# Biomarker Focus

## PCBs and FluoroPCB Internal Standards

### Native PCBs

Chiron offers **single native PCBs** in solution and as neat material for analysis and toxicological studies. **Mixtures** are offered according to international methods and on request.

### PCB congeners are classified as:

- **Coplanar**, dioxinlike with no substitution or monosubstitution in the *ortho*-positions
- **Nonplanar** with two or more substitutions in the *ortho*-positions

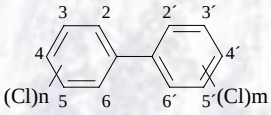


**Fig.**: Chemical structure, and numbering of PCBs.

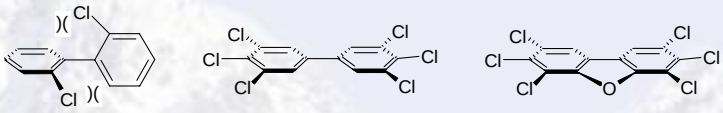


**Fig.**: Non-planar and coplanar PCBs, The latter of coplanar ones is similar to the conformation of dibenzofurans and dibenzodioxins.

### Internal Standards for PCBs

**Mono- and difluorinated PCBs** are closely similar to the parent PCBs in terms of physico-chemical properties, and are **ideal internal or surrogate standards including GC-MS and GC-ECD**.

The **FluoroPCB internal standards** offered by Chiron have **several advantages** over the more traditionally used $^{13}C$ isotopes and unlabelled internal standards:

- **Cost efficient** - much cheaper than the $^{13}C$ isotopes
- Gives **one single, pure isotope** (F has only one isotope)
- Can be used with **GC-ECD detection**, $^{13}C$ can not since they coelute with the native
- **Do not discriminate from the native** upon work-up
- **"Designer retention times"** (*ortho*-, *meta*-, *para*-F) possible for optimal elution rate

## Custom Synthesis

Chiron offers **custom synthesis** of native standards in larger quantities, new internal standards and metabolites.

## International Standard Methods for PCB Analysis

| | |
|---|---|
| • ISO 17858-2004 | Water quality - Dioxin-like PCBs by GC-MS |
| • ISO 10382-2002 | Soil quality – Organochlorine pesticided and PCBs by GC-ECD |
| • ISO 6468-1996 | Water quality – Organochlorine insecticides and PCBs by GC-methods |
| • EPA 8082-1996 | PCBs from solid and aqueous matices by GC-ECD or GC-ELCD |
| • EPA 8270C-1996 | Semivolatile compounds from solid waste, soil, air, and water by GC-MS |
| • EPA 505-1995 | Organohalide pesticides and PCBs in water by GC |
| • EPA 608-1984 | Organochlorine pestisides and PCBs by GC and GC-MS (cf methods 625) in municipal discharges |
| • "The Dutch Seven PCBs" | |

**Ready made solutions for the above standards are available**

**Please inquire for more info!**

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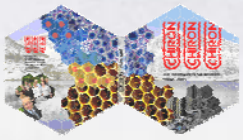

Tel +47 73 87 44 90
Fax +47 73 87 44 99
chiron@chiron.no
www.chiron.no

## Dioxin-like PCBs

Each in 20 ng/mL, solution in n-nonane

| Compound | PCB No. | Chiron No. | Conc. |
|---|---|---|---|
| 3,3'4,4'-TetraCB | PCB-77 | 2006,12 | 20 ng/mL |
| 3,4,4',5-TetraCB | PCB-81 | 2007,12 | 20 ng/mL |
| 2,3,3',4,4'-PentaCB | PCB-105 | 2008,12 | 20 ng/mL |
| 2,3,4,4',5-PentaCB | PCB-114 | 2009,12 | 20 ng/mL |
| 3,3',4,4',5-PentaCB | PCB-126 | 2012,12 | 20 ng/mL |
| 2,3,3',4,4',5-HexaCB | PCB-156 | 2013,12 | 20 ng/mL |
| 2,3,3',4,4',5'-HexaCB | PCB-157 | 2014,12 | 20 ng/mL |
| 2,3',4,4',5,5'-HexaCB | PCB-167 | 2015,67 | 20 ng/mL |
| 3,3',4,4',5,5'-HexaCB | PCB-169 | 2220,12 | 20 ng/mL |
| 2,3,3',4,4',5,5'-HeptaCB | PCB-189 | 2016,12 | 20 ng/mL |

## Dioxin-like PCBs

Optional calibration standards

| Compound | PCB No. | Chiron No. | Conc. / 1 mL |
|---|---|---|---|
| 2,2',3,4,4'5-HeptaCB | PCB-170 | 2267,12 | 20 ng/mL |
| 2,2',3,4,4',5,5'-HeptaCB | PCB-180 | 2005,12 | 20 ng/mL |

## Dutch Seven PCBs

Solutions of single reference substances, internal standards and multiple component solution

| Compound | PCB No. | Chiron No. | Conc. / 1 mL |
|---|---|---|---|
| 2,4,4'-Trichlorobiphenyl | PCB-28 | 1999,12 | 50 µg/mL |
| 2,2',5,5'-Tetrachlorobiphenyl | PCB-52 | 2000,12 | 50 µg/mL |
| 2,2',4,5,5'-Pentachlorobiphenyl | PCB-101 | 2001,12 | 50 µg/mL |
| 2,3',4,4'5-Pentachlorobiphenyl | PCB-118 | 2002,12 | 50 µg/mL |
| 2,2',3,4,4',5'-Hexachlorobiphenyl | PCB-138 | 2003,12 | 50 µg/mL |
| 2,2',4,4',5,5'Hexachlorobiphenyl | PCB-153 | 2004,12 | 50 µg/mL |
| 2,2'3,4,4',5,5'-Heptachlorobiphenyl | PCB-180 | 2005,12 | 50 µg/mL |
| | | | |
| Dutch Seven PCBs – Multiple Comp. Solution | | S-4236 | 10 µg/mL |

## FluoroPCB Internal Standards

Solutions of single internal standards in isooctane

| Compound | PCB No. | Chiron No. | Conc. / 1 mL |
|---|---|---|---|
| 4-Chloro-4'-fluorobiphenyl | Fluoro-PCB-3 p | 2654,12 | 10 µg/mL |
| 3-Fluoro-4,4'-dichlorobiphenyl | Fluoro-PCB-15 | 2655,12 | 10 µg/mL |
| 3-Fluoro-2,2',5-trichlorobiphenyl | Fluoro-PCB-18 m | 2656,12 | 10 µg/mL |
| 3'-Fluoro-2,3,4'-trichlorobiphenyl | Fluoro-PCB-22 m | 2657,12 | 10 µg/mL |
| 3'-Fluoro-2,4,4'-trichlorobiphenyl | Fluoro-PCB-28 m | 2228,12 | 10 µg/mL |
| 3'-Fluoro-2,4,5-trichlorobipehnyl | Fluoro-PCB-29 m | 2223,12 | 10 µg/mL |
| 2'-Fluoro-2,4,6-trichlorobiphenyl | Fluoro-PCB-30 o | 2224,12 | 10 µg/mL |
| 3'-Fluoro-2,4,6-trichlorobiphenyl | Fluoro-PCB-30 m | 2225,12 | 10 µg/mL |
| 4'-Fluoro-2,4,6-trichlorobiphenyl | Fluoro-PCB-30 p | 2229,12 | 10 µg/mL |
| 3'-Fluoro-2,4,5'-trichlorobiphenyl | Fluoro-PCB-31 m | 2175,12 | 10 µg/mL |
| 3'-Fluoro-3,4,4'-trichlorobiphenyl | Fluoro-PCB-37 m | 2658,12 | 10 µg/mL |
| 3'-Fluoro-3,4',5-trichlorobiphenyl | Fluoro-PCB-39 | 2666,12 | 10 µg/mL |
| 3-Fluoro-2,2'3,5'-tetrachlorobiphenyl | Fluoro-PCB-44 | 2659,12 | 10 µg/mL |
| 3'-Fluoro-2,2',4,4'-tetrachlorobiphenyl | Fluoro-PCB-47 | 2177,12 | 10 µg/mL |
| 3-Fluoro-2,2',4,5-tetrachlorobiphenyl | Fluoro-PCB-49 m | 2667,12 | 10 µg/mL |
| 3-Fluoro-2,2',5,5'-tetrachlorobiphenyl | Fluoro-PCB-52 m | 2660,12 | 10 µg/mL |
| 4'-Fluoro-2,3',4,5-tetrachlorobiphenyl | Fluoro-PCB-67 | 2222,12 | 10 µg/mL |
| 3'-Fluoro-3,4,4',5-tetrachlorobiphenyl | Fluoro-PCB-81 | 2344,12 | 10 µg/mL |

**Technical Mixtures** - Available in concentrations 10-1000 ng/mL in isooctane

| Name | Chiron No. | Name | Chiron No. |
|---|---|---|---|
| Aroclor 1016 | 2124,12 | Aroclor 1248 | 2127,12 |
| Aroclor 1221 | 2125,12 | Aroclor 1254 | 2128,12 |
| Aroclor 1232 | 2661,12 | Aroclor 1260 | 2129,12 |
| Aroclor 1242 | 2126,12 | | |

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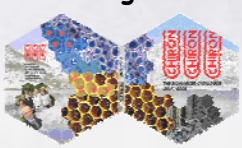

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