CPST

# Test Report

No. C160907030002 Date: Sep 14, 2016 Page 1 of 14

Dragino Technology Co., Limited

Room 7009, Zi'An Commercial Building, Qian Jin 1 Road. Xin'An 6th District, Bao'an District ; Shenzhen 518101,China

The following samples were submitted and identified on behalf of the clients as

| | |
|---|---|
| Sample Name: | Lora GPS HAT |
| CPST Internal Reference No.: | C160907030 |
| Sample Received Date: | Sep 07, 2016 |
| Test Period: | Sep 07, 2016 to Sep 14, 2016 |
| Test Method: | Please refer to next pages |
| Test Result: | Please refer to next pages |

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CONCLUSION :

| TESTED SAMPLES | TEST ITEM | RESULT |
|---|---|---|
| Lora GPS HAT | 1. Lead, Cadmium, Mercury, Hexavalent Chromium, PBBs and PBDEs Content — RoHS Directive 2011/65/EU Annex II | **PASS** |

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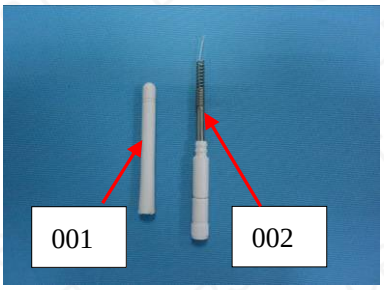
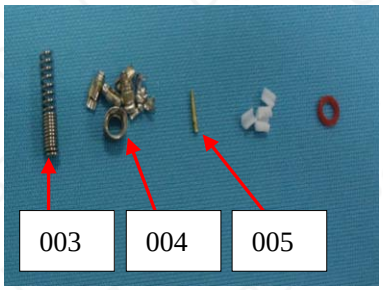
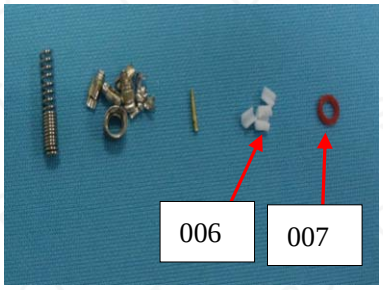
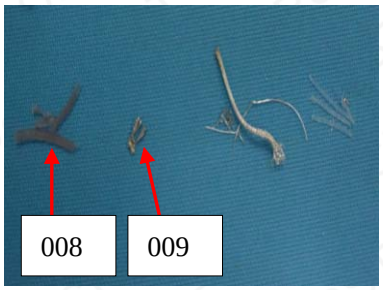
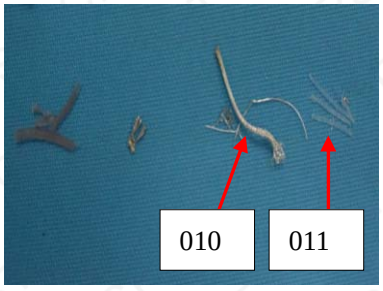
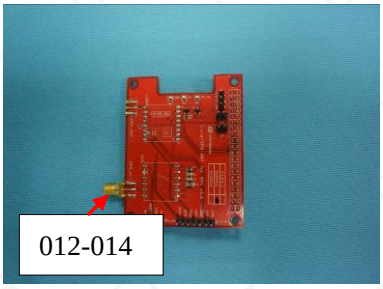
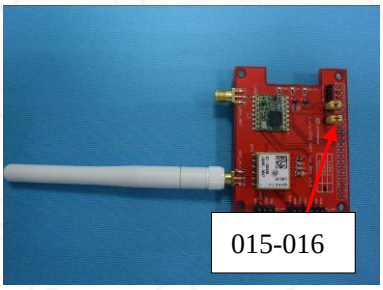
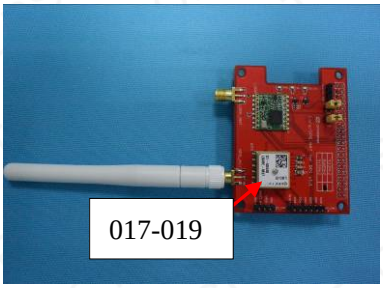
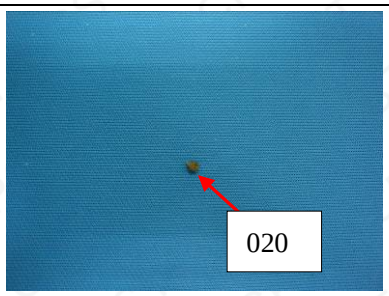
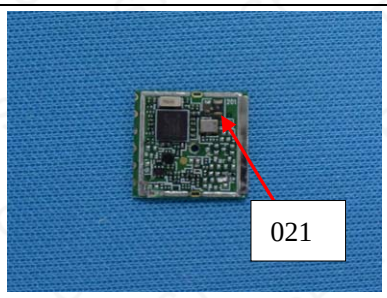
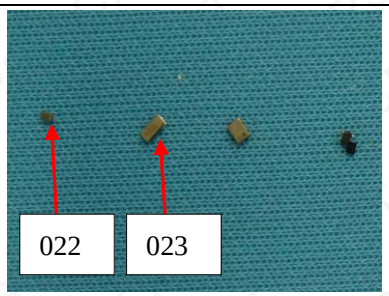
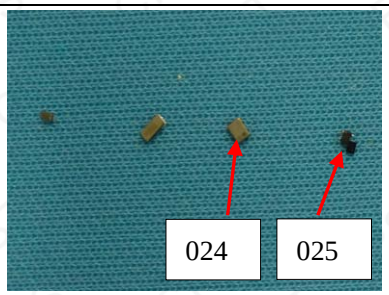
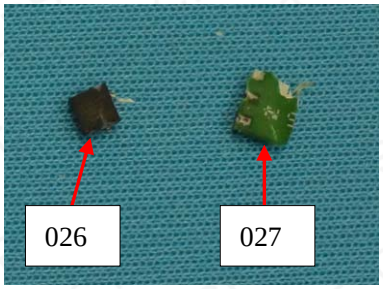
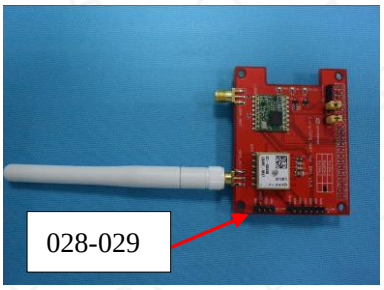
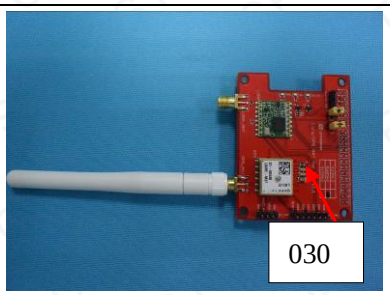
**Signed for and on behalf of**
**Eurones Consumer Products Testing Service Co., Ltd**

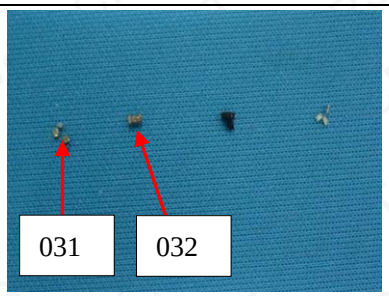
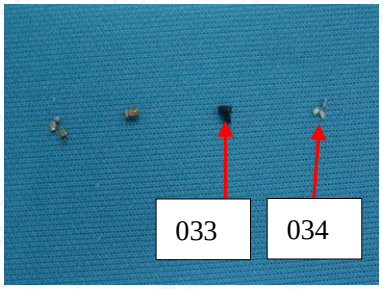
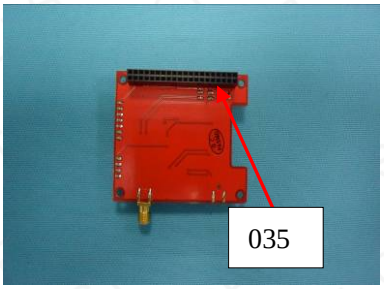
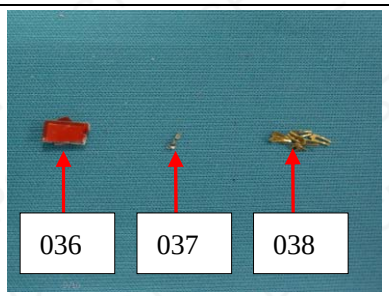
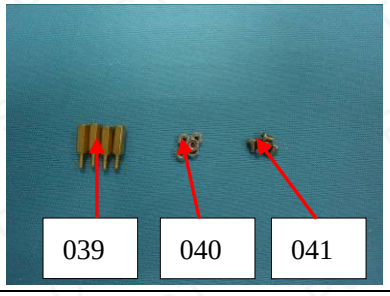
| TESTED BY : | REVIEWED BY: | APPROVED BY: |
|---|---|---|
| Andy Wang | Chery Li | Will Pan |
| Wang Guang Yu, Anndy | Li Hui Lian, Cheryl | Pan Jian Ding, Will |
| Project Leader | Laboratory Supervisor | Technical Supervisor |

**Test Item Description And Photo List**

| Sample No. | Description | Photograph |
|---|---|---|
| **001** | White plastic shell |   |
| **002** | Silvery metal tube | |
| **003** | Silvery metal spring |   |
| **004** | Silvery metal | |
| **005** | Golden metal pin | |
| **006** | White plastic |   |
| **007** | Red rubber ring | |
| **008** | Translucent plastic jacket |   |
| **009** | Silvery metal solder | |
| **010** | Silvery metal wire |   |
| **011** | Transparent plastic jacket | |

| Sample No. | Description | Photograph |
|---|---|---|
| **012** | Copper metal |   |
| **013** | Copper metal pin | |
| **014** | White plastic | |
| **015** | Yellow plastic |   |
| **016** | Silvery metal | |
| **017** | Label |   |
| **018** | Beige ceramic | |
| **019** | Silvery metal sheet | |
| **020** | Brown viscose |   |
| **021** | Black chip resistor |   |

| Sample No. | Description | Photograph |
|---|---|---|
| **022** | Brown chip resistor |   |
| **023** | Silvery chip resistor | |
| **024** | Silvery chip resistor |   |
| **025** | Black ceramic | |
| **026** | Black ceramic pieces |   |
| **027** | Green PCB | |
| **028** | Black plastic |   |
| **029** | Silvery metal contact pin | |
| **030** | Chip resistor(L1) |   |

| Sample No. | Description | Photograph |
|---|---|---|
| **031** | Brown chip resistor(C1,C3) |   |
| **032** | Brown chip resistor(C4) | |
| **033** | Black ceramic(T1,T2) |   |
| **034** | LED lamp | |
| **035** | Black plastic |   |
| **036** | Red PCB |   |
| **037** | Silvery metal solder | |
| **038** | Copper metal contact pin | |
| **039** | Copper metal screw |   |
| **040** | Silvery metal nut | |
| **041** | Silvery metal screw | |

Test Results

**Screening test for the specified hazardous substances of RoHS for the selected materials of the submitted sample:**

- Heavy Metal (Cadmium, Chromium, Mercury, Lead) Content Test
- Bromine Content Test

According to IEC 62321:2013, and Quantification analyzed with Energy Dispersive X-ray Fluorescence Spectrometers.

| Sample No. | Total Cadmium | Total Lead | Total Mercury | Total Chromium | Total Bromine |
|---|---|---|---|---|---|
| Sample 001 | BL | BL | BL | BL | BL |
| Sample 002 | BL | BL | BL | BL | N.A. |
| Sample 003 | BL | BL | BL | BL | N.A. |
| Sample 004 | BL | BL | BL | BL | N.A. |
| Sample 005 | BL | OL^ | BL | BL | N.A. |
| Sample 006 | BL | BL | BL | BL | BL |
| Sample 007 | BL | BL | BL | BL | BL |
| Sample 008 | BL | BL | BL | BL | BL |
| Sample 009 | BL | BL | BL | BL | N.A. |
| Sample 010 | BL | BL | BL | BL | N.A. |
| Sample 011 | BL | BL | BL | BL | BL |
| Sample 012 | BL | OL^ | BL | BL | N.A. |
| Sample 013 | BL | OL^ | BL | BL | N.A. |
| Sample 014 | BL | BL | BL | BL | BL |
| Sample 015 | BL | BL | BL | BL | Inconclusive^ |
| Sample 016 | BL | BL | BL | BL | N.A. |
| Sample 017 | BL | BL | BL | BL | BL |
| Sample 018 | BL | BL | BL | BL | BL |
| Sample 019 | BL | BL | BL | BL | N.A. |
| Sample 020 | BL | BL | BL | BL | BL |
| Sample 021 | BL | BL | BL | BL | BL |
| Sample 022 | BL | BL | BL | BL | BL |
| Sample 023 | BL | BL | BL | Inconclusive^ | Inconclusive^ |
| Sample 024 | BL | BL | BL | BL | BL |

| Sample No. | Total Cadmium | Total Lead | Total Mercury | Total Chromium | Total Bromine |
|---|---|---|---|---|---|
| Sample 025 | BL | BL | BL | BL | BL |
| Sample 026 | BL | BL | BL | BL | Inconclusive^ |
| Sample 027 | BL | BL | BL | BL | Inconclusive^ |
| Sample 028 | BL | BL | BL | BL | Inconclusive^ |
| Sample 029 | BL | BL | BL | BL | N.A. |
| Sample 030 | BL | BL | BL | BL | BL |
| Sample 031 | BL | BL | BL | BL | BL |
| Sample 032 | BL | BL | BL | BL | BL |
| Sample 033 | BL | BL | BL | BL | BL |
| Sample 034 | BL | BL | BL | BL | BL |
| Sample 035 | BL | BL | BL | BL | Inconclusive^ |
| Sample 036 | BL | BL | BL | BL | Inconclusive^ |
| Sample 037 | BL | BL | BL | BL | N.A. |
| Sample 038 | BL | BL | BL | BL | N.A. |
| Sample 039 | BL | BL | BL | BL | N.A. |
| Sample 040 | BL | BL | BL | Inconclusive^ | N.A. |
| Sample 041 | BL | BL | BL | BL | N.A. |

Note:

1. All Concentrations express in “mg/kg” (milligram per kilogram), mg/kg ~ ppm
2. “OL” denotes “over limit”
3. “BL” denotes “below limit”
4. “N.A.” denotes “Not Applicable”
5. “Inconclusive” denotes result is intermediate between “OL” and “BL”
6. “^”denotes the screening result was inconclusive(X) or over limit (OL), thus further confirmation test was conducted, results are listed in 3.2 and 3.3.
7. “φ” denotes as the information (the submitted sample is electronic ceramic part) provided by the client, when Lead in electronic ceramic parts is exempted from RoHS Directive 2011/65/EU Annex III.
   XRF screening limits for different materials:

| Materials | Concentration (mg/kg) | | | | |
|---|---|---|---|---|---|
| | Cd | Cr | Pb | Hg | Br |
| **Metal** | BL≤(70-3σ)<X<(130+3σ )≤OL | BL≤(700-3σ)<X | BL≤(700-3σ)<X<(1300+3σ )≤OL | BL≤(700-3σ)<X<(1300+3σ )≤OL | N.A. |
| **Polymers** | BL≤(70-3σ)<X<(130+3σ )≤OL | BL≤(700-3σ)<X | BL≤(700-3σ)<X<(1300+3σ )≤OL | BL≤(700-3σ)<X<(1300+3σ )≤OL | BL≤(300-3σ)<X |
| **Composite material** | BL≤(50-3σ)<X<(150+3σ )≤OL | BL≤(500-3σ)<X | BL≤(500-3σ)<X<(1500+3σ )≤OL | BL≤(500-3σ)<X<(1500+3σ )≤OL | BL≤(250-3σ)<X |

### 3. 2 Test for Heavy Metals

– Lead, Cadmium, Hexavalent Chromium and Mercury Tests according to IEC 62321-4:2013 & IEC 62321-5:2013 & IEC 62321-7-1:2015& IEC 62321:2008.

| Element | Total Cadmium [mg/kg] | Total Lead [mg/kg] | Total Mercury [mg/kg] | Hexavalent Chromium [-] | Hexavalent Chromium [mg/kg] |
|---|---|---|---|---|---|
| **Detection Limit** | **5** | **5** | **5** | **Δ** | **5** |
| **RoHS Requirements** | **100** | **1000** | **1000** | **#** | **1000** |
| Sample 005 | / | 29481Φ | / | / | / |
| Sample 012 | / | 39472Φ | / | / | / |
| Sample 013 | / | 37478Φ | / | / | / |
| Sample 023 | / | / | / | / | N.D. |
| Sample 040 | / | / | / | Negative | / |

Note:

1. All Concentrations express in “mg/kg”(milligram per kilogram), mg/kg ~ ppm.
2. “N.D.” = “Not Detected”.
3. Boiling-water-extraction:
   Negative = Absence of Cr(VI) coating / surface layer: the detected concentration in boiling-water-extraction solution is less than 0.10μg with 1cm2 sample surface area.
   Positive = Presence of Cr(VI) coating / surface layer: the detected concentration in boiling-water-extraction solution is greater than 0.13μg with 1cm2 sample surface area.
   Inconclusive =the detected concentration in boiling-water-extraction solution is greater than 0.10μg and less than 0.13μg with 1cm2 sample surface area.
4. # =Positive indicates the presence of CrVI on the tested areas.
   Negative indicates the absence of CrVI on the tested areas.
5. “-” =Not regulated
6. “Φ”=the sample 005, sample 012, sample 013 are copper alloy.The lead content which is under 4% is exempted from the requirement of directive 2011/65/EU（Rohs）.

### 3. 3 Test for Flame retardants

– Test Method: With reference to IEC 62321-6:2015, extracted by toluene and analyzed by Gas Chromatography and Mass Spectrometry (GC-MS). [Reporting Limit: 5mg/kg]

| Test Item | | Result [mg/kg] | | RoHS Requirement [mg/kg] |
|---|---|---|---|---|
| | | Sample 015 | Sample 023 | |
| PBBs | Monobromobiphenyl | < 5 | < 5 | Sum of PBBs < 1000 |
| | Dibromobiphenyl | < 5 | < 5 | |
| | Tribromobiphenyl | < 5 | < 5 | |
| | Tetrabromobiphenyl | < 5 | < 5 | |
| | Pentabromobiphenyl | < 5 | < 5 | |
| | Hexabromobiphenyl | < 5 | < 5 | |
| | Heptabromobiphenyl | < 5 | < 5 | |
| | Octabromobiphenyl | < 5 | < 5 | |
| | Nonabromobiphenyl | < 5 | < 5 | |
| | Decabromobiphenyl | < 5 | < 5 | |
| | Sum of PBBs | < 5 | < 5 | |
| PBDEs | Monobromodiphenyl Ether | < 5 | < 5 | Sum of PBDEs < 1000 |
| | Dibromodiphenyl Ether | < 5 | < 5 | |
| | Tribromodiphenyl Ether | < 5 | < 5 | |
| | Tetrabromodiphenyl Ether | < 5 | < 5 | |
| | Pentabromodiphenyl Ether | < 5 | < 5 | |
| | Hexabromodiphenyl Ether | < 5 | < 5 | |
| | Heptabromodiphenyl Ether | < 5 | < 5 | |
| | Octabromodiphenyl Ether | < 5 | < 5 | |
| | Nonabromodiphenyl Ether | < 5 | < 5 | |
| | Decabromodiphenyl Ether | < 5 | < 5 | |
| | Sum of PBDEs | < 5 | < 5 | |

| Test Item | | Result [mg/kg] | | RoHS Requirement [mg/kg] |
|---|---|---|---|---|
| | | Sample 026 | Sample 027 | |
| PBBs | Monobromobiphenyl | < 5 | < 5 | Sum of PBBs < 1000 |
| | Dibromobiphenyl | < 5 | < 5 | |
| | Tribromobiphenyl | < 5 | < 5 | |
| | Tetrabromobiphenyl | < 5 | < 5 | |
| | Pentabromobiphenyl | < 5 | < 5 | |
| | Hexabromobiphenyl | < 5 | < 5 | |
| | Heptabromobiphenyl | < 5 | < 5 | |
| | Octabromobiphenyl | < 5 | < 5 | |
| | Nonabromobiphenyl | < 5 | < 5 | |
| | Decabromobiphenyl | < 5 | < 5 | |
| | Sum of PBBs | < 5 | < 5 | |
| PBDEs | Monobromodiphenyl Ether | < 5 | < 5 | Sum of PBDEs < 1000 |
| | Dibromodiphenyl Ether | < 5 | < 5 | |
| | Tribromodiphenyl Ether | < 5 | < 5 | |
| | Tetrabromodiphenyl Ether | < 5 | < 5 | |
| | Pentabromodiphenyl Ether | < 5 | < 5 | |
| | Hexabromodiphenyl Ether | < 5 | < 5 | |
| | Heptabromodiphenyl Ether | < 5 | < 5 | |
| | Octabromodiphenyl Ether | < 5 | < 5 | |
| | Nonabromodiphenyl Ether | < 5 | < 5 | |
| | Decabromodiphenyl Ether | < 5 | < 5 | |
| | Sum of PBDEs | < 5 | < 5 | |

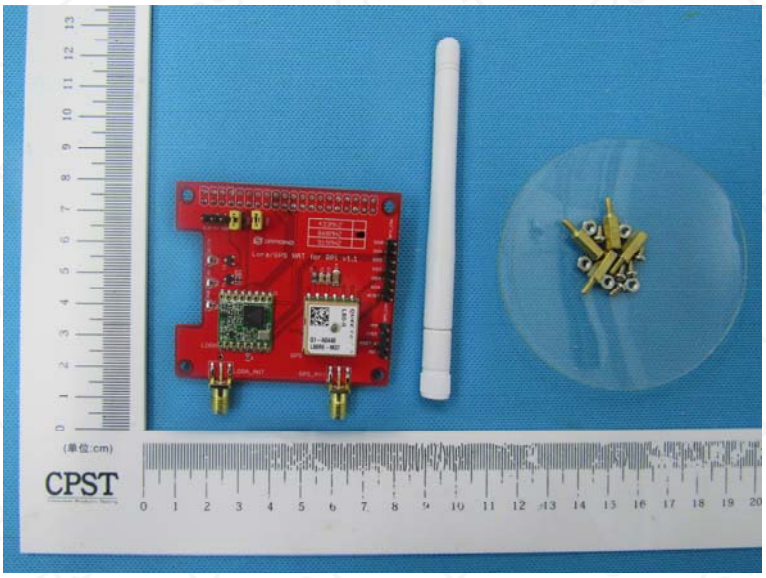
| Test Item | | Result [mg/kg] | | RoHS Requirement [mg/kg] |
|---|---|---|---|---|
| | | Sample 028 | Sample 035 | |
| PBBs | Monobromobiphenyl | < 5 | < 5 | Sum of PBBs < 1000 |
| | Dibromobiphenyl | < 5 | < 5 | |
| | Tribromobiphenyl | < 5 | < 5 | |
| | Tetrabromobiphenyl | < 5 | < 5 | |
| | Pentabromobiphenyl | < 5 | < 5 | |
| | Hexabromobiphenyl | < 5 | < 5 | |
| | Heptabromobiphenyl | < 5 | < 5 | |
| | Octabromobiphenyl | < 5 | < 5 | |
| | Nonabromobiphenyl | < 5 | < 5 | |
| | Decabromobiphenyl | < 5 | < 5 | |
| | Sum of PBBs | < 5 | < 5 | |
| PBDEs | Monobromodiphenyl Ether | < 5 | < 5 | Sum of PBDEs < 1000 |
| | Dibromodiphenyl Ether | < 5 | < 5 | |
| | Tribromodiphenyl Ether | < 5 | < 5 | |
| | Tetrabromodiphenyl Ether | < 5 | < 5 | |
| | Pentabromodiphenyl Ether | < 5 | < 5 | |
| | Hexabromodiphenyl Ether | < 5 | < 5 | |
| | Heptabromodiphenyl Ether | < 5 | < 5 | |
| | Octabromodiphenyl Ether | < 5 | < 5 | |
| | Nonabromodiphenyl Ether | < 5 | < 5 | |
| | Decabromodiphenyl Ether | < 5 | < 5 | |
| | Sum of PBDEs | < 5 | < 5 | |

| Test Item | | Result [mg/kg] | RoHS Requirement [mg/kg] |
|---|---|---|---|
| | | Sample 036 | |
| PBBs | Monobromobiphenyl | < 5 | Sum of PBBs < 1000 |
| | Dibromobiphenyl | < 5 | |
| | Tribromobiphenyl | < 5 | |
| | Tetrabromobiphenyl | < 5 | |
| | Pentabromobiphenyl | < 5 | |
| | Hexabromobiphenyl | < 5 | |
| | Heptabromobiphenyl | < 5 | |
| | Octabromobiphenyl | < 5 | |
| | Nonabromobiphenyl | < 5 | |
| | Decabromobiphenyl | < 5 | |
| | Sum of PBBs | < 5 | |
| PBDEs | Monobromodiphenyl Ether | < 5 | Sum of PBDEs < 1000 |
| | Dibromodiphenyl Ether | < 5 | |
| | Tribromodiphenyl Ether | < 5 | |
| | Tetrabromodiphenyl Ether | < 5 | |
| | Pentabromodiphenyl Ether | < 5 | |
| | Hexabromodiphenyl Ether | < 5 | |
| | Heptabromodiphenyl Ether | < 5 | |
| | Octabromodiphenyl Ether | < 5 | |
| | Nonabromodiphenyl Ether | < 5 | |
| | Decabromodiphenyl Ether | < 5 | |
| | Sum of PBDEs | < 5 | |

Note:

1. All Concentrations express in “mg/kg” (milligram per kilogram), mg/kg ~ ppm.
2. “<” denotes less than

## Photo of the Submitted Sample




*** End of Report ***