Standard operating procedures (SOPs) for new POPs

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New POPs to be analysed

<table>
<thead>
<tr>
<th>POP</th>
<th>Air</th>
<th>Human milk/blood</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlordecone</td>
<td>Chlordecone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endosulfan</td>
<td>α-, β-endosulfan; and endosulfan sulfate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBCD</td>
<td>α-HBCD, β-HBCD, γ-HBCD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hexachlorocyclohexanes</td>
<td>α-HCH, β-HCH, γ-HCH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hexabromobiphenyl</td>
<td>PBB-153</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pentachlorobenzene</td>
<td>PeCBz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penta BDE, Octa BDE</td>
<td>PBDE 28, 47, 99, 153, 154, 175/183 (may co-elute)</td>
<td>Optional: PBDE 17, 100</td>
<td></td>
</tr>
<tr>
<td>PFOS</td>
<td>PFOS (linear and sum of PFOS)</td>
<td>NMeFOSA, NEtFOSA, NMeFOSE, NEtFOSE</td>
<td></td>
</tr>
</tbody>
</table>
Guidance for Global Monitoring Plan

Orientation and benchmark for POPs [www.pops.int](http://www.pops.int)
POPs Analysis and Monitoring

SOPs and supporting materials

Pacific Islands Region

- SOP Regional Guidance for Mothers Collecting Milk Samples
- USP-IAS Instructions for PAS

- Guide for PAS (en, sp)
- SOP Cleaning of glassware (en, sp)
- SOP Collection of mothers’ milk (en, sp)
- SOP Indicator PCB in air (en, sp)
- SOP Indicator PCB in fish (en, sp)
- SOP Indicator PCB in mothers’ milk (en, sp)
- SOP OCP en aire (en, sp)
- SOP OCP en leche materna (en, sp)
- SOP OCP en pescado (en, sp)
- SOP OCP en sedimentos (en, sp)
- SOP PCDD PCDF dl-PCB en aire (en, sp)
- SOP PCDD PCDF dl-PCB en leche materna (en, sp)
- SOP PCDD PCDF dl-PCB en pescado (en, sp)
- SOP PCDD PCDF dl-PCB en sedimentos (en, sp)

- SOP Kenya: Mothers’ Milk
- SOP Recetox PAS

GRULAC Region

East and South Africa

- SOP in passive air sampling (PAS)

West Africa

Cross-cuttings

- Guidance for organisation, sampling and analysis of human milk

<table>
<thead>
<tr>
<th>Laboratory instrumentation level</th>
<th>Equipment</th>
<th>Infrastructure needs</th>
<th>Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Sample extraction and cleanup systems (manually or automated), LC-MS/MS</td>
<td>Nitrogen/air conditioning/consistent power/high operational costs/personnel specifically trained to operate and troubleshoot complicated instrumentation</td>
<td>PFOS and other anionic PFCs, PFOSA</td>
</tr>
<tr>
<td>3</td>
<td>Basic sample extraction and cleanup equipment, capillary GC-ECD</td>
<td>Nitrogen/air conditioning/power/personnel specifically trained to operate and troubleshoot equipment problems</td>
<td>PBB, most PCB and all OCPs except toxaphene</td>
</tr>
<tr>
<td>2a</td>
<td>Sample extraction and cleanup equipment, capillary GC-LRMS – electron ionization mode</td>
<td>Helium/air conditioning/consistent power/personnel specifically trained to operate and troubleshoot equipment problems</td>
<td>PBB, most PCB and all OCPs; Also perfluoro-sulfamido alcohols in positive chemical ionization mode</td>
</tr>
<tr>
<td>2b</td>
<td>Sample extraction and cleanup equipment, capillary GC-LRMS – negative chemical ionization mode</td>
<td>Methane or other moderating gas/air conditioning/consistent power/personnel specifically trained to operate and troubleshoot equipment problems</td>
<td>PBDE and PBB, as well as toxaphene and other highly chlorinated (≥4 Cl) OCPs</td>
</tr>
<tr>
<td>1</td>
<td>Sample extraction and cleanup equipment, capillary GC-HRMS</td>
<td>Helium/air conditioning/consistent power/high operational costs/personnel specifically trained to operate and troubleshoot complicated instrumentation</td>
<td>PCDD/PCDF, all PCB, all OCPs, PBB, all PBDE</td>
</tr>
</tbody>
</table>

GC-ECD – gas chromatography/electron capture detection
GC-LRMS – gas chromatography/low resolution mass spectrometry
GC-HRMS – gas chromatography/high resolution mass spectrometry
LC-MS/MS – high performance liquid chromatography/tandem mass spectrometry
PY – Person-year
Standard operational procedures for new POPs – example of PFAS
How to use SOPs

- SOPs are *guidelines*
- If followed precisely: good results
- Other methods are possible and allowed
- However: always optimize and validate!
- Validation: in house reference materials, certified reference materials, interlab study
SOPs for POPs

• Protocol 1: Analysis of PFOS in Water and FOSA in Mothers’ Milk Serum and Air, and the Analysis of some FOSAs and FOSEs in Air

• Protocol 2: Analysis of PCB and OCP in Human Milk, Air and Human Serum

• Protocol 3: Analysis of PBDE in Human Milk, Air and Human Serum

• Mirror samples

Method development

• In order to generate high quality and comparable results, the protocols and methods for sampling and analysis of all POPs in relevant types of samples have to be harmonized;

• In all regions and over time, the same basic approaches and quality criteria for acceptance of data and assessment of results should be applied.
  – Standard operating procedures (SOPs) for groups of POPs
  – General guidelines for specific matrices (types of samples):

Note: The guides and SOPs should be taken as an orientation and be transferred into daily routines by each laboratory.

Choice of analytical method

• The SOPs prepared for UNEP describe general procedures for analysis;

• However, it is possible to change certain parameters and analytical conditions described in this protocol, while still obtaining the same results;

• In any case, the entire method should be optimized and validated to ensure the comparability of data.
Water quality — Determination of perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) — Method for unfiltered samples using solid phase extraction and liquid chromatography/mass spectrometry
How to control background contamination in the laboratory?
How to control background contamination from the instrument?

How to control instrumental blank?

- seal
- solvent selection valve
- rotor seal

Septum blank?

- Polyethylene
- Teflon
- Viton

POLYETHYLENE
TEFLON
VITON
Structural isomers of PFOS identified in technical mixtures

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Formula</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-PFOS</td>
<td>$\text{CF}_3\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{SO}_3^-$</td>
<td>$\nu$-perfluoro-octanesulfonate</td>
</tr>
<tr>
<td>1-PFOS</td>
<td>$\text{CF}_3\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}(\text{CF}_3)\text{SO}_3^-$</td>
<td>perfluoro-1-methyl-heptanesulfonate</td>
</tr>
<tr>
<td>2-PFOS</td>
<td>$\text{CF}_3\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{SO}_3^-$</td>
<td>perfluoro-2-methyl-heptanesulfonate</td>
</tr>
<tr>
<td>3-PFOS</td>
<td>$\text{CF}_3\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}(\text{CF}_3)\text{CF}_2\text{CF}_2\text{CF}_2\text{SO}_3^-$</td>
<td>perfluoro-3-methyl-heptanesulfonate</td>
</tr>
<tr>
<td>4-PFOS</td>
<td>$\text{CF}_3\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}(\text{CF}_3)\text{CF}_2\text{CF}_2\text{CF}_2\text{SO}_3^-$</td>
<td>perfluoro-4-methyl-heptanesulfonate</td>
</tr>
<tr>
<td>5-PFOS</td>
<td>$\text{CF}_3\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}(\text{CF}_3)\text{CF}_2\text{CF}_2\text{CF}_2\text{SO}_3^-$</td>
<td>perfluoro-5-methyl-heptanesulfonate</td>
</tr>
<tr>
<td>6-PFOS</td>
<td>$\text{CF}_3\text{CF}(\text{CF}_3)\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{SO}_3^-$</td>
<td>perfluoro-6-methyl-heptanesulfonate</td>
</tr>
<tr>
<td>4,4-PFOS</td>
<td>$\text{CF}_3\text{CF}(\text{CF}_3)\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{SO}_3^-$</td>
<td>perfluoro-4,4-dimethyl-hexanesulfonate</td>
</tr>
<tr>
<td>3,5-PFOS</td>
<td>$\text{CF}_3\text{CF}(\text{CF}_3)\text{CF}_2\text{CF}_2\text{CF}(\text{CF}_3)\text{CF}_2\text{CF}_2\text{CF}_2\text{SO}_3^-$</td>
<td>perfluoro-3,5-dimethyl-hexanesulfonate</td>
</tr>
<tr>
<td>4,5-PFOS</td>
<td>$\text{CF}_3\text{CF}(\text{CF}_3)\text{CF}_2\text{CF}_2\text{CF}(\text{CF}_3)\text{CF}_2\text{CF}_2\text{CF}_2\text{SO}_3^-$</td>
<td>perfluoro-4,5-dimethyl-hexanesulfonate</td>
</tr>
<tr>
<td>5,5-PFOS</td>
<td>$\text{CF}_3\text{CF}(\text{CF}_3)_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{SO}_3^-$</td>
<td>perfluoro-5,5-dimethyl-hexanesulfonate</td>
</tr>
</tbody>
</table>

Technical mixtures typically contain between 71% and 83% L-PFOS (Vyas et al. 2007)
Differences in PFOS isomer profiles in human plasma

Why do we see differences?
- sources of exposure
- historical vs. recent exposure
- precursors
- differences in internal elimination

![Bar chart showing differences in PFOS isomer profiles for different samples](image)

- DL08007: 650 - 54% branched PFOS
- DL08007: 910 - 35% branched PFOS
- DL08007: 906 - 19% branched PFOS
**Choice of analytical method**

The choice of analytical method should be needs-oriented and developed to fit the purpose of the study!

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**Table 2. A summary of selected analytical methods for the determination of fluorinated POPs in human serum/plasma**

<table>
<thead>
<tr>
<th>Analytes</th>
<th>N analytes</th>
<th>Study type</th>
<th>Year</th>
<th>Sample amount</th>
<th>Pre-treatment</th>
<th>Extraction and clean-up</th>
<th>Instrumental analysis</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFAAs</td>
<td>13</td>
<td>Method development</td>
<td>2011</td>
<td>100 µL</td>
<td>0.1 M formic acid</td>
<td>On-line SPE: C18</td>
<td>HPLC-ESI-MS/MS</td>
<td>[41]</td>
</tr>
<tr>
<td>PFAAs</td>
<td>13</td>
<td>Inter-laboratory comparison</td>
<td>2010</td>
<td>0.15–1.2 g</td>
<td>Formic acid (50/50, v/v)</td>
<td>SPE: Oasis WAX</td>
<td>HPLC-ESI-MS/MS</td>
<td>[38]</td>
</tr>
<tr>
<td>PFAAs</td>
<td>10</td>
<td>Inter-laboratory comparison</td>
<td>2010</td>
<td>0.2 mL</td>
<td>0.1 mol/L formic acid</td>
<td>On-line SPE: C18</td>
<td>HPLC-TIS-MS/MS</td>
<td>[38]</td>
</tr>
<tr>
<td>PFAAs</td>
<td>13</td>
<td>Inter-laboratory comparison</td>
<td>2010</td>
<td>0.2 mL</td>
<td>PP with acetonitrile</td>
<td>n.i.</td>
<td>HPLC-TIS-MS/MS</td>
<td>[38]</td>
</tr>
<tr>
<td>PFAAs</td>
<td>8</td>
<td>Inter-laboratory comparison</td>
<td>2010</td>
<td>1 mL</td>
<td>n.i.</td>
<td>LLE using ion pair, filtration with PTFE</td>
<td>HPLC-ESI-MS/MS</td>
<td>[38]</td>
</tr>
<tr>
<td>PFAAs</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PFAAs</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PFAAs</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PFAAs</td>
<td>25</td>
<td>Method development</td>
<td>2010</td>
<td>0.5 mL whole blood</td>
<td>Formic acid (50% in water) or acetonitrile</td>
<td>SPE: Oasis WAX, LLE using ion pair, and LLE using acetonitrile</td>
<td>LC-ESI-MS/MS and JI-50 2D</td>
<td>[36]</td>
</tr>
<tr>
<td>PFAAs</td>
<td>18</td>
<td>Method development</td>
<td>2005</td>
<td>100 µL</td>
<td>0.1 M formic acid</td>
<td>SPE: C18, filtration with membrane 0.2 µm filter</td>
<td>HPLC-TIS-MS/MS</td>
<td>[34]</td>
</tr>
<tr>
<td>PFAAs</td>
<td>12</td>
<td>Method development</td>
<td>2005</td>
<td>0.75 mL whole blood</td>
<td>Formic acid (50/50, v/v)</td>
<td>SPE: C18, filtration with membrane 0.2 µm filter</td>
<td>HPLC-ESI-MS and LC-MS/MS</td>
<td>[43]</td>
</tr>
<tr>
<td>PFAAs</td>
<td>13</td>
<td>Method development</td>
<td>2004</td>
<td>1 mL</td>
<td>0.1 M formic acid</td>
<td>Off-line SPE: Oasis HLB</td>
<td>HPLC-TIS-MS/MS</td>
<td>[39]</td>
</tr>
</tbody>
</table>

Note: no information (n.i.).

Salihovic et al, TRAC 2013
Principle

- Sample preparation of water, milk, and serum/plasma samples is similar but different for air
- Extraction: Soxhlet extraction and SPE
- Clean-up (ENV carb): depending on the complexity of the sample matrix
- Method validation: ILSs, SRMs, CRMs, and spiking experiments
- Instrumental analysis: UPLC-ESI-MS/MS in negative ion mode
**Materials and reagents**

**Materials:**
- Glass Beaker (2 L)
- Polypropylene bottle (100 mL)
- Plastic pipettes
- Polypropylene tubes (15 mL)
- Micro tubes (1.5 mL)
- Crimp cap polypropylene vial (700 µL)
- Seal, silver aluminum 11 mm, PTFE/Rubber Liner
- Capper/Decapper
- Ultrasonic bath
- Vacuum dessicator
- Balance (precision 0.01 g)
- Pipettes (50, 100 and 200 µL)
- Centrifuge
- Oven (37 °C)
- SPE device (rinse with methanol and water prior to use)
- pH meter
- Vacuum pump
- Water bath (50 °C)
- Whirl mixer
- LC-MS/MS (LC-QQQ). Electrospray source (ESI) with negative polarity
- FluoroSEP-RP Octyl column, 15 cm x 2.1 mm, 5 µm particle size, ES Industries (132211-FO)
- 2 x Symmetry columns C18, 20 mm x 3.9 mm, 5 µm particle size, Waters (WAT054225)
- Symmetry column C18, 50 mm x 2.1 mm, 5 µm particle size, Waters (18600206)

**Reagents:**
- Polyurethane foam (PUF) disk, 14 cm x 1.35 cm, surface area 365 cm², mass 4.40 g, volume 207 cm³, Tisch Environmental, Cleves, OH
- Aceton, Ultraresi, J.T.Baker (9254)
- Petroleum ether, J.T.Baker
- Methanol, HPLC gradient grade, J.T.Baker (8402)
- Internal standard (\(^{13}\text{C}_4\) PFOS + \(^{18}\text{O}_2\) PFOSA + \(^2\text{H}_3\) MeFOSA + \(^2\text{H}_5\) EtFOSA + \(^2\text{H}_7\) MeFOSE + \(^2\text{H}_9\) EtFOSE) in methanol (100 ng/mL)
- Internal standard (\(^{13}\text{C}_4\) PFOS + \(^{18}\text{O}_2\) PFOSA) in methanol (100 ng/mL)
- 50% Formic acid in water
- SPE Cartridge, Oasis WAX 6cc, Waters 186002493
- Acetic acid 100 % pro analysis (p.a.) purity
- Ammonium acetate p.a. purity
- 0.1% NH4OH in methanol; add 400 µL ammonia to 100 mL methanol
- 2 % NH4OH in methanol; add 8 mL ammonia to 92 mL methanol
- HPLC water, HPLC analyzed, J.T. Baker (4218), or MilliQ purity
- Acetic acid 100 % pro analysis (p.a.) purity
- Ammonium acetate p.a. purity
- 25 mM Ammonium acetate; add 190 mg ammonium acetate to 100 mL water and adjust the pH to pH=4 with acetic acid
- Nitrogen gas. Purity 5.0
- Injection standard (1) (13C8 PFOS) in methanol/water (1:1, v/v) (150 ng/mL)
- Injection standard (2) (13C8 PFOS) in methanol/water (1:1, v/v) (50 ng/mL)
- Injection standard (3) (13C8 PFOS) in methanol/water (1:1, v/v) (25 ng/mL)
- Ammonium formate, (>99%), Fluka (09735)
- Ammonium formate buffer 5 mM: Dissolve 315 mg ammonium formate in 1 L HPLC water. Filter prior to use.
- PFAS calibration solutions (0.05, 0.25, 0.5, 5, 50, 100 ng/mL) in methanol/water (1:1, v/v)
Air

- Polyurethane foam (PUF) disk
  - Preparation of the PUF
  - Cleaning of a PUF:
    - If necessary, wash the PUF in water;
    - Perform a Soxhlet extraction on the PUF with acetone (24 h), followed by petroleum ether (24 h)
    - Dry the PUF in a desiccator (24 h)

- Air sampling
  - Place PUF in passive sampler for 3 months at sampling location

- Sample preparation
  - Take PUF out of the sampler
  - Add 150 µL Internal standard (I.S.) to the PUF

- Procedural blank
  - Prepare a PUF as described above without the exposure time during the sampling
Air - analysis

- Perform a Soxhlet extraction with methanol (12 h)
- Concentrate extract to 1 mL by rotary evaporator or Kuderna-Danish
- Filter extract through a 0.2 µm glass hydrophilic polypropylene (GHP) filter into a polypropylene LC vial
- Concentrate to 200 µL under a gentle stream of nitrogen
- Add 100 µL injection standard
- Add 300 µL 2mM ammonium acetate and shake manually
- Analyze with LC-MS/MS
Water sampling and sample preparation

Water sampling described in “PFOS analysis in water for the Global Monitoring Plan of the Stockholm Convention” (UNEP GMP WG)

Sample preparation

- As soon as the sample arrives to the analytical laboratory internal standards (IS) should be added to compensate for absorbance to laboratory equipment
- The sample (incl. IS) should have time to equilibrate before analysis
- Keep the water samples (500 mL) in a high density polyethylene (HDPE) in the fridge or freezer (-20 °C) and defrost them the day before analysis
- Shake the water rigorously before subsamples are taken out;
- Weigh 100 mL of water sample in a HDPE bottle

Procedural blank

- Prepare a procedural blank sample using ultra clean (MilliQ) water as sample substitute
Human milk and serum sample preparation

Follow the UNEP/WHO protocol for sampling of human milk ‘UNEP-coordinated Survey of Mothers’ Milk for Persistent Organic Pollutants’ (http://www.unep.org/chemicalsandwaste/portals/9/POPs/docs/Mothers%20milk%20guide%20POPs.pdf)

Sample preparation
• Homogenise sample (50 mL) by shaking for 1 min
• Weigh 1 mL of milk, or 0.5 mL serum in PP tube (15 mL)
• Add 50 µL I.S.
• Add 2 mL 50% formic acid and shake manually
• Place sample in an ultrasonic bath for 15 min
• Centrifuge 15 min at 3,000 rpm
• Place sample in an oven at 37 °C for 30 min

Procedural blank
• Prepare a procedural blank sample as described above in sample description using ultra clean (MilliQ) water
Water, human milk and human serum

- Solid phase extraction (SPE) is used for the extraction of water, mothers’ milk and serum.
- Install an SPE cartridge on the SPE device

- Waters Oasis® WAX SPE Column
- Mixed-mode Weak Anion-exchange and reversed-phase sorbent
- Single use Oasis cartridge
- Retain and release strong acids (e.g. sulfonates)
Method validation and performance

• Sensitivity
  – MDLs ranged 0.01 ng mL⁻¹-0.17 ng mL⁻¹
  – Linear range: 0.01 ng mL⁻¹-60 ng mL⁻¹
• Accuracy
  – Conformed well with NIST SRM 1957 (n=54)
  – 6-32% normalized difference

Repeatability (QC n=7) and reproducibility (QC n=103) ranged between 2%-20% including structural PFOS isomers
Instrumental analysis

- Analytical column and guard column
- **Extra column** (50 mm) and a guard column **between the LC pump and the injector**, to prevent interference of PFASs, originating from the LC system
- Purge all the mobile phase solvents through the system
- Start pump with 65% ammonium formate and 35% methanol
- Place all extracts, blanks, calibration solutions in tray of autosampler
- Make a sequence in the computer. Analyse the samples, the calibration solutions, the blank and the reference material in random order
- Inject calibration solution after pump has been running for 30 min
- Check performance of LC-MS/MS by comparing retention times and peak intensities of the calibration solution with earlier results;
Sample chromatogram

Chromatogram showing the separation of linear and branched PFOS in water (surface water sample from The Netherlands)

Note: PFAS concentrations should be reported on wet weight basis. However, often, results are reported on sulfonate anion basis, i.e., corrected for the molecular weight of the PFOS salt (with cation)
<table>
<thead>
<tr>
<th>Compound</th>
<th>Precursor Ion (m/z)</th>
<th>Production (m/z)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFOS</td>
<td>499</td>
<td>80</td>
<td>Quantifier</td>
</tr>
<tr>
<td>13C4 PFOS</td>
<td>503</td>
<td>80</td>
<td>Quantifier</td>
</tr>
<tr>
<td>13C8 PFOS</td>
<td>507</td>
<td>80</td>
<td>Quantifier</td>
</tr>
<tr>
<td>FOSA</td>
<td>498</td>
<td>78</td>
<td>Quantifier</td>
</tr>
<tr>
<td>18O2 FOSA</td>
<td>502</td>
<td>82</td>
<td>Quantifier</td>
</tr>
<tr>
<td>MeFOSA</td>
<td>512</td>
<td>169</td>
<td>Quantifier</td>
</tr>
<tr>
<td>2H3 MeFOSA</td>
<td>515</td>
<td>169</td>
<td>Quantifier</td>
</tr>
<tr>
<td>EtFOSA</td>
<td>526</td>
<td>169</td>
<td>Quantifier</td>
</tr>
<tr>
<td>2H5 EtFOSA</td>
<td>531</td>
<td>169</td>
<td>Quantifier</td>
</tr>
<tr>
<td>MeFOSE</td>
<td>602</td>
<td>45</td>
<td>Quantifier</td>
</tr>
<tr>
<td>2H7 MeFOSE</td>
<td>609</td>
<td>45</td>
<td>Quantifier</td>
</tr>
<tr>
<td>EtFOSE</td>
<td>616</td>
<td>45</td>
<td>Quantifier</td>
</tr>
<tr>
<td>2H9 EtFOSE</td>
<td>625</td>
<td>45</td>
<td>Quantifier</td>
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</tbody>
</table>
Tools and methods for new POPs

• PFAS analysis in water - Set-up and guidelines for monitoring
• Instructive movie for analysis of PFOS and precursors
• Movie with instructions for the cleaning of PUF disks for passive sampling of ambient air