

Annex A - Microwave tuner - Technical specification

1. Frequency (input):
 - a. The frequency range SHALL minimum be 2 GHz to 18 GHz
 - b. Frequency range SHOULD be 500 MHz to 18 GHz
 - c. Tuning steps SHALL be 1 MHz or less
 - d. External reference for local oscillator(s) SHALL be possible
 - e. Operation without external reference SHALL be possible
2. Frequency (output):
 - a. The tuner SHALL have a wideband output with minimum 350 MHz bandwidth
 - b. This output SHOULD be centered at 1 GHz and have 500 MHz bandwidth
 - c. The tuner SHOULD have a LOG VIDEO output
 - d. See Option 2
3. Signal input :
 - a. The input noise figure SHALL be 15 dB or less
 - b. Input power without damage (10% duty cycle) SHALL be +20 dBm or higher
 - c. Third order intercept point (TOI) SHALL be +3 dBm or higher
 - d. Third order intercept point (TOI) SHOULD be +13 dBm or higher
 - e. 1 dB compression (P_{-1dB}) SHALL be -10 dBm or higher
 - f. 1 dB compression (P_{-1dB}) SHOULD be 0 dBm or higher
 - g. The tuner SHALL have a filtering scheme to prevent interference from out of band signals – explain.
 - h. The tuner SHOULD have tunable band-pass filter before first frequency conversion
 - i. Image rejection SHALL be 60 dBc or better
4. Signal output:
 - a. Gain flatness over the tuning range SHALL be ± 1.5 dB or less
 - b. Gain flatness over 80% of IF bandwidth SHALL be ± 0.5 dB or less
 - c. IF filters SHALL have low group delay variation – supply info
 - d. Group delay variation over 80% of IF bandwidth SHOULD be 5 ns or less
 - e. Internal generated spurious SHALL be -75dBm or less
 - f. Tuner shall have 2 coherent and phase/amplitude equal channels (see Option 1)
 - g. Gain variation between channels SHALL be ± 1 dB or less
 - h. Phase match between channels SHALL be ± 15 deg or less
5. Phase noise:
 - a. The integrated phase noise SHALL be 1° or less
 - b. The integrated phase noise SHOULD be 0.5° or less
 - c. The phase noise SHOULD not exceed:
 - i. Offset 100 Hz -75 dBc/Hz
 - ii. Offset 1 kHz -90 dBc/Hz
 - iii. Offset 10 kHz -95 dBc/Hz
 - iv. Offset 100 kHz -105 dBc/Hz
 - v. Offset 1 MHz -115 dBc/Hz
 - vi. Offset 10 MHz -140 dBc/Hz

6. Tuner control/BITE:
 - a. It SHALL be possible to control the tuner by Ethernet and/or USB
 - b. Interface document for tuner control and monitoring SHALL be delivered
 - c. A Windows GUI for external control of the tuner SHALL be delivered (the tuner does NOT need to have operator controls on the tuner unit). Source code SHOULD be delivered.
 - d. BITE SHALL be included and monitored by Ethernet and/or USB
7. Power supply
 - a.1 The tuner SHALL have a single power connection of 230 VAC 50 Hz (voltage deviation at least $\pm 10\%$)
OR
 - a.2 The tuner SHALL have a single DC power connection accepting voltages in the range 11 to 16 VDC)
 - b. The tuner SHOULD have low power consumption – give number
8. Environment
 - a. Operating temperature SHALL be 0° to $+40^{\circ}$
 - b. Non operating temperature SHALL be -30° to $+65^{\circ}$
 - c. Relative humidity 95% non-condensing
 - d. EMI SHOULD meet MIL-STD- 461C, CE03 and RE02
 - e. Vibration and shock SHOULD meet the required operation (main document 1.3.c)
9. Documentation
 - a. Documentation SHALL be in Norwegian or English
 - b. Documentation SHALL be delivered in electronic form (CD/DVD etc)

Option 1:

1. Three coherent and phase/amplitude equal channels

Option 2: Additional Intermediate frequency output

1. Frequency (output):
 - a. The tuner SHALL have a narrowband output with center frequency below 200MHz and bandwidth between 50 MHz and 100 MHz
 - b. This output SHOULD be centered at 160 MHz and minimum 80 MHz bandwidth
 - c. The tuner SHOULD have a LOG VIDEO output