

Prüfbericht-Nr.: Test report no.:	50343090 001	Auftrags-Nr.: Order no.:	238111259	Seite 1 von 68 Page 1 of 68
Kunden-Referenz-Nr.: Client reference no.:	N/A	Auftragsdatum: Order date:	2019.11.27	
Auftraggeber: Client:	Vencer Co., Ltd. 14F-12, No.79, Sec. 1, Hsin Tai Wu Road, His-Chih, New Taipei City, Taiwan 22101 Manufacturer: WANSTONIC ELECTRONICS (DONG GUAN) CO., LTD. TUNG FU RD. WEST, SHI JIE TOWN, DONGGUAN CITY, GUANGDONG, CHINA			
Prüfgegenstand: Test item:	Truly Wireless Earphones			
Bezeichnung / Typ-Nr.: Identification / Type no.:	TW-E5A			
Auftrags-Inhalt: Order content:	FCC Part 15C / IC RSS-247 Test report			
Prüfgrundlage: Test specification:	FCC 47CFR Part 15: Subpart C Section 15.247 (FHSS) ISED RSS-247 Issue 2, Feb 2017			
Wareneingangsdatum: Date of sample receipt:	2019.11.28			
Prüfmuster-Nr.: Test sample no.:	A001041513-004, 005 A001020252-002, 003			
Prüfzeitraum: Testing period:	2019.11.29 - 2020.06.02			
Ort der Prüfung: Place of testing:	EMC/RF Laboratory Taipei			
Prüflaboratorium: Testing laboratory:	Taipei Testing laboratories			
Prüfergebnis*: Test result*:	Pass			
überprüft von: reviewed by:			genehmigt von: authorized by:	
Datum: 2020.06.03 Date:	Mars Y.J. Lin		Datum: 2020.06.03 Date:	
Stellung / Position:	Project Engineer		Stellung / Position:	Project Manager
Sonstiges / Other:				
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable
5 = mangelhaft N/T = nicht getestet				
5 = poor N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

TEST SUMMARY

5.1.1 ANTENNA REQUIREMENT

RESULT: Passed

5.1.2 PEAK OUTPUT POWER

RESULT: Passed

5.1.3 20dB BANDWIDTH AND 99% BANDWIDTH

RESULT: Passed

5.1.4 CONDUCTED SPURIOUS EMISSIONS AND FREQUENCY BAND EDGE MEASURED IN 100kHz BANDWIDTH

RESULT: Passed

5.1.5 SPURIOUS EMISSION

RESULT: Passed

5.1.6 FREQUENCY SEPARATION

RESULT: Passed

5.1.7 NUMBER OF HOPPING FREQUENCY

RESULT: Passed

5.1.8 TIME OF OCCUPANCY

RESULT: Passed

5.2.1 MAINS CONDUCTED EMISSIONS

RESULT: N/A

6.1.1 ELECTROMAGNETIC FIELDS

RESULT: Passed

Contents

1.	GENERAL REMARKS	5
1.1	COMPLEMENTARY MATERIALS.....	5
1.2	DECISION RULE OF CONFORMITY.....	5
2.	TEST SITES	6
2.1	TEST LABORATORY	6
2.2	TEST FACILITY.....	6
2.3	LIST OF TEST AND MEASUREMENT INSTRUMENTS.....	7
2.4	TRACEABILITY	8
2.5	CALIBRATION	8
2.6	MEASUREMENT UNCERTAINTY	8
3.	GENERAL PRODUCT INFORMATION.....	9
3.1	PRODUCT FUNCTION AND INTENDED USE	9
3.2	SYSTEM DETAILS AND RATINGS.....	9
3.3	INDEPENDENT OPERATION MODES.....	11
3.4	NOISE GENERATING AND NOISE SUPPRESSING PARTS	11
3.5	SUBMITTED DOCUMENTS.....	11
4.	TEST SET-UP AND OPERATION MODES.....	12
4.1	PRINCIPLE OF CONFIGURATION SELECTION	12
4.2	TEST OPERATION AND TEST SOFTWARE.....	13
4.3	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	13
4.4	COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE.....	13
4.5	TEST SETUP DIAGRAM	14
5.	TEST RESULTS	16
5.1	TRANSMITTER REQUIREMENT & TEST SUITES	16
5.1.1	Antenna Requirement	16
5.1.2	Peak Output Power	17
5.1.3	20dB Bandwidth and 99% Bandwidth	19
5.1.4	Conducted spurious emissions and Frequency Band Edge measured in 100kHz Bandwidth.....	34
5.1.5	Spurious Emission	51
5.1.6	Frequency Separation.....	52
5.1.7	Number of hopping frequency.....	54
5.1.8	Time of Occupancy	57
5.2	MAINS EMISSIONS.....	62
5.2.1	Mains Conducted Emissions.....	62

6.	SAFETY HUMAN EXPOSURE	63
6.1	RADIO FREQUENCY EXPOSURE COMPLIANCE	63
6.1.1	Electromagnetic Fields.....	63
7.	PHOTOGRAPHS OF THE TEST SET-UP.....	64
8.	LIST OF TABLES	68
9.	LIST OF PHOTOGRAPHS.....	68

1. General Remarks

1.1 Complementary Materials

The following attachments are integral parts of this test report:

Appendix P: Photo Documentation internal view
(File Name: 50343090 001, 50343091 001 Appendix P)

Appendix D: Test Result of Radiated Emissions
(File Name: 50343090 001 001 Appendix D)

Test Specifications

The following standards were applied.

Table 1: Applied Standard and Test Levels

Radio
FCC CFR47 Part 15: Subpart C Section 15.247 FCC 47CFR Part 2: Subpart J Section 2.1093 ANSI C63.10:2013 ISED RSS-247 Issue 2, Feb 2017 FCC KDB Publication 447498 D01 v06

1.2 Decision Rule of conformity

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard

2. Test Sites

2.1 Test Laboratory

Taipei Testing Laboratories

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

2.2 Test Facility

Taipei Testing Laboratories

AC Mains Conduction:
11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)
FCC Registration No.: 180491
IC Canada Registration No.: 9465A

Conducted Test / Radiated Test:
No. 458-18, Sec 2, Fenliao., Linkou Dist.
New Taipei City 244
Taiwan (R.O.C.)
FCC Registration No.: 226631
IC Canada Registration No.: 25563

TAF Accredited NCC Test Lab. No.:3567
TAF ISO17025 Certification effective period: 6th-May-2019 to 05th-May-2022



Testing Laboratory
3567

2.3 List of Test and Measurement Instruments

Table 2: List of Test and Measurement Equipment

Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
EMI Test Receiver	R&S	ESR7	102108	2020/4/22	2021/4/22
Spectrum Analyzer	R&S	FSV40	101508	2020/2/05	2021/2/04
Pre-Amplifier	Agilent	8447D	2944A10772	2020/2/11	2021/2/10
Pre-Amplifier	EMCI	EMC051845SE	980633	2020/2/17	2021/2/16
Pre-Amplifier	EMCI	EMC184045SE	980657	2020/2/17	2021/2/16
Bilog Antenna	SCHWARZBECK	VULB-9168	00951	2020/1/14	2021/1/13
Horn Antenna	ETS-Lindgren	3117	00218930	2020/12/27	2021/12/26
Horn Antenna	SCHWARZBECK	BBHA 9170	00887	2020/4/10	2021/4/10
Loop Antenna	EMCI	LPA600	287	2019/12/20	2020/12/19
Test Software	Audix	e3	Ver. 9	N/A	N/A
Test Cable	HUBER+SUHNER	SUCOFLEX 104EA_9k~18G	800056/4EA	2020/3/25	2021/3/25
Test Cable	HUBER+SUHNER	SUCOFLEX 104_9k~18G	804680/4	2020/3/25	2021/3/25
Test Cable	HUBER+SUHNER	SUCOFLEX 104_9k~18G	MY37202/4	2020/3/25	2021/3/25
Test Cable	HUBER+SUHNER	SUCOFLEX 102EA_1G~40G	800898/2EA	2020/4/22	2021/4/22
Test Cable	HUBER+SUHNER	SUCOFLEX 102EA_1G~40G	800901/2EA	2020/4/22	2021/4/22
Test Cable	HUBER+SUHNER	SUCOFLEX 102EA_1G~40G	801027/2EA	2020/4/22	2021/4/22
Spectrum Analyzer	R&S	FSV40	101513	2020/2/8	2021/2/8
Thermo Chamber	Giant Force	GHT-150-40-CP-SD	MAA1902-010	2020/2/1	2021/2/1
Signal Generator	R&S	SMB100A03	181335	2020/1/23	2021/1/23
Power Meter	Anritsu	ML2495A	1901008	2020/4/6	2021/4/6
Power Sensor	Anritsu	MA2411B	1725269	2020/4/7	2021/4/7
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100797	2020/3/13	2021/3/13
Two-Line V-Network (for EUT)	Rohde & Schwarz	ENV216	101243	2019/6/23	2020/6/23
Two-Line V-Network	Rohde & Schwarz	ENV216	101262	2019/7/16	2020/7/16
Telecom ISN 4 Line	Fischer Custom Communications	FFCC-TLISN- T4-02-09	101168	2020/2/8	2021/2/8
Impedance Stabilization Network	TESEQ	ISN T800	51949	2020/2/20	2021/2/20
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	0357.8810.54- 102102-HN	2019/7/25	2020/7/25
Test Software	Audix	e3	Ver. 9	N/A	N/A

2.4 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

2.5 Calibration

Equipment requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular schedule using in house standards or comparisons.

2.6 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements .

Table 3: Emission Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	± 0.1 ppm
RF power/RF Exposure(MPE), conducted	± 1.5 dB
RF power density, conducted	± 3 dB
spurious emissions, conducted	± 3 dB
all emissions, radiated	± 6 dB
Temperature	± 1 °C
Humidity	± 5 %
DC and low frequency voltages	±3 %

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a Truly Wireless Earphones. It contains a Bluetooth compatible module enabling the user to communicate data through a Wireless interface.
For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 System Details and Ratings

Table 4: Basic Information of EUT

Item	EUT information
Kind of Equipment/Test Item	Truly Wireless Earphones
Type Identification	TW-E5A
FCC ID	VHVTWE5A
IC	10565A-TWE5A
HVIN	TW-E5A

Table 5: Technical Specification of EUT

Technical Specification	Value
Operating Frequencies	2402~2480 MHz
Channel Spacing	1 MHz
Channel number	79
Operation Voltage	3.7 Vdc
Modulation	GFSK, $\pi/4$ DQPSK, 8 DPSK
Antenna gain	-0.4 dBi

Table 6: Frequency hopping information

Technical Specification	Description
Hopping Range	Hereby we declare that the maximum frequency of this device is: 2402-2480MHz. The product is contain Bluetooth chipset as QCC3020 which is support Bluetooth v5.0 specification fully qualified software. This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/04).
Hopping Sequence	Example of a 79 hopping sequence in data mode: 33,04,21,44,23,42,53,46,55,48,40,59,72,29,76,31,08,73,07,75,09,45,60,39,58,13,47,11,77,52,35,50,65,54,67,56,69,62,71,64, 7,25,27,66,57,70,74,61,78,63,10,41,05,43,15,44,64,68,02,70,06,01,51,03,55,05,03,66,53,49,36,47,
Receiver input bandwidth	The input bandwidth of the receiver is 1MHz. In every connection one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally the type of connection is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings. Repeating of a packer has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

3.3 Independent Operation Modes

Basic operation modes are:

- A. Transmitting
 - 1. Low channel
 - 2. Middle channel
 - 3. High channel
- B. Receiving
- C. Standby
- D. Normal

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The test modes were adapted accordingly in reference to the instructions for use.

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Table 7: Table for Parameters of Test Software Setting_ Left Ear

Mode	Channel Frequency		
	2402 MHz	2441 MHz	2480 MHz
1-DH5	0,2,0	0,3,0	0,3,0
2-DH5	0,3,0	0,3,0	0,4,0
3-DH5	0,3,0	0,3,0	0,3,0

Table 8: Table for Parameters of Test Software Setting_ Right Ear

Mode	Channel Frequency		
	2402 MHz	2441 MHz	2480 MHz
1-DH5	0,3,0	0,3,0	0,3,0
2-DH5	0,3,0	0,4,0	0,4,0
3-DH5	0,3,0	0,4,0	0,4,0

4.2 Test Operation and Test Software

Setup for testing: Test samples are provided with a USB interface which makes it possible to control them through a test software installed on a notebook computer.

This software was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed in section 3.3 as appropriate.

The samples were used as follows:

Conducted: A001041513-004 (Right Ear), 005 (Left Ear)

Radiation: A001020252-002 (Right Ear), 003(Left Ear)

Full test was applied on all test modes, but only worst case was shown

Test Software	Bluesuite 3.2.2.144
---------------	---------------------

4.3 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

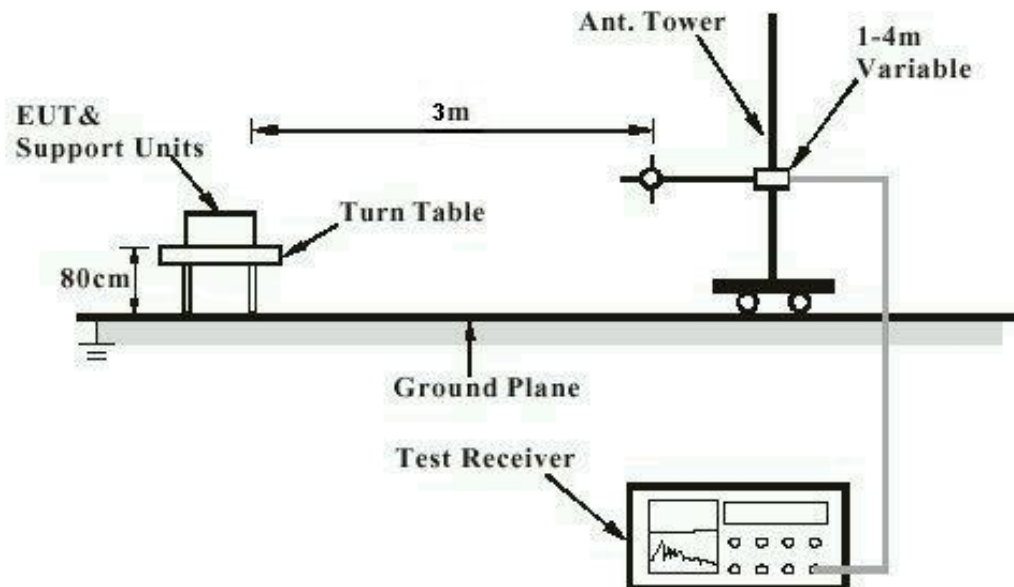
Description	Manufacturer	Model No.	Serial No.
Notebook(EMC-06)	Lenovo	TP00048A	PB-0F8B2

4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1 GHz are done with a table height of 1.5m

Diagram of Measurement Equipment Configuration for Mains Conduction Measurement

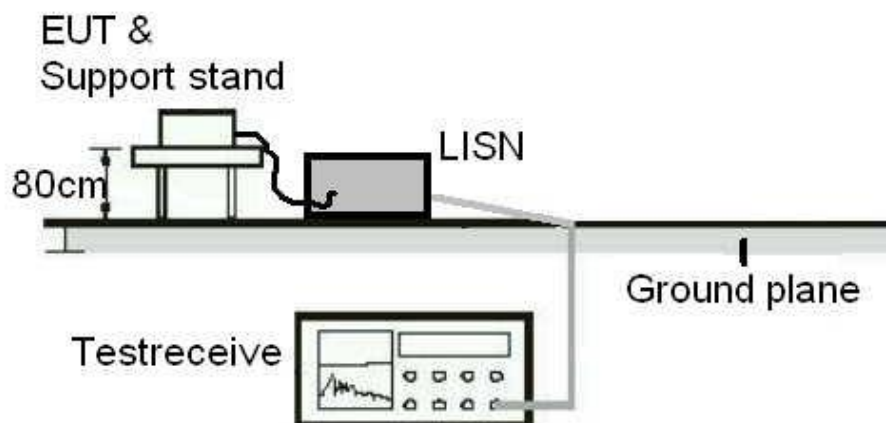
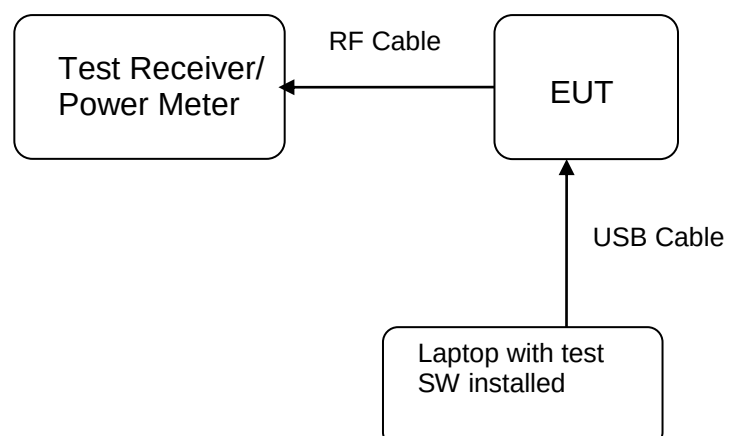


Diagram of Measurement Equipment Configuration for Conducted Transmitter Measurement



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT:

Passed

Test standard : FCC Part 15.247(b)(4), Part 15.203

According to the manufacturer declaration, the EUT has an antenna with a directional gain of -0.4 dBi. The antenna is a Polarization Pillar Antenna with no possibility of replacement with a non-approved antenna by the end-user.

The directional gain of this antenna does not exceed 6 dBi, so the limit does not reduce.

Refer to EUT photo for details.

Prüfbericht - Nr.: 50343090 001

Test Report No.

Seite 17 von 68

Page 17 of 68

5.1.2 Peak Output Power

RESULT:

Passed

Test standard : FCC Part 15.247(b)(1), ISSED RSS-247 5.4(b)
Basic standard : ANSI C63.10:2013
Limit : 1 Watt
Kind of test site : Shielded room

Test setup

Test Channel : Low/ Middle/ High
Operation Mode : A

Ambient temperature : 22-26 °C
Relative humidity : 50-65 %
Atmospheric pressure : 100-103 kPa

Table 9: Test result of Peak Output Power 1-DH5_Left Ear

Channel	Channel Frequency (MHz)	Output Power		Average Output Power (W)	Limit (W)
		(dBm)	(W)		
Low Channel	2402.0	9.15	0.00822	0.00809	0.125
Middle Channel	2441.0	9.37	0.00865	0.00849	0.125
High Channel	2480.0	9.15	0.00822	0.00811	0.125

Table 10: Test result of Peak Output Power 2-DH5_Left Ear

Channel	Channel Frequency (MHz)	Output Power		Average Output Power (W)	Limit (W)
		(dBm)	(W)		
Low Channel	2402.0	11.75	0.01496	0.00877	0.125
Middle Channel	2441.0	11.54	0.01426	0.00820	0.125
High Channel	2480.0	11.38	0.01374	0.00869	0.125

Table 11: Test result of Peak Output Power 3-DH5_Left Ear

Channel	Channel Frequency (MHz)	Output Power		Average Output Power (W)	Limit (W)
		(dBm)	(W)		
Low Channel	2402.0	11.72	0.01486	0.00861	0.125
Middle Channel	2441.0	11.55	0.01429	0.00820	0.125
High Channel	2480.0	11.37	0.01371	0.00869	0.125

Table 12: Test result of Peak Output Power 1-DH5_Right Ear

Channel	Channel Frequency (MHz)	Output Power		Average Output Power (W)	Limit (W)
		(dBm)	(W)		
Low Channel	2402.0	9.25	0.00841	0.00822	0.125
Middle Channel	2441.0	9.15	0.00822	0.00807	0.125
High Channel	2480.0	9.16	0.00824	0.00805	0.125

Table 13: Test result of Peak Output Power 2-DH5_Right Ear

Channel	Channel Frequency (MHz)	Output Power		Average Output Power (W)	Limit (W)
		(dBm)	(W)		
Low Channel	2402.0	11.42	0.01387	0.00798	0.125
Middle Channel	2441.0	11.40	0.01380	0.00873	0.125
High Channel	2480.0	11.36	0.01368	0.00871	0.125

Table 14: Test result of Peak Output Power 3-DH5_Right Ear

Channel	Channel Frequency (MHz)	Output Power		Average Output Power (W)	Limit (W)
		(dBm)	(W)		
Low Channel	2402.0	11.44	0.01393	0.00800	0.125
Middle Channel	2441.0	11.41	0.01384	0.00873	0.125
High Channel	2480.0	11.37	0.01371	0.00871	0.125

5.1.3 20dB Bandwidth and 99% Bandwidth

RESULT:

Passed

Test standard : FCC Part 15.247(a)(1), ISED RSS-247 5.1(a)
Basic standard : ANSI C63.10:2013, ISED RSS-Gen
Kind of test site : Shielded room

Test setup

Test Channel : Low/ Middle/ High
Operation Mode : A

Ambient temperature : 22-26°C
Relative humidity : 50-65%
Atmospheric pressure : 100-103 kPa

Table 15: Test result of 20dB Bandwidth 1-DH5_Left Ear

Channel	Channel Frequency (MHz)	20dB Bandwidth (kHz)	Result
Low Channel	2402	955.1	Pass
Mid Channel	2441	955.1	Pass
High Channel	2480	959.5	Pass

Table 16: Test result of 20dB Bandwidth 2-DH5_Left Ear

Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)	Result
Low Channel	2402	1.332	Pass
Mid Channel	2441	1.328	Pass
High Channel	2480	1.328	Pass

Table 17: Test result of 20dB Bandwidth 3-DH5_Left Ear

Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)	Result
Low Channel	2402	1.301	Pass
Mid Channel	2441	1.302	Pass
High Channel	2480	1.302	Pass

Prüfbericht - Nr.: 50343090 001
Test Report No.

Seite 20 von 68
Page 20 of 68

Table 18: Test result of 20dB Bandwidth 1-DH5_Right Ear

Channel	Channel Frequency (MHz)	20dB Bandwidth (kHz)	Result
Low Channel	2402	950.8	Pass
Mid Channel	2441	955.1	Pass
High Channel	2480	955.1	Pass

Table 19: Test result of 20dB Bandwidth 2-DH5_Right Ear

Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)	Result
Low Channel	2402	1.328	Pass
Mid Channel	2441	1.328	Pass
High Channel	2480	1.332	Pass

Table 20: Test result of 20dB Bandwidth 3-DH5_Right Ear

Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)	Result
Low Channel	2402	1.302	Pass
Mid Channel	2441	1.306	Pass
High Channel	2480	1.302	Pass

Table 21: Test result of 99% Bandwidth 1-DH5_Left Ear

Channel	Channel Frequency (MHz)	99% Bandwidth (kHz)
Mid Channel	2441	868.306

Table 22: Test result of 99% Bandwidth 2-DH5_Left Ear

Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Mid Channel	2441	1.787

Table 23: Test result of 99% Bandwidth 3-DH5_Left Ear

Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Mid Channel	2441	1.664

Table 24: Test result of 99% Bandwidth 1-DH5_Right Ear

Channel	Channel Frequency (MHz)	99% Bandwidth (kHz)
Mid Channel	2441	892.21

Table 25: Test result of 99% Bandwidth 2-DH5_Right Ear

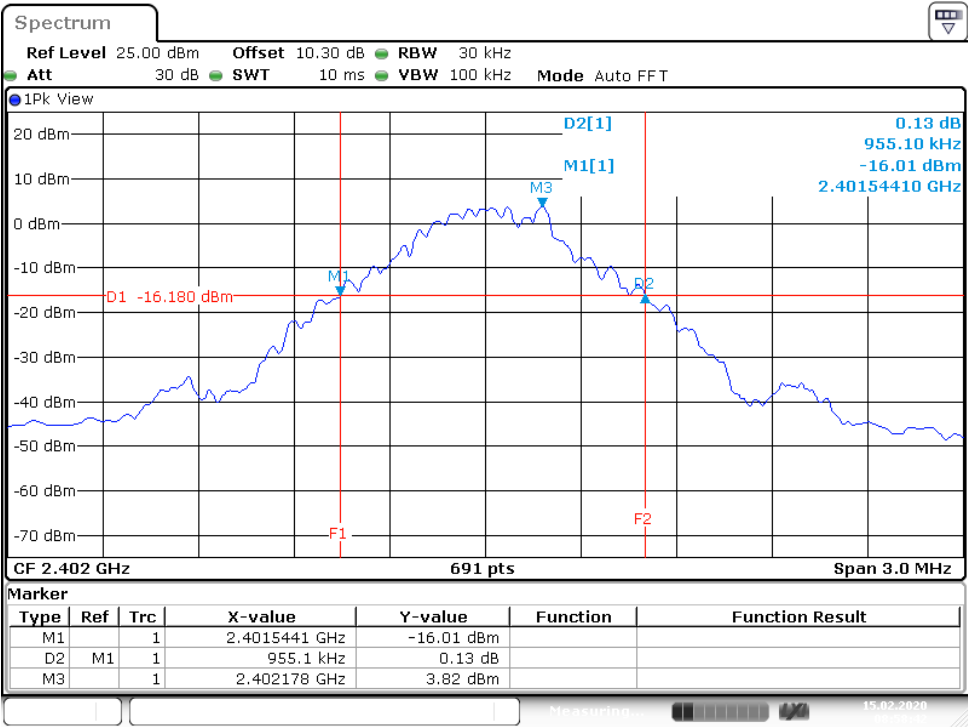
Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Mid Channel	2441	1.766

Table 26: Test result of 99% Bandwidth 3-DH5_Right Ear

Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Mid Channel	2441	1.616

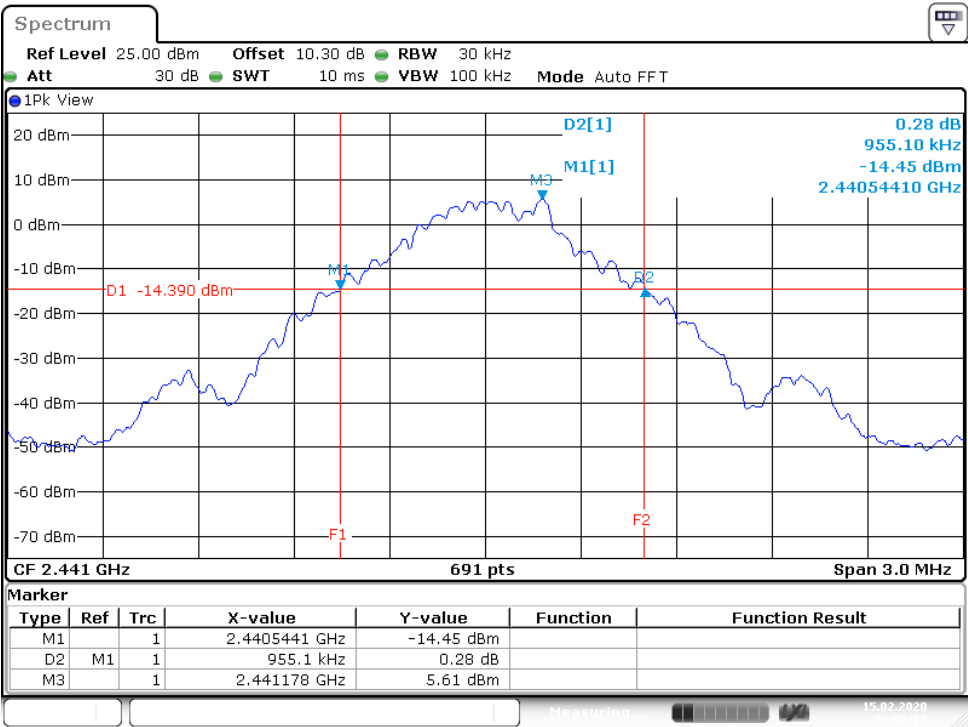
Test Plot of 20dB Bandwidth 1-DH5_Left Ear

Low Channel



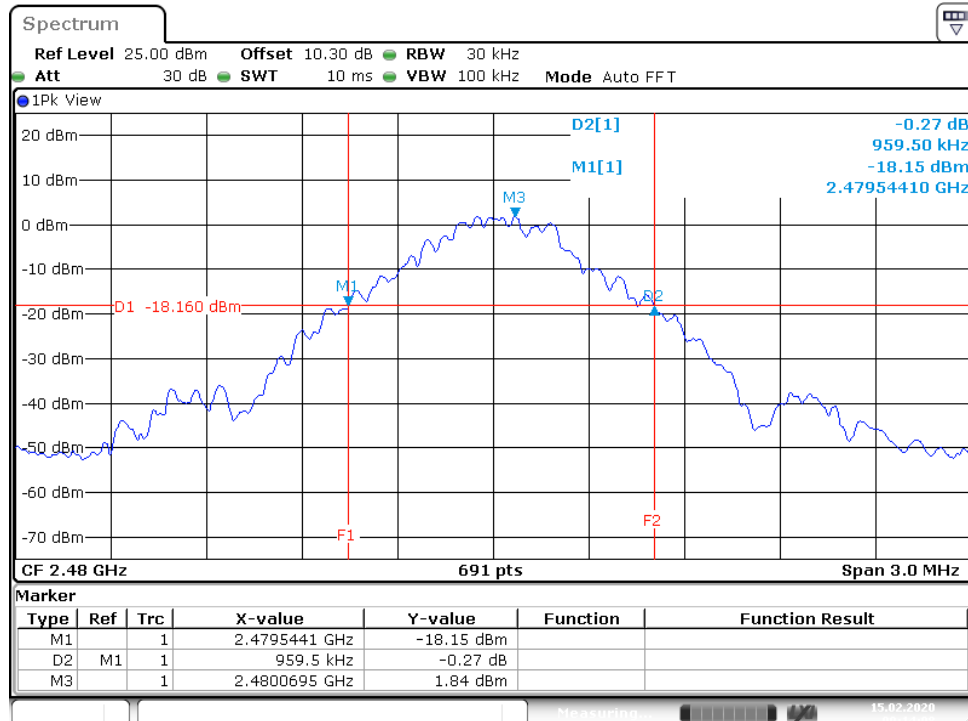
Date: 15.FEB.2020 08:58:43

Middle Channel



Date: 15.FEB.2020 09:08:19

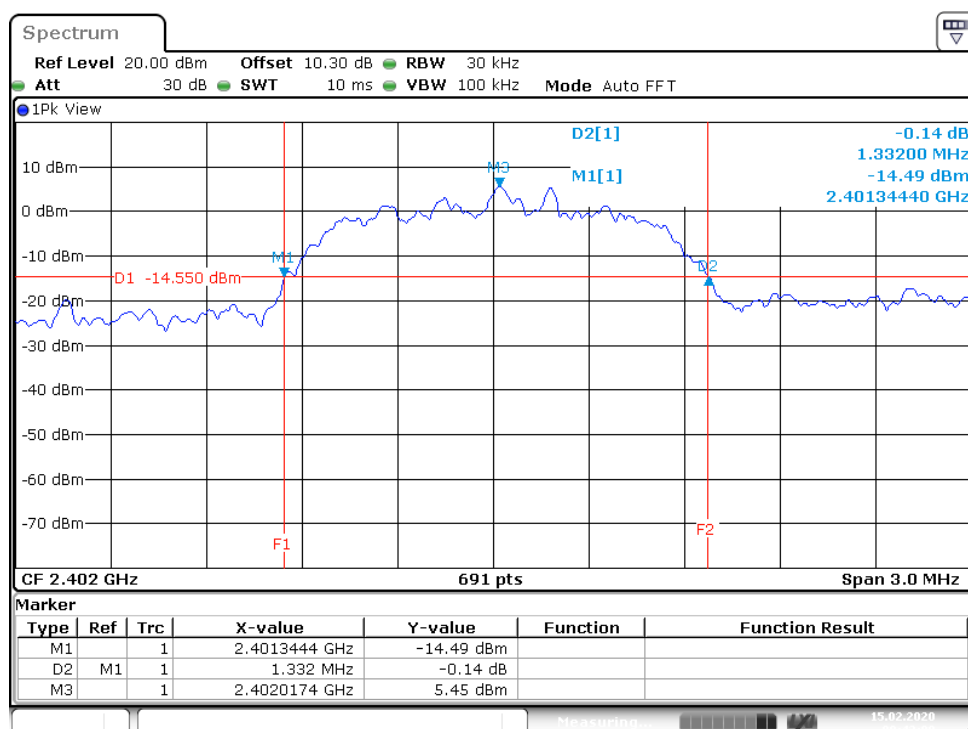
High Channel



Date: 15.FEB.2020 09:14:09

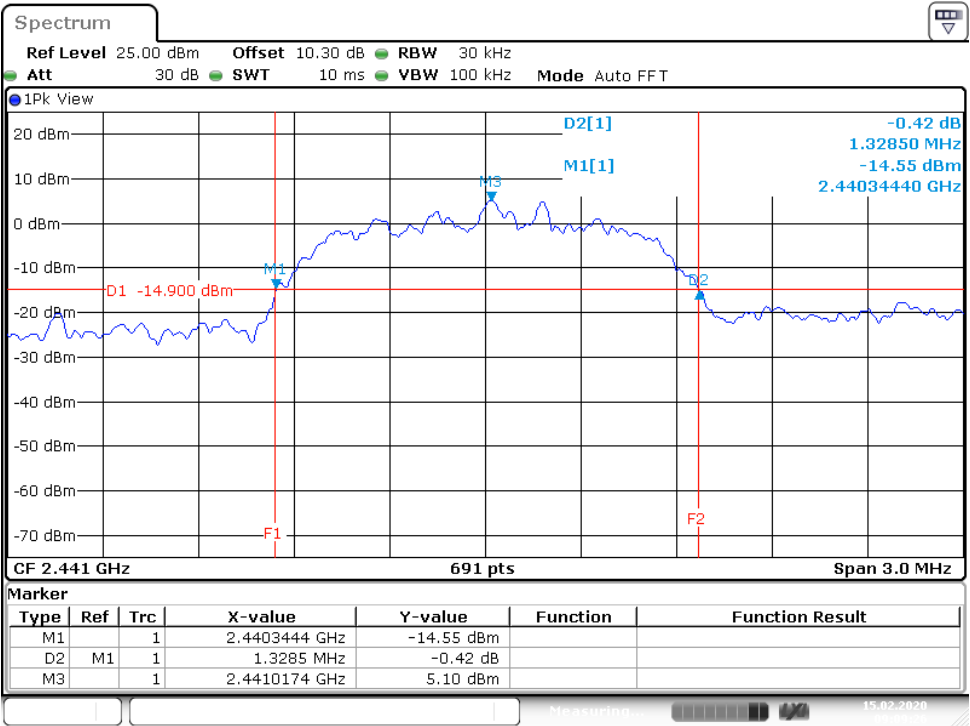
Test Plot of 20dB Bandwidth 2-DH5_Left Ear

Low Channel



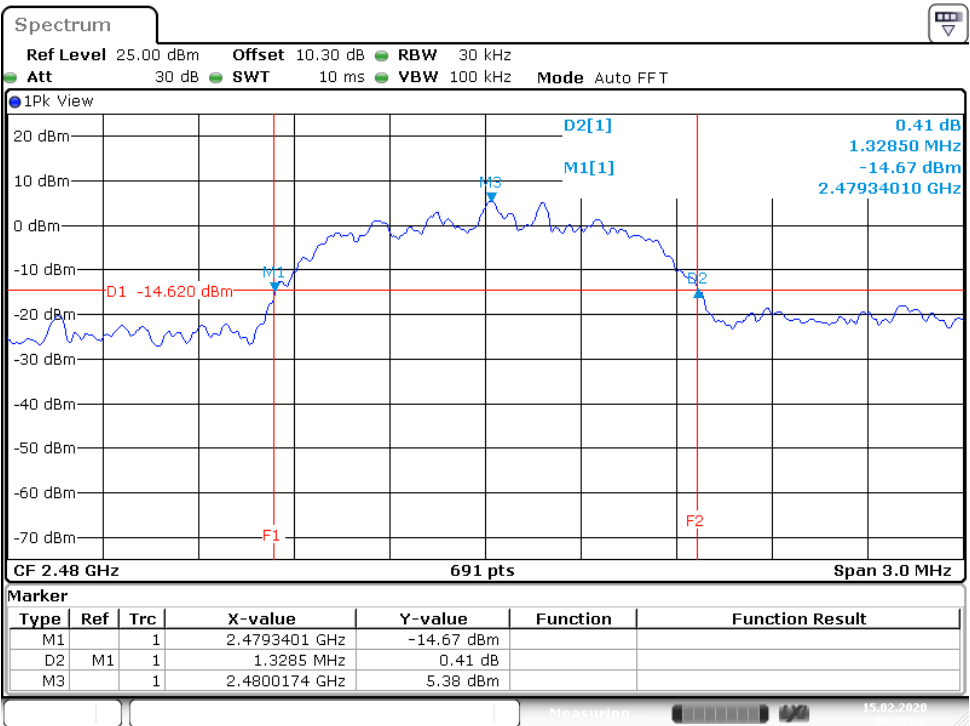
Date: 15.FEB.2020 09:43:10

Middle Channel



Date: 15.FEB.2020 09:09:26

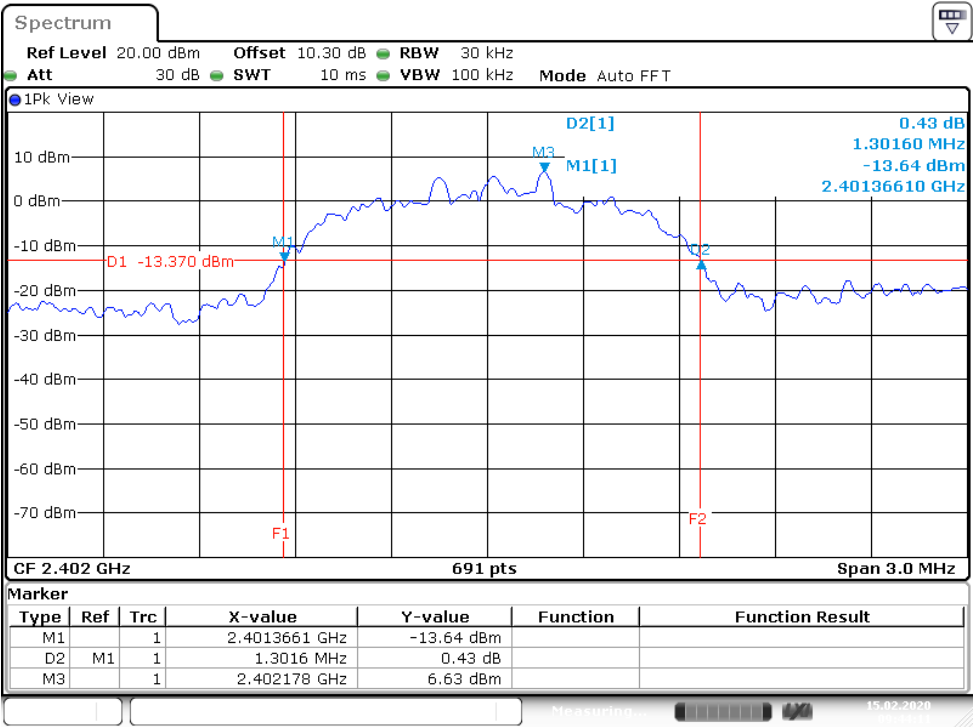
High Channel



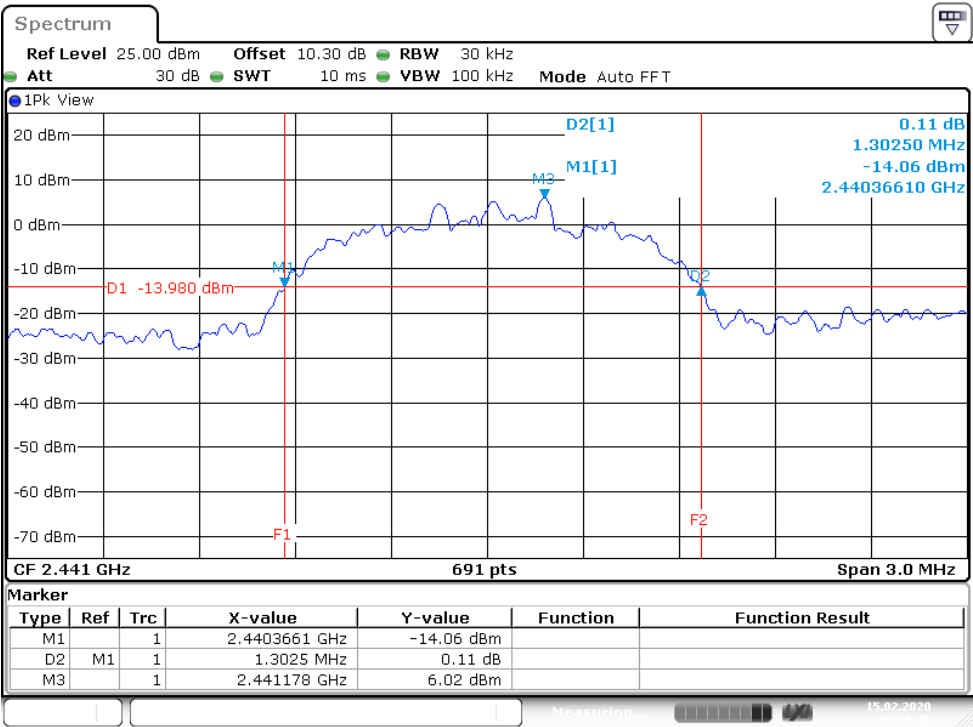
Date: 15.FEB.2020 09:12:32

Test Plot of 20dB Bandwidth 3-DH5_Left Ear

Low Channel



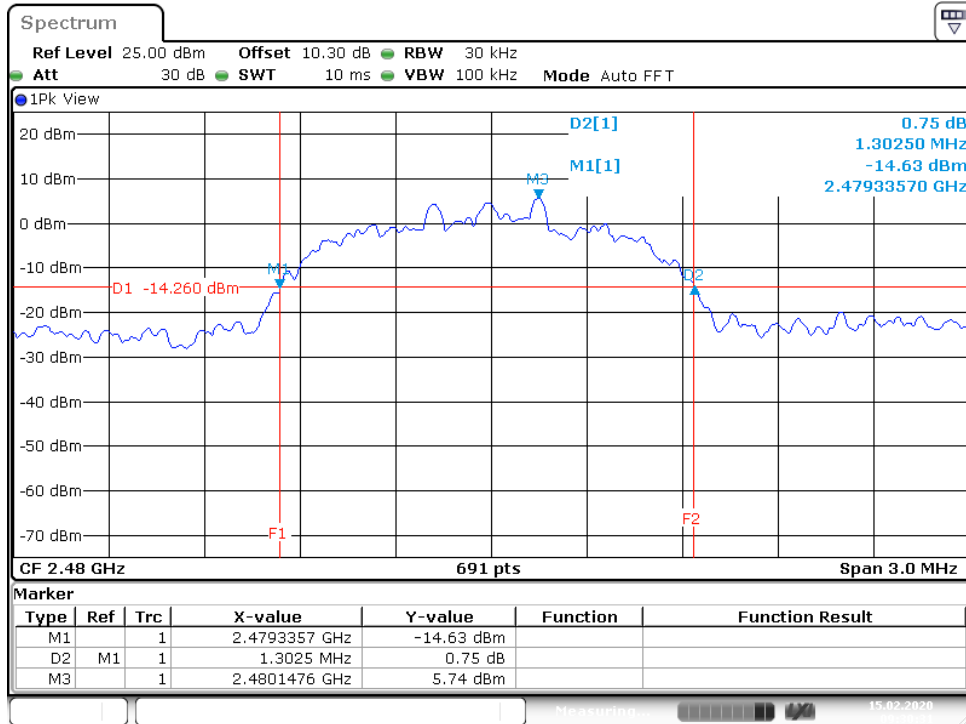
Middle Channel



Prüfbericht - Nr.: 50343090 001
Test Report No.

Seite 26 von 68
Page 26 of 68

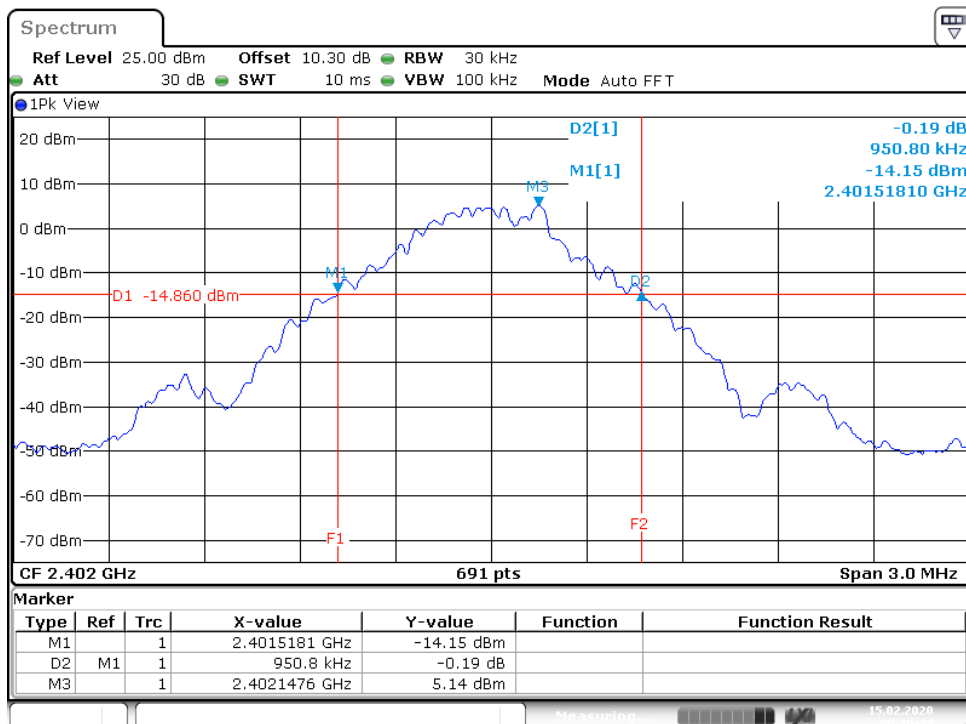
High Channel



Date: 15.FEB.2020 09:30:32

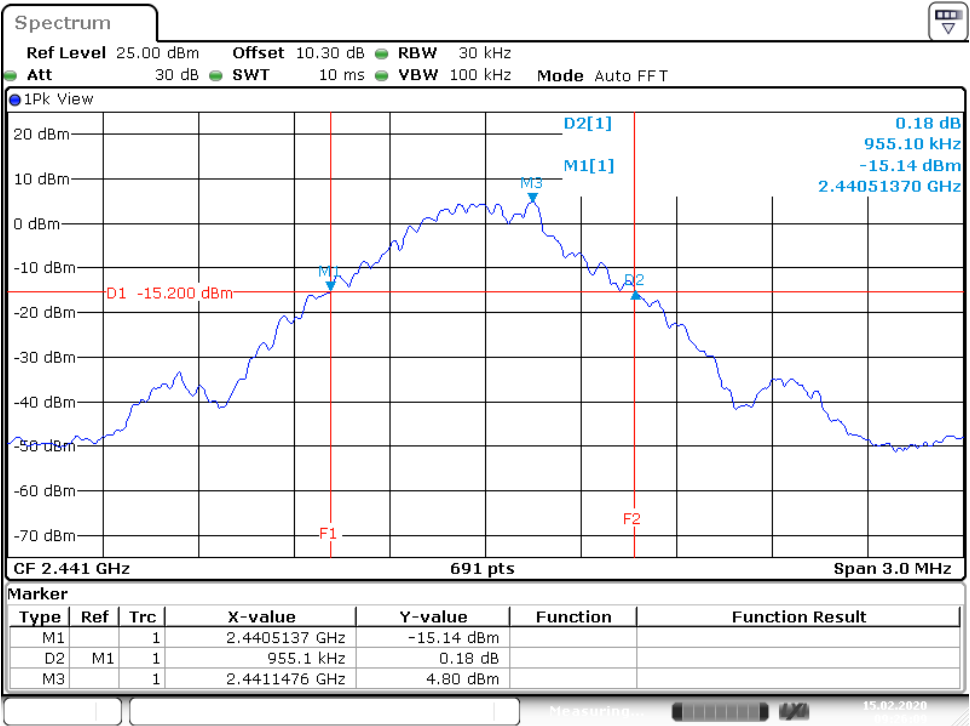
Test Plot of 20dB Bandwidth 1-DH5_Right Ear

Low Channel



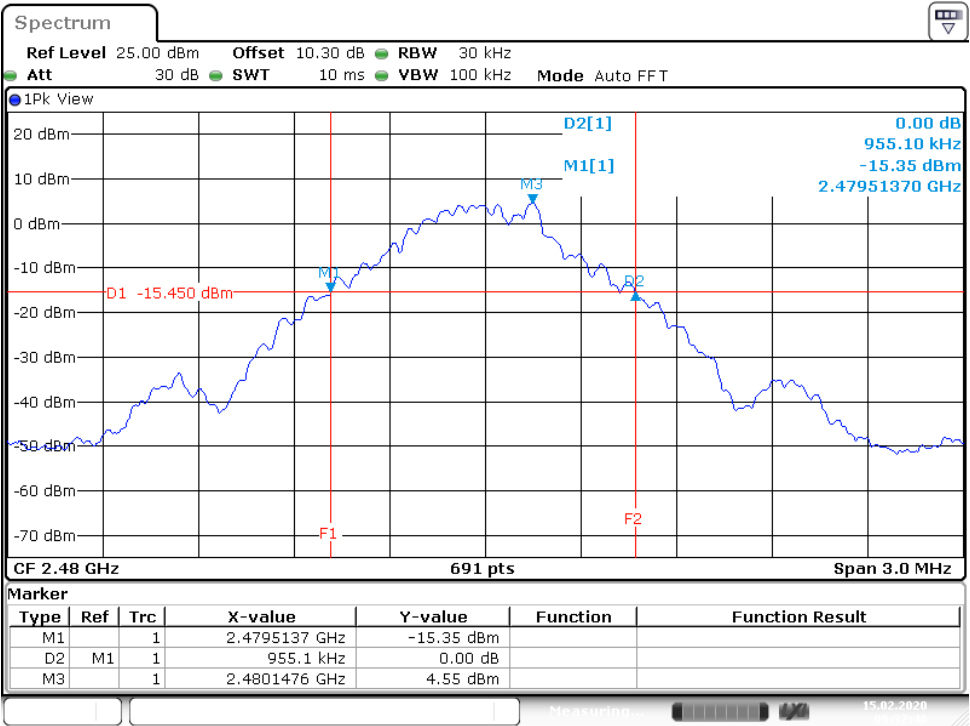
Date: 15.FEB.2020 09:20:34

Middle Channel



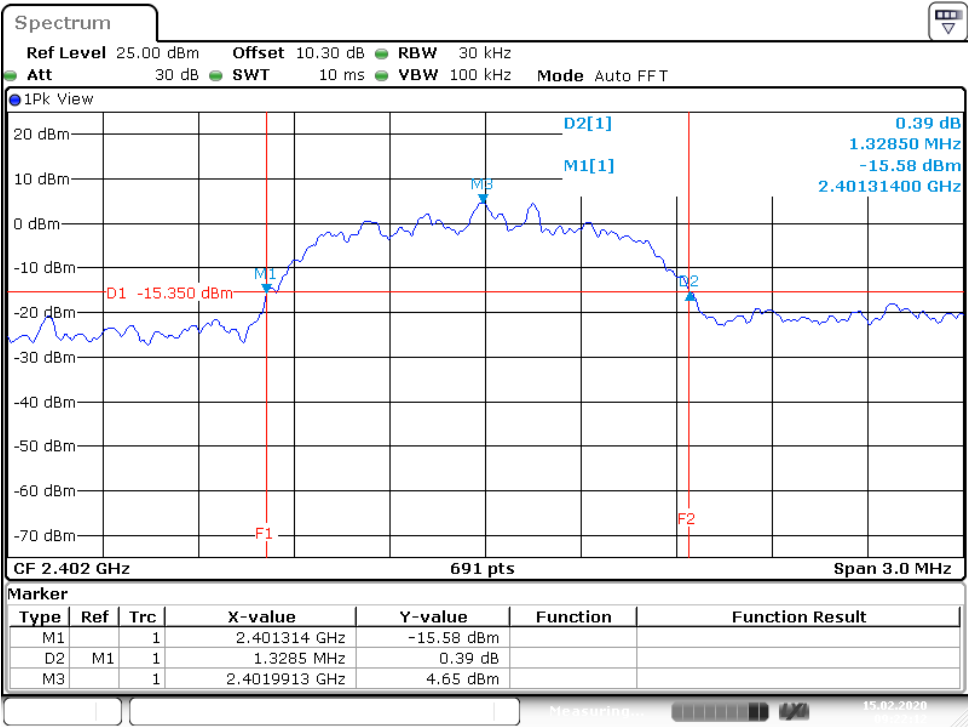
Date: 15.FEB.2020 09:26:09

High Channel



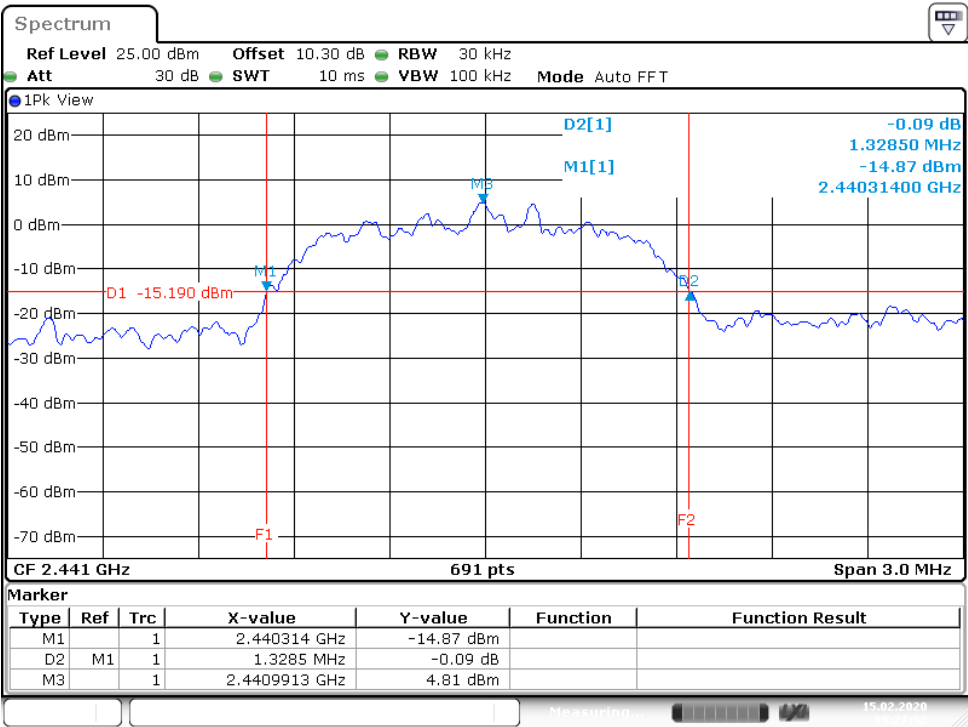
Date: 15.FEB.2020 09:32:49

Test Plot of 20dB Bandwidth 2-DH5_Right Ear
Low Channel



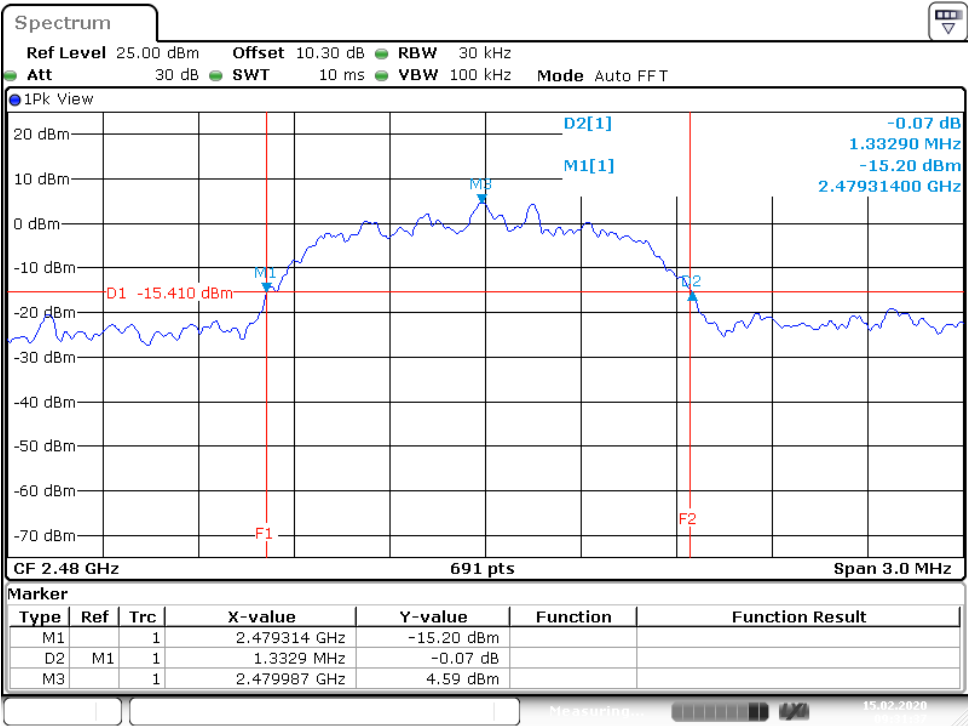
Date: 15.FEB.2020 09:22:13

Middle Channel



Date: 15.FEB.2020 09:27:52

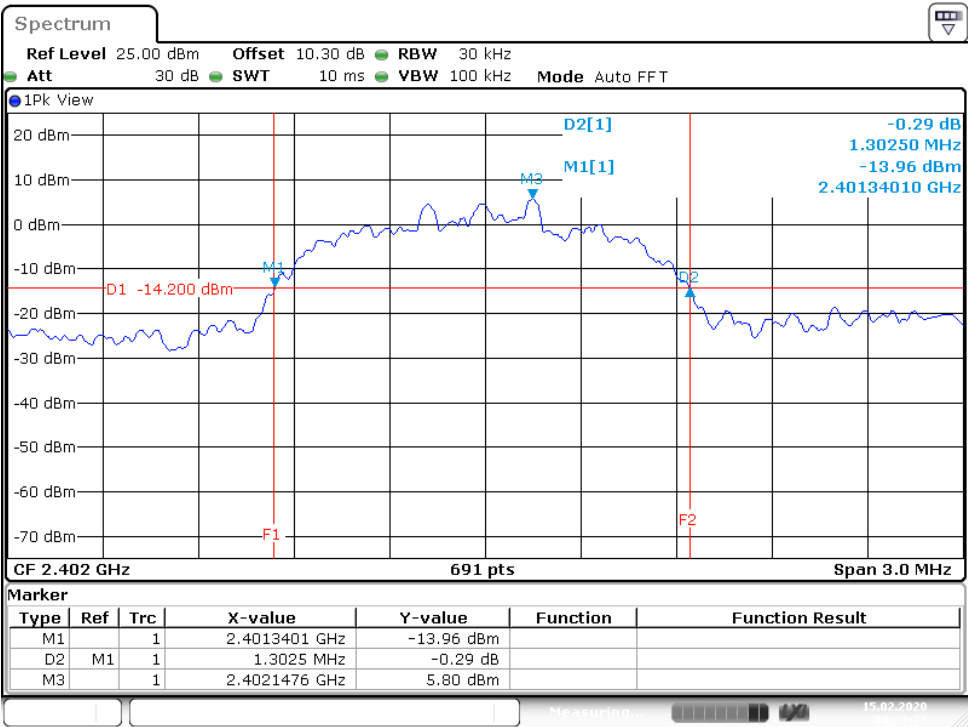
High Channel



Date: 15.FEB.2020 09:31:38

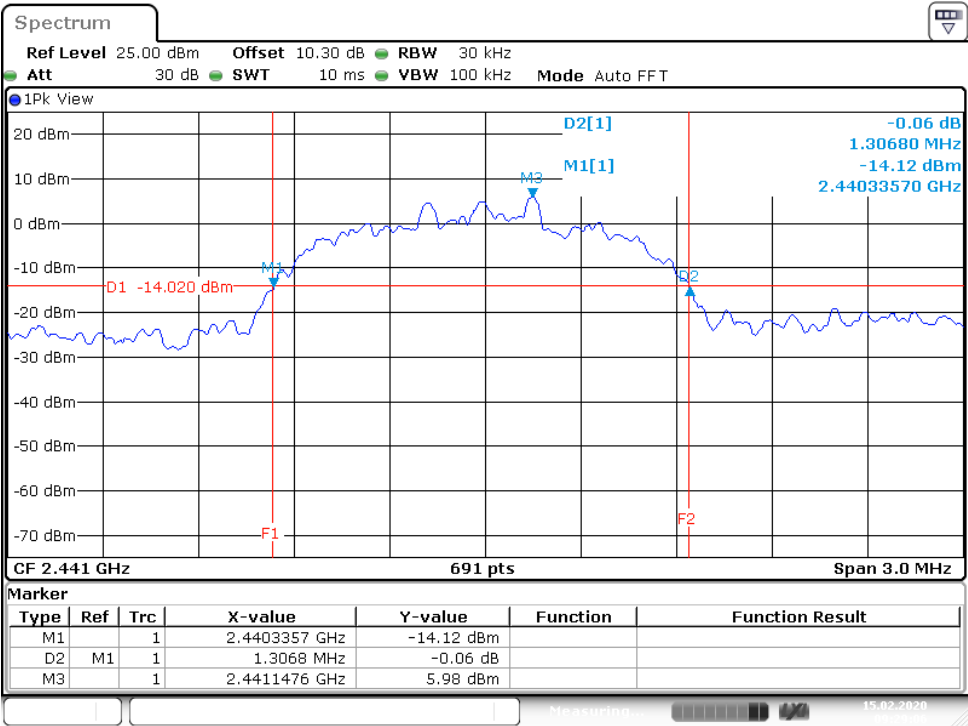
Test Plot of 20dB Bandwidth 3-DH5_Right Ear

Low Channel



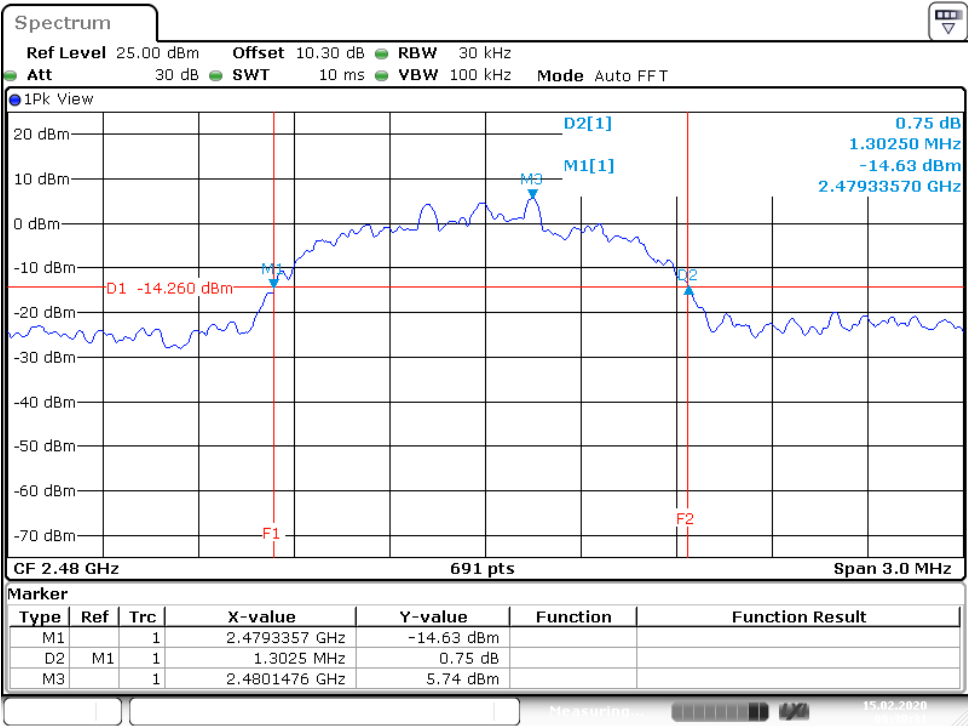
Date: 15.FEB.2020 09:23:28

Middle Channel



Date: 15.FEB.2020 09:29:06

High Channel

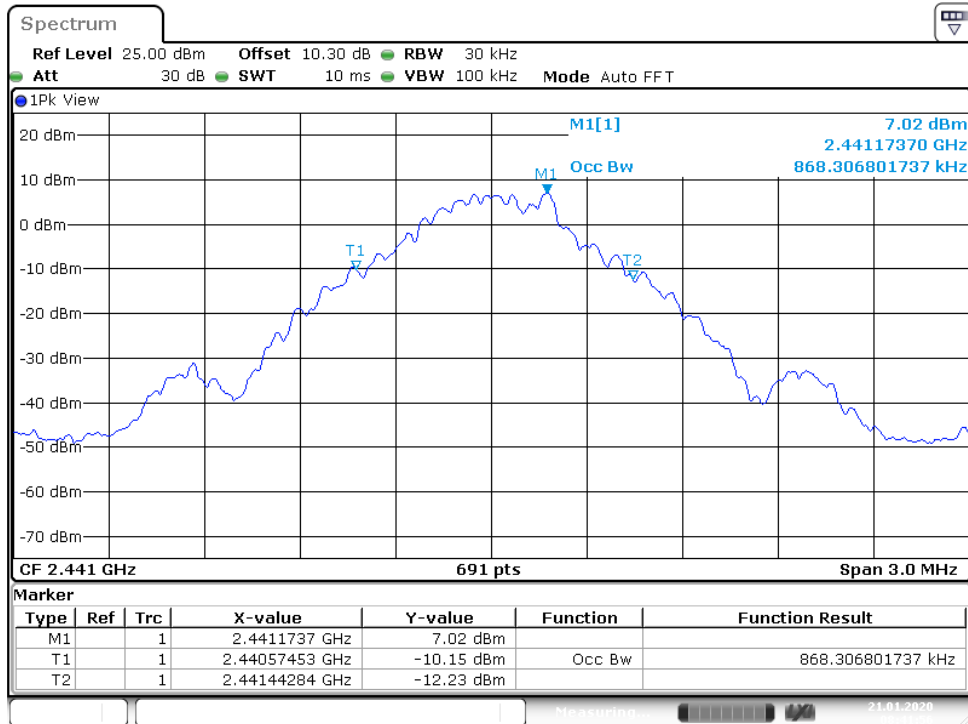


Date: 15.FEB.2020 09:30:32

Prüfbericht - Nr.: 50343090 001
Test Report No.

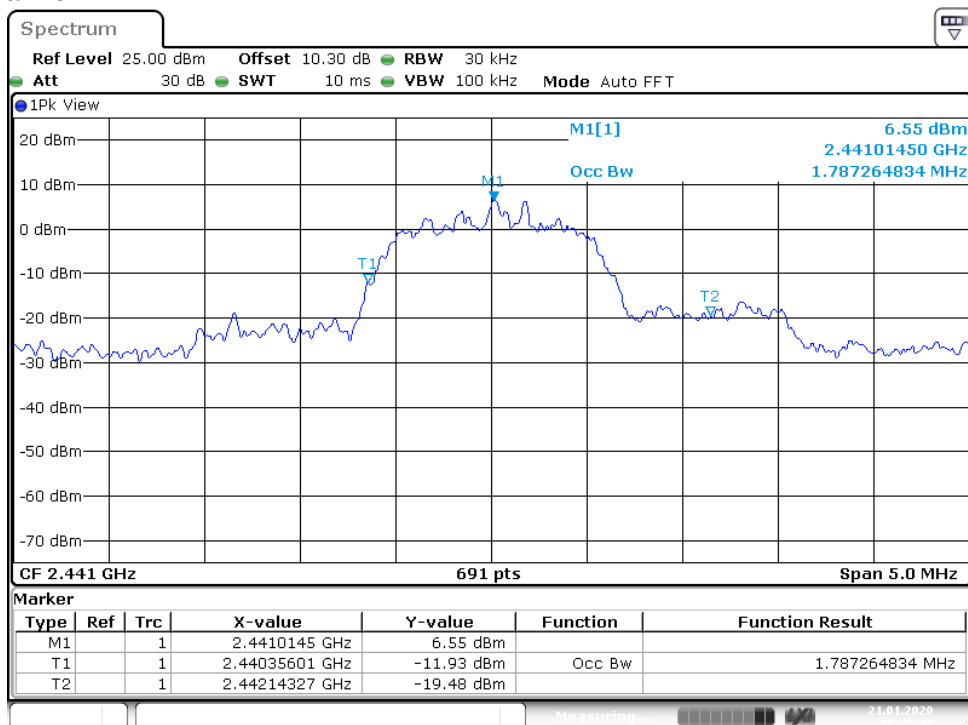
Seite 31 von 68
Page 31 of 68

Test Plot of 99% Bandwidth 1-DH5_Left Ear Middle Channel



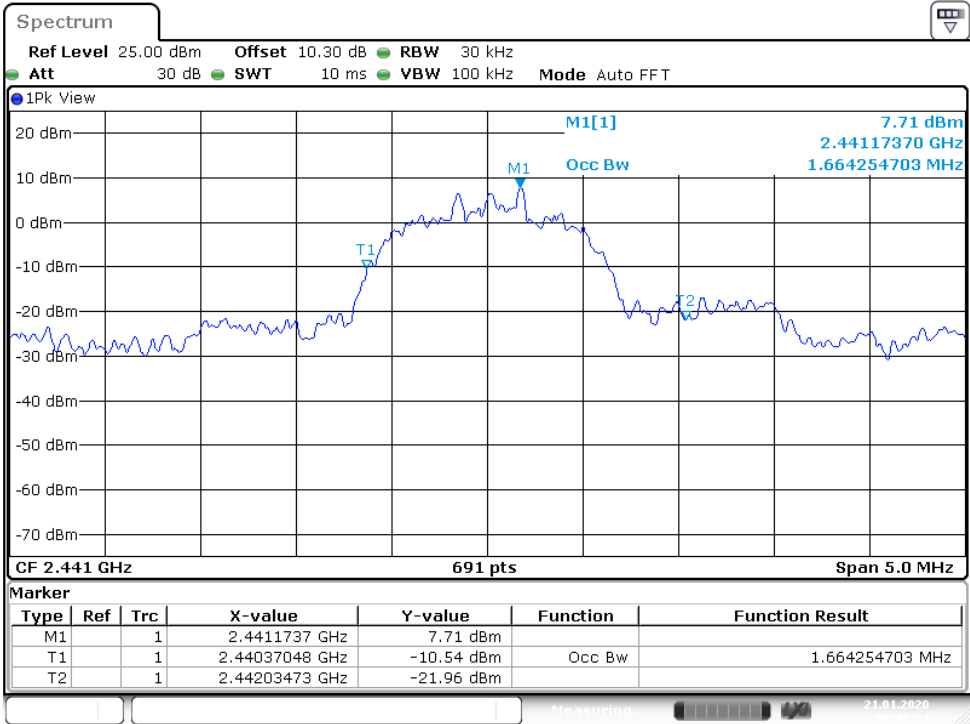
Date: 21.JAN.2020 08:41:56

Test Plot of 99% Bandwidth 2-DH5_Left Ear Middle Channel



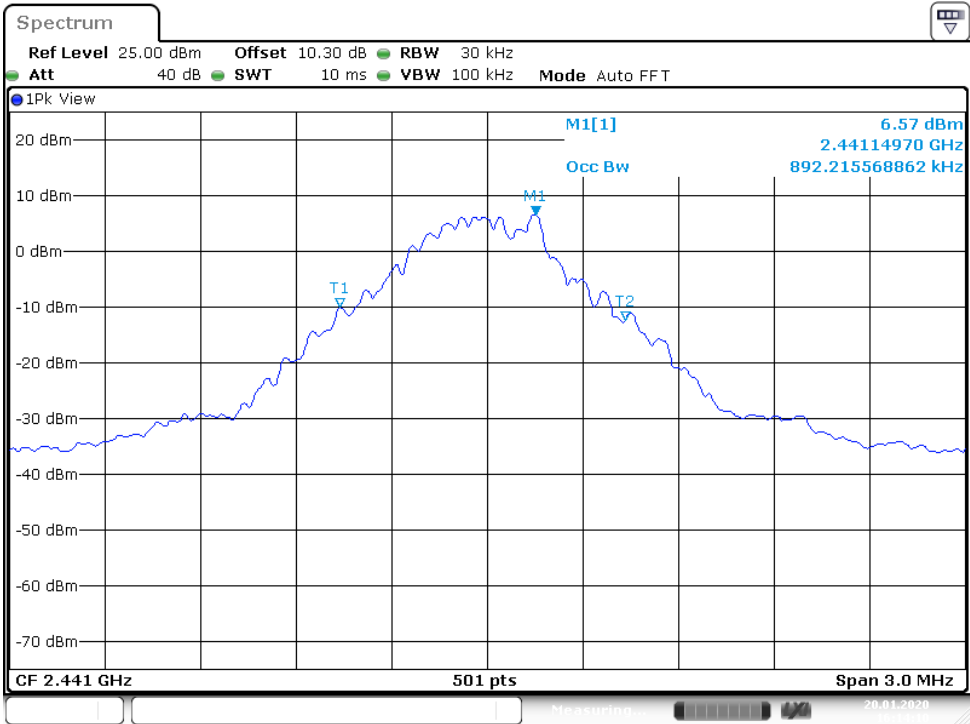
Date: 21.JAN.2020 08:45:47

Test Plot of 99% Bandwidth 3-DH5_Left Ear
Middle Channel



Date: 21.JAN.2020 08:46:24

Test Plot of 99% Bandwidth 1-DH5_Right Ear
Middle Channel

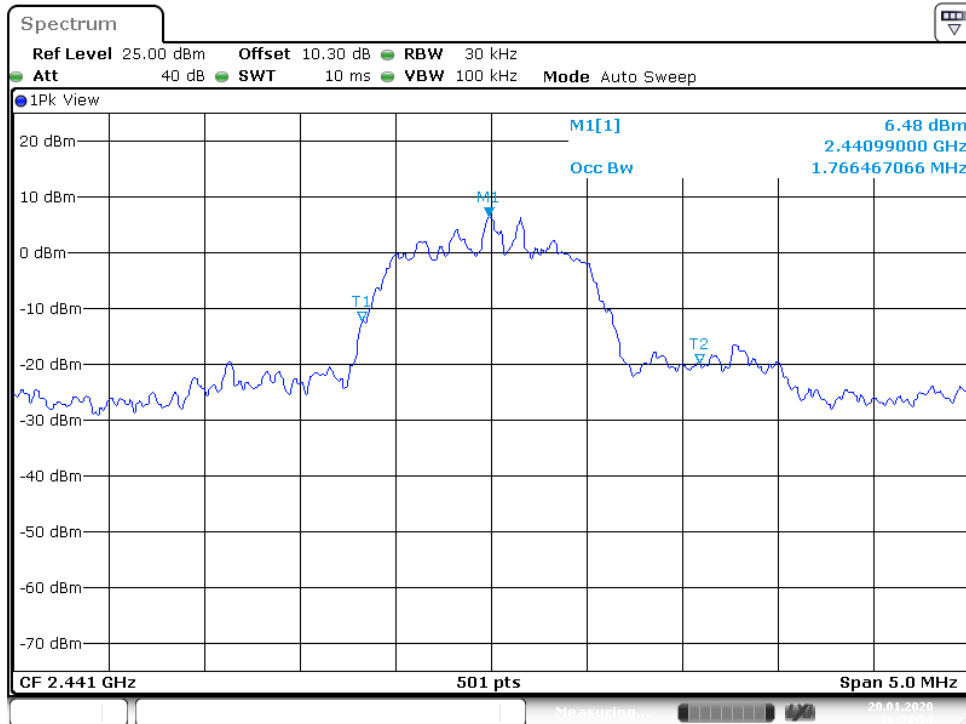


Date: 20.JAN.2020 16:14:10

Prüfbericht - Nr.: 50343090 001
Test Report No.

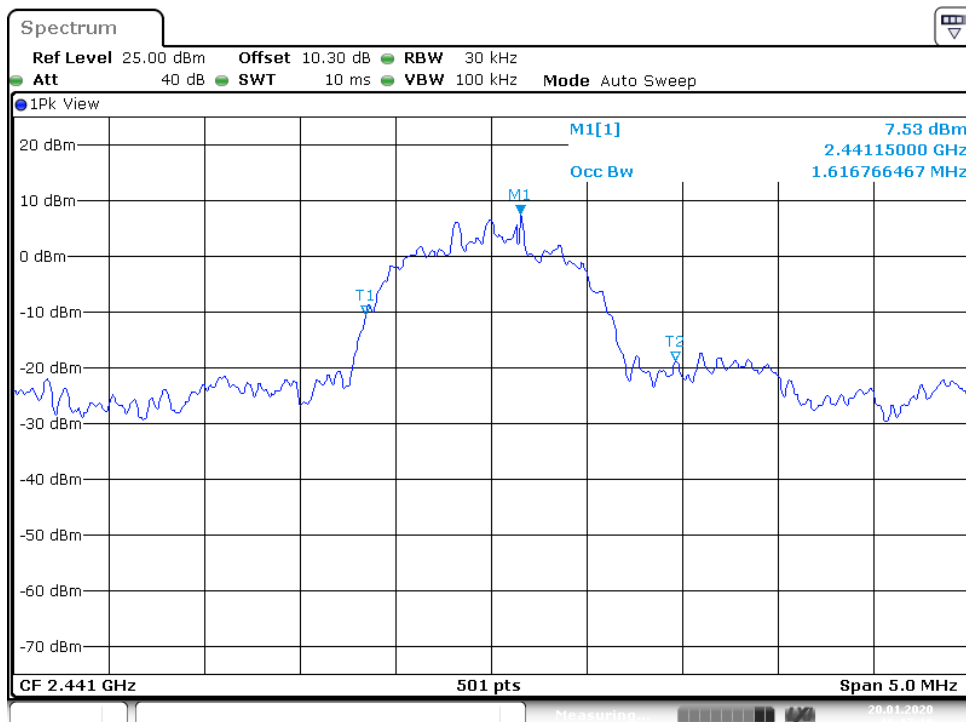
Seite 33 von 68
Page 33 of 68

Test Plot of 99% Bandwidth 2-DH5_Right Ear Middle Channel



Date: 20.JAN.2020 16:21:54

Test Plot of 99% Bandwidth 3-DH5_Right Ear Middle Channel



Date: 20.JAN.2020 16:17:18

5.1.4 Conducted spurious emissions and Frequency Band Edge measured in 100kHz Bandwidth

RESULT:

Passed

Test standard	:	FCC part 15.247(d), ISED RSS-247 5.5
Basic standard	:	ANSI C63.10:2013
Limit	:	20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power)
Kind of test site	:	Shielded room

Test setup

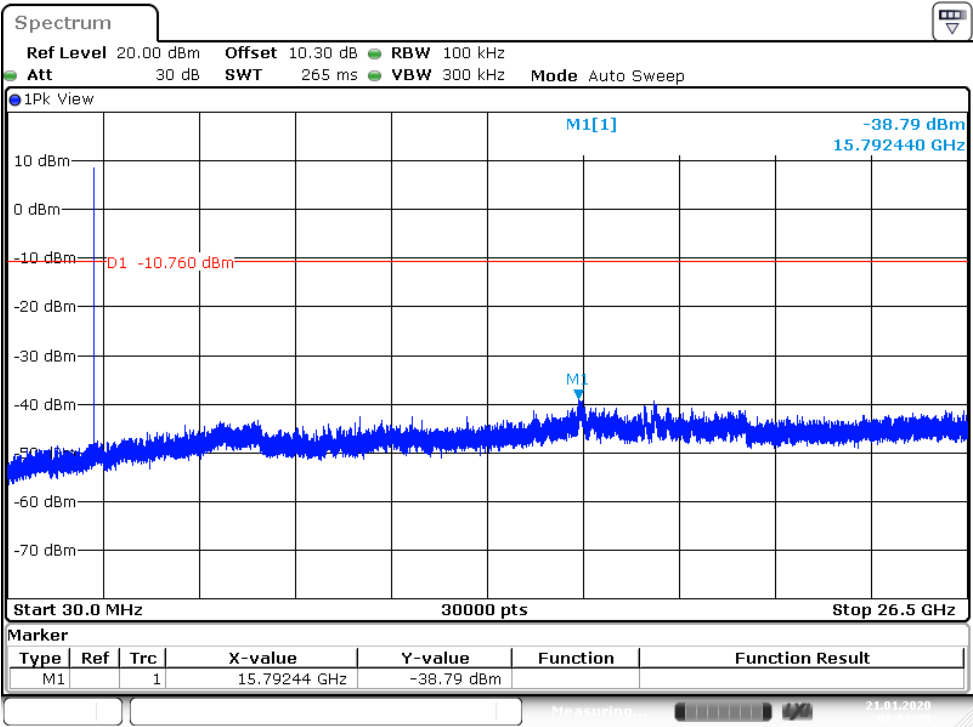
Test Channel	:	Low/ Middle/ High for Conducted Spurious Emissions Low/ High for Frequency Band Edge
Operation Mode	:	A
Ambient temperature	:	22-26°C
Relative humidity	:	50-65%
Atmospheric pressure	:	100-103 kPa

All emissions are more than 20dB below fundamental, details refer to following test plot, and compliance is achieved as well.

Due to the small size of the RF circuit and that there are no inductive components of significant size connected to the antenna port, 9kHz to 30MHz frequency range is not tested based on technical judgment.

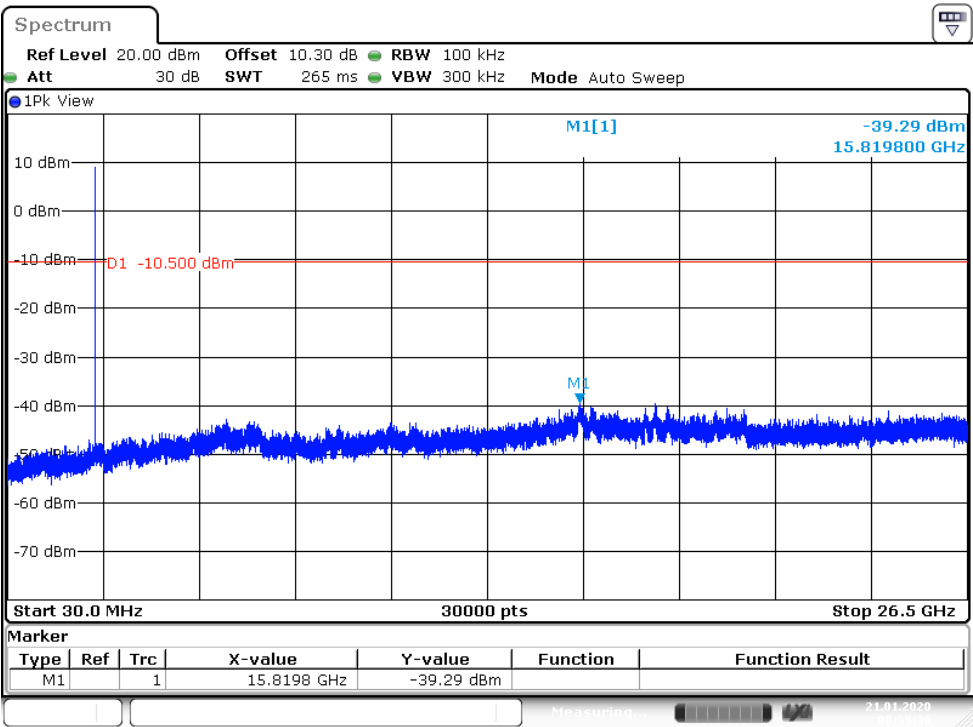
Test Plot 100kHz Conducted Emissions 1-DH5_Left Ear

Low Channel



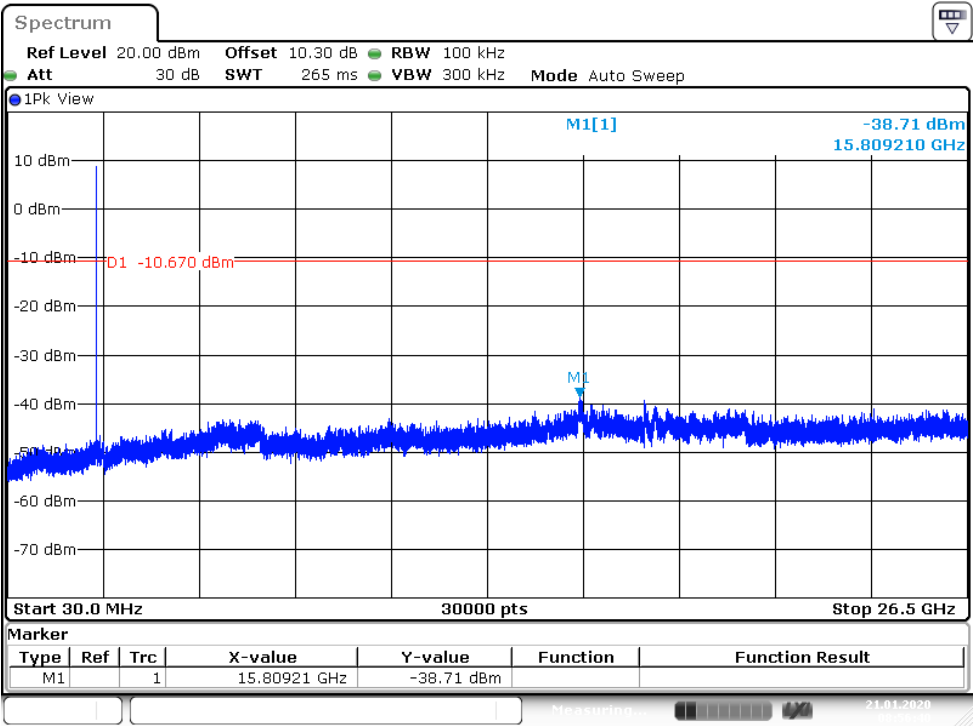
Date: 21.JAN.2020 08:53:35

Middle Channel



Date: 21.JAN.2020 08:55:36

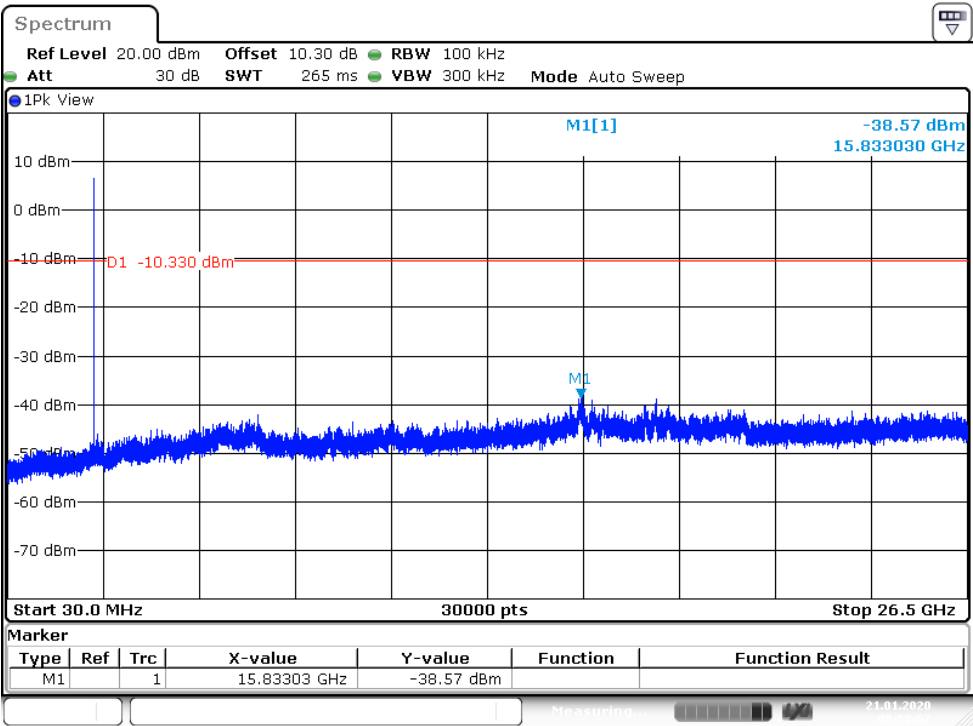
High Channel



Date: 21.JAN.2020 08:56:40

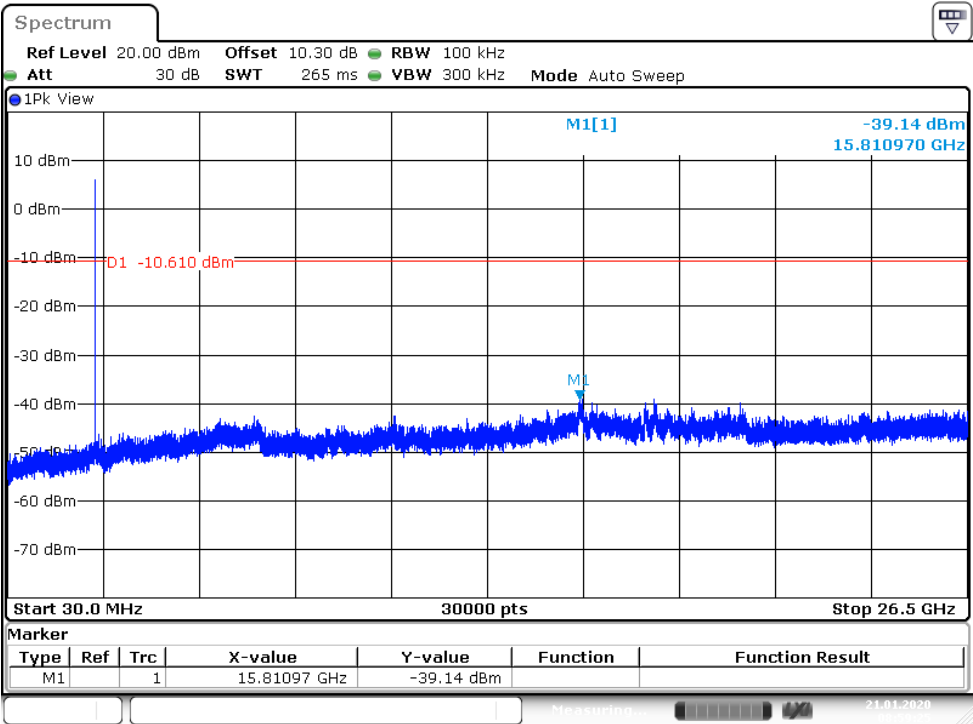
Test Plot 100kHz Conducted Emissions 2-DH5_Left Ear

Low Channel



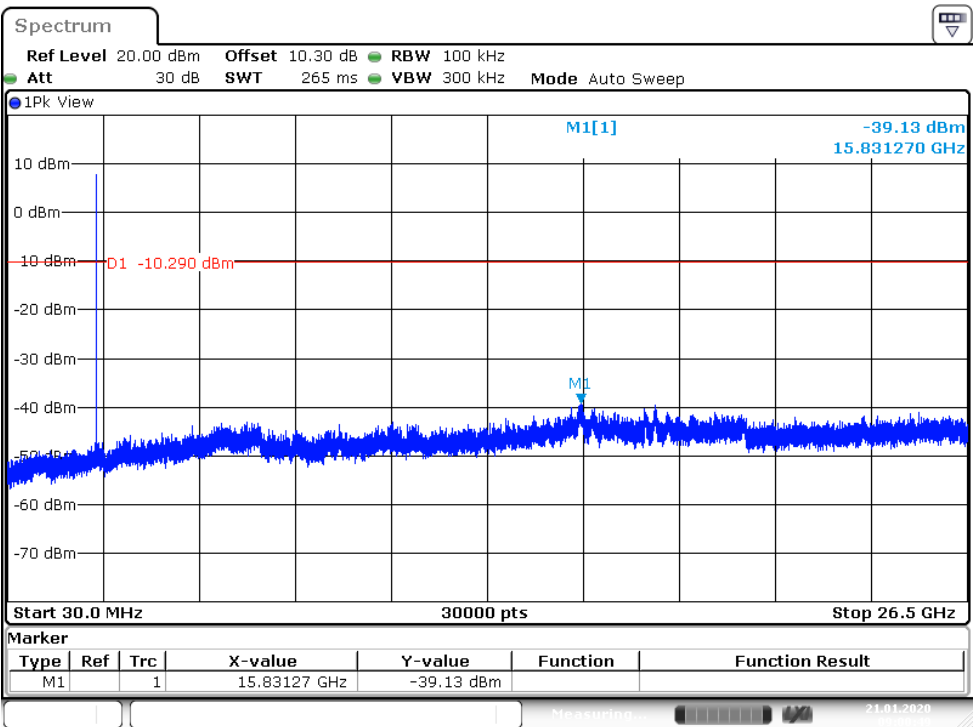
Date: 21.JAN.2020 08:58:08

Middle Channel



Date: 21.JAN.2020 08:59:25

High Channel



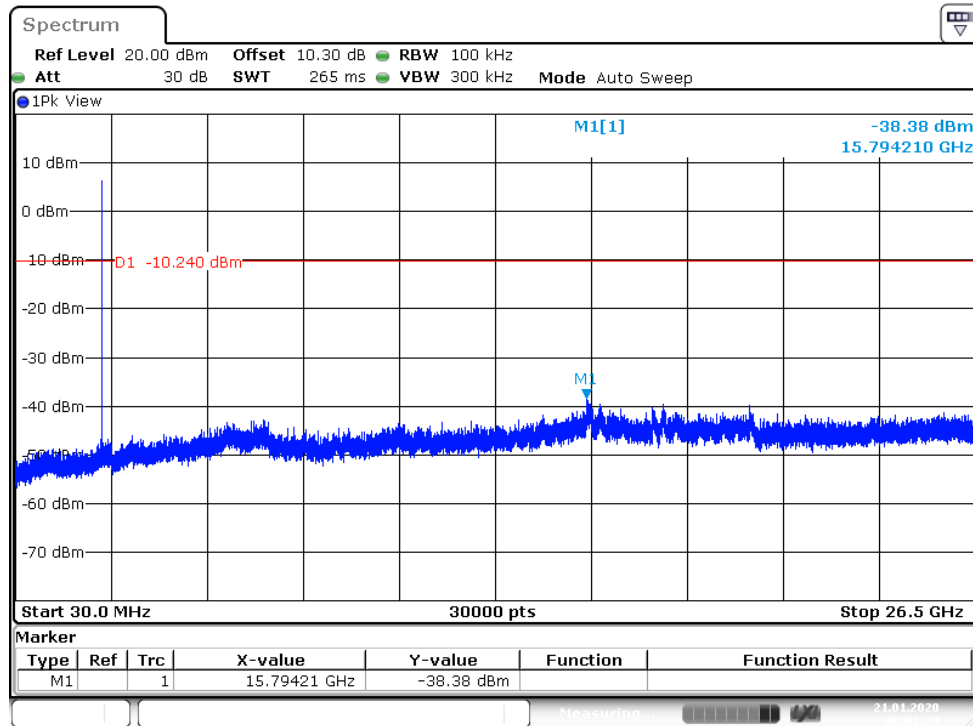
Date: 21.JAN.2020 09:00:49

Prüfbericht - Nr.: 50343090 001
Test Report No.

Seite 38 von 68
Page 38 of 68

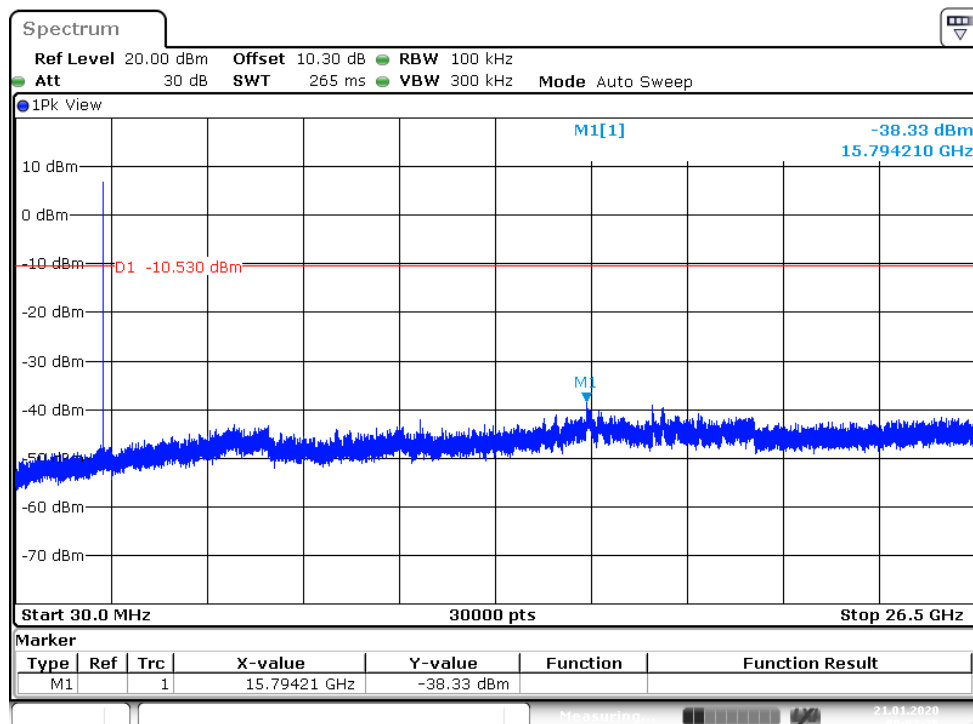
Test Plot 100kHz Conducted Emissions 3-DH5_Left Ear

Low Channel



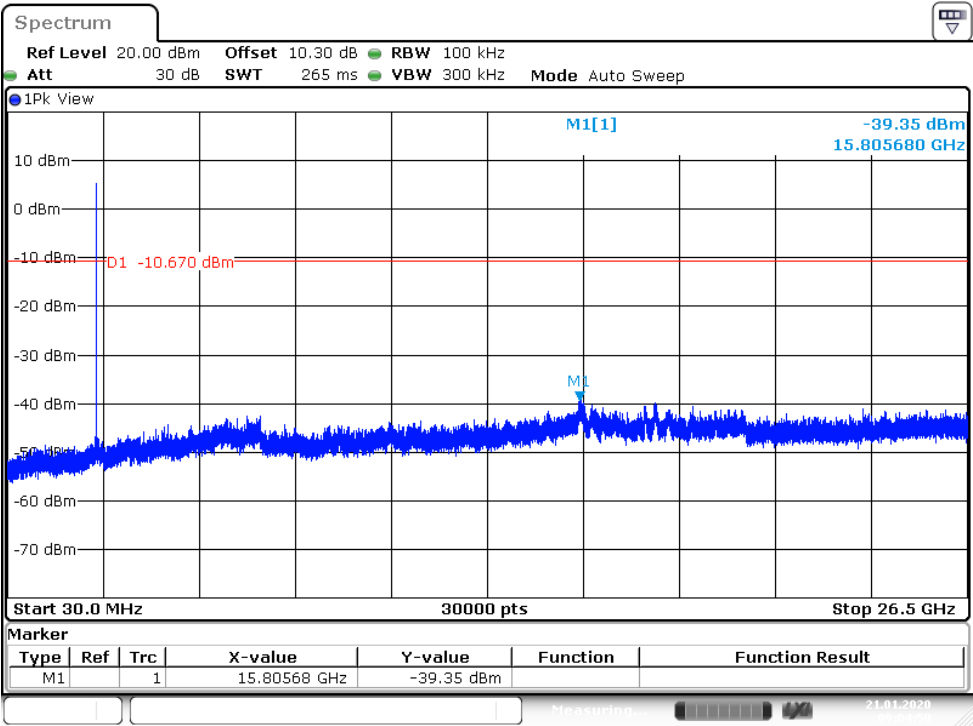
Date: 21.JAN.2020 09:02:24

Middle Channel



Date: 21.JAN.2020 09:03:25

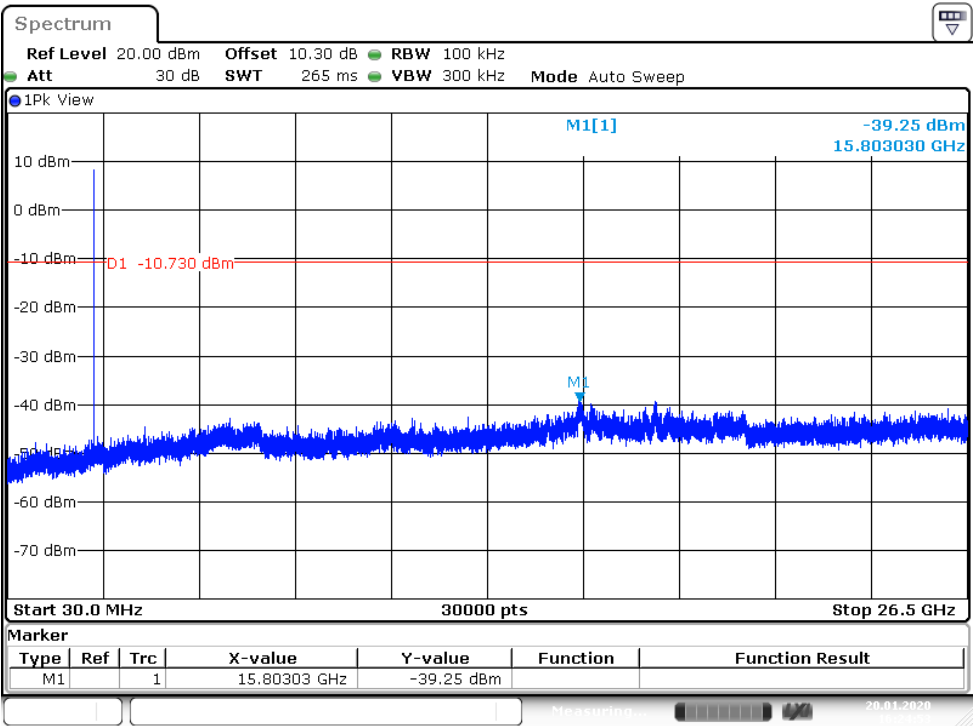
High Channel



Date: 21.JAN.2020 09:04:51

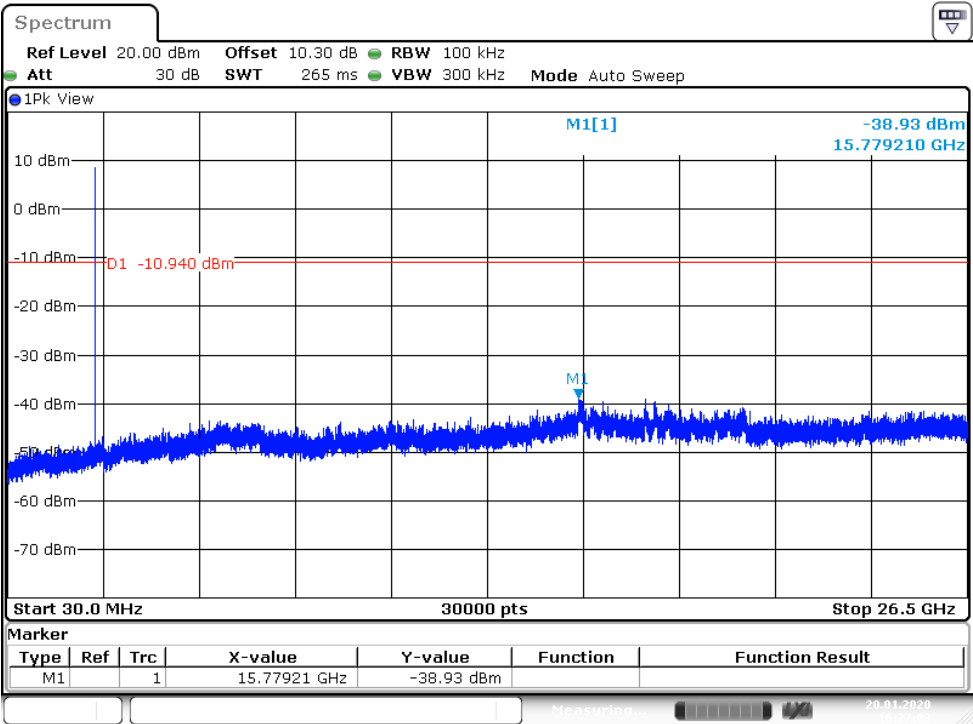
Test Plot 100kHz Conducted Emissions 1-DH5_Right Ear

Low Channel



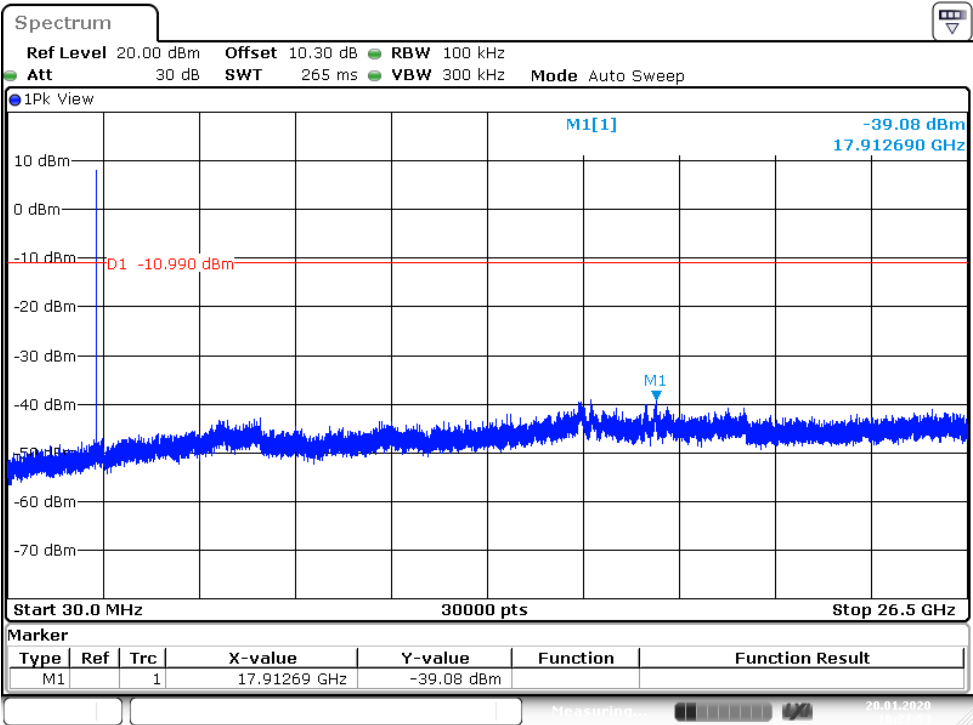
Date: 20.JAN.2020 16:24:53

Middle Channel



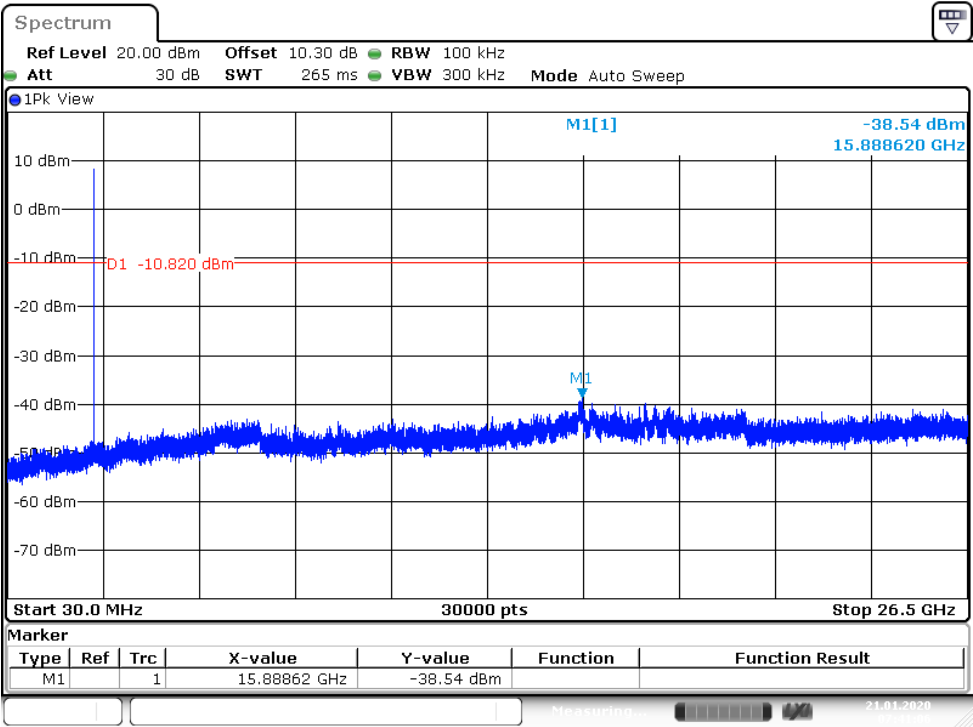
Date: 20.JAN.2020 16:27:04

High Channel



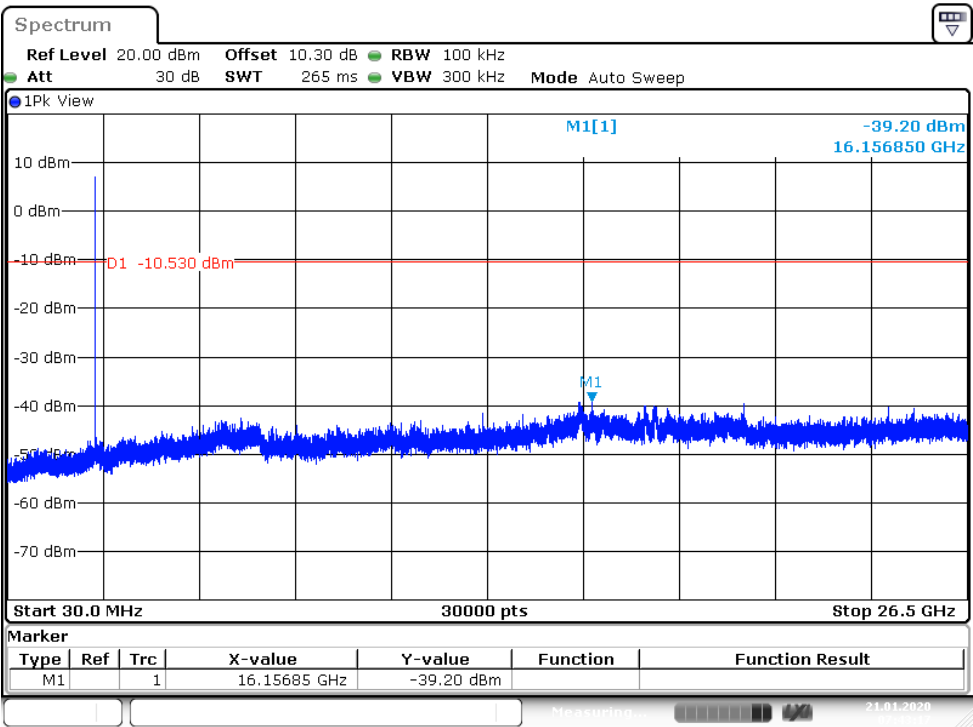
Date: 20.JAN.2020 16:27:53

Test Plot 100kHz Conducted Emissions 2-DH5_Right Ear
Low Channel



Date: 21.JAN.2020 07:41:06

Middle Channel

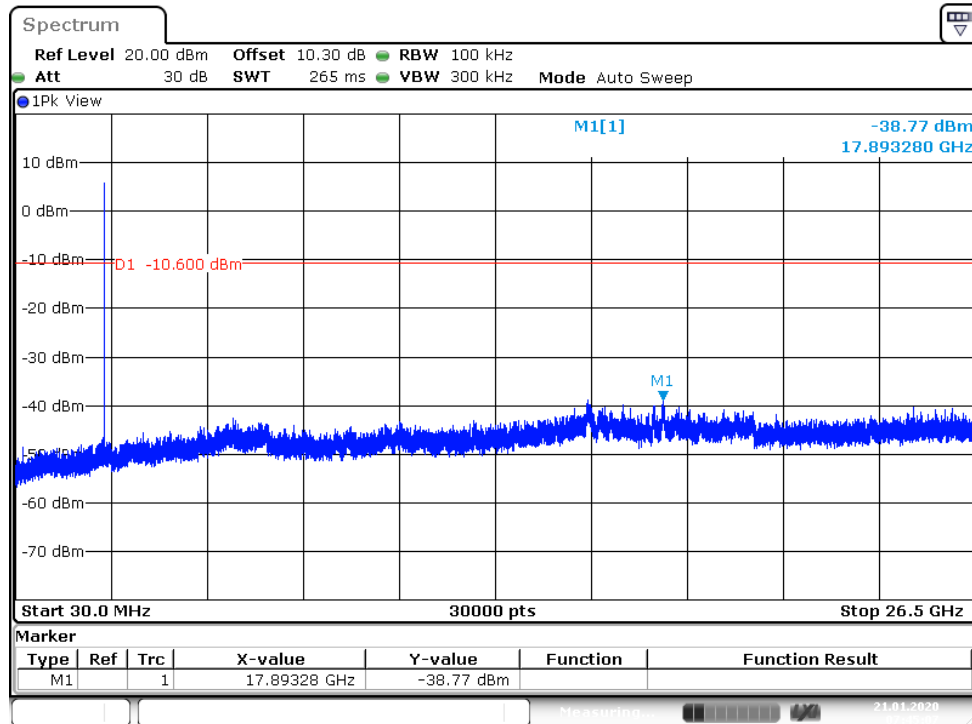


Date: 21.JAN.2020 07:43:17

Prüfbericht - Nr.: 50343090 001
Test Report No.

Seite 42 von 68
Page 42 of 68

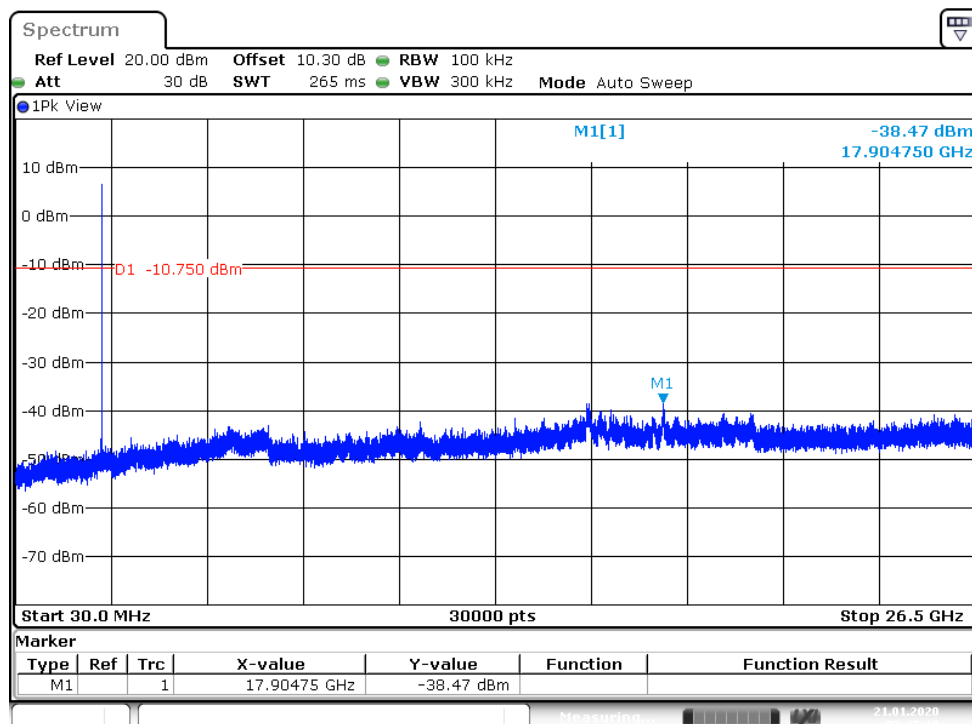
High Channel



Date: 21.JAN.2020 07:45:07

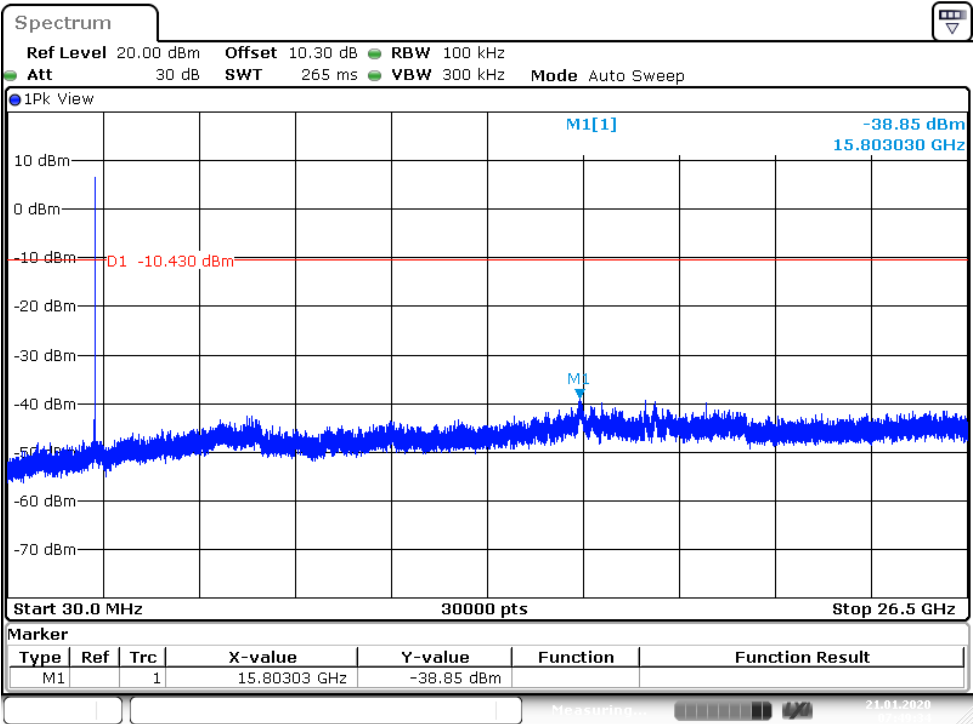
Test Plot 100kHz Conducted Emissions 3-DH5_Right Ear

Low Channel



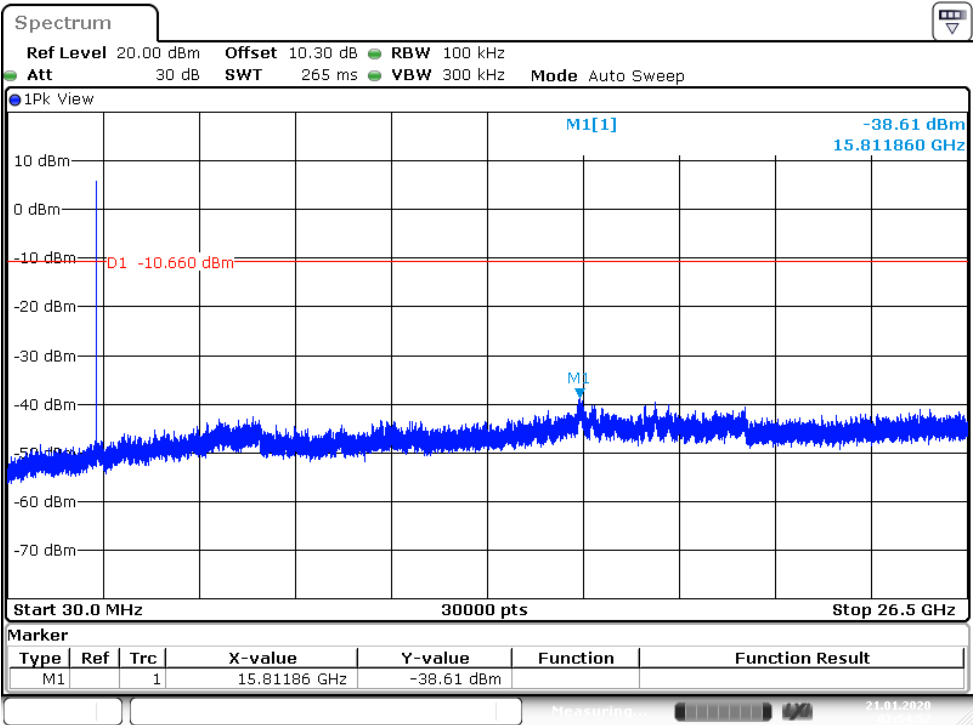
Date: 21.JAN.2020 07:47:10

Middle Channel



Date: 21.JAN.2020 07:49:34

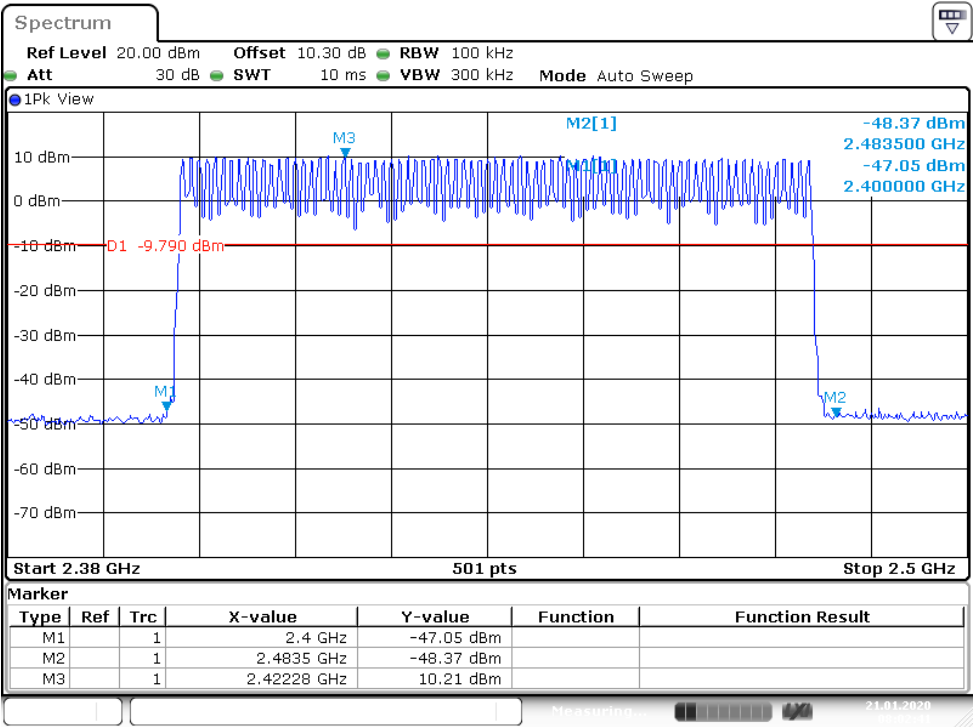
High Channel



Date: 21.JAN.2020 07:54:52

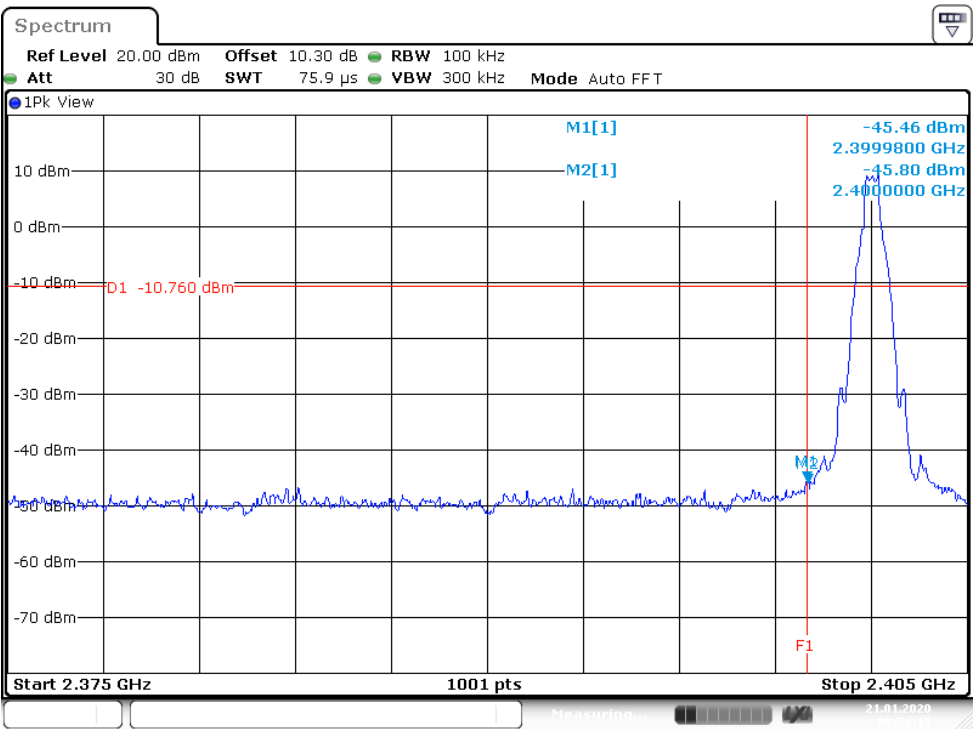
Test Plot 100kHz RBW of Band Edge 1-DH5_Left Ear

Hopping



Date: 21.JAN.2020 08:02:41

Low Channel

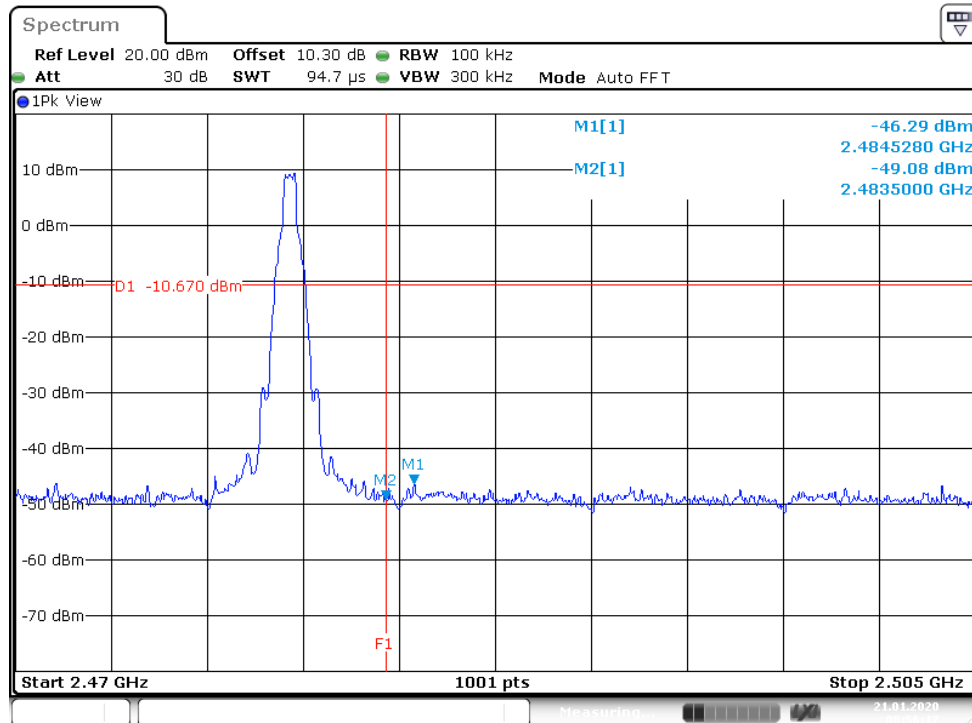


Date: 21.JAN.2020 08:53:16

Prüfbericht - Nr.: 50343090 001
Test Report No.

Seite 45 von 68
Page 45 of 68

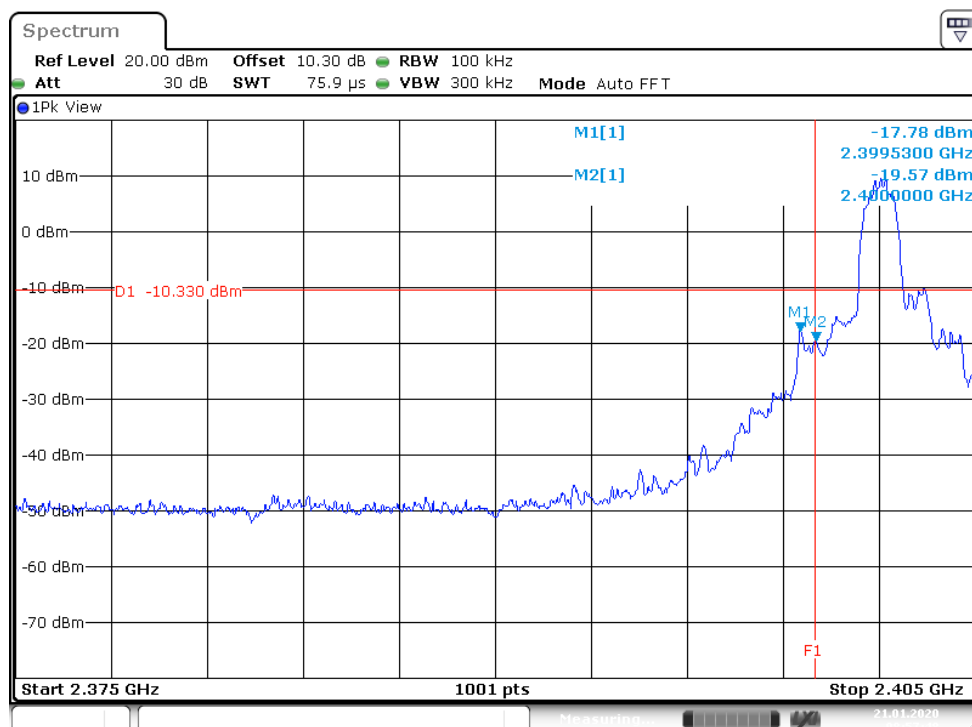
High Channel



Date: 21.JAN.2020 08:56:17

Test Plot 100kHz RBW of Band Edge 2-DH5_Left Ear

Low Channel

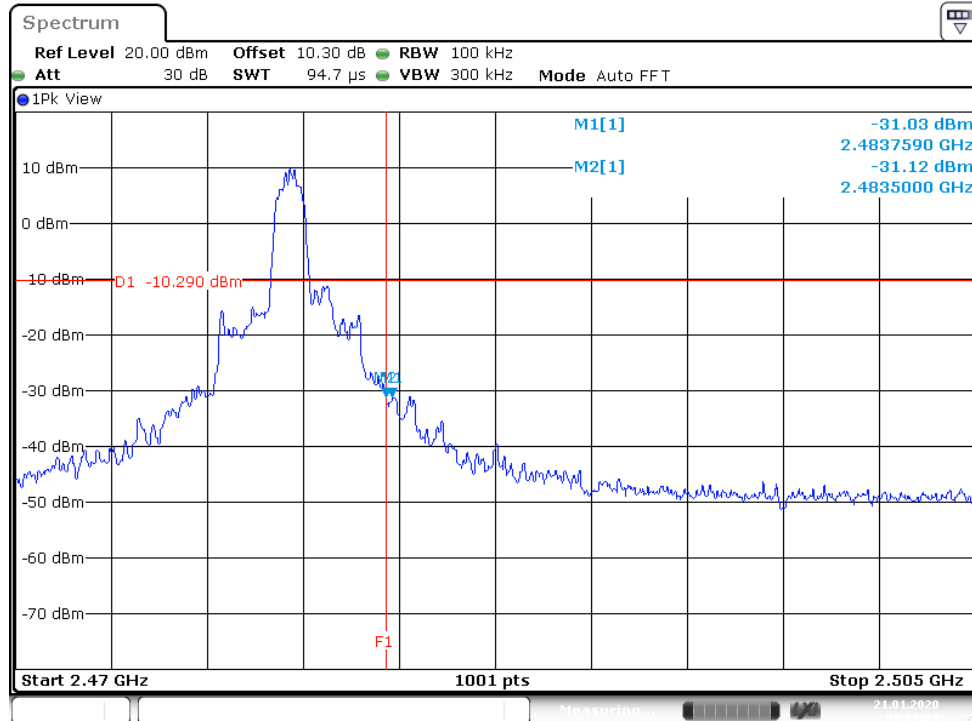


Date: 21.JAN.2020 08:57:49

Prüfbericht - Nr.: 50343090 001
Test Report No.

Seite 46 von 68
Page 46 of 68

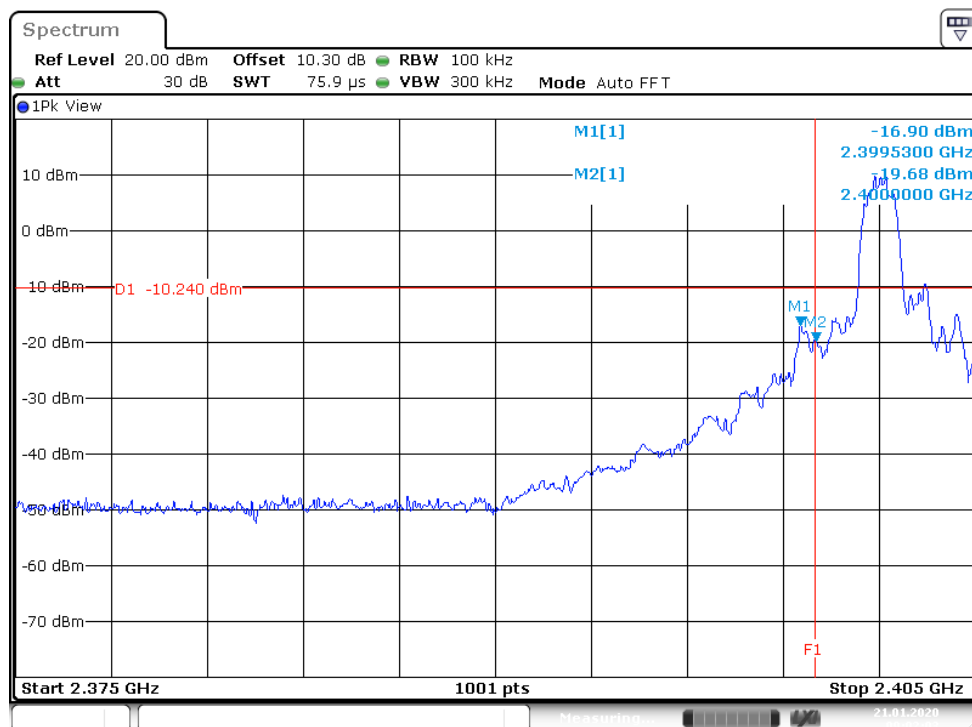
High Channel



Date: 21.JAN.2020 09:00:29

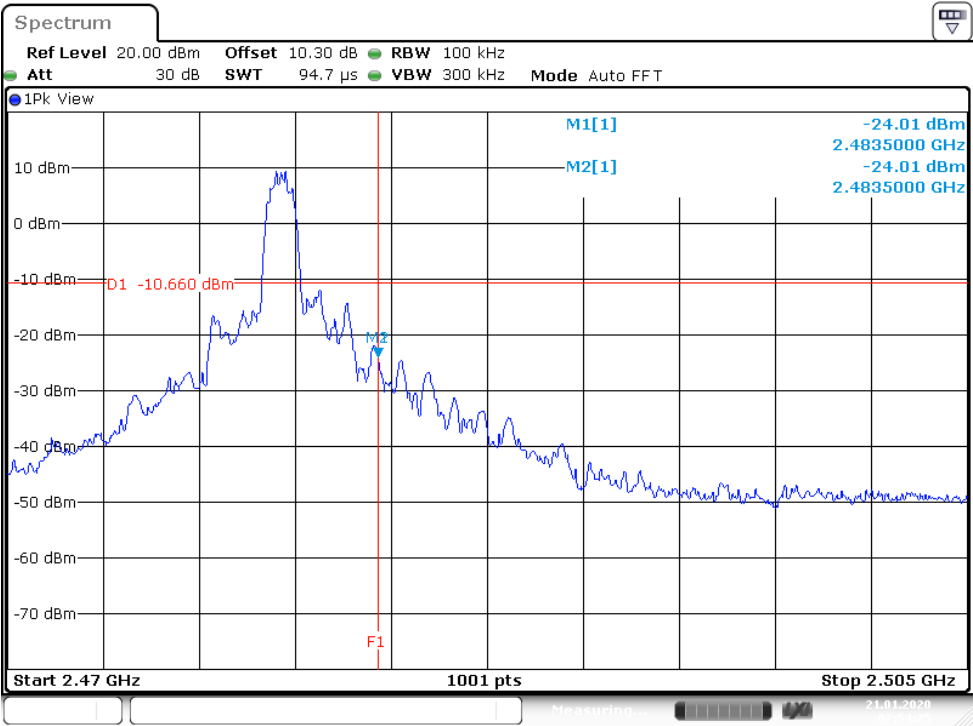
Test Plot 100kHz RBW of Band Edge 3-DH5_Left Ear

Low Channel



Date: 21.JAN.2020 09:02:03

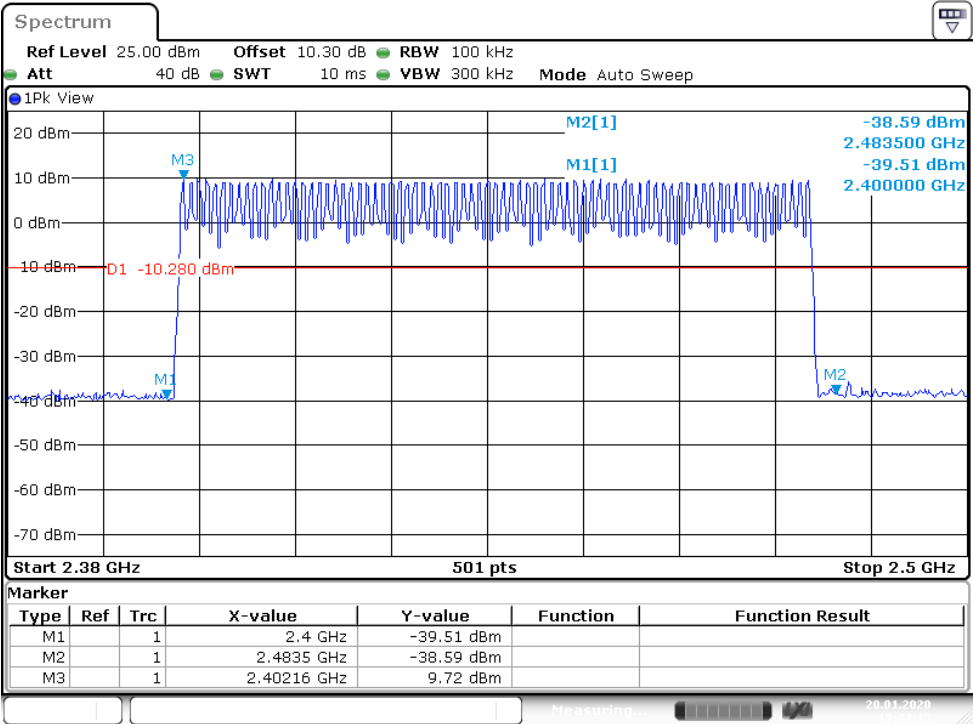
High Channel



Date: 21.JAN.2020 07:54:25

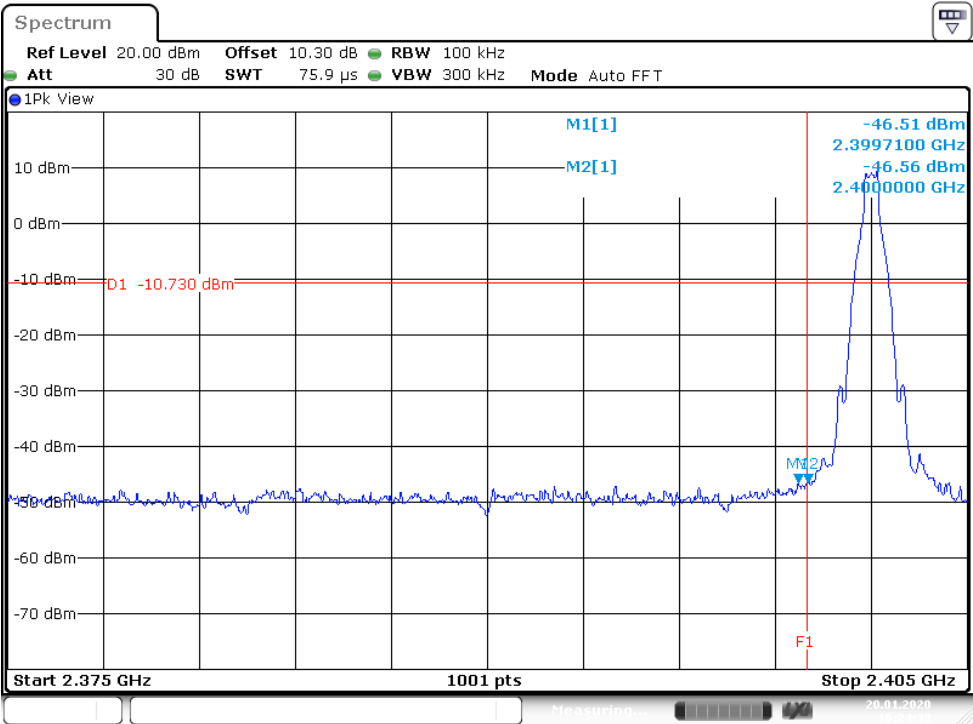
Test Plot 100kHz RBW of Band Edge 1-DH5_Right Ear

Hopping



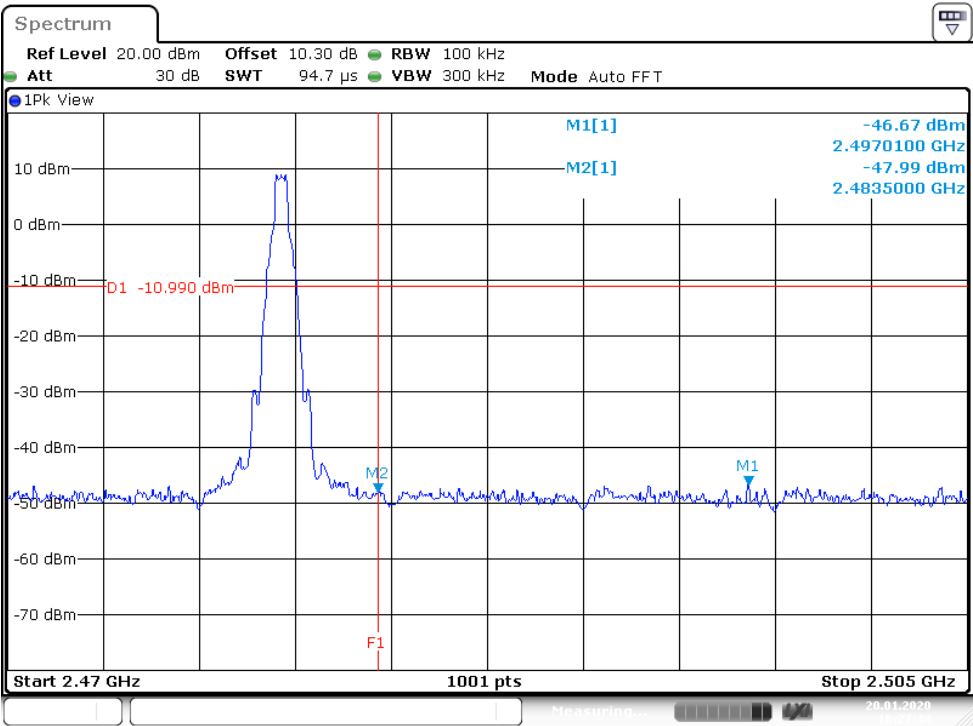
Date: 20.JAN.2020 15:44:15

Low Channel



Date: 20.JAN.2020 16:24:33

High Channel



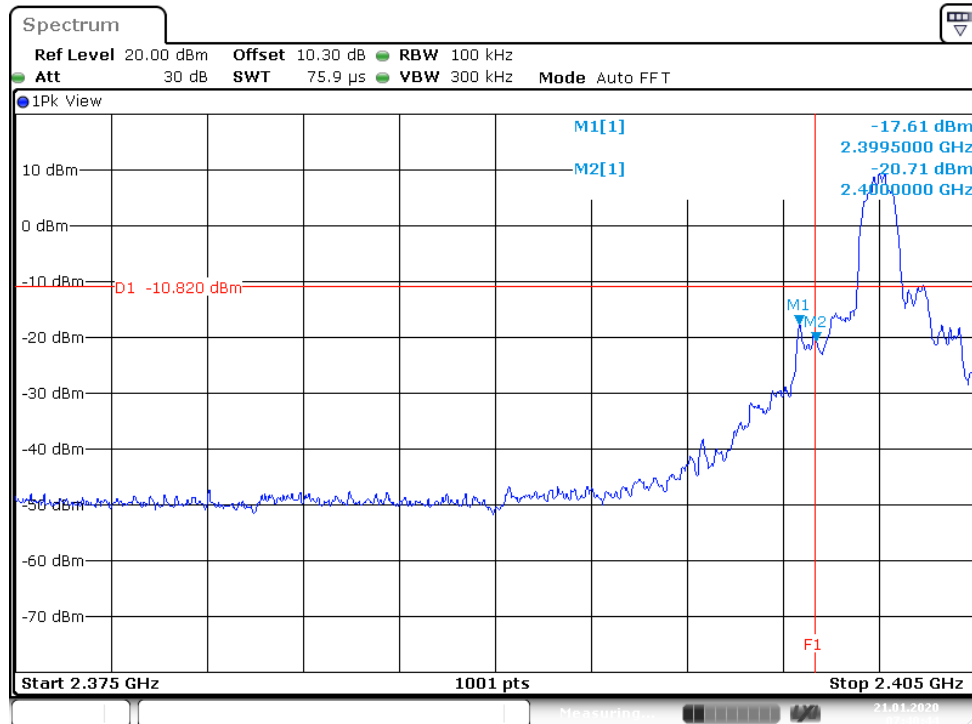
Date: 20.JAN.2020 16:27:34

Prüfbericht - Nr.: 50343090 001
Test Report No.

Seite 49 von 68
Page 49 of 68

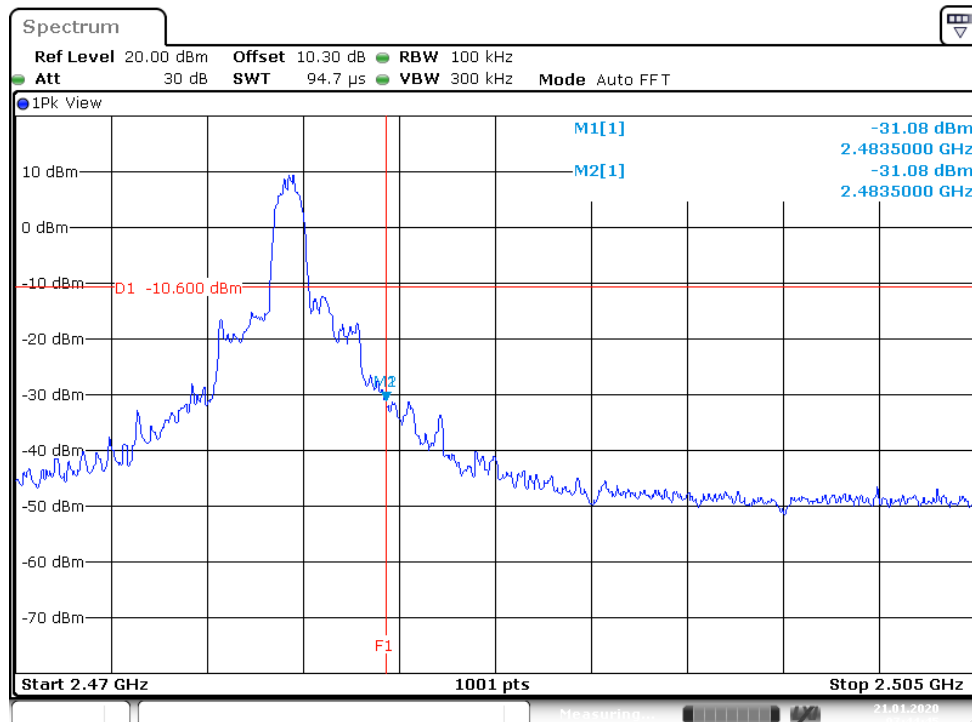
Test Plot 100kHz RBW of Band Edge 2-DH5_Right Ear

Low Channel



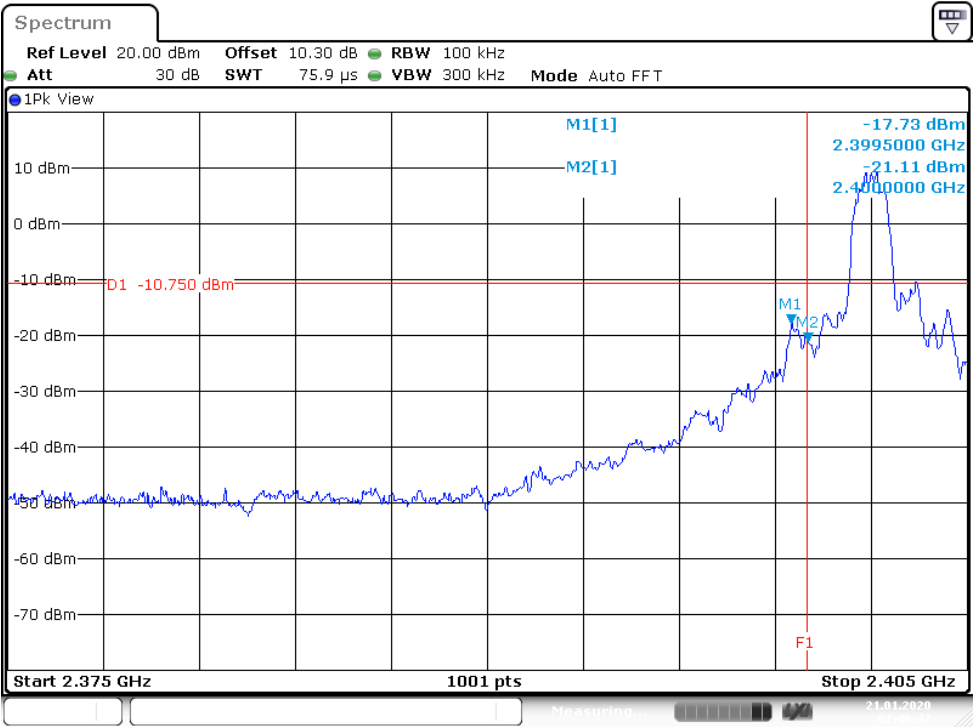
Date: 21.JAN.2020 07:40:44

High Channel



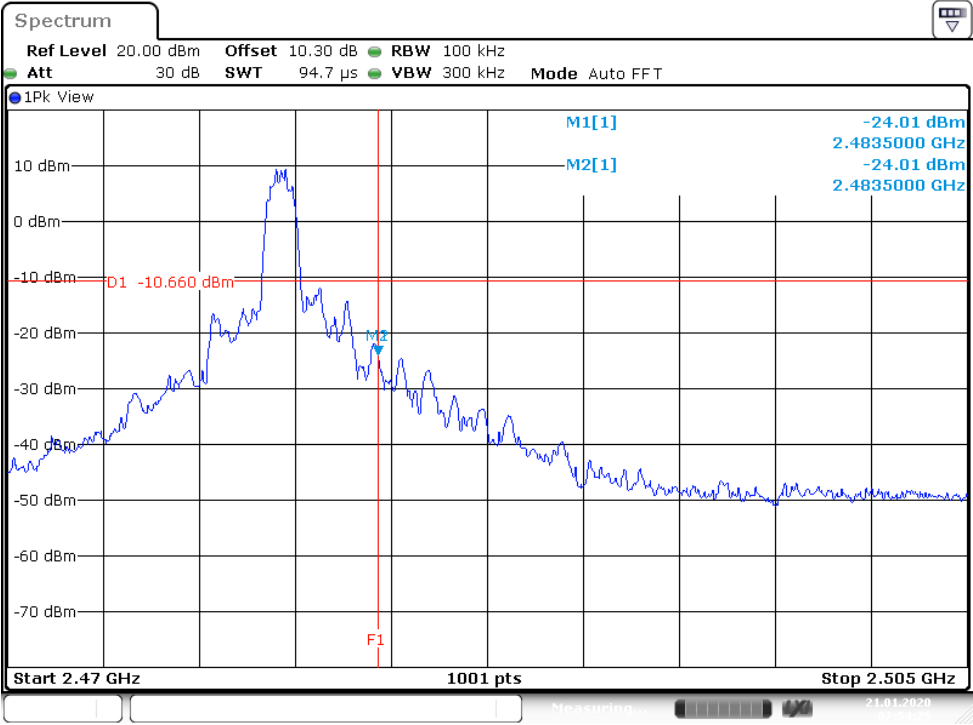
Date: 21.JAN.2020 07:44:45

Test Plot 100kHz RBW of Band Edge 3-DH5_Right Ear
Low Channel



Date: 21.JAN.2020 07:46:47

High Channel



Date: 21.JAN.2020 07:54:25

Prüfbericht - Nr.: 50343090 001

Test Report No.

Seite 51 von 68

Page 51 of 68

5.1.5 Spurious Emission

RESULT:

Passed

Test standard	:	FCC part 15.247(d), FCC 15.205, FCC 15.209 and ISED RSS-247 clause 3.3
Basic standard	:	ANSI C63.10: 2013
Limits	:	Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and ISED RSS-Gen i5, 8.10 (Table 7), must comply with the radiated emission limits specified in FCC 15.209(a) and ISED RSS-Gen 5, 8.9 (Table 5 and 6). Emission radiated outside the restricted and authorized frequency bands must either comply with the radiated emission limits specified for the restricted bands or in FCC15.247(d) and ISED RSS-247 i2, 5.5
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/ Middle/ High
Operation mode	:	A, B
Ambient temperature	:	22-26°C
Relative humidity	:	50-65 %
Atmospheric pressure	:	100-103 kPa

Remark: Testing was carried out within frequency range 9kHz to the tenth harmonic. For details refer to Appendix D. The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The worst-case Axis orientation is recorded in this test report.

Prüfbericht - Nr.: 50343090 001

Test Report No.

Seite 52 von 68

Page 52 of 68

5.1.6 Frequency Separation

RESULT:

Passed

Test standard : FCC part 15.247(a)(1), ISSED RSS-247 5.1(b)
Basic standard : ANSI C63.10:2013
Limits : $\geq 25\text{kHz}$ or $2/3$ of 20dB bandwidth, whichever is greater

Test setup

Test Channel : Hopping On
Operation mode : C

Ambient temperature : 22-26°C
Relative humidity : 50-65 %
Atmospheric pressure : 100-103 kPa

Table 27: Test result of Frequency Separation, 1-DH5_Left Ear

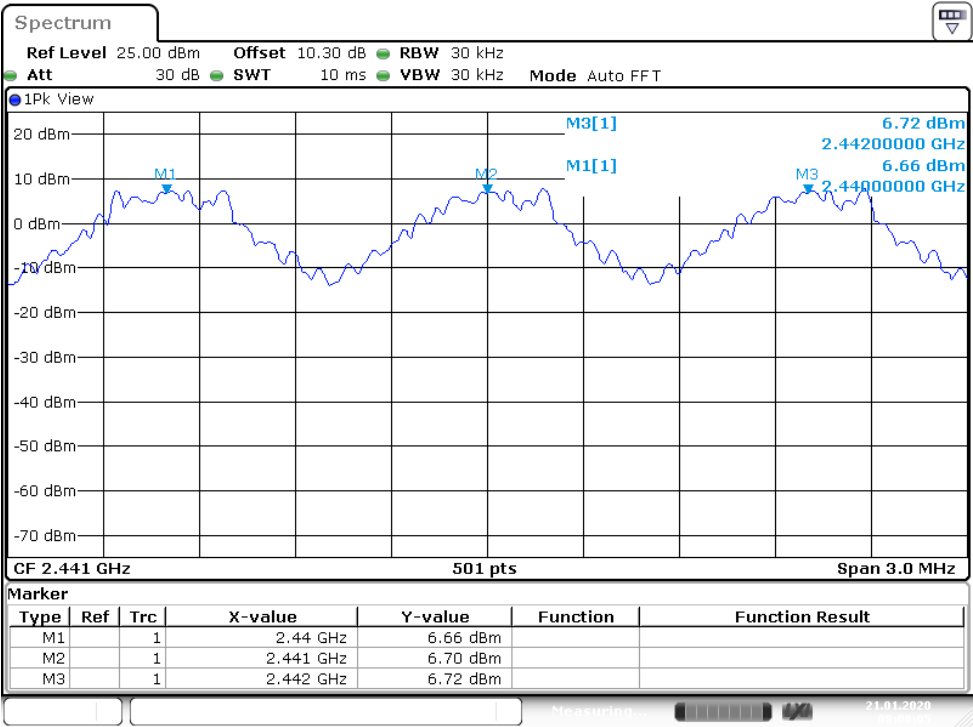
Channel	Channel Frequency (MHz)	Measured Channel Separation (MHz)	Limit (kHz)	Result
Record Channel	2441	1	$\geq 25\text{kHz}$ or $2/3$ of 20dB bandwidth	Pass
Record Channel adj 1	2440			
Record Channel adj 2	2442			

Table 28: Test result of Frequency Separation, 1-DH5_Right Ear

Channel	Channel Frequency (MHz)	Measured Channel Separation (MHz)	Limit (kHz)	Result
Record Channel	2441	1	$\geq 25\text{kHz}$ or $2/3$ of 20dB bandwidth	Pass
Record Channel adj 1	2440			
Record Channel adj 2	2442			

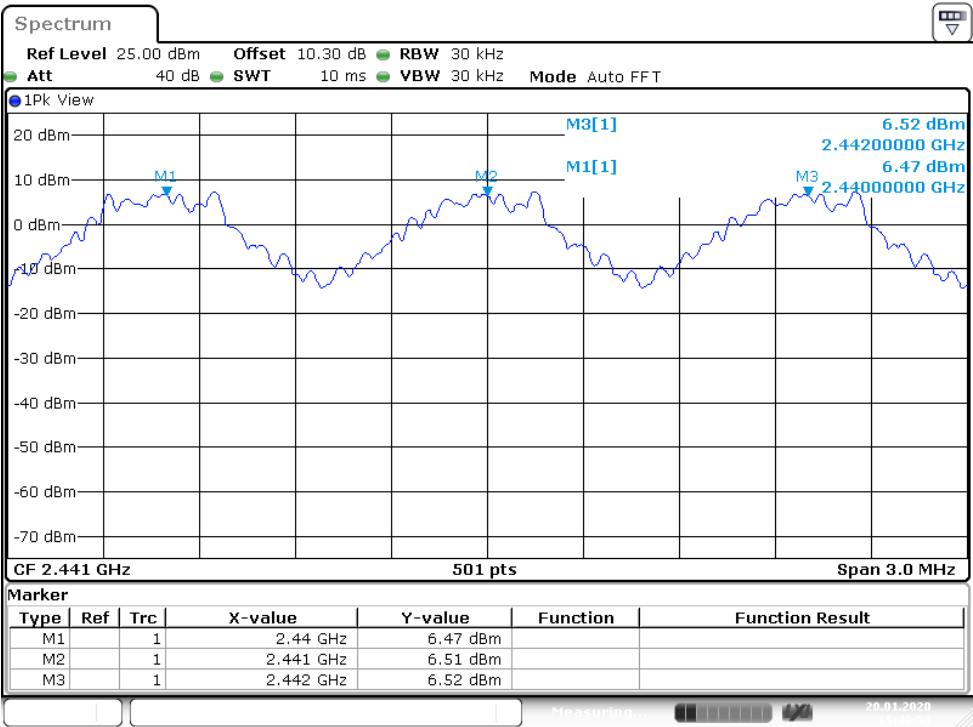
Test Plot of Frequency Separation

1-DH5, Left Ear



Date: 21.JAN.2020 08:08:05

1-DH5, Right Ear



Date: 20.JAN.2020 15:49:53

Prüfbericht - Nr.: 50343090 001

Test Report No.

Seite 54 von 68

Page 54 of 68

5.1.7 Number of hopping frequency

RESULT:

Passed

Test standard : FCC part 15.247(a)(1)(iii), ISSED RSS-247 5.1(e)
Basic standard : ANSI C63.10:2013
Limits : ≥ 15 non-overlapping channels
Kind of test site : Shield room

Test setup

Test Channel : Hopping On
Operation mode : C

Ambient temperature : 22-26°C
Relative humidity : 50-65%
Atmospheric pressure : 100-103 kPa

Table 29: Test result of Number of hopping frequency, 1-DH5_Left Ear

Frequency Range	Measured Quantity of Hopping Channel	Limit	Result
<u>2402</u> to <u>2480</u> MHz	79	≥ 15	Pass

Table 30: Test result of Number of hopping frequency, 1-DH5_Right Ear

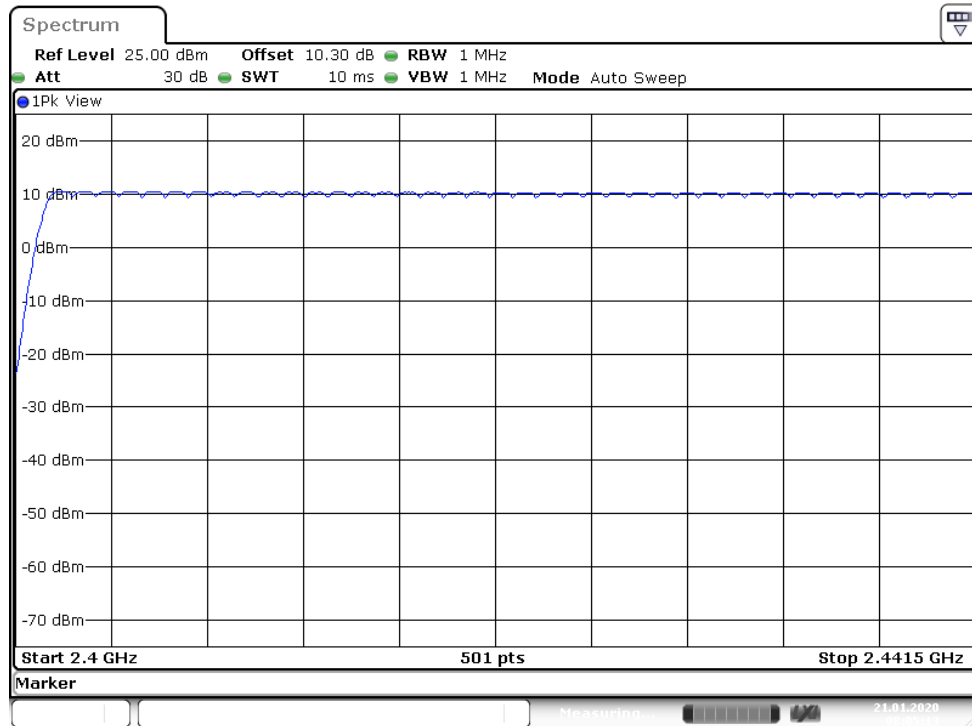
Frequency Range	Measured Quantity of Hopping Channel	Limit	Result
<u>2402</u> to <u>2480</u> MHz	79	≥ 15	Pass

Prüfbericht - Nr.: 50343090 001
Test Report No.

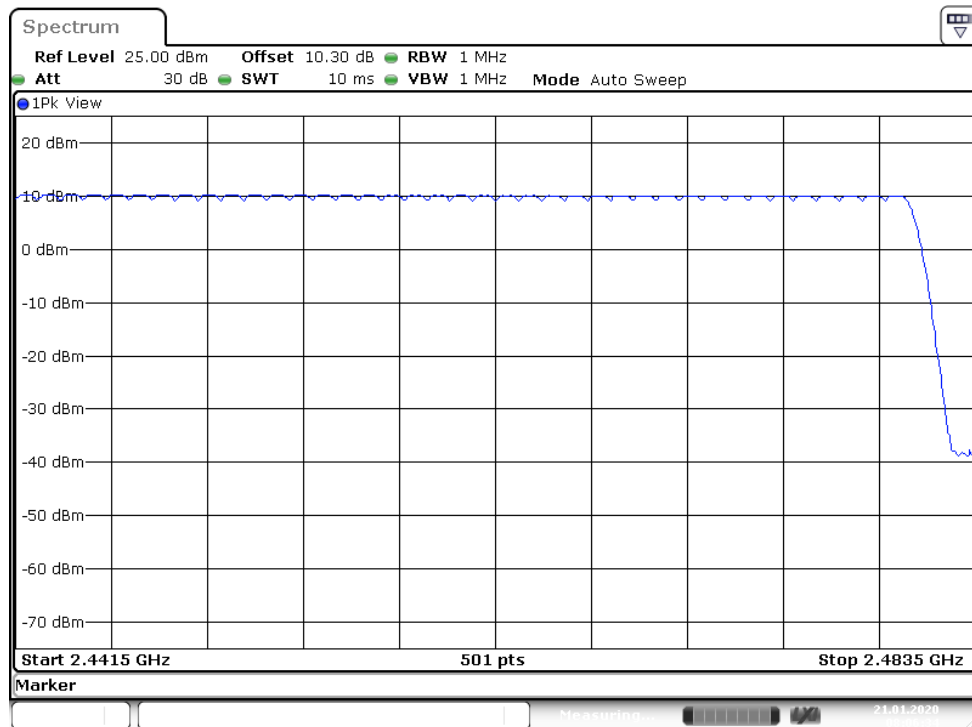
Seite 55 von 68
Page 55 of 68

Test Plot of Number of hopping frequencies

1-DH5, Left Ear



Date: 21.JAN.2020 08:05:13

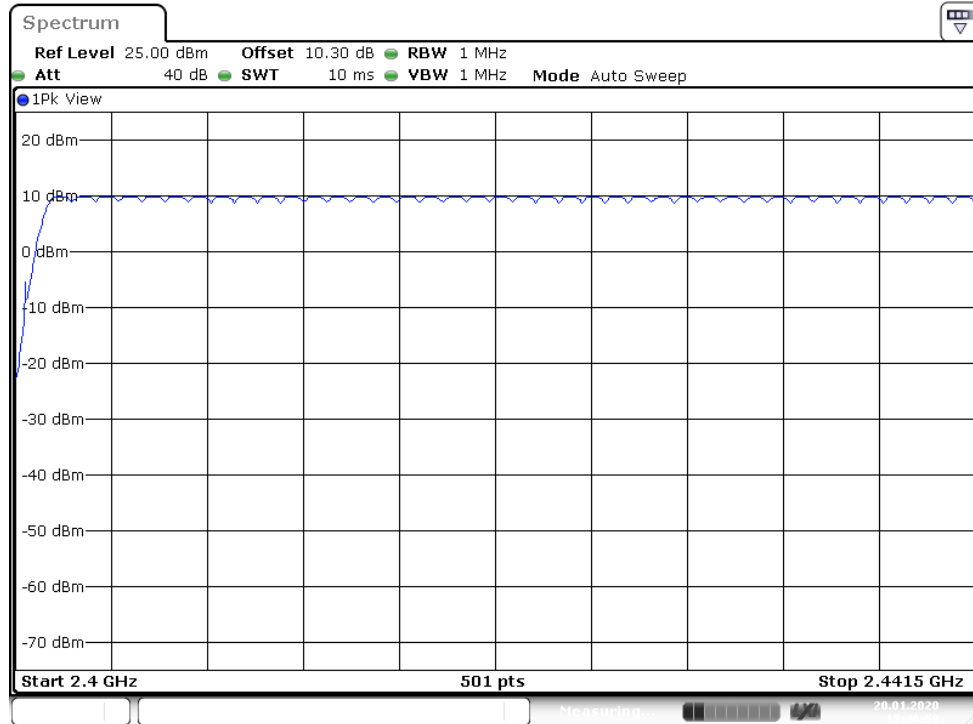


Date: 21.JAN.2020 08:06:34

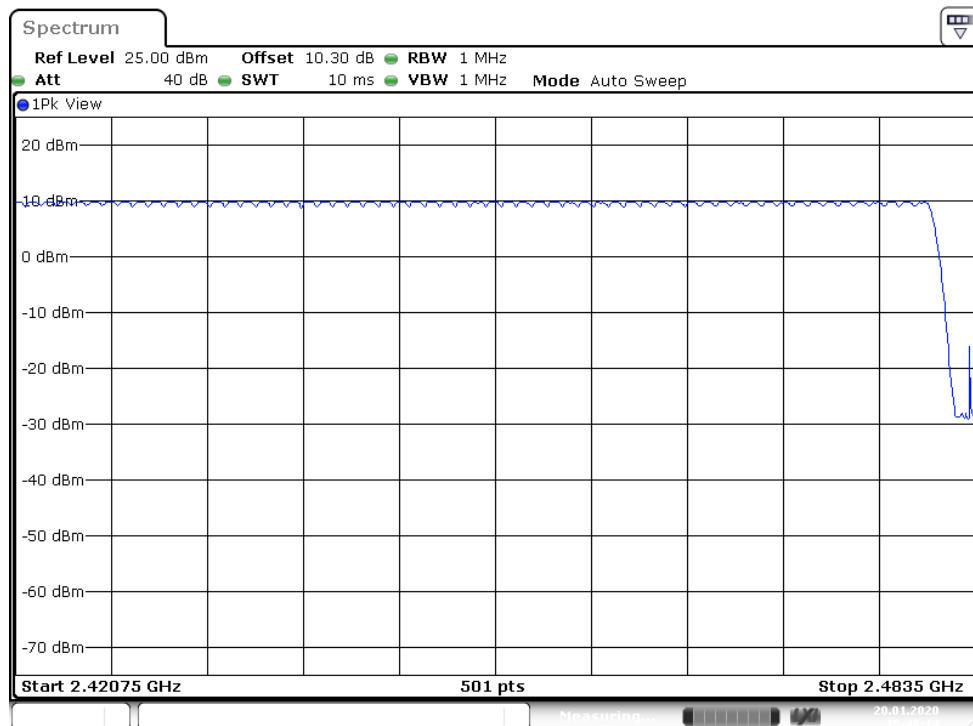
Prüfbericht - Nr.: 50343090 001
Test Report No.

Seite 56 von 68
Page 56 of 68

1-DH5, Right Ear



Date: 20.JAN.2020 15:47:00



Date: 20.JAN.2020 15:48:14

5.1.8 Time of Occupancy

RESULT:

Passed

Test standard : FCC part 15.247(a)(1)(iii), ISED RSS-247 5.1(e)
Basic standard : ANSI C63.10:2013
Limits : 400ms
Kind of test site : Conducted room

Test setup

Test Channel : Low
Operation Mode : A
Ambient temperature : 22-26°C
Relative humidity : 50-65%
Atmospheric pressure : 100-103 kPa

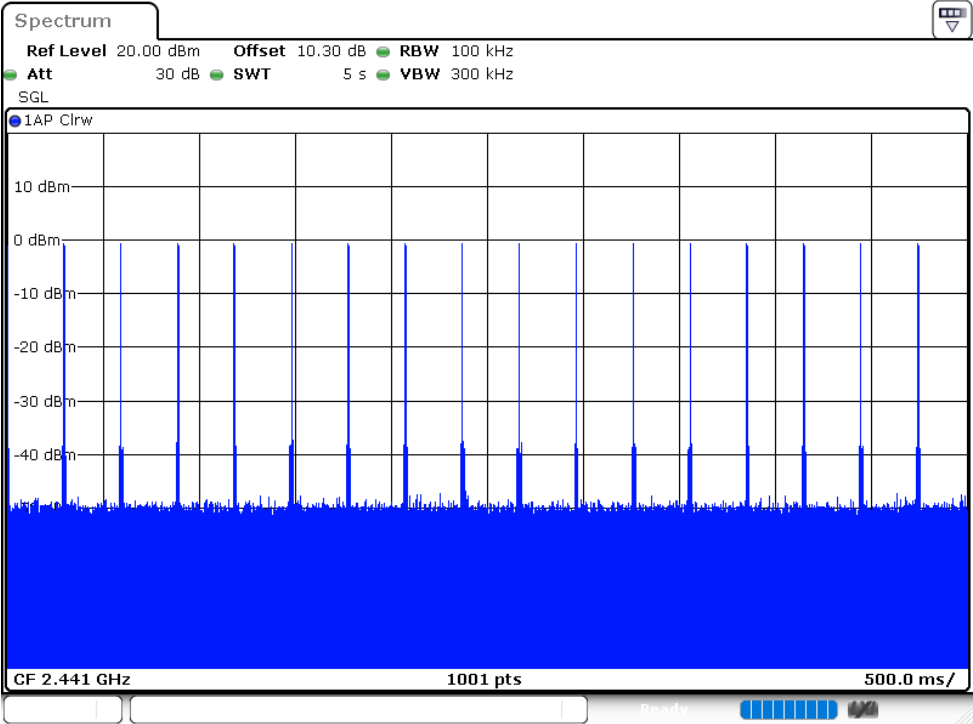
Table 31: Test result of Time of Occupancy_Left Ear

Package Mode	Average Hopping Channel	Package Transfer Time (ms)	Sweep Time (s)	Dwell Time (ms)	Limit (ms)	Result
1-DH5	16.00	2.89	5.00	292.24	400	Pass
3-DH5	16.00	2.92	5.00	295.27	400	Pass

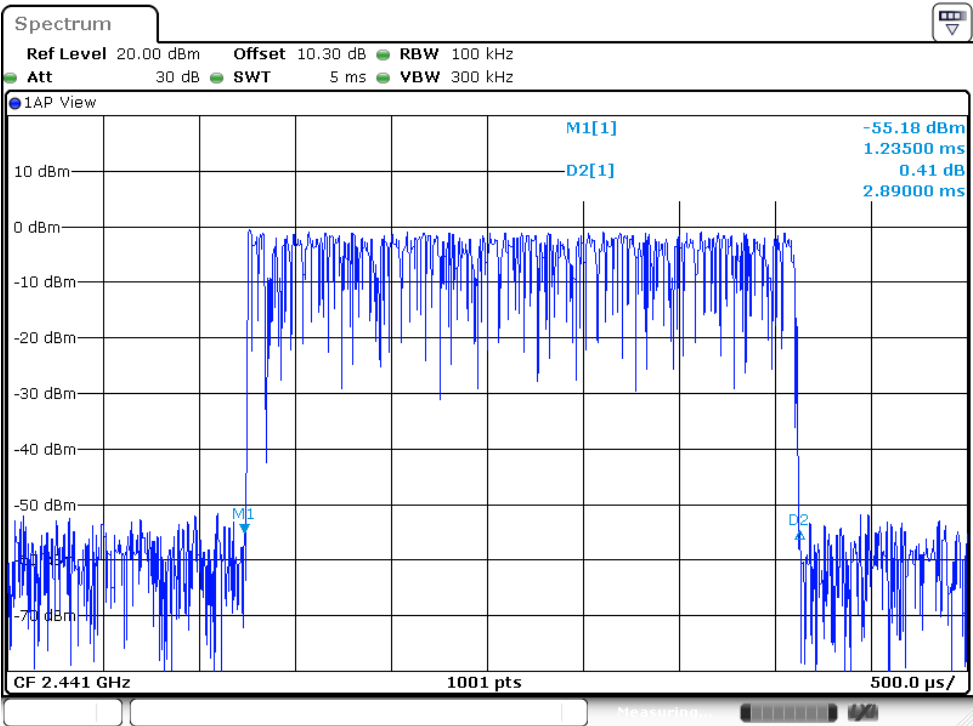
Table 32: Test result of Time of Occupancy_Right Ear

Package Mode	Average Hopping Channel	Package Transfer Time (ms)	Sweep Time (s)	Dwell Time (ms)	Limit (ms)	Result
1-DH5	16.00	2.89	5.00	310.50	400	Pass
3-DH5	16.00	2.92	5.00	313.72	400	Pass

Test Plot of Time of Occupancy, 1-DH5_Left Ear

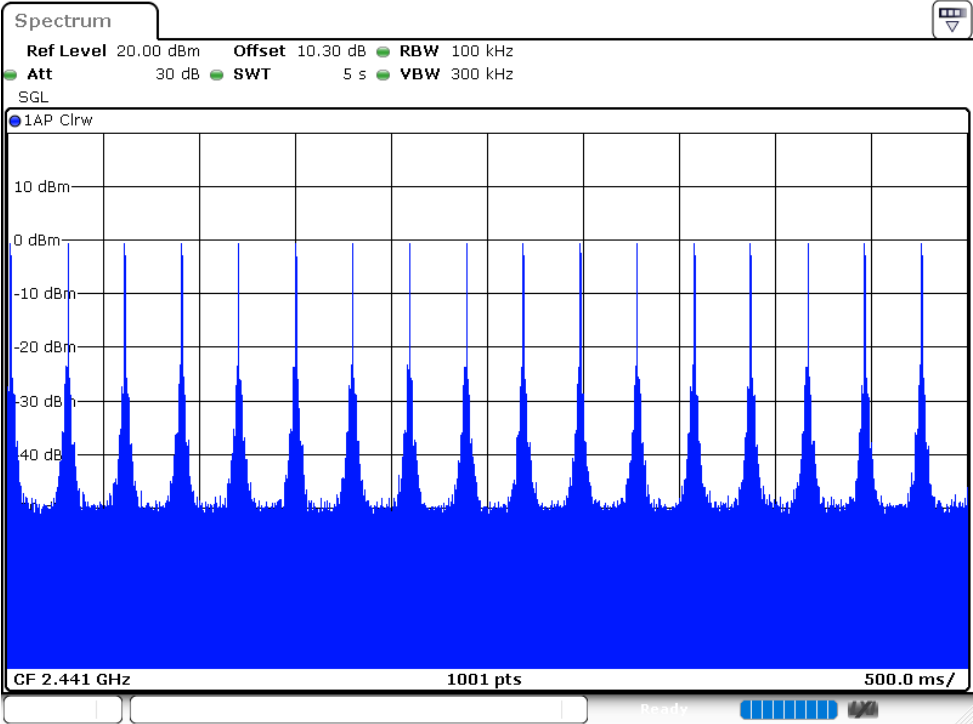


Date: 2.JUN.2020 15:48:27

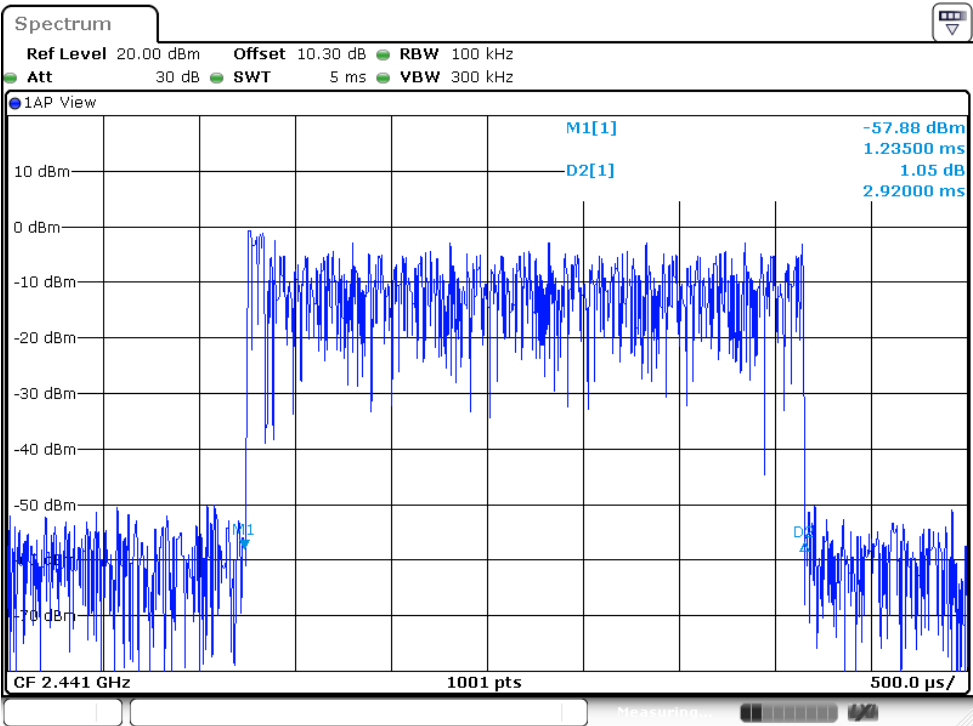


Date: 2.JUN.2020 15:48:45

Test Plot of Time of Occupancy, 3-DH5_Left Ear

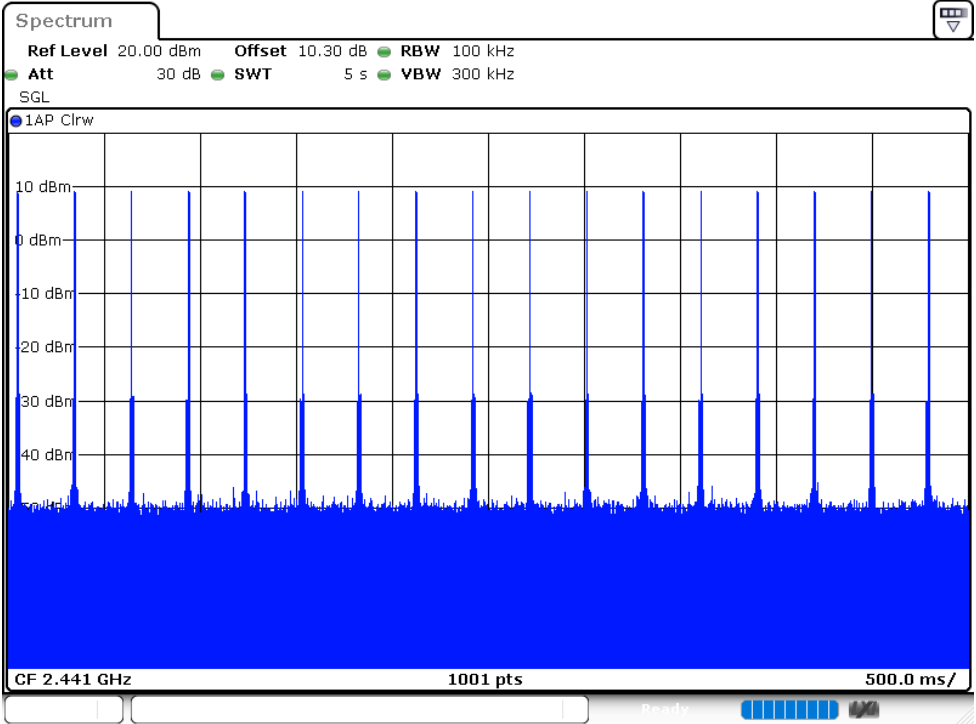


Date: 2.JUN.2020 15:49:25

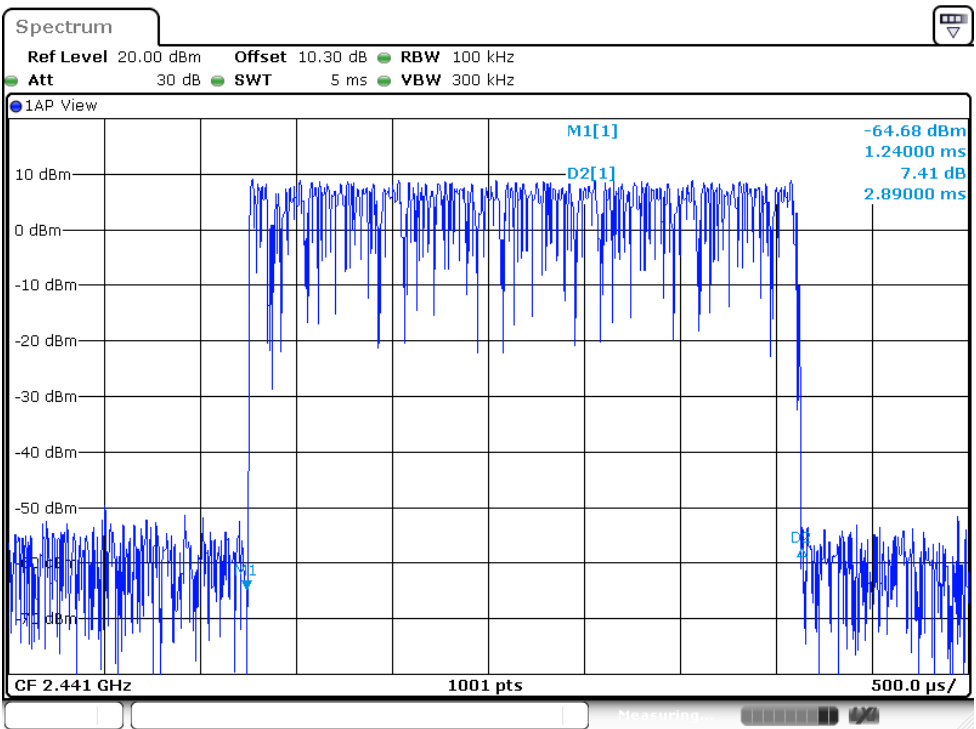


Date: 2.JUN.2020 15:49:44

Test Plot of Time of Occupancy, 1-DH5_Right Ear

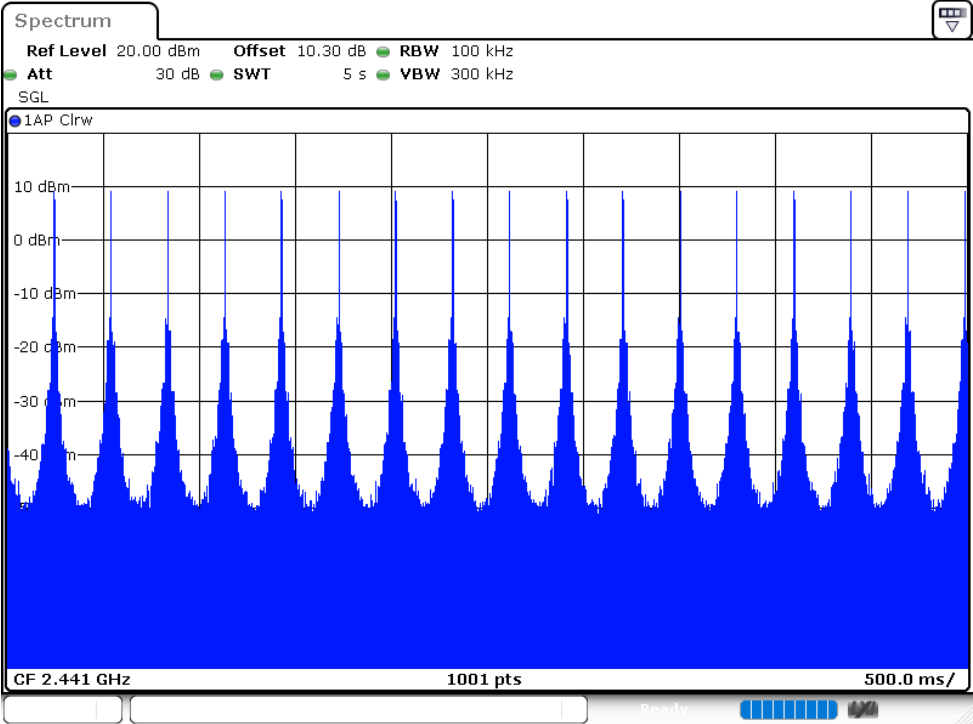


Date: 2.JUN.2020 15:45:17

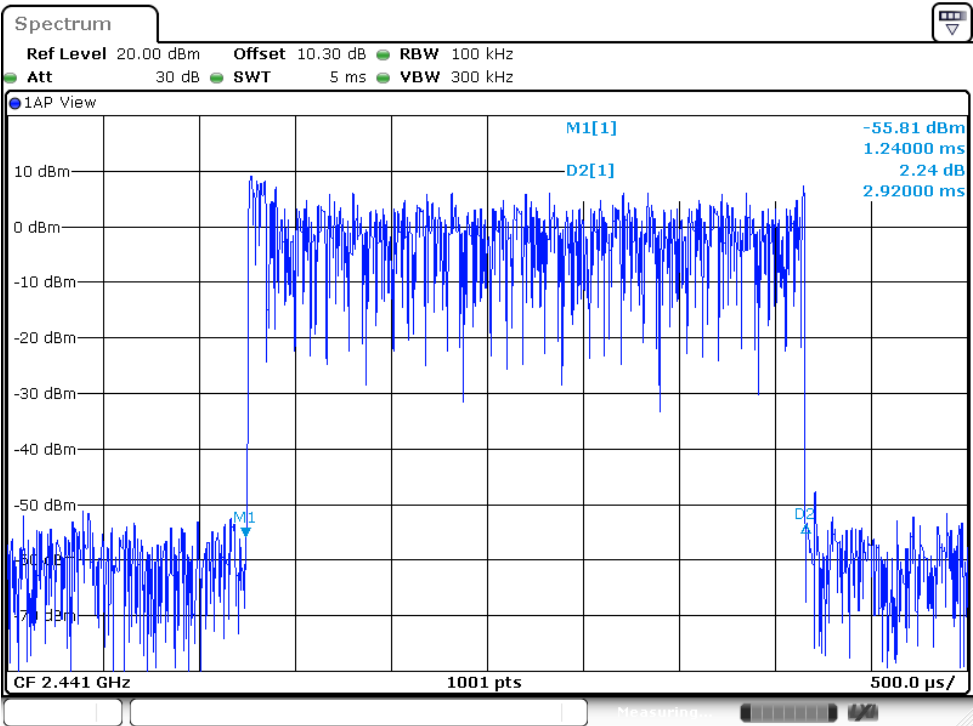


Date: 2.JUN.2020 15:45:36

Test Plot of Time of Occupancy, 3-DH5_Right Ear



Date: 2.JUN.2020 15:46:25



Date: 2.JUN.2020 15:46:43

5.2 Mains Emissions

5.2.1 Mains Conducted Emissions

RESULT:

N/A

Test standard	:	FCC Part 15.207 FCC Part 15.107 ISED RSS-Gen 8.8
Limits	:	Mains Conducted emissions as defined in above standards
Kind of test site	:	Shielded Room

The Bluetooth connection cannot be used while charging, so this test item is exempt from evaluation test.

Prüfbericht - Nr.: 50343090 001

Test Report No.

Seite 63 von 68

Page 63 of 68

6. Safety Human exposure

6.1 Radio Frequency Exposure Compliance

6.1.1 Electromagnetic Fields

RESULT:

Passed

Test standard : FCC KDB Publication 447498 D01 v06

Left Ear

FCC:

Therefore the maximum output power of the transmitter is $8.77\text{mW} < 10\text{mW}$ (Distance: 5 mm), hence the EUT is excluded from SAR evaluation according to FCC KDB publication 447498 D01: Mobile Portable RF Exposure.

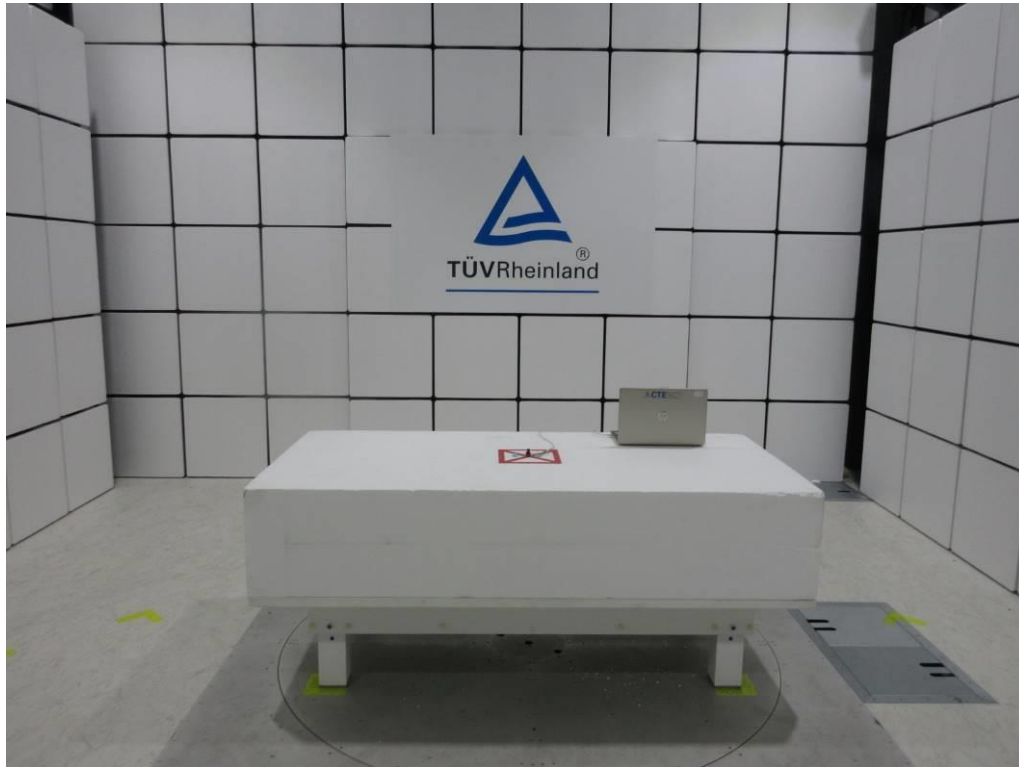
Right Ear

FCC:

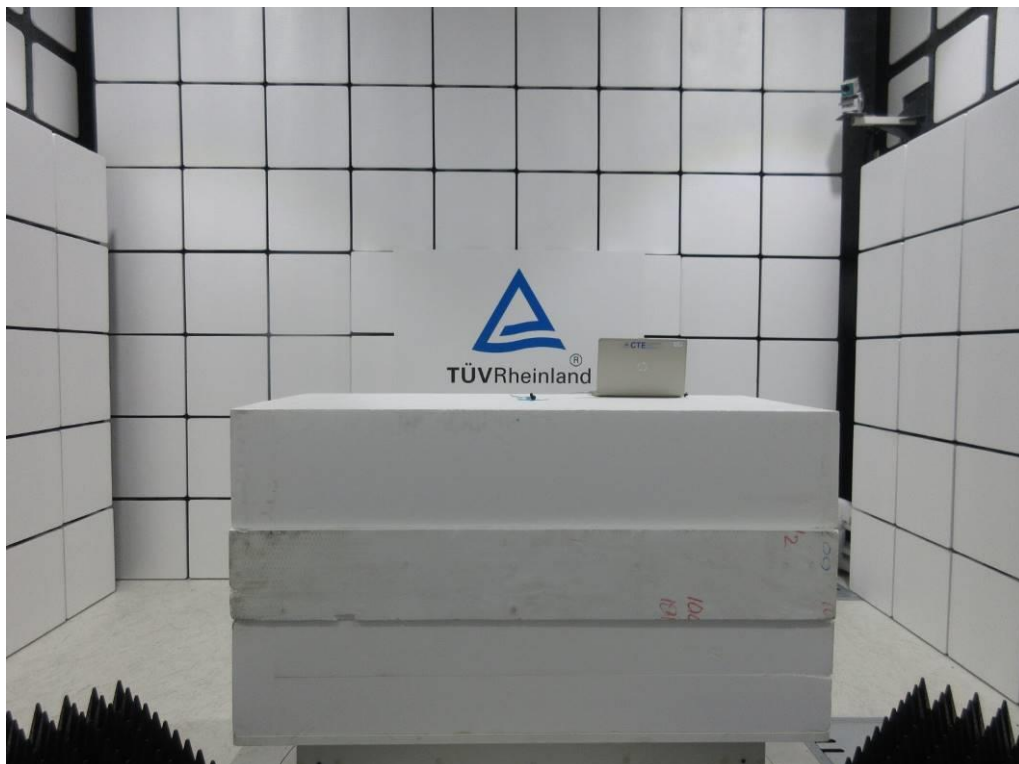
Therefore the maximum output power of the transmitter is $8.73\text{ mW} < 10\text{mW}$ (Distance: 5 mm), hence the EUT is excluded from SAR evaluation according to FCC KDB publication 447498 D01: Mobile Portable RF Exposure.

7. Photographs of the Test Set-Up

Photograph 1: Set-up for Spurious Emissions (Front View 1)



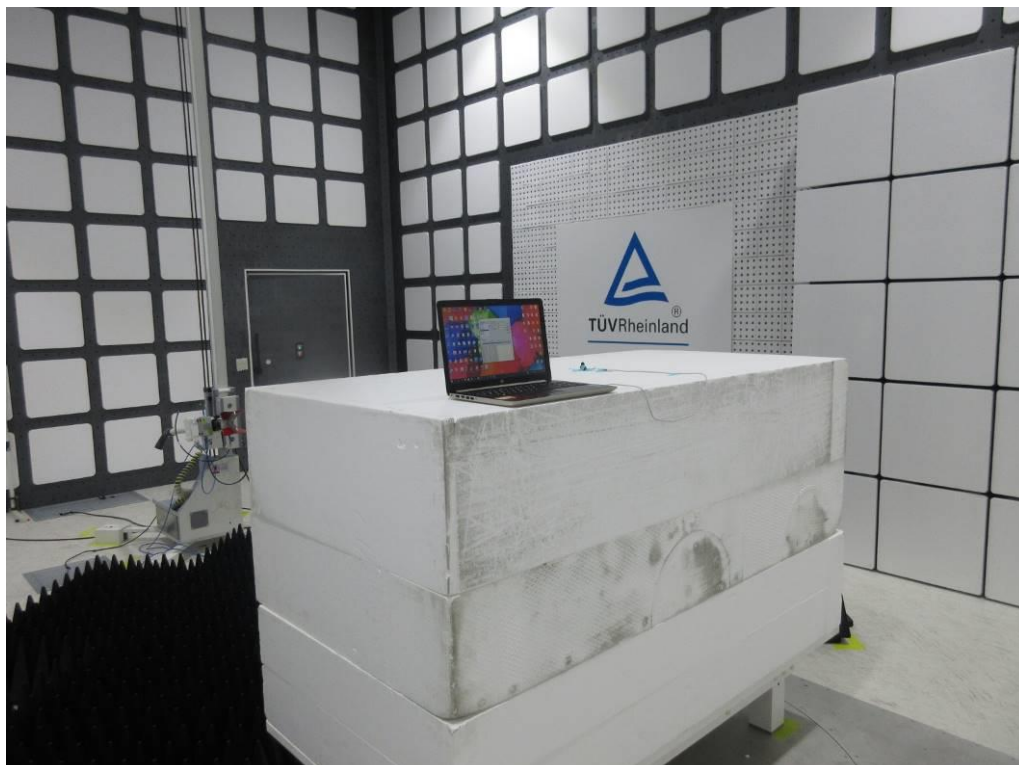
Photograph 2: Set-up for Spurious Emissions (Front View 2)



Photograph 3: Set-up for Spurious Emissions (Back View 1)



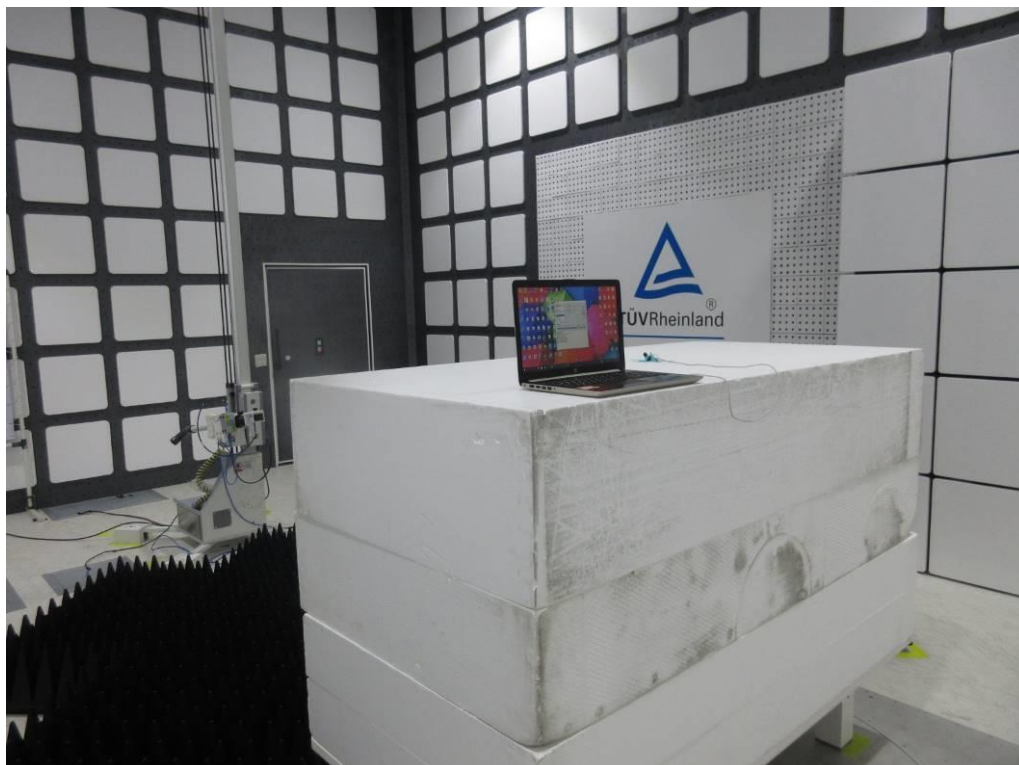
Photograph 4: Set-up for Spurious Emissions (Back View 2)



Photograph 5: Set-up for Spurious Emissions (Back View 3)



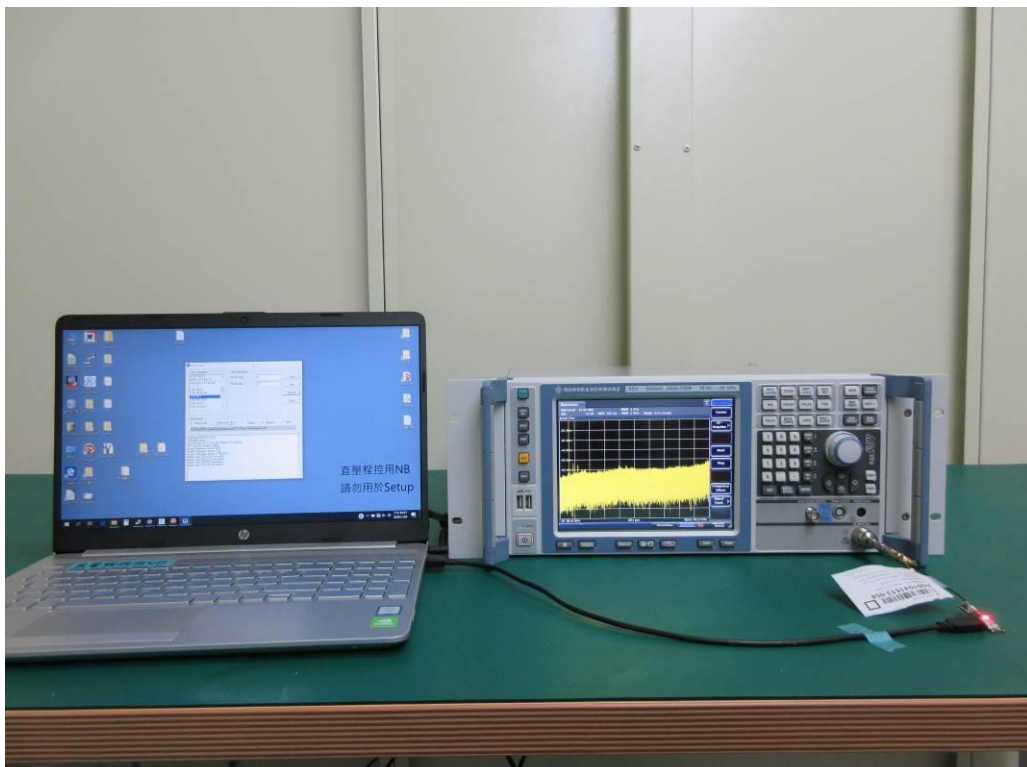
Photograph 6: Set-up for Spurious Emissions (Back View 4)



Photograph 7: Set-up for Conducted testing (View 1)



Photograph 8: Set-up for Conducted testing (View 2)



8. List of Tables

Table 1: Applied Standard and Test Levels	5
Table 2: List of Test and Measurement Equipment	7
Table 3: Emission Measurement Uncertainty.....	8
Table 4: Basic Information of EUT	9
Table 5: Technical Specification of EUT	9
Table 6: Frequency hopping information.....	10
Table 7: Table for Parameters of Test Software Setting_ Left Ear	12
Table 8: Table for Parameters of Test Software Setting_ Right Ear	12
Table 9: Test result of Peak Output Power 1-DH5_ Left Ear	17
Table 10: Test result of Peak Output Power 2-DH5_ Left Ear	17
Table 11: Test result of Peak Output Power 3-DH5_ Left Ear	18
Table 12: Test result of Peak Output Power 1-DH5_ Right Ear	18
Table 13: Test result of Peak Output Power 2-DH5_ Right Ear	18
Table 14: Test result of Peak Output Power 3-DH5_ Right Ear	18
Table 15: Test result of 20dB Bandwidth 1-DH5_ Left Ear	19
Table 16: Test result of 20dB Bandwidth 2-DH5_ Left Ear	19
Table 17: Test result of 20dB Bandwidth 3-DH5_ Left Ear	19
Table 18: Test result of 20dB Bandwidth 1-DH5_ Right Ear	20
Table 19: Test result of 20dB Bandwidth 2-DH5_ Right Ear	20
Table 20: Test result of 20dB Bandwidth 3-DH5_ Right Ear	20
Table 21: Test result of 99% Bandwidth 1-DH5_ Left Ear	20
Table 22: Test result of 99% Bandwidth 2-DH5_ Left Ear	20
Table 23: Test result of 99% Bandwidth 3-DH5_ Left Ear	20
Table 24: Test result of 99% Bandwidth 1-DH5_ Right Ear	21
Table 25: Test result of 99% Bandwidth 2-DH5_ Right Ear	21
Table 26: Test result of 99% Bandwidth 3-DH5_ Right Ear	21
Table 27: Test result of Frequency Separation, 1-DH5_ Left Ear	52
Table 28: Test result of Frequency Separation, 1-DH5_ Right Ear	52
Table 29: Test result of Number of hopping frequency, 1-DH5_ Left Ear	54
Table 30: Test result of Number of hopping frequency, 1-DH5_ Right Ear	54
Table 31: Test result of Time of Occupancy_ Left Ear	57
Table 32: Test result of Time of Occupancy_ Right Ear	57

9. List of Photographs

Photograph 1: Set-up for Spurious Emissions (Front View 1).....	64
Photograph 2: Set-up for Spurious Emissions (Front View 2).....	64
Photograph 3: Set-up for Spurious Emissions (Back View 1)	65
Photograph 4: Set-up for Spurious Emissions (Back View 2)	65
Photograph 5: Set-up for Spurious Emissions (Back View 3)	66
Photograph 6: Set-up for Spurious Emissions (Back View 4)	66
Photograph 7: Set-up for Conducted testing (View 1).....	67
Photograph 8: Set-up for Conducted testing (View 2).....	67