# Bluetooth & Wi-Fi antennas

Specification & Test report

**Applicable to Set top boxes**

**Platform: UCW4060MCS**

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### Document revision

| Version | Owner | Status | Description |
|---|---|---|---|
| 0.1 | I. Ben Trad | Draft | Creation |
| | | | |
| | | | |

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## 1.1 Introduction

Document does provide antenna technical data for UCW4060MCS.

## 1.2 Test equipment

- List of used equipment:
  - Network Analyzer: R&S ZNB 20

**Figure 1 : Used network analyzer**

- StarLab

**Figure 2 : Used StarLab.**

| | |
|---|---|
| **Test Company** | Vantiva<br>(formerly known as Technicolor) |
| **Test Address** | 975 Avenue des Champs Blancs. 35576 Cesson-Sévigné Cédex, France |
| **Test Date** | 06-06-2023 |
| **Test Instruments** | Network Analyzer: R&S ZNB 20, StarLab |

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## 1.3 D.U.T

The UCW4060MCS contains:
- Two off-board dual-band WiFi antennas: DB1 & DB2
- One on-board printed 2.4G antenna: BT

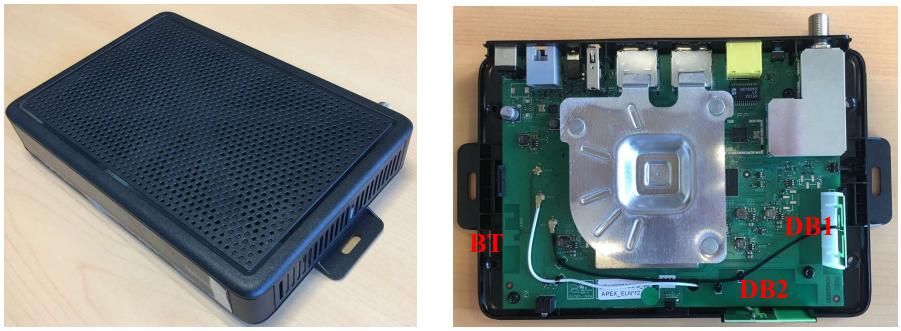


**Figure 3: View of the UCW4060MCS device.**

## 1.4 Antenna gain summary table

(maximum values)

| Frequency band | 2400-2483,5 MHz | 5150-5350 MHz | 5470-5725 MHz | 5725-5850 MHz |
|---|---|---|---|---|
| WiFi frequency channels | CH1-13 | CH36-64 | CH100-140 | CH149-165 |
| **ANT1=DB1** | 2.72 | 4.28 | 5.25 | 5.25 |
| **ANT2=DB2** | 3.37 | 5.05 | 4.65 | 4.32 |
| Correlated directional gain | 5.57 | 5.69 | 5.84 | 5.46 |
| Uncorrelated directional gain | 2.83 | 2.81 | 3.27 | 3.29 |
| **BT** | 3.03 | - | - | - |

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## 1.5 Peak Gain & efficiency

| DB1 | | |
|---|---|---|
| Frequency (MHz) | Efficiency (%) | Gain (dBi) |
| 2400 | 75 | 2.19 |
| 2412 | 77 | 2.29 |
| 2417 | 76 | 2.4 |
| 2422 | 77 | 2.38 |
| 2427 | 78 | 2.45 |
| 2432 | 78 | 2.52 |
| 2437 | 78 | 2.59 |
| 2442 | 78 | 2.56 |
| 2447 | 79 | 2.66 |
| 2452 | 78 | 2.63 |
| 2457 | 78 | 2.63 |
| 2462 | 79 | **2.72** |
| 2467 | 80 | **2.72** |
| 2472 | 78 | 2.65 |
| 2477 | 77 | 2.58 |
| 2483.5 | 77 | **2.63** |
| 2484 | 77 | 2.62 |
| 2490 | 77 | 2.65 |
| 2500 | 78 | 2.71 |

| DB2 | | |
|---|---|---|
| Frequency (MHz) | Efficiency (%) | Gain (dBi) |
| 2400 | 76 | 2.53 |
| 2412 | 79 | 2.72 |
| 2417 | 79 | 2.85 |
| 2422 | 79 | 2.81 |
| 2427 | 80 | 2.86 |
| 2432 | 80 | 2.97 |
| 2437 | 80 | 3.08 |
| 2442 | 80 | 3.05 |
| 2447 | 81 | 3.17 |
| 2452 | 80 | 3.16 |
| 2457 | 79 | 3.19 |
| 2462 | 81 | 3.3 |
| 2467 | 81 | 3.37 |
| 2472 | 80 | 3.33 |
| 2477 | 79 | 3.25 |
| 2483.5 | 79 | **3.37** |
| 2484 | 78 | 3.37 |
| 2490 | 79 | 3.44 |
| 2500 | 80 | 3.53 |

| BT | | |
|---|---|---|
| Frequency (MHz) | Efficiency (%) | Gain (dBi) |
| 2400 | 64 | 2.53 |
| 2412 | 67 | 2.73 |
| 2417 | 67 | 2.78 |
| 2422 | 68 | 2.83 |
| 2427 | 69 | 2.88 |
| 2432 | 69 | 2.9 |
| 2437 | 70 | 2.91 |
| 2442 | 70 | 2.93 |
| 2447 | 71 | 2.96 |
| 2452 | 70 | 2.95 |
| 2457 | 70 | 2.95 |
| 2462 | 71 | **3.03** |
| 2.96 | 70 | 2.92 |
| 2472 | 69 | 2.9 |
| 2477 | 68 | 2.84 |
| 2483.5 | 68 | 2.84 |
| 2484 | 68 | 2.8 |
| 2490 | 68 | 2.79 |
| 2500 | 68 | 2.85 |

**Figure 4 : Efficiency and peak gain of DB1, DB2 and BT in 2.4GHz band**

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| DB1 | | |
|---|---|---|
| Frequency (MHz) | Efficiency (%) | Gain (dBi) |
| 5150 | 72 | 4.14 |
| 5180 | 72 | 4.16 |
| 5190 | 72 | 4.2 |
| 5200 | 73 | 4.22 |
| 5210 | 71 | 4.21 |
| 5220 | 73 | 4.22 |
| 5230 | 72 | 4.21 |
| 5240 | 72 | 4.19 |
| 5250 | 73 | 4.18 |
| 5260 | 72 | 4.13 |
| 5270 | 72 | 4.11 |
| 5280 | 71 | 4.12 |
| 5290 | 71 | 4.14 |
| 5300 | 71 | 4.14 |
| 5310 | 71 | 4.18 |
| 5320 | 72 | 4.19 |
| 5350 | 71 | **4.28** |
| 5400 | 72 | 4.37 |
| 5450 | 73 | 4.43 |
| 5470 | 72 | 4.44 |
| 5500 | 73 | 4.46 |
| 5510 | 73 | 4.47 |
| 5520 | 72 | 4.43 |
| 5530 | 72 | 4.48 |
| 5540 | 71 | 4.53 |
| 5550 | 71 | 4.58 |
| 5560 | 72 | 4.69 |
| 5570 | 70 | 4.66 |
| 5580 | 73 | 4.68 |
| 5590 | 70 | 4.8 |
| 5600 | 70 | 4.8 |
| 5610 | 71 | 4.86 |
| 5620 | 72 | 4.96 |
| 5630 | 72 | 4.96 |
| 5640 | 73 | 5.05 |
| 5660 | 73 | 5.08 |
| 5670 | 74 | 5.18 |
| 5680 | 74 | 5.19 |
| 5690 | 73 | 5.17 |
| 5700 | 74 | 5.23 |
| 5710 | 73 | 5.23 |
| 5720 | 74 | **5.25** |
| 5725 | 73 | 5.22 |
| 5745 | 75 | **5.25** |
| 5755 | 74 | 5.24 |
| 5765 | 71 | 5.13 |
| 5775 | 71 | 5.14 |

| DB2 | | |
|---|---|---|
| Frequency (MHz) | Efficiency (%) | Gain (dBi) |
| 5150 | 64 | **5.05** |
| 5180 | 63 | 4.75 |
| 5190 | 65 | 4.65 |
| 5200 | 66 | 4.67 |
| 5210 | 66 | 4.68 |
| 5220 | 66 | 4.62 |
| 5230 | 67 | 4.63 |
| 5240 | 68 | 4.49 |
| 5250 | 68 | 4.48 |
| 5260 | 70 | 4.49 |
| 5270 | 68 | 4.35 |
| 5280 | 69 | 4.29 |
| 5290 | 68 | 4.25 |
| 5300 | 67 | 4.12 |
| 5310 | 68 | 4.19 |
| 5320 | 68 | 4.14 |
| 5350 | 67 | 4.13 |
| 5400 | 71 | 4.37 |
| 5450 | 74 | 4.75 |
| 5470 | 72 | **4.65** |
| 5500 | 72 | 4.62 |
| 5510 | 72 | 4.56 |
| 5520 | 72 | 4.53 |
| 5530 | 71 | **4.53** |
| 5540 | 69 | 4.42 |
| 5550 | 70 | 4.43 |
| 5560 | 70 | 4.42 |
| 5570 | 68 | 4.32 |
| 5580 | 69 | 4.4 |
| 5590 | 70 | 4.4 |
| 5600 | 70 | 4.41 |
| 5610 | 72 | 4.55 |
| 5620 | 72 | 4.53 |
| 5630 | 72 | 4.51 |
| 5640 | 73 | 4.53 |
| 5660 | 72 | 4.47 |
| 5670 | 72 | 4.45 |
| 5680 | 71 | 4.39 |
| 5690 | 70 | 4.34 |
| 5700 | 69 | 4.24 |
| 5710 | 69 | 4.19 |
| 5720 | 69 | 4.19 |
| 5725 | 68 | 4.1 |
| 5745 | 72 | **4.3** |
| 5755 | 70 | 4.2 |
| 5765 | 69 | 4.11 |
| 5775 | 69 | 4.14 |

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| | | |
|---|---|---|
| 5785 | 73 | **5.24** |
| 5795 | 72 | 5.14 |
| 5800 | 71 | 5.15 |
| 5805 | 69 | 5.09 |
| 5825 | 68 | 5.16 |
| 5850 | 68 | 5.08 |

| | | |
|---|---|---|
| 5785 | 71 | 4.17 |
| 5795 | 72 | **4.32** |
| 5800 | 72 | 4.27 |
| 5805 | 70 | 4.19 |
| 5825 | 71 | 4.08 |
| 5850 | 70 | 4.08 |

**Figure 5 : Efficiency and peak gain of DB1 and DB2 in 5GHz band**

## *1.6 BT antenna: 2D radiation pattern*

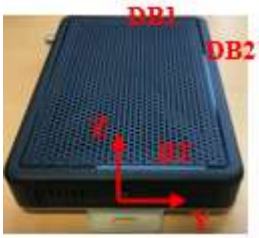
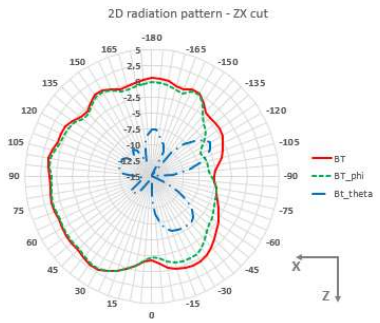
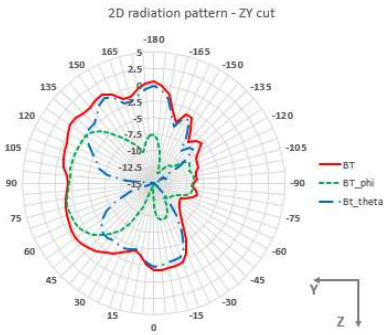
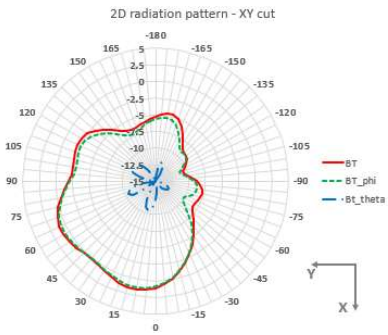
| X-Z plane | Y-Z plane | X-Y plane |
|---|---|---|
| Front view |   Left view | Front view |
|   |   |   |

**Figure 6 : 2D cuts of peak gain for BT antenna @2.45GHz.**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## 1.7 Directional gain

| Frequency (MHz) | Peak directional gain 1S2T (DB1+DB2) (dBi) | Peak directional gain 2S2T (DB1, DB2) (dBi) |
|---|---|---|
| 2400 | 5.02 | 2.17 |
| 2412 | 5.15 | 2.32 |
| 2417 | 5.28 | 2.45 |
| 2422 | 5.19 | 2.37 |
| 2427 | 5.23 | 2.43 |
| 2432 | 5.34 | 2.55 |
| 2437 | 5.43 | 2.65 |
| 2442 | 5.35 | 2.58 |
| 2447 | 5.47 | 2.71 |
| 2452 | 5.43 | 2.67 |
| 2457 | 5.43 | 2.66 |
| 2462 | 5.56 | 2.81 |
| 2467 | **5.57** | **2.83** |
| 2472 | 5.50 | 2.76 |
| 2477 | 5.39 | 2.66 |
| 2483.5 | 5.49 | 2.77 |
| 2484 | 5.49 | 2.76 |
| 2490 | 5.51 | 2.80 |
| 2500 | 5.55 | 2.85 |

**Figure 7 : Directional gain for correlated signals of Wi-Fi antennas @2G.**

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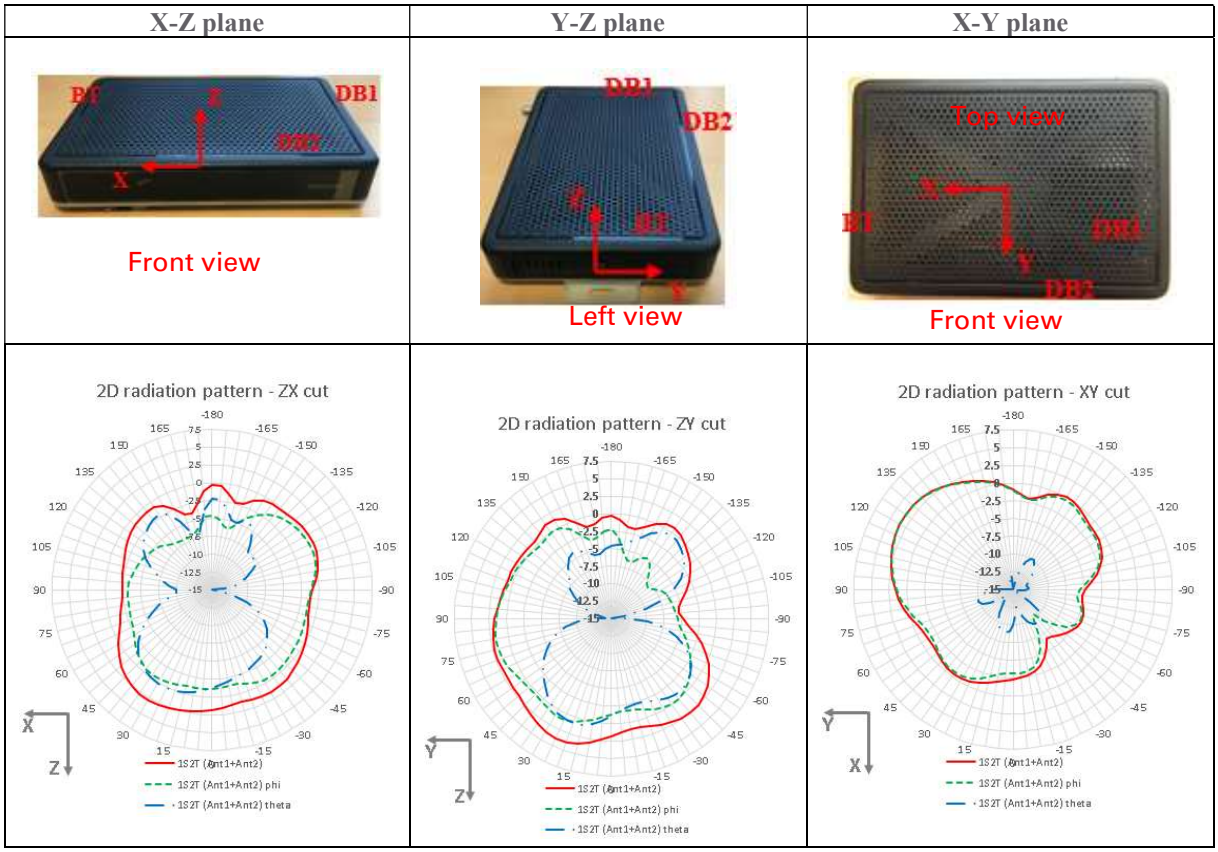


**Figure 8 : 2D cuts of the directional gain for correlated signals of Wi-Fi antennas @2.45GHz.**

| Frequency (MHz) | Peak directional gain 1S2T (DB1+DB2) (dBi) | Peak directional gain 2S2T (DB1, DB2) (dBi) |
|---|---|---|
| 5150 | 5.57 | 2.77 |
| 5180 | 5.53 | 2.69 |
| 5190 | 5.53 | 2.70 |
| 5200 | 5.57 | 2.71 |
| 5210 | 5.58 | 2.69 |
| 5220 | 5.60 | 2.72 |
| 5230 | 5.64 | 2.76 |
| 5240 | 5.63 | 2.75 |
| 5250 | 5.64 | 2.76 |
| 5260 | 5.66 | 2.78 |
| 5270 | 5.62 | 2.74 |
| 5280 | 5.63 | 2.76 |
| 5290 | 5.63 | 2.76 |
| 5300 | 5.61 | 2.74 |
| 5310 | 5.68 | **2.81** |
| 5320 | 5.68 | **2.81** |
| 5350 | **5.69** | **2.81** |
| 5400 | 5.77 | 2.87 |
| 5450 | 5.92 | 3.01 |

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| | | |
|---|---|---|
| 5470 | **5.84** | 2.93 |
| 5500 | 5.76 | 2.84 |
| 5510 | 5.70 | 2.79 |
| 5520 | 5.63 | 2.75 |
| 5530 | 5.62 | 2.81 |
| 5540 | 5.56 | 2.78 |
| 5550 | 5.54 | 2.78 |
| 5560 | 5.55 | 2.87 |
| 5570 | 5.43 | 2.83 |
| 5580 | 5.41 | 2.87 |
| 5590 | 5.41 | 2.96 |
| 5600 | 5.36 | 2.96 |
| 5610 | 5.40 | 3.03 |
| 5620 | 5.40 | 3.10 |
| 5630 | 5.39 | 3.10 |
| 5640 | 5.45 | 3.18 |
| 5660 | 5.41 | 3.19 |
| 5670 | 5.44 | 3.25 |
| 5680 | 5.41 | 3.25 |
| 5690 | 5.39 | 3.23 |
| 5700 | 5.42 | 3.26 |
| 5710 | 5.42 | 3.25 |
| 5720 | **5.42** | **3.27** |
| 5725 | 5.38 | 3.22 |
| 5745 | **5.46** | **3.29** |
| 5755 | 5.36 | 3.24 |
| 5765 | 5.38 | 3.17 |
| 5775 | 5.41 | 3.18 |
| 5785 | 5.42 | 3.26 |
| 5795 | 5.37 | 3.20 |
| 5800 | 5.38 | 3.21 |
| 5805 | 5.36 | 3.16 |
| 5825 | 5.32 | 3.21 |
| 5850 | 5.27 | 3.12 |

**Figure 9 : Directional gain for correlated signals of Wi-Fi antennas @5G.**

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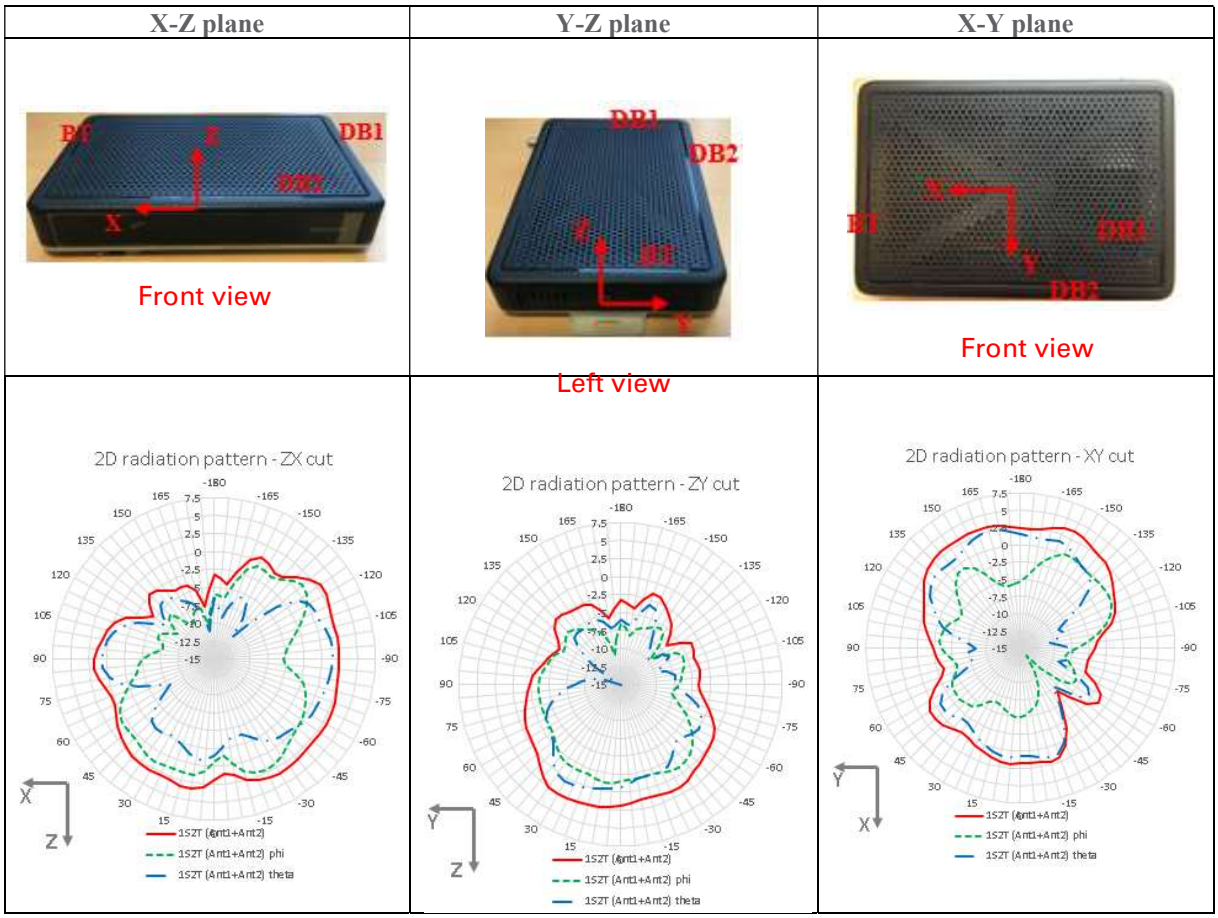


**Figure 10 : 2D cuts of the directional gain for correlated signals of Wi-Fi antennas @5.5GHz.**

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