Get Your Device PTCRB Certified

1. Overview

This document outlines the certification processes for a 3GPP Machine Type Communications (MTC) device in the AT&T networks operating in North America. This document will focus on UMTS and LTE, as they are the most widely deployed and used communication technologies at AT&T.

This document outlines the regulatory requirements, industry requirements and AT&T's carrier acceptance requirements.

2. Regulatory Requirements

In the United States, a device manufacturer should start with FCC Telecommunications Certification Body (TCB) to understand what it takes to obtain FCC grant.

It is suggested to start the certification process as early as possible for TCB to understand the device, provide test scope, and review results.

3. Industry Requirements (PTCRB)

3.1 Over the Air Testing

Good radiated performance is critical to the effective operation of a wireless device in mobile broadband networks. As device form factor becomes smaller, radiated performance often becomes compromised. Over the Air (OTA) performance testing verifies radiated performance of a wireless device. CTIA Test Plan for Wireless Device Over-the-Air Performance has defined the OTA test methodologies and procedures for a wireless cellular device.

3.2 Total Radiated Power (TRP) testing

TRP is a measure of how much power is radiated by a device when the antenna is connected to a radio (transmitter). TRP is an active measurement. In a cellular environment, it is best to maximize the spatial coverage of the antenna system so that the user does not have to point the antenna in one direction to get good performance. Hence, average spherical effective isotropic radiated power (Total Radiated Power, TRP) measurement is more meaningful than peak EIRP (Effective Isotropic Radiated Power) measurement. Further, the human body such as head, hand and/or wrist can alter the shape and peak value of the Device Under Test (DUT) radiation pattern. Losses due to the head, hand and/or wrist can vary significantly with frequency, device size, and antenna design.

DUT TRP is measured by sampling the radiated transmit power of the mobile at various locations (every 15 degrees) surrounding the device. A 3D characterization of the transmit performance of the DUT is pieced together by analyzing the data from the spatially distributed measurements. This test is run on the low, mid, and high channels of each supported frequency band on the cellular radio.

3.3 Total Isotropic Receiver Sensitivity (TIS) testing

A receiver sensitivity is the smallest amount of power input to a receiver so that the receiver can maintain reliable communication connection. Total Isotropic Sensitivity (TIS) is a measure of the average sensitivity of the device receiver system, when averaged over the entire 3D sphere.

As transmitter performance, receiver performance is as important to the overall system performance. The cause of poor receive sensitivity on a single channel or a small number of channels, is due to receiver in-band interference, or spurious signals from the transmitter itself being radiated back into the device receiver. Wireless receiver design may experience a significant amount of in-band interference. The internal sources of interference have more of an impact on a system and

they may also be periodic and change frequency with time. The variation of the interference can also change from component to component and affects the overall system performance differently.

3.4 Multiple Input Multiple Output over the Air (MIMO OTA) testing

AT&T does not require CTIA's MIMO OTA testing for M2M devices in general. However, if there is an implementation that demands the highest possible data rates, an antenna system design verification using the CTIA MIMO OTA methodology is recommended. Development and testing using a reverberation chamber (RC) is a good approach, but AT&T has found there are orientation-specific aspects of MIMO performance that which can only be evaluated in the spatially-controlled environment of a multi-probe anechoic chamber (MPAC).

3.5 Radiated Spurious Emissions (RSE) testing

Cellular device is required to perform RSE testing both in active mode and idle mode per PTCRB certification requirement. Similar as FCC unintentional emission testing, idle mode RSE testing measures the emission generated from the device when its cellular radio is not in transmitting mode.

Active mode RSE testing need be performed on all bands radio transmit and measures the radiated signal of the harmonics from the cellular transmitted signal.

3.6 Subscriber Identity Module (SIM) electrical testing

SIM Electrical testing verifies the Device / UICC Interface to ensure interoperability between an UICC and Device regardless of card manufacturer/issuer/ operator.

The test cases follow what is specified in ETSI TS 102 230 and consists of tests which measure:

- Electrical interface between the UICC and the Device (Voltage, Rise/Fall times of the UICC Pins)
- Initial Communication establishment (Power On sequences, Answer to Reset (ATR), Speed enhancements)
- Transmission Protocol tests (Timing, Command processing, Error Detection/Correction)

4. AT&T Carrier Acceptance Requirements

Some U.S. carriers, including AT&T require your device to be FCC and PTCRB certified to be allowed on their network. Along with passing FCC and PTCRB certification the carrier also has limits imposed on the TRP/TIS performance results measured during PTCRB testing. If your device performs under these required limits it may not be allowed on the network.

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