



# HR-E 40-1 set

E-Field Probe up to 40 GHz



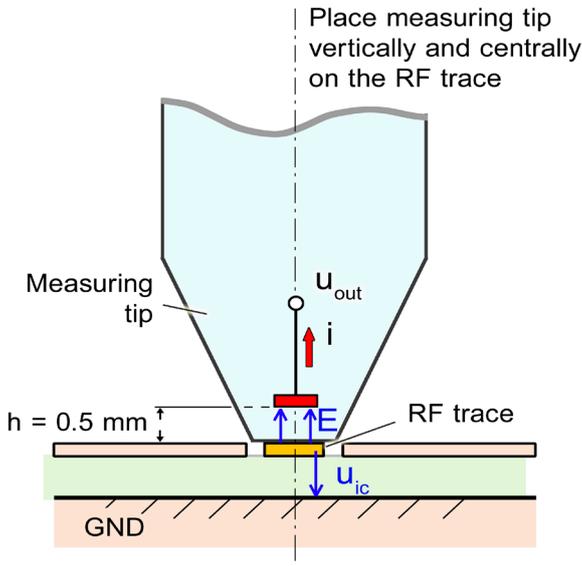
sales@langer-emv.de  
www.langer-emv.com

### Short Description



The HR-E 40-1 is a passive near-field probe for measuring electric fields up to 40 GHz. The probe is placed vertically and centrally on the RF trace for measurement. By placing the probe directly on the RF trace, a defined distance (0.5 mm) between RF trace and measuring electrode is achieved. The measuring tip is decoupled from the cable shield by special damping systems. In addition, the probe contains a current attenuator. The probe is designed for manual operation. To reproduce measurements the HR-E 40-1 should be used in conjunction with a positioning system, for example ICS 105. For measurements in the range up to 40 GHz, a suitable microwave cable is required. It is not included in the scope of delivery but can be ordered optionally. Either spectrum analyzers or oscilloscopes can be used for signal evaluation.

Technical Parameters HR-E 40-1	
Upper cutoff frequency	40 GHz
Lower cutoff frequency	depending on measuring device (see frequency response)
Size of measuring electrode	Ø 0.25 mm
Resolution	0.2 mm
Inner distance of the measuring electrode to the measuring tip	0.5 mm
Connector	2.92 mm (K) (SMA compatible)
Weight	15 g
Sizes (L x W x H)	(9 x 9 x 140) mm



The measuring tip is placed on the RF line. Output voltage of the probe is designated as  $u_{out}$ . The electrical quantities (Figure 1) can be calculated with corresponding correction functions.

- E: Electrical field between probe tip and RF trace
- $u_{ic}$ : Voltage of the RF trace
- i: Current coupling into the measuring tip of the probe from the RF trace

Figure 1





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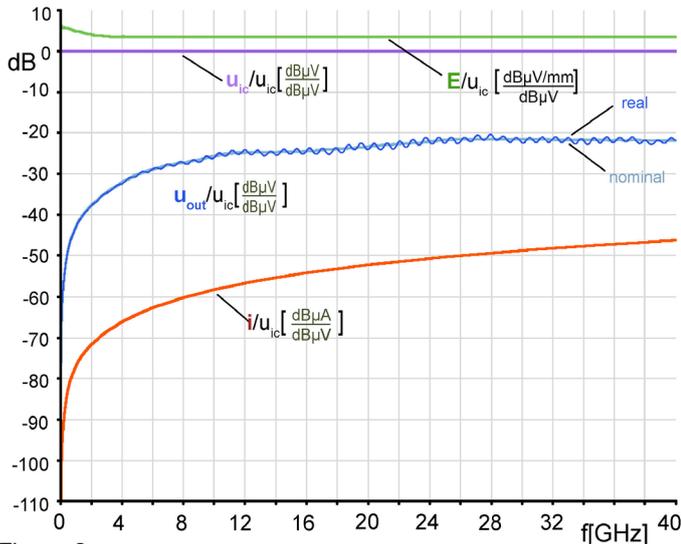


Figure 2

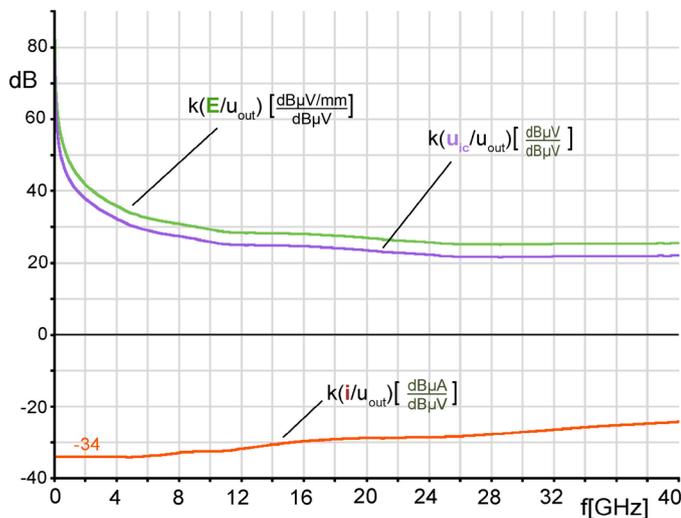


Figure 3

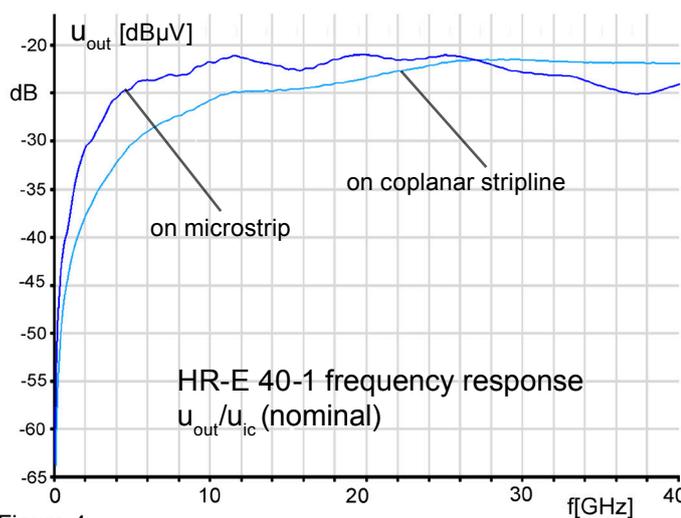


Figure 4

The frequency response of the output voltage and other quantities (Fig. 2) are normalized to the RF trace voltage  $u_{ic}$ . The real curve of the output voltage  $u_{ic}$  has a ripple of 1.2 dB. From the real curve a nominal curve was derived (by using moving averages), in which the ripple was eliminated.

In addition to the output voltage  $u_{out}$ , other electrical quantities are effective in the test set-up at the measuring tip and RF line (Fig. 1). The frequency responses of these electrical quantities are shown in Figure 2 as nominal curves.

The probe has two working ranges according to the frequency response  $u_{out}/u_{ic}$  (Figure 2):

1. in the lower range with a slope of 20 dB/dec
2. in the upper range the output voltage is nearly constant

The output voltage  $u_{out}$  of the probe can be converted with correction functions (Fig. 3) into the following electrical quantities:

- Electrical Field E** between measuring tip and RF trace
- Voltage  $u_{ic}$**  of the RF trace
- Current coupling i** into the measuring tip of the probe from the RF trace

The correction functions are nominal curves. The real curves have a ripple of 1.2 dB (see frequency response  $u_{out}$  real curve, Fig. 2).

The frequency response and correction curves were determined on a coplanar stripline. If the design of the DUT differs from the design of the coplanar stripline, deviations are to be expected in the measurement result.

Figure 4 shows the nominal frequency response  $u_{out}/u_{ic}$  determined on the stripline compared to the nominal frequency response  $u_{out}/u_{ic}$  determined on the microstrip.

