Auto TPL Tripler Control Panel

The control panel has three main pages: **Front Page, Run,** and **Calibration** pages.

Front Page: shows the company name and the model of **Auto TPL tripler**

Run page: the major page for wavelength auto scan. The run page contains the wavelength indicators, the **TrackBar** for wavelength scan, the command **buttons**, and the THG power indicator.

> **THG wavelength indicator** shows the THG wavelength in nm.

> **SHG wavelength indicator** shows the SHG wavelength in nm.

> **Input wavelength indicator** shows the input laser wavelength in nm. The wavelength can be changed in the text window. **Press** the **return key** will start to scan the tripler to the input wavelength calculated according to the data saved in the calibration table. The wavelength range is from 680nm to 1060nm.

> **TrackBar** can also change the wavelength and scan the tripler to the input wavelength. The wavelength is calculated according to the data saved in the calibration table.

> **Turn On/Turn Off Button** turns on or turns off the motor controller.

> **Optimize Button** starts the optimization process to find the best motor positions for the maximum THG power. The motors to be optimized are selected by the menu bar **Run/ Option for Optimization.** The motors and three position ranges can be selected.

> **Controller Indicator** shows the On/Off statue of the controller.

> **THG Power Indicator** displays the relative THG power when the **THG monitor** is turned on in the menu bar **THG monitor/ Turn On Monitor**.

Calibration page: has the calibration table containing the calibration data for scan the wavelength. The page also has the motor controller for each motor to move the motor manually.

> **Calibration Table**: the table contains the data of each motor position at each laser wavelength after optimized the THG power. Each row has a set of motor position data for one input laser wavelength. The first column is the wavelength, the second column is the motor W position, the third column is the motor X position and so on as indicated by the title of each column. Every 10nm may have a set of the calibrated data. The motor positions corresponding to each input laser wavelength is calculated and moved according to the data in the table.

> **Add Data button**: The data can be added to the table by Press **Add Data** button. The Calibration data can be deleted using the **Edit menu Cut** function. The data can be added or

deleted only in a data set having one wavelength and positions of each motor (6 motors total). Note the old data set will be replaced by a new data set if the wavelength of the new data set is same as that of the old data set.

Reference position: the motor reference positions are set for 800nm laser wavelength. The reference position can be changed by using the menu bar **Calibration/change reference position (800nm).** Change reference position will led to whole column of motor data shift a same amount of position determined by the difference of the new position and the old position at 800nm for each motor.

Change Motor direction: the motor can be moved in a positive direction with the motor position increasing with the wavelength increasing or in a negative direction with the motor position decreasing with wavelength increasing.

Motor controller: there are six motor controllers to move or scan the motor position separately. **Motor W** is for SHG phase match angle controlling, **Motor X** for THG phase match angle controlling, **Motor Y** for the time plate angle controlling, **Motor Z** for the half wave plate angle controlling, **Motor A** for controlling the focal distance of the SHG focal lens (Lens1) to the SHG crystal, and **Motor B** for controlling focal distance of the THG focal mirror (Lens2) to the THG crystal. The motor controller is for manually moving the motor.

Wavelength window: the wavelength can be changed to the input laser wavelength by the change of the number in the **window** or by moving the **Trackbar**.

Menu Bar: has **File, Run, Calibration, THG Monitor**, and **Help Bar**.

File/Open: to open the calibration data file.

Close: to close the control program.

Save: to save the calibration data to the same file name.

Save As: to save the calibration data to a different file name.

Exit: to exit the control program.

Run/Go Home: to move the selected motors to the home (zero) position, and then move to the last motor positions.

All Motors: press to go home for all motors.

Motor W (SHG): press to go home for motor W.

Motor X (THG): press to go home for motor X.

Motor Y (SHG): press to go home for motor Y.

Motor Z (SHG): press to go home for motor Z.

Motor A (SHG): press to go home for motor A.

Motor B (SHG): press to go home for motor B.

Run/Do Optimization: Press to start the process to optimize the selected motor position for maximizing the THG power. The motor and the range are selected in the **Option for Optimization** menu bar.

Run/Turn on: to turn on the motor controller

Run/Option for Optimization: each motor or all the motors can be checked or unchecked and three position ranges (**Large, Medium, and small** ranges) can be selected for the optimization process. Most time the medium range is good enough.

Calibration/Open Table: to open the calibration data table in another window page.

Open Calibration File: to open a calibration data file to the calibration table.

Add Data to Table: to add a set of motor position data optimized at one wavelength to the calibration table.

Cut A Row from Table: to cut a set of data to the selected wavelength (Row).

Change Reference Position (800nm): Press to change the selected motor reference position. The motor reference positions are set for 800nm laser wavelength. Change reference position will led to the whole set of data of the selected motor to shift a same amount of position determined by the difference of the new position and the old position at 800nm for each motor.

Motor W (SHG), Motor X (THG), Motor Y (TP), Motor Z (WP), Motor A (Lens1), Motor B (Lens2), All Motors

Change Motor Direction: Press to change the selected motor direction. The motor can be moved in a positive direction with the motor position increasing with the wavelength increasing or in a negative direction with the motor position decreasing with wavelength increasing.

Motor W (SHG), Motor X (THG), Motor Y (TP), Motor Z (WP), Motor A (Lens1), Motor B (Lens2)

THG Monitor/Open Graph: press to open the graph of the relative THG power. The graph will show the THG power in seconds (up plot), minutes (middle plot), and hours (bottom plot).

ReStart Graph: to clean the previous data in the graph and start to show the new data of the THG power.

Change Graph Scale

Top Plot Maximum: press to input/change the Y-axis maximum of the top plot.

Top Plot Minimum: press to input/change the Y-axis minimum of the top plot.

Bottom Plot Maximum: press to input/change the Y-axis maximum of the middle and bottom plots.

Bottom Plot Minimum: press to input/change the Y-axis minimum of the middle and bottom plots.

Turn On/Off Monitor: Press to turn on/off the sensor of the THG power monitor.

High/Low Sensitivity: Press to select the high (100 times) sensitivity or the low (1 time) sensitivity for the sensor of the THG power monitor.

Measure Background: To measure the background signal without the THG power. The measured THG power will subtract the background signal.