

## Test Report

No. HKGEC1800535231

Date: 06 Aug 2018

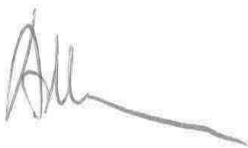
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POSSEHL ELECTRONICS HK LTD  
2/F POSSEHL BUILDING  
18 MA KOK ST  
TSUEN WAN  
N.T. HONG KONG

The following sample(s) was/were submitted and identified on behalf of the clients as : LEADFRAME - C19400 (A194 / C194) WITH SILVER PLATING

SGS Job No. : 4121278 - HK  
Date of Sample Received : 13 Jul 2018  
Testing Period : 13 Jul 2018 - 31 Jul 2018  
Test Requested : Selected test(s) as requested by client.  
Test Method : Please refer to next page(s).  
Test Results : Please refer to next page(s).  
Conclusion : Based on the performed tests on submitted sample(s), the results of Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBBs), Polybrominated diphenyl ethers (PBDEs) and Phthalates such as Bis(2-ethylhexyl) phthalate (DEHP) , Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP) , and Diisobutyl phthalate (DIBP) comply with the limits as set by RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU.

Signed for and on behalf of  
SGS Hong Kong Limited.



Lam Ka Yung, Allen  
Chemist

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Test Results :

## Test Part Description :

Specimen No.	SGS Sample ID	Description
1	HKG18-005352.001	Metal w/ silvery plating (base: coppery metal)

Remarks :

- (1) 1 mg/kg = 1 ppm = 0.0001%
- (2) MDL = Method Detection Limit
- (3) ND = Not Detected ( < MDL )
- (4) "-" = Not Regulated

## RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU

- Test Method :
- (1) With reference to IEC 62321-5:2013, determination of Cadmium by ICP-OES.
  - (2) With reference to IEC 62321-5:2013, determination of Lead by ICP-OES.
  - (3) With reference to IEC 62321-4:2013+A1:2017, determination of Mercury by ICP-OES.
  - (4) With reference to IEC 62321-7-1:2015 , determination of Hexavalent Chromium by Colorimetric Method using UV-Vis.
  - (5) With reference to IEC 62321-6:2015, determination of PBBs and PBDEs by GC-MS.
  - (6) With reference to IEC 62321-8:2017., determination of phthalates by GC-MS.

Test Item(s)	Limit	Unit	MDL	001
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1,000	mg/kg	5	ND
Mercury (Hg)	1,000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))▼	-	µg/cm <sup>2</sup>	0.1	ND
Sum of PBBs	1,000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1,000	mg/kg	-	ND
Monobromodiphenyl ether	-	mg/kg	5	ND
Dibromodiphenyl ether	-	mg/kg	5	ND

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<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND
Octabromodiphenyl ether	-	mg/kg	5	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND
Decabromodiphenyl ether	-	mg/kg	5	ND
Dibutyl Phthalate (DBP)	1,000	mg/kg	50	ND
Benzylbutyl Phthalate (BBP)	1,000	mg/kg	50	ND
Bis-(2-ethylhexyl) Phthalate (DEHP)	1,000	mg/kg	50	ND
Diisobutyl Phthalate (DIBP)	1,000	mg/kg	50	ND

### Notes :

(1) The maximum permissible limit is quoted from RoHS Directive (EU) 2015/863.

(2) ▼ =

a. The sample is positive for CrVI if the CrVI concentration is greater than 0.13 µg/cm<sup>2</sup>. The sample coating is considered to contain CrVI

b. The sample is negative for CrVI if CrVI is ND (concentration less than 0.10 µg/cm<sup>2</sup>). The coating is considered a non-CrVI based coating

c. The result between 0.10 µg/cm<sup>2</sup> and 0.13 µg/cm<sup>2</sup> is considered to be inconclusive - unavoidable coating variations may influence the determination

Information on storage conditions and production date of the tested sample is unavailable and thus Cr(VI) results represent status of the sample at the time of testing.

IEC 62321 series is equivalent to EN 62321 series

[http://www.cenelec.eu/dyn/www/f?p=104:30:1742232870351101:::FSP\\_ORG\\_ID,FSP\\_LANG\\_ID:1258637,25](http://www.cenelec.eu/dyn/www/f?p=104:30:1742232870351101:::FSP_ORG_ID,FSP_LANG_ID:1258637,25)

### Element(s)

Test Method : With reference to US EPA Method 3050B:1996. Analysis was performed by ICP-OES.

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Phosphorus (P)	-	mg/kg	20	160
Antimony (Sb)	-	mg/kg	10	ND
Sb <sub>2</sub> O <sub>3</sub> ♦	-	mg/kg	12	ND
Beryllium (Be)	-	mg/kg	5	ND
BeO♦	-	mg/kg	15	ND
Arsenic (As)	-	mg/kg	10	ND

### Notes :

(1) ♦ Calculated concentration of BeO is based on the identified Be

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Calculated concentration of  $Sb_2O_3$  is based on the identified Sb

### Halogen

Test Method : With reference to EN 14582: 2016. Analysis was performed by IC.

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Fluorine (F)	-	mg/kg	50	ND
Chlorine (Cl)	-	mg/kg	50	ND
Bromine (Br)	-	mg/kg	50	ND
Iodine (I)	-	mg/kg	50	ND

### Polychlorinated Naphthalenes (PCNs)

Test Method : With reference to In-house method. Analysis was performed by GC-ECD

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
1-Chlorinated Naphthalene	-	mg/kg	0.5	ND
2-Chlorinated Naphthalene	-	mg/kg	0.5	ND
1,4-Dichlorinated Naphthalene	-	mg/kg	0.5	ND
1,2,3-Trichlorinated Naphthalene	-	mg/kg	0.5	ND
1,2,3,4-Tetrachlorinated Naphthalene	-	mg/kg	0.5	ND
1,2,3,4,6-Pentachlorinated Naphthalene	-	mg/kg	0.5	ND
Octa-chlorinated Naphthalene	-	mg/kg	0.5	ND
Sum of PCN	-	mg/kg	5	ND

### Organotins

Test Method : With reference to BS ISO 17353:2005. Analysis was conducted by GC-MS.

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Tributyl tin (TBT)	-	%	0.01	ND
Triphenyl tin (TPhT)	-	%	0.01	ND
Dibutyl tin (DBT)	-	%	0.01	ND
Diocetyl tin (DOT)	-	%	0.01	ND
Tributyl Tin Oxide (TBTO)	-	%	0.02	ND

### PVC (Polyvinyl chloride)

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Test Method : With reference to SGS in-house method and performed by FT-IR.

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
PVC	-	-	-	Negative

Notes :

(1) Negative=Undetectable,Positive=Detectable

### Polychlorinated Terphenyls (PCTs)

Test Method : With reference to In-house method. Analysis was performed by GC-ECD

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Aroclor 5432	-	mg/kg	1	ND
Aroclor 5442	-	mg/kg	1	ND
Aroclor 5460	-	mg/kg	1	ND
Sum of PCT	-	mg/kg	5	ND

### Short Chained Chlorinated Paraffin (SCCP)

Test Method : In-house method. Analysis was performed by GC-ECD.

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Short Chained Chlorinated Paraffin (SCCP)	-	mg/kg	50	ND

### Phthalates

Test Method : With reference to EN14372: 2004. Analysis was performed by GC-MS.

<u>Test Item(s)</u>	<u>CAS NO</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Diisononyl Phthalate (DINP)	28553-12-0 / 68515-48-0	-	%	0.010	ND
Diisodecyl Phthalate (DIDP)	26761-40-0 / 68515-49-1	-	%	0.010	ND
Di-n-octyl Phthalate (DNOP)	117-84-0	-	%	0.003	ND
Di-n-hexyl Phthalate (DnHP)	84-75-3	-	%	0.003	ND
1,2-benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich (DIHP)	71888-89-6	-	%	0.010	ND

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<u>Test Item(s)</u>	<u>CAS_NO</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
1,2-benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters (DHNUP)	68515-42-4	-	%	0.010	ND
Bis-(methoxyethyl)-phthalate (DMEP)	117-82-8	-	%	0.003	ND
Dipentyl Phthalate (DnPP)	131-18-0	-	%	0.003	ND

### PFOA & PFOS (Perfluorooctanoic acid & Perfluorooctane sulfonates)

Test Method : With reference to US EPA Method 3540C:1996, analysis was performed by HPLC-MS

<u>Test Item(s)</u>	<u>CAS_NO</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Perfluorooctanoic Acid (PFOA)	335-67-1	-	mg/kg	10	ND
Perfluorooctane Sulfonates (PFOS)^	-	-	mg/kg	10	ND

Notes :

(1)^: PFOS refer to Perfluorooctanesulfonic acid and its derivatives including Perfluorooctanesulfonic acid Perfluorooctane sulfonamide, N-Methylperfluorooctane sulfonamide, N-Ethylperfluorooctane sulfonamide, N-Methylperfluorooctane sulfonamidoethanol and N-Ethylperfluorooctane sulfonamidoethanol.

### Polychlorinated Biphenyls (PCBs)

Test Method : With reference to In-house method. Analysis was performed by GC-ECD

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Aroclor 1016	-	mg/kg	0.5	ND
Aroclor 1221	-	mg/kg	0.5	ND
Aroclor 1232	-	mg/kg	0.5	ND
Aroclor 1242	-	mg/kg	0.5	ND
Aroclor 1248	-	mg/kg	0.5	ND
Aroclor 1254	-	mg/kg	0.5	ND
Aroclor 1260	-	mg/kg	0.5	ND
Sum of PCB	-	mg/kg	5	ND

### Hexabromocyclododecane (HBCDD)

Test Method : With reference to US EPA Method 3550C:2007, analysis was performed by GC-MS

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<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified ( $\alpha$ -HBCDD, $\beta$ -HBCDD, $\gamma$ -HBCDD)	-	mg/kg	10	ND

Notes :

- (1) The test results were obtained from a SGS affiliated laboratory.

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**Appendix**

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	Test Item	CAS No.
RoHS	Pb	7439-92-1
	Cd	7440-43-9
	Hg	7439-97-6
	Cr(VI)	18540-29-9
	<b>SUM of PBBs</b>	--
	<b>Monobromobiphenyl</b>	--
	3-Bromo-1,1'-biphenyl	2113-57-7
	2-Bromo-1,1'-biphenyl	2052-07-5
	4-Bromo-1,1'-biphenyl	92-66-0
	<b>Dibromobiphenyl</b>	--
	4,4'-Dibromobiphenyl	92-86-4
	2,2'-Dibromobiphenyl	13029-09-9
	2,6-Dibromobiphenyl	59080-32-9
	<b>Tribromobiphenyl</b>	--
	2,4,6-Tribromobiphenyl	59080-33-0
	2,4,5-Tribromobiphenyl	59080-39-3
	2,3,5-Tribromobiphenyl	59080-35-2
	2,2',5-Tribromobiphenyl	59080-34-1
	2,4,5-Tribromobiphenyl	--
	3,4,5-Tribromobiphenyl	--
	<b>Tetrabromobiphenyl</b>	--
	2,2',4,5'-TetrabromoBiphenyl	60044-24-8
	2,2',5,6'-TetrabromoBiphenyl	60044-25-9
	2,2',5,5'-TetrabromoBiphenyl	59080-37-4
	3,3',5,5'-TetrabromoBiphenyl	16400-50-3
	<b>Pentabromobiphenyl</b>	--
	2,2',4,5',6-PentabromoBiphenyl	59080-39-6
	2,2',4,5,5'-PentabromoBiphenyl	67888-96-4
	<b>Hexabromobiphenyl</b>	--
	2,2',4,4',5,5'-HexabromoBiphenyl	59080-40-9
	3,3',4,4',5,5'-HexabromoBiphenyl	60044-26-0
	Heptabromobiphenyl	-
	Nonabromobiphenyl	-
Decabromobiphenyl	13654-09-6	

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	Test Item	CAS No.
RoHS	<b>SUM of PBDEs</b>	--
	<b>Monobromodiphenyl ether</b>	--
	4-BromoBiphenyl ether	36563-47-0
	MonobromoBiphenyl ether	101-55-3
	<b>Dibromodiphenyl ether</b>	--
	Bis(4-bromoBiphenyl) ether	--
	DibromoBiphenyl ether	2050-47-7
	Tribromodiphenyl ether	49690-94-0
	Tetrabromodiphenyl ether	40088-47-9
	Pentabromodiphenyl ether	32534-81-9
	Hexabromodiphenyl ether	36483-60-0
	Heptabromodiphenyl ether	68928-80-3
	Octabromodiphenyl ether	32536-52-0
	Nonabromodiphenyl ether	63936-56-1
	Decabromodiphenyl ether	1163-19-5

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	Test Item	CAS No.
RoHS2.0	BBP	85-68-7
	DEHP	117-81-7
	DBP	84-74-2
	DIBP	84-69-5

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	Test Item	CAS No.
Phosphorus	P	12185-10-3

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**Appendix**

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	Test Item	CAS No.
Phthalate	Diisononyl Phthalate (DINP)	28553-12-0/ 68515-48-0
	Diisodecyl Phthalate (DIDP)	26761-40-0/ 68515-49-1
	Di-n-octyl Phthalate (DNOP)	117-84-0
	Di-n-hexyl Phthalate (DnHP)	84-75-3
	1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich	71888-89-6
	1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters (DHNUP)	68515-42-4
	Bis(methoxyethyl) Phthalate (DMEP)	117-82-8
	Dipentyl Phthalate (DPP)	131-18-0

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### Appendix

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	Test Item	CAS No.
Organo-fluorine Compounds	PFOA	335-67-1
	PFOS	1763-23-1

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	Test Item	CAS No.
Halogen	F	7782-41-4
	Cl	7782-50-5
	Br	7726-95-6
	I	7553-56-2

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	Test Item	CAS No.
Antimony	Sb	7440-36-0
	Sb2O3	1309-64-4

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	Test Item	CAS No.
Beryllium	Be	7440-41-7
	BeO	1304-56-9

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	Test Item	CAS No.
PVC	PVC	9002-86-2
	PVC blends	--

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	Test Item	CAS No.
Polychlorinated Biphenyls	PCBs	--
	Aroclor 1016	12674-11-2
	Aroclor 1221	11104-28-2
	Aroclor 1232	11141-16-5
	Aroclor 1242	53469-21-9
	Aroclor 1248	12672-29-6
	Aroclor 1254	11097-69-1
	Aroclor 1260	11096-82-5

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	Test Item	CAS No.
Polychlorinated Naphthalene	PCNs	--
	1-Chlorinated Naphthalene	--
	2-Chlorinated Naphthalene	--
	1,4-Dichlorinated Naphthalene	--
	1,2,3-Trichlorinated Naphthalene	--
	1,2,3,4-Tetrachlorinated Naphthalene	--
	1,2,3,4,6-Pentachlorinated Naphthalene	--
	Octa-chlorinated Naphthalene	--

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	Test Item	CAS No.
	PCTs	--
Polychlorinated Terphenyls	Aroclor 5432	63496-31-1
	Aroclor 5442	12642-23-8
	Aroclor 5460	11126-42-4

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	Test Item	CAS No.
Alkanes	Short-Chain Chlorinated Paraffins (SCCP), C10~C13	85535-84-8

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	Test Item	CAS No.
Organicotin Compounds	TBT	813-19
	TPT	36643-28-4
	TBTO	56-35-9
	DBT	1002-53-5
	DOT	94410-05-6

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	Test Item	CAS No.
Hexabromocyclododecane	HBCDD	25637-99-4 / 3194-55-6

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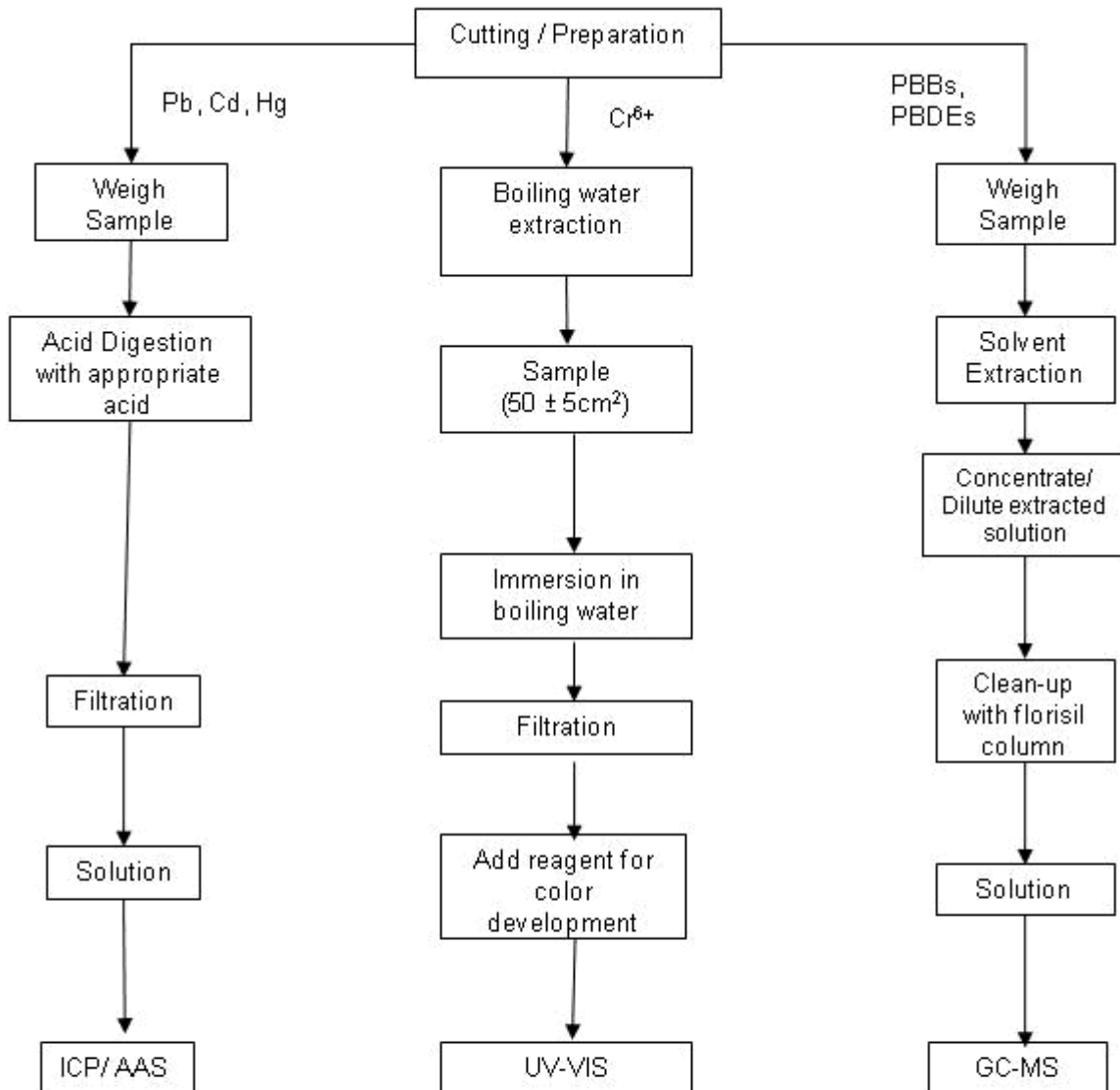
**Appendix**

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	Test Item	CAS No.
Arsenic	As	7784-42-1

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The metallic samples were dissolved totally by pre-conditioning method according to above flow chart for Cd, Pb and Hg contents analysis.

Operator : Chiu Kan Yuen/ Tang Koon Pang (Acid digestion)  
Nick Liu (Hexavalent Chromium)  
Kent Wan (PBBs and PBDEs)

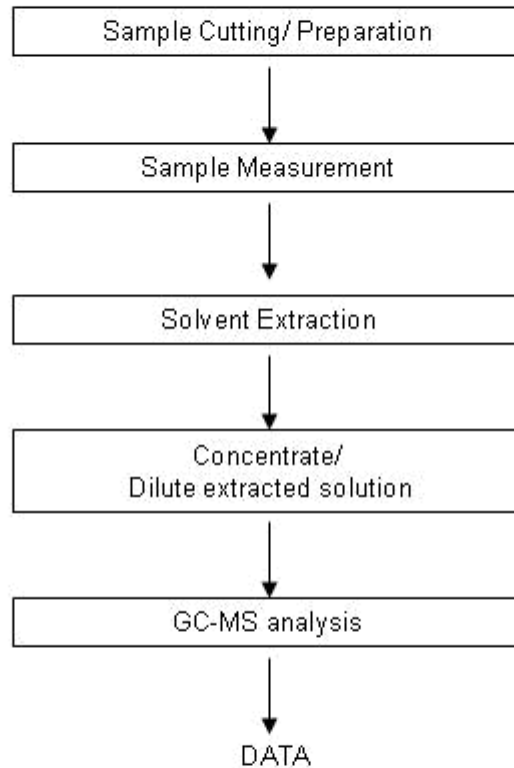
Section Chief : Chan Chun Kit (Dickson Chan)

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### Flowchart for Phthalates measurement

Method: IEC62321



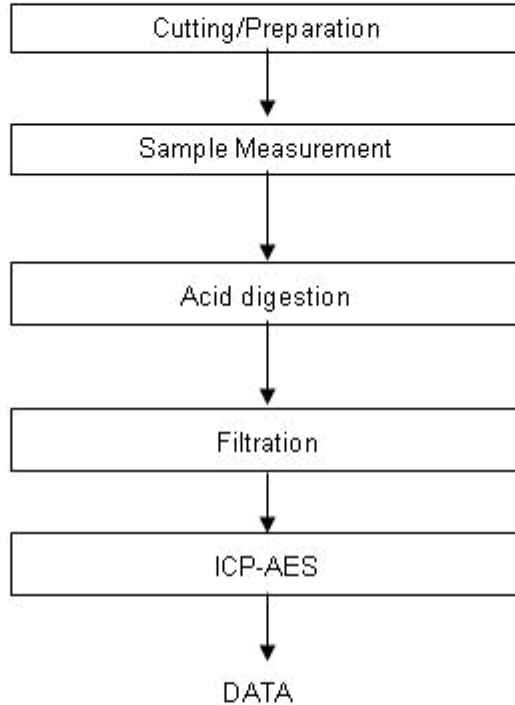
Tested by : Calvin Yuen  
Checked by : Brian Yip

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**Flowchart of Digestion for P Measurement**

Method: EPA method 3050B: 1996



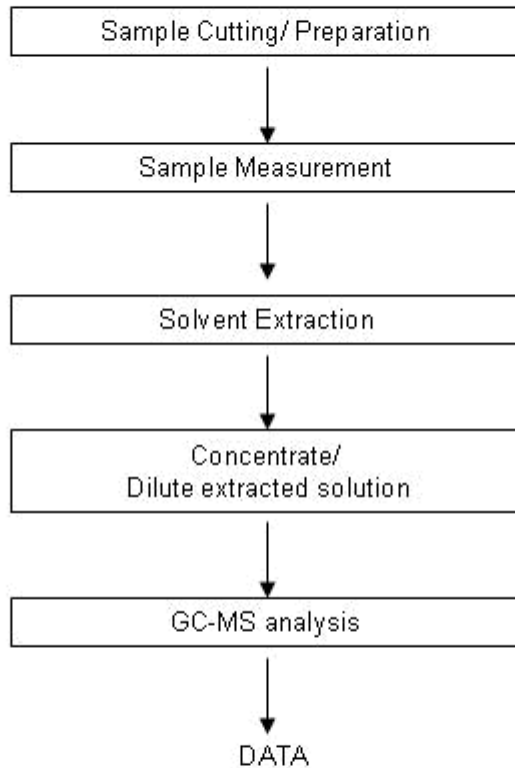
Operator : Chiu Kan Yuen  
 Section Chief : Chan Chun Kit (Dickson)

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**Flowchart for Phthalates measurement**

Method: EN 14372



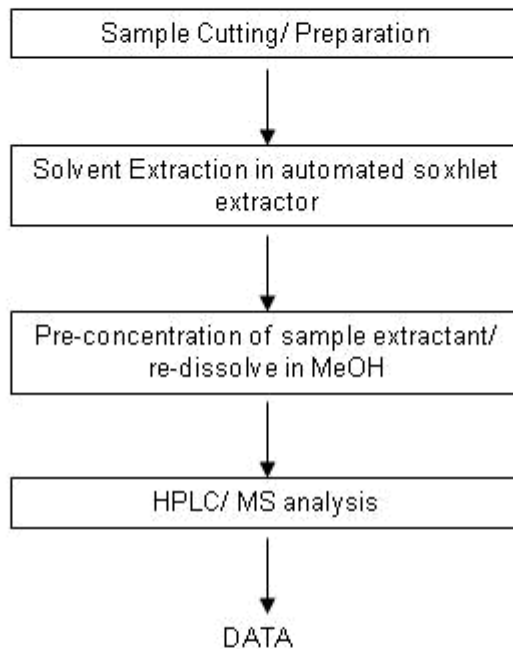
Tested by : Calvin Yuen  
 Checked by : Brian Yip

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**Flowchart for PFOS/ PFOA measurement**

Method: US EPA 3540C: 1996 method



Operator : Candy Luk  
Chief Supervisor : Yu Ka Lai

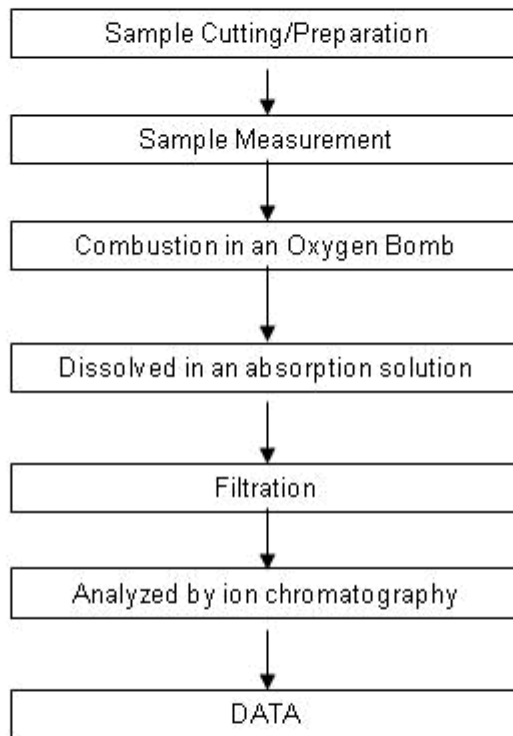
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**Flowchart for Halogen Free Test**

Method: BS EN14582:2016



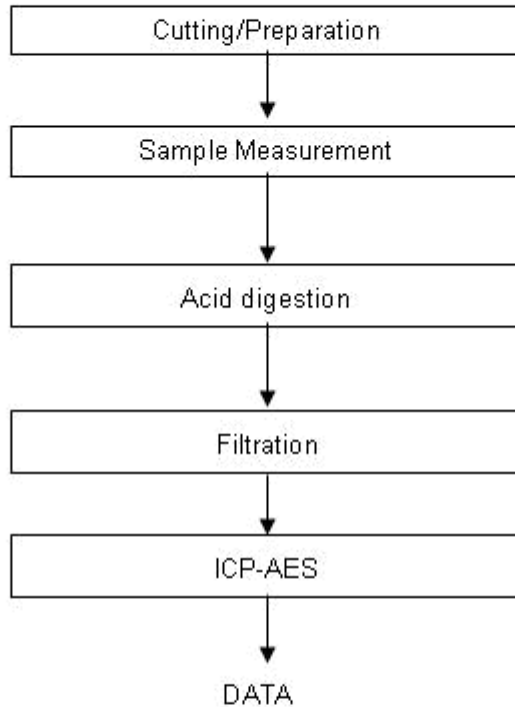
Operator: Tang Ying Sam  
 Supervisor: Chan Chun Kit (Dickson)

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**Flowchart of Digestion for Sb Measurement**

Method: EPA method 3050B: 1996



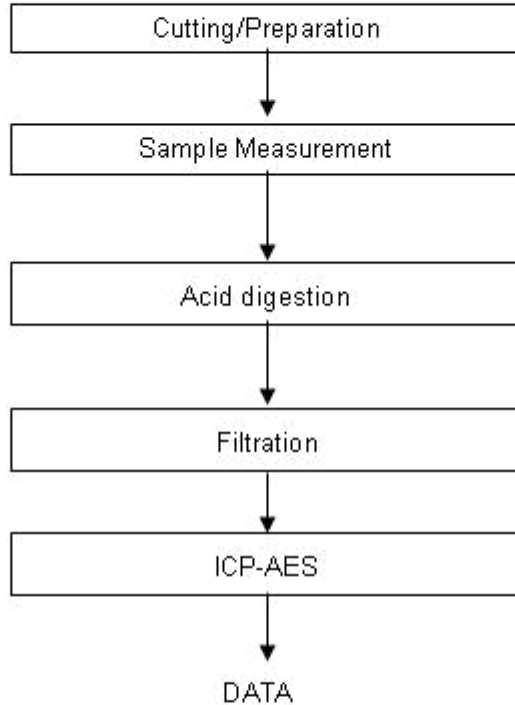
Operator : Chiu Kan Yuen  
 Section Chief : Chan Chun Kit (Dickson)

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**Flowchart of Digestion for Be Measurement**

Method: EPA method 3050B: 1996

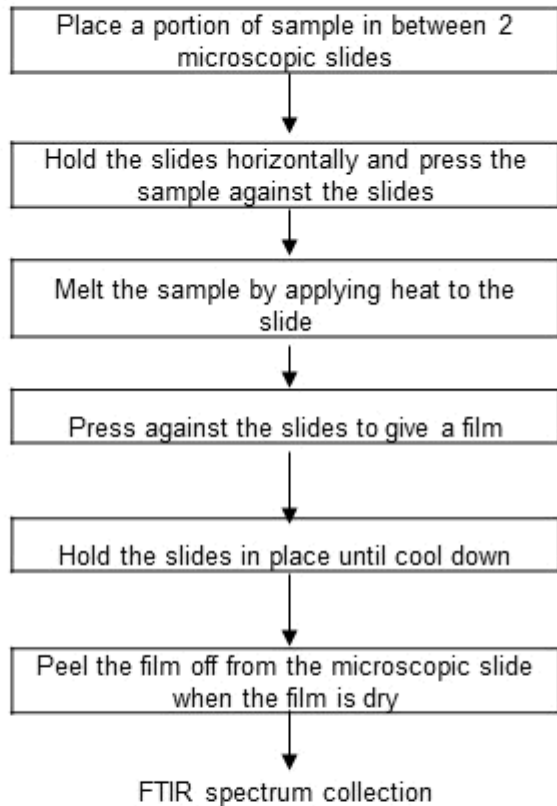


Operator : Chiu Kan Yuen  
 Section Chief : Chan Chun Kit (Dickson)

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**Flowchart for PVC Measurement  
by FTIR**



Operator : Chin Tung

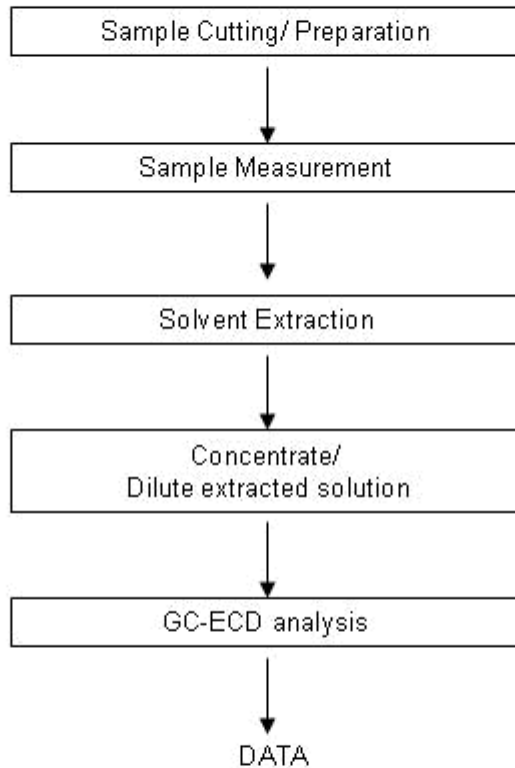
Supervisor : Chan Chun Kit, Dickson

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**Flowchart for PCB measurement**

Method: In-House Method



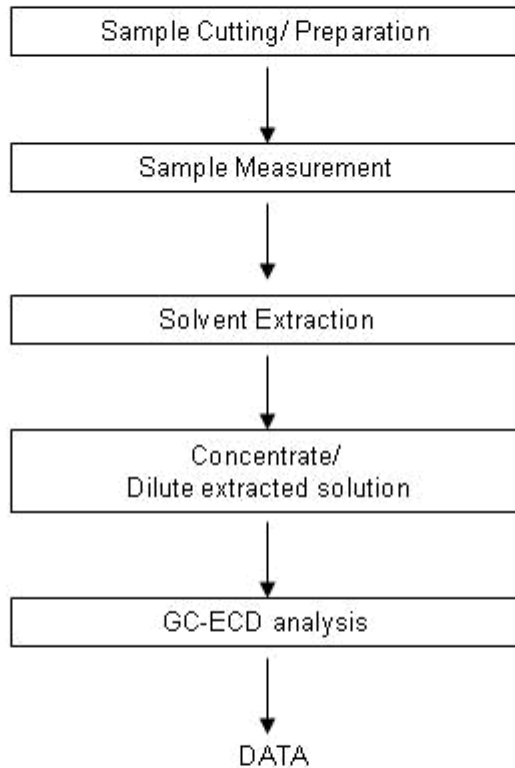
Tested by : Kent Wan  
 Checked by : Eric Sze , Billy Leung

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**Flowchart for PCN measurement**

Method: In-House Method



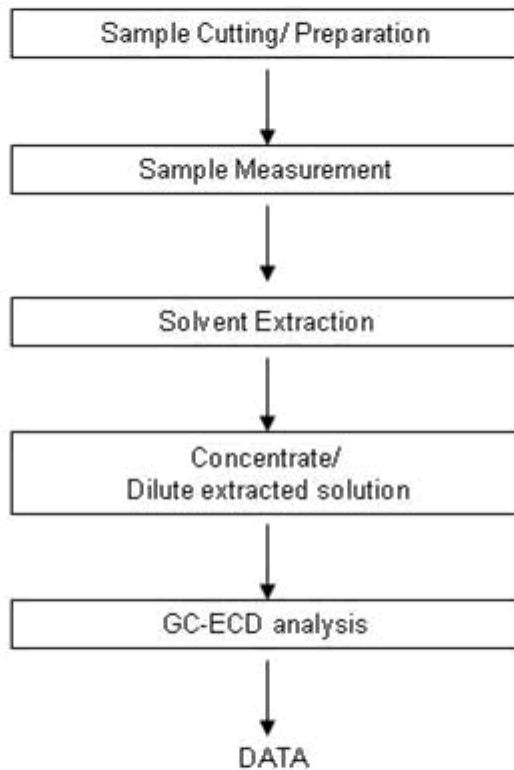
Tested by : Kent Wan  
 Checked by : Eric Sze , Billy Leung

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### Flowchart of PCT Measurement

Method: In-House Method



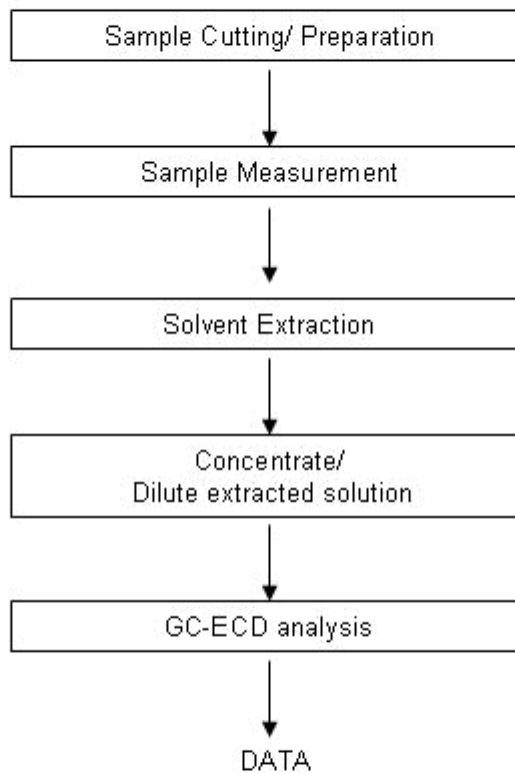
Tested by : Woo Po Chu  
Checked by : Eunice Lau

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**Flowchart for SCCP measurement**

Method: In-House Method



Tested by : Woo Po Chu  
 Checked by : Eunice Lau

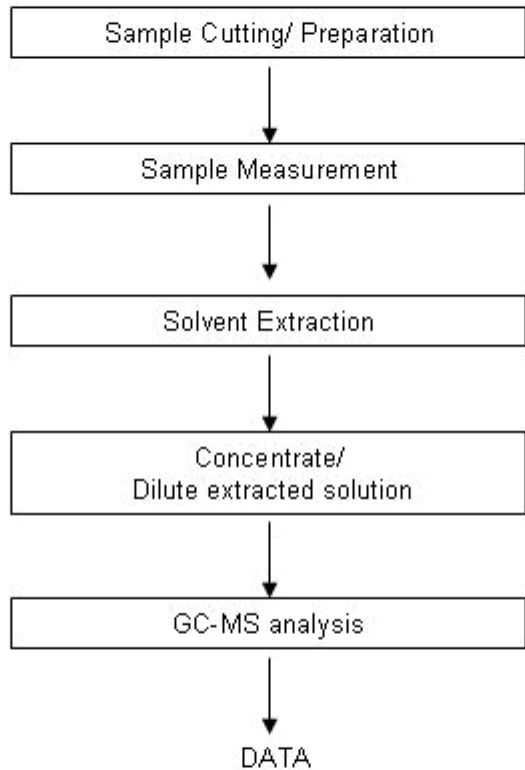
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### Flowchart for Organotin measurement

Method: ISO 17353



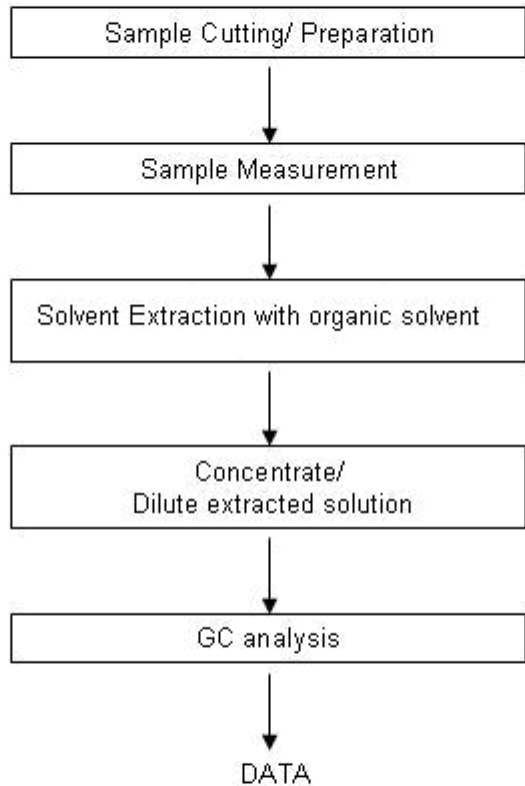
Tested by : Will Wong  
Checked by : Eunice Lau

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**Flowchart for HBCDD measurement**

Method: US EPA3550C:2007



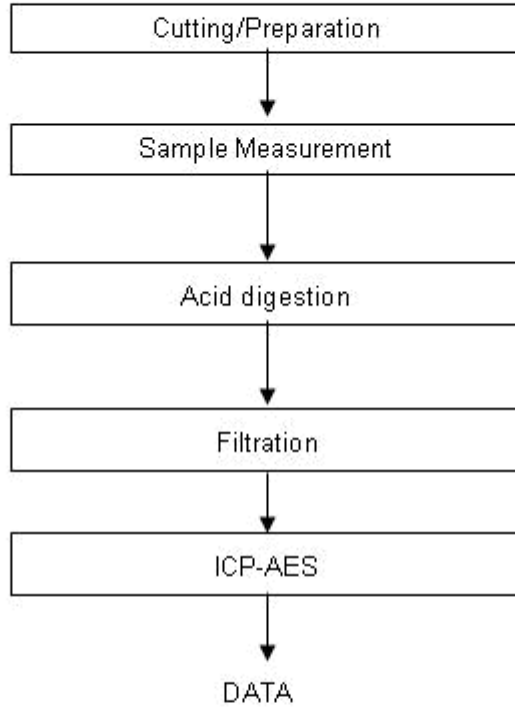
Operator : Zinna Chow  
 Chief Supervisor : Dicky Chan

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**Flowchart of Digestion for As Measurement**

Method: EPA method 3050B: 1996



Operator : Chiu Kan Yuen  
 Section Chief : Chan Chun Kit (Dickson)

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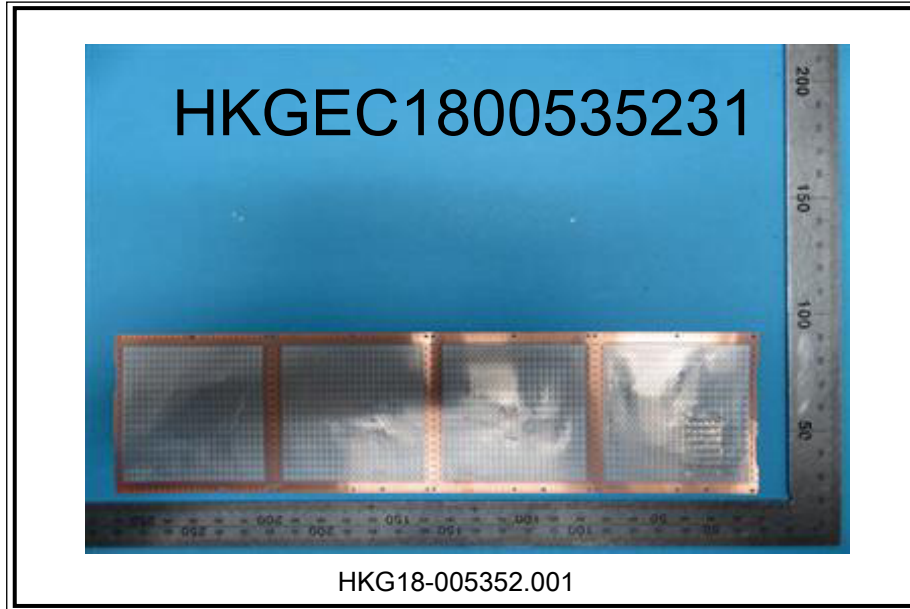
## Test Report

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Date: 06 Aug 2018

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