

Test report

REP018182-3TRFWL

Date of issue: March 27, 2024

Applicant:

SOLiD

Product description:

Distributed Antenna System (DAS)

Model:

MRDU_ 1900P_E

Product marketing name(s):

MRDU-1900P

FCC ID:

W6UHM1900PE

9354A-HM1900PE

ISED certification number:

Specifications:

- FCC 47 CFR Part 24 Personal Communication Services
- RSS 131 Issue 4 Zone Enhancers
- RSS 133 Issue 6 Amendment 1 2 GHz Personal Communications Services

WL_FCC Signal Boosters.dotm, Version V1.0





Lab and test locations

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ISED Test Site	2040B	
Tested by	Lan Sayasane, EMC Test Engineer	
Reviewed by	James Cunningham, EMC/WL Manager	
Review date	July 17, 2024	
Reviewer signature	re 981	

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko USA's ISO/IEC 17025 accreditation.

This report must not be used by the client to claim product certification, approval, or endorsement by ANAB, NIST, or any agency of the U.S. Government.

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Table of Contents

Table of C	Table of Contents		
Section 1	Report summary	. 4	
1.1	Test specifications	.4	
1.2	Test methods	.4	
1.3	Exclusions	. 4	
1.4	Statement of compliance	. 4	
1.5	Test report revision history	. 4	
Section 2	Summary of test results	. 5	
2.1	Sample information	. 5	
2.2	Testing period	. 5	
2.3	Test results	. 5	
Section 3	Equipment under test (EUT) details	. 6	
3.1	Disclaimer	. 6	
3.2	Applicant	. 6	
3.3	Manufacturer	. 6	
3.4	EUT information	. 6	
3.5	Transmitter Information	.7	
3.6	EUT setup details	.7	
Section 4	Engineering considerations	. 9	
4.1	Modifications incorporated in the EUT	. 9	
4.2	Technical judgement	. 9	
4.3	Deviations from laboratory test procedures	. 9	
Section 5	Test conditions	10	
5.1	Atmospheric conditions	10	
5.2	Power supply range	10	
Section 6	Measurement uncertainty	11	
6.1	Uncertainty of measurement	11	
Section 7	Test equipment	12	
7.1	Test equipment list	12	
7.2	Test software list	12	
Section 8	Testing data	13	
8.1	AGC Threshold	13	
8.2	Out of band rejection	14	
8.3	Occupied bandwidth / Input Versus Output Comparison	16	
8.4	Output power / Mean output power and amplifier gain	19	
8.5	Spurious emissions at RF connector	22	
8.6	Radiated spurious emissions	34	



Section 1 Report summary

1.1 Test specifications

FCC 47 CFR Part 24	Personal Communication Services
RSS-131 Issue 4	Zone Enhancers
RSS-133 Issue 6, Amendment 1	2 GHz Personal Communications Services

1.2 Test methods

ANSI C63.26 – 2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Services; Section 7 – RF Repeaters, amplifiers, and boosters testing
FCC KDB 935210 D05 v01r04	Measurements Guidance for Industrial, and Non-Consumer Signal Booster, Repeater, and Amplifier Devices

1.3 Exclusions

None.

1.4 Statement of compliance

Testing was performed against all relevant requirements of the test standard(s).

Results obtained indicate that the product under test complies in full with the tested requirements.

The test results relate only to the item(s) tested.

See "Section 2 Summary of test results" for full details.

1.5 Test report revision history

Table 1.5-1: Test report revision history

Revision #	Issue Date	Details of changes made to test report
REP018182-3TRFEMC	July 17, 2024	Original report issued



Section 2 Summary of test results

2.1 Sample information

Receipt date	26-Oct-23
Nemko sample ID number	REP018182

2.2 Testing period

Test start date	26-Oct-23
Test end date	05-Dec-23

2.3 Test results

Table 2.3-1: Summary of results				
FCC Part	ISED Part	Test method	Test description	Verdict
		KDB 935210 D05V01r04 (3.2) ANSI C63.26 7.2.2.1	AGC threshold	Pass
	RSS-131 Clause 9.1	KDB 935210 D05v01r04 (3.3) ANSI C63.26 7.2.2.2	Out of band rejection	Pass
FCC Part 2.1049	RSS-131 Clause 9.2	KDB 935210 D05v01r05 (3.4) ANSI C63.26 7.2.2.3	Occupied bandwidth / Input-versus-output spectrum	Pass
FCC Part 24.232 (band 25 operation)	RSS-131 Clause 9.3	KDB 935210 D05v01r05 (3.5) ANSI C63.26 7.2.2.4	Input/output power and amplifier/booster gain	Pass
FCC Part 24.238 (band 25 operation)	RSS-133 Clause 6.5.1 (band 25 operation)	KDB 935210 D05v01r05 (3.6) ANSI C63.26 7.2.2.5	Spurious emissions at RF antenna connector	Pass
FCC Part 24.235 (band 25 operation)	RSS-131 Clause 9.4	KDB 935210 D05v01r05 (3.7) ANSI C63.26 7.2.2.6	Frequency stability	Not applicable ¹
FCC Part 24.238 (band 25 operation)	RSS-133 Clause 6.5.1 (band 25 operation)	KDB 935210 D05v01r05 (3.8) ANSI C63.26 7.2.2.7	Radiated spurious emissions	Pass

Notes: ¹ Per ANSI C63.26-2015 clause 7.2.2.6 and KDB 935210 Clause 3.7, frequency stability testing is not required if the EUT does not process the input signal in a manner that can influence the output signal frequency/frequencies.



Section 3 Equipment under test (EUT) details

3.1 Disclaimer

This section contains information provided by the applicant and has been utilized to support the test plan. Inaccurate information provided by the applicant can affect the validity of the results within this test report. Nemko accepts no responsibility for the information contained within this section and the impact it may have on the test plan and resulting measurements.

3.2 Applicant

Company name	SOLID
Address	800 Klein Road, Suite 200
City	Plano
State	ТХ
Postal/Zip code	75074
Country	USA

3.3 Manufacturer

Company name	SOLiD
Address	800 Klein Road, Suite 200
City	Plano
State	тх
Postal/Zip code	75074
Country	USA

3.4 EUT information

Product name	Distributed Antenna System (DAS)		
Model	MRDU_1900P_E		
Variant(s)	None		
Serial number	N/A		
Part number	N/A		
Power requirements	Input: 120Vac, 50/60Hz		
Description/theory of operation	Distributed Antenna System (DAS) that efficiently delivers wireless RF signals into any indoor or outdoor location		
	difficult to cover with traditional macro networks.		
Operational frequencies	Band 25: 1930 – 1995 MHz DL / 1850 – 1915 MHz UL		
Software details	Alliance Rel6.0 Management Version 18.0.7		
Type of signal booster	FCC:		
	Consumer Signal Booster		
	Provider-Specific Consumer Signal Booster		
	🖾 Industrial Signal Booster		
	ISED:		
	Consumer Zone Enhancer		
	Fixed Consumer Zone Enhancer		
	🖾 Industrial Zone Enhancer		
	Mobile Consumer Zone Enhancer		
	Provider-Specific Consumer Zone Enhancer		



3.5 Transmitter Information

Frequency band(s)	Band 25: 1930 – 1995 MHz DL / 1850 – 1915 MHz UL
Antenna information	1 antenna port. Antenna details None
Nominal gain (*)	Nominal gain 57 dB
Gain-versus-frequency response (*)	Gain is nominally flat across the frequency bands. See out-of-band rejection data in section 8.2 for verification.
Rated mean output power P _{rated} (*)	37 dBm (5 Watts)
Output signal coupling attenuation (*)	0 dB
Mobile Station Coupling Loss (*)	N/A (EUT is not a Wideband Consumer Zone Enhancer)
Base Station Coupling Loss (*)	N/A (EUT is not a Provider-Specific Consumer Zone Enhancer)
Input port impedance	50 ohms (note - input port(s) are situated on the iBIU system interface unit, connected via fiber to EUT
Output port impedance	50 ohms

(*) Information required per RSS-131

3.6 EUT setup details

Table 3.6-1: EUT sub assemblies				
Description	Brand name	Model/Part number	Serial number	Rev.
MRDU_1900P_E	SOLiD	1900P_E	N/A	
	Table 3.6-2	: EUT interface ports		
Description				Qty.
Power In				1
Power Out (Not Used)				1
ANT1				1
ANT2 (Not Used)				1
Tx (Not Used)				1
Rx (Not Used)				1
I/O (Not Used)				1
Fan (Not Used)				1
Optic				1
	Table 3.6-3	: Support equipment		
Description	Brand name	Model/Part number	Serial number	Rev.
iBIU System Interface	SOLID	iBIU_AC	65100122800159	
Laptop	DELL	Latitude 5480	6KP16H2	

Table 3.6-4: Inter-connection cables

Cable description	From	То	Length (m)
Fiber Optic	Distributed Antenna Systems	iBIU System Interface	10
Serial to USB	iBIU System Interface	Laptop	2





Figure 3.6-1: Test setup diagram



Section 4 Engineering considerations

4.1 Modifications incorporated in the EUT

None.

4.2 Technical judgement

None.

4.3 Deviations from laboratory test procedures

None.



Section 5 Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	86–106 kPa

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.



Section 6 Measurement uncertainty

6.1 Uncertainty of measurement

Nemko USA Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 "Uncertainty in EMC measurements." Measurement uncertainty was calculated using the methods described in CISPR 16-4-2 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics, and limit modelling – Measurement instrumentation uncertainty. The expression of Uncertainty in EMC testing. Measurement uncertainty calculations assume a coverage factor of K=2 with 95% certainty.

Table 6.1-1: Measurement uncertainty calculations

Measurement		U _{cispr} dB	U _{lab} dB
Conducted disturbance at AC mains and other port power using a V-AMN	9 kHz to 150 kHz	3.8	2.9
	150 kHz to 30 MHz	3.4	2.3
Conducted disturbance at telecommunication port using AAN	150 kHz to 30 MHz	5.0	4.3
Conducted disturbance at telecommunication port using CVP	150 kHz to 30 MHz	3.9	2.9
Conducted disturbance at telecommunication port using CP	150 kHz to 30 MHz	2.9	1.4
Conducted disturbance at telecommunication port using CP and CVP	150 kHz to 30 MHz	4.0	3.1
Radiated disturbance (electric field strength in a SAC)	30 MHz to 1 GHz	6.3	5.5
Radiated disturbance (electric field strength in a FAR)	1 GHz to 6 GHz	5.2	4.7
Radiated disturbance (electric field strength in a FAR)	6 GHz to 18 GHz	5.5	5.0

Notes: Compliance assessment:

If U_{lab} is less than or equal to U_{cispr} then:

- compliance is deemed to occur is no measured disturbance level exceeds the disturbance limit.
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit

If U_{lab} is greater than U_{cispr} then:

- compliance is deemed to occur is no measured disturbance level, increased by (U_{lab} U_{cispr}), exceeds the disturbance limit.
- non-compliance is deemed to occur if any measured disturbance level, increased by (U_{lab} U_{cispr}), exceeds the disturbance limit
- V-AMN: V type artificial mains network
- AAN: Asymmetric artificial network
- CP: Current probe
- CVP: Capacitive voltage probe
- SAC: Semi-anechoic chamber
- FAR: Fully anechoic room



Section 7 Test equipment

7.1 Test equipment list

Table 7.1-1: Test Equipment List

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	E1120	2 years	14-Dec-2025
Vector Signal Generator	Rohde & Schwarz	SMW200A	E1156	3 years	10-May-2024
Power Sensor	ETS-Lindgren	7002-006	EW110	1 year	14-Apr-2024
EMI Test Receiver	Rohde & Schwarz	ESU 40	E1121	1 year	23-Aug-2024
System Controller	Sunol Sciences	SC104V	E1191	NCR	NCR
Antenna, Bilog	Schaffner-Chase	CBL6111C	1480	1 year	21-Feb-2024
Antenna, DRG Horn	ETS-Lindgren	3117-PA	E1160	1 year	13-Feb-2024
Antenna, Horn (18-26.5 GHz)	Eravant	SAZ-2410-42-S1	EW107	1 year	05-Dec-2024
Antenna, Horn (26.5-40 GHz)	Eravant	SAZ-2410-2-S1	EW108	1 year	05-Dec-2024
Termination, 50 ohms	Diamond Antenna	DC-500MHz	N/A	NCR	NCR
Attenuator, 30dB	Pasternack	PE7388-30	E1325	VBU	VBU

Notes: NCR: no calibration required VBU: verify before use

.

7.2 Test software list

Table 7.2-1: Test Software

Manufacturer	Details
Rohde & Schwarz	EMC 32 V10.60.10 (AC conducted emissions)
Rohde & Schwarz	EMC 32 V10.60.15 (radiated emissions)



Section 8 Testing data

8.1 AGC Threshold

8.1.1 References and limits

- ANSI C63.26 Section 7.2.2.1

- KDB 935210 D05v01r04 Clause 3.2

8.1.2 Test summary

Verdict	Pass		
Test date	November 15, 2023	Temperature	21 °C
Test engineer	Lan Sayasane, EMC Test Engineer	Air pressure	1006 mbar
Test location	 10m semi anechoic chamber 3m semi anechoic chamber Wireless bench Other: 	Relative humidity	51 %

8.1.3 Notes

Per KDB 935210 D05 v01r04, Clause 3.1 and ANSI C63.26 Clause 7.2.2.1, testing was performed with a narrowband test signal (MSK modulated, gaussian filter of 0.3 and data rate 270 kbps) and a broadband signal (AWGN, 4.1 MHz 99% occupied bandwidth).

8.1.4 Setup details

EUT power input during test	120 VAC / 60 Hz
EUT setup configuration	🖂 Table-top
	Floor standing
	Other:
Measurement details	The automatic gain control (AGC) threshold is determined as follows:
	a) Connect a signal generator to the input of the EUT.
	b) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation.
	c) The signal generator must be set to either of the required modulation signals.
	d) Set the frequency to the middle frequency of the EUT operating band.
	e) While monitoring the output of the EUT using the method of ANSI C63.26 7.2.2.4.2 or 7.2.2.4.3, increase
	the input level until a 1 dB increase in the input signal no longer causes a 1 dB increase in the output
	signal.
	f) This is the AGC threshold level of the EUT.
	g) Repeat for the other modulation signal.

8.1.5 Test data

Table 8.1-1: AGC Threshold results

Operating frequency band	Input signal type	AGC Threshold Level (dBm)
Band 25: 1930 – 1995 MHz	Narrowband	-20.0
	Broadband	-18.0



8.2 Out of band rejection

8.2.1 References and limits

- ANSI C63.26 Section 7.2.2.2

- KDB 935210 D05v01r04 Clause 3.3

- RSS-131 Clause 9.1

8.2.2 Test summary

Verdict	Pass		
Test date	October 26, 2023	Temperature	20 °C
Test engineer	Lan Sayasane, EMC Test Engineer	Air pressure	1010 mbar
Test location	 10m semi anechoic chamber 3m semi anechoic chamber Wireless bench Other: 	Relative humidity	55 %

8.2.3 Notes

None

8.2.4 Setup details

EUT power input during test	120 VAC / 60 Hz
EUT setup configuration	⊠ Table-top
	□ Floor standing
	Other:
Measurement details	The out-of-band rejection is measured as follows:
	a. Connect a signal generator to the input of the EUT.
	b. Configure a swept CW signal with the following parameters:
	 Frequency range = ± 250 % of the passband from the center of the passband, for each applicable operating frequency band.
	2) Level = a sufficient level to affirm that the out-of-band rejection is > 20 dB above the noise floor
	and will not engage the AGC during the entire sweep.
	3) Dwell time = approximately 10 ms.
	4) Number of points = SPAN/(RBW/2).
	c. Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
	d. Set the span of the spectrum analyzer to the same frequency range of the signal generator.
	e. Set the RBW of the spectrum analyzer to be 1% to 5% of the EUT passband and the VBW shall be set to
	≥ 3 x RBW.
	f. Set the detector to Peak Max-Hold and wait for the spectrum analyzer's display to fill.
	g. Capture the frequency response of the EUT.
	h. Please a marker to the peak of the frequency response and record this frequency as f_0 .
	i. Place two markers, one at the lowest and the other at the highest frequency of the envelope of the
	spectral display such that each marker is at or slightly below the -20 dB down amplitude to determine
	the 20 dB bandwidth.
	j. Repeat for all frequency bands applicable for use by the EUT.



8.2.5 Test data

8.2.5.1 Operating frequency band: Band 25 and Band 70: 1930 – 2020 MHz

Note: Since Band 25 and Band 70 are adjacent to each other, a single measurement was performed across both bands.

Table 8.2-1: Out of band rejection results, Band 25_Band 70

Parameter	Value
f ₀	1937.880
fı	1925.310
f _h	2024.690
20 dB bandwidth	99.380

Spectrum						
Ref Level 2	20.00 dBn	n Offset 20.00 dB 🥃	RBW 1 MHz			
Att	20 dE	3 SWT 1 ms 🥃	VBW 3 MHz	Mode Sweep		
Count 200/2	200	TDF				
Controlled by	NemkoW	TT O1Pk View				
				M3[1]		-13.58 dBr
10 dBm						2.024690 GH
10 00.00				M1[1]		5.10 dBr
					<u> </u>	1.937880 GH
					<u>}</u>	
-10 dBm-+		M2			¥.	
-20 dBm						
-30 dBm						
-40 dBm	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	minin			humas	menne
-50 dBm						
-60 dBm						
-70 dBm						
CF 1.975 G	Ηz		451 pt	s		Span 270.0 MHz
larker						
Type Ref	Trc	X-value	Y-value	Function	Fi	unction Result
M1	1	1.93788 GHz	5.10 dBm			
M2	1	1.92531 GHz	-16.54 dBm			
M3	1	2.02469 GHz	-13.58 dBm			

Figure 8.2-1: Out of band rejection results, Band 25_Band 70



8.3 Occupied bandwidth / Input Versus Output Comparison

8.3.1 References and limits

- FCC 47 CFR Part 2.1049

- ANSI C63.26 Clause 7.2.2.4
- KDB 935210 D05v01r04 Clause 3.4
- RSS-131 Clause 9.2

8.3.2 Test summary

Verdict	Pass		
Test date	November 15, 2023	Temperature	21 °C
Test engineer	Lan Sayasane, EMC Test Engineer	Air pressure	1006 mbar
Test location	 10m semi anechoic chamber 3m semi anechoic chamber Wireless bench Other: 	Relative humidity	51 %

8.3.3 Notes

Per KDB 935210 D05 v01r04, Clause 3.3 and ANSI C63.26 Clause 7.2.2.3, testing was performed with a narrowband test signal (MSK modulated, gaussian filter of 0.3 and data rate 270 kbps) and a broadband signal (AWGN, 4.1 MHz 99% occupied bandwidth).

8.3.4 Setup details

EUT power input during test	120 VAC / 60 Hz
EUT setup configuration	🖾 Table-top
	Floor standing
	□ Other:
Measurement details	A 26 dB bandwidth measurement shall be performed on the input and the output signal.
	a. Connect a signal generator to the EUT.
	b. Configure the signal generator to transmit the AWGN signal.
	c. Configure the signal level to be just below the AGC threshold, but not more than 015 dB below.
	d. Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
	e. Set the spectrum analyzer center frequency to the nominal EUT channel center frequency. The span
	range of the spectrum analyzer shall be between 2 x OBW and 5 x OBW.
	f. The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW and the VBW shall be ≥ 3 x RBW.
	g. Set the reference level of the instrument as required, to prevent the signal from exceeding the
	maximum spectrum analyzer input mixer level for linear operation. In general, the peak of the spectral
	envelope must be more than [10 log (OBW / RBW)] below the reference level. Step f) and step g) can
	require iteration to enable adjustments within the specified tolerances.
	h. The noise floor of the spectrum analyzer at the selected RBW shall be at least 36 dB below the reference
	level.
	i. Set spectrum analyzer detection mode to peak, and the trace mode to max hold.
	j. Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize.
	Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference level).
	k. Determine the -26 dB down amplitude by placing two markers, one at the lowest and the other at the
	highest frequency of the envelope of the spectral display such that each marker is at or slightly below
	the-26 dB down amplitude. If a marker is below the -26 dB down value, it should be as close as possible
	to this value. The OBW is the positive frequency difference between the two markers.
	Repeat step 3) to step k) to measure the input signal to the FIIT (i.e., signal generator output). Compare
	the 26 dB handwidths to affirm they are similar
	m Reneat step e) to step I) with the input signal to the FLIT set to 3 dB above the AGC threshold
	n Repeat step e) to step m) with the signal generator set to the narrowhand signal
	 Repeat step a) to step inf with the signal generator set to the narrowband signal. Repeat step a) to step inf with the signal bands used by the FUT
	o. Nepeat step of to step in for all ballus used by the EOT.



8.3.5 Test data

8.3.5.1 Operating frequency band: Band 25: 1930 – 1995 MHz

Condition	Test Frequency (MHz)	26 dB Bandwidth (Input Signal) (MHz)	26 dB Bandwidth (Output Signal) (MHz)
Input Level = AGC Threshold0.5 dB Input signal = narrowband	1962.5	0.3084	0.3084
Input Level = AGC Threshold + 3 dB Input signal = narrowband	1962.5	0.3084	0.3084
Input Level = AGC Threshold0.5 dB Input signal = broadband	1962.5	4.6667	4.6667
Input Level = AGC Threshold + 3 dB Input signal = broadband	1962.5	4.6667	4.6667





Occupied bandwidth (26 dB), TX 1962.5 MHz, BW: 0.2MHz, MOD:

Figure 8.3-1: Occupied bandwidth / Input Versus Output Comparison results, narrowband signal, 0.5 dB below AGC threshold, input and output signal respectively





Occupied bandwidth (26 dB), TX 1962.5 MHz, BW: 0.2MHz, MOD: GSM



Section 8 Testing data Test name Occupied bandwidth / Input Versus Output Comparison







CDMA

Figure 8.3-3: Occupied bandwidth / Input Versus Output Comparison results, broadband signal, 0.5 dB below AGC threshold, input and output signal respectively





CDMA

Occupied bandwidth (26 dB), TX 1962.5 MHz, BW: 5MHz, MOD: W CDMA





8.4 Output power / Mean output power and amplifier gain

8.4.1 References and limits

- FCC Part 24.232 & RSS-133 (band 25 operation)
- ANSI C63.26 Clause 7.2.2.4
- KDB 935210 D05v01r05 Clause 3.5

8.4.2 Test summary

Verdict	Pass		
Test date	November 15, 2023	Temperature	21 °C
Test engineer	Lan Sayasane, EMC Test Engineer	Air pressure	1006 mbar
Test location	 10m semi anechoic chamber 3m semi anechoic chamber Wireless bench Other: 	Relative humidity	51 %

8.4.3 Notes

Per KDB 935210 D05 v01r04, Clause 3.4 and ANSI C63.26 Clause 7.2.2.4, testing was performed with a narrowband test signal (MSK modulated, gaussian filter of 0.3 and data rate 270 kbps) and a broadband signal (AWGN, 4.1 MHz 99% occupied bandwidth).

8.4.4 Setup details

EUT power input during test	120 VAC / 60 Hz			
EUT setup configuration	🖾 Table-top			
	Floor standing			
	Other:			
Measurement details	Adjust the internal gain control of the EUT to the maximum gain for which the equipment certification is sought.			
	Any EUT attenuation settings shall be set to their minimum value.			
	a. Connect a signal generator to the input of the EUT.			
	b. The modulation shall be set to the AWGN signal.			
	c. The frequency of the signal generator shall be set to the frequency f ₀ as determined during the out-of-			
	band rejection measurement.			
	d. Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation,			
	e. Set the level of the signal generator to a level that produces an output just below the AGC threshold,			
	but not more than 0I5 dB below.			
	f. Measure the output power of the EUT.			
	g. Remove the EUT from the measurement set-up. Using the same signal generator settings, repeat the			
	power measurement on the input signal to the EUT (i.e., the signal generator output). Calculate the			
	amplifier gain as follows:			
	Gain (dB) = output (dBm) – input (dBm).			
	h. Repeat step f) and g) with the input level set to a level that is 3 dB above the AGC threshold.			
	i Repeat step a) to step h) with the input signal set to narrowhand modulation			
	i Pencat top of to stop i) for all back used by the EUT			



8.4.5 Test data

8.4.5.1 Operating frequency band: Band 25: 1930 – 1995 MHz

Table 8.4-1: Output power / Mean output power and amplifier gain test data

Condition	Test frequency (MHz)	Input power (dBm / MHz)	Output power (dBm/MHz)	Amplifier gain (dB)	0.1 % PAPR (dB)
Input Level = AGC Threshold0.5 dB Input signal = narrowband	1937.88	-20.78	34.88	55.66	0.43
Input Level = AGC Threshold + 3 dB Input signal = narrowband	1937.88	-17.28	35.85	53.13	0.38
Input Level = AGC Threshold0.5 dB Input signal = broadband	1937.88	-20.62	34.97	55.59	4.52
Input Level = AGC Threshold + 3 dB Input signal = broadband	1937.88	-17.09	35.04	52.13	4.78





Peak power, TX: 1937.88 MHz, BW: 0.2MHz, MOD: GSM





Peak power, TX: 1937.88 MHz, BW: 0.2MHz, MOD: GSM

Figure 8.4-2: Output power / Mean output power and amplifier gain results, narrowband signal, 3 dB above AGC threshold, input and output signal respectively

Peak power, TX: 1937.88 MHz, BW: 0.2MHz, MOD: GSM





20.00 dB



Peak power, TX: 1937.88 MHz, BW: 5MHz, MOD: WCDMA

Peak power, TX: 1937.88 MHz, BW: 5MHz, MOD: WCDMA



Figure 8.4-3: Output power / Mean output power and amplifier gain results, broadband signal, 0.5 dB below AGC threshold, input and output signal respectively

Peak power, TX: 1937.88 MHz, BW: 5MHz, MOD: WCDMA

Peak power, TX: 1937.88 MHz, BW: 5MHz, MOD: WCDMA

Figure 8.4-4: Output power / Mean output power and amplifier gain results, broadband signal, 3 dB above AGC threshold, input and output signal respectively



8.5 Spurious emissions at RF connector

8.5.1 References and limits

- FCC Part 24.238 & RSS-133 (band 25 operation)
- ANSI C63.26 Clause 7.2.2.5
- KDB 935210 D05v01r05 Clause 3.6

8.5.2 Test summary

Verdict	Pass		
Test date	November 15, 2023	Temperature	21 °C
Test engineer	Lan Sayasane, EMC Test Engineer	Air pressure	1006 mbar
Test location	 10m semi anechoic chamber 3m semi anechoic chamber Wireless bench Other: 	Relative humidity	51 %

8.5.3 Notes

Per KDB 935210 D05 v01r04, Clause 3.4 and ANSI C63.26 Clause 7.2.2.4, testing was performed with a narrowband test signal (MSK modulated, gaussian filter of 0.3 and data rate 270 kbps) and a broadband signal (AWGN, 4.1 MHz 99% occupied bandwidth).

For intermodulation products and out-of-channel block tests, testing is performed under the following two conditions (per ANSI C63.26 7.2.2.5.1 and KDB 935210 D05v01r04 Section 3.6):

- a) Two modulated signals set to the lower or upper block edge.
- b) A single modulated signal set to the low or high channel

8.5.4 Setup details

120 VAC / 60 Hz
⊠ Table-top
Floor standing
Other:
Out-of-channel-block and out-of-band emissions:
a. Connect a signal generator to the input of the EUT. If the signal generator is not capable of generating
two modulated carriers at one time, then it may be replaced by two signal generators connected with
an appropriate combining network
b. Set the signal generator to produce 2 AWGN signals.
c. The frequencies shall be set so that the AWGN signals occupy adjacent channels, as defined by industry
Standards Such as SGPP of SGPP2, at the upper block edge of the frequency band under test.
a. The composite power levels shall be set so that the signal is just below the AGC threshold, but not more than 0.5 dB below. The composite power set is a recovered using the work of a departition in the output of the set of th
than 0.5 dB below. The composite power can be measured using the methods described in the output
power methods, nowever, it will be necessary to measure the composite power by increasing the band
power integration bandwidth to include both transmit channels, or alternatively, this measurement can
be performed using an average power meter.
e. Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
f. Set the RBW= reference bandwidth in the applicable rule section for the supported frequency band
(typically 1% of the EBW or 100 kHz or 1 MHz).
g. Set the VBW = 3 x RBW.
h. Set the detector to power averaging (rms) detector.
i. Set the sweep time = auto couple.
j. Set the spectrum analyzer start frequency to the upper block edge frequency and the stop frequency to
the upper block edge frequency plus 300 kHz or 3 MHz for frequencies below and above 1 GHz, respectively.
k. Trace average at least one hundred traces in power averaging (i.e., rms) mode.
I. Use the marker function to find the maximum power level.
m. Capture the spectrum analyzer trace of the power level for inclusion in the test report.
n. Repeat step k) and step m) with the input level set to 3 dB above the AGC threshold.
o. Set the frequencies of the input signals to the lower block edge of the frequency band under test.

Report reference ID: REP018182-3TRFEMC



- p. Reset the analyzer start frequency to the lower block edge frequency minus 300 kHz or 3 MHz for frequencies below and above 1 GHZ, respectively, and the stop frequency to the lower block edge frequency.
- q. Repeat step k) to step n).
- r. Repeat step a) to step q) with the signal generator set to only a single signal closest to the block edges.
- s. Repeat step a) to step r) with the narrowband signal.
- t. Repeat step a) to step s) for all bands used by the EUT.

Conducted spurious:

- a. Connect a signal generator to the input of the EUT.
- b. Set the signal generator to produce the AWGN signal.
- c. Set the frequency of the signal to the lowest channel within the frequency block.
- d. The power levels shall be set so that the signal is just below the AGC threshold, but not more than 0.5 dB below.
- e. Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
- f. Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band (typically 100 kHz or 1 MHz).
- g. Set the VBW = 3 x RBW.
- h. Set the sweep time = auto-couple.
- i. Set the spectrum analyzer start frequency to the lowest RF signal generated in the equipment, without going below 9 kHz, and the stop frequency to the lower band/block edge frequency minus 100 kHz to 1 MHz, as specified in the applicable rule part. The number of measurement points in each sweep must be ≥ (2 x span/RBW), which may require that the measurement range defined by the start and stop frequencies be subdivided depending on the available number of measurement points provided by the spectrum analyzer.
- j. Trace average at least ten traces in power averaging (i.e., rms) mode.
- k. Use the peak marker function to identify the highest amplitude level over each of measured frequency range. Record the frequency and amplitude and capture a plot for inclusion in the test report.
- I. Reset the spectrum analyzer start frequency to the upper band/block edge frequency plus 100 kHz or 1 MHz, as specified in the applicable rule part, and the spectrum analyzer stop frequency to ten times the highest frequency of the fundamental emission. The number of measurement points in each sweep must be ≥ (2 x span/RBW), which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.
- m. Trace average at least ten traces in power averaging (i.e., rms) mode.
- N. Use the peak marker function to identify the highest amplitude level over each of the measured frequency ranges. Record the frequency and amplitude and capture a plot for inclusion in the test report; also provide tabular data, if required.
- o. Repeat step i) to step n) with the input signal firstly set to a middle channel frequency and then tuned to a high channel frequency.
- p. Repeat step c) to step o) with the narrowband signal.
- q. Repeat step b) to step p) for all bands used by the EUT



8.5.5 Test data – out-of-channel block and out-of-band emissions

8.5.5.1 Operating frequency band: Band 25: 1930-1995 MHz

Table 8.5-1: Spurious emissions at RF connector test data, narrowband

Condition	Frequency of highest emission (MHz)	Level (dBm)	Limit (dBm)
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband Number of signals: 2 Low band edge	1929.986	-17.12	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband Number of signals: 1 Low band edge	1929.989	-15.96	-13.00
Input Level = AGC Threshold +3 dB Input signal = narrowband Number of signals: 2 Low band edge	1929.971	-16.85	-13.00
Input Level = AGC Threshold + 3 dB Input signal = narrowband Number of signals: 1 Low band edge	1929.992	-16.06	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband Number of signals: 2 High band edge	1995.010	-17.10	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband Number of signals: 1 High band edge	1995.013	-14.84	-13.00
Input Level = AGC Threshold +3 dB Input signal = narrowband Number of signals: 2 High band edge	1995.010	-15.19	-13.00
Input Level = AGC Threshold + 3 dB Input signal = narrowband Number of signals: 1 High band edge	1995.016	-14.73	-13.00





Section 8 Test name

Testing data Spurious emissions at RF connector



•

SGL Count 200



a dan 1.93 GHz 1001 pts 300.0 kHz/ Frequency 1.929 99 GHz Power Ab -16.06 dB 1.930 GH High band edge, 1 signal, level = AGC Threshold - 0.5 -MultiView Spectrum Ref Level 30.98 dBm Offset 30.00 dB SGL Count 200/200 Mode Auto FFT 1001 pts 300.0 kHz/ 1.998 GHz RBW 5.000 kH Frequency 1,99501 GHz Power Ab -14.84 dB 1.84 dB Low hand edge, 1 signal, level = AGC Threshold + 3 MultiView Spectrum
Ref Level 30.98 dBm Offset 30.00 dB • Mode Auto FFT 1001 pts 800.0 kHz/ 1.998 GHz Frequency 1.995 02 GHz Power Abs -14.73 dBm .73 dB 1.998 GHz



Table 8.5-2: Spurious emissions at RF connector test data, broadband

Condition	Frequency of highest emission (MHz)	Level (dBm)	Limit (dBm)
Input Level = AGC Threshold - 0.5 dB Input signal = broadband Number of signals: 2 Low band edge	1929.998	-31.46	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = broadband Number of signals: 1 Low band edge	1929.935	-31.89	-13.00
Input Level = AGC Threshold +3 dB Input signal = broadband Number of signals: 2 Low band edge	1929.998	-17.58	-13.00
Input Level = AGC Threshold + 3 dB Input signal = broadband Number of signals: 1 Low band edge	1929.998	-27.53	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = broadband Number of signals: 2 High band edge	1995.001	-29.80	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = broadband Number of signals: 1 High band edge	1995.001	-28.27	-13.00
Input Level = AGC Threshold +3 dB Input signal = broadband Number of signals: 2 High band edge	1995.001	-25.96	-13.00
Input Level = AGC Threshold + 3 dB Input signal = broadband Number of signals: 1 High band edge	1995.001	-25.87	-13.00

Low band edge, 2 signals, level = AGC Threshold - 0.5





Report reference ID: REP018182-3TRFEMC

Section 8 Test name

Testing data Spurious emissions at RF connector



IultiView Spectru	m				
f Level 27.86 dBm Offse	t 30.00 dB Mode /	uto FFT			SGL Count 200/200
purious Emissions					
Limit Check	NBS 002	PASS			
dBm					
dBm					
obiii					
1Bm					
dBm					
dlm					
) dBm					
	\sim	\sim			
dom					
0 dBm					
0 dBm					
995 GHz		1001 pts	300.0 kHz/		1.998 GHz
esult Summary					
Range Low	Range Up	RBW	Frequency 1 pps pp GHz	Power Abs	AUmit -16.80 dB
h band edge, 2 sign	hals, level = AGC 1	threshold + 3	1.555 00 GH2	- Ready	
sh band edge, 2 sign	hals, level = AGC 1	threshold + 3	1.555 60 GH2	- Ready	÷
th band edge, 2 sign ultiView = Spectru	1.336 GH2	threshold + 3	1.555 60 GH2	- Ready	÷
h band edge, 2 sign h band edge, 2 sign ultiView = Spectru ef Level 27.86 dBm Offse	1.996 GH2 hals, level = AGC 1 m t 30.00 dB Mode A	threshold + 3	1.99300 GH2	- Ready	SGL Count 200/200
1.995 GH2 	1396 GHZ mals, level = AGC 5 m t 30.00 dB Mode A	soudd this threahold + 3 uto FFT	1.39500 GH2	- Rody	SGL Count 200/200
t.995 GH2 	1396 GHZ mals, level = AGC 5 m t 30.00 dB Mode A	stateshold + 3 uto FFT	1.39500 GH2	- Ready	SGL Count 200/200
1395 GH2 ph band edge, 2 sign ultiView Spectru ourious Emissions Umit Check Line_SPUR OUS_LINE_J differ	1.350 GH2 mais, level = AGC 2 m t 30.00 dB Mode A AB5_002	SUDDENZ threshold + 3 uto FFT PASS PASS	1.39500 GH2	- Ready	SGL Count 200/200
1395 GH2 th band edge, 2 sign ultiView = Spectru of Level 27.86 dBm Office surious Emissions Ume_SPUIR Check Line_SPUIR Check Line_	1.550 GH2 hals, level = AGC 1 m t 30.00 dB Mode A ABS_002	SUDDENZ		- Ready	SGL Count 200/200
1395 GH2 th band edge, 2 sign utliView = Spectru of Level 27.86 dBm Offse surious Emissions Line_SPURIOUS_INE_J dBm	1.550 GH2 hals, level = AGC 1 m t 30.00 dB Mode / has_002	success		Ready	SGL Count 200/200
h band edge, 2 sign h band edge, 2 sign ultiView Spectru f Level 27.65 dim Office purious Emissions Limit Check Limit Check Limi	1.550 GHz sals, level = 3.60 1 m 1.0.00 d0 Mode A 1.0.00 d0 Mode A	NUMBER PASS		Rady	SGL Count 200/200
h band edge, 2 sign h band edge, 2 sign ultiView = Spectru view = Spectru ultiView = Spec	1.556 GM2	PASS PASS			SGL Count 200/200
h band edge, 2 sign h band edge, 2 sign uttivitew = Spectru spectru of Level 27.66 dbm Office Spectru Unit Cocki Unit C	1.556 GPZ	PASS PASS		Katy	564. Count 200/200
bys GH2 band edge, 2 sign th band edge, 2 sign util/liew = Spectru util/liew = Spectru the start 27.86 dbm Office util/liew = Start 27.86 dbm	1,555 GH2	PASS		tay	564 Count 200/200
h band edge, 2 sign h band edge, 2 sign utitView = Spectru ef Level 27.66 dbm Office punces Entasions Limit Check Limit Check Li	1,555 GH2	PASS PASS PASS		tay	Sea of a second
Joyo Lit Joyoo	1,596 GH2	PASS PASS PASS PASS PASS PASS		tay	SGL Count 200/200
byo dra byo dra byo dra byo dra byo dra constraints	1.596 GH2	PRS // / / / / / / / / / / / / / / / / /		tay	1000 00 00 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000
I be off I be	1,596 GH2	PASS PASS			SGL Court 200/200
byo dra b hand edge, 2 sign b, band edge, 2 sign constraints	1.596 GH2	PASS		tay	562. Count 200/200
I Joro Lit I Joro Lit I hand edge, 2 sig h hand edge, 2 sig b hand edge, 2 sig composition of the second sec	1396 GH2	PASS PASS			SGL COURT 200/200
I Joo Grit I Joo Grit I h band edge, 2 sign Spectrum View * Spectrum of Level 226 data I we Spectrum I we	1596 GH2 hals, lavel = A2C 1 m 1000 d0 Mode A N85.002	PASS PASS PASS PASS			S64. Count 269/200
I Jayo Life I Jayo Life I hand edge, 2 eige Constraints I hand edge, 2 eige Constraints I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state I have been a state of the second state of the second state I have been a state of the second state of the second state I have been a state of the second sta	1.596 GH2	PASS PASS PASS PASS PASS PASS PASS			SG. Count 200/230
I Job GH2 I Job	1596 GH2	PASS PASS PASS PASS PASS PASS PASS PASS	200 0 HHz		1996 6U
1995 GH2	1396 GH2	PASS PASS PASS PASS PASS PASS PASS PASS	390.0 HH/		1.988 GHz
I Job GH2 I Job GH2 I Do GH2	1396 GH2	PASS PASS PASS PASS PASS PASS PASS PASS	300.0 HH/		1.998 GHz

MultiView = Spectrum					•
Ref Level 27.86 dBm Offset 30.0	00 dB Mode Au	ito FFT			SGL Count 200/200
Spurious Emissions					
Limit Check	102	PASS			
O dBm					
0 dBm					
/ dBm					
10 d8m					
SPURIOUS_LINE_ABS_002					
20 dBm					
30 dBm					
	\sim	$\sim \sim \sim$	$\sim \sim \sim$	hand	~~~
40 dBm					
50 dBm					
50 0011					
60 d8m	+			++	
1.995 GHz		1001 pts	300.0 kHz/		1.998 GHz
Result Summary					
Para an Laws	Range Up	RBW	Frequency	Power Abs	ΔUmit
1.995 GHz 	1.998 GHz level = AGC Thre	50.000 kHz	1.995 00 GHz	-28.27 dBm	-15.27 dB
1.995 GHz v band edge, 1 signal, MultiView Spectrum Ref Level 27.86 dBm Offset 30.8	1.998 GHz	50,000 kHz mahold + 3	1.99500 GHz	-28.27 dBm - Re	-15.27 dB
1.995 GHz 	1.998 GHz level = AGC Thre 00 dB Mode Λι	50.000 kHz kahold + 3 kto FFT	1.995 00 GHz	-28.27 dBm - Res	-15.27 dB
NJ95 GHz 1995 GHz - w band edge, 1 signal, MultiView - Spectrum Ref Level 27.86 dBm Offset 30.0 Spurious Emissions Linit Greek	1.998 GHz level = AGC Thre 0 dB Mode Λι	50.000 kHz sahold + 3 no FFT	1.995 00 GHz	-28.27 dBm	-15.27 dB
1.995 GHz 1.995 GHz ov band edge, 1 signal, MultiView = Spectrum Ref Level 27.86 dBm Offset 20.0 Spurlous Link: Check Unit Check Unit Check 0 dBm	1.998 GH2 level = AGC Thre 0 dB Mode Au	50.000 kHz sshold + 3 to FFT PASS PASS	1.995 00 GHz	-28.27 dBm	-15.27 dB
I 1995 UKz 1995 UKz w band edge, 1 signal, MultiView = Spectrum RefLevel 27.66 dBm Offict 30: Um8 Creel Um8 Creel Um8 Creel 0 dBm	1.998 GHz level = AGC Thre 20 dB Mode Au	50.000 kHz sahold + 3 to FFT PASS PASS	1.995 00 GHz	-28.27 dBm	-15.27 dB
1995 GHz vo band edge, 1 signal, vo band edge, 1 signal, MultiView = Spectrum Ref Level 27.86 GHz Offeet 30.0 Spaceous Emissions Line Spectrum (State State	1.998 GH2 level = AOC Thre 0 d0 Mode Au	50.000 kHz sehold + 5 ho FFT PASS PASS	1.995 00 GHz	-28.27 dBm	-15.27 dB
1995 GHz vv hand edge, 1 signal, WultiView = Spectrum Ket Level 27,86 dim Offset 30,0 Spurious Environment Umit Check Umit Check 0 dBm dBm	1.996 GH2 level = AOC Thre 00 00 Mode Au	50.000 kHz nahold + 3 no FIT PNSS PNSS	1.995 00 GHz	-28.27 dBm	-15.27 dB
1995 GHz ov hand edge, t signal, MultiView = Spectrum Ref Level 27.86 dbm Officet 30.0 Spurdeus Emissions Um Check 0 dbm 0 dbm 0 dbm	1.996 GH2 1evel = AOC Thre 0 00 Mode Λι	50.000 kHz ashold + 3 80 FFT PASS PASS	1.995 00 GHz	-28.27 dBm	-15.27 dB
1995 GHz v band edge, 1 signal, MultiView = Spectrum RefLevel 27.66 dim Office 10.0 SputPour Emissions Limit Cred Um Cred State Dim Office 0 dBm 0 dB	1.998 GHz	50.000 kHz ashold + 3 Ro FFT PASS PASS	1.995 00 GHz	-28.27 dBm	-15.27 dB -15.27 dB
1995 GHz w band edge, 1 signal, wutubliver = Spectrum Ref Level 27.66 dbm Office 10.0 Spectrum	1.996 GH2 level = AOC Thre 00 d0 Mode AL	50.000 Mtz stabuld + 3 PB45 PB45	1.995 00 GHz	-28.27 dBm	-15.27 dB
1995 Grz w band edge, 1 signal, MultiView ² Spectrum MultiView ² Spectrum Spectrum Comp Jum Comp	1.998 GHz level = AGC Thre 00 00 Mode Au	50.000 HHz ashold + 3 no FFT PMS 	1.995 00 GHz	-28.27 dBm	-1527 dB
1995 Grz ve band edge, 1 stignal, 1 MultiView * Spectrum MultiView * Spectrum Spectrum Spectrum Umo Gree Juno Gree Juno Gree	1.998 GHz level = XOC Thre 0 d0 Mode As	50.000 Htg askeld + 3 no FTT PASS 	1.995 00 GHz	-28.27 dBm	-15.27 dB
1995 Gra wo band edge, i signal, MultiView - Spectrum MultiView - Spectrum Unit Occo Devices Constant Spectra Constant Devices Constant Spectra Constant Devices Cons	1998 Griz	50.000 Htg sahald + 3 ao FT PR65 PR65	1.995 00 GHz	-28.27 dBm	-1527 dB
1998 GHz ov band edge, i signal, MultiView ² Spectrum MultiView ² Spectrum Spectrum Locations Umer Ores Umer Ores Spectrum Locations Umer Ores Spectrum Locations Umer Ores Spectrum Locations Marcology (Spectrum) Spectrum Locations Marcology (Spectrum) Spectrum) Spectrum Locations Marcology (Spectrum) Spectrum Locations Marcology (Spectrum) Spectrum Locations Marcology (Spectrum) Spectrum Locations Marcology (Spectrum) Spectrum Locations Marcology (Spectrum) Marcology (Spectrum)	1.998 Griz	50.000 Htz sshabid + 3 no/FT PASS PASS	1.995 00 GHz	-28.27 dBm	-1527 dB wy Hitten 2 *
1926 642 We band edge 1 signal, MultiView ² Spectrum MultiView ²	1998 Gric Isvel = AGC three 0 c0 Mede Au	50.000 Htg sabeld + 9 more PASS PASS	1.995 00 GHz	-28.27 dBm	-1527 dB
1928.042 sv band edge, i signal, MultiNiew * Spectrum MultiNiew * Spectrum Sectors 27.86 data Sectors 27.86	1.998 Grid level = AGC three 0.080 Mode Au 402	50.000 Htg ashold + 3 Ao FTT P055	1.995 00 GHz	-28.27 dBm	-1527 dB
1995 644 ov hand edge, 1 signal, 1 MultiView - Sectorum MultiView - Sectorum Bartonic Castor Dia dam	1.998 GHz	50.000 Urg babeld + 3 moTT PASS PASS PASS	1.995 00 GHz	-28.27 dbm	-15.27 dB
1995 GHz w band edge, 1 signal, w band edge, 2 signal, WuldWire * Spectrum Met Love 2256 dim. Offert 30 Deck 256 dim. Offert 356 dim. O	1.938 Grid.	50.000 Htg sahald + 3 ao FT PRS5 	1.995 00 GHz	-28.27 dbm	-1527 dB ing 1111111 v v 50. Count 200/200
1995 642 w baid edge, 1 signal, w baid edge, 1 signal, built/ww ² Spectrum fel cert 278 dam. Genetation fel cert 278 dam. Genetation Genetatio Genetation Genetatio	1.998 GHz	50.000 Urg habeld + 3 ho FTT PASS PASS PASS PASS PASS PASS PASS PA	1.995 00 GHz	-28.27 dbm	-15.27 dB
1926 642 w baad edge 1 signal, wu baad edge 1 signal, Wu biNew ² Spectrum Spectra Spectrum Spectra Spectrum Spectra Spectrum Spectra Spectrum O data	1998 Griz	50.000 Htg basheld + 3 more fit PASS PASS PASS PASS PASS PASS PASS PAS	1.995 00 GHz	-28.27 dBm	-1527 dB



8.5.6 Test data - conducted spurious emissions:

8.5.6.1 Operating frequency band: Band 25: 1930 – 1995 MHz

Input signal = **lowest channel** within the frequency block; **narrowband**:



Spurkou Emissions Umit Check Jo db/me SPURIOUS LINE ARS 0/2 20 db/m *0 db/m *0 db/m	PASS PASS					
Umit Check 30 dB/m 20 dB/m 10 dB/m 10 dB/m	PASS PASS					
30 dB <mark>l/ec _SPURIOUS_LINE_ABS_002</mark> 20 dBm 10 dBm	PASS					
20 dBm 10 dBm-) dBm-						
20 dBm 10 dBm						
20 dbm 10 dBm						
10 dBm						
10 dBm						
) dBm						
) dBm						
		-				
COLIDICALS LINE ARE OUT						
SPORIOUS_LINE_/ABS_002						
20.00						
20 dbm						
30 dBm						
						Concernance of the second
40 dBo	And a second	وترافيه المتعادية	and the second se	the second se		
and any second						
50 dBo						
(0.17)	1					
60 dBm						
1.975 GH2	24937 pts	9	97.5 MHZ/			19.95 GHz
Result Summary						
Range Low Range Up	RBW	Frequen	cy	Power Abs		<u>AUmit</u>
9.975 GH2 19.950 GH2	1.000 MHz	17.17774	GHZ	-35.13 dbm	-2	2.13 db



Input signal = middle channel within the frequency block; narrowband:





Input signal = highest channel within the frequency block; narrowband:



Nemko

Input signal = **lowest channel** within the frequency block; **broadband**:



Nemko

Input signal = middle channel within the frequency block; broadband:





Input signal = highest channel within the frequency block; broadband:





8.6 Radiated spurious emissions

8.6.1 References and limits

- FCC Part 24.238 & RSS-133 (band 25 operation)
- ANSI C63.26 Clause 7.2.2.5
- KDB 935210 D05v01r05 Clause 3.8

8.6.2 Test summary

Verdict	Pass		
Test date	December 1, 2023 December 5, 2023	Temperature	21 °C
Test engineer	Lan Sayasane, EMC Test Engineer	Air pressure	1010 mbar
Test location	 ☑ 10m semi anechoic chamber ☑ 3m semi anechoic chamber □ Other: 	Relative humidity	52 %

8.6.3 Notes

Testing was performed with a narrowband test signal (MSK modulated, gaussian filter of 0.3 and data rate 270 kbps) and a broadband signal (AWGN, 4.1 MHz 99% occupied bandwidth) on lowest, middle, and highest channels of each supported frequency band. Only the worst-case data (broadband signal) are presented here.

8.6.4 Setup details

EUT power input during test	120 VAC / 60 Hz	
EUT setup configuration	🛛 Table-top	
	Floor standing	
	□ Other:	
Measurement details	Receiver/spectrum analyzer	settings for frequencies below 1 GHz:
	Resolution bandwidth	100 kHz
	Detector mode	 Peak (Preview measurement)
	Trace mode	Max Hold
	Measurement time	 100 ms (Peak preview measurement)
		 5000 ms (Peak final measurement)
	Receiver/spectrum analyzer	settings for frequencies above 1 GHz:
	Resolution bandwidth	1 MHz
	Detector mode	Peak (Preview measurement)
		Peak (Final measurement)
	Trace mode	Max Hold
	Measurement time	 100 ms (Peak preview measurement)
		 5000 ms (Peak final measurement)



8.6.5 Test data



Full Spectrum



Figure 8.6-1: Radiated emissions spectral plot (30 MHz - 1 GHz) – Band 25 (1930 MHz)

Table 8.6-1: Radiated emissions results

(MHz)	(dBμV/m)	limit (dBμV/m)	(dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	(dB/m)
997.484167	40.43	84.38	43.95	5000.0	100.000	320.0	Н	22.0	35.8

¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Notes:





Figure 8.6-2: Radiated emissions spectral plot (1 GHz - 18 GHz) - Band 25 (1930 MHz)

Table 8.6-2: Radiated emissions results

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1753.833333	36.26	82.23	45.97	5000.0	1000.000	258.0	Н	0.0	-12.6
1892.300000	46.92	82.23	35.31	5000.0	1000.000	350.0	Н	87.0	-10.8
2665.233333	39.21	82.23	43.02	5000.0	1000.000	400.0	Н	0.0	-8.9
3861.833333	50.51	82.23	31.72	5000.0	1000.000	149.0	V	11.0	-4.4
16761.000000	50.65	82.23	31.58	5000.0	1000.000	148.0	V	11.0	14.8
17198.100000	50.89	82.23	31.34	5000.0	1000.000	170.0	н	0.0	14.9

Notes:

¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB) ² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Marked emission at 1.93 GHz is the fundamental emission and is not evaluated against the limits.





Figure 8.6-3: Radiated emissions spectral plot (18 GHz - 19.95 GHz) - Band 25 (1930 MHz)

	Table 8.6-3: Radiated emissions results									
Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBμV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18126.168750		27.42			5000.0	1000.000	315.0	V	321.0	15.7
18126.168750	40.30		82.23	41.93	5000.0	1000.000	315.0	V	321.0	15.7
18191.634375	40.10		82.23	42.14	5000.0	1000.000	244.0	Н	244.0	15.6
18191.634375		26.88			5000.0	1000.000	244.0	Н	244.0	15.6
18741.440625	41.08		82.23	41.15	5000.0	1000.000	361.0	Н	160.0	15.9
18741.440625		27.09			5000.0	1000.000	361.0	Н	160.0	15.9
18784.462500	41.37		82.23	40.86	5000.0	1000.000	248.0	н	248.0	15.9
18784.462500		27.67			5000.0	1000.000	248.0	Н	248.0	15.9
19320.300000		27.43			5000.0	1000.000	332.0	Н	138.0	16.8
19320.300000	40.81		82.23	41.42	5000.0	1000.000	332.0	Н	138.0	16.8
19377.103125	41.27		82.23	40.96	5000.0	1000.000	264.0	Н	11.0	16.6
19377.103125		28.09			5000.0	1000.000	264.0	Н	11.0	16.6
otes: ¹ Field streng	th (dB V/m) = rece	eiver/spectrum ar	alyzer value (dB	V) + correctio	on factor (dB))	204.0	11	11.0	10.0

¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.





Figure 8.6-4: Radiated emissions spectral plot (30 MHz - 1 GHz) – Band 25 (1962.5 MHz)

	Table	8.6-4:	Radiated	emissions	results
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Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
112.025833	29.74	84.38	54.64	5000.0	100.000	397.0	V	108.0	18.2
113.641667	29.75	84.38	54.63	5000.0	100.000	365.0	V	172.0	18.4
120.027500	28.12	84.38	56.26	5000.0	100.000	397.0	V	21.0	18.4
486.896667	29.75	84.38	54.63	5000.0	100.000	104.0	н	0.0	26.4
663.315833	35.04	84.38	49.34	5000.0	100.000	107.0	V	46.0	30.1
999.020000	40.57	84.38	43.81	5000.0	100.000	289.0	V	208.0	35.9

Notes:

¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.





Figure 8.6-5: Radiated emissions spectral plot (1 GHz - 18 GHz) – Band 25 (1962.5 MHz)

Table 8.6-5: Radiated emissions result	Table 8.6-5	: Radiated	emissions	result
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Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2497.200000	38.45	82.23	43.78	5000.0	1000.000	263.0	V	0.0	-9.6
2517.100000	40.63	82.23	41.60	5000.0	1000.000	100.0	V	253.0	-9.4
3924.966667	56.01	82.23	26.22	5000.0	1000.000	194.0	V	10.0	-4.2
16359.466667	48.91	82.23	33.32	5000.0	1000.000	307.0	н	89.0	13.0
16737.800000	50.84	82.23	31.39	5000.0	1000.000	262.0	Н	0.0	14.8
17893.866667	49.48	82.23	32.75	5000.0	1000.000	354.0	V	248.0	15.1

Notes:

¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB) ² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Marked emission at 1.96 GHz is the fundamental emission and is not evaluated against the limits.







Figure 8.6-6: Radiated emissions spectral plot (18 GHz - 19.95 GHz) - Band 25 (1962.5 MHz)

Table 8.6-6: Radiated emissions results										
Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBμV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18565.753125	40.27		82.23	41.96	5000.0	1000.000	382.0	V	126.0	16.1
18565.753125		27.35			5000.0	1000.000	382.0	V	126.0	16.1
18747.900000		27.10			5000.0	1000.000	400.0	V	194.0	15.9
18747.900000	40.02		82.23	42.21	5000.0	1000.000	400.0	V	194.0	15.9
18758.850000	40.26		82.23	41.97	5000.0	1000.000	400.0	V	241.0	15.9
18758.850000		27.10			5000.0	1000.000	400.0	V	241.0	15.9
18984.768750	41.13		82.23	41.10	5000.0	1000.000	265.0	н	354.0	16.0
18984.768750		27.46			5000.0	1000.000	265.0	Н	354.0	16.0
19315.846875	40.79		82.23	41.44	5000.0	1000.000	149.0	V	330.0	16.7
19315.846875		27.49			5000.0	1000.000	149.0	V	330.0	16.7
19357.687500		26.00			5000.0	1000.000	396.0	Н	78.0	16.7
19357.687500	39.62		82.23	42.61	5000.0	1000.000	396.0	Н	78.0	16.7

¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.





Figure 8.6-7: Radiated emissions spectral plot (30 MHz - 1 GHz) – Band 25 (1995 MHz)

Table 8.6-7: Radiated emissions results

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
959.080000	40.31	84.38	44.07	5000.0	100.000	283.0	V	21.0	35.7

Notes:

 1 Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.





Figure 8.6-8: Radiated emissions spectral plot (1 GHz - 18 GHz) – Band 25 (1995 MHz)

Table 8.6-8: Radiated emissions results

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2401.766667	42.66	82.23	39.57	5000.0	1000.000	263.0	Н	170.0	-10.0
3990.133333	54.59	82.23	27.64	5000.0	1000.000	195.0	V	10.0	-4.0
12456.633333	46.25	82.23	35.98	5000.0	1000.000	241.0	Н	170.0	7.4
16841.566667	50.94	82.23	31.29	5000.0	1000.000	195.0	V	10.0	13.8
17261.833333	51.05	82.23	31.18	5000.0	1000.000	262.0	Н	327.0	15.1
17643.400000	49.36	82.23	32.87	5000.0	1000.000	400.0	н	169.0	13.7

Notes:

¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB) ² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Marked emission at 1.99 GHz is the fundamental emission and is not evaluated against the limits.





Figure 8.6-9: Radiated emissions spectral plot (18 GHz - 19.95 GHz) – Band 25 (1995 MHz)

Table 8.6-9: Radiated emissions results										
Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBμV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18283.865625	41.47		82.23	40.76	5000.0	1000.000	349.0	Н	243.0	15.5
18283.865625		27.78			5000.0	1000.000	349.0	Н	243.0	15.5
18533.896875	41.22		82.23	41.01	5000.0	1000.000	372.0	Н	357.0	15.9
18533.896875		27.60			5000.0	1000.000	372.0	Н	357.0	15.9
18817.678125		27.73			5000.0	1000.000	307.0	V	241.0	15.9
18817.678125	40.61		82.23	41.62	5000.0	1000.000	307.0	V	241.0	15.9
19028.859375		27.09			5000.0	1000.000	373.0	V	243.0	16.0
19028.859375	40.22		82.23	42.01	5000.0	1000.000	373.0	V	243.0	16.0
19345.828125	41.51		82.23	40.72	5000.0	1000.000	363.0	Н	265.0	16.7
19345.828125		27.41			5000.0	1000.000	363.0	Н	265.0	16.7
19377.403125	41.24		82.23	40.99	5000.0	1000.000	387.0	Н	88.0	16.6
19377.403125		27.59			5000.0	1000.000	387.0	Н	88.0	16.6

Notes: ¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

End of test report