

MEASUREMENT REPORT

EN 300 328 V2.1.1 WLAN 802.11b/g/n

Applicant: Compex Systems Pte Ltd

Address: No:9 Harrison Road, Harrison Industrial Building, #05-01,
Singapore 369651

Product: WIRELESS-ABGN 2X2 NETWORK MINIPCIE ADAPTER

Model No.: WLE200NX, WLE200NX-I

Brand Name: COMPEX

Standards: EN300 328 V2.1.1 (2016-11)

Result: Complies

Test Date: June 24 ~ July 11, 2017

Reviewed By : Jame Yuan
(Jame Yuan)

Approved By : Marlinchen
(Marlin Chen)



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

| Report No. | Version | Description | Issue Date | Note |
|--------------|---------|----------------|------------|-------|
| 1706RSU02302 | Rev. 01 | Initial report | 07-11-2017 | Valid |
| | | | | |

Note: This test report was based on MRT report number 1608RSU02005 and updated the standard EN 300 328 version from v1.9.1 to v2.1.1. Besides the receiver blocking items, there is no any other updated item.

CONTENTS

| Description | Page |
|--------------------------------------------------------------|-----------|
| 1. General Information..... | 4 |
| 1.1. Applicant..... | 4 |
| 1.2. Manufacturer | 4 |
| 1.3. Testing Facility | 4 |
| 1.4. Feature of Equipment under Test..... | 5 |
| 1.5. Product Specification Subjective to this Standard | 5 |
| 1.6. Operation Frequency / Channel List | 5 |
| 1.7. Description of Available Antennas..... | 6 |
| 1.8. Application Form for Testing | 7 |
| 1.9. Standards Applicable for Testing | 8 |
| 2. Test Configuration of Equipment under Test..... | 9 |
| 2.1. Description of Test Mode | 9 |
| 2.2. Description of Test Softwar | 9 |
| 3. Test Summary | 10 |
| 4. Receiver Blocking..... | 11 |
| 4.1. Limit..... | 11 |
| 4.2. Test Setup | 11 |
| 4.3. Test Procedure | 11 |
| 4.4. Test Result..... | 12 |
| 5. Measurement Uncertainty | 16 |
| 6. List of Measuring Instrument..... | 17 |

1. General Information

1.1. Applicant

Compex Systems Pte Ltd

No:9 Harrison Road, Harrison Industrial Building, #05-01, Singapore 369651

1.2. Manufacturer

Compex Systems Pte Ltd

No:9 Harrison Road, Harrison Industrial Building, #05-01, Singapore 369651

1.3. Testing Facility

Test Site

MRT Technology (Suzhou) Co., Ltd

Test Site Location

D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- MRT facility is a FCC registered (MRT Reg. No. 809388) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.
- MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.
- MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.



1.4. Feature of Equipment under Test

| | |
|----------------------|----------------------------------------------------------------------------------|
| Product Name: | WIRELESS-ABGN 2X2 NETWORK MINIPCIE ADAPTER |
| Model No.: | WLE200NX, WLE200NX-I |
| Brand Name: | COMPEX |
| Wi-Fi Specification: | 802.11a/b/g/n |
| Frequency Range: | For 802.11b/g/n-HT20: 2412 ~ 2472 MHz For 802.11n-HT40: 2422 ~ 2462 MHz |

1.5. Product Specification Subjective to this Standard

| Wi-Fi Specification | |
|---------------------|-----------------------------------------------------------------------------------------|
| Frequency Range | 802.11b/g/n-HT20: 2412 ~ 2472MHz 802.11n-HT40: 2422 ~ 2462MHz |
| Channel Number | 802.11b/g/n-HT20: 13 802.11n-HT40: 9 |
| Type of Modulation | 802.11b: DSSS 802.11g/n: OFDM |
| Data Rate | 802.11b: 1/2/5.5/11Mbps 802.11g: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 300Mbps |

Note: For other features of this EUT, test report will be issued separately.

1.6. Operation Frequency / Channel List

802.11b/g/n-HT20

| Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|---------|-----------|
| 01 | 2412 MHz | 02 | 2417 MHz | 03 | 2422 MHz |
| 04 | 2427 MHz | 05 | 2432 MHz | 06 | 2437 MHz |
| 07 | 2442 MHz | 08 | 2447 MHz | 09 | 2452 MHz |
| 10 | 2457 MHz | 11 | 2462 MHz | 12 | 2467 MHz |
| 13 | 2472 MHz | -- | -- | -- | -- |

802.11n-HT40

| Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|---------|-----------|
| 03 | 2422 MHz | 04 | 2427 MHz | 05 | 2432 MHz |
| 06 | 2437 MHz | 07 | 2442 MHz | 08 | 2447 MHz |
| 09 | 2452 MHz | 10 | 2457 MHz | 11 | 2462 MHz |

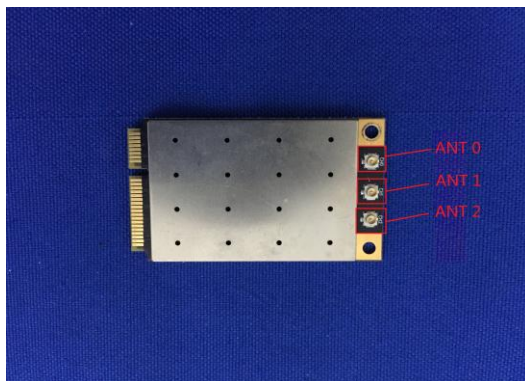
1.7. Description of Available Antennas

| Antenna Type | Manufacturer | Tx Paths | Max Directional Gain (dBi) |
|-------------------|---------------------------------------|----------|----------------------------|
| Dipole Antenna 1# | Kunshan Wavelink Electronic Co., Ltd. | 3 | 2.4GHz: 2.0, 5GHz: 2.0 |
| Dipole Antenna 2# | Smart Ant Inc | 3 | 2.4GHz: 4.5, 5GHz: 7.0 |
| PCB Antenna 3# | TAOGLAS Inc | 3 | 2.4GHz: 4.5, 5GHz: 6.7 |
| PCB Antenna 4# | Compex Systems Pte Ltd | 3 | 2.4GHz: 5.0, 5GHz: 5.0 |
| PCB Antenna 5# | Compex Systems Pte Ltd | 3 | 2.4GHz: 5.0, 5GHz: 5.0 |

Note: We selected the dipole antenna 2# and PCB antenna 4# for all radiated emission testing.

1.8. Description of Antenna RF Port

| Antenna RF Port | | | |
|-----------------------|--------------------------|----------|----------|
| -- | 2.4/5GHz Antenna RF Port | | |
| | 2.4/5GHz | 2.4/5GHz | 2.4/5GHz |
| Software Control Port | Ant 0 | Ant 1 | Ant 2 |

Antenna RF Port Plot


1.9. Application Form for Testing

| Modulation Type | |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> | FHSS |
| <input checked="" type="checkbox"/> | other forms of modulation |
| Adaptivity Equipment | |
| <input type="checkbox"/> | Non-Adaptive Equipment: |
| | The maximum RF Output Power (e.i.r.p.): ... dBm |
| | The maximum (corresponding) Duty Cycle: ... % |
| <input checked="" type="checkbox"/> | Adaptive Equipment without the possibility to switch to a non-adaptive mode: |
| <input checked="" type="checkbox"/> | The equipment has implemented an LBT based DAA mechanism: |
| | <input type="checkbox"/> The equipment is Frame Based equipment |
| | <input checked="" type="checkbox"/> The equipment is Load Based equipment |
| | The CCA time implemented by the equipment: μ s |
| | The value q as referred to in clause 4.3.2.5.2.2.2 |
| | <input type="checkbox"/> The equipment can switch dynamically between Frame Based and Load Based equipment |
| <input type="checkbox"/> | The equipment has implemented an non-LBT based DAA mechanism |
| <input type="checkbox"/> | The equipment can operate in more than one adaptive mode |
| <input type="checkbox"/> | Adaptive Equipment which can also operate in a non-adaptive mode |
| The Worst Case Operational Mode for Each of The Following Tests | |
| <input checked="" type="checkbox"/> | RF Output Power: 19.78dBm |
| <input checked="" type="checkbox"/> | Power Spectral Density: 9.76dBm/MHz |
| <input type="checkbox"/> | Duty cycle, Tx-Sequence, Tx-gap |
| <input type="checkbox"/> | Accumulated Transmit time, Frequency Occupation & Hopping Sequence |
| <input type="checkbox"/> | Medium Utilisation: |
| <input type="checkbox"/> | Hopping Frequency Separation: |
| <input checked="" type="checkbox"/> | Adaptivity & Receiver Blocking: 19.04ms, 154.5us |
| <input checked="" type="checkbox"/> | Occupied Nominal Channel Bandwidth: 36.32MHz |
| <input checked="" type="checkbox"/> | Transmitter unwanted emissions in the OOB domain: -10.69dBm/MHz |
| <input checked="" type="checkbox"/> | Transmitter unwanted emissions in the spurious domain: -32.4dBm |
| <input checked="" type="checkbox"/> | Receiver spurious emissions: -60.6dBm |
| <input checked="" type="checkbox"/> | Receiver Blocking: 3.2% (PER) |
| Antenna Category | |
| <input checked="" type="checkbox"/> | Integral antenna (antenna permanently attached) |
| <input type="checkbox"/> | Temporary RF connector provided |
| <input checked="" type="checkbox"/> | No temporary RF connector provided |

| Device Type | | | |
|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------------------------|
| <input checked="" type="checkbox"/> | Stand-alone | | |
| <input type="checkbox"/> | Combined (EUT where the radio part is fully integrated within another device) Combined Equipment - Brand Name / Model No.: | | |
| <input type="checkbox"/> | Plug-in radio (EUT intended for a variety of host systems) Host System - Brand Name / Model No.: | | |
| Operating Conditions | | | |
| <input checked="" type="checkbox"/> | AC Mains AC Voltage Range:100 - 240 V | <input type="checkbox"/> | DC DC Voltage Range 3.7 V |
| Type of DC Source <input type="checkbox"/> Internal DC supply | | | |
| <input type="checkbox"/> External DC adapter | | | |
| <input type="checkbox"/> Battery | | | |
| <input checked="" type="checkbox"/> | Temperature Range: -20 ~ 70°C | | |
| Geo-Location Capability Supported by The Equipment | | | |
| <input type="checkbox"/> | Yes <input type="checkbox"/> The geographical location determined by the equipment is not accessible to the user. | | |
| <input checked="" type="checkbox"/> | No | | |

1.10. Standards Applicable for Testing

The EUT complies with the requirements of ETSI EN 300 328 V2.1.1.

2. Test Configuration of Equipment under Test

2.1. Description of Test Mode

| Test Mode |
|----------------------------------|
| Mode 1: Transmit by 802.11b |
| Mode 2: Transmit by 802.11g |
| Mode 3: Transmit by 802.11n-HT20 |
| Mode 4: Transmit by 802.11n-HT40 |
| Mode 5: Receive by 802.11b |
| Mode 6: Receive by 802.11g |
| Mode 7: Receive by 802.11n-HT20 |
| Mode 8: Receive by 802.11n-HT40 |

2.2. Description of Test Software

The test utility software used during testing was “ART” , and the version was “v09 b27”.

3. Test Summary

| Clause (EN 300328) | Test Parameter | Result (Pass/Fail) | Remark |
|-----------------------|-------------------|-----------------------|--------|
| Receiver Parameters | | | |
| 4.3.2.11 | Receiver Blocking | Pass | --- |

4. Receiver Blocking

4.1. Limit

The minimum performance criterion shall be a PER less than or equal to 10 %. The manufacturer may declare alternative performance criteria as long as that is appropriate for the intended use of the equipment.

| Wanted signal mean power from companion device (dBm) | Blocking signal frequency (MHz) | Blocking signal power (dBm) (see note 2) | Type of blocking signal |
|------------------------------------------------------|----------------------------------------------------|------------------------------------------|-------------------------|
| P _{min} + 6 dB | 2380, 2503.5 | -53 | CW |
| P _{min} + 6 dB | 2300, 2330, 2360 | -47 | CW |
| P _{min} + 6 dB | 2523.5, 2553.5 2583.5, 2613.5 2643.5, 2673.5 | -47 | CW |

Note 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal.

Note 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.

4.2. Test Setup

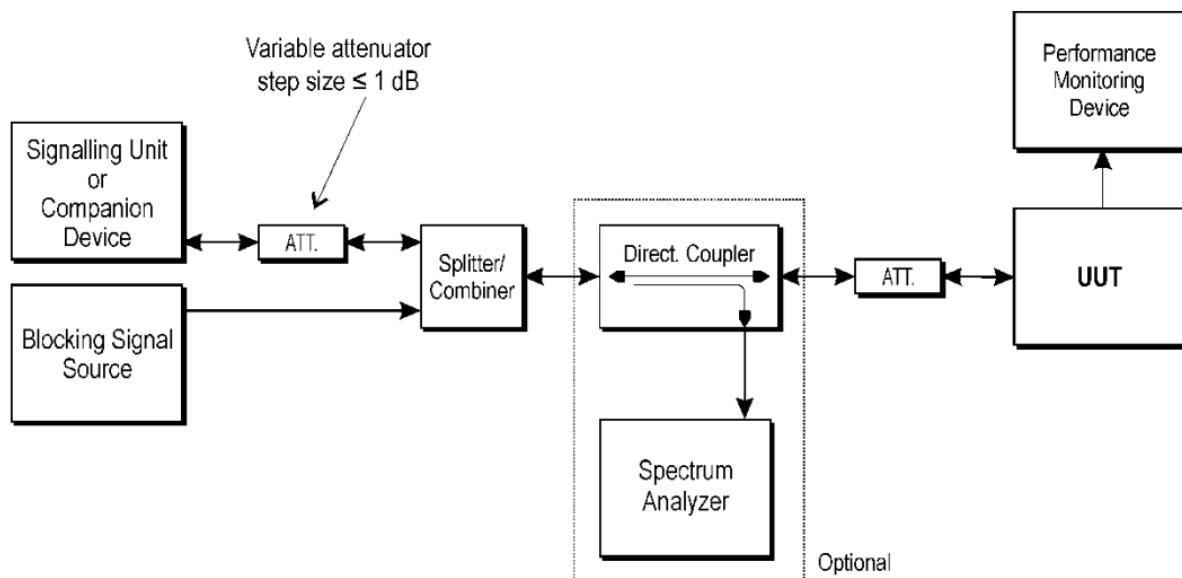


Figure 6: Test Set-up for receiver blocking

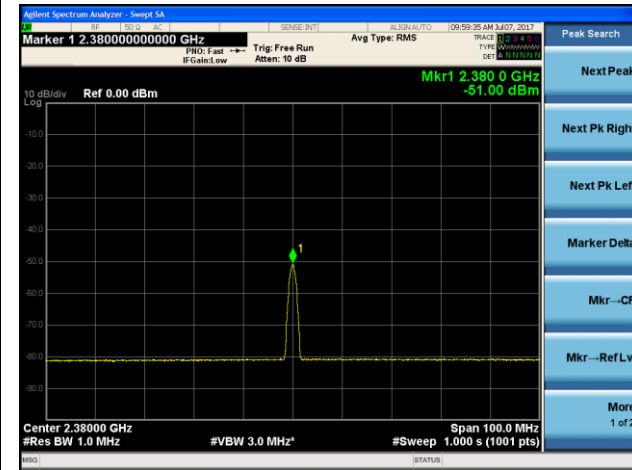
4.3. Test Procedure

Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.11.2.1.

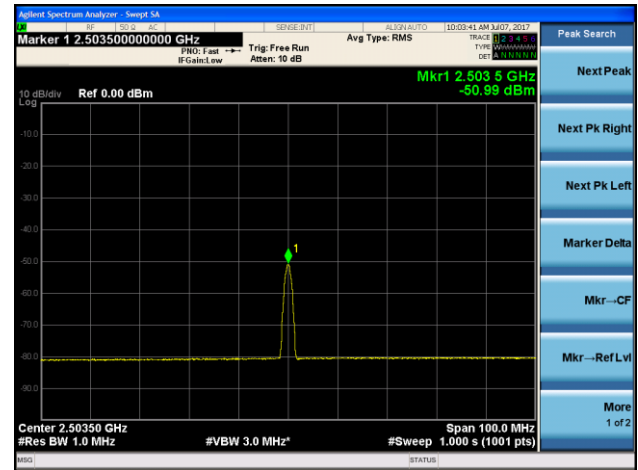
4.4. Test Result

Blocking Signal Calibration Plots

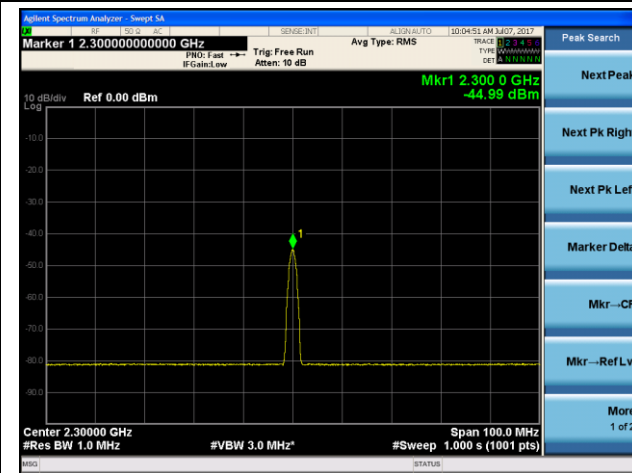
2380MHz



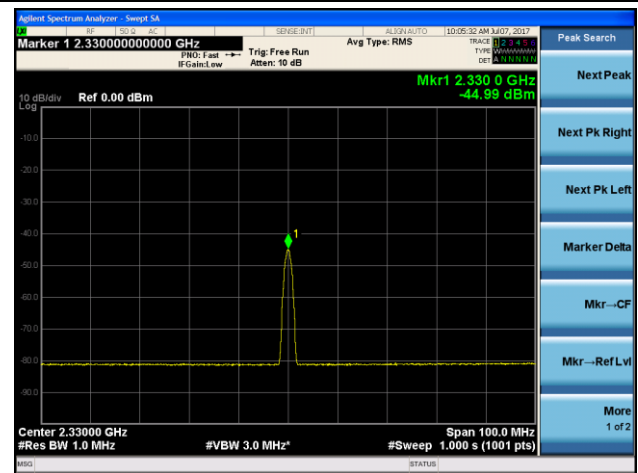
2503.5MHz



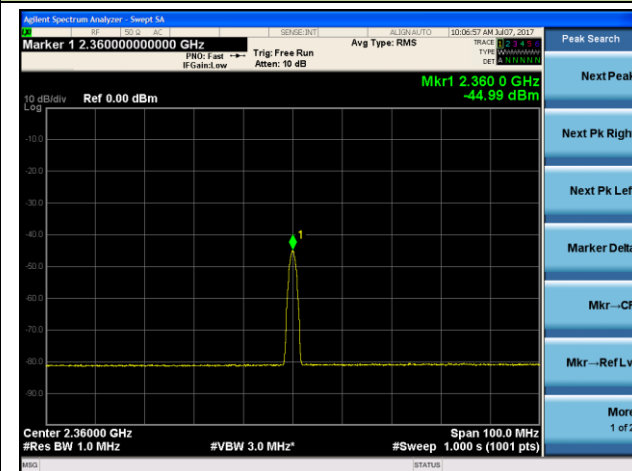
2300MHz



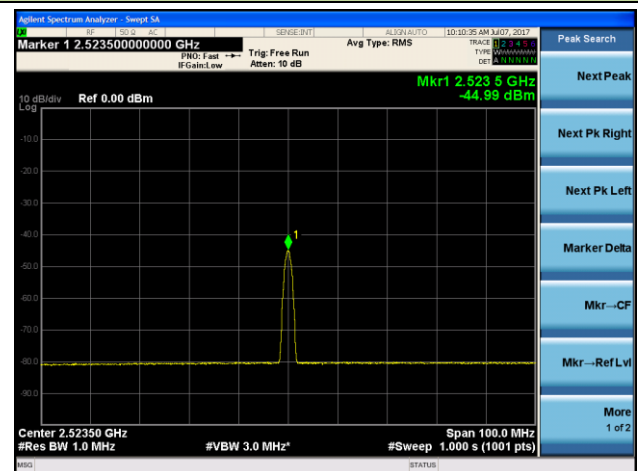
2330MHz

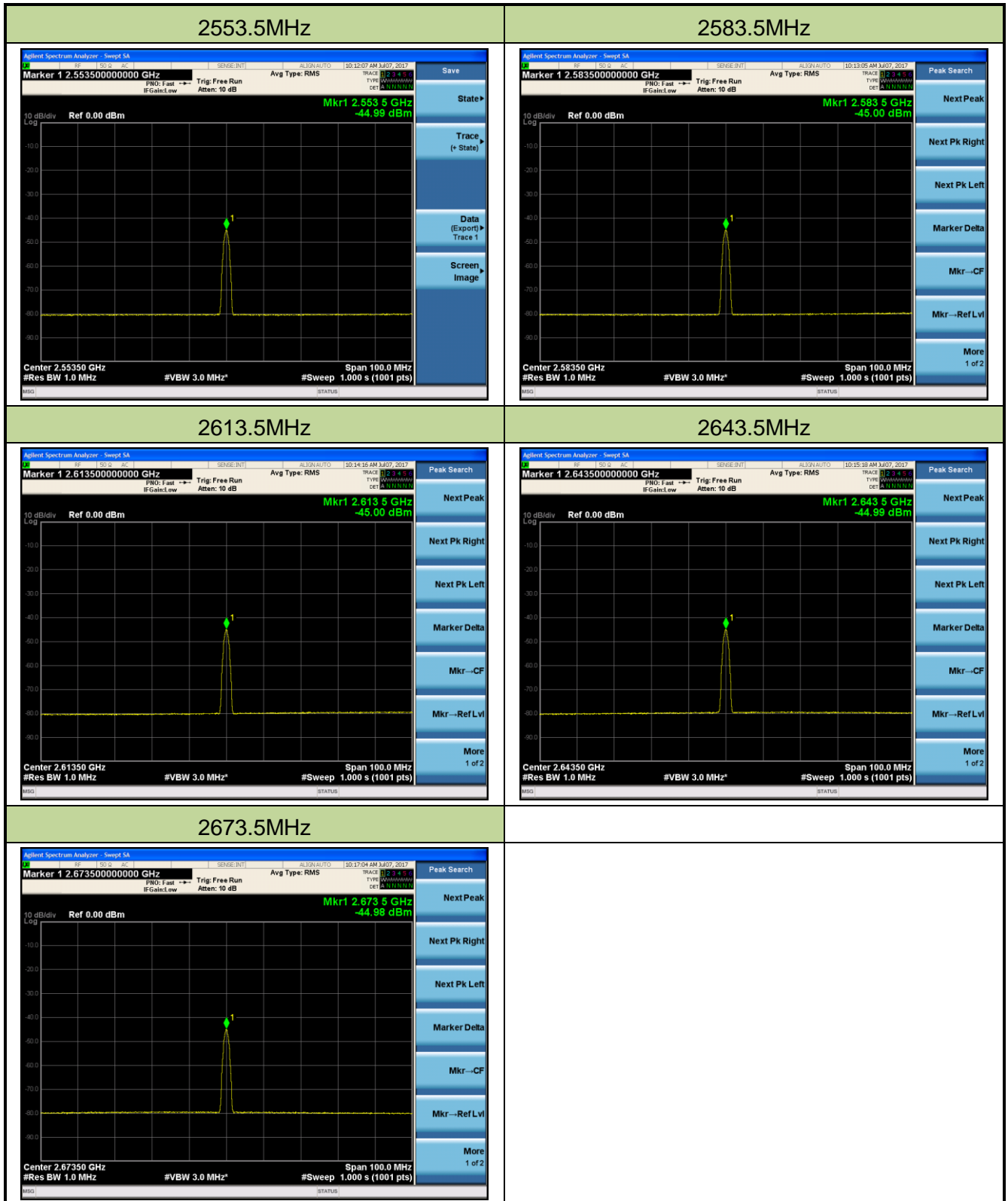


2360MHz



2523.5MHz





Note: This interference level has been included the antenna gain.

| | | | |
|---------------|------------|-------------------|------|
| Test Engineer | Andy Zhu | Temperature | 25°C |
| Test Data | 2017/07/07 | Relative Humidity | 52% |
| Test Mode | 802.11b | Test Site | TR4 |

| Channel | Wanted Signal Mean Power from Companion Device (dBm) | Blocking Signal Frequency (MHz) | Blocking Signal Power (dBm) | Type of Blocking Signal | PER Test Result (%) | Limit (PER) | Test Result |
|---------|---------------------------------------------------------------|------------------------------------------|--------------------------------------|-------------------------------|------------------------------|----------------|----------------|
| 01 | $P_{\min} + 6 \text{ dB}$ | 2300.0 | -45 | CW | 1.5 | < 10% | Pass |
| | | 2330.0 | -45 | | 1.2 | | Pass |
| | | 2360.0 | -45 | | 1.5 | | Pass |
| | | 2380.0 | -51 | | 2.1 | | Pass |
| | | 2503.5 | -51 | | 1.5 | | Pass |
| | | 2523.5 | -45 | | 1.3 | | Pass |
| | | 2553.5 | -45 | | 1.3 | | Pass |
| | | 2583.5 | -45 | | 1.6 | | Pass |
| | | 2613.5 | -45 | | 2.1 | | Pass |
| | | 2643.5 | -45 | | 2.1 | | Pass |
| | | 2673.5 | -45 | | 3.2 | | Pass |
| 13 | $P_{\min} + 6 \text{ dB}$ | 2300.0 | -45 | CW | 0.1 | < 10% | Pass |
| | | 2330.0 | -45 | | 0.0 | | Pass |
| | | 2360.0 | -45 | | 0.0 | | Pass |
| | | 2380.0 | -51 | | 0.0 | | Pass |
| | | 2503.5 | -51 | | 0.1 | | Pass |
| | | 2523.5 | -45 | | 0.0 | | Pass |
| | | 2553.5 | -45 | | 0.0 | | Pass |
| | | 2583.5 | -45 | | 0.0 | | Pass |
| | | 2613.5 | -45 | | 0.0 | | Pass |
| | | 2643.5 | -45 | | 0.1 | | Pass |
| | | 2673.5 | -45 | | 0.3 | | Pass |

| | | | |
|---------------|------------|-------------------|------|
| Test Engineer | Andy Zhu | Temperature | 25°C |
| Test Data | 2017/07/07 | Relative Humidity | 52% |
| Test Mode | 802.11g | Test Site | TR4 |

| Channel | Wanted Signal Mean Power from Companion Device (dBm) | Blocking Signal Frequency (MHz) | Blocking Signal Power (dBm) | Type of Blocking Signal | PER Test Result (%) | Limit (PER) | Test Result |
|---------|---------------------------------------------------------------|------------------------------------------|--------------------------------------|-------------------------------|------------------------------|----------------|----------------|
| 01 | $P_{\min} + 6 \text{ dB}$ | 2300.0 | -45 | CW | 1.9 | < 10% | Pass |
| | | 2330.0 | -45 | | 2.1 | | Pass |
| | | 2360.0 | -45 | | 2.9 | | Pass |
| | | 2380.0 | -51 | | 1.9 | | Pass |
| | | 2503.5 | -51 | | 2.1 | | Pass |
| | | 2523.5 | -45 | | 3.1 | | Pass |
| | | 2553.5 | -45 | | 1.5 | | Pass |
| | | 2583.5 | -45 | | 2.8 | | Pass |
| | | 2613.5 | -45 | | 4.0 | | Pass |
| | | 2643.5 | -45 | | 2.1 | | Pass |
| | | 2673.5 | -45 | | 2.1 | | Pass |
| 13 | $P_{\min} + 6 \text{ dB}$ | 2300.0 | -45 | CW | 0.0 | < 10% | Pass |
| | | 2330.0 | -45 | | 0.0 | | Pass |
| | | 2360.0 | -45 | | 0.5 | | Pass |
| | | 2380.0 | -51 | | 0.0 | | Pass |
| | | 2503.5 | -51 | | 0.2 | | Pass |
| | | 2523.5 | -45 | | 0.1 | | Pass |
| | | 2553.5 | -45 | | 0.0 | | Pass |
| | | 2583.5 | -45 | | 0.1 | | Pass |
| | | 2613.5 | -45 | | 0.3 | | Pass |
| | | 2643.5 | -45 | | 0.0 | | Pass |
| | | 2673.5 | -45 | | 0.3 | | Pass |

5. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| Parameter | Uncertainty |
|-----------------------------------|----------------------------------|
| Occupied Channel Bandwidth | $\pm 5 \%$ |
| RF output power, conducted | $\pm 1,5 \text{ dB}$ |
| Power Spectral Density, conducted | $\pm 3 \text{ dB}$ |
| Unwanted Emissions, conducted | $\pm 3 \text{ dB}$ |
| All emissions, radiated | $\pm 6 \text{ dB}$ |
| Temperature | $\pm 3 \text{ }^{\circ}\text{C}$ |
| Supply voltages | $\pm 3 \%$ |
| Time | $\pm 5 \%$ |

6. List of Measuring Instrument

Receiver Blocking - TR3

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|-------------------------------------|---------------|--------------|-------------|----------------|----------------|
| Wideband Radio Communication Tester | R&S | CMW500 | MRTSUE06243 | 1 year | 2018/02/14 |
| Vector Signal Generator | Agilent | E4438C | MRTSUE06026 | 1 year | 2017/12/06 |
| Directional Coupler | Narda | 4216-20 | MRTSUE06065 | 1 year | 2018/03/28 |
| Power Splitter | Mini-Circuits | ZFRSC-123-S+ | MRTSUE06122 | N/A | N/A |
| Temperature/Humidity Meter | Yuhuaze | HTC-2 | MRTSUE06180 | 1 year | 2017/12/20 |

| Software | Version | Function |
|----------|---------|-------------------|
| e3 | V8.3.5 | EMI Test Software |

The End