Hello, I am currently testing the performance of the ADS1118 chip to determine whether it meets our project requirements. I have encountered several issues during the testing process and would appreciate your assistance in addressing them. Thank you.

1. When testing noise in μVRMS (μVPP) at VDD = 3.3 V, the ADC inputs were shorted as required and a bias voltage was applied. A total of 32,768 samples were acquired. Noise was calculated using the standard deviation method, and the measured results show a significant discrepancy compared with the values specified in the device datasheet.

2. The μVPP values should be integer multiples of the minimum range, but those listed in the datasheet are not. For example, in the ±2.048 V column, the value at 128 SPS is 62.5 μVPP, while at 250 SPS it is 84.03 μVPP, and these two values are not integer multiples of each other.

$$\text{ENOB} = \ln(\text{FSR} / V_{\text{RMS-Noise}}) / \ln(2) \quad (1)$$

$$\text{Noise-Free Bits} = \ln(\text{FSR} / V_{\text{PP-Noise}}) / \ln(2) \quad (2)$$

Table 1. Noise in μV_{RMS} (μV_{PP}) at VDD = 3.3 V

DATA RATE (SPS)	FSR (Full-Scale Range)					
	±6.144 V	±4.096 V	±2.048 V	±1.024 V	±0.512 V	±0.256 V
8	187.5 (187.5)	125 (125)	62.5 (62.5)	31.25 (31.25)	15.62 (15.62)	7.81 (7.81)
16	187.5 (187.5)	125 (125)	62.5 (62.5)	31.25 (31.25)	15.62 (15.62)	7.81 (7.81)
32	187.5 (187.5)	125 (125)	62.5 (62.5)	31.25 (31.25)	15.62 (15.62)	7.81 (7.81)
64	187.5 (187.5)	125 (125)	62.5 (62.5)	31.25 (31.25)	15.62 (15.62)	7.81 (7.81)
128	187.5 (187.5)	125 (125)	62.5 (62.5)	31.25 (31.25)	15.62 (15.62)	7.81 (12.35)
250	187.5 (252.09)	125 (148.28)	62.5 (84.03)	31.25 (39.54)	15.62 (16.06)	7.81 (18.53)
475	187.5 (266.92)	125 (227.38)	62.5 (79.08)	31.25 (56.84)	15.62 (32.13)	7.81 (25.95)
860	187.5 (430.06)	125 (266.93)	62.5 (118.63)	31.25 (64.26)	15.62 (40.78)	7.81 (35.83)

Table 2. ENOB from RMS Noise (Noise-Free Bits from Peak-to-Peak Noise) at VDD = 3.3 V

DATA RATE (SPS)	FSR (Full-Scale Range)					
	±6.144 V	±4.096 V	±2.048 V	±1.024 V	±0.512 V	±0.256 V
8	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)
16	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)
32	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)
64	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)
128	16 (16)	16 (16)	16 (16)	16 (16)	16 (16)	16 (15.33)
250	16 (15.57)	16 (15.75)	16 (15.57)	16 (15.66)	16 (15.96)	16 (14.75)
475	16 (15.49)	16 (15.13)	16 (15.66)	16 (15.13)	16 (14.95)	16 (14.26)
860	16 (14.8)	16 (14.9)	16 (15.07)	16 (14.95)	16 (14.61)	16 (13.8)

The following are my test results:

(μVrms/μVPP)						
(SPS)	±6.144V	±4.096V	±2.048V	±1.024V	±0.512V	±0.256V
8 SPS	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
16 SPS	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.43 (7.81)
32 SPS	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.98 (7.81)
64 SPS	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.49 (15.62)	1.83 (15.62)
128 SPS	5.93 (187.50)	3.95 (125.00)	4.42 (125.00)	1.71 (31.25)	1.30 (15.62)	2.87 (15.62)
250 SPS	32.47 (375.00)	17.67 (250.00)	10.05 (125.00)	5.39 (62.50)	2.82 (31.25)	4.07 (23.44)
475 SPS	63.01 (375.00)	44.34 (250.00)	22.74 (125.00)	10.57 (62.50)	6.09 (31.25)	5.83 (31.25)
860 SPS	101.20 (750.00)	67.51 (375.00)	33.24 (187.50)	16.36 (125.00)	8.18 (31.25)	7.51 (46.88)

ENOB						
(SPS)	±6.144V	±4.096V	±2.048V	±1.024V	±0.512V	±0.256V
8 SPS	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
16 SPS	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	16.00 (16.00)
32 SPS	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	16.00 (16.00)
64 SPS	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	16.00 (16.00)	16.00 (15.00)
128 SPS	16.00 (16.00)	16.00 (16.00)	16.00 (15.00)	16.00 (16.00)	16.00 (16.00)	16.00 (15.00)
250 SPS	16.00 (15.00)	16.00 (15.00)	16.00 (15.00)	16.00 (15.00)	16.00 (15.00)	16.00 (14.41)
475 SPS	16.00 (15.00)	16.00 (15.00)	16.00 (15.00)	16.00 (15.00)	16.00 (15.00)	16.00 (14.00)
860 SPS	16.00 (14.00)	16.00 (14.41)	16.00 (14.41)	16.00 (14.00)	16.00 (15.00)	16.00 (13.41)