Integrated Device Technology

F1912 Settling Time

- AT0342
- August 15, 2016

Michael J. Virostko
Principal Product Application Engineer

Agenda

- Customer is using three F1912 Digital Step Attenuator to control the power in a channel.
- During testing they are intermittently seeing failures for attenuations values.
- During a conversation the following points were mentioned:
  - Power testing is done approximately every 500 ns.
  - Errors occur mostly at cold temperatures (-40 °C).
  - Testing is done in the parallel mode.

Observations

- We specify the switching time as either 0.9 µs or 1.8 µs when switching for the minimum to maximum attenuation states.
- We specify the switching time in the serial mode.

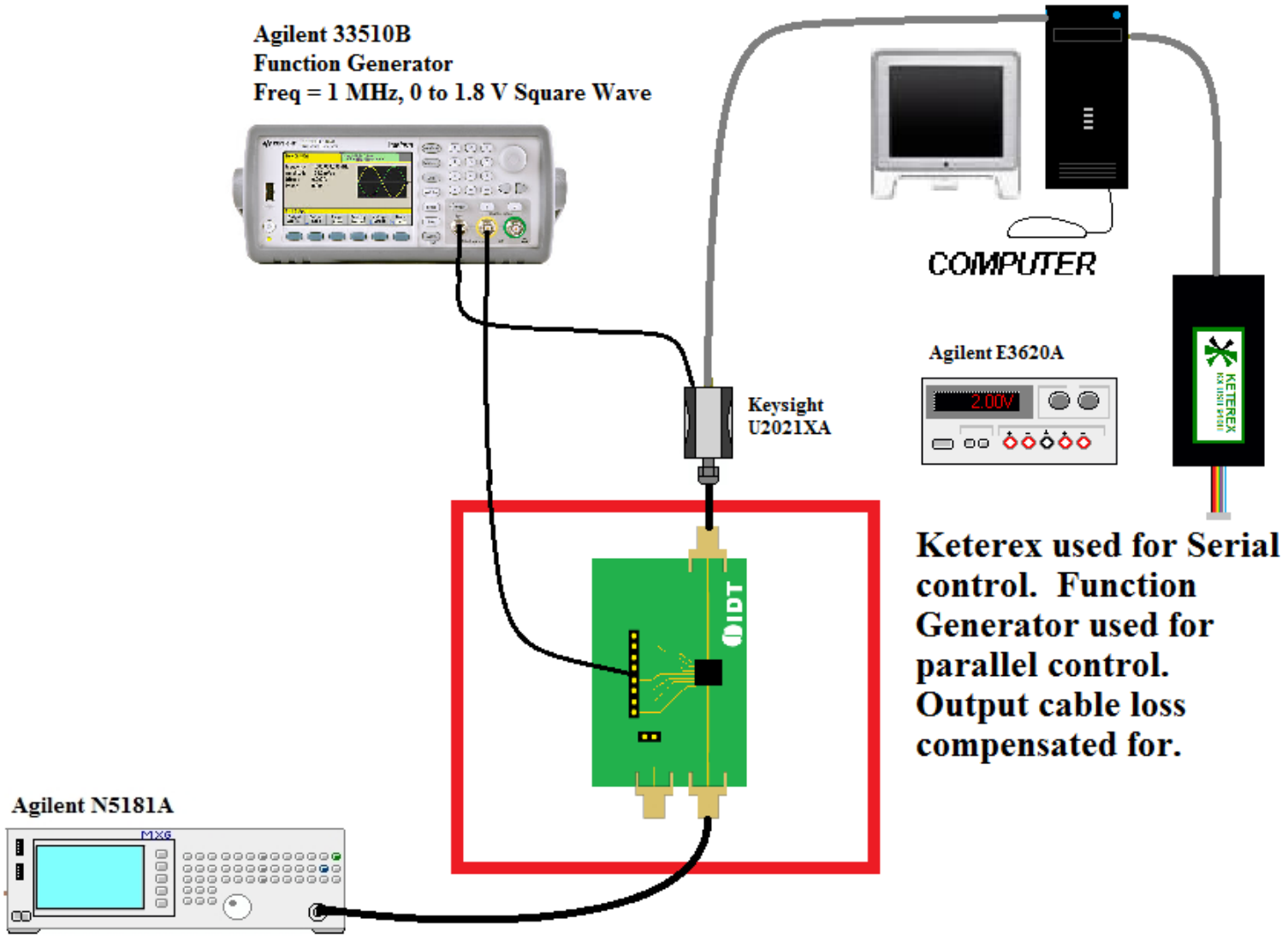
Specifications apply at V_{DD} = +3.3 V, T_{CASE} = +25 °C, F_{RF} = 2000 MHz, P_{in} = 0 dBm, Serial Mode (V_{mode} > V_{IH}), Z_{source} = Z_{Load} = 50 Ω unless otherwise noted. EvKit losses are de-embedded.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
MSB Step Time	T_{LSB}	Start LE rising edge > V_{IH} End ±0.10 dB Pout settling for 15.5 dB to 16.0 dB transition		500		ns
Maximum spurious level on any RF port[4]	$Spur_{MAX}$			-140		dBm
Maximum Switching Frequency	SW_{FREQ}			25		kHz
DSA Settling time	τ_{SET}	Max to Min Attenuation to settle to within 0.5 dB of final value		0.9		µs
		Min to Max Attenuation to settle to within 0.5 dB of final value		1.8		

Observations

- We do not expect the switching time to change drastically over temperature or by using the parallel mode.
- Testing will show this to be true.

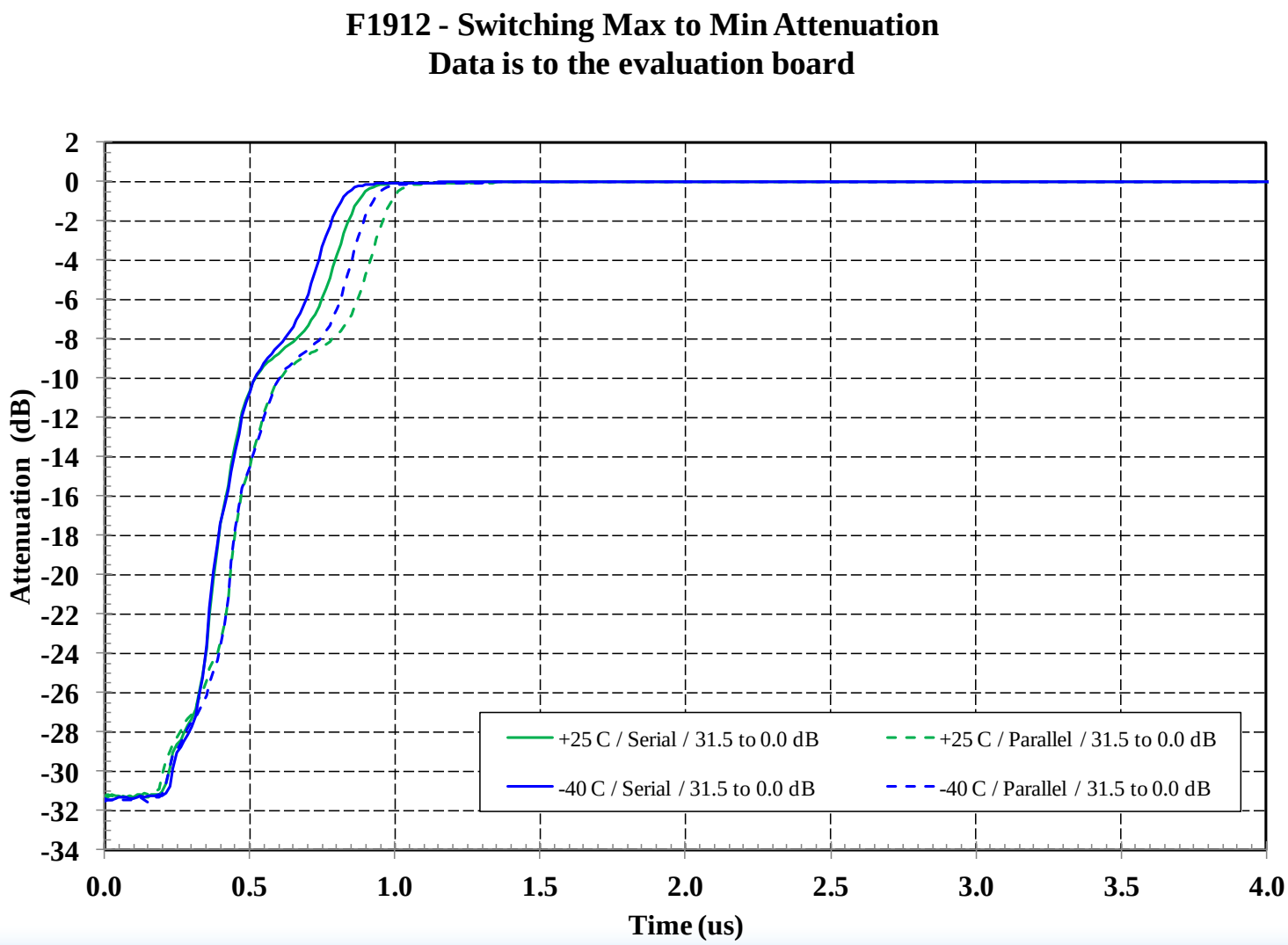
Test Setup


Agilent 33510B
Function Generator
Freq = 1 MHz, 0 to 1.8 V Square Wave
COMPUTER
Agilent E3620A
2.00V
Keysight
U2021XA
Agilent N5181A
Keterex used for Serial control. Function Generator used for parallel control. Output cable loss compensated for.

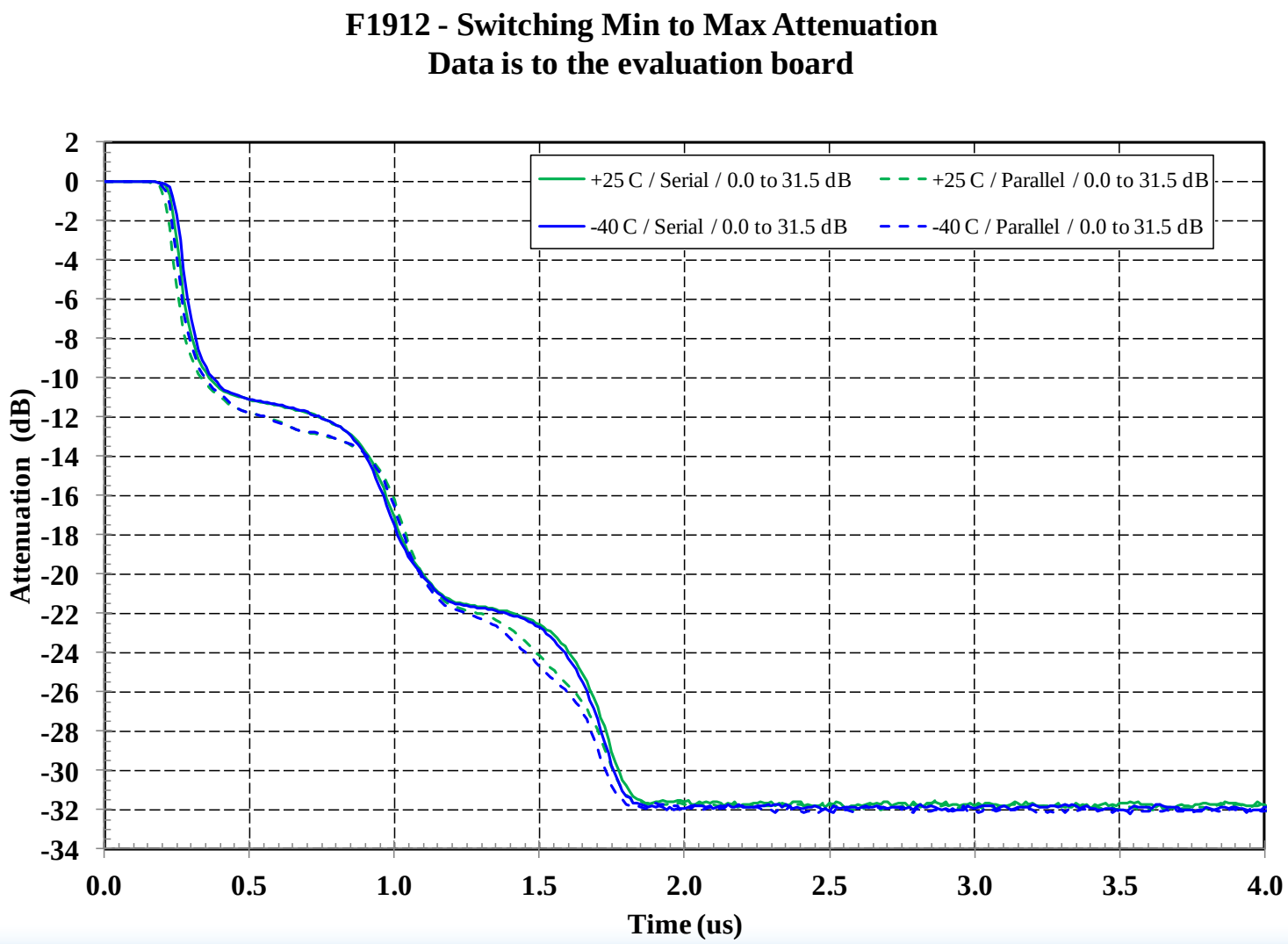
Test Setup (continued)

- Keysight U2021XA is used to capture data since we can capture the full dynamic range (~ 32 dB) and the time measurement is greater than 200 ns.
- Output power is set for 18 dBm.
- Frequency is 1 GHz.

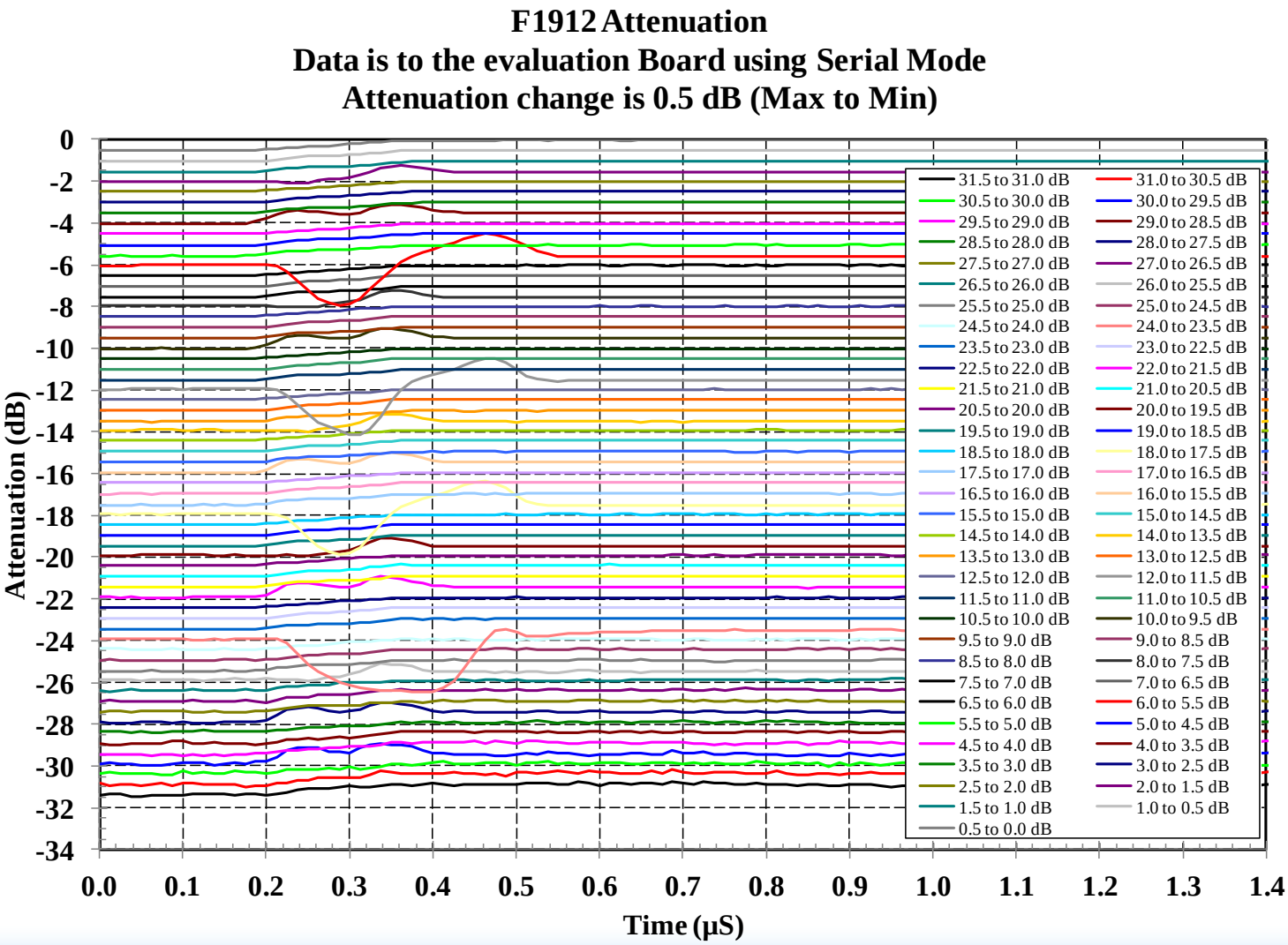
Maximum to Minimum Settling Time



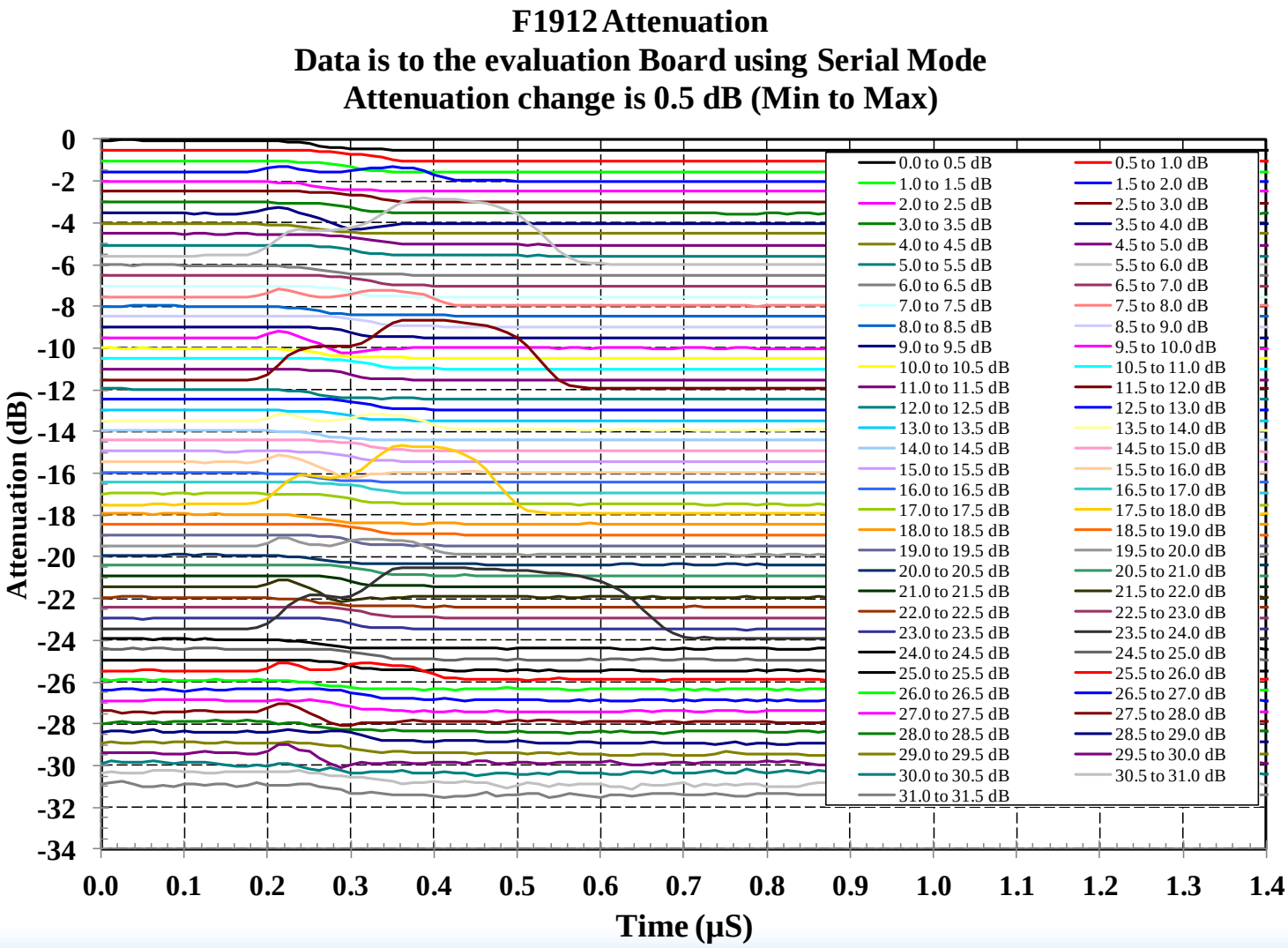
Minimum to Maximum Settling Time



0.5 dB step for Max to Min Attenuation



0.5 dB step for Min to Max Attenuation



Conclusion

- Switching all attenuators simultaneously does not show any difference over temperature or using either Parallel or Serial Mode.
- The datasheet values of 0.9 and 1.8 µs are confirmed.
- There is a slightly different power profile between the Parallel and Serial mode.
- Changing the individual states sequentially show the maximum switching time is 0.72 µs with most being under 0.4 µs.

- We recommend a delay is added to the measurement so the device can settle out.