#### **MSADC Status**

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## **ADC Problems**

- ADC readout problems from 50 MS/s upwards
  - 12 bit \* 50 MHz →600 MHz data rate →300 MHz DDR clock rate
- New deserializer code with data-eye alignment
- Did not fully solve the problem







#### **ADC Problems**

- High impedance ADC driver (13 k $\Omega$ )
- High FPGA pin capacitance (10 pF)
- Reflections from FPGA not terminated on ADC side
- Additional 100 $\Omega$  termination resistor on ADC side







## **MSADC** Measurements

- Average ADC noise: 0.58 LSB
- Scintillator measurement (<sup>22</sup>Na + LYSO + 400 cell MPPC) Energy resolution:  $\Delta E/E = 20.8\%$  FWHM
- 70 MHz sampling frequency, 6x OpAmp, no PreAmp







# **Power Consumption**

- 32 channels @ 70MS/s
- USB interface card with DC/DC converters
- ~ 13 W (10 W analog / 3 W digital)
  - 7 W for input OpAmps
  - 3 W for ADC analog supply
  - 3 W for ADC digital supply and FPGA (only ADC interface)
    - ("real" firmware will add another 2 5 W)
- ~ 18 W total power consumption
  - DC/DC converter efficiency ~ 70%

(low current region with bad efficiency)

Should increase up to 85 – 90 % near nominal current (ATCA carrier)







### **USB** Status

- USB 1.1 interface working (firmware load, register access, data readout)
- USB 2.0 partly working (firmware load, data readout)
- Problems with USB 2.0 register access (works only once, then USB interface is locked)
- Similar behavior in early Linux USB days
- Same firmware working with USB1.1 PC interface





### **ATCA Integration**







# **Open Questions**

- ATCA backplane pin assignment
  - Gigabit Ethernet
  - Xilinx RocketIO
- Custom backplane signals (clock, trigger)
- Custom interface via RTM (clock, trigger, data IO)
- ATCA base interface switch





## **ATCA Base Interface**

• Base channels shall be 10/100/1000BASE-T

(A four pair point to point interconnect capable of supporting the 1000BASE-T baseband medium and 100BASE-TX and 10BASE-T subject to auto-negotiation as specified in Clause 28 of IEEE 802.3-2002.)

- Shelf-Manager interfaces via Ethernet and switch modules to outside world
- Dedicated switch modules for ~ 1500 USD maybe with option for CPU modules
- Really needed at this stage?
- Can we "waste" one ATCA-Slot for CPU/Switch module (only PC coupled via Gigabit Ethernet)





# **Switch Options**

- "self made" interface module
  base interface -> RJ45 -> external switch
- additional debug connectors to fabric interface, IPMI

- "piggy-back" option for next ATCA carriers
  (16x4x2 = 128 connections + GND shield)
- own GE-switch design



