

Different Cellular Bands, Data Rates, Service Providers, Standards and Polices

- **General Information on 3G, 4G, and 5G**

- ❖ 3G Cellular

- Data Rate: 2 Mbps [2]
- Technology: CDMA, WCDMA, WLAN, Bluetooth, UMTS, HSDPA [1]
- WEB Standard: www(IPv4) [2]
- Circuit: Packet except circuit for air interface [2]
- Throughput: For 3G:200Kbps; For 3.5G:1 to 3 Mbps [2]

- ❖ 4G Cellular

- Data Rate: 200 Mbps to 1 Gbps [2]
- Technology: 802.16e, WiMAX, LTE, 3GPP, MIMO, OFDM, 802.20 [1]
- WEB Standard: www (IPv4) [2]
- Circuit: Packet switching, Message Switching [2]
- Throughput: 100-300Mbps [2]

- ❖ 5G Cellular

- Data Rate: greater than 1 Gbps [2]
- Technology: Coming soon [1]
- WEB Standard: WWW (IPv6) [2]
- Circuit: Packet switching, Message Switching [2]
- Throughput (Proposed): Unified IP and seamless combination of broadband, Local area networks, wide area networks, personal area networks, wireless LAN [2]

- **T- Mobile (HSPA, HSPA +, LTE, UMTS, GSM)**

- 3G Cellular

- ❖ Download Speed: 2 Mb/s [4]
- ❖ Upload Speed: 0.3 Mb/s [4]
- ❖ Latency: 598 ms [4]
- ❖ Frequency: Band 4 (1700/2100 MHz) [3]

- 4G Cellular

- ❖ Download Speed: 8.6 Mb/s [4]
- ❖ Upload Speed: 3.8 Mb/s [4]
- ❖ Latency: 45 ms [4]
- ❖ Frequency: Band 2 (1900 MHz), Band 4 (1700/2100 MHz) [3]

- 4G LTE Cellular

- ❖ Download Speed: 8.6 Mb/s [4]
- ❖ Upload Speed: 3.8 Mb/s [4]

- ❖ Latency: 45 ms [4]
- ❖ Frequency: Band 2 (1900 MHz), Band 4 (1700/2100 MHz), Band 12 (700 MHz) [3]
- **AT&T** (HSPA, HSPAP, LTE, GSM)
 - 3G Cellular
 - ❖ Download Speed: 1.6 Mb/s [4]
 - ❖ Upload Speed: 0.3 Mb/s [4]
 - ❖ Latency: 586 ms [4]
 - ❖ Frequency: 850/1900 MHz [5]
 - 4G Cellular
 - ❖ Download Speed: 4.5 Mb/s [4]
 - ❖ Upload Speed: 2 Mb/s [4]
 - ❖ Latency: 48 ms [4]
 - ❖ Frequency: Band 2 (1900 MHz), Band 4 (1700/2100 MHz), Band 5 (850 MHz), Band 12 & 17 (700 MHz) [5]
- **Sprint** (CDMA, eHRPD, LTE, EVDO A)
 - 3G Cellular
 - ❖ Download Speed: 0.4 Mb/s [4]
 - ❖ Upload Speed: 0.3 Mb/s [4]
 - ❖ Latency: 283 ms [4]
 - ❖ Frequency: 800/1900 MHz [5]
 - 4G Cellular
 - ❖ Download Speed: 3.5 Mb/s [4]
 - ❖ Upload Speed: 2.6 Mb/s [4]
 - ❖ Latency: 44 ms [4]
 - ❖ Frequency: Band 25 (1900 MHz), Band 26 (800 MHz), Band 41 (2500 MHz) [5]
- **Verizon** (CDMA, LTE)
 - 3G Cellular
 - ❖ Download Speed: 600 Kbps to 1.4 Mbps [6]
 - ❖ Upload Speed: 500 Kbps to 800 Kbps [6]
 - ❖ Latency: 120 ms [6]
 - ❖ Frequency: 850/1900 MHz [5]
 - 4G Cellular

- ❖ Download Speed: 5 to 12 Mbps [6]
- ❖ Upload Speed: 2 to 5 Mbps [6]
- ❖ Latency: 50 ms [6]
- ❖ Frequency: Band 4 (1700/2100 MHz), Band 5 (850 MHz), Band 13 (700 MHz) [5]

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- [2] Jain, Vivek, Sanchit Jain, Lakshmi Kurup, and Aruna Gawade. "Overview on Generations of Network: 1G,2G,3G,4G,5G." IJCTA, 1 Sept. 2014. Web. 27 May 2015.
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- [3] "T-Mobile Network Coverage." T-Mobile Network Coverage Version History. T-Mobile, 27 May 2015. Web. 2 June 2015. <https://support.t-mobile.com/docs/DOC-4988>
- [4] "Sprint Coverage Maps." OpenSignal. Web. 2 June 2015.
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- [5] "Frequencies by Provider." Wilson Amplifiers, 12 Oct. 2014. Web. 2 June 2015.
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- [6] "Important Information About Verizon Wireless Broadband Internet Access Services." Important Information About Verizon Wireless Broadband Internet Access Services. Verizon. Web. 3 June 2015. <http://www.verizonwireless.com/support/broadband-services/>