



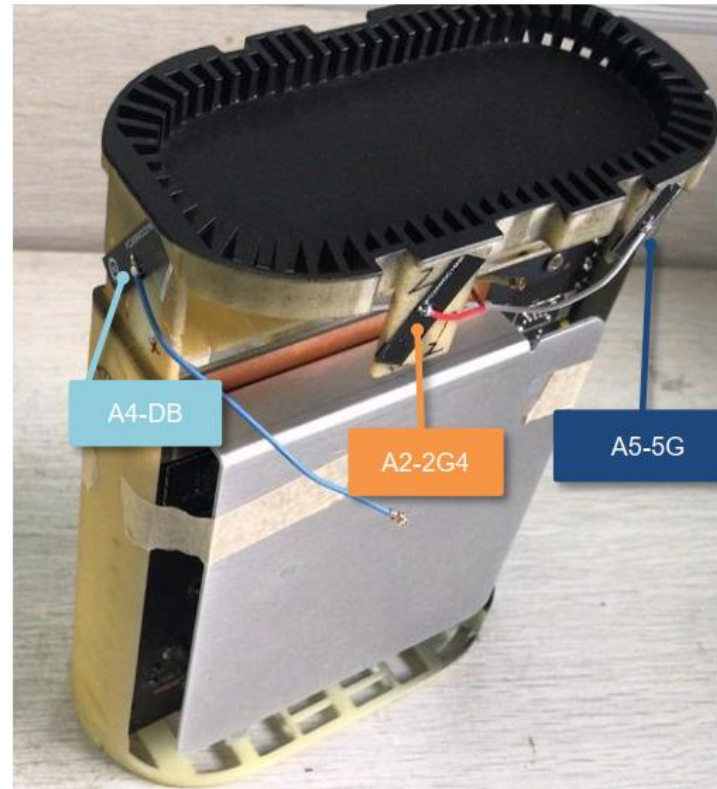
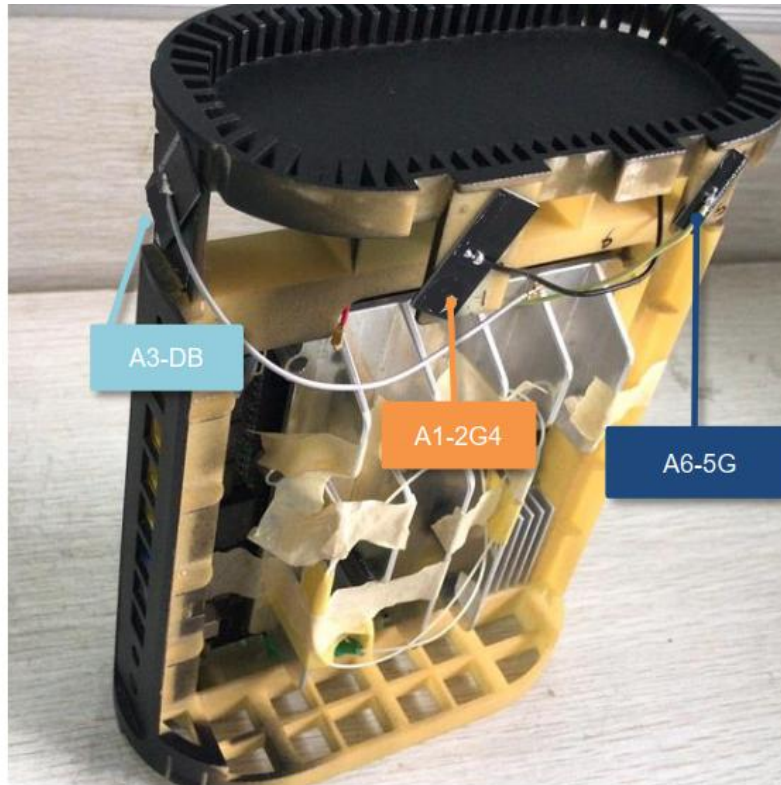
Antenna Gain Measurement for Nokia G6

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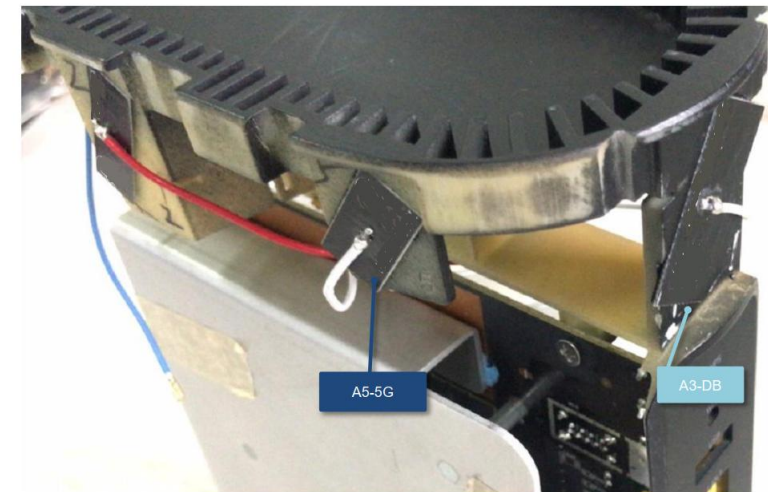
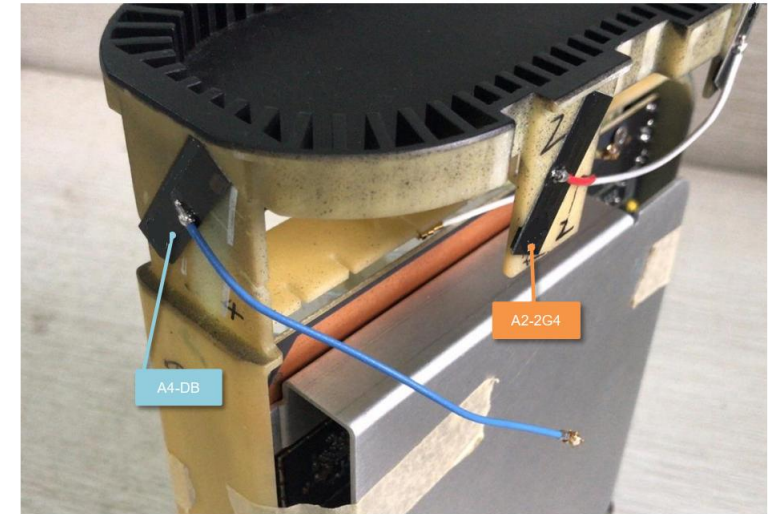
Antenna System description

- 6 x dipole type internal antennas and don't have beam steering
 - 2 x 2.4GHz band antennas
 - 2 x dual band(2.4GHz+5GHz) antennas
 - 2 x 5GHz band antennas



Antenna System Description

- Antenna system description:
 - A1,A2 - 2.4G band antennas
 - A3,A4 - dual band antennas (2.4GHz+5GHz)
 - A5,A6 – 5G band antennas



Measurement Quantity

- The composite gain is based on FCC document 662911. Part e (ii)

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;

N_{SS} = the number of independent spatial streams of data;

N_{ANT} = the total number of antennas

$g_{j,k} = 10^{G_k / 20}$ if the k th antenna is being fed by spatial stream j , or zero if it is not;

G_k is the gain in dBi of the k th antenna.

Reference: FCC document, “Emissions Testing of Transmitters with Multiple Outputs in the Same Band”, 662911 D01 Multiple Transmitter Output v02r01

2. Measurement Quantity

- The composite gain is based on FCC document 662911. Part d (ii)

d) *Unequal antenna gains, with equal transmit powers.* For antenna gains given by $G_1, G_2, \dots, G_N$ dBi

(ii) If all transmit signals are *completely uncorrelated*, then

$$\text{Directional gain} = 10 \log[(10^{G_1/10} + 10^{G_2/10} + \dots + 10^{G_N/10})/N_{\text{ANT}}] \text{ dBi}$$

Reference: FCC document, “Emissions Testing of Transmitters with Multiple Outputs in the Same Band”, 662911 D01 Multiple Transmitter Output v02r01

Measurement Method

- Use Gain-transfer method to perform directional gain measurement.

Measurement Environment

- CATR (Compact antenna test range)
 - MVG Satimo SG24 chamber
 - LxWxH : 5mx5mx5m
 - Measurement Frequency Range: 600MHz-6000MHz



Beamforming Gain

2.4G 非Beamforming												
Antenna Gain	2400				2450				2490			
	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4
	2.75	3.04	2.24	3.78	2.92	2.41	2.07	3.32	3.56	2.49	2.09	3.28
Power Direction Gain （the maximum individual antenna gain）	3.78				3.32				3.56			
PSD Direction Gain （direction gain）	5.90				5.80				5.80			
5G 非Beamforming												
Antenna Gain	5200				5500				5800			
	A3	A4	A5	A6	A3	A4	A5	A6	A3	A4	A5	A6
	3.37	4.54	3.24	3.97	3.71	3.24	3.25	4.08	3.61	2.89	4.37	4.69
Power Direction Gain （the maximum individual antenna gain）	4.54				4.08				4.69			
PSD Direction Gain （direction gain）	5.90				5.90				5.90			
2.4G Beamforming												
	2400				2450				2490			
Power Direction Gain （the maximum individual antenna gain）	3.78				3.32				3.56			
PSD Direction Gain （direction gain）	5.90				5.80				5.80			
5G Beamforming												
	5200				5500				5800			
Power Direction Gain （the maximum individual antenna gain）	4.54				4.08				4.69			
PSD Direction Gain （direction gain）	5.90				5.90				5.90			

