DEVELOPMENT OF HIGH-LEVEL APPLICATION FRAMEWORK WITH A SCRIPT LANGUAGE JCE FOR ACCELERATOR BEAM COMMISSIONING

THP091

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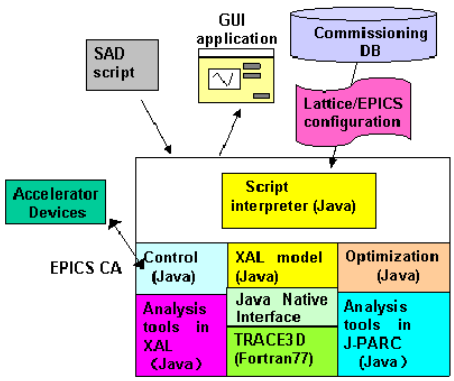
Abstract **: For accelerator beam commissioning, script language is indispensable, especially in the early stage of commissioning, to create and modify applications quickly and iteratively. A high-level application framework based on script language, J-PARC Commissioning Environment (JCE), has been developed in Java. It is capable of device control via EPICS, a beam transport simulation, GUI components, mathematical functions, and so on, which are flexibly and seamlessly combined in the script. A Mathematica style of language ("SAD script") is adopted. A special care is taken to clearly separate the parser part from actual function parts, and to document the codes. Thus modularity of the architecture, code understandability, and extensibility are dramatically improved. JCE has been utilized successfully for beam commissioning of J-PARC linac.**

JCE (J-PARC Commissioning Environment)

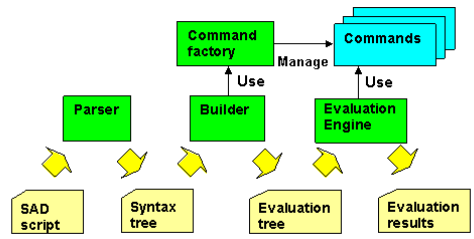
Script language for accelerator commissioning, operation

Seamless environment

- **Quick development of beam tuning/operation applications**
- **Control : EPICS**
- **Simulation : XAL model**
- **GUI : GUI components, plots**
- **Optimization, mathematics**
- **User command extension**



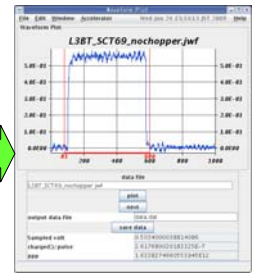
Script Parser Process



Script

```
cf = KBFComponentFrame[f,
Add->{
   KBFGroup[Text->"Waveform Plot"],
IndexBasedFastWavePlot[WidgetVariable->p, Anchor->"n",Fill->"both", Expand->True,Width->500,Height->300],
   KBFGroup[Text->""],
TextLabel[Width->42,Text->"data file",Anchor->"w",Height->20],
Entry[Width->50, Text->"data file", Anchor->"w",TextVariable:>datafile],
KBFButton[Text->"plot", Command:>plot[]],
KBFButton[Text->"next", Command:>next[]],
KBFString[Width->10,Height->20,BG->"white",Variable:>ofile,Text->"output data file"],
KBFButton[Text->"save data", Command:>saveData[ofile]],
KBFNumber[Width->10,Height->20,BG->"white",Variable:>nave,Text->"Sampled volt",ReadOnly->True],
KBFNumber[Width->10,Height->20,BG->"white",Variable:>coul,Text->"charge(C)/pulse",ReadOnly->True],
KBFNumber[Width->10,Height->20,BG->"white",Variable:>ppp,Text->"ppp",ReadOnly->True]
}
 ,Fill->"both",Expand->True
]
```

Application



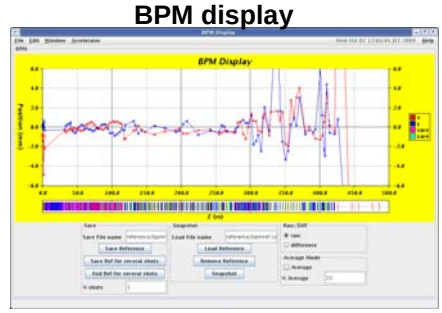
JCE Applications

JCE Commands

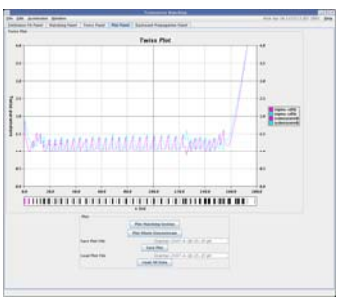
Category	Command examples
Pattern matching	Pattern(:),PatternTest(?), Alternatvies(|)
Mathematics	Plus(+),Equal(==),And(&&),Cos, Fourier
Flow control	If, Do, For, Throw
Optimization	SimplexMinimize, ResponseMatrixMiniize
EPICS	CaRead, CaWrite, CaMonitor
Online model	XalLatticeInfo,XalProbeInfo, XalCalc
Waveform	WaveArchiveReader,CaWaveArchiver
Graphics	Window, Frame, Button, TkWait
Plots	FastXYPlot, OpticsPlot
List operation	Table, Length, Map, Scan
String operation	StringJoin(//), StringLength
File I/O	Get, OpenRead, Read, Write

QM set / alarm

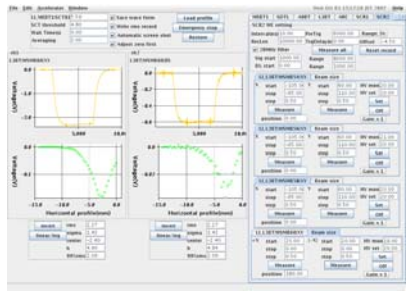
BPM display



Transverse matching



Beam profile measurement



Beam monitor timing adjustment

Online Accelerator Map

Summary and Outlook

- **A high-level framework JCE based on a script language has been developed for J-PARC beam commissioning and operation. Based on the framework, high-level applications have been developed and utilized successfully for J-PARC linac. In a near future, environment tools for JCE script development are going to be developed.**