



# Dongle Antenna Report

## **Cheng Uei Precision Industry Co., LTD. RF Technology Center**

No. 18, Chung Shan Rd., Tu Cheng City, Taipei Hsien, 23680,  
Taiwan, R. O. C.

Tel: 886-2-2269-9888

Fax: 886-2-2267-3672





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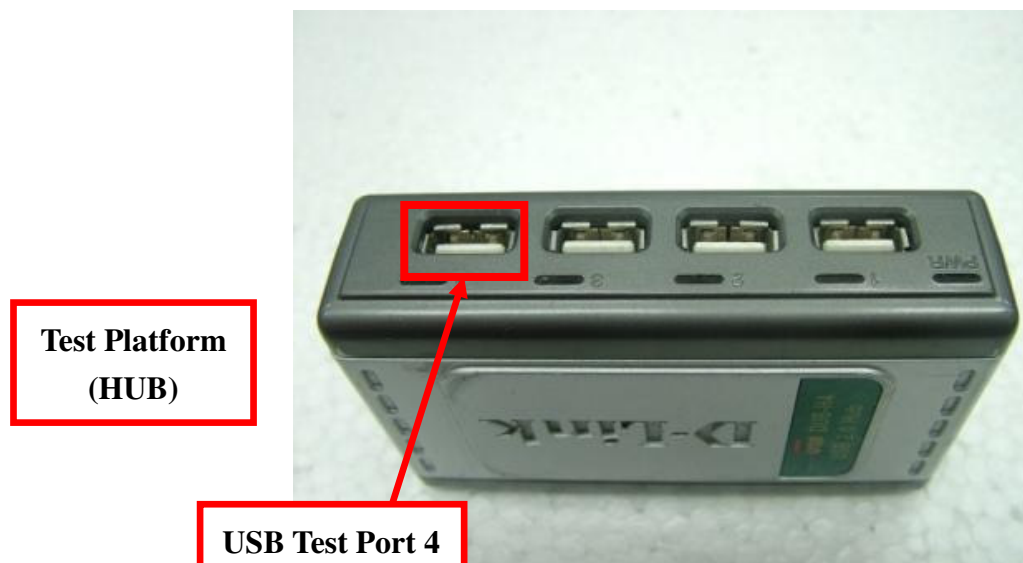


# Evaluation History

| REV. No. | DATE       | CHANGES      | Other |
|----------|------------|--------------|-------|
| 1        | 2012/12/19 | Antenna test |       |
| 2        | 2013/3/8   | Antenna test |       |
| 3        | 2013/4/17  | Antenna test |       |
|          |            |              |       |
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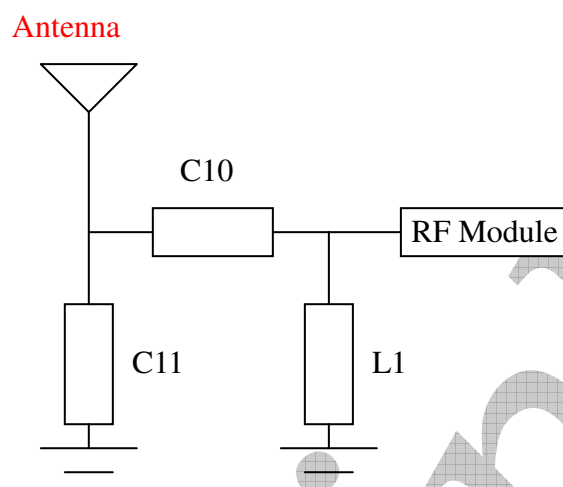


# Antenna Placement





# Matching Circuit



| Component | Sample219 | Sample233 | Sample406 |
|-----------|-----------|-----------|-----------|
| L1        | NA        | NA        | NA        |
| C10       | 0Ω        | 0Ω        | 0Ω        |
| C11       | NA        | NA        | NA        |

# S11 Test Setup

## 1. Equipment Setup



## 2. Test Procedure

- 2.1 Set start and stop frequency and Calibrate the NA with 50 ohm calibration kit
- 2.2 Connect the NA cable to DUT antenna via SMA or I-PAX connector.
- 2.3 Measure the DUT antenna performance in the free space and record the s11.



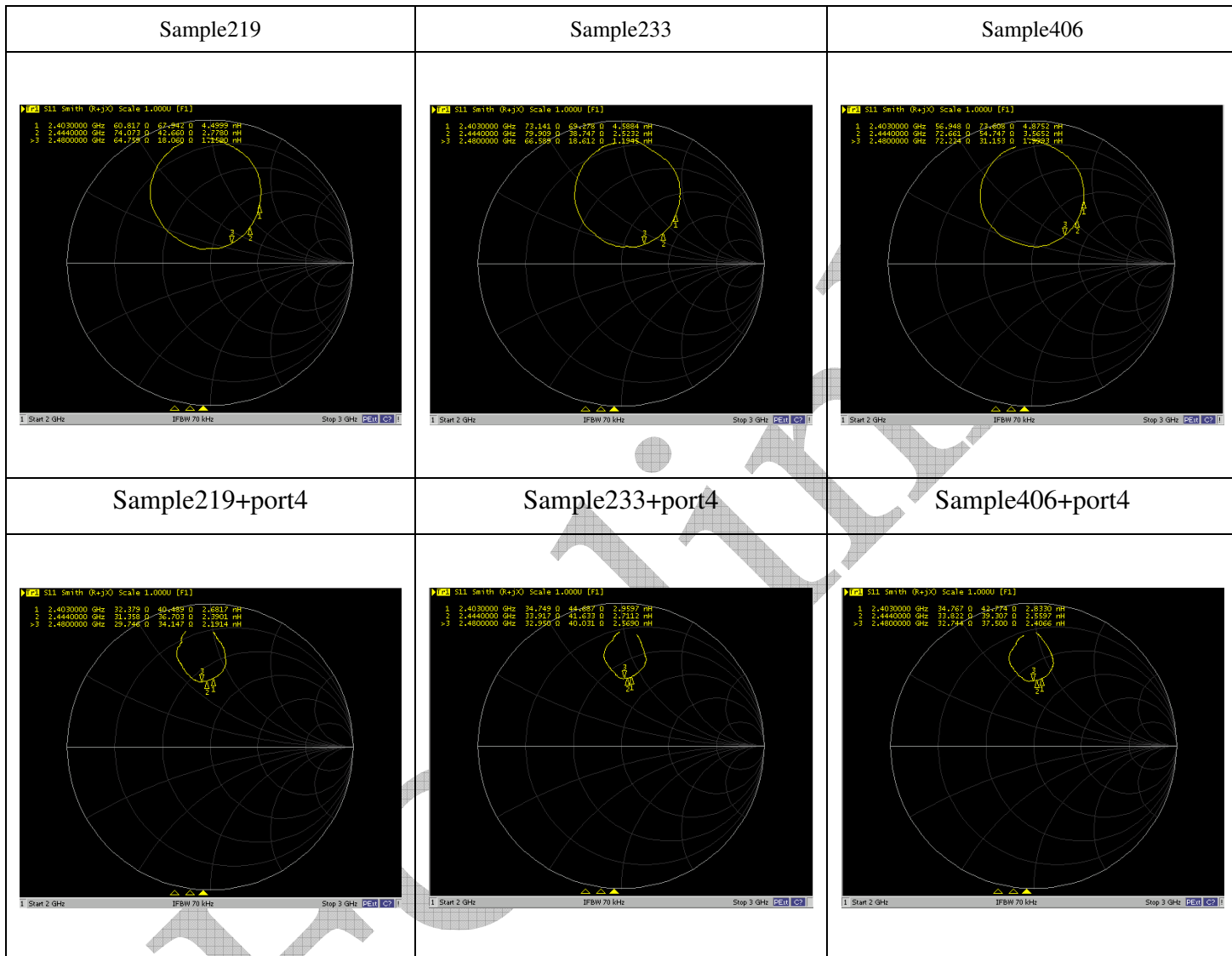
### 3.Test Result(VSWR, Smith Chart , Return loss)

#### ● VSWR

| Sample219                                                                                                                                  | Sample233       | Sample406       |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------|----------|-----|----------|-----|--------------------------------------------------------------------------------------------------------------------------------------------|----------|-----|----------|-----|----------|-----|--------------------------------------------------------------------------------------------------------------------------------------------|----------|-----|----------|-----|----------|-----|
| <table><tr><td>2403 MHz</td><td>&lt; 4</td></tr><tr><td>2444 MHz</td><td>&lt; 3</td></tr><tr><td>2480 MHz</td><td>&lt; 2</td></tr></table> | 2403 MHz        | < 4             | 2444 MHz | < 3 | 2480 MHz | < 2 | <table><tr><td>2403 MHz</td><td>&lt; 4</td></tr><tr><td>2444 MHz</td><td>&lt; 3</td></tr><tr><td>2480 MHz</td><td>&lt; 2</td></tr></table> | 2403 MHz | < 4 | 2444 MHz | < 3 | 2480 MHz | < 2 | <table><tr><td>2403 MHz</td><td>&lt; 4</td></tr><tr><td>2444 MHz</td><td>&lt; 3</td></tr><tr><td>2480 MHz</td><td>&lt; 2</td></tr></table> | 2403 MHz | < 4 | 2444 MHz | < 3 | 2480 MHz | < 2 |
| 2403 MHz                                                                                                                                   | < 4             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
| 2444 MHz                                                                                                                                   | < 3             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
| 2480 MHz                                                                                                                                   | < 2             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
| 2403 MHz                                                                                                                                   | < 4             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
| 2444 MHz                                                                                                                                   | < 3             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
| 2480 MHz                                                                                                                                   | < 2             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
| 2403 MHz                                                                                                                                   | < 4             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
| 2444 MHz                                                                                                                                   | < 3             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
| 2480 MHz                                                                                                                                   | < 2             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
| Sample219+port4                                                                                                                            | Sample233+port4 | Sample406+port4 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
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| 2403 MHz                                                                                                                                   | < 3             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
| 2444 MHz                                                                                                                                   | < 3             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
| 2480 MHz                                                                                                                                   | < 3             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
| 2403 MHz                                                                                                                                   | < 3             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
| 2444 MHz                                                                                                                                   | < 3             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
| 2480 MHz                                                                                                                                   | < 3             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
| 2403 MHz                                                                                                                                   | < 3             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
| 2444 MHz                                                                                                                                   | < 3             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |
| 2480 MHz                                                                                                                                   | < 3             |                 |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |                                                                                                                                            |          |     |          |     |          |     |



## Smith Chart



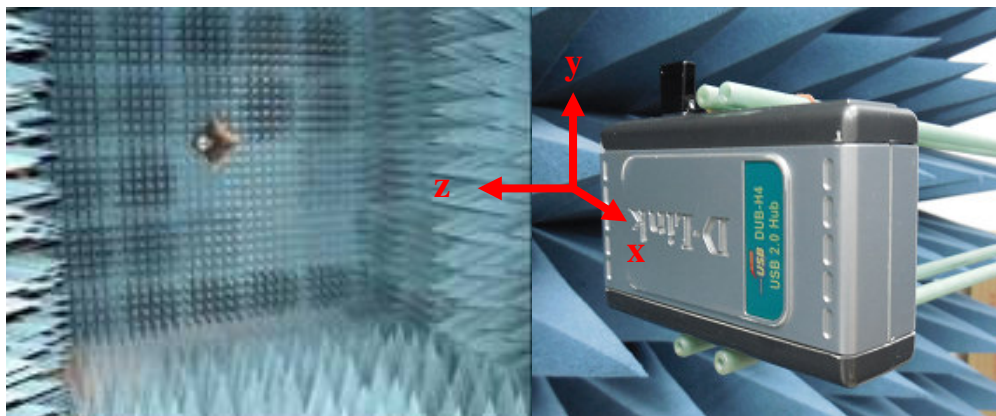


## Return loss



# S21 Test Setup

## 1. Testing Environment



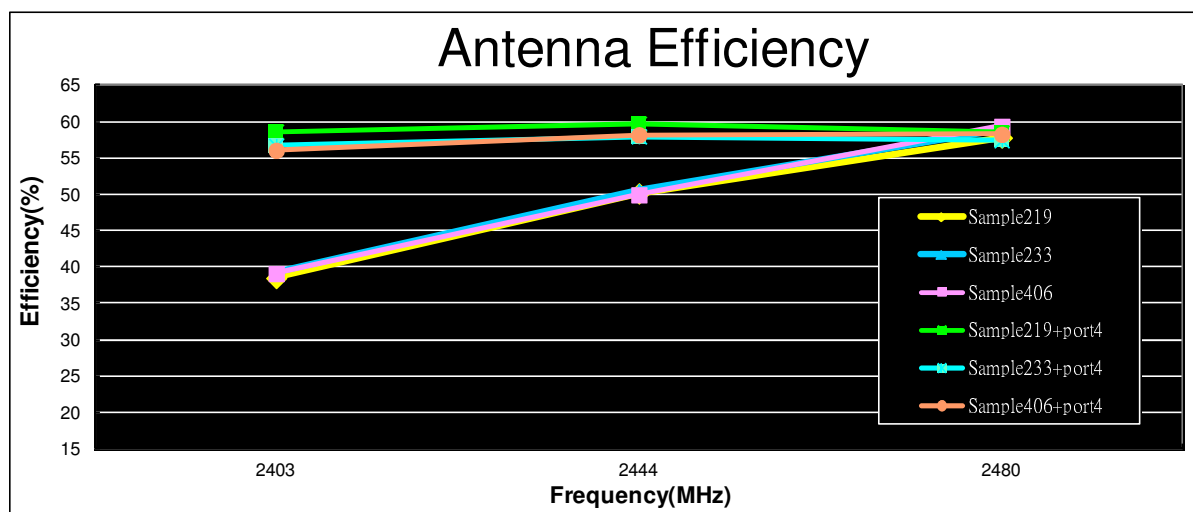
- **Lab standard:** 3D Chamber for CTIA standard
- **Chamber size:** 7.2 \* 3.6 \* 3.6(meter)
- **Chamber type:** Fully anechoic Chamber
- **Chamber usable frequency range:** 700~6000MHz
- **Measurement instrument:** Network Analyzer
- **Measurement Software:** EMQuest (ETS-Lindgren)
- **DUT :** Dongle

**ETS-Lindgren**

**AMS-8500**



## 2. Antenna Performance

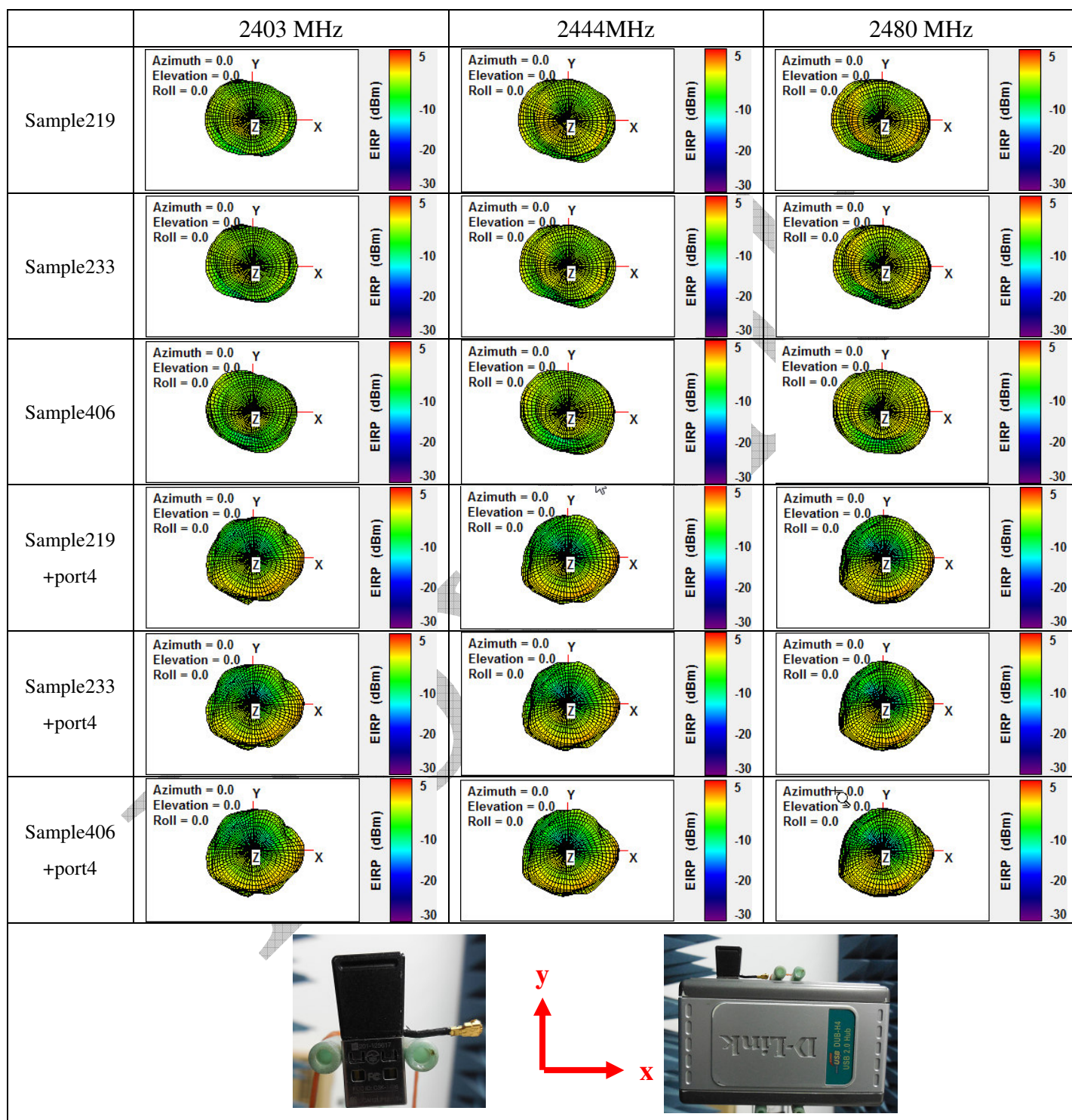


## 3. Experiment Result

| Dongle          |                       | 2403  | 2444  | 2480  |
|-----------------|-----------------------|-------|-------|-------|
| Sample219       | Total Rad. Power(dBi) | -4.15 | -3.00 | -2.38 |
|                 | Peak EIRP(dBi)        | 0.29  | 1.37  | 2.18  |
|                 | Efficiency(%)         | 38.50 | 50.13 | 57.80 |
|                 | Average Efficiency(%) | 48.81 |       |       |
| Sample233       | Total Rad. Power(dBi) | -4.05 | -2.96 | -2.31 |
|                 | Peak EIRP(dBi)        | 0.97  | 1.97  | 2.17  |
|                 | Efficiency(%)         | 39.34 | 50.61 | 58.79 |
|                 | Average Efficiency(%) | 49.58 |       |       |
| Sample406       | Total Rad. Power(dBi) | -4.08 | -3.02 | -2.26 |
|                 | Peak EIRP(dBi)        | 2.35  | 2.61  | 3.01  |
|                 | Efficiency(%)         | 39.11 | 49.94 | 59.37 |
|                 | Average Efficiency(%) | 49.47 |       |       |
| Sample219+port4 | Total Rad. Power(dBi) | -2.32 | -2.24 | -2.33 |
|                 | Peak EIRP(dBi)        | 2.82  | 2.30  | 2.01  |
|                 | Efficiency(%)         | 58.63 | 59.71 | 58.48 |
|                 | Average Efficiency(%) | 58.94 |       |       |
| Sample233+port4 | Total Rad. Power(dBi) | -2.46 | -2.37 | -2.41 |
|                 | Peak EIRP(dBi)        | 2.65  | 2.17  | 2.08  |
|                 | Efficiency(%)         | 56.70 | 57.96 | 57.45 |
|                 | Average Efficiency(%) | 57.37 |       |       |
| Sample406+port4 | Total Rad. Power(dBi) | -2.51 | -2.35 | -2.35 |
|                 | Peak EIRP(dBi)        | 2.62  | 2.26  | 2.09  |
|                 | Efficiency(%)         | 56.05 | 58.19 | 58.25 |
|                 | Average Efficiency(%) | 57.50 |       |       |

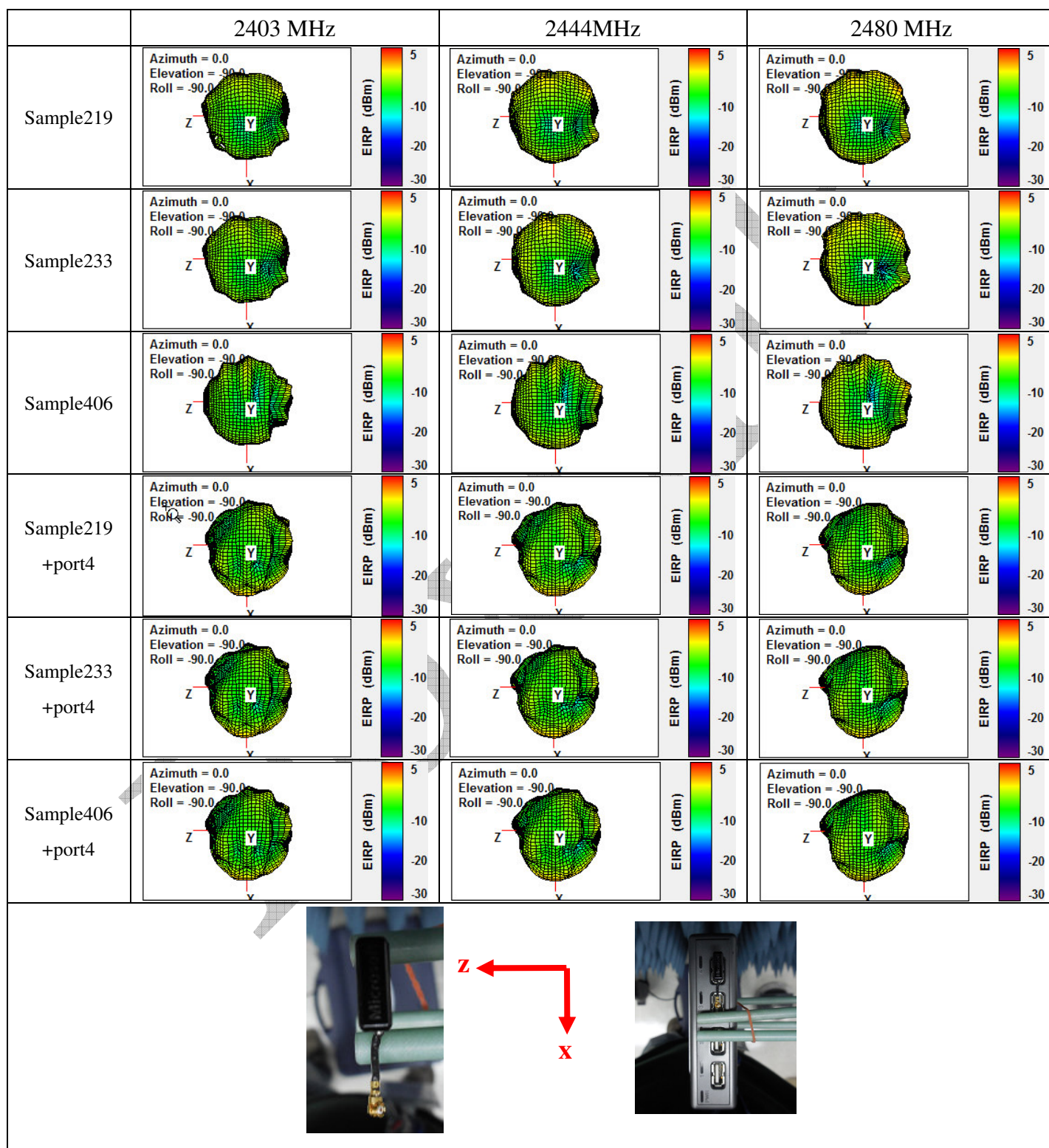


## 4. Antenna Pattern—3D (X-Y Cut)



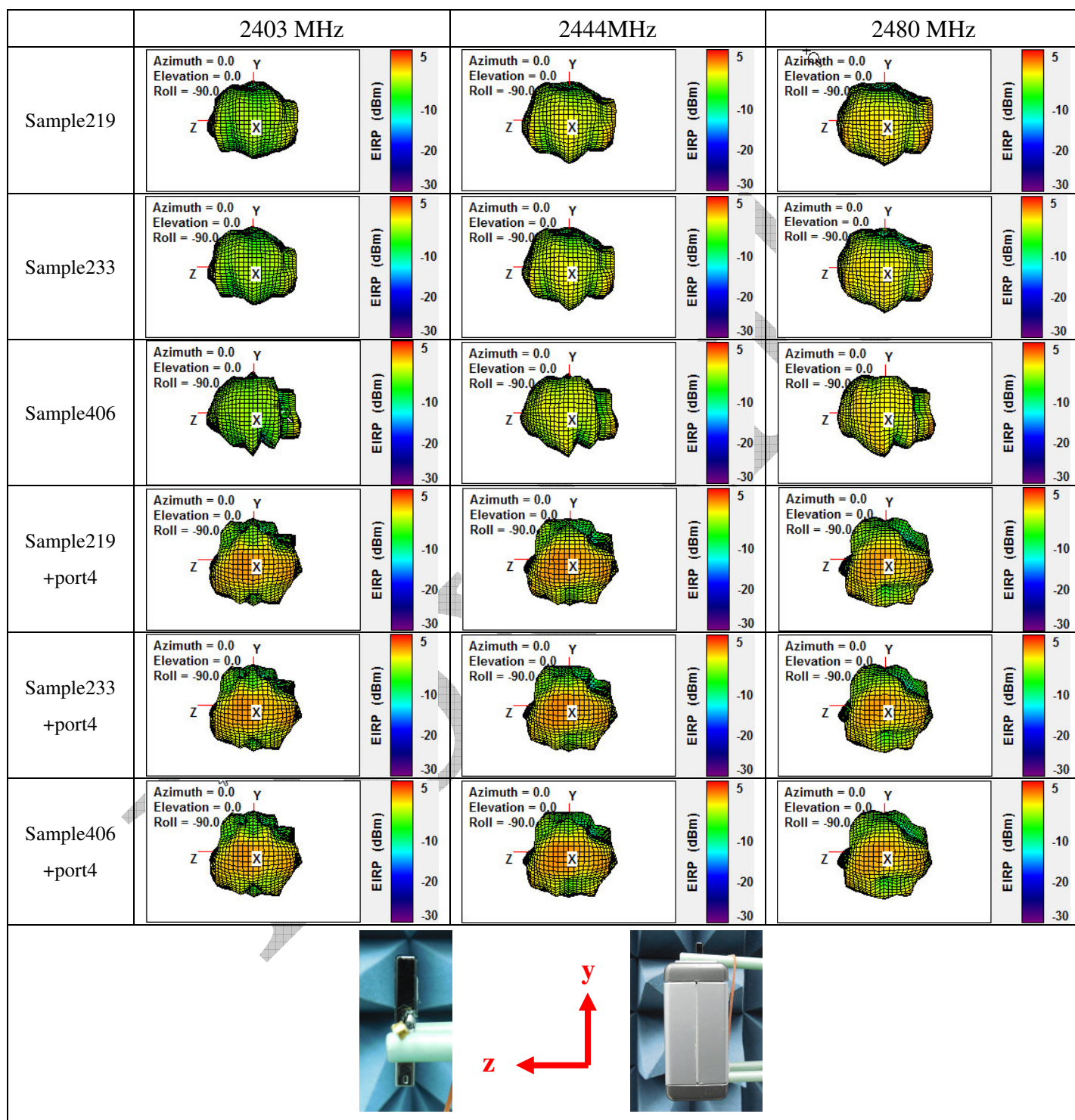


## 4. Antenna Pattern—3D (X-Z Cut)





## 4. Antenna Pattern—3D (Y-Z Cut)





# Conclusion

This report provides a series of experiments dongle samples.

Experimental results such as the above data.

FOXLINK