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1   Introduction: what is FMGSkal?

FMGSkal is a newly developed application written in JavaFX which allows the user to perform Hall Probe (HP) calibrations and precycling procedures on magnets (from now on often also called as "devices") belonging to a selected beamline from the ion source up to the experiment.

2   How to start the application

In order to start FMGSkal, open a new terminal and perform the following instructions:

- Type "`scheidenb@asl740.acc.gsi.de`" followed by password to connect to an "asl" machine.

- Navigate to "`/common/usr/cscoap/bin`".

- Start the launcher typing "`./launcher pro`".

- Select the tab "FRS".

- Select "FRS FMGSkal" from the menu to start the application.

3   The working principle

Figure 1 depicts a simple schematic describing the working principle of FMGSkal. The main activity is performed by the *FMGSKAL_AppController.class* which, making use of *Pattern*, *Chain* and *Beamline* as input parameters, allows to generate a list of filtered devices to be calibrated or precycled. The list is injected into the *Sequencer*, an external tool which is able to execute a certain task in a sequence of operations. Table 1 reports the main Sequencer methods employed by FMGSkal.
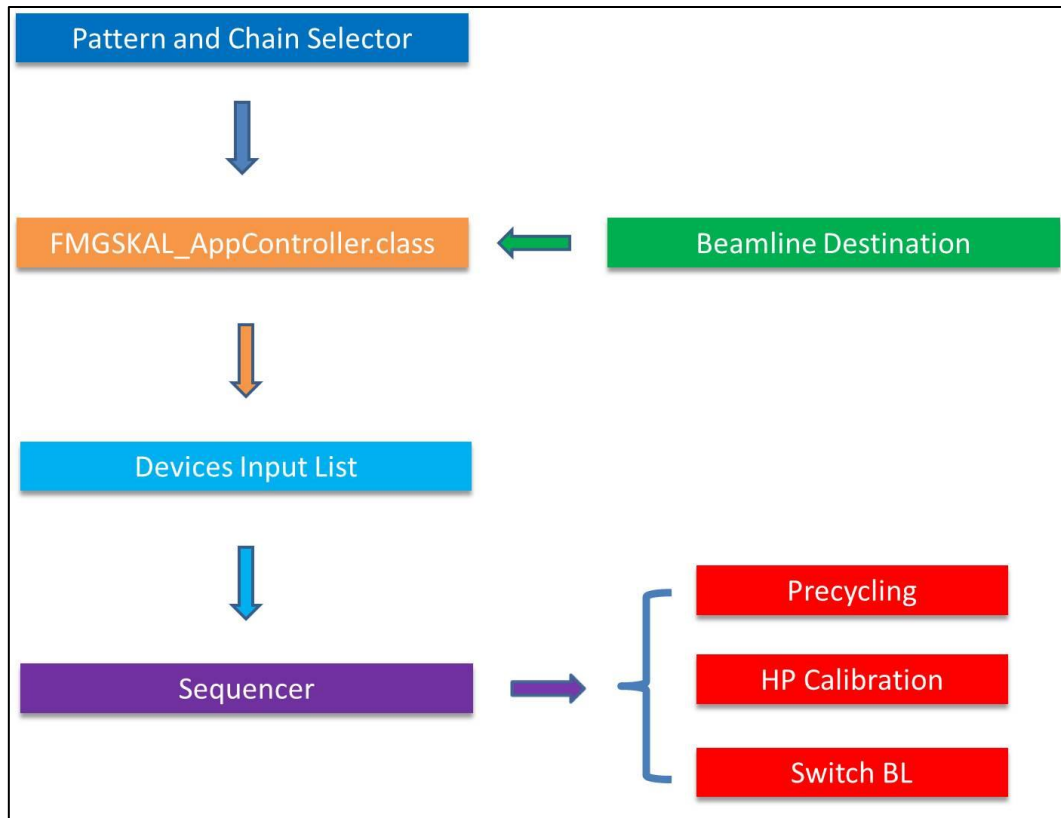
Figure 1: schematic of the FMGSkal working principle.

4   The main user interface and its components

Figure 2 shows the FMGSkal main user interface. It consists of the following components:

- Top: pattern and chain selectors;
- Center-Left: magnet group check box selectors and device filter viewer;
- Right: action buttons;
- Bottom: beamline destination switch and status bar for messaging.

Table 1: Sequencer classes and methods called by FMGSkal and their functionality.

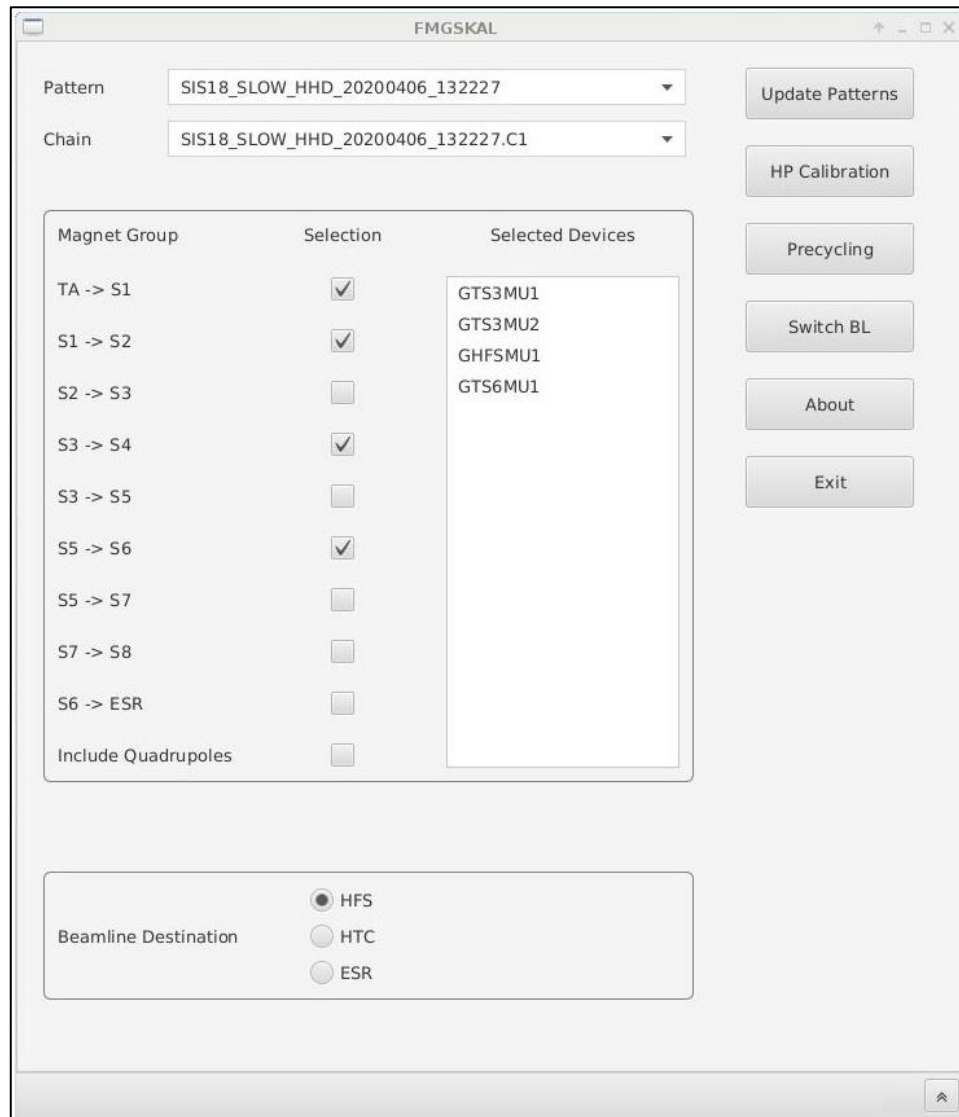| *\<class>.\<method>*	Parameter required	Functionality
CalibrateAllHallProbes.runSequence	List of magnets	HP Calibration
PrecycleAllFrsMagnets.runSequence	List of magnets Selected Pattern	Precycling
SwitchFrsMagnets.runSequence	Beamline Destination	Beamline Switch

Figure 2: the main user interface.

4.1 Pattern and Chain selectors

Pattern and Chain selectors contain a list of available patterns (both active and inactive) and chains initially loaded. A pattern represents a group of beam production chains that are executed periodically in a certain order (so far each pattern has only one beam production chain associated). A beam production chain defines a sequence and parameters of beamlines. The choice of the correct pattern is necessary in order to perform, as shown in Table 1, a correct precycling of the selected magnets.

4.2 Magnet Group selector

As reported in Table 2, selectable magnets are grouped into accelerator sections. Selection of each group is performed by ticking the relative check box which, in turns, updates the current list viewer containing the selected magnets. Without ticking the *Include Quadrupoles* check box, the list will contain only dipole type devices. In case the list includes also quadrupoles, a HP calibration procedure will be not allowed.

Table 2: list of accelerator sections with included magnets.

Sections	Devices
TA – S1	[GTS2QT11], [GTS2QT12], [GTS2QT13], [GTS3MU1], [GTS3QD11], [GTS3QD12]
S1 – S2	[GTS3QD21], [GTS3QD22], [GTS3MU2], [GTS3QT31], [GTS3QT32], [GTS3QT33]
S2 – S3	[GTS4QT11], [GTS4QT12], [GTS4QT13], [GTS4MU1], [GTS4QD21], [GTS4QD22]
S3 – S4	[GTS4QD31], [GTS4QD32], [GHFSMU1], [GHFSQT11], [GHFSQT12], [GHFSQT13]
S3 – S5	[GTS4QD31], [GTS4QD32], [GTS5MU1]
S5 – S6	[GTS5QT11], [GTS5QT12], [GTS5QT13], [GTS6MU1], [GTE5QD11], [GTE5QD12]
S5 – S7	[GTS5QT11], [GTS5QT12], [GTS5QT13], [GTS6MU1]
S7 – S8	[GTS7QD11], [GTS7QD12], [GTS7MU1], [GTH4QD11], [GTH4QD12]
S6 – ESR	[GTE5MU0], [GTE5QD21], [GTE5QD22]

4.3 Action Buttons

4.3.1 Update Patterns

It updates the list of the Pattern and Chain selectors. Upon the completion of the update, the first pattern and chain will be automatically selected. The user will be then able to switch to another pattern and chain if needed.

4.3.2 HP Calibration

It allows the user to perform the calibration of the Hall Probe which might be connected to the selected magnets. In case *Include Quadrupoles* check box is selected, such functionality is disabled.

4.3.3 Precycling

The precycling procedure is required any time a new value of electric current has to be set to the magnet power supply. It is executed by performing a ramping of the selected magnets relative to the pattern of choice. The procedure, valid both for dipoles and quadrupoles, includes the following steps:

- Switch to DC Mode.
- Ramp up in 20 seconds from the actual electric current value (whatever it is) up to 900 A (or max value).
- Wait 20 seconds at 900 A (or max value).
- Ramp down to 0 A (or min value) in 20 seconds in 10% steps. Step value is defined by the capability of the power supply.
- Wait 20 seconds at 0 A (or min value).
- Ramp up to 900 A (or max value) in 20 seconds in 10% steps.
- Wait 20 seconds at 900 A (or max value).
- Ramp down to 0 A (or min value) in 20 seconds in 10% steps.
- Wait 20 seconds at 0 A (or min value).
- Ramp up to the new set value from pattern in 10% steps.
- Turn DC Mode off.

4.3.4 Switch BL

Due to some restrictions within the control system, the procedure is disabled at the moment. The functionality consists in switching to dipoles and quadrupoles and to perform a degaussing whenever a beamline switch occurs.

4.3.5 About

As reported in Figure 3, the About dialog provides general information about FMGSkal (Version, Authors, Contacts).

4.3.6 Exit

It closes FMGSkal.

4.4 Beamline Destination

It allows the user to change between different beamlines: FRS, HTS and ESR. In order to make operative the beamline change, the action button "Switch BL" (see 4.3.4) has to be pressed in order to start the procedure.

4.5 Status bar

The status bar, located just below the Beamline Destination panel, displays messages related to the completion of the HP calibration, precycling and beamline switch procedures.

Figure 3: the About dialog.