Application Note

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Wander Client™

The Digital Lightwave® Wander Client is a PC software application that works in conjunction with the Jitter/Wander circuit pack on a NIC® unit to provide synchronization analysis by using data, graphs, and menu commands. The file storage capability allows you to open saved files and analyze their data, and apply standards and masks long after the live measurements have been uploaded.

This document provides information on installing and launching Wander Client, and opening saved measurement files, and using Wander Masks.

Installing and Launching Wander Client

The Wander Client executable file is stored in the GalaxyNIC folder on the PC when the RemoteNIC™ application is installed. There are two ways to launch Wander Client:

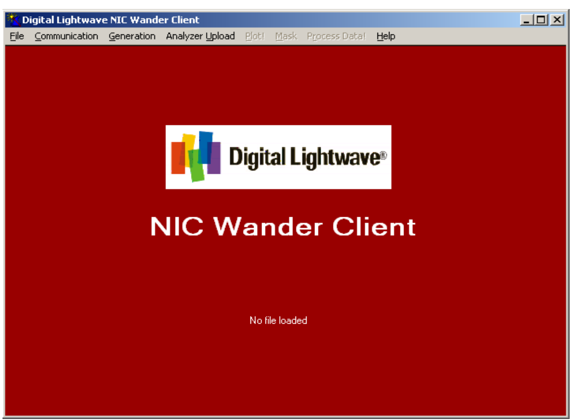
- From a NIC unit equipped with a Jitter circuit pack and licensed for Wander Client
- From the GalaxyNIC directory

To open Wander Client from a NIC unit:

1. From your PC, open the **RemoteNIC** application and connect to the NIC unit.

   The NIC unit must be equipped with a Jitter circuit pack and licensed for Wander Client.

2. From the **Jitter TX** or **Jitter RX** tab, select **Start Wander GUI**. The Wander Client screen appears.



To open Wander Client from the GalaxyNIC directory:

1. From your PC, open **Windows Explorer** and locate the Remote Control Application directory. For example, C:\Program Files\GalaxyNIC.
2. Expand the **GalaxyNIC** directory and choose the **Compat60001<xxxx>** folder, depending on the NIC unit's current Feature Set version.
3. Select the **WanderClient.exe** file. The Wander Client screen appears.

   For easy access, you can place a shortcut to Wander Client on your desktop. It is important to remember that when the NIC unit's software is upgraded, the Remote GUI will create a new Compat60001<xxxx> folder based on the new Feature Set version, making it necessary to replace the old shortcut to the new WanderClient.exe file in the new Compat60001<xxxx> folder.

Opening Saved Measurement Files

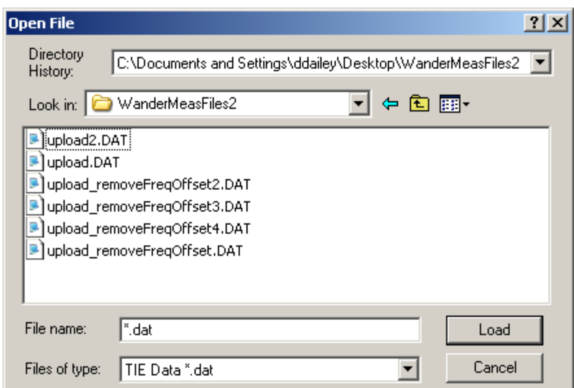
The Open menu command allows you to open saved TIE, MTIE, TDEV, Drift, and Offset files. Once a file is opened you can manipulate a plot's data in several ways using various menu command options.

The following list describes the file types and their extensions:

- .dat – TIE data file
- .mti – MTIE file
- .tdv – TDEV file
- .dft – Drift file
- .off – Offset file

To open saved measurement files:

1. Open the Wander Client application as described in the previous section.
2. From the **File** menu, choose **Open**. The Open File dialog box appears showing the default system32 directory folder.
3. Locate the desired file by selecting the **Look in** drop-down arrow and drilling down to the file, or by selecting the **Directory History** list and choosing from recently used locations.



4. Select the **Files of type** arrow to choose a specific file type, which restricts the files that display in the directory folder list.
5. Select the desired file and choose **Load**. The plot appears on the measurement screen.

Wander Masks

The Digital Lightwave Wander Client allows users to create or select specific MTIE and TDEV Wander masks. Wander masks are used as pass/fail criteria for the Wander measurement performed by Digital Lightwave NIC test units.

The Wander Client allows users to create user-defined Wander masks on the screen, or upload user-defined Wander masks from a file.

The Wander Client also provides an extensive array of pre-defined MTIE and TDEV Wander Masks to choose from, as defined by a list of telecommunication industry standards. See the Pre-Defined Wander Mask section below for details.

User-Defined Wander Masks

The Digital Lightwave Wander Client allows users to create their user-defined Wander mask to test against.

Users can draw a Wander Mask on the screen, as well as save their created Wander mask to file, so it can be uploaded at a later time.

Users can also save any of the pre-defined Wander masks as a user-defined file, then edit portions of mask's test parameters, and then upload the revised mask for testing Wander without having to create a user-defined mask from scratch.

Drawing Wander Masks

To draw a user-defined Wander mask, make sure the Wander test is stopped. Select MTIE or TDEV, depending on the desired mask type. Click on the Mask drop down menu, highlight User-Defined and choose "From Points Start".

Note that the Mask drop down menu is only available for MTIE and TDEV testing.

Click the X, Y coordinate you want the mask to start at. Then either drag the mouse across the screen to draw the mask, or perform a series of clicks at various X, Y coordinates to draw the mask as a sequence of straight lines from each previous set of coordinates to the next. Work your way from Left to Right, clicking the screen each time you want to designate a new set of X, Y coordinates to draw a line to. Note, if you make a mistake, you can always adjust the selected coordinates with in the saved file.

When drawing the mask by holding down the left mouse button, keep in mind that each change in angle that is made is a new set of X, Y coordinates, and a user-defined mask is limited to 500 sets of X, Y coordinates. Thus, masks that have rounded or curved appearances might require hundreds of sets of coordinates. Whereas masks that have only a few straight horizontally, vertically and/or diagonal lines, might only require a very small set of X, Y coordinates to draw the entire mask.

After you have selected the last X, Y coordinate for the mask, choose "From Points End" from the User-Defined drop down menu. This action will stop new X, Y coordinates from being entered when the screen is clicked, and the new mask is now ready to be saved.

Saving Wander Masks

To save the user-defined Wander mask, choose "To File" from the User-Defined drop down menu. Enter the file name, and click Save. Notice that user-defined Wander masks have a **.msk** file extension. Mask files are saved as using text format, and can be opened in any text editor for editing any incorrectly selected X, Y coordinates.

Uploading Wander Masks

To open a user-defined Wander mask, choose "From File" from the User-Defined drop down menu. Use the "Look In" menu to browse your PC for the user-defined Wander mask to be opened. You can either double-click on the **.msk** file to open it, or highlight the desired file and click the Load button.

Editing Wander Masks

The NIC Wander mask files are saved with a **.msk** file extension, which can be edited using a text editor programs such as Notepad.

Each line within the mask file represents a set of X, Y coordinates which the Wander Client uses to draw the threshold line between one set of coordinates to the next, and so on.

Each set of X, Y coordinates is preceded with a sequential integer number followed by a comma and a space, then followed by the X coordinate and another comma and space, and then followed by the Y coordinate.

The X coordinate designates the Observation Interval time location (in seconds) and the Y coordinate designates the Maximum Time Interval Error (MTIE) location (in nanoseconds), and each should be entered as a whole number with at least 2 decimal places.

A maximum of 500 sets of X, Y coordinates can be entered.

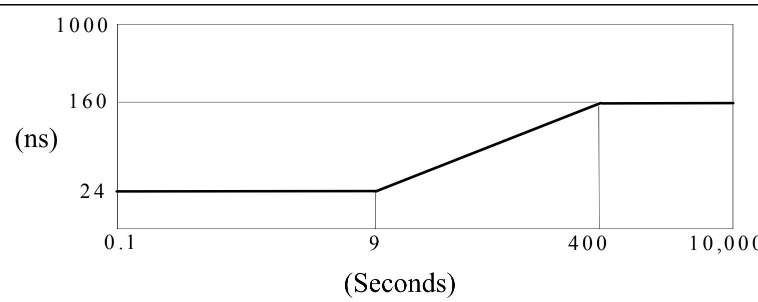
The following is an example of a Wander mask file. When uploaded, this file will draw the mask criteria as specified in Mask MTIE 30 (as listed in the Pre-Defined Wander Mask section below).

```
# MTIE Mask file
# seq number, x, y
1, 0.10, 24.000
2, 9.00, 24.000
3, 400.00, 160.000
4, 1000.00, 160.000
```

Mask MTIE 30
SSU Type I Generation (G.812, Fig. 1)
(EN 300 462-4, Fig.2)

MTIE = 24	$0.1 < \tau < 9$
MTIE = $8 \times \tau^{0.5}$	$9 < \tau < 400$
MTIE = 160	$400 < \tau < 1000$

(τ = Time)



Pre-Defined Wander Masks

This section identifies detailed information as specific by the list of telecommunication industry standards below, for each MTIE and TDEV Wander mask defined within the specified standard, and supported by the Digital Lightwave Wander Client.

The Digital Lightwave Wander Client also provides defined in the list of standards below, or from a list of masks in numerical order based on the Mask numbers below, to analyze measurement compliance.

There are two ways to select a pre-defined Wander mask. One is by the Name of the Mask per the selected telecommunications Standard. And the second way is by selecting the Mask Number, as defined below.

To select a pre-defined Wander mask by its **Name**, first click either MTIE or TDEV, depending on the desired type of mask. Next click Select Mask from the Mask drop-down menu. Next, from the Standard drop-down menu, select the industry standard from the list of standards to test against. Then select the Name of the mask, from the Mask drop-down menu, as it is called within the selected standard.

To select a pre-defined Wander mask by its **Number**, first click either MTIE or TDEV, depending on the desired type of mask. Next click Select Mask from the Mask drop-down menu. Next, select "Mask Type" from the Standard drop-down menu. Then select the desired mask type by its mask number, from the Mask drop-down menu.

MTIE (Maximum Time Interval Error) Masks per Standard Name — Mask Number

G.811, EN 300 462-6, PRC Timing Characteristics

PRC Wander Generation .... MTIE 35

G.812, EN 300 462-4, Node Clock Timing Requirements: Type I, V, and VI

SSU Type I Wander Generation .... MTIE 30

SSU Types V, VI Wander Generation .... MTIE 41

SSU Type I Wander Tolerance .... MTIE 29

SSU Types I, V, VI 2048 Kbit/s Interface Transient Generation .... MTIE 31

SSU Types I, V, VI STM-N Interface Transient Generation .... MTIE 32

SSU Type I Phase Discontinuity .... MTIE 33

SSU Types V, VI Phase Discontinuity .... MTIE 34

G.812, Node Clock Timing Requirements: Types II, III, and IV

SSU Types II, III, IV Wander Generation .... MTIE 3

SSU Types II, III, IV Wander Tolerance .... MTIE 6

SSU Types II, III DS1 Interface Transient Generation .... MTIE 13

SSU Types II, III STM-N Interface Transient Generation .... MTIE 12

SSU Types II, III, IV Phase Discontinuity .... MTIE 23

SSU Type IV Transient Generation .... MTIE 11

G.813, EN 300 462-5 SEC Timing Characteristics: Option 1

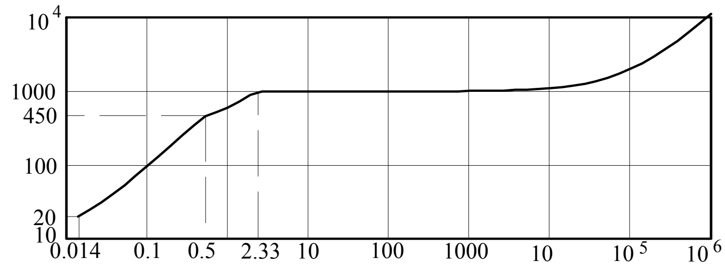
SEC Wander Generation, variable temp. .... MTIE 25

TDEV (Time Deviation) Masks per Standard Name **Mask Number**

MTIE Masks – (SONET / DS-n)

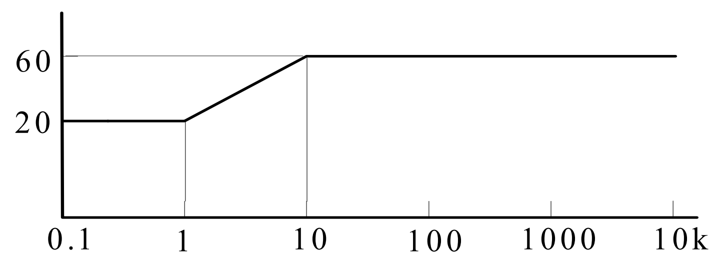
Mask MTIE 1
OC-N Interface Transient (T1.101-1999, Fig. 9)

MTIE = 7.6 + 885 × S	$0.014 \le S < 0.5$
MTIE = 300 + 300 × S	$0.5 \le S < 2.33$
MTIE = 1000	$2.33 \le S < 280$
MTIE = 997 + 0.01 × S	$280 \le S$



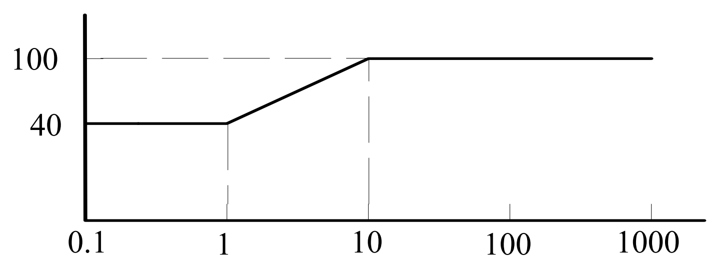
Mask MTIE 2
SONET NE Clock Generation (GR-253 Issue 3, Fig. 5-17)
SEC Option 2 generation (G.813, Fig. 3)

MTIE = 20	$0.1 \le S < 1$
MTIE = 20 × $S^{0.48}$	$1 \le S < 10$
MTIE = 60	$10 \le S < 1000$



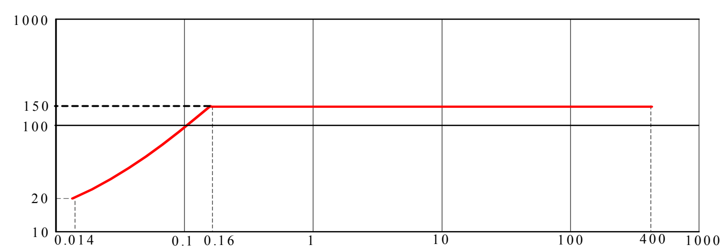
Mask MTIE 3
BITS Clock Generation (GR-1244 Issue 2, Fig. 5-5)
SSU Type II, III, IV Generation (G.812, Fig. 1, Fig. A.1)

MTIE = 40	$0.1 \le S < 1$
MTIE = 40 × $S^{0.4}$	$1 \le S < 10$
MTIE = 100	$10 \le S$



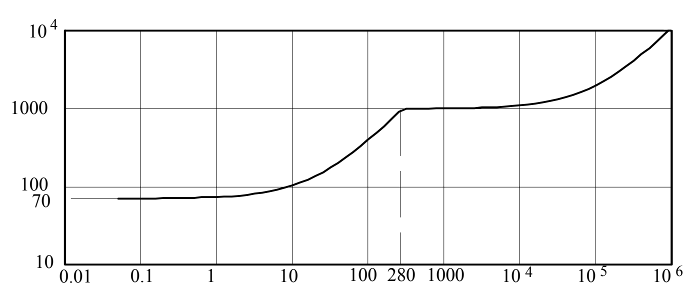
Mask MTIE 4
PRS Transient Generation
(GR-2830-CORE, Fig. 6-3)

MTIE = 7.6 + 885 × S	0.014 < S < 0.16
MTIE = 150	0.16 < S < 400



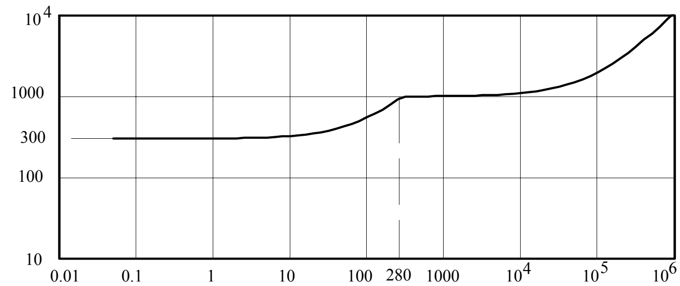
Mask MTIE 5
OC-N Interface Output Wander
(T1.101-1999, Fig. 8)

MTIE = 70 + 3.32 × S	$0.05 \le S < 280$
MTIE = 997 + 0.01 × S	$280 \le S$



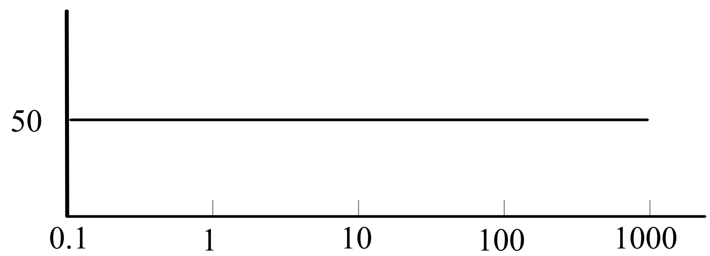
Mask MTIE 6
DS1 Interface Output Wander
(T1.101-1999, Fig. 5) (G.824, Fig. 3)
SSU Type II, III, IV Tolerance (G.812, Fig. 3 & A.3)

$\text{MTIE} = 300 + 2.5 \times S$ $\quad 0.05 \le S < 280$
$\text{MTIE} = 997 + 0.01 \times S$ $\quad 280 \le S$



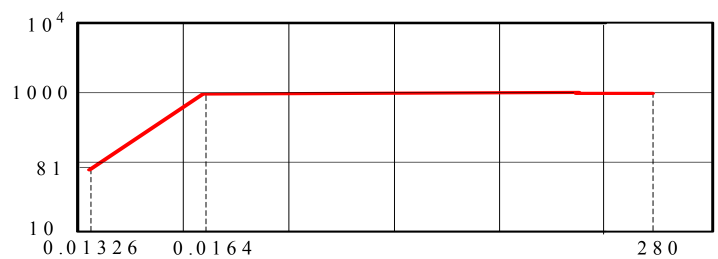
Mask MTIE 7
Derived DS1 Wander Generation
(GR-253 Issue 3, **R5-169**)

$\text{MTIE} = 50$ $\quad 0.1 \le S \le 1000$



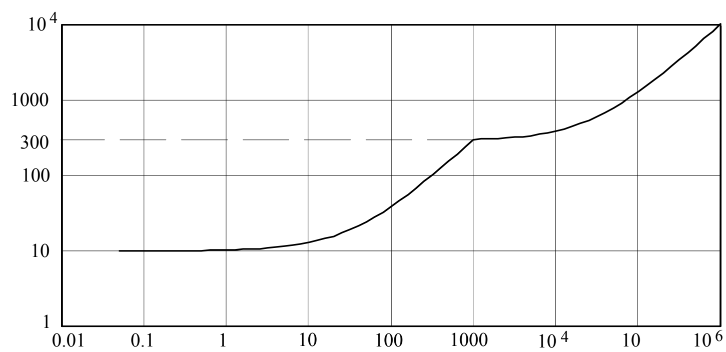
Mask MTIE 8
Derived DS1 Transient Generation
(GR-253 Issue 3, **R5-172**)

$\text{MTIE} = 61000 \times S$ $\quad 0.001326 < S < 0.0164$
$\text{MTIE} = 1000$ $\quad 0.0164 < S < 280$



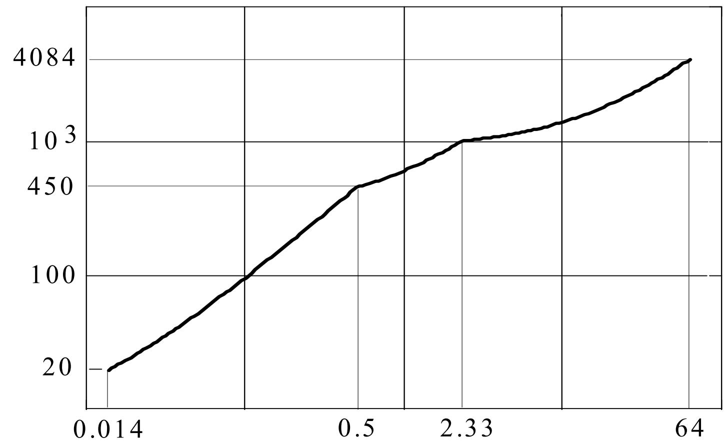
Mask MTIE 9
PRS Wander Generation (T1.101-1999, Fig. 4)
(GR-2830 Issue 2, Fig. 6-1)
(G.824, Fig. 2)

$\text{MTIE} = 10 + 0.29 \times S$ $\quad 0.05 \le S < 1000$
$\text{MTIE} = 290 + 0.01 \times S$ $\quad 1000 \le S$



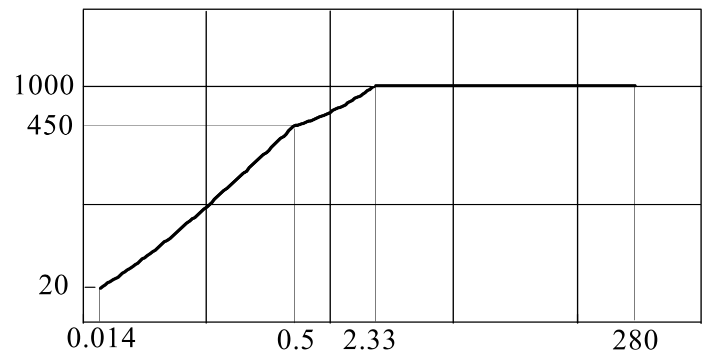
Mask MTIE 10
SMC Holdover Entry Transient Generation
(T1.105.09, Fig. 2) (GR-253 Issue 3, Fig. 5-14)
Stratum 3/3E Clock OC-N Holdover Entry Transient
Generation (T1.101-1999, Fig. 15)
SEC Option 2 Holdover Entry Transient Generation
(G.813, Fig. 15)

$MTIE = 7.6 + 885 \times S$	$0.014 < S < 0.5$
$MTIE = 300 + 300 \times S$	$0.5 < S < 2.33$
$MTIE = 884 + 50 \times S$	$2.33 < S < 64$



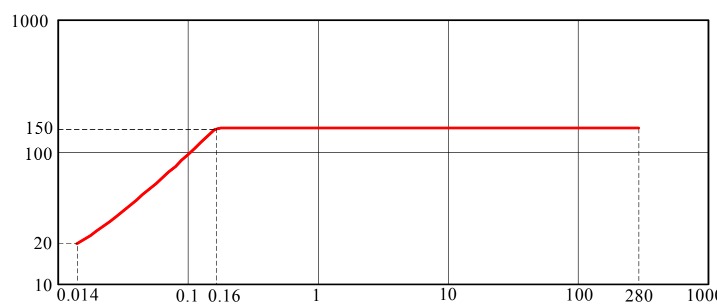
Mask MTIE 11
SMC, Stratum 3/3E SONET NE Clock Transient Generation
(Requirement) (GR-253 Issue 3, Fig. 5-19)
SEC Option 2 Transient Generation (G.813, Fig. 13)
SSU Type IV Transient Generation (G.812, Fig. A.8)

$MTIE = 7.6 + 885 \times S$	$0.014 < S < 0.5$
$MTIE = 300 + 300 \times S$	$0.5 < S < 2.33$
$MTIE = 1000$	$2.33 < S < 280$



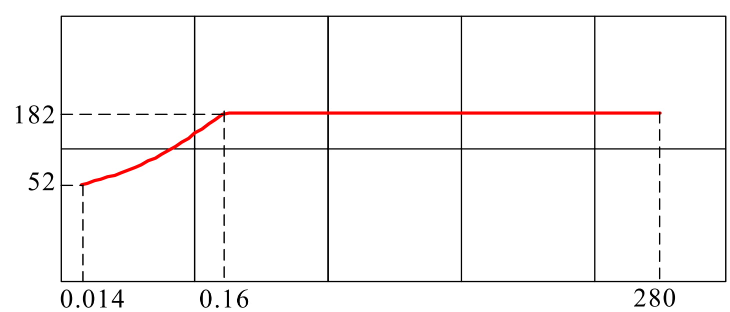
Mask MTIE 12
Stratum 2 SONET NE Clock Transient Generation
(GR-253 Issue 3, Fig. 5-19)
SMC, Stratum 3/3E SONET NE Clock Transient Generation
(Objective) (GR-253 Issue 3, Fig. 5-19)
SSU Type II and III STM-N Interface Transient Generation
(G.812, Fig. 9)

$MTIE = 7.6 + 885 \times S$	$0.014 < S < 0.16$
$MTIE = 150$	$0.16 < S < 280$



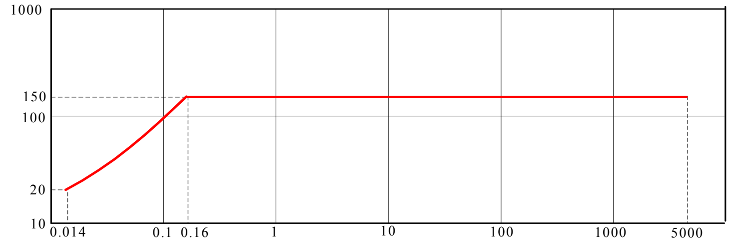
Mask MTIE 13
SSU Type II and III DS1 Interface Transient Generation
(G.812, Fig. 9)

$MTIE = 40 + 885 \times S$	$0.014 < S < 0.16$
$MTIE = 182$	$0.16 < S < 280$



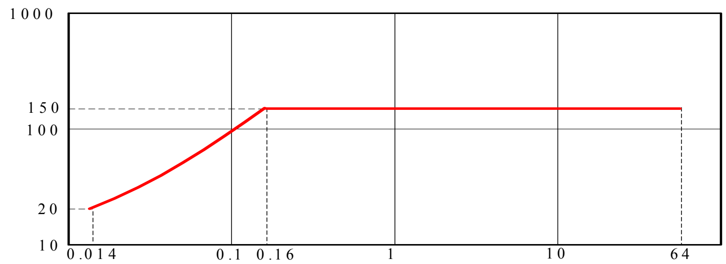
Mask MTIE 14
Stratum 2 Clock Rearrangement Transient Generation
(GR-1244-CORE, Fig. 5-7)

MTIE = 7.6 + 885 × S	0.014 < S < 0.16
MTIE = 150	0.16 < S < 5000



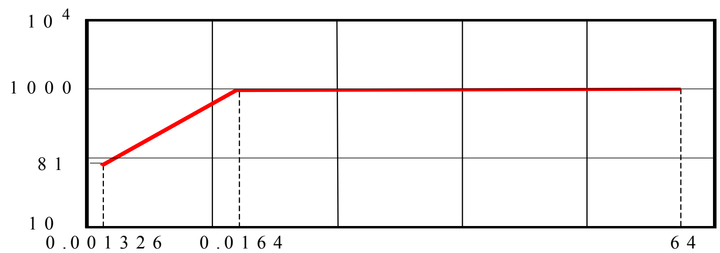
Mask MTIE 15
Stratum 3E Clock Rearrangement Transient Generation (GR-1244-CORE, Fig. 5-7)

MTIE = 7.6 + 885 × S	0.014 < S < 0.16
MTIE = 150	0.16 < S < 64



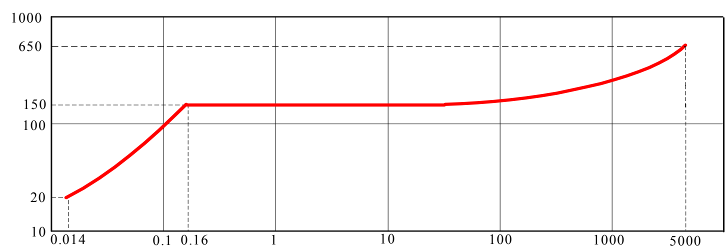
Mask MTIE 16
Stratum 3/4E Clock Rearrangement Transient Generation
(GR-1244-CORE, Fig. 5-7)

MTIE = 61000 × S	0.001326 < S < 0.0164
MTIE = 1000	0.0164 < S < 64



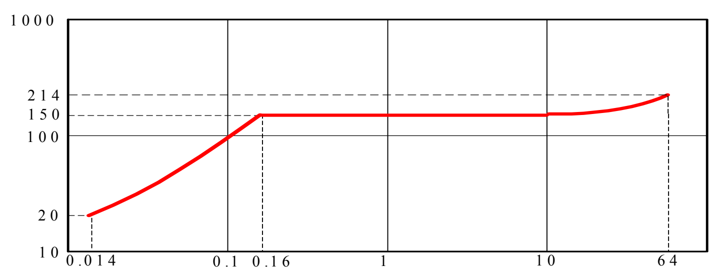
Mask MTIE 17
Stratum 2 Clock Holdover Entry Transient Generation
(GR-1244-CORE, Fig. 5-9)
(T1.101-1999, Fig. 12)

MTIE = 7.6 + 885 × S	0.014 < S < 0.16
MTIE = 150 + 0.1 × S	0.16 < S < 5000



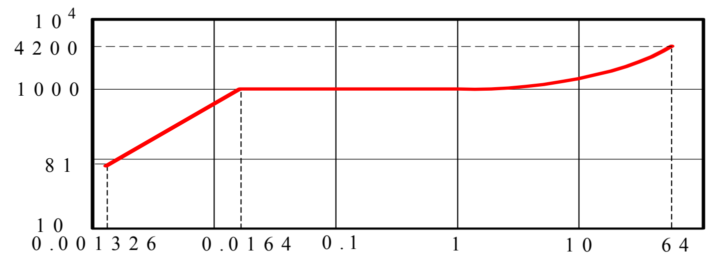
Mask MTIE 18
Stratum 3E Clock Holdover Entry Transient Generation (GR-1244-CORE, Fig. 5-9)

MTIE = 7.6 + 885 × S	0.014 < S < 0.16
MTIE = 150 + S	0.16 < S < 64



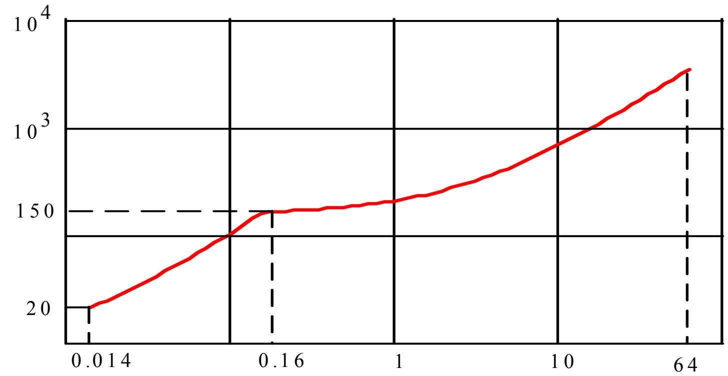
Mask MTIE 19
Stratum 3/3E Clock Holdover Entry DS1 Transient (T1.101-1999, Fig. 14).
Stratum 3 Clock Holdover Entry Transient Requirement (GR-1244-CORE, Fig. 5-8).

$MTIE = 61000 \times S$	$0.001326 < S < 0.0164$
$MTIE = 1000 + 50 \times S$	$0.0164 < S < 64$



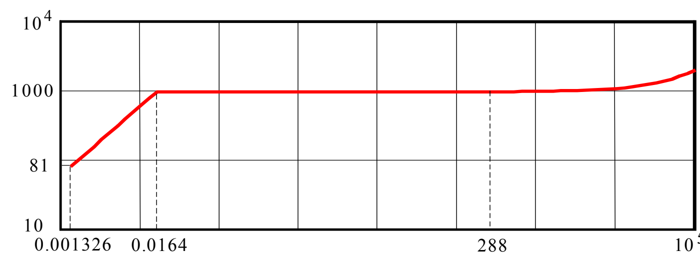
Mask MTIE 20
Stratum 3 Clock Holdover Entry Transient Objective (GR-1244-CORE, Fig. 5-8).

$MTIE = 7.6 + 935 \times S$	$0.014 < S < 0.16$
$MTIE = 150 + 50 \times S$	$0.16 < S < 64$



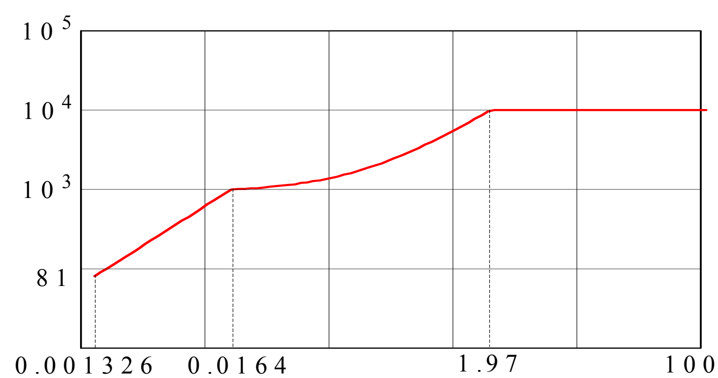
Mask MTIE 21
DS1 Interface Output Transient (T1.101-1999, Fig. 6)

$MTIE = 61000 \times S$	$0.001326 < S < 0.0164$
$MTIE = 1000$	$0.0164 < S < 288$
$MTIE = 997 + 0.01 \times S$	$288 < S$



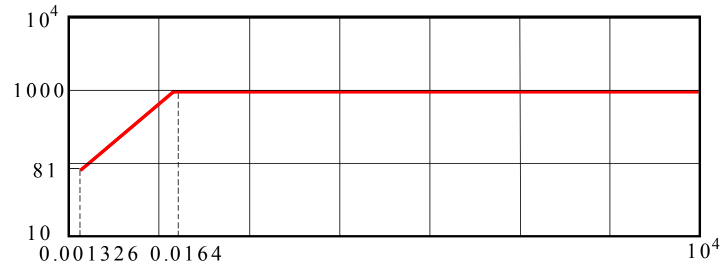
Mask MTIE 22
Transported DS1 Transient Tolerance (GR-1244-CORE Issue 2, Fig. 4-3)

$MTIE = 61000 \times S$	$0.001326 < S < 0.0164$
$MTIE = 925 + 4600 \times S$	$0.0164 < S < 1.97$
$MTIE = 10{,}000$	$1.97 < S < 100$



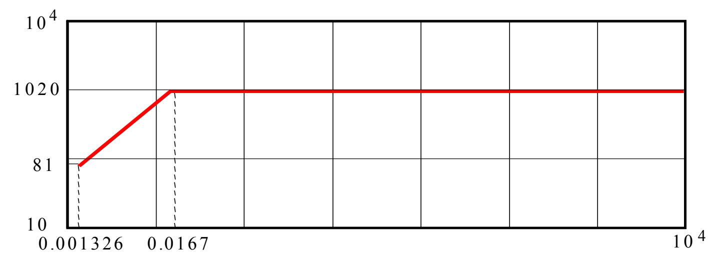
Mask MTIE 23
BITS Clock Transient Tolerance
(GR-1244-CORE Issue 2, Fig. 5-9)
SSU Type II, III, IV Phase Discontinuity
(G.812, Fig. 11, Fig. A.9)
SSU Type IV DS1 Interface Transient Generation
(G.812, Fig. A.8)

$MTIE = 61000 \times S$ $\quad 0.001326 < S < 0.0164$
$MTIE = 1000$ $\quad 0.0164 < S$



Mask MTIE 24
BITS Clock Transient Transfer
(GR-1244-CORE Issue 2, Fig. 5-9)
"slightly greater than 1000 ns"

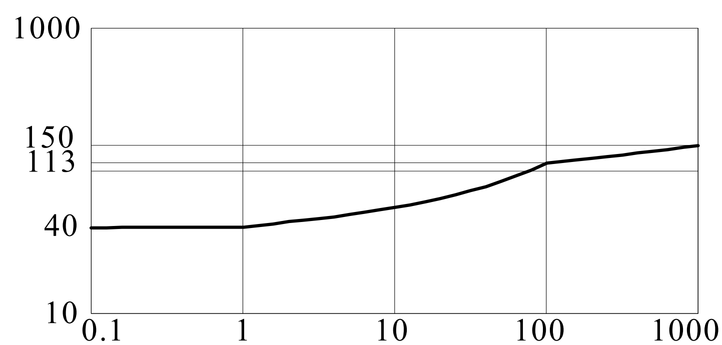
$MTIE = 61000 \times S$ $\quad 0.001326 < S < 0.0167$
$MTIE = 1020$ $\quad 0.0167 < S$



MTIE Masks – (European SDH / PDH)

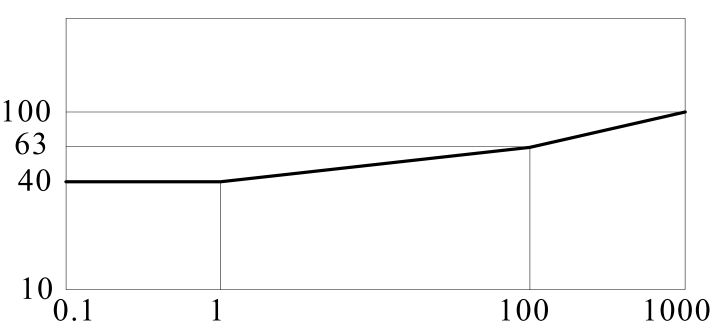
Mask MTIE 25
SEC Option 1 Generation variable Temp (G.813, Fig. 1)
(EN 300 462-5, Fig. 2)

$MTIE = 40 + 0.5 \times \tau$ $\quad 0.1 < \tau \le 1$
$MTIE = 40\tau^{0.1} + 0.5 \times \tau$ $\quad 1 < \tau \le 100$
$MTIE = 25.25 \times \tau^{0.2} + 50$ $\quad 100 < \tau \le 1000$



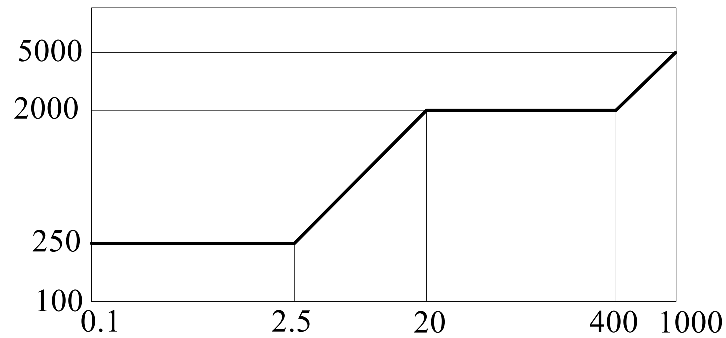
Mask MTIE 26
SEC Option 1 Generation Const Temp (G.813, Fig.1)
(EN 300 462-5, Fig. 2)

$MTIE = 40$ $\quad 0.1 < \tau \le 1$
$MTIE = 40 \times \tau^{0.1}$ $\quad 1 < \tau \le 100$
$MTIE = 25.25 \times \tau^{0.2}$ $\quad 100 < \tau \le 1000$



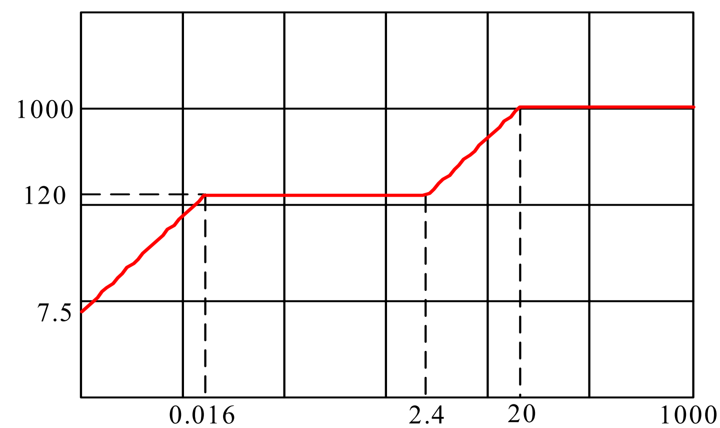
Mask MTIE 27
SEC Option 1 Tolerance (G.813, Fig. 5)
(EN 300 462-5, Fig. 5)

MTIE = 250	$0.1 < \tau \leq 2.5$
MTIE = $100 \times \tau$	$2.5 < \tau \leq 20$
MTIE = 2000	$20 < \tau \leq 400$
MTIE = $5 \times \tau$	$400 < \tau \leq 1000$



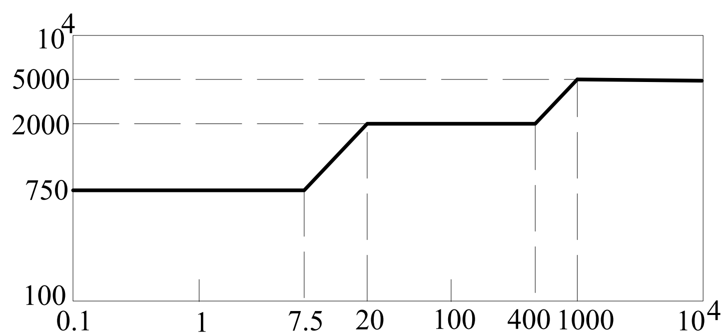
Mask MTIE 28
SEC Option 1 Phase Discontinuity (G.813, Sect. 10.4)
(EN 300 462-5, Sect. 9.4)

MTIE = $7500 \times \tau$	$\tau \leq 0.016$
MTIE = 120	$0.016 < \tau \leq 2.4$
MTIE = $50 \times \tau$	$2.4 < \tau \leq 20$
MTIE = 1000	$20 < \tau$



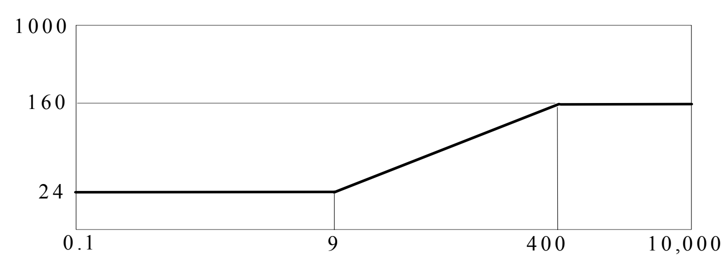
Mask MTIE 29
SSU Type I Tolerance (G.812, Fig. 3)
(EN 300 462-4, Fig. 5)

MTIE = 750	$0.1 < \tau \leq 7.5$
MTIE = $100 \times \tau$	$7.5 < \tau \leq 20$
MTIE = 2000	$20 < \tau \leq 400$
MTIE = $5 \times \tau$	$400 < \tau < 1000$
MTIE = 5000	$1000 < \tau < 10^4$



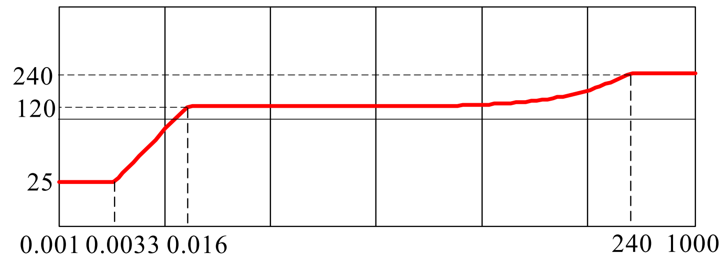
Mask MTIE 30
SSU Type I Generation (G.812, Fig. 1)
(EN 300 462-4, Fig.2)

MTIE = 24	$0.1 < \tau < 9$
MTIE = $8 \times \tau^{0.5}$	$9 < \tau < 400$
MTIE = 160	$400 < \tau < 1000$



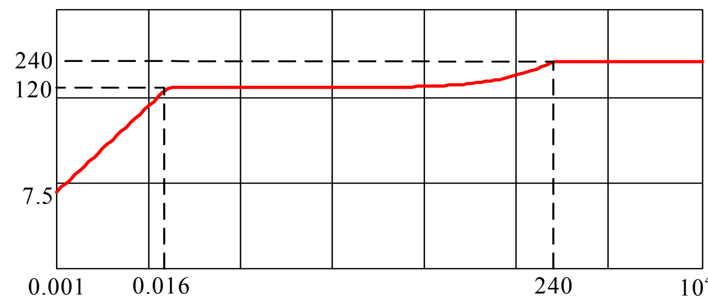
Mask MTIE 31
SSU Type I, V, VI 2048 Kbit/s Interface Transient Generation
(G.812, Fig. 9, Fig. A.8)

MTIE = 25	$0.001 < \tau < 0.0033$
MTIE = $7500 \times \tau$	$0.0033 < \tau < 0.016$
MTIE = $120 + 0.5 \times \tau$	$0.016 < \tau < 240$
MTIE = 240	$240 < \tau < 1000$



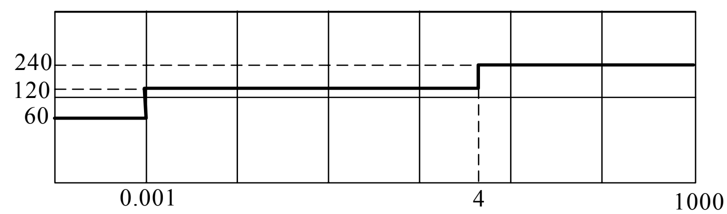
Mask MTIE 32
SSU Type I, V, VI STM-N Interface Transient Generation
(G.812, Fig. 9, Fig. A.8)

MTIE = $7500 \times \tau$	$0.001 < \tau < 0.016$
MTIE = $120 + 0.5 \times \tau$	$0.016 < \tau < 240$
MTIE = 240	$240 < \tau < 10\,000$



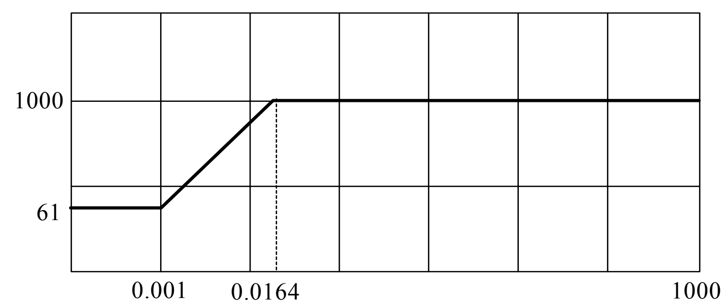
Mask MTIE 33
SSU Type I, Phase Discontinuity (G.812, Fig. 11)

MTIE = 60	$\tau < 0.001$
MTIE = 120	$0.001 < \tau < 4$
MTIE = 240	$4 < \tau$



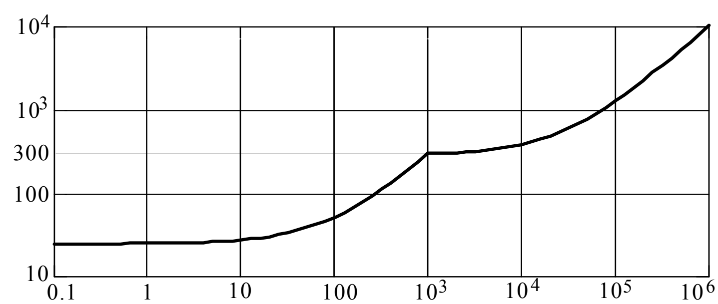
Mask MTIE 34
SSU Type V, VI Phase Discontinuity (G.812, Fig. A.9)

MTIE = 61	$\tau < 0.001$
MTIE = $61000 \times \tau$	$0.016 < \tau < 0.0164$
MTIE = 1000	$0.0164 < \tau$



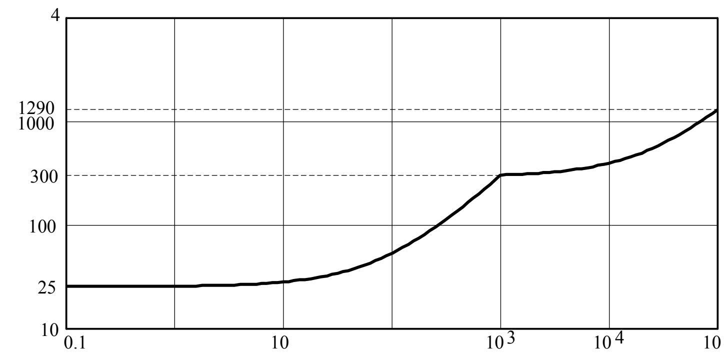
Mask MTIE 35
PRC Wander Generation (G.811, Fig. 1)
(EN 300 462-6, Fig. 1)
PRC Timing Characteristics

MTIE = $25 + 0.275 \times \tau$	$0.1 < \tau < 1000$
MTIE = $290 + 0.01 \times \tau$	$1000 < \tau$



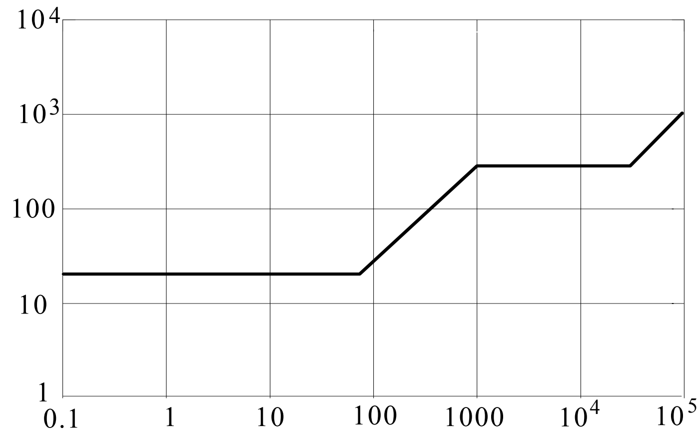
Mask MTIE 36
PRC Interface Output (G.823, Fig. 4)

$MTIE = 25 + 0.275 \times \tau$	$0.1 < \tau \leq 1000$
$MTIE = 290 + 0.01 \times \tau$	$1000 < \tau < 10^5$



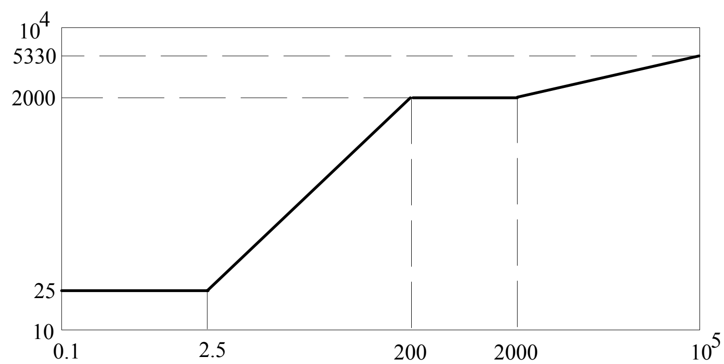
Mask MTIE 37
PRC Interface Output (EN 300 462-3, Fig. 3)

$MTIE = 25$	$0.1 < \tau < 83$
$MTIE = 0.3 \times \tau$	$83 < \tau < 1000$
$MTIE = 300$	$1000 < \tau < 3 \times 10^4$
$MTIE = 0.01 \times \tau$	$3 \cdot 10^4 < \tau$



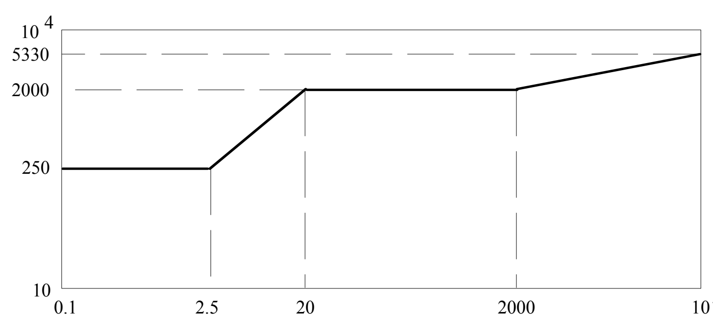
Mask MTIE 38
SSU Interface Output (G.823, Fig. 6)
(EN 300 462-3, Fig. 5)

$MTIE = 25$	$0.1 < \tau \leq 2.5$
$MTIE = 10 \times \tau$	$2.5 < \tau \leq 200$
$MTIE = 2000$	$200 < \tau \leq 2000$
$MTIE = 433 \times \tau^{0.2} + 0.01 \times \tau$	$2000 < \tau$



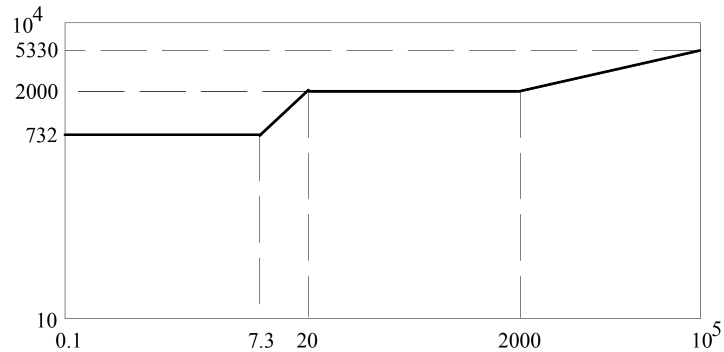
Mask MTIE 39
SEC Interface Output (G.823, Fig. 8)
(EN 300 462-3, Fig. 7)

$MTIE = 250$	$0.1 < \tau \leq 2.5$
$MTIE = 100 \times \tau$	$2.5 < \tau \leq 20$
$MTIE = 2000$	$20 < \tau \leq 2000$
$MTIE = 433 \times \tau^{0.2} + 0.01 \times \tau$	$2000 < \tau$



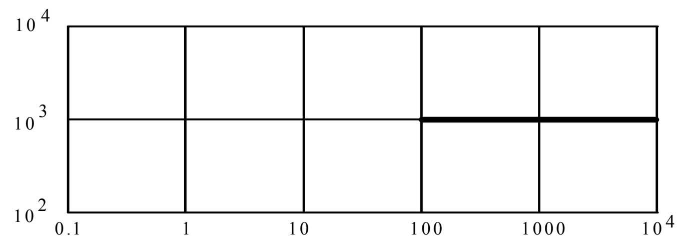
Mask MTIE 40
PDH Interface Output (G.823, Fig. 10)
(EN 300 462-3, Fig. 9)

$MTIE = 732$	$0.1 < \tau \le 7.3$
$MTIE = 100 \times \tau$	$7.3 < \tau \le 20$
$MTIE = 2000$	$20 < \tau \le 2000$
$MTIE = 433 \times \tau^{0.2} + 0.01 \times \tau$	$2000 < \tau < 10^5$



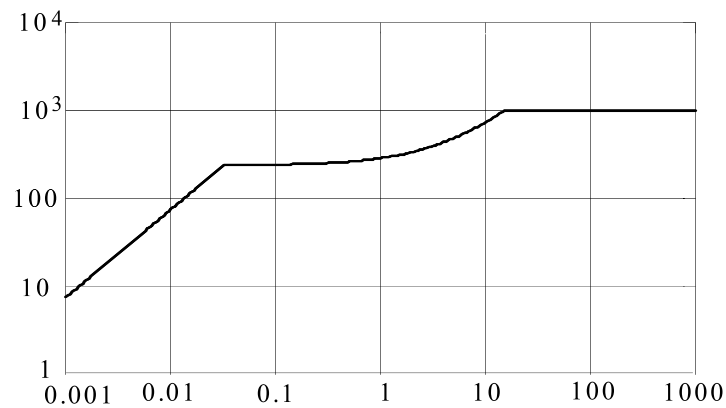
Mask MTIE 41
SSU Types V, VI Generation (G.812, Fig. A.1)

$MTIE = 1000$	$100 < \tau$



Mask MTIE 42
SEC Option 1 Transient Generation (G.813, Fig.12)
(EN 300 462-5, Fig. 7)

$MTIE = 7500 \times \tau$	$0.001 < \tau < 0.032$
$MTIE = 238.4 + 50 \times \tau$	$0.032 < \tau < 15$
$MTIE = 1000$	$15 < \tau < 1000$



Comment on SEC Option 1 Transient Generation MTIE mask

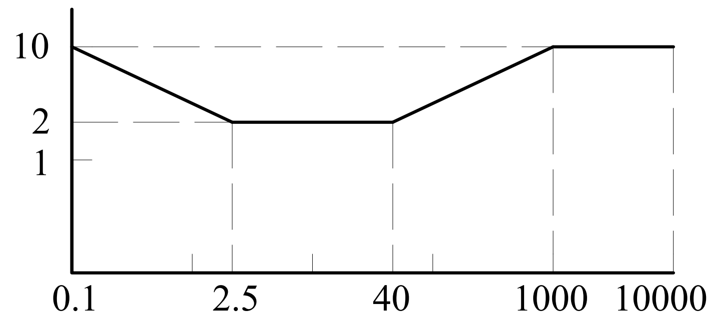
The transient out of an SEC due to an up-steam switch is restricted. The specification is given in words rather than by an MTIE mask (see ITU-T Recommendation G.813, Section 10.1 and EN 300 462-5, Section 9.1).

Note that TIE plot referred to in the specification is not an MTIE mask; it is only a summary of the transient specification. Meeting the MTIE mask provided here is the closest practical test of meeting the implied transient requirements.

TDEV Masks – (SONET / DS-n)

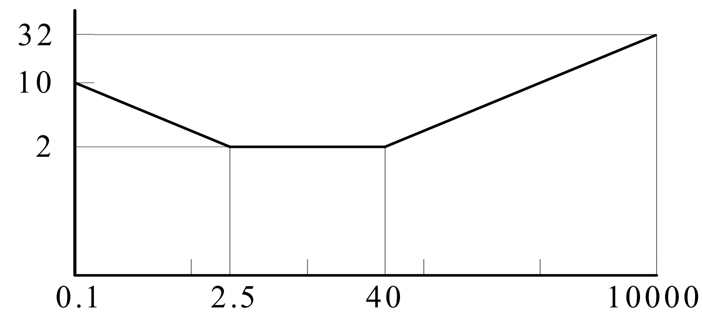
Mask TDEV 1
SMC Generation (GR-253 Issue 3, Fig. 5-18)
Derived DS1 Generation (GR-253 Issue 3, Fig. 5-22)
BITS Generation (GR-1244 Issue 2, Fig. 5-4)
SEC Option 2 Generation (G.813, Fig. 4)
SSU Type II, III, IV Generation (G.812, Fig. 2, Fig. A.2)

$TDEV = 3.2\times\tau^{-0.5}$	$0.1 \le \tau < 2.5$
$TDEV = 2$	$2.5 \le \tau < 40$
$TDEV = 0.32\times\tau^{0.5}$	$40 \le \tau < 1000$
$TDEV = 10$	$1000 \le \tau \le 10^4$



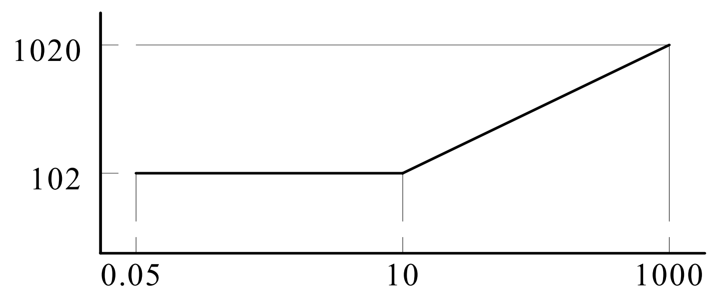
Mask TDEV 2
PRS Generation (GR-2830 Issue 2, Fig. 6-2)

$TDEV = 3.2\times\tau^{-0.5}$	$0.1 \le \tau < 2.5$
$TDEV = 2$	$2.5 \le \tau < 40$
$TDEV = 0.32\times\tau^{0.5}$	$40 \le \tau < 10{,}000$



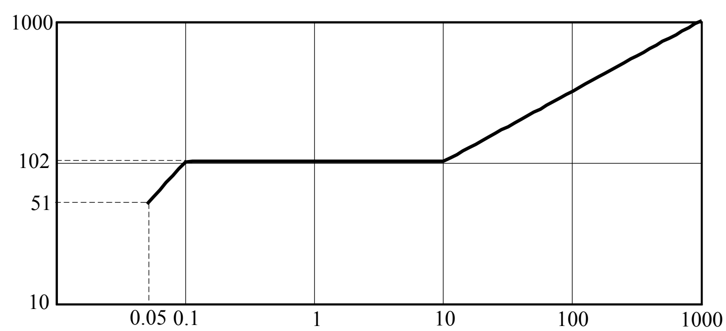
Mask TDEV 3
Stratum 4E/4 Transfer (GR-1244 Issue 2, Fig. 5-6)

$TDEV = 102$	$0.05 \le \tau < 10$
$TDEV = 32.2\times\tau^{0.5}$	$10 \le \tau \le 1000$



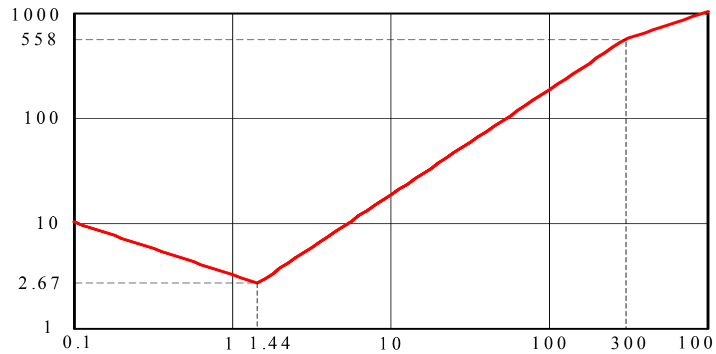
Mask TDEV 4
Stratum 3 Transfer (T1.101-1999, Fig.17)
(GR-1244 Issue 2, Fig.5-6)
SSU Type IV Transfer (G.812, Fig. A.7)

$TDEV = 1020\times\tau$	$0.05 < \tau < 0.1$
$TDEV = 102$	$0.1 < \tau < 10$
$TDEV = 32.2\times\tau^{0.5}$	$10 < \tau < 1000$



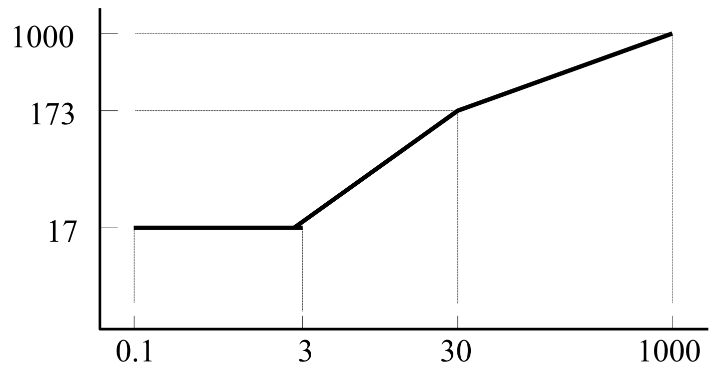
Mask TDEV 5
Stratum 2/3E Transfer (T1.101-1999, Fig.17)
(GR-1244 Issue 2, Fig.5-6)
SSU Types II, III Transfer (G.813, Fig. 8)

$TDEV = 3.2 \times \tau^{-0.5}$	$0.1 < \tau < 1.44$
$TDEV = 1.86 \times \tau$	$1.44 < \tau < 300$
$TDEV = 32.2 \times \tau^{0.5}$	$300 < \tau < 1000$



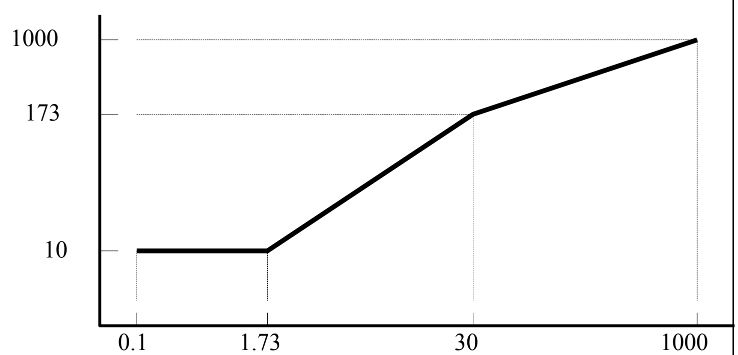
Mask TDEV 6
Stratum 3 Clock Tolerance (T1.101-1999, Fig. 16)
SEC Option 2 Tolerance (G.813, Fig. 8)
SMC and Stratum 3 NE Clock DS1 Tolerance
(GR-253 Issue 3, Fig. 5-16)

$TDEV = 17$	$0.1 \le \tau < 3$
$TDEV = 5.77 \times \tau$	$3 \le \tau < 30$
$TDEV = 31.62 \times \tau^{0.5}$	$30 \le \tau \le 1000$



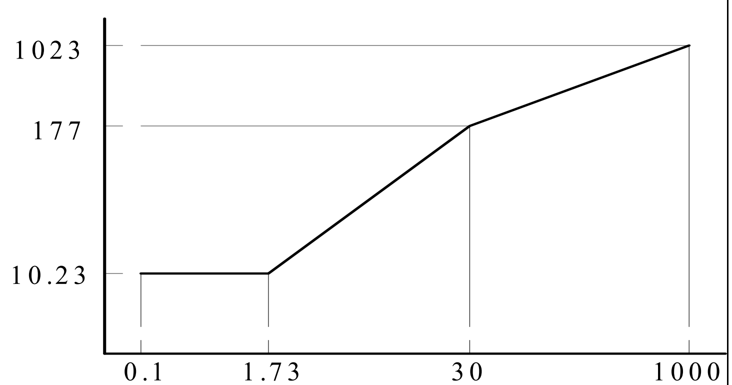
Mask TDEV 7
OC-N Interface (T1.101-1999, Fig. 10)
SMC and Stratum 3 NE Clock OC-N Tolerance
(GR-253 Issue 3, Fig. 5-15)

$TDEV = 10$	$0.1 \le \tau < 1.73$
$TDEV = 5.77 \times \tau$	$1.73 \le \tau < 30$
$TDEV = 31.62 \times \tau^{0.5}$	$30 \le \tau \le 1000$



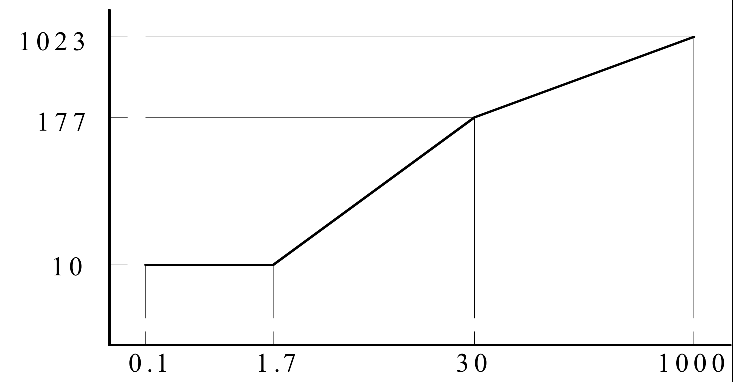
Mask TDEV 8
SMC and Stratum 3 NE Clock OC-N Transfer
(GR-253 Issue 3, Fig. 5-15 + pass band 0.2 dB)

$TDEV = 10.23$	$0.1 \le \tau < 1.73$
$TDEV = 5.9 \times \tau$	$1.73 \le \tau < 30$
$TDEV = 32.3 \times \tau^{0.5}$	$30 \le \tau \le 1000$



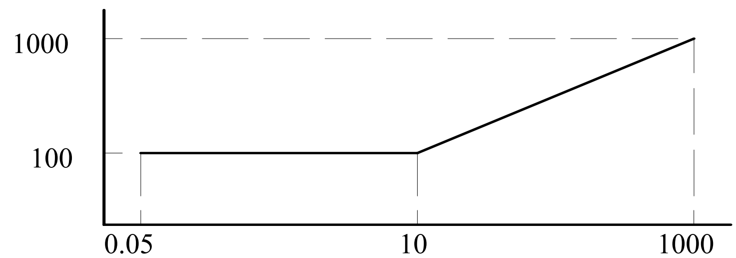
Mask TDEV 9
SMC and Stratum 3 NE Clock DS1 Transfer
(GR-253 Issue 3, Fig. 5-15 + pass band 0.2 dB)
SEC Option 2 Transfer (G.813, Fig. 11)

$TDEV = 10$	$0.1 \le \tau < 1.7$
$TDEV = 5.9 \times \tau$	$1.7 \le \tau < 30$
$TDEV = 32.3 \times \tau^{0.5}$	$30 \le \tau \le 1000$



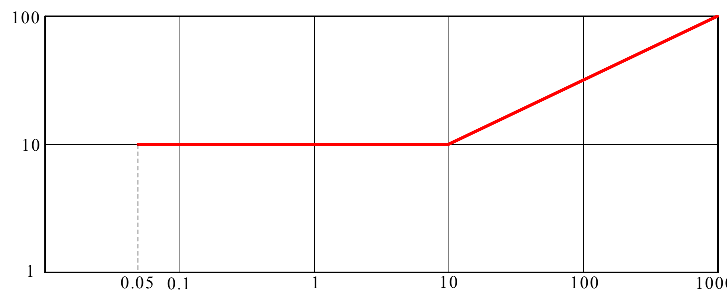
Mask TDEV 10
DS1 Interface (T1.101-1999, Fig. 7) (G.824, Fig. 4)
BITS Clock Tolerance (GR-1244 Issue 2, Fig. 4-2)
SSU Type II, II, IV Tolerance (G.812, Fig. 4 & A.4)

$TDEV = 100$	$0.05 \le \tau < 10$
$TDEV = 31.6 \times \tau^{0.5}$	$10 \le \tau \le 1000$



Mask TDEV 11
DS1 Interface Output Wander at SMC Input
(T1.105.09-1996, Fig. 1)
DS1 Interface Output Wander at Option-2 SEC Input
(G.824, Fig. 5)

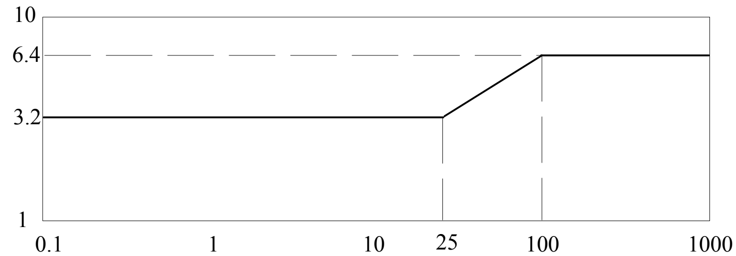
$TDEV = 10$	$0.05 < \tau < 10$
$TDEV = 3.1623 \times \tau^{0.5}$	$10 < \tau < 1000$



TDEV Masks – (European SDH / PDH)

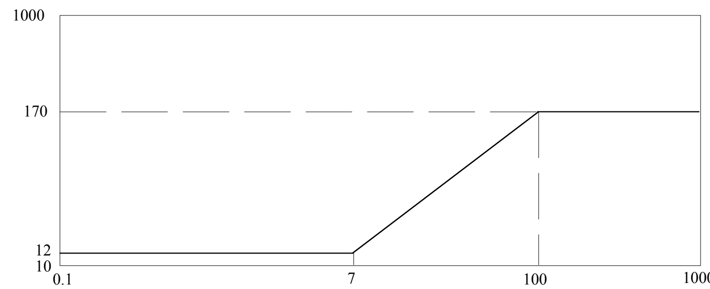
Mask TDEV 12
SEC Option 1 Generation Const Temp
(G.813, Fig.2) (EN 300 462-5, Fig. 1)

$TDEV = 3.2$	$0.1 < \tau \leq 25$
$TDEV = 0.64 \times \tau^{0.5}$	$25 < \tau \leq 100$
$TDEV = 6.4$	$100 < \tau \leq 1000$



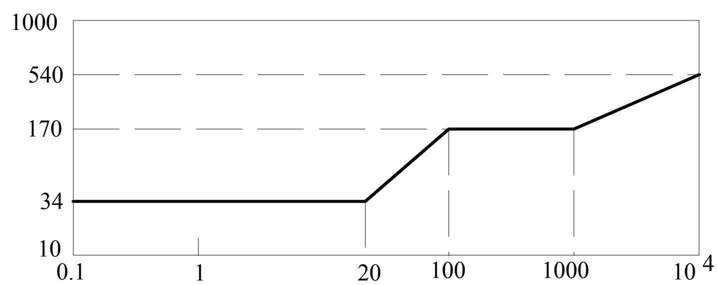
Mask TDEV 13
SEC Option 1 Tolerance (G.813, Fig. 6)
(EN 300 462-5, Fig. 4)

$TDEV = 12$	$0.1 < \tau \leq 7$
$TDEV = 1.7 \times \tau$	$7 < \tau \leq 100$
$TDEV = 170$	$100 < \tau \leq 400$



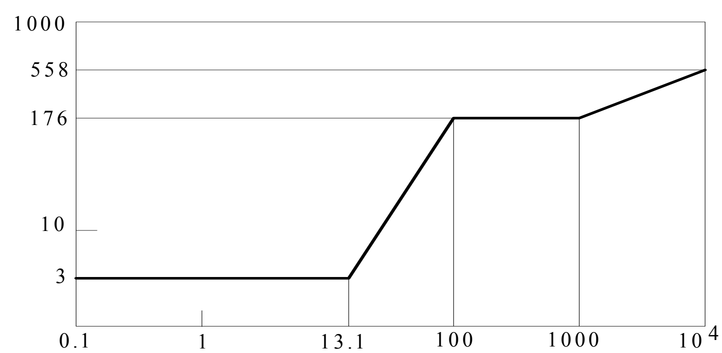
Mask TDEV 14
SSU Type I Tolerance (G.812, Fig. 4)
(EN 300 462-4, Fig. 4)

$TDEV = 34$	$0.1 < \tau \leq 20$
$TDEV = 1.7 \times \tau$	$20 < \tau \leq 100$
$TDEV = 170$	$100 < \tau \leq 1000$
$TDEV = 5.4 \times \tau^{0.5}$	$1000 < \tau \leq 10^4$



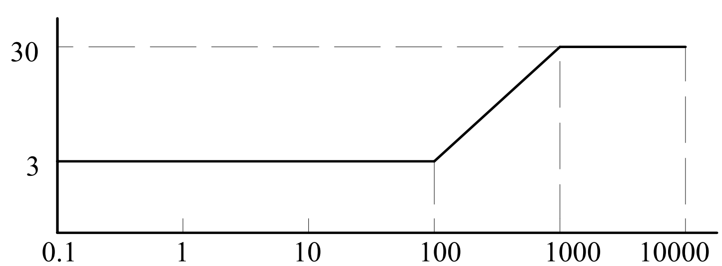
Mask TDEV 15
SSU Type I Transfer (G.812, Fig. 8)
(EN 300 462-4, Fig. 7)

$TDEV = 3$	$0.1 < \tau \leq 13.1$
$TDEV = 0.0176 \times \tau^{2}$	$13.1 < \tau \leq 100$
$TDEV = 176$	$100 < \tau \leq 1000$
$TDEV = 5.58 \times \tau^{0.5}$	$1000 < \tau \leq 10^4$



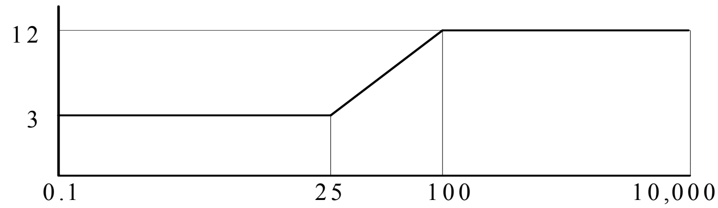
Mask TDEV 16
PRC Generation (G.811, Fig. 2)
(EN 300 462-6, Fig.2)

$TDEV = 3$	$0.1 < \tau < 100$
$TDEV = 0.03 \times \tau$	$100 < \tau < 1000$
$TDEV = 30$	$1000 < \tau < 10^4$



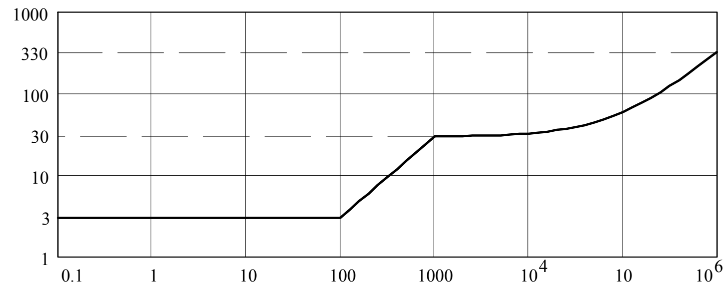
Mask TDEV 17
SSU Type I Generation (G.812, Fig. 2)
(EN 300 462-4, Fig.1)

TDEV = 3 $0.1 < \tau < 25$
TDEV = $0.12\times\tau$ $25 < \tau < 100$
TDEV = 12 $100 < \tau < 10^4$



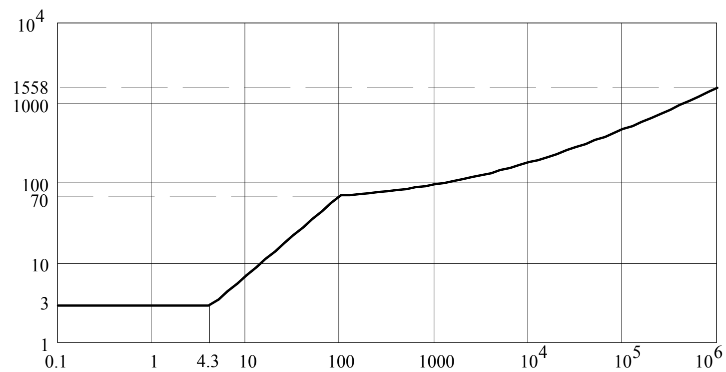
Mask TDEV 18
PRC Interface Output (G.823, Fig. 5)

TDEV = 3 $0.1 < \tau \le 100$
TDEV = $0.03\times\tau$ $100 < \tau \le 1000$
TDEV = 30 $1000 < \tau \le 10^4$
TDEV = $27 + 0.0003\times\tau$ $10^4 < \tau < 10^6$



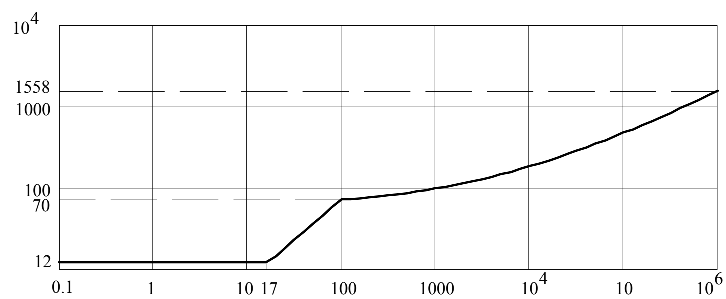
Mask TDEV 19
SSU Interface Output (G.823, Fig. 7)
(EN 300 462-3, Fig. 6)

TDEV = 3 $0.1 < \tau \le 4.3$
TDEV = $0.7\times\tau$ $4.3 < \tau \le 100$
TDEV = $58 + 1.2\times\tau^{0.5} + 0.0003\times\tau$ $100 < \tau < 10^6$



Mask TDEV 20
SEC Interface Output (G.823, Fig. 9)
(EN 300 462-3, Fig. 8)

TDEV = 12 $0.1 < \tau \le 17.14$
TDEV = $0.7\times\tau$ $17.14 < \tau \le 100$
TDEV = $58 + 1.2\times\tau^{0.5} + 0.0003\times\tau$ $100 < \tau < 10^6$



Mask TDEV 21
PDH Interface Output (G.823, Fig. 11)
(EN 300 462-3, Fig. 10)

TDEV = 34 $0.1 < \tau \le 48$
TDEV = $0.7\times\tau$ $48 < \tau \le 100$
TDEV = $58 + 1.2\times\tau^{0.5} + 0.0003\times\tau$ $100 < \tau < 10^6$