

**Agilent Technologies**

**E444xA Option HBA**

User's and Service Guide Supplement



# **Agilent Technologies E444xA Option HBA**

## **User's and Service Guide Supplement**



**Agilent Technologies**

**Manufacturing Part Number: E4443-90001**

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## Safety Notes

The following safety notes are used throughout this document. Familiarize yourself with each of these notes and its meaning before performing any of the procedures in this document.

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<b>WARNING</b>	<b>Warning denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.</b>
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## Definitions

- Specifications describe the performance of parameters covered by the product warranty (temperature –0 to 55 °C, unless otherwise noted.)
- *Typical* describes additional product performance information that is not covered by the product warranty. It is performance beyond specification that 80% of the units exhibit with a 95% confidence level over the temperature range 20 to 30 °C. Typical performance does not include measurement uncertainty.
- *Nominal* values indicate expected performance, or describe product performance that is useful in the application of the product, but is not covered by the product warranty.

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## Verifying the Shipment

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 please notify the nearest Agilent Technologies office. Refer to [“Contacting Agilent” on page 7](#). Keep the damaged shipping materials (if any) for inspection by the carrier and an Agilent Technologies representative.

For information concerning the operation and connections, refer to the PSA User's and Service Guide supplied with the standard product.



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# **E444xA Option HBA**

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## Introduction

The E444xA Option HBA locates the RF input on the rear panel, using a 3.5 mm (male) connector. This option utilizes the 21.4 MHz IF output connector hole on the rear panel, therefore special Option HB2 is not available with Option HBA.

The Displayed Average Noise Level (DANL) will degrade slightly in instruments with Option HBA. This is due to the additional cabling required to move the RF input to the rear panel of the instrument. This DANL degradation increases as the RF input frequency increases. The DANL will nominally degrade approximately 1 dB at 13.2 GHz and approximately 2 dB at 26.5 GHz when compared to the DANL of a standard PSA. In all other respects Option HBA specification are identical to the standard PSA product specifications.

The following equation may be used to predict how the DANL will nominally degrade based on the frequency of interest.

**Equation 1**      **E4440/43/45A Option HBA Nominal DANL**

$$DHBA = D + 28.4 \times \left( \frac{5.758 + 4.89 \times F - 0.146 \times F^2 + 2.433 \times 10^{-3} \times F^3}{1200} \right)$$

For [Equation 1](#):

- $F$  is the Frequency in GHz.
- $D$  is the term used for representing the instruments DANL specification found in the PSA Series Specification Guide.
- $DHBA$  is the term used to represent the resultant instrument DANL from the inclusion of Option HBA.

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## Performance Verification

This test measures the Displayed Average Noise Level (DANL) of the PSA. The test measures the noise in zero span with a 1 kHz resolution bandwidth, and then normalizes the amplitude to a 1 Hz bandwidth.

DANL is defined as the average of the displayed trace. There is no practical method for manually reading the average of the trace. This procedure averages the trace 100 times and then the operator scrolls the display line to the middle of the trace. The display line reading is considered the trace average. The reading is normalized to a 1 Hz RBW by subtracting 30 dB ( $10 \times \log(1000)$ ) from the display line value.

### Displayed Average Noise Level

#### Equipment Required

- Termination, 50  $\Omega$ , 3.5 mm (f)

#### Procedure

1. Connect the appropriate termination to the PSA RF input connector.  
Press **System, Alignments, Align All Now**.
2. Press **Preset**. Set the analyzer controls by pressing the following keys:  
**SPAN, Span, 0 Hz**  
**Sweep, Sweep Time, 20 ms**  
**Amplitude, Ref Level, -100 dBm**  
**Amplitude, Attenuation, Man, 0 dB**  
**BW/Avg, Res BW, 1 kHz**  
**BW/Avg, Average, On**  
**Single**
3. If the analyzer does not have Option 1DS (Internal Preamplifier) installed, then continue with [step 11](#).
4. Press **AMPLITUDE, More 1 of 3, Int Preamp, On**.

5. Press **FREQUENCY** and enter the first frequency listed in [Table 1](#).

**Table 1 DANL (PSA with Option 1DS)**

Frequency	Normalized DANL
100 kHz	1)
199 kHz	2)
201 kHz	3)
499 kHz	4)
501 kHz	5)
9.9 MHz	6)
10.1 MHz	7)
1.0 GHz	8)
1.2 GHz	9)
2.4 GHz	10)
2.6 GHz	11)
3.0 GHz	12)

6. Press **Single** and wait for 100 averages.
7. Press **Display, Display Line, On**.
8. Scroll the display line so that it bisects the trace. Read the display line amplitude and subtract 30 from the value. Record the result under Normalized DANL in the table.
9. Repeat [step 5](#) through [step 8](#) for all frequencies listed in [Table 1](#).
10. Press **AMPLITUDE, More 1 of 3, Int Preamp, Off**.

11. Press **FREQUENCY** and enter the first frequency listed in [Table 2](#).

**Table 2 DANL (All PSA Instruments)**

Frequency	Normalized DANL
10 kHz	<b>13)</b>
99 kHz	<b>14)</b>
101 kHz	<b>15)</b>
990 kHz	<b>16)</b>
1.01 MHz	<b>17)</b>
500 MHz	<b>18)</b>
1.1 GHz	<b>19)</b>
1.3 GHz	<b>20)</b>
2.0 GHz	<b>21)</b>
2.4 GHz	<b>22)</b>
2.6 GHz	<b>23)</b>
3.0 GHz	<b>24)</b>
3.1 GHz	<b>25)</b>
4.0 GHz	<b>26)</b>
5.0 GHz	<b>27)</b>
6.5 GHz	<b>28)</b>
6.7 GHz	<b>29)</b>

12. Press **Single** and wait for 100 averages.

13. Press **Display, Display Line, On**.

14. Scroll the display line so that it bisects the trace. Read the display line amplitude and subtract 30 from the value. Record the result under Normalized DANL in the table.

15. Repeat [step 11](#) through [step 14](#) for all frequencies listed in [Table 2](#).

16. If the analyzer is an E4443A stop here.

17.Repeat [step 11](#) through [step 14](#) for all frequencies listed in [Table 3](#).

**Table 3 DANL (PSA E4445A, E4440A)**

Frequency	Normalized DANL
8.0 GHz	30)
9.0 GHz	31)
10.0 GHz	32)
11.0 GHz	33)
12.0 GHz	34)
13.1 GHz	35)

18.If the analyzer is an E4445A stop here.

19.Repeat [step 11](#) through [step 14](#) for all frequencies listed in [Table 4](#).

**Table 4 DANL (PSA E4440A)**

Frequency	Normalized DANL
13.3 GHz	36)
14.0 GHz	37)
15.0 GHz	38)
16.0 GHz	39)
17.0 GHz	40)
18.0 GHz	41)
19.9 GHz	42)
20.1 GHz	43)
21.0 GHz	44)
22.4 GHz	45)
22.6 GHz	46)
24.0 GHz	47)
25.0 GHz	48)
26.4 GHz	49)

20.If the analyzer is an E4440A stop here.

## Contacting Agilent

By internet, phone, or fax, get assistance with all your test and measurement needs.

This information supersedes all prior HP contact information.			
<b>Online assistance:</b> <a href="http://www.agilent.com/find/assist">www.agilent.com/find/assist</a>			
<b>Americas</b>			
<b>Brazil</b> (tel) (+55) 11 3351 7012 (fax) (+55) 11 3351 7024	<b>Canada</b> (tel) +1 877 894 4414 (fax) +1 303 662 3369	<b>Mexico</b> (tel) 1 800 254 2440 (fax) 1 800 254 4222	<b>United States</b> (tel) 800 829 4444 (alt) (+1) 303 662 3998 (fax) 800 829 4433
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