3.5GHz Indoor Field Trial Report

Version: 1.0

Date: 1-Aug-2018

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Revision History

Revision Date	Previous Revision Date	Summary of Changes	Changes Marked
1-Aug-2018	N/A	V1.0	N/A

Approvals

Name	Signature	Title	Date of Issue	Version
				1.0

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1. Introduction

With refer to The Communications Authority (CA) announcement on 28 March 2018, 3.4-3.7GHz band (currently assigned for fixed satellite service provision) will be allocated to mobile service with effect from 1 April 2020. In this field trial, 3.5GHz cell site is set up in the indoor environment to evaluate any potential impact to the fixed satellite services.

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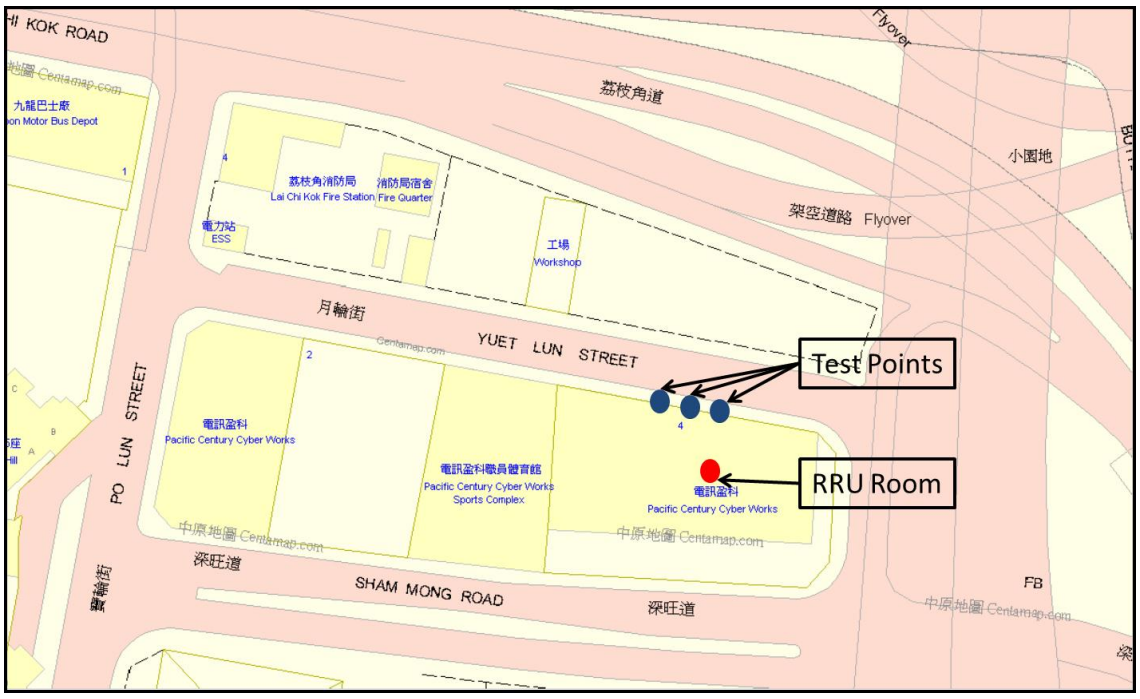
2. Trial Set Up

A) JOINT TEST WITH SATELLITE OPERATOR

23-Jul-2018 – 24-Jul-2018

B) SITE LOCATION

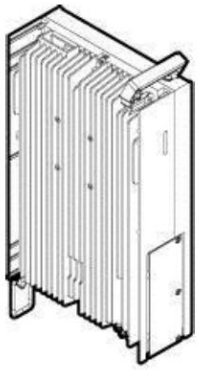


C) EQUIPMENT

Amphenol 3.5G Indoor Antenna (5005350A)

Huawei RRU3278 with 100MHz Bandwidth from 3.5GHz to 3.6GHz

- EIRP 1W
- 5*20M TDD channels - 42690/42890/43090/43290/43490



D) TEST TOOLS

Mobile Coverage Test – CPE (HW 5318)

Coverage Test – Spectrum Analyser+ High Gain Receiver

N9938A FieldFox Handheld Microwave Spectrum Analyser

LowNoiseAmplifier + receive antenna

(75dB gain)

E) SITE SETUP

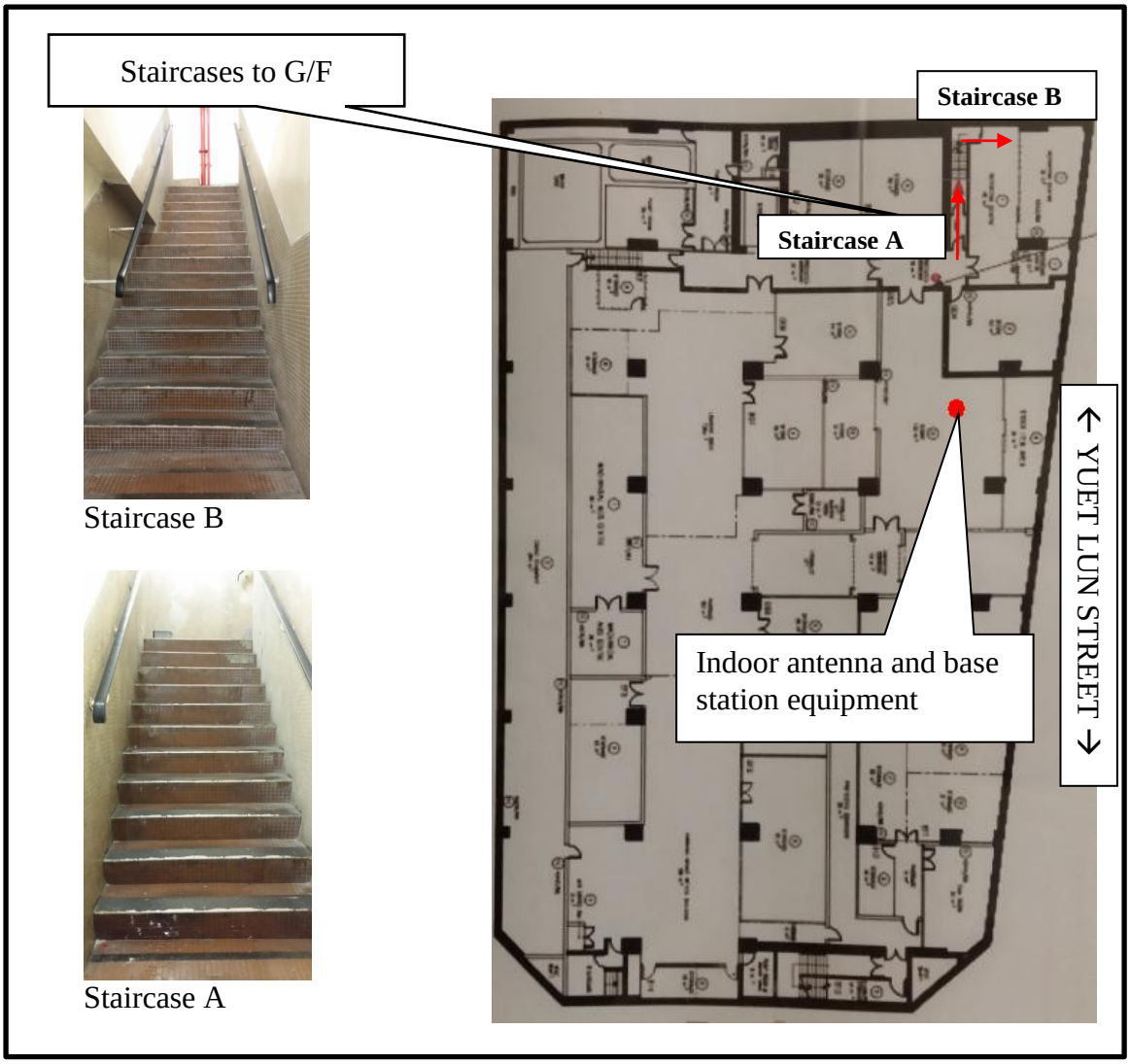


Figure 1: Antenna and Equipment at Basement

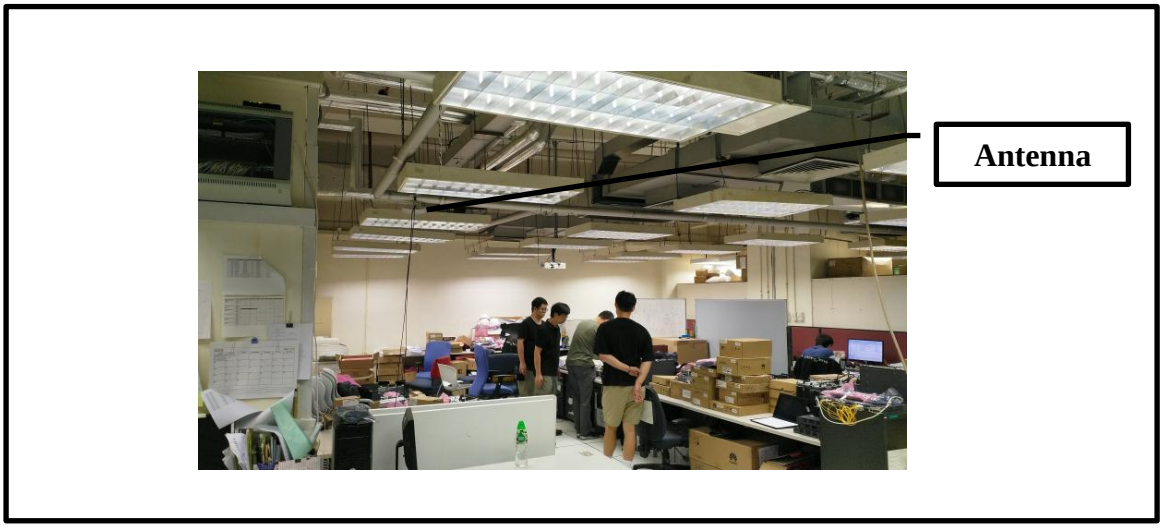


Figure 2: Antenna Location

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3. Test Items

A) COVERAGE TEST

3 test points (A, B and C) will be selected for the signal level measurement using CPE and Spectrum Analyser (with Low Noise Amplifier) as shown below :

Figure 3: 3 Test Points

The measurement results will be updated in the following format to see any potential impact to the existing fixed satellite network

Test Point	Measured by N9938A FieldFox Handheld with Low Noise Amplifier	Measured by CPE from HKT(RSRP)
A		
B		
C		

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B) FUNCTIONAL TEST

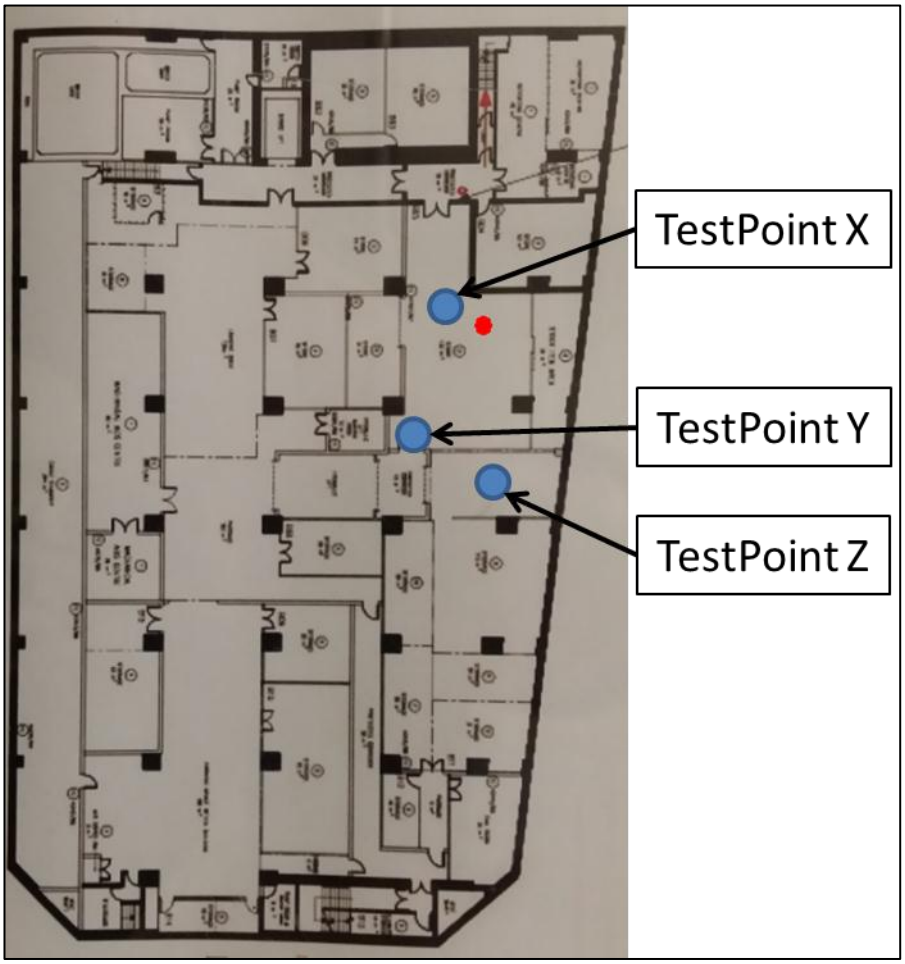

Figure 4: 3 Test Points at basement

The following basic 4G mobile functionality test will be carried out in the test

Item	Type	Description	Status (Pass/Fail)
1	Functionality	MO VOLTE Call	
2	Functionality	MT VOLTE Call	
3	Functionality	SMS MO Service	
4	Functionality	SMS MT Service	
5	Functionality	MO Video Call	
6	Functionality	MT Video Call	
7	Functionality	PS Service	
8	User Experience	RSRP (Signal bar from the device) performance along the antenna system in basement to G/F	
9	User Experience	Downlink Throughput at antenna - Near point (X)	
10	User Experience	Downlink Throughput at antenna - Middle point (Y)	

11	User Experience	Downlink Throughput at antenna - Far point	
12	User Experience	Uplink Throughput at antenna - Near point (X)	
13	User Experience	Uplink Throughput at antenna - Middle point (Y)	
14	User Experience	Uplink Throughput at antenna - Far point (Z)	
15	User Experience	User cannot select “3GHz cell” at G/F (Test Points A, B & C)	
16	Interference Check	Keeping the interference level at G/F (10m from exit) to minimal LTE RSRP level (-120dbm , -130dBm, or -140dBm) to avoid affecting satellite transmission (Test Points at A, B & C)	

4. Test Result

A) COVERAGE TEST AT GROUND LEVEL

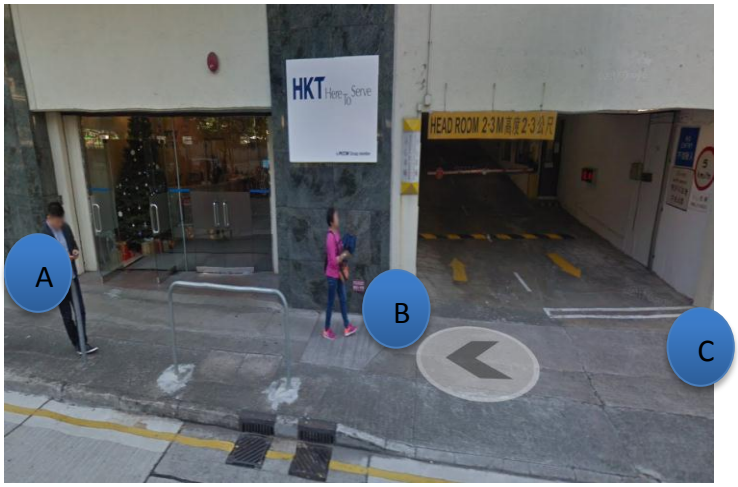

Figure 5: 3 Test Points at ground level

Test Point	Measured by N9938A FieldFox Handheld with 75dB Low Noise Amplifer	Measured by CPE from HKT(RSRP)
A	-110dBm * per 100MHz	No Network
B	-108dBm * per 100MHz	No Network
C	-107dBm * per 100MHz	No Network

*Measured by spectrum analyser with 75dB offset - gain LowNoiseAmplifer receiver

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B) FUNCTIONAL TEST AT BASEMENT UNDER INDOOR ANTENNA

The 4G test results at basement are shown as below

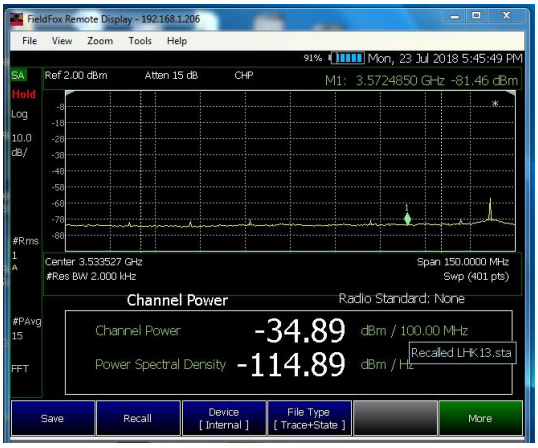
Item	Type	Description	Expected Result	Status (Pass/Fail)
1	Functionality	MO VOLTE Call	Call Normal	Pass
2	Functionality	MT VOLTE Call	Call Normal	Pass
3	Functionality	SMS MO Service	Service Normal	Pass
4	Functionality	SMS MT Service	Service Normal	Pass
5	Functionality	MO Video Call	Call Normal	Pass
6	Functionality	MT Video Call	Call Normal	Pass
7	Functionality	PS Service	Service Normal	Pass
8	User Experience	RSRP (Signal bar from the device) performance along the antenna system in basement to G/F	With LTE signal as serving cell where signal can reach -60dBm at least 1 point	Pass
9	User Experience	Downlink Throughput at antenna - Near point (X)	Better than 45Mbps	Pass
10	User Experience	Downlink Throughput at antenna - Middle point (Y)	Better than 20Mbps	Pass
11	User Experience	Downlink Throughput at antenna - Far point (Z)	Better than 0Mbps	Pass
12	User Experience	Uplink Throughput at antenna - Near point (X)	Better than 15Mbps	Pass
13	User Experience	Uplink Throughput at antenna - Middle point (Y)	Better than 5Mbps	Pass
14	User Experience	Uplink Throughput at antenna - Far point (Z)	Better than 0Mbps	Pass
15	User Experience	User cannot select “3.5GHz cell” at G/F (Test Points A, B & C)	Device cannot select LTE network	Pass
16	Interference Check	Keeping the interference level at G/F (10m from exit) to minimal LTE RSRP level (-120dbm , -130dBm, or -140dBm) to avoid affecting satellite transmission (Test Points A, B & C)	Device cannot select LTE network	Pass

5. Conclusion

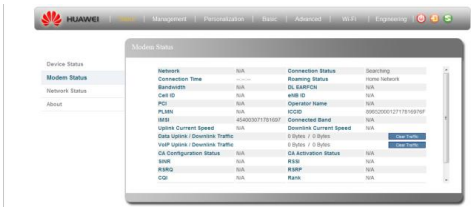
1) From the result based on 4G signal test at 3.5GHz band, it is shown that proper indoor coverage planning is capable to avoid any unexpected 3.5GHz mobile network selection at the street level from the mobile device, which can help to avoid any abnormal uplink interference to affect the existing satellite service before the enhancement work from satellite network for coming 5G rollout preparations.

2) The scanned signal levels at Point A, B and C are taken by our HKT satellite team, the signal levels at street level are less than -107dBm per 100MHz, which shall not affect the performance of fixed satellite network. Furthermore, there is around 30dB to 40dB coupling loss from the street level to the fixed satellite antenna, the interference from 3.5GHz indoor mobile network shall not contribute to any degradation to the overall performance of the fixed satellite network.

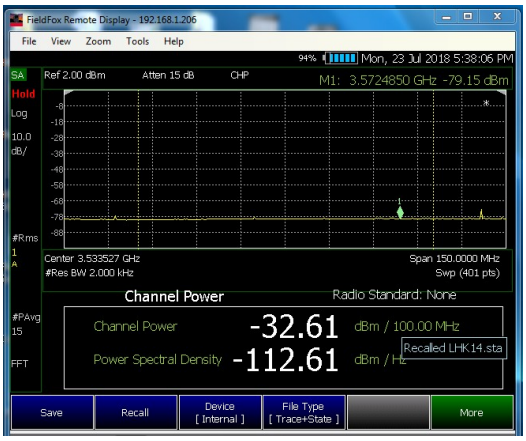
6. Appendix



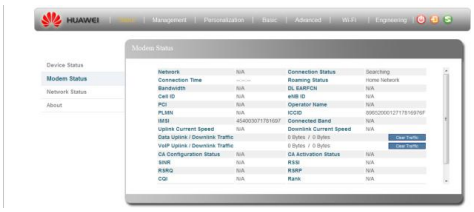
Scanned Signal at Point A (amplified by 75dB)



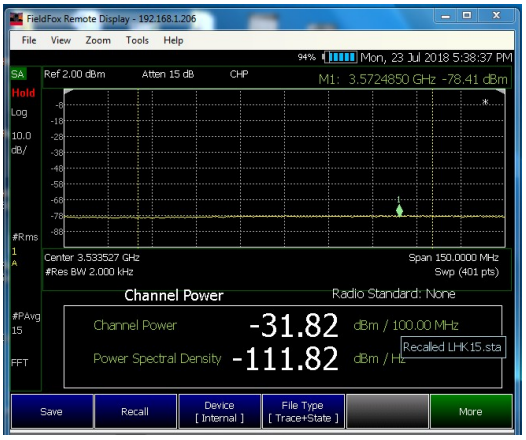
No network detected by CPE



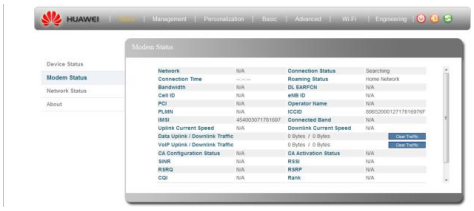
Scanned Signal at Point B (amplified by 75dB)



No network detected by CPE



Scanned Signal at Point C (amplified by 75dB)



No network detected by CPE

- END -