



Report No.: FG420209A

: 01

FCC RADIO TEST REPORT

FCC ID : LHJ-LNAD

Equipment : LHJ-LNAD

Brand Name : Continental

Model Name : LNAD, LNADV

Applicant : Continental Automotive Systems, Inc.

21440 W Lake Cook Rd., Deer Park, IL 60010, USA

Manufacturer : Continental Automotive Systems, Inc.

21440 W Lake Cook Rd., Deer Park, IL 60010, USA

Standard : FCC 47 CFR Part 2, 22(H), 24(E)

The product was received on Feb. 01, 2024 and testing was performed from Feb. 19, 2024 to Feb. 21, 2024. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA-603-E and has been in compliance with the applicable technical standards.

The test results in this partial report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

Sporton International Inc. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)

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History of this test report

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Report No.	Version	Description	Issue Date
FG420209A	01	Initial issue of report	Mar. 01, 2024

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Summary of Test Result

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Report Clause		Test Items	Result (PASS/FAIL)	Remark
	§2.1046	§2.1046 Conducted Output Power		
3.2	§22.913 (a)(5)	Effective Radiated Power (WCDMA Band V)	Pass	-
	§24.232 (c)	Equivalent Isotropic Radiated Power (WCDMA Band II)		
4.4	§2.1053 §22.917 (a) §24.238 (a)	Field Strength of Spurious Radiation (WCDMA Band V) (WCDMA Band II)	Pass	32.35 dB under the limit at 5565.00 MHz

Note:

- This partial report differs form FCC ID: LHJ-LNAD report as it tests for the replacement of the end-of-life (EOL) RF front-end switch with a pin-to-pin compatible replacement part, which is declared by the customer.
- 2. The test configurations are specified by the manufacturer.

Conformity Assessment Condition:

- The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against
 the regulation limits or in accordance with the requirements stipulated by the
 applicant/manufacturer who shall bear all the risks of non-compliance that may potentially
 occur if measurement uncertainty is taken into account.
- 2. The measurement uncertainty please refer to each test result in the section "Measurement Uncertainty".

Disclaimer:

- The product specifications of the EUT presented in the test report that may affect the test
 assessments are declared by the manufacturer who shall take full responsibility for the
 authenticity.
- The purpose of different model name is that LNAD does not supports voice function and LNADV support.

Reviewed by: Yun Huang

Report Producer: Michelle Chen

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1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature				
Equipment	LHJ-LNAD			
Brand Name	Continental			
Model Name	LNAD, LNADV			
FCC ID	LHJ-LNAD			
Installed into the Host	Equipment name: LNAD Brand name: Continental Model name: LNAD			
EUT supports Radios application	WCDMA/HSPA/LTE/GNSS			
EUT Stage	Identical Prototype			

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Support Band and Evaluated Information			
Supported Band	WCDMA Band V, II		
Evaluated and Tested Band	WCDMA Band V, II		

TDD Band Power Class					
PC3 PC2					
WCDMA Band II	V	-			
WCDMA Band V V		-			

1.2 Product Specification of Equipment Under Test

Product Specification is subject to this standard					
	WCDMA:	WCDMA:			
Tx Frequency	Band V:	826.4 MHz ~ 846.6 MHz			
	Band II:	1852.4 MHz ~ 1907.6 MHz			
	WCDMA:				
Rx Frequency	Band V:	871.4 MHz ~ 891.6 MHz			
	Band II:	1932.4 MHz ~ 1987.6 MHz			
	WCDMA:				
Maximum Output Power to Antenna	Band V:	22.52 dBm			
	Band II:	23.95 dBm			
Antenna Type	Dipole Ante	nna			
Antenna Gain	Cellular Band: 0.82 dBi				
Antenna Gain	PCS Band: 1.52 dBi				
	WCDMA: QPSK (Uplink)				
Type of Modulation	HSDPA: 64QAM (Downlink)				
	HSUPA: QPSK (Uplink)				

Remark: The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.

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1.3 Modification of EUT

No modifications made to the EUT during the testing.

1.4 Testing Location

Test Site	Sporton International Inc. EMC & Wireless Communications Laboratory		
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978		
Test Site No.	Sporton Site No.		
Test Site No.	TH03-HY		
Test Engineer	Cotty Hsu		
Temperature (°C)	22.1~22.8		
Relative Humidity (%)	53.2~55.3		

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Test Site	Sporton International Inc. Wensan Laboratory	
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Faoyuan City 333010, Taiwan (R.O.C.) FEL: +886-3-327-0868 FAX: +886-3-327-0855	
Test Site No.	Sporton Site No.	
Test Site No.	03CH15-HY (TAF Code: 3786)	
Test Engineer	Danel Lee, Quentin Liu and Bigshow Wang	
Temperature (°C)	21.4~22.8	
Relative Humidity (%)	48~59	
Remark	The Radiated Spurious Emission test item subcontracted to Sporton International Inc. Wensan Laboratory.	

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC Designation No.: TW1190 and TW3786

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1.5 Applicable Standards

According to the specifications declared by the manufacturer, the EUT must comply with the requirements of the following standards:

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- + ANSI C63.26-2015
- ANSI / TIA-603-E
- FCC 47 CFR Part 2, 22(H), 24(E)
- FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- FCC KDB 412172 D01 Determining ERP and EIRP v01r01
- FCC KDB 414788 D01 Radiated Test Site v01r01

Remark:

- 1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
- 2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.
- 3. The TAF code is not including all the FCC KDB listed without accreditation.

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2 Test Configuration of Equipment Under Test

2.1 Test Mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

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For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in two config (Degree 0 and Degree 90), and adjusting the measurement antenna orientation, following C63.26 exploratory test procedures and only the worst case emissions were reported in this report..

Radiated emissions were investigated as following frequency range:

- 1. 30 MHz to 9000 MHz for WCDMA Band V
- 2. 30 MHz to 19100 MHz for WCDMA Band II

All modes, data rates and positions were investigated.

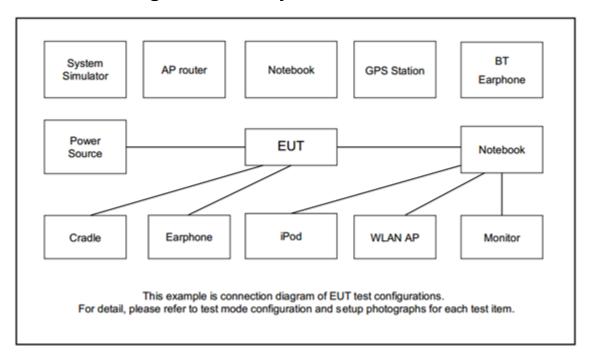
Test modes are chosen to be reported as the worst case configuration below:

Test Modes						
Band	Radiated TCs	Conducted TCs				
WCDMA Band V	■ RMC 12.2Kbps Link	■ RMC 12.2Kbps Link				
WCDMA Band II	■ RMC 12.2Kbps Link	■ RMC 12.2Kbps Link				

Remark: All the tests were performed with LNADV.

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2.2 Connection Diagram of Test System



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2.3 Support Unit used in test configuration

Item	Equipment	Brand Name	Model No.	FCC ID	Data Cable	Power Cord
1.	WWAN Antenna	LARSEN	SPDA24700/2700	N/A	N/A	N/A
2.	System Simulator	Anritsu	MT8820C	N/A	N/A	N/A

2.4 Frequency List of Low/Middle/High Channels

Frequency List							
Band	Band Channel/Frequency(MHz) Lowest Middle Highest						
WCDMA	Channel	4132	4182	4233			
Band V	Frequency	826.4	836.4	846.6			
WCDMA	Channel	9262	9400	9538			
Band II	Frequency	1852.4	1880.0	1907.6			

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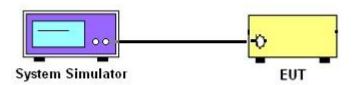
3 Conducted Test Result

3.1 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.1.1 Test Setup

3.1.2 Conducted Output Power



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3.1.3 Test Result of Conducted Test

Please refer to Appendix A.

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3.2 Conducted Output Power and ERP/EIRP

3.2.1 Description of the Conducted Output Power and ERP/EIRP

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at the maximum power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

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The ERP of mobile transmitters must not exceed 7 Watts for WCDMA Band V

The EIRP of mobile transmitters must not exceed 2 Watts for WCDMA Band II

According to KDB 412172 D01 Power Approach,

 $EIRP = P_T + G_T - L_C$, ERP = EIRP - 2.15, where

P_T = transmitter output power in dBm

G_T = gain of the transmitting antenna in dBi

Lc = signal attenuation in the connecting cable between the transmitter and antenna in dB

3.2.2 Test Procedures

- 1. The transmitter output port is connected to the system simulator.
- 2. Set EUT at maximum power through system simulator.
- 3. Select the lowest, middle, and the highest channels for each band and different modulation.
- Measure the maximum burst average power for GSM and maximum average power for other modulation signal.

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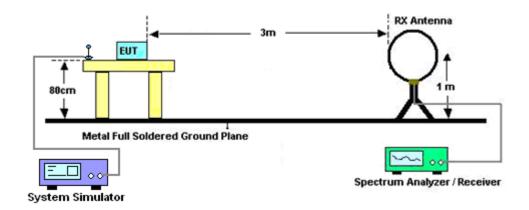
4 Radiated Test Items

4.1 Measuring Instruments

Please refer to the measuring equipment list in this test report.

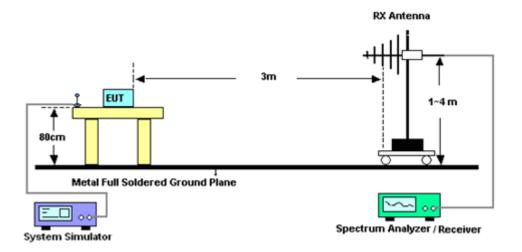
4.2 Test Setup

For radiated test below 30MHz



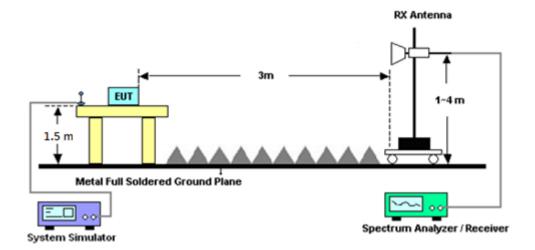
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For radiated test from 30MHz to 1GHz



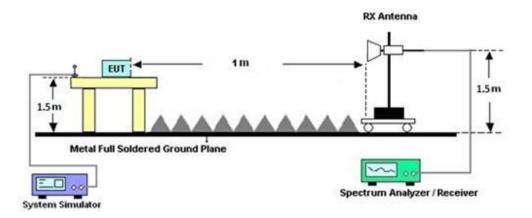
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For radiated test from 1GHz to 18GHz



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For radiated test above 18GHz



4.3 Test Result of Radiated Test

Please refer to Appendix B.

Note:

The low frequency, which starts from 9 kHz to 30 MHz, is pre-scanned and the result which is 20 dB lower than the limit line is not reported.

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

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4.4 Field Strength of Spurious Radiation Measurement

4.4.1 Description of Field Strength of Spurious Radiated Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

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4.4.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 7 and ANSI C63.26-2015 section 5.5.4 Radiated measurement using the field strength method.

- 1. The EUT is placed on a rotatable wooden table 0.8 meters for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz above the ground.
- 2. The EUT is set 3 meters away from the receiving antenna, which is mounted on the antenna tower.
- 3. The table is rotated 360 degrees to determine the position of the highest spurious emission.
- 4. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.
- 5. Make the measurement with the spectrum analyzer's RBW = 1 MHz, VBW = 3 MHz, taking record of maximum spurious emission.
- To convert spectrum reading E(dBuV/m) to EIRP(dBm)
 EIRP(dBm) = Level (dBuV/m) + 20log(d) -104.77, where d is the distance at which filed strength limit is specified in the rules
- 7. Field Strength Level (dBm) = Spectrum Reading (dBm) + Antenna Factor + Cable Loss + Read Level Preamp Factor.
- 8. ERP (dBm) = EIRP (dBm) 2.15
- 9. The RF fundamental frequency shall be excluded against the limit line in the operating frequency band.
- 10. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts)

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5 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark	
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Sep. 12, 2023	Feb. 19, 2024~ Feb. 20, 2024	Sep. 11, 2024	Radiation (03CH15-HY)	
Bilog Antenna	TESEQ	CBL 6111D & 00802N1D01N-06	47020 & 06	30MHz~1GHz	Oct. 07, 2023	Feb. 19, 2024~ Feb. 20, 2024	Oct. 06, 2024	Radiation (03CH15-HY)	
Horn Antenna	SCHWARZB ECK	BBHA 9120 D	9120D-02294	1GHz~18GHz	Jun. 30, 2023	Feb. 19, 2024~ Feb. 20, 2024	Jun. 29, 2024	Radiation (03CH15-HY)	
SHF-EHF Horn Antenna	SCHWARZB ECK	BBHA 9170	00993	18GHz~40GHz	Nov. 24, 2023	Feb. 19, 2024~ Feb. 20, 2024	Nov. 23, 2024	Radiation (03CH15-HY)	
Amplifier	SONOMA	310N	363440	9kHz~1GHz	Dec. 25, 2023	Feb. 19, 2024~ Feb. 20, 2024	Dec. 24, 2024	Radiation (03CH15-HY)	
Preamplifier	EMEC	EM1G18G	060812	1GHz~18GHz	Dec. 25, 2023	Feb. 19, 2024~ Feb. 20, 2024	Dec. 24, 2024	Radiation (03CH15-HY)	
Preamplifier	EM Electronics	EM01G18G	060802	1GHz~18GHz	Mar. 03, 2023	Feb. 19, 2024~ Feb. 20, 2024	Mar. 02, 2024	Radiation (03CH15-HY)	
Preamplifier	EMEC	EM18G40G	060801	18GHz~40GHz	Jun. 27, 2023	Feb. 19, 2024~ Feb. 20, 2024	Jun. 26, 2024	Radiation (03CH15-HY)	
Spectrum Analyzer	Keysight	N9010B	MY60241058	10Hz~44GHz	Jul. 06, 2023	Feb. 19, 2024~ Feb. 20, 2024	Jul. 05, 2024	Radiation (03CH15-HY)	
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Feb. 19, 2024~ Feb. 20, 2024	N/A	Radiation (03CH15-HY)	
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Feb. 19, 2024~ Feb. 20, 2024	N/A	Radiation (03CH15-HY)	
Software	Audix	E3 6.2009-8-24(k5)	RK-000451	N/A	N/A	Feb. 19, 2024~ Feb. 20, 2024	N/A	Radiation (03CH15-HY)	
RF Cable	HUBER + SUHNER	SUCOFLEX 104, 102E	MY582185/4, 519228/2,803 950/2	30MHz~18G	Jun. 13, 2023	Feb. 19, 2024~ Feb. 20, 2024	Jun. 12, 2024	Radiation (03CH15-HY)	
RF Cable	HUBER + SUHNER	SUCOFLEX 102	804011/2,804 012/2	18-40G	Jan. 02, 2024	Feb. 19, 2024~ Feb. 20, 2024	Jan. 01, 2025	Radiation (03CH15-HY)	
Filter	Wainwright	WHKX12-1080-12 00-15000-60ST	SN5	1.2GHz High Pass Filter	Jun. 14, 2023	Feb. 19, 2024~ Feb. 20, 2024	Jun. 13, 2024	Radiation (03CH15-HY)	
Filter	Wainwright	WHKX12-2700-30 00-18000-60ST	SN4	3GHz High Pass Filter	Jun. 14, 2023	Feb. 19, 2024~ Feb. 20, 2024			
Radio Communication Analyzer	Anritsu	MT8821C	6262025353	LTE FDD/TDD LTE-2CC DLCA/ULCA	LTE-2CC Oct. 03, 2023		Feb. 21, 2024 Oct. 02, 2024		
Thermal Chamber	ESPEC	SH-641	92013720	-40℃ ~90℃	Sep. 04, 2023	Feb. 21, 2024	Sep. 03, 2024	Conducted (TH03-HY)	
DC Power Supply	GW Instek	GPP-2323	GES906037	0V~64V ; 0A~6A	Nov. 28, 2023	Feb. 21, 2024	Nov. 27, 2024	Conducted (TH03-HY)	
Coupler	Warison	20dB 25W SMA Directional Coupler	#B	1-18GHz	Jan. 08, 2024	Feb. 21, 2024	Jan. 07, 2025	Conducted (TH03-HY)	
Spectrum Analyzer	Rohde & Schwarz	FSV40	101905	10Hz~40GHz Jul. 14, 2023		Feb. 21, 2024	Jul. 13, 2024	Conducted (TH03-HY)	

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6 Measurement Uncertainty

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of	3.02 dB
Confidence of 95% (U = 2Uc(y))	3.02 db

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<u>Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)</u>

Measuring Uncertainty for a Level of	3.57 dB
Confidence of 95% (U = 2Uc(y))	3.57 UB

<u>Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)</u>

Measuring Uncertainty for a Level of	2 07 AD
Confidence of 95% (U = 2Uc(y))	3.97 dB

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Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power) & ERP / EIRP

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WCDI	WCDMA Band V Maximum Average Power [dBm] (GT - LC = 0.82 dB)										
Channel	4132	4182	4233	ERP (dBm)	ERP (W)						
Frequency	826.4	836.4	846.6	EKP (UBIII)							
RMC 12.2K	22.52	22.15	21.95								
HSDPA Subtest-1	19.40	19.26	19.16								
HSDPA Subtest-2	19.40	19.24	19.23								
HSDPA Subtest-3	19.38	19.22	18.84		0.1315						
HSDPA Subtest-4	19.38	19.22	19.17	21.19							
HSUPA Subtest-1	20.64	20.82	20.61								
HSUPA Subtest-2	20.39	20.14	20.20								
HSUPA Subtest-3	20.01	19.73	19.81								
HSUPA Subtest-4	20.19	20.41	20.08								
HSUPA Subtest-5	21.40	21.20	21.20								
Limit		ERP < 7W		Result	Pass						

WCDMA Band II Maximum Average Power [dBm] (GT - LC = 1.52 dB)										
Channel	9262	9400	9538	EIRP (dBm)	EIRP (W)					
Frequency	1852.4	1880	1907.6	EIRF (UBIII)						
RMC 12.2K	23.55	23.60	23.95							
HSDPA Subtest-1	20.38	20.35	20.82							
HSDPA Subtest-2	20.48	20.35	20.83							
HSDPA Subtest-3	20.45	20.34	20.83		0.2524					
HSDPA Subtest-4	20.44	20.33	20.83	25.47						
HSUPA Subtest-1	22.47	22.48	22.48 22.90		0.3524					
HSUPA Subtest-2	21.37	21.33	21.75							
HSUPA Subtest-3	21.17	21.16	21.46							
HSUPA Subtest-4	21.70	21.40	21.99							
HSUPA Subtest-5	22.70	22.50	23.00							
Limit		EIRP < 2W		Result	Pass					

Appendix B. Test Results of Radiated Test

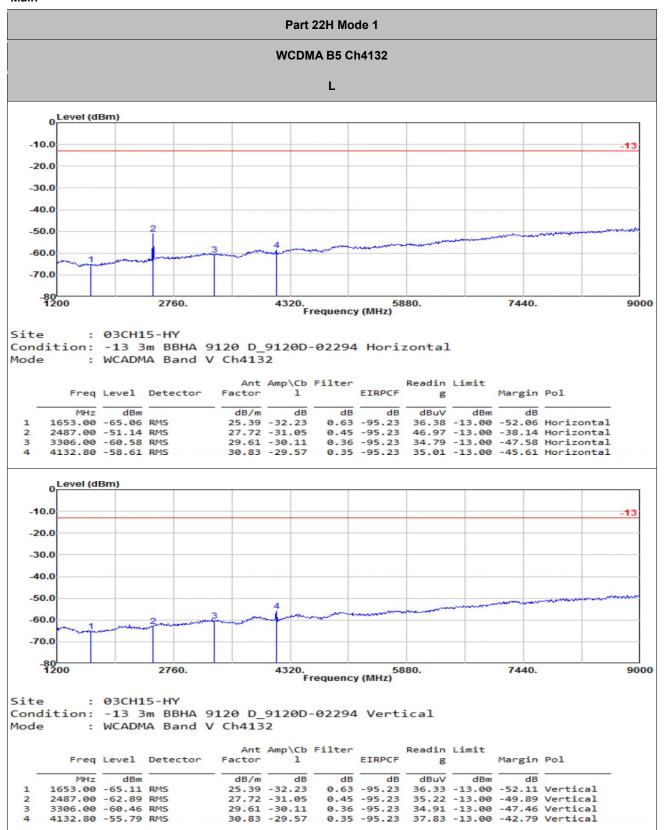
B1. Summary of each worse mode

=															
Mode	Part	Band	Ch	Freq (MHz)	Level (dBm)	Det	Ant Factor (dB)	Amp\CbI (dB)	Filter (dB)	EIRPCF (dB)	Reading (dBuV)	Limit (dBm)	Margin (dB)	Pol	Ant
1	Part 22H	WCDMA B5	L	2487	-51.14	RMS	27.72	-31.05	0.45	-95.23	46.97	-13.00	-38.14	Н	Main
2	Part 24E	WCDMA B2	L	5565	-45.35	RMS	32.93	-27.94	0.39	-95.23	44.50	-13.00	-32.35	V	Main

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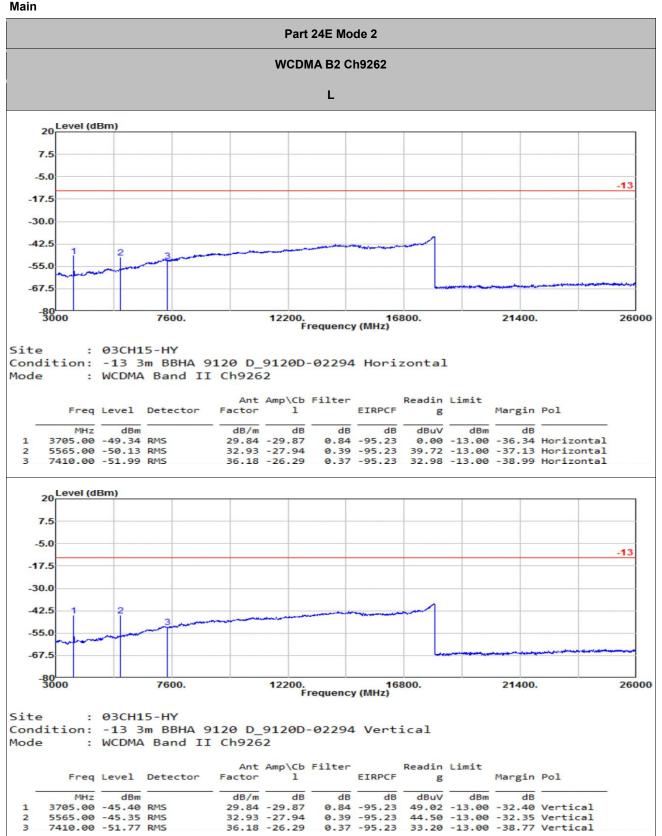
Main



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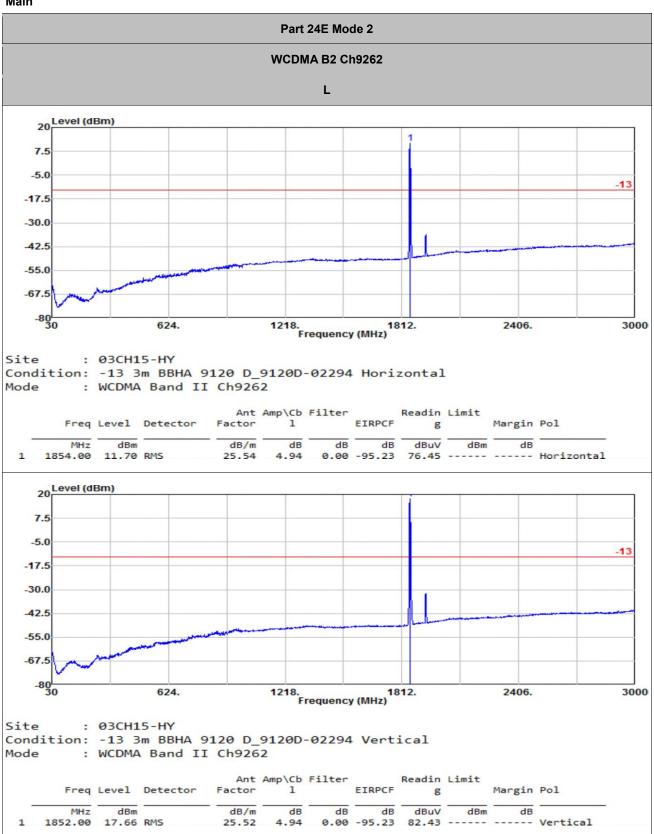


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Main



Remark: #1 is fundamental signal which can be ignored.

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