Elettra Sincrotrone Trieste

Wire Scanner Diagnostic System

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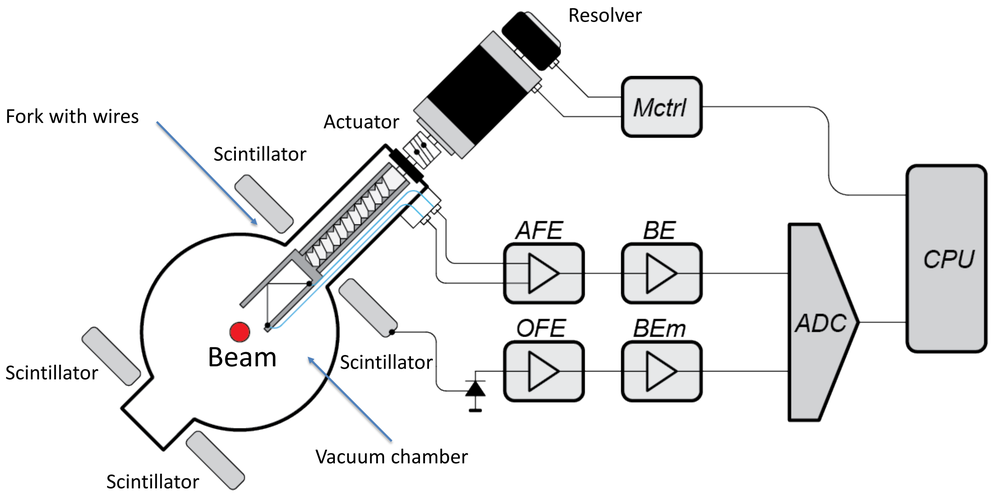
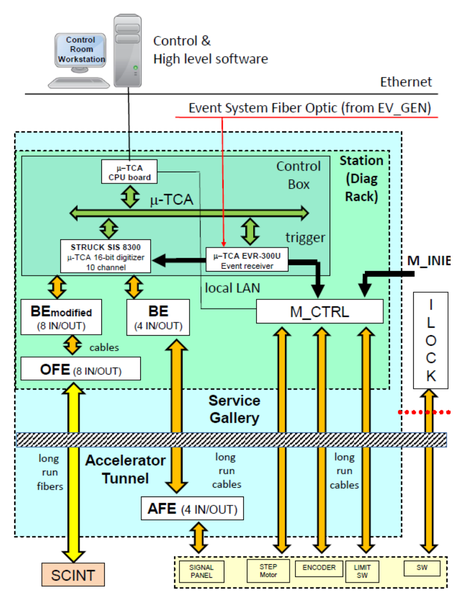
The ESS diagnostic system adopts Wire Scanners for the measurement of the transverse beam profile. The purpose is to acquire and to made available to the ESS ICS the signals either electrical or optical generated when a thin metal wire is scanned across the ESS accelerator beam. The amplitude of these signals is proportional to the charge density of the beam and the beam transverse profile may be obtained by plotting the signal amplitudes vs. the wire transverse position.

System general outline



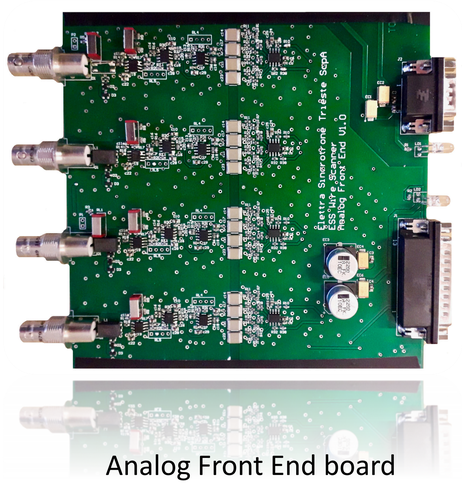
To EPICS system control

WS ACQ SYS global picture

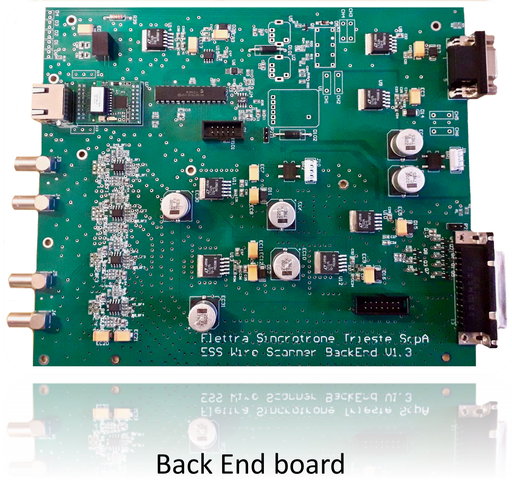


A schematic representation of the WS operation

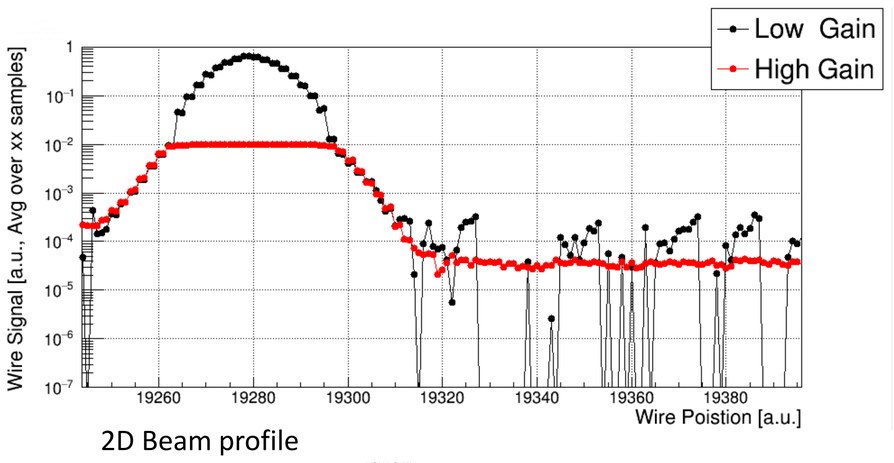
AFE / BE for the SEM current read out



Analog Front End board

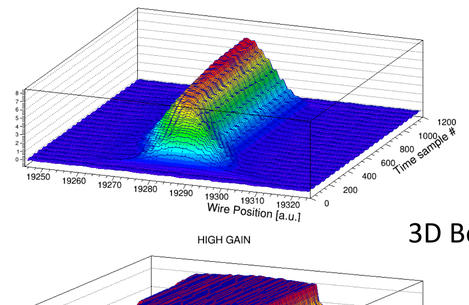


Back End board



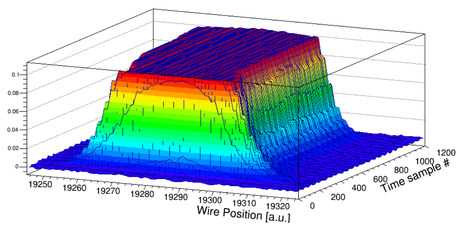
2D Beam profile

LOW GAIN



3D Beam profile

HIGH GAIN

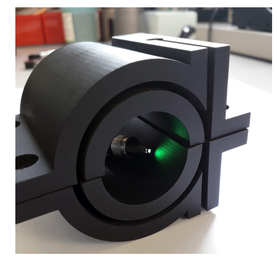


The AFE Trans impedance Amplifier (TIA) convert the ultra-low current generated in the wire into a voltage. This voltage is transmitted to the acquisition system at long distance, outside the machine tunnel.

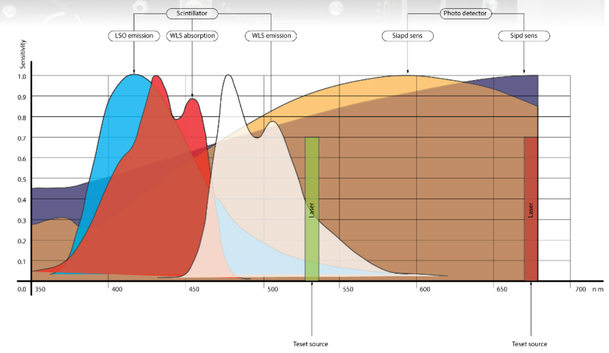
The Optical Front End (OFE) v1 and v2

Optical Front End assembly v1 and v2

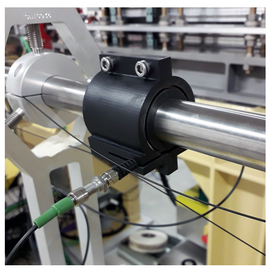
Scintillator fiber



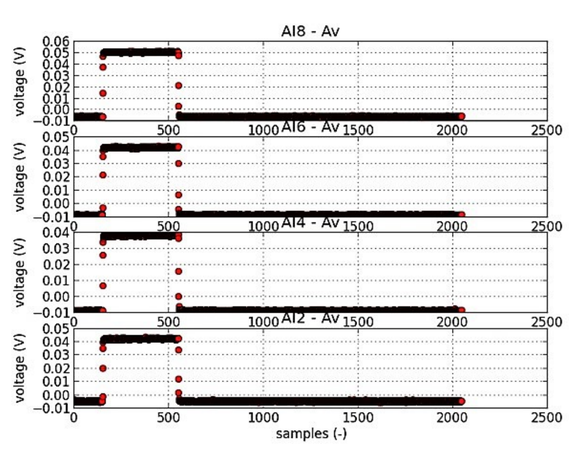
Scintillator holder



Light wave length spectrum



Scintillator assembly



OFE Beam profile

The OFE is an 8-channel module used to convert into electrical signal the light pulses coming from the scintillator and propagates up to the service gallery in optical fibers where OFE is located.

In order to interface the front end modules to the digital acquisition part of the system, dedicated back end modules have been developed.

In the development of the WS ACQ SYS modules and of the associated control software, a fundamental role has been played by the in-field tests of the modules in a real accelerator environment.