MOTOROLA SOLUTIONS	STANDARDS MALAYSIA CCREDITED CERTIFICATE 2518.08
MOTOROLA PENANG ADV. COMM. LABORATO Motorola Solutions Malaysia Sdn. Bhd. Plot 2A Medan Bayan Lepas, Mukim 12, S.W.D. 11900 Bayan Lepas, Penang, Malaysia.	RY FCC / ISED TEST REPORT Report Revision : Rev.A
Report Issue Date:17-NovemberManufacturer/Location:Motorola SolRequestor:SIEW KHENProduct Type (PMN):PortableModel Number (HVIN):AAH90ZDUFrequency Band:2.402 - 2.480Rated / Max RF Output Power:5.62 mWattsApplicant Name:Motorola SolApplicant Address:8000 West SuFCC Registrations:461337IC Registrations:MY0001	ution Malaysia Sdn Bhd IG TAN 9RH1AN (PMUE5674A) 9 GHz utions Inc unrise Boulevard, Fort Lauderdale, Florida 33322. 081 (BP), D00.60.44 (AP)
This report shall not be reproduced without written approv Penang Adv. Comm. Laboratory. The results and statemen evaluated.	ral from an officially designated representative of the Motorola nts contained in this report pertain only to the device(s)
Prepared By:	Approved Signatory:
Azil Ezzaddin Khalil Test Personnel	Ho Sze Khian Responsible Engineer

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REVISION HISTORY

Revision History	Description	Date	Originator
Rev. A	Initial Report	17-Nov-2020	Azil Ezzaddin Khalil

1.0. General Information

EUT Description:

Technologies	2.4GHz BT LE
TX Frequency range	2402MHz - 2480MHz
Modulation Type	GFSK
Input/Output	RF port
Connector type	PROGRAMMING, TEST & ALIGNMENT CABLE
Antenna type	INTERNAL BT/WLAN ANTENNA (RADIO ONLY)

The EUT contains following accessory devices and data cable:

Item	Brand	Model or P/N
BATTERY PACK, BATTERY PACK, IMPRES GEN2, LIION, IP68, 2900T, TIA4950	MOTOROLA	PMNN4804A
UHF SLIM WHIP ANTENNA (400-527MHZ) 400 - 527MHZ	MOTOROLA	PMAE4079A

Channel number and frequency information:

40 channels are provided to this EUT:

Channel	Freq. (MHz)						
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, the EUT is to comply with the requirements of the following standards:

FCC 47 CFR Part 15 Subpart C KDB 558074 D01 15.247 Meas Guidance v05 ANSI C63.10-2013

Deviation from standard

Not applicable as no deviation from standard test method

Modifications to EUT

For RF conducted measurements a pigtail was soldered out of the board while for radiated measurements there were no modifications to the device

2.0. Summary of Test Results

FCC Clause	ISED Clause	Test Item	Result	Remark	Serial number tested	Tested by
15.205, 15.209, 15.247 (d)	RSS-247 5.5	Radiated Emission within Restricted Bands	Pass	Test on channel with lowest margin from limit (device alone - SR18058-EMC- 00038)	734TWV0114	Nazrin & Fendi
15.207	RSS-Gen 8.8	AC Powerline Conducted Emission	NA	Testing is not required, radio shall turn off during charging mode	Not Applicable	Not Applicable
15.203	-	Antenna Requirement	NA	Internal antenna is not accessible to the end-user	Not Applicable	Not Applicable

3.0. Measurement Uncertainty

Measurement	Frequency	Expended Uncertainty (k=1.96) (±dB)
AC Power Line Conducted Spurious Emission	150KHz ~ 30MHz	3.43
	30MHz ~ 200MHz	5.01
Radiated Emissions up to 1 GHz	200MHz ~ 1000MHz	5.01
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.01
Radiated Emissions above 1 GHZ	18GHz ~ 25GHz	5.01
Conducted Spurious Emissions	9kHz ~ 12.75GHz	2.82

4.0. Equipment List

Radiated Emission Station (SW Version: EMC FCC RE v1.6.0)

DESCRIPTION	MODEL	SERIAL NUMBER	CALIBRATION DATE	CALIBRATION DUE DATE		
DRG HORN FREQ.	SAS-571	720	21-Mar-19	21-Mar-21		
DRG HORN FREQ.	SAS-571	1143	14-Feb-19	14-Feb-21		
POWER SUPPLY (0-60V / 0- 50A, 1000W)	6032A	2615A01178	21-May-20	21-May-21		
SIGNAL GENERATOR	SMB 100A	181117	8-Nov-18	8-Nov-21		
EMI TEST RECEIVER	ESW44	101731	3-Dec-19	3-Dec-20		
EMI TEST RECEIVER	ESIB26	100017	19-Jul-19	19-Nov-20		
5m SEMI-ANECHOIC CHAMBER	S800-HX	J2308	No Cal. Req'd	No Cal. Req'd		
BILOG ANTENNA	CBL6112B	2964	23-Apr-19	23-Apr-21		
BILOG ANTENNA	CBL6112B	2950	8-Jul-19	8-Jul-21		
DATA LOGGER	SDL500	A.016776	4-Jun-20	4-Jun-21		
SYSTEM CONTROLLER	SC104V	050806-1	No Cal. Req'd	No Cal. Req'd		
TURNTABLE FLUSH MOUNT 2M	FM2011	NA	No Cal. Req'd	No Cal. Req'd		
ANTENNA POSITIONING TOWER	TLT2	NA	No Cal. Req'd	No Cal. Req'd		
BROAD-BAND HORN ANTENNA	BBHA9170	BBHA9170255	27-Jan-20	27-Jan-21		
18 - 40GHz PREAMPLIFIER	MITEQ Hi GAIN SUCOFLEX	001	No Cal. Req'd	No Cal. Req'd		
PREAMPLIFIER	PAM-0118	269	24-May-19	24-May-22		
LOOP ANTENNA	6502	00203479	21-Jan-20	21-Jan-21		
Test Software	EMC_FCC_IC_BLUETOOTH_RE_TEST					
Version	EMC_FCC_RE_v1.6.2					

5.0. Test Mode Applicability and Test Channel Detail

Radiated Emission Test (Above 1GHz)

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

EUT Configure	Available	Tested	Modulation	Environmental		
Mode	Channel	Channel	Туре	Conditions		
Test Mode	0 to 39	19 for RSE	GFSK	23.9°C,		
		39 for RBE		69.8%RH		

Radiated Emission Test (Below 1GHz)

 \square Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). \square Following channel(s) was (were) selected for the final test as listed below.

To nowing enamer(s) was (were) selected for the final test as listed below.						
EUT Configure	Available	Tested	Modulation	Environmental		
Mode	Channel	Channel	Туре	Conditions		
Test Mode	0 to 39	19 for RSE	GFSK	23.9°C,		
				69.8%RH		

Power Line Conducted Emission Test

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

EUT Configure	Available	Tested	Modulation	Environmental		
Mode	Channel	Channel	Туре	Conditions		
Application Mode	0 to 39	AUTO	AUTO	Not Applicable		

Antenna Port Conducted Measurement:

This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

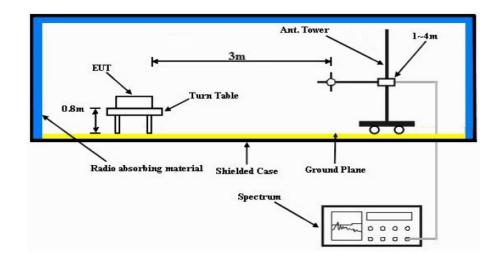
Following channel(s) was (were) selected for the final test as listed below.

EUT Configure	Available	Tested	Modulation	Environmental
Mode	Channel	Channel	Туре	Conditions
Test Mode	0 to 39	0,19,39	GFSK, Pi/4	Not
			DQPSK,8DPSK	Applicable

6.0. Transmitter Test Parameters

6.1. Radiated Emission within restricted Bands

6.1.1. Test Setup



- a. The EUT is placed on the top of a rotating table 0.8m above the ground at a 3m semi-anechoic chamber. The table is rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT is set 3m away from the interference-receiving antenna, which is mounted on the top of a variable-height antenna tower.
- c. The antenna is Bilog/Horn antenna depend on which frequency range uses, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT is arranged to its worst case and then the antenna is tuned to heights from 1m to 4m and the rotatable table is turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system is set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode is fall within the range of 10dB from the limit specified, the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. Otherwise, the testing could be stopped and the peak values of the EUT would be reported.

NOTE:

- a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection at frequency below 1GHz.
- b. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3 MHz for Peak detection at frequency above 1 GHz.
- c. All modes of operation were investigated and the worst-case emissions are reported.

6.1.2. Test Limits:

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

NOTE:

- a. The lower limit shall apply at the transition frequencies.
- b. Emission level $(dBuV/m) = 20 \log Emission level (uV/m)$.
- c. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

6.1.3. Test Data:

Motorola Solutions.

FCC ID: AZ489FT7133, IC ID: 109U-89FT7133

Test: Bluetooth SAC Restricted Band Edge Model Number: AAH90ZDU9RH1AN S/N: 734TWV0114 EMC SR ID#: 18058-EMC-00096 Battery: PMNN4804A Accessory: PMAE4079A Test Channel: High Test Frequency: 2480.0000 MHz Test Standard: ANSI C63.10-2013 Worst Case Plane: Z-Plane (BTLE 2M)

Restricted Band Edge (High Channel) tabular data

				Vertical Rad	liated Emissio	n Result				
Spur Freq (MHz)	Spur level QPK (dBµV/ m)	Spur level PK (dBµV/m)	Spur level AV (dBµV/m)	Limit QPK (dBµV/m)	Limit PK (dBµV/m)	Limit AV (dBµV/m)	Margin QPK (dBµV/ m)	Margin PK (dBµV/ m)	Margin AV (dBµV/ m)	Carrier PK Power (dBµV/ m)
2483.5000	-	58.8444	47.5283	-	74.0000	54.0000	-	-15.1556	-6.4717	-
										<u> </u>
										<u> </u>
			I	Horizontal Ra	diated Emiss	ion Result				
2483.5000	-	59.5387	47.3860	-	74.0000	54.0000	-	-14.4613	-6.6140	-
										
										───┤
										┝───┤
										<u>├</u> ───┤

Remarks: Pass Result	Marginal Result	Fail Result
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Temperature (degC): 23.9 Test Performed by: Nazrin&Fendi System MU: 4.03dB Humidity (%): 69.8 Test Date: Fri, 13 Nov, 2020

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Motorola Solutions.

FCC ID: AZ489FT7133, IC ID: 109U-89FT7133

esult Summ Range Lo 2.484 GH	w	Range Up 2.563 GHz		RBW	Frequency 2.54997 GHz	Power Abs 60.27 dBµV	ΔLimit -13.73 dB
^{18μν} 2.5065 GHz			1000	ote	11.3 MHz/	,	Span 113.0 Mł
18µV							
18µV							
Buv	الماليك أواريعا والإستيار الاستقرار	amut	H?	un march	an marine and a second and the second s	munenter	munuman
18µV							
-							
		\square					
жару		-A					
dBµV		Mi					
d8µV							2,4835000-0
							M2[1] 58.84 dB
RIQUALLINE SPU	IE_002 RICUS <u>_LINE</u>	ABS 002		PASS PASS			M1[1] 94.48 dB 2.4794800 0
F "FCC_IC_TP purious Emis	ANSDUCER_AT	Τ"					
put	1 AC PS	Off Notch Off				Frequer	ncy 2.5065000 G
f Level 125.	DO dBuy		Mode Auto 5	ween			

Restricted Band Edge (High Channel, Vertical, Peak) graphical screen shot

Restricted Band Edge (High Channel, Horizontal, Peak) graphical screen shot

MultiView 💠 Spectru	m				
Ref Level 125.00 dBµV		Mode Auto Sweep			
Input 1 AC PS TDF "FCC_1C_TRANSDUCER_A				Frequency 2.5	065000 GHz
1 Spurious Emissions					1 Max
_SPURIONSTFIRES		PASS		M1[1]	98.78 dBµV
120 dbgWireSPURICUS_LINE	_ABS_002	PASS			2.4794800 GHz
				M2[1]	59.54 dBµV
110 dBuV					2.4835000 GHz
					1
	MI				
100 dBµV	- <u>F</u>				
	-1				
90 daµV					
20 00pr	1 1 1				
	1 1 1				
80 d8µV			<u> </u>		
70 dBµV					
Vol dapv					
	1 100				
60 BW	Mar da a Martín	and a second sec	and the ball of the second sec	a second a local de la seconda de la	Accession and a features from a
all the second	maked bulles. al	Alante and and a second second	contradication descention of the standard states a	Taxes designed and endersome a survey	the second second
50 dBµV					
40 d8µV					
30 dBµV					
CF 2.5065 GHz		1000 pts	11.3 MHz/		ban 113.0 MHz
		1000 pts	11.3 MHZ/	3	pan 113.0 MHz
2 Result Summary	Panga Lie	RBW	Energy and a	Power Abs	ALimit
2.484 GHz	Range Up 2.563 GHz	1.000 MHz	Erequency 2.49530 GHz		3.32 dB
2.404 GH2	2,303 GFI2	1.000 MHz			
ί Π			Measuring	08:07:48	RBW

08:07:48 13.11.2020

Motorola Solutions.

FCC ID: AZ489FT7133, IC ID: 109U-89FT7133

MultiView 🗉 Spectrur	n				S
Ref Level 125.00 dBµV	Off Notch Off	ide Auto Sweep SGL Count 1/5	50	Frequency 2.5	5065000 GHz
Spurious Emissions					1 Max
SPURIOUS LENGER BE DO2		PASS		M1[1	
L20 dBUI/re _SPURIOUS_LINE	ABS_002	PASS			2.4800900 GHz
				M2[1]	1
110 dBuV				MZLI	
.10 deb v					-2.4835000 GHz
100 dBµV					
	M1				
	. <u>.</u>				
in ophia					
90 d8μV					
70 dBuV	1 (1)				
50 dBµV	+ + + +				
-					
	()				
50 daµV	internet the				
	1				
40 dBμV					
30 dBµV					
F 2.5065 GHz		1000 pts	11.3 MHz/		Span 113.0 MHz
Result Summary			2 110 10 1027		
Range Low	Range Up	RBW	Erequency	Power Abs	∆Limit
2.484 GHz	2.563 GHz	1.000 MHz	Erequency 2.55139 GHz		-5.83 dB
The second secon			Aborted	13.11.2020 Ref Lev	

Restricted Band Edge (High Channel, Vertical, Average) graphical screen shot

08:12:04 13.11.2020

Restricted Band Edge (High Channel, Horizontal, Average) graphical screen shot

MultiView	Spectrum	<u> </u>							v v
Ref Level 125. Input TDF "FCC_JC_TF	1 AC PS	Off Notch Off	Mode Auto Swe	ep SGL Count 1/3	50		Fre	quency 2.5	065000 GHz
1 Spurious Emi									1 Max
SPURIOUSLEINE			PAS	is				M1[1]	98.00 dBµV
120 dBuline _SPU	RIOUS LINE	AB5_002	PAS						2.4799500 GHz
_		_						M2[1]	47.39 dBµV
A REAL PROPERTY.								MZ[1]	
110 dBµV									2.4835000 GHz
100 dBµV		M1							
		$\Gamma = I \Lambda$							
90 dBµV									
		1 1 1							
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sn geha									
70 dBµV									
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60 dBµV									
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50 dBµV			12						
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40 dBµV									
30 dBµV									
CF 2.5065 GHz		1	1000 pts		11	.3 MHz/		S	pan 113.0 MHz
2 Result Summ			2000 000						
2 Result Summ		Range Up	RB	A/	Frequen	~	Power Abs		∆Limit
2.484 GH		2.563 GHz	1.000 [Erequen 2.56087	Hz	48.34 dBµ\		5.66 dB
2.404 GH	~	2.303 012	1.0001	-11 Ma	-				
					Aborted		13.11.20 08:15	120 Ref Level	RBW

08:15:56 13.11.2020

Motorola Solutions.

FCC ID: AZ489FT7133, IC ID: 109U-89FT7133

Test: SAC Transmitter Radiated Emission Model#: AAH90ZDU9RH1AN S/N: 734TWV0114 EMC SR ID#: 18058-EMC-00096 Battery: PMNN4804A Accessory: PMAE4079A Test Channel: Mid Test Frequency: 2440.0000 MHz Test Standard: ANSI C63.10-2013 Worst Case Plane: Z-Plane (BTLE 2M)

	Vertical Radiated Emission Result									
Spur Freq (MHz)	Spur level QPK (dBµ V/m)	Spur level PK (dBµV/m)	Spur level AV (dBµV/m)	Limit QPK (dBµ V/ m)	Limit PK (dBµV/m)	Limit AV (dBµV/m)	Margin QPK (dBµV/m)	Margin PK (dBµV/ m)	Margin AV (dBµV/ m)	Carrier PK Power (dBµV/m)
	1		1	Horizontal R	adiated Emis	sion Result				

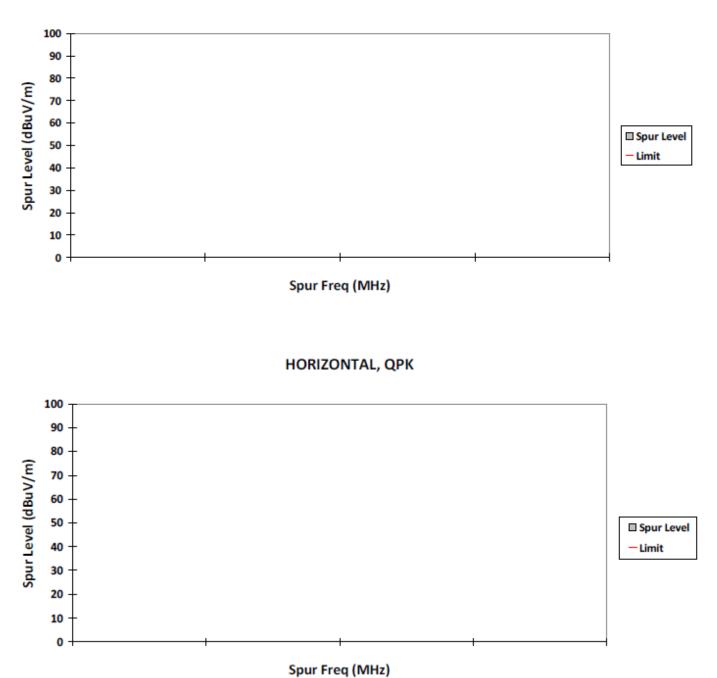
Radiated Emission (Mid Channel) tabular data

Remarks: Pass Result	Marginal Result	Fail Result
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Temperature (degC): 23.9 Test Performed by: Nazrin&Fendi System MU: 4.03dB Humidity (%): 69.8 Test Date: Thu, 12 Nov, 2020

Remarks: ** Indicates the spurious emission could not be detected due to noise limitations or ambient. *Pursuant to CFR 47 Part 2.1057 (c), emissions attenuated more than 20 dB below the permissible limit are not reported.

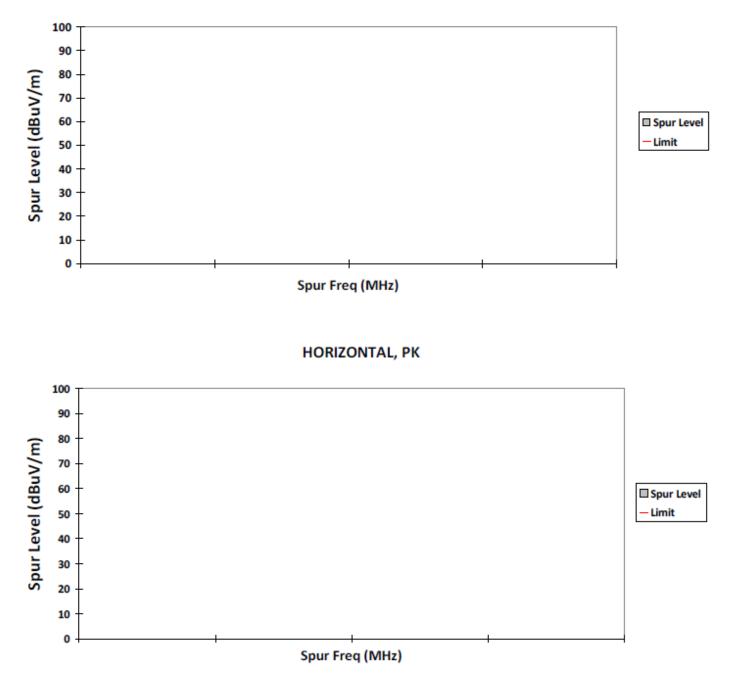
FCC ID: AZ489FT7133, IC ID: 109U-89FT7133



VERTICAL, QPK

Motorola Solutions.

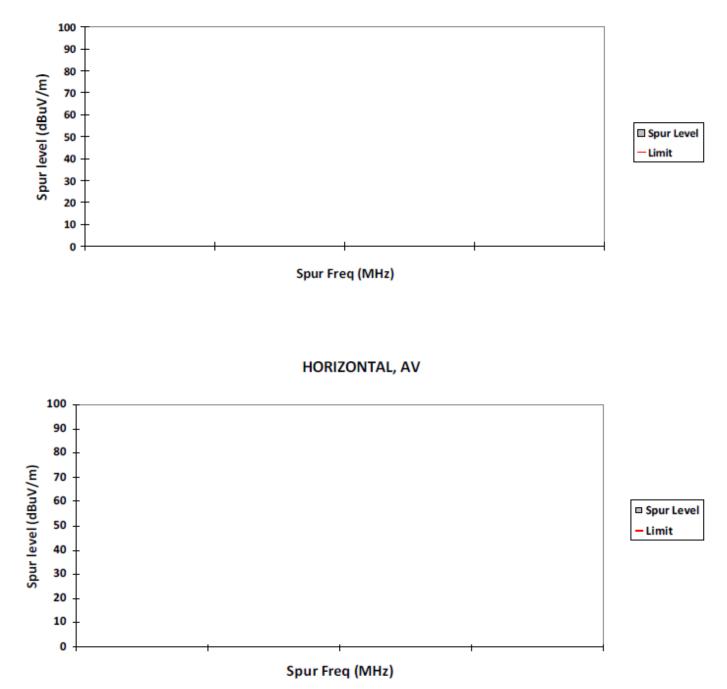
FCC ID: AZ489FT7133, IC ID: 109U-89FT7133



VERTICAL, PK

Motorola Solutions.

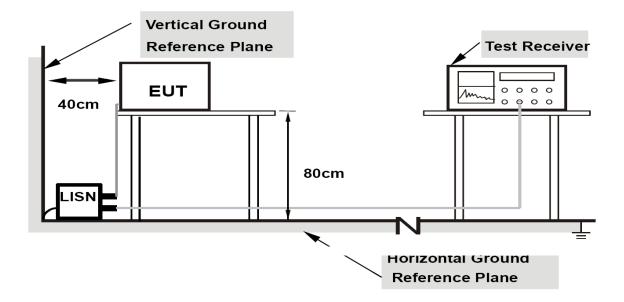
FCC ID: AZ489FT7133, IC ID: 109U-89FT7133



VERTICAL, AV

AC Powerline Conducted Emission

6.1.4. Test Setup



- 1) Tests were conducted for both Receive and Transmit Mode of the EUT.
- 2) The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50uH of coupling impedance for the measuring instrument.
- 3) Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- 4) The frequency range from 150 kHz to 30MHz was measured.

6.1.5. Test Limits:

For AC Power Line Conducted Test Limit can be Class A or B depends on product classification.

Limits for conducted disturbance at the mains ports of class A ITE

Frequency range MHz	Limits dB(µ∨)				
MITIZ	Quasi-peak	Average			
0,15 to 0,50	79	66			
0,50 to 30	73	60			
NOTE The lower limit shall apply at the transition frequency.					

Table 1: Limits for Conducted Disturbance at the Mains Ports of Class A ITE.

of class bille							
Frequency range MHz	Limits dB(µ∀)						
MITZ	Quasi-peak	Average					
0,15 to 0,50	66 to 56	56 to 46					
0,50 to 5	56	46					
5 to 30	60	50					
NOTE 1 The lower limit shall apply at the transition frequencies. NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.							

Limits for conducted disturbance at the mains ports of class B ITE

Table 2: Limits for Conducted Disturbance at the Mains Ports of Class B ITE

6.1.6. Test Result

Not Applicable. Testing is not required, radio shall turn off during charging mode

END OF TEST REPORT