There are two options available using LOLA

1. **SMATCH** section -> Manual starting page 2
   - Tasks / properties:
     - **Measure** the longitudinal profile during SASE tuning / **Bunch length**
     - Kicks one bunch from bunch train
     - LOLA middle layer server and LOLA slow feedback

2. **SDUMP** section -> Manual starting page 11
   - Tasks / properties:
     - **Measure the longitudinal phase space**
     - Only one bunch in the machine is allowed

Switch LOLA off -> Manual starting page 20

This manual is based on Minjie Yan’s LOLA manual from 2014.02.28.
SMATCH section -> Manual starting page

- Tasks / properties:
  - Measure the longitudinal profile during SASE tuning / Bunch length
  - Kick one bunch from bunch train
  - LOLA middle layer server and LOLA slow feedback
Open panels

SMATCH
Open panels

SMATCH
1.1: Select the LOLA bunch (typically user bunches + 1)  
1.2: Press ‘Set Timing for SMATCH’

2: Select the LOLA repetition rate (typically 10 Hz for setup / single measurement / calibration and 1 Hz for continuous operation).

3: Enable BLM MASK
3.2: In long pulse mode, also enable TPS MASK

4: Set kicker voltage to the suggested value. Deviations are possible due to variations of e.g. beam orbit at LOLA. (Can be >2000V, 100V steps see 6.2)

5: Make sure direction is set to LOLA
5.2: Make sure HV is switched on

6: Generate LOLA bunch by selecting ‘1 LOLA bunch’.

7.1: If you are ready, you can turn on the kicker with ‘HV SWITCH’ to ON.
7.2: The beam should be visible on the screen. If not you may need to adjust the kicker voltage in steps of +/-100 V (can be >2000V) - It’s ok that the beam is in the lower part of the camera (attention if the voltage is too small it goes into FI1 beamline)
3.1: Change the phase in 10 degree steps until you see the beam on the camera.
3.2: Increase the amplitude in small steps (~ 0.100) and adjust the phase accordingly. Always keep the beam on the camera in sight.
3.3: Go to maximum amplitude of 1.250.

Note: if you steer the beam off the screen it might cause BLM alarms in the undulator area. Don’t worry, either you continue playing with the phase to find the beam again or start from the beginning with amplitude = 0.100.
Do time calibration

1: Chose camera SMATCH

2.1: Type in here the LOLA RF phases at which the beam is on the LEFT and RIGHT side of the screen.
2.2: Click 'do time calibration'.
2.3: During the calibration, you may need to click a continue button in the GUI.

Note: Time calibration needs to be repeated if the machine optics changes, OR the LOLA amplitude changes.

3: Print the calibration plot to the logbook.
**Do measurements**

- Save and display one single shot measurement (typically used)
- Don’t forget to print to logbook. To do that you can use the print button on the Matlab panel.

- It is also possible to save multiple raw data for future offline analysis.
- If you are doing some LOLA studies, you may need to save some data using this option.
Reconstruct bunch length from two measurements

For a reliable bunch length, the measurement has to be performed on both zero-crossings!

1. Make two measurements of the bunch length, one for each zero crossing of the LOLA RF. Change here zero-crossing and redo steps on page 7 & 8.

2. This file selection GUI will open two times. Select the last and the second last measurement taken before.

3. A plot showing the results of the bunch length calculation based on the chosen measurements opens.
LOLA middle layer server

- Open LOLA Display for continually ongoing measurement of the bunch length.
- The time calibration is automatically used from the last calibration measurement.
- Activate the LOLA phase feedback in order to keep the beam (horizontally) centered on the screen. Attention take care that the sign is correct (test it by slightly changing the LOLA phase)!
- Operate LOLA with 1 Hz (see page 5) to avoid high activation of the screen!
**SDUMP section**

- Tasks / properties:
  - Measure the longitudinal phase space
  - Only one bunch in the machine is allowed
Open panels

SDUMP
Open panels

SDUMP
Set timing and ensure kickers are off

1: Make sure that at least the HV switch is set to off.

2.1: Change the phase in 10 degree steps until you see the beam on the camera.
2.2: Increase the amplitude in small steps (~ 0.100) and adjust the phase accordingly. Always keep the beam on the camera in sight.
2.3: Go to maximum amplitude of 1.250.

Note: if you steer the beam off the screen it might cause BLM alarms in the undulator area. Don’t worry, either you continue playing with the phase to find the beam again or start from the beginning with amplitude = 0.100.
1. Switch on the camera 6SDUMP

2. Turn on dipole D9SMATCH
   - Set the suggested dipole current for the actual beam energy e.g. for 700 MeV -> current -175 A.
   - Note: The negative sign of the dipole current!
   - Set the number of bunches to one.
   - Now you should see the beam on the screen. If not, adjust the current in 0.1 A steps.
3.1: Change the phase in 10 degree steps until you see the beam on the camera.
3.2: Increase the amplitude in small steps (~ 0.100) and adjust the phase accordingly. Always keep the beam on the camera in sight.
3.3: Go to maximum amplitude of 1.250.

Note: if you steer the beam off the screen it might cause BLM alarms in the undulator area. Don’t worry, either you continue playing with the phase to find the beam again or start from the beginning with amplitude = 0.100.

- LOLA measurements in the SDUMP beamline are carried out with ‘normal’ bunches.
- No 1 Hz operation possible. Reduce the time with beam on the screen to minimize activation.
- Maximum 2 bunches are allowed.
Do time calibration

1: Choose camera SDUMP

2: Type in here the LOLA RF phases at which the beam is on the LEFT and RIGHT side of the screen.
2.2: Click 'do time calibration'.
2.3: During the calibration, you may need to click a continue button in the GUI.

3: Print the calibration plot to the logbook.

Note: Time calibration needs to be repeated if the machine optics changes, OR the LOLA amplitude changes.
1. Type in here the dipole current, at which the beam is no the top and bottom of the screen.
2. Click the do energy-calibration button.

2.1: Click the print button to print the plot of the calibration to theelog.
Do measurements

- Save and display one single shot measurement
- Don’t forget to print to logbook. To do that you can use the print button on the Matlab panel.

- Save multiple raw data for future offline analysis.
- If you are doing some LOLA studies, you may need to save some data using this option.
Switch LOLA off
Switch off

1 use this button to switch everything off
or switch off kicker, PFN, special bunch (typically A is used)