

# TBCG3-CN Comb Generator

## 1 Introduction

The TBCG3-CN comb generator is primarily designed to verify conducted emission test set ups. It is a useful tool to validate correct operation of the LISN, correct set-up and correct configuration of the spectrum analyzer.

A rotary switch allows you to choose between five fixed comb frequencies and an external excitation input with a frequency range of 5 kHz to 300 MHz.

The comb generator comes with country specific adapter cables, which plug into the DUT socket of the (unpowered!) LISN.

The device is powered by four AA NiMH batteries and includes an external charger.



Picture 1: TBCG3-CN comb generator

The TBCG3-CN produces a comb spectrum with approximately 8 dB flatness in the frequency range up to 1.5 GHz and has a 50 Ohm output with a female N-connector.

The housing is milled from solid aluminium. A 1/4" – 20 UNC thread in the comb panel accepts standard tripod bolts.

## TBCG3-CN Comb Generator

### 2 Specification

Specified bandwidth: 1.5 GHz

Flatness of the comb spectrum: 8 dB typically (above 6<sup>th</sup> harmonic)

Output impedance: 50 Ohm

Output power: 66 dB $\mu$ V @ 10 MHz  $f_{\text{comb}}$ ; decreasing 6 dB with every  $f_{\text{comb}}/2$

Amplitude stability: < 0.2 dB; <0.1 dB after 15 minutes

Aging: < 0.5 dB over 12 months

Output connector: N-female

Selectable, fixed comb frequencies: 100 kHz, 500 kHz, 1 MHz, 5 MHz, 10 MHz

Frequency stability: 50 ppm

External excitation input: 5 kHz – 300 MHz @ square input signal; 3.3 Vpp max  
100 kHz – 300 MHz @ sinus input signal; 3.3 Vpp max

Input impedance: 50 Ohm

Input connector: SMA-female

Current consumption: 70 mA

Indicators: Power On LED, Low Battery LED

Power supply: 4 x AA NiMH (e.g. Varta Mignon 2700, **not supplied**)

Charger: external; Ansmann ACS310

Operation time: battery capacity / 70 mA

Temperature range: -20°C to +45 °C

Housing diameter: 180 mm

Housing height: 60 mm

Weight: 1250 g

### 3 Spectrum plots, $f_{\text{comb}}$ : 10 MHz, 5 MHz, 1 MHz, 500 kHz, 100 kHz

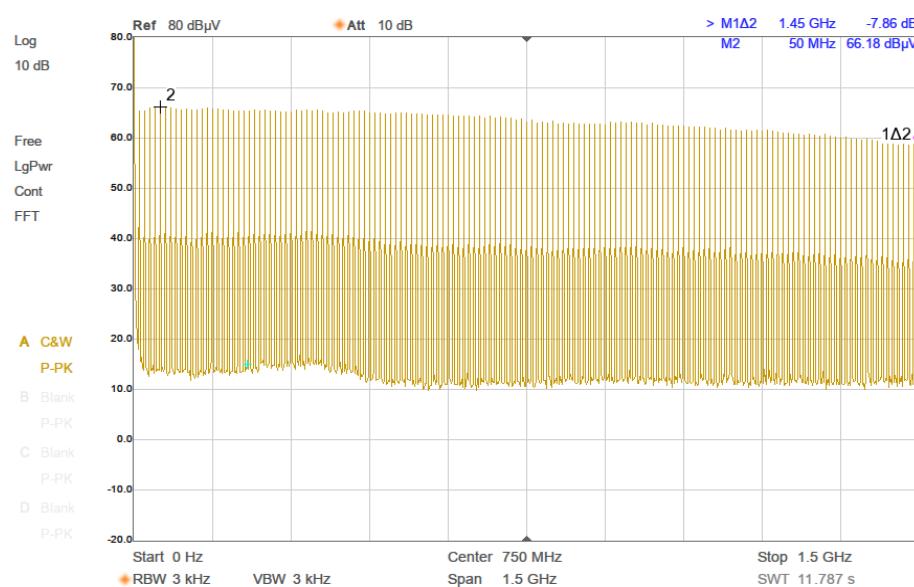


Figure 1 -  $f_{\text{comb}}$ : 10 MHz; 66 dB $\mu$ V @ 50 MHz; spectrum flatness up to 1.5 GHz: -8dB

## TBCG3-CN Comb Generator

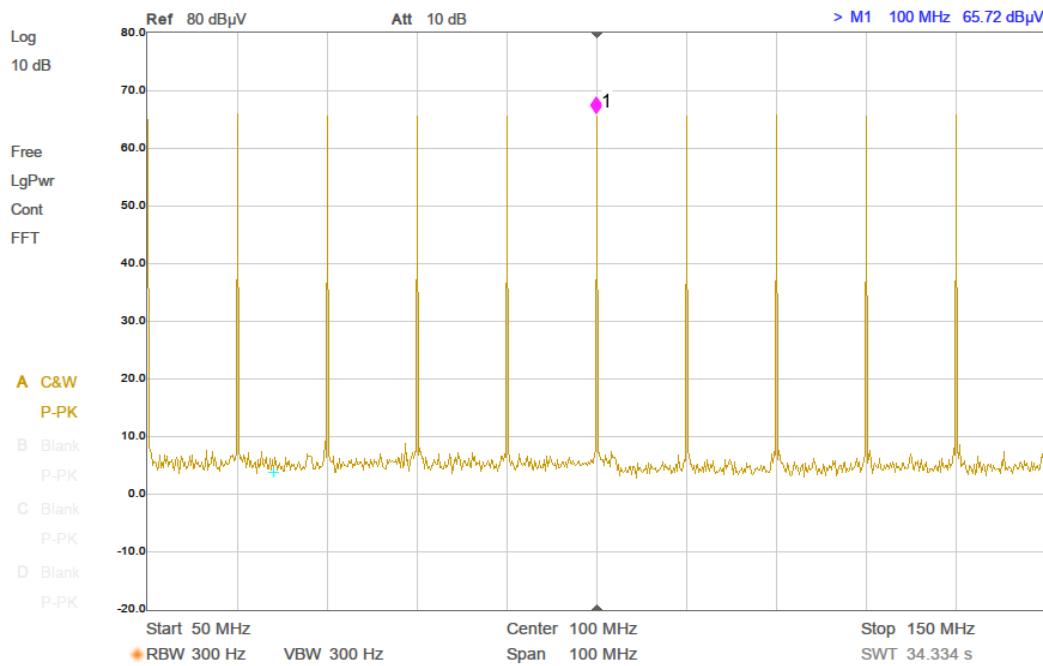


Figure 2 – zoomed;  $f_{comb}$ : 10 MHz; span: 50 MHz – 150 MHz

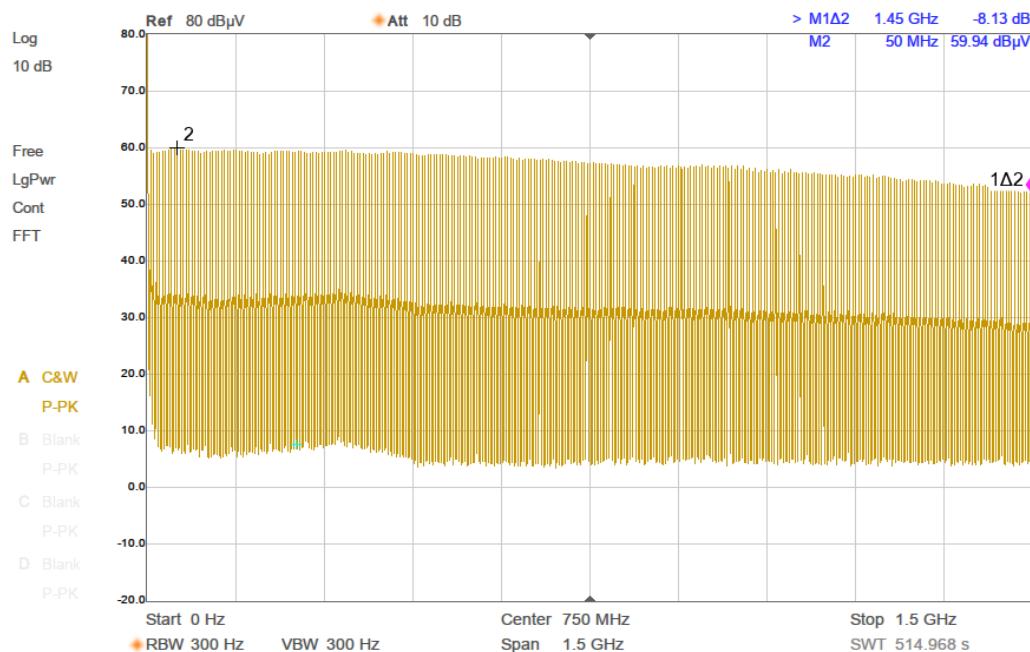


Figure 3 -  $f_{comb}$ : 5 MHz; 60 dB $\mu$ V @ 50 MHz; spectrum flatness up to 1.5 GHz: -8dB

## TBCG3-CN Comb Generator

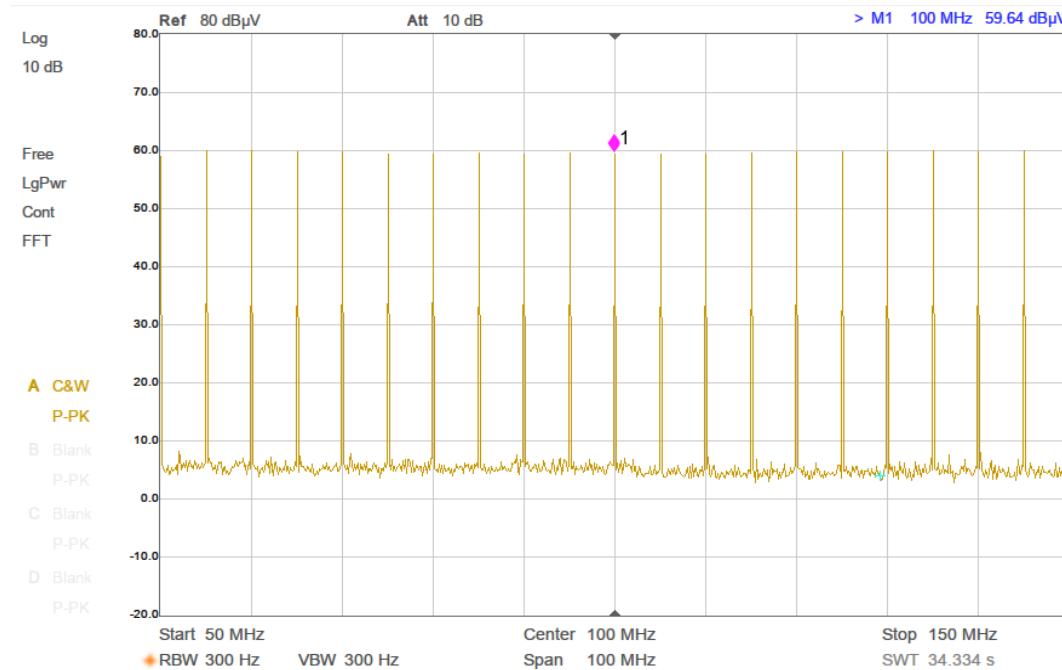


Figure 4 – zoomed;  $f_{comb}$ : 5 MHz; span: 50 MHz – 150 MHz

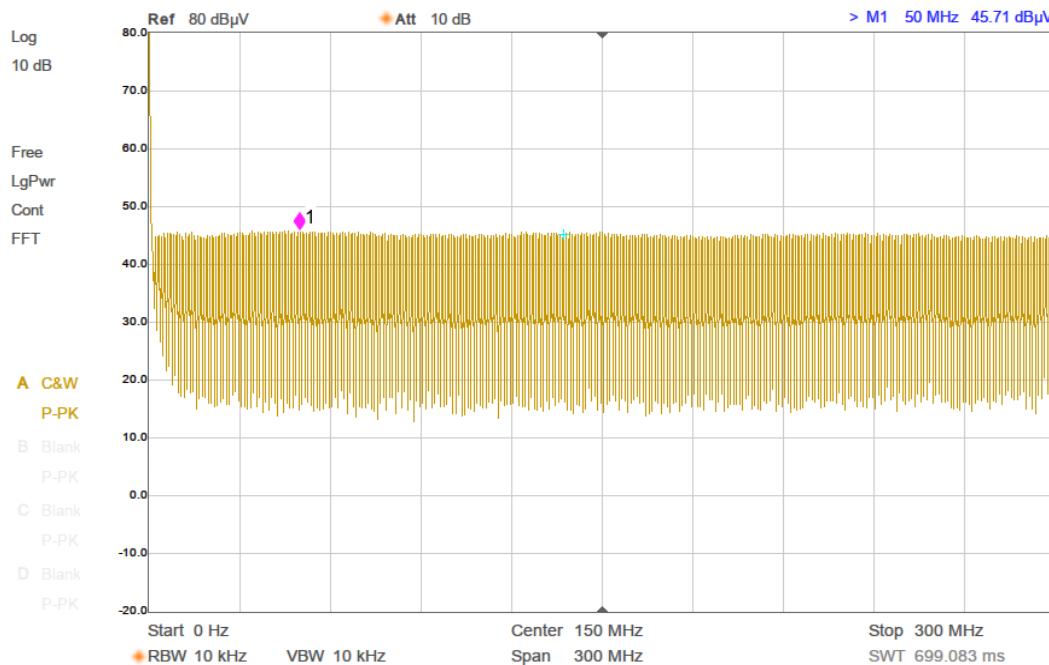


Figure 5 – zoomed;  $f_{comb}$ : 1 MHz; 45 dB $\mu$ V @ 50 MHz; span: 0 MHz – 300 MHz; spectrum flatness up to 1.5 GHz: -8dB

## TBCG3-CN Comb Generator

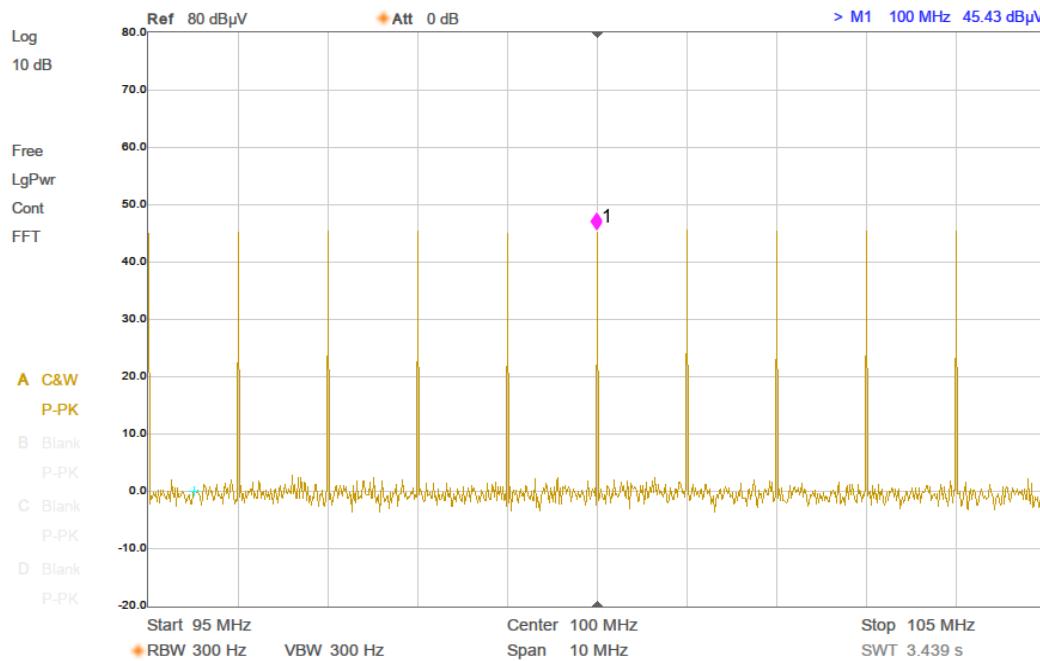


Figure 6 – zoomed;  $f_{comb}$ : 1 MHz; span: 95 MHz – 105 MHz

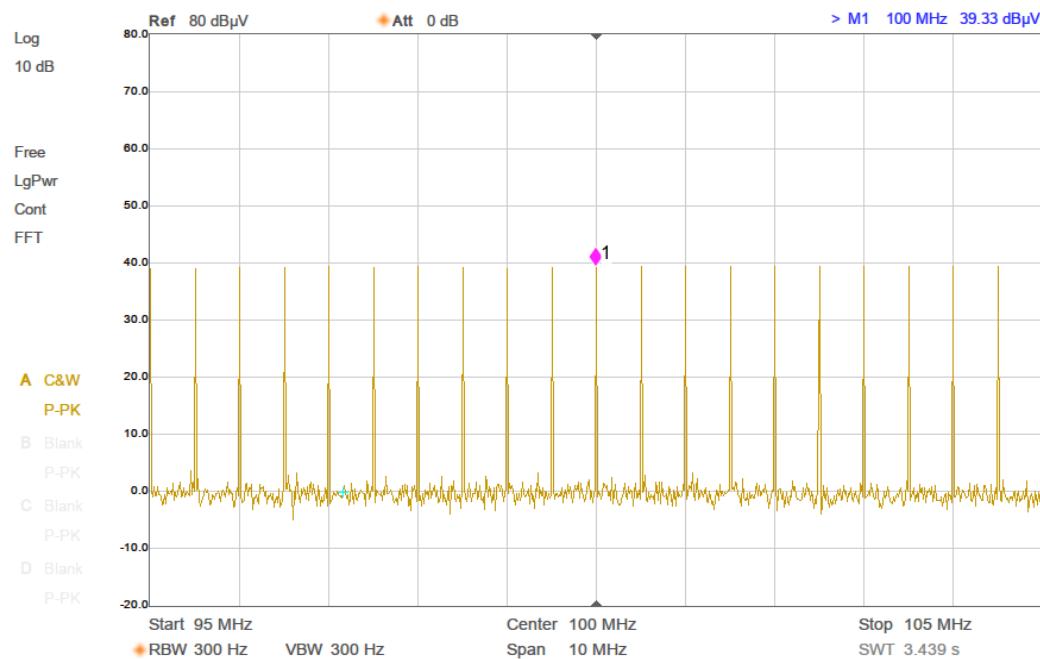


Figure 7 – zoomed;  $f_{comb}$ : 500 kHz; 39 dB $\mu$ V @ 100 MHz;  
span: 95 MHz – 105 MHz; spectrum flatness up to 1.5 GHz: -8dB

## TBCG3-CN Comb Generator

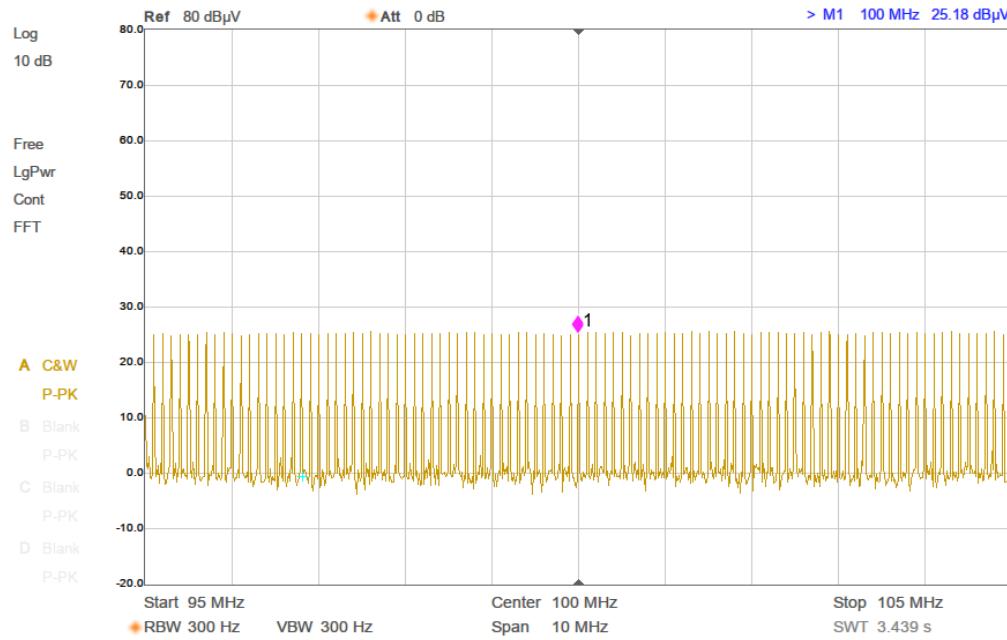


Figure 8 – zoomed;  $f_{comb}$ : 100 kHz; 25 dB $\mu$ V @ 100 MHz; span: 95 MHz – 105 MHz; spectrum flatness up to 1.5 GHz: -17dB

## 4 Spectrum plots, external frequency input

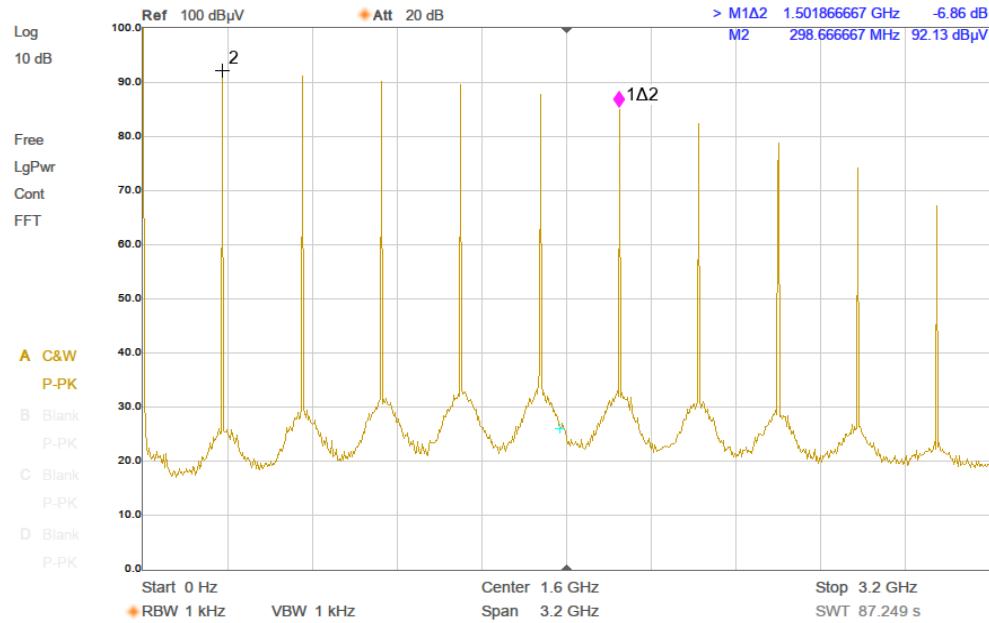


Figure 9 -  $f_{comb}$ : 300 MHz; 92 dB $\mu$ V @ 300 MHz; spectrum flatness up to 1.5 GHz: -7dB  
Signal amplitude at external input: +6 dBm

## TBCG3-CN Comb Generator

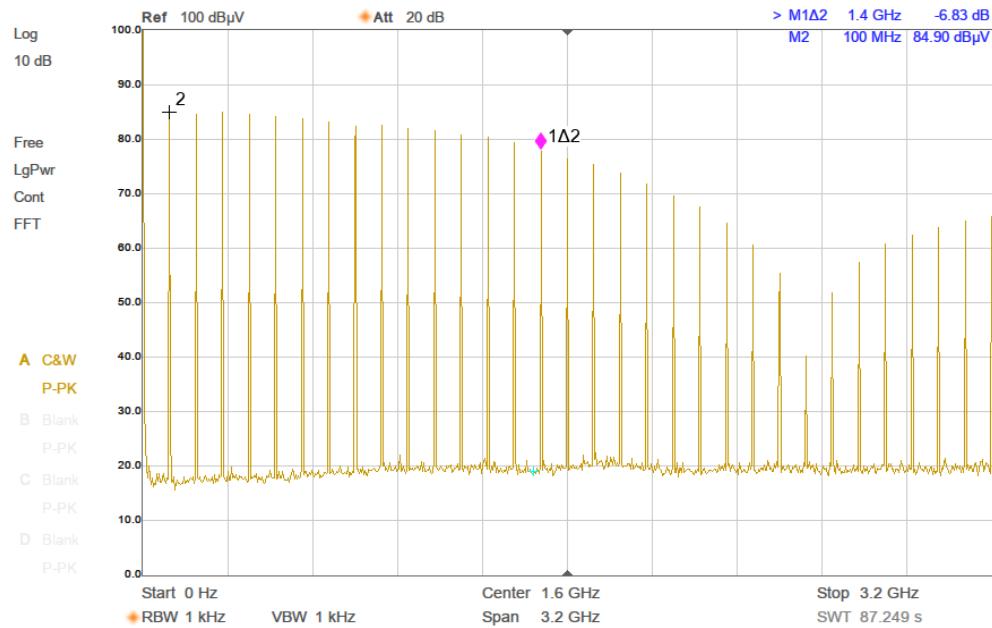


Figure 10 -  $f_{\text{comb}}$ : 100 MHz; 85 dB $\mu$ V @ 100 MHz; spectrum flatness up to 1.5 GHz: -7dB  
Signal amplitude at external input: +6 dBm

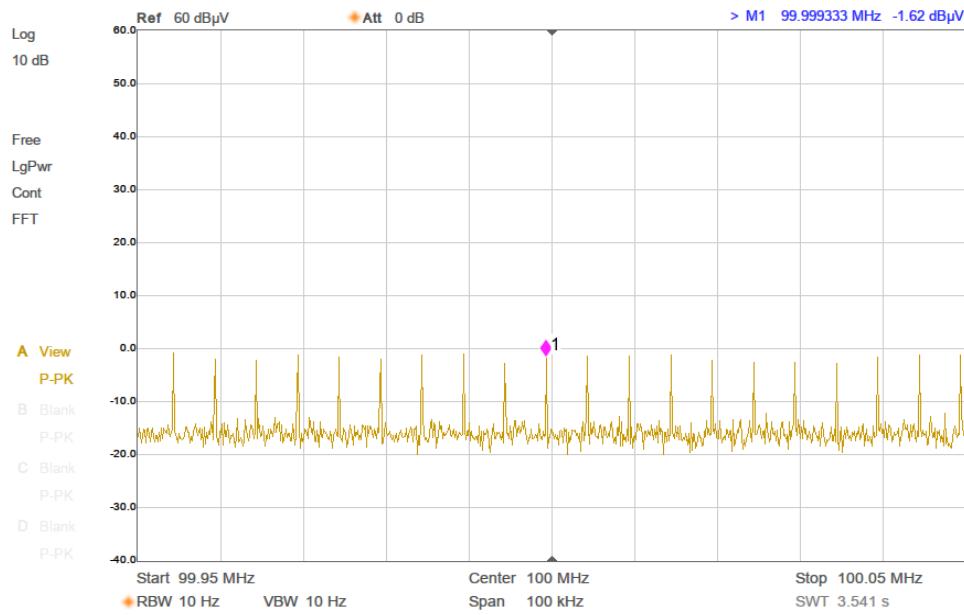


Figure 10 – zoomed;  $f_{\text{comb}}$ : 5 kHz; -1 dB $\mu$ V @ 100 MHz;  
span: 99.95 MHz – 100.05 MHz  
Signal amplitude at external input: square, 3.3 Vpp

## TBCG3-CN Comb Generator

### 5 Application

Checking the sanity of a LISN or conducted emission measurement setup.

There is no need to swap the N-connectors of the LISN adapter cable to switch between LISN channels, when utilising a TBRFPS1 power splitter:



*Picture 1: TBCG3-CN connected to a LISN utilizing a RF power splitter*

#### **Warning:**

Never connect the comb generator or the comb generator adapter cable to a powered LISN to avoid potentially lethal electric shock. Before connecting the comb generator adapter cable into the DUT / EUT socket, always unhook the mains connector on the back of the LISN.

Never plug the comb generator adapter cord into a power outlet to avoid potentially lethal electric shock.

### 6 Accessory

As standard accessories, Tekbox includes a charger and a country specific adapter coaxial interfacing cable for LISN.

## TBCG3-CN Comb Generator

### 7 Inserting / replacing batteries

Due to airfreight regulations concerning batteries, the TBCG3 is not supplied with batteries. Loosen the SMA-connector nut a few turns. Remove the six screws at the bottom of the comb generator housing and take off the bottom lid.

**Use a suitably large screwdriver with Pozidriv tip. Phillips screwdrivers may slip and damage the screw head.**

Insert six AA rechargeable 1.2V NiMH batteries in the battery compartments taking care to follow the polarity indicated on the PCB.

Reattach the bottom lid, then tighten the screws and the SMA-connector nut as well.

Before connecting the charger plug to the unit connector, please check that the centre tip polarity is shown as (positive) "+".

**Never connect the charger to the comb generator, without batteries inserted.** The universal charger is pulsing with high voltage to detect the battery pack and may damage the internal polyfuse, if no batteries are inserted. Align the charger tip as shown below.



## TBCG3-CN Comb Generator

### 8 Ordering Information

Part Number	Description
TBCG3-CN-EU	Comb generator, Ansmann ACS310 charger, LISN adapter cable with Schuko connector
TBCG3-CN-UK	Comb generator, Ansmann ACS310 charger, LISN adapter cable with UK connector
TBCG3-CN-US	Comb generator, Ansmann ACS310 charger, LISN adapter cable with US connector
TBCG3-CN-AU	Comb generator, Ansmann ACS310 charger, LISN adapter cable with Australian connector
TBLA-3P-16A	BNC adapter for 3 Phase LISN TBL5032-16A EUT socket
TBLA-3P-32A	BNC adapter for 3 Phase LISN TBL5032-32A EUT socket
TBLA-PH1	BNC adapter for TBL5016-1 or TBL0550 EUT/SOURCE socket
TBLA-PH2	BNC adapter for TBL50100 or TBL05100 EUT/SOURCE socket
TBRFPS1	Power splitter

### 9 History

Version	Date	Author	Changes
V 1.0	4.2.2023	Mayerhofer	Creation
V 1.1	19.6.2023	Minh Nguyen	Update Charger part number
V 1.2	10.4.2024	Mayerhofer	Chapter 7 updated
V 1.3	13.4.2024	Mayerhofer	Chapter 7 updated
V 1.4	13.4.2024	Mayerhofer	Chapter 2 updated