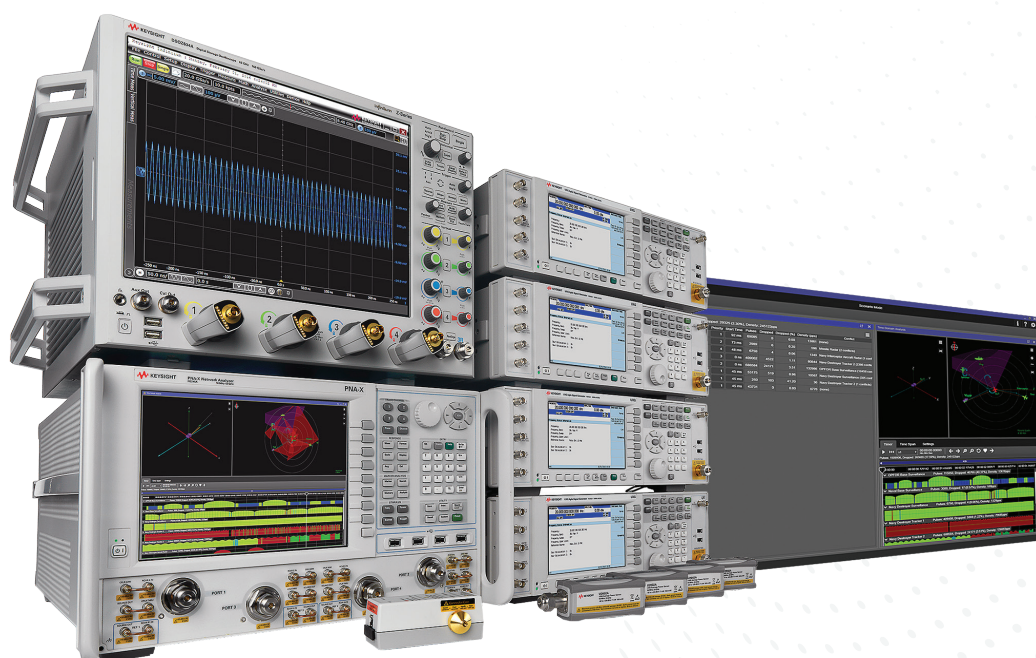


# Multi-Emitter Scenario Generator, Reference Solution

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Recommended options for the Multi-Emitter Scenario Generator, reference solution indicated by ■ below.

## A. Choose the UXG agile signal generator and options. N5193A is export restricted, N5191A not restricted

### 1. Select options for the N5193A UXG agile signal generator<sup>2, 3</sup>

| Quantity                                                                          | Step 1. Start with N5193A base configuration                                                                                                                                                                                                                                                                                                                                     |                                                                                                                              |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| ■ 2 <sup>1</sup>                                                                  | Standard options and accessories included with the UXG base model at no additional charge <ul style="list-style-type: none"><li>– 10 kHz frequency resolution</li><li>– 100 μs switching speed up to 31.6 GHz, 500 μs to 40 GHz</li><li>– Amplitude range of +10 to -10 dBm</li><li>– Phase noise of -117 dBc/Hz (typ) at 20 kHz offset for a 10 GHz carrier frequency</li></ul> |                                                                                                                              |
| Step 2. Select frequency range (required option; frequency range not upgradeable) |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                              |
| <input type="checkbox"/>                                                          | N5193A-520: Frequency range from 10 MHz to 20 GHz                                                                                                                                                                                                                                                                                                                                | Not compatible with Option 540.<br>Includes standard adapter 3.5 mm female to 3.5 mm female                                  |
| ■                                                                                 | N5193A-540: Frequency range from 10 MHz to 40 GHz                                                                                                                                                                                                                                                                                                                                | Not compatible with Option 520.<br>Includes standard adapter set, 2.4 mm female to female and 2.4 mm female to 2.9 mm female |
| Step 3. Choose frequency resolution                                               |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                              |
| <input type="checkbox"/>                                                          | Standard: Frequency resolution 10 kHz                                                                                                                                                                                                                                                                                                                                            |                                                                                                                              |
| ■                                                                                 | N5193A-FR1: Frequency resolution 0.001 Hz                                                                                                                                                                                                                                                                                                                                        |                                                                                                                              |
| Step 4. Choose switching speed options                                            |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                              |
| <input type="checkbox"/>                                                          | Standard: Switching speed 100 μs                                                                                                                                                                                                                                                                                                                                                 | List update rate 100 μs                                                                                                      |
| <input type="checkbox"/>                                                          | N5193A-SS1: Switching speed 1 μs                                                                                                                                                                                                                                                                                                                                                 | List update rate 1 μs; not compatible with Option SS2                                                                        |
| ■                                                                                 | N5193A-SS2: Switching speed 370 ns                                                                                                                                                                                                                                                                                                                                               | List update rate < 180 ns; switching speed of 370 ns applies in fast CW mode; not compatible with Option SS1                 |
| Step 5. Choose spectral purity option                                             |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                              |
| <input type="checkbox"/>                                                          | Standard: Standard phase noise                                                                                                                                                                                                                                                                                                                                                   | -117 dBc/Hz (typ) at 20 kHz offset for a 10 GHz carrier frequency                                                            |
| ■                                                                                 | N5193A-EP1: Enhanced phase noise                                                                                                                                                                                                                                                                                                                                                 | -126 dBc/Hz (typ) at 10 kHz offset for a 10 GHz carrier frequency; not upgradeable                                           |
| Step 6. Choose amplitude range                                                    |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                              |
| <input type="checkbox"/>                                                          | Standard: Amplitude range -10 to +10 dBm                                                                                                                                                                                                                                                                                                                                         |                                                                                                                              |
| <input type="checkbox"/>                                                          | N5193A-AT1: Mechanical and solid-state attenuator                                                                                                                                                                                                                                                                                                                                | 80 dB agile range and 120 dB overall range; not upgradeable                                                                  |
| Step 7. Choose modulation options                                                 |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                              |
| ■                                                                                 | N5193A-UNT: AM, FM, phase modulation, narrowband chirp, and LF output                                                                                                                                                                                                                                                                                                            |                                                                                                                              |
| ■                                                                                 | N5193A-WC1: Wideband chirp                                                                                                                                                                                                                                                                                                                                                       | Requires UNT                                                                                                                 |
| ■                                                                                 | N5193A-PM1: Pulse modulation                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                              |
| Step 8. Optional connector configurations                                         |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                              |
| <input type="checkbox"/>                                                          | N5193A-1EM: Move all connectors to rear panel                                                                                                                                                                                                                                                                                                                                    | Not upgradeable                                                                                                              |
| <input type="checkbox"/>                                                          | N5193A-1ED: Type-N (f) RF output connector                                                                                                                                                                                                                                                                                                                                       | Only available on 52E units<br>Includes standard adapter Type-N male to 3.5 mm female                                        |
| <input type="checkbox"/>                                                          | N5193A-CC1: 100-pin LVDS I/O interface                                                                                                                                                                                                                                                                                                                                           | Must select CC1 or CC2                                                                                                       |
| <input type="checkbox"/>                                                          | N5193A-CC2: 50-pin BCD I/O interface                                                                                                                                                                                                                                                                                                                                             | Must select CC1 or CC2                                                                                                       |

1. A minimum of 2 UXGs is recommended to simulate AoA or increase pulse density. Performance increases as more UXGs are added.

2. For more UXG options, the N5193A configuration guide, literature number 5992-0093EN.

3. Because of the high-performance characteristics of the N5193A UXG, a US export license is required. See next N5191A UXG, Modified Version for a version of UXG that does not require an export license.

## 2. Select options for the N5191A UXG agile signal generator<sup>2, 3</sup>

| Quantity                                                                          |                |                                                                                                                                                                                                                                                                                                                                                                                  | Step 1. Start with N5191A base configuration                                                                            |  |
|-----------------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|--|
| ■                                                                                 | 2 <sup>1</sup> | Standard options and accessories included with the UXG base model at no additional charge <ul style="list-style-type: none"><li>– 10 kHz frequency resolution</li><li>– 100 μs switching speed up to 31.6 GHz, 500 μs to 40 GHz</li><li>– Amplitude range of +10 to –10 dBm</li><li>– Phase noise of –117 dBc/Hz (typ) at 20 kHz offset for a 10 GHz carrier frequency</li></ul> |                                                                                                                         |  |
| Step 2. Select frequency range (required option; frequency range not upgradeable) |                |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                         |  |
| □                                                                                 |                | N5191A-52E: Frequency range from 10 MHz to 20 GHz                                                                                                                                                                                                                                                                                                                                | Not compatible with Option 54E<br>Includes standard adapter 3.5 mm female to 3.5 mm female                              |  |
| ■                                                                                 |                | N5191A-54E: Frequency range from 10 MHz to 40 GHz                                                                                                                                                                                                                                                                                                                                | Not compatible with Option 52E<br>Includes standard adapter set, 2.4 mm female-female and 2.4 mm female - 2.9 mm female |  |
| Step 3. Choose frequency resolution                                               |                |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                         |  |
| □                                                                                 |                | Standard: Frequency resolution 10 kHz                                                                                                                                                                                                                                                                                                                                            |                                                                                                                         |  |
| ■                                                                                 |                | N5191A-FR1: Frequency resolution 0.001 Hz                                                                                                                                                                                                                                                                                                                                        |                                                                                                                         |  |
| Step 4. Choose switching speed options                                            |                |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                         |  |
| □                                                                                 |                | Standard: Switching speed 100 μs                                                                                                                                                                                                                                                                                                                                                 | List update rate 100 μs up to 31.6 GHz, 500 μs to 40 GHz                                                                |  |
| ■                                                                                 |                | N5191A-SS3: Switching speed 370 ns                                                                                                                                                                                                                                                                                                                                               | List update rate < 180 ns; switching speed of 370 ns applies in fast CW mode up to 6.89 GHz                             |  |
| Step 5. Choose amplitude range                                                    |                |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                         |  |
| □                                                                                 |                | Standard: Amplitude range –10 to +10 dBm                                                                                                                                                                                                                                                                                                                                         |                                                                                                                         |  |
| ■                                                                                 |                | N5191A-AT1: Mechanical and solid-state attenuator                                                                                                                                                                                                                                                                                                                                | 80 dB agile range and 120 dB overall range; not upgradeable                                                             |  |
| Step 6. Choose modulation options                                                 |                |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                         |  |
| ■                                                                                 |                | N5191A-UT1: AM, FM, phase modulation, narrowband chirp, and LF output                                                                                                                                                                                                                                                                                                            | ■                                                                                                                       |  |
| ■                                                                                 |                | N5191A-WC2: Wideband chirp                                                                                                                                                                                                                                                                                                                                                       | Requires UT1                                                                                                            |  |
| ■                                                                                 |                | N5191A-PM2: Pulse modulation                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                         |  |
| Step 7. Optional connector configurations                                         |                |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                         |  |
| □                                                                                 |                | N5191A-1EM: Move all connectors to rear panel                                                                                                                                                                                                                                                                                                                                    | Not upgradeable                                                                                                         |  |
| □                                                                                 |                | N5191A-1ED: Type-N (f) RF output connector                                                                                                                                                                                                                                                                                                                                       | Only available on 52E units<br>Includes standard adapter Type-N male to 3.5 mm female                                   |  |
| ■                                                                                 |                | N5191A-CC1: 100-pin LVDS I/O interface<br>Must select CC1 or CC2                                                                                                                                                                                                                                                                                                                 |                                                                                                                         |  |
| □                                                                                 |                | N5191A-CC2: 50-pin BCD I/O interface<br>Must select CC1 or CC2                                                                                                                                                                                                                                                                                                                   |                                                                                                                         |  |

1. A minimum of 2 UXGs is recommended to simulate AoA or increase pulse density. Performance increases as more UXGs are added.
2. For more UXG options, the N5191A configuration guide, literature number 5992-1116EN.
3. The N5191A is a modified version of the N5193A UXG, designed to set the performance as high as possible without requiring an export license. Notable differences include switching speed, minimum pulse width, and chirp bandwidth. By choosing the N5191A, you will eliminate all processing time associated with the export license processes, thereby dramatically reducing the amount of time it takes to receive your new instrument.

## B. Choose hardware to support your AoA calibration method:

- U2000 series power sensor for amplitude comparison AoA calibration
- Infiniium oscilloscopes for TDOA AoA calibration
- PNA family of network analyzers for interferometry AoA calibration

### 1. Select options for U2000 series power sensor for amplitude comparison AoA calibration

#### Step 1. Select a power sensor for your application's frequency range<sup>1,2</sup>

|                          |            |                                                                   |
|--------------------------|------------|-------------------------------------------------------------------|
| <input type="checkbox"/> | U2000A     | 10 MHz to 18 GHz, –60 dBm to +20 dBm USB Power Sensor, N-type (m) |
| <input type="checkbox"/> | U2001A     | 10 MHz to 6 GHz, –60 dBm to +20 dBm USB Power Sensor, N-type (m)  |
| <input type="checkbox"/> | U2002A     | 50 MHz to 24 GHz, –60 dBm to +20 dBm USB Power Sensor, 3.5 mm (m) |
|                          | U2002A-H26 | U2002A sensor with extended frequency range, 10 MHz to 26.5 GHz   |
| <input type="checkbox"/> | U2004A     | 9 kHz to 6 GHz, –60 dBm to +20 dBm USB Power Sensor, N-type (m)   |

1. Other configuration options are listed in the U2000 Series USB power sensors configuration guide, literature number 5989–6281EN.
2. The electronic attenuators in the UXG do not function up to 26.5 GHz, so agile amplitude settling is not possible above this point. Qualified the power sensor calibration is available up to the maximum frequency range of the selected power sensor.

### 2. Select options for Infiniium oscilloscopes for TDOA AoA calibration

#### Step 1. Select an Infiniium oscilloscope for your application's frequency range<sup>1,2</sup>

|                          |                                                 |                                 |
|--------------------------|-------------------------------------------------|---------------------------------|
| <input type="checkbox"/> | S-Series: For up to 8 GHz TDOA AoA calibration  | Select options in step 2, below |
| <input type="checkbox"/> | V-Series: For up to 33 GHz TDOA AoA calibration | Select options in step 3, below |
| <input type="checkbox"/> | Z-Series: For up to 63 GHz TDOA AoA calibration | Select options in step 4, below |

#### Step 2. For the S-Series Infiniium oscilloscope, select from the following options

|                          | Model    | Bandwidth | Sample rate | Memory depth | See S-Series Infiniium oscilloscope product fact sheet, literature number 5991-4028EN for more options. |
|--------------------------|----------|-----------|-------------|--------------|---------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> | DSOS054A | 500 MHz   | 20 GSa/s    | 100 Mpts     |                                                                                                         |
| <input type="checkbox"/> | DSOS104A | 1 GHz     | 20 GSa/s    | 100 Mpts     |                                                                                                         |
| <input type="checkbox"/> | DSOS204A | 2 GHz     | 20 GSa/s    | 100 Mpts     |                                                                                                         |
| <input type="checkbox"/> | DSOS254A | 2.5 GHz   | 20 GSa/s    | 100 Mpts     |                                                                                                         |
| <input type="checkbox"/> | DSOS404A | 4 GHz     | 20 GSa/s    | 100 Mpts     |                                                                                                         |
| <input type="checkbox"/> | DSOS604A | 6 GHz     | 20 GSa/s    | 100 Mpts     |                                                                                                         |
| <input type="checkbox"/> | DSOS804A | 8 GHz     | 20 GSa/s    | 100 Mpts     |                                                                                                         |

#### Step 3. For the V-Series Infiniium oscilloscope, select from the following options

|                          | Model    | Bandwidth | Sample rate | Memory depth | See V-Series Infiniium oscilloscope configuration guide, literature number 5992-0481EN for more options. |
|--------------------------|----------|-----------|-------------|--------------|----------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> | DSOV084A | 8 GHz     | 80 GSa/s    | 2 Gpts       |                                                                                                          |
| <input type="checkbox"/> | DSOV134A | 13 GHz    | 80 GSa/s    | 2 Gpts       |                                                                                                          |
| <input type="checkbox"/> | DSOV164A | 16 GHz    | 80 GSa/s    | 2 Gpts       |                                                                                                          |
| <input type="checkbox"/> | DSOV204A | 20 GHz    | 80 GSa/s    | 2 Gpts       |                                                                                                          |
| <input type="checkbox"/> | DSOV254A | 25 GHz    | 80 GSa/s    | 2 Gpts       |                                                                                                          |
| <input type="checkbox"/> | DSOV334A | 33 GHz    | 80 GSa/s    | 2 Gpts       |                                                                                                          |

#### Step 4. For the Z-Series Infiniium oscilloscope, select from the following options

|                          | Model    | Bandwidth | Sample rate | Memory depth | See Keysight oscilloscope brochure, literature number 5989-7650EN for more options. |
|--------------------------|----------|-----------|-------------|--------------|-------------------------------------------------------------------------------------|
| <input type="checkbox"/> | DSOZ204A | 20 GHz    | 80 GSa/s    | 2 Gpts       |                                                                                     |
| <input type="checkbox"/> | DSOZ254A | 25 GHz    | 80 GSa/s    | 2 Gpts       |                                                                                     |
| <input type="checkbox"/> | DSOZ334A | 33 GHz    | 80 GSa/s    | 2 Gpts       |                                                                                     |
| <input type="checkbox"/> | DSOZ504A | 50 GHz    | 160 GSa/s   | 2 Gpts       |                                                                                     |
| <input type="checkbox"/> | DSOZ592A | 59 GHz    | 160 GSa/s   | 2 Gpts       |                                                                                     |
| <input type="checkbox"/> | DSOZ634A | 63 GHz    | 160 GSa/s   | 2 Gpts       |                                                                                     |

1. Other performance considerations such as spurious performance and dynamic range may affect reference solution performance.
2. The UXG's maximum frequency limits the maximum frequency of the solution to 40 GHz but we encourage the purchase of higher frequency oscilloscopes if there is an additional application space beyond calibrating the reference solution that requires higher frequency measurements with an oscilloscope.

### 3. Select options for PNA family of network analyzers for interferometry AoA calibration

| Step 1. Select a PNA network analyzer                                                   |            |                                                                                                                      |
|-----------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/>                                                                | N523xA     | Basic: PNA-L (Up to dynamic range 124 dB @ 20 GHz, Noise Floor -107 dBm @ 20 GHz) Select options in step 2, below    |
| <input type="checkbox"/>                                                                | N522xA     | Mid-range: PNA: (Up to dynamic range 139 dB @ 20 GHz, Noise Floor -116 dBm @ 20 GHz) Select options in step 3, below |
| <input type="checkbox"/>                                                                | N524xA     | High-end: PNA-X: (Up to dynamic range 141 dB @ 20 GHz, NF -118 dBm @ 20 GHz) Select options in step 4, below         |
| Step 2. For PNA-L, choose the desired frequency range for your application <sup>1</sup> |            |                                                                                                                      |
| <input type="checkbox"/>                                                                | N5239A     | 300 kHz to 8.5 GHz                                                                                                   |
| <input type="checkbox"/>                                                                | N5231A     | 300 kHz to 13.5 GHz                                                                                                  |
| <input type="checkbox"/>                                                                | N5232A     | 300 kHz to 20 GHz                                                                                                    |
| <input type="checkbox"/>                                                                | N5234A     | 10 MHz to 43.5 GHz                                                                                                   |
| <input type="checkbox"/>                                                                | N5235A     | 10 MHz to 50 GHz                                                                                                     |
| Step 3. For PNA choose the desired frequency range for your application <sup>1</sup>    |            |                                                                                                                      |
| <input type="checkbox"/>                                                                | N5221A     | 10 MHz to 13.5 GHz                                                                                                   |
| <input type="checkbox"/>                                                                | N5222A     | 10 MHz to 26.5 GHz                                                                                                   |
| <input type="checkbox"/>                                                                | N5224A     | 10 MHz to 43.5 GHz                                                                                                   |
| <input type="checkbox"/>                                                                | N5225A     | 10 MHz to 50 GHz                                                                                                     |
| <input type="checkbox"/>                                                                | N5227A     | 10 MHz to 67 GHz                                                                                                     |
| <input type="checkbox"/>                                                                | N522XA-219 | 2 ports, single source, configurable test set, extended power range, bias-tees Required option for PNA and PNA-X     |
| Step 4. For PNA-X, choose the desired frequency range for your application <sup>1</sup> |            |                                                                                                                      |
| <input type="checkbox"/>                                                                | N5249A     | 10 MHz to 8.5 GHz                                                                                                    |
| <input type="checkbox"/>                                                                | N5241A     | 10 MHz to 13.5 GHz                                                                                                   |
| <input type="checkbox"/>                                                                | N5242A     | 10 MHz to 26.5 GHz                                                                                                   |
| <input type="checkbox"/>                                                                | N5244A     | 10 MHz to 43.5 GHz                                                                                                   |
| <input type="checkbox"/>                                                                | N5245A     | 10 MHz to 50 GHz                                                                                                     |
| <input type="checkbox"/>                                                                | N5247A     | 10 MHz to 67 GHz                                                                                                     |
| <input type="checkbox"/>                                                                | N524XA-219 | Add extended power range and bias-tees to 2 port analyzer Required option for PNA and PNA-X                          |
| Step 5. Choose your power sensor based on VNA frequency range <sup>2</sup>              |            |                                                                                                                      |
| <input type="checkbox"/>                                                                | U2001A     | 10 MHz to 6 GHz, -60 dBm to +20 dBm USB Power Sensor, N-type (m)                                                     |
| <input type="checkbox"/>                                                                | U2004A     | 9 kHz to 6 GHz, -60 dBm to +20 dBm USB Power Sensor, N-type (m)                                                      |
| <input type="checkbox"/>                                                                | U2000A     | 10 MHz to 18 GHz, -60 dBm to +20 dBm USB Power Sensor, N-type (m)                                                    |
| <input type="checkbox"/>                                                                | U2002A     | 50 MHz to 24 GHz, -60 dBm to +20 dBm USB Power Sensor, 3.5 mm (m)                                                    |
| <input type="checkbox"/>                                                                | U2002A-H26 | U2002A sensor with extended frequency range, 10 MHz to 26.5 GHz                                                      |
| <input type="checkbox"/>                                                                | U2022XA    | 50 MHz to 40 GHz, -35 dBm to +20 dBm, 2.4 mm (m)                                                                     |
| Step 6. Choose your electronic calibration based on VNA frequency range <sup>3,4</sup>  |            |                                                                                                                      |
| <input type="checkbox"/>                                                                | 85092C     | RF Electronic Calibration Module (ECal), 300 kHz to 9 GHz, Type-N, 50 ohm, 2-port                                    |
| <input type="checkbox"/>                                                                | N4691B     | Electronic Calibration Module (ECal), 300 kHz to 26.5 GHz, 3.5 mm, 2-port                                            |
| <input type="checkbox"/>                                                                | N4693A     | Electronic Calibration Module (ECal), 10 MHz to 50 GHz, 2.4 mm, 2-port                                               |

1. The UXG's maximum frequency limits the maximum frequency of the solution to 40 GHz but we encourage the purchase of higher frequency VNAs if there is an additional application space beyond calibrating the reference solution that requires higher frequency measurements with a VNA.
2. You can also use non-USB power sensors with an accompanying power meter.
3. For more information see Electronic Calibration Technical Overview, literature number 5963-3743E.
4. A mechanical calibration kit can also be used.
5. For other network analyzer options, see the network analyzer selection guide, literature number 5989-7603EN and the PNA family microwave network analyzers configuration guide, literature number 5990-7745EN.

## C. Select software

### 1. Select Signal Studio for Multi-Emitter Scenario Generation (MESG)

#### Start with N5193A/91A base configuration

- N5193A/91A comes standard with the following software:
  - Keysight IO libraries, including Connection Expert<sup>1</sup>
  - Instrument software, drivers for use with MATLAB, LabVIEW

#### Add one license of N7660B Signal Studio software per UXG

##### Quickly and easily set up complex multi-emitter scenarios with AoA and kinematics

|   |            |                                                                      |
|---|------------|----------------------------------------------------------------------|
| ■ | N7660B     | Signal Studio for Multi-Emitter Scenario Generation (MESG)           |
| ■ | N7660B-4FP | Connect to N5193A UXG, fixed perpetual license                       |
| ■ | N7660B-EFP | Basic multiple emitters from 1 or more UXG , fixed perpetual license |
| ■ | N7660B-FFP | Multi-channel for AoA and kinematics, fixed perpetual license        |

### 2. Add MATLAB software (required for PNA or oscilloscope calibration)

#### Calibration software for TDOA or interferometry AoA requires calibration software written in MATLAB

|                          |            |                         |
|--------------------------|------------|-------------------------|
| <input type="checkbox"/> | N6171A-M01 | MATLAB basic package    |
| <input type="checkbox"/> | N6171A-M02 | MATLAB standard package |
| <input type="checkbox"/> | N6171A-M03 | MATLAB advanced package |

### 3. Select calibration software

#### Contact your Keysight representative to receive the following calibration software packages

- ☐ Amplitude correction software for U2000 series power sensor
- ☐ Time, phase and amplitude correction software for Infiniium oscilloscope (Requires MATLAB)
- ☐ Phase and amplitude correction software for PNA network analyzer (Requires MATLAB)

1. Both IO library (version 16.3 or newer) and Connection Expert software need to be installed on the PC controlling the equipment. For software download link and more information, please visit [www.keysight.com/find/iosuite](http://www.keysight.com/find/iosuite).
2. For software download link and more information, please visit [www.keysight.com/find/commandexpert](http://www.keysight.com/find/commandexpert)

### 4. Download free Keysight Command Expert software (optional)

#### FREE Command Expert software provides fast and easy instrument control via your PC<sup>2</sup>

Command Expert combines instrument command sets, sequences, documentation, syntax checking and execution in one simple interface. It helps you:

- Find instrument commands
- Access command documentation
- Verify command syntax
- Build instrument command sequences
- Execute instrument command sequences
- Profile command execution time
- Integrate sequences in MATLAB, Visual Studio, Excel, LabVIEW, VEE or SystemVue PC application environment
- Generate code for command sequences in MATLAB, Visual C#, Visual Basic.NET and Visual C++
- Debug command sequences using breakpoints and single stepping

## D. Select services, calibration, startup assistance

|                                     |                                                       |                                      |
|-------------------------------------|-------------------------------------------------------|--------------------------------------|
| <input type="checkbox"/>            | On site calibration services                          | Contact your Keysight representative |
| <input checked="" type="checkbox"/> | One day start-up assistance                           | Included with reference solution     |
| <b>Calibration<sup>1</sup></b>      |                                                       |                                      |
| <input type="checkbox"/>            | N5193A-UK6 Commercial calibration certificate         | Includes test data for N5193A        |
| <input type="checkbox"/>            | N5193A-1A7 Calibration + uncertainties + guardbanding | Includes ISO17025 calibration        |
| <input type="checkbox"/>            | N5193A-A6J ANSI Z540-1-1994 calibration               |                                      |

1. Listed calibration options are also available for upon purchase of instrument for the N5191A, oscilloscope, PNA and power sensor. Contact your Keysight representative for more information.

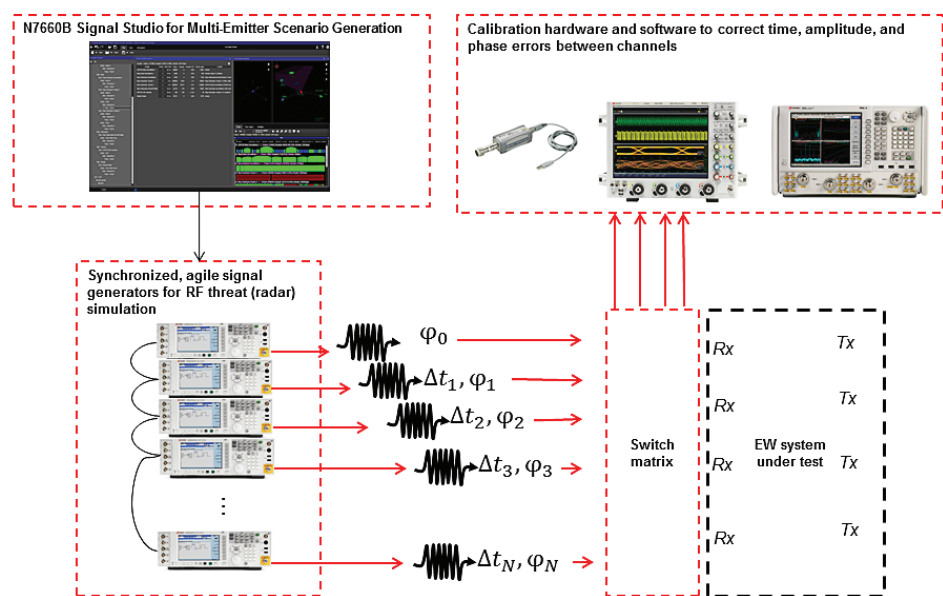
## Calibration Services

Keysight hardware is factory calibrated and shipped with an ISO-9002, NIST-traceable calibration certificate. A one year calibration cycle is recommended. On site calibration services are available to test all product specifications and compliance with ISO 17025:2005, ANSI/NCSL Z540.3-2006 and Measurement Uncertainty per ISO Guide to Expression of Measurement Uncertainty 1995.

## One Day Start-up Assistance

A Keysight applications engineer will get you started quickly by helping you put the system together with all of the hardware and software required to get up and running.

## E. Configurations



## F. PC requirements

The following table contains the minimum requirements for running the N7660B Signal Studio for Multi-Emitter Scenario Generation. The minimum specifications also apply to the custom calibration software provided with the reference solution.

|                      |                                                                                                                                                                                                  |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating system     | Windows 7 Professional, Ultimate or Enterprise (64-bit only)                                                                                                                                     |
| Processor speed      | 1 GHz minimum<br>2 GHz, multi-core recommended<br>Faster processing speed improves streaming performance                                                                                         |
| Available memory     | 6 GB minimum<br>8 GB or more recommended for complex simulations                                                                                                                                 |
| Available disk space | 1 GB minimum available hard disk space (if files generated for streaming are saved locally rather than streamed)                                                                                 |
| Display              | 1024 x 768 screen resolution minimum<br>1280 x 1024 recommended                                                                                                                                  |
| Interface card       | Installed GPIB IO interface card, LAN interface card, or USB interface connector                                                                                                                 |
| Software             | Microsoft .NET framework version 4.5.1 or later<br>Keysight IO Libraries, version 15.5 or later (17.1 or later recommended)<br>Keysight VISA<br>Microsoft Windows Installer version 2.0 or later |
| Browser              | Microsoft Internet Explorer version 10.0 or later (11.0 or later recommended for more reliable context-sensitive help functionality)                                                             |

## G. Related literature

|                                                                                          |             |
|------------------------------------------------------------------------------------------|-------------|
| <i>Multi-Emitter Scenario Generator, Reference Solution - Brochure</i>                   | 5992-1485EN |
| <i>Electronic Warfare Signal Generation: Technologies and Methods - Application Note</i> | 5992-0094EN |

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