

Monitoring Waveforms Using WE7000

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<talk presented by> N. Kamikubota, KEK

and J-PARC Control members

Contributions to the EPICS Meeting from KEK/JAERI (KEKB/J-PARC)

- WE7000-based waveform monitor
by M.Takagi
- Cookies for coffee break
by N. Kamikubota

J-PARC Status during 2004-2006

YEAR	KEK - Tsukuba	JAERI - Tokai
2004	Pre-injector part * Commissioning	Build. Constructions
2005		Linac - Installation Rings - Constructions
2006		Linac - Commissioning will start in autumn

* 60MeV Proton Linac at KEK

(In fact, 20MeV achieved)

Prototype EPICS-based control

More will be in the Talk

By T. Katoh on Monday

WE7000 and Waveform Monitoring

- WE7000 – a measurement station
 - A commercial product by Yokogawa
 - **Module-type**: Various measurement modules at low cost
 - **PC-based**: MS Windows tools are provided by Yokogawa
 - **Network-based**: Ethernet connection is possible
- WE7000 in J-PARC project
 - Use WE modules as **front-end Interfaces**
 - Use an **oscilloscope module (WE7111, 100MS/s, 1ch/module)** as a low-cost waveform-monitor
 - Used in the **MEBT/DTL1 beam-commissioning studies at KEK in 2004**

(WE7000 – a measurement station)

WE7000 station

CPU module
(SH)

Ethernet
module
(WE7052)

100MS/s
oscilloscopes
(WE7111)



Development of WE software

Fiscal Year 2001	Developed EPICS drivers and device supports for three modules 100 MS/s oscilloscope (WE7111) 100 kS/s digitizer (WE7271) 10 MHz function generator (WE7121)
Fiscal Year 2002 Fiscal Year 2003	Measurement of basic performance of WE7111 Debug and enhancement of the drivers with EPICS Reference - ICALEPCS2003 WP565 「Network-based waveform monitor for the J-PARC Accelerator Complex」
Fiscal Year 2004	Developed application software of beam-monitors for the J-PARC pre-injector at KEK campus Used in the beam-commissioning studies of MEBT and DTL1

Beam Diagnoses Signals and IOCs

	SCT (current)	FCT (energy)	BPM (position)	Total	IOC
MEBT	3	3	16	22 (3 WE stations)	1
DTL1	2	2	4	8 (1 WE station)	1

The values in the table are numbers of WE7111 modules

EPICS

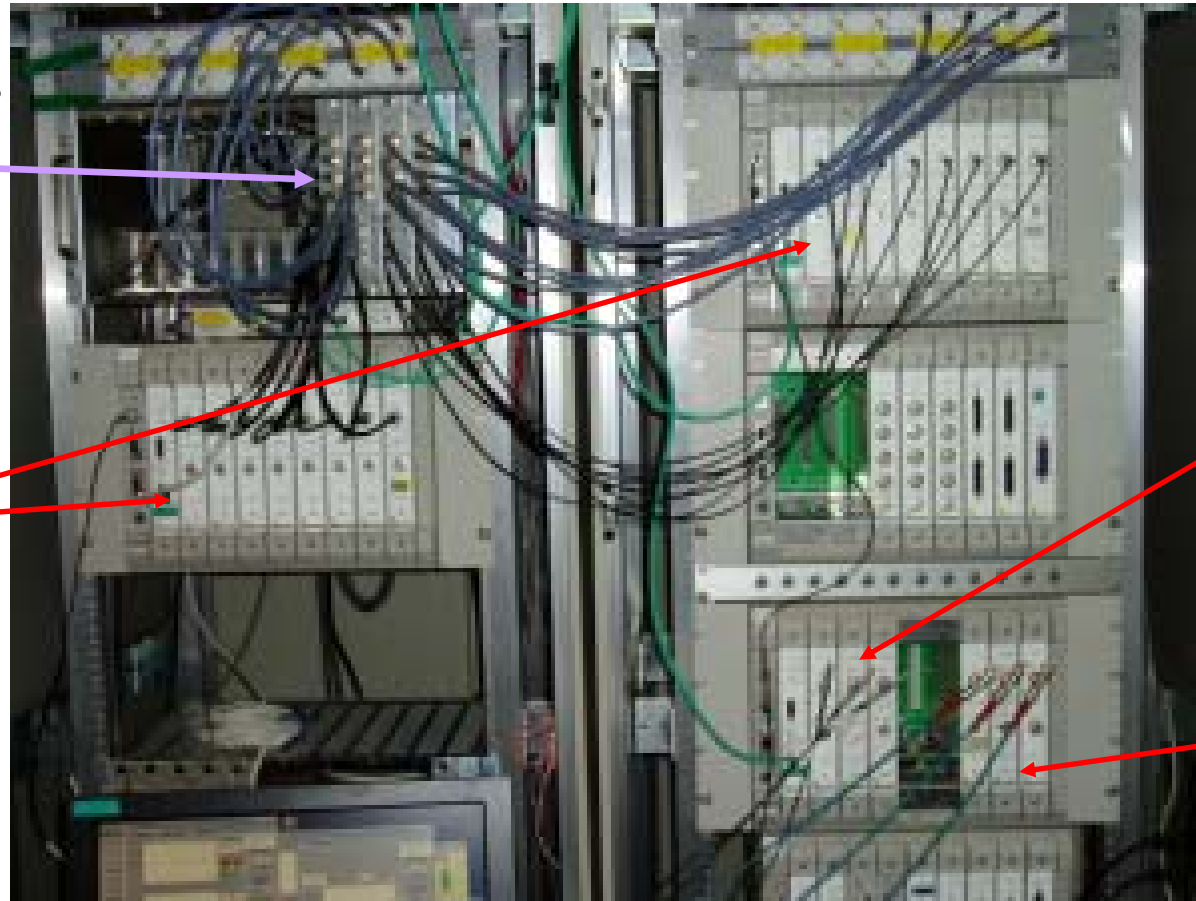
- EPICS: Verison 3.13.6 and VxWorks 5.4
- IOC: VME-bus, Advanet advme7501 (PPC 300MHz)

WE7000 Setup for MEBT

BPM
electronics

BPM
WE7111*16

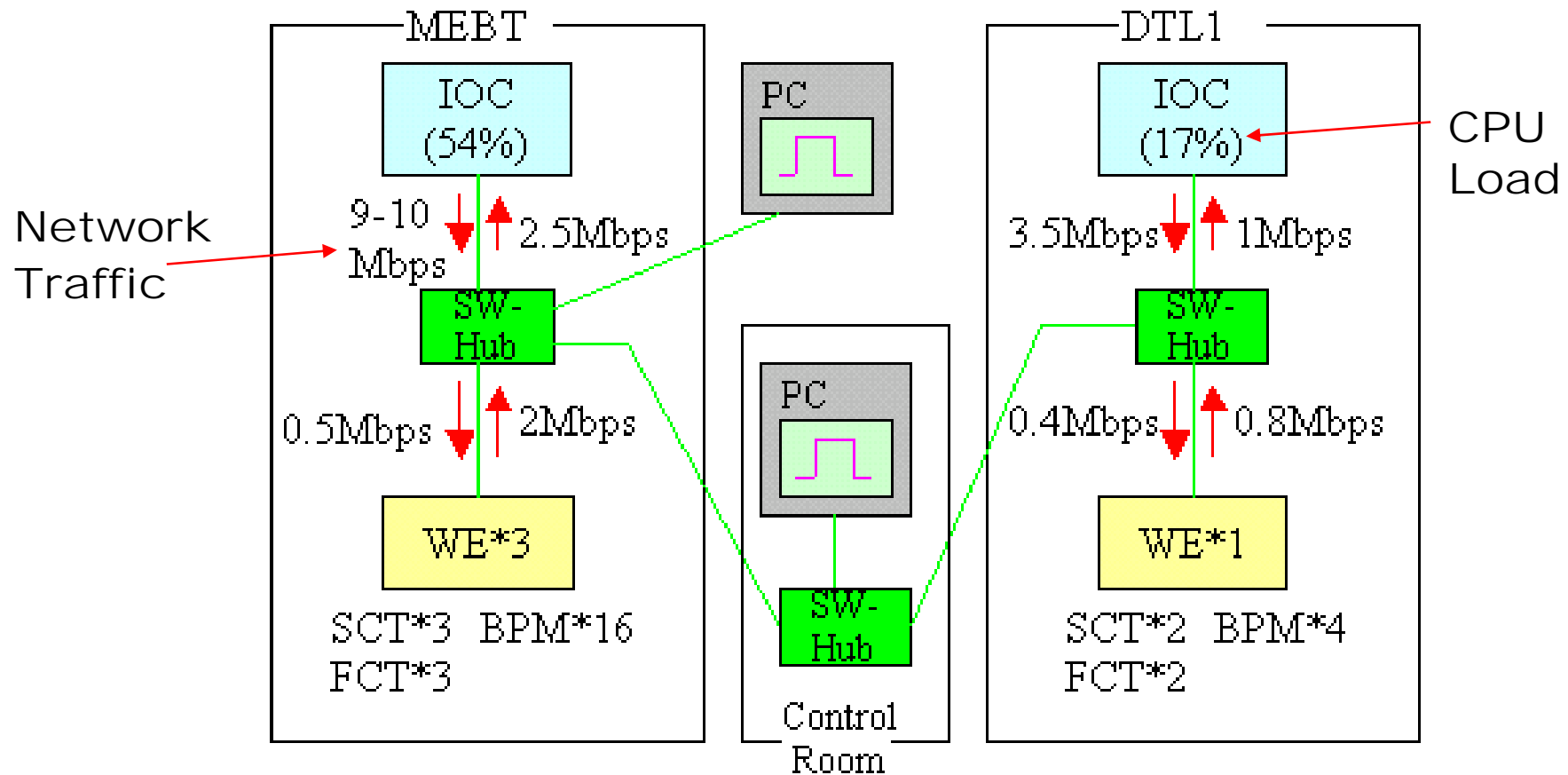
IOC(s)
is not
shown



SCT
WE7111*3

FCT
WE7111*3

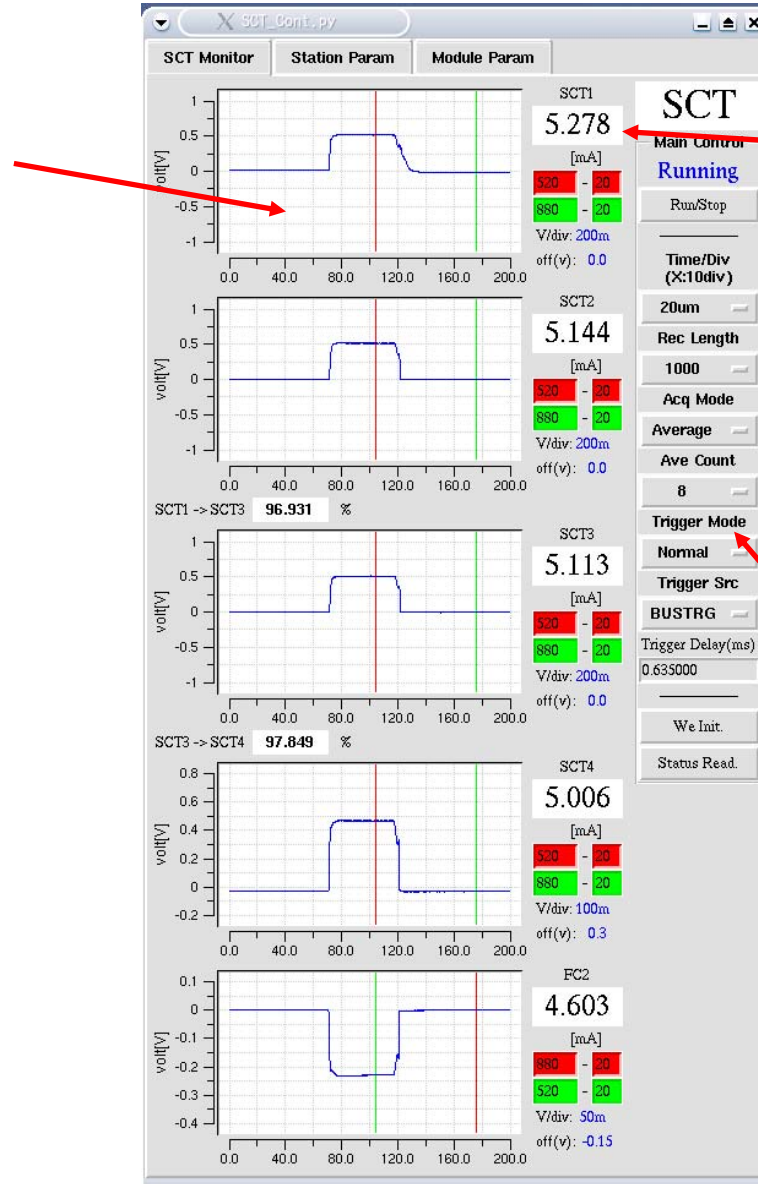
Network Traffic and CPU Loads



Each WE7111 = 1000*2byte waveform (30 waveforms in Total)
 Trigger rate = 5 Hz

Application - Beam Currents of MEBT

Observed waveform



Calculated Beam-current (mA unit)

Python

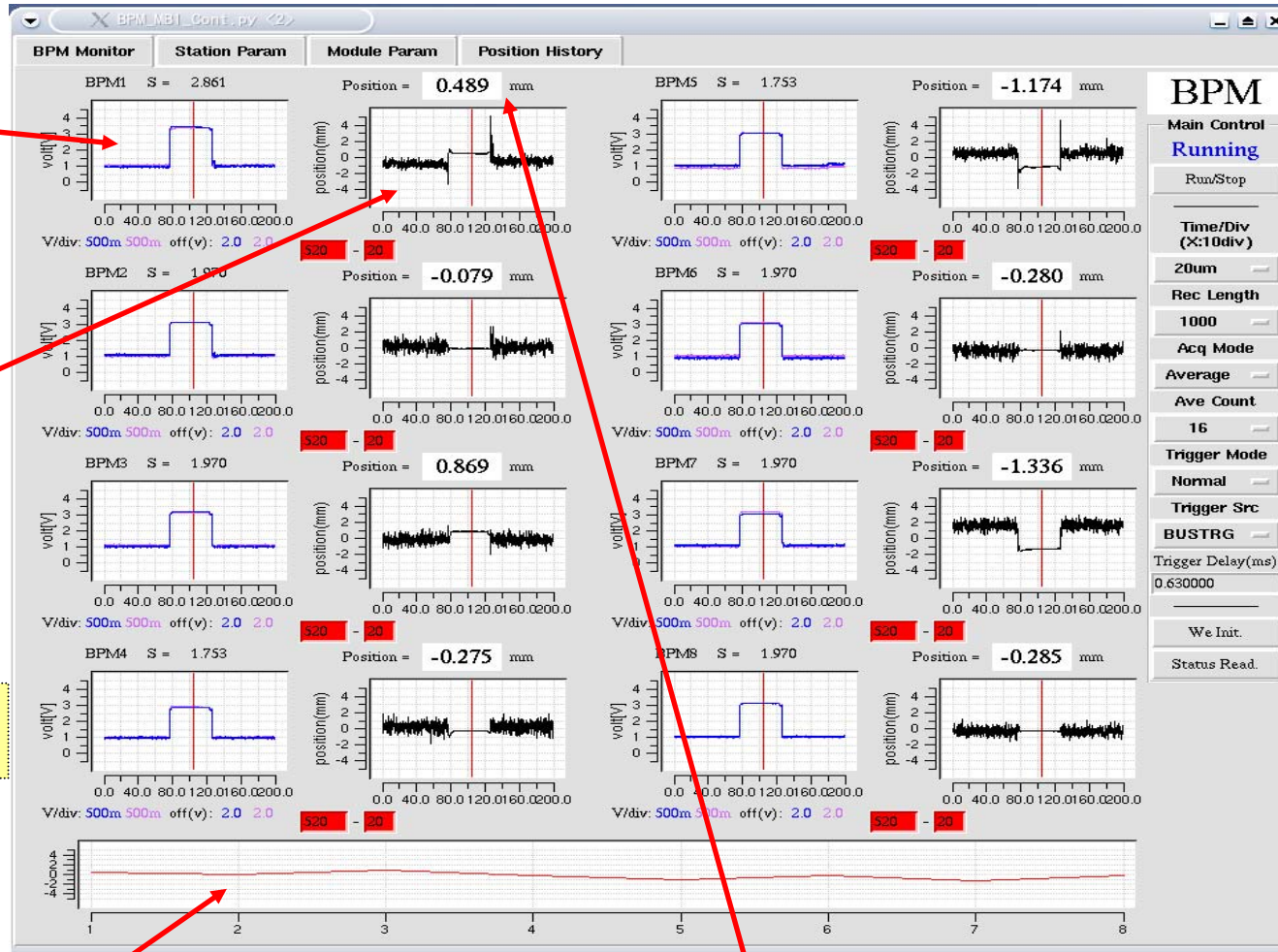
Setting for WE7111 modules

Application - Beam Positions of MEBT

Waveforms
(2ch.s)

Subtracted
WF

Python

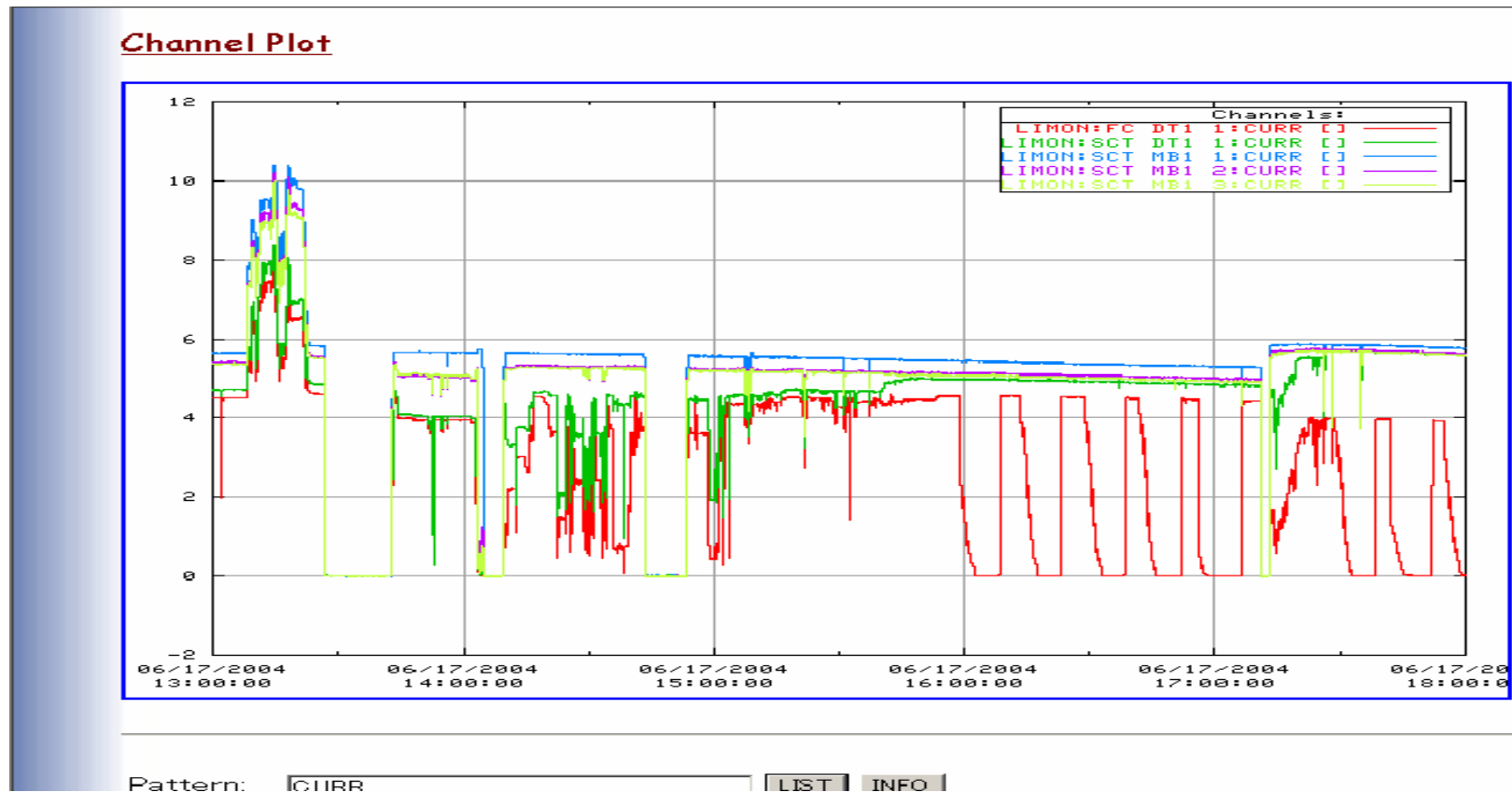


Orbit with 8 positions

Calculated Position (mm)

EPICS in Oct.2005, m.takagi+n.kami, KEK

Data log - Beam Currents



Channel Archiver

Thanks > Kai

8-hour history of 5 beam currents

Commissioning study on 17/06/2004

Conclusion

- The EPICS software support for the WE7111 (Oscilloscope) module was developed at KEK
- In 2004, during the MEBT/DTL1 commissioning studies for the J-PARC pre-injector, 30 WE7111 modules were used to monitor 30x2kB waveforms at the rate 5Hz. The result was very successful.
- (not shown due to the time limit – visit the poster on Tuesday)
Study for higher DAQ rate, and supports for other WE modules, are in progress.