

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).
