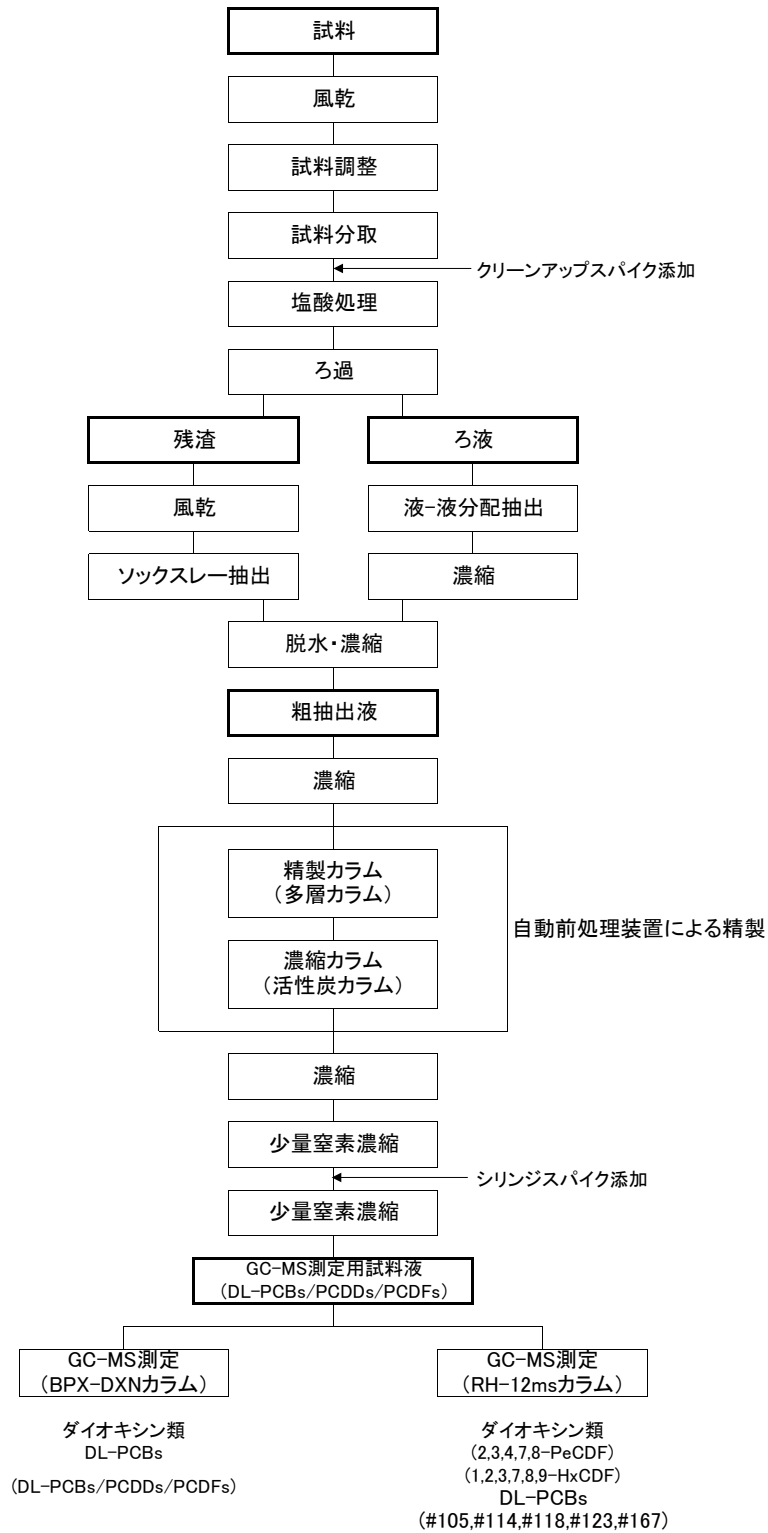








## <資料 - 1> 分析フロー



ダイオキシン類分析フロー図(ばいじん及び焼却灰その他の燃え殻)

< 資料 - 2 > 分析条件

## 1. ダイオキシン類の測定条件

### (1) GC/MS の測定条件

#### 1) JMS-800D Ultra Focus (BPX-DXN 長さ:60m 口径:0.25mmID)

##### [ GC : Agilent 7890B ]

カラム温度 : 150°C(1min)→ (20°C/min)→ 220°C→ (2°C/min)→260°C→ (5°C/min)→320°C (3.5min)  
注入口温度 : 270°C  
注入方法 : スプリットレス

##### [ MS : JEOL JMS-800D Ultra Focus ]

分解能(M/ΔM) : 10,000 以上  
イオン化電圧 : 38eV  
イオン化電流 : 500 μ A  
イオン源温度 : 270°C  
イオン加速電圧 : 10kV

#### 2) JMS-800D (RH-12ms 長さ:60m 口径:0.25mmID)

##### [ GC : Agilent 7890A ]

カラム温度 : 150°C(1min)→ (10°C/min)→ 210°C→ (3°C/min)→280°C→ (20°C/min)→320°C (11.7min)  
注入口温度 : 270°C  
注入方法 : スプリットレス

##### [ MS : JEOL JMS-800D ]

分解能(M/ΔM) : 10,000 以上  
イオン化電圧 : 38eV  
イオン化電流 : 500 μ A  
イオン源温度 : 270°C  
イオン加速電圧 : 10kV

(2) 測定対象異性体

1) 使用キャピラリーカラム:BPX-DXN

2, 3, 7, 8-TeCDD	3, 3', 4, 4'-TeCB(#77)
1, 2, 3, 7, 8-PeCDD	3, 4, 4', 5-TeCB(#81)
1, 2, 3, 4, 7, 8-HxCDD	3, 3', 4, 4', 5-PeCB(#126)
1, 2, 3, 6, 7, 8-HxCDD	3, 3', 4, 4', 5, 5'-HxCB(#169)
1, 2, 3, 7, 8, 9-HxCDD	2', 3, 4, 4', 5-PeCB(#123) 注2
1, 2, 3, 4, 6, 7, 8-HpCDD	2, 3, 3', 4, 4', 5-HxCB(#156)
OCDD	2, 3, 3', 4, 4', 5'-HxCB(#157)
2, 3, 7, 8-TeCDF	2, 3, 3', 4, 4', 5, 5'-HpCB(#189)
1, 2, 3, 7, 8-PeCDF	
1, 2, 3, 4, 7, 8-HxCDF	注1:どちらのカラムでも単離できないため、単離
1, 2, 3, 6, 7, 8-HxCDF	できない異性体との合計で定量している。
2, 3, 4, 6, 7, 8-HxCDF 注1	注2:通常 RH-12ms 測定分を採用する。
1, 2, 3, 4, 6, 7, 8-HpCDF	
1, 2, 3, 4, 7, 8, 9-HpCDF	
OCDF	

2) 使用キャピラリーカラム:RH-12ms

BPX-DXN で単離できなかった異性体化合物  
 主な RH-12ms 測定で採用する化合物

2, 3, 4, 7, 8-PeCDF	2', 3, 4, 4', 5-PeCB(#123)
1, 2, 3, 7, 8, 9-HxCDF	2, 3', 4, 4', 5-PeCB(#118)
	2, 3, 3', 4, 4'-PeCB(#105)
	2, 3, 4, 4', 5-PeCB(#114) 注1
	2, 3', 4, 4', 5, 5'-HxCB(#167)

(3) 検出法

SIM 検出法(ロックマス方式)

(4) 設定質量数(モニターイオン)

Compound		Native			Label		
		M <sup>+</sup>	(M+2) <sup>+</sup>	(M+4) <sup>+</sup>	M <sup>+</sup>	(M+2) <sup>+</sup>	(M+4) <sup>+</sup>
PCDDs	TeCDDs	319.8965	321.8936		331.9368	333.9339	
	PeCDDs	353.8576	355.8547		365.8978	367.8949	
	HxCDDs		389.8158	391.8128		401.8559	403.8530
	HpCDDs		423.7767	425.7738		435.8169	437.814
	OCDD		457.7377	459.7348		469.7779	471.775
PCDFs	TeCDFs	303.9016	305.8987		315.9419	317.9389	
	PeCDFs		339.8598	341.8568		351.9000	353.8970
	HxCDFs		373.8208	375.8179		385.8610	387.8581
	HpCDFs		407.7818	409.7789		419.8220	421.8191
	OCDF		441.7428	443.7399		453.7830	455.7801
DL-PCBs	TeCBs	289.9224	291.9194		301.9626	303.9597	
	PeCBs		325.8804	327.8775		337.9207	339.9178
	HxCBs		359.8415	361.8385		371.8817	373.8788
	HpCBs		393.8025	395.7995		405.8428	407.8398
ロックマス		質量校正用標準物質(PFK)					



## 2. 標準物質と内標準物質との対応

### (1) BPX-DXN

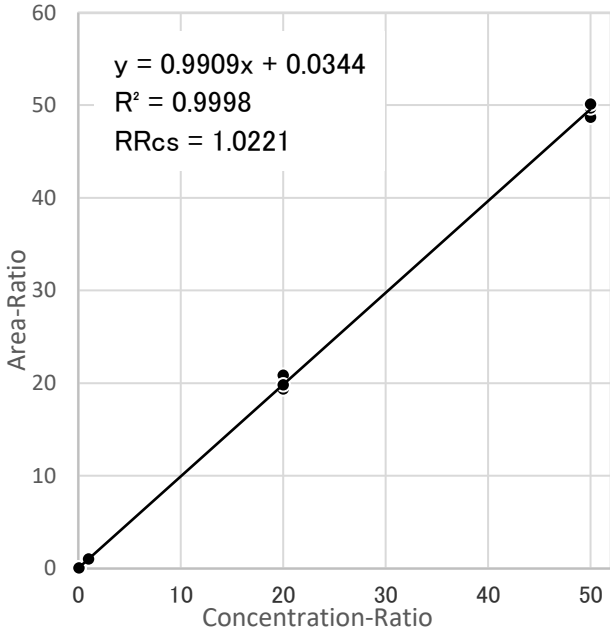
Compound		標準物質	クリーンアップスパイク	シリンジスパイク	サンプリングスパイク
PCDDs	TeCDDs	1,3,6,8-	<sup>13</sup> C <sub>12</sub> -2,3,7,8-	<sup>13</sup> C <sub>12</sub> -1,3,7,8-TeCDD	<sup>13</sup> C <sub>12</sub> -1,2,3,4-TeCDD
		1,3,7,9-	<sup>13</sup> C <sub>12</sub> -2,3,7,8-		
		2,3,7,8-	<sup>13</sup> C <sub>12</sub> -2,3,7,8-		
		1,2,8,9-	<sup>13</sup> C <sub>12</sub> -2,3,7,8-		
	PeCDDs	1,2,3,7,8-	<sup>13</sup> C <sub>12</sub> -1,2,3,7,8-	<sup>13</sup> C <sub>12</sub> -1,2,4,7,8-PeCDD	
	HxCDDs	1,2,3,4,7,8-	<sup>13</sup> C <sub>12</sub> -1,2,3,4,7,8-	<sup>13</sup> C <sub>12</sub> -1,2,3,4,6,8-HxCDD	
		1,2,3,6,7,8-	<sup>13</sup> C <sub>12</sub> -1,2,3,6,7,8-		
		1,2,3,7,8,9-	<sup>13</sup> C <sub>12</sub> -1,2,3,7,8,9-		
	HpCDDs	1,2,3,4,6,7,8-	<sup>13</sup> C <sub>12</sub> -1,2,3,4,6,7,8-	<sup>13</sup> C <sub>12</sub> -1,2,3,4,6,7,9-HpCDD	
	OCDD	OCDD	<sup>13</sup> C <sub>12</sub> -OCDD		
PCDFs	TeCDFs	1,3,6,8-	<sup>13</sup> C <sub>12</sub> -2,3,7,8-	<sup>13</sup> C <sub>12</sub> -1,3,7,8-TeCDD	
		1,2,7,8-	<sup>13</sup> C <sub>12</sub> -2,3,7,8-		
		2,3,7,8-	<sup>13</sup> C <sub>12</sub> -2,3,7,8-		
		1,2,8,9-	<sup>13</sup> C <sub>12</sub> -2,3,7,8-		
	PeCDFs	1,2,3,7,8-	<sup>13</sup> C <sub>12</sub> -1,2,3,7,8-	<sup>13</sup> C <sub>12</sub> -1,2,4,7,8-PeCDD	
		2,3,4,7,8-	<sup>13</sup> C <sub>12</sub> -2,3,4,7,8-		
	HxCDFs	1,2,3,4,7,8-	<sup>13</sup> C <sub>12</sub> -1,2,3,4,7,8-	<sup>13</sup> C <sub>12</sub> -1,2,3,4,6,8-HxCDD	
		1,2,3,6,7,8-	<sup>13</sup> C <sub>12</sub> -1,2,3,6,7,8-		
		1,2,3,7,8,9-	<sup>13</sup> C <sub>12</sub> -1,2,3,7,8,9-		
		2,3,4,6,7,8-	<sup>13</sup> C <sub>12</sub> -2,3,4,6,7,8-		
	HpCDFs	1,2,3,4,6,7,8-	<sup>13</sup> C <sub>12</sub> -1,2,3,4,6,7,8-	<sup>13</sup> C <sub>12</sub> -1,2,3,4,6,7,9-HpCDD	
		1,2,3,4,7,8,9-	<sup>13</sup> C <sub>12</sub> -1,2,3,4,7,8,9-		
	OCDF	OCDF	<sup>13</sup> C <sub>12</sub> -OCDF		
	DL-PCBs	TeCBs	3,3',4,4'-(#77)	<sup>13</sup> C <sub>12</sub> -3,3',4,4'-(#77)	<sup>13</sup> C <sub>12</sub> -2,3',4',5-TeCB(#70)
3,4,4',5-(#81)			<sup>13</sup> C <sub>12</sub> -3,4,4',5-(#81)		
PeCBs		2,3,3',4,4'-(#105)	<sup>13</sup> C <sub>12</sub> -2,3,3',4,4'-(#105)		
		2,3,4,4',5-(#114)	<sup>13</sup> C <sub>12</sub> -2,3,4,4',5-(#114)		
		2,3',4,4',5-(#118)	<sup>13</sup> C <sub>12</sub> -2,3',4,4',5-(#118)		
		2',3,4,4',5-(#123)	<sup>13</sup> C <sub>12</sub> -2',3,4,4',5-(#123)		
		3,3',4,4',5-(#126)	<sup>13</sup> C <sub>12</sub> -3,3',4,4',5-(#126)		
HxCBs		2,3,3',4,4',5-(#156)	<sup>13</sup> C <sub>12</sub> -2,3,3',4,4',5-(#156)	<sup>13</sup> C <sub>12</sub> -2,2',3,4,4',5'-HxCB(#138)	
		2,3,3',4,4',5'-(#157)	<sup>13</sup> C <sub>12</sub> -2,3,3',4,4',5'-(#157)		
		2,3',4,4',5,5'-(#167)	<sup>13</sup> C <sub>12</sub> -2,3',4,4',5,5'-(#167)		
		3,3',4,4',5,5'-(#169)	<sup>13</sup> C <sub>12</sub> -3,3',4,4',5,5'-(#169)		
HpCBs		2,2',3,3',4,4',5-(#170)	<sup>13</sup> C <sub>12</sub> -2,2',3,3',4,4',5-(#170)		
		2,2',3,4,4',5,5'-(#180)	<sup>13</sup> C <sub>12</sub> -2,2',3,4,4',5,5'-(#180)		
	2,3,3',4,4',5,5'-(#189)	<sup>13</sup> C <sub>12</sub> -2,3,3',4,4',5,5'-(#189)			

## (2) RH-12ms

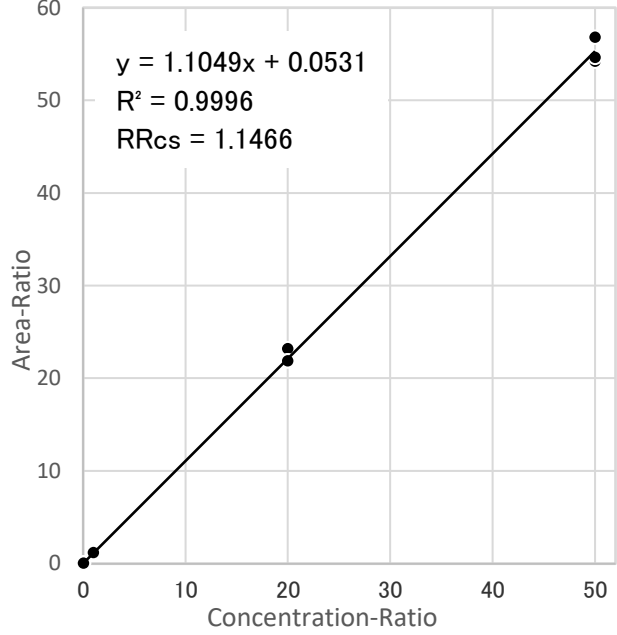
Compound		標準物質	クリーンアップスパイク	シリンジスパイク	サンプリングスパイク
PCDDs	TeCDDs	1,3,6,8-	$^{13}\text{C}_{12}$ -2,3,7,8-	$^{13}\text{C}_{12}$ -1,3,7,8-TeCDD	$^{13}\text{C}_{12}$ -1,2,3,4-TeCDD
		1,3,7,9-	$^{13}\text{C}_{12}$ -2,3,7,8-		
		2,3,7,8-	$^{13}\text{C}_{12}$ -2,3,7,8-		
		1,2,8,9-	$^{13}\text{C}_{12}$ -2,3,7,8-		
	PeCDDs	1,2,3,7,8-	$^{13}\text{C}_{12}$ -1,2,3,7,8-	$^{13}\text{C}_{12}$ -1,2,4,7,8-PeCDD	
	HxCDDs	1,2,3,4,7,8-	$^{13}\text{C}_{12}$ -1,2,3,4,7,8-	$^{13}\text{C}_{12}$ -1,2,3,4,6,8-HxCDD	
		1,2,3,6,7,8-	$^{13}\text{C}_{12}$ -1,2,3,6,7,8-		
		1,2,3,7,8,9-	$^{13}\text{C}_{12}$ -1,2,3,7,8,9-		
	HpCDDs	1,2,3,4,6,7,8-	$^{13}\text{C}_{12}$ -1,2,3,4,6,7,8-	$^{13}\text{C}_{12}$ -1,2,3,4,6,7,9-HpCDD	
	OCDD	OCDD	$^{13}\text{C}_{12}$ -OCDD		
PCDFs	TeCDFs	1,3,6,8-	$^{13}\text{C}_{12}$ -2,3,7,8-	$^{13}\text{C}_{12}$ -1,3,7,8-TeCDD	
		1,2,7,8-	$^{13}\text{C}_{12}$ -2,3,7,8-		
		2,3,7,8-	$^{13}\text{C}_{12}$ -2,3,7,8-		
		1,2,8,9-	$^{13}\text{C}_{12}$ -2,3,7,8-		
	PeCDFs	1,2,3,7,8-	$^{13}\text{C}_{12}$ -1,2,3,7,8-	$^{13}\text{C}_{12}$ -1,2,4,7,8-PeCDD	
		2,3,4,7,8-	$^{13}\text{C}_{12}$ -2,3,4,7,8-		
	HxCDFs	1,2,3,4,7,8-	$^{13}\text{C}_{12}$ -1,2,3,4,7,8-	$^{13}\text{C}_{12}$ -1,2,3,4,6,8-HxCDD	
		1,2,3,6,7,8-	$^{13}\text{C}_{12}$ -1,2,3,6,7,8-		
		1,2,3,7,8,9-	$^{13}\text{C}_{12}$ -1,2,3,7,8,9-		
		2,3,4,6,7,8-	$^{13}\text{C}_{12}$ -2,3,4,6,7,8-		
HpCDFs	1,2,3,4,6,7,8-	$^{13}\text{C}_{12}$ -1,2,3,4,6,7,8-	$^{13}\text{C}_{12}$ -1,2,3,4,6,7,9-HpCDD		
	1,2,3,4,7,8,9-	$^{13}\text{C}_{12}$ -1,2,3,4,7,8,9-			
OCDF	OCDF	$^{13}\text{C}_{12}$ -OCDF			
DL-PCBs	TeCBs	3,3',4,4'-(#77)	$^{13}\text{C}_{12}$ -3,3',4,4'-(#77)	$^{13}\text{C}_{12}$ -2,3',4',5'-TeCB(#70)	
		3,4,4',5'-(#81)	$^{13}\text{C}_{12}$ -3,4,4',5'-(#81)		
	PeCBs	2,3,3',4,4'-(#105)	$^{13}\text{C}_{12}$ -2,3,3',4,4'-(#105)	$^{13}\text{C}_{12}$ -2,3,3',5,5'-PeCB- (#111)	
		2,3,4,4',5'-(#114)	$^{13}\text{C}_{12}$ -2,3,4,4',5'-(#114)		
		2,3',4,4',5'-(#118)	$^{13}\text{C}_{12}$ -2,3',4,4',5'-(#118)		
		2',3,4,4',5'-(#123)	$^{13}\text{C}_{12}$ -2',3,4,4',5'-(#123)		
		3,3',4,4',5'-(#126)	$^{13}\text{C}_{12}$ -3,3',4,4',5'-(#126)		
	HxCBs	2,3,3',4,4',5'-(#156)	$^{13}\text{C}_{12}$ -2,3,3',4,4',5'-(#156)	$^{13}\text{C}_{12}$ -2,3,3',5,5'-PeCB- (#111)	
		2,3,3',4,4',5'-(#157)	$^{13}\text{C}_{12}$ -2,3,3',4,4',5'-(#157)		
		2,3',4,4',5,5'-(#167)	$^{13}\text{C}_{12}$ -2,3',4,4',5,5'-(#167)		
		3,3',4,4',5,5'-(#169)	$^{13}\text{C}_{12}$ -3,3',4,4',5,5'-(#169)		
	HpCBs	2,2',3,3',4,4',5'-(#170)	$^{13}\text{C}_{12}$ -2,2',3,3',4,4',5'-(#170)	$^{13}\text{C}_{12}$ -2,2',3,4,4',5,5'-(#180)	
		2,2',3,4,4',5,5'-(#180)	$^{13}\text{C}_{12}$ -2,2',3,4,4',5,5'-(#180)		
2,3,3',4,4',5,5'-(#189)		$^{13}\text{C}_{12}$ -2,3,3',4,4',5,5'-(#189)			

## <資料 - 3> 検量線

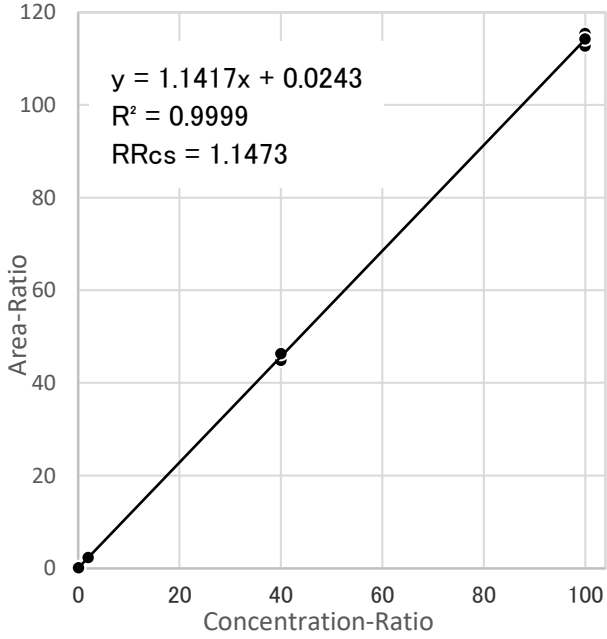
**2,3,7,8-TeCDD**



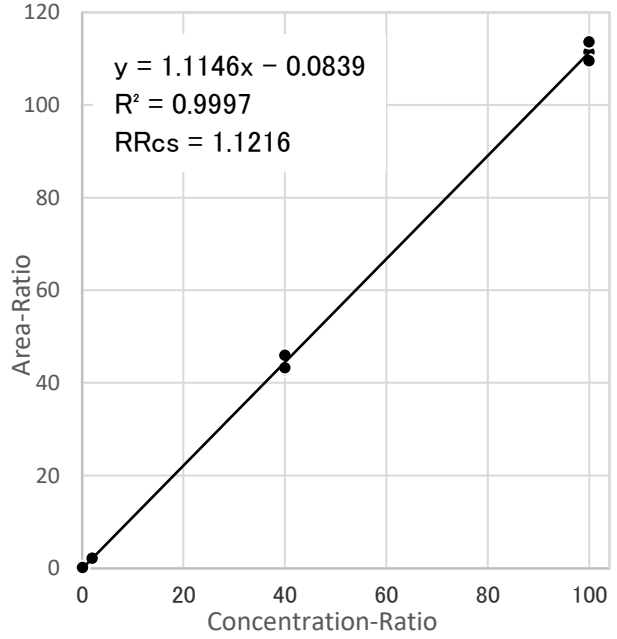
**1,2,3,7,8-PeCDD**



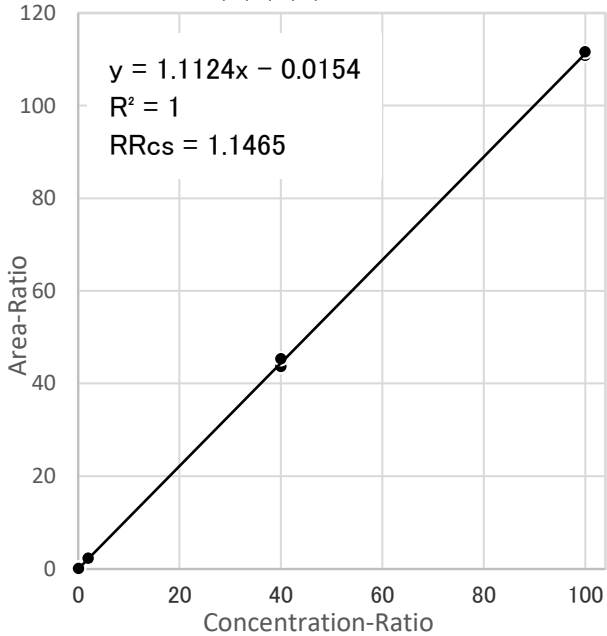
**1,2,3,4,7,8-HxCDD**



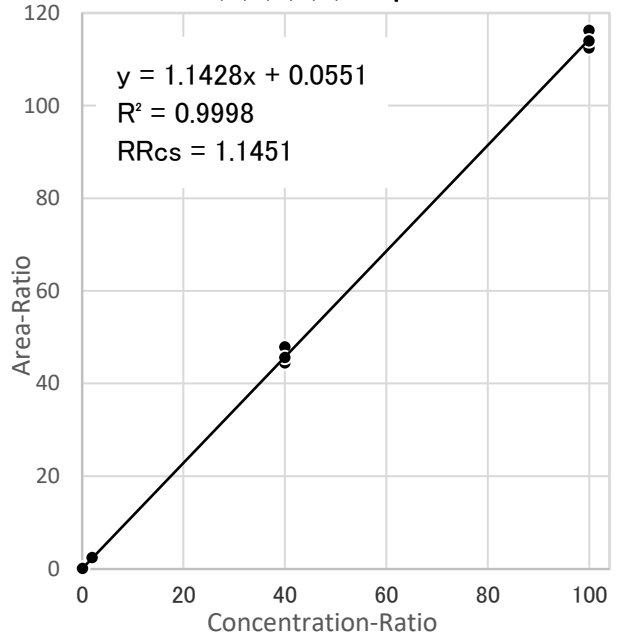
**1,2,3,6,7,8-HxCDD**



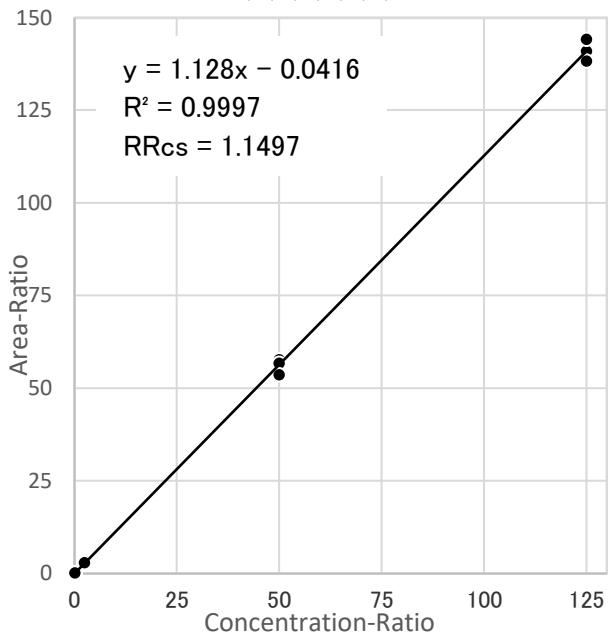
**1,2,3,7,8,9-HxCDD**



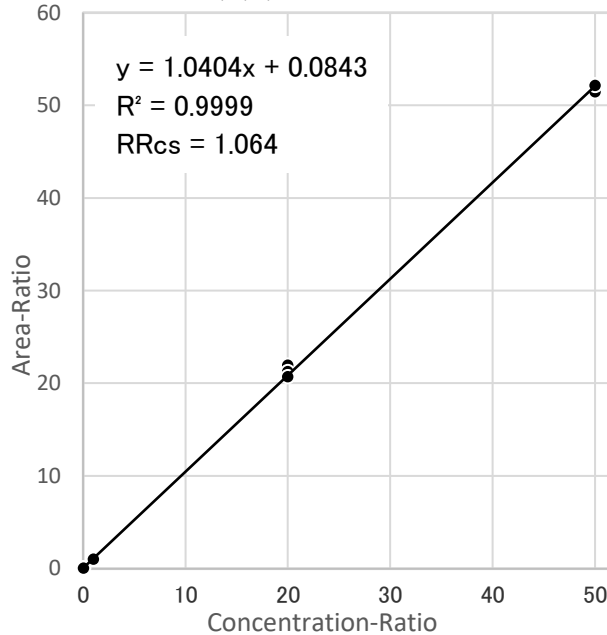
**1,2,3,4,6,7,8-HpCDD**



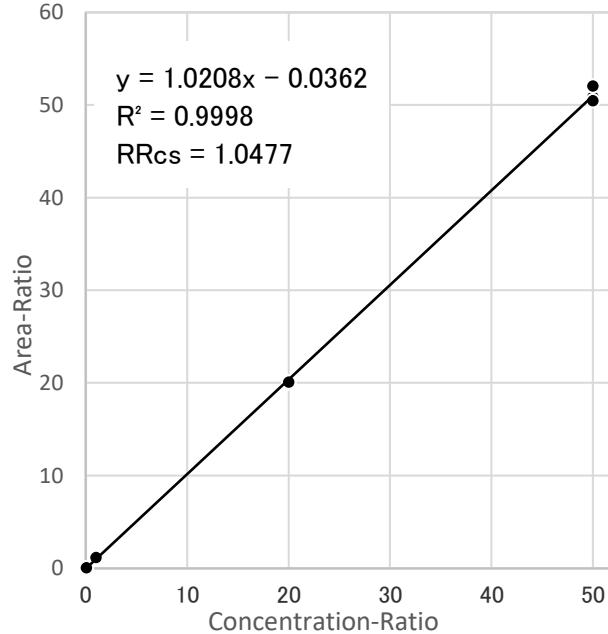
1,2,3,4,6,7,8,9-OCDD



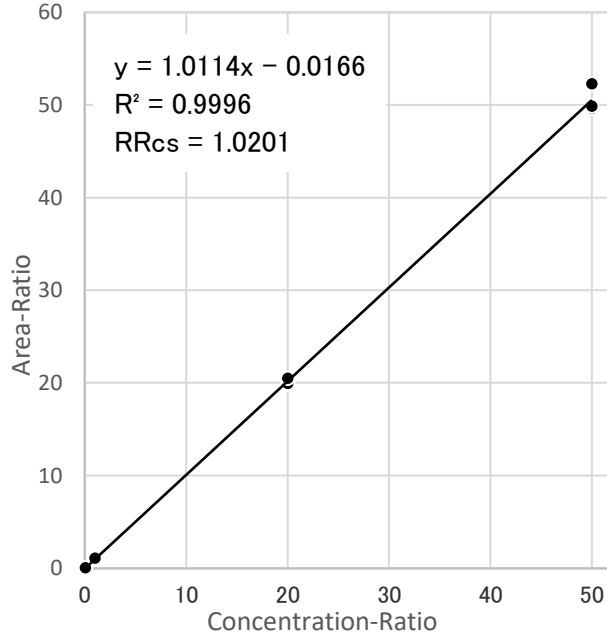
2,3,7,8-TeCDF



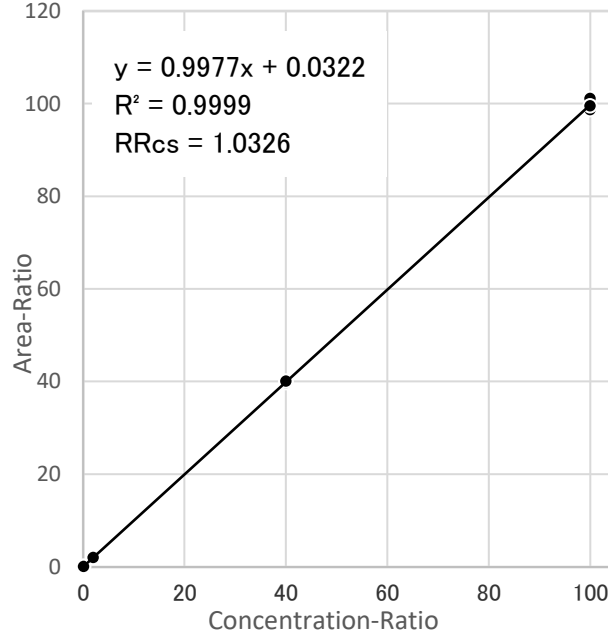
1,2,3,7,8-PeCDF



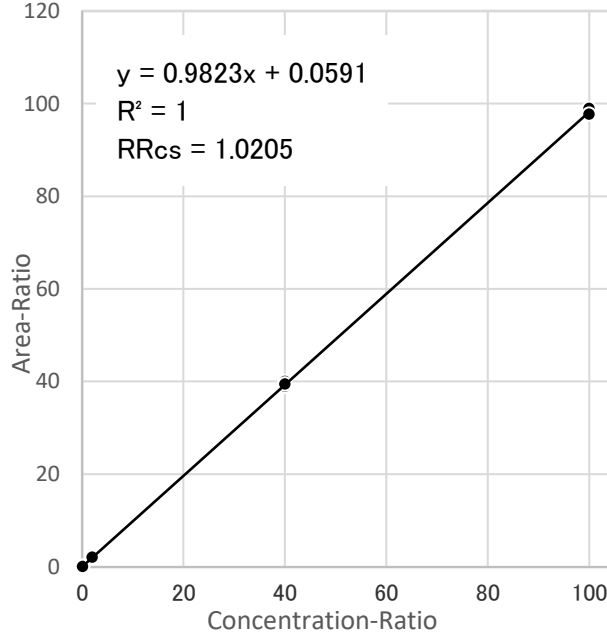
2,3,4,7,8-PeCDF



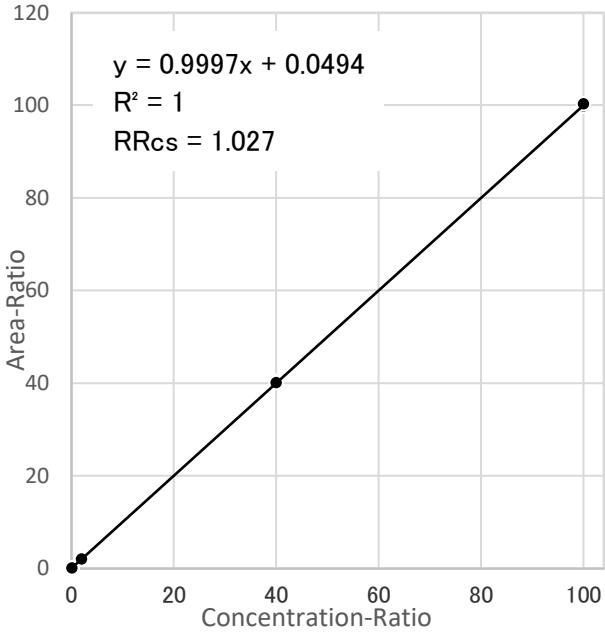
1,2,3,4,7,8-HxCDF



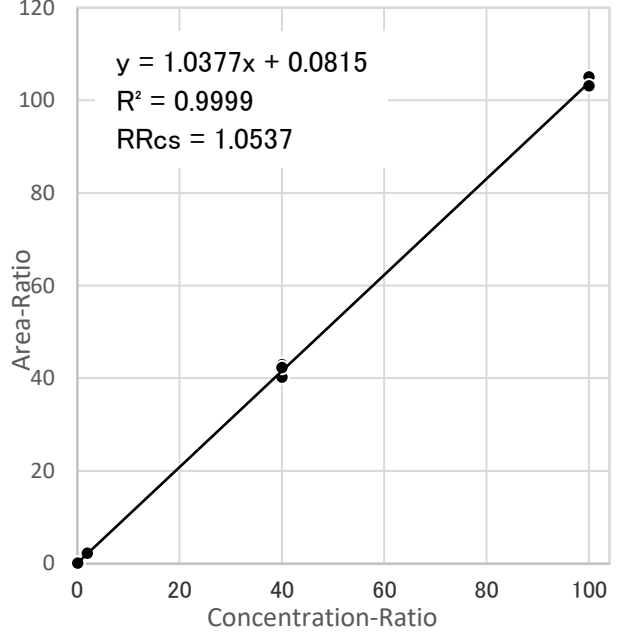
1,2,3,6,7,8-HxCDF



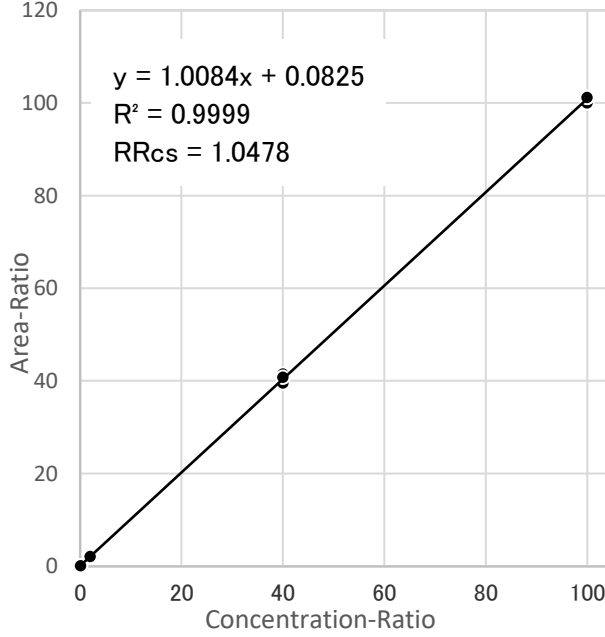
1,2,3,7,8,9-HxCDF



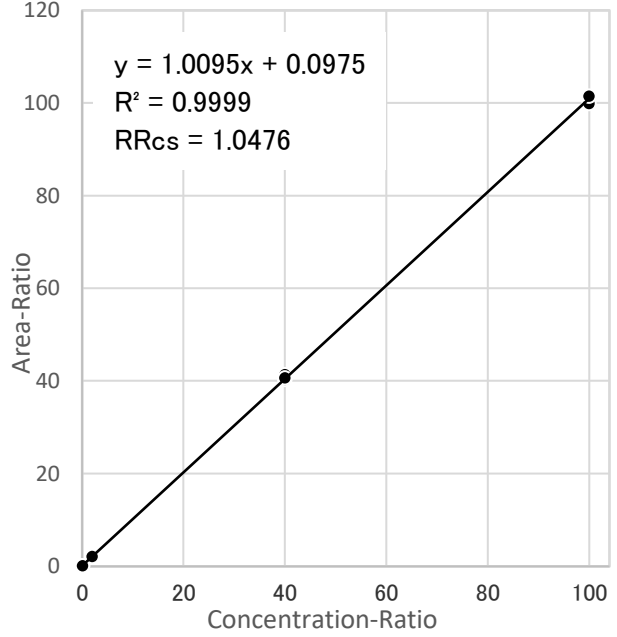
2,3,4,6,7,8-HxCDF



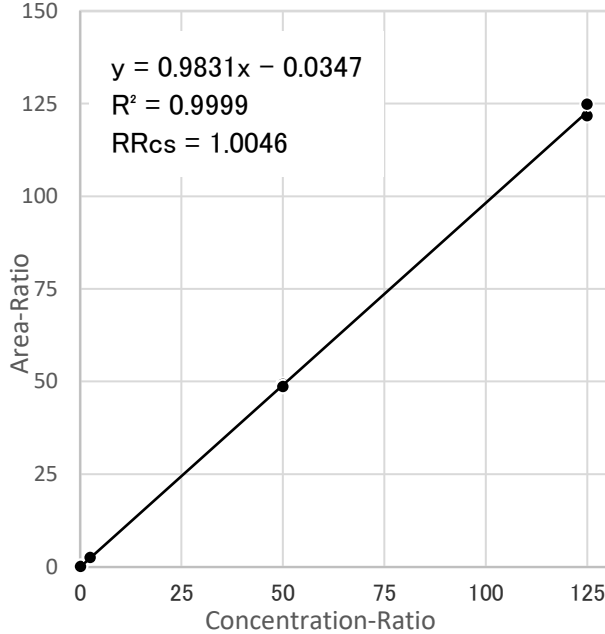
1,2,3,4,6,7,8-HpCDF



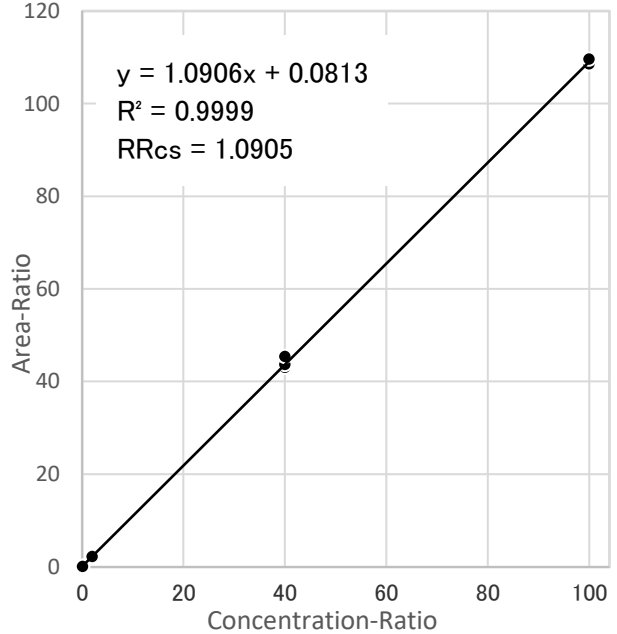
1,2,3,4,7,8,9-HpCDF



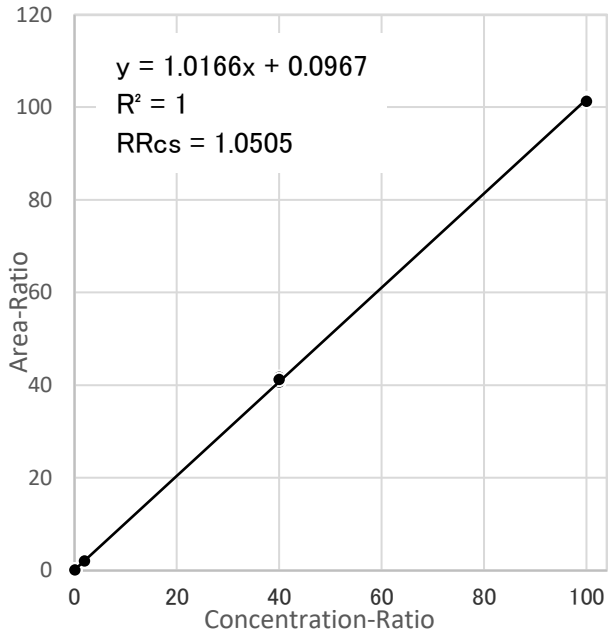
1,2,3,4,6,7,8,9-OCDF



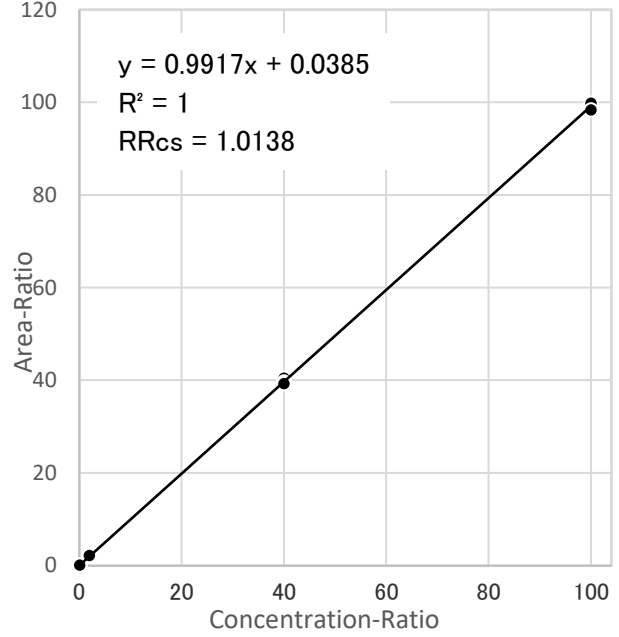
3,4,4',5-TeCB(#81)



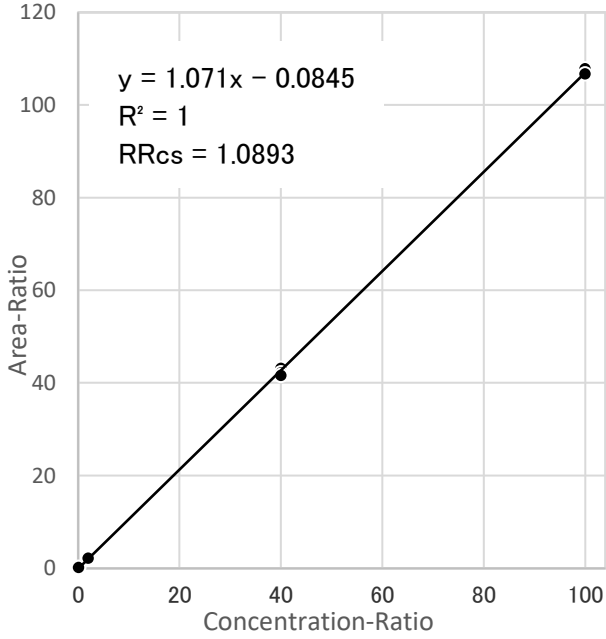
3,3',4,4'-TeCB(#77)



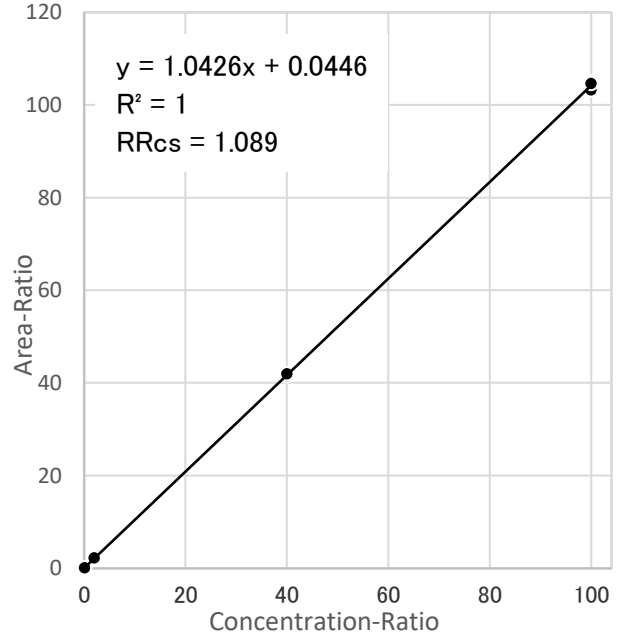
2',3,4,4',5-PeCB(#123)



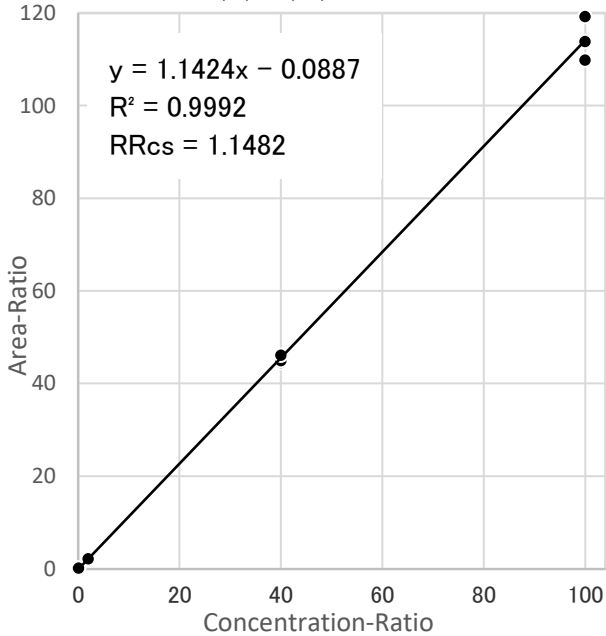
2,3,3',4,4'-PeCB(#105)



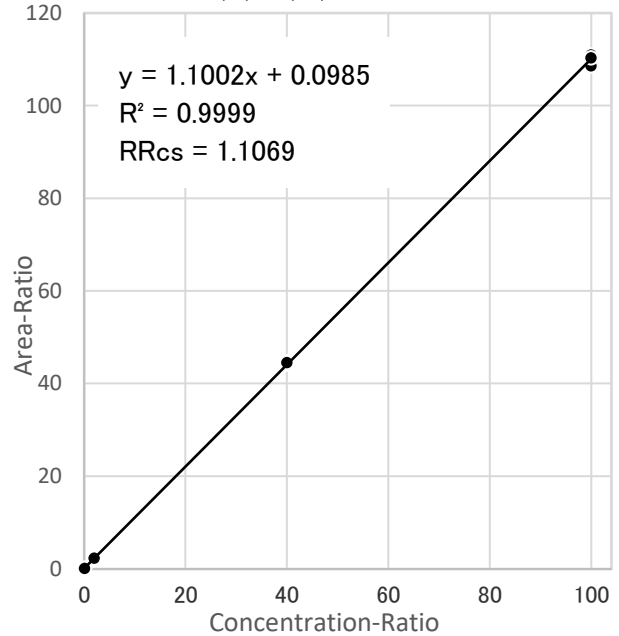
3,3',4,4',5-PeCB(#126)



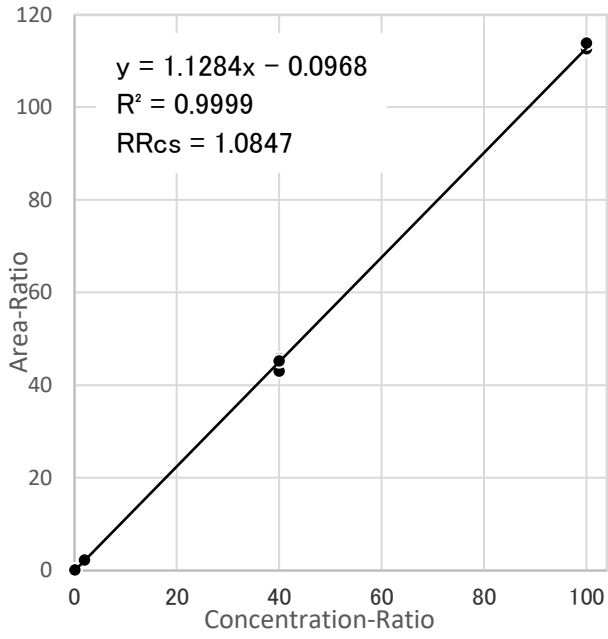
2,3,3',4,4',5-HxCB(#156)



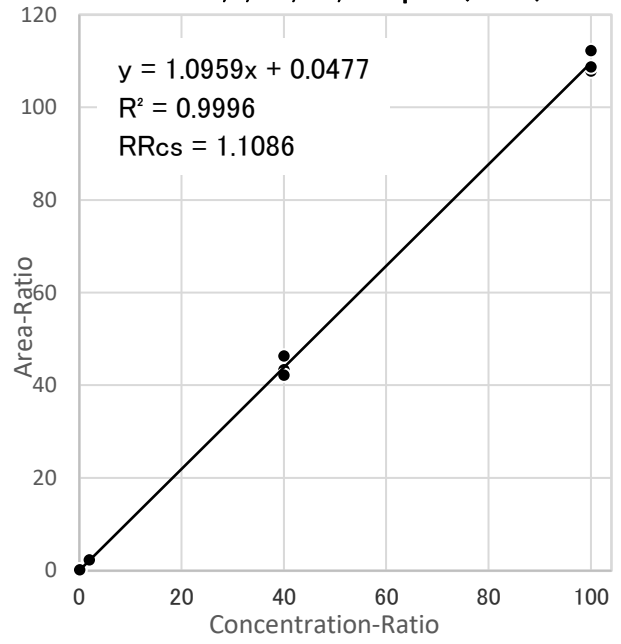
2,3,3',4,4',5'-HxCB(#157)



3,3',4,4',5,5'-HxCB(#169)

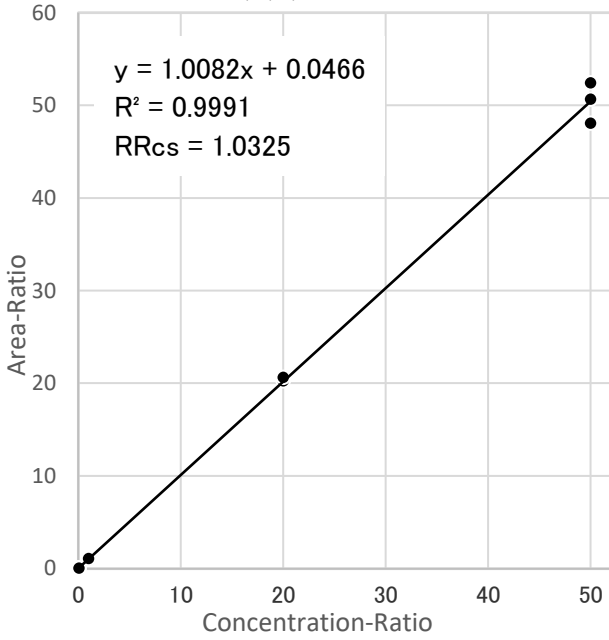


2,3,3',4,4',5,5'-HpCB(#189)

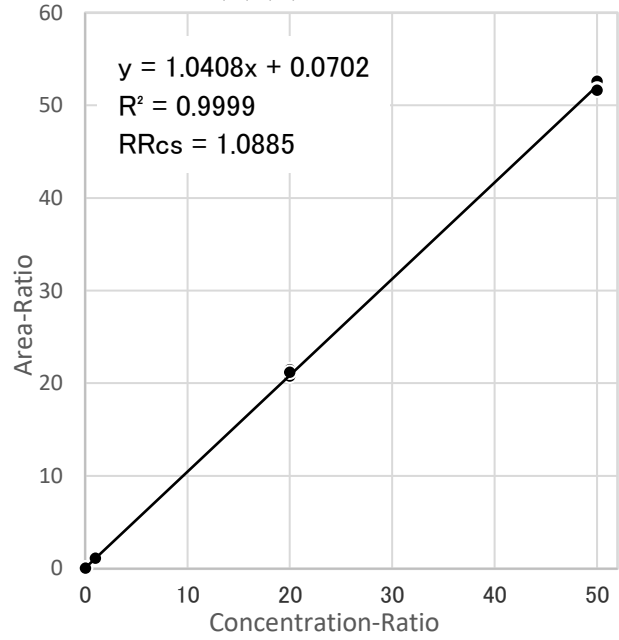




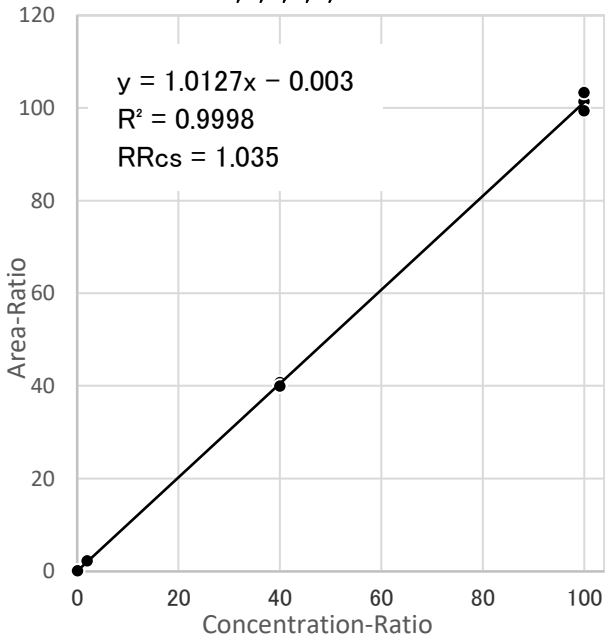
**2,3,7,8-TeCDD**



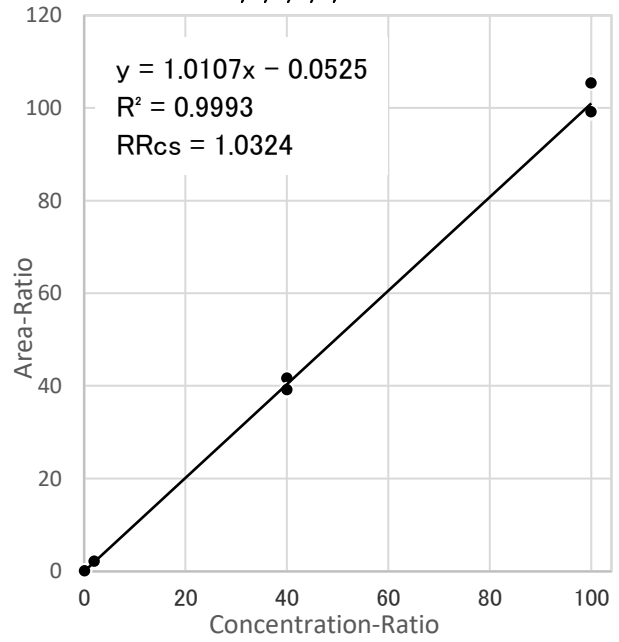
**1,2,3,7,8-PeCDD**



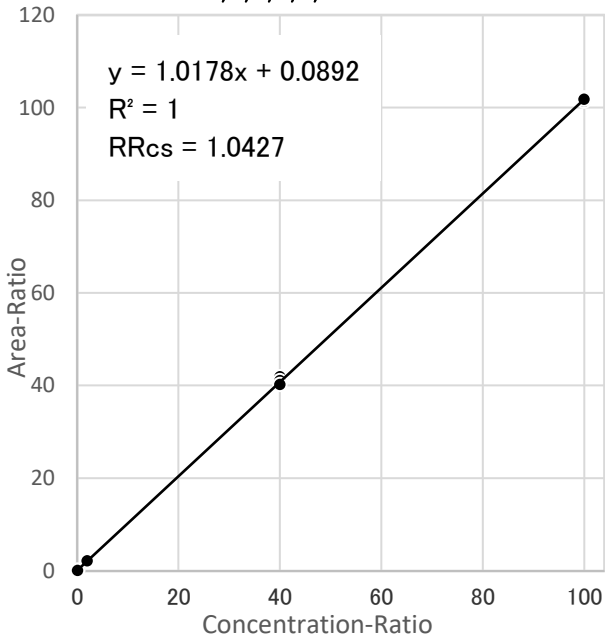
**1,2,3,4,7,8-HxCDD**



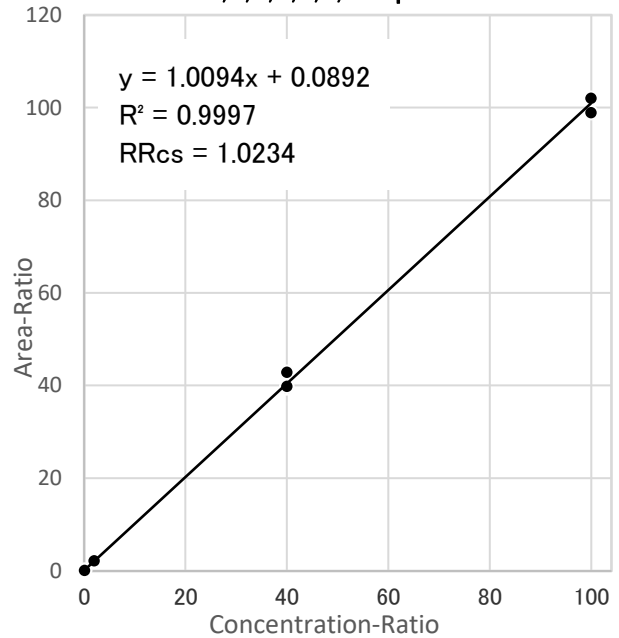
**1,2,3,6,7,8-HxCDD**



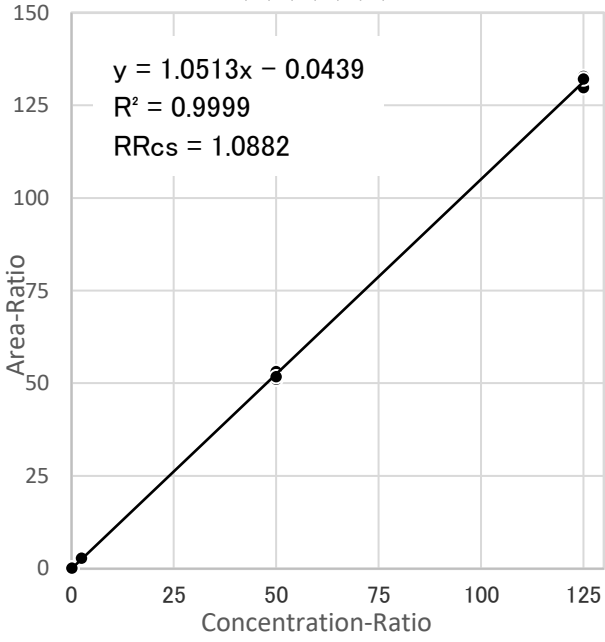
**1,2,3,7,8,9-HxCDD**



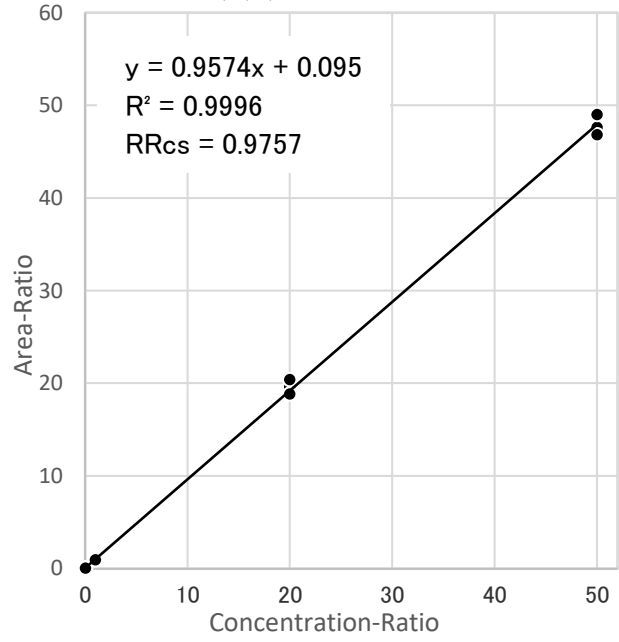
**1,2,3,4,6,7,8-HpCDD**



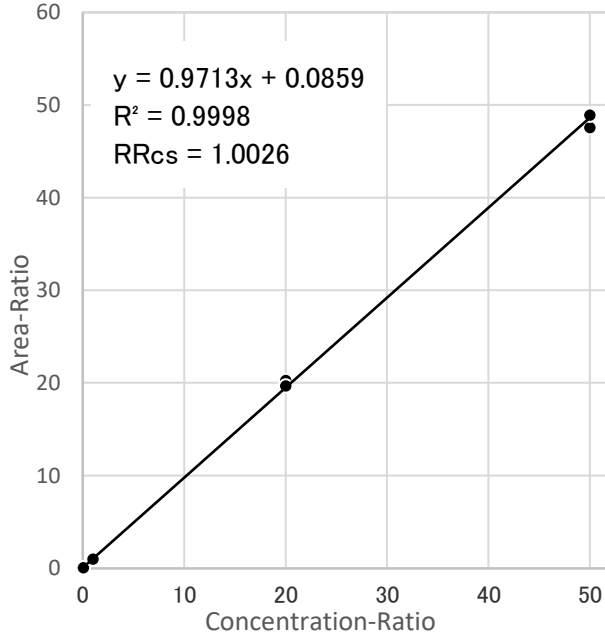
**1,2,3,4,6,7,8,9-OCDD**



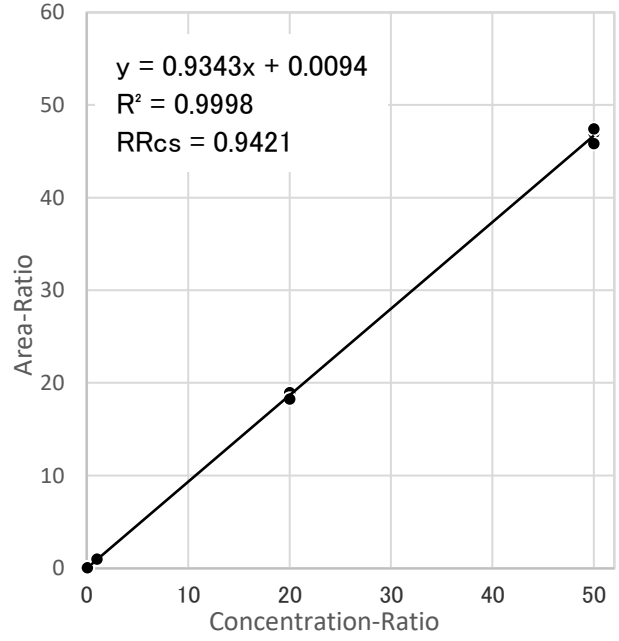
**2,3,7,8-TeCDF**



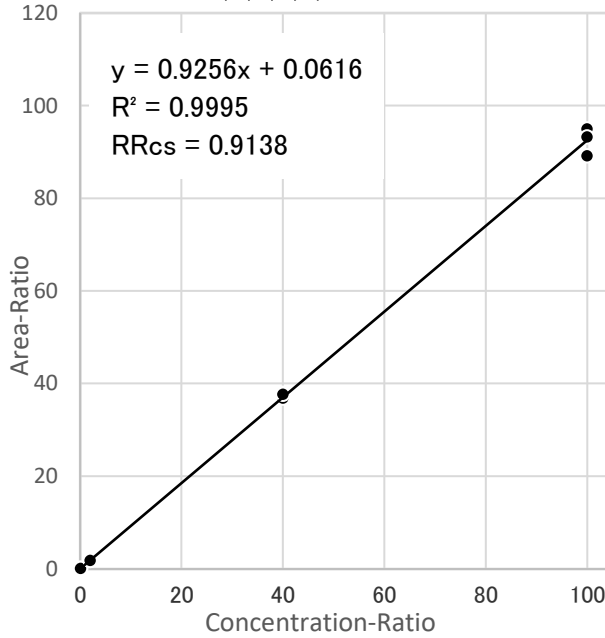
**1,2,3,7,8-PeCDF**



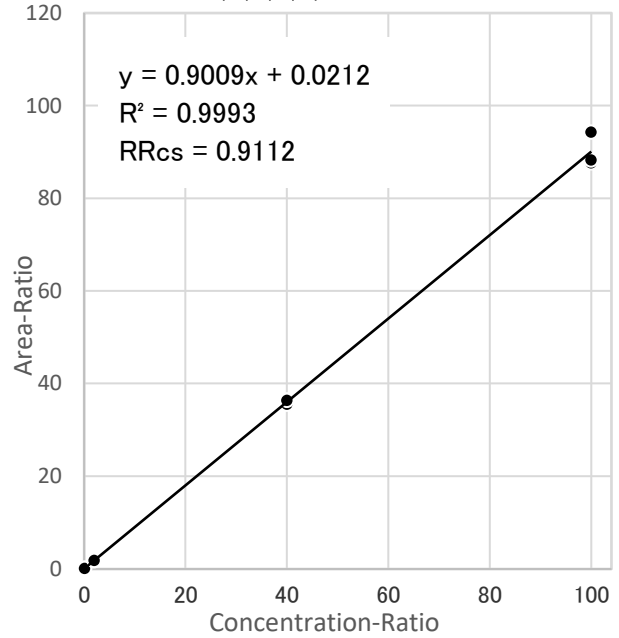
**2,3,4,7,8-PeCDF**



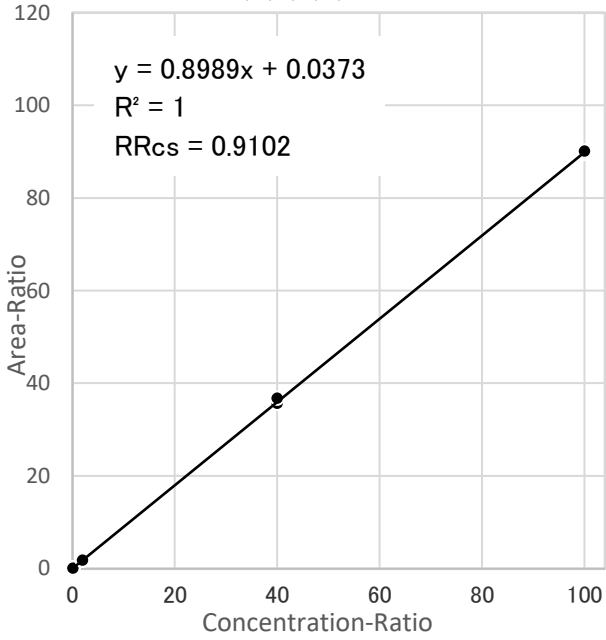
**1,2,3,4,7,8-HxCDF**



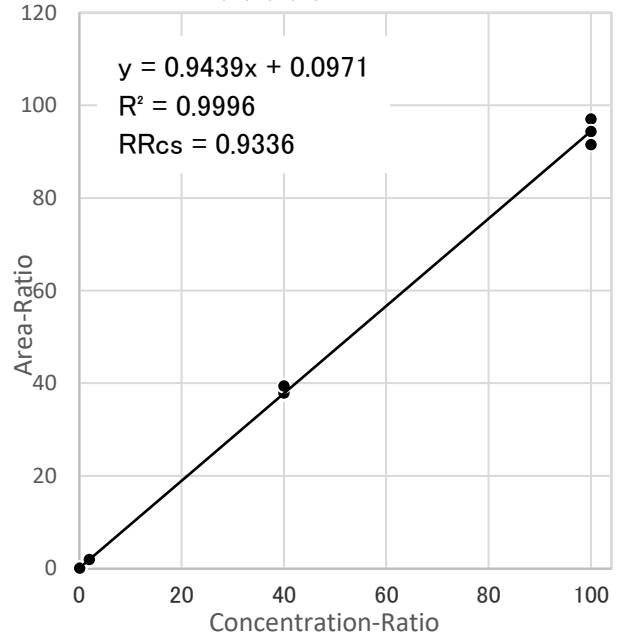
**1,2,3,6,7,8-HxCDF**



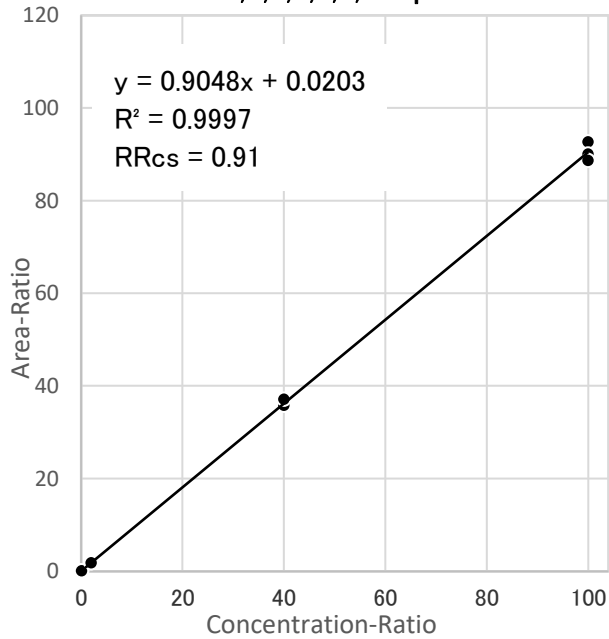
1,2,3,7,8,9-HxCDF



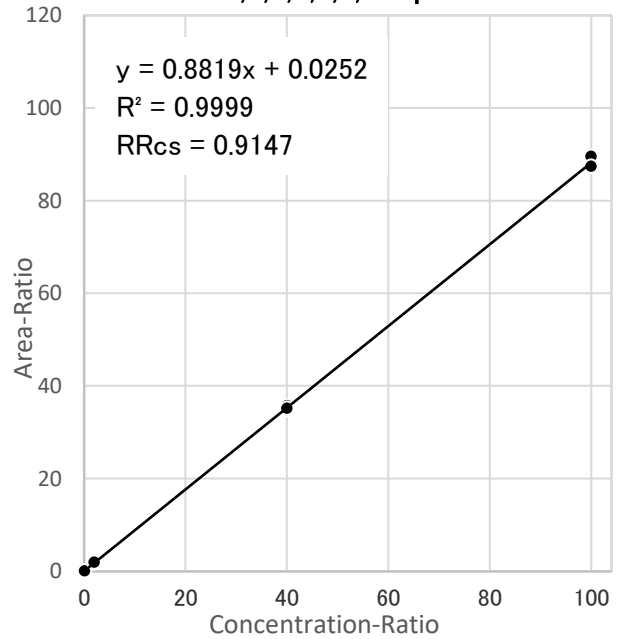
2,3,4,6,7,8-HxCDF



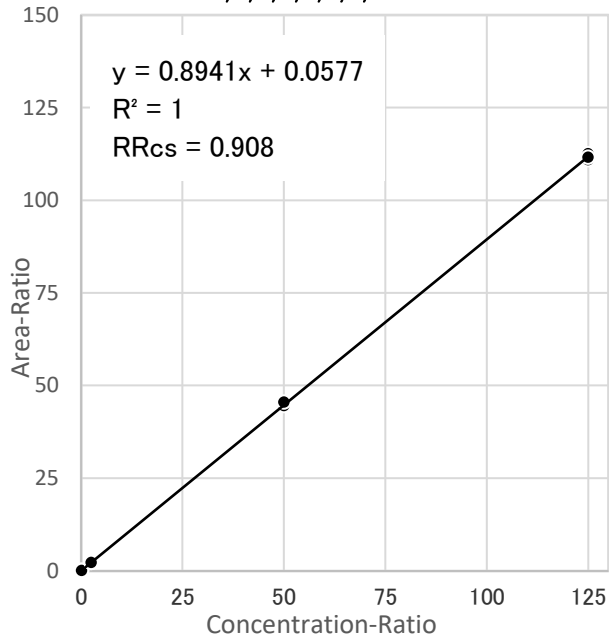
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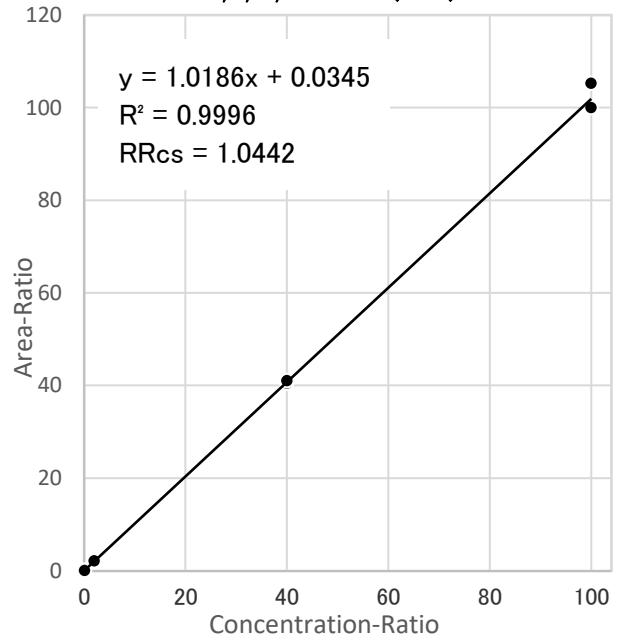
1,2,3,4,7,8,9-HpCDF

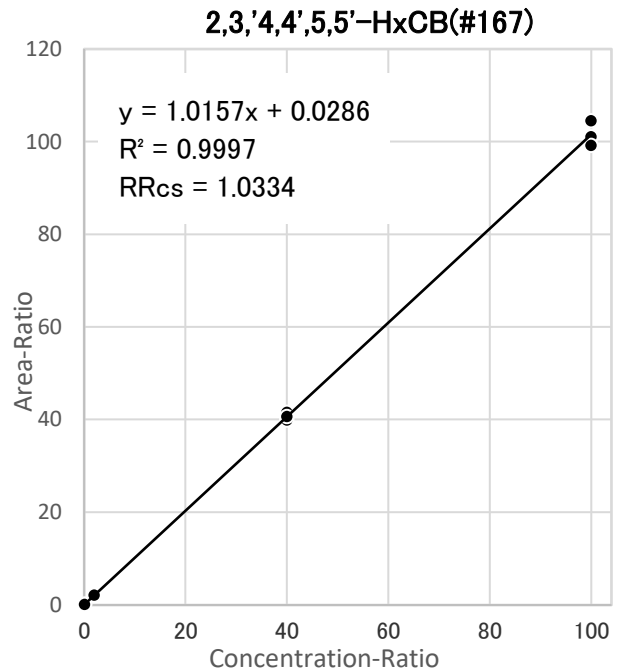
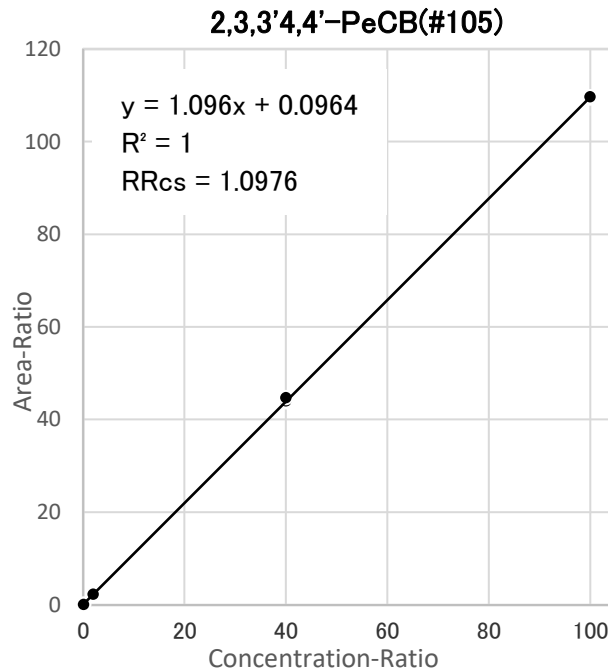
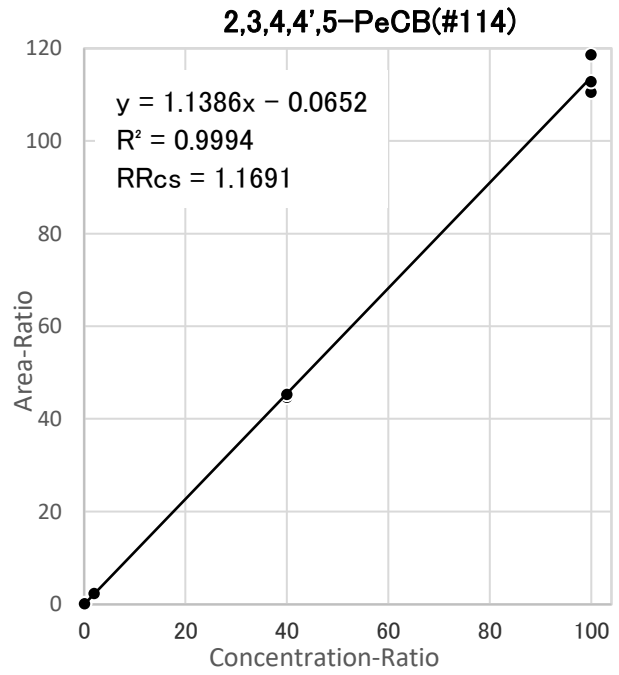
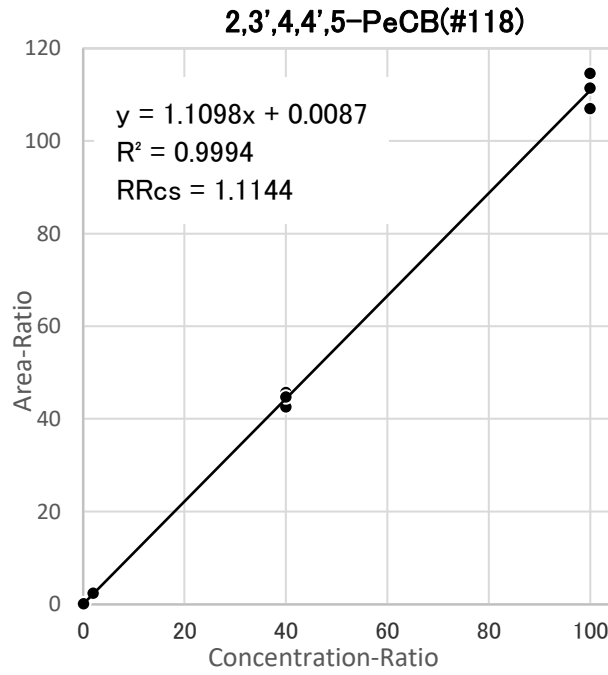
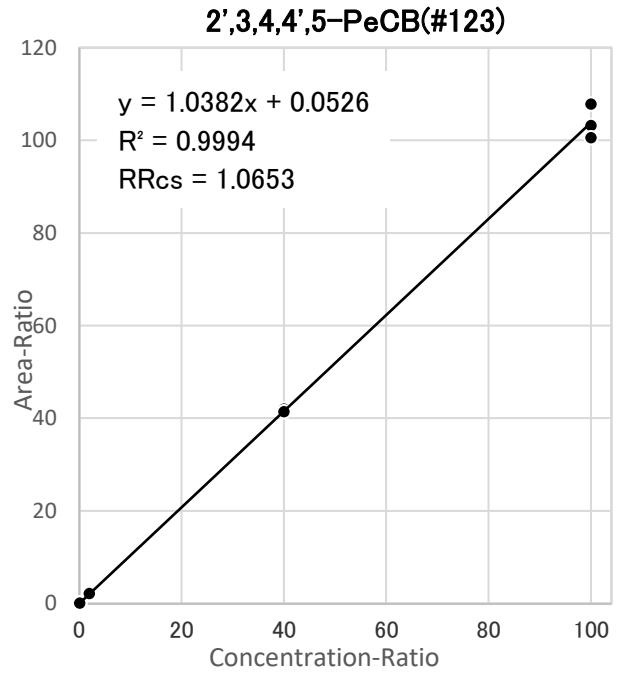
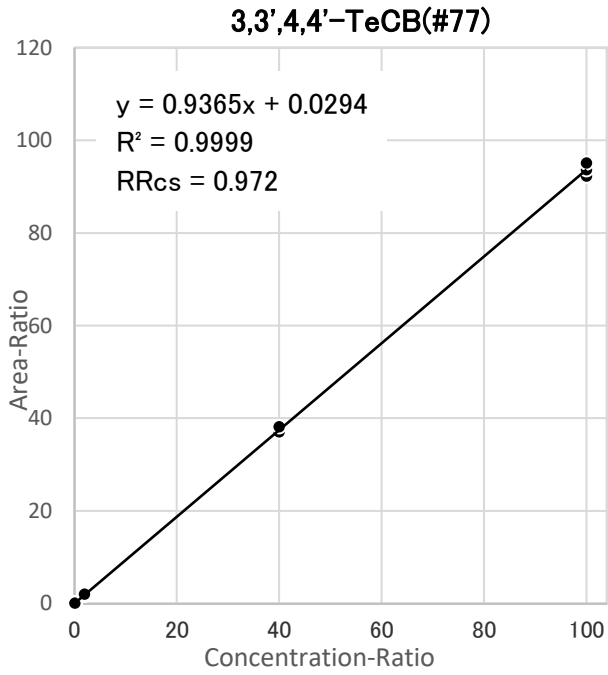


1,2,3,4,6,7,8,9-OCDF

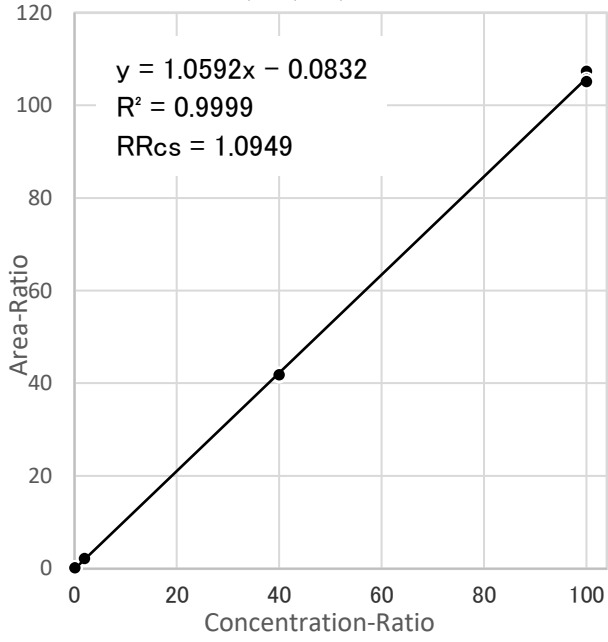


3,4,4',5-TeCB(#81)

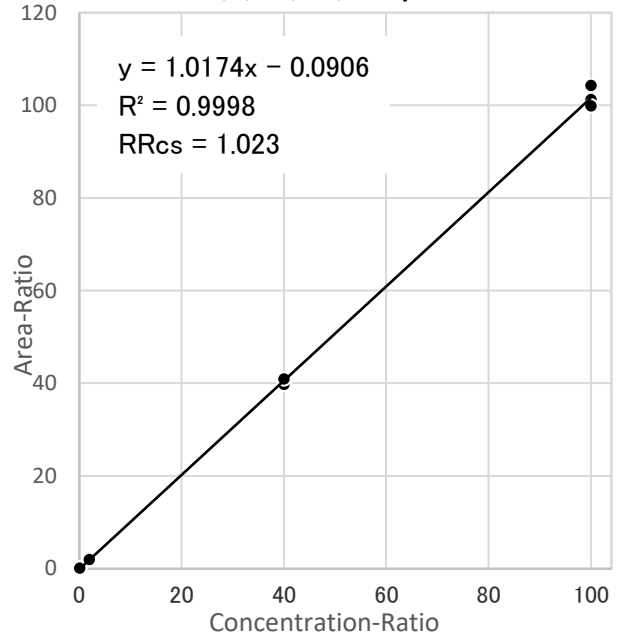




3,3',4,4',5,5'-HxCB(#169)



2,3,3',4,4',5,5'-HpCB(#189)

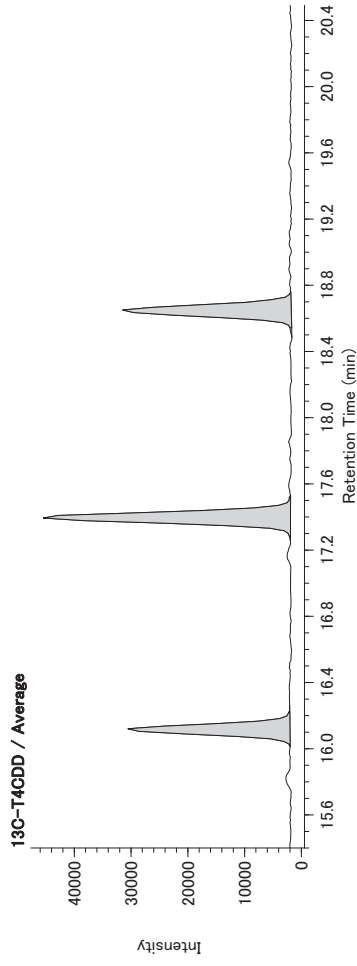
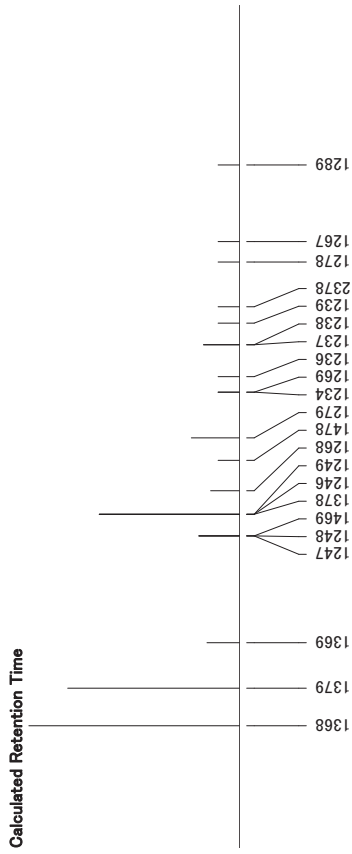
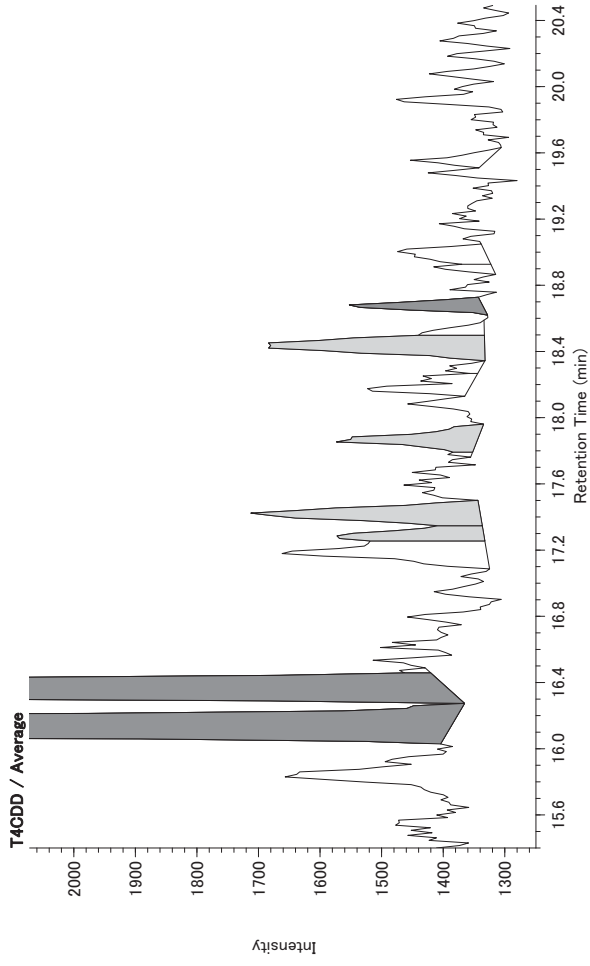
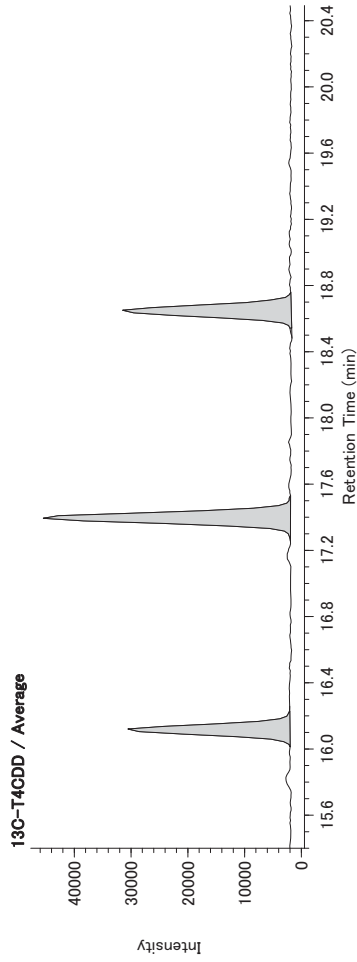
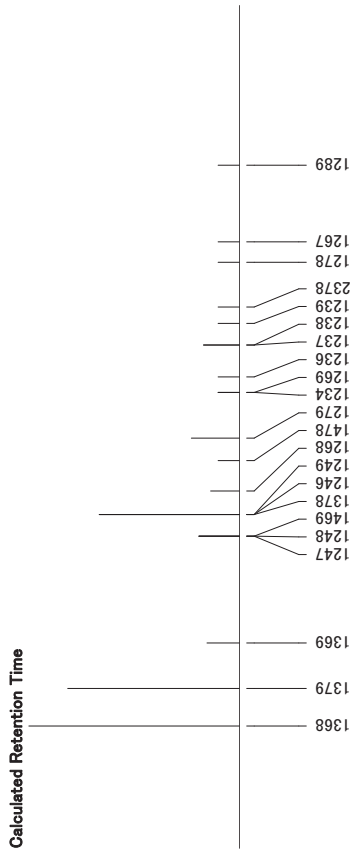
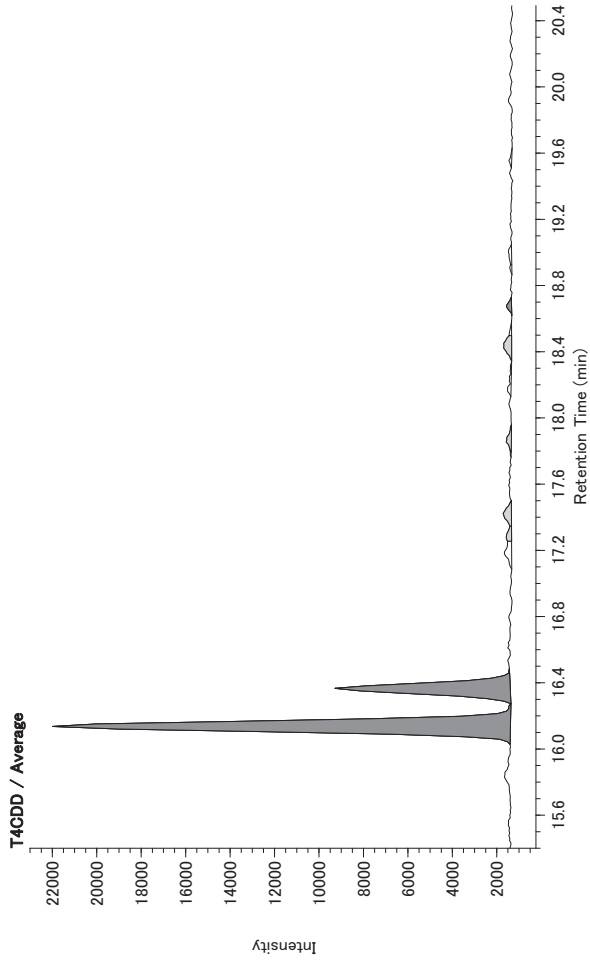


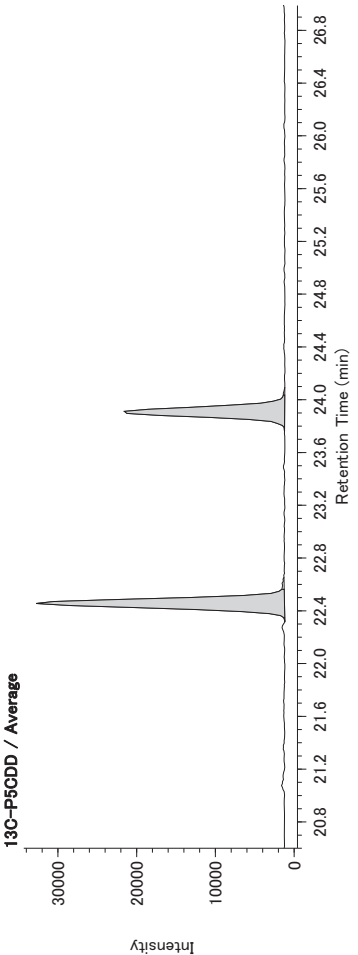
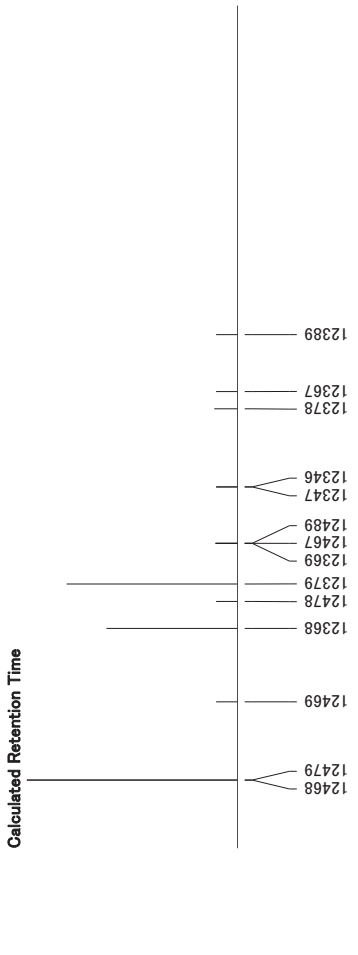
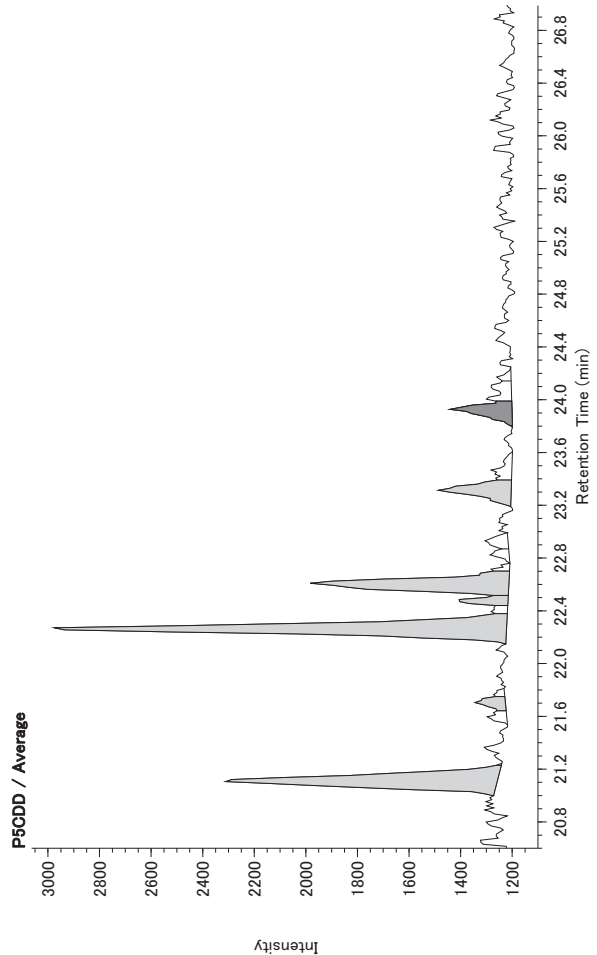
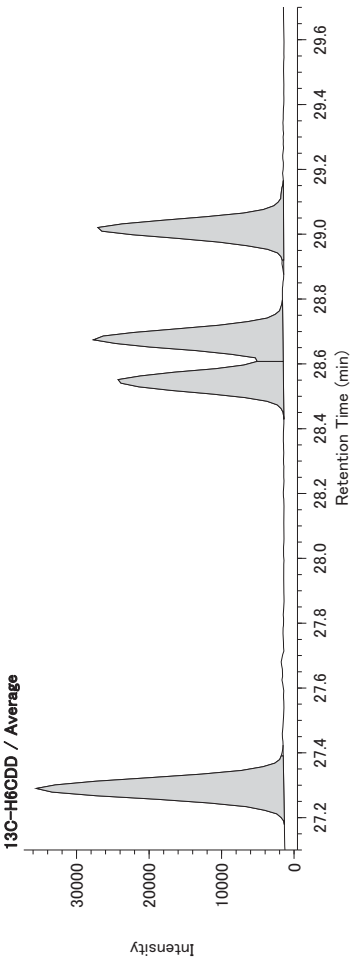
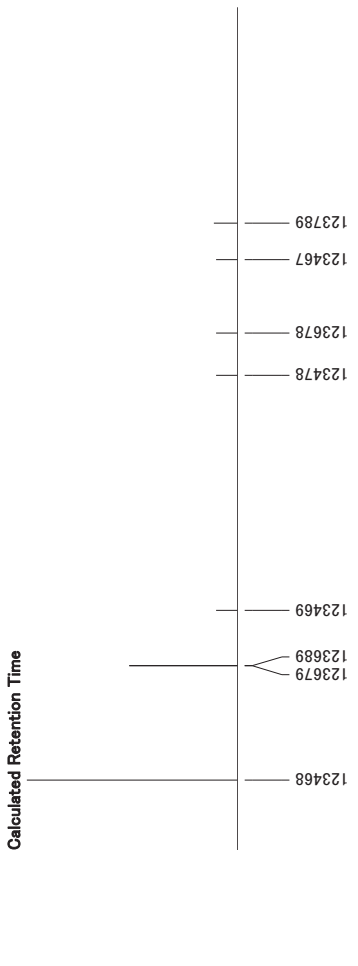
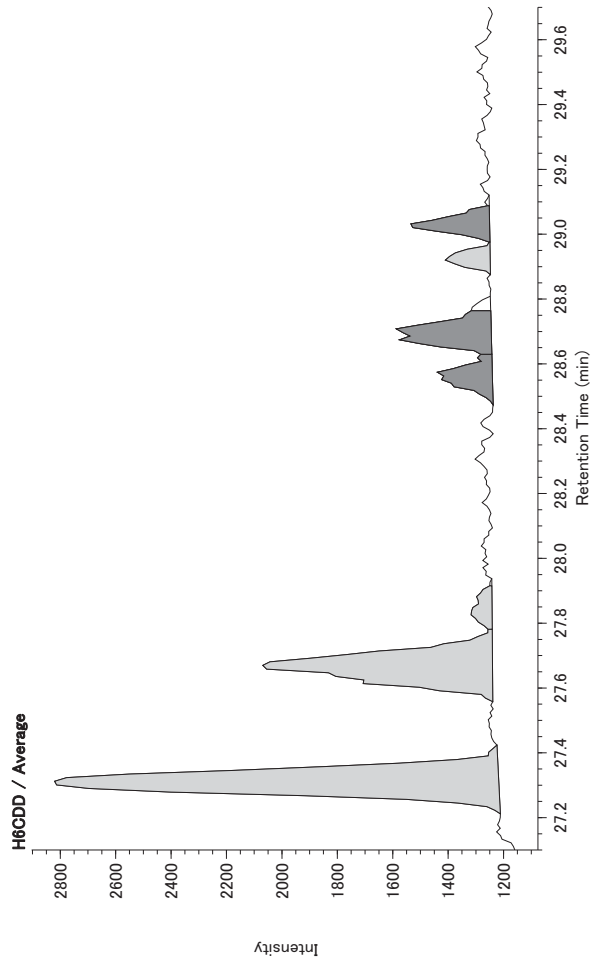
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22HS12478P

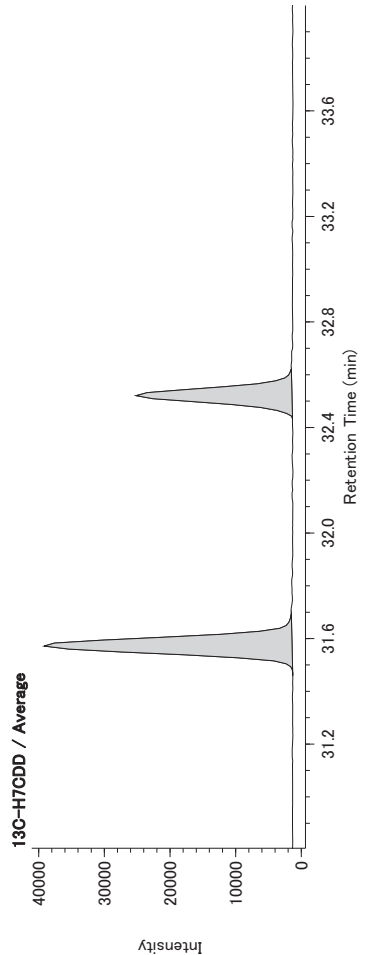
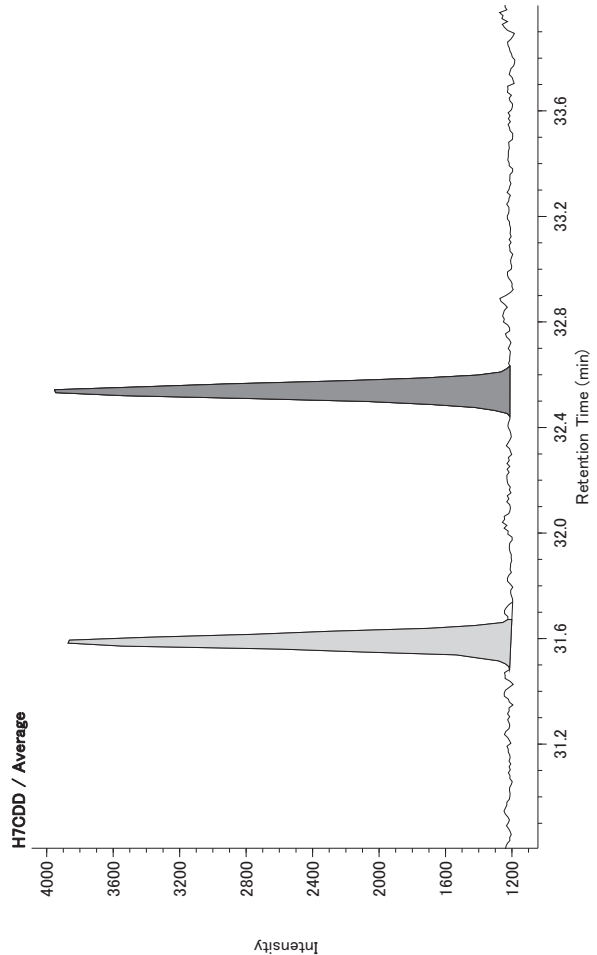
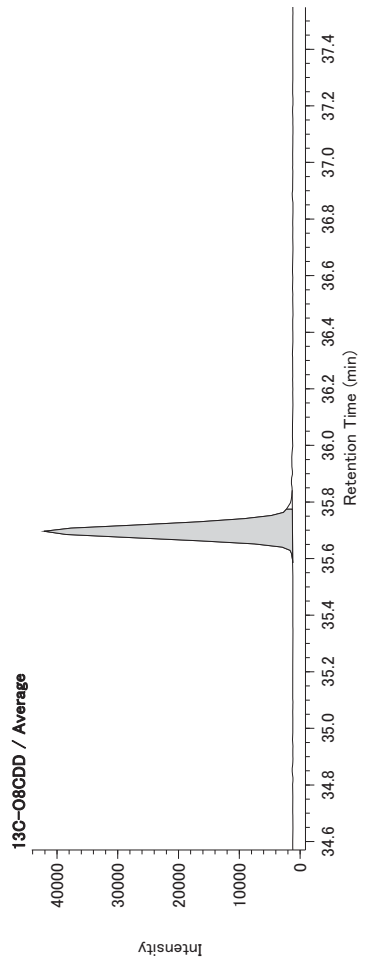
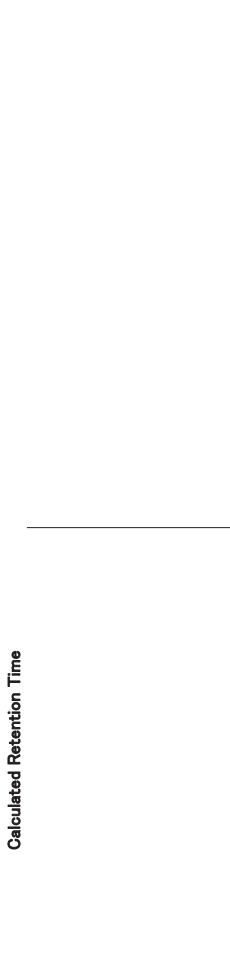
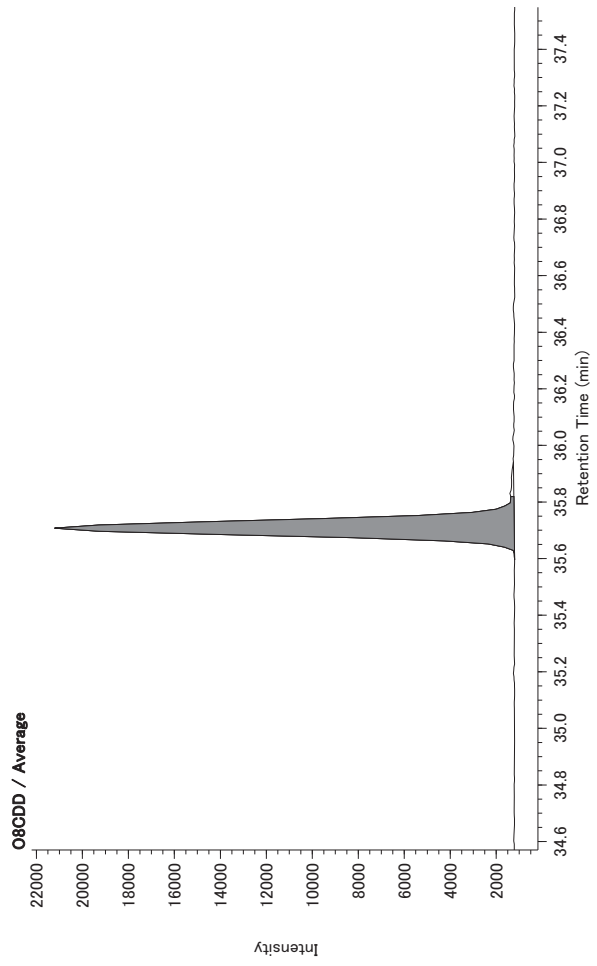
煙道内焼却残渣

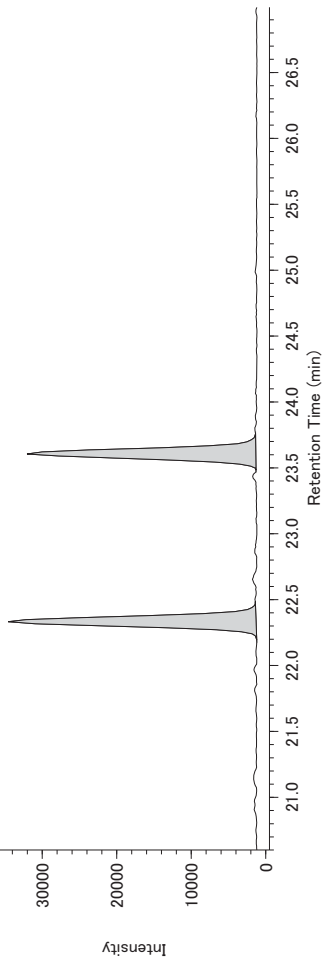
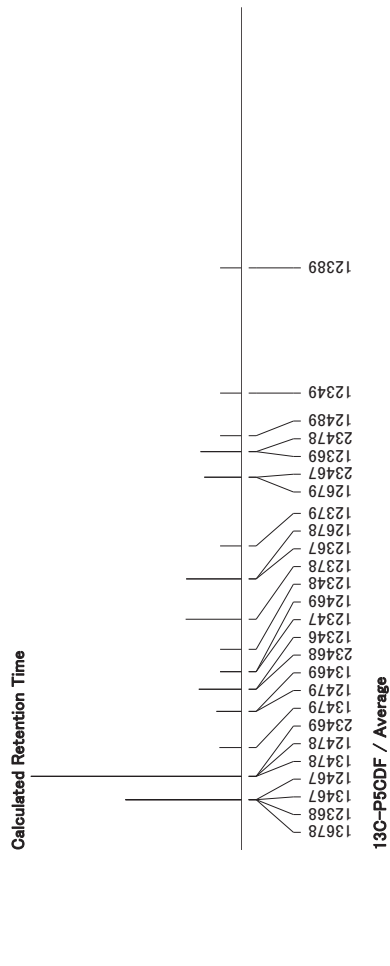
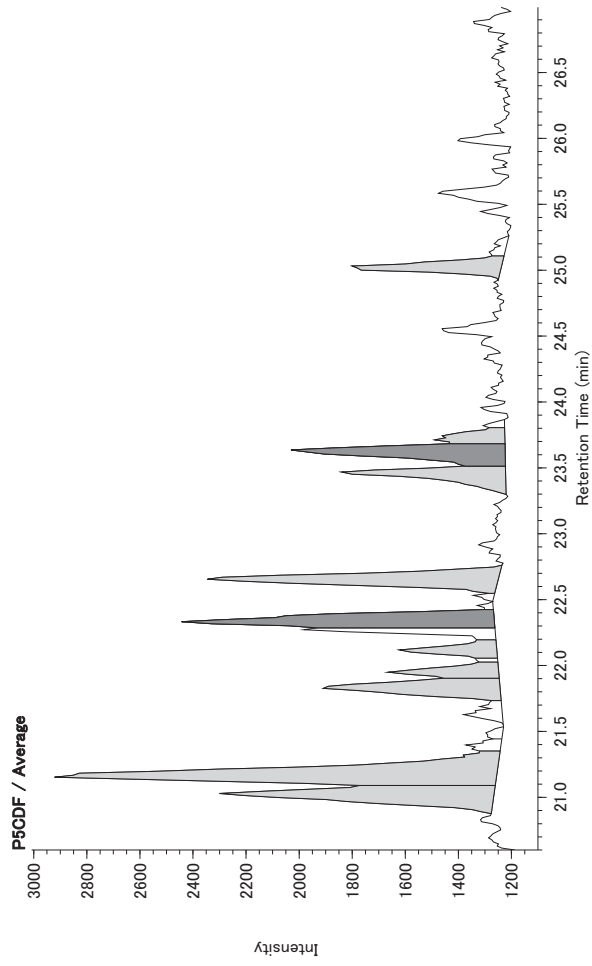
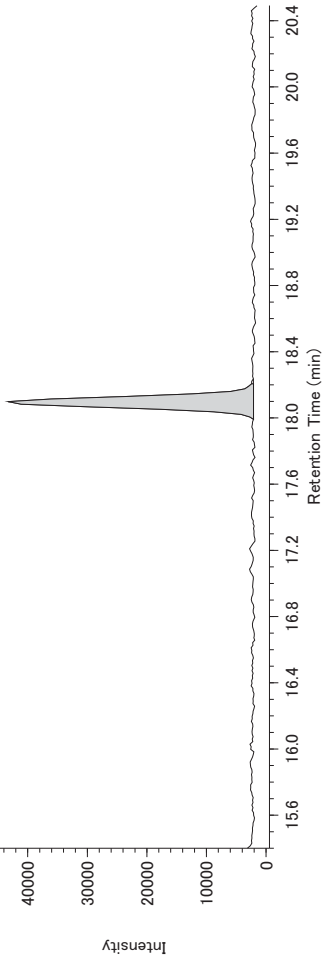
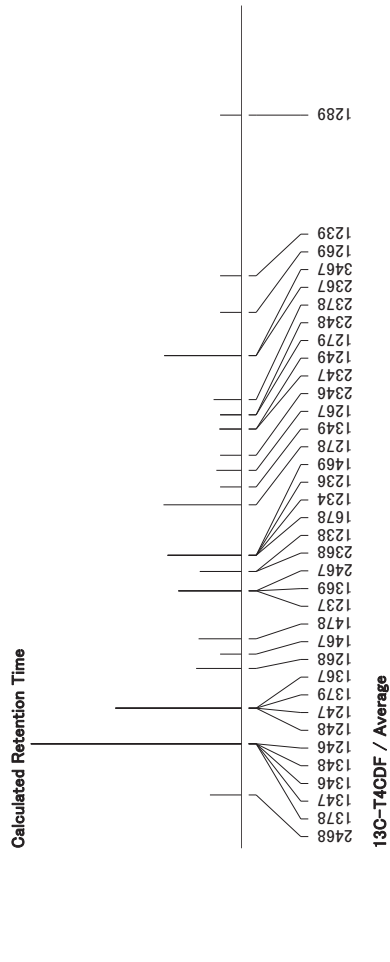
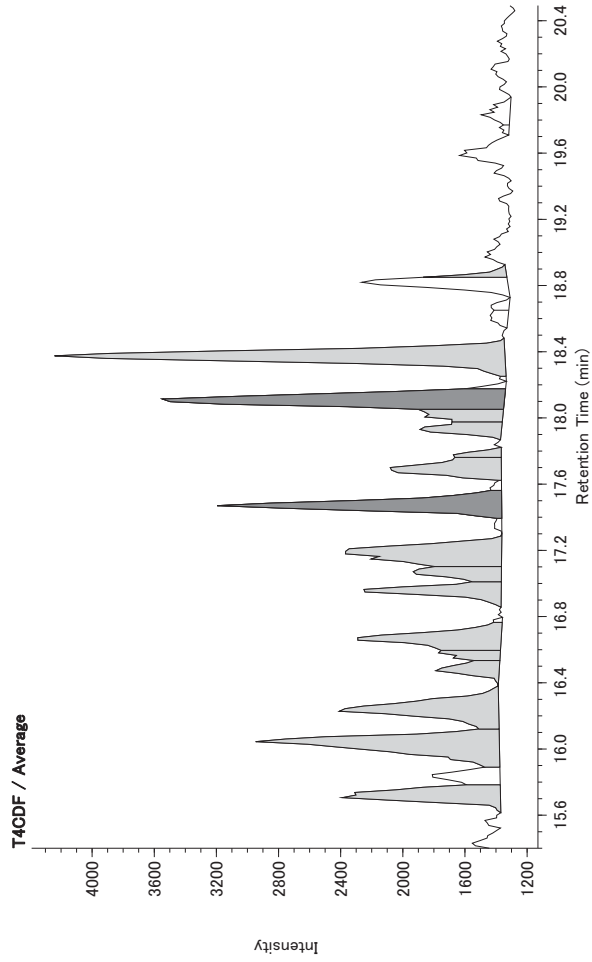
どらドラパーク米子市民体育館  
機械室 煙道

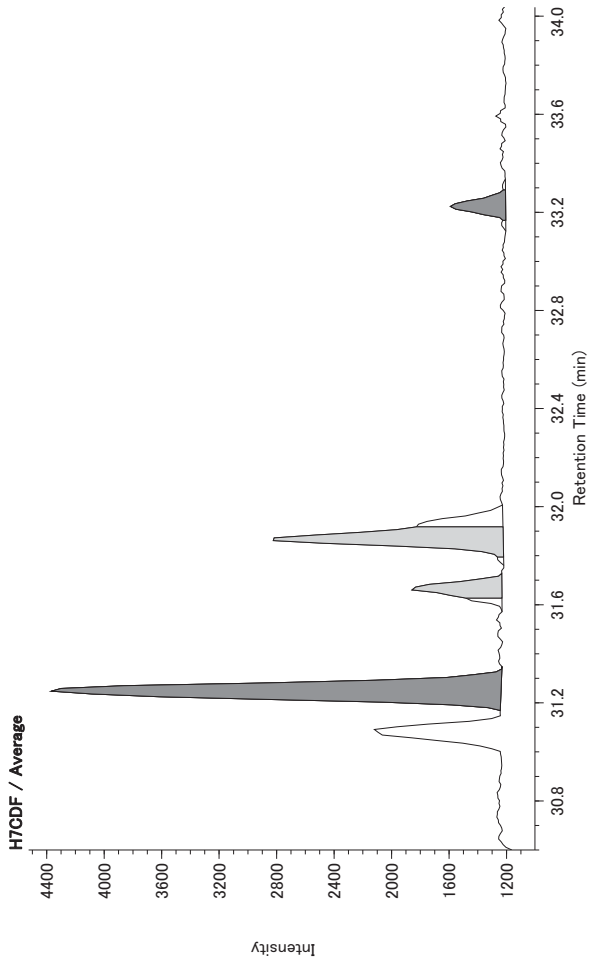




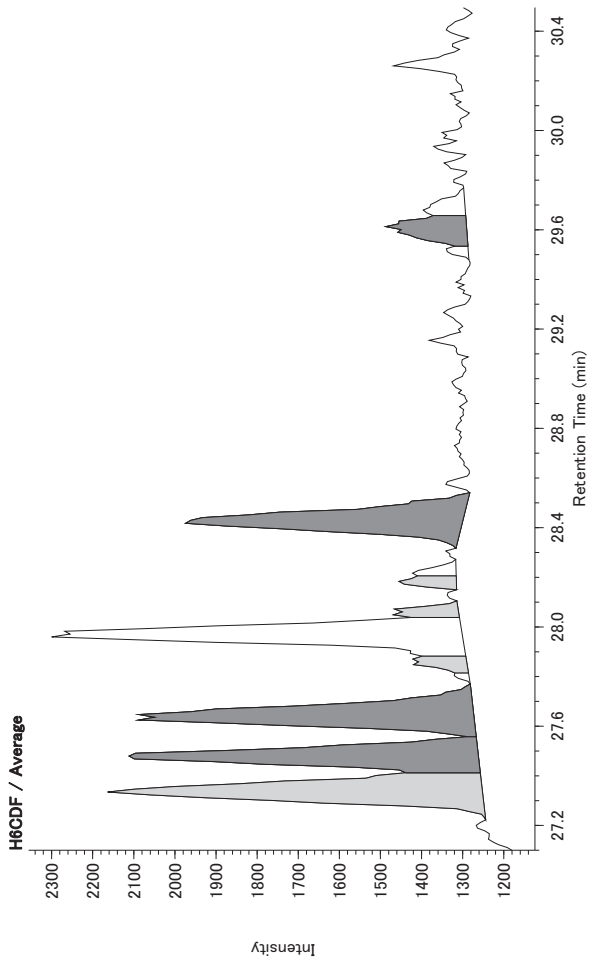
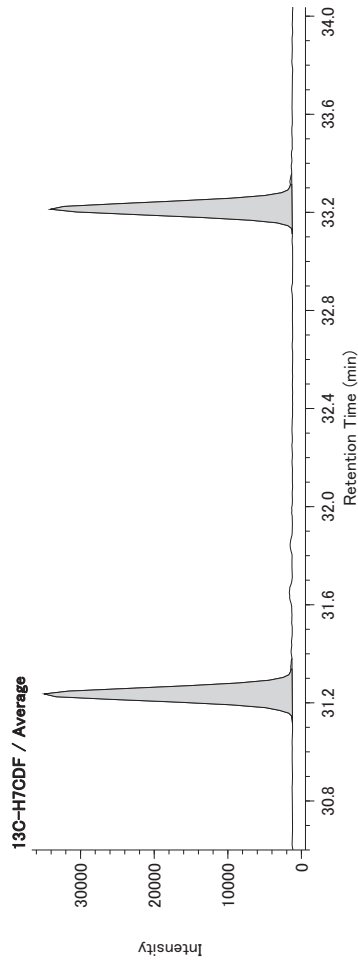
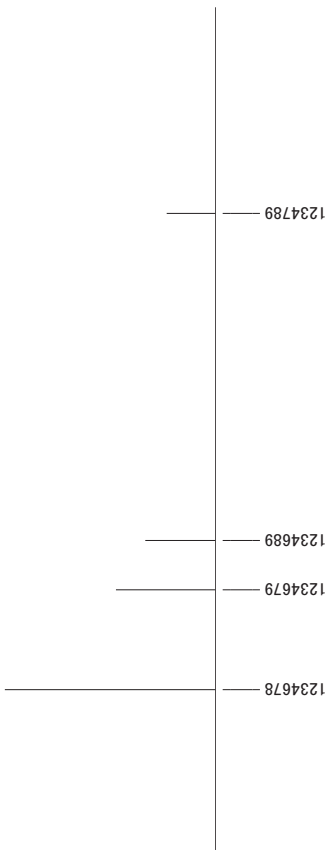




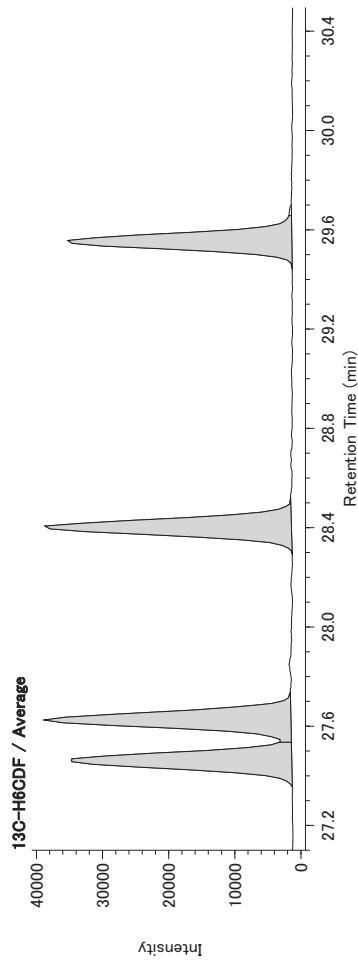
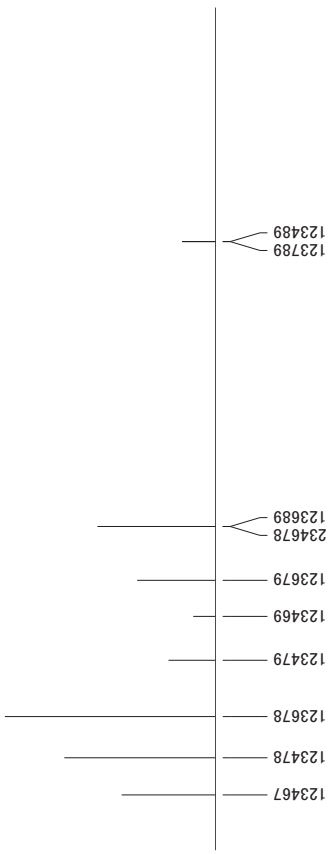




Calculated Retention Time



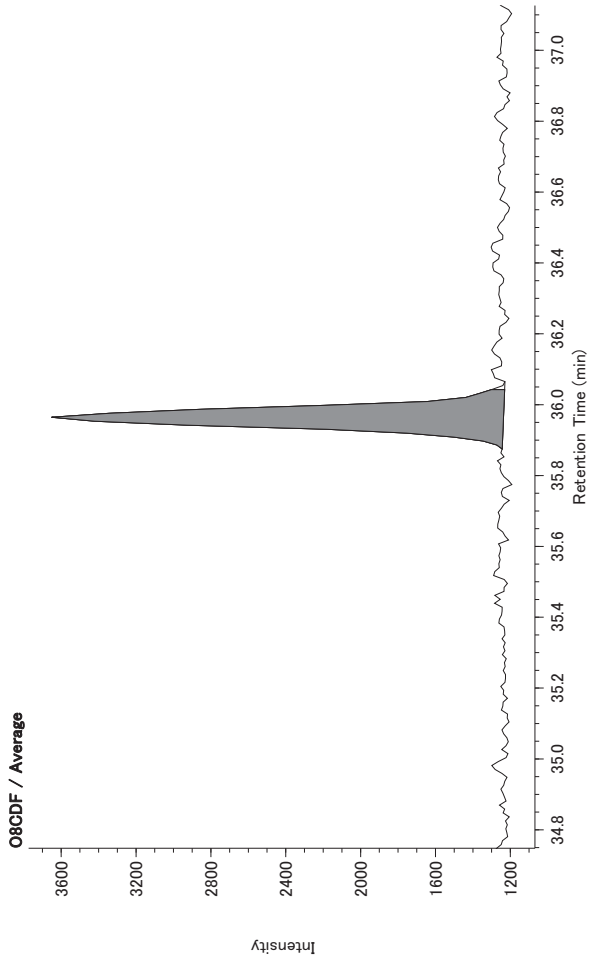
Calculated Retention Time



**DQ Main View**

DqData: si2023-0313-BPX-1 ( ), Injection= 2023-0313-BPX-009 (UNK) 22hs12478  
Original: 2023-0313-BPX-003.mfl, InjectionNo= 6, Sample= , Date= 2023/3/13 20:46:55

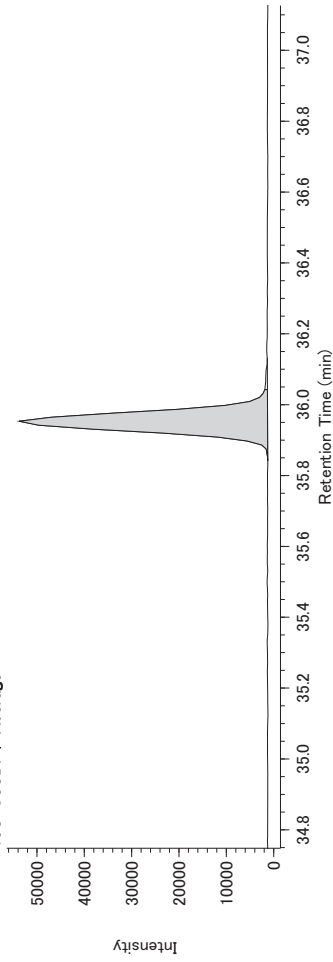
JEOL DioK V4.02 2023/03/14 18:10:14 Page 10



Calculated Retention Time



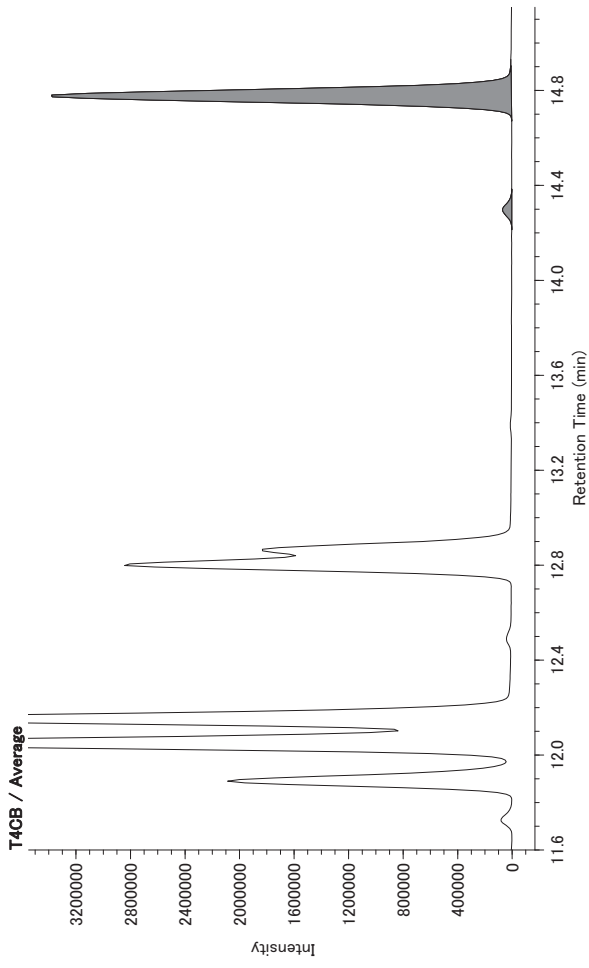
13C-O8CDF / Average



**DQ Main View**

DqData: si2023-0313-BPX-1 ( ), Injection= 2023-0313-BPX-009 (UNK) 22hs12478  
Original: 2023-0313-BPX-003.mfl, InjectionNo= 6, Sample= , Date= 2023/3/13 20:46:55

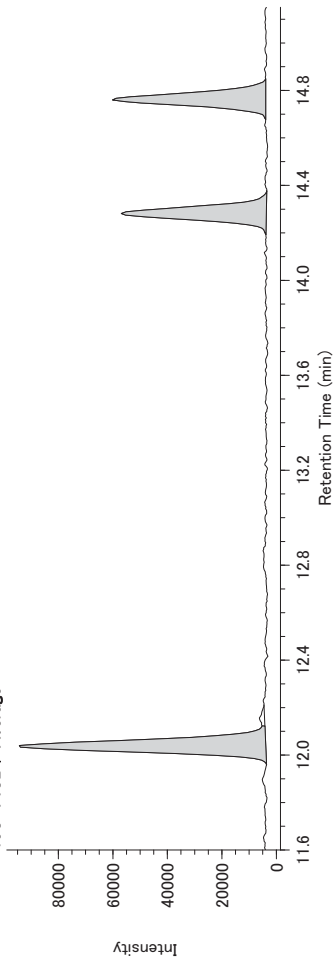
JEOL DioK V4.02 2023/03/14 14:00:54 Page 1

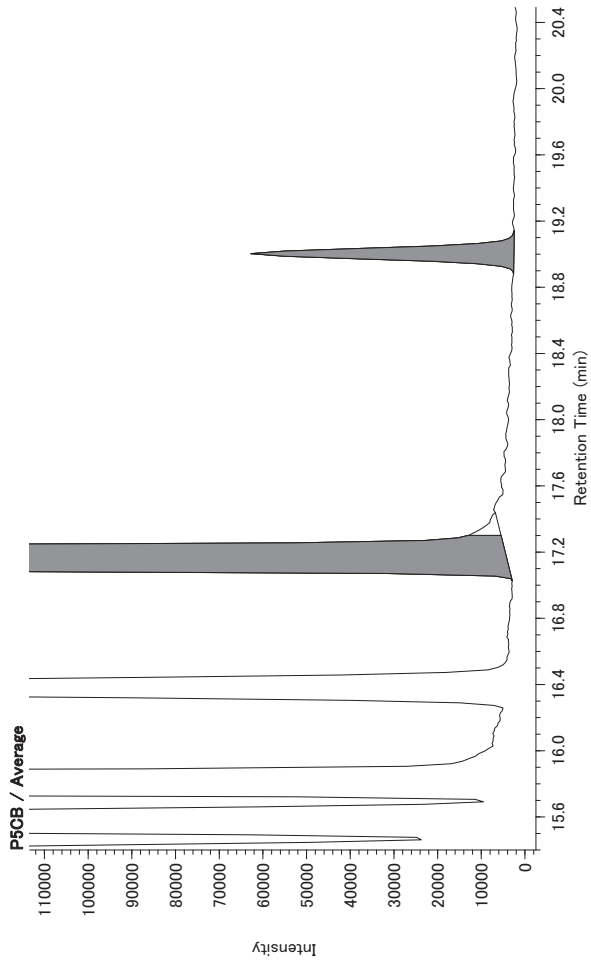


Calculated Retention Time

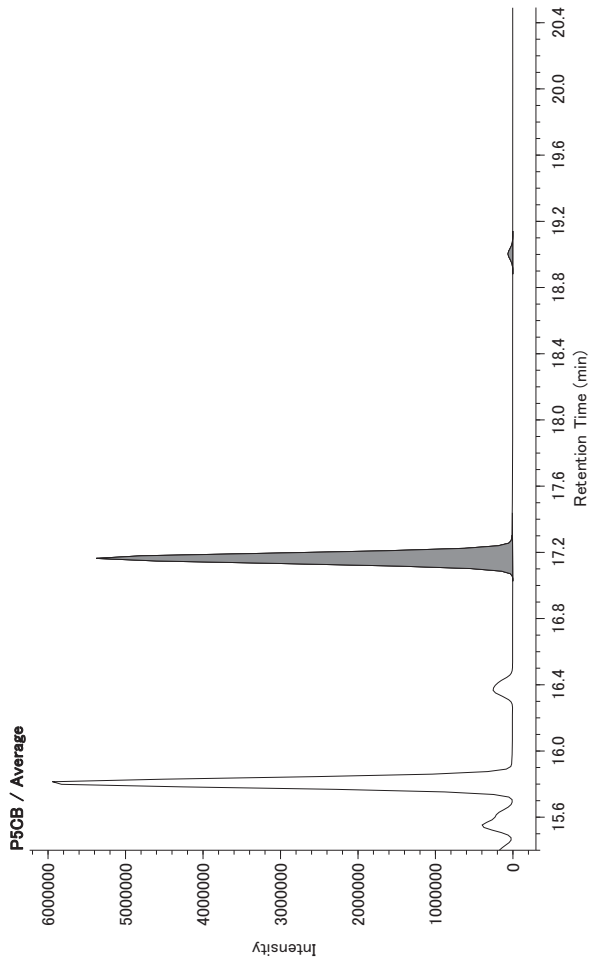
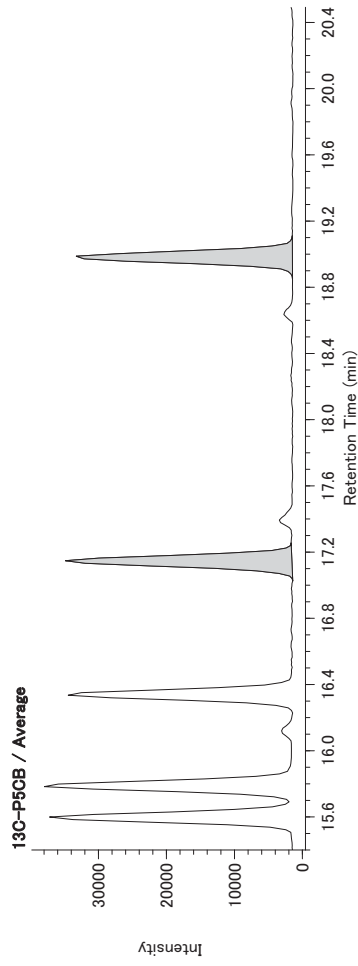
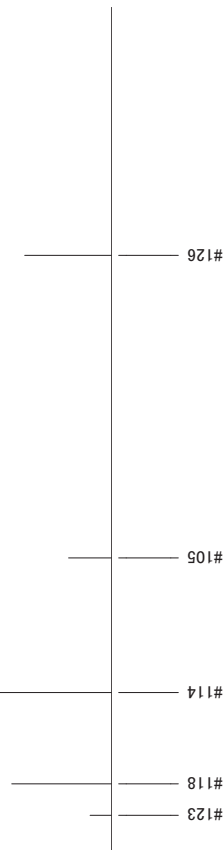


13C-T4CB / Average

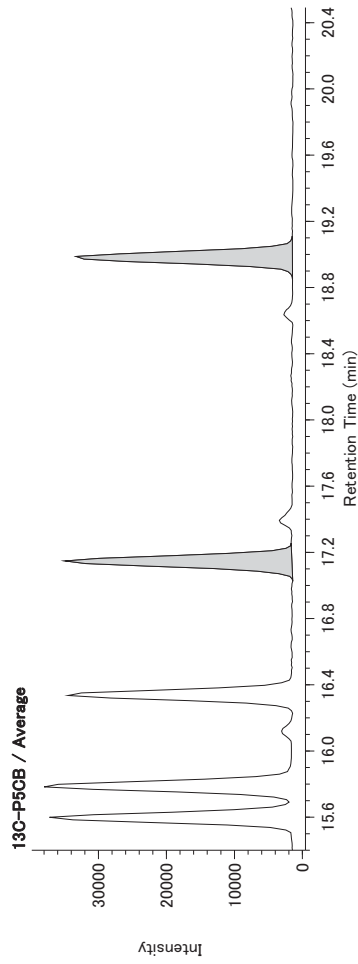
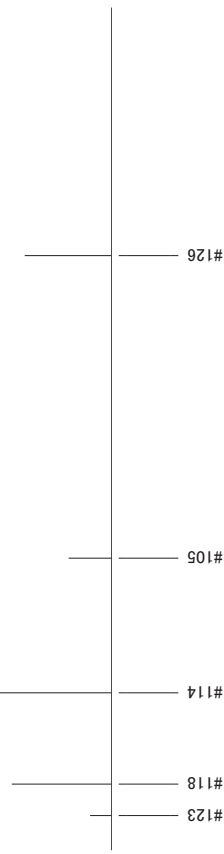


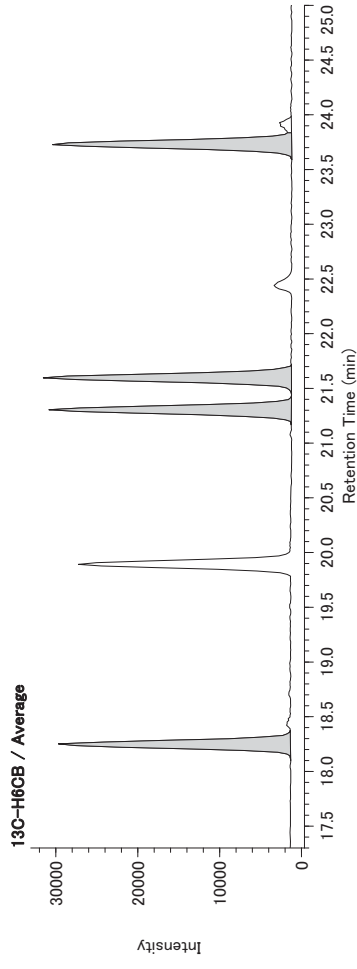
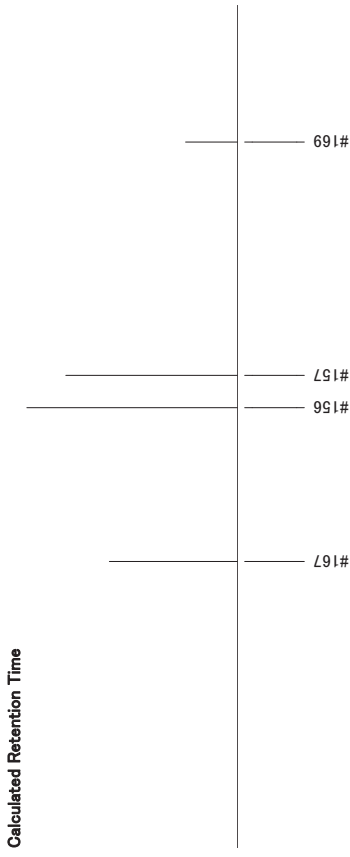
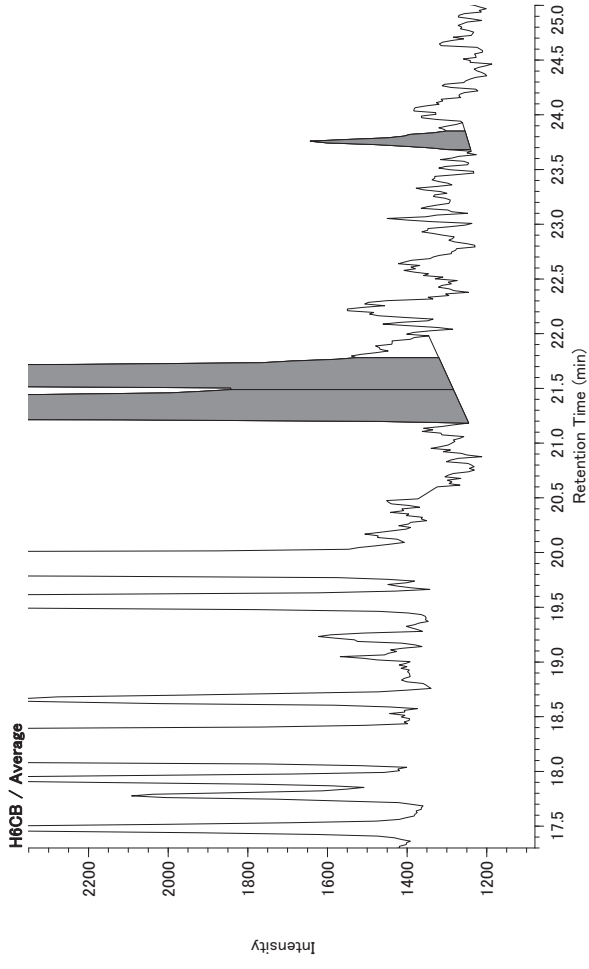
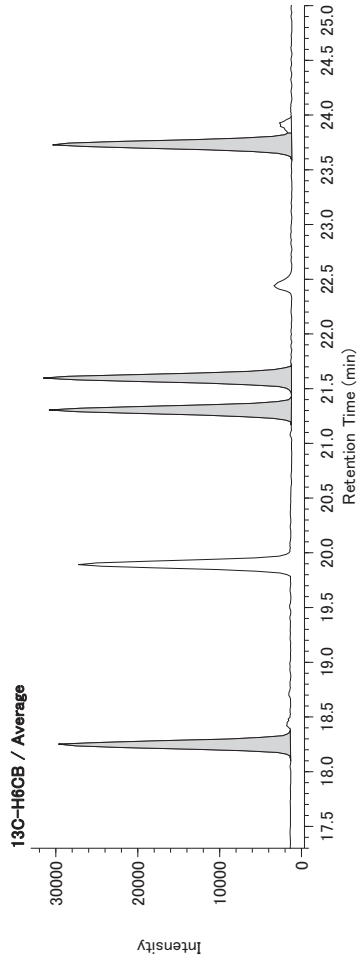
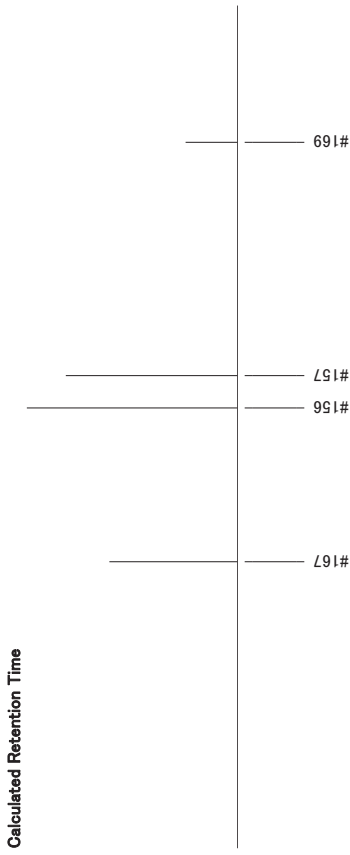
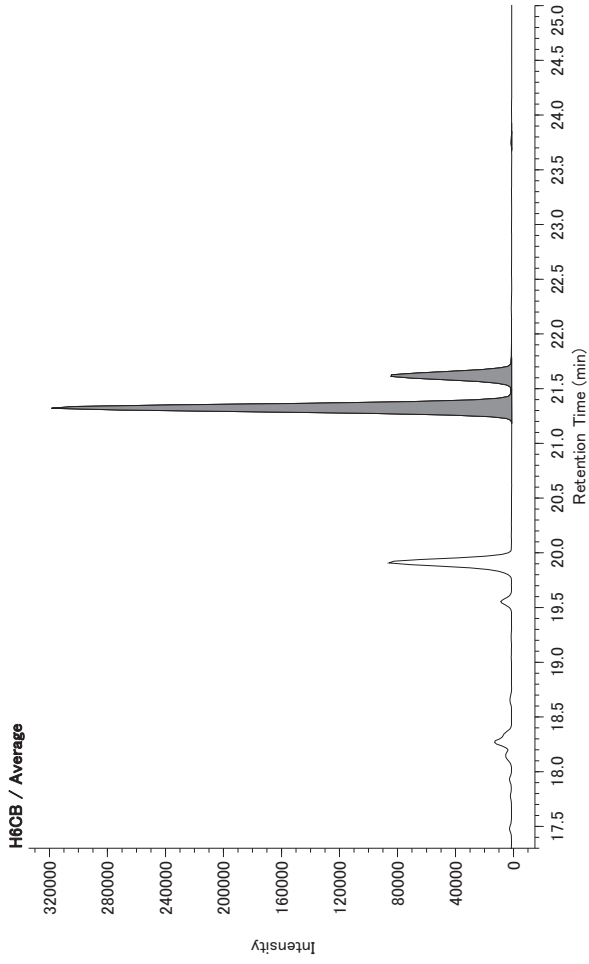


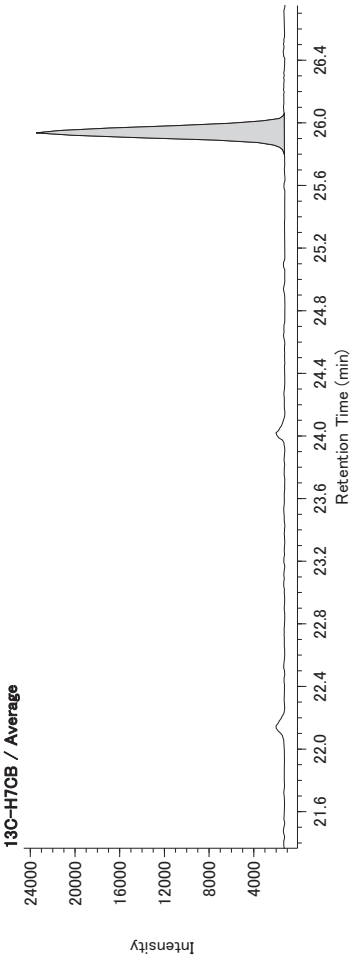
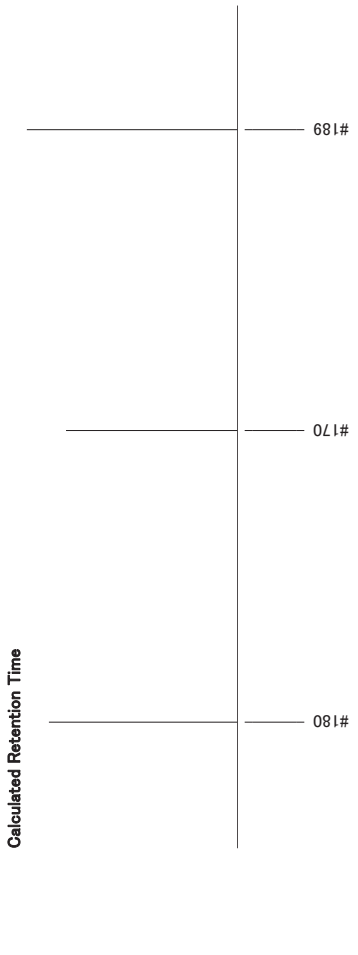
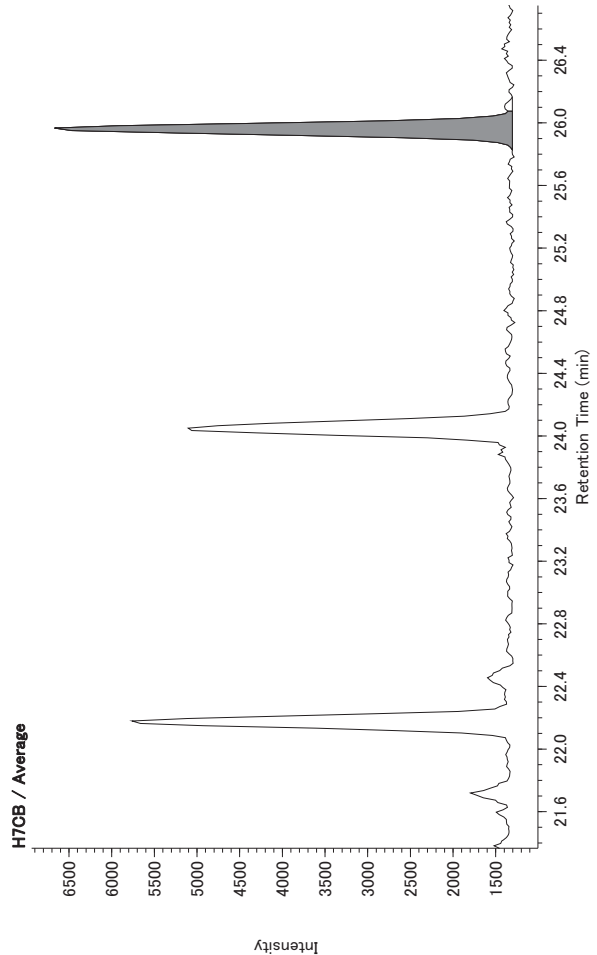
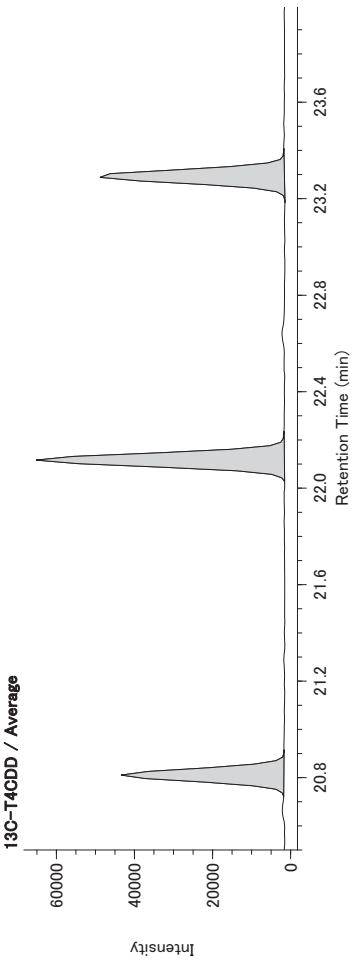
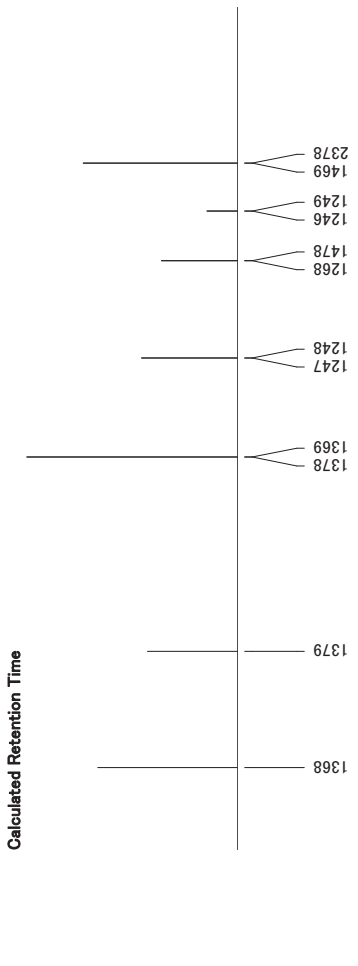
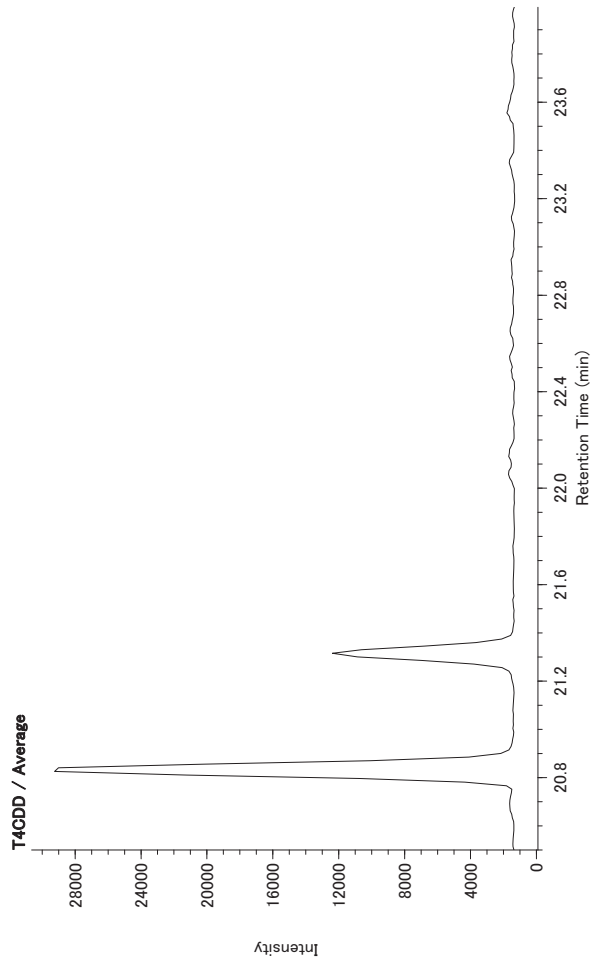
Calculated Retention Time

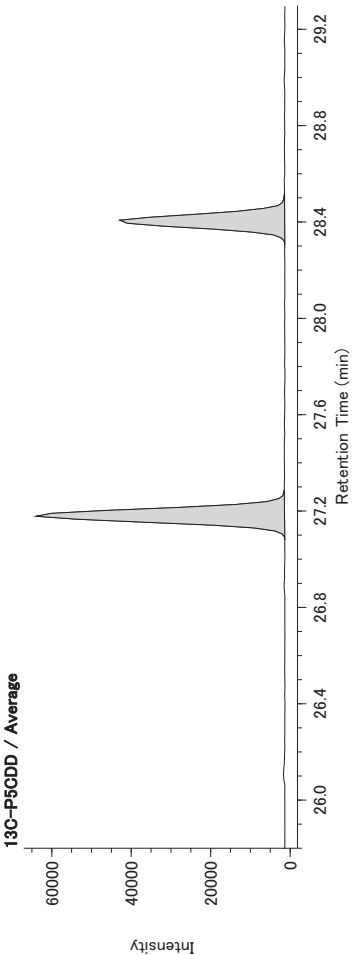
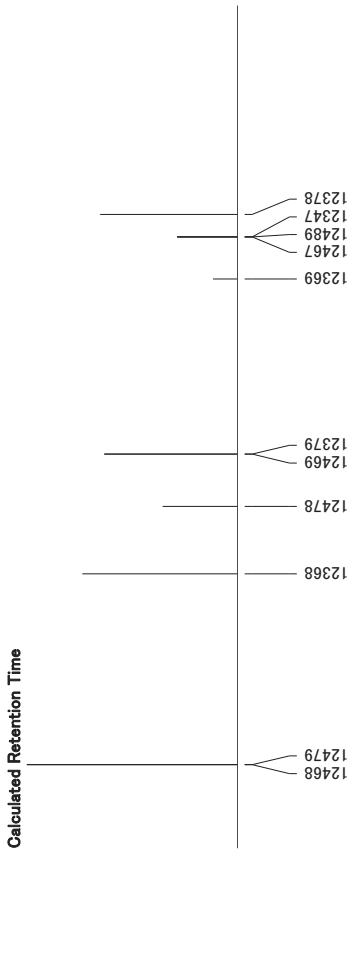
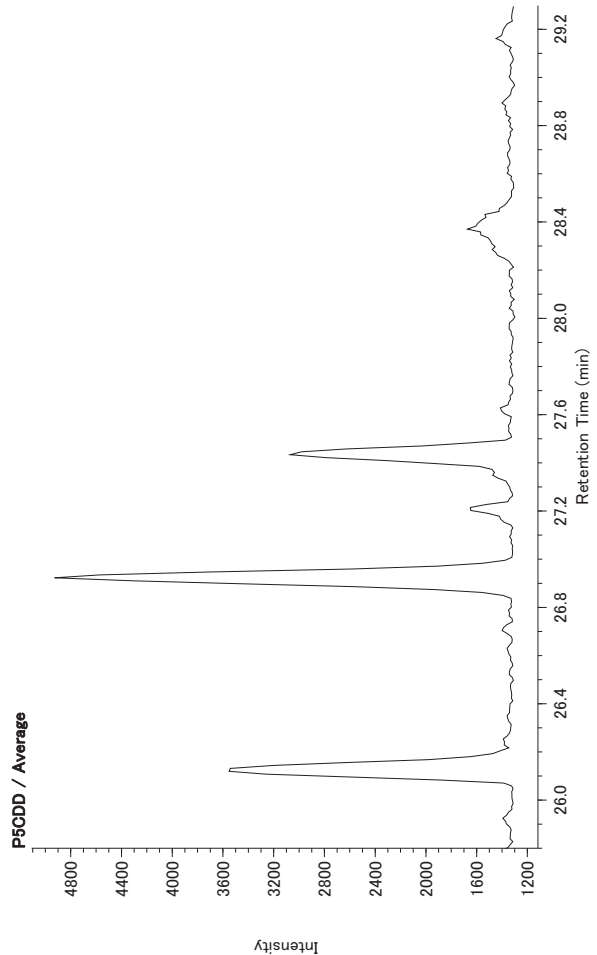
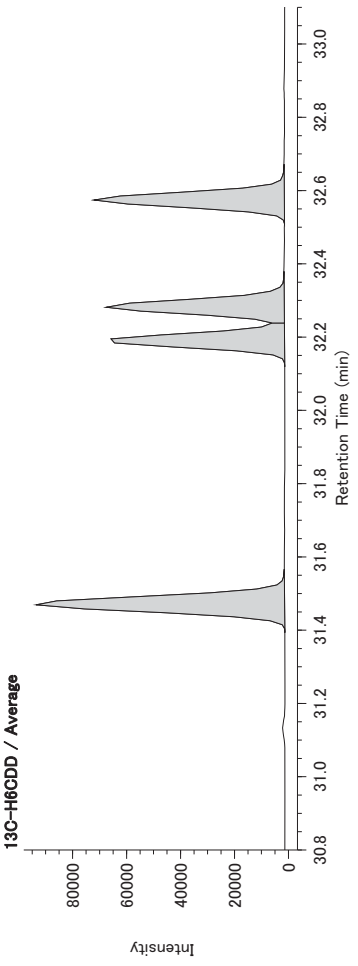
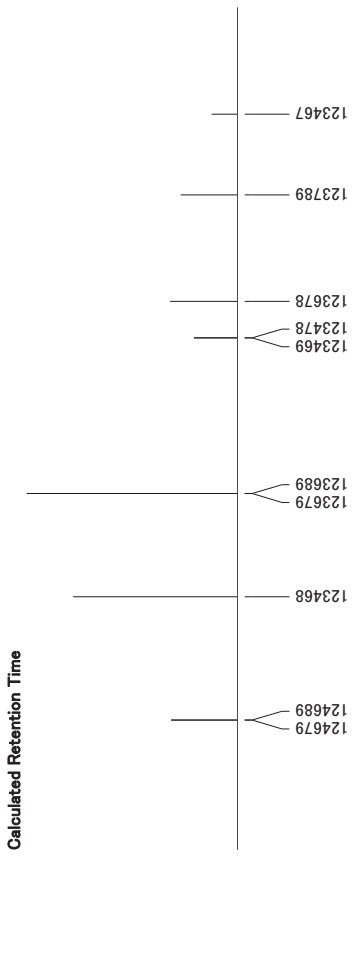
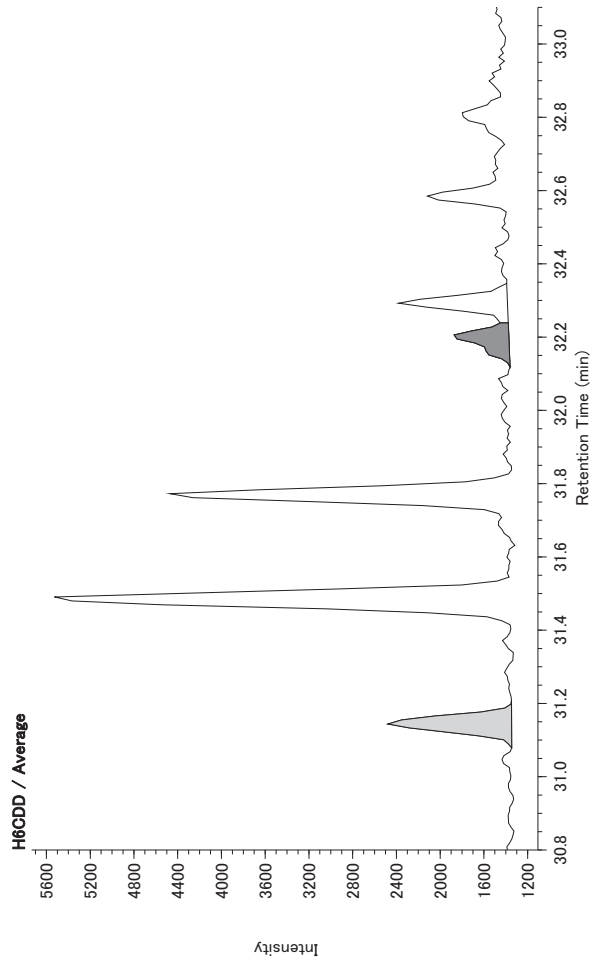


Calculated Retention Time





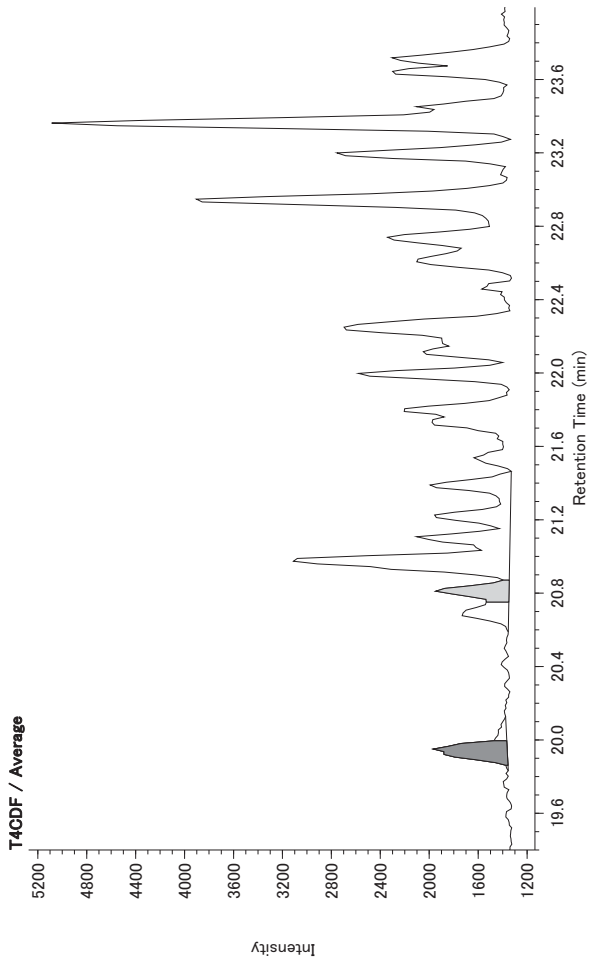




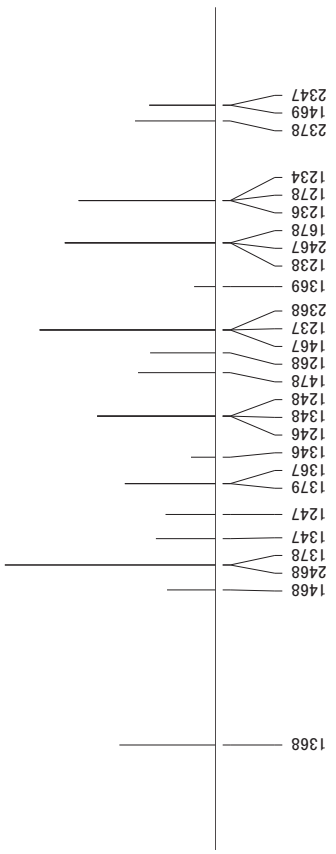


**DQ Main View**

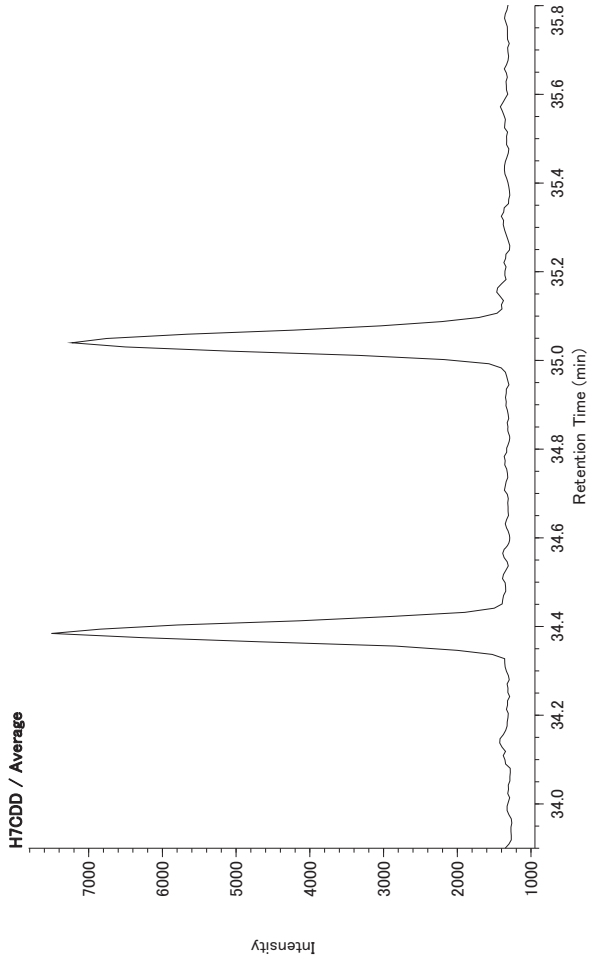
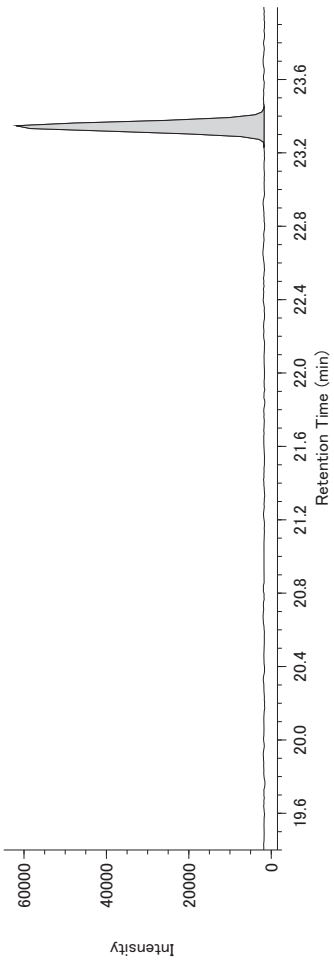
**DQ Main View**



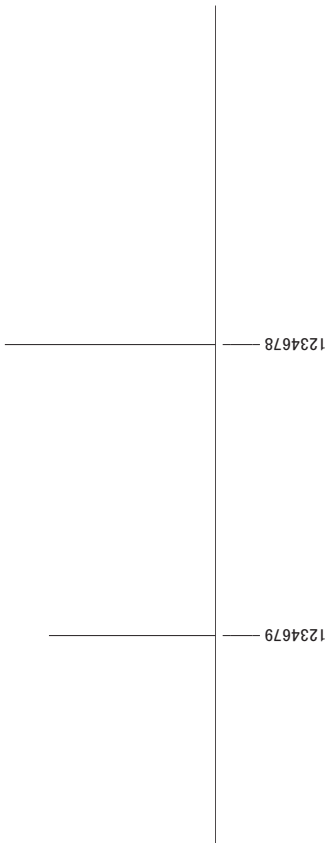
**Calculated Retention Time**



**13C-T4CDF / Average**



**Calculated Retention Time**



**13C-H7CDD / Average**

