# Technical Description of Power Reduction through Proximity Sensor

| | | |
|---|---|---|
| **Equipment** | **:** | **AUTO Smart Diagnostic Tool** |
| **Brand Name** | **:** | **LAUNCH** |
| **Model Name** | **:** | **X-431 V+ V4.0, X-431 PRO5** |
| **FCC ID** | **:** | **XUJX431V1V40** |

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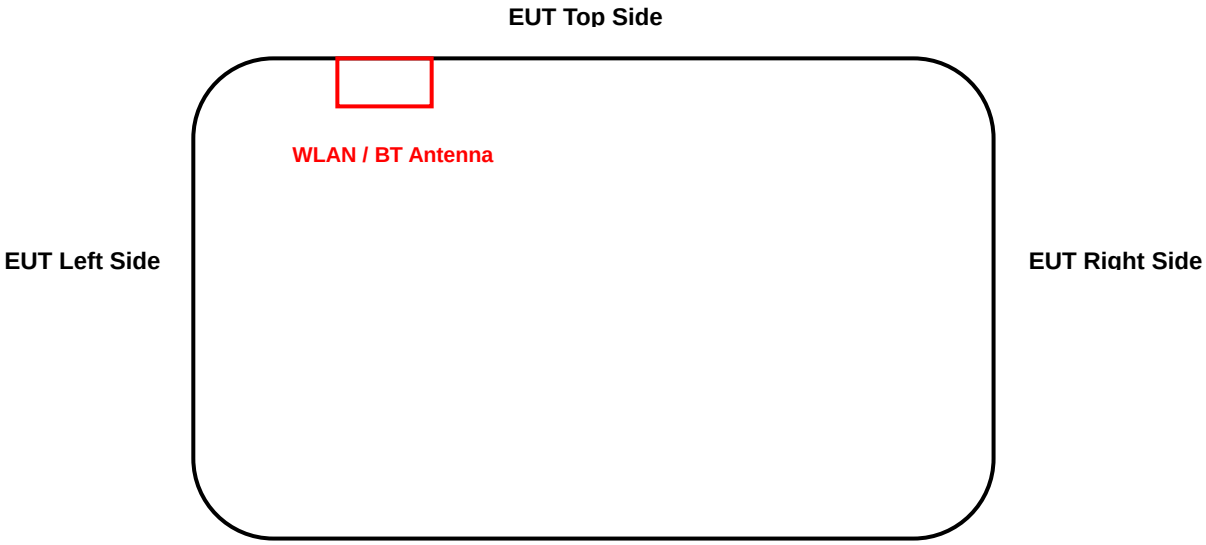
# 1. EUT Antenna Placement

This is a Portable AUTO Smart Diagnostic Tool, model name X-431 V+ V4.0, X-431 PRO5.
The antenna location and the EUT dimension is shown in the following diagram.




**<EUT Front View>**

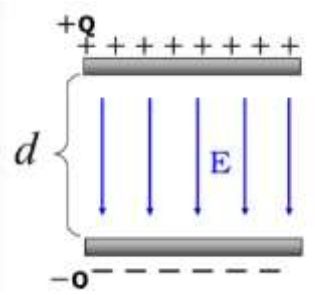
The separation distance for antenna to edge:

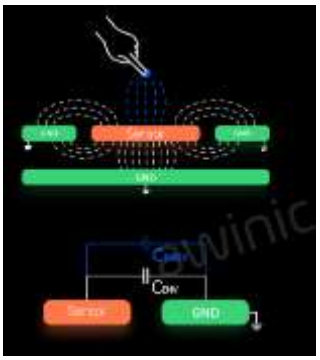
| Antenna to edge (mm) | overall diagonal | display diagonal | Left Side | Right Side | Top Side | Bottom Side |
|---|---|---|---|---|---|---|
| WLAN / BT | 288 | 156 | 52 | 160 | 0 | 154 |

# 2. Considerations Related to Proximity Sensor

The device supports WLAN, and Bluetooth capabilities.It is designed with a proximity sensor which can trigger/not trigger power reduction for WLAN on Rear Face and Top Side of EUT for SAR compliance. Others RF capability (Bluetooth) have no power reduction. The power levels for all wireless technologies and the power reduction please refer to section 3 of this report.

When the human body approaches the SAR sensor, a simple parallel capacitor plate is formed between the human surface and the sensor.



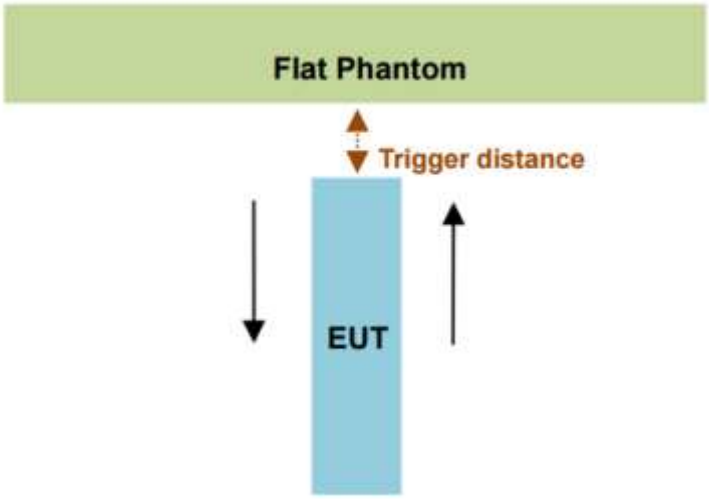




Distances can cause parasitic capacitance changes between each other. The SAR sensor IC detects the change of the parasitic capacitance. The sensors determine whether a human body is approaching or moving away from it based on capacitance.

When the SAR sensor detects a person approaching the antenna, the device reduces the RF transmission power, How much power to reduce is a preset value.

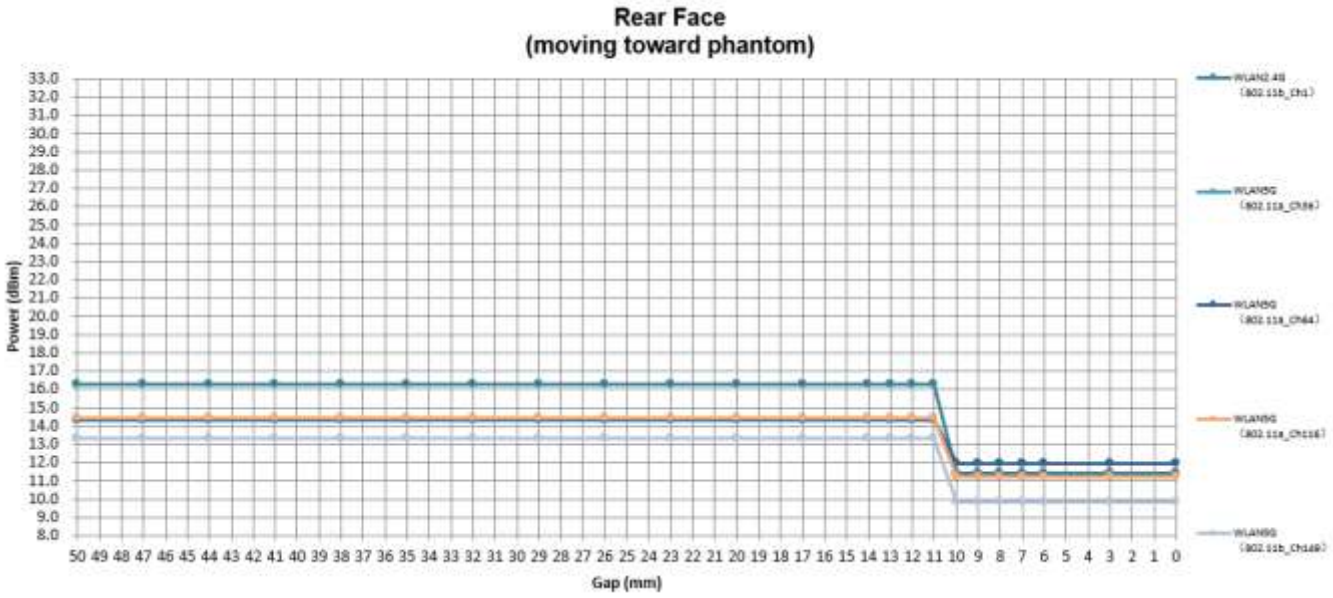
## 3. Proximity Sensor Triggering Distances (KDB 616217 D04 §6.2)

The proximity sensor triggering distance was determined per KDB 616217 section 6.2,and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed.
In the preliminary triggering distance testing, the tissue-equivalent medium for different frequency bands were used for verification; no other frequency bands tissue-equivalent medium was found to result in shortest triggering than that for 5700MHz, and the tissue-equivalent medium for 5700MHz was used for formal proximity sensor triggering testing.

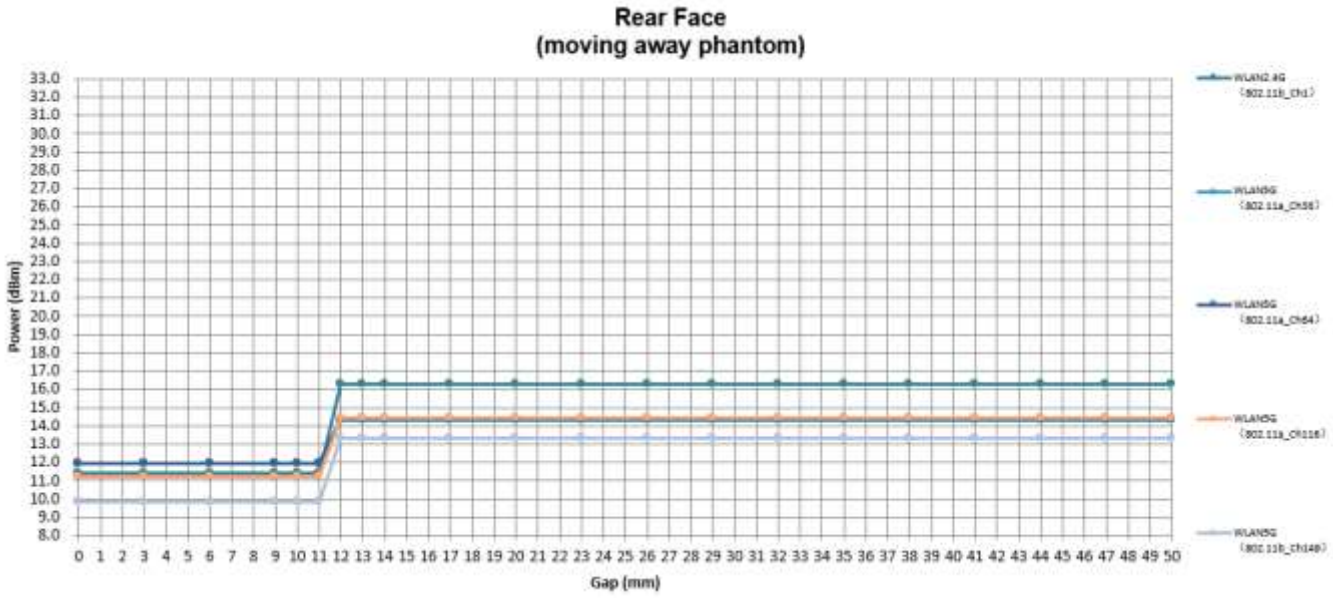



Summary for power verification per distance was tabulated in the below table.

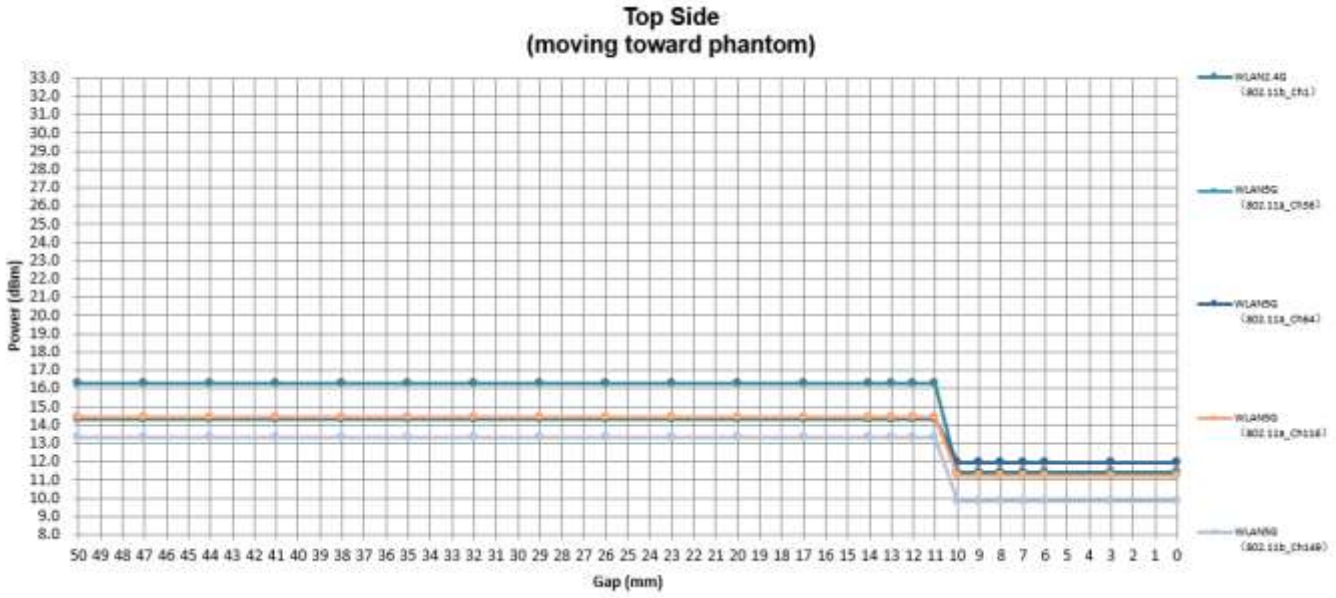
| Output Power Verification in dBm for EUT Rear Face (Moving toward phantom) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Distance (mm) | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| WLAN2.4G （802.11b_Ch1） | 11.39 | 11.39 | 11.39 | 11.39 | 11.39 | 11.39 | 16.31 | 16.31 | 16.31 | 16.31 | 16.31 |
| WLAN5G （802.11a_Ch36） | 11.93 | 11.93 | 11.93 | 11.93 | 11.93 | 11.93 | 14.34 | 14.34 | 14.34 | 14.34 | 14.34 |
| WLAN5G （802.11a_Ch64） | 11.96 | 11.96 | 11.96 | 11.96 | 11.96 | 11.96 | 14.38 | 14.38 | 14.38 | 14.38 | 14.38 |
| WLAN5G （802.11a_Ch116） | 11.25 | 11.25 | 11.25 | 11.25 | 11.25 | 11.25 | 14.42 | 14.42 | 14.42 | 14.42 | 14.42 |
| WLAN2.4G （802.11b_Ch149） | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 | 13.33 | 13.33 | 13.33 | 13.33 | 13.33 |



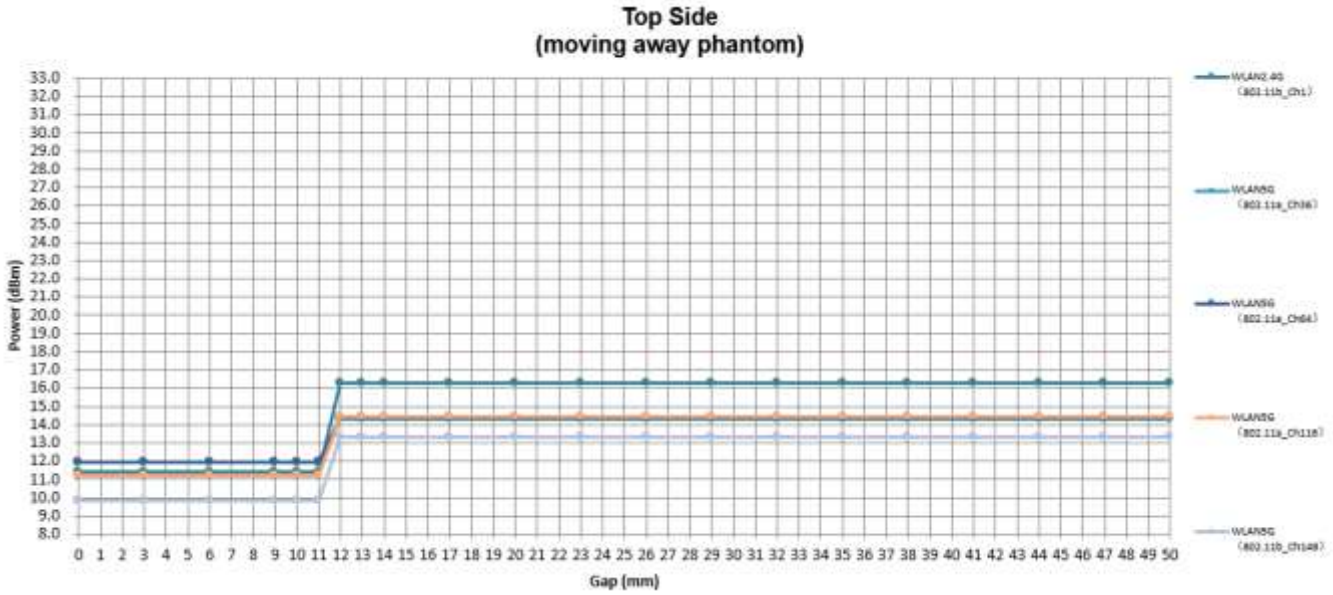
| Output Power Verification in dBm for EUT Rear Face (Moving away phantom) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Distance (mm) | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| WLAN2.4G （802.11b_Ch1） | 11.39 | 11.39 | 11.39 | 11.39 | 11.39 | 11.39 | 16.31 | 16.31 | 16.31 | 16.31 | 16.31 |
| WLAN5G （802.11a_Ch36） | 11.93 | 11.93 | 11.93 | 11.93 | 11.93 | 11.93 | 14.34 | 14.34 | 14.34 | 14.34 | 14.34 |
| WLAN5G （802.11a_Ch64） | 11.96 | 11.96 | 11.96 | 11.96 | 11.96 | 11.96 | 14.38 | 14.38 | 14.38 | 14.38 | 14.38 |
| WLAN5G （802.11a_Ch116） | 11.25 | 11.25 | 11.25 | 11.25 | 11.25 | 11.25 | 14.42 | 14.42 | 14.42 | 14.42 | 14.42 |
| WLAN2.4G （802.11b_Ch149） | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 | 13.33 | 13.33 | 13.33 | 13.33 | 13.33 |



| Output Power Verification in dBm for EUT Top Side (Moving toward phantom) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Distance (mm) | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| WLAN2.4G （802.11b_Ch1） | 11.39 | 11.39 | 11.39 | 11.39 | 11.39 | 11.39 | 16.31 | 16.31 | 16.31 | 16.31 | 16.31 |
| WLAN5G （802.11a_Ch36） | 11.93 | 11.93 | 11.93 | 11.93 | 11.93 | 11.93 | 14.34 | 14.34 | 14.34 | 14.34 | 14.34 |
| WLAN5G （802.11a_Ch64） | 11.96 | 11.96 | 11.96 | 11.96 | 11.96 | 11.96 | 14.38 | 14.38 | 14.38 | 14.38 | 14.38 |
| WLAN5G （802.11a_Ch116） | 11.25 | 11.25 | 11.25 | 11.25 | 11.25 | 11.25 | 14.42 | 14.42 | 14.42 | 14.42 | 14.42 |
| WLAN2.4G （802.11b_Ch149） | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 | 13.33 | 13.33 | 13.33 | 13.33 | 13.33 |



| Output Power Verification in dBm for EUT Top Side<br>(Moving away phantom) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Distance (mm) | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| WLAN2.4G<br>（802.11b_Ch1） | 11.39 | 11.39 | 11.39 | 11.39 | 11.39 | 11.39 | 16.31 | 16.31 | 16.31 | 16.31 | 16.31 |
| WLAN5G<br>（802.11a_Ch36） | 11.93 | 11.93 | 11.93 | 11.93 | 11.93 | 11.93 | 14.34 | 14.34 | 14.34 | 14.34 | 14.34 |
| WLAN5G<br>（802.11a_Ch64） | 11.96 | 11.96 | 11.96 | 11.96 | 11.96 | 11.96 | 14.38 | 14.38 | 14.38 | 14.38 | 14.38 |
| WLAN5G<br>（802.11a_Ch116） | 11.25 | 11.25 | 11.25 | 11.25 | 11.25 | 11.25 | 14.42 | 14.42 | 14.42 | 14.42 | 14.42 |
| WLAN2.4G<br>（802.11b_Ch149） | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 | 9.81 | 13.33 | 13.33 | 13.33 | 13.33 | 13.33 |



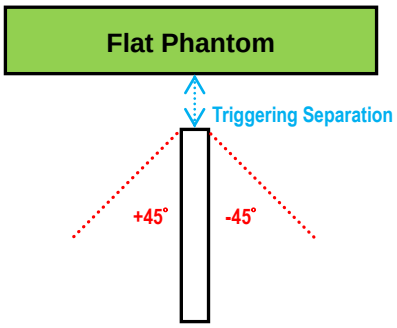

| WWAN Ant-1 Proximity Sensor Trigger Distance (mm) | | |
|---|---|---|
| Position | Rear Face | Top Side |
| Minimum | 10 | 10 |

## 4. Proximity Sensor Coverage (KDB 616217 D04 §6.3)

In KDB 616217 section 6.3, if a sensor is spatially offset from the antenna(s), it is necessary to verify sensor triggering for conditions where the antenna is next to the user but the sensor is laterally further away to ensure sensor coverage is sufficient for reducing the power to maintain compliance. For p-sensor coverage testing, the device is moved and “along the direction of maximum antenna and sensor offset”.
However, this device uses a capacitive proximity sensor that is same metallic component as the transmitting antenna to facilitate triggering in any condition the user may use the device in proximity of the antenna in the device.
Therefore, no further sensor coverage assessments were required.

## 5. Proximity Sensor Tilt Angle Influences (KDB 616217 D04 §6.4)

The proximity sensor tilt angle influence was determined per KDB 616217 for applicable edge. Summary for proximity sensor tilt angle influence is shown in below.




**WLAN**

| Orientation | Separation Distance (mm) | Tilt Angle | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | -45° | -40° | -30° | -20° | -10° | 0° | 10° | 20° | 30° | 40° | 45° |
| Top Side | 10 | On | On | On | On | On | On | On | On | On | On | On |

## 6. Summary for Proximity Sensor Triggering Test

According to the procedures noticed in KDB 616217 D04,
The WLAN for proximity sensor triggering distance is 10 mm for EUT Rear Face, and 10 mm for Top Side. The separation distance of 10 mm determined by the smallest triggering distance on Top Side is used to access the tilt angle influence and the sensor does not release during ±45 degree. Therefore, the smallest separation distance for tilt angle influence is 9 mm for the Top Side. The conservation triggering distances based on the separation distance for the sensor trigger / not triggered as EUT with power reduction at 0 mm, and EUT without power reduction at 9 mm for EUT Rear Face, and 9 mm for Top Side were used to test SAR.

The power reduction is depends on the proximity sensor input. For a steady SAR test, the power reduction was enabled or disabled manually by engineering software during SAR testing.