



Western Digital.

Acoustics Surrogate Discussion - OCP meeting 08-20-2020

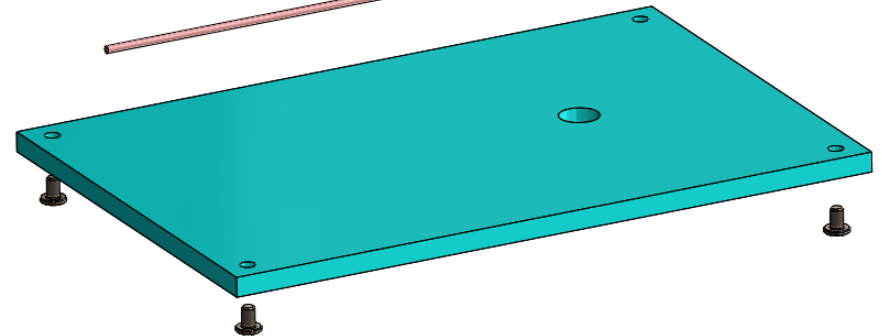
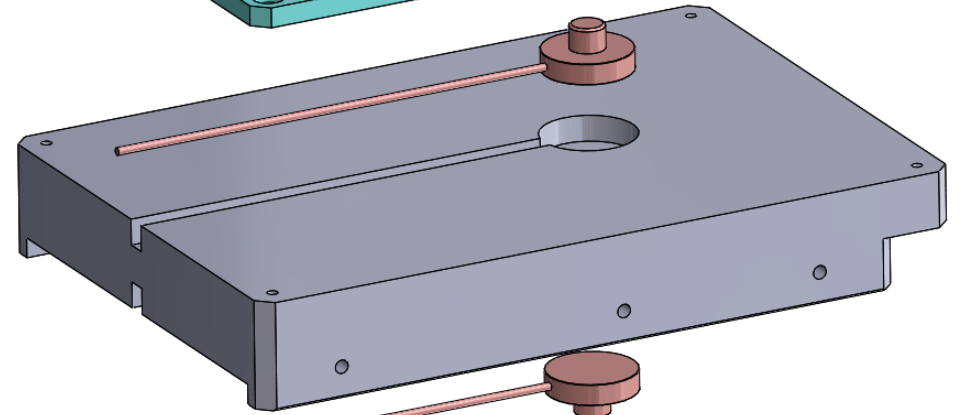
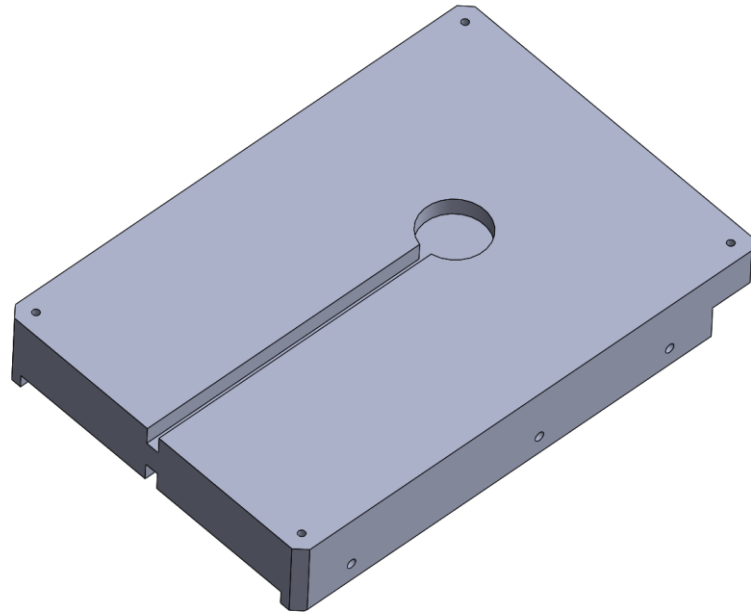
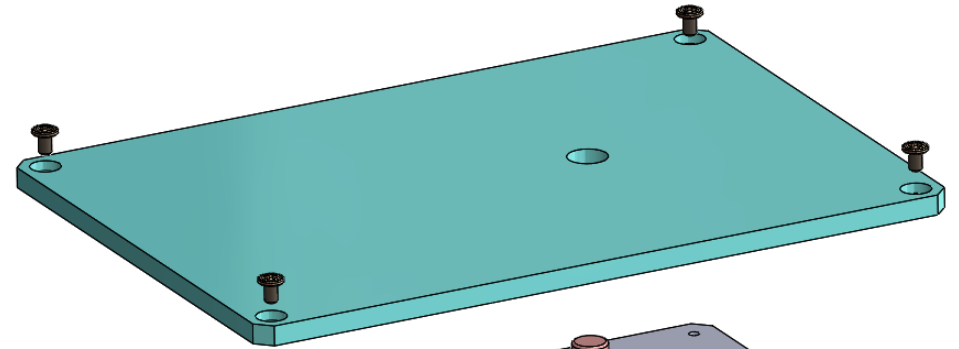
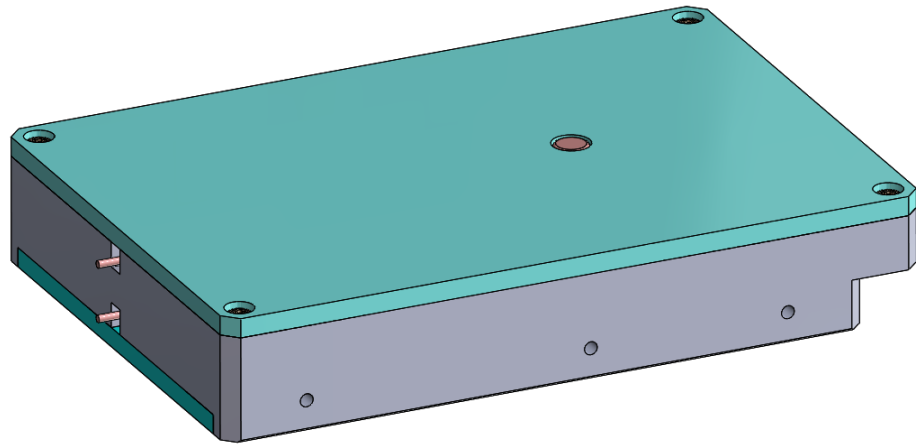
Aug 20, 2020
Zakir Quabili

Acoustics Surrogate Discussion

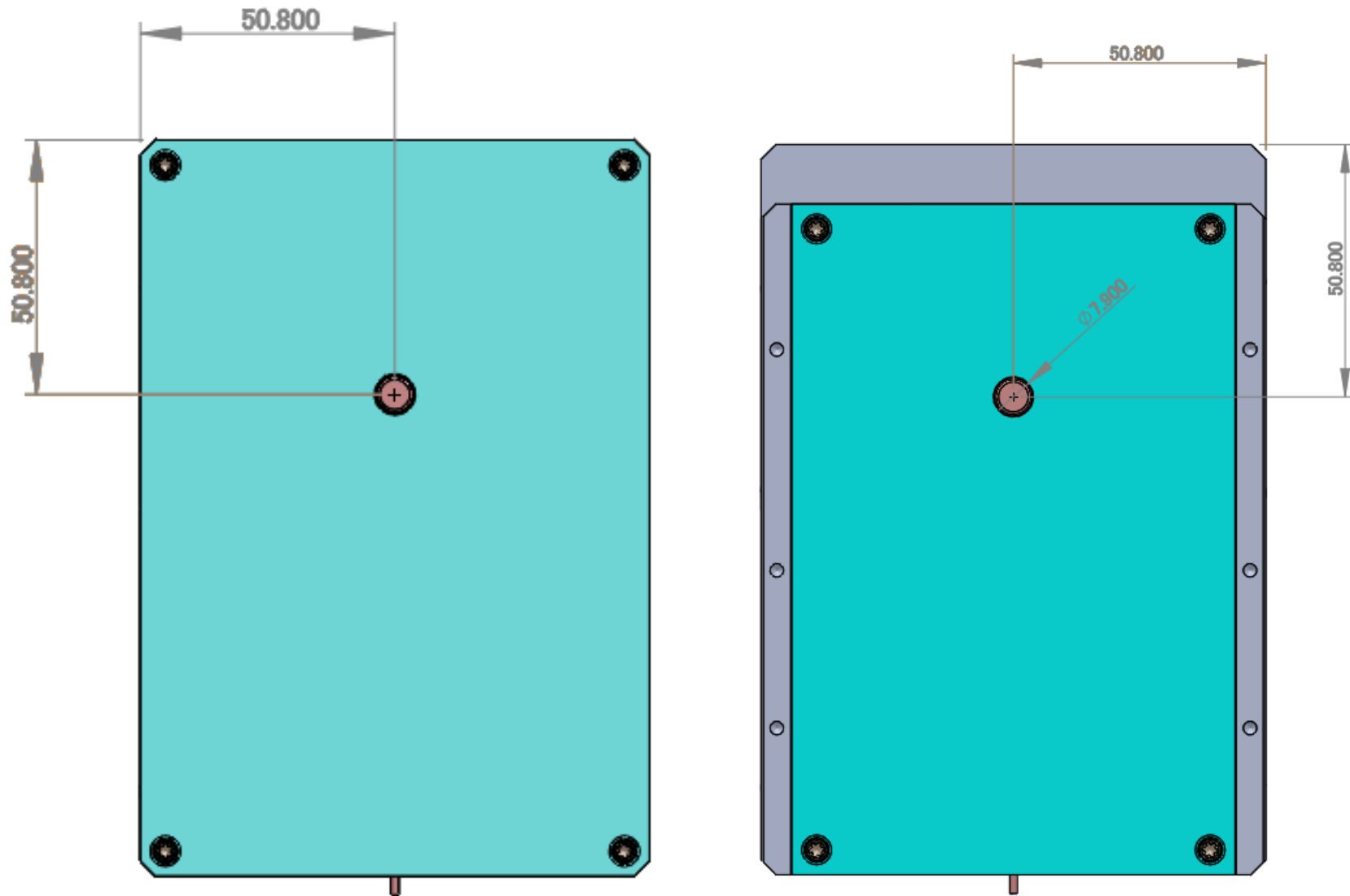
Below are some points from discussion on 07-16-2020

1. How is microphone attached to WD surrogate? Is there a drawing or picture?
 1. Microphones are attached with double-side adhesive tape (Fig1 illustrate the attachment method)
2. I/O Connector: WD Surrogate do not have a connector. It has stepped-cut area to accommodate the chassis connector area without any contact. Chris Peterson informed that Dell Surrogate do not have a connector
 1. I/O connector is likely not needed for sound pressure measurement, but is needed for vibration measurement
3. Offset from the base mounting rail to the base surface
 1. Offset will affect air flow passing by HDD (overall impact unknown). Most high capacity drives do not have offset below the disk-pack. Offset is only below the PCBA area, and real HDD will likely not have an offset



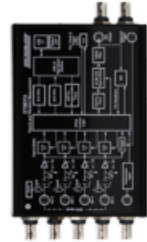

Acoustics Surrogate Design – Western Digital



Acoustics Surrogate Design – WD (Mic Position)



Acoustics Data Acquisition – Comparison

Company	HEAD Acoustics	Data Physics	Data Translation	National Instruments	National Instruments
Model Hard Ware	SQobold	Quattro DSPcentric	DT DT9837B	NI 9234	NI 9250
Cost (HW)	\$ 7,064.95	\$ 4,350.00	\$ 1,675.00	\$ 2,100.00	\$ 1,150.00
Analysis Software	Need to purchase	Need to purchase	Matlab Programm	Matlab Programm	Matlab Programm
Cost (SW)	\$ 1,368.55	\$ 3,950.00	\$ -	\$ -	\$ -
Framework/ Chassis	N/A	N/A	N/A	\$ 1,500.00	\$ 600.00
Total	\$ 8,433.50	\$ 8,300.00	\$ 1,675.00	\$ 3,600.00	\$ 1,750.00
# Channels	4 Channel/ 24 bit	2 Channel/ 24 bit	4 Channel/ 24bit	4 Channel/ 24bit	2 Channel/ 24bit
Resolution/ Channel	51.2kHz	40kHz	105.4kHz	51.2kHz	51.2kHz
Votage Range/ Auto	+/-5.0V (Auto Range)	+/-0.1V, 1.0V, 10.0V (Fixed Voltage)	+/-1.0V, 10.0V (Fixed Voltage)	+/-5.0V (Fixed Voltage)	+/-5.0V (Fixed Voltage)
Dynamic Range	97dBA			102dB	102dB
SNR			95dB	97dB	97dB
ICP supply	YES	YES	YES	YES	YES
Power	Battery-6hr (Portable)	USB Power (Portable)	USB Power (Portable)	USB Power (Portable)	USB Power (Portable)
Picture					

Data Acquisition System for two mic measurement of sound pressure level (3rd Octave or narrow-band): Some analyzers have fixed voltage ranges. e.g. National Instrument NI9234 has fixed voltage +/- 5V, some others like Data Translation DT9837B has two fixed ranges +/-1V and +/-10V

- GRAS 47BX 1/4" mic has sensitivity 1.6mV/Pa
- For SPL=105dB -> 3.6Pa -> 5.76mV
- NI9234 with +/-5V: we only use 0.115% of full range (5.6mV/5V). It is 24-bit DAQ and can detect 0.6 micro Volts, but using such small 0.115% of full range may not be best for SNR (in my mind). At the same time, this being 24bit system with fine resolution 2^{24} (~16.8million), **should this really be a concern?**