

## 1.1 Frequency stability test

### 1.1.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 1.1.1. The test results are provided in Table 1.1.2.

**Table 1.1.1 Frequency stability limits**

| Assigned frequency, MHz | Maximum allowed frequency displacement |    |
|-------------------------|--|----|
|                         | ppm                                    | Hz |
| 1930.0125               |  |    |
| 1960.0000               |  |    |
| 1989.9875               |  |    |

### 1.1.2 Test procedure

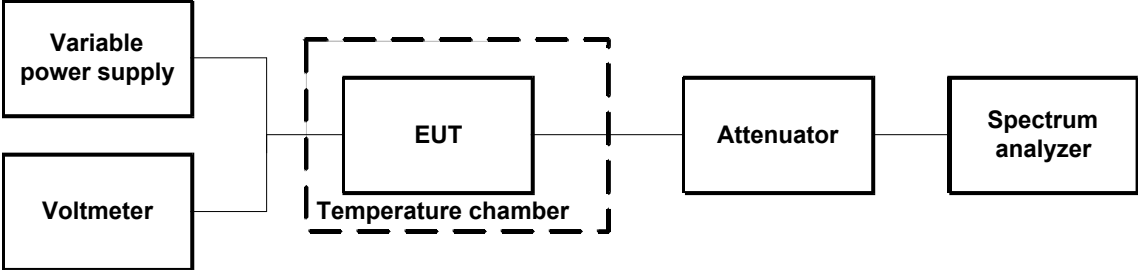
- 1.1.2.1 The EUT was set up as shown in Figure 1.1.1, energized and its proper operation was checked.
- 1.1.2.2 The EUT power was turned off. Temperature within test chamber was set to +30°C and a period of time sufficient to stabilize all of the oscillator circuit components was allowed.
- 1.1.2.3 The EUT was powered on and carrier frequency was measured at start up moment and then every minute until frequency had been stabilized or 10 minutes elapsed whichever reached the last. The EUT was powered off.
- 1.1.2.4 The above procedure was repeated at 0°C and at the lowest test temperature.
- 1.1.2.5 The EUT was powered on and carrier frequency was measured at start up moment and at the end of stabilization period at the rest of test temperatures and voltages. The EUT was powered off.
- 1.1.2.6 Frequency displacement was calculated and compared with the limit as provided in Table 1.1.2.

### Frequency stability tested for two cases:

MA1200 unit tested with MA1000 system including the MA1000 RHU.

MA1200 unit tested with MA1000 system, in which the MA1200 optical module is placed instead of the MA1000 RHU.

Figure 1.1.1 Frequency stability test setup



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Photograph 1.1.1 Frequency stability test setup



**Table 1.1.2.1 Frequency stability test results**

MA1200 tests results (with MA1200 optical module)

OPERATING FREQUENCY: 1930 – 1990 MHz  
 NOMINAL POWER VOLTAGE: 48 V  
 TEMPERATURE STABILIZATION PERIOD: 20 min  
 POWER DURING TEMPERATURE TRANSITION: Off  
 SPECTRUM ANALYZER MODE: Counter  
 RESOLUTION BANDWIDTH: 100 Hz  
 VIDEO BANDWIDTH: Off  
 MODULATION: Unmodulated

| T, °C                                | Voltage, V | Frequency, MHz |                     |                     |                     |                     |                     |                      | Max frequency drift, Hz |          | Limit, Hz | Margin, Hz | Verdict |
|--------------------------------------|------------|----------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------------|-------------------------|----------|-----------|------------|---------|
|                                      |            | Start up       | 1 <sup>st</sup> min | 2 <sup>nd</sup> min | 3 <sup>rd</sup> min | 4 <sup>th</sup> min | 5 <sup>th</sup> min | 10 <sup>th</sup> min | Positive                | Negative |           |            |         |
| <b>Low frequency, 1930.0125 MHz</b>  |            |                |                     |                     |                     |                     |                     |                      |                         |          |           |            |         |
| -30                                  | nominal    | 1930.0117      | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117            | 0                       | 0        |           |            |         |
| -20                                  | nominal    | 1930.0117      | NA                  | NA                  | NA                  | NA                  | NA                  | 1930.0117            | 0                       | 0        |           |            |         |
| -10                                  | nominal    | 1930.0117      | NA                  | NA                  | NA                  | NA                  | NA                  | 1930.0117            | 0                       | 0        |           |            |         |
| 0                                    | nominal    | 1930.0117      | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117            | 0                       | 0        |           |            |         |
| 10                                   | nominal    | 1930.0117      | NA                  | NA                  | NA                  | NA                  | NA                  | 1930.0117            | 0                       | 0        |           |            |         |
| 20                                   | +15%       | 1930.0117      | NA                  | NA                  | NA                  | NA                  | NA                  | 1930.0117            | 0                       | 0        |           |            |         |
| 20                                   | nominal    | 1930.0117      | NA                  | NA                  | NA                  | NA                  | NA                  | 1930.0117            | 0                       | 0        |           |            |         |
| 20                                   | -15%       | 1930.0117      | NA                  | NA                  | NA                  | NA                  | NA                  | 1930.0117            | 0                       | 0        |           |            |         |
| 30                                   | nominal    | 1930.0117      | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117            | 0                       | 0        |           |            |         |
| 40                                   | nominal    | 1930.0117      | NA                  | NA                  | NA                  | NA                  | NA                  | 1930.0117            | 0                       | 0        |           |            |         |
| 50                                   | nominal    | 1930.0117      | NA                  | NA                  | NA                  | NA                  | NA                  | 1930.0117            | 0                       | 0        |           |            |         |
| <b>Mid frequency, 1960.0 MHz</b>     |            |                |                     |                     |                     |                     |                     |                      |                         |          |           |            |         |
| -30                                  | nominal    | 1959.99917     | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917           | 0                       | 0        |           |            |         |
| -20                                  | nominal    | 1959.99917     | NA                  | NA                  | NA                  | NA                  | NA                  | 1959.99917           | 0                       | 0        |           |            |         |
| -10                                  | nominal    | 1959.99917     | NA                  | NA                  | NA                  | NA                  | NA                  | 1959.99917           | 0                       | 0        |           |            |         |
| 0                                    | nominal    | 1959.99917     | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917           | 0                       | 0        |           |            |         |
| 10                                   | nominal    | 1959.99917     | NA                  | NA                  | NA                  | NA                  | NA                  | 1959.99917           | 0                       | 0        |           |            |         |
| 20                                   | +15%       | 1959.99917     | NA                  | NA                  | NA                  | NA                  | NA                  | 1959.99917           | 0                       | 0        |           |            |         |
| 20                                   | nominal    | 1959.99917     | NA                  | NA                  | NA                  | NA                  | NA                  | 1959.99917           | 0                       | 0        |           |            |         |
| 20                                   | -15%       | 1959.99917     | NA                  | NA                  | NA                  | NA                  | NA                  | 1959.99917           | 0                       | 0        |           |            |         |
| 30                                   | nominal    | 1959.99917     | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917           | 0                       | 0        |           |            |         |
| 40                                   | nominal    | 1959.99917     | NA                  | NA                  | NA                  | NA                  | NA                  | 1959.99917           | 0                       | 0        |           |            |         |
| 50                                   | nominal    | 1959.99917     | NA                  | NA                  | NA                  | NA                  | NA                  | 1959.99917           | 0                       | 0        |           |            |         |
| <b>High frequency, 1989.9875 MHz</b> |            |                |                     |                     |                     |                     |                     |                      |                         |          |           |            |         |
| -30                                  | nominal    | 1989.98668     | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668           | 0                       | 0        |           |            |         |
| -20                                  | nominal    | 1989.98668     | NA                  | NA                  | NA                  | NA                  | NA                  | 1989.98668           | 0                       | 0        |           |            |         |
| -10                                  | nominal    | 1989.98668     | NA                  | NA                  | NA                  | NA                  | NA                  | 1989.98668           | 0                       | 0        |           |            |         |
| 0                                    | nominal    | 1989.98668     | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668           | 0                       | 0        |           |            |         |
| 10                                   | nominal    | 1989.98668     | NA                  | NA                  | NA                  | NA                  | NA                  | 1989.98668           | 0                       | 0        |           |            |         |
| 20                                   | +15%       | 1989.98668     | NA                  | NA                  | NA                  | NA                  | NA                  | 1989.98668           | 0                       | 0        |           |            |         |
| 20                                   | nominal    | 1989.98668     | NA                  | NA                  | NA                  | NA                  | NA                  | 1989.98668           | 0                       | 0        |           |            |         |
| 20                                   | -15%       | 1989.98668     | NA                  | NA                  | NA                  | NA                  | NA                  | 1989.98668           | 0                       | 0        |           |            |         |
| 30                                   | nominal    | 1989.98668     | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668           | 0                       | 0        |           |            |         |
| 40                                   | nominal    | 1989.98668     | NA                  | NA                  | NA                  | NA                  | NA                  | 1989.98668           | 0                       | 0        |           |            |         |
| 50                                   | nominal    | 1989.98668     | NA                  | NA                  | NA                  | NA                  | NA                  | 1989.98668           | 0                       | 0        |           |            |         |

\* - Reference frequency

**Reference numbers of test equipment used**

|         |         |         |         |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|
| HL 0255 | HL 0026 | HL 2358 | HL 0493 |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|

Full description is given in Appendix A.

**Table 1.1.3.2 Frequency stability test results**

MA1200 tests results (with MA1000 RHU)

OPERATING FREQUENCY: 1930 – 1990 MHz  
 NOMINAL POWER VOLTAGE: 48 V  
 TEMPERATURE STABILIZATION PERIOD: 20 min  
 POWER DURING TEMPERATURE TRANSITION: Off  
 SPECTRUM ANALYZER MODE: Counter  
 RESOLUTION BANDWIDTH: 100 Hz  
 VIDEO BANDWIDTH: Off  
 MODULATION: Unmodulated

| T, °C                                | Voltage, V | Frequency, MHz |                     |                     |                     |                     |                     |                      | Max frequency drift, Hz |          | Limit, Hz | Margin, Hz | Verdict |
|--------------------------------------|------------|----------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------------|-------------------------|----------|-----------|------------|---------|
|                                      |            | Start up       | 1 <sup>st</sup> min | 2 <sup>nd</sup> min | 3 <sup>rd</sup> min | 4 <sup>th</sup> min | 5 <sup>th</sup> min | 10 <sup>th</sup> min | Positive                | Negative |           |            |         |
| <b>Low frequency, 1930.0125 MHz</b>  |            |                |                     |                     |                     |                     |                     |                      |                         |          |           |            |         |
| -30                                  | nominal    | 1930.0117      | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117            | 0                       | 0        |           |            |         |
| -20                                  | nominal    | 1930.0117      | NA                  | NA                  | NA                  | NA                  | NA                  | 1930.0117            | 0                       | 0        |           |            |         |
| -10                                  | nominal    | 1930.0117      | NA                  | NA                  | NA                  | NA                  | NA                  | 1930.0117            | 0                       | 0        |           |            |         |
| 0                                    | nominal    | 1930.0117      | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117            | 0                       | 0        |           |            |         |
| 10                                   | nominal    | 1930.0117      | NA                  | NA                  | NA                  | NA                  | NA                  | 1930.0117            | 0                       | 0        |           |            |         |
| 20                                   | +15%       | 1930.0117      | NA                  | NA                  | NA                  | NA                  | NA                  | 1930.0117            | 0                       | 0        |           |            |         |
| 20                                   | nominal    | 1930.0117      | NA                  | NA                  | NA                  | NA                  | NA                  | 1930.0117            | 0                       | 0        |           |            |         |
| 20                                   | -15%       | 1930.0117      | NA                  | NA                  | NA                  | NA                  | NA                  | 1930.0117            | 0                       | 0        |           |            |         |
| 30                                   | nominal    | 1930.0117      | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117           | 1930.0117            | 0                       | 0        |           |            |         |
| 40                                   | nominal    | 1930.0117      | NA                  | NA                  | NA                  | NA                  | NA                  | 1930.0117            | 0                       | 0        |           |            |         |
| 50                                   | nominal    | 1930.0117      | NA                  | NA                  | NA                  | NA                  | NA                  | 1930.0117            | 0                       | 0        |           |            |         |
| <b>Mid frequency, 1960.0 MHz</b>     |            |                |                     |                     |                     |                     |                     |                      |                         |          |           |            |         |
| -30                                  | nominal    | 1959.99917     | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917           | 0                       | 0        |           |            |         |
| -20                                  | nominal    | 1959.99917     | NA                  | NA                  | NA                  | NA                  | NA                  | 1959.99917           | 0                       | 0        |           |            |         |
| -10                                  | nominal    | 1959.99917     | NA                  | NA                  | NA                  | NA                  | NA                  | 1959.99917           | 0                       | 0        |           |            |         |
| 0                                    | nominal    | 1959.99917     | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917           | 0                       | 0        |           |            |         |
| 10                                   | nominal    | 1959.99917     | NA                  | NA                  | NA                  | NA                  | NA                  | 1959.99917           | 0                       | 0        |           |            |         |
| 20                                   | +15%       | 1959.99917     | NA                  | NA                  | NA                  | NA                  | NA                  | 1959.99917           | 0                       | 0        |           |            |         |
| 20                                   | nominal    | 1959.99917     | NA                  | NA                  | NA                  | NA                  | NA                  | 1959.99917           | 0                       | 0        |           |            |         |
| 20                                   | -15%       | 1959.99917     | NA                  | NA                  | NA                  | NA                  | NA                  | 1959.99917           | 0                       | 0        |           |            |         |
| 30                                   | nominal    | 1959.99917     | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917          | 1959.99917           | 0                       | 0        |           |            |         |
| 40                                   | nominal    | 1959.99917     | NA                  | NA                  | NA                  | NA                  | NA                  | 1959.99917           | 0                       | 0        |           |            |         |
| 50                                   | nominal    | 1959.99917     | NA                  | NA                  | NA                  | NA                  | NA                  | 1959.99917           | 0                       | 0        |           |            |         |
| <b>High frequency, 1989.9875 MHz</b> |            |                |                     |                     |                     |                     |                     |                      |                         |          |           |            |         |
| -30                                  | nominal    | 1989.98668     | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668           | 0                       | 0        |           |            |         |
| -20                                  | nominal    | 1989.98668     | NA                  | NA                  | NA                  | NA                  | NA                  | 1989.98668           | 0                       | 0        |           |            |         |
| -10                                  | nominal    | 1989.98668     | NA                  | NA                  | NA                  | NA                  | NA                  | 1989.98668           | 0                       | 0        |           |            |         |
| 0                                    | nominal    | 1989.98668     | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668           | 0                       | 0        |           |            |         |
| 10                                   | nominal    | 1989.98668     | NA                  | NA                  | NA                  | NA                  | NA                  | 1989.98668           | 0                       | 0        |           |            |         |
| 20                                   | +15%       | 1989.98668     | NA                  | NA                  | NA                  | NA                  | NA                  | 1989.98668           | 0                       | 0        |           |            |         |
| 20                                   | nominal    | 1989.98668     | NA                  | NA                  | NA                  | NA                  | NA                  | 1989.98668           | 0                       | 0        |           |            |         |
| 20                                   | -15%       | 1989.98668     | NA                  | NA                  | NA                  | NA                  | NA                  | 1989.98668           | 0                       | 0        |           |            |         |
| 30                                   | nominal    | 1989.98668     | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668          | 1989.98668           | 0                       | 0        |           |            |         |
| 40                                   | nominal    | 1989.98668     | NA                  | NA                  | NA                  | NA                  | NA                  | 1989.98668           | 0                       | 0        |           |            |         |
| 50                                   | nominal    | 1989.98668     | NA                  | NA                  | NA                  | NA                  | NA                  | 1989.98668           | 0                       | 0        |           |            |         |

\* - Reference frequency

**Reference numbers of test equipment used**

|         |         |         |         |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|
| HL 0255 | HL 0026 | HL 2358 | HL 0493 |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|

Full description is given in Appendix A.