FODTS: Steps for Operating Silixa XT DTS System

User Guide Supplement

Purpose:

The user guides provided by Silixa supply details about some steps for setting up the hardware and software, and details about the various input options. This user guide acts as a supplement to the Silixa Hardware and Software user guides, and describes the considerations necessary and order of steps to be taken to set-up, operate, and analyze the XT DTS data, as it will be used by me and future graduate students.

Installing Software and Establishing Communications with XT DTS

- When installing the XT DTS software, make sure to follow the detailed instructions and order of instructions given by the XT-DTS Software Manual pg 10-24.
    - **Note:** Software versions are specific to XT DTS units, if you are working with multiple XT DTS units, make sure you have the correct software versions installed.
- Plug in and power up the XT DTS unit. Connect to computer via ethernet. Let sit for about 5-10 min to allow for start up.
- Open XT Client UI
- In top left corner, click DTS Remote Client >> Manage Connections >> +
    - Type in XT DTS unit number 'XT19090', and test connection.
    - When successful click Add to save the DTS system
    - Come back to this page whenever having issues communicating with DTS system, or see troubleshooting connection issues section of Software Manual pg 31-32.
    - **Note:** If you are using parallels virtual machine as your Windows 10 machine, you may have issues stemming from your network settings.
        - Parallels>> Configure>> Hardware >> Network >> Source. Change source to 'Thunderbolt Ethernet'. Wait a few minutes, and try connecting again.

Configuring for Testing:

- All available setting options are described in the XT-DTS Software Manuel pg. 33-69
- In XT Client UI: DTS Remote Client >> Preferences.
    - Set Units of Measurement (Metric/Imperial)
    - Set Save data folder
    - Set Time zone
- Back on the XT Client UI main page, make sure you are connected to your DTS system (you will be given a "Communication Failure" error message if you are no longer connected).

    - **Note:** It is important to create a unique configuration for each sampling experiment – Configuration should be specific to your experiment.
- Click Configure >>
    - Use last configuration as template: If conducting similar sampling as previously done
    - Create a new configuration: If you would like to start from scratch.
- You will then be prompted to take a test measurement. Select sampling interval and Acquisition Time and press start
    - These inputs are for the test measurement only, they are not the settings of your configuration.
    - Wait for the measurement to proceed and produce a graph.
    - **Note:** Taking test measurements throughout the configuration process is a great way to see how your input changes.
        - Default is to view the Temperature graph of the data, you can also switch to the "Raw Data" view to see the Stokes v. Anti-Stokes measurements
- **Activation:** Select the first channel you have a fiber connected to (repeat for all channels that measurements will be taken from. >> Check the Channel Activation box
    - You will be prompted to select the fiber length (select the shortest length that is greater than the length of your fiber.
    - Name the Channel as you like
- **Fiber Correction:** Select your zero reference (length along the fiber), and the Fiber length
    - **Note:** These are used to define the User Measurement System: the starting point to end length of the fiber
- **Acquisition:** Set the Sampling Interval (Distance between measurement points.
    - Set the measurement length: This allows you to select the length of fiber you are specifically looking at.
    - Set the Acquisition Time this is used to set the averaging time. For example: 10s means that all the measurements within a 10s interval will be averaged, and you will receive 1 measurement every 10 seconds.
        - Longer Acquisition times result in less noise, but are less receptive to fast/small scale changes
- **Reference Sections:** If a reference section is applicable, select the appropriate probe and reference section.
    - Only set a reference section if you have one set up. See pg. 48 -49
- **Differential Loss:** Select the type of differential loss see pg. 50-61 for all applicable options.
    - **Note:** The recommended Fixed value dB/km loss will be used in most measurement settings that we deal with. This fixed value is specific to the fiber that is being used. If the Differential Loss of the fiber is unknown, use default value.
- **Temperature Offset:** Select the best temperature offset for your experiment.
    - **Note:** Unless you have:
        - Set up a probe measurement section with a specific length of fiber, or
        - Have used an accurate temperature probe to measure against the sensing fiber and have come up with a constant value.

        - Than **None** is the best option.
- Repeat process for all active channels
- In the all channels section, Name and describe your configuration.
    - Set your measurement interval
    - Set your measurement type (continuous, or for a set amount of time).
    - **Note:** the XT DTS system can only measure through one channel at a time. This will be reflected in your measurement interval.
- Save the configuration and start measuring.

During Sampling:

- During sampling, you can click "View Graph" on the XT Client UI main page to watch the live measurements.
    - This can only be done if your computer is connected to the XT DTS system.
    - Connecting your computer will automatically download all measurement files from the XT DTS.
- To stop sampling, click "Stop" on the XT Client UI main page.

Viewing and Exporting Data:

- Once measurement files have been uploading on your computer, open the DTS Viewer Lite program.
- In the Menu bar select File>>
    - Open DTS File(s) to open one or more measurement files
    - Open Folder to open a whole folder of DTS measurement files.
- Once Open, use the animation controls to play, stop and control play speed of data/ navigate through individual files.
- Use the zoom and movement tools to navigate the data.
- In the menu bar, use "View" to switch between Temperature, and Raw Stokes/Anti-Stokes data visuals.
- To Export data, select Export from the menu bar
    - >> Current file to .csv to export only the current file
    - >> Folder as .csv to export multiple files
    - You will be prompted to select your time range & length range of interest when exporting
    - You will be prompted to select:
        - Export as individual files or as an aggregate file (for aggregate, select number of measurements in a batch)
        - The data you want to export: Stokes, Antistokes, Temperature, Probe

Hardware Set up & Considerations:

- Connect XT DTS system to power, turn on (this takes several minutes)
- The fiber you are using must be spiced onto an initiator to be compatible with the system
    - If possible, how the Differential Loss dB/km of your fiber.
    - Plug fiber into channel

    - Lay out fiber as desired for sampling experiment
    - **Note:** If using the Custom Fiber Optic Fishing Line, apply some tension so that the fiber does not spin up, bend, and expose cladding.
- Connect XT DTS system to computer with XT DTS software installed.
    - Configure sampling as discussed
    - Begin sampling
- You can disconnect your computer once sampling has begun. Or leave it connected to observe the live data.
- Connect your computer again to view live data at any point in the sampling process, download measurement files, or stop the sampling.