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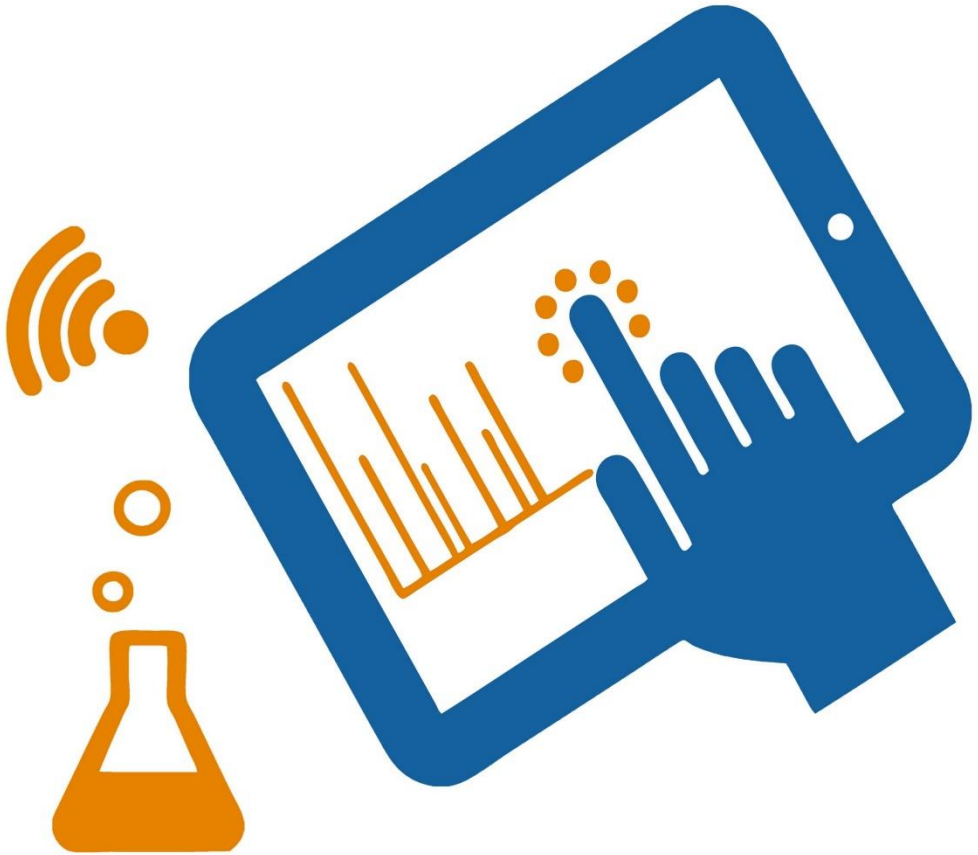

NETCHEM

WP 1.3. Presentation of this deliverable

Tatjana Anđelković
University of Nis Faculty of Science and Mathematics

ICT Networking for Overcoming Technical and Social Barriers in Instrumental Analytical Chemistry Education

Programme:	Erasmus +
Key action:	Cooperation for innovation and the exchange of good practices
Action:	Capacity Building in Higher Education
Acronym:	NETCHEM
Ref. No:	573885-EPP-1-2016-1-RS-EPPKA2-CBHE-JP

Deliverables for WP 1 – Three Reports

1.1. Report on EU Practice in using OER and Instrumental Analysis

Done!

1.2. Report on PC Practice in using OER and Instrumental Analysis

Done!

1.3. Assessment and proposal of procedures for using OER/WARIAL and Instrumental Analysis in EFSC

Draft version: Available on web site

Final fersion: up to 31 October 2017

Objective of 1.3. Assessment and proposal of procedures for using OER/WARIAL and Instrumental Analysis in EFSC

Objective of the NETCHEM

- NETCHEM project intends to rise the awareness of the usefulness of using OER for educational institutions and business entities.

Objective of the 1.3. Report

- The analysis of the current situation in WP 1, identifying SWOT parameters in using OER, **should serve as the basis for the recommended strategies to improve implementation of OER in higher education.**

Headlines of the 1.3. Report

I part – Rational behind the study

II part – Open Educational Resources

- **Massive Open Online Courses**
  1. EdX
  2. Moodle
  3. Open edX vs. Moodle

Headlines of the 1.3. Report

III part – Remote Access to Analytical Instruments

1. Remote Access in Science – key issues
2. Virtual laboratory versus Remote Access
3. Examples of Remote Projects
4. Analysis of current practice in EU and PC countries using OER
   - PC Practice in using OER
   - EU Practice in using OER
5. SWOT in the implementation of OER

Headlines of the 1.3. Report

IV part – Strategy for implementation of OER and WARIAL in NETCHEM project

1. Technical background
2. Pedagogical background
3. Implementation

V part – CONCLUSION - required competences and technical background for using OER/WARIAL in EFSC for PC universities

VI part – References

Implementation of strategy set in 1.3.

NETCHEM Remote experiment

- Use Team Viewer /Skype
- experiment with 2 - 3 scenarios
- analyse the results of experiments and choose the best scenarios(s)

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The instrumental techniques that can be usually undergone this procedure are:

- Nuclear magnetic resonance,
- Mass spectrometry,
- High Performance Liquid Chromatography (HPLC) or
- Gas Chromatography Mass Spectrometry (GC-MS),
- Ion chromatography,
- ICP-MS,
- UV/VIS.

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Table 3. Characteristics selected for defining type of NETCHEM communication

Communication sides		
host side		participant's/instrument's PC in laboratory/office
guest side		participant's/instrument's PC in laboratory/office
Communication sofware		
Team Viewer	**Meeting:**	Yes/No
	Remote control:	Yes/No
	Meeting and Remote control simultaneously:	Yes/No
Skype	Call 1:1	Yes/No
	Conference Call	Yes/No
Comunication hardware		
on host side		2 independent PCs (1 PC for instrument + 1 PC for participant)
		Other
on guest side		1 PC with 2 monitors
		Other
Information exchange type:		
1. Educational (one side is dominantly receptive):		Yes/No
Place of Educator participant:		host side/guest side
Number of educator(s):		
Place of student participant:		host side/guest side
Number of student participant(s):		
2. Consultative (two sides are equal in giving-receiving information):		Yes/No
Number of host side participant(s):		Yes/No
Number of guest side participant(s):		

Description of the Educational element

Educational element title	Determination of atrazine in water sample
Educational field	Chemistry
Level of study	Master academic studies
Teaching course	Environmental chemistry
Teaching unit	Xenobiotics in food
Teacher	PhD Tatjana Andjelkovic, prof.
Target group (study program, year of study)	Master Study Programme - Chemistry, 2nd year
Educational objectives	To develop and implement analysis incorporating remote access to a GC-MS instrument. A gas chromatography-mass spectrometry (GC-MS) case study as a teaching and learning tool.
Required preliminary knowledge and skills	

EXAMPLE could be seen at NERELA website:
https://ad-biel-00001.ceyeclon.com/ResourceServer/output/0/0/lirex/public/pdf/1299_BLDC.pdf

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A CASE STUDY 1:
GCMS instrument remote acces – a case study

A CASE STUDY 2:
Electrospray ionization – mass spectrometry

Environmetal Chemistry Course

DESCRIPTION OF THE COURSE

- **4 hours of lecture + 3 hours of laboratory practice per week.**
- **Master Study Programme *Environmental Chemistry* at Faculty of Science and Mathematics Niš, accredited after MCHEM - TEMPUS study programe design**
- **Content: complex chemical processes in the environment and their mutual interrelationships and dependance.**

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Learning objective for the educational element: Phthalate in milk samples determined by Gas Chromatography-Mass spectrometry:

- **On completion of the chromatography section of the course, students will be able to:**

  Define chromatography and related terms
  Develop conditions for analysis: stationary/mobile phase and detection
  Optimize the separation process

Learning objective for the educational element: Fragmentation of Phthalate ions by MS-MS:

- **On completion of the mass spectrometry section of the course, students will be able to:**

  Evaluate and assign mass-to-charge (m/z) ratios

A CASE STUDY 1: GCMS instrument remote acces – a case study

1. Assistant loads the sample at the laboratory site.

2. Teacher at the classroom site takes the charge.

3. The conditions of the instrument are monitored on the remote PCs.

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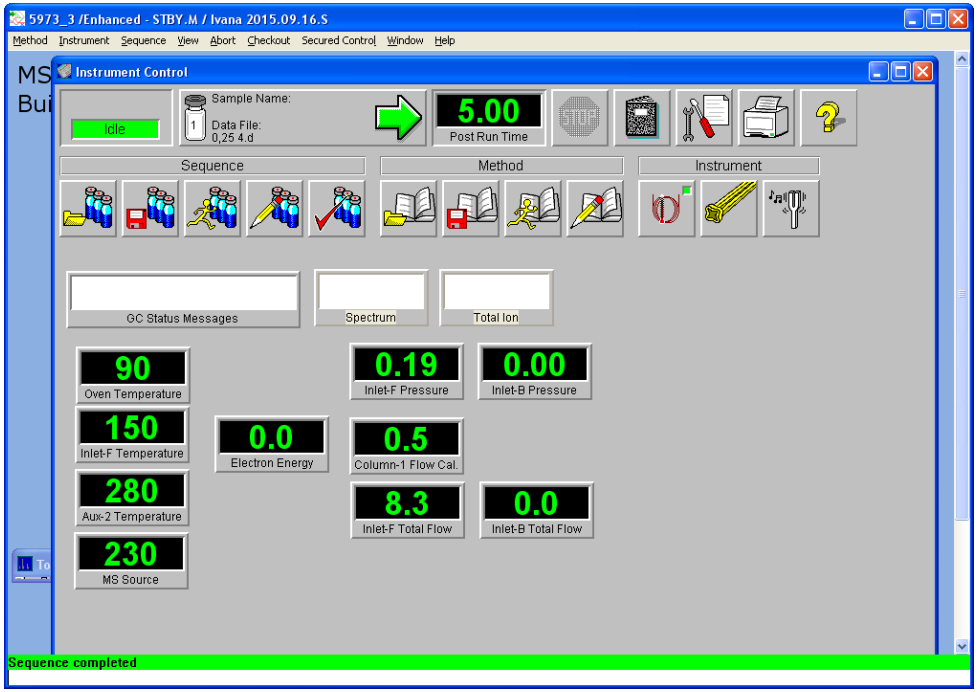
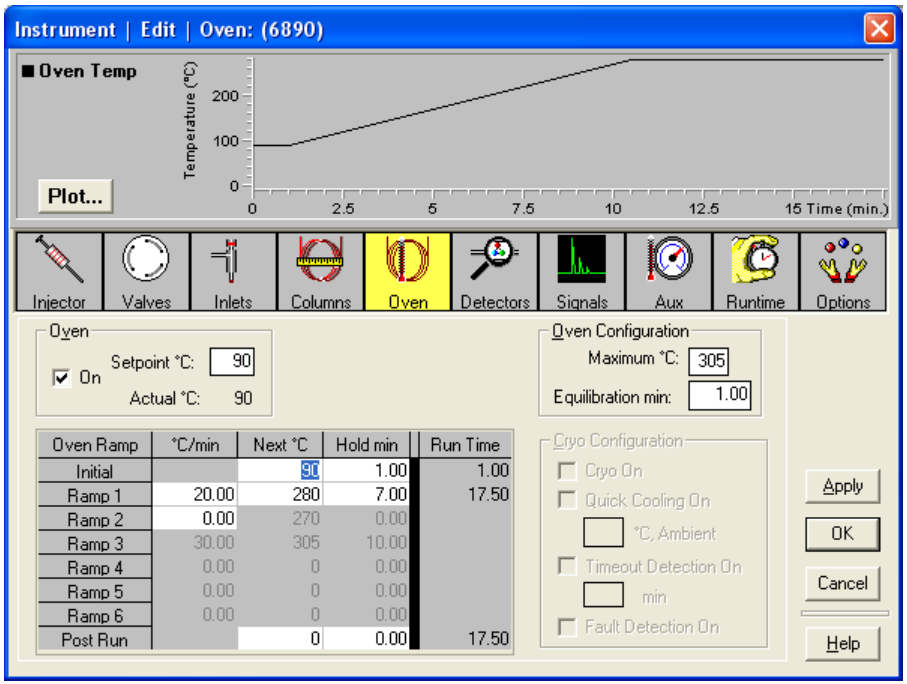
Monitored parameters at the remote site



Parameters that are monitored during run:

- Oven temperature
- Inlet temperature
- Auxiliary temperature
- MS source temperature
- Electron energy
- Pressure

Setting the conditions at the remote site



Parameters that are set for the optimization of run:

- Injector
- Valve
- Inlet
- Column
- Oven
- Detector
- Signal
- Runtime

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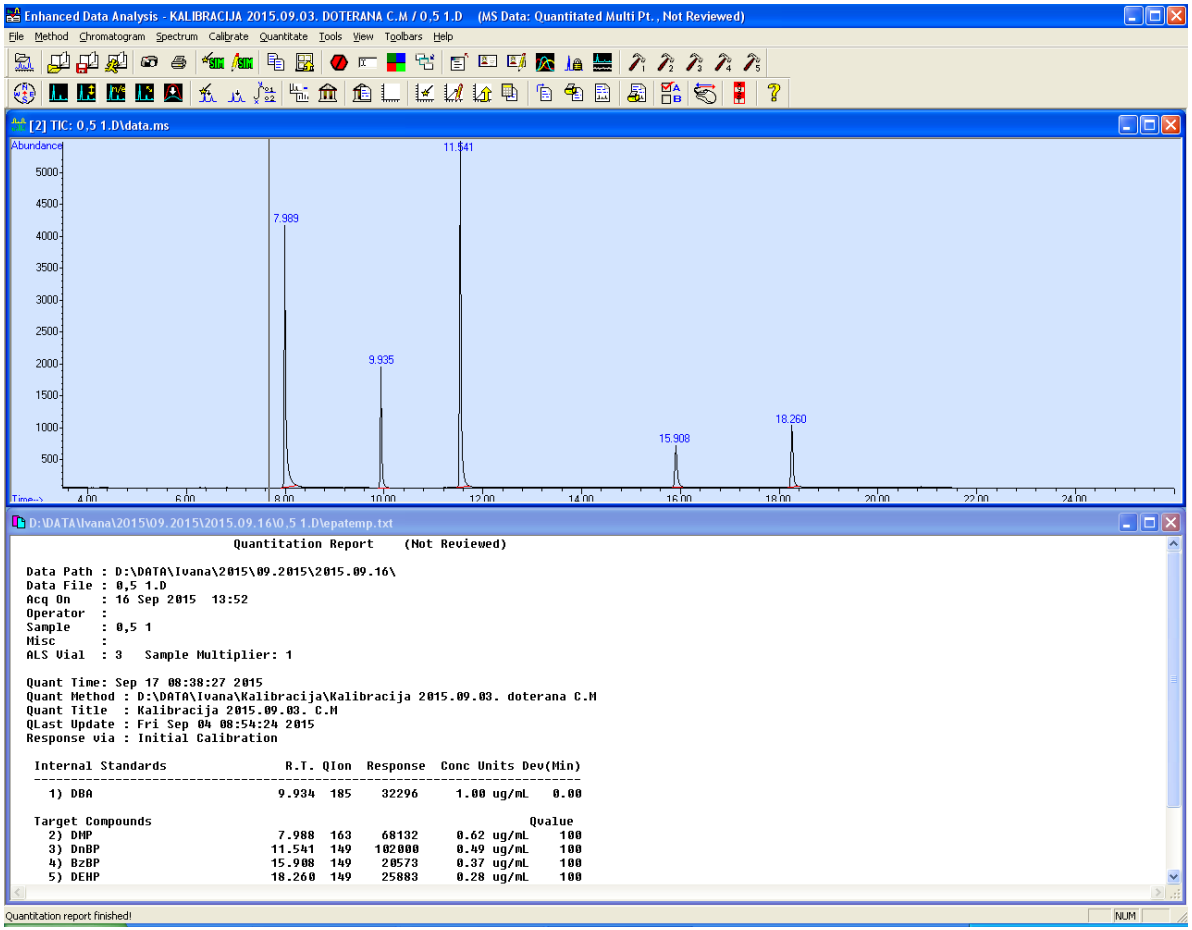

Student files are sent to teacher by mail to be accessed and checked for consistency with reports submitted.

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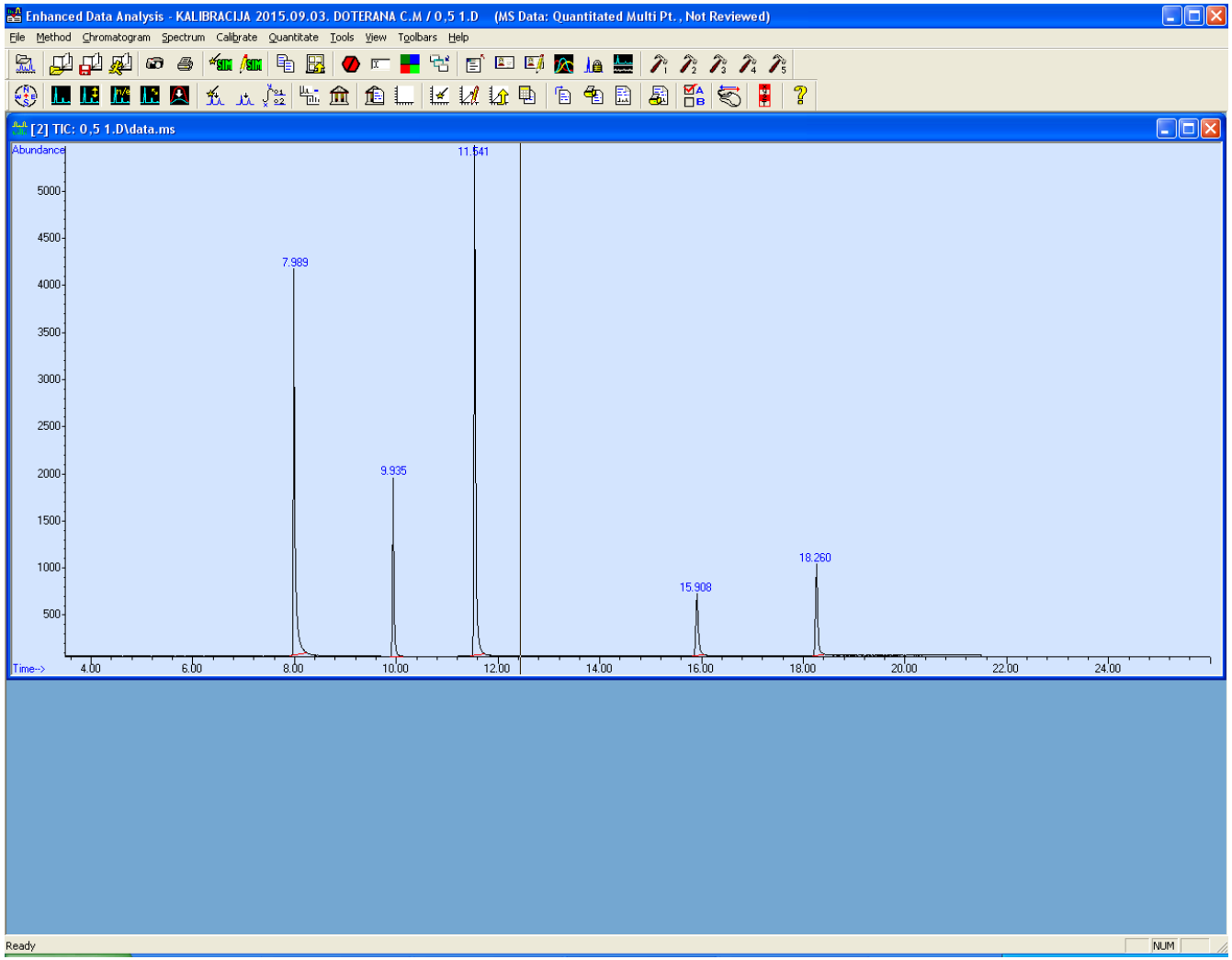

Manipulation of spectra is easily achiavable

A CASE STUDY 2: Electrospray ionization – mass spectrometry

- Analysis is more time dependent.
- Process of ion creation is timely infleunced.
- Optimization of parameters is conditioned by the accumulation of enough ions in the ion trap, thus leading to more interactive, time-consuming operator involvment.

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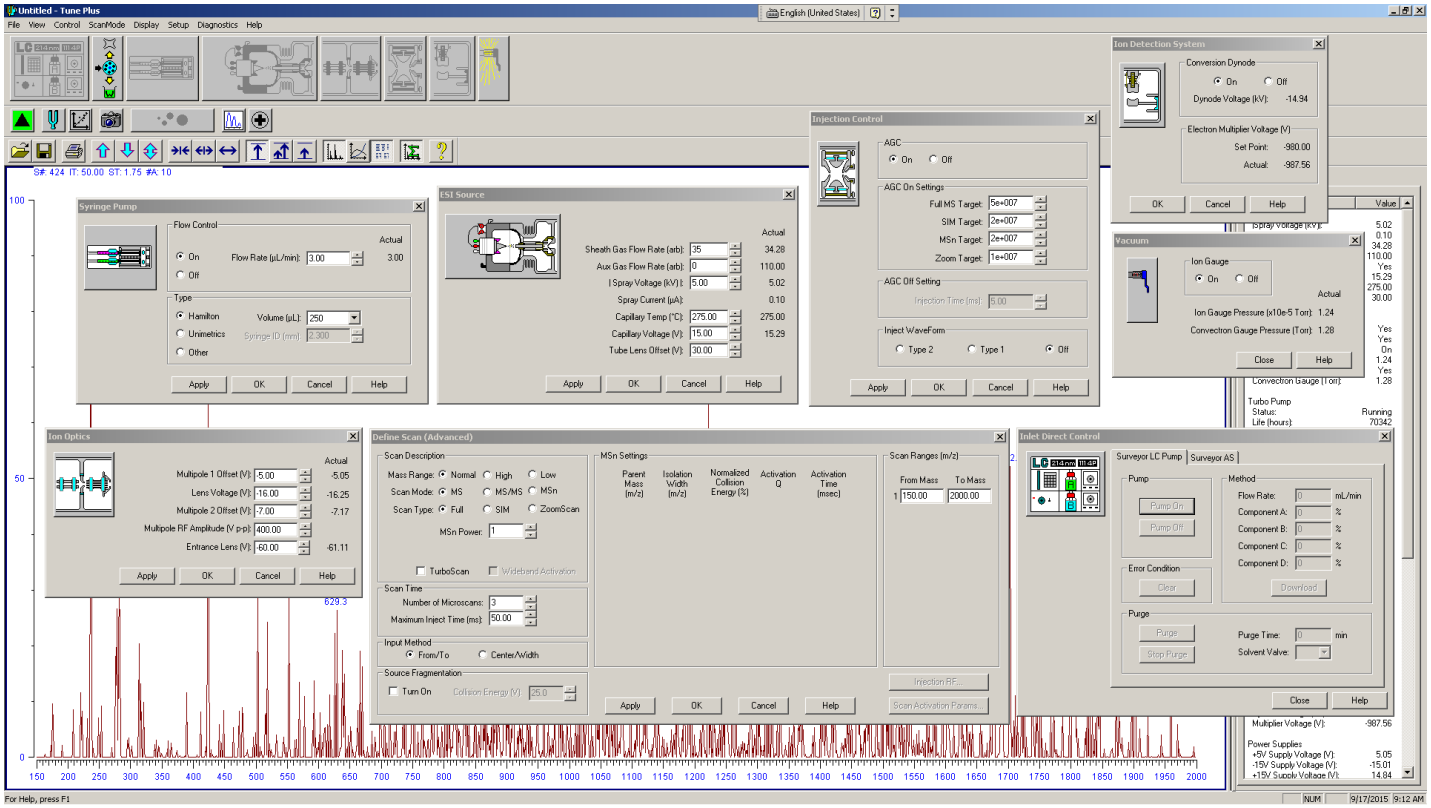

Huge number of parameters and windows for their change

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PI SOURCE
- Source Voltage (kV): 5.21
- Source Current (uA): 0.05
- Vaporizer Thermocouple OK: No
- Vaporizer Temp (C): 1.60
- Sheath Gas Flow Rate (): 18.94
- Aux Gas Flow Rate(): 4.03
- Capillary RTD OK: Yes
- Capillary Voltage (V): 14.27
- Capillary Temp (C): 201.50
- Tube Lens Voltage (V, set po -45.00

VACUUM
- Vacuum OK: Yes
- Ion Gauge Pressure OK: Yes
- Ion Gauge Status: On
- Ion Gauge (x10e-5 Torr): 1.52
- Convectron Pressure OK: Yes
- Convectron Gauge (Torr): 1.41

TURBO PUMP
- Status: Running
- Life (hours): 61007
- Speed (rpm): 59000
- Power (Watts): 73
- Temperature (C): 49.00

ION OPTICS
- Multipole Frequency On: Yes
- Multipole 1 Offset (V): -3.15
- Lens Voltage (V): -42.67
- Multipole 2 Offset (V): -9.74
- Multipole RF Amplitude (Vp-p 400.00
- Entrance Lens (V): -52.99
- Coarse Trap DC Offset (V): -10.10
- Fine Trap DC Offset (V): -10.03

MAIN RF
- Reference Sine Wave OK: Yes
- Standing Wave Ratio OK: Yes
- Main RF DAC (steps): -1.00
- Main RF Detected (V): -0.01
- RF Detector Temp (C): 44.87
- Main RF Modulation (V): 0.02
- Main RF Amplifier (Vp-p): 8.26
- RF Generator Temp (C): 38.08

ION DETECTION SYSTEM
- Dynode Voltage (kV): -14.94
- Multiplier Actual (V): -1014.13

POWER SUPPLIES
- +5V Supply Voltage (V): 5.04
- -15V Supply Voltage (V): -15.01
- +15V Supply Voltage (V): 14.84
- +24V Supply Voltage (V): 23.56
- -28V Supply Voltage (V): -28.03
- +28V Supply Voltage (V): 28.26
- +28V Supply Current (Amps): 1.07
- +35V Supply Voltage (V): 37.82
- +36V Supply Voltage (V): 35.71
- -150V Supply Voltage (V): -147.96
- +150V Supply Voltage (V): 150.57
- -205V Supply Voltage (V): -195.61
- +205V Supply Voltage (V): 192.64
- Ambient Temp (C): 34.47

INSTRUMENT STATUS
- Instrument: On
- Analysis: Acquiring

SYRINGE PUMP
- Status: Running
- Flow Rate (uL/min): 100.00
- Infused Volume (uL): 2275.00
- Syringe Diameter (mm): 3.26

DIGITAL INPUTS
- READY IN is active: No
- START IN is active: No
- Divert/Inject valve: Load

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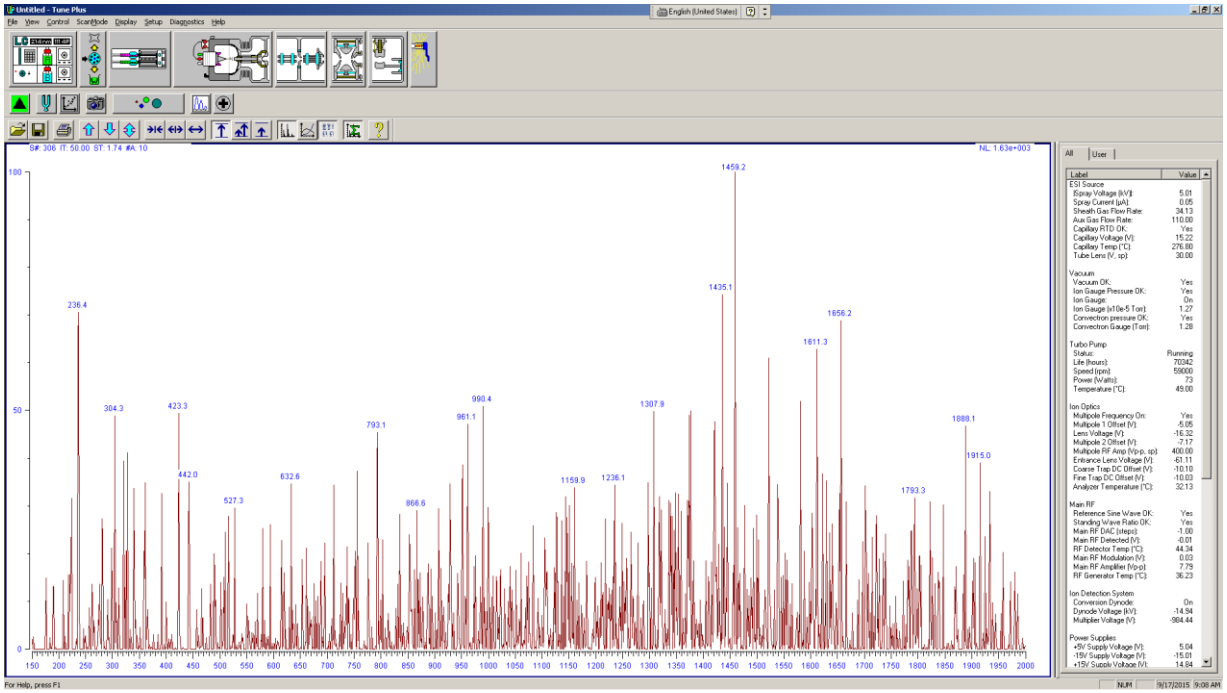

Constant change of appearance of spectra, due to different velocity of accumulation of ions.

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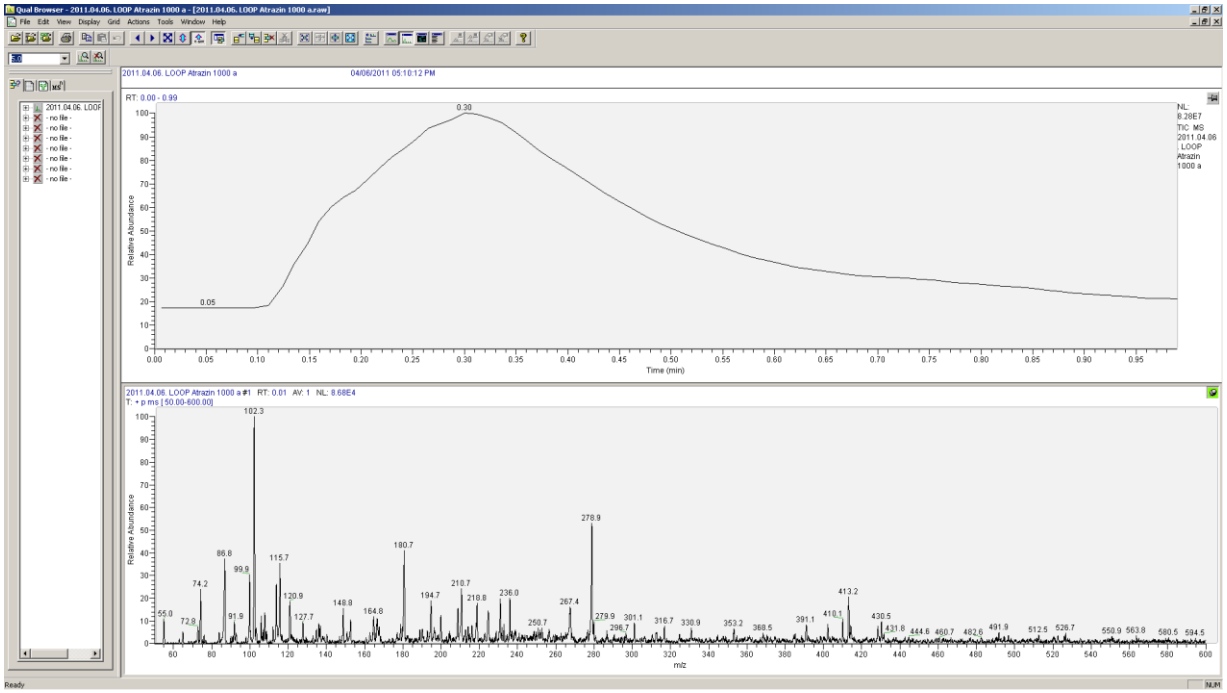

Each part of upper picture - chromatogram, generates the mass spectra in the down picture.
Easily manipulation, dinamic, not static!