

RFI-5G FE-Top SSV asRun

23/10/2023

1. Document Scope

The objective of this document is to detail the procedures, results and conclusions to properly test at subsystem level the RFI-5G front-end top board. Several parts will be tested:

1. Test of the LNA chain
2. Test of the LO chain
3. Test of the Front-End top board RF
4. Test of the temperature sensor

The as run versions of this document will have the title as "RFI-5G FE-Top SSV as run dd/mm/yyyy".

2. Test of the LNA chain

2.1. Test Description and Objectives

The purpose of this test is to validate that the HMC342 LNA amplifier provides the expected +19 dB of gain for input signals between 24 to 25 GHz, and that the band-pass filter does not introduce more than the expected -4 dB of losses.

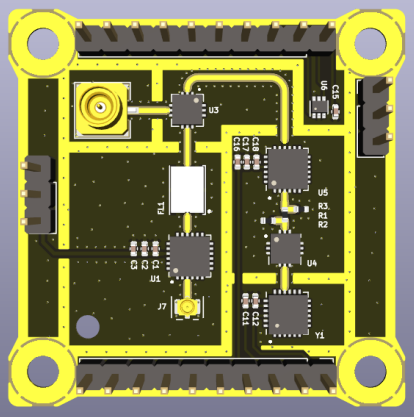

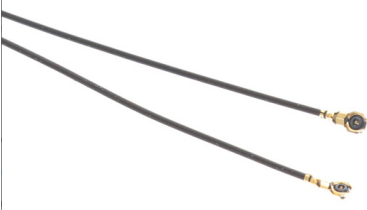



Since the probing used is not the frequency range used, this is only a qualitative test to check if the LNA is providing gain and validate that the consumption is nominal.

2.2. Requirements Verification

This test does not verify any requirement, and is only to check that the board part works as expected.

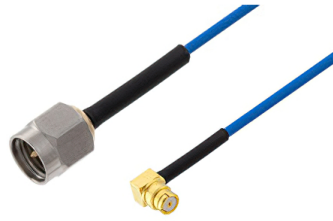
2.3. Test Set-Up

The required components for this test are the following:

RFI-5G front-end top board	 A photograph of a green printed circuit board (PCB) with a yellow border. The board is populated with various electronic components, including integrated circuits, capacitors, and connectors. It is mounted on a blue base with four yellow circular mounting points.
C.FL to SMA-2.92mm adapter	 A cylindrical, silver-colored metal adapter with a C.FL connector on one end and an SMA-2.92mm connector on the other.
C.FL cable	 A black flexible cable with two SMA connectors at the ends.
RF probe	 A gold-colored metal RF probe with a threaded base and two fine needles extending from the top.
SMA 50 Ohm RF load	 A small, gold-colored SMA connector with a threaded base.
DC Block N to SMA adapter	 A cylindrical metal adapter with a DC block. It has an N-type connector on one end and an SMA connector on the other. The text on the side reads: "ATTN Inc PWR req 10M Hz SER P134003 SIDE 5100".

<p>Power supply</p>	 <p>A digital power supply unit with a color LCD screen displaying three output channels: 16.00 V 1.437 A, 32.00 V 1.000 A, and 5.00 V 2.000 A. The control panel includes a rotary knob, several buttons, and three output terminals labeled Ch.1, Ch.2, and Ch.3.</p>
<p>Signal Generator capable of at least 25 GHz</p>	 <p>A rack-mountable signal generator with a silver faceplate and blue handles. It features a central LCD screen and a dense array of control buttons and knobs on the right side.</p>
<p>Spectrum Analyzer capable of at least 25 GHz</p>	 <p>A handheld spectrum analyzer with a large color LCD screen and a control panel with numerous buttons and a rotary knob. It is mounted on a blue carrying case.</p>
<p>2x Jumper cables</p>	 <p>Two parallel rainbow-colored jumper cables with female headers on both ends.</p>
<p>2x Banana cables</p>	 <p>Two banana cables with SMA connectors. One is red and the other is black, both with SMA female connectors on the banana ends.</p>
<p>2x Crocodrile clips</p>	 <p>Two crocodile clips, one with a red handle and one with a black handle.</p>
<p>2x SMA 2.92 mm cables</p>	 <p>Two SMA 2.92 mm cables, one blue and one black, both with SMA female connectors on both ends.</p>

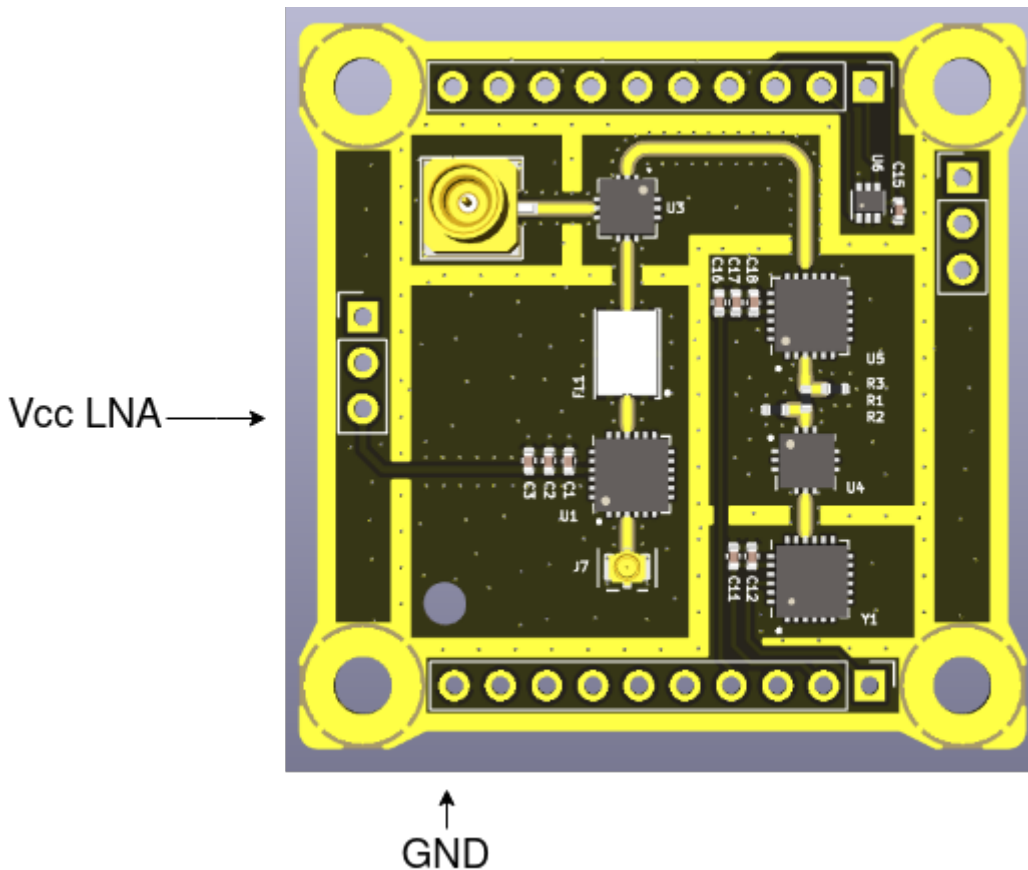
SMA to SMP cable



The steps to prepare the setup are the following:

1. Connect the output from the signal generator to the antenna input of the RFI-5G front-end top board by using the C.FL cable and the C.FL to 2.92 mm adapter.
2. Connect the power supply to the Vcc_LNA1 and GND pins with the jumper cables and the crocodile clips.
3. Connect the DC-block N to SMA adapter to the spectrum analyzer input.
4. Connect the RF probe to the spectrum analyzer using one SMA cable.
5. Connect the SMA 50 Ohm RF load to the output of the mixer with the SMA to SMP cable.

The diagram below represents the initial setup:



2.4. Pass/Fail Criteria

The test will be considered successful if the LNA shows to provide gain (~19 dB) and the power consumption matches the expected one (~43 mA at 3.3 V). There is though some margin accepted, since the RF probe and cables are not rated for the frequency range used.

2.5. Test Plan

Step ID	Description	Pass/Fail Criteria	Actual	Passed [Y/N]
RFI-5G-TOP-LNA-000	Make sure that the power supply and signal generator outputs are off.	Passes if power supply and signal generator outputs are off.	ok	y
RFI-5G-TOP-LNA-010	Prepare the setup as stated in 2.3.	Passes if setup prepared.	setup done	y
RFI-5G-TOP-LNA-020	Set the power supply to 3 V and limit the current to 60 mA.	Passes if power supply set.	power supply set	y
RFI-5G-TOP-LNA-030	Set the signal generator to: f = 24.5 GHz Pout = -70 dBm	Passes if signal generator set.	signal generator set	y
RFI-5G-TOP-LNA-040	Set the spectrum analyzer to: f = 24.5 GHz Span = 10 MHz RBW = 10 kHz VBW = 1 kHz Trace = Max Hold	Passes if spectrum analyzer set.	spectrum analyzer set	y
RFI-5G-TOP-LNA-050	Switch on the signal generator output.	Passes if signal generator output is on.	signal generator on	y
RFI-5G-TOP-LNA-060	Switch on the power supply. If the power supply is limiting switch it off immediately.	Passes if power supply is on and not current limiting.	power supply on	y
RFI-5G-TOP-LNA-070	Note the voltage and current. If the current consumption is abnormal switch it off immediately.	Passes if voltage and current are within specification (some margin is allowed but has to be explained why).	Voltage: 2.99 V Current: 40 mA	y
RFI-5G-TOP-LNA-080	With the RF probe, probe the input of the LNA by carefully touching with the signal pogo-pin the RF input pin of the LNA.	Passes if a signal is shown in the spectrum analyzer.	signal appears if signal generator power is -50 dBm due to probe	y
RFI-5G-TOP-LNA-090	Set the trace mode in the spectrum analyzer to VIEW to freeze the image.	Passes if trace mode is VIEW.	trace mode VIEW	y

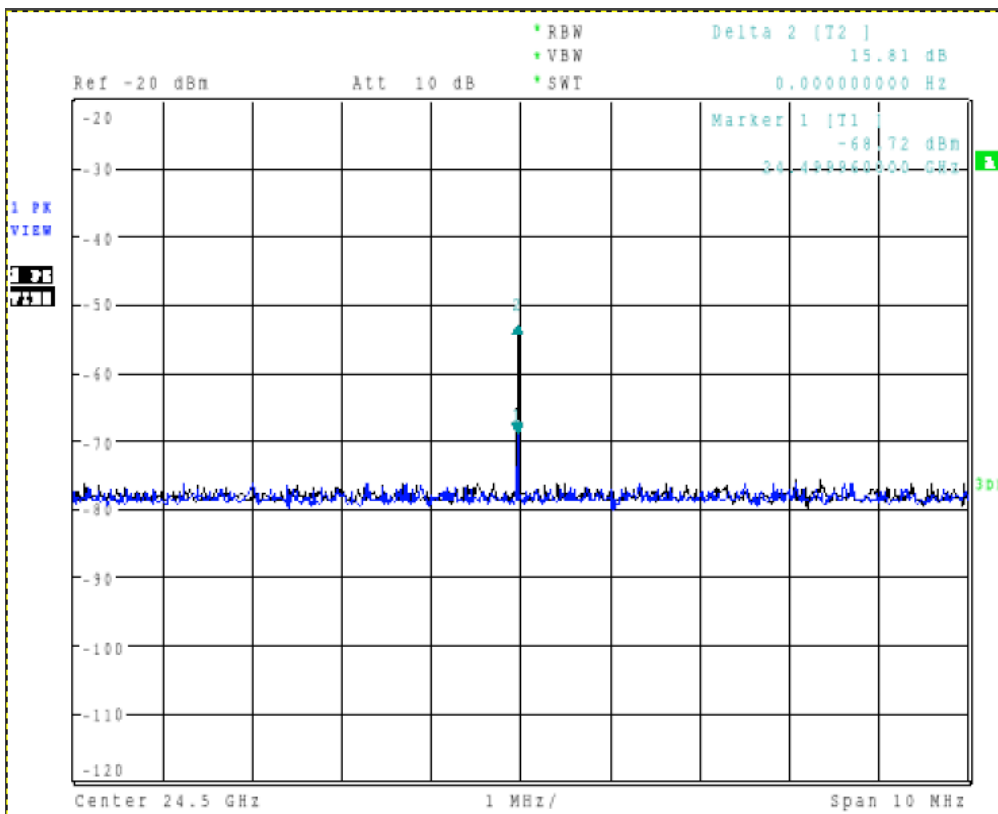
RFI-5G-TOP-LNA-100	Add a second trace in the spectrum analyzer with the same configuration as the first one.	Passes if spectrum analyzer set.	spectrum analyzer set	y
RFI-5G-TOP-LNA-110	With the RF probe, probe the output of the LNA by carefully touching with the signal pogo-pin the RF output pin of the LNA.	Passes if a signal is shown in the spectrum analyzer.	signal shows in spectrum analyzer	y
RFI-5G-TOP-LNA-120	Set the trace mode in the spectrum analyzer to VIEW to freeze the image.	Passes if trace mode is VIEW.	trace mode VIEW	y
RFI-5G-TOP-LNA-130	Add one marker to the peak of trace 1, and another marker that measures the delta in the peak of trace 2. Note the gain and frequency delta values.	Passes if the gain is within specification (some margin is allowed but has to be explained why).	Gain: 15.8 dB Frequency: 0 Hz	y
RFI-5G-TOP-LNA-140	Capture the screen of the spectrum analyzer and save it into a USB drive.	Passes if .wmf is saved into a USB drive.	File name: LNA_001.wmf	y
RFI-5G-TOP-LNA-150	Add a third trace in the spectrum analyzer with the same configuration as the first one.	Passes if spectrum analyzer set.	third trace added	y
RFI-5G-TOP-LNA-160	With the RF probe, probe the output of the band-pass filter by carefully touching with the signal pogo-pin the RF output pin of the filter.	Passes if the gain is within specification (some margin is allowed but has to be explained why).	signal shows in spectrum analyzer	y
RFI-5G-TOP-LNA-170	Set the trace mode in the spectrum analyzer to VIEW to freeze the image.	Passes if trace mode is VIEW.	trace mode VIEW	y
RFI-5G-TOP-LNA-180	Add a third marker in trace 3. Note the power and frequency delta values with marker 1.	Passes if the gain is within specification (some margin is allowed but has to be explained why).	Gain: 11.15 dB Frequency: 0 Hz	y
RFI-5G-TOP-LNA-190	Capture the screen of the spectrum analyzer and save it into a USB drive.	Passes if .wmf is saved into a USB drive.	File name: LNA_002.wmf	y
RFI-5G-TOP-LNA-200	Switch off the power supply and the signal generator.	Passes if power supply and signal generator are off.	power supply and signal generator off	y

RFI-5G-TOP-LNA-210	If all steps are passed, proceed with next test.	Passes if all steps passed.	Discussion in results	y
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2.6. Test Results

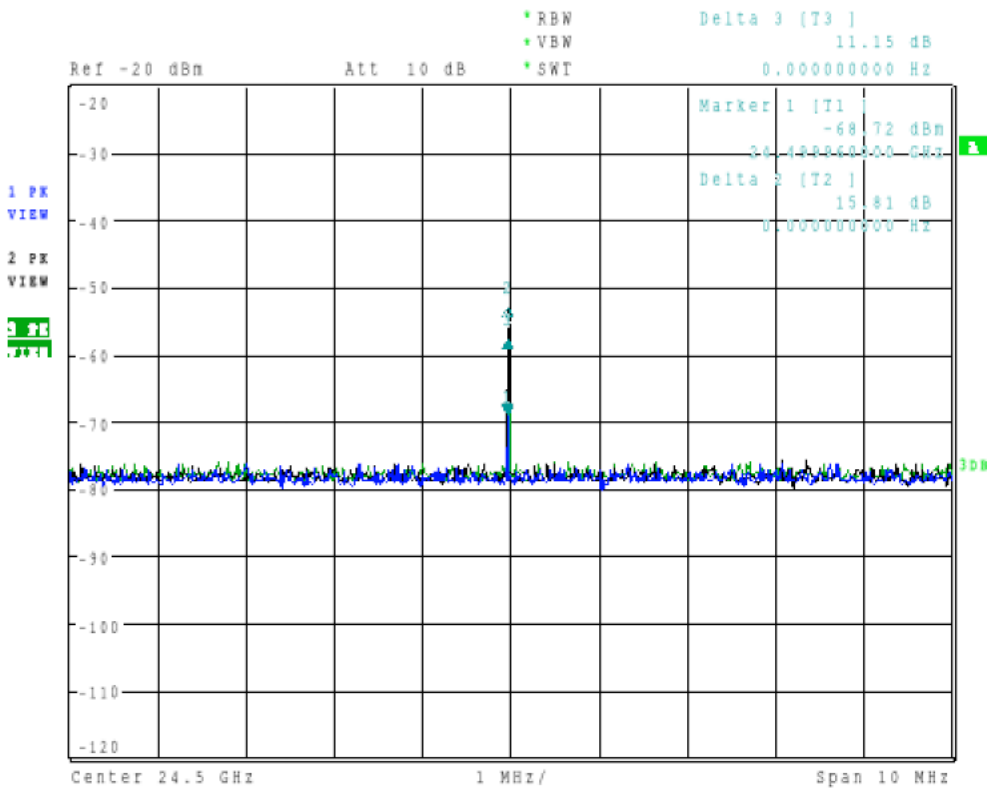
LNA:

Perceived LNA gain is of ~ 16 dB. Compared to the expected 19.2 dB of gain, the performance is considered valid, since the measuring technique introduces losses that are not accounted for. Additionally, the power consumption of 40 mA seems to be nominal since the expected was 43 mA.



Band-pass filter:

The band-pass filter seems to introduce ~ 4 dB of losses, which was expected from the specifications.



2.7. Anomalies

The signal power from the signal generator has been increased to 50 dBm because of the probing method used, otherwise the signal was not strong enough to be coupled to the probe and appear in the spectrum analyzer measurement.

2.8. Conclusions







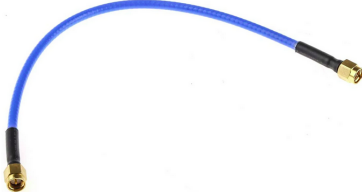
This test concludes that the LNA chain implementation performs as expected.

3. Test of the LO chain

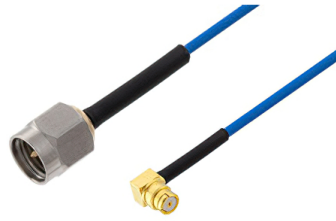
3.1. Test Description and Objectives

The purpose of this test is to validate that the LO chain works as intended. This means that the HMC506 VCO provides a tone at the expected 8665.5 MHz, and that the HMC342 LO amplifier provides gain (~19 dB) so that the LO input of the mixer is over 12 dBm (~14 dBm).

Since the probing used is not the frequency range used, this is only a qualitative test to check if the LO chain is providing the correct LO tone to the mixer and that the consumption is nominal.

<p>DC Block N to SMA adapter</p>	
<p>Power supply</p>	
<p>Spectrum Analyzer capable of at least 25 GHz</p>	
<p>6x Jumper cables</p>	
<p>6x Banana cables</p>	
<p>6x Crocodile clips</p>	
<p>2x SMA 2.92 mm cables</p>	

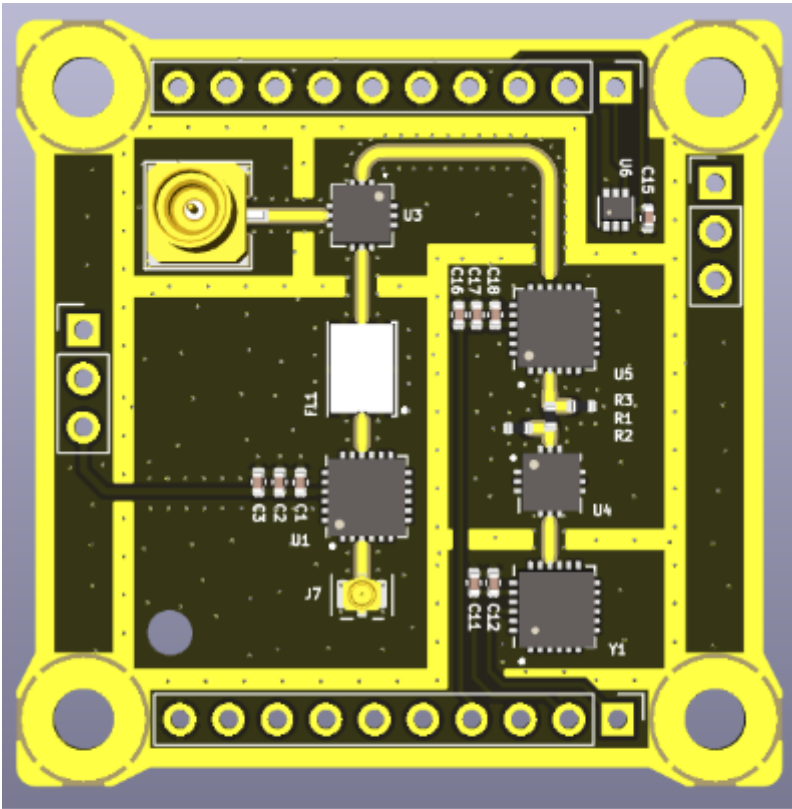
SMA to SMP cable



The steps to prepare the setup are the following:

1. Connect the output from the signal generator to the antenna input of the RFI-5G front-end top board by using the C.FL cable and the C.FL to 2.92 mm adapter.
2. Connect the first channel of the power supply to the Vcc_VCO and GND pins with the jumper cables and the crocodile clips.
3. Connect the second channel of the power supply to the Vtune1 and GND pins with the jumper cables and the crocodile clips.
4. Connect the third channel of the power supply to the Vcc_IF1Amp and GND pins with the jumper cables and the crocodile clips.
5. Connect the DC-block N to SMA adapter to the spectrum analyzer input.
6. Connect the RF probe to the spectrum analyzer using one SMA cable.
7. Connect the SMA 50 Ohm RF load to the output of the mixer with the SMA to SMP cable.

The diagram below represents the initial setup:



GND ↑

Vcc_LO1Amp ↑

Vcc_VCO ↑
VTUNE1 ↑

3.4. Pass/Fail Criteria

The test will be considered successful if the LO shows a tone at 8665.5 MHz \pm 5%, if the LO amplifier provides the expected gain (\sim 19 dB) and if the level of the LO input of the mixer is over 10 dBm. Additionally, the current consumption has to be nominal.

3.5. Test Plan

Step ID	Description	Pass/Fail Criteria	Actual	Passed [Y/N]
RFI-5G-TOP-LO-000	Make sure that the power supply is off.	Passes if power supply and signal generator outputs are off.	power supply off	y
RFI-5G-TOP-LO-010	Prepare the setup as stated in 3.3.	Passes if setup prepared.	setup prepared	y

RFI-5G-TOP-LO-020	Set the first channel of the power supply to 3 V and limit the current to 100 mA.	Passes if power supply set.	ch1 set	y
RFI-5G-TOP-LO-030	Set the second channel of the power supply to 8.7 V and limit the current to 10 mA.	Passes if power supply set.	ch2 set	y
RFI-5G-TOP-LO-040	Set the third channel of the power supply to 3 V and limit the current to 60 mA.	Passes if power supply set.	ch3 set	y
RFI-5G-TOP-LO-050	Set the spectrum analyzer to: f = 8665.5 MHz Span = 100 MHz RBW = 100 kHz VBW = 3 kHz Trace = Clear/Write	Passes if spectrum analyzer set.	spectrum analyzer set	y
RFI-5G-TOP-LO-060	Switch on the first channel of the power supply. If the power supply is limiting switch it off immediately.	Passes if power supply is on and not current limiting.	ch1 on	y
RFI-5G-TOP-LO-070	Switch on the first channel of the power supply. If the power supply is limiting switch it off immediately.	Passes if power supply is on and not current limiting.	ch2 on	y
RFI-5G-TOP-LO-080	Note the voltage and current. If the current consumption is abnormal switch it off immediately.	Passes if voltage and current are within specification (some margin is allowed but has to be explained why)	CH1 Voltage: 3 V Current: 81 mA CH2 Voltage: 8.7 V Current: 0 mA	y
RFI-5G-TOP-LO-080	With the RF probe, probe the output of the VCO by carefully touching with the signal pogo-pin the RF output pin of the LNA.	Passes if a signal is shown in the spectrum analyzer.	Signal present in spectrum analyzer	y
RFI-5G-TOP-LO-090	Adjust the Vtune1 voltage until the LO frequency is centered to the desired 8665.5 MHz.	Passes if LO frequency is ~8665.5 MHz.	CH2 Voltage: 8.17 V frequency: 8665.5 MHz	y

RFI-5G-TOP-LO-100	Set the trace mode in the spectrum analyzer to VIEW to freeze the image.	Passes if trace mode is VIEW.	trace mode VIEW	y
RFI-5G-TOP-LO-110	Capture the screen of the spectrum analyzer and save it into a USB drive.	Passes if .wmf is saved into a USB drive.	File name: VCO-001.wmf	y
RFI-5G-TOP-LO-120	Set the trace mode in the spectrum analyzer to CLEAR/WRITE to clear the spectrum.	Passes if trace mode is CLEAR/WRITE.	trace mode CLEAR/WRITE	y
RFI-5G-TOP-LO-130	Set the spectrum analyzer to: f = 17331 MHz Span = 200 MHz RBW = 100 kHz VBW = 3 kHz Reference level = 10 dBm Trace = Max Hold	Passes if spectrum analyzer set.	spectrum analyzer set	y
RFI-5G-TOP-LO-140	With the RF probe, probe the output of the frequency multiplier by carefully touching with the signal pogo-pin the RF output pin of the frequency multiplier.	Passes if a signal is shown in the spectrum analyzer.	signal shows in spectrum analyzer	y
RFI-5G-TOP-LO-150	Set the trace mode in the spectrum analyzer to VIEW to freeze the image.	Passes if trace mode is VIEW.	trace mode VIEW	y
RFI-5G-TOP-LO-160	Add one marker at the peak. Note the power and frequency values.	Passes if power and frequency are within specification.	Power: -25.92 dBm Frequency: 17335.8 MHz	y
RFI-5G-TOP-LO-170	Add a second trace in the spectrum analyzer with the same configuration as the first one.	Passes if spectrum analyzer set.	spectrum analyzer set	y
RFI-5G-TOP-LO-180	Switch on the third channel of the power supply. If the power supply is limiting switch it off immediately.	Passes if power supply is on and not current limiting.	ch3 on	y

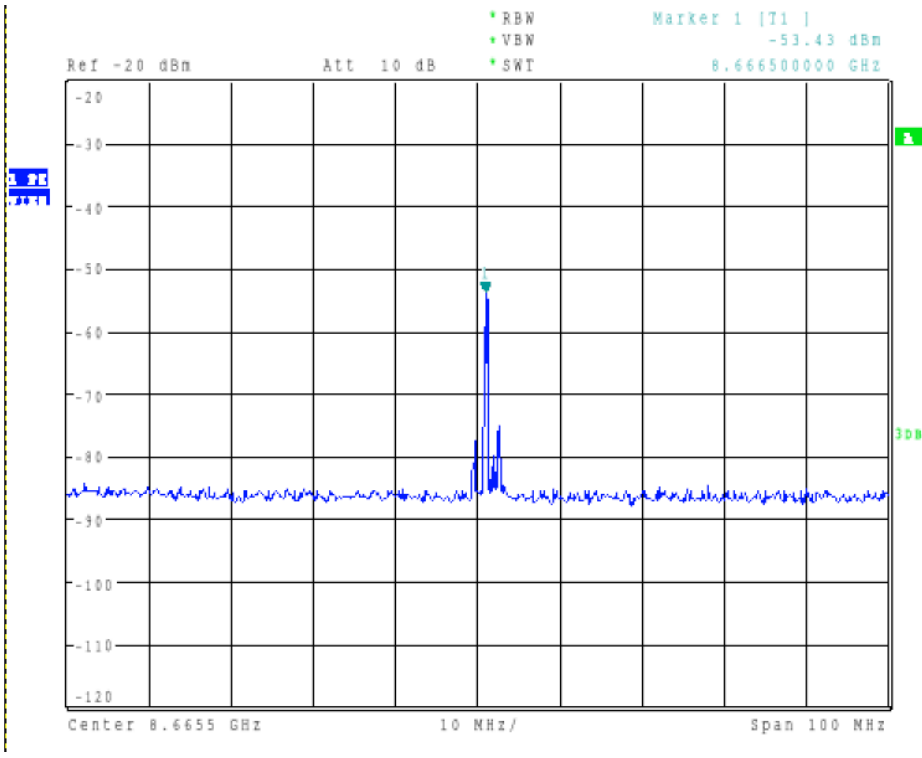
RFI-5G-TOP-LO-190	Note the voltage and current. If the current consumption is abnormal switch it off immediately.	Passes if voltage and current are within specification (some margin is allowed but has to be explained why)	CH3 Voltage: 3 V Current: 44 mA	y
RFI-5G-TOP-LO-200	With the RF probe, probe the output of the LO amplifier by carefully touching with the signal pogo-pin the RF output pin of the LO amplifier.	Passes if a signal is shown in the spectrum analyzer.	signal shows in spectrum analyzer	y
RFI-5G-TOP-LO-210	Set the trace mode in the spectrum analyzer to VIEW to freeze the image.	Passes if trace mode is VIEW.	trace mode VIEW	y
RFI-5G-TOP-LO-220	Add one marker to the peak of trace 1, and another marker that measures the delta in the peak of trace 2. Note the power and frequency delta values.	Passes if the gain is within specification (some margin is allowed but has to be explained why).	Power: 11.07 dB Frequency: 0.8 kHz	y
RFI-5G-TOP-LO-230	Capture the screen of the spectrum analyzer and save it into a USB drive.	Passes if .wmf is saved into a USB drive.	File name: DOUBLER_001.wmf	y
RFI-5G-TOP-LO-240	Switch off the power supply and the signal generator.	Passes if power supply and signal generator are off.	power supply off	y
RFI-5G-TOP-LO-250	If all steps are passed, proceed with next test.	Passes if all steps passed.	Discussion in results	y

3.6. Test Results

VCO:

The VCO output provides a tone centered to a frequency provided by the Vtune voltage. In order to obtain the desired 8665.5 MHz of VCO frequency, the tuning voltage has been lowered from the expected 8.7 V to 8.17 V. Additionally, the frequency tuning appears to be erroneous: when the front-end is shifted or the cables are moved, the output of the VCO varies significantly.

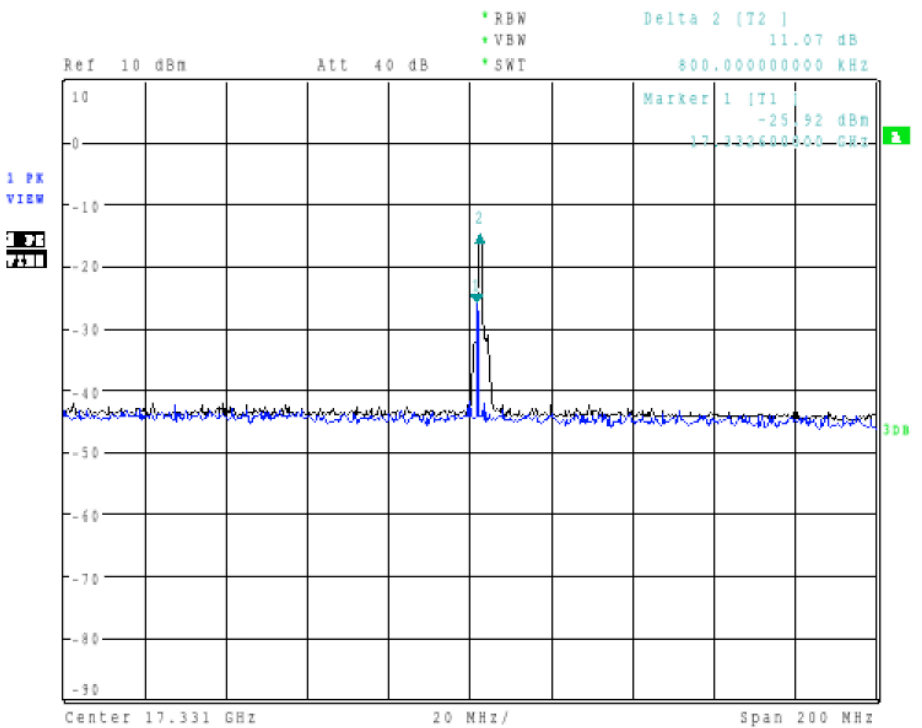
The power consumption of the VCO is of 81 mA at 3 V, which is higher than the expected 77 mA from the specification. The reasoning of this increase in consumption might be the bad connections used with the jumper.



Frequency doubler and amplifier:

The frequency doubler doubles the VCO output tone accordingly. The losses introduced by the doubling cannot be measured accurately.

The LO amplifier provides a net gain of ~11 dB, and when considering the 50 Ohm resistor in series at its input to reduce the signal power that adds ~4dB of extra losses , the behavior of the amplifier is in pair with the LNA (is the same ic). The power consumption appears to be of a nominal 40 mA.



3.7. Anomalies

The list of anomalies is shown below:

1. Erroneous VCO frequency tuning when front-end or cables are shifted.
2. Higher power consumption than nominal of the VCO.
3. The LO signal at the input of the mixer seems to be of not powerful enough to drive the mixer.

3.8. Conclusions

The VCO behavior is validated, but its characteristics need to be measured with the interface board attached, to reduce the impedance of the jumper cables used and improve the performance.

4. Test of the Front-end Top board RF

4.1. Test Description and Objectives

The purpose of this test is to validate the correct functioning of the RF part of the RFI-5G front-end top, i.e., with an input signal between 24-25 GHz, the signal is down-converted to an intermediate signal with frequency between 6669-76669 MHz, with a net gain of 5 dB.

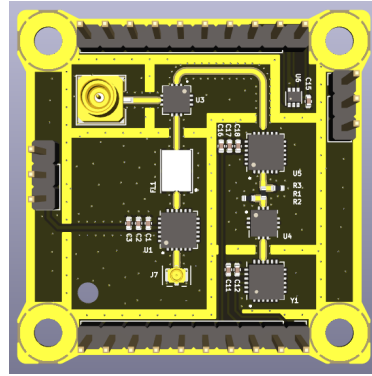
4.2. Requirements Verification

This test does not verify any requirement, and is only to check that the board part works as expected.

4.3. Test Set-Up

The required components for this test are the following:

RFI-5G front-end top board

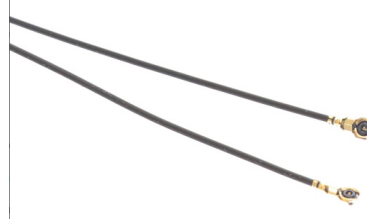


RFI-5G interface board with inverse connectors

C.FL to SMA-2.92mm adapter



C.FL cable



DC Block N to SMA adapter



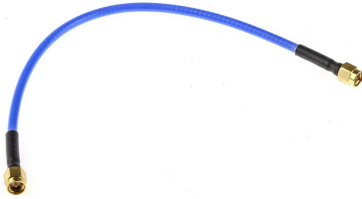
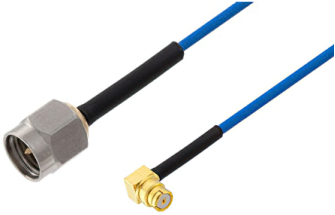


Power supply



Signal Generator capable of at least 25 GHz

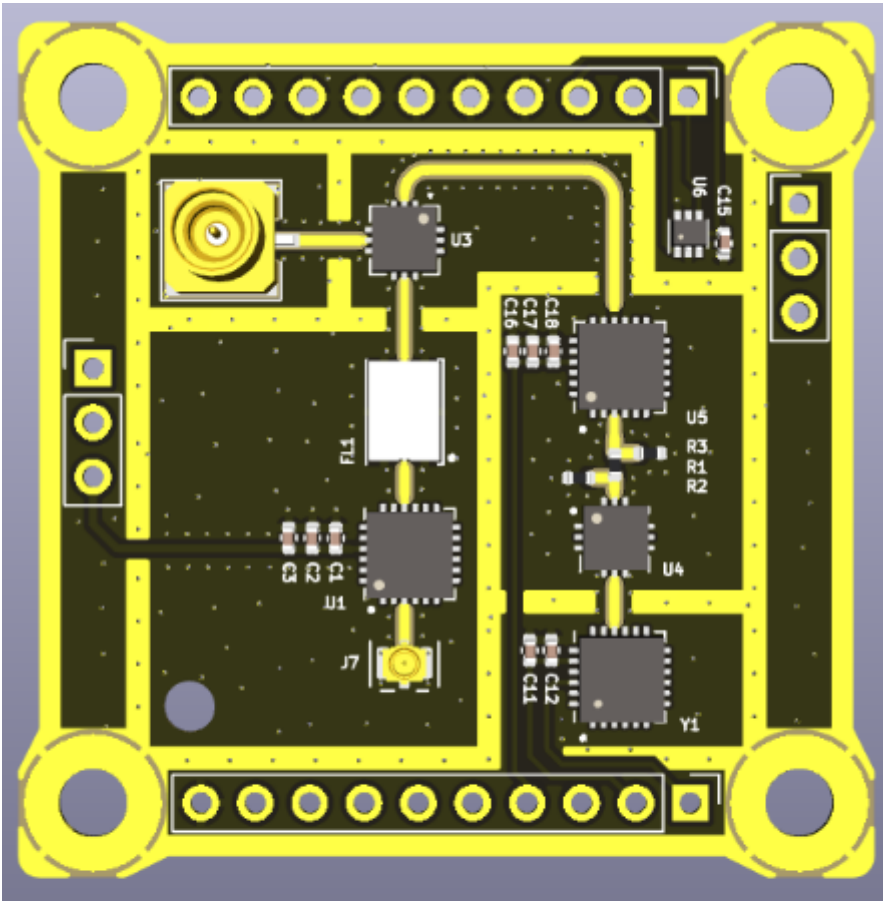


Spectrum Analyzer capable of at least 25 GHz	
2x Banana cables	
SMA 2.92 mm cables	
SMA to SMP cable	

The steps to prepare the setup are the following:

1. Mate the RFI-5G front-end top board with the RFI-5G interface board that has the inverse pin header.
2. Connect the EGSE to the power supply with the banana cables.
3. Connect the output from the signal generator to the antenna input of the RFI-5G front-end top board by using the C.FL cable and the C.FL to 2.92 mm adapter.
4. Connect the DC-block N to SMA adapter to the spectrum analyzer input.
5. Connect the RFI-5G front-end top board output to the spectrum analyzer using the SMA to SMP cable.

The diagram below represents the initial setup:



GND ↑

PoL ↑

4.4. Pass/Fail Criteria

The test will be considered successful if the output of the RFI-5G front-end top board is a signal between 6669-7669 MHz when the antenna input is between 24-25 GHz, and the board provides a net gain of +5 dB. Additionally, the current consumption has to be nominal.

4.5. Test Plan

Step ID	Description	Pass/Fail Criteria	Actual	Passed [Y/N]
RFI-5G-TOP-RF-000	Make sure that the power supply and signal generator outputs are off.	Passes if power supply and signal generator outputs are off.	power supply and signal generator off	y
RFI-5G-TOP-RF-010	Prepare the setup as stated in 4.3.	Passes if setup prepared.	setup prepared	y

RFI-5G-TOP-RF-020	Set the first channel of the power supply to 3.3 V and limit the current to 200 mA.	Passes if power supply set.	power supply set	y
RFI-5G-TOP-RF-030	Set the spectrum analyzer to: f = 7169 MHz Span = 200 MHz RBW = 100 kHz VBW = 3 kHz Reference level = -20 dBm Trace = Clear/Write	Passes if spectrum analyzer set.	spectrum analyzer set	y
RFI-5G-TOP-RF-040	Set the signal generator to: f = 24.5 GHz Pout = -80 dBm	Passes if signal generator set.	signal generator set	y
RFI-5G-TOP-RF-050	Switch on the first channel of the power supply. If the power supply is limiting switch it off immediately.	Passes if power supply is on and not current limiting.	power supply on	y
RFI-5G-TOP-RF-060	Note the voltage and current. If the current consumption is abnormal switch it off immediately.	Passes if voltage and current are within specification (some margin is allowed but has to be explained why).	CH1 Voltage: 3.3 V Current: 150 mA	y
RFI-5G-TOP-RF-070	Enable the output of the signal generator.	Passes if signal generator output is enabled.	signal generator enabled	y
RFI-5G-TOP-RF-080	Note the voltage and current. If the current consumption is abnormal switch it off immediately.	Passes if voltage and current are same as in RFI-5G-TOP-RF-060.	CH1 Voltage: 3.3 V Current: 150 mA	n
RFI-5G-TOP-RF-090	Add one marker at the peak. Note the frequency and power of the intermediate signal. Additionally compute the net gain and the frequency shift.	Passes if the net gain is +5 dB and the frequency shift of 17331 MHz.	frequency = Power = frequency shift = Gain =	n
RFI-5G-TOP-RF-100	Set the trace mode in the spectrum analyzer to VIEW to freeze the image.	Passes if trace mode is VIEW.		
RFI-5G-TOP-RF-110	Capture the screen of the spectrum analyzer and save it into a USB drive.	Passes if .wmf is saved into a USB drive.	File name:	

RFI-5G-TOP-RF-120	Set the trace mode in the spectrum analyzer to CLEAR/WRITE to clear the spectrum.	Passes if trace mode is CLEAR/WRITE.		
RFI-5G-TOP-RF-130	Switch off the output of the signal generator.	Passes if signal generator output is off.		
RFI-5G-TOP-RF-140	Set the spectrum analyzer to: f = 7169 MHz Span = 1200 MHz RBW = 300 kHz VBW = 30 kHz Trace = Max Hold	Passes if spectrum analyzer set.		
RFI-5G-TOP-RF-150	Set the signal generator to: Mode = frequency sweep f = 24.5 GHz Span = 1 GHz Step = 10 MHz P = -80 dBm	Passes if signal generator set.		
RFI-5G-TOP-RF-160	Switch on the output of the signal generator.	Passes if signal generator output is on.		
RFI-5G-TOP-RF-170	Wait until a complete frequency sweep is done.	Passes when complete frequency sweep finishes.		
RFI-5G-TOP-RF-180	Check qualitatively the flatness of the RFI-5G front-end top board RF output.	Passes if the RF output is "flat".		
RFI-5G-TOP-RF-190	Set the trace mode in the spectrum analyzer to VIEW to freeze the image.	Passes if trace mode is VIEW.		
RFI-5G-TOP-RF-200	Capture the screen of the spectrum analyzer and save it into a USB drive.	Passes if .wmf is saved into a USB drive.	File name:	
RFI-5G-TOP-RF-210	Switch off the power supply and the signal generator.	Passes if power supply and signal generator are off.		
RFI-5G-TOP-RF-220	If all steps are passed, proceed with next test.	Passes if all steps passed.		

4.6. Test Results

The mixer does not seem to perform the frequency downconversion

Upon investigation

4.7. Anomalies

List of deviations to the Test Specification and Procedure and non-conformances witnessed during the test campaign, including a brief description, the close-out status and reference to the relevant reports.

4.8. Conclusions

The Conclusions shall include (where needed as annex):

1. Test results, including as a minimum:
 - Requirement to be verified
 - Subsections of test campaign in which that requirement was verified (e.g. Thermal Vacuum RFT 1, Inspection 1, Inspection 2, ...)
 - Close-out judgement (compliance status) and rationale, per subsection of the test
 - Traceability to used documentation
 - Conformance or deviation including references
2. Overall conclusion on the success of the test, including clearly stated and described open issues and possible remediating actions.
3. Test Readiness Review minutes and Post Test Review minutes

5. Test of the temperature sensor

5.1. Test Description and Objectives

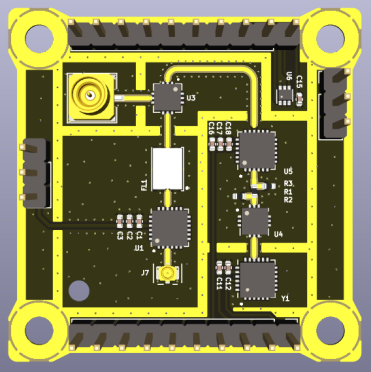
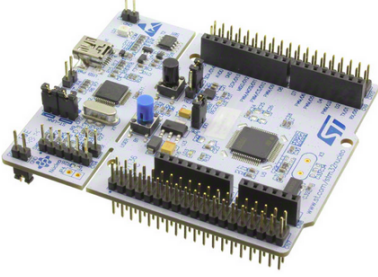



The purpose of this test is to validate the correct functioning of temperature sensor in the RFI-5G front-end top board, and that the sensor library code functions correctly.

5.2. Requirements Verification

This test does not verify any requirement, and is only to check that the board part works as expected.

5.3. Test Set-Up

The required components for this test are the following:

RFI-5G front-end top board	 A top-down view of a black PCB with yellow traces. It features several integrated circuits, including a central chip labeled 'U5' and another labeled 'U4'. There are also various passive components like resistors and capacitors. The board has four circular mounting holes at the corners.
RFI-5G interface board with inverse connectors	
RFI-5G EGSE	
STM32 Nucleo-L476RG board	 A blue and white STM32 Nucleo-L476RG development board. It features a central microcontroller chip, a USB Type-C port, a USB Type-A port, and several pin headers for external connections.
USB A-to-mini cable	 A black USB A-to-mini cable. One end has a standard USB Type-A connector, and the other end has a USB Type-B mini connector.
Power supply	 A Rohde & Schwarz NGE 150 Power Supply Series unit. The digital display shows three output channels: 16.00 V 1.437 A, 32.00 V 1.000 A, and 5.00 V 2.000 A. The unit has a control knob and several buttons on the right side, and three sets of output terminals (blue, red, and black) at the bottom.
2x Banana cables	 Two sets of banana cables. Each set consists of a red and a black cable with banana plugs at both ends. The cables are coiled together.

2x Jumper cables	
Temperature sensor test code	NA

The steps to prepare the setup are the following:

1. Mate the RFI-5G front-end top board with the RFI-5G interface board that has the inverse pin header.
2. Connect the EGSE to the power supply with the banana cables.
3. Connect the output from the signal generator to the antenna input of the RFI-5G front-end top board by using the C.FL cable and the C.FL to 2.92 mm adapter.
4. Connect the DC-block N to SMA adapter to the spectrum analyzer input.
5. Connect the RFI-5G front-end top board output to the spectrum analyzer using the SMA to SMP cable.

The diagram below represents the initial setup:

Missing setup picture

5.4. Pass/Fail Criteria

Description of which metric is used to perform the test and when it is considered that the test passed or not. If different metrics are used, it is important to define when the test passed or not (e.g. when all the metrics are in the pass criteria, or when only one of them).

5.5. Test Plan

This section includes the test sequence necessary to do the test. The test sequence must include all the steps, from the set-up up to the conclusion of the test.

5.6. Test Results

Description of the Test results with supporting data.

- Test name, test execution dates, the test facility used and the operators
- Test Logbooks
- “As-run” procedures (to be provided in annex)
- Test facility results (if applicable)
- Photographs relevant to the set-up(s) and inspection(s) (may also be added in the Conclusions to clarify a close-out judgement, e.g. for an inspection)
- Analysis of the test data and relevant assessment.
- Synthesis of the overall test results per verification (e.g. Vibration, Inspection 1, Inspection 2, etc.).

5.7. Anomalies

List of deviations to the Test Specification and Procedure and non-conformances witnessed during the test campaign, including a brief description, the close-out status and reference to the relevant reports.

5.8. Conclusions

The Conclusions shall include (where needed as annex):

1. Test results, including as a minimum:
 - Requirement to be verified
 - Subsections of test campaign in which that requirement was verified (e.g. Thermal Vacuum RFT 1, Inspection 1, Inspection 2, ...)
 - Close-out judgement (compliance status) and rationale, per subsection of the test
 - Traceability to used documentation
 - Conformance or deviation including references
2. Overall conclusion on the success of the test, including clearly stated and described open issues and possible remediating actions.
3. Test Readiness Review minutes and Post Test Review minutes

Revision #1

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