

**Tables to 40 CFR 98, Subpart I, Effective on January 1, 2014<sup>1</sup>**

**Table I-1 to Subpart I—Default Emission Factors for Threshold Applicability Determination**

Product type	Emission factors EF <sub>i</sub>					
	CF <sub>4</sub>	C <sub>2</sub> F <sub>6</sub>	CHF <sub>3</sub>	C <sub>3</sub> F <sub>8</sub>	NF <sub>3</sub>	SF <sub>6</sub>
Semiconductors (kg/m <sup>2</sup> )	0.90	1.00	0.04	0.05	0.04	0.20
LCD (g/m <sup>2</sup> )	0.50	NA	NA	NA	0.90	4.00
MEMS (kg/m <sup>2</sup> )	NA	NA	NA	NA	NA	1.02

**Notes:** NA denotes not applicable based on currently available information.

[75 FR 74818, December 1, 2010, as amended at 78 FR 68221, November 13, 2013]

**Table I-2 to Subpart I—Examples of Fluorinated GHGs Used by the Electronics Industry**

Product type	Fluorinated GHGs used during manufacture
Electronics	CF <sub>4</sub> , C <sub>2</sub> F <sub>6</sub> , C <sub>3</sub> F <sub>8</sub> , c-C <sub>4</sub> F <sub>8</sub> , c-C <sub>4</sub> F <sub>8</sub> O, C <sub>4</sub> F <sub>6</sub> , C <sub>5</sub> F <sub>8</sub> , CHF <sub>3</sub> , CH <sub>2</sub> F <sub>2</sub> , NF <sub>3</sub> , SF <sub>6</sub> , and fluorinated HTFs (CF <sub>3</sub> -(O-CF(CF <sub>3</sub> )-CF <sub>2</sub> ) <sub>n</sub> -(O-CF <sub>2</sub> ) <sub>m</sub> -O-CF <sub>3</sub> , C <sub>n</sub> F <sub>2n+2</sub> , C <sub>n</sub> F <sub>2n+1</sub> (O)C <sub>m</sub> F <sub>2m+1</sub> , C <sub>n</sub> F <sub>2n</sub> O, (C <sub>n</sub> F <sub>2n+1</sub> ) <sub>3</sub> N).

[77 FR 10381, February 22, 2012]

<sup>1</sup> Except Tables I-3 and I-4. The versions listed in this document became effective on January 1, 2017.

**Table I-3 to Subpart I of Part 98—Default Emission Factors (1-U<sub>ij</sub>) for Gas Utilization Rates (U<sub>ij</sub>) and By-Product Formation Rates (B<sub>ijk</sub>) for Semiconductor Manufacturing for 150mm and 200 mm Wafer Sizes**

Process type/Sub-type	Process gas i												
	CF <sub>4</sub>	C <sub>2</sub> F <sub>6</sub>	CHF <sub>3</sub>	CH <sub>2</sub> F <sub>2</sub>	C <sub>2</sub> HF <sub>5</sub>	CH <sub>3</sub> F	C <sub>3</sub> F <sub>8</sub>	C <sub>4</sub> F <sub>8</sub>	NF <sub>3</sub>	SF <sub>6</sub>	C <sub>4</sub> F <sub>6</sub>	C <sub>5</sub> F <sub>8</sub>	C <sub>4</sub> F <sub>8</sub> O
<b>ETCHING/WAFER CLEANING</b>													
1-U <sub>i</sub>	0.81	0.72	0.51	0.13	0.064	0.70	NA	0.14	0.19	0.55	0.17	0.072	NA
BCF <sub>4</sub>	NA	0.10	0.085	0.079	0.077	NA	NA	0.11	0.0040	0.13	0.13	NA	NA
BC <sub>2</sub> F <sub>6</sub>	0.046	NA	0.030	0.025	0.024	0.0034	NA	0.037	0.025	0.11	0.11	0.014	NA
BC <sub>4</sub> F <sub>6</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BC <sub>4</sub> F <sub>8</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BC <sub>3</sub> F <sub>8</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BC <sub>5</sub> F <sub>8</sub>	0.0012	NA	0.0012	NA	NA	NA	NA	0.0086	NA	NA	NA	NA	NA
BCHF <sub>3</sub>	0.10	0.047	NA	0.049	NA	NA	NA	0.040	NA	0.0012	0.066	0.0039	NA
<b>CHAMBER CLEANING</b>													
In situ plasma cleaning:													
1-U <sub>i</sub>	0.92	0.55	NA	NA	NA	NA	0.40	0.10	0.18	NA	NA	NA	0.14
BCF <sub>4</sub>	NA	0.21	NA	NA	NA	NA	0.20	0.11	0.050	NA	NA	NA	0.13
BC <sub>2</sub> F <sub>6</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.045
BC <sub>3</sub> F <sub>8</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Remote plasma cleaning:													
1-U <sub>i</sub>	NA	NA	NA	NA	NA	NA	NA	NA	0.017	NA	NA	NA	NA
BCF <sub>4</sub>	NA	NA	NA	NA	NA	NA	NA	NA	0.015	NA	NA	NA	NA
BC <sub>2</sub> F <sub>6</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BC <sub>3</sub> F <sub>8</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
In situ thermal cleaning:													
1-U <sub>i</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BCF <sub>4</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BC <sub>2</sub> F <sub>6</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BC <sub>3</sub> F <sub>8</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

**Notes:** NA = Not applicable; i.e., there are no applicable default emission factor measurements for this gas. This does not necessarily imply that a particular gas is not used in or emitted from a particular process sub-type or process type.

**Table I-4 to Subpart I of Part 98—Default Emission Factors (1-U<sub>ij</sub>) for Gas Utilization Rates (U<sub>ij</sub>) and By-Product Formation Rates (B<sub>ijk</sub>) for Semiconductor Manufacturing for 300 mm and 450 mm Wafer Size**

Process type/sub-type	Process gas i											
	CF <sub>4</sub>	C <sub>2</sub> F <sub>6</sub>	CHF <sub>3</sub>	CH <sub>2</sub> F <sub>2</sub>	CH <sub>3</sub> F	C <sub>3</sub> F <sub>8</sub>	C <sub>4</sub> F <sub>8</sub>	NF <sub>3</sub>	SF <sub>6</sub>	C <sub>4</sub> F <sub>6</sub>	C <sub>5</sub> F <sub>8</sub>	C <sub>4</sub> F <sub>8</sub> O
<b>ETCHING/WAFER CLEANING</b>												
1-U <sub>i</sub>	0.65	0.80	0.42	0.21	0.33	0.30	0.18	0.15	0.32	0.15	0.10	NA
BCF <sub>4</sub>	NA	0.21	0.095	0.049	0.045	0.21	0.045	0.046	0.040	0.059	0.11	NA
BC <sub>2</sub> F <sub>6</sub>	0.079	NA	0.064	0.052	0.00087	0.18	0.031	0.045	0.044	0.074	0.083	NA
BC <sub>4</sub> F <sub>6</sub>	NA	NA	0.00010	NA	NA	NA	0.018	NA	NA	NA	NA	NA
BC <sub>4</sub> F <sub>8</sub>	0.00063	NA	0.00080	NA	NA	NA	NA	NA	NA	NA	NA	NA
BC <sub>3</sub> F <sub>8</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00012	NA
BCHF <sub>3</sub>	0.011	NA	NA	0.050	0.0057	0.012	0.027	0.025	0.0037	0.019	0.0069	NA
BCH <sub>2</sub> F <sub>2</sub>	NA	NA	0.0036	NA	0.0023	NA	0.0015	0.00086	0.000029	0.000030	NA	NA
BCH <sub>3</sub> F	0.0080	NA	0.0080	0.0080	NA	0.00073	NA	0.0080	NA	NA	NA	NA
<b>Chamber Cleaning</b>												
In situ plasma cleaning:												
1-U <sub>i</sub>	NA	NA	NA	NA	NA	NA	NA	0.23	NA	NA	NA	NA
BCF <sub>4</sub>	NA	NA	NA	NA	NA	NA	NA	0.037	NA	NA	NA	NA
BC <sub>2</sub> F <sub>6</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BC <sub>3</sub> F <sub>8</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Remote Plasma Cleaning:												
1-U <sub>i</sub>	NA	NA	NA	NA	NA	0.063	NA	0.017	NA	NA	NA	NA
BCF <sub>4</sub>	NA	NA	NA	NA	NA	NA	NA	0.075	NA	NA	NA	NA
BC <sub>2</sub> F <sub>6</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BC <sub>3</sub> F <sub>8</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
In Situ Thermal Cleaning:												
1-U <sub>i</sub>	NA	NA	NA	NA	NA	NA	NA	0.28	NA	NA	NA	NA
BCF <sub>4</sub>	NA	NA	NA	NA	NA	NA	NA	0.010	NA	NA	NA	NA
BC <sub>2</sub> F <sub>6</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BC <sub>3</sub> F <sub>8</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

**Notes:** NA = Not applicable; i.e., there are no applicable default emission factor measurements for this gas. This does not necessarily imply that a particular gas is not used in or emitted from a particular process sub-type or process type.

[81 FR 89256, December 9, 2016]

**Table I-5 to Subpart I of Part 98—Default Emission Factors (1-U<sub>ij</sub>) for Gas Utilization Rates (U<sub>ij</sub>) and By-Product Formation Rates (B<sub>ijk</sub>) for MEMS Manufacturing**

Process type factors	Process gas i											
	CF <sub>4</sub>	C <sub>2</sub> F <sub>6</sub>	CHF <sub>3</sub>	CH <sub>2</sub> F <sub>2</sub>	C <sub>3</sub> F <sub>8</sub>	c-C <sub>4</sub> F <sub>8</sub>	NF <sub>3</sub> Remote	NF <sub>3</sub>	SF <sub>6</sub>	C <sub>4</sub> F <sub>6a</sub>	C <sub>5</sub> F <sub>8a</sub>	C <sub>4</sub> F <sub>8O<sub>a</sub></sub>
Etch 1-U <sub>i</sub>	0.7	<sup>1</sup> 0.4	<sup>1</sup> 0.4	<sup>1</sup> 0.06	NA	<sup>1</sup> 0.2	NA	0.2	0.2	0.1	0.2	NA
Etch BCF <sub>4</sub>	NA	<sup>1</sup> 0.4	<sup>1</sup> 0.07	<sup>1</sup> 0.08	NA	0.2	NA	NA	NA	<sup>1</sup> 0.3	0.2	NA
Etch BC <sub>2</sub> F <sub>6</sub>	NA	NA	NA	NA	NA	0.2	NA	NA	NA	<sup>1</sup> 0.2	0.2	NA
CVD Chamber Cleaning 1-U <sub>i</sub>	0.9	0.6	NA	NA	0.4	0.1	0.02	0.2	NA	NA	0.1	0.1
CVD Chamber Cleaning BCF <sub>4</sub>	NA	0.1	NA	NA	0.1	0.1	<sup>2</sup> 0.02	<sup>2</sup> 0.1	NA	NA	0.1	0.1
CVD Chamber Cleaning BC <sub>3</sub> F <sub>8</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.4

**Notes:** NA = Not applicable; i.e., there are no applicable default emission factor measurements for this gas. This does not necessarily imply that a particular gas is not used in or emitted from a particular process sub-type or process type.

<sup>1</sup>Estimate includes multi-gas etch processes.

<sup>2</sup>Estimate reflects presence of low-k, carbide and multi-gas etch processes that may contain a C-containing fluorinated GHG additive.

[75 FR 74818, December 1, 2010, as amended at 78 FR 68225, November 13, 2013]

**Table I-6 to Subpart I of Part 98—Default Emission Factors (1-U<sub>ij</sub>) for Gas Utilization Rates (U<sub>ij</sub>) and By-Product Formation Rates (B<sub>ijk</sub>) for LCD Manufacturing**

Process type factors	Process Gas i									
	CF <sub>4</sub>	C <sub>2</sub> F <sub>6</sub>	CHF <sub>3</sub>	CH <sub>2</sub> F <sub>2</sub>	C <sub>3</sub> F <sub>8</sub>	c-C <sub>4</sub> F <sub>8</sub>	NF <sub>3</sub> Remote	NF <sub>3</sub>	SF <sub>6</sub>	
Etch 1-U <sub>i</sub>	0.6	NA	0.2	NA	NA	0.1	NA	NA	0.3	
Etch BCF <sub>4</sub>	NA	NA	0.07	NA	NA	0.009	NA	NA	NA	
Etch BCHF <sub>3</sub>	NA	NA	NA	NA	NA	0.02	NA	NA	NA	
Etch BC <sub>2</sub> F <sub>6</sub>	NA	NA	0.05	NA	NA	NA	NA	NA	NA	
CVD Chamber Cleaning 1-U <sub>i</sub>	NA	NA	NA	NA	NA	NA	0.03	0.3	0.9	

**Notes:** NA = Not applicable; i.e., there are no applicable default emission factor measurements for this gas. This does not necessarily imply that a particular gas is not used in or emitted from a particular process sub-type or process type.

[75 FR 74818, December 1, 2010, as amended at 78 FR 68225, November 13, 2013]

**Table I-7 to Subpart I of Part 98—Default Emission Factors (1-U<sub>ij</sub>) for Gas Utilization Rates (U<sub>ij</sub>) and By-Product Formation Rates (B<sub>ijk</sub>) for PV Manufacturing**

Process type factors	Process Gas i								
	CF <sub>4</sub>	C <sub>2</sub> F <sub>6</sub>	CHF <sub>3</sub>	CH <sub>2</sub> F <sub>2</sub>	C <sub>3</sub> F <sub>8</sub>	c-C <sub>4</sub> F <sub>8</sub>	NF <sub>3</sub> Remote	NF <sub>3</sub>	SF <sub>6</sub>
Etch 1-U <sub>i</sub>	0.7	0.4	0.4	NA	NA	0.2	NA	NA	0.4
Etch BCF <sub>4</sub>	NA	0.2	NA	NA	NA	0.1	NA	NA	NA
Etch BC <sub>2</sub> F <sub>6</sub>	NA	NA	NA	NA	NA	0.1	NA	NA	NA
CVD Chamber Cleaning 1-U <sub>i</sub>	NA	0.6	NA	NA	0.1	0.1	NA	0.3	0.4
CVD Chamber Cleaning BCF <sub>4</sub>	NA	0.2	NA	NA	0.2	0.1	NA	NA	NA

**Notes:** NA = Not applicable; i.e., there are no applicable default emission factor measurements for this gas. This does not necessarily imply that a particular gas is not used in or emitted from a particular process sub-type or process type.

[75 FR 74818, December 1, 2010, as amended at 78 FR 68225, November 13, 2013]

**Table I-8 to Subpart I of Part 98—Default Emission Factors (1-U<sub>N<sub>2</sub>O j</sub>) for N<sub>2</sub>O Utilization (U<sub>N<sub>2</sub>O j</sub>)**

Process type factors	N <sub>2</sub> O
CVD 1-U <sub>i</sub>	0.8
Other Manufacturing Process 1-U <sub>i</sub>	1.0

[75 FR 74831, December 1, 2010]

**Table I-9 to Subpart I of Part 98—Methods and Procedures for Conducting Emissions Tests for Stack Systems**

For each stack system for which you use the “stack test method” to calculate annual emissions...	You must...	Using...
For each fluorinated GHG	Measure the concentration in the stack system.	Method 320 at 40 CFR part 63, appendix A or ASTM D6348-03 <sup>a</sup> (incorporated by reference, see § 98.7). Conduct the test run for a minimum of 8 hours for each stack system.
	Select sampling port locations and the number of traverse points.	Method 1 or 1A at 40 CFR part 60, appendix A-1.
	Determine gas velocity and volumetric flow rate.	Method 2, 2A, 2C, 2D, 2F, or 2G at 40 CFR part 60, appendix A-1 and A-2.
	Determine gas molecular weight.	Method 3, 3A, or 3B at 40 CFR part 60, appendix A-2 using the same sampling site and time as fluorinated GHG sampling.
	Measure gas moisture content.	Method 4 at 40 CFR part 60, appendix A-3, or using FTIR <sup>b</sup> .

<sup>a</sup> Reporters may use ASTM D6348-03 (incorporated by reference, see § 98.7) as an alternative to Method 320 at 40 CFR part 63, appendix A, with the following additional requirements: (1) The test plan preparation and implementation in the Annexes to ASTM D6348-03, Sections A1 through A8 are mandatory; and (2) In ASTM D6348-03 Annex A5 (Analyte Spiking Technique), the percent recovery (%R) must be determined for each target analyte (Equation A5.5). The reporter must also follow Section 4.1 of ASTM D6348-03 to ensure F-GHG remain in the gas phase. In order for the test data to be acceptable for a compound, the percent recovery must be between 70 and 130 percent. If the percent recovery does not meet this criterion for a target compound, the test data are not acceptable for that compound and the test must be repeated for that analyte (i.e., the sampling and/or analytical procedure should be adjusted before a retest). The percent recovery value for each compound must be reported in the test report, required under 40 CFR 98.94(j)(4), and all field measurements must be corrected with the calculated percent recovery value for that compound by using the following equation: Reported Result = Measured Concentration in the stack x (100/% R).

<sup>b</sup> Extractive FTIR is an acceptable method, in lieu of Method 4 at 40 CFR part 60 appendix A, of determining the volumetric concentrations of moisture in semiconductor stack gas streams. The spectral calibrations employed should bracket the anticipated range of optical depths (H<sub>2</sub>O concentration in parts per million multiplied by FTIR sample cell path length) measured in the field for moisture saturated (relative humidity approximately 100 percent) air streams at temperatures characterized via Method 2 at 40 CFR part 60 appendix A, within the stack. The HITRAN molecular spectroscopic database is an

example of a widely used international standard of IR absorption parameters that provide accurate H<sub>2</sub>O FTIR calibrations at atmospheric conditions. Field measurements should be verified to be in line with moisture saturated wet scrubber exhaust concentrations at measured temperatures. Field measurements at saturated conditions should be verified to be consistent with published water vapor pressure curves at the current stack temperatures (Perry, R.H. and D.W. Green. Perry's Chemical Engineer's Handbook (8<sup>th</sup> Edition). McGraw-Hill Publishing Company, Inc. New York, New York. 2008). For unsaturated conditions, field measurements should be verified using a single point verification of the FTIR moisture reading using Method 4 at 40 CFR part 60 appendix A, or a NIST traceable hygrometer accurate to +/- 2 percent relative humidity. The FTIR moisture reading shall agree within 10 percent of the moisture measurement obtained using Method 4 at 40 CFR part 60 appendix A or a NIST traceable hygrometer.

[78 FR 68227, November 13, 2013]

**Table I-10 to Subpart I of Part 98—Maximum Field Detection Limits Applicable to Fluorinated GHG Concentration Measurements for Stack Systems**

<b>Fluorinated GHG Analyte</b>	<b>Maximum Field Detection Limit (ppbv)</b>
CF <sub>4</sub>	20
C <sub>2</sub> F <sub>6</sub>	20
C <sub>3</sub> F <sub>8</sub>	20
C <sub>4</sub> F <sub>6</sub>	20
C <sub>5</sub> F <sub>8</sub>	20
c-C <sub>4</sub> F <sub>8</sub>	20
CH <sub>2</sub> F <sub>2</sub>	40
CH <sub>3</sub> F	40
CHF <sub>3</sub>	20
NF <sub>3</sub>	20
SF <sub>6</sub>	4
Other fully fluorinated GHGs	20
Other fluorinated GHGs	40

ppbv – Parts per billion by volume

[78 FR 68228, November 13, 2013]

**Table I–11 to Subpart I of Part 98–Default Emission Factors (1–U<sub>ij</sub>) for Gas Utilization Rates (U<sub>ij</sub>) and By-Product Formation Rates (B<sub>ijk</sub>) for Semiconductor Manufacturing for use with the Stack Test Method (150 mm and 200 mm wafers)**

All Processes	Process Gas i													
	CF <sub>4</sub>	C <sub>2</sub> F <sub>6</sub>	CHF <sub>3</sub>	CH <sub>2</sub> F <sub>2</sub>	C <sub>2</sub> HF <sub>5</sub>	CH <sub>3</sub> F	C <sub>3</sub> F <sub>8</sub>	C <sub>4</sub> F <sub>8</sub>	NF <sub>3</sub>	NF <sub>3</sub> Remote	SF <sub>6</sub>	C <sub>4</sub> F <sub>6</sub>	C <sub>5</sub> F <sub>8</sub>	C <sub>4</sub> F <sub>8</sub> O
1-U <sub>i</sub>	0.85	0.56	0.50	0.13	0.064	0.51	0.40	0.13	0.16	0.018	0.55	0.17	0.072	0.14
BCF <sub>4</sub>	NA	0.19	0.085	0.079	0.077	NA	0.20	0.11	0.045	0.015	0.13	0.13	NA	0.13
BC <sub>2</sub> F <sub>6</sub>	0.046	NA	0.030	0.025	0.024	0.0034	NA	0.037	0.025	NA	0.11	0.11	0.014	0.045
BC <sub>4</sub> F <sub>6</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BC <sub>4</sub> F <sub>8</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BC <sub>3</sub> F <sub>8</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BC <sub>5</sub> F <sub>8</sub>	0.0012	NA	0.0012	NA	NA	NA	NA	0.0086	NA	NA	NA	NA	NA	NA
BCHF <sub>3</sub>	0.10	0.047	NA	0.049	NA	NA	NA	0.040	NA	NA	0.0012	0.066	0.0039	NA

**Notes:** NA = Not applicable; i.e., there are no applicable emission factor measurements for this gas. This does not necessarily imply that a particular gas is not used in or emitted from a particular process sub-type or process type.

[78 FR 68229, November 13, 2013]



**Table I–12 to Subpart I of Part 98–Default Emission Factors (1–U<sub>ij</sub>) for Gas Utilization Rates (U<sub>ij</sub>) and By-Product Formation Rates (B<sub>ijk</sub>) for Semiconductor Manufacturing for use with the Stack Test Method (300 mm and 450 mm Wafer Sizes)**

All Processes	Process Gas i												
	CF <sub>4</sub>	C <sub>2</sub> F <sub>6</sub>	CHF <sub>3</sub>	CH <sub>2</sub> F <sub>2</sub>	CH <sub>3</sub> F	C <sub>3</sub> F <sub>8</sub>	C <sub>4</sub> F <sub>8</sub>	NF <sub>3</sub>	NF <sub>3</sub> Remote	SF <sub>6</sub>	C <sub>4</sub> F <sub>6</sub>	C <sub>5</sub> F <sub>8</sub>	C <sub>4</sub> F <sub>8</sub> O
1-U <sub>i</sub>	0.65	0.80	0.42	0.21	0.33	0.20	0.18	0.20	0.018	0.32	0.15	0.10	NA
BCF <sub>4</sub>	NA	0.21	0.095	0.049	0.045	0.21	0.045	0.040	0.075	0.040	0.059	0.11	NA
BC <sub>2</sub> F <sub>6</sub>	0.079	NA	0.064	0.052	0.00087	0.18	0.031	0.045	NA	0.044	0.074	0.083	NA
BC <sub>4</sub> F <sub>6</sub>	NA	NA	0.00010	NA	NA	NA	0.018	NA	NA	NA	NA	NA	NA
BC <sub>4</sub> F <sub>8</sub>	0.00063	NA	0.00080	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BC <sub>3</sub> F <sub>8</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00012	NA
BCH <sub>2</sub> F <sub>2</sub>	NA	NA	0.0036	NA	0.0023	NA	0.0015	0.00086	NA	0.000029	0.000030	NA	NA
BCH <sub>3</sub> F	0.0080	NA	0.0080	0.0080	NA	0.00073	NA	0.0080	NA	NA	NA	NA	NA
BCHF <sub>3</sub>	0.011	NA	NA	0.050	0.0057	0.012	0.027	0.025	NA	0.0037	0.019	0.0069	NA

**Notes:** NA = Not applicable; i.e., there are no applicable emission factor measurements for this gas. This does not necessarily imply that a particular gas is not used in or emitted from a particular process sub-type or process type.

[78 FR 68230, November 13, 2013]

**Table I–13 to Subpart I of Part 98—Default Emission Factors (1–U<sub>ij</sub>) for Gas Utilization Rates (U<sub>ij</sub>) and By-Product Formation Rates (B<sub>ijk</sub>) for LCD Manufacturing for use with the Stack Test Method**

Process Gas (i)	Process Gas i								
	CF <sub>4</sub>	C <sub>2</sub> F <sub>6</sub>	CHF <sub>3</sub>	CH <sub>2</sub> F <sub>2</sub>	C <sub>3</sub> F <sub>8</sub>	c-C <sub>4</sub> F <sub>8</sub>	NF <sub>3</sub> Remote	NF <sub>3</sub>	SF <sub>6</sub>
1–U <sub>i</sub>	0.6	NA	0.2	NA	NA	0.1	0.03	0.3	0.6
BCF <sub>4</sub>	NA	NA	0.07	NA	NA	0.009	NA	NA	NA
BCHF <sub>3</sub>	NA	NA	NA	NA	NA	0.02	NA	NA	NA
BC <sub>2</sub> F <sub>6</sub>	NA	NA	0.05	NA	NA	NA	NA	NA	NA
BC <sub>3</sub> F <sub>8</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA

**Notes:** NA = Not applicable; i.e., there are no applicable emission factor measurements for this gas. This does not necessarily imply that a particular gas is not used in or emitted from a particular process sub-type or process type.

[78 FR 68231, November 13, 2013]

**Table I–14 to Subpart I of Part 98—Default Emission Factors (1–U<sub>ij</sub>) for Gas Utilization Rates (U<sub>ij</sub>) and By-Product Formation Rates (B<sub>ijk</sub>) for PV Manufacturing for use with the Stack Test Method**

Process Gas (i)	Process Gas i								
	CF <sub>4</sub>	C <sub>2</sub> F <sub>6</sub>	CHF <sub>3</sub>	CH <sub>2</sub> F <sub>2</sub>	C <sub>3</sub> F <sub>8</sub>	c-C <sub>4</sub> F <sub>8</sub>	NF <sub>3</sub> Remote	NF <sub>3</sub>	SF <sub>6</sub>
1–U <sub>i</sub>	0.7	0.6	0.4	NA	0.4	0.2	NA	0.2	0.4
BCF <sub>4</sub>	NA	0.2	NA	NA	0.2	0.1	NA	0.05	NA
BC <sub>2</sub> F <sub>6</sub>	NA	NA	NA	NA	NA	0.1	NA	NA	NA
BC <sub>3</sub> F <sub>8</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA

**Notes:** NA = Not applicable; i.e., there are no applicable emission factor measurements for this gas. This does not necessarily imply that a particular gas is not used in or emitted from a particular process sub-type or process type.

[78 FR 68232, November 13, 2013]

**Table I–15 to Subpart I of Part 98–Default Emission Factors (1–U<sub>ij</sub>) for Gas Utilization Rates (U<sub>ij</sub>) and By-Product Formation Rates (B<sub>ijk</sub>) for MEMS Manufacturing for use with the Stack Test Method**

All Processes	Process Gas i											
	CF <sub>4</sub>	C <sub>2</sub> F <sub>6</sub>	CHF <sub>3</sub>	CH <sub>2</sub> F <sub>2</sub>	C <sub>3</sub> F <sub>8</sub>	c-C <sub>4</sub> F <sub>8</sub>	NF <sub>3</sub> Remote	NF <sub>3</sub>	SF <sub>6</sub>	C <sub>4</sub> F <sub>6</sub>	C <sub>5</sub> F <sub>8</sub>	C <sub>4</sub> F <sub>8</sub> O
1-U <sub>i</sub>	0.9	0.6	0.4	0.1	0.4	0.1	0.2	0.2	0.2	0.1	0.1	0.1
BCF <sub>4</sub>	NA	0.2	0.07	0.08	0.1	0.1	<sup>a</sup> 0.02	0.09	NA	0.3	0.1	0.1
BC <sub>2</sub> F <sub>6</sub>	NA	NA	NA	NA	NA	0.04	NA	NA	NA	0.2	0.04	NA
BC <sub>3</sub> F <sub>8</sub>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

**Notes:** NA = Not applicable; i.e., there are no applicable emission factor measurements for this gas. This does not necessarily imply that a particular gas is not used in or emitted from a particular process sub-type or process type.

<sup>a</sup> Estimate reflects presence of low-k, carbide and multi-gas etch processes that may contain a C-containing fluorinated GHG additive.

[78 FR 68233, November 13, 2013]

**Table I-16 to Subpart I of Part 98—Default Emission Destruction or Removal Efficiency (DRE) Factors For Electronics Manufacturing**

<b>Manufacturing Type/Process Type/Gas</b>	<b>Default DRE (percent)</b>
MEMS, LCDs, and PV Manufacturing	60
Semiconductor Manufacturing	
Plasma Etch/Wafer Clean Process Type	
CF <sub>4</sub>	75
CH <sub>3</sub> F	97
CHF <sub>3</sub>	97
CH <sub>2</sub> F <sub>2</sub>	97
C <sub>2</sub> F <sub>6</sub>	97
C <sub>3</sub> F <sub>8</sub>	97
C <sub>4</sub> F <sub>6</sub>	97
C <sub>4</sub> F <sub>8</sub>	97
C <sub>5</sub> F <sub>8</sub>	97
SF <sub>6</sub>	97
NF <sub>3</sub>	96
All other carbon-based plasma etch/wafer clean fluorinated GHG	60
Chamber Clean Process Type	
NF <sub>3</sub>	88
All other chamber clean fluorinated GHG	60
N <sub>2</sub> O Processes	
CVD and all other N <sub>2</sub> O-using processes	60

[78 FR 68234, November 13, 2013]

**Table I-17 to Subpart I of Part 98—Expected and Possible By-products For Electronics Manufacturing**

<b>For each stack system for which you use the “stack test method” to calculate annual emissions, you must measure the following:</b>	<b>If emissions are detected intermittently, use the following procedures:</b>	<b>If emissions are not detected, use the following procedures:</b>
Expected By-products: $\text{CF}_4$ $\text{C}_2\text{F}_6$ $\text{CHF}_3$ $\text{CH}_2\text{F}_2$ $\text{CH}_3\text{F}$	Use the measured concentration for “ $X_{\text{ksm}}$ ” in Equation I-18 when available and use one-half of the field detection limit you determined for the fluorinated GHG according to § 98.94(j)(2) for the value of “ $X_{\text{ksm}}$ ” when the fluorinated GHG is not detected.	Use one-half of the field detection limit you determined for the fluorinated GHG according to § 98.94(j)(2) for the value of “ $X_{\text{ksm}}$ ” in Equation I-18.
Possible By-products $\text{C}_3\text{F}_8$ $\text{C}_4\text{F}_6$ $c\text{-C}_4\text{F}_8$ $\text{C}_5\text{F}_8$	Use the measured concentration for “ $X_{\text{ksm}}$ ” in Equation I-18 when available and use one-half of the field detection limit you determined for the fluorinated GHG according to § 98.94(j)(2) for the value of “ $X_{\text{ksm}}$ ” when the fluorinated GHG is not detected.	Assume zero emissions for that fluorinated GHG for the tested stack system.

[78 FR 68234, November 13, 2013]