#### Procedure Run 2-600/600 Matched Network 40dB IL

1. Set up the symmetrical cascaded network as in Figure 2a (matching 600Ω to 600Ω with a total attenuation or insertion loss of 40dB); measure the resistance in each branch:

|  |  |  |
| --- | --- | --- |
|  | **Port A (Ω)** | **Port B (Ω)** |
| **Za** |  |  |
| **Zb** |  |  |
| **Zc** |  |  |

1. Open-circuit z Parameters: V1 = Z11 \* I1 + Zl2 \* I2 and V2 = Z21 \* I1 + Z22 \* I2
   1. Connect the dc voltage source to Port A-1 with Port B-2 in an open-circuit condition (Figure 2a). Set the voltage to 5.0Vdc; record:

|  |  |
| --- | --- |
| **VA-l (Vdc)** |  |
| **VB-2 (Vdc)** |  |
| **IA-1 (Adc)** |  |

* 1. Connect the 5.0Vdc source to Port B-2 with Port A-1 in an open-circuit condition (Figure 2b):

|  |  |
| --- | --- |
| **VB-2(Vdc)** |  |
|  |  |
| **IB-2 Adc)** |  |

1. Attenuation
   1. Replace the dc source at Port A-1 with the ATS generator. Connect a 600Ω load across Port B-2 (Figure 2c).
   2. In an open-circuit condition, set the ATS output to approximately l.0Vrms at 1kHz.
   3. Measure and record the voltage and dB/dBm at Ports A-1 and B-2. Use the ATS and/or the VFM for dB/dBm readings, and the DMM for rms voltage:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **DMM(Vrms)** | **ATS (dB/dBm)** | **VFM (dB/dBm)** |
| **Port A-1** |  |  |  |
| **Ports A-2 and B-1** |  |  |  |
| **Port B-2** |  |  |  |

1. Insertion Loss
   1. Disconnect the network and verify the ATS output in the open-circuit condition is the same as in Step C2. Connect the ATS output directly to the 600Ω load; measure across the load:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **DMM(Vrms)** | **ATS (dB/dBm)** | **VFM (dB/dBm)** |
| **Port B-2** |  |  |  |

**Procedure Run 3- 600/50 Mismatched Network (Resistive L-Pad)**

1. For the network of Figure 3, measure the resistance in each branch:

I **Ra (Ω)** I **Rc (Ω)**

1. Impedance Matching; set the L-Pad as per Figure 3 to image-match the 600Ω source to the 50Ω load.
2. Attenuation; repeat Step lE and measure:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **DMM(Vrms)** | **ATS (dB/dBm)** | **VFM (dB/dBm)** |
| **Port 1** |  |  |  |
| **Port2** |  |  |  |

1. Insertion Loss; repeat Step 1F and measure:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **DMM(Vrms)** | **ATS (dB/dBm)** | **VFM (dB/dBm)** |
| **Port2** |  |  |  |

**Questions**

**Run 1- 600/50 Mismatched Network 20dB IL**

* 1. Aside from component damage, why is the exact generator voltage not important? Refer to Step B2.
  2. Given that all the components are 250mW or more and the impedance levels are 600 and 50 ohms, what is the allowable maximum generator voltage?
  3. Using measured resistance values: Za, Zb and Zc, calculate: Z11, Z12, Z21, Z22 and ABCD parameters to the third-decimal place using T-Circuit Values and Open-Circuit Z Values from the Table Equations;

show calculations. Using the Condition Verification formula, AD- BC = 1, confirm the theoretical calculations.

* 1. Using experimental results, calculate ABCD parameters to the third decimal place; show calculations.

Compare to the theoretical results by calculating the percentage difference:



* 1. Confirm the experimental results by using the Condition Verification formula, AD- BC = 1.
  2. Using Cascade ABCD Values from the Table Equations and experimental results, calculate: Z10C, Z2oc, Z1sc, Z2sc and Zimage1  and Zimage2; show calculations. Compare to the theoretical results by calculating the percentage difference.
  3. Determine dBm at the generator; show calculation.
  4. Determine dB of the circuit; show calculations.
  5. Determine the Voltage Attenuation; show calculations.
  6. Determine the Power Attenuation; show calculations.
  7. Determine the Insertion Loss; show calculations.

**Run 2- 600/600 Matched Network 40dB IL**

1. Using experimental results, calculate ABCD parameters; show calculations. Derive Parameter B from the Condition Verification formula.
2. Calculate the Insertion Loss; show calculations:
   1. With the network
3. With the network at Port B2
4. With the network at PortAl
5. With the network at Ports A2/B 1
6. Total Insertion Loss (Al - B2)
7. Confirm Total Insertion Loss (Al - A2/B 1) + (A2/B 1- B2)

**Run 3-600/50 Mismatched Network (Resistive L-Pad)**

1. Determine Voltage Attenuation at Ports 1 and 2, and Total Voltage Attenuation; show calculations.
2. Determine Power Attenuation; show calculation.
3. Determine Insertion Loss; show calculations.