



# China Unicom Shenzhen Division

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**SZ Longhua RiverBack**

**2<sup>nd</sup> district**

**NO.5**

**5G Base station**

**Jaguar Wave PTP6151**

**mmWave equipment**

**test report**

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## 1. Introduction

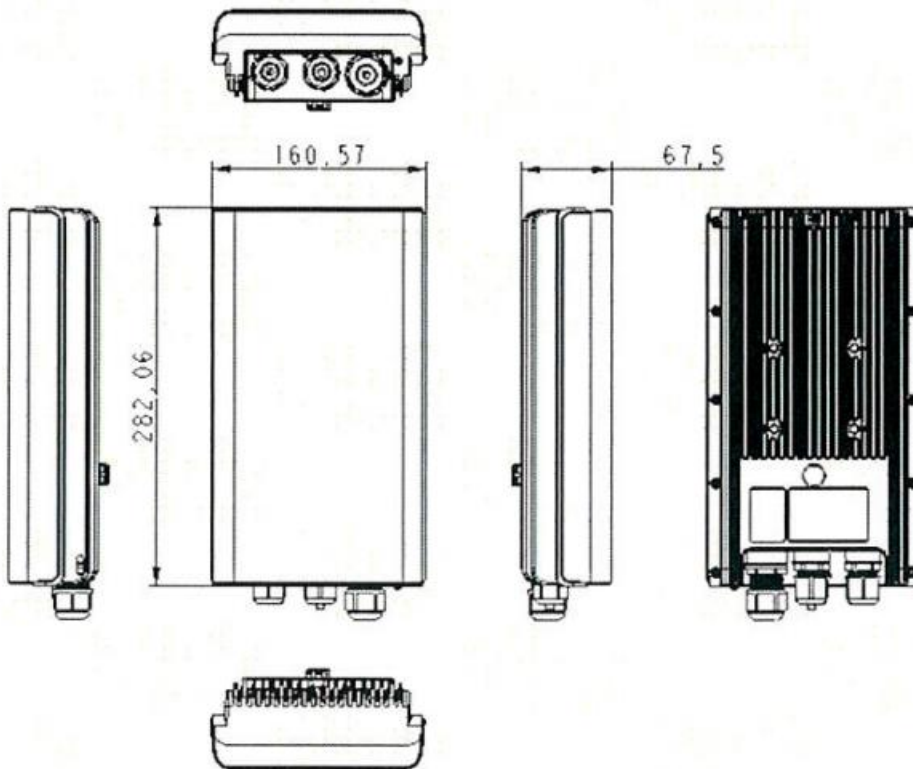
This test report summarizes the field test result with and without 5G Network along with loopback test result at Shenzhen area while Jaguar Wave Technology Co., LTD. mmWave wireless data transmission product (model: PTP6151) networks with upstream connecting with ZTE 5G equipment 6180 and downstream connecting with Huawei 5G BBU device 5900. This document is designed to guide relevant operator networking construction personnel and networking optimization department personnel understanding mmWave equipment playing a reliable and effective wireless transmission role and the product itself providing wireless transmission stability while lacking of optical cable resource in 5G networking construction process.

## 2. PTP6150 equipment basic Information

### 2.1 Equipment specification

<b>Power supply / Power consumption</b>	PoE/DC-12V, 22W
<b>Interfaces</b>	1*10G SFP+, 1x 2.5G GbE
<b>Throughput</b>	500m: 1.8Gbps 800m: 1.5Gbps 1300m: 1.0Gbps
<b>Working Temperature</b>	-30 degree C ~ +55 degree C
<b>Working moisture</b>	10 % ~ 90 %
<b>Protection grade</b>	IP67, +/- 15KV ESD, +/- 6KV Lightning proof
<b>Size/Weight</b>	288*150*68mm, 1.2Kg (without bracket) 1.9Kg (with bracket)
<b>Installation</b>	Wall mount / Pole mount

### 2.2 Equipment View

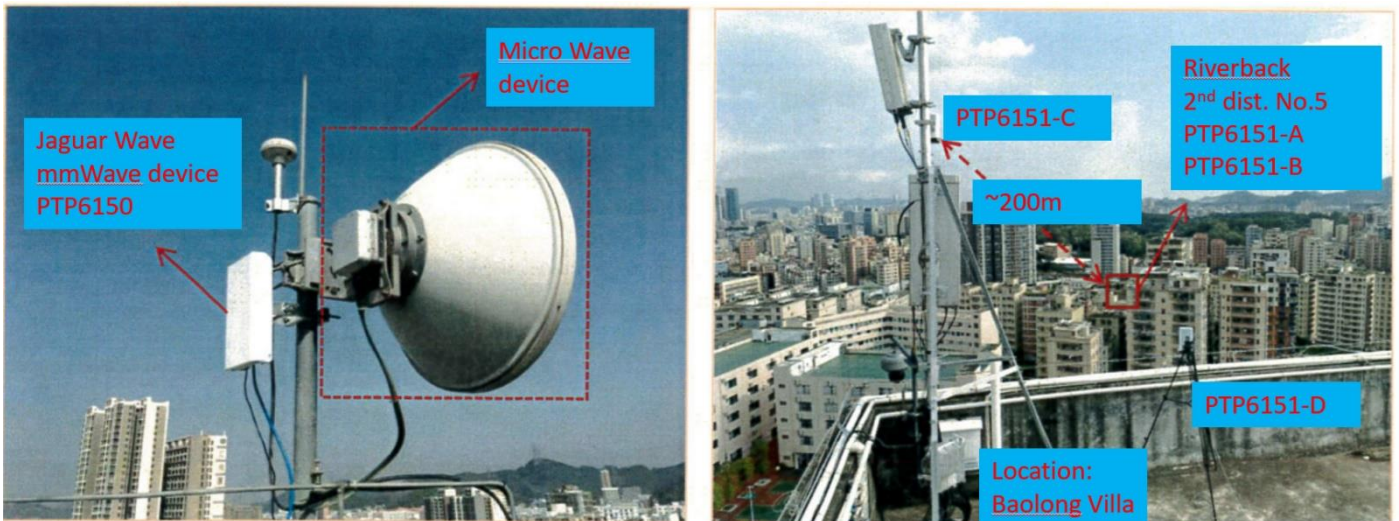


### 3. Test Verification

#### 3.1 Test Instructions:

Location	UP-stream: Shenzhen Longhua Baolong Villa
Data collection Period	2021-07-19 - 2021-07-21
Testing Items	1. Without connecting 5G Networks test (using Spirent C1 tester) 2. With connecting 5G Networks test
Test crew	[REDACTED]
Test tool	<ul style="list-style-type: none"> <li>Spirent C1 tester,</li> <li>Huawei MATE30 Pro 5G version phone,</li> <li>“网优任我行” (China version network test tool),</li> <li>“Speed test”</li> </ul>

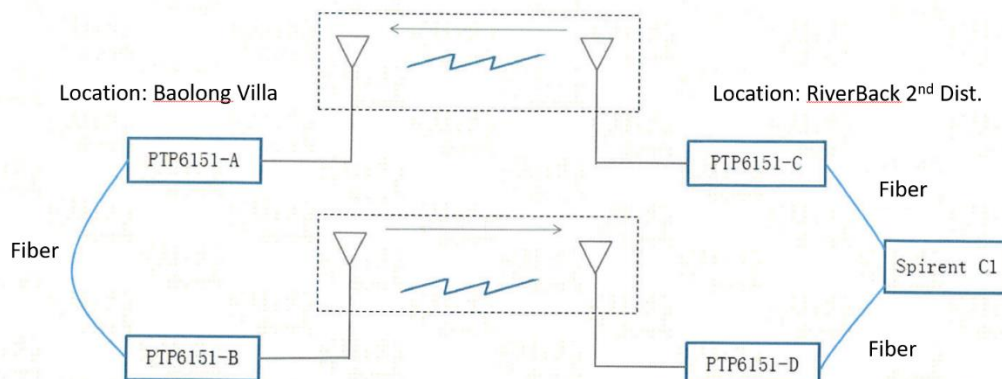
#### 3.2 Field installation and environment setup



#### 3.3 Field testing - Without connecting 5G Networks (by using Spirent C1 tester)

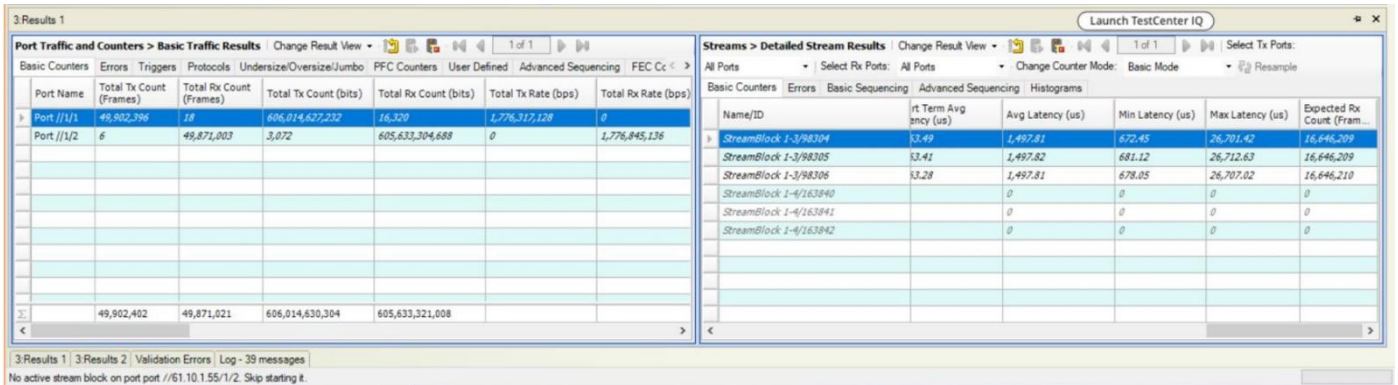
##### 3.3.1 Block diagram

Using loopback test, Spirent C1 equipment uses SFP+ interface sending data to PTP6151-C and then through PTP6151-C -> PTP6151-A (60GHz mmWAVE wireless transmission), PTP6151-A to PTP6151-C (SFP+) by fiber, PTP6151-B -> PTP6151-D (60GHz mmWAVE wireless transmission), PTP6151-D back to Spirent C1 (through fiber interface). Running the Spirent tester tests to obtain the data of throughput, latency and packets loss performance.



### 3.3.2 Spirent C1 tester Data

Product	Test location	Dist. (meter)	Test Period	TX rate	RX rate	P.loss	Latency
PTP6151	Shenzhen Longhua River back 2 <sup>nd</sup> area, No.5	200	5min	1776Mbps	1776Mbps	0.01%	0.74ms
			20min	1776Mbps	1775Mbps	0.01%	0.84ms
			30min	1776Mbps	1776Mbps	0.01%	0.84ms
			32min	1776Mbps	1775Mbps	0.01%	0.84ms



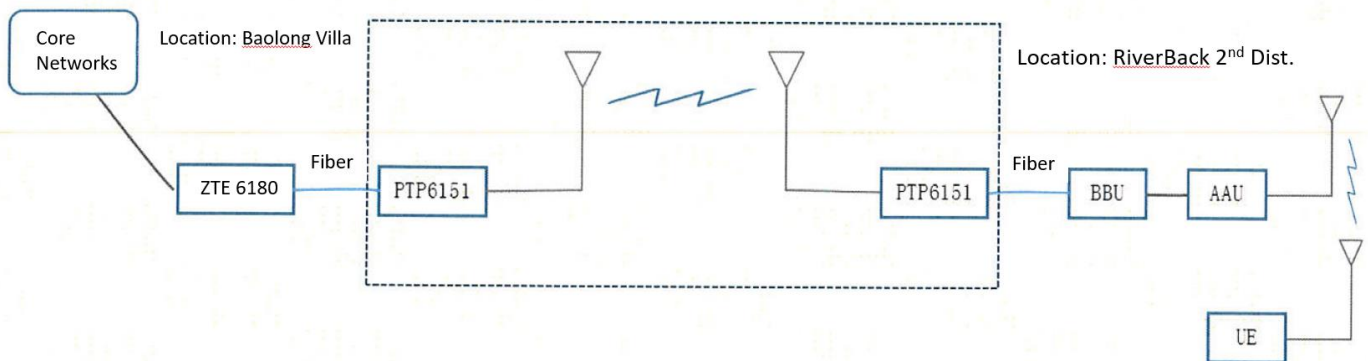
### 3.3.3 Summary

- mmWave product has strong anti-interference capability and won't impact each other while multiple pairs are installed in complex wireless environment.
- mmWave product offers high throughput (~1.8Gbps), low latency (<1ms) and low packet error rates (~0.01%)

## 3.4 Field test – connecting with 5G Networks

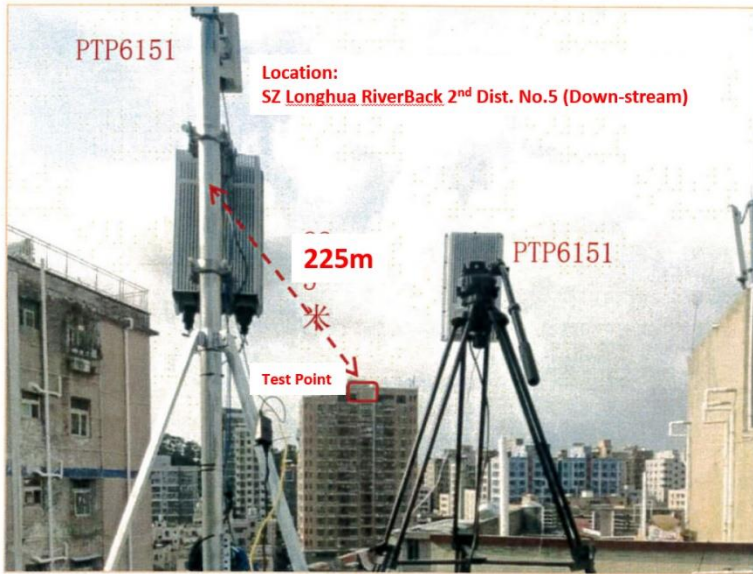
### 3.4.1 Block diagram

At “Shenzhen Longhua Baolong Villa” (Upstream location), PTP6151 networks with upstream connecting with ZTE 5G equipment 6180 through fiber and downstream connecting with Huawei 5G BBU device 5900 through fiber at “Shenzhen Longhua Riverback 2<sup>nd</sup> dist. No.5”. The ZTE 5G 6180 and Huawei 5G BBU 5900 are connected wirelessly through PTP6151s.



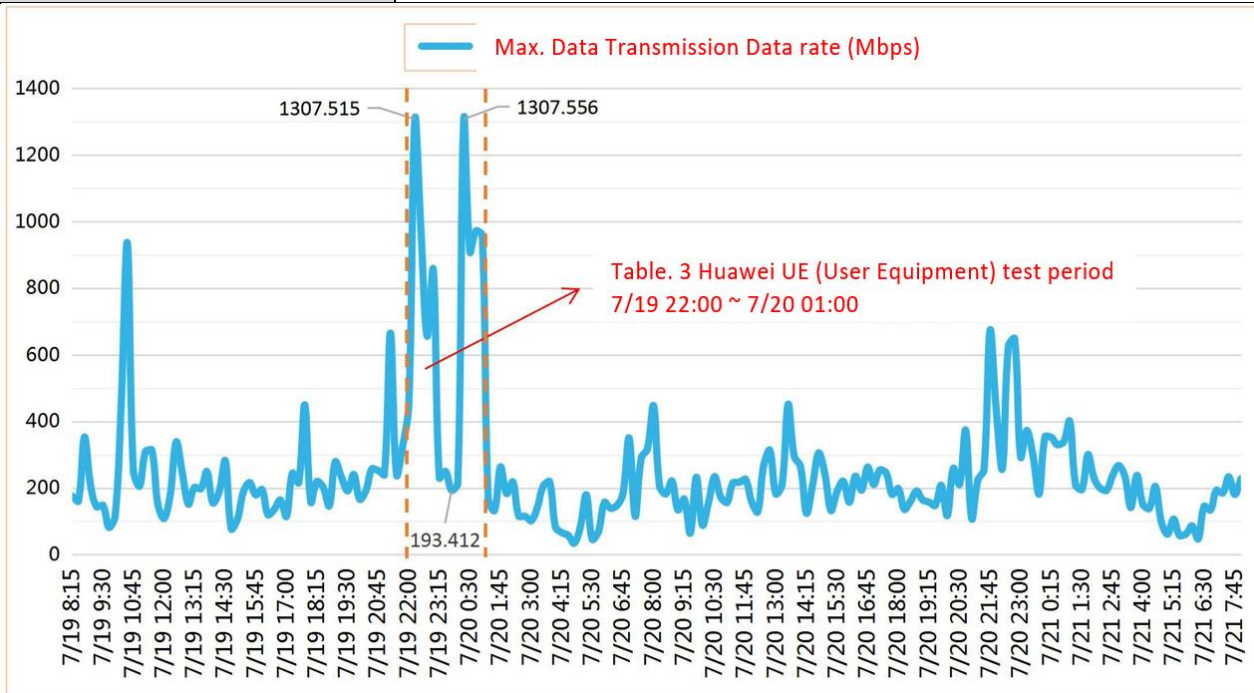


### 3.4.2 Field installation and environment setup



### 3.4.3 Upstream ZTE equipment test data

Location	UP-stream: Shenzhen Longhua Baolong Villa
Data collection Period	2021-07-19 08:00:00 - 2021-07-21 08:00:00
Test crew	[REDACTED]
Max. Transmission Data rate	1307.556 Mbps (7/19 22:00~7/20 01:00)



### 3.4.4 Downstream Huawei UE test data

Downstream test location	5G UE test location	7/19~7/20 Test period	Single User		Multi-Users				
			Ave. Rate (Mbps)	Max. Rate (Mbps)	User1 (Mbps)	User2 (Mbps)	User3 (Mbps)	Ave. (Mbps)	Total (Mbps)
Downstream: Shenzhen Longhua River back 2 <sup>nd</sup> area, No.5	8495897-1-1	Non-busy period (0 clock)	915	1136	377	294	319	316	990
		Busy period (22 clock)	671	1004	313	302	326	313	941
	8495897-2-1	Non-busy period (0 clock)	523	728	250	267	254	257	771
		Busy period (22 clock)	336	466	223	223	224	223	670
	8495897-3-1	Non-busy period (0 clock)	428	602	157	199	170	175	526
		Busy period (22 clock)	342	492	144	136	140	140	420

Note: In Table 3. The 5G UE testing period is separated into two period, non-busy and busy. During the testing period with 5G UE, there are some other UEs are used at the same time. So, the real total max throughput/rate should be bigger than the number recorded in the table.

### 3.4.5 Summary

- Max. Peak Rate is 1307.556Mbps at ZTE equipment
- Max. Peak Rate is 1136Mbps at Huawei BBU End User device
- In real normal usage, at these stations the work loading is not heavy.
- After PTP6151s connect with 5G network, the up/down stream performance and each parameter are meet 5G stations' inquire. Switching performance to each indicators, for example, power, access-in successfully rate, drop-line rate and CQI..etc. are all good.
- In the test period, there is no dis-connected situation observed while tests were conducted under serious weather conditions including high temperatures, rain storms and lightning strikes. It proofs PTP6151's water-proof, lightning-proof and high temperature resistance qualities.

### 3.4.6 Comparison - PTP6151 mmWave device versus traditional microwave device

- Jaguar Wave PTP6151 mmwave device is smaller and lighter than micro wave device. The PTP6151 device only weight 1.2KG (without bracket). Size is 288\*150\*68mm is more convenient to be transported and installed in the field.
- Jaguar Wave PTP6151 mmWave device is with better performance than micro wave device. It offers high throughput (~1.8Gbps), low latency (<1ms) and low packet error rates (~0.01%)
- Jaguar Wave PTP6151 mmWave device offers better anti-interferences, networking securities and stabilities. The total power consumption is lower (22W) than micro wave device.
- Jaguar Wave PTP6151 mmWave device is much cheaper than micro wave device which can reduce the costs during the infrastructure construction.

### 3.5 Supplements

- “Shenzhen Shiyuan area” Base station uses mmWave devices to transmit the data, the distance is 850 meters. It is limited by giga-Ethernet, the Max. peak of throughput is 990Mbps. It operates for 6 months long without any faults, it has passed under critical weathers conditions including high tempertures, rain storms and lightning strikes at Shenzhen shiyuan area.
- “Shenzhen Longhua area” Bases station uses mmWave devices to transmit the data, the distance is 615 meters. It operates for 3 months long without any faults.

### 4. Attachments

“Shenzhen Longhua Riverback 2<sup>nd</sup> dist. No.5” Upstream ZTE equipment and Downstream Huawei 5G UE test data.