MODEL NUMBER:
CG18G

Comb Generator

ACCREDITED
Calibration Laboratory
Cert. 5518.01

DESCRIPTION

The comb generator CG18G produces a frequency spectrum consisting of lines with 100 MHz spacing up to 18 GHz. In combination with an antenna it can be used as an emission source for testing open area test sites, anechoic chambers or GTEM-cells. Single components like measuring receivers, spectrum analysers, cables and attenuators can be tested as well.

SPECIFICATIONS

Frequency range	0.1 - 18 GHz
Connector: female	N, 50 Ω
Output voltage level typical	see Table Page 5
Frequency error	+-1,5 x 10-6 (-20°C-+70°C)
Dimension	105 x 80 x 130 mm
Typical operation time	8 h
Power supply	3.7 V, 2.6 Ah LiOn
Weight (incl. battery)	430 g
Dimension BxHxT	105 x 80 x 130 mm

SPECTRUM (AMPLITUDE)

The spectrum delivered by the CG18G covers the frequency range from 100 MHz to approximately 20 GHz. The upper limit of 18 GHz results from the fact, that N-connectors are specified up to 18 GHz only. We deliberately banned SMA from the front panel because it suffers more from mechanical stress due to its tiny dimensions.

The amplitude of the spectrum shows a continuous decay towards higher frequency with some minor "ripple". In contrast to a typical signal generator, which can control the output level by rectifying and comparing it to a stable DC-voltage, the output spectrum of a comb-generator is unregulated. This means that the spectrum differs between units and also depends on other factors to a certain degree. It is good practise to prefer differential (compensation) measurement

STABILITY OF FREQUENCY

Using a temperature compensated crystal oscillator the frequency error is limited to ±1.5x10-6 (-20°C - +70°C). Even though this is good already, we have to take this point into consideration especially at higher frequencies.

At 18 GHz (worst case) the absolute maximum frequency error is ±27 kHz. The receiver may also have a comparable error which means that we have to face a potential higher frequency difference.If a continuous frequency scan is made for a site attenuation measurement, this is no problem because the maximum of each spectrum line will be found anyway.
In the case that only the expected frequencies are tuned, there are potential errors when the resolution bandwidth is not wide enough to compensate the tuning error. This is usually not the case because the resolution bandwidth is chosen relatively narrow to keep the noise down.

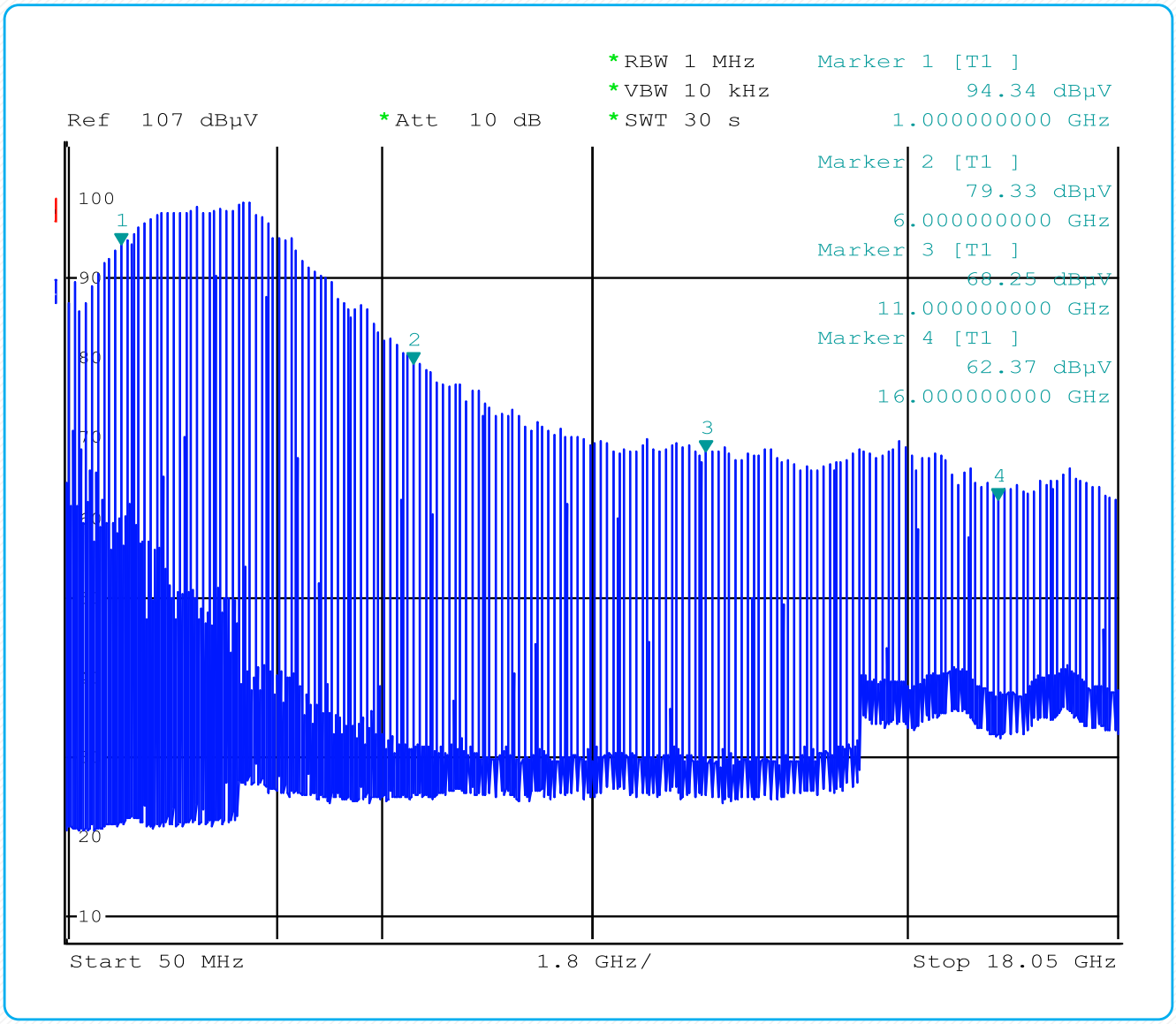
INTENTIONAL FREQUENCY TUNING

Using the frequency fine tuning control " -Δf + " the reference frequency can be shifted in a narrow range. The red LED illuminates when the fine tune is active to avoid unintentional frequency shifting which could result in wrong measurement.

The fixed position "100 MHz" is the standard position (LED dark). The intentional frequency tuning can be used to compensate for a frequency difference between the CG18G and a receiver. However it must be considered that in contrast to a comb-generator, a receiver or spectrum–analyser has no simple relation between reference frequency and receiving frequency. A perfect tracking on one frequency may cause a severe offset somewhere else. Frequency tuning may also be helpful to avoid collisions with interfering signals for example in an open area test site.

DIAGRAM AND TABLE

The measurement must be considered as typical. The absence of output level control leads to differences between units. Especially in the GHz-range cables and adapters may cause substantial loss. The measurement was made by connecting the output of the CG18G to the RF-input of the spectrum-analyser via a qualified 10-dB-attenuator and an adapter N-connector / N-connector. The table shows the voltage level of the spectrum lines in [dBµV]. To get the power level in [dBm] subtract 107 dB from the voltage level in [dBµV].



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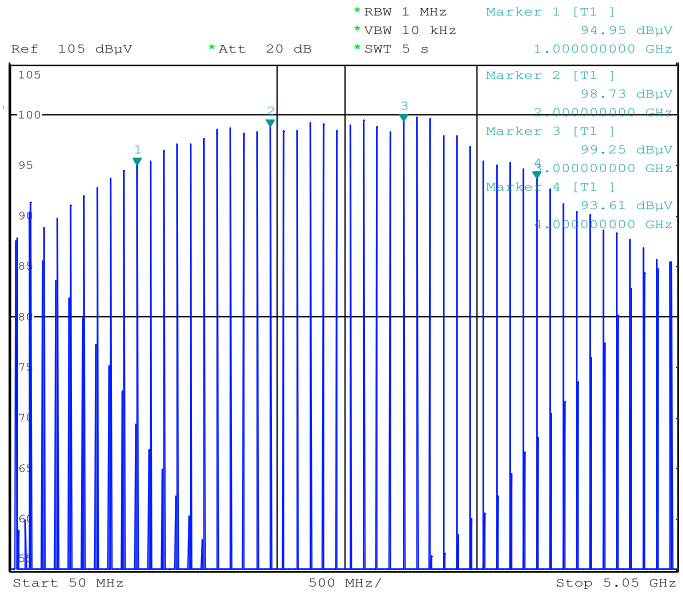
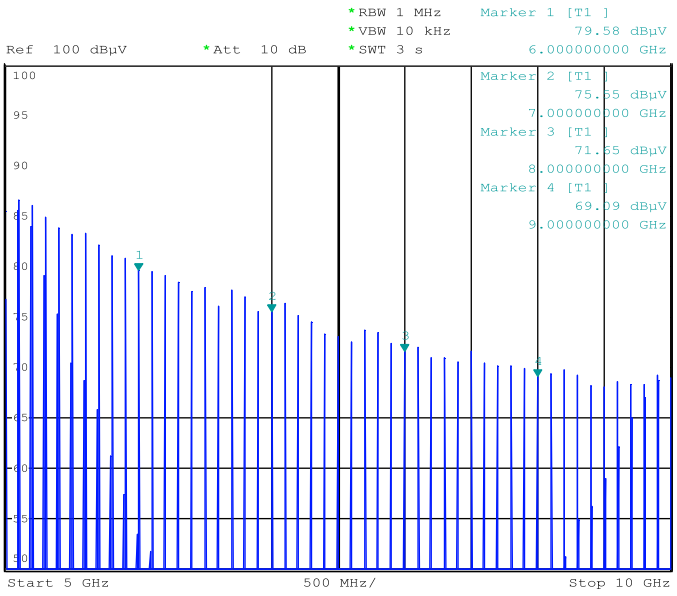
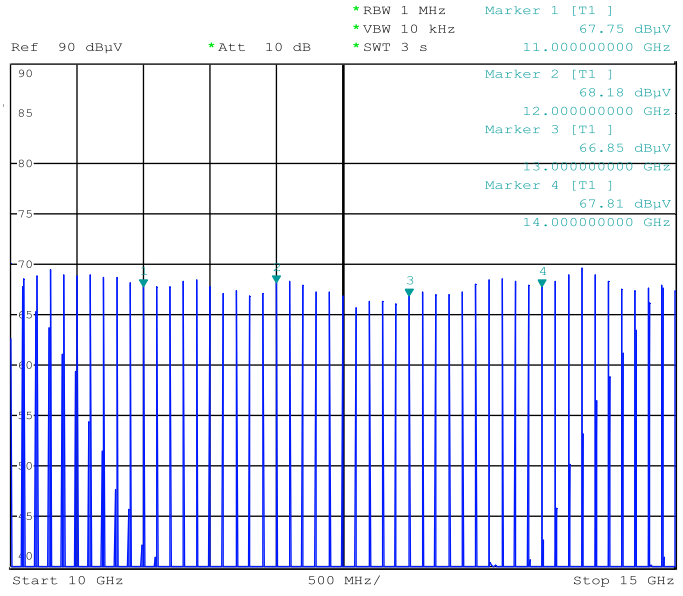
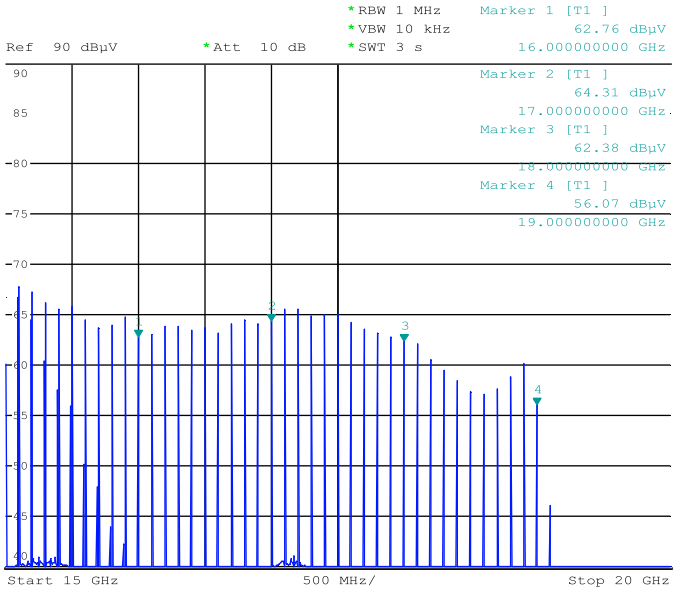

*RBW 1 MHz
*VBW 10 kHz
*SWT 5 s
Marker 1 [T1]
94.95 dBµV
1.000000000 GHz
Ref 105 dBµV
*Att 20 dB
Marker 2 [T1]
98.73 dBµV
2.000000000 GHz
Marker 3 [T1]
99.25 dBµV
4.000000000 GHz
Marker 4 [T1]
93.61 dBµV
4.000000000 GHz
Start 50 MHz
500 MHz/
Stop 5.05 GHz


*RBW 1 MHz
*VBW 10 kHz
*SWT 3 s
Marker 1 [T1]
79.58 dBµV
6.000000000 GHz
Ref 100 dBµV
*Att 10 dB
Marker 2 [T1]
75.55 dBµV
7.000000000 GHz
Marker 3 [T1]
71.55 dBµV
8.000000000 GHz
Marker 4 [T1]
69.09 dBµV
9.000000000 GHz
Start 5 GHz
500 MHz/
Stop 10 GHz


*RBW 1 MHz
*VBW 10 kHz
*SWT 3 s
Marker 1 [T1]
67.75 dBµV
11.000000000 GHz
Ref 90 dBµV
*Att 10 dB
Marker 2 [T1]
68.18 dBµV
12.000000000 GHz
Marker 3 [T1]
66.85 dBµV
13.000000000 GHz
Marker 4 [T1]
67.81 dBµV
14.000000000 GHz
Start 10 GHz
500 MHz/
Stop 15 GHz


*RBW 1 MHz
*VBW 10 kHz
*SWT 3 s
Marker 1 [T1]
62.76 dBµV
16.000000000 GHz
Ref 90 dBµV
*Att 10 dB
Marker 2 [T1]
64.31 dBµV
17.000000000 GHz
Marker 3 [T1]
62.38 dBµV
18.000000000 GHz
Marker 4 [T1]
56.07 dBµV
19.000000000 GHz
Start 15 GHz
500 MHz/
Stop 20 GHz

OUTPUT VOLTAGE LEVEL TYPICAL

f [GHz]	U [dBµV]	f [GHz]	U [dBµV]	f [GHz]	U [dBµV]	f [GHz]	U [dBµV]
0.1	86.8	5.1	86.4	10.1	68.3	15.1	66.9
0.2	89.8	5.2	85.9	10.2	67.9	15.2	65.7
0.3	86.1	5.3	84.4	10.3	68.3	15.3	63.9
0.4	87.5	5.4	83.3	10.4	68.5	15.4	64.8
0.5	89.4	5.5	82.3	10.5	69.0	15.5	65.3
0.6	90.9	5.6	82.6	10.6	68.6	15.6	63.7
0.7	91.9	5.7	81.7	10.7	68.6	15.7	63.4
0.8	92.7	5.8	80.3	10.8	68.0	15.8	63.5
0.9	93.8	5.9	79.9	10.9	67.3	15.9	63.1
1.0	94.4	6.0	79.6	11.0	67.2	16.0	62.0
1.1	94.9	6.1	79.2	11.1	67.8	16.1	62.9
1.2	95.4	6.2	78.7	11.2	68.0	16.2	63.0
1.3	96.5	6.3	78.4	11.3	68.3	16.3	63.6
1.4	97.0	6.4	77.3	11.4	68.1	16.4	62.8
1.5	97.3	6.5	76.8	11.5	67.2	16.5	62.5
1.6	98.1	6.6	75.8	11.6	66.7	16.6	62.8
1.7	98.3	6.7	76.9	11.7	67.3	16.7	64.0
1.8	98.2	6.8	76.3	11.8	66.9	16.8	63.7
1.9	98.2	6.9	75.3	11.9	67.1	16.9	63.7
2.0	98.1	7.0	75.8	12.0	68.0	17.0	63.9
2.1	98.2	7.1	76.4	12.1	68.1	17.1	64.7
2.2	98.5	7.2	75.0	12.2	67.4	17.2	64.5
2.3	98.9	7.3	74.3	12.3	66.8	17.3	64.4
2.4	98.3	7.4	73.1	12.4	67.0	17.4	64.3
2.5	98.2	7.5	72.7	12.5	66.4	17.5	63.8
2.6	98.5	7.6	72.1	12.6	65.3	17.6	63.2
2.7	98.6	7.7	73.3	12.7	66.0	17.7	62.5
2.8	98.2	7.8	73.1	12.8	66.1	17.8	62.1
2.9	98.5	7.9	72.3	12.9	65.7	17.9	62.0
3.0	99.1	8.0	71.4	13.0	66.5	18.0	61.6
3.1	99.3	8.1	71.7	13.1	66.8	18.1	60.8
3.2	99.3	8.2	70.7	13.2	66.6	18.2	59.3
3.3	98.4	8.3	70.5	13.3	66.5	18.3	58.5
3.4	97.1	8.4	70.1	13.4	66.7	18.4	57.2
3.5	96.4	8.5	71.5	13.5	67.4	18.5	56.4
3.6	94.6	8.6	70.9	13.6	67.7	18.6	56.6
3.7	95.0	8.7	70.2	13.7	68.1	18.7	57.3
3.8	95.4	8.8	69.8	13.8	67.9	18.8	58.0
3.9	93.6	8.9	69.5	13.9	67.6	18.9	59.3
4.0	93.3	9.0	68.2	14.0	67.3	19.0	55.0
4.1	92.6	9.1	69.0	14.1	67.5		
4.2	91.4	9.2	69.6	14.2	68.2		
4.3	90.4	9.3	68.8	14.3	69.2		
4.4	89.9	9.4	67.9	14.4	68.9		
4.5	89.5	9.5	67.7	14.5	68.0		
4.6	89.2	9.6	68.0	14.6	67.0		
4.7	87.5	9.7	68.0	14.7	66.9		
4.8	87.1	9.8	67.7	14.8	66.8		
4.9	86.3	9.9	68.8	14.9	67.5		
5.0	86.1	10.0	69.6	15.0	67.3		

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MORE INFORMATION ABOUT THE BATTERY

The CG18G is equipped with a 3.7 V Lithium cell. The battery voltage is indicated with a green LED for normal operation. If the red LED “Low Bat” is illuminated recharge is required.

A full battery charging period using the USB port takes around 5 hours. While recharging the yellow LED “Charge” is illuminated. The power-switch should be set to OFF during the recharging period. It is possible to measure during recharging. But disturbances generated by the charger could have an unwanted influence on the measurement. A special circuit prevents the battery from being discharged completely.

Whenever the voltage is too low for battery health or measurement precision, it will be automatically isolated from the load. When the CG18G is switched ON and the red LED below is dark, this isolation has taken place. In this case the battery must be charged immediately. The second best advice is to switch OFF the CG18G to avoid the (very low) idle current of the protection circuit.