

Title: T-Mobile F5688W Antenna Qualification report ed04  
Reference: 31006587

## 5.5 WIFI Correlated Combined Gain (FCC Gain) and Beamforming Gain

We have calculated the WIFI Combined Gains, FCC Gains and Beamforming Gains with the measurements for all the antenna in ed04.

- 1) The H & V results are sorted for each antenna in separate pages (e.g. 0\_2G4\_H&V)
- 2) The absolute gain of each antenna is calculated with these formulas (e.g. 0\_2G4\_Abs\_dB):

$$P_H = 10^{P_{HdBm}}$$

$$P_V = 10^{P_{VdBm}}$$

$$G_{ant} = 10 * \log(P_H + P_V)$$

- 3) Combined, FCC and BF gain are calculated for all combinations of the antennas

$$Combined\ Gain_{i\_antennas} = 10 * \log\left(\frac{\left(10^{\frac{G_{anto}}{10}} + 10^{\frac{G_{ant1}}{10}} + 10^{\frac{G_{ant2}}{10}} + \dots + 10^{\frac{G_{ant\ i}}{10}}\right)}{Number\ of\ antennas}}\right)$$

$$FCC\ Gain_{i\_antennas} = 10 * \log\left(\frac{\left(10^{\frac{G_{anto}}{20}} + 10^{\frac{G_{ant1}}{20}} + 10^{\frac{G_{ant2}}{20}} + \dots + 10^{\frac{G_{ant\ i}}{20}}\right)^2}{Number\ of\ antennas}}\right)$$

$$BF\ Gain_{i\_antennas} = FCC\ Gain_{i\_antennas} - Combined\ Gain_{i\_antennas}$$

Table 13: Calculated WIFI Combined Gain, FCC Gain and Beamforming Gain with the measurements ed04

### MIMO4x4

	WIFI2G4 @ 2437MHz	WIFI5G UNII-1 @ 5180MHz	WIFI5G UNII-2A @ 5320MHz	WIFI5G UNII-2C @ 5700MHz	WIFI5G UNII-3 @ 5825MHz
Uncorrelated Combined Gain	0.31	0.10	0.12	-0.48	-0.39
Gain FCC (correlated Combined Gain)	5.88	5.42	4.90	4.61	4.89
BeamForming Gain	5.57	5.32	4.78	5.09	5.28