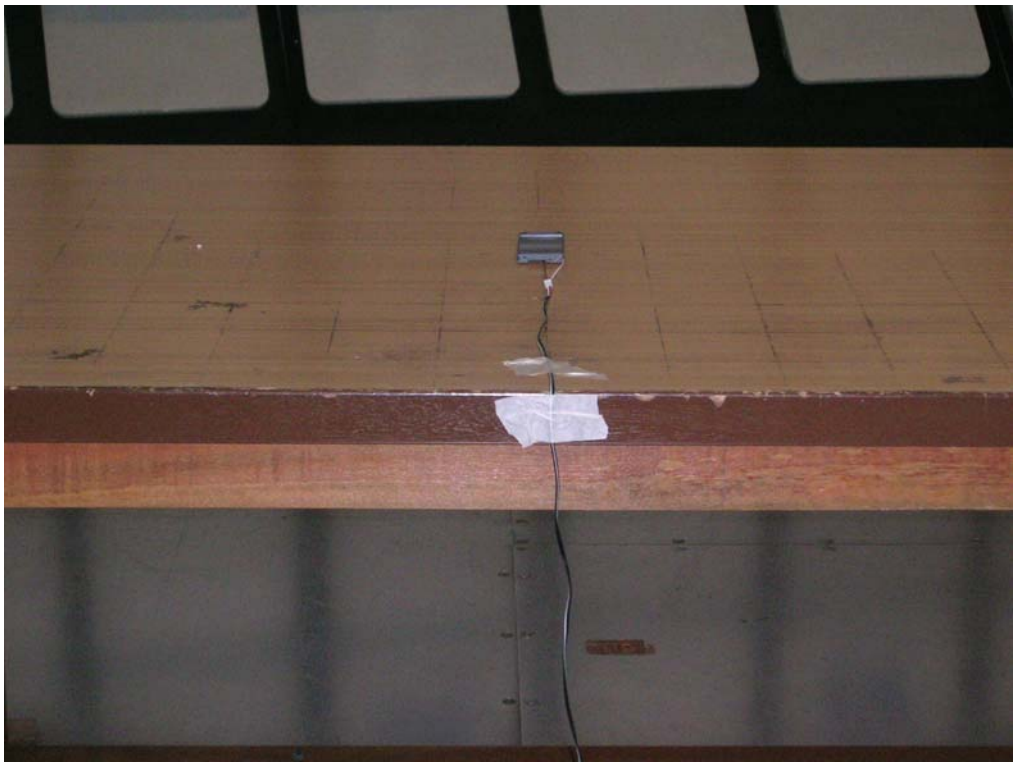
Conducted Emissions Setup (Front View)

Conducted Emissions Setup (Rear View)

Radiated Emissions Setup (Front View)



Radiated Emissions Setup (Rear View)

FCC Part 15C (15.247(a)(1)) Carrier Frequency Separation Results

The EUT shows compliance to the requirements of this section, which states the adjacent carrier frequencies must be separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

Adjacent Channels	Channel Separation (MHz)
1 and 2 (2.403GHz and 2.404GHz)	1.015
38 and 39 (2.440GHz and 2.441GHz)	1.015
77 and 78 (2.479GHz and 2.480GHz)	1.005

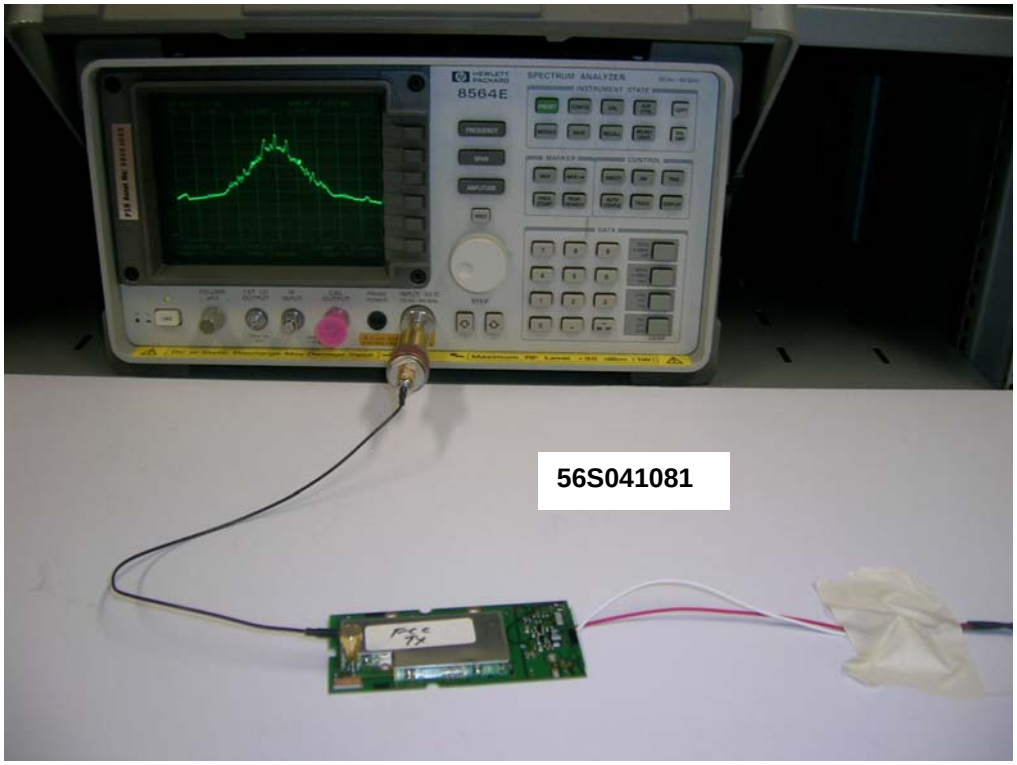
Please refer to the attached Plots 1 - 3 for details.

Tested by: Lim Cher Hwee

Notes :

1. Environmental Conditions

Temperature	25°C
Relative Humidity	59%
Atmospheric Pressure	1030mbar



Carrier Frequency Separation Measurement Test Setup

FCC Part 15C (15.247(a)(1)) Spectrum Bandwidth (20dB Bandwidth Measurement) Results

The EUT shows compliance to the requirements of this section, which states that the 20dB bandwidth of the hopping channel shall be the channel frequency separation by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

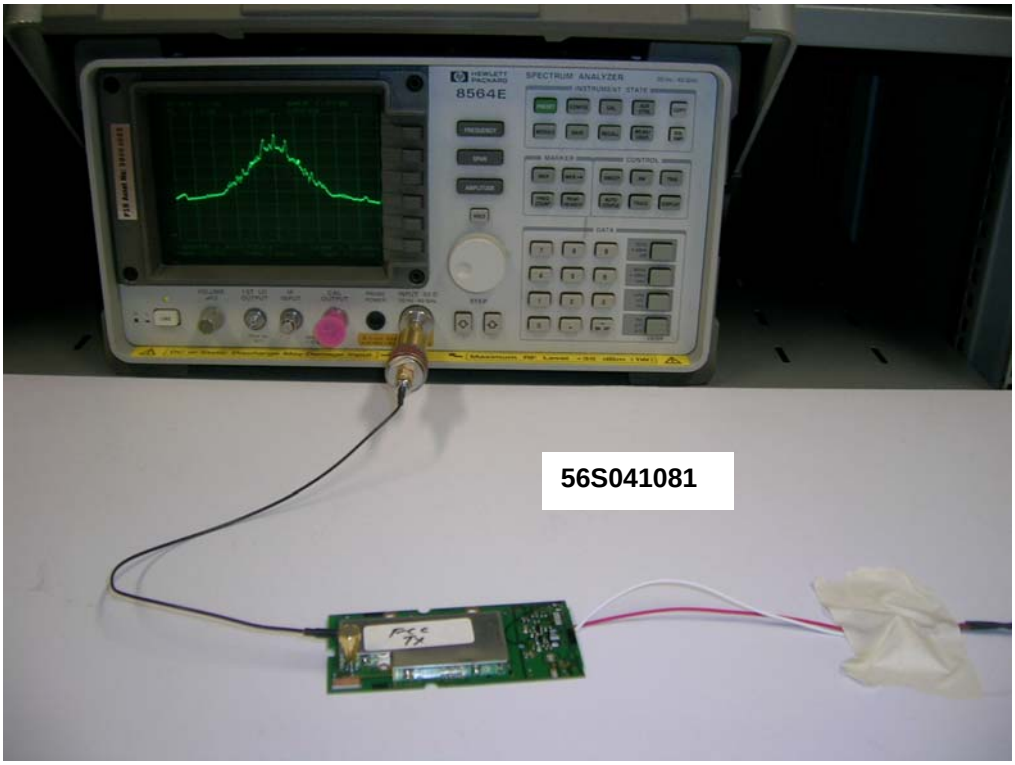
Channel	Channel Frequency (GHz)	20dB Bandwidth (MHz)
1	2.403	0.635
39	2.441	0.695
78	2.480	0.630

Please refer to attached Plots 4 - 6 for details.

Tested by: Lim Cher Hwee

Notes :

1. Environmental Conditions — Temperature 25°C; Relative Humidity 59%; Atmospheric Pressure 1030mbar



Spectrum Bandwidth Measurement Test Setup

FCC Part 15C (15.247(a)(1)(iii)) Number of Hopping Frequencies Results

The EUT shows compliance to the requirements of this section, which states the number of hopping frequencies shall be at least 15.

The EUT was found t to have 69 hopping frequencies.

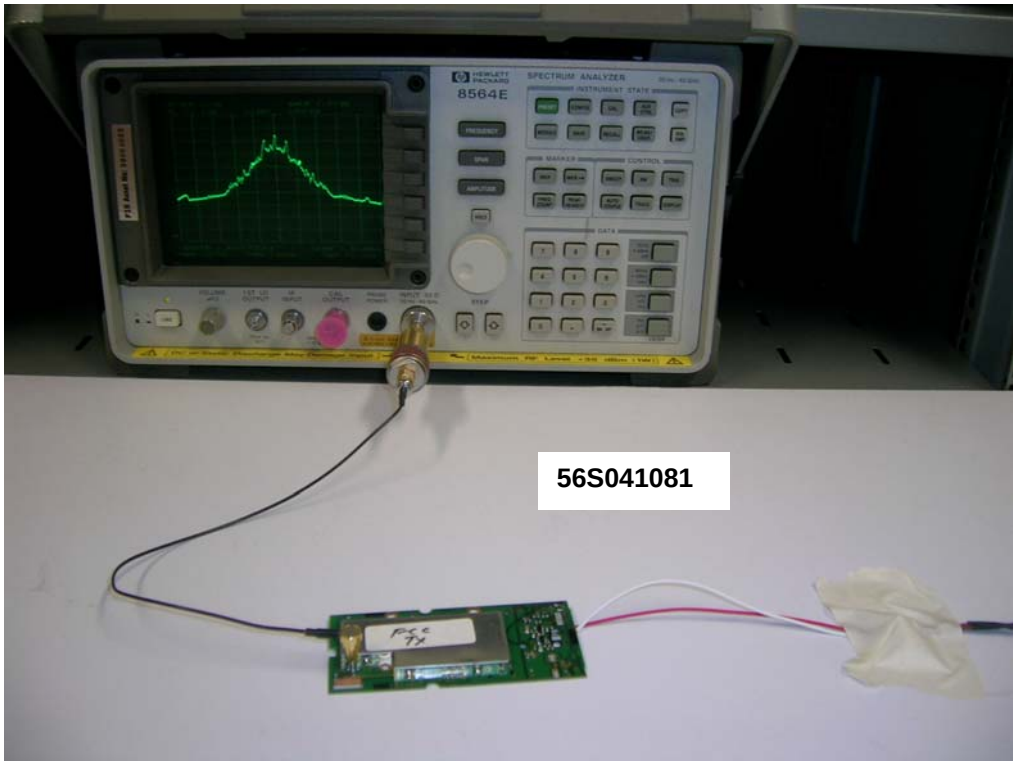
Following channels are not used after initialisation: 0, 8, 16, 24, 32, 40, 48, 56, 64, 72 (as detailed in the Operational Description).

Please refer to the attached Plots 7 - 10 for details.

Tested by: Lim Cher Hwee

Notes :

1.	Environmental Conditions	Temperature	25°C
		Relative Humidity	59%
		Atmospheric Pressure	1030mbar



Number of Hopping Frequencies Measurement Test Setup

FCC Part 15C (15.247(a)(1)(iii)) Average Frequency Dwell Time Results

The EUT shows compliance to the requirements of this section, which states the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a period of 0.4second multiplied by the number of hopping channels employed.

EUT hopping rate = 400 hops/s
Number of EUT hopping frequencies = 69 hops

Average Frequency Dwell Time = measured time slot length (l) x hopping rate (h) / number of hopping frequencies x 30 seconds period

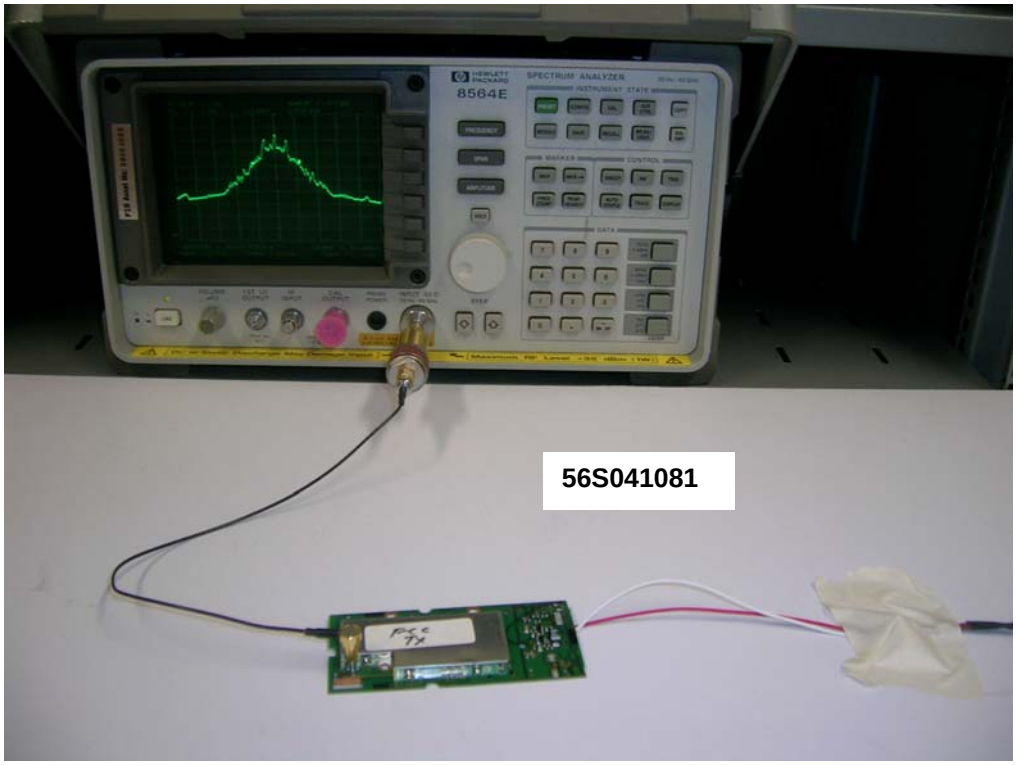
Channel	Channel Frequency (GHz)	Measured Time Slot Length for Packet(ms)	Average Frequency Dwell Time (s)	Average Occupancy Limit (s)
1	2.403	1.2500	0.2415	0.4
39	2.441	1.2500	0.2415	0.4
78	2.480	1.2500	0.2415	0.4

Please refer to the attached Plots 11 – 13 for measured time slot length details.

Tested by: Lim Cher Hwee

Notes :

1. Environmental Conditions — Temperature 25°C; Relative Humidity 59%; Atmospheric Pressure 1030mbar



Average Frequency Dwell Time Measurement Test Setup

FCC Part 15C (15.247(b)(1)) Maximum Peak Power Results

The EUT shows compliance to the requirements of this section, which states the peak power of an intentional radiator (EUT) shall not exceed 21dBm (0.125 Watt) for other frequency hopping systems.

The maximum peak power for Channels 1, 39 and 78 at 2.403GHz, 2.441GHz and 2.480GHz respectively were investigated and found below 21dBm (0.125Watt).

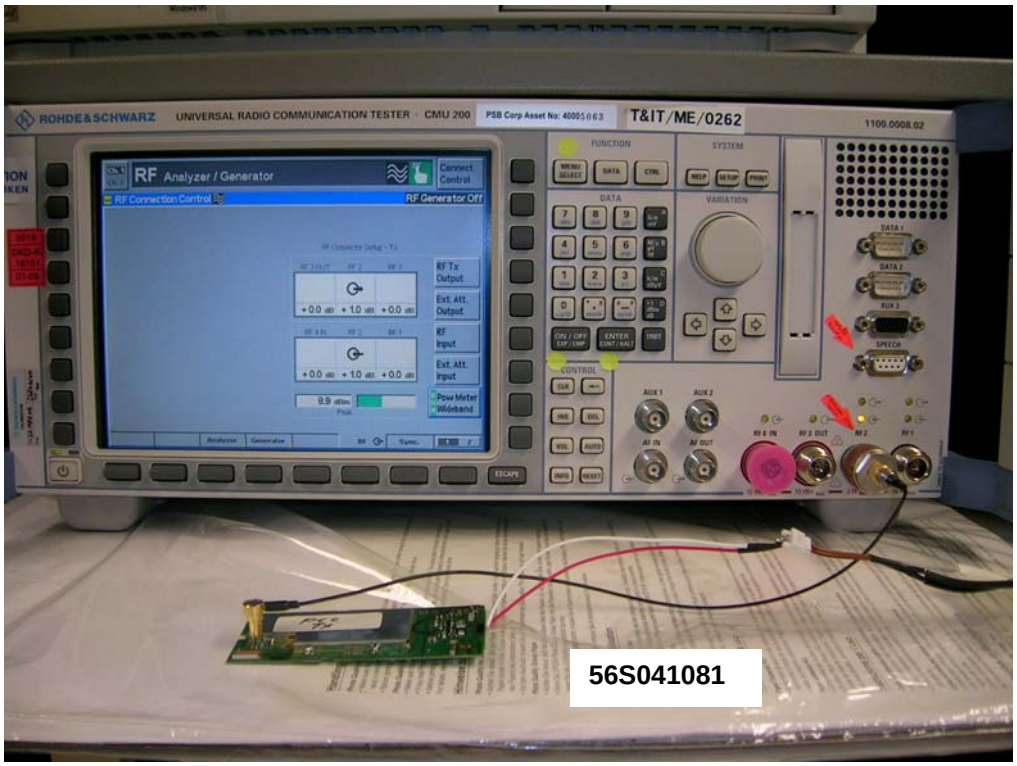
Channel	Channel Frequency (GHz)	Maximum Peak Power (W)	Limit (W)
1	2.403	0.0110	0.125
39	2.441	0.0148	0.125
78	2.480	0.0079	0.125

Tested by: Lim Cher Hwee

Notes :

1. Environmental Conditions — Temperature 25°C; Relative Humidity 59%; Atmospheric Pressure 1030mbar

2. Power analyser of Universal Radio Communication Tester was used for power measurement with peak detection as mode of measurement. The power analyser mode supports a wideband power measurement ranging from 100kHz to 2700MHz.



Maximum Peak Power Measurement Test Setup

FCC Part 15C (15.247(d)) RF Conducted Spurious Emissions & Band Edge Compliance at the Transmitter Antenna Results

The EUT shows compliance to the requirements of this section, which states in any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator (EUT) is operating, the RF power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.

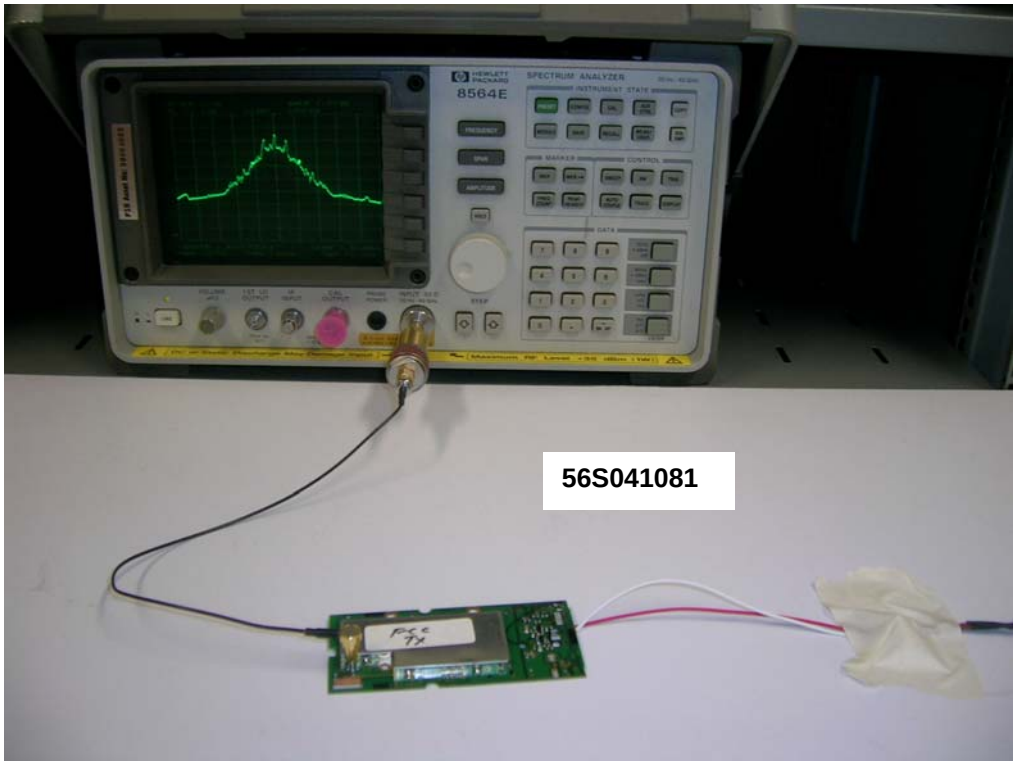
The RF conducted spurious emissions were scanned from 10MHz to 25GHz for Channels 1, 39, and 78 with channel frequency at 2.403GHz, 2.441GHz and 2.480GHz respectively. No significant signal was found and they were below the specified limit. Please refer to the attached Plots 14 – 19 for details.

The conducted spurious at lower and upper band-edges (2.4000GHz and 2.4835GHz) were scanned. The spurious emissions at band-edges were found below the specified limit. Please refer to the attached Plots 20 – 21 for details.

Tested by: Lim Cher Hwee

Notes :

1.	Environmental Conditions	Temperature	25°C
		Relative Humidity	59%
		Atmospheric Pressure	1030mbar



RF Conducted Spurious & Band Edge Measurement Test Setup

FCC Part 15C (15.247(e)) Peak Power Spectral Density Results

The EUT shows compliance to the requirements of this section, which states the peak power spectral density of an intentional radiator (EUT) to the antenna shall not be greater than 8dBm (6.3mW) in any 3kHz band during any time interval of continuous transmission.

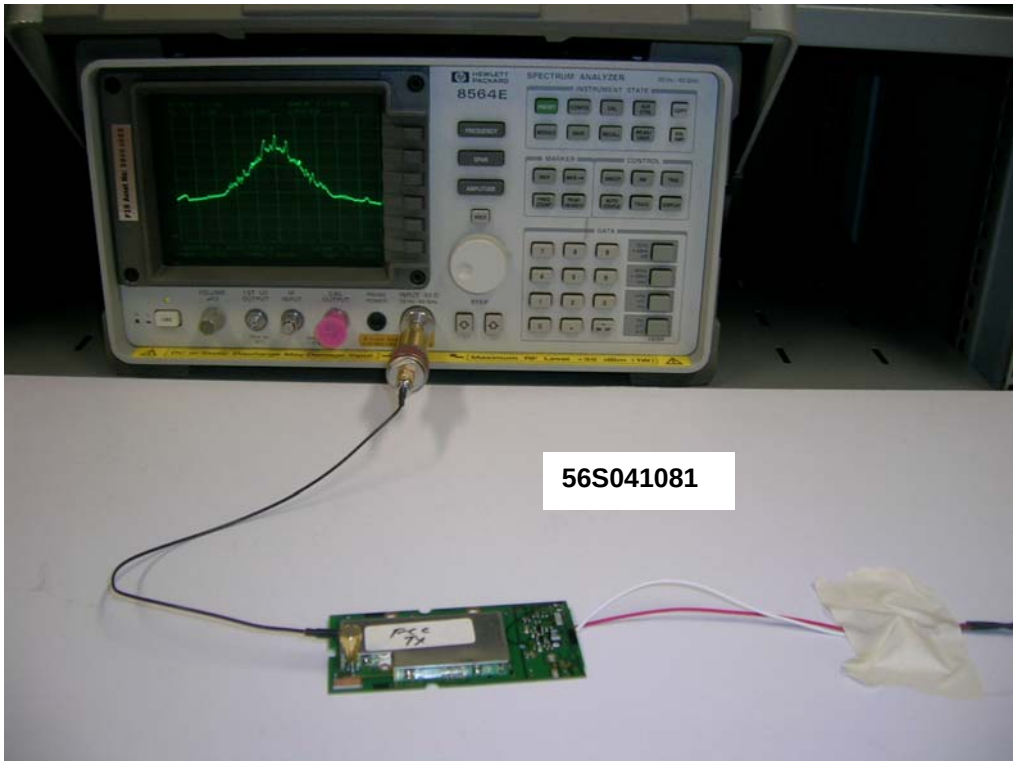
Channel	Channel Frequency (GHz)	Peak Power Spectral Density (mW)	Limit (mW)
1	2.403	0.9268	6.3
39	2.441	1.4689	6.3
78	2.480	0.5212	6.3

Please refer to the attached Plots 22 – 24 for details.

Tested by: Lim Cher Hwee

Notes :

1. Environmental Conditions — Temperature 25°C; Relative Humidity 59%; Atmospheric Pressure 1030mbar



Peak Power Spectral Density Measurement Test Setup

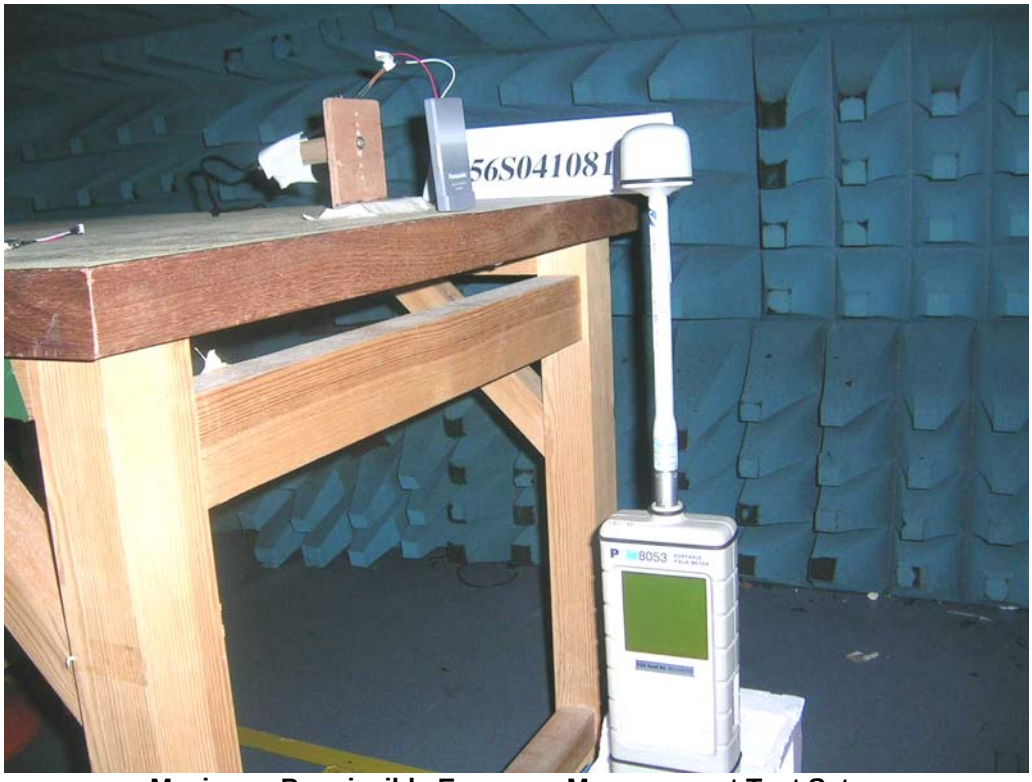
FCC Part 1.1310 Maximum Permissible Exposure (MPE) Results

Frequency (MHz)	Power Density Value (mW/cm^2)	Averaging Time (min)	Limit (mW/cm^2)	Margin (mW/cm^2)
2403	0.05	30	1.0	-0.95
2441	0.13	30	1.0	-0.87
2480	0.07	30	1.0	-0.93

Tested by: Gary Ng

Notes :

1. Environmental Conditions — Temperature: 24°C; Relative Humidity: 55%; Atmospheric Pressure: 1030mbar
2. All possible modes of operation were investigated. Only the worst case, highest radiation levels were measured. Measurements were taken at the required averaging time. All other radiation levels were relatively insignificant.
3. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
4. Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 0.1MHz – 3GHz is ±15% .



Maximum Permissible Exposure Measurement Test Setup