LBT(Listen Before Talk) Test Results

1 Description

The product complies with the requirements of an unrestricted contention based protocol. It employs spectrum sensing to determine if other devices are transmitting based on thresholds which can be configured by the operator. When the Listen Before Talk feature is enabled, transmission will be disabled when detected interference levels is above the higher threshold; similarly transmission will be enabled when detected interference levels is below the lower threshold. This test is to verify the LBT functionality of product.

2 Test Summary

2.1 Technical Requirement

Specification Reference	§90.7 of US FCC rules
Specification Description of Connection Based Protocol(CBP)	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. The “Listen before Talk” (LBT) operational procedure is the most well-known Contention-based Protocol(CBP)

2.2 Summary of Test Results

Reference	Part	Measurement	Result
§90.7 of US FCC rules	90	Verification of Unrestricted Contention	PASS

		Based Protocol operation	

2.3 Product Specification

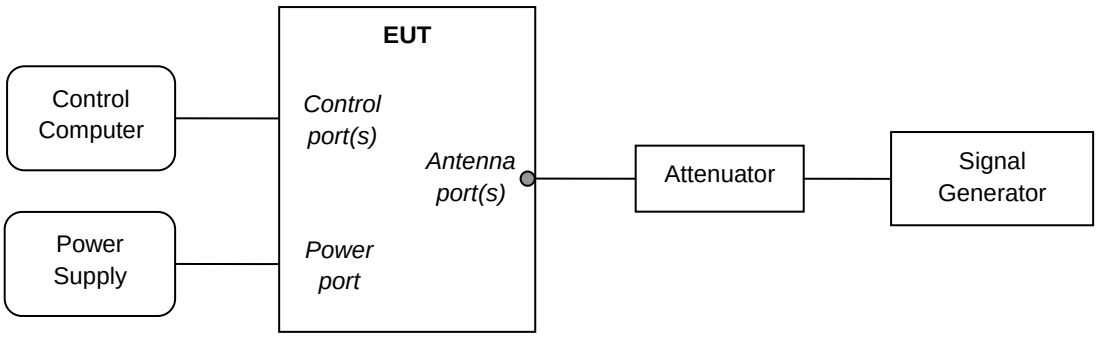
Characteristics	Description	
Radio System Type	☐ GSM (GO) ☐ UMTS (UO) ☒ LTE (LO) ☐ CDMA (CO) ☐ GSM & UMTS (GU) ☐ GSM & LTE (GL) ☐ GSM & UMTS & LTE (GUL) ☐ CDMA & LTE (CL) ☐ P2P	
Equipment Type	Type #1	☒ Base Station Equipment ☐ CPE (Customer Premises Equipment) Equipment ☐ Subscriber Equipment (User Equipment) ☐ Fixed Point-to-Point Equipment
	Type #2	☒ Fixed ☐ Mobile ☐ Portable
	Type #3	☐ Indoor ☒ Outdoor
Frequency Range (Transmission (TX) and Receiving (RX))	#1	TX: 3650 to 3700 MHz RX: 3650 to 3700 MHz
TX and RX Antenna Ports	TX & RX port: 8, TX-only port: 0, RX-only port: 0	

Characteristics	Description	
Multiple Carrier Supported	3	
Maximum RF Bandwidth	50 MHz	
TX Output Power	Max. 1.25 W (per antenna port) Max. 8*1.25 W (8 antenna ports)	
Supported Channel Bandwidth	10 MHz, 20 MHz	
Modulation Type	LTE system:	Base-band: QPSK, 16QAM,64QAM Carrier: OFDM/OFDMA
Designation of Emissions (Note: the necessary bandwidth of which is the worst value from the measured occupied bandwidths for each type of channel bandwidth configuration.)	LTE system:	10M0D9W, 20M0D9W
Power Supply	Type:	☐ External AC mains, ☒ External DC mains,

Characteristics	Description	
		☐ AC/DC Adapter, ☐ Powered over Ethernet (PoE)
	Nominal Voltage, Input to EUT:	-48 VDC
	Voltage Range, Input to EUT:	-36 to -57 VDC

3 Configuration of Test

3.1 Test Setup



3.2 Test Procedure

All tests were performed as conducted measurements, the antenna ports gave independent access to horizontal and vertical antenna connections.

1) Power on EUT, set LBT state including Channel on Threshold level and Channel off Threshold level(these two levels can be configured by operator);
2) Adjust output power of signal generator to act as an interference at the antenna port;
3) Monitor EUT state on the control computer;

4 Test Results

P_i: interference power level

P1: higher channel off threshold power level

P2: lower channel on threshold power level

DL: down link

LBT State	Channel BW [MHz]	TX Freq. [MHz]	Channel off Threshold Level P1 [dBm]	Channel on Threshold Level P2 [dBm]	Result
ON	10MHz	3655	-75	-85	Detected P_i > P1: DL off; Detected P_i < P2: DL on
ON	10MHz	3675	-75	-85	Detected P_i > P1: DL off; Detected P_i < P2: DL on
ON	10MHz	3695	-75	-85	Detected P_i > P1: DL off; Detected P_i < P2: DL on
ON	20MHz	3660	-75	-85	Detected P_i > P1: DL off; Detected P_i < P2: DL on
ON	20MHz	3675	-75	-85	Detected P_i > P1: DL off; Detected P_i < P2: DL on
ON	20MHz	3690	-75	-85	Detected P_i > P1: DL off;

					Detected P_i < P2: DL on
OFF	20MHz	3675	--	--	Detected P_i > P1 (long term): DL always on;

Notes 1: CW signal was used as an interference for unlike systems, and it is located in the center of EUT carrier;

Note 2: Interference power level can be detected by EUT and checked on the control computer.

END