



***Bias Current Capability
versus Differential
Performance in a LAN
Transformer***

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IEEE 802.3 July Plenary, 7/18/05



What is bias current

- Remainder when the arithmetic sum of all DC currents flowing in the transformer windings do not equal zero.
- In transformers, expressed in Oersteds, represents the peak magnetizing force, and has the following relationship.

$$H = \frac{0.4\pi N I_p}{l_e}$$

where N = number of turns

I_p = peak bias current in amps

l_e = mean magnetic path length in cm

- Peak magnetizing force for core materials used in LAN applications should be less than .4 Oe maximum.





Methods to reduce drive level

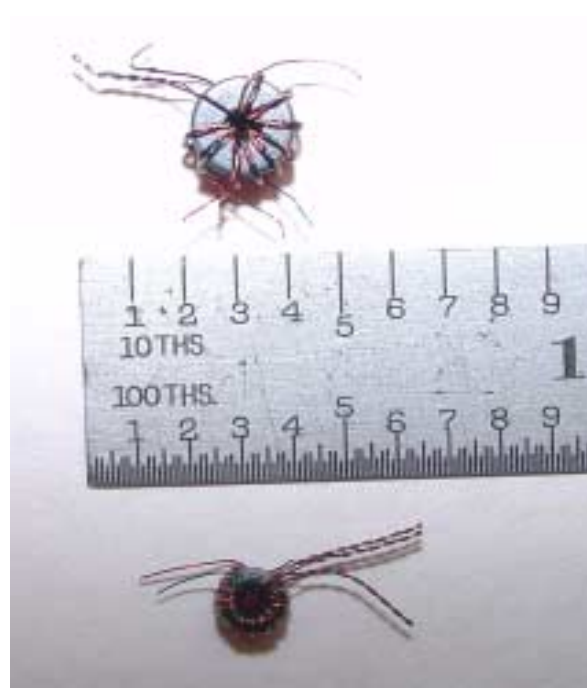
- Decrease number of turns
 - Inductance is the square of the turns
- Decrease current
 - Set by resistance imbalance in cabling
- Increase mean magnetic path length



Transformer capable of supporting 22mA bias current

“HiBias”

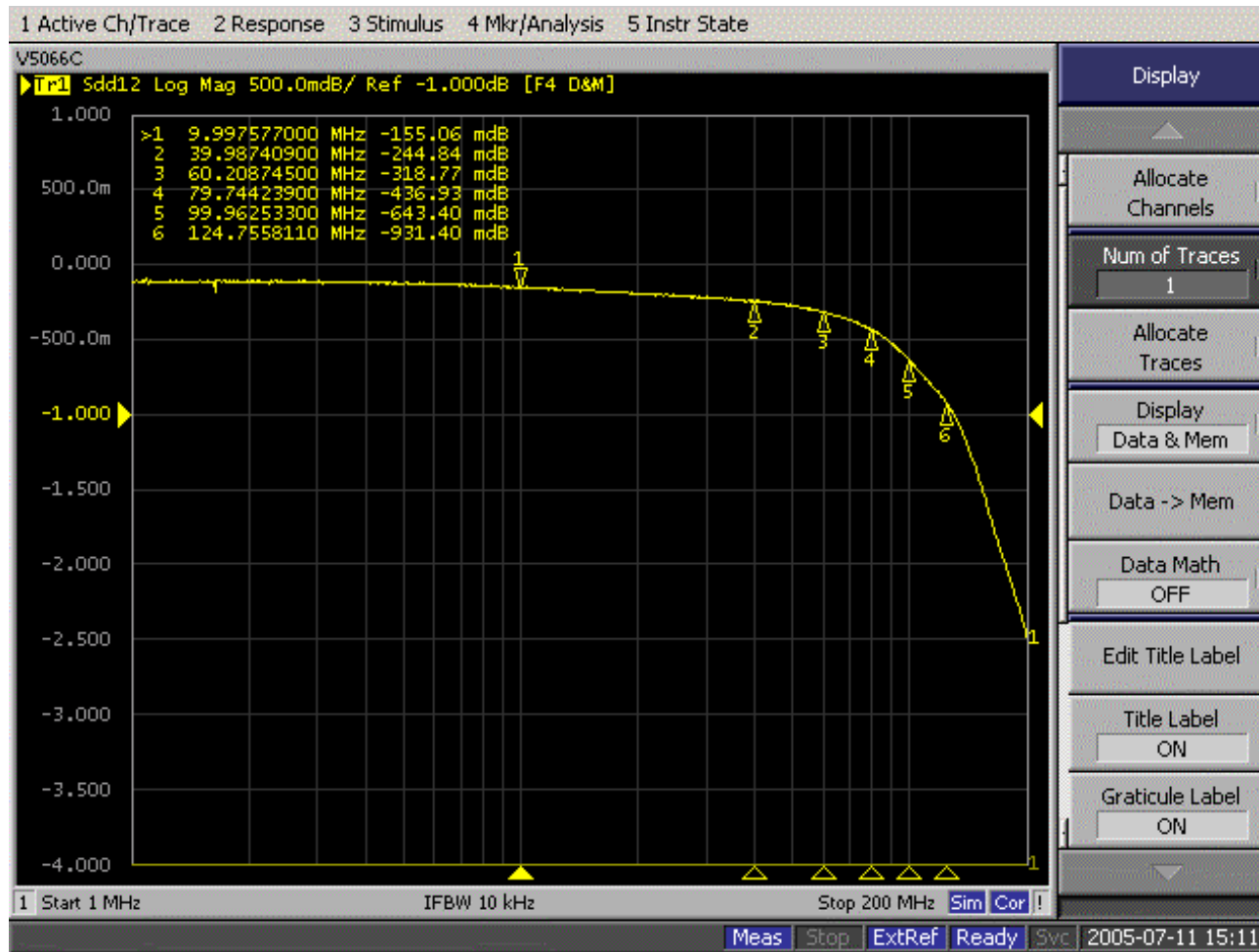
5.5mm Dia X 3.3mmHt = 77.2mm³



Standard

3.9mm Dia X 3.0mm Ht = 35.8mm³

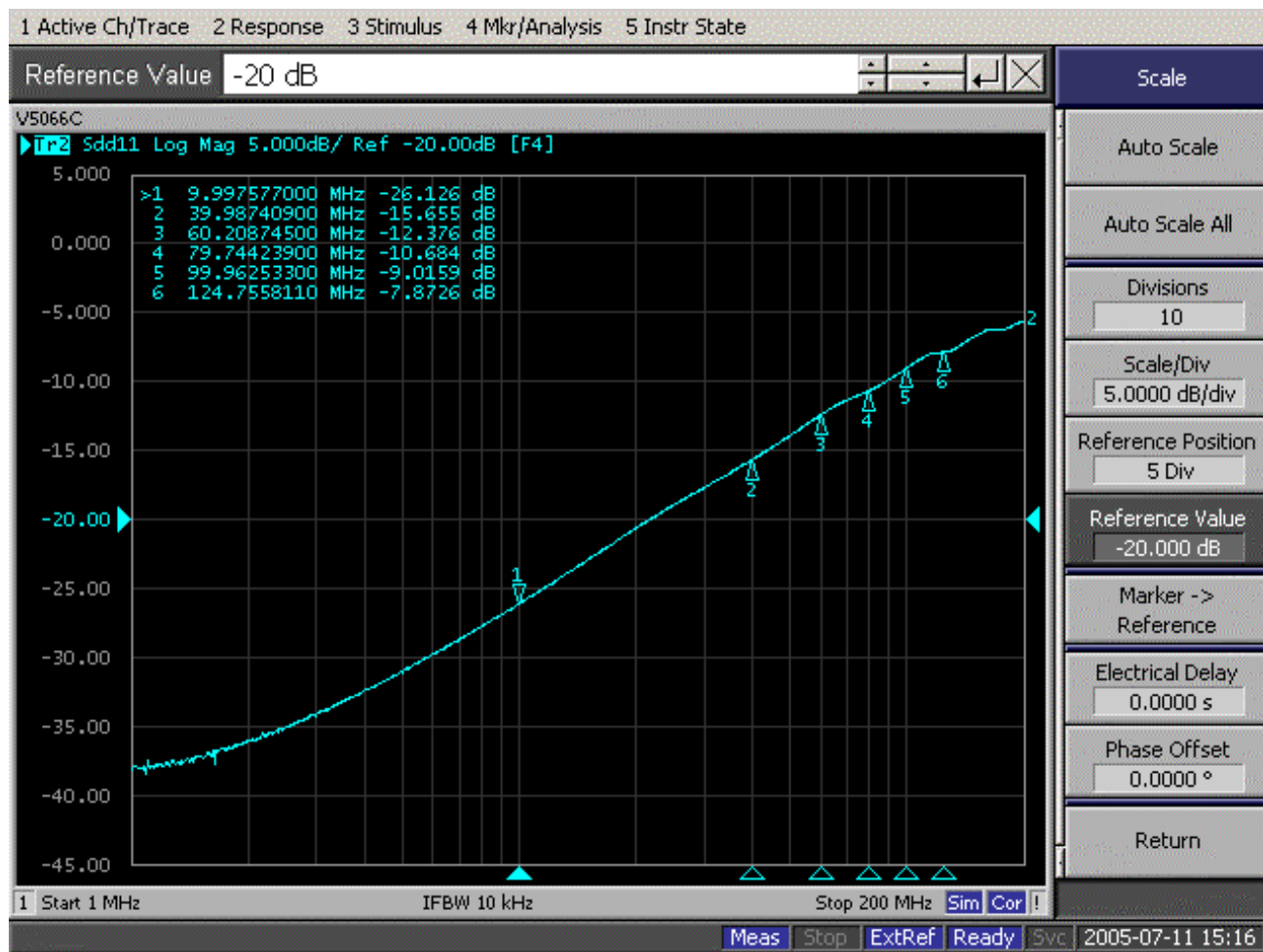
Insertion Loss



Phase Response



Return Loss



Note: Fails limit at 40 MHz by .35dB



Summary

- Transformer size must increase to support additional bias current.
- Increasing transformer size, increases leakage current.
- Increased leakage current adversely affects transformer performance.
 - Reduced bandwidth
 - Marginal return loss
- Set permitted current imbalance to 12 mA maximum.

