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

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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 ±10%

Internal modulation frequencies PM: 1 kHz ±10%, 217 Hz ±20%

Duty cycle, PM: 50% ±10% @ 1 kHZ; 12.5% ±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

CH1 S	21	log MAG	10 dB/	REF 0 dB		1: 20.071 dB

21.147 271 MHz

Cor

MARKER 1

21.147271 MHz

START .300 000 MHz   STOP 100.000 000 MHz
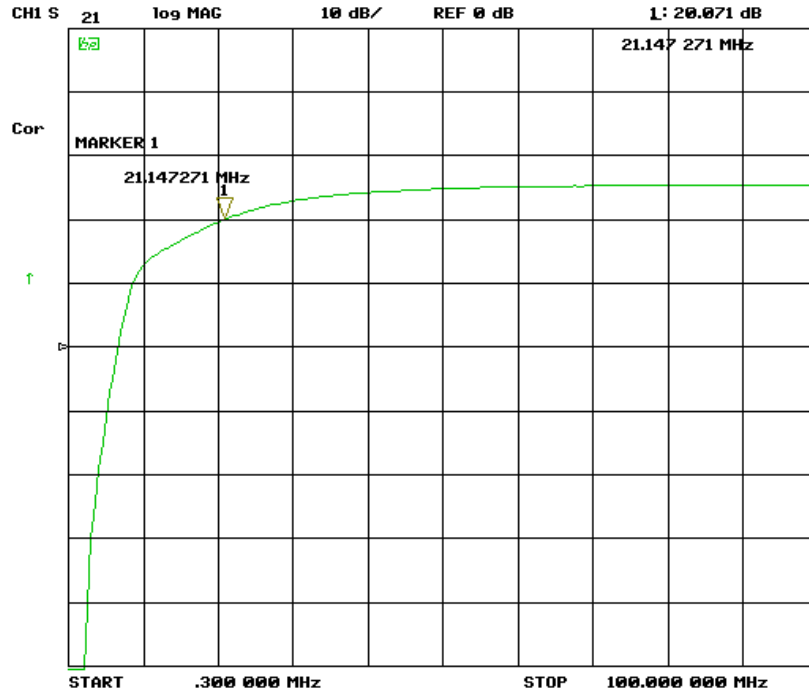
Picture 3 – TBMDA1, gain, 300 kHz – 100 MHz*, lin.*

CH1 S	21	log MAG	10 dB/	REF 0 dB		1: 25.82	dB

3 000.000 000 MHz

Cor

MARKER 1

3 GHz

START .300 000 MHz   STOP 3 000.000 000 MHz
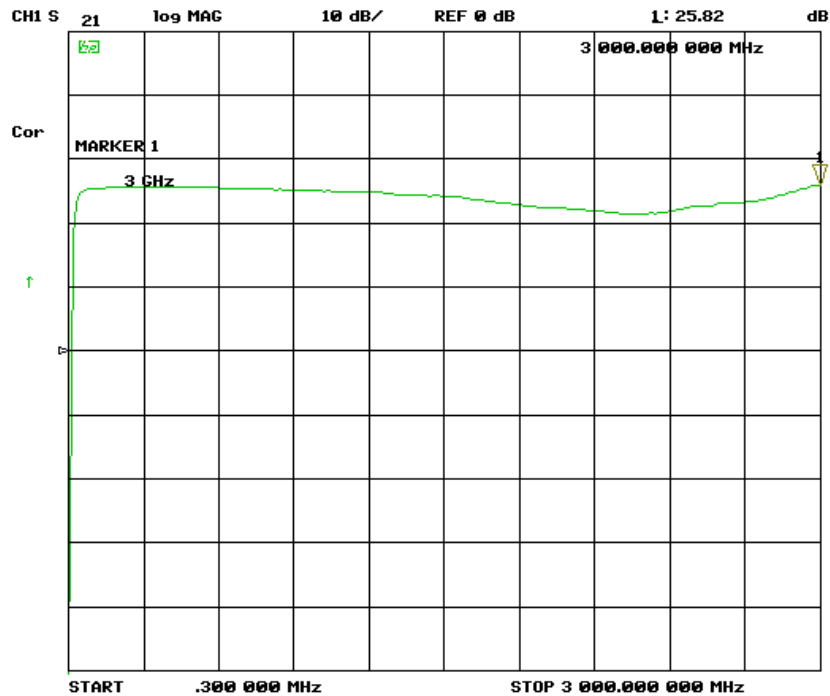
Picture 4 – TBMDA1, gain, 300 kHz – 3 GHz, lin.
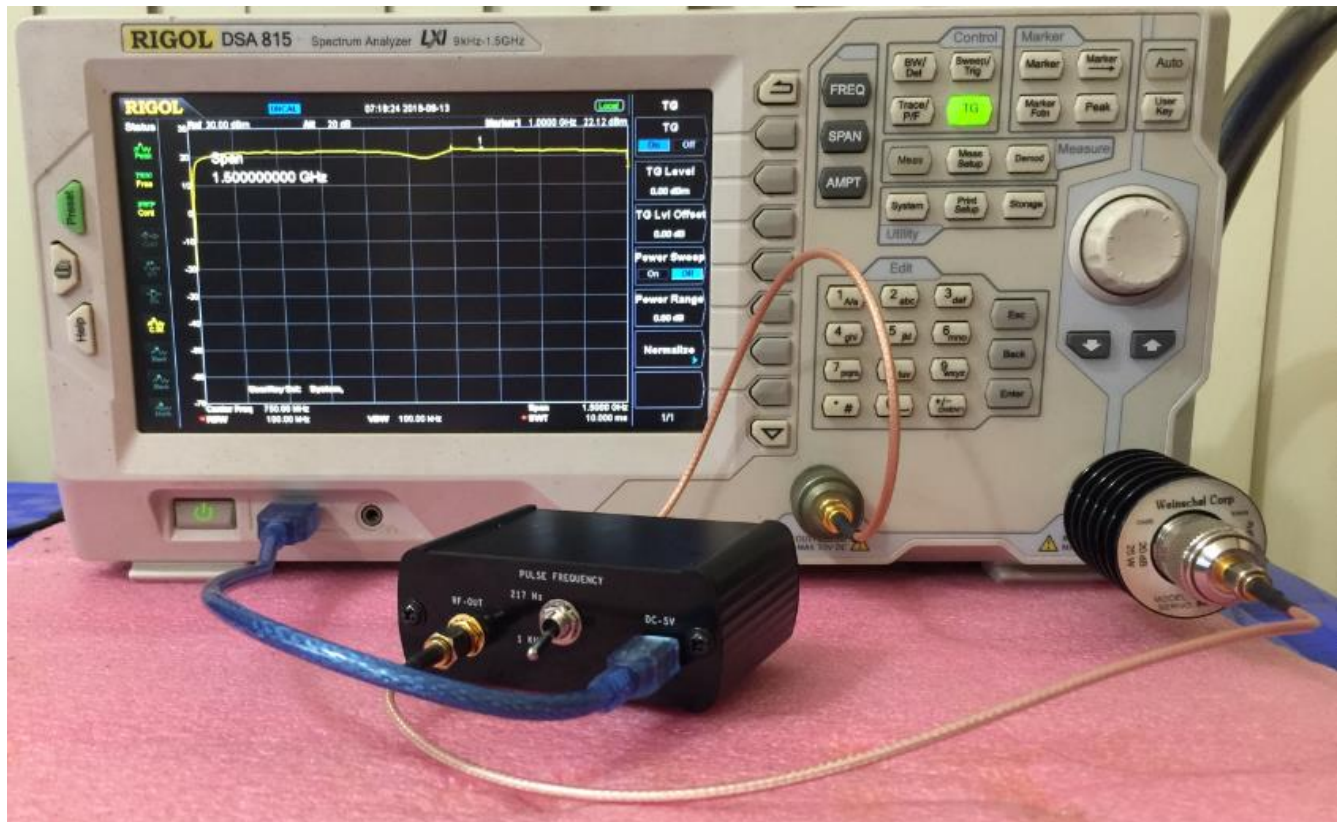
Modulated Wideband Driver Amplifier

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

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Picture 6 – output power of the TBMDA1, CW, driven by the DSA815 tracking generator set to -5dBm
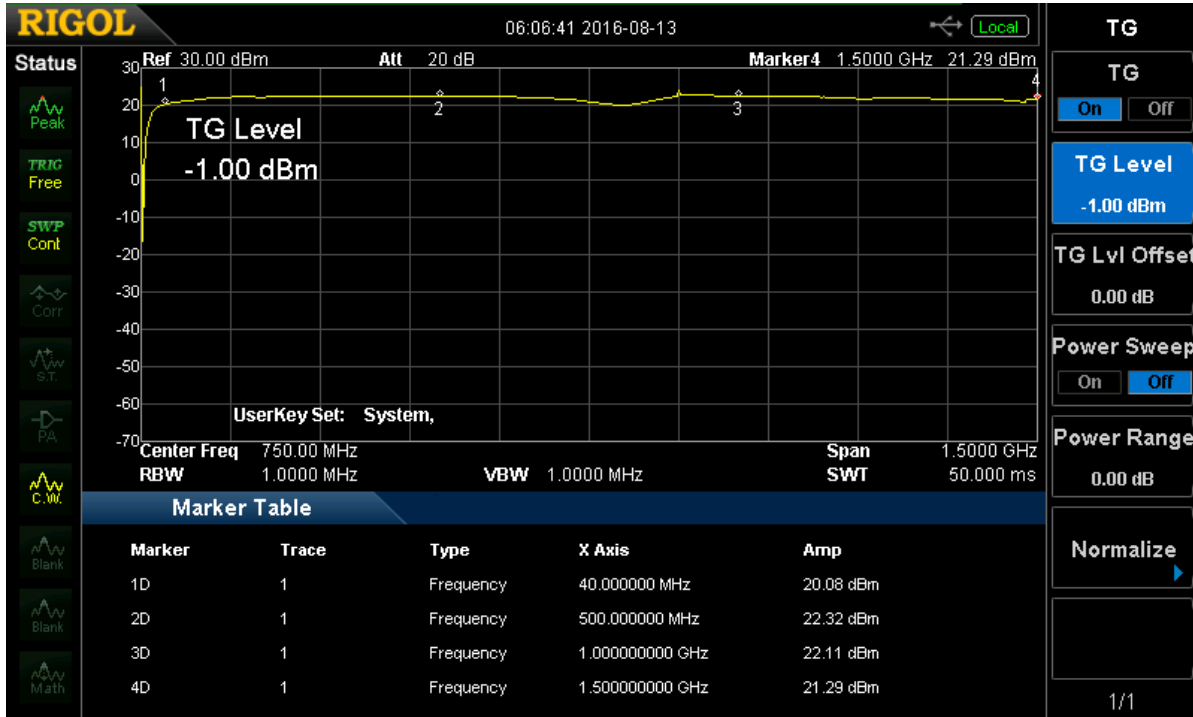
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Picture 7 – output power of the TBMDA1, CW, driven by the DSA815 tracking generator set to -3dBm

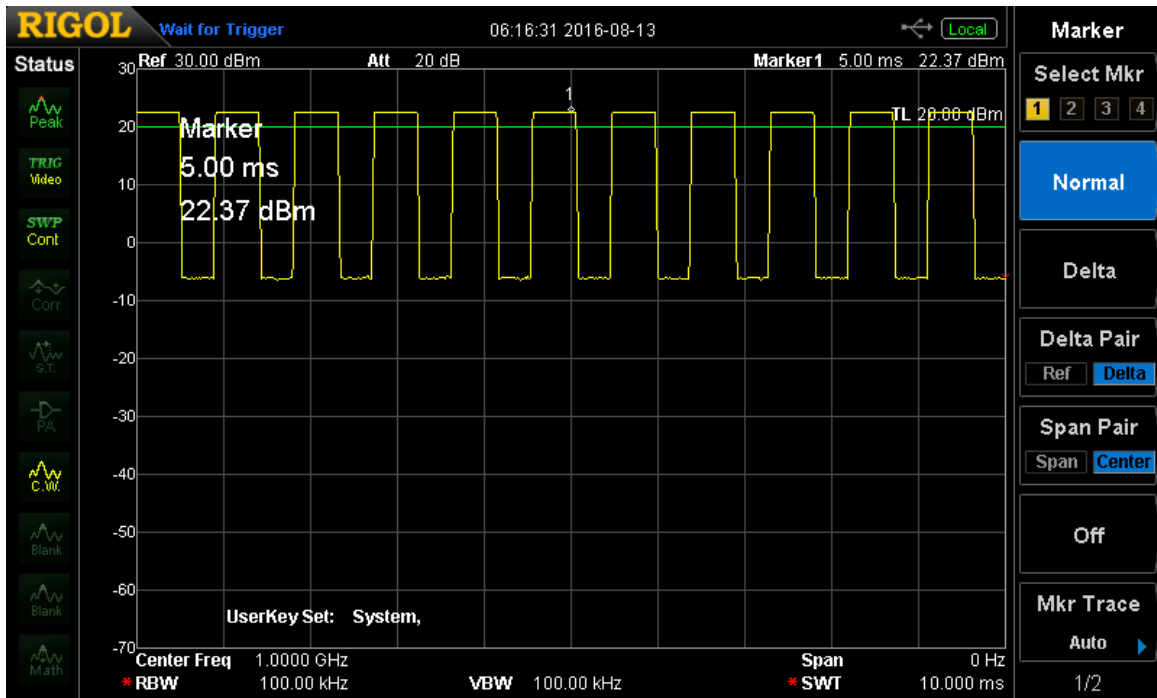*Picture 8 – output power of the TBMDA1, CW, driven by the DSA815 tracking generator set to -1dBm*

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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
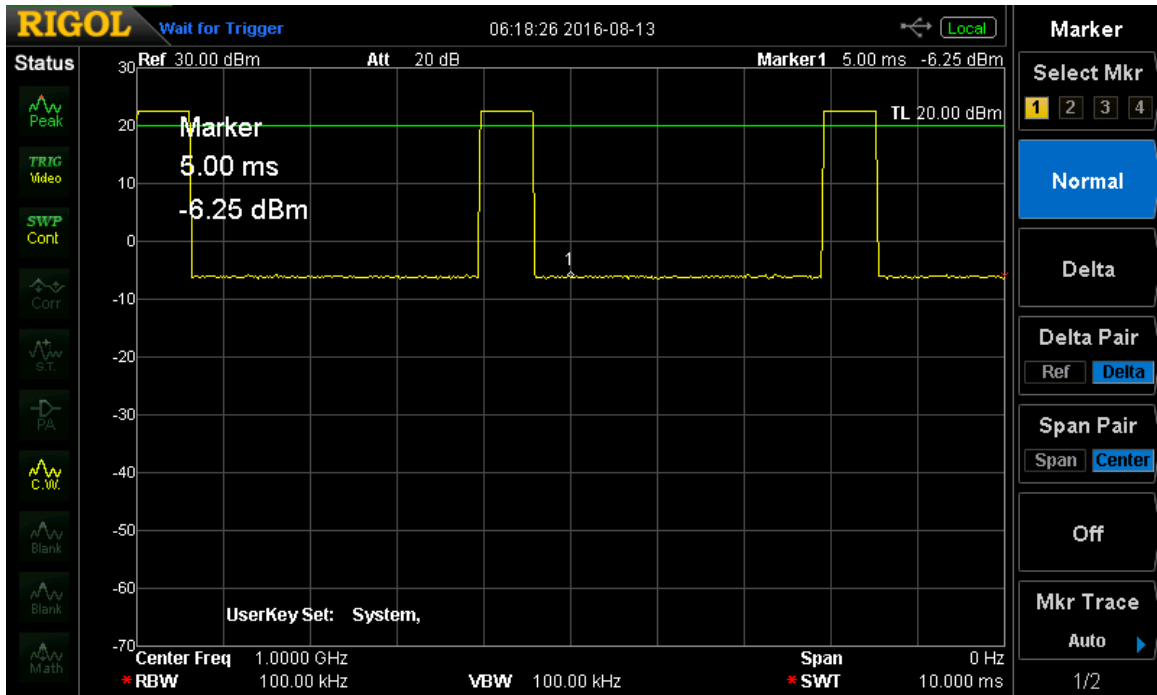
Modulated Wideband Driver Amplifier

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

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Modulated Wideband Driver Amplifier

Spectrum Analyzer
USB   TG

TBMDA1
-3 ...0dBm

Modulated Amplifier

+22dBm

TBTC1 TEM Cell
50V/m
DUT

50 OHM TERMINATION

AM, 1kHz, 80%
PM, 50%, 1kHz
PM, 12.5%, 217 Hz
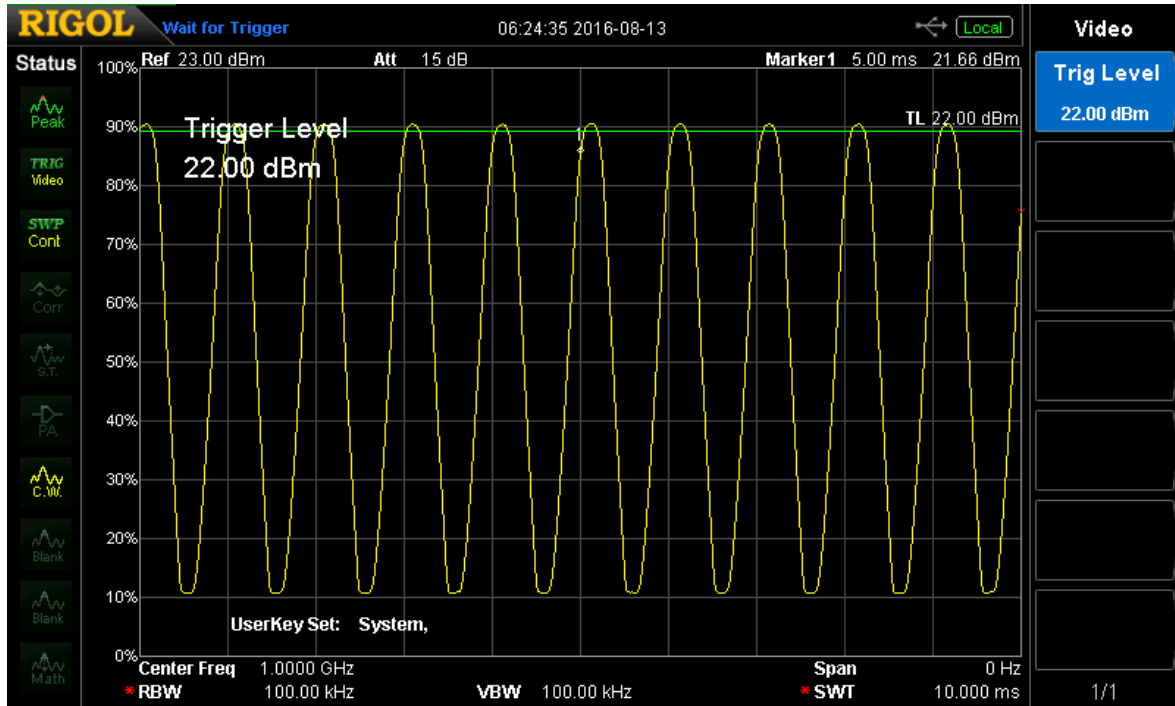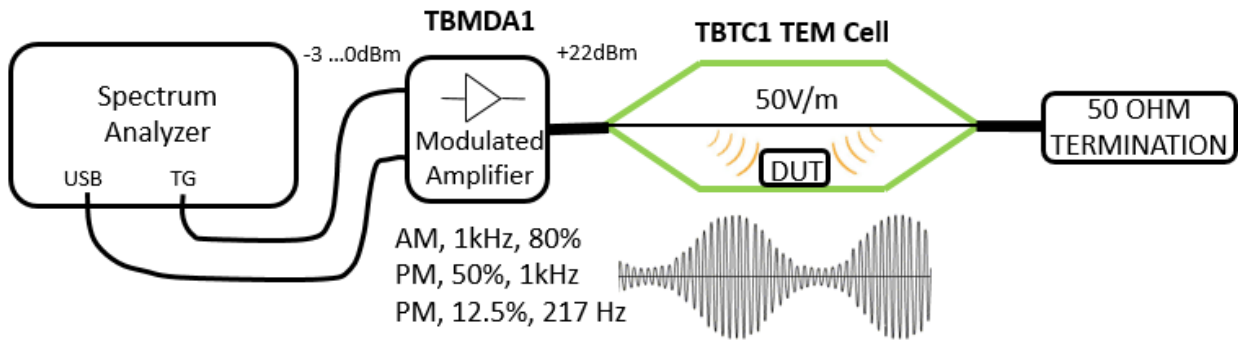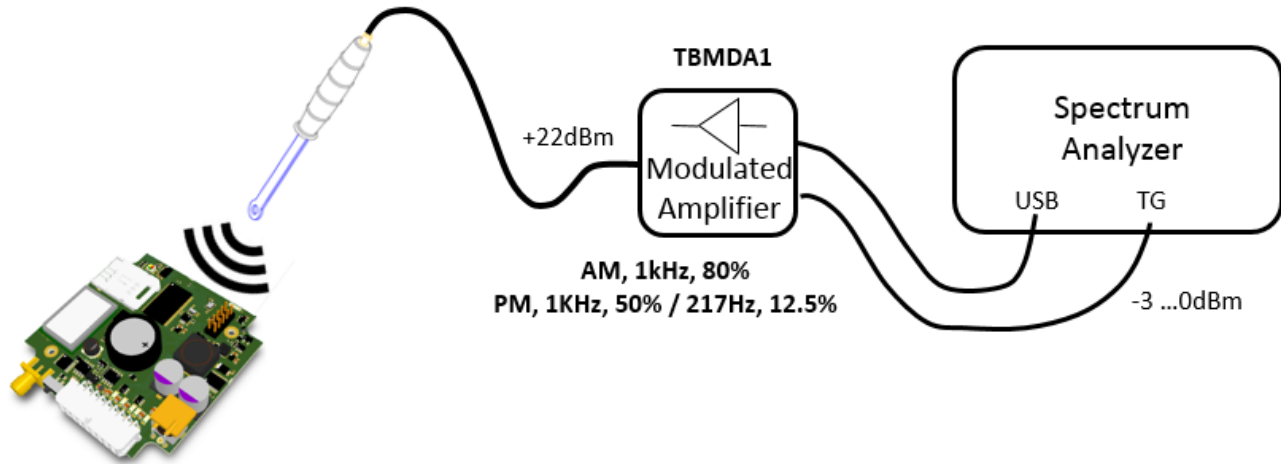
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Immunity testing using near field probes

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

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