UDS710_UDX710 EngineerMode Application Manual

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About This Document

Purpose

This document describes the design of EngineerMode of UNISOC UDS710_UDX710, including the opening method, working mode, purpose of each menu item, implementation plan and interface behavior. Engineers can enter EngineerMode through password to debug and test the mobile phone.

Intended Audience

This document is mainly suitable for UNISOC platform testing, debugging, and development engineers. They must have the following experience and skills:

- Familiar about the UNISOC platform.
- Understand the basic knowledge of mobile communication.

Symbol Conventions

The symbols that may be found in this guide are defined in the following table.

Symbol	Description
NOTE	Calls attention to important information, best practices and tips. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Acronyms and Abbreviations

Acronym and Abbreviation	Full Name
AT	Attention
CFU	Call Forwarding Unconditional
EUT	Enterprise Unified Talker
NV	Non-volatile
MCC	Mobile Country Code
MNC	Mobile Network Code
UA	User Agent
PDP	Packet Data Protocol

Acronym and Abbreviation	Full Name
SCELL	Service Cell
NCELL	Neighbor Cell
PLMN	Public Land Mobile Network
TE	Terminal equipment
MS	Mobile Station

Change History

Issue	Date	Description
V1.0	2020-11-12	This issue is the first official release.

Keywords

EngineerMode, TELEPHONY, DEBUG&LOG, CONNECTIVITY, HARDWARE, LOCATION.

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1 **Introduction**

1.1 Overview

EngineerMode is an application used for debugging the configuration of Android phones. It can be accessed by means of password to set up telephony-related parameters, network, debug means, system information, etc. EngineerMode is independent of the upper layer, which can be used to judge and debug bottom layer problems directly when the upper layer application has not completed or has logical problems.

1.2 Method to Enter EngineerMode

Input the password (*#*#83781#*#*) in the dial interface to enter EngineerMode. Switch the interface by sliding left and right. You can enter the relevant sub module interface for viewing, setting and other operations.

1.3 Components

EngineerMode consists of five modules, which are TELEPHONY Tab, DEBUG&LOG Tab, CONNECTIVITY Tab, HARDWARE Tab and LOCATION Tab.

- TELEPHONY Tab, as shown in Figure 1-1, provides the content of protocol stack testing including BandSelect, CFU, Network mode, NetInfo, Netinfo Statistics, GPRS, etc.

Figure 1-1 TELEPHONY Tab
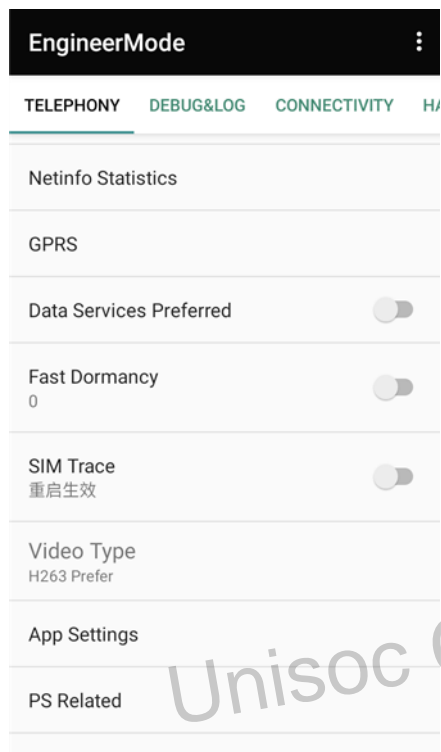
- DEBUG&LOG Tab, as shown in Figure 1-2, provides System info, CFT Result, Log settings, Debug Utils, Design for Test, GPS settings, etc. Design For Test has quick setting for CMCC, CTA, CUCC and GCF test.

Figure 1-2 DEBUG&LOG Tab

- CONNECTIVITY Tab, as shown in Figure 1-3, provides device-related tests such as Wifi eut, BT eut, etc.

Figure 1-3 CONNECTIVITY Tab
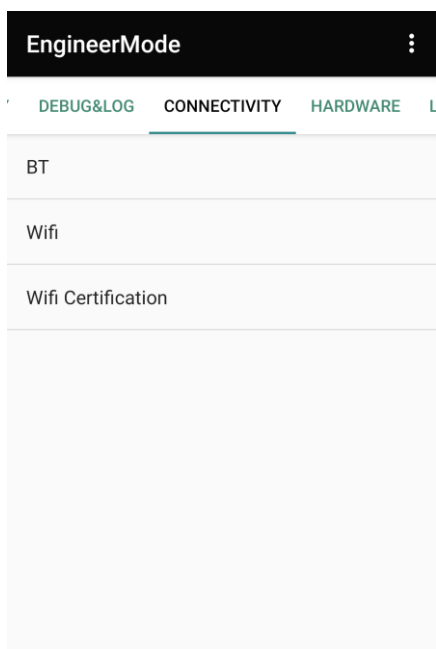
● HARDWARE Tab, as shown in Figure 1-4, provides hardware-related tests, such as USB Charge/Camera Api etc.

Figure 1-4 HARDWARE Tab
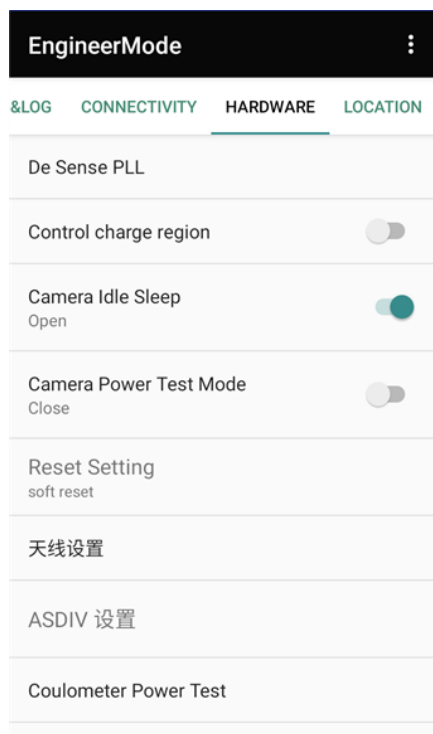
● LOCATION Tab, as shown in Figure 1-5, provides SGPS-related tests, such as automatic test of clock frequency drift in different heat sources, etc.

Figure 1-5 LOCATION Tab
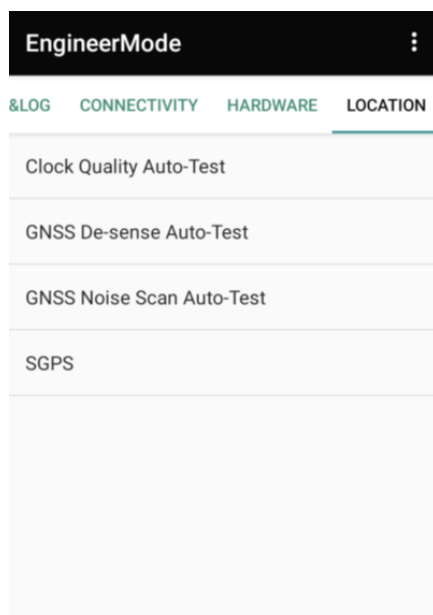
2 TELEPHONY

2.1 Auto Answer

Function Description

Set auto answer. Switch on to receive video or regular calls automatically.

Implementation Plan

AT+SPAUTO

Interface Behavior

Click the button to turn on or turn off. A prompt box will indicate whether the setting is successful or failed.

2.2 Band Select

Function Description

Select frequency band for SIM0/SIM1 single band and mixed band test under various network modes.

Implementation Plan

- GSM: AT+SBAND
- TD: AT+SPLOCKBADN
- WCDMA: AT+SPFDDBAND
- LTE: AT+SPLBAND

Interface Behavior

Click to select the frequency band each SIM card supports in accordance with the support ability of card slot. Secondary card only supports GSM.

2.3 CFU

Function Description

Set whether to trigger Call Forwarding function automatically when start the phone.

Implementation Plan

Set the value of "sist.sys.callforwarding".

Interface Behavior

Enter the menu to query and display current settings. Click corresponding item to set up and the interface will indicate whether the setting is successful or failed.

2.4 Evdo Status

Function Description

CTCC warehousing test does not need EVDO capability, but this is required for formal mass production. EVDO under telephony menu is off by default and user can turn on or turn off this function.

Implementation Plan

AT command interface:

- query: at + spc2ksetrat?
  - Return value 1 means DO is open.
  - Return value 0 means DO is closed.
- close DO: at+spc2ksetrat=1,0
- open DO: at+spc2ksetrat=1,1

```
>at+spc2ksetrat?
+SPC2KSETRAT: 1
OK
>at+spc2ksetrat=1,0
OK
>at+spc2ksetrat?
+SPC2KSETRAT: 0
OK
>at+spc2ksetrat=1,1
OK
>at+spc2ksetrat?
+SPC2KSETRAT: 1
OK
```

Interface Behavior

Slide switch.

2.5 Network Mode

Function Description

Set network mode by requirement.

📖 **NOTE**

> According to the warehousing requirements, this menu is not available if one of the two cards is CMCC SIM card under CMCC customized version.

Implementation Plan

- W product: AT^SYSCONFIG
- TD product: write NV through AT+SNVM and send AT+RESET=1 to restart Modem.
- LTE product:
  - LTE network modes are divided into four main categories with several sub categories.
  - Network switch is mainly realized in Ril. EngineerMode only needs to set systemPreperties and Reset.
  - Switch between main categories requires restarting mobile phone. Switch between subcategories only needs to restart Modem. Modem will perceive the change after restart and configure different network modes according to systemPreperties.

Interface Behavior

According to instructions, insert the corresponding SIM card, and the options will be displayed according to the different dynamic loading views defined by the product.

📖 **NOTE**

> - This setting is for the card slot setting. All card slots of TD products are the same. If TD+G/G products are set in TD network, the second card cannot register the network.
> - This menu affects network selection in Setting. A notification will pop up in status bar upon on entering this menu and you must pull down the status bar and select to exit the network selection mode in EngineerMode, and restart the mobile phone before select the network mode in Setting.

- W product: provide GSM only, W only, and W prefer options.
- TD products: provide GSM only, TD only, and TD prefer options.
- LTE products: provide SVLTE, FDD CSFB, TDD CSFB and CSFB.
  - SVLTE: SVLTE, GSM single mode, TD single mode, TG dual mode.
  - FDD CSFB: LTE FDD/W/GSM CSFB multimode single standby, TD-LTE/W/GSM CSFB multimode single standby, TD-LTE single mode, LTE FDD single mode, TD-LTE/LTE FDD dual mode, TD-LTE/LTE FDD/W/GSM CSFB multimode single standby, GSM single mode, W single mode, WG dual mode.
  - TDD CSFB: TD-LTE/TD/GSM CSFB multimode single mode, TD-LTE single mode, LTE FDD single mode, TD-LTE/LTE FDD dual mode, TD-LTE/LTE FDD/TD/GSM CSFB multimode single mode, GSM single mode, TD single mode, TG dual mode
  - CSFB: TD-LTE/LTE FDD/W/TD/GSM CSFB multimode single standby, TD-LTE/LTE FDD/W/GSM CSFB multimode single standby, LTE FDD/W/GSM CSFB multimode single standby, TD-LTE/W/GSM CSFB multimode single standby, TD-LTE single mode, LTE FDD single mode, TD-LTE/LTE FDD dual mode, TD-LTE/TD/GSM CSFB multimode single standby, TD-LTE/LTE FDD/TD/GSM CSFB multimode single standby, GSM single mode, WG dual-mode, TG dual-mode, W single mode, TG dual mode

2.6 DSDS Mode

Function Description

Switch network mode to L+G/L+W/L+L for different test scenarios.

Implementation Plan

By the value of "persist.radio.modem.workmode".

Interface Behavior

Click ON/OFF.

2.7 WCDMA Prefered

Function Description

Only WCDMA products support this function. Stay on WCDMA network first.

Implementation Plan

AT+SPWPREFERSWITCH

Interface Behavior

Click ON/OFF.

2.8 Netinfo

Function Description

- information displayed under 2G:
    - CellID, frequency point, BSIC, C/I and signal strength of the service cell.
    - CellID, frequency point, BSIC, C/I and signal strength of adjacent cells in the system.
    - CellID, frequency point, BSIC, C/I and signal strength of adjacent cells between systems.

📖 NOTE

Examples of scene between systems: measure TD-SCDMA under GSM or measure WCDMA under GSM.

- description of information displayed under 3G:
    - CellID, RNC ID, frequency point, scrambling code, C/I and signal strength of the service cell (increase DC-HSDPA working state, cell ID, frequency point, ECNO and signal strength of PCELL and SCELL under W).
    - CellID, frequency point, scrambling code, C/I and signal strength of adjacent cells in the system.
    - CellID, frequency point, scrambling code, C/I and signal strength of adjacent cells between systems.

📖 NOTE

Examples of scene description between systems: measure GSM under TD-SCDMA or measure GSM under WCDMA.

- description of information displayed under 4G:
    - CellID, E-NODEB ID, frequency point, SINR, signal strength, transmission mode and network bandwidth of the service cell.
    - CellID, frequency point, SINR and signal strength of adjacent cells in the system.
    - CellID, frequency point, SINR and signal strength of adjacent cells between systems.

📖 NOTE

Examples of scene between systems: measure GSM/TD under TD-LTE.

Requirement

1. The above information should be displayed in real time.
2. The above information description should be displayed adaptively according to the current resident network, and cover GSM/WCDMA/TD-SCDMA/TD-LTE/LTE-FDD network modes.
3. Distinguish SIM0/SIM1.

Implementation Plan

Get the above information through AT+SPENGMD and display it according to the rules provided by Modem.

Interface Behavior

The interface is displayed in the form of list and is queried every 0.2S (200ms).

2.9 UE Capability Query

Function Description

Query UE Cat capability.

Implementation Plan

AT+SPUECAT

Interface Behavior

Click the corresponding menu item to display its support.

2.10 CSFB2GSM_DELAY

Function Description

This function is only for LTE product. Set the SIM0/SIM1 to stay on GRRC and randomly access GRRC.

Implementation Plan

AT+SPSETGRRC

Interface Behavior

Click ON/OFF.

2.11 Netinfo Statistics

Function Description

Display the drive test information:

- cell reselection times, success rate and average delay.
- cell handover times, success rate and average delay.
- statistics of network time.
- statistics of network outage times.

Implementation Plan

- AT+SPENGMD=0,7,1, the number and success rate of cell reselection.
- AT+SPENGMD=0,7,2, the number and success rate of cell handover.
- AT+SPENGMD=0,7,7, attach time at 2G/3G/LTE.
- AT+SPENGMD=0,2,2, the numbers of getting off 2G/3G network.

Interface Behavior

Entry the interface：Telephony-> Netinfo statistics-> SIM0/SIM1

- RESELECT tab shows information about cell reselection.
- HANDOVER tab shows information about cell handover.
- ATTACHTIME tab shows online attach time.
- DROPTIMES tab shows the number of times of getting off network.

2.12 GPRS

Function Description

Test GPRS Attach/Detach, Activate/Deactive PDP and Send GPRS data.

Implementation Plan

- Attach/Detach GPRS: AT+CGATTA.
- Activate/Deactive GPRS: AT+CGACT, AT+CGDCONT, AT+CGEQREQ.
- Send GPRS data: AT+SGPRSDATA.

Interface Behavior

Only the primary card is tested as follows.

- Click the button to set Attach GPRS.
- Activate/Deactivate the specified PDP context.
- Set Send GPRS data.

  There are two input boxes. Set GPRS data length (1-16000) in input box 1, and input the specified GPRS data in input box 2.

2.13 Data Service Prefered

Function Description

Verify the influence of the secondary card receiving Paging on the primary card service.

Implementation Plan

AT+SPBPM

Interface Behavior

Slide switch.

2.14 Fast Dormancy

Function Description

Set phone time to get fast dormancy.

Implementation plan

1. Set the attribute "fastdormancy_state" to enable or disable this function, true means enable, false means disable. If there is no value, check whether the attribute "persist.vendor.radio.fd.disable" is 0, 0 means enable and 1 means disable.

2. When it is on, set the attribute "persist.vendor.radio.fd.disable" to identify whether the current value is by default or customized.

- When "persist.vendor.radio.fd.disable" value is 0, it means that the default value is set.
- When "persist.vendor.radio.fd.disable" value is 1, it means that a custom value is set.

  The default value and custom value are set to Modem through AT*FDY. The default value is 8 and custom value is between 1～65535.

3. Set the attribute "fastdormancy_summary" to save dormancy time. Input the specific time value to save the customized dormancy time, for example 10s.

4. Set the attribute value of "persist.vendor.radio.fd.disable" as 1 to disable this function, and send AT command AT*FDY=0 at the same time.

Interface Behavior

Slide switch.

This function is turned on by default. The default value is 8s. You can also customize the fast dormancy time. The set time range is 1-65535 (s). It opens automatically when the default value is set.

2.15 Sim Trace

Function Description

Open USIM driver log to locate some special problems related to USIM cards.

Implementation Plan

AT+ SPUSIMDRVLS

Interface Behavior

Slide switch.

2.16 Video Type

Function Description

Set the format of video call during test.

Implementation Plan

Set the value of "debug.videophone.videotype".

Interface Behavior

Enter the interface and click to select the video format to be tested.

☐ NOTE

> This function has not been realized yet. There is a selection menu but setting does not take effect.

2.17 App Settings

2.17.1 UA setting

Function Description

Set UA manually.

Implementation Plan

Read the configuration of Default UA, Other UA, Custom UA and current Choice from settings. Select UA configuration to display specific information, and click OK button to confirm the modification and return to Choice.

Interface Behavior

Select the default UA or input UA manually. OK button enables setting, and Cancel button cancels setting.

2.18 PS Related

Related to Protocol.

2.18.1 Frequency

Function Description

Lock/unlock frequency.

Implementation Plan

AT+SPFRQ

Interface Behavior

There are sixteen input boxes, one Lock button and one Unlock button. Users can modify and click Lock button to save data, or click Unlock button to clear all data.

LTE has no cell locking function.

2.18.2 AOC Setting

Function Description

Enable or disable call charging query function,

📖 NOTE

This function needs the support of the operator, and SIM card is required to enable related functions.

Implementation Plan

AT＋CAOC

Interface Behavior

Slide switch.

2.18.3 AOC MAX

Function Description

Set the maximum cumulative call costs. When the cumulative call cost reaches this value, call will be forbidden.

Implementation Plan

AT+CAMM

Interface Behavior

Click menu to pop up an input box, input the maximum value. The range is between 000000 and FFFFFF.

2.18.4 HSPA Setting

Function Description

Enable/disable HSDPA/HSUPA function to facilitate the test of protocol stack performance in compatible with filed environment.

Implementation Plan

- Enable: AT+SPENGMD=1,10,2,3, supports HSDPA and HSUPA, R7.
- Disable: AT+SPENGMD=1,10,2,1, supports HSDPA, and does not support HSUPA, R5.

Interface Behavior

Slide switch.

2.19 VT Option

Function Description

Volte switch.

Implementation Plan

Attribute "persist.sys.support.vt" determines whether the volte function is enabled or disabled.

- True: enable
- False: disable

Restart the phone to take effect.

Interface Behavior

Slide switch.

2.20 Qos Switch

Function Description

Switch default parameters of UMTS QoS to save on mobile phone, and send them to network through the PDP context when the PDP is activated.

Implementation Plan

Modify property "persist.sys.qosstate as 1 or 0.

- When it is 1, switch the default QoS parameters by AT+CGEQREQ=cid,2,0,0,0,0,2,0,"1e4","0e0",3,0,0.
- When it is 0, QoS parameters are not changed.

Interface behavior

Slide switch.

2.21 USB Interface Activation

Function Description

Whether to pop up the USB function selection interface after inserting an USB cable. This is a requirement of CMCC warehouse entry test.

Implementation Plan

Controlled by SWITCH_FOR_USB_ACTIVE in setting.

Interface Behavior

Click the button to enable or disable this function, and the prompt box displays whether the setting is successful or failed.

2.22 DNS Filter

Function Description

Support telephony debugging through the switch to enable or disable DNS process.

Implementation Plan

- Disable: setDnsFilterEnable(0)
- Enable: setDnsFilterEnable(1)

Interface Behavior

Switch to enable or disable DNS process.

2.23 VoLTE Settings

Function Description

Set APN, IMPI, IMPU, P-CSCF and others in the volte version. Only volte version phones support.

Implementation Plan

All functions are realized by sending AT command.

Interface Behavior

Click to set or input.

2.24 PDP TEST

Function Description

Add the functions of PDN control switch, PDP status control switch, and no retry after deactivation.

Implementation Plan

Control by changing properties "persist.sys.volte.iot", "persist.sys.pdp.noretry", etc.

Interface Behavior

Click to view the list, switch the slider to turn on or turn off.

2.25 NV Item List

Function Description

For Telcel operator to view some network information, including whether support VAMOS and CPC, etc.

Implementation Plan

Send AT Command：AT^SYSCONFIG, AT+COPS, AT+SPENGMD, AT+SPUECAT, AT+SPBANDCTRL, AT+CAVIMS, AT+CGSMS, AT+SPTEST.

Interface Behavior

Click to view this information.

2.26 Ignore DualVoLTE Whitelist

Function Description

At present, only operators on the white list support VOLTE DSDA. Enable this function if there is a need to verify DSDA information of other operators.

Implementation Plan

Set the value of property "persist.radio.dsda.wl.ignore".

Interface Behavior

Slide switch.

2.27 VoWiFi White List Enable

Function Description

Control the platform to enable VoWiFi network on the white list card.

Implementation Plan

Set the value of property "persist.sys.vowifi.lab.sim".

Interface Behavior

Click the slider switch to turn the function on or off, and the phone will restart after selection.

2.28 UPLMN Switch

Function Description

This function is only used for CTA test to realize the UPLMN list controlled by user. Please enable the function switch before the test.

Implementation Plan

Set the value of property "persist.sys.uplmn.enable".

Interface Behavior

Slide switch.

2.29 IMS APN

Function Description

Required by telephony to control IMS APN.

Open: IMS APN of telephony displays and users can set up.

Implementation Plan

Set the value of property "persist.sys.ims.visibility".

Interface Behavior

Slide switch.

For mobile phones not supporting LTE, this menu is gray.

2.30 Load APN

Function Description

Related to the BIP protocol of telephony. "3G bip" can only be tested when the switch is turned on.

Implementation Plan

Set the value of property "persist.sys.loaded.apn".

Interface Behavior

Slide switch.

2.31 NXP

Function Description

Turn on or turn off NXP, and view NXP in different modes.

Implementation Plan

AT+SPTEST

Interface Behavior

27 different mode options in total and each of them can be checked.

2.32 MOS

Function Description

To view, enable and disable MOS test mode.

- Enable: MOS test mode.
- Disable: non-MOS test mode.

Implementation Plan

AT+SPCAPABILITY

Interface behavior

- MOS test mode:

  The second and tenth items of NXP are unchecked by default.
- Non-MOS test mode:

  The second and tenth items of NXP are checked by default.

2.33 Store Meid At Sim Init

Function Description

Whether writes MEID to SIM card or not when CTCC SIM card is initialized. This is CTCC warehousing requirement.

Implementation Plan

Get Status: AT+SPCARDINFO=0,1,0

- Open: AT+SPCARDINFO=1,0,1
- Close: AT+SPCARDINFO=1,0,0

Interface Behavior

Slide switch.

2.34 C2k Test Configuration

Function Description

Different tests (CTCC warehousing entry test, real network test, SRRC instrument test, etc.) require different NV configurations, which can be flexibly controlled and easily used through the model menu.

Implementation Plan

There are five sub items.

- Default setting (AT command: AT+SPCASPARAM=141)
- CTCC test settings (AT command: AT+SPCASPARAM=143)
- Roaming registration settings (AT command: AT+SPCASPARAM=145)
- Extended test setting 1 (the name can be modified according to the actual situation, and the AT command is AT+SPCASPARAM=147)
- Extended test setting 2 (the name can be modified according to the actual situation, and the AT command is AT+SPCASPARAM=149)

Interface Behavior

Entrance name is CDMA2000 test configuration, with five sub items, default the first item.

2.35 Usage Setting

Function Description

Configure Usage Setting as Voice centric or Data centric through different options.

Implementation Plan

AT+CEUS and AT+CEMODE

Interface Behavior

Enter the menu to query current setting and click corresponding menu to set Usage state.

2.36 NR Cap

Function Description

Switch different NR capability mode through different options. There are three options, namely, SA/NSA, SA Only and NSA Only.

Implementation Plan

AT+SPCAPABILITY

Interface Behavior

Click NR Cap menu to get current NR mode, switch the option to set different NR modes.

2.37 Smart 5G

Function Description

Custom 5G configuration item, including uplink rate, downlink rate, minimum network time, minimum high-speed duration, etc.

Implementation Plan

AT+SPLASDUMMY

Interface Behavior

Input four parameters and click the button.

3 DEBUG&LOG

3.1 Adb shell

Function Description

Input adb shell command in the command box and execute it.

Implementation Plan

Add adb shell function under the DEBUG&LOG tab in EngineerMode. Click to input adb shell command.

Interface Behavior

Enter adb shell interface and input any shell command including iperf command.

3.2 System Update

Function Description

This is the entrance to OTA upgrade in the EngineerMode. OTA is an independent apk SystemUpdate.apk to query system version and update downloading.

📖 **NOTE**

Only support UNISOC internal server for verification.

Implementation Plan

Call SystemUpdate through Intent. If the version does not preset this apk, the option will be gray.

Interface Behavior

Click to enter.

3.3 System Info

3.3.1 Version Info

Function Description

Read version information, including:

- Hardware info
- Hardware Version
- AP Version
- CP Version
- CP2 Version
- GPS Version
- TP Version

Implementation Plan

- Hardware info：ro.product.hardware
- Hardware Version：sys.hardware.version
- AP Version：Build.DISPLAY
- CP Version：AT+CGMR/AT+SPDSPVERSION
- BT: socket: wcn at+spatgetcp2info
- GPS: parse /data/cg/supl/supl.xml

Interface Behavior

Click menu text to view relevant information

3.3.2 Power Log

Power related log.

3.4 CFT Result

Function Description

Display the list of calibration results.

Implementation Plan

At+SGMR=0,0,3, where the calibration information is read-only, including GSM calibration info, WCDMA calibration info, LTE calibration info and other information.

Interface Behavior

Click the menu to display the relevant content.

3.5 YLog

This function provides various configurations to capture logs. For detailed information, see *Android10.0 YLog Capture User Guide*.

3.6 Design For Test

Facilitate the configuration required for a test scenario.

Unless otherwise specified, implementation function is mostly realized through AT calls, and interface behavior is mostly slide the switch and pop up selection box. We will not explain this item by item.

3.6.1 RPS Switch

Function Description

In high throughput test, occupancy of softirq is 100%, which needs other cores to share the load.

Turn on this switch, other cores will share part of the load and softirq will not reach 100%, therefore its speed will increase.

This switch is used to enable and disable RPS function.

Implementation Plan

Turn on or turn off RPS function through switch.

Interface Behavior

Switch the button.

3.6.2 Ping Packet Function

Function Description

Check if the PING packet link works normally in IOT testing. The current convention is to connect with PC through USB and then access UE PING server through PC, which is not suitable for testers.

Implementation Plan

Complete UE Attach and operate the UE Ping server through EngineerMode. You can select IP type, set Ping packet time, Ping packet interval and Ping packet size.

Interface behavior

- The interface can select IP type, and choose whether to use IPv4 address or IPv6 address.
- You can fill in the server address, Ping package time, Ping package interval and Ping package size. Except for the server address, if you do not fill in other values, the default value will be used.
- After filling in the parameters, there is a Ping button. Click to Ping the package. The Ping package status will display below.

3.6.3 PDN Test

Function Description

This is a necessary operation in IOT test. At present, it is set by APK and AT commands. The process is complex, which is not conducive to testing staff.

Implementation Plan

UE attach establishes the first default bearer. In EngineerMode, you can establish multiple PDNs, with each PDN corresponding to a different APN, set parameters for establishing the special bearer, activate the special bearer and associate it with the default bearer, and at the same time, deactivate the special bearer and the default bearer.

Interface Behavior

There are three different types of APNs in the settings - > APN interface: default, MMS, and SUPL.

- The interface displays three buttons to activate three default bearers, with each button corresponding to a default bearer of different APNs.

- The interface displays the special bearing menu. There are default settings in the menu, which can activate the dedicated bearer directly or activate it after parameter setting (especially the default bearer associated with the dedicated bearer can be selected).

The AT command to establish a dedicated bearer:

```
at+cgdscont=7,1 /* 7:dedicate pdn cid，    1:default pdn cid */
at+cgeqos=7,1,128,128,384,384
at+cgtft=7,2,5,"192.168.1.81.255.255.255.255",1
at+cgact=1,7）
```

- For each default bearer, there is a corresponding deactivation key, which can deactivate the default bearer.

3.6.4 GPRS attach/detach Service

Function Description

Set attach/detach GPRS service by sending AT+CGATT command.

Implementation Plan

N/A

Interface behavior

N/A

3.6.5 Message Retransmission

Function Description

Resend SMS automatically.

3.7 Power Dissipation Setting

Function Description

DFS/DVFS function switch. Change the voltage and frequency of mobile phone when the DVFS function is off.

Implementation Plan

DFS/DVFS function switch, VDDARM and CPU frequency input box.

When DVFS disabled, set the voltage and CPU frequency manually.

- DFS on：echo 0 > sys/devices/platform/scxx30-dmcfreq.0/devfreq/scxx30-dmcfreq.0/ondemand/set_freq
- DFS off：echo 533000 > sys/devices/platform/scxx30-dmcfreq.0/devfreq/scxx30-dmcfreq.0/ondemand/set_freq
- DVFS on：echo sprdemand > /sys/devices/system/cpu/cpu0/cpufreq/scaling_governor
- DVFS off：echo performance > /sys/devices/system/cpu/cpu0/cpufreq/scaling_governor

When DVFS is off:

- Set voltage: echo voltage > /sys/power/cpufreq_voltage
- Set CPU frequency: echo cpu frequency > /sys/power/cpufreq_frequency

Interface Display

Two sliders control DFS and DVFS and two input boxes input voltage and frequency. If the underlying node does not exist, the option is gray.

3.8 MIPI Log

Function Description：

Set MIPI Log channel.

Implementation Plan:

- 0: stop sending data
- 1: trainnig channel
- 2: WTL channel

The upper layer controls by the file node "/sys/devices/platform/soc/soc:ap-ahb/402e0000.sprd-mipi-log/channel".

Interface Behavior:

Click the interface.

3.9 Performance Tool

3.9.1 Starting Window

Function Description

Whether there is a screen capture function when the application starts.

Implementation plan

By control the property "persist.sys.startingwindow".

Interface behavior

Click ON/OFF.

3.10 System Settings

3.10.1 GPU Frequency

Function Description：

Display GPU frequency list and the option of whether to output GPU log.

Implementation Plan

Controlled by the file node /sys/module/mali/parameters/gpu_freq_cur and attribute debug.egl.trace.

Interface Behavior

Click ON/OFF.

3.11 Launcher debug

Function Description

Add a switch for testing and debugging in Launcher module.

Implementation Plan

Controlled by related system attribute values.

Interface Behavior

Click ON/OFF.

3.12 Browser debug

Function Description

Control chromium log to export webkit related logs for debugging Browser.

Implementation Plan

Controlled by system attribute value.

Interface Behavior

Click ON/OFF.

3.13 Switch Machine Info

Function Description

Count the number of times and reasons of power on, power off and Modem assert as well as battery and other relevant information.

- Power on info：dump power on info to SD card.
- Power off info：dump power off info to SD card.
- Modem assert Info: dump Modem assert info to SD card.

3.14 No Sleep

Function Description

Set phone screen always on.

Implementation Plan

Control by the keyword Setting.System.SCREEN_OFF_TIMEOUT, thus is, to set a very large value.

Interface Behavior

Click ON/OFF.

📖 **NOTE**

> Please do not enter the setting-〉display menu after open. Entering this menu, setting will check whether the setting value is legal. If there is no value in the option, it will be directly restored to the default value.

3.15 Watch Dog

Function Description

Watch dog switch in Cm4.

Implementation Plan

Controlled by the file node /dev/sctl_pm.

Interface behavior

Click the slider to turn on or turn off

3.16 USB Debug

Function Description

Open USB mode function in developer in the user version.

Implementation Plan

Controlled by the value of Settings.Global.DEVELOPMENT_SETTINGS_ENABLED.

Interface Behavior

Click the slider to turn on or turn off.

📖 NOTE

> In the user version, this function is turned off by default. Turn on it manually and it will restore to the off status after restart.

3.17 PreCheck

Function Description

One button checkup the configuration before warehousing.

Interface Behavior

Click Precheck to view version number of ap, cp, bt, WiFi, etc., check whether they are calibrated before warehousing as well as other information needed.

3.18 Thermal

Function Description

Thermal related debug options:

- Thermal Switch: turn thermal on or off.
- Thermal PA Switch: switch control limits the charging current function.
- IPA: control temperature.

Implementation Plan

- Thermal Switch and Thermal PA Switch send command to "thermal" through socket.
- IPA is realized by reading node /sys/class/thermal/thermal_zone0/thm_enable directly.

Interface Behavior

Click the slider to switch.

3.19 Jeita Control

Function Description

Charger Jeita control switch. Limit current to lower temperature to avoid the damage on mobile phone when charging.

Implementation Plan

Control nodes by attributes:

on property: persist.vendor.eng.jeita=0

write /sys/class/power_supply/battery/charger.0/jeita_control 0

on property: persist.vendor.eng.jeita=1

write /sys/class/power_supply/battery/charger.0/jeita_control 1

Interface Behavior

Switch the slider.

3.20 ThroughPut

Function Description

SETH network card GRO aggregation function is used in EngineerMode. It is convenient for the tester to start the test manually in the subsequent data transmission test.

Implementation Plan

SETH network card GRO aggregation function belongs to downstream data message aggregation function of AP side network card, which can reduce the processing pressure of network subsystem in the kernel, the number of uplink TCP ACK and the mips overhead of CP.

- Turn on GRO, setprop ctl.start gro_on
- Turn off GRO, setprop ctl.start gro_off

Query: sys/module/seth/parameter/gro_enable

If the value is 1, GRO is on; if the value is 0, GRO is off.

Interface Behavior

Click the slider to turn on or turn off.

3.21 LVDS Dump

Function Description

LVDS-related problems need to analyze dump register and Log to improve problem-solving efficiency. At present, LVDS abnormal ASSERT function has been opened to NV.

This function enables NV through EngineerMode, therefore when there is a problem, it can communicate with test staff in the first place, and provide DUMP file for analysis.

Implementation Plan

EngineerMode adds a switch to indicate LVDS DUMP, with values of 0,1,4,5 optional.

- Set AT command to disable and enable LVDS DUMP: AT^LVDSDUMP=X
    - X=0 :disable LVDS DUMP
    - X=1: enable LVDS DUMP uplink
    - X=2: enable LVDS DUMP downlink
    - X=3: enable LVDS DUMP uplink and downlink
- Query AT command of LVDS DUMP: AT^LVDSDUMP？

    Return value is X

- Test AT command of LVDS DUMP: AT^LVDSDUMP=?

    Return value is (0-3)

Interface Behavior

Click LVDS DUMAP and a selection box will appear with the following options:

- LVDS DUMP
- LVDS DUMP uplink
- LVDS DUMP downlink
- LVDS DUMP uplink and downlink

3.22 SMS center number

Function Description

The SMS center number is convenient for laboratory test. When there is no SMS center by default, the white card can send SMS normally.

Implementation Plan

- It can display the SMS center number of SIM card. If insert two SIM cards in mobile phone, their SMS center number will be listed separately. The interfaces involved are:

    SmsManagerEx.getDefault().getSmscForSubscriber(subId)

- It can modify the SMS center number of SIM card. If insert two SIM cards in mobile phone, please pay attention to the distinction. The interfaces involved are:

SmsManagerEx.getDefault().setSmscForSubscriber(smscAddr, subId)

📖 NOTE

- Import SmsManagerEx file: import android.telephony.TelephonyManagerEx.
- subId (like 1, 2, 3...) is the ID value of SIM card in the mobile phone.
- smscAddr is the SMS center number that needs to be set.

Interface Behavior

Control combination.

3.23 GCF Test

Function Description

To add GCF test menu option in EngineerMode. Messaging module will read the database value of this option, turn on the GCF mode when the value is true, and set the configuration properties of the GCF test module.

Implementation Plan

System API:

private final String SEND_RETRIE_TIME = "message_send_retries"

Settings.Global.get*String*(mContext.getContentResolver(),SEND_RETRIE_TIME)

Interface Behavior

Slide switch.

3.24 AT port lock

Function Description

Close the AT/DIAG port to prevent SIMLOCK from being cracked.

Implementation Plan

Open: set the",gser" property. Close: set the "disable" property, as follows:

- SystemProperties.set("persist.vendor.sys.modem.diag", ",gser");
- SystemProperties.set("persist.vendor.sys.modem.diag", "disable");

Each time the property value is set, let the bottom layer trigger the enumeration again to make the setting take effect, as follows:

UsbManager mUsbManager = (UsbManager) AppSettingsPrefActivity.this.getSystemService(Context.USB_SERVICE);

mUsbManager.setCurrentFunctions(UsbManager.FUNCTION_NONE);

Interface Behavior

Slide switch.

3.25 CABC Test

Function Description

Implement the function of switch CABC to test CABC or eliminate the interference of CABC.

Implementation Plan

Write value to **/sys/module/dpu_r4p0/parameters/cabc_disable** node, 0 is enable and 1 is disable.

Interface Behavior

Slide switch.

3.26 Rps_dup

Function Description

Automatic downstream packet filling test through switch control. Turn on the switch during the test, and the bottom layer will determine whether to bind the big core according to the switch state.

Implementation Plan

Set through the SystemPropertiesProxy setting method.

- If the value of "persist.sys.rps.udp" is "true", enabled and send broadcast.
- If the value of "persist.sys.rps.udp" is "false", disabled.

Interface Behavior

Click the switch to enable and disable the function.

3.27 SFP Option

Function Description

The SFP function is turned on and off through the switch.

Implementation Plan

Set through the SystemPropertiesProxy setting method.

- If the value of "ctl.start" is "vendor.sfp_on", enabled the SFP function.
- If the value of "ctl.start" is "vendor.sfp_off", disabled the SFP function.

Interface Behavior

Click the switch to enable and disable the function.

4 CONNECTIVITY

4.1 BT

4.1.1 RF Path

Function Description

Select BT path in EVB and Ott modules.

Implementation Plan

WCN command will be sent through socket

- Enable: Send the command "eng bt set_rf_path 1"
- Disable: Send the command "eng bt set_rf_path 2"

Interface Behavior

Slide switch.

4.1.2 BT CLASSIC BQB

Function Description

Enter or exit BT class BQB mode, which is disabled by default. After enabled, the BT transmit power can be set through the instrument in the non-signaling comprehensive test.

Implementation Plan

Send the AT command "eng bt dut_mode_configure" through socket.

Interface Behavior

Slide switch.

4.1.3 BT Non-signaling TEST

4.1.3.1 Non-signaling TX

Function Description

To test the transmission function of BT, please turn off BT EUT before testing.

Implementation Plan

Figure 4-1 Non Signaling TX interface

- TX Pattern drop-down selection control.

Table 4-1 TX Pattern drop-down selection widget

parameter	Option
1	00000000
2	11111111
3	10101010
4	PRBS9
9	11110000

- TX Channel Edit Control: Up to three integers can be input (0-78 and 255). The input content, which cannot be retained on the interface, is the command and parameters that are issued.
- TX Pac Type drop-down selection control.

Table 4-2 TX Pac Type drop down selection control

Parameter	Option	Max Pac Len	Parameter	Option	Max Pac Len	Parameter	Option	Max Pac Len
0	NULLpkt	0	11	DH3	183	24	EDR_3DH1	83

Parameter	Option	Max Pac Len	Parameter	Option	Max Pac Len	Parameter	Option	Max Pac Len
1	POLLpkt	0	12	EV4	120	25	EDR_AUX1	29
2	FHSpkt	18	13	EV5	180	26	EDR_2DH3	367
3	DM1	17	14	DM5	224	27	EDR_3DH3	552
4	DH1	27	15	DH5	339	28	EDR_2EV5	360
5	DV1	10	16	IDpkt	0	29	EDR_3EV5	540
6	DV2	20	17	INVALLpkt	0	30	EDR_2DH5	679
7	HV3	30	20	EDR_LDH1	54	31	EDR_3DH5	1021
8	DV	9	21	EV3	30			
9	AUX1	29	22	EDR_2EH3	60			
10	DM3	121	23	EDR_3EV3	90			

- TX Pac Len Edit Control: Up to four integers can be input, and the input range is related to TX PAC type (See the Table 4-2). There is a Maxlen prompt at the bottom of TX PAC Len on the interface. Please input according to the prompt range.

- TX Power Value Edit Control: Up to two integers can be input (0-33). The input content, which cannot be retained on the interface, is the command and parameters that are issued.

- TX Pac Cnt Edit Control: Up to five integers can be input (0-65536). The input content, which cannot be retained on the interface, is the command and parameters that are issued.

- TX Mode Drop-down Menu: To choose CW or CALSSIC mode.

  There are two buttons namely Start and Stop.

  – Click Start button to do the following:

```
//Open bt
#eng bt bt_on
// Set parameters and start
#eng bt set_nosig_tx_testmode 1 0 %s(pattern) %s(channel) %s(pactype)
%s(paclen) %s(powertype ) %s(powervalue) %s(paccnt)
```

  – Click Stop button to do the following:

```
//stop
#eng bt set_nosig_tx_testmode 0 0 %s(pattern) %s(channel) %s(pactype)
%s(paclen) %s(powertype ) %s(powervalue) %s(paccnt)
```

  – In order to reduce the switching times of BT, please open BT when clicking the Start button and close it when exiting the sub test interface BT.

```
//close bt
#eng bt bt_off
```

Interface Behavior

Please refer to Implementation Plan in 4.1.3.1 .

4.1.3.2 Non-signaling RX

Function Description

To test the transmission function of BT, please turn off BT EUT before testing.

Implementation Plan

Figure 4-2 Non-Signaling RX interface

- RX Pattern drop-down selection control.

Table 4-3 RX Pattern drop-down selection control

Parameter	Option
1	00000000
2	11111111
3	10101010
4	PRBS9

Parameter	Option
9	11110000

- RX Channel Edit Control: Up to two integers can be input (0-78). The input content, which cannot be retained on the interface, is the command and parameters that are issued.
- RX Pac Type Drop-down selection control.

Table 4-4 RX Pac Type Drop-down selection control

Parameter	Option	Parameter	Option	Parameter	Option
0	NULLpkt	11	DH3	24	EDR_3DH1
1	POLLpkt	12	EV4	25	EDR_AUX1
2	FHSpkt	13	EV5	26	EDR_2DH3
3	DM1	14	DM5	27	EDR_3DH3
4	DH1	15	DH5	28	EDR_2EV5
5	DV1	16	IDpkt	29	EDR_3EV5
6	DV2	17	INVALLpkt	30	EDR_2DH5
7	HV3	20	EDR_LDH1	31	EDR_3DH5
8	DV	21	EV3		
9	AUX1	22	EDR_2EH3		
10	DM3	23	EDR_3EV3		

- RX Gain Edit Control: Up to two integers can be input (0-32). The input content, which cannot be retained on the interface, is the command and parameters that are issued.
- RX Addr Edit Control: Supports 12-digit address input, which is limited to "0123456789abcdefabcdef". The input content is in the units of 2digits, sperated by ":". For example, the input content is "1234567890ab", the parameter carried in the issued command is "12:34:56: 7:90: ab". The setting item has no reserved function.
- RX is used to test the receiving function of BT chip, and the receiving result is reflected by RSSI/PER/BER.
  - RSSI: The negative value of RSSI in the return result of execution eng bt set_nosig_rx_recv_data.
  - PER: The returned result of pkt_err_cnt/ pkt_cnt retains 6 significant digits after the decimal point, and then convert to a percentage display.
  - The returned result of bit_err_cnt/ bit_cnt retains 6 significant digits after the decimal point, and then convert to a percentage display.
- There are five buttons, namely Start, Read, Auto, Clear, Stop.
  - Click Start button to do the following:

```
//Open BT
#eng bt bt_on
// Issue setting parameters and start
#eng bt set_nosig_rx_testmode 1 0 7 %s(channel) %s(pactype) %s(gain) %s(addr)
```

  - Click Read button to do the following:

```
// Get BT RX capability
#eng bt set_nosig_rx_recv_data
```

Format of the return value: OK rssi:9, pkt_cnt:3, pkt_err_cnt:3, bit_cnt:4672, bit_err_cnt:2351

－ Click Auto button to do the following:

The function of this button is used to cyclically issue command and get BT RX capability. After clicking Auto button, please set the interval time for issuing commands cyclically. The time interval that can be input is t1000ms+.

－ Click Clear button to do the following:

The function of this button is to enable the result. The AP side saves the test results in the ArrayList. Click this button, the AP clears the data in the ArrayList and informs the interface to refresh.

－ Click Stop button to do the following:

```
//stop test
#eng bt set_nosig_rx_testmode 0 0 7 %s(channel) %s(pactype) %s(gain) %s(addr)
```

－ In order to reduce the switching times of BT, please open BT when clicking the Start button and close it when exiting the sub test interface BT.

```
//Close bt
#eng bt bt_off
```

4.1.3.3 Non-signaling BLE TX

Function Description

To test BLE TX function.

Implementation Plan

Figure 4-3 Non-signaling BLE TX interface

- BLE TX LE PHY: The drop-down options include LE1M, LE2M, LE Coded S8, LE Coded S2.
- BLE TX Pattern drop-down selection control:

Table 4-5 BLE TX Pattern drop-down selection controls

Parameter	Option
1	00000000
2	11111111
3	10101010
4	PRBS9
9	11110000

- BLE TX Channel Edit Control: Up to three integers can be input (0-78 and 255). The input content, which cannot be retained on the interface, is the command and parameters that are issued.

- BLE TX Data Length Edit Control: Up to three integers can be input (0-192). The input content, which cannot be retained on the interface, is the command and parameters that are issued.

- BLE TX PAC CNT Edit Control: Up to two integers can be input (0-65536). The input content, which cannot be retained on the interface, is the command and parameters that are issued.

- TX Mode Drop-down Menu: To choose CW or BLE mode.

- There are two buttons, namely Start and Stop.

    - Click Start button to do the following:

```
//Open bt
#eng bt bt_on
// Set parameters and start
#eng bt set_nosig_tx_testmode 1 0 %s(pattern) %s(channel) %s(pactype)
%s(paclen) %s(powertype ) %s(powervalue) %s(paccnt)
```

    - Click Stop button to do the following:

```
//Stop
#eng bt set_nosig_tx_testmode 0 0 %s(pattern) %s(channel) %s(pactype)
%s(paclen) %s(powertype ) %s(powervalue) %s(paccnt)
```

    - In order to reduce the switching times of BT, please open BT when clicking the Start button and close it when exiting the sub test interface BT.

```
//Close bt
#eng bt bt_off
```

Interface Behavior

Please refer to the Implementation Plan in 4.1.3.3 .

4.1.3.4 Non-signaling BLE RX

Function Description

To test BLE RX function.

Implementation Plan

Figure 4-4 Non-signaling BLE RX interface

- BLE RX Mod_Index: Debug index options include Standard/Stable.
- BLE RX LE_PHY: Test rate options include LE1M/LE2M/LE Coded.
- BLE RX Channel: Set channel (0~39, decimal data).
- BLE RX Gain: Set gain (0~5, decimal data).
- BLE RX Addr: Input 12-digit address.

Interface Behavior

N/A.

4.1.4 BT LE BQB

Function Description

Bluetooth BQB certification function.

Implementation Plan

Send AT command to "/data/misc/.bqb_ctrl" through socket:

- Send SPBQBTEST=1 and open BQB MODE:
    - Return OK, indicating the setting is successful.
    - Return ALREADY, indicating the setting has been set, and no operation is required.
- Send SPBQBTEST=0 and close BQB MODE:
    - Return OK, indicating the setting is successful.
    - Return ALREADY, indicating the setting has been set, and no operation is required.

Interface Behavior

A clickable button, the interface will display "enabled" and "disabled".

4.2 FM

Function Description

To test the FM playback path (headphone or external amplifier), input the frequency band to test the signal strength, and obtain the RDS BLER value.

Implementation Plan

In EngineerMode, switch the playback path by calling the AudioManager.setAudioPath function to detect the playback status of headphone. If the headphone is unplugged or not plugged in, aprompt dialog box if forced to popup.

RDS BLER: The chip directly calls FmNative.getBler() to get BLER value, or calls back the onStatusEvent in IFmReceiverEventHandler to get BLER value.

Interface Behavior

- Input channel in EditView.
- Set two buttons for headphone and external playback.
- Display BLER value in TextView.

4.3 Wi-Fi

Function Description

After entering Wi-Fi test, to test Rx, TX and REG_WR functions of Wi-Fi respectively. To verify these functions of Wi-Fi, commands related to Wi-Fi non-signaling test are integrated into the EngineerMode.

Implementation Plan

Send the relevant commands to WCND through socket, and then WCND will continue to send these commands to the WCN. The WCN will complete these operations, as follows:

Figure 4-5 Wi-Fi interface
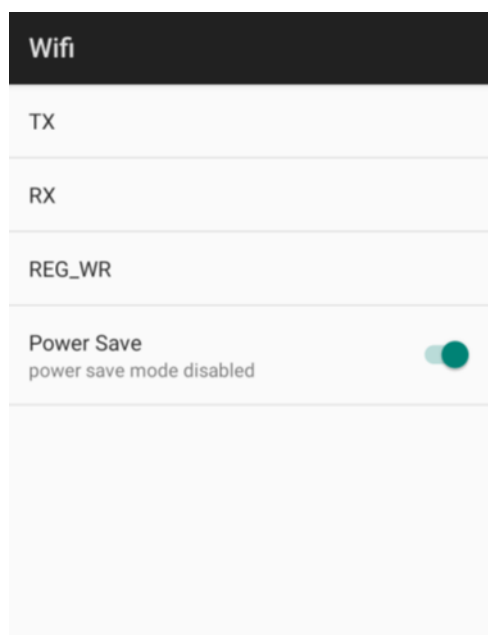
Enter the Wi-Fi option, which includes:

- TX
- RX
- REG_WR
- Disabled Power Save Mode

Enter the submenu shown in Figure 4-5 and perform the following operations:

```
//Start cmdservice
# SystemProperties.set("persist.sys.cmdservice.enable", "enable");
//Load WiFi driver
# insmod /lib/modules/sprdwl.ko
//Send start instruction through communication with wcnd
# eng iwnpi wlan0 start
//Query the status of disabled power save mode and update the interface switch status
# eng iwnpi wlan0 lna_status

To exit the interface, you need to perform the following operations
//Communication with wcnd to issue stop instruction
# iwnpi wlan0 stop
//Unload drive
# rmmod system/lib/modules/sprdwl.ko
```

Connect the mobile phone and the test equipment in a wired way to test the sending ability of the Wi-Fi chip of the device through the TX. In Wi-Fi TX interface, START is the data-sending button, STOP is the stop data-sending button.

Figure 4-6 Wi-Fi TX interface

The sub-options of TX include the following:

- RF Tx Path: Primary/Diversity/MIMO are included. Partially supported.

- Pkt Length: Set the packet length (64-4095), the default value is 1000.

- Pkt cnt: Set the number of sending packets (0-65535). The default value is 0, which indicates continuous sending.

- Power level: Set the transmit power level of Wi-Fi, different values correspond to different power, see Figure 4-6 and Figure 4-7 for details.

- RF Standard: Including 802.11b/802.11g/802.11n_2.4G/802.11n_5.0G/802.11ac/802.11a.

- CBW: channel band width, adaptive adjustment options according to RF Standard, see Table 4-6 and Table 4-7 for details.

- SBW: signal band width, adaptive adjustment options according to RF Standard, see Table 4-6 and Table 4-7 for details.

- Offset: Frequency offset, adaptive adjustment options according to RF Standard, see Table 4-6 and Table 4-7 for details.

- Channel: Set the transmit channel, adaptive adjustment options according to RF Standard, see Table 4-6 and Table 4-7 for details.

- Rate: Set the WiFi rate, adaptive adjustment options according to RF Standard, see Table 4-6 and Table 4-7 for details.

- Preamble: See Table 4-6 and Table 4-7 for details.

- Mode: Set 802.11 pkt and sinewave.

- Guard interval: Set 400ns and 800ns.

RX option:

RX is used to test the receiving ability of Wi-Fi chip of the device. Connect with the transmitting equipment by wire, and perform statistical calculation on the amount of data successfully received and the bit error rate.

Figure 4-7 Wi-Fi RX interface

The sub-options of RX include the following:

- Test RX Num: Set the number of received packets.
- RF Standard: Including 802.11b/802.11g/802.11n_2.4G/802.11n_5.0G/802.11ac/802.11a.
- CBW: channel band width, adaptive adjustment options according to RF Standard, see Table 4-6 and Table 4-7 for details.
- SBW: signal band width, adaptive adjustment options according to RF Standard, see Table 4-6 and Table 4-7 for details.
- Offset: Frequency offset, adaptive adjustment options according to RF Standard, see Table 4-6 and Table 4-7 for details.
- Channel: Set the transmit channel, adaptive adjustment options according to RF Standard, see Table 4-6 and Table 4-7 for details.

Table 4-6 Parameter Value Range Table 1

RF Standard	Power level	CBW	SBW	Offset	Preamble
802.11b	0~17	20MHz	20MHz	0MHz	Normal /CCK Short
802.11g	0~15	20MHz	20MHz	0MHz	Normal
802.11n_2.4G	0~15	20MHz	20MHz	0MHz	

RF Standard	Power level	CBW	SBW	Offset	Preamble
(Supports MIMO)		40MHz	20MHz/40MHz Default 40MHz	-10MHz/+10MHz	802.11n Mixed Mode
802.11n_5.0G (Supports MIMO)	0~15	20MHz	20MHz	0MHz	802.11n Mixed Mode
		40MHz	20MHz/40MHz Default 40MHz	-10MHz/+10MHz Default -10MHz	
802.11ac (Supports MIMO)	0~15	20MHz	20MHz	0MHz	802.11ac
		40MHz	20MHz/40MHz Default 40MHz	-10MHz/+10MHz Default -10MHz	
		80MHz	20MHz/40MHz/80MHz Default 80MHz	-30MHz/-10MHz/ +10MHz/+30MHz Default -30MHz	
802.11a	0~15	20MHz	20MHz	0MHz	Normal

Table 4-7 Parameter Value Range Table 2

RF Standard	Channel	Rate
802.11b	CH1[2412M]、CH2[2417M] 、CH3[2422M]、CH4[2427M]、CH5[2432M]、CH6[2437M]、CH7[2442M]、CH8[2447M]、CH9[2452M]、CH10[2457M]、CH11[2462M]、CH12[2467M]、CH13[2472M]、CH14[2484M]	1M_Long、2M_Long、2M_Short、5.5M_Long、5.5M_Short、11M_Long、11M_Short
802.11g	CH1[2412M]、CH2[2417M] 、CH3[2422M]、CH4[2427M]、CH5[2432M]、CH6[2437M]、CH7[2442M]、CH8[2447M]、CH9[2452M]、CH10[2457M]、CH11[2462M]、CH12[2467M]、CH13[2472M]、CH14[2484M]	6M、9M、12M、18M、24M、36M、48M、54M

RF Standard	Channel		Rate	
802.11n_2.4G (Supports MIMO)	20MHz	CH1[2412M]、CH2[2417M]、CH3[2422M]、CH4[2427M]、CH5[2432M]、CH6[2437M]、CH7[2442M]、CH8[2447M]、CH9[2452M]、CH10[2457M]、CH11[2462M]、CH12[2467M]、CH13[2472M]、CH14[2484M]	Primary/ Diversity	HT_MCS0、HT_MCS1、HT_MCS2、HT_MCS3、HT_MCS4、HT_MCS5、HT_MCS6、HT_MCS7
	40MHz	CH3[2422M]、CH4[2427M]、CH5[2432M]、CH6[2437M]、CH7[2442M]、CH8[2447M]、CH9[2452M]、CH10[2457M]、CH11[2462M]	MIMO	HT_MCS8、HT_MCS9、HT_MCS10、HT_MCS11、HT_MCS12、HT_MCS13、HT_MCS14、HT_MCS15
802.11n_5.0G (Supports MIMO)	20MHz	CH36[5180M]、CH40[5200M]、CH44[5220M]、CH48[5240M]、CH52[5260M]、CH56[5280M]、CH60[5300M]、CH64[5320M]、CH100[5500M]、CH104[5520M]、CH108[5540M]、CH112[5560M]、CH116[5580M]、CH120[5600M]、CH124[5620M]、CH128[5640M]、CH132[5660M]、CH136[5680M]、CH140[5700M]、CH149[5745M]、CH153[5765M]、CH157[5785M]、CH161[5805M]、CH165[5825M]	Primary/ Diversity	HT_MCS0、HT_MCS1、HT_MCS2、HT_MCS3、HT_MCS4、HT_MCS5、HT_MCS6、HT_MCS7
	40MHz	CH38[5190M]、CH46[5230M]、CH54[5270M]、CH62[5310M]、CH102[5510M]、CH110[5550M]、CH118[5590M]、CH126[5630M]、CH134[5670M]、CH151[5755M]、CH159[5795M]	MIMO	HT_MCS8、HT_MCS9、HT_MCS10、HT_MCS11、HT_MCS12、HT_MCS13、HT_MCS14、HT_MCS15

RF Standard	Channel		Rate	
802.11ac (Supports MIMO)	20MHz	CH36[5180M]、CH40[5200M]、CH44[5220M]、CH48[5240M]、CH52[5260M]、CH56[5280M]、CH60[5300M]、CH64[5320M]、CH100[5500M]、CH104[5520M]、CH108[5540M]、CH112[5560M]、CH116[5580M]、CH120[5600M]、CH124[5620M]、CH128[5640M]、CH132[5660M]、CH136[5680M]、CH140[5700M]、CH149[5745M]、CH153[5765M]、CH157[5785M]、CH161[5805M]、CH165[5825M]	Primary/ Diversity	VHT_MCS0_1SS、VHT_MCS1_1SS、VHT_MCS2_1SS、VHT_MCS3_1SS、VHT_MCS4_1SS、VHT_MCS5_1SS、VHT_MCS6_1SS、VHT_MCS7_1SS、VHT_MCS8_1SS、VHT_MCS9_1SS
	40MHz	CH38[5190M]、CH46[5230M]、CH54[5270M]、CH62[5310M]、CH102[5510M]、CH110[5550M]、CH118[5590M]、CH126[5630M]、CH134[5670M]、CH151[5755M]、CH159[5795M]		
	80MHz	CH42[5210M]、CH58[5290M]、CH106[5530M]、CH122[5610M]、CH138[5690M]、CH155[5775M]	MIMO	VHT_MCS0_2SS、VHT_MCS1_2SS、VHT_MCS2_2SS、VHT_MCS3_2SS、VHT_MCS4_2SS、VHT_MCS5_2SS、VHT_MCS6_2SS、VHT_MCS7_2SS、VHT_MCS8_2SS、VHT_MCS9_2SS
802.11a	CH36[5180M]、CH40[5200M]、CH44[5220M]、CH48[5240M]、CH52[5260M]、CH56[5280M]、CH60[5300M]、CH64[5320M]、CH100[5500M]、CH104[5520M]、CH108[5540M]、CH112[5560M]、CH116[5580M]、CH120[5600M]、CH124[5620M]、CH128[5640M]、CH132[5660M]、CH136[5680M]、CH140[5700M]、CH149[5745M]、CH153[5765M]、CH157[5785M]、CH161[5805M]、CH165[5825M]		6M、9M、12M、18M、24M、36M、48M、54M	

REG_WR:

REG_WR implements the read and write operations of the fixed address registers, which is used to assist the Wi-Fi hardware colleagues to debug. There existed some addresses that cannot be read or written and the dialog box toast fail or error. Please ignore these situations.

- Type drop-down selection control

Table 4-8 Type drop-down selection control

Parameter	Option
mac	mac (default)
phy0	phy0
phy1	phy1
rf	rf

- Addr Edit control: The default value is 0. It supports input of integers and "abcdef", and the setting content can be retained. The corresponding relationship between the input range and the type of Addr is as follows:

Table 4-9 Addr Edit control

Type	Addr input range
mac	0-800
phy0	0-ff
phy1	0-ff
rf	0-6ff

- Length Edit control: The default value is 1, and currently does not support input.
- Value Edit control: The default value is 0, supports the input of integers, no input range limitation.
- Read and Write button:
    - Click Read button to do the following:

```
# iwnpi wlan0 get_reg %s(type) %s(Addr) %s(Length)
```

    - Click Write button to do the following:

```
# iwnpi wlan0 set_reg %s(type) %s(Addr) %s(Vlaue)
```

Power Save:

```
            //close
#eng iwnpi wlan0 lna_on
//open
#eng iwnpi wlan0 lna_off
```

Interface Behavior

Please refer to the Implementation Plan in 4.3 .

4.4 Wi-Fi Certification

Function Description

- No sleep
- Wi-Fi Scan Off

Implementation Plan

- Max Power：

Sending command to WCND through socket:

Open command: " iwnpi wlan0 set_tx_power"

- No sleep:

Sending command to WCND through socket:

- Open command: " iwnpi wlan0 lna_on"
- Close command: " iwnpi wlan0 lna_off"
- Query command: " iwnpi wlan0 lna_status"
- Wi-Fi Adaptive:

Sending command to WCND through socket:

- Open command: " iwnpi wlan0 set_eng_mode 1 1"
- Close command: " iwnpi wlan0 set_eng_mode 1 0"
- Query command: " iwnpi wlan0 set_eng_mode 2"
- Wi-Fi Scan Off:

Sending command to WCND through socket:

- Open command: " iwnpi wlan0 set_eng_mode 3 1"
- Close command: " iwnpi wlan0 set_eng_mode 3 0"
- Query command: " iwnpi wlan0 set_eng_mode 4"
- Beamforming:

Sending command to WCND through socket:

- Open command: " iwnpi wlan0 set_beamf_status 1"
- Close command: " iwnpi wlan0 set_beamf_status 0"
- Query command: " iwnpi wlan0 get_beamf_status "
- STBC RX:

Sending command to "wcnd" through socket:

- Open command: " iwnpi wlan0 set_rxstbc_status 1"
- Close command: " iwnpi wlan0 set_rxstbc_status 0"
- Query command: " iwnpi wlan0 get_rxstbc_status "

Interface Behavior

Slide switch.

4.5 Wi-Fi Noise Scan Auto-Test

Function Description

- To ensure that the platform dose not rely on meters, and quickly evaluate the PCB internal interference level of each channel.
- In the absence of a meter, quickly locate Wi-Fi problems.
- To improve platform/customer debugging efficiency.

Implementation Plan

- Detect the noise of all Wi-Fi channels and the selection channels.
- Specify the test time duration and number of tests.
- Display the average value of the optional channel.

Interface Behavior

Control Combination.

5 HARDWARE

5.1 De Sense PLL

Function Description

This function can modify the PLL registers in the EngineerMode, similar to the read and write function of the arm registers in mobile tester. It can read and write whether there is frequency hopping.

Implementation Plan

Calling lookat tool to modify registers:

```
lookat [-l nword] [-s value] [-h] phy_addr_in_hex
```

EXAMPLES:

- Print single register (@0x82000004) value:

```
$ ./lookat 0x82000004
0x00000004
```

- print values of 8 continuous regs start from 0x82000030 in a formatted way:

```
$ ./lookat -l 8 0x82000030
    ADDRESS |   VALUE
-----------+----------
0x82000030 | 0x00000002
0x82000034 | 0x00000000
0x82000038 | 0x00000000
0x8200003c | 0x00000000
0x82000040 |     0x0000
0x82000044 |     0x0000
0x82000048 |     0x0000
0x8200004c |     0x0000
```

- set register (@0x820004c0) 's value to 0xa072:

```
$ ./lookat -s 0xa072 0x820004c0
```

Interface Behavior

The UI has an Address input box, a data input box, a number input box, a result display window as well as Read and Write button. These two buttons can read and write the PLL registers by calling lookat functions.

📖 NOTE

After Android 7.0, due to the permission issues, only the userdebug version supports De Sense PLL, and the relevant permission check needs to be turned off when using De Sense PLL.

5.2 Control Charging Interval

Function Description

When the mobile phone is displayed in the business hall, it is necessary to control the charging interval of the mobile phone. Charging starts when the battery power is lower than 30%, and stops when the battery power is higher than 90%.

Implementation Plan

Kernel drive interface:

- Sys/class/power_supply/battery/capacity: To get battery power.
- Sys/class/power_supply/battery/stop_charge: Enable/disable charging.

Interface Behavior

Slide switch:

- when the switch is turned on, it indicates the function is enable.
- when the switch is turned off, it indicates the function is disable.

5.3 Camera Idle Sleep

Function Description

Exit the camera application when it is idle for a little while.

Implementation Plan

Disable the "camera idle sleep" function, i.e. changing the value of persist.sys.camera.idlesleep from true (default) to false.

- When the value of persist.sys.camera.idlesleep is true, the camera application will exit after 2 minutes of inactivity.
- When the value of persist.sys.camera.idlesleep is false, the camera application will not exit after 2 minutes of inactivity.

Interface Behavior

Slide switch:

- Switch on indicates "camera idle sleep" is enabled,
- Switch off indicates "camera idle sleep" is disabled.

5.4 Camera Power Test Mode

Function Description

At present, when testing the power consumption of the default camera, please manually input the ADB command to set various modes for testing. The camera power consumption can be tested in the user version without affecting the functions of the mobile phone.

Implementation Plan

The upper layer switches the Camera Power Test Mode by setting the value of "persist.sys.isp.af.bypass":

- Value 1 indicates to enable the Camera Power Test Mode.
- Value 0 indicates to disable the Camera Power Test Mode.

Interface Behavior

Slide switch:

- Switch on indicates to enable the Camera Power Test Mode.
- Switch off indicates to disable the Camera Power Test Mode.

5.5 Reset Settings

Function Description

Set the restart mode, including soft reset and hard reset:

- Soft reset: It refers to incomplete power-down mode. When the power button is pressed for 7 seconds in the shutdown state, the system will be systemdump.
- Hard reset: It refers to complete power-down mode. When the power button is pressed for 7 seconds in the shutdown state, the system will not be systemdump.

Implementation Plan

The upper layer is set by writing the value of the node "/sys/class/misc/sprd_7sreset/hard_mode":

- Value "0" indicates the soft reset.
- Value "1" indicates the hard reset.

Interface Behavior

Design an optional ListView UI, and the options include soft reset and hard reset.

5.6 Antenna Settings

Function Description

Used to set the main and auxiliary antennas to assist the RF for debugging.

Implementation Plan

AT+SPDUALRFSEL

Interface Behavior

There are four ListView on the interface. Enter the menu interface, the AT command will be issued to query the current status of the mobile phone. The tester can select the corresponding option according to the function requirements, and the mobile phone will restart after the option is confirmed.

- LTE：Primary and Diversity, Primary only, Diversity only

- WCDMA：Primary and Diversity, Primary only, Diversity only

- GSM div：Primary and Diversity, Primary only, Diversity only

- NR：Default, RX0 performance evaluation~RX3 performance evaluation, TX0 performance evaluation~TX3 performance evaluation

5.7 ASDIV Settings

Function Description
- Test the OTA of upper antenna / lower antenna
- Single main and single auxiliary functions.

Implementation Plan
- At+SPDPDTENABLE
- At+SPWASDUMMY

Interface Behavior

There are some ListView. Enter the menu interface, the AT command will be issued to query the current status of the mobile phone. The tester can select the corresponding option according to the function requirements.

- LTE DPDT switch to ANT1
- LTE DPDT switch to ANT2
- GSM DPDT switch to ANT1
- GSM DPDT switch to ANT2
- WCDMA DPDT switch to ANT1
- WCDMA DPDT switch to ANT2
- C2K DPDT switch to ANT1
- C2K DPDT switch to ANT2

5.8 Power Consumption of Coulometer

Function Description

Users can see the approximate power consumption of a scenario when using the mobile phone.

Implementation Plan

Record the current data every 10 minutes, and then draw all the data into a simple graph (the horizontal axis represents time and the vertical axis represent power consumption). Because Android has a Healthd mechanism that synchronizes data every 10 minutes, data is saved according to this mechanism. In a long-time standby power consumption test such as 24-hour or 48-hour, the data is collected every one or two hours and plotted as a point in the chart. In a short-time standby power consumption test such as less than 20 minutes, no chart is needed.

Steps to obtain power consumption data:

1. Click the Start button, echo 1 > /sys/class/power_supply/sprdfgu/cc_test_cmd node.
2. Click the Stop button, echo 0 > /sys/class/power_supply/sprdfgu/cc_test_cmd node.
3. Read the value of the cat/sys/class/power_supply/sprdfgu/cc_test_result node and display it.
4. Power consumption test is divided into long-time standby test and single scene test. In either case, write echo 0 > /sys/class/power_supply/sprdfgu/cc_test_cmd to this node when the test is ended.

Interface Behavior

The function interface consists of three periods, each of which includes the following:

- Start time: the start time of the test, after which the power consumption test function will be started regularly.
- Test duration: duration of the test.
- "Start" button: used to start timing power consumption test.
- "View results" button: used to jump to the result display interface to view results and graphs.
- "Display icon" check box: to view the power consumption data graph.
- "Clear" button: used to clear test data.

5.9 Camera FPS

Function Description

When testing the power consumption of the camera, please manually input the ADB command to set various modes for testing. The camera power consumption can be tested in the user version without affecting the functions of the mobile phone.

Implementation Plan

Control is achieved by controlling the values of the persist.sys.camera.idlesleep and persist.sys.isp.ae.manual.

Interface Behavior

The interface contains three value filling boxes and buttons, they are Preview, Recording and Restore Defaults.

5.10 FM Paly by DSP

Function Description

FM plays with DSP to solve the noise caused by FM clock asynchronous.

Implementation plan

Add FM play mode in EngineerMode: with DSP or without DSP..

The interfaces are as follows:

```
private AudioManager mAudioManager;
mAudioManager = (AudioManager) getSystemService(Context.AUDIO_SERVICE);
```

- Whether the function is supported：

```
mAudioManager.getParameters("isAudioDspExist");
```

- FM initial state：

```
mAudioManager.getParameters ("FM_WITH_DSP=1");
```

- FM with DSP：

```
mAudioManager.setParameters ("FM_WITH_DSP=1");
```

- FM without DSP：

```
mAudioManager.setParameters ("FM_WITH_DSP=0");
```

- Native layer:

```
AudioSystem::SetParameters(0, " FM_WITH_DSP =1");
```

Interface behavior

Add switches in EngineerMode.

5.11 RF Send Power

Function Description

1. Set the maximum transmit power of GSM/TD DSP according to different bands.

2. There are six bands: GSM850、EGSM900、DCS1800、PCS1900、TD1.9 and TD2.1.

3. Enter the transmit power value in the corresponding band input box, press the "Set" button to trigger the set command, and press the "Clear" button to clear the previously set command.

Implementation Plan

- AT commands for setting the maximum transmit power of each band:
  - GSM850: AT+SPMAXRF="1,1,max_value"; max_value is value of the maximum transmit frequency input.
  - EGSM900: AT+SPMAXRF="2,1,max_value"; max_value is value of the maximum transmit frequency input.
  - DCS1800: AT+SPMAXRF="3,1,max_value"; max_value is value of the maximum transmit frequency input.
  - PCS1900: AT+SPMAXRF="4,1,max_value"; max_value is value of the maximum transmit frequency input.
  - TD1.9: AT+SPMAXRF="5,1,max_value"; max_value is value of the maximum transmit frequency input.
  - TD2.1: AT+SPMAXRF="6,1,max_value"; max_value is value of the maximum transmit frequency input.

- The AT commands for clearing the maximum transmit power of each band are as follows:
  - GSM850: AT+SPMAXRF="1,0,max_value"; max_value is value of the maximum transmit frequency input.
  - EGSM900: AT+SPMAXRF="2,0,max_value"; max_value is value of the maximum transmit frequency input.
  - DCS1800: AT+SPMAXRF="3,0,max_value"; max_value is value of the maximum transmit frequency input.
  - PCS1900: AT+SPMAXRF="4,0,max_value"; max_value is value of the maximum transmit frequency input.
  - TD1.9: AT+SPMAXRF="5,0,max_value"; max_value is value of the maximum transmit frequency input.
  - TD2.1: AT+SPMAXRF="6,0,max_value"; max_value is value of the maximum transmit frequency input.

Interface Behavior

Click the interface.

6 LOCATION

6.1 Clock Quality Auto-Test

Function Description

Enable heat source, and automatically test the clock frequency drift when different heat sources work.

Implementation Plan

- Test Items
    - currently five items are supported
    - can be tested individually
- Clk Type
    - supports TCXO and TSX solutions
    - if the TSX solution is not calibrated, there will be a red light reminder
    - the solution supported by the current mobile phone will be automatically selected and cannot be switched manually
- Test Modes
    - only signal is supported
- Time setting
    - Heating time

        The duration of the heat source, that is, the execution time of each scene, during which data collection will take place.

    - Cool time

        The cooling duration after each heat source test is completed until the start of the next test scenario. Data collection is still taking place during the cooling time.

Interface Behavior

Control combination.

6.2 GNSS De-sense Auto Test

Function Description

Open different interference source modules to test the impact on GPS CN0.

Implementation Plan

- Test Items
  - currently five items are supported
  - can be tested individually
- GNSS Band
  - GPS：1~32
  - B1C (Beidou): 151~187
  - BD2 (Beidou): 201~237
  - GLN (Glonass): 65~92
  - GAL (Galileo):301~336
- Test Modes
  - only support Signal
- Test Result
  - Test Item
  - Result
    - Successful positioning, sampling is performed every second.
    - Take 30s sampling twice in each case: one is before the scene runs (cool time), the other is in the scene running (heating time).
    - During the test, the word Testing is displayed.
    - If the absolute value of the cool data's average minus the heating data' average is less than or equal to 3, the test passed, otherwise, the test failed.
  - De-sense (dB):

    The data is displayed as the absolute value of cool data average - heating data average;
- Extension
  - There are two situations of failure: one is the data is unqualified, the other is the abnormal end of the test process.
  - Click each result: if it is the end of abnormity, the error message will pop up, otherwise, the sampling data graph will pop up.
  - The span size of the vertical (value) and horizontal (time) coordinates of the graph depends on the peak value of the single sampling and the total sampling time.

Interface Behavior

Control combination.

6.3 GNSS Noise Scan Auto Test

Function Description

Enable different interference source modules to test the effect on the band bottom noise.

Implementation Plan

- Test Items

- – currently nine items are supported
- – can be tested separately

- Test Setting
  - – Repeat times: the number of tests for each case (the maximum number of time is 3)
  - – Period per test case: test time of each case
  - – Fisrtdelay: the time interval between clicking start and the first case runs

- Test Result
  - – Test Item
  - – Result
    - ■ After the conditions are met (such as successful positioning), sampling is performed once per second.
    - ■ The sampling times and period of each case are determined by Repeat times and Period per test case.
    - ■ If there is no exception in each test, the test passed, otherwise, the test failed.

- RSSI (dB)

  The format of each result is [average value of current sampling, maximum value of current sampling]. The final results are displayed side by side.

  Warning

- Warning are divided into three categories:
  - – The preset conditions are not met

    When click "Start" button, it will popup that the preset conditions are not met, and then it will automatically jump to the specified system page (like GPS is not turned on); if it not jump to the specified system page, it will give a prompt (like 3D third-party tools for testing).

  - – An exception occurred during the operation

    If the test is abnormal, the word FAIL will be displayed in the result, but due to there is no test data, and the data area will be displayed as "--";

  - – Suggestive reminder

    Click "stop" button during the test, which will prompt "testing", indicating that the current item is being tested. Once the current item is tested, the following test items (if any) will all fail.

Interface Behavior

Control combination.

7 FAQ

1. The design scheme of network mode switching in EngineerMode.

   – WCDMA products use AT+SYSCONFIG

   – TD-SCDMA products use at + AT+SNVM

   – LTE products: LTE has many network modes, which are divided into four categories and many sub categories. The switching is mainly implemented in RIL. What the EngineerMode needs to do is to set the relevant attribute values through SystemPreperties and validate through Modem Reset. After the modem restarts, it will perceive the changes and configure the corresponding network mode according to the SystemPreperties.

2. The log that needs to be provided when switching network mode fails in EngineerMode.

   This kind of problem needs to submit a complete YLog, including Android log and Modem log.

3. Information that needs to be provided when the application stops running or dose not response in the UI of the EngineerMode.

   This kind of problem needs to grab a complete YLog and record the time points and screenshots of the problems.

4. Description of items displayed in gray in EngineerMode.

   – the version itself does not support the function or the project does not need to support the project

   – lack of relevant affiliated APK, etc

   – reserved items, not implemented yet

   – relevant services are not started

8 Reference Documents

1. *Android 10.0 YLog Capture User Guide*
2. *AT Command User Guide*
3. *3GPP TS 27.007 V4.6.0 (2003-3)*