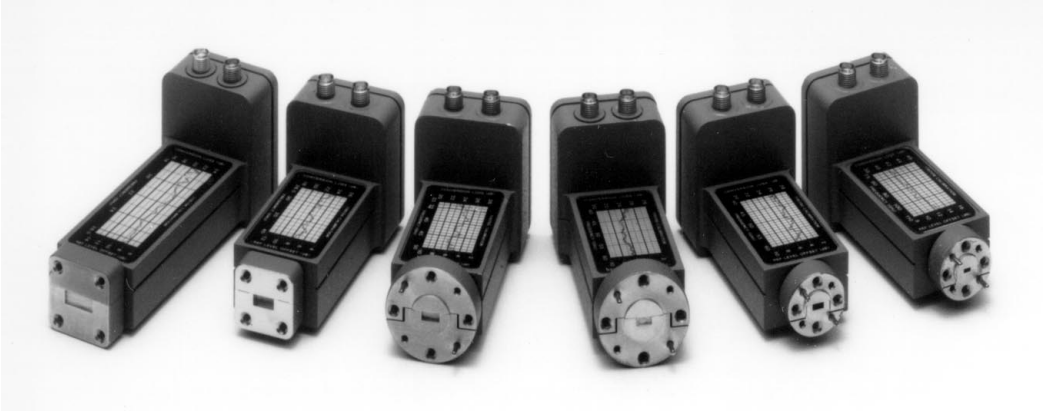
# Agilent 11970 Series Harmonic Mixers

Data Sheet

**For use with the Agilent E4407B, 8560E/EC Series, 8566B, and 71000 Series Spectrum Analyzers**

- **Excellent frequency response**
- **Low conversion loss**
- **No bias or tuning adjustments**
- **High safe input level, 100 mW**
- **Amplitude calibrated**

**18 to 110 GHz**
**11970K, 11970A, 11970Q, 11970U, 11970V, 11970W**



## Exceptional performance

The Agilent Technologies 11970 series harmonic mixers are general purpose mixers employing a dual-diode design to achieve very flat frequency response and low conversion loss. Each mixer is calibrated across its full band:

11970K, 18 to 26.5 GHz
11970A, 26.5 to 40 GHz
11970Q, 33 to 50 GHz
11970U, 40 to 60 GHz
11970V, 50 to 75 GHz
11970W, 75 to 110 GHz

This series of mixers has been designed for a local oscillator frequency of 3 to 6.1 GHz. Accurate absolute amplitude measurements can be made by using the mixer's conversion loss calibration chart. The SWR of the waveguide input is typically 2.2:1 to further minimize measurement uncertainty. The combination of high gain-compression level and low conversion loss provides the maximum dynamic range for measuring input signals.

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## Easy to use

The excellent frequency response and low conversion loss are achieved without external dc bias or tuning stubs. Since bias and tuning stubs are not required, manual operation is simplified, and the complexity of hardware and software for automatic systems is greatly reduced. The repeatability of amplitude measurements is also enhanced. The dual-diode design of the mixers further simplifies measurements by suppressing the odd-order harmonics by more than 20 dB, which makes identification of the mixing products easier.

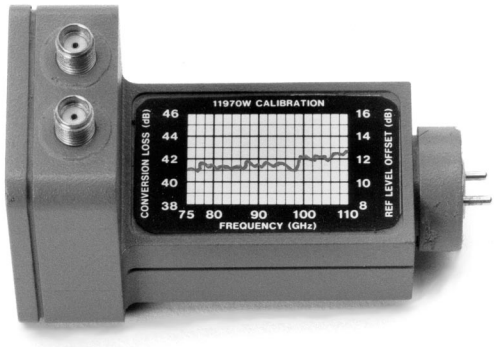


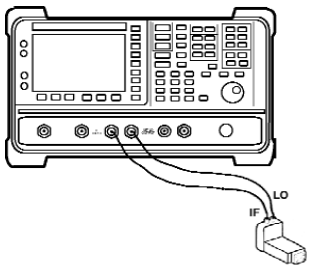

**Figure 1. A conversion loss chart is attached to each mixer.**

## Rugged

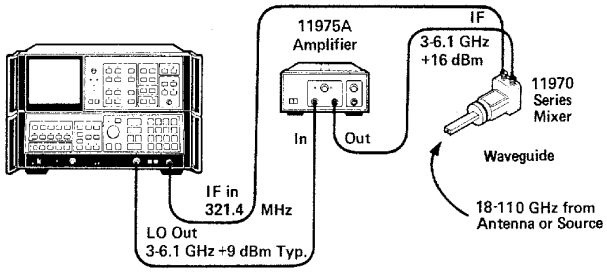
The rugged Agilent 11970 Series Mixers will survive input levels up to 100 milliwatts (+20 dBm) with no damage to the mixer diodes. They will withstand shocks up to 30 G's and the vibration required by MIL-STD 28800C, Type III, Class 3 tests.

## Frequency extension for the Agilent E4407B, 8560E/EC Series, 8566B, and 71000 Series spectrum analyzers

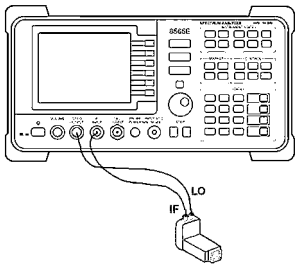
The 11970 Series Harmonic Mixers are fully compatible with the Agilent E4407B, 8560E/EC Series, 8566B, and 71000 Series Spectrum Analyzers. Accurate frequency and amplitude measurements are made directly from the spectrum analyzer's display after calibration using the mixer's calibration chart. The 11975A Microwatt Power Amplifier can be used with the 8566B Spectrum Analyzer to provide the necessary LO power of 14 to 18 dBm to the mixers. The 11975A has internal power leveling to achieve maximum measurement accuracy.



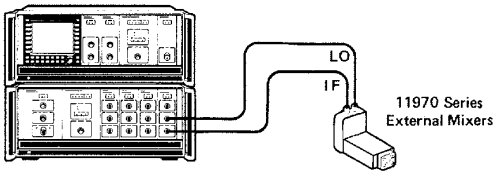

**Agilent E4407B Spectrum Analyzer**
Extended Frequency E4407B ESA-E Series




**Agilent 8566B Spectrum Analyzer**
Extended Frequency 8566B Spectrum Analyzer



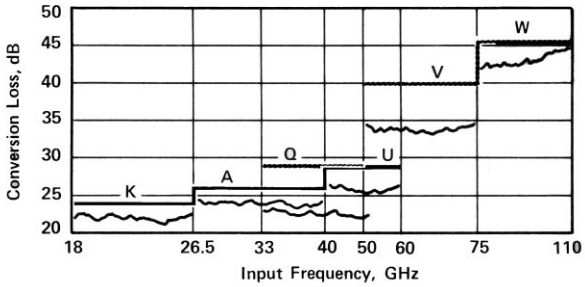

**Agilent 8560E/EC Series Spectrum Analyzer**
Extended Frequency 8560E/EC Series




**Agilent 71000 Series Spectrum Analyzer**
Extended Frequency 71000 Series Spectrum Analyzer

## Specifications


| | |
|---|---|
| **IF range** | DC to 1300 MHz |
| **LO amplitude range** | +14 to +18 dBm[1] |
| **Calibration accuracy (with IF of 321.4 MHz)** | |
| 11970A/Q/U | ±2.0 dB with LO amplitude range of +14.5 to +16 dBm; ±3.0 dB with LO amplitude range of +16 to +18 dBm |
| 11970V/W | ±2.6 dB with LO amplitude range of +14.5 to +16 dBm; ±3.2 dB with LO amplitude range of +16 to +18 dBm |
| **Typical RF input SWR** | |
| 11970A/Q/U | <2.2:1 |
| 11970V/W | <2.6:1 |
| **Bias requirements** | None |
| **Typical odd-order suppression** | |
| 11970A/Q/U | >20 dB |
| 11970V/W | >15 dB |
| **Maximum CW RF input level** | +20 dBm (100 mW) |
| **Maximum peak pulse power** | +24 dBm (250 mW) with <1 m sec pulse (average power +20 dBm) |

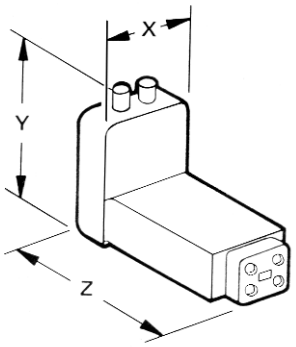


Typical Frequency Response & Conversion Loss

**Specifications** describe the device's warranted performance over the temperature range 0 to 55° C (except where noted).
**Supplemental characteristics** are typical, but non-warranted, performance parameters intended to provide information useful in applying the device. These are denoted as "typical," "nominal," or "approximately."

| Agilent model number | Frequency range (GHz) | LO harmonic number | Maximum conversion loss (dB) | Spectrum analyzer noise (dBm) 1 kHz BW | Frequency response (dB) | Typical gain compression (dBm) |
|---|---|---|---|---|---|---|
| **11970K** | 18–26.5 | 6– | 24 | –105 | ±1.9 | –3 |
| **11970A** | 26.5–40 | 8– | 26 | –102 | ±1.9 | –5 |
| **11970Q** | 33–50 | 10– | 28 | –101 | ±1.9 | –7 |
| **11970U** | 40–60 | 10– | 28 | –101 | ±1.9 | –7 |
| **11970V** | 50–75 | 14– | 40 | –92 | ±2.1 | –3 |
| **11970W** | 75–110 | 18– | 46 | –85 | ±3.0 | –1 |

| Agilent model number | Flange | Weight | X | Y | Z |
|---|---|---|---|---|---|
| **11970K** | UG-595/U | 0.17 kg | 36 mm | 51 mm | 90 mm |
| | WR-42 | 0.36 lb | 1.4 in | 2.0 in | 3.5 in |
| **11970A** | UG-599/U | 0.14 kg | 36 mm | 51 mm | 71 mm |
| | WR-28 | 0.32 lb | 1.4 in | 2.0 in | 2.8 in |
| **11970Q** | UG-383/U | 0.14 kg | 36 mm | 51 mm | 76 mm |
| | WR-22 | 0.32 lb | 1.4 in | 2.0 in | 3.0 in |
| **11970U** | UG-383/U-M | 0.14 kg | 36 mm | 51 mm | 76 mm |
| | WR-19 | 0.32 lb | 1.4 in | 2.0 in | 3.0 in |
| **11970V** | UG-385/U | 0.14 kg | 36 mm | 51 mm | 76 mm |
| | WR-15 | 0.32 lb | 1.4 in | 2.0 in | 3.0 in |
| **11970W** | UG-387/U | 0.14 kg | 36 mm | 51 mm | 76 mm |
| | WR-10 | 0.32 lb | 1.4 in | 2.0 in | 3.0 in |




1. The Agilent 11975A amplifier (2 to 8 GHz) or a similar amplifier can be used to provide sufficient LO power (14 to 18 dBm) to the mixers. An LO power of between 14.5 to 16 dBm at the mixer's LO input is necessary to achieve the given frequency response and spectrum analyzer amplitude accuracy specifications. When LO power varies between 14 to 18 dBm at the mixer's LO input, add ±1 dB to the frequency response and spectrum analyzer amplitude accuracy specification.

## Ordering information

| | |
|---|---|
| **11970K** | 18 to 26.5 GHz mixer |
| **11970A** | 26.5 to 40 GHz mixer |
| **11970Q** | 33 to 50 GHz mixer |
| **1970U** | 40 to 60 GHz mixer |
| **11970V** | 50 to 75 GHz mixer |
| **11970W** | 75 to 110 GHz mixer |
| **Option 009** | Mixer connection kit containing three 1-meter SMA cables, wrench, and allen driver |
| **11975A** | 2 to 8 GHz amplifier (for use with the 8566B) |

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