

## Pa0nhc RF power meter.

### Operation. v20180131

This instrument measures the RFrms voltage on the internal 50 Ohms transmission line. One BNC bus is connected to the RF source, the other to a 50 Ohms load.

SMD chip IC1 is an accurate and sensitive wide band 2.5 GHz "**rms detector**" SMD chip It has a conversion gain of 7.5 Vdc out, per 1 Vrms in. And capable of detecting as little as -30dBm or 7mVrms with only -1dB error. Between 0 and 100 MHz is has a constant input impedance of 225 Ohms // 1pF.

With s1 in position "0", the total impedance on the input of IC1 is : **22.3 Ohms**.  
The input attenuation is then :  $(5,023 + 0,0223) \text{ kOhm} / 0,0223 \text{ kOhm} = \mathbf{226,2x}$ .

With s1 in position "-20", the input attenuation is :  $(5,023 + 0,225) \text{ kOhm} / 0,225 \text{ kOhm} = \mathbf{23,32x}$ . Resulting in 20dB higher sensitivity.

The total resistance of R5//R6 is 3.083 kOhms.

With s2 in position R5//R6 = "0", and full scale deflection of mete M, the output of IC1 is :  $(210 + 3083) \text{ Ohm} \times 0,001 \text{ A} = 3,293 \text{ Vdc}$ , rounded off to **3,3Vdc**.

With s2 in position R4 = "-20", and full scale deflection of mete M, the output of IC1 is :  $0,001 \text{ A} \times (210 + 120) \text{ Ohm} = \mathbf{0,33Vdc}$ . Resulting in 20dB higher sensitivity.

The measurable power range is therefore +53dBm - (-4dBm) = 57dB (!!).

To prevent influence from low frequency signals, coupling capacitor C2 causes the sensitivity to roll off 6db / octave from abt. 160 kHz down.

#### **Extended frequency range up :**

- C8 and C9 compensate for a parasitic coupling C which exists in the attenuator resistor chain R1//R2.
- With S1 in the "open" position, abt. 90 pF parallel to the input of IC1 gave correct power indication between 3.5 Mhz, 29 Mhz an 145 Mhz.
- With S2 in the "closed" position, abt. 820 pF parallel to R3 also should give correct power indication between 3.5 Mhz, 29 Mhz an 145 Mhz.

#### **Extending the frequency range down :**

- By soldering an extra SMD capacitor of 100 nF on top of (in parallel to) C2, the low frequency range can be extended down to abt. 16 kHz (-45 dB @ 50 Hz).
- By soldering an extra SMD capacitor of 1uF on top of (in parallel to) C2, the low frequency range can be extended down to abt. 1.6 kHz (-25 dB @ 50 Hz).
- By soldering an extra ceramic SMD capacitor of 10uF on top of (in parallel to) C2, the low frequency range can be extended down to abt. 160 Hz (-5 dB @ 50 Hz).

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