



DESIGN ASSURANCE ENGINEERING  
Mains Conducted Interference Test Report



FCC ID: A94423376 IC: 3232A-423376

Test Type: Emissions  Immunity

Product Type: Wireless Headphones

Product Name/Number: *Model Number: 423376*  
*FCC ID: A94423376*  
*IC: 3232A-423376*

Prepared For: *Design Assurance Engineering Department,*  
*Bose Corporation*

Test Results: Pass  Fail

Applicable Standards: Mains Conducted Interference within:  
FCC CFR 47 PART 15 SUBPART C  
Industry Canada RSS-247 Issue 2  
Industry Canada RSS-GEN Issue 4

Report Number: *EMC.423376.18.75.1*

General Comments/Special Test Conditions:

This report relates only to the items tested. This report covers EMC marking requirements for *Enter product and any special modifications or test conditions.*

	Print Name	Signature	Date
Prepared By:	Brent DeWitt		March 16, 2018
Electrical Engineer Review* By:	Chad Bell		March 29, 2018

\* Since every test result is separately reviewed after its completion, the electrical engineer review indicated above represents a higher level review to ensure this report lists and contains all applicable and appropriate requirements. If the report carries the "accredited" logo, the reviewer must verify all the tests in this report are covered under the current ISO17025 accreditation. The A2LA-accredited logo must be removed if any of the tests in the report are not performed under the current scope of accreditation. It is the responsibility of the reviewer to ensure the A2LA advertising policy is followed.



# RF Conducted Emissions – AC Mains, Network and Antenna Ports

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## Test information:

<b>Project code name:</b>		<b>Marketing name:</b>		<b>Model number:</b>	423376
<b>Build Phase:</b>	DP1				
<b>Project number (Integrity):</b>					
<b>EUT Serial number:</b>	25AE and 53AE				
<b>Software installed:</b>	Dan Najemy				
<b>Tested by:</b>	Brent DeWitt				
<b>Date:</b>	12 July 2017				
<b>Requirements Standard(s):</b>	FCC Part15B, EN55032, EN301489				
<b>Referenced Standard(s):</b>					
<b>EUT powered with:</b>	Bose Model PSA05F-050QBT1 USB 5V charger				
<b>Temp / Humidity:</b>					
<b>EUT Modifications:</b>	None				
<b>Test equipment used TN's:</b>	2247, 2225, 1380				
<b>Test location:</b>	DAE Henry Room				
<b>Comments:</b>					



## Objective/Summary/Conclusion:

**Objective:**

Confirm compliance with required standards and Bose margins.

**Summary:**

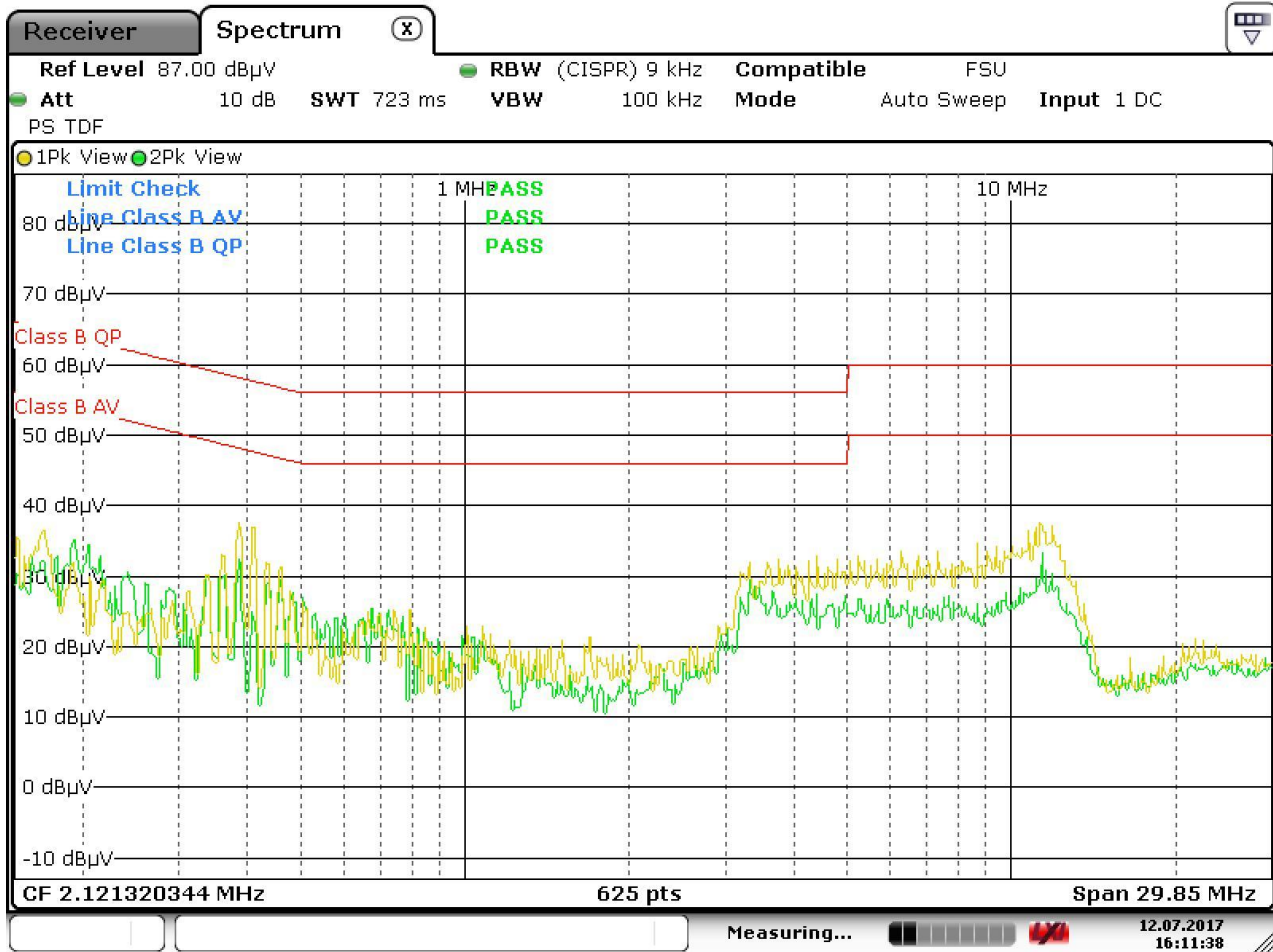
The worst-case configuration is when the AUX IN cable is grounded to the shield room wall with the charger operating from 120 VAC/60 Hz and charging a discharged battery.

**Conclusion:**

The combination of charger and BOSEBuild2 pass regulatory and Bose recommended margins with 3.7 dB below the regulatory limit at 0.3885 MHz.



# Data Collection:



Date: 12.JUL.2017 16:11:39

### Peak Hold detection

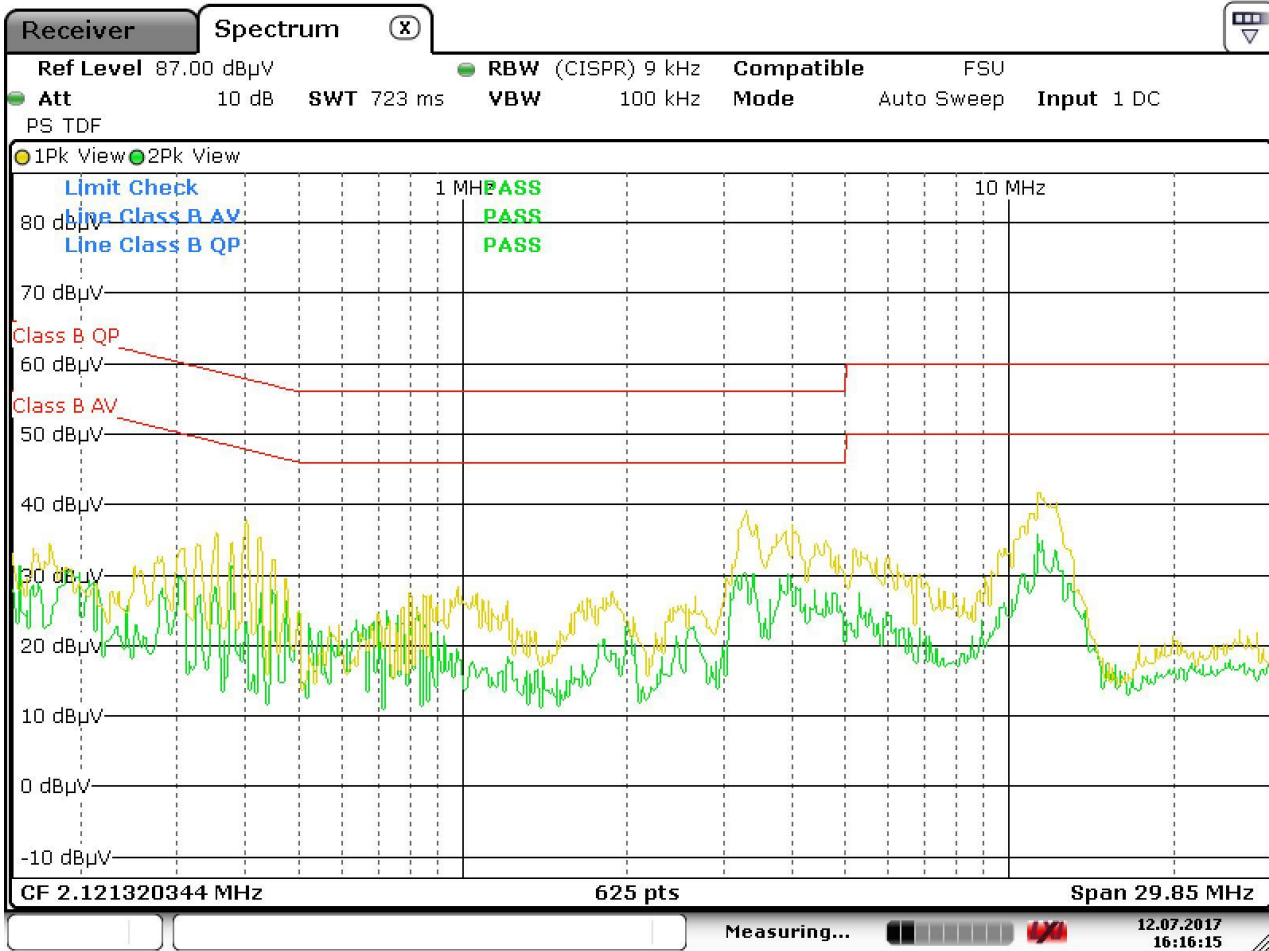
120 VAC/60 Hz full volume IEC Pink Noise and "rainbow" LEDS. Yellow trace: LINE, Green trace: NEUTRAL



Certificate # 1514.1

# DESIGN ASSURANCE ENGINEERING Mains Conducted Interference Test Report

FCC ID: A94423376 IC: 3232A-423376



Date: 12.JUL.2017 16:16:15

Peak Hold detection

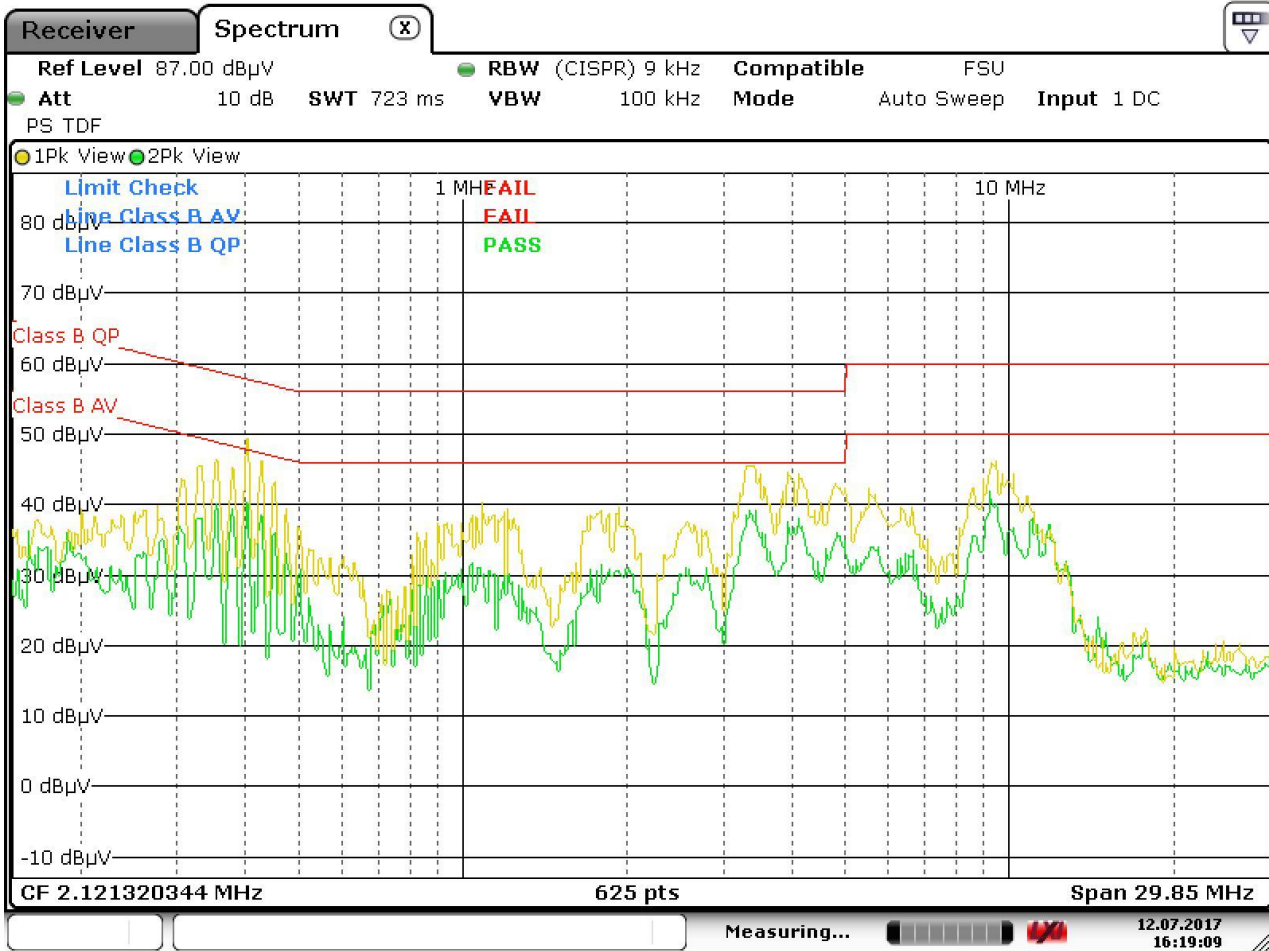
230 VAC/50 Hz full volume IEC Pink Noise and "rainbow" LEDS. Yellow trace: LINE, Green trace: NEUTRAL



Certificate # 1514.1

# DESIGN ASSURANCE ENGINEERING Mains Conducted Interference Test Report

FCC ID: A94423376 IC: 3232A-423376



Date: 12.JUL.2017 16:19:09

Peak Hold detection

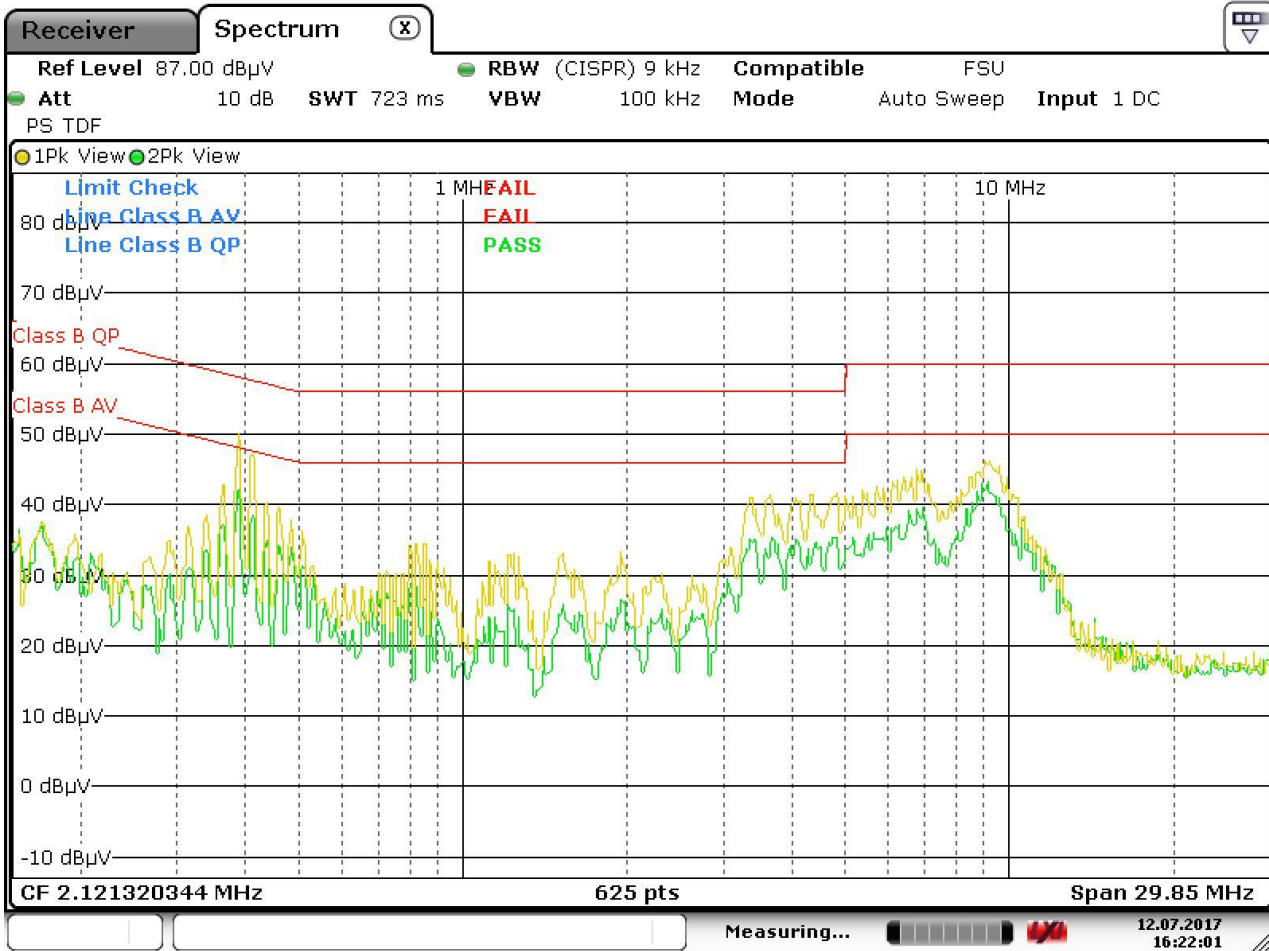
230 VAC/50 Hz, AUX IN cable grounded, no audio (see Details). Yellow trace: LINE, Green trace: NEUTRAL



Certificate # 1514.1

# DESIGN ASSURANCE ENGINEERING Mains Conducted Interference Test Report

FCC ID: A94423376 IC: 3232A-423376



Date: 12.JUL.2017 16:22:01

Peak Hold detection

120 VAC/60 Hz, AUX IN cable grounded, no audio (see Details). Yellow trace: LINE, Green trace: NEUTRAL

FCC 15B and CISPR 32 Class B Product

Frequency MHz	MEASURED		LIMIT		MARGIN		Notes
	dBμV QP	dBμV AVG	dBμV QP	dBμV AVG	dB QP	dB AVG	
0.3885	48.10	44.40	58.1	48.1	10.0	3.7	120 VAC, 60 Hz, charging, grounded AUX IN. Worst case.
0.3885	48.10	44.40	58.1	48.1	10.0	3.7	
3.6443	40.50	34.40	56.0	46.0	15.5	11.6	
3.6443	40.50	34.40	56.0	46.0	15.5	11.6	
4.0065	39.50	33.10	56.0	46.0	16.5	12.9	
4.0088	39.50	33.10	56.0	46.0	16.5	12.9	
3.3045	38.90	32.90	56.0	46.0	17.1	13.1	
3.3045	38.90	32.90	56.0	46.0	17.1	13.1	
4.3733	39.00	32.40	56.0	46.0	17.0	13.6	
9.2355	44.10	36.20	60.0	50.0	15.9	13.8	
9.2355	44.10	36.20	60.0	50.0	15.9	13.8	
4.4363	39.20	30.70	56.0	46.0	16.8	15.3	



FCC 15B and CISPR 32 Class B Product							
Frequency MHz	MEASURED		LIMIT		MARGIN		Notes
	dB $\mu$ V QP	dB $\mu$ V AVG	dB $\mu$ V QP	dB $\mu$ V AVG	dB QP	dB AVG	
0.4065	47.70	42.40	57.7	47.7	10.0	5.3	230 VAC/50 Hz, charging, grounded AUX IN
0.4065	47.70	42.40	57.7	47.7	10.0	5.3	
3.3608	44.20	36.60	56.0	46.0	11.8	9.4	
3.3833	44.40	36.40	56.0	46.0	11.6	9.6	
4.1033	43.50	35.80	56.0	46.0	12.5	10.2	
4.1033	43.50	35.80	56.0	46.0	12.5	10.2	
4.8705	41.90	34.00	56.0	46.0	14.1	12.0	
4.8705	41.90	34.00	56.0	46.0	14.1	12.0	
1.2233	38.40	31.80	56.0	46.0	17.6	14.2	
9.4043	45.10	35.40	60.0	50.0	14.9	14.6	
9.4043	45.10	35.40	60.0	50.0	14.9	14.6	
1.0793	38.60	30.20	56.0	46.0	17.4	15.8	

FCC 15B and CISPR 32 Class B Product							
Frequency MHz	MEASURED		LIMIT		MARGIN		Notes
	dB $\mu$ V QP	dB $\mu$ V AVG	dB $\mu$ V QP	dB $\mu$ V AVG	dB QP	dB AVG	
0.3885	38.50	29.50	58.1	48.1	19.6	18.6	230 VAC/50 Hz, fully charged, grounded AUX IN
0.3885	38.50	29.50	58.1	48.1	19.6	18.6	
0.6068	34.90	25.60	56.0	46.0	21.1	20.4	
0.6023	34.90	25.60	56.0	46.0	21.1	20.4	
1.6598	30.60	21.70	56.0	46.0	25.4	24.3	
1.6575	30.60	21.70	56.0	46.0	25.4	24.3	
3.3158	30.80	21.20	56.0	46.0	25.2	24.8	
3.3158	30.80	21.20	56.0	46.0	25.2	24.8	
9.1140	32.50	22.30	60.0	50.0	27.5	27.7	
9.1140	32.50	22.30	60.0	50.0	27.5	27.7	
9.8858	30.90	22.20	60.0	50.0	29.1	27.8	
10.2660	31.50	21.10	60.0	50.0	28.5	28.9	





FCC 15B and CISPR 32 Class B Product							
Frequency MHz	MEASURED		LIMIT		MARGIN		Notes
	dB $\mu$ V QP	dB $\mu$ V AVG	dB $\mu$ V QP	dB $\mu$ V AVG	dB QP	dB AVG	
0.3998	39.30	32.90	57.9	47.9	18.6	15.0	120 VAC/50 Hz, fully charged, grounded AUX IN
0.3998	39.30	32.90	57.9	47.9	18.6	15.0	
3.7590	30.20	23.40	56.0	46.0	25.8	22.6	
3.7590	30.20	23.40	56.0	46.0	25.8	22.6	
1.0050	28.70	22.70	56.0	46.0	27.3	23.3	
1.0050	28.70	22.70	56.0	46.0	27.3	23.3	
4.3575	29.00	22.50	56.0	46.0	27.0	23.5	
4.3575	29.00	22.50	56.0	46.0	27.0	23.5	
0.6203	28.30	21.90	56.0	46.0	27.7	24.1	
0.6203	28.30	21.90	56.0	46.0	27.7	24.1	
1.6328	26.60	20.40	56.0	46.0	29.4	25.6	
9.0218	33.20	23.90	60.0	50.0	26.8	26.1	

## Limits:

### AC MAINS PORTS

Standard	Class	Freq Range (MHz)	Limits (dB $\mu$ V)		Comments
			QP	AVG	
FCC 15B/ CISPR32 based	A	0.15 - 0.5	79	66	-Ensure bandwidth set to 9 kHz. -EUT must pass both QP and AVG limits.  <sup>1</sup> These limits decrease linearly with the log of the frequency.
		0.5 - 30	73	60	
	B	0.15 - 0.5	66-56 <sup>1</sup>	56-46 <sup>1</sup>	CISPR32 based standards: EN55032, AS/NZS CISPR32
		0.5 - 5	56	46	
		5 - 30	60	50	

### NETWORK/ANTENNA PORTS

Standard	Class	Freq Range (MHz)	Limits (dB $\mu$ V)		Comments
			QP	AVG	
CISPR32 based	A	0.15 - 0.5	97 - 87 <sup>1</sup>	84 - 74 <sup>1</sup>	-Ensure bandwidth set to 9 kHz. -EUT must pass both QP and AVG limits  <sup>1</sup> These limits decrease linearly with the log of the frequency,
		0.5 - 30	87	74	
	B	0.15 - 0.5	84 - 74 <sup>1</sup>	74 - 64 <sup>1</sup>	<sup>2</sup> Limits are for measurements taken with RF current probe method.  CISPR32 based standards: EN55032, AS/NZS CISPR32
		0.5 - 30	74	64	
		Freq Range (MHz)	Limits (dB $\mu$ A)		
			QP	AVG	
		0.15 - 0.5	40 - 30 <sup>1,2</sup>	30 - 20 <sup>1,2</sup>	
	0.5 - 30	30 <sup>2</sup>	20 <sup>2</sup>		



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# Equipment Used:

TN	Description	Model	S/N	Manufacturer	Most Recent Calibration	Calibration Due Date	Most Recent Verification	Verification Due Date
2247	EMI Test Receiver, 7GHZ	ESR7	101263	Rohde & Schwarz	04-Apr-2017	04-Apr-2018		
1380	Conducted Comb Generator	CGC-510	311559	Com-Power Corporation			25-Apr-2017	25-Apr-2018
2235	2-LINE V-NETWORK	ENV216	101192	Rohde & Schwarz	03-Dec-2015	02-Dec-2017		



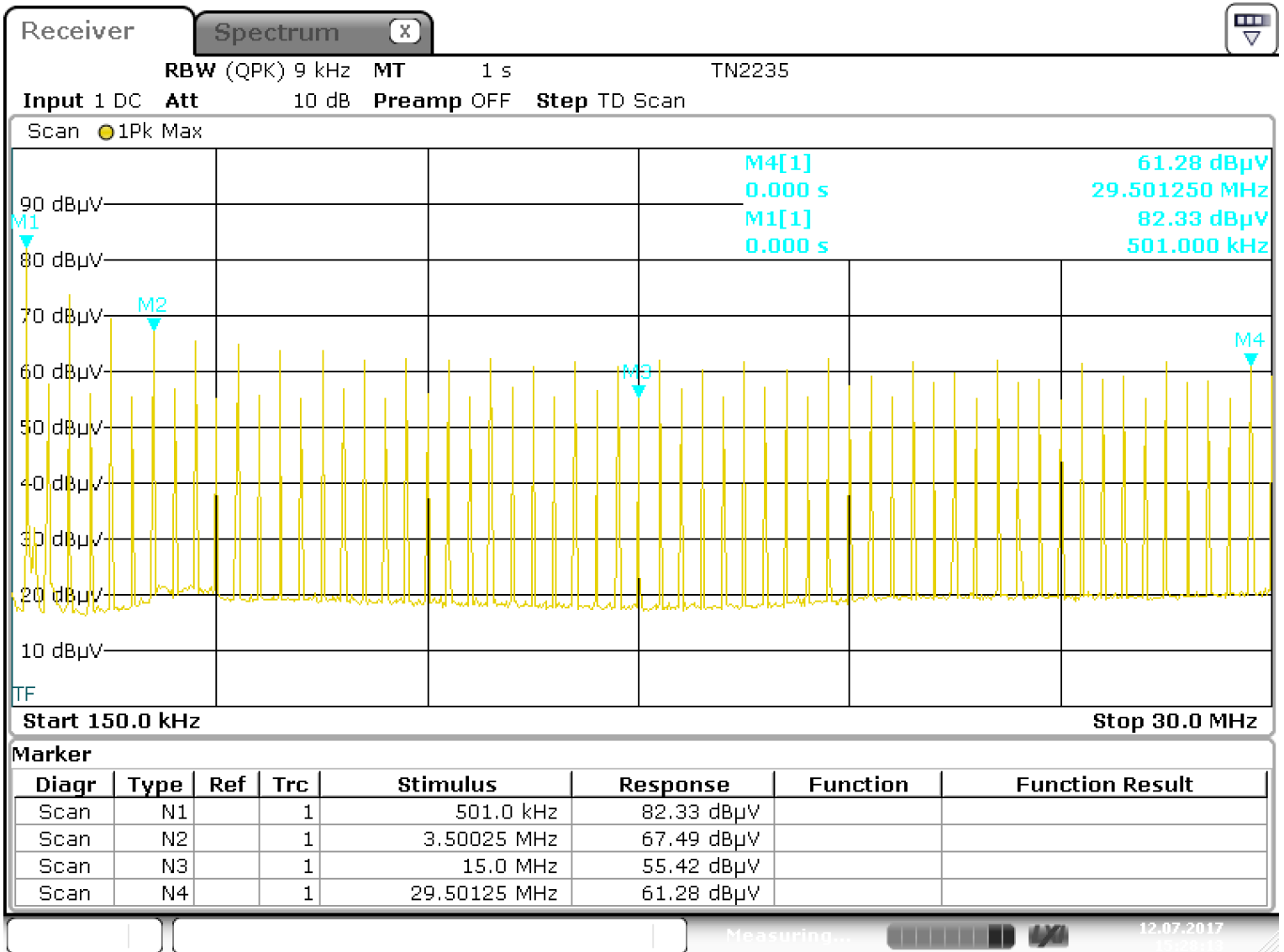
# Uncertainty:

Uncertainty Budget (AC mains measurements)				
Title:		Conducted RF Emissions (Mains)		
Source of Uncertainty	Value units:± dB	Distribution	Divisor	Uncertainty (± dB)
Receiver - absolute level	0.3	Rect.	1.73	0.17
Receiver - frequency response	1.0	Rect	1.73	0.58
Receiver - attenuator switching	0.2	Rect.	1.73	0.12
Receiver - bandwidth switching	0.2	Rect.	1.73	0.12
Receiver - display	0.5	Rect.	1.73	0.29
LISN impedance	2.6	Triang.	2.45	1.06
LISN insertion loss	0.6	Norm.	2.00	0.30
Cable correction factor	0.1	Norm.	2.00	0.05
Combined uncertainty (RSS):				1.30
Coverage factor (2 sigma):				2.00
Extended uncertainty (95% confidence):				<b>2.60</b>



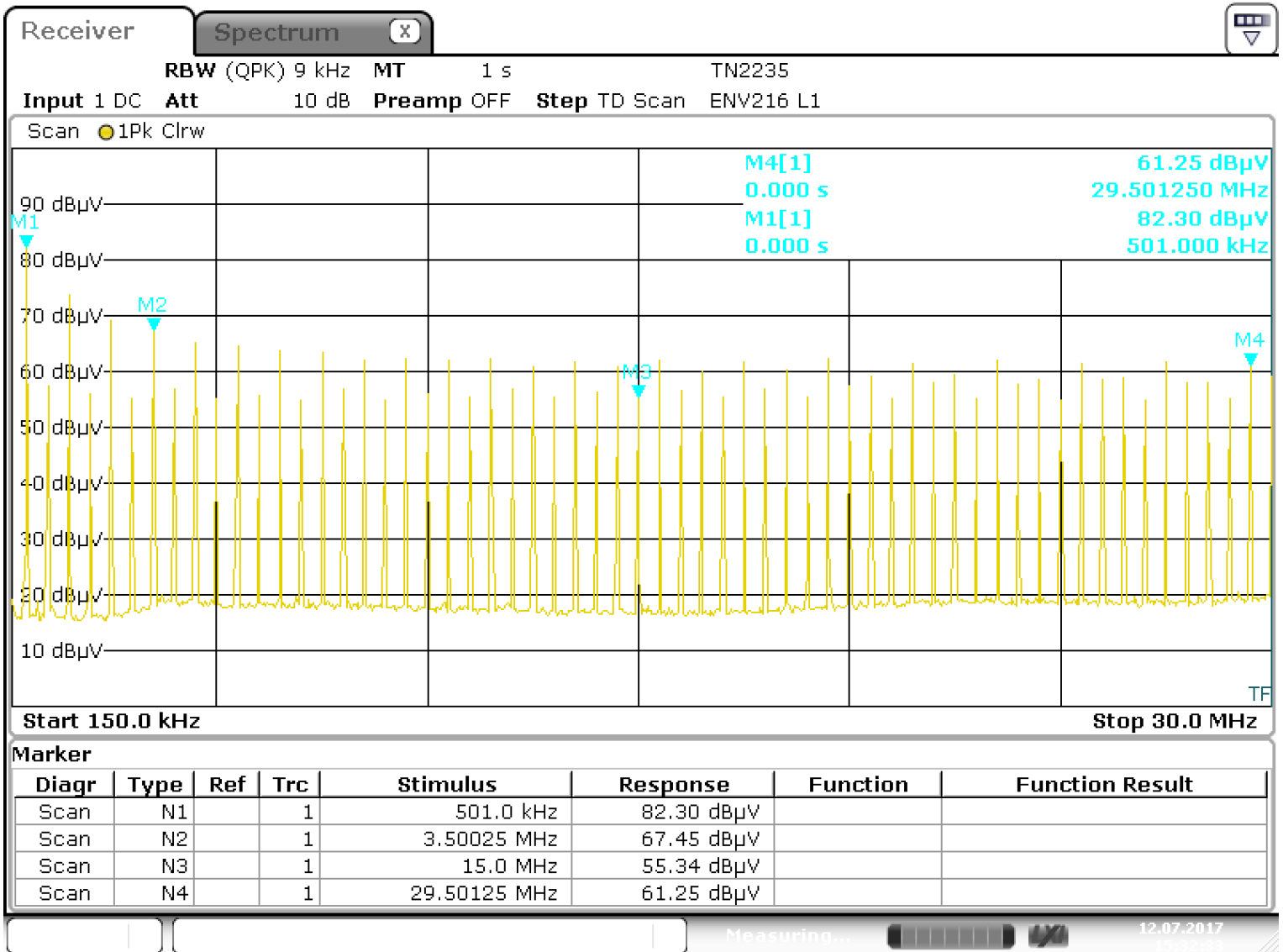
## Test setup verification check(s):

Test Setup/Procedure:	
1	Set up EMI receiver for standard conducted emissions configuration. Use transient limiter.
2	Plug reference source (TN1380) directly into EUT LISN mains outlet. Set source spacing to 500 kHz.
3	Compare resulting sweeps with reference plots file on computer desktop (file name is "Conducted Emissions Verification xxxxxx", where xxxxxx represents latest plot date). File is located on desktop and also in "Henry_Room" folder -> "Conducted reference plots". Any data/plots taken for comparison to reference should be recorded in this section.
4	If desired, use the Excel file below to compare the four marker points (four max hold peak, one QP, and one average measurement) of the measured verification plots with the reference plots. It is sufficient to store a copy of the verification plots along with the product test results in the Integrity database.
5	Measurements may be made by any method (manual, semi-automated software, screen capture). Record the method used.



Date: 12.JUL.2017 15:28:14

Line



Date: 12.JUL.2017 15:32:34

Neutral

\*Note: Actual frequencies measured depend upon instrument characteristics and settings. Measured amplitude data is important, actual measured frequency is not as critical, as long as the correct peak is chosen. See reference plot markers to obtain appropriate measurement points.

Test method used:	Screen capture	LISN	ENV216
List your name:	B. DeWitt	Receiver/SA:	ESR
Date of PT:	12 July 2017	Limiter:	internal
		Cable(s):	RG223