Title*: Wi-Fi Alliance Revised Position on receiver blocking requirements

from **Source***: Wi-Fi Alliance

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input for **Committee***: ERM TG11

Contribution **For***:

Decision	
Discussion	X
Information	

Submission date*: 2016-12-29

Meeting & Allocation: **ERMTG11#49**

Relevant WI(s), or deliverable(s):

ABSTRACT: *This document provides Wi-Fi Alliance's perspective on the receiver blocking requirements. Specifically, test signal characteristics and DUT device settings are considered.*

1. Blocking Signal Type

In TG11 meeting #48, there were contributions that supported using an unmodulated tone (CW) as blocking test signal instead of wideband LTE signal. The reason for using CW was simplicity as LTE signal model would be complicated due to considerations of FDD/TDD modes, bandwidth, duty cycle etc. Wi-Fi Alliance agrees to continue using CW signal as given in the current EN 300 328 draft. This would be consistent with other out-of-band blocking methodology used by relevant technologies.

2. Receiver Spurious Consideration

The failing of blocking testing might be due to reciprocal mixing of the interferer/blocker with a local oscillator spur which might result in the interferer appearing in the passband of the receiver. As testing with narrowband signal might cause all of the blocker energy in the passband of the receiver, narrowband testing with CW signal makes the effects of receiver spurs worse compared to the testing with wideband signals.

Wi-Fi Alliance proposes the following modification to the testing method in order to account for unwanted reciprocal mixing with narrowband blocker signals: if any spot frequency measurement fails the blocker test, the test should be repeated by incrementing up and down the blocker frequency by the *DUT channel bandwidth* while DUT stays in the same channel. This will move the spurious response to the adjacent

channel of the DUT. If both additional tests still fail then the UUT fails the test. If one of the additional passes, then the DUT passes the test.

Example:

- Blocking test at 2360MHz fails for Wi-Fi device at channel 2437 MHz with channel bandwidth of 20MHz.
- Repeat tests at 2340MHz and 2380MHz while Wi-Fi device stays at 2437MHz with channel bandwidth of 20MHz.
- If both tests at 2340MHz and 2380MHz fails, device fails blocking test
- If either test at 2340MHz or 2380MHz passes, device passes the test for test point of 2360MHz.

3. Wanted Signal Level

Contribution ERMTG11(16)000039 proposed to update the level of wanted signal level as maximum of *Pmin* + 6dB and *Pabs*. *Pmin* is the minimum level of wanted signal (dBm) required to meet the minimum performance criteria. *Pabs* is an absolute requirement for sensitivity and set to -76dBm (-82dBm + 6dB) for Category 1 devices.

Wi-Fi Alliance supports the proposal in the above referenced contribution as that would prevent penalization of receivers with better sensitivity levels.

Wanted signal level = Max (Pmin + 6 dB, Pabs)

4. Blocking Signal Level

Previous contribution to TG11, ERMTG11(16)000018 contains a list of possible scenarios where Wi-Fi equipment can be subject to blocking from cellular LTE systems. Wi-Fi Alliance believes some of the assumptions made in referenced document is not realistic. Wi-Fi Alliance considers the cases given in Table 1 as the typical case where Wi-Fi equipment should be able to continue operating under blockage:

Table 1 LTE Blocking Scenarios

Scenario	Tx Power (dBm)	Distance from Wi-Fi (meters)	RMS Blocking Level (dBm)
LTE handset power into Wi-Fi	9 dBm	2	-37 dBm
Femtocells to Wi-Fi Aps	20 dBm	6	-36 dBm
Micro Base stations to Wi-Fi APs	35 dBm	40	-37 dBm

In *Table 1*, we assumed free space path loss with path-loss exponent of 2. In practical environments, path-loss is expected to be larger due to body absorption, furniture clutter etc.

Based on the scenarios presented above, Wi-Fi Alliance proposes to use -36dBm as the blocking signal test level. For the two frequencies that are close to band edge, we propose to relax the requirement by 6dB since at those frequencies only very small rejection is possible due to the roll-off characteristics of internal and external filters.

5. Summary

A summary of Wi-Fi Alliance's proposed test method is given in table below. We note that the blocking levels are tightened more than 10dB compared to the levels in the current EN 300 328.

Wanted signal mean power from companion device Pmin (dBm) (see note 1)	Blocking signal frequency (MHz) (see note 4)	Blocking signal power (dBm) CURRENT LEVELS (see note 1 & 3)	Blocking signal power (dBm) NEW LEVELS P_{Block} (see notes 1 & 2 & 3)	Type of blocking Signal
max (P	2 380 2 503,5	-53	-42	CW
max (P	2 300 2 330 2 360	-47	-36	CW
max (P	2 523,5 2 553,5 2 583,5 2 613,5 2 643,5 2 673,5	-47	-36	CW

NOTE 1: P_{min} performance criteria as defined in clause [4.3.2.11.3] in the absence of the blocking signal.
NOTE 2: Pabs is an absolute requirement for sensitivity and set to -76dBm for Category 1 devices.
NOTE 3: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the same levels should be used irrespective of antenna gain.
NOTE 4: If any spot frequency measurement fails the blocker test, the blocker frequency shall be incremented up and down by the UUT channel bandwidth and the test repeated. If both tests still fail then the UUT fails the test. If one of them passes, then the UUT passes the test.