## EME UHF-LVR-Meter 430-1400MHz 0,5W-2kW

Matthias, DD1US, May 24th2022, Rev 1.0

For many years I have been using directional couplers from the company EME Karl Mueller for various measurements from the 2m band up to the 13cm band. He had offered different versions covering the 2m/70cm/23cm bands respectively the 70cm/23cm/13cm bands.





## **Technical specifications**

Туре:	E	ME 7020/3	0	EME 2320/30			
Frequency (MHz)	145	435	1275	435	1275	2350	
Typical Coupling (dB)	29	20	14	29	20	16	
Absolute Calibration Accuragy (dB)	0,3	0,2	0,5	0,3	0,2	0,5	
Directivity (dB min.	32	32	26	32	32	26	
VSWR (max.) prim. line secondary Lines	1,04 1,04	1,10 1,20	1,25 1,20	1,02 1,05	1,08 1,05	1,10 1,20	
Power (max.) CW PEP	1000 2000	200 500	100 200	1000 2000	200 500	100 200	
Impedance (ohms)		50			50		
Connectors prim. Line secondary Lines	7020/30A 7020/30B N male-male female-male BNC female			2320/30A 2320/30B N male-male N female-male BNC female			
Dimensions (mm)		120x62x25		90x62x25			
Weight (grams)	430			300			

At the time those directional couplers were sold there was also the option to buy them integrated into complete SWR & Power meters. The looked like this:



This meter was also available in 2 versions: for the 2m/70cm/23cm bands and for the 70cm/23cm/13cm bands.

Recently I was able to acquire second hand the display unit for the 430-2400MHz coupler. It was sold untested and I found it operational except for the push button ("Rücklauf") for the SWR measurements which I had to replace. After cleaning the unit properly, it looks now almost as new:



You can see on the front plate the 4 measurement ranges for each frequency band plus the SWR mode. For instance, in the 70cm band the following maximum power measurements are possible: range 1 = 5W, range 2 = 50W, range 3 = 500W, range 4 = 2000W. As the coupling factor of the directional coupler is decreasing with increasing frequency the maximum power measurements in the 13cm band are lower. They are: range 1 = 0.5W, range 2 = 5W, range 3 = 50W, range 4 = 200W.

I mounted my directional coupler in a suitable encasing which I had available:



Each directional coupler delivered by EME Karl Mueller was calibrated by him and the coupling factors for each band and each direction are marked on the directional coupler:



As mentioned before the coupling factor is decreasing from about 29.5dB in the 70cm band to about 16.5dB in the 13cm band.

I checked the coupling factor as well as the directivity and they matched the specified values very well:

s	21&M LO	G 1	0 dB/R	FØ dB		:	3:-20.548	3dB 1	296.000	000 MHz	
5	MAR 1	KER . 296	З GH	Z					1	H1 Markers -38.543 dE 44.000 MHz	B B N
					З Д				2	-29.216 dE <u>32.000 M</u> Hz	89 N
									4	-16.804 dB .32000 GHz	
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START 100.000 000 MHz STOP 2 600.000 000 MHz											

The upper curve is the coupling factor in forward direction. The difference between the upper and lower curve is the directivity of the directional coupler: approx. 27dB@432MHz, 33dB@1296MHz and 26dB@2320MHz.

As the coupling factors of the directional coupler and probably also the behavior of the diode detectors are frequency dependent, the complete Power & SWR meter had to be calibrated as well. To do this a number of trimming resistors can be found inside the meter as you can see on the following pictures:



In total there are 12 trimming potentiometers in the display unit. For each of the 3 frequency bands you can see 4 potentiometers for each measurement range.



Actually, there can be found a 13<sup>th</sup> potentiometer with 10 turns in the lower left corner of the picture above. This is to adjust full scale ("Abgleich") of the forward power during SWR measurements. The switch next to it has 3 positions and the range can be changed.

I extracted the schematic of the display unit:



There are 2 multi level rotary switches. The first one is for the selection of the frequency band (S1A and S1B). The second one is for the selection of the measurement ranges (S2A, S2B and S2C).

As mentioned before the third switch has 3 positions to extend the range of the 10 turn potentiometer to adjust forward power to full scale for SWR measurements.

In the next picture you can see the effective circuit diagrams for the 4 different measurement ranges in the 70cm band:



As the measurement voltage is heavily dependent on the diodes used in the detectors attached to the directional coupler the overall sensitivity of the meter can be changed by choosing the adequate resistors placed in parallel to the instrument (see the 10kOhm resistor in the picture above). In my setup I had to change the resistor for the 23cm band from 10kOhm to 22kOhm and the resistor for 13cm band from 2.2kOhm to 4.7kOhm.



Overall, I can confirm the specified accuracy of the power meter which is +/-10% fullscale.

I am always grateful to get feedback and will be happy to answer questions.

Please direct them to the Email address which you will find below.

Best regards

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