

Wideband Linear Amplifier Propagation Delay

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1. Background

Two AH15199B, AH15203A/B single-ended wideband linear amplifiers can be paired to use as a differential amplifier, however the phase difference between the output signals degrades waveforms, making it essential to minimize the difference between the two signals.

This technical note uses actual measurement data to explain how the small delay distribution of this amplifier is unlikely to cause degraded waveforms due to phase difference.

2. Optical Device Evaluation Setup

Figure 1 shows the evaluation setup. Two wideband linear amplifiers are required to evaluate a DUT with differential IF.

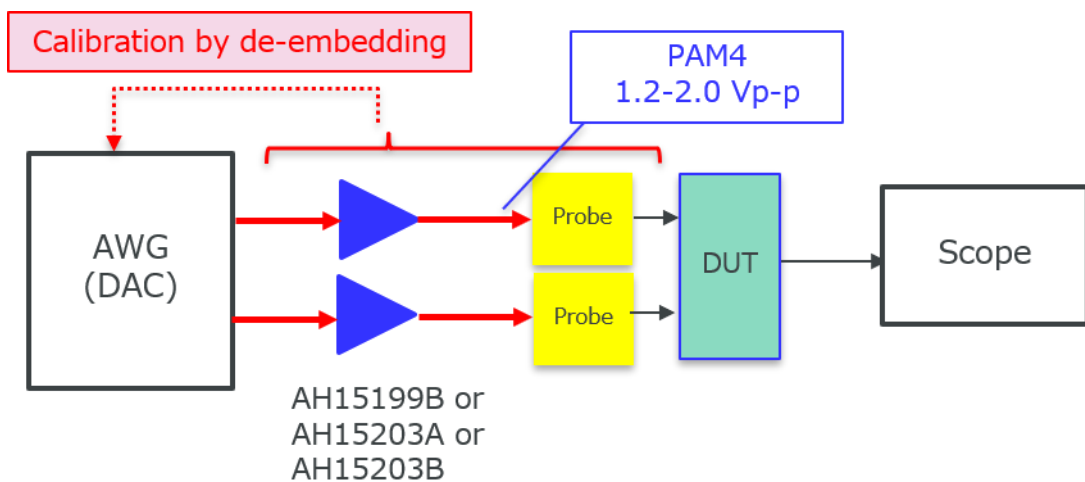


Fig. 1 Differential IF Optical Device Evaluation Setup

3. Wideband Linear Amplifier Phase Characteristics

Figure 2 shows typical data for the phase characteristics of the AH15203B. Table 1 shows the standard deviation (SD) of the phase characteristics calculated based on actual test data; the SD of the phase characteristics at 80 GHz is as low as 7.63 deg (265 fs) is sufficiently small, and will not cause degraded waveforms even at 100 Gbaud PAM4 (10 ps per cycle).

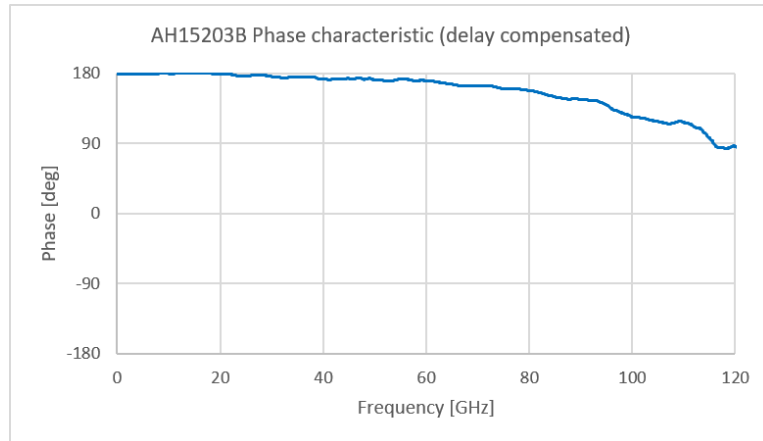


Fig. 2 Typical AH15203B Phase Characteristics

Table 1. Standard Deviation of Phase Characteristics*

Frequency [GHz]	Total Standard Deviation (σ) [Deg]
10	1.38
20	2.21
40	3.83
60	6.45
80	7.63

*: Comparison of the same model number

4. Phase Difference Between Two Wideband Linear Amplifiers

Figure 3 shows a typical example of the phase difference between two Wideband Linear Amplifier units*, and Fig. 4 shows the typical phase difference between the two positive and negative outputs of the AH54192A 56 Gbaud differential linear amplifier. The typical phase for two combined Wideband Linear Amplifier units* varies by about 5 deg. at 80 GHz, which is equivalent to the positive-negative phase difference (3 to 4 deg. @40 GHz) of the AH54192A.

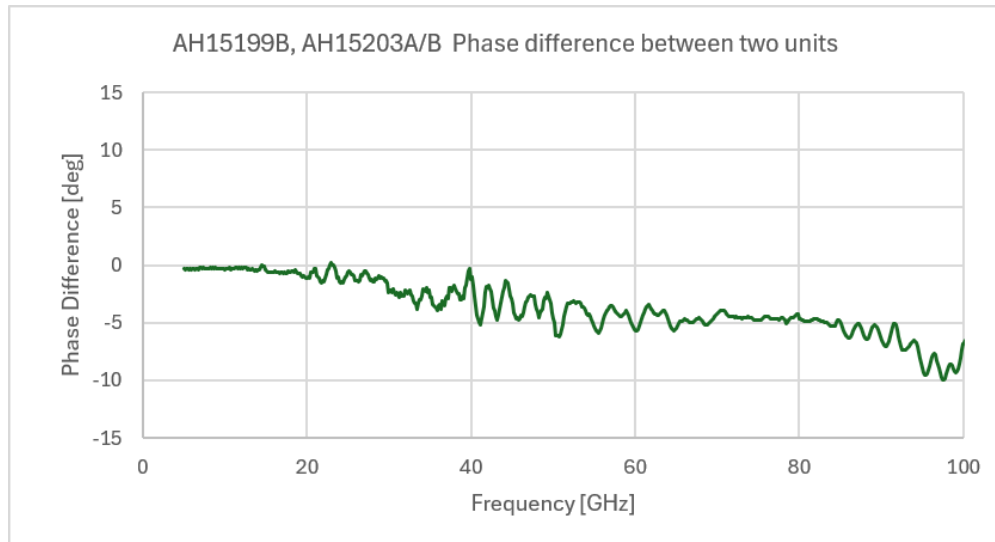


Fig. 3 Typical Phase Difference Between Two Wideband Linear Amplifiers

*: Comparison of the same model number

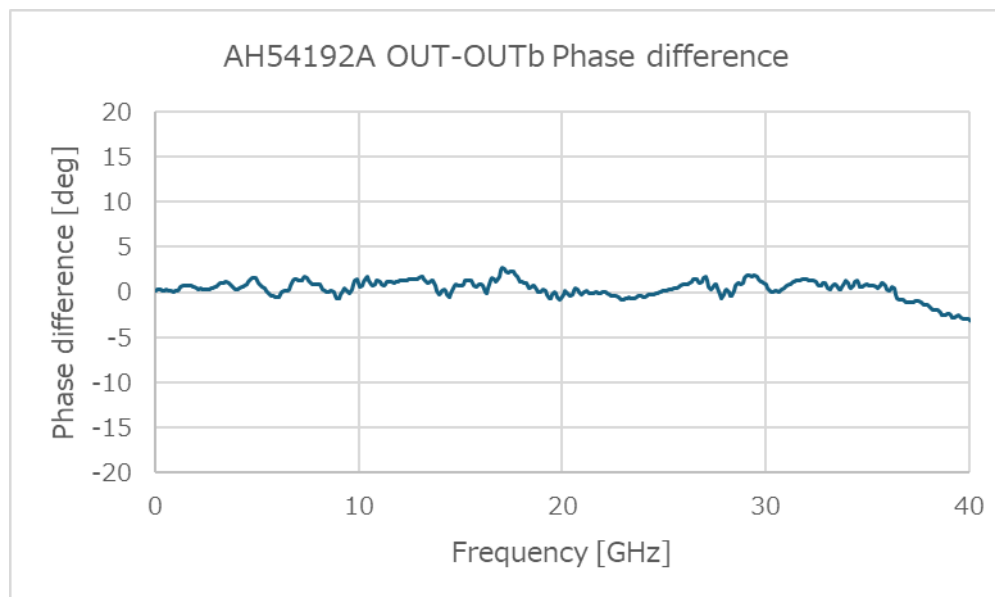


Fig. 4 Typical Phase Difference Between AH54192A Outputs

5. Conclusions

Two AH15199B, AH15203A/B wideband linear amplifiers can be used in combination as a differential linear amplifier, allowing it to be used without requiring skew matching due to the low propagation delay distribution (standard deviation: σ).

Additionally, when using a commercially available AWG as the signal source, the skew and amplitude between the two signals can be matched using calibration tool.



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