Supplementary Material

The average chamber concentration as determined from the charcoal tube analysis was 32.1 ± 0.92 ppm (mean ± 95% confidence interval), 162 ± 2.3 ppm, 323 ± 6.4 ppm, and 473 ± 6.8 ppm for the 30, 150, 300, and 475 target concentrations, respectively.

Monitor performance was measured as percent recoveries compared to the reference tube method (% charcoal tube = %CT) with below detection limit (BDL) values removed and BDL data replaced with ½ the detection limit (all data) displayed in Tables S1-S4 for each of the four target concentrations. BDL values are data where monitors failed to measure above the detection limit in the presence of a known concentration (i.e., false negative responses). The following discussion will focus on the BDL data removed. Regardless of target concentration, the PIDs performed best (i.e., %CT closest to 100%) when no response factor was applied, while the FIDs performed best when a cyclohexane response factor was applied. Performance of the FIDs and SAPs generally improved with increasing target concentration while performance of the PIDs was too variable across target concentrations to identify any trends. As was expected, removing the BDL data had the greatest effect on the 30 ppm target concentration (Table S1) since this condition had the most false negatives (64.1%, Table 2, main text).

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| Table S1. Summary statistics of %CT values at target total VOCs = 30 ppm | | | | | | | | | |  | |  | | |
| Instrument |  | All data (n=105) | | | | | BDL data removed | | | | | | | |
| RF applied | Mean | Median | CV | Min | Max | n | Mean | Median | | CV | | Min | Max |
| PID1 | None | 21.7 | 0.8 | 202.9 | 0.5 | 161.9 | 26 | 85.0 | 91.0 | | 58.6 | | 4.8 | 161.9 |
| PID1 | Cyclo | 40.8 | 0.8 | 206.8 | 0.5 | 310.3 | 26 | 162.2 | 174.5 | | 59.1 | | 8.9 | 310.3 |
| PID1 | Mixed | 34.2 | 0.8 | 215.8 | 0.5 | 310.3 | 26 | 135.6 | 144.3 | | 67.7 | | 8.9 | 310.3 |
| PID2 | None | 41.8 | 1.0 | 148.0 | 0.5 | 225.0 | 43 | 101.0 | 103.4 | | 58.0 | | 3.7 | 225.0 |
| PID2 | Cyclo | 79.3 | 1.0 | 149.8 | 0.5 | 431.3 | 43 | 192.5 | 198.1 | | 58.6 | | 7.0 | 431.3 |
| PID2 | Mixed | 72.4 | 1.0 | 184.4 | 0.5 | 710.6 | 43 | 175.7 | 138.4 | | 91.2 | | 4.7 | 710.6 |
| PID3 | None | 35.3 | 1.0 | 148.9 | 0.6 | 191.0 | 44 | 83.1 | 78.9 | | 62.0 | | 8.9 | 191.0 |
| PID3 | Cyclo | 66.5 | 1.0 | 151.2 | 0.6 | 366.1 | 44 | 157.7 | 147.9 | | 62.9 | | 16.6 | 366.1 |
| PID3 | Mixed | 63.8 | 1.0 | 160.8 | 0.6 | 404.5 | 44 | 151.0 | 115.9 | | 72.5 | | 12.9 | 404.5 |
| PID Group | None | 32.9 | 14.5 | 127.8 | 0.6 | 171.3 | 59 | 87.1 | 83.5 | | 51.4 | | 3.7 | 171.3 |
| PID Group | Cyclo | 62.2 | 26.6 | 129.8 | 0.6 | 328.4 | 59 | 165.5 | 156.8 | | 52.1 | | 7.0 | 328.4 |
| PID Group | Mixed | 56.8 | 16.3 | 135.1 | 0.6 | 328.4 | 59 | 160.0 | 120.9 | | 75.5 | | 4.7 | 492.1 |
| FID1 | None | 229.0 | 231.7 | 35.1 | 1.4 | 471.3 | 101 | 237.9 | 233.9 | | 28.4 | | 80.9 | 471.3 |
| FID1 | Cyclo | 106.2 | 107.7 | 34.9 | 1.4 | 218.2 | 101 | 110.4 | 108.3 | | 28.3 | | 37.8 | 218.2 |
| FID1 | Mixed | 126.3 | 130.3 | 29.9 | 1.4 | 205.0 | 101 | 131.3 | 130.5 | | 22.0 | | 34.3 | 205.0 |
| FID2 | None | 234.9 | 198.6 | 65.8 | 1.4 | 709.5 | 96 | 256.7 | 206.9 | | 55.8 | | 6.8 | 709.5 |
| FID2 | Cyclo | 109.5 | 92.3 | 64.6 | 1.4 | 328.5 | 96 | 119.6 | 96.2 | | 54.7 | | 47.7 | 328.5 |
| FID2 | Mixed | 128.7 | 108.9 | 55.3 | 1.4 | 302.0 | 96 | 140.6 | 113.0 | | 44.3 | | 48.5 | 302.0 |
| FID3 | None | 284.2 | 279.8 | 32.0 | 1.3 | 556.5 | 103 | 289.7 | 281.9 | | 28.5 | | 46.5 | 556.5 |
| FID3 | Cyclo | 131.7 | 129.9 | 31.8 | 1.3 | 257.7 | 103 | 134.2 | 130.5 | | 28.4 | | 21.7 | 257.7 |
| FID3 | Mixed | 154.4 | 152.2 | 25.9 | 1.3 | 267.8 | 103 | 157.4 | 153.6 | | 21.7 | | 19.8 | 267.8 |
| FID Group | None | 249.4 | 238.2 | 34.3 | 28.2 | 456.7 | 105 | 262.5 | 248.7 | | 33.5 | | 55.6 | 527.7 |
| FID Group | Cyclo | 115.8 | 110.6 | 33.8 | 13.8 | 211.5 | 105 | 121.8 | 115.3 | | 33.1 | | 37.8 | 244.3 |
| FID Group | Mixed | 136.5 | 131.7 | 28.3 | 12.6 | 233.9 | 105 | 142.4 | 137.0 | | 24.7 | | 34.3 | 233.9 |
| SAP1 | - | 175.8 | 167.5 | 51.6 | 6.1 | 466.6 | 105 | 175.8 | 167.5 | | 51.6 | | 6.1 | 466.6 |
| SAP2 | - | 147.4 | 119.6 | 53.1 | 33.0 | 391.5 | 105 | 147.4 | 119.6 | | 53.1 | | 33.0 | 391.5 |
| SAP3 | - | 184.0 | 177.8 | 34.9 | 36.1 | 395.3 | 105 | 184.0 | 177.8 | | 34.9 | | 36.1 | 395.3 |
| SAP Group | - | 169.1 | 154.1 | 41.9 | 35.3 | 391.0 | 105 | 169.5 | 154.1 | | 41.3 | | 48.6 | 391.0 |

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| Table S2. Summary statistics of %CT values at target total VOCs = 150 ppm | | | | | | | | | |  | |  | | |
| Instrument |  | All data (n=105) | | | | | BDL data removed | | | | | | | |
| RF applied | Mean | Median | CV | Min | Max | n | Mean | Median | | CV | | Min | Max |
| PID1 | None | 76.3 | 60.9 | 83.6 | 0.2 | 250.7 | 87 | 92.0 | 76.7 | | 63.8 | | 1.7 | 250.7 |
| PID1 | Cyclo | 156.9 | 116.8 | 88.4 | 0.2 | 599.7 | 87 | 189.4 | 147.1 | | 69.0 | | 3.1 | 599.7 |
| PID1 | Mixed | 107.4 | 89.9 | 82.4 | 0.2 | 399.1 | 87 | 129.6 | 119.4 | | 62.5 | | 5.3 | 399.1 |
| PID2 | None | 102.7 | 103.4 | 67.0 | 0.2 | 303.8 | 96 | 112.3 | 111.6 | | 56.9 | | 9.0 | 303.8 |
| PID2 | Cyclo | 217.8 | 206.1 | 73.8 | 0.2 | 726.8 | 96 | 238.2 | 228.9 | | 64.2 | | 16.9 | 726.8 |
| PID2 | Mixed | 170.3 | 152.5 | 79.4 | 0.2 | 920.4 | 96 | 186.3 | 159.7 | | 70.0 | | 27.9 | 920.4 |
| PID3 | None | 96.7 | 101.5 | 66.5 | 0.2 | 307.6 | 97 | 104.6 | 107.9 | | 57.6 | | 1.2 | 307.6 |
| PID3 | Cyclo | 201.5 | 195.9 | 72.7 | 0.2 | 735.8 | 97 | 218.1 | 210.0 | | 64.2 | | 2.2 | 735.8 |
| PID3 | Mixed | 152.0 | 149.4 | 59.5 | 0.2 | 499.0 | 97 | 164.6 | 151.2 | | 50.1 | | 7.7 | 499.0 |
| PID Group | None | 91.9 | 90.7 | 66.2 | 0.2 | 261.1 | 102 | 97.5 | 92.5 | | 59.7 | | 1.2 | 261.1 |
| PID Group | Cyclo | 192.0 | 181.5 | 71.2 | 0.2 | 624.6 | 102 | 203.6 | 183.9 | | 65.2 | | 2.2 | 624.6 |
| PID Group | Mixed | 143.3 | 142.7 | 63.6 | 0.2 | 473.2 | 102 | 157.9 | 153.9 | | 60.2 | | 7.7 | 709.7 |
| FID1 | None | 240.8 | 248.6 | 37.2 | 0.3 | 408.9 | 101 | 250.3 | 253.9 | | 30.8 | | 58.6 | 408.9 |
| FID1 | Cyclo | 108.5 | 111.4 | 36.7 | 0.3 | 183.2 | 101 | 112.8 | 113.8 | | 30.2 | | 27.1 | 183.2 |
| FID1 | Mixed | 126.2 | 129.1 | 27.5 | 0.3 | 198.2 | 101 | 131.2 | 129.6 | | 18.6 | | 48.2 | 198.2 |
| FID2 | None | 247.2 | 208.1 | 56.4 | 0.3 | 542.2 | 99 | 262.1 | 212.5 | | 49.2 | | 98.2 | 542.2 |
| FID2 | Cyclo | 110.8 | 95.3 | 54.2 | 0.3 | 242.9 | 99 | 117.5 | 97.3 | | 46.9 | | 45.0 | 242.9 |
| FID2 | Mixed | 128.4 | 114.0 | 44.4 | 0.3 | 283.8 | 99 | 136.1 | 116.0 | | 35.9 | | 76.4 | 283.8 |
| FID3 | None | 271.7 | 290.6 | 44.4 | 0.3 | 547.2 | 98 | 291.1 | 294.2 | | 34.2 | | 3.2 | 547.2 |
| FID3 | Cyclo | 121.5 | 130.2 | 43.5 | 0.3 | 235.3 | 98 | 130.1 | 131.8 | | 33.2 | | 1.5 | 235.3 |
| FID3 | Mixed | 138.9 | 148.6 | 39.0 | 0.3 | 221.2 | 98 | 148.8 | 150.9 | | 27.4 | | 1.3 | 221.2 |
| FID Group | None | 253.2 | 250.0 | 40.2 | 1.3 | 468.8 | 105 | 259.8 | 252.6 | | 37.2 | | 3.2 | 468.8 |
| FID Group | Cyclo | 113.6 | 113.4 | 39.3 | 0.7 | 206.8 | 105 | 116.6 | 114.6 | | 36.2 | | 1.5 | 206.8 |
| FID Group | Mixed | 131.1 | 130.9 | 29.5 | 0.7 | 200.6 | 105 | 135.3 | 132.5 | | 25.7 | | 1.3 | 200.6 |
| SAP1 | - | 172.7 | 145.8 | 47.9 | 65.5 | 435.2 | 105 | 172.7 | 145.8 | | 47.9 | | 65.5 | 435.2 |
| SAP2 | - | 142.4 | 137.9 | 45.2 | 37.8 | 334.3 | 105 | 142.4 | 137.9 | | 45.2 | | 37.8 | 334.3 |
| SAP3 | - | 135.7 | 128.8 | 33.2 | 50.4 | 268.8 | 105 | 135.7 | 128.8 | | 33.2 | | 50.4 | 268.8 |
| SAP Group | - | 150.3 | 139.2 | 40.3 | 51.7 | 339.0 | 105 | 150.3 | 139.2 | | 40.3 | | 51.7 | 339.0 |

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| Table S3. Summary statistics of %CT values at target total VOCs = 300 ppm | | | | | | | | | |  |  | | | |
| Instrument |  | All data (n=105) | | | | | BDL data removed | | | | | | | |
| RF applied | Mean | Median | CV | Min | Max | n | Mean | Median | | | CV | Min | Max |
| PID1 | None | 82.6 | 73.6 | 70.9 | 0.1 | 230.9 | 92 | 94.3 | 76.8 | | | 56.2 | 1.4 | 230.9 |
| PID1 | Cyclo | 191.6 | 156.0 | 83.1 | 0.1 | 674.1 | 92 | 218.6 | 163.1 | | | 69.3 | 2.7 | 674.1 |
| PID1 | Mixed | 144.9 | 111.1 | 70.1 | 0.1 | 393.3 | 92 | 165.4 | 154.4 | | | 55.4 | 2.0 | 393.3 |
| PID2 | None | 96.4 | 93.5 | 65.8 | 0.1 | 332.0 | 100 | 101.2 | 96.5 | | | 60.4 | 1.6 | 332.0 |
| PID2 | Cyclo | 220.7 | 199.0 | 76.3 | 0.1 | 969.5 | 100 | 231.7 | 205.4 | | | 71.2 | 3.0 | 969.5 |
| PID2 | Mixed | 190.2 | 147.7 | 100.6 | 0.1 | 1533.7 | 100 | 199.7 | 157.6 | | | 95.7 | 5.1 | 1533.7 |
| PID3 | None | 97.5 | 93.6 | 63.1 | 0.1 | 265.4 | 99 | 103.4 | 98.2 | | | 56.4 | 7.8 | 265.4 |
| PID3 | Cyclo | 230.2 | 199.1 | 74.0 | 0.1 | 774.9 | 99 | 244.2 | 208.9 | | | 67.8 | 14.6 | 774.9 |
| PID3 | Mixed | 185.0 | 149.3 | 65.1 | 0.1 | 661.4 | 99 | 196.2 | 181.4 | | | 58.5 | 26.1 | 661.4 |
| PID Group | None | 92.2 | 88.4 | 61.0 | 0.1 | 226.5 | 101 | 97.0 | 91.4 | | | 55.4 | 1.6 | 226.5 |
| PID Group | Cyclo | 214.2 | 188.8 | 70.1 | 0.1 | 625.8 | 101 | 225.2 | 200.5 | | | 64.9 | 3.0 | 625.8 |
| PID Group | Mixed | 173.4 | 146.1 | 71.8 | 0.1 | 843.3 | 101 | 183.3 | 157.3 | | | 65.3 | 5.1 | 843.3 |
| FID1 | None | 246.0 | 239.5 | 30.6 | 0.2 | 416.9 | 103 | 250.8 | 240.3 | | | 26.9 | 86.7 | 416.9 |
| FID1 | Cyclo | 107.0 | 105.4 | 29.4 | 0.2 | 179.3 | 103 | 109.1 | 105.6 | | | 25.7 | 39.7 | 179.3 |
| FID1 | Mixed | 128.1 | 127.2 | 24.8 | 0.2 | 225.9 | 103 | 130.6 | 127.3 | | | 20.3 | 36.0 | 225.9 |
| FID2 | None | 235.6 | 200.1 | 57.3 | 0.2 | 548.5 | 100 | 247.4 | 205.1 | | | 51.5 | 74.6 | 548.5 |
| FID2 | Cyclo | 102.5 | 89.5 | 54.2 | 0.2 | 235.9 | 100 | 107.6 | 90.8 | | | 48.2 | 34.2 | 235.9 |
| FID2 | Mixed | 119.0 | 103.7 | 43.4 | 0.2 | 274.8 | 100 | 124.9 | 105.5 | | | 36.3 | 31.5 | 274.8 |
| FID3 | None | 266.6 | 283.1 | 38.9 | 0.1 | 461.2 | 100 | 280.0 | 287.8 | | | 31.0 | 17.7 | 461.2 |
| FID3 | Cyclo | 114.4 | 121.7 | 37.7 | 0.1 | 188.6 | 100 | 120.1 | 123.7 | | | 29.6 | 8.2 | 188.6 |
| FID3 | Mixed | 132.4 | 136.4 | 34.4 | 0.1 | 265.0 | 100 | 139.0 | 138.2 | | | 25.4 | 7.4 | 265.0 |
| FID Group | None | 249.4 | 243.4 | 37.0 | 6.0 | 411.3 | 105 | 252.8 | 243.4 | | | 34.2 | 17.7 | 411.3 |
| FID Group | Cyclo | 108.0 | 107.0 | 35.6 | 2.8 | 176.9 | 105 | 109.5 | 107.0 | | | 32.7 | 8.2 | 176.9 |
| FID Group | Mixed | 126.5 | 124.1 | 25.9 | 2.6 | 211.1 | 105 | 129.5 | 125.7 | | | 23.5 | 7.4 | 211.1 |
| SAP1 | - | 160.9 | 150.1 | 39.9 | 61.4 | 303.2 | 105 | 160.9 | 150.1 | | | 39.9 | 61.4 | 303.2 |
| SAP2 | - | 134.5 | 122.4 | 42.1 | 36.3 | 268.4 | 105 | 134.5 | 122.4 | | | 42.1 | 36.3 | 268.4 |
| SAP3 | - | 126.4 | 121.5 | 33.7 | 39.2 | 226.8 | 105 | 126.4 | 121.5 | | | 33.7 | 39.2 | 226.8 |
| SAP Group | - | 140.6 | 135.7 | 36.1 | 46.4 | 247.7 | 105 | 140.6 | 135.7 | | | 36.1 | 46.4 | 247.7 |

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| Table S4. Summary statistics of %CT values at target total VOCs = 475 ppm | | | | | | | | | | |  | |  | |
| Instrument |  | All data (n=105) | | | | | BDL data removed | | | | | | | |
| RF applied | Mean | Median | CV | Min | Max | n | Mean | Median | CV | | Min | | Max |
| PID1 | None | 80.4 | 65.2 | 67.1 | 0.1 | 213.2 | 101 | 83.5 | 70.3 | 62.9 | | 7.2 | | 213.2 |
| PID1 | Cyclo | 195.0 | 138.8 | 79.5 | 0.1 | 622.6 | 101 | 202.8 | 149.6 | 75.5 | | 13.7 | | 622.6 |
| PID1 | Mixed | 151.7 | 127.2 | 66.1 | 0.1 | 497.2 | 101 | 157.8 | 129.5 | 61.9 | | 12.2 | | 497.2 |
| PID2 | None | 94.4 | 91.0 | 50.6 | 15.7 | 252.0 | 105 | 94.4 | 91.0 | 50.6 | | 15.7 | | 252.0 |
| PID2 | Cyclo | 229.3 | 217.6 | 60.4 | 30.2 | 735.7 | 105 | 229.3 | 217.6 | 60.4 | | 30.2 | | 735.7 |
| PID2 | Mixed | 199.7 | 170.8 | 78.0 | 52.3 | 1357.2 | 105 | 199.7 | 170.8 | 78.0 | | 52.3 | | 1357.2 |
| PID3 | None | 96.9 | 87.9 | 60.0 | 0.1 | 255.6 | 104 | 97.8 | 88.2 | 58.9 | | 10.3 | | 255.6 |
| PID3 | Cyclo | 241.8 | 210.2 | 71.9 | 0.1 | 746.4 | 104 | 244.2 | 211.0 | 70.9 | | 19.7 | | 746.4 |
| PID3 | Mixed | 189.8 | 153.0 | 52.4 | 0.1 | 583.6 | 104 | 191.6 | 153.1 | 51.2 | | 53.1 | | 583.6 |
| PID Group | None | 90.5 | 80.4 | 54.8 | 8.7 | 213.8 | 105 | 91.1 | 80.9 | 54.1 | | 13.0 | | 213.8 |
| PID Group | Cyclo | 222.0 | 187.0 | 65.3 | 16.6 | 624.3 | 105 | 223.2 | 188.6 | 64.7 | | 24.9 | | 624.3 |
| PID Group | Mixed | 180.4 | 155.6 | 57.7 | 43.2 | 772.0 | 105 | 182.1 | 155.6 | 56.4 | | 43.2 | | 772.0 |
| FID1 | None | 230.5 | 226.6 | 40.6 | 0.1 | 470.0 | 100 | 242.0 | 228.4 | 33.0 | | 12.0 | | 470.0 |
| FID1 | Cyclo | 97.2 | 97.5 | 38.1 | 0.1 | 184.2 | 100 | 102.1 | 98.2 | 30.0 | | 5.6 | | 184.2 |
| FID1 | Mixed | 114.4 | 122.7 | 30.1 | 0.1 | 160.3 | 100 | 120.1 | 123.8 | 19.6 | | 13.9 | | 160.3 |
| FID2 | None | 241.6 | 213.4 | 60.6 | 0.1 | 764.4 | 98 | 258.9 | 215.8 | 52.5 | | 98.6 | | 764.4 |
| FID2 | Cyclo | 101.0 | 91.8 | 55.7 | 0.1 | 299.6 | 98 | 108.2 | 92.8 | 47.2 | | 44.2 | | 299.6 |
| FID2 | Mixed | 120.5 | 109.2 | 45.6 | 0.1 | 279.3 | 98 | 129.1 | 110.2 | 35.6 | | 80.4 | | 279.3 |
| FID3 | None | 272.5 | 280.8 | 41.6 | 0.1 | 536.3 | 100 | 286.1 | 288.6 | 34.2 | | 28.8 | | 536.3 |
| FID3 | Cyclo | 114.0 | 120.7 | 38.8 | 0.1 | 210.2 | 100 | 119.7 | 124.1 | 30.9 | | 13.3 | | 210.2 |
| FID3 | Mixed | 134.4 | 134.8 | 40.5 | 0.1 | 382.6 | 100 | 141.1 | 135.5 | 32.9 | | 12.1 | | 382.6 |
| FID Group | None | 248.2 | 242.5 | 39.3 | 9.7 | 452.1 | 105 | 258.8 | 244.5 | 38.7 | | 28.8 | | 553.7 |
| FID Group | Cyclo | 104.1 | 104.0 | 36.7 | 4.5 | 177.2 | 105 | 108.4 | 105.1 | 35.4 | | 13.3 | | 217.0 |
| FID Group | Mixed | 123.1 | 121.8 | 28.0 | 4.1 | 220.6 | 105 | 129.3 | 124.8 | 30.8 | | 12.1 | | 330.8 |
| SAP1 | - | 145.5 | 146.7 | 30.7 | 54.8 | 210.4 | 105 | 145.5 | 146.7 | 30.7 | | 54.8 | | 210.4 |
| SAP2 | - | 129.0 | 122.8 | 37.8 | 33.9 | 236.4 | 105 | 129.0 | 122.8 | 37.8 | | 33.9 | | 236.4 |
| SAP3 | - | 119.6 | 121.5 | 31.4 | 37.5 | 197.6 | 105 | 119.6 | 121.5 | 31.4 | | 37.5 | | 197.6 |
| SAP Group | - | 131.4 | 124.7 | 30.8 | 42.1 | 214.8 | 105 | 131.4 | 124.7 | 30.8 | | 42.1 | | 214.8 |