Parametric test fixture and results for Annex 163B (comment #132)

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comment #132

Cl **163B** *SC* **163B.2** *P* **290** *L* **16** # 132

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Comment Type **TR** *Comment Status* **D** *TP0v/TP5v example*

(addressing TBD)
The example test fixture is defined only by the magnitude of its insertion loss. Therefore it is impossible for a reader to calculate reference values at TP0a, and this example does not help.

The lack of full channel information also prevents calculation of consensus values to replace the TBDs in Table 163B–1.

It is suggested to replace the definition to a full s-parameters model based on the equations in 162.11.7.1.1 with the same z_p, creating an IL of 4.33 dB at 26.56 GHz. This will enable calculation of the reference values.

Alternatively, use a smaller value for z_p to create an IL of 2.8 dB.

SuggestedRemedy

Replace the text of this paragraph with text referring to 162.11.7.1.1 and equation 162-12 and update the reference values (currently TBD) accordingly.

A presentation with a more detailed proposal is planned.

Proposed Response *Response Status* **W**

PROPOSED REJECT.
This comment proposes a technical change to the draft that does not address technical completeness.
Although this Annex is informative, this subclause is incomplete as written.
Phase information is missing for the existing test fixture specification. The suggested remedy does not provide sufficient details for implementation.
However, the comment mentions that a presentation may be provided.

Current example test fixture definition

163B.2 Characteristics

The insertion loss of this example test fixture is 2.8 dB at 26.56 GHz. The magnitude of the insertion loss deviation of the test fixture is less than or equal to 0.1 dB from 0.05 to 26.56 GHz.

The insertion loss of the test fixture is defined by Equation (163–1).

$$IL(f) = 0.074 + 0.2104\sqrt{f} + 0.0674f \qquad 0.05 \le f \le 53.125 \qquad (163B–1)$$

As stated in the comment, this definition does not enable calculation of reference values, since it does not include phase information required to create the time-domain responses.

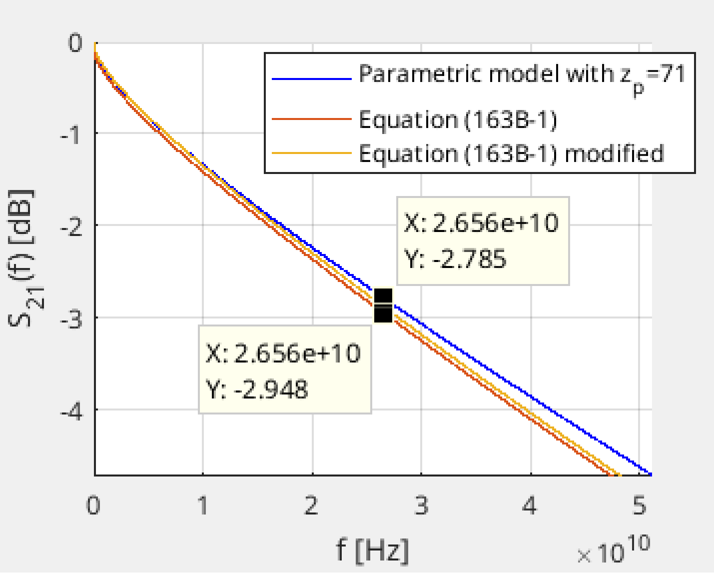
An alternative definition is suggested below, using the PCB trace model in 162.11.7.1.

Fitting PCB trace to the equation

- Using PCB trace model in 162.11.7.1
  - Scattering parameters calculated using Equation (93A–13) and Equation (93A–14) and parameters values given in Table 162–19.
  - z_p=71 mm is chosen to achieve ~2.8 dB at 26.5625 GHz.
    (Equation 163B-1 actually yields a slightly different value)

Table 162–19—PCB model parameters and values

Parameter	Value	Units
γ_0	0	1/mm
a_1	3.8206×10^{-4}	$ns^{1/2}$/mm
a_2	9.5909×10^{-5}	ns/mm
τ	5.79×10^{-3}	ns/mm
C_0	Not used (=0)	nF
C_1	Not used (=0)	nF
Z_c	100	Ω



Calculation of reference transfer function

- Using equation (163A–2)

$$H^{(0)}(f) = H_t(f)H_{21}(f)H_{BT}(f) \quad (163A\text{–}2)$$

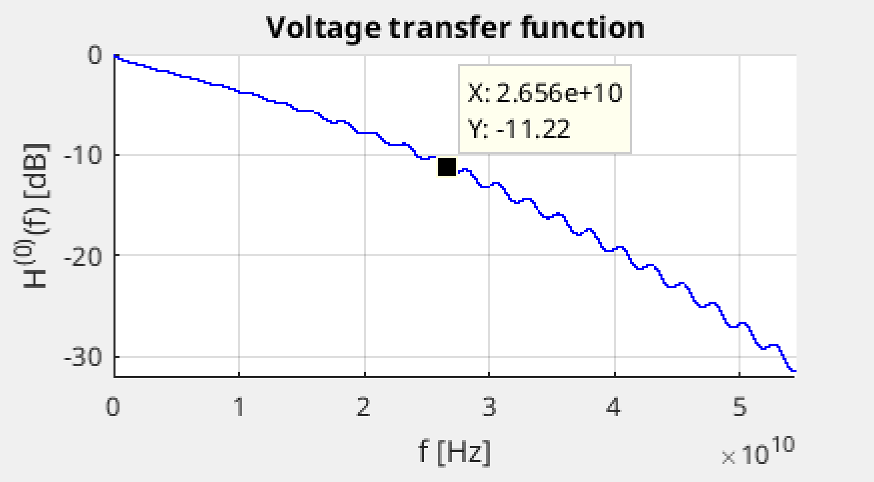
where

$H_t(f)$ is calculated using Equation (93A–46) with T_r specified by the clause that invokes this method

$H_{BT}(f)$ is calculated using Equation (52–2) with f_r specified by the clause that invokes this method

Apparently, there is a mistake here; H_{BT} should use 40 GHz rather than f_r - but in this case the difference is insignificant

- For clause 163:
  - T_r=7.5 ps
  - f_r=0.75*f_b=39.8438 GHz



Reference pulse and step responses

- Pulse response and step response

Obtain the output pulse response, $h(t)$, using Equation (93A–23) and Equation (93A–24) with $H^{(0)}(f)$ from Equation (163A–2), where A_t and T_b are specified by the clause that invokes this method.

The reference pulse response peak, $v_{peak}^{(ref)}$, is the peak value of $h(t)$. If the invoking clause lists more than one set of reference package parameters, the calculation is performed with the longer package trace length.

From the output pulse response calculate the reference value for the transmitter output steady state voltage, $v_f^{(ref)}$, using Equation (163A–3). The value for parameter N_v is provided by the clause that invokes this method.

$$v_f^{(ref)} = \sum_{i=0}^{N_v} h(t-(i \cdot T_b)) \quad (163A\text{–}3)$$

where

T_b	is the unit interval in ps
N_v	represents the number of symbols to include in the steady-state voltage calculation

If the invoking clause lists more than one set of reference package parameters, the calculation in Equation (163A–3) is performed with the longer package trace length.

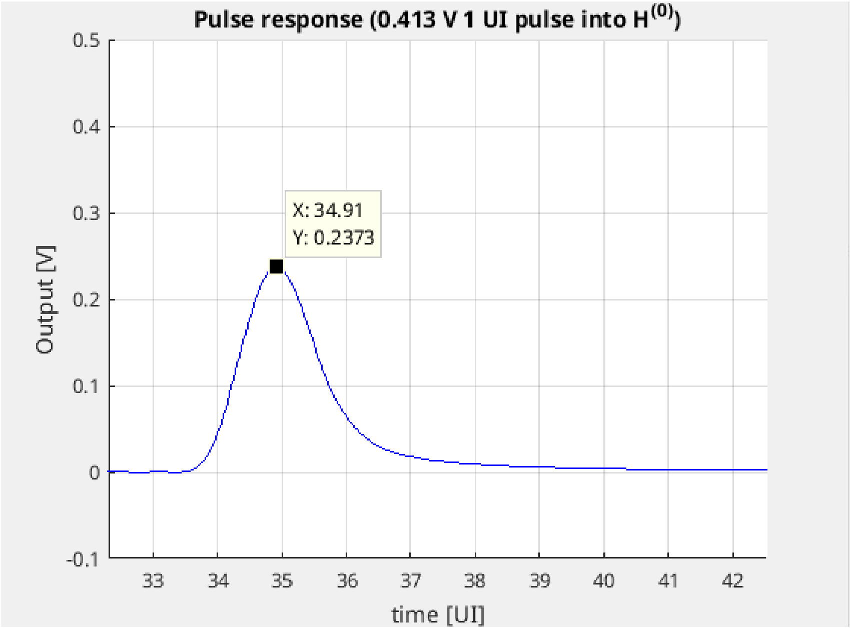
Should be A_v

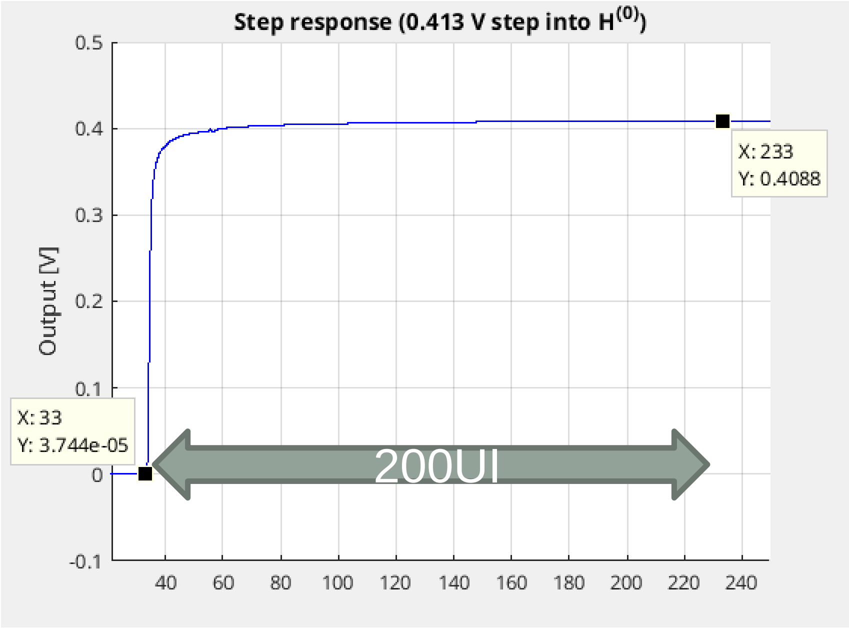
A_v=0.413 V in Table 163–10

z_p=31 mm in Table 163–10

N_v=200 in 163.9.2.3

Results

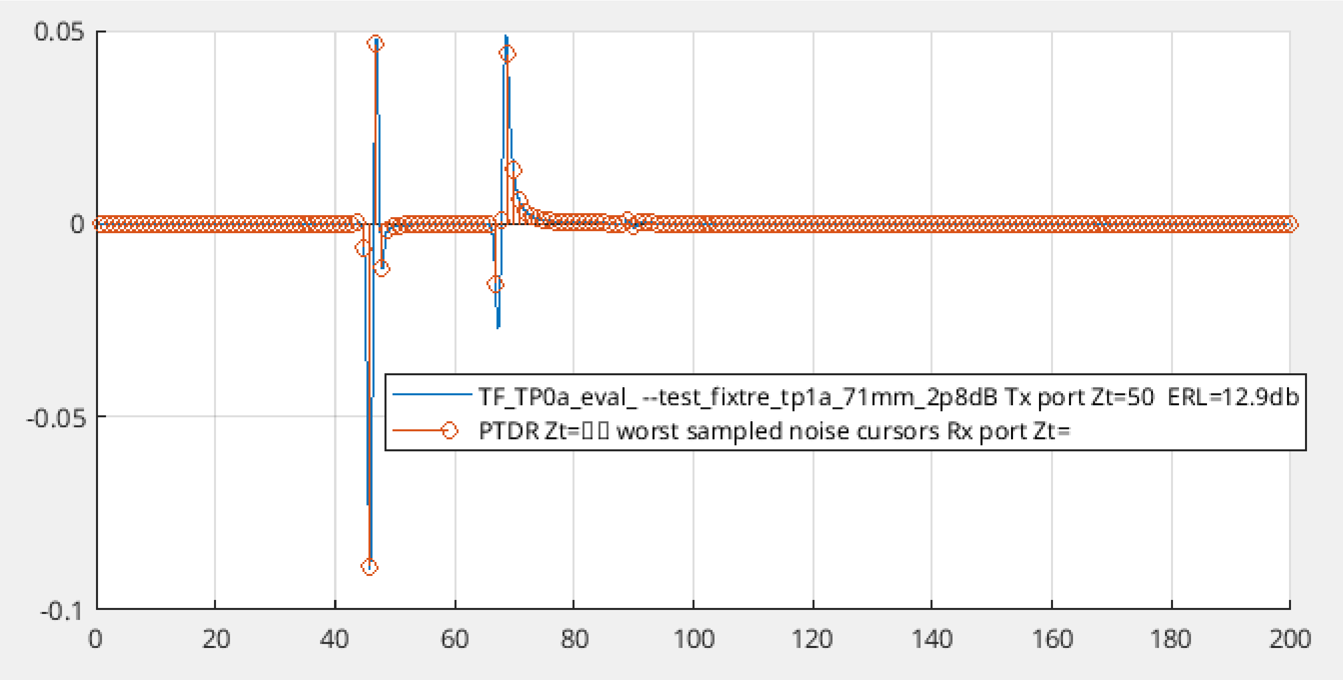




$$V_f^{(ref)} = 409\ mV;\ V_{peak}^{(ref)} = 237\ mV$$

$$R_{peak}^{(ref)} = \frac{237}{409} = 0.58$$

Results (cont.)



$$ERL^{(ref)} = 12.95\ dB$$

Proposed text for Annex 163B

163B.2 Characteristics

This example test fixture is defined using the PCB trace model in 162.11.7.1, with z_p=71 mm, and parameter values in Table 162–19, with the exception that C_0 and C_1 are both 0. This results in a TP0-TP0a insertion loss of 2.8 dB at 26.5625 GHz.

The reference values are calculated for the transmitter characteristics of Clause 163. The reference transmitter device and package model uses the parameter values T_r=7.5 ps, f_r=0.75×f_b=39.8438 GHz, z_p=31 mm, and A_v=0.413 V. The values of v_{peak} and v_f are calculated with f_b=53.125 GBd and N_v=200.

The calculated reference values are listed in Table 163B–1.

Table 163B–1—Summary of transmitter reference values at TP0a

Parameter	Reference	Value	Unit
$V_f^{(ref)}$	163A.3.1.1	0.409	V
$V_{peak}^{(ref)}$	163A.3.1.1	0.237	V
$R_{peak}^{(ref)}$	163A.3.2.1	0.58	—
$ERL^{(ref)}$	163A.3.1.2	12.95	dB