

## *Supplementary Materials File S5*

### 1 Percent Difference to Combustible Cigarettes

#### 1.1 Virginia Tobacco 18 mg/mL Non-Intense Percent Difference to Combustible Cigarettes

Parameter/ Constituent	Aerosol or Smoke Yields Normalized by Nicotine (mg/mg)		% Diff vs CC
	AEROSOL MAX	CC	
# of puffs	150	NA	NA
pH	6.19	NA	NA
<b>Primary Constituents</b>			
Nicotine	1.00E+00	1.00E+00	NA
Glycerol	4.35E+01	8.95E-01	↑ 4762.55%
Propylene Glycol	2.50E+01	4.21E-03	↑ 593469.80%
Water	5.68E+00	4.21E+00	↑ 34.96%
Menthol	~ 5.69E-02	~1.32E-05	NC
Diethylene Glycol	~ 5.33E-03	~1.42E-03	NC
Ethylene Glycol	~ 5.71E-03	9.96E-03	↓ ≥ 42.68%
<b>Carbonyls &amp; Glycidol</b>			
Acetaldehyde	2.74E-04	7.24E-01	↓ 99.96%
Acrolein	1.78E-04	5.96E-02	↓ 99.70%
Diacetyl	~ 3.90E-05	1.64E-01	↓ ≥ 99.98%
Formaldehyde	1.13E-03	3.74E-02	↓ 96.98%
Glycidol	2.39E-04	1.04E-03	↓ 76.91%
Acetyl Propionyl	~ 3.58E-06	4.21E-02	↓ ≥ 99.99%
Butyraldehyde	~ 3.64E-06	3.33E-02	↓ ≥ 99.99%
Crotonaldehyde	~ 5.74E-06	1.53E-02	↓ ≥ 99.96%
Furfural	~ 5.88E-06	1.84E-02	↓ ≥ 99.97%
<b>Nicotine Degradants &amp; TSNA</b>			
β-Nicotyrine	1.35E-04	1.07E-02	↓ 98.73%
Cotinine	2.41E-03	6.96E-03	↓ 65.35%
Myosmine	1.99E-03	NA	NA
Nicotine N Oxide	7.73E-05	~5.37E-04	NC
Nornicotine	7.91E-04	9.50E-03	↓ 91.67%
Anabasine	~ 2.88E-06	8.33E-04	↓ ≥ 99.65%
Anatabine	~ 2.66E-05	6.00E-03	↓ ≥ 99.56%
NNK	~ 7.49E-07	9.85E-05	↓ ≥ 99.24%
NNN	~ 8.99E-08	1.18E-04	↓ ≥ 99.92%
<b>Metals</b>			
Arsenic	~ 1.78E-06	NA	NA

<b>Beryllium</b>	~ 6.97E-08	NA	NA
<b>Cadmium</b>	~ 3.17E-08	3.35E-05	↓ ≥ 99.91%
<b>Chromium</b>	~ 1.90E-06	~6.27E-07	NC
<b>Cobalt</b>	~ 1.58E-08	NA	NA
<b>Copper</b>	~ 2.72E-06	1.64E-05	↓ ≥ 83.36%
<b>Gold</b>	~ 4.63E-06	NA	NA
<b>Iron</b>	~ 8.17E-06	NA	NA
<b>Lead</b>	~ 7.92E-08	~4.18E-07	NC
<b>Nickel</b>	~ 1.58E-07	~9.64E-07	NC
<b>Selenium</b>	1.40E-06	NA	NA
<b>Silver</b>	~ 3.17E-08	NA	NA
<b>Tin</b>	~ 1.63E-06	NA	NA
<b>Zinc</b>	~ 1.36E-05	NA	NA
<b>Organic Acids</b>			
<b>Benzoic Acid</b>	5.67E-01	NA	NA
<b>Propionic Acid</b>	~ 1.76E-03	NA	NA
<b>VOCs</b>			
<b>1,3-Butadiene</b>	~ 1.49E-06	NA	NA
<b>Acrylonitrile</b>	~ 9.79E-07	9.71E-03	↓ ≥ 99.99%
<b>Benzene</b>	~ 1.71E-06	4.58E-02	↓ ≥ 99.99%
<b>Isoprene</b>	~ 2.30E-06	NA	NA
<b>Propylene Oxide</b>	~ 3.96E-06	8.44E-01	↓ ≥ 99.99%
<b>Toluene</b>	~ 1.21E-05	7.35E-02	↓ ≥ 99.98%
<b>Esters &amp; Alcohols</b>			
<b>1-Butanol</b>	~ 4.41E-05	NA	NA
<b>Benzyl Acetate</b>	~ 6.84E-05	NA	NA
<b>Ethyl Acetate</b>	~ 7.83E-05	NA	NA
<b>Ethyl Acetoacetate</b>	~ 5.59E-05	NA	NA
<b>Isoamyl Acetate</b>	~ 4.77E-05	NA	NA
<b>Isobutyl Acetate</b>	~ 4.73E-05	NA	NA
<b>Methyl Acetate</b>	~ 5.08E-05	NA	NA
Average Difference			↑ 22927.46%
Average Difference without PG, VG, and Water			↓ 93.63%

## 1.2 Virginia Tobacco 18 mg/mL Intense Percent Difference to Combustible Cigarettes

Parameter/ Constituent	Aerosol or Smoke Yields Normalized by Nicotine (mg/mg)		% Diff vs CC
	AEROSOL MAX	CC	
# of puffs	87	NA	NA

<b>pH</b>	6.46	NA	NA
<b>Primary Constituents</b>			
<b>Nicotine</b>	1.00E+00	1.00E+00	NA
<b>Glycerol</b>	4.16E+01	1.20E+00	↑ 3375.92%
<b>Propylene Glycol</b>	2.53E+01	1.36E-02	↑ 185337.92%
<b>Water</b>	5.00E+00	7.94E+00	↓ 37.02%
<b>Menthol</b>	~ 4.74E-03	~4.76E-06	NC
<b>Diethylene Glycol</b>	~ 5.00E-03	~9.90E-04	NC
<b>Ethylene Glycol</b>	~ 5.36E-03	1.73E-02	↓ ≥ 69.09%
<b>Carbonyls &amp; Glycidol</b>			
<b>Acetaldehyde</b>	3.96E-04	8.19E-01	↓ 99.95%
<b>Acrolein</b>	4.05E-04	8.12E-02	↓ 99.50%
<b>Diacetyl</b>	~ 4.27E-05	1.69E-01	↓ ≥ 99.97%
<b>Formaldehyde</b>	1.48E-03	5.47E-02	↓ 97.29%
<b>Glycidol</b>	3.37E-04	1.01E-03	↓ 66.69%
<b>Acetyl Propionyl</b>	~ 3.92E-06	4.62E-02	↓ ≥ 99.99%
<b>Butyraldehyde</b>	~ 4.01E-05	4.23E-02	↓ ≥ 99.91%
<b>Crotonaldehyde</b>	~ 6.29E-06	2.89E-02	↓ ≥ 99.98%
<b>Furfural</b>	~ 4.32E-05	1.49E-02	↓ ≥ 99.71%
<b>Nicotine Degradants &amp; TSNA's</b>			
<b>β-Nicotyrine</b>	1.74E-04	3.50E-03	↓ 95.04%
<b>Cotinine</b>	2.54E-03	7.09E-03	↓ 64.14%
<b>Myosmine</b>	1.98E-03	6.55E-03	↓ 69.80%
<b>Nicotine N Oxide</b>	6.33E-05	~3.26E-04	NC
<b>Nornicotine</b>	8.71E-04	1.09E-02	↓ 92.05%
<b>Anabasine</b>	~ 3.15E-06	5.10E-04	↓ ≥ 99.38%
<b>Anatabine</b>	~ 3.26E-05	3.08E-03	↓ ≥ 98.94%
<b>NNK</b>	~ 7.83E-07	9.86E-05	↓ ≥ 99.21%
<b>NNN</b>	~ 9.41E-08	1.12E-04	↓ ≥ 99.92%
<b>Metals</b>			
<b>Arsenic</b>	~ 2.97E-07	NA	NA
<b>Beryllium</b>	~ 6.54E-08	NA	NA
<b>Cadmium</b>	~ 2.97E-08	4.01E-05	↓ ≥ 99.93%
<b>Chromium</b>	4.11E-06	~3.95E-07	↑ ≥ 940.13%
<b>Cobalt</b>	~ 1.49E-08	NA	NA
<b>Copper</b>	~ 7.43E-07	1.23E-05	↓ ≥ 93.95%
<b>Gold</b>	~ 4.84E-06	NA	NA
<b>Iron</b>	3.40E-05	NA	NA
<b>Lead</b>	~ 7.43E-08	1.79E-05	↓ ≥ 99.59%
<b>Nickel</b>	~ 4.27E-07	~7.89E-07	NC

<b>Selenium</b>	~ 7.11E-07	NA	NA
<b>Silver</b>	~ 1.64E-07	NA	NA
<b>Tin</b>	~ 1.71E-06	NA	NA
<b>Zinc</b>	~ 4.46E-06	NA	NA
<b>Organic Acids</b>			
<b>Benzoic Acid</b>	7.84E-01	NA	NA
<b>Propionic Acid</b>	~ 2.43E-03	NA	NA
<b>VOCs</b>			
<b>1,3-Butadiene</b>	~ 1.56E-06	NA	NA
<b>Acrylonitrile</b>	~ 1.02E-06	1.27E-02	↓ ≥ 99.99%
<b>Benzene</b>	~ 1.79E-06	4.64E-02	↓ ≥ 99.99%
<b>Isoprene</b>	~ 2.41E-06	NA	NA
<b>Propylene Oxide</b>	~ 4.15E-06	9.00E-04	↓ ≥ 99.54%
<b>Toluene</b>	~ 1.27E-05	7.91E-02	↓ ≥ 99.98%
<b>Esters &amp; Alcohols</b>			
<b>1-Butanol</b>	~ 4.61E-05	NA	NA
<b>Benzyl Acetate</b>	~ 7.16E-05	NA	NA
<b>Ethyl Acetate</b>	~ 8.19E-05	NA	NA
<b>Ethyl Acetoacetate</b>	~ 5.85E-05	NA	NA
<b>Isoamyl Acetate</b>	~ 4.99E-05	NA	NA
<b>Isobutyl Acetate</b>	~ 4.94E-05	NA	NA
<b>Methyl Acetate</b>	~ 5.32E-05	NA	NA
Average Difference			↑ 6654.76%
Average Difference without PG, VG, Water, and Chromium			↓ 93.74%

### 1.3 Crisp Menthol 18 mg/mL Non-Intense Percent Difference to Combustible Cigarettes

Parameter/ Constituent	Aerosol or Smoke Yields Normalized by Nicotine (mg/mg)		% Diff vs CC
	AEROSOL MAX	CC	
<b># of puffs</b>	125	NA	NA
<b>pH</b>	6.36	NA	NA
<b>Primary Constituents</b>			
<b>Nicotine</b>	1.00E+00	1.00E+00	NA
<b>Glycerol</b>	2.69E+01	8.95E-01	↑ 2901.15%
<b>Propylene Glycol</b>	3.80E+01	4.21E-03	↑ 902232.62%
<b>Water</b>	4.66E+00	4.21E+00	↑ 10.57%
<b>Menthol</b>	7.39E-01	~1.32E-05	↑ ≥ 5615211.37%
<b>Diethylene Glycol</b>	~ 5.19E-03	~1.42E-03	NC
<b>Ethylene Glycol</b>	~ 5.55E-03	9.96E-03	↓ ≥ 44.22%
<b>Carbonyls &amp; Glycidol</b>			

Acetaldehyde	1.67E-04	7.24E-01	↓ 99.98%
Acrolein	1.06E-04	5.96E-02	↓ 99.82%
Diacetyl	~ 3.83E-05	1.64E-01	↓ ≥ 99.98%
Formaldehyde	7.17E-04	3.74E-02	↓ 98.09%
Glycidol	1.66E-04	1.04E-03	↓ 84.02%
Acetyl Propionyl	~ 3.49E-06	4.21E-02	↓ ≥ 99.99%
Butyraldehyde	~ 3.69E-06	3.33E-02	↓ ≥ 99.99%
Crotonaldehyde	~ 5.59E-06	1.53E-02	↓ ≥ 99.96%
Furfural	~ 5.72E-06	1.84E-02	↓ ≥ 99.97%
<b>Nicotine Degradants &amp; TSNAs</b>			
β-Nicotyrine	2.46E-04	1.07E-02	↓ 97.69%
Cotinine	~ 3.07E-05	6.96E-03	↓ ≥ 99.56%
Myosmine	1.66E-04	NA	NA
Nicotine N Oxide	1.03E-04	~5.37E-04	NC
Nornicotine	8.85E-04	9.50E-03	↓ 90.68%
Anabasine	~ 2.80E-06	8.33E-04	↓ ≥ 99.66%
Anatabine	~ 2.79E-06	6.00E-03	↓ ≥ 99.95%
NNK	~ 7.85E-07	9.85E-05	↓ ≥ 99.20%
NNN	~ 9.42E-08	1.18E-04	↓ ≥ 99.92%
<b>Metals</b>			
Arsenic	~ 3.08E-07	NA	NA
Beryllium	~ 6.78E-08	NA	NA
Cadmium	~ 3.08E-08	3.35E-05	↓ ≥ 99.91%
Chromium	~ 1.71E-06	~6.27E-07	NC
Cobalt	~ 1.54E-08	NA	NA
Copper	~ 2.85E-06	1.64E-05	↓ ≥ 82.56%
Gold	~ 4.85E-06	NA	NA
Iron	1.22E-05	NA	NA
Lead	~ 7.71E-08	~4.18E-07	NC
Nickel	~ 1.54E-07	~9.64E-07	NC
Selenium	~ 7.37E-07	NA	NA
Silver	~ 3.08E-08	NA	NA
Tin	~ 1.81E-06	NA	NA
Zinc	~ 1.43E-05	NA	NA
<b>Organic Acids</b>			
Benzoic Acid	6.20E-01	NA	NA
Propionic Acid	~ 1.20E-03	NA	NA
<b>VOCs</b>			
1,3-Butadiene	~ 1.57E-06	NA	NA
Acrylonitrile	~ 1.03E-06	9.71E-03	↓ ≥ 99.99%

<b>Benzene</b>	~ 1.80E-06	4.58E-02	↓ ≥ 99.99%
<b>Isoprene</b>	~ 2.41E-06	NA	NA
<b>Propylene Oxide</b>	~ 4.15E-06	8.44E-01	↓ ≥ 99.99%
<b>Toluene</b>	~ 2.64E-06	7.35E-02	↓ ≥ 99.99%
<b>Esters &amp; Alcohols</b>			
<b>1-Butanol</b>	~ 4.62E-05	NA	NA
<b>Benzyl Acetate</b>	~ 7.17E-05	NA	NA
<b>Ethyl Acetate</b>	6.31E-03	NA	NA
<b>Ethyl Acetoacetate</b>	~ 5.86E-05	NA	NA
<b>Isoamyl Acetate</b>	~ 5.00E-05	NA	NA
<b>Isobutyl Acetate</b>	~ 4.95E-05	NA	NA
<b>Methyl Acetate</b>	~ 5.33E-05	NA	NA
Average Difference			↑ 241413.36%
Average Difference without PG, VG, Water, and Menthol			↓ 95.44%

#### 1.4 Crisp Menthol 18 mg/mL Intense Percent Difference to Combustible Cigarettes

Parameter/ Constituent	Aerosol or Smoke Yields Normalized by Nicotine (mg/mg)		% Diff vs CC
	AEROSOL MAX	CC	
<b># of puffs</b>	88	NA	NA
<b>pH</b>	6.53	NA	NA
<b>Primary Constituents</b>			
<b>Nicotine</b>	1.00E+00	1.00E+00	NA
<b>Glycerol</b>	2.68E+01	1.20E+00	↑ 2143.99%
<b>Propylene Glycol</b>	3.76E+01	1.36E-02	↑ 276111.72%
<b>Water</b>	4.29E+00	7.94E+00	↓ 45.95%
<b>Menthol</b>	7.21E-01	~4.76E-06	↑ ≥ 15145814.61%
<b>Diethylene Glycol</b>	~ 4.67E-03	~9.90E-04	NC
<b>Ethylene Glycol</b>	~ 4.97E-03	1.73E-02	↓ ≥ 71.34%
<b>Carbonyls &amp; Glycidol</b>			
<b>Acetaldehyde</b>	2.23E-04	8.19E-01	↓ 99.97%
<b>Acrolein</b>	2.20E-04	8.12E-02	↓ 99.73%
<b>Diacetyl</b>	~ 4.28E-05	1.69E-01	↓ ≥ 99.97%
<b>Formaldehyde</b>	1.04E-03	5.47E-02	↓ 98.10%
<b>Glycidol</b>	2.80E-04	1.01E-03	↓ 72.35%
<b>Acetyl Propionyl</b>	~ 4.96E-06	4.62E-02	↓ ≥ 99.99%
<b>Butyraldehyde</b>	~ 8.46E-06	4.23E-02	↓ ≥ 99.98%
<b>Crotonaldehyde</b>	~ 1.01E-05	2.89E-02	↓ ≥ 99.97%
<b>Furfural</b>	~ 8.32E-06	1.49E-02	↓ ≥ 99.94%
<b>Nicotine Degradants &amp; TSNAs</b>			

<b>β-Nicotyrine</b>	2.09E-04	3.50E-03	↓ 94.04%
<b>Cotinine</b>	6.08E-05	7.09E-03	↓ 99.14%
<b>Myosmine</b>	1.58E-04	6.55E-03	↓ 97.59%
<b>Nicotine N Oxide</b>	6.36E-05	~3.26E-04	NC
<b>Nornicotine</b>	7.68E-04	1.09E-02	↓ 92.99%
<b>Anabasine</b>	~ 2.98E-06	5.10E-04	↓ ≥ 99.42%
<b>Anatabine</b>	~ 2.97E-06	3.08E-03	↓ ≥ 99.90%
<b>NNK</b>	~ 7.64E-07	9.86E-05	↓ ≥ 99.23%
<b>NNN</b>	~ 9.18E-08	1.12E-04	↓ ≥ 99.92%
<b>Metals</b>			
<b>Arsenic</b>	~ 2.80E-07	NA	NA
<b>Beryllium</b>	~ 6.16E-08	NA	NA
<b>Cadmium</b>	~ 2.80E-08	4.01E-05	↓ ≥ 99.93%
<b>Chromium</b>	~ 1.67E-06	~3.95E-07	NC
<b>Cobalt</b>	~ 1.40E-08	NA	NA
<b>Copper</b>	~ 7.00E-07	1.23E-05	↓ ≥ 94.30%
<b>Gold</b>	~ 4.72E-06	NA	NA
<b>Iron</b>	1.23E-05	NA	NA
<b>Lead</b>	~ 7.00E-08	1.79E-05	↓ ≥ 99.61%
<b>Nickel</b>	~ 1.40E-07	~7.89E-07	NC
<b>Selenium</b>	~ 6.69E-07	NA	NA
<b>Silver</b>	~ 1.66E-07	NA	NA
<b>Tin</b>	~ 1.68E-06	NA	NA
<b>Zinc</b>	~ 4.20E-06	NA	NA
<b>Organic Acids</b>			
<b>Benzoic Acid</b>	7.34E-01	NA	NA
<b>Propionic Acid</b>	~ 1.06E-03	NA	NA
<b>VOCs</b>			
<b>1,3-Butadiene</b>	~ 1.53E-06	NA	NA
<b>Acrylonitrile</b>	~ 9.99E-07	1.27E-02	↓ ≥ 99.99%
<b>Benzene</b>	~ 1.75E-06	4.64E-02	↓ ≥ 99.99%
<b>Isoprene</b>	~ 2.35E-06	NA	NA
<b>Propylene Oxide</b>	~ 4.05E-06	9.00E-04	↓ ≥ 99.55%
<b>Toluene</b>	~ 1.24E-05	7.91E-02	↓ ≥ 99.98%
<b>Esters &amp; Alcohols</b>			
<b>1-Butanol</b>	~ 4.50E-05	NA	NA
<b>Benzyl Acetate</b>	~ 6.98E-05	NA	NA
<b>Ethyl Acetate</b>	6.60E-03	NA	NA
<b>Ethyl Acetoacetate</b>	~ 5.71E-05	NA	NA
<b>Isoamyl Acetate</b>	~ 4.87E-05	NA	NA

Isobutyl Acetate	~ 4.82E-05	NA	NA
Methyl Acetate	~ 5.19E-05	NA	NA
Average Difference			↑ 531779.57%
Average Difference without PG, VG, Water, and Menthol			↓ 96.68%

### 1.5 Polar Menthol 18 mg/mL Non-Intense Percent Difference to Combustible Cigarettes

Parameter/ Constituent	Aerosol or Smoke Yields Normalized by Nicotine (mg/mg)		% Diff vs CC
	AEROSOL MAX	CC	
# of puffs	132	NA	NA
pH	6.55	NA	NA
<b>Primary Constituents</b>			
Nicotine	1.00E+00	1.00E+00	NA
Glycerol	2.72E+01	8.95E-01	↑ 2943.60%
Propylene Glycol	4.50E+01	4.21E-03	↑ 1067675.68%
Water	4.92E+00	4.21E+00	↑ 16.79%
Menthol	7.88E-01	~1.32E-05	↑ ≥ 5991318.81%
Diethylene Glycol	~ 5.53E-03	~1.42E-03	NC
Ethylene Glycol	~ 5.92E-03	9.96E-03	↓ ≥ 40.53%
<b>Carbonyls &amp; Glycidol</b>			
Acetaldehyde	2.90E-04	7.24E-01	↓ 99.96%
Acrolein	1.28E-04	5.96E-02	↓ 99.78%
Diacetyl	~ 3.87E-06	1.64E-01	↓ ≥ 99.99%
Formaldehyde	8.77E-04	3.74E-02	↓ 97.66%
Glycidol	1.64E-04	1.04E-03	↓ 84.13%
Acetyl Propionyl	~ 3.72E-06	4.21E-02	↓ ≥ 99.99%
Butyraldehyde	~ 3.82E-06	3.33E-02	↓ ≥ 99.99%
Crotonaldehyde	~ 5.96E-06	1.53E-02	↓ ≥ 99.96%
Furfural	~ 6.10E-06	1.84E-02	↓ ≥ 99.97%
<b>Nicotine Degradants &amp; TSNA's</b>			
β-Nicotyrine	3.08E-04	1.07E-02	↓ 97.11%
Cotinine	1.57E-04	6.96E-03	↓ 97.74%
Myosmine	4.00E-04	NA	NA
Nicotine N Oxide	1.17E-04	~5.37E-04	NC
Nornicotine	9.36E-04	9.50E-03	↓ 90.15%
Anabasine	~ 2.99E-06	8.33E-04	↓ ≥ 99.64%
Anatabine	~ 3.27E-05	6.00E-03	↓ ≥ 99.45%
NNK	~ 8.58E-07	9.85E-05	↓ ≥ 99.13%
NNN	~ 1.03E-07	1.18E-04	↓ ≥ 99.91%
<b>Metals</b>			



<b>Arsenic</b>	~ 1.81E-06	NA	NA
<b>Beryllium</b>	~ 7.23E-08	NA	NA
<b>Cadmium</b>	~ 3.29E-08	3.35E-05	↓ ≥ 99.90%
<b>Chromium</b>	~ 1.87E-06	~6.27E-07	NC
<b>Cobalt</b>	~ 1.64E-08	NA	NA
<b>Copper</b>	~ 3.29E-06	1.64E-05	↓ ≥ 79.90%
<b>Gold</b>	~ 5.31E-06	NA	NA
<b>Iron</b>	~ 9.36E-06	NA	NA
<b>Lead</b>	~ 8.22E-08	~4.18E-07	NC
<b>Nickel</b>	~ 4.53E-07	~9.64E-07	NC
<b>Selenium</b>	1.21E-06	NA	NA
<b>Silver</b>	~ 3.29E-08	NA	NA
<b>Tin</b>	~ 3.29E-07	NA	NA
<b>Zinc</b>	~ 1.56E-05	NA	NA
<b>Organic Acids</b>			
<b>Benzoic Acid</b>	5.81E-01	NA	NA
<b>Propionic Acid</b>	~ 1.33E-03	NA	NA
<b>VOCs</b>			
<b>1,3-Butadiene</b>	~ 1.71E-06	NA	NA
<b>Acrylonitrile</b>	~ 1.12E-06	9.71E-03	↓ ≥ 99.99%
<b>Benzene</b>	~ 1.97E-06	4.58E-02	↓ ≥ 99.99%
<b>Isoprene</b>	~ 2.64E-06	NA	NA
<b>Propylene Oxide</b>	~ 4.54E-06	8.44E-01	↓ ≥ 99.99%
<b>Toluene</b>	~ 2.89E-06	7.35E-02	↓ ≥ 99.99%
<b>Esters &amp; Alcohols</b>			
<b>1-Butanol</b>	~ 5.06E-05	NA	NA
<b>Benzyl Acetate</b>	~ 7.84E-05	NA	NA
<b>Ethyl Acetate</b>	~ 9.87E-04	NA	NA
<b>Ethyl Acetoacetate</b>	~ 6.41E-05	NA	NA
<b>Isoamyl Acetate</b>	~ 5.47E-05	NA	NA
<b>Isobutyl Acetate</b>	~ 5.42E-05	NA	NA
<b>Methyl Acetate</b>	~ 5.82E-05	NA	NA
Average Difference			↑ 261472.96%
Average Difference without PG, VG, Water, and Menthol			↓ 94.99%

## 1.6 Polar Menthol 18 mg/mL Intense Percent Difference to Combustible Cigarettes

Parameter/ Constituent	Aerosol or Smoke Yields Normalized by Nicotine (mg/mg)		% Diff vs CC
	AEROSOL MAX	CC	
<b># of puffs</b>	81	NA	NA
<b>pH</b>	6.57	NA	NA

Primary Constituents			
Nicotine	1.00E+00	1.00E+00	NA
Glycerol	2.74E+01	1.20E+00	↑ 2187.99%
Propylene Glycol	4.04E+01	1.36E-02	↑ 296295.19%
Water	4.21E+00	7.94E+00	↓ 46.98%
Menthol	7.70E-01	~4.76E-06	↑ ≥ 16168585.56%
Diethylene Glycol	~ 4.71E-03	~9.90E-04	NC
Ethylene Glycol	~ 5.02E-03	1.73E-02	↓ ≥ 71.04%
Carbonyls & Glycidol			
Acetaldehyde	3.14E-04	8.19E-01	↓ 99.96%
Acrolein	2.79E-04	8.12E-02	↓ 99.66%
Diacetyl	~ 4.33E-05	1.69E-01	↓ ≥ 99.97%
Formaldehyde	8.65E-04	5.47E-02	↓ 98.42%
Glycidol	2.06E-04	1.01E-03	↓ 79.64%
Acetyl Propionyl	~ 5.03E-06	4.62E-02	↓ ≥ 99.99%
Butyraldehyde	~ 8.57E-06	4.23E-02	↓ ≥ 99.98%
Crotonaldehyde	~ 1.02E-05	2.89E-02	↓ ≥ 99.96%
Furfural	~ 8.43E-06	1.49E-02	↓ ≥ 99.94%
Nicotine Degradants & TSNAs			
β-Nicotyrine	3.38E-04	3.50E-03	↓ 90.35%
Cotinine	1.15E-04	7.09E-03	↓ 98.37%
Myosmine	3.28E-04	6.55E-03	↓ 94.99%
Nicotine N Oxide	~ 4.01E-05	~3.26E-04	NC
Nornicotine	7.08E-04	1.09E-02	↓ 93.54%
Anabasine	~ 2.98E-05	5.10E-04	↓ ≥ 94.15%
Anatabine	~ 3.31E-05	3.08E-03	↓ ≥ 98.93%
NNK	~ 7.71E-07	9.86E-05	↓ ≥ 99.22%
NNN	~ 9.26E-08	1.12E-04	↓ ≥ 99.92%
Metals			
Arsenic	~ 1.71E-06	NA	NA
Beryllium	~ 6.26E-08	NA	NA
Cadmium	~ 2.85E-08	4.01E-05	↓ ≥ 99.93%
Chromium	~ 1.68E-06	~3.95E-07	NC
Cobalt	~ 1.42E-08	NA	NA
Copper	~ 7.12E-07	1.23E-05	↓ ≥ 94.20%
Gold	~ 4.77E-06	NA	NA
Iron	~ 8.42E-06	NA	NA
Lead	~ 7.12E-08	1.79E-05	↓ ≥ 99.60%
Nickel	~ 4.23E-07	~7.89E-07	NC

<b>Selenium</b>	1.40E-06	NA	NA
<b>Silver</b>	~ 1.69E-07	NA	NA
<b>Tin</b>	~ 1.71E-06	NA	NA
<b>Zinc</b>	~ 1.42E-05	NA	NA
<b>Organic Acids</b>			
<b>Benzoic Acid</b>	7.22E-01	NA	NA
<b>Propionic Acid</b>	~ 1.76E-03	NA	NA
<b>VOCs</b>			
<b>1,3-Butadiene</b>	~ 1.54E-06	NA	NA
<b>Acrylonitrile</b>	~ 1.01E-06	1.27E-02	↓ ≥ 99.99%
<b>Benzene</b>	~ 1.77E-06	4.64E-02	↓ ≥ 99.99%
<b>Isoprene</b>	~ 2.37E-06	NA	NA
<b>Propylene Oxide</b>	~ 4.08E-06	9.00E-04	↓ ≥ 99.55%
<b>Toluene</b>	~ 2.60E-06	7.91E-02	↓ ≥ 99.99%
<b>Esters &amp; Alcohols</b>			
<b>1-Butanol</b>	~ 4.54E-05	NA	NA
<b>Benzyl Acetate</b>	~ 7.05E-05	NA	NA
<b>Ethyl Acetate</b>	~ 8.88E-04	NA	NA
<b>Ethyl Acetoacetate</b>	~ 5.76E-05	NA	NA
<b>Isoamyl Acetate</b>	~ 4.92E-05	NA	NA
<b>Isobutyl Acetate</b>	~ 4.87E-05	NA	NA
<b>Methyl Acetate</b>	~ 5.24E-05	NA	NA
Average Difference			↑ 567745.19%
Average Difference without PG, VG, Water, and Menthol			↓ 96.45%

## 1.7 Autumn Tobacco 18 mg/mL Non-Intense Percent Difference to Combustible Cigarettes

Parameter/ Constituent	Aerosol or Smoke Yields Normalized by Nicotine (mg/mg)		% Diff vs CC
	AEROSOL MAX	CC	
<b># of puffs</b>	128	NA	NA
<b>pH</b>	6.41	NA	NA
<b>Primary Constituents</b>			
<b>Nicotine</b>	1.00E+00	1.00E+00	NA
<b>Glycerol</b>	2.59E+01	8.95E-01	↑ 2799.86%
<b>Propylene Glycol</b>	3.40E+01	4.21E-03	↑ 807778.37%
<b>Water</b>	6.24E+00	4.21E+00	↑ 48.28%
<b>Menthol</b>	~ 2.01E-03	~1.32E-05	NC
<b>Diethylene Glycol</b>	~ 1.84E-03	~1.42E-03	NC
<b>Ethylene Glycol</b>	~ 1.28E-03	9.96E-03	↓ ≥ 87.11%

Carbonyls & Glycidol			
Acetaldehyde	1.60E-04	7.24E-01	↓ 99.98%
Acrolein	7.06E-05	5.96E-02	↓ 99.88%
Diacetyl	~ 3.73E-05	1.64E-01	↓ ≥ 99.98%
Formaldehyde	5.57E-04	3.74E-02	↓ 98.51%
Glycidol	1.61E-04	1.04E-03	↓ 84.43%
Acetyl Propionyl	~ 4.29E-06	4.21E-02	↓ ≥ 99.99%
Butyraldehyde	~ 3.52E-05	3.33E-02	↓ ≥ 99.89%
Crotonaldehyde	~ 5.51E-06	1.53E-02	↓ ≥ 99.96%
Furfural	~ 5.88E-06	1.84E-02	↓ ≥ 99.97%
Nicotine Degradants & TSNA			
β-Nicotyrine	1.17E-04	1.07E-02	↓ 98.90%
Cotinine	1.89E-04	6.96E-03	↓ 97.29%
Myosmine	1.88E-04	NA	NA
Nicotine N Oxide	2.51E-04	~5.37E-04	NC
Nornicotine	5.91E-04	9.50E-03	↓ 93.78%
Anabasine	~ 3.69E-06	8.33E-04	↓ ≥ 99.56%
Anatabine	~ 2.93E-06	6.00E-03	↓ ≥ 99.95%
NNK	~ 9.18E-08	9.85E-05	↓ ≥ 99.91%
NNN	~ 2.47E-08	1.18E-04	↓ ≥ 99.98%
Metals			
Arsenic	~ 1.82E-06	NA	NA
Beryllium	~ 6.68E-08	NA	NA
Cadmium	~ 3.04E-08	3.35E-05	↓ ≥ 99.91%
Chromium	~ 1.80E-06	~6.27E-07	NC
Cobalt	~ 1.52E-08	NA	NA
Copper	~ 7.59E-07	1.64E-05	↓ ≥ 95.36%
Gold	~ 5.16E-06	NA	NA
Iron	~ 3.04E-06	NA	NA
Lead	~ 7.59E-08	~4.18E-07	NC
Nickel	~ 1.52E-07	~9.64E-07	NC
Selenium	~ 7.26E-07	NA	NA
Silver	~ 3.04E-08	NA	NA
Tin	~ 1.80E-06	NA	NA
Zinc	~ 4.56E-06	NA	NA
Organic Acids			
Benzoic Acid	7.08E-01	NA	NA
Propionic Acid	~ 1.96E-03	NA	NA
VOCs			

<b>1,3-butadiene</b>	~ 2.12E-06	NA	NA
<b>Acrylonitrile</b>	~ 1.09E-06	9.71E-03	↓ ≥ 99.99%
<b>Benzene</b>	~ 1.12E-05	4.58E-02	↓ ≥ 99.98%
<b>Isoprene</b>	~ 2.57E-06	NA	NA
<b>Propylene Oxide</b>	~ 6.89E-06	8.44E-01	↓ ≥ 99.99%
<b>Toluene</b>	~ 1.35E-05	7.35E-02	↓ ≥ 99.98%
<b>Esters &amp; Alcohols</b>			
<b>1-Butanol</b>	~ 6.54E-04	NA	NA
<b>Benzyl Acetate</b>	~ 7.65E-05	NA	NA
<b>Ethyl Acetate</b>	~ 6.09E-05	NA	NA
<b>Ethyl Acetoacetate</b>	~ 1.19E-04	NA	NA
<b>Isoamyl Acetate</b>	~ 6.15E-05	NA	NA
<b>Isobutyl Acetate</b>	~ 6.12E-05	NA	NA
<b>Methyl Acetate</b>	~ 7.00E-04	NA	NA
Average Difference			↑ 31091.24%
Average Difference without PG, VG, and Water			↓ 98.01%

## 1.8 Autumn Tobacco 18 mg/mL Intense Percent Difference to Combustible Cigarettes

Parameter/ Constituent	Aerosol or Smoke Yields Normalized by Nicotine (mg/mg)		% Diff vs CC
	AEROSOL MAX	CC	
<b># of puffs</b>	80	NA	NA
<b>pH</b>	6.43	NA	NA
<b>Primary Constituents</b>			
<b>Nicotine</b>	1.00E+00	1.00E+00	NA
<b>Glycerol</b>	2.62E+01	1.20E+00	↑ 2095.82%
<b>Propylene Glycol</b>	3.41E+01	1.36E-02	↑ 249907.01%
<b>Water</b>	5.42E+00	7.94E+00	↓ 31.79%
<b>Menthol</b>	~ 4.90E-03	~4.76E-06	NC
<b>Diethylene Glycol</b>	~ 2.10E-03	~9.90E-04	NC
<b>Ethylene Glycol</b>	~ 1.47E-03	1.73E-02	↓ ≥ 91.53%
<b>Carbonyls &amp; Glycidol</b>			
<b>Acetaldehyde</b>	1.92E-04	8.19E-01	↓ 99.98%
<b>Acrolein</b>	1.27E-04	8.12E-02	↓ 99.84%
<b>Diacetyl</b>	~ 4.84E-05	1.69E-01	↓ ≥ 99.97%
<b>Formaldehyde</b>	6.99E-04	5.47E-02	↓ 98.72%
<b>Glycidol</b>	2.70E-04	1.01E-03	↓ 73.35%
<b>Acetyl Propionyl</b>	~ 4.79E-05	4.62E-02	↓ ≥ 99.90%
<b>Butyraldehyde</b>	~ 4.58E-06	4.23E-02	↓ ≥ 99.99%

<b>Crotonaldehyde</b>	~ 7.12E-06	2.89E-02	↓ ≥ 99.98%
<b>Furfural</b>	~ 7.84E-06	1.49E-02	↓ ≥ 99.95%
<b>Nicotine Degradants &amp; TSNA</b>			
<b>β-Nicotyrine</b>	1.17E-04	3.50E-03	↓ 96.65%
<b>Cotinine</b>	2.75E-04	7.09E-03	↓ 96.12%
<b>Myosmine</b>	2.12E-04	6.55E-03	↓ 96.76%
<b>Nicotine N Oxide</b>	2.92E-04	~3.26E-04	NC
<b>Nornicotine</b>	7.23E-04	1.09E-02	↓ 93.40%
<b>Anabasine</b>	~ 4.92E-06	5.10E-04	↓ ≥ 99.04%
<b>Anatabine</b>	~ 3.91E-06	3.08E-03	↓ ≥ 99.87%
<b>NNK</b>	~ 1.02E-07	9.86E-05	↓ ≥ 99.90%
<b>NNN</b>	~ 1.11E-07	1.12E-04	↓ ≥ 99.90%
<b>Metals</b>			
<b>Arsenic</b>	~ 1.90E-06	NA	NA
<b>Beryllium</b>	~ 7.40E-08	NA	NA
<b>Cadmium</b>	~ 3.37E-08	4.01E-05	↓ ≥ 99.92%
<b>Chromium</b>	~ 1.90E-06	~3.95E-07	NC
<b>Cobalt</b>	~ 1.68E-08	NA	NA
<b>Copper</b>	~ 8.41E-07	1.23E-05	↓ ≥ 93.15%
<b>Gold</b>	~ 5.72E-06	NA	NA
<b>Iron</b>	~ 3.37E-06	NA	NA
<b>Lead</b>	~ 8.41E-08	1.79E-05	↓ ≥ 99.53%
<b>Nickel</b>	~ 1.68E-07	~7.89E-07	NC
<b>Selenium</b>	~ 8.04E-07	NA	NA
<b>Silver</b>	~ 3.37E-08	NA	NA
<b>Tin</b>	~ 2.02E-06	NA	NA
<b>Zinc</b>	~ 5.05E-06	NA	NA
<b>Organic Acids</b>			
<b>Benzoic Acid</b>	8.34E-01	NA	NA
<b>Propionic Acid</b>	~ 2.24E-03	NA	NA
<b>VOCs</b>			
<b>1,3-butadiene</b>	~ 1.85E-06	NA	NA
<b>Acrylonitrile</b>	~ 1.21E-06	1.27E-02	↓ ≥ 99.99%
<b>Benzene</b>	~ 1.24E-05	4.64E-02	↓ ≥ 99.97%
<b>Isoprene</b>	~ 2.85E-06	NA	NA
<b>Propylene Oxide</b>	~ 4.90E-06	9.00E-04	↓ ≥ 99.46%
<b>Toluene</b>	~ 1.50E-05	7.91E-02	↓ ≥ 99.98%
<b>Esters &amp; Alcohols</b>			
<b>1-Butanol</b>	~ 7.26E-04	NA	NA

<b>Benzyl Acetate</b>	~ 8.47E-05	NA	NA
<b>Ethyl Acetate</b>	~ 6.75E-05	NA	NA
<b>Ethyl Acetoacetate</b>	~ 1.31E-04	NA	NA
<b>Isoamyl Acetate</b>	~ 6.82E-05	NA	NA
<b>Isobutyl Acetate</b>	~ 6.78E-05	NA	NA
<b>Methyl Acetate</b>	~ 7.03E-05	NA	NA
Average Difference			↑ 8911.94%
Average Difference without PG, VG, and Water			↓ 97.47%

## 1.9 Ruby Menthol 18 mg/mL Non-Intense Percent Difference to Combustible Cigarettes

Parameter/ Constituent	Aerosol or Smoke Yields Normalized by Nicotine (mg/mg)		% Diff vs CC
	AEROSOL MAX	CC	
<b># of puffs</b>	135	NA	NA
<b>pH</b>	5.90	NA	NA
<b>Primary Constituents</b>			
<b>Nicotine</b>	1.00E+00	1.00E+00	NA
<b>Glycerol</b>	2.60E+01	8.95E-01	↑ 2802.08%
<b>Propylene Glycol</b>	3.50E+01	4.21E-03	↑ 830431.54%
<b>Water</b>	8.20E+00	4.21E+00	↑ 94.74%
<b>Menthol</b>	5.73E-01	~1.32E-05	↑ ≥ 4357200.89%
<b>Diethylene Glycol</b>	~ 2.02E-03	~1.42E-03	NC
<b>Ethylene Glycol</b>	~ 1.41E-03	9.96E-03	↓ ≥ 85.84%
<b>Carbonyls &amp; Glycidol</b>			
<b>Acetaldehyde</b>	2.93E-04	7.24E-01	↓ 99.96%
<b>Acrolein</b>	~ 4.04E-05	5.96E-02	↓ ≥ 99.93%
<b>Diacetyl</b>	~ 3.93E-05	1.64E-01	↓ ≥ 99.98%
<b>Formaldehyde</b>	8.18E-04	3.74E-02	↓ 97.82%
<b>Glycidol</b>	1.84E-04	1.04E-03	↓ 82.21%
<b>Acetyl Propionyl</b>	~ 4.71E-06	4.21E-02	↓ ≥ 99.99%
<b>Butyraldehyde</b>	~ 3.78E-06	3.33E-02	↓ ≥ 99.99%
<b>Crotonaldehyde</b>	~ 5.71E-06	1.53E-02	↓ ≥ 99.96%
<b>Furfural</b>	~ 6.46E-06	1.84E-02	↓ ≥ 99.96%
<b>Nicotine Degradants &amp; TSNAs</b>			
<b>β-Nicotyrine</b>	2.07E-04	1.07E-02	↓ 98.05%
<b>Cotinine</b>	2.42E-04	6.96E-03	↓ 96.52%
<b>Myosmine</b>	3.01E-04	NA	NA
<b>Nicotine N Oxide</b>	2.56E-04	~5.37E-04	NC
<b>Nornicotine</b>	6.68E-04	9.50E-03	↓ 92.97%

<b>Anabasine</b>	~ 4.05E-06	8.33E-04	↓ ≥ 99.51%
<b>Anatabine</b>	~ 3.22E-06	6.00E-03	↓ ≥ 99.95%
<b>NNK</b>	~ 9.52E-08	9.85E-05	↓ ≥ 99.90%
<b>NNN</b>	3.53E-07	1.18E-04	↓ 99.70%
<b>Metals</b>			
<b>Arsenic</b>	~ 3.15E-07	NA	NA
<b>Beryllium</b>	~ 6.93E-08	NA	NA
<b>Cadmium</b>	~ 3.15E-08	3.35E-05	↓ ≥ 99.91%
<b>Chromium</b>	~ 3.15E-07	~6.27E-07	NC
<b>Cobalt</b>	~ 1.57E-08	NA	NA
<b>Copper</b>	~ 7.87E-07	1.64E-05	↓ ≥ 95.19%
<b>Gold</b>	~ 5.35E-06	NA	NA
<b>Iron</b>	~ 3.15E-06	NA	NA
<b>Lead</b>	~ 7.87E-08	~4.18E-07	NC
<b>Nickel</b>	~ 1.57E-07	~9.64E-07	NC
<b>Selenium</b>	~ 7.52E-07	NA	NA
<b>Silver</b>	~ 1.67E-07	NA	NA
<b>Tin</b>	~ 3.15E-07	NA	NA
<b>Zinc</b>	~ 4.72E-06	NA	NA
<b>Organic Acids</b>			
<b>Benzoic Acid</b>	7.19E-01	NA	NA
<b>Propionic Acid</b>	~ 2.15E-03	NA	NA
<b>VOCs</b>			
<b>1,3-butadiene</b>	~ 2.20E-06	NA	NA
<b>Acrylonitrile</b>	~ 1.09E-06	9.71E-03	↓ ≥ 99.99%
<b>Benzene</b>	~ 1.15E-05	4.58E-02	↓ ≥ 99.97%
<b>Isoprene</b>	~ 2.55E-06	NA	NA
<b>Propylene Oxide</b>	~ 7.17E-06	8.44E-01	↓ ≥ 99.99%
<b>Toluene</b>	~ 1.35E-05	7.35E-02	↓ ≥ 99.98%
<b>Esters &amp; Alcohols</b>			
<b>1-Butanol</b>	~ 6.02E-05	NA	NA
<b>Benzyl Acetate</b>	~ 7.92E-05	NA	NA
<b>Ethyl Acetate</b>	~ 6.31E-05	NA	NA
<b>Ethyl Acetoacetate</b>	~ 1.23E-04	NA	NA
<b>Isoamyl Acetate</b>	~ 6.38E-05	NA	NA
<b>Isobutyl Acetate</b>	~ 6.35E-05	NA	NA
<b>Methyl Acetate</b>	~ 7.29E-04	NA	NA
Average Difference			↑ 192158.59%
Average Difference without PG, VG, Water, and Menthol			↓ 97.71%



### 1.10 Ruby Menthol 18 mg/mL Intense Percent Difference to Combustible Cigarettes

Parameter/ Constituent	Aerosol or Smoke Yields Normalized by Nicotine (mg/mg)		% Diff vs CC
	AEROSOL MAX	CC	
# of puffs	90	NA	NA
pH	6.09	NA	NA
<b>Primary Constituents</b>			
Nicotine	1.00E+00	1.00E+00	NA
Glycerol	2.62E+01	1.20E+00	↑ 2092.98%
Propylene Glycol	3.50E+01	1.36E-02	↑ 257107.51%
Water	6.18E+00	7.94E+00	↓ 22.10%
Menthol	5.58E-01	~4.76E-06	↑ ≥ 11720092.34%
Diethylene Glycol	~ 2.09E-03	~9.90E-04	NC
Ethylene Glycol	~ 1.46E-03	1.73E-02	↓ ≥ 91.60%
<b>Carbonyls &amp; Glycidol</b>			
Acetaldehyde	3.62E-04	8.19E-01	↓ 99.96%
Acrolein	1.25E-04	8.12E-02	↓ 99.85%
Diacetyl	~ 5.03E-05	1.69E-01	↓ ≥ 99.97%
Formaldehyde	9.31E-04	5.47E-02	↓ 98.30%
Glycidol	3.21E-04	1.01E-03	↓ 68.28%
Acetyl Propionyl	~ 5.67E-06	4.62E-02	↓ ≥ 99.99%
Butyraldehyde	~ 4.55E-06	4.23E-02	↓ ≥ 99.99%
Crotonaldehyde	~ 7.24E-06	2.89E-02	↓ ≥ 99.97%
Furfural	~ 7.78E-06	1.49E-02	↓ ≥ 99.95%
<b>Nicotine Degradants &amp; TSNAs</b>			
β-Nicotyrine	2.94E-04	3.50E-03	↓ 91.59%
Cotinine	2.65E-04	7.09E-03	↓ 96.27%
Myosmine	3.21E-04	6.55E-03	↓ 95.09%
Nicotine N Oxide	2.35E-04	~3.26E-04	NC
Nornicotine	8.86E-04	1.09E-02	↓ 91.91%
Anabasine	~ 4.88E-06	5.10E-04	↓ ≥ 99.04%
Anatabine	~ 3.88E-06	3.08E-03	↓ ≥ 99.87%
NNK	~ 1.03E-07	9.86E-05	↓ ≥ 99.90%
NNN	4.46E-07	1.12E-04	↓ 99.60%
<b>Metals</b>			
Arsenic	~ 3.42E-07	NA	NA
Beryllium	~ 7.53E-08	NA	NA
Cadmium	~ 3.42E-08	4.01E-05	↓ ≥ 99.91%
Chromium	~ 3.42E-07	~3.95E-07	NC

<b>Cobalt</b>	~ 1.71E-08	NA	NA
<b>Copper</b>	~ 8.56E-07	1.23E-05	↓ ≥ 93.03%
<b>Gold</b>	~ 5.82E-06	NA	NA
<b>Iron</b>	~ 3.42E-06	NA	NA
<b>Lead</b>	~ 4.17E-07	1.79E-05	↓ ≥ 97.68%
<b>Nickel</b>	~ 1.71E-07	~7.89E-07	NC
<b>Selenium</b>	~ 8.18E-07	NA	NA
<b>Silver</b>	~ 1.79E-07	NA	NA
<b>Tin</b>	~ 2.00E-06	NA	NA
<b>Zinc</b>	~ 5.13E-06	NA	NA
<b>Organic Acids</b>			
<b>Benzoic Acid</b>	8.02E-01	NA	NA
<b>Propionic Acid</b>	~ 2.22E-03	NA	NA
<b>VOCs</b>			
<b>1,3-butadiene</b>	~ 1.88E-06	NA	NA
<b>Acrylonitrile</b>	~ 1.23E-06	1.27E-02	↓ ≥ 99.99%
<b>Benzene</b>	~ 1.27E-05	4.64E-02	↓ ≥ 99.97%
<b>Isoprene</b>	~ 2.89E-06	NA	NA
<b>Propylene Oxide</b>	~ 4.98E-06	9.00E-04	↓ ≥ 99.45%
<b>Toluene</b>	~ 1.53E-05	7.91E-02	↓ ≥ 99.98%
<b>Esters &amp; Alcohols</b>			
<b>1-Butanol</b>	~ 6.55E-05	NA	NA
<b>Benzyl Acetate</b>	~ 8.62E-05	NA	NA
<b>Ethyl Acetate</b>	~ 6.86E-05	NA	NA
<b>Ethyl Acetoacetate</b>	~ 1.34E-04	NA	NA
<b>Isoamyl Acetate</b>	~ 6.93E-05	NA	NA
<b>Isobutyl Acetate</b>	~ 6.90E-05	NA	NA
<b>Methyl Acetate</b>	~ 8.02E-04	NA	NA
Average Difference			↑ 412994.81%
Average Difference without PG, VG, Water, and Menthol			↓ 96.85%

### 1.11 Summer Menthol 18 mg/mL Non-Intense Percent Difference to Combustible Cigarettes

Parameter/ Constituent	Aerosol or Smoke Yields Normalized by Nicotine (mg/mg)		% Diff vs CC
	AEROSOL MAX	CC	
<b># of puffs</b>	138	NA	NA
<b>pH</b>	6.46	NA	NA
<b>Primary Constituents</b>			
<b>Nicotine</b>	1.00E+00	1.00E+00	NA

<b>Glycerol</b>	2.57E+01	8.95E-01	↑ 2777.39%
<b>Propylene Glycol</b>	3.34E+01	4.21E-03	↑ 793277.57%
<b>Water</b>	8.38E+00	4.21E+00	↑ 99.11%
<b>Menthol</b>	5.65E-01	~1.32E-05	↑ ≥ 4297635.85%
<b>Diethylene Glycol</b>	~ 2.09E-03	~1.42E-03	NC
<b>Ethylene Glycol</b>	~ 1.46E-03	9.96E-03	↓ ≥ 85.35%
<b>Carbonyls &amp; Glycidol</b>			
<b>Acetaldehyde</b>	1.12E-04	7.24E-01	↓ 99.98%
<b>Acrolein</b>	~ 4.02E-05	5.96E-02	↓ ≥ 99.93%
<b>Diacetyl</b>	~ 4.06E-05	1.64E-01	↓ ≥ 99.98%
<b>Formaldehyde</b>	5.38E-04	3.74E-02	↓ 98.56%
<b>Glycidol</b>	1.17E-04	1.04E-03	↓ 88.75%
<b>Acetyl Propionyl</b>	~ 3.30E-05	4.21E-02	↓ ≥ 99.92%
<b>Butyraldehyde</b>	~ 3.91E-06	3.33E-02	↓ ≥ 99.99%
<b>Crotonaldehyde</b>	~ 5.62E-06	1.53E-02	↓ ≥ 99.96%
<b>Furfural</b>	~ 6.68E-06	1.84E-02	↓ ≥ 99.96%
<b>Nicotine Degradants &amp; TSNAs</b>			
<b>β-Nicotyrine</b>	7.87E-05	1.07E-02	↓ 99.26%
<b>Cotinine</b>	1.18E-04	6.96E-03	↓ 98.31%
<b>Myosmine</b>	1.13E-04	NA	NA
<b>Nicotine N Oxide</b>	1.86E-04	~5.37E-04	NC
<b>Nornicotine</b>	4.54E-04	9.50E-03	↓ 95.22%
<b>Anabasine</b>	~ 4.19E-06	8.33E-04	↓ ≥ 99.50%
<b>Anatabine</b>	~ 3.33E-06	6.00E-03	↓ ≥ 99.94%
<b>NNK</b>	~ 9.37E-08	9.85E-05	↓ ≥ 99.90%
<b>NNN</b>	~ 2.52E-08	1.18E-04	↓ ≥ 99.98%
<b>Metals</b>			
<b>Arsenic</b>	~ 3.16E-07	NA	NA
<b>Beryllium</b>	~ 6.95E-08	NA	NA
<b>Cadmium</b>	~ 3.16E-08	3.35E-05	↓ ≥ 99.91%
<b>Chromium</b>	~ 3.16E-07	~6.27E-07	NC
<b>Cobalt</b>	~ 1.58E-08	NA	NA
<b>Copper</b>	~ 7.89E-07	1.64E-05	↓ ≥ 95.17%
<b>Gold</b>	~ 5.37E-06	NA	NA
<b>Iron</b>	~ 3.16E-06	NA	NA
<b>Lead</b>	~ 7.89E-08	~4.18E-07	NC
<b>Nickel</b>	~ 1.58E-07	~9.64E-07	NC
<b>Selenium</b>	~ 7.41E-07	NA	NA
<b>Silver</b>	~ 1.61E-07	NA	NA
<b>Tin</b>	~ 3.16E-07	NA	NA

<b>Zinc</b>	~ 1.49E-05	NA	NA
<b>Organic Acids</b>			
<b>Benzoic Acid</b>	6.87E-01	NA	NA
<b>Propionic Acid</b>	~ 2.23E-03	NA	NA
<b>VOCs</b>			
<b>1,3-butadiene</b>	~ 2.17E-06	NA	NA
<b>Acrylonitrile</b>	~ 1.07E-06	9.71E-03	↓ ≥ 99.99%
<b>Benzene</b>	~ 1.13E-05	4.58E-02	↓ ≥ 99.98%
<b>Isoprene</b>	~ 2.52E-06	NA	NA
<b>Propylene Oxide</b>	~ 7.06E-06	8.44E-01	↓ ≥ 99.99%
<b>Toluene</b>	~ 1.33E-05	7.35E-02	↓ ≥ 99.98%
<b>Esters &amp; Alcohols</b>			
<b>1-Butanol</b>	~ 5.93E-05	NA	NA
<b>Benzyl Acetate</b>	~ 7.80E-05	NA	NA
<b>Ethyl Acetate</b>	1.02E-02	NA	NA
<b>Ethyl Acetoacetate</b>	~ 1.21E-04	NA	NA
<b>Isoamyl Acetate</b>	~ 6.28E-05	NA	NA
<b>Isobutyl Acetate</b>	~ 6.25E-05	NA	NA
<b>Methyl Acetate</b>	~ 7.18E-04	NA	NA
Average Difference			↑ 188575.20%
Average Difference without PG, VG, Water, and Menthol			↓ 98.24%

### 1.12 Summer Menthol 18 mg/mL Intense Percent Difference to Combustible Cigarettes

Parameter/ Constituent	Aerosol or Smoke Yields Normalized by Nicotine (mg/mg)		% Diff vs CC
	AEROSOL MAX	CC	
<b># of puffs</b>	86	NA	NA
<b>pH</b>	6.51	NA	NA
<b>Primary Constituents</b>			
<b>Nicotine</b>	1.00E+00	1.00E+00	NA
<b>Glycerol</b>	2.59E+01	1.20E+00	↑ 2062.53%
<b>Propylene Glycol</b>	3.36E+01	1.36E-02	↑ 246305.78%
<b>Water</b>	6.47E+00	7.94E+00	↓ 18.53%
<b>Menthol</b>	5.60E-01	~4.76E-06	↑ ≥ 11751564.85%
<b>Diethylene Glycol</b>	~ 2.19E-03	~9.90E-04	NC
<b>Ethylene Glycol</b>	~ 1.52E-03	1.73E-02	↓ ≥ 91.20%
<b>Carbonyls &amp; Glycidol</b>			
<b>Acetaldehyde</b>	1.20E-04	8.19E-01	↓ 99.99%
<b>Acrolein</b>	1.24E-04	8.12E-02	↓ 99.85%

<b>Diacetyl</b>	~ 4.95E-05	1.69E-01	↓ ≥ 99.97%
<b>Formaldehyde</b>	6.56E-04	5.47E-02	↓ 98.80%
<b>Glycidol</b>	2.62E-04	1.01E-03	↓ 74.15%
<b>Acetyl Propionyl</b>	~ 5.94E-06	4.62E-02	↓ ≥ 99.99%
<b>Butyraldehyde</b>	~ 4.76E-06	4.23E-02	↓ ≥ 99.99%
<b>Crotonaldehyde</b>	~ 6.31E-06	2.89E-02	↓ ≥ 99.98%
<b>Furfural</b>	~ 8.15E-06	1.49E-02	↓ ≥ 99.95%
<b>Nicotine Degradants &amp; TSNA</b>			
<b>β-Nicotyrine</b>	7.81E-05	3.50E-03	↓ 97.77%
<b>Cotinine</b>	1.23E-04	7.09E-03	↓ 98.26%
<b>Myosmine</b>	1.08E-04	6.55E-03	↓ 98.35%
<b>Nicotine N Oxide</b>	1.72E-04	~3.26E-04	NC
<b>Nornicotine</b>	4.49E-04	1.09E-02	↓ 95.90%
<b>Anabasine</b>	~ 5.11E-06	5.10E-04	↓ ≥ 99.00%
<b>Anatabine</b>	~ 4.06E-06	3.08E-03	↓ ≥ 99.87%
<b>NNK</b>	~ 9.03E-08	9.86E-05	↓ ≥ 99.91%
<b>NNN</b>	~ 2.43E-08	1.12E-04	↓ ≥ 99.98%
<b>Metals</b>			
<b>Arsenic</b>	~ 3.30E-07	NA	NA
<b>Beryllium</b>	~ 7.26E-08	NA	NA
<b>Cadmium</b>	~ 3.30E-08	4.01E-05	↓ ≥ 99.92%
<b>Chromium</b>	~ 3.30E-07	~3.95E-07	NC
<b>Cobalt</b>	~ 1.65E-08	NA	NA
<b>Copper</b>	~ 8.25E-07	1.23E-05	↓ ≥ 93.28%
<b>Gold</b>	~ 5.61E-06	NA	NA
<b>Iron</b>	~ 3.30E-06	NA	NA
<b>Lead</b>	~ 8.25E-08	1.79E-05	↓ ≥ 99.54%
<b>Nickel</b>	~ 1.65E-07	~7.89E-07	NC
<b>Selenium</b>	~ 7.89E-07	NA	NA
<b>Silver</b>	~ 1.72E-07	NA	NA
<b>Tin</b>	~ 3.30E-07	NA	NA
<b>Zinc</b>	~ 4.95E-06	NA	NA
<b>Organic Acids</b>			
<b>Benzoic Acid</b>	7.84E-01	NA	NA
<b>Propionic Acid</b>	~ 2.33E-03	NA	NA
<b>VOCs</b>			
<b>1,3-butadiene</b>	~ 1.64E-06	NA	NA
<b>Acrylonitrile</b>	~ 1.07E-06	1.27E-02	↓ ≥ 99.99%
<b>Benzene</b>	~ 1.11E-05	4.64E-02	↓ ≥ 99.98%
<b>Isoprene</b>	~ 2.52E-06	NA	NA

## Supplementary Material

<b>Propylene Oxide</b>	~ 4.35E-06	9.00E-04	↓ ≥ 99.52%
<b>Toluene</b>	~ 1.34E-05	7.91E-02	↓ ≥ 99.98%
<b>Esters &amp; Alcohols</b>			
<b>1-Butanol</b>	~ 5.71E-05	NA	NA
<b>Benzyl Acetate</b>	~ 7.52E-05	NA	NA
<b>Ethyl Acetate</b>	1.07E-02	NA	NA
<b>Ethyl Acetoacetate</b>	~ 1.17E-04	NA	NA
<b>Isoamyl Acetate</b>	~ 6.05E-05	NA	NA
<b>Isobutyl Acetate</b>	~ 6.02E-05	NA	NA
<b>Methyl Acetate</b>	~ 7.14E-04	NA	NA
Average Difference			↑ 413705.85%
Average Difference without PG, VG, Water, and Menthol			↓ 97.80%

### 1.13 Average Non-Intense and Intense Percent Difference to Combustible Cigarettes

Parameter/ Constituent	Aerosol or Smoke Yields Normalized by Nicotine (mg/mg)			
	MAX Non-Intense Average % Difference vs CC	Range of Non-Intense % Difference vs CC Results	MAX Intense Average % Difference vs CC	Range of Intense % Difference vs CC Results
# of puffs	NA	NA	NA	
pH	NA	NA	NA	
<b>Primary Constituents</b>				
Nicotine	NA	NA	NA	NA
Glycerol	↑ 3164%	↑ 2777% - ↑ 4763%	↑ 2327%	↑ 2063% - ↑ 3376%
Propylene Glycol	↑ 832447%	↑ 593470% - ↑ 1067676%	↑ 251844%	↑ 185338% - ↑ 296295%
Water	↑ 51%	↑ 10.57% - ↑ 99.11%	↓ 33.73%	↓ 18.53% - ↓ 46.98%
Menthol*	↑ ≥ 5065342%	↑ ≥ 4297636% - ↑ ≥ 5991319%	13696514%	↑ 11720092% - ↑ 16168586%
Diethylene Glycol	NC	NC	NC	NC
Ethylene Glycol	↓ ≥ 64%	↓ ≥ 40.53% - ↓ ≥ 87.11%	↓ ≥ 81%	↓ ≥ 69.09% - ↓ ≥ 91.6%
<b>Carbonyls &amp; Glycidol</b>				
Acetaldehyde	↓ 99.97%	↓ 99.96% - ↓ 99.98%	↓ 99.97%	↓ 99.95% - ↓ 99.99%
Acrolein	↓ 99.84%	↓ 99.7% - ↓ 99.93%	↓ 99.74%	↓ 99.5% - ↓ 99.85%
Diacetyl	↓ ≥ 99.98%	↓ ≥ 99.98 - ↓ ≥ 99.99	↓ ≥ 99.97%	↓ 99.97% - ↓ 99.97%
Formaldehyde	↓ 97.94%	↓ 98.56% - ↓ 96.98%	↓ 98.27%	↓ 98.29% - ↓ 97.8%
Glycidol	↓ 83.41%	↓ 76.91% - ↓ 88.75%	↓ 72.41%	↓ 66.69% - ↓ 79.64%
Acetyl Propionyl	↓ ≥ 99.98%	↓ ≥ 99.92% - ↓ ≥ 99.99%	↓ ≥ 99.98%	↓ ≥ 99.9% - ↓ ≥ 99.99%
Butyraldehyde	↓ ≥ 99.97%	↓ ≥ 99.89% - ↓ ≥ 99.99%	↓ ≥ 99.97%	↓ ≥ 99.91% - ↓ ≥ 99.99%
Crotonaldehyde	↓ ≥ 99.96%	↓ ≥ 99.96% - ↓ ≥ 99.96%	↓ ≥ 99.97%	↓ ≥ 99.96% - ↓ ≥ 99.98%
Furfural	↓ ≥ 99.97%	↓ ≥ 99.96% - ↓ ≥ 99.97%	↓ ≥ 99.91%	↓ ≥ 99.71% - ↓ ≥ 99.95%
<b>Nicotine Degradants &amp; TSNAs</b>				

<b>β-Nicotyrine</b>	↓ 98.29%	↓ 97.11% - ↓ 99.26%	↓ 94.24%	↓ 90.35% - ↓ 97.77%
<b>Cotinine</b>	↓ 92.46%	↓ 65.35% - ↓ 99.56%	↓ 92.05%	↓ 64.14% - ↓ 99.14%
<b>Myosmine</b>	NA	NA	↓ 92.10%	↓ 69.8% - ↓ 98.35%
<b>Nicotine N Oxide</b>	NC	NC	NC	NC
<b>Nornicotine</b>	↓ 92.41%	↓ 90.15% - ↓ 95.22%	↓ 93.30%	↓ 91.91% - ↓ 95.9%
<b>Anabasine</b>	↓ ≥ 99.59%	↓ ≥ 99.5% - ↓ ≥ 99.66%	↓ ≥ 98.34%	↓ ≥ 94.15% - ↓ ≥ 99.42%
<b>Anatabine</b>	↓ ≥ 99.8%	↓ ≥ 99.45% - ↓ ≥ 99.95%	↓ ≥ 99.56%	↓ ≥ 99.9% - ↓ ≥ 98.93%
<b>NNK</b>	↓ ≥ 99.55%	↓ ≥ 99.13% - ↓ ≥ 99.91%	↓ ≥ 99.56%	↓ ≥ 99.21% - ↓ ≥ 99.91%
<b>NNN</b>	↓ ≥ 99.90%	↓ ≥ 99.70% - ↓ ≥ 99.98%	↓ ≥ 99.87%	↓ ≥ 99.6% - ↓ ≥ 99.98%
<b>Metals</b>				
<b>Arsenic</b>	NA	NA	NA	NA
<b>Beryllium</b>	NA	NA	NA	NA
<b>Cadmium</b>	↓ ≥ 99.91%	↓ ≥ 99.9% - ↓ ≥ 99.91%	↓ ≥ 99.92%	↓ ≥ 99.91% - ↓ ≥ 99.93%
<b>Chromium</b>	NC	NC	NC	NC
<b>Cobalt</b>	NA	NA	NA	NA
<b>Copper</b>	↓ ≥ 88.59%	↓ ≥ 79.9% - ↓ ≥ 95.36%	↓ ≥ 93.65%	↓ ≥ 93.03% - ↓ ≥ 94.3%
<b>Gold</b>	NA	NA	NA	NA
<b>Iron</b>	NA	NA	NA	NA
<b>Lead</b>	NC	NC	↓ ≥ 99.26%	↓ ≥ 97.68% - ↓ ≥ 99.61%
<b>Nickel</b>	NC	NC	NC	NC
<b>Selenium</b>	NA	NA	NA	NA
<b>Silver</b>	NA	NA	NA	NA
<b>Tin</b>	NA	NA	NA	NA
<b>Zinc</b>	NA	NA	NA	NA
<b>Organic Acids</b>				
<b>Benzoic Acid</b>	NA	NA	NA	NA
<b>Propionic Acid</b>	NA	NA	NA	NA
<b>VOCs</b>				



1,3-butadiene	NA	NA	NA	NA
Acrylonitrile	↓ ≥ 99.99%	↓ ≥ 99.99% - ↓ ≥ 99.99%	↓ ≥ 99.99%	↓ ≥ 99.99% - ↓ ≥ 99.99%
Benzene	↓ ≥ 99.98%	↓ ≥ 99.97% - ↓ ≥ 99.99%	↓ ≥ 99.98%	↓ ≥ 99.97% - ↓ ≥ 99.99%
Isoprene	NA	NA	NA	NA
Propylene Oxide	↓ ≥ 99.99%	↓ ≥ 99.99% - ↓ ≥ 99.99%	↓ ≥ 99.51%	↓ ≥ 99.45% - ↓ ≥ 99.55%
Toluene	↓ ≥ 99.98%	↓ ≥ 99.98% - ↓ ≥ 99.99%	↓ ≥ 99.98%	↓ ≥ 99.98% - ↓ ≥ 99.99%
Esters & Alcohols				
1-Butanol	NA	NA	NA	NA
Benzyl Acetate	NA	NA	NA	NA
Ethyl Acetate	NA	NA	NA	NA
Ethyl Acetoacetate	NA	NA	NA	NA
Isoamyl Acetate	NA	NA	NA	NA
Isobutyl Acetate	NA	NA	NA	NA
Methyl Acetate	NA	NA	NA	NA
Average Max % Difference	218475%		480974%	
Average Max % Difference without PG, VG, and Water	96.34%		96.50%	
Non-Intense and Intense Average Max % Difference without PG, VG, and Water	96.42%			

### 1.14 Statistical Comparison of Non-Intense 1R6F COA Values to Quantifiable Non-Intense JUUL2 Virginia Tobacco Constituents

Parameter/ Constituent	Certified 1R6F Value	Certified 1R6F Uncertainty	Nicotine Normalized Certified Value	Nicotine Normalized Certified Uncertainty	Maximum T0-T12 VT Mean Value	SD	Nicotine Normalized Mean Value	Nicotine Normalized SD	P Value
	1R6F ISO 3308:2012				JUUL2 Virginia Tobacco ISO 20768:2018				
	mg/cigarette		mg/mg nicotine		mg/collection		mg/mg nicotine		
Nicotine	7.21E-01	1.03E-01	NA	NA	1.58E+01	4.30E-01	NA	NA	NA
Acetaldehyde	5.22E-01	7.10E-02	7.24E-01	9.85E-02	4.32E-03	3.60E-04	2.74E-04	2.28E-05	0.0001
Acrolein	4.30E-02	1.40E-02	5.96E-02	1.94E-02	2.81E-03	2.70E-04	1.78E-04	1.71E-05	0.0001
Formaldehyde	2.70E-02	1.00E-02	3.74E-02	1.39E-02	1.79E-02	3.30E-04	1.13E-03	2.09E-05	0.002

### 1.15 Statistical Comparison of Intense 1R6F COA Values to Quantifiable Intense JUUL2 Virginia Tobacco Constituents

Parameter/ Constituent	Certified 1R6F Value	Certified 1R6F Uncertainty	Nicotine Normalized Certified Value	Nicotine Normalized Certified Uncertainty	Maximum T0-T12 VT Mean Value	SD	Nicotine Normalized Mean Value	Nicotine Normalized SD	P Value
	1R6F ISO 20778:2018				JUUL2 Virginia Tobacco Intense				
	mg/cigarette		mg/mg nicotine		mg/collection		mg/mg nicotine		
Nicotine	1.90E+00	1.30E-01	NA	NA	1.68E+01	2.66E+00	NA	NA	NA
Acetaldehyde	1.55E+00	2.39E-01	8.19E-01	1.26E-01	6.66E-03	5.10E-04	3.96E-04	3.03E-05	0.0001
Acrolein	1.54E-01	3.30E-02	8.12E-02	1.74E-02	6.82E-03	5.80E-04	4.05E-04	3.45E-05	0.0001
Formaldehyde	1.04E-01	3.40E-02	5.49E-02	1.79E-02	2.50E-02	1.13E-03	1.48E-03	6.72E-05	0.0001

