



PROJECT CODE: 1808

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TEST REPORT

THE DETERMINATION OF SELECTED ANALYTES IN MAINSTREAM SMOKE UNDER FTC CONDITIONS

Prepared for:

Liggett Group Inc.
100 Maple Lane
Mebane, NC 27302

October 31, 2004

The results in this test report relate only to the samples identified in this report. The information is confidential and is only to be used by the client identified in this report. Arista Laboratories accepts no liability in the use of this report or the results contained, herein. The original controlled report shall not be reproduced without written approval of Arista Laboratories, Inc.



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I. STUDY OVERVIEW

The objective of this study was to determine the deliveries of selected smoke constituents in mainstream cigarette smoke under FTC smoking conditions.

Test cigarettes for this study consisted of five cigarette types, which are listed in Table I.

Selected analyte groups that were determined are listed in Table II.

The laboratory control cigarette for this project was the Kentucky Reference 2R4F cigarette.

A minimum of five observations per brand were determined for mainstream smoke, as specified by the client.

The results were electronically submitted to the client on October 20, 2004.

Analytical Methods and results are included in the attached Appendices.

II. TESTING FACILITY

Activities were conducted at Arista Laboratories, 1941 Reymet Road Richmond, VA. 23237.

III. TEST CIGARETTES

A. Receipt, storage and conditioning of test cigarettes

- 1400 sticks of each cigarette type were received on August 27, 2004.
- Cigarettes were stored at ambient conditions until required for testing.
- The brand code designations are given in Table I.
- Before smoking, cigarettes were conditioned according to Arista SOP QP-18 Handling of Test Items.

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Table I: Brand Coding

Client Brand Description	Arista Code
Camel 100	3557
Marlboro Light	3558
Quest 1	3559
Quest 2	3560
Quest 3	3561

B. Constituent List

The analyses requested are listed in Table II. All applicable SOPs have been fully validated. For lists of specific compounds in each analyte group, refer to the Appendices.

Table II: Constituent List

Analyte Group	Arista SOP	Validation Report
Tar, Nicotine, and CO	T-001 v.2, T-007 v.1	V-005 and V-005-2
Carbonyls	T-005 v.4	V-002
Phenolics	T-027 v.4	V-017
Volatiles	T-015 v.4	V-007
Semivolatiles	T-006 v.2	V-004
Ammonia	T-011 v.2	V-009
Polynuclear Aromatic Hydrocarbons (PAHs)	T-038 v.5	V-025
Hydrogen Cyanide (HCN)	T-049 v.0	V-033
Aromatic Amines I	T-030 v.5	V-016
Nitric Oxide	T-029 v.2	V-018
Aromatic Amines II	T-091 v. 0	V-046
Metals	T-021 v.3	V-014
Mercury	T-036 v.3	V-021
Tobacco Specific Nitrosamines (TSNAs)	T-020 v.2	V-013



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C. Sample Generation and Records

Smoking was performed under FTC conditions (35cc puff volume every 60 seconds). Randomized run orders were generated for each analysis. The project was completed with the electronic submission of the final data.

IV. QUALITY STATEMENTS/SIGNATURES

The results of this study have been 100% independently reviewed by the Quality Assurance Unit.

The analytical results in the attached appendices were tested with the Dixon Q test where deemed necessary. All outliers were noted and repeats were conducted if cause was determined. All control runs passed according to Arista policies and procedures and according to the relevant Arista SOPs.

QA
Review:

(b) (6)

QA Manager

Date

Oct. 31 / 04

Management
Approval:

(b) (6)

Date

Nov. 1, 2004

(b) (6)

Laboratory Director



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APPENDIX A

Analysis of Mainstream Cigarette Smoke for Tar, Nicotine and Carbon Monoxide

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DETERMINATION OF TAR, NICOTINE AND CARBON MONOXIDE IN MAINSTREAM SMOKE

I. PRINCIPLE OF METHOD

The analytical methods used for this study are detailed in Arista SOP T-001, Determination of Nicotine and Water in Smoke Condensates – Gas Chromatographic Method, and Arista SOP T-007, Determination of Carbon Monoxide in Vapor Phase Cigarette Smoke.

This method applies to the measurements of nicotine and water in total particulate matter (TPM) from cigarette smoke collected on a 44mm Cambridge filter pad. The smoke condensate collected on the pad is dissolved in iso-propanol. Subsequently, an aliquot of the sample solution is analyzed by gas chromatography (GC), and the nicotine and water content of the smoke condensate is determined. Using the nicotine and water values, and the measured wet total particulate matter (WTPM), the tar content is then calculated. The resulting data is reported in milligrams per cigarette (mg/cig) for each smoke sample.

For carbon monoxide determination, the smoke is collected in gas sampling bags attached to the smoking machine. A non-dispersive infrared absorption method (NDIR) is used to measure the CO concentration in the vapor phase in percent by volume (%vol). Using the number of cigarettes, puff counts, puff volume and ambient conditions, the %CO is converted to milligrams per cigarette (mg/cig).

Mainstream TNC Test Report for:
 Liggett Group Inc.
 100 Maple Lane
 Mebane, NC 27302
 (b) (4)

Project Code: 1808
 Project Start Date: 27-Aug-04
 Arista SOP #: T-001/T-007
 Smoking Protocol: FTC
 Authorized By: (b) (6)
 Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run#	Port#	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	CO (mg/cigt)	Water (mg/cigt)	Nicotine (mg/cigt)	Tar (mg/cigt)
C00420	E	Camel 100	3557	11.3	24.74	16.66	3.96	1.48	19.30
C00420	J	Camel 100	3557	11.3	23.58	16.31	2.49	1.52	19.58
C00420	Q	Camel 100	3557	11.6	24.66	18.05	3.56	1.53	19.57
C00421	J	Camel 100	3557	11.2	24.14	17.36	2.79	1.49	19.86
C00421	O	Camel 100	3557	11.5	23.66	16.82	2.74	1.49	19.43
C00421	Q	Camel 100	3557	11.0	23.96	18.04	2.32	1.47	20.17
Average				11.3	24.12	17.21	2.98	1.50	19.65
sd				0.2	0.49	0.73	0.64	0.02	0.32
%RSD				1.9	2.0	4.3	21.7	1.4	1.6
C00420	C	Marlboro Light	3558	8.6	12.72	11.60	1.09	0.83	10.79
C00420	I	Marlboro Light	3558	8.1	12.18	12.69	0.86	0.81	10.50
C00420	K	Marlboro Light	3558	8.1	12.56	10.90	0.99	0.81	10.76
C00420	M	Marlboro Light	3558	8.1	12.46	10.93	1.07	0.80	10.59
C00420	O	Marlboro Light	3558	8.1	12.20	10.96	0.94	0.81	10.44
C00421	R	Marlboro Light	3558	8.6	13.50	11.70	0.95	0.86	11.70
Average				8.3	12.60	11.46	0.98	0.82	10.80
sd				0.3	0.49	0.70	0.09	0.02	0.46
%RSD				3.4	3.9	6.1	8.8	2.5	4.3
C00421	A	Quest 1	3559	7.1	11.12	11.46	1.09	0.48	9.54
C00421	D	Quest 1	3559	6.6	11.22	11.36	0.93	0.49	9.80
C00421	F	Quest 1	3559	6.6	10.98	10.68	1.08	0.47	9.44
C00421	H	Quest 1	3559	6.3	10.78	10.44	1.12	0.47	9.20
C00421	K	Quest 1	3559	6.8	11.20	11.28	1.18	0.45	9.57
C00421	M	Quest 1	3559	6.7	11.04	11.19	0.65	0.48	9.91
Average				6.7	11.06	11.07	1.01	0.47	9.58
sd				0.3	0.16	0.41	0.19	0.01	0.26
%RSD				3.8	1.5	3.7	19.1	3.0	2.7
C00420	D	Quest 2	3560	6.4	10.88	11.89	0.70	0.29	9.90
C00420	S	Quest 2	3560	6.6	10.52	12.03	1.03	0.27	9.21
C00421	B	Quest 2	3560	6.7	12.18	11.91	1.67	0.31	10.20
C00421	I	Quest 2	3560	6.2	10.44	10.88	0.97	0.25	9.21
C00421	L	Quest 2	3560	6.2	10.78	11.25	1.32	0.28	9.18
Average				6.4	10.96	11.59	1.14	0.28	9.54
sd				0.2	0.71	0.50	0.37	0.02	0.48
%RSD				3.9	6.4	4.3	32.7	7.0	5.0

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 Richmond, Va. 23237

10/20/2004

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Mainstream TNC Test Report for:
Liggett Group Inc.
100 Maple Lane
Mebane, NC 27302

(b) (4)

Project Code: 1808
Project Start Date: 27-Aug-04
Arista SOP #: T-001/T-007
Smoking Protocol: FTC
Authorized By: (b) (6)
Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run#	Port#	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	CO (mg/cigt)	Water (mg/cigt)	Nicotine (mg/cigt)	Tar (mg/cigt)
C00420	B	Quest 3	3561	6.1	8.72	9.79	0.79	0.049	7.89
C00420	P	Quest 3	3561	6.1	7.94	9.76	0.44	0.047	7.46
C00420	R	Quest 3	3561	6.3	8.58	10.39	0.58	0.052	7.95
C00421	C	Quest 3	3561	6.2	9.22	10.30	0.89	0.045	8.28
C00421	N	Quest 3	3561	6.2	8.62	10.38	0.95	0.047	7.62
Average				6.2	8.62	10.12	0.73	0.048	7.84
sd				0.1	0.46	0.32	0.22	0.003	0.32
%RSD				1.5	5.3	3.2	29.6	5.7	4.1
C00420	N	2R4F	912	9.0	10.80	11.50	0.62	0.79	9.39
C00421	G	2R4F	912	9.1	12.24	13.32	0.92	0.83	10.49
C00421	P	2R4F	912	9.3	11.50	12.09	0.78	0.80	9.92
Average				9.1	11.51	12.30	0.77	0.81	9.93
sd				0.2	0.72	0.93	0.15	0.02	0.55
%RSD				1.8	6.3	7.5	19.4	2.9	5.5

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APPENDIX B

Analysis of Mainstream Cigarette Smoke for Carbonyls and Aldehydes

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DETERMINATION OF CARBONYLS AND ALDEHYDES IN MAINSTREAM SMOKE

I. PRINCIPLE OF METHOD

The analytical method used for this study is detailed in Arista SOP T-005 Determination of Carbonyls and Aldehydes in Mainstream Smoke.

Mainstream smoke is collected in two impingers containing acidified 2,4-dinitrophenylhydrazine (DNPH) solution. After smoking, the combined solution from the impingers containing the derivatized carbonyls is stabilized by adding pyridine and subsequently analyzed by HPLC. Individual carbonyl concentrations are determined by an external standard method using UV detection. Note that for this method, the term carbonyls refers to the following compounds: formaldehyde, acetaldehyde, acrolein, acetone, propionaldehyde, crotonaldehyde, butyraldehyde & methylethylketone.

An HPLC (High Pressure Liquid Chromatograph) equipped with a reversed phase column and a photodiode array or fixed wavelength UV detector is used for the analysis of the samples. A gradient is used to separate interfering compounds from the analytes of interest. The eluting compounds are detected on the basis of their absorbance at 355 nm. The detector's responses of the hydrazone derivatives of the carbonyls are calibrated against standard solutions of known concentration to form a linear calibration curve.

The concentrations of the carbonyls determined by HPLC are reported in units of mass-to-volume (i.e., $\mu\text{g/mL}$). The measured concentration, the number of cigarettes smoked, and the sample solution volume(s) are also used to calculate the total analyte mass on a per cigarette basis.

Mainstream Carbonyls Test Report for:
 Liggett Group Inc.
 100 Maple Lane
 Mebane, NC 27302
 (b) (4)

Project Code: 1808
 Project Start Date: 27-Aug-04
 Arista SOP #: T-005
 Smoking Protocol: FTC
 Authorized By: (b) (6)
 Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run #	Port Code	Client Code	Arista Code	Puffs (/cigt)	formaldehyde (µg/cigt)	acetaldehyde (µg/cigt)	acetone (µg/cigt)	acrolein (µg/cigt)	propionaldehyde (µg/cigt)	crotonaldehyde (µg/cigt)	methylethylketone (µg/cigt)	butyraldehyde (µg/cigt)
400877	B	Camel 100	3557	10	32.9	811	364	93.6	67.9	27.4	103	42.3
400878	A	Camel 100	3557	9	36.5	851	374	97.7	71.2	24.5	110	44.2
400878	I	Camel 100	3557	10	46.7	1015	449	105	86.0	34.9	137	52.0
400879	B	Camel 100	3557	11	37.1	938	410	109	78.3	26.8	124	47.7
400879	H	Camel 100	3557	11	39.0	948	413	101	81.2	27.8	126	49.2
400896	A	Camel 100	3557	11	45.3	925	408	115	75.5	30.7	122	59.5
Average				10.3	39.6	915	403	104	76.7	28.7	120	49.2
SD				0.8	5.4	73	31	8	6.6	3.6	12	6.1
%RSD				7.9	13.6	8.0	7.6	7.6	8.6	12.7	9.9	12.5
400877	C	Marlboro Light	3558	8	25.7	597	260	70.0	50.6	20.3	77.9	30.3
400877	E	Marlboro Light	3558	7	24.1	581	251	67.8	47.8	20.1	71.7	30.2
400877	G	Marlboro Light	3558	8	27.5	715	311	68.2	60.1	27.3	91.1	35.9
400877	I	Marlboro Light	3558	7	22.0	572	249	53.0	48.0	19.5	65.8	28.3
400878	C	Marlboro Light	3558	8	30.2	632	275	73.6	54.6	20.1	81.9	32.8
400878	J	Marlboro Light	3558	7	24.0	618	271	61.3	49.7	18.4	78.6	33.2
Average				7.5	25.6	619	269	65.6	51.8	21.0	77.8	31.8
SD				0.5	2.9	52	23	7.4	4.7	3.2	8.7	2.7
%RSD				7.3	11.3	8.4	8.4	11.2	9.1	15.1	11.1	8.5
400877	J	Quest 1	3559	6	21.4	399	133	24.4	26.2	9.82	35.9	15.0
400878	B	Quest 1	3559	6	31.3	558	198	48.9	38.6	14.4	53.8	23.8
400878	D	Quest 1	3559	6	19.9	352	111	24.9	22.2	6.40	28.2	13.1
400879	A	Quest 1	3559	7	19.5	360	106	25.2	22.5	5.81	27.2	12.8
400879	C	Quest 1	3559	6	24.3	447	158	36.5	30.6	10.0	42.1	17.5
400879	I	Quest 1	3559	8	23.7	498	164	36.0	32.3	8.82	41.4	17.9
Average				6.5	23.4	436	145	32.6	28.8	9.20	38.1	16.7
SD				0.8	4.4	81	35	9.7	6.4	3.08	9.9	4.1
%RSD				12.9	18.7	18.7	24.0	29.8	22.1	33.5	26.1	24.4

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 Richmond, Va. 23237

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Mainstream Carbonyls Test Report for:
Liggett Group Inc.
100 Maple Lane
Mebane, NC 27302

(b) (4)

Project Code: 1808
Project Start Date: 27-Aug-04
Arista SOP #: T-005
Smoking Protocol: FTC
Authorized By: (b) (6)
Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run #	Port Code	Client Code	Arista Code	Puffs (/cigt)	formaldehyde (µg/cigt)	acetaldehyde (µg/cigt)	acetone (µg/cigt)	acrolein (µg/cigt)	propionaldehyde (µg/cigt)	crotonaldehyde (µg/cigt)	methylethylketone (µg/cigt)	butyraldehyde (µg/cigt)
400877	D	Quest 2	3560	5	15.0	269	75.3	17.4	15.9	4.70	19.7	9.32
400879	D	Quest 2	3560	6	16.4	401	125	25.3	24.4	6.00	31.5	14.1
400879	G	Quest 2	3560	7	25.9	523	159	35.4	33.1	8.70	39.2	18.5
400896	B	Quest 2	3560	6	12.4	302	110	22.0	19.1	4.90	27.2	13.6
400896	E	Quest 2	3560	6	17.0	406	153	29.7	26.5	8.37	40.3	19.0
400896	H	Quest 2	3560	7	21.9	533	182	39.2	33.6	10.0	45.4	23.3
Average				6.2	18.1	406	134	28.2	25.4	7.12	33.9	16.3
SD				0.8	4.9	109	38	8.3	7.2	2.22	9.5	4.9
%RSD				12.2	27.2	26.9	28.6	29.3	28.3	31.2	28.2	30.3
400877	A	Quest 3	3561	6	9.12	372	138	25.4	22.3	7.66	34.0	15.0
400878	E	Quest 3	3561	6	10.6	333	95.7	19.3	18.0	4.02	21.7	10.9
400878	H	Quest 3	3561	6	9.82	312	105	18.1	20.4	4.78	25.3	12.1
400879	J	Quest 3	3561	6	10.2	342	107	20.9	20.4	5.11	25.6	12.3
400896	C	Quest 3	3561	6	8.74	375	115	23.0	19.0	4.60	24.7	14.5
400896	F	Quest 3	3561	6	8.17	338	116	21.2	18.8	4.7	26.2	16.2
Average				6.0	9.44	345	113	21.3	19.8	5.15	26.3	13.5
SD				0.0	0.92	24	14	2.6	1.5	1.28	4.1	2.0
%RSD				0.0	9.7	7.1	12.7	12.3	7.8	24.8	15.7	15.1
400877	F	2R4F	912	8	28.6	714	312	71.2	57.7	21.0	96.9	36.2
400878	G	2R4F	912	8	20.9	567	256	54.2	49.1	13.4	80.2	28.1
400879	E	2R4F	912	9	27.9	706	312	71.9	58.5	16.5	96.4	34.7
400896	D	2R4F	912	9	22.2	637	296	67.0	51.8	15.2	91.2	39.2
Average				8.5	24.9	656	294	66.1	54.3	16.5	91.2	34.6
SD				0.6	3.9	69	26	8.2	4.6	3.3	7.8	4.7
%RSD				6.8	15.8	10.4	8.9	12.4	8.4	19.7	8.5	13.6

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APPENDIX C

Analysis of Mainstream Cigarette Smoke for Phenolics

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DETERMINATION OF PHENOLIC COMPOUNDS IN MAINSTREAM SMOKE

I. PRINCIPLE OF METHOD

The analytical method used for this study is detailed in Arista SOP T-027, Determination of Phenolic Compounds in Mainstream Smoke. Phenolics refers to hydroquinone, resorcinol, catechol, phenol, o-cresol and m+p-cresol.

Phenolics in mainstream tobacco smoke are collected on a 44 mm Cambridge filter pad. The pad is extracted with 20 mL of 1% Acetic Acid/ 5% MeOH in H₂O, and the solution is diluted to a known volume. Before analysis by High Performance Liquid Chromatography (HPLC), the solution is filtered. An HPLC equipped with a reversed-phase column and a fluorescence detector is used for the analysis. This system utilizes an increasing methanol fraction in a methanol:water gradient to elute potentially interfering compounds, and the analytes from the column, at different times. All phenolics are well separated except m-cresol and p-cresol, which coelute. Therefore, only one value is reported for m+p-cresol. The eluted compounds are detected with a fluorescence detector. Hydroquinone is detected with an excitation wavelength of 304 nm and emission wavelength of 338 nm. The other compounds are detected with an excitation wavelength of 274 nm and emission wavelength of 298 nm.

The concentrations of phenolic compounds determined by HPLC are reported in units of mass-to-volume (i.e., µg/mL). The measured concentration, the number of cigarettes smoked, and the sample solution volume(s) are also used to calculate the total mass of phenolics on a per cigarette basis.

Mainstream Phenolics Test Report for:
 Liggett Group Inc.
 100 Maple Lane
 Mebane, NC 27302

(b) (4)

Project Code: 1808
 Project Start Date: 27-Aug-04
 Arista SOP #: T-027
 Smoking Protocol: FTC
 Authorized By: (b) (6)
 Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>.

Run #	Port#	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	Hydroquinone (µg/cigt)	Resorcinol (µg/cigt)	Catechol (µg/cigt)	Phenol (µg/cigt)	m+p-Cresol (µg/cigt)	o-Cresol (µg/cigt)
C00416	B	Camel 100	3557	11.2	27.0	71.6	1.55	79.6	21.0	15.1	5.44
C00416	C	Camel 100	3557	11.3	25.1	68.8	1.46	77.7	19.7	14.0	4.98
C00416	H	Camel 100	3557	11.5	27.3	70.5	1.52	79.4	22.5	15.2	5.49
C00416	J	Camel 100	3557	10.8	24.3	67.4	1.47	78.8	19.2	13.9	5.05
C00416	O	Camel 100	3557	11.0	26.1	66.6	1.47	80.1	19.8	13.5	4.79
C00419	D	Camel 100	3557	11.9	25.1	68.2	1.40	81.7	20.8	13.8	4.98
Average				11.3	25.8	68.9	1.48	79.5	20.5	14.2	5.12
SD				0.4	1.2	1.9	0.05	1.4	1.2	0.7	0.28
%RSD				3.6	4.5	2.8	3.5	1.7	5.9	5.0	5.5
C00416	T	Marlboro Light	3558	8.7	13.7	40.4	1.10	45.9	9.45	7.38	2.42
C00419	C	Marlboro Light	3558	8.2	12.8	37.7	1.08	41.7	9.14	7.06	2.33
C00419	F	Marlboro Light	3558	8.2	13.2	38.2	1.07	43.3	8.86	6.60	2.17
C00419	H	Marlboro Light	3558	8.2	13.0	36.8	0.99	41.5	8.06	6.15	2.02
C00419	P	Marlboro Light	3558	7.9	12.9	37.4	1.07	42.2	8.56	6.83	2.28
C00419	Q	Marlboro Light	3558	8.0	12.3	35.6	0.99	42.1	7.20	5.86	1.93
Average				8.2	13.0	37.7	1.05	42.8	8.55	6.65	2.19
SD				0.3	0.5	1.6	0.05	1.7	0.81	0.57	0.19
%RSD				3.4	3.7	4.3	4.5	3.9	9.5	8.5	8.6

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Mainstream Phenolics Test Report for:
 Liggett Group Inc.
 100 Maple Lane
 Mebane, NC 27302

(b) (4)

Project Code: 1808
 Project Start Date: 27-Aug-04
 Arista SOP #: T-027
 Smoking Protocol: FTC
 Authorized By: (b) (6)
 Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run #	Port#	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	Hydroquinone (µg/cigt)	Resorcinol (µg/cigt)	Catechol (µg/cigt)	Phenol (µg/cigt)	m+p-Cresol (µg/cigt)	o-Cresol (µg/cigt)
C00416	D	Quest 1	3559	6.7	11.0	35.7	0.77	35.2	11.2	8.52	2.99
C00416	E	Quest 1	3559	6.6	11.3	34.8	0.85	35.1	10.6	8.38	2.89
C00416	G	Quest 1	3559	6.7	10.0	30.5	0.71	30.5	9.38	7.43	2.61
C00416	K	Quest 1	3559	6.7	11.3	33.7	0.78	35.0	10.2	8.01	2.81
C00416	P	Quest 1	3559	6.7	11.0	34.4	0.79	35.2	10.9	8.30	2.93
C00419	G	Quest 1	3559	6.8	11.2	35.7	0.89	37.6	11.1	8.49	2.99
Average				6.7	11.0	34.1	0.80	34.7	10.6	8.19	2.87
SD				0.1	0.5	1.9	0.06	2.3	0.7	0.42	0.14
%RSD				1.0	4.5	5.7	7.83	6.6	6.4	5.1	4.9
C00416	N	Quest 2	3560	6.3	10.9	29.9	0.63	30.9	9.67	8.06	2.79
C00419	E	Quest 2	3560	6.2	10.1	29.2	0.57	30.2	9.43	7.49	2.67
C00419	I	Quest 2	3560	6.4	11.1	30.5	0.65	32.1	9.77	8.31	2.92
C00419	K	Quest 2	3560	6.4	10.8	31.5	0.69	32.7	9.32	7.99	2.79
C00419	M	Quest 2	3560	6.0	9.68	27.7	0.57	28.7	8.89	7.43	2.61
C00419	O	Quest 2	3560	6.3	10.9	29.1	0.59	31.0	9.76	7.82	2.69
Average				6.3	10.6	29.6	0.62	30.9	9.47	7.85	2.74
SD				0.1	0.6	1.3	0.05	1.4	0.34	0.34	0.11
%RSD				2.3	5.4	4.4	7.49	4.6	3.6	4.3	4.0

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Mainstream Phenolics Test Report for:
 Liggett Group Inc.
 100 Maple Lane
 Mebane, NC 27302

(b) (4)

Project Code: 1808
 Project Start Date: 27-Aug-04
 Arista SOP #: T-027
 Smoking Protocol: FTC
 Authorized By: (b) (6)
 Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run #	Port#	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	Hydroquinone (µg/cigt)	Resorcinol (µg/cigt)	Catechol (µg/cigt)	Phenol (µg/cigt)	m+p-Cresol (µg/cigt)	o-Cresol (µg/cigt)
C00416	I	Quest 3	3561	6.3	9.78	16.2	0.38	21.0	8.87	8.05	2.52
C00416	L	Quest 3	3561	6.0	8.68	15.0	0.34	19.1	7.86	7.33	2.23
C00416	M	Quest 3	3561	6.0	8.96	14.2	0.34	18.6	7.12	6.91	2.14
C00416	R	Quest 3	3561	6.3	9.16	14.7	0.34	19.8	7.83	7.41	2.36
C00416	S	Quest 3	3561	6.2	8.40	14.7	0.32	19.1	7.46	6.69	2.11
C00419	R	Quest 3	3561	6.0	8.52	14.0	0.34	20.0	8.20	7.82	2.46
Average				6.2	8.9	14.8	0.34	19.6	7.89	7.37	2.30
SD				0.1	0.5	0.8	0.02	0.8	0.61	0.52	0.17
%RSD				2.2	5.7	5.2	5.62	4.3	7.7	7.0	7.3
C00416	F	2R4F	912	9.1	12.5	36.4	0.73	46.0	7.69	6.63	2.31
C00416	Q	2R4F	912	8.9	11.4	32.3	0.67	43.8	8.57	6.96	2.48
C00419	J	2R4F	912	9.2	11.6	32.2	0.67	43.7	7.56	6.45	2.25
C00419	N	2R4F	912	9.1	12.0	30.8	0.64	41.9	6.78	5.79	1.99
Average				9.1	11.9	32.9	0.68	43.8	7.65	6.46	2.26
SD				0.1	0.5	2.4	0.03	1.7	0.73	0.49	0.20
%RSD				1.4	4.1	7.4	5.1	3.8	9.6	7.6	8.9

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PROJECT CODE: 1808

APPENDIX D

Analysis of Mainstream Cigarette Smoke for Volatiles

The results in this test report relate only to the samples identified in this report. The information is confidential and is only to be used by the client identified in this report. Arista Laboratories accepts no liability in the use of this report or the results contained, herein. The original controlled report shall not be reproduced without written approval of Arista Laboratories, Inc.

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DETERMINATION OF VOLATILES IN MAINSTREAM SMOKE

I. PRINCIPLE OF METHOD

The analytical method used for this study is detailed in Arista SOP T-015 Determination of Volatiles in Mainstream Smoke. The term Volatiles refers to 1,3-butadiene, isoprene, acrylonitrile, benzene, toluene, and styrene.

Mainstream smoke from test cigarettes is generated under conditions specified by the study protocol, passed through a 44-mm Cambridge filter and collected in one fritted impinger containing 20mL methanol that is immersed in a dry-ice/isopropanol bath. After smoking, the filter is weighed and transferred to the impinger. Internal standard is added, the impinger is vortexed briefly and the extract subsequently analyzed using gas chromatography with a mass selective detector (GC/MSD).

Individual volatile concentrations are determined by the internal standard method. The concentrations of the volatiles determined by the GC/MSD are reported in units of mass-to-volume (i.e., $\mu\text{g/mL}$). The measured concentration, the number of cigarettes smoked, and the sample solution volume(s) are used to calculate the total analyte mass on a per cigarette basis.

Mainstream Volatiles Test Report for:
 Liggett Group Inc.
 100 Maple Lane
 Mebane, NC 27302

(b) (4)

Project Code: 1808
 Project Start Date: 27-Aug-04
 Arista SOP #: T-015
 Smoking Protocol: FTC
 Authorized By: (b) (6)
 Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run #	Port#	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	1,3-butadiene (µg/cigt)	Isoprene (µg/cigt)	Acrylonitrile (µg/cigt)	Benzene (µg/cigt)	Toluene (µg/cigt)	Styrene (µg/cigt)
400868	D	Camel 100	3557	10.6	20.9	48.1	470	12.0	57.4	108	10.9
400868	G	Camel 100	3557	10.8	23.7	59.0	560	15.0	64.4	119	13.6
400871	B	Camel 100	3557	11.0	22.8	49.3	500	16.5	66.1	122	13.3
400871	F	Camel 100	3557	11.0	23.8	49.0	495	14.0	61.4	115	12.4
400871	H	Camel 100	3557	11.0	22.7	57.6	556	13.9	65.3	121	12.4
400872	A	Camel 100	3557	11.0	23.4	50.3	514	13.7	61.8	116	12.5
Average				10.9	22.9	52.2	516	14.2	62.7	117	12.5
sd				0.2	1.1	4.8	36	1.5	3.2	5	0.9
%RSD				1.5	4.7	9.1	6.9	10.6	5.1	4.5	7.4
400862	F	Marlboro Light	3558	7.6	13.2	45.8	467	10.4	45.6	83.1	8.00
400868	E	Marlboro Light	3558	8.0	12.6	35.3	371	8.72	41.2	74.6	6.24
400868	H	Marlboro Light	3558	7.8	12.0	43.2	417	9.04	41.8	76.2	6.76
400871	D	Marlboro Light	3558	8.2	13.0	38.0	407	9.12	42.6	80.0	6.88
400872	E	Marlboro Light	3558	8.0	12.8	37.7	374	7.96	40.6	75.5	6.08
400872	G	Marlboro Light	3558	8.0	13.2	38.2	377	8.28	39.6	74.2	6.36
Average				7.9	12.8	39.7	402	8.92	41.9	77.3	6.72
sd				0.2	0.4	4.0	37	0.85	2.1	3.5	0.70
%RSD				2.6	3.3	10.0	9.2	9.5	4.9	4.6	10.4

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Mainstream Volatiles Test Report for:
Liggett Group, Inc.
100 Maple Lane
Mebane, NC 27302

(b) (4)

Project Code: 1808
Project Start Date: 27-Aug-04
Arista SOP #: T-015
Smoking Protocol: FTC
Authorized By: (b) (6)
Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run #	Port#	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	1,3-butadiene (µg/cigt)	Isoprene (µg/cigt)	Acrylonitrile (µg/cigt)	Benzene (µg/cigt)	Toluene (µg/cigt)	Styrene (µg/cigt)
400862	E	Quest 1	3559	6.6	10.1	23.0	172	3.72	16.3	26.6	2.92
400868	A	Quest 1	3559	6.6	11.2	22.9	189	5.28	17.3	28.4	2.92
400868	C	Quest 1	3559	6.8	11.2	23.5	184	3.92	16.3	26.4	3.00
400868	F	Quest 1	3559	7.0	11.8	30.0	218	4.60	18.9	30.8	3.64
400871	A	Quest 1	3559	7.0	11.6	25.6	211	4.88	20.6	33.6	3.44
400871	J	Quest 1	3559	6.8	13.2	27.2	213	5.08	20.8	33.5	3.84
				Average	6.8	11.5	198	4.58	18.4	29.9	3.29
				sd	0.2	1.0	19	0.63	2.0	3.3	0.40
				%RSD	2.6	8.9	9.4	13.8	11.1	10.9	12.2
400862	D	Quest 2	3560	6.2	10.7	22.9	168	5.16	19.6	32.0	3.76
400862	H	Quest 2	3560	6.4	10.8	26.0	182	5.16	19.6	31.6	3.88
400862	J	Quest 2	3560	6.2	11.4	23.4	171	5.08	19.7	32.2	3.96
400868	I	Quest 2	3560	6.0	9.70	24.2	150	4.72	16.2	26.2	3.08
400871	C	Quest 2	3560	6.6	11.7	22.6	164	5.12	19.5	31.8	3.72
400871	I	Quest 2	3560	6.0	10.1	23.3	155	4.60	16.8	27.5	3.20
				Average	6.2	10.8	165	4.97	18.6	30.2	3.60
				sd	0.2	0.8	12	0.25	1.6	2.7	0.37
				%RSD	3.8	7.0	7.1	5.0	8.7	8.8	10.2

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Mainstream Volatiles Test Report for:
 Liggett Group Inc.
 100 Maple Lane
 Mebane, NC 27302

(b) (4)

Project Code: 1808
 Project Start Date: 27-Aug-04
 Arista SOP #: T-015
 Smoking Protocol: FTC
 Authorized By: (b) (6)
 Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run #	Port#	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	1,3-butadiene (µg/cigt)	Isoprene (µg/cigt)	Acrylonitrile (µg/cigt)	Benzene (µg/cigt)	Toluene (µg/cigt)	Styrene (µg/cigt)
400862	C	Quest 3	3561	6.2	9.16	18.4	129	4.28	13.7	22.2	2.32
400862	G	Quest 3	3561	6.2	10.0	18.4	128	4.60	13.8	23.3	2.64
400862	I	Quest 3	3561	6.2	10.2	16.6	123	4.56	13.9	23.6	2.60
400872	B	Quest 3	3561	6.2	10.5	20.0	152	5.08	16.1	26.2	3.08
400872	D	Quest 3	3561	6.0	10.3	21.1	149	5.04	15.2	25.6	3.04
400872	H	Quest 3	3561	6.0	9.34	20.5	142	4.44	14.3	22.8	2.60
Average				6.1	9.93	19.2	137	4.67	14.5	24.0	2.71
sd				0.1	0.55	1.7	12	0.32	1.0	1.6	0.29
%RSD				1.7	5.6	8.8	8.8	7.0	6.6	6.7	10.8
400862	A	2R4F	912	8.8	11.9	38.8	381	9.64	48.5	92.8	7.12
400868	B	2R4F	912	8.8	12.2	40.7	399	8.76	47.7	90.7	7.36
400871	G	2R4F	912	8.8	12.6	38.8	376	8.80	47.0	87.7	7.08
400872	C	2R4F	912	8.8	11.5	36.7	318	6.96	42.4	77.9	5.56
Average				8.8	12.0	38.7	369	8.54	46.4	87.3	6.78
sd				0.0	0.4	1.7	35	1.13	2.7	6.6	0.82
%RSD				0.0	3.6	4.3	9.6	13.2	5.9	7.5	12.1

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PROJECT CODE: 1808

APPENDIX E

Analysis of Mainstream Cigarette Smoke for Pyridine, 3-Vinylpyridine and Quinoline

The results in this test report relate only to the samples identified in this report. The information is confidential and is only to be used by the client identified in this report. Arista Laboratories accepts no liability in the use of this report or the results contained, herein. The original controlled report shall not be reproduced without written approval of Arista Laboratories, Inc.

DETERMINATION OF PYRIDINE, 3-VINYLPYRIDINE AND QUINOLINE (SEMIVOLATILES) IN MAINSTREAM SMOKE

I. PRINCIPLE OF METHOD

The analytical method used for this study is detailed in Arista SOP T-006 Determination of Pyridine, 3-Vinylpyridine and Quinoline in Mainstream Smoke.

Mainstream (MS) smoke is passed through a 44-mm Cambridge filter and collected in one impinger containing 20 mL MeOH/TEA that is immersed in a dry-ice/isopropanol bath. After smoking, the MS filter is weighed and transferred to an Erlenmeyer flask. The contents of the impinger are added, the internal standard (ISTD) is added, and the sample is shaken for 30 min at 200 rpm. The extract is filtered into an ALS vial and subsequently analyzed by GC/MSD.

Individual analyte concentrations are determined by the internal standard method using gas-chromatography with mass-selective detection. The concentrations of the analytes determined by the GC/MSD are reported in units of mass-to-volume (i.e., $\mu\text{g/mL}$). The measured concentration, the number of cigarettes smoked, and the sample solution volume(s) are used to calculate the total analyte mass on a per cigarette basis.

Mainstream Semivolatiles Test Report for:
Liggett Group Inc.
100 Maple Lane
Mebane, NC 27302

(b) (4)

Project Code: 1808
Project Start Date: 27-Aug-04
Arista SOP #: T-006
Smoking Protocol: FTC
Authorized By: (b) (6)
Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run #	Port	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	Pyridine (µg/cigt)	3-vinylpyridine (µg/cigt)	Quinoline (µg/cigt)
400860	E	Camel 100	3557	11.0	22.9	10.5	2.72	0.438
400861	C	Camel 100	3557	10.8	24.0	12.7	3.36	0.503
400861	I	Camel 100	3557	10.6	22.1	9.88	3.23	0.483
400866	A	Camel 100	3557	10.6	23.4	11.7	2.97	0.458
400866	F	Camel 100	3557	11.0	23.6	11.2	3.00	0.426
400867	A	Camel 100	3557	10.8	21.0	8.52	2.37	0.333
Average				10.8	22.8	10.8	2.94	0.440
sd				0.2	1.1	1.5	0.36	0.060
% RSD				1.7	4.9	13.6	12.2	13.6
400860	C	Marlboro Light	3558	7.6	13.0	6.15	1.59	0.241
400861	A	Marlboro Light	3558	8.0	12.5	5.78	1.58	0.244
400866	B	Marlboro Light	3558	7.8	11.6	5.29	1.39	0.210
400866	E	Marlboro Light	3558	8.0	12.1	5.96	1.43	0.218
400866	H	Marlboro Light	3558	8.0	12.6	5.58	1.26	0.204
400867	B	Marlboro Light	3558	8.2	14.1	7.01	1.61	0.208
Average				7.9	12.6	5.96	1.47	0.221
sd				0.2	0.9	0.59	0.14	0.017
% RSD				2.6	6.7	10.0	9.5	7.8
400860	F	Quest 1	3559	6.8	11.5	3.68	1.36	0.261
400861	B	Quest 1	3559	6.4	10.5	3.22	1.16	0.229
400861	G	Quest 1	3559	7.0	11.5	3.99	1.31	0.263
400866	G	Quest 1	3559	7.0	12.1	4.37	1.35	0.244
400866	I	Quest 1	3559	6.6	11.1	3.29	1.21	0.226
400867	D	Quest 1	3559	6.2	10.7	2.87	1.10	0.226
Average				6.7	11.2	3.57	1.25	0.242
sd				0.3	0.6	0.55	0.11	0.017
% RSD				4.9	5.4	15.4	8.5	7.2
400860	A	Quest 2	3560	6.0	10.7	3.11	0.749	0.213
400861	D	Quest 2	3560	6.2	10.9	2.99	0.721	0.211
400861	F	Quest 2	3560	6.4	10.4	3.17	0.781	0.211
400861	H	Quest 2	3560	6.2	10.4	2.76	0.697	0.204
400866	J	Quest 2	3560	6.8	11.2	3.58	0.873	0.231
400867	E	Quest 2	3560	5.8	9.16	2.20	0.557	0.174
Average				6.2	10.5	2.97	0.730	0.207
sd				0.3	0.7	0.46	0.104	0.019
% RSD				5.5	6.8	15.6	14.3	9.0

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Mainstream Semivolatiles Test Report for:
Liggett Group Inc.
100 Maple Lane
Mebane, NC 27302

(b) (4)

Project Code: 1808
Project Start Date: 27-Aug-04
Arista SOP #: T-006
Smoking Protocol: FTC
Authorized By: (b) (6)
Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run #	Port	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	Pyridine (µg/cigt)	3-vinylpyridine (µg/cigt)	Quinoline (µg/cigt)
400860	B	Quest 3	3561	6.4	11.4	4.00	0.490	0.225
400860	D	Quest 3	3561	6.0	9.22	2.63	0.410	0.222
400860	G	Quest 3	3561	6.4	11.3	4.48	0.522	0.227
400860	J	Quest 3	3561	6.0	8.30	2.09	0.370	0.200
400867	C	Quest 3	3561	6.0	10.2	3.48	0.476	0.214
400867	F	Quest 3	3561	6.2	9.66	3.06	0.432	0.211
Average				6.2	10.0	3.29	0.450	0.216
sd				0.2	1.2	0.88	0.056	0.010
% RSD				3.2	12.1	26.8	12.5	4.7
400860	H	2R4F	912	9.0	11.8	4.35	1.12	0.208
400861	E	2R4F	912	8.8	11.4	5.26	1.12	0.225
400866	D	2R4F	912	8.6	11.7	4.94	1.17	0.194
400867	G	2R4F	912	9.0	11.5	5.14	1.23	0.194
Average				8.9	11.6	4.92	1.16	0.205
sd				0.2	0.2	0.40	0.05	0.015
% RSD				2.2	1.8	8.2	4.4	7.3



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PROJECT CODE: 1808

APPENDIX F

Analysis of Mainstream Cigarette Smoke for Ammonia

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DETERMINATION OF AMMONIA IN MAINSTREAM SMOKE

I. PRINCIPLE OF METHOD

The analytical method used for this study is detailed in Arista SOP T-011 Determination of Ammonia in Mainstream Smoke.

For mainstream smoke collection, cigarette smoke is passed through a 44-mm Cambridge filter and collected in 2 impingers each containing 30 ml of 10 mmol Methanesulfonic acid (MSA). Immediately after smoking, the filter is transferred to a 125 ml Polymethylpentene Erlenmeyer flask along with the contents of both impingers. The flask is placed on the shaker for 30 min at 200rpm and the extract is subsequently analyzed by High Performance Liquid Chromatography, (HPLC), with conductivity detection.

The concentration of ammonia determined by ion chromatography is reported in units of mass-to-volume (i.e., $\mu\text{g/mL}$). The measured ammonia concentration, the number of cigarettes smoked, and the sample solution volume(s) are also used to calculate the total amount of ammonia on a per cigarette basis.

Mainstream Ammonia Test Report for:
 Liggett Group Inc.
 100 Maple Lane
 Mebane, NC 27302
 (b) (4)

Project Code: 1808
 Project Start Date: 27-Aug-04
 Arista SOP #: T-011
 Smoking Protocol: FTC
 Authorized By: (b) (6)
 Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run #	Port	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	Ammonia (µg/cigt)
400873	A	Camel 100	3557	10.8	23.6	21.6
400873	C	Camel 100	3557	11.0	22.6	19.4
400873	F	Camel 100	3557	11.0	21.1	20.1
400873	H	Camel 100	3557	10.8	22.2	18.8
400888	E	Camel 100	3557	10.6	20.8	16.6
400888	H	Camel 100	3557	10.8	18.9	16.9
Average				10.8	21.5	18.9
SD				0.2	1.6	1.9
%RSD				1.4	7.7	10.2
400875	C	Marlboro Light	3558	7.8	11.7	13.1
400876	B	Marlboro Light	3558	7.8	12.3	13.8
400876	H	Marlboro Light	3558	8.0	12.9	13.3
400888	A	Marlboro Light	3558	7.6	12.3	15.8
400888	C	Marlboro Light	3558	7.8	11.5	13.0
400888	G	Marlboro Light	3558	8.4	12.6	14.7
Average				7.9	12.2	13.9
SD				0.3	0.5	1.1
%RSD				3.5	4.3	8.0
400873	D	Quest 1	3559	6.6	10.1	11.3
400873	I	Quest 1	3559	6.4	10.1	11.8
400875	B	Quest 1	3559	6.2	10.4	10.1
400875	E	Quest 1	3559	6.4	9.36	9.77
400875	H	Quest 1	3559	6.8	12.0	11.8
400875	J	Quest 1	3559	6.2	10.3	10.9
Average				6.4	10.4	11.0
SD				0.2	0.9	0.9
%RSD				3.6	8.4	7.9
400873	E	Quest 2	3560	6.0	9.74	14.2
400873	J	Quest 2	3560	6.0	10.1	16.4
400875	A	Quest 2	3560	6.0	9.06	12.2
400876	A	Quest 2	3560	6.0	9.84	13.2
400876	G	Quest 2	3560	6.0	9.66	13.0
400888	I	Quest 2	3560	6.2	12.1	14.9
Average				6.0	10.1	14.0
SD				0.1	1.0	1.5
%RSD				1.4	10.2	10.7

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Mainstream Ammonia Test Report for:
Liggett Group Inc.
100 Maple Lane
Mebane, NC 27302
(b) (4)

Project Code: 1808
Project Start Date: 27-Aug-04
Arista SOP #: T-011
Smoking Protocol: FTC
Authorized By: (b) (6)
Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run #	Port	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	Ammonia (µg/cigt)
400875	D	Quest 3	3561	5.8	8.58	38.6
400875	I	Quest 3	3561	6.0	8.94	36.4
400876	C	Quest 3	3561	6.2	9.96	41.8
400876	F	Quest 3	3561	6.4	8.70	38.7
400888	D	Quest 3	3561	6.2	10.3	43.1
400888	F	Quest 3	3561	6.4	10.1	50.0
Average				6.2	9.43	41.4
SD				0.2	0.78	4.8
%RSD				3.8	8.2	11.7
400873	B	2R4F	912	8.8	11.4	9.76
400875	F	2R4F	912	9.0	10.9	9.14
400876	E	2R4F	912	8.8	10.8	9.61
400888	J	2R4F	912	8.6	11.1	9.69
Average				8.8	11.0	9.55
SD				0.2	0.3	0.28
%RSD				1.9	2.3	3.0

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APPENDIX G

Analysis of Mainstream Cigarette Smoke for Select Polynuclear Aromatic Hydrocarbons (PAHs)

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PROJECT CODE: 1808

THE DETERMINATION OF SELECTED POLYNUCLEAR AROMATIC HYDROCARBONS (PAHS) IN MAINSTREAM

I. PRINCIPLE OF METHOD

The analytical method used for this study is detailed in Arista SOP T-038 Determination of Selected Polynuclear Aromatic Hydrocarbons (PAHs) in Mainstream Smoke.

Mainstream (MS) smoke from test cigarettes is generated under conditions specified by the study protocol and passed through a 44-mm Cambridge filter and collected in one impinger containing 20 mL of OPTIMA grade MeOH that is immersed in an ice-water bath. After smoking, the MS filter is weighed and transferred to a brown glass bottle. The contents of the impinger and Internal standard are added to the amber bottle and the sample is shaken for 30 min at 200 rpm on an orbital shaker. TYPE-1 water is added and the solution is passed through a C-18 SPE cartridge that has been rinsed with 30% MeOH in Type 1 water using a vacuum manifold. After all of the solution has passed through the SPE cartridge, the eluent is discarded and approximately 1.5 mL of benzene is added to the SPE cartridge for extraction of the PAH fraction. Finally, the extract is passed through a silica SPE cartridge. The sample is then transferred to an autosampler vial for analysis by GC/MSD.

Individual analyte concentrations are determined by the internal standard method using gas-chromatography with a DB-5ms column for chromatographic separation of the analytes and selected ion monitoring (SIM) after electron impact ionization. The concentrations of the analytes, determined by the GC/MSD are reported in units of mass-to-volume (i.e., ng/mL). The measured concentration, the number of cigarettes smoked, and the sample solution volume(s) are used to calculate the total analyte mass on a per cigarette basis.

Mainstream PAH Test Report for:
 Liggett Group Inc.
 100 Maple Lane
 Mebane, NC 27302

(b) (4)

Project Code: 1808
 Project Start Date: 27-Aug-04
 Arista SOP #: T-038
 Smoking Protocol: FTC
 Authorized By: (b) (6)
 Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run#	Port	Client Code	Arista Code	Puffs (/cigt)	MS TPM (mg/cigt)	Naphthalene (ng/cigt)	Fluorene (ng/cigt)	Phenanthrene (ng/cigt)	Anthracene (ng/cigt)	Fluoranthene (ng/cigt)	Pyrene (ng/cigt)	Benz- anthracene (ng/cigt)	Chrysene (ng/cigt)	Benzo(e) pyrene (ng/cigt)	Benzo(a) pyrene (ng/cigt)	Indeno[1,2,3-cd]pyrene (ng/cigt)
400863	A	Camel 100	3557	10.6	22.2	880	364	285	98.9	119	90.2	25.2	29.2	8.04	12.4	6.93
400863	E	Camel 100	3557	11.0	18.2	713	325	232	84.1	92.3	70.9	22.3	26.3	7.35	11.0	6.77
400863	I	Camel 100	3557	11.0	21.9	929	373	273	98.9	111	84.9	26.9	31.3	8.41	12.6	7.65
400864	A	Camel 100	3557	11.0	22.5	940	374	253	94.6	105	82.6	27.9	31.7	8.58	13.2	8.09
400869	E	Camel 100	3557	11.0	19.8	831	367	257	95.8	106	80.5	25.9	29.8	8.13	12.2	7.33
400869	G	Camel 100	3557	11.0	21.4	890	375	258	94.6	104	80.3	25.9	30.2	8.30	12.2	8.48
Average				10.9	21.0	864	363	260	94.5	106	81.6	25.7	29.7	8.14	12.3	7.54
SD				0.2	1.7	83	19	18	5.5	9	6.4	1.9	1.9	0.43	0.7	0.66
%RSD				1.5	7.9	9.7	5.3	7.0	5.8	8.3	7.8	7.4	6.5	5.3	5.9	8.8
400863	D	Marlboro Light	3558	7.8	12.2	376	175	155	52.8	62.1	45.3	13.8	15.9	4.15	6.43	3.36
400864	C	Marlboro Light	3558	8.0	13.0	456	205	156	55.6	58.6	45.1	14.8	17.0	4.28	7.03	3.74
400864	E	Marlboro Light	3558	8.0	12.2	388	197	160	55.0	61.8	46.9	14.9	17.2	4.49	6.98	4.10
400869	B	Marlboro Light	3558	7.8	11.4	395	182	157	54.3	59.1	45.3	13.9	15.7	3.93	6.17	3.48
400870	C	Marlboro Light	3558	8.2	11.9	377	182	140	51.8	53.5	41.6	14.0	16.1	4.18	6.58	3.86
400870	F	Marlboro Light	3558	8.0	11.8	405	190	146	53.5	53.2	42.0	13.9	15.6	4.03	6.63	3.57
Average				8.0	12.1	400	188	152	53.8	58.0	44.4	14.2	16.3	4.18	6.63	3.68
SD				0.2	0.5	30	11	8	1.4	3.9	2.1	0.5	0.7	0.19	0.33	0.27
%RSD				1.9	4.3	7.5	6.0	5.1	2.6	6.7	4.7	3.4	4.3	4.6	4.9	7.4
400863	C	Quest 1	3559	6.4	10.5	343	170	128	43.3	50.1	33.4	9.91	11.0	3.09	4.36	2.66
400864	J	Quest 1	3559	6.4	10.0	347	173	120	41.6	43.2	30.8	10.1	11.3	3.19	4.48	2.95
400869	C	Quest 1	3559	6.6	11.9	400	174	148	47.1	57.4	39.0	11.8	12.8	3.73	5.50	3.00
400869	I	Quest 1	3559	6.4	9.64	340	162	127	41.4	47.4	31.9	9.91	11.3	3.28	4.68	3.01
400870	A	Quest 1	3559	6.8	10.7	420	193	128	46.5	47.8	32.9	11.3	12.5	3.48	5.21	3.16
400870	E	Quest 1	3559	6.8	10.2	348	176	121	42.7	46.6	33.5	10.6	11.4	3.45	4.87	2.83
Average				6.6	10.5	367	175	128	43.8	48.8	33.6	10.6	11.7	3.37	4.85	2.94
SD				0.2	0.8	35	10	10	2.5	4.8	2.8	0.8	0.7	0.23	0.44	0.17
%RSD				3.0	7.5	9.4	6.0	7.4	5.6	9.8	8.4	7.4	6.4	6.9	9.0	5.8

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Mainstream PAH Test Report for:
 Liggett Group Inc.
 100 Maple Lane
 Mebane, NC 27302

(b) (4)

Project Code: 1808
 Project Start Date: 27-Aug-04
 Arista SOP #: T-038
 Smoking Protocol: FTC
 Authorized By: (b) (6)
 Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run#	Port	Client Code	Arista Code	Puffs (/cigt)	MS TPM (mg/cigt)	Naphthalene (ng/cigt)	Fluorene (ng/cigt)	Phenanthrene (ng/cigt)	Anthracene (ng/cigt)	Fluoranthene (ng/cigt)	Pyrene (ng/cigt)	Benz- anthracene (ng/cigt)	Chrysene (ng/cigt)	Benzo(e) pyrene (ng/cigt)	Benzo(a) pyrene (ng/cigt)	Indeno[1,2,3- cd]pyrene (ng/cigt)
400863	B	Quest 2	3560	6.2	10.2	334	165	133	41.8	52.7	33.5	10.3	11.4	3.54	4.49	2.44
400864	B	Quest 2	3560	6.0	9.74	366	175	113	38.2	44.5	28.5	9.49	10.3	3.23	4.37	2.36
400869	A	Quest 2	3560	6.2	11.1	426	205	162	49.7	64.6	40.0	11.7	13.1	4.07	5.46	3.40
400869	D	Quest 2	3560	6.2	9.98	338	164	129	41.7	48.8	32.0	10.3	11.1	3.28	4.55	3.01
400869	H	Quest 2	3560	6.2	10.6	407	178	136	44.0	52.1	32.9	10.5	11.2	3.68	4.90	2.88
400870	D	Quest 2	3560	6.0	9.40	393	173	116	41.5	45.6	29.9	10.2	10.8	3.47	4.72	3.22
Average				6.1	10.2	377	177	132	42.8	51.4	32.8	10.4	11.3	3.54	4.75	2.88
SD				0.1	0.6	38	15	17	3.9	7.3	4.0	0.7	0.9	0.31	0.39	0.42
%RSD				1.7	5.9	10.0	8.3	13.2	9.0	14.2	12.2	6.9	8.3	8.7	8.3	14.5
400863	F	Quest 3	3561	6.2	8.34	326	157	124	38.5	48.8	28.9	8.90	9.55	3.18	4.04	2.20
400863	H	Quest 3	3561	6.2	9.34	337	175	133	41.4	53.4	31.2	9.75	10.3	3.18	4.27	2.73
400864	D	Quest 3	3561	6.2	9.28	374	184	116	38.9	46.3	27.9	9.87	9.81	3.38	4.36	2.53
400864	F	Quest 3	3561	6.2	9.40	357	174	118	39.1	44.3	27.5	9.54	9.51	3.18	4.06	2.53
400864	I	Quest 3	3561	6.2	8.60	369	176	119	38.4	44.7	27.4	9.30	9.77	3.32	4.38	2.50
400870	B	Quest 3	3561	6.0	9.36	330	172	119	38.9	44.4	27.3	9.99	10.1	3.17	4.23	2.68
Average				6.2	9.05	349	173	122	39.2	47.0	28.4	9.56	9.84	3.23	4.22	2.53
SD				0.1	0.46	21	9	6	1.1	3.6	1.5	0.41	0.31	0.09	0.15	0.19
%RSD				1.3	5.1	5.9	5.1	5.2	2.9	7.7	5.4	4.3	3.2	2.8	3.4	7.3
400863	G	2R4F	912	8.6	10.6	380	198	162	54.8	56.7	41.0	13.0	14.8	3.98	5.80	2.74
400864	H	2R4F	912	9.0	11.0	409	217	171	56.6	60.6	44.8	14.5	16.8	4.21	6.29	3.35
400869	J	2R4F	912	9.0	12.5	426	217	168	60.5	61.0	45.6	15.0	16.7	4.34	6.58	3.56
400870	G	2R4F	912	9.0	10.8	350	206	144	54.5	52.9	41.4	13.9	15.2	3.75	6.03	3.32
Average				8.9	11.2	391	210	161	56.6	57.8	43.2	14.1	15.9	4.07	6.17	3.24
SD				0.2	0.9	33	9	12	2.8	3.8	2.3	0.9	1.0	0.26	0.33	0.35
%RSD				2.2	7.9	8.5	4.4	7.5	4.9	6.6	5.4	6.0	6.3	6.3	5.4	10.9

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APPENDIX H

Analysis of Mainstream Cigarette Smoke for Hydrogen Cyanide (HCN)

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DETERMINATION OF HYDROGEN CYANIDE IN MAINSTREAM SMOKE

I. PRINCIPLE OF METHOD

The analytical method used for this study is detailed in Arista SOP T-049 Determination of Hydrogen Cyanide (HCN) in Mainstream Smoke.

HCN is determined from mainstream smoke collected on a Cambridge filter followed by one non-fritted impinger containing 0.1N sodium hydroxide as the collection media. An automated spectrophotometer is used to analyze the pad extract and the impinger trapping solutions where each sample undergoes quantitative addition of reagents. Hydrogen cyanide in the sample is converted to cyanogen chloride by the addition of an aqueous solution of chloramine-T. The cyanogen chloride then reacts with pyridine and barbituric acid to produce a reddish-violet color complex that is measured photometrically at 575nm. The Beer-Lambert Law linearly relates formation of the colored complex to concentration.

The concentration of HCN is reported in units of mass-to-volume (i.e., $\mu\text{g/mL}$). The measured HCN concentration, the number of cigarettes smoked, and the sample solution volume(s) is also used to calculate the total mass of HCN on a per cigarette basis.

Mainstream HCN Test Report for:
 Liggett Group Inc.
 100 Maple Lane
 Mebane, NC 27302
 (b) (4)

Project Code: 1808
 Project Start Date: 27-Aug-04
 Arista SOP #: T-049
 Smoking Protocol: FTC
 Authorized By: (b) (6)
 Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run #	Port#	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	Impinger HCN (µg/cigt)	Pad HCN (µg/cigt)	Total HCN (µg/cigt)
400881	C	Camel 100	3557	11.0	23.7	101.2	91.8	193.1
400881	H	Camel 100	3557	10.3	22.7	98.6	87.4	186.0
400882	B	Camel 100	3557	11.0	20.9	85.3	79.3	164.6
400882	H	Camel 100	3557	10.3	22.5	95.8	96.5	192.2
400883	H	Camel 100	3557	11.0	22.9	98.5	95.0	193.5
400883	J	Camel 100	3557	11.0	24.1	101.8	83.8	185.7
Average				10.8	22.8	96.9	89.0	185.8
sd				0.3	1.1	6.1	6.7	11.0
%RSD				3.2	4.8	6.3	7.5	5.9
400881	F	Marlboro Light	3558	8.0	11.8	68.6	49.5	118.1
400881	J	Marlboro Light	3558	7.0	11.8	75.6	49.8	125.3
400882	I	Marlboro Light	3558	7.7	12.8	86.0	55.7	141.7
400883	B	Marlboro Light	3558	7.7	12.2	76.0	53.9	129.9
400883	D	Marlboro Light	3558	8.0	12.2	68.1	53.6	121.7
400883	F	Marlboro Light	3558	8.0	12.5	69.6	57.8	127.4
Average				7.7	12.2	74.0	53.4	127.4
sd				0.4	0.4	6.8	3.3	8.2
%RSD				5.0	3.1	9.2	6.1	6.4
400881	B	Quest 1	3559	6.3	12.6	56.6	33.4	89.9
400882	C	Quest 1	3559	6.7	10.6	47.8	29.2	77.0
400882	G	Quest 1	3559	7.0	11.7	55.5	32.2	87.7
400883	C	Quest 1	3559	6.3	10.1	45.3	34.1	79.4
400884	C	Quest 1	3559	6.3	11.2	52.2	27.1	79.4
400884	I	Quest 1	3559	6.0	9.63	49.9	23.0	73.0
Average				6.4	11.0	51.2	29.8	81.1
sd				0.3	1.1	4.4	4.3	6.5
%RSD				5.3	9.9	8.6	14.3	8.0
400881	A	Quest 2	3560	7.0	12.2	54.3	28.0	82.3
400881	G	Quest 2	3560	6.7	11.9	62.4	32.0	94.4
400882	J	Quest 2	3560	6.0	9.13	52.7	28.4	81.1
400883	G	Quest 2	3560	6.3	9.40	54.0	25.8	79.8
400884	H	Quest 2	3560	6.0	11.0	55.9	28.7	84.6
Average				6.4	10.7	55.9	28.6	84.4
sd				0.4	1.4	3.8	2.2	5.8
%RSD				6.8	13.2	6.8	7.8	6.9

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Mainstream HCN Test Report for:**Liggett Group Inc.****100 Maple Lane****Mebane, NC 27302****(b) (4)****Project Code: 1808****Project Start Date: 27-Aug-04****Arista SOP #: T-049****Smoking Protocol: FTC****Authorized By: (b) (6)****Title: QA Mgr***For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>*

Run #	Port#	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	Impinger HCN (µg/cigt)	Pad HCN (µg/cigt)	Total HCN (µg/cigt)
400881	I	Quest 3	3561	6.0	9.47	53.5	22.2	75.7
400882	A	Quest 3	3561	6.3	11.6	42.9	34.2	77.1
400883	A	Quest 3	3561	6.0	8.70	53.6	22.1	75.7
400884	B	Quest 3	3561	6.3	10.3	51.2	22.9	74.1
400884	D	Quest 3	3561	6.0	9.07	56.4	21.9	78.3
400884	G	Quest 3	3561	6.0	9.77	58.9	23.6	82.5
Average				6.1	9.82	52.8	24.5	77.2
sd				0.2	1.04	5.5	4.8	3.0
%RSD				2.8	10.6	10.4	19.6	3.8
400881	D	2r4f	912	8.3	11.2	68.1	46.5	114.6
400882	F	2r4f	912	9.0	11.1	60.1	45.8	105.9
400883	I	2r4f	912	8.7	11.9	59.3	44.9	104.1
400884	F	2r4f	912	8.3	12.0	68.2	50.7	118.9
Average				8.6	11.6	63.9	47.0	110.9
sd				0.3	0.5	4.9	2.6	7.0
%RSD				3.7	4.0	7.7	5.5	6.3

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APPENDIX I

Analysis of Mainstream Cigarette Smoke for Polycyclic Aromatic Amines I (PAA I)

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THE DETERMINATION OF 1-NAPHTHYLAMINE, 2-NAPHTHYLAMINE, 3-AMINOBIIPHENYL AND 4-AMINOBIIPHENYL (PAAS) IN MAINSTREAM SMOKE

I. PRINCIPLE OF METHOD

The analytical method used for this study is detailed in Arista SOP T-030 Determination of 1-naphthylamine, 2-naphthylamine, 3-aminobiphenyl and 4-aminobiphenyl (PAAs) in mainstream smoke.

Mainstream (MS) smoke from test cigarettes is generated under conditions specified by the study protocol and passed through a 44-mm Cambridge filter. After smoking, the filter is weighed and transferred to a Polymethylpentene Erlenmeyer flask containing 25 mL of 5% HCl. Internal standard is added and the sample is shaken for 30 min on a wrist action shaker. The extract is filtered into a separatory funnel and extracted with dichloromethane. The dichloromethane is disposed of as chlorinated waste and sodium hydroxide (50% solution in water) is added to the aqueous phase to make the sample basic. The contents are extracted three times with dichloromethane. The combined dichloromethane extract is derivatized with pentafluoropropionic acid anhydride (PFPA), passed through a Florisil Cartridge clean-up step and concentrated to approximately 2 mL.

Individual analyte concentrations are determined by the internal standard method using gas-chromatography followed by negative chemical ionization with Selected Ion Monitoring (SIM) detection. The concentrations of the analytes, determined by the GC/MSD are reported in units of mass-to-volume (i.e., ng/mL). The measured concentration, the number of cigarettes smoked, and the sample solution volume(s) are used to calculate the total analyte mass on a per cigarette basis.

Mainstream Aromatic Amines Test Report for:
Liggett Group Inc.
100 Maple Lane
Mebane, NC 27302
(b) (4)

Project Code: 1808
Project Start Date: 27-Aug-04
Arista SOP #: T-030
Smoking Protocol: FTC
Authorized By: [REDACTED]
Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run #	Port	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	1-Naphthyl Amine (ng/cigt)	2-Naphthyl Amine (ng/cigt)	3-Amino Biphenyl (ng/cigt)	4-Amino Biphenyl (ng/cigt)
C00414	G	Camel 100	3557	11.7	24.7	12.3	6.78	3.15	1.97
C00414	I	Camel 100	3557	11.4	23.0	10.2	6.15	2.71	1.68
C00414	K	Camel 100	3557	11.3	24.2	10.9	6.04	2.74	1.67
C00414	O	Camel 100	3557	11.6	24.5	12.7	6.91	3.17	2.12
C00417	I	Camel 100	3557	11.4	24.3	13.6	7.69	3.50	2.13
C00417	P	Camel 100	3557	12.1	24.7	12.8	7.15	3.22	2.02
Average				11.6	24.2	12.1	6.79	3.08	1.93
sd				0.3	0.6	1.3	0.62	0.30	0.21
% RSD				2.4	2.6	10.4	9.2	9.8	10.7
C00414	C	Marlboro Light	3558	8.0	13.1	7.67	4.68	1.99	1.36
C00414	E	Marlboro Light	3558	8.1	12.7	7.91	4.95	2.11	1.46
C00414	N	Marlboro Light	3558	8.1	12.7	8.67	5.16	2.25	1.58
C00414	T	Marlboro Light	3558	8.1	13.5	8.20	5.01	2.11	1.40
C00417	H	Marlboro Light	3558	8.7	12.7	8.55	5.45	2.32	1.62
C00417	M	Marlboro Light	3558	8.3	13.3	7.97	5.07	2.16	1.35
Average				8.2	13.0	8.16	5.05	2.16	1.46
sd				0.3	0.3	0.39	0.25	0.12	0.11
% RSD				3.1	2.6	4.7	5.0	5.3	7.9
C00414	B	Quest 1	3559	6.7	11.6	8.21	4.92	2.13	1.58
C00414	F	Quest 1	3559	6.7	12.6	7.89	4.39	2.13	1.50
C00414	L	Quest 1	3559	6.5	11.1	6.51	3.75	1.86	1.30
C00414	S	Quest 1	3559	6.7	12.4	7.66	4.25	2.20	1.44
C00417	N	Quest 1	3559	6.7	11.1	6.38	3.81	1.87	1.17
C00417	Q	Quest 1	3559	7.0	12.0	6.35	3.94	1.96	1.20
Average				6.7	11.8	7.17	4.18	2.03	1.37
sd				0.2	0.6	0.85	0.44	0.15	0.17
% RSD				2.4	5.4	11.8	10.6	7.2	12.1

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Mainstream Aromatic Amines Test Report for:
 Liggett Group Inc.
 100 Maple Lane
 Mebane, NC 27302
 (b) (4)

Project Code: 1808
 Project Start Date: 27-Aug-04
 Arista SOP #: T-030
 Smoking Protocol: FTC
 Authorized By: (b) (6)
 Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run #	Port	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	1-Naphthyl Amine (ng/cigt)	2-Naphthyl Amine (ng/cigt)	3-Amino Biphenyl (ng/cigt)	4-Amino Biphenyl (ng/cigt)
C00414	M	Quest 2	3560	6.3	9.90	6.89	3.92	2.16	1.49
C00414	P	Quest 2	3560	6.1	10.7	7.24	4.05	2.25	1.54
C00414	R	Quest 2	3560	6.1	11.3	6.76	3.90	2.28	1.37
C00417	C	Quest 2	3560	6.4	10.4	7.58	4.12	2.33	1.65
C00417	E	Quest 2	3560	6.5	10.9	7.61	4.45	2.43	1.71
C00417	G	Quest 2	3560	6.5	9.76	7.40	4.35	2.36	1.65
Average				6.3	10.5	7.25	4.13	2.30	1.57
sd				0.2	0.6	0.36	0.22	0.09	0.13
% RSD				2.6	5.6	4.9	5.4	4.1	8.2
C00414	A	Quest 3	3561	6.2	8.76	8.65	5.11	3.03	2.26
C00414	Q	Quest 3	3561	6.4	9.96	8.44	4.76	3.06	2.16
C00417	D	Quest 3	3561	6.0	8.72	8.23	4.60	2.93	2.06
C00417	J	Quest 3	3561	6.0	9.00	8.45	4.74	3.00	2.08
C00417	L	Quest 3	3561	6.1	8.96	7.52	4.25	2.62	1.84
C00417	O	Quest 3	3561	6.0	8.84	7.05	4.32	2.71	1.82
Average				6.1	9.04	8.06	4.63	2.89	2.04
sd				0.2	0.46	0.63	0.32	0.18	0.18
% RSD				2.5	5.1	7.8	6.8	6.3	8.7
C00414	D	2R4F	912	8.9	11.5	7.36	4.60	1.96	1.34
C00414	J	2R4F	912	9.1	11.5	6.57	4.40	1.90	1.21
C00417	F	2R4F	912	8.8	10.8	7.70	4.83	2.06	1.47
C00417	K	2R4F	912	9.0	11.1	7.06	4.59	1.96	1.20
Average				9.0	11.2	7.17	4.60	1.97	1.30
sd				0.1	0.4	0.48	0.17	0.06	0.13
% RSD				1.0	3.2	6.7	3.8	3.2	9.9

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APPENDIX J

Analysis of Mainstream Cigarette Smoke for Nitric Oxide (NO)

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THE DETERMINATION OF NITRIC OXIDE IN MAINSTREAM SMOKE

I. PRINCIPLE OF METHOD

The analytical method used for this study is detailed in Arista SOP T-029 - The Determination of Nitric Oxide in Mainstream Cigarette Smoke.

The mainstream smoke from one cigarette is collected puff by puff into a mixing chamber attached to an analytical smoking machine. Once the smoke is collected in the mixing chamber a valve is switched to allow the sample to enter the analyzer. A highly sensitive and selective chemiluminescent gas analyzer measures the chemiluminescence of the smoke sample after the completion of each puff. The concentration of NO is proportional to the intensity of the chemiluminescent reaction. Results are generated from puff by puff sample measurements and reported as parts per million and then corrected to STP (standard temperature and pressure) and finally converted to μg NO per cigarette.

Mainstream Nitric Oxide Test Report for:
 Liggett Group Inc.
 100 Maple Lane
 Mebane, NC 27302

(b) (4)

Project Code: 1808
 Project Start Date: 27-Aug-04
 Arista SOP #: T-029
 Smoking Protocol: FTC
 Authorized By: (b) (6)
 Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Day	Run #	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	NO (µg/cigt)
500759	5	Camel 100	3557	11.0	24.0	231
500759	6	Camel 100	3557	11.0	21.6	213
500760	7	Camel 100	3557	10.0	21.4	215
500760	10	Camel 100	3557	11.0	19.0	234
500760	11	Camel 100	3557	11.0	18.8	224
Average				10.8	21.0	223
SD				0.4	2.1	9
%RSD				4.1	10.2	4.2
500759	3	Marlboro Light	3558	8.0	11.8	171
500759	4	Marlboro Light	3558	8.0	12.5	178
500759	7	Marlboro Light	3558	8.0	14.2	198
500759	14	Marlboro Light	3558	7.0	11.3	163
500759	19	Marlboro Light	3558	8.0	10.8	167
Average				7.8	12.1	175
SD				0.4	1.3	14
%RSD				5.7	10.9	8.0
500759	9	Quest 1	3559	7.0	11.1	166
500759	13	Quest 1	3559	6.0	9.6	139
500760	4	Quest 1	3559	7.0	13.2	166
500760	6	Quest 1	3559	7.0	14.6	173
500760	8	Quest 1	3559	7.0	11.6	163
Average				6.8	12.0	161
SD				0.4	1.9	13
%RSD				6.6	16.1	8.1
500759	10	Quest 2	3560	6.0	9.2	154
500759	15	Quest 2	3560	6.0	10.7	176
500759	16	Quest 2	3560	6.0	8.7	151
500760	3	Quest 2	3560	6.0	11.0	165
500760	5	Quest 2	3560	7.0	10.4	193
Average				6.2	10.0	168
SD				0.4	1.0	17
%RSD				7.2	10.0	10.2

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Mainstream Nitric Oxide Test Report for:
Liggett Group Inc.
100 Maple Lane
Mebane, NC 27302
(b) (4)

Project Code: 1808
Project Start Date: 27-Aug-04
Arista SOP #: T-029
Smoking Protocol: FTC
Authorized By: (b) (6)
Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Day	Run #	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	NO (µg/cigt)
500759	8	Quest 3	3561	6.0	10.1	229
500759	12	Quest 3	3561	6.0	9.5	255
500759	17	Quest 3	3561	6.0	9.6	253
500759	18	Quest 3	3561	6.0	9.1	206
500760	9	Quest 3	3561	6.0	7.8	178
Average				6.0	9.2	224
SD				0.0	0.9	33
%RSD				0.0	9.4	14.6
500759	2	2R4F	912	9.0	12.9	207
500759	11	2R4F	912	9.0	11.1	184
500759	20	2R4F	912	9.0	11.7	197
500760	2	2R4F	912	10.0	12.3	191
500760	12	2R4F	912	9.0	11.7	203
Average				9.2	11.9	196
SD				0.4	0.7	9
%RSD				4.9	5.7	4.8

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APPENDIX K

Analysis of Mainstream Cigarette Smoke for Polycyclic Aromatic Amines II (PAA II)

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THE DETERMINATION OF ANILINE, ORTHO-TOLUIDINE, META-TOLUIDINE, AND ORTHO-ANISIDINE (PAA II) IN MAINSTREAM SMOKE

I. PRINCIPLE OF METHOD

The analytical method used for this study is detailed in Arista SOP T-091, The Determination Of Aniline, ortho-Toluidine, meta-Toluidine, and ortho-Anisidine (PAAs) in Mainstream Smoke.

Mainstream (MS) smoke from test cigarettes is generated under conditions specified by the study protocol and passed through a 44-mm Cambridge filter. After smoking, the filter is weighed and transferred to a Polymethylpentene Erlenmeyer flask containing 25 mL of 5% HCl. Internal standard is added and the sample is shaken for 30 min on a wrist action shaker. The extract is filtered into a separatory funnel and extracted with dichloromethane. The dichloromethane is disposed of as chlorinated waste and sodium hydroxide (50% solution in water) is added to the aqueous phase to make the sample basic. The contents are extracted three times with dichloromethane. The combined dichloromethane extract is derivatized with pentafluoropropionic acid anhydride (PFPA), passed through a Florisil Cartridge clean-up step and concentrated to approximately 2 mL.

Individual analyte concentrations are determined by the internal standard method using gas-chromatography mass spectrometry. The GC/MSD is equipped with a DB-5MS column for chromatographic separation of the analytes and selected ion monitoring (SIM) detection after negative chemical ionization. The concentrations of the analytes determined, are reported in units of mass-to-volume (i.e., ng/mL). The measured concentration, the number of cigarettes smoked, and the sample solution volume(s) are used to calculate the total analyte mass on a per cigarette basis.

Mainstream Aromatic Amines II Test Report for:
Liggett Group Inc.
100 Maple Lane
Mebane, NC 27302
(b) (4)

Project Code: 1808
Project Start Date: 27-Aug-04
Arista SOP #: T-091
Smoking Protocol: FTC
Authorized By: (b) (6)
Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run #	Port	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	Aniline (ng/cigt)	o-Toluidine (ng/cigt)	m-Toluidine (ng/cigt)	o-Anisidine (ng/cigt)
C00414	G	Camel 100	3557	11.7	24.7	284	63.8	57.3	4.39
C00414	I	Camel 100	3557	11.4	23.0	282	60.5	63.2	5.27
C00414	K	Camel 100	3557	11.3	24.2	251	57.0	50.4	4.04
C00414	O	Camel 100	3557	11.6	24.5	283	64.5	57.7	4.19
C00417	I	Camel 100	3557	11.4	24.3	285	63.2	56.4	4.60
C00417	P	Camel 100	3557	12.1	24.7	282	62.6	56.0	4.69
Average				11.6	24.2	278	61.9	56.8	4.53
sd				0.3	0.6	13	2.8	4.1	0.44
% RSD				2.4	2.6	4.8	4.4	7.2	9.6
C00414	C	Marlboro Light	3558	8.0	13.1	171	35.7	33.9	2.74
C00414	E	Marlboro Light	3558	8.1	12.7	188	38.4	37.3	2.87
C00414	N	Marlboro Light	3558	8.1	12.7	193	40.1	38.9	2.86
C00414	T	Marlboro Light	3558	8.1	13.5	206	42.5	42.8	3.22
C00417	H	Marlboro Light	3558	8.7	12.7	201	40.3	40.8	3.25
C00417	M	Marlboro Light	3558	8.3	13.3	176	36.1	36.1	2.85
Average				8.2	13.0	189	38.9	38.3	2.97
sd				0.3	0.3	14	2.7	3.2	0.21
% RSD				3.1	2.6	7.3	6.8	8.5	7.2
C00414	B	Quest 1	3559	6.7	11.6	186	40.2	35.9	2.55
C00414	F	Quest 1	3559	6.7	12.6	194	43.1	36.9	2.71
C00414	L	Quest 1	3559	6.5	11.1	162	35.8	31.7	2.32
C00414	S	Quest 1	3559	6.7	12.4	199	43.0	39.8	2.98
C00417	N	Quest 1	3559	6.7	11.1	179	38.2	38.2	2.91
C00417	Q	Quest 1	3559	7.0	12.0	192	41.7	42.2	3.28
Average				6.7	11.8	185	40.3	37.5	2.79
sd				0.2	0.6	13	2.9	3.6	0.34
% RSD				2.4	5.4	7.2	7.2	9.6	12.2
C00414	M	Quest 2	3560	6.3	9.90	180	40.2	36.0	2.06
C00414	P	Quest 2	3560	6.1	10.7	197	42.8	39.2	2.67
C00414	R	Quest 2	3560	6.1	11.3	167	36.9	33.7	2.19
C00417	C	Quest 2	3560	6.4	10.4	195	43.1	38.3	2.18
C00417	E	Quest 2	3560	6.5	10.9	201	43.5	39.9	2.34
C00417	G	Quest 2	3560	6.5	9.76	192	41.5	38.3	2.37
Average				6.3	10.5	189	41.3	37.6	2.30
sd				0.2	0.6	13	2.5	2.3	0.21
% RSD				2.6	5.6	6.7	6.0	6.1	9.3

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Mainstream Aromatic Amines II Test Report for:
 Liggett Group Inc.
 100 Maple Lane
 Mebane, NC 27302
 (b) (4)

Project Code: 1808
 Project Start Date: 27-Aug-04
 Arista SOP #: T-091
 Smoking Protocol: FTC
 Authorized By: (b) (6)
 Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run #	Port	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	Aniline (ng/cigt)	o-Toluidine (ng/cigt)	m-Toluidine (ng/cigt)	o-Anisidine (ng/cigt)
C00414	A	Quest 3	3561	6.2	8.76	215	39.5	41.7	1.95
C00414	Q	Quest 3	3561	6.4	9.96	217	41.0	42.6	2.01
C00417	D	Quest 3	3561	6.0	8.72	210	37.9	39.5	1.99
C00417	J	Quest 3	3561	6.0	9.00	222	40.4	42.3	2.05
C00417	L	Quest 3	3561	6.1	8.96	183	34.0	35.6	1.79
C00417	O	Quest 3	3561	6.0	8.84	198	35.7	38.9	2.24
Average				6.1	9.04	208	38.1	40.1	2.00
sd				0.2	0.46	15	2.8	2.7	0.15
% RSD				2.5	5.1	7.0	7.2	6.6	7.4
C00414	D	2R4F	912	8.9	11.5	173	38.5	36.8	2.86
C00414	J	2R4F	912	9.1	11.5	191	40.4	46.5	3.27
C00417	F	2R4F	912	8.8	10.8	167	36.9	35.1	2.63
C00417	K	2R4F	912	9.0	11.1	159	34.8	34.1	2.70
Average				9.0	11.2	173	37.6	38.1	2.86
sd				0.1	0.4	14	2.4	5.7	0.29
% RSD				1.0	3.2	8.0	6.3	14.9	10.0

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APPENDIX L

Analysis of Mainstream Cigarette Smoke for Selected Trace Elements

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THE DETERMINATION OF SELECTED METALS IN MAINSTREAM SMOKE

I. PRINCIPLE OF METHOD

The analytical method used for this study is detailed in Arista SOP T-021 - The Determination of Selected Metals in Mainstream Cigarette Smoke. Note that the term metals, in this SOP, refers to the following: Arsenic, Cadmium, Chromium, Lead, Nickel and Selenium.

Smoking is performed on a Borgwaldt RM 20 CSR analytical smoking machine equipped with an electrostatic precipitation (EP) unit. A quartz EP tube is used in the EP unit for smoke collection. The smoke condensate is rinsed out of the EP tube, using methanol. Next, the methanol is evaporated and the sample is digested using nitric acid, hydrogen peroxide and heat. The digested samples are subsequently analyzed by ICP-MS. The ICP-MS used in the method is a Perkin Elmer ICP-MS equipped with a dynamic reaction cell that allows for the determination of elements, including Chromium and Selenium, which normally suffer from severe polyatomic interferences. Ammonia and methane are used as the reaction cell gas for chromium and selenium, respectively. Samples are introduced by nebulization into a radio frequency plasma where energy transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially pumped vacuum interface and detected on the basis of their mass to charge ratio by a quadrupole mass spectrometer. The ions transmitted through the quadrupole are detected by an electron multiplier and the ELAN software processes the ion information. Instrumental drift is corrected for by the use of indium and gallium as internal standards, which are added online.

The metals are reported in units of mass-to-volume (ng/mL). The measured concentration, the number of cigarettes smoked, and the sample solution volume(s) are also used to calculate the total analyte mass on a per cigarette basis. The measured concentration of the metals and the number of cigarettes smoked are used to calculate the concentration of each element in units of nanograms per cigarette (ng/cigt).

Mainstream Metals Test Report for:
 Liggett Group Inc.
 100 Maple Lane
 Mebane, NC 27302

(b) (4)

Project Code: 1808
 Project Start Date: 27-Aug-04
 Arista SOP #: T-021
 Smoking Protocol: FTC
 Authorized By: (b) (6)
 Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Set #	Run#	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	Chromium (ng/cigt)	Selenium (ng/cigt)	Arsenic (ng/cigt)	Nickel (ng/cigt)	Lead (ng/cigt)	Cadmium (ng/cigt)
800157	3	Camel 100	3557	11.3	21.1	<LOD	2.2	8.89	<LOD	28.7	75.5
800157	16	Camel 100	3557	11.3	21.3	<LOD	2.2	8.76	<LOD	28.5	74.4
800158	6	Camel 100	3557	11.5	19.7	<LOD	1.9	7.02	<LOD	23.8	63.5
800158	11	Camel 100	3557	11.0	20.3	<LOD	2.0	7.20	<LOD	24.2	64.5
800158	12	Camel 100	3557	11.5	22.6	<LOD	2.2	8.47	<LOD	27.2	73.0
800158	16	Camel 100	3557	11.2	21.1	<LOD	1.9	7.57	<LOD	25.1	65.4
Average				11.3	21.0	<LOD	2.1	7.99	<LOD	26.2	69.4
SD				0.2	1.0	na	0.2	0.82	na	2.2	5.5
%RSD				1.7	4.6	na	8.3	10.3	na	8.2	7.9
800157	4	Marlboro Light	3558	8.0	11.5	<LOD	1.2	4.70	<LOD	15.8	48.4
800157	18	Marlboro Light	3558	8.4	12.1	<LOD	1.1	4.55	<LOD	14.0	49.1
800157	21	Marlboro Light	3558	8.2	11.6	<LOD	1.1	3.97	<LOD	13.4	46.6
800157	22	Marlboro Light	3558	8.1	11.4	<LOD	1.2	4.42	<LOD	14.4	46.8
800158	4	Marlboro Light	3558	8.0	11.5	<LOD	1.1	4.43	<LOD	13.9	45.3
800158	14	Marlboro Light	3558	8.3	11.5	<LOD	1.1	3.95	<LOD	14.1	45.4
Average				8.2	11.6	<LOD	1.1	4.34	<LOD	14.3	46.9
SD				0.2	0.3	na	0.1	0.31	na	0.8	1.5
%RSD				1.9	2.4	na	4.7	7.1	na	5.6	3.3

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Mainstream Metals Test Report for:
Liggett Group Inc.
100 Maple Lane
Mebane, NC 27302
(b) (4)

Project Code: 1808
Project Start Date: 27-Aug-04
Arista SOP #: T-021
Smoking Protocol: FTC
Authorized By: (b) (6)
Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Set #	Run#	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	Chromium (ng/cigt)	Selenium (ng/cigt)	Arsenic (ng/cigt)	Nickel (ng/cigt)	Lead (ng/cigt)	Cadmium (ng/cigt)
800157	13	Quest 1	3559	6.6	9.63	<LOD	2.21	2.41	<LOD	12.4	15.3
800157	15	Quest 1	3559	6.6	9.45	<LOD	<LOD	2.09	<LOD	11.6	15.1
800158	5	Quest 1	3559	6.1	7.90	<LOD	<LOD	1.90	<LOD	9.90	12.1
800158	7	Quest 1	3559	6.5	9.30	<LOD	<LOD	2.39	<LOD	11.7	13.4
800158	8	Quest 1	3559	6.6	9.33	<LOD	<LOD	2.35	<LOD	11.5	14.8
800158	15	Quest 1	3559	6.8	9.96	<LOD	1.10	2.77	<LOD	12.7	15.1
Average				6.5	9.26	<LOD	<LOD	2.23	<LOD	11.6	14.3
SD				0.2	0.71	na	na	0.28	na	1.0	1.3
%RSD				3.8	7.7	na	na	11.6	na	8.3	8.9
800157	5	Quest 2	3560	6.2	8.83	<LOD	0.9	2.82	<LOD	14.3	16.4
800157	6	Quest 2	3560	6.2	8.99	<LOD	1.0	3.15	<LOD	15.6	16.9
800157	7	Quest 2	3560	6.3	8.62	<LOD	1.2	3.56	<LOD	17.5	18.8
800157	11	Quest 2	3560	6.0	8.76	<LOD	1.0	2.89	<LOD	14.4	15.1
800157	12	Quest 2	3560	6.1	8.84	<LOD	1.2	3.11	<LOD	15.4	15.5
800157	20	Quest 2	3560	6.4	9.45	<LOD	1.0	2.88	<LOD	14.3	15.4
Average				6.2	8.92	<LOD	1.1	3.07	<LOD	15.2	16.3
SD				0.1	0.29	na	0.1	0.28	na	1.2	1.4
%RSD				2.3	3.2	na	10.5	9.0	na	8.1	8.4

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Mainstream Metals Test Report for:
 Liggett Group Inc.
 100 Maple Lane
 Mebane, NC 27302
 (b) (4)

Project Code: 1808
 Project Start Date: 27-Aug-04
 Arista SOP #: T-021
 Smoking Protocol: FTC
 Authorized By: (b) (6)
 Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Set #	Run#	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	Chromium (ng/cigt)	Selenium (ng/cigt)	Arsenic (ng/cigt)	Nickel (ng/cigt)	Lead (ng/cigt)	Cadmium (ng/cigt)
800157	8	Quest 3	3561	6.3	9.65	<LOD		2.82	<LOD	14.4	23.9
800157	14	Quest 3	3561	6.1	7.84	<LOD		2.80	<LOD	13.3	22.6
800157	19	Quest 3	3561	6.1	7.45	<LOD		2.86	<LOD	14.0	20.5
800158	3	Quest 3	3561	6.1	7.69	<LOD			<LOD	12.6	21.4
800158	13	Quest 3	3561	6.2	8.08	<LOD			<LOD	12.3	22.9
Average				6.2	8.14	<LOD			<LOD	13.3	22.3
SD				0.1	0.87	na	0.1	0.20	na	0.9	1.3
%RSD				1.6	10.7	na	8.3	7.4	na	6.5	6.1
800157	2	2R4F	912	9.0	10.3	<LOD		3.37	<LOD	12.6	45.9
800157	10	2R4F	912	9.1	10.1	<LOD		3.17	<LOD	12.7	50.5
800157	23	2R4F	912	9.1	10.6	<LOD		3.47	<LOD	12.7	53.2
800158	2	2R4F	912	9.3	10.6	<LOD		3.59	<LOD	12.6	50.5
Average				9.1	10.4	<LOD		3.40	<LOD	12.7	50.0
SD				0.1	0.2	na	0.0	0.18	na	0.0	3.0
%RSD				1.5	2.1	na	3.0	5.3	na	0.3	6.0
Note: Shaded cells contain values between the Limit of Detection (LOD) and Limit of Quantitation (LOQ) for the method.						LOD	1.8	0.9	1.0	1.8	0.5
						LOQ	4.3	2.3	2.8	4.8	1.3

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PROJECT CODE: 1808

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APPENDIX M

Analysis of Mainstream Cigarette Smoke For Mercury (Hg)

The results in this test report relate only to the samples identified in this report. The information is confidential and is only to be used by the client identified in this report. Arista Laboratories accepts no liability in the use of this report or the results contained, herein. The original controlled report shall not be reproduced without written approval of Arista Laboratories, Inc.

ANALYSIS OF MAINSTREAM CIGARETTE SMOKE FOR MERCURY (Hg)

I. PRINCIPLE OF METHOD

The analytical method used for this study is detailed in Arista SOP T-036 - The Determination of Mercury in Mainstream Cigarette Smoke.

Smoking is performed on a Borgwaldt RM 20 CSR. Particulate phase and gas phase mercury in mainstream smoke is trapped using two impingers connected in-series, each containing an acidic potassium permanganate solution. The impinger solutions containing the smoke are subjected to a microwave digestion in which mercury compounds (organic and inorganic) are oxidized to Hg^{+2} . Mercury ions (Hg^{+2}) in the digestate are reduced by stannous chloride to elemental mercury and analyzed by cold vapor atomic absorption spectrometry.

Mercury is reported in units of mass-to-volume (ng/mL). The measured concentration, the number of cigarettes smoked, and the sample solution volume(s) are used to calculate the total analyte mass in units of nanograms per cigarette (ng/cigt).

Mainstream Mercury Test Report for:
Liggett Group Inc.
100 Maple Lane
Mebane, NC 27302
(b) (4)

Project Code: 1808
Project Start Date: 27-Aug-04
Arista SOP #: T-036
Smoking Protocol: FTC
Authorized By: (b) (6)
Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Set #	Run #	Client Code	Arista Code	Puffs/Cigt	Mercury (ng/cigt)
800157	3	Camel 100	3557	11.3	2.59
800157	16	Camel 100	3557	11.3	2.69
800158	6	Camel 100	3557	11.5	2.73
800158	11	Camel 100	3557	11.0	2.44
800158	12	Camel 100	3557	11.5	2.58
800158	16	Camel 100	3557	11.2	2.44
Average				11.3	2.58
SD				0.2	0.12
%RSD				1.7	4.8
800157	4	Marlboro Light	3558	8.0	1.82
800157	18	Marlboro Light	3558	8.4	1.96
800157	21	Marlboro Light	3558	8.2	1.95
800157	22	Marlboro Light	3558	8.1	1.95
800158	4	Marlboro Light	3558	8.0	1.90
800158	14	Marlboro Light	3558	8.3	1.82
Average				8.2	1.90
SD				0.2	0.07
%RSD				1.9	3.5
800157	13	Quest 1	3559	6.6	1.26
800157	15	Quest 1	3559	6.6	1.19
800158	5	Quest 1	3559	6.1	1.08
800158	7	Quest 1	3559	6.5	1.26
800158	8	Quest 1	3559	6.6	1.31
800158	15	Quest 1	3559	6.8	1.25
Average				6.5	1.23
SD				0.3	0.08
%RSD				3.9	6.5
800157	5	Quest 2	3560	6.2	1.16
800157	6	Quest 2	3560	6.2	1.14
800157	11	Quest 2	3560	6.0	1.15
800157	12	Quest 2	3560	6.1	1.17
800157	20	Quest 2	3560	6.4	1.22
Average				6.2	1.17
SD				0.2	0.03
%RSD				2.5	2.7

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Mainstream Mercury Test Report for:
Liggett Group Inc.
100 Maple Lane
Mebane, NC 27302
(b) (4)

Project Code: 1808
Project Start Date: 27-Aug-04
Arista SOP #: T-036
Smoking Protocol: FTC
Authorized By: (b) (6)
Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Set #	Run #	Client Code	Arista Code	Puffs/Cigt	Mercury, (ng/cigt)
800157	8	Quest 3	3561	6.3	1.37
800157	14	Quest 3	3561	6.1	1.34
800157	19	Quest 3	3561	6.1	1.32
800158	3	Quest 3	3561	6.1	1.36
800158	13	Quest 3	3561	6.2	1.31
Average				6.1	1.34
SD				0.1	0.03
%RSD				1.5	2.1
800157	2	2R4F	912	9.0	2.09
800157	10	2R4F	912	9.1	1.91
800157	23	2R4F	912	9.1	2.08
800158	2	2R4F	912	9.3	2.19
Average				9.1	2.07
SD				0.1	0.12
%RSD				1.4	5.6

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Certificate No. 1873.01

PROJECT CODE: 1808

APPENDIX N

Analysis of Mainstream Cigarette Smoke for Tobacco Specific N-Nitrosamines

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DETERMINATION OF TOBACCO SPECIFIC N-NITROSAMINES IN MAINSTREAM SMOKE

I. PRINCIPLE OF METHOD

The analytical method used for this study is detailed in Arista SOP T-020 Determination of Tobacco Specific N-Nitrosamines in Mainstream Smoke.

The tobacco specific n-nitrosamines (TSNAs) are quantitated from mainstream smoke collected on a 44 mm Cambridge filter as the collection media. LC-MS/MS (liquid chromatography coupled to a triple quadrupole mass spectrometer) allows for the determination of the targeted nitrosamines with minimum interference from other components in mainstream smoke. The LC-MS/MS method uses a high performance liquid chromatograph (HPLC) equipped with a C18 reversed phase column to resolve TSNAs from potential interference. Further selectivity is accomplished using a triple quadrupole mass spectrometer with electrospray ionization (ESI) and selective reaction monitoring of characteristic daughter ions. Deuterated internal standards (d-NNN, and d-NNK) are added to the buffer extraction solution and are used to correct for recovery of nitrosamines.

The concentrations of the TSNAs determined by this method are reported in units of mass-to-volume (i.e., ng/mL). The measured concentration, the number of cigarettes smoked, and the sample solution volume(s) are also used to calculate the total analyte mass on a per cigarette basis.

Mainstream TSNAs Test Report for:

Liggett Group Inc.
100 Maple Lane
Mebane, NC 27302

(b) (4)

Project Code: 1808
Project Start Date: 27-Aug-04
Arista SOP #: T-020
Smoking Protocol: FTC
Authorized By: (b) (6)
Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run#	Port	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	NAB (ng/cigt)	NAT (ng/cigt)	NNK (ng/cigt)	NNN (ng/cigt)
C00415	B	Camel 100	3557	11.5	24.2	25.8	203	103	235
C00415	P	Camel 100	3557	11.0	22.4	27.6	200	114	197
C00415	R	Camel 100	3557	11.0	20.8	25.0	186	103	207
C00415	T	Camel 100	3557	11.3	22.9	26.7	213	111	216
C00418	I	Camel 100	3557	11.3	22.9	26.1	200	106	204
C00418	O	Camel 100	3557	11.4	23.9	23.3	201	112	223
Average				11.3	22.9	25.8	201	108	214
SD				0.2	1.2	1.5	9	5	14
%RSD				1.8	5.3	5.8	4.3	4.6	6.5
C00415	E	Marlboro Light	3558	8.4	12.9	16.8	127	75.5	138
C00415	I	Marlboro Light	3558	8.2	13.4	17.6	135	89.6	144
C00415	K	Marlboro Light	3558	7.8	12.6	16.0	115	79.9	144
C00415	S	Marlboro Light	3558	8.3	12.6	18.9	138	84.5	138
C00418	J	Marlboro Light	3558	8.1	12.6	17.1	135	83.5	128
C00418	M	Marlboro Light	3558	7.8	12.0	14.0	119	77.3	138
Average				8.1	12.7	16.7	128	81.7	138
SD				0.3	0.4	1.7	10	5.2	6
%RSD				3.3	3.5	9.9	7.5	6.4	4.3
C00415	C	Quest 1	3559	6.7	12.5	6.59	41.5	27.3	62.7
C00415	L	Quest 1	3559	6.6	10.6	6.20	40.6	25.6	64.9
C00415	N	Quest 1	3559	6.0	9.84	6.39	37.9	26.3	56.1
C00418	F	Quest 1	3559	7.0	11.4	6.27	37.7	27.6	56.5
C00418	H	Quest 1	3559	6.6	10.3	5.39	39.1	24.6	51.3
C00418	L	Quest 1	3559	6.6	10.0	5.90	41.9	26.5	58.4
Average				6.6	10.8	6.13	39.8	26.3	58.3
SD				0.3	1.0	0.43	1.8	1.1	4.9
%RSD				4.8	9.2	7.0	4.6	4.2	8.4

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Mainstream TSNAs Test Report for:
 Liggett Group Inc.
 100 Maple Lane
 Mebane, NC 27302
 (b) (4)

Project Code: 1808
 Project Start Date: 27-Aug-04
 Arista SOP #: T-020
 Smoking Protocol: FTC
 Authorized By: (b) (6)
 Title: QA Mgr

For questions or concerns, please see the customer feedback form at <http://www.aristalabs.com>

Run#	Port	Client Code	Arista Code	Puffs/Cigt	MS TPM (mg/cigt)	NAB (ng/cigt)	NAT (ng/cigt)	NNK (ng/cigt)	NNN (ng/cigt)
C00415	D	Quest 2	3560	6.3	9.72	3.64	26.3	29.5	62.2
C00415	G	Quest 2	3560	6.0	9.80	3.34	23.8	29.6	52.4
C00415	J	Quest 2	3560	6.2	10.4	3.67	23.5	31.3	59.4
C00418	N	Quest 2	3560	6.1	10.6	3.72	23.4	31.4	58.3
C00418	P	Quest 2	3560	6.3	10.5	3.53	22.4	31.3	56.1
C00418	R	Quest 2	3560	6.4	10.9	3.91	21.5	38.2	54.1
Average				6.2	10.3	3.63	23.5	31.9	57.1
SD				0.1	0.5	0.19	1.6	3.2	3.6
%RSD				2.1	4.5	5.3	7.0	10.1	6.3
C00415	F	Quest 3	3561	6.0	8.64		5.34	10.4	78.4
C00415	H	Quest 3	3561	6.0	8.46		6.13	13.2	79.0
C00415	O	Quest 3	3561	6.1	8.68		6.63	14.6	76.0
C00418	C	Quest 3	3561	6.2	9.76		6.66	11.6	78.9
C00418	E	Quest 3	3561	6.2	8.88		6.31	14.5	81.1
C00418	K	Quest 3	3561	6.0	8.94		6.42	16.0	81.9
Average				6.1	8.89		6.25	13.4	79.2
SD				0.1	0.46	0.1	0.49	2.1	2.1
%RSD				1.3	5.2	7.4	7.8	15.6	2.7
C00415	M	2R4F	912	9.0	11.1	17.2	124	137	145
C00415	Q	2R4F	912	9.1	10.8	17.2	141	146	147
C00418	D	2R4F	912	9.2	11.8	16.5	126	143	153
C00418	G	2R4F	912	9.0	11.9	17.2	137	150	146
Average				9.1	11.4	17.0	132	144	148
SD				0.1	0.5	0.4	8	5	4
%RSD				1.0	4.8	2.2	6.1	3.8	2.5

Note: Shaded cells contain values between the Limit of Detection (LOD) and Limit of Quantitation (LOQ) for the method.

LOD: 0.8 1.4 0.4 1.0
 LOQ: 2.5 4.5 1.4 3.5

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