GET MEETING 2014 September 22-25 2014, Saint-Avit Loisirs, FRANCE



<u>G.Cardella</u> for the FARCOS-EXOCHIM collaboration



Farcos physics cases

- 1. Dynamics in heavy-ion collision (low and intermediate energies, stable beams and RIB)
 - Femtoscopy: space-time probes of light particle emitting sources
- 2. Invariant mass spectroscopy (with stable and exotic fragmentation beams)
 - Multi-particle decay correlations
 - Cluster states (alpha-conjugate, boson condensates)
 - Direct reactions

Technical planned features

- High energy and <u>angle resolution (θ,φ)</u>
- Modularity, Flexibility, Portability

Geometry: coupling to 4π and Mag. Spectr. Electronics: integrated, reconfigurable

- Synergy with other highly segmented silicon detectors: shared technical efforts and physics cases with Must2, Trace, ...
- Other features from new electronics:
 - Pulse-shape capabilities (Low identification thresholds)
 - Digitalization of detector signals
 - Wide dynamic range (correlation observables require light particle detection)

Wide dynamic range



We need to see protons but also heavy ions at least up to Neon and this means to measure at least from 0.5 to 500 MeV



And 400 MeV

 α -particles

For some particular experiment we should also go to GeV range (Obviously loosing protons)



FARCOS PROJECTS @ INFN-CATANIA

Based on (62x64x64 mm³) clusters

 square (0.3x64x64 mm³) DSSSD 32+32 strips
 square (1.5x64x64 mm³) DSSSD 32+32 strips
 4 60x32x32 mm³ Csl(Tl) crystals

 4 Csl(Tl) crystals (3rd stage)

 DSSSD 1500 µm (2nd stage)
 DSSSD 300 µm (1st stage)

Fully reconfigurable: more Si layers, \rightarrow neutron detection (future?)

132 channels by each cluster

Important step for the future



Do you know that we got from INFN money to change CsI electronics for CHIMERA an we decided to use GET electronics – now we already received 8 ASAD for this and we ordered 3 COBO and 1 Mutant card

This year we presented to INFN a plan to build a total of 20 Farcos telescopes in 5 years

We want to buy next year the electronics for these detectors - 15 ASAD cards - 5 Cobo - 1 Mutant

Our project was approved and we will have money in January

Future experiments: Break-up -measurements



We are doing a check with published data measured around 30 MeV/A to verify calibrations and efficiency

A new dedicated experiment with more complete angular coverage and better resolution to look for such exotic states in ¹⁰Be but also in ¹⁶C and all the other beams produced will be performed at the end of this year



Future experiment: the Pygmy resonance measurement



G.Cardella ERICE 2014

Test with FARCOS and GET electronics: FPN



Fig. 7: Schematic of a FPN channel.

Structure of the fixed pattern noise channels from the AGET description document



Test with FARCOS and GET electronics: need of FPN

One can better understand the use of FPN channels looking to these signals. Here we show the signals that we can register from channels of ASAD with no input



You can see that some structures are present in the signals, and that the shape of the "noise" is similar in all channels. This common "noise" can be therefore removed subtracting the FPN channels from the channels connected to detectors

Test with FARCOS and GET electronics: FPN effect

This is the pulser spectrum obtained sending various values of pulser signals integrated without subtracting the fixed pattern noise to the baseline With a zoom on the peak around channel 2000



Doing, on the same set of data, the FPN subtraction, we get a much better result, comparable to results obtained with CHIMERA DAQ



CsI(Tl) test with GET: alpha signals



CsI(Tl) test with GET: gamma - signals



FARCOS DSSSD test with GET: alpha analysis



give the same result.

Red line is the digitized alpha signal (100 MHz G-2Input) after subtraction of the nearest FPN channel and baseline restore, in black the result of our digital filter (triangular filter with 321 points +-160 points before and after the point to be averaged). After the filter we take the maximum of the signal and we plot on the histogram you have seen.



On beam CsI-test

Tandem beam ⁷Li 27 MeV on various targets





On beam CsI-test

Tandem beam ⁷Li 27 MeV on various targets



Same detector different ACQ



DSSSD BEAM TEST - Fit of elastic scattering peak seen in all strips with Rutherford weighted angular distribution



We extract an average energy resolution of about 0.3% (include electronic noise and beam spread) 27 MeV= 80 keV

DUALGAIN module to match dynamic range

We need to use two channels of GET electronics for each strip and for some of the CHIMERA CSI



Ackonwledgments

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THANK YOU FOR YOUR ATTENTION !!!