**Ultrashort laser pulse temporal duration measurement:**

**2nd order intensity autocorrelator – BONSAI**

Activity objective: Measurement of the temporal duration (FWHM) of an ultrashort laser pulse employing an intensity autocorrelator at the 2nd order.

In the first part of the activity, you will set up the autocorrelator for the measurement of the temporal duration. In this phase the laser is extracted two optical cycles in advance (it misses two round trips in the regenerative amplifier) to work at low intensity.

Walkthrough and tasks:

* Alignment of the laser on the two irises at the entrance of the BONSAI
  + Do you see just one beam at the entrance?
* Verify that the laser follows the path that you are expecting.
* Once satisfied with the alignment, block the laser and turn on the software (BONSAI on desktop).
* Set the acquisition time to 100 ms and take the background
  + What happens if you turn on/off the room light?
* You are ready to get your measurement, let the laser reach the CCD (remove the two irises)
  + What are you looking at? How is the signal generated?
  + Try to change the delay between the two beams, what do you observe? Can you explain why?
  + Is this a single pulse measurement or an integrated one?
  + Note down the temporal duration you get.
  + Try to change the acquisition time (stop the acquisition and restart from taking the BG), what do you observe?
* Now we want to verify that this is the minimum temporal duration we can get, on which element of the laser chain should we operate on?
* Ask to the operators to change the alignment of this element and observe how the temporal duration is affected.

In the second part of the activity the operators will show you the same measurement but extracting the laser at the proper position.

* What do you observe?