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IR for Wi-Fi Data Card (USB)

Interface Requirements

No. TEC/IR/CP/WFU-001/01/DEC.-13

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History Sheet

S. No.	Document Number & Name	Issued on	Remarks
1.	*IR No. TEC/IR/CP/WFU-001/01/DEC.-13* **Wi-Fi Data Card (USB)**	DEC.2013	First Issue

REFERENCES

a) TEC GRs/IRs	
TEC/EMI/TEL-001/01/FEB-09	Compatibility Standard For Telecommunication Device
TEC/TP/EMF/001/01.SEP-2009	Supplement on Test Procedure for Measurement of Electromagnetic Fields from Base Station Antenna
b) IEEE Standards	
IEEE 802.1q	IEEE standards for local and metropolitan area networks – Virtual Bridge local Area Networks
IEEE 802.1x	Standards for Local and metropolitan area networks—Port-Based Network Access Control
IEEE 802.11a	Supplement to IEEE Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements. Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: High-Speed Physical Layer in the 5 GHz Band
IEEE 802.11b	IEEE Standard for Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications—Amendment 2: Higher-speed Physical Layer (PHY) extension in the 2.4 GHz band—Corrigendum1
IEEE 802.11d	Information technology--Telecommunications and information exchange between systems--Local and metropolitan area networks--Specific requirements--Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Specification for Operation in Additional Regulatory Domains
IEEE 802.11g	IEEE standard for information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – specific requirements – Part 11: wireless LAN medium access control (MAC) and physical layer (PHY) specifications – Amendment 4: further higher – speed physical layer extension in the 2.4GHz band
IEEE 802.11n	IEEE standard for information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – specific requirements – Part 11: wireless LAN medium access control (MAC) and physical layer (PHY) specifications – Amendment 5: enhancements for higher throughput
IEEE 802.11i	IEEE Standard for Information technology--Telecommunications and information exchange between system--Local and metropolitan area networks? Specific requirements--Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications--Amendment 6: Medium Access Control (MAC) Security Enhancements

IEEE 802.3	Telecommunications and information exchange between systems-Local and metropolitan area networks--Specific requirements Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications.
c) IETF Standards	
RFC 2222	Simple Authentication and Security Layer (SASL)
RFC 2253	The LDAP Data Interchange Format (LDIF) - Technical Specification
RFC 2849	The LDAP Data Interchange Format (LDIF) - Technical Specification
d) Other Standards	
CISPR 22 (2003)	Limits and methods of measurement of radio disturbance characteristics of Information Technology device
IEC 61000-4-2 (2001)	Testing and measurement techniques of Electrostatic discharge immunity test
IEC 61000-4-3 (2002)	Radiated RF Electromagnetic Field Immunity test
IEC 61000-4-4 {1995 with Amendment 1 (2000) and Amendment 2 (2001)}	Testing and measurement techniques of electrical fast transients/burst immunity test
IEC 61000-4-5(2001)	Test & Measurement techniques for Surge immunity tests
IEC 61000-4-6(2001)	Immunity to conducted disturbances, induced by radio frequency fields
USB 3.1 Specification	Universal Serial Bus Revision 3.1 Specification provides the technical details to understand USB 3.1 requirements and design USB 3.1 compatible products. Modifications to the USB 3.1 specification are made through Engineering Change Notices (ECNs).
USB Power Delivery Specification	USB Power Delivery Specification Rev. 1.0, Version 1.2, Including Errata through June 26, 2013
Inter-Chip Supplement to the USB Revision 3.0	Inter-Chip Supplement to the USB Revision 3.0 Specification, Revision 1.01 as of February 11, 2013

Note-1- For all TEC GRs / IRs and International Standards, latest issue shall be applicable unless specified otherwise.

Index

GOVERNMENT OF INDIA
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Interface Requirements of

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1.0 Scope

1.1 This document specifies the Interface Requirements (IR) of Wi-Fi Data Card (USB) conforming to IEEE 802.11 standards for operation in ISM band as specified in latest NFAP. WiFi Data Card is a short-range, high-bandwidth wireless radio communication device, meant to be attached to a client/end user terminal, thereby facilitating wireless connectivity in a WLAN/Wi-Fi environment (Figure 1 in Annexure-I) for accessing high definition band width intensive content.

1.2 This IR covers requirements for interoperability, Electromagnetic Compatibility, Safety and Security.

1.3 This document covers requirements for Wi-Fi Data Card (USB) suitable for Indoor, Outdoor, Mixed (Indoor & outdoor) applications.

1.4 Prevailing National Regulations shall apply in case of VoIP and Internet telephony.

1.5 Information to be mentioned on the TEC Certificate may, inter-alia, include the following :-

a. IEEE/USB Standard
b. Frequency of Operation

1.6 Wi-Fi interface which is part of any device can also be certified against this IR.

2.0 Technical Requirements

2.1 Conformance to Standards

2.1.1 The device shall conform to relevant IEEE 802.11 standard (IEEE 802.11 a/b/g/n).

2.1.2 The device shall conform to relevant USB standard (USB 1.0/2.0/3.0/4.0).

2.2 Radio

The device shall comply with radio requirements specified in Clause 15.4.6 of IEEE 802.11 / clause 18.4.6 of IEEE 802.11b / clause 19.4 of IEEE 802.11g (IEEE 802.11-2007) / clause 20 of IEEE 802.11n-2009 standards, as applicable.

2.3 Operating Frequency Range

The operation of device shall be in the license free band in 2.4 and 5 GHz bands and as per latest National Frequency Allocation Plan (NFAP), revised from time to time.

2. 4 Transmitter parameters

2. 4.1 Effective isotropic radiated power

EIRP limit shall be as per prevailing NFAP. At present the EIRP up to 4W is allowed as per existing regulatory conditions. The manufacturer /vendors shall specify the EIRP limits at the time of application.

2. 4.2 Field Strength

The field strength of emissions from the device shall comply with the following:

Table 1: Field strength of emissions

Fundamental Frequency	Field Strength of Harmonics
2.4 GHz and 5 GHz band	0.5 mV/ metre

Field strength limits are specified at a distance of 3 meters. Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental.

2. 4.3 Spurious emissions

Spurious emissions are emissions outside the frequency range (s) of the device as defined in clause 2. 3.

The level of spurious emissions shall be measured as:

either

a) (i) Its power in a specified load (conducted spurious emissions); and

(ii) Its effective radiated power when radiated by the cabinet or structure of the device or

b) Its effective radiated power when radiated by cabinet and antenna.

The spurious emissions of the device shall not exceed the values in tables 2 and 3 in the indicated bands.

Table 2: Transmitter limits for narrowband spurious emissions

Frequency Range	Limit when operating	Limit when in standby
30 MHz -1000 MHz	-36 dBm	-57 dBm
Above 1 GHz —12.75 GHz	-30 dBm	-47 dBm
1.8 GHz — 1.9 GHz 5 .15 GHz — 5.3 GHz	-47 dBm	- 47 dBm

Wideband spurious emission shall not exceed the values given in table 3.

Table 3: Transmitter limits for wideband spurious emissions

Frequency Range	Limit when operating	Limit when in standby
30 MHz —1000MHz	-86 dBm/Hz	-107dBm/Hz
Above 1 GHz —12.75 GHz	- 80 dBm/Hz	- 97 dBm/Hz
1.8 GHz— 1.9 GHz 5 .15 GHz — 5.3 GHz	- 97 dBm/Hz	- 97 dBm/Hz

2. 5 Receiver parameter limits

2.5.1 Receiver Sensitivity

As per clause 17.3.10.1 of IEEE 802.11-2007 (for 802.11a/ b/g) and clause 20.3.22.1 of IEEE 802.11n -2009 (Refer Annexure –II of this document).

2.5.2 Spurious emissions

The level of spurious emissions shall be measured as:

either

a) (i) Its power in a specified load (conducted spurious emissions); and
(ii) Its effective radiated power when radiated by the cabinet

or

Structure of the device (cabinet radiation);

or

b) Its effective radiated power when radiated by cabinet and antenna.

The spurious emissions of the receiver shall not exceed the values in tables 4 and 5 in the indicated bands.

Table 4: Narrowband spurious emissions limits for receivers

Frequency Range	Limit
30 MHz -1000 MHz	-57 dBm
Above 1 GHz - 12.75 GHz	- 47 dBm

Note: The limit values of Table 4 apply to narrowband emission, e.g. as caused by local oscillator leakage. The measurement bandwidth for such emission may be as small as necessary to get a reliable measurement result.

Wideband emission shall not exceed the values given in table 5.

Table 5: Wideband spurious emissions limits for receivers

Frequency Range	**Limit**
30 MHz- 1000MHz	-107 dBm/Hz
Above 1 GHz - 12.75 GHz	- 97 dBm/Hz

2. 6 Device shall be fully Plug & Play.

2. 7 Power supply requirements

The device shall operate on power supply derived from the active unit i.e. PC/laptop etc. on USB port.

3.0 Interconnectivity and Interoperability

3.1 The Device shall be “Wi-Fi CERTIFIED™”.

Note: - 1. If the device is “Wi-Fi CERTIFIED™” clauses/parameters already tested may not be tested again for TEC certification.
2. If the device is not “Wi-Fi CERTIFIED™”, then device shall be tested by TEC against this IR, for TEC certification purposes.

3.2 Radio interface shall conform to IEEE standards 802.11a/b/g/n.

3.3 **Interface Ports:** The device shall conform to relevant USB standard (USB 1.0/2.0/3.0/4.0).

3.4 The device shall be capable of carrying IPv6 traffic either on dual stack (IPv4v6) or on native IPv6 compliant (as per latest DoT guidelines)”.

4.0 Security Requirements

4.1 Device shall conform to WPA2 based on IEEE 802.11i standard and access control authentication based on 802.1X / EAP Standard.

4.2 Service Set Identifier (SSID) shall be definable by Administrator.

4.3 RADIUS supplicant (IETF RFC 2865, 2866, 2867)

5.0 Safety Requirements

5.1 The operating personnel should be protected against shock hazards as per IS 8437 {1993} “Guide on the effects of current passing through the human body” [equivalent to IEC publication 479-1 {1894}].

5.1.2 The device shall conform to IS 13252 (1992) “Safety of information technology device including electrical business device” {equivalent to IEC Publication 950 (1986)} and IEC 215 {1987} “Safety requirements of radio transmitting devices” {for Radio Devices only}.

5.1.3 The device should follow proper construction practice to minimise unintended radiations due to leakage from any gap or monitoring points. All unused if/rf ports and monitoring points should be terminated. The power flux density shall not exceed 1 mW/cm^2 at a distance of 2.5 cms.

6.0 EMI/EMC Requirements

6.1 General Electromagnetic Compatibility (EMC) Requirements:-

The device shall conform to the EMC requirements as per the following standards and limits indicated therein. A test certificate and test report shall be furnished from a test agency.

a). Conducted and radiated emission (applicable to telecom device):

Name of EMC Standard: "CISPR 22 (2005) with amendment 1 (2005) and amendment 2 (2006) – Limited and methods of measurement of radio disturbance characteristics of Information Technology Device".

Limits:-

i) To comply with Class B of CISPR 22 (2005) with amendment 1 (2005) and amendment 2 (2006).

ii) The values of limits shall be as per TEC Standard No. TEC/EMI/TEL-001.

b) Immunity to Electrostatic discharge:

Name of EMC Standard: IEC 61000-4-2 {2001} "Testing and measurement techniques of Electrostatic discharge immunity test".

Limits:-

i) Contact discharge level 2 {$\pm$ 4 kV} or higher voltage;

ii) Air discharge level 3 {$\pm$ 8 kV} or higher voltage;

c) Immunity to radiated RF:

Name of EMC Standard: IEC 61000-4-3 (2006) "Testing and measurement techniques – Radiated RF Electromagnetic Field Immunity test".

Limits:-

i) Under Test level 2 {Test field strength of 3 V/m} for general purposes in frequency range 80 MHz to 1000 MHz and

ii) Under test level 3 (10 V/m) for protection against digital radio telephones and other RF devices in frequency ranges 800 MHz to 960 MHz and 1.4 GHz to 6.0 GHz.

d) Immunity to fast transients (burst):

Name of EMC Standard: IEC 61000-4-4 {2004} "Testing and measurement techniques of electrical fast transients / burst immunity test".

Limits:-

Test Level 2 i.e. a) 1 kV for AC/DC power lines; b) 0.5 kV for signal / control / data / telecom lines;

e) Immunity to surges:

Name of EMC Standard: IEC 61000-4-5 {2005} "Testing and measurement techniques for Surge immunity test".

Limits:-

i) For mains power input ports : (a) 1.0 kV peak open circuit voltage for line to ground coupling (b) 0.5 kV peak open circuit voltage for line to line coupling

ii) For telecom ports : (a) 0.5 kV peak open circuit voltage for line to ground (b) 0.5 kV peak open circuit voltage for line to line coupling

f) Immunity to conducted disturbance induced by Radio frequency fields:

Name of EMC Standard: IEC 61000-4-6 (2003) with amendment 1 (2004} and 2 (2006) "Testing and measurement techniques-immunity to conducted disturbances induced by radio-frequency fields".

Limits:-

Under the test level 2 {3 V r.m.s} in the frequency range 150 kHz -80 MHz for AC / DC lines and Signal / Control / telecom lines.

g) Immunity to voltage dips & short interruptions (applicable to only ac mains power input ports, if any):

Name of EMC Standard: IEC 61000-4-11 {2004} "Testing and measurement techniques-voltage dips, short interruptions and voltage variations immunity test".

Limits:-

i) a voltage dips corresponding to a reduction of the supply voltage of 30% for 500ms (i.e. 70% supply voltage for 500 ms)

ii) a voltage dips corresponding to a reduction of the supply voltage of 60% for 200ms (i.e. 40% supply voltage for 200 ms)

iii) a voltage interruption corresponding to a reduction of supply voltage of > 95% for 5s.

Note 1: The test agency for EMC tests shall be an accredited agency and details of accreditation shall be submitted.

Alternatively EMC test report from a non-accredited test lab, which is audited by an accredited lab / accrediting authority for the availability of all the essential facilities (test device, test chamber, calibrations in order, test instructions, skilled personnel etc.), required for performing the tests according to the EMC test methods audited, may be acceptable.

However, such accredited lab / accrediting authority should take responsibility of the test results of the "non accredited lab" along with indication of period of such delegation and the submitted test report should be of such valid period of delegation. The audit report, mentioning above facts, should be provided along with EMC test report.

Note 2:- For checking compliance with the above EMC requirements, the method of measurements shall be in accordance with TEC Standard No. TEC/EMI/TEL-001 and the references mentioned therein unless otherwise specified specifically. Alternatively, corresponding relevant Euro Norms of the above IEC/CISPR standards are also acceptable subject to the condition that frequency range and test level are met as per above mentioned sub clauses (a) to (g) and TEC Standard No. TEC/EMI/TEL-001. The details of IEC/CISPR and their corresponding Euro Norms are as follows:

IEC/CISPR	**Euro Norm**
CISPR 11	EN 55011
CISPR 22	EN 55022
IEC 61000-4-2	EN 61000-4-2
IEC 61000-4-3	EN 61000-4-3
IEC 61000-4-4	EN 61000-4-4
IEC 61000-4-5	EN 61000-4-5
IEC 61000-4-6	EN 61000-4-6
IEC 61000-4-11	EN 61000-4-11

7.0 Abbreviations

AP	Access Point
API	Application Program Interface
CD	Compact Disc
CDR	Call Details Records
CISC	Complex Instruction Set Computer
CISPR	Comite International Special des Perturbations Radioelectriques
CPE	Customer Premises Device
DAT	Digital Audio Tape
DC	Direct Current
DHCP	Dynamic Host Configuration Protocol
DNIS	Dialled Number Identification Service
DNS	Domain Name Service
EAP	Extensible Authentication Protocol
EAP-TLS	Extensible Authentication Protocol -Transport Layer Security
EAP-TTLS	Extensible Authentication Protocol-Ttunneled Transport Layer Security
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interface
EMS	Electronic Message Service
FCAPS	Fault Configuration Accounting Performance Security
FTP	File Transfer Protocol
FWS	Firewall System
GB	Giga Byte
GHz	Giga Hertz
GR	Generic Requirement
GRIC	Global Reach Internet Connection
GSM	Global System for Mobile Communications
GUI	Graphic User Interface
HDD	Hard Disk Drive
HTTP	Hypertext Transfer Protocol
ID	Identification Data
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical & Electronics Engineers
IETF	Internet Engineers Task Force
IP	Internet Protocol
ISO	International Standards Organisation
ITU	International Telecommunication Union
IVR	Interactive Voice Response
LAN	Local Area Network
LCI	LDAP Configuration Interface
LDAP	Lightweight Directory Access Protocol
LED	Light Emitting Diode
MAC	Media Access Control
MIB	Management Information Base

MTBF	Mean Time Between Faults
MTTR	Mean Time To Restore
mW	Milli watts
NAI	Network Access Identifier
NAT	Network Address Translator
NE	Network Element
NMS	Network Management System
NOC	Network Operation Centre
OS	Operating System
PPP	Point-to-Point Protocol
PPPoE	Point to Point Protocol over Ethernet
PPTP	Point to Point Tunneling Protocol
QA	Quality Assurance
QM	Quality Manual
QoS	Quality of Service
QR	Quality Requirements
RADIUS	Remote Authentication Dial In User Service
RAID	Redundant Array of Independent Desks
RAM	Random Access memory
RDBMS	Relational Database Management System
RFC	Request For Comment
RIP	Routing Information Protocol
RISC	Reduced Instruction Set Computer
RP	Radio Paging
SASL	Simple Authentication Security Layer
SD	Secure Digital
SIM	Subscriber Identity Module
SMPP	Short Message Peer to Peer Protocol
SNMP	Simple Network Management Protocol
SQL	Structured Query Language
SSID	Service Set identifier
SSL	Secured Socket Layer
TCP	Transmission Control Protocol
TEC	Telecom Engineering Centre
TMN	Telecommunication Management Network
URL	Uniform Resource Locator
UTF	Unicode Transformation Format
VLAN	Virtual Local Area Network
VoIP	Voice over Internet Protocol
VPN	Virtual Private Network
WAN	Wide Area Network
WEP	Wired Equivalent Privacy
Wi-Fi	Wireless Fidelity
WLAN	Wireless Local Area Network
WPA	Wi-Fi Protected Access
XML	Extensible Markup Language

Annexure-I

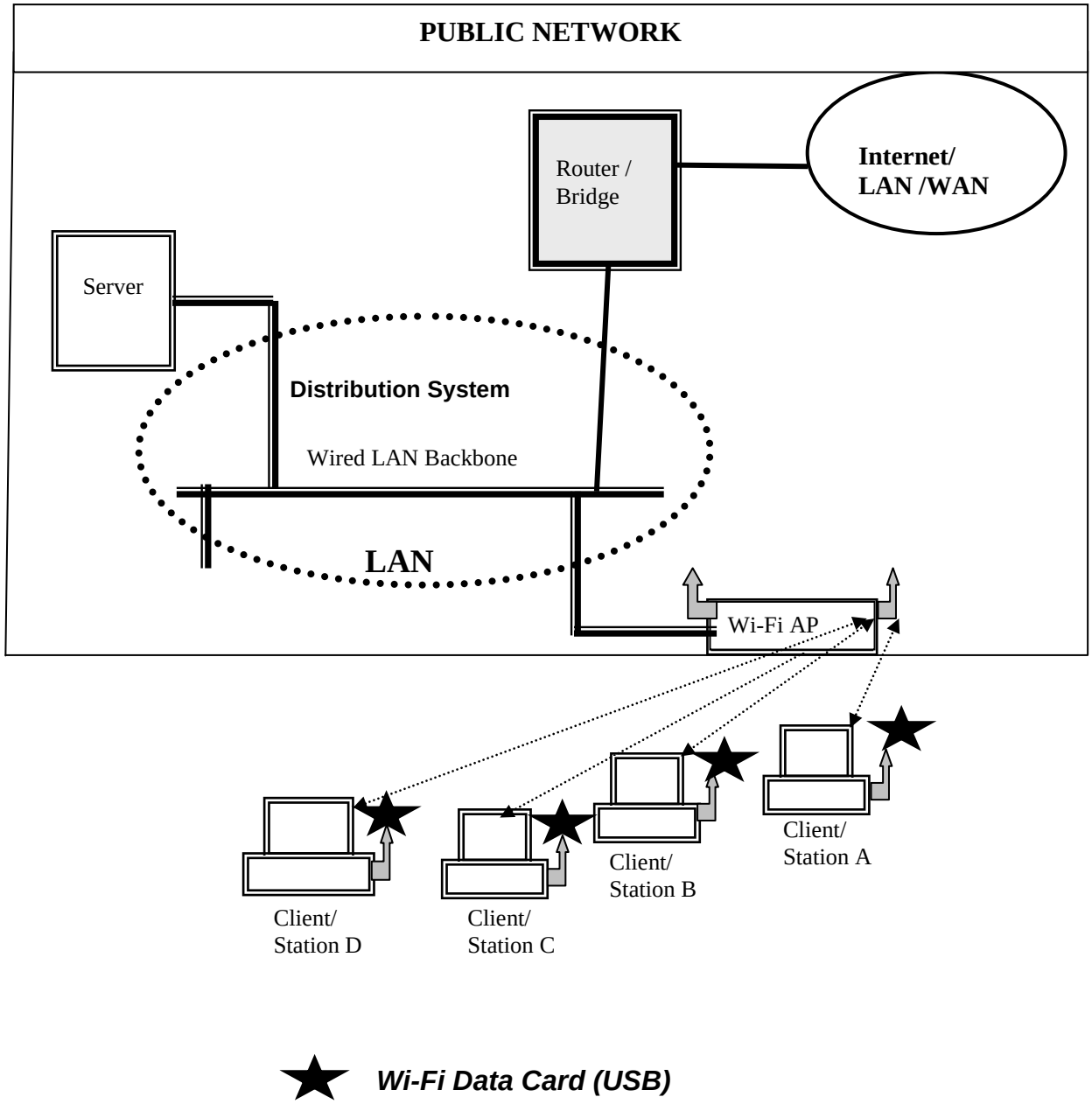

Figure 1. Schematic of Wireless LAN showing Wi-Fi Data card (USB) connectivity

Annexure-II

Receiver Sensitivity:

1. Clause 17.3.10.1 of IEEE 802.11-2007 for 802.11(a/b/g) –

Receiver minimum input sensitivity :- The packet error rate (PER) shall be less than 10% at a PSDU length of 1000 octets for rate-dependent input levels shall be the numbers listed in Table 17-13 or less. The minimum input levels are measured at the antenna connector (noise factor of 10 dB and 5 dB implementation margins are assumed).

Table 17-13—Receiver performance requirements

Modulation	Coding rate (R)	Adjacent channel rejection (dB)	Alternate adjacent channel rejection (dB)	Minimum sensitivity (dBm) (20 MHz channel spacing)	Minimum sensitivity (dBm) (10 MHz channel spacing)	Minimum sensitivity (dBm) (5 MHz channel spacing)
BPSK	1/2	16	32	–82	–85	–88
BPSK	3/4	15	31	–81	–84	–87
QPSK	1/2	13	29	–79	–82	–85
QPSK	3/4	11	27	–77	–80	–83
16-QAM	1/2	8	24	–74	–77	–80
16-QAM	3/4	4	20	–70	–73	–76
64-QAM	2/3	0	16	–66	–69	–72
64-QAM	3/4	–1	15	–65	–68	–71

2. Clause 20.3.22.1 of IEEE 802.11n-2009

Receiver minimum input sensitivity:- The packet error rate (PER) shall be less than 10% for a PSDU length of 4096 octets with the rate-dependent input levels listed in Table 20-22 or less. The minimum input levels are measured at the antenna connectors and are referenced as the average power per receive antenna. The number of spatial streams under test shall be equal to the number of utilized transmitting STA antenna (output) ports and also equal to the number of utilized device under test input ports. Each output port of the transmitting STA shall be connected through a cable to one input port of the device under test. The test in this subclause and the minimum sensitivity levels specified in Table 20-22 apply only to non-STBC modes, MCSs 0–31, 800 ns GI, and BCC.

Table 20-22—Receiver minimum input level sensitivity

Modulation	Rate (R)	Adjacent channel rejection (dB)	Nonadjacent channel rejection (dB)	Minimum sensitivity (20 MHz channel spacing) (dBm)	Minimum sensitivity (40 MHz channel spacing) (dBm)
BPSK	1/2	16	32	–82	–79
QPSK	1/2	13	29	–79	–76
QPSK	3/4	11	27	–77	–74
16-QAM	1/2	8	24	–74	–71
16-QAM	3/4	4	20	–70	–67
64-QAM	2/3	0	16	–66	–63
64-QAM	3/4	–1	15	–65	–62
64-QAM	5/6	–2	14	–64	–61

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