

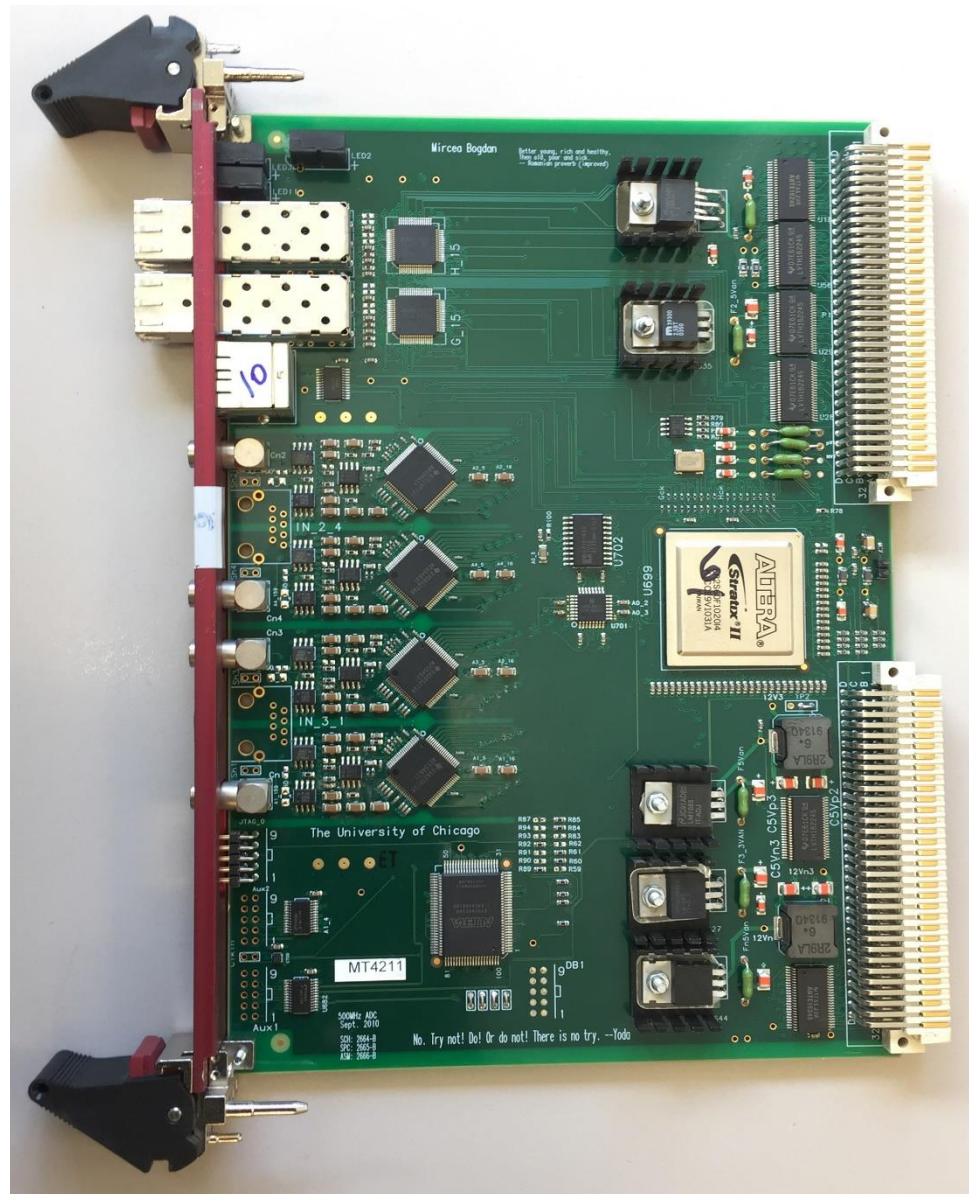
# 16-Channel, 14-Bit, 500 MHz ADC Module Status Report

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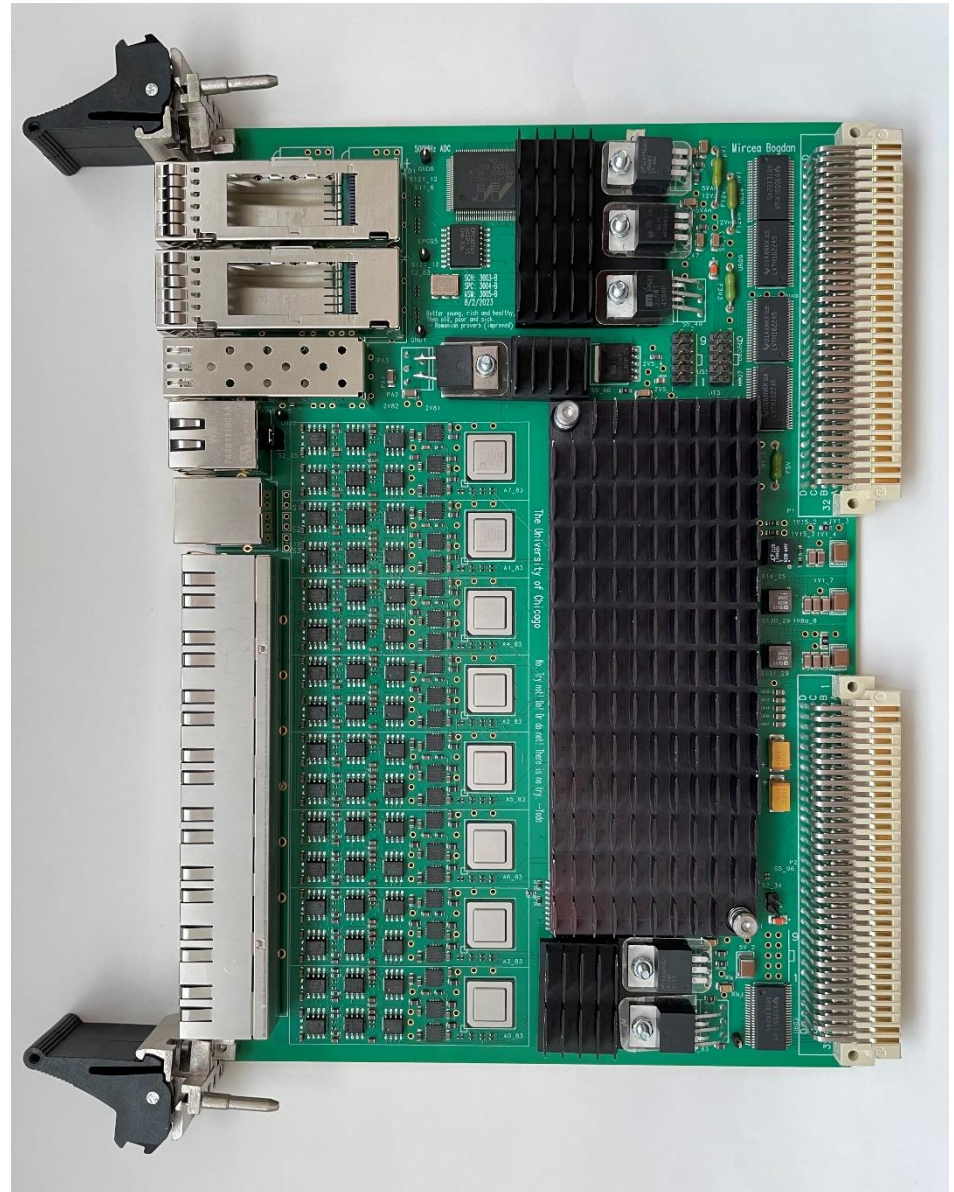
# KOTO – 2010

4-Channel, 12-Bit,  
500MHz ADC Board



# KOTO – 2024

16-Channel, 14-Bit,  
500MHz ADC Board



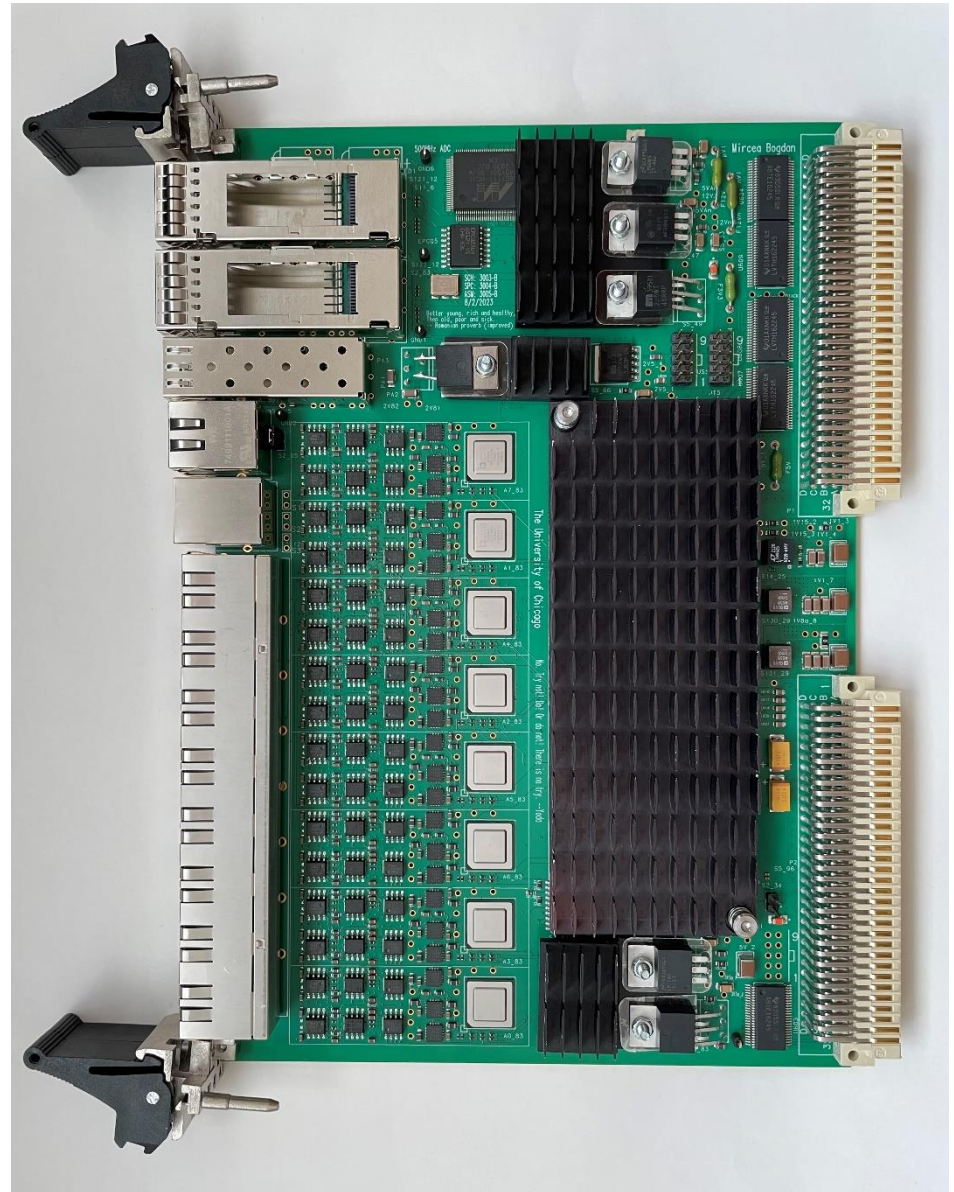


# KOTO – 2024

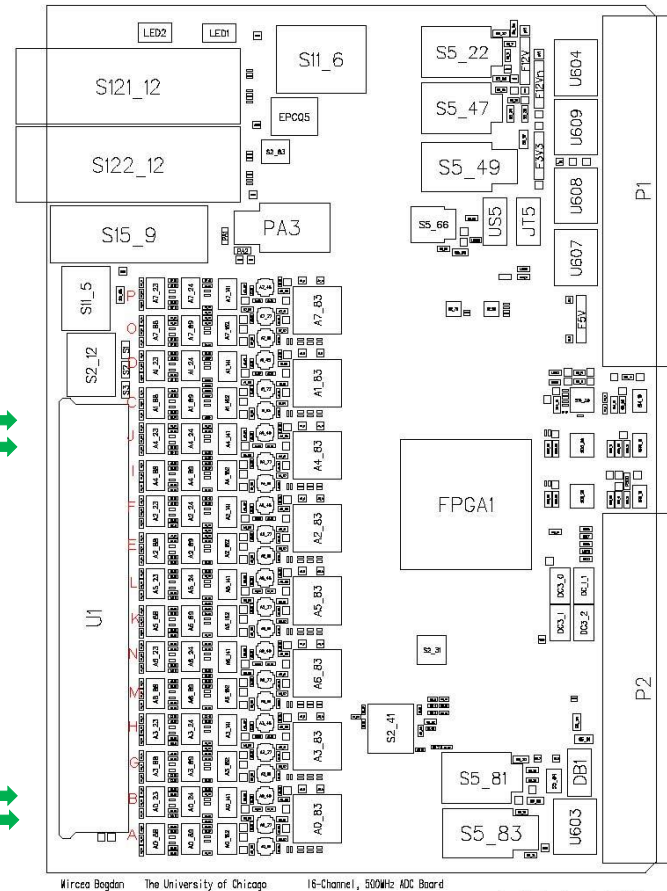
## 16-Channel, 14-Bit, 500MHz ADC Board

New module can be directly  
integrated next to the old ones.

- Same Format
- Same KOTO diff Input Range [-1V;+1V]
- Same Power Requirements
- Same Trigger Inputs
- Each QSFP -> 4 x SFP (with octopus cable)
- One New ADC = 4 x Old ADCs



# 16-Channel, 14-Bit, 500MHz ADC Board



**QSFP: 4 x 6Gbps**

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**SFP: 1 x 6Gbps**

## 1G Ethernet

**KOTO: 4xLVDS**

Analog Signal →  
Analog Signal →

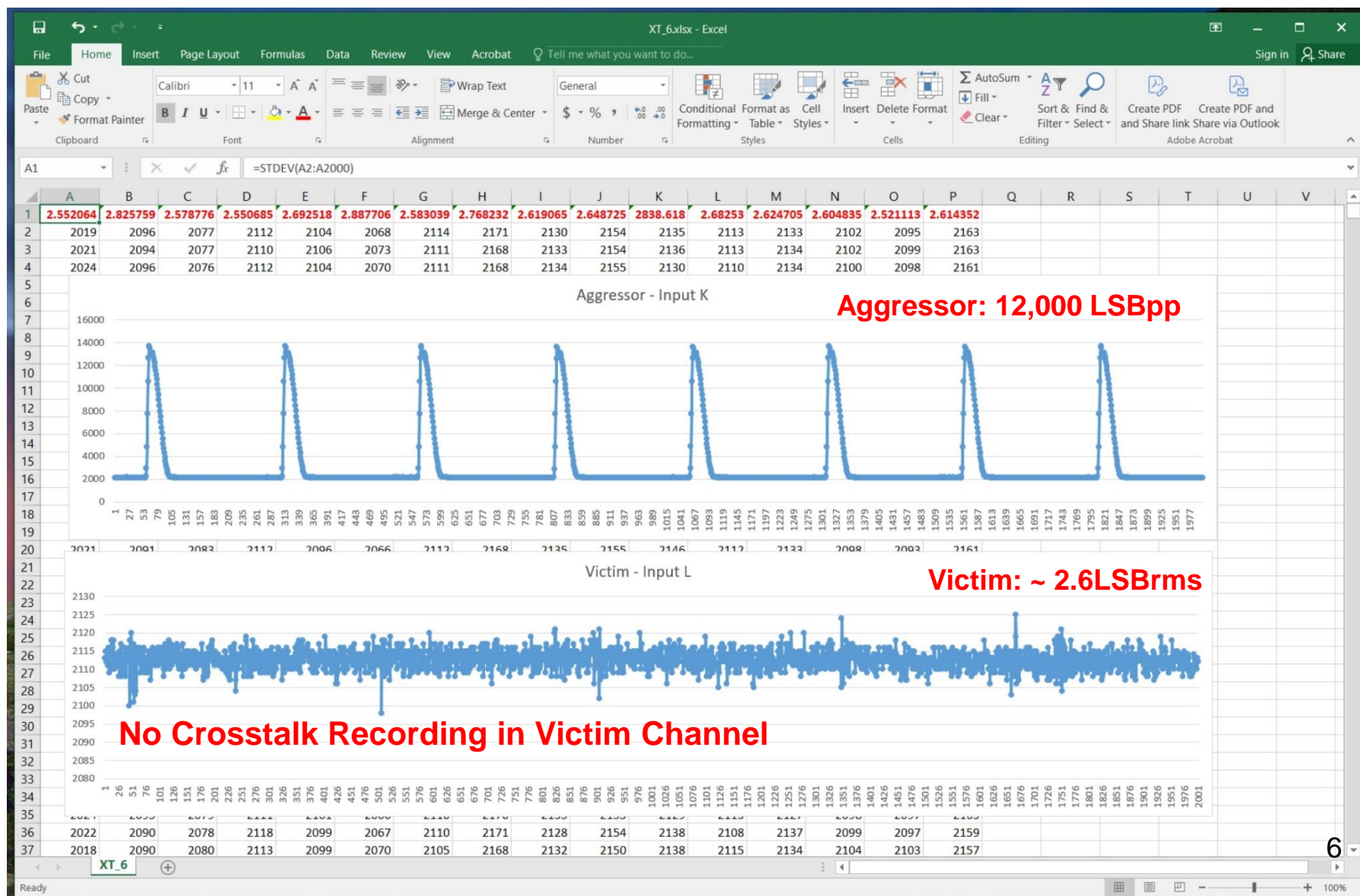
## KOTO Style RJ45 Connection for the Analog Input Signals – 2 signals per connector

**Analog Signal**   
**Analog Signal** 

3005\_ASM\_Top.pdf (uchicago.edu)

# Crosstalk Test

Aggressor and Victim channels in the same RJ45 port and same ADC package

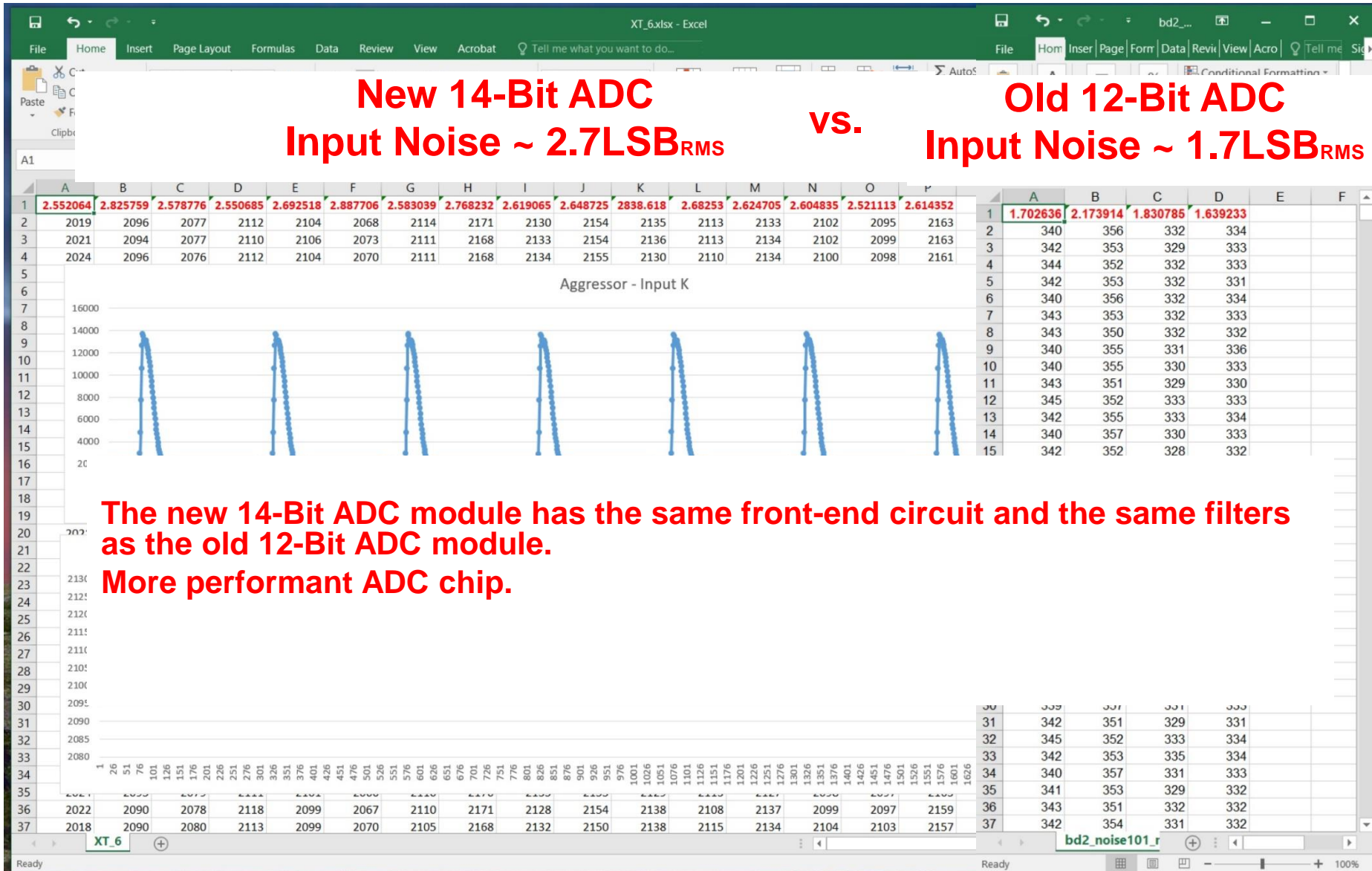


# Input Noise Test

**New 14-Bit ADC**  
**Input Noise ~ 2.7LSB<sub>RMS</sub>**

**vs.**

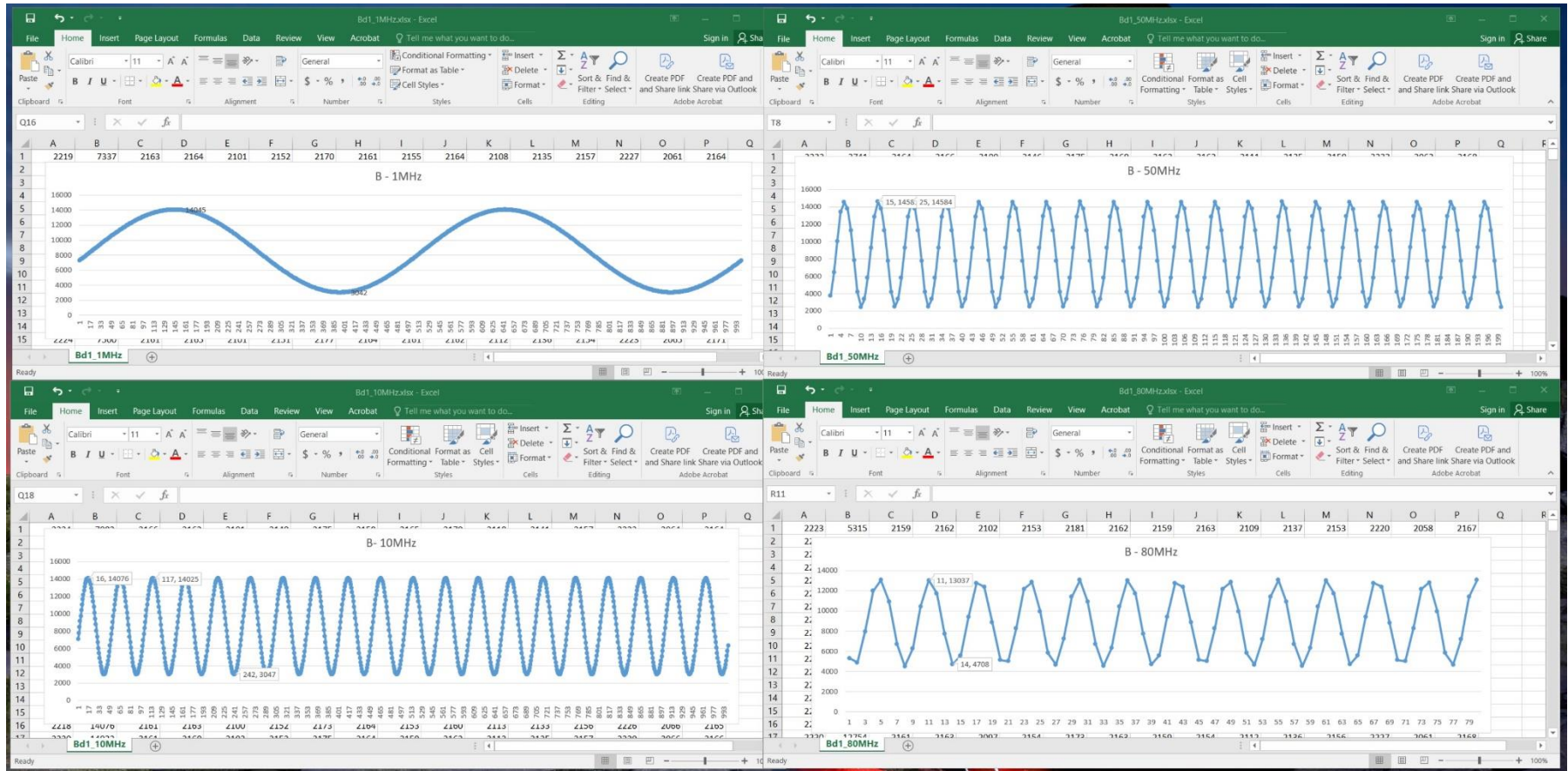
**Old 12-Bit ADC**  
**Input Noise ~ 1.7LSB<sub>RMS</sub>**





# Bandwidth

**Calculated Bandwidth ~100MHz (same as the old 4-Ch, 500MHz ADC module)**  
**Measured Bandwidth ~90MHz**





# ADC Module Dynamic Range

ADC chip theoretical output full scale: [0; 16,000]

Signal distortion observed when output under 1,000LSB

Manufacturer recommendation: signal up to -1dBFS

In datasheet (as with most of ADCs) product performance specified at -1 dBFS.

Adjusted input gain for baseline reading ~2,000LSB

Current Dynamic Range Setting:

Module Analog Input:  $V_{inp} = [-1V; 0V]$ ,  $V_{inn} = [0V; +1V]$

Digital Output: [2,000; 14,000]

Current setting a bit more conservative than -1dBFS

(-1dBFS =  $0.891 \times FS$ , i.e. 14,256 bits)

# Conclusions

**We fabricated two fully functional Rev. B modules and reused the ADC chips from Rev.A**

**Preliminary tests show good performance.**

**To Do:**

- Implement firmware to integrate old KOTO 500MHz ADC functionality in new module.**
- Test new module just like the old one and compare results**
- Replace one existing 500MHz ADC module in next Run**