

DARE FRONT END UNIT (BALUN)
MEASUREMENTS AT ASU

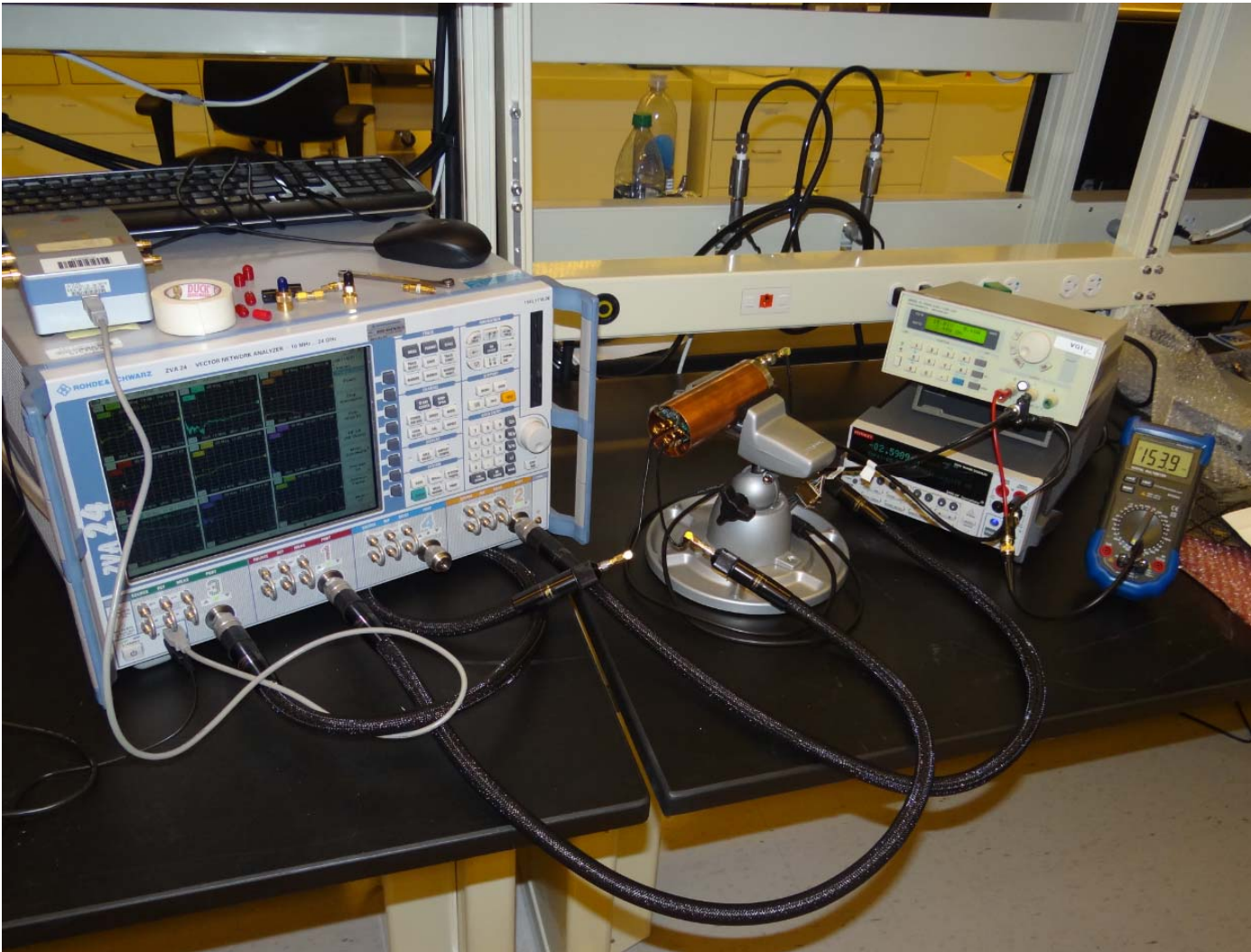
HAMDI MANI

02/28/2013

Measurement Plan

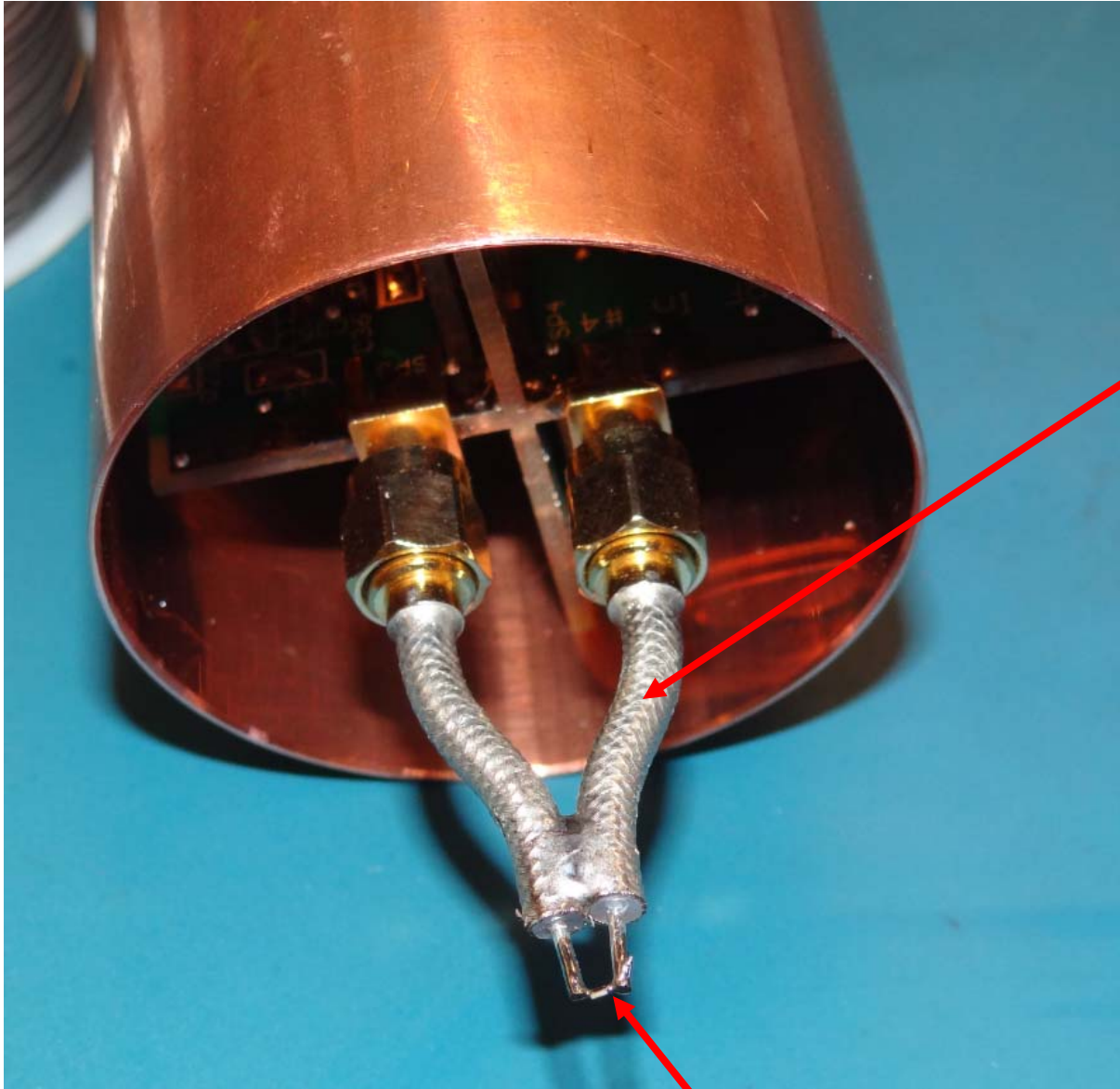
- **Single ended and differential sparameters:** common mode and differential impedances, differential gain, common mode gain , common mode rejection ratio: this will allow us to predict the frequency response of the Balun when connected to the antenna.
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- **Noise temperature using 3 methods:** 1) a variable temperature load and a calibrated balun (liquid nitrogen cooled) 2)differential variable temperature load without balun 3)calibrated HP346C noise source and balun. All measurements on an RFI tight enclosure at constant bias. Balun input terminated with a load as close as possible to its impedance.
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- **Noise at different input impedances** (50 , 75, 100, 150, 200, 250, 300 Ohm for example) : this will give us an idea about the noise parameters (noise temperature of the balun as a function of Antenna Impedance)
- **Linearity measurements:** 1dB Compression point , IP3, 2 tone measurement to simulate the RFI environment of the MRO: inject 2 tones at about 20 -30 MHz .
- **Bias dependence:** Measure some of the RF parameters at different bias : gain, impedance, noise ...
- **Temperature dependence:** Measure some of the RF parameters at fixed bias and few different temperatures

S-parameter Measurement Setup

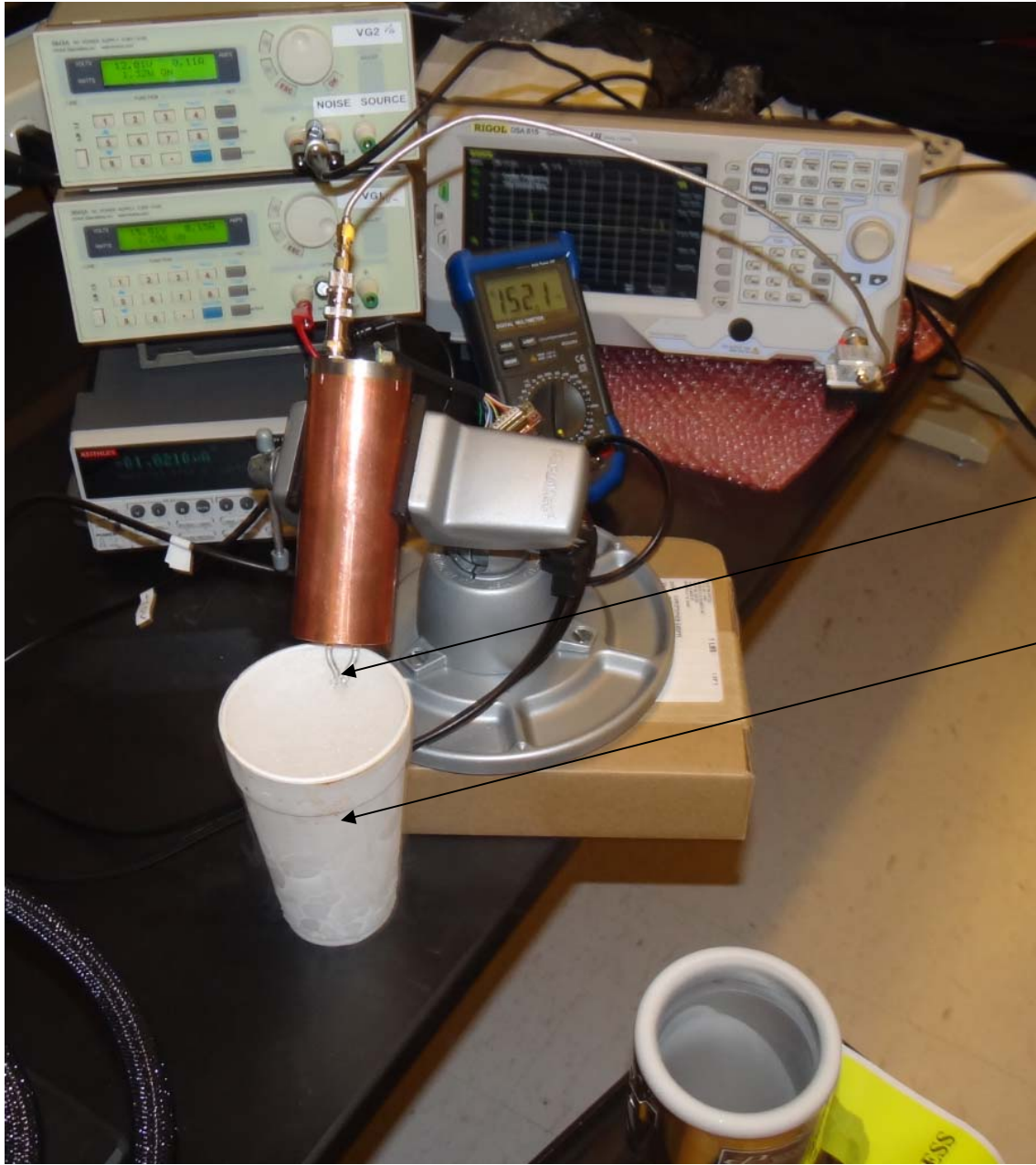


3 Port measurement made using a ZVA24 4 Port VNA Calibrated using an Ecal unit
-40dBm Test port power was used with 100Hz IF Bandwidth to reduce noise

Noise Measurement Setup



Cold Load:0402 Resistor



100 and 200 Ohm resistors
Cooled In LN2 to 77K

Liquid Nitrogen filled
Foam bucket

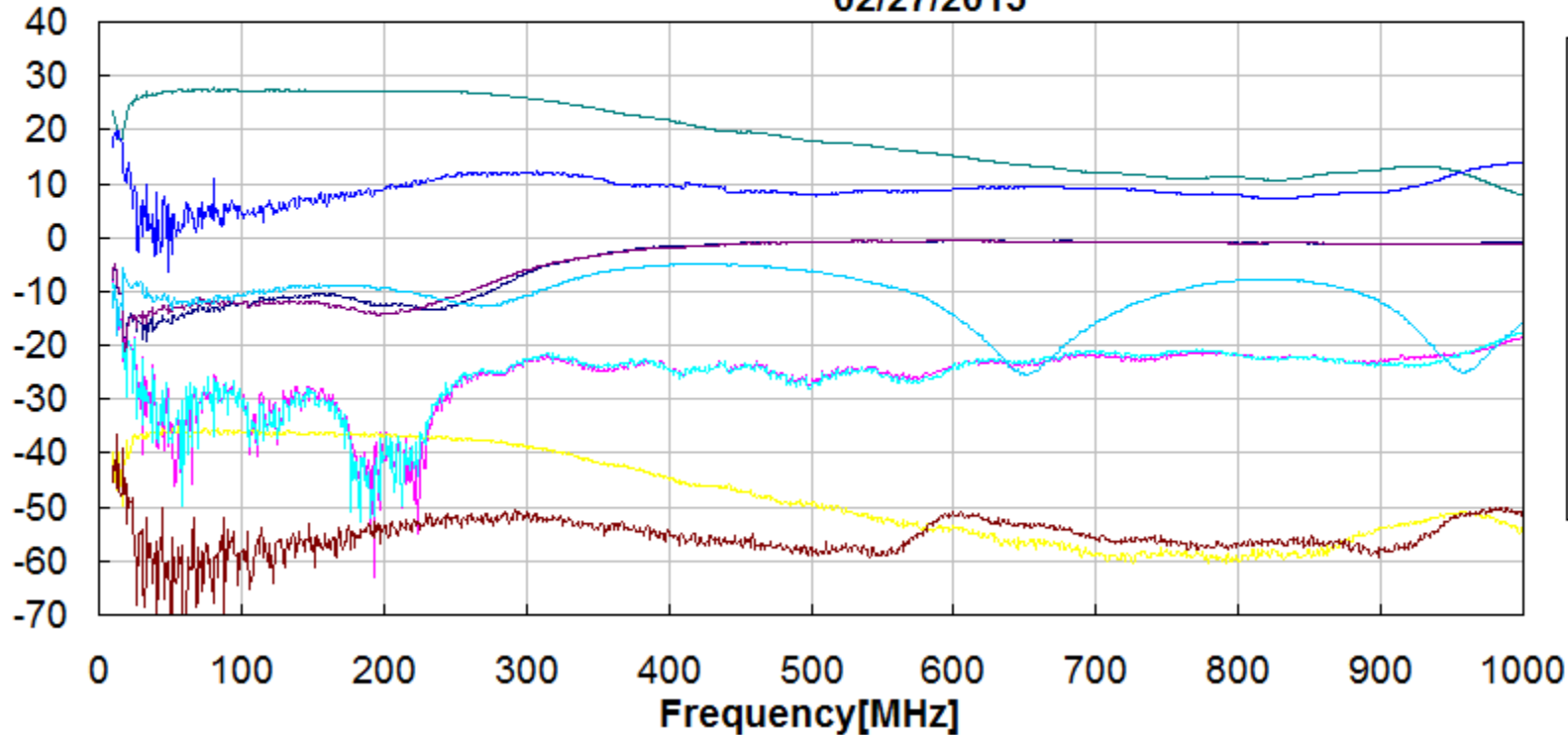
Bias: 15V @ 154.8mA
-5V @ -2.56uA

DARE Balun Mixed-Mode Sparameters

Wide-band Measurement (1GHz)

02/27/2013

$|S_{xy}|$ [dB]



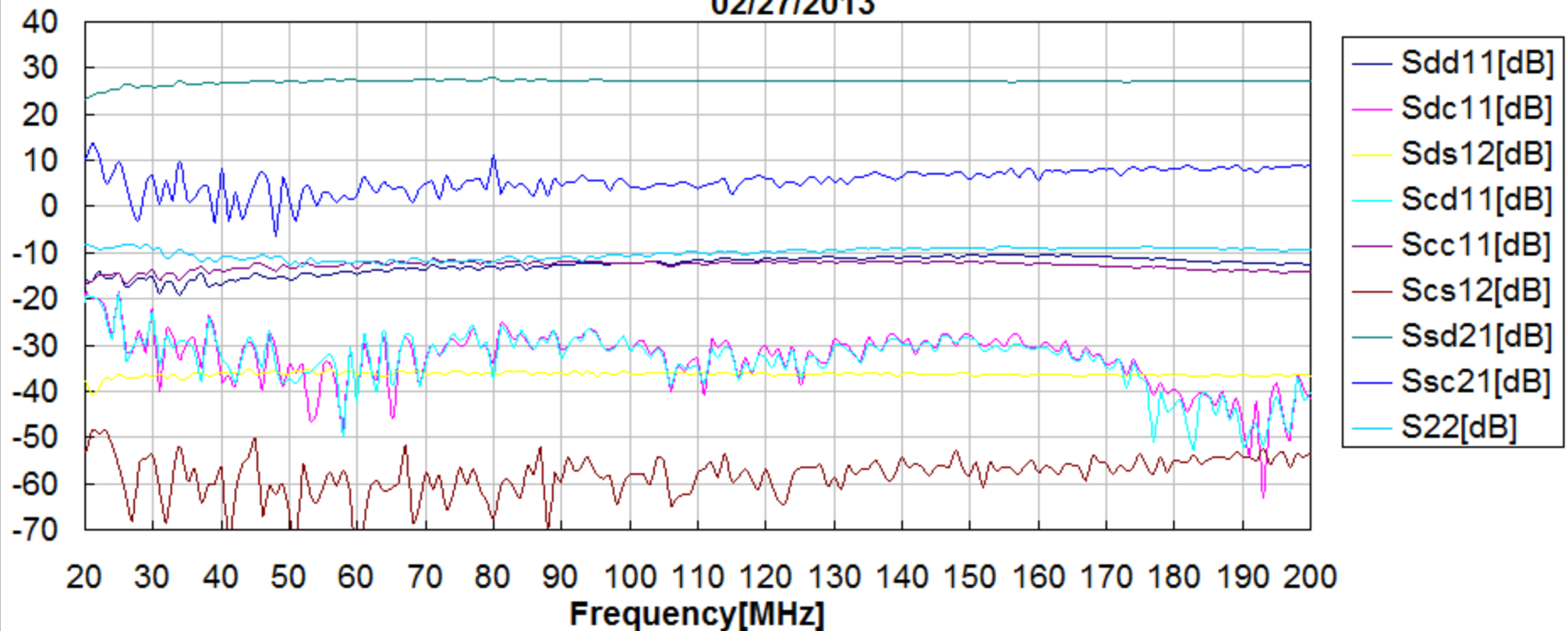
- Sdd11[dB]
- Sdc11[dB]
- Sds12[dB]
- Scd11[dB]
- Scc11[dB]
- Scs12[dB]
- Ssd21[dB]
- Ssc21[dB]
- S22[dB]

DARE Balun Mixed-Mode Sparameters

Narrow-band Measurement (200 MHz)

02/27/2013

$|S_{xy}|$ [dB]

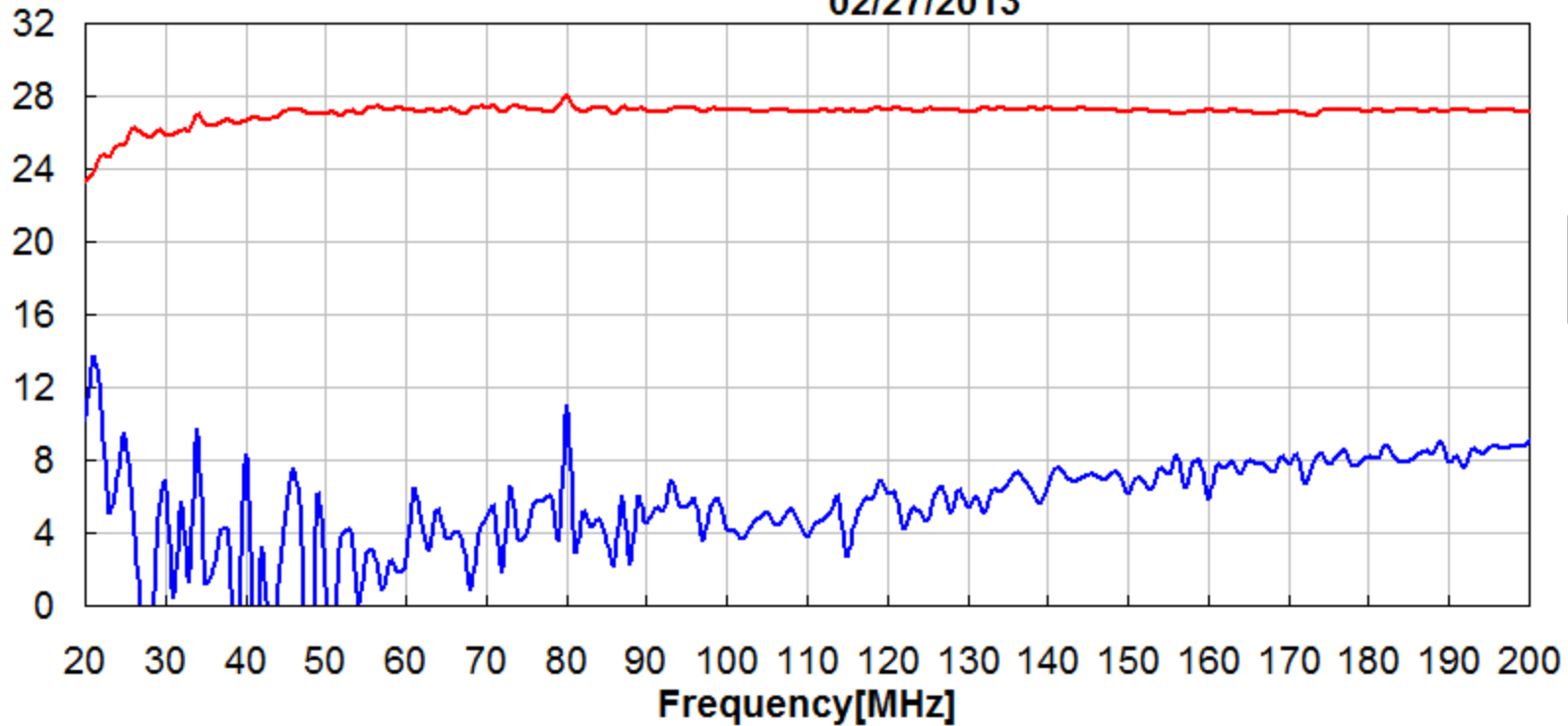


DARE Balun Sparmeters

FORWARD GAIN: DIFFERENTIAL AND COMMON MODE

02/27/2013

|Sxy| [dB]

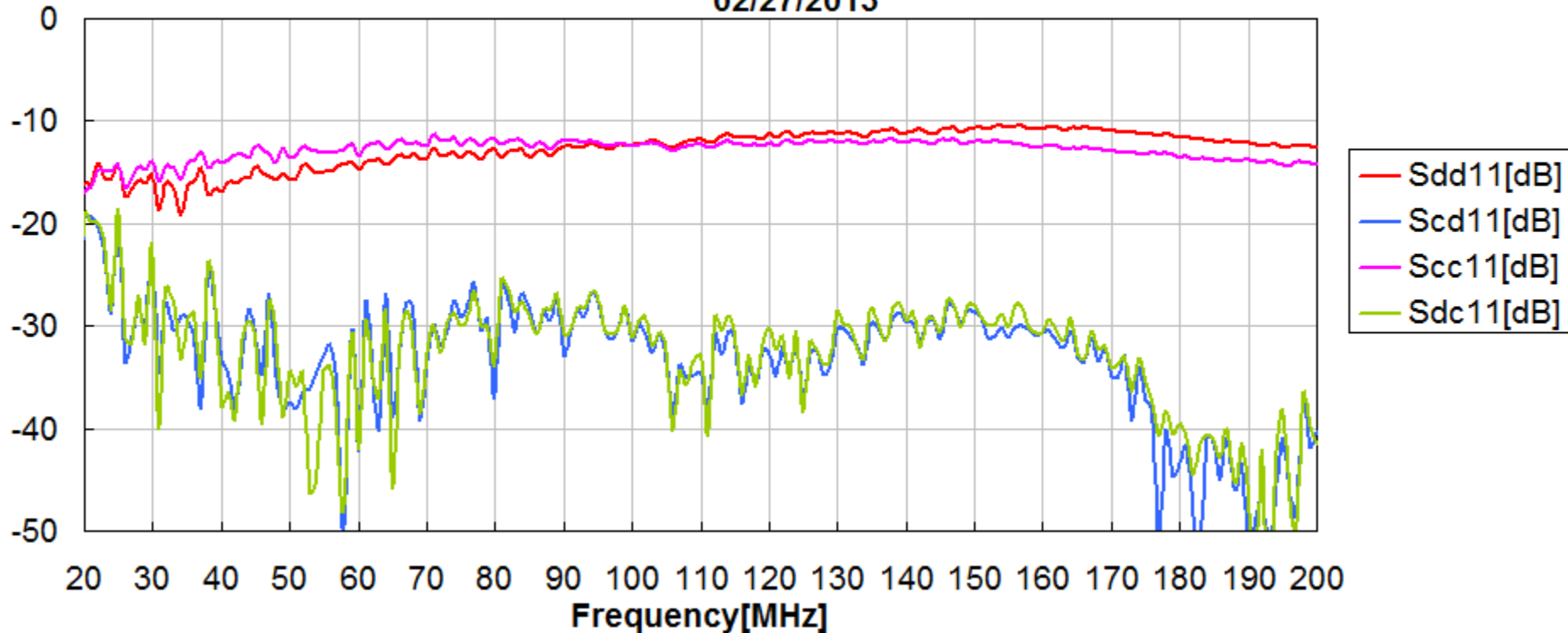


— Ssd21[dB]
— Ssc21[dB]

DARE Balun Sparameters

INPUT RETURN LOSS: DIFFERENTIAL , COMMON MODE AND MIXED MODE

02/27/2013

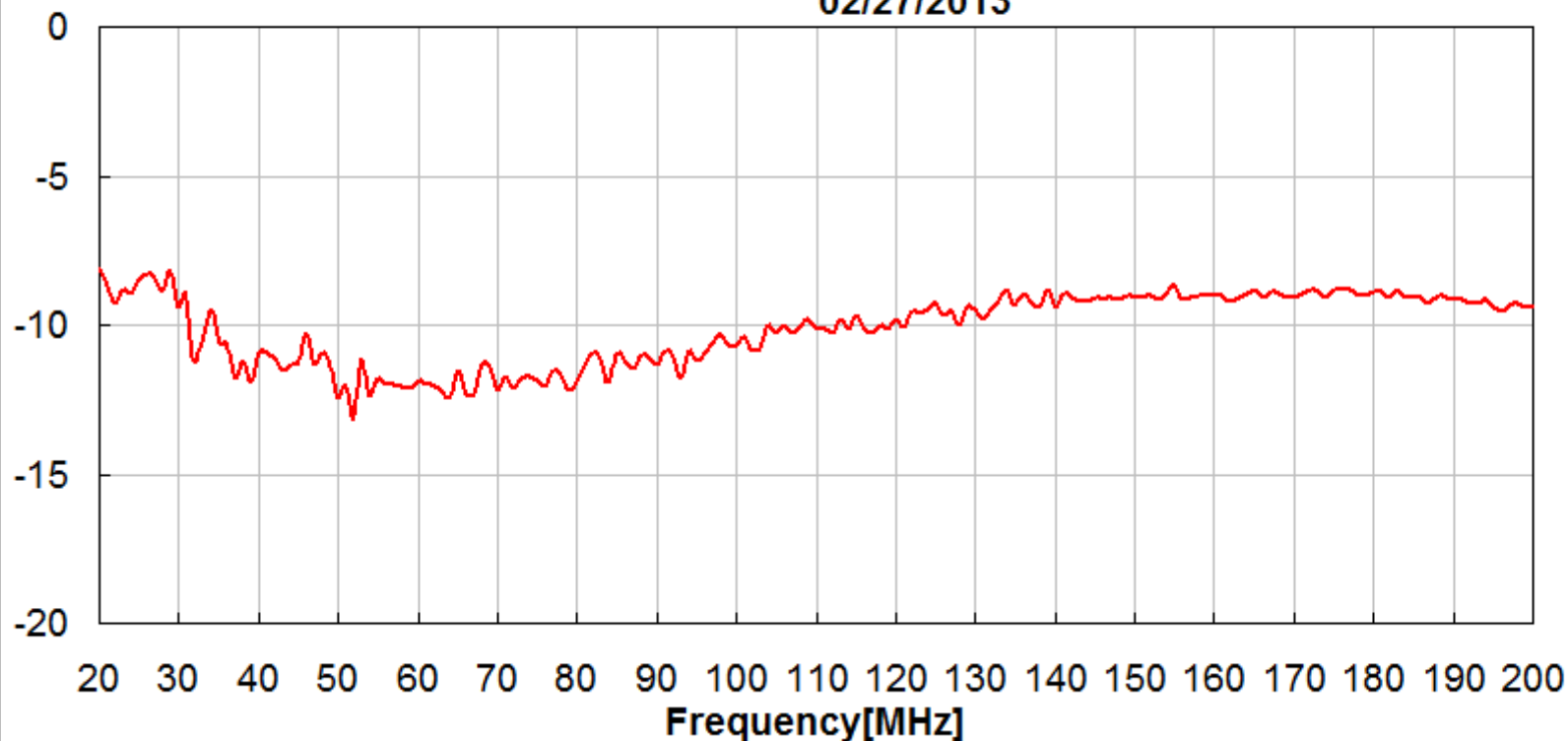


DARE Balun Mixed-Mode Sparameters

OUTPUT RETURN LOSS

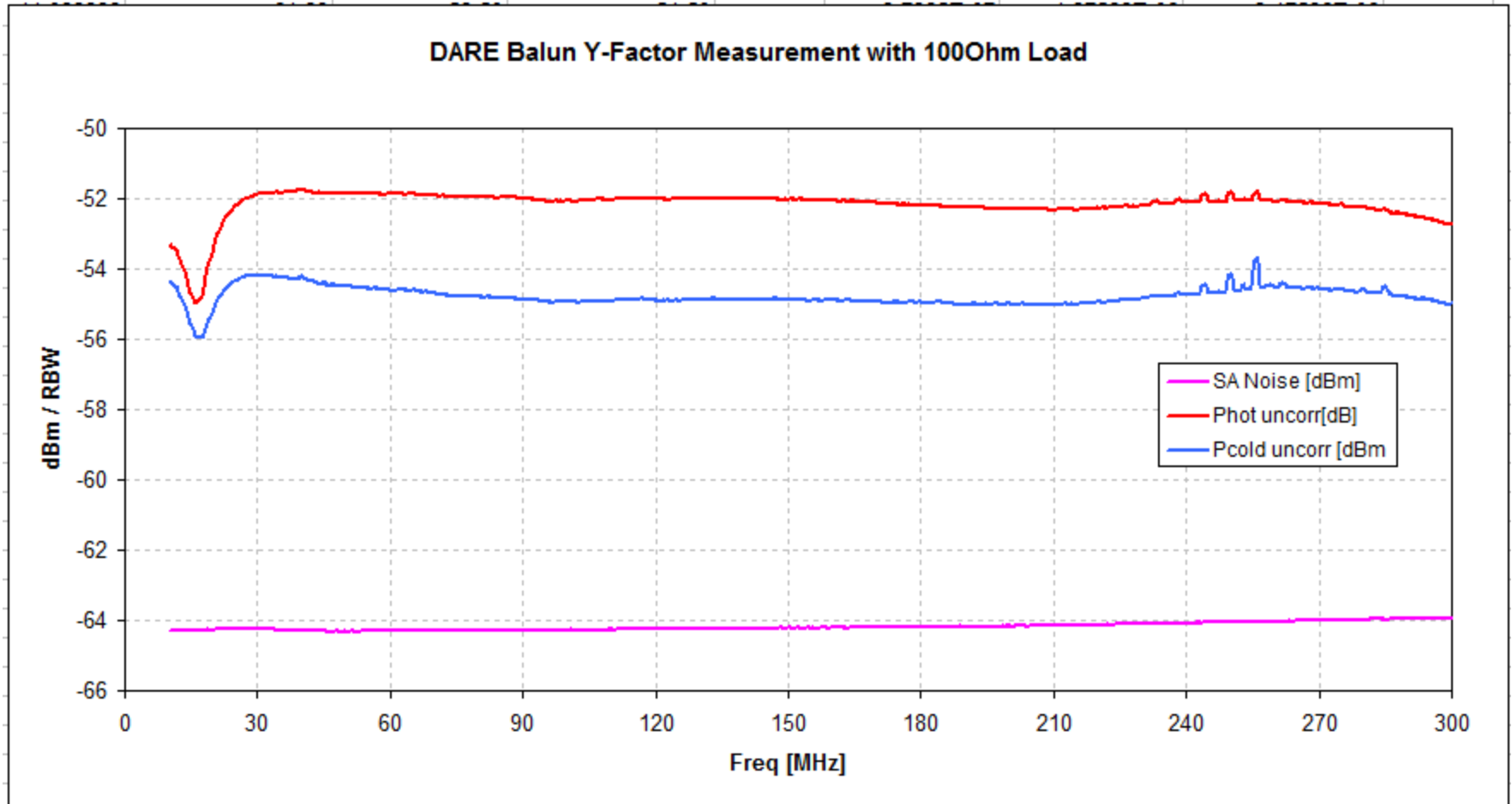
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|Sxy| [dB]

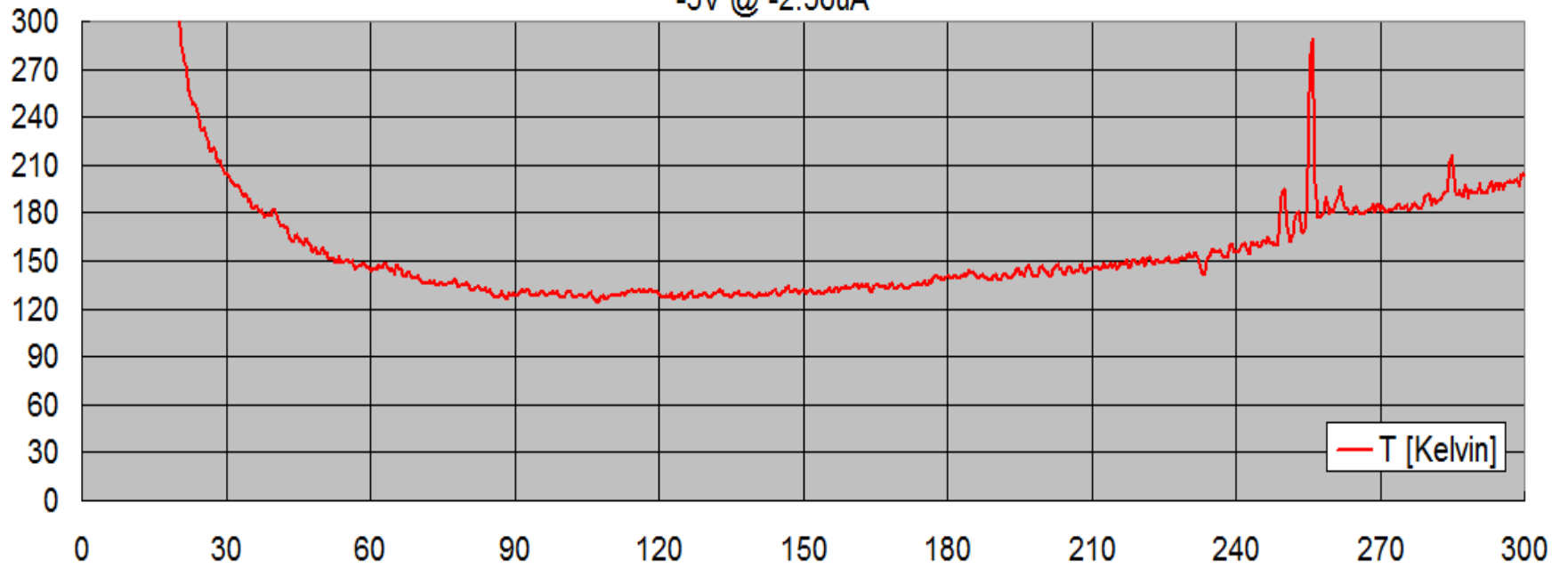


— S22[dB]

Noise Measurement with 100 Ohm Generator Impedance

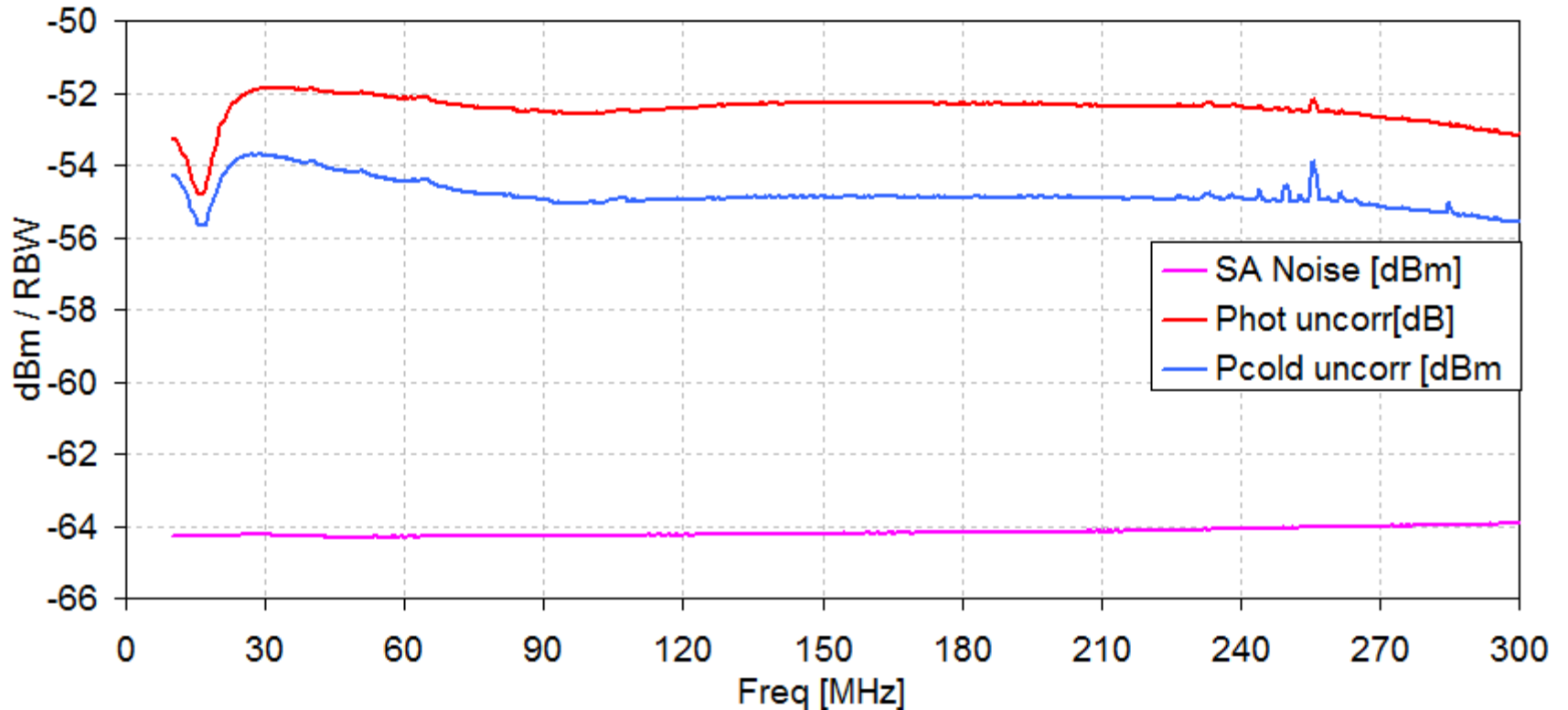


DARE BALUN
Noise Temperature with 100 Ohm Generator Impedance
Bias: 15V @ 154.8mA
-5V @ -2.56uA

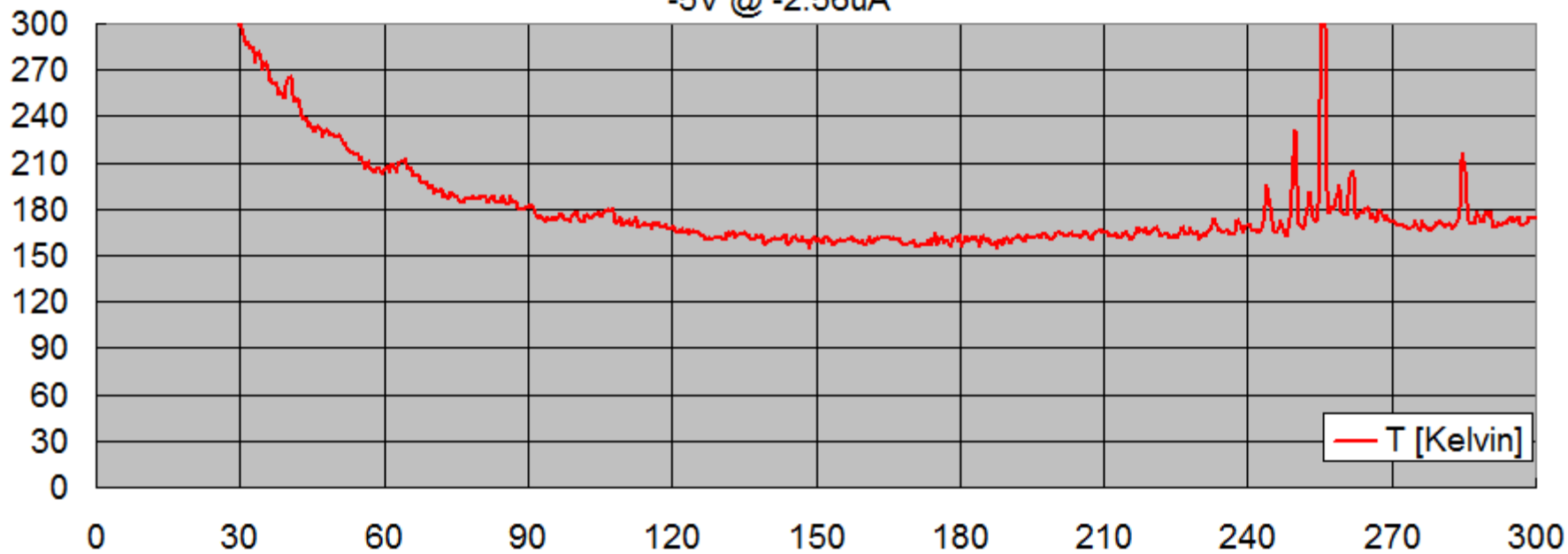


Noise Measurement with 200 Ohm Generator Impedance

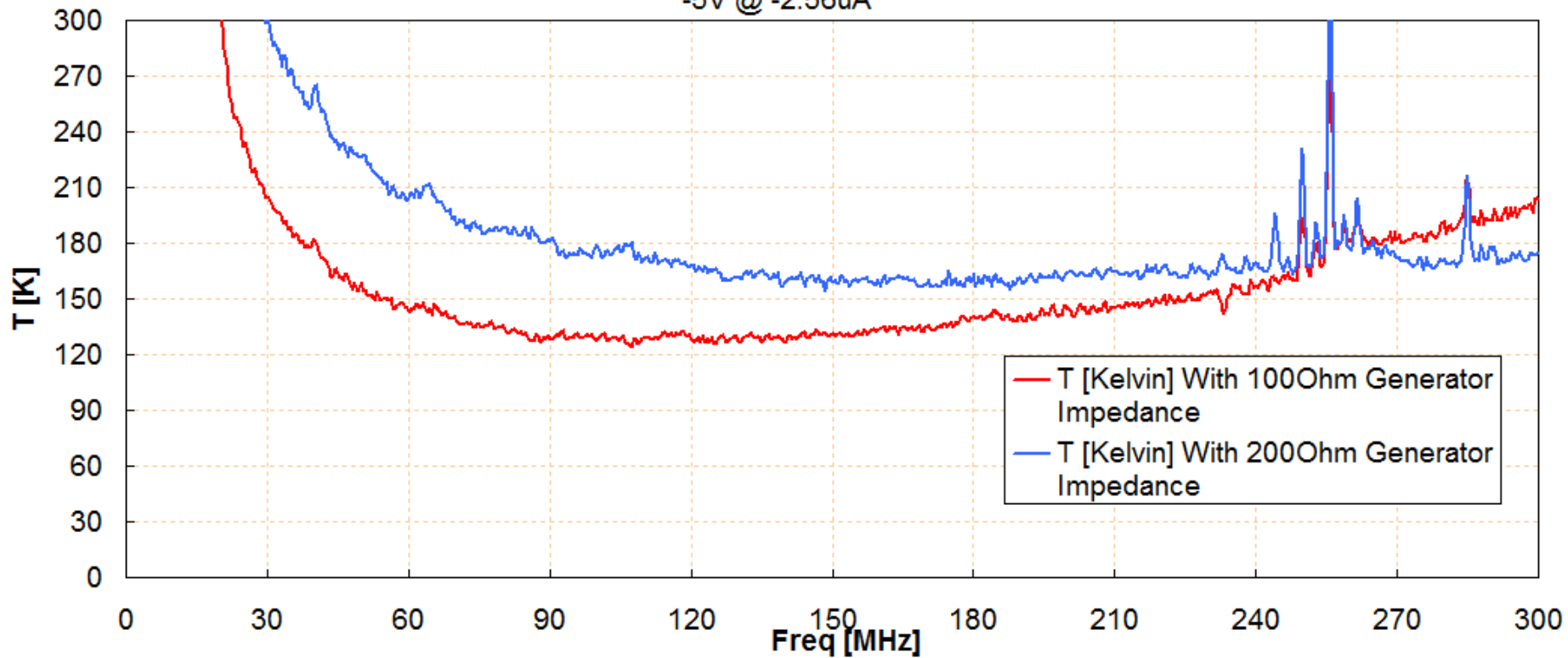
DARE Balun Y-Factor Measurement with 200Ohm Load



DARE BALUN
Noise Temperature with 200 Ohm Generator Impedance
Bias: 15V @ 154.8mA
-5V @ -2.56uA



DARE BALUN
Noise Temperature Measurement Using 300K/77K Load
Bias: 15V @ 154.8mA
-5V @ -2.56uA



Noise temperature measured with 2 different Load impedances: 100 Ohm Resistor
And a 200 Ohm resistor