

# 5G Throughput data rate calculation using Python

Calculate 5G Throughput data rate calculation using Python. The 5G Throughput formula is below

## 5G Throughput formula

formula

$$\text{data rate (in Mbps)} = 10^{-6} \cdot \sum_{j=1}^J \left( v_{\text{Layers}}^{(j)} \cdot Q_m^{(j)} \cdot f^{(j)} \cdot R_{\text{max}} \cdot \frac{N_{\text{PRB}}^{BW(j), \mu}}{T_s^{\mu}} \cdot 12 \cdot \left( 1 - OH^{(j)} \right) \right)$$

Sum of carriers

Modulation order:  
2-QPSK,  
4-16QAM  
6-64QAM  
8-256QAM

Just a number  
948/1024

RB allocation  
(determined by subcarrier spacing,  
which can be elucidated from  
numerology  $\mu$ , and bandwidth)

Just a number  
12

Just a number  
1

Just a number  
0.000001

Number of  
layers (gNB Tx  
streams to UE)

Scaling factor:  
1, 0.8, 0.75, 0.4

Overhead:  
0.14 FR1 DL  
0.18 FR2 DL  
0.08 FR1 UL  
0.10 FR2 UL

Numerology:  
0-15kHz SCS  
1-30kHz SCS  
2-60kHz SCS

Formula: 3GPP TS 38.306 version 15.2.0 Release 15