Agilent GC/MS QQQ 7010D: když jde citlivost s robustností ruku v ruce

Altium

Jitka Zrostlíková

Agilent GC/MS trojité kvadrupóly

7000E GC/TQ

Rutinní výkonný systém

Trusted

Versatility

Numerous Apps.

7010D GC/TQ

Ultra stopová analýza

Sensitivity

Specifications

Stability

Agilent 7010D GC/MS trojitý kvadrupól

Hardware
Iontový zdroj HES 2.0
Excelentní citlivost a vysoká odolnost zátěži matricí

Přístrojová inteligence
Chytré alerty, upozornění na údržby, SWARM ladění, inteligentní GC

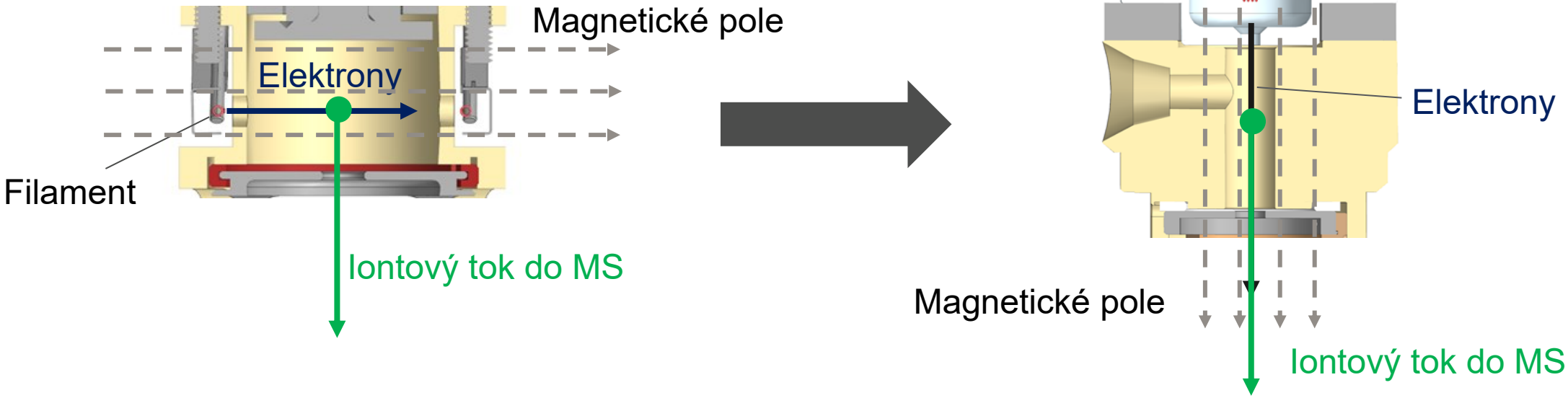
MassHunter 13
MRM optimizer, vylepšené RTL, Compliance

Hardware

High efficiency source (HES)

Orthogonální iontový zdroj
(Agilent Stainless Steel, Extractor, HydroInert)

Axiální design
(Agilent HES)

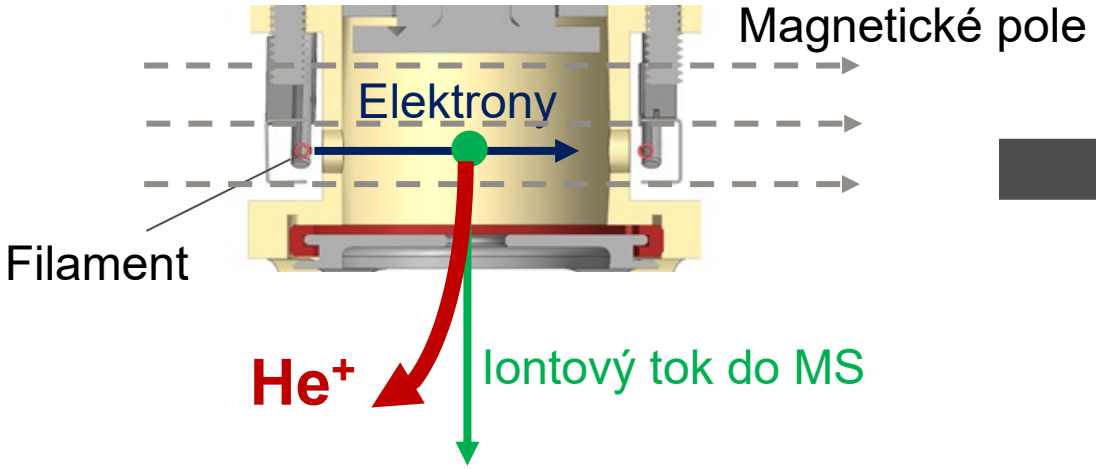


HES iontový zdroj: 10x vyšší signál analytů

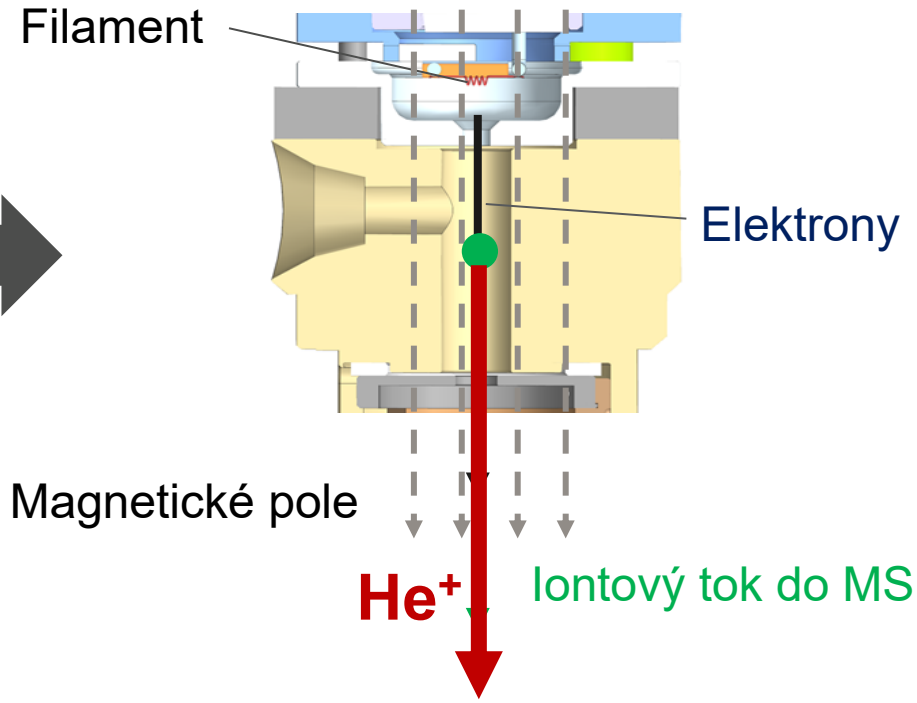
- Nižší meze detekce
- Nižší množství vzorku = méně údržby

High efficiency source (HES)

Orthogonální iontový zdroj
(Agilent Stainless Steel, Extractor, HydroInert)



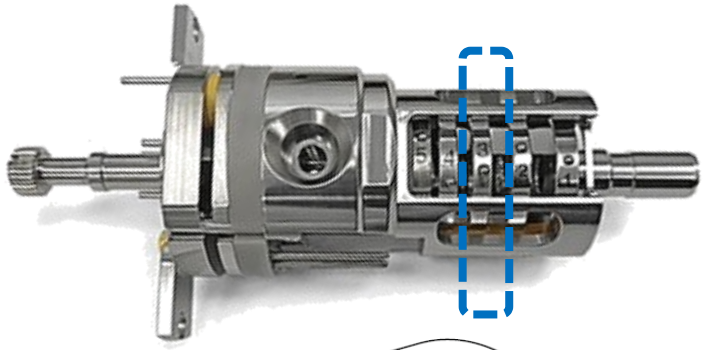
Axiální design
(Agilent HES)

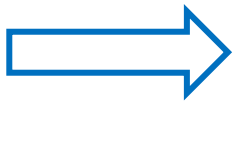


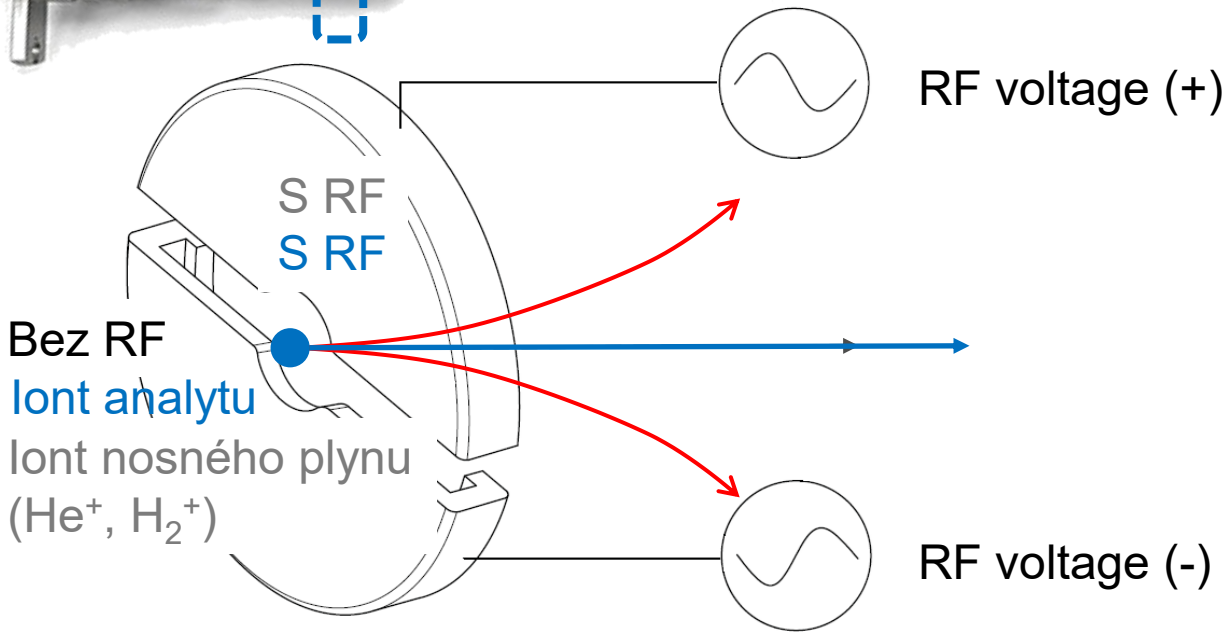
Velmi **málo iontů** nosného plynu **vstupuje do kvadrupólu**

Vysokoenergetické **ionty nosného plynu vstupují do kvadrupólu**

Nová generace iontového zdroje HES 2.0







Ion landing pattern as observed experimentally

The ion burn can be easily cleaned with standard method

Nově integrovaná čočka v iontovém zdroji **odklání malé ionty mimo osu** – minimalizace dopadu do kvadrupolu

Pod patentem US

Agilent 7010D Instrument Detection Limit (IDL)

Nižší chemický šum = lepší LOQ

7010A/B/C

Parameter	Value
EI MRM IDL	0.5 fg or less octafluoronaphthalene (OFN) Statistically derived at 99% confidence level from the area precision of eight sequential splitless injections* of 1 µL, 2 fg/µL OFN standard. MS/MS transition of *m/z* 272 → 222 100 msec dwell time

All tests were carried out on a 30 m × 0.25 mm, 0.25 µm column.
*IDL specification is only demonstrated if an autosampler is part of the installed system. If an autosampler is not present, the EI MRM S/N specification is performed.

7010D

Parameter	Value
EI MRM IDL	0.3 fg or less octafluoronaphthalene (OFN) Statistically derived at 99% confidence level from the area precision of eight sequential splitless injections* of 1 µL 1 fg/µL OFN standard. MS/MS transition of *m/z* 272 → 222 100 msec dwell time

All tests were carried out on a 30 m × 0.25 mm, 0.25 µm column.
*IDL specification is only demonstrated if an autosampler is part of the installed system. If an autosampler is not present, the EI MRM S/N specification is performed.

Altium

Důkaz místo slibů: GC/MS/MS 7010D analýza pesticidů v obtížné matrici

Metoda pro 246 pesticidů v černém čaji

- **QuEChERs** extrakce z 2 g čaje, přečištění extraktu, celkem **5 x ředění**
- GC systém s využitím technologií **mid-column backflush** a **MMI cold splitless** nástřik
- GC/QQQ MS **Agilent 7000D** s HES 2.0 iontovým zdrojem
- Sběr dat v **dynamickém MRM** (dMRM) režimu – celkem **749 MRM přechodů**, až **64 konkurenčních** přechodů
- **Retention time locking (RTL)** během sběru dat
- Využití MRM databáze Agilent MassHunter **Pesticides and Environmental Pollutants 4.0** s retenčními časy

- Validace metody dle **SANTE 11312/2021 guideline**
- Testování **dlouhodobé stability systému > 800 nástřiků** matričních vzorků

Příprava vzorku QuEChERs

s přečištěním na Captiva EMR GPD

Sample extraction

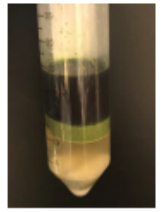
2 g of black tea

– Dry sample hydration and equilibration
– Addition of extraction solvent

Agilent QuEChERs EN extraction kit

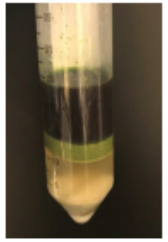
Mechanical shaker

Centrifuge



Crude extract

Sample cleanup



– Premixing with 2% acidic buffer
– Loading 2.5 to 3 mL on cartridge

Black tea extract on Agilent Captiva EMR–GPD

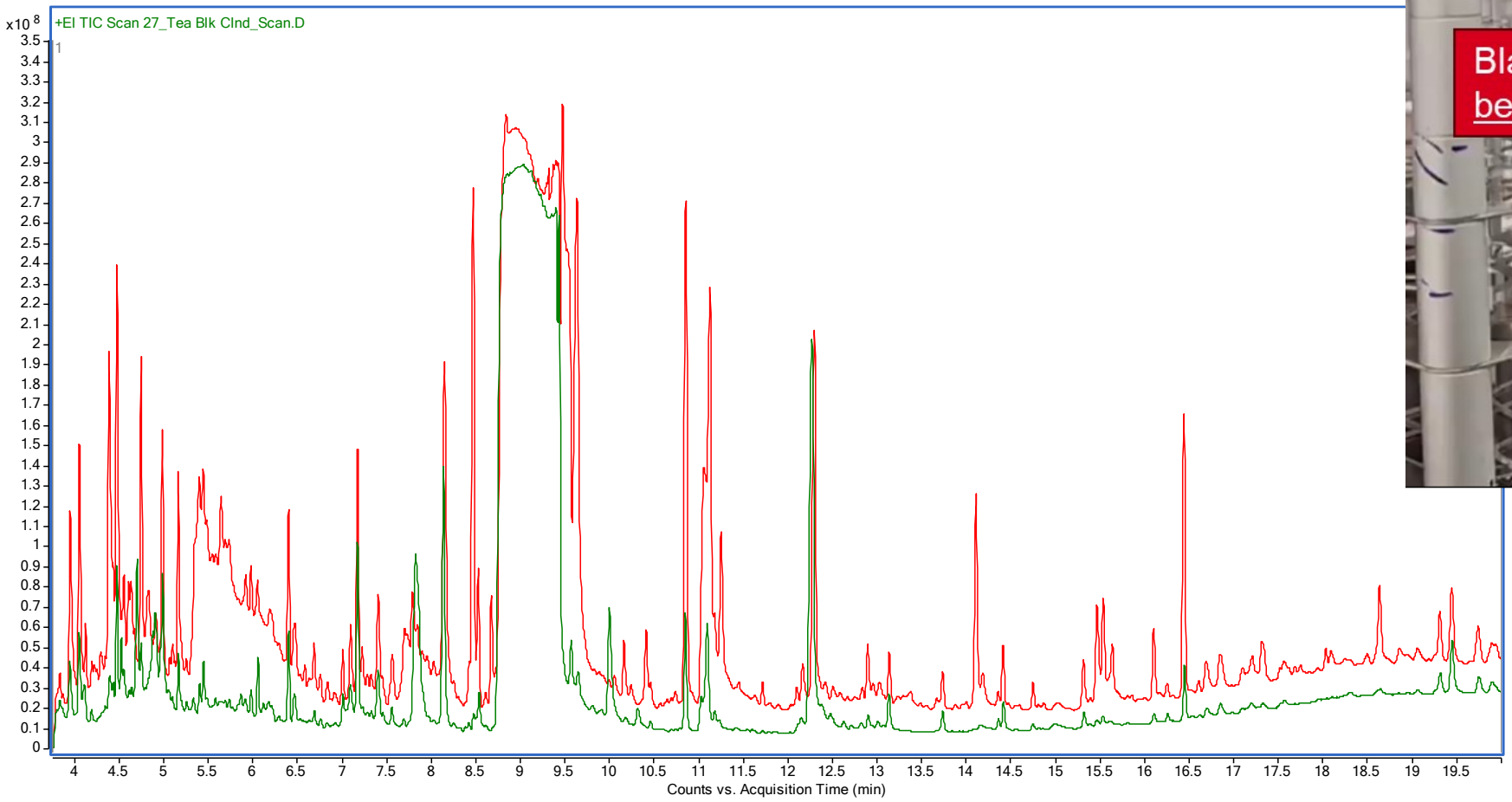
Sample eluent drying with $MgSO_4$

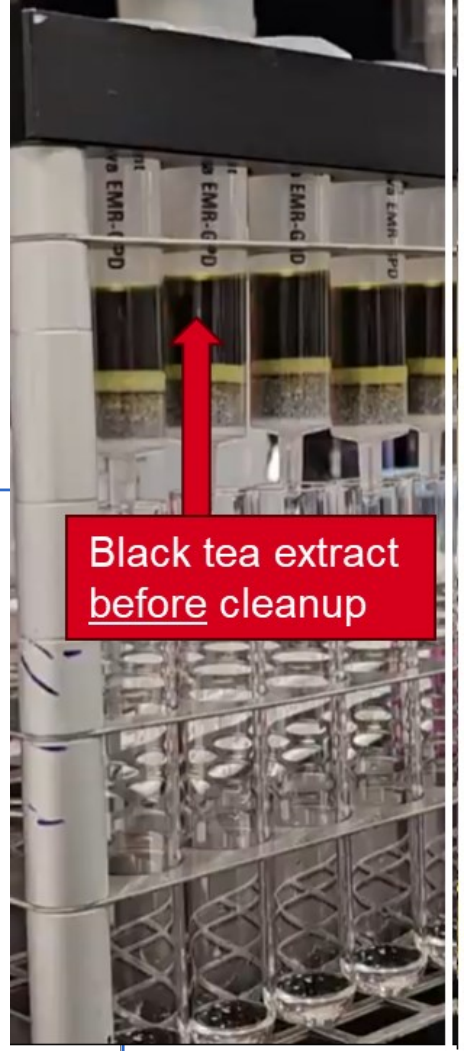
Sample analysis on the Agilent 7010D GC/TQ

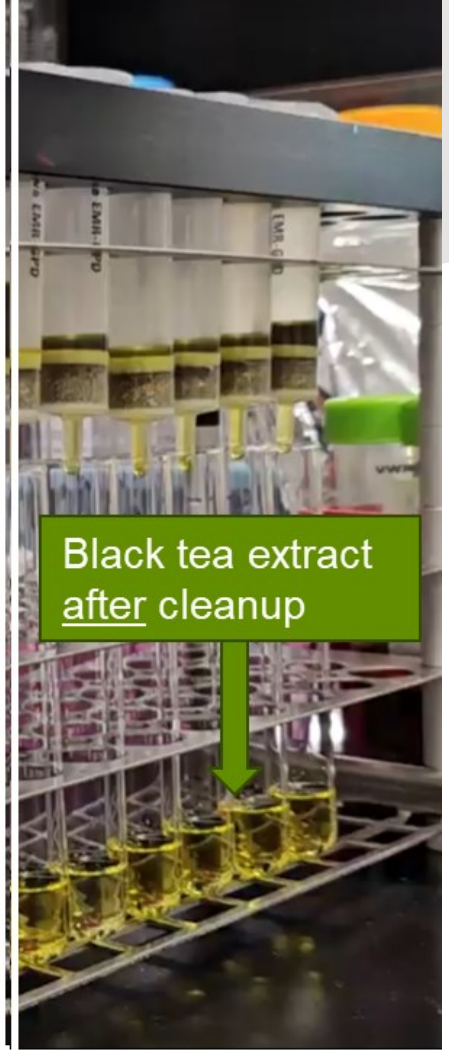
Příprava vzorku

Přečištění vzorků pomocí Captiva EMR-GPD*

Chromatogram pozadí ve skenu (full MS)







*General Pigmented Dry

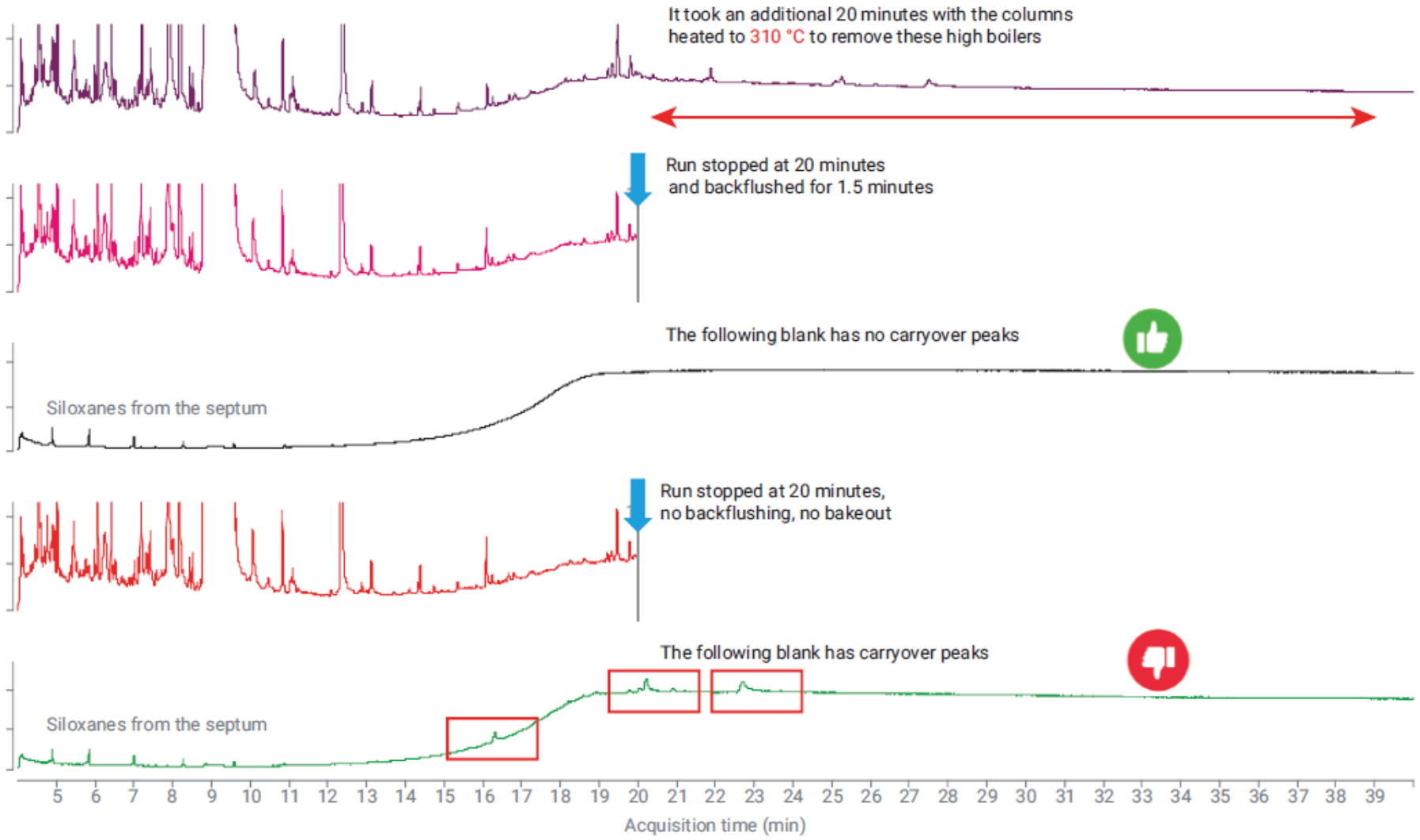
Konfigurace GC

Mid-column backflush

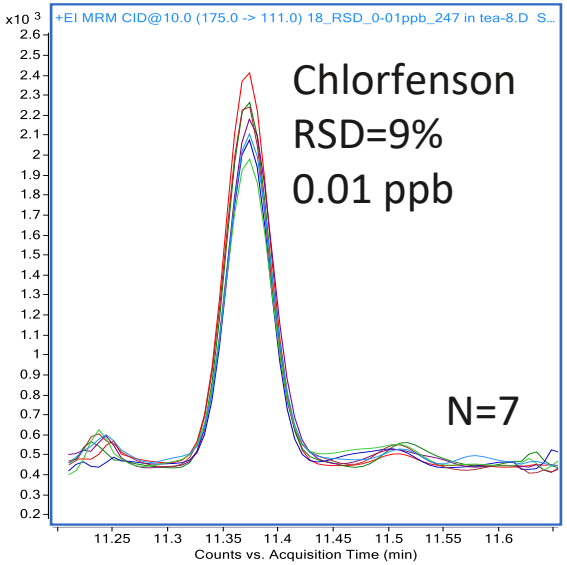
Purged Ultimate Union

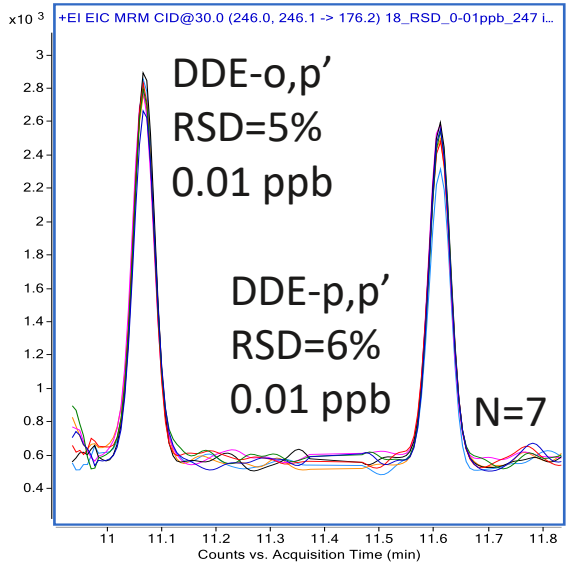
Mid-column backflush

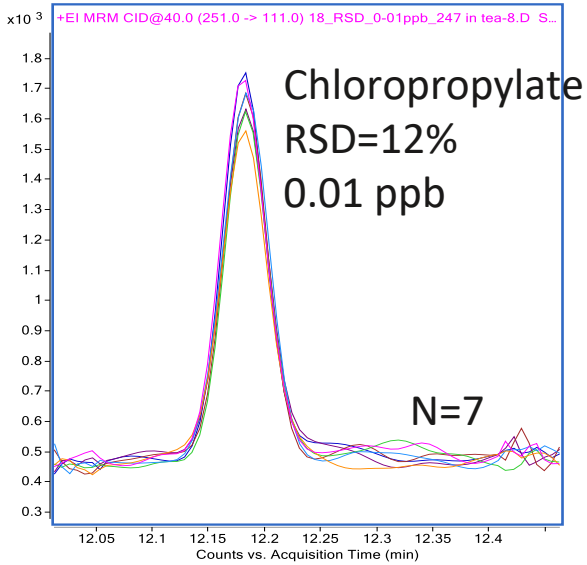
Možnost zkrácení metody a eliminace carryover

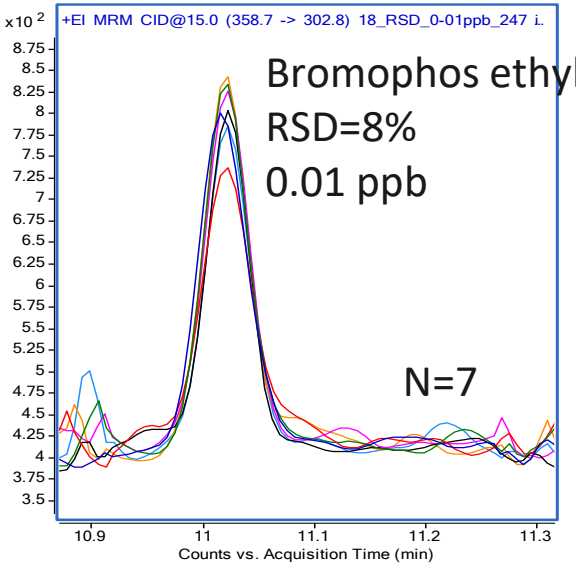


Výsledky validace: LOQ, linearita

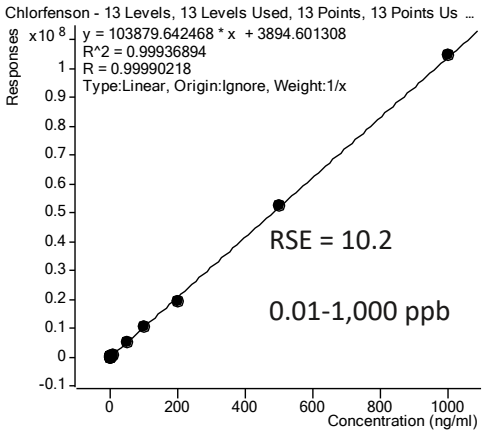




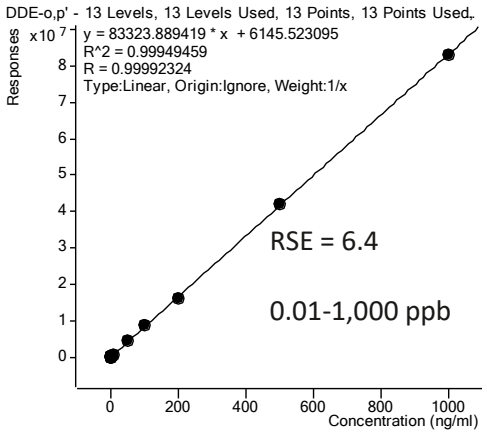




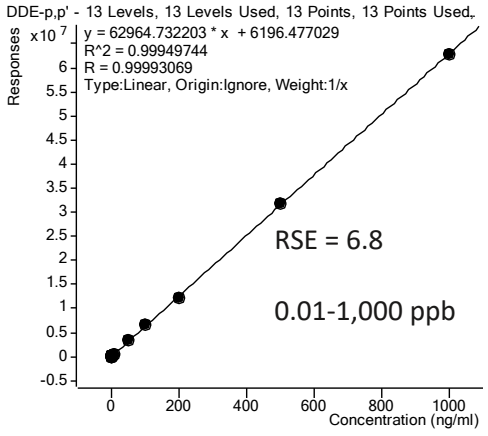
Chlorfenson



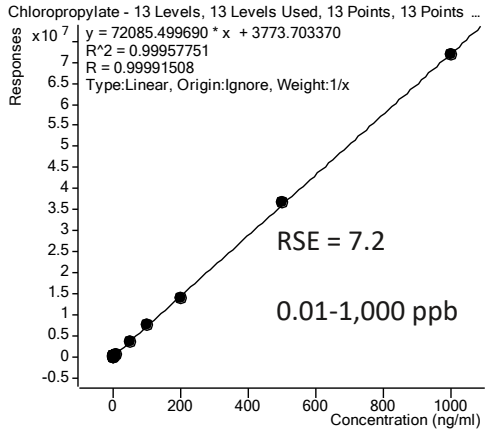
DDE-o,p'



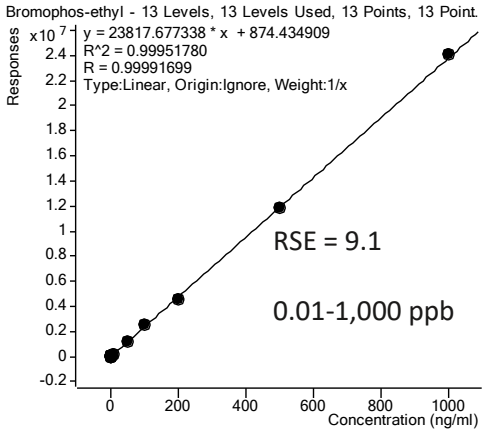
DDE-p,p'



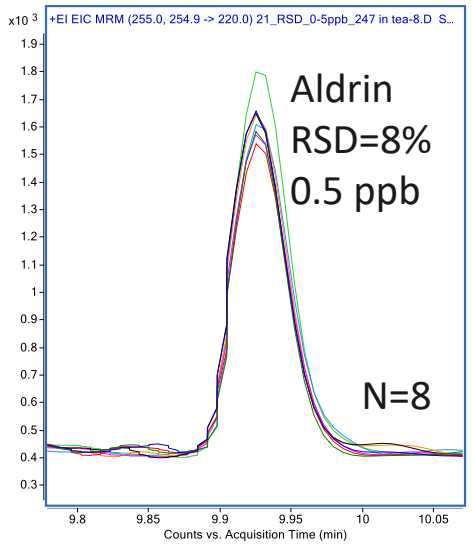
Chloropropylate

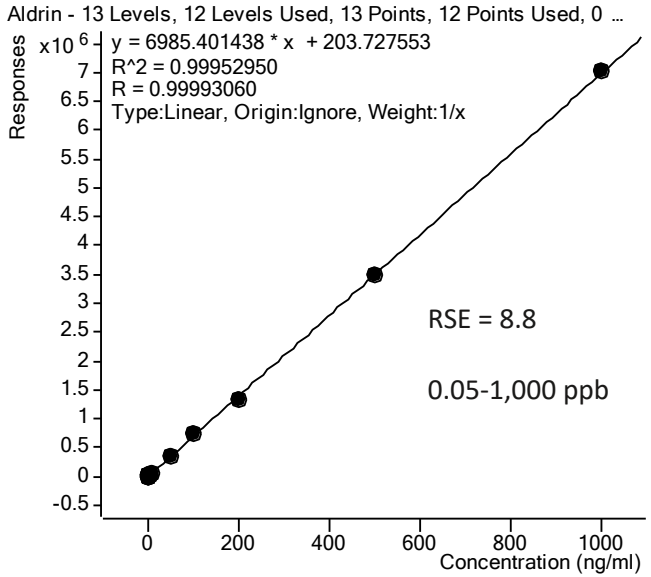


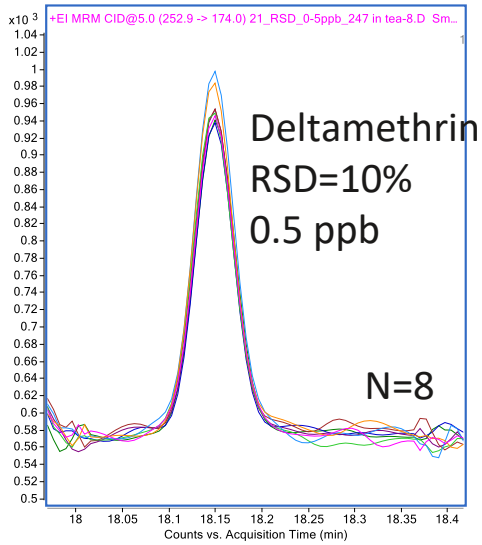
Bromophos ethyl

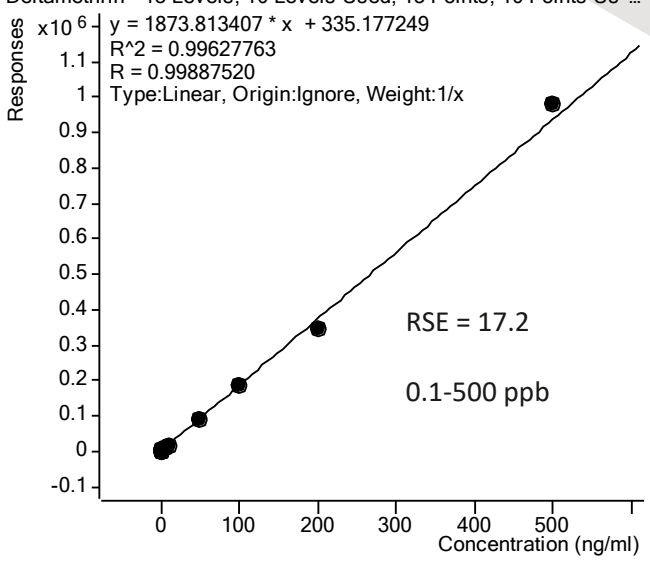


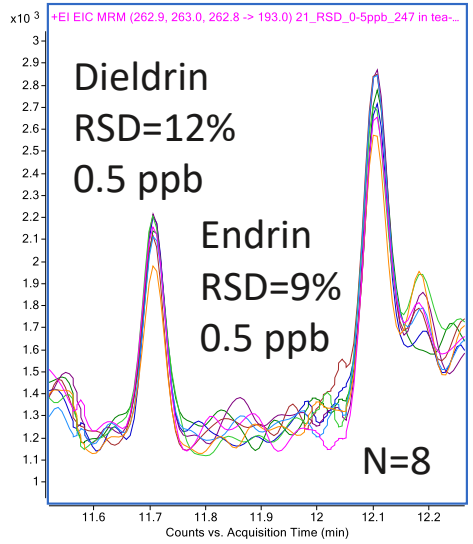
Výsledky validace: LOQ, linearita

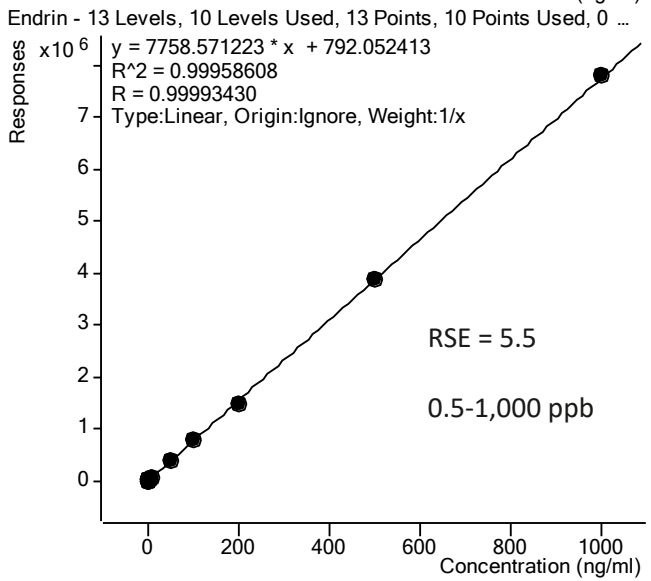


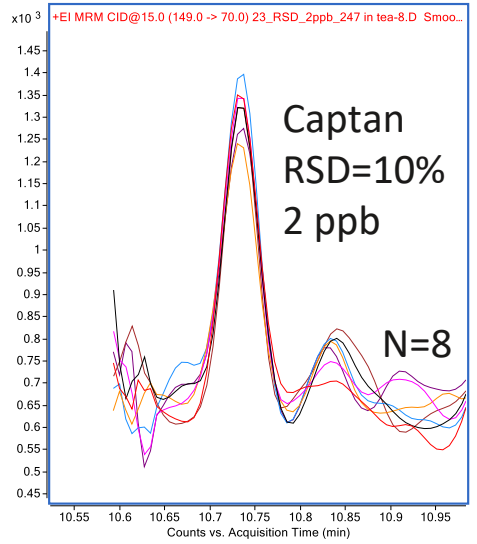


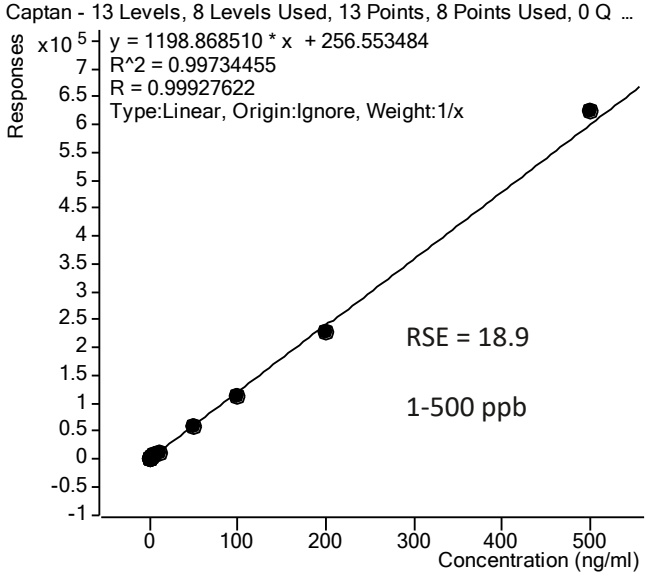






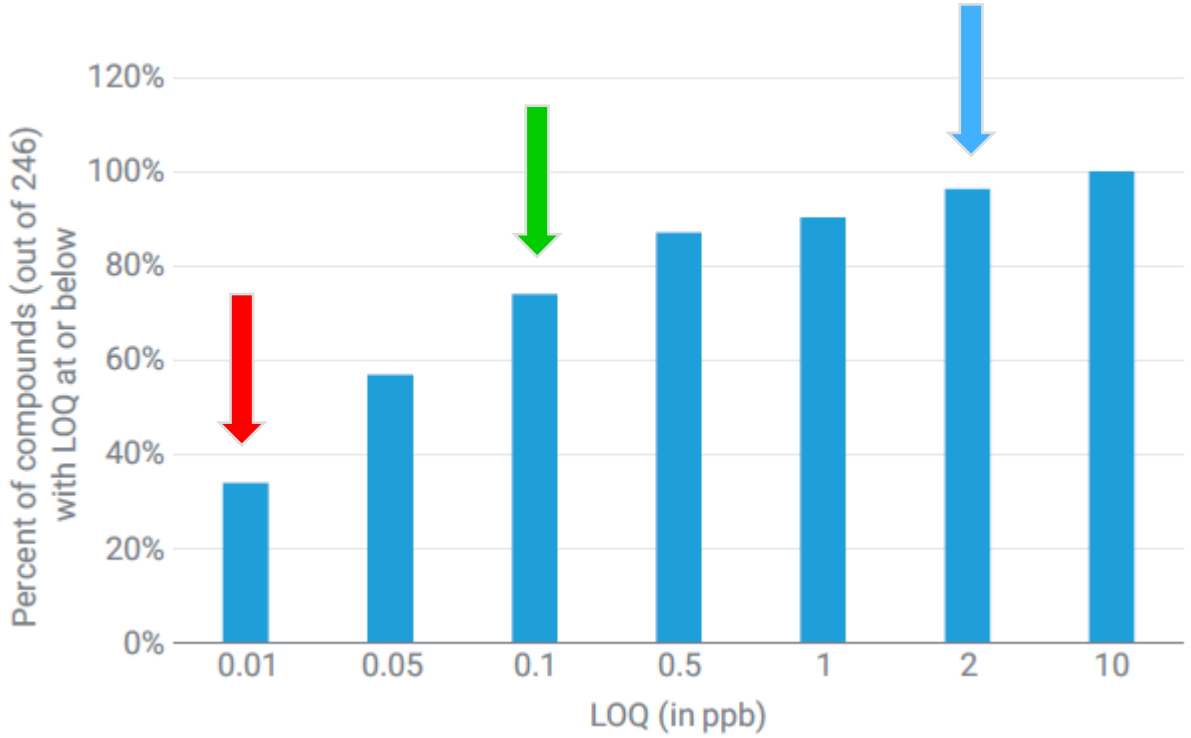






Výsledky validace: LOQ, linearita

Histogram LOQ 246 pesticidů

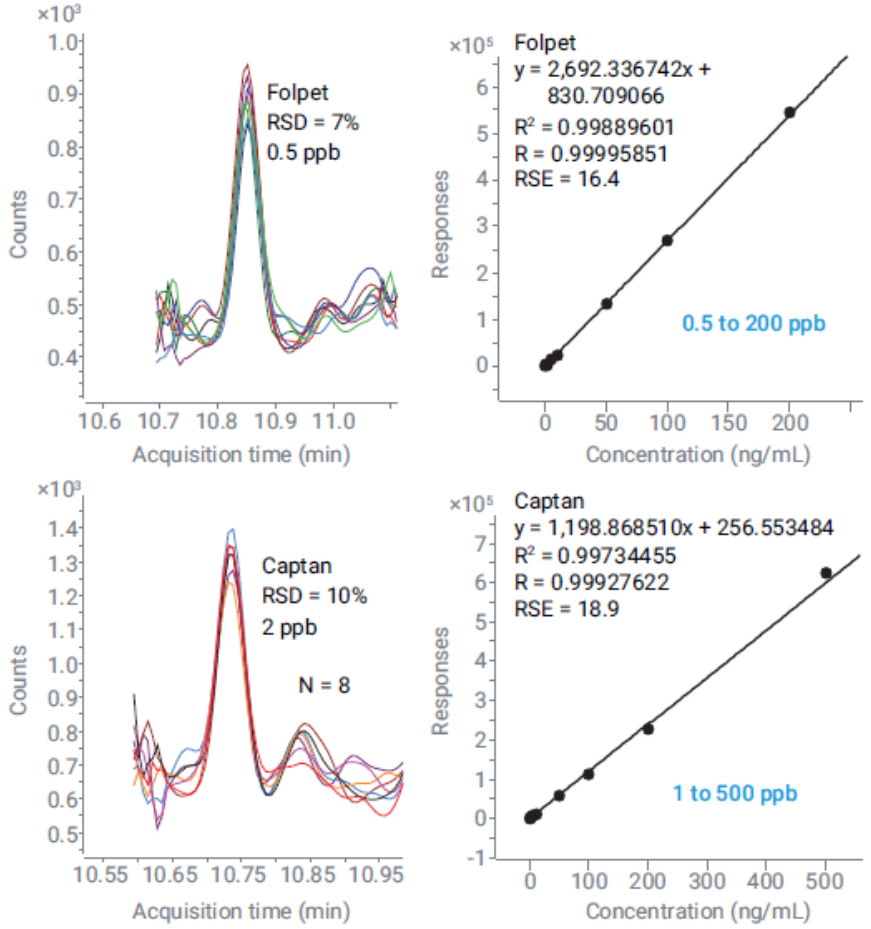


34% látek LOQ < 0,01 ppb

74% látek LOQ < 0,1 ppb

96% látek LOQ < 2 ppb

Captan a folpet



Dlouhodobá stabilita: 800 nástřiků

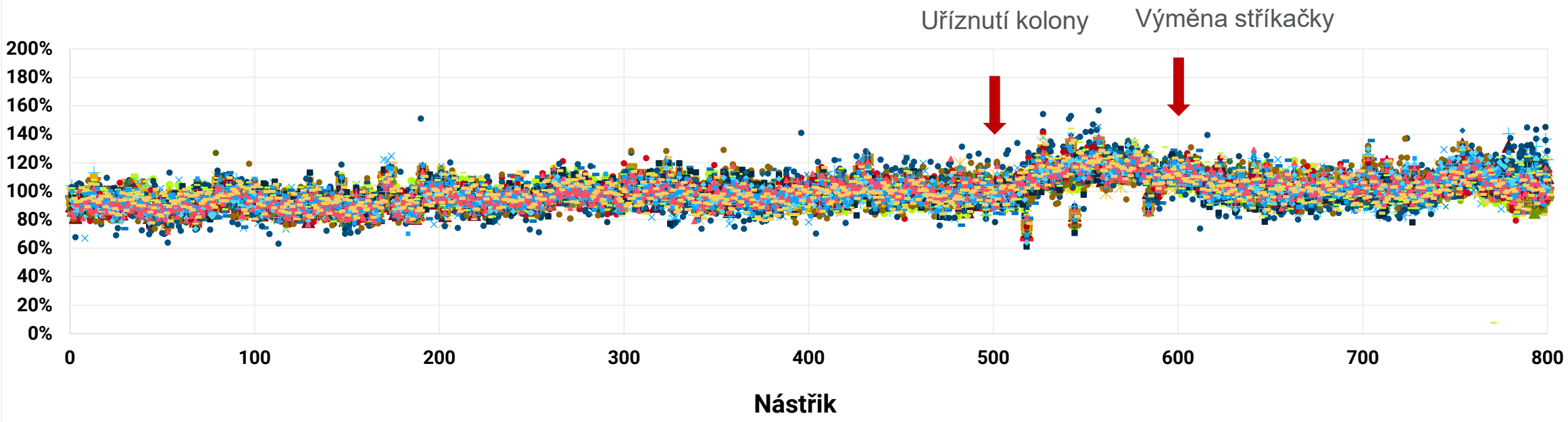
Podmínky experimentu:

- Extrakt čaje s přídavkem pesticidů na **úrovni 2 ppb**
- Každých **100 nástřiků výměna lineru a septa** (< 4 min)
- Každých **500 nástřiků uříznutí 5 cm kolony** (5-10 min)
- Po **600 nástřicích** výměna stříkačky (5 min)
- **Žádné čištění** GC Inletu nebo MS detektoru

Dlouhodobá stabilita: 800 nástřiků

2 ppb pesticidy v černém čaji

Plochy normalizované na vnitřní standard (parathion-d10) a na průměrnou odezvu každého analytu



Application Note

Food

Agilent
Trusted Answers

Brewing Excellence: Quantitating Over 200 Pesticides in Black Tea with Steady Performance and Maximized Uptime by GC/MS/MS

Authors

Anastasia A. Andrianova and
Limian Zhao
Agilent Technologies, Inc.

Abstract

This application note presents results for the sensitive and robust quantitation of 246 pesticides in black tea extract with the **Agilent 7010D Triple Quadrupole Mass Spectrometer** (GC/TQ) featuring a second-generation High Efficiency Source 2.0 (HES 2.0), that addresses the challenges posed by residual pesticide analysis in complex matrices. By optimizing sample preparation and using state-of-the-art GC/MS hardware, including ion source technology and midcolumn backflushing, excellent calibration performance and sensitivity at low-ppb levels were achieved. The method demonstrated exceptional ruggedness and robustness over 800 consecutive injections of a black tea extract spiked with pesticides at 2 ppb, with high precision and low RSDs, ensuring prolonged instrument uptime and maximum throughput. The demonstrated limits of quantitation (LOQs) were as low as 0.01 ppb for over a third of evaluated compounds, and the calibration range spanned up to five orders of magnitude while meeting SANTE 11312/2021 guidelines.

This application note highlights intelligent GC/TQ features, such as early maintenance feedback and an instrument health status dashboard, maintaining confidence in the results for a high-throughput analysis. The updated data acquisition platform provides enhanced user experience, including a new implementation of the retention time locking functionality.

Application Note

Environmental

Agilent
Trusted Answers

Enhanced Longevity and Revolutionized Robustness for the Sensitive Detection of 190 Pesticides over 800 Injections

Author

Brooke C. Reaser
Agilent Technologies, Inc.

Abstract

Multiresidue pesticide analysis has become one of the most difficult but important analytical challenges for those using gas chromatography and mass spectrometry. The Agilent 8890 gas chromatograph (GC) coupled with the Agilent 7010 triple quadrupole mass spectrometer (GC/TQ) with a high efficiency source 2.0 (HES 2.0) upgrade is an analytically accurate, robust, and reproducible instrument for multiresidue pesticide analysis of complex samples. The analysis of 190 pesticides in a spinach extract was conducted using an Agilent QuEChERS extraction kit across 800 injections. Only GC inlet maintenance was required over the duration of the injections. The instrument configuration that enabled robust performance included a multimode inlet, a mid-column backflushing configuration, and the HES 2.0. No degradation of the analytical method, sensitivity, or instrument performance occurred, allowing for the high-throughput, accurate, robust, and sensitive detection of pesticides in spinach.

Altium

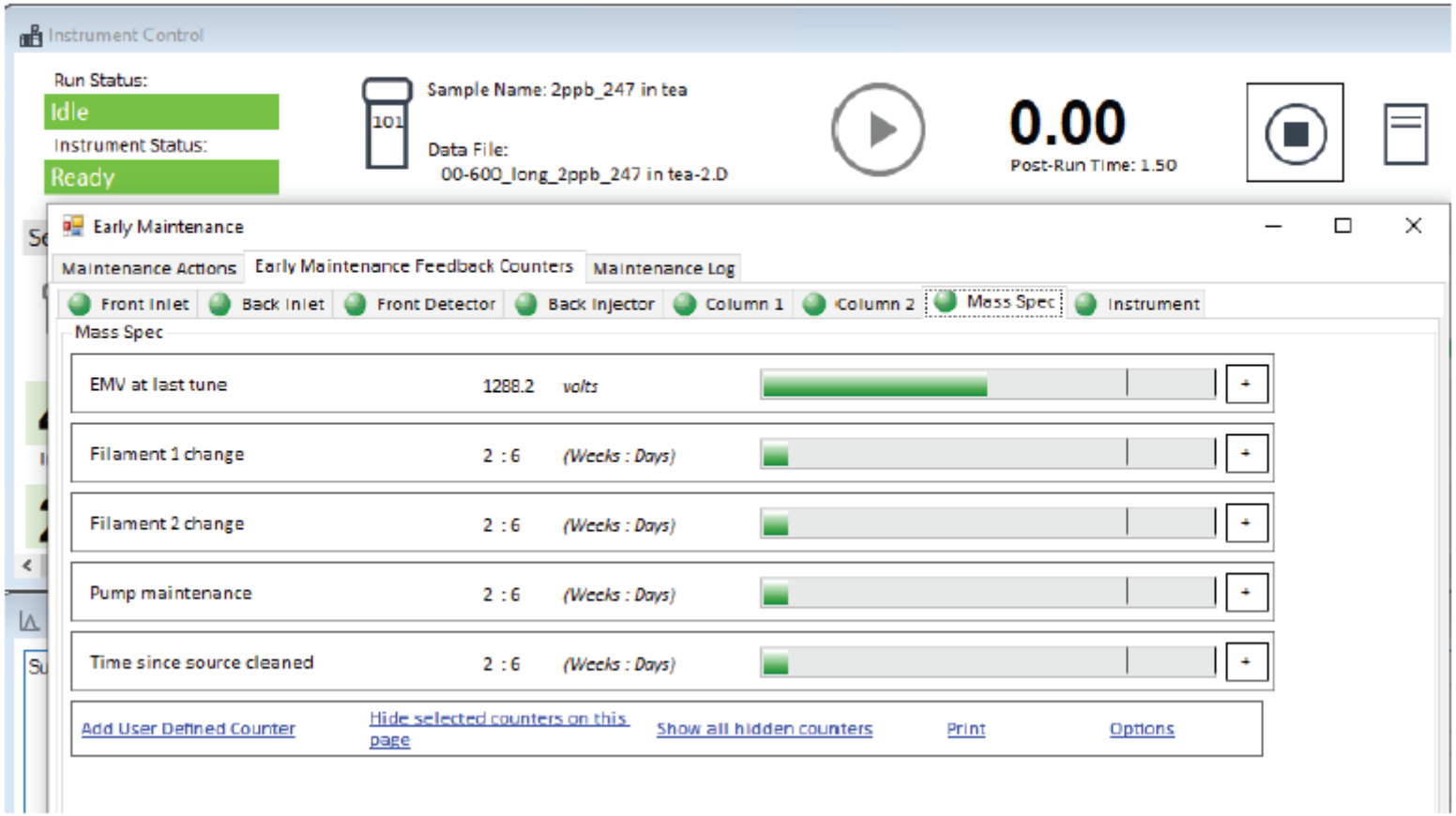
Přístrojová inteligence

Přístrojová inteligence

- **Včasné upozornění na údržby a chytrá upozornění**

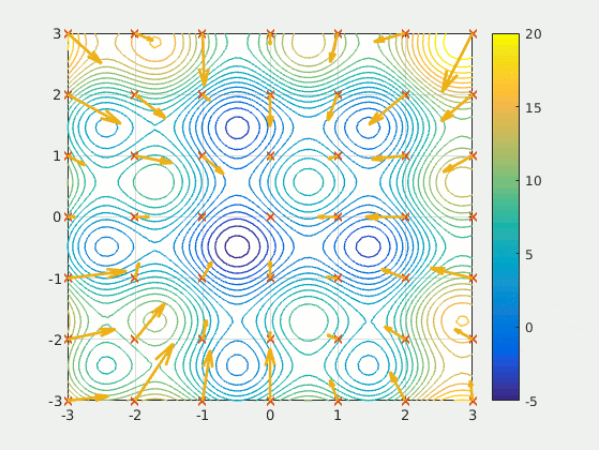
  Monitoruje „zdraví“ GC/MS přístroje a e-mailem zasílá upozornění na nutnou údržbu a zastavení chodu přístroje

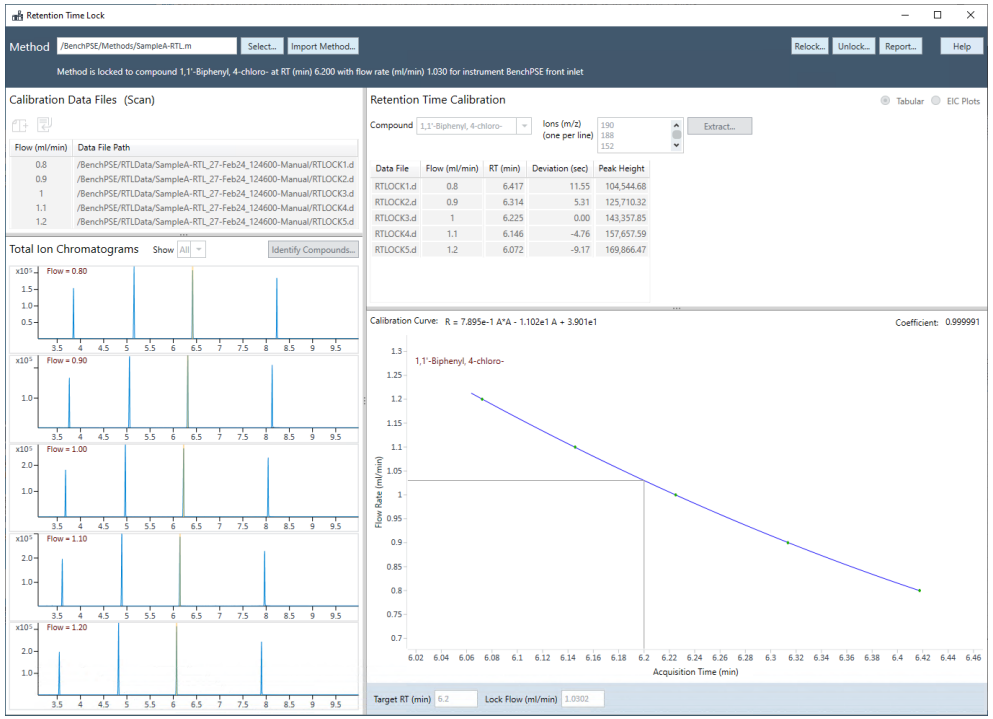
A



Přístrojová inteligence

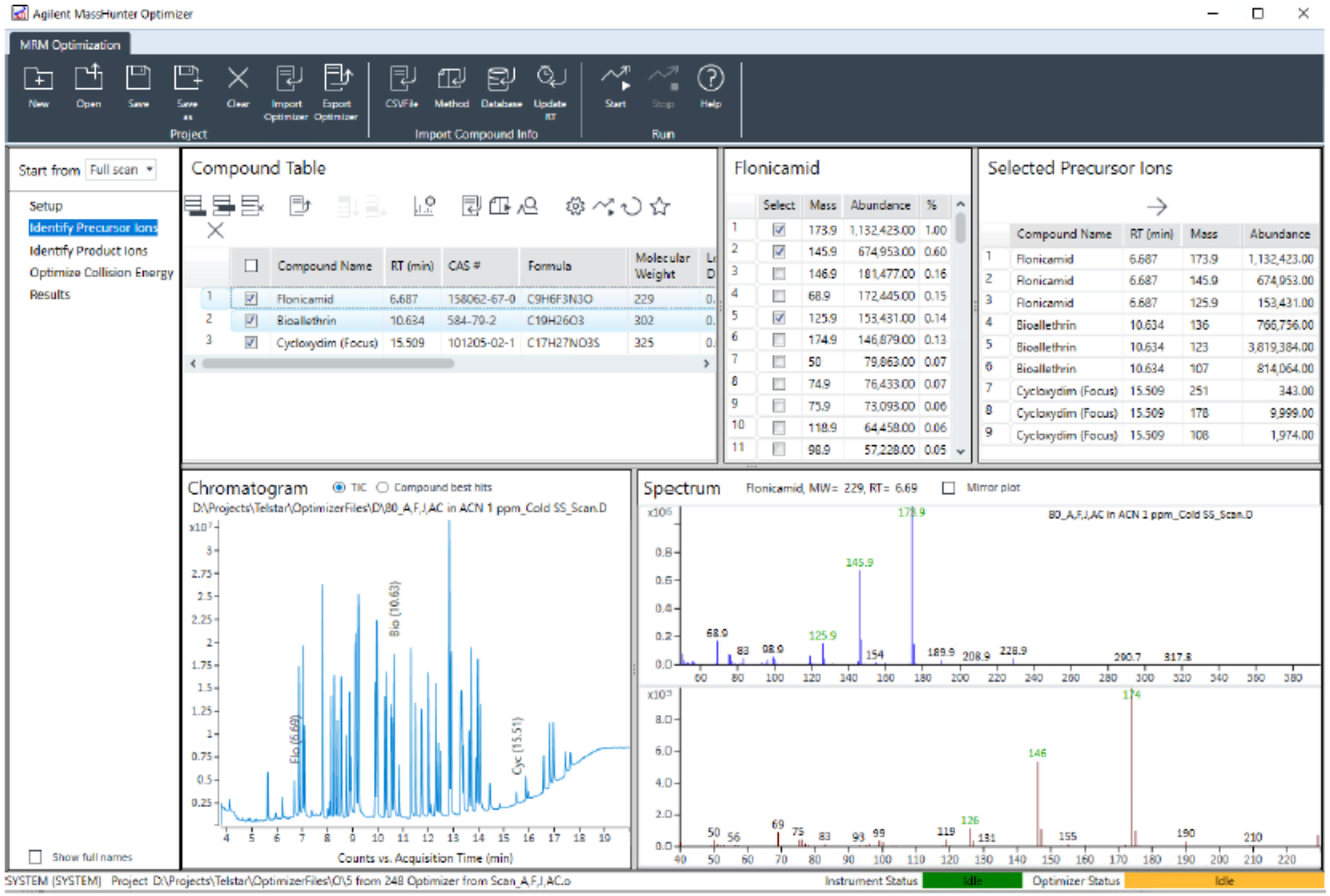
- **SWARM** autotune
- **Leak check** v reálném čase
- Nový **RT locking**





Přístrojová inteligence

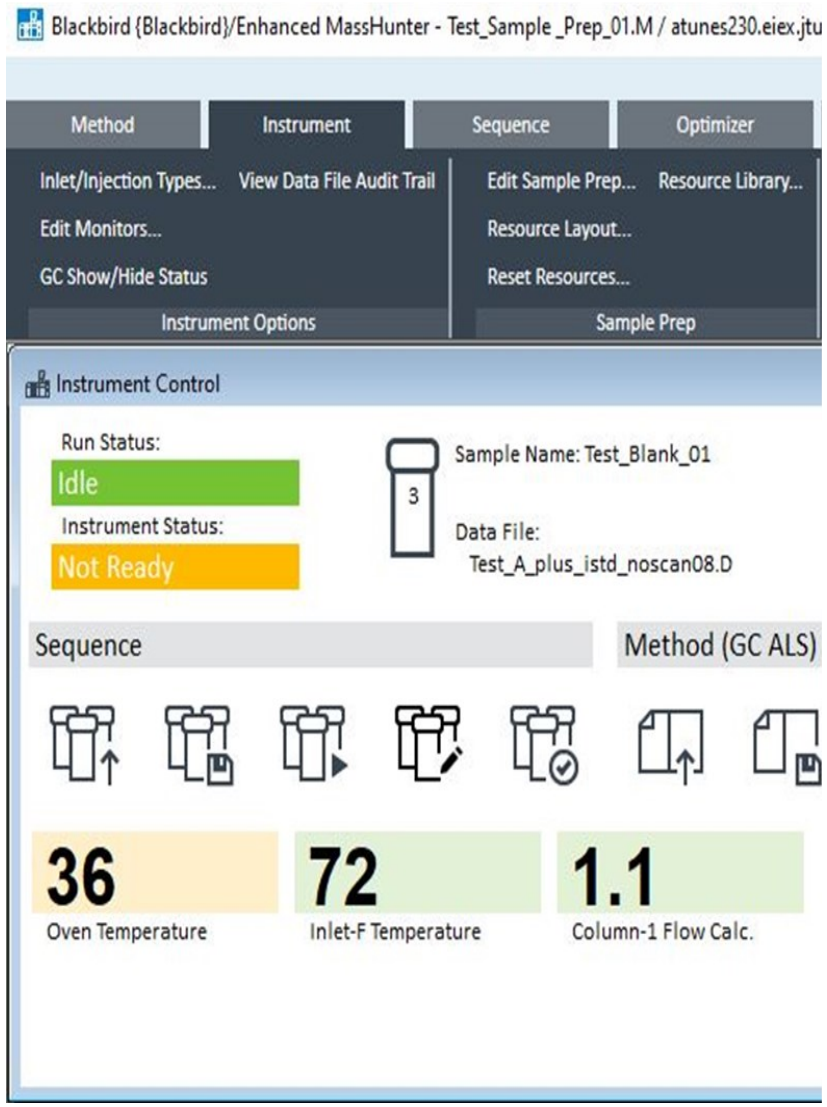
- **Optimizer MRM přechodů**
  - ✓ Plná automatizace
  - ✓ Zabudovaný přímo v akvizici
  - ✓ Splňuje požadavky na „compliance“
  - ✓ Jednoduchý transfer GC/MSD metody na GC/MS/MS metodu

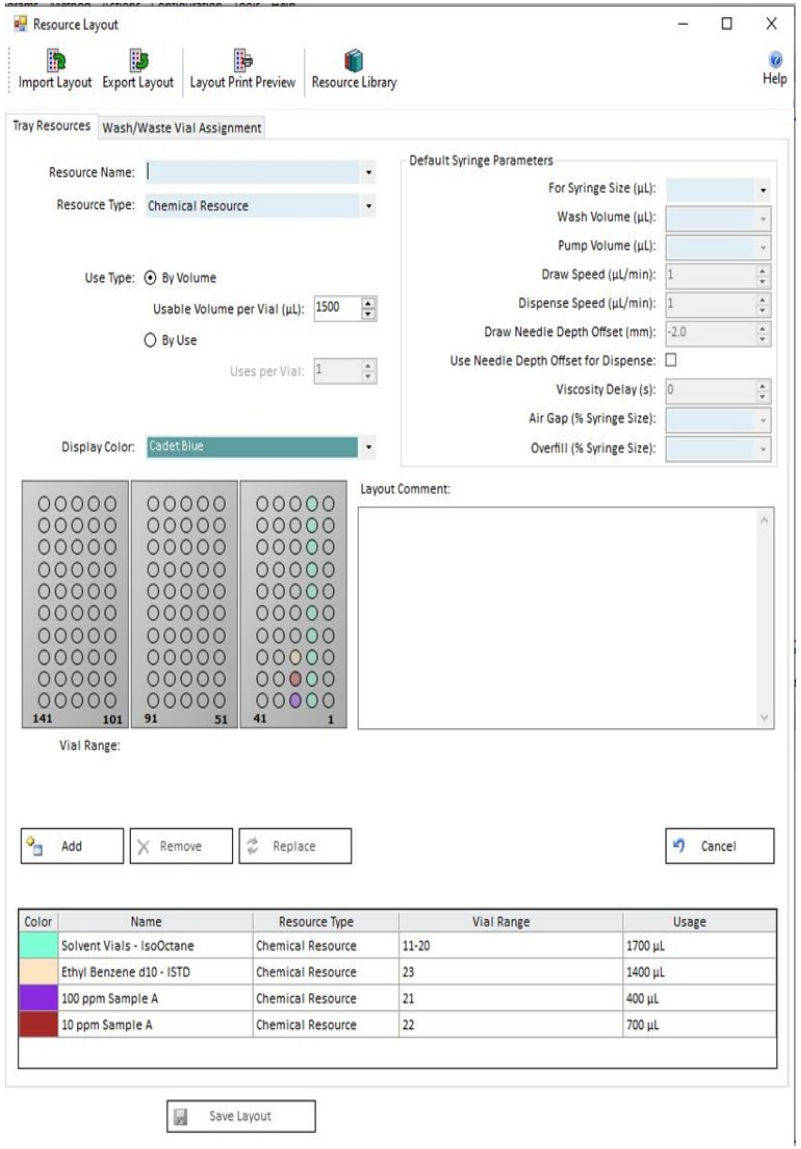


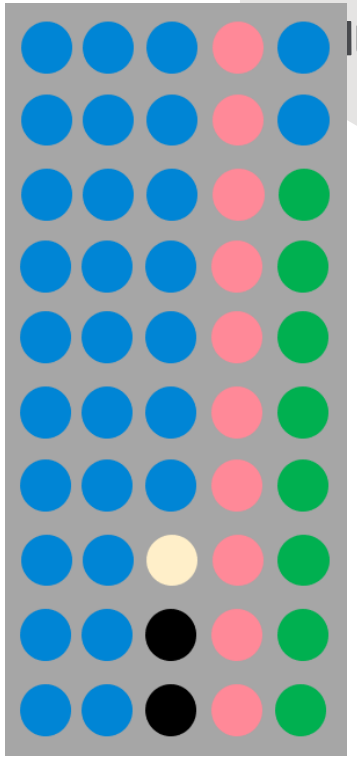
Easy sample prep in MassHunter 13

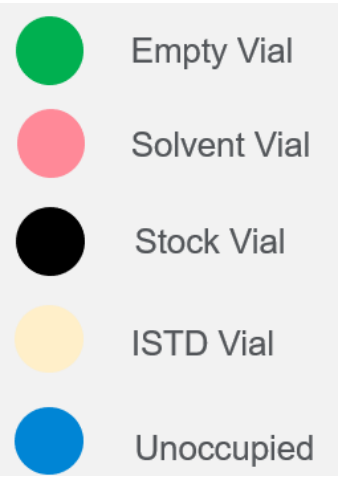
Dvě věže

Easy sample prep in MassHunter 13









Altium

Správa dat a uživatelů, systémy pro regulované prostředí

Požadavky na zabezpečení kvality dat v regulovaném prostředí


Energy


Chemical


Environment

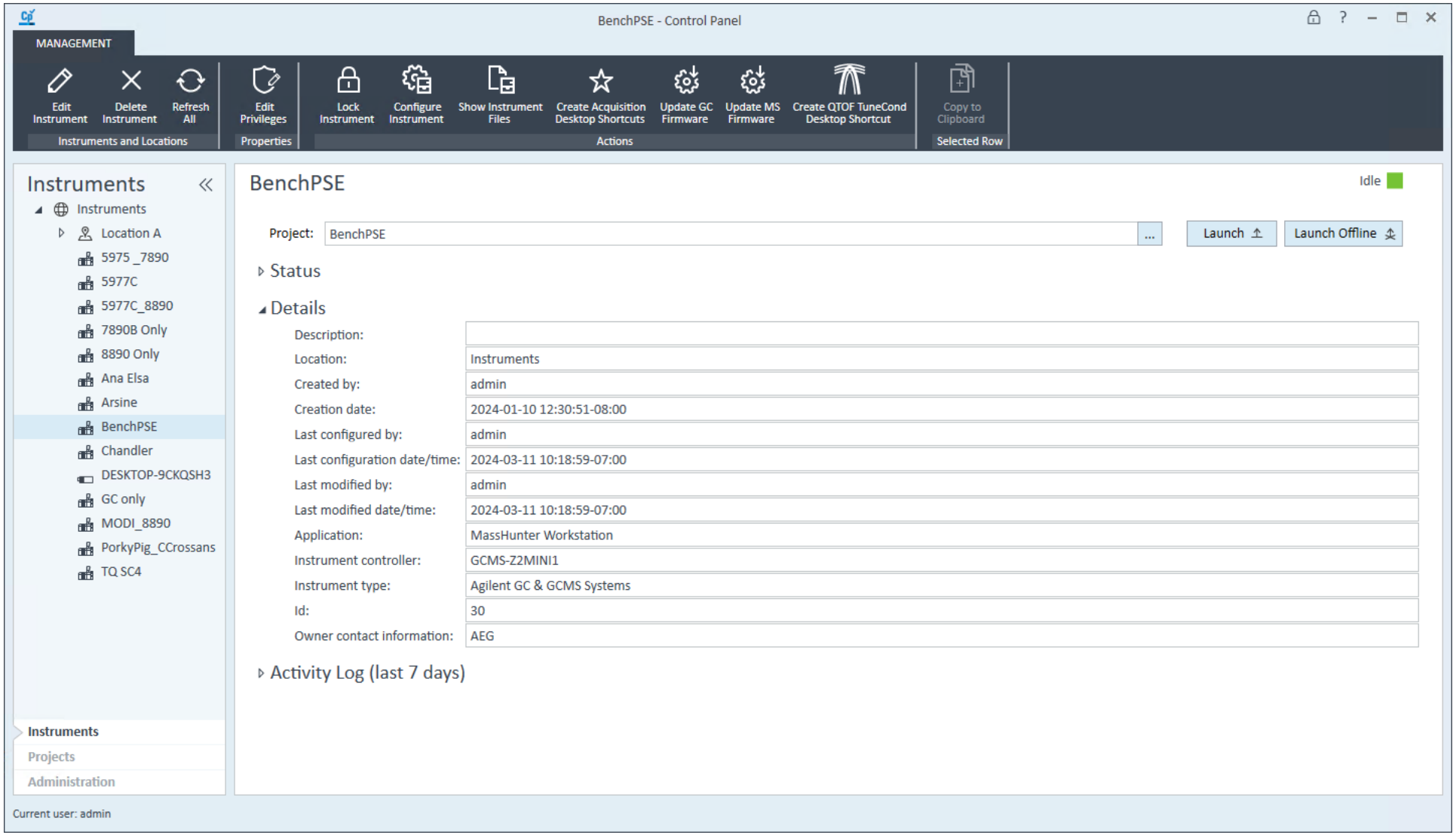

Food


Pharmaceuticals & Supplements

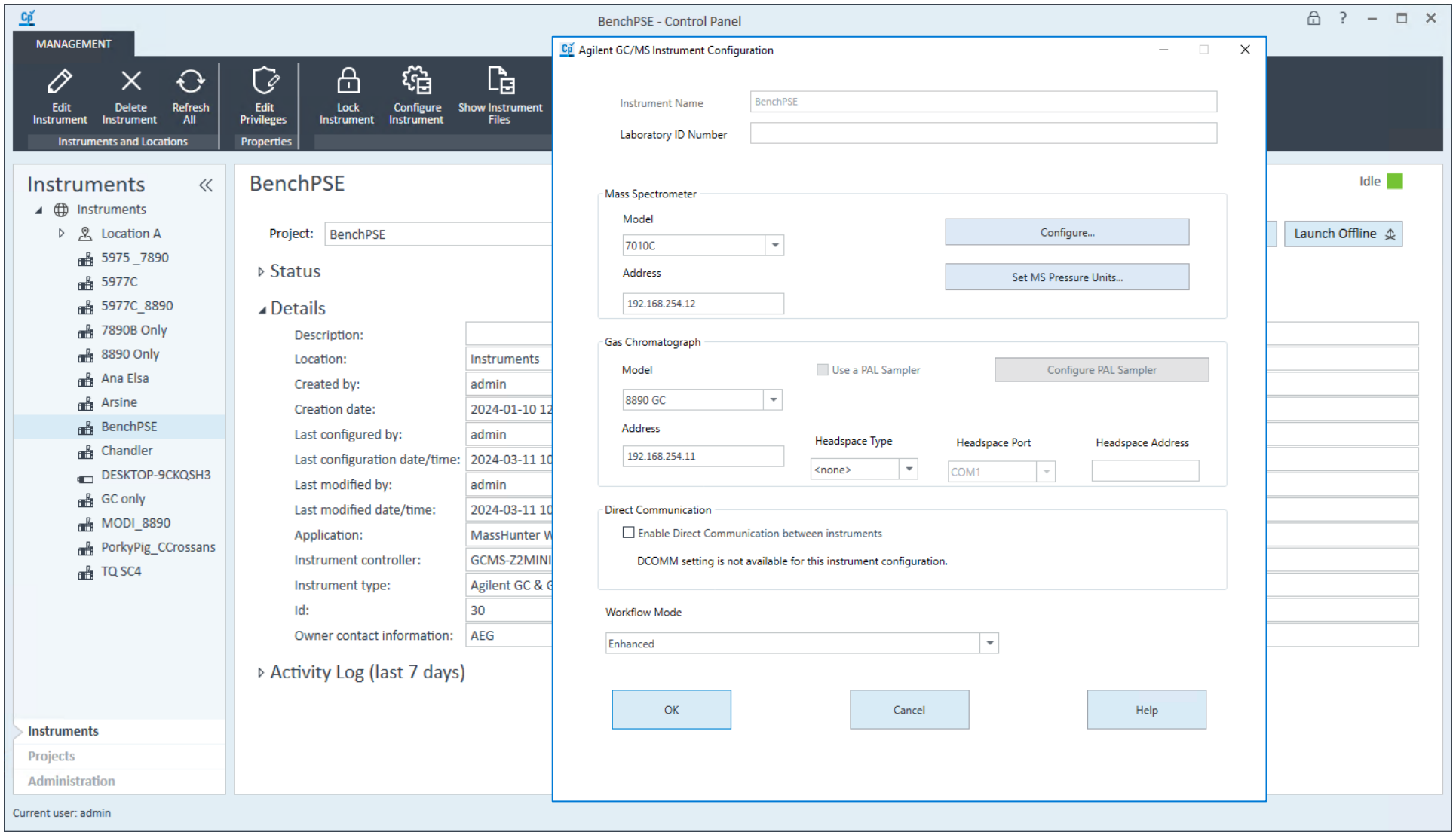

Forensics

Technical Control	Executive order	ISO 17025	40 CFR Part 80, 160	ISO 17025	21 CFR Part 11	CAP
Ochrana dat	●	●	●	●	●	●
Kontrola přístupových oprávnění	●	●	●	●	●	●
Audit Trail		●	●	●	●	●
E-Signature				●	●	●
Vestavěný reporting	●	●	●	●	●	●

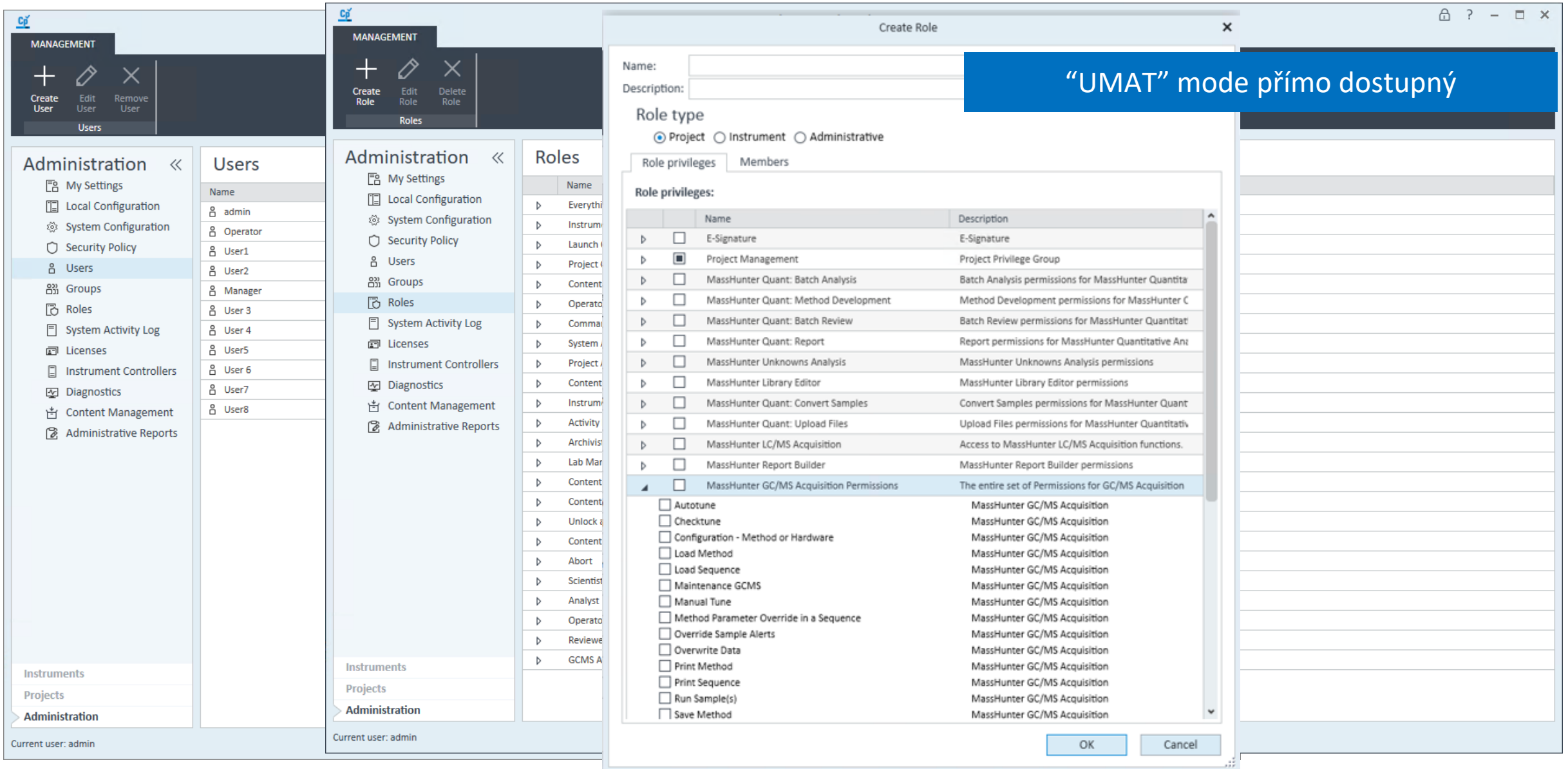
OpenLab řídící panel



Konfigurace přístroje/přístrojů

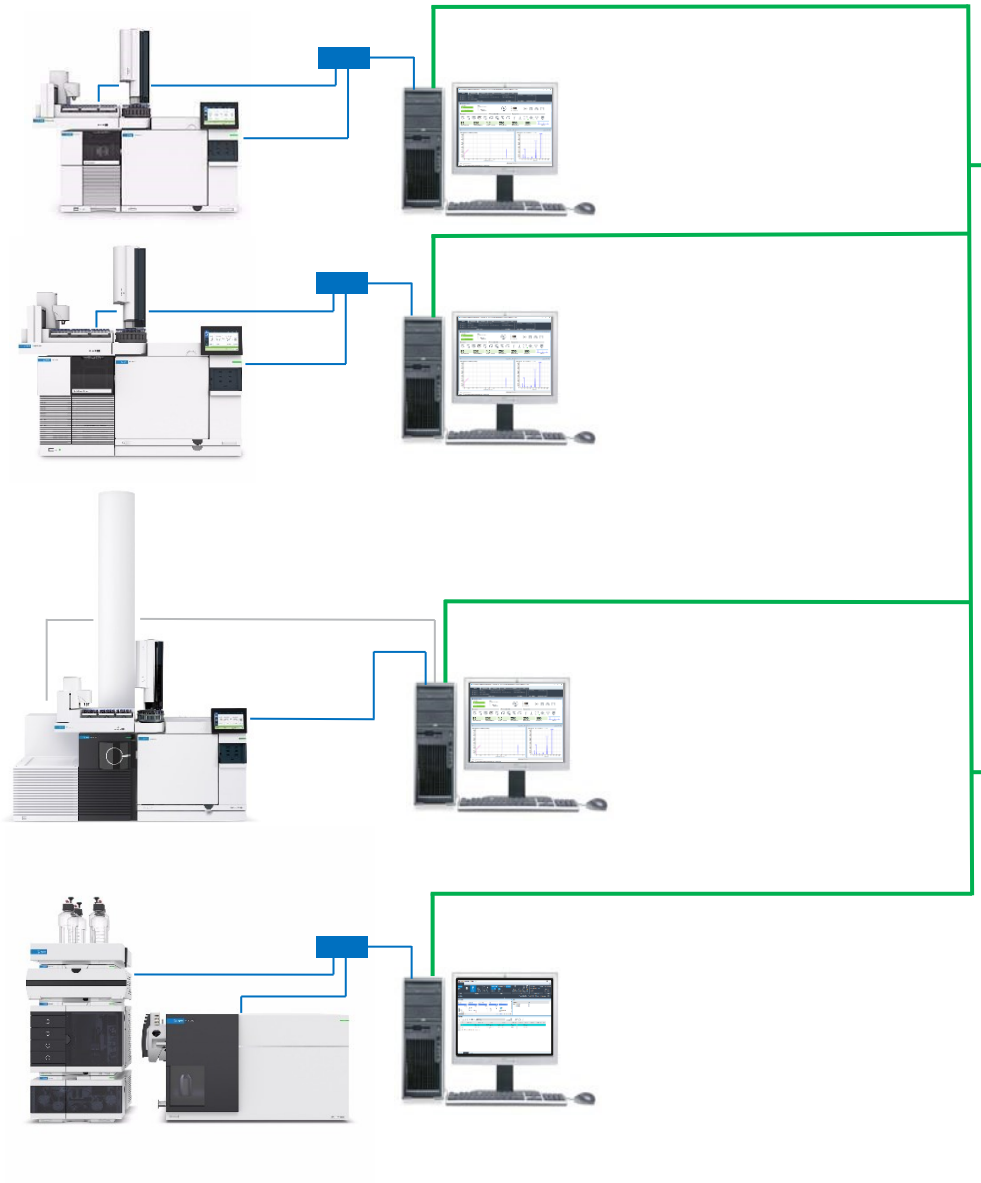


Uživatelské role a oprávnění



"UMAT" mode přímo dostupný

Client/server řešení pro MassHunter systémy



ECM server
and
OLSS server

Co si odnést domů…

Agilent 7010D a MassHunter 13

- ✓ Nový citlivější a robustnější GC/MS/MS s iontovým zdrojem HES 2.0
- ✓ **Přístrojová inteligence** a nové funkce: **MRM optimizer** a **RT locking** přímo v akvizici, **Easy sample prep**
- ✓ Možnost **nastavení uživatelských rolí a oprávnění**, **Client/server** management dat

Altium

Děkuji za pozornost…