
FCC 6SD

Geolocation Justification Report

for TP-Link Archer BE550 &Archer BE9300

Corporation: TP-Link Systems Inc.

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**TP-Link PIA inquiry re Use of
Skyhook Wi-Fi positioning Geolocation for 6GHz Access Points
Geolocation Justification Report**

This is a General Description of the Access Point Product "TP-Link Archer BE550" (the "Product") of TP-Link Systems Inc. ("TP-Link") to determine geographic coordinates and location uncertainty, with a confidence level of 95% per the requirements in 47 CFR Part. E 15.407(k)(9), for 6GHz Standard Power and Automated Frequency Coordination (AFC) support. This document in conjunction with the confidential details in the associated "Geolocation and Justification Report" from Qualcomm Technology, Inc. ("QTI"), as the "Product" adopting the "Wi-Fi based Geolocation for Standard Power Devices" and the "3D Buildings Database – Based Elevation Determination for Standard Power Devices " as a part of "Terrestrial Positioning Service (TPS)" provided by Qualcomm Technology, Inc.

Section I will describe the general process of the "Product" to finish AFC request and to set AP power and PSD limit according to the AFC response. Sections II and III include attestations of the 95% location uncertainty and confirmation that a daily AFC confirmation will be performed according to the requirements in KDB 987594 D01 U-NII 6GHz General Requirements v02r02 clause 10.2.1.

Catalogue

Abbreviations and acronyms.....	- 3 -
1. Overview of device geo-location technology.....	- 4 -
2. Attestation confirming the location uncertainty with a 95% confidence level.....	- 6 -
3. Periodically AFC confirmation and power cycle operation	- 6 -

Abbreviations and acronyms

Definition	Acronyms
Automated Frequency Coordination	AFC
Access Point	AP
Federal Communications Commission	FCC
Low Power Indoor	LPI
Standard Power	SP
Low Power Indoor Access Point (6 GHz)	6ID
Standard Power Access Point (6 GHz)	6SD
Transport Layer Security	TLS
Basic Service Set	BSS
Media Access Control	MAC
Service Set Identifier	SSID

1. Overview of device geo-location technology

The "Product" uses AFC component, in which AFC Geolocation Solution is used to automatically determine the product's geographic location. This solution consists of three interoperable systems as described:

- 1) The "Access Point", including hardware and software that can perform basic wireless communication which compliant with IEEE802.11 specification.
- 2) The "AFC Software", a software package that would run on the access points to perform AFC related actions like geo-location information acquisition and AFC available spectrum inquiry.
- 3) The "Wi-Fi Positioning Server", a remote cloud-based server which provides a hybrid geo-location service in the United States.
- 4) The "Building Elevation Server", a remote cloud-based server which provides a lookup service on the height of buildings distributed in the United States.

The process of determining the geo-location of the "Product" is as described below in figure 1:

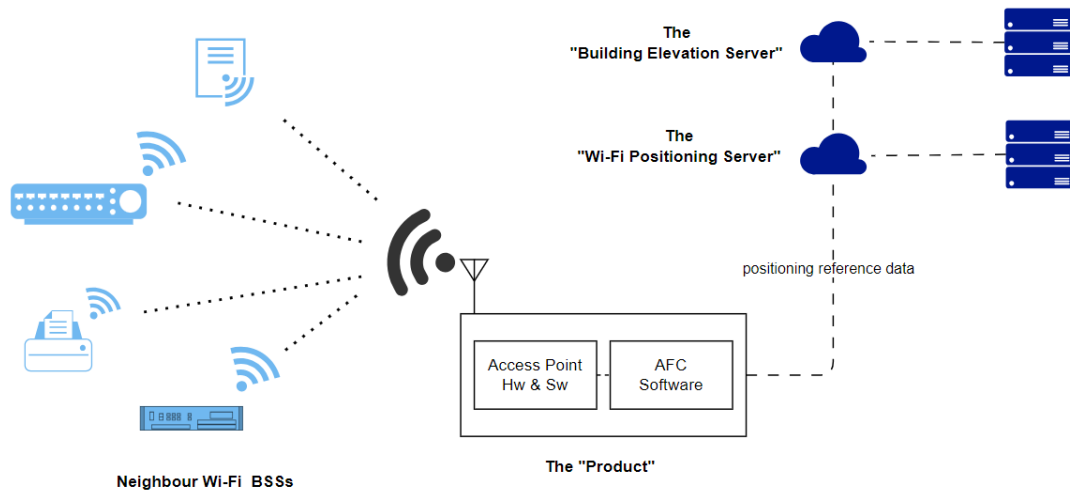


Figure 1 – Overall working flow of the "Product" AFC solution

1. When first time boot up, or after a power cycle, the product works at LPI mode as a 6G access point.
2. If customer enabled the "AFC function", The "AFC Software" control the "Access Point" to do a Wi-Fi scanning to collect BSSs nearby and extract some identifiable parameters including MAC Address, SSID, and signal strength, etc. as a "positioning reference data" after the "Access Point" boots up.
3. The "AFC Software" control the "Access Point" to send the "positioning reference data" to

the "Wi-Fi Positioning Server".

4. The "Wi-Fi Positioning Server" calculates the coordinates of the requested device, and send back a message with latitude, longitude, and an associated uncertainty radius at 95% confidence level.
5. The "AFC Software" controls the "Access Point" to send the coordinates and associated uncertainties of the product obtained from step 4 to the " Building Elevation Server".
6. The "Building Elevation Server" finds the tallest building nearby the requested coordinate on the uncertain areas and return the maximum building height and an associated vertical uncertainty at 95% confidence level.
7. Once the geo-location information is determined, and the location obtained from step 3 and step 5 will be used to request AFC available spectrum from an FCC-approved AFC system.

Note that:

- 1) The "Product" may be a part of a mesh network that consists of more than 1pcs AP, in which each AP device's AFC will function independently, means that they will do the same process as described above by determining their own geolocation and inquiring the AFC system for available spectrum independently. Only FCC authorized 6SD AP device will have the AFC components and functions in the mesh network.
- 2) When the "Product" is connecting to the "Wi-Fi Positioning Server" or the "Building Elevation Server", all the data is transferred via a TLSv1.2 secured connection and we will take essential identification procedures to ensure any fake server will not be able to forge or modify the coordinates or height information.
- 3) The "Wi-Fi Positioning Server" (step 3~5) and "Building Elevation Server" (step 5~6) are provided by Qualcomm who has completed PIA approvals for the respective geolocation features. This application includes the following associated Qualcomm PIA documents:

Geolocation Feature	Qualcomm PIA Document	Confidentiality
WI-FI Location	Qualcomm Wi-Fi Location PIA General Description	Public
	Qualcomm Wi-Fi Location PIA Confidential Information	Long term confidentiality
	Qualcomm Wi-Fi Location FCC PIA Acceptance Letter	Long term confidentiality
	Qualcomm Wi-Fi Location FCC PIA Inquiry Correspondence	Long term confidentiality
Building Elevation	Qualcomm 3D Building Elevation PIA General Description	Public
	Qualcomm 3D Building Elevation PIA Confidential Information	Long term confidentiality
	Qualcomm 3D Building Elevation FCC PIA Acceptance Letter	Long term confidentiality
	Qualcomm 3D Building Elevation FCC PIA Inquiry Correspondence	Long term confidentiality

2. Attestation confirming the location uncertainty with a 95% confidence level

The "Product" uses the external cloud-based "Positioning Server" and "Building Elevation Server" to determine the geo-location, as described in section 1, the cloud server always return a coordinates or height with an associated horizontal and vertical uncertainty at 95% confidence level. The "AFC Software" will use the geo-location information as is, without any additional changes, to do the AFC available spectrum inquiry, so these procedures will ensure that the geo-location solution always gets a geo-location information under 95% confidence level for AFC Service accessing.

3. Periodically AFC confirmation and power cycle operation

As a residential access point device, the "Product" relies on an external power adapter connected to an AC power socket. Thus, it is not possible to move the "Product" for a long distance without removing the power adapter and hence powering down the "Product". For this reason, we consider the device's position to be static, and the "AFC Software" will reuse the same geo-location information to do the AFC available spectrum inquiry, unless the device is power down and reboot. If the device is powered down or rebooted, the device will start as a LPI mode AP device at 6GHz as described in the previous section until the AFC initialization process described below is completed again.

A daily AFC inquiry will be performed as required by the regulation. An AFC inquiry will be performed after any power cycle operation as illustrated by the steps in Figure 2.

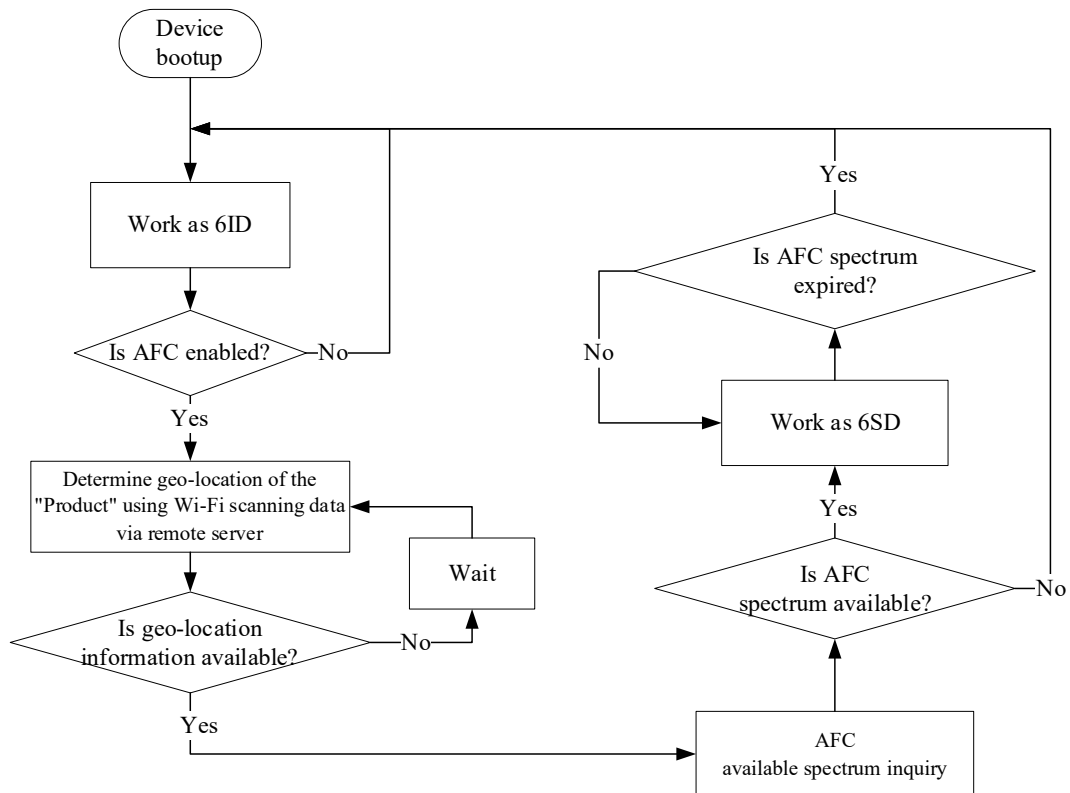


Figure 2 – Working flow diagram of the "Product" to perform AFC confirmation daily or after a power cycle

The behavior of the "Product" after a power cycle is described as following: the product works in LPI mode as a 6ID access point after power cycle. After it successfully determines the geo-location and requests available spectrum, it will work at SP mode as a 6SD access point. The "AFC Software" will continuously check whether the spectrum is expired and return LPI mode once the AFC response data expire or go to a new AFC execution cycle. The AFC spectrum response is valid for one day, which necessitates a daily AFC inquiry is performed.

If the "AFC Software" fails to determine the geo-location or failed to contact with the AFC server, it will continue to operate in 6SD mode until 11:59 p.m. of the following day if a valid AFC spectrum is not available and then return to operate at LPI mode in compliance with the 47 CFR 15.407(k)(8) regulations.