Informative Spec Values Recommendations

Richard Mellitz, Intel
Supporter: John D'Ambrosia, Tyco
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ToC

- Equations Revisited
  - Loss limit
  - LMS equation
  - Insertion loss deviation
- Ripple parameter
- Channel data
- Ripple and loss limit table
- Equations

May Interim - Key Motions

- Motion #5 General Session Motion
- Description: Move that channel characterization be defined using:
  - Attenuation limits as in Draft 0.9
  - Deviation Limits as in Draft 0.9
  - Crosstalk methodology as in D'Ambrosia_01_0505
    - Single Aggressor
    - ACR
- Motion #12 General Session Motion
- Description: Move to add a table to subclause 69.3 binding f1 and f2 values to the port types.

- We need to use the attenuation / deviation limits per Draft 0.9, and bind f1 / f2 to port type

Insertion loss limit text in Spec

69.3.3 Insertion loss

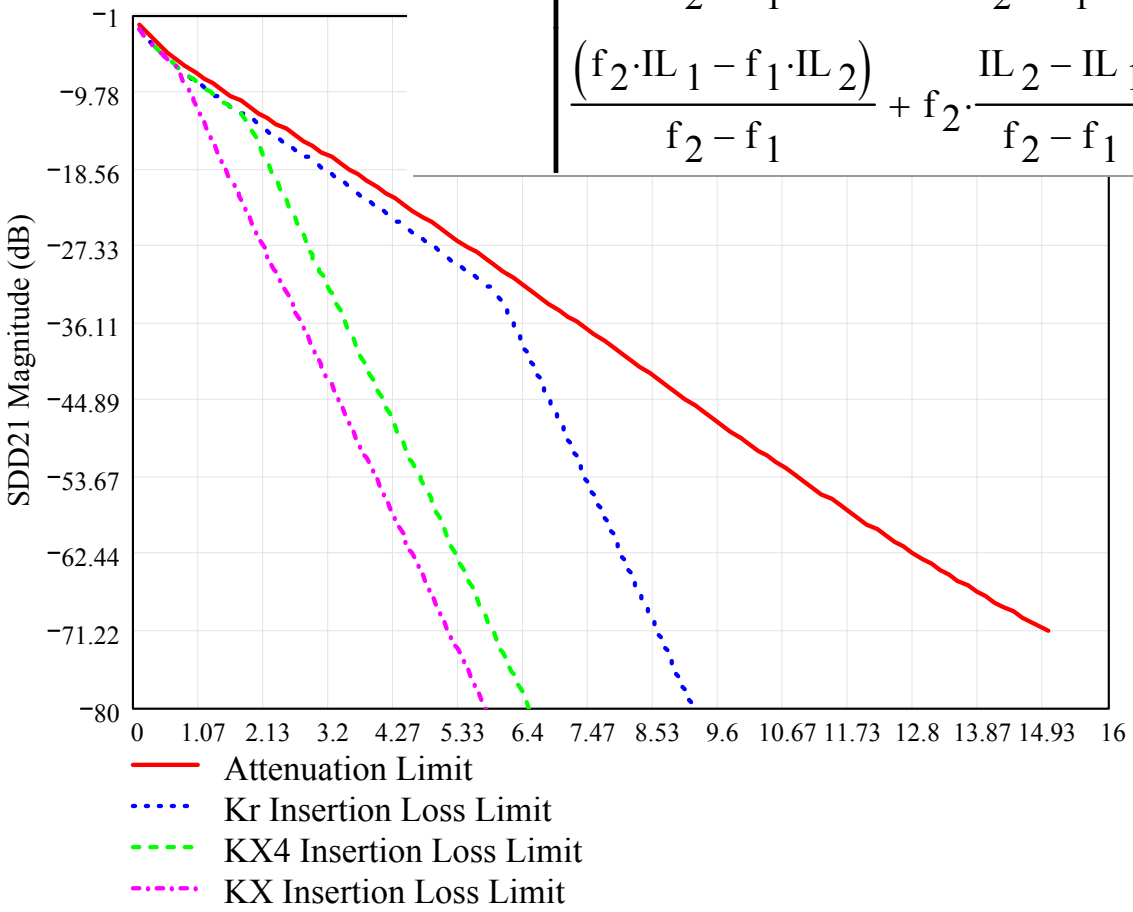
The insertion loss is defined as the magnitude, expressed in decibels, of the differential response measured from TP1 to TP4. It is recommended that the insertion loss magnitude, IL(f), be greater than the lower limit defined by the equation:

$$IL(f) \le IL_{min}(f) = IL_1 + f\frac{IL_2 - IL_1}{f_2 - f_1}, f_1 \le f \le f_2 \quad (69\text{–}1)$$
$$= IL_2 + fm_{HF}, f_2 \le f \le f_{max}$$

where the values of f_1, f_2, f_{max}, IL_1, IL_2, and m_{HF} are given in Table 69–2. The insertion loss limit is illustrated in Figure 69–2.

Suggested Change

$$IL(f) = \begin{cases} \frac{\left(f_2 \cdot IL_1 - f_1 \cdot IL_2\right)}{f_2 - f_1} + f \cdot \frac{IL_2 - IL_1}{f_2 - f_1} & \text{if } f_1 \le f \le f_2 \\ \frac{\left(f_2 \cdot IL_1 - f_1 \cdot IL_2\right)}{f_2 - f_1} + f_2 \cdot \frac{IL_2 - IL_1}{f_2 - f_1} - m_{HF} \cdot \left(f - f_2\right) & \text{if } f_2 \le f \le f_{max} \end{cases}$$



Equation used for LMS fit line

- Add these equations to spec

$$slope = m = \frac{\sum_{i=F1index}^{F2index} [x(i) - x_{avg}] * [y(i) - y_{avg}]}{\sum_{i=F1}^{F2} [x(i) - x_{avg}]^2}$$

$$b = y_{avg} - m * x_{avg}$$

Where x's are frequency points between f1 and f2 and y's are corresponding SDD21 insertion loss value in dB

$$LMS\_fit(f) = m * f + b$$

Insertion Loss text

$$A(f) \geq A_{min}f = -20\log(e) \times (b_1\sqrt{f} + b_2 f + b_3 f^2 + b_4 f^3), f_{min} \leq f \leq f_{max} \quad (69\text{–}2)$$

where f is expressed in Hz and the coefficients b_1 is illustrated in Figure 69–3.

$$ILD_{min}(f) = \frac{\left(f_2 \cdot \Delta_{1min} - \Delta_{2min} \cdot IL_2\right)}{f_2 - f_1} + f \cdot \frac{\Delta_{2min} - \Delta_{1min}}{f_2 - f_1}$$

$$ILD_{max}(f) = \frac{\left(f_2 \cdot \Delta_{1max} - \Delta_{2max} \cdot IL_2\right)}{f_2 - f_1} + f \cdot \frac{\Delta_{2max} - \Delta_{1max}}{f_2 - f_1}$$

69.3.3.2 Insertion loss deviation

The insertion loss deviation is defined to be the difference between the insertion loss and the least mean squares line fit defined in 69.3.3.1 over the frequency range f_1 to f_2. The insertion loss deviation, ILD(f) is recommended to be constrained within the limits defined by the equations

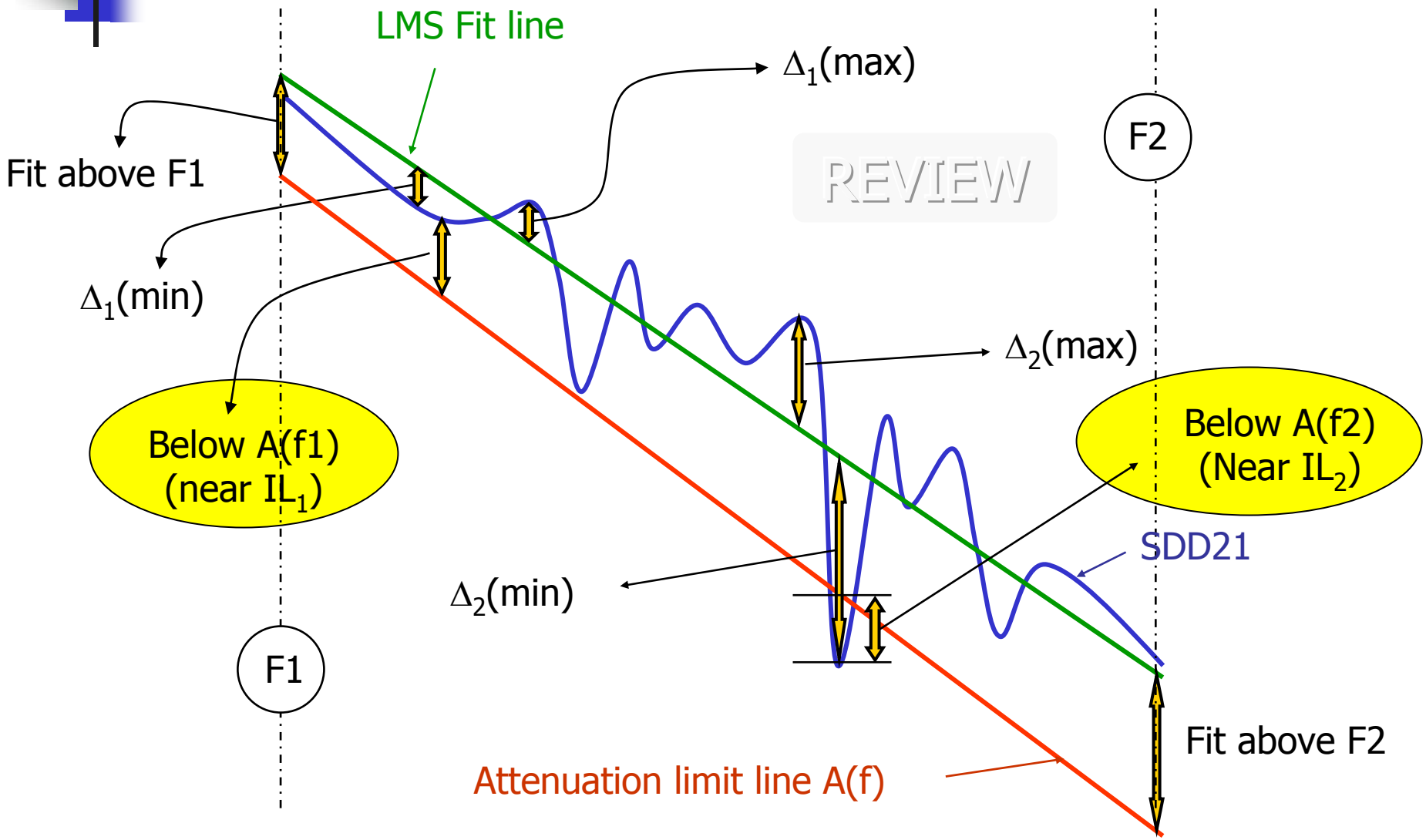
≥

$$ILD(f) \leq ILD_{min}(f) = \Delta_1(min) + f\frac{\Delta_2(min) - \Delta_1(min)}{f_2 - f_1}, f_1 \leq f \leq f_2 \quad (69\text{–}3)$$

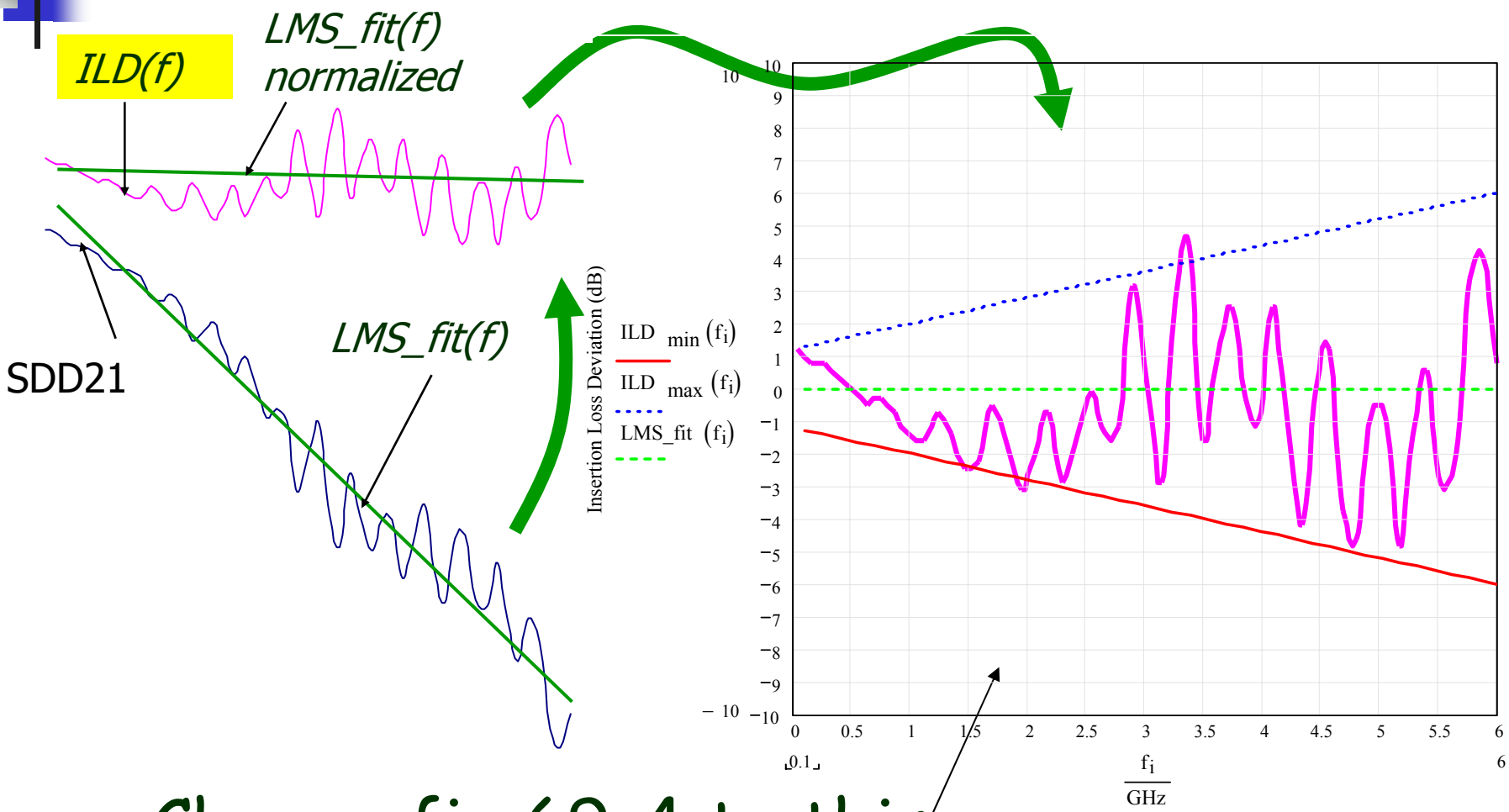
$$ILD(f) \leq ILD_{max}(f) = \Delta_1(max) + f\frac{\Delta_2(max) - \Delta_1(max)}{f_2 - f_1}, f_1 \leq f \leq f_2$$

- Add equation: *ILD(f)=SDD21(f)-LMS_fit(f)*

Ripple Parameters Review: Terminology



Ripple parameter concept



- Change fig 69-4 to this

dB below fit line vs. 1dB@1GHz, 3dB@6GHz limits

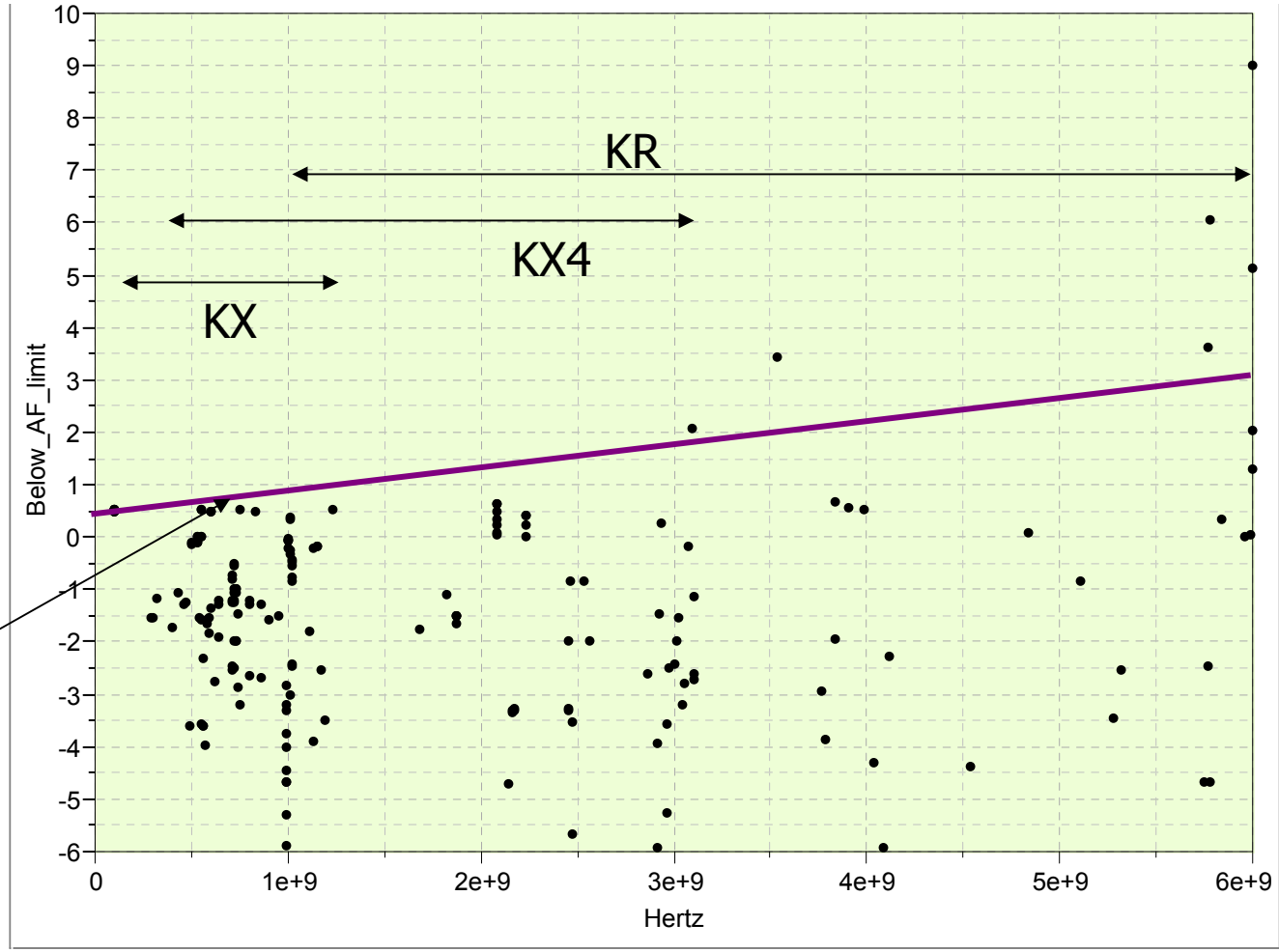
If we choose a line at 1 an 3 dB then the following are <u>above the line</u>

Case3 FM 13SI 20 T D6 L10.s4p
peters_01_0305_T12.s4p
peters_01_0305_T20.s4p
peters_01_0904_T12_thru.s4p
peters_01_0904_T20_thru.s4p

Eq. 1

$$\text{Below\_AF\_limit} = f \cdot 4 \cdot 10^{-10} \text{sec} + .6$$

S-parameters alone (no package)



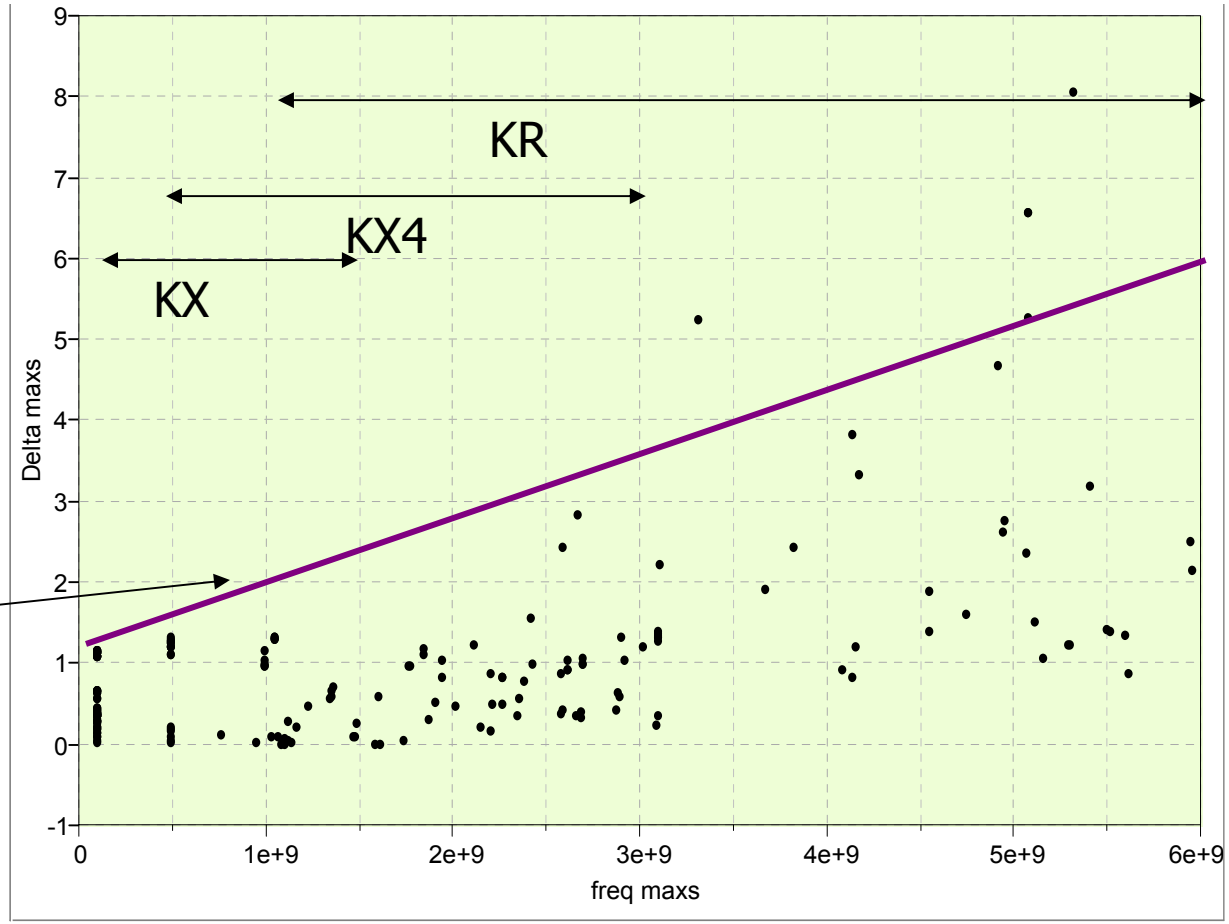
Δ Max peaks

The following are above the line

peters_01_0305_T1.s4p
peters_01_0904_T1_thru.s4p

Eq. 2

$$\text{Delta\_max\_limit} = f \cdot 8 \cdot 10^{-10}\,\text{sec} + 1.2$$



S-parameters alone were used (no package)

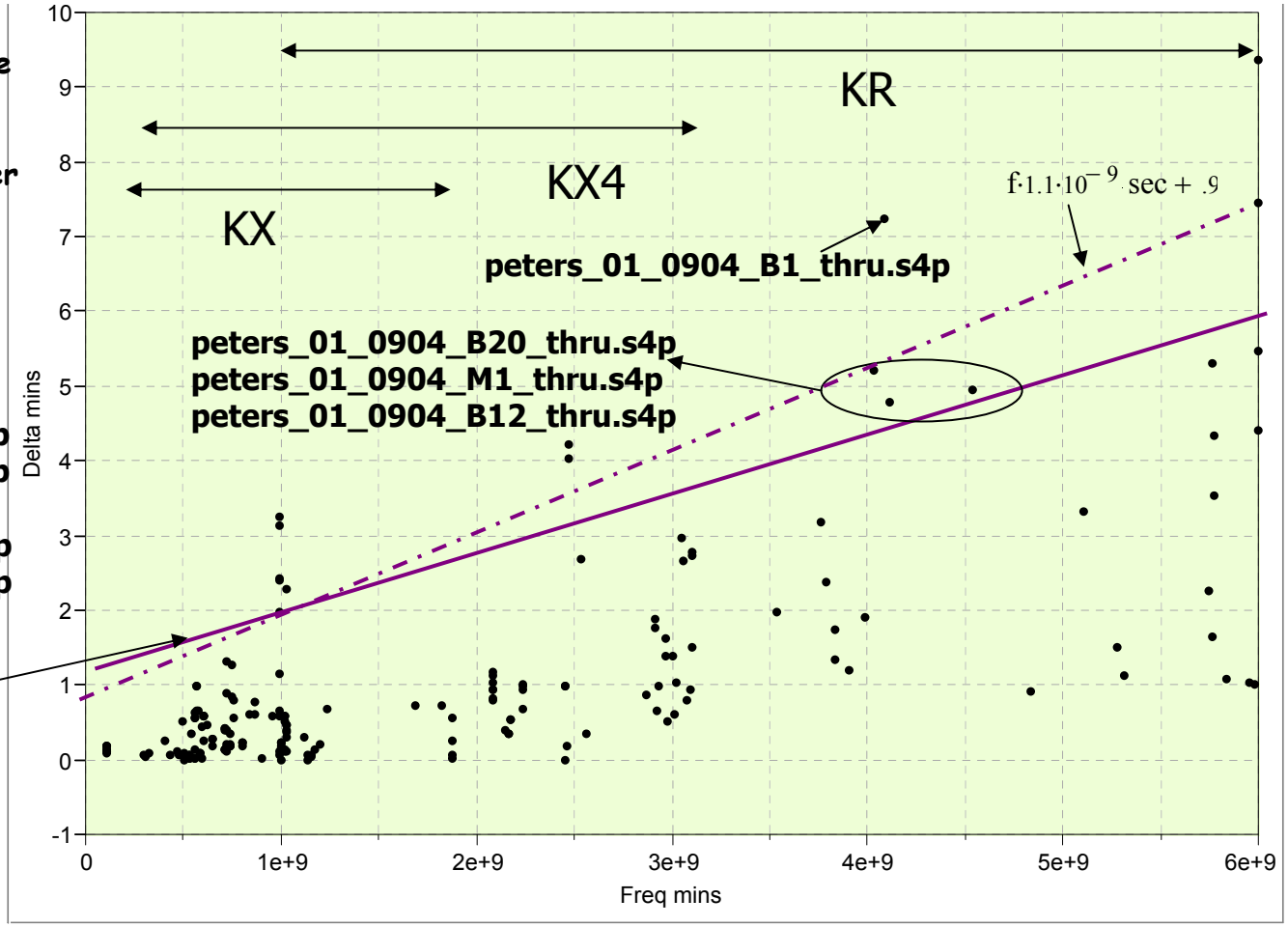
Δ Min peaks

The following are above the line note: min's are reported as a positive number here but correspond to a negative number in the spec.

peters_01_0305_T1.s4p
peters_01_0305_T12.s4p
peters_01_0305_T20.s4p
peters_01_0904_T1_thru.s4p
peters_01_0904_T12_thru.s4p
peters_01_0904_T20_thru.s4p
peters_01_0904_B1_thru.s4p
peters_01_0904_B12_thru.s4p
peters_01_0904_B20_thru.s4p
peters_01_0904_M1_thru.s4p

Eq. 3

$$Delta\_min\_limit = f \cdot 8 \cdot 10^{-10}\,sec + 1.2$$



S-parameters alone were used (no package)

Proposed limits

Parameter	KX Value	KX4 Value	KR Value	Units
f_{min}	0.05			GHz
f_{max}	15			GHz
b1	2.25E-0.5			
b2	1.20E-10			
b3	3.50E-20			
b4	–1.25E-30			
f_1	0.125	0.312	1	GHz
f_2	1.25	3.125	6	GHz
IL_1 *per equation 1	-0.65	-0.72	-1	dB
IL_2 *per equation 1	-1.1	-1.85	-3	dB
m_{HF}	10	10	10	dB/GHz
Δ_1(min) ** per equation 2	-1.3	-1.45	-2	dB
Δ_1(max)*** per equation 3	1.3	1.45	2	dB
Δ_2(min) ** per equation 2	-2.2	-3.7	6	dB
Δ_2(max)*** per equation 3	2.2	3.7	6	dB

Equations

- Equation 1:
  - Below_AF_Limit=f*4e-10+.6
- Equation 2
  - Delta_max_Limit=f*8e-10+1.2
- Equation 3
  - Delta_mmin_Limit=-(f*8e-10+1.2)