

**MAT 95 - A DOUBLE FOCUSING HIGH RESOLUTION MASS SPECTROMETER
FOR FULL AUTOMATED ANALYSIS**

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HRGC/HRMS is a proven and well accepted technique to quantitate trace amounts of dioxins/furans in environmental and biological extracts. The advantage of HRMS versus LRMS (Quadrupole benchtop) in respect to better selectivity and better detection limits is demonstrated in figure 1.

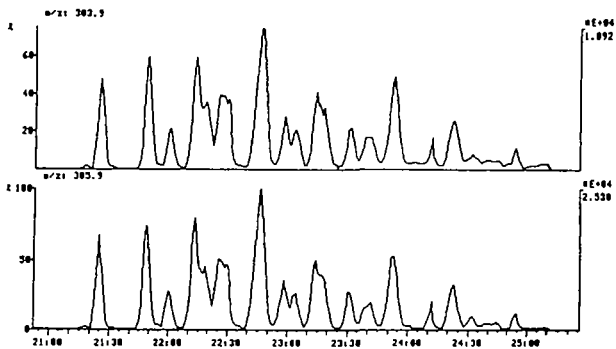
In contrast to benchtop systems low picogram to subpicogram levels of dioxins/furans yields reproducible results.

The MAT 95 is a fully microprocessor controlled HRMS system which has the feature of automatic instrument control including the mass spectrometer, the GC and an autosampler. In addition it allows complete automatic data processing on an unix based DECstation™ (Fig. 2).

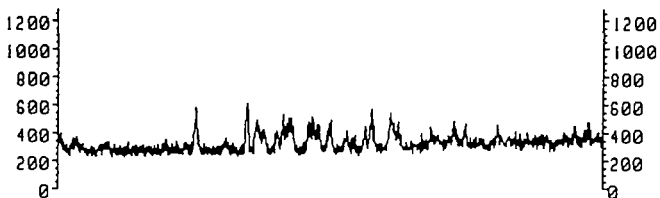
Starting an analysis the system checks the status of the mass spectrometer in respect to predefined resolution and availability of a lockmass for high resolution written in Instrument Control Language™ (ICL™). It loads the predefined GC program, the autosampler setup and after injection starts acquisition of data with an user defined delay time. Data evaluation following the acquisition only takes a few minutes and includes plotting of dioxin/furan mass traces in order of the degree of chlorination and a detailed quantitation report (Fig. 3).

Lockmass stability, actual isotopic ratios based on area or height calculation and retention time tolerances for specified single isomeres are some of the quality control parameters incorporated into this report. Verification and recovering standards are checked automatically and give the opportunity to stop the system in case the results are out of limit. Amount calculation is area or hight based using multiple point calibration response curves. Calculated amounts can be transferred to toxicity equivalents within the data evaluation procedure using the six most common calculation methods.

For multiple analysis data evaluation quantitation reports can be transferred to RSCII format for further use in spreadsheet programs supported by unix on the DECstation. Network transfer to other operating systems is another easy to access alternative.



Ion 303.90 amu.



Ion 305.90 amu.

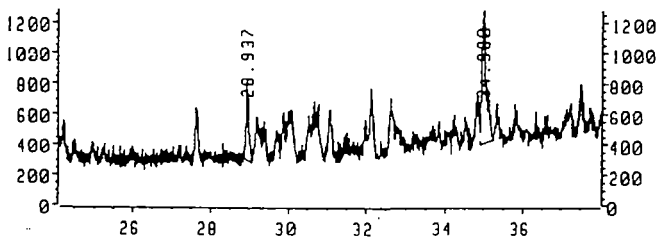


Fig. 1: Comparison of the TCDF-traces from identical sample run on a LRMS (Quadrupole) and MAT 95 - HRMS.

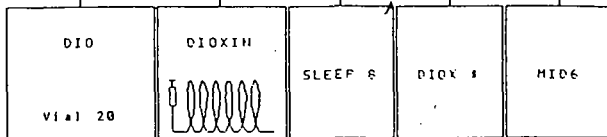
NOT ACQUIRING

ELAPSED:

4 Dec 1989 11:52 END:

FILE: STANDARD	Time: MID run time
SAMP: Vial 20	
OPER: RS	
CDMM: FINHST0	

METHOD LIST:
DIOFUR
(10)



FILE	AUTOSAMP	VIAL	INLET	ICL PROC	OS PROC	S/T/M	DLV
1:MMILK1	DIO	1	C: DIOXIN	SLEEP 8	DIOX 8		MID6
2:MMILK2	DIO	2	C: DIOXIN	SLEEP 8	DIOX 8		MID6
3:MMILK3	DIO	3	C: DIOXIN	SLEEP 8	DIOX 8		MID6
4:MMILK4	DIO	4	C: DIOXIN	SLEEP 8	DIOX 8		MID6
5:STANDARD	DIO	20	C: DIOXIN	SLEEP 8	DIOX 8		MID6
6:MMILK6	DIO	6	C: DIOXIN	SLEEP 8	DIOX 8		MID6
7:MMILK7	DIO	7	C: DIOXIN	SLEEP 8	DIOX 8		MID6
8:MMILK8	DIO	8	C: DIOXIN	SLEEP 8	DIOX 8		MID6
9:MMILK9	DIO	9	C: DIOXIN	SLEEP 8	DIOX 8		MID6
10:STANDARD	DIO	20	C: DIOXIN	SLEEP 8	DIOX 8		MID6

ANALYSIS: _

Fig. 2: Analysis program incorporating GC-, Autosampler- and Instrument control as well as automatic data evaluation program.

QUAN:

Entries: 112

Data file(s) used

File:

12-APR-89

Samp: Flyash

Start: 11:44:02 1426

Comm: 25m SE54 * 180/30sec-210/10-300/4.5 * split1.0 Jul * R=10000

Mode: EI +VE + LMR ESCAN LR

Oper:

Inlet: GC

Disp: SEAR

Amount = (area * ref amnt) / (ref area * response factor)

Response factors from quantitation library

Compound Name	Actua Time	Quan	Ratio	Area	Actua Mass	Calculat Amount	Percent Recovery
2378-TCDF STD	12:09	317.9	315.9	3453425.	0.810	885.252	80.48
2378-TCDD STD	12:35	333.9	331.9	1458667.	0.799	707.874	88.48
1234-TCDD STD	12:30	327.9	325.9	346911.	0.764	190.000	100.00
23478-PeCDF STD	15:29	351.9	353.9	3266200.	0.641	965.402	87.76
12378-PeCDD STD	15:46	367.9	369.9	1012445.	0.637	623.274	89.04
123478-HxCDF STD	18:02	385.8	387.9	3560824.	0.781	1268.537	90.61
123789-HxCDD STD	19:09	401.8	403.9	1957958.	0.776	1163.214	89.48
1234678-HpCDF STD	20:59	419.8	421.8	2211329.	0.957	1031.909	93.81
1234678-HpCDD STD	21:58	435.8	437.8	1623006.	0.930	1272.525	97.89
QCDD STD	25:01	471.8	469.8	1036331.	0.898	627.446	104.57

# Compound Name	Act. RT	Quan	Ratio	Area	Act. Ratio	Calc. Amount
1 2378-TCDF	12:12	305.9	303.9	912698.	0.790	370.072
2 2378-TCDD	12:32	321.9	319.9	117299.	0.800	72.341
3 12378-PeCDF	14:54	339.8	341.9	454955.	0.601	282.455
4 23478-PeCDF	15:30	339.8	341.9	605457.	0.618	283.265
5 12378-PeCDD	15:47	355.8	357.9	98146.	0.629	83.269
6 123478-HxCDF	18:02	373.8	375.8	1763738.	0.794	700.525
7 123678-HxCDF	18:09	373.8	375.8	605530.	0.757	558.890
8 123789-HxCDF	18:39	373.8	375.8	1280615.	0.794	788.045
9 234678-HxCDF	19:30	373.8	375.8	329561.	0.789	222.202
10 123478-HxCDD	18:47	389.8	391.8	148580.	0.805	111.907
11 123678-HxCDD	18:51	389.8	391.8	373086.	0.787	540.665
12 123789-HxCDD	19:09	389.8	391.8	503524.	0.781	462.147
13 1234678-HpCDF	20:59	407.8	409.8	5648209.	0.941	3331.734
14 1234789-HpCDF	22:24	407.8	409.8	595850.	0.939	466.482
15 1234678-HpCDD	21:59	423.8	423.8	5178416.	0.966	4926.899
16 QCDF	25:09	443.7	441.7	4049797.	0.884	3147.328
17 QCDD	25:02	459.7	457.7	21252858.	0.868	15831.605
18 Total native TCDF	10:45	305.9	303.9	4114332.	0.767	1646.986
19 Total native TCDD	11:08	321.9	319.9	563630.	0.777	346.753
20 Total native PeCDF	14:07	339.8	341.9	4677978.	0.621	2278.313
21 Total native PeCDD	14:19	355.8	357.9	1422873.	0.625	1205.626
22 Total native HxCDF	17:06	373.8	375.8	7216165.	0.788	4081.094
23 Total native HxCDD	17:35	389.8	391.8	4315717.	0.786	4137.711
24 Total native HpCDF	20:59	407.8	409.8	8322678.	0.943	5391.822
25 Total native HpCDD	21:18	423.8	423.8	9367403.	0.963	8890.038

Fig. 3: Example of quantitation report.