Report on the
Software Development Tools
developed for the
ATF control system.

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- **Project Goals:**

To develop the software tools to allow modeling and beam analysis applications to be developed.

The intent is to allow physicists to run Matlab scripts or write Fortran programs that may:

- Set a magnet to several values

- Take position data at each setting

- Save beam positions and magnet "K-values"

- Use SAD-derived TWISS data to analyze results.

As much as possible, we want to:

- Isolate users from database names

- Allow users to get lists of device names (e.g.: the database names of all the ring BPMs)

- Allow information on classes of devices to easily extracted from the database and control system

- Allow information to be easily extracted from the SAD model files (e.g.: TWISS parameters for each device)

- Provide top-level routines to acquire and return BPM data

- Provide top-level routines to check some or all magnets

- Provide top-level routines to set a magnet (and wait until completed)

- **Matlab analysis program**

An important analysis tool used by the SLC physicists is the Matlab program available from the Mathworks.

This program allows arrays of data to be manipulated, fitted and plotted. It is a very efficient language, easily modified and tested by physicists and engineers.

The SLC at SLAC has a small number of licenses which may be used on computers other than the main control computer at SLAC, which have been used at the ATF at KEK.

Matlab is extendible, and subroutines have been written to allow direct access to the VISTA database and ATF control routines.

- **an example:**

The following two lines result in the data being acquired and plotted:

```
>> read_bpm
>> plot_bpm
```
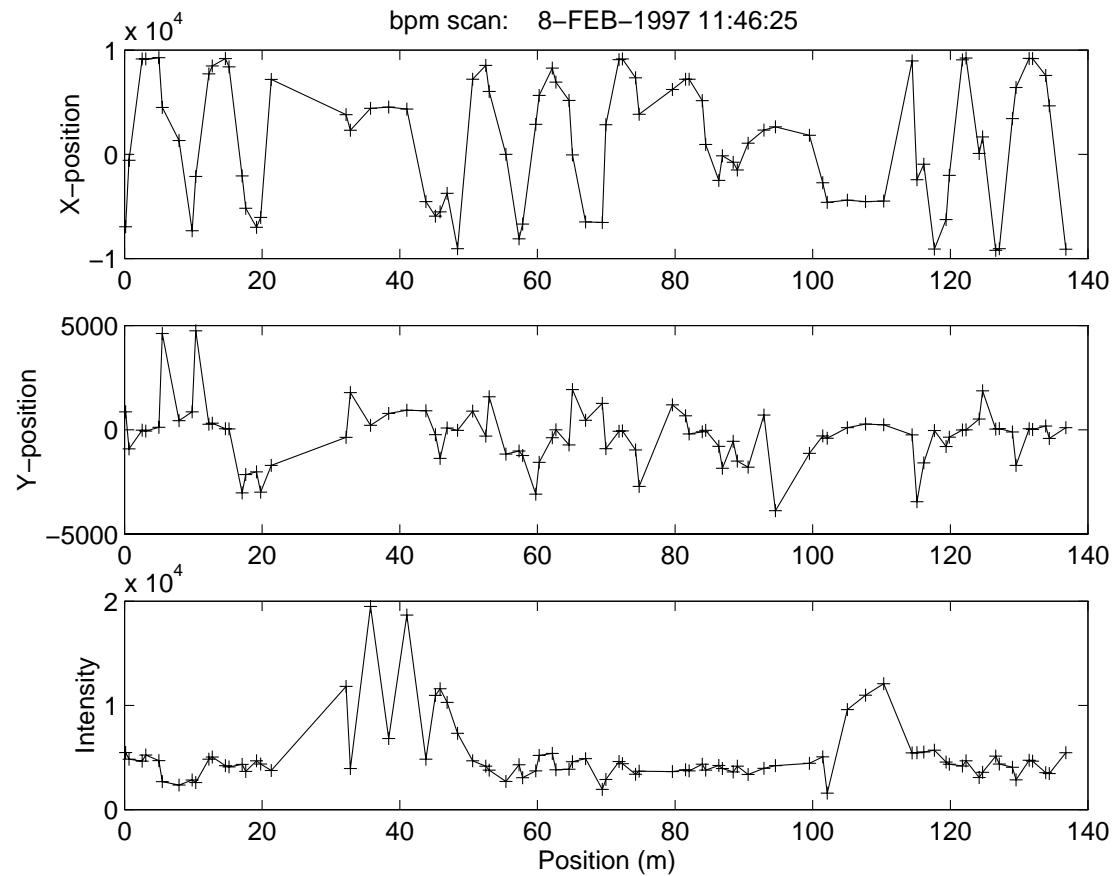
- **Routines and interfaces:**

Fortran	Matlab
vatf_rget (*)	n/a
vatf_iget (*)	n/a
not supported	vatf_get (string, real, integer)
vatf_listget	vatf_listget
vatf_get_twiss	vatf_get_twiss
vatf_get_names	vatf_get_names
vatf_bpm_get	vatf_bpm_get
vatf_mag_check	vatf_mag_check
vatf_mag_trim	vatf_mag_trim
vatf_database_name	n/a

(*) - these items were already part of the ATF software support.

These tools provide a reliable interface between the physicist and the control system. The above routines will provide the appropriate database names for the supplied channel name or device class. (Channel names that include database names are also supported),

- **an example:**

The following code fragments demonstrate some the the tools available.

```
>> [twiss, s_position] = vatf_twiss_get('R','QF*');
```

returns the TWISS parameters for all of the Ring Focusing Quads derived from the official SAD output deck.

```
>> [twiss, s_position] = vatf_twiss_get('[dir]file.dat','QUAD');
```

returns the TWISS parameters for all of the Ring QUADs derived from the indicated SAD output deck.

```
>> [name_list, s_position] = vatf_names('R','QUAD');
```

returns the list of all VISTA device names matching the region and device specification. Device names are derived from the official SAD output deck.

```
>> [data, s_position] = vatf_bpm_get('R');
```

forces a BPM read and returns the acquired data set. Data consists of the X, Y, Tmit, raw data and status.

```
>> value = vatf_get(channel_name);
```

returns the data in the specified channel (integer, real, string or array) .

```
>> value = vatf_listget('D', 'QM*', 'CURRENT.MONITOR');
```

returns an array of data for the the specified channel for all matching devices in the region.

- **Concluding Remarks**

The ATF control system seems to have many of the tools required for initial commissioning, with some other important ones expected shortly.

There will be a large amount of work required to achieve the operational goals of the ATF. Many people will contribute to this effort.

A very large number of software routines have been developed for the SLC linear collider. Many of the functions that will be needed have already been written and debugged at this facility, and are freely available for the collaboration to use.

The tools that we have developed will allow physicists to investigate the machine's parameters in a semi-off-line manner. We have not tried to make these tools available online but they could be integrated later.

Off-line tools are very important to understanding the machine. We strongly recommend that the ATF purchase a few licenses to allow Matlab to run on their control computer.

We thank the ATF team for their help and guidance in this effort.