Thoughts on Comment 128 (linear fit to ICR curve)

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John D’Ambrosia (dambrosia_02_0905) suggested these equations for fitting ICR:

$$favg = \frac{1}{N}\sum_n f_n$$

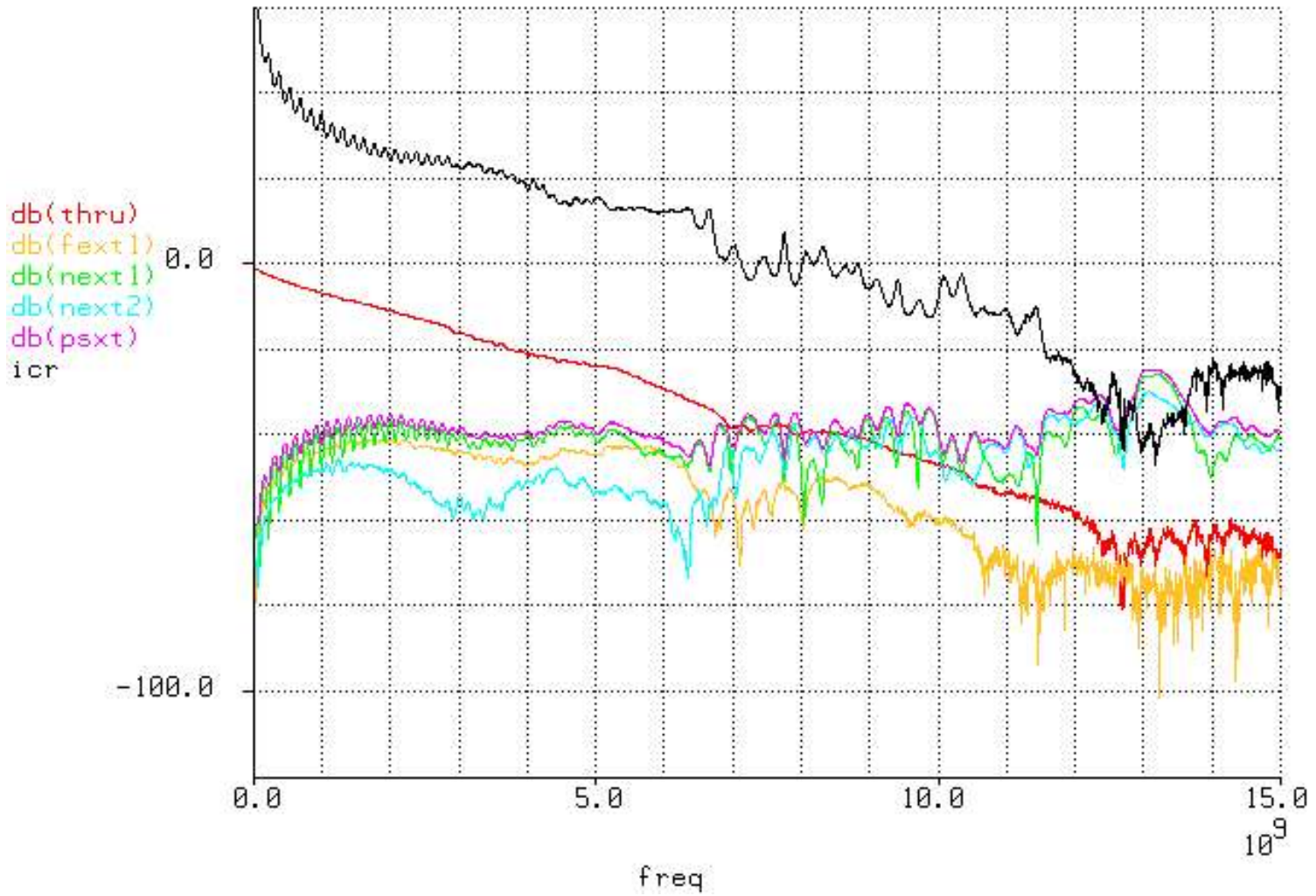
$$ICRavg = \frac{1}{N}\sum_n ICR(f_n)$$

$$m = \frac{\sum_n (f_n - favg)(ICR(f_n) - ICRavg)}{\sum_n (f_n - favg)^2}$$

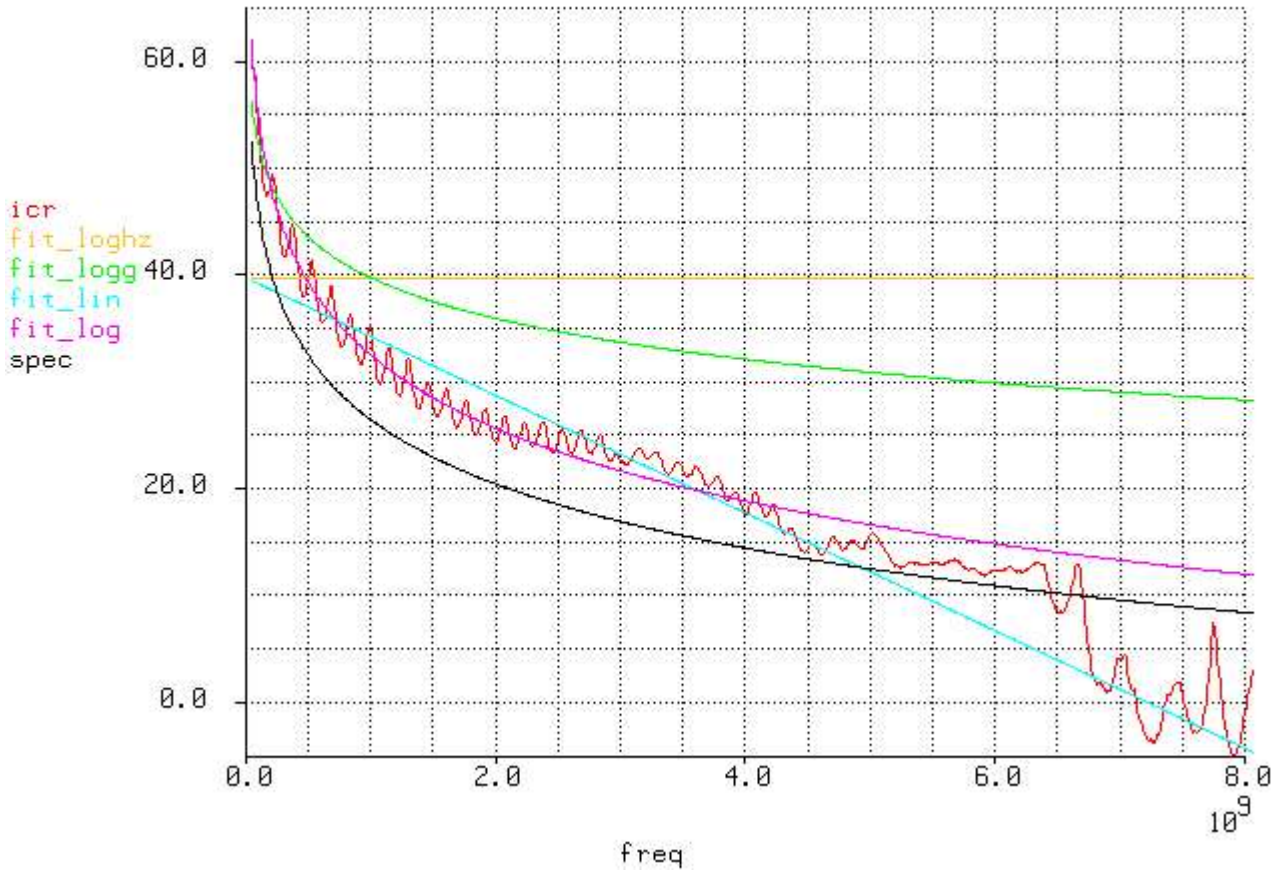
$$b = ICRavg - m\,favg$$

$$ICRLOG(f) = m \ln f - b$$

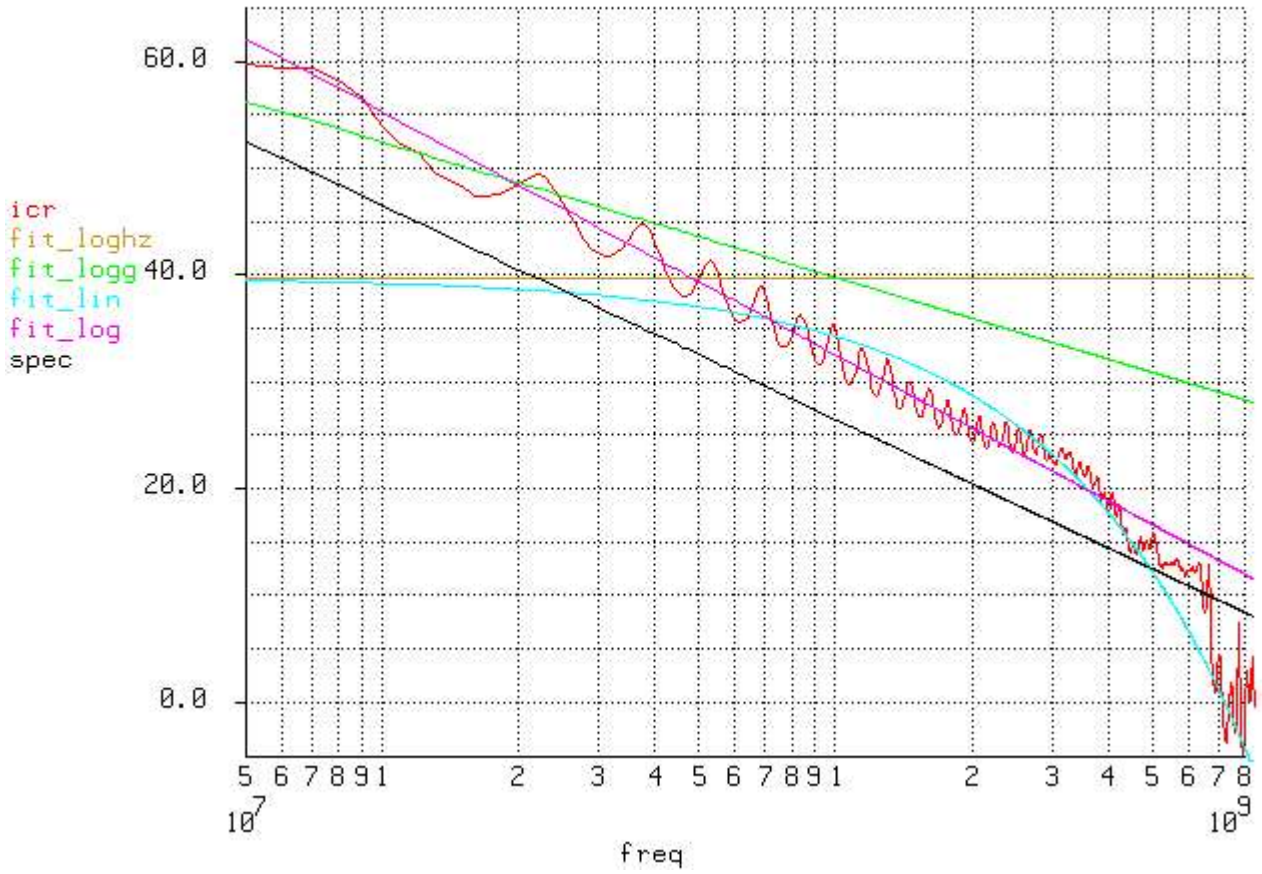
To test these equations I used the following curves from D’Ambrosia Case2 channel model.


db(thru)
db(fext1)
db(next1)
db(next2)
db(psxt)
icr
0.0
-100.0
0.0
5.0
10.0
15.0
10^9
freq

I tried 4 ways of fitting the ICR curve:
In linear frequency:



Or in log frequency:



On these plots:
The Red curve is ICR
The Brownish curve is a literal following of the D'Ambrosia equations.
The Green Curve is the D'Ambrosia equations assuming frequency is in GHz rather than Hz
The Light Blue curve is a linear frequency fit
The Magenta curve is a log fit using equations given below
The Black curve is the ICR spec.

All fits were done over the frequency range 100MHz-5GHz

I think that the magenta curve is the best fit and recommend that we use it.

Equations for performing log fit:

$$\log favg = \frac{1}{N}\sum_{n} \log(f_n)$$

$$ICRavg = \frac{1}{N}\sum_{n} ICR(f_n)$$

$$m = \frac{\sum_{n} (\log(f_n) - \log favg)(ICR(f_n) - ICRavg)}{\sum_{n} (\log(f_n) - \log favg)^2}$$

$$b = ICRavg - m \cdot \log favg$$

$$ICRLOG(f) = m \cdot \log(f) - b$$

I recommend that we propose acceptance of comment 128 in principal with recommended verbiage:I

The ICR_{LOG} is defined to be the least mean square fit of the ICR with frequency plotted on a log scale, and is defined by Equations (69-20) through (69-24). The sums in these equations are to be performed over the range of values such that f_n is in the range of frequencies for which IRC is specified.

$$\log favg = \frac{1}{N}\sum_n \log(f_n) \qquad \text{Equation 69-20}$$

$$ICRavg = \frac{1}{N}\sum_n ICR(f_n) \qquad \text{Equation 69-21}$$

$$m = \frac{\sum_n (\log(f_n) - \log favg)(ICR(f_n) - ICRavg)}{\sum_n (\log(f_n) - \log favg)^2} \qquad \text{Equation 69-22}$$

$$b = ICRavg - m \cdot \log favg \qquad \text{Equation 69-23}$$

$$ICRLOG(f) = m \cdot \log(f) - b \qquad \text{Equation 69-24}$$

The ICRLOG(*f*) at the receiver is recommended to be at least:

$$ICRLOG(f) > 12.5 - 20 \cdot \log\left(\frac{f}{5\,GHz}\right) \qquad \text{Equation 69-25}$$