**WITH THE COLLABORATION OF YONSEI UNIVERSITY**

# SMARTPHONE & MOBILE NETWORK PROJECT

## COURSE 2: SMART DEVICE & MOBILE EMERGING TECHNOLOGIES

## PROJECT 1: SMARTPHONE & NETWORK ANALYSIS

## PROJECT 2: OBSERVATION ON THE NETWORK TESTING BASED ON TWO DIFFERENT SMARTPHONE

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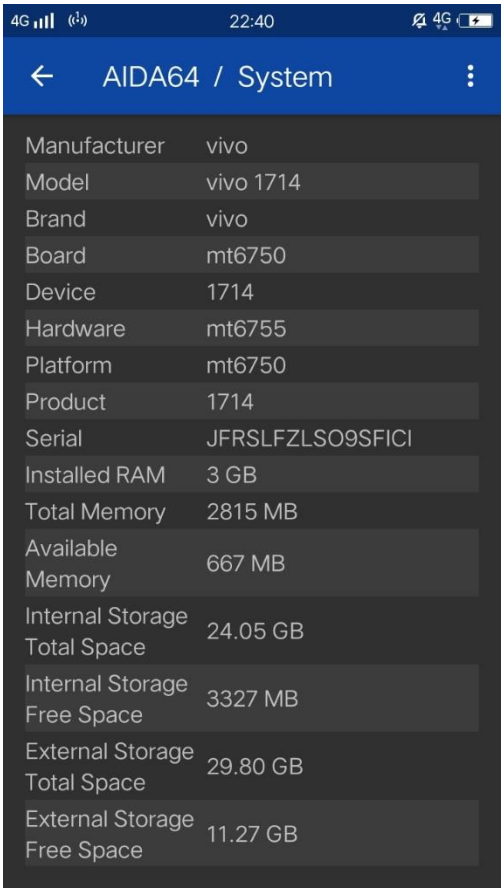
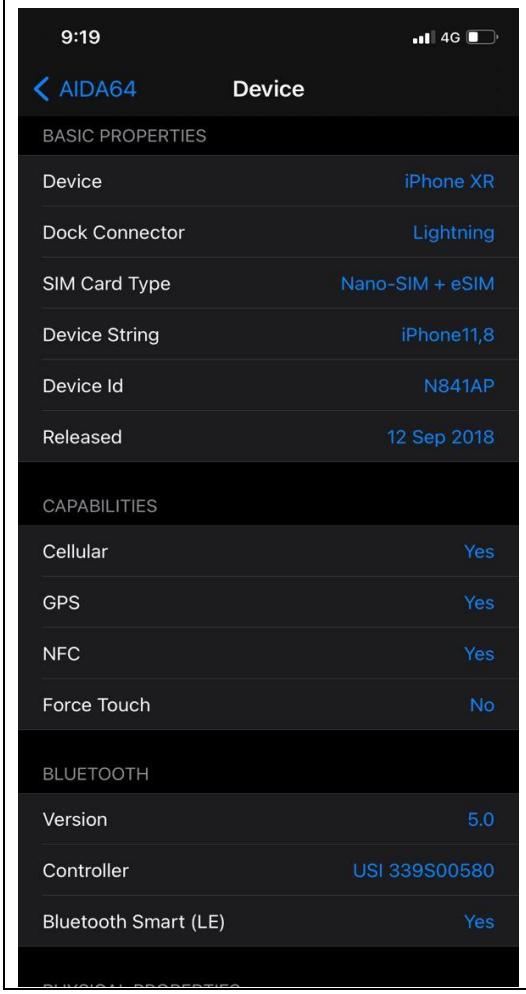
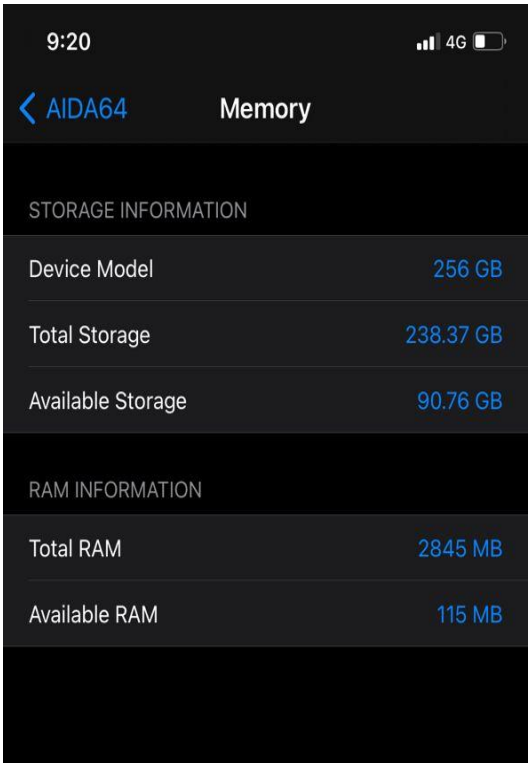
# PROJECT 1: SMARTPHONE & NETWORK ANALYSIS

System

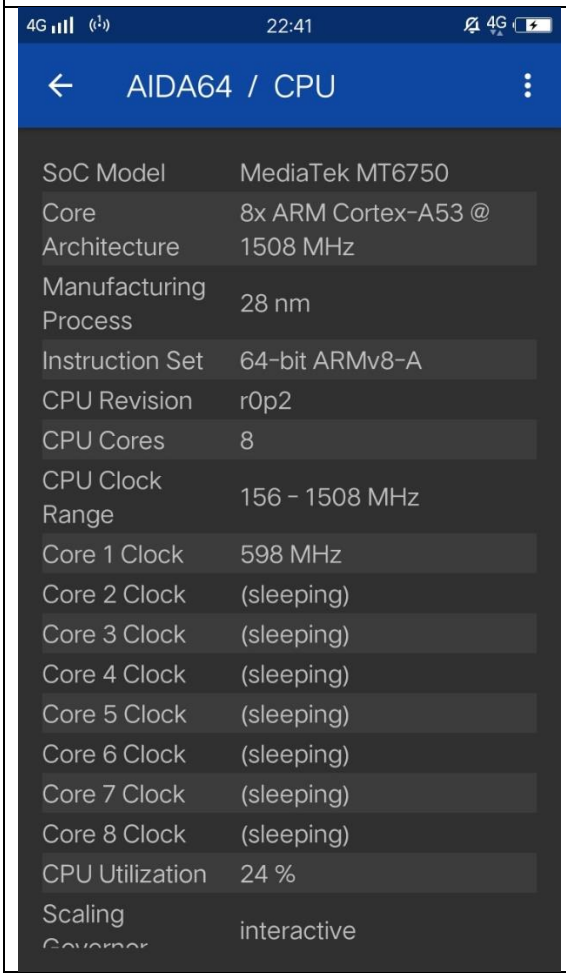
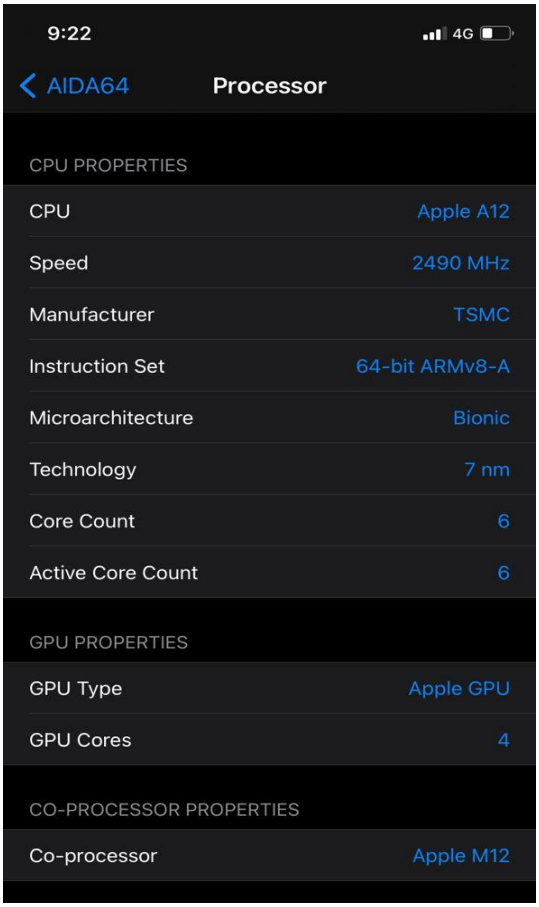
Android



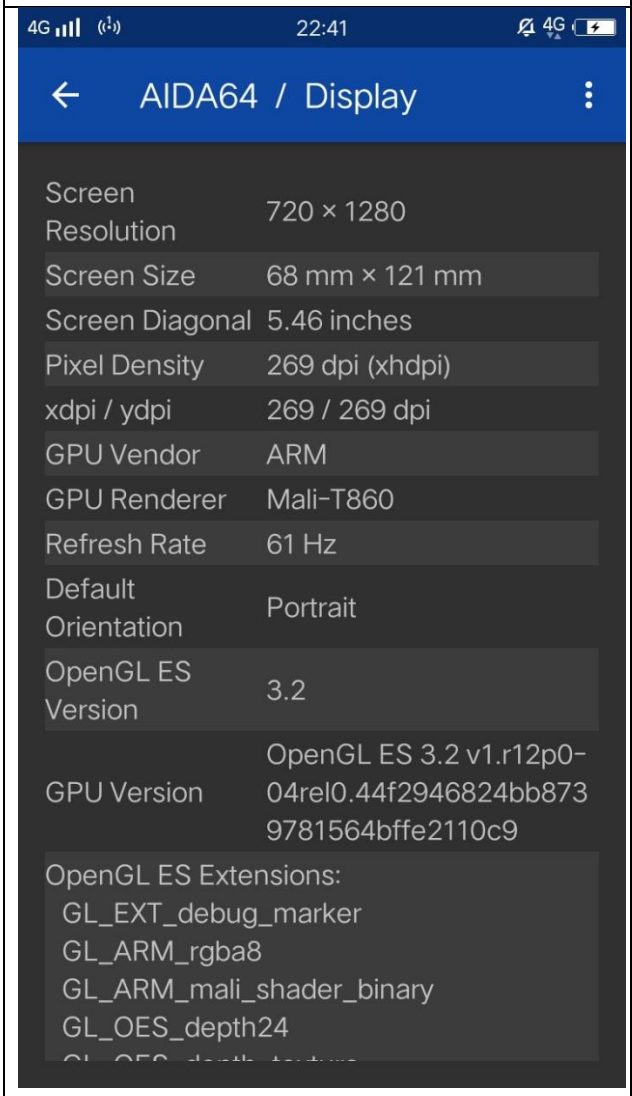
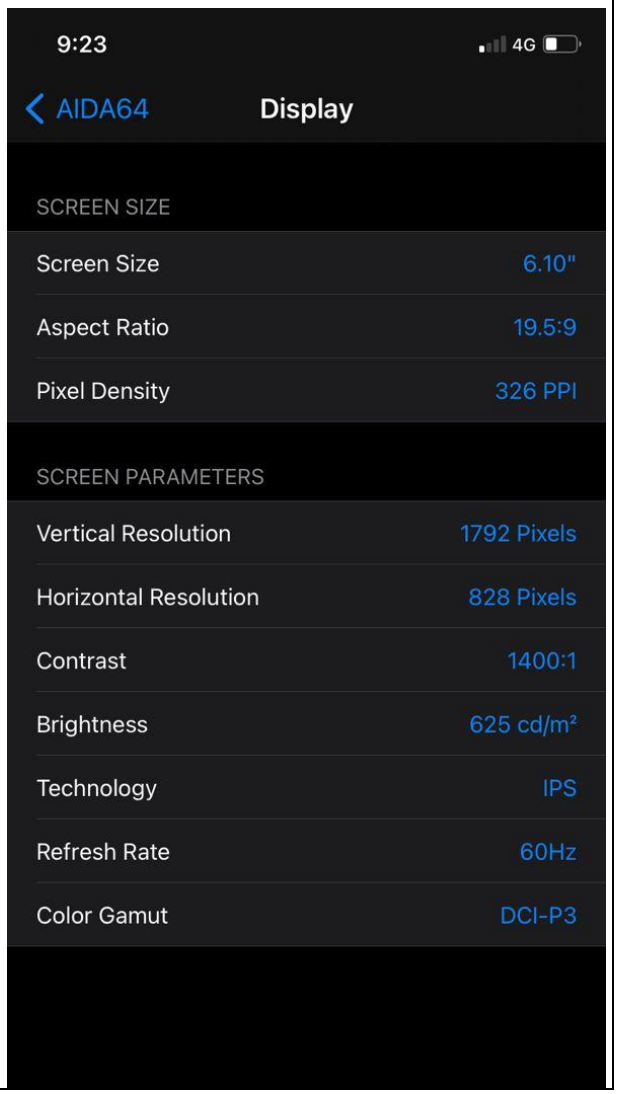
iPhone

| Device | Memory |
| --- | --- |
|  |  |

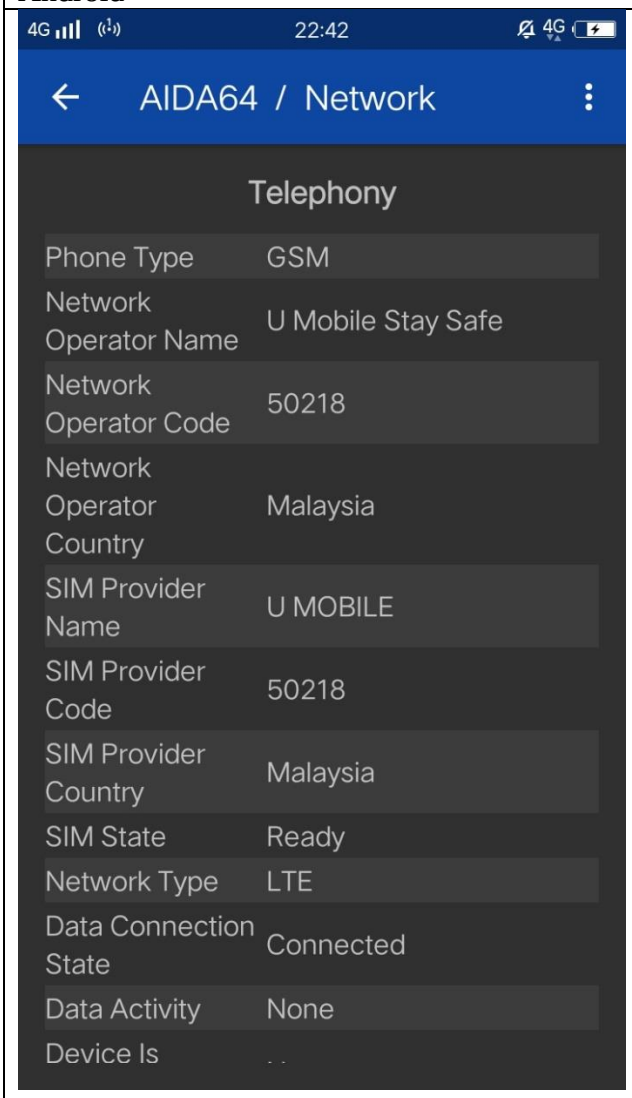
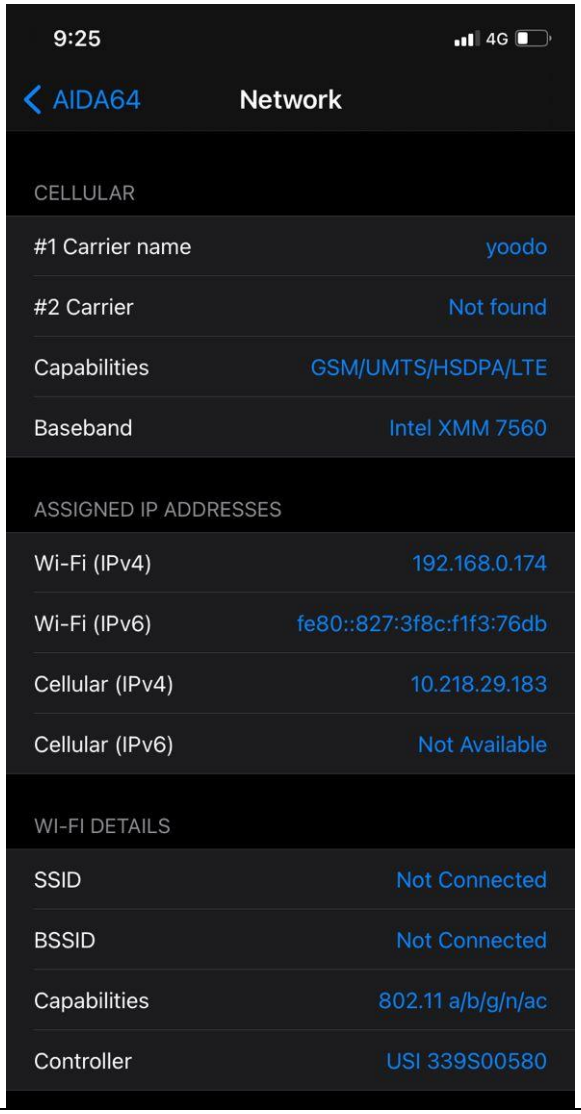
CPU/PROCESSOR

| Android | iPhone |
| --- | --- |
|  |  |

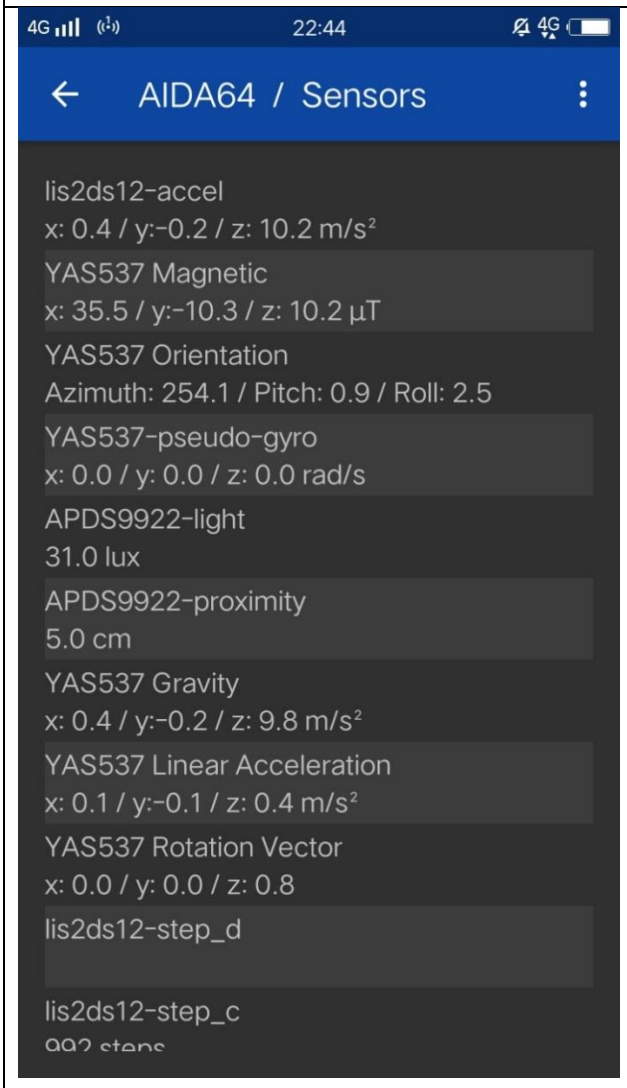
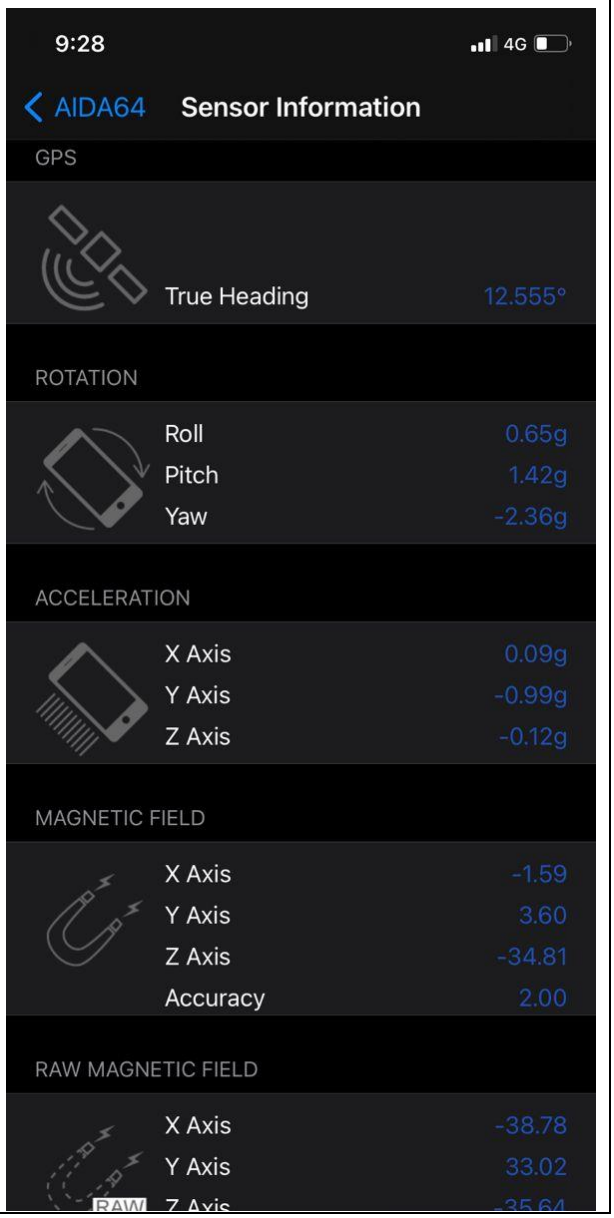
DISPLAY

| Android | iPhone |
| --- | --- |
|  |  |

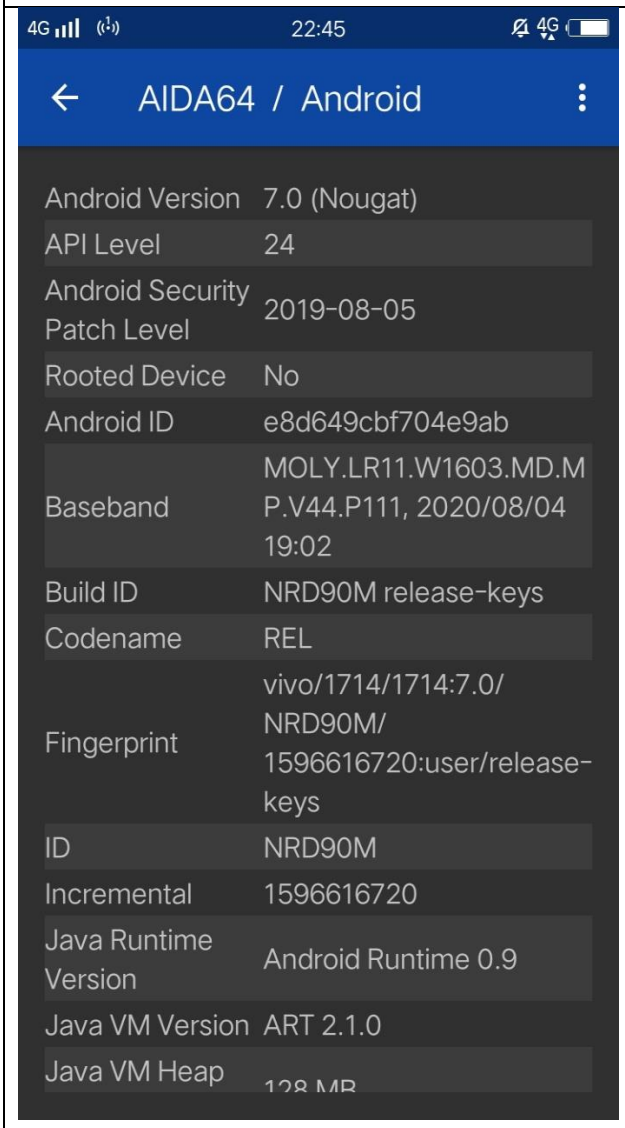
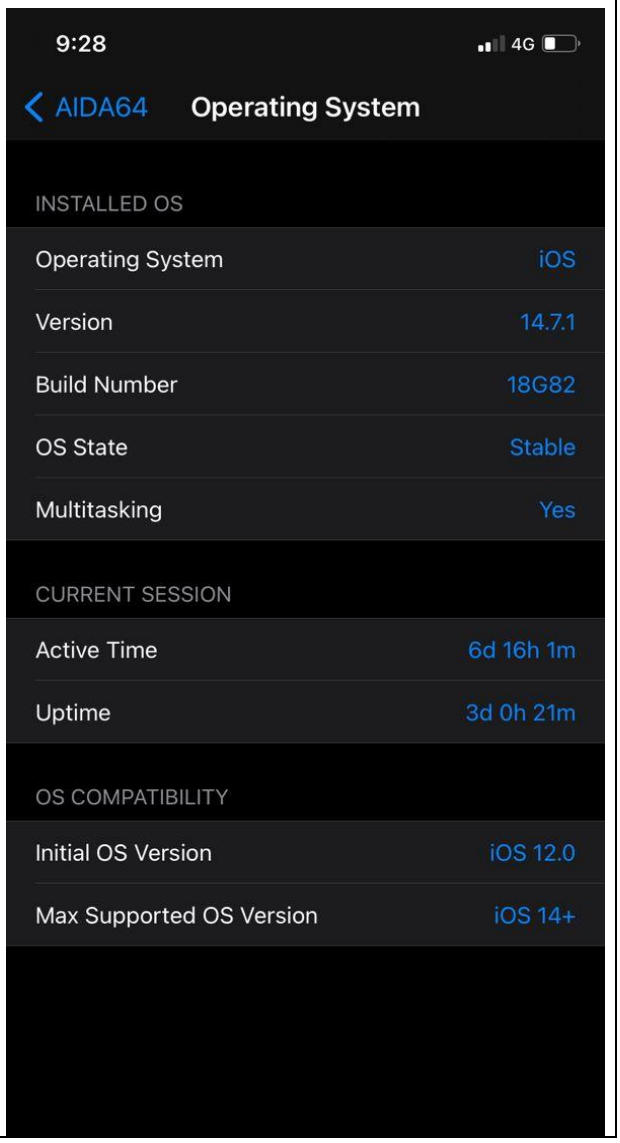
NETWORK

| Android | iPhone |
| --- | --- |
|  |  |

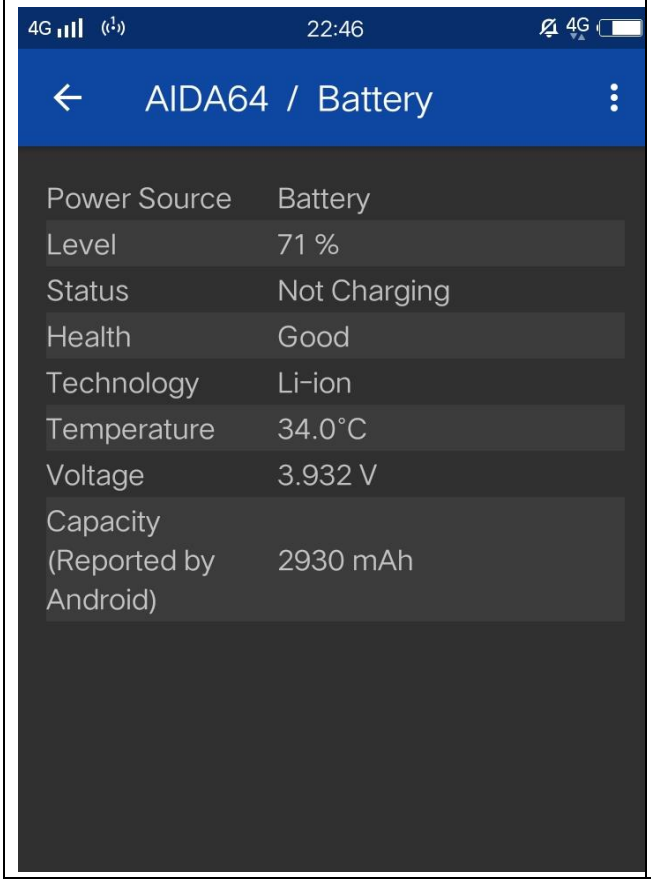
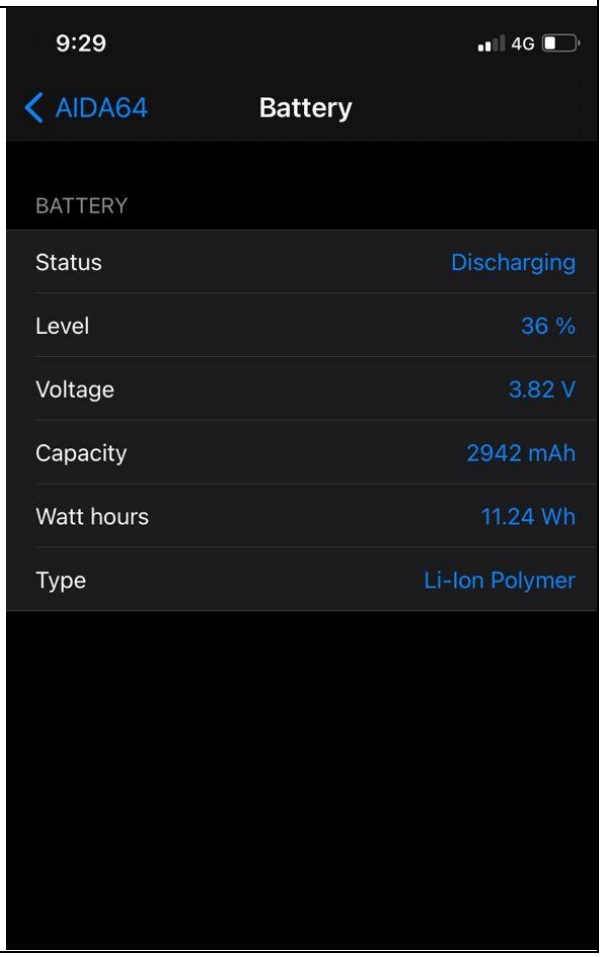
SENSOR

| Android | iPhone |
| --- | --- |
|  |  |

OPERATING SYSTEM

| Android | iPhone |
| --- | --- |
|  |  |

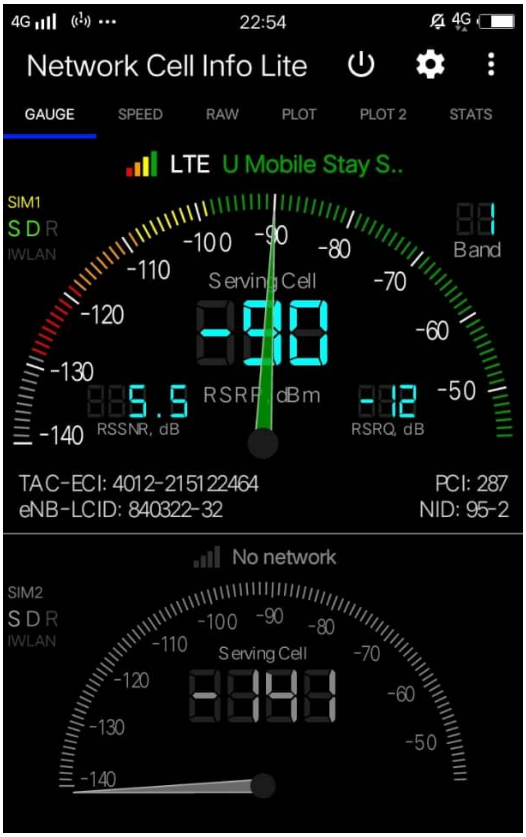
BATTERY

| Android | iPhone |
| --- | --- |
|  |  |

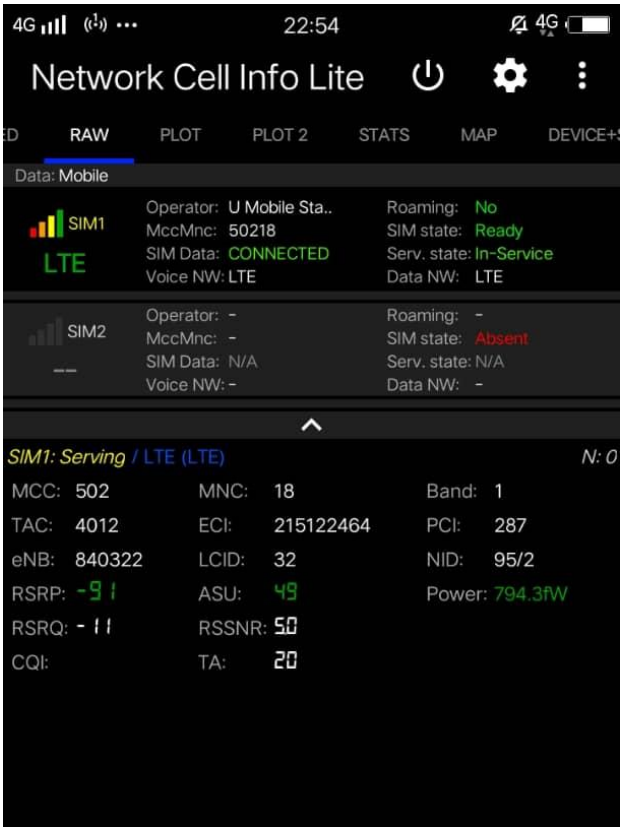
NETWORK PROJECT

NETWORK CELL INFO LITE(ANDROID)

GAUGE TAP



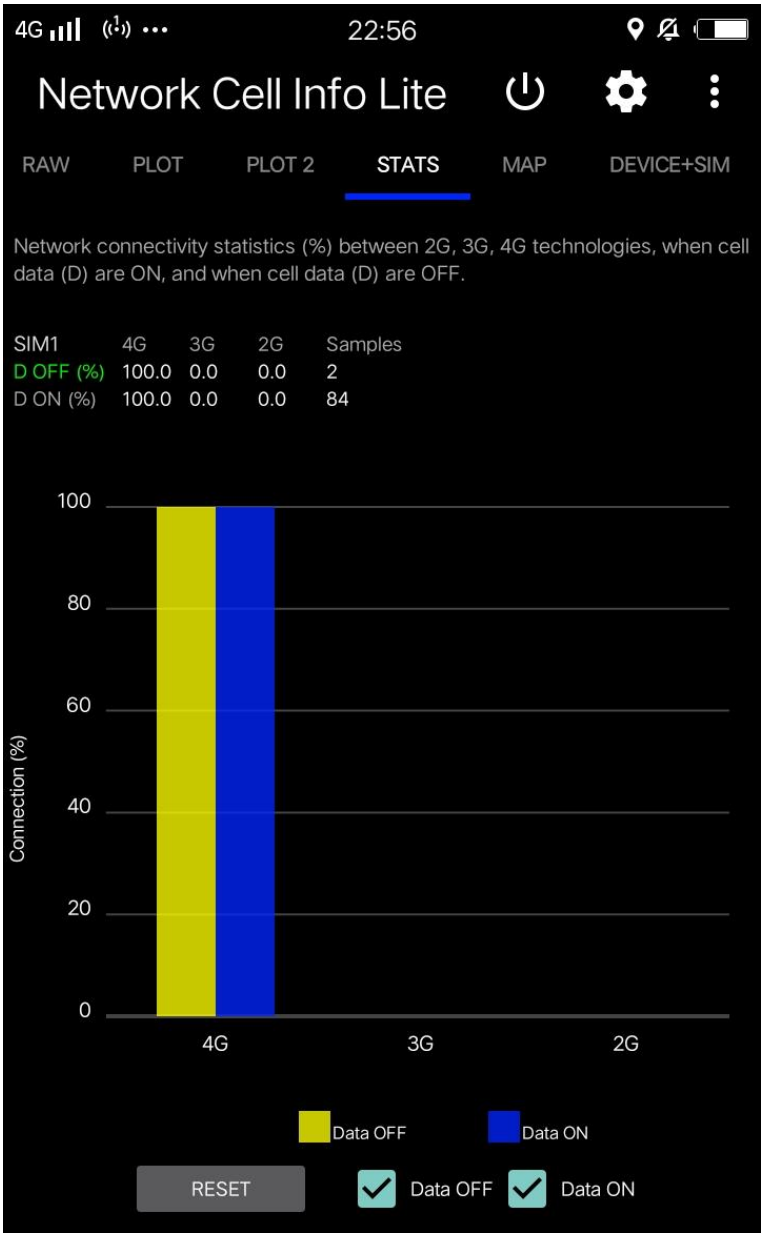
RAW TAP


4G
22:54
4G
Network Cell Info Lite
RAW
PLOT
PLOT 2
STATS
MAP
Data: Mobile
SIM1
LTE
Operator: U Mobile Sta..
MccMnc: 50218
SIM Data: CONNECTED
Voice NW: LTE
Roaming: No
SIM state: Ready
Serv. state: In-Service
Data NW: LTE
SIM2
Operator: -
MccMnc: -
SIM Data: N/A
Voice NW: -
Roaming: -
SIM state: Absent
Serv. state: N/A
Data NW: -
SIM1: Serving / LTE (LTE)
N: 0
MCC: 502
MNC: 18
Band: 1
TAC: 4012
ECI: 215122464
PCI: 287
eNB: 840322
LCID: 32
NID: 95/2
RSRP: -91
ASU: 49
Power: 794.3fW
RSRQ: -11
RSSNR: 50
CQI:
TA: 20

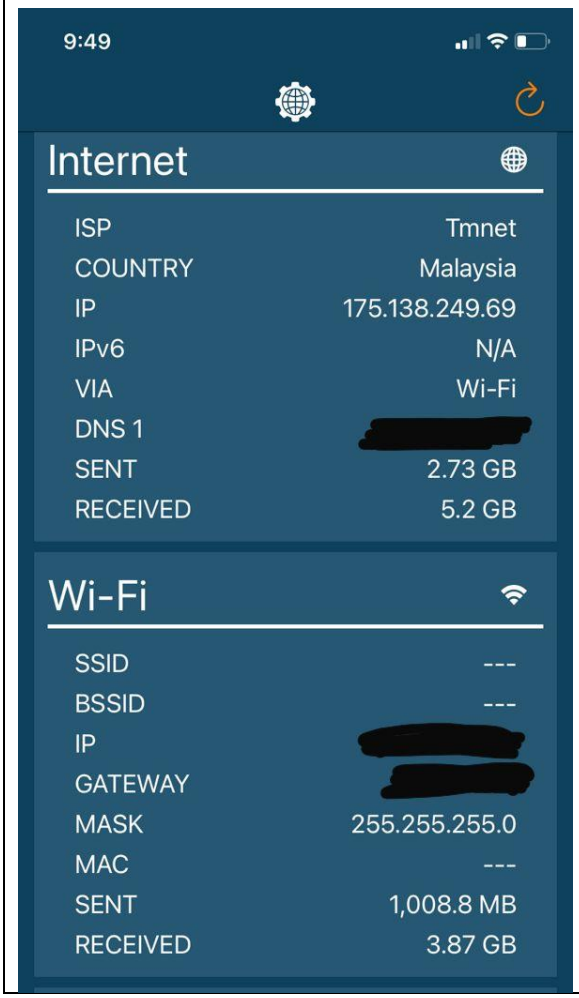
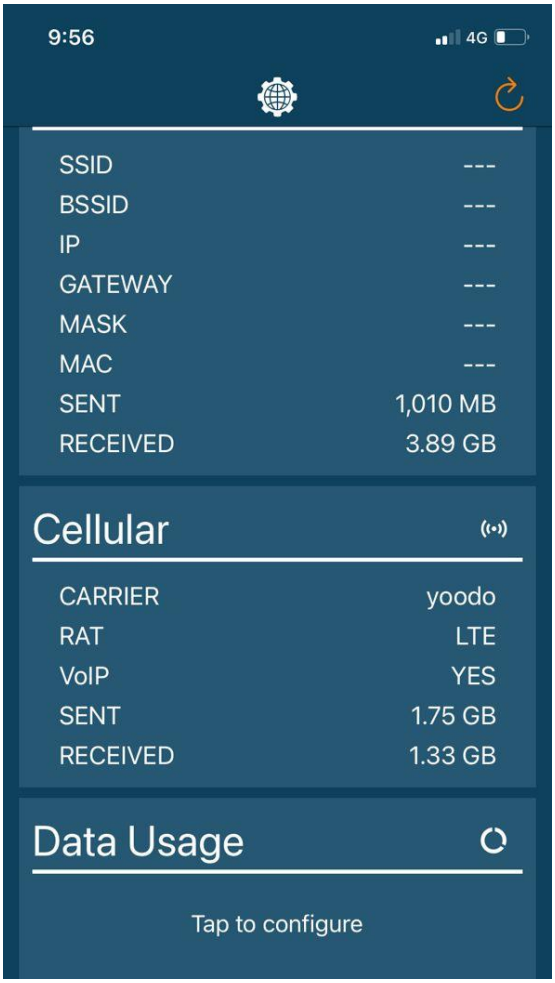
PLOT TAP

| PLOT TAP 1 | PLOT TAP 2 |
| --- | --- |
|  |  |

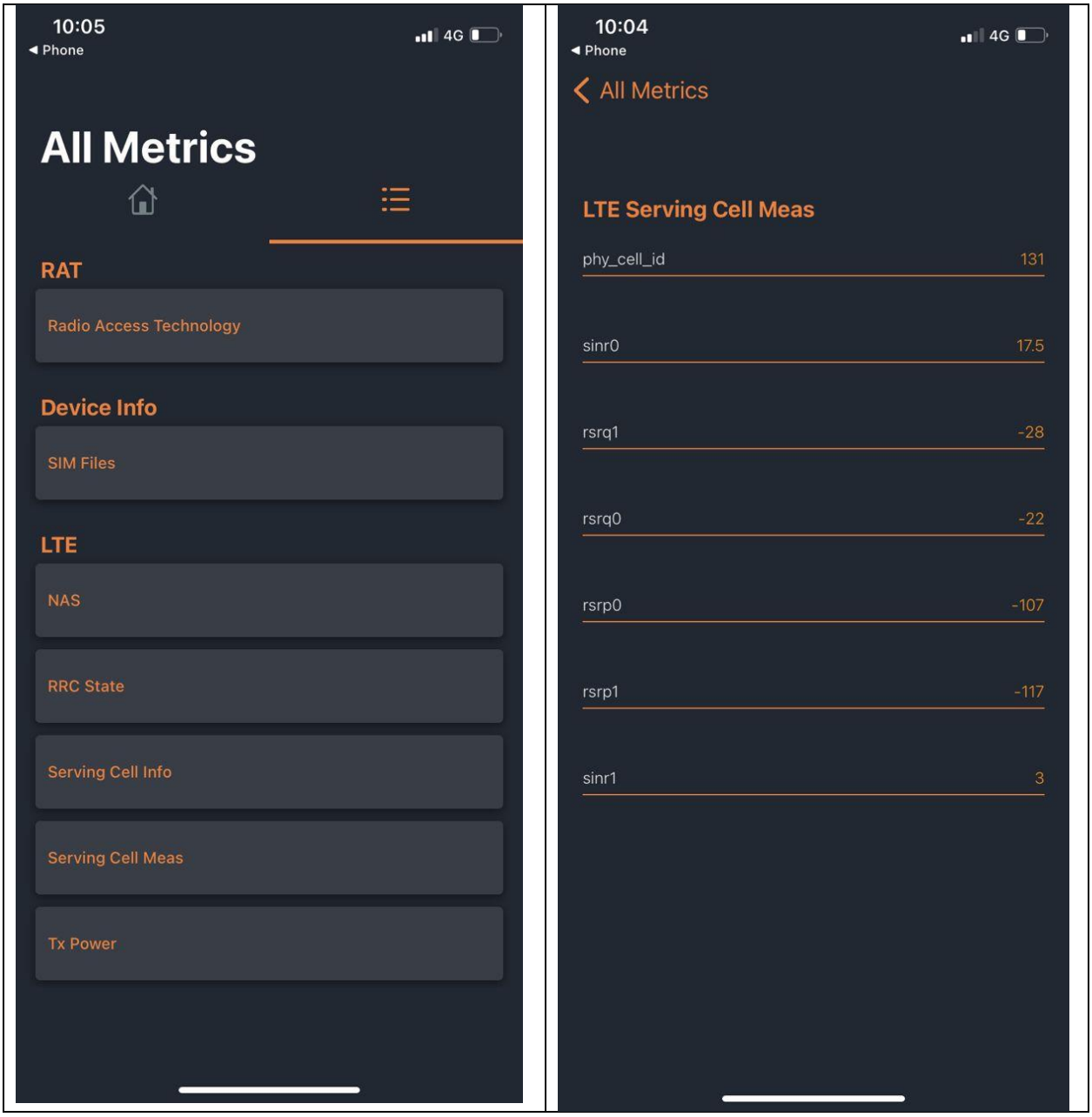
STATS TAP


4G
22:56
Network Cell Info Lite
RAW
PLOT
PLOT 2
STATS
MAP
DEVICE+SIM
Network connectivity statistics (%) between 2G, 3G, 4G technologies, when cell data (D) are ON, and when cell data (D) are OFF.
SIM1 4G 3G 2G Samples
D OFF (%) 100.0 0.0 0.0 2
D ON (%) 100.0 0.0 0.0 84
100
80
60
40
20
0
Connection (%)
4G
3G
2G
Data OFF
Data ON
RESET
Data OFF
Data ON

Network Utility(iPhone)

| Wi-Fi | Cellular |
| --- | --- |
|  |  |

Field Test(iPhone)



# PROJECT 2: OBSERVATION ON THE NETWORK TESTING BASED ON TWO DIFFERENT SMARTPHONE

Based on project 1, the received signal strength indicator (RSSI) value will change its value depends on their Wi-Fi frequency bandwidth. If the user uses their Wi-Fi channel for 5Ghz, he can receive high bandwidth and signal but not in a longer distance but if the user use Wi-Fi channel for 2.4Ghz, they can access internet signal in a long distance due to its lower frequency bandwidth. Therefore, the relationship between distance and frequency is inversely proportional, so the distance also makes the RSSI reading change its value. The app that running on background also can give an impact to RSSI reading if the apps consume data or online app. If the user uses cellular data, the Reference Signal Received Power (RSRP) value depends on mobile network-types based on their coverage distance and places. Most place has LTE coverage because government already shutdown 2G and 3G service network (unless a few places or countries which is not developed gradually). In my experiment on the Raw tap, my smartphone actually can detect RSRP for neighboring cell but it was really poor due to coverage distance. The value for serving cell was -90dBm while for the neighboring cell was -100dBm (sometimes it disappeared). The RSRP value was quite good for RF quality but when the value almost approaching zero, the rf quality will be excellent. The LTE protocol provides a second metric, RSRQ (Reference Signal Received Quality), as the carrier power to interference power ratio: effectively, this is a signal-noise ratio evaluated with a standard signal. Even though the RSRP is low, a connection with a high RSRQ should be excellent since the modem can retrieve information from the weak signal due to little noise. For stats(statistics) tap, Radio Access Technology (RAT) majority was 4G(LTE) because it's already expanded widely nowadays.

For iPhone experiment, this smartphone can detect precisely network Maps due to its quality and RAM make network test speed work smoothly. For RSSI measure in iPhone, that was also depends on 2 channels of Wi-Fi. But for RSRP different than Android device because iPhone (that used in this experiment) baseband is Intel® XMM™ 7560, The XMM 7560 transceiver offers world-class band density—supporting more than 35 bands simultaneously in a single SKU for true global mobile coverage. With 4x4 DL-MIMO and 256QAM, it's not just fast, it's agile—benefiting both manufacturers and carriers with gigabit speeds, delivered over mixed spectrum assets for performance and efficiency. That's why iPhone still able reach 4g when the device is too far from coverage rather than Android.