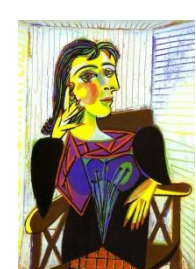# HIGH-LEVEL MATLAB APPLICATION PROGRAMS FOR SPEAR3

Jeff Corbett, et al (SLAC)

Abstract

The SPEAR3 control system operates with the EPICS toolbox on top of VMS hardware. The Matlab Middlelayer (MML), Accelerator Toolbox (AT) and EPICS Channel Access (LabCA) allow for parallel, high-level machine control and accelerator physics applications. MML is machine independent but site-specific high-level applications are required to control the accelerator. This paper describes several such high-level application programs for SPEAR3. Examples include a time-dependent waveform display gui, beam steering applications, transport line optics correction, SR beam diagnostics and add-ons to the main MML routines.
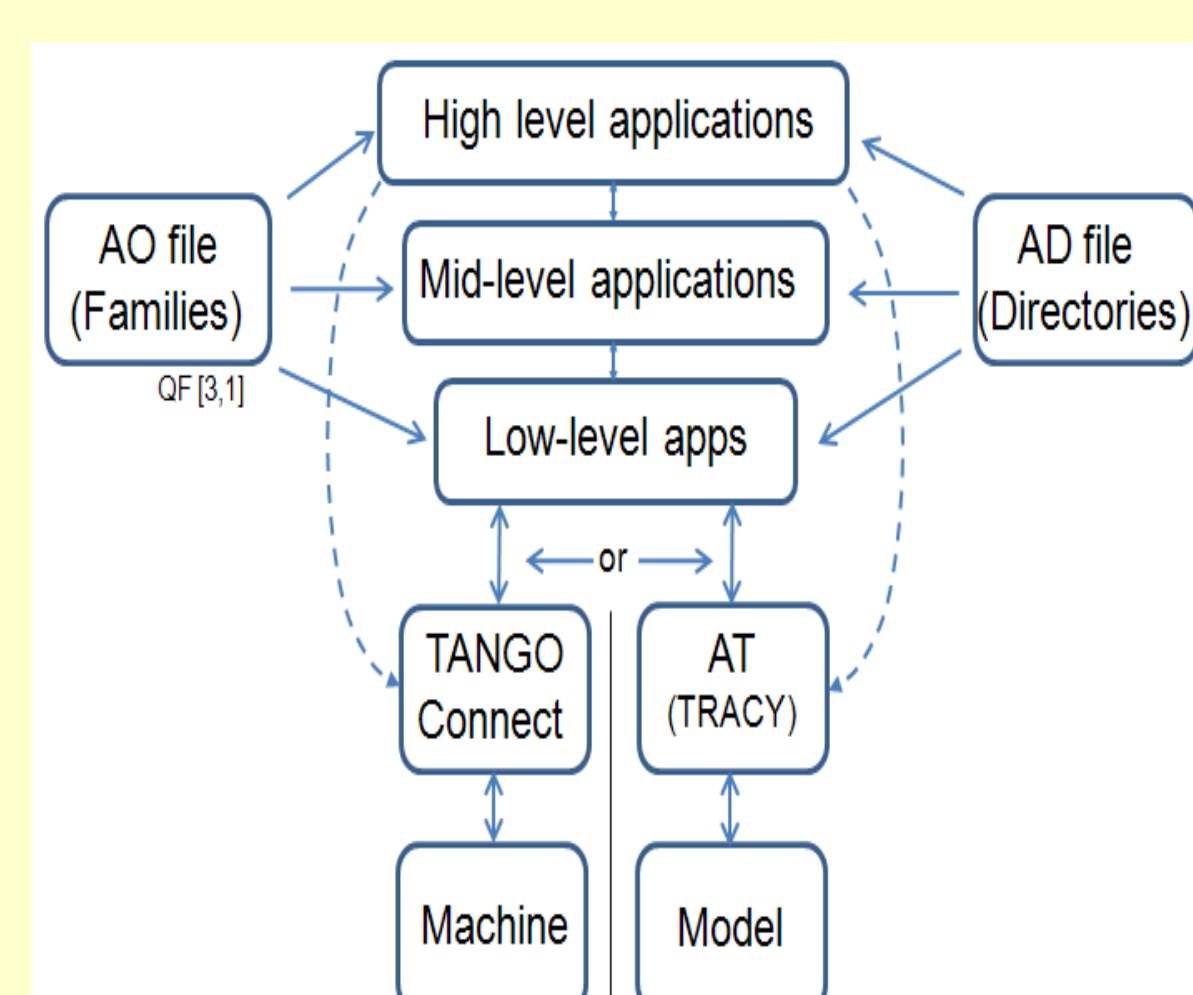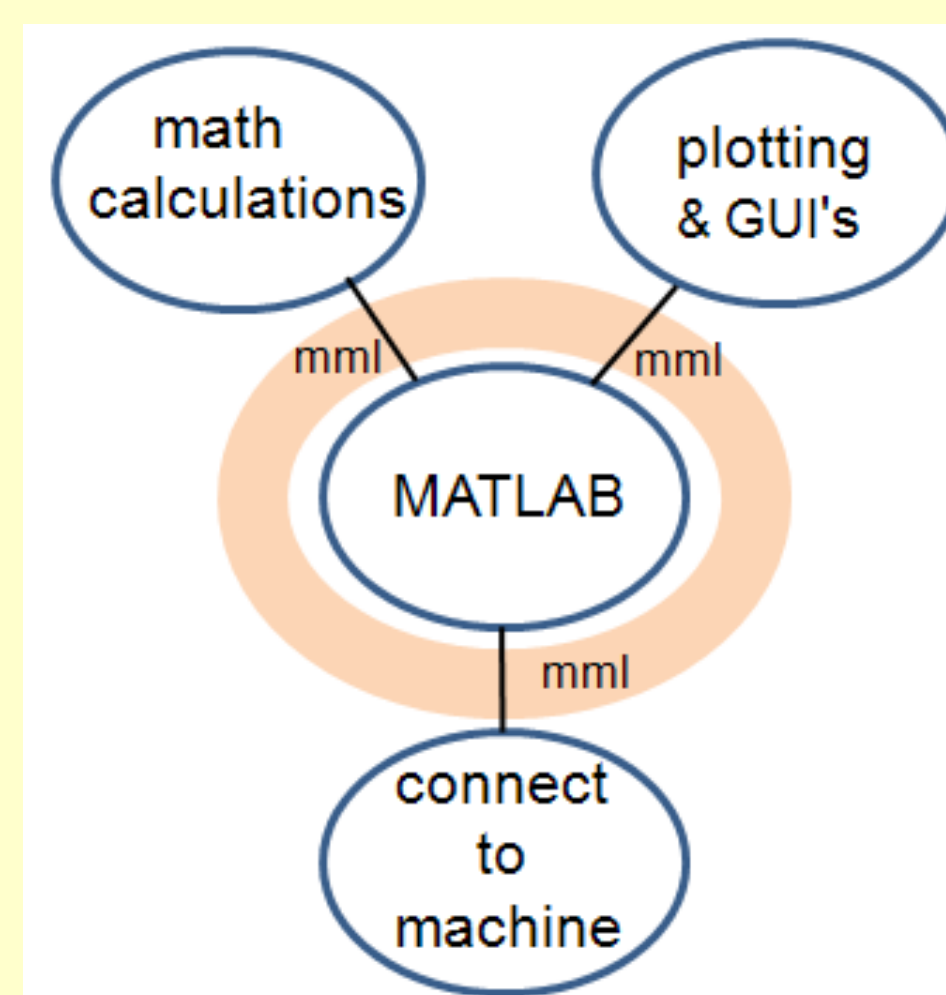
SPEAR3 Synchrotron Light Source

E=3 GeV
I=350 mA
ε=10 nm-rad
N=18 cell
10 Hz injection
(single bunch)

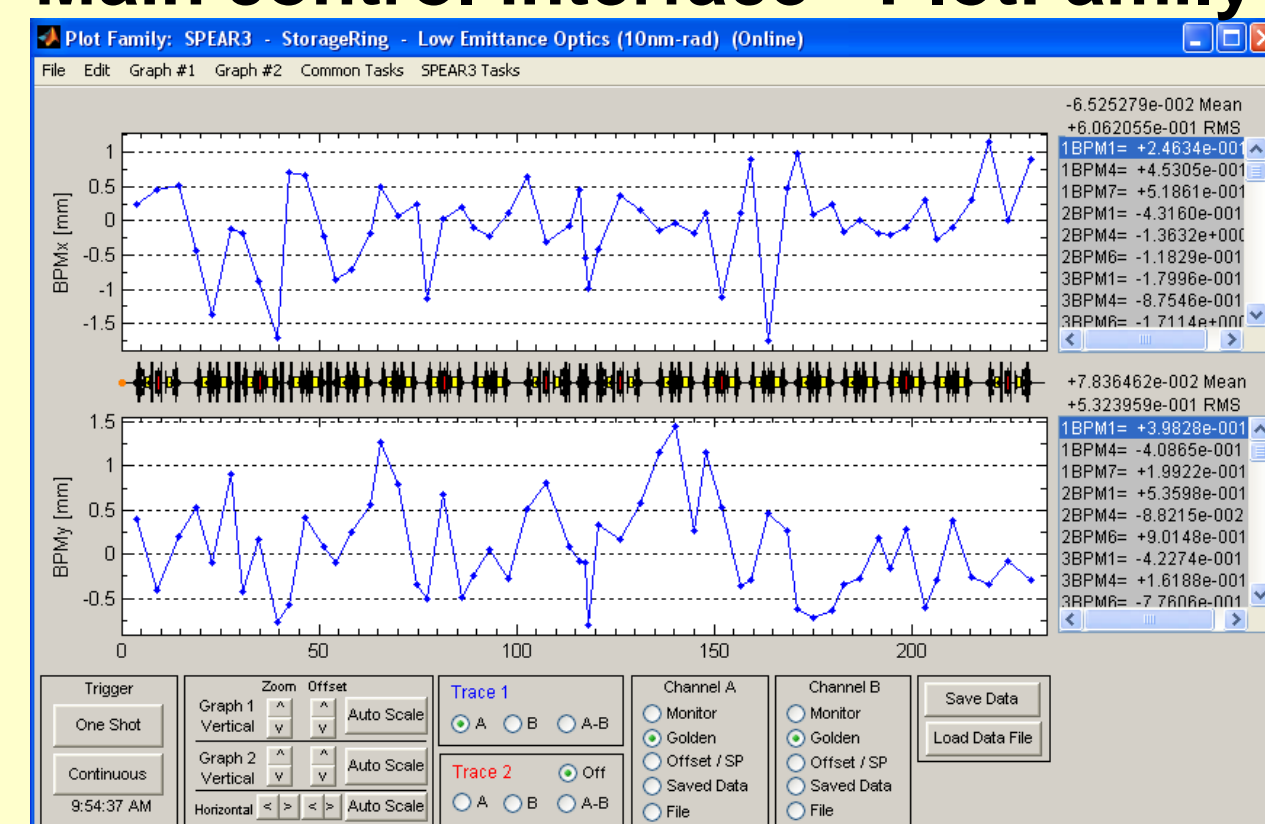| Table 1: SPEAR3 injection parameters	
Injection amplitude	x=-13 mm
Stored beam size	310x20 μm, 20 ps
Stored beam, dp/p	0.1%
Damping times	4.2, 5.1, 2.8 ms
Injected beam size	~1.0x0.8 mm at SLM
Injected dp/p	0.07%

Why MATLAB?

- Matrix programming language
- Command-line driven (no compile/link)
- Easy cut/paste, debug
- Built-in math libraries
- Compact code, easy to read, easy to test/debu
- Workspace for experiment and development
- Easy to import/export data
- Graphics capability (plotting, applications)
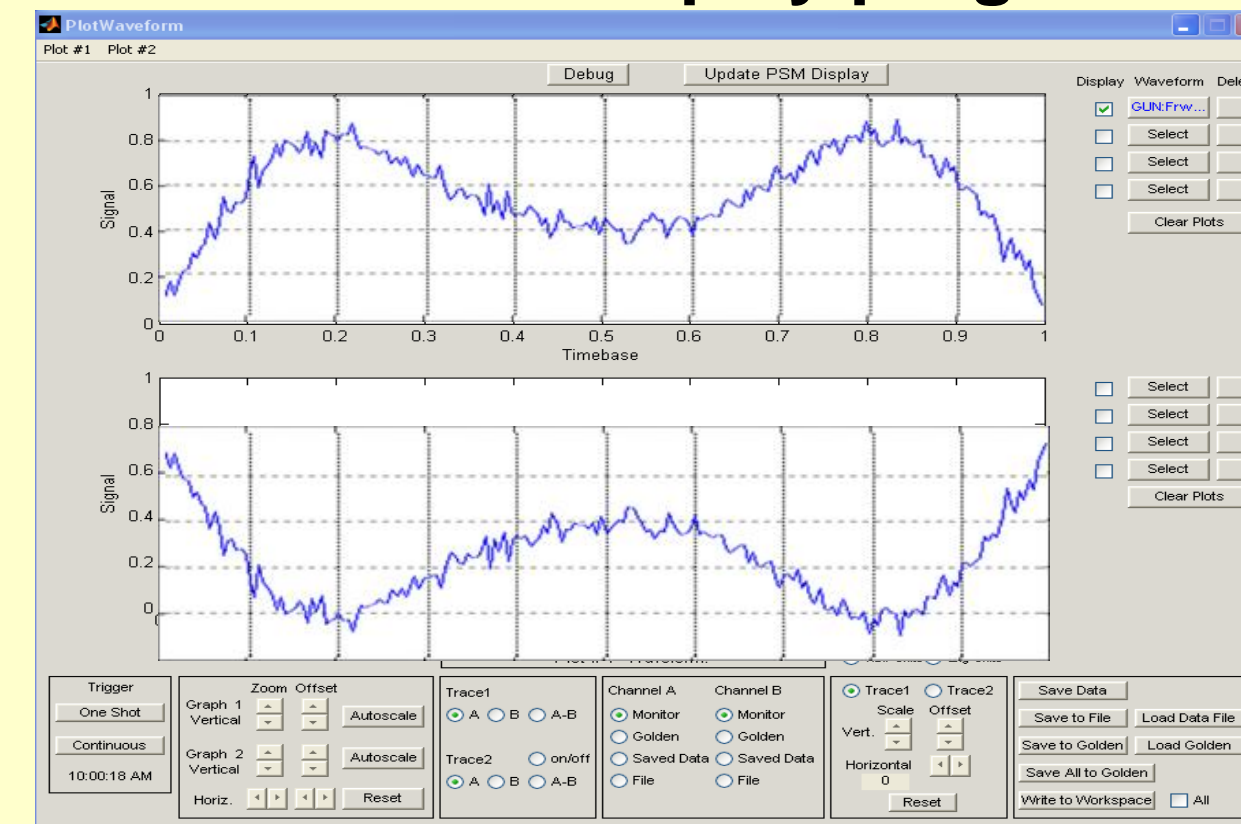- APS circa 1995: "we write scripts during shifts"

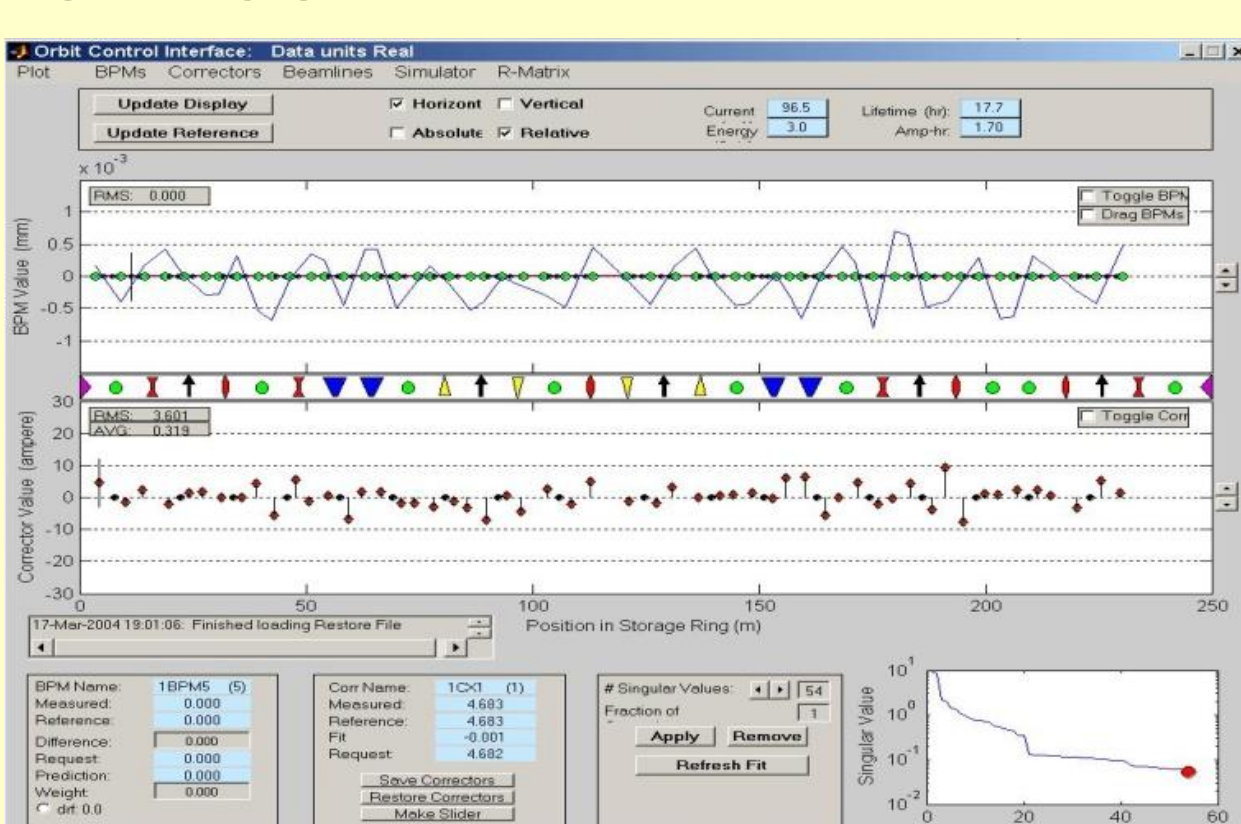## Machine control, Waveform display and Orbit Correction
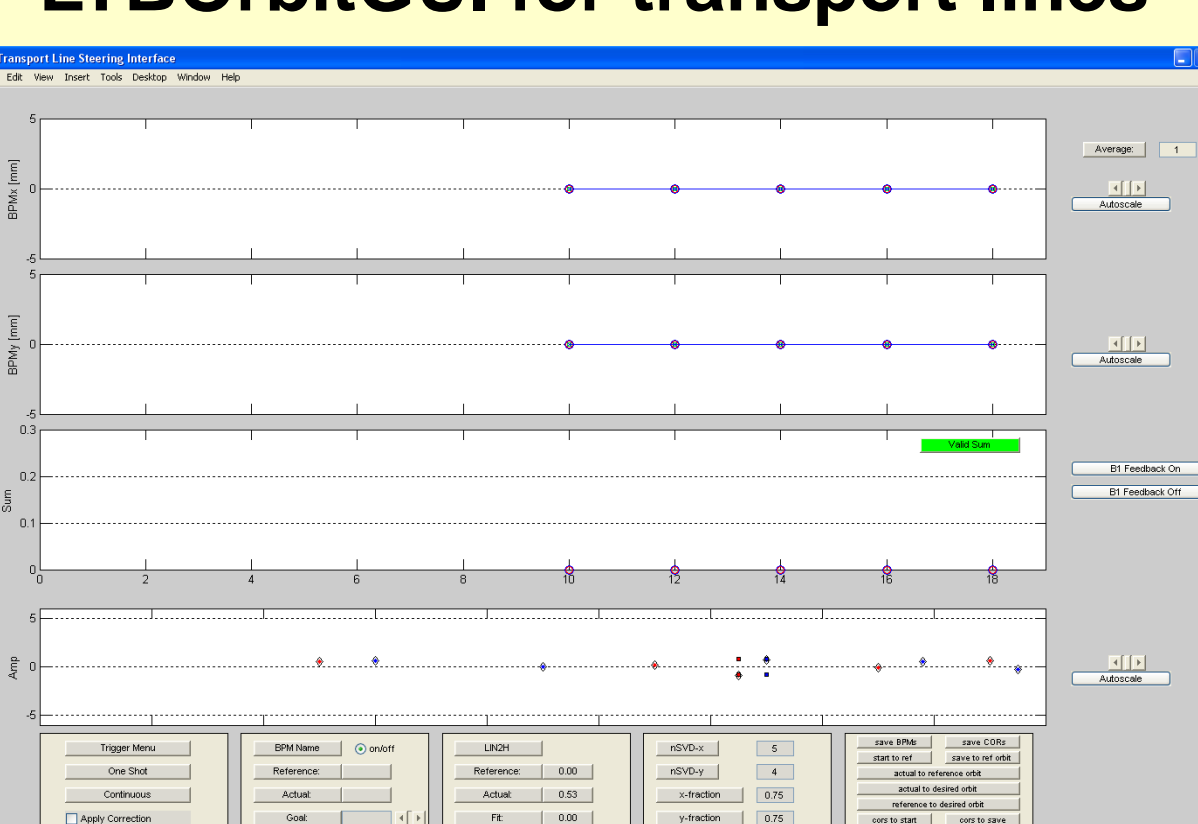
Main control interface - PlotFamily
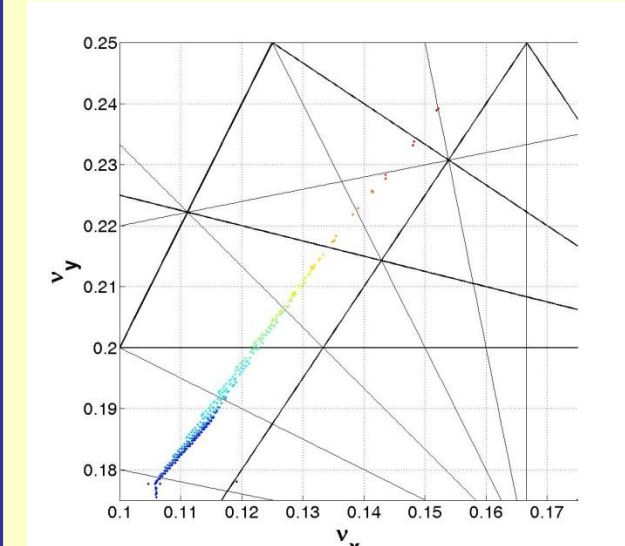
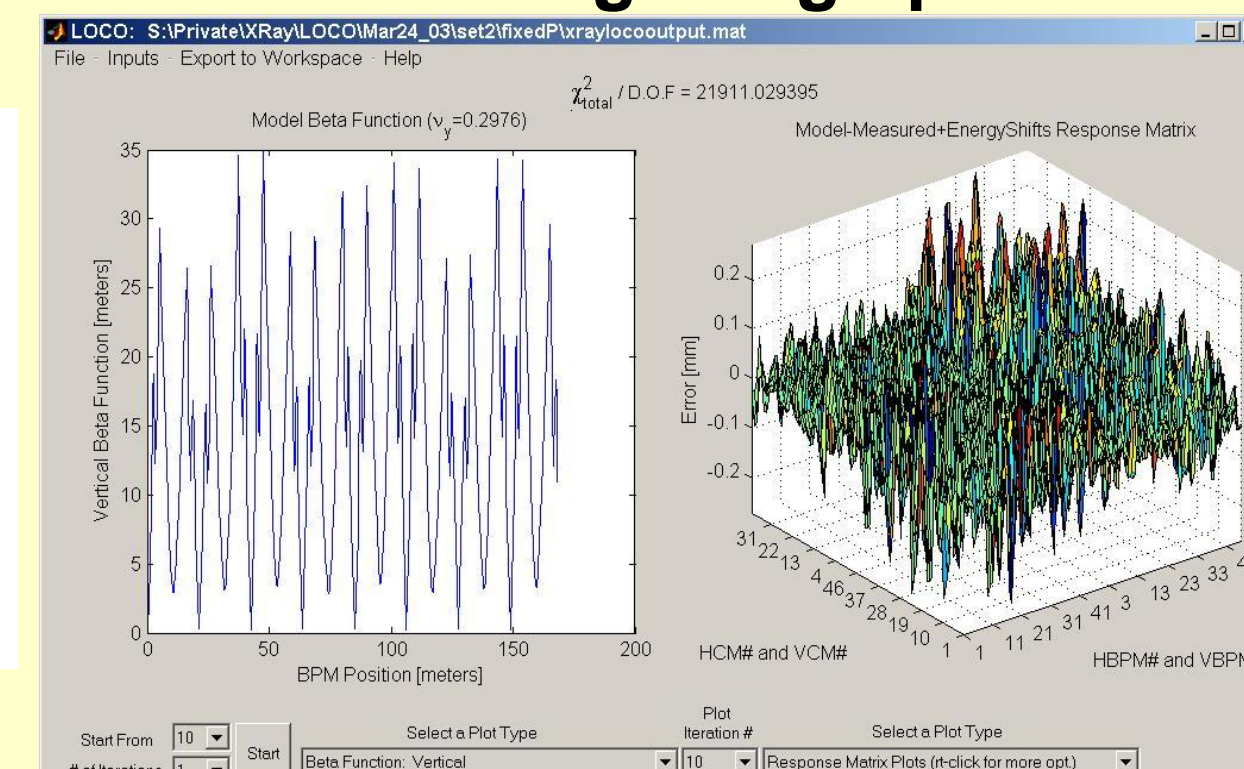### PlotWaveform display program

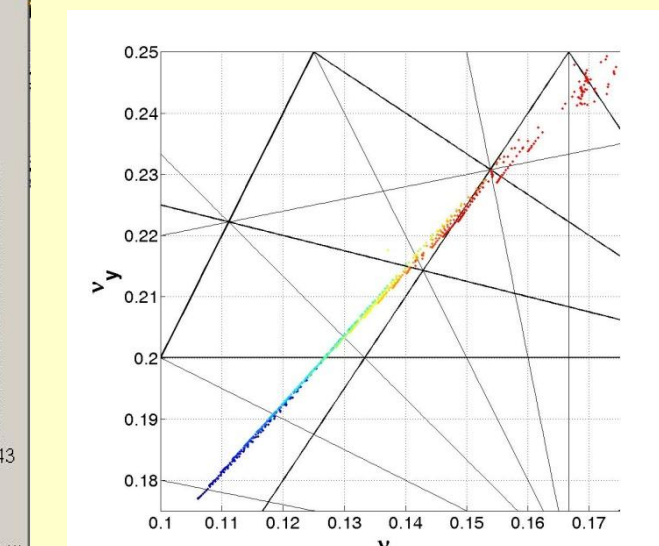### OrbitGUI for closed orbit control

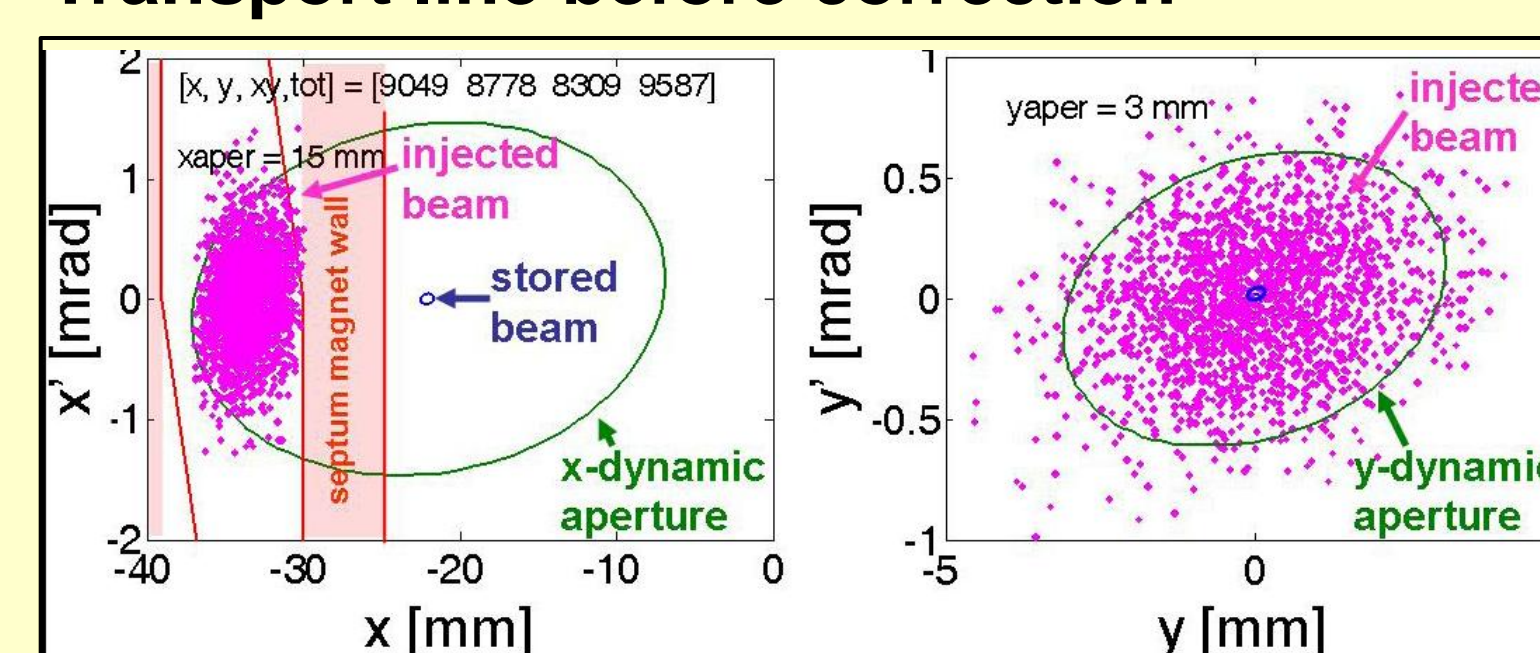### LTBOrbitGUI for transport lines

LOCO for storage ring optics
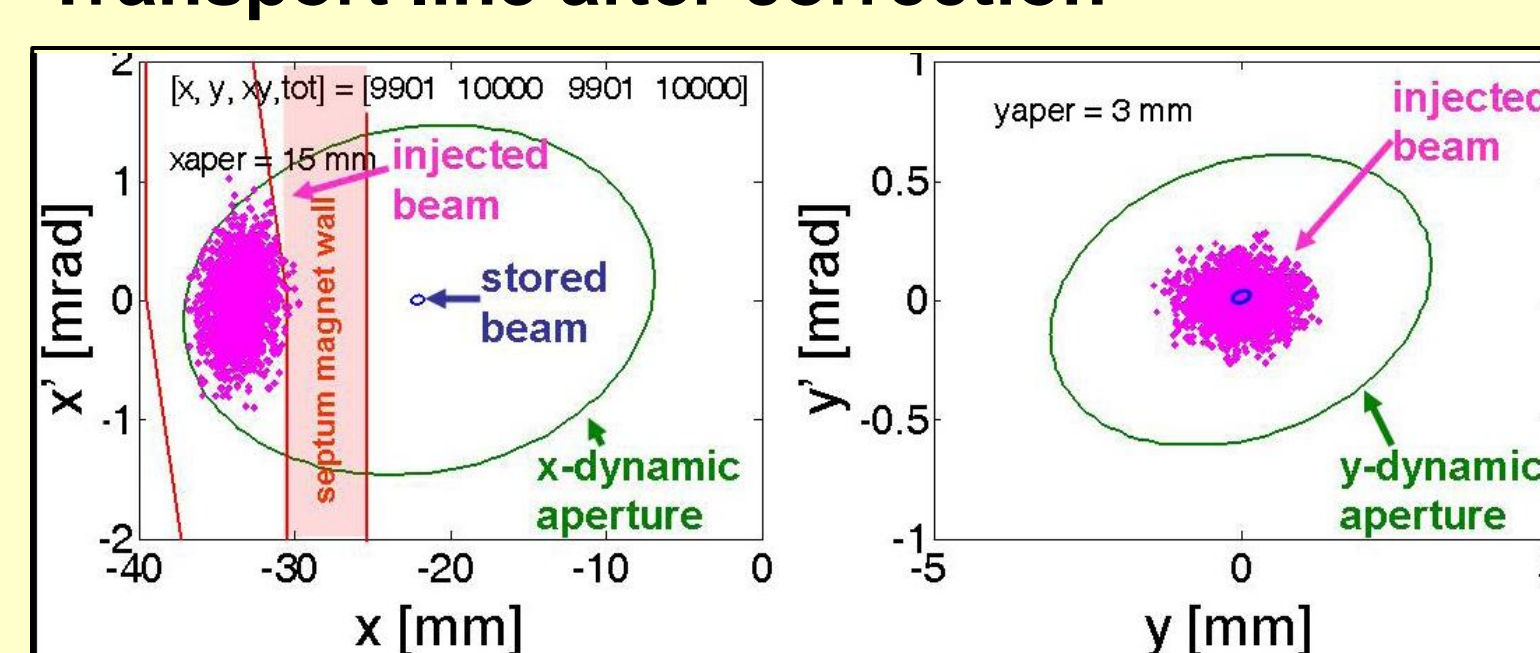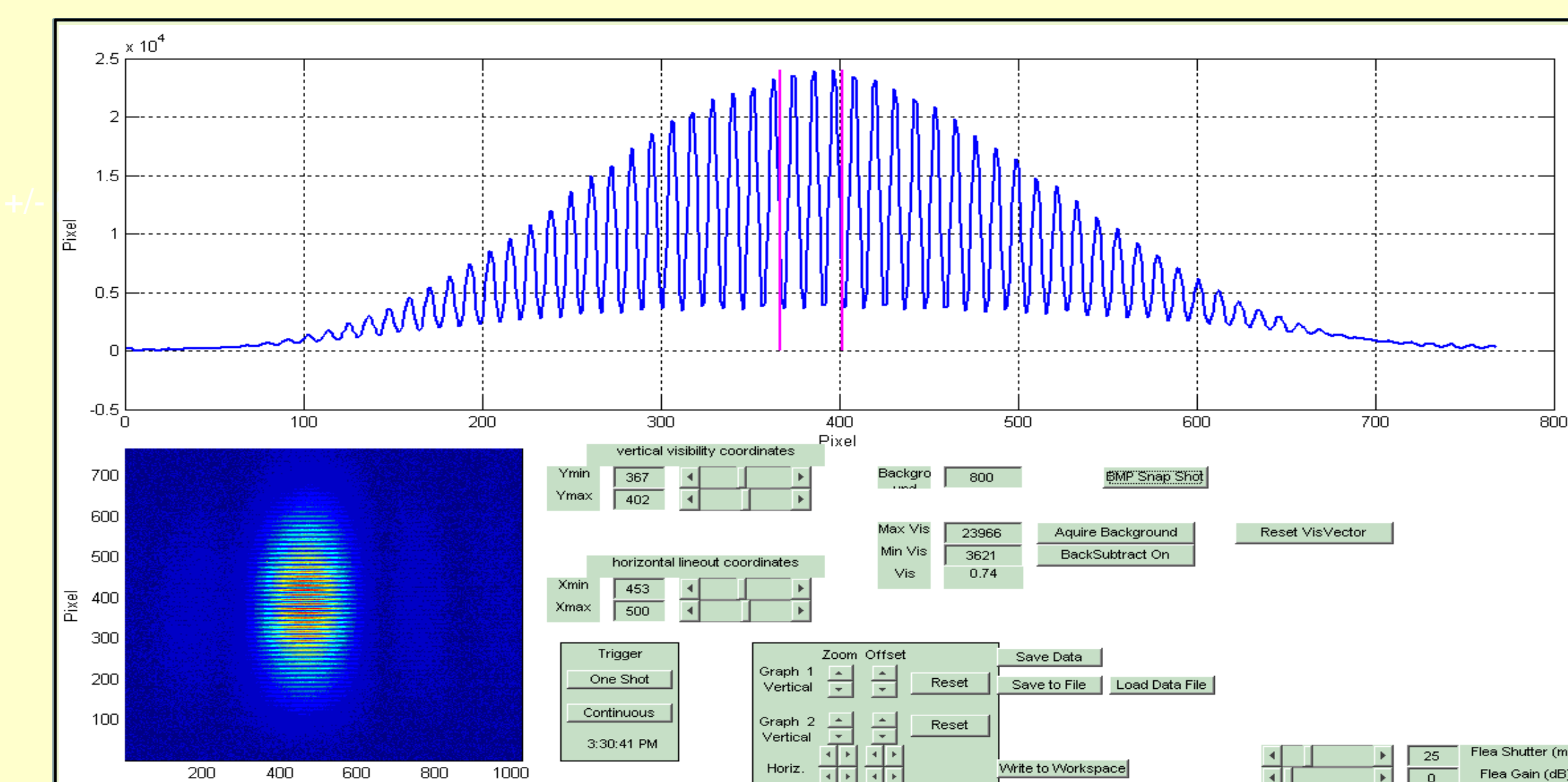
measured

model

Transport line before correction

Transport line after correction
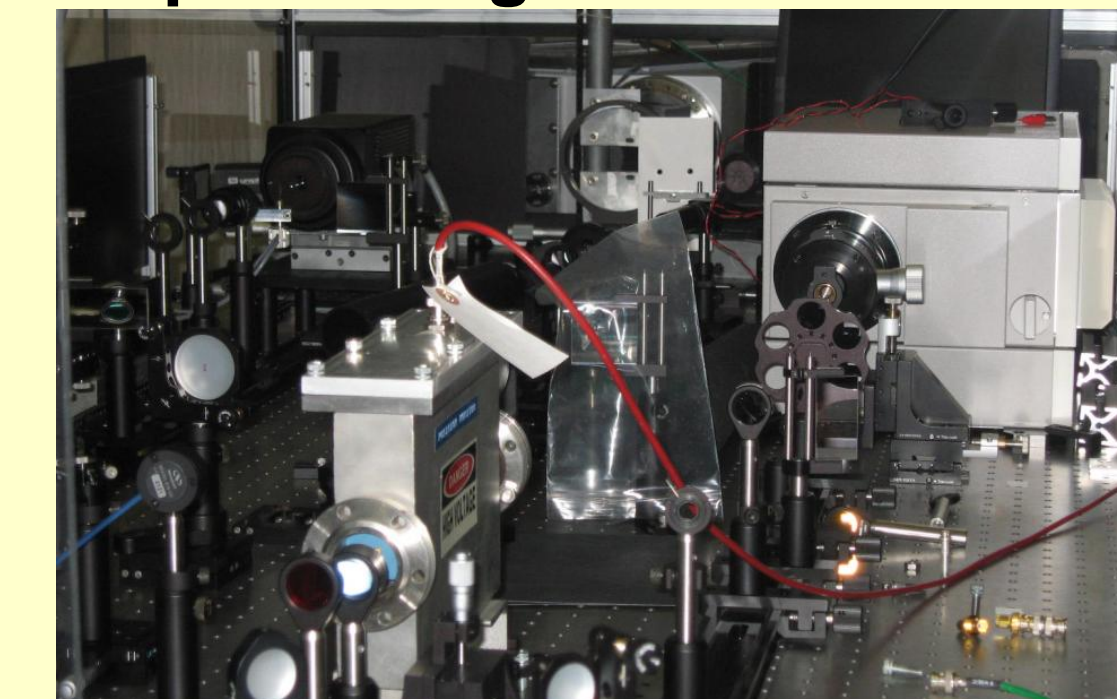
Applications for Optical Diagnostics

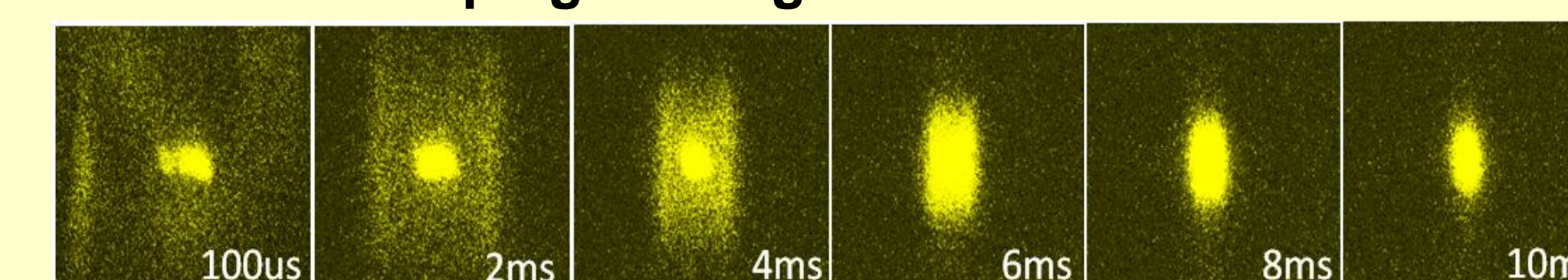Interferometer control and data analysis
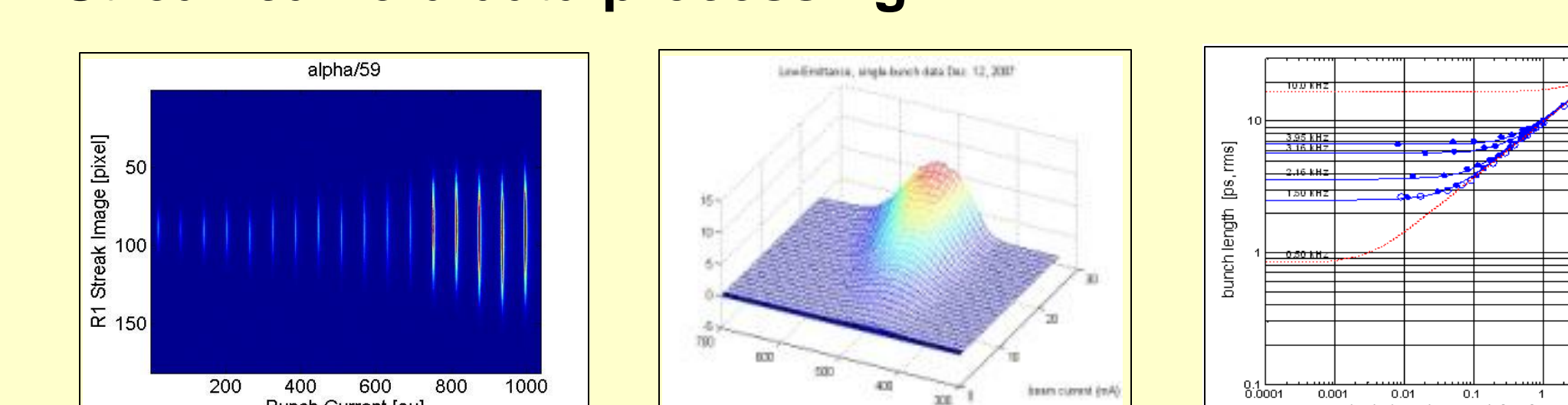
Fast Camera Image Processing

Optical bench

Optical diagnostics

Transverse damping on long time scale

100us 2ms 4ms 6ms 8ms 10ms

Streak camera data processing

Summary

- Matlab middle layer a main operating tool at SPEAR3
- High-level applications for orbit, optics, RF waveforms
- Data from fast-gated and streak cameras post-processed
- Future applications will increase connectivity to diagnostics