



AGH UNIVERSITY OF SCIENCE  
AND TECHNOLOGY

# **Progress on ADC development**

**First measurement results with multichannel ADC**

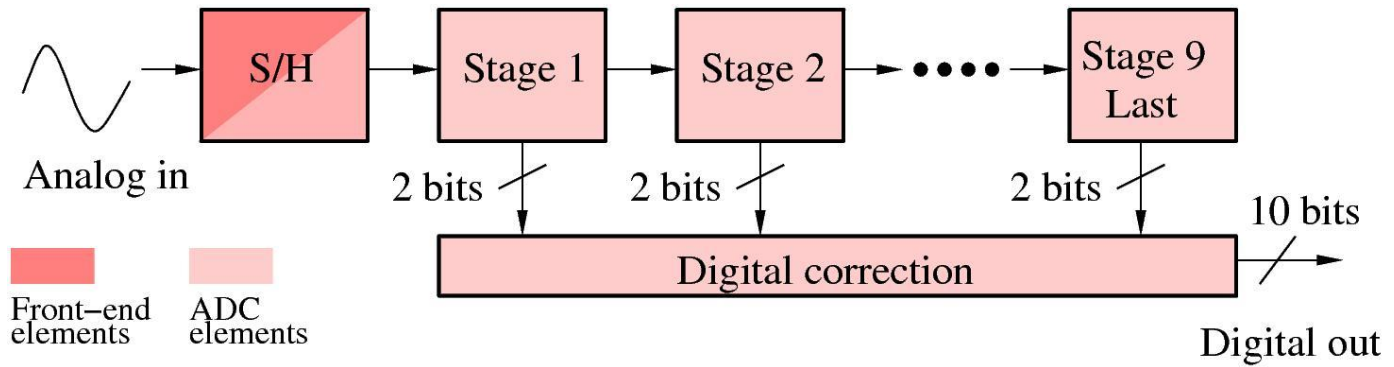
**M. Idzik, K. Świentek, Sz. Kulis, T. Fiutowski, A.K. Prasoon**

Department of Physics and Applied Computer Science

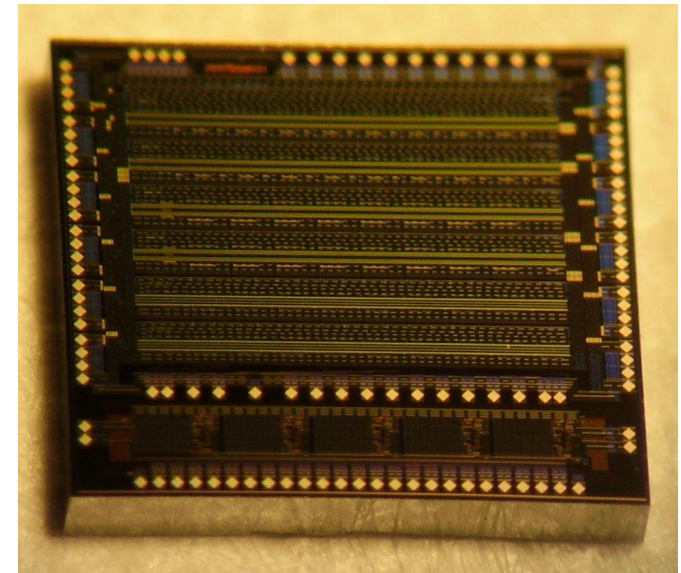
**FCAL Collaboration Meeting , 3-5 October 2010, Tel-Aviv**

- **ADC architecture – reminder**
- **One channel ADC measurements (2<sup>nd</sup> prototype)**
- **Multichannel ADC measurements**
- **Summary**

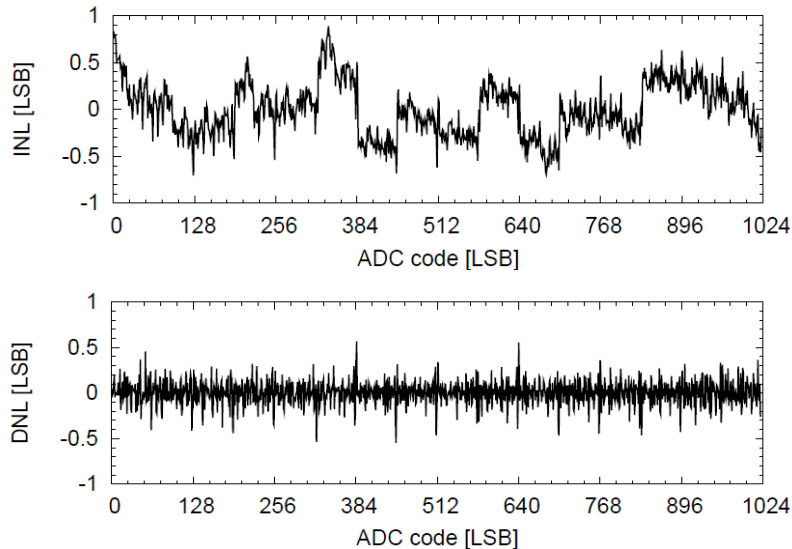
# Single channel 10-bit pipeline ADC



- Variable sampling frequency up to  $\sim 25$  Ms/s
- Scalable power consumption
- Fully differential
- Power switching OFF/ON

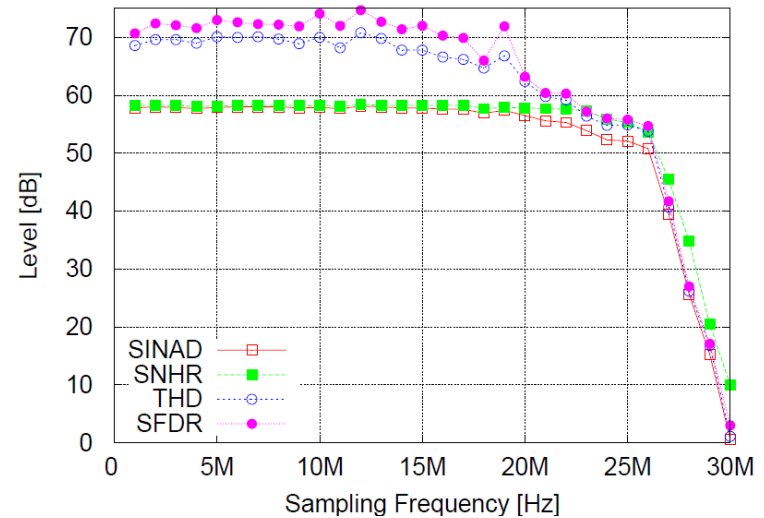


# Static and dynamic parameters (2<sup>nd</sup> prot.)



Static parameters:

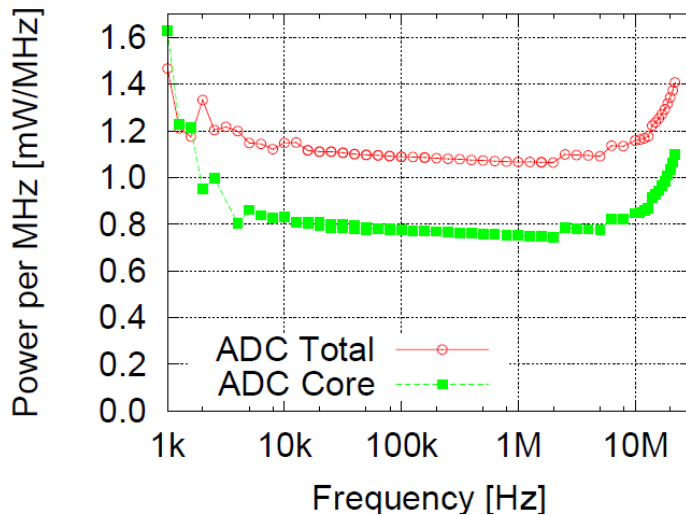
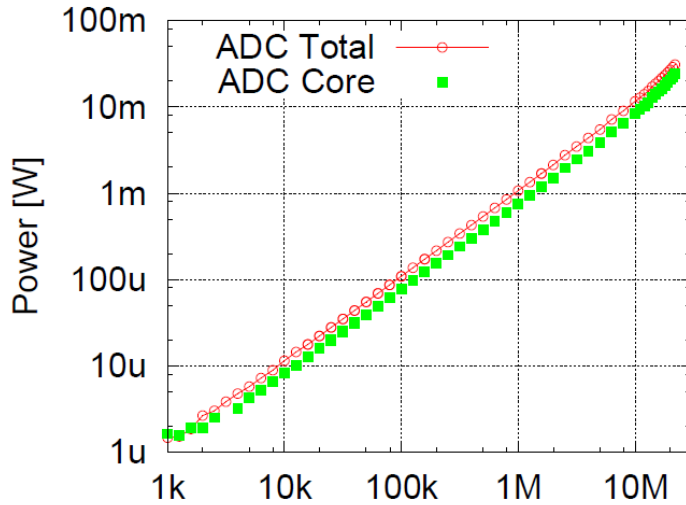
- INL < 1 LSB
- DNL < 0.5 LSB



Dynamic parameters:

- SINAD = 57.7 dB
- ENOB = 9.3
- works well up to 25 MHz

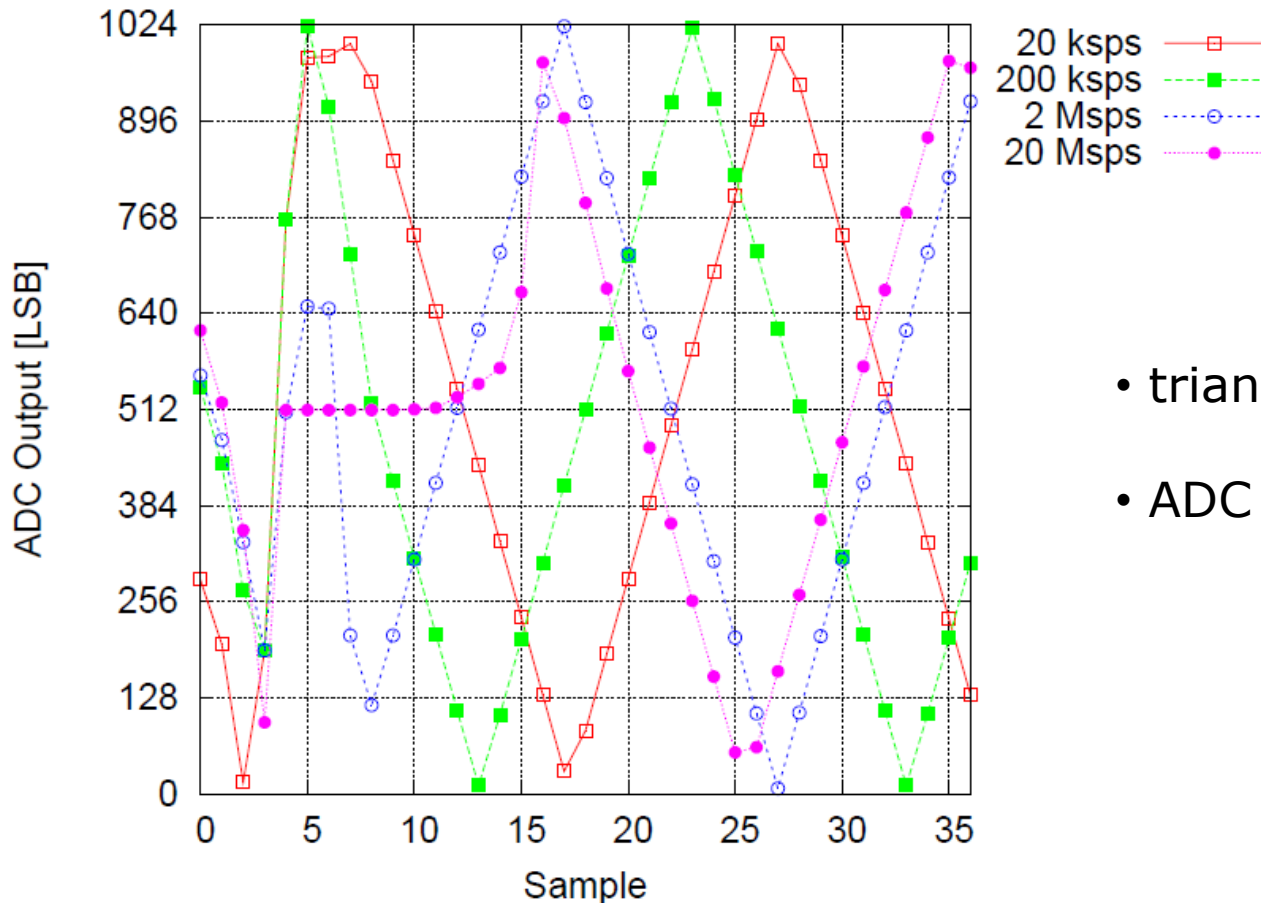
# ADC power consumption (2<sup>nd</sup> prot.)



- Power consumption scales lineary in frequency range 3 kHz ÷ 1 MHz:
- 0.8 mW/MHz with supply 3.0 V (plot)
  - 0.6 mW/MHz with supply 2.6 V

Total includes also I/O buffers

## Power ON/OFF (2<sup>nd</sup> prot.)



- triangle input signal
- ADC power ON at  $t = 0$

**Depending on sampling frequency 8 clock cycles or 800 ns are needed to restart correct conversion**

## ADC summary and future plans



## Summary

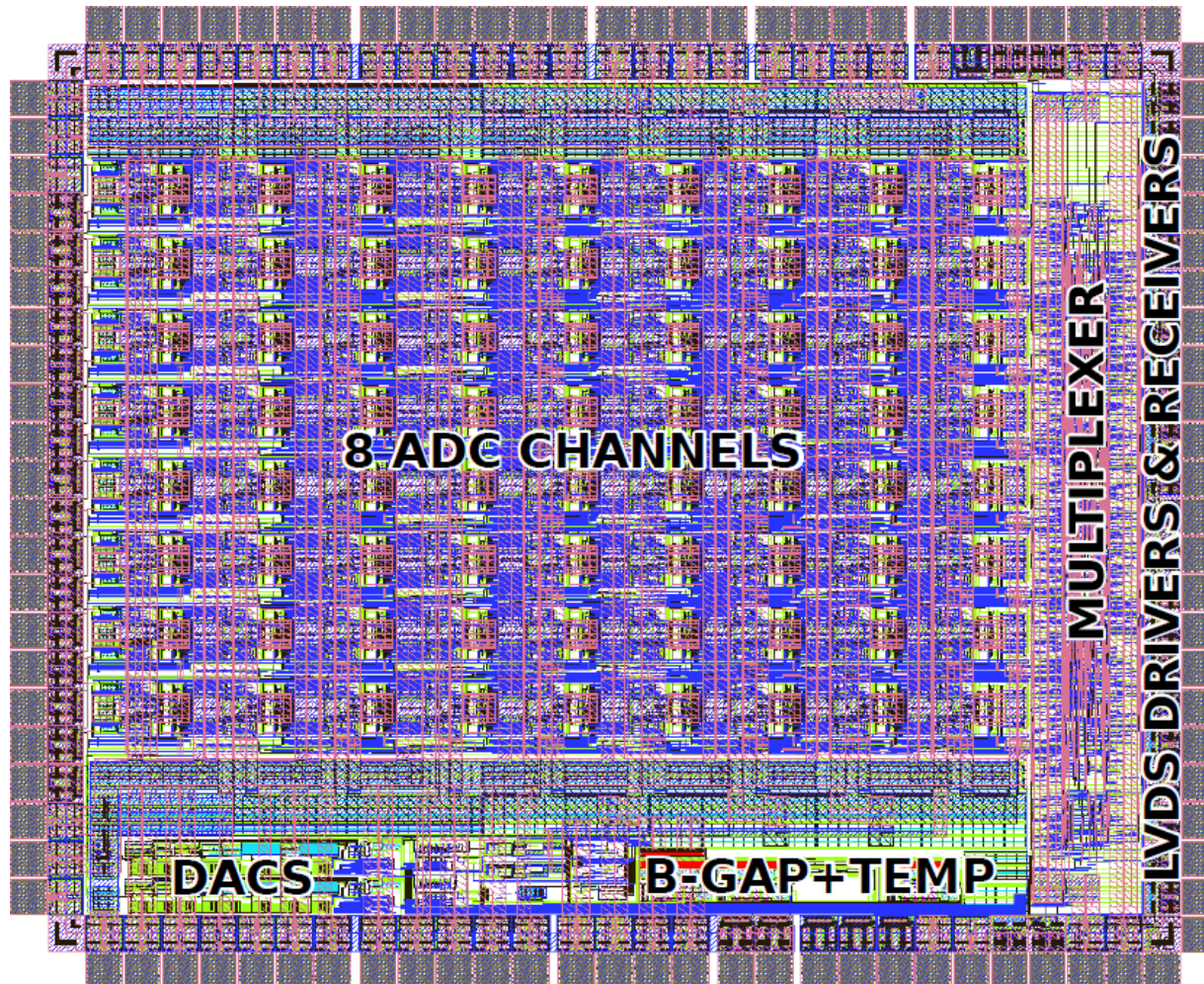
- ADC fully functional and fulfils the requested specifications
- A prototype of the multichannel ADC version should be in cracow in a couple of days...
- Thank you

- Summary
  - New 10-bit prototypes of ADC with and without S/H are fully functional
  - They work stable up to about 35 MHz as expected
  - Static measurements show good DNL, INL & ENOB
  - Dynamic measurements . . .
  - Power consumption can be scaled with frequency
- Future plans
  - Measurements
    - Continue power scaling measurements
    - Perform dynamic measurements
    - Perform clock and power switching tests
  - Prepare multichannel version

June 2009

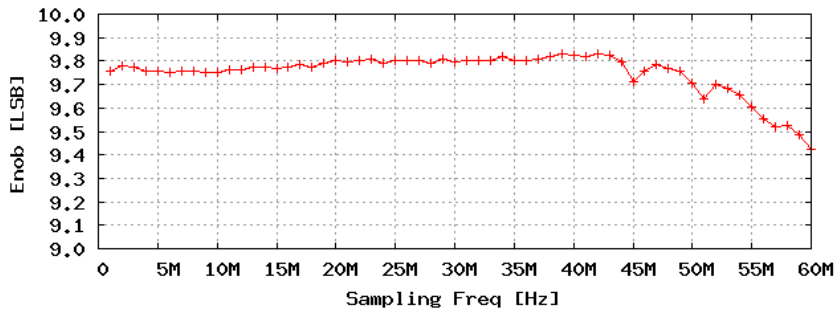
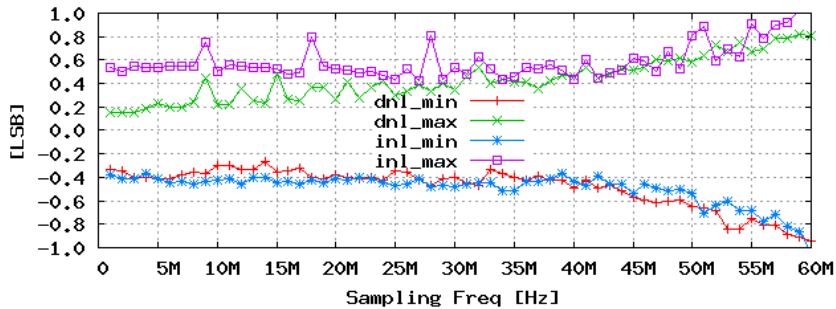
April 2010

# Multichannel ADC



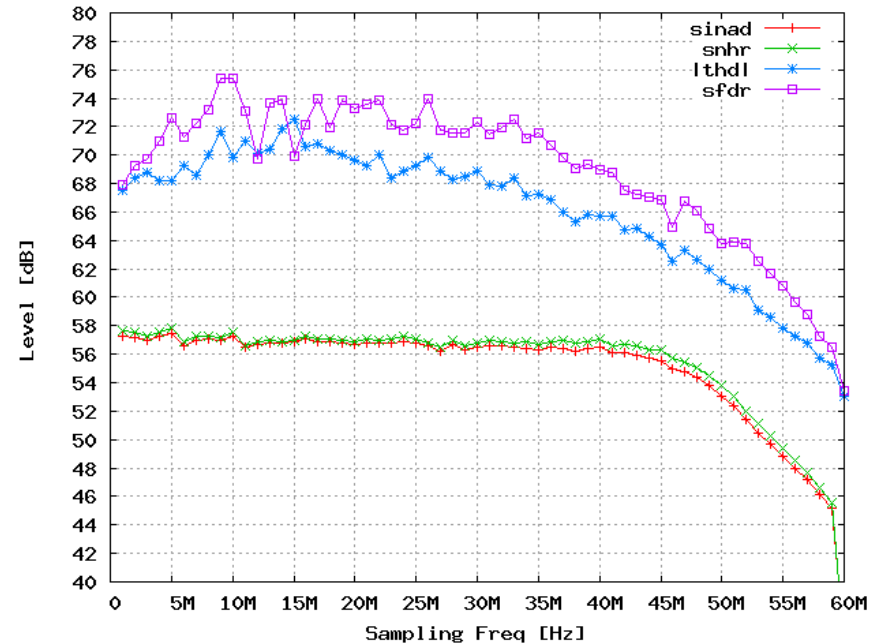


# Static and dynamic parameters



Static parameters:

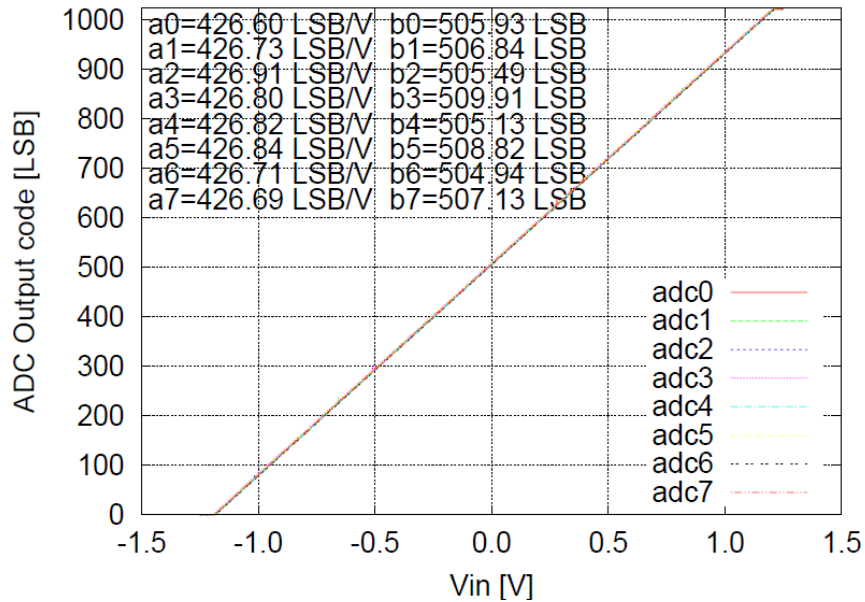
- INL < 0.5 LSB
- DNL < 0.5 LSB



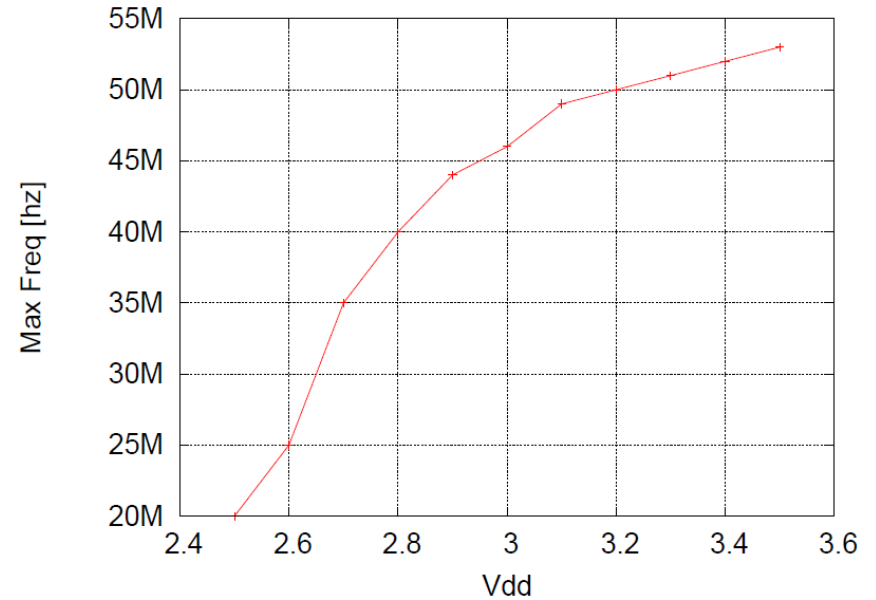
Dynamic parameters:

- SINAD = 57.7 dB
- ENOB = 9.3
- works well up to ~50 MHz

# Parameters spread and max. sampling freq.

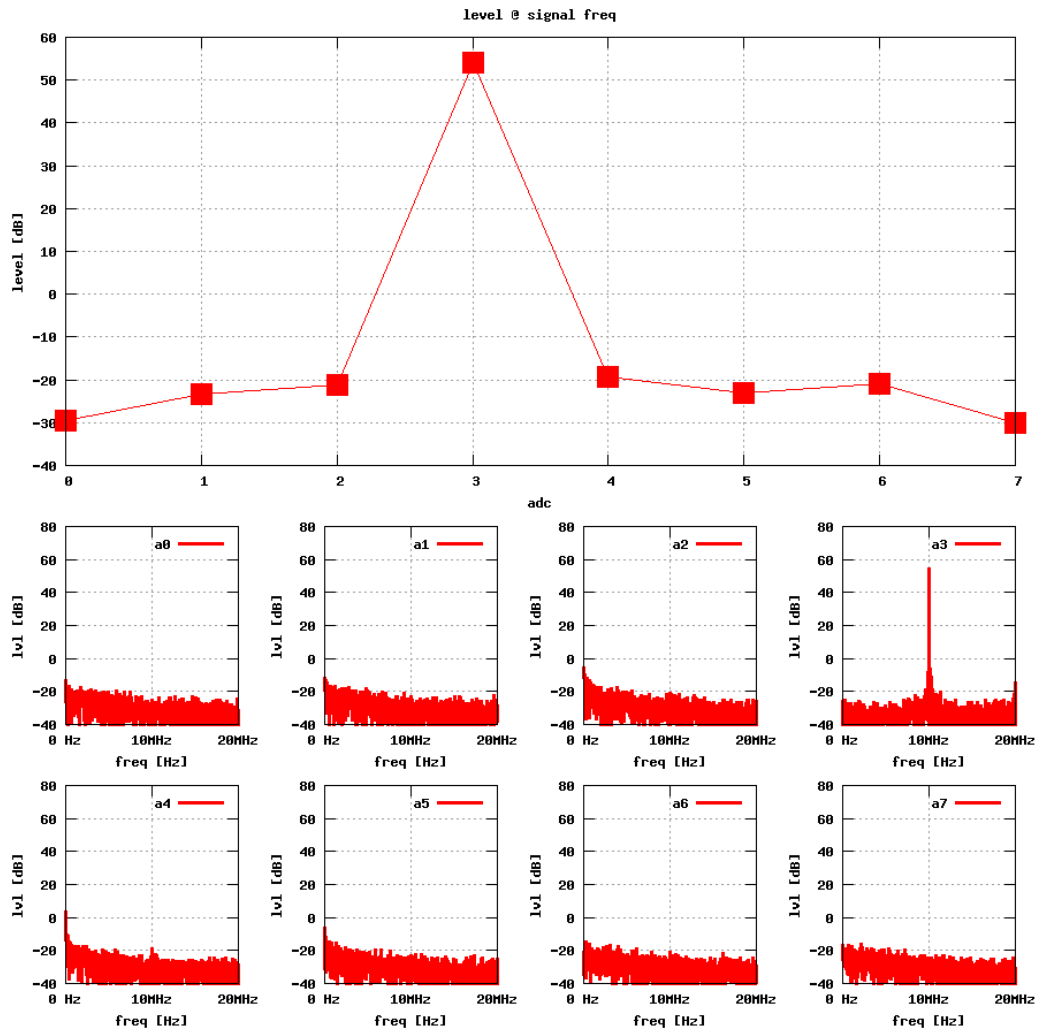


Gain and offset spread < 1%



Higher max. sampling freq.

# Crosstalk





## Summary

- **ADC is fully functional and fulfils the requested specifications**
- **Preliminary measurements of the multichannel ADC are very promising**

# ADC single stage

