IEEE P802.11
Wireless LANs

|  |
| --- |
| TGah D1.0 Comment Collections XX Resolutions on 24.5 Sections |
| Date: 2013-11-11 |
| Author(s): |
| Name | Affiliation | Address | Phone | Email |
| Eugene Baik | Qualcomm Technologies, Inc.  | 5775 Morehouse Dr. San Diego, CA 92122 | 858-658-2568 | eugeneb@qti.qualcomm.com |

Abstract: This document contains proposed resolutions for the following CIDs from TGah D1.0 Letter Ballot 200:

* ***Clause 24.5:*** 1771, 1780

##### CIDs for Clause 24.5

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| CID | Commenter | Section | Page | Line | Comment | Proposed Change | Resolution |
| 1771 | Eugene Baik | 24.5 | 358 | 26 | "Support for 4 ms GI is optional in all cases." Unit of ms seems to be wrong. | Replace "ms" with "us" in first sentence of line 26 in page 358. | Accept |
| 1780 | Eugene Baik | 24.5 | 358 | 21 | Not necessary in 11ah to require mulitple encoder streams for BCC because SIFS time has increased 10x. | Set the number of encoder streams (N\_es) to 1 in the MCS tables for all bandwidth and Nss cases | Accept |

Discussion:

* **For 11ac, MCS tables were defined such that:**
	+ Nes = 1 when resulting Data Rate < 600Mbps
	+ Additional encoder stream allocated for every 600Mbps increase in Data Rate
* **In 11ah draft text, MCS tables for >=2MHz are downclocked versions of 11ac >=20MHz MCS tables**
	+ Nes = 1 when resulting Data Rate < 60Mbps
	+ Additional encoder stream allocated for every 60Mbps increase in Data Rate
* **Original reasoning for Nes > 1 for high data rates was to ease hardware implementation:**
	+ Example: Viterbi Decoder latency for processing high data rate packets could be parallelized to meet SIFS time requirement for ACK response
* **For 11ah:**
	+ SIFS time is 10x longer than 11ac
	+ VDecs in 11ah will run much faster than simple 10x downclocks of 11ac implementations
	+ Propose to set Nes = 1 for all BW and Nss combinations

*TGah Editor: Please make the following CID1771 and CID 1780 changes for clause 24.5 highlighted in yellow:*

* 1. Parameters for S1G-MCSs

The rate-dependent parameters for 1 MHz, 2 MHz, 4 MHz, 8 MHz, and 16 MHz, Nss = 1,...,4 are given in Table 24-38 (S1G MCSs for 1MHz, Nss = 1) through Table 24-57 (S1G MCSs for 16MHz, Nss = 4). Support for 4 ~~ms~~ us GI is optional in all cases. Support for MCS 8 and 9 (when valid) is optional in all cases. An S1G AP-STA shall support single spatial stream MCSs within the range MCS 0 through MCS 7 for all channel widths for which it has indicated support regardless of the Tx or Rx Highest Supported Data Rate subfield values in the VHT Supported MCS Set field. An S1G non-AP-STA shall support single spatial stream MCSs within the range MCS 0 through MCS 2 for 1 and 2MHz channel widths. When more than one spatial stream is supported, the Tx or Rx Highest Supported Data Rate subfield values in the VHT Supported MCS Set field may result in a reduced MCS range (cut-off) for greater than one spatial stream. Support for 1MHz, 2 MHz with N ss = 1 is mandatory. Support for 1 and 2MHz with N ss = 2,3,4 is optional. Support for 4,8 and 16 MHz with N ss = 1,...,4 is optional.

**Table 24-38: S1G MCSs for 1MHz, Nss = 1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 24 | 2 | 24 | 12 | 1 | 300.0 | 333.3 |
| 1 | QPSK |  1/2 | 2 | 24 | 2 | 48 | 24 | 1 | 600.0 | 666.7 |
| 2 | QPSK |  3/4 | 2 | 24 | 2 | 48 | 36 | 1 | 900.0 | 1000.0 |
| 3 | 16-QAM |  1/2 | 4 | 24 | 2 | 96 | 48 | 1 | 1200.0 | 1333.3 |
| 4 | 16-QAM |  3/4 | 4 | 24 | 2 | 96 | 72 | 1 | 1800.0 | 2000.0 |
| 5 | 64-QAM |  2/3 | 6 | 24 | 2 | 144 | 96 | 1 | 2400.0 | 2666.7 |
| 6 | 64-QAM |  3/4 | 6 | 24 | 2 | 144 | 108 | 1 | 2700.0 | 3000.0 |
| 7 | 64-QAM |  5/6 | 6 | 24 | 2 | 144 | 120 | 1 | 3000.0 | 3333.3 |
| 8 | 256-QAM |  3/4 | 8 | 24 | 2 | 192 | 144 | 1 | 3600.0 | 4000.0 |
| 9 | 256-QAM |  5/6 | 8 | 24 | 2 | 192 | 160 | 1 | 4000.0 | 4444.4 |
| 10 | BPSK |  1/4 | 1 | 24 | 2 | 24 | 6 | 1 | 150.0 | 166.7 |

**Table24-39: S1G MCSs for 1MHz, Nss = 2**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 24 | 2 | 48 | 24  | 1 | 600.0 | 666.7 |
| 1 | QPSK |  1/2 | 2 | 24 | 2 | 96 | 48  | 1 | 1200.0 | 1333.3 |
| 2 | QPSK |  3/4 | 2 | 24 | 2 | 96 | 72  | 1 | 1800.0 | 2000.0 |
| 3 | 16-QAM |  1/2 | 4 | 24 | 2 | 192 | 96  | 1 | 2400.0 | 2666.7 |
| 4 | 16-QAM |  3/4 | 4 | 24 | 2 | 192 | 144  | 1 | 3600.0 | 4000.0 |
| 5 | 64-QAM |  2/3 | 6 | 24 | 2 | 288 | 192  | 1 | 4800.0 | 5333.3 |
| 6 | 64-QAM |  3/4 | 6 | 24 | 2 | 288 | 216  | 1 | 5400.0 | 6000.0 |
| 7 | 64-QAM |  5/6 | 6 | 24 | 2 | 288 | 240  | 1 | 6000.0 | 6666.7 |
| 8 | 256-QAM |  3/4 | 8 | 24 | 2 | 384 | 288  | 1 | 7200.0 | 8000.0 |
| 9 | 256-QAM |  5/6 | 8 | 24 | 2 | 384 | 320  | 1 | 8000.0 | 8888.9 |

**Table 24-40: S1G MCSs for 1MHz, Nss = 3**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 24 | 2 | 72 | 36  | 1 | 900.0 | 1000.0 |
| 1 | QPSK |  1/2 | 2 | 24 | 2 | 144 | 72  | 1 | 1800.0 | 2000.0 |
| 2 | QPSK |  3/4 | 2 | 24 | 2 | 144 | 108  | 1 | 2700.0 | 3000.0 |
| 3 | 16-QAM |  1/2 | 4 | 24 | 2 | 288 | 144  | 1 | 3600.0 | 4000.0 |
| 4 | 16-QAM |  3/4 | 4 | 24 | 2 | 288 | 216  | 1 | 5400.0 | 6000.0 |
| 5 | 64-QAM |  2/3 | 6 | 24 | 2 | 432 | 288  | 1 | 7200.0 | 8000.0 |
| 6 | 64-QAM |  3/4 | 6 | 24 | 2 | 432 | 324  | 1 | 8100.0 | 9000.0 |
| 7 | 64-QAM |  5/6 | 6 | 24 | 2 | 432 | 360  | 1 | 9000.0 | 10000.0 |
| 8 | 256-QAM |  3/4 | 8 | 24 | 2 | 576 | 432  | 1 | 10800.0 | 12000.0 |
| 9 | 256-QAM |  5/6 | 8 | 24 | 2 | 576 | 480  | 1 | 12000.0 | 13333.3 |

**Table 24-41: S1G MCSs for 1MHz, Nss = 4**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 24 | 2 | 96 | 48  | 1 | 1200.0 | 1333.3 |
| 1 | QPSK |  1/2 | 2 | 24 | 2 | 192 | 96  | 1 | 2400.0 | 2666.7 |
| 2 | QPSK |  3/4 | 2 | 24 | 2 | 192 | 144  | 1 | 3600.0 | 4000.0 |
| 3 | 16-QAM |  1/2 | 4 | 24 | 2 | 384 | 192  | 1 | 4800.0 | 5333.3 |
| 4 | 16-QAM |  3/4 | 4 | 24 | 2 | 384 | 288  | 1 | 7200.0 | 8000.0 |
| 5 | 64-QAM |  2/3 | 6 | 24 | 2 | 576 | 384  | 1 | 9600.0 | 10666.7 |
| 6 | 64-QAM |  3/4 | 6 | 24 | 2 | 576 | 432  | 1 | 10800.0 | 12000.0 |
| 7 | 64-QAM |  5/6 | 6 | 24 | 2 | 576 | 480  | 1 | 12000.0 | 13333.3 |
| 8 | 256-QAM |  3/4 | 8 | 24 | 2 | 768 | 576  | 1 | 14400.0 | 16000.0 |
| 9 | 256-QAM |  5/6 | 8 | 24 | 2 | 768 | 640  | 1 | 16000.0 | 17777.8 |

**Table 24-42: S1G MCSs for 2MHz, Nss = 1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 52 | 4 | 52 | 26  | 1 | 650.0 | 722.2 |
| 1 | QPSK |  1/2 | 2 | 52 | 4 | 104 | 52  | 1 | 1300.0 | 1444.4 |
| 2 | QPSK |  3/4 | 2 | 52 | 4 | 104 | 78  | 1 | 1950.0 | 2166.7 |
| 3 | 16-QAM |  1/2 | 4 | 52 | 4 | 208 | 104  | 1 | 2600.0 | 2888.9 |
| 4 | 16-QAM |  3/4 | 4 | 52 | 4 | 208 | 156  | 1 | 3900.0 | 4333.3 |
| 5 | 64-QAM |  2/3 | 6 | 52 | 4 | 312 | 208  | 1 | 5200.0 | 5777.8 |
| 6 | 64-QAM |  3/4 | 6 | 52 | 4 | 312 | 234  | 1 | 5850.0 | 6500.0 |
| 7 | 64-QAM |  5/6 | 6 | 52 | 4 | 312 | 260  | 1 | 6500.0 | 7222.2 |
| 8 | 256-QAM |  3/4 | 8 | 52 | 4 | 416 | 312  | 1 | 7800.0 | 8666.7 |
| 9 | Not valid |

**Table 24-43: S1G MCSs for 2MHz, Nss = 2**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 52 | 4 | 104 | 52  | 1 | 1300.0 | 1444.4 |
| 1 | QPSK |  1/2 | 2 | 52 | 4 | 208 | 104  | 1 | 2600.0 | 2888.9 |
| 2 | QPSK |  3/4 | 2 | 52 | 4 | 208 | 156  | 1 | 3900.0 | 4333.3 |
| 3 | 16-QAM |  1/2 | 4 | 52 | 4 | 416 | 208  | 1 | 5200.0 | 5777.8 |
| 4 | 16-QAM |  3/4 | 4 | 52 | 4 | 416 | 312  | 1 | 7800.0 | 8666.7 |
| 5 | 64-QAM |  2/3 | 6 | 52 | 4 | 624 | 416  | 1 | 10400.0 | 11555.6 |
| 6 | 64-QAM |  3/4 | 6 | 52 | 4 | 624 | 468  | 1 | 11700.0 | 13000.0 |
| 7 | 64-QAM |  5/6 | 6 | 52 | 4 | 624 | 520  | 1 | 13000.0 | 14444.4 |
| 8 | 256-QAM |  3/4 | 8 | 52 | 4 | 832 | 624  | 1 | 15600.0 | 17333.3 |
| 9 | Not valid |

**Table 24-44: S1G MCSs for 2MHz, Nss = 3**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 52 | 4 | 156 | 78  | 1 | 1950.0 | 2166.7 |
| 1 | QPSK |  1/2 | 2 | 52 | 4 | 312 | 156  | 1 | 3900.0 | 4333.3 |
| 2 | QPSK |  3/4 | 2 | 52 | 4 | 312 | 234  | 1 | 5850.0 | 6500.0 |
| 3 | 16-QAM |  1/2 | 4 | 52 | 4 | 624 | 312  | 1 | 7800.0 | 8666.7 |
| 4 | 16-QAM |  3/4 | 4 | 52 | 4 | 624 | 468  | 1 | 11700.0 | 13000.0 |
| 5 | 64-QAM |  2/3 | 6 | 52 | 4 | 936 | 624  | 1 | 15600.0 | 17333.3 |
| 6 | 64-QAM |  3/4 | 6 | 52 | 4 | 936 | 702  | 1 | 17550.0 | 19500.0 |
| 7 | 64-QAM |  5/6 | 6 | 52 | 4 | 936 | 780  | 1 | 19500.0 | 21666.7 |
| 8 | 256-QAM |  3/4 | 8 | 52 | 4 | 1248 | 936  | 1 | 23400.0 | 26000.0 |
| 9 | 256-QAM |  5/6 | 8 | 52 | 4 | 1248 | 1040  | 1 | 26000.0 | 28888.9 |

**Table 24-45: S1G MCSs for 2MHz, Nss = 4**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 52 | 4 | 208 | 104  | 1 | 2600.0 | 2888.9 |
| 1 | QPSK |  1/2 | 2 | 52 | 4 | 416 | 208  | 1 | 5200.0 | 5777.8 |
| 2 | QPSK |  3/4 | 2 | 52 | 4 | 416 | 312  | 1 | 7800.0 | 8666.7 |
| 3 | 16-QAM |  1/2 | 4 | 52 | 4 | 832 | 416  | 1 | 10400.0 | 11555.6 |
| 4 | 16-QAM |  3/4 | 4 | 52 | 4 | 832 | 624  | 1 | 15600.0 | 17333.3 |
| 5 | 64-QAM |  2/3 | 6 | 52 | 4 | 1248 | 832  | 1 | 20800.0 | 23111.1 |
| 6 | 64-QAM |  3/4 | 6 | 52 | 4 | 1248 | 936  | 1 | 23400.0 | 26000.0 |
| 7 | 64-QAM |  5/6 | 6 | 52 | 4 | 1248 | 1040  | 1 | 26000.0 | 28888.9 |
| 8 | 256-QAM |  3/4 | 8 | 52 | 4 | 1664 | 1248  | 1 | 31200.0 | 34666.7 |
| 9 | Not valid |

**Table 24-46: S1G MCSs for 4MHz, Nss = 1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 108 | 6 | 108 | 54  | 1 | 1350.0 | 1500.0 |
| 1 | QPSK |  1/2 | 2 | 108 | 6 | 216 | 108  | 1 | 2700.0 | 3000.0 |
| 2 | QPSK |  3/4 | 2 | 108 | 6 | 216 | 162  | 1 | 4050.0 | 4500.0 |
| 3 | 16-QAM |  1/2 | 4 | 108 | 6 | 432 | 216  | 1 | 5400.0 | 6000.0 |
| 4 | 16-QAM |  3/4 | 4 | 108 | 6 | 432 | 324  | 1 | 8100.0 | 9000.0 |
| 5 | 64-QAM |  2/3 | 6 | 108 | 6 | 648 | 432  | 1 | 10800.0 | 12000.0 |
| 6 | 64-QAM |  3/4 | 6 | 108 | 6 | 648 | 486  | 1 | 12150.0 | 13500.0 |
| 7 | 64-QAM |  5/6 | 6 | 108 | 6 | 648 | 540  | 1 | 13500.0 | 15000.0 |
| 8 | 256-QAM |  3/4 | 8 | 108 | 6 | 864 | 648  | 1 | 16200.0 | 18000.0 |
| 9 | 256-QAM |  5/6 | 8 | 108 | 6 | 864 | 720  | 1 | 18000.0 | 20000.0 |

**Table 24-47: S1G MCSs for 4MHz, Nss = 2**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 108 | 6 | 216 | 108  | 1 | 2700.0 | 3000.0 |
| 1 | QPSK |  1/2 | 2 | 108 | 6 | 432 | 216  | 1 | 5400.0 | 6000.0 |
| 2 | QPSK |  3/4 | 2 | 108 | 6 | 432 | 324  | 1 | 8100.0 | 9000.0 |
| 3 | 16-QAM |  1/2 | 4 | 108 | 6 | 864 | 432  | 1 | 10800.0 | 12000.0 |
| 4 | 16-QAM |  3/4 | 4 | 108 | 6 | 864 | 648  | 1 | 16200.0 | 18000.0 |
| 5 | 64-QAM |  2/3 | 6 | 108 | 6 | 1296 | 864  | 1 | 21600.0 | 24000.0 |
| 6 | 64-QAM |  3/4 | 6 | 108 | 6 | 1296 | 972  | 1 | 24300.0 | 27000.0 |
| 7 | 64-QAM |  5/6 | 6 | 108 | 6 | 1296 | 1080  | 1 | 27000.0 | 30000.0 |
| 8 | 256-QAM |  3/4 | 8 | 108 | 6 | 1728 | 1296  | 1 | 32400.0 | 36000.0 |
| 9 | 256-QAM |  5/6 | 8 | 108 | 6 | 1728 | 1440  | 1 | 36000.0 | 40000.0 |

**Table 24-48: S1G MCSs for 4MHz, Nss = 3**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 108 | 6 | 324 | 162  | 1 | 4050.0 | 4500.0 |
| 1 | QPSK |  1/2 | 2 | 108 | 6 | 648 | 324  | 1 | 8100.0 | 9000.0 |
| 2 | QPSK |  3/4 | 2 | 108 | 6 | 648 | 486  | 1 | 12150.0 | 13500.0 |
| 3 | 16-QAM |  1/2 | 4 | 108 | 6 | 1296 | 648  | 1 | 16200.0 | 18000.0 |
| 4 | 16-QAM |  3/4 | 4 | 108 | 6 | 1296 | 972  | 1 | 24300.0 | 27000.0 |
| 5 | 64-QAM |  2/3 | 6 | 108 | 6 | 1944 | 1296  | 1 | 32400.0 | 36000.0 |
| 6 | 64-QAM |  3/4 | 6 | 108 | 6 | 1944 | 1458  | 1 | 36450.0 | 40500.0 |
| 7 | 64-QAM |  5/6 | 6 | 108 | 6 | 1944 | 1620  | 1 | 40500.0 | 45000.0 |
| 8 | 256-QAM |  3/4 | 8 | 108 | 6 | 2592 | 1944  | 1 | 48600.0 | 54000.0 |
| 9 | 256-QAM |  5/6 | 8 | 108 | 6 | 2592 | 2160  | 1 | 54000.0 | 60000.0 |

**Table 24-49: S1G MCSs for 4MHz, Nss = 4**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 108 | 6 | 432 | 216  | 1 | 5400.0 | 6000.0 |
| 1 | QPSK |  1/2 | 2 | 108 | 6 | 864 | 432  | 1 | 10800.0 | 12000.0 |
| 2 | QPSK |  3/4 | 2 | 108 | 6 | 864 | 648  | 1 | 16200.0 | 18000.0 |
| 3 | 16-QAM |  1/2 | 4 | 108 | 6 | 1728 | 864  | 1 | 21600.0 | 24000.0 |
| 4 | 16-QAM |  3/4 | 4 | 108 | 6 | 1728 | 1296  | 1 | 32400.0 | 36000.0 |
| 5 | 64-QAM |  2/3 | 6 | 108 | 6 | 2592 | 1728  | 1 | 43200.0 | 48000.0 |
| 6 | 64-QAM |  3/4 | 6 | 108 | 6 | 2592 | 1944  | 1 | 48600.0 | 54000.0 |
| 7 | 64-QAM |  5/6 | 6 | 108 | 6 | 2592 | 2160  | 1 | 54000.0 | 60000.0 |
| 8 | 256-QAM |  3/4 | 8 | 108 | 6 | 3456 | 2592  | ~~2~~ 1 | 64800.0 | 72000.0 |
| 9 | 256-QAM |  5/6 | 8 | 108 | 6 | 3456 | 2880  | ~~2~~ 1 | 72000.0 | 80000.0 |

**Table 24-50: S1G MCSs for 8MHz, Nss = 1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 234 | 8 | 234 | 117  | 1 | 2925.0 | 3250.0 |
| 1 | QPSK |  1/2 | 2 | 234 | 8 | 468 | 234  | 1 | 5850.0 | 6500.0 |
| 2 | QPSK |  3/4 | 2 | 234 | 8 | 468 | 351  | 1 | 8775.0 | 9750.0 |
| 3 | 16-QAM |  1/2 | 4 | 234 | 8 | 936 | 468  | 1 | 11700.0 | 13000.0 |
| 4 | 16-QAM |  3/4 | 4 | 234 | 8 | 936 | 702  | 1 | 17550.0 | 19500.0 |
| 5 | 64-QAM |  2/3 | 6 | 234 | 8 | 1404 | 936  | 1 | 23400.0 | 26000.0 |
| 6 | 64-QAM |  3/4 | 6 | 234 | 8 | 1404 | 1053  | 1 | 26325.0 | 29250.0 |
| 7 | 64-QAM |  5/6 | 6 | 234 | 8 | 1404 | 1170  | 1 | 29250.0 | 32500.0 |
| 8 | 256-QAM |  3/4 | 8 | 234 | 8 | 1872 | 1404  | 1 | 35100.0 | 39000.0 |
| 9 | 256-QAM |  5/6 | 8 | 234 | 8 | 1872 | 1560  | 1 | 39000.0 | 43333.3 |

**Table 24-51: S1G MCSs for 8MHz, Nss = 2**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 234 | 8 | 468 | 234  | 1 | 5850.0 | 6500.0 |
| 1 | QPSK |  1/2 | 2 | 234 | 8 | 936 | 468  | 1 | 11700.0 | 13000.0 |
| 2 | QPSK |  3/4 | 2 | 234 | 8 | 936 | 702  | 1 | 17550.0 | 19500.0 |
| 3 | 16-QAM |  1/2 | 4 | 234 | 8 | 1872 | 936  | 1 | 23400.0 | 26000.0 |
| 4 | 16-QAM |  3/4 | 4 | 234 | 8 | 1872 | 1404  | 1 | 35100.0 | 39000.0 |
| 5 | 64-QAM |  2/3 | 6 | 234 | 8 | 2808 | 1872  | 1 | 46800.0 | 52000.0 |
| 6 | 64-QAM |  3/4 | 6 | 234 | 8 | 2808 | 2106  | 1 | 52650.0 | 58500.0 |
| 7 | 64-QAM |  5/6 | 6 | 234 | 8 | 2808 | 2340  | ~~2~~ 1 | 58500.0 | 65000.0 |
| 8 | 256-QAM |  3/4 | 8 | 234 | 8 | 3744 | 2808  | ~~2~~ 1 | 70200.0 | 78000.0 |
| 9 | 256-QAM |  5/6 | 8 | 234 | 8 | 3744 | 3120  | ~~2~~ 1 | 78000.0 | 86666.7 |

**Table 24-52: S1G MCSs for 8MHz, Nss = 3**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 234 | 8 | 702 | 351  | 1 | 8775.0 | 9750.0 |
| 1 | QPSK |  1/2 | 2 | 234 | 8 | 1404 | 702  | 1 | 17550.0 | 19500.0 |
| 2 | QPSK |  3/4 | 2 | 234 | 8 | 1404 | 1053  | 1 | 26325.0 | 29250.0 |
| 3 | 16-QAM |  1/2 | 4 | 234 | 8 | 2808 | 1404  | 1 | 35100.0 | 39000.0 |
| 4 | 16-QAM |  3/4 | 4 | 234 | 8 | 2808 | 2106  | 1 | 52650.0 | 58500.0 |
| 5 | 64-QAM |  2/3 | 6 | 234 | 8 | 4212 | 2808  | ~~2~~ 1 | 70200.0 | 78000.0 |
| ~~6~~ | ~~Not valid~~ |
| 6 | 64-QAM | ¾ | 6 | 234 | 8 | 4212 | 3159 | 1 | 78975.0 | 87750.0 |
| 7 | 64-QAM |  5/6 | 6 | 234 | 8 | 4212 | 3510  | ~~2~~ 1 | 87750.0 | 97500.0 |
| 8 | 256-QAM |  3/4 | 8 | 234 | 8 | 5616 | 4212  | ~~2~~ 1 | 105300.0 | 117000.0 |
| 9 | 256-QAM |  5/6 | 8 | 234 | 8 | 5616 | 4680  | ~~3~~ 1 | 117000.0 | 130000.0 |

**Table 24-53: S1G MCSs for 8MHz, Nss = 4**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 234 | 8 | 936 | 468  | 1 | 11700.0 | 13000.0 |
| 1 | QPSK |  1/2 | 2 | 234 | 8 | 1872 | 936  | 1 | 23400.0 | 26000.0 |
| 2 | QPSK |  3/4 | 2 | 234 | 8 | 1872 | 1404  | 1 | 35100.0 | 39000.0 |
| 3 | 16-QAM |  1/2 | 4 | 234 | 8 | 3744 | 1872  | 1 | 46800.0 | 52000.0 |
| 4 | 16-QAM |  3/4 | 4 | 234 | 8 | 3744 | 2808  | ~~2~~ 1 | 70200.0 | 78000.0 |
| 5 | 64-QAM |  2/3 | 6 | 234 | 8 | 5616 | 3744  | ~~2~~ 1 | 93600.0 | 104000.0 |
| 6 | 64-QAM |  3/4 | 6 | 234 | 8 | 5616 | 4212  | ~~2~~ 1 | 105300.0 | 117000.0 |
| 7 | 64-QAM |  5/6 | 6 | 234 | 8 | 5616 | 4680  | ~~3~~ 1 | 117000.0 | 130000.0 |
| 8 | 256-QAM |  3/4 | 8 | 234 | 8 | 7488 | 5616  | ~~3~~ 1 | 140400.0 | 156000.0 |
| 9 | 256-QAM |  5/6 | 8 | 234 | 8 | 7488 | 6240  | ~~3~~ 1 | 156000.0 | 173333.3 |

**Table 24-54: S1G MCSs for 16MHz, Nss = 1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 468 | 16 | 468 | 234  | 1 | 5850.0 | 6500.0 |
| 1 | QPSK |  1/2 | 2 | 468 | 16 | 936 | 468  | 1 | 11700.0 | 13000.0 |
| 2 | QPSK |  3/4 | 2 | 468 | 16 | 936 | 702  | 1 | 17550.0 | 19500.0 |
| 3 | 16-QAM |  1/2 | 4 | 468 | 16 | 1872 | 936  | 1 | 23400.0 | 26000.0 |
| 4 | 16-QAM |  3/4 | 4 | 468 | 16 | 1872 | 1404  | 1 | 35100.0 | 39000.0 |
| 5 | 64-QAM |  2/3 | 6 | 468 | 16 | 2808 | 1872  | 1 | 46800.0 | 52000.0 |
| 6 | 64-QAM |  3/4 | 6 | 468 | 16 | 2808 | 2106  | 1 | 52650.0 | 58500.0 |
| 7 | 64-QAM |  5/6 | 6 | 468 | 16 | 2808 | 2340  | ~~2~~ 1 | 58500.0 | 65000.0 |
| 8 | 256-QAM |  3/4 | 8 | 468 | 16 | 3744 | 2808  | ~~2~~ 1 | 70200.0 | 78000.0 |
| 9 | 256-QAM |  5/6 | 8 | 468 | 16 | 3744 | 3120  | ~~2~~ 1 | 78000.0 | 86666.7 |

**Table 24-55: S1G MCSs for 16MHz, Nss = 2**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 468 | 16 | 936 | 468  | 1 | 11700.0 | 13000.0 |
| 1 | QPSK |  1/2 | 2 | 468 | 16 | 1872 | 936  | 1 | 23400.0 | 26000.0 |
| 2 | QPSK |  3/4 | 2 | 468 | 16 | 1872 | 1404  | 1 | 35100.0 | 39000.0 |
| 3 | 16-QAM |  1/2 | 4 | 468 | 16 | 3744 | 1872  | 1 | 46800.0 | 52000.0 |
| 4 | 16-QAM |  3/4 | 4 | 468 | 16 | 3744 | 2808  | ~~2~~ 1 | 70200.0 | 78000.0 |
| 5 | 64-QAM |  2/3 | 6 | 468 | 16 | 5616 | 3744  | ~~2~~ 1 | 93600.0 | 104000.0 |
| 6 | 64-QAM |  3/4 | 6 | 468 | 16 | 5616 | 4212  | ~~2~~ 1 | 105300.0 | 117000.0 |
| 7 | 64-QAM |  5/6 | 6 | 468 | 16 | 5616 | 4680  | ~~3~~ 1 | 117000.0 | 130000.0 |
| 8 | 256-QAM |  3/4 | 8 | 468 | 16 | 7488 | 5616  | ~~3~~ 1 | 140400.0 | 156000.0 |
| 9 | 256-QAM |  5/6 | 8 | 468 | 16 | 7488 | 6240  | ~~3~~ 1 | 156000.0 | 173333.3 |

**Table 24-56: S1G MCSs for 16MHz, Nss = 3**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 468 | 16 | 1404 | 702  | 1 | 17550.0 | 19500.0 |
| 1 | QPSK |  1/2 | 2 | 468 | 16 | 2808 | 1404  | 1 | 35100.0 | 39000.0 |
| 2 | QPSK |  3/4 | 2 | 468 | 16 | 2808 | 2106  | 1 | 52650.0 | 58500.0 |
| 3 | 16-QAM |  1/2 | 4 | 468 | 16 | 5616 | 2808  | ~~2~~ 1 | 70200.0 | 78000.0 |
| 4 | 16-QAM |  3/4 | 4 | 468 | 16 | 5616 | 4212  | ~~2~~ 1 | 105300.0 | 117000.0 |
| 5 | 64-QAM |  2/3 | 6 | 468 | 16 | 8424 | 5616  | ~~3~~ 1 | 140400.0 | 156000.0 |
| 6 | 64-QAM |  3/4 | 6 | 468 | 16 | 8424 | 6318  | ~~3~~ 1 | 157950.0 | 175500.0 |
| 7 | 64-QAM |  5/6 | 6 | 468 | 16 | 8424 | 7020  | ~~4~~ 1 | 175500.0 | 195000.0 |
| 8 | 256-QAM |  3/4 | 8 | 468 | 16 | 11232 | 8424  | ~~4~~ 1 | 210600.0 | 234000.0 |
| 9 | 256-QAM | 5/6 | 8 | 468 | 16 | 11232 | 9360 | 1 | 234000.0 | 260000.0 |
| ~~9~~ | ~~Not valid~~ |

**Table 24-57: S1G MCSs for 16MHz, Nss = 4**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MCS Idx | Mod | R | N\_bpscs | N\_sd | N\_sp | N\_cbps | N\_dbps | N\_es | Data\_rate (Kbps) |
| 8us GI | 4us GI |
| 0 | BPSK |  1/2 | 1 | 468 | 16 | 1872 | 936  | 1 | 23400.0 | 26000.0 |
| 1 | QPSK |  1/2 | 2 | 468 | 16 | 3744 | 1872  | 1 | 46800.0 | 52000.0 |
| 2 | QPSK |  3/4 | 2 | 468 | 16 | 3744 | 2808  | ~~2~~ 1 | 70200.0 | 78000.0 |
| 3 | 16-QAM |  1/2 | 4 | 468 | 16 | 7488 | 3744  | ~~2~~ 1 | 93600.0 | 104000.0 |
| 4 | 16-QAM |  3/4 | 4 | 468 | 16 | 7488 | 5616  | ~~3~~ 1 | 140400.0 | 156000.0 |
| 5 | 64-QAM |  2/3 | 6 | 468 | 16 | 11232 | 7488  | ~~4~~ 1 | 187200.0 | 208000.0 |
| 6 | 64-QAM |  3/4 | 6 | 468 | 16 | 11232 | 8424  | ~~4~~ 1 | 210600.0 | 234000.0 |
| 7 | 64-QAM |  5/6 | 6 | 468 | 16 | 11232 | 9360  | ~~6~~ 1 | 234000.0 | 260000.0 |
| 8 | 256-QAM |  3/4 | 8 | 468 | 16 | 14976 | 11232  | ~~6~~ 1 | 280800.0 | 312000.0 |
| 9 | 256-QAM |  5/6 | 8 | 468 | 16 | 14976 | 12480  | ~~6~~ 1 | 312000.0 | 346666.7 |