

Prüfbericht-Nr.: <i>Test report no.:</i>	CN247ZUB 001	Auftrags-Nr.: <i>Order no.:</i>	48246439	Seite 1 von 15 Page 1 of 15
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2024-04-15	
Auftraggeber: <i>Client:</i>	BSIZE INC. 2-12-11-9F, SHIN-YOKOHAMA KOUHOKU-KU, Yokohama, Kanagawa, Japan			
Prüfgegenstand: <i>Test item:</i>	Cellular Wireless Module			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	nRF9160			
Auftrags-Inhalt: <i>Order content:</i>	FCC Part 24 Test report			
Prüfgrundlage: <i>Test specification:</i>	FCC 47CFR Part 24 Subpart E			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2024-01-25			
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003694723-007			
Prüfzeitraum: <i>Testing period:</i>	2024-05-06 - 2024-05-16			
Ort der Prüfung: <i>Place of testing:</i>	EMC/RF Taipei Testing Site			
Prüflaboratorium: <i>Testing laboratory:</i>	Taipei Testing Laboratories			
Prüfergebnis*: <i>Test result*:</i>	Pass			
überprüft von: <i>compiled by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: <i>Date:</i>	2024-06-28	Ausstellungsdatum: <i>Issue date:</i>	2024-06-28	
Stellung / Position:	Senior Project Manager	Stellung / Position:	Senior Project Manager	
Sonstiges / Other:	This is C2PC report. Only radiated spurious emissions is performed in this report. For other test results, refer to original report no.: (NIE) 59675RRF.001.			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* 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
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>				

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Anmerkungen
Remarks

- | | |
|----------|--|
| 1 | <p>Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben.
Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.</p> <p><i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i></p> |
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| 3 | <p>Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben.
Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.</p> <p><i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.
Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i></p> |
| 4 | <p>Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019.</p> <p><i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</i></p> |

TEST SUMMARY

Report Section	FCC Clause	Test Item	Result
-	2.1046 24.232(c)	Conducted Output Power and Effective Isotropically Radiated Power	Note 1
-	2.1055 24.235	Frequency Stability	Note 1
-	24.232(d)	Peak to Average Ratio	Note 1
-	2.1049	Occupied Bandwidth and 26 dB Bandwidth	Note 1
-	2.1051 24.238(a)	Conducted Band Edge	Note 1
-	2.1051 24.238(a)	Conducted Spurious Emissions	Note 1
5.1.1	2.1053 24.238(a)	Radiated Spurious Emissions	Pass

Note:

1. Refer to original report.
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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APPENDIX A - TEST RESULT OF RADIATED SPURIOUS EMISSIONS

APPENDIX SP - PHOTOGRAPHS TEST SETUP

APPENDIX EP - PHOTOGRAPHS OF EUT

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HISTORY OF THIS TEST REPORT

Revision	Description	Date Issued
R01	Original Release	2024-06-28

1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A - Test Result of Radiated Spurious Emissions

Appendix SP - Photographs Test Setup

Appendix EP - Photographs of EUT

Applied Standard and Test Levels

Radio
FCC 47CFR Part 2
FCC 47CFR Part 24 Subpart E
KDB 971168 D01 Power Meas License Digital Systems v03r01
ANSI/TIA/EIA-603-E 2016
ANSI C63.26-2015

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

No.458-18, Sec. 2, Fenliao Rd., Linkou Dist.,
New Taipei City 244
Taiwan (R.O.C.)
FCC Registration No.: 180491
ISED Registration No.: 25563

2.3 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.

2.4 Calibration

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

2.5 Measurement Uncertainty

All measurement uncertainty values are shown with a coverage factor of $k=2$ to indicate a 95% level of confidence.

Emission Measurement Uncertainty

Parameter	Uncertainty
Radiated Emission (9 kHz ~ 30 MHz)	± 1.15 dB
Radiated Emission (30 MHz ~ 200 MHz)	± 1.32 dB
Radiated Emission (200 MHz ~ 1 GHz)	± 1.31 dB
Radiated Emission (1 GHz ~ 18 GHz)	± 1.53 dB
Radiated Emission (18 GHz ~ 40 GHz)	± 2.50 dB
Mains Conducted Emission	± 1.65 dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a Cellular Wireless Module. It contains a WWAN 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

Basic Information of EUT

Item	EUT information
Kind of Equipment/Test Item	Cellular Wireless Module
Type Identification	nRF9160
FCC ID	2BFDZBLM-GTNU
Host Information	Product Name: BoT Talk Brand: Bsize Model: BLM-GTN

Note: The EUT is installed into the host during the test.

Technical Specification of EUT

Item	EUT information	
Operating Frequency	eMTC Band 2 (1.4 MHz)	1850.7 ~ 1909.3 MHz
	eMTC Band 2 (3 MHz)	1851.5 ~ 1908.5 MHz
	eMTC Band 2 (5 MHz)	1852.5 ~ 1907.5 MHz
	eMTC Band 2 (10 MHz)	1855.0 ~ 1905.0 MHz
	eMTC Band 2 (15 MHz)	1857.5 ~ 1902.5 MHz
	eMTC Band 2 (20 MHz)	1860.0 ~ 1900.0 MHz
Modulation	QPSK, 16QAM	
Operation Voltage	5 Vdc (from host)	
Antenna Information	PIFA antenna with -2.36 dBi gain	
Accessory Device	Refer to 4.3	

3.3 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.4 Submitted Documents

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

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Setup for testing: Test samples enable WWAN function and make it possible to control them through Base Station simulator.

The samples were used as follows:
A003694723-007

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

Radiated Spurious Emissions

- ☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Band	Channel Bandwidth	Available Channel	Tested Channel	Modulation	Mode	Position
-	eMTC Band 2	3 MHz	18615 to 19185	18615, 18900, 19185	QPSK	1 RB	X-plane

Test Condition

Test Item	Ambient Temperature	Relative Humidity	Tested by
Radiated Spurious Emissions	22.6-24.5 °C	52-54 %	Roger Liao

4.3 Special Accessories and Auxiliary Equipment

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

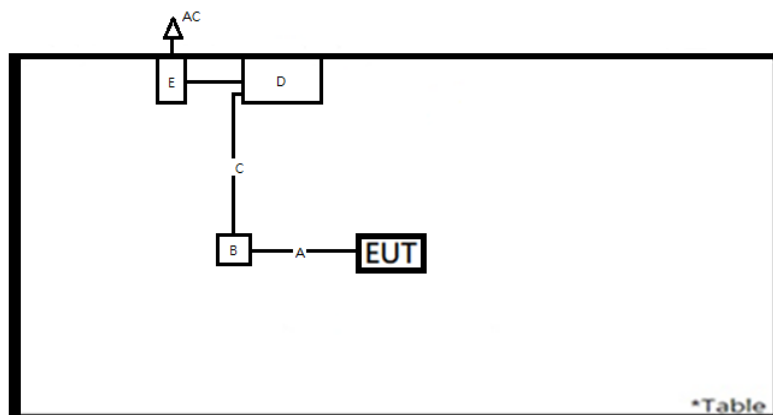
Accessory of EUT

None

Support Unit

Support Unit								
No	Description	Brand	Model	S/N	Shielded	Ferrite Core (Qty)	Length (cm)	Remark
A	USB to Type-C	TUV-JP	TUV-JP-01	N/A	N/A	N/A	30	--
B	Fixture	TUV-JP	TUV-JP-02	N/A	-	-	-	--
C	USB to Micro	TUV-JP	TUV-JP-03	N/A	N/A	N/A	50	--
D	Notebook	Panasonic	CF-SZ5PDYVS	N/A	-	-	-	--
E	Adapter	Panasonic	CF-AA6412C M3	N/A	NO	YES	200	--

4.4 Test Setup Diagram



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Radiated Spurious Emissions

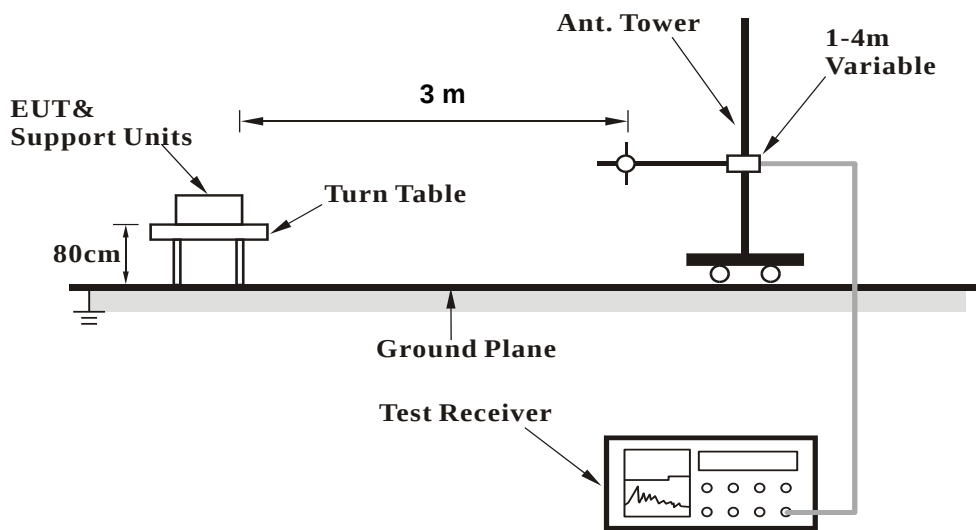
Limit

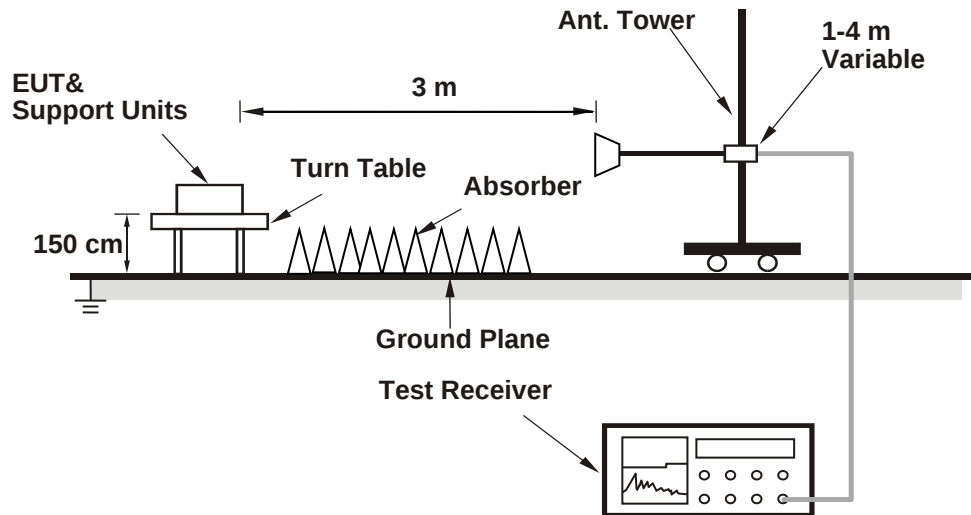
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

Kind of Test Site 3m Semi-Anechoic Chamber

Test Setup

<Radiated Emissions below or equal to 1 GHz>



<Radiated Emissions above 1 GHz>


For the actual test configuration, please refer to the attached file (Test Setup Photo).

Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Above 1 GHz					
Signal Analyzer	R&S	FSV40	101509	2024/4/30	2025/4/29
Horn Antenna	ETS-Lindgren	3117	00218929	2023/11/17	2024/11/15
HF-AMP + AC source	EMCI	EM01G18GA	980635	2024/3/28	2025/3/27
Wireless Tester	R&S	CMW500	166923	2024/4/9	2025/4/8
Test Software	Audix E3	15914a_20191106 tuv	PK-001087	N/A	N/A
30 MHz ~ 1 GHz					
Receiver	R&S	ESR7	101509	2024/4/30	2025/4/29
Bilog Antenna	SCHWARZBECK	VULB-9168	00951	2024/3/21	2025/3/20
LF-AMP	Agilent	8447D	2727A05146	2024/1/24	2025/1/22
Wireless Tester	R&S	CMW500	166923	2024/4/9	2025/4/8
Test Software	Audix E3	15914a_20191106 tuv	PK-001087	N/A	N/A

Test Procedures

- a. In the semi-anechoic chamber, EUT placed on the 0.8m (below or equal 1 GHz) and/or 1.5m (above 1 GHz) height of turn table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- b. The height of antenna 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.
- c. Perform a field strength measurement and record the worse rad value, is the filed strength value via a spectrum reading obtained corrected for antenna factor, cable loss and pre-amplifier factor and then mathematically convert the measured field strength level to EIRP/ERP level.
- d. Following C63.26 section 5.5 and 5.2.7
$$\text{EIRP (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20\log(D) - 104.8;$$
 where D is measurement distance (in the far field region) in m.
$$\text{ERP (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20\log(D) - 104.8 - 2.15;$$
 where D is measurement distance (in the far field region) in m.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.
2. Testing was carried out within frequency range 30 MHz to the tenth harmonic.
3. All modes of operation were investigated and the worst-case emissions are reported.
4. The Radiated Emissions testing was performed in the X(E1), Y(H) and Z(E2)w axis orientation. The worst-case Axis orientation is recorded in this test report.

Test Results

Please refer to Appendix A.

Appendix A: Test Results of Radiated Spurious Emissions

Worst Mode 30MHz ~ 1000MHz

eMTC Band 2												
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor	Cable Factor	Pre- Amplifier	Correction Factor (dB/m)	Polarization (H/V)
Mid	89	-63.6	-13	-50.6	200	290	44.07	14	0.65	27.06	-107.67	H
	304	-67.91	-13	-54.91	100	199	32.9	20.08	1.27	26.9	-100.81	H
	517	-66.65	-13	-53.65	300	72	29.96	24.52	1.72	27.59	-96.61	H
	709	-62.27	-13	-49.27	200	16	30.72	27.6	2.07	27.4	-92.99	H
	845	-59.58	-13	-46.58	100	244	31.57	29.08	2.29	27.26	-91.15	H
	963	-60.26	-13	-47.26	300	282	29.45	30.23	2.47	27.15	-89.71	H
	87	-61.67	-13	-48.67	244	360	46	14	0.65	27.06	-107.67	V
	170	-64.83	-13	-51.83	100	189	35.98	20.08	1.27	26.9	-100.81	V
	372	-64.16	-13	-51.16	100	132	32.45	24.52	1.72	27.59	-96.61	V
	606	-62.03	-13	-49.03	100	86	30.96	27.6	2.07	27.4	-92.99	V
	750	-61.23	-13	-48.23	300	353	29.92	29.08	2.29	27.26	-91.15	V
	924	-59.8	-13	-46.8	300	117	29.91	30.23	2.47	27.15	-89.71	V

Remarks:

- EIRP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre Amp(dB) + 20log(D) – 104.8
- Margin value = EIRP – Limit
- The other EIRP levels were very low against the limit.

1GHz ~ 20GHz

eMTC Band 2												
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor	Cable Factor	Pre- Amplifier	Correction Factor (dB/m)	Polarization (H/V)
Low	3702	-44.07	-13	-31.07	200	158	61.17	33.51	7.68	51.17	-105.24	H
	5553	-44.42	-13	-31.42	100	114	57.88	35.19	9.49	51.72	-102.3	H
	7406	-47.59	-13	-34.59	300	305	53.08	36	11.02	52.43	-100.67	H
	3702	-45.65	-13	-32.65	144	360	59.59	33.51	7.68	51.17	-105.24	V
	5553	-47.54	-13	-34.54	300	351	54.76	35.19	9.49	51.72	-102.3	V
	7406	-52.68	-13	-39.68	300	246	47.99	36	11.02	52.43	-100.67	V
Mid	3759	-40.87	-13	-27.87	300	165	64.14	33.68	7.74	51.17	-105.01	H
	5639	-44.36	-13	-31.36	10	251	58.11	35	9.57	51.78	-102.47	H
	7519	-48.19	-13	-35.19	200	157	52.27	36.14	11.11	52.45	-100.46	H
	3759	-36.01	-13	-23.01	100	304	69	33.68	7.74	51.17	-105.01	V
	5639	-46.75	-13	-33.75	300	1	55.72	35	9.57	51.78	-102.47	V
	7519	-48.71	-13	-35.71	300	162	51.75	36.14	11.11	52.45	-100.46	V
High	3815	-42.86	-13	-29.86	200	179	62.15	33.63	7.8	51.18	-105.01	H
	5724	-43.94	-13	-30.94	100	294	58.37	35.14	9.65	51.84	-102.31	H
	7633	-48.93	-13	-35.93	100	311	51.38	36.27	11.2	52.52	-100.31	H
	3815	-40.82	-13	-27.82	100	288	64.19	33.63	7.8	51.18	-105.01	V
	5724	-44.34	-13	-31.34	300	27	57.97	35.14	9.65	51.84	-102.31	V
	7633	-49.94	-13	-36.94	200	135	50.37	36.27	11.2	52.52	-100.31	V

Remarks:

1. $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre\ Amp(dB) + 20\log(D) - 104.8$
3. $Margin\ value = EIRP - Limit$
4. The other EIRP levels were very low against the limit.