Test specification:	**FCC Section 90.203 (o) / RSS-197 Section 5.4, Contention based protocol**		
Test procedure:	FCC Section 90.203 (o), RSS-197 Section 4.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	1/7/2014 - 1/13/2014		
Temperature: 23 ºC	**Air Pressure:** 1022 hPa	**Relative Humidity:** 39 %	**Power Supply:** 48 VDC
Remarks:			

8 Contention Based Protocol

8.1 General

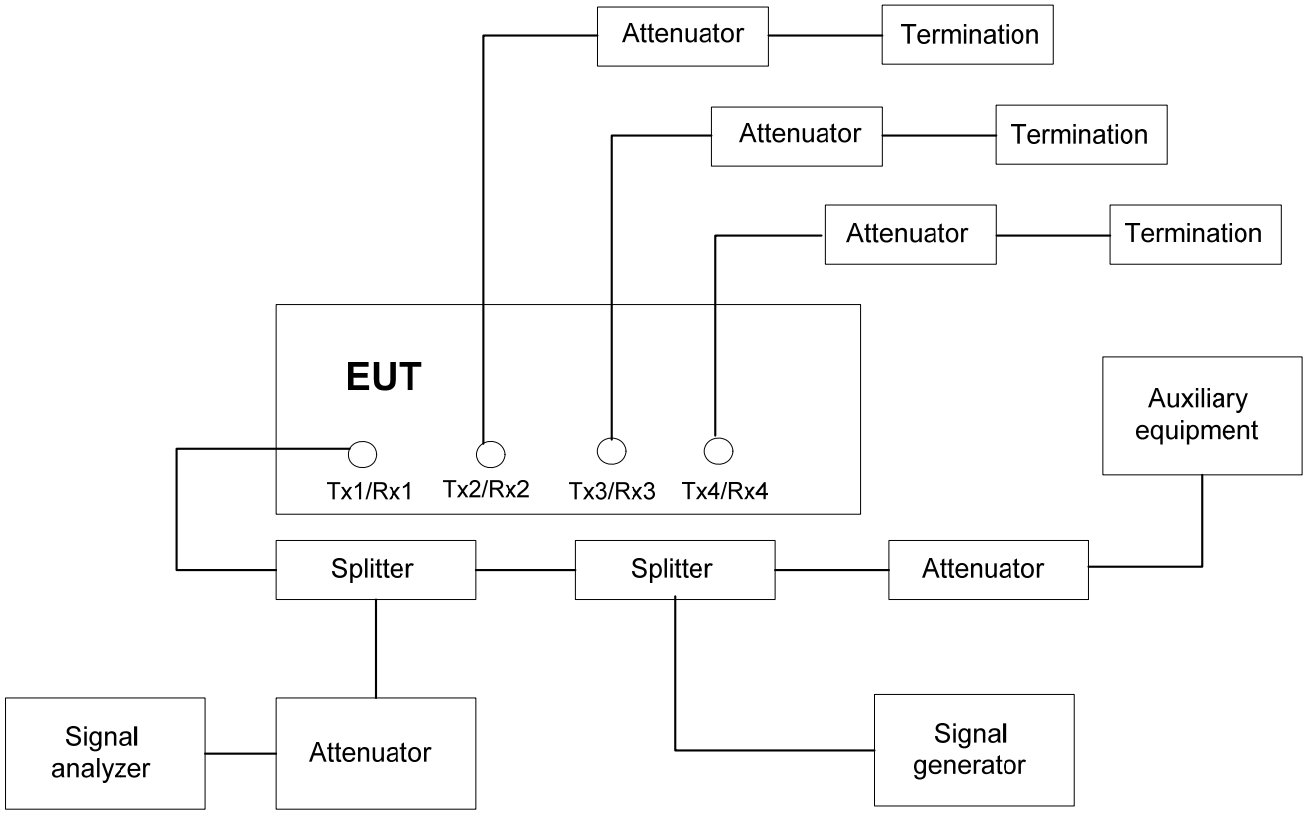
This test was performed to verify the EUT contention-based protocol function. Contention-based protocol is defined as:
A protocol that allows multiple users to share the same spectrum by defining the events that must occur when two or more transmitters attempt to simultaneously access the same channel and establishing rules by which a transmitter provides reasonable opportunities for other transmitters to operate. Such a protocol may consist of procedures for initiating new transmissions, procedures for determining the state of the channel (available or unavailable), and procedures for managing retransmissions in the event of a busy channel. Contention-based protocols shall fall into one of two categories:
(1) An unrestricted contention-based protocol is one which can avoid co-frequency interference with devices using all other types of contention-based protocols.
(2) A restricted contention-based protocol is one that does not qualify as unrestricted.

The EUT is BreezeCOMPACT Base station linked with CPE 3.65 GHz capable to operate in TDD mode at the full 3650.0 – 3700.0 MHz band and using unrestricted Contention Based Protocol.

The EUT, BreezeCOMPACT base station, implements a channel collision sensing mechanism. The system performs a “listen before transmit” function at system startup (channel availability check) and monitoring the channel during its regular listening periods. The system will detect (both at startup and on normal operation) if another system , using any technology, is transmitting on the same frequency bandwidth, regardless of the type of transmitting protocol, raising a proper alarm and evacuate the channel as long as the channel is occupied, restarting the “listen before talk” mechanism.
Upon alarm, the operator may manually set the base station to a new non-busy channel, always restarting the “listen before talk” mechanism.
Because of radio planning considerations, the system designed not to change automatically the carrier frequency to a new non-busy channel.

Test specification:	FCC Section 90.203 (o) / RSS-197 Section 5.4, Contention based protocol		
Test procedure:	FCC Section 90.203 (o), RSS-197 Section 4.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	1/7/2014 - 1/13/2014		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 39 %	Power Supply: 48 VDC
Remarks:			

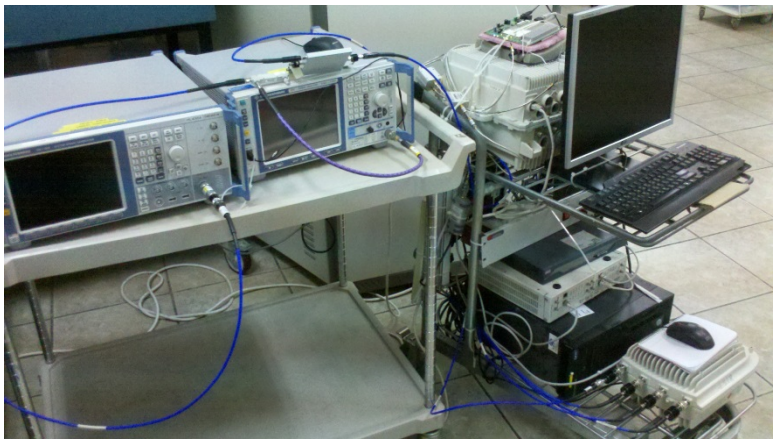
Figure 8.1.1 Set-up for contention-based protocol verification test



Test specification:	FCC Section 90.203 (o) / RSS-197 Section 5.4, Contention based protocol		
Test procedure:	FCC Section 90.203 (o), RSS-197 Section 4.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	1/7/2014 - 1/13/2014		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 39 %	Power Supply: 48 VDC
Remarks:			

Photograph 8.1.1 Test setup for contention-based protocol verification test

Photograph 8.1.2 Test setup for contention-based protocol verification test



Test specification:	**FCC Section 90.203 (o) / RSS-197 Section 5.4, Contention based protocol**		
Test procedure:	FCC Section 90.203 (o), RSS-197 Section 4.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	1/7/2014 - 1/13/2014		
Temperature: 23 ºC	**Air Pressure:** 1022 hPa	**Relative Humidity:** 39 %	**Power Supply:** 48 VDC
Remarks:			

8.2 Test procedure

The EUT is equipped with four Tx/Rx chains. As four transmit chains operate simultaneously and four chains are equipped with contention-based protocol function the test was performed while interferer signal is injected in Tx_1/Rx_1 port, the EUT operation monitored by a spectrum analyzer connected to the Tx_1/Rx_1 port.

The EUT was set to transmit as shown in Figure 8.1.1 and the transmission was verified by the spectrum analyzer.

The signal generator was connected as shown in Figure 8.1.1, an interferer signal was generated.
The combination of EUT transmission bandwidth, channel, interferer signal type and level was chosen according to Table 8.2.1.

The CW interferer signal was continuously injected to the receiver input and the EUT response was monitored and reported in Table 8.2.1.

The OFDMA interferer signal was continuously injected to the receiver input and the EUT response was monitored and reported in Table 8.2.1.

Test specification:	**FCC Section 90.203 (o) / RSS-197 Section 5.4, Contention based protocol**		
Test procedure:	FCC Section 90.203 (o), RSS-197 Section 4.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	1/7/2014 - 1/13/2014		
Temperature: 23 ºC	**Air Pressure:** 1022 hPa	**Relative Humidity:** 39 %	**Power Supply:** 48 VDC
Remarks:			

Table 8.2.1 Contention based protocol test results

INTERFERER SIGNAL INJECTION: To port Tx_1/Rx_1
EUT TRANSMISSION MONITORING: At port Tx_1/Rx_1

Test number	Wanted signal characteristics			Interferer signal characteristics			Results		
	Channel frequency, MHz	Channel bandwidth, MHz	RSL turn-off level settings, dBm	Frequency, MHz	Modulation	Level, dBm	Interference detection	Tx OFF time, ms**	Verdict
1	3697.5	5	-87	3695.3	CW	-87	Yes	9.3	Pass
2	3697.5		-90	3695.3	CW	-90	No	NA	Pass
3	3697.5		-87	3699.7	CW	-87	Yes	10.0	Pass
4	3697.5		-90	3699.7	CW	-90	No	NA	Pass
5	3697.5		-87	3697.5	CW	-87	Yes	14.7	Pass
6	3697.5		-90	3697.5	CW	-90	No	NA	Pass
7	3697.5		-87	3697.5	OFDMA	-86.5	Yes	26.0	Pass
8	3697.5		-90	3697.5	OFDMA	-90	No	NA	Pass
9	3675		-87	3673	CW	-87	Yes	9.8	Pass
10	3675		-90	3673	CW	-90	No	NA	Pass
11	3675		-87	3677	CW	-87	Yes	9.7	Pass
12	3675		-90	3677	CW	-90	No	NA	Pass
13	3675		-87	3675	CW	-87	Yes	14.6	Pass
14	3675		-90	3675	CW	-90	No	NA	Pass
15	3675		-87	3675	OFDMA	-86.4	Yes	26.0	Pass
16	3675		-90	3675	OFDMA	-90	No	NA	Pass
17	3652.5		-87	3652.5	CW	-87	Yes	14.4	Pass
18	3652.5		-90	3652.5	CW	-90	No	NA	Pass
19	3652.5		-87	3654.5	CW	-87	Yes	8.6	Pass
20	3652.5		-90	3654.5	CW	-90	No	NA	Pass
21	3652.5		-87	3650.5	CW	-87	Yes	8.6	Pass
22	3652.5		-90	3650.5	CW	-90	NA	NA	Pass
23	3652.5		-87	3652.5	OFDMA	-86.2	Yes	30.0	Pass
24	3652.5		-90	3652.5	OFDMA	-90	No	NA	Pass

Test specification:	FCC Section 90.203 (o) / RSS-197 Section 5.4, Contention based protocol		
Test procedure:	FCC Section 90.203 (o), RSS-197 Section 4.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	1/7/2014 - 1/13/2014		
Temperature: 23 ºC	Air Pressure: 1022 hPa	Relative Humidity: 39 %	Power Supply: 48 VDC
Remarks:			

Table 8.2.1 Contention base protocol test results (continued)

INTERFERER SIGNAL INJECTION: To port Tx_1/Rx_1

EUT TRANSMISSION MONITORING: At port Tx_1/Rx_1

Test number	Wanted signal characteristics			Interferer signal characteristics			Results		
	Channel frequency, MHz	Channel bandwidth, MHz	RSL turn-off level settings, dBm	Frequency, MHz	Modulation	Level, dBm	Interference detection	Tx OFF time, ms**	Verdict
25	3696.5	7	-87	3693.5	CW	-87	Yes	9.5	Pass
26	3696.5		-90	3693.5	CW	-90	No	N/A	Pass
27	3696.5		-87	3699.8	CW	-87	Yes	9.7	Pass
28	3696.5		-90	3699.8	CW	-90	No	N/A	Pass
29	3696.5		-87	3696.5	CW	-87	Yes	10.3	Pass
30	3696.5		-90	3696.5	CW	-90	No	N/A	Pass
31	3696.5		-87	3696.5	OFDMA	-87	Yes	14.0	Pass
32	3696.5		-90	3696.5	OFDMA	-90	No	NA	Pass
33	3675		-87	3672	CW	-87	Yes	9.1	Pass
34	3675		-90	3672	CW	-90	No	N/A	Pass
35	3675		-87	3678	CW	-87	Yes	8.8	Pass
36	3675		-90	3678	CW	-90	No	N/A	Pass
37	3675		-87	3675	CW	-87	Yes	14.4	Pass
38	3675		-90	3675	CW	-90	No	N/A	Pass
39	3675		-87	3675	OFDMA	-87	Yes	10.0	Pass
40	3675		-90	3675	OFDMA	-90	No	NA	Pass
41	3653.5		-87	3650.2	CW	-87	Yes	13.4	Pass
42	3653.5		-90	3650.2	CW	-90	No	N/A	Pass
43	3653.5		-87	3656.5	CW	-87	Yes	13.5	Pass
44	3653.5		-90	3656.5	CW	-90	No	N/A	Pass
45	3653.5		-87	3653.5	CW	-87	Yes	9.7	Pass
46	3653.5		-90	3653.5	CW	-90	No	N/A	Pass
47	3653.5		-87	3653.5	OFDMA	-87	Yes	13.0	Pass
48	3653.5		-90	3653.5	OFDMA	-90	No	NA	Pass

Test specification:	**FCC Section 90.203 (o) / RSS-197 Section 5.4, Contention based protocol**		
Test procedure:	FCC Section 90.203 (o), RSS-197 Section 4.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	1/7/2014 - 1/13/2014		
Temperature: 23 ºC	**Air Pressure:** 1022 hPa	**Relative Humidity:** 39 %	**Power Supply:** 48 VDC
Remarks:			

Table 8.2.1 Contention base protocol test results (continued)

INTERFERER SIGNAL INJECTION: To port Tx_1/Rx_1
EUT TRANSMISSION At port Tx_1/Rx_1
MONITORING:

Test number	Wanted signal characteristics			Interferer signal characteristics			Results		
	Channel frequency, MHz	Channel bandwidth, MHz	RSL turn-off level settings, dBm	Frequency, MHz	Modulation	Level, dBm	Interference detection	Tx OFF time, ms**	Verdict
49	3695	10	-87	3695	CW	-87	Yes	10.6	Pass
50	3695		-90	3695	CW	-90	No	N/A	Pass
51	3695		-87	3690.5	CW	-87	Yes	10.0	Pass
52	3695		-90	3690.5	CW	-90	No	N/A	Pass
53	3695		-87	3699.5	CW	-87	Yes	9.7	Pass
54	3695		-90	3699.5	CW	-90	No	N/A	Pass
55	3695		-87	3695	OFDMA	-87	Yes	14.0	Pass
56	3695		-87	3695	OFDMA	-90	No	NA	Pass
57	3675		-87	3670.5	CW	-87	Yes	9.7	Pass
58	3675		-90	3670.5	CW	-90	No	N/A	Pass
59	3675		-87	3679.5	CW	-87	Yes	10.0	Pass
60	3675		-90	3679.5	CW	-90	No	N/A	Pass
61	3675		-87	3675	CW	-87	Yes	10.6	Pass
62	3675		-90	3675	CW	-90	No	N/A	Pass
63	3675		-90	3655	OFDMA	-87	Yes	10.0	Pass
64	3675		-90	3655	OFDMA	-90	No	NA	Pass
65	3655		-87	3655	CW	-87	Yes	10.6	Pass
66	3655		-90	3655	CW	-90	No	N/A	Pass
67	3655		-87	3650.5	CW	-87	Yes	10.0	Pass
68	3655		-90	3650.5	CW	-90	No	N/A	Pass
69	3655		-87	3659.5	CW	-87	Yes	9.7	Pass
70	3655		-90	3659.5	CW	-90	No	N/A	Pass
71	3655		-87	3655	OFDMA	-87	Yes	14.6	Pass
72	3655		-90	3655	OFDMA	-90	No	NA	Pass

* - Interference and wanted signal durations are measured in ms and each frame duration is 5 ms
** - Tx OFF time is measured as a time period from the start of interference signal (interference signal exceeds the threshold level) and till the EUT ceases to transmit

*** - Interference detection without stopping of the transmission monitored on the auxiliary PC

Reference numbers of test equipment used

HL 3901	HL 4274	HL 4354	HL 4355	HL 4367			

Full description is given in Appendix A.