Operation of the Toxic Organic Chemical Air Monitor (TOCAM®) with the Ellvin® Chromatography Software
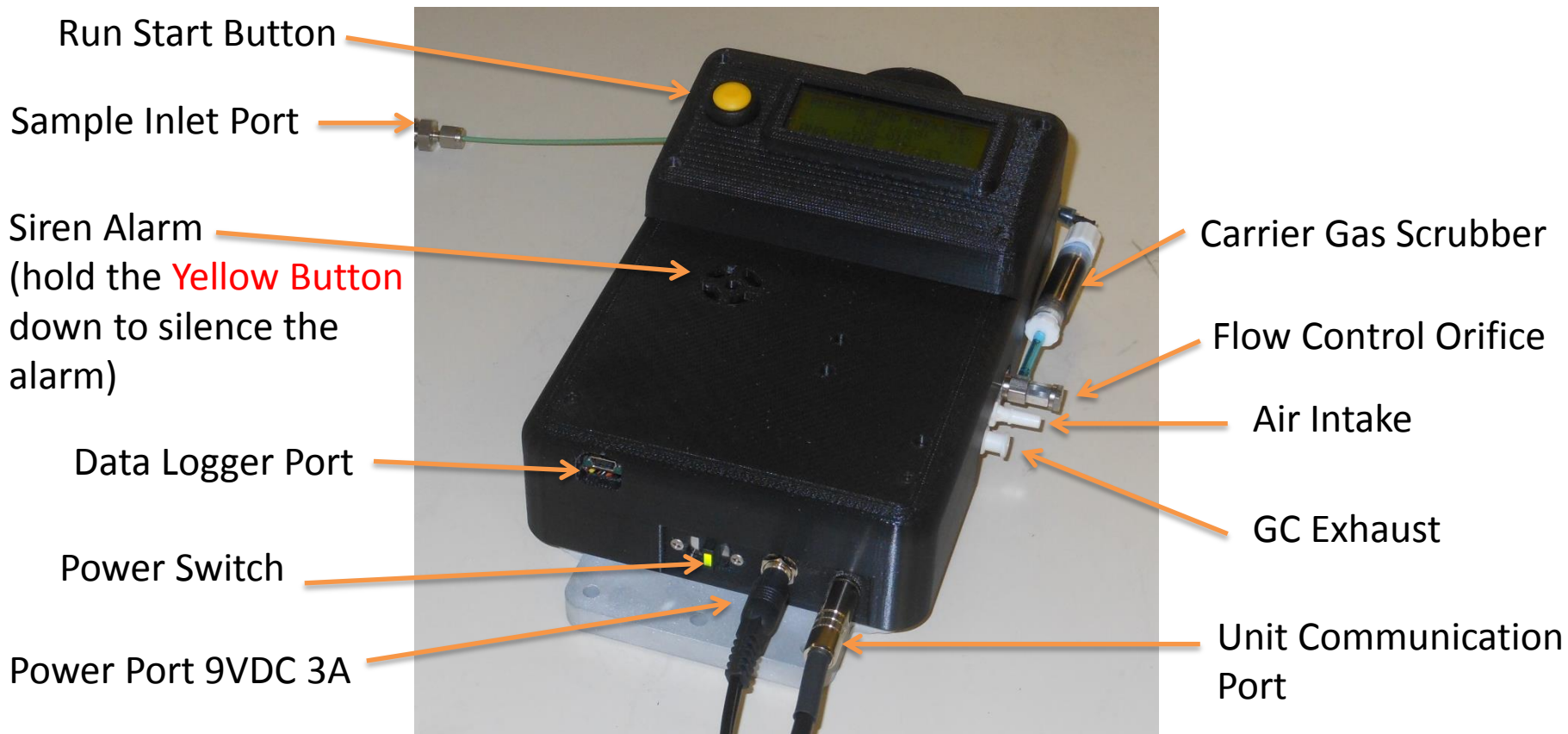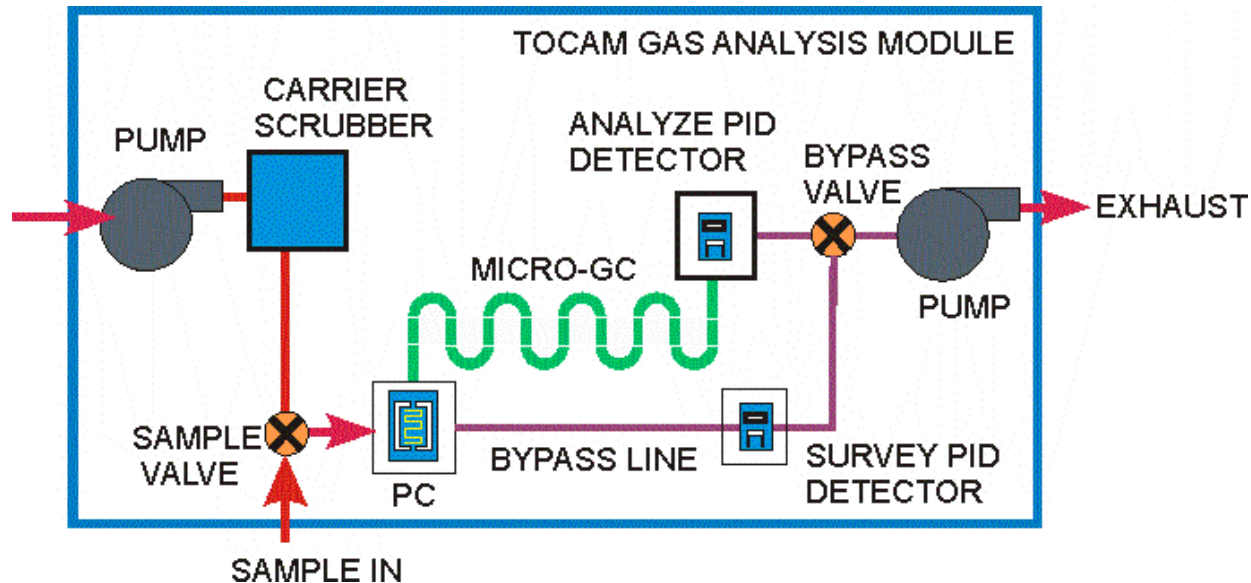
Basic Parts of the Toxic Organic Chemical Air Monitor (TOCAM®)

Run Start Button

Sample Inlet Port

Siren Alarm
(hold the Yellow Button down to silence the alarm)

Data Logger Port

Power Switch

Power Port 9VDC 3A

Carrier Gas Scrubber

Flow Control Orifice

Air Intake

GC Exhaust

Unit Communication Port

Basic Operation of the Toxic Organic Chemical Air Monitor (TOCAM®)

1. Sample air is drawn over the Preconcentrator (PC) and Survey PID
2. PC heats periodically to send concentrated chemical plume over the Survey PID
3. A jump in Survey PID signal indicates presence of a chemical above allowable threshold
4. When threshold level is exceeded, the PC is loaded for full analysis
5. Valves and Pumps are switched to push chemical plume through micro-gas chromatography (GC) column and over Analysis PID

Basic Gas Chromatography Concept

1. A concentrated mix of chemical is injected into a long tube (that is, the micro-GC)
2. Chemicals in the mix separate as they interact with a coating on the walls of the micro-GC column
3. A detector (that is the Analyze PID) senses analytes as the emerge (or elute) from the GC one at a time
4. Chemical identity is based on the time it takes an analyte to move through the micro-GC (i.e., the Retention Time)
5. Chemical concentration is a function of the signal level from the detector
6. A calibration is created for the GC system by running known chemical challenges on the instrument

Analyze PID Signal

GC Column Temperature (^oC). This is the purple line on graph

Time (seconds)
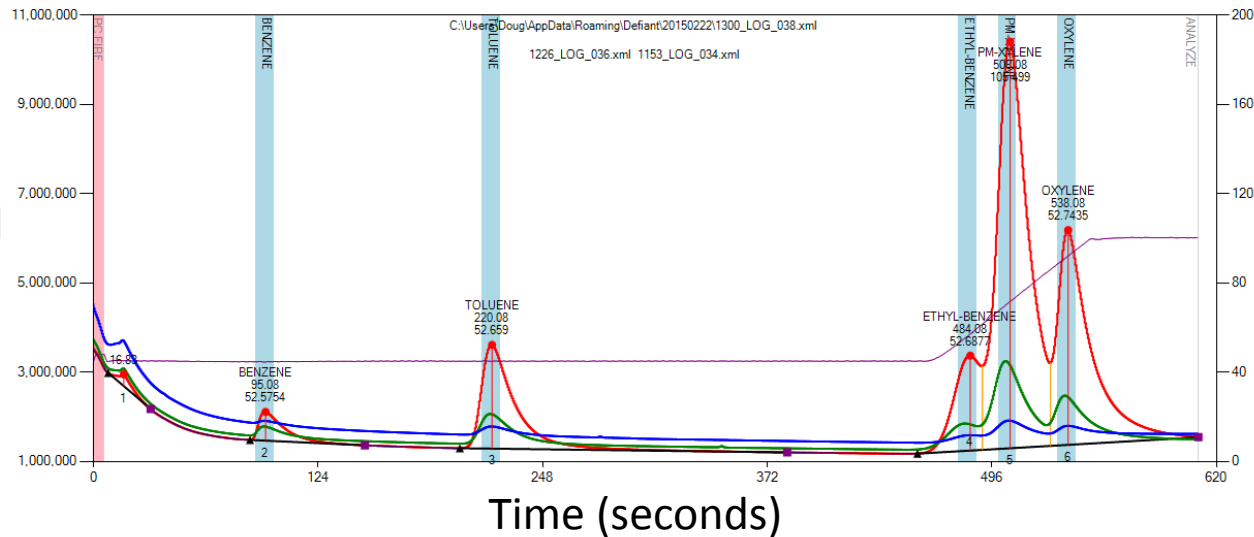
Installing Ellvin Software and Connecting to TOCAM®

1. Load Ellvin CD
2. Run Setup
3. Go into the USBtoSerialSerialDrivers folder on CD
4. Run CDM 2.04.06.exe to install the drivers for the USB to Serial Cable
5. Start Ellvin program

6. Plug power cable into TOCAM®
7. Plug clear USB plug into PC USB port
8. Plug the other end of the USB cable into the Unit Communication port on TOCAM
9. Slide TOCAM® on
10. Select the new Serial Port in PORT menu to connect to TOCAM®

Serial Port Select menu
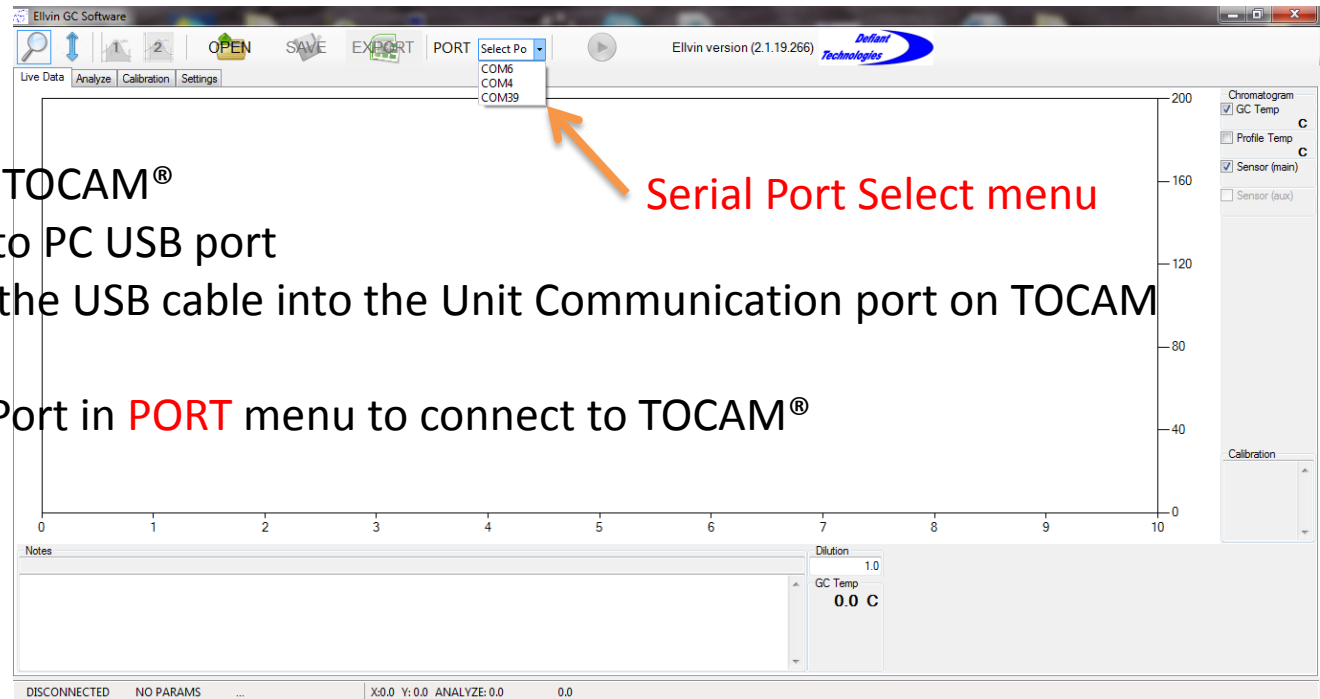
Ellvin Software Settings Tab

1. GC Temperature profile is setup here (see figure to right)
2. This is how long a sample is collected for an analysis
3. Time PC is heated to clean before run
4. Time for settling before and after sample collect
5. How long the PC is heated
6. SET sends changes to TOCAM
7. How long material is collected during the rapid screening
8. How many rapid screening cycles are repeated before a full analysis is performed
9. What is the height limit on a screening pulse that will initiate an instant analysis

Running a Test from the Live Data Tab

1. Press the Play Button to begin a run
2. A run can also be initiated by pressing the Yellow Button on the TOCAM® box
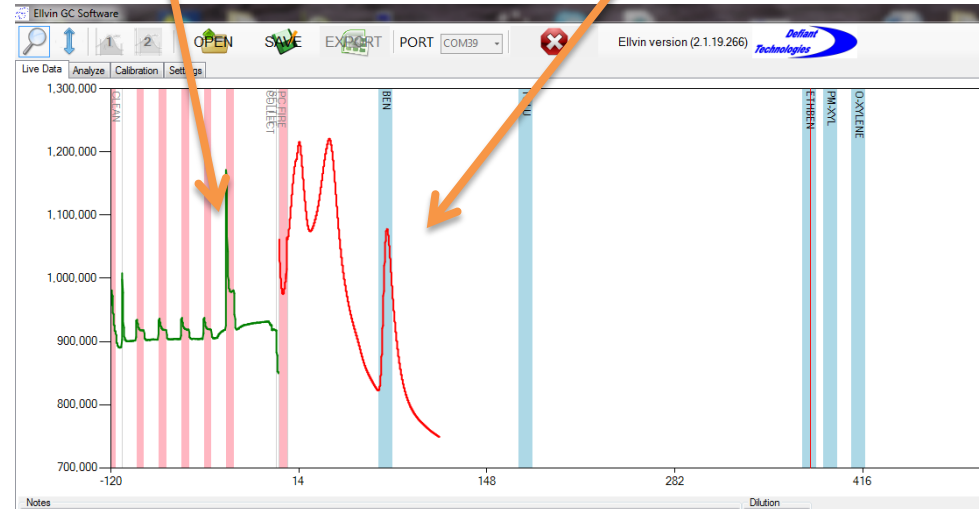3. Pressing the Stop Button will end a run and initiate a short PC cleaning cycle.
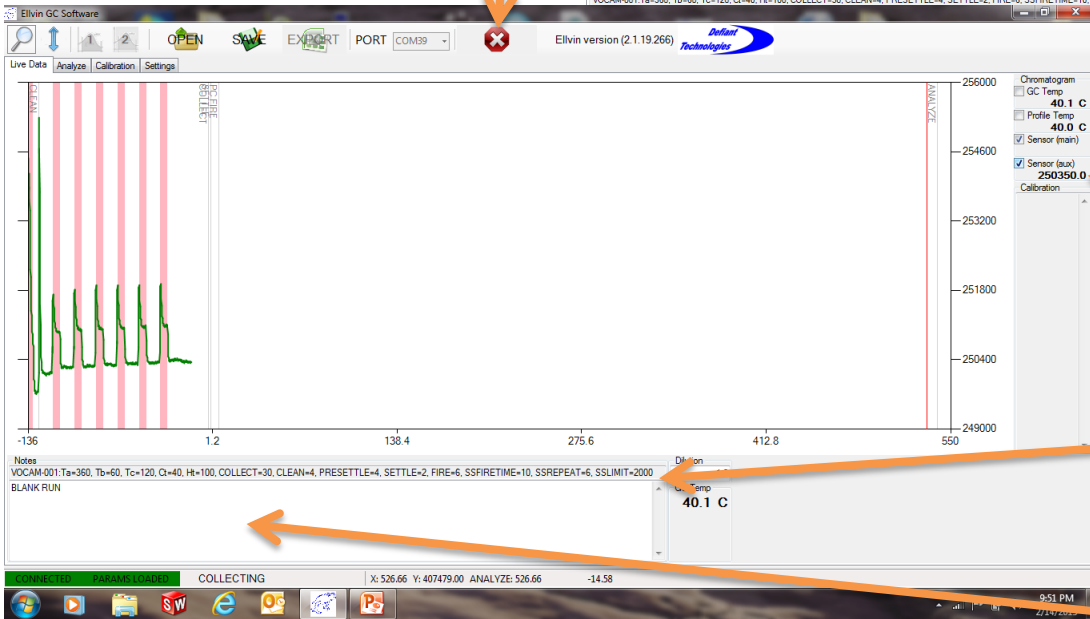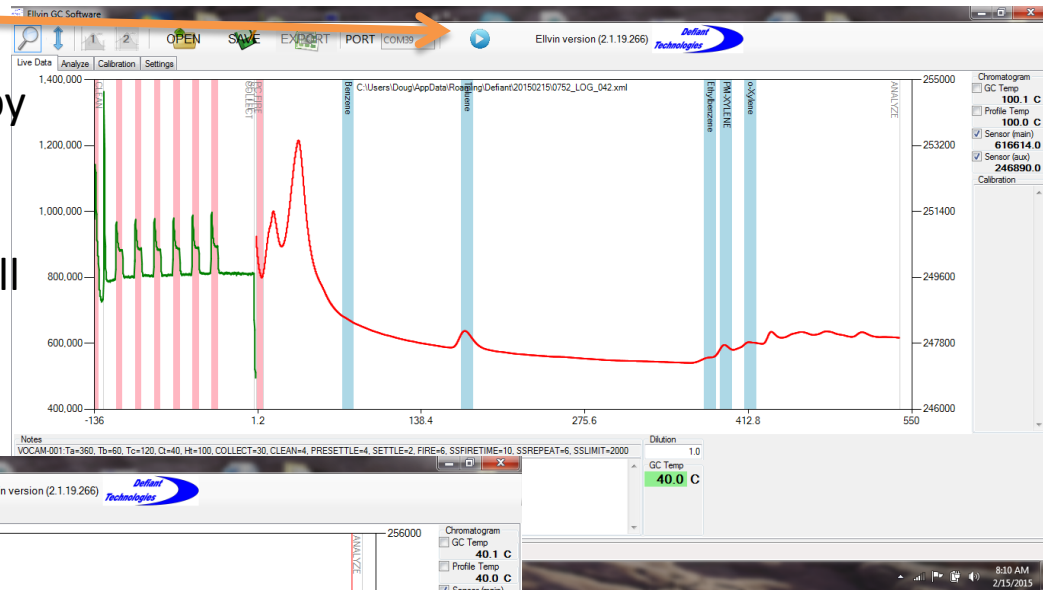
4. These tabs allow you to toggle between displaying the GC temperature and data from the Survey PID.
5. The operating parameters are listed here and stored in an annotations file.
6. Add notes here to indicate test conditions for later reference

Features of the Live Data Tab

1. If the survey run sees a chemical hit, it will immediately begin collecting for an analysis run
2. The peak level to initiate an instant analysis is entered in the Settings Tab as the SSLIMIT

Chemical Hit

Analysis Underway

3. The height of the survey peaks appears here in the Settings Tab

More Features of the Live Data Tab

1. At the end of a run, the file location is indicated at the top of the graph
2. The blue retention time windows   only appear if a calibration file is loaded.

3. Select this to display the Survey PID data

4. Pink stripes show where preconcentrator (PC) fires
5. A fan runs to cool the GC column while this box is still red

Analyzing Data in the Analyze Tab

1. Select OPEN and an Explorer Window opens to locate a stored data file
2. Each run is stored in a folder with the Current Date Stamp
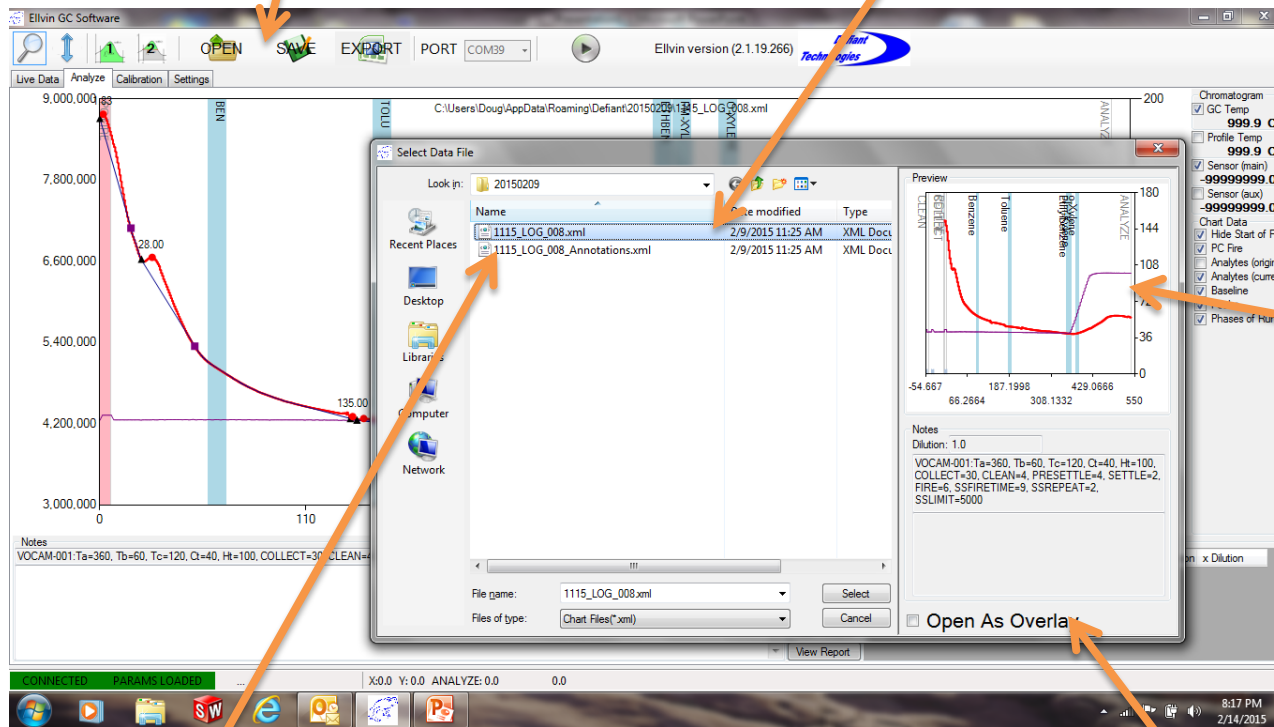
Thumbnail of data

3. Open the first file - Annotations files contains your notes
4. Open as Overlay allows up to 8 files to be displayed simultaneously.

Analyzing Data in the Analyze Tab (continued 1)

1. Tools to integrate analysis peaks. Tool 2 snaps to data line
2. Blue lines indicate retention time windows from calibration
3. Pink lines shows when PC fires
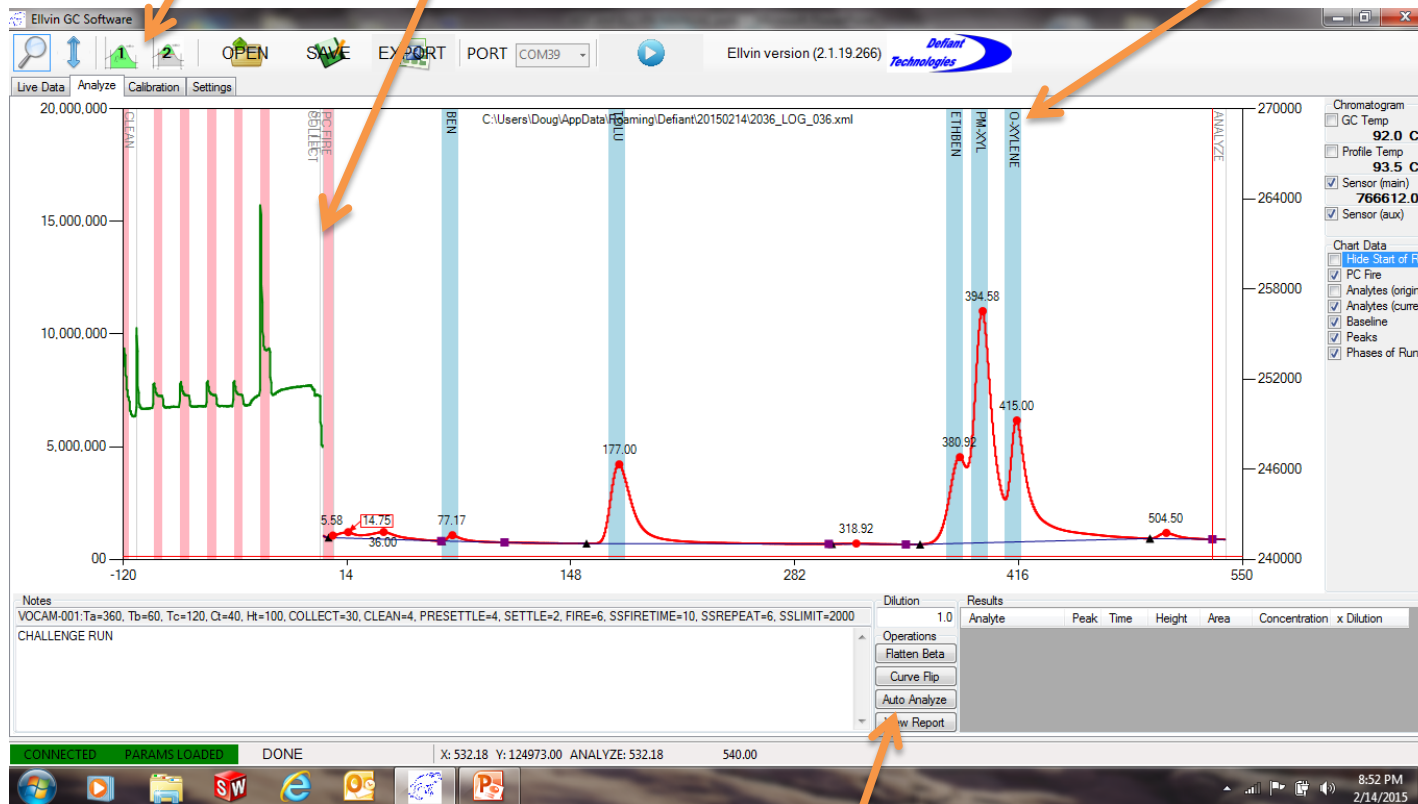
4. Auto Analyze will automatically find peaks and integrate area

Settings Tab (Creating a Calibration File)

1. Create a new calibration file here
2. Open an existing calibration file here

3. Analyte files end with a .ana extension

Creating a New Calibration File in the Calibration Tab

1. Enter Analyte Name and a short Alias Name (Alias will appear on TOCAM® Display)
2. Press ADD to add name to list

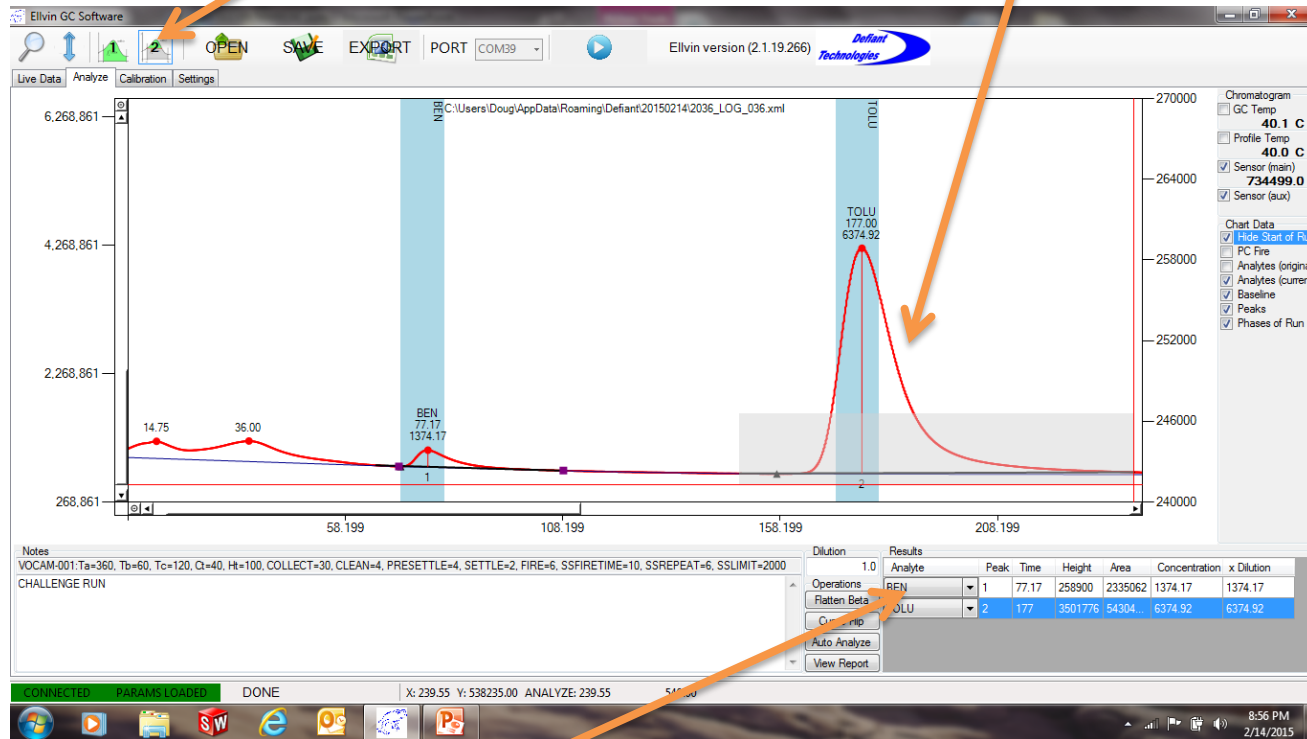3. Sample runs used to create system calibration are displayed here

4. Data is added to the table when peaks are integrated in the Analyze Tab

5. As peaks are added, a calibration curve is developed
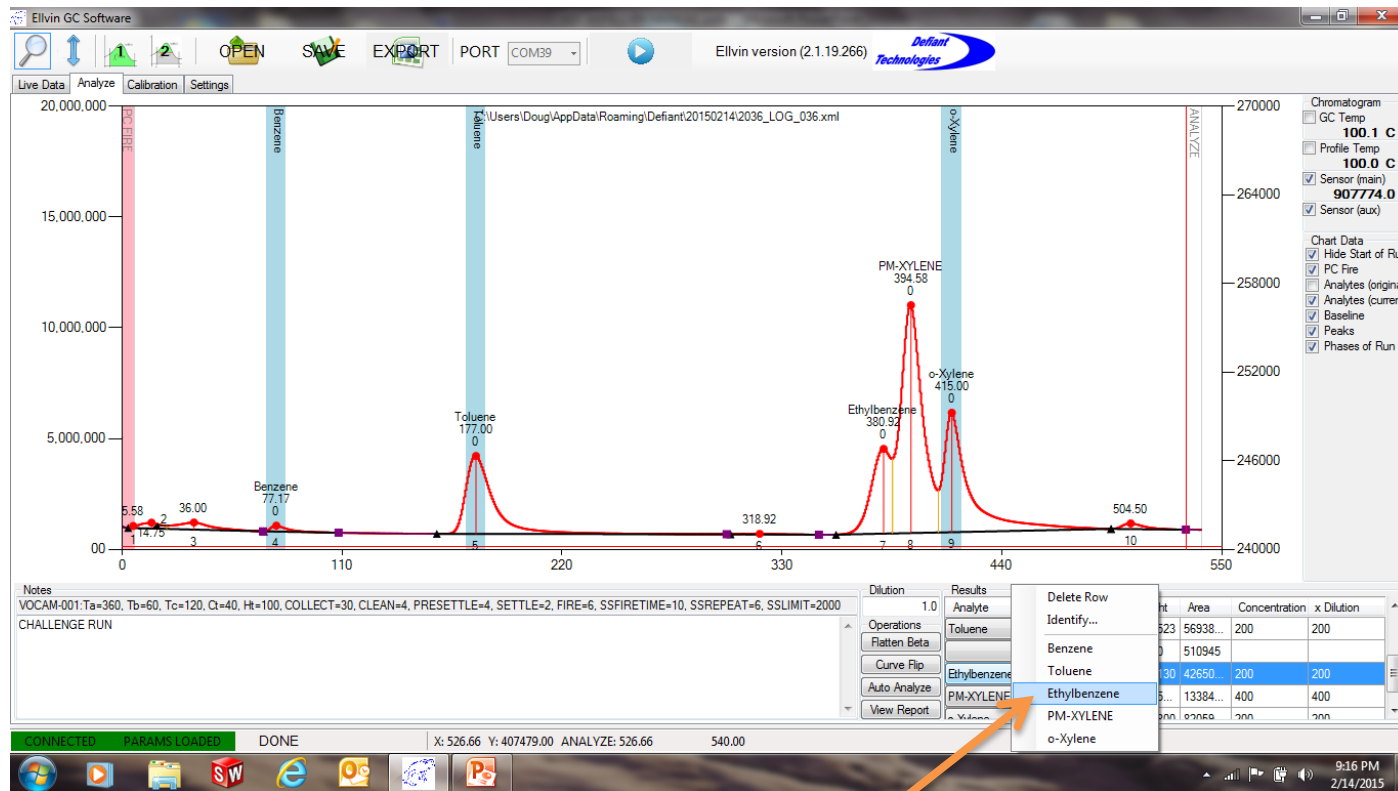
Creating a Calibration (continued)
Analyzing Data in the Analyze Tab

1. Select Integration Tool 2 then hold left mouse down and drag across peak

2. Integrated peaks appear here
3. Analyte name will not appear at first (associating name with retention time on next page)

Creating a Calibration (continued 3) Analyzing Data in the Analyze Tab

1. Left click to select row (row turns blue)
2. Right click to open list of calibration analytes
3. Left click on analyte name for peak data to go into the calibration table in Calibration Tab
4. This procedure associates an analyte name with the retention time

Calibration Data in the Calibrate Tab (continued 4)

1. Data selected in the Analyze table will transfer to here.
2. Add the concentration data of the test sample here.
3. The calibration curve will begin to build with even a single point.

Analyzing Data in the Analyze Tab (continued)

1. Use zoom to focus on part of the analyze data
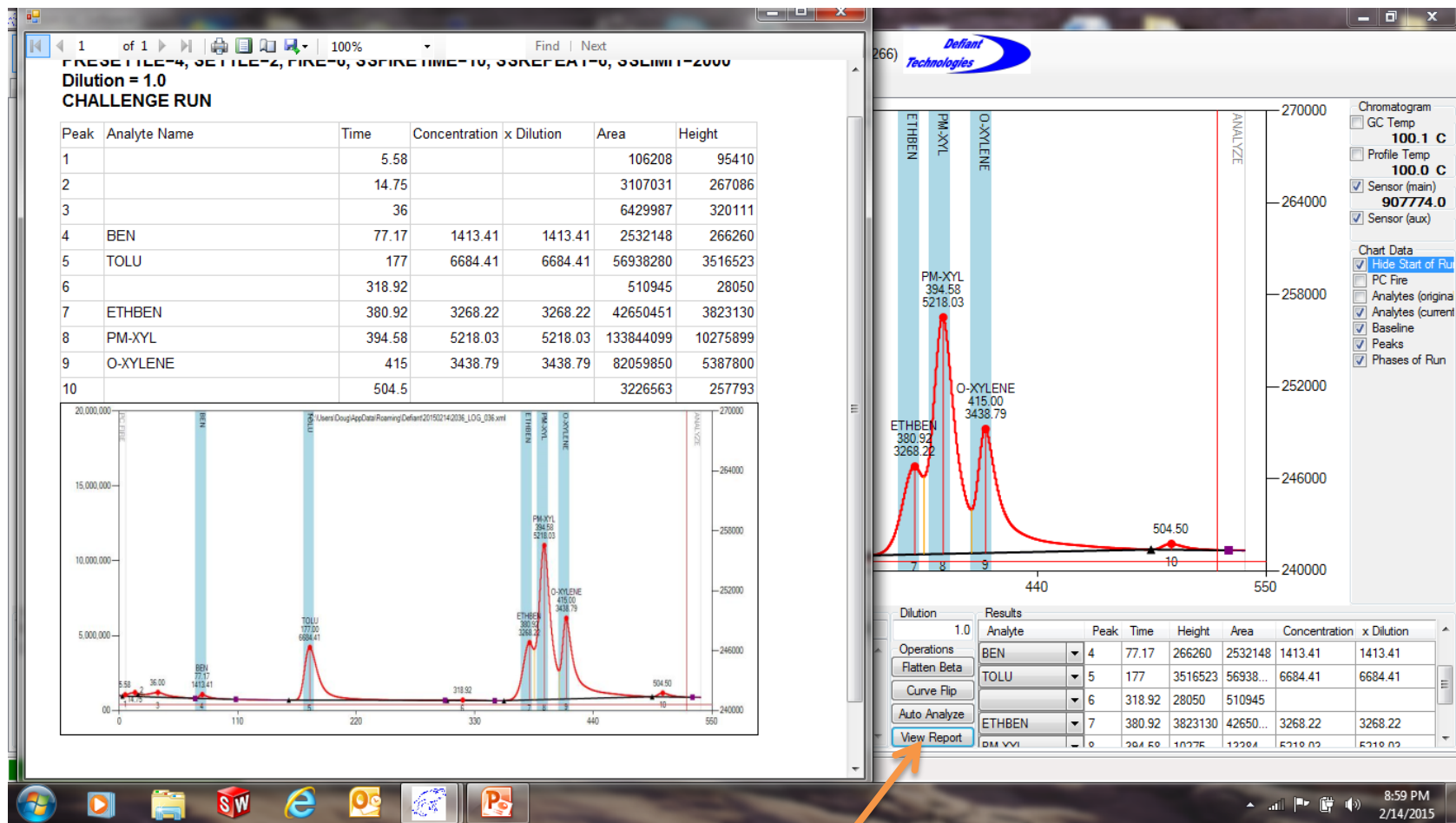2. Double-click on magnifier to zoom out to full screen
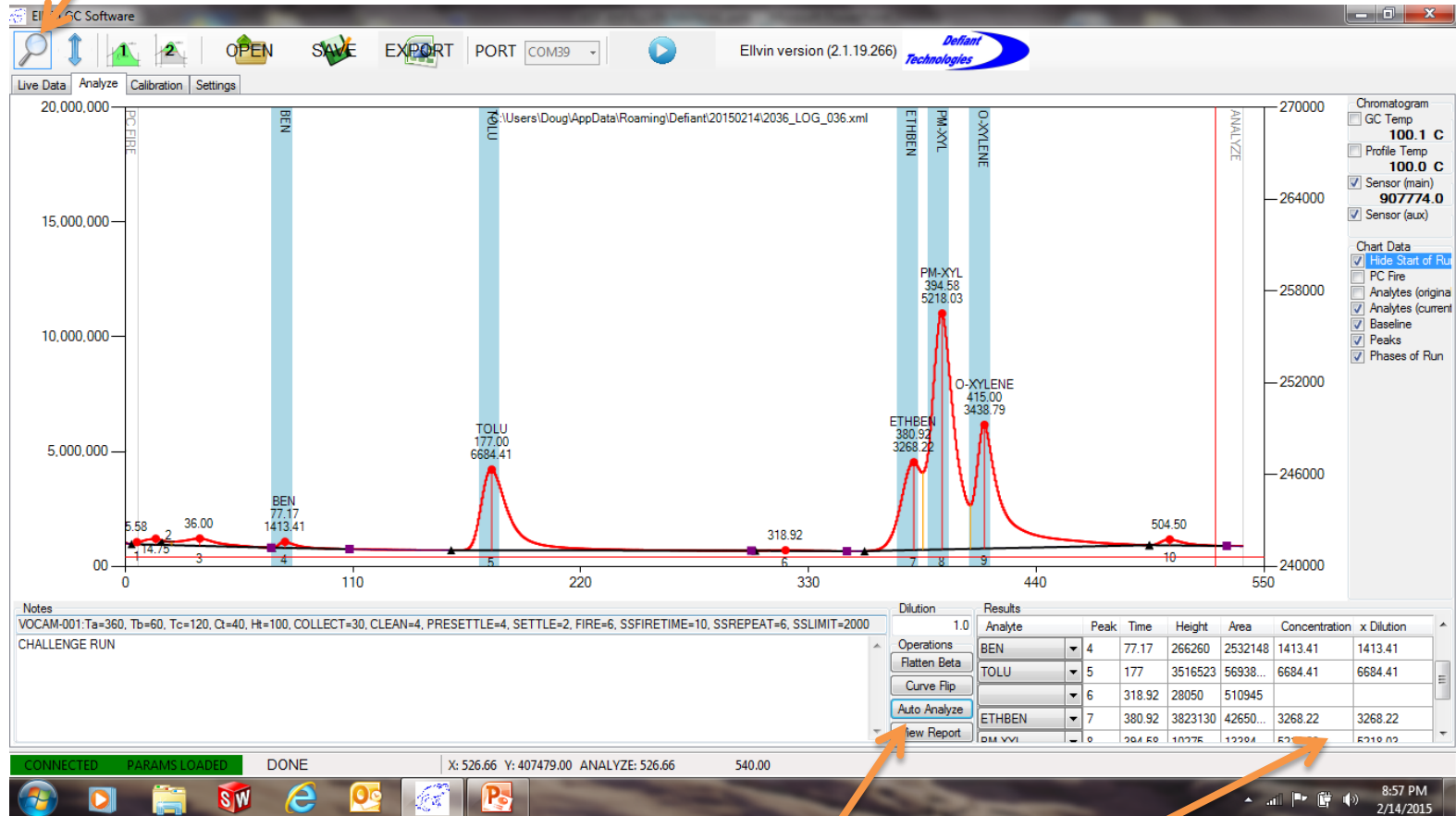
3. Once a calibration file is created, pressing Auto Analyze will identify peaks and calculate concentrations

More Features in Analyze Tab

1. After integrating data, press View Report to create a summary data sheet
2. Summary sheet can be saved as a PDF or Excel file

Frog Doctor Diagnostics in Settings Window
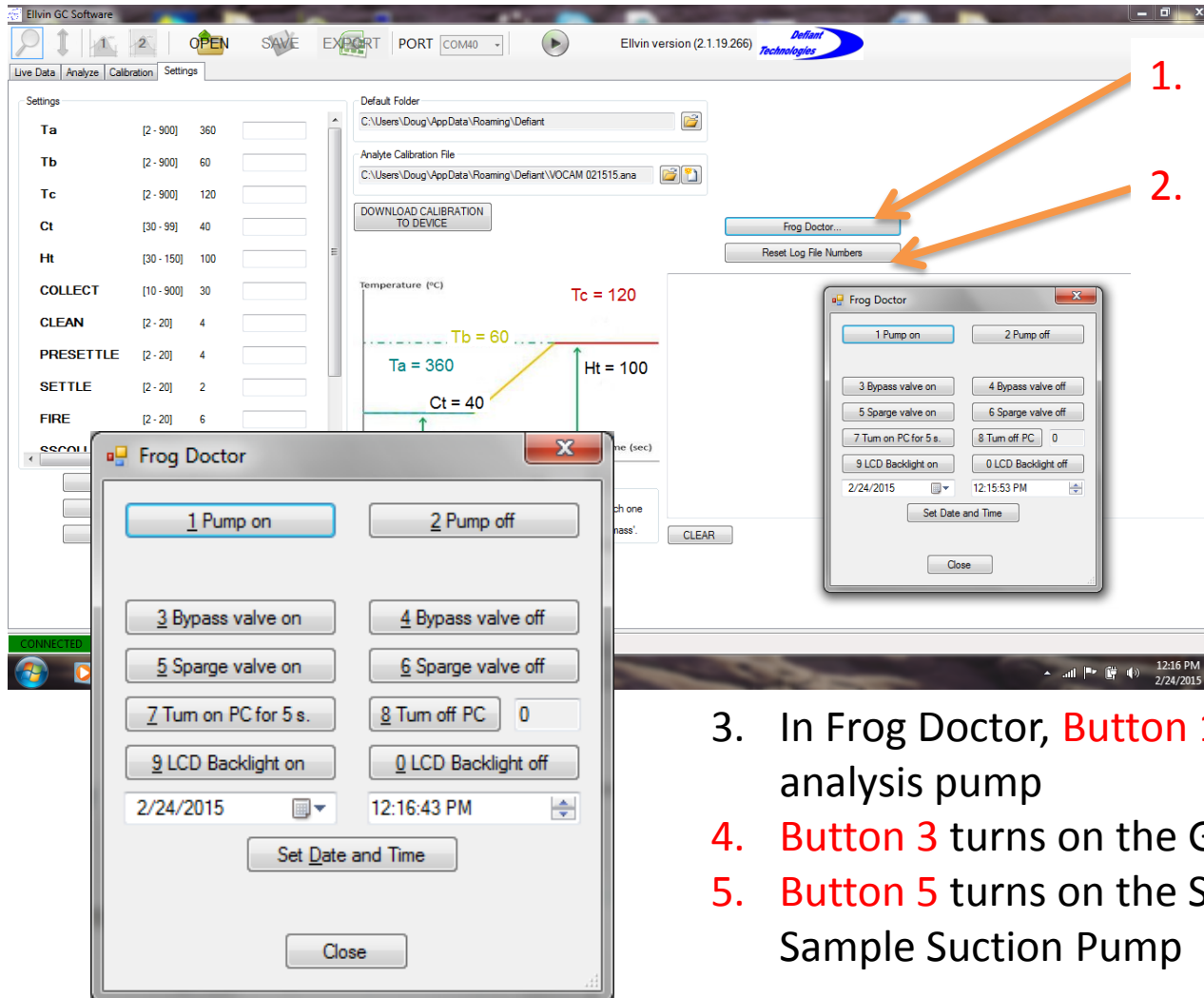
1. **Frog Doctor** opens a diagnostic program
2. **Reset Log** puts the log file number back to 001
3. In Frog Doctor, **Button 1** turns on the analysis pump
4. **Button 3** turns on the GC bypass valve
5. **Button 5** turns on the Sample Valve and Sample Suction Pump

Common Concepts - Cleaning

These peaks will go away after with clean air runs
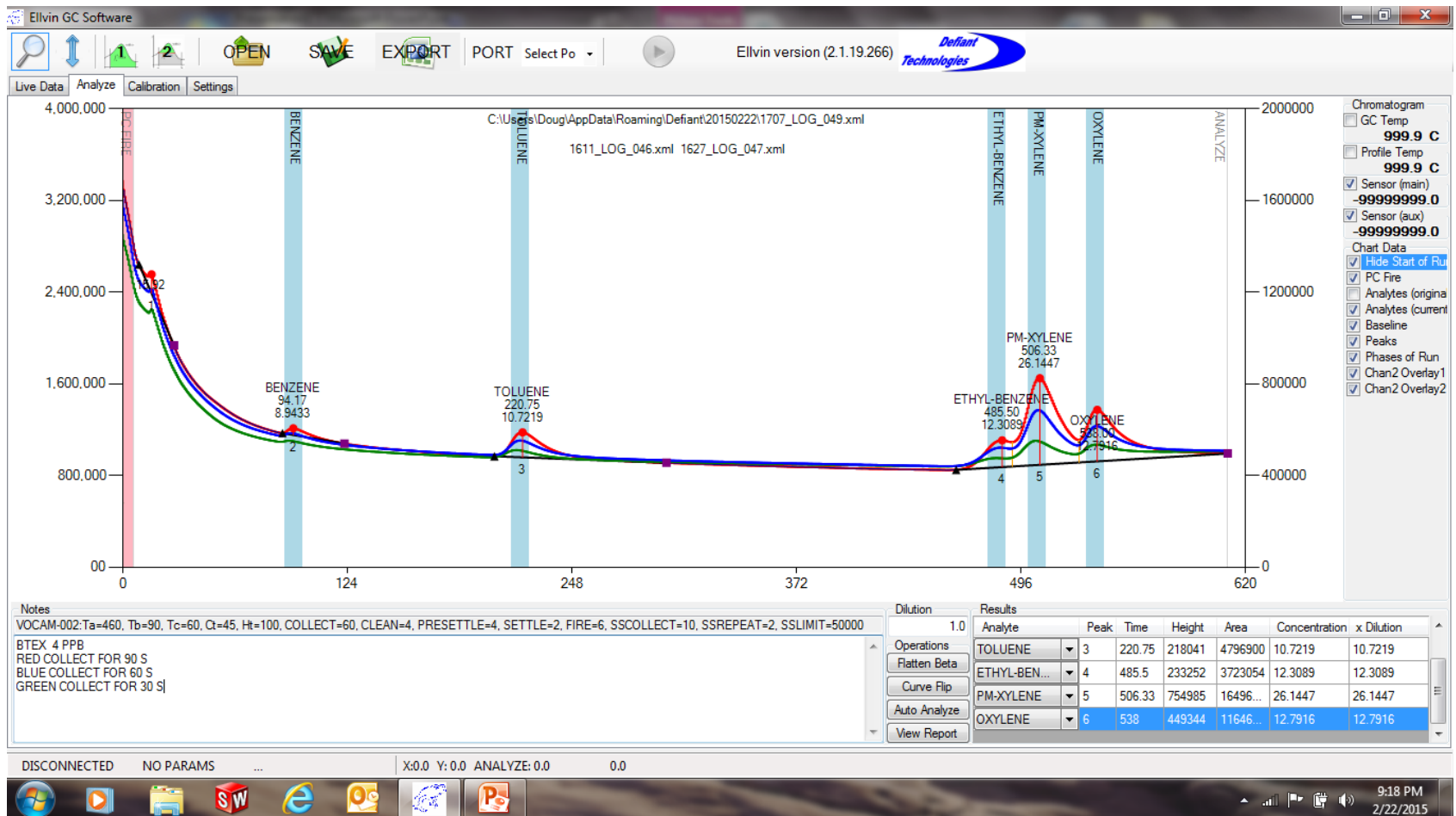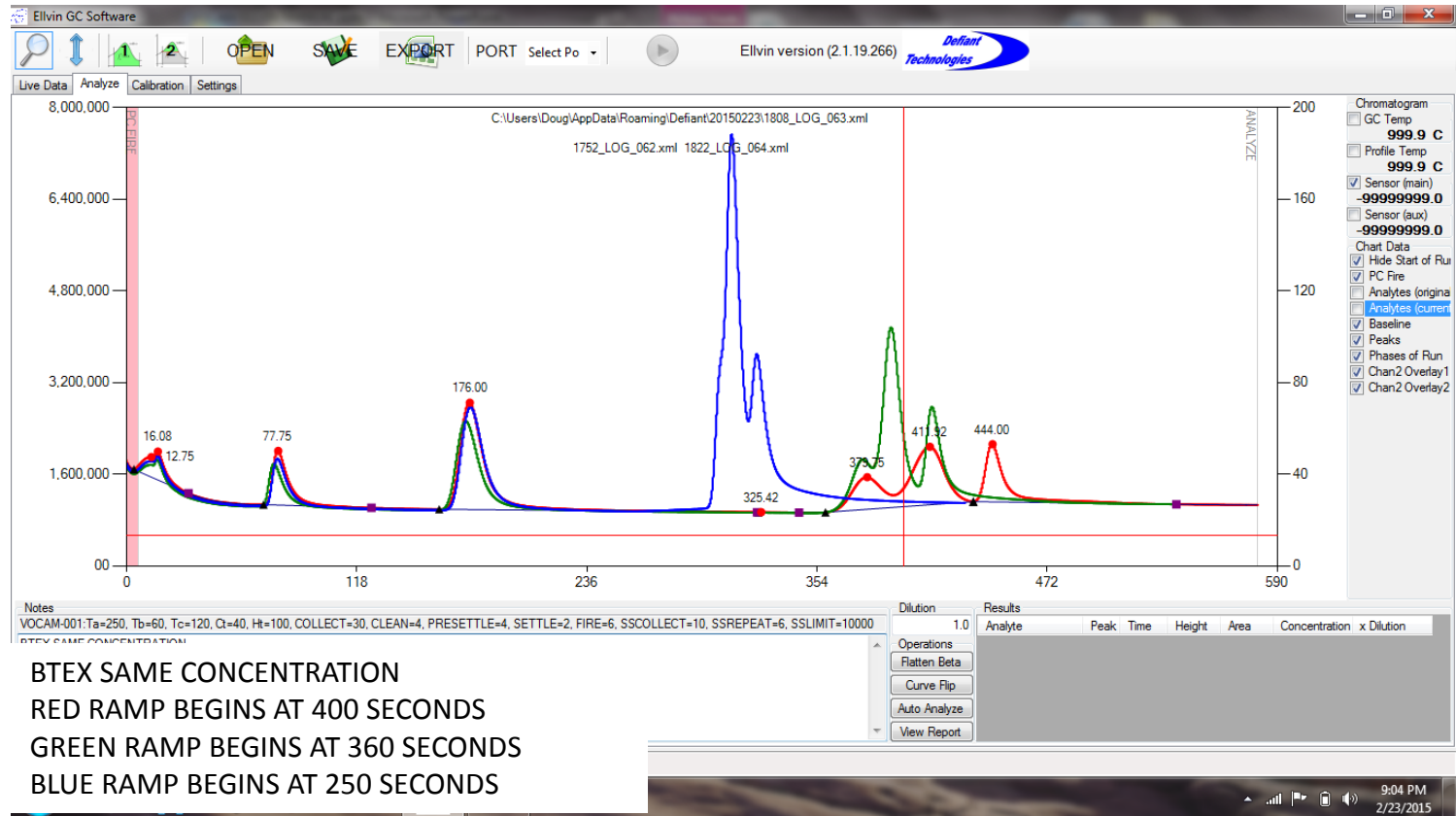

These peaks are common background peaks from solvents used in the PC production or surroundings

Common Concepts - Collect Time

A longer Collect Time will create larger peaks (up to about 120 seconds)

Common Concepts - Temperature Ramping

BTEX SAME CONCENTRATION
RED RAMP BEGINS AT 400 SECONDS
GREEN RAMP BEGINS AT 360 SECONDS
BLUE RAMP BEGINS AT 250 SECONDS

By changing temperature profiles you can often improve separation. Shown are three runs at similar BTEX concentrations with different start times for a GC ramp. All three went from 40ºC to 100ºC in 60 seconds.

Common Concepts - Ghosting
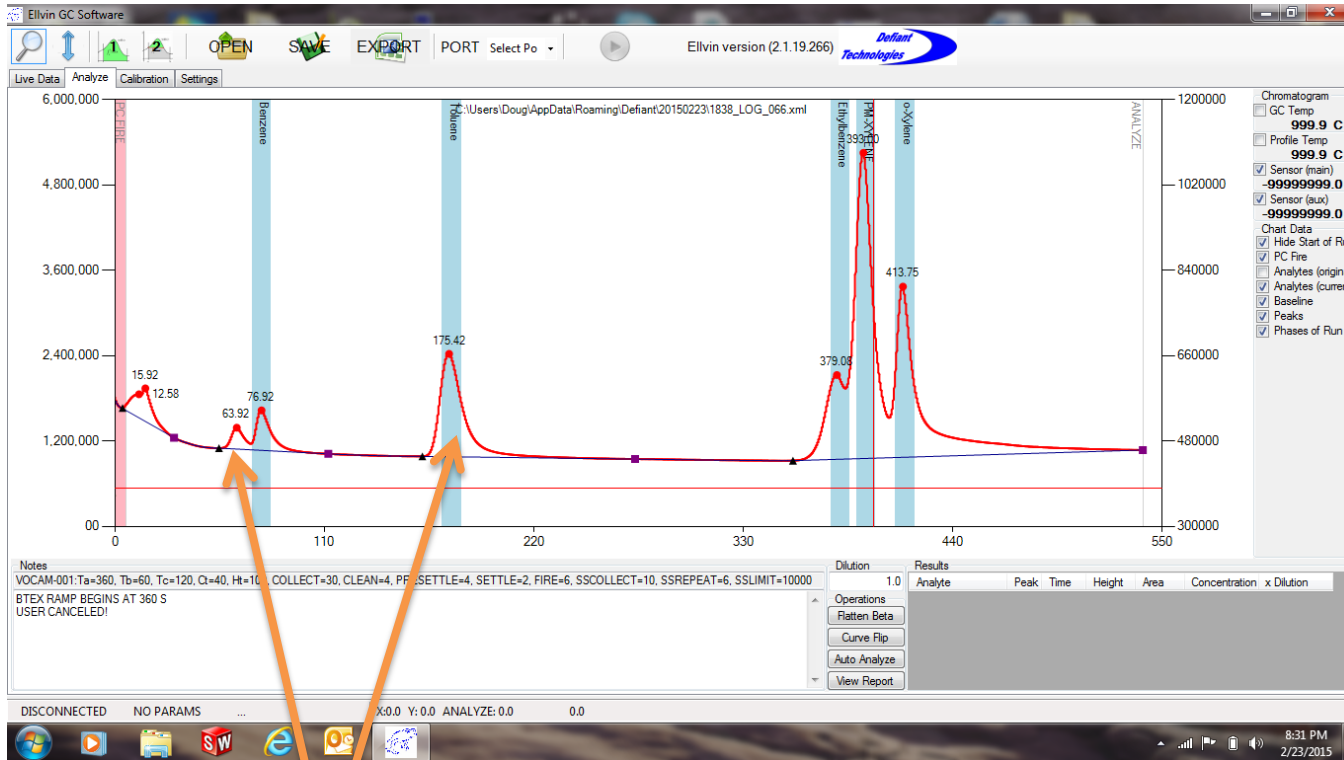
Halting a run after the PC is fired will leave analyte suspended in the column. These analytes will emerge on the next run as separate peaks or merged with another peak

Common Concepts - Do's and Don'ts

- Do let the instrument run one cycle after a complete power shutdown to clean the PC and allow the GC temperature to equilibrate
- Do run a calibration check daily if possible
- Do run the GC at temperatures above ambient
- Do not suck liquid into the TOCAM®
- Do not use elastomeric tubing for the gas sample lines (they will absorb the chemicals and bleed them out slowly)
- Do use PTFE (good), PEEK (better), or Sulfinert® treated stainless (best) tubing for gas sample lines
- Do play with the instrument and learn how it works – we have yet to see one destroyed beyond repair

Finally: If you want TOCAM® to run multiple unattended runs, hold the shift key down when you click on the PLAY BUTTON.
You can also start multiple runs by holding down the Yellow Button when power to TOCAM® is switched on.