Freq (Hz)
magn(Bout/Aout)


Magn(Bout/Aout): driven by source B
L90CAL
5
4
3
2
1
0
-1
-2
-3
-4
-5
dB
1.0E+09
1.1E+09
1.2E+09
1.3E+09
1.4E+09
1.5E+09
1.6E+09
1.7E+09
1.8E+09
Freq (Hz)
magn(Bout/Aout)



Type	Name	SW A	SW B	Descr
0	CORR	UP	UP	Both from Src A (in-ph)
1	XCAL	DN	UP	A from B, B from A
2	CAL	UP	DN	A from A, B from B
3	90deg	DN	DN	Both from B (quadr)

Dana Whitlow
8 April 2008
LBW_CAL_blk.fc7

LBW CAL Switch Block Diagram