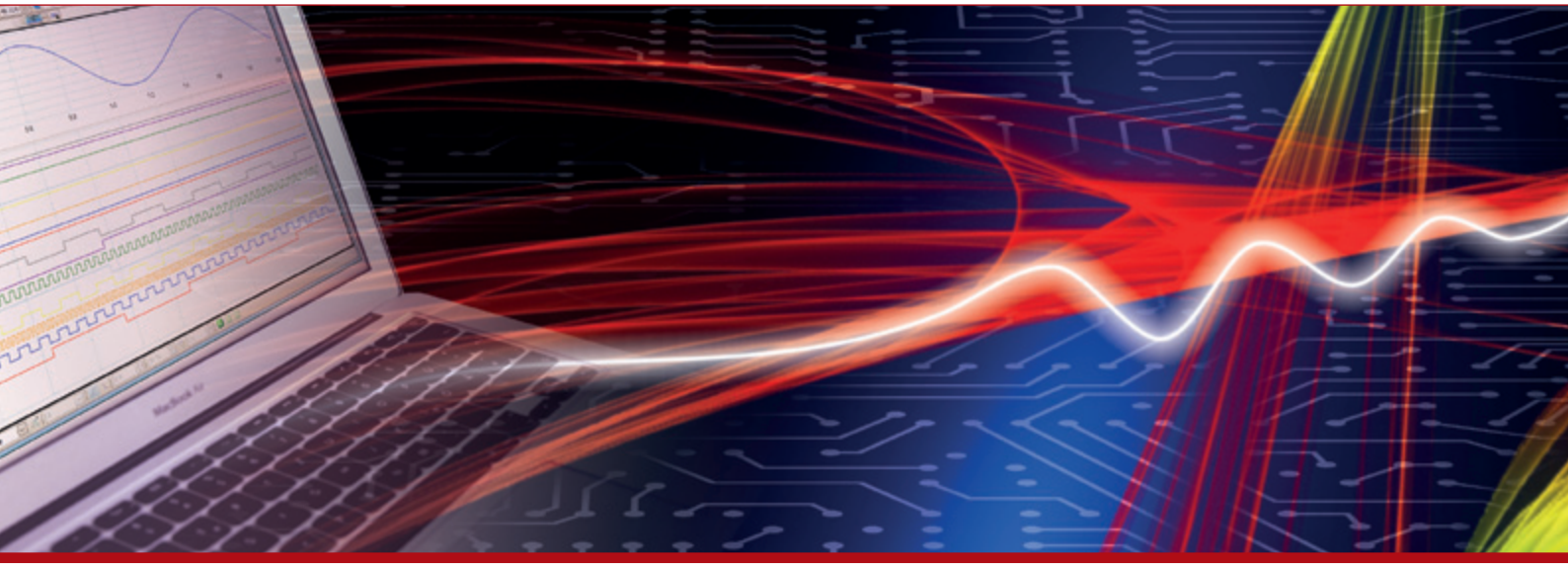
Product Datasheet - Technical Specifications



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V 1.0

TBHDR1

TEKBOX DIGITAL SOLUTIONS

TBHDR1 HIGH DYNAMIC RANGE AMPLIFIER

The TBHDR1 is a high dynamic range amplifier with a frequency range from 30kHz to 1.5GHz. Its gain is characterized up to 6GHz.

V 1.0

TBHDR1

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1. INTRODUCTION

The TBHDR1 is a high dynamic range amplifier with a frequency range from 30kHz to 1.5GHz. Its gain is characterized up to 6GHz.

The TBHDR1 has a high IP3 and a low noise figure which makes it an ideal alternative pre-amplifier for spectrum analyzers and receivers in EMC test applications. Due to its low noise figure, high IP3 and gain down to the kHz range it also performs very well as amplifier for active loop antennas.

1.1 APPLICATION

- **General purpose gain block**
- **Pre-amplifier in applications with low noise and high IP3 requirements**
- **Pre-amplifier for spectrum analyzers, especially in EMC pre-compliance test applications.**
- **Loop antenna amplifier**

Picture 1 – TBHDR1 wide-band RF pre-amplifier, front view

Picture 2 – TBHDR1 wide-band RF pre-amplifier, rear view

2. ELECTRICAL SPECIFICATIONS

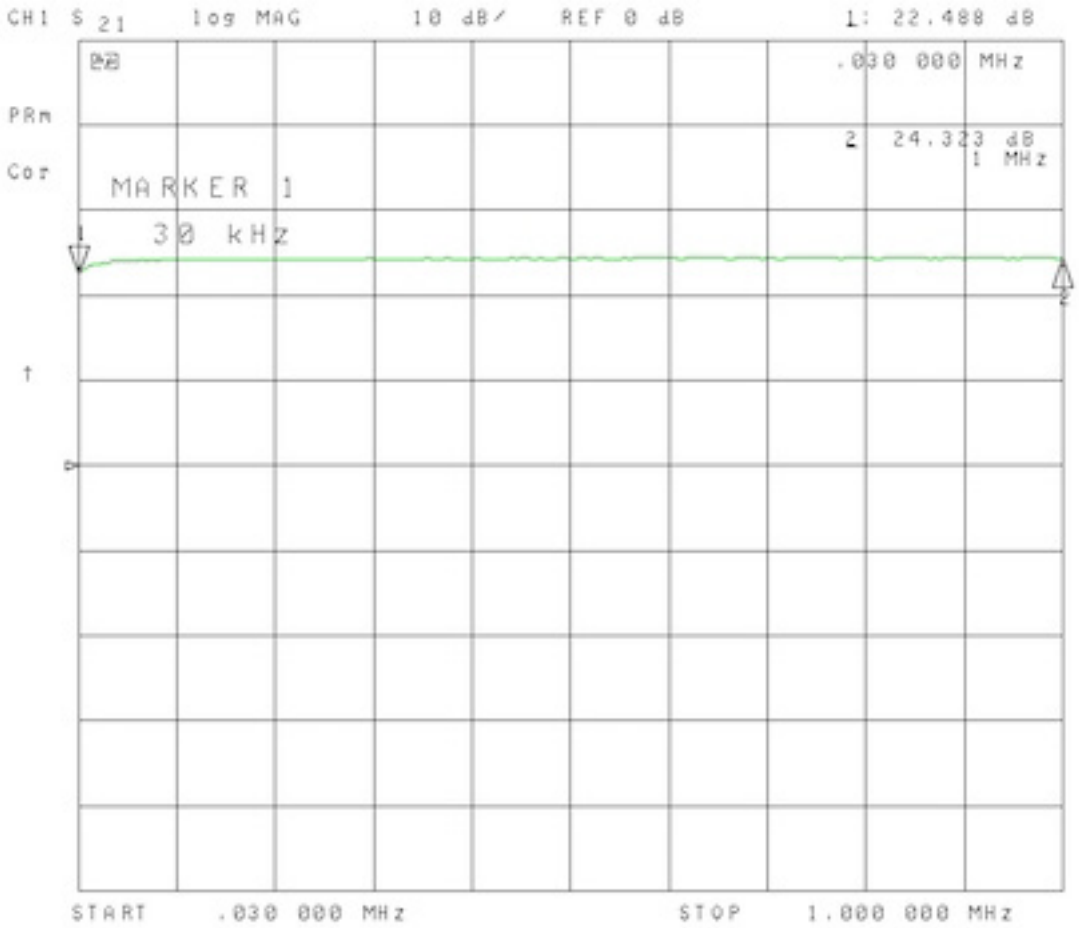
Technical Data:

- **Maximum supply voltage: 5.5V**
- **Maximum input power: +10 dBm**
- **Input, Output: 50 Ohm, SMA female**
- **Nominal supply Voltage: 5V, typ. 100mA, Mini-USB-B connector**
- **1dB output compression point @ 100 MHz: +19.2 dBm typical**
- **1dB output compression point @ 500 MHz: +19 dBm typical**
- **1dB output compression point @ 1000 MHz: +18.3 dBm typical**
- **3rd order output intercept point @ 100 MHz: +38dBm**
- **3rd order output intercept point @ 500 MHz: +37dBm**
- **3rd order output intercept point @ 1000 MHz: +33dBm**
- **Reverse isolation S12: -28dB**
- **Input matching: 30kHz-1.5GHz < - 16 dB**
- **Output matching: 30kHz-1.5GHz < - 10 dB**
- **Noise Figure: 2.7 dB**

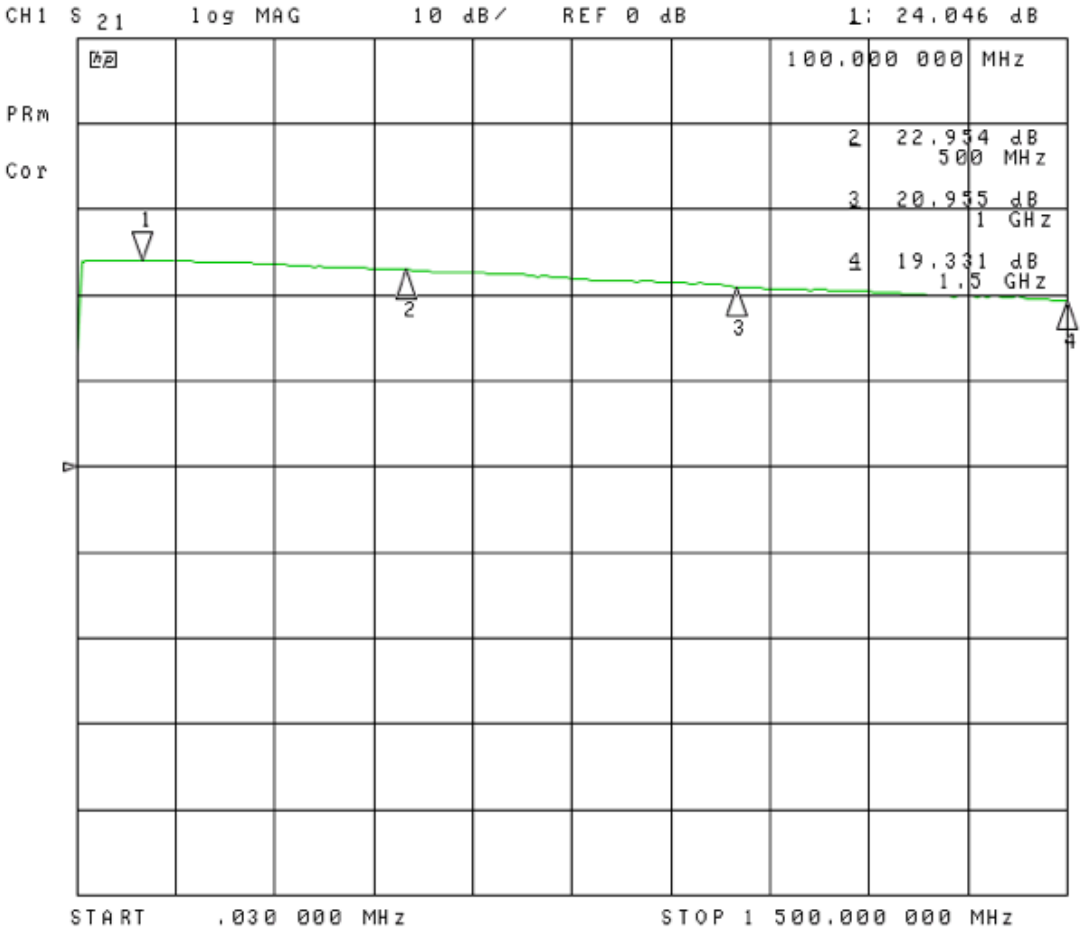
typ. gain:

30 kHz	150 kHz	1 MHz	100 MHz	500 MHz	1 GHz	1.5 GHz	3 GHz	6 GHz
22.5 dB	23.6 dB	24.2 dB	24 dB	22.9 dB	21.1 dB	19.5 dB	14.1 dB	5.3 dB

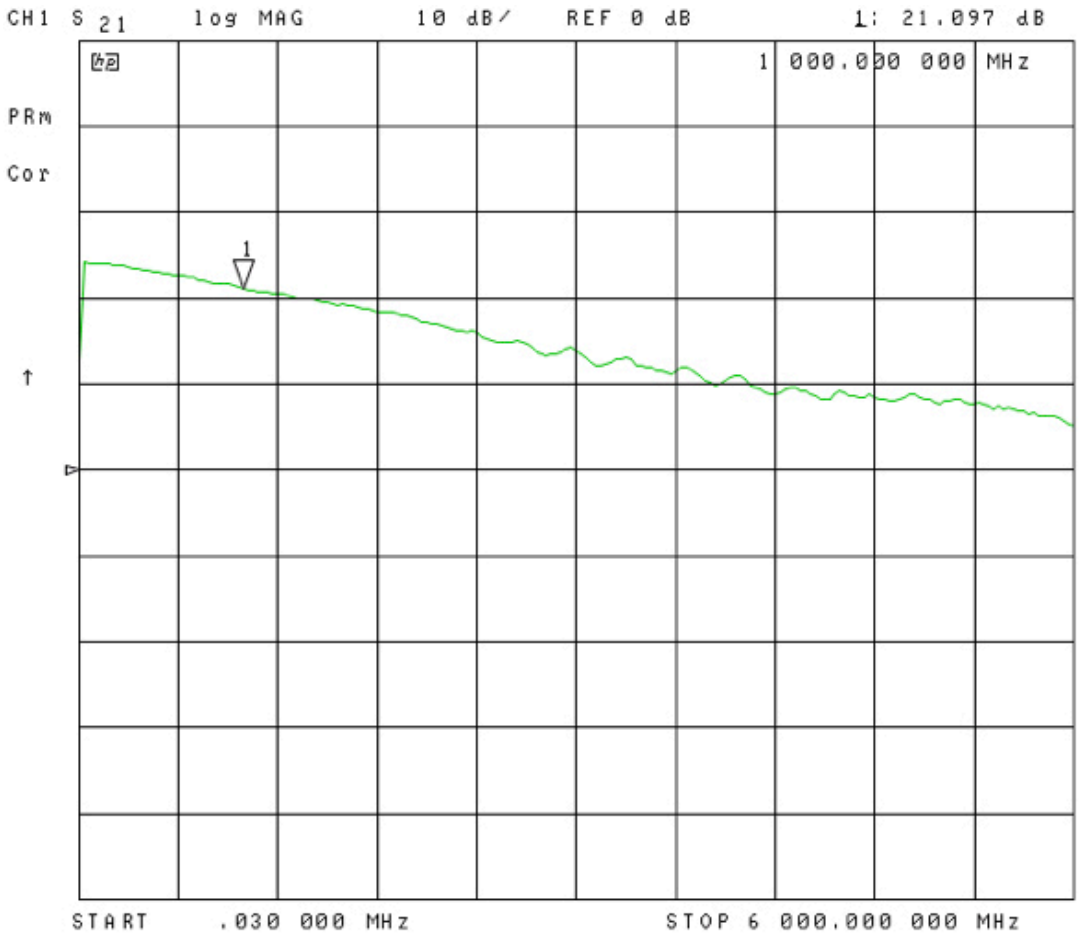
Table 1 – TBHDR1 gain



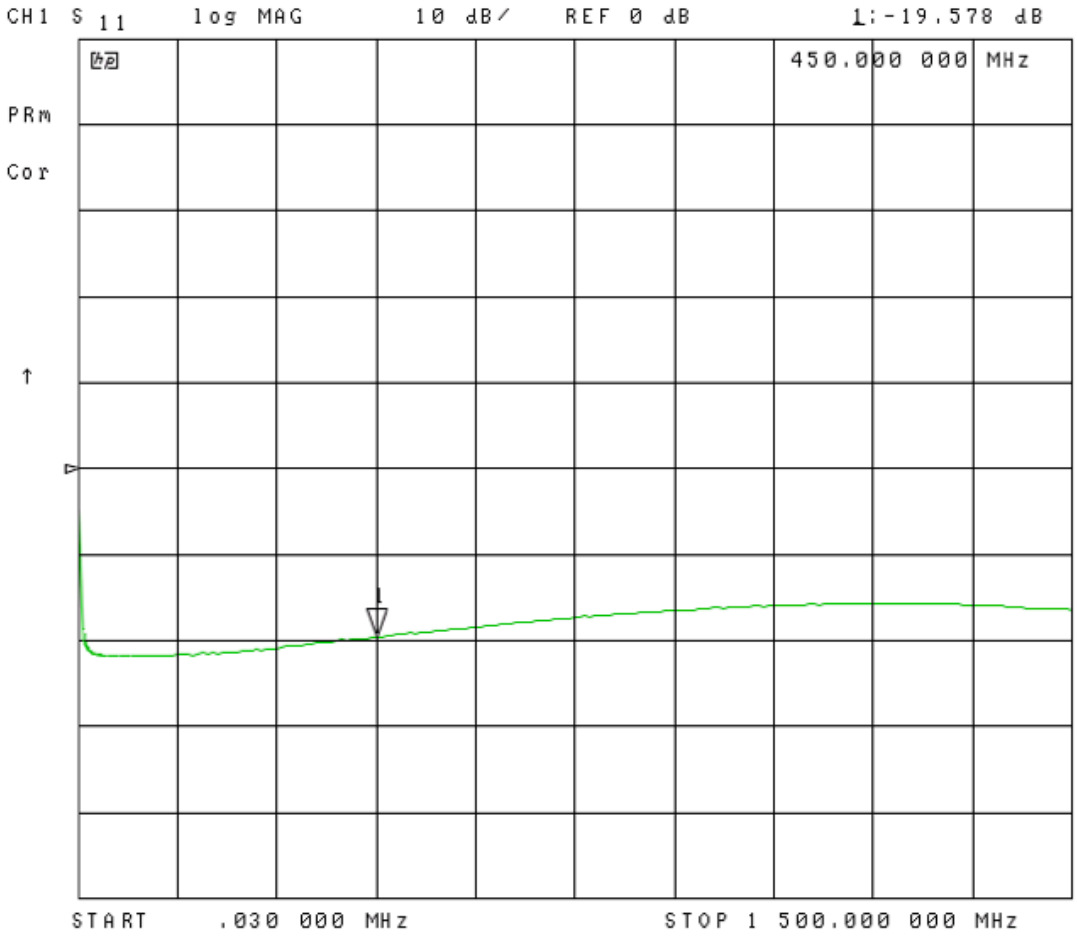
Picture 3 – TBHDR1, gain, 30 kHz – 1 MHz



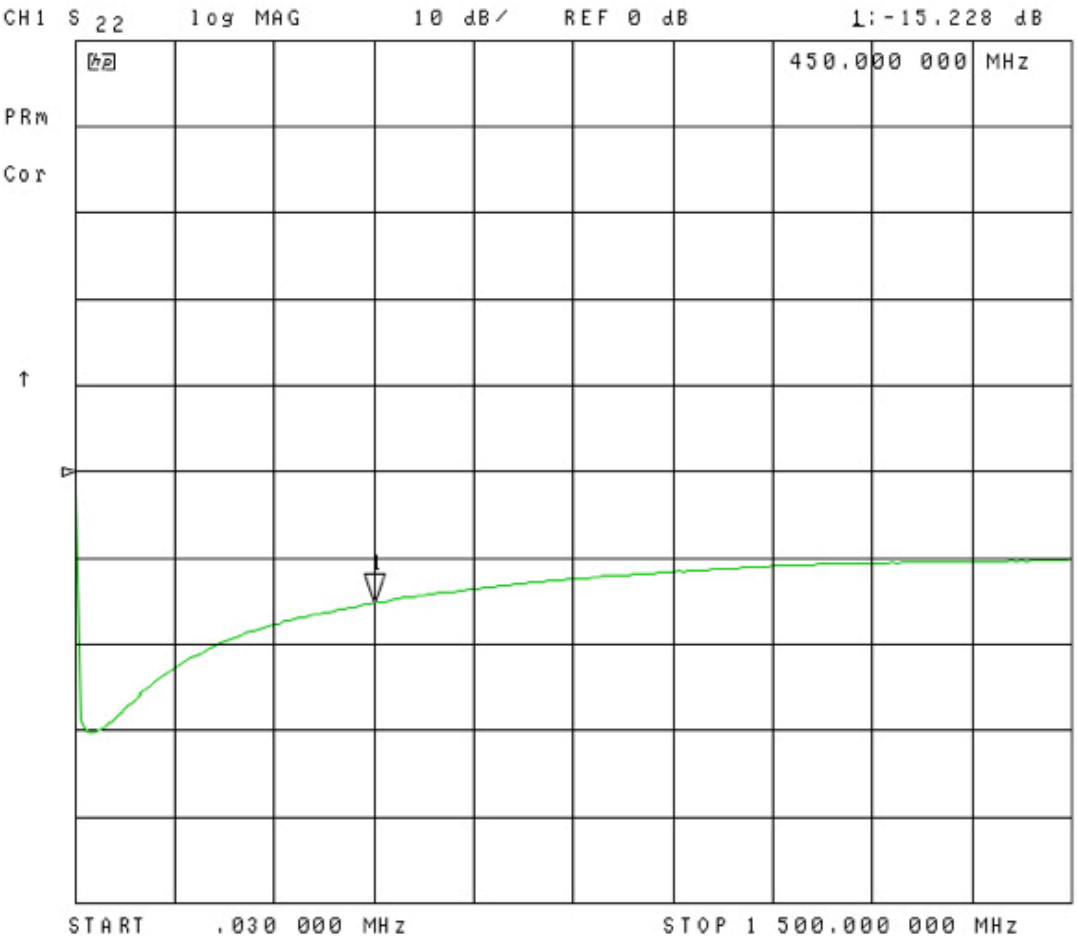
Picture 4 – TBHDR1, gain, 30 kHz – 1.5 GHz



Picture 5 – TBHDR1, gain, 30 kHz – 6 GHz



Picture 6 – TBHDR1, input return loss, IS11I, 30 kHz – 1.5 GHz



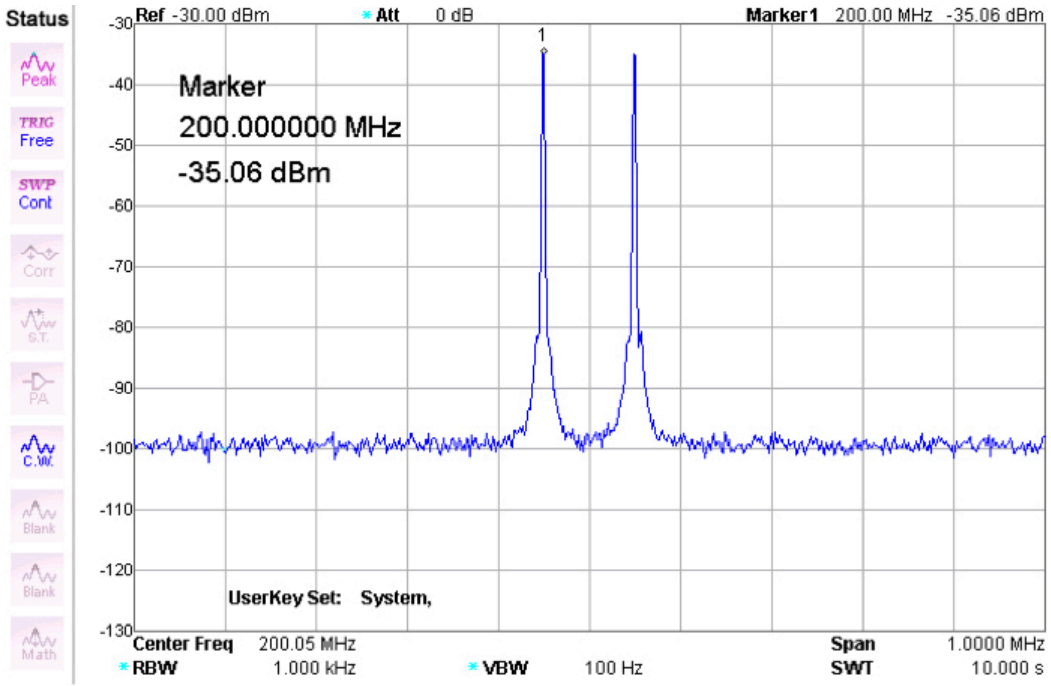
Picture 7 – TBHDR1, output return loss, IS22I, 30 kHz – 1.5 GHz

3. APPLICATION AS PRE-AMPLIFIER FOR SPECTRUM ANALYZERS

In applications, where signals close to the base noise floor of the spectrum analyzer need to be investigated, it may be necessary to turn on the internal pre-amplifier. However, as pre-amplifiers of spectrum analyzers are typically optimized for low noise, non-linearities may create distortions, which falsify the displayed spectrum. Third order non-linearities are especially critical, as they often appear in the frequency range of interest.

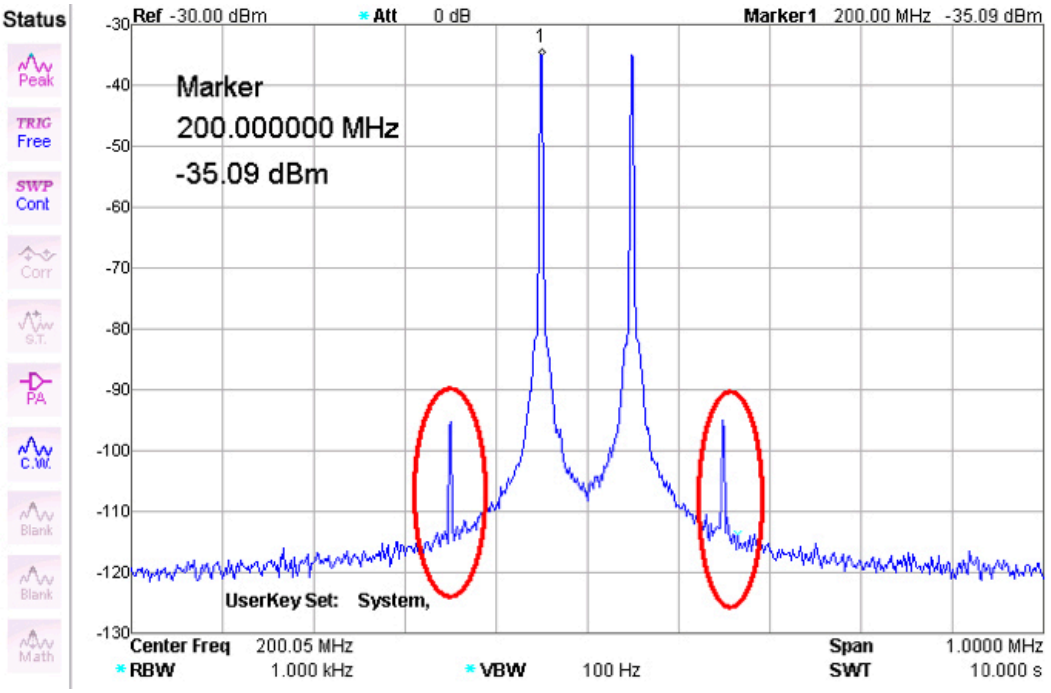
EXAMPLE:

The picture below shows two signals with an amplitude of -35dBm and frequencies 200MHz, 200.1MHz at the input of a spectrum analyzer

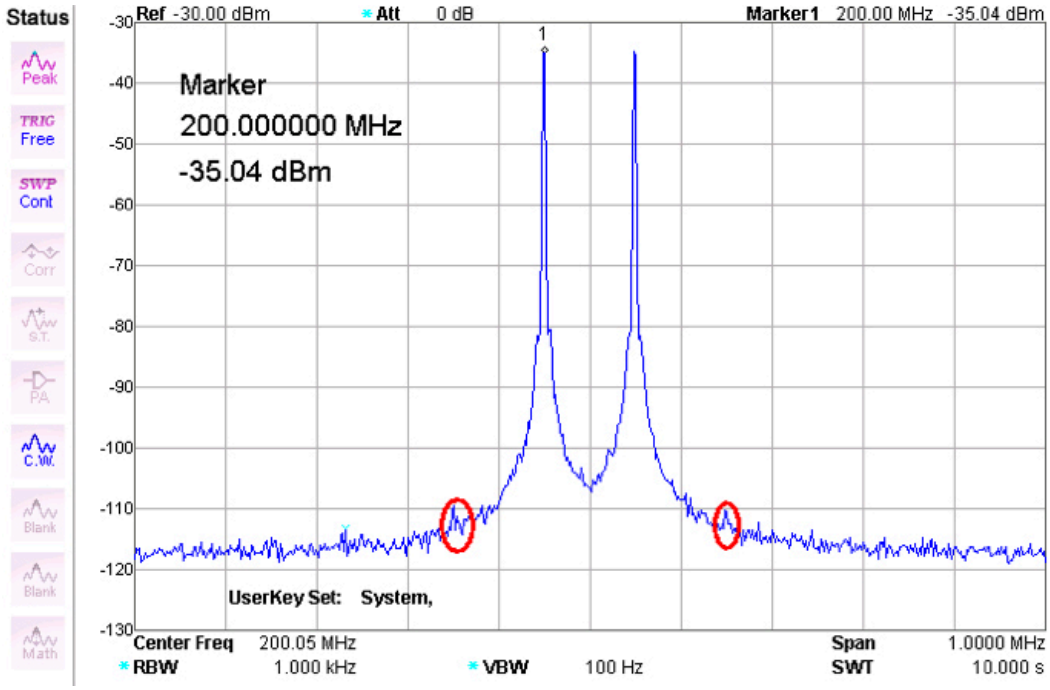


If there is no requirement to look at signals with amplitudes close to the noise floor, everything is fine. However, if the spectrum has to be checked for signals with amplitudes close to the noise floor of approximately -100 dBm, the internal pre-amplifier of the spectrum analyzer needs to be turned on.

The picture below shows the spectrum of exactly the same set up, with the pre-amplifier of the spectrum analyzer turned on. It shows two additional spectral lines which are caused by third order intermodulation of the internal preamplifier. Assuming there are more than two signals present at the analyzer, e.g. when doing radiated or conducted noise EMC pre-compliance testing or when investigating broadcast spectrum. It will become hard to tell which signals are real and which signals are intermodulation products generated by the pre-amplifier of the spectrum analyzer:



The following spectrum shows the spectrum of the same set up, however using the TBHDR1 pre-amplifier instead of the internal amplifier of the analyzer. Due to the high IP3 of the TBHDR1, the amplitude of the intermodulation products are significantly lower, compared to the preamplifier of the spectrum analyzer.



4. ORDERING INFORMATION

PART NUMBER	DESCRIPTION
TBHDR1	24 dB pre-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

5. HISTORY

VERSION	DATE	AUTHOR	CHANGES
V1.0	30.8.2017	Mayerhofer	Creation of the document

Table 3 – History