

BEPCII wire scanner system

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outline

- Introduction of wire scanner
- The control of wire scanner
 - ✓ Local machine control
 - ✓ High level application
- Summary



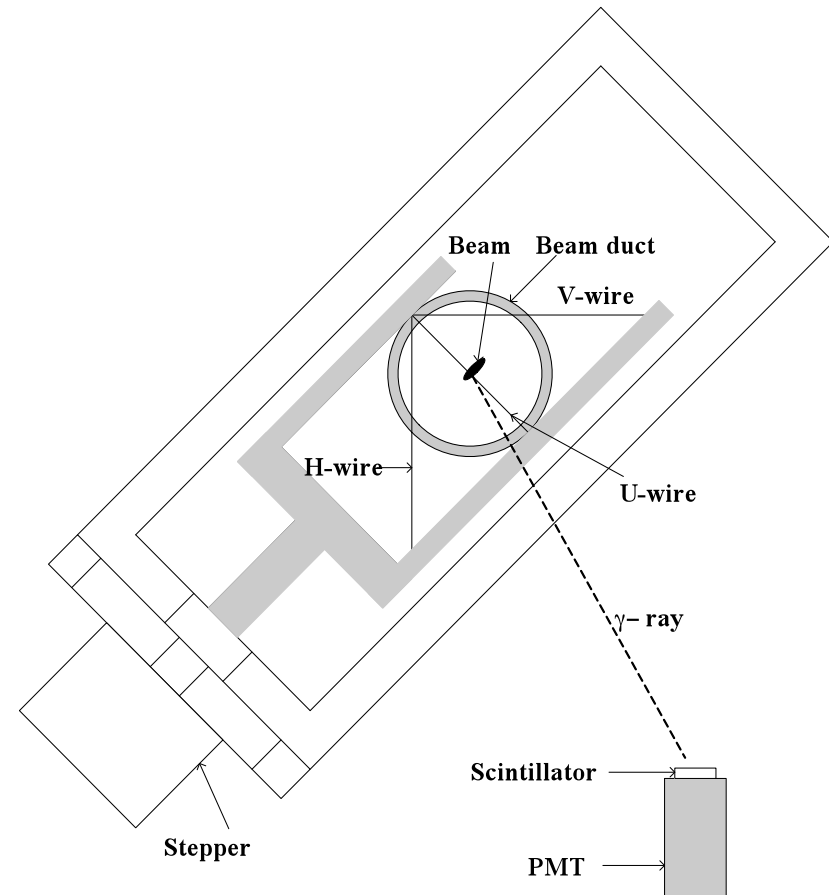
Introduction of wire scanner

- Wire scanner is a common device for beam profile measurement.
- Using three or more wire scanners, beam emittance can be measured online.



Introduction of wire scanner

- In the measurement, a gold plated wire is moved across the beam transversely and gamma-ray photons, and secondary-electron, which are caused by the interaction between beam and wire, are observed by a detector (Photomultiplier Tube with scintillator on head). Recording position of wire and signal from detector and then fitting them with Gaussian shape, we can obtain beam size.





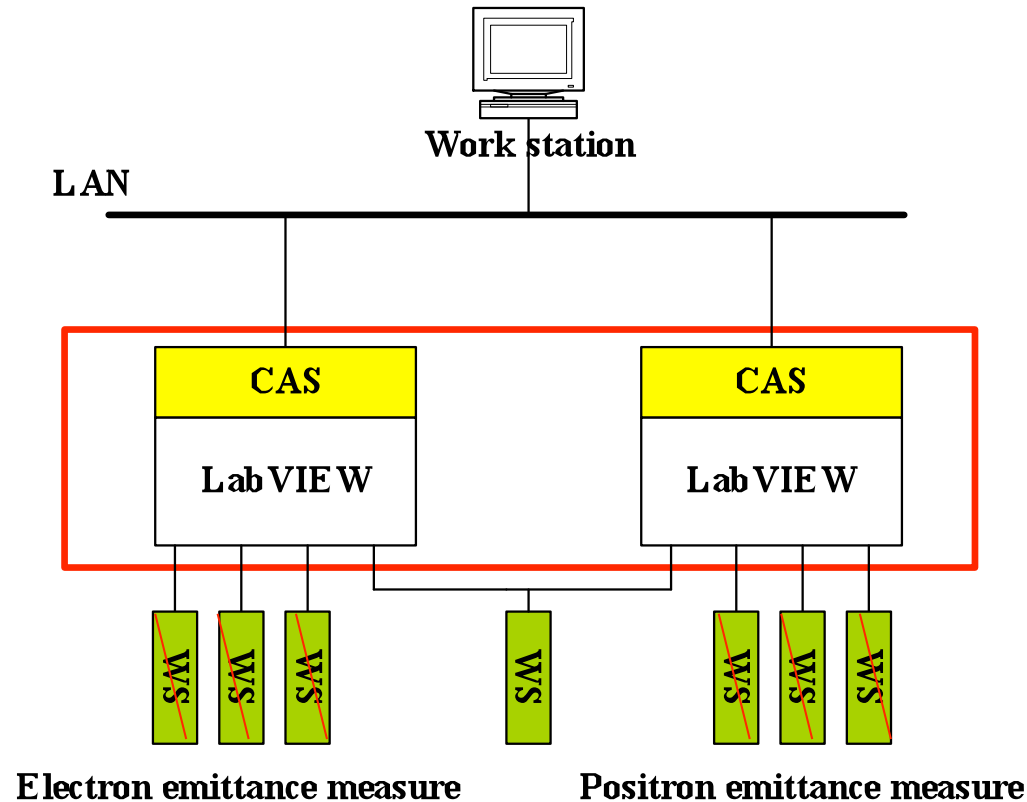
Introduction of wire scanner

- the control system functions are:
 - ✓ Data-Acquisition: the position of the wire and the amplifier of the Photomultiplier Tube (PMT) detector.
 - ✓ Motion control: controlling the step motor move into and out of the beam.
 - ✓ Set Voltage of PMT detector.



The control of wire scanner

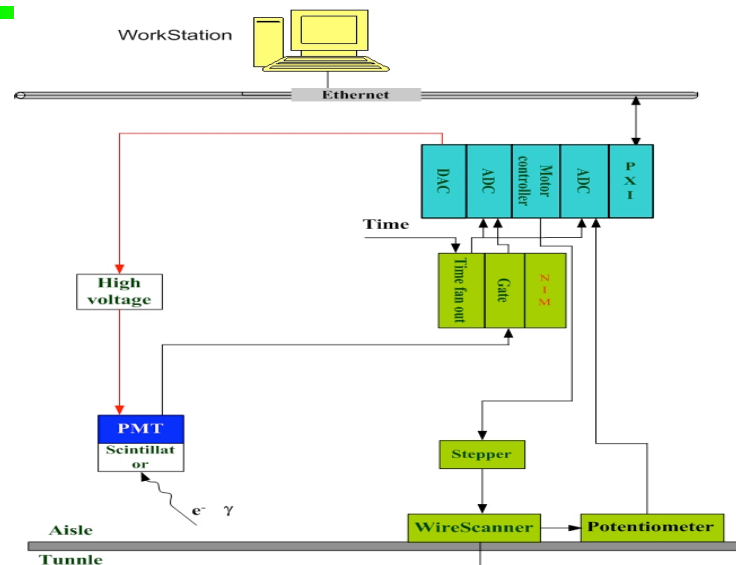
- The control system of the wire scanner adopts client/sever architecture .





The control of wire scanner

- The controller NI-PXI 8195, Intel Celeron 1.5G.
- the controller runs Windows as operating system and LabVIEW as programming environment.
- Build an IOC combined a Share Memory Interface on PXI controller.



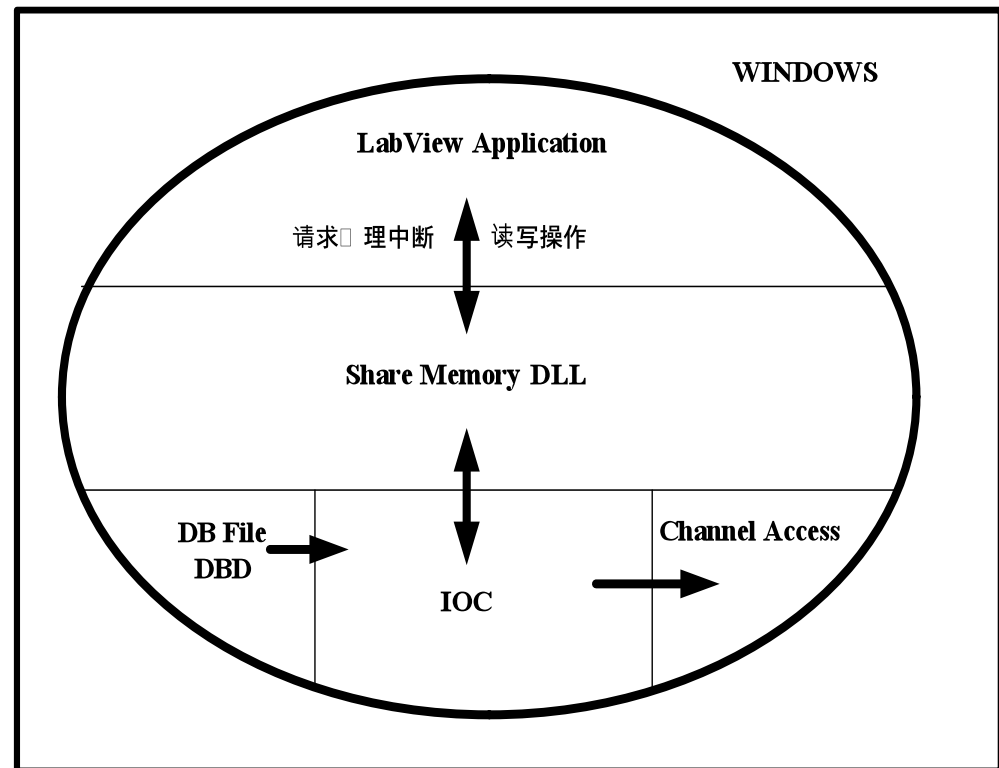
The schema of wire scanner





The control of wire scanner

- the software architecture of local controller
 - Three components: a dynamic link library (DLL), IOC device support and labVIEW applications.
 - Data is shared equally between applications.
 - DLL supports reading and writing of data and also the event handling.





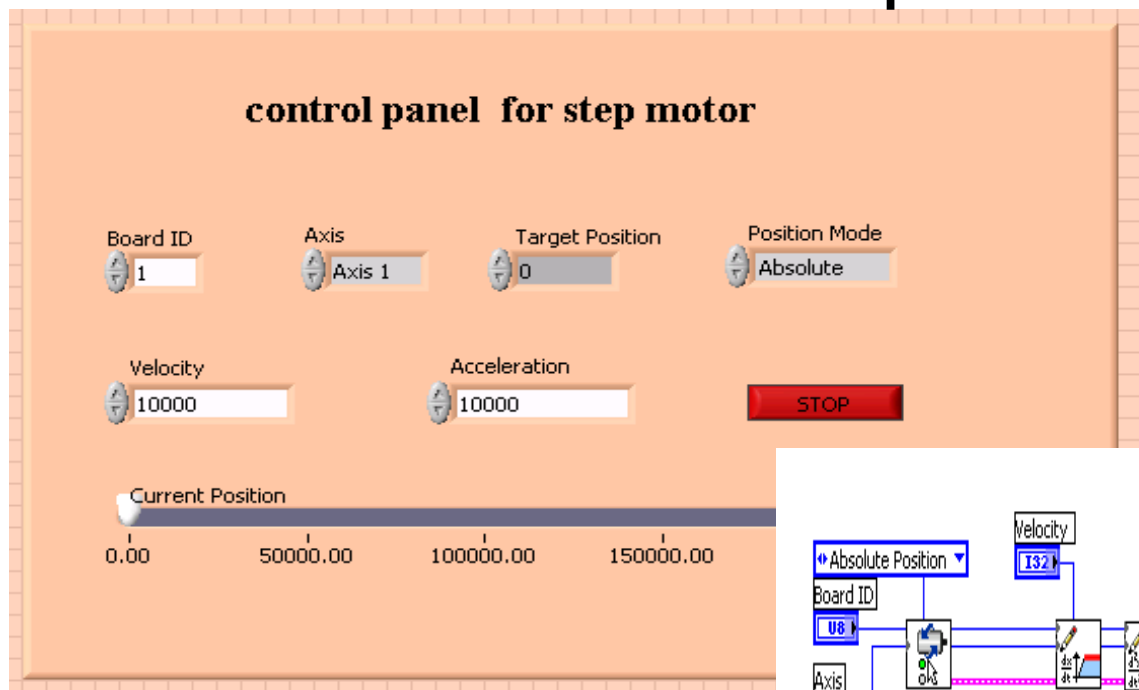
The control of wire scanner

- The program in local machine is developed in LabVIEW. It contains three subprograms. The initial program, motor control and DAQ.
- The program in local machine is transparent to high level application and only operators can modify the program in local station.

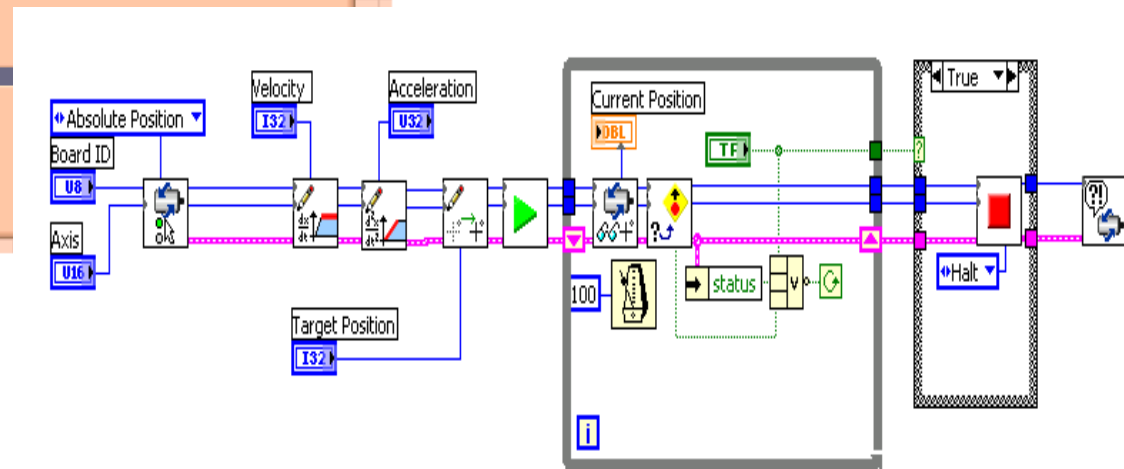


The control of wire scanner

- The motor control panel of local controller.



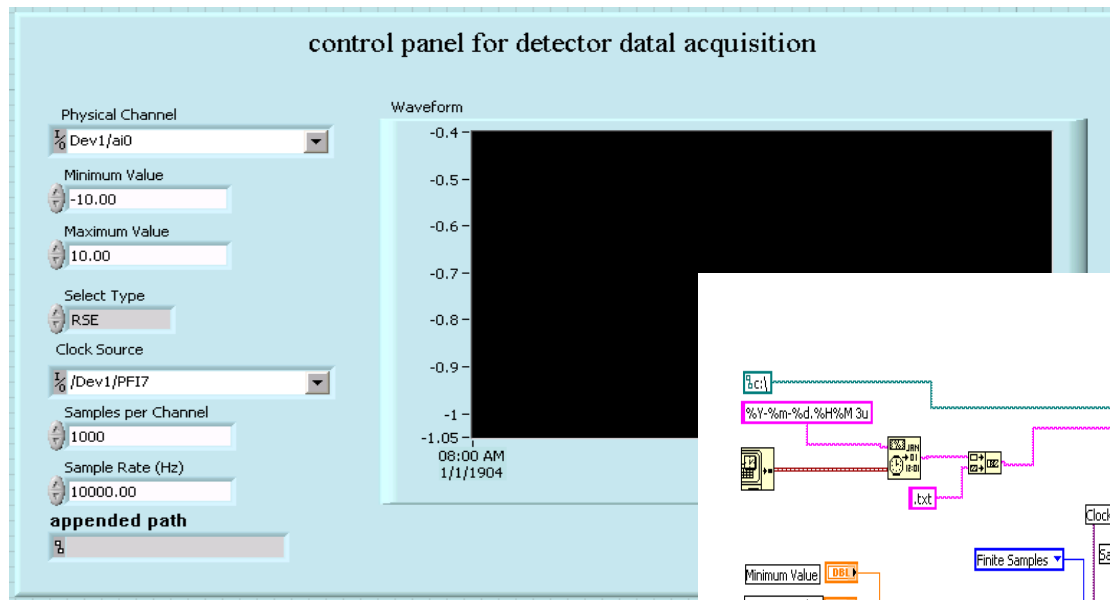
- Set parameter for motor. Such as velocity, target position, etc.



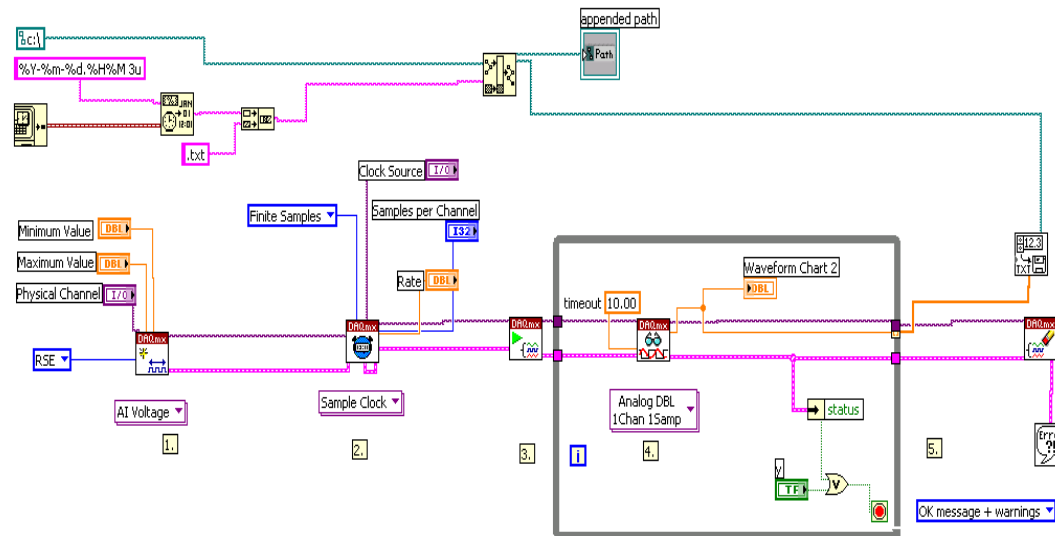


The control of wire scanner

- The Data-Acquisition in local controller.



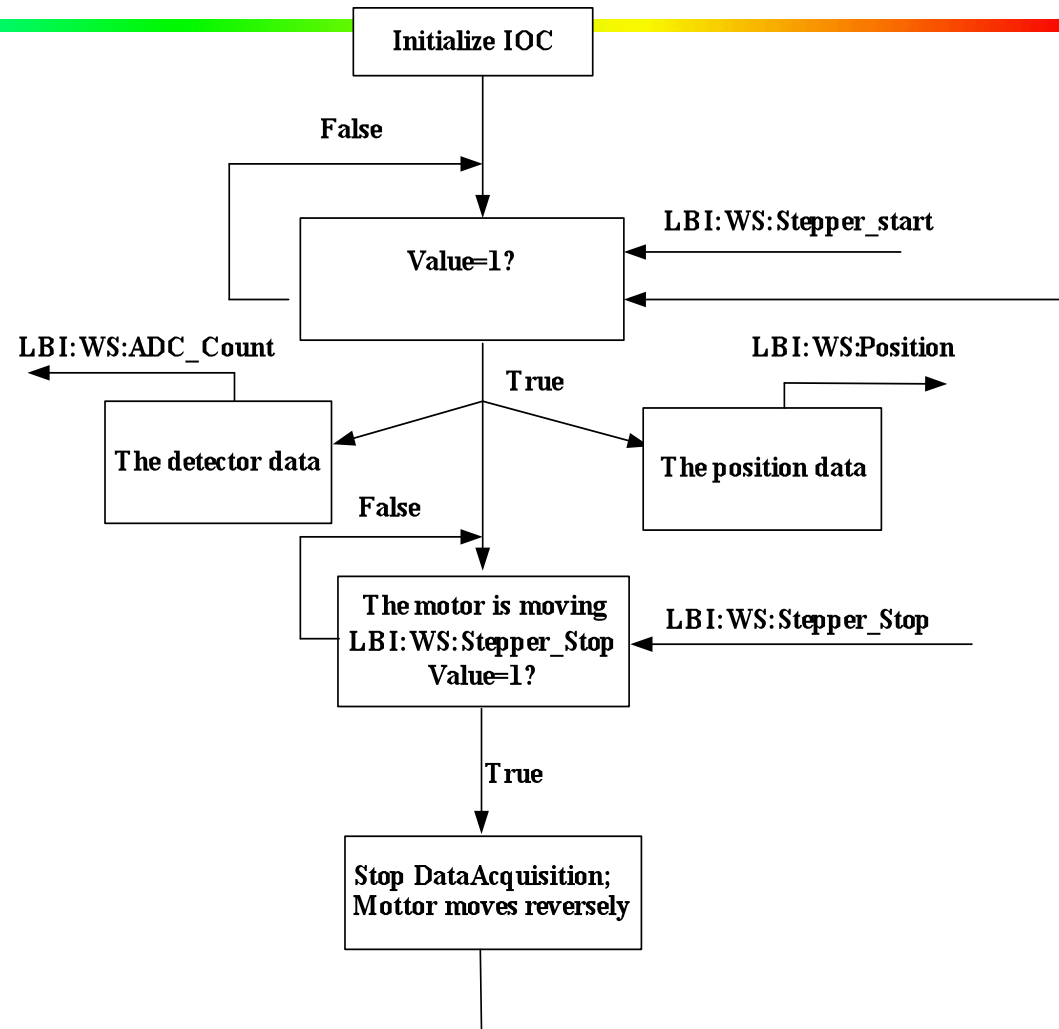
- Set parameter for DAC.





The control of wire scanner

- Scanning
LBI:WS:Stepper_start . if the valuse is “1”,the wire scanning and DAQ starts.
- In the processing, if there is an interrupt, the motor returns to intial position and DAQ stop.



The control logic of wire scanner



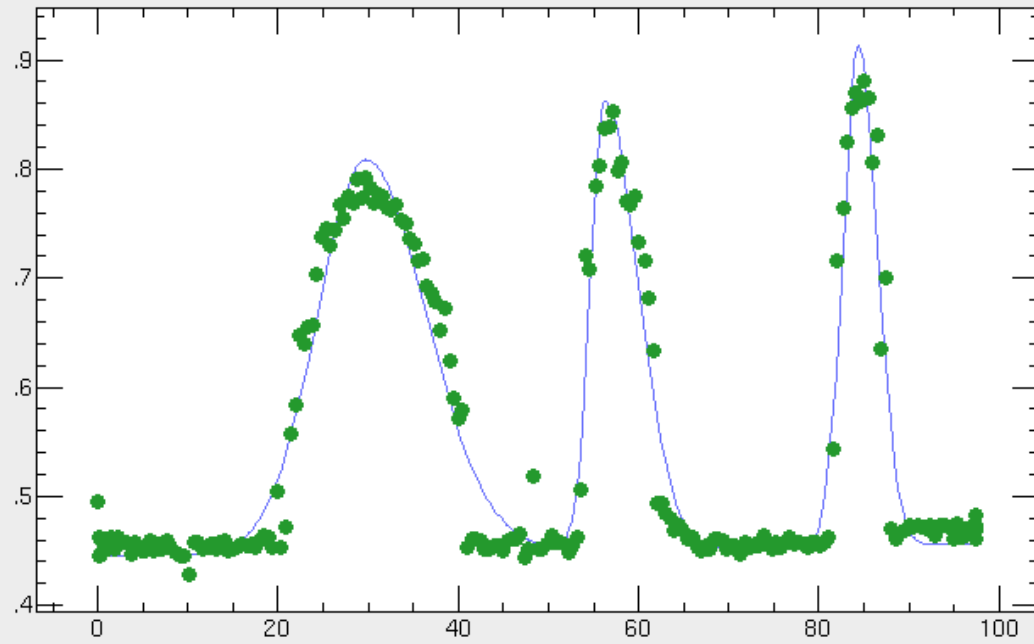
The control of wire scanner

- High level application is developed in SAD.
 - ✓ HLA runs on the sever station.
 - ✓ Remote control panel. Start/stop/pause a scanning; apply high voltage to PMT detector.
 - ✓ Data process. Fit the data with Gaussian and calculate the beam size.



ChiSquare = .18739 Goodness = .48657

sigma1 = 6.03427 +/- .17712	sigma2 = 2.61448 +/- .09520	sigma3 = 1.91403 +/- .07432
asymm1 = .11172 +/- .05490	asymm2 = .39851 +/- .06645	asymm3 = .11031 +/- .07519
xwire1 = 29.7212 +/- .40271	xwire2 = 56.2839 +/- .21260	xwire3 = 84.4014 +/- .17567
b1 = .35994 +/- .00850	b2 = .41122 +/- .01264	b3 = .45982 +/- .01470
a1 = .44527 +/- .00539	a2 = 1.09E-4 +/- 8.69E-5	



Function = (a1\$148+(a2\$148 x\$148)+(b1\$148 Exp[(-.5 (((x\$148+(-xwire1\$148)) ((sigma1\$148 (1+(asymm1 Sign[(x\$148+

Start

Current Wire Position = 97.52199999999988 mm

Save Screen

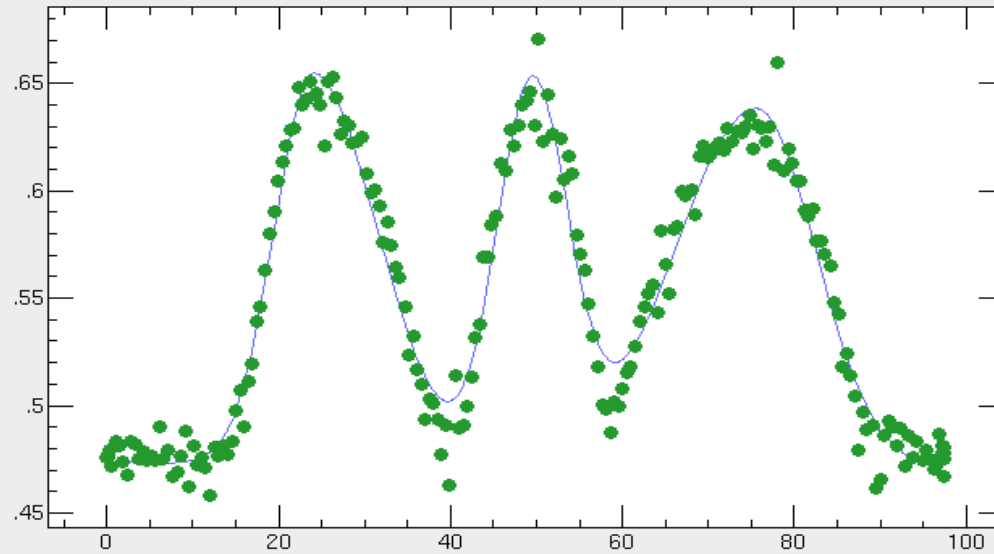


Display of fitted positron beam profile (raw data is green point, fitted data is blue line)



ChiSquare = .03048 Goodness = .48857

sigma1 = 5.97701 +/- .15194	sigma2 = 4.11240 +/- .13219	sigma3 = 8.16349 +/- .23997
asymm1 = .24699 +/- .04616	asymm2 = .01424 +/- .06237	asymm3 = -.15679 +/- .05283
xwire1 = 24.0504 +/- .32510	xwire2 = 49.4882 +/- .28459	xwire3 = 75.6200 +/- .46349
b1 = .18203 +/- .00371	b2 = .17751 +/- .00434	b3 = .16746 +/- .00376
a1 = .47353 +/- .00244	a2 = -3.6E-5 +/- 4.64E-5	



Function = (a1\$150+(a2\$150 x\$150)+(b1\$150 Exp[(-.5 (((x\$150+(-xwire1\$150)) ((sigma1\$150 (1+(asymm1 Sign[(x\$150+

Start

Current Wire Position = 97.52199999999988 mm

Save Screen



Display of fitted electron beam profile (raw data is green point, fitted data is blue line)



summary

- The preliminary measurements of the beam transverse size show that the system performed well.
- We are planning to install more wire scanners for measuring beam emittance online .



Thanks for your attention !
Any question ??