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|  |     <p>CERTIFICATE 2518.08</p> <p>MS ISO/IEC 17025 TESTING SAMM NO. 0825</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>MOTOROLA PENANG ADV. COMM. LABORATORY Motorola Solutions Malaysia SDN BHD, Plot 2A, Medan Bayan Lepas, Mukim 12 S.W.D, 11900 Bayan Lepas, Penang, Malaysia.</p> | <p>FCC/ISED TEST REPORT Report Revision : Rev.A</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>Date/s Tested</td><td>: 09-October-2022 to 10-October-2022</td></tr><tr><td>Report Issue Date</td><td>: 10-November-2022</td></tr><tr><td>Manufacturer</td><td>: Motorola Solutions Malaysia SDN BHD</td></tr><tr><td>Manufacturer Address</td><td>: Plot 2A, Medan Bayan Lepas, Mukim 12 SWD, 11900 Bayan Lepas, Penang, Malaysia</td></tr><tr><td>Requestor</td><td>: CHEW LOOI WONG</td></tr><tr><td>Product Type</td><td>: MOBILE</td></tr><tr><td>Product Version (PMN)</td><td>: XPR 5580e</td></tr><tr><td>Model Number (HVIN)</td><td>: AAM28UMN9RA1AN-1 (IC Model: PMUF2011ABUNWA)</td></tr><tr><td>Frequency Band</td><td>: 806 - 870 MHz / 896 - 941 MHz</td></tr><tr><td>Max RF Output Power</td><td>: 36 Watt / 42 Watt</td></tr><tr><td>Applicant Name</td><td>: Motorola Solutions Inc</td></tr><tr><td>Applicant Address</td><td>: 8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322</td></tr><tr><td>ISED Registrations</td><td>: MY0001</td></tr><tr><td>FCC Registrations</td><td>: 461337</td></tr><tr><td>Firmware Version (FVIN)</td><td>: D02.22.02.3002</td></tr></table> <p>The equipment was tested accordance to the requirement listed below:</p> <table><tr><td>(LMR) FCC 47 CFR Part 24 / 90 ISED RSS- Gen Issue 5 / 119 Issue 12</td><td>PASS</td></tr></table> | | Date/s Tested | : 09-October-2022 to 10-October-2022 | Report Issue Date | : 10-November-2022 | Manufacturer | : Motorola Solutions Malaysia SDN BHD | Manufacturer Address | : Plot 2A, Medan Bayan Lepas, Mukim 12 SWD, 11900 Bayan Lepas, Penang, Malaysia | Requestor | : CHEW LOOI WONG | Product Type | : MOBILE | Product Version (PMN) | : XPR 5580e | Model Number (HVIN) | : AAM28UMN9RA1AN-1 (IC Model: PMUF2011ABUNWA) | Frequency Band | : 806 - 870 MHz / 896 - 941 MHz | Max RF Output Power | : 36 Watt / 42 Watt | Applicant Name | : Motorola Solutions Inc | Applicant Address | : 8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322 | ISED Registrations | : MY0001 | FCC Registrations | : 461337 | Firmware Version (FVIN) | : D02.22.02.3002 | (LMR) FCC 47 CFR Part 24 / 90 ISED RSS- Gen Issue 5 / 119 Issue 12 | PASS |
| Date/s Tested | : 09-October-2022 to 10-October-2022 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Report Issue Date | : 10-November-2022 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manufacturer | : Motorola Solutions Malaysia SDN BHD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manufacturer Address | : Plot 2A, Medan Bayan Lepas, Mukim 12 SWD, 11900 Bayan Lepas, Penang, Malaysia | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Requestor | : CHEW LOOI WONG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Product Type | : MOBILE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Product Version (PMN) | : XPR 5580e | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Model Number (HVIN) | : AAM28UMN9RA1AN-1 (IC Model: PMUF2011ABUNWA) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency Band | : 806 - 870 MHz / 896 - 941 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Max RF Output Power | : 36 Watt / 42 Watt | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Applicant Name | : Motorola Solutions Inc | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Applicant Address | : 8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ISED Registrations | : MY0001 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FCC Registrations | : 461337 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Firmware Version (FVIN) | : D02.22.02.3002 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (LMR) FCC 47 CFR Part 24 / 90 ISED RSS- Gen Issue 5 / 119 Issue 12 | PASS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>This report shall not be reproduced without written approval from an officially designated representative of the Motorola Penang Adv. Comm. Laboratory. The results and statements contained in this report pertain only to the device(s) evaluated.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Prepared By:</p>  <p>WAN NUR ATHIRAH Test Personnel</p> | <p>Approved Signatory:</p>  <p>SOON OI MAY Responsible Engineer</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Report Revision History

| Revision History | Description | Date | Originator |
|------------------|----------------|------------------|-----------------|
| Rev. A | Initial Report | 10-November-2022 | WAN NUR ATHIRAH |

1.0 General Information

EUT Description:

| | |
|------------------------|-----------|
| Technologies | LMR, GNSS |
| Modulation Type | FM, 4FSK |

The EUT contains following accessory devices and data cable:

| Item | Brand | Model or P/N |
|---------------------------------------------------------------|----------|--------------|
| COMB, 5dB GAIN, THRU-HOLE, MU, GPS/UHF,806-941MHZ | MOTOROLA | HAF4033A |
| IMPRES 4-WAY NAVIGATION KEYPAD MICROPHONE WITH ENHANCED AUDIO | MOTOROLA | RMN5127C |

General Description of Applied Standards

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

ANSI C63.26-2015

No modifications were done to the UUT to facilitate the tests in this report.

Deviation from standard

Not applicable as no deviation from standard test method

Antenna gain disclaimer

Antenna gain information is provided by customer. The validity of the results is dependent upon this information. The lab will not be held accountable in the event the supplied information affects compliance.

Test configuration of EUT

All relevant configurations involving radio models and accessories (including chargers, batteries, and antennas) were assessed. Only worst case configurations will be included in this report.

2.0 Summary of Test Results

| FCC General Rules Part (47CFR) | ISED General Rules Part | Test Item | Result | Remarks | Serial number tested |
|--------------------------------|-------------------------|---------------------------------------|--------|----------------------------------------------------------------|----------------------|
| 2.1046(a) | RSS-119 | RF Power Output | NA | See NOTE1& NOTE2 | |
| 2.1055, 90.213 | RSS-119 | Frequency Stability | NA | See NOTE1& NOTE2 | |
| 2.1047 | - | Audio Frequency Response | NA | See NOTE1& NOTE2 | |
| 2.1047 | - | Audio Low Pass Filter Response | NA | See NOTE1& NOTE2 | |
| 2.1047 | - | Modulation limiting | NA | See NOTE1& NOTE2 | |
| 2.1049, 90.210 | RSS-119 | Occupied Bandwidth | NA | See NOTE1& NOTE2 | |
| 2.1051 | - | Band Edge Conducted Spurious Emission | NA | See NOTE1& NOTE2 | |
| 90.214 | RSS-119 | Transient Frequency Behavior | NA | See NOTE1& NOTE2 | |
| - | - | Adjacent Channel Power | NA | See NOTE1& NOTE2 | |
| 2.1051, 90.210 | RSS-119 | Conducted Spurious Emissions | NA | See NOTE1& NOTE2 | |
| 2.1051 ,90.210 | RSS-119 | Radiated Spurious Emission | Pass | Worst case Emission: -43.0900 (Noise floor) (Margin: 30.09 dB) | 203TYT0049 |
| - | - | GNSS (EIRP for 1559 – 1610MHz) | NA | See NOTE1& NOTE2 | |
| - | - | Effective Radiated Power (ERP) | NA | See NOTE1& NOTE2 | |

NA → Not Applicable

Note1: Reference data from FCC ID: AZ492FT7083/IC: 109U-92FT7083.

Note2: The LMR section is identical to FCC ID: AZ492FT7083/IC: 109U-92FT7083. Hence the conducted parameters will inherit from FCC ID: AZ492FT7083/IC: 109U-92FT7083. Radiated parameter is repeated as sanity check for the depopulation of components in a different subsection circuitry. As per KDB 484596 D01v01, the applicant takes full responsibility that data referenced represents compliance to the relevant rules for this current FCC ID.

3.0 Measurement Uncertainty

| Measurement | Frequency | Expended Uncertainty (k=1.96) (±) |
|-----------------------------------------------------------------|--------------------|--------------------------------------|
| AC Power Line Conducted Spurious Emission | 150KHz ~ 30MHz | 3.48 dB |
| Radiated Emissions up to 1 GHz dB μ V/m (Field Strength) | 30MHz ~ 1000MHz | 5.88 dB |
| Radiated Emissions above 1 GHz dB μ V/m (Field Strength) | 1GHz ~ 18GHz | 5.84 dB |
| | 18GHz ~ 40GHz | 6.02 dB |
| Radiated Emissions dBm (ERP/EiRP) | 30MHz ~ 18GHz | 4.03 dB |
| Conducted Spurious Emissions | 9kHz ~ 12.75GHz | 2.82 dB |
| Frequency Stability | 9kHz ~ 12.75GHz | 0.0085 ppm |
| Audio Frequency Response / Low Pass Filter Response | 300Hz – 20kHz | 4.09 % |
| Modulation Limiting | 300Hz – 3kHz | 1.15 % |
| Occupied Bandwidth | 9kHz ~ 12.75GHz | 2.82 dB |
| Band Edge Conducted Spurious Emission | 9kHz ~ 12.75GHz | 2.82 dB |
| Transient Frequency Behavior | 9kHz ~ 12.75GHz | 5.4 ms |
| Adjacent Channel Power | 9kHz ~ 12.75GHz | 2.82 dB |

4.0 Equipment List

FCC Analog ATE#1:
Not Applicable

FCC Transient ATE #1:
Not Applicable

FCC CONDUCTED SPUR EMISSION ATE # 1 :
Not Applicable

RADIATED EMISSION STATION:

| Description | Model # | Serial Number | Calibration Date | Calibration Due Date |
|--------------------------|------------------------------|---------------|------------------|----------------------|
| EMI TEST RECEIVER | ESIB26 | 100017 | 09-Aug-22 | 08-Aug-23 |
| 3m Semi-anechoic Chamber | NA | 888032 | No Cal. Req'd | No Cal. Req'd |
| TURNTABLE FLUSH MOUNT 2M | T-200-S | N/A | No Cal. Req'd | No Cal. Req'd |
| PROGRAMMING CONTROLLER | MF-7802BS | N/A | No Cal. Req'd | No Cal. Req'd |
| DC POWER SUPPLY | 6031A | MY41000662 | 28-Jun-22 | 28-Jun-23 |
| SIGNAL ANALYZER | FSV40 | 101103 | 11-Apr-22 | 11-Apr-23 |
| DATA LOGGER | SDL500 | A.016800 | 13-Jun-22 | 13-Jun-23 |
| BILOG ANTENNA | CBL6112D | 30991 | 05-Oct-21 | 05-Jan-23 |
| BILOG ANTENNA | CBL6112B | 2863 | 22-Jun-22 | 22-Jun-23 |
| DRG HORN FREQ. | SAS-571 | 1143 | 24-Feb-21 | 24-Feb-23 |
| DRG HORN FREQ. | SAS-571 | 1027 | 03-Jun-22 | 03-Jun-23 |
| PREAMPLIFIER | PAM-0118P | 270 | 18-Oct-21 | 18-Oct-22 |
| SIGNAL GENERATOR | SMB100A | 180683 | 13-Apr-21 | 13-Apr-24 |
| LOOP ANTENNA | 6502 | 00203479 | 10-Feb-22 | 10-Feb-23 |
| BROAD-BAND HORN ANTENNA | BBHA9170 | BBHA9170255 | 18-Feb-22 | 18-Feb-23 |
| Test Software | EMC_FCC_IC_Bluetooth_RE_Test | | | |
| Version | EMC_FCC_RE_v1.6.4 | | | |

5.0 Test Condition

5.1. Transmitter Test Conditions

| Test Item, (Channel Spacing) | Power (W) | Modulation | Test Frequency (MHz) | Tested By | Environmental conditions |
|----------------------------------------------------------------------------------|--------------|--------------------|--------------------------|--------------|-----------------------------------|
| RF Output Power | NA | NA | NA | | |
| Frequency Stability | NA | NA | NA | | |
| Audio Frequency Response (12.5kHz / 25kHz) | NA | NA | NA | | |
| Audio Low Pass Filter Response (12.5kHz / 25kHz) | NA | NA | NA | | |
| Modulation limiting (12.5kHz / 25kHz) | NA | NA | NA | | |
| Occupied Bandwidth (12.5kHz / 20kHz / 25kHz) | NA | NA | NA | | |
| Band Edge Conducted Spurious Emissions (Part 22) (12.5kHz / 20kHz / 25kHz) | NA | NA | NA | | |
| Transient Frequency Behavior (UHF & VHF Band) (12.5kHz / 25kHz) | NA | NA | NA | | |
| Adjacent Channel Power (700MHz Band) (12.5kHz / 25kHz) | NA | NA | NA | | |
| Conducted Spurious Emissions- (12.5kHz / 25kHz) | NA | NA | NA | | |
| Radiated Spurious Emission (12.5kHz / 25kHz) | Max | Analog, Digital | *900.9875, *901.5000, | Aiman (Fuad) | Temp(Deg): 24.6 Hum(%RH): 55.4 |
| GNSS (EIRP for 1559 - 1610MHz) (12.5kHz / 25kHz) | NA | NA | NA | | |
| Effective Radiated Power (ERP) (12.5kHz / 25kHz) | NA | NA | NA | | |

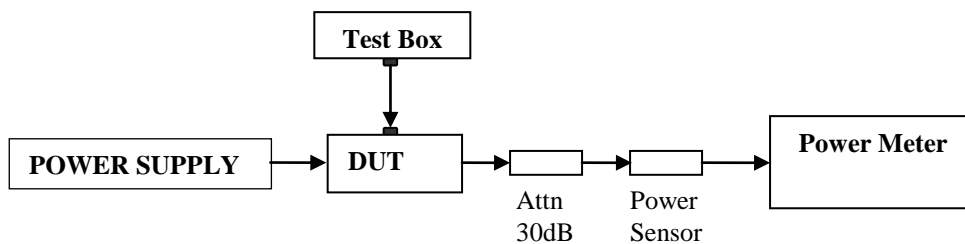
NA → Not Applicable

*The tested channel selected is based on the worst case radiated emission result from FCC ID: AZ492FT7083/IC:109U-92FT7083

6.0 Transmitter Test Parameters

6.1. RF Output Power

6.1.1. Test Setup

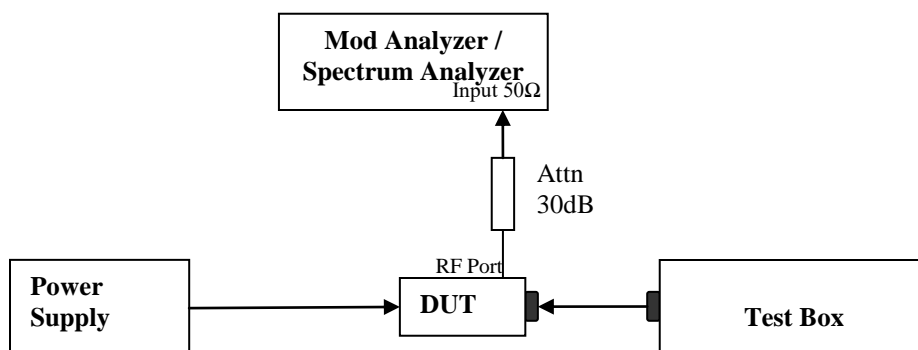


- 1) The DUT transmitter connected to Power Meter using the 30 dB attenuator and power sensor with above setup.
- 2) Path loss for the measurement included.
- 3) All the measurement was done at low, mid, high frequency for each band.
- 4) Record the power into the test report.

6.1.2. Test Result Not Applicable

6.2. Frequency Stability

6.2.1. Test Setup



- 1) The DUT transmitter output port was connected to Modulation / Spectrum Analyzer.
- 2) Path loss for the measurement included.
- 3) Transmit the DUT and record the freq in MCF_{MHz} .
- 4) Test in 2 conditions:
 - Temperature: The frequency of the transmitter was measured from -30°C to 50°C.
 - Supply Voltage:
 - Mobile: The frequency of the transmitter was measured from 85% to 115% of the nominal operating input voltage.
 - Portable: The frequency of the transmitter was measured from nominal $\pm x\%$ as specified by the manufacturer
- 5) Calculate the ppm frequency error by the following:

$$ppm\ error = \left(\frac{MCF_{MHz}}{ACF_{MHz}} - 1 \right) * 10^6$$

Where: MCF_{MHz} is the Measured Carrier Frequency in MHz
 ACF_{MHz} is the Assigned Carrier Frequency in MHz

6.2.2. Test Result

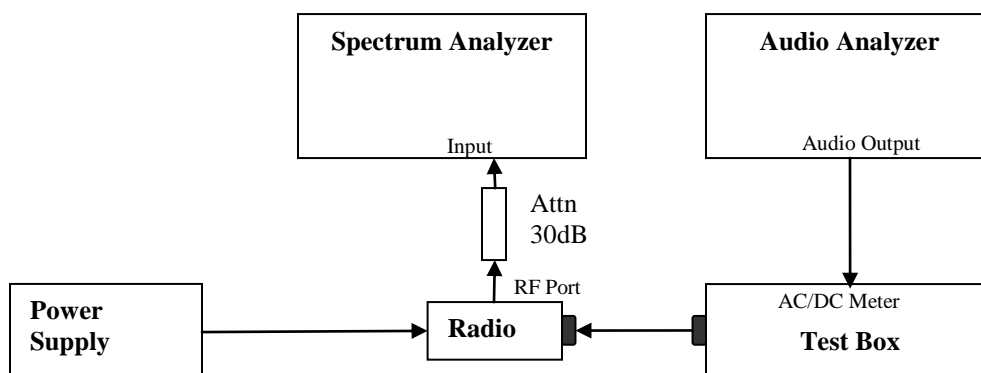
Not Applicable

6.2.3. Test Limit

As per manufacturer declared spec +/- 0.5ppm

6.3. Modulation Characteristics

6.3.1. Test Setup

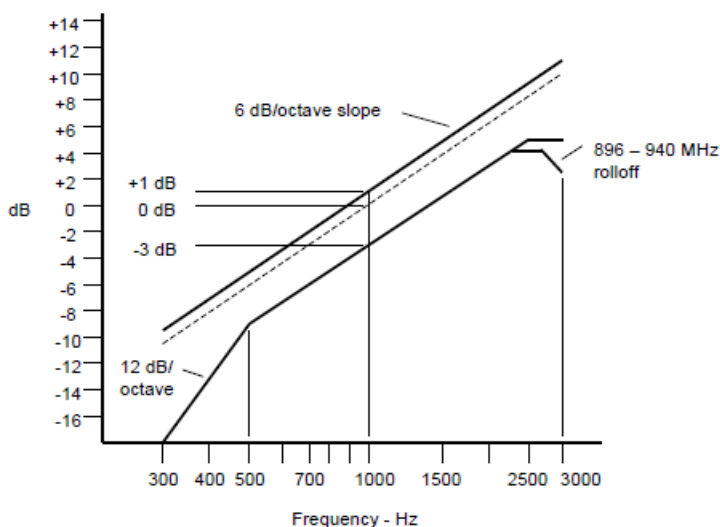


- 1) The DUT transmitter output port was connected to Modulation Analyzer.
- 2) Path loss for the measurement included.
- 3) Set the audio bandwidth filter to 15 kHz and 50 kHz.
- 4) Transmit the radio and set the audio analyzer to 1 kHz audio frequency and 20% of the Full rated system deviation.
- 5) On audio analyzer, set the rated level as 0dB reference
- 6) Vary the audio frequency from 300 Hz to 20 kHz. Record the change in modulation in reference to step 5.

6.3.2. Test Result

Not Applicable

6.3.3. Test Limit

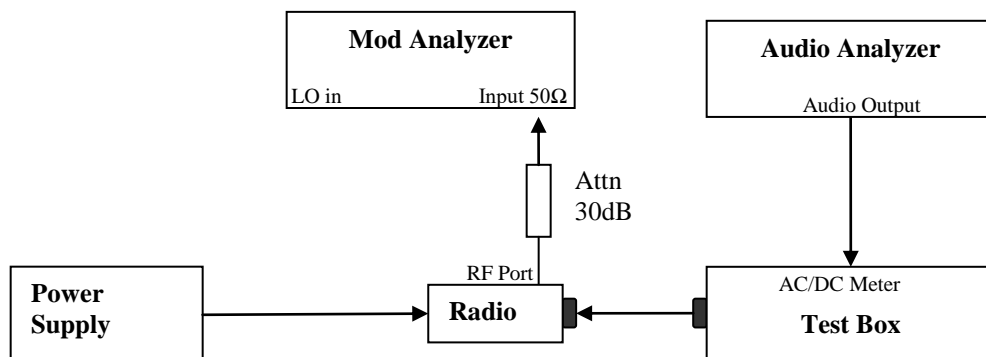


Note:

- o There are additional 6 dB per octave attenuation is allowed from 2.5KHz to 3KHz in equipment 25MHz to 869MHz radio.
- o Additional 6 dB per octave attenuation is allowed from 2.3KHz to 2.7KHz & additional 12 dB per octave attenuation is allowed from 2.7KHz to 3KHz in equipment 896MHz to 940MHz radio.

6.4. Modulation Limiting

6.4.1. Test Setup



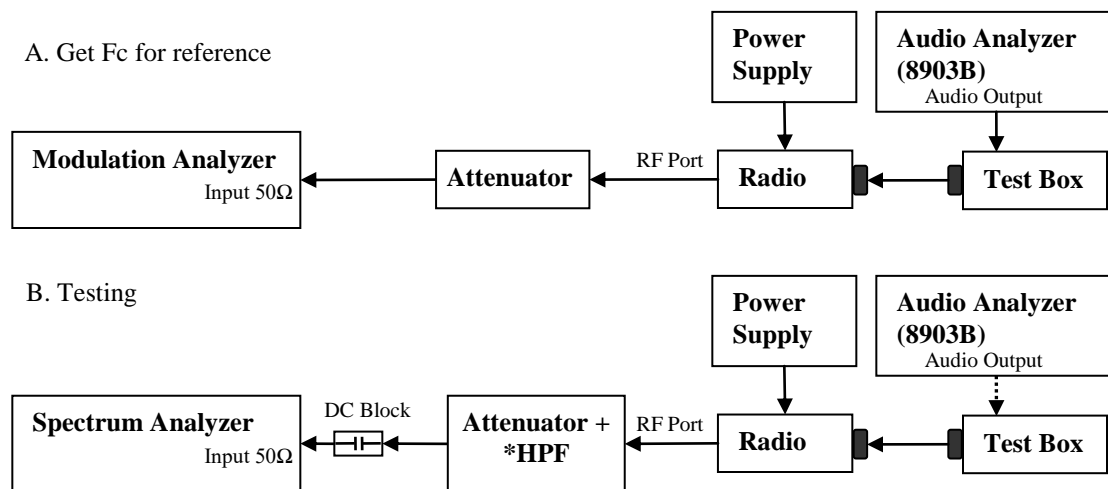
- 1) The DUT transmitter output port was connected to Modulation Analyzer.
- 2) Path loss for the measurement included.
- 3) Set the audio bandwidth filter to 15 kHz.
- 4) Transmit the radio and set the audio analyzer to 1 kHz audio frequency and 60% of the Full rated system deviation.
- 5) Record the frequency deviation as 0dB input level at 1kHz audio frequency.
- 6) Repeat the step and record the frequency deviation from -20 dB to 20dB by 5 dB increments and different audio freq 300 Hz, 2.5 kHz and 3 kHz.

6.4.2. Test Result Not Applicable

6.4.3. Test Limit Modulation Limiting shall not exceed 100 percent.

6.5. Occupied Bandwidth

6.5.1. Test Setup (Analog)



- 1) The DUT transmitter output port was connected to Modulation Analyzer.
- 2) Set the audio bandwidth filter to 15 kHz low pass filter and 50 kHz high pass filter.
- 3) Transmit the radio and set the audio analyzer to 2.5 kHz audio frequency and 50% of the rated deviation. Up the amplitude by 16 dB. Dekey the DUT.
- 4) Path loss for the measurement included.
- 5) Select the Occupied Bandwidth measurement for 99% Emissions Bandwidth Measurement.
- 6) Key in the Fc and Resolution Bandwidth (1 ~ 5 % of emission designator).
- 7) Transmit the DUT and record the occupied Bandwidth frequency.
- 8) Preset the spectrum analyzer for sideband spectrum measurement.
- 9) Set the span and Resolution Bandwidth (according to FCC/ ISED standard).
- 10) Save the screen shot as modulated signal
- 11) Remove the audio tone from audio analyzer to capture unmodulated signal.

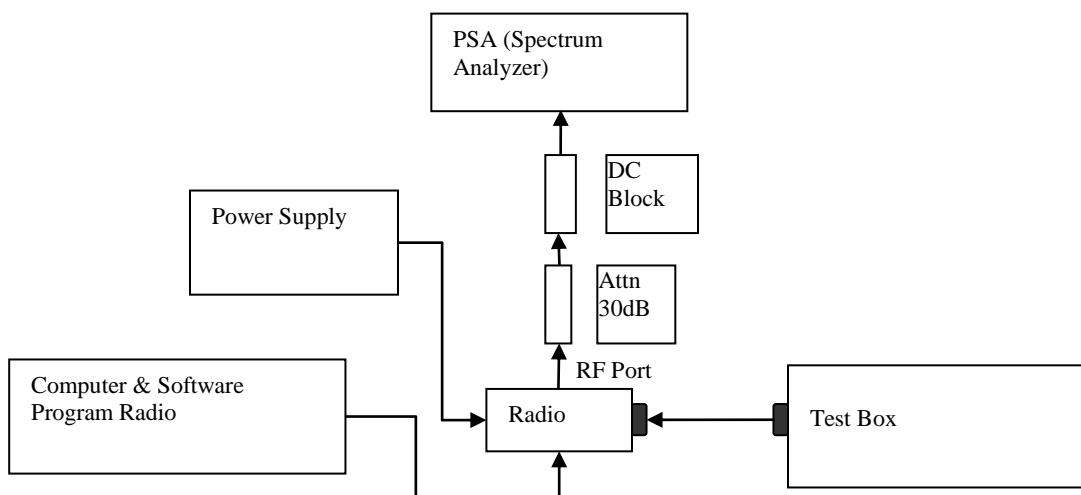
* Only HPF added for Mask 80.211 measurement with attenuator.

* 99% Bandwidth measurement is computed by the spectrum analyzer and is consistent with the C63.26 5.4.4 method.

6.5.2. Test Result (Analog)

Not Applicable

6.5.3. Test Setup (Digital)



- 1) Program and set radio to operate in desire test frequency and digital mode with modulation. (*4FSK, C4FM or other digital modulation form).
- 2) Path loss for the measurement included.
- 3) Select the Occupied Bandwidth measurement for 99% Emissions Bandwidth Measurement.
- 4) Key in the Fc and Resolution Bandwidth (1 ~ 5 % of emission designator).
- 5) Transmit the DUT and record the occupied Bandwidth frequency.
- 6) Preset the spectrum analyzer for modulation emission spectrum measurement.
- 7) Set the span and Resolution Bandwidth (according to FCC/ ISED standard).
- 8) Capture the screen shot as modulated signal.

* 99% Bandwidth measurement is computed by the spectrum analyzer and is consistent with the C63.26 5.4.4 method.

*Note:

- For Digital Modulation, 12.5 kHz Data F1D & FXD would be the same. Therefore only measurements with F1D modulation shown below.
- For Digital Modulation, 12.5 kHz Data F1E & FXE would be the same. Therefore only measurements with F1E modulation shown below.

6.5.4. Test Result (Digital)

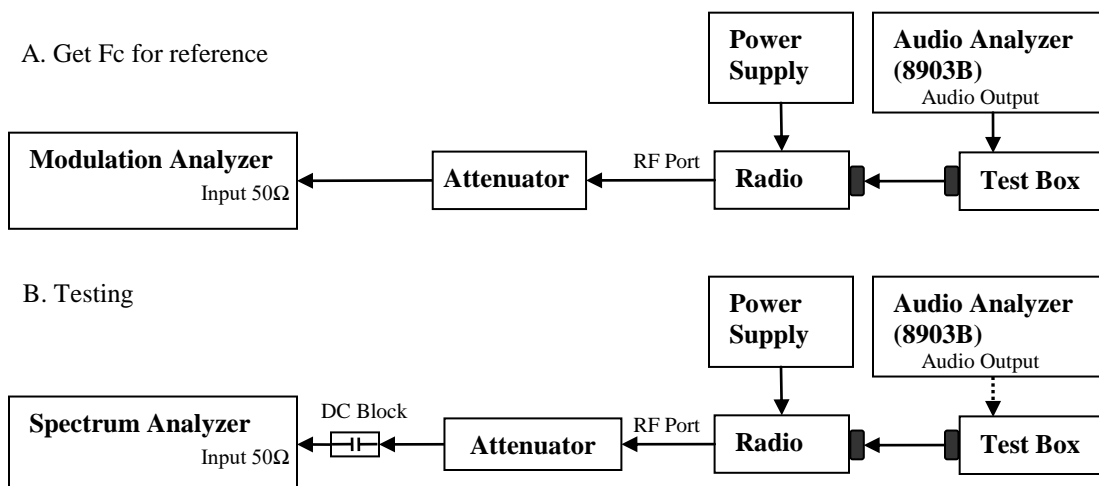
Not Applicable

6.5.5. Test Limit

The 99% occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

6.6. Band Edge Conducted Spurious Emission (Part 22)

6.6.1. Test Setup (Analog)



- 1) The DUT transmitter output port was connected to Modulation Analyzer.
- 2) Set the audio bandwidth filter to 15 kHz low pass filter and 50 kHz high pass filter.
- 3) Transmit the radio and set the audio analyzer to 2.5 kHz audio frequency and 50% of the rated deviation. Up the amplitude by 16 dB. Dekey the DUT.
- 4) Path loss for the measurement included.
- 5) Select the Occupied Bandwidth measurement for 99% and 26dB Emissions Bandwidth Measurement.
- 6) Key in the Fc and Resolution Bandwidth.
- 7) Transmit the DUT and record the occupied Bandwidth frequencies.
- 8) Preset the spectrum analyzer for band edge measurement.
- 9) The band edges of lowest and highest channels were measured.
- 10) Key in the Lowest and highest channel frequency, span is 60 kHz and Resolution Bandwidth is at least 1% of Emission Bandwidth.
- 11) Save the screen shot as modulated signal.
- 12) Remove the audio tone from audio analyzer to capture unmodulated signal.

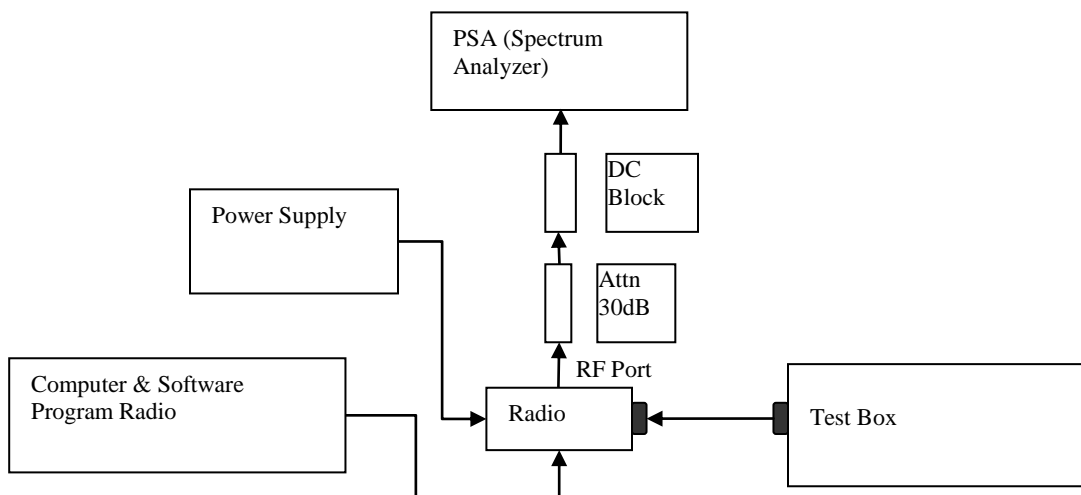
*Note:

- For emission designator ending with F3E, 16K0F3E is the worst case and therefore only 16K0F3E will be shown.

6.6.2. Test Result (Analog)

Not Applicable

6.6.3. Test Setup (Digital)



- 1) Program and set radio to operate in desire test frequency and digital mode with modulation. (*4FSK, C4FM or other digital modulation form).
- 2) Path loss for the measurement included.
- 3) Select the Occupied Bandwidth measurement for 99% and 26dB Emissions Bandwidth Measurement.
- 4) Key in the Fc and Resolution Bandwidth.
- 5) Transmit radio record the occupied Bandwidth frequencies.
- 6) Preset the spectrum analyzer for band edge measurement.
- 7) Key in the lowest and highest channels frequency, span is 60 kHz and Resolution Bandwidth is at least 1% of Emission Bandwidth.
- 8) Save the screen shot.

*Note:

- For Digital Modulation, 12.5 kHz Data F1D & FXD would be the same. Therefore only measurements with F1D modulation shown below.
- For Digital Modulation, 12.5 kHz Data F1E & FXE would be the same. Therefore only measurements with F1E modulation shown below.

6.6.4. Test Result (Digital)

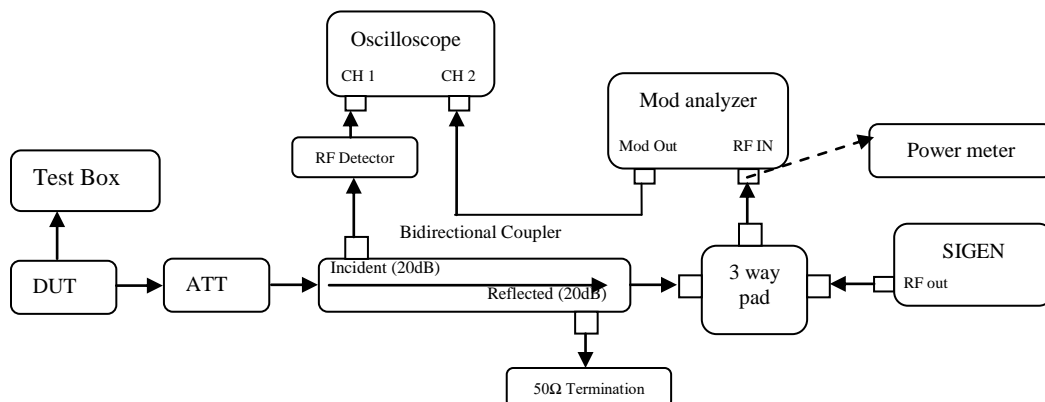
Not Applicable

6.6.5. Test 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.

6.7. Transient Frequency Behavior

6.7.1. Test Setup



- 1) Connect the setup as figure above.
- 2) Path loss for the measurement included.
- 3) Set on Siggen with the assigned center frequency, internal 1 kHz FM tone.
FM Deviation: Analog 25kHz Channel Spacing = 25 kHz
Analog 12.5 kHz Channel Spacing = 12.5 kHz
C4FM = 12.5 kHz
- 4) Turn on 50 kHz high pass filter and 15 kHz low pass filter on modulation analyzer.
- 5) Supply sufficient attenuation ATT to provide the output power of $\leq -11\text{dBm}$ into power meter when DUT is keying up.
- 6) Note the power level on power meter and dekey the DUT.
- 7) Adjust the amplitude of the signal generator to the level power meter, maintained the amplitude throughout the rest of the measurement.
- 8) Connect the output to modulation analyzer.
- 9) Reduce 30dB attenuation and transmit the radio to get the trigger line.
- 10) Capture the screen shot for key-up (rising edge) and de-key (falling edge) mode.

6.7.2. Test Result

Not Applicable

6.7.3. Test Limit

Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

| Time intervals ^{1 2} | Maximum frequency difference ³ | All equipment | |
|-------------------------------------------------------------------------------------|-------------------------------------------|----------------|----------------|
| | | 150 to 174 MHz | 421 to 512 MHz |
| Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels | | | |
| t ₁ ⁴ | ±25.0 kHz | 5.0 ms | 10.0 ms |
| t ₂ | ±12.5 kHz | 20.0 ms | 25.0 ms |
| t ₃ ⁴ | ±25.0 kHz | 5.0 ms | 10.0 ms |
| Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels | | | |
| t ₁ ⁴ | ±12.5 kHz | 5.0 ms | 10.0 ms |
| t ₂ | ±6.25 kHz | 20.0 ms | 25.0 ms |
| t ₃ ⁴ | ±12.5 kHz | 5.0 ms | 10.0 ms |
| Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels | | | |
| t ₁ ⁴ | ±6.25 kHz | 5.0 ms | 10.0 ms |
| t ₂ | ±3.125 kHz | 20.0 ms | 25.0 ms |
| t ₃ ⁴ | ±6.25 kHz | 5.0 ms | 10.0 ms |

¹ t_{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.

t_1 is the time period immediately following t_{on} .

t_2 is the time period immediately following t_1 .

t_3 is the time period from the instant when the transmitter is turned off until t_{off} .

t_{off} is the instant when the 1 kHz test signal starts to rise.

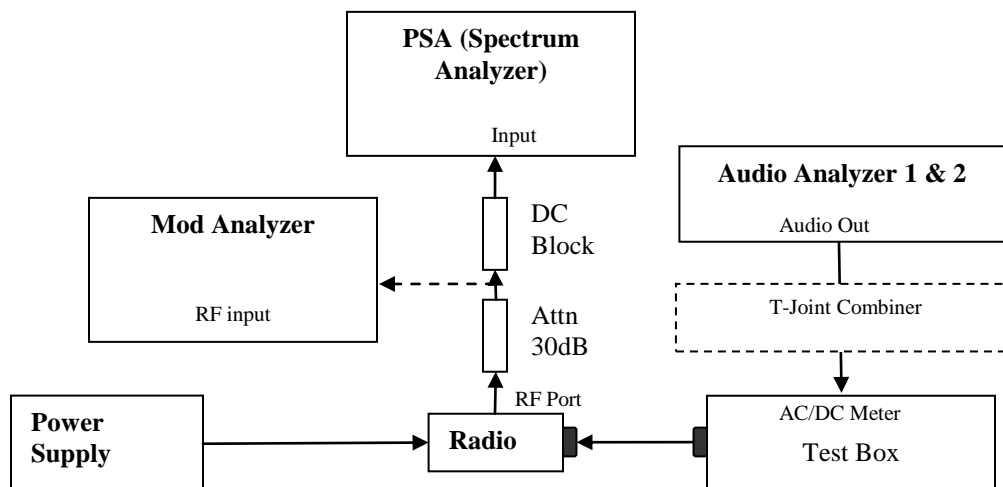
² During the time from the end of t_2 to the beginning of t_3 , the frequency difference must not exceed the limits specified in §90.213.

³ Difference between the actual transmitter frequency and the assigned transmitter frequency.

⁴ If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

6.8. Adjacent Channel Power

6.8.1. Test Setup (Analog)

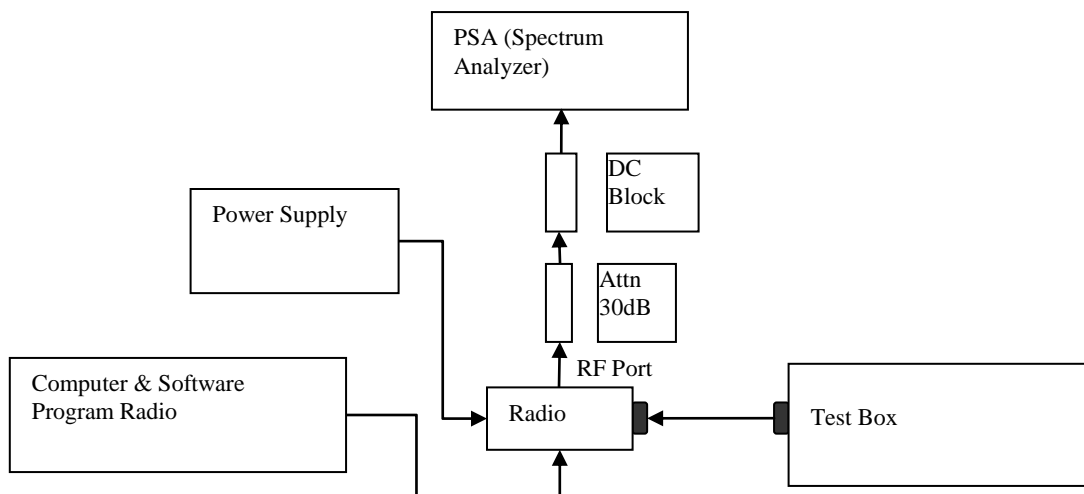


- 1) The DUT transmitter output port was connected to modulation analyzer.
- 2) Transmit the radio and turn on 1st audio analyzer with audio frequency 650Hz, 50% rated deviation, and record the amplitude value as AmpT1.
- 3) Turn off Audio analyzer 1 and turn on audio analyzer 2, set the audio frequency to 2.2 kHz and 50% deviation. Record the amplitude as AmpT2.
- 4) Turn both audio analyzers ON and up 10dB amplitude level.
- 5) Connect the output to PSA and set to assigned center frequency.
- 6) Set Span, Resolution Bandwidth and Video Bandwidth per rules part.
- 7) Transmit the radio and record the Adjacent Channel Power value in dBc.

6.8.2. Test Result

Not Applicable

6.8.3. Test Setup (Digital)



- 1) Program and set radio to operate in desire test frequency and digital mode with modulation. (4FSK, C4FM or other digital modulation form).
- 2) Prepare setup as per picture.
- 3) Turn on the ACP Measurement – Press Measure, ACP.
- 4) Set Span, Resolution Bandwidth and Video Bandwidth as per rules part.
- 5) Transmit the radio and record the Adjacent Channel Power value in dBc.

6.8.4. Test Result

Not Applicable

6.8.5. Test Limit

12.5 kHz MOBILE TRANSMITTER ACP REQUIREMENTS

| Offset from center frequency (kHz) | Measurement bandwidth (kHz) | Maximum ACP relative (dBc) |
|------------------------------------|-----------------------------|----------------------------|
| 9.375 | 6.25 | -40 |
| 15.625 | 6.25 | -60 |
| 21.875 | 6.25 | -60 |
| 37.50 | 25.00 | -60 |
| 62.50 | 25.00 | -65 |
| 87.50 | 25.00 | -65 |
| 150.00 | 100 | -65 |
| 250.00 | 100 | -65 |
| 350.00 | 100 | -65 |
| >400 to 12 MHz | 30 (s) | -75 |
| 12 MHz to paired receive band | 30 (s) | -75 |
| In the paired receive band | 30 (s) | -100 |

25 kHz MOBILE TRANSMITTER ACP REQUIREMENTS

| Offset from center frequency (kHz) | Measurement bandwidth (kHz) | Maximum ACP relative (dBc) |
|------------------------------------|-----------------------------|----------------------------|
| 15.625 | 6.25 | -40 |
| 21.875 | 6.25 | -60 |
| 37.50 | 25 | -60 |
| 62.50 | 25 | -65 |
| 87.50 | 25 | -65 |
| 150.00 | 100 | -65 |
| 250.00 | 100 | -65 |
| 350.00 | 100 | -65 |
| >400 kHz to 12 MHz | 30 (s) | -75 |
| 12 MHz to paired receive band | 30 (s) | -75 |
| In the paired receive band | 30 (s) | -100 |

12.5 kHz BASE TRANSMITTER ACP REQUIREMENTS

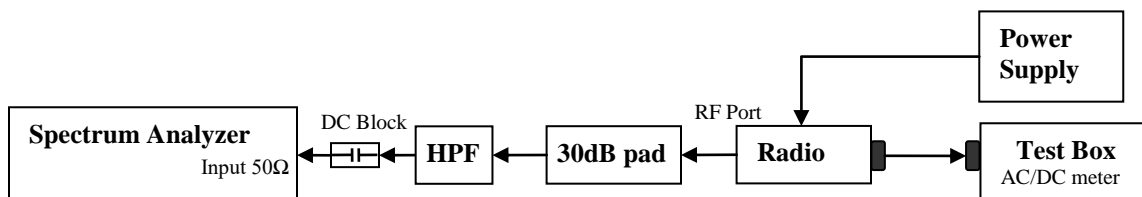
| Offset from center frequency (kHz) | Measurement bandwidth (kHz) | Maximum ACP (dBc) |
|------------------------------------|-----------------------------|-------------------|
| 9.375 | 6.25 | -40 |
| 15.625 | 6.25 | -60 |
| 21.875 | 6.25 | -60 |
| 37.5 | 25 | -60 |
| 62.5 | 25 | -65 |
| 87.5 | 25 | -65 |
| 150 | 100 | -65 |
| 250 | 100 | -65 |
| 350.00 | 100 | -65 |
| >400 kHz to 12 MHz | 30 (s) | -80 |
| 12 MHz to paired receive band | 30 (s) | -80 |
| In the paired receive band | 30 (s) | -85 |

25 kHz BASE TRANSMITTER ACP REQUIREMENTS

| Offset from center frequency (kHz) | Measurement bandwidth (kHz) | Maximum ACP (dBc) |
|------------------------------------|-----------------------------|-------------------|
| 15.625 | 6.25 | -40 |
| 21.875 | 6.25 | -60 |
| 37.5 | 25 | -60 |
| 62.5 | 25 | -65 |
| 87.5 | 25 | -65 |
| 150 | 100 | -65 |
| 250 | 100 | -65 |
| 350 | 100.00 | -65 |
| >400 kHz to 12 MHz | 30 (s) | -80 |
| 12 MHz to paired receive band | 30 (s) | -80 |
| In the paired receive band | 30 (s) | -85 |

6.9. Conducted Spurious Emission

6.9.1. Test Setup



- 1) The DUT transmitter output port was connected to Spectrum Analyzer with above setup.
- 2) Program and set radio to operate in desire test frequency and mode. (Analog / digital modulation form).
- 3) Path loss for the measurement included.
- 4) Set the PSA Resolution Bandwidth as per rules part.
- 5) Set the Ref offset from the pathloss offset calibration file.
- 6) Adjust the center frequency of the spectrum analyzer for incremental coverage of the range from:
 - a. 9 KHz to $F_c - \text{Test Bandwidth}$
 - b. $F_c + \text{Test Bandwidth}$ to $2F_c - 5\text{MHz}$.
- 7) Key up the DUT, Peak Search the highest Spur and record the levels of spurious emissions
- 8) Dekey the DUT.
- 9) Turn On High Pass Filter path and Key up the DUT.
- 10) Adjust the PSA Freq for incremental coverage of range from $2F_c$ to $10F_c$
- 11) Key up the DUT and record the highest spur levels of spurious emissions.

6.9.2. Test Result (Analog)
Not Applicable

6.9.3. Test Result (Digital)
Not Applicable

6.9.4. Test Limit

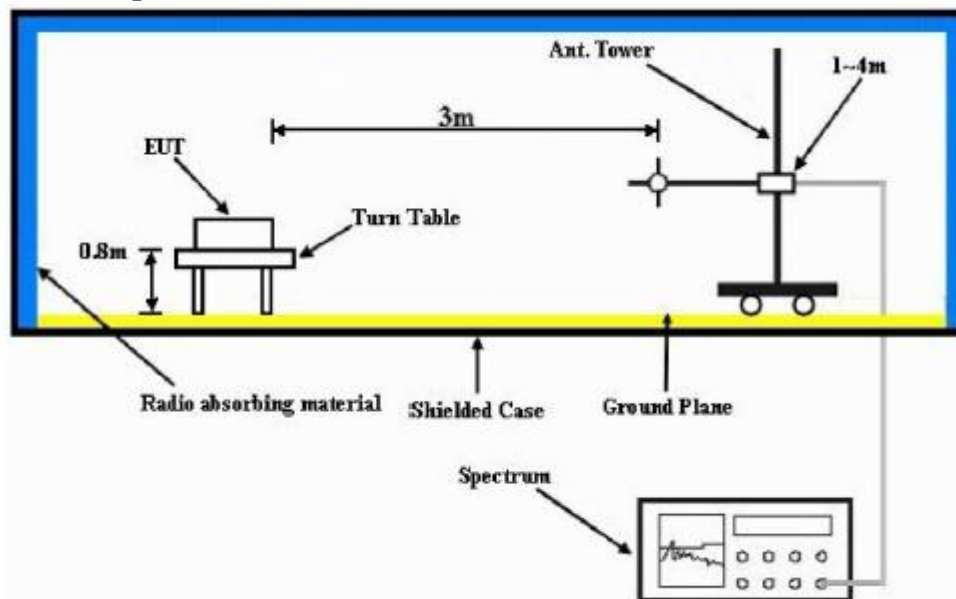
Table below summarized the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least

| Channel Spacing | Part 22 | Part 24D | Part 74 | Part 80 | Part 90 (UHF, VHF, 800, 900) | Part 90 (700) |
|-----------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
| 12.5kHz | 43 + log ₁₀ (P) (-13 dBm) | 43 + log ₁₀ (P) (-13 dBm) | 43 + log ₁₀ (P) (-13 dBm) | Not Applicable | 50 + log ₁₀ (P) (-20 dBm) | 43 + log ₁₀ (P) (-13 dBm) |
| 25kHz | | Not Applicable | | 43 + log ₁₀ (P) (-13 dBm) | 43 + log ₁₀ (P) (-13 dBm) | 43 + log ₁₀ (P) (-13 dBm) |

| Channel Spacing | RSS 134 | RSS 182 | RSS 119 (UHF, VHF, 800, 900) | RSS 119 (700) |
|-----------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
| 12.5kHz | 43 + log ₁₀ (P) (-13 dBm) | Not Applicable | 50 + log ₁₀ (P) (-20 dBm) | 43 + log ₁₀ (P) (-13 dBm) |
| 25kHz | Not Applicable | 43 + log ₁₀ (P) (-13 dBm) | 43 + log ₁₀ (P) (-13 dBm) | 43 + log ₁₀ (P) (-13 dBm) |

6.10. Radiated Spurious Emission

6.10.1. Test Setup



- 1) The Resolution Bandwidth for scanning Radiated Emission below 1 GHz is 100 kHz with Video Bandwidth = 300 kHz and Resolution Bandwidth for above 1 GHz is 1 MHz with Video Bandwidth = 3 MHz. Detector mode is positive peak.
- 2) In the semi- anechoic chamber, setup as illustrated above the DUT placed on the 0.8m height (for $F_c < 1\text{GHz}$) or 1.5m height (for $F_c > 1\text{GHz}$) 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.
- 3) The substitution antenna is substituted for DUT at the same position and signals generator (S.G) export the CW signal to the substitution antenna via a TX cable. The receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum radiation power. Record the power level of maximum radiation power from spectrum. So, the measured substitution value = Ref level of S.G + TX cables loss – Substituted Antenna Gain.
- 4) Final Radiated Spurious Emission = “Read Value” + Measured substitution value.

6.10.4. Test Limit

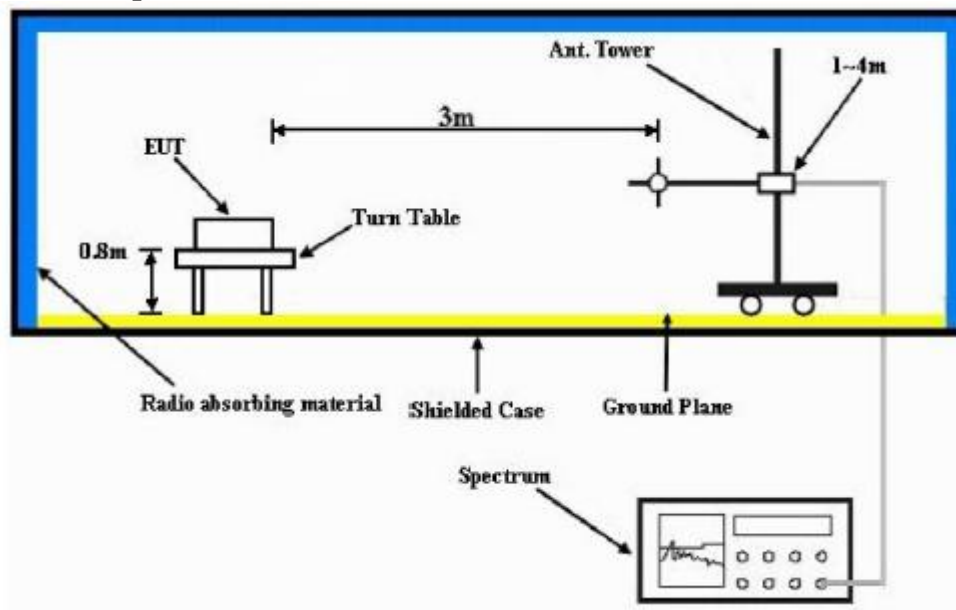
Table below summarized the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least

| Channel Spacing | Part 22 | Part 24D | Part 74 | Part 80 | Part 90 (UHF, VHF, 800, 900) | Part 90 (700) |
|-----------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
| 12.5kHz | 43 + log ₁₀ (P) (-13 dBm) | 43 + log ₁₀ (P) (-13 dBm) | 43 + log ₁₀ (P) (-13 dBm) | Not Applicable | 50 + log ₁₀ (P) (-20 dBm) | 43 + log ₁₀ (P) (-13 dBm) |
| 25kHz | | Not Applicable | | 43 + log ₁₀ (P) (-13 dBm) | 43 + log ₁₀ (P) (-13 dBm) | 43 + log ₁₀ (P) (-13 dBm) |

| Channel Spacing | RSS 134 | RSS 182 | RSS 119 (UHF, VHF, 800, 900) | RSS 119 (700) |
|-----------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
| 12.5kHz | 43 + log ₁₀ (P) (-13 dBm) | Not Applicable | 50 + log ₁₀ (P) (-20 dBm) | 43 + log ₁₀ (P) (-13 dBm) |
| 25kHz | Not Applicable | 43 + log ₁₀ (P) (-13 dBm) | 43 + log ₁₀ (P) (-13 dBm) | 43 + log ₁₀ (P) (-13 dBm) |

6.11. Effective Radiated Power (ERP)

6.11.1. Test Setup



- 1) The Resolution Bandwidth for Equivalent Radiated Power (ERP) below 1 GHz is 100 kHz with Video Bandwidth = 300 kHz and Resolution Bandwidth for EIRP above 1 GHz is 1 MHz with Video Bandwidth = 3 MHz. Detector Mode is RMS.
- 2) In the semi-anechoic chamber, setup as illustrated above the DUT placed on the 0.8m height (for $F_c < 1\text{GHz}$) or 1.5m (for $F_c > 1\text{GHz}$) of Turn Table, rotated the table 45 degree each interval 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 for each degree interval. The "Read Value" is the spectrum reading of maximum power value.
- 3) The substitution antenna is substituted for DUT at the same position and signals generator (S.G) export the CW signal to the substitution antenna via a TX cable. The receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum radiation power. Record the power level of maximum radiation power from spectrum. So, the Measured substitution value = Ref level of S.G + TX cables loss – Substituted Antenna Gain.

6.11.2. Test Result

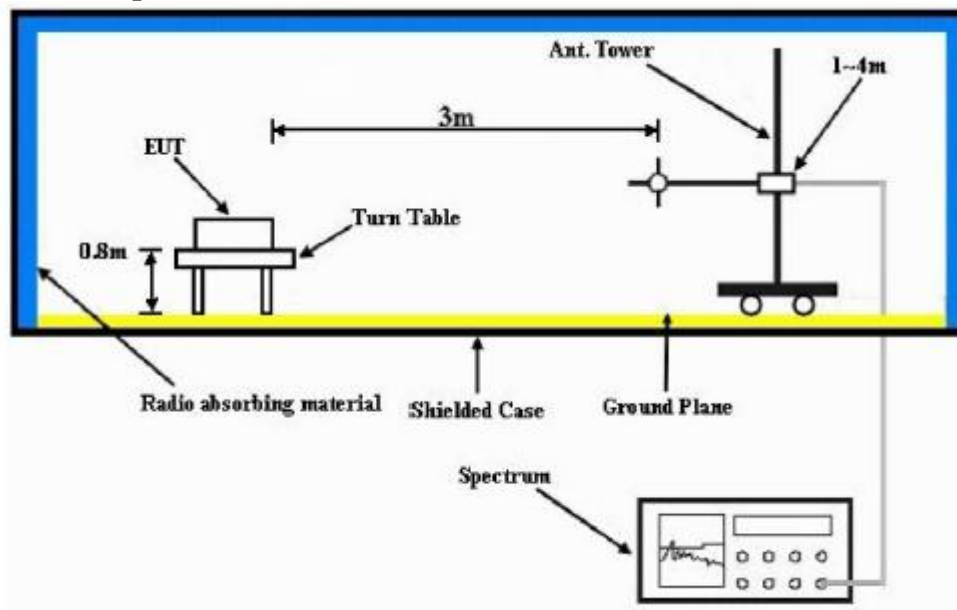
Not Applicable

6.11.3. Test Limit

The maximum output power of the transmitter for mobile stations is 100 watts (20 dB). Power is given in terms of effective radiated power (ERP).

6.12. GNSS (EIRP for 1559 - 1610MHz)

6.12.1. Test Setup



- 4) The Resolution Bandwidth for Equivalent Isotropically Radiated Power (EIRP) below 1 GHz is 100 kHz with Video Bandwidth = 300 kHz and Resolution Bandwidth for EIRP above 1 GHz is 1 MHz with Video Bandwidth = 3 MHz. Detector Mode is RMS.
- 5) In the semi-anechoic chamber, setup as illustrated above the DUT placed on the 0.8m height of Turn Table, rotated the table 45 degree each interval 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 for each degree interval. The “Read Value” is the spectrum reading of maximum power value.
- 6) The substitution antenna is substituted for DUT at the same position and signals generator (S.G) export the CW signal to the substitution antenna via a TX cable. The receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum radiation power. Record the power level of maximum radiation power from spectrum. So, the Measured substitution value = Ref level of S.G + TX cables loss – Substituted Antenna Gain.
- 7) $EIRP = \text{“Read Value”} + \text{Measured substitution value} + 2.15$.

6.12.1. Test Result

Not Applicable

6.12.2. Test Limit

For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

~ End of Test Report ~