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RF Test Report:

Airspan AirSynergy A25c

FCC ID:O2J-255AS

SC_TR_95_A

Prepared for:
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1 Revision History

Revision	Originator	Date	Comment
A	C Blackham	16 Aug 2013	1st release

2 Purpose

This document details the Airspan AirSynergy base station, model number SYN-CN-00-0A25C-000, designed for operation in the 2620-2690 MHz band.

This testing has been conducted as supplementary information to support a Class II Permissive Change in increase the frequency range of operation of the 2.X GHz AirSynergy basestation

3 Reference Documents

[Ref 1]	47CFR2	Title 47 Code of Federal Regulations Part 2: frequency allocations and radio treaty matters; general rules and regulations
[Ref 2]	47 CRF27	Title 47 Code of Federal Regulations Part 27: Miscellaneous wireless communication services
[Ref 3]	TIA-603-C	Land Mobile FM or PM – Communications Equipment – Measurement and Performance Standards
[Ref 4]	KDB 662911 D01 v01r02	Federal Communications Commission Office of Engineering and Technology Laboratory Division; Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc)

4 Test Information

4.1 Client

Airspan Communications Ltd
Capital Point,
33 Bath Road
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SL1 3UF
UK

4.2 Test personnel

Conducted Emissions (sections 8 to 12)
Testing was performed by Charlie Blackham of Sulis Consultants Ltd at Airspan Communications offices on 14th August 2013.

4.3 Test sample

The results herein only refer to sample detailed in section 6

5 Product Description

The Airsynergy unit supports operation with 5 and 10[1] MHz bandwidths, comprising 1024 subcarriers. Each of these subcarriers can be modulated in a number of modes:

- BPSK ½
- QPSK ½ and ¾
- 16 QAM ½ and ¾
- 64 QAM ½ and ¾
- 256QAM

Based on pre-testing, the following modulation schemes will be used during testing:

- 256 QAM 5/6

The unit is fitted with two RF transceiver RF ports, RF-1 and RF-3. These support MIMO operation and are connected to a variety of external cross-polarised sectored antennas having gains of up to 18.0 dBi.

Frequency of operation is aligned with EBS channels and operates within the 2620-2690 MHz band
5 MHz channels: Centre frequencies of 2623 to 2687 MHz
10 MHz channels Centre frequencies of 2626 to 2684 MHz

[1] BRS/ERS equipment in 2500-2690 MHz band may use channel bandwidths greater than 6 MHz as permitted in 27.1220, i.e. 2x 6 MHz blocks or 12 MHz for 10 MHz channels.

6 Test Configuration

6.1 Test sample and Operating mode

The equipment under test (EUT) was:

Manufacturer	Name	Model Number	Serial Number
Airspan	AirSynergy	SYN-CN-00-025C-000	5DC02D2FFEE2C

Table 1: Equipment under test

6.2 Support equipment

The support equipment was:

Description	Manufacturer	Name	Serial Number
Laptop	Dell	Latitude	Airspan 005837
Mains – 48 V PSU	Powerbox	PBUS-LUV-54V/100W-SN-QNA	P1131CV022587

Table 2: Support Equipment

6.3 Test equipment (sections 8 to 12)

Description	Manufacturer	Name	Serial Number	Calibration certificate
Receiver	Rohde & Schwarz	FSQ 26	200186	R&S Ref 1400-42103 17 July 2013
Signal Generator	Rohde & Schwarz	SMB100A03	175535	R&S 20-400919 16 Dec 2012
Attenuator	MCL	BW-N10W20+	1224	Calibrated in-situ and loaded as Transducer Factor
RF cable	Sucoflex	104	5884/4	

Table 3: Test Equipment for conducted tests

6.4 Equipment set-up

Equipment was configured as per figure 1:

- A "putty" sessions running on the laptop allows the Airsynergy unit to be controlled and set to required frequency, bandwidth, modulation and power.
- The insertion loss of the Attenuator and Co-ax cable were measured using a Signal Generator and the FSQ and their combined path-loss was programmed into the FSQ as a Transducer Factor.

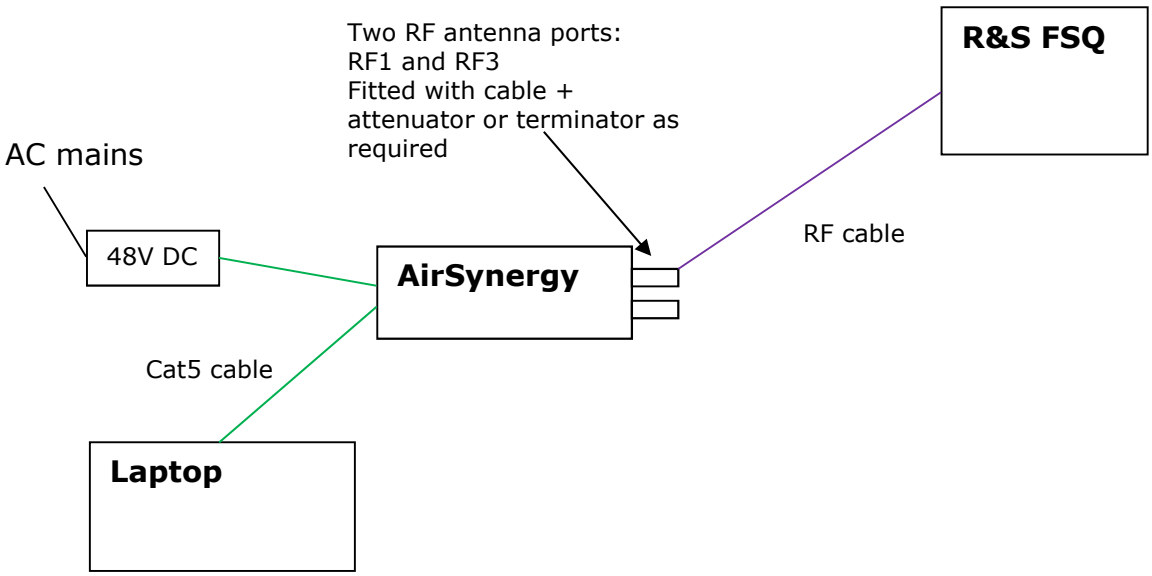


Figure 1: Airsynergy configuration for test

7 Summary of Tests performed

Selected tests were performed on unit operating in 10 MHz channel mode.

Power summing, where required, was performed by adding 3dB to the single antenna port measurement, thus giving a total power for two antenna ports

Test	47 CFR Part	Limit	Result	Section
Transmit Power	27.50(h)(1)	62.3 / 63.3 dBm EIRP	Pass	8
Spectral Power Density	27.50(h)(4)	45.23 dBm/MHz EIRP	Pass	9
Conducted Spurious Emissions at Band Edge	27.53(m)(2) 2.1051	-13.0 dBm	Pass	10
Conducted Spurious Emissions	27.53(m)(2) 2,1051	-13.0 dBm	Pass	11
Occupied Bandwidth	2.1049	None	Pass	12

Table 4: Summary of tests performed

8 Transmit Power 47CFR25.50(h)

8.1 Requirement and test method

(h) The following power limits shall apply in the BRS and EBS:

(1) Main, booster and base stations.

(i) The maximum EIRP of a main, booster or base station shall not exceed 33 dBW + 10log(X/Y) dBW, where X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition, except as provided in paragraph (h)(1)(ii) of this section.

(ii) If a main or booster station sectorizes or otherwise uses one or more transmitting antennas with a non-omnidirectional horizontal plane radiation pattern, the maximum EIRP in dBW in a given direction shall be determined by the following formula: EIRP = 33 dBW + 10 log(X/Y) dBW + 10 log(360/beamwidth) dBW, where X is the actual channel width in MHz, Y is either (i) 6 MHz if prior to transition or the station is in the MBS following transition or (ii) 5.5 MHz if the station is in the LBS and UBS following transition, and beamwidth is the total horizontal plane beamwidth of the individual transmitting antenna for the station or any sector measured at the half-power points

The worst case scenario is found using a value for Y of 6 MHz and not adding any additional permitted power for antenna directionality. The limits that are applied are therefore:

10 MHz channels: 33 dBW + 10log(6/6) = 33 + 0.0 = 33.00 dBW (63.00 dBm)

The equipment was configured as per figure 1 and the measurements were made conducted using the RMS detector of the FSQ which was gated to only perform measurement during the ON time of the transmitter.

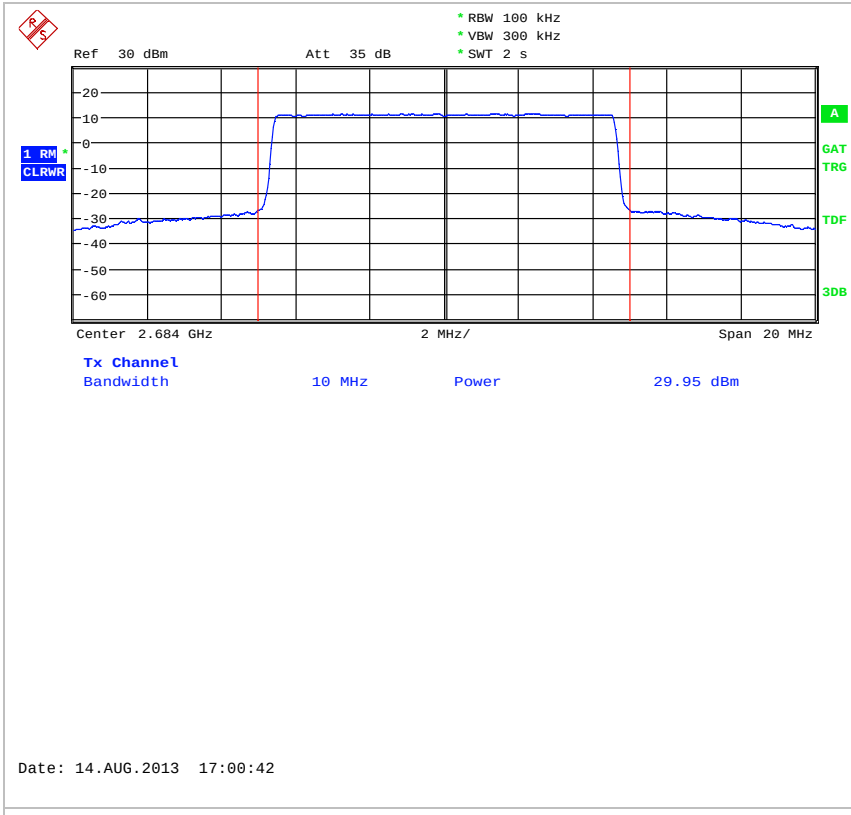
Power was measured using the in-built channel power measuring function

The total power was summed in accordance with KDB662911D01 and the result compared against the limit.

8.2 Test results

Channel Bandwidth	TX Freq (MHz)	Port	TX power (dBm)	Summed TX power (dBm)	Summed TX power EIRP[2] (dBm)	EIRP limit (dBm)	Result
10	2684.0	RF3	29.95	32.96	50.95	63.0	Pass

Table 5: Transmit power



10 MHz channel, RF3

Figure 2: Transmit Power plots

[2] 18 dBi antenna

9 Spectral Power Density 27.50(h)(4)

9.1 Requirement and test method

> (H)(4) For main, booster and response stations utilizing digital emissions with non-uniform power spectral density (e.g. unfiltered QPSK), the power measured within any 100 kHz resolution bandwidth within the 6 MHz channel occupied by the non-uniform emission cannot exceed the power permitted within any 100 kHz resolution bandwidth within the 6 MHz channel if it were occupied by an emission with uniform power spectral density, i.e. ……. 33.3 watts EIRP per 100 kHz bandwidth.

The equipment was configured as per figure 1 and the measurements were made conducted using the RMS detector of the FSQ which was gated to only perform measurement during the ON time of the transmitter. The following spectrum analyser settings were used: RBW of 100 kHz and VBW of 300 kHz.

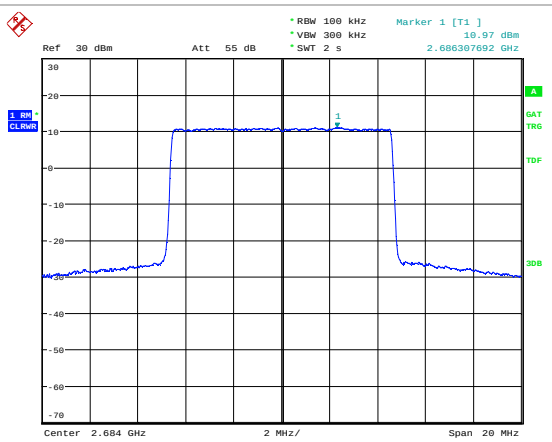
The total power was summed in accordance with KDB662911D01 and the result compared against the limit.

9.2 Test results

Channel Bandwidth	TX Freq (MHz)	Port	TX power (dBm)	Summed TX power (dBm)	Summed TX power EIRP[3] (dBm)	EIRP limit (dBm)	Result
10	2684.0	RF3	10.97	13.97	31.97	45.23	Pass

Table 6: Transmit power spectral density

[3] 18 dBi antenna



10 MHz channel, RF3

Figure 3: Transmit power spectral density plots

10 Conducted Band Edge 27.53(m)(2)

10.1 Requirement and test method

(m) For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts in accordance with the standards below. If a licensee has multiple contiguous channels, out-of-band emissions shall be measured from the upper and lower edges of the contiguous channels.

(2) For digital base stations, the attenuation shall be not less than 43 + 10 log (P) dB

Attenuation of 43+10log(P) dBm equates to an absolute limit of -13dBm. As this requirement originates as a relative limit, measurements are performed on each channel individually and compared to the limit.

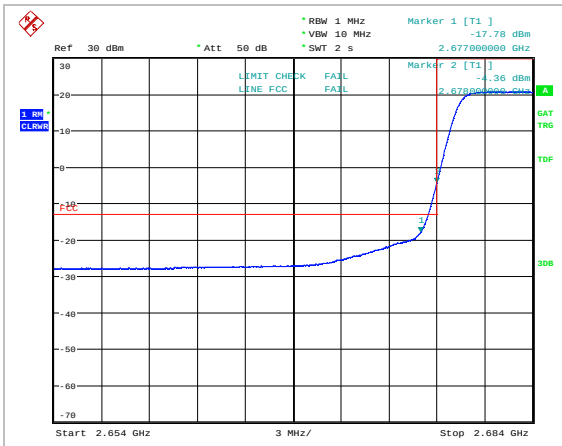
This test was performed at top and bottom of the band. The equipment was configured as per figure 1 and the measurements made gated using the RMS detector of the FSQ.

10.2 Results

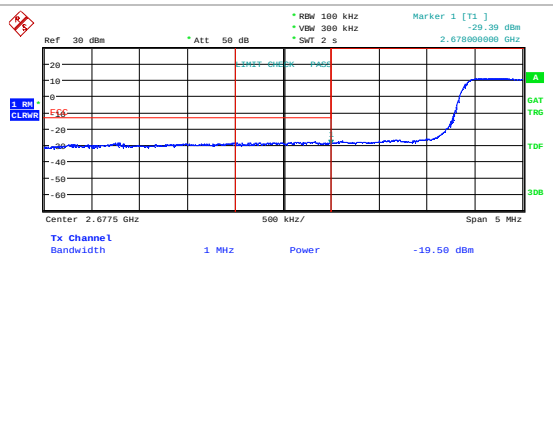
Channel	Measurement range (MHz)	Port	Max Emission (dBm)	Limit (dBm)	Graph
2684.0	2654 - 2684	RF3	-19.50	-13.0	CEM-10-1 CEM-10-1-CP
2684.0	2684 - 2714	RF3	-18.69	-13.0	CEM-10-2 CEM-10-2-CP

Table 7: Conducted Emissions masks results

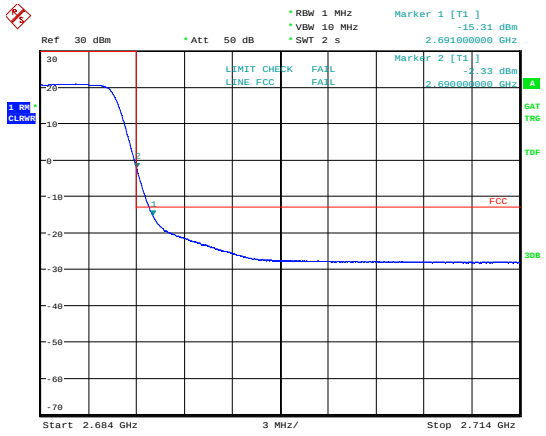
Band edge measurements failed to meet the mask when measured using a 1 MHz BW so the one MHz band nearest to the transmit signal was measured using the channel power measurement capability of the FSQ prior to comparing the measurement against the limit.



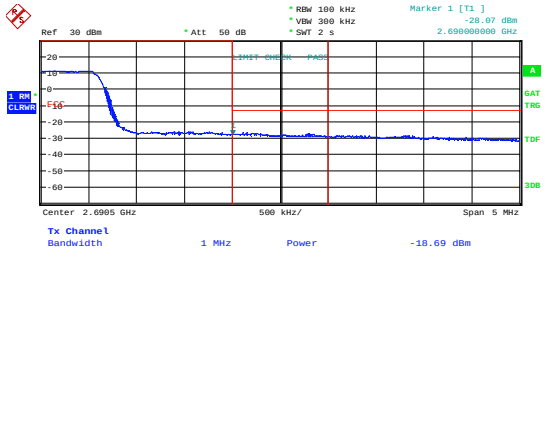
CEM-10-1



CEM-10-2



CEM-10-1-CP



CEM-10-2-CP

Figure 4: Conducted Emissions masks plots; 2684 MHz (10 MHz channels)

11 Conducted Spurious Emissions

11.1 Requirement and test method

(m) For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts in accordance with the standards below. If a licensee has multiple contiguous channels, out-of-band emissions shall be measured from the upper and lower edges of the contiguous channels.

(2) For digital base stations, the attenuation shall be not less than 43 + 10 log (P) dB

Attenuation of 43+10log(P) dBm equates to an absolute limit of -13dBm

Initial scan was performed on top channel using peak detector and max-hold on port RF-3 which had the highest transmit power.

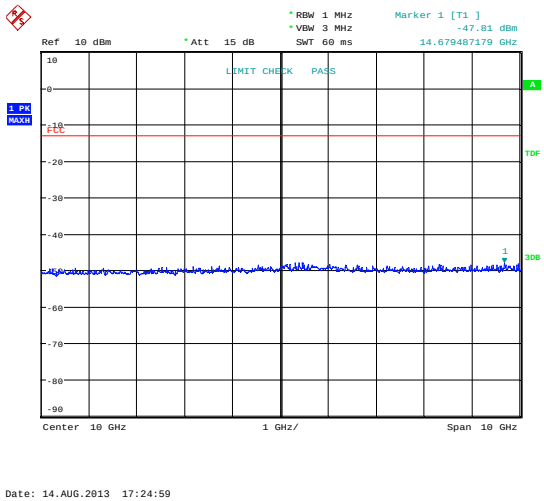
As no emissions or harmonics of note were found, determination of total spurious emission for comparing with limit line was done by adding 10 log (2), or 3dB to the emission level measured on port RF-3.

11.2 Results

Worst case emission result is shown in table below and on accompanying plot.

Bandwidth	Frequency Range	Maximum emission (Measured)	Maximum emission (calculated)	Limit (dBm)	Result	Plot
10 MHz	5 – 15 GHz	-47.81	-44.81	-13.0	Pass	CSE-1

Table 8: Conducted spurious emissions RF-3



CSE-1

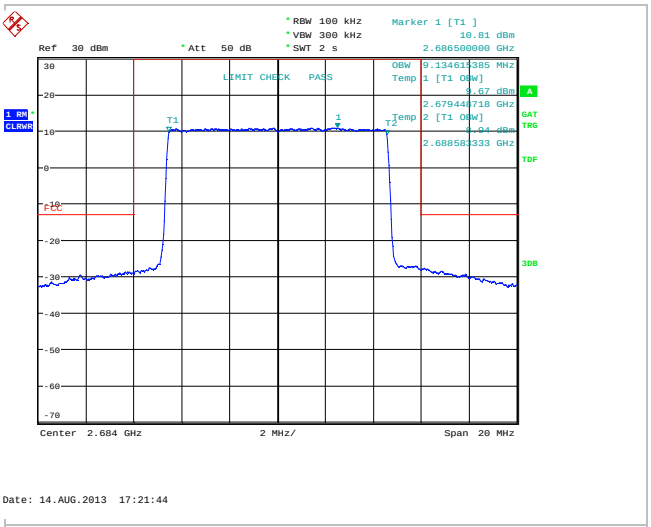
Figure 5: Conducted Spurious Emissions, 10 MHz channels

12 Occupied Bandwidth

The occupied bandwidth was measured using the inbuilt function on the FSQ. Measurement was made using RMS detector and gated measurement.

Channel Bandwidth	TX Freq (MHz)	Port	Bandwidth (MHz)	Result
10	2684.0	RF3	9.135	For information

Table 9: Occupied Bandwidth test results



10 MHz channel, RF3

Figure 6: Occupied Bandwidths