RSA306 USB Spectrum Analyzer Specifications and Performance Verification (Version 0 RF Signal Path Gain Cal)

Technical Reference

077-1030-01

Tektronix

RSA306 USB Spectrum Analyzer
Specifications and
Performance Verification
(Version 0 RF Signal Path Gain Cal)

Technical Reference

www.tektronix.com
077-1030-01

Contacting Tektronix

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For product information, sales, service, and technical support:

- In North America, call 1-800-833-9200.
- Worldwide, visit www.tektronix.com to find contacts in your area.

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Important safety information

This manual contains information and warnings that must be followed by the user for safe operation and to keep the product in a safe condition.

To safely perform service on this product, additional information is provided at the end of this section. (See page iv, *Service safety summary*.)

General safety summary

Use the product only as specified. Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. Carefully read all instructions. Retain these instructions for future reference.

Comply with local and national safety codes.

For correct and safe operation of the product, it is essential that you follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

The product is designed to be used by trained personnel only.

Only qualified personnel who are aware of the hazards involved should remove the cover for repair, maintenance, or adjustment.

This product is not intended for detection of hazardous voltages.

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component manuals for warnings and cautions related to operating the system.

When incorporating this equipment into a system, the safety of that system is the responsibility of the assembler of the system.

To avoid fire or personal injury

Connect and disconnect properly. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

Use only insulated voltage probes, test leads, and adapters supplied with the product, or indicated by Tektronix to be suitable for the product.

Observe all terminal ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

The measuring terminals on this product are not rated for connection to mains or Category II, III, or IV circuits.

Do not operate without covers. Do not operate this product with covers or panels removed, or with the case open.

Avoid exposed circuitry. Do not touch exposed connections and components when power is present.

Do not operate with suspected failures. If you suspect that there is damage to this product, have it inspected by qualified service personnel.

Disable the product if it is damaged. Do not use the product if it is damaged or operates incorrectly. If in doubt about safety of the product, turn it off and disconnect the power. Clearly mark the product to prevent its further operation.

Examine the exterior of the product before you use it. Look for cracks or missing pieces.

Use only specified replacement parts.

Do not operate in wet/damp conditions. Be aware that condensation may occur if a unit is moved from a cold to a warm environment.

Do not operate in an explosive atmosphere.

Keep product surfaces clean and dry. Remove the input signals before you clean the product.

Provide proper ventilation. Refer to the installation instructions in the manual for details on installing the product so it has proper ventilation.

Provide a safe working environment. Avoid improper or prolonged use of keyboards, pointers, and button pads. Improper or prolonged keyboard or pointer use may result in serious injury.

Be sure your work area meets applicable ergonomic standards. Consult with an ergonomics professional to avoid stress injuries.

Use only the Tektronix rackmount hardware specified for this product.

Service safety summary

The *Service safety summary* section contains additional information required to safely perform service on the product. Only qualified personnel should perform service procedures. Read this *Service safety summary* and the *General safety summary* before performing any service procedures.

To avoid electric shock. Do not touch exposed connections.

Do not service alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect power. To avoid electric shock, disconnect the USB 3.0 cable from the instrument before removing any covers or panels, or opening the case for servicing.

Use care when servicing with power on. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

Terms in this manual

These terms may appear in this manual:

***WARNING.** Warning statements identify conditions or practices that could result in injury or loss of life.*

***CAUTION.** Caution statements identify conditions or practices that could result in damage to this product or other property.*

Terms and symbols on the product

These terms may appear on the product:

- DANGER indicates an injury hazard immediately accessible as you read the marking.
- WARNING indicates an injury hazard not immediately accessible as you read the marking.
- CAUTION indicates a hazard to property including the product.

When this symbol is marked on the product, be sure to consult the manual to find out the nature of the potential hazards and any actions which have to be taken to avoid them. (This symbol may also be used to refer the user to ratings in the manual.)

The following symbol(s) may appear on the product:

Preface

Verify the proper manual

This manual applies only to instruments calibrated with **Version 0 RF Signal Path Gain Cal.** For instruments calibrated with Version 1 (or later) RF Signal Path Gain Cal, use the Specifications and Performance Verification manual Tektronix part number 077-1133-XX available on the Tektronix web site.

(See page vii, *Determining RF signal path gain calibration version*.)

Purpose

This manual lists the electrical, mechanical, and environmental specifications, and the certification and compliance statements for the Tektronix RSA306 USB Spectrum Analyzer. Also provided are procedures for verifying the performance of the instrument.

Documentation

The following table lists some of the documentation that is available for this product.

Product documentation

Document	Purpose	Location
Installation and Safety Instructions	Provides software and hardware installation instructions and associated safety warnings	Printed manual and also available in electronic format on the product flash drive and at www.tektronix.com/manuals
Specifications and Performance Verification Technical Reference (this manual)	Specifications and performance verification procedures for checking instrument performance	Available at www.tektronix.com/manuals
SignalVu-PC application help	Using the application and interpreting the measurement results	Application help files located within the application
RSA306 API Programmer manual	Details on commands used to control the instrument through an API	Available at www.tektronix.com/manuals
SignalVu-PC Programmer manual	Details on commands used with the SignalVu-PC application	Available at www.tektronix.com/manuals

Determining RF signal path gain calibration version

This manual applies only to those instruments calibrated with **Version 0 RF Signal Path Gain Cal.**

For instruments calibrated with Version 1 (or later) RF Signal Path Gain Cal,, do not use this manual. Instead, use the Specifications and Performance Verification manual Tektronix part number 077-1033-XX available on the Tektronix web site.

Use the following table to determine the version that was used to calibrate your instrument.

RF signal path gain calibration versions

RSA306 serial numbers		Version 1 (or later) RF Signal Path Gain Cal.	Version 0 RF Signal Path Gain Cal.
B010794 and above		X	
B010472, B010715, B010777		X	
B010793 and below			
Has the instrument been recalibrated at a Tektronix service center?	Yes	X	
	No		X
	Unsure	See the secondary process to determine version	

Secondary process to determine version

If your instrument is Serial numbered B010793 or below, and you are unsure if your instrument has ever been recalibrated (from its original factory calibration), use the following methods to verify the version.

Preferred method. The preferred method requires SignalVu-PC software version 3.5.0119 or greater. Run SignalVu-PC and connect to the RSA306. In the SignalVu-PC application, select Help/About Tektronix Real Time Signal Analyzer. In the displayed windo, scroll through the Hardware Information section to find the line that reads “RF signal path gain calibration constants Ver:. if 0 is displayed, you have Version 0 RF Signal Path Gain Cal. and you can use this manual. If the number 1 (or greater) is displayed, you cannot use this manual.

Alternate method. The alternate method is based on using a version of SignalVu-PC software that is below 3.5.0119. Run an alignment (accessed from menu item Tools/Alignments). If there is no message saying “Data from uncalibrated instrument” in the lower left corner of the graticule, then the instrument has Version 0 RF Signal Path Gain Cal. and you can use this manual.

Specifications

All specifications are guaranteed unless labeled Typical. Typical specifications are provided for your convenience.

***NOTE.** Warranted characteristics that are checked in the Performance Verification are marked with a ✓ symbol.*

The performance limits in this specification are valid within the following conditions:

- Operate the instrument in an environment that meets the temperature, altitude, and humidity characteristics listed in these specifications.
- Warm up the instrument for at least 30 minutes after connecting to the PC and starting the SignalVu application.

***NOTE.** This manual applies only to instruments calibrated with **Version 0 RF Signal Path Gain Cal.** For instruments calibrated with Version 1 (or later) RF Signal Path Gain Cal, use the Specifications and Performance Verification manual Tektronix part number 077-1133-XX available on the Tektronix web site.*

(See page vii, Determining RF signal path gain calibration version.)

Frequency

RF input frequency range	9 kHz to 6.2 GHz
Frequency reference accuracy	
Over 18 °C to 28 °C ambient temperature range✓	±3 x 10^{-6} + aging (after 20 minute warm up)
Aging, typical	±3 x 10^{-6} (first year), ±1 x 10^{-6} each year thereafter
Over operating temperature range (–10 °C to +55 °C ambient), typical	±25 x 10^{-6} + aging
External frequency reference input	
Input Frequency Range	10 MHz ±10 Hz
Input Level Range	–10 dBm to +10 dBm sinusoid
Impedance	50 Ω
Center frequency resolution	
Block IQ samples	1 Hz
Streamed ADC samples	500 kHz

Amplitude

RF input impedance	50 Ω
RF input VSWR, typical	≤ 1.8:1 (10 MHz to 6200 MHz, reference level ≥ +10 dBm) (Equivalent Return Loss: ≥ 11 dB)
Maximum RF input level without damage	The maximum voltage or power that the RF input can withstand without creating a shock hazard or damaging the input.
DC voltage	±40 V_{DC}
Ref Level ≥ –10 dBm	+23 dBm (continuous or peak)
Ref Level < –10 dBm	+15 dBm (continuous or peak)
Maximum RF input operating level	The maximum level at the RF input for which the instrument will meet its measurement specifications.
Center frequency < 22 MHz	+15 dBm
Center frequency ≥ 22 MHz	+20 dBm
Amplitude accuracy at all center frequencies✓	Reference level +20 dBm to –30 dBm, alignment run prior to testing Applies to corrected IQ data, with signal to noise ratios > 40 dB Accuracy may degrade up to ±0.6 dB after storage at maximum storage temperature, recovers within 24 hours
Center frequency 9 kHz to < 3 GHz	±2.0 dB (18 °C to 28 °C) ±1.25 dB (18 °C to 28 °C), typical (95% confidence) ±3.0 dB (–10 °C to 55 °C), typical
Center frequency ≥ 3 GHz to 6.2 GHz	±2.75 dB (18 °C to 28 °C) ±2.0 dB (18 °C to 28 °C), typical(95% confidence) ±3.0 dB (–10 °C to 55 °C), typical
Channel amplitude flatness ✓	Reference level +20 dBm to –30 dBm, alignment run prior to testing Applies to corrected IQ data, with signal to noise ratios > 40 dB ±1.0 dB (18 °C to 28 °C) ±2.0 dB, (–10 ºC to 55 ºC), typical ±3.0 dB, 22 MHz - 24 MHz, (-10 ºC to 55 ºC), typical

Trigger

Trigger/sync input	
Voltage range	TTL (0.0 V – 5.0 V)
Trigger level	Positive-going threshold voltage: 1.6 V minimum, 2.1 V maximum Negative-going threshold voltage: 1.0 V minimum, 1.35 V maximum
Impedance	10 kΩ (with Schottky clamps to 0 V, +5 V)
Power trigger	Trigger on RF power level transitions which cross the trigger level, for signals within the IF BW.
Threshold range	0 dB to –50 dB (from reference level, for trigger levels > 30 dB above the noise floor, 0.1 dB steps)
Type	Rising or falling edge
Trigger re-arm time	≤ 100 µs

Intermediate frequency and acquisition system

IF bandwidth	40 MHz
ADC sample rate and bit width	112 Ms/s, 14 bits Sample rate and bit-width of the Analog/Digital Converter used to digitize the IF signal
Real-time IF acquisition data (uncorrected)	112 Ms/s, 16-bit integer samples 40 MHz BW, at digital IF = 28 ±0.25 MHz, uncorrected Block streaming data at an average rate of 224 MB/sec
Block baseband acquisition data (corrected)	
Maximum acquisition time	1 s
Bandwidths	40 /(2^N) MHz, 0 Hz Digital IF, N ≥ 0
Sample rates	56 / (2^N) Ms/s, 32-bit float complex samples, N ≥ 0

Noise and distortion

Displayed average noise level (DANL) ✓	Reference level = –50 dBm, input terminated with 50 Ω load, log-average (10 averages)

Center frequency	Frequency range	DANL (dBm/Hz), 18 ºC to 28 ºC✓	DANL (dBm/Hz), –10 ºC to 55 ºC, typical
< 22 MHz (LF path)	100 kHz - 42 MHz	≤ –130	≤ –133
≥ 22 MHz (RF path)	2 MHz - 5 MHz	≤ –145	≤ –148
	5 MHz – 1.0 GHz	≤ –160	≤ –163
	1.0 GHz – 2.0 GHz	≤ –158	≤ –161
	2.0 GHz – 4.0 GHz	≤ –155	≤ –158
	4.0 GHz – 6.2 GHz	≤ –150	≤ –153

Phase noise✓

Phase Noise (dBc/Hz) measured with 1 GHz CW signal at 0 dBm

Offset	1 GHz ✓	Center frequency, dBc/Hz 10 MHz (typical)	1 GHz (typical)	2.5 GHz (typical)	6 GHz (typical)
1 kHz	–85	–115	–89	–78	–70
10 kHz	–84	–122	–87	–84	–83
100 kHz	–90	–126	–93	–92	–94
1 MHz	–118	–127	–120	–114	–108

Residual spurious response, typical

< –85 dBm (Reference level ≤ –50 dBm, RF input terminated with 50 Ω)

Exceptions: < –78 dBm:
For harmonics of 112 MHz at 1680 MHz – 2688 MHz
For ranges 4780 MHz – 4810 MHz and 4905 MHz - 4965 MHz

Input related spurious response (SFDR) ✓

Spurious responses due to the following mechanisms: Images (RFxLO1), RFx2*LO1, 2RFx2*LO1, RF to IF feed-through, IF2 Image.

< –50 dBc (18 ºC to 28 ºC, with auto settings on and signals 10 dB below reference level, reference level = –30 dBm, input frequencies ≤ 8 GHz)

≤ -50 dBc, -10 °C to 55 °C, typical
Exceptions:

- IF feedthrough: ≤ –30 dBc for 2340 MHz - 2420 MHz, typical
- Image: ≤ -45 dBc for 2860 MHz – 3460 MHz, typical
  ≤ –30 dBc for 4570 MHz – 4760 MHz, typical
- RFx2LO: ≤ –40 dBc for 1850 MHz – 1960 MHz, 3700 MHz – 4000 MHz, typical
  ≤ –45 dBc for 3890 MHz – 3910 MHz, typical
- 2RFx2LO: ≤ –40 dBc for 4260 MHz – 4280 MHz, typical

Residual FM, typical

< 10 Hz_{p-p}

3RD order IM distortion ✓

≤ –60 dBc at center frequency 2130 MHz, reference level = –15 dBm, 18 ºC to 28 ºC

≤ –60 dBc at center frequency 2130 MHz, reference level = –15 dBm, –10 ºC to 55 ºC, typical

≤ –60 dBc at center frequency 2130 MHz, reference level = –30 dBm, typical

< –58 dBc, 40 MHz to 6.2 GHz, reference level = –10 dBm, typical

< –50 dBc, 40 MHz to 6.2 GHz, reference level = –50 dBm, typical

Two input CW signals, 1 MHz separation, each input signal level 5 dB below the reference level setting at the RF input

3RD order intercept (TOI)

≥ +10 dBm at center frequency 2130 MHz, reference level –15 dBm, 18 ºC to 28 ºC

≥ +10 dBm at center frequency 2130 MHz, reference level –15 dBm, –10 ºC to 55 ºC, typical

≥ –5 dBm at center frequency 2130 MHz, reference level –30 dBm, typical

+14 dBm, 40 MHz to 6.2 GHz, reference level = –10 dBm, typical

–30 dBm, 40 MHz to 6.2 GHz, reference level = –50 dBm, typical

These are indirectly tested by the 3rd Order IM Distortion test

2ND harmonic distortion, typical

< –55 dBc, 10 MHz to 300 MHz, reference level = 0 dBm

< –60 dBc, 300 MHz to 3.1 GHz, reference level = 0 dBm

< –50 dBc, 10 MHz to 1850 MHz, and 2330 MHz to 3100 MHz, reference level = –40 dBm

< –45 dBc , 1850 MHz to 2330 MHz, reference level = –40 dBm

2ND harmonic distortion intercept (SHI), typical

+55 dBm, 10 MHz to 300 MHz, reference level = 0 dBm

+60 dBm, 300 MHz to 3.1 GHz, reference level = 0 dBm

+10 dBm, 10 MHz to 1850 MHz, and 2330 MHz to 3100 MHz, reference level = –40 dBm

+5 dBm, 1850 MHz to 2330 MHz, reference level = –40 dBm

Local oscillator feedthrough to input connector, typical

< –75 dBm
Reference level = –30 dBm

Real time

DPX minimum signal duration (100% POI)	100 µs DPX settings: Span = 40 MHz, RBW = 300 kHz (Auto) Due to the nondeterministic execution time of programs running under Microsoft Windows OS, this specification may not be met when the host PC is heavily loaded with other processing tasks
DPX bitmap image resolution	201 pixels vertical x 801 pixels horizontal
DPX spectrogram minimum time resolution	1 millisecond Due to the non-deterministic execution time of programs running under Microsoft Windows OS, this specification may not be met when the host PC is heavily loaded with other processing tasks
Audio demodulation	
Types	AM, FM
IF bandwidth range	Five selections, 8 kHz – 200 kHz
Audio output frequency range	50 Hz – 10 kHz

Interfaces, input, output ports

RF input	Type N, female
External frequency reference input	SMA, female
Trigger/sync input	SMA, female
Status indicator	LED, dual color red/green LED states: Steady Red: USB power applied, or resetting Steady Green: Initialized, ready for use Flickering Green: Transferring acquired data to host PC
USB device port	USB 3.0 - Micro-B

Physical

Weight	0.59 kg (1.3 lbs)
Dimensions	
Height	30.5 mm (1.2 in)
Width	127 mm (5.0 in)
Depth	190.5 mm (7.5 in)

Regulatory

Safety	UL61010-1, CAN/CSA-22.2 No.61010-1, EN61010-1, IEC61010-1
Regional certifications	Europe: EN61326 Australia/New Zealand: AS/NZS 2064
EMC emissions	EN61000-3-2, EN61000-3-3, EN61326-2-1
EMC immunity	EN61326–1/2, IEC61000-4-2/3/4/5/6/8/11

Environmental performance

Temperature	
Operating	–10 °C to +55 °C (+14 °F to +131 °F)
Nonoperating	–51 °C to +71 °C (–60 °F to +160 °F)
Humidity, operating	5% to 95 ±5% RH (relative humidity) in the temperature range of +10 °C to 30 °C (+50 °F to 86 °F) 5% to 75% ±5% RH from +30 °C to +40 °C (+86 °F to 104 °F) 5% to 45% RH above +40 °C to +55 °C (+86 °F to +131 °F) <10 °C humidity is uncontrolled; non-condensing
Altitude	
Operating	9144 meters (30,000 feet)
Nonoperating	15,240 meters (50,000 feet)
Dynamics	
Random vibration: nonoperating	0.030 g^2/Hz, 10 Hz – 500 Hz, 30 minutes per axis, three axes (90 minutes total)
Mechanical shock: operating	Half-sine mechanical shocks, 30 g peak amplitude, 11 ms duration, three drops in each direction of each axis (18 total)
Handling and transit	
Bench handling, operating	Per MIL-PRF-28800F Class 2 operating: Rotational-edge-drops of appropriate edges on appropriate sides of the equipment
Transit drop, nonoperating	Per MIL-PRF-28800F Class 2 nonoperating: Transit drops onto six faces and four corners of the equipment, from a height of 30 cm (11.8 in.) for a total of 10 impacts

Performance verification

__NOTE.__ The performance verification procedure is not a calibration procedure. The performance verification procedure only verifies that your instrument meets key specifications. For your instrument to be calibrated, it must be returned to a Tektronix service facility.

__NOTE.__ This manual applies only to instruments calibrated with ***Version 0 RF Signal Path Gain Cal.*** *For instruments calibrated with Version 1 (or later) RF Signal Path Gain Cal, use the Specifications and Performance Verification manual Tektronix part number 077-1133-XX available on the Tektronix web site.*

(See page vii, Determining RF signal path gain calibration version.)

Prerequisites

The tests in this section make up a confirmation of performance and functionality when the following requirements are met:

- The instrument must be in an environment with temperature, altitude, humidity, and vibration within the operating limits described the published specifications.
- The instrument must be completely assembled and covers installed per factory specification.
- The instrument must have been operating for a warm-up period of at least for 30 minutes after being connected to the PC, starting the SignalVu-PC application, and connecting SignalVu-PC to the RSA306 instrument.

__NOTE.__ The RSA306 does not fully power on until SignalVu-PC has established communication with the RSA306 and is ready to acquire measurements.

- The instrument must have had its last alignment routine done after at least a 30 minute warm–up period at an ambient temperature not more than ±2 °C different than the current ambient temperature.

Required equipment

These procedures use external, traceable signal sources to directly check warranted characteristics. The following table lists the equipment required for this procedure.

Table 1: RSA306 required test equipment

Item	Description	Qty	Model Number	Purpose
Desktop or Laptop PC	Intel Core i7-4-core with Intel HD4000 (clock speed 3.6 GHz or in this proximity), 8.00 GB RAM, WIN7 64 Bit OS, Solid State Drive (SSD) ≥128 GB with > 300 MBytes/sec sustained write speed, USB 3.0	1	Dell Optiplex 9020 MT, or equivalent	Run SignalVu-PC
USB3 cable	1 meter length	1	L-Com CAU3AMICB-1M 174-6584-00 (Tekronix P/N)	Required for the RSA306 communication and power
Signal generator	DC – 8 GHz	2	Stanford Research Systems SG386 option 02	One generator for most tests, two for third-order distortion
Power meter	9 kHz – 18 GHz (power head dependent)	1	Keysight E4418B	Verifies RSA306 input signal amplitude
Power sensor	9 kHz – 18 GHz	1	Keysight power head E9304A H18	Measures RSA306 input signal amplitude
Power splitter	DC – 18 GHz, N	1	Keysight 11667A	Amplitude adjustments and input amplitude setting in spurious tests
Power combiner	2 –18 GHz, SMA	1	M/A-COM 2089-6208-00	Third-order distortion measurement
Attenuator	3 dB, SMA, >8 GHz bandwidth	2	Mini-Circuits Labs FW-3+	For third-order distortion measurement
Termination	DC -18 GHz, N-m	1	Maury Microwave 2510B6	For DANL tests
Adapter N(male) to N(male)	DC -18 GHz coaxial adapter	1	Pasternack PE91034 orMaury Microwave 8828B	Amplitude adjustments
Adapter N(male) to SMA(female)	DC -18 GHz adapter	2-6 (as need-ed)	Needed for SG386 generator	May be needed for signal generator and filter RF connections
Band pass filter	2150 MHz, SMA	2	Mini-Circuits Labs ZX75BP-2150+	For third-order distortion measurement
Low pass filter	3300 MHz cutoff, L250 filter	1	K&L 5L3-3300/E 10000 – O/OP	Spurious test

Table 1: RSA306 required test equipment (cont.)

Item	Description	Qty	Model Number	Purpose
Tunable filter	375 MHz to 750 MHz, N connectors	1	K&L 5BT-375/750-5-N/N	Spurious test
Tunable filter	750 MHz to 1500 MHz, N connectors	1	K&L 5BT-750/1500-5-N/N	Spurious test
Tunable filter	1500 MHz to 3000 MHz, N connectors	1	K&L 5BT-1500/3000-5-N/N	Spurious test
Cable, SMA-to-N	ST18/SMAm/Nm/36in	1	Huber-Suhner 84004594	Generator output to RF input
Cable, SMA	ST18/SMAm/SMAm/36in	2	Huber-Suhner 84002061	TOI and tests requiring low-pass filters
Cable, SMA	ST18/SMAm/SMAm/8	2	Huber-Suhner 84028563	TOI tests
Cable, BNC-to-SMA	BNC(m) to SMA(m) cable - 1 meter	1	Pasternack PE3615-36	Generator timebase output to Ref IN. (External-timebase to generator-timebase input may need a similar cable)
Torque wrench	12 in-lb - Type N	1	Maury Microwave 2698C2	N- connector attachments
Torque wrench	8 in-lb Torque wrench - 3.5 mm	1	Huber-Suhner 74Z-0-0-21	SMA-connector attachments

NOTE. *Make sure that any adaptor and cable you use is specified to operate at the frequency range of the test you are performing. Connector frequency ranges:*

BNC*: DC to 1 GHz typical, up to 3 GHz for certain BNC cable/connectors.*

N*: DC to 18 GHz typical*

SMA*: DC to 18 GHz typical, up to 26.5 GHz for certain SMA cable/connectors.*

Preliminary checks

Do these steps before starting the performance verification procedures.

Warm up the instrument

1. Connect the RSA306 USB cable to the host PC. The LED on the RSA306 should initially glow red then turn green after a few moments.
2. Make sure the SignalVu-PC application can find the RSA306 and is connected to it over USB.
3. View hardware status bar in the lower left corner of the SignalVu display. Verify that there are no errors or messages indicating loss of or invalid calibration data. At startup, the application may show the message, “Not Aligned:” this is OK.
4. Start the application acquiring data and allow the instrument to warm up for at least 30 minutes.

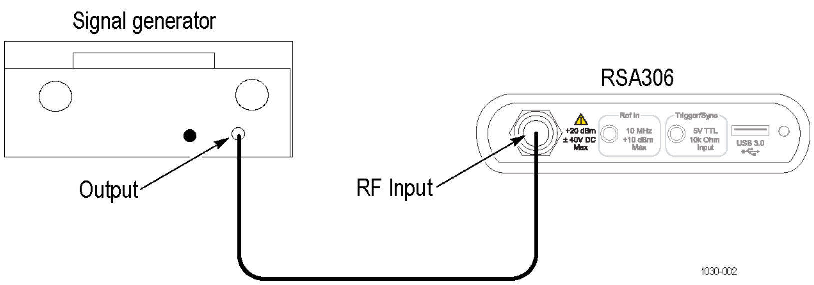
Run the alignment process

Align the instrument after the 30 minute warm-up period and before proceeding with the Warranted Characteristics tests:

1. Select **Alignments** in the Tools menu to open the Alignments dialog box.
2. Select **Align Now**. The alignment process takes a few seconds.
3. Verify that no alignment failures are reported in the status bar.

Performance verification procedures

Internal reference frequency accuracy



1. Connect a signal generator to the N-connector RF input of the RSA306.

***NOTE.** The signal generator accuracy must be better than ±0.05 ppm. If the signal generator accuracy does not meet this requirement, it must have its frequency reference phase locked to a precision frequency reference.*

***NOTE.** The Stanford Research Systems SG386 signal generator has adequate frequency stability without use of an external timebase, but only if it has been calibrated/verified within 1 year. If this is not the case, the signal generator must have an accurate external timebase connected to its timebase input (rear panel, BNC, 10 MHz).*

2. Set the signal generator to output a 0 dBm, 1 GHz CW frequency.
3. Reset the RSA306 to factory defaults: (**Presets > Main**) (The center frequency will be set to 1 GHz via Preset.)
4. Set the frequency span to **10 kHz**.
5. Connect the signal generator output to the RF Input, N-connector input of the RSA306.
6. Enter the measured marker frequency in the calculations table. (See Table 2.)
7. Calculate the specification based on aging rate. (See Table 3.)
8. Compare the measured value with the specification for Internal Frequency accuracy. Enter the results in the test record.

Table 2: Internal reference frequency instability calculations

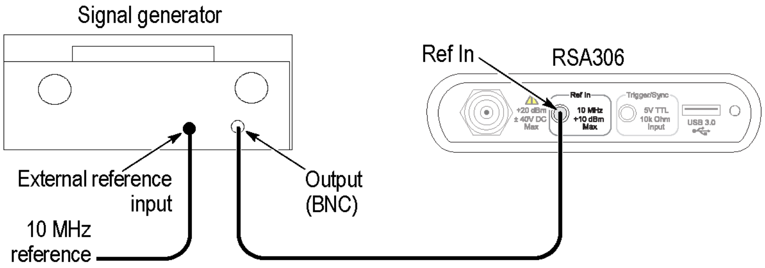
Marker frequency	Value
Instability measured [(Marker frequency – 1x10^9)/1000] ppm	
Instability due to aging (See Table 3.)	
Instability due to other drift (18 °C to 28 °C)	±3 ppm
Total specified Instability (aging plus other drift)	

Table 3: Instability due to aging

Time period	Aging after initial calibration (same date of manufacture)	Aging after calibration (Calibrated more than 1 year after manufacture)
0 to 3 months	±1 ppm	±0.5 ppm
3 to 6 months	±2 ppm	±0.8 ppm
6 to 12 months	±3 ppm	±1 ppm
1 year to 2 years	±4 ppm	±2 ppm

External reference input, functional test

This check is a functional check. It is an important check for customer use, but does not check warranted specification limits.



1. Connect a signal generator RF output to the N-connector Ref input of the RSA306, as shown. The signal generator accuracy must be better than ±0.05 ppm. If it does not, it must have its frequency reference phase locked to a precision frequency reference.

   Note: The Stanford Research Systems SG386 signal generator has adequate frequency stability without use of an external timebase, but only if it has been calibrated/verified within 1 year. If this is not the case, the signal generator must have an accurate external timebase connected to its timebase input (rear panel, BNC, 10 MHz).

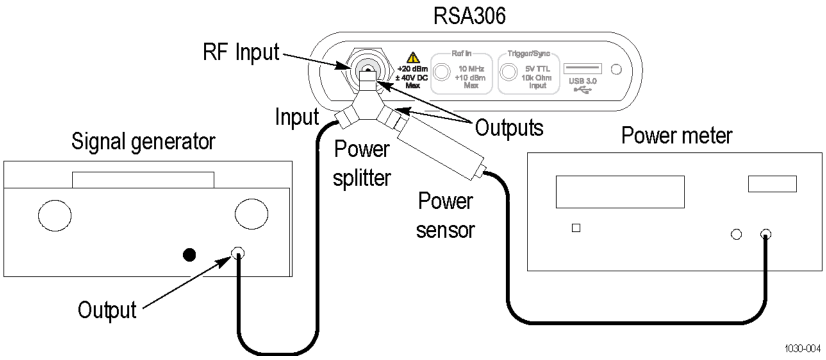
2. Set the signal generator controls:

   a. Frequency = **10 MHz**

   b. Amplitude =**0 dBm**

3. Set the RSA306 to use the external reference (**Setup > Acquire > Frequency Reference**).
4. Under the source field, select the **External (10 MHz)** radio button.
5. Check that the Status Bar shows **Ref: Ext**. This generally occurs within 5 seconds.
6. Enter pass/fail result in the test record.

Amplitude accuracy at all center frequencies



Amplitude accuracy is tested for four different reference levels which exercises the different RF gain conditions used in the RSA306.

1. Connect the signal generator, power splitter, power sensor, power meter, and RSA306 as shown. Connect the power sensor and RF signal generator directly to the power splitter, which is connected directly to the RSA306.
2. Reset the RSA306 to factory defaults (**Presets > Main**).
3. Run the RSA306 alignment procedure (**Tools > Alignments > Align Now**).
4. Set the RSA306 as follows:
   a. Reference Level = **+20 dBm**
   b. Detection = **+PEAK** (Setup > Settings > Traces > Detection > +PEAK)
   c. Filter shape = **Flat-Top** (Setup > Settings > BW > Filter Shape > Flat-top)
   d. Center Frequency: as listed in the amplitude accuracy tables. (See Table 4.) (See Table 5.) (See Table 6.) (See Table 7.)
   e. Span:
      - For CF < 1 MHz, Span = 100 kHz
      - For 1 MHz ≤ CF ≤ 30 MHz, Span = 1 MHz
      - For CF ≥ 30 MHz, Span = 10 MHz
   d. RBW:
      - For CF < 1 MHz, RBW = 1 kHz
      - For 1 MHz ≤ CF ≤ 30 MHz, RBW = 10 kHz
      - For CF > 30 MHz, RBW = 100 kHz
5. Set the signal generator output amplitude to **+12 dBm**. The RF amplitude at the power sensor and RSA306 input = +6 dBm nominal.
6. Set the signal generator frequency to the first frequency in the +20 dBm reference level accuracy table. (See Table 4.)
7. Set the RSA306 center frequency to the same frequency. (See Table 4.)
8. On the RSA306, peak the marker on the signal at the center frequency; measure and record the amplitude.

9. Measure and record the power meter amplitude.
10. Repeat steps 6 through 8 for all of the +20 dBm reference level frequencies in the table, measuring power meter amplitude and RSA306 amplitude.
11. Set the signal generator output amplitude to **+1 dBm** for the 0 dBm reference level tests. RF amplitude at the power sensor and the RSA306 = –5 dBm nominal.
12. Repeat steps 6 through 8 for all of the +0 dBm reference level frequencies in the table, measuring power meter amplitude and RSA306 amplitude. Enter the values in the 0 dBm accuracy table. (See Table 5.)
13. Set the signal generator output amplitude to **–12 dBm** for the –13 dBm reference level tests. RF amplitude at the power sensor and the RSA306 = –18 dBm nominal.
14. Repeat steps 6 through 8 for all of the –13 dBm reference level frequencies in the table, measuring power meter amplitude and RSA306 amplitude. Enter the values in the –13 dBm accuracy table. (See Table 6.)
15. Set the signal generator output amplitude to **–29 dBm** for the –30 dBm reference level tests. RF amplitude at the power sensor and the RSA306 = –35 dBm nominal.
16. Repeat steps 6 through 8 for all of the –30 dBm reference level frequencies in the table, measuring power meter amplitude and RSA306 amplitude. Enter the values in the –30 dBm accuracy table. (See Table 7.)
17. Calculate the amplitude errors for each frequency of each reference level accuracy table. Error = RSA306 measurement – power meter measurement. Readings are in dBm, error is in dB.
18. Note the largest positive and negative errors in the Error column in all the reference level measurement tables.
19. Enter these values in the Amplitude accuracy results table. (See Table 8.)
20. Compare the +peak and –peak errors against the specifications.
21. Enter pass or fail in the test record.

Table 4: Amplitude accuracy, +20 dBm reference level measurements

Center/signal frequency	RSA306 reading, dBm	Power meter value, dBm	Error (RSA306 – Pwr meter), dB
9 kHz			
20 kHz			
50 kHz			
100 kHz			
300 kHz			
1 MHz			
3 MHz			
10 MHz			
20 MHz			
22 MHz			
100 MHz			
699 MHz			
701 MHz			

Table 4: Amplitude accuracy, +20 dBm reference level measurements (cont.)

Center/signal frequency	RSA306 reading, dBm	Power meter value, dBm	Error (RSA306 – Pwr meter), dB
1 GHz			
1.849 GHz			
1.851 GHz			
2.339 GHz			
2.341 GHz			
2.419 GHz			
2.421 GHz			
2.699 GHz			
2.701 GHz			
3.000 GHz			
3.699 GHz			
3.701 GHz			
4.569 GHz			
4.571 GHz			
4.629 GHz			
4.631 GHz			
4.749 GHz			
4.751 GHz			
4.959 GHz			
4.961 GHz			
5.699 GHz			
5.701 GHz			
5.804 GHz			
5.806 GHz			
6.200 GHz			

Table 5: Amplitude accuracy, 0 dBm reference level measurements

Center/signal frequency	RSA306 reading, dBm	Power meter value, dBm	Error (RSA306 – Pwr meter), dB
9 kHz			
20 kHz			
50 kHz			
100 kHz			

Table 5: Amplitude accuracy, 0 dBm reference level measurements (cont.)

Center/signal frequency	RSA306 reading, dBm	Power meter value, dBm	Error (RSA306 – Pwr meter), dB
300 kHz			
1 MHz			
3 MHz			
10 MHz			
20 MHz			
22 MHz			
100 MHz			
699 MHz			
701 MHz			
1 GHz			
1.849 GHz			
1.851 GHz			
2.339 GHz			
2.341 GHz			
2.419 GHz			
2.421 GHz			
2.699 GHz			
2.701 GHz			
3.000 GHz			
3.699 GHz			
3.701 GHz			
4.569 GHz			
4.571 GHz			
4.629 GHz			
4.631 GHz			
4.749 GHz			
4.751 GHz			
4.959 GHz			
4.961 GHz			
5.699 GHz			
5.701 GHz			
5.804 GHz			

Table 5: Amplitude accuracy, 0 dBm reference level measurements (cont.)

Center/signal frequency	RSA306 reading, dBm	Power meter value, dBm	Error (RSA306 – Pwr meter), dB
5.806 GHz			
6.200 GHz			

Table 6: Amplitude accuracy, –13 dBm reference level measurements

Center/signal frequency	RSA306 reading, dBm	Power meter value, dBm	Error (RSA306 – Pwr meter), dB
9 kHz			
20 kHz			
50 kHz			
100 kHz			
300 kHz			
1 MHz			
3 MHz			
10 MHz			
20 MHz			
22 MHz			
100 MHz			
699 MHz			
701 MHz			
1 GHz			
1.849 GHz			
1.851 GHz			
2.339 GHz			
2.341 GHz			
2.419 GHz			
2.421 GHz			
2.699 GHz			
2.701 GHz			
3.000 GHz			
3.699 GHz			
3.701 GHz			
4.569 GHz			
4.571 GHz			

Table 6: Amplitude accuracy, –13 dBm reference level measurements (cont.)

Center/signal frequency	RSA306 reading, dBm	Power meter value, dBm	Error (RSA306 – Pwr meter), dB
4.629 GHz			
4.631 GHz			
4.749 GHz			
4.751 GHz			
4.959 GHz			
4.961 GHz			
5.699 GHz			
5.701 GHz			
5.804 GHz			
5.806 GHz			
6.200 GHz			

Table 7: Amplitude accuracy, –30 dBm reference level measurements

Center/signal frequency	RSA306 reading, dBm	Power meter value, dBm	Error (RSA306 – Pwr meter), dB
9 kHz			
20 kHz			
50 kHz			
100 kHz			
300 kHz			
1 MHz			
3 MHz			
10 MHz			
20 MHz			
22 MHz			
100 MHz			
699 MHz			
701 MHz			
1 GHz			
1.849 GHz			
1.851 GHz			
2.339 GHz			
2.341 GHz			

Table 7: Amplitude accuracy, –30 dBm reference level measurements (cont.)

Center/signal frequency	RSA306 reading, dBm	Power meter value, dBm	Error (RSA306 – Pwr meter), dB
2.419 GHz			
2.421 GHz			
2.699 GHz			
2.701 GHz			
3.000 GHz			
3.699 GHz			
3.701 GHz			
4.569 GHz			
4.571 GHz			
4.629 GHz			
4.631 GHz			
4.749 GHz			
4.751 GHz			
4.959 GHz			
4.961 GHz			
5.699 GHz			
5.701 GHz			
5.804 GHz			
5.806 GHz			
6.200 GHz			

Table 8: Amplitude accuracy results

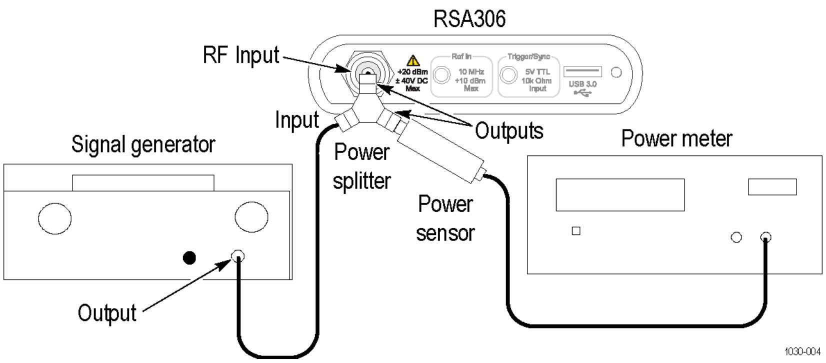
Reference level	Frequency range	Maximum +error	Maximum –error	Specification
+20 dBm	9 kHz to 2.701 GHz			±2.0 dB
	3 GHz to 6.2 GHz			±2.75 dB
0 dBm	9 kHz to 2.701 GHz			±2.0 dB
	3 GHz to 6.2 GHz			±2.75 dB

Table 8: Amplitude accuracy results (cont.)

Reference level	Frequency range	Maximum +error	Maximum –error	Specification
-13 dBm	9 kHz to 2.701 GHz			±2.0 dB
	3 GHz to 6.2 GHz			±2.75 dB
-30 dBm	9 kHz to 2.701 GHz			±2.0 dB
	3 GHz to 6.2 GHz			±2.75 dB

Channel amplitude flatness

The amplitude flatness test verifies amplitude at the two normalized bands and the band most likely to encounter a channel response problem. The channel flatness is measured for 2 MHz – 42 MHz, 1860 MHz – 1900 MHz, and 4180 MHz – 4220 MHz.



1. Connect the signal generator, power splitter, power sensor, power meter, and RSA306 as shown in the following figure. Connect the power splitter outputs directly to the RSA306 RF Input and to the power sensor.
2. Reset the RSA306 to factory defaults (**Presets > Main**).
3. Run the RSA306 alignment procedure (**Tools > Alignments > Align Now**).
4. Set the RSA306 as follows:
   a. Reference Level = **0 dBm**.
   b. Detection = **+PEAK** (Setup > Settings > Traces > Detection > +PEAK).
   c. Filter shape = **Flat-Top** (Setup > Settings > BW > Filter Shape > Flat-top).
   d. Center Frequency = **22 MHz**
   e. Span = **40 MHz**
   f. RBW = **Auto (300 kHz)**
   g. Function = **Normal** (Setup > Settings > Traces > Function)
5. Set the signal generator frequency to the first frequency in the 2 MHz – 42 MHz channel flatness table. (See Table 9.)
6. Set the signal generator amplitude for **–5 dBm** at the power meter and RSA306.
7. Record the power meter reading in the 2 MHz – 42 MHz channel flatness table. (See Table 9.)
8. On the RSA306, position the marker on the peak amplitude of the signal; record the amplitude in the channel flatness table.
9. Repeat steps 5 through 8 to measure and record for all the frequencies in the channel flatness table, 2 MHz through 42 MHz. Do not change the RSA306 center frequency setting.
10. Set the RSA center frequency to **1880 MHz.**. Keep other settings the same.
11. Set the signal generator frequency to **1860 MHz**.
12. Set the signal generator amplitude for **–5 dBm** at the power meter and RSA306.

13. Repeat steps 5 through 8 to measure and record for all the frequencies in the channel flatness table, 1860 MHz through 1900 MHz. (See Table 10.) Do not change the RSA306 center frequency setting.
14. Change the RSA306 center frequency to **4200 MHz**. Keep other settings the same.
15. Set the signal generator frequency to **4180 MHz.**
16. Set the signal generator amplitude for **–5 dBm** at the power meter and RSA306.
17. Repeat steps 5 through 8 to measure and record for all the frequencies in the channel flatness table, 4180 MHz through 4220 MHz. (See Table 11.) Do not change the RSA306 center frequency setting. An alternate IF setting is used in this range. This verifies the alternate setting.
18. Use the recorded values to calculate the amplitude differences for each measured frequency in the three channel flatness tables.

    Difference amplitude = (power meter amplitude – RSA306 marker amplitude)

    The measured amplitudes are dBm. The difference amplitude is dB.
19. Calculate the channel flatness error relative the center screen amplitude. Center screen value:

    22 MHz for the 2 – 42 MHz channel

    1880 MHz for the 1860 – 1900 MHz channel

    4200 MHz for the 4180 – 4220 MHz channel

    The flatness error at each frequency is:

    Error = (difference amplitude, each frequency – difference amplitude, center screen frequency)

NOTE. *All amplitudes are in dB.*

At center screen, Error = 0 dB.

Example calculation for 2 MHz frequency, 22 MHz center screen:

22 MHz Center screen difference amplitude = +0.13 dB

2 MHz Frequency difference amplitude = –0.32 dB

Error = (–0.32 dB – (0.13 dB)) = **–0.45 dB**

Table 9: 22 MHz channel flatness, 2 MHz – 42 MHz

Signal generator frequency	Power meter amplitude, dB	RSA306 marker amplitude, dB	Difference amplitude, dBm	Channel flatness error, dB
2 MHz				
4 MHz				
6 MHz				
8 MHz				
10 MHz				
12 MHz				
14 MHz				
16 MHz				
18 MHz				
20 MHz				
22 MHz				
24 MHz				
26 MHz				
28 MHz				
30 MHz				
32 MHz				
34 MHz				
36 MHz				
38 MHz				
40 MHz				
42 MHz				
Maximum difference amplitude				< +1 dB
Minimum difference amplitude				> –1 dB

Table 10: 1880 MHz channel flatness, 1860 MHz – 1900 MHz

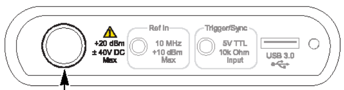
Signal generator frequency	Power meter amplitude, dB	RSA306 marker amplitude, dB	Difference amplitude, dBm	Channel flatness error, dB
1860 MHz				
1862 MHz				
1864 MHz				
1866 MHz				
1868 MHz				
1870 MHz				
1872 MHz				
1874 MHz				
1876 MHz				
1878 MHz				
1880 MHz				
1882 MHz				
1884 MHz				
1886 MHz				
1888 MHz				
1890 MHz				
1892 MHz				
1894 MHz				
1896 MHz				
1898 MHz				
1900 MHz				
Maximum difference amplitude				< +1 dB
Minimum difference amplitude				> –1 dB

Table 11: Channel flatness, 4180 MHz – 4220 MHz

Signal generator frequency	Power meter amplitude, dB	RSA306 marker amplitude, dB	Difference amplitude, dBm	Channel flatness error, dB
4180 MHz				
4182 MHz				
4184 MHz				
4186 MHz				
4188 MHz				
4190 MHz				
4192 MHz				
4194 MHz				
4196 MHz				
4198 MHz				
4200 MHz				
4202 MHz				
4204 MHz				
4206 MHz				
4208 MHz				
4210 MHz				
4212 MHz				
4214 MHz				
4216 MHz				
4218 MHz				
4220 MHz				
Maximum difference amplitude				< +1 dB
Minimum difference amplitude				> –1 dB

DANL (Displayed Average Noise Level)

The intent of the DANL test is to measure the average internal noise level of the instrument. The DANL specification does not cover residual spurs. If the specific measurement frequency results in measuring a residual spur that is visible above the noise level, the DANL specification applies not to the spur but to the noise level on either side of the spur. Please refer to the Spurious Response specifications.



1. Connect a 50 Ω N termination to the RSA306 RF Input.
2. Reset the RSA306 to factory defaults (**Presets > Main**).
3. Run the RSA306 alignment procedure (**Tools > Alignments > Align Now**).
4. Set the RSA306 as follows:
   a. Reference Level = **–50 dBm to –90 dBm**.

      The reference level can be set lower than -50 dBm to display the noise on screen. This helps avoid measuring on spurious signals since it is easier to determine the presence of spurious.

   b. Set Detection = **Avg (Vrms)** (Setup > Settings > Traces > Detection > Avg).

   c. Set Function = **Avg (of logs)** (Setup > Settings > Traces > Function)

   d. Averaging = **100** (Setup > Settings > Traces > Function: select 100 in field)

   e. Filter shape = **Flat-Top** (Setup > Settings > BW > Filter Shape > Flat-top).

   f. Center Frequency = **22 MHz**

   g. Span = **100 kHz**

   h. RBW = **Auto (100 Hz)**
5. Set the marker for POWER measurement:
   a. Marker function = **Power (dBm/Hz)** (Markers > Define Markers > Readouts (near bottom of screen) > Power)

   b. Turn on marker (Markers > Define Markers > Add)
6. Set the RSA306 to each of the center frequencies listed in the DANL frequencies of interest table. (See Table 12.) After averaging is completed, move the marker near the center screen to the baseline noise on either side of the center screen spurious. Make sure the marker is not on a coherent spurious signal. Enter the marker noise level amplitude in the DANL frequencies of interest table and the test record and compare with the specification.

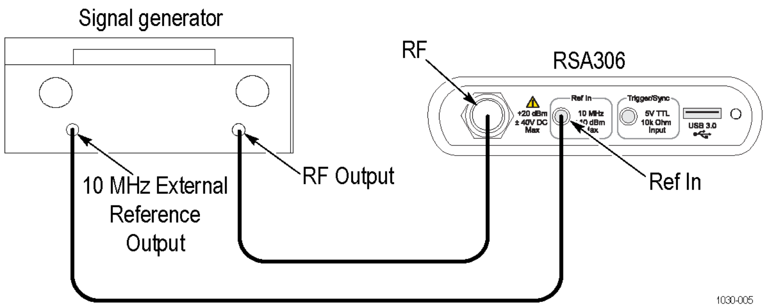
Table 12: DANL frequencies of interest

RSA306 center frequency	Marker noise level	Specification
100 kHz		< –130 dBm/Hz
1 MHz		< –130 dBm/Hz
10 MHz		< –130 dBm/Hz
20 MHz		< –130 dBm/Hz
22 MHz		< –160 dBm/Hz
100 MHz		< –160 dBm/Hz
500 MHz		< –160 dBm/Hz
1 GHz		< –160 dBm/Hz
1.5 GHz		< –158 dBm/Hz
2.0 GHz		< –158 dBm/Hz
2.5 GHz		< –155 dBm/Hz
3.0 GHz		< –155 dBm/Hz
3.5 GHz		< –155 dBm/Hz
4.0 GHz		< –155 dBm/Hz
4.5 GHz		< –150 dBm/Hz
5.0 GHz		< –150 dBm/Hz
5.5 GHz		< –150 dBm/Hz
6.0 GHz		< –150 dBm/Hz
6.2 GHz		< –150 dBm/Hz

Phase noise

The intent of the Phase Noise test is to measure the phase noise level of the instrument. The phase noise specification does not cover residual spurs. If the specific measurement frequency results in measuring a residual spur that is visible above the noise level, the phase noise specification applies not to the spur but to the noise level on either side of the spur. Please refer to the Spurious Response specifications. Also, refer to the Spurious Response section of this procedure to determine whether or not a residual spur is within the specification.

Connect the signal generator and RSA306 as shown in the following figure.



1. Reset the RSA306 to factory defaults (**Presets > Main**).
2. Run the RSA306 alignment procedure (**Tools > Alignments > Align Now**). Note: the Center frequency should be 1 GHz.
3. Set the signal generator CW frequency = **1 GHz**.
4. Set the signal generator CW amplitude = **0 dBm** at the RS306 input.
5. Select **External Reference** (Setup > Acquire > Frequency Reference > External)
6. Set trace detection = **+PEAK** (Setup > Settings > Traces > Detection)
7. Measure the CW amplitude for the following settings:
   a. Trace Function = **Avg (Vrms)**, 10 averages (Setup > Settings > Traces > Function: Avg (Vrms), count = 10)
   b. Span = **100 kHz**
   c. RBW = **1 kHz**
   d. Move MR marker to highest amplitude signal after 10 averages, write the marker value as the CW amplitude (for the 1 kHz filter) in the measurement table (See Table 13.) and test record.
8. Measure the CW amplitude for the following settings:
   a. Span = **10 kHz**
   b. RBW = **100 Hz**
   c. Move MR marker to highest amplitude signal after 10 averages, write marker value as the CW amplitude for the 100 Hz filter and 10 Hz filter in the measurement table (See Table 13.) and test record.
9. Set Trace detection = **Avg (Vrms)**.
10. Set Marker function = **Power (dBm/Hz)** (Markers > Define Markers > Readouts (near bottom of window) > Power).
11. Turn on marker (Markers > Define Markers > Add)

12. **Measure noise for 1 MHz offset:**
    - **a.** CF = **1000.95 MHz**
    - **b.** Span = **1 MHz**
    - **c.** RBW = **1 kHz**
    - **d.** Avg count = **100**
    - **e.** Marker frequency = **1000.997 MHz** (note, this avoids the 1 MHz offset spur)
    - **f.** After averaging is completed, enter the raw noise amplitude in dBm/Hz in the measurement table (See Table 13.) and test record.
    - **g.** Calculate Phase noise, the difference of CW amplitude in 1 kHz filter and noise measured with the POWER marker. Enter the calculations in the measurement table (See Table 13.) and test record.
13. **Measure noise for 100 kHz offset:**
    - **a.** CF = **1000.095 MHz**
    - **b.** Span = **100 kHz**
    - **c.** RBW = **1 kHz**
    - **d.** Avg count= **100**
    - **e.** Marker frequency = **1000.100 MHz**
    - **f.** After averaging is completed, enter the raw noise amplitude in dBm/Hz in the measurement table (See Table 13.) and test record.
    - **g.** Calculate Phase noise, the difference of CW amplitude in 1 kHz filter and noise measured with the POWER marker. Enter the calculations in the measurement table (See Table 13.) and test record.

14. Measure noise for 10 kHz offset:

a. CF = **1000.0095 MHz**

b. Span = **10 kHz**

c. RBW = **100 Hz**

d. Avg count =**100**

e. Marker frequency = **1000.010 MHz**

f. After averaging is completed, enter the raw noise amplitude in dBm/Hz in the measurement table (See Table 13.) and test record.

g. Calculate Phase noise, the difference of CW amplitude in 100 Hz filter and noise measured with the POWER marker. Enter the calculations in the measurement table (See Table 13.) and test record.

15. Measure noise for 1 kHz offset:

a. CF = **1000.000950 Hz**

b. Span = **1 kHz**

c. RBW =**10 Hz**

d. Avg count = **20** (note: If 20 averages does not result in a stable amplitude, more averages can be used.)

e. Marker frequency = **1000.001 MHz**

f. After averaging is completed, enter the raw noise amplitude in dBm/Hz in the measurement table (See Table 13.) and test record.

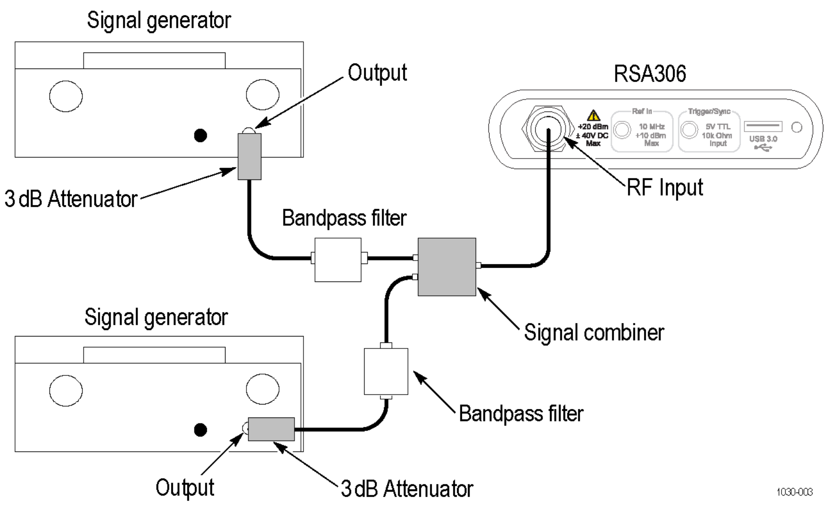
g. Calculate Phase noise, the difference of CW amplitude in 100 Hz filter and noise measured with the power marker. Enter the calculations in the measurement table (See Table 13.) and test record.

Table 13: Phase noise at 1 GHz center frequency

Phase noise offset frequency	RBW	CW amplitude, dBm	Raw noise, dBm/Hz	Phase noise (raw noise – CW amplitude), dBc/Hz	Specification
1 kHz	10 Hz				< –85 dBc/Hz
10 kHz	100 Hz				< –84 dBc/Hz
100 kHz	1 kHz				< –90 dBc/Hz
1 MHz	1 kHz				< –118 dBc/Hz

Third-order intermodulation distortion

Set up the RF signal generators, band-pass filters, signal combiner, and RSA306 as shown.



1. Reset the RSA306 to factory defaults (**Presets > Main**).
2. Run the RSA306 alignment procedure (**Tools > Alignments > Align Now**).
3. Set the RSA306 as follows:
   a. Reference Level = **–15 dBm**
   b. Span = **100 kHz**
   c. RBW = **1 kHz**
   d. Detection mode = **+PEAK** (Setup > Settings > Traces > Detection > +PEAK)
   e. Function = **Avg (Vrms)** (Setup > Settings > Traces > Function)
   f. Averaging = **10** (Setup > Settings > Traces > Function: set count = 10)
4. Set each of the RF signal generators to provide a power level of **-20 dBm** each at the RSA306. The initial generator amplitude setting is should be -13 dBm, and the amplitude is fine-tuned as follows:
   a. Set the RSA306 center frequency to **2.1295 GHz**. Move the marker to the largest amplitude. Adjust the first generator output level for a marker reading of **–20.0 dBm** (±0.1 dB) (after averaging).
   b. Set the RSA306 center frequency to **2.1305 GHz**. Move the marker to the largest amplitude. Adjust the second generator output level for a marker reading of **–20.0 dBm** (± 0.1 dB) (after averaging).
   c. Set the RSA306 center frequency to **2.1285 GHz**. After averaging has completed, position the marker on the highest amplitude trace point and read the marker amplitude. Record the IMD #1 amplitude. (See Table 14.)
5. Set the RTSA center frequency to 2.1315 GHz. After averaging has completed, position the marker on the largest trace point and read the marker amplitude. Record the IMD #2 amplitude. (See Table 14.)

6. Calculate IMD:

   (maximum of IMD #1 or IMD #2) – (–20 dBm)

   = (maximum of IMD #1 or IMD #2) +20 (dBc)

7. Enter the result in the test record.

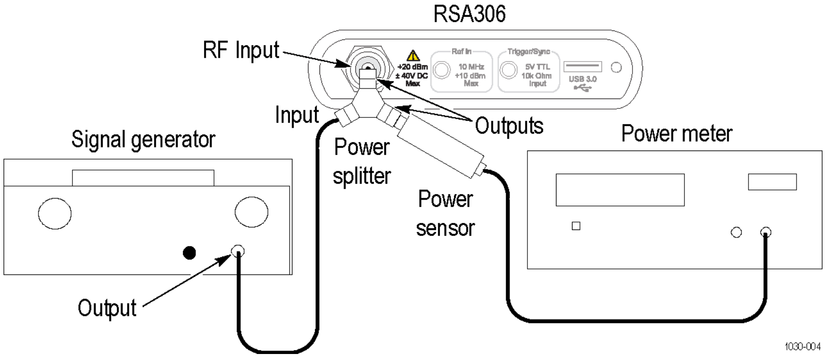
Table 14: Third order intermodulation distortion measurements

Item	Measurement	Specification
Carrier #1 amplitude		–20 dBm
Carrier #2 amplitude		–20 dBm
IMD #1 amplitude		< –80 dBm typ.
IMD #2 amplitude		< –80 dBm typ.
IMD (Max IMD – (-20 dBm))		< –60 dBc

Input-related spurious response: ADC

Requirements:

An RF signal generator capable of at least 8 GHz (example: Stanford Research Systems SG386 Option 02)



1. Connect the signal generator, power splitter, power sensor, power meter, and RSA306 as shown. Connect the power sensor and RF signal generator directly to the power splitter, which is connected directly to the RSA306.
2. Reset the RSA306 to factory defaults (**Presets > Main**).
3. Run the RSA306 alignment procedure (**Tools > Alignments > Align Now**).
4. Set the RSA306 as follows:
   a. Reference Level = **–30 dBm**
   b. Span = **40 MHz**
   c. RBW = **1 kHz**
   d. Detection mode = **+PEAK** (Setup > Settings > Traces > Detection > +PEAK)
   e. Function = **Avg (Vrms)** (Setup > Settings > Traces > Function)
   f. Averaging = **10** (Setup > Settings > Traces > Function: set count = 10)

LF ADC image.

5. Set the signal generator frequency to **21 MHz**.
6. Set the signal generator output level for **–30 dBm** on the power meter. This amplitude is also at the RSA306 input (the signal generator setting will be near –24 dBm).
7. Set the RSA306 center frequency to **21 MHz (40 MHz span)**.
8. Position the marker on the signal at 21 MHz.
9. Record the value in the ADC measurements table. (See Table 15.) The amplitude will be near -30 dBm, but may have some measurement error.
10. Set the signal generator frequency to **72 MHz**.

NOTE. *Do not change the center frequency of the RSA306.*

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11. Set the signal generator amplitude for **-30 dBm** on the power meter. This amplitude is also at the RSA306 input. Note: In this case, the signal generator setting will be near –24 dBm.

12. Set the RSA306 marker on the image spur at **40 MHz**, right edge of the span. Note its amplitude in table X below.

13. Calculate the image amplitude in dBc:

    Image (dBc) = Image amplitude at 40 MHz - CW amplitude at 21 MHz

14. Record the value in the ADC measurements table. (See Table 15.)

RF ADC image.

15. Set the signal generator frequency to **140 MHz**.

16. Set the signal generator amplitude for **-30 dBm** at the power meter. This amplitude is also at the RSA306 input. The signal generator setting will be near -24 dBm.

17. Set the RSA306 Center Frequency to **140 MHz**.

18. Peak the marker on the CW signal at **140 MHz**. Record the value in the ADC measurements table. (See Table 15.)

19. Set the signal generator frequency to **103.8 MHz**.

NOTE. *Do not change the center frequency of the RSA306.*

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20. Set the signal generator amplitude for **-30 dBm** on the power meter. This amplitude is also at the RSA306 input.

21. Set the RSA306 marker on the image spur seen at **120.2 MHz**, at left edge of the span. Record the amplitude in the ADC measurements table. (See Table 15.)

22. Set the signal generator frequency to **176.2 MHz**.

NOTE. *Do not change the center frequency of the RSA306.*

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23. Set the signal generator amplitude to **-30 dBm** on the power meter. This amplitude is also at the RSA306 input.

24. Set the RSA306 marker on the image spur seen at **159.8 MHz**, at right edge of the span. Record the amplitude in the ADC measurements table. (See Table 15.). Mark which image amplitude is larger: 159.8 MHz, or 120.2 MHz.

25. Calculate the largest image amplitude in dBc:

    Image (dBc) = Largest Image amplitude at (120.2 MHz or 159.8 MHz) - CW amplitude at 140 MHz

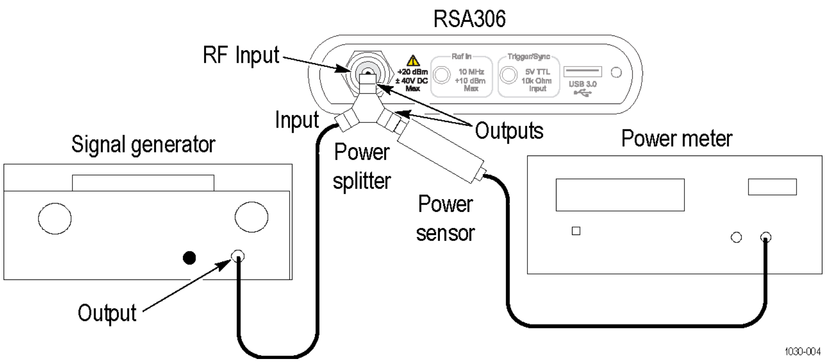
26. Note the calculated image amplitude in the measurement table and the test record and compare with the specification.

Table 15: ADC images (LF, RF) measurements

ADC images (LF, RF)	Measurement	Specification
LF CW amplitude 21 MHz		
LF Image amplitude 40 MHz CF		
LF ADC Image, dBc		< –50 dBc
RF CW amplitude 140 MHz		
RF Image amplitude 159.8 MHz		
RF Image amplitude 120.2 MHz		
RF ADC Image, dBc (largest RF image -140 MHz CW)		< –50 dBc

Input-related spurious response: second converter images

***NOTE.** You do not need to do the first three steps (setup, reset, and alignment) when you perform the input-related spurious response tests in sequence.*



1. Connect the signal generator, power splitter, power sensor, power meter, and RSA306 as shown. Connect the power sensor and RF signal generator directly to the power splitter, which is connected directly to the RSA306.
2. Reset the RSA306 to factory defaults (**Presets > Main**).
3. Run the RSA306 alignment procedure (**Tools > Alignments > Align Now**).
4. Set the RSA306 as follows:
   a. Center frequency = **1 GHz**
   b. Reference Level = **–30 dBm**
   c. Span = **1 MHz**
   d. RBW = **1 kHz**
   e. Detection mode = **+PEAK** (Setup > Settings > Traces > Detection > +PEAK)
   f. Function = **Avg (Vrms)** (Setup > Settings > Traces > Function)
   g. Averaging = **10** (Setup > Settings > Traces > Function: count = 10)
5. Set the signal generator frequency to **1.0 GHz**.
6. Set the signal generator for **-30 dBm** at the power meter and RSA306 input. Monitor and set the signal generator amplitude to -30 dBm at the power meter when changing frequency settings during this test.
7. Measure the CW amplitude at 1 GHz and note it in the second converter image measurements table. (See Table 16.)
8. Set the signal generator frequency to **1280 MHz**.
9. Set the signal generator for **-30 dBm** at the power meter and RSA306 input.
10. Measure the image spur amplitude at 1 GHz center frequency and note it in the second converter image measurements table. (See Table 16.)
11. Calculate the difference between the image amplitude and the CW amplitude. This is the image spur magnitude in dBc. Record this in the test record.

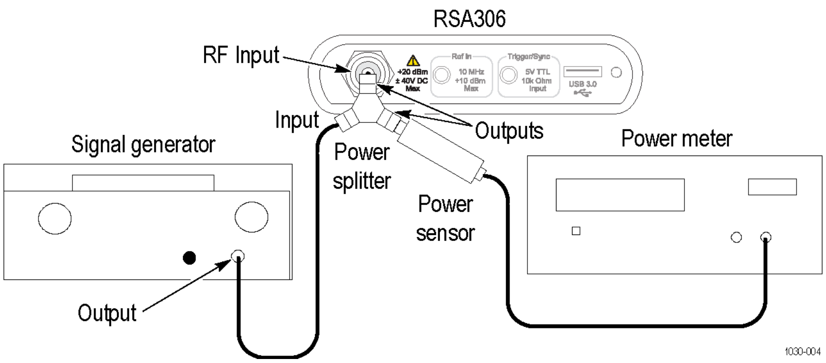
12. Set the signal generator frequency to **2 GHz**.
13. Set the RSA306 center frequency to **2 GHz**.
14. Measure the CW amplitude at 2 GHz and note it in the second converter image measurements table. (See Table 16.)
15. Set the signal generator frequency to **2280 MHz**.
16. Measure the image spur amplitude at 2 GHz center frequency and note it in the second converter image measurements table. (See Table 16.)
17. Calculate the difference between the image amplitude and the CW amplitude. This is the image spur magnitude in dBc. Record this in the test record.

Table 16: Second converter image measurements

Images	Measurement	Specification
CW amplitude 1 GHz		
Image amplitude 1 GHz CF (2440 IF)		
Second Converter Image, dBc Image – 1 GHz CW		< –50 dBc
CW amplitude 2 GHz		
Image amplitude 2 GHz CF (1190 IF)		
RF Image, dBc (Image – 2 GHz CW)		< –50 dBc

Input-related spurious response: first converter images

***NOTE.** You do not need to do the first three steps (setup, reset, and alignment) when you perform the input-related spurious response tests in sequence.*



1. Connect the signal generator, power splitter, power sensor, power meter, and RSA306 as shown. Connect the power sensor and RF signal generator directly to the power splitter, which is connected directly to the RSA306.
2. Reset the RSA306 to factory defaults (**Presets > Main**).
3. Run the RSA306 alignment procedure (**Tools > Alignments > Align Now**).
4. Set the RSA306 as follows:
   a. Reference Level = **–30 dBm**
   b. Span = **1 MHz**
   c. RBW = **1 kHz**
   d. Detection mode = **+PEAK** (Setup > Settings > Traces > Detection > +PEAK)
   e. Function = **Avg (Vrms)** (Setup > Settings > Traces > Function)
   f. Averaging = **10** (Setup > Settings > Traces > Function; count = 10)
5. Set the signal generator output for **-30 dBm** at the power meter and RSA306 input.
6. Set the RSA306 to the Center frequency shown in the first column of the first converter images table.(See Table 17.)
7. Set the signal generator frequency to the associated image frequency value in the second column of the table.

***NOTE.** Monitor and set the signal generator amplitude to -30 dBm whenever you change frequency settings during this test.*

8. Measure the Image Amplitude at the RSA306 CF (first column frequency).
9. Calculate the image spur difference amplitude (Image amplitude –30 dBm).
10. Record image spur amplitudes in the test record, and compare with the specification.
11. Repeat steps 6 through 10 for each center frequency listed in the table. (See Table 17.)

NOTE. *The intent of the image spurious test is to measure spurious responses caused by the injection of an external signal that would induce an image product on the display. These images can be the same frequencies as residual spurs. In case of question, slightly change the frequency of the input signal to induce a corresponding change in the displayed frequency of the image spur.*

Change the input frequency in steps that allow the product to stay within the on-screen frequency span. If the on-screen spur does not move in response to the input signal change, it is not an image and is not covered in the image spurious specification. Some care must be taken in noting the frequency change.

The images specified in the specification are 1:1 images and they will move either -1:1 or +1:1 with changes in input signal frequency.

Never discount the possibility that a spur in question could be coming from the test signal generator. Such spurious responses can also move with changes in signal generator frequency. In case of question, validate the performance of the generator with a different Signal Analyzer and/or filter the signal from the test generator to remove unwanted products.

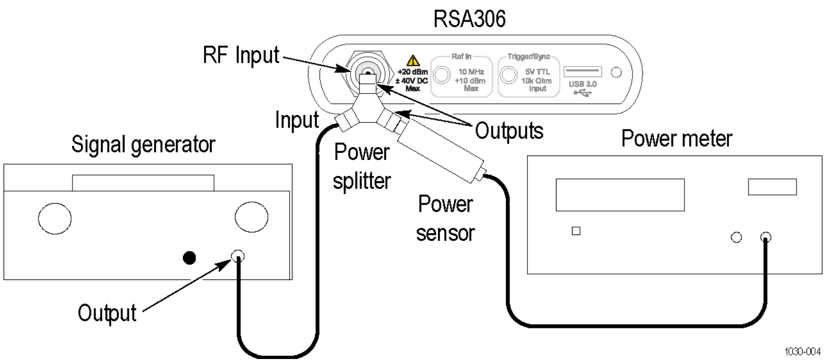
If the spur seen on screen is a residual, it will still be present with the input to the signal analyzer terminated in 50 Ω. Residual spurs are subject to separate specification limits.

Table 17: First converter images: RSA306 and signal generator settings

Center frequency, MHz (RSA306)	Image frequency, MHz (signal generator)	Image Spur Amplitude, dBm	Specification, dBm (relative to –30 dBm input)
22 MHz	4902 MHz		< –80 dBm
1840 MHz	6720 MHz		< –80 dBm
1860 MHz	4240 MHz		< –80 dBm
2330 MHz	4710 MHz		< –80 dBm
2350 MHz	7230 MHz		< –80 dBm
2410 MHz	7290 MHz		< –80 dBm
2430 MHz	4810 MHz		< –80 dBm
2690 MHz	5070 MHz		< –80 dBm
2710 MHz	5090 MHz		< –80 dBm
3690 MHz	6070 MHz		< –80 dBm
3710 MHz	1170 MHz		< –80 dBm
4560 MHz	320 MHz		< –80 dBm
4950 MHz	2570 MHz		< –80 dBm
4970 MHz	90 MHz		< –80 dBm
5690 MHz	810 MHz		< –80 dBm
5710 MHz	830 MHz		< –80 dBm
5800 MHz	920 MHz		< –80 dBm
6200 MHz	3820 MHz		< –80 dBm

Input-related spurious response: IF feedthrough

***NOTE.** You do not need to do the first three steps (setup, reset, and alignment) when you perform the input-related spurious response tests in sequence.*



1. Connect the signal generator, power splitter, power sensor, power meter, and RSA306 as shown. Connect the power sensor and RF signal generator directly to the power splitter, which is connected directly to the RSA306.
2. Reset the RSA306 to factory defaults (**Presets > Main**).
3. Run the RSA306 alignment procedure (**Tools > Alignments > Align Now**).
4. Set the RSA306:
   - **a.** Reference Level = **–30 dBm**
   - **b.** Span =**1 MHz**
   - **c.** RBW = **1 kHz**
   - **d.** Detection mode = **+PEAK** (Setup > Settings > Traces > Detection > +PEAK)
   - **e.** Function = **Avg (Vrms)** (Setup > Settings > Traces > Function)
   - **f.** Averaging = **10** (Setup > Settings > Traces > Function: count = 10)

1190 MHz IF feedthrough.

5. Set the signal generator to **1190 MHz**.
6. Set the signal generator for **-30 dBm** at the power meter. This is also the amplitude at the input of the RSA306. The generator amplitude will be close to -24 dBm.
7. Set the RSA306 to the center frequency shown in the first column of the 1190 MHz IF feedthrough table. (See Table 18.)
8. Measure and record IF feedthrough spur amplitude and compare with the specification.
9. Repeat steps 7 through 8 for each center frequency listed in the table. Do not change the signal generator frequency.

Table 18: 1190 MHz IF feedthrough spurious: RSA306 center frequencies

Center frequency, MHz (RSA306)	IF feedthrough spur amplitude, dBm	Specification, dBm (relative to -30 dBm input)
1860 MHz		< –80 dBm
2430 MHz		< –80 dBm
2710 MHz		< –80 dBm
4580 MHz		< –80 dBm
4760 MHz		< –80 dBm
5810 MHz		< –80 dBm

2440 MHz IF feedthrough.

10. Set the signal generator to **2440 MHz**.

11. Set the signal generator for **-30 dBm** at the power meter. This is also the amplitude at the input of the RSA306. The generator amplitude will be close to -24 dBm.

12. Set the RSA306 to the center frequency shown in the first column of the 2440 MHz IF feedthrough table. (See Table 19.)

13. Measure and record IF feedthrough spur amplitude and compare with the specification.

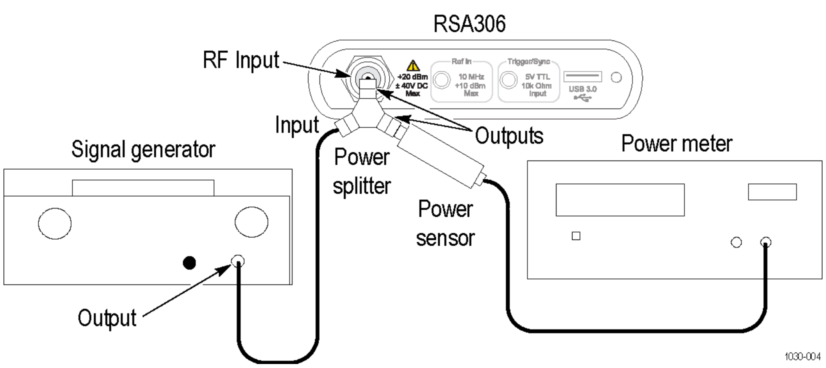
14. Repeat steps 12 through 13 for each center frequency listed in the table. Do not change the signal generator frequency.

Table 19: 2440 MHz IF feedthrough spurious: RSA306 center frequencies

Center frequency, MHz (RSA306)	IF feedthrough spur amplitude, dBm	Specification, dBm (relative to -30 dBm input)
30 MHz		< –80 dBm
710 MHz		< –80 dBm
3710 MHz		< –80 dBm
4640 MHz		< –80 dBm
4970 MHz		< –80 dBm
5710 MHz		< –80 dBm

Input-related spurious response: RF X 2LO

***NOTE.** You do not need to do the first three steps (setup, reset, and alignment) when you perform the input-related spurious response tests in sequence.*



1. Connect the signal generator, power splitter, power sensor, power meter, and RSA306 as shown. Connect the power sensor and RF signal generator directly to the power splitter, which is connected directly to the RSA306.
2. Reset the RSA306 to factory defaults (**Presets > Main**).
3. Run the RSA306 alignment procedure (**Tools > Alignments > Align Now**).
4. Set the RSA306 as follows:
   a. Reference Level = **–30 dBm**
   b. Span = **1 MHz**
   c. RBW = **1 kHz**
   d. Detection mode = **+PEAK** (Setup > Settings > Traces > Detection > +PEAK)
   e. Function = **Avg (Vrms)** (Setup > Settings > Traces > Function)
   f. Averaging = **10** (Setup > Settings > Traces > Function: count = 10)
5. Set the signal generator for **-30 dBm** at the power meter. This is also the amplitude at the input of the RSA306. The generator amplitude will be close to -24 dBm.
6. Set the RSA306 to the center frequency shown in the first column of the RF X 2LO table. (See Table 20.)
7. Set the signal generator to the frequency shown in the second column of the RF X 2LO table. (See Table 20.)
8. Set the signal generator for **-30 dBm** at the power meter.
9. Measure and record the spur amplitude and compare with the specification. (See Table 20.)
10. Repeat steps 6 through 9 for each center frequency and signal generator frequency listed in the table. Make sure to set the signal generator for **-30 dBm** at the power meter for each frequency change.

***NOTE.** This table includes the worst RF X 2LO spurs observed on the RSA306.*

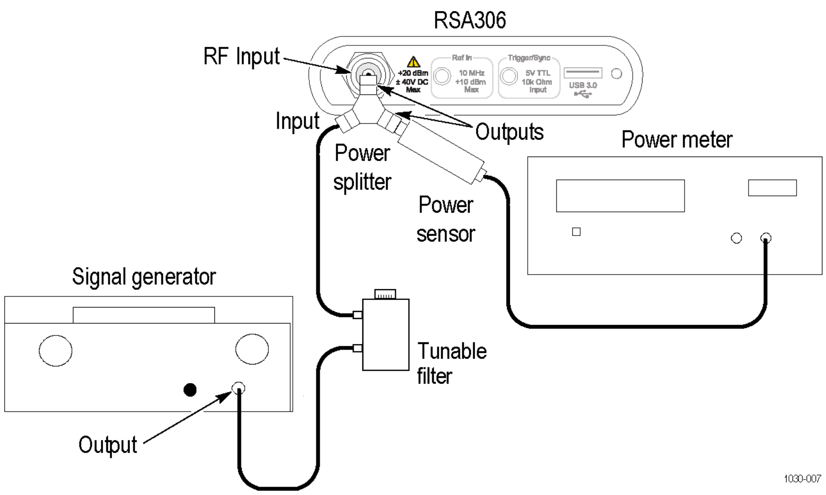
Table 20: RF X 2LO: RSA306 and signal generator frequencies

Center frequency, MHz (RSA306)	Signal generator frequency, MHz	RF X 2LO spur amplitude, dBm	Specification, dBm (relative to -30 dBm input)
1190 MHz	4820 MHz		< –80 dBm
1350 MHz	5140 MHz		< –80 dBm
2150 MHz	7870 MHz		< –80 dBm
3370 MHz	7930 MHz		< –80 dBm
4790 MHz	6010 MHz		< –80 dBm
5510 MHz	3700 MHz		< –80 dBm

Input-related spurious response: Half-IF response

***NOTE.** You do not need to do the first three steps (setup, reset, and alignment) when you perform the input-related spurious response tests in sequence.*

***NOTE.** The half-IF specification applies when the second harmonic distortion of the signal at the input of the RSA306 is less than -60 dBc. A tunable band pass filter is used to attenuate the second harmonic distortion of the generator.*



1. Connect the signal generator, power splitter, power sensor, power meter, tunable band pass filter (K&L 5BT-375/750-5-N/N), and RSA306 as shown. Connect the power sensor and RF signal generator directly to the power splitter, which is connected directly to the RSA306.

***NOTE.** You will replace the tunable band pass filter with a different range filter later in the procedure.*

2. Reset the RSA306 to factory defaults (**Presets > Main**).
3. Run the RSA306 alignment procedure (**Tools > Alignments > Align Now**).
4. Set the RSA306 as follows:
   a. Reference Level = **–30 dBm**
   b. Span = **1 MHz**
   c. RBW = **1 kHz**
   d. Detection mode = **+PEAK** (Setup > Settings > Traces > Detection > +PEAK)
   e. Function = **Avg (Vrms)** (Setup > Settings > Traces > Function)
   f. Averaging = **10** (Setup > Settings > Traces > Function: count = 10)

1190 MHz half-IF.

5. Set the signal generator to **595 MHz**.
6. Set the generator amplitude to **-23 dBm**.
7. Set the tunable band pass filter (K&L 5BT-375/750-5-N/N) near **595 MHz**.
8. Adjust the tunable filter for maximum power on the power meter.
9. Adjust the signal generator output for **-30 dBm** at the power meter. This is also the amplitude at the input of the RSA306. The generator amplitude will be close to -23 dBm.
10. Set the RSA306 to the center frequency shown in the first column of the 1190 MHz half-IF table. (See Table 20.)
11. Measure and record half-IF spur amplitude in the table and compare with the specification.
12. Repeat steps 10 through 11 for each RSA center frequency listed in the table, recording results for each freqency.

Table 21: 1190 MHz half-IF spurious: RSA306 center frequencies

Center frequency, MHz (RSA306)	Half-IF spur amplitude, dBm	Specification, dBm (relative to -30 dBm input)
1860 MHz		< –80 dBm
2430 MHz		< –80 dBm
2710 MHz		< –80 dBm
4580 MHz		< –80 dBm
4760 MHz		< –80 dBm
5810 MHz		< –80 dBm

2440 MHz half-IF.

13. Set the signal generator output to **Off**.
14. Disconnect the tunable band pass filter and install the (K&L 5BT-750/1500-5-N/N) tunable filter in its place.
15. Set the tunable band pass filter (K&L 5BT-750/1500-5-N/N)near **1220 MHz**.
16. Set the signal generator output to **On**.
17. Set the signal generator to **1220 MHz**.
18. Set the generator amplitude to **-23 dBm**.
19. Adjust the tunable filter for maximum power on the power meter.
20. Adjust the signal generator output for **-30 dBm** at the power meter. This is also the amplitude at the input of the RSA306. The generator amplitude will be close to -23 dBm.
21. Set the RSA306 to the center frequency shown in the first column of the 2440 MHz half-IF table. (See Table 22.)
22. Measure and record half-IF spur amplitude in the table and compare with the specification.
23. Repeat steps 21 through 22 for each center frequency listed in the table and record results in the table.
24. Record results in the Test record.

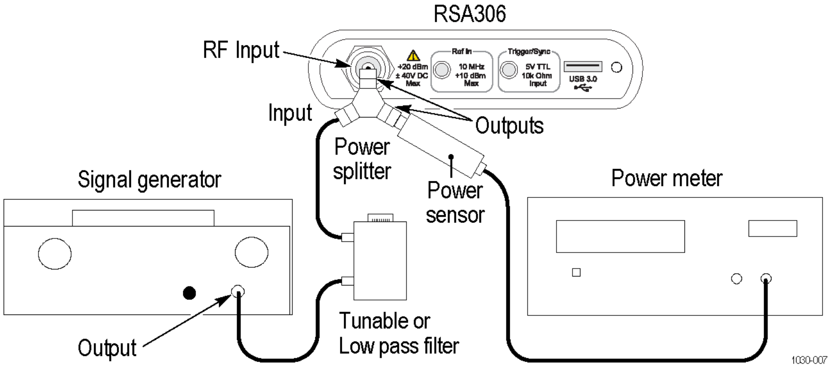
Table 22: 2440 MHz half-IF spurious: RSA306 center frequencies

Center frequency, MHz (RSA306)	Half-IF spur amplitude, dBm	Specification, dBm (relative to -30 dBm input)
30 MHz		< –80 dBm
710 MHz		< –80 dBm
2350 MHz		< –80 dBm
3710 MHz		< –80 dBm
4640 MHz		< –80 dBm
4970 MHz		< –80 dBm
5710 MHz		< –80 dBm

Input-related spurious response: signal 2RF X 2LO

***NOTE.** You do not need to do the first three steps (setup, reset, and alignment) when you perform the input-related spurious response tests in sequence.*

***NOTE.** The 2RF X 2LO specification applies when the second harmonic distortion of the signal at the input of the RSA306 is less than -60 dBc. A band pass filter or low pass filter is used to attenuate the second harmonic distortion of the generator.*



1. Connect the signal generator, power splitter, power sensor, power meter, tunable band pass filter (K&L 5BT-1500/3000-5-N/N), and RSA306 as shown. Connect the power sensor and RF signal generator directly to the power splitter, which is connected directly to the RSA306.

***NOTE.** You will replace the tunable band pass filter with a low pass filter later in the procedure.*

2. Reset the RSA306 to factory defaults (**Presets > Main**).
3. Run the RSA306 alignment procedure (**Tools > Alignments > Align Now**).
4. Set the RSA306 as follows:
   a. Reference Level = **–30 dBm**
   b. Span = **1 MHz**
   c. RBW = **1 kHz**
   d. Detection mode = **+PEAK** (Setup > Settings > Traces > Detection > +PEAK)
   e. Function = **Avg (Vrms)** (Setup > Settings > Traces > Function)
   f. Averaging = **10** (Setup > Settings > Traces > Function: count = 10)
5. Set the RSA306 to **2190 MHz** center frequency.
6. Set the signal generator frequency to **2790 MHz**.
7. Set the signal generator amplitude to **-23 dBm**.
8. Set the tunable band pass filter (K&L 5BT-1500/3000-5-N/N) near **2790 MHz**.

9. Adjust the tunable filter for maximum power on the power meter.
10. Set the signal generator output to **-30 dBm** at the power meter. This is also the amplitude at the input of the RSA306. The generator amplitude will be close to -23 dBm.
11. Measure and record the spur amplitude for these settings in the table and compare with the specification. (See Table 23.)
12. Set the RSA306 to **2330 MHz** center frequency.
13. Set the signal generator frequency to **2930 MHz**.
14. Set the signal generator amplitude to **-23 dBm**.
15. Set the tunable band pass filter near **2930 MHz**.
16. Adjust the tunable filter for maximum power on the power meter.
17. Set the signal generator output to **-30 dBm** at the power meter. This is also the amplitude at the input of the RSA306. The generator amplitude will be close to -23 dBm.
18. Measure and record the spur amplitude for these settings in the table and compare with the specification. (See Table 23.)
19. Set the signal generator output to **Off**.
20. Disconnect the tunable band pass filter and install the **3300 MHz cutoff, L250** low pass filter in its place (K&L 5L3-3300/E 10000 – O/OP).
21. Set the signal generator output to **On**.
22. Set the RSA306 to **4480 MHz** center frequency.
23. Set the signal generator frequency to **3260 MHz**.
24. Set the signal generator output to **-30 dBm** at the power meter. This is also the amplitude at the input of the RSA306. The generator amplitude will be close to -23 dBm.
25. Measure and record the spur amplitude for these settings in the table and compare with the specification. (See Table 23.)
26. Record results in the Test record.

NOTE. *This table includes the worst 2RF X 2LO spurs observed on the RSA306.*

Table 23: 2RF X 2LO: RSA306 and signal generator frequencies

Center frequency, MHz (RSA306)	Signal generator frequency, MHz	2RF X 2LO spur amplitude, dBm	Specification, dBm (relative to -30 dBm input)
2190 MHz	2790 MHz		< –80 dBm
2330 MHz	2930 MHz		< –80 dBm
4480 MHz	3260 MHz		< –80 dBm

Test record

Print out the following test record pages and use them to record the performance test results for the RSA306 spectrum analyzer.

Table 24: Test record: RSA306

Instrument Serial Number: Certificate Number:

Temperature: RH %:

Date of Calibration: Technician:

Frequency accuracy			
Measured Frequency (1 GHz CF)	**Instability measured, ppm [(Marker Frequency – 1E9)/1000]**	**Total specified Instability (aging plus other drift)**	**Pass/Fail**

External reference	
Phaselock to 10 MHz, 0 dBm	**Pass/Fail**

Amplitude accuracy			
Reference level	**Error, dB**	**Specification, dB**	**Pass/Fail**
+20 dBm < 3 GHz		±2.0 dB	
+20 dBm > 3 GHz		±2.75 dB	
+0 dBm < 3 GHz		±2.0 dB	
+0 dBm > 3 GHz		±2.75 dB	
–13 dBm < 3 GHz		±2.0 dB	
–13 dBm > 3 GHz		±2.75 dB	
–30 dBm < 3 GHz		±2.0 dB	
–30 dBm > 3 GHz		±2.75 dB	
Channel amplitude flatness			
Center Frequency	**Peak Error, dB**	**Specification, dB**	**Pass/Fail**
22 MHz		< ±1 dB	
1880 MHz		< ±1 dB	
4200 MHz		< ±1 dB	

DANL			
Center frequency	**Measurement, dBc**	**Specification, dB**	**Pass/Fail**
100 kHz		< –130 dBm/Hz	
1 MHz		< –130 dBm/Hz	
10 MHz		< –130 dBm/Hz	
20 MHz		< –130 dBm/Hz	
22 MHz		< –160 dBm/Hz	
100 MHz		< –160 dBm/Hz	
500 MHz		< –160 dBm/Hz	
1 GHz		< –160 dBm/Hz	
1.5 GHz		< –158 dBm/Hz	
2.0 GHz		< –158 dBm/Hz	
2.5 GHz		< –155 dBm/Hz	
3.0 GHz		< –155 dBm/Hz	
3.5 GHz		< –155 dBm/Hz	
4.0 GHz		< –155 dBm/Hz	
4.5 GHz		< –150 dBm/Hz	
5.0 GHz		< –150 dBm/Hz	
5.5 GHz		< –150 dBm/Hz	
6.0 GHz		< –150 dBm/Hz	
6.2 GHz		< –150 dBm/Hz	
Phase noise at 1 GHz center frequency			
Phase noise offset frequency	**Phase noise, dBc/Hz**	**Specification, dBc/Hz**	**Pass/Fail**
1 kHz		< –85 dBc/Hz	
10 kHz		< –84 dBc/Hz	
100 kHz		< –90 dBc/Hz	
1 MHz		< –118 dBc/Hz	
Third Order intermodulation distortion at 2130 MHz center frequency			
Test	**Measurement**	**Specification, dBc**	**Pass/Fail**
IMD		< –60 dBc	

Spurious response: ADC images				
Test	**Measurement, dBc**	**Specification, dBc**	**Pass/Fail**	**Notes**
LF ADC Image at 40 MHz CF		< –50 dBc		
RF ADC Image at 159.8 MHz CF		< –50 dBc		Only record the largest value measurement; see test instructions.
RF ADC Image at 120.2 MHz CF		< –50 dBc		Only record the largest value measurement; see test instructions.

Spurious response: Second convertor images			
Test	**Measurement, dBc**	**Specification, dBc**	**Pass/Fail**
2440 IF1 Image at 1 GHz CF		< –50 dBc	
1190 IF1 Image at 2 GHz CF		< –50 dBc	

Spurious response: First converter images				
Center frequency, MHz	**Image frequency, MHz**	**Measurement, dBc**	**Specification, dBc**	**Pass/Fail**
22 MHz	4902 MHz		< –50 dBc	
1840 MHz	6720 MHz		< –50 dBc	
1860 MHz	4240 MHz		< –50 dBc	
2330 MHz	4710 MHz		< –50 dBc	
2350 MHz	7230 MHz		< –50 dBc	
2410 MHz	7290 MHz		< –50 dBc	
2430 MHz	4810 MHz		< –50 dBc	
2690 MHz	5070 MHz		< –50 dBc	
2710 MHz	5090 MHz		< –50 dBc	
3690 MHz	6070 MHz		< –50 dBc	
3710 MHz	1170 MHz		< –50 dBc	
4560 MHz	320 MHz		< –50 dBc	
4950 MHz	2570 MHz		< –50 dBc	
4970 MHz	90 MHz		< –50 dBc	
5690 MHz	810 MHz		< –50 dBc	
5710 MHz	830 MHz		< –50 dBc	
5800 MHz	920 MHz		< –50 dBc	
6200 MHz	3820 MHz		< –50 dBc	

Spurious response: IF feedthrough 1990 MHz			
Center frequency, MHz	IF feedthrough spurious amplitude, dBm	Specification, dBm (relative to -30 dBm input)	Pass/Fail
1860 MHz		< –80 dBm	
2430 MHz		< –80 dBm	
2710 MHz		< –80 dBm	
4580 MHz		< –80 dBm	
4760 MHz		< –80 dBm	
5810 MHz		< –80 dBm	

Spurious response: IF feedthrough 2440 MHz			
Center frequency, MHz	IF feedthrough spurious amplitude, dBm	Specification, dBm (relative to -30 dBm input)	Pass/Fail
30 MHz		< –80 dBm	
710 MHz		< –80 dBm	
3710 MHz		< –80 dBm	
4640 MHz		< –80 dBm	
4970 MHz		< –80 dBm	
5710 MHz		< –80 dBm	

Spurious response: RF X 2LO				
Center frequency, MHz	Generator frequency, MHz	RF X 2LO spur amplitude, dBm	Specification, dBm (relative to -30 dBm input)	Pass/Fail
1190 MHz	4820 MHz		< –80 dBm	
1350 MHz	5140 MHz		< –80 dBm	
2150 MHz	7870 MHz		< –80 dBm	
3370 MHz	7930 MHz		< –80 dBm	
4790 MHz	6010 MHz		< –80 dBm	
5510 MHz	3700 MHz		< –80 dBm	

Spurious response: Half-IF, 1190 MHz			
Center frequency, MHz	Half-IF spurious amplitude, dBm	Specification, dBm (relative to -30 dBm input)	Pass/Fail
1860 MHz		< –80 dBm	
2430 MHz		< –80 dBm	
2710 MHz		< –80 dBm	
4580 MHz		< –80 dBm	
4760 MHz		< –80 dBm	
5810 MHz		< –80 dBm	

Spurious response: Half-IF, 2240 MHz			
Center frequency, MHz	Half-IF spurious amplitude, dBm	Specification, dBm (relative to -30 dBm input)	Pass/Fail
30 MHz		< –80 dBm	
710 MHz		< –80 dBm	
2350 MHz		< –80 dBm	
3710 MHz		< –80 dBm	
4640 MHz		< –80 dBm	
4970 MHz		< –80 dBm	
5710 MHz		< –80 dBm	

Spurious response: 2RF X 2LO				
Center frequency, MHz	Generator frequency, MHz	2RF X 2LO spur amplitude, dBm	Specification, dBm (relative to -30 dBm input)	Pass/Fail
2190 MHz	2790 MHz		< –80 dBm	
2330 MHz	2930 MHz		< –80 dBm	
4480 MHz	3260 MHz		< –80 dBm	