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Measured Voltage Noise on AOS Drive Electronics

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In this application note we are documenting an experiment where we measured the rms voltage noise on the AOS drive electronics. In these tests we measured the output of the electronics by AC-coupling the signal to a 60 MHz digital oscilloscope.

Low-Power USB Drive Electronics

We first tested one channel of a set of AOS 32-channel USB drive electronics under different bias conditions with no load, a membrane deformable mirror actuator, and a typical PZT actuator. During this testing we determined that the noise from the high voltage source was causing a significant amount of noise despite the large power supply rejection ratio (PSRR) of the amplifier. For applications where this level of noise is not acceptable, we can filter the power supply or change the replace the supply with a less noisy one.

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Table 1 – Voltage Noise Results from the USB DE

Bias	Load	RMS Voltage Noise (mV)
0%	None	31.6
1%	None	32.86
50%	None	35.34
100%	None	23.12
0%	MDM2-61R2-1	35.13
1%	MDM2-61R2-1	36.88
50%	MDM2-61R2-1	33.9
100%	MDM2-61R2-1	23.06
0%	PZT Actuator	13.11
1%	PZT Actuator	13.65
50%	PZT Actuator	13.61
100%	PZT Actuator	12.33

High-Power Drive Electronics (Plate-Type Deformable Mirrors)

We then repeated the experiments with the AOS high-power drive electronics. These electronics only output 120 V instead of the 300 V output by the USB DE. They use a much cleaner high-voltage power supply. Table 2 shows the results of the measurements at different bias levels and with different loads. We saw some relatively high ~60 Hz oscillation at very low bias conditions (<2%) when there was no load present, but under normal load there was no noise larger than 7 mV rms.

Table 2 - Voltage Noise Results from the High-Power Drive Electronics

Bias	Load	RMS Voltage Noise(mV)
0%	None	273.23
1%	None	244.34
2%	None	6.92
50%	None	7.96
0%	PZT Actuator	5.14
2%	PZT Actuator	3.22
50%	PZT Actuator	6.42
100%	PZT Actuator	4.49

Conclusions

In these experiments we found that the AOS drive electronics had a very small amount of output noise under a wide range of bias and load conditions. The AOS USB DE had approximately 30 mV rms noise. The AOS high-power drive electronics had less than 7 mV rms while loaded with a PZT actuator. These noise levels can be reduced if necessary by using better power supplies or filtering the power supply.