6. Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Base Station Simulator	R&S	CMU200	118133	2018-05-13	2019-05-12
Base Station Simulator	R&S	CMW500	113824	2018-05-20	2019-05-19
Power Splitter	Hua Xiang	SHX-GF2-2-13	10120101	/	/
Spectrum Analyzer	Key sight	N9010A	MY50210259	2018-05-20	2019-05-19
Universal Radio Communication Tester	Key sight	E5515C	MY48367192	2018-05-20	2019-05-19
Signal Analyzer	R&S	FSV30	100815	2018-12-16	2019-12-15
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2017-09-26	2019-09-25
Trilog Antenna	SCHWARZBECK	VUBL 9163	9163-201	2017-11-18	2019-11-17
Horn Antenna	R&S	HF907	100126	2018-07-07	2020-07-06
Horn Antenna	ETS-Lindgren	3160-09	00102643	2018-06-20	2020-06-19
Signal generator	R&S	SMB 100A	102594	2018-05-20	2019-05-19
Climatic Chamber	ESPEC	SU-242	93000506	2017-12-17	2020-12-16
Preampflier	R&S	SCU18	102327	2018-05-20	2019-05-19
MOB COMMS DC SUPPLY	Keysight	66319D	MY43004105	2018-05-07	2019-05-06
RF Cable	Agilent	SMA 15cm	0001	/	/
Software	R&S	EMC32	9.26.0	/	/

*****END OF REPORT *****

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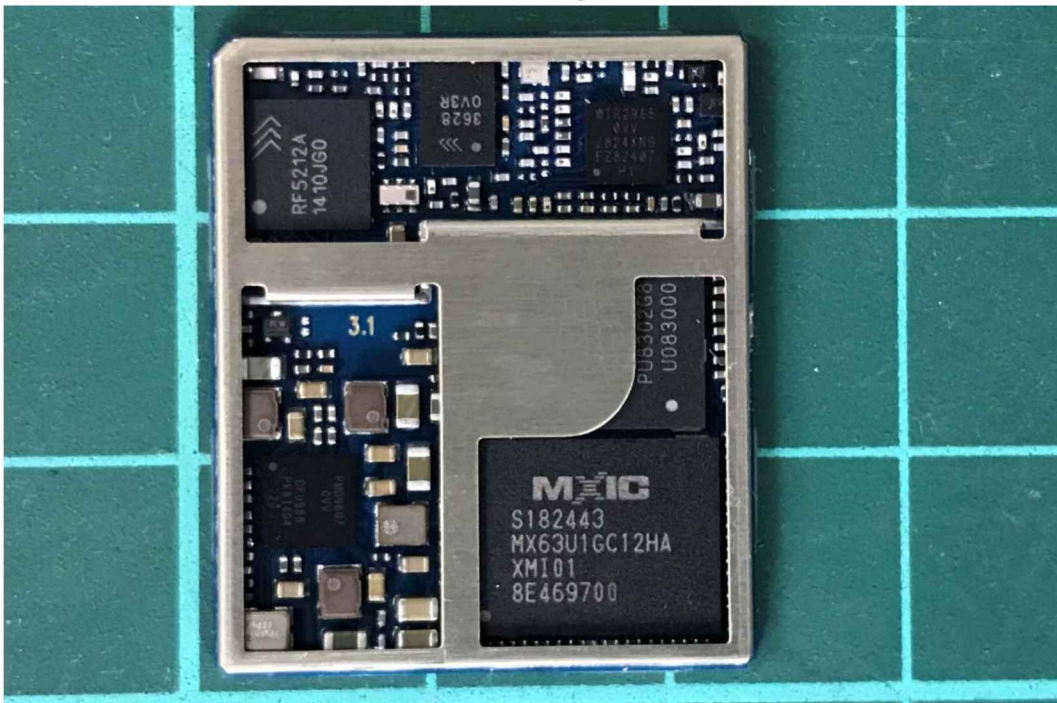*This report shall not be reproduced except in full, without the written approval of TA Technology (Shanghai) Co., Ltd.*

ANNEX A: EUT Appearance and Test Setup

A.1   EUT Appearance

sheilding

No sheilding

Front Side

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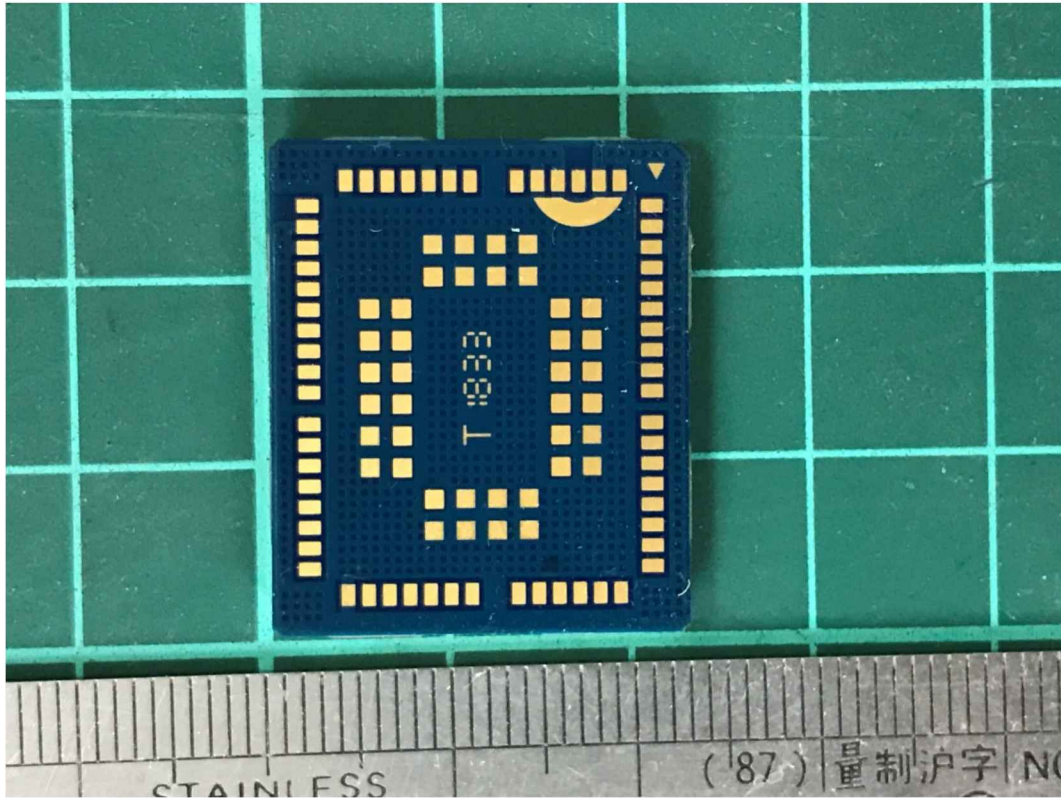
Back Side
a: EUT
Picture 1 EUT

A.2   Test Setup
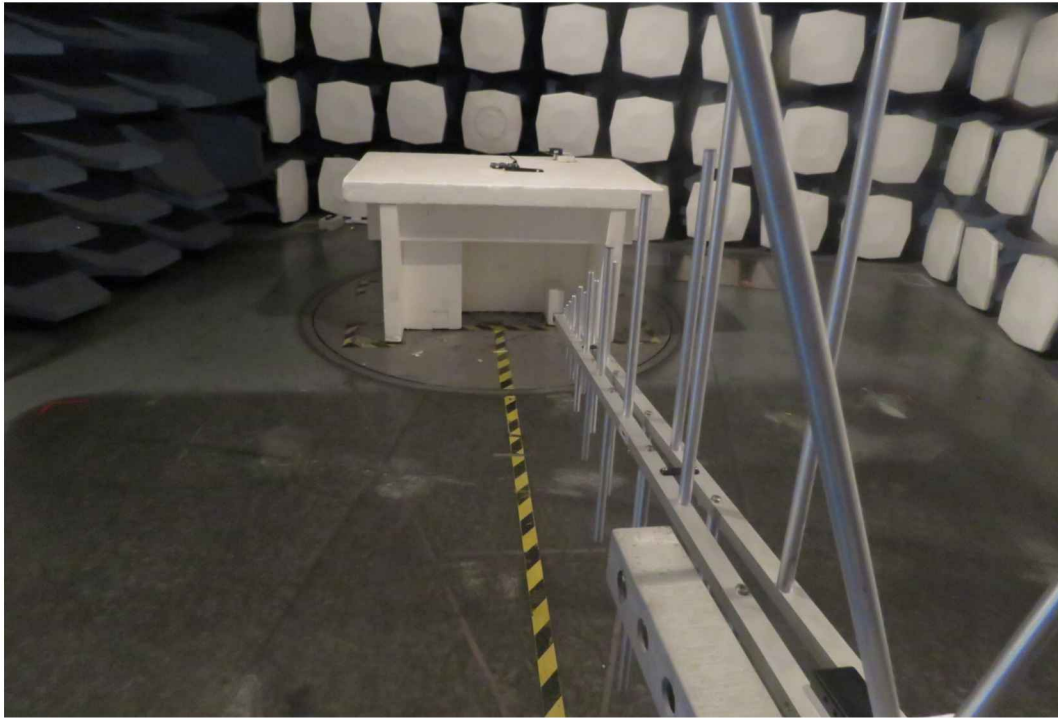
Below 1G
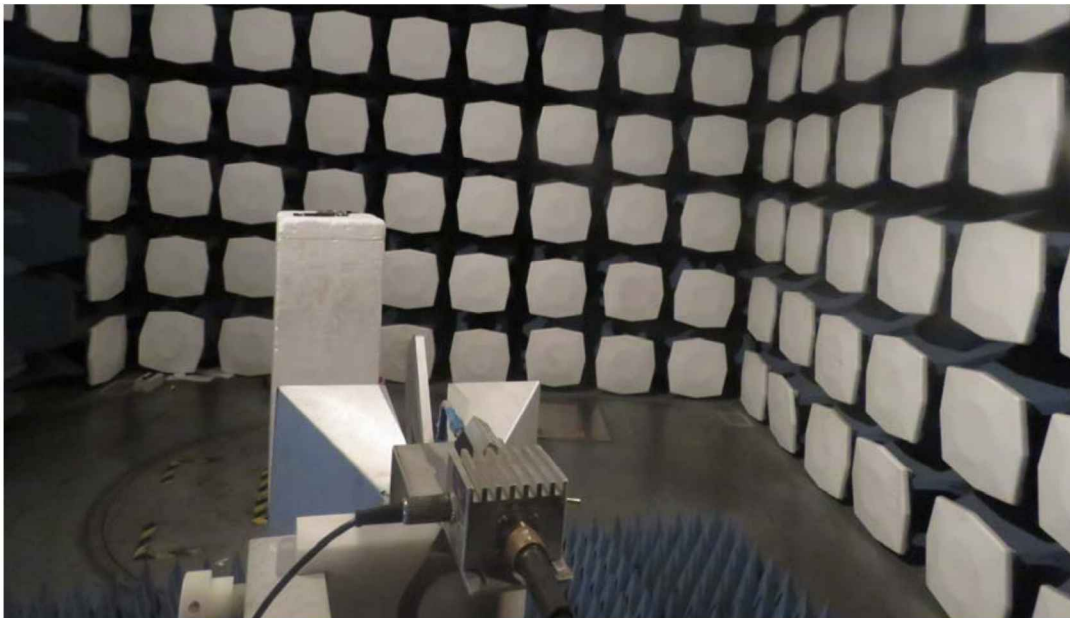
Above 1G

Picture 2 Radiated Spurious Emissions Test setup

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ANNEX B: Product Change Description

QUECTEL®
Build a Smarter World

BG96 R1.1 & BG96 R1.2
Differences Statement

LTE Module Series

PCB Rev.: R1.2

Date: 2018-10-08

www.quectel.com

Build a Smarter World

QUECTEL

Based on BG96 R1.1, BG96 R1.2 has enabled VDD_QFPROM_PRG hardware interface, which is connected to ground directly in BG96 R1.1, so as to support secure boot feature.

Some points are highlighted as below:

● BG96 R1.1 and R1.2 versions share the same hardware architecture and key components.
● BG96 R1.1 and R1.2 versions share the same pinout placements.
● Secure boot is enabled through a set of hardware fuses in BG96 R1.2. For the code to be executed, it must be signed by the trusted entity identified in the hardware fuses, so we have to enable VDD_QFPROM_PRG hardware interface.
● The new hardware will be used with the new software baseline TX3.0, and the software version is R04Axx.

The details are illustrated as below:

1. **What's Secure Boot**

Secure boot refers to the bootup sequence that establishes a trusted platform for secure applications. It starts as an immutable sequence that validates the origin of the code using cryptographic authentication so only authorized software can be executed. The bootup sequence places the device in a known security state and protects against binary manipulation of software and reflashing attacks.

A secure boot system adds cryptographic checks to each stage of the boot up process. This process asserts the authenticity of all secure software images that are executed by the device. This additional check prevents any unauthorized or maliciously modified software from running on the device. Secure boot is enabled through a set of hardware fuses. For the code to be executed, it must be signed by the trusted entity identified in the hardware fuses.

In simple terms, secure boot ensures running of signed/authorized software on the module, and unsigned/unauthorized software will not be allowed to run.

2. **Enabled VDD_QFPROM_PRG Hardware Interface**

A. BG96 R1.1 does not support secure boot function

The VDD_QFPROM_PRG (N19) pin of baseband chip is for secure boot function. In BG96 R1.1, this pin is connected to ground directly, which means secure boot function is disabled.

B. BG96 R1.2 supports secure boot function

According to Qualcomm's suggestion and our customers' requirements, the VDD_QFPROM_PRG pin is connected to VREG_L3_1P8(1.8V) in BG96 R1.2 so as to enable secure boot function.

The following pictures show the schematic and PCB designs of BG96 R1.1 and R1.2.

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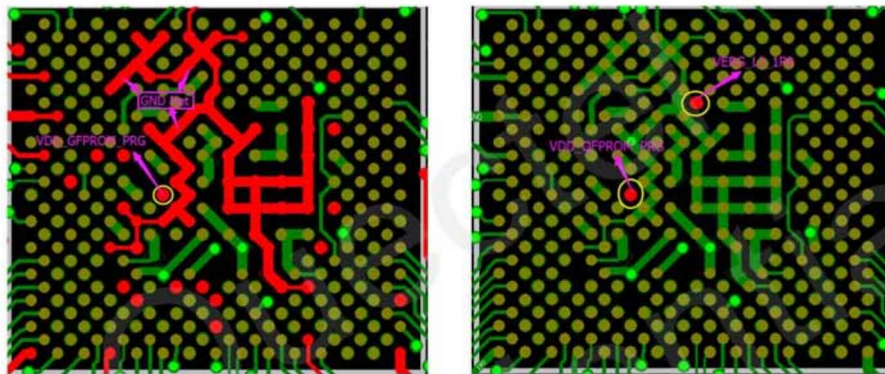Figure 1: Schematic Designs of BG96 R1.1 and R1.2

Figure 2: PCB Designs of BG96 R1.1 and R1.2

3. TX2.0 vs TX3.0

The biggest difference of TX3.0 as compared with TX2.0 lies in the adding of VoLTE and handover features. Since VoLTE environment has not been built so maturely yet, the main concern of customers is the handover function.

For TX2.0, re-selection is supported, while handover is not supported.

BG96 supports re-selection mechanism, which means when disconnection happens during cell handover, the module will reconnect automatically. This process lasts for about 1 (or 2) seconds, and the data transmitted (may happen by coincidence) will be buffered and resent once the reconnection established. So, the disconnection is generally imperceptible to customers.

● If the data transmission occurs at the moment that cell handover occurs coincidently, the connection is kept with handover function; the connection is broken and re-connection established in about 1 (or 2) seconds with re-selection. This causes nearly no difference for data telematics because users even cannot feel this disconnection, whereas VoLTE might be affected because of the short time disconnection.

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- If the data transmission occurs in the period that no cell alternates, then no any influence will be caused.