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Modulated Wideband Driver Amplifier

1 Introduction

The TBMDA1 modulated wideband driver amplifier is designed in order to create an inexpensive signal source for immunity testing of electronic building blocks and products. It is designed to be driven by the tracking generator output of spectrum analyzers. With its gain of 22 dB and 1dB compression point of +22dBm, it can boost the output power of a tracking generator up to 150mW. The TBMDA1 is ideal to drive Tekbox near field probes in order to find the sensitive spot of an electronic circuit or to create electric fields up to 50V/m when driving the Tekbox TEM Cell TBTC1, 25V/m when driving the TBTC2 or 18V/m when driving the TBTC3. Test signals for immunity testing can be CW, AM or PM. Consequently, the TBMDA1 provides built in modulation capability to generate 1kHz AM or PM signals. In PM mode, the TBMDA1 can also generate a 217Hz Signal with 12.5% duty cycle in order to simulate mobile phone TDMA noise.



Picture 1 – TBMDA1 modulated wideband driver amplifier front view



Picture 2 – TBMDA1 modulated wideband driver amplifier rear view

Modulated Wideband Driver Amplifier

Application:

general purpose gain block
 signal source for immunity testing, driving near field probes
 signal source for immunity testing, driving TEM Cells

Features:

CW amplifier (modulation off)
 1 kHz, 80% AM modulation
 1 kHz, 50% duty cycle pulse modulation
 217 Hz, 12.5% duty cycle pulse modulation

2 Electrical Specifications

Technical Data:

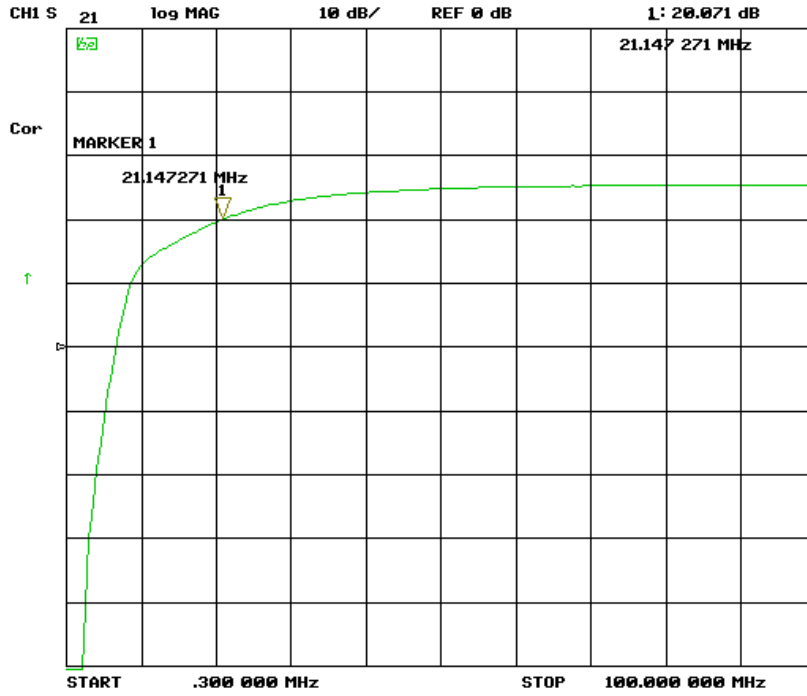
Input: 50 Ohm, SMA female
 Output: 50 Ohm, SMA female
 Nominal supply Voltage: 5V, typ. 235mA, Mini-USB-B connector
 Maximum supply voltage: 5.5V
 Maximum input power: +9dBm
 1dB output compression point @ 40MHz: +21.5dBm
 1dB output compression point @ 2 GHz: +22.5dBm
 3rd order output intercept point @ 40 MHz: +39dBm
 3rd order output intercept point @ 2 GHz: +42dBm
 Reverse isolation S12: -45dB
 Noise Figure: 3 ... 4 dB
 Internal modulation frequency AM: 1 kHz $\pm 10\%$
 Internal modulation frequencies PM: 1 kHz $\pm 10\%$, 217 Hz $\pm 20\%$
 Duty cycle, PM: 50% $\pm 10\%$ @ 1 kHz; 12.5% $\pm 20\%$ @ 217 Hz

Gain:

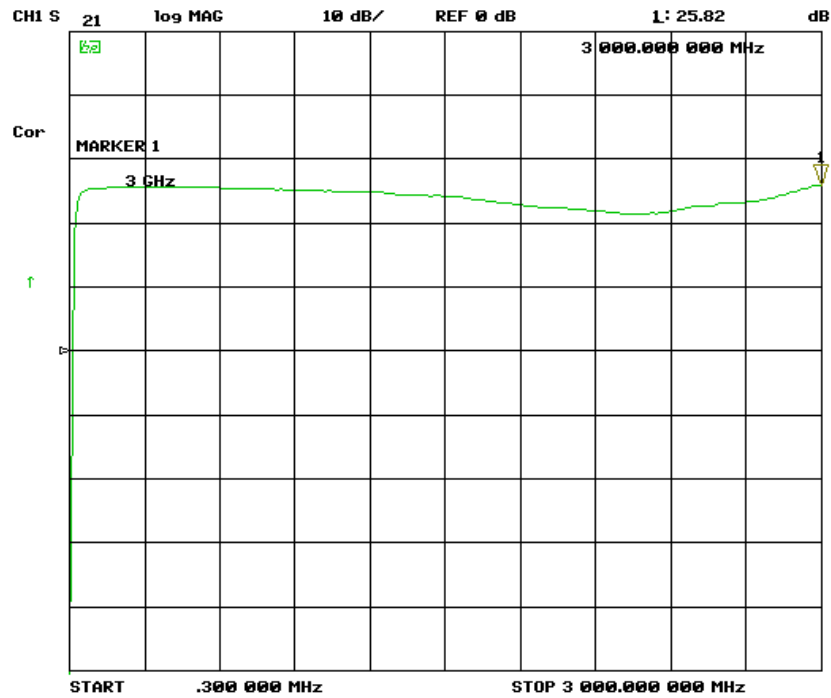
25 MHz	50 MHz	100 MHz	500 MHz	1 GHz	1.5 GHz	2 GHz	2.5 GHz	3 GHz
21.6 dB	24.9 dB	25.5 dB	25.6 dB	24.9 dB	24.1 dB	22.2 dB	22.8 dB	25.8 dB

Table 1 – TBMDA1 gain

Modulated Wideband Driver Amplifier



Picture 3 – TBMDA1, gain, 300 kHz – 100 MHz, lin.



Picture 4 – TBMDA1, gain, 300 kHz – 3 GHz, lin.

Modulated Wideband Driver Amplifier

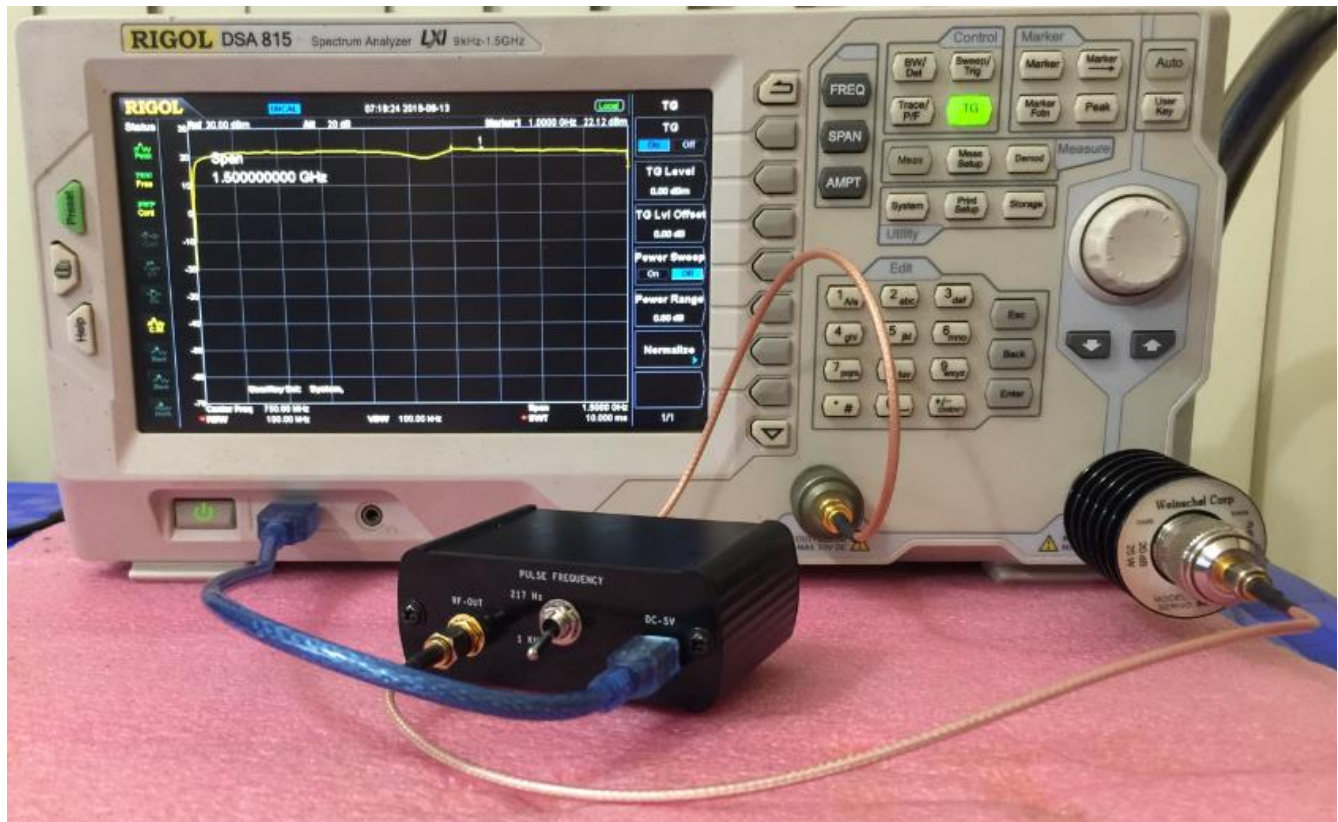
3 Driving the TBMDA1 with a tracking generator

WARNING:

Never connect the output of the TBMDA1 directly to the input of a spectrum analyzer. Check the maximum input ratings of the spectrum analyzer and protect it with an appropriate attenuator.

Example:

Rigol DSA815 – maximum input power rating: +20dBm



Picture 5 – DSA815 input protected with a 20dB attenuator

Modulated Wideband Driver Amplifier

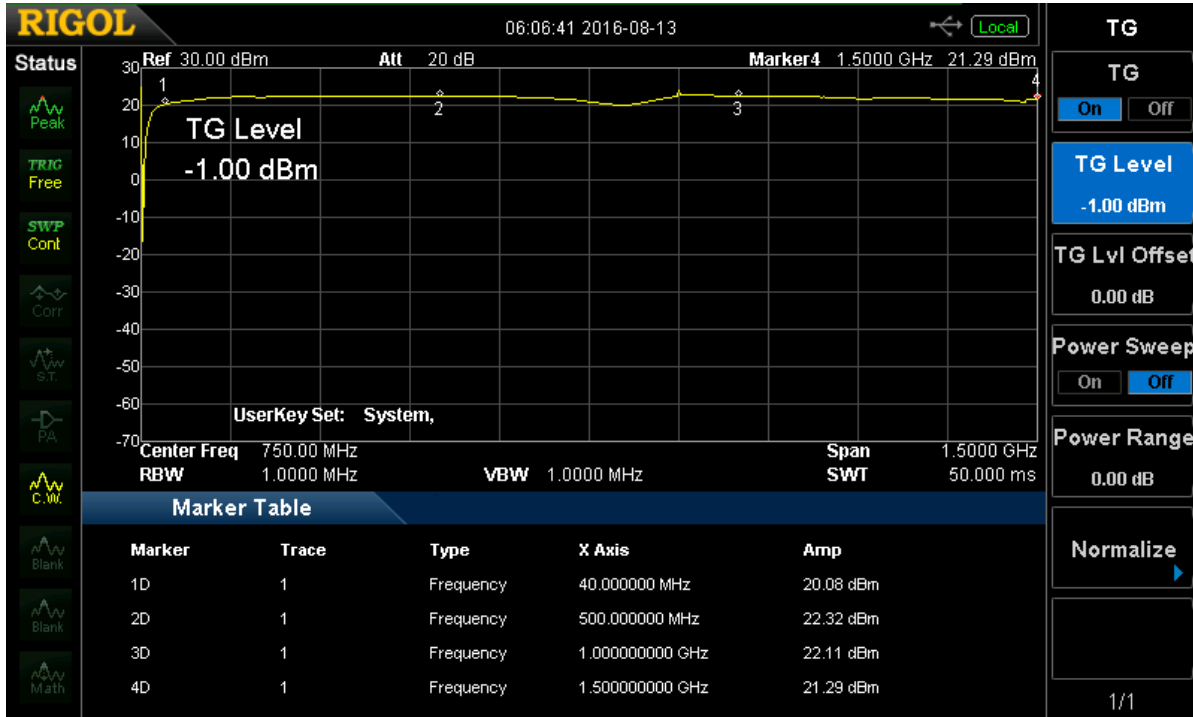


Picture 6 – output power of the TBMDA1, CW, driven by the DSA815 tracking generator set to -5dBm



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Picture 7 – output power of the TBMDA1, CW, driven by the DSA815 tracking generator set to -3dBm

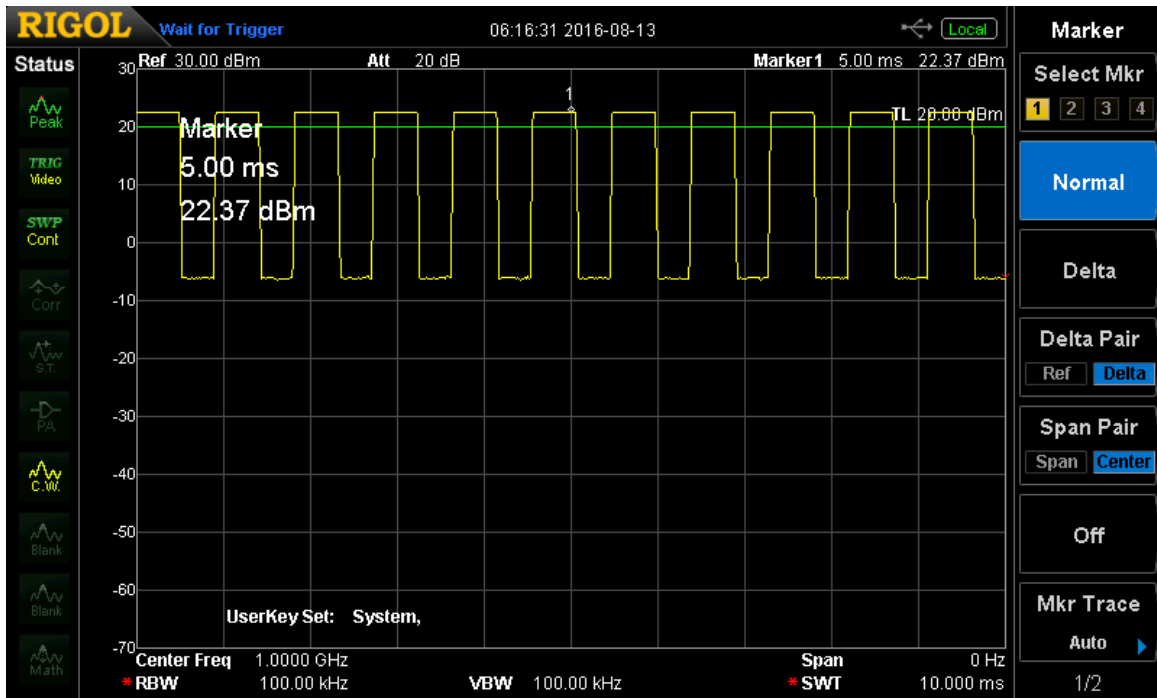


Picture 8 – output power of the TBMDA1, CW, driven by the DSA815 tracking generator set to -1dBm

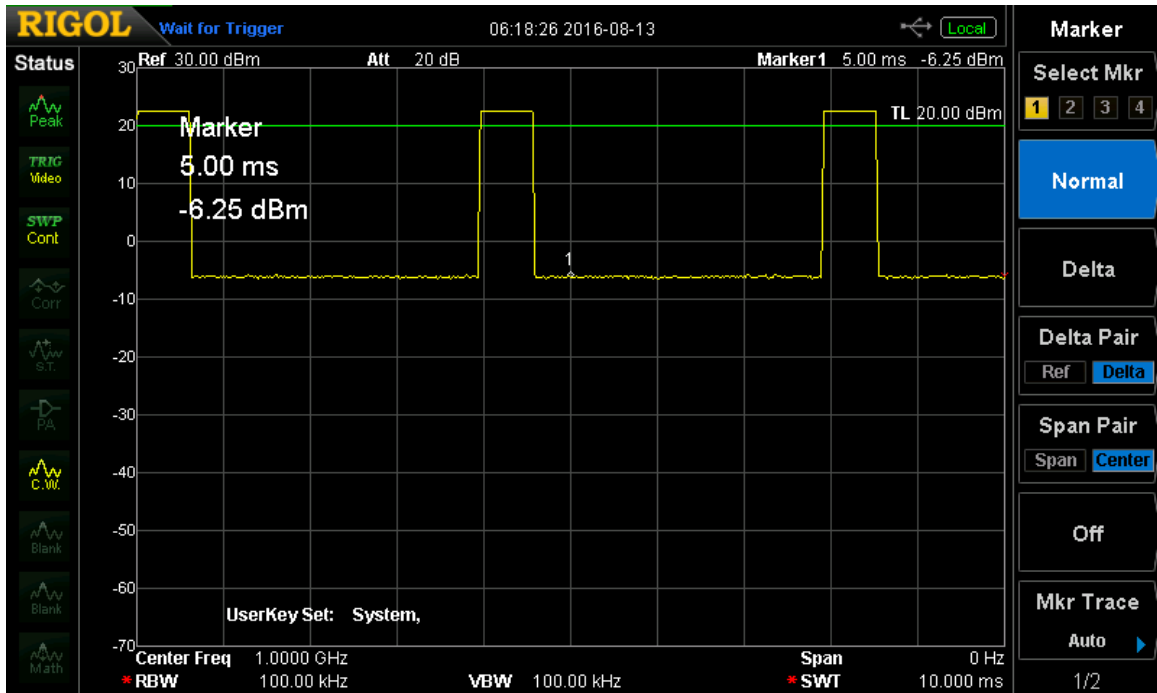


Modulated Wideband Driver Amplifier

Picture 9 – output power of the TBMDA1, CW, driven by the DSA815 tracking generator set to 0dBm

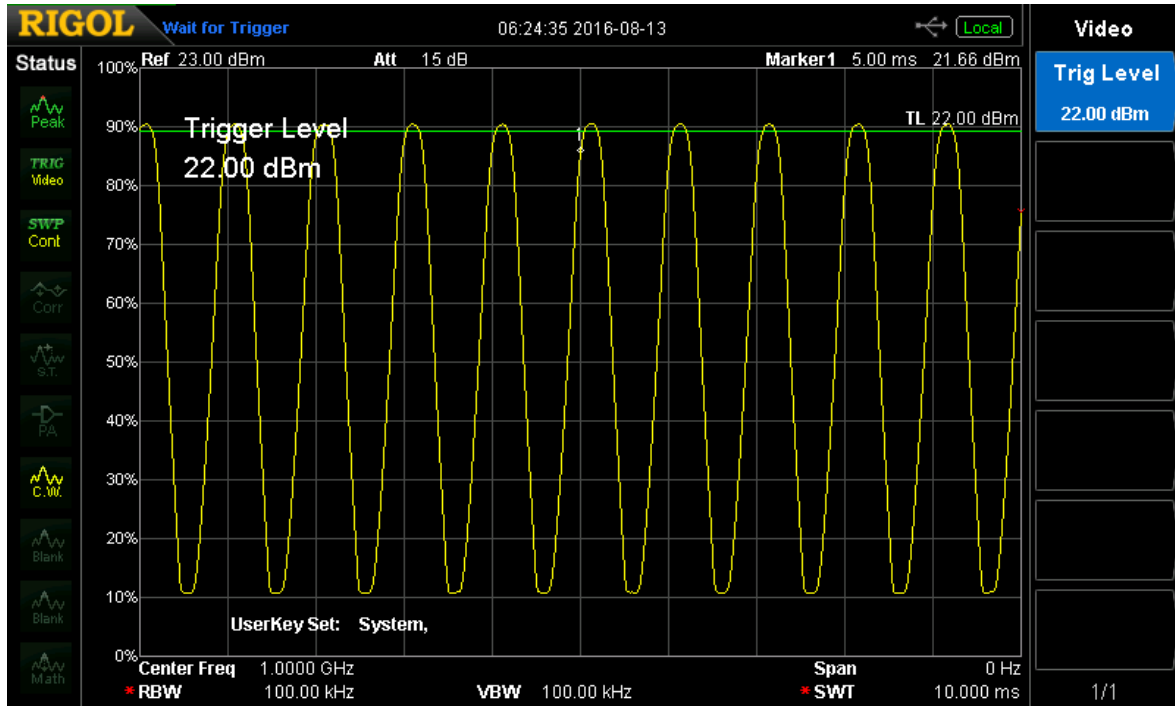


Picture 10 – output power of the TBMDA1, 1 kHz, 50% pulse modulation, driven by the DSA815 tracking generator set to 0dBm, zero span, 1GHz



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Picture 10 – output power of the TBMDA1, 217 Hz, 12.5% pulse modulation, driven by the DSA815 tracking generator set to 0dBm, zero span, 1GHz

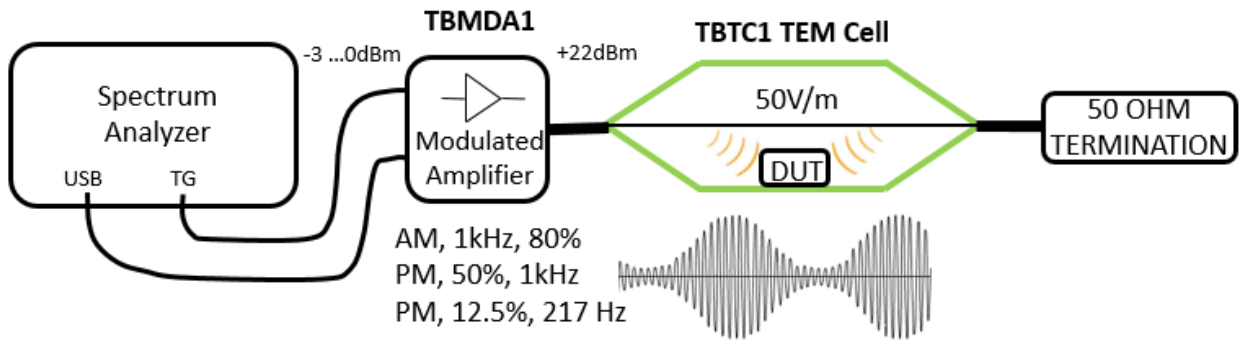


Picture 11 – output power of the TBMDA1, 1 kHz, 80% amplitude modulation, driven by the DSA815 tracking generator set to 0dBm, zero span, 1GHz

4 Applications

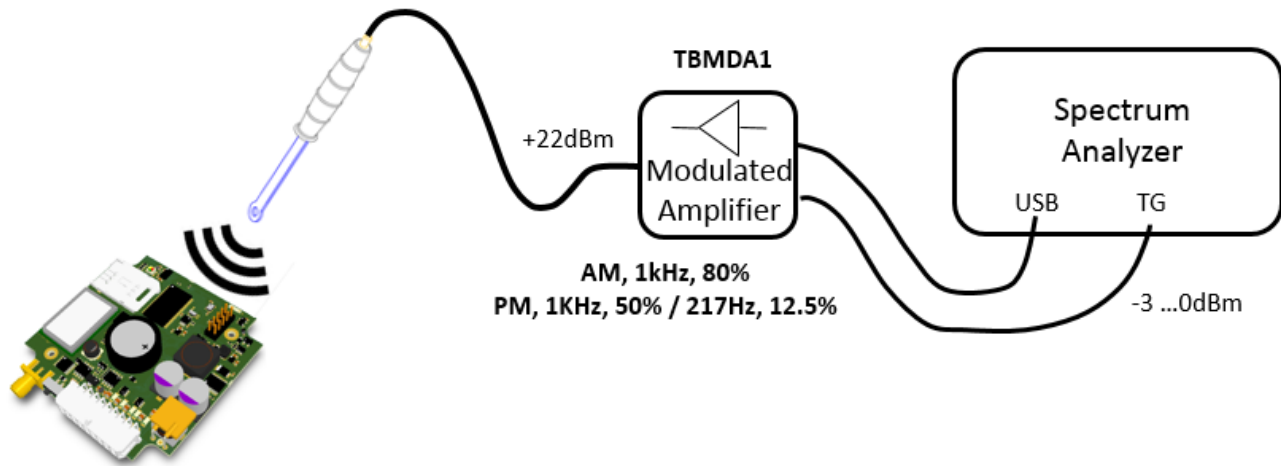
Immunity testing using a TEM cell

Modulated Wideband Driver Amplifier



Modulated Wideband Driver Amplifier

Immunity testing using near field probes



5 Ordering Information

Part Number	Description
TBMDA1	modulated driver amplifier, 1 pc 25cm SMA-male to SMA-male cable, 1 pc 75cm SMA-male to N-male cable. 1 pc SMA-female to N-male coaxial adapter, USB cable, measurement plot

Table 2 – Ordering Information

6 History

Version	Date	Author	Changes
V1.0	13.8.2016	Mayerhofer	Creation of the document
V1.1	16.8.2016	Mayerhofer	Chapter 2 updated
V1.2	10.9.2016	Mayerhofer	Frequency response updated
V1.3	14.11.2016	Mayerhofer	Chapter 5 updated, deliverables

Table 3 – History