# AN-420
# Antenna design proposal

V5.1
Tim Chao
2022/11/21

# Agenda

- History
- Antenna Placement
- Return Loss & Isolation
- Gain table
- 2D Radiation Pattern
- Combine Pattern

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# History

| Date | Description | Version |
|---|---|---|
| 2021/01/22 | Drift | V0.1 |
| 2021/04/29 | Change to slot 5G antenna, modify antenna location, improve High/Low band isolation | V0.2 |
| 2021/10/06 | New antennas, new lower housing, modified heat plates | V1.0 |
| 2022/01/07 | Final housing, 1.6mm ant PCB | V2.0 |
| 2022/01/19 | Final housing(2022/01/18), 0.6mm ant PCB | V3.0 |
| 2022/06/30 | S3 housing with final thermal solution, antenna rotation | V4.0 |
| 2022/11/04 | S3 DVT sample, finetune 2-2 layout | V5.0 |
| 2022/11/21 | Add antenna PN and pictures | V5.1 |

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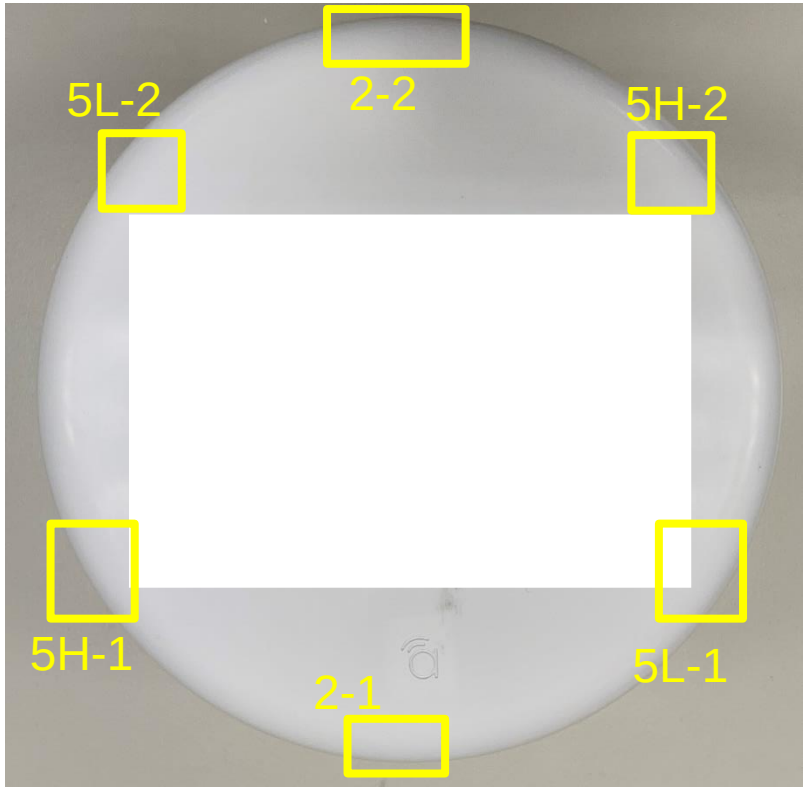
# Antenna location

- AN-420 have total six antennas as figure :
- 2.45GHz * 2
- 5GHz Low band * 2
- 5GHz High band * 2

| | Size | Material | PN | Type |
|---|---|---|---|---|
| 2-1 | 15*23.5*0.6 | FR4 | 7102A0568000 | Dipole |
| 2-2 | 15*23.5*0.6 | FR4 | 7102A0572000 | Dipole |
| 5L-1 | **15.5***11.7*0.6 | FR4 | 7102A0570000 | Monopole |
| 5L-2 | 11*19*0.6 | FR4 | 7102A0571000 | PIFA |
| 5H-1 | 17*11.7*0.6 | FR4 | 7102A0569000 | Monopole |
| 5H-2 | 11*19*0.6 | FR4 | 7102A0567000 | PIFA |

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# Antenna picture

2-1

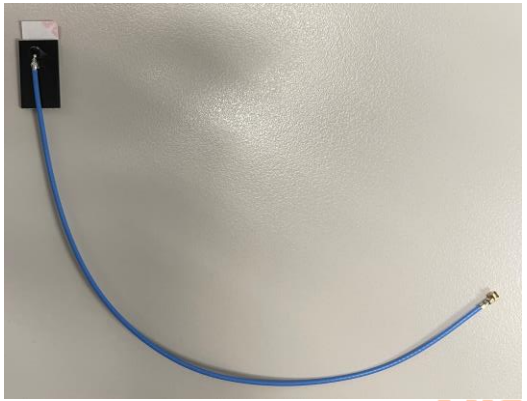
2-2

5L-1

5L-2

5H-1

5H-2



Manufactory : Advanced wireless & antenna inc.
Add.:B2-F,No.207-1,Sec.3,Beixin Rd.,Xindian Dist.,New Taipei City,231,Taiwan

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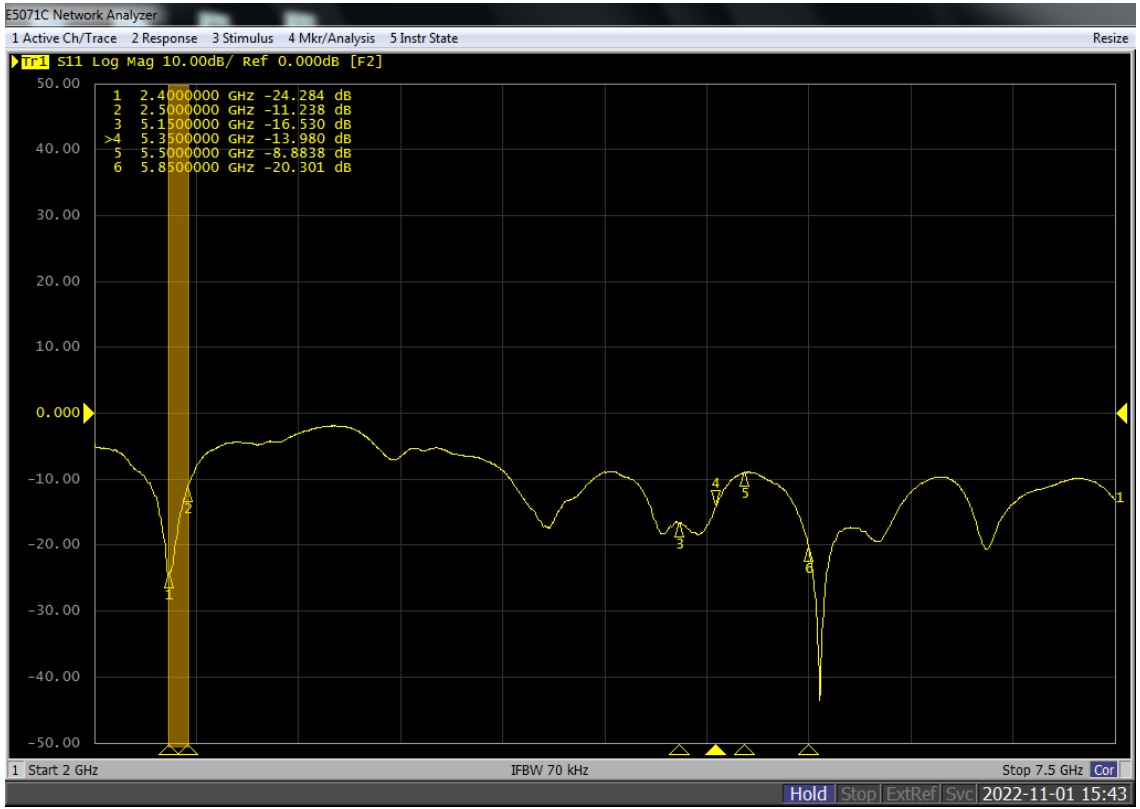
# Return loss : 2-1

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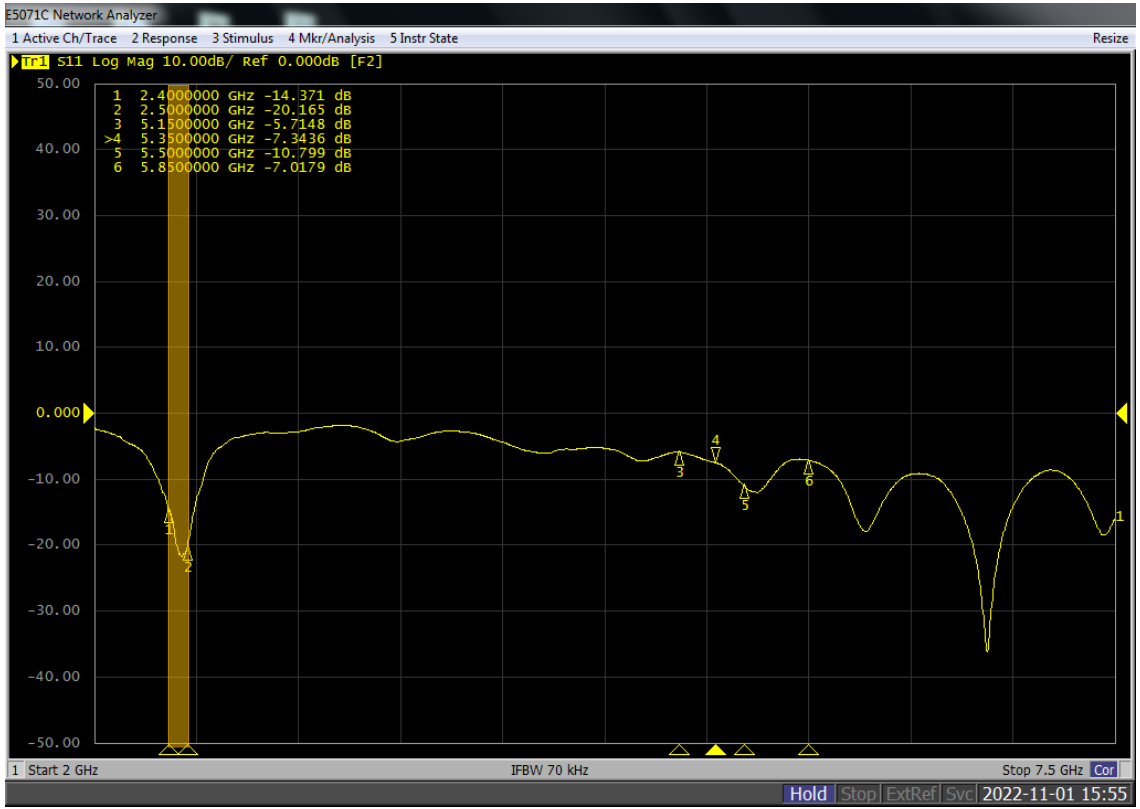
# Return loss : 2-2

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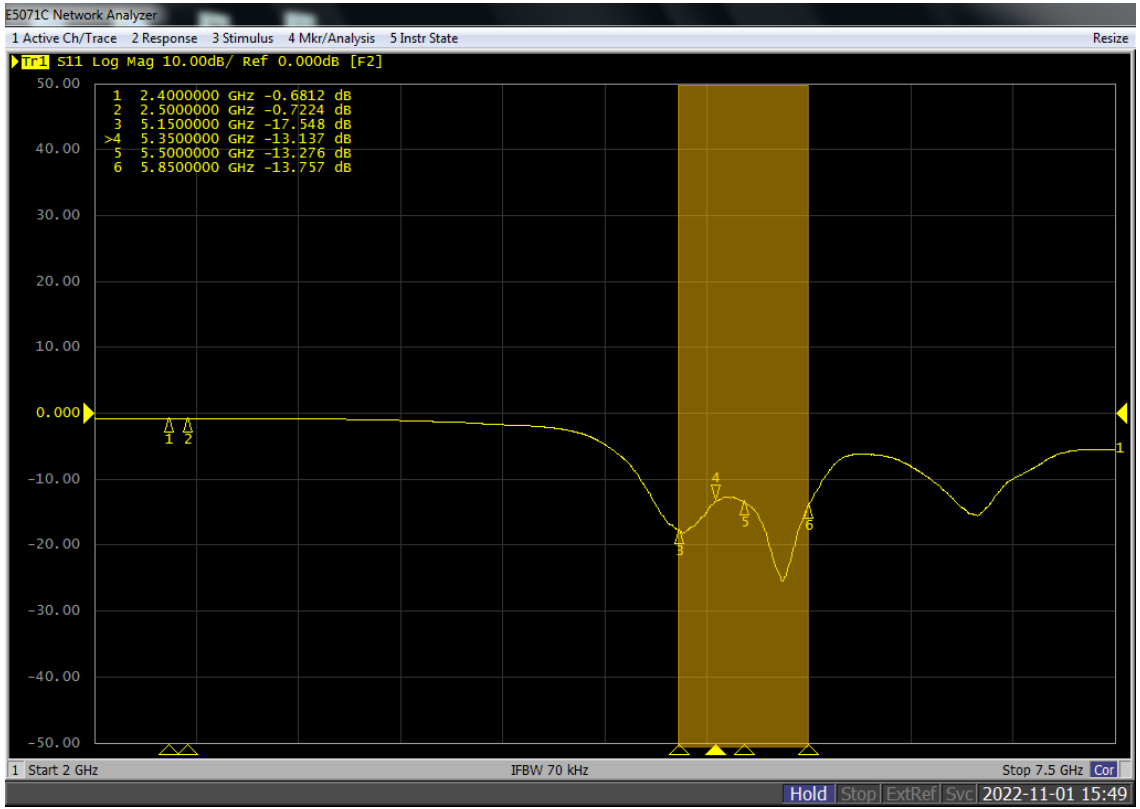
# Return loss : 5L-1

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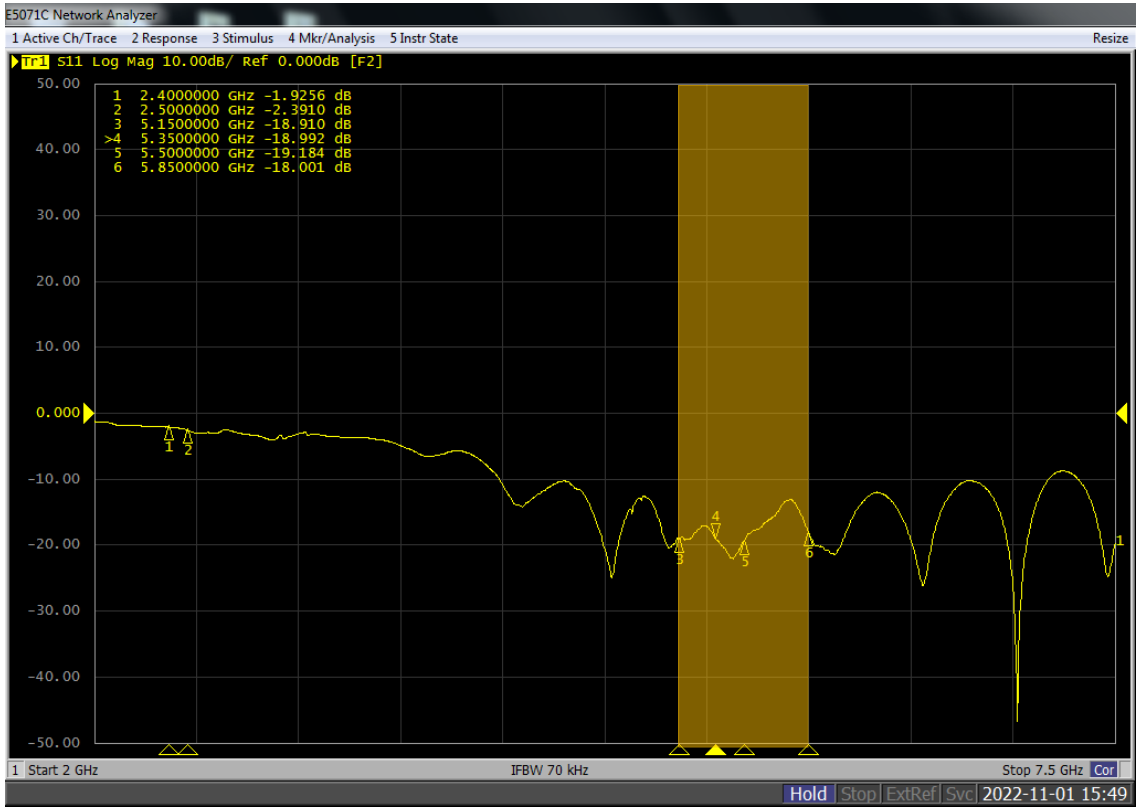
# Return loss : 5L-2

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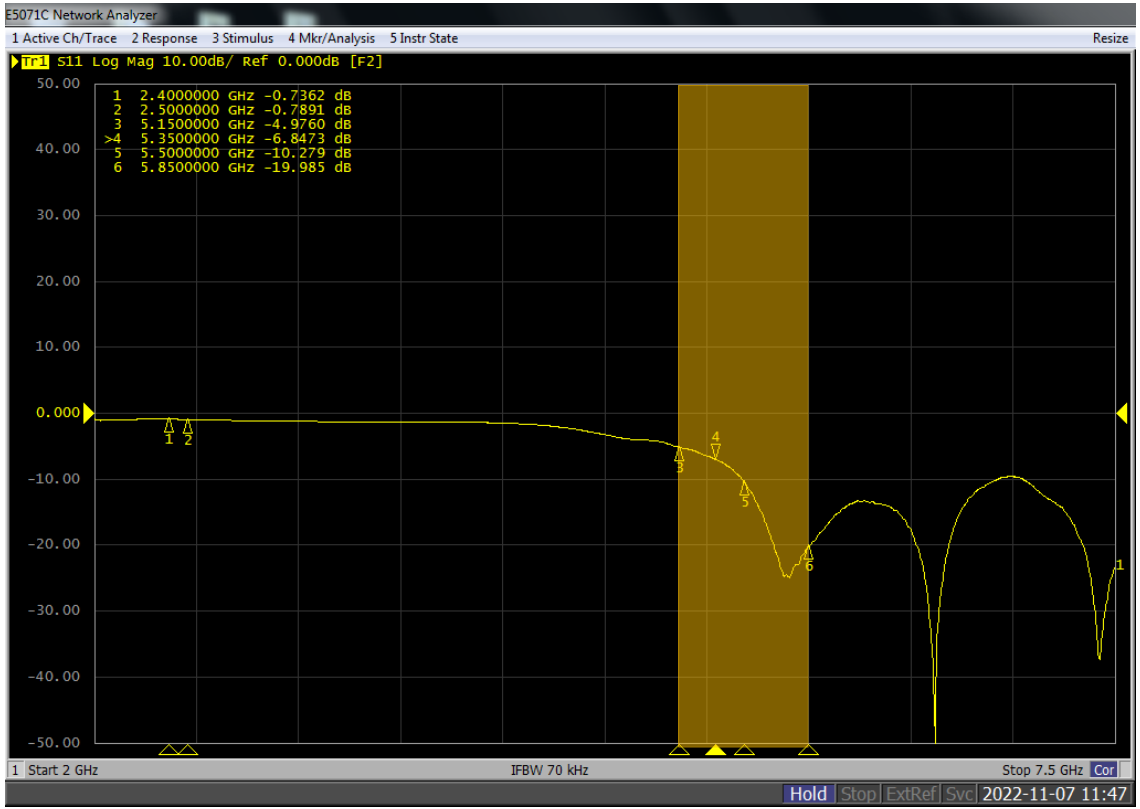
# Return loss : 5H-1

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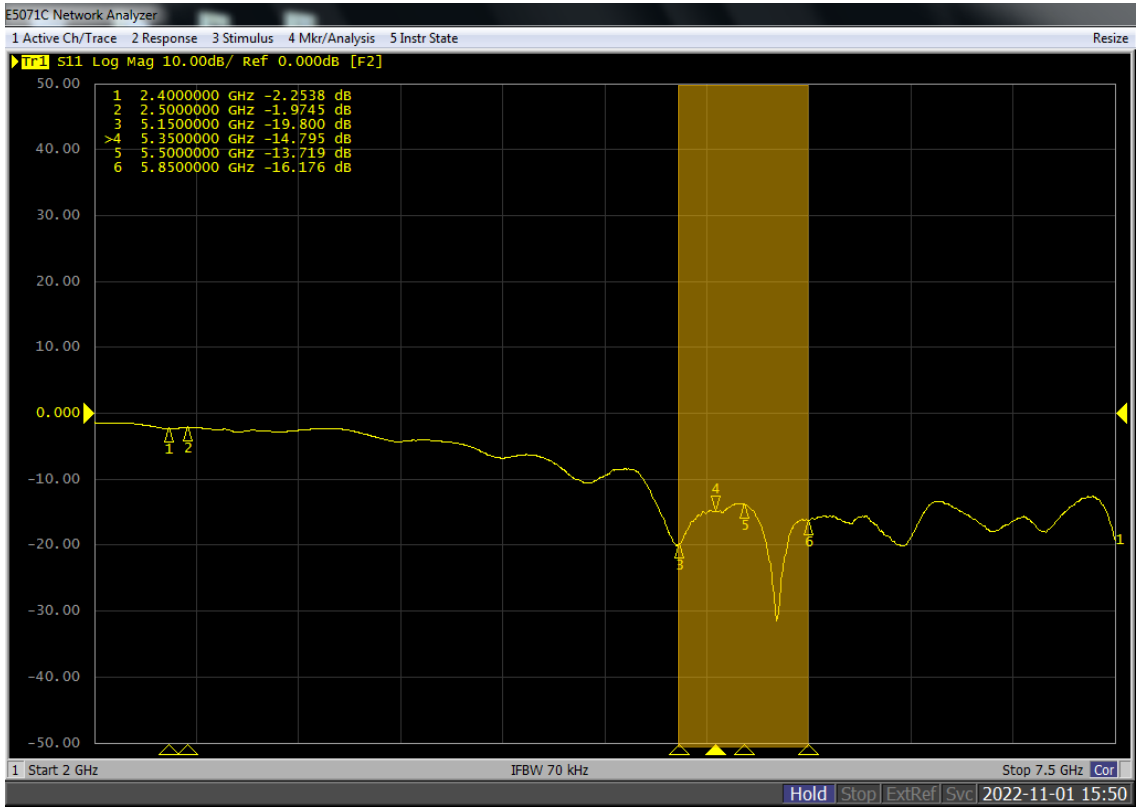
# Return loss : 5H-2

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# Return loss table

| S11(dB) | 2.4GHz | 2.5GHz | 5.15GHz | 5.35GHz | 5.5GHz | 5.85GHz |
|---|---|---|---|---|---|---|
| 2-1 | -24.2 | -11.2 | | | | |
| 2-2 | -14.3 | -20.1 | | | | |
| 5L-1 | | | -17.5 | -13.1 | -13.2 | -13.7 |
| 5L-2 | | | -18.9 | -18.9 | -19.1 | -18.0 |
| 5H-1 | | | -4.9 | -6.8 | -10.2 | -19.9 |
| 5H-2 | | | -19.8 | -14.7 | -13.7 | -16.1 |

Criteria : S11 < -10dB

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# Isolation at 2.45GHz

| | 2-1 | 2-2 | 5L-1 | 5L-2 | 5H-1 | 5H-2 |
|---|---|---|---|---|---|---|
| 2-1 | NA | -20.7 | -30.4 | -28.4 | -33.7 | -26.1 |
| 2-2 | NA | NA | -36.0 | -24.7 | -38.4 | -28.5 |
| 5L-1 | NA | NA | NA | -43.2 | -43.1 | -38.9 |
| 5L-2 | NA | NA | NA | NA | -48.1 | -53.7 |
| 5H-1 | NA | NA | NA | NA | NA | -35.7 |
| 5H-2 | NA | NA | NA | NA | NA | NA |

Criteria : S21 < -20dB

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# Isolation at 5.5GHz

| | 2-1 | 2-2 | 5L-1 | 5L-2 | 5H-1 | 5H-2 |
|---|---|---|---|---|---|---|
| 2-1 | NA | -25.4 | -27.7 | -21.4 | -20.1 | -26.8 |
| 2-2 | NA | NA | -26.4 | -21.7 | -33.6 | -30.2 |
| 5L-1 | NA | NA | NA | -30.8 | -25.6 | -27.7 |
| 5L-2 | NA | NA | NA | NA | -25.1 | -26.2 |
| 5H-1 | NA | NA | NA | NA | NA | -28.3 |
| 5H-2 | NA | NA | NA | NA | NA | NA |

Criteria : S21 < -20dB

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# Gain table

| | Antenna | Peak gain (dBi) | Efficiency (%) |
|---|---|---|---|
| 2.45GHz | 2-1 | 4.5 | 74.6 |
| | 2-2 | 4.8 | 65.6 |
| 5GHz Lowband | 5L-1 | 5.5 | 69 |
| | 5L-2 | 4.9 | 65.1 |
| 5GHz Highband | 5H-1 | 5.6 | 74 |
| | 5H-2 | 5.0 | 69.2 |

Criteria : 2.45GHz > 3dBi ; 5.5GHz > 4dB  Efficiency > 60%

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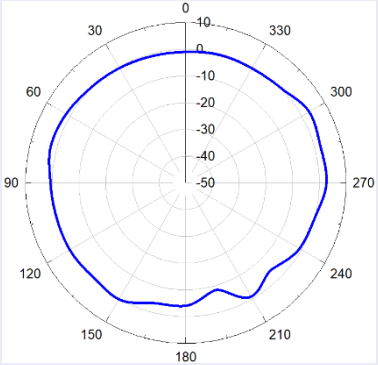
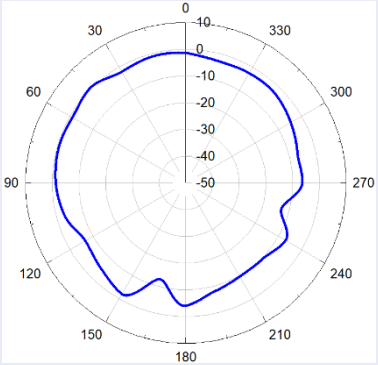
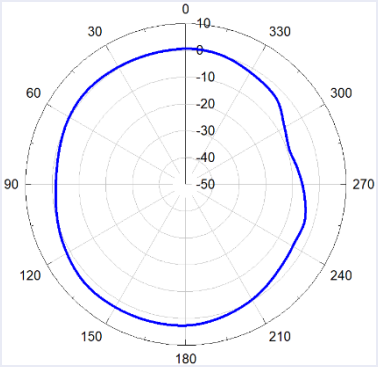
# 2D pattern : 2-1

| Frequency | XZ Plane | YZ Plane | XY Plane |
|---|---|---|---|
| 2.45GHz |  |  |  |

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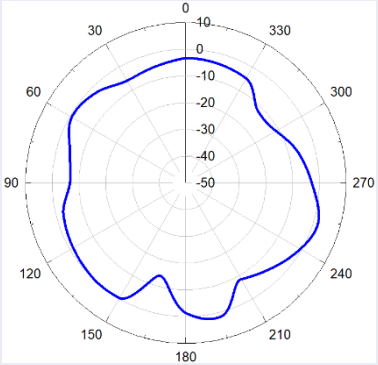
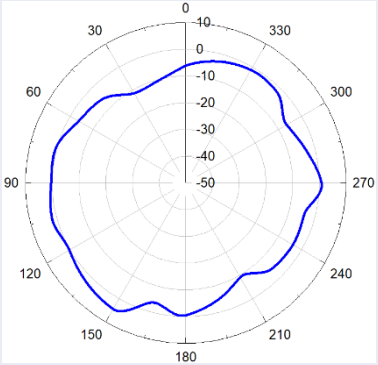
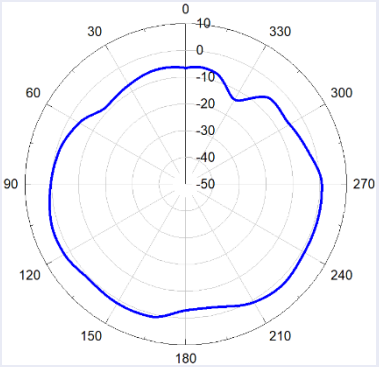
# 2D pattern : 2-2

| Frequency | XZ Plane | YZ Plane | XY Plane |
|---|---|---|---|
| 2.45GHz | | | |
| |  |  |  |



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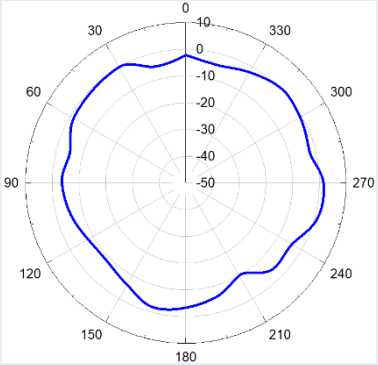
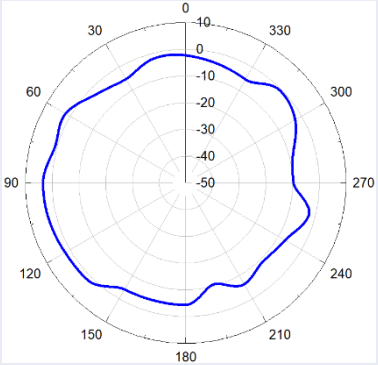
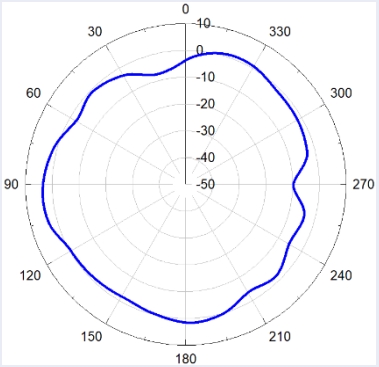
# 2D pattern : 5L-1

| Frequency | XZ Plane | YZ Plane | XY Plane |
|---|---|---|---|
| 5.35GHz | | | |
| |  |  |  |

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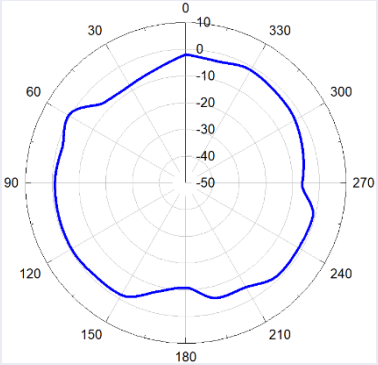
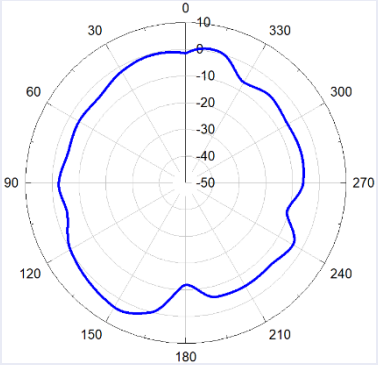
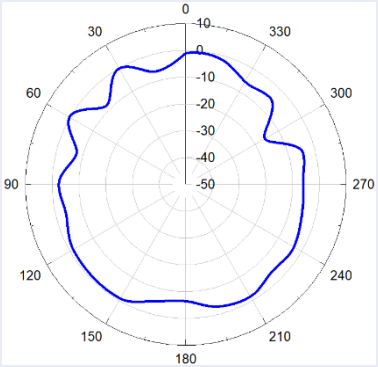
# 2D pattern : 5L-2

| Frequency | XZ Plane | YZ Plane | XY Plane |
|---|---|---|---|
| 5.35GHz | | | |
| |  |  |  |

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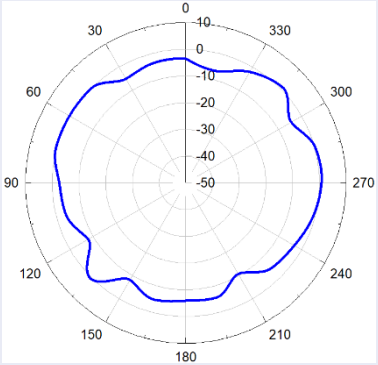
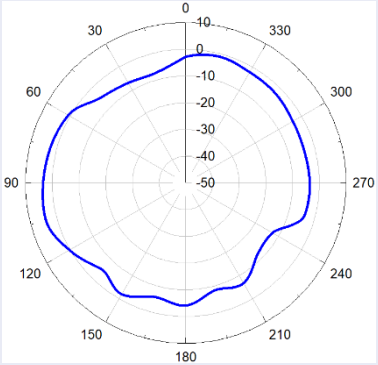
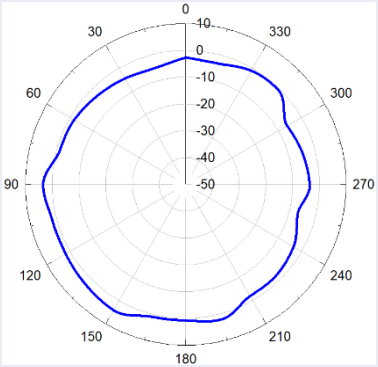
# 2D pattern : 5H-1

| Frequency | XZ Plane | YZ Plane | XY Plane |
|---|---|---|---|
| 5.75GHz |  |  |  |



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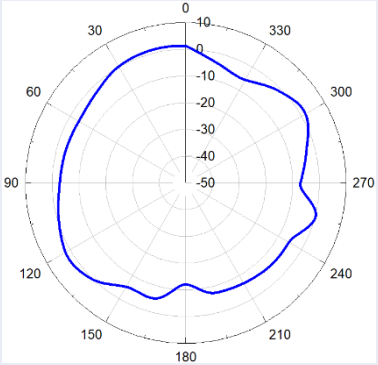
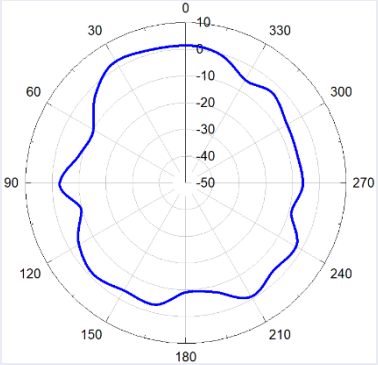
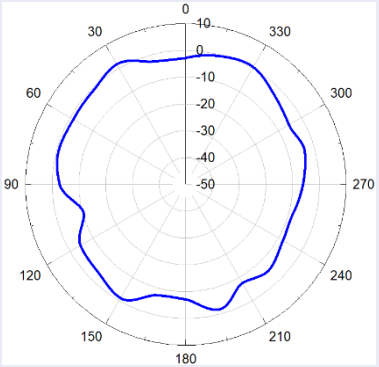
# 2D pattern : 5H-2

| Frequency | XZ Plane | YZ Plane | XY Plane |
|---|---|---|---|
| 5.75GHz | | | |
| |  |  |  |



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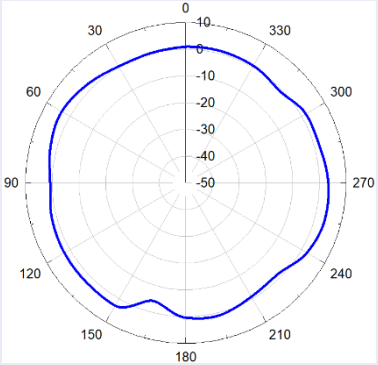
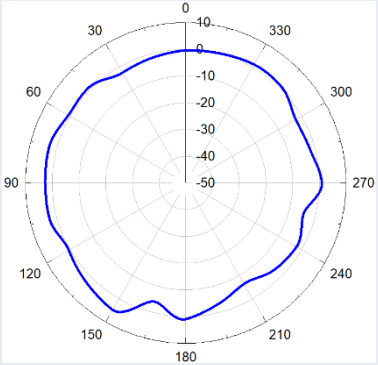
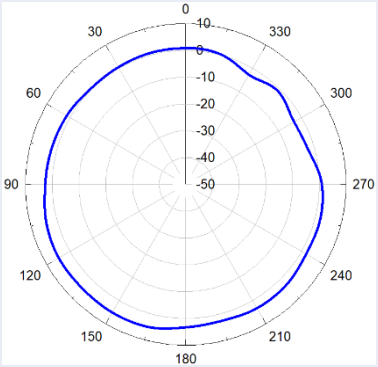
# Combine pattern : 2.4GHz antennas

| Frequency | XZ Plane | YZ Plane | XY Plane |
|---|---|---|---|
| 2.45GHz | | | |
| |  |  |  |



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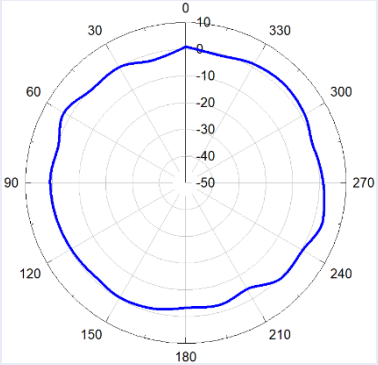
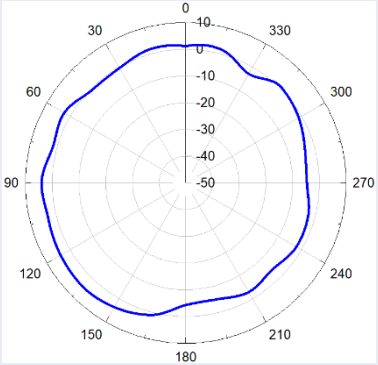
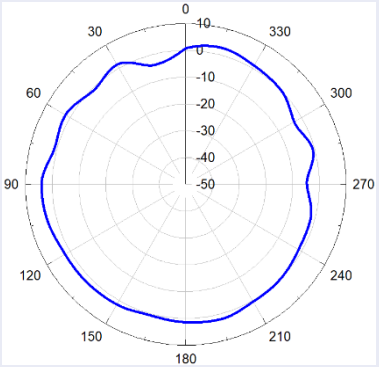
# Combine pattern : 5GHz Low-band antennas

| Frequency | XZ Plane | YZ Plane | XY Plane |
|---|---|---|---|
| 5.35GHz | | | |
| |  |  |  |



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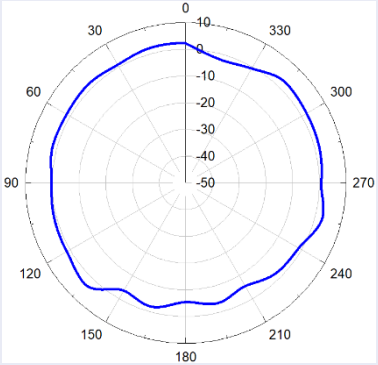
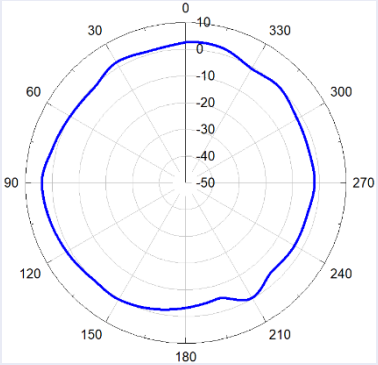
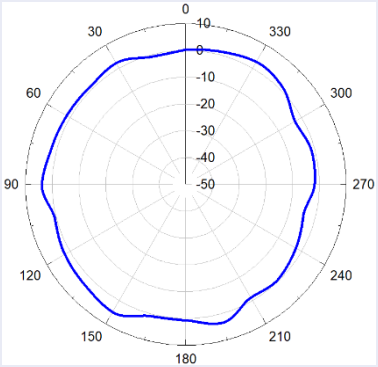
# Combine pattern : 5GHz High-band antennas

| Frequency | XZ Plane | YZ Plane | XY Plane |
|---|---|---|---|
| 5.75GHz | | | |
| |  |  |  |

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