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colour inside

Dynamic modules – Part 5-1 Test methods – Dynamic gain tilt equalizer – Gain tilt settling time measurement

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CONTENTS

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DYNAMIC MODULES –

Part 5-1 Test methods – Dynamic gain tilt equalizer – Gain tilt settling time measurement

FOREWORD

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International Standard IEC 62343-5-1 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics.

This second edition cancels and replaces the first edition published in 2009. It constitutes a technical revision. This edition includes the following significant technical changes with respect to the previous edition:

a) change in the title

b) changes in performance parameter names.

The text of this standard is based on the following documents:

CDV	Report on voting
86C/1249/CDV	86C/1277/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62343 series, published under the general title *Dynamic Modules*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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DYNAMIC MODULES –

Part 5-1 Test methods – Dynamic gain tilt equalizer – Gain tilt settling time measurement

1 Scope

This part of IEC 62343 contains the measurement method of gain tilt settling time for a dynamic gain tilt equalizer (DGTE) to change its gain tilt from an arbitrary initial value to a desired target value.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62343, *Dynamic modules – General and guidance*

IEC 62343-1-3, *Dynamic modules – Part 1-3: Performance standards – Dynamic gain tilt equalizer (non-connectorized)*

3 Terms, definitions, abbreviations and response waveforms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62343 and IEC 62343-1-3 and the following apply.

3.1.1
T_c
convergence time
time to converge from the first hit at the target $\pm Y$ % to the stay within the deviation $\pm Y$ % in the optical power from the output port of DGTE at pre-determined wavelength

3.1.2
T_l
latency time
<direct and analogue control types> time between the application of control signal and the change in output optical power by $\pm X$ % of the initial power of DGTE at pre-determined wavelength

3.1.3
T_p
processing time
<digital control type> time between the application of control command and the change in output optical power by $\pm X$ % of the initial power of DGTE at pre-determined wavelength

3.1.4
gain tilt settling time
(T_l or T_p) + T_r + T_c

3.1.5
T_r
rise time
time to change from the initial $\pm X$ % to the target $\pm Y$ % in the optical power from the output port of DGTE at pre-determined wavelength

3.1.6
T_s
settling time
time to be suppressed from the first hit at the target $\pm Y$ % to the final stay at the target within a required resolution of the optical power from the output port of DGTE at pre-determined wavelength

3.2 Abbreviations

CPU	central processing unit
DGTE	dynamic gain tilt equalizer
DUT	device under test
LCD	liquid crystal display
O/E	optical-to-electrical
PDL	polarization dependent loss
TLS	tuneable laser source
WDM	wavelength division multiplexing

3.3 Response waveforms

The definitions and symbols defined in 3.1 are shown in Figure 1, Figure 2 and Figure 3.

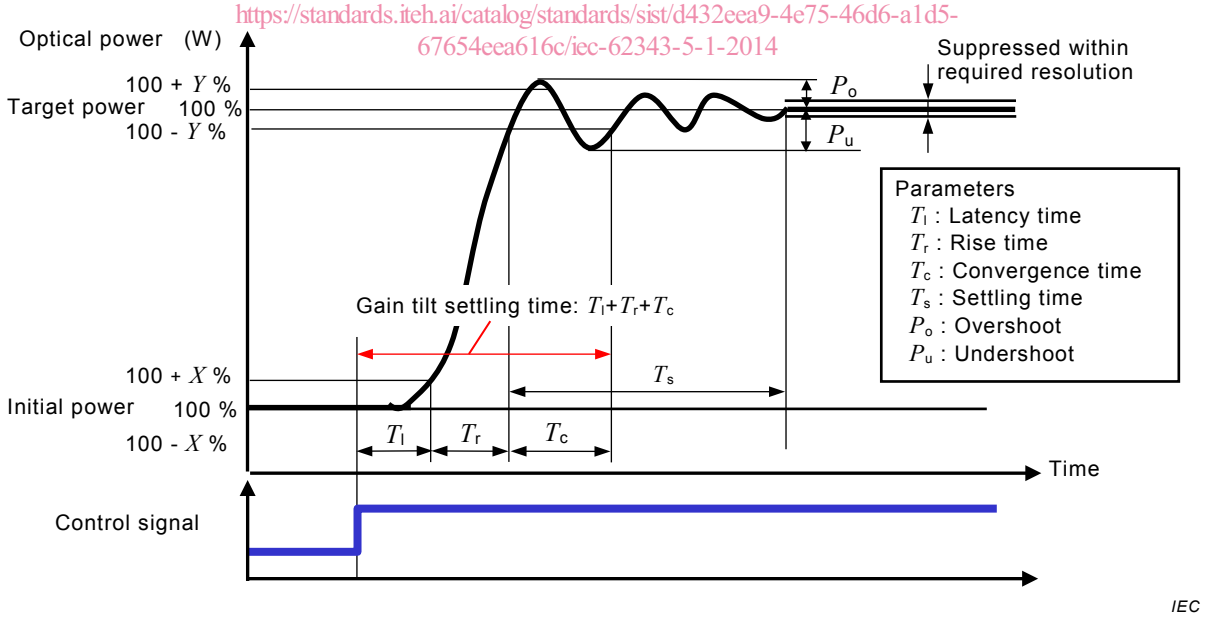


Figure 1 – Response waveforms for direct control DGTEs

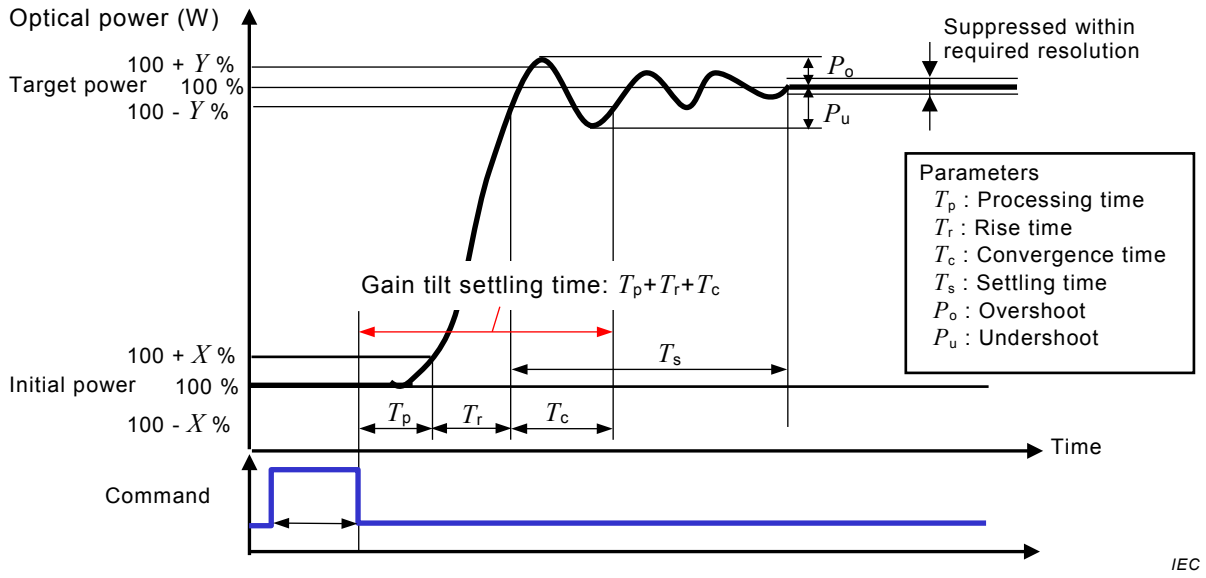


Figure 2 – Response waveforms for digital control DGTEs

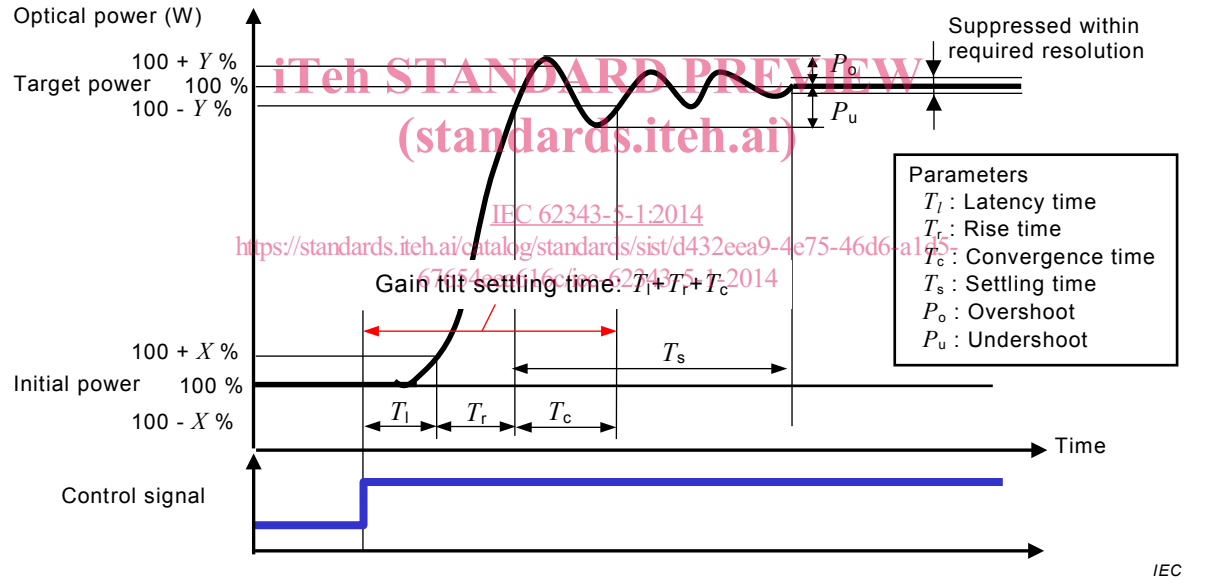
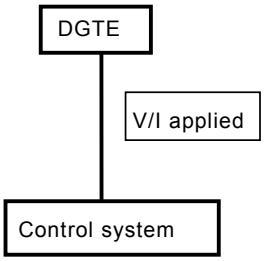
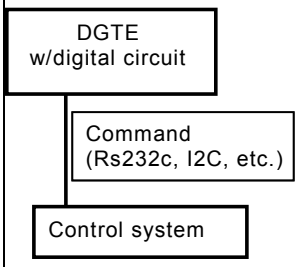
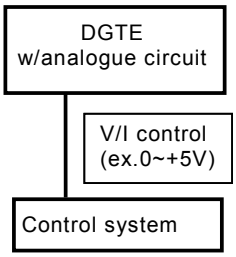


Figure 3 – Response waveforms for analogue control DGTEs

4 General information

The DGTE is categorized into three control methods as shown in Table 1. The direct control type is driven directly by voltage or current; the digital control type is operated by digital control system with digital signals; and the analogue control type is operated by analogue signals. The definition and the measurement method of gain tilt settling time for DGTE are different for the three control types. Table 1 also shows the configuration of operating systems and the correction for temperature dependency for three control types of DGTE. When the gain tilt settling time for the DGTE has temperature dependency, users may need to calibrate the temperature effect. The bottom row in Table 1 indicates the typical methods of the correction for temperature dependency (refer to Annex D).

Table 1 – Categorization of DGTE by the control method

	Direct control	Digital control	Analogue control
Control	By voltage or current directly	By command through digital circuit	By voltage or current through analogue circuit
Configurations			
Correction for temperature dependency	By control system	By digital circuit or control system	By analogue circuit or control system

5 Apparatus

5.1 Light source

A tuneable wavelength device is used as the light source. A tuneable laser source (TLS) or a combination of a broadband light source and tuneable filter is the typical equipment of tuneable wavelength light source. The tuning range of the tuneable wavelength light source shall be enough to cover the operating wavelength of DGTE to be measured.

In order to minimise the measurement uncertainty caused by the linewidth of the light source, the linewidth multiplied by the maximum value of the gain tilt slope of DGTE shall be smaller than one tenth of the dynamic gain tilt range. Typical value of operating wavelength range and dynamic gain tilt range of DGTE are 35 nm and ±4 dB respectively. For example, the error for the linewidth of 1 nm is calculated as:

$$1 \times \left\{ \frac{4/35}{[+4-(-4)]} \right\} = 1{,}4\% \qquad (1)$$

The output power of the light source shall remain stable during the measurement. The stability of the output power during the gain tilt settling time of DGTE to be measured shall be smaller than one tenth of dynamic gain tilt range of DGTE.

If the polarization dependent loss (PDL) of DGTE to be measured is larger than 0,5 dB, a depolarized light source shall be used.

5.2 Pulse generator

A pulse generator is used to drive DGTE to be measured. The shape of the pulse shall be rectangular to change the gain tilt. The intensity and width of the pulse shall be such to make the maximum tilt change defined as the specification of DGTE. The rise time/fall time of the rectangular pulse shall be shorter than 10 ns or one tenth of the rise time/fall time to be measured.

5.3 O/E converter

An O/E converter is used to convert the optical output power of DGTE to be measured to the electrical power to be observed by an oscilloscope. The bandwidth of O/E converter shall be from DC to greater than $10(1/T_r)$ Hz, where T_r is the rise time to be measured.