Characterization of Tobacco and Tobacco Smoke

Analytical Test Report

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Prepared for *Philip Morris International*

Project Code: NS298-H

Original Date: April 21, 2016
Revision 1 Date: May 27, 2016
Revision 2 Date: May 30, 2016
Revision 3 Date: June 6, 2016

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2 USE OF LABSTAT'S[1] ANALYTICAL REPORTS

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3 REVISION HISTORY

3.1 REVISION 1

This revision was required to correct the method descriptions in the written report, to reflect the inclusion of the method modifications for “heat-not-burn” products as appendices to the standard methods.

3.2 REVISION 2

This revision was required to correct the summary statistics for Acrolein in mainstream smoke under “Canadian Modified” conditions for sample 1680390 in the pdf report. Data originally reported did not include the removal of an obvious outlier and was incorrectly reported.

3.3 REVISION 3

This revision was required to add the constituent data back into the written report.

4 ADMINISTRATIVE INFORMATION

4.1 QUOTATION IDENTIFICATION

Quotation Number: T5301

Date of Quotation: January 12, 2016

Recipient's Name: Cyril Jeannet

4.2 CLIENT IDENTIFICATION

Philip Morris International

Quai Jeanrenaud 56

2000 Neuchatel

Switzerland

5 SAMPLE HANDLING

5.1 CHAIN OF CUSTODY

The samples to be tested for project NS298-H were received on March 11, 2016 via DHL.

5.2 SAMPLE CHARACTERIZATION AND CODING

5.2.1 SAMPLE CHARACTERISTICS

The shipment received on March 11, 2016 consisted of one box for each of 6 products. Additional sticks were received on April 04, 2016. There was no physical damage to the boxes.

5.2.2 SAMPLE IDENTIFICATION

The following sample codes have been used to identify the products associated with the results in each of the tables that are part of this report.

Labstat Sample ID	SMP Description	Qty/Type Received	Type of Product	Type of Analysis
1680388	SMP060619	1/box	sticks	mainstream smoke
1680389	SMP060620	1/box	sticks	mainstream smoke
1680390	SMP060647	1/box	sticks	mainstream smoke
1680391	SMP060627	1/box	sticks	tobacco constituents
1680392	SMP060628	1/box	sticks	tobacco constituents
1680393	SMP060629	1/box	sticks	tobacco constituents

5.2.3 PHYSICAL MEASUREMENTS

Physical measurements were performed on the sticks and tobacco rods.

A representative test sample of 10 sticks was selected haphazardly from the client-submitted laboratory sample. The sticks from the test sample went through a physical characterization process, based on 10 observations (1 observation per stick) in which the measurements were recorded to the nearest 0.5mm. The following represents the characteristics which were recorded for this process:

- Total Stick Length (mm)
- Filter Length (mm)
- Overwrap Length (mm)
- Stick Diameter (at 9.0mm from the mouth end)
- Weight of Tobacco (g/unit)

These 10 observations were averaged and recorded to the nearest 0.1mm. The expected measurement variability is mean ± 1mm or mean ± 0.1g, depending on the parameter measured.

For the tobacco rods, the weight of tobacco per rod was measured.

For this project, the variability of the physical parameters measured was within the acceptance limits.

6 PROJECT-SPECIFIC INSTRUCTIONS

A client table was followed for testing/running the samples in different days.

6.1 PLATFORM I TESTING

Test sticks were used in conjunction with a "tobacco heating system" by inserting the consumable (test stick) into a cigarette holder (CH). The CH was used in conjunction with a lighter bar to smoke the test sticks. Therefore, the following requirements of the ISO standard (see section 6.2.3) were either not applicable or could not be fulfilled for technical reasons:

- Air velocity control since the consumable is inserted into the CH.
- Butt length requirement since the heating of the consumable has no effect on the consumable length which remains unchanged after smoking.
- There was no ignition of the cigarette by an external lighter.

The use of the CH, in conjunction with the lighter bar for the test samples, required the reference cigarettes to be smoked on an independent run. All reference cigarettes were smoked to the ISO standard requirements for air velocity, butt length and ignition.

6.2 PLATFORM I END POINTS

Test sticks are puffed to a fixed puff number: 6 puffs per stick under ISO standard smoking regime[2] and 12 puffs per stick under Health Canada Intense (HCI) smoking regime[3].

7 EXPERIMENTAL DESIGN AND METHODS

The following is a summary of the instructions that have been received from the client in regard to the smoking and analysis of the tobacco products in this project.

7.1 PREPARATION OF LABORATORY COMPOSITE

A minimum sample size of 100g of tobacco is required for the testing of commercially available products. If this amount is not available, a smaller but adequate amount of sample is prepared for all analytical testing. Tobacco product is ground and sieved to ensure ≤4mm particle size, with analyses such as moisture, pH, nitrate, nitrite, eugenol and menthol being initiated as soon as possible following the preparation of the laboratory composite.

[2] ISO 3308:2012: (35.0±0.3)ml puff volume, (60±0.5)s puff frequency, (2.00±0.02)s puff duration, bell-shaped puff profile, no vent blocking

[3] Health Canada Intense: (55.0±0.5)ml puff volume, (30±0.5)s puff frequency, (2.00±0.02)s puff duration, bell-shaped puff profile, no vent blocking; Canadian Tobacco Reporting Regulations: 21 June, 2000, Part 3(6)(b)(iii) - *Canada Gazette Part II, Vol. 134, No. 15*

7.2 SAMPLE GENERATION

All tobacco products were conditioned and smoked under the smoking regimes outlined in the following sub-sections.

7.2.1 CIGARETTE BUTT MARKING

Prior to testing, reference cigarettes were marked with the standard butt length as specified in ISO 4387 (2000) *"Cigarettes -- Determination of total and nicotine-free dry particulate matter using a routine analytical smoking machine".* Test cigarettes did not require butt marking since these cigarettes were smoked to a pre-determined puff count (12 puffs for "Canadian Modified" and 6 puffs for "ISO").

7.2.2 CIGARETTE CONDITIONING AND SMOKING ENVIRONMENTS

Cigarettes were conditioned and smoked under the environmental conditions specified in ISO 3402 (1999) *"Tobacco and tobacco products – Atmosphere for conditioning and testing".* With respect to conditioning, this document states "*The conditioning atmosphere shall be as follows: temperature 22 ± 1℃; relative humidity 60 ± 3%*". Smoking requires an environment in which the temperature is 22 ± 2°C and the relative humidity 60 ± 5%.

7.2.3 MACHINE SMOKING CONDITIONS

Smoking of test and reference cigarettes were carried out on either a rotary smoking machine or a linear smoking machine. The smoking parameters and smoking machine specifications which were used are set out in the International Organization for Standardization standard ISO 3308:12, ***Routine analytical cigarette-smoking machine - Definitions and standard conditions*** with modifications as noted in the table below.

The following table is a summary of the smoking parameters that were employed in this project.

Variable	"ISO"	"Canadian Modified"
Puff Volume (ml)	35	55
Interval (sec)	60	30
Duration (sec)	2	2
Vents[4]	"open"	"fully blocked"

Note: Test samples did not have any vent blocking applied. Vent blocking for "Canadian Modified" was only applied to the reference cigarettes.

[4] Health Canada 100% Vent Blocking Method
Canadian Tobacco Reporting Regulations: 21 June 2000, Part 3(6)(b)(iii) all ventilation holes must be blocked by placing over them a strip of Mylar adhesive tape, Scotch Brand product no. 600 Transparent Tape, and the tape must be cut so that it covers the circumference and is tightly secured from the end of the filter to the tipping overwrap seam, or by another method of equivalent efficiency.

Mainstream yields (MS) were obtained under "ISO" and "Canadian Modified" conditions (as defined above). Yields obtained using "ISO" smoking parameters are referred to as "standard" (s) and yields obtained using "Canadian Modified" smoking parameters are referred to as "non-standard" (n). Data files ending in (s) or (n) denote results obtained under the various conditions as noted in the previous sentence and in the above table.

7.3 ANALYTICAL METHODS[5]

7.3.1 SMOKE ANALYSIS

Test methods for the analysis of mainstream tobacco smoke are referenced in the table(s) below and were practiced as written unless otherwise indicated (see "Method Modifications").

OFFICIAL METHODS FOR THE COLLECTION OF EMISSION DATA ON MAINSTREAM SMOKE[6]

Item	Emission	Official Method	Method Description
1.	Ammonia	T-101	*Determination of Ammonia in Mainstream Tobacco Smoke*
2.	*(a)* Formaldehyde *(b)* Acetaldehyde *(c)* Acrolein *(d)* Crotonaldehyde	T-104	*Determination of Selected Carbonyls in Mainstream Tobacco Smoke*
3.	*(a)* Tar *(b)* Nicotine *(c)* Carbon Monoxide	T-115	*Determination of "Tar", Nicotine and Carbon Monoxide in Mainstream Tobacco Smoke*

OTHER METHODS FOR THE COLLECTION OF EMISSION DATA ON MAINSTREAM SMOKE

Item	Emission	Labstat Method	Method Description
1.	Benzo(a)pyrene	TMS-00120	*Determination of Selected Polynuclear Aromatic Hydrocarbons in Mainstream Tobacco Smoke*

[5] The most current version available at the time of testing was used for all test methods listed.

[6] Canadian Tobacco Reporting Regulations: 2000-07-19 Canada Gazette Part II, Vol. 134, No. 15 Part 3: Emissions from Designated Tobacco Products. Test method numbers refer to Health Canada methodologies which have been posted by Health Canada on the internet at site http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/legislation/reg/indust/index_e.html

Item	Emission	Labstat Method	Method Description
2.	*(a)* 1,3-Butadiene *(b)* Isoprene *(c)* Acrylonitrile *(d)* Benzene *(e)* Toluene	TMS-00124	*Determination of Vinyl Chloride, 1,3-Butadiene, Isoprene, Acrylonitrile, Benzene, Toluene, Styrene, and Acetamide in Mainstream Tobacco Smoke (expanded list)*
3.	*(a)* 1- aminonaphthalene *(b)* 2- aminonaphthalene *(c)* 4- aminobiphenyl	TMS-00128	*Determination of Aromatic Amines in Mainstream Tobacco Smoke (expanded list)*
4.	*(a)* *N*-nitrosonornicotine *(b)* 4-(*N*-nitrosomethylamino)-1-(3-pyridyl)-1-butanone	TMS-00135	*Determination of Tobacco Specific Nitrosamines in Mainstream Tobacco Smoke by High-Performance Liquid Chromatography-Tandem Mass Spectrometry*

7.3.2 CONSTITUENT ANALYSIS

Test methods for the analysis of processed tobacco are referenced in the table(s) below and were practiced as written unless otherwise indicated (see "Method Modifications").

OFFICIAL METHODS FOR THE COLLECTION OF DATA ON CONSTITUENTS[7]

Item	Constituent	Official Method	Method Description
1.	Nicotine	T-301	*Determination of Alkaloids in Whole Tobacco*
2.	Ammonia	T-302	*Determination of Ammonia in Whole Tobacco*
3.	*(a)* Cadmium *(b)* Arsenic	T-306	*Determination of Ni, Pb, Cd, Cr, As, Se and Hg in Whole Tobacco*
4.	Moisture	AOAC 966.02	*Loss on Drying (Moisture) in Tobacco, Gravimetric Method*

OTHER METHODS FOR THE COLLECTION OF DATA ON CONSTITUENTS

Item	Constituent	Labstat Method	Method Description
1.	*(a)* *N*-nitrosonornicotine *(b)* 4-(*N*-nitrosomethylamino)-1 -(3-pyridyl)-1-butanone	TWT-00333	*Determination of Tobacco Specific Nitrosamines in Tobacco Products by Liquid Chromatography-Tandem Mass Spectrometry*

[7] Canadian Tobacco Reporting Regulations: 2000-07-19 Canada Gazette Part II, Vol. 134, No. 15 Part 3: Emissions from Designated Tobacco Products. Test method numbers refer to Health Canada methodologies which have been posted by Health Canada on the internet at site http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/legislation/reg/indust/index_e.html

7.3.3 INTERNAL METHOD REFERENCES AND SYNOPSES

7.3.3.1 POLYNUCLEAR AROMATIC HYDROCARBONS (LABSTAT METHOD TMS-00120)

7.3.3.1.1 REFERENCE(S)

G. Gmeiner, G. Stehlkik, H. Tausch, Determination of Seventeen Polycyclic Aromatic Hydrocarbons in Tobacco Smoke Condensate, *J. Chromatogr.* A 767 (1997) 163-169.

TMS-00115 Labstat Test Method: Determination of "Tar", Nicotine and Carbon Monoxide in Mainstream Tobacco Smoke.

7.3.3.1.2 METHOD SYNOPSIS

Ten conditioned sticks (cigarettes) were smoked using a standard rotary smoking machine, onto a conditioned, pre-weighed 92mm glass fiber filter disc (pad). The pad was spiked with internal standards (d12-benzo[a]pyrene, d14-dibenz[a,h]anthracene, d10-anthracene and d10-pyrene) and extracted with 50 mL of methanol. The methanol extracts were filtered through a filter paper. A portion of filtered extract was cleaned up by Solid Phase Extraction (SPE) using a RapidTrace SPE Workstation and analyzed by gas chromatography-mass spectrometry for quantification. The mass detector was operated under Selected Ion Monitoring (SIM) mode. The ions of interest (i.e. molecular ions and in some cases specific fragment ions) were mass-selected and used for quantification.

For the analysis of "heat-not-burn" products, five sticks were smoked per port on a standard 20 port linear smoking machine using a 44mm pad instead of a rotary smoking machine. After adding the internal standards solution to the pad, the pad was extracted with 20mL of methanol. The sample was then analyzed by GC/MS as described above.

7.3.3.2 VOLATILE ORGANICS (LABSTAT METHOD TMS-00124)

7.3.3.2.1 REFERENCE(S)

T-116 Health Canada Test Method: Determination of Selected Volatiles (1,3-Butadiene, Isoprene, Acrylonitrile, Benzene and Toluene) in Mainstream Smoke.

Byrd, G.D., K.W. Fowler, R.D. Hicks, M.E. Lovette and M.F. Borgerding (1990). Isotope dilution gas chromatography-mass spectrometry in the determination of benzene, toluene, styrene and acrylonitrile in mainstream cigarette smoke. *J. Chromat.* 503, 359-368.

Brunnemann, K.D., M.R. Kagan, J.E. Cox, and D. Hoffmann (1990). Analysis of 1,3-butadiene and other selected gas phase components in cigarette mainstream and sidestream smoke by gas chromatography-mass selective detection. *Carcinogenesis* 11, 1863-1868.

Brunnemann, K.D., M.R. Kagan, J.E. Cox, and D. Hoffmann (1989). Determination of benzene, toluene and 1,3-butadiene in cigarette smoke by GC-MSD. *Exp. Pathol.* 11, 108-113.

T-115 Health Canada Test Method: Determination of "Tar", Nicotine and Carbon Monoxide in Mainstream Tobacco Smoke.

7.3.3.2.2 METHOD SYNOPSIS

Ten conditioned sticks (cigarettes) were smoked on a standard rotary smoking machine. The mainstream smoke was passed through a conditioned, pre-weighed 92mm glass fiber filter disc (pad) and then into two cryogenic traps placed in series after the pad, each containing 10mL of methanol. An aliquot of the solution from the two traps was spiked with the internal standards (d6-benzene, d8-styrene and d5-pyridine) and analyzed by gas chromatography – mass spectrometry (GC/MS) with ion trap under full scan mode.

A second aliquot of the solution from the two traps was derivatized with 48% hydrobromic acid, then spiked with internal standards (d6-benzene and d4-2-bromoethanol) and analyzed for ethylene oxide via gas chromatography – mass spectrometry (GC/MS) operating under selective ion monitoring (SIM) mode.

For the analysis of "heat-not-burn" products, ten sticks were smoked per port on a standard 20 port linear smoking machine using a 44mm pad instead of a rotary smoking machine. The pad was replaced after five sticks were smoked per port for HCI smoking conditions (two pads per replicate for HCI). Lower calibrations standards were prepared and analysis of the trapping solution was done by gas chromatography – mass spectrometry (GC/MS) using a single quadrupole mass detector operating under selective ion monitoring (SIM) mode.

The instrument operating parameters are presented in the following table:

GC/MS in SIM mode: Peak Areas Used for Quantification and Qualification

Component	Target (m/z)	Qualifier ion(s) (m/z)	Dwell Time (ms)
1,3-butadiene	53	54, 51	50
Isoprene	67	68, 53	50
Acrylonitrile	52	53	50
Benzene	78	77, 51	50
Toluene	91	92	50
D6-benzene	84		50

7.3.3.3 AROMATIC AMINES (LABSTAT METHOD TMS-00128)

7.3.3.3.1 REFERENCE(S)

Pieraccini, G., F. Luceri, and G. Moneti (1992). New Gas-Chromatographic/Mass-Spectrometric Method for the Quantitative Analysis of Primary Amines in Main- and Sidestream Cigarette Smoke. I. *Rapid Communications in Mass Spectrometry. 6, 406-409.*

TMS-00115 Labstat Test Method: Determination of "Tar", Nicotine and Carbon Monoxide in Mainstream Tobacco Smoke.

7.3.3.3.2 METHOD SYNOPSIS

Ten conditioned sticks (cigarettes) were smoked on a standard rotary smoking machine. The mainstream total particulate matter (TPM) was collected on a conditioned, pre-weighed 92mm glass fiber filter disc (pad). The pad was quartered and extracted with 100mL of 5% hydrochloric acid solution. The extraction flask was shaken for 30 minutes on a wrist-action shaker and the contents filtered into a 500mL separatory funnel. The internal standards (d5-aniline, d9-o-toluidine, d7-o-anisidine, d7-4-aminobiphenyl, d8-benzidine) were spiked into the solution. The filtrate was washed with dichloromethane, made basic with sodium hydroxide solution and extracted with hexane. The hexane extracts were dried with sodium sulphate, derivatized with pentafluoropropionic acid anhydride (PFPA) and trimethylamine, concentrated by rotary evaporation, passed through a florisil column, and quantified using gas chromatography – mass spectrometry (GC/MS) with ion trap under full scan mode.

For the analysis of "heat-not-burn" products, a standard 20 port linear smoking machine and a 44mm pad was used instead of a rotary smoking machine. The 44mm pad was replaced after five sticks were smoked per port for HCI smoking conditions (two pads per replicate for HCI). Lower calibrations standards were prepared with the addition of d7-1-aminonaphthalene, d7-2-aminonaphthalene as internal standards. Quantification was achieved using negative chemical ionization (NCI) gas chromatography – mass spectrometry (GC/MS) operating in selective ion monitoring (SIM) mode.

The instrument operating parameters are presented in the following table:

NCI-GC/MS in SIM mode: Peak Areas Used for Quantification

Component	Retention Time (min)	Target (m/z)	Dwell Time (ms)
1-aminonaphthalene	13.035	269	100
2-aminonaphthalene	13.8	269	100
3-aminobiphenyl	15.601	295	100
4-aminobiphenyl	15.95	295	100
o-toluidine	7.532	233	100
benzidine	19.279	456	100
D7-1-aminonaphthalene	12.997	276	100
D7-2-aminonaphthalene	13.761	275	100
D7-4-aminobiphenyl	15.911	304	100
D9-o-toluidine	7.453	240	100
D8-benzidine	19.268	464	100

7.3.3.4 TOBACCO SPECIFIC NITROSAMINES (LABSTAT METHOD TMS-00135)

7.3.3.4.1 REFERENCE(S)

Wu, W.; Ashley, D. L.; Watson, C. H. Anal. Chem. 2003, 75, 4827-4832.

Wagner, K. A.; Finkel, N. H.; Fossett, J. E.; Gillman, I. G. Anal. Chem. 2005, 77, 1001-1006.

Lee, J-M.; Shin, J-W.; Oh, I-H.; Lee U-C.; Rhee M-S. 2004 CORESTA Congress Kyoto. Paper SS20; full text available on CORESTA CD-ROM Vol. 22; abstract available on the Internet at http://www.coresta.org/Past_Abstracts/Kyoto2004-SmokeTech.pdf (accessed December 29, 2006).

Chwojdak, C. A.; Self, D. A.; Wheeler, H. R. A Collaborative, Harmonized LC-MS/MS Method for the Determination of Tobacco Specific Nitrosamines (TSNA) in Tobacco and Tobacco Related Materials. 61st Tobacco Science Research Conference, Charlotte, NC. USA. September 24, 2007.

NIH Guidelines for the Laboratory Use of Chemical Carcinogens; NIH Publication 81-2385, 1981.

Wu. J.; Joza, P.; Sharifi, M.; Rickert, W. S.; Lauterbach, J. H. Anal. Chem. 2008, 80, 1341-1345.

7.3.3.4.2 METHOD SYNOPSIS

Five conditioned sticks (cigarettes) were smoked per port on a standard 20 port linear smoking machine. The mainstream total particulate matter (TPM) was collected on a conditioned, pre-weighed 44mm glass fiber filter disc (pad). The pad was spiked with a deuterium labeled internal standard solution (containing NNN-d4, NAT-d4, NAB-d4, and NNK-d4) and then extracted with a 100mM ammonium acetate solution. The extract was then filtered and subject to LC-MS/MS analysis with positive electrospray ionization (ESI). Two mass transition pairs for each analyte can be used to assist analyte confirmation and quantification. The most intense pairs are used for quantification while the less intense transition pairs are used as qualifiers for further compound confirmation.

For the analysis of “heat-not-burn” products, no additional changes to the sample generation, collection or sample preparation of the base method for cigarettes were required.

7.3.3.5 CONSTITUENT TOBACCO SPECIFIC NITROSAMINES (LABSTAT METHOD TWT-00333)

7.3.3.5.1 REFERENCE(S)

Wu, W.; Ashley, D. L.; Watson, C. H. *Anal. Chem*. **2003**, *75*, 4827-4832.

Wagner, K. A.; Finkel, N. H.; Fossett, J. E.; Gillman, I. G. *Anal. Chem.* **2005**, *77*, 1001-1006.

Lee, J-M.; Shin, J-W.; Oh, I-H.; Lee U-C.; Rhee M-S. **2004** CORESTA Congress Kyoto. Paper SS20; full text available on CORESTA CD-ROM Vol. 22; abstract available on the Internet at http://www.coresta.org/Past_Abstracts/Kyoto2004-SmokeTech.pdf (accessed December 29, **2006**).

Chwojdak, C. A.; Self, D. A.; Wheeler, H. R. *A Collaborative, Harmonized LC-MS/MS Method for the Determination of Tobacco Specific Nitrosamines (TSNA) in Tobacco and Tobacco Related Materials.* 61st Tobacco Science Research Conference, Charlotte, NC. USA. September 24, **2007**.

NIH Guidelines for the Laboratory Use of Chemical Carcinogens; NIH Publication 81-2385, **1981**.

Wu. J.; Joza, P.; Sharifi, M.; Rickert, W. S.; Lauterbach, J. H. Anal. Chem. **2008**, 80, 1341-1345.

Nicotine and Total Reducing Sugars", Technicon Industrial Systems Corp., 1025 Busch Parkway, Buffalo Grove, Illinois, USA 60090 - 4516

7.3.3.5.2 METHOD SYNOPSIS

Two (2) grams of tobacco product was ground using a bench-top grinder and a #40 screen (40 sections / square inch). Seven hundred fifty milligrams of ground tobacco product was spiked with the internal standards solution (d4-NNN and d4-NNK) and extracted with 30mL of an aqueous ammonium acetate solution on a wrist action shaker for 30 minutes. The extract was then filtered and subject to LC-MS/MS analysis with positive electrospray ionization (ESI). Two mass transition pairs for each analyte can be used to assist analyte confirmation and quantification. The most intense pairs are used for quantification while the less intense transition pairs are used as qualifiers for further compound confirmation.

7.4 METHOD MODIFICATIONS

7.4.1 CONSTITUENT METALS (HEALTH CANADA METHOD T-306)

For the analysis of the filler from the "heat-not-burn" products, samples were digested using 0.5g of ground, freeze-dried sample, 4mL of nitric acid (Ultrapure Fisher Optima chemical grade) and 2mL of Type I water. An Ultrawave digestion system was used for the digestion of the samples. This digestion system is a pressure vessel with microwave heating where samples are digested at 230°C and 40bar pressure.

8 ACCEPTANCE OF DATA

8.1 EVALUATION OF RESULTS FROM CONTROL MATERIALS

Data obtained using control materials are deemed acceptable if the data are in keeping with Labstat's database for the control material and the specific method of analysis[8]. This is not a simple problem since there is no "yes" or "no" answer but rather one which is phrased in terms of probabilities. In the approach taken by Labstat, the measure of random variation in the procedure is taken to be the sample standard deviation (S.D. or "s").

To evaluate control data accuracy, a "*Z score*" statistic is determined as follows:

$$Z\text{ - }score = \frac{\text{Sample Average - Historical Average}}{\text{Historical Standard Deviation}}$$

To evaluate control data precision, a "*Chi-square*" statistic is determined as follows:

$$Chi\text{ - }square = (\text{Sample Size - 1}) \times \frac{(\text{Sample Standard Deviation})^2}{(\text{Historical Standard Deviation})^2}$$

[8] A minimum of 30 results is normally required for the purpose of this comparison.

P values are generated and the cut-off point (α) chosen in such a way as to minimize the chance of rejecting data which are legitimate members of the set (i.e. type 1 error). Thus, in most cases where the number of observed control samples is greater than or equal to 5, z-score p-values are generated from the Standard Normal distribution.

The standard deviation rather than the standard error for the mean has been chosen when determining the 'Z score'. This allows for both project-to-project variation, which is inherent in the historical data, and the 'normal' run-to-run variability, which is present in the data set. The cut-off point for P values is a matter of judgment and has been set at 0.005 assuming the probability of falsely rejecting a data point is 0.5% (i.e. α=0.01) or less for a two tailed test.

In instances where expected values are not known, a decision to accept the data is made based on observed levels of precision in comparison with that determined for similar analyses. Also, there are circumstances where the expected value may be "Below Detection Limits". In this case the decision to accept or reject the data is made upon the ability of the method to recover the analyte of interest either in the form of a laboratory fortified blank (LFB) or laboratory fortified matrix (LFM). Acceptable recoveries are close to 100%, but vary depending on the analyte.

8.2 IDENTIFICATION OF OUTLIERS[9]

8.2.1 OUTLIER DEFINITION

An outlying observation, or "outlier," is one that appears to deviate markedly from other members of the sample in which it occurs. In this case, there are two alternatives:

1. An outlying observation may be merely an extreme manifestation of the random variability inherent in the data. If this is true, the value is retained and processed in the same manner as the other observations in the sample.
2. The observation may be the result of gross deviation from prescribed experimental procedure or an error in calculating or recording the numerical value. In such cases, an investigation must be carried out. When the experimenter is clearly aware that a gross deviation from prescribed experimental procedure has taken place, the resultant observation is discarded (assignable cause) without recourse to a statistical test. A statistical test may always be used to support a judgment that a physical reason does actually exist for an outlier, or the statistical criterion may be used routinely as a basis to initiate action to find a physical cause.

8.2.2 STATISTICAL CRITERIA

There are a number of criteria for testing outliers. In all of these, the doubtful observation is included in the calculation of the numerical value of a sample criterion (or statistic) that is then compared with a critical value. The critical value is that which would be exceeded by chance with some specified (small) probability on the assumption that all the observations did indeed constitute a random sample from a single parent population, distribution or

[9] The term "outlier" has been defined in International Standard ISO 3534-1:2006 entitled "*Statistics - Vocabulary and symbols - Part 1: General statistical terms and terms used in probability*"

universe. The specified small probability is called the "significance level" and can be thought of as the risk of erroneously rejecting a good observation. A level of significance of 0.02 has been chosen in conjunction with the statistical test and tables described in ASTM E178-08[10].

Significant departures from the expected results (i.e. “outliers”) are viewed seriously, requiring an investigation for an assignable cause. This is a documented procedure that, at a minimum, consists of the following steps:

1. Review of all associated calculations to ensure that arithmetic errors have not been made
2. Review of linearity range for any standards
3. Assessment of instrument status
4. Review of reagents, columns, standards etc. to ensure that contamination or decomposition has not occurred
5. Review of sample preparation and handling procedures as they relate to the result in question

If the outlier is present in the analyte data and an assignable cause is found, the test result is removed from the data set but recorded in the quality control section of the laboratory’s record of test results for that project. The analysis must then be repeated. If the outlier is present in the ancillary[11] data and an assignable cause is found, the test result is not removed, but rather the outlying observation is replaced by the designation “AC” (Assignable Cause). If this investigation fails to determine an assignable cause, the test result is assumed to be a legitimate member of the data set and is included in all subsequent calculations.

9 RESULTS

9.1 QUALITY CONTROL

The control results for the variables of interest were acceptable as defined in section 8.1. Consequently it is reasonable to assume that the values determined for the test samples are reflective of the characteristics of the products as received and tested as described in the Analytical Methods section.

9.2 ANALYTICAL DATA

Individual results and the corresponding sample statistics (consisting of means, standard deviations, and coefficients of variation or 95% confidence limits) may be found in the data files, labeled *NS298-H_ms_dataCF.xls, NS298-H_ms_controlsCF.xls, NS298-H_wt_dataCF.xls,* and *NS298-H_wt_controlsCF.xls*, which accompany this report.

[10] ASTM Designation: E178-08. Standard Practice for Dealing with Outlying Observations

[11] Data, which are related, but not normally required as part of the reporting process (e.g. puff counts, TPM, cigarette weights etc.). Outliers in the analyte data that have an assignable cause are always repeated.

9.2.1 SAMPLE STATISTIC CALCULATIONS

In cases where a sample result is below the limit of detection (LOD), the average of the value zero (0) and the LOD is used in the sample statistic calculation. In cases where a sample result is between the LOD and the limit of quantification (LOQ), the average of the LOD and the LOQ is used in the sample statistic calculation.

10 ACCREDITATION

Labstat International ULC has been accredited by the Standards Council of Canada to International Standard ISO/IEC 17025:2005 "*General requirements for the competence of testing and calibration laboratories*" with a scope[12] that includes all of the mandated tobacco-related Health Canada methods (see Tobacco Reporting Regulations dated 26 June 2000, Canada Gazette Part II, Vol. 134, No. 15 Schedules 1, 2 and 3 pages 1780 – 1785). The testing included in this report is within the scope of this accreditation, unless otherwise noted.

Accredited LAB 368
(SCC Accreditation & Design Mark is an Official Mark of the Standards Council of Canada, used under license)

[12] Labstat's accreditation scope is available on Standards Council of Canada website at: http://palcan.scc.ca/specs/pdf/180_e.pdf

11 AUTHORIZATION

11.1 ORIGINAL

This report has been reviewed by me and is certified, to the best of my knowledge, to be a true and accurate description of the procedures, protocols and test methods used to arrive at the data and/or findings that accompany this report.

Dated: April 21, 2016



Peter Joza,

Director, Science & Technology

Labstat International ULC

11.2 REVISION 1

This report has been reviewed by me and is certified, to the best of my knowledge, to be a true and accurate description of the procedures, protocols and test methods used to arrive at the data and/or findings that accompany this report.

Dated: May 27, 2016



Peter Joza,

Director, Science & Technology

Labstat International ULC

11.3 REVISION 2

This report has been reviewed by me and is certified, to the best of my knowledge, to be a true and accurate description of the procedures, protocols and test methods used to arrive at the data and/or findings that accompany this report.

Dated: May 30, 2016



Peter Joza,

Director, Science & Technology

Labstat International ULC

12 APPENDIX A: "RAW" DATA AND SUMMARY STATISTICS: MAINSTREAM SMOKE

Labstat Sample ID	SMP Description	Qty/Type Received	Type of Product	Type of Analysis
1680388	SMP060619	1/box	sticks	mainstream smoke
1680389	SMP060620	1/box	sticks	mainstream smoke
1680390	SMP060647	1/box	sticks	mainstream smoke

Limits of Detection (LOD) and Limits of Quantification (LOQ) Determined for Selected Mainstream Constituents of Tobacco Smoke

Health Canada Method	Analyte	Units	Mainstream ('ISO')		Mainstream ('Intense')	
			LOD	LOQ	LOD	LOQ
	Ammonia					
T-101	Ammonia	µg/cig	0.184	0.613	0.184	0.613
	Selected Carbonyls					
T-104	Formaldehyde	µg/cig	0.361	1.20	0.361	1.20
T-104	Acetaldehyde	µg/cig	0.973	3.24	0.973	3.24
T-104	Acrolein	µg/cig	0.713	2.38	0.713	2.38
T-104	Crotonaldehyde	µg/cig	0.988	3.29	0.988	3.29
	Tar, Nicotine, and Carbon Monoxide					
T-115	Tar	mg/cig	0.071	0.237	0.071	0.237
T-115	Nicotine	mg/cig	0.001	0.004	0.001	0.004
T-115	CO	mg/cig	0.067	0.223	0.067	0.223
T-115	Water	mg/cig	0.038	0.128	0.038	0.128
T-115	TPM	mg/cig	0.060	0.200	0.060	0.200

Abbreviations: BDL, below detection limit; NQ, below quantitation limit; N/A, not applicable
Date of last review: May 30, 2012

For further information regarding the terms 'ISO' and 'Intense' ('Modified'), please refer to Health Canada's website at: http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/legislation/reg/indust/constitu_e.html

LOD Definition: The limit of detection (LOD) for a particular analyte is a statistically defined decision point that, with a specified probability, measured results falling at or above this point are interpreted to indicate an analyteconcentration greater than zero within the sample.

LOQ Definition: The limit of quantification for a particular analyte is another statistically defined decision point that results falling at or above this point can be assigned a statistically significant numerical value with an associated level of precision. Values falling between the LOD and LOQ are interpreted as a positive but not quantifiable result for the analyte in question.

Limits of Detection (LOD) and Limits of Quantification (LOQ) Determined for Selected PAH Mainstream Constituents of Tobacco Smoke

Labstat Method		Analyte	Units	Mainstream ('ISO')		Mainstream ('Intense')	
				LOD	LOQ	LOD	LOQ
	PAH						
TMS-00120		Benzo(a)pyrene	ng/cig	0.106	0.354	0.106	0.354

Abbreviations: BDL, below detection limit; NQ, below quantitation limit; N/A, not applicable
Date of last review: May 30, 2012

For further information regarding the terms 'ISO' and 'Intense' ('Modified'), please refer to Health Canada's website at: http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/legislation/reg/indust/constitu_e.html

LOD Definition: The limit of detection (LOD) for a particular analyte is a statistically defined decision point that, with a specified probability, measured results falling at or above this point are interpreted to indicate an analyte concentration greater than zero within the sample.

LOQ Definition: The limit of quanitification for a particular analyte is another statistically defined decision point that results falling at or above this point can be assigned a statistically significant numerical value with an associated level of precision. Values falling between the LOD and LOQ are intrepreted as a positive but not quantifiable result for the analyte in question.

Limits of Detection (LOD) and Limits of Quantification (LOQ) Determined for Selected Mainstream Constituents of Tobacco Smoke

Labstat Method	Analyte	Units	Mainstream ('ISO')		Mainstream ('Intense')	
			LOD	LOQ	LOD	LOQ
	Volatiles (Gas Phase)					
TMS-00124	1,3-butadiene	µg/cig	0.029	0.095	0.029	0.095
TMS-00124	Isoprene	µg/cig	0.041	0.135	0.041	0.135
TMS-00124	Acrylonitrile	µg/cig	0.032	0.107	0.032	0.107
TMS-00124	Benzene	µg/cig	0.017	0.056	0.017	0.056
TMS-00124	Toluene	µg/cig	0.061	0.204	0.061	0.204
	Aromatic Amines (HPHC)					
TMS-00128	1-aminonaphthalene	ng/cig	0.008	0.027	0.008	0.027
TMS-00128	2-aminonaphthalene	ng/cig	0.004	0.012	0.004	0.012
TMS-00128	4-aminobiphenyl	ng/cig	0.001	0.005	0.001	0.005

Abbreviations: BDL, below detection limit; NQ, below quantitation limit; N/A, not applicable
Date of last review: May 30, 2012

For further information regarding the terms 'ISO' and 'Intense' ('Modified'), please refer to Health Canada's website at: http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/legislation/reg/indust/constitu_e.html

LOD Definition: The limit of detection (LOD) for a particular analyte is a statistically defined decision point that, with a specified probability, measured results falling at or above this point are interpreted to indicate an analyte concentration greater than zero within the sample.

LOQ Definition: The limit of quantification for a particular analyte is another statistically defined decision point that results falling at or above this point can be assigned a statistically significant numerical value with an associated level of precision. Values falling between the LOD and LOQ are interpreted as a positive but not quantifiable result for the analyte in question.

Limits of Detection (LOD) and Limits of Quantification (LOQ) Determined for Selected Mainstream Constituents of Tobacco Smoke

Labstat Method	Analyte	Units	Mainstream ('ISO')		Mainstream ('Intense')	
			LOD	LOQ	LOD	LOQ
	Tobacco Specific Nitrosamines (LC-MS/MS)					
TMS-00135	Nitrosonornicotine (NNN)	ng/cig	0.098	0.328	0.098	0.328
TMS-00135	4-(N-nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK)	ng/cig	0.151	0.502	0.151	0.502

Abbreviations: BDL, below detection limit; NQ, below quantitation limit; N/A, not applicable
Date of last review: May 01, 2013

For further information regarding the terms 'ISO' and 'Intense' ('Modified'), please refer to Health Canada's website at:
http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/legislation/reg/indust/constitu_e.html

LOD Definition: The limit of detection (LOD) for a particular analyte is a statistically defined decision point that, with a specified probability, measured results falling at or above this point are interpreted to indicate an analyte concentration greater than zero within the sample.

LOQ Definition: The limit of quantification for a particular analyte is another statistically defined decision point that results falling at or above this point can be assigned a statistically significant numerical value with an associated level of precision. Values falling between the LOD and LOQ are interpreted as a positive but not quantifiable result for the analyte in question.

Weight of Tobacco in Bidi, Cigarette, Cigar, Tobacco Stick or Kretek Samples (milligrams of tobacco per unit 'as received')*

	Sample ID		
Obs.	1680388	1680389	1680390
1	285.9	307.2	291.4
2	306.9	283.4	300.6
3	284.6	298.8	276.9
4	270.9	308.8	293.0
5	282.8	282.9	284.8
6	293.0	291.4	298.4
7	303.1	297.4	310.5
8	297.1	278.8	303.7
9	296.6	290.9	264.4
10	273.8	297.5	286.9
Average	289.5	293.7	291.1
Std. Dev	11.9	10.1	13.6
L. Limit (95%)	280.9	286.5	281.4
U. Limit (95%)	298.0	301.0	300.8

Weight of Tobacco in Bidi, Cigarette, Cigar, Tobacco Stick or Kretek Samples (milligrams of tobacco per unit 'dry weight')**

Sample ID	Tobacco Weight (mg/unit)	Dry Matter (%)	Tobacco Weight (mg/unit) 'dry weight'
1680388	289.5	n/a	n/a
1680389	293.7	n/a	n/a
1680390	291.1	n/a	n/a

* as required in part 3, section 14 (2)c of the Canadian Tobacco Reporting Regulations

** as required in part 2, section 12 (6) and 12 (7)ci. of the Canadian Tobacco Reporting Regulations

n/a: not applicable

Smoke Constituent	Matrix Code / Sample ID / Condition / Unit	MS 1680388 S Average	MS 1680388 S Std. Dev.	MS 1680388 S L. Limit (95%)	MS 1680388 S U. Limit (95%)	MS 1680388 N Average	MS 1680388 N Std. Dev.	MS 1680388 N L. Limit (95%)	MS 1680388 N U. Limit (95%)
Ammonia									
Ammonia	[µg/cig]	2.41	0.44	2.01	2.82	10.8	0.9	9.99	11.6
Selected Carbonyls									
Formaldehyde	[µg/cig]	12.2	0.4	11.9	12.6	14.0	1.0	13.1	15.0
Acetaldehyde	[µg/cig]	128	6	122	133	187	6	181	193
Acrolein	[µg/cig]	4.47	0.29	4.20	4.73	8.86	0.74	8.18	9.54
Crotonaldehyde	[µg/cig]	NQ	NQ	N/A	N/A	NQ	NQ	N/A	N/A
Tar, Nicotine, and Carbon Monoxide									
Tar	[mg/cig]	10.7	1.6	9.97	11.5	22.5	3.5	20.9	24.2
Nicotine	[mg/cig]	0.416	0.031	0.401	0.431	1.19	0.06	1.16	1.22
CO	[mg/cig]	NQ	NQ	N/A	N/A	0.318	0.036	0.301	0.335
PAH									
Benzo(a)pyrene	[ng/cig]	0.359	0.064	0.299	0.418	0.662	0.063	0.604	0.720
Volatiles (Gas Phase)									
1,3-butadiene	[µg/cig]	NQ	NQ	N/A	N/A	0.206	0.018	0.189	0.222
Isoprene	[µg/cig]	0.694	0.076	0.624	0.765	1.36	0.10	1.27	1.45
Acrylonitrile	[µg/cig]	NQ	NQ	N/A	N/A	0.118	0.024	0.096	0.141
Benzene	[µg/cig]	0.163	0.018	0.146	0.180	0.432	0.028	0.406	0.457
Toluene	[µg/cig]	0.512	0.062	0.455	0.570	1.36	0.10	1.27	1.46
Aromatic Amines (HPHC)									
1-aminonaphthalene	[ng/cig]	NQ	NQ	N/A	N/A	0.034	0.014	0.021	0.047
2-aminonaphthalene	[ng/cig]	NQ	NQ	N/A	N/A	0.022	0.008	0.015	0.030
4-aminobiphenyl	[ng/cig]	NQ	NQ	N/A	N/A	0.008	0.001	0.007	0.009
Tobacco Specific Nitrosamines (LC-MS/MS)									
Nitrosonornicotine (NNN)	[ng/cig]	3.49	0.33	3.19	3.80	9.91	0.62	9.34	10.5
4-(N-nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK)	[ng/cig]	2.70	0.34	2.39	3.01	8.56	0.48	8.12	9.00

Glossary of Abbreviations

Condition:

S: puff volume, 35mL; interval, 60 sec; duration, 2 sec; vent blocking, none.

N: puff volume, 55mL; interval, 30 sec; duration, 2 sec; vent blocking, 0%.

NQ: Below the Limit of Quantification

N/A: Not Applicable

L. Limit (95%): lower limit of the 95% confidence interval

U. Limit (95%): upper limit of the 95% confidence interval

Smoke Constituent	Matrix Code / Sample ID / Condition / Unit	MS 1680389 S Average	MS 1680389 S Std. Dev.	MS 1680389 S L. Limit (95%)	MS 1680389 S U. Limit (95%)	MS 1680389 N Average	MS 1680389 N Std. Dev.	MS 1680389 N L. Limit (95%)	MS 1680389 N U. Limit (95%)
Ammonia									
Ammonia	[µg/cig]	2.68	0.40	2.31	3.04	10.9	0.8	10.2	11.6
Selected Carbonyls									
Formaldehyde	[µg/cig]	12.5	0.2	12.3	12.7	13.0	1.5	11.6	14.4
Acetaldehyde	[µg/cig]	130	6	125	135	190	12	179	201
Acrolein	[µg/cig]	4.47	0.36	4.15	4.80	9.15	0.70	8.50	9.80
Crotonaldehyde	[µg/cig]	NQ	NQ	N/A	N/A	NQ	NQ	N/A	N/A
Tar, Nicotine, and Carbon Monoxide									
Tar	[mg/cig]	11.5	1.5	10.8	12.2	21.9	4.2	19.9	23.9
Nicotine	[mg/cig]	0.413	0.043	0.393	0.433	1.15	0.08	1.11	1.19
CO	[mg/cig]	NQ	NQ	N/A	N/A	0.326	0.042	0.306	0.346
PAH									
Benzo(a)pyrene	[ng/cig]	NQ	NQ	N/A	N/A	0.673	0.049	0.628	0.718
Volatiles (Gas Phase)									
1,3-butadiene	[µg/cig]	NQ	NQ	N/A	N/A	0.224	0.007	0.218	0.231
Isoprene	[µg/cig]	0.857	0.080	0.783	0.931	1.58	0.14	1.44	1.71
Acrylonitrile	[µg/cig]	NQ	NQ	N/A	N/A	0.120	0.027	0.095	0.144
Benzene	[µg/cig]	0.185	0.016	0.170	0.200	0.474	0.099	0.383	0.565
Toluene	[µg/cig]	0.563	0.067	0.500	0.625	1.40	0.34	1.09	1.71
Aromatic Amines (HPHC)									
1-aminonaphthalene	[ng/cig]	NQ	NQ	N/A	N/A	0.036	0.014	0.024	0.049
2-aminonaphthalene	[ng/cig]	NQ	NQ	N/A	N/A	0.022	0.007	0.016	0.029
4-aminobiphenyl	[ng/cig]	NQ	NQ	N/A	N/A	0.009	0.001	0.008	0.010
Tobacco Specific Nitrosamines (LC-MS/MS)									
Nitrosonornicotine (NNN)	[ng/cig]	3.29	0.65	2.69	3.89	8.65	0.42	8.26	9.03
4-(N-nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK)	[ng/cig]	2.58	0.61	2.02	3.15	8.06	0.86	7.26	8.86

Glossary of Abbreviations

Condition:

S: puff volume, 35mL; interval, 60 sec; duration, 2 sec; vent blocking, none.

N: puff volume, 55mL; interval, 30 sec; duration, 2 sec; vent blocking, 0%.

NQ: Below the Limit of Quantification

N/A: Not Applicable

L. Limit (95%): lower limit of the 95% confidence interval

U. Limit (95%): upper limit of the 95% confidence interval

Smoke Constituent	Unit	MS 1680390 S Average	MS 1680390 S Std. Dev.	MS 1680390 S L. Limit (95%)	MS 1680390 S U. Limit (95%)	MS 1680390 N Average	MS 1680390 N Std. Dev.	MS 1680390 N L. Limit (95%)	MS 1680390 N U. Limit (95%)
Ammonia									
Ammonia	[µg/cig]	2.49	0.39	2.14	2.85	10.8	0.6	10.3	11.4
Selected Carbonyls									
Formaldehyde	[µg/cig]	12.1	0.5	11.7	12.5	13.4	1.4	12.2	14.7
Acetaldehyde	[µg/cig]	131	10	122	140	203	19	185	220
Acrolein	[µg/cig]	4.41	0.51	3.94	4.89	9.31	1.68	7.76	10.9
Crotonaldehyde	[µg/cig]	NQ	NQ	N/A	N/A	NQ	NQ	N/A	N/A
Tar, Nicotine, and Carbon Monoxide									
Tar	[mg/cig]	11.0	2.0	10.1	12.0	23.7	3.3	22.1	25.3
Nicotine	[mg/cig]	0.429	0.029	0.416	0.443	1.17	0.10	1.12	1.21
CO	[mg/cig]	NQ	NQ	N/A	N/A	0.318	0.036	0.301	0.335
PAH									
Benzo(a)pyrene	[ng/cig]	NQ	NQ	N/A	N/A	0.627	0.037	0.594	0.661
Volatiles (Gas Phase)									
1,3-butadiene	[µg/cig]	0.101	0.009	0.093	0.109	0.226	0.027	0.202	0.251
Isoprene	[µg/cig]	0.766	0.096	0.677	0.854	1.54	0.20	1.36	1.73
Acrylonitrile	[µg/cig]	NQ	NQ	N/A	N/A	0.120	0.026	0.096	0.145
Benzene	[µg/cig]	0.170	0.027	0.145	0.194	0.450	0.064	0.390	0.509
Toluene	[µg/cig]	0.548	0.100	0.456	0.640	1.39	0.29	1.13	1.66
Aromatic Amines (HPHC)									
1-aminonaphthalene	[ng/cig]	0.035	0.019	0.018	0.053	0.040	0.019	0.022	0.058
2-aminonaphthalene	[ng/cig]	0.034	0.027	0.008	0.059	0.030	0.032	0.001	0.060
4-aminobiphenyl	[ng/cig]	0.009	0.004	0.005	0.013	0.010	0.005	0.006	0.015
Tobacco Specific Nitrosamines (LC-MS/MS)									
Nitrosonornicotine (NNN)	[ng/cig]	3.82	0.45	3.41	4.24	9.10	0.85	8.31	9.88
4-(N-nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK)	[ng/cig]	2.96	0.40	2.59	3.34	8.01	0.76	7.31	8.71

Glossary of Abbreviations

Condition:

S: puff volume, 35mL; interval, 60 sec; duration, 2 sec; vent blocking, none.

N: puff volume, 55mL; interval, 30 sec; duration, 2 sec; vent blocking, 0%.

NQ: Below the Limit of Quantification

N/A: Not Applicable

L. Limit (95%): lower limit of the 95% confidence interval

U. Limit (95%): upper limit of the 95% confidence interval

AEROSOL (ISO REGIMEN) REPORT WORKSHEET (1680388)

HPHC Name	CAS Code	FDA UNII Code	Smoking Machine	Number of Cigarettes per Smoke Trap	Number of Smoke Traps per Replicate	Number of Replicate Measurements	Test Start Date	Test End Date
Acetaldehyde	75-07-0	GO1N1ZPR3B	Linear	2	1	7	09/04/2016	11/04/2016
Acrolein	107-02-8	7864XYD3JJ	Linear	2	1	7	09/04/2016	11/04/2016
Acrylonitrile	107-13-1	MP1U0D42PE	Linear	10	1	7	29/03/2016	04/04/2016
4-Aminobiphenyl	92-67-1	16054949HJ	Linear	10	1	7	29/03/2016	04/04/2016
1-Aminonaphthalene	134-32-7	9753I242R5	Linear	10	1	7	29/03/2016	04/04/2016
2-Aminonaphthalene	91-59-8	CKR7XL41N4	Linear	10	1	7	29/03/2016	04/04/2016
Ammonia	7664-41-7	5138Q19F1X	Linear	5	1	7	23/03/2016	28/03/2016
Benzene	71-43-2	J64922108F	Linear	10	1	7	29/03/2016	04/04/2016
Benzo[a]pyrene	50-32-8	3417WMA06D	Linear	5	1	7	24/03/2016	06/04/2016
1,3-Butadiene	106-99-0	JSD5FGP5VD	Linear	10	1	7	29/03/2016	04/04/2016
Carbon monoxide	630-08-0	7U1EE4V452	Linear	5	1	20	23/03/2016	24/03/2016
Crotonaldehyde	4170-30-3	9G72074TUW	Linear	2	1	7	09/04/2016	11/04/2016
Formaldehyde	50-00-0	1HG84L3525	Linear	2	1	7	09/04/2016	11/04/2016
Isoprene	78-79-5	0A62964IBU	Linear	10	1	7	29/03/2016	04/04/2016
Nicotine (total)	54-11-5	6M3C89ZY6R	Linear	5	1	20	23/03/2016	24/03/2016
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	64091-91-4	7S395EDO61	Linear	5	1	7	06/04/2016	11/04/2016
N-nitrosonornicotine (NNN)	16543-55-8	X656TZ86DX	Linear	5	1	7	06/04/2016	11/04/2016
Toluene	108-88-3	3FPU23BG52	Linear	10	1	7	29/03/2016	04/04/2016

HPHC Name	Method of Extraction	Method of Separation	If "Other" Method of Separation, Specify	Method of Detection	If "Other" Method of Detection, Specify
Acetaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Acrolein	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Acrylonitrile	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
4-Aminobiphenyl	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
1-Aminonaphthalene	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
2-Aminonaphthalene	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
Ammonia	Health Canada Method T-101; Extract with 0.05N H2SO4, 30 min.	IC	Not Applicable	Other	CD: Conductivity detection
Benzene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Benzo[a]pyrene	NS235_Report.pdf Section 6.3.3.1; methanol, shake 30 min + sonicate 15 min.	GC	Not Applicable	MSD	Not Applicable
1,3-Butadiene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Carbon monoxide	Health Canada Method T-115 (ISO 4387, 8454); direct vapour phase collection	Not Applicable	Not Applicable	NDIR	Not Applicable
Crotonaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Formaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Isoprene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Nicotine (total)	Health Canada Method T-115 (ISO 4387, 10315); isopropanol, 45 min.	GC	Not Applicable	FID	Not Applicable
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.	HPLC	Not Applicable	MSMS	Not Applicable
N-nitrosonornicotine (NNN)	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.	HPLC	Not Applicable	MSMS	Not Applicable
Toluene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable

HPHC Name	Mean Quantity of HPHC per Cigarette	Variance of Mean HPHC Quantity	Type of Variance	Unit of Measurement - Mean & Variance	If "Other" Unit of Measurement Mean & Variance, Specify
Acetaldehyde	127.645	5.888	standard deviation	µg/cig	Not Applicable
Acrolein	4.466	0.286	standard deviation	µg/cig	Not Applicable
Acrylonitrile	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4-Aminobiphenyl	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1-Aminonaphthalene	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Aminonaphthalene	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Ammonia	2.412	0.439	standard deviation	µg/cig	Not Applicable
Benzene	0.163	0.018	standard deviation	µg/cig	Not Applicable
Benzo[a]pyrene	0.359	0.064	Not Applicable	Not Applicable	Not Applicable
1,3-Butadiene	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Carbon monoxide	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Crotonaldehyde	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Formaldehyde	12.237	0.359	standard deviation	µg/cig	Not Applicable
Isoprene	0.694	0.076	standard deviation	µg/cig	Not Applicable
Nicotine (total)	0.416	0.031	standard deviation	mg/cig	Not Applicable
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	2.700	0.336	standard deviation	ng/cig	Not Applicable
N-nitrosonornicotine (NNN)	3.494	0.325	standard deviation	ng/cig	Not Applicable
Toluene	0.512	0.062	standard deviation	µg/cig	Not Applicable

AEROSOL REPORT (INTENSE REGIMEN) WORKSHEET (1680388)

HPHC Name	CAS Code	FDA UNII Code	Smoking Machine	Number of Cigarettes per Smoke Trap	Number of Smoke Traps per Replicate	Number of Replicate Measurements	Test Start Date	Test End Date
Acetaldehyde	75-07-0	GO1N1ZPR3B	Linear	2	1	7	07/04/2016	08/04/2016
Acrolein	107-02-8	7864XYD3JJ	Linear	2	1	7	07/04/2016	08/04/2016
Acrylonitrile	107-13-1	MP1U0D42PE	Linear	10	1	7	28/03/2016	04/04/2016
4-Aminobiphenyl	92-67-1	16054949HJ	Linear	10	1	7	28/03/2016	01/04/2016
1-Aminonaphthalene	134-32-7	9753I242R5	Linear	10	1	7	28/03/2016	01/04/2016
2-Aminonaphthalene	91-59-8	CKR7XL41N4	Linear	10	1	7	28/03/2016	01/04/2016
Ammonia	7664-41-7	5138Q19F1X	Linear	5	1	7	22/03/2016	28/03/2016
Benzene	71-43-2	J64922108F	Linear	10	1	7	28/03/2016	04/04/2016
Benzo[a]pyrene	50-32-8	3417WMA06D	Linear	5	1	7	21/03/2016	06/04/2016
1,3-Butadiene	106-99-0	JSD5FGP5VD	Linear	10	1	7	28/03/2016	04/04/2016
Carbon monoxide	630-08-0	7U1EE4V452	Linear	5	1	20	22/03/2016	28/03/2016
Crotonaldehyde	4170-30-3	9G72074TUW	Linear	2	1	7	07/04/2016	08/04/2016
Formaldehyde	50-00-0	1HG84L3525	Linear	2	1	7	07/04/2016	08/04/2016
Isoprene	78-79-5	0A62964IBU	Linear	10	1	7	28/03/2016	04/04/2016
Nicotine (total)	54-11-5	6M3C89ZY6R	Linear	5	1	20	22/03/2016	28/03/2016
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	64091-91-4	7S395EDO61	Linear	5	1	7	11/04/2016	12/04/2016
N-nitrosonornicotine (NNN)	16543-55-8	X656TZ86DX	Linear	5	1	7	11/04/2016	12/04/2016
Toluene	108-88-3	3FPU23BG52	Linear	10	1	7	28/03/2016	04/04/2016

HPHC Name	Method of Extraction	Method of Separation	If "Other" Method of Separation, Specify	Method of Detection	If "Other" Method of Detection, Specify
Acetaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Acrolein	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Acrylonitrile	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
4-Aminobiphenyl	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
1-Aminonaphthalene	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
2-Aminonaphthalene	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
Ammonia	Health Canada Method T-101; Extract with 0.05N H2SO4, 30 min.	IC	Not Applicable	Other	CD: Conductivity detection
Benzene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Benzo[a]pyrene	NS235_Report.pdf Section 6.3.3.1; methanol, shake 30 min + sonicate 15 min.	GC	Not Applicable	MSD	Not Applicable
1,3-Butadiene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Carbon monoxide	Health Canada Method T-115 (ISO 4387, 8454); direct vapour phase collection	Not Applicable	Not Applicable	NDIR	Not Applicable
Crotonaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Formaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Isoprene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Nicotine (total)	Health Canada Method T-115 (ISO 4387, 10315); isopropanol, 45 min.	GC	Not Applicable	FID	Not Applicable
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.	HPLC	Not Applicable	MSMS	Not Applicable
N-nitrosonornicotine (NNN)	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.	HPLC	Not Applicable	MSMS	Not Applicable
Toluene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable

HPHC Name	Mean Quantity of HPHC per Cigarette	Variance of Mean HPHC Quantity	Type of Variance	Unit of Measurement - Mean & Variance	If "Other" Unit of Measurement Mean & Variance, Specify
Acetaldehyde	186.843	6.318	standard deviation	µg/cig	Not Applicable
Acrolein	8.858	0.735	standard deviation	µg/cig	Not Applicable
Acrylonitrile	0.118	0.024	standard deviation	µg/cig	Not Applicable
4-Aminobiphenyl	0.008	0.001	standard deviation	ng/cig	Not Applicable
1-Aminonaphthalene	0.034	0.014	standard deviation	ng/cig	Not Applicable
2-Aminonaphthalene	0.022	0.008	standard deviation	ng/cig	Not Applicable
Ammonia	10.792	0.871	standard deviation	µg/cig	Not Applicable
Benzene	0.432	0.028	standard deviation	µg/cig	Not Applicable
Benzo[a]pyrene	0.662	0.063	standard deviation	ng/cig	Not Applicable
1,3-Butadiene	0.206	0.018	standard deviation	µg/cig	Not Applicable
Carbon monoxide	0.318	0.036	standard deviation	mg/cig	Not Applicable
Crotonaldehyde	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Formaldehyde	14.021	1.041	standard deviation	µg/cig	Not Applicable
Isoprene	1.363	0.097	standard deviation	µg/cig	Not Applicable
Nicotine (total)	1.188	0.061	standard deviation	mg/cig	Not Applicable
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	8.560	0.477	standard deviation	ng/cig	Not Applicable
N-nitrosonornicotine (NNN)	9.914	0.616	standard deviation	ng/cig	Not Applicable
Toluene	1.364	0.099	standard deviation	µg/cig	Not Applicable

AEROSOL (ISO REGIMEN) REPORT WORKSHEET (1680389)

HPHC Name	CAS Code	FDA UNII Code	Smoking Machine	Number of Cigarettes per Smoke Trap	Number of Smoke Traps per Replicate	Number of Replicate Measurements	Test Start Date	Test End Date
Acetaldehyde	75-07-0	GO1N1ZPR3B	Linear	2	1	7	09/04/2016	11/04/2016
Acrolein	107-02-8	7864XYD3JJ	Linear	2	1	7	09/04/2016	11/04/2016
Acrylonitrile	107-13-1	MP1U0D42PE	Linear	10	1	7	29/03/2016	04/04/2016
4-Aminobiphenyl	92-67-1	16054949HJ	Linear	10	1	7	29/03/2016	04/04/2016
1-Aminonaphthalene	134-32-7	9753I242R5	Linear	10	1	7	29/03/2016	04/04/2016
2-Aminonaphthalene	91-59-8	CKR7XL41N4	Linear	10	1	7	29/03/2016	04/04/2016
Ammonia	7664-41-7	5138Q19F1X	Linear	5	1	7	23/03/2016	28/03/2016
Benzene	71-43-2	J64922108F	Linear	10	1	7	29/03/2016	04/04/2016
Benzo[a]pyrene	50-32-8	3417WMA06D	Linear	5	1	7	24/03/2016	06/04/2016
1,3-Butadiene	106-99-0	JSD5FGP5VD	Linear	10	1	7	29/03/2016	04/04/2016
Carbon monoxide	630-08-0	7U1EE4V452	Linear	5	1	20	23/03/2016	24/03/2016
Crotonaldehyde	4170-30-3	9G72074TUW	Linear	2	1	7	09/04/2016	11/04/2016
Formaldehyde	50-00-0	1HG84L3525	Linear	2	1	7	09/04/2016	11/04/2016
Isoprene	78-79-5	0A62964IBU	Linear	10	1	7	29/03/2016	04/04/2016
Nicotine (total)	54-11-5	6M3C89ZY6R	Linear	5	1	20	23/03/2016	24/03/2016
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	64091-91-4	7S395EDO61	Linear	5	1	7	06/04/2016	11/04/2016
N-nitrosonornicotine (NNN)	16543-55-8	X656TZ86DX	Linear	5	1	7	06/04/2016	11/04/2016
Toluene	108-88-3	3FPU23BG52	Linear	10	1	7	29/03/2016	04/04/2016

HPHC Name	Method of Extraction	Method of Separation	If "Other" Method of Separation, Specify	Method of Detection	If "Other" Method of Detection, Specify
Acetaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Acrolein	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Acrylonitrile	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
4-Aminobiphenyl	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
1-Aminonaphthalene	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
2-Aminonaphthalene	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
Ammonia	Health Canada Method T-101; Extract with 0.05N H2SO4, 30 min.	IC	Not Applicable	Other	CD: Conductivity detection
Benzene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Benzo[a]pyrene	NS235_Report.pdf Section 6.3.3.1; methanol, shake 30 min + sonicate 15 min.	GC	Not Applicable	MSD	Not Applicable
1,3-Butadiene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Carbon monoxide	Health Canada Method T-115 (ISO 4387, 8454); direct vapour phase collection	Not Applicable	Not Applicable	NDIR	Not Applicable
Crotonaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Formaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Isoprene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Nicotine (total)	Health Canada Method T-115 (ISO 4387, 10315); isopropanol, 45 min.	GC	Not Applicable	FID	Not Applicable
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.	HPLC	Not Applicable	MSMS	Not Applicable
N-nitrosonornicotine (NNN)	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.	HPLC	Not Applicable	MSMS	Not Applicable
Toluene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable

HPHC Name	Mean Quantity of HPHC per Cigarette	Variance of Mean HPHC Quantity	Type of Variance	Unit of Measurement - Mean & Variance	If "Other" Unit of Measurement Mean & Variance, Specify
Acetaldehyde	129.650	5.505	standard deviation	µg/cig	Not Applicable
Acrolein	4.474	0.356	standard deviation	µg/cig	Not Applicable
Acrylonitrile	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4-Aminobiphenyl	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1-Aminonaphthalene	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Aminonaphthalene	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Ammonia	2.678	0.395	standard deviation	µg/cig	Not Applicable
Benzene	0.185	0.016	standard deviation	µg/cig	Not Applicable
Benzo[a]pyrene	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1,3-Butadiene	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Carbon monoxide	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Crotonaldehyde	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Formaldehyde	12.522	0.220	standard deviation	µg/cig	Not Applicable
Isoprene	0.857	0.080	standard deviation	µg/cig	Not Applicable
Nicotine (total)	0.413	0.043	standard deviation	mg/cig	Not Applicable
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	2.583	0.611	standard deviation	ng/cig	Not Applicable
N-nitrosonornicotine (NNN)	3.291	0.646	standard deviation	ng/cig	Not Applicable
Toluene	0.563	0.067	standard deviation	µg/cig	Not Applicable

AEROSOL REPORT (INTENSE REGIMEN) WORKSHEET (1680389)

HPHC Name	CAS Code	FDA UNII Code	Smoking Machine	Number of Cigarettes per Smoke Trap	Number of Smoke Traps per Replicate	Number of Replicate Measurements	Test Start Date	Test End Date
Acetaldehyde	75-07-0	GO1N1ZPR3B	Linear	2	1	7	07/04/2016	08/04/2016
Acrolein	107-02-8	7864XYD3JJ	Linear	2	1	7	07/04/2016	08/04/2016
Acrylonitrile	107-13-1	MP1U0D42PE	Linear	10	1	7	28/03/2016	04/04/2016
4-Aminobiphenyl	92-67-1	16054949HJ	Linear	10	1	7	28/03/2016	01/04/2016
1-Aminonaphthalene	134-32-7	9753I242R5	Linear	10	1	7	28/03/2016	01/04/2016
2-Aminonaphthalene	91-59-8	CKR7XL41N4	Linear	10	1	7	28/03/2016	01/04/2016
Ammonia	7664-41-7	5138Q19F1X	Linear	5	1	7	22/03/2016	28/03/2016
Benzene	71-43-2	J64922108F	Linear	10	1	7	28/03/2016	04/04/2016
Benzo[a]pyrene	50-32-8	3417WMA06D	Linear	5	1	7	21/03/2016	06/04/2016
1,3-Butadiene	106-99-0	JSD5FGP5VD	Linear	10	1	7	28/03/2016	04/04/2016
Carbon monoxide	630-08-0	7U1EE4V452	Linear	5	1	20	22/03/2016	28/03/2016
Crotonaldehyde	4170-30-3	9G72074TUW	Linear	2	1	7	07/04/2016	08/04/2016
Formaldehyde	50-00-0	1HG84L3525	Linear	2	1	7	07/04/2016	08/04/2016
Isoprene	78-79-5	0A62964IBU	Linear	10	1	7	28/03/2016	04/04/2016
Nicotine (total)	54-11-5	6M3C89ZY6R	Linear	5	1	20	22/03/2016	28/03/2016
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	64091-91-4	7S395EDO61	Linear	5	1	7	11/04/2016	12/04/2016
N-nitrosonornicotine (NNN)	16543-55-8	X656TZ86DX	Linear	5	1	7	11/04/2016	12/04/2016
Toluene	108-88-3	3FPU23BG52	Linear	10	1	7	28/03/2016	04/04/2016

HPHC Name	Method of Extraction	Method of Separation	If "Other" Method of Separation, Specify	Method of Detection	If "Other" Method of Detection, Specify
Acetaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Acrolein	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Acrylonitrile	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
4-Aminobiphenyl	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
1-Aminonaphthalene	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
2-Aminonaphthalene	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
Ammonia	Health Canada Method T-101; Extract with 0.05N H2SO4, 30 min.	IC	Not Applicable	Other	CD: Conductivity detection
Benzene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Benzo[a]pyrene	NS235_Report.pdf Section 6.3.3.1; methanol, shake 30 min + sonicate 15 min.	GC	Not Applicable	MSD	Not Applicable
1,3-Butadiene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Carbon monoxide	Health Canada Method T-115 (ISO 4387, 8454); direct vapour phase collection	Not Applicable	Not Applicable	NDIR	Not Applicable
Crotonaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Formaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Isoprene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Nicotine (total)	Health Canada Method T-115 (ISO 4387, 10315); isopropanol, 45 min.	GC	Not Applicable	FID	Not Applicable
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.	HPLC	Not Applicable	MSMS	Not Applicable
N-nitrosonornicotine (NNN)	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.	HPLC	Not Applicable	MSMS	Not Applicable
Toluene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable

HPHC Name	Mean Quantity of HPHC per Cigarette	Variance of Mean HPHC Quantity	Type of Variance	Unit of Measurement - Mean & Variance	If "Other" Unit of Measurement Mean & Variance, Specify
Acetaldehyde	190.335	12.069	standard deviation	µg/cig	Not Applicable
Acrolein	9.151	0.704	standard deviation	µg/cig	Not Applicable
Acrylonitrile	0.120	0.027	standard deviation	µg/cig	Not Applicable
4-Aminobiphenyl	0.009	0.001	standard deviation	ng/cig	Not Applicable
1-Aminonaphthalene	0.036	0.014	standard deviation	ng/cig	Not Applicable
2-Aminonaphthalene	0.022	0.007	standard deviation	ng/cig	Not Applicable
Ammonia	10.904	0.762	standard deviation	µg/cig	Not Applicable
Benzene	0.474	0.099	standard deviation	µg/cig	Not Applicable
Benzo[a]pyrene	0.673	0.049	standard deviation	ng/cig	Not Applicable
1,3-Butadiene	0.224	0.007	standard deviation	µg/cig	Not Applicable
Carbon monoxide	0.326	0.042	standard deviation	mg/cig	Not Applicable
Crotonaldehyde	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Formaldehyde	12.986	1.510	standard deviation	µg/cig	Not Applicable
Isoprene	1.576	0.145	standard deviation	µg/cig	Not Applicable
Nicotine (total)	1.150	0.076	standard deviation	mg/cig	Not Applicable
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	8.057	0.864	standard deviation	ng/cig	Not Applicable
N-nitrosonornicotine (NNN)	8.646	0.419	standard deviation	ng/cig	Not Applicable
Toluene	1.399	0.337	standard deviation	µg/cig	Not Applicable

AEROSOL (ISO REGIMEN) REPORT WORKSHEET (1680390)

HPHC Name	CAS Code	FDA UNII Code	Smoking Machine	Number of Cigarettes per Smoke Trap	Number of Smoke Traps per Replicate	Number of Replicate Measurements	Test Start Date	Test End Date
Acetaldehyde	75-07-0	GO1N1ZPR3B	Linear	2	1	7	09/04/2016	11/04/2016
Acrolein	107-02-8	7864XYD3JJ	Linear	2	1	7	09/04/2016	11/04/2016
Acrylonitrile	107-13-1	MP1U0D42PE	Linear	10	1	7	29/03/2016	04/04/2016
4-Aminobiphenyl	92-67-1	16054949HJ	Linear	10	1	7	29/03/2016	04/04/2016
1-Aminonaphthalene	134-32-7	9753I242R5	Linear	10	1	7	29/03/2016	04/04/2016
2-Aminonaphthalene	91-59-8	CKR7XL41N4	Linear	10	1	7	29/03/2016	04/04/2016
Ammonia	7664-41-7	5138Q19F1X	Linear	5	1	7	23/03/2016	28/03/2016
Benzene	71-43-2	J64922108F	Linear	10	1	7	29/03/2016	04/04/2016
Benzo[a]pyrene	50-32-8	3417WMA06D	Linear	5	1	7	24/03/2016	06/04/2016
1,3-Butadiene	106-99-0	JSD5FGP5VD	Linear	10	1	7	29/03/2016	04/04/2016
Carbon monoxide	630-08-0	7U1EE4V452	Linear	5	1	20	23/03/2016	24/03/2016
Crotonaldehyde	4170-30-3	9G72074TUW	Linear	2	1	7	09/04/2016	11/04/2016
Formaldehyde	50-00-0	1HG84L3525	Linear	2	1	7	09/04/2016	11/04/2016
Isoprene	78-79-5	0A62964IBU	Linear	10	1	7	29/03/2016	04/04/2016
Nicotine (total)	54-11-5	6M3C89ZY6R	Linear	5	1	20	23/03/2016	24/03/2016
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	64091-91-4	7S395EDO61	Linear	5	1	7	06/04/2016	11/04/2016
N-nitrosonornicotine (NNN)	16543-55-8	X656TZ86DX	Linear	5	1	7	06/04/2016	11/04/2016
Toluene	108-88-3	3FPU23BG52	Linear	10	1	7	29/03/2016	04/04/2016

HPHC Name	Method of Extraction	Method of Separation	If "Other" Method of Separation, Specify	Method of Detection	If "Other" Method of Detection, Specify
Acetaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Acrolein	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Acrylonitrile	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
4-Aminobiphenyl	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
1-Aminonaphthalene	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
2-Aminonaphthalene	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
Ammonia	Health Canada Method T-101; Extract with 0.05N H2SO4, 30 min.	IC	Not Applicable	Other	CD: Conductivity detection
Benzene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Benzo[a]pyrene	NS235_Report.pdf Section 6.3.3.1; methanol, shake 30 min + sonicate 15 min.	GC	Not Applicable	MSD	Not Applicable
1,3-Butadiene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Carbon monoxide	Health Canada Method T-115 (ISO 4387, 8454); direct vapour phase collection	Not Applicable	Not Applicable	NDIR	Not Applicable
Crotonaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Formaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Isoprene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Nicotine (total)	Health Canada Method T-115 (ISO 4387, 10315); isopropanol, 45 min.	GC	Not Applicable	FID	Not Applicable
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.	HPLC	Not Applicable	MSMS	Not Applicable
N-nitrosonornicotine (NNN)	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.	HPLC	Not Applicable	MSMS	Not Applicable
Toluene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable

HPHC Name	Mean Quantity of HPHC per Cigarette	Variance of Mean HPHC Quantity	Type of Variance	Unit of Measurement - Mean & Variance	If "Other" Unit of Measurement Mean & Variance, Specify
Acetaldehyde	131.086	9.508	standard deviation	µg/cig	Not Applicable
Acrolein	4.412	0.512	standard deviation	µg/cig	Not Applicable
Acrylonitrile	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4-Aminobiphenyl	0.009	0.004	standard deviation	ng/cig	Not Applicable
1-Aminonaphthalene	0.035	0.019	standard deviation	ng/cig	Not Applicable
2-Aminonaphthalene	0.034	0.027	standard deviation	ng/cig	Not Applicable
Ammonia	2.494	0.387	standard deviation	µg/cig	Not Applicable
Benzene	0.170	0.027	standard deviation	µg/cig	Not Applicable
Benzo[a]pyrene	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1,3-Butadiene	0.101	0.009	standard deviation	µg/cig	Not Applicable
Carbon monoxide	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Crotonaldehyde	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Formaldehyde	12.121	0.450	standard deviation	µg/cig	Not Applicable
Isoprene	0.766	0.096	standard deviation	µg/cig	Not Applicable
Nicotine (total)	0.429	0.029	standard deviation	mg/cig	Not Applicable
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	2.965	0.402	standard deviation	ng/cig	Not Applicable
N-nitrosonornicotine (NNN)	3.822	0.450	standard deviation	ng/cig	Not Applicable
Toluene	0.548	0.100	standard deviation	µg/cig	Not Applicable

AEROSOL REPORT (INTENSE REGIMEN) WORKSHEET (1680390)

HPHC Name	CAS Code	FDA UNII Code	Smoking Machine	Number of Cigarettes per Smoke Trap	Number of Smoke Traps per Replicate	Number of Replicate Measurements	Test Start Date	Test End Date
Acetaldehyde	75-07-0	GO1N1ZPR3B	Linear	2	1	7	07/04/2016	08/04/2016
Acrolein	107-02-8	7864XYD3JJ	Linear	2	1	7	07/04/2016	08/04/2016
Acrylonitrile	107-13-1	MP1U0D42PE	Linear	10	1	7	28/03/2016	04/04/2016
4-Aminobiphenyl	92-67-1	16054949HJ	Linear	10	1	7	28/03/2016	01/04/2016
1-Aminonaphthalene	134-32-7	9753I242R5	Linear	10	1	7	28/03/2016	01/04/2016
2-Aminonaphthalene	91-59-8	CKR7XL41N4	Linear	10	1	7	28/03/2016	01/04/2016
Ammonia	7664-41-7	5138Q19F1X	Linear	5	1	7	22/03/2016	28/03/2016
Benzene	71-43-2	J64922108F	Linear	10	1	7	28/03/2016	04/04/2016
Benzo[a]pyrene	50-32-8	3417WMA06D	Linear	5	1	7	21/03/2016	06/04/2016
1,3-Butadiene	106-99-0	JSD5FGP5VD	Linear	10	1	7	28/03/2016	04/04/2016
Carbon monoxide	630-08-0	7U1EE4V452	Linear	5	1	20	22/03/2016	28/03/2016
Crotonaldehyde	4170-30-3	9G72074TUW	Linear	2	1	7	07/04/2016	08/04/2016
Formaldehyde	50-00-0	1HG84L3525	Linear	2	1	7	07/04/2016	08/04/2016
Isoprene	78-79-5	0A62964IBU	Linear	10	1	7	28/03/2016	04/04/2016
Nicotine (total)	54-11-5	6M3C89ZY6R	Linear	5	1	20	22/03/2016	28/03/2016
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	64091-91-4	7S395EDO61	Linear	5	1	7	11/04/2016	12/04/2016
N-nitrosonornicotine (NNN)	16543-55-8	X656TZ86DX	Linear	5	1	7	11/04/2016	12/04/2016
Toluene	108-88-3	3FPU23BG52	Linear	10	1	7	28/03/2016	04/04/2016

HPHC Name	Method of Extraction	Method of Separation	If "Other" Method of Separation, Specify	Method of Detection	If "Other" Method of Detection, Specify
Acetaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Acrolein	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Acrylonitrile	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
4-Aminobiphenyl	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
1-Aminonaphthalene	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
2-Aminonaphthalene	NS235_Report.pdf Section 6.3.3.2; Extract in 5% HCl, 30 min.	GC	Not Applicable	MSD	Not Applicable
Ammonia	Health Canada Method T-101; Extract with 0.05N H2SO4, 30 min.	IC	Not Applicable	Other	CD: Conductivity detection
Benzene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Benzo[a]pyrene	NS235_Report.pdf Section 6.3.3.1; methanol, shake 30 min + sonicate 15 min.	GC	Not Applicable	MSD	Not Applicable
1,3-Butadiene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Carbon monoxide	Health Canada Method T-115 (ISO 4387, 8454); direct vapour phase collection	Not Applicable	Not Applicable	NDIR	Not Applicable
Crotonaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Formaldehyde	Health Canada Method T-104; 12mM acidified DNPH in acetonitrile trap	HPLC	Not Applicable	UVD	Not Applicable
Isoprene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable
Nicotine (total)	Health Canada Method T-115 (ISO 4387, 10315); isopropanol, 45 min.	GC	Not Applicable	FID	Not Applicable
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.	HPLC	Not Applicable	MSMS	Not Applicable
N-nitrosonornicotine (NNN)	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.	HPLC	Not Applicable	MSMS	Not Applicable
Toluene	Health Canada Method T-116; Gas phase collected into cryogenic methanol trap	GC	Not Applicable	MSD	Not Applicable

HPHC Name	Mean Quantity of HPHC per Cigarette	Variance of Mean HPHC Quantity	Type of Variance	Unit of Measurement - Mean & Variance	If "Other" Unit of Measurement Mean & Variance, Specify
Acetaldehyde	202.822	18.733	standard deviation	µg/cig	Not Applicable
Acrolein	9.309	1.677	standard deviation	µg/cig	Not Applicable
Acrylonitrile	0.120	0.026	standard deviation	µg/cig	Not Applicable
4-Aminobiphenyl	0.010	0.005	standard deviation	ng/cig	Not Applicable
1-Aminonaphthalene	0.040	0.019	standard deviation	ng/cig	Not Applicable
2-Aminonaphthalene	0.030	0.032	standard deviation	ng/cig	Not Applicable
Ammonia	10.825	0.582	standard deviation	µg/cig	Not Applicable
Benzene	0.450	0.064	standard deviation	µg/cig	Not Applicable
Benzo[a]pyrene	0.627	0.037	standard deviation	ng/cig	Not Applicable
1,3-Butadiene	0.226	0.027	standard deviation	µg/cig	Not Applicable
Carbon monoxide	0.318	0.036	standard deviation	mg/cig	Not Applicable
Crotonaldehyde	0.000	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Formaldehyde	13.441	1.369	standard deviation	µg/cig	Not Applicable
Isoprene	1.544	0.198	standard deviation	µg/cig	Not Applicable
Nicotine (total)	1.168	0.097	standard deviation	mg/cig	Not Applicable
4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	8.006	0.757	standard deviation	ng/cig	Not Applicable
N-nitrosonornicotine (NNN)	9.097	0.846	standard deviation	ng/cig	Not Applicable
Toluene	1.395	0.288	standard deviation	µg/cig	Not Applicable

Table 1a: **Yields of 'Tar', Nicotine and CO in Mainstream Tobacco Smoke: 'ISO' Conditions***

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	CO [mg/cig]	Water [mg/cig]	Nicotine [mg/cig]	Tar [mg/cig]
1680388	798	6.0	26.2	0.240	13.8	0.382	12.0
1680388	788	6.0	24.8	< 0.223 but ≥ 0.067	13.3	0.382	11.1
1680388	810	6.0	26.5	< 0.223 but ≥ 0.067	13.9	0.390	12.2
1680388	798	6.0	28.3	< 0.223 but ≥ 0.067	15.4	0.430	12.5
1680388	797	6.0	26.0	< 0.223 but ≥ 0.067	18.2	0.435	7.30
1680388	794	6.0	24.2	< 0.223 but ≥ 0.067	15.5	0.427	8.30
1680388	801	6.0	25.8	< 0.223 but ≥ 0.067	14.9	0.415	10.4
1680388	797	6.0	30.1	< 0.223 but ≥ 0.067	16.5	0.445	13.2
1680388	800	6.0	25.0	< 0.223 but ≥ 0.067	15.3	0.369	9.36
1680388	800	6.0	27.1	< 0.223 but ≥ 0.067	15.8	0.439	10.9
1680388	797	6.0	28.5	< 0.223 but ≥ 0.067	19.5	0.474	8.46
1680388	791	6.0	26.4	< 0.223 but ≥ 0.067	15.6	0.451	10.3
1680388	791	6.0	23.0	< 0.223 but ≥ 0.067	12.2	0.375	10.4
1680388	798	6.0	25.4	< 0.223 but ≥ 0.067	15.8	0.444	9.22
1680388	800	6.0	24.3	< 0.223 but ≥ 0.067	13.1	0.392	10.8
1680388	789	6.0	28.3	< 0.223 but ≥ 0.067	15.0	0.453	12.8
1680388	795	6.0	24.7	< 0.223 but ≥ 0.067	14.1	0.384	10.2
1680388	797	6.0	25.2	< 0.223 but ≥ 0.067	14.4	0.406	10.4
1680388	793	6.0	26.2	< 0.223 but ≥ 0.067	13.7	0.391	12.1
1680388	806	6.0	28.2	< 0.223 but ≥ 0.067	15.2	0.436	12.6
Average	797	6.0	26.2	**NQ**	15.1	0.416	10.7
Std. Dev.	5	0.0	1.8	**NQ**	1.7	0.031	1.6
L. Limit (95%)	795	6.0	25.4	N/A	14.3	0.401	10.0
U. Limit (95%)	800	6.0	27.0	N/A	15.9	0.431	11.5

Table 1a: **Yields of 'Tar', Nicotine and CO in Mainstream Tobacco Smoke: 'ISO' Conditions***

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	CO [mg/cig]	Water [mg/cig]	Nicotine [mg/cig]	Tar [mg/cig]
1680389	785	6.0	23.8	< 0.223 but ≥ 0.067	13.9	0.360	9.54
1680389	787	6.0	26.3	0.240	13.5	0.363	12.5
1680389	789	6.0	25.6	< 0.223 but ≥ 0.067	12.9	0.397	12.3
1680389	790	6.0	25.5	< 0.223 but ≥ 0.067	12.9	0.379	12.1
1680389	796	6.0	26.9	< 0.223 but ≥ 0.067	13.8	0.395	12.7
1680389	795	6.0	26.1	< 0.223 but ≥ 0.067	14.5	0.391	11.1
1680389	789	6.0	26.2	< 0.223 but ≥ 0.067	14.4	0.406	11.4
1680389	790	6.0	28.7	0.240	15.4	0.443	12.8
1680389	784	6.0	29.6	0.240	15.6	0.447	13.5
1680389	790	6.0	29.6	< 0.223 but ≥ 0.067	17.6	0.464	11.6
1680389	777	6.0	30.3	< 0.223 but ≥ 0.067	17.5	0.520	12.3
1680389	788	6.0	26.0	< 0.223 but ≥ 0.067	18.7	0.395	6.90
1680389	780	6.0	30.0	< 0.223 but ≥ 0.067	20.0	0.471	9.48
1680389	788	6.0	28.0	< 0.223 but ≥ 0.067	15.4	0.405	12.2
1680389	791	6.0	28.8	< 0.223 but ≥ 0.067	16.6	0.452	11.8
1680389	785	6.0	24.8	< 0.223 but ≥ 0.067	13.2	0.399	11.3
1680389	789	6.0	25.0	< 0.223 but ≥ 0.067	13.6	0.362	11.0
1680389	792	6.0	26.2	< 0.223 but ≥ 0.067	15.0	0.423	10.7
1680389	781	6.0	25.4	< 0.223 but ≥ 0.067	13.2	0.364	11.8
1680389	786	6.0	28.8	< 0.223 but ≥ 0.067	15.2	0.428	13.1
Average	788	6.0	27.1	**NQ**	15.2	0.413	11.5
Std. Dev.	5	0.0	2.0	**NQ**	2.0	0.043	1.5
L. Limit (95%)	786	6.0	26.2	N/A	14.2	0.393	10.8
U. Limit (95%)	790	6.0	28.0	N/A	16.1	0.433	12.2

Table 1a: **Yields of 'Tar', Nicotine and CO in Mainstream Tobacco Smoke: 'ISO' Conditions***

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	CO [mg/cig]	Water [mg/cig]	Nicotine [mg/cig]	Tar [mg/cig]
1680390	805	6.0	27.2	< 0.223 but ≥ 0.067	13.5	0.420	13.3
1680390	802	6.0	24.2	< 0.223 but ≥ 0.067	14.3	0.395	9.51
1680390	810	6.0	25.9	< 0.223 but ≥ 0.067	14.4	0.383	11.1
1680390	799	6.0	24.6	< 0.223 but ≥ 0.067	13.6	0.395	10.7
1680390	806	6.0	27.9	0.240	14.2	0.432	13.3
1680390	793	6.0	25.8	< 0.223 but ≥ 0.067	14.2	0.405	11.2
1680390	796	6.0	27.9	< 0.223 but ≥ 0.067	16.0	0.426	11.5
1680390	793	6.0	29.6	< 0.223 but ≥ 0.067	20.9	0.447	8.24
1680390	780	6.0	26.2	< 0.223 but ≥ 0.067	15.7	0.469	10.0
1680390	803	6.0	27.3	< 0.223 but ≥ 0.067	15.8	0.457	11.0
1680390	787	6.0	26.8	< 0.223 but ≥ 0.067	19.2	0.462	7.16
1680390	802	6.0	28.3	< 0.223 but ≥ 0.067	19.1	0.467	8.72
1680390	783	6.0	27.1	< 0.223 but ≥ 0.067	19.2	0.449	7.39
1680390	792	6.0	26.8	< 0.223 but ≥ 0.067	15.4	0.420	11.0
1680390	799	6.0	28.5	< 0.223 but ≥ 0.067	14.6	0.406	13.5
1680390	799	6.0	29.0	< 0.223 but ≥ 0.067	15.2	0.443	13.4
1680390	791	6.0	30.0	< 0.223 but ≥ 0.067	17.0	0.474	12.6
1680390	799	6.0	27.0	< 0.223 but ≥ 0.067	15.6	0.426	11.0
1680390	796	6.0	27.7	< 0.223 but ≥ 0.067	14.2	0.386	13.1
1680390	793	6.0	27.9	< 0.223 but ≥ 0.067	14.7	0.421	12.8
Average	796	6.0	27.3	**NQ**	15.8	0.429	11.0
Std. Dev.	8	0.0	1.5	**NQ**	2.1	0.029	2.0
L. Limit (95%)	793	6.0	26.6	N/A	14.8	0.416	10.1
U. Limit (95%)	800	6.0	28.0	N/A	16.8	0.443	12.0

* puff volume, 35mL; interval, 60 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Glossary of Abbreviations
NQ: Below the Limit of Quantification
N/A: Not Applicable

Table 1b: **Yields of 'Tar', Nicotine and CO in Mainstream Tobacco Smoke: 'Intense' Conditions***

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	CO [mg/cig]	Water [mg/cig]	Nicotine [mg/cig]	Tar [mg/cig]
1680388	790	12.0	53.9	0.310	31.6	1.12	21.2
1680388	794	12.0	51.4	0.230	34.2	1.03	16.2
1680388	802	12.0	58.2	0.310	30.9	1.26	26.1
1680388	803	12.0	57.4	0.310	38.4	1.18	17.8
1680388	804	12.0	57.8	0.310	33.3	1.23	23.2
1680388	791	12.0	55.0	0.310	35.0	1.16	18.8
1680388	792	12.0	53.9	0.310	37.6	1.12	15.1
1680388	803	12.0	56.0	0.310	31.2	1.11	23.7
1680388	797	12.0	56.4	0.310	35.7	1.25	19.5
1680388	799	12.0	56.1	0.310	29.0	1.22	25.9
1680388	800	12.0	55.9	0.310	31.9	1.23	22.7
1680388	797	12.0	54.8	0.310	29.0	1.19	24.7
1680388	797	12.0	55.7	0.390	30.9	1.18	23.6
1680388	797	12.0	57.7	0.310	30.2	1.24	26.2
1680388	798	12.0	55.8	0.390	30.9	1.24	23.6
1680388	803	12.0	57.2	0.310	27.9	1.27	28.0
1680388	792	12.0	56.2	0.390	29.9	1.23	25.1
1680388	791	12.0	54.5	0.310	31.6	1.20	21.7
1680388	785	12.0	54.8	0.310	30.2	1.17	23.4
1680388	784	12.0	53.6	0.310	28.1	1.13	24.3
Average	796	12.0	55.6	0.318	31.9	1.19	22.5
Std. Dev.	6	0.0	1.7	0.036	3.0	0.06	3.5
L. Limit (95%)	793	12.0	54.8	0.301	30.5	1.16	20.9
U. Limit (95%)	799	12.0	56.4	0.335	33.3	1.22	24.2

Table 1b: **Yields of 'Tar', Nicotine and CO in Mainstream Tobacco Smoke: 'Intense' Conditions***

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	CO [mg/cig]	Water [mg/cig]	Nicotine [mg/cig]	Tar [mg/cig]
1680389	785	12.0	55.8	0.390	31.6	1.11	23.1
1680389	780	12.0	54.1	0.310	28.9	1.15	24.0
1680389	779	12.0	57.5	0.310	37.8	1.17	18.5
1680389	785	12.0	51.4	0.310	38.7	1.06	11.7
1680389	789	12.0	56.0	0.310	38.8	1.14	16.0
1680389	796	12.0	55.2	0.310	39.7	1.13	14.3
1680389	784	12.0	51.4	0.310	27.7	1.02	22.8
1680389	787	12.0	53.9	0.310	31.6	1.13	21.2
1680389	801	12.0	58.6	0.390	29.8	1.25	27.6
1680389	781	12.0	50.6	0.310	25.2	0.978	24.5
1680389	791	12.0	55.7	0.390	33.0	1.18	21.5
1680389	795	12.0	56.2	0.310	32.5	1.18	22.5
1680389	784	12.0	50.9	0.230	30.0	1.06	19.9
1680389	783	12.0	50.8	0.310	29.4	1.19	20.3
1680389	789	12.0	57.6	0.310	30.3	1.21	26.1
1680389	792	12.0	53.8	0.390	25.6	1.14	27.1
1680389	786	12.0	54.7	0.310	28.1	1.22	25.3
1680389	786	12.0	56.6	0.310	30.3	1.26	25.0
1680389	785	12.0	54.8	0.310	30.6	1.23	23.0
1680389	775	12.0	54.6	0.390	29.8	1.20	23.6
Average	787	12.0	54.5	0.326	31.5	1.15	21.9
Std. Dev.	6	0.0	2.4	0.042	4.2	0.08	4.2
L. Limit (95%)	784	12.0	53.4	0.306	29.5	1.11	19.9
U. Limit (95%)	790	12.0	55.6	0.346	33.5	1.19	23.9

Table 1b: **Yields of 'Tar', Nicotine and CO in Mainstream Tobacco Smoke: 'Intense' Conditions***

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	CO [mg/cig]	Water [mg/cig]	Nicotine [mg/cig]	Tar [mg/cig]
1680390	783	12.0	55.1	0.310	29.1	1.10	24.8
1680390	794	12.0	56.6	0.310	32.2	1.13	23.2
1680390	798	12.0	40.3	0.230	23.0	0.840	16.4
1680390	789	12.0	56.4	0.310	39.0	1.16	16.2
1680390	789	12.0	56.2	0.310	30.0	1.19	25.1
1680390	794	12.0	54.0	0.310	34.7	1.09	18.2
1680390	801	12.0	57.5	0.310	31.2	1.30	24.9
1680390	787	12.0	56.9	0.310	31.6	1.18	24.1
1680390	785	12.0	54.2	0.310	29.4	1.16	23.6
1680390	803	12.0	57.9	0.310	32.8	1.25	23.8
1680390	790	12.0	55.6	0.390	27.8	1.09	26.7
1680390	787	12.0	55.6	0.310	33.8	1.21	20.6
1680390	788	12.0	54.8	0.310	29.9	1.21	23.6
1680390	799	12.0	57.5	0.390	28.9	1.25	27.4
1680390	787	12.0	57.0	0.310	30.1	1.27	25.5
1680390	793	12.0	55.2	0.390	30.0	1.24	24.0
1680390	783	12.0	53.3	0.310	26.5	1.15	25.7
1680390	790	12.0	55.8	0.310	27.4	1.20	27.1
1680390	790	12.0	55.0	0.310	27.8	1.19	26.0
1680390	792	12.0	54.9	0.310	26.9	1.16	26.9
Average	791	12.0	55.0	0.318	30.1	1.17	23.7
Std. Dev.	6	0.0	3.7	0.036	3.4	0.10	3.3
L. Limit (95%)	788	12.0	53.3	0.301	28.5	1.12	22.1
U. Limit (95%)	794	12.0	56.7	0.335	31.7	1.21	25.3

* puff volume, 55mL; interval, 30 sec; duration, 2 sec; vent blocking, 100%
See text for additional details.

Table 2a: **Yields of Selected 'Carbonyls' in Mainstream Tobacco Smoke: 'ISO' Conditions***

Sample ID	Weight [mg/cig]	Puff Count [per cig]	Formaldehyde [µg/cig]	Acetaldehyde [µg/cig]	Acrolein [µg/cig]	Crotonaldehyde [µg/cig]
1680388	800	6.0	13.0	133	4.92	< 3.29 but ≥ 0.988
1680388	787	6.0	12.1	120	4.28	< 3.29 but ≥ 0.988
1680388	790	6.0	12.0	125	4.42	< 3.29 but ≥ 0.988
1680388	789	6.0	12.2	137	4.66	< 3.29 but ≥ 0.988
1680388	805	6.0	12.1	123	4.25	< 3.29 but ≥ 0.988
1680388	792	6.0	11.9	124	4.10	< 3.29 but ≥ 0.988
1680388	791	6.0	12.3	130	4.64	< 3.29 but ≥ 0.988
Average	793	6.0	12.2	128	4.47	**NQ**
Std. Dev.	6	0.0	0.4	6	0.29	**NQ**
L. Limit (95%)	787	6.0	11.9	122	4.20	N/A
U. Limit (95%)	799	6.0	12.6	133	4.73	N/A
1680389	779	6.0	12.8	132	4.71	< 3.29 but ≥ 0.988
1680389	775	6.0	12.6	127	4.05	< 3.29 but ≥ 0.988
1680389	781	6.0	12.2	123	4.31	< 0.988
1680389	794	6.0	12.6	128	4.51	< 3.29 but ≥ 0.988
1680389	776	6.0	12.2	126	4.20	< 3.29 but ≥ 0.988
1680389	782	6.0	12.8	131	4.41	< 3.29 but ≥ 0.988
1680389	794	6.0	12.4	140	5.12	< 3.29 but ≥ 0.988
Average	783	6.0	12.5	130	4.47	**NQ**
Std. Dev.	8	0.0	0.2	6	0.36	**NQ**
L. Limit (95%)	776	6.0	12.3	125	4.15	N/A
U. Limit (95%)	790	6.0	12.7	135	4.80	N/A

Table 2a: **Yields of Selected 'Carbonyls' in Mainstream Tobacco Smoke: 'ISO' Conditions***

Sample ID	Weight [mg/cig]	Puff Count [per cig]	Formaldehyde [µg/cig]	Acetaldehyde [µg/cig]	Acrolein [µg/cig]	Crotonaldehyde [µg/cig]
1680390	815	6.0	12.5	142	5.13	< 3.29 but ≥ 0.988
1680390	786	6.0	12.3	128	4.28	< 3.29 but ≥ 0.988
1680390	798	6.0	11.4	114	3.58	< 0.988
1680390	799	6.0	11.6	133	4.23	< 3.29 but ≥ 0.988
1680390	794	6.0	12.0	124	4.22	< 3.29 but ≥ 0.988
1680390	800	6.0	12.5	139	4.91	< 3.29 but ≥ 0.988
1680390	785	6.0	12.5	137	4.54	< 3.29 but ≥ 0.988
Average	797	6.0	12.1	131	4.41	**NQ**
Std. Dev.	10	0.0	0.5	10	0.51	**NQ**
L. Limit (95%)	787	6.0	11.7	122	3.94	N/A
U. Limit (95%)	806	6.0	12.5	140	4.89	N/A

* puff volume, 35mL; interval, 60 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Glossary of Abbreviations
NQ: Below the Limit of Quantification
N/A: Not Applicable

Note Regarding EZ Isomerism of Acetaldehyde:
Recent studies have demonstrated a previously unidentified peak to be an isomer of the acetaldehyde hydrazone. Consistent with current practice and the Coresta recommended method (CRM 74), results for acetaldehyde will be increased to reflect the inclusion of this isomer. For comparison to historical data, results from previous projects should be adjusted by 1.27 which takes into account the typical average contribution of the isomer.

Table 2a: **Yields of Selected 'Carbonyls' in Laboratory Reagent BLank: 'ISO' Conditions***

Sample ID	Formaldehyde [µg/cig]	Acetaldehyde [µg/cig]	Acrolein [µg/cig]	Crotonaldehyde [µg/cig]
LRB	9.44	< 3.24 but ≥ 0.973	< 0.713	< 0.988
Average	9.44	**NQ**	**BDL**	**BDL**
Std. Dev.	ND	**NQ**	**BDL**	**BDL**
L. Limit (95%)	ND	ND	ND	ND
U. Limit (95%)	ND	ND	ND	ND

* puff volume, 35mL; interval, 60 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Glossary of Abbreviations
BDL: Below the Limit of Detection
NQ: Below the Limit of Quantification
ND: Not Defined

Note Regarding EZ Isomerism of Acetaldehyde:
Recent studies have demonstrated a previously unidentified peak to be an isomer of the acetaldehyde hydrazone. Consistent with current practice and the Coresta recommended method (CRM 74), results for acetaldehyde will be increased to reflect the inclusion of this isomer. For comparison to historical data, results from previous projects should be adjusted by 1.27 which takes into account the typical average contribution of the isomer.

Table 2b: **Yields of Selected 'Carbonyls' in Mainstream Tobacco Smoke: 'Intense' Conditions***

Sample ID	Weight [mg/cig]	Puff Count [per cig]	Formaldehyde [µg/cig]	Acetaldehyde [µg/cig]	Acrolein [µg/cig]	Crotonaldehyde [µg/cig]
1680388	807	12.0	14.0	183	8.56	< 3.29 but ≥ 0.988
1680388	802	12.0	15.0	181	7.98	< 3.29 but ≥ 0.988
1680388	815	12.0	14.4	178	7.98	< 3.29 but ≥ 0.988
1680388	794	12.0	12.9	191	9.26	< 3.29 but ≥ 0.988
1680388	798	12.0	14.9	195	9.02	< 3.29 but ≥ 0.988
1680388	787	12.0	14.7	190	10.00	< 3.29 but ≥ 0.988
1680388	796	12.0	12.2	191	9.20	< 3.29 but ≥ 0.988
Average	800	12.0	14.0	187	8.86	**NQ**
Std. Dev.	9	0.0	1.0	6	0.74	**NQ**
L. Limit (95%)	791	12.0	13.1	181	8.18	N/A
U. Limit (95%)	808	12.0	15.0	193	9.54	N/A
1680389	798	12.0	14.7	205	10.5	< 3.29 but ≥ 0.988
1680389	809	12.0	15.5	200	9.45	< 3.29 but ≥ 0.988
1680389	801	12.0	11.6	188	8.99	< 3.29 but ≥ 0.988
1680389	782	12.0	12.7	184	8.28	< 3.29 but ≥ 0.988
1680389	795	12.0	12.3	190	8.74	< 3.29 but ≥ 0.988
1680389	802	12.0	11.8	169	8.95	< 3.29 but ≥ 0.988
1680389	800	12.0	12.4	197	9.13	< 3.29 but ≥ 0.988
Average	798	12.0	13.0	190	9.15	**NQ**
Std. Dev.	8	0.0	1.5	12	0.70	**NQ**
L. Limit (95%)	791	12.0	11.6	179	8.50	N/A
U. Limit (95%)	806	12.0	14.4	201	9.80	N/A

Table 2b: **Yields of Selected 'Carbonyls' in Mainstream Tobacco Smoke: 'Intense' Conditions***

Sample ID	Weight [mg/cig]	Puff Count [per cig]	Formaldehyde [µg/cig]	Acetaldehyde [µg/cig]	Acrolein [µg/cig]	Crotonaldehyde [µg/cig]
1680390	806	12.0	13.7	236	NR	< 3.29 but ≥ 0.988
1680390	792	12.0	13.9	196	8.69	< 3.29 but ≥ 0.988
1680390	788	12.0	15.7	203	11.7	< 3.29 but ≥ 0.988
1680390	793	12.0	12.8	219	11.1	< 3.29 but ≥ 0.988
1680390	798	12.0	11.6	190	7.60	< 3.29 but ≥ 0.988
1680390	798	12.0	14.2	194	8.02	< 3.29 but ≥ 0.988
1680390	797	12.0	12.1	182	8.79	< 3.29 but ≥ 0.988
Average	796	12.0	13.4	203	9.31	**NQ**
Std. Dev.	6	0.0	1.4	19	1.68	**NQ**
L. Limit (95%)	791	12.0	12.2	185	7.76	N/A
U. Limit (95%)	801	12.0	14.7	220	10.9	N/A

* puff volume, 55mL; interval, 30 sec; duration, 2 sec; vent blocking, 100%
See text for additional details.

Glossary of Abbreviations
NQ: Below the Limit of Quantification
N/A: Not Applicable
NR: Not Reported

Note Regarding EZ Isomerism of Acetaldehyde:
Recent studies have demonstrated a previously unidentified peak to be an isomer of the acetaldehyde hydrazone. Consistent with current practice and the Coresta recommended method (CRM 74), results for acetaldehyde will be increased to reflect the inclusion of this isomer. For comparison to historical data, results from previous projects should be adjusted by 1.27 which takes into account the typical average contribution of the isomer.

Table 2b: **Yields of Selected 'Carbonyls' in Laboratory Reagent Blank: 'Intense' Conditions***

Sample ID	Formaldehyde [µg/cig]	Acetaldehyde [µg/cig]	Acrolein [µg/cig]	Crotonaldehyde [µg/cig]
LRB	8.00	< 0.973	2.41	< 3.29 but ≥ 0.988
Average	8.00	**BDL**	2.41	**NQ**
Std. Dev.	ND	**BDL**	ND	**NQ**
L. Limit (95%)	ND	ND	ND	ND
U. Limit (95%)	ND	ND	ND	ND

* puff volume, 55mL; interval, 30 sec; duration, 2 sec; vent blocking, 100%
See text for additional details.

Glossary of Abbreviations
BDL: Below the Limit of Detection
NQ: Below the Limit of Quantification
ND: Not Defined

Note Regarding EZ Isomerism of Acetaldehyde:
Recent studies have demonstrated a previously unidentified peak to be an isomer of the acetaldehyde hydrazone. Consistent with current practice and the Coresta recommended method (CRM 74), results for acetaldehyde will be increased to reflect the inclusion of this isomer. For comparison to historical data, results from previous projects should be adjusted by 1.27 which takes into account the typical average contribution of the isomer.

Table 8a: Yields of Ammonia in Mainstream Tobacco Smoke: 'ISO' Conditions*

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	Ammonia [µg/cig]
1680388	795	6.0	23.0	2.93
1680388	787	6.0	23.1	2.59
1680388	786	6.0	21.3	1.69
1680388	790	6.0	21.6	1.97
1680388	780	6.0	22.3	2.55
1680388	800	6.0	24.2	2.41
1680388	792	6.0	23.4	2.75
Average	790	6.0	22.7	2.41
Std. Dev.	6	0.0	1.0	0.44
L. Limit (95%)	784	6.0	21.8	2.01
U. Limit (95%)	796	6.0	23.6	2.82
1680389	782	6.0	23.9	2.72
1680389	781	6.0	22.4	2.50
1680389	786	6.0	26.0	3.01
1680389	781	6.0	25.1	3.28
1680389	779	6.0	24.0	2.28
1680389	780	6.0	26.3	2.17
1680389	778	6.0	24.6	2.78
Average	781	6.0	24.6	2.68
Std. Dev.	3	0.0	1.4	0.40
L. Limit (95%)	779	6.0	23.4	2.31
U. Limit (95%)	784	6.0	25.9	3.04
1680390	796	6.0	25.7	2.44
1680390	779	6.0	25.7	2.07
1680390	773	6.0	23.5	2.65
1680390	787	6.0	23.4	2.16
1680390	786	6.0	24.1	2.34
1680390	786	6.0	23.8	3.23
1680390	779	6.0	23.8	2.57
Average	784	6.0	24.3	2.49
Std. Dev.	7	0.0	1.0	0.39
L. Limit (95%)	777	6.0	23.4	2.14
U. Limit (95%)	791	6.0	25.2	2.85

* puff volume, 35mL; interval, 60 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Table 8b: Yields of Ammonia in Mainstream Tobacco Smoke: 'Intense' Conditions*

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	Ammonia [µg/cig]
1680388	793	12.0	56.1	12.1
1680388	787	12.0	52.7	10.7
1680388	790	12.0	54.3	11.4
1680388	791	12.0	53.4	11.4
1680388	795	12.0	53.8	10.1
1680388	805	12.0	55.1	10.1
1680388	786	12.0	51.0	9.80
Average	792	12.0	53.8	10.8
Std. Dev.	6	0.0	1.7	0.9
L. Limit (95%)	787	12.0	52.2	10.0
U. Limit (95%)	798	12.0	55.3	11.6
1680389	790	12.0	55.6	11.2
1680389	794	12.0	54.6	10.4
1680389	799	12.0	54.5	9.90
1680389	791	12.0	54.8	11.2
1680389	779	12.0	54.4	10.1
1680389	785	12.0	51.6	12.0
1680389	779	12.0	52.7	11.4
Average	788	12.0	54.0	10.9
Std. Dev.	8	0.0	1.4	0.8
L. Limit (95%)	781	12.0	52.7	10.2
U. Limit (95%)	795	12.0	55.3	11.6
1680390	787	12.0	54.9	12.0
1680390	790	12.0	52.4	10.3
1680390	788	12.0	55.3	10.7
1680390	794	12.0	53.5	10.9
1680390	780	12.0	52.1	10.9
1680390	793	12.0	50.6	10.1
1680390	789	12.0	53.4	10.8
Average	789	12.0	53.2	10.8
Std. Dev.	5	0.0	1.6	0.6
L. Limit (95%)	784	12.0	51.7	10.3
U. Limit (95%)	793	12.0	54.7	11.4

* puff volume, 55mL; interval, 30 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Table 16a: Yields of Benzo(a)pyrene in Particulate Phase of Mainstream Tobacco Smoke: 'ISO' Conditions*

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	Benzo(a) pyrene [ng/cig]
1680388	792	6.0	16.0	< 0.354 but ≥ 0.106
1680388	792	6.0	16.0	0.360
1680388	792	6.0	16.0	0.360
1680388	807	6.0	19.9	0.440
1680388	794	6.0	14.4	0.360
1680388	804	6.0	15.3	0.360
1680388	798	6.0	23.7	0.400
Average	797	6.0	17.3	0.359
Std. Dev.	6	0.0	3.3	0.064
L. Limit (95%)	791	6.0	14.3	0.299
U. Limit (95%)	803	6.0	20.4	0.418
1680389	792	6.0	16.0	< 0.354 but ≥ 0.106
1680389	792	6.0	16.0	0.360
1680389	792	6.0	16.0	< 0.354 but ≥ 0.106
1680389	799	6.0	15.9	< 0.354 but ≥ 0.106
1680389	797	6.0	18.6	0.360
1680389	786	6.0	15.9	< 0.354 but ≥ 0.106
1680389	777	6.0	24.5	0.400
Average	791	6.0	17.5	**NQ**
Std. Dev.	7	0.0	3.2	**NQ**
L. Limit (95%)	784	6.0	14.6	N/A
U. Limit (95%)	798	6.0	20.5	N/A
1680390	792	6.0	16.0	< 0.354 but ≥ 0.106
1680390	792	6.0	16.0	0.400
1680390	792	6.0	16.0	< 0.354 but ≥ 0.106
1680390	792	6.0	16.0	< 0.354 but ≥ 0.106
1680390	792	6.0	16.0	< 0.354 but ≥ 0.106
1680390	799	6.0	22.1	0.400
1680390	798	6.0	15.6	0.360
Average	794	6.0	16.8	**NQ**
Std. Dev.	3	0.0	2.4	**NQ**
L. Limit (95%)	791	6.0	14.6	N/A
U. Limit (95%)	797	6.0	19.0	N/A

* puff volume, 35mL; interval, 60 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Glossary of Abbreviations
NQ: Below the Limit of Quantification
N/A: Not Applicable

Table 16a: Yields of Benzo(a)pyrene in Particulate Phase of Laboratory Reagent Blank: 'ISO' Conditions*

Sample ID	Benzo(a) pyrene [ng/cig]
LRB	< 0.106
Average	**BDL**
Std. Dev.	**BDL**
L. Limit (95%)	ND
U. Limit (95%)	ND

* puff volume, 35mL; interval, 60 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Glossary of Abbreviations
BDL: Below the Limit of Detection
ND: Not Defined

Table 16g: Yields of Benzo(a)pyrene in Particulate Phase of Mainstream Tobacco Smoke: 'Intense' Conditions*

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	Benzo(a) pyrene [ng/cig]
1680388	780	12.0	52.2	0.624
1680388	780	12.0	52.2	0.728
1680388	780	12.0	52.2	0.560
1680388	799	12.0	52.0	0.664
1680388	795	12.0	51.7	0.712
1680388	790	12.0	49.2	0.720
1680388	802	12.0	51.9	0.624
Average	789	12.0	51.6	0.662
Std. Dev.	10	0.0	1.1	0.063
L. Limit (95%)	780	12.0	50.6	0.604
U. Limit (95%)	798	12.0	52.7	0.720
1680389	780	12.0	52.2	0.608
1680389	780	12.0	52.2	0.712
1680389	780	12.0	52.2	0.704
1680389	780	12.0	52.2	0.640
1680389	776	12.0	52.2	0.688
1680389	771	12.0	51.2	0.736
1680389	784	12.0	51.6	0.624
Average	779	12.0	52.0	0.673
Std. Dev.	4	0.0	0.4	0.049
L. Limit (95%)	775	12.0	51.6	0.628
U. Limit (95%)	782	12.0	52.4	0.718
1680390	780	12.0	52.2	0.560
1680390	780	12.0	52.2	0.632
1680390	780	12.0	52.2	0.632
1680390	780	12.0	52.2	0.640
1680390	788	12.0	47.4	0.640
1680390	786	12.0	50.8	0.608
1680390	783	12.0	52.5	0.680
Average	782	12.0	51.4	0.627
Std. Dev.	3	0.0	1.8	0.037
L. Limit (95%)	779	12.0	49.7	0.594
U. Limit (95%)	785	12.0	53.1	0.661

* puff volume, 55mL; interval, 30 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Table 16g: Yields of Benzo(a)pyrene in Particulate Phase of Laboratory Reagent Blank: 'Intense' Conditions*

Sample ID	Benzo(a) pyrene [ng/cig]
LRB	< 0.106
Average	**BDL**
Std. Dev.	**BDL**
L. Limit (95%)	ND
U. Limit (95%)	ND

* puff volume, 55mL; interval, 30 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Glossary of Abbreviations
BDL: Below the Limit of Detection
ND: Not Defined

Table 18a: **Yields of Selected Aromatic Amines in Mainstream Tobacco Smoke: 'ISO' Conditions***

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	1-amino-naphthalene [ng/cig]	2-amino-naphthalene [ng/cig]	4-amino-biphenyl [ng/cig]
1680388	793	6.0	24.5	< 0.027 but ≥ 0.008	< 0.012 but ≥ 0.004	0.006
1680388	801	6.0	24.2	< 0.027 but ≥ 0.008	< 0.012 but ≥ 0.004	< 0.005 but ≥ 0.001
1680388	793	6.0	25.6	< 0.027 but ≥ 0.008	< 0.012 but ≥ 0.004	0.005
1680388	794	6.0	25.3	< 0.027 but ≥ 0.008	< 0.012 but ≥ 0.004	< 0.005 but ≥ 0.001
1680388	797	6.0	27.1	< 0.027 but ≥ 0.008	< 0.012 but ≥ 0.004	0.005
1680388	795	6.0	24.5	< 0.027 but ≥ 0.008	< 0.012 but ≥ 0.004	< 0.005 but ≥ 0.001
1680388	794	6.0	26.3	< 0.027 but ≥ 0.008	< 0.012 but ≥ 0.004	0.005
Average	795	6.0	25.4	**NQ**	**NQ**	**NQ**
Std. Dev.	3	0.0	1.1	**NQ**	**NQ**	**NQ**
L. Limit (95%)	793	6.0	24.4	N/A	N/A	N/A
U. Limit (95%)	798	6.0	26.3	N/A	N/A	N/A
1680389	783	6.0	25.3	< 0.027 but ≥ 0.008	< 0.012 but ≥ 0.004	0.006
1680389	790	6.0	25.5	< 0.027 but ≥ 0.008	< 0.012 but ≥ 0.004	< 0.005 but ≥ 0.001
1680389	782	6.0	26.2	< 0.027 but ≥ 0.008	< 0.012 but ≥ 0.004	< 0.005 but ≥ 0.001
1680389	786	6.0	26.9	< 0.027 but ≥ 0.008	< 0.012 but ≥ 0.004	< 0.005 but ≥ 0.001
1680389	786	6.0	26.6	< 0.027 but ≥ 0.008	< 0.012 but ≥ 0.004	< 0.005 but ≥ 0.001
1680389	783	6.0	25.2	< 0.027 but ≥ 0.008	< 0.012 but ≥ 0.004	< 0.005 but ≥ 0.001
1680389	772	6.0	28.4	0.038	0.022	0.006
Average	783	6.0	26.3	**NQ**	**NQ**	**NQ**
Std. Dev.	6	0.0	1.1	**NQ**	**NQ**	**NQ**
L. Limit (95%)	778	6.0	25.2	N/A	N/A	N/A
U. Limit (95%)	788	6.0	27.4	N/A	N/A	N/A

Table 18a: **Yields of Selected Aromatic Amines in Mainstream Tobacco Smoke: 'ISO' Conditions***

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	1-amino-naphthalene [ng/cig]	2-amino-naphthalene [ng/cig]	4-amino-biphenyl [ng/cig]
1680390	793	6.0	26.2	< 0.027 but ≥ 0.008	< 0.012 but ≥ 0.004	0.005
1680390	793	6.0	24.8	0.063	0.054	0.012
1680390	796	6.0	26.0	0.049	0.057	0.012
1680390	791	6.0	25.8	0.051	0.073	0.016
1680390	793	6.0	25.3	< 0.027 but ≥ 0.008	< 0.012 but ≥ 0.004	0.005
1680390	790	6.0	27.9	0.031	0.030	0.009
1680390	797	6.0	27.5	< 0.027 but ≥ 0.008	< 0.012 but ≥ 0.004	0.005
Average	793	6.0	26.2	0.035	0.034	0.009
Std. Dev.	2	0.0	1.1	0.019	0.027	0.004
L. Limit (95%)	791	6.0	25.2	0.018	0.008	0.005
U. Limit (95%)	796	6.0	27.3	0.053	0.059	0.013

* puff volume, 35mL; interval, 60 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Glossary of Abbreviations
NQ: Below the Limit of Quantification
N/A: Not Applicable

Table 18b: **Yields of Selected Aromatic Amines in Mainstream Tobacco Smoke: 'Intense' Conditions***

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	1-amino-naphthalene [ng/cig]	2-amino-naphthalene [ng/cig]	4-amino-biphenyl [ng/cig]
1680388	799	12.0	56.1	0.041	0.022	0.006
1680388	793	12.0	54.4	0.035	0.019	0.009
1680388	790	12.0	55.9	0.055	0.033	0.009
1680388	790	12.0	53.4	< 0.027 but ≥ 0.008	0.012	0.008
1680388	791	12.0	55.9	0.045	0.033	0.010
1680388	801	12.0	55.3	0.028	0.017	0.008
1680388	797	12.0	52.9	< 0.027 but ≥ 0.008	0.019	0.008
Average	794	12.0	54.8	0.034	0.022	0.008
Std. Dev.	5	0.0	1.3	0.014	0.008	0.001
L. Limit (95%)	790	12.0	53.6	0.021	0.015	0.007
U. Limit (95%)	799	12.0	56.0	0.047	0.030	0.009
1680389	794	12.0	56.6	0.035	0.016	0.009
1680389	791	12.0	49.3	< 0.027 but ≥ 0.008	0.017	0.007
1680389	794	12.0	54.8	0.048	0.028	0.008
1680389	791	12.0	57.6	0.051	0.020	0.009
1680389	793	12.0	58.4	0.043	0.034	0.009
1680389	797	12.0	54.4	< 0.027 but ≥ 0.008	0.016	0.010
1680389	799	12.0	57.7	0.043	0.025	0.010
Average	794	12.0	55.5	0.036	0.022	0.009
Std. Dev.	3	0.0	3.1	0.014	0.007	0.001
L. Limit (95%)	791	12.0	52.6	0.024	0.016	0.008
U. Limit (95%)	797	12.0	58.4	0.049	0.029	0.010

Table 18b: **Yields of Selected Aromatic Amines in Mainstream Tobacco Smoke: 'Intense' Conditions***

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	1-amino-naphthalene [ng/cig]	2-amino-naphthalene [ng/cig]	4-amino-biphenyl [ng/cig]
1680390	788	12.0	57.1	0.046	0.032	0.010
1680390	790	12.0	57.6	0.030	0.016	0.008
1680390	794	12.0	53.0	0.052	0.023	0.008
1680390	796	12.0	56.7	0.075	0.101	0.021
1680390	790	12.0	55.0	0.028	0.016	0.005
1680390	795	12.0	52.9	< 0.027 but ≥ 0.008	0.016	0.012
1680390	794	12.0	56.7	0.032	< 0.012 but ≥ 0.004	0.009
Average	792	12.0	55.6	0.040	0.030	0.010
Std. Dev.	3	0.0	2.0	0.019	0.032	0.005
L. Limit (95%)	790	12.0	53.8	0.022	0.001	0.006
U. Limit (95%)	795	12.0	57.4	0.058	0.060	0.015

* puff volume, 55mL; interval, 30 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Table 18b: **Yields of Selected Aromatic Amines in Laboratory Reagent Blank: 'Intense' Conditions***

Sample ID	1-amino-naphthalene [ng/cig]	2-amino-naphthalene [ng/cig]	4-amino-biphenyl [ng/cig]
LRB	< 0.008	0.013	0.006
Average	**BDL**	0.013	0.006
Std. Dev.	**BDL**	ND	ND
L. Limit (95%)	ND	ND	ND
U. Limit (95%)	ND	ND	ND

* puff volume, 55mL; interval, 30 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Glossary of Abbreviations
BDL: Below the Limit of Detection
ND: Not Defined

Table 19a: **Yields of Various Volatile Organics in Mainstream Tobacco Smoke: 'ISO' Conditions***

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	Gas Phase				
				1,3-butadiene [µg/cig]	Isoprene [µg/cig]	Acrylonitrile [µg/cig]	Benzene [µg/cig]	Toluene [µg/cig]
1680388	793	6.0	24.5	0.102	0.800	< 0.107 but ≥ 0.032	0.198	0.595
1680388	801	6.0	24.2	0.103	0.680	< 0.107 but ≥ 0.032	0.164	0.546
1680388	793	6.0	25.6	< 0.095 but ≥ 0.029	0.760	< 0.107 but ≥ 0.032	0.174	0.569
1680388	794	6.0	25.3	< 0.095 but ≥ 0.029	0.640	< 0.107 but ≥ 0.032	0.143	0.448
1680388	797	6.0	27.1	0.100	0.740	< 0.107 but ≥ 0.032	0.156	0.489
1680388	795	6.0	24.5	0.096	0.660	< 0.107 but ≥ 0.032	0.152	0.510
1680388	794	6.0	26.3	< 0.095 but ≥ 0.029	0.580	< 0.107 but ≥ 0.032	0.152	0.428
Average	795	6.0	25.4	**NQ**	0.694	**NQ**	0.163	0.512
Std. Dev.	3	0.0	1.1	**NQ**	0.076	**NQ**	0.018	0.062
L. Limit (95%)	793	6.0	24.4	N/A	0.624	N/A	0.146	0.455
U. Limit (95%)	798	6.0	26.3	N/A	0.765	N/A	0.180	0.570
1680389	783	6.0	25.3	0.104	0.780	< 0.107 but ≥ 0.032	0.192	0.619
1680389	790	6.0	25.5	0.105	0.880	< 0.107 but ≥ 0.032	0.196	0.637
1680389	782	6.0	26.2	< 0.095 but ≥ 0.029	0.820	< 0.107 but ≥ 0.032	0.160	0.513
1680389	786	6.0	26.9	0.105	0.840	< 0.107 but ≥ 0.032	0.170	0.448
1680389	786	6.0	26.6	0.108	0.960	< 0.107 but ≥ 0.032	0.200	0.585
1680389	783	6.0	25.2	< 0.095 but ≥ 0.029	0.760	< 0.107 but ≥ 0.032	0.178	0.533
1680389	772	6.0	28.4	0.115	0.960	< 0.107 but ≥ 0.032	0.202	0.603
Average	783	6.0	26.3	**NQ**	0.857	**NQ**	0.185	0.563
Std. Dev.	6	0.0	1.1	**NQ**	0.080	**NQ**	0.016	0.067
L. Limit (95%)	778	6.0	25.2	N/A	0.783	N/A	0.170	0.500
U. Limit (95%)	788	6.0	27.4	N/A	0.931	N/A	0.200	0.625

Table 19a: **Yields of Various Volatile Organics in Mainstream Tobacco Smoke: 'ISO' Conditions***

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	Gas Phase				
				1,3-butadiene [µg/cig]	Isoprene [µg/cig]	Acrylonitrile [µg/cig]	Benzene [µg/cig]	Toluene [µg/cig]
1680390	793	6.0	26.2	0.100	0.720	< 0.107 but ≥ 0.032	0.145	0.643
1680390	793	6.0	24.8	0.095	0.680	< 0.107 but ≥ 0.032	0.159	0.518
1680390	796	6.0	26.0	0.095	0.720	< 0.107 but ≥ 0.032	0.145	0.482
1680390	791	6.0	25.8	0.097	0.720	< 0.107 but ≥ 0.032	0.164	0.450
1680390	793	6.0	25.3	0.100	0.740	< 0.107 but ≥ 0.032	0.161	0.437
1680390	790	6.0	27.9	0.098	0.820	< 0.107 but ≥ 0.032	0.200	0.631
1680390	797	6.0	27.5	0.120	0.960	< 0.107 but ≥ 0.032	0.214	0.677
Average	793	6.0	26.2	0.101	0.766	**NQ**	0.170	0.548
Std. Dev.	2	0.0	1.1	0.009	0.096	**NQ**	0.027	0.100
L. Limit (95%)	791	6.0	25.2	0.093	0.677	N/A	0.145	0.456
U. Limit (95%)	796	6.0	27.3	0.109	0.854	N/A	0.194	0.640

* puff volume, 35mL; interval, 60 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Glossary of Abbreviations
NQ: Below the Limit of Quantification
N/A: Not Applicable

Table 19a: Yields of Various Volatile Organics in Laboratory Reagent Blank: 'ISO' Conditions*

Sample ID	Gas Phase				
	1,3-butadiene [µg/cig]	Isoprene [µg/cig]	Acrylonitrile [µg/cig]	Benzene [µg/cig]	Toluene [µg/cig]
LRB	< 0.029	< 0.041	< 0.032	< 0.017	< 0.061
LRB	< 0.029	< 0.041	< 0.032	< 0.017	< 0.061
Average	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
Std. Dev.	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
L. Limit (95%)	ND	ND	ND	ND	ND
U. Limit (95%)	ND	ND	ND	ND	ND

* puff volume, 35mL; interval, 60 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Glossary of Abbreviations
BDL: Below the Limit of Detection
ND: Not Defined

Table 19b: **Yields of Various Volatile Organics in Mainstream Tobacco Smoke: 'Intense' Conditions***

Sample ID	Weight	Puff Count	MS TPM	Gas Phase				
				1,3-butadiene	Isoprene	Acrylonitrile	Benzene	Toluene
	[mg/cig]	[per cig]	[mg/cig]	[µg/cig]	[µg/cig]	[µg/cig]	[µg/cig]	[µg/cig]
1680388	799	12.0	56.1	0.201	1.46	0.139	0.476	1.50
1680388	793	12.0	54.4	0.187	1.30	< 0.107 but ≥ 0.032	0.420	1.27
1680388	790	12.0	55.9	0.215	1.46	0.123	0.420	1.28
1680388	790	12.0	53.4	0.208	1.34	0.139	0.428	1.36
1680388	791	12.0	55.9	0.239	1.34	0.110	0.399	1.31
1680388	801	12.0	55.3	0.201	1.44	0.129	0.463	1.51
1680388	797	12.0	52.9	0.190	1.20	0.120	0.415	1.32
Average	794	12.0	54.8	0.206	1.36	0.118	0.432	1.36
Std. Dev.	5	0.0	1.3	0.018	0.10	0.024	0.028	0.10
L. Limit (95%)	790	12.0	53.6	0.189	1.27	0.096	0.406	1.27
U. Limit (95%)	799	12.0	56.0	0.222	1.45	0.141	0.457	1.46
1680389	794	12.0	56.6	0.239	1.78	0.119	0.644	1.82
1680389	797	12.0	57.8	0.225	1.40	0.113	0.444	1.20
1680389	794	12.0	54.8	0.221	1.50	0.111	0.397	1.14
1680389	791	12.0	57.6	0.225	1.48	< 0.107 but ≥ 0.032	0.414	1.20
1680389	793	12.0	58.4	0.221	1.50	0.132	0.392	1.19
1680389	797	12.0	54.4	0.220	1.63	0.143	0.447	1.29
1680389	799	12.0	57.7	0.220	1.75	0.151	0.581	1.95
Average	795	12.0	56.7	0.224	1.58	0.120	0.474	1.40
Std. Dev.	3	0.0	1.6	0.007	0.14	0.027	0.099	0.34
L. Limit (95%)	793	12.0	55.3	0.218	1.44	0.095	0.383	1.09
U. Limit (95%)	798	12.0	58.2	0.231	1.71	0.144	0.565	1.71

Table 19b: **Yields of Various Volatile Organics in Mainstream Tobacco Smoke: 'Intense' Conditions***

Sample ID	Weight	Puff Count	MS TPM	Gas Phase				
				1,3-butadiene	Isoprene	Acrylonitrile	Benzene	Toluene
	[mg/cig]	[per cig]	[mg/cig]	[µg/cig]	[µg/cig]	[µg/cig]	[µg/cig]	[µg/cig]
1680390	788	12.0	57.1	0.219	1.44	0.143	0.413	1.22
1680390	786	12.0	57.0	0.209	1.44	0.118	0.401	1.16
1680390	790	12.0	57.6	0.208	1.40	0.110	0.453	1.43
1680390	794	12.0	53.0	0.239	1.48	< 0.107 but ≥ 0.032	0.383	1.17
1680390	796	12.0	56.7	0.250	1.75	0.133	0.438	1.32
1680390	790	12.0	55.0	0.269	1.90	0.147	0.571	1.98
1680390	795	12.0	52.9	0.193	1.40	0.122	0.488	1.48
Average	791	12.0	55.6	0.226	1.54	0.120	0.450	1.39
Std. Dev.	4	0.0	2.0	0.027	0.20	0.026	0.064	0.29
L. Limit (95%)	788	12.0	53.8	0.202	1.36	0.096	0.390	1.13
U. Limit (95%)	795	12.0	57.5	0.251	1.73	0.145	0.509	1.66

* puff volume, 55mL; interval, 30 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Table 19b: Yields of Various Volatile Organics in Laboratory Reagent Blank: 'Intense' Conditions*

Sample ID	Gas Phase				
	1,3-butadiene [µg/cig]	Isoprene [µg/cig]	Acrylonitrile [µg/cig]	Benzene [µg/cig]	Toluene [µg/cig]
LRB	< 0.029	< 0.041	< 0.032	< 0.017	< 0.061
Average	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
Std. Dev.	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
L. Limit (95%)	ND	ND	ND	ND	ND
U. Limit (95%)	ND	ND	ND	ND	ND

* puff volume, 55mL; interval, 30 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Glossary of Abbreviations
BDL: Below the Limit of Detection
ND: Not Defined

Yields of Tobacco Specific Nitrosamines in Mainstream Tobacco Smoke (LC-MS/MS Method): 'ISO' Conditions*

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	NNN [ng/cig]	NNK [ng/cig]
1680388	798	6.0	28.6	3.64	2.35
1680388	802	6.0	27.3	3.00	2.36
1680388	823	6.0	27.3	3.26	2.40
1680388	809	6.0	29.6	3.25	2.80
1680388	811	6.0	29.7	3.80	2.79
1680388	812	6.0	33.2	3.86	3.18
1680388	813	6.0	33.1	3.65	3.02
Average	810	6.0	29.8	3.49	2.70
Std. Dev.	8	0.0	2.4	0.33	0.34
L. Limit (95%)	802	6.0	27.6	3.19	2.39
U. Limit (95%)	817	6.0	32.1	3.80	3.01
1680389	813	6.0	31.3	2.44	1.67
1680389	805	6.0	30.7	3.44	2.50
1680389	810	6.0	29.8	2.44	2.04
1680389	801	6.0	32.1	3.98	3.20
1680389	822	6.0	32.2	3.94	3.24
1680389	809	6.0	30.5	3.17	2.36
1680389	814	6.0	33.0	3.64	3.08
Average	810	6.0	31.4	3.29	2.58
Std. Dev.	7	0.0	1.1	0.65	0.61
L. Limit (95%)	804	6.0	30.4	2.69	2.02
U. Limit (95%)	817	6.0	32.4	3.89	3.15
1680390	805	6.0	30.3	4.32	3.00
1680390	799	6.0	28.7	3.71	2.22
1680390	813	6.0	29.2	3.08	2.65
1680390	809	6.0	31.5	3.70	3.27
1680390	823	6.0	33.5	3.60	3.06
1680390	811	6.0	29.2	3.94	3.39
1680390	810	6.0	29.8	4.40	3.16
Average	810	6.0	30.3	3.82	2.96
Std. Dev.	7	0.0	1.7	0.45	0.40
L. Limit (95%)	803	6.0	28.7	3.41	2.59
U. Limit (95%)	817	6.0	31.9	4.24	3.34

* puff volume, 35mL; interval, 60 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Yields of Tobacco Specific Nitrosamines in Laboratory Reagent Blank (LC-MS/MS Method): 'ISO' Conditions*

Sample ID	NNN [ng/cig]	NNK [ng/cig]
LRB	< 0.098	< 0.151
Average	**BDL**	**BDL**
Std. Dev.	**BDL**	**BDL**
L. Limit (95%)	ND	ND
U. Limit (95%)	ND	ND

* puff volume, 35mL; interval, 60 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Glossary of Abbreviations
BDL: Below the Limit of Detection
ND: Not Defined

Yields of Tobacco Specific Nitrosamines in Mainstream Tobacco Smoke (LC-MS/MS Method): 'Intense' Conditions*

Sample ID	Weight [mg/cig]	Puff Count [per cig]	MS TPM [mg/cig]	NNN [ng/cig]	NNK [ng/cig]
1680388	792	12.0	56.3	10.5	9.36
1680388	797	12.0	55.4	8.80	8.72
1680388	798	12.0	56.6	9.76	8.64
1680388	793	12.0	56.4	10.7	8.68
1680388	799	12.0	53.0	10.0	7.92
1680388	799	12.0	53.1	9.76	8.56
1680388	789	12.0	54.4	9.84	8.04
Average	795	12.0	55.0	9.91	8.56
Std. Dev.	4	0.0	1.5	0.62	0.48
L. Limit (95%)	792	12.0	53.6	9.34	8.12
U. Limit (95%)	799	12.0	56.5	10.48	9.00
1680389	780	12.0	53.2	8.24	6.92
1680389	777	12.0	54.9	9.08	7.96
1680389	786	12.0	55.6	8.12	9.60
1680389	787	12.0	55.5	8.52	8.60
1680389	781	12.0	54.3	8.60	8.12
1680389	791	12.0	54.9	8.68	7.40
1680389	780	12.0	55.0	9.28	7.80
Average	783	12.0	54.8	8.65	8.06
Std. Dev.	5	0.0	0.8	0.42	0.86
L. Limit (95%)	778	12.0	54.0	8.26	7.26
U. Limit (95%)	788	12.0	55.5	9.03	8.86
1680390	783	12.0	54.5	10.2	7.44
1680390	791	12.0	55.0	9.60	8.32
1680390	795	12.0	54.4	7.80	8.84
1680390	792	12.0	54.2	8.20	7.64
1680390	791	12.0	53.2	9.72	7.68
1680390	789	12.0	55.2	9.24	7.04
1680390	791	12.0	55.7	8.96	9.08
Average	790	12.0	54.6	9.10	8.01
Std. Dev.	4	0.0	0.8	0.85	0.76
L. Limit (95%)	787	12.0	53.9	8.31	7.31
U. Limit (95%)	794	12.0	55.3	9.88	8.71

* puff volume, 55mL; interval, 30 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Yields of Tobacco Specific Nitrosamines in Laboratory Reagent Blank (LC-MS/MS Method): 'Intense' Conditions*

Sample ID	NNN [ng/cig]	NNK [ng/cig]
LRB	< 0.098	< 0.151
Average	**BDL**	**BDL**
Std. Dev.	**BDL**	**BDL**
L. Limit (95%)	ND	ND
U. Limit (95%)	ND	ND

* puff volume, 55mL; interval, 30 sec; duration, 2 sec; vent blocking, 0%
See text for additional details.

Glossary of Abbreviations
BDL: Below the Limit of Detection
ND: Not Defined

13 APPENDIX B: "RAW" DATA AND SUMMARY STATISTICS: PROCESSED TOBACCO

Labstat Sample ID	SMP Description	Qty/Type Received	Type of Product	Type of Analysis
1680391	SMP060627	1/box	sticks	tobacco constituents
1680392	SMP060628	1/box	sticks	tobacco constituents
1680393	SMP060629	1/box	sticks	tobacco constituents

Limits of Detection (LOD) and Limits of Quantification (LOQ) Determined for Selected Constituents in Processed Tobacco

Health Canada Method	Analyte	Units	Processed Tobacco	
			LOD	LOQ
	Alkaloids			
T-301	Nicotine	µg/g (dry wt)	75.0	250
	Ammonia			
T-302	Ammonia	µg/g (dry wt)	18.0	60.0
	Toxic Trace Metals			
T-306*	Cadmium	ng/g (dry wt)	8.23	27.4
T-306*	Arsenic	ng/g (dry wt)	7.01	23.4

Abbreviations: BDL, below detection limit; NQ, below quantitation limit; N/A, not applicable
Date of last review: May 30, 2012

NOTE: The above limits referred to samples processed as required by the referenced Health Canada Method (ie. either "as received" or "dried"). Corrections for the moisture content, determined independently, must be applied where applicable in order to convert the "as received" limits to limits expressed on a "dry weight" basis.

*NOTE: The LOD and LOQ are based on the lowest standard concentration used for calibration of the instruments as referenced in the Health Canada Method.

LOD Definition: The limit of detection (LOD) for a particular analyte is a statistically defined decision point that, with a specified probability, measured results falling at or above this point are interpreted to indicate an analyte concentration greater than zero within the sample.

LOQ Definition: The limit of quantification for a particular analyte is another statistically defined decision point that results falling at or above this point can be assigned a statistically significant numerical value with an associated level of precision. Values falling between the LOD and LOQ are interpreted as a positive but not quantifiable result for the analyte in question.

*Methods have been modified from the standard methods.

Limits of Detection (LOD) and Limits of Quantification (LOQ) Determined for Selected Constituents in Processed Tobacco

Labstat Method	Analyte	Units	Processed Tobacco	
			LOD	LOQ
	Tobacco Specific Nitrosamines (LC-MS/MS)			
TWT-00333	Nitrosonornicotine (NNN)	ng/g (as rec'd)	0.985	3.28
TWT-00333	4-(N-nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK)	ng/g (as rec'd)	1.51	5.02

Abbreviations: BDL, below detection limit; NQ, below quantitation limit; N/A, not applicable
Date of last review: August 12, 2013

NOTE: The above limits referred to samples processed as required by the referenced Health Canada Method (i.e. either "as received" or "dried"). Corrections for the moisture content, determined independently, must be applied where applicable in order to convert the "as received" limits to limits expressed on a "dry weight" basis.

**NOTE: The LOD and LOQ are based on the lowest standard concentration used for calibration of the instruments as referenced in the Health Canada Method.

LOD Definition: The limit of detection (LOD) for a particular analyte is a statistically defined decision point that, with a specified probability, measured results falling at or above this point are interpreted to indicate an analyte concentration greater than zero within the sample.

LOQ Definition: The limit of quantification for a particular analyte is another statistically defined decision point that results falling at or above this point can be assigned a statistically significant numerical value with an associated level of precision. Values falling between the LOD and LOQ are interpreted as a positive but not quantifiable result for the analyte in question.

Weight of Tobacco in Bidi, Cigarette, Cigar, Tobacco Stick or Kretek Samples (milligrams of tobacco per unit 'as received')*

	Sample ID		
Obs.	1680391	1680392	1680393
1	280.6	291.9	297.2
2	279.1	275.1	283.2
3	285.8	310.5	305.1
4	270.7	311.0	300.2
5	296.4	278.2	294.5
6	290.1	304.0	306.1
7	297.4	282.7	296.9
8	298.7	307.0	292.6
9	262.5	291.4	280.6
10	281.4	292.1	278.5
Average	284.3	294.4	293.5
Std. Dev	11.9	13.2	9.8
L. Limit (95%)	275.8	284.9	286.5
U. Limit (95%)	292.8	303.9	300.5

Weight of Tobacco in Bidi, Cigarette, Cigar, Tobacco Stick or Kretek Samples (milligrams of tobacco per unit 'dry weight')**

Sample ID	Tobacco Weight (mg/unit)	Dry Matter (%)	Tobacco Weight (mg/unit) 'dry weight'
1680391	284.3	85.9	244.2
1680392	294.4	86.0	253.1
1680393	293.5	85.9	252.1

* as required in part 3, section 14 (2)c of the Canadian Tobacco Reporting Regulations

** as required in part 2, section 12 (6) and 12 (7)ci. of the Canadian Tobacco Reporting Regulations

Tobacco Constituent	Matrix Code / Sample ID / Unit	WT 1680391 Average	WT 1680391 Std. Dev.	WT 1680391 L. Limit (95%)	WT 1680391 U. Limit (95%)	WT 1680392 Average	WT 1680392 Std. Dev.	WT 1680392 L. Limit (95%)	WT 1680392 U. Limit (95%)
Alkaloids									
Nicotine	[µg/g]	17942	184	17772	18112	17827	206	17637	18017
Ammonia									
Ammonia	[µg/g]	431	6	425	437	437	4	433	440
Toxic Trace Metals									
Cadmium	[ng/g]	656	4	652	660	659	5	655	664
Arsenic	[ng/g]	141	4	137	144	142	2	141	144
Tobacco Specific Nitrosamines (LC-MS/MS)									
Nitrosonornicotine (NNN)	[ng/g]	362	50	316	408	412	57	359	464
4-(N-nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK)	[ng/g]	184	17	168	199	183	10	173	192
Water									
Dry Matter	(%)	85.9	0.3	85.6	86.2	86.0	0.4	85.6	86.3
Moisture	(%)	14.1	0.3	13.8	14.4	14.0	0.4	13.7	14.4

Glossary of Abbreviations

L. Limit (95%): lower limit of the 95% confidence interval

U. Limit (95%): upper limit of the 95% confidence interval

Tobacco Constituent	Matrix Code Sample ID Unit	WT 1680393 Average	WT 1680393 Std. Dev.	WT 1680393 L. Limit (95%)	WT 1680393 U. Limit (95%)
Alkaloids					
Nicotine	[µg/g]	17809	161	17660	17958
Ammonia					
Ammonia	[µg/g]	416	9	407	424
Toxic Trace Metals					
Cadmium	[ng/g]	644	7	638	651
Arsenic	[ng/g]	146	3	143	148
Tobacco Specific Nitrosamines (LC-MS/MS)					
Nitrosonornicotine (NNN)	[ng/g]	378	64	319	438
4-(N-nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK)	[ng/g]	189	11	179	199
Water					
Dry Matter	(%)	85.9	0.4	85.6	86.3
Moisture	(%)	14.1	0.4	13.7	14.4

Glossary of Abbreviations

L. Limit (95%): lower limit of the 95% confidence interval

U. Limit (95%): upper limit of the 95% confidence interval

Tobacco Constituent	Matrix Code / Sample ID / Unit	WT 1680391 Average	WT 1680391 Std. Dev.	WT 1680391 L. Limit (95%)	WT 1680391 U. Limit (95%)	WT 1680392 Average	WT 1680392 Std. Dev.	WT 1680392 L. Limit (95%)	WT 1680392 U. Limit (95%)
Alkaloids									
Nicotine	[µg/unit]	4381	45	4340	4423	4512	52	4464	4561
Ammonia									
Ammonia	[µg/unit]	105	1	104	107	111	1	110	111
Toxic Trace Metals									
Cadmium	[ng/unit]	160	1	159	161	167	1	166	168
Arsenic	[ng/unit]	34.3	0.9	33.5	35.2	36.0	0.5	35.6	36.5
Tobacco Specific Nitrosamines (LC-MS/MS)									
Nitrosonornicotine (NNN)	[ng/unit]	88.4	12.2	77.1	99.7	104	14	90.9	117
4-(N-nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK)	[ng/unit]	44.9	4.1	41.1	48.7	46.2	2.6	43.8	48.6

Glossary of Abbreviations
L. Limit (95%): lower limit of the 95% confidence interval
U. Limit (95%): upper limit of the 95% confidence interval
[/unit]: as required in part 2, section 12 (5) of the Canadian Tobacco Reporting Regulations

Tobacco Constituent	Matrix Code Sample ID Unit	WT 1680393 Average	WT 1680393 Std. Dev.	WT 1680393 L. Limit (95%)	WT 1680393 U. Limit (95%)
Alkaloids					
Nicotine	[µg/unit]	4490	41	4453	4528
Ammonia					
Ammonia	[µg/unit]	105	2	103	107
Toxic Trace Metals					
Cadmium	[ng/unit]	162	2	161	164
Arsenic	[ng/unit]	36.8	0.6	36.2	37.3
Tobacco Specific Nitrosamines (LC-MS/MS)					
Nitrosonornicotine (NNN)	[ng/unit]	95.4	16.1	80.5	110
4-(N-nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK)	[ng/unit]	47.7	2.7	45.2	50.2

Glossary of Abbreviations
L. Limit (95%): lower limit of the 95% confidence interval
U. Limit (95%): upper limit of the 95% confidence interval
[/unit]: as required in part 2, section 12 (5) of the Canadian Tobacco Reporting Regulations

FILLER REPORT WORKSHEET (1680391)

HPHC Name	CAS Code	FDA UNII Code	Number of Replicate Measurements	Test Start Date	Test End Date	Method of Extraction
Ammonia	7664-41-7	5138Q19F1X	7	08/04/2016	15/04/2016	Health Canada Method T-302; Extract with 0.025N H2SO4, 60 min.
Arsenic	7440-38-2	N712M78A8G	7	08/04/2016	12/04/2016	Health Canada Method T-306; nitric acid microwave digestion; 230°C, 40bar.
Cadmium	7440-43-9	00BH33GNGH	7	08/04/2016	12/04/2016	Health Canada Method T-306; nitric acid microwave digestion; 230°C, 40bar.
Nicotine (total)	54-11-5	6M3C89ZY6R	7	08/04/2016	14/04/2016	Health Canada Method T-306; methanolic KOH, sonicate 3 hours + shake 0.5 hours
4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	64091-91-4	7S395EDO61	7	11/04/2016	13/04/2016	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.
N-Nitrosonornicotine (NNN)	16543-55-8	X656TZ86DX	7	11/04/2016	13/04/2016	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.

HPHC Name	Method of Separation	If "Other" Method of Separation, Specify	Method of Detection	If "Other" Method of Detection, Specify	Mean Quantity of HPHC per Cigarette	Variance of Mean HPHC Quantity	Type of Variance
Ammonia	IC	N/A	other	CD: Suppressed Conductivity Detection	105.251	1.487	Standard Deviation
Arsenic	N/A	Inductively Coupled Argon Plasma	MSD	Not Applicable	34.317	0.904	Standard Deviation
Cadmium	N/A	Inductively Coupled Argon Plasma	MSD	Not Applicable	160.206	0.986	Standard Deviation
Nicotine (total)	GC	N/A	NPD	Not Applicable	4.381	0.045	Standard Deviation
4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	HPLC	N/A	MSMS	Not Applicable	44.891	4.113	Standard Deviation
N-Nitrosonornicotine (NNN)	HPLC	N/A	MSMS	Not Applicable	88.415	12.217	Standard Deviation

HPHC Name	Unit of Measurement - Mean & Variance	If "Other" Unit of Measurement Mean & Variance, Specify
Ammonia	[µg/unit]	Not Applicable
Arsenic	[ng/unit]	Not Applicable
Cadmium	[ng/unit]	Not Applicable
Nicotine (total)	mg/unit	Not Applicable
4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	[ng/unit]	Not Applicable
N-Nitrosonornicotine (NNN)	[ng/unit]	Not Applicable

FILLER REPORT WORKSHEET (1680392)

HPHC Name	CAS Code	FDA UNII Code	Number of Replicate Measurements	Test Start Date	Test End Date	Method of Extraction
Ammonia	7664-41-7	5138Q19F1X	7	08/04/2016	15/04/2016	Health Canada Method T-302; Extract with 0.025N H2SO4, 60 min.
Arsenic	7440-38-2	N712M78A8G	7	08/04/2016	12/04/2016	Health Canada Method T-306; nitric acid microwave digestion; 230°C, 40bar.
Cadmium	7440-43-9	00BH33GNGH	7	08/04/2016	12/04/2016	Health Canada Method T-306; nitric acid microwave digestion; 230°C, 40bar.
Nicotine (total)	54-11-5	6M3C89ZY6R	7	08/04/2016	14/04/2016	Health Canada Method T-306; methanolic KOH, sonicate 3 hours + shake 0.5 hours
4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	64091-91-4	7S395EDO61	7	11/04/2016	13/04/2016	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.
N-Nitrosonornicotine (NNN)	16543-55-8	X656TZ86DX	7	11/04/2016	13/04/2016	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.

HPHC Name	Method of Separation	If "Other" Method of Separation, Specify	Method of Detection	If "Other" Method of Detection, Specify	Mean Quantity of HPHC per Cigarette	Variance of Mean HPHC Quantity	Type of Variance
Ammonia	IC	N/A	other	CD: Suppressed Conductivity Detection	110.539	0.936	Standard Deviation
Arsenic	N/A	Inductively Coupled Argon Plasma	MSD	Not Applicable	36.027	0.490	Standard Deviation
Cadmium	N/A	Inductively Coupled Argon Plasma	MSD	Not Applicable	166.855	1.223	Standard Deviation
Nicotine (total)	GC	N/A	NPD	Not Applicable	4.512	0.052	Standard Deviation
4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	HPLC	N/A	MSMS	Not Applicable	46.217	2.619	Standard Deviation
N-Nitrosonornicotine (NNN)	HPLC	N/A	MSMS	Not Applicable	104.189	14.328	Standard Deviation

HPHC Name	Unit of Measurement - Mean & Variance	If "Other" Unit of Measurement Mean & Variance, Specify
Ammonia	[µg/unit]	Not Applicable
Arsenic	[ng/unit]	Not Applicable
Cadmium	[ng/unit]	Not Applicable
Nicotine (total)	mg/unit	Not Applicable
4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	[ng/unit]	Not Applicable
N-Nitrosonornicotine (NNN)	[ng/unit]	Not Applicable

FILLER REPORT WORKSHEET (1680393)

HPHC Name	CAS Code	FDA UNII Code	Number of Replicate Measurements	Test Start Date	Test End Date	Method of Extraction
Ammonia	7664-41-7	5138Q19F1X	7	08/04/2016	15/04/2016	Health Canada Method T-302; Extract with 0.025N H2SO4, 60 min.
Arsenic	7440-38-2	N712M78A8G	7	08/04/2016	12/04/2016	Health Canada Method T-306; nitric acid microwave digestion; 230°C, 40bar.
Cadmium	7440-43-9	00BH33GNGH	7	08/04/2016	12/04/2016	Health Canada Method T-306; nitric acid microwave digestion; 230°C, 40bar.
Nicotine (total)	54-11-5	6M3C89ZY6R	7	08/04/2016	14/04/2016	Health Canada Method T-306; methanolic KOH, sonicate 3 hours + shake 0.5 hours
4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	64091-91-4	7S395EDO61	7	11/04/2016	13/04/2016	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.
N-Nitrosonornicotine (NNN)	16543-55-8	X656TZ86DX	7	11/04/2016	13/04/2016	NS235_Report.pdf Section 6.3.3.3; Extract in 100 mM ammonium acetate, 30 min.

HPHC Name	Method of Separation	If "Other" Method of Separation, Specify	Method of Detection	If "Other" Method of Detection, Specify	Mean Quantity of HPHC per Cigarette	Variance of Mean HPHC Quantity	Type of Variance
Ammonia	IC	N/A	other	CD: Suppressed Conductivity Detection	104.806	2.387	Standard Deviation
Arsenic	N/A	Inductively Coupled Argon Plasma	MSD	Not Applicable	36.755	0.642	Standard Deviation
Cadmium	N/A	Inductively Coupled Argon Plasma	MSD	Not Applicable	162.457	1.697	Standard Deviation
Nicotine (total)	GC	N/A	NPD	Not Applicable	4.490	0.041	Standard Deviation
4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	HPLC	N/A	MSMS	Not Applicable	47.727	2.721	Standard Deviation
N-Nitrosonornicotine (NNN)	HPLC	N/A	MSMS	Not Applicable	95.386	16.141	Standard Deviation

HPHC Name	Unit of Measurement - Mean & Variance	If "Other" Unit of Measurement Mean & Variance, Specify
Ammonia	[µg/unit]	Not Applicable
Arsenic	[ng/unit]	Not Applicable
Cadmium	[ng/unit]	Not Applicable
Nicotine (total)	mg/unit	Not Applicable
4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	[ng/unit]	Not Applicable
N-Nitrosonornicotine (NNN)	[ng/unit]	Not Applicable

Table 1: Nicotine Contents of Processed Tobacco (per gram 'Dry Weight' Basis)

Sample ID	Nicotine [µg/g]
1680391	18074
1680391	17808
1680391	17788
1680391	17738
1680391	17885
1680391	18228
1680391	18072
Average	17942
Std. Dev.	184
L. Limit (95%)	17772
U. Limit (95%)	18112
1680392	17589
1680392	17864
1680392	17889
1680392	18054
1680392	18087
1680392	17574
1680392	17733
Average	17827
Std. Dev.	206
L. Limit (95%)	17637
U. Limit (95%)	18017
1680393	17490
1680393	17842
1680393	18029
1680393	17860
1680393	17778
1680393	17830
1680393	17832
Average	17809
Std. Dev.	161
L. Limit (95%)	17660
U. Limit (95%)	17958

Table 2: Ammonia Content of Processed Tobacco (per gram 'Dry Weight' Basis)

Sample ID	Ammonia [µg/g]
1680391	431
1680391	419
1680391	434
1680391	438
1680391	435
1680391	428
1680391	432
Average	431
Std. Dev.	6
L. Limit (95%)	425
U. Limit (95%)	437
1680392	435
1680392	437
1680392	441
1680392	441
1680392	437
1680392	434
1680392	431
Average	437
Std. Dev.	4
L. Limit (95%)	433
U. Limit (95%)	440
1680393	413
1680393	419
1680393	415
1680393	428
1680393	425
1680393	408
1680393	401
Average	416
Std. Dev.	9
L. Limit (95%)	407
U. Limit (95%)	424

Table 4: Toxic Trace Metals Content of Processed Tobacco (per gram 'Dry Weight' Basis)

Sample ID	Cd [ng/g]	As [ng/g]
1680391	658	140
1680391	653	138
1680391	656	148
1680391	654	142
1680391	664	139
1680391	653	136
1680391	654	141
Average	656	141
Std. Dev.	4	4
L. Limit (95%)	652	137
U. Limit (95%)	660	144
1680392	659	140
1680392	651	142
1680392	661	143
1680392	663	146
1680392	666	141
1680392	656	143
1680392	658	142
Average	659	142
Std. Dev.	5	2
L. Limit (95%)	655	141
U. Limit (95%)	664	144
1680393	641	150
1680393	643	147
1680393	638	143
1680393	642	147
1680393	639	143
1680393	655	146
1680393	653	144
Average	644	146
Std. Dev.	7	3
L. Limit (95%)	638	143
U. Limit (95%)	651	148

TSNA Content of Processed Tobacco - LC-MS/MS Method
(per gram 'Dry Weight' Basis)

Sample ID	NNN [ng/g]	NNK [ng/g]
1680391	391	201
1680391	409	163
1680391	388	163
1680391	313	185
1680391	389	208
1680391	272	183
1680391	372	183
Average	362	184
Std. Dev.	50	17
L. Limit (95%)	316	168
U. Limit (95%)	408	199
1680392	412	175
1680392	422	183
1680392	469	186
1680392	469	198
1680392	322	184
1680392	437	165
1680392	350	186
Average	412	183
Std. Dev.	57	10
L. Limit (95%)	359	173
U. Limit (95%)	464	192
1680393	322	174
1680393	316	186
1680393	390	196
1680393	369	196
1680393	325	184
1680393	457	183
1680393	470	206
Average	378	189
Std. Dev.	64	11
L. Limit (95%)	319	179
U. Limit (95%)	438	199

Table 13: Moisture Content of Processed Tobacco

Sample ID	Dry Matter (%)	Moisture (%)
1680391	85.8	14.2
1680391	85.7	14.3
1680391	85.9	14.1
1680391	86.2	13.8
1680391	86.4	13.6
1680391	85.4	14.6
1680391	85.9	14.1
Average	85.9	14.1
Std. Dev.	0.3	0.3
L. Limit (95%)	85.6	13.8
U. Limit (95%)	86.2	14.4
1680392	85.5	14.5
1680392	85.6	14.4
1680392	86.1	13.9
1680392	86.6	13.4
1680392	86.3	13.7
1680392	85.9	14.1
1680392	85.8	14.2
Average	86.0	14.0
Std. Dev.	0.4	0.4
L. Limit (95%)	85.6	13.7
U. Limit (95%)	86.3	14.4
1680393	86.5	13.5
1680393	85.8	14.2
1680393	85.6	14.4
1680393	85.6	14.4
1680393	85.5	14.5
1680393	86.2	13.8
1680393	86.2	13.8
Average	85.9	14.1
Std. Dev.	0.4	0.4
L. Limit (95%)	85.6	13.7
U. Limit (95%)	86.3	14.4