

**Problems  
using  
VNA HP 8753 E  
for  
S-Parameter-Measurements**

by  
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presented at the  
Arbeitskreis Bipolar 2001  
Frankfurt (Oder)  
25.10.2001

# 1 High Leakage Current at HP8753E DC-Ports

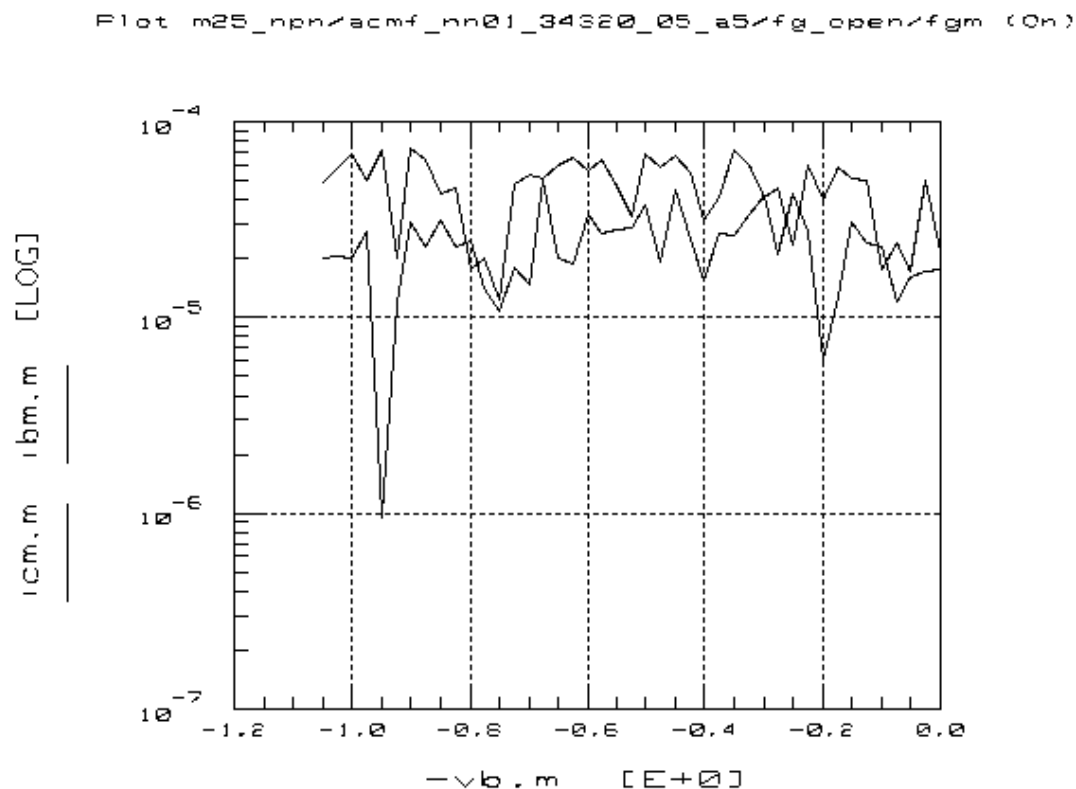
## 1.1 Problem

At the Dc-ports the VNA HP8753E an illegal high leakage current in the order of 10 to 100  $\mu\text{A}$  was observed. This value was measured under the following conditions:

- Software: HP-ICCAP 5.30 530.800 Jun 9 2000
- DC-measurement device: HP4142
- AC ports 1 and port 2: open, no DUT connected

Obviously the current is created by oscillations (sign changes). Because of this high leakage current at the DC inputs an measurement of the collector current of a bjt during the s-parameter measurement is impossible.

Note: using the older VNA versions HP8753C and D and the appropriate testsets the leakage current was constant  $1\mu\text{A}$  at 1V, created by the 1MEG shunt resistor in the testset. At the DC inputs of the HP8753E however it is not possible to measure a constant value.



**Fig 1: Leakage current at the DC-ports of the HP8753E**

## **1.2 Reason**

The reason for the leakage current seems to be a ground loop problem between hp4142 and HP8753E.

Note, that this problem did not appear using the older versions C and D of the VNA HP8753.

Obviously the ground design for the new HP8753E is changed against the older versions, because now test set and VNA are in a common case. The ground of the DC-BNC-inputs and the ground of the housing are now identical.

## **1.3 Work Around**

- Open the bridge between circuit common and ground at the front side of the HP4142.
- Use only 1A units in the HP4142, because the 0.1 A units are much more sensitive against oscillations
- Use a medium integration time for the HP4142 1A units (to be defined in the ICCAP instrument option table)

All this results in an reduced value of the oscillation current lower than 1  $\mu$ A measured by the HP4142. Note: additional connections between HP4142 ground and HP8753E ground or HP4142 circuit common an HP8753E ground gives no further improvement.

# **2 Pitfall: DUT Overdrive using VNA HP8753E**

## **2.1 Problem**

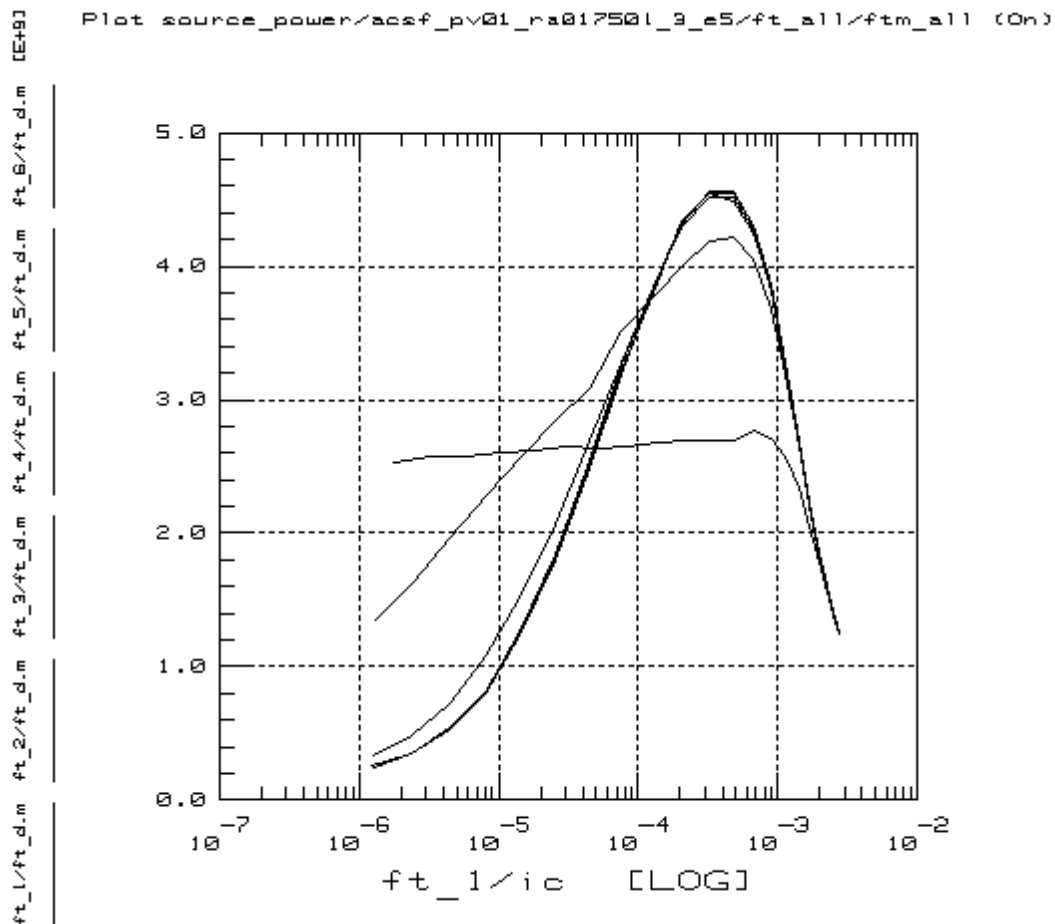
During S-Parameter-Measurements the right source power choice is important to avoid an overdrive of the DUT. The new VNA HP8753 E includes the test set in one device, contrary to the older versions HP8753 A,B,C,D , where the test set was an separate device. Moreover, the instrument option table in ICCAP does not contain no longer the input fields for the separate testfield

- attenuation1 and
- attenuation 2

with it's defaults 20dB. On the other hand, the default for the source power was left on the value of -10dBm. The result is a measurement of the device using -10 dBm instead of -30 dBm at the input (overdrive), if you use the ICCAP default values.

## 2.2 Solution

Change in each case the source power default value in the instrument option table in ICCAP from  $-10\text{dBm}$  to  $-30\text{ dBm}$  to avoid overdrive.



**Fig 2: Effect of source power on  $f_T$ -characteristics, source power at port1=- 0, -10, -20, -30, -40, -50dBm, and for all curves source power at port2=- 30 dBm**

## 3 References

- [1] Berkner, J.: " Richtige Source Power bei Transistor-S-Paramettermessungen ", Infineon Technologies AG, HF SI CDB, Laborbericht LB164 vom 30.6.2000
- [2] Berkner, J.: „Leakage Current Problem using HP8753E and HP4142"., Infineon Technologies AG, HF SI CDB, Laborbericht LB174, vom 5.1.2001