









































































































## Appendix F: Frequency Stability

### Test Result

#### Channel Bandwidth: 1.4 MHz

| Channel Bandwidth: 1.4 MHz |         |               |                  |                |                 |             |         |
|----------------------------|---------|---------------|------------------|----------------|-----------------|-------------|---------|
| Voltage                    |         |               |                  |                |                 |             |         |
| Modulation                 | Channel | Voltage [Vdc] | Temperature (°C) | Deviation (Hz) | Deviation (ppm) | Limit (ppm) | Verdict |
| QPSK                       | LCH     | VL            | TN               | 3.6            | 0.002104        | ± 2.5       | PASS    |
|                            |         | VN            | TN               | 4.42           | 0.002584        | ± 2.5       | PASS    |
|                            |         | VH            | TN               | 3.86           | 0.002256        | ± 2.5       | PASS    |
|                            | MCH     | VL            | TN               | 2.5            | 0.001443        | ± 2.5       | PASS    |
|                            |         | VN            | TN               | 0.25           | 0.000144        | ± 2.5       | PASS    |
|                            |         | VH            | TN               | -1.08          | -0.000623       | ± 2.5       | PASS    |
|                            | HCH     | VL            | TN               | 2.06           | 0.001174        | ± 2.5       | PASS    |
|                            |         | VN            | TN               | 3.59           | 0.002046        | ± 2.5       | PASS    |
|                            |         | VH            | TN               | -1.57          | -0.000895       | ± 2.5       | PASS    |
| 16QAM                      | LCH     | VL            | TN               | 4.75           | 0.002777        | ± 2.5       | PASS    |
|                            |         | VN            | TN               | 4.35           | 0.002543        | ± 2.5       | PASS    |
|                            |         | VH            | TN               | 2.86           | 0.001672        | ± 2.5       | PASS    |
|                            | MCH     | VL            | TN               | 2.91           | 0.001680        | ± 2.5       | PASS    |
|                            |         | VN            | TN               | 0.89           | 0.000514        | ± 2.5       | PASS    |
|                            |         | VH            | TN               | 0.21           | 0.000121        | ± 2.5       | PASS    |
|                            | HCH     | VL            | TN               | 0.38           | 0.000217        | ± 2.5       | PASS    |
|                            |         | VN            | TN               | 2.96           | 0.001687        | ± 2.5       | PASS    |
|                            |         | VH            | TN               | 1.41           | 0.000804        | ± 2.5       | PASS    |
| Temperature                |         |               |                  |                |                 |             |         |
| Modulation                 | Channel | Voltage [Vdc] | Temperature (°C) | Deviation (Hz) | Deviation (ppm) | Limit (ppm) | Verdict |
| QPSK                       | LCH     | VN            | -30              | 4.83           | 0.002823        | ± 2.5       | PASS    |
|                            |         | VN            | -20              | 0.66           | 0.000386        | ± 2.5       | PASS    |
|                            |         | VN            | -10              | 3.15           | 0.001841        | ± 2.5       | PASS    |
|                            |         | VN            | 0                | 3.35           | 0.001958        | ± 2.5       | PASS    |
|                            |         | VN            | 10               | 4.48           | 0.002619        | ± 2.5       | PASS    |
|                            |         | VN            | 20               | 1.42           | 0.000830        | ± 2.5       | PASS    |
|                            |         | VN            | 30               | -1.49          | -0.000871       | ± 2.5       | PASS    |
|                            |         | VN            | 40               | -0.22          | -0.000129       | ± 2.5       | PASS    |
|                            |         | VN            | 50               | -1.12          | -0.000655       | ± 2.5       | PASS    |
|                            | MCH     | VN            | -30              | 4.59           | 0.002649        | ± 2.5       | PASS    |
|                            |         | VN            | -20              | 2.16           | 0.001247        | ± 2.5       | PASS    |

|       |     |    |     |       |           |           |      |
|-------|-----|----|-----|-------|-----------|-----------|------|
|       | HCH | VN | -10 | -0.96 | -0.000554 | $\pm 2.5$ | PASS |
|       |     | VN | 0   | -0.17 | -0.000098 | $\pm 2.5$ | PASS |
|       |     | VN | 10  | -0.2  | -0.000115 | $\pm 2.5$ | PASS |
|       |     | VN | 20  | 0.71  | 0.000410  | $\pm 2.5$ | PASS |
|       |     | VN | 30  | -0.07 | -0.000040 | $\pm 2.5$ | PASS |
|       |     | VN | 40  | 4.15  | 0.002395  | $\pm 2.5$ | PASS |
|       |     | VN | 50  | 1.95  | 0.001126  | $\pm 2.5$ | PASS |
|       |     | VN | -30 | 3.13  | 0.001784  | $\pm 2.5$ | PASS |
|       |     | VN | -20 | 4.42  | 0.002520  | $\pm 2.5$ | PASS |
|       |     | VN | -10 | 4.34  | 0.002474  | $\pm 2.5$ | PASS |
| 16QAM | LCH | VN | 0   | 0.78  | 0.000445  | $\pm 2.5$ | PASS |
|       |     | VN | 10  | 4.07  | 0.002320  | $\pm 2.5$ | PASS |
|       |     | VN | 20  | 3.63  | 0.002069  | $\pm 2.5$ | PASS |
|       |     | VN | 30  | 3.52  | 0.002006  | $\pm 2.5$ | PASS |
|       |     | VN | 40  | -0.97 | -0.000553 | $\pm 2.5$ | PASS |
|       |     | VN | 50  | 1.01  | 0.000576  | $\pm 2.5$ | PASS |
|       |     | VN | -30 | -1.54 | -0.000900 | $\pm 2.5$ | PASS |
|       |     | VN | -20 | 3.9   | 0.002280  | $\pm 2.5$ | PASS |
|       |     | VN | -10 | 2.99  | 0.001748  | $\pm 2.5$ | PASS |
|       | MCH | VN | 0   | 2.51  | 0.001467  | $\pm 2.5$ | PASS |
|       |     | VN | 10  | -1.27 | -0.000742 | $\pm 2.5$ | PASS |
|       |     | VN | 20  | -0.47 | -0.000275 | $\pm 2.5$ | PASS |
|       |     | VN | 30  | 1.31  | 0.000766  | $\pm 2.5$ | PASS |
|       |     | VN | 40  | -0.74 | -0.000433 | $\pm 2.5$ | PASS |
|       |     | VN | 50  | 2.03  | 0.001187  | $\pm 2.5$ | PASS |
|       |     | VN | -30 | 1.1   | 0.000627  | $\pm 2.5$ | PASS |
|       |     | VN | -20 | 1.03  | 0.000587  | $\pm 2.5$ | PASS |
|       |     | VN | -10 | -1.19 | -0.000678 | $\pm 2.5$ | PASS |
|       |     | VN | 0   | 3.23  | 0.001841  | $\pm 2.5$ | PASS |
|       | HCH | VN | 10  | -0.98 | -0.000559 | $\pm 2.5$ | PASS |
|       |     | VN | 20  | 2.32  | 0.001322  | $\pm 2.5$ | PASS |
|       |     | VN | 30  | 3.1   | 0.001767  | $\pm 2.5$ | PASS |
|       |     | VN | 40  | -0.87 | -0.000496 | $\pm 2.5$ | PASS |
|       |     | VN | 50  | 0.16  | 0.000091  | $\pm 2.5$ | PASS |
|       |     | VN | -30 | 2.13  | 0.001214  | $\pm 2.5$ | PASS |
|       |     | VN | -20 | 3.78  | 0.002155  | $\pm 2.5$ | PASS |

|  |  |    |    |      |          |           |      |
|--|--|----|----|------|----------|-----------|------|
|  |  | VN | 40 | 3.02 | 0.001721 | $\pm 2.5$ | PASS |
|  |  | VN | 50 | 0.73 | 0.000416 | $\pm 2.5$ | PASS |

### Channel Bandwidth: 3 MHz

| Channel Bandwidth: 3 MHz+ |         |               |                  |                |                 |             |         |
|---------------------------|---------|---------------|------------------|----------------|-----------------|-------------|---------|
| Voltage                   |         |               |                  |                |                 |             |         |
| Modulation                | Channel | Voltage [Vdc] | Temperature (°C) | Deviation (Hz) | Deviation (ppm) | Limit (ppm) | Verdict |
| QPSK                      | LCH     | VL            | TN               | -1.19          | -0.000695       | $\pm 2.5$   | PASS    |
|                           |         | VN            | TN               | 1.87           | 0.001093        | $\pm 2.5$   | PASS    |
|                           |         | VH            | TN               | 4.62           | 0.002699        | $\pm 2.5$   | PASS    |
|                           | MCH     | VL            | TN               | -1.35          | -0.000779       | $\pm 2.5$   | PASS    |
|                           |         | VN            | TN               | 2.27           | 0.001310        | $\pm 2.5$   | PASS    |
|                           |         | VH            | TN               | 4.61           | 0.002661        | $\pm 2.5$   | PASS    |
|                           | HCH     | VL            | TN               | -1.27          | -0.000724       | $\pm 2.5$   | PASS    |
|                           |         | VN            | TN               | 2.55           | 0.001454        | $\pm 2.5$   | PASS    |
|                           |         | VH            | TN               | 0.65           | 0.000371        | $\pm 2.5$   | PASS    |
| 16QAM                     | LCH     | VL            | TN               | 4.97           | 0.002904        | $\pm 2.5$   | PASS    |
|                           |         | VN            | TN               | -0.23          | -0.000134       | $\pm 2.5$   | PASS    |
|                           |         | VH            | TN               | 3.89           | 0.002273        | $\pm 2.5$   | PASS    |
|                           | MCH     | VL            | TN               | 1.73           | 0.000999        | $\pm 2.5$   | PASS    |
|                           |         | VN            | TN               | 3.43           | 0.001980        | $\pm 2.5$   | PASS    |
|                           |         | VH            | TN               | 0.27           | 0.000156        | $\pm 2.5$   | PASS    |
|                           | HCH     | VL            | TN               | -1.9           | -0.001084       | $\pm 2.5$   | PASS    |
|                           |         | VN            | TN               | -1             | -0.000570       | $\pm 2.5$   | PASS    |
|                           |         | VH            | TN               | -1.82          | -0.001038       | $\pm 2.5$   | PASS    |
| Temperature               |         |               |                  |                |                 |             |         |
| Modulation                | Channel | Voltage [Vdc] | Temperature (°C) | Deviation (Hz) | Deviation (ppm) | Limit (ppm) | Verdict |
| QPSK                      | LCH     | VN            | -30              | -1.95          | -0.001139       | $\pm 2.5$   | PASS    |
|                           |         | VN            | -20              | 4.7            | 0.002746        | $\pm 2.5$   | PASS    |
|                           |         | VN            | -10              | 0.69           | 0.000403        | $\pm 2.5$   | PASS    |
|                           |         | VN            | 0                | 4.14           | 0.002419        | $\pm 2.5$   | PASS    |
|                           |         | VN            | 10               | 1.34           | 0.000783        | $\pm 2.5$   | PASS    |
|                           |         | VN            | 20               | 4.05           | 0.002366        | $\pm 2.5$   | PASS    |
|                           |         | VN            | 30               | 1.31           | 0.000765        | $\pm 2.5$   | PASS    |
|                           |         | VN            | 40               | 1.32           | 0.000771        | $\pm 2.5$   | PASS    |
|                           |         | VN            | 50               | -1.22          | -0.000713       | $\pm 2.5$   | PASS    |
|                           | MCH     | VN            | -30              | -1.81          | -0.001045       | $\pm 2.5$   | PASS    |
|                           |         | VN            | -20              | 1.82           | 0.001051        | $\pm 2.5$   | PASS    |
|                           |         | VN            | -10              | 2.59           | 0.001495        | $\pm 2.5$   | PASS    |

|  |     |    |     |       |           |           |      |
|--|-----|----|-----|-------|-----------|-----------|------|
|  |     | VN | 0   | 3.64  | 0.002101  | $\pm 2.5$ | PASS |
|  |     | VN | 10  | 2.59  | 0.001495  | $\pm 2.5$ | PASS |
|  |     | VN | 20  | 1.81  | 0.001045  | $\pm 2.5$ | PASS |
|  |     | VN | 30  | 4.29  | 0.002476  | $\pm 2.5$ | PASS |
|  |     | VN | 40  | 1.78  | 0.001027  | $\pm 2.5$ | PASS |
|  |     | VN | 50  | 4.4   | 0.002540  | $\pm 2.5$ | PASS |
|  |     | VN | -30 | 2.64  | 0.001506  | $\pm 2.5$ | PASS |
|  |     | VN | -20 | 2.81  | 0.001603  | $\pm 2.5$ | PASS |
|  |     | VN | -10 | -1.16 | -0.000662 | $\pm 2.5$ | PASS |
|  |     | VN | 0   | 1.18  | 0.000673  | $\pm 2.5$ | PASS |
|  | HCH | VN | 10  | 0.29  | 0.000165  | $\pm 2.5$ | PASS |
|  |     | VN | 20  | 1.01  | 0.000576  | $\pm 2.5$ | PASS |
|  |     | VN | 30  | 0.63  | 0.000359  | $\pm 2.5$ | PASS |
|  |     | VN | 40  | -1.17 | -0.000667 | $\pm 2.5$ | PASS |
|  |     | VN | 50  | -1.73 | -0.000987 | $\pm 2.5$ | PASS |
|  |     | VN | -30 | -1.49 | -0.000860 | $\pm 2.5$ | PASS |
|  |     | VN | -20 | 2.11  | 0.001218  | $\pm 2.5$ | PASS |
|  |     | VN | -10 | 4.29  | 0.002476  | $\pm 2.5$ | PASS |
|  |     | VN | 0   | 3.07  | 0.001772  | $\pm 2.5$ | PASS |
|  |     | VN | 10  | 2.14  | 0.001235  | $\pm 2.5$ | PASS |
|  | LCH | VN | 20  | 3.85  | 0.002222  | $\pm 2.5$ | PASS |
|  |     | VN | 30  | -0.72 | -0.000416 | $\pm 2.5$ | PASS |
|  |     | VN | 40  | -0.02 | -0.000012 | $\pm 2.5$ | PASS |
|  |     | VN | 50  | -1.76 | -0.001016 | $\pm 2.5$ | PASS |
|  |     | VN | -30 | -0.98 | -0.000559 | $\pm 2.5$ | PASS |
|  |     | VN | -20 | 2.48  | 0.001414  | $\pm 2.5$ | PASS |
|  |     | VN | -10 | -1.16 | -0.000662 | $\pm 2.5$ | PASS |
|  |     | VN | 0   | 1.96  | 0.001118  | $\pm 2.5$ | PASS |
|  |     | VN | 10  | -1.2  | -0.000684 | $\pm 2.5$ | PASS |
|  |     | VN | 20  | 2.5   | 0.001426  | $\pm 2.5$ | PASS |
|  | MCH | VN | 30  | 3.92  | 0.002236  | $\pm 2.5$ | PASS |
|  |     | VN | 40  | -0.77 | -0.000439 | $\pm 2.5$ | PASS |
|  |     | VN | 50  | -1.95 | -0.001112 | $\pm 2.5$ | PASS |
|  |     | VN | -30 | 0.81  | 0.000462  | $\pm 2.5$ | PASS |
|  |     | VN | -20 | -0.02 | -0.000011 | $\pm 2.5$ | PASS |
|  |     | VN | -10 | 3.95  | 0.002253  | $\pm 2.5$ | PASS |
|  |     | VN | 0   | 3.15  | 0.001796  | $\pm 2.5$ | PASS |
|  |     | VN | 10  | 1.84  | 0.001049  | $\pm 2.5$ | PASS |
|  |     | VN | 20  | 3.56  | 0.002030  | $\pm 2.5$ | PASS |
|  |     | VN | 30  | 4.7   | 0.002680  | $\pm 2.5$ | PASS |
|  | HCH | VN | 40  | 1.99  | 0.001135  | $\pm 2.5$ | PASS |

|  |  |    |    |      |          |           |      |
|--|--|----|----|------|----------|-----------|------|
|  |  | VN | 50 | 3.29 | 0.001876 | $\pm 2.5$ | PASS |
|--|--|----|----|------|----------|-----------|------|

## Channel Bandwidth: 5 MHz

| Channel Bandwidth: 5 MHz |         |               |                  |                |                 |             |         |
|--------------------------|---------|---------------|------------------|----------------|-----------------|-------------|---------|
| Voltage                  |         |               |                  |                |                 |             |         |
| Modulation               | Channel | Voltage [Vdc] | Temperature (°C) | Deviation (Hz) | Deviation (ppm) | Limit (ppm) | Verdict |
| QPSK                     | LCH     | VL            | TN               | 4.67           | 0.002727        | $\pm 2.5$   | PASS    |
|                          |         | VN            | TN               | 4.77           | 0.002787        | $\pm 2.5$   | PASS    |
|                          |         | VH            | TN               | 0.64           | 0.000374        | $\pm 2.5$   | PASS    |
|                          | MCH     | VL            | TN               | 0.47           | 0.000271        | $\pm 2.5$   | PASS    |
|                          |         | VN            | TN               | -0.03          | -0.000017       | $\pm 2.5$   | PASS    |
|                          |         | VH            | TN               | -0.2           | -0.000115       | $\pm 2.5$   | PASS    |
|                          | HCH     | VL            | TN               | 4.26           | 0.002429        | $\pm 2.5$   | PASS    |
|                          |         | VN            | TN               | 0.15           | 0.000086        | $\pm 2.5$   | PASS    |
|                          |         | VH            | TN               | 4.08           | 0.002327        | $\pm 2.5$   | PASS    |
| 16QAM                    | LCH     | VL            | TN               | 4.61           | 0.002694        | $\pm 2.5$   | PASS    |
|                          |         | VN            | TN               | 0.52           | 0.000304        | $\pm 2.5$   | PASS    |
|                          |         | VH            | TN               | 2.55           | 0.001490        | $\pm 2.5$   | PASS    |
|                          | MCH     | VL            | TN               | 4.92           | 0.002840        | $\pm 2.5$   | PASS    |
|                          |         | VN            | TN               | 4.96           | 0.002863        | $\pm 2.5$   | PASS    |
|                          |         | VH            | TN               | 0.06           | 0.000035        | $\pm 2.5$   | PASS    |
|                          | HCH     | VL            | TN               | 0.29           | 0.000165        | $\pm 2.5$   | PASS    |
|                          |         | VN            | TN               | 3.74           | 0.002133        | $\pm 2.5$   | PASS    |
|                          |         | VH            | TN               | -1.3           | -0.000741       | $\pm 2.5$   | PASS    |
| Temperature              |         |               |                  |                |                 |             |         |
| Modulation               | Channel | Voltage [Vdc] | Temperature (°C) | Deviation (Hz) | Deviation (ppm) | Limit (ppm) | Verdict |
| QPSK                     | LCH     | VN            | -30              | 3.89           | 0.002272        | $\pm 2.5$   | PASS    |
|                          |         | VN            | -20              | 2.28           | 0.001331        | $\pm 2.5$   | PASS    |
|                          |         | VN            | -10              | 3.95           | 0.002307        | $\pm 2.5$   | PASS    |
|                          |         | VN            | 0                | 4.69           | 0.002739        | $\pm 2.5$   | PASS    |
|                          |         | VN            | 10               | 2.05           | 0.001197        | $\pm 2.5$   | PASS    |
|                          |         | VN            | 20               | 3.11           | 0.001816        | $\pm 2.5$   | PASS    |
|                          |         | VN            | 30               | -0.43          | -0.000251       | $\pm 2.5$   | PASS    |
|                          |         | VN            | 40               | 4.92           | 0.002873        | $\pm 2.5$   | PASS    |
|                          |         | VN            | 50               | -0.86          | -0.000502       | $\pm 2.5$   | PASS    |
|                          | MCH     | VN            | -30              | 3.43           | 0.001980        | $\pm 2.5$   | PASS    |
|                          |         | VN            | -20              | 4.3            | 0.002482        | $\pm 2.5$   | PASS    |
|                          |         | VN            | -10              | 1.44           | 0.000831        | $\pm 2.5$   | PASS    |
|                          |         | VN            | 0                | 4.85           | 0.002799        | $\pm 2.5$   | PASS    |

|  |  |    |     |       |           |           |      |
|--|--|----|-----|-------|-----------|-----------|------|
|  |  | VN | 10  | 3.32  | 0.001916  | $\pm 2.5$ | PASS |
|  |  | VN | 20  | -1.2  | -0.000693 | $\pm 2.5$ | PASS |
|  |  | VN | 30  | -0.76 | -0.000439 | $\pm 2.5$ | PASS |
|  |  | VN | 40  | -1.81 | -0.001045 | $\pm 2.5$ | PASS |
|  |  | VN | 50  | 3.47  | 0.002003  | $\pm 2.5$ | PASS |
|  |  | VN | -30 | 3.06  | 0.001746  | $\pm 2.5$ | PASS |
|  |  | VN | -20 | -1.06 | -0.000556 | $\pm 2.5$ | PASS |
|  |  | VN | -10 | -0.19 | -0.000100 | $\pm 2.5$ | PASS |
|  |  | VN | 0   | -1.21 | -0.000634 | $\pm 2.5$ | PASS |
|  |  | VN | 10  | 1.13  | 0.000592  | $\pm 2.5$ | PASS |
|  |  | VN | 20  | 4.9   | 0.002569  | $\pm 2.5$ | PASS |
|  |  | VN | 30  | 2.52  | 0.001321  | $\pm 2.5$ | PASS |
|  |  | VN | 40  | 1.69  | 0.000886  | $\pm 2.5$ | PASS |
|  |  | VN | 50  | -1.93 | -0.001012 | $\pm 2.5$ | PASS |
|  |  | VN | -30 | 3.75  | 0.002165  | $\pm 2.5$ | PASS |
|  |  | VN | -20 | 2.06  | 0.001189  | $\pm 2.5$ | PASS |
|  |  | VN | -10 | -0.28 | -0.000162 | $\pm 2.5$ | PASS |
|  |  | VN | 0   | 4.88  | 0.002817  | $\pm 2.5$ | PASS |
|  |  | VN | 10  | 1.73  | 0.000999  | $\pm 2.5$ | PASS |
|  |  | VN | 20  | 1.59  | 0.000918  | $\pm 2.5$ | PASS |
|  |  | VN | 30  | 3.62  | 0.002089  | $\pm 2.5$ | PASS |
|  |  | VN | 40  | 4.35  | 0.002511  | $\pm 2.5$ | PASS |
|  |  | VN | 50  | -0.02 | -0.000012 | $\pm 2.5$ | PASS |
|  |  | VN | -30 | 0.39  | 0.000223  | $\pm 2.5$ | PASS |
|  |  | VN | -20 | -1.21 | -0.000690 | $\pm 2.5$ | PASS |
|  |  | VN | -10 | -0.08 | -0.000046 | $\pm 2.5$ | PASS |
|  |  | VN | 0   | 2.58  | 0.001472  | $\pm 2.5$ | PASS |
|  |  | VN | 10  | -0.94 | -0.000536 | $\pm 2.5$ | PASS |
|  |  | VN | 20  | -0.43 | -0.000245 | $\pm 2.5$ | PASS |
|  |  | VN | 30  | 0.05  | 0.000029  | $\pm 2.5$ | PASS |
|  |  | VN | 40  | 0.54  | 0.000308  | $\pm 2.5$ | PASS |
|  |  | VN | 50  | -1.01 | -0.000576 | $\pm 2.5$ | PASS |
|  |  | VN | -30 | 1.35  | 0.000708  | $\pm 2.5$ | PASS |
|  |  | VN | -20 | 2.65  | 0.001389  | $\pm 2.5$ | PASS |
|  |  | VN | -10 | 1.87  | 0.000980  | $\pm 2.5$ | PASS |
|  |  | VN | 0   | 4.06  | 0.002128  | $\pm 2.5$ | PASS |
|  |  | VN | 10  | -1.57 | -0.000823 | $\pm 2.5$ | PASS |
|  |  | VN | 20  | 1.43  | 0.000750  | $\pm 2.5$ | PASS |
|  |  | VN | 30  | 3.4   | 0.001782  | $\pm 2.5$ | PASS |
|  |  | VN | 40  | -1.36 | -0.000713 | $\pm 2.5$ | PASS |
|  |  | VN | 50  | 0.33  | 0.000173  | $\pm 2.5$ | PASS |

## Channel Bandwidth: 10 MHz

| Channel Bandwidth: 10 MHz |         |               |                  |                |                 |             |         |
|---------------------------|---------|---------------|------------------|----------------|-----------------|-------------|---------|
| Voltage                   |         |               |                  |                |                 |             |         |
| Modulation                | Channel | Voltage [Vdc] | Temperature (°C) | Deviation (Hz) | Deviation (ppm) | Limit (ppm) | Verdict |
| QPSK                      | LCH     | VL            | TN               | 0.36           | 0.000210        | ± 2.5       | PASS    |
|                           |         | VN            | TN               | 2.78           | 0.001621        | ± 2.5       | PASS    |
|                           |         | VH            | TN               | 4.46           | 0.002601        | ± 2.5       | PASS    |
|                           | MCH     | VL            | TN               | 0.85           | 0.000491        | ± 2.5       | PASS    |
|                           |         | VN            | TN               | -1.62          | -0.000935       | ± 2.5       | PASS    |
|                           |         | VH            | TN               | -0.42          | -0.000242       | ± 2.5       | PASS    |
|                           | HCH     | VL            | TN               | 4.56           | 0.002606        | ± 2.5       | PASS    |
|                           |         | VN            | TN               | 3.27           | 0.001869        | ± 2.5       | PASS    |
|                           |         | VH            | TN               | 1.6            | 0.000914        | ± 2.5       | PASS    |
| 16QAM                     | LCH     | VL            | TN               | 0.8            | 0.000466        | ± 2.5       | PASS    |
|                           |         | VN            | TN               | -0.51          | -0.000297       | ± 2.5       | PASS    |
|                           |         | VH            | TN               | 4.88           | 0.002845        | ± 2.5       | PASS    |
|                           | MCH     | VL            | TN               | 3.24           | 0.001870        | ± 2.5       | PASS    |
|                           |         | VN            | TN               | 3.73           | 0.002153        | ± 2.5       | PASS    |
|                           |         | VH            | TN               | -0.6           | -0.000346       | ± 2.5       | PASS    |
|                           | HCH     | VL            | TN               | 1.91           | 0.001091        | ± 2.5       | PASS    |
|                           |         | VN            | TN               | 2.52           | 0.001440        | ± 2.5       | PASS    |
|                           |         | VH            | TN               | 2.8            | 0.001600        | ± 2.5       | PASS    |
| Temperature               |         |               |                  |                |                 |             |         |
| Modulation                | Channel | Voltage [Vdc] | Temperature (°C) | Deviation (Hz) | Deviation (ppm) | Limit (ppm) | Verdict |
| 16QAM                     | LCH     | VN            | -30              | 2.51           | 0.001464        | ± 2.5       | PASS    |
|                           |         | VN            | -20              | 4.31           | 0.002513        | ± 2.5       | PASS    |
|                           |         | VN            | -10              | 3.67           | 0.002140        | ± 2.5       | PASS    |
|                           |         | VN            | 0                | 2.66           | 0.001551        | ± 2.5       | PASS    |
|                           |         | VN            | 10               | 4.87           | 0.002840        | ± 2.5       | PASS    |
|                           |         | VN            | 20               | -1.68          | -0.000980       | ± 2.5       | PASS    |
|                           |         | VN            | 30               | 1.74           | 0.001015        | ± 2.5       | PASS    |
|                           |         | VN            | 40               | 2.64           | 0.001539        | ± 2.5       | PASS    |
|                           |         | VN            | 50               | -0.86          | -0.000501       | ± 2.5       | PASS    |
|                           | MCH     | VN            | -30              | 0.19           | 0.000110        | ± 2.5       | PASS    |
|                           |         | VN            | -20              | -0.83          | -0.000479       | ± 2.5       | PASS    |
|                           |         | VN            | -10              | 3.72           | 0.002147        | ± 2.5       | PASS    |
|                           |         | VN            | 0                | 0.11           | 0.000063        | ± 2.5       | PASS    |
|                           |         | VN            | 10               | -0.08          | -0.000046       | ± 2.5       | PASS    |
|                           |         | VN            | 20               | 4.74           | 0.002736        | ± 2.5       | PASS    |

|  |     |    |     |       |           |           |      |
|--|-----|----|-----|-------|-----------|-----------|------|
|  |     | VN | 30  | -1.9  | -0.001097 | $\pm 2.5$ | PASS |
|  |     | VN | 40  | -0.13 | -0.000075 | $\pm 2.5$ | PASS |
|  |     | VN | 50  | 3.91  | 0.002257  | $\pm 2.5$ | PASS |
|  | HCH | VN | -30 | 2.04  | 0.001166  | $\pm 2.5$ | PASS |
|  |     | VN | -20 | -0.51 | -0.000291 | $\pm 2.5$ | PASS |
|  |     | VN | -10 | 1.25  | 0.000714  | $\pm 2.5$ | PASS |
|  |     | VN | 0   | 0.85  | 0.000486  | $\pm 2.5$ | PASS |
|  |     | VN | 10  | 2.69  | 0.001537  | $\pm 2.5$ | PASS |
|  |     | VN | 20  | 2.61  | 0.001491  | $\pm 2.5$ | PASS |
|  |     | VN | 30  | 0.8   | 0.000457  | $\pm 2.5$ | PASS |
|  | LCH | VN | 40  | -1.2  | -0.000686 | $\pm 2.5$ | PASS |
|  |     | VN | 50  | 4.87  | 0.002783  | $\pm 2.5$ | PASS |
|  | MCH | VN | -30 | 0.6   | 0.000346  | $\pm 2.5$ | PASS |
|  |     | VN | -20 | -0.78 | -0.000450 | $\pm 2.5$ | PASS |
|  |     | VN | -10 | -0.28 | -0.000162 | $\pm 2.5$ | PASS |
|  |     | VN | 0   | 3.95  | 0.002280  | $\pm 2.5$ | PASS |
|  |     | VN | 10  | 0.84  | 0.000485  | $\pm 2.5$ | PASS |
|  |     | VN | 20  | 4.91  | 0.002834  | $\pm 2.5$ | PASS |
|  |     | VN | 30  | -1.07 | -0.000618 | $\pm 2.5$ | PASS |
|  |     | VN | 40  | 2.19  | 0.001264  | $\pm 2.5$ | PASS |
|  |     | VN | 50  | 0.11  | 0.000063  | $\pm 2.5$ | PASS |
|  | HCH | VN | -30 | 0.3   | 0.000171  | $\pm 2.5$ | PASS |
|  |     | VN | -20 | 0.62  | 0.000354  | $\pm 2.5$ | PASS |
|  |     | VN | -10 | 2.23  | 0.001274  | $\pm 2.5$ | PASS |
|  |     | VN | 0   | -0.83 | -0.000474 | $\pm 2.5$ | PASS |
|  |     | VN | 10  | -0.94 | -0.000537 | $\pm 2.5$ | PASS |
|  |     | VN | 20  | 2.28  | 0.001303  | $\pm 2.5$ | PASS |
|  |     | VN | 30  | 2.86  | 0.001634  | $\pm 2.5$ | PASS |
|  |     | VN | 40  | 4.03  | 0.002303  | $\pm 2.5$ | PASS |
|  |     | VN | 50  | -1.65 | -0.000943 | $\pm 2.5$ | PASS |
|  |     | VN | -30 | -1.41 | -0.000806 | $\pm 2.5$ | PASS |

## Channel Bandwidth: 15 MHz

| Channel Bandwidth: 15 MHz |         |               |                  |                |                 |             |         |
|---------------------------|---------|---------------|------------------|----------------|-----------------|-------------|---------|
| Voltage                   |         |               |                  |                |                 |             |         |
| Modulation                | Channel | Voltage [Vdc] | Temperature (°C) | Deviation (Hz) | Deviation (ppm) | Limit (ppm) | Verdict |
| QPSK                      | LCH     | VL            | TN               | 1.61           | 0.000937        | ± 2.5       | PASS    |
|                           |         | VN            | TN               | -1.53          | -0.000891       | ± 2.5       | PASS    |
|                           |         | VH            | TN               | 4.67           | 0.002719        | ± 2.5       | PASS    |
|                           | MCH     | VL            | TN               | 3.97           | 0.002291        | ± 2.5       | PASS    |
|                           |         | VN            | TN               | 4.59           | 0.002649        | ± 2.5       | PASS    |
|                           |         | VH            | TN               | -0.19          | -0.000110       | ± 2.5       | PASS    |
|                           | HCH     | VL            | TN               | 0.59           | 0.000338        | ± 2.5       | PASS    |
|                           |         | VN            | TN               | 0.79           | 0.000452        | ± 2.5       | PASS    |
|                           |         | VH            | TN               | 4.22           | 0.002415        | ± 2.5       | PASS    |
| 16QAM                     | LCH     | VL            | TN               | 1.51           | 0.000879        | ± 2.5       | PASS    |
|                           |         | VN            | TN               | 3.81           | 0.002218        | ± 2.5       | PASS    |
|                           |         | VH            | TN               | 3.37           | 0.001962        | ± 2.5       | PASS    |
|                           | MCH     | VL            | TN               | 3.26           | 0.001882        | ± 2.5       | PASS    |
|                           |         | VN            | TN               | 3.32           | 0.001916        | ± 2.5       | PASS    |
|                           |         | VH            | TN               | 4.79           | 0.002765        | ± 2.5       | PASS    |
|                           | HCH     | VL            | TN               | 3.73           | 0.002134        | ± 2.5       | PASS    |
|                           |         | VN            | TN               | 2.46           | 0.001408        | ± 2.5       | PASS    |
|                           |         | VH            | TN               | 3.54           | 0.002026        | ± 2.5       | PASS    |
| Temperature               |         |               |                  |                |                 |             |         |
| Modulation                | Channel | Voltage [Vdc] | Temperature (°C) | Deviation (Hz) | Deviation (ppm) | Limit (ppm) | Verdict |
| QPSK                      | LCH     | VN            | -30              | 2.57           | 0.001496        | ± 2.5       | PASS    |
|                           |         | VN            | -20              | -1.41          | -0.000821       | ± 2.5       | PASS    |
|                           |         | VN            | -10              | 0.83           | 0.000483        | ± 2.5       | PASS    |
|                           |         | VN            | 0                | 0.6            | 0.000349        | ± 2.5       | PASS    |
|                           |         | VN            | 10               | -1.9           | -0.001106       | ± 2.5       | PASS    |
|                           |         | VN            | 20               | 3.7            | 0.002154        | ± 2.5       | PASS    |
|                           |         | VN            | 30               | 3              | 0.001747        | ± 2.5       | PASS    |
|                           |         | VN            | 40               | 3.06           | 0.001782        | ± 2.5       | PASS    |
|                           |         | VN            | 50               | 0.28           | 0.000163        | ± 2.5       | PASS    |
|                           | MCH     | VN            | -30              | 3.42           | 0.001974        | ± 2.5       | PASS    |
|                           |         | VN            | -20              | 0.76           | 0.000439        | ± 2.5       | PASS    |
|                           |         | VN            | -10              | 0.19           | 0.000110        | ± 2.5       | PASS    |
|                           |         | VN            | 0                | 4.95           | 0.002857        | ± 2.5       | PASS    |
|                           |         | VN            | 10               | 3.91           | 0.002257        | ± 2.5       | PASS    |
|                           |         | VN            | 20               | 3.53           | 0.002038        | ± 2.5       | PASS    |

|       |     |    |     |       |           |           |      |
|-------|-----|----|-----|-------|-----------|-----------|------|
|       | HCH | VN | 30  | 0.79  | 0.000456  | $\pm 2.5$ | PASS |
|       |     | VN | 40  | -0.01 | -0.000006 | $\pm 2.5$ | PASS |
|       |     | VN | 50  | 3.68  | 0.002124  | $\pm 2.5$ | PASS |
|       |     | VN | -30 | 3.62  | 0.002072  | $\pm 2.5$ | PASS |
|       |     | VN | -20 | -0.12 | -0.000069 | $\pm 2.5$ | PASS |
|       |     | VN | -10 | 2.21  | 0.001265  | $\pm 2.5$ | PASS |
|       |     | VN | 0   | -0.65 | -0.000372 | $\pm 2.5$ | PASS |
|       |     | VN | 10  | 2.3   | 0.001316  | $\pm 2.5$ | PASS |
|       |     | VN | 20  | 2.19  | 0.001253  | $\pm 2.5$ | PASS |
|       |     | VN | 30  | 1.5   | 0.000858  | $\pm 2.5$ | PASS |
| 16QAM | LCH | VN | 40  | -1.35 | -0.000773 | $\pm 2.5$ | PASS |
|       |     | VN | 50  | 4.89  | 0.002798  | $\pm 2.5$ | PASS |
|       |     | VN | -30 | -0.25 | -0.000144 | $\pm 2.5$ | PASS |
|       |     | VN | -20 | 0.5   | 0.000289  | $\pm 2.5$ | PASS |
|       |     | VN | -10 | 4.37  | 0.002522  | $\pm 2.5$ | PASS |
|       |     | VN | 0   | -0.46 | -0.000266 | $\pm 2.5$ | PASS |
|       |     | VN | 10  | 4.38  | 0.002528  | $\pm 2.5$ | PASS |
|       |     | VN | 20  | 0.86  | 0.000496  | $\pm 2.5$ | PASS |
|       |     | VN | 30  | 3.19  | 0.001841  | $\pm 2.5$ | PASS |
|       | MCH | VN | 40  | -1.03 | -0.000595 | $\pm 2.5$ | PASS |
|       |     | VN | 50  | 0.99  | 0.000571  | $\pm 2.5$ | PASS |
|       |     | VN | -30 | 3.99  | 0.002283  | $\pm 2.5$ | PASS |
|       |     | VN | -20 | 0.07  | 0.000040  | $\pm 2.5$ | PASS |
|       |     | VN | -10 | -1    | -0.000572 | $\pm 2.5$ | PASS |
|       |     | VN | 0   | 2.24  | 0.001282  | $\pm 2.5$ | PASS |
|       |     | VN | 10  | 4.66  | 0.002667  | $\pm 2.5$ | PASS |
|       |     | VN | 20  | 0.94  | 0.000538  | $\pm 2.5$ | PASS |
|       |     | VN | 30  | -1.48 | -0.000847 | $\pm 2.5$ | PASS |
|       |     | VN | 40  | 1.79  | 0.001024  | $\pm 2.5$ | PASS |
|       | HCH | VN | 50  | 4.2   | 0.002403  | $\pm 2.5$ | PASS |
|       |     | VN | -30 | 4.17  | 0.002386  | $\pm 2.5$ | PASS |
|       |     | VN | -20 | -1.03 | -0.000589 | $\pm 2.5$ | PASS |
|       |     | VN | -10 | -1.31 | -0.000750 | $\pm 2.5$ | PASS |
|       |     | VN | 0   | 3.34  | 0.001911  | $\pm 2.5$ | PASS |
|       |     | VN | 10  | -1.72 | -0.000984 | $\pm 2.5$ | PASS |
|       |     | VN | 20  | 2.11  | 0.001207  | $\pm 2.5$ | PASS |
|       |     | VN | 30  | 3.98  | 0.002278  | $\pm 2.5$ | PASS |
|       |     | VN | 40  | 1.72  | 0.000984  | $\pm 2.5$ | PASS |
|       |     | VN | 50  | -1.95 | -0.001116 | $\pm 2.5$ | PASS |

## Channel Bandwidth: 20 MHz

| Channel Bandwidth: 20 MHz |         |               |                  |                |                 |             |         |
|---------------------------|---------|---------------|------------------|----------------|-----------------|-------------|---------|
| Voltage                   |         |               |                  |                |                 |             |         |
| Modulation                | Channel | Voltage [Vdc] | Temperature (°C) | Deviation (Hz) | Deviation (ppm) | Limit (ppm) | Verdict |
| QPSK                      | LCH     | VL            | TN               | -1.22          | -0.000709       | ± 2.5       | PASS    |
|                           |         | VN            | TN               | 2.75           | 0.001599        | ± 2.5       | PASS    |
|                           |         | VH            | TN               | 4.03           | 0.002343        | ± 2.5       | PASS    |
|                           | MCH     | VL            | TN               | 3.23           | 0.001864        | ± 2.5       | PASS    |
|                           |         | VN            | TN               | -1.22          | -0.000704       | ± 2.5       | PASS    |
|                           |         | VH            | TN               | 0.23           | 0.000133        | ± 2.5       | PASS    |
|                           | HCH     | VL            | TN               | 2.17           | 0.001244        | ± 2.5       | PASS    |
|                           |         | VN            | TN               | 0.21           | 0.000120        | ± 2.5       | PASS    |
|                           |         | VH            | TN               | -0.51          | -0.000292       | ± 2.5       | PASS    |
| 16QAM                     | LCH     | VL            | TN               | -1.65          | -0.000959       | ± 2.5       | PASS    |
|                           |         | VN            | TN               | 2.71           | 0.001576        | ± 2.5       | PASS    |
|                           |         | VH            | TN               | 4.85           | 0.002820        | ± 2.5       | PASS    |
|                           | MCH     | VL            | TN               | 4.67           | 0.002696        | ± 2.5       | PASS    |
|                           |         | VN            | TN               | 0.45           | 0.000260        | ± 2.5       | PASS    |
|                           |         | VH            | TN               | -0.33          | -0.000190       | ± 2.5       | PASS    |
|                           | HCH     | VL            | TN               | 2.86           | 0.001639        | ± 2.5       | PASS    |
|                           |         | VN            | TN               | 3.57           | 0.002046        | ± 2.5       | PASS    |
|                           |         | VH            | TN               | 2.92           | 0.001673        | ± 2.5       | PASS    |
| Temperature               |         |               |                  |                |                 |             |         |
| Modulation                | Channel | Voltage [Vdc] | Temperature (°C) | Deviation (Hz) | Deviation (ppm) | Limit (ppm) | Verdict |
| QPSK                      | LCH     | VN            | -30              | 2.85           | 0.001657        | ± 2.5       | PASS    |
|                           |         | VN            | -20              | -1.57          | -0.000913       | ± 2.5       | PASS    |
|                           |         | VN            | -10              | 2.96           | 0.001721        | ± 2.5       | PASS    |
|                           |         | VN            | 0                | 2.71           | 0.001576        | ± 2.5       | PASS    |
|                           |         | VN            | 10               | 4.6            | 0.002674        | ± 2.5       | PASS    |
|                           |         | VN            | 20               | 0.97           | 0.000564        | ± 2.5       | PASS    |
|                           |         | VN            | 30               | 3.71           | 0.002157        | ± 2.5       | PASS    |
|                           |         | VN            | 40               | -0.59          | -0.000343       | ± 2.5       | PASS    |
|                           |         | VN            | 50               | 3.05           | 0.001773        | ± 2.5       | PASS    |
|                           | MCH     | VN            | -30              | 0.56           | 0.000323        | ± 2.5       | PASS    |
|                           |         | VN            | -20              | 4.37           | 0.002522        | ± 2.5       | PASS    |
|                           |         | VN            | -10              | 2.17           | 0.001253        | ± 2.5       | PASS    |
|                           |         | VN            | 0                | 4.12           | 0.002378        | ± 2.5       | PASS    |
|                           |         | VN            | 10               | 0.64           | 0.000369        | ± 2.5       | PASS    |
|                           |         | VN            | 20               | 4.52           | 0.002609        | ± 2.5       | PASS    |

|       |     |    |     |       |           |           |      |
|-------|-----|----|-----|-------|-----------|-----------|------|
|       |     | VN | 30  | 4.76  | 0.002747  | $\pm 2.5$ | PASS |
|       |     | VN | 40  | -1.34 | -0.000773 | $\pm 2.5$ | PASS |
|       |     | VN | 50  | 3.51  | 0.002026  | $\pm 2.5$ | PASS |
|       | HCH | VN | -30 | 2.84  | 0.001628  | $\pm 2.5$ | PASS |
|       |     | VN | -20 | 4.42  | 0.002533  | $\pm 2.5$ | PASS |
|       |     | VN | -10 | 0.93  | 0.000533  | $\pm 2.5$ | PASS |
|       |     | VN | 0   | -0.63 | -0.000361 | $\pm 2.5$ | PASS |
|       |     | VN | 10  | 2.52  | 0.001444  | $\pm 2.5$ | PASS |
|       |     | VN | 20  | 2.07  | 0.001186  | $\pm 2.5$ | PASS |
|       |     | VN | 30  | -0.05 | -0.000029 | $\pm 2.5$ | PASS |
| 16QAM | LCH | VN | 40  | -0.26 | -0.000149 | $\pm 2.5$ | PASS |
|       |     | VN | 50  | 4.39  | 0.002516  | $\pm 2.5$ | PASS |
|       | MCH | VN | -30 | 1.45  | 0.000837  | $\pm 2.5$ | PASS |
|       |     | VN | -20 | 4.49  | 0.002592  | $\pm 2.5$ | PASS |
|       |     | VN | -10 | -0.8  | -0.000462 | $\pm 2.5$ | PASS |
|       |     | VN | 0   | 0.82  | 0.000473  | $\pm 2.5$ | PASS |
|       |     | VN | 10  | 4.15  | 0.002395  | $\pm 2.5$ | PASS |
|       |     | VN | 20  | 1.66  | 0.000958  | $\pm 2.5$ | PASS |
|       |     | VN | 30  | 2.66  | 0.001535  | $\pm 2.5$ | PASS |
|       |     | VN | 40  | 3.83  | 0.002211  | $\pm 2.5$ | PASS |
|       |     | VN | 50  | 0.58  | 0.000335  | $\pm 2.5$ | PASS |
|       | HCH | VN | -30 | -0.87 | -0.000499 | $\pm 2.5$ | PASS |
|       |     | VN | -20 | 1.39  | 0.000797  | $\pm 2.5$ | PASS |
|       |     | VN | -10 | -1.87 | -0.001072 | $\pm 2.5$ | PASS |
|       |     | VN | 0   | 4.51  | 0.002585  | $\pm 2.5$ | PASS |
|       |     | VN | 10  | 1.22  | 0.000699  | $\pm 2.5$ | PASS |
|       |     | VN | 20  | 0.26  | 0.000149  | $\pm 2.5$ | PASS |
|       |     | VN | 30  | 2.79  | 0.001599  | $\pm 2.5$ | PASS |
|       |     | VN | 40  | 4.01  | 0.002298  | $\pm 2.5$ | PASS |
|       |     | VN | 50  | -1.96 | -0.001123 | $\pm 2.5$ | PASS |