# Keysight Technologies
# Model 346C Option K40

# Product Note

The Keysight 346C Option K40 is a 40 GHz, 2.4 mm connector Noise Source. It has a 6 dB attenuator attached to the output connector to allow for better uncertainty comparing to the 346C-K01. The operating frequency is from 1 GHz to 40 GHz, usable to 50 GHz. Data is provided in a USB flash memory device and a printed copy for the entire frequency band from 1 GHz to 50 GHz at 1 GHz steps.

Electrical performance and specifications:

| Description | Specification | Supplemental Information |
|---|---|---|
| ENR | | |
| 1 GHz | | 14 dB (nominal) |
| 10 GHz | | 10 dB (nominal) |
| 20 GHz | | 8 dB (nominal) |
| 26.5 GHz to 36 GHz | 4 to 8 dB | |
| 37 GHz to 40 GHz | 3 to 7 dB | |
| 44 GHz | | 3 dB (nominal) |
| 50 GHz | | -0.5 dB (nominal) |
| VSWR | | See graph (nominal) |
| Reflection coefficient match between on and off states | | See graph (nominal) |

Note: Specifications are valid at ambient temperature 23 ± 5° C. For operations and other respects, please refer to document 00346-90148.

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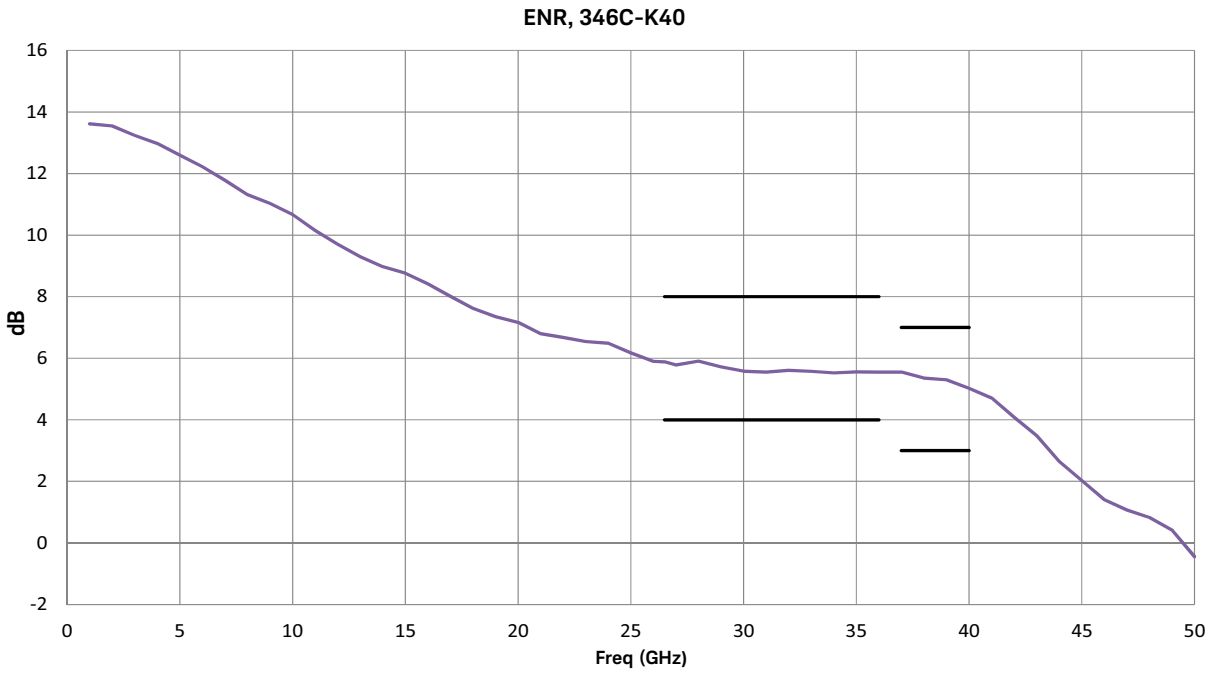
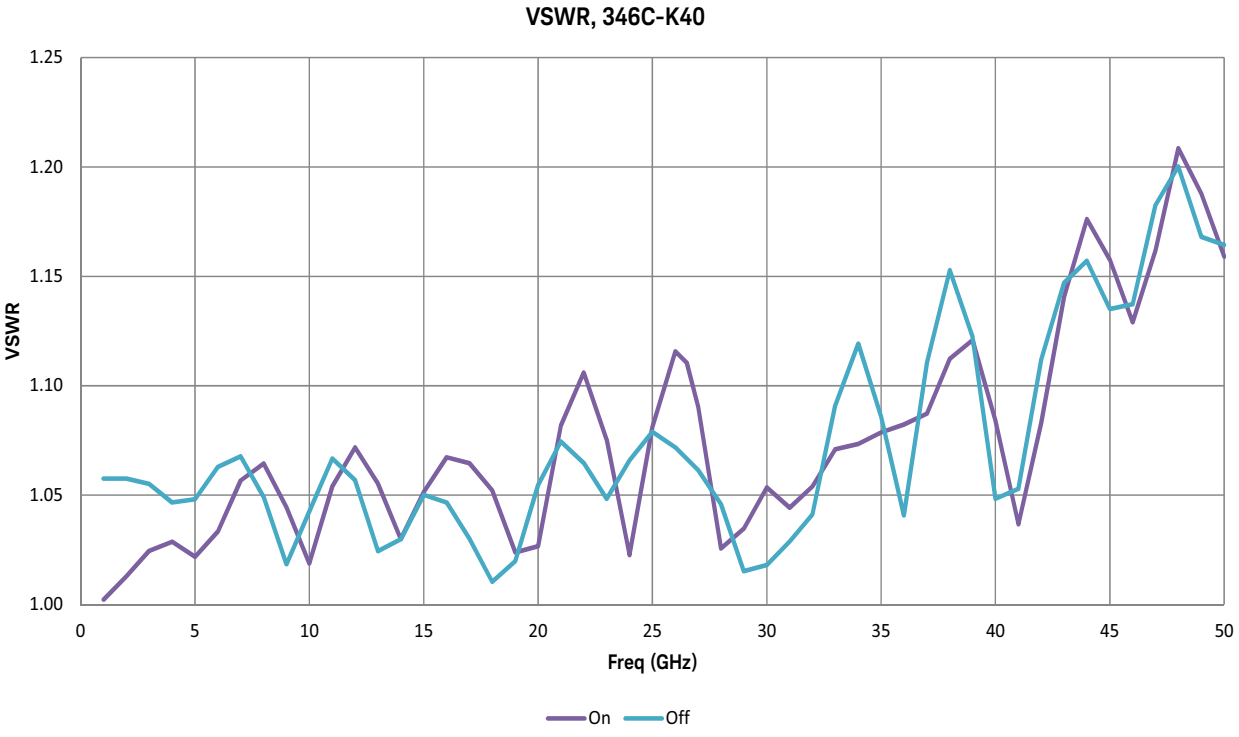
**Nominal Performance:**

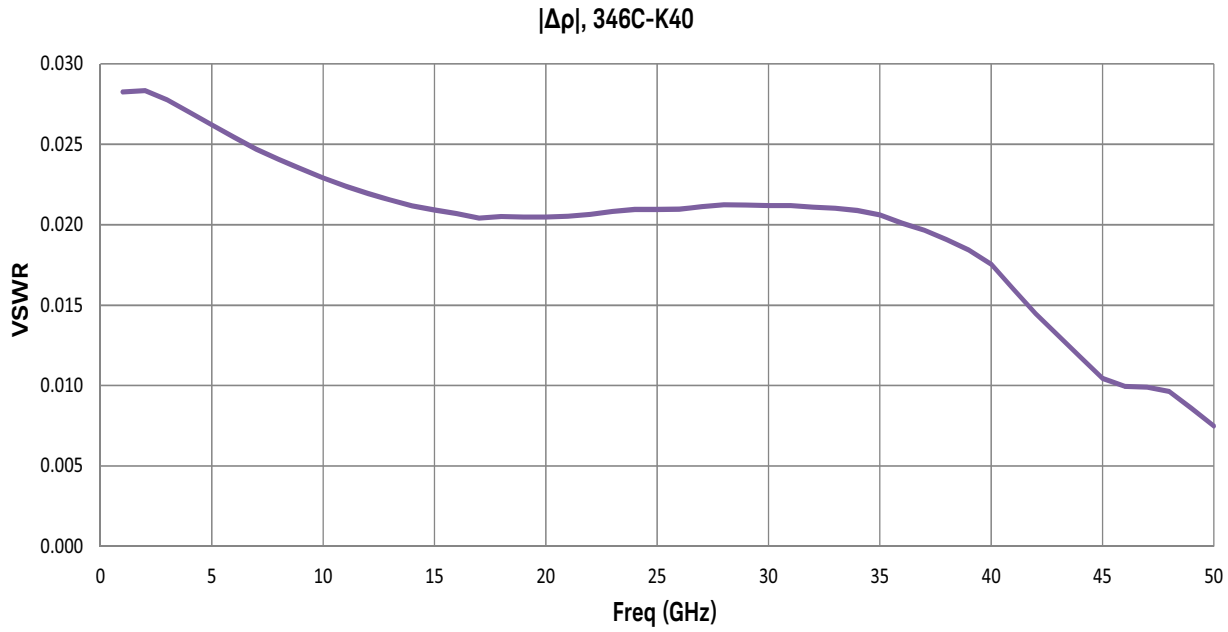
Graph 1. ENR Performance



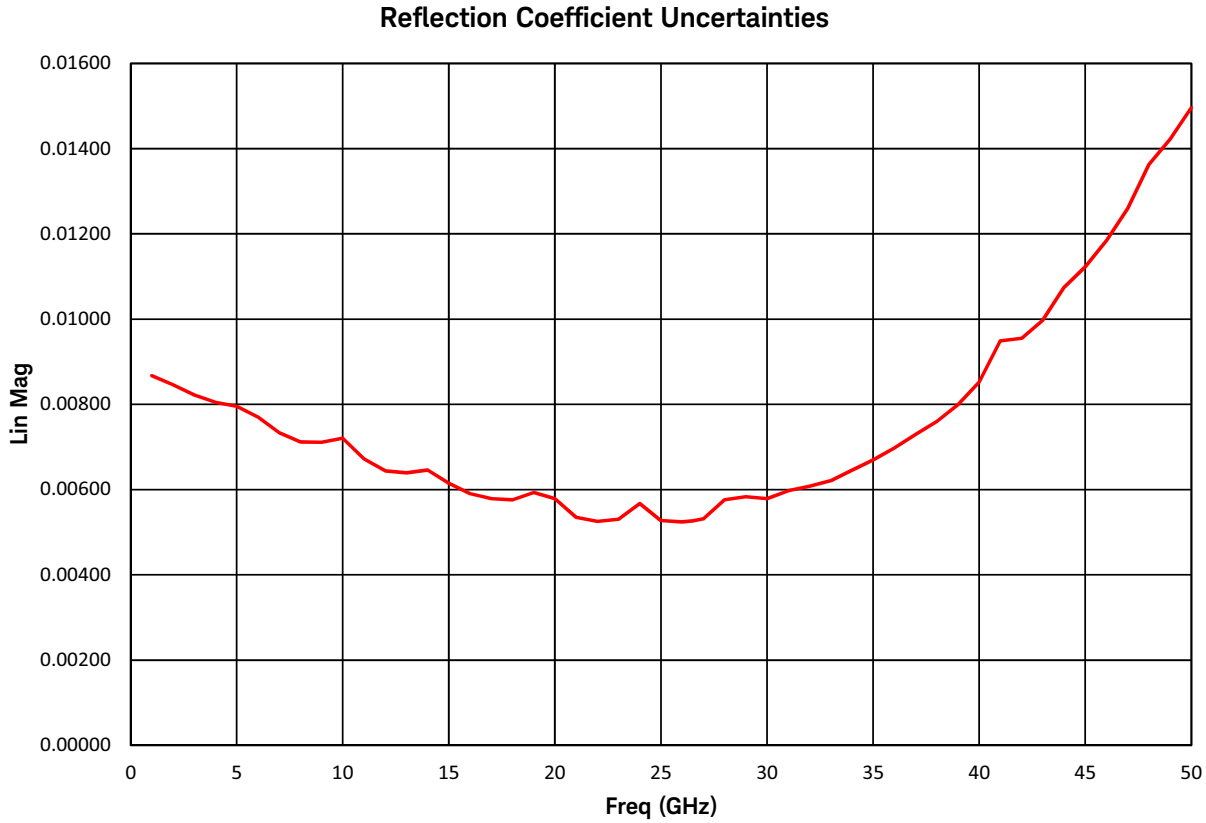

Graph 2. VSWR Performance



Graph 3. Delta Vector Reflection Coefficient




Graph 4. Reflection Coefficient Uncertainties



## General Information:

In the frequency range above 26.5 GHz, Keysight 346C-K01 and 346C-K40 are both available.

The –K01 has higher ENR throughout its entire frequency range. The –K40 has a better match throughout the entire frequency range.

When the –K40 is well inside its best usability range, the noise figure measurements made with it will have better uncertainty than will those made with the –K01. Thus, if the DUT is operating at 40 GHz and lower, and has a noise figure below about 16 dB, and has significant gain, such as 15 dB or more, the –K40 is the better choice. Its better match allows for lower uncertainties for two reasons: The lower mismatch between the DUT and the noise source reduces uncertainties in how much noise is transferred to the DUT during a noise figure measurement. The lower mismatch of the noise source reduces the uncertainty effect from a DUT whose noise figure depends on source impedance significantly, which most do. In other cases, use the –K01.

Low gain DUTs deserve special consideration regarding the choice of noise source. Low gain DUTs can have higher NF measurement uncertainty due to the uncertainty of the computed correction for the effect of the NF of the "second stage." When that second stage is a modern millimeter-wave signal analyzer, its NF can be so high that the calibration phase of a NF measurement can fail. Higher ENR allows calibration to extend to higher frequencies before unacceptable ENR-to-NF ratios are encountered. However, there are many ways around this limitation. One way is to use the U7227F USB preamp to achieve an excellent second stage NF. Another is to use "internal cal" instead of "user cal" on analyzers (and even the USB preamp) that have this feature.

The –K40 has significantly decreasing ENR above 40 GHz. Error contributors that are negligible with ENRs of 6 dB and greater can be significant with lower ENRs, and are not well documented or exposed by the NF Uncertainty Calculator. But its advantage of better match might still make it a good choice in some cases up to 50 GHz. The ENR may actually go negative at 50 GHz. This does not make measurements impossible, because ENR is the excess noise ratio; at 0 dB ENR there is still twice as much noise power at the output when on as when off.

Inspect the shipping container. If the container or packing material is damaged, it should be kept until the contents of the shipment have been checked mechanically and electrically. If there is physical damage refer to "Contacting Keysight" on page 5. Keep the damaged shipping materials (if any) for inspection by the carrier and a Keysight Technologies representative.

## Contacting Keysight

Assistance with test and measurement needs, and information on finding a local Keysight office are available on the Internet at:
http://www.keysight.com/find/assist

You can also purchase accessories or documentation items on the Internet at:
http://www.keysight.com/find

If you do not have access to the Internet, contact your field engineer.

**NOTE**

In any correspondence or telephone conversation, refer to the Keysight product by its model number and full serial number. With this information, the Keysight representative can determine the warranty status of your unit.

This information is subject to change without notice.

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