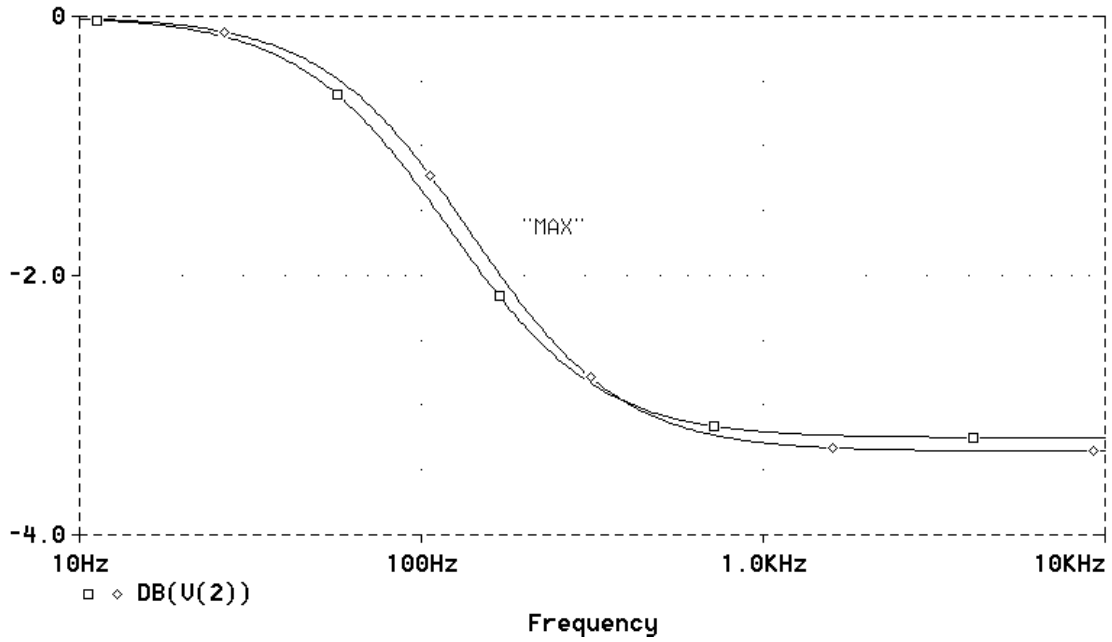
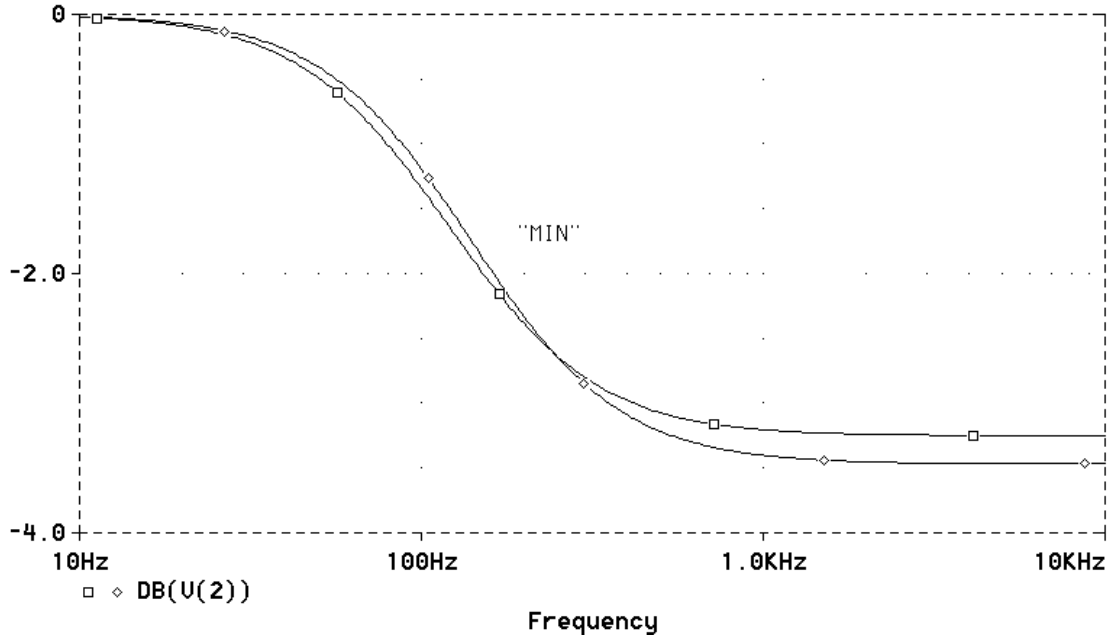
Spice Worst-Case Analysis of Magnet Driver Circuit.

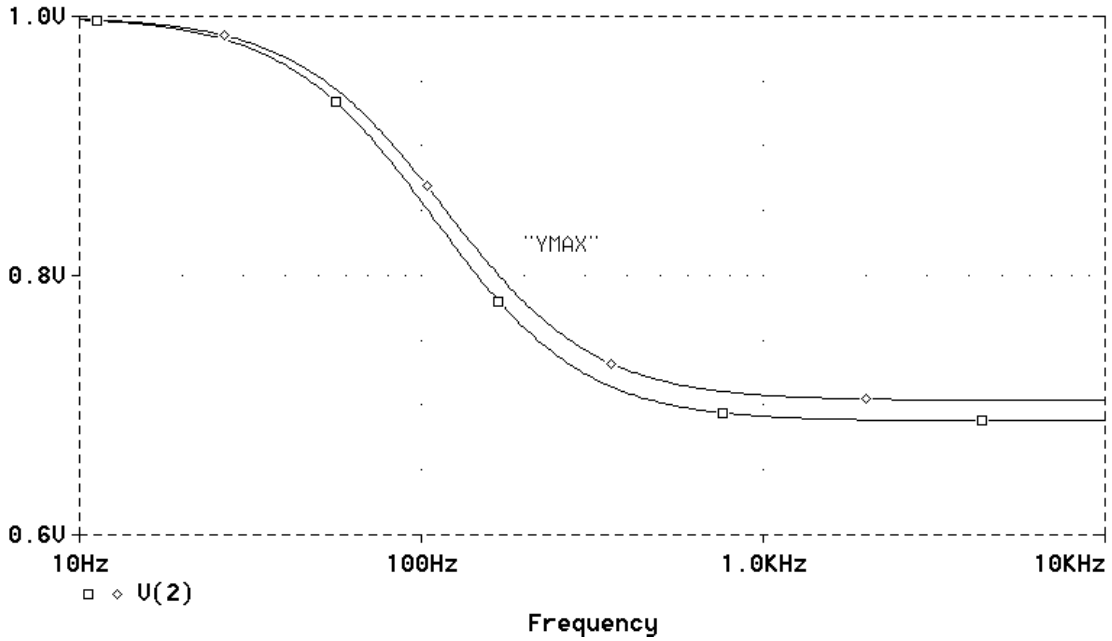


Spice Net List Creating Above Plots

```
Magnet Driver Drain-Gate Circuit
V1 0 1 AC 1
R1 1 2 RA 4.99K
R2 2 3 RA 1K
R3 4 0 RB 10K
C1 3 4 CA 0.1uF
C2 2 4 CB 400pF
.MODEL RA RES(R=1 DEV/UNIFORM=2%)
.MODEL RB RES(R=1 DEV/UNIFORM=6%)
.MODEL CA CAP(C=1 DEV/UNIFORM=10%)
.MODEL CB CAP(C=1 DEV/UNIFORM=50%)
.AC DEC 100 10 10000
.PROBE V(2)
.OPTIONS NOECHO NOMOD NOPAGE
.WCASE AC V(2) MAX VARY DEV
.END
```

The "MIN" and “YMAX” below refers to the Spice statement .WCASE AC V(2) MIN VARY DEV, the listing of which is the same as that given above except for this change.





Note the vast difference between these Spice plots and the MATLAB EVA/RSS plots shown in magdrvreva.doc. Intuitively one would expect tolerance bands on both sides of the nominal, which is what is shown on the MATLAB plots. The MIN plot above implies that at about 200Hz the tolerance band is zero! Hence something is definitely amiss here.

This example is not an isolated case. The Berkeley Spice 2G code, upon which this commercial circuit analysis software is based, has algorithmic errors that repeat with each AC ".WCASE" analysis.

Normalized ac sensitivities are continuous functions of frequency. Not only the sensitivity magnitude but quite often the polarity will change with frequency. (Note the polarity change in the plot of R3 sensitivity in the MATLAB plots.) Hence the sensitivity sets at each frequency will produce different numbers for Extreme Value Analysis (EVA) and Root Sum Square (RSS) analysis.

Commentary: Spice has been in commercial use since the early 1980's. One wonders how many so-called Spice "worst-case ac" analyses have been accepted by the Defense Department and NASA as gospel for systems now in use in military and space programs!