A New Alternative Test Procedure for the Determination of Dioxins & Furans by Method 1613b replacing GC-HRMS with GC-MS/MS

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August 2021

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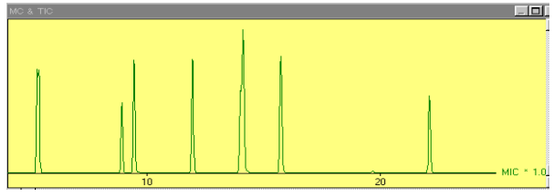
Brief introduction to the project goals: What will be changed?

	Method 1613b	PAM1613
Scope		No change
Sampling and preservation		No change
Matrices	Wastewater, solids, tissue	Wastewater, drinking water, solids, tissue, air
Extraction		Same as method, air = CAA method
Detection	**GC/HRMS**	**GC-MS/MS**
QC criteria	**HRMS specific**	**MS/MS specific**
QC criteria		No change
Reporting		No change

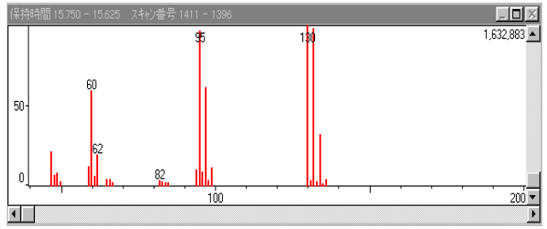
HRMS and MS/MS Instrument Operation

	HRMS	MS/MS
GC	Agilent	Shimadzu
Column	DB-5MS UI 60m x 0.25mm x 0.25µm	DB-5MS UI 60m x 0.25mm x 0.25µm
Injection port liner	4 mm ID x 78.5 mm Volume ~ 800 µL	3.5 mm ID x 95 mm Volume ~ 800 µL
Source Temperature	280 °C	230 °C
Detection resolution	**10,000**	**Unit (0.6 FWHM)**
Mass scan range	**339.86 – 409.80**	**MRM transitions (ranging from 319.0 to 513.7)**
Drift	**Mass locking**	**Monitor PFTBA**

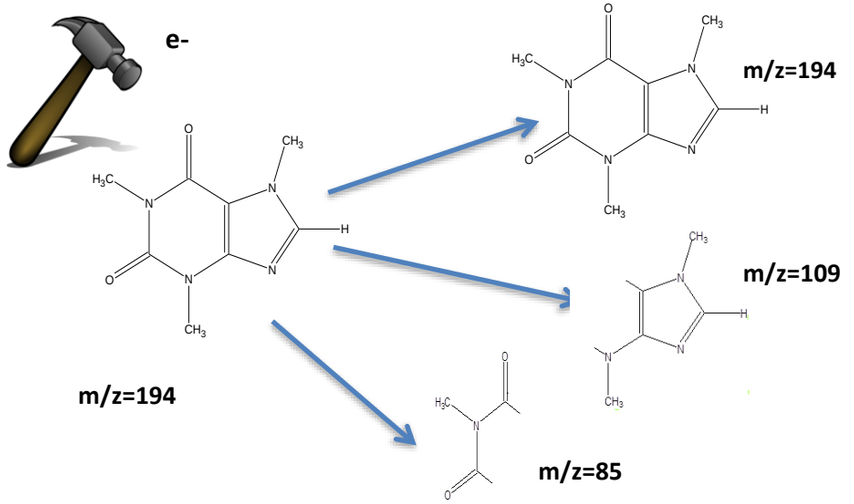
Brief explanation of GCMS and GC-MSMS…..

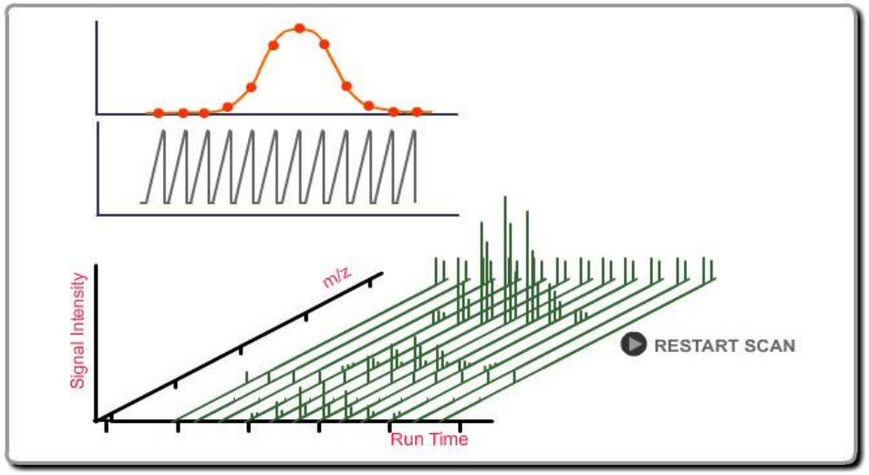


Gas Chromatograph: separation on a capillary column, identification by RT, and quantitation



Mass Spectrometer: positive identification by matching to a library





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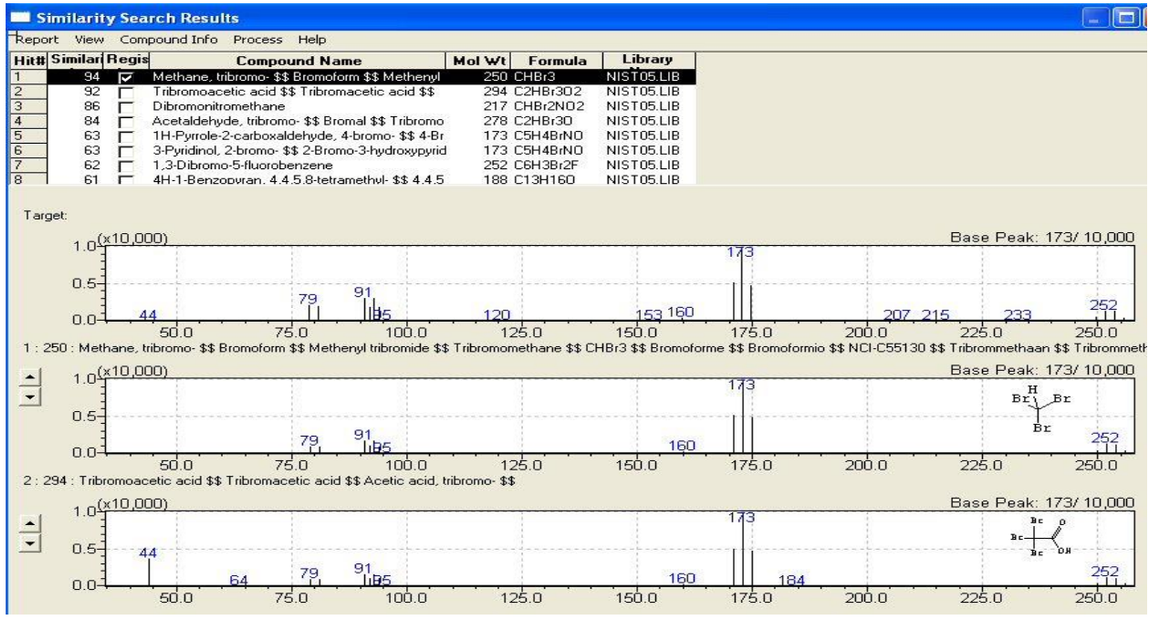
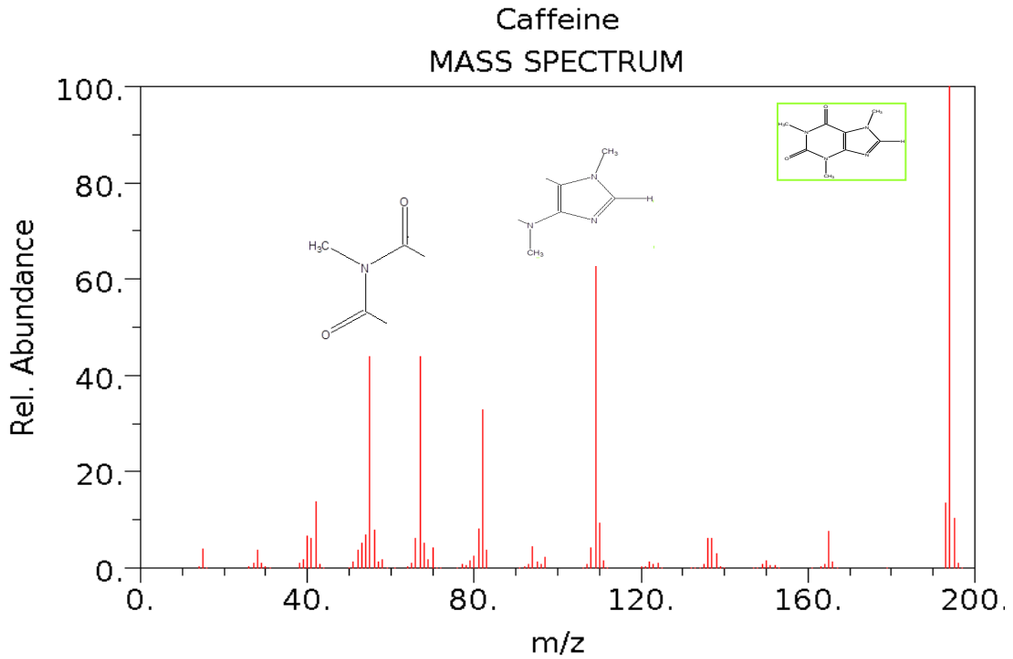
Detected Peaks - Confirmed for Positive Identification, with Mass Spectra Specific to Compound





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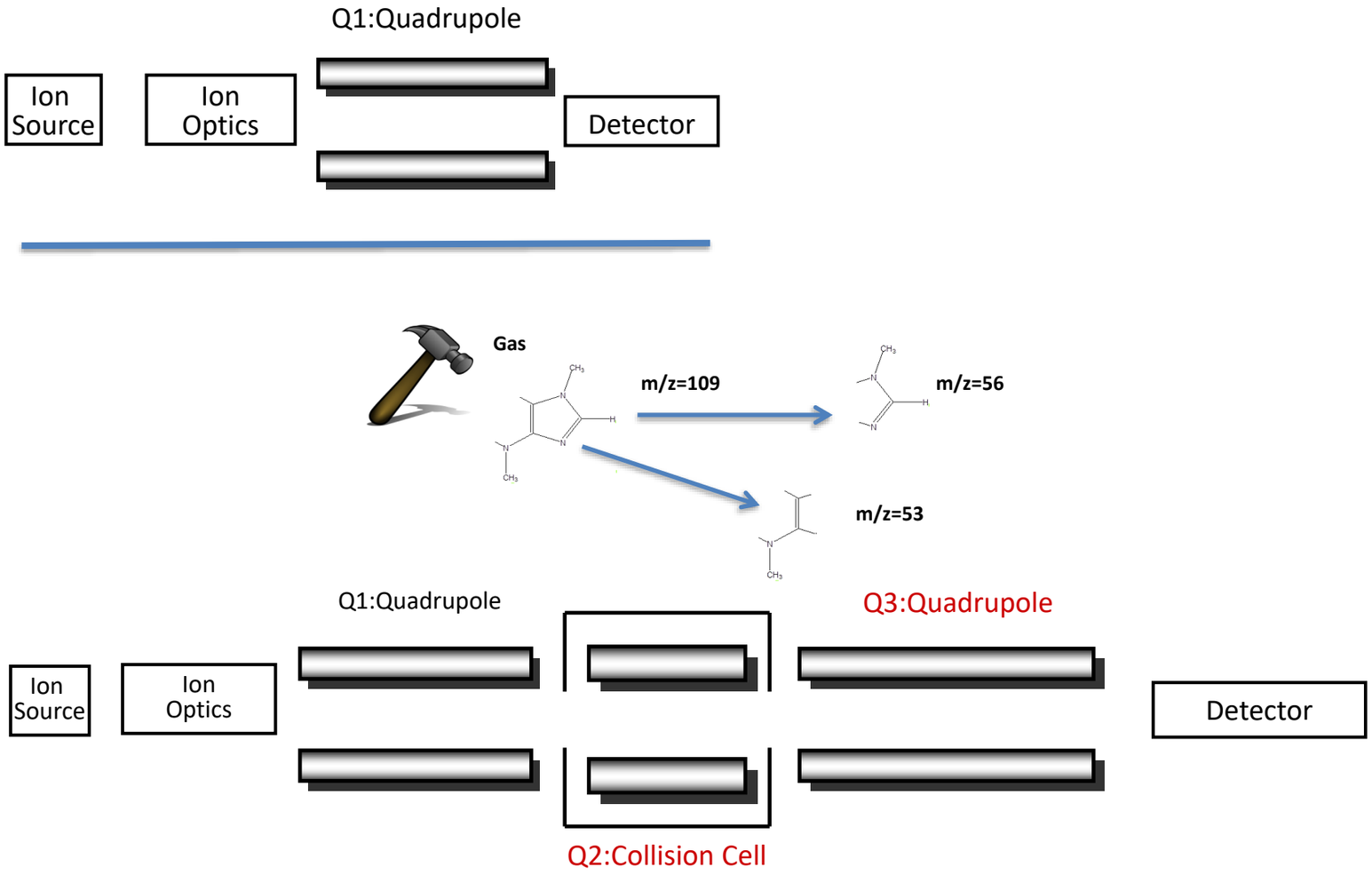
Triple Quadrupole -
Adds a Collision Cell and Another Quadrupole



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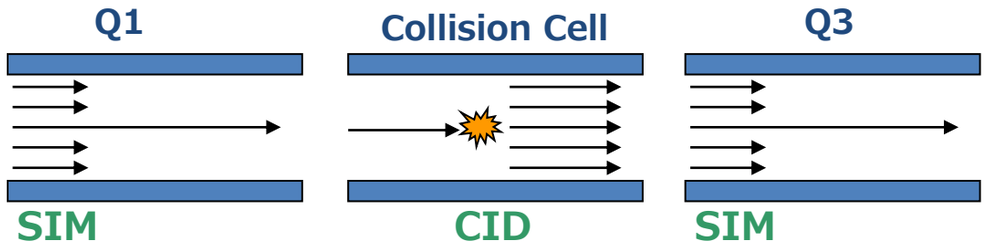
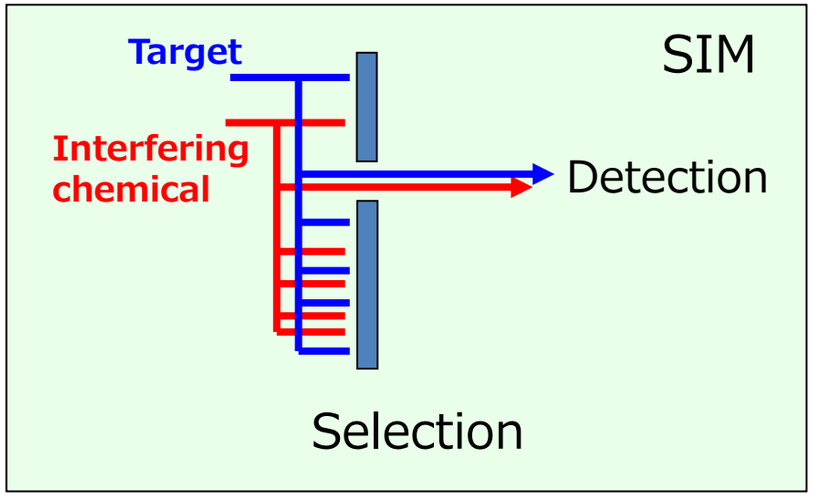
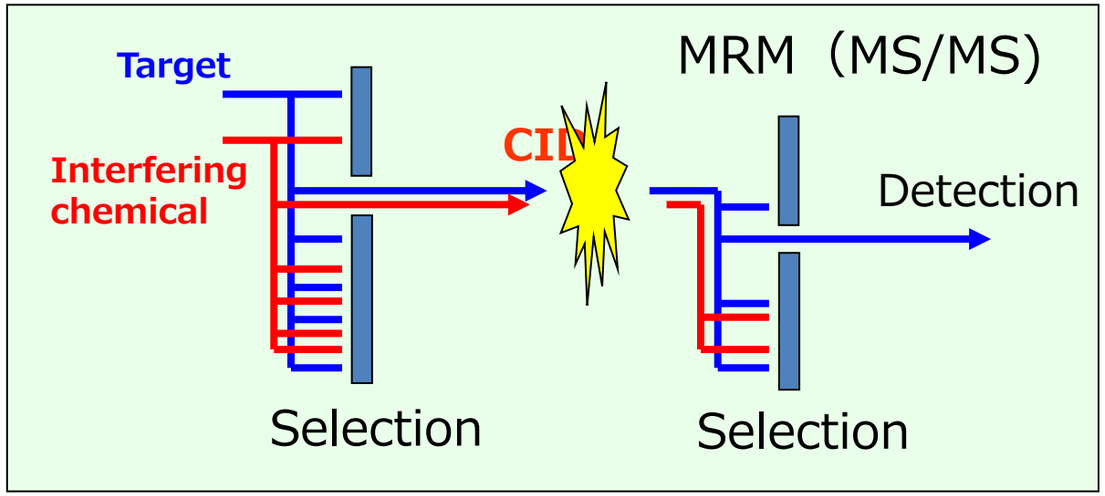
“SIM” the first fragment and “SIM” the second fragment for a very selective measurement with high S/N





SIM reduces interference, but does not completely eliminate it



MRM eliminates remaining interference

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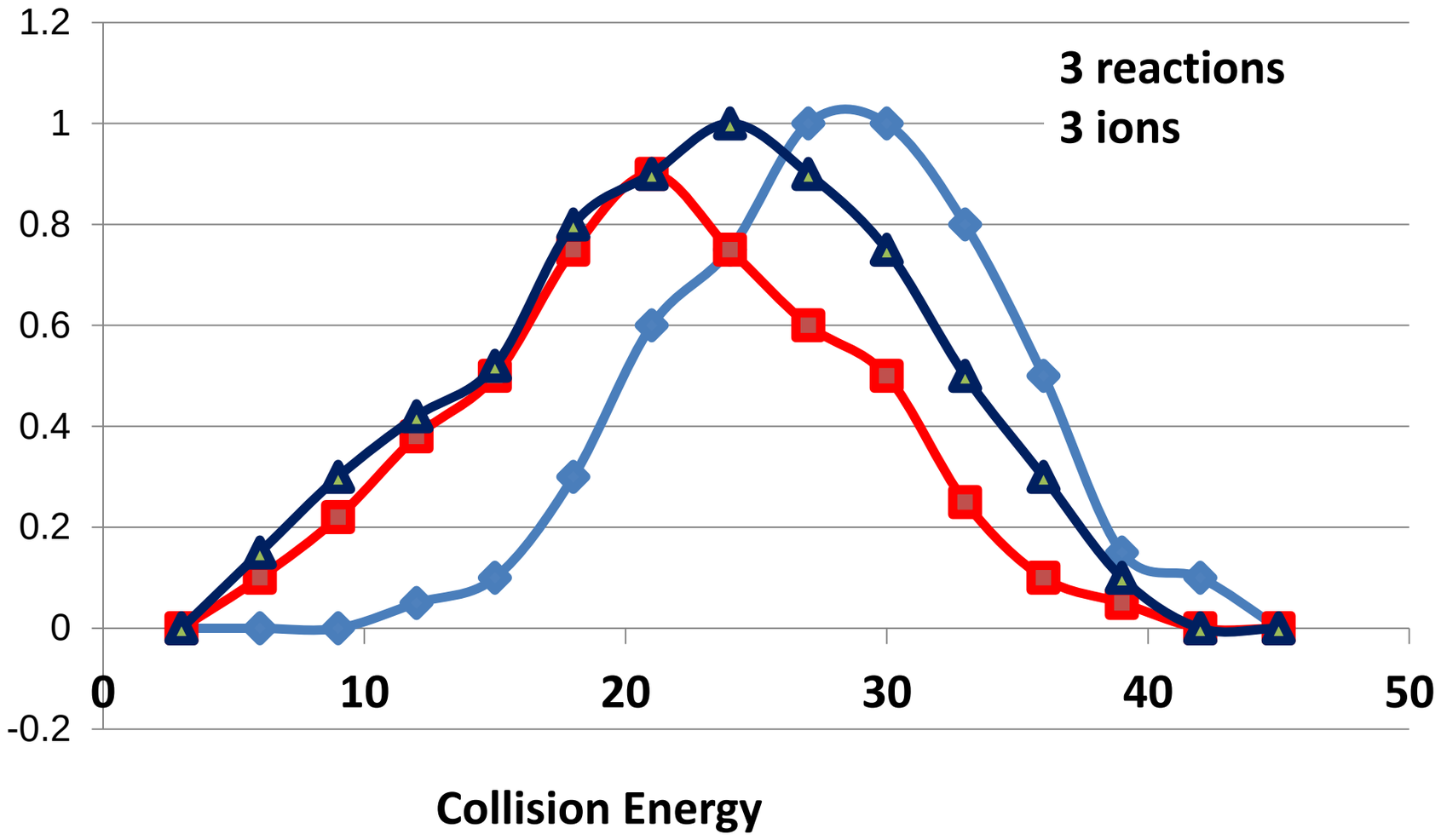
Each MRM Transition is Optimized by Collision Energy for Maximum Sensitivity



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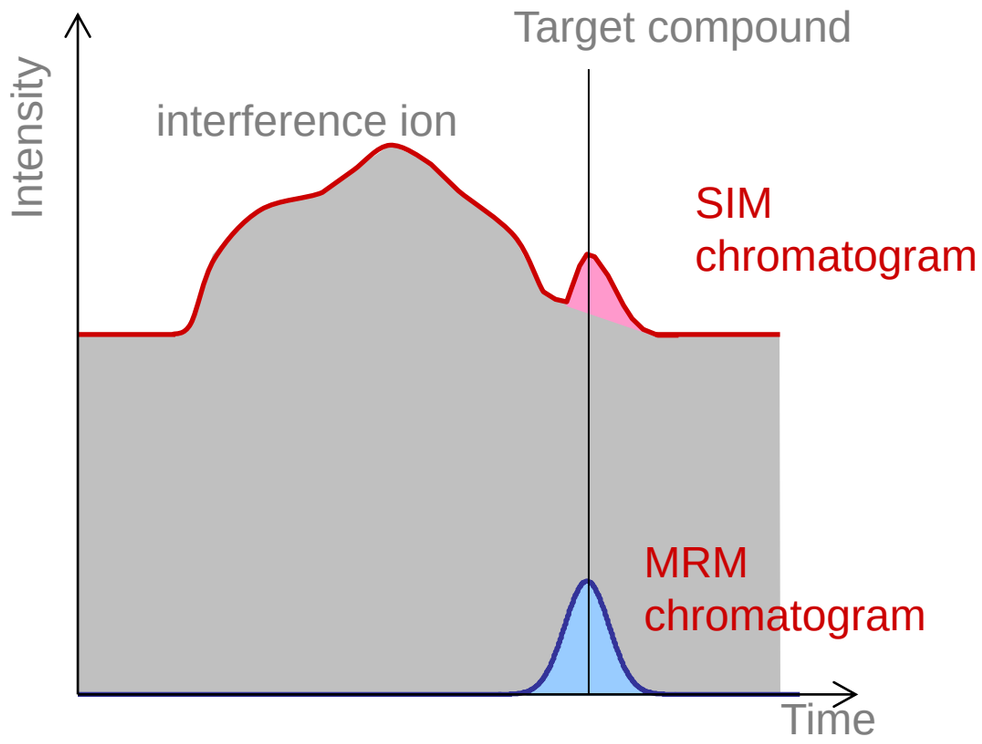
Triple Quad - Ideal for GCMS Analysis in Complex Matrices Where SIM is Problematic



- **S/N ratio is enhanced**
- **Extremely selective for quantitation**
- **10x lower MDL than SIM**
- **Extended linear range**

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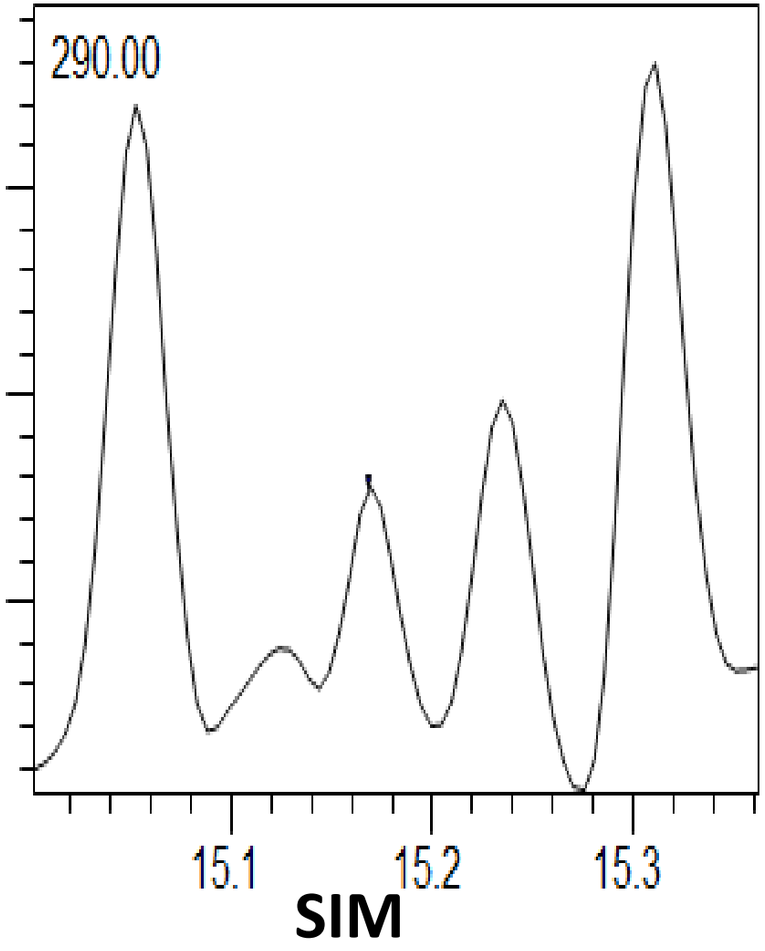
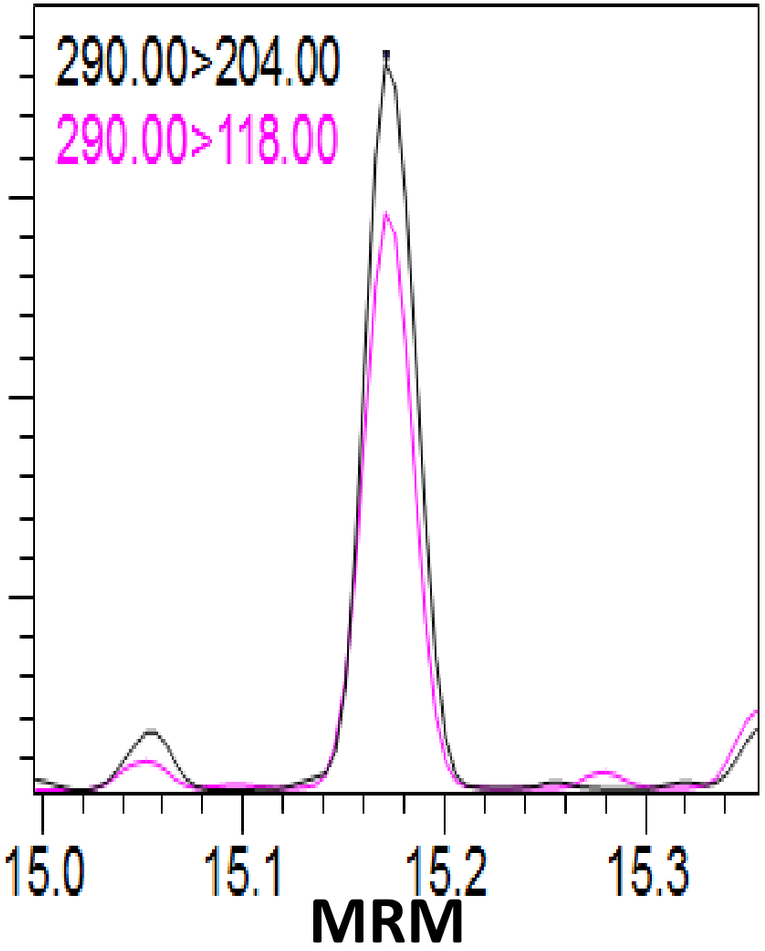
SIM and MRM Data Showing Better Detection and Selectivity by MRM



SIM



MRM

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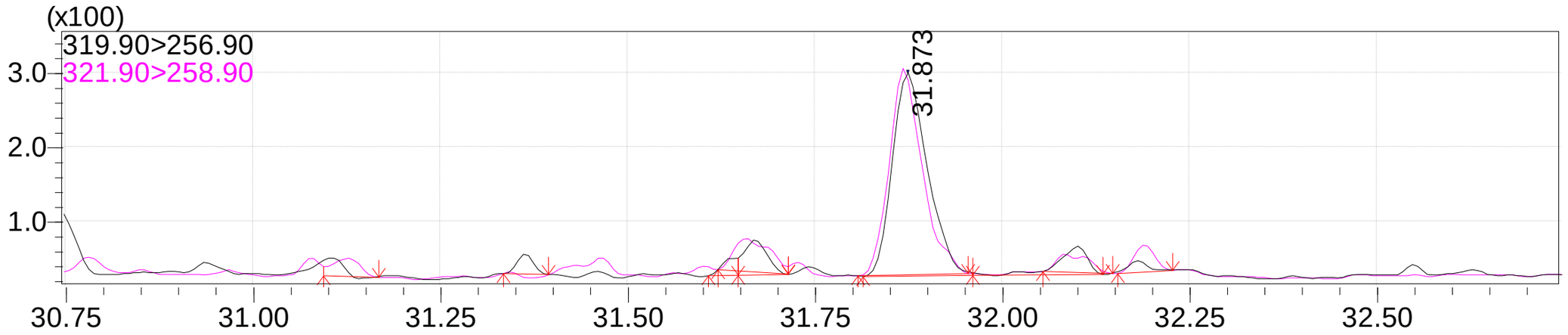
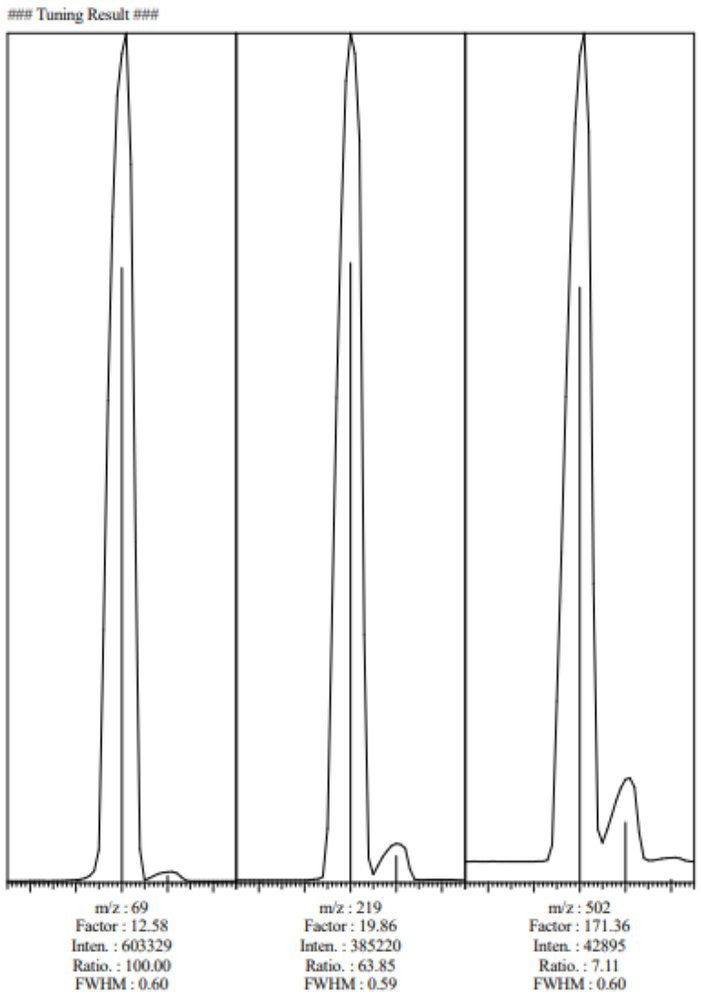
In this ATP, we are simply replacing the selectivity of high resolution with the selectivity of MRM



Low level MRM “trace” of 2,3,7,8 - TCDD in highly contaminated soil



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Section 10.1.2.3: Tune parameters were adjusted to reflect at least 1 AMU unit resolution

Not greater than 0.7 AMU FWHM in autotune

- **m/z 69**
- **m/z 264**
- **m/z 502**

Drift no more than a 0.2 amu

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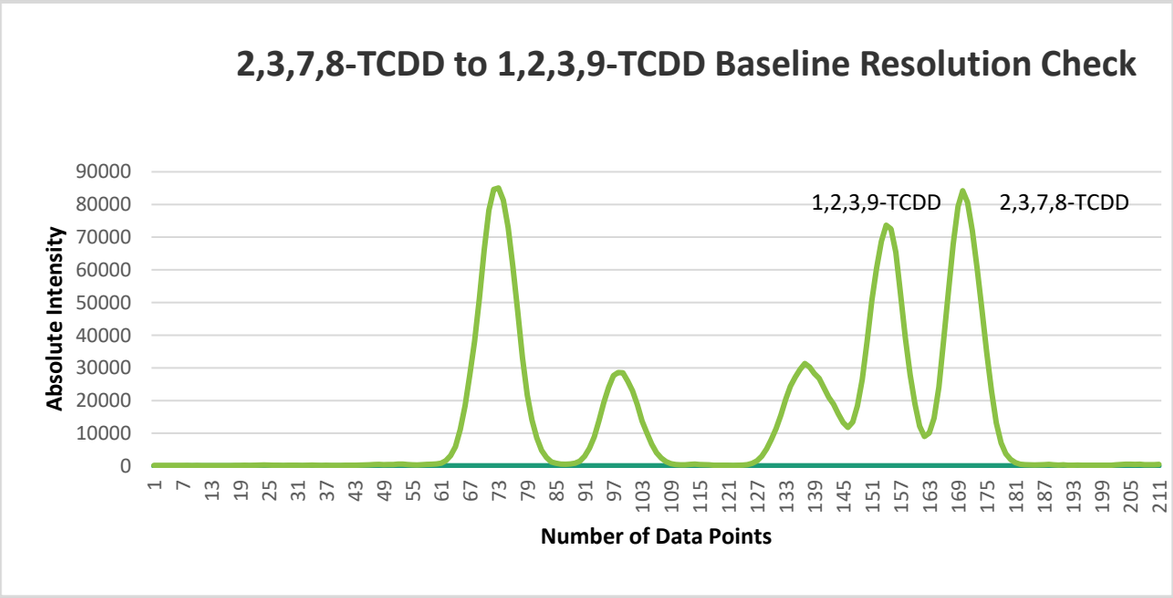
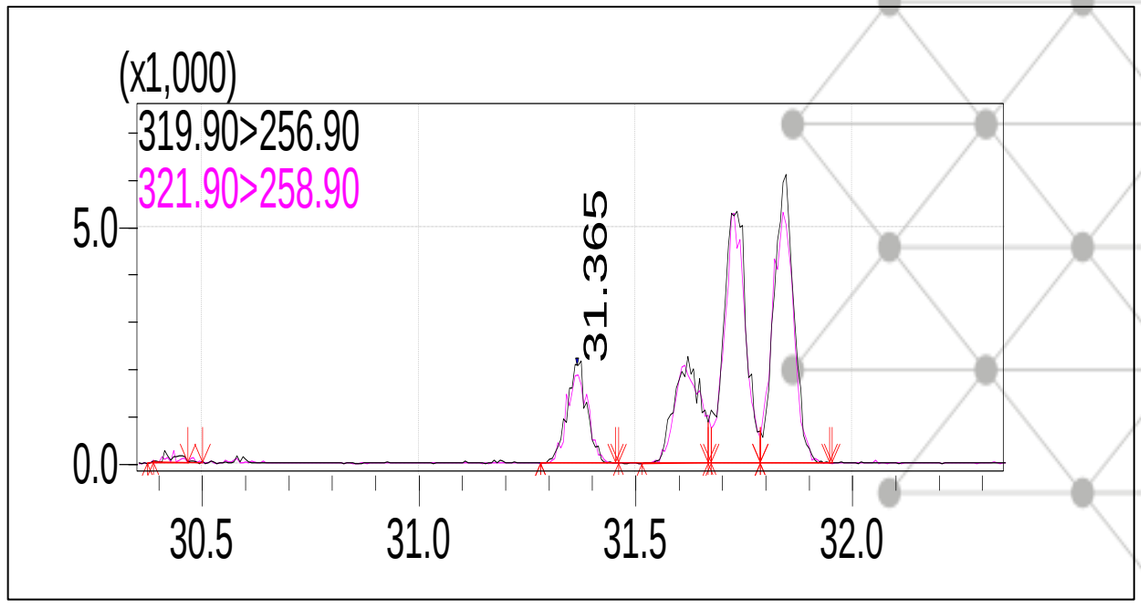
The first step in the validation – Duplicate chromatography with the HRMS (to extent possible)

10.4.3 Isomer specificity



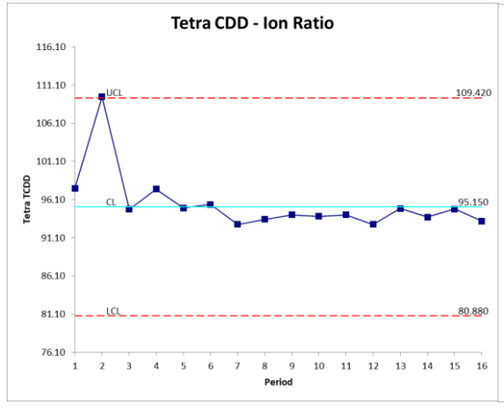
Resolution: **11%** **Limit = 25%**

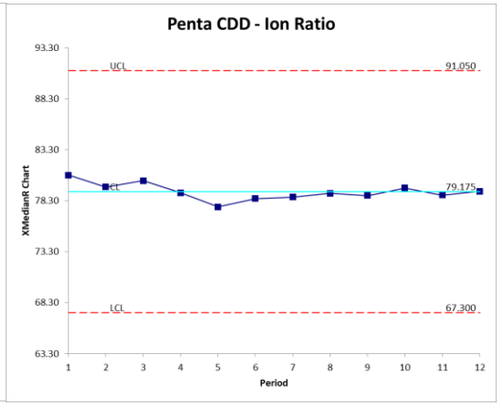
10.2.4 Absolute Retention time

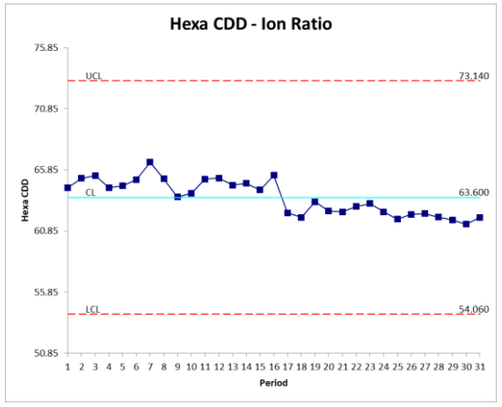


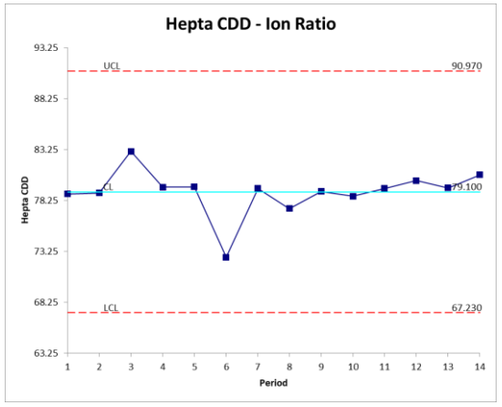
1,2,3,4 – TCDD absolute retention time > 25 minutes on DB-5 column (required)

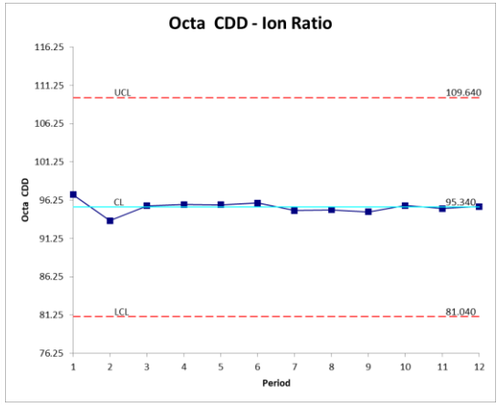
Next, we verified MRM transitions (Table 8) & qualifier ion ratios were within theoretical values (Table 9)

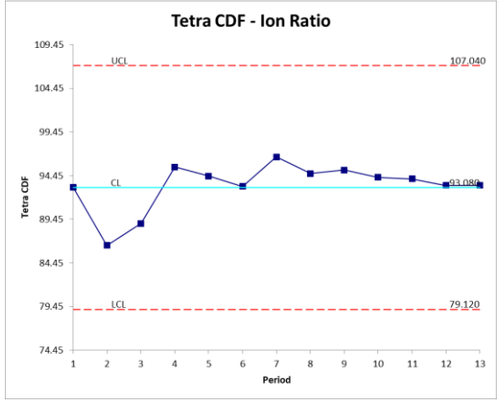


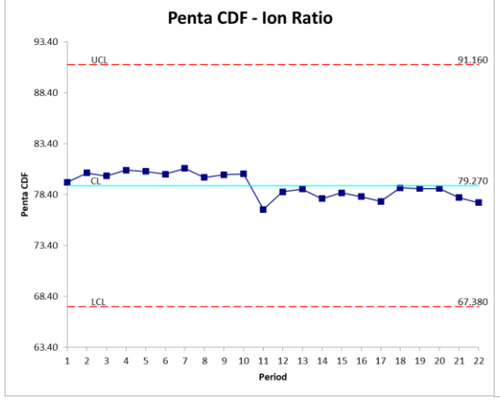


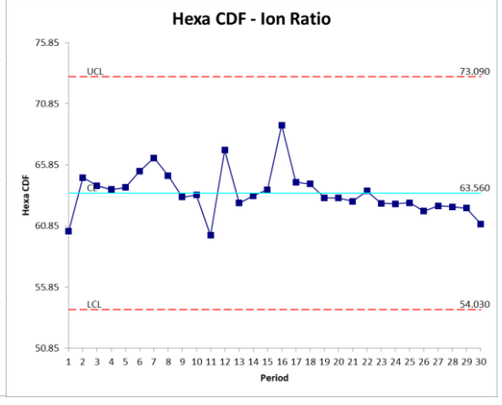


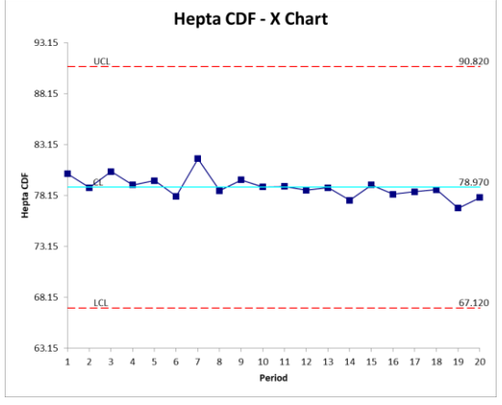


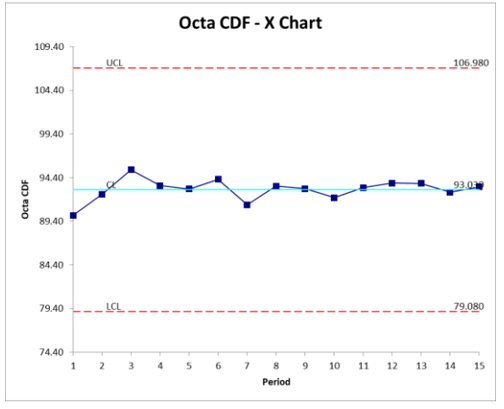












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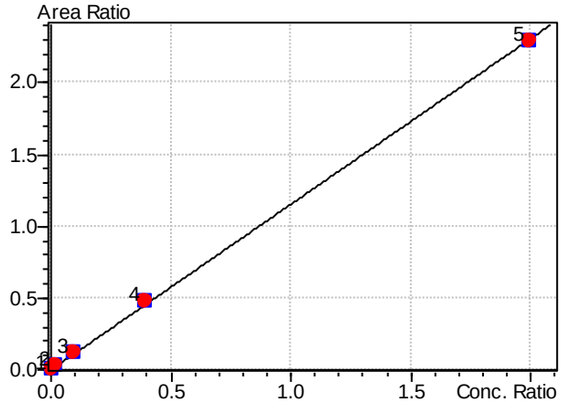
Next: Verification that the CS1 standard (1 µL injection) has a S/N of 10 or greater (10.2.3)

Analyte	5/10/2021	6/1/2021	6/2/2021	6/14/2021	6/24/2021	6/29/2021	7/8/2021	7/15/2021
2,3,7,8-Tetrachlorodibenzo-p-dioxin	959	623	469	471	181	295	655	145
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	992	1869	4096	347	1511	1472	3335	689
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	228	187	169	95	126	122	144	155
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	235	193	185	92	137	122	156	109
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	226	176	173	92	132	119	147	98
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	777	2052	3147	197	797	987	2766	422
Octachlorodibenzo-p-dioxin	5033	5008	6028	515	1117	1428	5391	530
2,3,7,8-Tetrachlorodibenzofuran	392	427	1146	58	378	357	1042	178
1,2,3,7,8-Pentachlorodibenzofuran	666	1276	1378	163	1618	1664	1196	785
2,3,4,7,8-Pentachlorodibenzofuran	709	796	1338	183	2102	681	1132	876
1,2,3,4,7,8-Hexachlorodibenzofuran	678	1597	2358	219	1593	1994	1971	818
1,2,3,6,7,8-Hexachlorodibenzofuran	644	1501	2163	194	1655	1751	1867	807
1,2,3,7,8,9-Hexachlorodibenzofuran	671	776	572	190	556	1461	490	599
2,3,4,6,7,8-Hexachlorodibenzofuran	548	679	484	142	616	1167	419	447
1,2,3,4,6,7,8-Heptachlorodibenzofuran	873	1373	1887	102	1381	1098	1702	616
1,2,3,4,7,8,9-Heptachlorodibenzofuran	671	614	1186	81	799	614	1029	531
Octachlorodibenzofuran	1201	1717	5861	222	1269	1455	5512	682

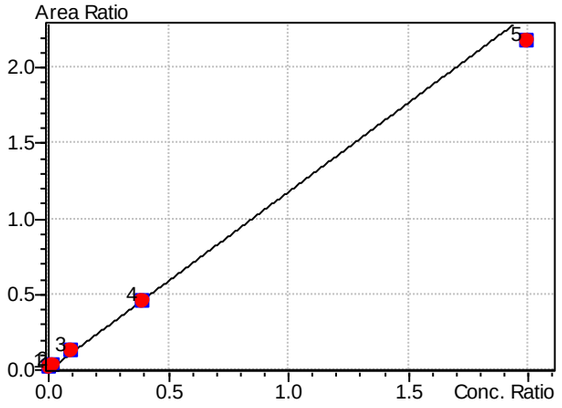
Calibrate Instrument for Fifteen 2,3,7,8 Target Analytes Using Isotope Dilution (Section 10.5)

2,3,7,8-Tetrachlorodibenzo-p-dioxin



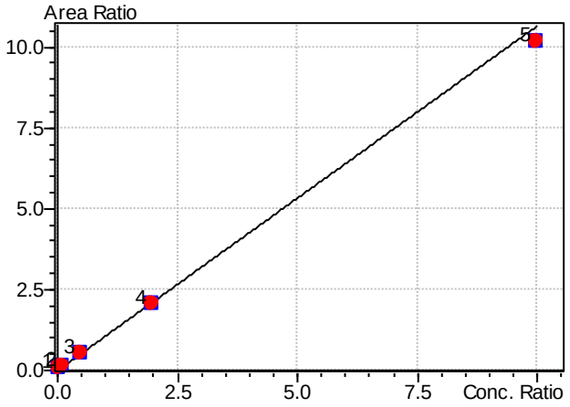
Mean RF : 1.154748
RF SD : 0.0723729
RF %RSD : 6.267419

2,3,7,8-Tetrachlorodibenzofuran



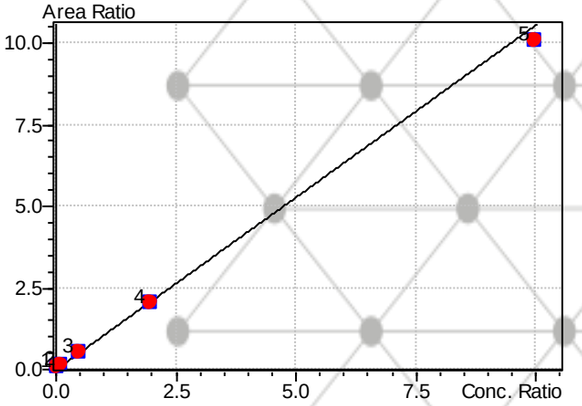
Mean RF : 1.179659
RF SD : 0.0796125
RF %RSD : 6.748773

1,2,3,7,8-Pentachlorodibenzo-p-dioxin



Mean RF : 1.066094
RF SD : 0.0578500
RF %RSD : 5.426357

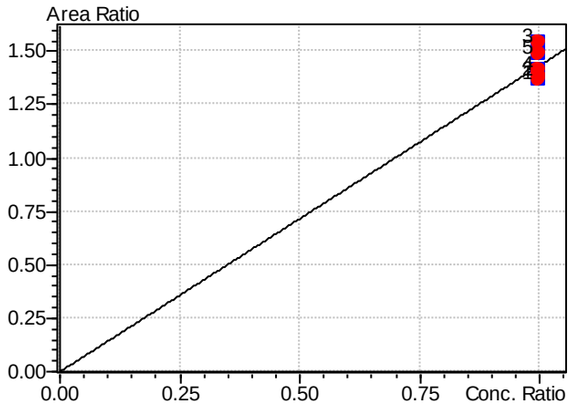
1,2,3,7,8-Pentachlorodibenzofuran



Mean RF : 1.055942
RF SD : 0.0523577
RF %RSD : 4.958388

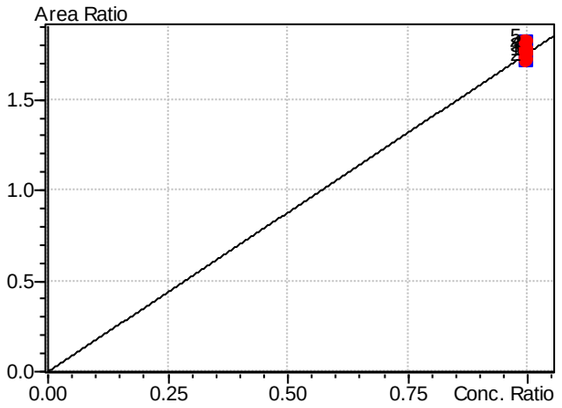
Instrument Calibration of Compounds Calculated by Internal Standard vs Isotope Dilution (per Sec 10.6 in 1613B)

2,3,7,8-Tetrachlorodibenzo-p-dioxin-13C12 (S)



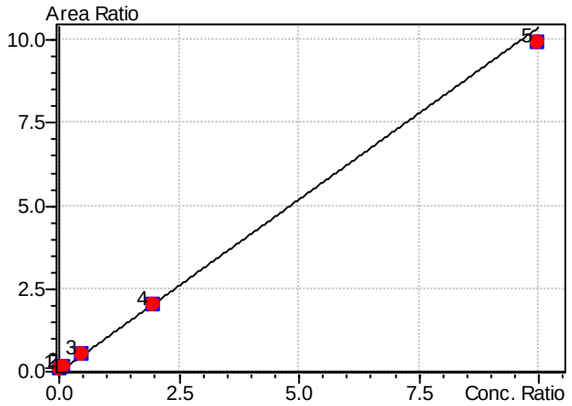
Mean RF : 1.434384
RF SD : 0.0721951
RF %RSD : 5.033180

2,3,7,8-Tetrachlorodibenzofuran-13C12 (S)



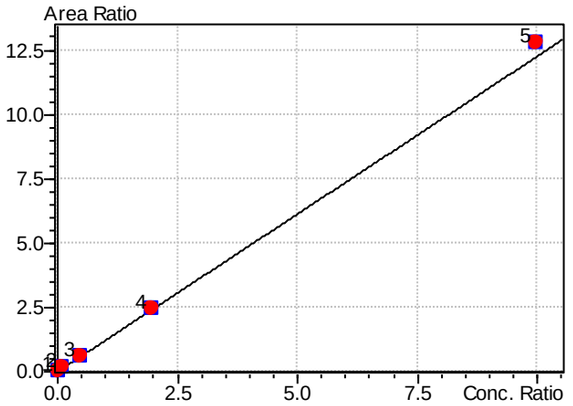
Mean RF : 1.757166
RF SD : 0.0355826
RF %RSD : 2.024997

1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin



Mean RF : 1.039866
RF SD : 0.0648624
RF %RSD : 6.237573

Octachlorodibenzofuran



Mean RF : 1.226142
RF SD : 0.0639670
RF %RSD : 5.216930

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Repeatability of Target ICAL over ~ three months

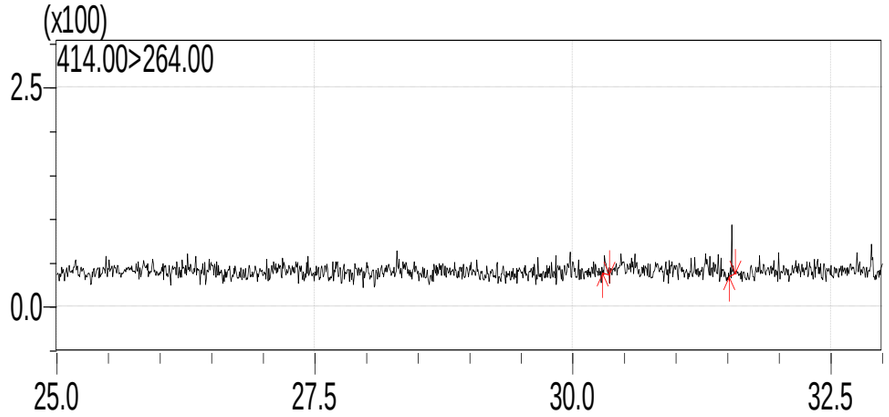
Compound Name	5/10/2021		6/12/2021		6/29/2021	
	Mean RF	RF %RSD	Mean RF	RF %RSD	Mean RF	RF %RSD
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1.179348	9.267654	1.159625	7.374795	1.169744	8.825416
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.041278	7.984401	1.004499	5.520641	1.052229	8.048561
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	1.052185	8.336673	1.006229	6.089719	1.046507	9.829302
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	1.05505	6.813428	1.001459	5.10416	1.096707	7.931747
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	1.087861	11.58138	0.997987	6.111245	1.051466	6.035913
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	1.112426	8.237804	1.07554	5.22895	1.113814	9.481065
Octachlorodibenzo-p-dioxin	1.237598	22.50152	1.203738	22.652314	1.042218	7.18232
2,3,7,8-Tetrachlorodibenzofuran	1.158012	10.31181	1.112381	5.596462	1.10659	6.221342
1,2,3,7,8-Pentachlorodibenzofuran	1.033088	7.800385	0.998834	4.486977	1.03322	6.871412
2,3,4,7,8-Pentachlorodibenzofuran	1.11178	6.905324	1.071585	4.792594	1.119704	7.555176
1,2,3,4,7,8-Hexachlorodibenzofuran	1.059481	8.543972	1.002317	5.910157	1.076827	8.41047
1,2,3,6,7,8-Hexachlorodibenzofuran	1.01215	5.744571	0.991316	6.276268	1.05709	8.953919
1,2,3,7,8,9-Hexachlorodibenzofuran	1.18842	14.93938	1.157542	6.231949	1.253174	8.97111
2,3,4,6,7,8-Hexachlorodibenzofuran	0.860941	5.566722	0.84456	5.130754	0.893158	7.947057
1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.101583	7.801756	1.054935	3.302767	1.08034	7.458126
1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.078697	11.71977	1.02199	6.880244	1.040864	7.635429
Octachlorodibenzofuran	1.081007	6.752986	1.057972	11.769038	1.220162	7.104081

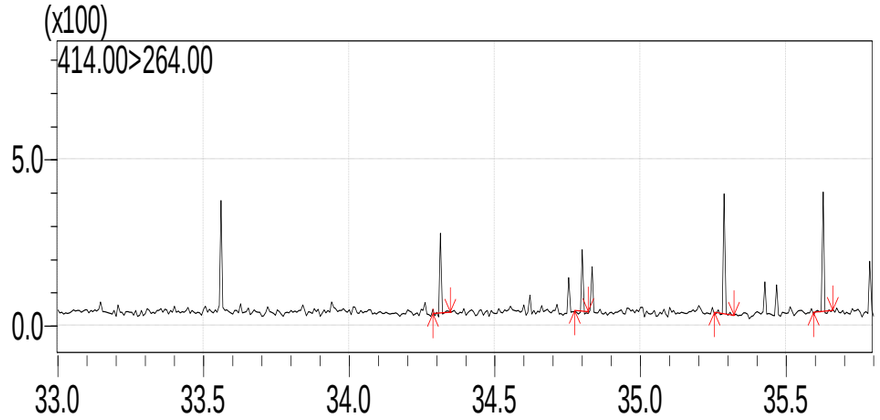
Repeatability of Surrogate ICAL over ~ three months

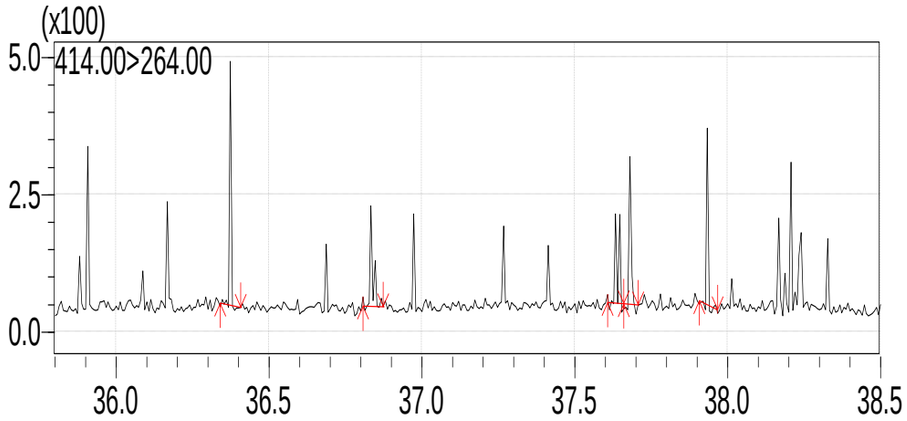
Compound Name	5/10/2021		6/12/2021		6/29/2021	
	Mean RF	RF %RSD	Mean RF	RF %RSD	Mean RF	RF %RSD
2,3,7,8-Tetrachlorodibenzo-p-dioxin-13C12 (S)	1.47086	1.685002	1.419643	1.268207	1.433139	5.098128
2,3,7,8-Tetrachlorodibenzo-p-dioxin-37Cl4 *	3.535532	9.139408	3.22633	5.309459	3.483264	10.52561
1,2,3,7,8-Pentachlorodibenzo-p-dioxin-13C12 (S)	1.380991	5.622272	1.318395	3.667073	1.202359	2.843046
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin-13C12 (S)	0.980491	4.202868	0.944708	1.775542	0.984945	3.036991
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin-13C12 (S)	0.911365	3.620442	0.941063	1.6085	0.947313	2.343127
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin-13C12 (S)	0.794038	2.357297	0.809551	2.068466	0.773139	2.021059
Octachlorodibenzo-p-dioxin-13C12 (S)	0.624091	3.632486	0.632046	5.080355	0.581543	3.716926
2,3,7,8-Tetrachlorodibenzofuran-13C12 (S)	1.787497	1.276091	1.75273	1.622427	1.786612	1.681549
1,2,3,7,8-Pentachlorodibenzofuran-13C12 (S)	1.730429	2.938881	1.678984	3.891992	1.509653	3.310403
2,3,4,7,8-Pentachlorodibenzofuran-13C12 (S)	1.844474	4.649975	1.797223	4.15323	1.570551	2.668893
1,2,3,4,7,8-Hexachlorodibenzofuran-13C12 (S)	1.233442	2.280982	1.194707	2.281161	1.217693	1.753531
1,2,3,6,7,8-Hexachlorodibenzofuran-13C12 (S)	1.155494	3.868279	1.141301	2.497376	1.180354	2.282872
2,3,4,6,7,8-Hexachlorodibenzofuran-13C12 (S)	1.218267	1.324792	1.198561	1.490342	1.207497	1.205949
1,2,3,7,8,9-Hexachlorodibenzofuran-13C12 (S)	1.055359	3.11881	1.060354	1.934957	1.048848	3.093955
1,2,3,4,6,7,8-Heptachlorodibenzofuran-13C12 (S)	1.008051	6.73874	0.992382	8.027804	0.944264	2.538748
1,2,3,4,7,8,9-Heptachlorodibenzofuran-13C12 (S)	0.933166	4.688486	0.952988	3.641022	0.928067	2.426142

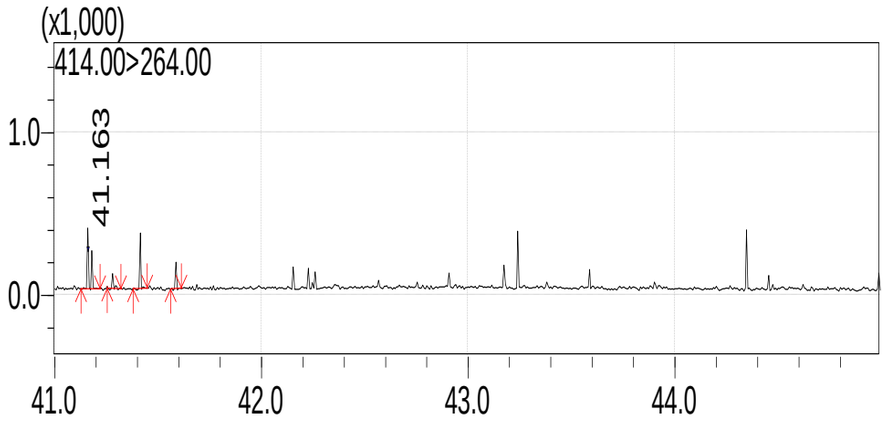
* Clean-up standard verification

Effect of a Contaminated Soil Matrix on PFTBA (10.4.1.1)









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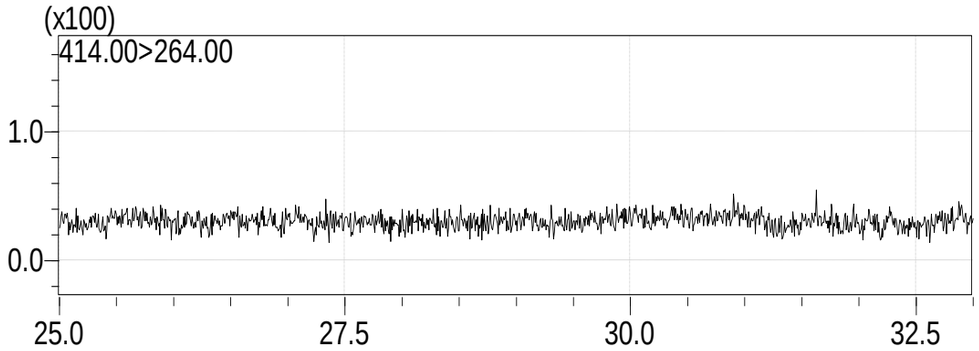
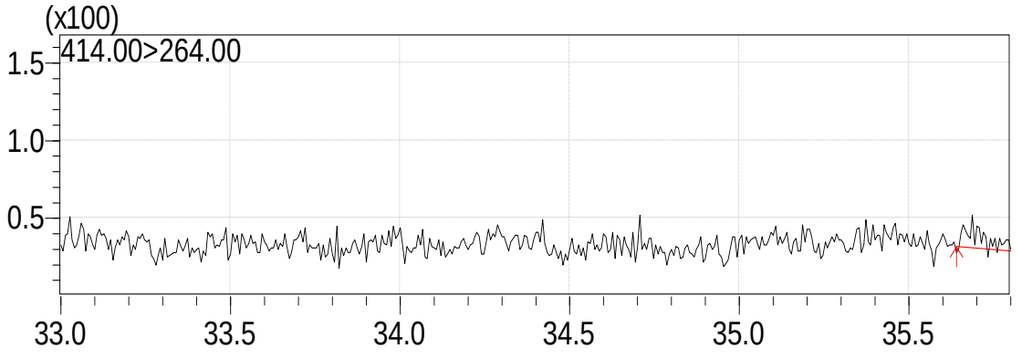
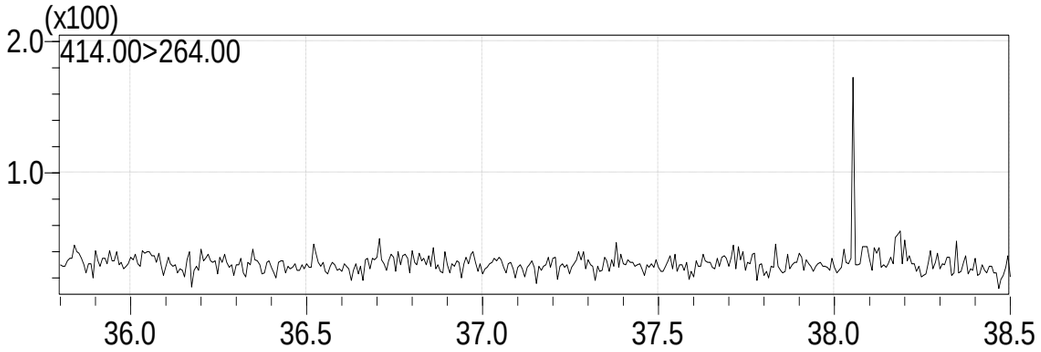
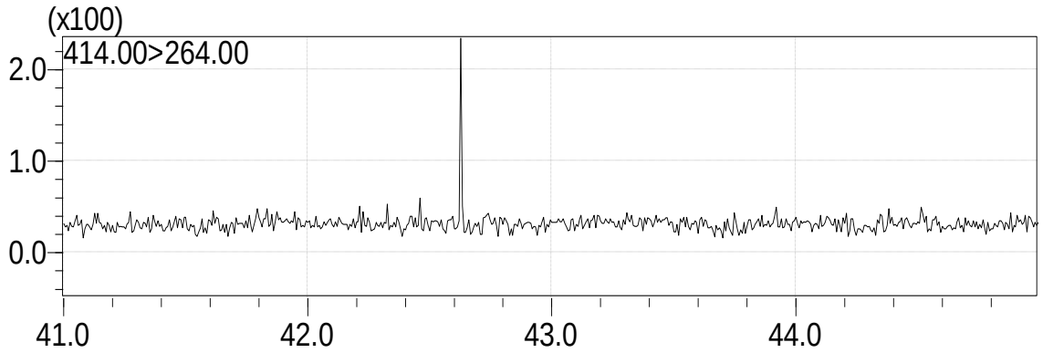
Effects of a Fish Tissue Matrix on PFTBA (10.4.1.1)

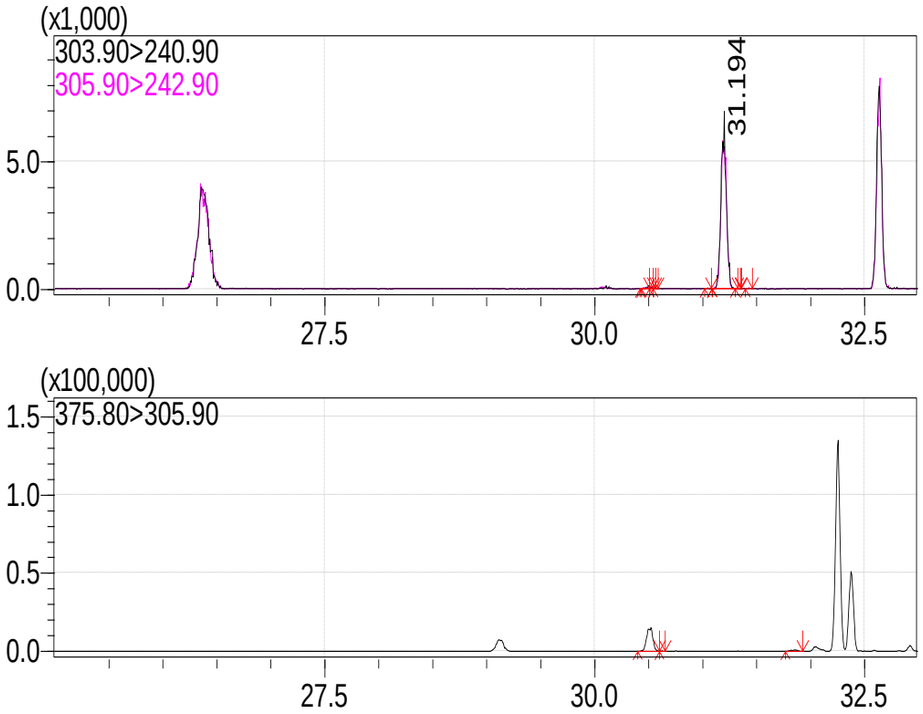


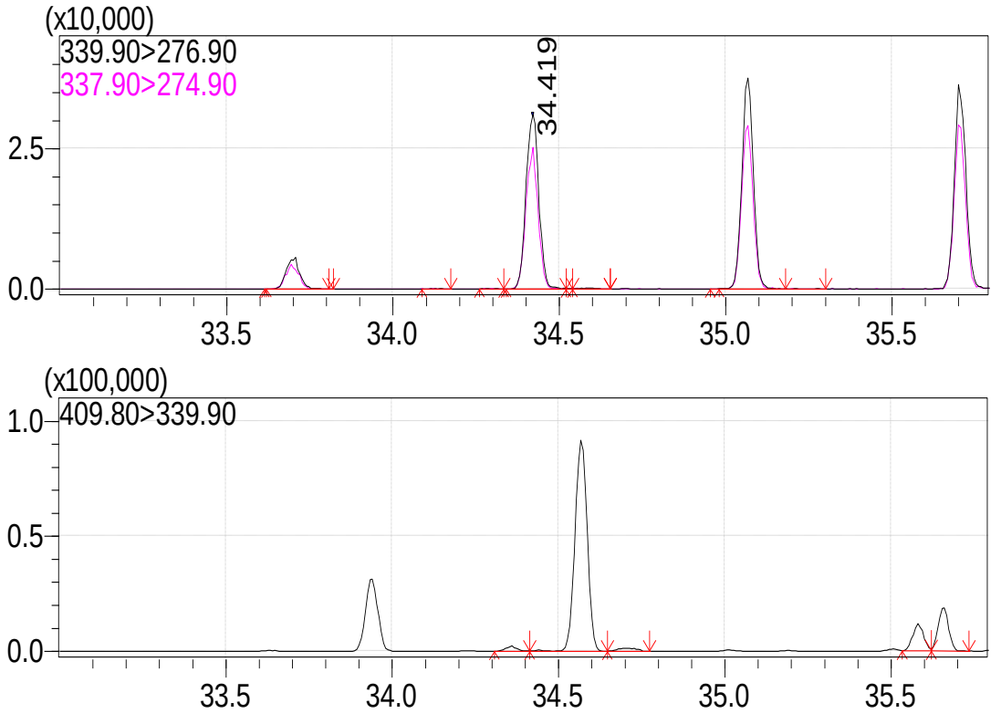






Potential for Ether Interference in tetra- and penta-furans in Tissue Samples (10.4.1.2)





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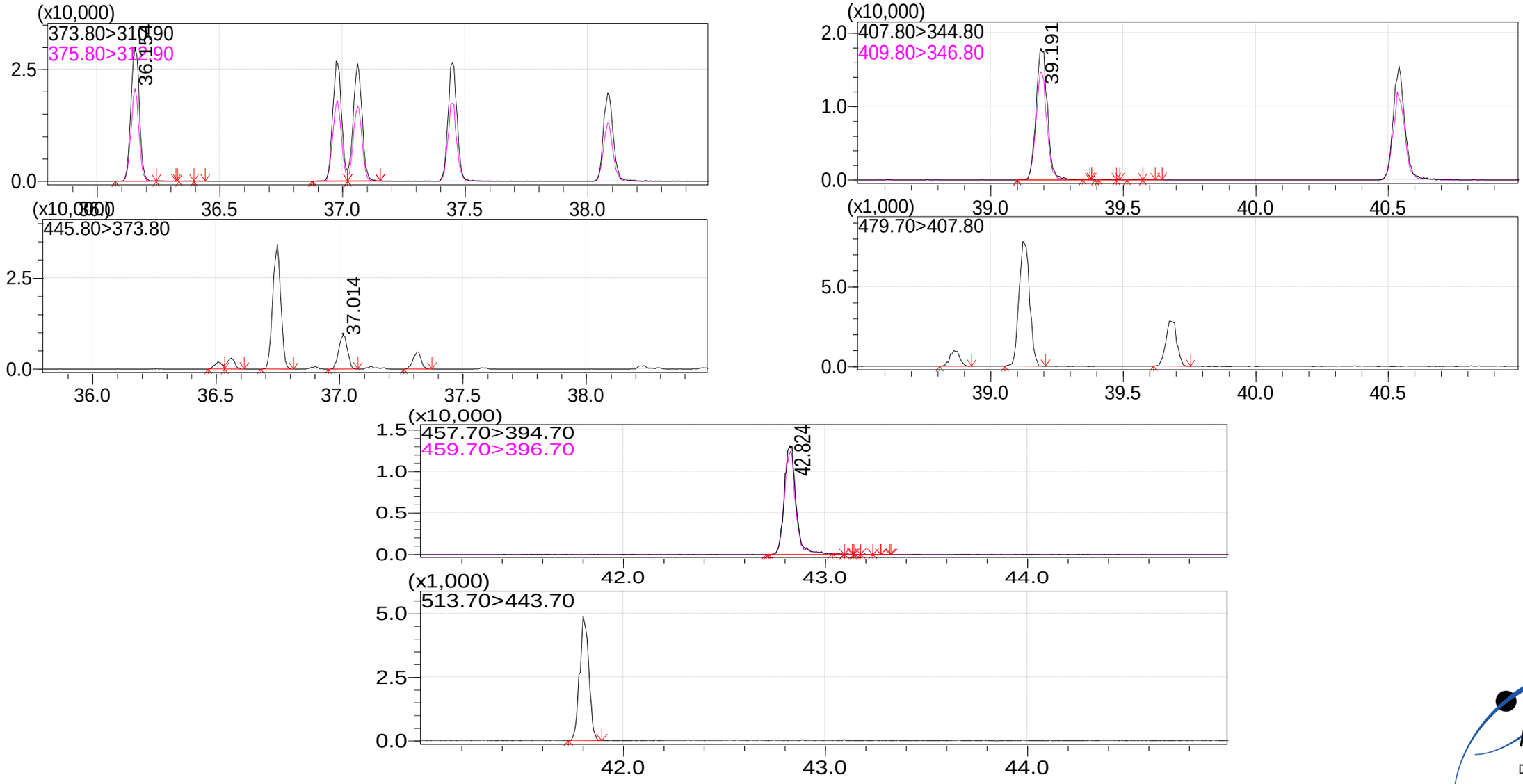
Monitoring for CDPE Interference for Hexa-, Hepta-, and Octa- Furans (10.4.1.2)



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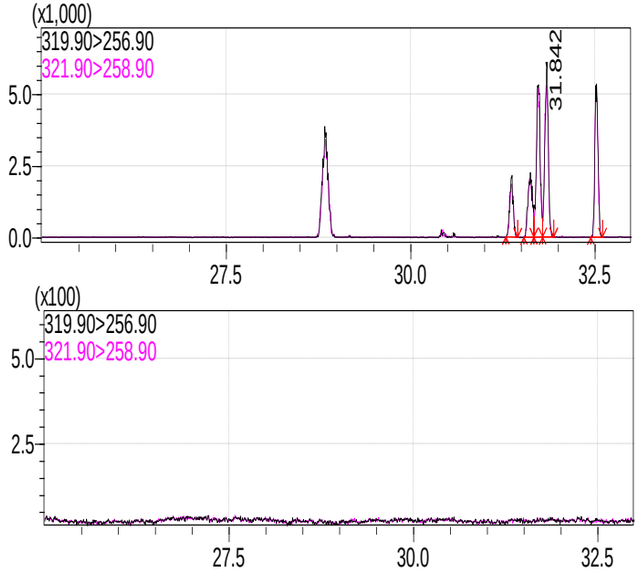
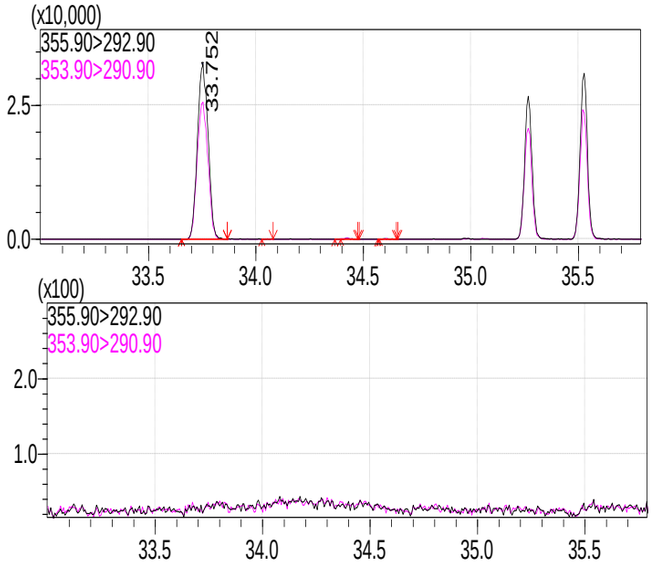
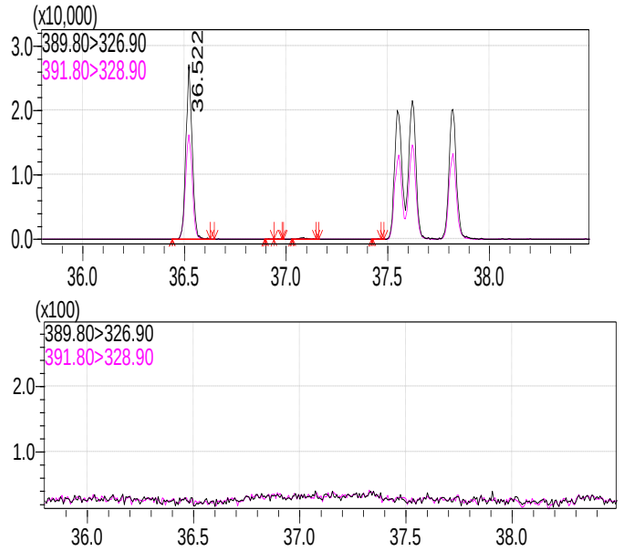
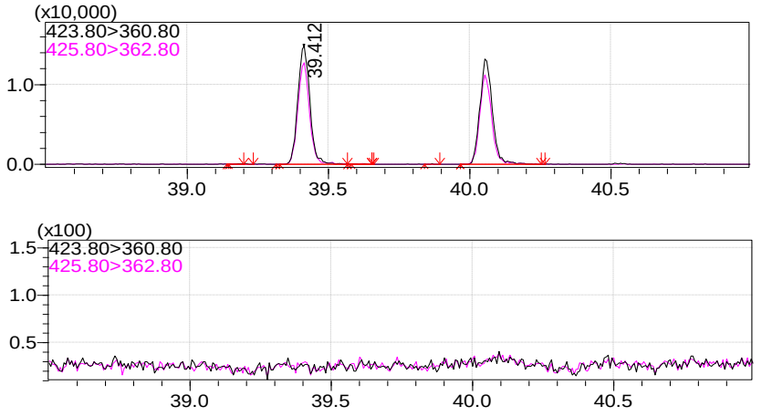
Verification – Absence of Interferences by PCBs on Dioxins (10.1.4.3)









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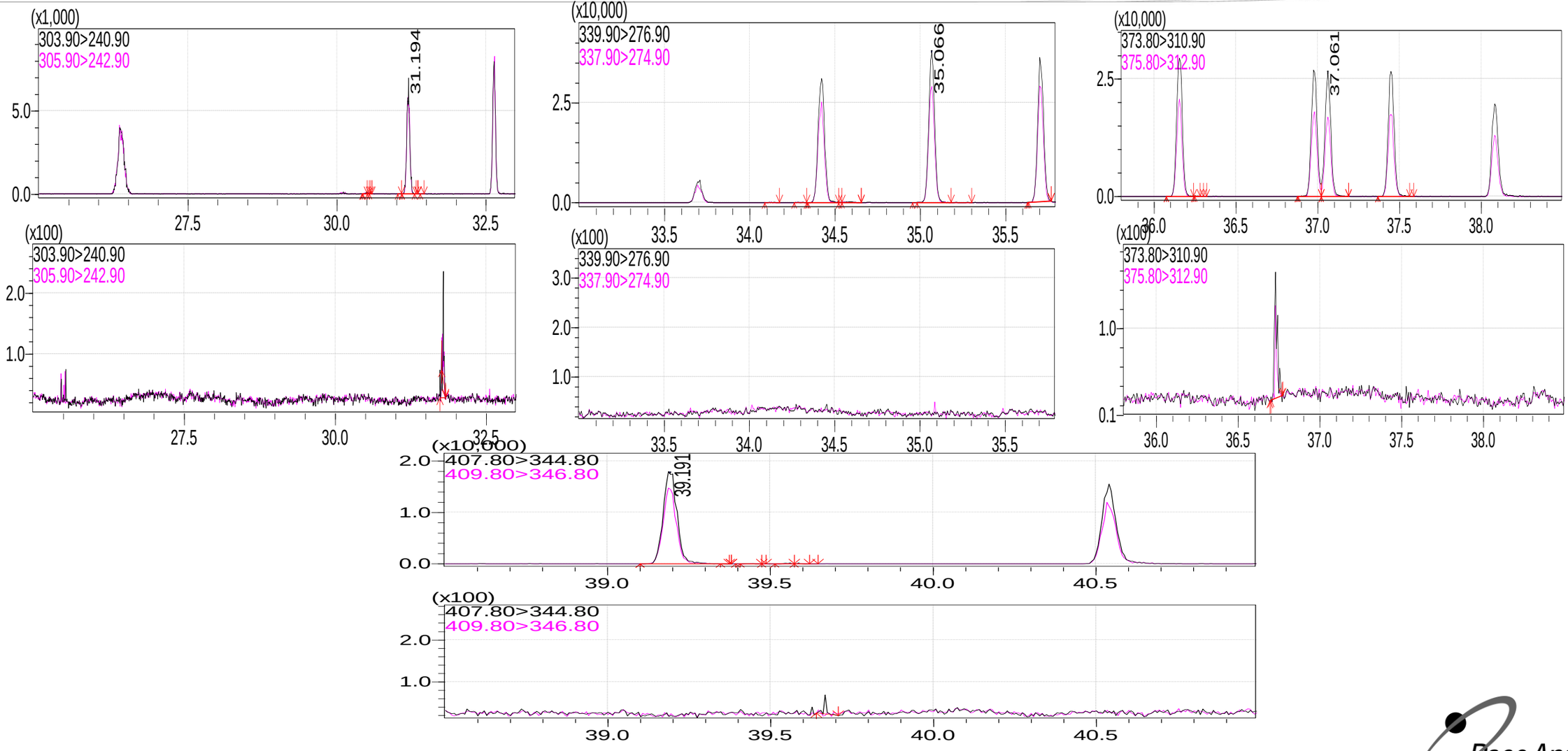
Verification of Absence of Interferences by PCBs on Furans (10.1.4.3)



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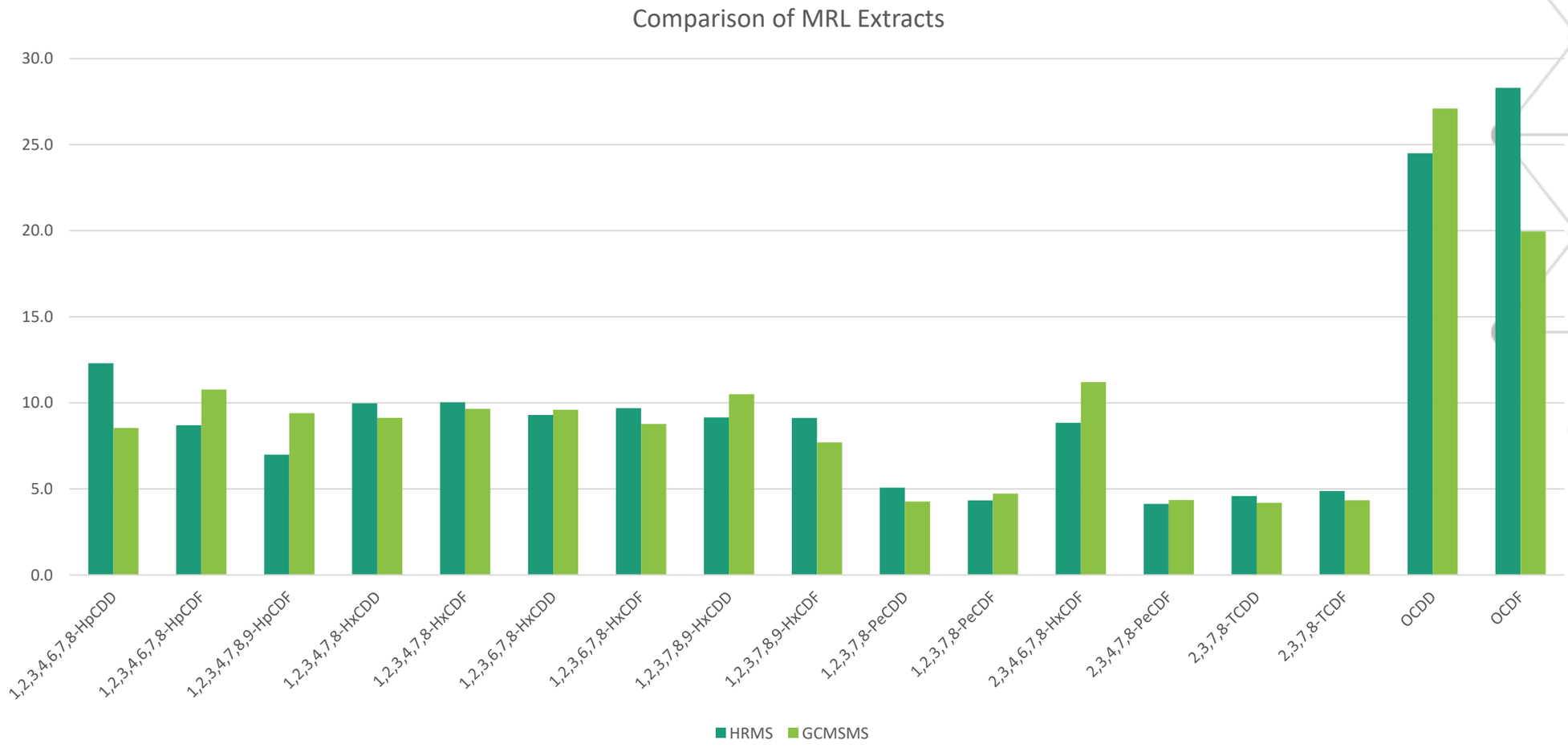
Analysis of MRL Verification Extracts on HRMS and MS/MS Instruments (aqueous samples)



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Analysis of OPR (LCS) Over Several Months

						IPR		OPR	
Analyte	**LCS (7/8/2021)**	**LCS2 (7/9/2021)**	**LCS (6/16/2021)**	**LCS (7/12/2021)**	**LCS(6/17/2021)**	**LCL**	**UCL**	**LCL**	**UCL**
2,3,7,8 TCDD	11	9.7	10.3	10.7	10.4	8.3	12.9	6.7	15.8
2,3,7,8 –TCDF	10	9.2	10.3	10.8	9.4	8.7	13.7	7.5	15.8
1,2,3,7,8 PeCDD	46	42	43	49	42	38	66	35	71
1,2,3,7,8-PeCDF	49	46	46	51	44	43	62	40	67
2,3,4,7,8-PeCDF	49	43	46	53	43	36	75	34	80
1,2,3,4,7,8-HxCDD	56	47	49	55	43	39	76	35	82
1,2,3,6,7,8-HxCDD	52	54	49	52	54	42	62	38	67
1,2,3,7,8,9-HxCDD	54	53	47	57	56	37	71	32	81
1,2,3,4,7,8_HxCDF	52	47	49	54	47	41	59	36	67
1,2,3,6,7,8-HxCDF	48	50	45	53	45	46	60	42	65
1,2,3,7,8,9-HxCDF	38	48	39	52	36	42	61	39	65
2,3,4,6,7,8-HxCDF	68	43	56	53	54	37	74	35	78
1,2,3,4,6,7,8-HpCDD	46	43	44	49	42	38	65	35	70
1,2,3,4,6,7,8-HpCDF	52	47	48	55	46	45	56	41	61
1,2,3,4,7,8,9-HpCDF	52	48	49	54	44	43	63	39	69
OCDD	110	98	105	108	103	89	127	78	144
OCDF	110	97	97	110	89	74	146	63	170
						IPR		**OPR**	
Surrogate Recovery	**LCS (7/8/2021)**	**LCS2 (7/9/2021)**	**LCS (6/16/2021)**	**LCS (5/29/2021)**	**LCS(6/17/2021)**	**LCL**	**UCL**	**LCL**	**UCL**
2,3,7,8-Tetrachlorodibenzo-p-dioxin-13C12 (S)	70	78	62	63	43	28	134	20	175
1,2,3,7,8-Pentachlorodibenzo-p-dioxin-13C12 (S)	87	135	88	70	26	27	184	21	227
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin-13C12 (S)	79	83	73	68	64	29	147	21	193
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin-13C12 (S)	74	74	70	67	46	34	122	25	163
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin-13C12 (S)	74	83	79	70	70	34	129	26	166
Octachlorodibenzo-p-dioxin-13C12 (S)	57	127	132	113	142	41	276	26	397
2,3,7,8-Tetrachlorodibenzofuran-13C12 (S)	72	77	61	66	57	31	113	22	152
1,2,3,7,8-Pentachlorodibenzofuran-13C12 (S)	69	116	79	65	32	27	156	21	192
2,3,4,7,8-Pentachlorodibenzofuran-13C12 (S)	74	126	87	64	30	16	279	13	328
1,2,3,4,7,8-Hexachlorodibenzofuran-13C12 (S)	75	88	70	68	65	27	152	19	202
1,2,3,6,7,8-Hexachlorodibenzofuran-13C12 (S)	79	86	75	60	66	30	122	21	159
2,3,4,6,7,8-Hexachlorodibenzofuran-13C12 (S)	77	88	74	70	65	24	157	22	176
1,2,3,7,8,9-Hexachlorodibenzofuran-13C12 (S)	105	85	54	70	27	29	136	17	205
1,2,3,4,6,7,8-Heptachlorodibenzofuran-13C12 (S)	73	84	76	68	68	32	110	21	158
1,2,3,4,7,8,9-Heptachlorodibenzofuran-13C12 (S)	68	77	73	66	64	28	141	20	186
2,3,7,8-Tetrachlorodibenzo-p-dioxin-37Cl4	71	68	62	81	56	39	154	31	191

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Results and Surrogate Recovery in 9 Contaminated Matrices

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Analyte	Matrix 1	Matrix 2	Matrix 3	Matrix 4	Matrix 5	Matrix 6	Matrix 7	Matrix 8	Matrix 9		
2,3,7,8 TCDD			0.3								
2,3,7,8 -TCDF	0.5	0.63	2.5		0.22	0.28	0.99				
1,2,3,7,8 PeCDD			0.87		0.24	0.32	1.7		0.82		
1,2,3,7,8-PeCDF							0.6		2.9		
2,3,4,7,8-PeCDF	0.88	1.2	2.5	0.3	0.7	0.61	1.2	0.81	2.7		
1,2,3,4,7,8-HxCDD	0.38			0.3	2.3		3.9	0.47	0.72		
1,2,3,6,7,8-HxCDD	0.39	0.33	1.2	0.33	2.1	1.1		0.5	1.3		
1,2,3,7,8,9-HxCDD	0.49	0.36	0.56		1.3	0.79		0.77	1.1		
1,2,3,4,7,8_HxCDF	0.86	1.7	5.4	0.38	1.3	1.2	1.8	1	4.7		
1,2,3,6,7,8-HxCDF	0.94	1.7	3.1	0.39	1.2	1.2	1.8		2.6		
1,2,3,7,8,9-HxCDF	0.71	2.5	3.4	0.24	0.26	0.94		0.82	2.2		
2,3,4,6,7,8-HxCD/F	0.6	0.36	0.94	0.32	0.76	0.29		0.31	1.4		
1,2,3,4,6,7,8-HpCDD	5.1	5.3	13	4.8	41	33	81	19	20		
1,2,3,4,6,7,8-HpCDF	4.7	12		4.2	8.2			8.6	18		
1,2,3,4,7,8,9-HpCDF	0.27	0.63			1.2	0.74			0.62		
OCDD	20	29	74	1100	760	240	360	130	100		
OCDF	2	5.7	12	5.3	44		16	5.7	15		
Surrogate Recovery	Matrix 1	Matrix 2	Matrix 3	Matrix 4	Matrix 5	Matrix 6	Matrix 7	Matrix 8	Matrix 9	LCL	UCL
2,3,7,8-Tetrachlorodibenzo-p-dioxin-13C12 (S)	61	71	57	75	50	73	62	47	68	20	175
1,2,3,7,8-Pentachlorodibenzo-p-dioxin-13C12 (S)	69	78	84	106	57	79	88	46	89	21	227
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin-13C12 (S)	68	73	63	88	48	63	54	54	69	21	193
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin-13C12 (S)	65	76	66	79	51	63	57	50	66	25	163
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin-13C12 (S)	65	70	61	81	47	62	75	50	74	26	166
Octachlorodibenzo-p-dioxin-13C12 (S)	56	50	40	2	0	35	32	35	52	26	397
2,3,7,8-Tetrachlorodibenzofuran-13C12 (S)	64	69	59	76	53	60	53	48	72	22	152
1,2,3,7,8-Pentachlorodibenzofuran-13C12 (S)	60	71	67	77	50	57	58	49	68	21	192
2,3,4,7,8-Pentachlorodibenzofuran-13C12 (S)	61	69	74	83	54	61	73	48	67	13	328
1,2,3,4,7,8-Hexachlorodibenzofuran-13C12 (S)	65	74	58	82	47	62	54	54	67	19	202
1,2,3,6,7,8-Hexachlorodibenzofuran-13C12 (S)	69	72	60	83	51	62	58	52	67	21	159
2,3,4,6,7,8-Hexachlorodibenzofuran-13C12 (S)	68	75	63	84	52	64	57	53	71	22	176
1,2,3,7,8,9-Hexachlorodibenzofuran-13C12 (S)	127	77	75	139	92	59	62	98	117	17	205
1,2,3,4,6,7,8-Heptachlorodibenzofuran-13C12 (S)	64	70	61	81	47	61	75	49	74	21	158
1,2,3,4,7,8,9-Heptachlorodibenzofuran-13C12 (S)	63	65	55	78	9	55	47	46	52	20	186
2,3,7,8-Tetrachlorodibenzo-p-dioxin-37Cl4	61	58	75	79	72	65	54	82	69	31	191

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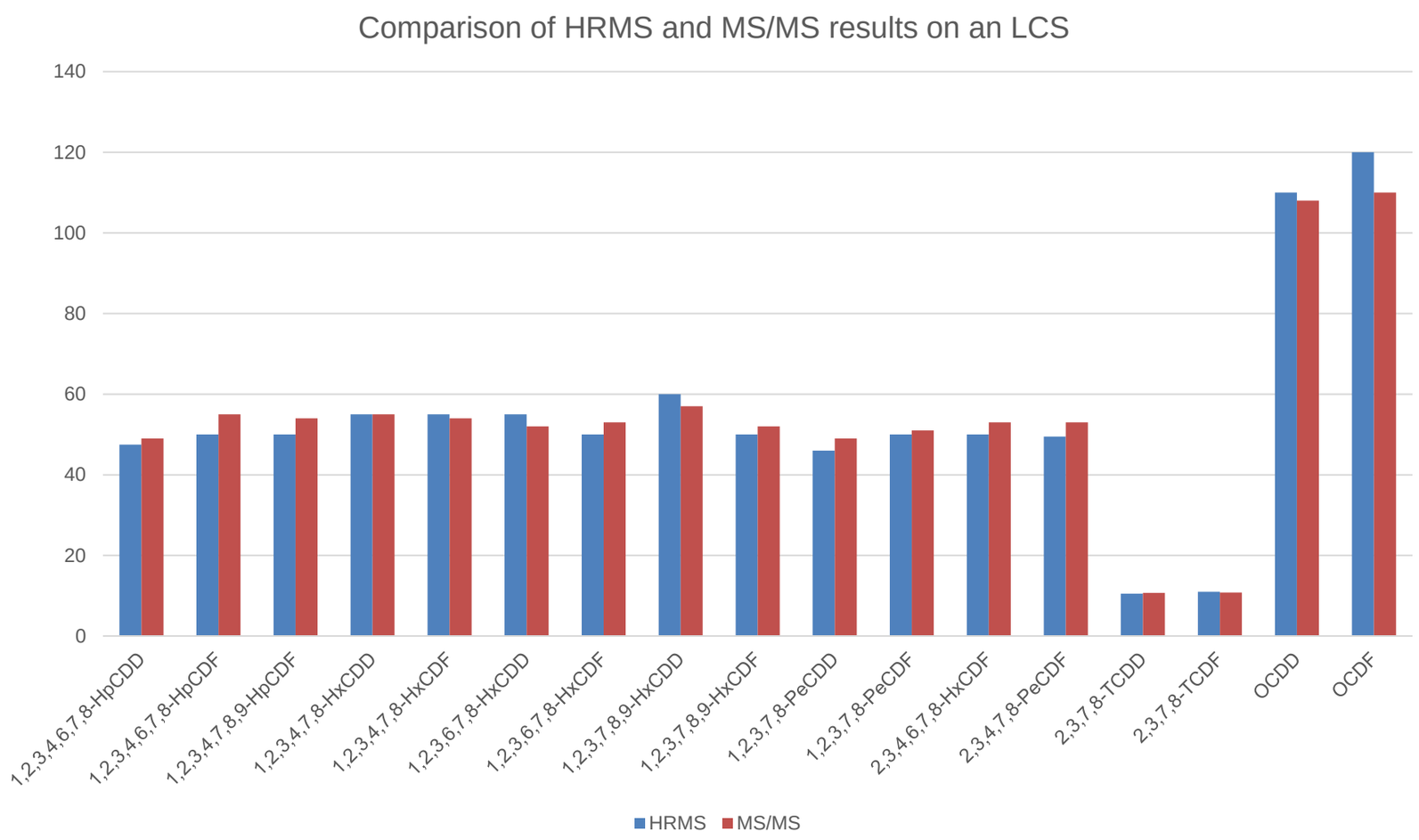
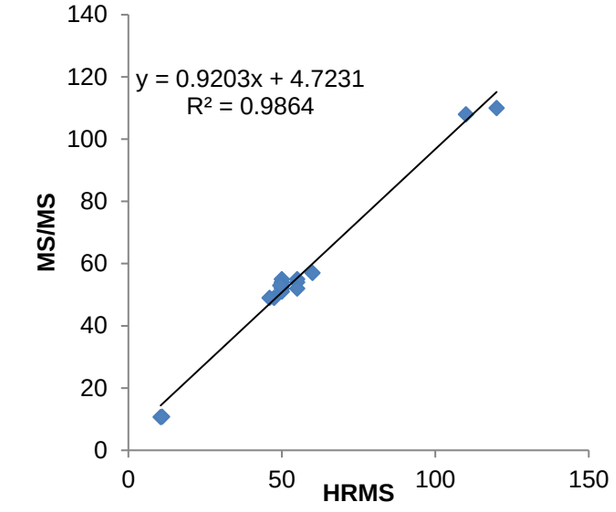
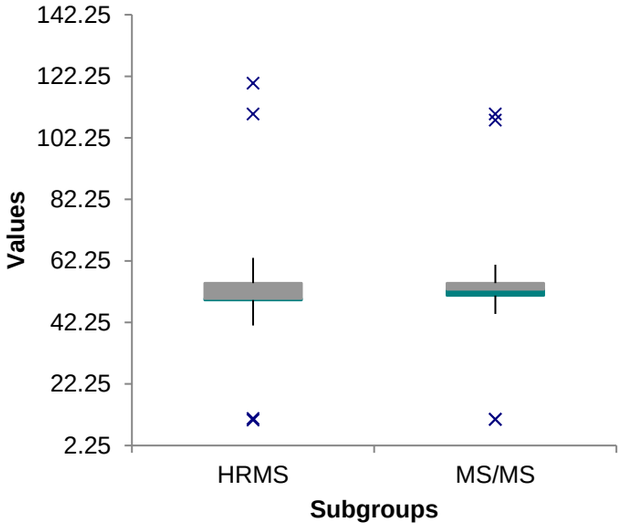
Matrix Spike and Matrix Spike Duplicate results – 2 sets

Analyte	MS1	MS1D	MS2	MS2D	Blank		
2,3,7,8 TCDD	9.8	11	9.9	9.6			
2,3,7,8 -TCDF	10	14	11	10			
1,2,3,7,8 PeCDD	44	47	45	44			
1,2,3,7,8-PeCDF	47	52	49	48			
2,3,4,7,8-PeCDF	47	54	55	47			
1,2,3,4,7,8-HxCDD	48	51	54	50			
1,2,3,6,7,8-HxCDD	53	57	52	53			
1,2,3,7,8,9-HxCDD	52	62	52	50			
1,2,3,4,7,8_HxCDF	50	56	51	50			
1,2,3,6,7,8-HxCDF	46	51	52	51			
1,2,3,7,8,9-HxCDF	26	32	42	40			
2,3,4,6,7,8-HxCD/F	83	88	61	55			
1,2,3,4,6,7,8-HpCDD	51	62	92	57			
1,2,3,4,6,7,8-HpCDF	53	63	66	52			
1,2,3,4,7,8,9-HpCDF	50	53	52	50			
OCDD	120	160	480	150			
OCDF	100	110	130	97			
Surrogate Recovery	**MS1**	**MS1D**	**MS2**	**MS2D**	**Blank**	**LCL**	**UCL**
2,3,7,8-Tetrachlorodibenzo-p-dioxin-13C12 (S)	60	64	57	67	60	**20**	**175**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin-13C12 (S)	65	73	85	101	70	**21**	**227**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin-13C12 (S)	65	73	59	70	68	**21**	**193**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin-13C12 (S)	58	64	61	66	66	**25**	**163**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin-13C12 (S)	61	73	60	67	68	**26**	**166**
Octachlorodibenzo-p-dioxin-13C12 (S)	51	54	47	45	57	**26**	**397**
2,3,7,8-Tetrachlorodibenzofuran-13C12 (S)	63	66	58	69	63	**22**	**152**
1,2,3,7,8-Pentachlorodibenzofuran-13C12 (S)	57	63	69	80	60	**21**	**192**
2,3,4,7,8-Pentachlorodibenzofuran-13C12 (S)	59	66	71	83	65	**13**	**328**
1,2,3,4,7,8-Hexachlorodibenzofuran-13C12 (S)	64	68	59	66	66	**19**	**202**
1,2,3,6,7,8-Hexachlorodibenzofuran-13C12 (S)	66	71	61	67	69	**21**	**159**
2,3,4,6,7,8-Hexachlorodibenzofuran-13C12 (S)	65	70	60	69	69	**22**	**176**
1,2,3,7,8,9-Hexachlorodibenzofuran-13C12 (S)	120	123	76	82	123	**17**	**205**
1,2,3,4,6,7,8-Heptachlorodibenzofuran-13C12 (S)	61	73	60	67	68	**21**	**158**
1,2,3,4,7,8,9-Heptachlorodibenzofuran-13C12 (S)	59	69	64	59	65	**20**	**186**
2,3,7,8-Tetrachlorodibenzo-p-dioxin-37Cl4	54	63	45	63	68	**31**	**191**

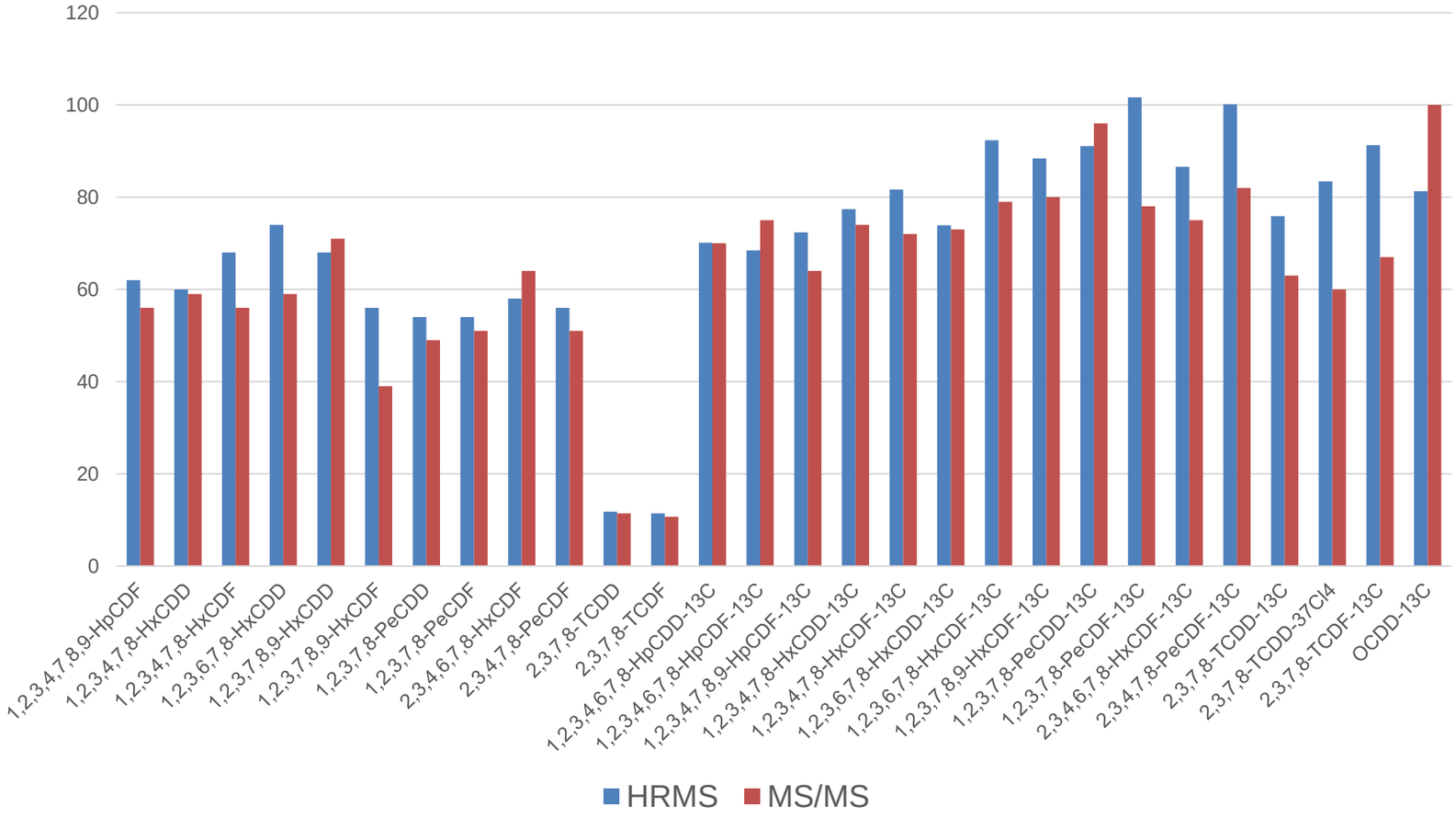
Comparison of LCS Data Between the Two Instrument - Same extract….MS/MS data more precise.

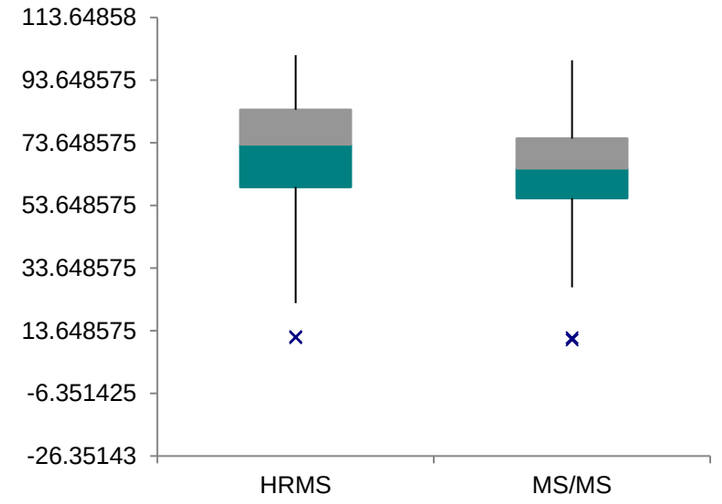






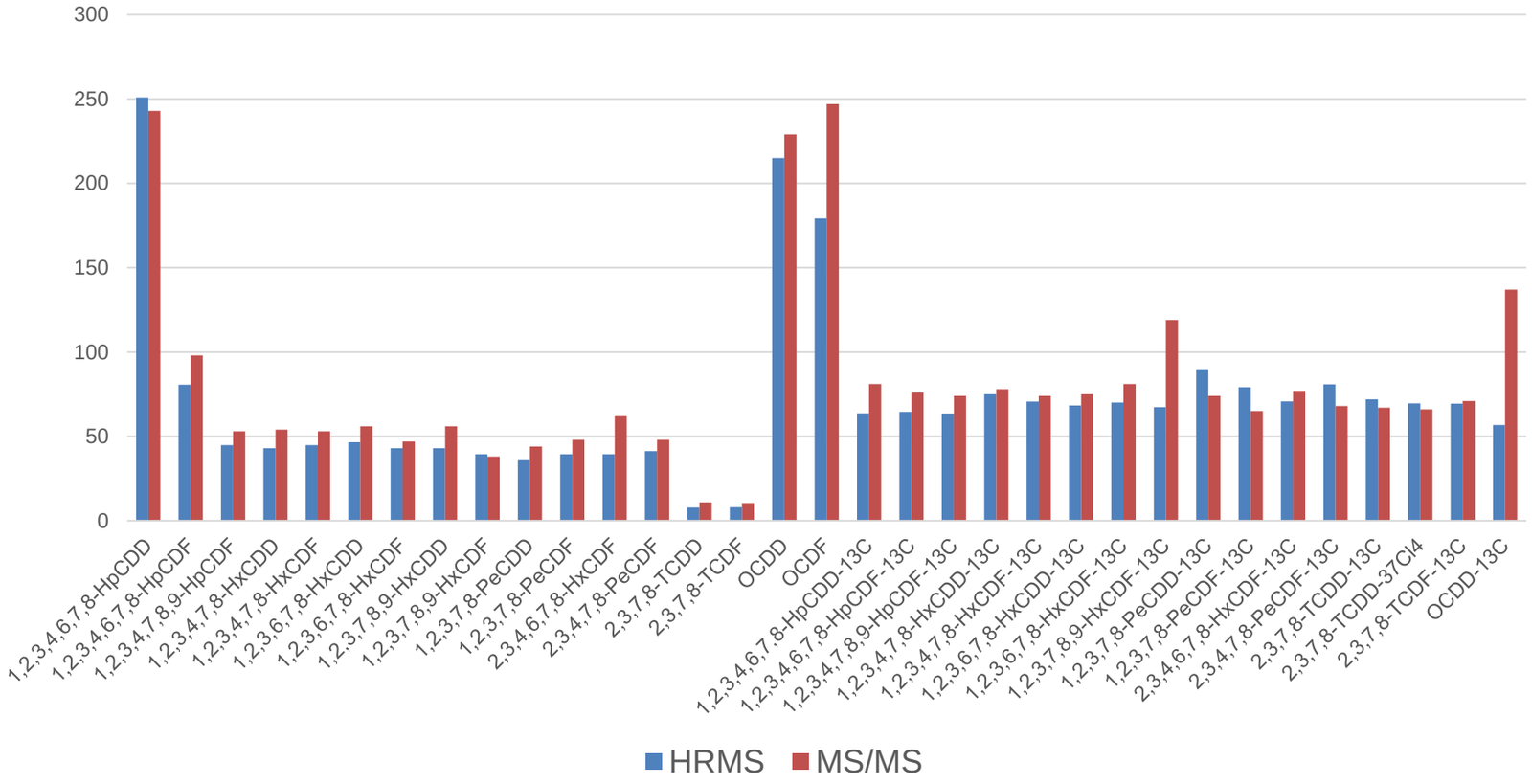
Comparison of Matrix Spike Data (solid sample) - MS/MS Data…. More precise, slightly lower

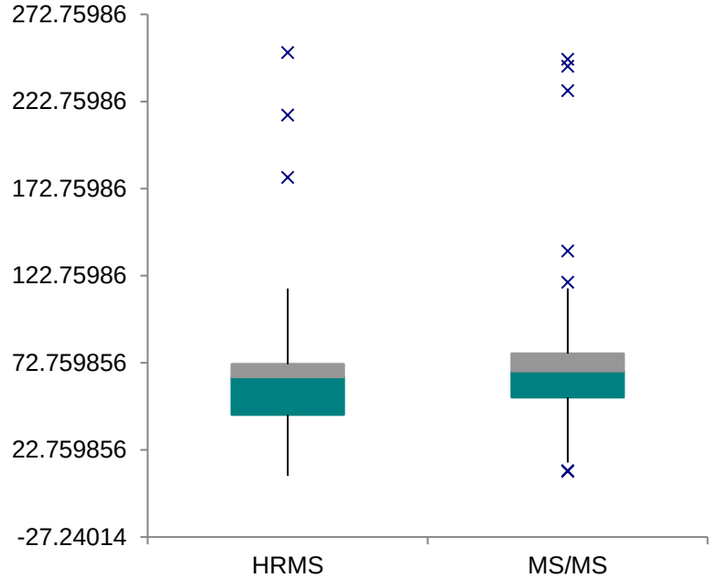




Flagged HRMS data excluded

Comparison of Matrix Spike Data (solid sample - MS/MS data….More precise, slightly higher





Summary and Conclusion

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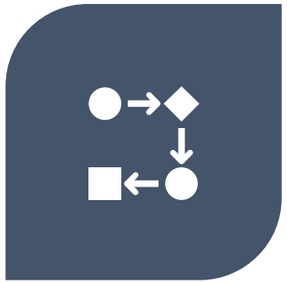

DATA IS PRELIMINARY AND WAITING FOR COMPLETE VALIDATION (OF DATA).

THIS PRESENTATION REPRESENTS PROGRESS TO DATE

PRELIMINARY DATA SHOWS MS/MS SUITABLE AS AN ALTERNATIVE DETECTOR FOR HRMS

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Thank You

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Many Thanks to the following:

- William Lipps - Technical Collaboration and Support - Shimadzu
- Judy Morgan – Technical Sponsor and Coordinator – Pace Corporate
- Brian Pike and Team - Pace Analytical Services - Idea Lab Minneapolis, MN for technical support, instrument setup and analysis of various samples and matrices