Beckman Coulter DTX 880
Multimode Detector

Bergen County Technical Schools
Stem Cell Lab

Room 213

Beckman Coulter DTX 880 Multimode Detector Information

The Beckman Coulter DTX 880 Multimode Detector is a microplate reader and analyzer. The instrument essentially functions as a spectrophotometer, which measures intensity as a function of the color, or more specifically, the wavelength of light, and has the capability to scan samples for absorbance, fluorescence, and luminescence. The instrument has applications that would prove useful for multiple disciplines, from Biology, to Chemistry and Nanotechnology.

The DTX 880 supports a wide range of labware, with many common microplate formats already preconfigured and ready for use in the software, ranging from 6 well to 384 well plates. In addition to the preconfigured templates, new labware types may be created at any time using the program's Labware Editor.

The Multimode Analysis Software configures and controls all measurement, protocols, and actions performed by the DTX 880 Detection Platform. The software supports detection for absorbance, glow luminescence, fluorescence intensity, fluorescence polarization, and time-resolved fluorescence (TRF) measurements including HTRF. This instrument has been suggested to be used for studies involved with apoptosis, fluorescent molecule binding, cell proliferation and viability, immunoassays (such as ELISA), and nucleic acid or protein quantification.

The software allows the user to establish unique protocols to analyze different sample plates. Samples are analyzed in the instrument, and the results stored in the software. The measurement results can then be viewed in the Multimode Analysis Software or easily exported to compatible applications such as Microsoft Excel.

Beckman Coulter DTX 880 Multimode Detector Quick Start Guide

1. Turn the DTX 880 on by flipping the power switch (located in the back of the instrument on the back right).

2. Determine correct filters for the analysis and insert them into the instrument if necessary (see the Instrument and Software Information Guide).

    a. When changing a filter for the first time, an instructor should be present to supervise.

3. Press the eject button on the instrument.

    a. Place the microplate in the tray with letters to the left and numbers on top.

        i. See the Safety Sheet for warnings about the moving parts of the instrument.

    b. On the desktop, go to Start→ Programs→ Beckman Coulter→ Multimode Analysis Software→ Multimode Analysis Software.

    c. The software screen will open to the software main window. On this panel are the *Navigation Pane*, *Tool Bar*, *Selection and Configuration Pane*, and *Preview Pane* (See Instrument and Software Information Sheet).
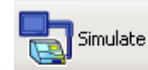
Setting up a Protocol

1. Click the **Instrument Icon** on the *Navigation Panel*.

    a. If the system is on and connected, the instrument status will show **"Busy"**, and the **Simulate Icon** will be located on the *Tool Bar*.

        i. If the instrument is not connected, click the **Connect Icon** on the *Tool Bar*.

ii. "Busy" should appear under the instrument status. If not, instructor should check the instruments cables.

b. Next click the **Initialize Icon** on the *Tool Bar* to ensure the instrument is reading the correct filters.

c. The microplate can also be inserted into the machine from this screen by clicking the **Eject Icon** and **Load Icon** on the *Tool Bar.*

2. Click on the **Labware Icon** on the *Navigation Pane*.

a. Click the type of plate that will be used in the analysis (All plates that are optimized for the instrument start with Rm213 and state the type of study it should be used for).

Rm213 - ABS - Costar Clear 96 Well - bulk	96
Rm213 - ABS - Costar Clear 96 Well - steril	96
Rm213 - FLU - Costar Clear 96 Well - bulk	96
Rm213 - FLU - Costar Clear 96 Well - steril	96
Rm213 - LUM - Perkins Bl 96 Well - Sterile	96

b. In the *Preview Pane*, make sure the optimization says "Optimized for" and the type of scan being performed (Absorbance, Luminescence, or Fluorescence).

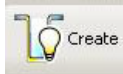3. Click the **Detection Methods** icon on the *Navigation Pane*.

a. Find the type of reading that will be used in the procedure.

Example: A plate that needs the absorbance to be read at 405nm should look for the button that says x_DTX880_Abs_405.

x_DTX880_Lumi_100ms	Luminescence	SL 1
x_DTX880_Lumi_400ms	Luminescence	SL 1
x_DTX880_Lumi_1000ms	Luminescence	SL 1
x_DTX880_Abs_260nm	Absorbance	SL 2
x_DTX880_Abs_340nm	Absorbance	SL 2
x_DTX880_Abs_405nm	Absorbance	SL 2
x_DTX880_Abs_450nm	Absorbance	SL 2
x_DTX880_Abs_595nm	Absorbance	SL 2
x_DTX880_Abs_620nm	Absorbance	SL 2

b. If the type of reading is already in the system, continue to Step 4.

c. If the type of reading is not on the list:

   i. Click the **Create Icon** on the *Tool Bar*.

   ii. Select the type of reading from the dropdown menu, click **Next**.

   iii. Select the method type from the dropdown menu, click **Next**.

   iv. Enter the **Method Name** in the box, and select the excitation wavelength or Integration Time for the method. Click **Save**.

Method Technique

Supported Technique	Absorbance ▼
	Absorbance
	Luminescence
	FRET
	Fluorescence Intensity Top
	Fluorescence Intensity Bottom
	Fluorescence Polarization
	Time Resolved Fluorescence

Method Type

Method Type	Monochromatic ▼
	Monochromatic
	Bichromatic

Method Parameters

| Method Name	NewMethod 1
Excitation Wavelength (nm)	260 SL 2 ▼
	260 SL 2
Date Created	340 SL 2
	405 SL 2
	450 SL 2
	595 SL 2
	620 SL 2

   v. The new method will now show up in the list.

4. Click the **Protocols Icon** on the *Navigation Pane*.

a. If the protocol was previously established, but changes need to be made to it, click the **Copy Icon** in the *Tool Bar*, then the **Edit Icon**. If it is the first time the protocol is being run, click the **Create Icon** on the *Tool Bar*.
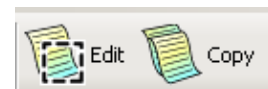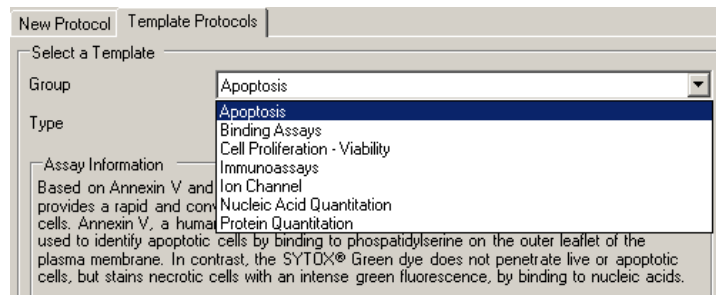
b. For a New Protocol:

    i. Select the **Protocol Type** from the dropdown menu, click **Next**.

        1. **Analysis** is the type that will mostly be used. It allows users to establish formulas, variables, and parameters.
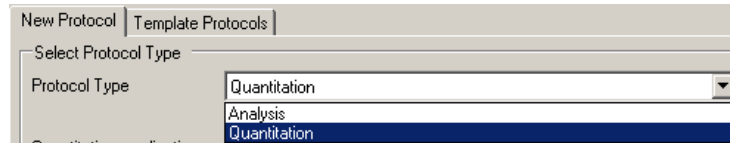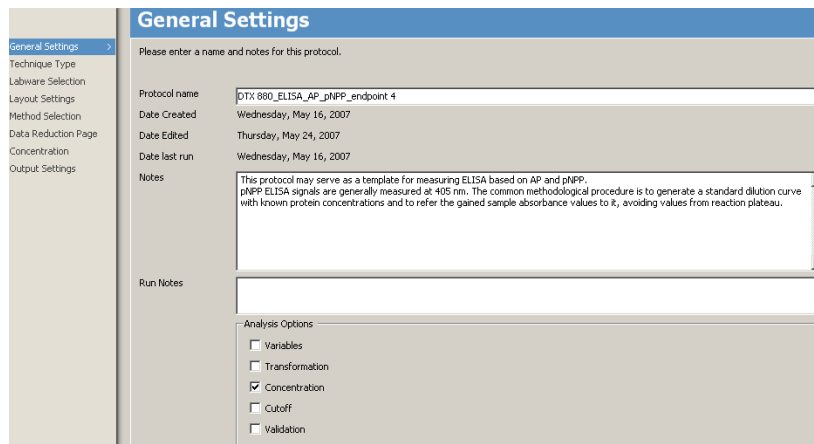

    ii. Select the **Group** and then **Type** of experiment being performed from the dropdown menu, click **Next**.

Note: Immunoassay is used for ELISA readings.

    iii. A new screen will pop up to allow the user to edit the settings for the individual protocol.
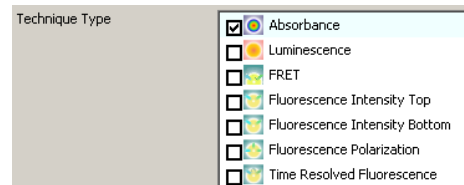
    iv. The **General Settings** window appears.

1. **Name** the new protocol, or rename the copy of an established protocol.

2. Enter **Notes** with information about the protocol.

   a. This section can be used to enter information such as who's protocol it is, the number or type of samples being run, conditions, the project name, etc.

3. **Run Notes** is used for additional information

4. Select the **Analysis Options** that best suit the type of analysis being performed. Click **Next**.

v. **Technique Type**

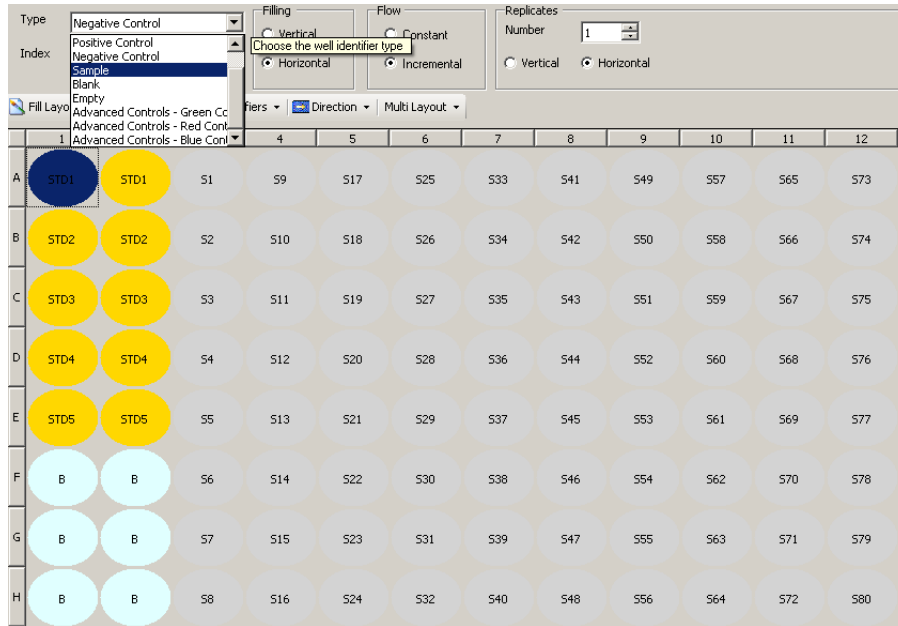1. Select the technique that will be used for the protocol. Click **Next**.


vi. **Labware Selection**

1. Select the labware that was identified earlier. Click Next.

vii. **Layout Settings** – This is where you tell the instrument what is in each of the microplate's wells.

1. Select Type.

2. If there are dilutions of the selected type in the plate, click **View: Identifiers**, and select Dilutions.

3. In **Filing**, choose to label wells vertically (by column) or horizontally (by row).

4. In **Flow**, choose if all of the items highlighted will have the same number (Constant), or if they should increase (Increment).

5. Determine the number of replicates of that type.

6. Click the **Fill Layout Icon** to add the type to the template.

7. Select next type and repeat steps 2 – 6 until all wells are labeled.

viii. **Method Selection** – Allows you to add additional options to the run, such as shaking, waiting, and setting a temperature for the instrument to perform the run at.
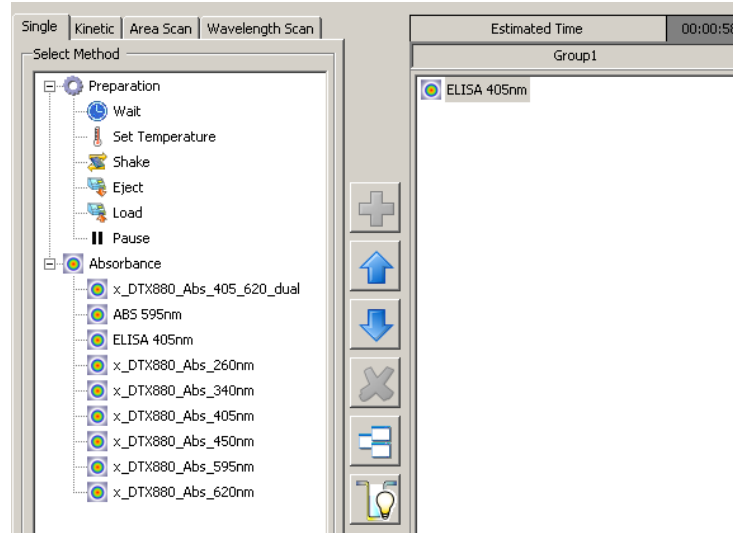
1. To add an option to the protocol, highlight it and press the + button.

2. To change the order of the protocol, highlight the task in the right side window and move it with the up and down arrows.

3. Click **Next** once method selection is completed.

ix. **Data Reduction** – Used to add formula information to the run

1. Can be skipped; The option is available in the results page.

x. **Additional Pages** – Depending on the type of protocol, additional pages may appear with options for that protocol. One example is **Concentration**.

1. First set the type of curve and number of standards.

2. Change the Y and X axis if a different option is needed.

3. In the standards window, enter the concentrations of each standard used in the protocol. Click **Next.**

xi. **Output Settings**

1. The only option in this window that needs to be checked is **Show Results Viewer**. The other options can be selected after the protocol is run.

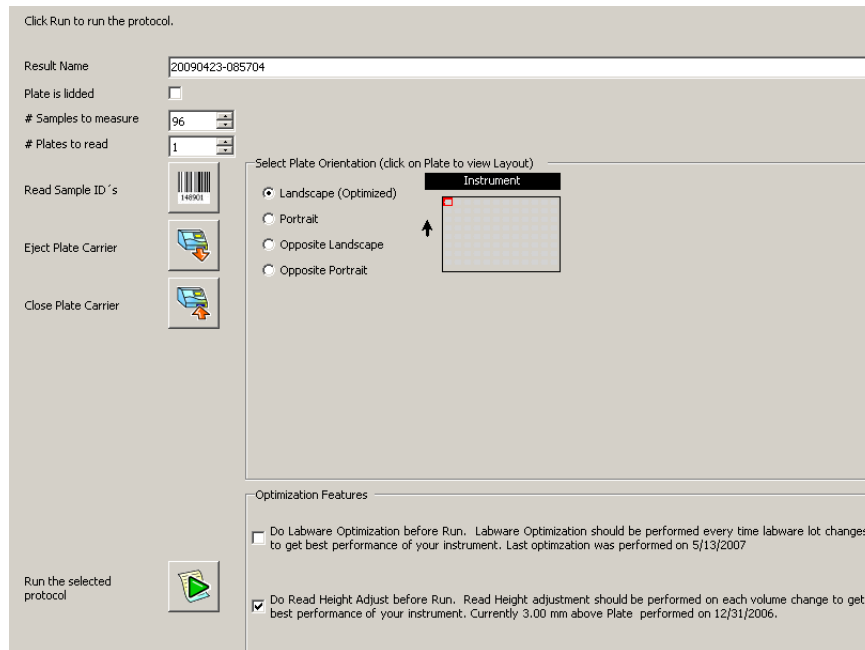2. Click **Save** at the bottom of the screen.

Running a Protocol on a Sample Plate

Once a protocol for the plate has been established, it can be run and analyzed.

1. Select the protocol to be used in the **Protocol** tab of the *Navigation Pane*.

2. Click the **Run** icon on the *Tool Bar*.

3. A **Run Window** will pop-up.

Click Run to run the protocol.

Result Name	20090423-085704
Plate is lidded	☐
# Samples to measure	96
# Plates to read	1

Select Plate Orientation (click on Plate to view Layout)

Instrument

Read Sample ID´s

⦿ Landscape (Optimized)
○ Portrait
○ Opposite Landscape
○ Opposite Portrait

Eject Plate Carrier

Close Plate Carrier

Optimization Features

☐ Do Labware Optimization before Run. Labware Optimization should be performed every time labware lot changes to get best performance of your instrument. Last optimzation was performed on 5/13/2007

Run the selected
protocol

☑ Do Read Height Adjust before Run. Read Height adjustment should be performed on each volume change to get best performance of your instrument. Currently 3.00 mm above Plate performed on 12/31/2006.

   a. Create a **Result Name** for the samples.

      i. The project name, name of student, or type of samples are good to use for the result's name. The data of the run should also always be used.

   b. If the plate needs to be analyzed with a lid on, check the lid box.

   c. The number of samples should be 96, and the number of plates 1.

   d. **Plate Orientation** should always be landscape.

   e. In the Optimization Features window, leave the first box unchecked, and make sure the second box is checked (Plates have already been optimized).

4. Click the button next to **Run the Selected Protocol** to start the run.

5. A status bar will appear on the screen showing the progress of the run.

   a. After the run is complete, a **Results** page will open.

Analyzing Results

Results can be accessed in two ways:

1. A pop-up window with the results will appear after a run is completed.

2. On the main screen, the **Results** icon can be clicked in the
   Navigation Pane.

   a. Results are saved in this section, and can be accessed any time.

In the results pop-up window:

1. Select the **Data** button in the left panel.

   a. The variables button lists variables from the Protocol section to be used in formulas.

2. A screen with multiple tabs to analyze the data will appear.

   a. **Raw Data** – This tab shows the actual reading from the instrument for each well in the plate that was selected in the protocol.

      i. The data in A1, A2, B1, & B2 will be compared in raw, blanked and reduced data to show differences.

ELISA 405nm
└ Data

	1	2	3	4	5	6	7	8	9	10	11	12
A	0.0315 OK	0.0344 OK	0.0349 OK	0.0342 OK	0.0363 OK	0.0342 OK	0.0344 OK	0.037 OK	0.0345 OK	0.0354 OK	0.0346 OK	0.0336 OK
B	0.0342 OK	0.0348 OK	0.0352 OK	0.0362 OK	0.035 OK	0.0351 OK	0.0351 OK	0.0352 OK	0.0355 OK	0.0351 OK	0.0351 OK	0.0342 OK
C	0.0341 OK	0.035 OK	0.0351 OK	0.0353 OK	0.0357 OK	0.0354 OK	0.0353 OK	0.0357 OK	0.0353 OK	0.0351 OK	0.0351 OK	0.0341 OK
D	0.0343 OK	0.0347 OK	0.035 OK	0.0351 OK	0.0353 OK	0.0354 OK	0.0352 OK	0.0353 OK	0.0352 OK	0.0356 OK	0.035 OK	0.0341 OK
E	0.034 OK	0.0345 OK	0.0349 OK	0.0349 OK	0.0351 OK	0.0353 OK	0.0354 OK	0.0352 OK	0.0357 OK	0.0354 OK	0.0348 OK	0.0341 OK
F	0.034 OK	0.0346 OK	0.0348 OK	0.0351 OK	0.0355 OK	0.0351 OK	0.0352 OK	0.0357 OK	0.0354 OK	0.0351 OK	0.0348 OK	0.034 OK
G	0.0341 OK	0.0347 OK	0.0348 OK	0.0349 OK	0.0347 OK	0.0348 OK	0.0348 OK	0.0351 OK	0.0353 OK	0.0349 OK	0.0346 OK	0.0342 OK
H	0.0331 OK	0.0342 OK	0.0348 OK	0.0348 OK	0.0346 OK	0.0345 OK	0.0341 OK	0.0341 OK	0.034 OK	0.0349 OK	0.0344 OK	0.033 OK

	1	2
A	0.0315 OK	0.0344 OK
B	0.0342 OK	0.0348 OK

b. **Edit** – Provides an area to enter formulas to apply to the data.

Group1	First Pass	Add new Pass

○ A = ELISA 405nm

REDUCTION_A1
Formula

A1

Formula

Formula
A

Name of Data   absorbance

Name of Units   OD

Notes

Syntax Helper

Apply Formula for Wells with Category
☑ Blank
☑ Sample

Add new Item

Note: Formulas can also be applied in **Excel** if information is exported. See section e4 on how to export data.

c. **Blanked Data** – Averages the readings from wells identified as Blank in the protocol setup, and subtracts the value from the remaining wells in the plate.

	1	2
A	-0.004 OK	0.035 OK
B	0.035 OK	0.035 OK

i. Corrects for any background signal observed in media only wells.

d. **Reduced Data** – Shows the data after all corrections and formulas are applied. Also shows data reduced to their lowest significant figures.

i. This is the data page best used for analysis of results.

e. **Graph View** – Places data from all wells into a graph.
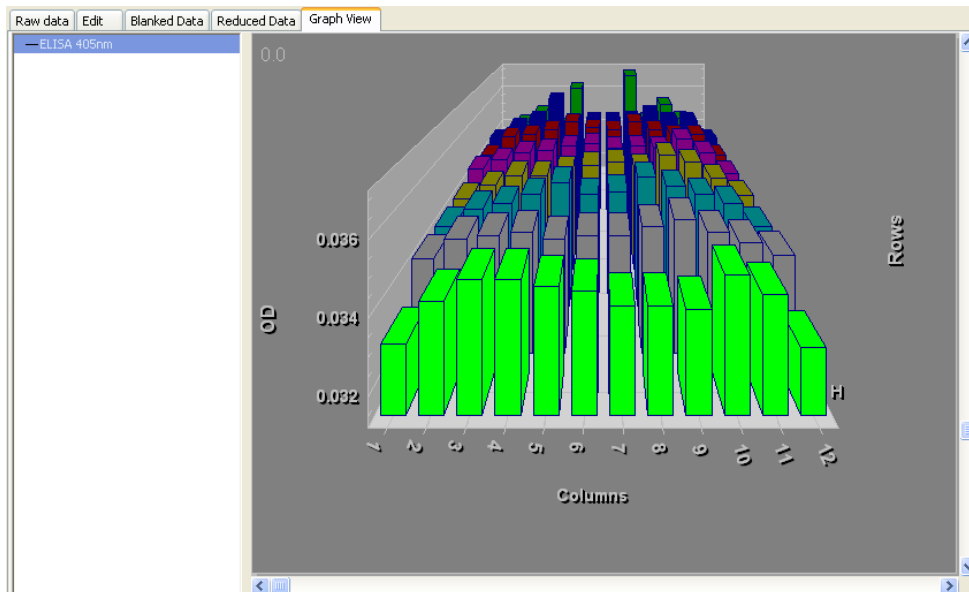
i. The row and column information is displayed on the **X** and **Z Axis**, and the readings from the machine on the **Y Axis**.

ii. The graph can be rotated 360 degrees in the X direction using the **Slide Bar** below the graph.

iii. The graph can be turned 45 degrees up and down using the **Slide Bar** to the right of the graph.

iv. All of the settings for the graph, including the plotting style, shading, coloring, font, etc. can be controlled by **Right Clicking** on the graph (See above).

3. After analyzing results in this window, the data from each tab and the graph can be printed by selecting the tab and pressing the **Print** icon on the *Tool Bar*.

4. The data can also be exported to excel by pressing the **Excel** icon on the *Tool Bar.*
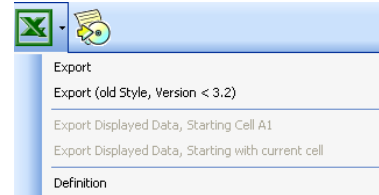
a. The data can be exported in two ways:

i. **Export**: Sends data to Excel as a list of information from each table.

1. Tabs at the bottom allow different data sets to be observed.

ii. **Export Displayed Data, Starting Cell…**: Places data into Excel in a format that replicates the microplate arrangement.

Removing the Plate and Shutdown

To remove the plate from the machine once the run is complete and shut down the equipment:

1. Press the **Eject Button** on the outside of the instrument.

    a. The tray will slide out containing the microplate.
       Remove it from the tray, and press the button again to
       close the tray panel.

2. Make sure that the **EX2** and **EMP1** filters are in the instrument.

    a. If filters were changed for the protocol, press **EM** or
       EXP Eject Button on the instrument, and replace
       the correct filter in the machine.

3. Shut down the instrument by pressing the power switch behind the machine on the bottom right side.

4. Shut down the software by clicking the (X) at the top right of the screen.

    a. All result data is stored in the program and can be accessed at anytime by logging back into the program. No saving is necessary.

5. **Make sure the station is neat before leaving the instrument!**

Beckman Coulter DTX 880 Multimode Detector Safety Sheet

1. Samples should be handled according to good laboratory procedures and methods in order to prevent accidents.

2. Dispose of all waste solutions according to waste disposal procedures.

3. Do not remove any panels or cords from the instrument to avoid electrical shock.

4. The instrument has moving parts:

    a. Do not attempt to exchange microplates or filters while the instrument is operating.

    b. Keep the work area around the instrument clear to avoid obstruction of the moving parts.

    c. When the microplate tray is open, only place a microplate in the tray to avoid breaking the instrument.

    d. Do not force the filter slides into their respective locations in the filter panel. Doing so could break the instrument or filters.

    e. Be aware of clothing and body parts when instrument doors are opening and closing.

5. Cleaning the workstation around the instrument is necessary. Never attempt to clean any internal spaces of the instrument.

6. If a microplate is to be run with a lid on, make sure that in the protocol or run page the lidded plate option is selected.

    a. Not selecting a lidded plate in the protocol or run pages can cause damage to the filters and/or the internal parts of the instrument.

7. Luminescent light levels visible to the human eye may cause damage to the detection system.

8. Food and drinks should not be placed on or near the instrument.

9. Running unauthorized programs or changing preferences on the instrument's computer is not allowed. Laptops are provided for personal use and internet access. Do not plug memory sticks in the instrument's computer unless instructed to do so by the instructor.
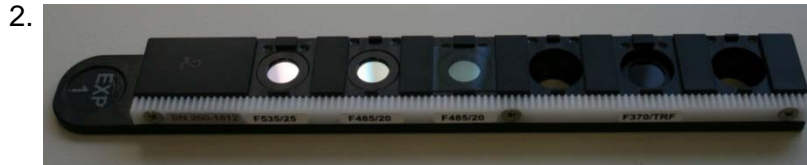
Beckman Coulter DTX 880 Multimode Detector Instrument and Software

**DTX 880 Multimode Detector Overview:**

1. Power Switch

2. Eject Microplate Tray Button

3. Eject Excitation or Emission Filter Buttons

4. Excitation and Emission Filter Door

5. Microplate Tray Holder

Instrument Filters:

1.

2.

3.

4.

1. EM 31 – Blocking Filter
   a. Blocks light for Luminescence
      i. Not left in the Instrument

2. EXP 1 – Excitation Filter 1   F = Fluorescence
   a. Used for F535/25, F485/20, F485/20, F370/TRF
      i. Not left in the Instrument – Used for Fluorescence analysis

3. EX 2 – Excitation Filter 2   A = Absorbance
   a. Used for A260/12, A340/10, A405/10, A450/8, A595/8, A620/8
      i. Left in instrument - Used for Absorbance and Luminescence analysis.

4. EMP 1 – Emission Filter 1   F = Fluorescence
   a. Used for F595/35, F535/25, F535/25, F535/35, F625/35, empty
      i. Left in instrument - Used for Fluorescence analysis.

Multimode Analysis Software Main Window:
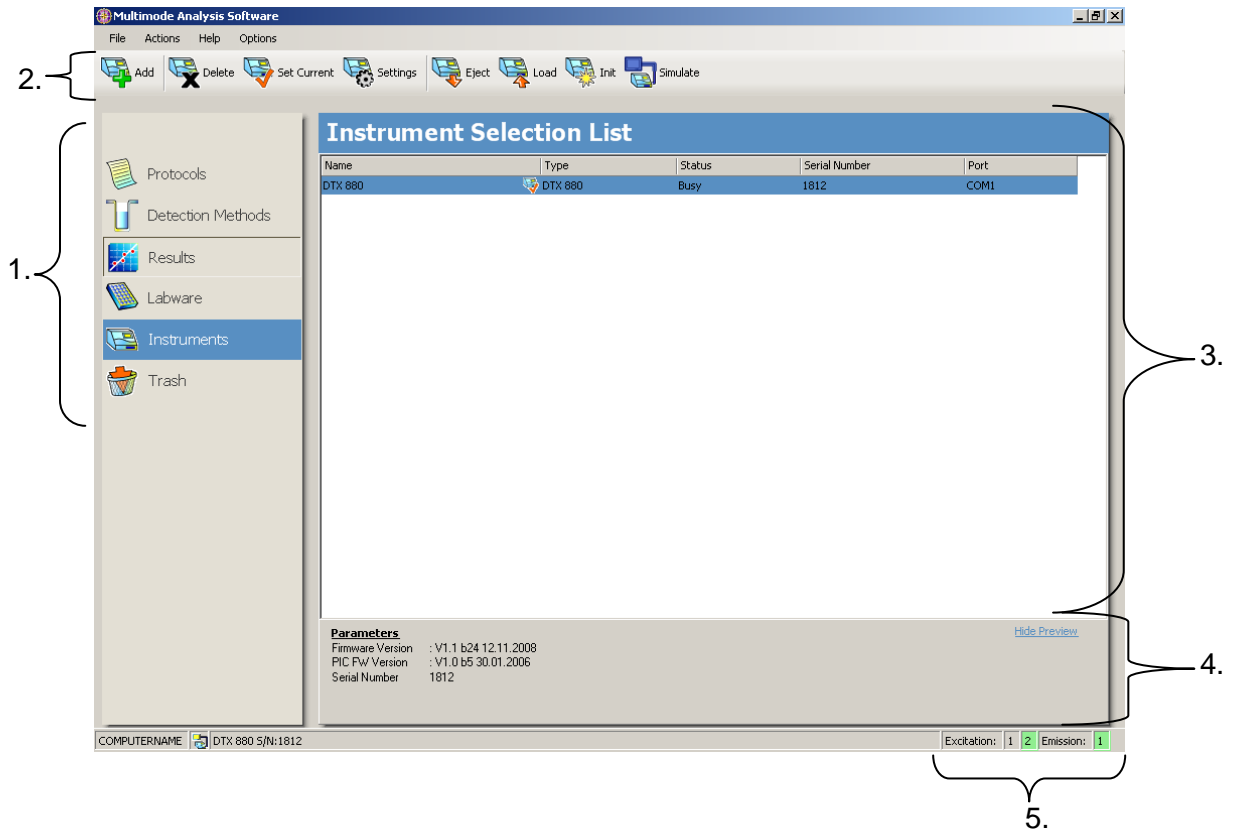
4. **Navigation Pane** – The narrow window on the left side of the main screen. Contains the action buttons to set up protocols.

5. **Tool Bar** – The bar at the top of the screen. Provides easy access to the software actions available for each icon in the Navigation Pane.

6. **Selection and Configuration Pane** – Large pane to the right of the Navigation Pane. All actions are performed in this window.

7. **Preview Pane** – Provides user with additional information about items selected in the program.

8. **Filters** – Shows the filter slides that are inserted in the instrument.