111550022 施采緹
Lab1 result

<Result of task1, 2, 3 (graph will be provided below in Report section) and Report>

```
Rx1 location: (-10.10, 21.09)
Rx2 location: (18.18, 8.51)

Task 1: Calculate AoD
        Rx1 actual Angle: 115.595208 degree
        Rx2 actual Angle: 25.076622 degree
Task 2: Calculate Rx power and SNR
        // Debug - Rx1 optimal beam resolution: 115.500000 degrees
        // Debug - Rx2 optimal beam resolution: 25.000000 degrees
        // Debug - Tx Gain: 81.693222 dBm
        Rx1 power: -48.307848 dBm
        Rx1 SNR: 39.692152 dB
Task 3: Calculate SINR of two concurrent beams
        Rx1 interference power: -67.169912 dBm
        Rx1 SINR: 18.826338 dB
```

```
Report
       // Debug - Cartesian plot for user 1
       // Debug - Cartesian plot for user 2
       // Debug - Polar plot corresponding to figure 1
       // Debug - Polar plot corresponding to figure 2
       // Debug - Comparisons
       --- Tx Antennas: 4 ---

       --- Codebook Size:  5 ---

       Calculate Rx1 power and SNR
       Reciever1 actual Angle: 115.595208 degree
       Reciever1 power: -55.391847 dBm
       Reciever1 SNR: 32.608153 dB

       Calculate SINR of two concurrent beams
       Rx1 interference power: -67.514705 dBm
       Rx1 SINR: 12.084193 dB

       --- Codebook Size: 15 ---

       Calculate Rx1 power and SNR
       Reciever1 actual Angle: 115.595208 degree
       Reciever1 power: -55.648994 dBm
       Reciever1 SNR: 32.351006 dB

       Calculate SINR of two concurrent beams
       Rx1 interference power: -66.827962 dBm
       Rx1 SINR: 11.145937 dB
```

```
--- Tx Antennas: 8 ---

--- Codebook Size:  5 ---

Calculate Rx1 power and SNR
Reciever1 actual Angle: 115.595208 degree
Reciever1 power: -49.381932 dBm
Reciever1 SNR: 38.618068 dB

Calculate SINR of two concurrent beams
Rx1 interference power: -67.193355 dBm
Rx1 SINR: 17.775504 dB

--- Codebook Size: 15 ---

Calculate Rx1 power and SNR
Reciever1 actual Angle: 115.595208 degree
Reciever1 power: -50.484011 dBm
Reciever1 SNR: 37.515989 dB

Calculate SINR of two concurrent beams
Rx1 interference power: -71.612014 dBm
Rx1 SINR: 21.029364 dB

// Debug - Avg from 20 random run!
avg Rx1 power: -39.973351 dBm
avg Rx1 SNR: 48.026649 dB
avg Rx1 interference power: -67.228352 dBm
avg Rx1 SINR: 27.083776 dB
```

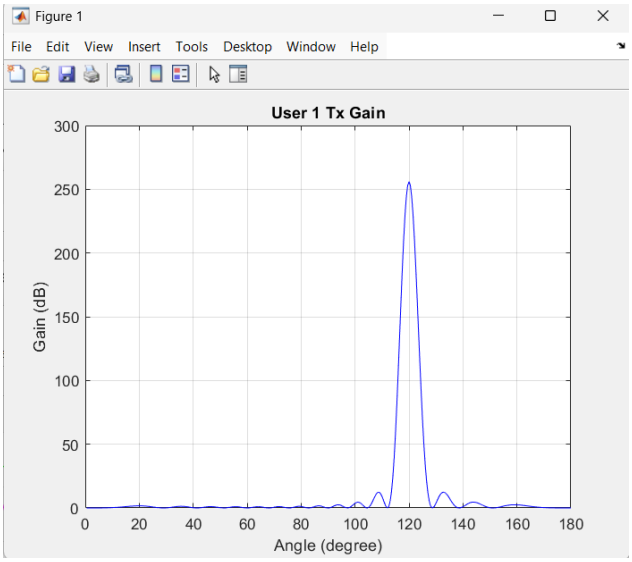
Figure 1
File Edit View Insert Tools Desktop Window Help
User 1 Tx Gain
Gain (dB)
Angle (degree)

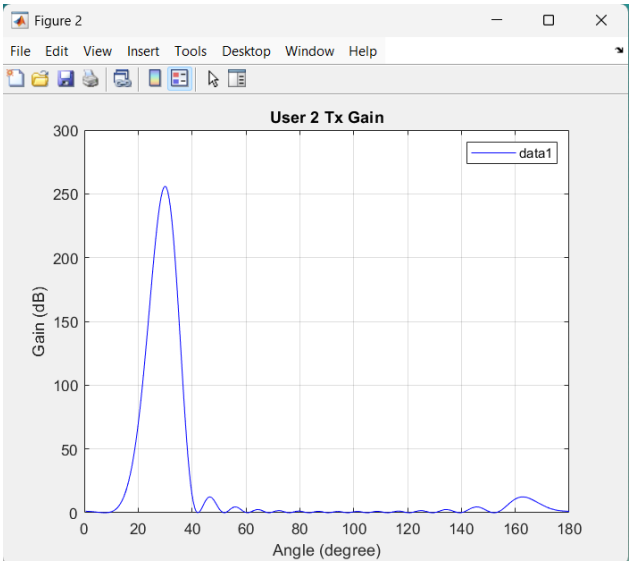
Figure 2
File Edit View Insert Tools Desktop Window Help
User 2 Tx Gain
data1
Gain (dB)
Angle (degree)

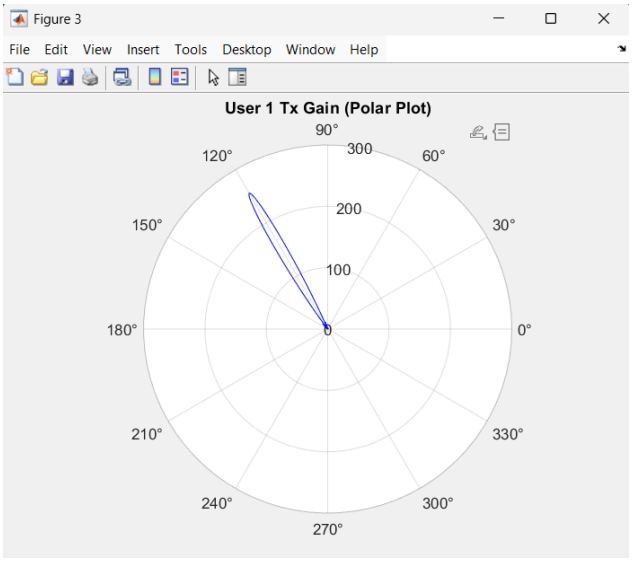
Figure 3
File Edit View Insert Tools Desktop Window Help
User 1 Tx Gain (Polar Plot)

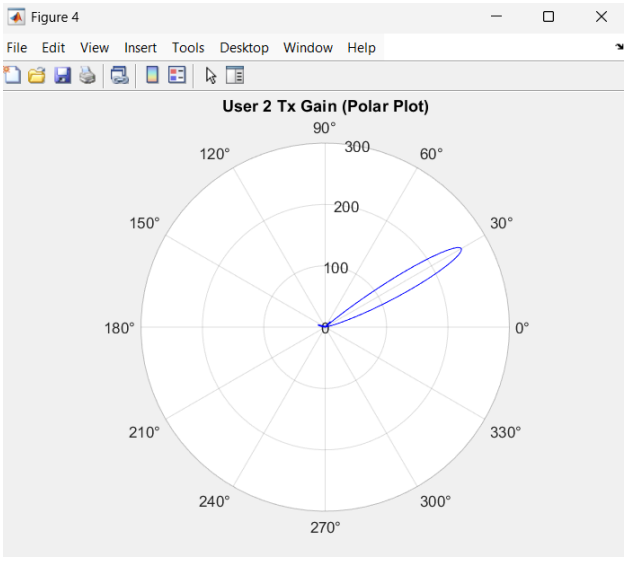
Figure 4
File Edit View Insert Tools Desktop Window Help
User 2 Tx Gain (Polar Plot)

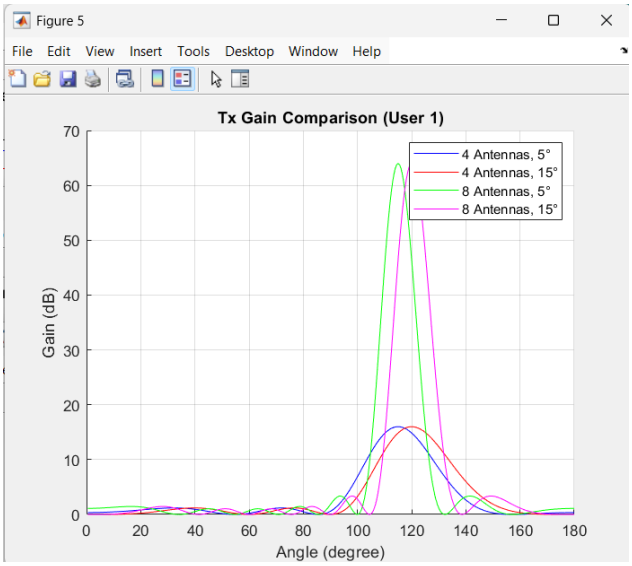
Figure 5
File Edit View Insert Tools Desktop Window Help
Tx Gain Comparison (User 1)
4 Antennas, 5°
4 Antennas, 15°
8 Antennas, 5°
8 Antennas, 15°
Gain (dB)
Angle (degree)

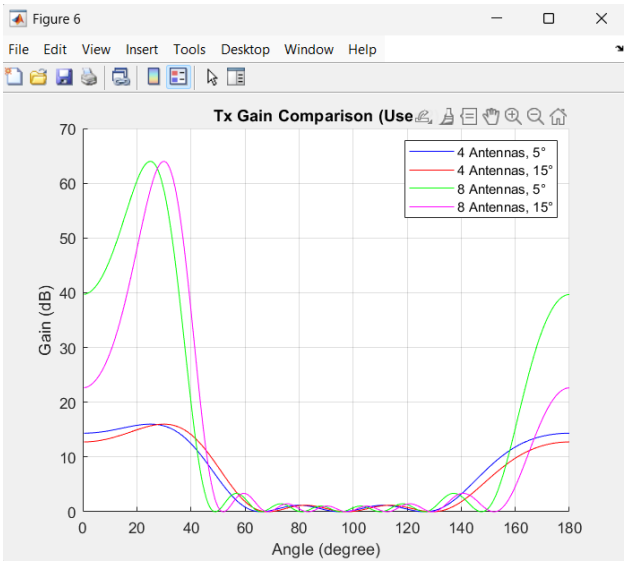
Figure 6
File Edit View Insert Tools Desktop Window Help
Tx Gain Comparison (Use
4 Antennas, 5°
4 Antennas, 15°
8 Antennas, 5°
8 Antennas, 15°
Gain (dB)
Angle (degree)

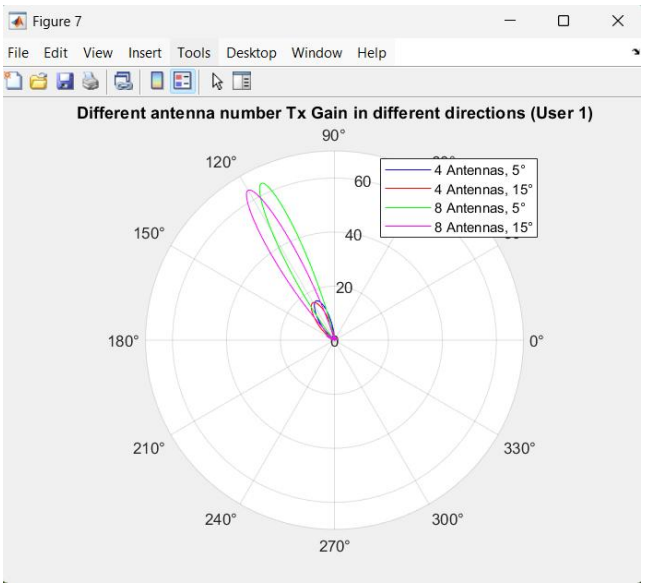
Figure 7
File Edit View Insert Tools Desktop Window Help
Different antenna number Tx Gain in different directions (User 1)
90°
120°
60
4 Antennas, 5°
4 Antennas, 15°
8 Antennas, 5°
8 Antennas, 15°
150°
40
20
180°
0°
210°
330°
240°
300°
270°

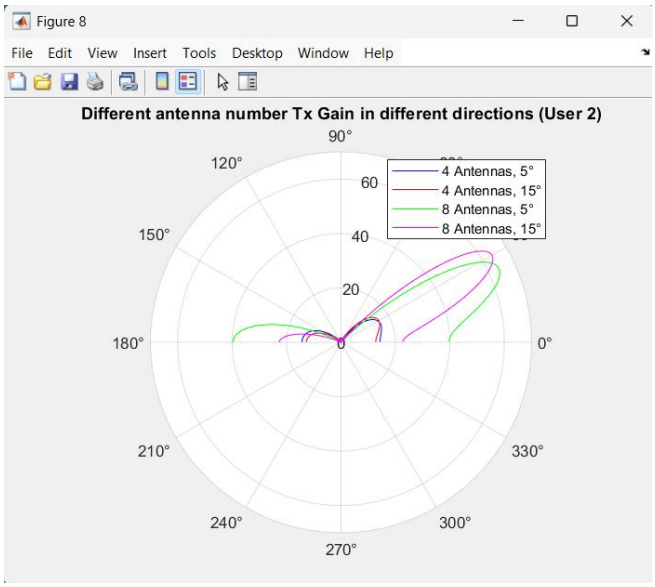
Figure 8
File Edit View Insert Tools Desktop Window Help
Different antenna number Tx Gain in different directions (User 2)
90°
120°
60
4 Antennas, 5°
4 Antennas, 15°
8 Antennas, 5°
8 Antennas, 15°
150°
40
20
180°
0°
210°
330°
240°
300°
270°