Category	CASRN	PFAS	Acronym	OCSPP Priorities	OSRTI Priorities	UCMR List	Found in AFFF	Standards Available	NHANES	Method 537	New EPA Method
Perfluoro Carboxylic Acids	307-55-1	Perfluorododecanoic acid	PFDoA	x	x		x	x	x	x	x
	2058-94-8	Perfluoroundecanoic acid	PFUnA	x	x		x	x	x	x	x
	335-76-2	Perfluorodecanoic acid	PFDA	x	x		x	x	x	x	x
	375-95-1	Perfluorononanoic acid	PFNA	x	x	x	x	x	x	x	x
	335-67-1	Perfluorooctanoic acid	PFOA		x	x	x	x	x	x	x
	375-85-9	Perfluoroheptanoic acid	PFHpA	x	x	x	x	x	x	x	x
	307-24-4	Perfluorohexanoic acid	PFHxA	x	x		x	x		x	x
	2706-90-3	Perfluoropentanoic acid	PFPeA	x	x		x	x			x
	375-22-4	Perfluorobutyric acid	PFBA	x	x		x	x			x
Perfluoro Sulfonates	335-77-3	Perfluorodecanesulfonate	PFDS		x		x	x			x
	68259-12-1	Perfluorononanesulfonate	PFNS		x		x	x			x
	1763-23-1	Perfluorooctanesulfonate	PFOS		x	x	x	x	x	x	x
	375-92-8	Perfluoroheptanesulfonate	PFHpS		x		x	x			x
	355-46-4	Perfluorohexanesulfonate	PFHxS		x	x	x	x	x	x	x
	2706-91-4	Perfluoropentansulfonate	PFPeS		x		x	x			x
	375-73-5	Perfluorobutanesulfonate	PFBS	x	x	x	x	x	x	x	x
Perfluoro Sulfonamide	754-91-6	Perfluorooctanesulfonamide	PFOSA		x			x	x		x
Fluorotelomers	39108-34-4	Fluorotelomer sulfonate 8:2	FtS 8:2		x		x	x			x
	27619-97-2	Fluorotelomer sulfonate 6:2	FtS 6:2		x		x	x			x
	2991-50-6	N-ethyl-N-[(heptadecafluorooctyl)sulfonyl]glycine	NEtFOSAA					x	x	x	x
	2355-31-9	N-(Heptadecafluorooctylsulfonyl)-N-methyl glycine	NMeFOSAA					x	x	x	x
Fluorotelomer Alcohols	678-39-7	Fluorotelomer alcohol 8:2	FtOH 8:2					x			
	647-42-7	Fluorotelomer alcohol 6:2	FtOH 6:2	x				x			
Perfluoro Ether Carboxylic Acids	13252-13-6	Perfluoro(2-methyl-3-oxahexanoic) acid	GenX	x							
	919005-14-4	4,8-dioxa-3H-perfluorononanoic acid	ADONA	x							
Fluorotelomer Phosphates	57678-01-0	6:2 Fluorotelomer phosphate monoester	6:2 monoPAP	x				x			
	57677-95-9	6:2 Fluorotelomer phosphate diester	6:2 diPAP	x				x			
	57678-03-2	8:2 Fluorotelomer phosphate monoester	8:2 monoPAP	see writeup				x			
	678-41-1	8:2 Fluorotelomer phosphate diester	8:2 diPAP	see writeup				x			
	943913-15-3	6:2/8:2 Fluorotelomer phosphate diester	6:2/8:2 diPAP	see writeup							
Fluorotelomer Carboxylic Acid	914637-49-3	5:3 Polyfluorinated acid	5:3 acid	x				x			

Note: PFOA and PFOS are included as information on these chemicals will be utilized in the analysis.

New EPA method = non-drinking water (groundwater, surface water, soil and sediment).

			density		Mol wt	melting pt	boiling pt	Solubility
Tricosafluorododecanoic acid		solid		C12HF23O2	614.1	96-103	245	NA
Perfluoroundecanoic acid		solid		C11HF21O2	564.09	96-101	160	NA
Perfluorodecanoic acid		solid		C10HF19O2	514.08	77-81	218	9.5 g/liter water
Perfluorononananoic acid		solid		C9HF17O2	464.08	59-62	218	9.5 g/liter water
Perfluorooctanoic acid	PFOA	liquid	1.8	C8HF15O2	414.07		189-192	9.5 g/liter water
Perfluoroheptanoic acid		liquid	1.792	C7H13O2	364.062		175	
Perfluorooctanesulfonate	PFOS	liquid	0.79	C8HF17O3S	500.13			not miscible/low miscible in DI h20
Fluorotelomer alcohol 8:2		solid		C10HF17O	464.12		?	?
Fluorotelomer alcohol 6:2		liquid	1.651	C8H5F13O	364.1		88-95	?
GenX					330.04			

5psig

Summa Air Concentration of component
If .05 ng/ml

0.05	350
	20

Therefore...

350	ng	Each compound is needed

Proposed Stock solution
Take 5 ul of each neat liquid and add to 50 ml methanol

PFOA	0.18	mg/ml
PFOS	0.079	mg/ml
Fluorotelomer sulfonate 6:2	0.1651	mg/ml

Weigh solid Flourotelomer 8:2

5	mg
50	ml
0.1	mg/ml

100	ng/ul	If 0.1 mg/ml
1500	ng	Shoot 15 ul
85.71428571	ng on column	

7000 ml

	Tricosafluorododecanoic acid	
	Perfluoroundecanoic acid	
	Perfluorodecanoic acid	
	Perfluorononanoic acid	
Ng Total to Can	Perfluorooctanoic acid	PFOA
ng on column	Perfluoroheptanoic acid	
	Perfluorooctanesulfonate	PFOS
	Fluorotelomer sulfonate 8:2	
	Fluorotelomer sulfonate 6:2	

180	ng/ul	liquid soln in MeOH
79	ng/ul	liquid soln in MeOH
165.1	ng/ul	liquid soln in MeOH
100	ng/ul	liquid soln in MeOH

Gen X mol wt	330.05	
1 ppbv	13.7271571	ng/l
If 7000 cc	6.244139633	ppbv

	density		Mol wt	melting pt	boiling pt	Solubility
solid		C12HF23O2	614.1	96-103	245	NA
solid		C11HF21O2	564.09	96-101	160	NA
solid		C10HF19O2	514.08	77-81	218	9.5 g/liter water
solid		C9HF17O2	464.08	59-62	218	9.5 g/liter water
liquid	1.8	C8HF15O2	414.07		189-192	9.5 g/liter water
liquid	1.792	C7H13O2	364.062		175	
liquid	0.79	C8HF17O3S	500.13			not miscible/low miscible in DI h20
solid		C10HF17O	464.12		?	?
liquid	1.651	C8H5F13O	364.1		88-95	?

Hexafluoropropene and hexafluoropropene oxide Summa Canister spike

(400 ml projected sample pull)

Volume (liters of mole gas)	24.04358	liters
Mole wt of hexafluropropene	150.02	g/mole
Mole wt of hexafluropropene oxide	166.02	g/mole
1 mole hexafluoropropene	6.239503435	g/liter
1 mole hexafluoropropene oxide	6.90496174	g/liter

(molar volume)

Preparation of HFP and HFPO at 5 ppbv

Step 1
If we spike 10 ul of pure HFP and HFPO into 6 liter summa at 30 psia (2.04 atm)

5.095594472	ug/l HFP	
5.639052088	ug/l HFPO	

The PPB for each would be

816.6666667	ppbv HFP	Summa 1 "N1"
816.6666667	ppbv HFPO	Summa 2 "NP 1"

Only 20 cc was analyzed that simulated a concentration of

40.83333333	ppbv HFP	Summa HFP
40.83333333	ppbv HFPO	Summa HFPO

Summary
HFP was seen with a good target ion of 131 m/z-Further work at a lower concentration will be done and shot onto Markes system
HFP had even better peak shape on the Markes system that used a plot column. A lower concentration will be prepared at 5 ppbv-see next worksheet.

HFPO had lower response but did show a small and broad target ion of 119 m/z on the Entech system. The Markes looked worse.
HFPO will be reprepared at a lower concentration of 5 ppbv and will be reshot on both the Entech and Markes systems.

2.15 # minutes from Summa 1 to Summa 2 @ 50cc/min

			liq density		Mol wt	melting pt	boiling pt	Solubility
Tricosafluorododecanoic acid		solid		C12HF23O2	614.1	96-103	245	NA
Perfluoroundecanoic acid		solid		C11HF21O2	564.09	96-101	160	NA
Perfluorodecanoic acid		solid		C10HF19O2	514.08	77-81	218	9.5 g/liter water
Perfluorononanoic acid		solid		C9HF17O2	464.08	59-62	218	9.5 g/liter water
Perfluorooctanoic acid	PFOA	liquid	1.8	C8HF15O2	414.07		189-192	9.5 g/liter water
Perfluoroheptanoic acid		liquid	1.792	C7H13O2	364.062		175	
hexafluoropropene		gas		C3F6	150.02	-153	-28	
hexafluoropropene oxide		gas		C3F6O	166.02		-27.4	
Perfluorooctanesulfonate	PFOS	liquid	0.79	C8HF17O3S	500.13			not miscible/low miscible in DI h20
Fluorotelomer sulfonate 8:2		solid		C10HF17O	464.12		?	?
		liquid	1.651	C8H5F13O	364.1		88-95	?

	6.90496E-09 g/liter
1 ppb HFPO	6.90496174 ng/liter
If we spike 5ul pure	2.819526044 ug/l HFPO
HFPO can conc	408.3333333 ppbv HFPO
If we shoot 20 cc	0.056390521 ug to MS

5 ppbv Prep of Hexafluoropropene and hexafluoropropene oxide Summa

(400 ml projected sample pull)

Volume (liters of mole gas)
Mole wt of hexafluropropene
Mole wt of hexafluropropene oxide
1 mole hexafluoropropene
1 mole hexafluoropropene oxide

Preparation of HFP and HFPO at 5 ppbv

Step 1
If we spike 10 ul of pure HFP and HFPO into 6 liter summa at 43.9 psia (2.98 atm)

3.48218301
3.853566347

The PPB for each would be

558.0865604
558.0865604

Step 2
A 2nd Summa was prepared at 5 ppb via dilution at a final pressue of 29.4 psia using a 50 cc/min MFC

Final normalized concentration

Summary
HFP was detected on the Markes system with good peak shaped and a sub 0.5 ppbv detection limit. HFPO did not demor

a Canister

24.04358	liters
150.02	g/mole
166.02	g/mole
6.239503435	g/liter
6.90496174	g/liter

(molar volume)

ug/l HFP
ug/l HFPO

ppbv HFP	Summa 1 "015"	
ppbv HFPO	Summa 1 "015"	

107.5102041	ml needed Summa 1 "015"	
107.5102041	ml needed Summa 1 "015"	
1.08	corresponding pressure change	
5.034246575	ppbv HFP	Summa "MTL 31"
5.034246575	ppbv HFPO	Summa "MTL 31"

nstrate good chromatography.

2.15

Tricosafluorododecanoic acid		solid
Perfluoroundecanoic acid		solid
Perfluorodecanoic acid		solid
Perfluorononanoic acid		solid
Perfluorooctanoic acid	PFOA	liquid
Perfluoroheptanoic acid		liquid
hexafluoropropene		gas
hexafluoropropene oxide		gas
Perfluorooctanesulfonate	PFOS	liquid
Fluorotelomer sulfonate 8:2		solid
		liquid

111.6173121

minutes from Summa 1 to Summa 2 @ 50cc/min

liq density		Mol wt	melting pt	boiling pt	Solubility
	C12HF23O2	614.1	96-103	245	NA
	C11HF21O2	564.09	96-101	160	NA
	C10HF19O2	514.08	77-81	218	9.5 g/liter water
	C9HF17O2	464.08	59-62	218	9.5 g/liter water
1.8	C8HF15O2	414.07		189-192	9.5 g/liter water
1.792	C7H13O2	364.062		175	
	C3F6	150.02	-153	-28	
	C3F6O	166.02		-27.4	
0.79	C8HF17O3S	500.13			not miscible/low miscible in DI h20
	C10HF17O	464.12		?	?
1.651	C8H5F13O	364.1		88-95	?

5 ppbv Prep of Tetrafluoroethylene Summa Canister

(400 ml projected sample pull)

Volume (liters of mole gas)
Mole wt of tetrafluroethylene

1 mole tetrafluoroethylene

Preparation of HFP and HFPO at 5 ppbv

Step 1
If we spike 10 ul of pure HFP and HFPO into 6 liter summa at 43.9 psia (2.98 atm)

2.321145854

The PPB for each would be

558.0865604

Step 2
A 2nd Summa was prepared at 5 ppb via dilution at a final pressue of 29.4 psia using a 50 cc/min MFC

Final normalized concentration

Summary
HFP was detected on the Markes system with good peak shaped and a sub 0.5 ppbv detection limit. HFPO did not demor

24.04358 liters
100 g/mole

4.159114408 g/liter

(molar volume)

ug/l TFE

ppbv TFE Summa 1 "015"

107.5268817 ml needed Summa 1

1.08 corresponding pressure change

5.034246575 ppbv HFP Summa "MTL 31"
5.034246575 ppbv HFPO Summa "MTL 31"

nstrate good chromatography.

2.15

Tricosafluorododecanoic acid	
Perfluoroundecanoic acid	
Perfluorodecanoic acid	
Perfluorononanoic acid	
Perfluorooctanoic acid	PFOA
Perfluoroheptanoic acid	
hexafluoropropene	
hexafluoropropene oxide	
Perfluorooctanesulfonate	PFOS
Fluorotelomer sulfonate 8:2	

111.6 dil factor
12000 available at 29.4 psia
107.5268817

minutes from Summa 1 to Summa 2 @ 50cc/min

	liq density		Mol wt	melting pt	boiling pt
solid		C12HF23O2	614.1	96-103	245
solid		C11HF21O2	564.09	96-101	160
solid		C10HF19O2	514.08	77-81	218
solid		C9HF17O2	464.08	59-62	218
liquid	1.8	C8HF15O2	414.07		189-192
liquid	1.792	C7H13O2	364.062		175
gas		C3F6	150.02	-153	-28
gas		C3F6O	166.02		-27.4
liquid	0.79	C8HF17O3S	500.13		
solid		C10HF17O	464.12		?
liquid	1.651	C8H5F13O	364.1		88-95

Solubility
NA
NA
9.5 g/liter water
9.5 g/liter water
9.5 g/liter water

not miscible/low miscible in DI h20

?
?

Perfluoro(2-methyl-3-oxahexanoic) acid (GenX process cmpd) and Perfluorooctai

(400 ml projected sample pull)

Volume (liters of mole gas)	
Mole wt of Perfluoro(2-methyl-3-oxahexanoic) acid	
Mole wt of Perfluorooctanoic Acid	
1ppbv pure GenX process cmpd as a gas	
1ppbv pure PFOA process cmpd as a gas	

Preparation of High Conc GenX and PFOA

Step 1

If we spike 15 ul of 100 ng/ul soln in (MeOH) into 6 liter summa at 30 psia (2.04 atm)

	122.5
	122.5
PPB Amount	
	8.924186614
	7.113141619
We Shot 400 cc therefore we put on	
	49
	49

Summary

Both targets did not show promise on the Entech volatiles system at 400 cc and will be analyzed on the SVOC QQQ syster

noic Acid (PFOA) Summa Prep

24.04358	liters
330.04	g/mole
414.07	g/mole
13.72674119	ng/liter
17.22164503	ng/liter

(molar volume)

ng/l Perfluoro(2-methyl-3-oxahexanoic)acid/GenX process cmpd
ng/l PFOA

PPBv GenX compound Can 404
PPBv PFOA compound Can 96

ng on column GenX
ng on column PFOA

n via direct injection on a DB 5

Tricosafluorododecanoic acid	
Perfluoroundecanoic acid	
Perfluorodecanoic acid	
Perfluorononanoic acid	
Perfluorooctanoic acid	PFOA
Perfluoroheptanoic acid	
hexafluoropropene	
hexafluoropropene oxide	
Perfluorooctanesulfonate	PFOS
Fluorotelomer sulfonate 8:2	

1.422628324

	liq density		Mol wt	melting pt	boiling pt	Solubility
solid		C12HF23O2	614.1	96-103	245	NA
solid		C11HF21O2	564.09	96-101	160	NA
solid		C10HF19O2	514.08	77-81	218	9.5 g/liter water
solid		C9HF17O2	464.08	59-62	218	9.5 g/liter water
liquid	1.8	C8HF15O2	414.07		189-192	9.5 g/liter water
liquid	1.792	C7H13O2	364.062		175	
gas		C3F6	150.02	-153	-28	
gas		C3F6O	166.02		-27.4	
liquid	0.79	C8HF17O3S	500.13			not miscible/low miscible in DI h20
solid		C10HF17O	464.12		?	?
liquid	1.651	C8H5F13O	364.1		88-95	?

2.15 # minutes from Summa 1 to Summa 2 @ 50cc/min

Perfluoro(2-methyl-3-oxahexanoic) acid (GenX process cmpd) and Perfluorooctai

BTP prep of GenX process compound and PFOA
Weight of GenX process compound
Weight of PFOA compound
Conc of GenX process compound in 10 ml methanol (amber glass)
Conc of PFOA compound in 10 ml methanol (amber glass)

Preparation of Blank
500 ul of dichloromethane B &J plus 500 ul methanol from E288

Preparation of 100 ng/ul GenX (On GCQQQ currently)
42 ul of BTP Genx at 2380 ng/ul plus 458 ul of methanol (e288A) plus 500 ul of DCM from E581A

99.96

Preparation of 100 ng/ul PFOA (On GCQQQ currently)
263 ul of BTP PFOA at 100 ng/ul plus 237 ul of methanol (e288A) plus 500 ul of DCM from E581A

99.94

Summary of QQQ direct injection work for these 2 compounds

Blank was clean but MeOH from Johnsies stock is necessary for comparison or the runs need to be reprepared using the s
Samples were reprepared September 12th and injected. Blank was much cleaner, but discernment from the blank was ne

noic Acid (

23.8 mg
3.8 mg
2380 ug/ml
380 ug/ml

ng/ul

ng/ul

same methanol
egligible for bot

Perfluoro(2-methyl-3-oxahexanoic) acid (GenX process cmpd) and Perfluorooctai

Concentration of Genx Cmpd and PFOA from Johnsie Lang

100

Preparation of Blank

500 ul of dichloromethane B &J plus 500 ul methanol from E288

5

Preparation of 50 ng/ul GenX

500 ul of Johnsie Genx at 100 ng/ul plus 500 ul of DCM from E581A

Preparation of 50 ng/ul PFOA

500 ul of Johnsie PFOA at 100 ng/ul plus 500 ul of DCM from E581A

Initial Summary as of September 7th

Blank was clean but MeOH from Johnsies stock is necessary for comparison. It does appear that peaks are present in the

noic Acid (

ng/ul MeOH

GenX process

Fluorotelomer Alcohol 6:2 and Fluorotelomer Alcohol 8:2

(400 ml projected sample pull)

Volume (liters of mole gas)

Mole weight Fluorotelomer alcohol 6:2

Mole weight Fluorotelomer alcohol 8:2

1ppbv Fluorotelomer alcohol 6:2 as a gas

1ppbv Fluorotelomeralcohol 8:2 as a gas

Stock solution of 6:2 in methanol (ref PLB 2424 P 170)

Stock solution of 8:2 in methanol (ref PLB 2424 P 170)

Preparation of High Conc GenX and PFOA

Step 1

If we spike 5 ul of 420-430 ng/ul soln in (MeOH) into 6 liter summa at 30 psia (2.04 atm)

175.5833333

171.5

PPB Amount

11.59475947

8.884499634

We shot 400 cc therefore we will put on

70.23333333

68.6

Summary

QQQ direct injection showed hits for both in particular the 8/2 under these sets of conditions in full scan direct inject mo

Full scan analyses via the Entech 7150 volatiles system were run and showed a hit at 17.4 minutes for 6:2 and 22.4 minut

24.04358	liters
364.1	g/mole
464.12	g/mole
15.14333556	ng/liter
19.30328179	ng/liter
430	ng/ul
420	ng/ul

ng/l Fluorotelomer alcohol 6:2
ng/l Fluorotelomer alcohol 8:2

PPBv Fluorotelomer alcohol 6:2 compound Can 253
PPBv Fluorotelomer alcohol 8:2 compound MTC48

ng on column Fluorotelomer alcohol 6:2 Can 253
ng on column Fluorotelomer alcohol 8:2 MTC48

de.
e for 8:2. A SIM method was then run than demonstrated that between 1-3 ppbv can be detected for 6:

4
4

Tricosafluorododecanoic acid	
Perfluoroundecanoic acid	
Perfluorodecanoic acid	
Perfluorononanoic acid	
Perfluorooctanoic acid	PFOA
Perfluoroheptanoic acid	
hexafluoropropene	
hexafluoropropene oxide	
Perfluorooctanesulfonate	PFOS
Fluorotelomer alcohol 6:2	
Fluorotelomer alcohol 8:2	

2 and 8:2 fluoroalcohols using the typical 400 cc sample pull.

psi lost due to 2X 400 cc sample pulls
psi lost due to 2X 400 cc sample pulls

	liq density		Mol wt	melting pt
solid		C12HF23O2	614.1	96-103
solid		C11HF21O2	564.09	96-101
solid		C10HF19O2	514.08	77-81
solid		C9HF17O2	464.08	59-62
liquid	1.8	C8HF15O2	414.07	
liquid	1.792	C7H13O2	364.062	
gas		C3F6	150.02	-153
gas		C3F6O	166.02	
liquid	0.79	C8HF17O3S	500.13	
liquid	1.651	C8H5F13O	364.1	
solid		C10HF17O	464.12	

boiling pt	Solubility
245	NA
160	NA
218	9.5 g/liter water
218	9.5 g/liter water
189-192	9.5 g/liter water
175	
-28	
-27.4	

not miscible/low miscible in DI h20

88-95	?
?	?

Weighing strategy

	# ul	density	Actual (by weight)		Stock for Summa spike ug/ml (10 ml)
fluror 6/2	2.4	1.651		4.3	430
	mg				ug/ml (10 ml)
fluror 8/2	4			4.2	420
					ug/ml (10 ml)
PFHNOA Na+	6.1			6.1	610

QQQ
ug/ml (1 ml)
107.5

ug/ml (1 ml)
105

E1 fluorocarbon

(400 ml projected sample pull)

Volume (liters of mole gas)

Mole weight E1 flourocarbon

1ppbv E1

Stock solution of E1 in methanol

Preparation of High Conc GenX and PFOA

Step 1

If we spike 5 ul of 300 ng/ul soln in (MeOH) into 6 liter summa at 30 psia (2.04 atm)

122.5

PPB Amount

10.29694641

We shot 400 cc therefore we will put on

49

Summary

Not prepared as of September 27, 2018

24.04358 liters
286.04 g/mole

11.89673085 ng/liter

300 ng/ul

ng/l E1

PPBv Fluorotelomer alcohol 6:2 compound Can 253

ng on column E1

			liq density	
Tricosafluorododecanoic acid		solid		$C_{12}HF_{23}O_2$
Perfluoroundecanoic acid		solid		$C_{11}HF_{21}O_2$
Perfluorodecanoic acid		solid		$C_{10}HF_{19}O_2$
Perfluorononanoic acid		solid		$C_9HF_{17}O_2$
Perfluorooctanoic acid	PFOA	liquid	1.8	$C_8HF_{15}O_2$
Perfluoroheptanoic acid		liquid	1.792	$C_7H_{13}O_2$
hexafluoropropene		gas		C_3F_6
hexafluoropropene oxide		gas		C_3F_6O
Perfluorooctanesulfonate	PFOS	liquid	0.79	$C_8HF_{17}O_3S$
Fluorotelomer alcohol 6:2		liquid	1.651	$C_8H_5F_{13}O$
Fluorotelomer alcohol 8:2		solid		$C_{10}HF_{17}O$

Mol wt	melting pt	boiling pt	Solubility
614.1	96-103	245	NA
564.09	96-101	160	NA
514.08	77-81	218	9.5 g/liter water
464.08	59-62	218	9.5 g/liter water
414.07		189-192	9.5 g/liter water
364.062		175	
150.02	-153	-28	
166.02		-27.4	

500.13			not miscible/low miscible in DI h20

364.1		88-95	?
464.12		?	?

Weighing strategy

	# ul	density	Actual (by weight)	Stock for Summa spike ug/ml (10 ml)	QQQ ug/ml (1 ml)
fluror 6/2	2.4	1.651	4.3	430	107.5
	mg			ug/ml (10 ml)	ug/ml (1 ml)
fluror 8/2	4		4.2	420	105
				ug/ml (10 ml)	
PFHNOA Na+	6.1		6.1	610	

PFAS Summa Blanks Set to 50 psia

Can ID	Sample ID	Pressure initial	Pressure final	100 ul DI Added	after cleaning 20x Date filled to 50 psia	CIMS Date given to Theran	Pressure after CIMS	GCMS TO15 analysis date
MTC3	10041801	0.01	49.9	yes	10/4/2018	10/12/2018		
755	10041802	0.01	49.9	yes	10/4/2018	10/12/2018		
723	10041803	0.01	49.9	yes	10/4/2018	10/12/2018		
2045	10041804	0.01	49.9	yes	10/4/2018	10/12/2018		
262	10041805	0.01	49.9	yes	10/4/2018	10/12/2018		
2521	10041807	0.01	49.9	yes	10/4/2018	10/12/2018		
2504	10041808	0.01	49.9	yes	10/4/2018	10/12/2018		
A378	10041809	0.01	49.9	yes	10/4/2018	10/12/2018		
744	10041810	0.01	49.9	yes	10/4/2018	10/12/2018		
BTP1	10041811	0.01	49.9	yes	10/4/2018	10/12/2018		
709	10041812	0.01	49.9	yes	10/4/2018	10/12/2018		
MTC48	10091801	0.01	49.9	yes	10/9/2018	10/16/2018		
748	10091802	0.01	49.9	yes	10/9/2018	10/16/2018		
MTC46	10091803	0.01	49.9	yes	10/9/2018	10/16/2018		
96	10091804	0.01	49.9	yes	10/9/2018	10/16/2018		
700	10091805	0.01	49.9	yes	10/9/2018	10/16/2018		
MTC31	10091806	0.01	49.9	yes	10/9/2018	10/16/2018		
253	10091807	0.01	49.9	yes	10/9/2018	10/16/2018		
751	10091808	0.01	49.9	yes	10/9/2018	10/16/2018		
RK8	10091809	0.01	49.9	yes	10/9/2018	10/16/2018		
793	10091810	0.01	49.9	yes	10/9/2018	10/16/2018		
404	10091811	0.01	49.9	yes	10/9/2018	10/16/2018		
196	10091812	0.01	49.9	yes	10/9/2018	10/16/2018		
68	10151801	0.01	49.9	yes	10/15/2018	10/23/2018		
721	10151802	0.01	49.9	yes	10/15/2018	10/23/2018		
21	10151803	0.01	49.9	yes	10/15/2018	10/23/2018		
A013	10151804	0.01	49.9	yes	10/15/2018	10/23/2018		
5	10151805	0.01	49.9	yes	10/15/2018	10/23/2018		

E1 fluorocarbon

(400 ml projected sample pull)

Volume (liters of mole gas)

Mole weight E1 flourocarbon

1ppbv E1

Stock solution of E1 in methanol

Preparation of High and low conc of E1

Step 1

Can #651...If we spike 5 ul of 300 ng/ul soln in (MeOH) into 6 liter summa at 30 psia (1.36 atm)

Can#809... If we spike 1 ul of 300 ng/ul soln in (MeOH) into 6 liter summa at 20 psia (1.36 atm)

124.548495

24.909699

PPB Amount

10.46913615

2.093827229

We shot 400 cc therefore we will put on

49.81939799

9.963879599

Summary

Stock solution prepared October 22, 2018

Cans prepared October 24, 2018

24.04358	liters
286.04	g/mole
11.89673085	ng/liter
304	ng/ul

ng/liter Air E1 in Can#651
ng/liter Air E1 in Can#809

PPBv E1 fluorocarbon can 651
PPBv E1 fluorocarbon can 809

ng on column E1 Can 651
ng on column E1 Can 809

Weighing strategy

	# ul	density	Actual (by weight)	Stock for Summa spike ug/ml (10 ml)	QQQ ug/ml (1 ml)
fluror 6/2	2.4	1.651	4.3	430	107.5
	mg			ug/ml (10 ml)	ug/ml (1 ml)
fluror 8/2	4		4.2	420	105
				ug/ml (10 ml)	
PFHNOA Na+	6.1		6.1	610	

E2 fluorocarbon

(400 ml projected sample pull)

Volume (liters of mole gas)

Mole weight E2 flourocarbon

1ppbv E2

Stock solution of E1 in methanol

Preparation of High and low conc of E1

Step 1

Can #BTP1...If we spike 5 ul of 300 ng/ul soln in (MeOH) into 6 liter summa at 30 psia (1.36 atm)

135.9381271

PPB Amount

7.229940571

We shot 400 cc therefore we will put on

54.37525084

Summary

Stock solution prepared December 4th, 2018

Can prepared December 4th, 2018

24.04358	liters
452.07	g/mole
18.8021085	ng/liter
331.8	ng/ul

ng/liter Air E1 in Can#

PPBv E1 fluorocarbon can BTP1

ng on column E1 Can BTP1

density	1.659	mg/ul
# ul spiked	2	ul
	3318	ug
# ml Methanol	10	
Final conc stock	331.8	ng/ul

Weighing strategy

	# ul	density	Actual (by weight)	Stock for Summa spike ug/ml (10 ml)	QQQ ug/ml (1 ml)
fluror 6/2	2.4	1.651	4.3	430	107.5
	mg			ug/ml (10 ml)	ug/ml (1 ml)
fluror 8/2	4		4.2	420	105
				ug/ml (10 ml)	
PFHNOA Na+	6.1		6.1	610	

TFE Summa Canister Prep

(400 ml projected sample pull)

Volume (liters of mole gas)
Mole wt of TFE monomer gas
1000 ppm of TFE

1 mole TFE monomer gas

1000 ppm TFE

1 ppm TFE

Preparation of HFP and HFPO at 5 ppbv

Step 1
If we spike 100 ul of 1000 ppm TFE into 6 liter summa at 30 psia (2.04 atm)

0.033966101
33.966101

The PPB for each would be

8.166666667

Summary

TFE was analyzed on the TO 15 Entech system but it broke through. It was detected via the Markes system with 100 ml o

24.04358	liters
100	g/mole
0.1	g/mole
4.159114408	g/liter
0.004159114	g/liter
4.15911E-06	g/liter
	(molar volume)

ug/l TFE monomer gas
ng/l TFE monomer gas

ppbv HFP

f 8 ppb. Breakthrough volumes are being established.

Tricosafluorododecanoic acid	
Perfluoroundecanoic acid	
Perfluorodecanoic acid	
Perfluorononanoic acid	
Perfluorooctanoic acid	PFOA
Perfluoroheptanoic acid	
hexafluoropropene	
hexafluoropropene oxide	
Perfluorooctanesulfonate	PFOS
Fluorotelomer sulfonate 8:2	

2.15 # minutes from Summa 1 to Summa 2 @ 50cc/min

	liq density		Mol wt	melting pt	boiling pt
solid		C12HF23O2	614.1	96-103	245
solid		C11HF21O2	564.09	96-101	160
solid		C10HF19O2	514.08	77-81	218
solid		C9HF17O2	464.08	59-62	218
liquid	1.8	C8HF15O2	414.07		189-192
liquid	1.792	C7H13O2	364.062		175
gas		C3F6	150.02	-153	-28
gas		C3F6O	166.02		-27.4
liquid	0.79	C8HF17O3S	500.13		
solid		C10HF17O	464.12		?
liquid	1.651	C8H5F13O	364.1		88-95

Solubility
NA
NA
9.5 g/liter water
9.5 g/liter water
9.5 g/liter water

not miscible/low miscible in DI h20

?
?

data file Markes
"020819_01"
"020719_01"
"020819_02"
"020609_02"
"020609_04"
"020719_02"

The 50 and 75 levels match well with the 100 cc being way too high

amount of 8 ppb vol (ml)	quant amount for 100 ml using 50cc as 4 ppbv
75	8.546666667
75	7.826666667
100	14.441
100	17.64
50	4
50	8.14

used as cal

Theran Info

Theran Can Information

Summa PPBV	Description		Summa GCMS viable at 10 ppbv or less?
5.03	HFP	Summa "MTL 31"	Yes
5.03	HFPO	Summa "MTL 31"	No
8.92	Perfluoro(2-methyl-3-oxahexanoic) acid	Summa "404"	No
7.11	PFOA	Summa "96"	No
11.59	Fluorotelomer alcohol 6:2 compound	Summa "253"	Yes
8.88	Fluorotelomer alcohol 8:2 compound	Summa "MTC 48"	Yes

Current liquid solutions in MeOH

Conc ng/ul	Description
2380	Perfluoro(2-methyl-3-oxahexanoic) acid
380	PFOA
430	Fluorotelomer alcohol 6:2 compound
420	Fluorotelomer alcohol 8:2 compound

Current pressure	final pressure	new ppb	date
26.5	49.8	2.7	9/27/2018
26.5	49.9	2.7	9/27/2018
28.7	49.9	5.1	9/27/2018
28.6	49.8	4.1	9/27/2018
25.3	49.9	5.9	9/27/2018
25.7	49.9	4.6	9/27/2018

Jeff Ryan In House Powder Summa Cans (TO15 Analyzer)

Can ID

A378
755
"005"
262
"021"
A013
794
RK8
MTC31
2045

Jeff Ryan In House Powder Summa Cans Markes Analyzer)

Can ID

A378
755
"005"
262
"021"
A013
794
RK8
MTC31
2045

Date given to Jeff	Blanked data file	Before Sample PFAS Data Reduction	TO15 data Reduction	Field Sample ID
12/7/2018	111318012	Clean		Test 5 Powder E
12/7/2018	110818004	Clean		
12/7/2018	110818011	Clean		
12/7/2018	111518007	Clean		Test 3 Powder C
12/7/2018	111618002	Clean		Test 4 Powder D
12/7/2018	111318018	Clean		Test 6 System Blank
12/7/2018	111318016	Clean/small E1 0.02		Test 2 Powder B
12/13/2018	111618004	Clean/small E1 0.01		Test 7 Powder J
12/13/2018	110818007	Clean/small E1 0.01		
12/7/2018	11061806	Clean		Test 1 Powder A

Date given to Jeff	Blanked data file	Before Sample TFE Data Reduction	TO15 data Reduction	Field Sample ID
12/7/2018	111318012	Clean	TFE	Test 5 Powder E
12/7/2018	110818004	Clean		
12/7/2018	110818011	Clean		
12/7/2018	111518007	Clean	TFE	Test 3 Powder C
12/7/2018	111618002	Clean	TFE	Test 4 Powder D
12/7/2018	111318018	Clean	TFE	Test 6 System Blank
12/7/2018	111318016	Clean/small E1 0.02	TFE	Test 2 Powder B
12/13/2018	111618004	Clean/small E1 0.01	TFE	Test 7 Powder J
12/13/2018	110818007	Clean/small E1 0.01		
12/7/2018	11061806	Clean	TFE	Test 1 Powder A

Sampled data file	After Sample PFAS Data Reduction	After Sample TO15 data Reduction	psia Post sampling pressure
			10.5
			10.2
			10.8
			11.2
			10.4
			14.6
			10.8

Sampled data file	After Sample PFAS Data Reduction	After Sample TO15 data Reduction	psia Post sampling pressure
NA			10.5
NA			10.2
NA			10.8
122119_17			11.2
NA			10.4
122119_16			14.6
122119_14			10.8

added 50 ul DI H2O

psia final air fill pressure	E377 test comments	Status
29.9	Analyzed-looked clean	Filled w/Air to30 psig 12/14
	Leaked	evac 12/14
	Leaked	evac 12/14
29.9	Analyzed-looked clean	Filled w/Air to30 psig 12/14
29.9	Analyzed-looked clean	Filled w/Air to30 psig 12/14
29.9		Filled w/Air to30 psig 12/14
29.9	Analyzed-looked clean	Filled w/Air to30 psig 12/14
29.9		Filled w/Air to30 psig 12/14
		Filled w/Air to30 psig 12/14
29.9	Had hit around 5.2 min	

added 50 ul DI H2O

psia final air fill pressure	100 cc sample volume TFE quant amount	Status
29.9		
29.9		
29.9		
29.9	0.02	
29.9		
29.9	0.02	
29.9	0.01	

Deemed good 12/21
Deemed good 12/21

Pertinent Data Files for PFAS Airborne Emissions

Description	Conc (ppbv)
HFP	5
HFPO	NA
Genx	NA
PFOA	NA
6:2 Flurotelomer	11.6
8:2 Flurotelomer	8.9
E1	5
E2	7.2

Data file	Ret Time (min)
"091018003"	3.9
NA	NA
NA	NA
NA	NA
"091818005"	17.4
"091818006"	22.4
"102518003"	5.2
"120718004"	6.3

Status of Current PFAS cans as of March 13, 2019

Description	Can ID	Last Cleaned 30x	Markes PFAS Validated clean	Markes data file	Additional	Can ID	Current location			Can ID	TO15 blanked	" Hg Final vac check	Batch ID	3/12/2019 Shipped as Sample	3/12/2019 Batch blank	
Test 1 Powder A	2045	3/7/2018	PFAS Clean	112018_28	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	2045	Top shelf	1		2045	110618006	[redacted]	1			
Test 2 Powder B	794	3/7/2018	PFAS Clean	112018_25	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	794	Top shelf	2		794	111518010	[redacted]	1			
Test 3 Powder C	262	3/7/2018	PFAS Clean	112018_23	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	262	transit NY trip	3		262	111518007	30	1	262		
Test 4 Powder D	"021"	3/7/2018	PFAS Clean	112018_19	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	"021"	transit NY trip	4		"021"	111618002	30	1	"021"		
Test 5 Powder E	A378	3/7/2018	PFAS Clean	112018_30	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	A378	transit NY trip	5		A378	111318012	30	1	A378		
Test 6 Blank	A013									A013	111318018					
Test 7 Powder A	RK8	3/7/2018	PFAS Clean	112018_17	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	RK8	transit NY trip	6		RK8	111618004	30	1	RK8		
Blanking-	700	3/7/2018	PFAS Clean	112118_03	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	700	transit NY trip	7		700	111418021	30	1	700		
Blanking	68	3/7/2018	PFAS Clean	112118_13	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	"068"	Top Shelf Lab-Batch blank 1	8		"068"	111418017	30	1		"068"	Batch 1
Blanking	MTC46									MTC46	111418015					
Blanking	MTC48	3/7/2018	PFAS Clean	112018_22	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	MTC48	transit NY trip	9		MTC48	111418011	30	1	MTC48		
Blanking	751	3/7/2018	PFAS Clean	112018_27	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	751	transit NY trip	10		751	111418009	30	1	751		
Blanking	709									709	111418006					
Blanking	176									176	111318020					
Blanking	2521	3/7/2018	PFAS Clean	112118_09	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	2521	transit NY trip	11		2521	111318014	30	1	2521		
Blanking	"005"		PFAS Clean	112118_05	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	"005"	suspect leak Jeff in house			"005"	110618011					
Blanking	404	3/7/2018	PFAS Clean	112018_24	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	404	transit NY trip	12		404	110618010	30	1	404		
Blanking	MTC31		PFAS Clean	112018_20	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	MTC31	lab?			MTC31	110618007					
std	793	3/8/2018	PFAS Clean	112018_29	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	793	transit NY trip	13		793	111518010	30	2	793		
Blanking	748		PFAS Clean	112018_26	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	748	lab?			748	see Ingrid???					
Blanking	MTC3	3/8/2018	PFAS Clean	112118_08	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	MTC3	In lab-going with Jeff-subbing as sample	14		MTC3	110618009	30	2		MTC3	Giving to Jeff/use as sample
Blanking	755		PFAS Clean	112118_10	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	755	suspect leak Jeff in house			755						
Blanking	196		PFAS Clean	112118_11	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP					196	See Ingrid???					
Blanking	253	3/8/2018	PFAS Clean	112118_12	Older file therefore istd's don't match well/no target hits for E1, E2, TFE, HFP	253	transit NY trip	15		253	111418013	30	2	253		

		Last cleaned 30x		Markes data file	Additional											
Blanking	RK9	3/8/2018	PFAS Clean	030419_2	Istds lower compared to curves/no target hits for E1,E2, TFE, HFP	RK9	transit NY trip	16		RK9	"030719004"	30	2	RK9		
Blanking (previous 8 ppb std E1,E2,TFE and HFP)	NP1	3/8/2018	PFAS Clean	030419_3	Istds lower compared to curves/no target hits for E1,E2, TFE, HFP	NP1	transit NY trip	17	Meoh std prev use for std prep	NP1		30	2	NP1	switch to FB	
Blanking	721	3/8/2018	PFAS Clean	030419_4	Istds lower compared to curves/no target hits for E1,E2, TFE, HFP	721	transit NY trip	18		721	110618008	30	2	721		
Blanking	723	3/8/2018	PFAS Clean	030419_5	Istds lower compared to curves/no target hits for E1,E2, TFE, HFP	723	transit NY trip	19		723	111318005	30	2	723		
Blanking (previous E2 std)	BTP1	3/8/2018	PFAS Clean	030419_6	Istds lower compared to curves/no target hits for E1,E2, TFE, HFP	BTP1	transit NY trip	20	Meoh std prev use for std prep	BTP1	111318010	30	2	BTP1		
Blanking (HFP and TFE previous std)	744	3/8/2018	PFAS Clean	030419_7	Istds lower compared to curves/no target hits for E1,E2, TFE, HFP	744	transit NY trip	21		744	110618012	30	2	744		
Blanking	321	3/8/2018	PFAS Clean	030419_8	Istds lower compared to curves/no target hits for E1,E2, TFE, HFP	321	transit NY trip	22		321	"030719007"	30	2	321		
Blanking (E1 previous std)	651	3/8/2018	PFAS Clean	030419_9	Istds lower compared to curves/no target hits for E1,E2, TFE, HFP	651	transit NY trip	23	Meoh std prev use for std prep	651		30	2	651	switch to BB	Batch 2
Blanking	2504	3/8/2018	PFAS Clean	030419_10	Istds lower compared to curves/no target hits for E1,E2, TFE, HFP	2504	transit NY trip	24		2504	111318008	30	2	2504		
		Last cleaned 5x		Markes data file	Additional											
Blanking (GenX previous std)	" 096"	3/12/2018	PFAS Clean	030419_11	Istds lower compared to curves/no target hits for E1,E2, TFE, HFP	" 096"	On Shelf-Use for PFAS calibration	25	Meoh std prev use for std prep	" 096"	111418017	30	3			
Blanking (HFP and HFPO previous std)	" 015"	3/12/2018	PFAS Clean	030419_12	Istds lower compared to curves/no target hits for E1,E2, TFE, HFP	" 015"	In lab-going with Jeff-subbing as sample	26		" 015"	"030719009"	30	3	Giving to Jeff/use as sample		Had a 20x cleaning on Feb 28th,2019 too
Blanking (previous E1,E2,TFE and HFP std)	N1	3/12/2018	PFAS Clean	030419_13	Istds lower compared to curves/no target hits for E1,E2, TFE, HFP	N1	On Shelf-Use as Batch blank 3	27	Meoh std prev use for std prep	N1		29	3	Use as batch blank pending vacuum 2nd ck		Batch 3
A013		3/12/2018				A013	In lab-going with Jeff-used for calibrating not sampling					30	3			
MTC46		3/12/2018				MTC46	In lab-going with Jeff-used for calibrating not sampling					30	3			
709		3/12/2018				709	On Shelf-Use for PFAS calibration					30	3			
176		3/12/2018				176	On Shelf-Use for PFAS calibration					30	3			

St. Gobain_New York Sintering Chain of Custody Information

Can ID

BTP1
NP1
721
2504
A378
262
404
751
MTC48
"021" FB
700
2521
651
793
RK9
RK8 Trip Blank
253
723
321
744
"068"
"N1"

Sample information	Can ID	Field pressure before sampling
N2 System blank	BTP1	30
Sample 1 Process start	NP1	30
Sample 2-Start 250°-615°	721	30
Sample 3-Ramped 250°-615°	2504	30
Sample 4-Ramped 250°-615°	A378	30
Sample 5-Ramped 250°-615°	262	30
Sample 6-Ramped 250°-615°	404	30
Sample 7-Ramped 250°-615°	751	30
Sample 8-Ramped 250°-615°	MTC48	30
Field Blank	"021"	30
Sample 9 Run 1 Sample hold 650°F	700	30
Sample 10 Run 2 Sample hold 650°F	2521	30
Sample 11 Run 1 Sample ramp 615-700°F	651	30
Sample 12 Run 2 Sample ramp 615-700°F	793	30
Sample 13 Run 3 Sample ramp 615-700°F	RK9	30
Trip Blank	RK8	No Reading
Sample 14 Run 1 700° hold	253	30
Sample 15 Run 1 700° hold	723	30
Sample 16 Run 1 700° hold	321	30
Floor ambient sample	744	30
Batch blank #1	"068"	30
Batch blank #2	N1	30

Field pressure after sampling	negative bias of 1 " Hg Lab pressure gauge	psia Entech pressure gauge	inches of Hg Entech pressure gauge
12	12	8.9	11.8
8.5	8	11.4	6.7
9	8.2	11	7.6
7	7.9	11.3	6.9
8	8	11.4	6.7
7	7.8	11.4	6.7
8	7.8	11.4	6.7
7	7.8	11.3	6.9
7	7.9	11.3	6.9
No Reading	29.5	0.5	29.0
6	8	11.2	7.1
6	7.9	11.3	6.9
6	8	11.4	6.7
7	8	11.1	7.3
6	8	11.4	6.7
	30	0.1	29.8
6	7.8	11.5	6.5
7	8	11	7.6
7	10	10.4	8.8
14	18	8.8	12.0

psia Fill pressure	liters Sampled volume	GCMS Sample plus fill dilution factor	psi gauge after GCMS	psia gauge after GCMS	GCMS liters sampled	psia Entech after GCMS
29.9	3.632653061	3.359550562	11	25.7	1.346938776	26.6
29.2	4.653061224	2.561403509	6.9	21.6	2.857142857	22.2
29.7	4.489795918	2.7	9.3	24	1.959183673	24.9
29.9	4.612244898	2.646017699	9.3	24	1.755102041	25.6
29.7	4.653061224	2.605263158	9.2	23.9	2	24.8
29.9	4.653061224	2.622807018	0	14.7	6.448979592	14.1
29.8	4.653061224	2.614035088	9.3	24	2	24.9
29.8	4.612244898	2.637168142	-5.9	8.8	7.510204082	11.4
29.4	4.612244898	2.601769912	9.1	23.8	1.87755102	24.8
29.7	0.204081633	1	10	24.7	1.673469388	25.6
29.9	4.571428571	2.669642857	8.9	23.6	2.244897959	24.4
29.2	4.612244898	2.584070796	8.1	22.8	2.326530612	23.5
29.2	4.653061224	2.561403509	2	16.7	5.06122449	16.8
29.9	4.530612245	2.693693694	9.9	24.6	1.836734694	25.4
29.9	4.653061224	2.622807018	8.8	23.5	2.285714286	24.3
29.8	#VALUE!	1	8.8	23.5	2.285714286	24.2
29.5	4.693877551	2.565217391	10	24.7	1.591836735	25.6
29.7	4.489795918	2.7	10.7	25.4	1.428571429	26.2
29.8	4.244897959	2.865384615	2.7	17.4	5.102040816	17.3
29	3.591836735	3.295454545	9.2	23.9	1.714285714	24.8
		1	8.1	22.8	-9.714285714	23.8
		1	4.5	19.2	-8.12244898	19.9

after GCMS

Theran Repressure	2nd dilution Theran dilution	Theran Total dilution
49.9	1.87593985	5.235490411
49.9	2.247747748	4.809151257
49.9	2.004016064	4.704016064
49.9	1.94921875	4.595236449
49.9	2.012096774	4.617359932
49.9	3.539007092	6.16181411
49.9	2.004016064	4.618051152
49.9	4.377192982	7.014361124
49.9	2.012096774	4.613866686
49.9	1.94921875	2.94921875
49.9	2.045081967	4.714724824
44.5	1.893617021	4.477687818
49.9	2.970238095	5.531641604
49.9	1.964566929	4.658260623
49.9	2.053497942	4.67630496
49.9	2.061983471	3.061983471
49.5	1.93359375	4.498811141
49.9	1.904580153	4.604580153
49.9	2.884393064	5.749777679
49.9	2.012096774	5.30755132
49.9	2.096638655	3.096638655
49.9	2.507537688	3.507537688

Hexafluoropropene and TFE Summa Canister spike

(400 ml projected sample pull)

Volume (liters of mole gas)	24.04358
Mole wt of hexafluropropene	150.02
Mole wt of TFE	100
1 mole hexafluoropropene	6.239503435
1 mole TFE	4.159114408
1 mole of 1000 ppm TFE	0.004159114

Preparation of HFP into initial 2 liter gas bulb staging

Step 1

If we spike 1000 ul of pure gas flow into 2 liter staging bulb

0.003119752 g/l HFP

Step 2

If we spike 120 ul of gas bulb into 6 liter summa at 30 psia (2.04 atm)

30.57356683 ng/l HFP

The PPB for each would be

4.9 ppbv HFP

Preparation of TFE into 6 liter bulb

Step 1

If we take 100 ul of a 1000 ppm gas standard

33.966101 ng/l TFE

The PPB for TFE would be

8.166666667 ppbv HFP

liters
g/mole
g/mole
g/liter
g/liter
g/liter

Can 744

			liq density		Mol wt	melting pt
Tricosafluorododecanoic acid		solid		C12HF23O2	614.1	96-103
Perfluoroundecanoic acid		solid		C11HF21O2	564.09	96-101
Perfluorodecanoic acid		solid		C10HF19O2	514.08	77-81
Perfluorononanoic acid		solid		C9HF17O2	464.08	59-62
Perfluorooctanoic acid	PFOA	liquid	1.8	C8HF15O2	414.07	
Perfluoroheptanoic acid		liquid	1.792	C7H13O2	364.062	
hexafluoropropene		gas		C3F6	150.02	-153
hexafluoropropene oxide		gas		C3F6O	166.02	
Perfluorooctanesulfonate	PFOS	liquid	0.79	C8HF17O3S	500.13	
Fluorotelomer sulfonate 8:2		solid		C10HF17O	464.12	
		liquid	1.651	C8H5F13O	364.1	

boiling pt	Solubility
245	NA
160	NA
218	9.5 g/liter water
218	9.5 g/liter water
189-192	9.5 g/liter water
175	
-28	
-27.4	

not miscible/low miscible in DI h20

?	?
88-95	?

2.15 # minutes from Summa 1 to Summa 2 @ 50cc/min

Fluorotelomer Alcohol 6:2 and Fluorotelomer Alcohol 8:2

(400 ml projected sample pull)

Volume (liters of mole gas)	
Mole weight Fluorotelomer alcohol 6:2	
Mole weight Fluorotelomer alcohol 8:2	
1ppbv Fluorotelomer alcohol 6:2 as a gas	
1ppbv Fluorotelomeralcohol 8:2 as a gas	
Stock solution of 6:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 8:2 in methanol (ref PLB 2424 P 170)	
Preparation of Flurotelomer 6:2 and 8:2	
Step 1	
If we spike 5 ul of 420-430 ng/ul soln in (MeOH) into 6 liter summa at 30 psia (2.04 atm)	
	175.5833333
	171.5
PPB Amount	
	11.59475947
	8.884499634
If 400 cc therefore we will put on	
	70.23333333
	68.6
If 100 cc therefore we will put on	
	17.55833333
	17.15

24.04358	liters
364.1	g/mole
464.12	g/mole
15.14333556	ng/liter
19.30328179	ng/liter
430	ng/ul
420	ng/ul

ng/l Fluorotelomer alcohol 6:2
ng/l Fluorotelomer alcohol 8:2

PPBv Fluorotelomer alcohol 6:2 compound Can N1
PPBv Fluorotelomer alcohol 8:2 compound N1

ng on column Fluorotelomer alcohol 6:2 Can N1
ng on column Fluorotelomer alcohol 8:2 Can N1

ng on column Fluorotelomer alcohol 6:2 Can N1
ng on column Fluorotelomer alcohol 8:2 Can N1

E1 and E2 fluorocarbon

(400 ml projected sample pull)

Volume (liters of mole gas)	
Mole weight E1 flourocarbon	
Mole weight E2 flourocarbon	
1ppbv E1	
1ppbv E2	
Stock solution of E1 in methanol	
Stock solution of E2 in methanol	
Preparation of E1 and E2	
Step 1	
If we spike 5 ul of 300 ng/ul soln in (MeOH) into 6 liter summa at 30 psia (2.04 atm)	
	124.548495
	135.9381271
PPB Amount	
	10.46913615
	7.229940571
If we shoot 400 cc therefore we will put on	
	49.81939799
	54.37525084
If we shoot 100 cc therefore we will put on	
	12.4548495
	13.59381271

24.04358	liters
286.04	g/mole
452.07	g/mole
11.89673085	ng/liter
18.8021085	ng/liter
304	ng/ul
331.8	ng/ul

ng/liter Air E1 in Can#N1
ng/liter Air E2 in Can#N1

PPBv E1 fluorocarbon can N1
PPBv E2 fluorocarbon can N1

ng on column E1 Can N1
ng on column E2 Can N1

ng on column E1 Can N1
ng on column E2 Can N1

Weighing strategy

fluror 6/2

fluror 8/2

PFHNOA Na+

Fluorotelomer Alcohol 4:2, 6:2 and 8:2 (400 ml sample pull on Entech system)

Volume (liters of mole gas)	
Mole weight Fluorotelomer alcohol 4:2	
Mole weight Fluorotelomer alcohol 6:2	
Mole weight Fluorotelomer alcohol 8:2	
1ppbv Fluorotelomer alcohol 4:2 as a gas	
1ppbv Fluorotelomer alcohol 6:2 as a gas	
1ppbv Fluorotelomeralcohol 8:2 as a gas	
Stock solution of 4:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 6:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 8:2 in methanol (ref PLB 2424 P 170)	
Preparation of Flurotelomer 4:2, 6:2 and 8:2	
Step 1	
If we spike 5 ul of working stock solns in (MeOH) into 6 liter summa at 30 psia (2.04 atm)	
	129.85
	175.5833333
	171.5
PPB Amount	
	11.82195033
	11.59475947
	8.884499634
If 400 cc therefore we will put on	
	51.94
	70.23333333
	68.6
If 100 cc therefore we will put on	
	12.985
	17.55833333
	17.15

24.04358	liters			
264.09	g/mole	density of 4:2	1.59	g/ml
364.1	g/mole	density of 4:2	1.59	mg/ul
464.12	g/mole	density of 4:2	1590	ug/ul
10.98380524	ng/liter	inject 10 ul into 5 ml MeOH	3180	ug/ml
15.14333556	ng/liter	10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ug/ml
19.30328179	ng/liter	10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ng/ul
318	ng/ul working stock			
430	ng/ul working stock			
420	ng/ul working stock			

ng/l Fluorotelomer alcohol 4:2
ng/l Fluorotelomer alcohol 6:2
ng/l Fluorotelomer alcohol 8:2

PPBv Fluorotelomer alcohol 4:2 compound
PPBv Fluorotelomer alcohol 6:2 compound
PPBv Fluorotelomer alcohol 8:2 compound

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can
ng on column Fluorotelomer alcohol 8:2 Can

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can
ng on column Fluorotelomer alcohol 8:2 Can

Hexafluoropropene and TFE Summa

(100 ml projected sample pull) on Markes

Volume (liters of mole gas)	24.04358	liters
Mole wt of hexafluropropene	150.02	g/mole
Mole wt of TFE	100	g/mole
1 mole hexafluoropropene	6.239503435	g/liter
1 mole TFE	4.159114408	g/liter
1 mole of 1000 ppm TFE	0.004159114	g/liter

Preparation of HFP into initial 2 liter gas bulb staging

Step 1

If we spike 1000 ul of pure gas flow into 2 liter staging bulb

0.003119752 g/l HFP

Step 2

If we spike 100 ul of gas bulb into 6 liter summa at 30 psia (2.04 atm)

25.56318297 ng/l HFP

The PPB for each would be

4.096989967 ppbv HFP

Preparation of TFE into 6 liter bulb

Step 1

If we take 100 ul of a 1000 ppm gas standard

34.0797 ng/l TFE

The PPB for TFE would be

8.193979933 ppbv TFE

E1 and E2 fluorocarbon

(100 ml projected sample pull) on Markes

Volume (liters of mole gas)	24.04358	liters
Mole weight E1 flourocarbon	286.04	g/mole
Mole weight E2 flourocarbon	452.07	g/mole
1ppbv E1	11.89673085	ng/liter
1ppbv E2	18.8021085	ng/liter
Stock solution of E1 in methanol	304	ng/ul
Stock solution of E2 in methanol	331.8	ng/ul

Preparation of E1 and E2

Step 1 (30 psia/2.04 atm)

If we spike 4 ul of 304/331.8 ng/ul soln in (MeOH) into 6 liter summa at 30 psia (2.04 atm)

99.63879599	ng/liter Air E1
108.7505017	ng/liter Air E2

PPB Amount

8.375308916	PPBv E1 fluorocarbon
5.783952456	PPBv E2 fluorocarbon

If we shoot 400 cc therefore we will put on

39.85551839	ng on column
43.50020067	ng on column

If we shoot 100 cc therefore we will put on

9.963879599	ng on column E1
10.87505017	ng on column E2

			liq density	
Tricosafluorododecanoic acid		solid		C12HF23O2
Perfluoroundecanoic acid		solid		C11HF21O2
Perfluorodecanoic acid		solid		C10HF19O2
Perfluorononanoic acid		solid		C9HF17O2
Perfluorooctanoic acid	PFOA	liquid	1.8	C8HF15O2
Perfluoroheptanoic acid		liquid	1.792	C7H13O2
hexafluoropropene		gas		C3F6
hexafluoropropene oxide		gas		C3F6O
Perfluorooctanesulfonate	PFOS	liquid	0.79	C8HF17O3S
Fluorotelomer sulfonate 8:2		solid		C10HF17O
		liquid	1.651	C8H5F13O

Mol wt	melting pt	boiling pt	Solubility
614.1	96-103	245	NA
564.09	96-101	160	NA
514.08	77-81	218	9.5 g/liter water
464.08	59-62	218	9.5 g/liter water
414.07		189-192	9.5 g/liter water
364.062		175	
150.02	-153	-28	
166.02		-27.4	

500.13			not miscible/low miscible in DI h20

464.12		?	?
364.1		88-95	?

Weighing strategy

fluror 6/2

fluror 8/2

PFHNOA Na+

2.15 # minutes from Summa 1 to Summa 2 @ 50cc/min

Markes Calibration and data files March 21-April 11, 2019

Description	data file
Light composite cal 1	032119_2
Light composite cal 2	032119_3
Light composite cal 3	032119_4
Light composite cal 4	032119_5
Light composite cal 5	032119_6
Trap heat	040419_1
Light PFAS mid cal	040419_4
Batch blk #1	040419_3
Sample 1	040419_5
Sample 1 dup	040419_6
Sample 2	040419_7
Sample 3	040419_8
Sample 4	040419_9
Sample 5	040419_10
Sample 6	040419_11
Sample 7	040419_12
Sample 8	040419_13
Sample 9	040419_14
Sample 10	040419_15
Sample 11	040419_16
Trap heat	040819_1
Light PFAS mid cal	040819_4
Batch blk #2	040819_3
Trip blk	040819_5
Trip blk dup	040819_6
Batch blk #2	040919_3
Field blk	040819_7
Ambient	040819_8
System blk	040819_9
Light PFAS mid cal	041119_3
Batch blk #2	041119_4
Sample 12	041119_5
Sample 12 dup	041119_6
Sample 13	041119_7
Sample 14	041119_8
Sample 15	041119_9
Sample 16	041119_10

Instrument	
Markes	
Markes	
Markes	Formed 5 level light cal for Markes
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Entech St. Gobain data files April 11-17,2019

Description	data file
1 ppb TO15 std	41219003
Ambient	41219004
Ambient dup	41219006
System Blank	41219007
Batch Blank 2	41219009
Trip Blank	41219011
Field Blank	41219013
Instrument blank	41519002
1 ppb TO15 std	41519003
Fluorotelomer std	41519004
Batch blank 1	41519005
Sample 1	41519006
Sample 1 dup	41519007
Sample 2	41519009
Sample 3	41519011
Sample 4	41519013
Sample 5	41519015
Sample 6	41519017
Instrument blank	41619002
1 ppb TO15 std	41619003
Fluorotelomer std	41619004
Batch Blank 2	41619005
Sample 7	41619006
Sample 7 dup	41619007
Sample 8	41619009
Sample 9	41619011
Sample 10	41619013
Sample 11	41619015
Sample 12	41619017
Instrument blank	41719002
1 ppb TO15 std	41719003
Fluorotelomer std	41719004
Batch blank 1	41719005
Sample 13	41719006
Sample 13 dup	41719007
Sample 14	41719009
Sample 15	41719011
Sample 16	41719013

Instrument
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Fluorotelomer Alcohol 4:2, 6:2 and 8:2 (400 ml sample pull on Entech sy

Volume (liters of mole gas)	
Mole weight Fluorotelomer alcohol 4:2	
Mole weight Fluorotelomer alcohol 6:2	
Mole weight Fluorotelomer alcohol 8:2	
1ppbv Fluorotelomer alcohol 4:2 as a gas	
1ppbv Fluorotelomer alcohol 6:2 as a gas	
1ppbv Fluorotelomeralcohol 8:2 as a gas	
Stock solution of 4:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 6:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 8:2 in methanol (ref PLB 2424 P 170)	
Preparation of Flurotelomer 4:2, 6:2 and 8:2	
Step 1	
If we spike 5 ul of working stock solns in (MeOH) into 6 liter summa at 30 psia (2.04 atm)	
	130.2842809
	176.1705686
	172.0735786
PPB Amount	
	11.86148863
	11.63353793
	8.914213679
If 400 cc therefore we will put on	
	52.11371237
	70.46822742
	68.82943144
If 100 cc therefore we will put on	
	13.02842809
	17.61705686
	17.20735786

stem)

24.04358	liters
264.09	g/mole
364.1	g/mole
464.12	g/mole
10.98380524	ng/liter
15.14333556	ng/liter
19.30328179	ng/liter
318	ng/ul working stock
430	ng/ul working stock
420	ng/ul working stock

ng/l Fluorotelomer alcohol 4:2
ng/l Fluorotelomer alcohol 6:2
ng/l Fluorotelomer alcohol 8:2

PPBv Fluorotelomer alcohol 4:2 compound
PPBv Fluorotelomer alcohol 6:2 compound
PPBv Fluorotelomer alcohol 8:2 compound

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can
ng on column Fluorotelomer alcohol 8:2 Can

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can
ng on column Fluorotelomer alcohol 8:2 Can

density of 4:2	1.59	g/ml
density of 4:2	1.59	mg/ul
density of 4:2	1590	ug/ul
inject 10 ul into 5 ml MeOH	3180	ug/ml
10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ug/ml
10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ng/ul

Hexafluoropropene and TFE Summa

(100 ml projected sample pull) on Markes

Volume (liters of mole gas)	24.04358	liters
Mole wt of hexafluropropene	150.02	g/mole
Mole wt of TFE	100	g/mole
1 mole hexafluoropropene	6.239503435	g/liter
1 mole TFE	4.159114408	g/liter
1 mole of 1000 ppm TFE	0.004159114	g/liter

Preparation of HFP into initial 2 liter gas bulb staging

Step 1

If we spike 1000 ul of pure gas flow into 2 liter staging bulb

0.003119752 g/l HFP

Step 2

If we spike 100 ul of gas bulb into 6 liter summa at 30 psia (2.04 atm)

25.56318297 ng/l HFP

The PPB for each would be

4.096989967 ppbv HFP

Preparation of TFE into 6 liter bulb

Step 1

If we take 100 ul of a 1000 ppm gas standard

34.0797 ng/l TFE

The PPB for TFE would be

8.193979933 ppbv TFE

E1 and E2 fluorocarbon

(100 ml projected sample pull) on Markes

Volume (liters of mole gas)	
Mole weight E1 flourocarbon	
Mole weight E2 flourocarbon	
1ppbv E1	
1ppbv E2	
Stock solution of E1 in methanol	
Stock solution of E2 in methanol	
Preparation of E1 and E2	
Step 1 (30 psia/2.04 atm)	
If we spike 4 ul of 304/331.8 ng/ul soln in (MeOH) into 6 liter summa at 30 psia (2.04 atm)	
	99.63879599
	108.7505017
PPB Amount	
	8.375308916
	5.783952456
If we shoot 400 cc therefore we will put on	
	39.85551839
	43.50020067
If we shoot 100 cc therefore we will put on	
	9.963879599
	10.87505017

24.04358	liters
286.04	g/mole
452.07	g/mole
11.89673085	ng/liter
18.8021085	ng/liter
304	ng/ul
331.8	ng/ul

ng/liter Air E1
ng/liter Air E2

PPBv E1 fluorocarbon
PPBv E2 fluorocarbon

ng on column
ng on column

ng on column E1
ng on column E2

Tricosafluorododecanoic acid		solid
Perfluoroundecanoic acid		solid
Perfluorodecanoic acid		solid
Perfluorononanoic acid		solid
Perfluorooctanoic acid	PFOA	liquid
Perfluoroheptanoic acid		liquid
hexafluoropropene		gas
hexafluoropropene oxide		gas
Perfluorooctanesulfonate	PFOS	liquid
Fluorotelomer sulfonate 8:2		solid
		liquid

liq density		Mol wt	melting pt	boiling pt	Solubility
	C12HF23O2	614.1	96-103	245	NA
	C11HF21O2	564.09	96-101	160	NA
	C10HF19O2	514.08	77-81	218	9.5 g/liter water
	C9HF17O2	464.08	59-62	218	9.5 g/liter water
1.8	C8HF15O2	414.07		189-192	9.5 g/liter water
1.792	C7H13O2	364.062		175	
	C3F6	150.02	-153	-28	
	C3F6O	166.02		-27.4	
0.79	C8HF17O3S	500.13			not miscible/low miscible in DI h20
	C10HF17O	464.12		?	?
1.651	C8H5F13O	364.1		88-95	?

Weighing strategy

fluror 6/2

fluror 8/2

PFHNOA Na+

2.15 # minutes from Summa 1 to Summa 2 @ 50cc/min

Hexafluoropropene and TFE Summa

(100 ml projected sample pull) on Markes

Volume (liters of mole gas)	24.04358	liters
Mole wt of hexafluropropene	150.02	g/mole
Mole wt of TFE	100	g/mole
1 mole hexafluoropropene	6.239503435	g/liter
1 mole TFE	4.159114408	g/liter
1 mole of 1000 ppm TFE	0.004159114	g/liter

Preparation of HFP into initial 2 liter gas bulb staging

Step 1

If we spike 200 ul of pure gas flow into 2 liter staging bulb

0.00062395 g/l HFP

Step 2

If we spike 100 ul of gas bulb into 6 liter summa at 30 psia (2.04 atm)

5.112636594 ng/l HFP

The PPB for each would be

0.819397993 ppbv HFP

Preparation of TFE into 6 liter bulb

Step 1

If we take 100 ul of a 1000 ppm gas standard

34.0797 ng/l TFE

The PPB for TFE would be

8.193979933 ppbv TFE

Hexafluoropropene and TFE Summa-Can ID A378

(100 ml projected sample pull) on Markes

Volume (liters of mole gas)	24.04358	liters
Mole wt of hexafluropropene	150.02	g/mole
Mole wt of TFE	100	g/mole
1 mole hexafluoropropene	6.239503435	g/liter
1 mole TFE	4.159114408	g/liter
1 mole of 1000 ppm TFE	0.004159114	g/liter

Preparation of HFP into initial 2 liter gas bulb staging

Step 1

If we spike 1000 ul of pure gas flow into 2 liter staging bulb

0.003119752 g/l HFP

Step 2

If we spike 200 ul of gas bulb into 6 liter summa at 30 psia (2.04 atm)

51.12636594 ng/l HFP

The PPB for each would be

8.193979933 ppbv HFP

Preparation of TFE into 6 liter bulb

Step 1

If we take 100 ul of a 1000 ppm gas standard

34.0797 ng/l TFE

The PPB for TFE would be

8.193979933 ppbv TFE

Fluorotelomer Alcohol 4:2, 6:2 and 8:2 (100 ml sample pull on Markes sy

Volume (liters of mole gas)	
Mole weight Fluorotelomer alcohol 4:2	
Mole weight Fluorotelomer alcohol 6:2	
Mole weight Fluorotelomer alcohol 8:2	
1ppbv Fluorotelomer alcohol 4:2 as a gas	
1ppbv Fluorotelomer alcohol 6:2 as a gas	
1ppbv Fluorotelomeralcohol 8:2 as a gas	
Stock solution of 4:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 6:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 8:2 in methanol (ref PLB 2424 P 170)	
Preparation of Flurotelomer 4:2, 6:2 and 8:2	
Step 1	
If we spike 5 ul of working stock solns in (MeOH) into 6 liter summa at 30 psia (2.04 atm)	
	130.2842809
	176.1705686
	172.0735786
PPB Amount	
	11.86148863
	11.63353793
	8.914213679
If 400 cc therefore we will put on	
	52.11371237
	70.46822742
	68.82943144
If 100 cc therefore we will put on	
	13.02842809
	17.61705686
	17.20735786

ystem)-October 22, 2019

24.04358	liters
264.09	g/mole
364.1	g/mole
464.12	g/mole
10.98380524	ng/liter
15.14333556	ng/liter
19.30328179	ng/liter
318	ng/ul working stock
430	ng/ul working stock
420	ng/ul working stock

ng/l Fluorotelomer alcohol 4:2
ng/l Fluorotelomer alcohol 6:2
ng/l Fluorotelomer alcohol 8:2

PPBv Fluorotelomer alcohol 4:2 compound
PPBv Fluorotelomer alcohol 6:2 compound
PPBv Fluorotelomer alcohol 8:2 compound

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can
ng on column Fluorotelomer alcohol 8:2 Can

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can
ng on column Fluorotelomer alcohol 8:2 Can

density of 4:2	1.59	g/ml
density of 4:2	1.59	mg/ul
density of 4:2	1590	ug/ul
inject 10 ul into 5 ml MeOH	3180	ug/ml
10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ug/ml
10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ng/ul

E1 and E2 fluorocarbon

(100 ml projected sample pull) on Markes

Volume (liters of mole gas)	
Mole weight E1 flourocarbon	
Mole weight E2 flourocarbon	
1ppbv E1	
1ppbv E2	
Stock solution of E1 in methanol	
Stock solution of E2 in methanol	
Preparation of E1 and E2	
Step 1 (30 psia/2.04 atm)	
If we spike 5 ul of 304/331.8 ng/ul soln in (MeOH) into 6 liter summa at 30 psia (2.04 atm)	
	99.63879599
	108.7505017
PPB Amount	
	8.375308916
	5.783952456
If we shoot 400 cc therefore we will put on	
	39.85551839
	43.50020067
If we shoot 100 cc therefore we will put on	
	9.963879599
	10.87505017

24.04358	liters
286.04	g/mole
452.07	g/mole
11.89673085	ng/liter
18.8021085	ng/liter
304	ng/ul
331.8	ng/ul

ng/liter Air E1
ng/liter Air E2

PPBv E1 fluorocarbon
PPBv E2 fluorocarbon

ng on column
ng on column

ng on column E1
ng on column E2

Weighing strategy

fluror 6/2

fluror 8/2

PFHNOA Na+

Hexafluoropropene and TFE Summa-Can ID A378

(100 ml projected sample pull) on Markes

Volume (liters of mole gas)	24.04358	liters
Mole wt of hexafluropropene	150.02	g/mole
Mole wt of TFE	100	g/mole
1 mole hexafluoropropene	6.239503435	g/liter
1 mole TFE	4.159114408	g/liter
1 mole of 1000 ppm TFE	0.004159114	g/liter

Preparation of HFP into initial 2 liter gas bulb staging

Step 1

If we spike 50 ul of pure gas flow into 2 liter staging bulb

0.000155988 g/l HFP

Step 2

If we spike 200 ul of gas bulb into 6 liter summa at 30 psia (2.04 atm)

2.556318297 ng/l HFP

The PPB for each would be

0.409698997 ppbv HFP

Preparation of TFE into 6 liter bulb

Step 1

If we take 5 ul of a 1000 ppm gas standard

1.703985 ng/l TFE

The PPB for TFE would be

0.409698997 ppbv TFE

Fluorotelomer Alcohol 4:2, 6:2 and 8:2 (50 ml sample pull on Markes sys

Volume (liters of mole gas)	
Mole weight Fluorotelomer alcohol 4:2	
Mole weight Fluorotelomer alcohol 6:2	
Mole weight Fluorotelomer alcohol 8:2	
1ppbv Fluorotelomer alcohol 4:2 as a gas	
1ppbv Fluorotelomer alcohol 6:2 as a gas	
1ppbv Fluorotelomeralcohol 8:2 as a gas	
Stock solution of 4:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 6:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 8:2 in methanol (ref PLB 2424 P 170)	

Preparation of Flurotelomer 4:2, 6:2 and 8:2	
Step 1	
If we spike 1 ul of 10 x working stock solns in (MeOH) into 6 liter summa at 30 psia (2.04 atm)	
	2.605685619
	17.61705686
PPB Amount	
	0.237229773
	1.163353793
If 400 cc therefore we will put on	
	1.042274247
	7.046822742
If 50 cc therefore we will put on	
	0.130284281
	0.880852843

stem)-Feb 5, 2020

24.04358
264.09
364.1
464.12
10.98380524
15.14333556
19.30328179
318
430
420

ng/l Fluorotelomer alcohol 4:2
ng/l Fluorotelomer alcohol 6:2 (also added 4 ul of the individual standard plus 1 ul of the 10x mix)

PPBv Fluorotelomer alcohol 4:2 compound
PPBv Fluorotelomer alcohol 6:2 compound

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can

liters			
g/mole	density of 4:2	1.59	g/ml
g/mole	density of 4:2	1.59	mg/ul
g/mole	density of 4:2	1590	ug/ul
ng/liter	inject 10 ul into 5 ml MeOH	3180	ug/ml
ng/liter	10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ug/ml
ng/liter	10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ng/ul
ng/ul working stock	10 x working stock 4/2 (ref PLB 4092 P.18) mix	31.8	ng/ul
ng/ul working stock	10 x working stock 6/2 (ref PLB 4092 P.18) mix	43	ng/ul
ng/ul working stock			
	10 x working stock 6/2 (ref PLB 4092 P.18)-Individual	43	ng/ul

E1 and E2 fluorocarbon

(100 ml projected sample pull) on Markes

Volume (liters of mole gas)	
Mole weight E1 flourocarbon	
Mole weight E2 flourocarbon	
1ppbv E1	
1ppbv E2	
Stock solution of E1 in methanol	
Stock solution of E2 in methanol	
Preparation of E1 and E2	
Step 1 (30 psia/2.04 atm)	
If we spike 1 ul of 10x working mix in (MeOH) into 6 liter summa at 30 psia (2.04 atm)	
	24.909699
	27.18762542
PPB Amount	
	2.093827229
	1.445988114
If we shoot 400 cc therefore we will put on	
	9.963879599
	10.87505017
If we shoot 50 cc therefore we will put on	
	1.24548495
	1.359381271

24.04358	liters			
286.04	g/mole			
452.07	g/mole			
11.89673085	ng/liter			
18.8021085	ng/liter			
304	ng/ul	10 x working stock E1 (ref PLB 4092 P.18)	30.4	ng/ul
331.8	ng/ul	10 x working stock E2 (ref PLB 4092 P.18)	33.18	ng/ul

ng/liter Air E1
ng/liter Air E2

PPBv E1 fluorocarbon
PPBv E2 fluorocarbon

ng on column
ng on column

ng on column E1
ng on column E2

Weighing strategy

fluror 6/2

fluror 8/2

PFHNOA Na+

Fluorotelomer Alcohol 4:2, 6:2 and 8:2 (100 ml sample pull on Markes sy

Volume (liters of mole gas)	
Mole weight Fluorotelomer alcohol 4:2	
Mole weight Fluorotelomer alcohol 6:2	
Mole weight Fluorotelomer alcohol 8:2	
1ppbv Fluorotelomer alcohol 4:2 as a gas	
1ppbv Fluorotelomer alcohol 6:2 as a gas	
1ppbv Fluorotelomeralcohol 8:2 as a gas	
Stock solution of 4:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 6:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 8:2 in methanol (ref PLB 2424 P 170)	

Preparation of Flurotelomer 4:2, 6:2 and 8:2	
Step 1	
If we spike 1 ul of 20 x working stock solns in (MeOH) into 6 liter summa at 30 psia (2.04 atm)	
	1.302842809
	3.523411371
PPB Amount	
	0.118614886
	0.232670759
If 400 cc therefore we will put on	
	0.521137124
	1.409364548
If 100 cc therefore we will put on	
	0.130284281
	0.352341137

ystem)

24.04358	liters
264.09	g/mole
364.1	g/mole
464.12	g/mole
10.98380524	ng/liter
15.14333556	ng/liter
19.30328179	ng/liter
318	ng/ul working stock
430	ng/ul working stock
420	ng/ul working stock

ng/l Fluorotelomer alcohol 4:2
ng/l Fluorotelomer alcohol 6:2

PPBv Fluorotelomer alcohol 4:2 compound
PPBv Fluorotelomer alcohol 6:2 compound

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can

density of 4:2	1.59	g/ml
density of 4:2	1.59	mg/ul
density of 4:2	1590	ug/ul
inject 10 ul into 5 ml MeOH	3180	ug/ml
10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ug/ml
10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ng/ul
MDL 4/2 (ref PLB 4092 P.18) mix-20x	15.9	ng/ul
MDL 6/2 (ref PLB 4092 P.18) mix-10x	43	ng/ul

E1 and E2 fluorocarbon

(100 ml projected sample pull) on Markes

Volume (liters of mole gas)	
Mole weight E1 flourocarbon	
Mole weight E2 flourocarbon	
1ppbv E1	
1ppbv E2	
Stock solution of E1 in methanol	
Stock solution of E2 in methanol	

Preparation of E1 and E2

Step 1 (30 psia/2.04 atm)

If we spike 1 ul of 10x working mix in (MeOH) into 6 liter summa at 30 psia (2.04 atm)

	1.24548495
	1.359381271
PPB Amount	
	0.104691361
	0.072299406
If we shoot 400 cc therefore we will put on	
	0.49819398
	0.543752508
If we shoot 50 cc therefore we will put on	
	0.062274247
	0.067969064

24.04358	liters		
286.04	g/mole		
452.07	g/mole		
11.89673085	ng/liter		
18.8021085	ng/liter		
304	ng/ul	MDL mix B (ref PLB 4092 P.18)-20x	15.2
331.8	ng/ul	MDL mix B (ref PLB 4092 P.18)-20x	16.59

ng/liter Air E1
ng/liter Air E2

PPBv E1 fluorocarbon
PPBv E2 fluorocarbon

ng on column
ng on column

ng on column E1
ng on column E2

Weighing strategy

fluror 6/2

fluror 8/2

PFHNOA Na+

Hexafluoropropene and TFE Summa-Can ID BTP1 and #721

(100 ml projected sample pull) on Markes

18-Feb-20

Volume (liters of mole gas)
Mole wt of hexafluropropene
Mole wt of TFE

1 mole hexafluoropropene

1 mole TFE

1 mole of 1000 ppm TFE

Preparation of HFP into initial 2 liter gas bulb staging
Step 1
If we spike 50 ul of pure gas flow into 2 liter staging bulb

0.000155988

Step 2
If we spike 200 ul of gas bulb into 6 liter summa at 30 psia (2.04 atm)

2.556318297

The PPB for each would be

0.409698997

Preparation of TFE into 6 liter bulb
Step 1
If we take 5 ul of a 1000 ppm gas standard

1.703985

The PPB for TFE would be

0.409698997

If 100 cc therefore we will put on

0.1703985
0.25563183

24.04358	liters
150.02	g/mole
100	g/mole
6.239503435	g/liter
4.159114408	g/liter
0.004159114	g/liter

g/l HFP

ng/l HFP

ppbv HFP

ng/l TFE

ppbv TFE

ng on column TFE
ng on column HFP

Fluorotelomer Alcohol 4:2, 6:2 and 8:2 (100 ml sample pull on Markes sy

18-Feb-20

Volume (liters of mole gas)	
Mole weight Fluorotelomer alcohol 4:2	
Mole weight Fluorotelomer alcohol 6:2	
Mole weight Fluorotelomer alcohol 8:2	
1ppbv Fluorotelomer alcohol 4:2 as a gas	
1ppbv Fluorotelomer alcohol 6:2 as a gas	
1ppbv Fluorotelomeralcohol 8:2 as a gas	
Stock solution of 4:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 6:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 8:2 in methanol (ref PLB 2424 P 170)	

Preparation of Flurotelomer 4:2, 6:2 and 8:2	
Step 1	
If we spike 1 ul of Mix C working stock solns in (MeOH) into 6 liter summa at 30 psia (2.04 atm)	
	2.605685619
	14.09364548
PPB Amount	
	0.237229773
	0.930683034
If 400 cc therefore we will put on	
	1.042274247
	5.637458194
If 100 cc therefore we will put on	
	0.260568562
	1.409364548

ystem)

24.04358	liters
264.09	g/mole
364.1	g/mole
464.12	g/mole
10.98380524	ng/liter
15.14333556	ng/liter
19.30328179	ng/liter
318	ng/ul working stock
430	ng/ul working stock
420	ng/ul working stock

ng/l Fluorotelomer alcohol 4:2
ng/l Fluorotelomer alcohol 6:2

PPBv Fluorotelomer alcohol 4:2 compound
PPBv Fluorotelomer alcohol 6:2 compound

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can

Can ID's 2504 and MTC 48

density of 4:2	1.59	g/ml
density of 4:2	1.59	mg/ul
density of 4:2	1590	ug/ul
inject 10 ul into 5 ml MeOH	3180	ug/ml
10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ug/ml
10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ng/ul
MDL 4/2 mix C (ref PLB 4092 P.20) mix-20x	31.8	ng/ul
MDL 6/2 mix C (ref PLB 4092 P.20) mix-20x	172	ng/ul

E1 and E2 fluorocarbon

(100 ml projected sample pull) on Markes

Volume (liters of mole gas)	24.04358
Mole weight E1 flourocarbon	286.04
Mole weight E2 flourocarbon	452.07
1ppbv E1	11.89673085
1ppbv E2	18.8021085
Stock solution of E1 in methanol	304
Stock solution of E2 in methanol	331.8

Preparation of E1 and E2

Step 1 (30 psia/2.04 atm)
If we spike 1 ul of MDL mix C (MeOH) into 6 liter summa at 30 psia (2.04 atm)

0.311371237	ng/liter Air E1
0.340050167	ng/liter Air E2

PPB Amount

0.02617284	PPBv E1 fluorocarbon
0.018085746	PPBv E2 fluorocarbon

If we shoot 400 cc therefore we will put on

0.124548495	ng on column
0.136020067	ng on column

If we shoot 100 cc therefore we will put on

0.031137124	ng on column E1
0.034005017	ng on column E2

liters		
g/mole		
g/mole		
ng/liter		
ng/liter		
ng/ul	MDL mix C (ref PLB 4092 P.20)-20x	3.8
ng/ul	MDL mix C (ref PLB 4092 P.20)-20x	4.15

Weighing strategy

fluror 6/2

fluror 8/2

PFHNOA Na+

Fluorotelomer Alcohol 4:2, 6:2 and 8:2 (100 ml sample pull on Markes sy

26-Feb-20

Volume (liters of mole gas)	
Mole weight Fluorotelomer alcohol 4:2	
Mole weight Fluorotelomer alcohol 6:2	
Mole weight Fluorotelomer alcohol 8:2	
1ppbv Fluorotelomer alcohol 4:2 as a gas	
1ppbv Fluorotelomer alcohol 6:2 as a gas	
1ppbv Fluorotelomeralcohol 8:2 as a gas	
Stock solution of 4:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 6:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 8:2 in methanol (ref PLB 2424 P 170)	

Preparation of Flurotelomer 4:2, 6:2 and 8:2	
Step 1	
If we spike 1 ul of Mix C working stock solns in (MeOH) into 6 liter summa at 30 psia (2.04 atm)	
	2.605685619
	14.09364548
PPB Amount	
	0.237229773
	0.930683034
If 400 cc therefore we will put on	
	1.042274247
	5.637458194
If 100 cc therefore we will put on	
	0.260568562
	1.409364548

ystem)

24.04358	liters
264.09	g/mole
364.1	g/mole
464.12	g/mole
10.98380524	ng/liter
15.14333556	ng/liter
19.30328179	ng/liter
318	ng/ul working stock
430	ng/ul working stock
420	ng/ul working stock

ng/l Fluorotelomer alcohol 4:2
ng/l Fluorotelomer alcohol 6:2

PPBv Fluorotelomer alcohol 4:2 compound
PPBv Fluorotelomer alcohol 6:2 compound

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can

Can ID's 721 and BTP1

density of 4:2	1.59	g/ml
density of 4:2	1.59	mg/ul
density of 4:2	1590	ug/ul
inject 10 ul into 5 ml MeOH	3180	ug/ml
10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ug/ml
10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ng/ul
MDL 4/2 mix C (ref PLB 4092 P.20) mix-20x	31.8	ng/ul
MDL 6/2 mix C (ref PLB 4092 P.20) mix-20x	172	ng/ul

E1 and E2 fluorocarbon

(100 ml projected sample pull) on Markes

Volume (liters of mole gas)	24.04358
Mole weight E1 flourocarbon	286.04
Mole weight E2 flourocarbon	452.07
1ppbv E1	11.89673085
1ppbv E2	18.8021085
Stock solution of E1 in methanol	304
Stock solution of E2 in methanol	331.8

Preparation of E1 and E2

Step 1 (30 psia/2.04 atm)
If we spike 1 ul MDL mix C in (MeOH) into 6 liter summa at 30 psia (2.04 atm)

0.311371237	ng/liter Air E1
0.340050167	ng/liter Air E2

PPB Amount

0.02617284	PPBv E1 fluorocarbon
0.018085746	PPBv E2 fluorocarbon

If we shoot 400 cc therefore we will put on

0.124548495	ng on column
0.136020067	ng on column

If we shoot 100 cc therefore we will put on

0.031137124	ng on column E1
0.034005017	ng on column E2

liters		
g/mole		
g/mole		
ng/liter		
ng/liter		
ng/ul	MDL mix C (ref PLB 4092 P.20)-20x	3.8
ng/ul	MDL mix C (ref PLB 4092 P.20)-20x	4.15

Weighing strategy

fluror 6/2

fluror 8/2

PFHNOA Na+

Hexafluoropropene and TFE Summa-Can ID MTC48 and #2504

(100 ml projected sample pull) on Markes

26-Feb-20

Volume (liters of mole gas)
Mole wt of hexafluropropene
Mole wt of TFE

1 mole hexafluoropropene

1 mole TFE

1 mole of 1000 ppm TFE

Preparation of HFP into initial 2 liter gas bulb staging
Step 1
If we spike 50 ul of pure gas flow into 2 liter staging bulb

0.000155988

Step 2
If we spike 200 ul of gas bulb into 6 liter summa at 30 psia (2.04 atm)

2.556318297

The PPB for each would be

0.409698997

Preparation of TFE into 6 liter bulb
Step 1
If we take 5 ul of a 1000 ppm gas standard

1.703985

The PPB for TFE would be

0.409698997

If 100 cc therefore we will put on

0.1703985
0.25563183

24.04358	liters
150.02	g/mole
100	g/mole
6.239503435	g/liter
4.159114408	g/liter
0.004159114	g/liter

g/l HFP

ng/l HFP

ppbv HFP

ng/l TFE

ppbv TFE

ng on column TFE
ng on column HFP

Hexafluoropropene and TFE Summa-Can ID BTP-1 and can #721

(100 ml projected sample pull) on Markes

3-Mar-20

Mid level-BTP-1

Volume (liters of mole gas)	24.04358	liters
Mole wt of hexafluropropene	150.02	g/mole
Mole wt of TFE	100	g/mole
1 mole hexafluoropropene	6.239503435	g/liter
1 mole TFE	4.159114408	g/liter
1 mole of 1000 ppm TFE	0.004159114	g/liter

Preparation of HFP into initial 2 liter gas bulb staging

Step 1

If we spike 500 ul of pure gas flow into 2 liter staging bulb

0.001559876 g/l HFP

Step 2

If we spike 400 ul of gas bulb into 6 liter summa at 30 psia (2.04 atm)

51.12636594 ng/l HFP

The PPB for each would be

8.193979933 ppbv HFP

Preparation of TFE into 6 liter can

Step 1

If we take 100 ul of a 1000 ppm gas standard

34.0797 ng/l TFE

The PPB for TFE would be

8.193979933 ppbv TFE

If 100 cc therefore we will put on

3.40797 ng on column TFE

5.112636594 ng on column HFP

MDL-can #721

Volume (liters of mole gas)	24.04358	liters
Mole wt of hexafluropropene	150.02	g/mole
Mole wt of TFE	100	g/mole
1 mole hexafluoropropene	6.239503435	g/liter
1 mole TFE	4.159114408	g/liter
1 mole of 1000 ppm TFE	0.004159114	g/liter

Preparation of HFP into initial 2 liter gas bulb staging

Step 1

If we spike 500 ul of pure gas flow into 2 liter staging bulb

0.001559876 g/l HFP

Step 2

If we spike 20 ul of gas bulb into 6 liter summa at 30 psia (2.04 atm)

2.556318297 ng/l HFP

The PPB for each would be

0.409698997 ppbv HFP

Preparation of TFE into 6 liter can

Step 1

If we take 5 ul of a 1000 ppm gas standard

1.703985 ng/l TFE

2.442002442

The PPB for TFE would be

0.409698997 ppbv TFE

If 100 cc therefore we will put on

0.1703985 ng on column TFE

0.25563183 ng on column HFP

Can ID#2504 Fluorotelomer Alcohol 4:2, 6:2 and 8:2 (100 ml sample pull on Markes system)-March 3, 2020

3-Mar-20

Volume (liters of mole gas)	24.04358	liters		
Mole weight Fluorotelomer alcohol 4:2	264.09	g/mole	density of 4:2	1.59 g/ml
Mole weight Fluorotelomer alcohol 6:2	364.1	g/mole	density of 4:2	1.59 mg/ul
Mole weight Fluorotelomer alcohol 8:2	464.12	g/mole	density of 4:2	1590 ug/ul
1ppbv Fluorotelomer alcohol 4:2 as a gas	10.98380524	ng/liter	inject 10 ul into 5 ml MeOH	3180 ug/ml
1ppbv Fluorotelomer alcohol 6:2 as a gas	15.14333556	ng/liter	10x dilution 100 ul of 3180 + 900 ul of MeOH	318 ug/ml
1ppbv Fluorotelomeralcohol 8:2 as a gas	19.30328179	ng/liter	10x dilution 100 ul of 3180 + 900 ul of MeOH	318 ng/ul
Stock solution of 4:2 in methanol (ref PLB 2424 P 170)	318	ng/ul working stock		
Stock solution of 6:2 in methanol (ref PLB 2424 P 170)	430	ng/ul working stock		
Stock solution of 8:2 in methanol (ref PLB 2424 P 170)	420	ng/ul working stock		

Preparation of Flurotelomer 4:2, 6:2 and 8:2

Step 1
If we spike 5 ul of working stock solns in (MeOH) into 6 liter summa at 30 psia (2.04 atm)

130.2842809	ng/l	Fluorotelomer alcohol 4:2
176.1705686	ng/l	Fluorotelomer alcohol 6:2
172.0735786	ng/l	Fluorotelomer alcohol 8:2

PPB Amount

11.86148863	PPBv	Fluorotelomer alcohol 4:2 compound
11.63353793	PPBv	Fluorotelomer alcohol 6:2 compound
8.914213679	PPBv	Fluorotelomer alcohol 8:2 compound

If 400 cc therefore we will put on

52.11371237	ng on column	Fluorotelomer alcohol 4:2 Can
70.46822742	ng on column	Fluorotelomer alcohol 6:2 Can
68.82943144	ng on column	Fluorotelomer alcohol 8:2 Can

If 100 cc therefore we will put on

13.02842809	ng on column	Fluorotelomer alcohol 4:2 Can
17.61705686	ng on column	Fluorotelomer alcohol 6:2 Can
17.20735786	ng on column	Fluorotelomer alcohol 8:2 Can

E1 and E2 fluorocarbon

(100 ml projected sample pull) on Markes

Volume (liters of mole gas)	24.04358	liters
Mole weight E1 flourocarbon	286.04	g/mole
Mole weight E2 flourocarbon	452.07	g/mole
1ppbv E1	11.89673085	ng/liter
1ppbv E2	18.8021085	ng/liter
Stock solution of E1 in methanol	304	ng/ul
Stock solution of E2 in methanol	331.8	ng/ul

Preparation of E1 and E2

Step 1 (30 psia/2.04 atm)
If we spike 5 ul of 304/331.8 ng/ul soln in (MeOH) into 6 liter summa at 30 psia (2.04 atm)

99.63879599	ng/liter Air	E1
108.7505017	ng/liter Air	E2

PPB Amount

8.375308916	PPBv	E1 fluorocarbon
5.783952456	PPBv	E2 fluorocarbon

If we shoot 400 cc therefore we will put on

39.85551839	ng on column	
43.50020067	ng on column	

If we shoot 100 cc therefore we will put on

9.963879599	ng on column	E1
10.87505017	ng on column	E2

Fluorotelomer Alcohol 4:2, 6:2 and 8:2 (100 ml sample pull on Markes system)

3-Mar-20

Volume (liters of mole gas)	24.04358 liters		
Mole weight Fluorotelomer alcohol 4:2	264.09 g/mole	density of 4:2	1.59 g/ml
Mole weight Fluorotelomer alcohol 6:2	364.1 g/mole	density of 4:2	1.59 mg/ul
Mole weight Fluorotelomer alcohol 8:2	464.12 g/mole	density of 4:2	1590 ug/ul
1ppbv Fluorotelomer alcohol 4:2 as a gas	10.98380524 ng/liter	inject 10 ul into 5 ml MeOH	3180 ug/ml
1ppbv Fluorotelomer alcohol 6:2 as a gas	15.14333556 ng/liter	10x dilution 100 ul of 3180 + 900 ul of MeOH	318 ug/ml
1ppbv Fluorotelomeralcohol 8:2 as a gas	19.30328179 ng/liter	10x dilution 100 ul of 3180 + 900 ul of MeOH	318 ng/ul
Stock solution of 4:2 in methanol (ref PLB 2424 P 170)	318 ng/ul working stock	MDL 4/2 mix C (ref PLB 4092 P.20) mix-20x	31.8 ng/ul
Stock solution of 6:2 in methanol (ref PLB 2424 P 170)	430 ng/ul working stock	MDL 6/2 mix C (ref PLB 4092 P.20) mix-20x	172 ng/ul
Stock solution of 8:2 in methanol (ref PLB 2424 P 170)	420 ng/ul working stock		

Can ID MTC 48

Preparation of Flurotelomer 4:2, 6:2 and 8:2

Step 1
If we spike 1 ul of Mix C working stock solns in (MeOH) into 6 liter summa at 30 psia (2.04 atm)

2.605685619 ng/l Fluorotelomer alcohol 4:2
14.09364548 ng/l Fluorotelomer alcohol 6:2

PPB Amount

0.237229773 PPBv Fluorotelomer alcohol 4:2 compound
0.930683034 PPBv Fluorotelomer alcohol 6:2 compound

If 400 cc therefore we will put on

1.042274247 ng on column Fluorotelomer alcohol 4:2 Can
5.637458194 ng on column Fluorotelomer alcohol 6:2 Can

If 100 cc therefore we will put on

0.260568562 ng on column Fluorotelomer alcohol 4:2 Can
1.409364548 ng on column Fluorotelomer alcohol 6:2 Can

E1 and E2 fluorocarbon

(100 ml projected sample pull) on Markes

Volume (liters of mole gas)	24.04358 liters		
Mole weight E1 flourocarbon	286.04 g/mole		
Mole weight E2 flourocarbon	452.07 g/mole		
1ppbv E1	11.89673085 ng/liter		
1ppbv E2	18.8021085 ng/liter		
Stock solution of E1 in methanol	304 ng/ul	MDL mix C (ref PLB 4092 P.20)-20x	3.8
Stock solution of E2 in methanol	331.8 ng/ul	MDL mix C (ref PLB 4092 P.20)-20x	4.15

Preparation of E1 and E2

Step 1 (30 psia/2.04 atm)
If we spike 1 ul of MDL mix C (MeOH) into 6 liter summa at 30 psia (2.04 atm)

0.311371237 ng/liter Air E1
0.340050167 ng/liter Air E2

PPB Amount

0.02617284 PPBv E1 fluorocarbon
0.018085746 PPBv E2 fluorocarbon

If we shoot 400 cc therefore we will put on

0.124548495 ng on column
0.136020067 ng on column

If we shoot 100 cc therefore we will put on

0.031137124 ng on column E1
0.034005017 ng on column E2

Weighing strategy

fluror 6/2

fluror 8/2

PFHNOA Na+

Hexafluoropropene and TFE Summa-Can ID MTC-48 and can #253

(100 ml projected sample pull) on Markes

10-Mar-20

MDL-can #MTC-48 -ACCIDENTLY OVERFILLED A Little

Volume (liters of mole gas)

Mole wt of hexafluropropene

Mole wt of TFE

1 mole hexafluoropropene

1 mole TFE

1 mole of 1000 ppm TFE

Preparation of HFP into initial 2 liter gas bulb staging

Step 1

If we spike 500 ul of pure gas flow into 2 liter staging bulb

0.001559876

Step 2

If we spike 20 ul of gas bulb into 6 liter summa at 31.9 psia (2.04 atm)

2.396047557

The PPB for each would be

0.384012539

Preparation of TFE into 6 liter can

Step 1

If we take 5 ul of a 1000 ppm gas standard

1.597152085

The PPB for TFE would be

0.384012539

If 106.7 cc therefore we will put on

0.170416127

0.255658274

24.04358	liters
150.02	g/mole
100	g/mole
6.239503435	g/liter
4.159114408	g/liter
0.004159114	g/liter

g/l HFP

ng/l HFP

ppbv HFP

ng/l TFE

ppbv TFE

ng on column TFE
ng on column HFP

MDL-can #253

Volume (liters of mole gas)	24.04358	liters
Mole wt of hexafluropropene	150.02	g/mole
Mole wt of TFE	100	g/mole
1 mole hexafluoropropene	6.239503435	g/liter
1 mole TFE	4.159114408	g/liter
1 mole of 1000 ppm TFE	0.004159114	g/liter

Preparation of HFP into initial 2 liter gas bulb staging

Step 1

If we spike 500 ul of pure gas flow into 2 liter staging bulb

0.001559876 g/l HFP

Step 2

If we spike 20 ul of gas bulb into 6 liter summa at 29.9 psia (2.04 atm)

2.556318297 ng/l HFP

The PPB for each would be

0.409698997 ppbv HFP

Preparation of TFE into 6 liter can

Step 1

If we take 5 ul of a 1000 ppm gas standard

1.703985 ng/l TFE

The PPB for TFE would be

0.409698997 ppbv TFE

If 100 cc therefore we will put on

0.1703985 ng on column TFE

0.25563183 ng on column HFP

0.999896562

Fluorotelomer Alcohol 4:2, 6:2 and 8:2 (100 ml sample pull on Markes sy

26-Feb-20

Volume (liters of mole gas)	
Mole weight Fluorotelomer alcohol 4:2	
Mole weight Fluorotelomer alcohol 6:2	
Mole weight Fluorotelomer alcohol 8:2	
1ppbv Fluorotelomer alcohol 4:2 as a gas	
1ppbv Fluorotelomer alcohol 6:2 as a gas	
1ppbv Fluorotelomeralcohol 8:2 as a gas	
Stock solution of 4:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 6:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 8:2 in methanol (ref PLB 2424 P 170)	

Preparation of Flurotelomer 4:2, 6:2 and 8:2	
Step 1	
If we spike 1 ul of Mix C working stock solns in (MeOH) into 6 liter summa at 30 psia (2.04 atm)	
	2.605685619
	14.09364548
PPB Amount	
	0.237229773
	0.930683034
If 400 cc therefore we will put on	
	1.042274247
	5.637458194
If 100 cc therefore we will put on	
	0.260568562
	1.409364548

ystem)

24.04358	liters
264.09	g/mole
364.1	g/mole
464.12	g/mole
10.98380524	ng/liter
15.14333556	ng/liter
19.30328179	ng/liter
318	ng/ul working stock
430	ng/ul working stock
420	ng/ul working stock

ng/l Fluorotelomer alcohol 4:2
ng/l Fluorotelomer alcohol 6:2

PPBv Fluorotelomer alcohol 4:2 compound
PPBv Fluorotelomer alcohol 6:2 compound

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can

Can ID's 721 and A378

density of 4:2	1.59	g/ml
density of 4:2	1.59	mg/ul
density of 4:2	1590	ug/ul
inject 10 ul into 5 ml MeOH	3180	ug/ml
10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ug/ml
10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ng/ul
MDL 4/2 mix C (ref PLB 4092 P.20) mix-20x	31.8	ng/ul
MDL 6/2 mix C (ref PLB 4092 P.20) mix-20x	172	ng/ul

E1 and E2 fluorocarbon

(100 ml projected sample pull) on Markes

Volume (liters of mole gas)	24.04358
Mole weight E1 flourocarbon	286.04
Mole weight E2 flourocarbon	452.07
1ppbv E1	11.89673085
1ppbv E2	18.8021085
Stock solution of E1 in methanol	304
Stock solution of E2 in methanol	331.8

Preparation of E1 and E2

Step 1 (30 psia/2.04 atm)
If we spike 1 ul MDL mix C in (MeOH) into 6 liter summa at 30 psia (2.04 atm)

0.311371237	ng/liter Air E1
0.340050167	ng/liter Air E2

PPB Amount

0.02617284	PPBv E1 fluorocarbon
0.018085746	PPBv E2 fluorocarbon

If we shoot 400 cc therefore we will put on

0.124548495	ng on column
0.136020067	ng on column

If we shoot 100 cc therefore we will put on

0.031137124	ng on column E1
0.034005017	ng on column E2

liters		
g/mole		
g/mole		
ng/liter		
ng/liter		
ng/ul	MDL mix C (ref PLB 4092 P.20)-20x	3.8
ng/ul	MDL mix C (ref PLB 4092 P.20)-20x	4.15

Weighing strategy

fluror 6/2

fluror 8/2

PFHNOA Na+

Tetrafluoromethane Summa-Can ID RK8

(1 ml projected sample pull) on Entech

26-Feb-20

Volume (liters of mole gas)	24.04358	liters
Mole wt of CF4	88.0046	g/mole
1 mole CF4	3.660211998	g/liter
1 ppm CF4	3.660211998	ug/liter

Step 1

Filled 6 liter can to 5.7 psia with 10 ppm CF4

Filled 6 liter can to 28.5 psia with zero air

7320.423997 ng/l CF4

The PPB for CF4

2 ppmv CF4

	Mol wt
CF4	88.0046

If 1 cc therefore we will put on

7.320423997 ng on column CF4

Hexafluoropropene and TFE Summa-Can ID #721 and A378

(100 ml projected sample pull) on Markes

10-Mar-20

MDL-can #721

Volume (liters of mole gas)

Mole wt of hexafluropropene

Mole wt of TFE

1 mole hexafluoropropene	
1 mole TFE	
1 mole of 1000 ppm TFE	
Preparation of HFP into initial 2 liter gas bulb staging	
Step 1	
If we spike 500 ul of pure gas flow into 2 liter staging bulb	
	0.001559876
Step 2	
If we spike 20 ul of gas bulb into 6 liter summa at 31.9 psia (2.04 atm)	
	2.556318297
The PPB for each would be	
	0.409698997
Preparation of TFE into 6 liter can	
Step 1	
If we take 5 ul of a 1000 ppm gas standard	
	1.597152085
The PPB for TFE would be	
	0.384012539
If 100.0 cc therefore we will put on	
	0.159715208
	0.25563183

24.04358	liters
150.02	g/mole
100	g/mole
6.239503435	g/liter
4.159114408	g/liter
0.004159114	g/liter

g/l HFP

ng/l HFP

ppbv HFP

ng/l TFE

ppbv TFE

ng on column TFE
ng on column HFP

MDL-can #A378

Volume (liters of mole gas)	24.04358	liters
Mole wt of hexafluropropene	150.02	g/mole
Mole wt of TFE	100	g/mole
1 mole hexafluoropropene	6.239503435	g/liter
1 mole TFE	4.159114408	g/liter
1 mole of 1000 ppm TFE	0.004159114	g/liter

Preparation of HFP into initial 2 liter gas bulb staging

Step 1

If we spike 500 ul of pure gas flow into 2 liter staging bulb

0.001559876 g/l HFP

Step 2

If we spike 20 ul of gas bulb into 6 liter summa at 29.9 psia (2.04 atm)

2.556318297 ng/l HFP

The PPB for each would be

0.409698997 ppbv HFP

Preparation of TFE into 6 liter can

Step 1

If we take 5 ul of a 1000 ppm gas standard

1.703985 ng/l TFE

The PPB for TFE would be

0.409698997 ppbv TFE

If 100 cc therefore we will put on

0.1703985 ng on column TFE

0.25563183 ng on column HFP

1.066889632

Fluorotelomer Alcohol 4:2, 6:2 and 8:2 (100 ml sample pull on Markes sy

26-Feb-20

Volume (liters of mole gas)	
Mole weight Fluorotelomer alcohol 4:2	
Mole weight Fluorotelomer alcohol 6:2	
Mole weight Fluorotelomer alcohol 8:2	
1ppbv Fluorotelomer alcohol 4:2 as a gas	
1ppbv Fluorotelomer alcohol 6:2 as a gas	
1ppbv Fluorotelomeralcohol 8:2 as a gas	
Stock solution of 4:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 6:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 8:2 in methanol (ref PLB 2424 P 170)	

Preparation of Flurotelomer 4:2, 6:2 and 8:2	
Step 1	
If we spike 1 ul of Mix C working stock solns in (MeOH) into 6 liter summa at 30 psia (2.04 atm)	
	2.605685619
	14.09364548
PPB Amount	
	0.237229773
	0.930683034
If 400 cc therefore we will put on	
	1.042274247
	5.637458194
If 100 cc therefore we will put on	
	0.260568562
	1.409364548

ystem)

24.04358	liters
264.09	g/mole
364.1	g/mole
464.12	g/mole
10.98380524	ng/liter
15.14333556	ng/liter
19.30328179	ng/liter
318	ng/ul working stock
430	ng/ul working stock
420	ng/ul working stock

ng/l Fluorotelomer alcohol 4:2
ng/l Fluorotelomer alcohol 6:2

PPBv Fluorotelomer alcohol 4:2 compound
PPBv Fluorotelomer alcohol 6:2 compound

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can

Can ID's MTC48 and #253

density of 4:2	1.59	g/ml
density of 4:2	1.59	mg/ul
density of 4:2	1590	ug/ul
inject 10 ul into 5 ml MeOH	3180	ug/ml
10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ug/ml
10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ng/ul
MDL 4/2 mix C (ref PLB 4092 P.20) mix-20x	31.8	ng/ul
MDL 6/2 mix C (ref PLB 4092 P.20) mix-20x	172	ng/ul

E1 and E2 fluorocarbon

(100 ml projected sample pull) on Markes

Volume (liters of mole gas)	24.04358
Mole weight E1 flourocarbon	286.04
Mole weight E2 flourocarbon	452.07
1ppbv E1	11.89673085
1ppbv E2	18.8021085
Stock solution of E1 in methanol	304
Stock solution of E2 in methanol	331.8

Preparation of E1 and E2

Step 1 (30 psia/2.04 atm)
If we spike 1 ul MDL mix C in (MeOH) into 6 liter summa at 30 psia (2.04 atm)

0.311371237	ng/liter Air E1
0.340050167	ng/liter Air E2

PPB Amount

0.02617284	PPBv E1 fluorocarbon
0.018085746	PPBv E2 fluorocarbon

If we shoot 400 cc therefore we will put on

0.124548495	ng on column
0.136020067	ng on column

If we shoot 100 cc therefore we will put on

0.031137124	ng on column E1
0.034005017	ng on column E2

liters		
g/mole		
g/mole		
ng/liter		
ng/liter		
ng/ul	MDL mix C (ref PLB 4092 P.20)-20x	3.8
ng/ul	MDL mix C (ref PLB 4092 P.20)-20x	4.15

Weighing strategy

fluror 6/2

fluror 8/2

PFHNOA Na+

Hexafluoropropene and TFE Summa-Can ID MTC 48 and Can#253

(100 ml projected sample pull) on Markes

24-Mar-20

MDL-can #MTC-48

Volume (liters of mole gas)

Mole wt of hexafluropropene

Mole wt of TFE

1 mole hexafluoropropene

1 mole TFE

1 mole of 1000 ppm TFE

Preparation of HFP into initial 2 liter gas bulb staging

Step 1

If we spike 500 ul of pure gas flow into 2 liter staging bulb

0.001559876

Step 2

If we spike 20 ul of gas bulb into 6 liter summa at 31.9 psia (2.04 atm)

2.556318297

The PPB for each would be

0.409698997

Preparation of TFE into 6 liter can

Step 1

If we take 5 ul of a 1000 ppm gas standard

1.703985

The PPB for TFE would be

0.409698997

If 100 cc therefore we will put on

0.1703985

0.25563183

24.04358	liters
150.02	g/mole
100	g/mole
6.239503435	g/liter
4.159114408	g/liter
0.004159114	g/liter

g/l HFP

ng/l HFP

ppbv HFP

ng/l TFE

ppbv TFE

ng on column TFE
ng on column HFP

MDL-can #253

Volume (liters of mole gas)	24.04358	liters
Mole wt of hexafluropropene	150.02	g/mole
Mole wt of TFE	100	g/mole
1 mole hexafluoropropene	6.239503435	g/liter
1 mole TFE	4.159114408	g/liter
1 mole of 1000 ppm TFE	0.004159114	g/liter

Preparation of HFP into initial 2 liter gas bulb staging

Step 1

If we spike 500 ul of pure gas flow into 2 liter staging bulb

0.001559876 g/l HFP

Step 2

If we spike 20 ul of gas bulb into 6 liter summa at 29.9 psia (2.04 atm)

2.556318297 ng/l HFP

The PPB for each would be

0.409698997 ppbv HFP

Preparation of TFE into 6 liter can

Step 1

If we take 5 ul of a 1000 ppm gas standard

1.703985 ng/l TFE

The PPB for TFE would be

0.409698997 ppbv TFE

If 100 cc therefore we will put on

0.1703985 ng on column TFE

0.25563183 ng on column HFP

Fluorotelomer Alcohol 4:2, 6:2 and 8:2 (100 ml sample pull on Markes sy

24-Mar-20

Can ID's 721 and A378-prepared 2 cans on this date exactly the same

Volume (liters of mole gas)	
Mole weight Fluorotelomer alcohol 4:2	
Mole weight Fluorotelomer alcohol 6:2	
Mole weight Fluorotelomer alcohol 8:2	
1ppbv Fluorotelomer alcohol 4:2 as a gas	
1ppbv Fluorotelomer alcohol 6:2 as a gas	
1ppbv Fluorotelomeralcohol 8:2 as a gas	
Stock solution of 4:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 6:2 in methanol (ref PLB 2424 P 170)	
Stock solution of 8:2 in methanol (ref PLB 2424 P 170)	

Preparation of Flurotelomer 4:2, 6:2 and 8:2	
Step 1	
If we spike 1 ul of Mix C working stock solns in (MeOH) into 6 liter summa at 30 psia (2.04 atm)	
	2.605685619
	14.09364548
PPB Amount	
	0.237229773
	0.930683034
If 400 cc therefore we will put on	
	1.042274247
	5.637458194
If 100 cc therefore we will put on	
	0.260568562
	1.409364548

ystem)

24.04358	liters
264.09	g/mole
364.1	g/mole
464.12	g/mole
10.98380524	ng/liter
15.14333556	ng/liter
19.30328179	ng/liter
318	ng/ul working stock
430	ng/ul working stock
420	ng/ul working stock

ng/l Fluorotelomer alcohol 4:2
ng/l Fluorotelomer alcohol 6:2

PPBv Fluorotelomer alcohol 4:2 compound
PPBv Fluorotelomer alcohol 6:2 compound

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can

ng on column Fluorotelomer alcohol 4:2 Can
ng on column Fluorotelomer alcohol 6:2 Can

density of 4:2	1.59	g/ml
density of 4:2	1.59	mg/ul
density of 4:2	1590	ug/ul
inject 10 ul into 5 ml MeOH	3180	ug/ml
10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ug/ml
10x dilution 100 ul of 3180 + 900 ul of MeOH	318	ng/ul
MDL 4/2 mix C (ref PLB 4092 P.20) mix-20x	31.8	ng/ul
MDL 6/2 mix C (ref PLB 4092 P.20) mix-20x	172	ng/ul

E1 and E2 fluorocarbon

(100 ml projected sample pull) on Markes

Volume (liters of mole gas)	24.04358
Mole weight E1 flourocarbon	286.04
Mole weight E2 flourocarbon	452.07
1ppbv E1	11.89673085
1ppbv E2	18.8021085
Stock solution of E1 in methanol	304
Stock solution of E2 in methanol	331.8

Preparation of E1 and E2

Step 1 (30 psia/2.04 atm)
If we spike 1 ul MDL mix C in (MeOH) into 6 liter summa at 30 psia (2.04 atm)

0.311371237	ng/liter Air E1
0.340050167	ng/liter Air E2

PPB Amount

0.02617284	PPBv E1 fluorocarbon
0.018085746	PPBv E2 fluorocarbon

If we shoot 400 cc therefore we will put on

0.124548495	ng on column
0.136020067	ng on column

If we shoot 100 cc therefore we will put on

0.031137124	ng on column E1
0.034005017	ng on column E2

liters		
g/mole		
g/mole		
ng/liter		
ng/liter		
ng/ul	MDL mix C (ref PLB 4092 P.20)-20x	3.8
ng/ul	MDL mix C (ref PLB 4092 P.20)-20x	4.15

Weighing strategy

fluror 6/2

fluror 8/2

PFHNOA Na+

Dilution of 10 Component Mix

Description	Cat #	Amount ppmv
Tetrafluoroethene	116-14-3	1
Hexafluoropropene	116-15-4	1
Hexafluoropropene oxide (HFPO)	428-59-1	2
Heptafluoropropyl 1,2,2,2-tetrafluoroethyl ether (Fluoroether E1)	3330-15-2	1
2H-Perfluoro-5-methyl-3,6-dioxanonane (Fluoroether E2)	3330-14-1	1
1H,1H,2H,2H-Perfluorohexan-1-ol (4:2-FTOH)	2043-47-2	1
1H,1H,2H,2H-Perfluorooctan-1-ol (6:2-FTOH)	647-42-7	1
1H,1H,2H,2H-Perfluordecan-1-ol (8:2-FTOH)	678-39-7	0.1
Tetrafluoromethane	75-73-0	10
Hexafluoroethane	76-16-4	5

Markes total flow cc	10	25
Description	cal 1	cal 2
Tetrafluoroethene	0.5	1.25
Hexafluoropropene	0.5	1.25
Hexafluoropropene oxide (HFPO)	1	2.5
Heptafluoropropyl 1,2,2,2-tetrafluoroethyl ether (Fluoroether E1)	0.5	1.25
2H-Perfluoro-5-methyl-3,6-dioxanonane (Fluoroether E2)	0.5	1.25
1H,1H,2H,2H-Perfluorohexan-1-ol (4:2-FTOH)	0.5	1.25
1H,1H,2H,2H-Perfluorooctan-1-ol (6:2-FTOH)	0.5	1.25
1H,1H,2H,2H-Perfluordecan-1-ol (8:2-FTOH)	0.05	0.125
Tetrafluoromethane	5	12.5
Hexafluoroethane	2.5	6.25

Dilution 200x	cc/min	cc/min
Cal 4 nominal 5 ppbv	1ppm flow	zero air
5	10	1990
5		
10		
5		
5		
5		
5		
0.5		
50		
25		

50	100	200
cal 3	cal 4	cal 5
2.5	5	10
2.5	5	10
5	10	20
2.5	5	10
2.5	5	10
2.5	5	10
2.5	5	10
0.25	0.5	1
25	50	100
12.5	25	50

Summer 2020 PFAS Scoping Runs Log to Extend Cal for CF4,

Datafile

071320_6
071320_7
071320_8
071320_9
071320_10

071420_5
071420_6
071420_7
071420_8

Plan for 4 cans

prepare a 200x dilution of cansiter-Can#1
Prepare a 1 ppm CF4 canister
Prepare a 1 pph CHF3 canister
Depends upon Results

Dilution of 10 Component Mix

Description
Tetrafluoroethene
Hexafluoropropene
Hexafluoropropene oxide (HFPO)
Heptafluoropropyl 1,2,2,2-tetrafluoroethyl ether (Fluoroether E1)
2H-Perfluoro-5-methyl-3,6-dioxanonane (Fluoroether E2)
1H,1H,2H,2H-Perfluorohexan-1-ol (4:2-FTOH)
1H,1H,2H,2H-Perfluorooctan-1-ol (6:2-FTOH)
1H,1H,2H,2H-Perfluordecan-1-ol (8:2-FTOH)
Tetrafluoromethane
Hexafluoroethane

Markes total flow cc
Description
Tetrafluoroethene
Hexafluoropropene
Hexafluoropropene oxide (HFPO)
Heptafluoropropyl 1,2,2,2-tetrafluoroethyl ether (Fluoroether E1)

, CF3H and C2F6

# cc	Description	Column
5	1 ppm CF4 and 20 ppb C2F6	New 30 meter DB 1
10	1 ppm CF4 and 20 ppb C2F6	New 30 meter DB 1
15	1 ppm CF4 and 20 ppb C2F6	New 30 meter DB 1
20	1 ppm CF4 and 20 ppb C2F6	New 30 meter DB 1
25	1 ppm CF4 and 20 ppb C2F6	New 30 meter DB 1
10	2 ppm CF4 only	New 30 meter DB 1
20	2 ppm CF4 only	New 30 meter DB 1
25	2 ppm CF4 only	New 30 meter DB 1
100	20 ppb TFE	New 30 meter DB 1

Cat #	Amount ppmv	Dilution 200x Cal 4 nominal 5 ppbv	cc/min 1ppm flow	cc/min zero air
116-14-3	1	5	10	1990
116-15-4	1	5	10	1990
428-59-1	2	10	10	1990
3330-15-2	1	5	10	1990
3330-14-1	1	5	10	1990
2043-47-2	1	5	10	1990
647-42-7	1	5	10	1990
678-39-7	0.1	0.5	10	1990
75-73-0	10	50	10	1990
76-16-4	5	25	10	1990
10	25	50	100	200
cal 1	cal 2	cal 3	cal 4	cal 5
0.5	1.25	2.5	5	10
0.5	1.25	2.5	5	10
1	2.5	5	10	20
0.5	1.25	2.5	5	10

25 cc shows dropoff for CF4

25 cc show dropoff for CF4-need to prepare 1 ppm and reshot for 5,,10,15,20,25

2H-Perfluoro-5-methyl-3,6-dioxanonane (Fluoroether E2)
1H,1H,2H,2H-Perfluorohexan-1-ol (4:2-FTOH)
1H,1H,2H,2H-Perfluorooctan-1-ol (6:2-FTOH)
1H,1H,2H,2H-Perfluordecan-1-ol (8:2-FTOH)
Tetrafluoromethane
Hexafluoroethane

0.5	1.25	2.5	5	10
0.5	1.25	2.5	5	10
0.5	1.25	2.5	5	10
0.05	0.125	0.25	0.5	1
5	12.5	25	50	100
2.5	6.25	12.5	25	50

TFE Summa-Can

(100 ml projected sample pull) on Markes

29-Jun-20

Mid level-BTP-1

Volume (liters of mole gas)	24.04358	liters
Mole wt of hexafluropropene	150.02	g/mole
Mole wt of TFE	100	g/mole
1 mole hexafluoropropene	6.239503435	g/liter
1 mole TFE	4.159114408	g/liter
1 mole of 1000 ppm TFE	0.004159114	g/liter

[redacted]

Preparation of TFE into 6 liter can

Step 1

If we take 250 ul of a 1000 ppm gas standard

85.19925 ng/l TFE

The PPB for TFE would be

20.48494983 ppbv TFE

If 100 cc therefore we will put on

8.519925 ng on column TFE

[redacted]