PANDA EMC meeting
Electronics session

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Agenda:

1. News from GSI ASIC group
   - APFEL ASIC new version - Peter
   - Further plans for APFEL ASIC- Holger
   - Hit detection ASIC   - Holger
2. EMC readout electronics work packages and responsibilities
3. Plans for near future
4. Impact of increased annihilation rate on EMC performance

Work packages

1. Coordination : Mirolsav Kavatsyuk

2. Development system architecture : group of sub-system managers

    Detector requirements

    Readout architecture

    Performance parameters optimization

    integration with slow control

    integration with monitoring system

    system integration

Hardware development

Preamplifier + Shapers	GSI, Basel
Preamplifier board	
Opt.shaper parameters for Basel preamp	KVI
Hit detection ASIC	GSI
Digitizer	Uppsala
Multiplexer	KVI
Monitoring system	
Safety system	
Optical interface	

Firmware development

Digitizer

• Architecture	KVI
• interface protocols	KVI
• data processing	KVI
• slow control	KVI

Multiplexer

• Architecture	KVI
• interface protocols	KVI
• data processing	KVI
• slow control	KVI

Others

Zero suppression algorithm	KVI
Feature extraction algorithm	KVI
Clusterization algorithm	
Software	
Slow control	
Monitoring	
Powering scheme	

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Impact of 50MHz annihilation rate on EMC performance

- **Radiation damage**
  - crystal transparency
  - APD - noise, amplification
  - Preamplifier-shaper - noise
- **FEE**
  - Signal pile up
  - Time/Amplitude resolution
  - Data losses
  - Data rate

- **Detector performance**
  - Event deconvolution
  - Pattern recognition
  - Energy resolution

	@20MHz	@30 MHz	@50MHz
Hit rate			
Barrel	0.1 MHz	0.2 MHz	0.3 MHz
Barrel/forward	0.5 MHz	0.8 MHz	1.3 MHz
Forward	0.8 MHz	1.2 MHz	2.0 MHz
Date rate			
Barrel	8 GB/s	12 GB/s	20 GB/s
Barrel/Forward	16 GB/s	24 GB/s	40 GB/s
Forward	?	?	?

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ADC FEE limitation

Barrel EMC

- APFEL ASIC
  - Rise time 250 ns
  - Pulse length 750 ns
  - Maximum hit rate 500 kHz
- Pileup
  - @20 MHz hit rate 100kHz , pileup 10%
  - @30 MHz hit rate 150kHz , pileup 15%
  - @50 MHz hit rate 250 kHz, pileup 25%

Forward

- Signal length : 70 ns
- Pileup
  - @20 MHz hit rate 0.8 MHz , pileup 6%
  - @30 MHz hit rate 1.2 MHz , pileup 9%
  - @50 MHz hit rate 2.0 MHz, pileup 12%

PANDA data rate

	@20 MHz	@30 MHz
MVD	6 GB/s	9 GB/s
Central Straw	0.4 GB/s	0.6 GB/s
TPC - GEM	100 GB/s	150 GB/s
Planar GEM	8 GB/s	12 GB/s
MDC - Straw	20 GB/s	30 GB/s
EMC		
Barrel	8 GB/s	12 GB/s
Barrel/Forward	16 GB/s	24 GB/s
Forward		
DIRC		
barrel	4 GB/s	6 GB/s
ToP/FDD	20 GB/s	30 GB/s
Total:	180 GB/s	270 GB/s

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Data analysis

- Can we deal with more than one event occurring in the same time?

- What is a minimum time interval between events ?

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