



Integrated Device Technology

F1912 Settling Time

- AT0342
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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 $V_{DD} = +3.3\text{ V}$, $T_{CASE} = +25\text{ }^{\circ}\text{C}$, $F_{RF} = 2000\text{ MHz}$, $P_{in} = 0\text{ dBm}$, Serial Mode ($V_{mode} > V_{IH}$), $Z_{source} = Z_{Load} = 50\text{ }\Omega$ unless otherwise noted. EvKit losses are de-embedded.

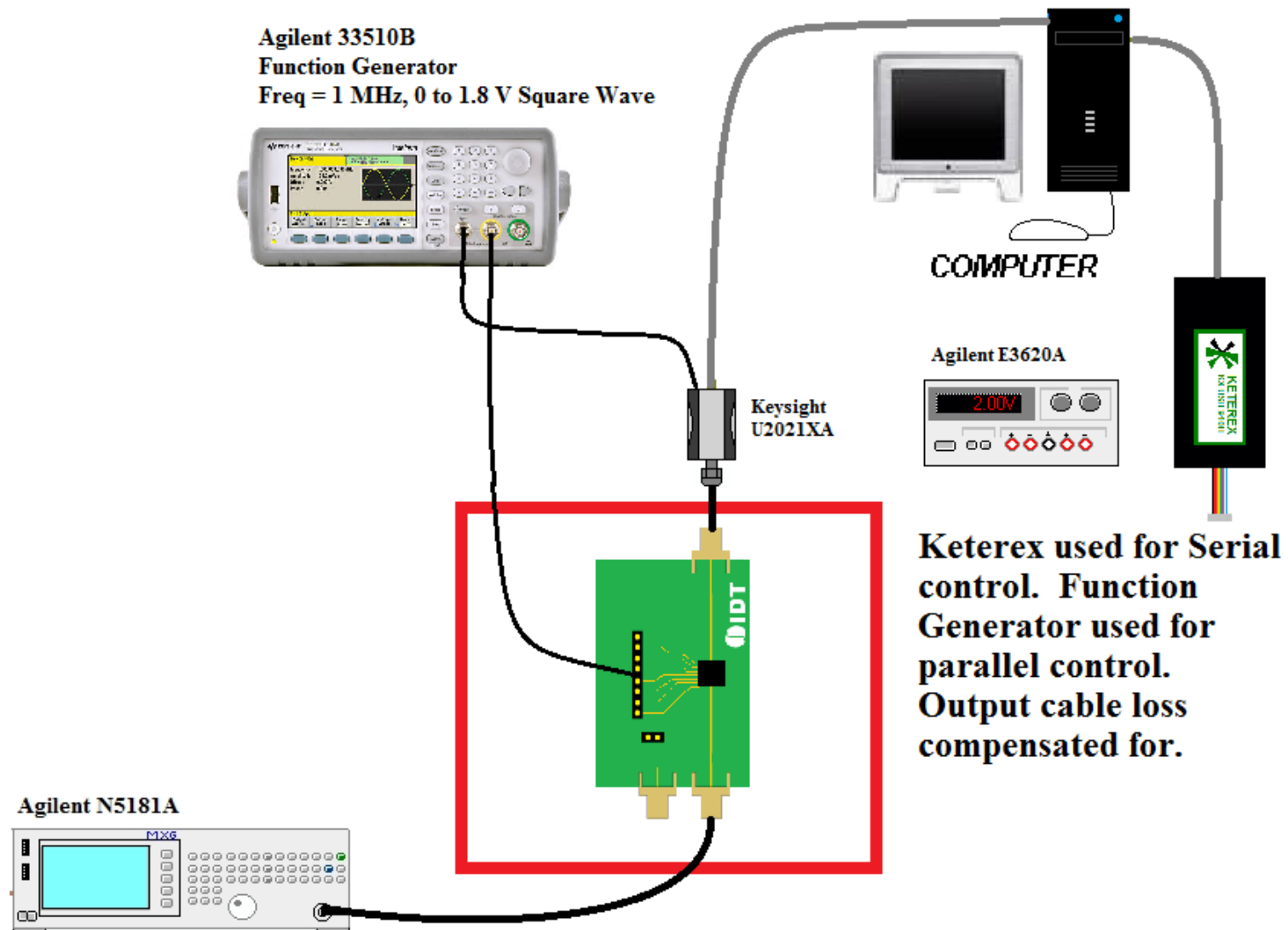
Parameter	Symbol	Conditions	Min	Typ	Max	Units
MSB Step Time	T_{LSB}	Start LE rising edge $> V_{IH}$ End $\pm 0.10\text{ dB}$ Pout settling for 15.5 dB to 16.0 dB transition		500		ns
Maximum spurious level on any RF port ⁴	$Spur_{MAX}$			-140		dBm
Maximum Switching Frequency	SW_{FREQ}			25		kHz
DSA Settling 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



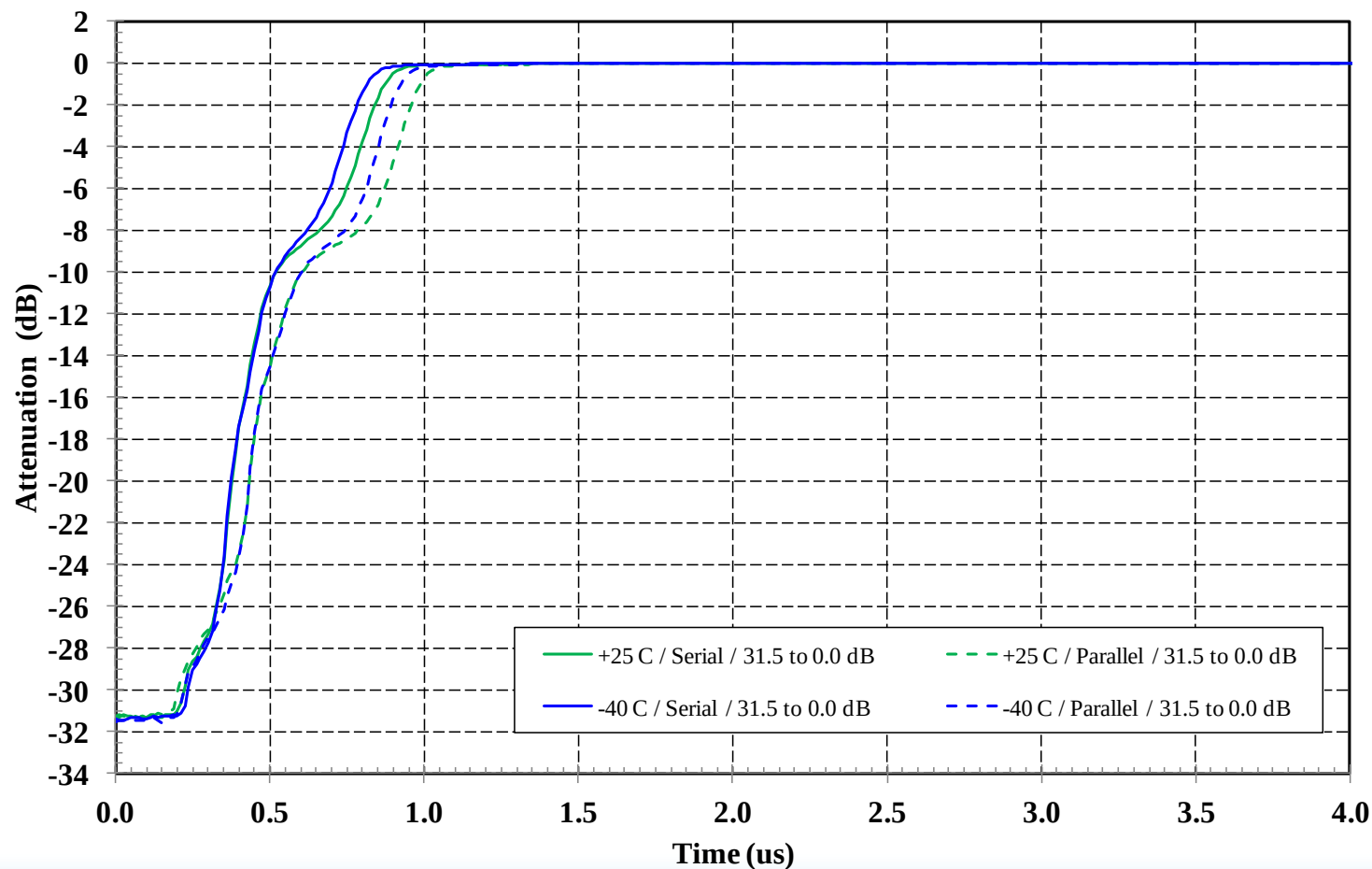
Test Setup (continued)

- 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.



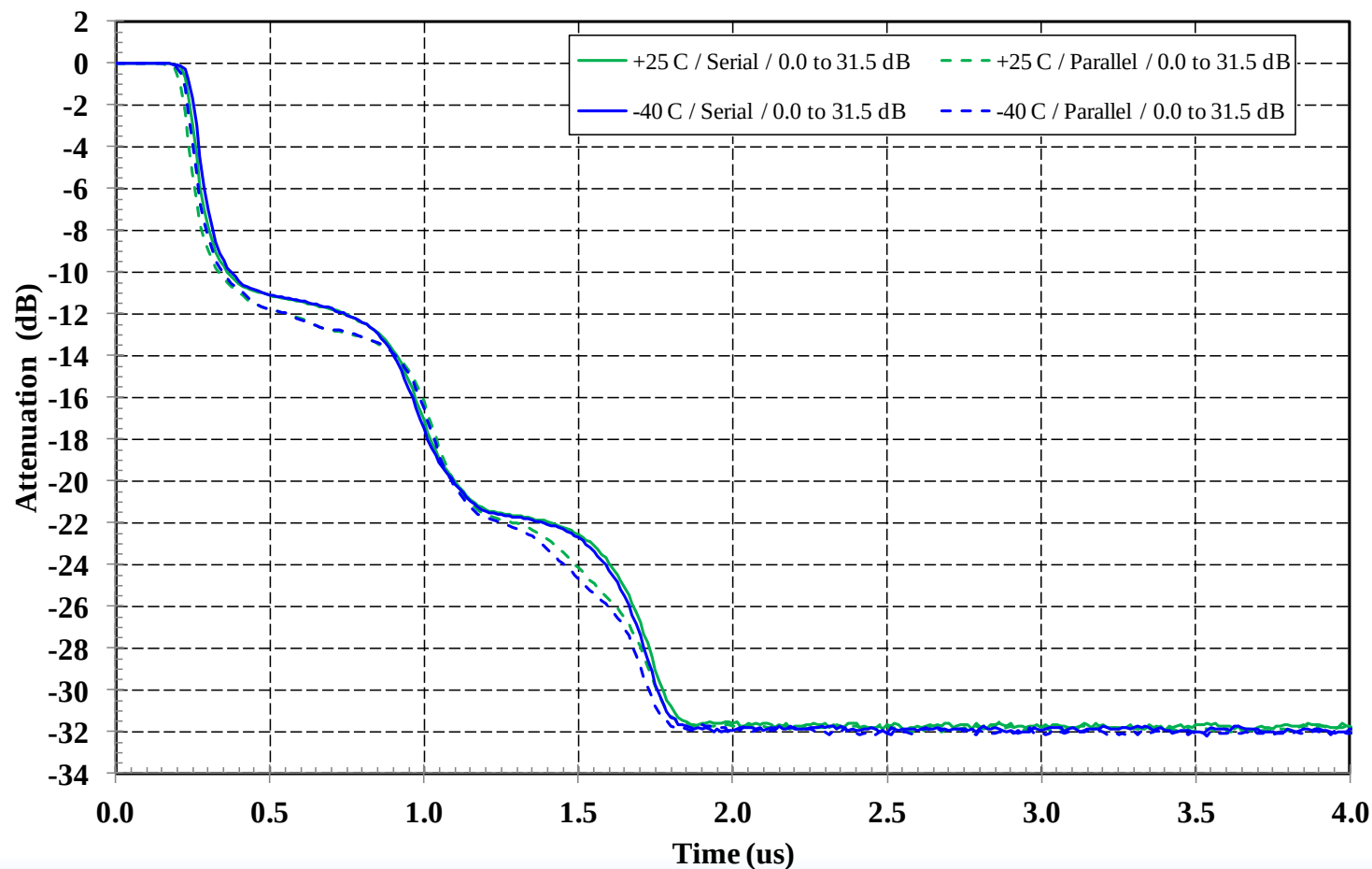
Maximum to Minimum Settling Time

F1912 - Switching Max to Min Attenuation
Data is to the evaluation board

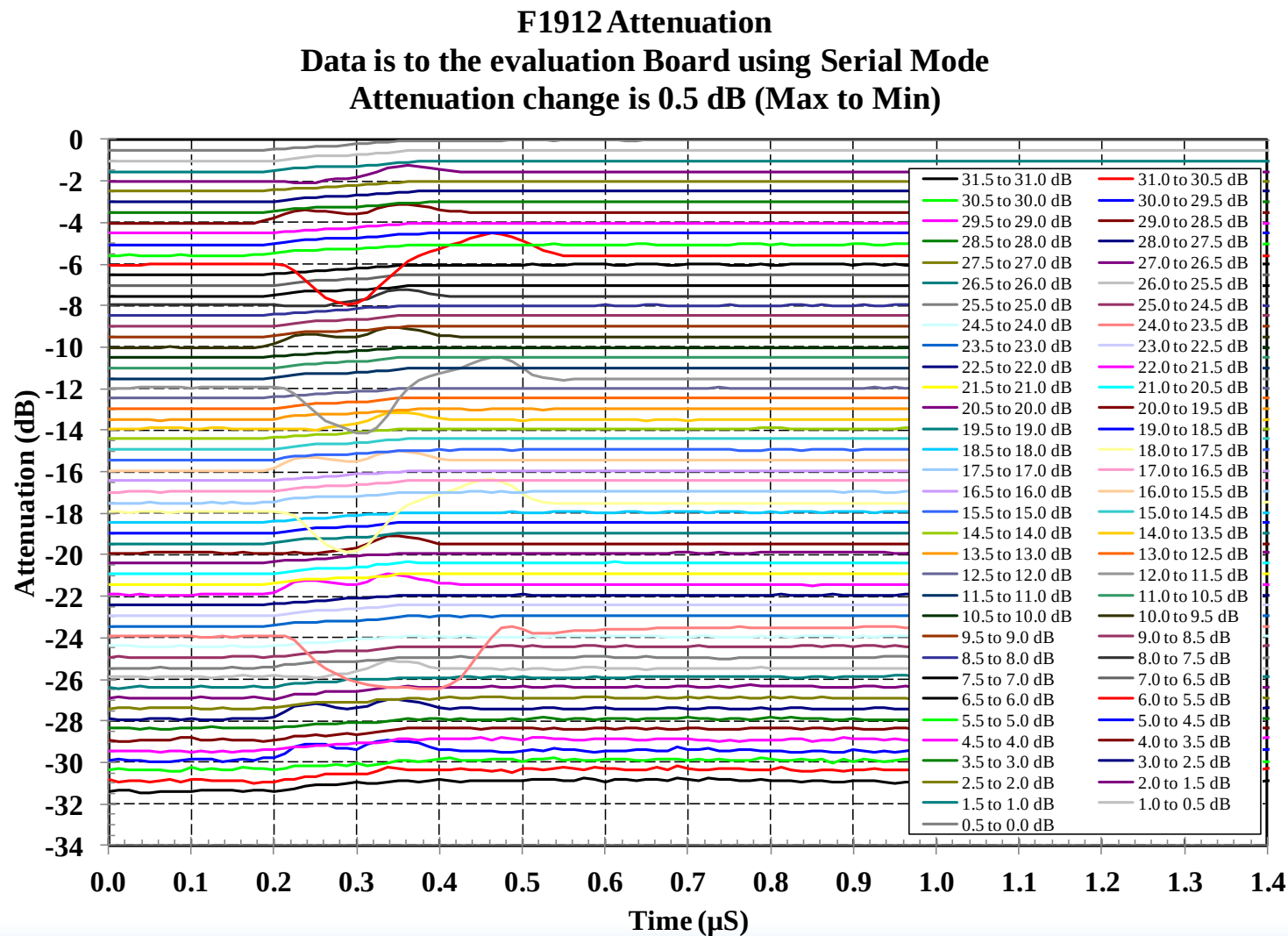


Minimum to Maximum Settling Time

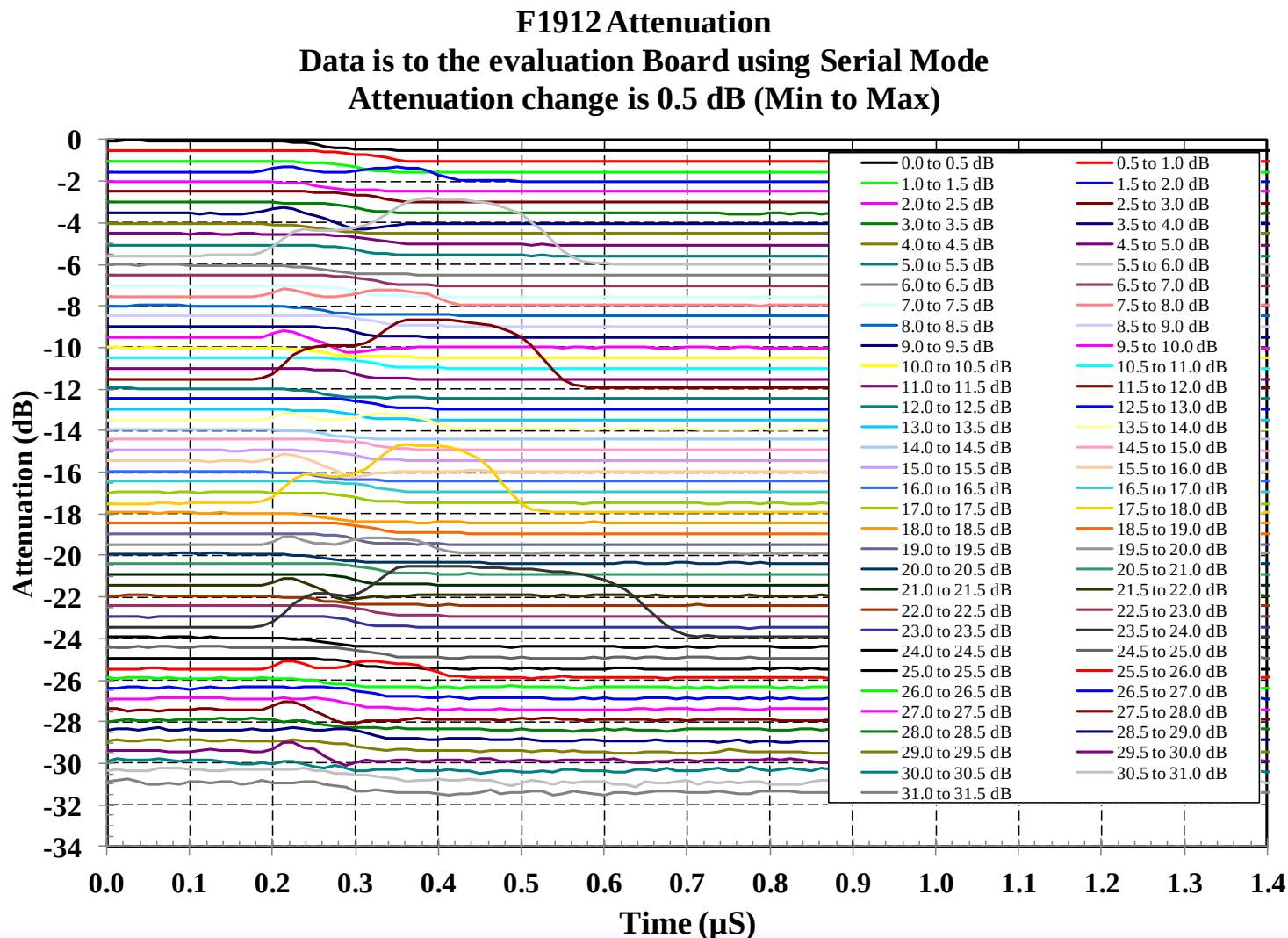
F1912 - Switching Min to Max Attenuation
Data is to the evaluation board



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.

