MP2100A

BERTWave

Procedure for Calculating Extinction Ratio Correction Factor

Contents

1. Introduction

This document explains how to measure the extinction ratio using sampling oscilloscopes; it is necessary because the measured value must be synchronized with the measuring instrument acting as the reference. The measurement method, Correction Factor calculation and input procedure are described using the MP2100A BERTWave as an example.

2. Measurement System

The explanation of the measurement procedure assumes that the following measurement system is being used.

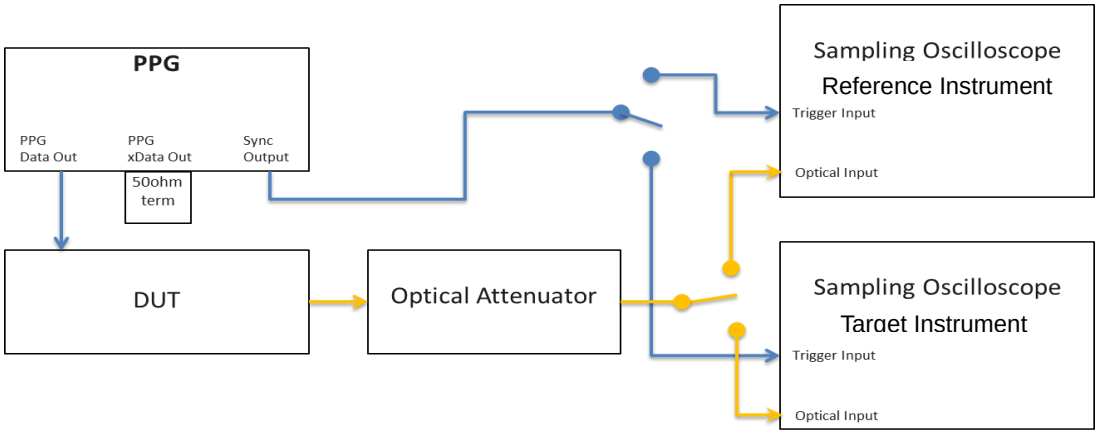

Fig. 1

3. Procedure

3.1 Calibration

Allow the instruments to warm-up sufficiently (>1 hour) before measurement.

After warming-up, press the [O/E] button at the right side of the screen to set the measured Bit Rate filter and wavelength (Fig. 2).

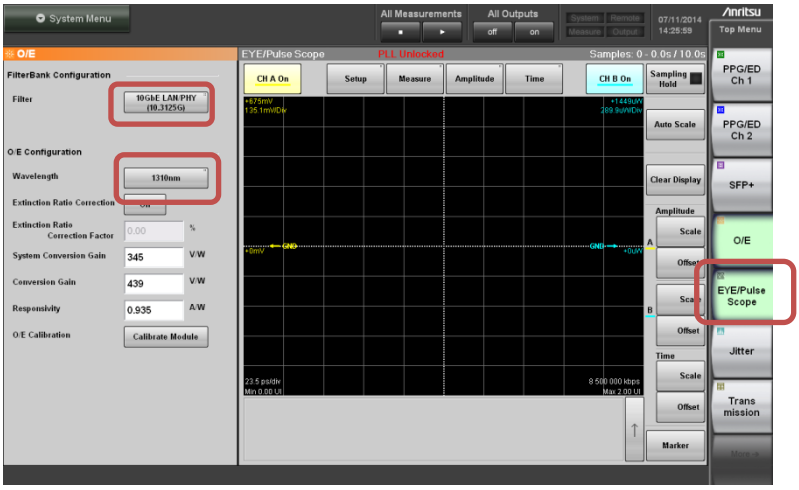

Fig. 2

Move to the Eye/Pulse Scope screen and set Ch A to Off; press the [Setup] button and run Calibration from the Utilities tab (Fig. 3). At Calibration, disconnect all cables and fit the cap on the optical input (Ch B input) to ensure there is no optical input.

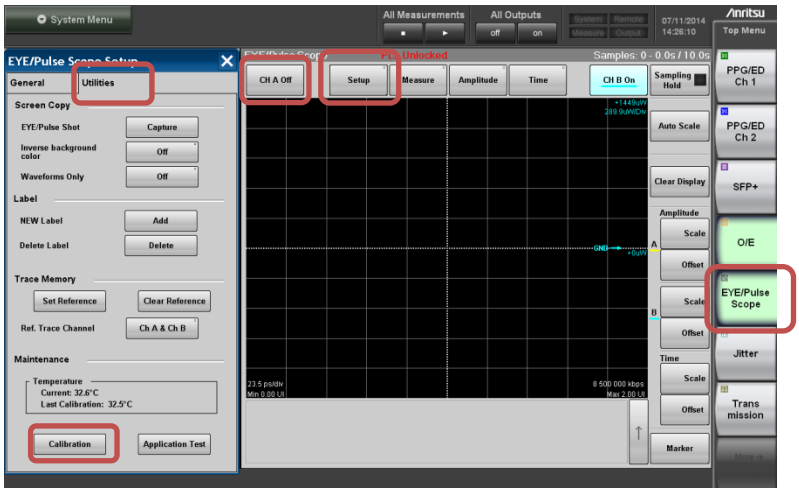

Fig. 3

3.2 Measuring Extinction Ratio

Press the Eye/Pulse Scope [Setup] button and set Number of Samples, Accumulation Type, and Limit Types at the General tab. In this example, measurement is performed by setting the Total Sample count to 1.35 MSa. To capture 1.35 MSa as the Total Sample, set Number of Samples to 1021 and the number of Waveforms to 1323 (Fig. 4).

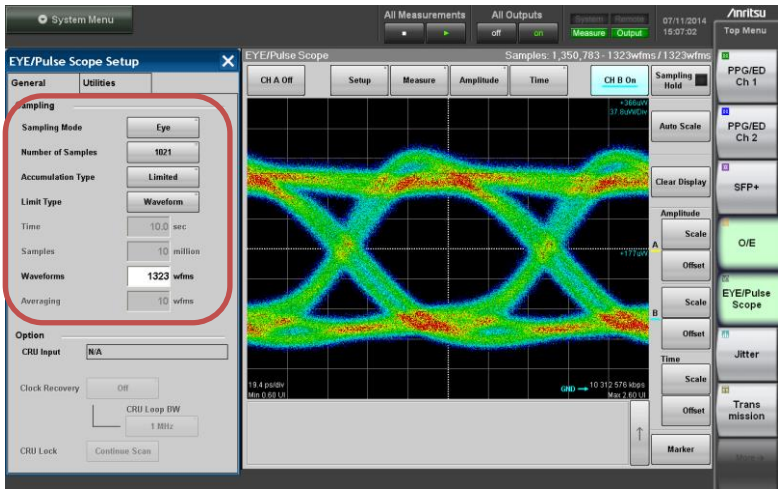

Fig. 4

Press the [Measure] button to set Measure Item to Amplitude/Time and display the extinction ratio measurement results (Fig. 5).

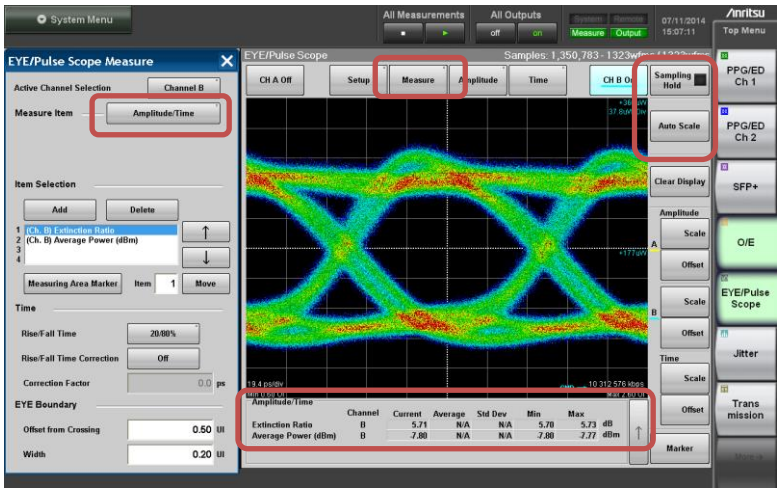

Fig. 5

4. Correcting Extinction Ratio

4.1 Comparing and Calculating Extinction Ratio

To calculate the extinction ratio Correction Factor, prepare the target DUT and measure the extinction ratio under the exact same conditions such as temperature, Bit Rate, DUT, optical fiber, etc., for both the reference instrument and the instrument to be corrected. The Correction Factor is calculated from the following equation based on the measured extinction ratios.

$$\mathrm{ER[CF]} = \left(\frac{1}{10^{\frac{ER[meas]}{10}}} - \frac{1}{10^{\frac{ER\{ref\}}{10}}} \right) * 100$$

ER[ref]= Reference instrument measured value (dB)

ER[meas] = Measured value (dB)

ER[CF] = ER Correction Factor (%)

The Correction Factor calculated from the above equation can be found easily using the appended spreadsheet (Excel file).

Input the measured extinction ratio values into the Excel spreadsheet Correction Factor Target Measured Value and Reference Measured Value columns to calculate the Correction Factor and the extinction ratio after correction. In addition, to ensure that the measured value always has the same measurement error as well as to minimize the measurement error, the mean Correction Factor is calculated from the average of five extinction ratio measurements and displayed automatically (Fig.6).

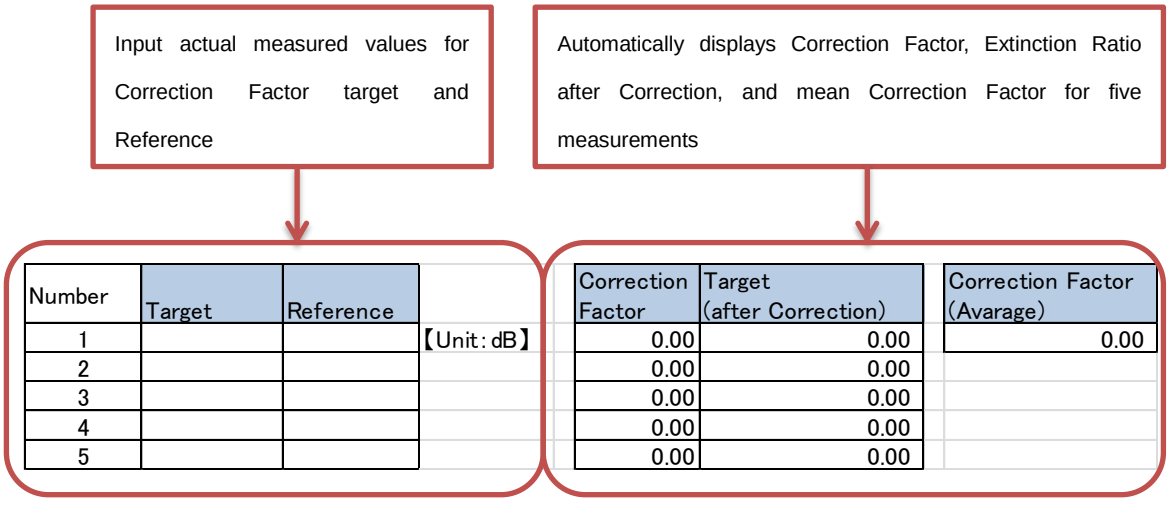

Fig. 6

4.2 Extinction Ratio Correction Factor Procedure for BERTWave

Input the extinction ratio calculated from the extinction ratio spreadsheet to the BERTWave using the following procedure. In this example, an extinction ratio of 3.0% is input.

Press the [O/E] button at the right side of the screen, change the O/E Configuration [Extinction Ratio Correction] button to On and input the Extinction Ratio Correction Factor.

*Corrected is displayed on the measurement screen, confirming that the extinction ratio value has been updated. Compare the updated extinction ratio with the extinction ratio of the reference instrument and confirm that they are about the same value (Fig. 7).

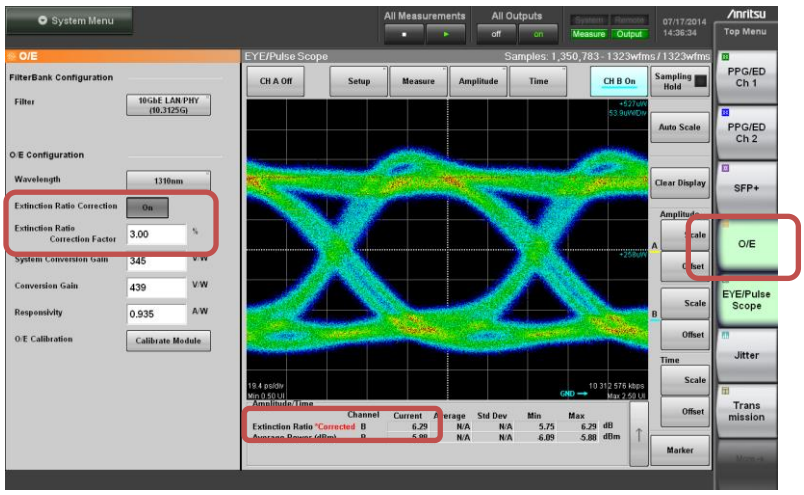

Fig. 7

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No. MP2100A-E-T-2-(1.00) 公知 Printed in Japan 2014-11 MG