

A one-pot parallel reductive amination of aldehydes with heteroaromatic amines

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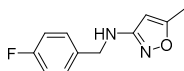
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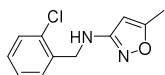
Analytical data for the selected compounds

N-(4-fluorobenzyl)-5-methylisoxazol-3-amine (Entry 1, in Table 1)



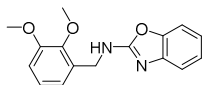
Yield: 143 mg, 69%; yellowish solid, mp 78-80°C. **IR** (KBr): ν (cm⁻¹) 3270, 3110, 3086, 3049, 2928, 2862, 1632, 1573, 1506, 1217, 1155; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 2.20 (s, 3H, CH₃), 4.20 (d, *J* = 6.1 Hz, 2H, CH₂), 5.65 (d, *J* = 0.6 Hz, 1H, Het), 6.53 (t, *J* = 5.2 Hz, 1H, NH), 7.13 (t, *J* = 8.8 Hz, 2H, Ar), 7.35 (m, 2H, Ar); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 12.1, 45.9, 93.7, 114.9 (d, *J* = 21 Hz), 129.4 (d, *J* = 8 Hz), 136.2 (d, *J* = 3 Hz), 161.0 (d, *J* = 245 Hz), 164.4, 167.6; **MS** (APCI) *m/z* [M+H]⁺ calculated for C₁₁H₁₂FN₂O: 207.1; found: 207.0; **Anal. Calcd.**: C, 64.07; H, 5.38; N, 13.58; found C, 63.80; H, 5.10; N, 13.70.

N-(2-chlorobenzyl)-5-methylisoxazol-3-amine (Entry 2, in Table 1)



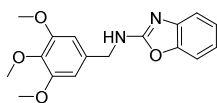
Yield: 51 mg, 23%; yellow solid, mp 105-107°C; **IR** (KBr): ν (cm⁻¹) 3255, 3187, 3072, 2929, 2871, 1627, 1560, 1520, 1356, 1050; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 2.21 (s, 3H, CH₃), 4.30 (d, *J* = 6.1 Hz, 2H, CH₂), 5.69 (s, 1H, Het), 6.59 (t, *J* = 6.1 Hz, 1H, NH), 7.29 (m, 2H, Ar), 7.42 (m, 2H, Ar); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 12.1, 44.3, 93.6, 127.1, 128.6, 129.0, 129.2, 132.3, 136.9, 164.2, 167.8; **MS** (APCI) *m/z* [M+H]⁺ calculated for C₁₁H₁₂ClN₂O: 223.1; found: 222.8; **Anal. Calcd.**: C, 59.33; H, 4.98; N, 12.58; found C, 59.10; H, 5.15; N, 12.45.

N-(2,3-dimethoxybenzyl)benzo[*d*]oxazol-2-amine (Entry 3, in Table 1)



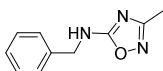
Yield: 241 mg, 84%; yellow solid, mp 79-81°C; **IR** (KBr): ν (cm⁻¹) 3170, 3053, 3000, 2961, 2905, 2832, 1680, 1586, 1480, 1457, 1266, 1243, 1063; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 3.78 (s, 3H, CH₃), 3.80 (s, 3H, CH₃), 4.53 (d, *J* = 5.9 Hz, 2H, CH₂), 6.92 – 6.99 (m, 3H, Ar), 7.02 (t, *J* = 7.9 Hz, 1H, Ar), 7.1 (t, *J* = 7.3 Hz, 1H, Ar), 7.23 (d, *J* = 7.7 Hz, 1H, Ar), 7.33 (d, *J* = 7.8 Hz, 1H, Ar), 8.34 (t, *J* = 5.5 Hz, 1H, NH); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 40.7, 55.8, 60.2, 108.6, 112.0, 115.6, 120.0, 120.2, 123.7, 123.9, 132.3, 143.3, 146.4, 148.2, 152.4, 162.5; **MS** (APCI) *m/z* [M+H]⁺ calculated for C₁₆H₁₇N₂O₃: 285.1; found: 285.0; **Anal. Calcd.**: C, 67.59; H, 5.67; N, 9.85; found C, 67.20; H, 5.90; N, 9.55.

N-(3,4,5-trimethoxybenzyl)benzo[*d*]oxazol-2-amine (Entry 4, in Table 1)



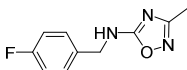
Yield: 100 mg, 32%; whitish solid, mp 112-114°C; **IR** (KBr): ν (cm⁻¹) 3335, 3250, 3178, 3063, 2954, 2937, 1677, 1648, 1586, 1457, 1415, 1247, 1128; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 3.63 (s, 3H, CH₃), 3.75 (s, 6H, 2CH₃), 4.46 (d, J = 6.0 Hz, 2H, CH₂), 6.72 (s, 2H, Ar), 6.98 (t, J = 7.7 Hz, 1H, Ar), 7.10 (t, J = 7.7 Hz, 1H, Ar), 7.24 (d, J = 7.7 Hz, 1H, Ar), 7.34 (d, J = 7.7 Hz, 1H, Ar), 7.41 (t, J = 5.7 Hz, 1H, NH); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 46.1, 55.9, 60.1, 104.7, 108.7, 115.6, 120.3, 123.7, 134.7, 136.6, 143.2, 148.2, 152.9, 162.5; **MS** (APCI) m/z [M+H]⁺ calculated for C₁₇H₁₉N₂O₄: 315.2; found: 315.0; **Anal. Calcd.**: C, 64.96; H, 5.77; N, 8.91; found C, 65.05; H, 5.90; N, 8.80.

N-benzyl-3-methyl-1,2,4-oxadiazol-5-amine (Entry 5, in Table 1)



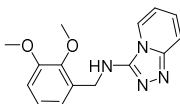
Yield: 113 mg, 60%; yellowish solid, mp 108-110°C; **IR** (KBr): ν (cm⁻¹) 3293, 3178, 3069, 2930, 2882, 1661, 1414, 1355, 1302, 1010; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 2.08 (s, 3H, CH₃), 4.44 (d, J = 6.0 Hz, 2H, CH₂), 7.22 – 7.28 (m, 1H, Ar), 7.29 – 7.38 (m, 4H, Ar), 8.75 (t, J = 5.7 Hz, 1H, NH); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 11.5, 46.4, 127.2, 127.3, 128.5, 138.7, 167.0, 171.4; **MS** (APCI) m/z [M+H]⁺ calculated for C₁₀H₁₂N₃O: 190.1; found: 190.0; **Anal. Calcd.**: C, 63.48; H, 5.86; N, 22.21; found C, 63.20; H, 6.05; N, 22.10.

N-(4-fluorobenzyl)-3-methyl-1,2,4-oxadiazol-5-amine (Entry 6, in Table 1)



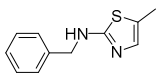
Yield: 89 mg, 43%; yellowish solid, mp 82-84°C; **IR** (KBr): ν (cm⁻¹) 3299, 3201, 3161, 3072, 2964, 2868, 1661, 1507, 1415, 1326, 1210, 1007; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 2.08 (s, 3H, CH₃), 4.40 (d, J = 6.0 Hz, 2H, CH₂), 7.16 (t, J = 8.8 Hz, 2H, Ar), 7.35 (m, 2H, Ar), 8.70 (m, 1H, NH); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 11.5, 45.7, 115.2 (d, J = 21 Hz), 129.3 (d, J = 8 Hz), 134.8 (d, J = 3 Hz), 161.0 (d, J = 244 Hz), 166.9, 171.3; **MS** (APCI) m/z [M+H]⁺ calculated for C₁₀H₁₁FN₃O: 208.1; found: 207.8; **Anal. Calcd.**: C, 57.97; H, 4.86; N, 20.28; found C, 57.80; H, 5.00; N, 20.44.

N-(2,3-dimethoxybenzyl)-[1,2,4]triazolo[4,3-a]pyridin-3-amine (Entry 11, in Table 1)



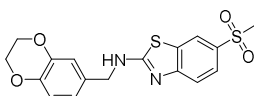
Yield: 57 mg, 20%; white solid, mp 182-184°C; **IR** (KBr): ν (cm⁻¹) 3431, 3181, 3053, 3003, 2954, 2924, 2832, 1635, 1598, 1592, 1486, 1230, 1088, 1003; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 3.79 (s, 3H, OCH₃), 3.81 (s, 3H, OCH₃), 4.60 (d, J = 5.6 Hz, 2H, CH₂), 6.73 (t, J = 6.5 Hz, 1H, NH), 7.02 (m, 5H, Ar), 7.43 (d, J = 9.3 Hz, 1H, Ar), 8.16 (d, J = 7.0 Hz, 1H, Ar); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 41.3, 55.8, 60.2, 111.4, 111.9, 115.5, 120.5, 122.4, 123.8, 125.5, 132.9, 146.2, 146.6, 148.7, 152.4; **MS** (APCI) m/z [M+H]⁺ calculated for C₁₅H₁₇N₄O₂: 285.1; found: 285.1; **Anal. Calcd.**: C, 63.37; H, 5.67; N, 19.71; found C, 63.44; H, 5.83; N, 19.83.

***N*-benzyl-5-methylthiazol-2-amine (Entry 13, in Table 1)**



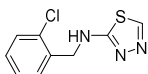
Yield: 161 mg, 79%; yellow solid, mp 98-100°C; **IR** (KBr): ν (cm⁻¹) 3165, 3063, 2967, 2915, 2855, 1569, 1536, 1510, 1467, 1283, 1145; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 2.18 (s, 3H, CH₃), 4.38 (d, *J* = 4.8 Hz, 2H, CH₂), 6.65 (s, 1H, CH), 7.23 (m, 1H, Ar), 7.31 (m, 4H, Ar), 7.81 (m, 1H, NH); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 11.7, 47.5, 119.5, 126.9, 127.4, 128.3, 135.5, 139.6, 167.6; **MS** (APCI) *m/z* [M+H]⁺ calculated for C₁₁H₁₃N₂S: 205.1; found: 205.0; **Anal. Calcd.**: C, 64.67; H, 5.92; N, 13.71; found C, 64.55; H, 6.06; N, 13.85.

***N*-((2,3-dihydrobenzo[*b*][1,4]dioxin-6-yl)methyl)-6-(methylsulfonyl)benzo[*d*]thiazol-2-amine (Entry 15, in Table 1)**



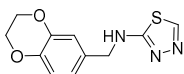
Yield: 177 mg, 47%; white solid, mp 282-284°C; **IR** (KBr): ν (cm⁻¹) 3217, 3194, 3082, 3030, 2941, 2895, 1612, 1572, 1510, 1303, 1280, 1141; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 3.17 (s, 3H, CH₃), 4.20 (s, 4H, 2CH₂O), 4.50 (d, *J* = 4.6 Hz, 2H, CH₂), 6.82 (s, 2H, Ar), 6.87 (s, 1H, Ar), 7.53 (d, *J* = 8.6 Hz, 1H, Ar), 7.72 (d, *J* = 8.6 Hz, 1H, Ar), 8.28 (s, 1H, Ar), 8.90 (m, 1H, NH); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 44.3, 46.9, 64.1, 64.2, 116.3, 117.1, 117.8, 120.5, 120.9, 125.0, 131.1, 131.4, 132.6, 142.7, 143.3, 156.5, 169.6; **MS** (APCI) *m/z* [M+H]⁺ calculated for C₁₇H₁₇N₂O₄S₂: 377.1; found: 377.0; **Anal. Calcd.**: C, 54.24; H, 4.28; N, 7.44; found C, 54.10; H, 4.40; N, 7.60.

***N*-(2-chlorobenzyl)-1,3,4-thiadiazol-2-amine (Entry 17, in Table 1)**



Yield: 153 mg, 68%; yellow solid, Mp 87-89°C; **IR** (KBr): ν (cm⁻¹) 3188, 3065, 2987, 2790, 1556, 1497, 1437, 1040; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 4.61 (m, 2H, CH₂), 7.30 (m, 2H, Ar), 7.44 (m, 2H, Ar), 8.32 (br. s, 1H, NH), 8.66 (s, 1H, Het); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 46.1, 127.3, 129.0, 129.3, 129.4, 132.6, 135.8, 142.9, 168.2; **MS** (APCI) *m/z* [M+H]⁺ calculated for C₉H₉ClN₃S: 226.0; found: 225.8; **Anal. Calcd.**: C, 47.90; H, 3.57; N, 18.62; found C, 47.83; H, 3.65; N, 18.70.

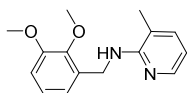
***N*-((2,3-dihydrobenzo[*b*][1,4]dioxin-6-yl)methyl)-1,3,4-thiadiazol-2-amine (Entry 18, in Table 1)**



Yield: 114 mg, 46%; white solid, mp 117-119°C; **IR** (KBr): ν (cm⁻¹) 3204, 3086, 2997, 2947, 2924, 2882, 1590, 1566, 1506, 1441, 1319, 1283, 1260, 1072, 1050; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 4.20 (s, 4H, 2CH₂O), 4.35 (d, *J* = 5.6 Hz, 2H, CH₂), 6.80 (s, 2H, Ar), 6.84 (s, 1H, Ar), 8.19 (t, *J* = 4.8 Hz, 1H, NH), 8.61 (s, 1H, Het); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 47.9, 64.1, 64.2, 116.4, 116.9, 120.6, 131.7, 142.5, 142.6, 143.2, 168.5; **MS** (APCI) *m/z*

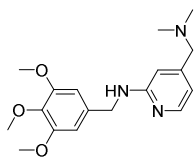
[M+H]⁺ calculated for C₁₁H₁₂N₃O₂S: 250.1; found: 249.8; **Anal. Calcd.:** C, 53.00; H, 4.45; N, 16.86; found C, 52.85; H, 4.65; N, 16.74.

***N*-(2,3-dimethoxybenzyl)-3-methylpyridin-2-amine (Entry 19, in Table 1)**



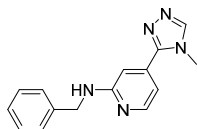
Yield: 83 mg, 32%; white solid, mp 84-86°C; **IR** (KBr): ν (cm⁻¹) 3417, 3008, 2963, 2936, 2899, 2836, 1598, 1507, 1480, 1275, 1060; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 2.11 (s, 3H, CH₃), 3.79 (s, 6H, 2OCH₃), 4.60 (d, *J* = 5.8 Hz, 2H, CH₂), 6.24 (t, *J* = 5.6 Hz, 1H, NH), 6.43 (m, 1H, Py), 6.81 (d, *J* = 7.4 Hz, 1H, Ar), 6.88 (d, *J* = 7.3 Hz, 1H, Ar), 6.94 (t, *J* = 7.9 Hz, 1H, Ar), 7.22 (d, *J* = 6.4 Hz, Py), 7.80 (d, *J* = 3.8 Hz, 1H, Py); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 17.0, 38.9, 55.7, 59.9, 111.1, 111.8, 116.6, 119.7, 123.6, 134.6, 136.4, 144.9, 146.3, 152.2, 156.8; **MS** (APCI) *m/z* [M+H]⁺ calculated for C₁₅H₁₉N₂O₂: 259.1; found: 259.0; **Anal. Calcd.:** C, 69.74; H, 7.02; N, 10.84; found C, 69.53; H, 7.13; N, 10.67.

4-((dimethylamino)methyl)-*N*-(3,4,5-trimethoxybenzyl)pyridin-2-amine (Entry 21, in Table 1)



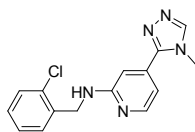
Yield: 315 mg, 95%; yellowish solid, mp 102-104°C; **IR** (KBr): ν (cm⁻¹) 3411, 3217, 3076, 2997, 2963, 2944, 2855, 2813, 2776, 1599, 1576, 1503, 1454, 1250, 1158; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 2.11 (s, 6H, 2NCH₃), 3.63 (s, 3H, CH₃), 3.073 (s, 6H, 2CH₃), 4.42 (d, *J* = 5.5 Hz, 2H, CH₂), 6.43 (d, *J* = 5.0 Hz, 1H, Py), 6.50 (s, 1H, Py), 6.67 (s, 2H, Ar), 6.90 (t, *J* = 4.8 Hz, 1H, NH), 7.90 (d, *J* = 5.2 Hz, 1H, Py); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 44.7, 45.1, 55.8, 60.0, 62.7, 104.6, 107.7, 112.4, 136.2, 136.4, 147.4, 148.4, 152.8, 159.1; **MS** (APCI) *m/z* [M+H]⁺ calculated for C₁₈H₂₆N₃O₃: 332.2; found: 332.0; **Anal. Calcd.:** C, 65.23; H, 7.60; N, 12.68; found C, 65.11; H, 7.75; N, 12.60.

***N*-benzyl-4-(4-methyl-4*H*-1,2,4-triazol-3-yl)pyridin-2-amine (Entry 23, in Table 1)**



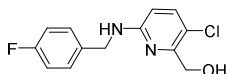
Yield: 111 mg, 42%; yellowish solid, mp 146-148°C; **IR** (KBr): ν (cm⁻¹) 3273, 3181, 3131, 3105, 3065, 3036, 2977, 2918, 1615, 1549, 1497, 1194; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 3.72 (s, 3H, NCH₃), 4.53 (d, *J* = 5.8 Hz, 2H, CH₂), 6.84 (d, *J* = 5.2 Hz, 1H, Py), 6.88 (s, 1H, Py), 7.22 (t, *J* = 7.1 Hz, 1H, Ar), 7.31 (m, 2H, Ar), 7.35 (m, 3H, NH + Ar), 8.11 (d, *J* = 5.2 Hz, 1H, Py), 8.58 (s, 1H, Het); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 32.2, 44.3, 106.9, 110.3, 126.7, 127.3, 128.3, 135.0, 140.4, 146.7, 148.5, 151.9, 159.1; **MS** (APCI) *m/z* [M+H]⁺ calculated for C₁₅H₁₆N₅: 266.1; found: 266.1; **Anal. Calcd.:** C, 67.90; H, 5.70; N, 26.40; found C, 67.75; H, 5.85; N, 26.30.

***N*-(2-chlorobenzyl)-4-(4-methyl-4*H*-1,2,4-triazol-3-yl)pyridin-2-amine (Entry 24, in Table 1)**



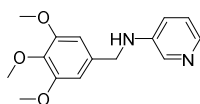
Yield: 75 mg, 25%; yellowish solid, mp 186-188°C; **IR** (KBr): ν (cm⁻¹) 3293, 3250, 3095, 3046, 2941, 2915, 1618, 1553, 1500, 1286, 1197, 1040; **¹H NMR** (500 MHz, DMSO-*d*₆): δ (ppm) 3.75 (s, 3H, NCH₃), 4.60 (d, *J* = 5.8 Hz, 2H, CH₂), 6.87 (d, *J* = 5.2 Hz, 1H, Py), 6.96 (s, 1H, Py), 7.28 (m, 2H, Ar), 7.39 (m, 2H, Ar), 7.44 (d, *J* = 7.7 Hz, 1H, Py), 8.09 (d, *J* = 5.2 Hz, 1H, NH), 8.59 (s, 1H, Het); **¹³C NMR** (125 MHz, DMSO-*d*₆): δ (ppm) 32.3, 42.1, 107.2, 110.6, 127.2, 128.5, 128.8, 129.2, 132.3, 135.1, 137.4, 146.8, 148.4, 151.8, 158.8; **MS** (APCI) *m/z* [M+H]⁺ calculated for C₁₅H₁₅ClN₅: 300.1; found: 300.0; **Anal. Calcd.**: C, 60.10; H, 4.71; N, 23.36; found C, 60.05; H, 4.85; N, 23.23.

(3-chloro-6-(4-fluorobenzylamino)pyridin-2-yl)methanol (Entry 27, in Table 1)



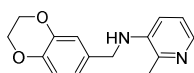
Yield: 198 mg, 74%; yellow solid, mp 58-60°C; **IR** (KBr): ν (cm⁻¹) 3332, 3046, 2918, 2866, 1595, 1507, 1408, 1220, 1076; **¹H NMR** (500 MHz, DMSO-*d*₆): δ (ppm) 4.43 (s, 2H, CH₂), 4.48 (d, *J* = 5.6, 2H, CH₂), 4.77 (br. s, 1H, OH), 6.44 (d, *J* = 8.6 Hz, 1H, Ar), 7.12 (t, *J* = 8.8 Hz, 2H, Ar), 7.30 (t, *J* = 5.3 Hz, 1H, NH), 7.38 (m, 3H, Ar); **¹³C NMR** (125 MHz, DMSO-*d*₆): δ (ppm) 43.7, 61.7, 108.3, 115.0 (d, *J* = 20 Hz), 115.2, 129.3 (d, *J* = 9 Hz), 136.5 (d, *J* = 2.5 Hz), 137.9, 138.1, 153.4, 156.6, 161.2 (d, *J* = 243 Hz); **MS** (APCI) *m/z* [M+H]⁺ calculated for C₁₃H₁₃ClFN₂O: 267.1; found: 267.2; **Anal. Calcd.**: C, 58.55; H, 4.54; N, 10.50; found C, 58.45; H, 4.66; N, 10.34.

***N*-(3,4,5-trimethoxybenzyl)pyridin-3-amine (Entry 30, in Table 1)**



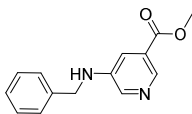
Yield: 230 mg, 84%; brownish solid, mp 91-93°C; **IR** (KBr): ν (cm⁻¹) 3257, 3112, 3056, 3000, 2931, 2832, 2826, 1595, 1540, 1507, 1467, 1418, 1422, 1337, 1233, 1130, 1010; **¹H NMR** (500 MHz, DMSO-*d*₆): δ (ppm) 3.65 (s, 3H, CH₃), 3.74 (s, 6H, 2CH₃), 4.23 (d, *J* = 5.5 Hz, 2H, CH₂), 6.46 (t, *J* = 5.2 Hz, 1H, NH), 6.72 (s, 2H, Ar), 6.93 (m, 1H, Py), 7.04 (m, 1H, Py), 7.78 (s, 1H, Py), 8.06 (s, 1H, Py); **¹³C NMR** (125 MHz, DMSO-*d*₆): δ (ppm) 46.6, 55.8, 60.0, 104.6, 117.9, 123.6, 135.4, 135.7, 136.4, 137.2, 144.8, 153.0; **MS** (APCI) *m/z* [M+H]⁺ calculated for C₁₅H₁₉N₂O₃: 275.1; found: 275.0; **Anal. Calcd.**: C, 65.68; H, 6.61; N, 10.21; found C, 65.55; H, 6.75; N, 10.14.

***N*-((2,3-dihydrobenzo[*b*][1,4]dioxin-6-yl)methyl)-2-methylpyridin-3-amine (Entry 31, in Table 1)**



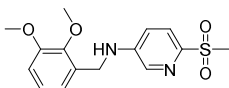
Yield: 92 mg, 36%; yellowish solid, mp 103-105°C; **IR** (KBr): ν (cm⁻¹) 3434, 3030, 2993, 2938, 2871, 1579, 1506, 1467, 1302, 1277, 1060; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 2.35 (s, 3H, CH₃), 4.18 (s, 4H, 2CH₂), 4.22 (d, *J* = 5.9 Hz, 2H, CH₂), 5.85 (d, *J* = 5.7 Hz, 1H, NH), 6.64 (d, *J* = 8.1 Hz, 1H, Py), 6.80 (m, 3H, Ar), 6.88 (m, 1H, Py), 7.63 (d, *J* = 4.6 Hz, 1H, Py); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 21.0, 45.3, 64.0, 64.1, 115.3, 115.6, 116.9, 119.8, 121.7, 132.8, 135.6, 142.0, 142.2, 143.3, 143.7; **MS** (APCI) *m/z* [M+H]⁺ calculated for C₁₅H₁₇N₂O₂: 257.1; found: 257.0; **Anal. Calcd.**: C, 70.29; H, 6.29; N, 10.93; found C, 70.12; H, 6.45; N, 10.86.

Methyl 5-(benzylamino)nicotinate (Entry 33, in Table 1)



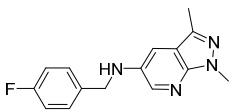
Yield: 177 mg, 73%; whitish solid, mp 128-130°C; **IR** (KBr): ν (cm⁻¹) 3253, 3049, 3007, 2951, 2860, 1717, 1597, 1418, 1315, 1224, 1099; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 3.80 (s, 3H, CH₃), 4.35 (d, *J* = 5.2 Hz, 2H, CH₂), 6.89 (t, *J* = 5.2 Hz, 1H, NH), 7.23 (t, *J* = 7.1 Hz, 1H, Ar), 7.26 – 7.40 (m, 5H, 4Ar + 1Py), 8.22 (s, 1H, Py), 8.30 (s, 1H, Py); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 46.0, 52.2, 117.6, 125.6, 127.0, 127.3, 128.5, 137.3, 139.1, 139.3, 144.6, 165.9; **MS** (APCI) *m/z* [M+H]⁺ calculated for C₁₄H₁₅N₂O₂: 242.1; found: 243.0; **Anal. Calcd.**: C, 69.41; H, 5.82; N, 11.56; found C, 69.33; H, 5.96; N, 11.50.

N-(2,3-dimethoxybenzyl)-6-(methylsulfonyl)pyridin-3-amine (Entry 35, in Table 1)



Yield: 161 mg, 50%; white solid, mp 142-144°C; **IR** (KBr): ν (cm⁻¹) 3243, 3078, 3003, 2934, 2835, 1579, 1477, 1302, 1161, 1125; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 3.09 (s, 3H, SO₂CH₃), 3.78 (s, 3H, OCH₃), 3.80 (s, 3H, OCH₃), 4.36 (d, *J* = 5.6 Hz, 2H, CH₂), 6.86 (d, *J* = 6.9 Hz, 1H, Py), 7.01 (m, 3H, Ar), 7.35 (t, *J* = 5.4, 1H, NH), 7.69 (d, *J* = 8.6 Hz, Py), 8.09 (d, *J* = 2.2 Hz, 1H, Py); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 40.7, 40.9, 55.8, 60.4, 112.2, 116.5, 120.2, 122.6, 124.1, 131.5, 135.2, 143.6, 146.7, 147.6, 152.5; **MS** (APCI) *m/z* [M+H]⁺ calculated for C₁₅H₁₉N₂O₄S: 323.1; found: 323.1; **Anal. Calcd.**: C, 55.89; H, 5.63; N, 8.69; found C, 55.80; H, 5.70; N, 8.59.

N-(4-fluorobenzyl)-1,3-dimethyl-1H-pyrazolo[3,4-b]pyridin-5-amine (Entry 40, in Table 1)



Yield: 59 mg, 22%; white solid, mp 96-98°C; **IR** (KBr): ν (cm⁻¹) 3290, 3046, 2928, 2839, 1602, 1507, 1477, 1224, 1151; **¹H NMR** (500 MHz, DMSO-d₆): δ (ppm) 2.64 (s, 3H, CH₃), 3.86 (3H, NCH₃), 4.29 (d, *J* = 5.9 Hz, 2H, CH₂), 6.25 (t, *J* = 5.8 Hz, 1H, NH), 7.04 (d, *J* = 2.2 Hz, 1H, Het), 7.15 (t, *J* = 8.9 Hz, 2H, Ar), 7.44 (m, 2H, Ar), 8.16 (d, *J* = 2.4 Hz, 1H, Het); **¹³C NMR** (125 MHz, DMSO-d₆): δ (ppm) 12.1, 33.2, 46.5, 106.3, 114.4, 115.1 (d, *J* = 21 Hz), 129.4 (d, *J* = 7.5 Hz), 135.9 (d, *J* = 3.8 Hz), 137.2, 139.7, 140.3, 144.3, 145.8, 161.3 (d, *J* = 239 Hz); **MS** (APCI) *m/z* [M+H]⁺ calculated for C₁₅H₁₆FN₄: 271.1; found: 271.0; **Anal. Calcd.**: C, 66.65; H, 5.59; N, 20.73; found C, 66.60; H, 5.73; N, 20.55.

LC-MS spectra of the crude mixtures.

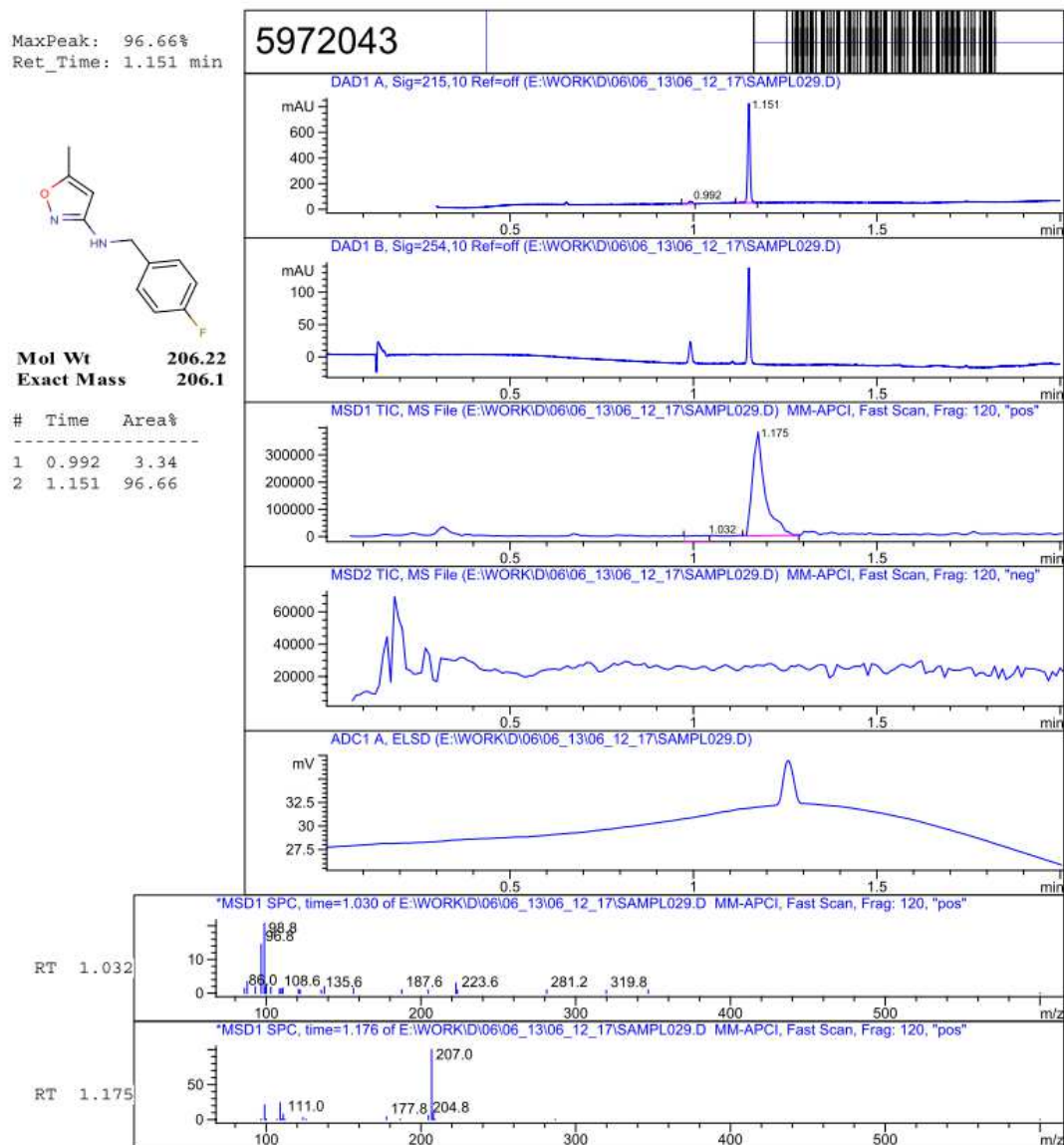
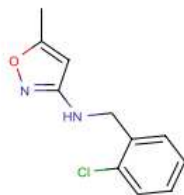


Figure S1. Entry 1, in Table 1: peak was assigned to the product (rt 1.15 min).

MaxPeak: 48.60%
Ret_Time: 1.232 min



Mol Wt 222.67
Exact Mass 222.07

#	Time	Area%
1	0.296	11.94
2	0.611	2.69
3	0.985	4.74
4	1.024	1.17
5	1.159	25.85
6	1.232	48.60
7	1.373	1.67
8	1.473	1.50
9	1.684	1.84

5972046

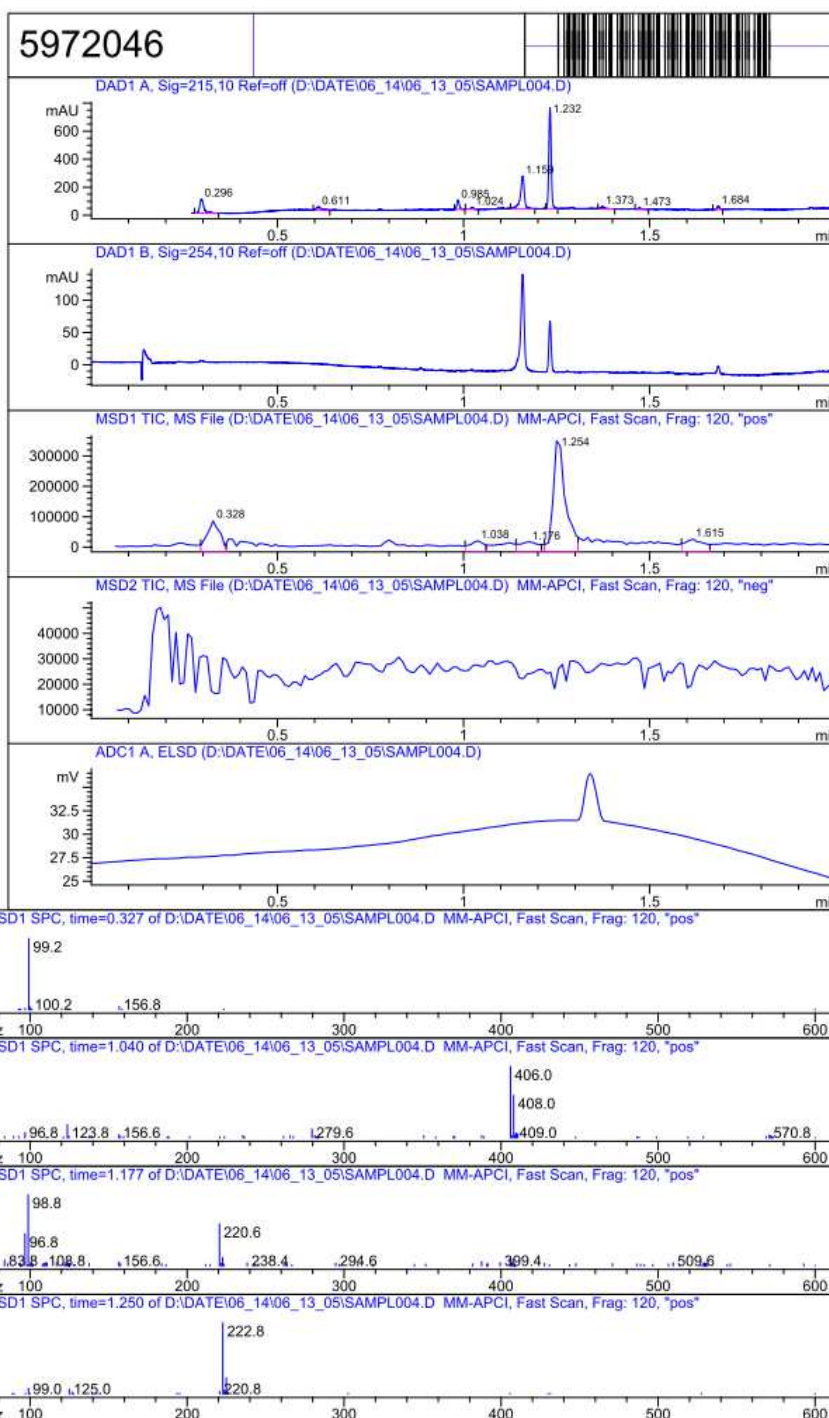
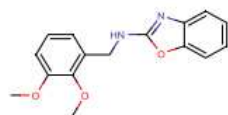


Figure S2. Entry 2, in Table 1: peaks were assigned to the starting amine (rt 0.3 min), the aldehyde (rt 0.99 min), the tertiary amine (rt 1.02 min), the intermediate imine (rt 1.16 min), and the product (rt 1.23 min).

MaxPeak: 91.66%
Ret_Time: 1.294 min



Mol Wt 284.31
Exact Mass 284.13

#	Time	Area%
1	0.643	1.92
2	0.743	1.43
3	1.120	5.00
4	1.294	91.66

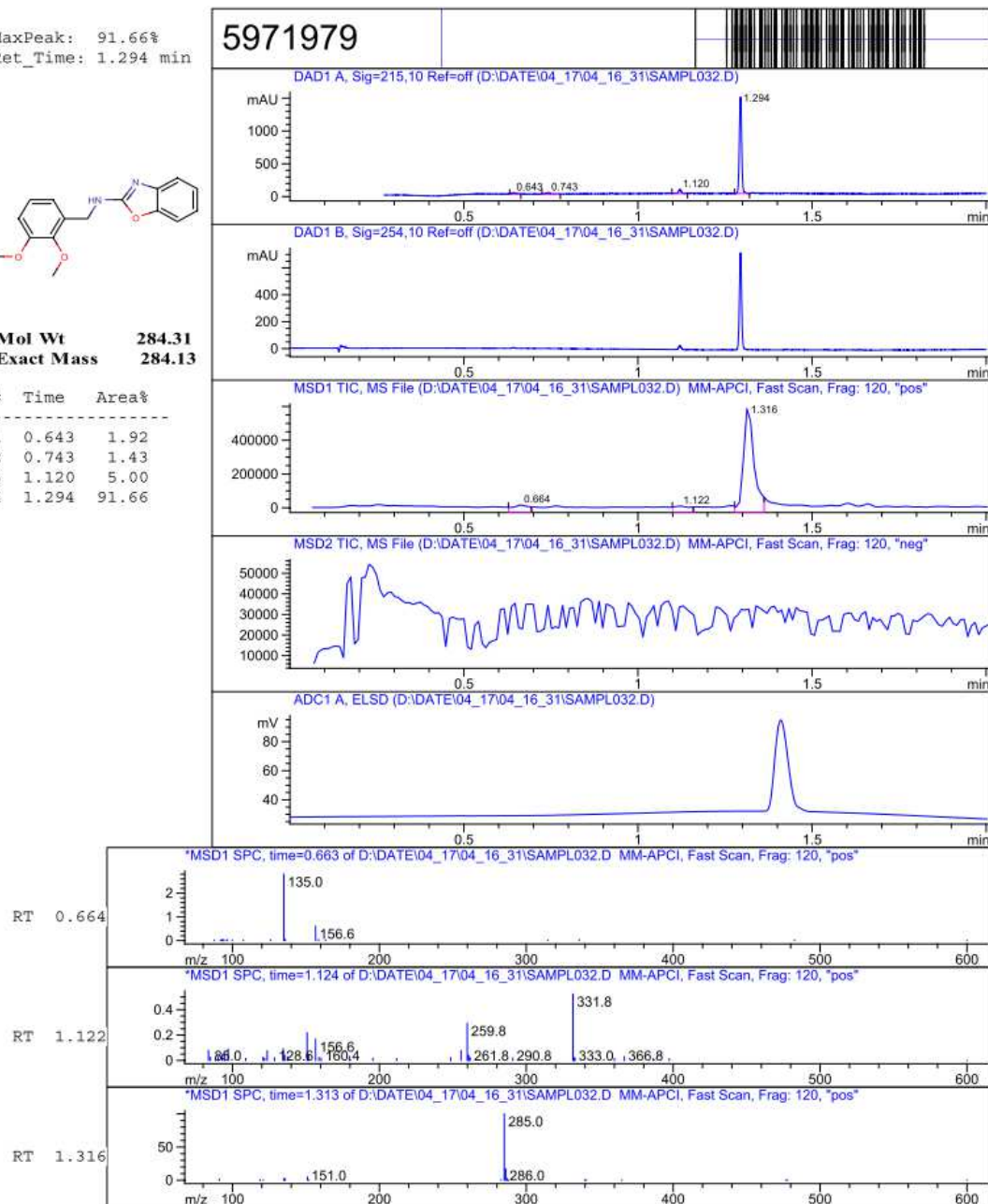
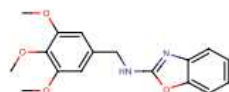


Figure S3. Entry 3, in Table 1: peaks were assigned to the starting amine (rt 0.64 min) and the product (rt 1.29 min).

MaxPeak: 82.85%
Ret_Time: 1.238 min



Mol Wt 314.34
Exact Mass 314.14

#	Time	Area%
1	0.650	3.24
2	0.730	3.33
3	1.082	8.71
4	1.182	1.87
5	1.238	82.85

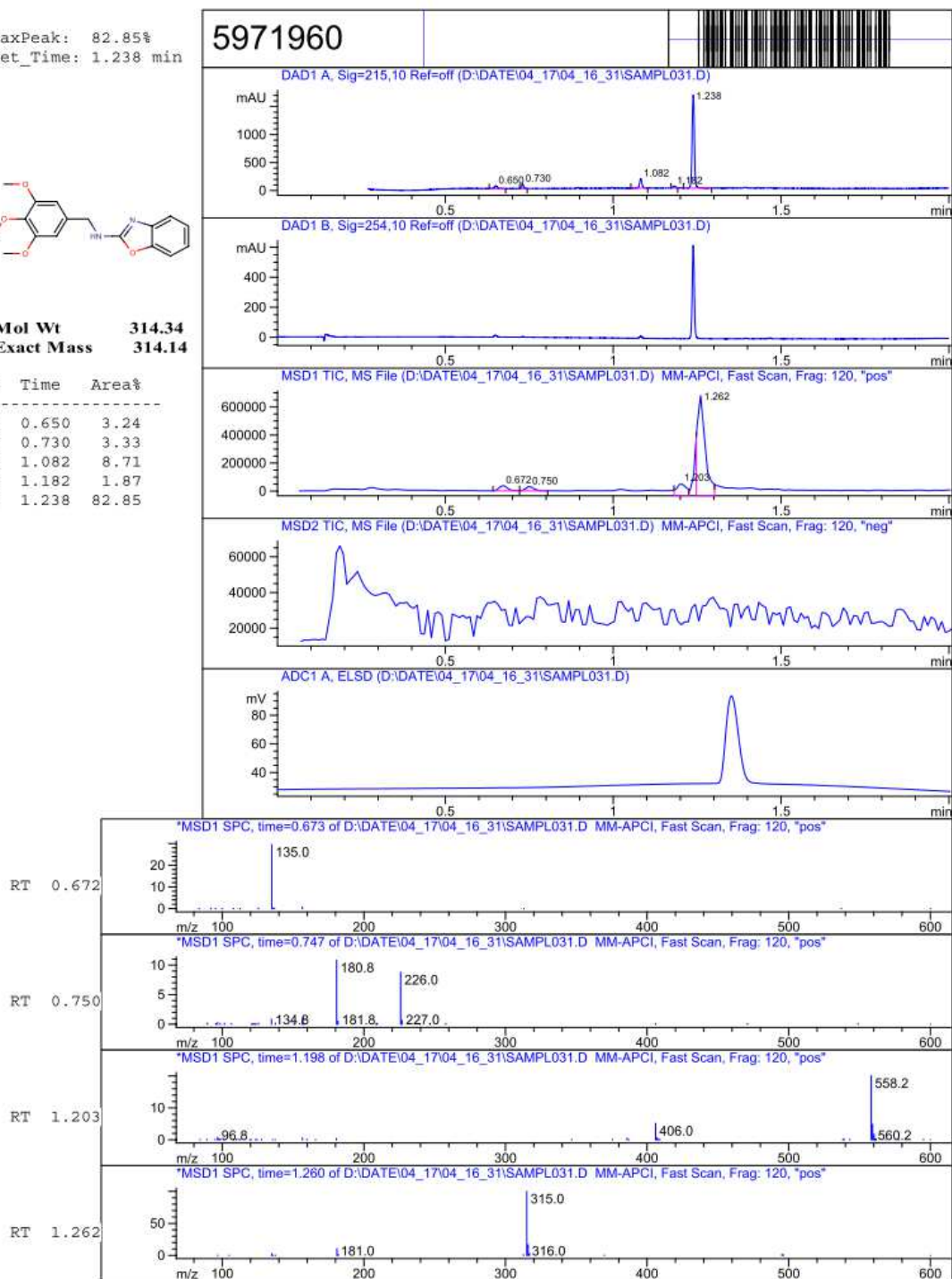


Figure S4. Entry 4, in Table 1: peaks were assigned to the starting amine (rt 0.65 min), the aldehyde (rt 1.08 min) and the product (rt 1.23 min).

MaxPeak: 100.00%
Ret_Time: 1.024 min



Mol Wt 189.21
Exact Mass 189.1

#	Time	Area%
1	1.024	100.00

RT 1.045

6151399

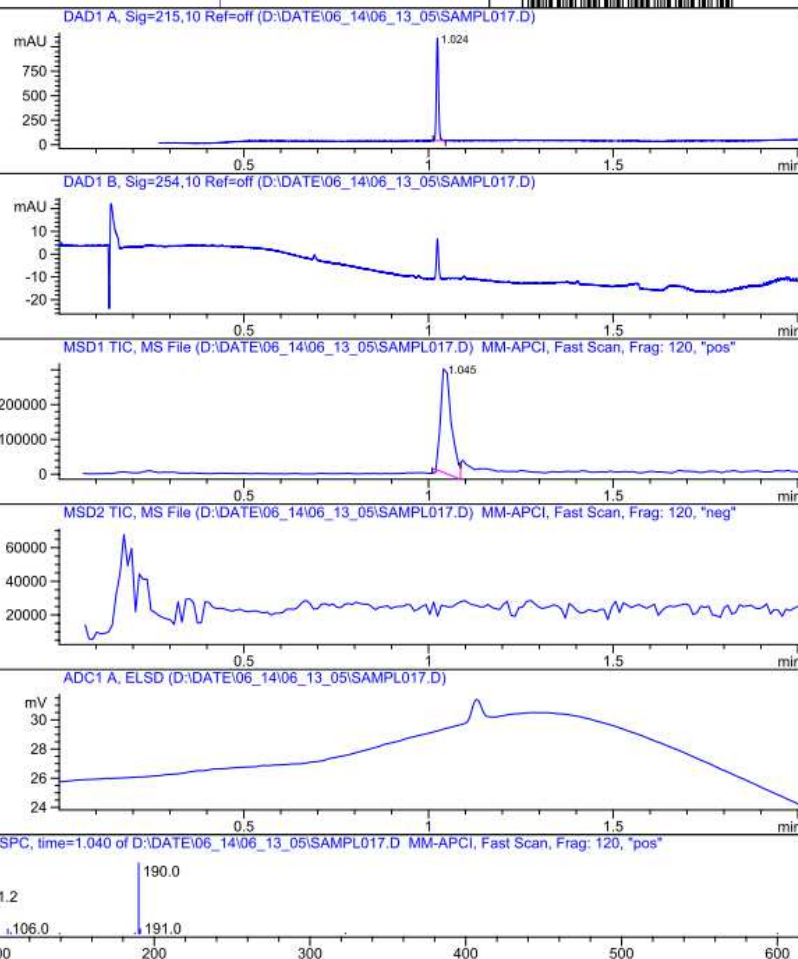
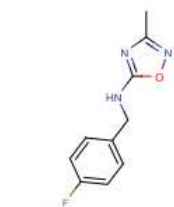


Figure S5. Entry 5, in Table 1: peak was assigned to the product (rt 1.02 min).

MaxPeak: 100.00%
Ret_Time: 1.058 min



Mol Wt 207.2
Exact Mass 207.09

#	Time	Area%
1	1.058	100.00

RT 1.080

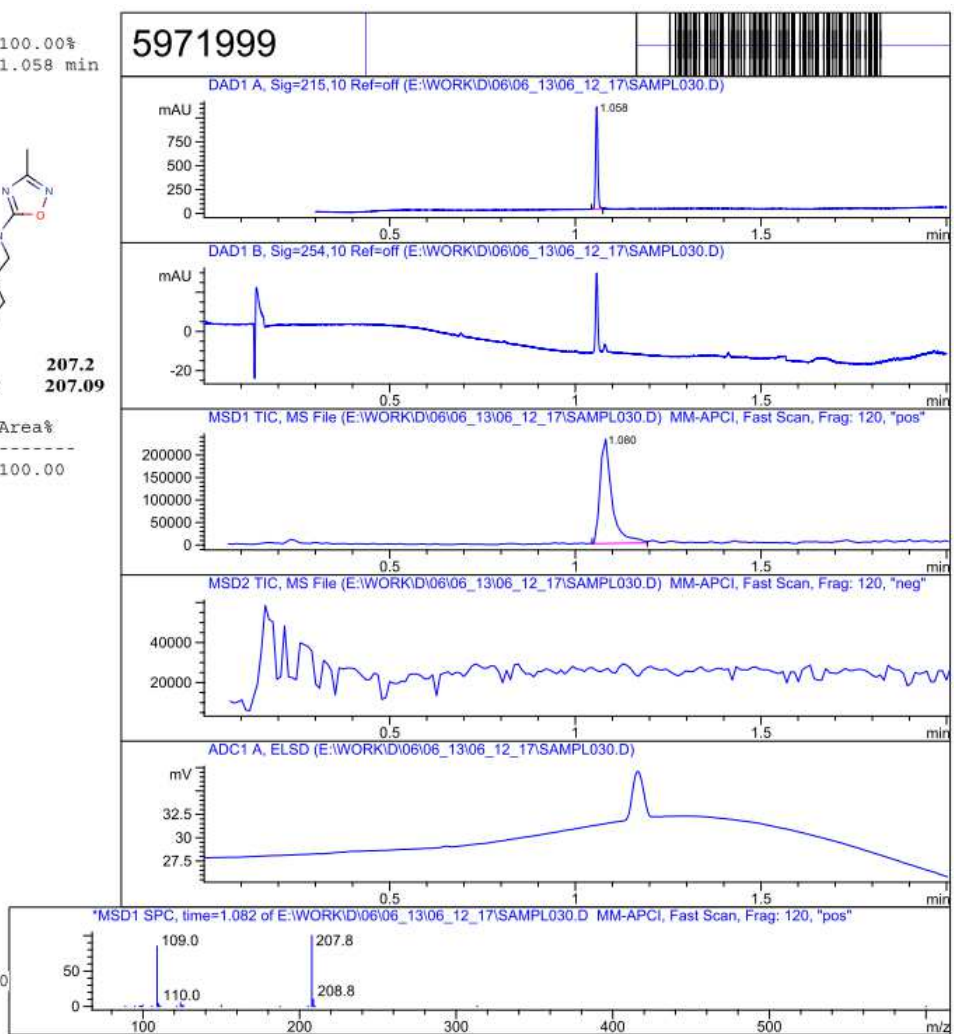
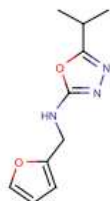


Figure S6. Entry 6, in Table 1: peak was assigned to the product (rt 1.06 min).

MaxPeak: 97.15%
Ret_Time: 0.996 min

6343155



Mol Wt 207.23
Exact Mass 207.11

#	Time	Area%
1	0.640	2.85
2	0.996	97.15

RT 0.663

RT 1.020

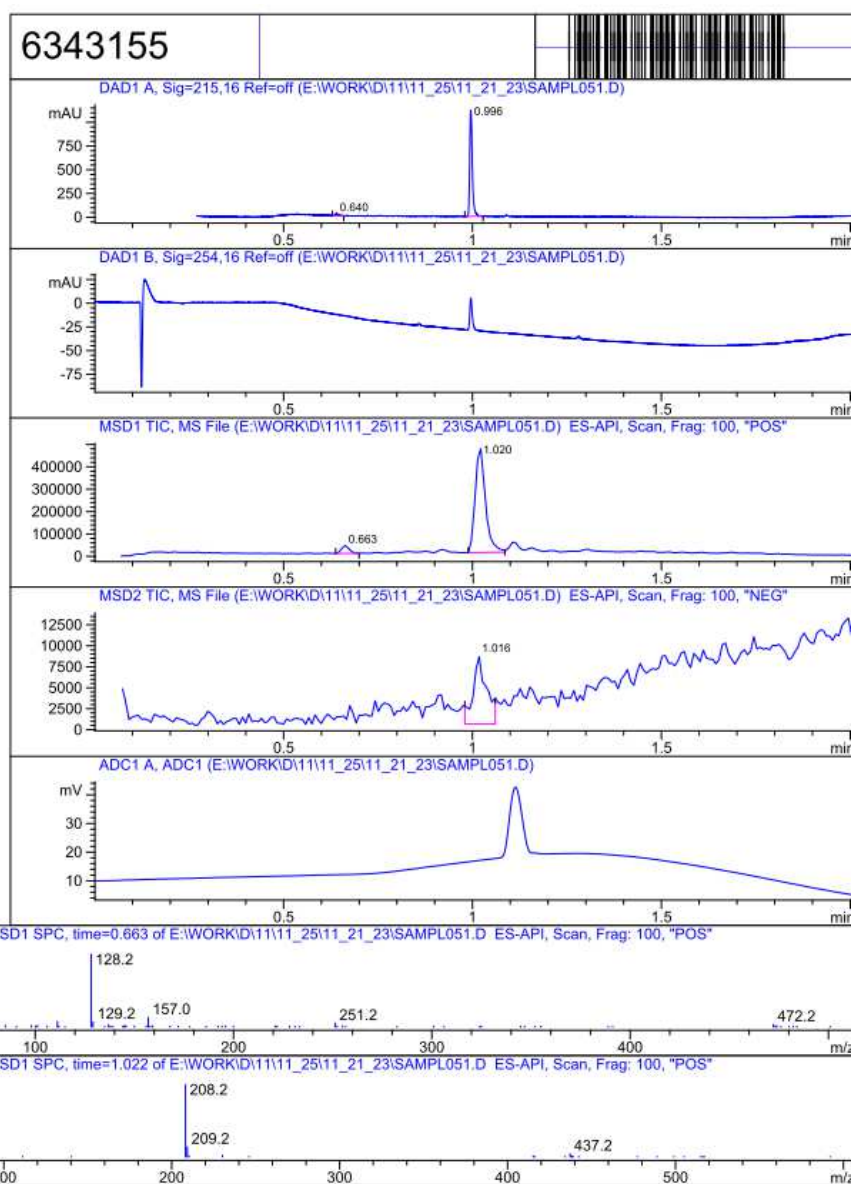
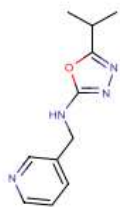


Figure S7. Entry 7, in Table 1: peaks were assigned to the starting amine (rt 0.66 min) and the product (rt 1.00 min).

MaxPeak: 100.00%
Ret_Time: 0.646 min



Mol Wt 218.26
Exact Mass 218.13

#	Time	Area%
1	0.646	100.00

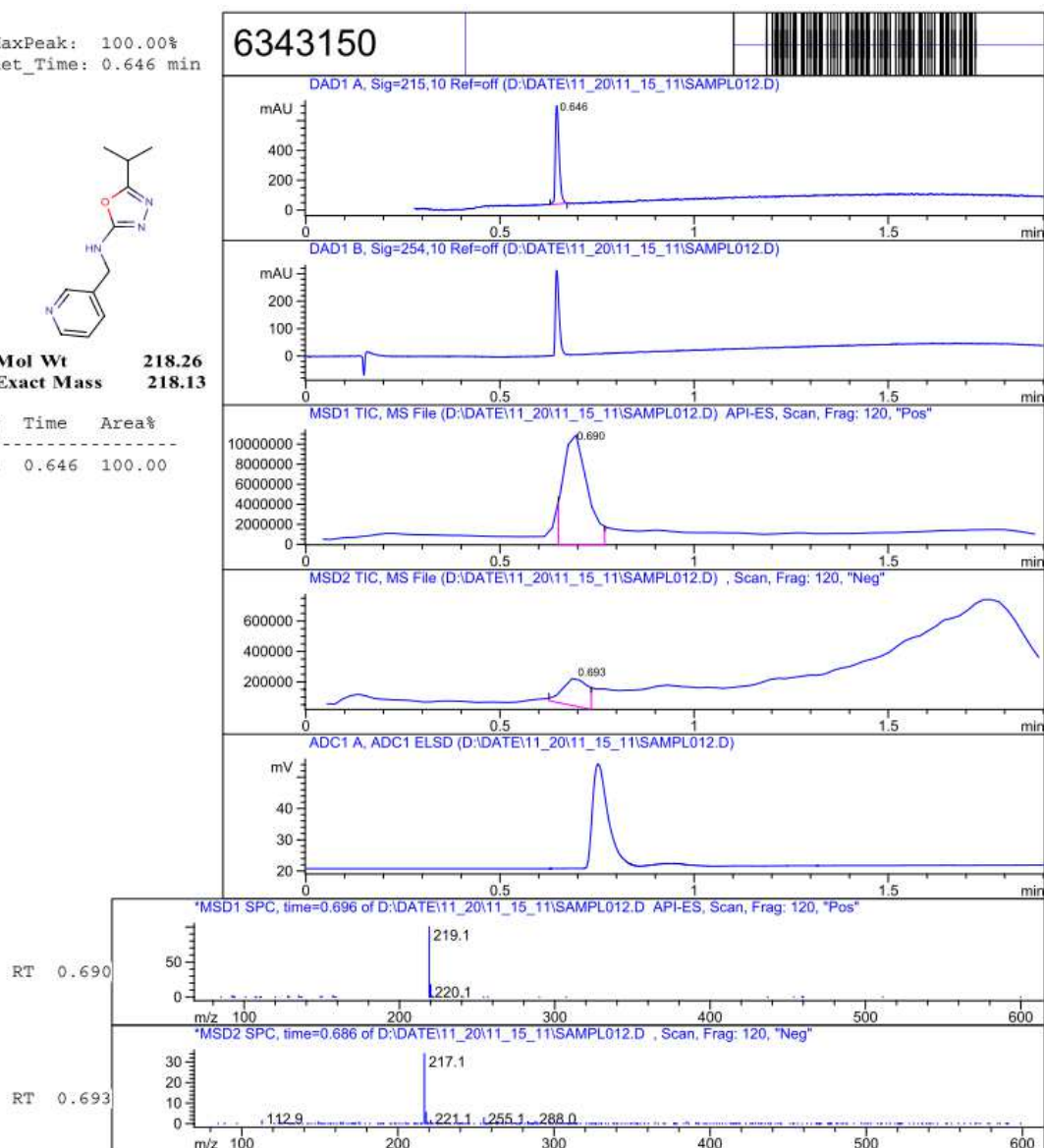
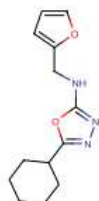


Figure S8. Entry 8, in Table 1: peak was assigned to the product (rt 0.65 min).

MaxPeak: 57.67%
Ret_Time: 1.173 min



Mol Wt 247.29
Exact Mass 247.15

#	Time	Area%
1	0.907	42.33
2	1.173	57.67

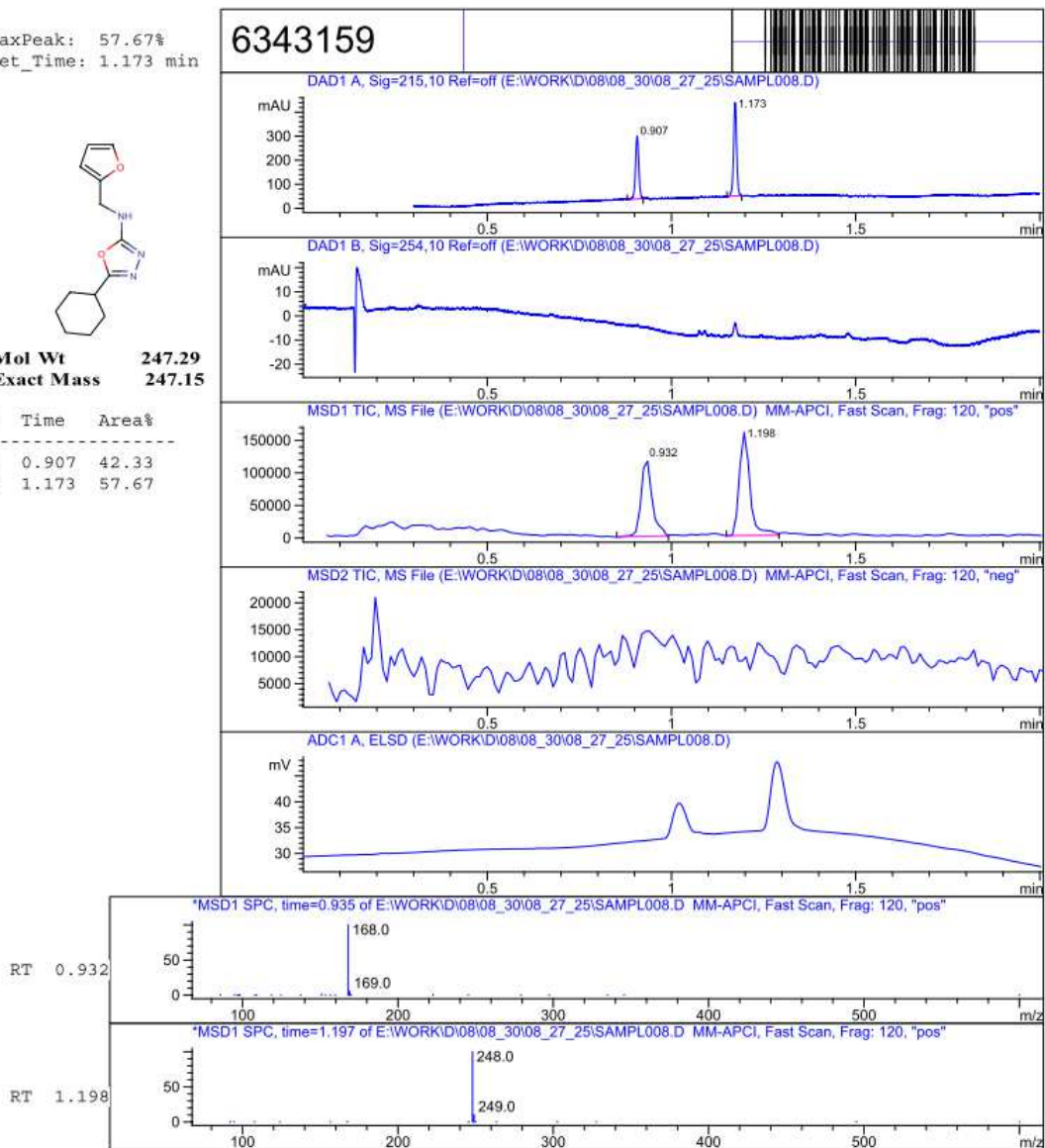
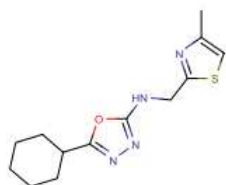


Figure S9. Entry 9, in Table 1: peaks were assigned to the starting amine (rt 0.91 min) and the product (rt 1.17 min).

MaxPeak: 91.82%
Ret_Time: 1.116 min

6348307



Mol Wt 278.37
Exact Mass 278.14

#	Time	Area%
1	0.889	8.18
2	1.116	91.82

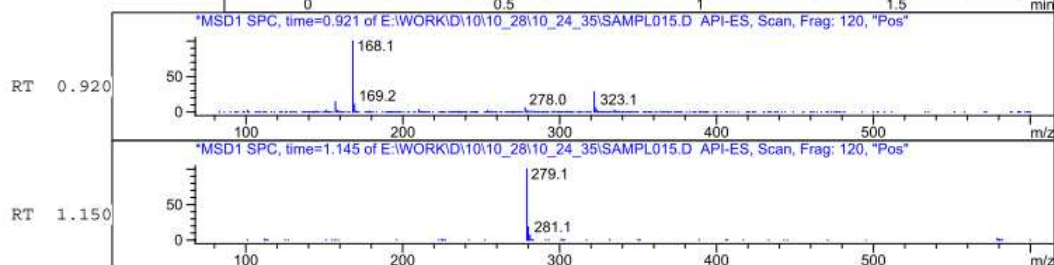
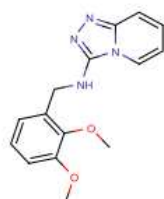


Figure S10. Entry 10, in Table 1: peaks were assigned to the starting amine (rt 0.89 min) and the product (rt 1.12 min).

MaxPeak: 85.43%
Ret_Time: 0.869 min



Mol Wt 284.31
Exact Mass 284.14

#	Time	Area%
1	0.869	85.43
2	0.993	4.34
3	1.052	7.10
4	1.170	3.13

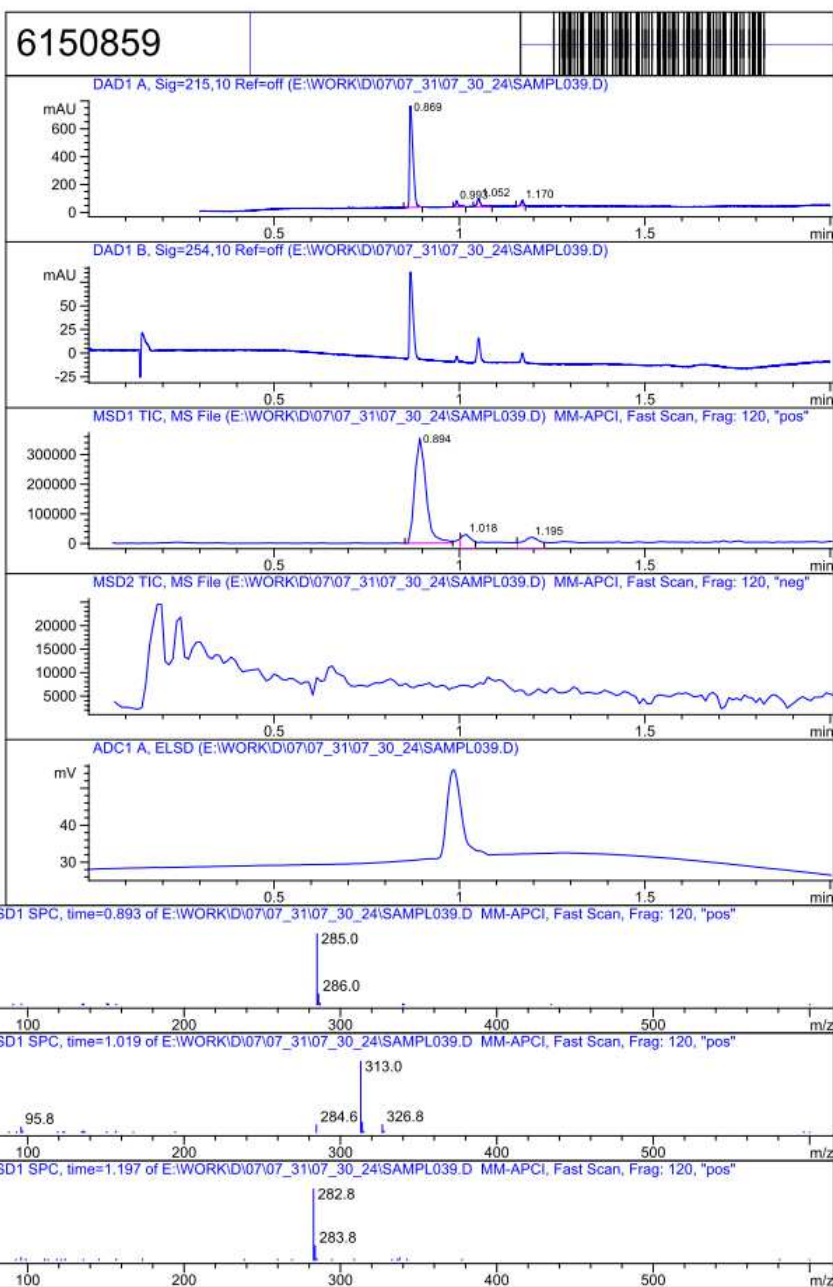
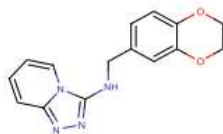


Figure S11. Entry 11, in Table 1: peak was assigned to the product (rt 0.87 min).

MaxPeak: 73.73%
Ret_Time: 0.856 min



Mol Wt 282.3
Exact Mass 282.12

#	Time	Area%
1	0.835	8.70
2	0.856	73.73
3	0.888	2.83
4	0.989	10.55
5	1.141	4.19

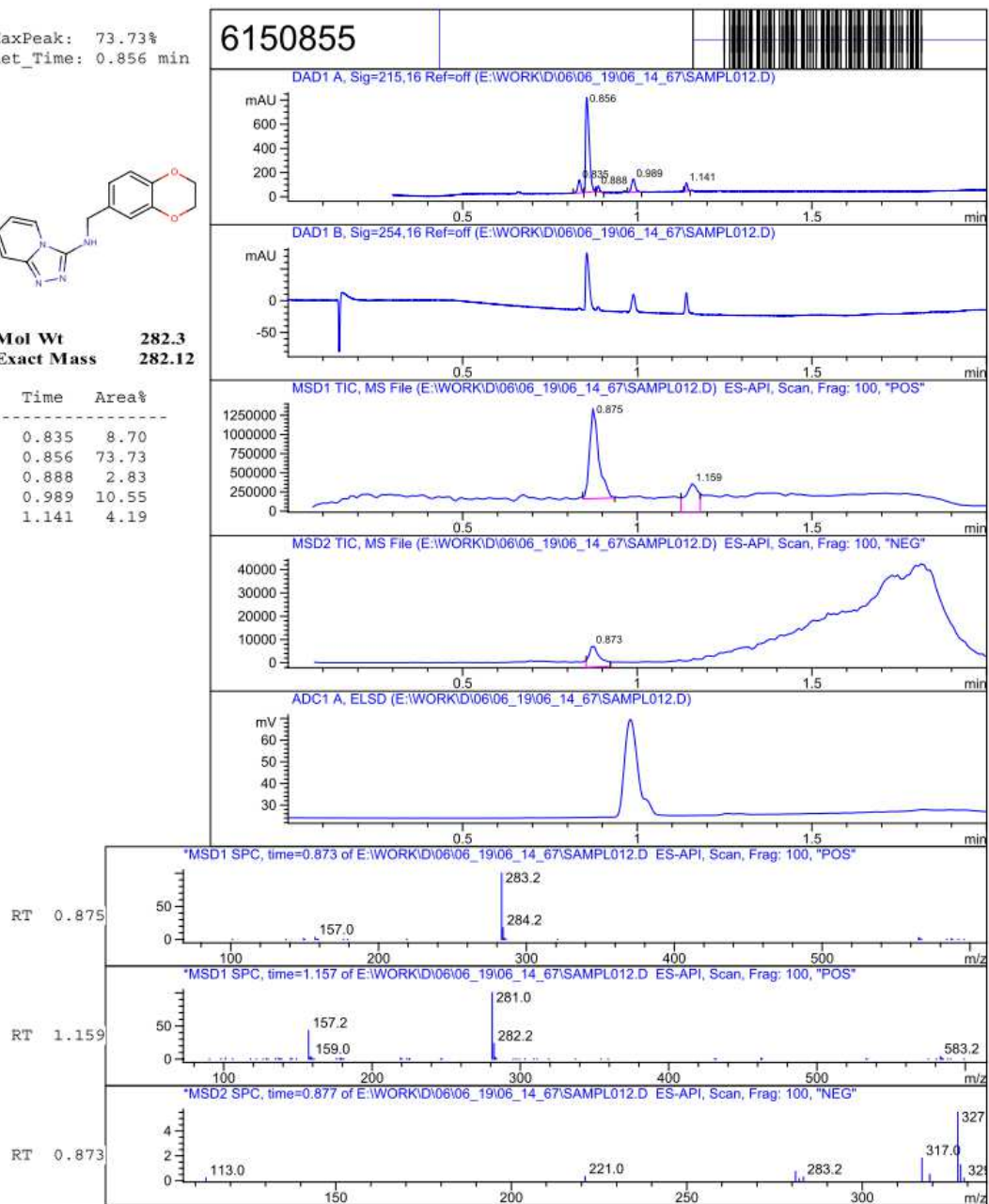
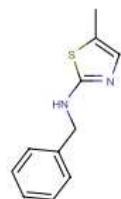


Figure S12. Entry 12, in Table 1: peaks were assigned to the product (rt 0.86 min), the aldehyde (rt 0.99 min), and the intermediate imine (rt 1.14 min).

MaxPeak: 100.00%
Ret_Time: 0.858 min



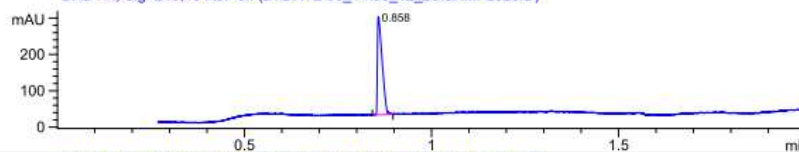
Mol Wt 204.29
Exact Mass 204.09

#	Time	Area%
1	0.858	100.00

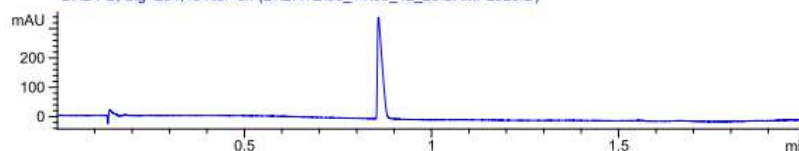
6150473



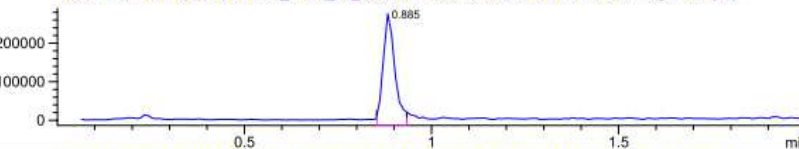
DAD1 A, Sig=215,10 Ref=off (D:\DATE\06_14\06_12_28\SAMPL026.D)



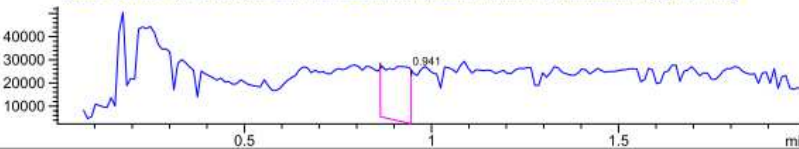
DAD1 B, Sig=254,10 Ref=off (D:\DATE\06_14\06_12_28\SAMPL026.D)



MSD1 TIC, MS File (D:\DATE\06_14\06_12_28\SAMPL026.D) MM-APCI, Fast Scan, Frag: 120, "pos"



MSD2 TIC, MS File (D:\DATE\06_14\06_12_28\SAMPL026.D) MM-APCI, Fast Scan, Frag: 120, "neg"



ADC1 A, ELSD (D:\DATE\06_14\06_12_28\SAMPL026.D)

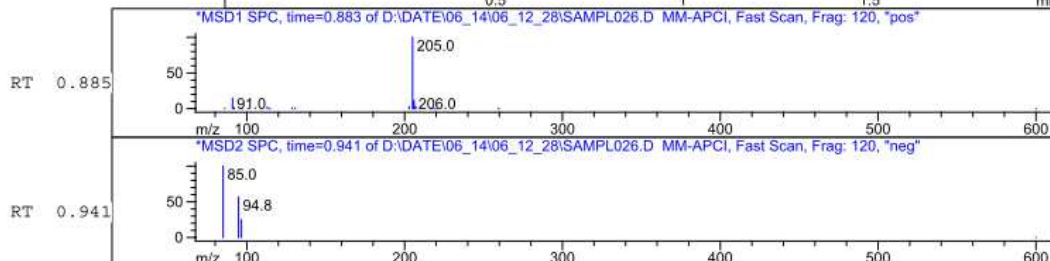
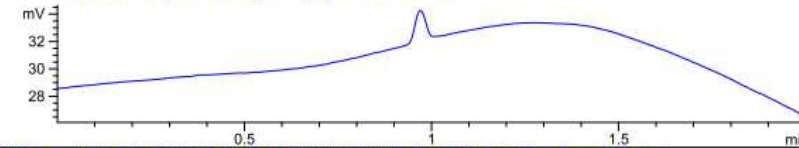
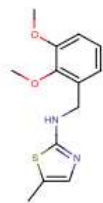


Figure S13. Entry 13, in Table 1: peak was assigned to the product (rt 0.86 min).

MaxPeak: 63.93%
Ret_Time: 0.910 min



Mol Wt 264.34
Exact Mass 264.11

#	Time	Area%
1	0.702	3.61
2	0.884	4.40
3	0.910	63.93
4	1.006	1.69
5	1.079	20.49
6	1.212	5.87

6150475

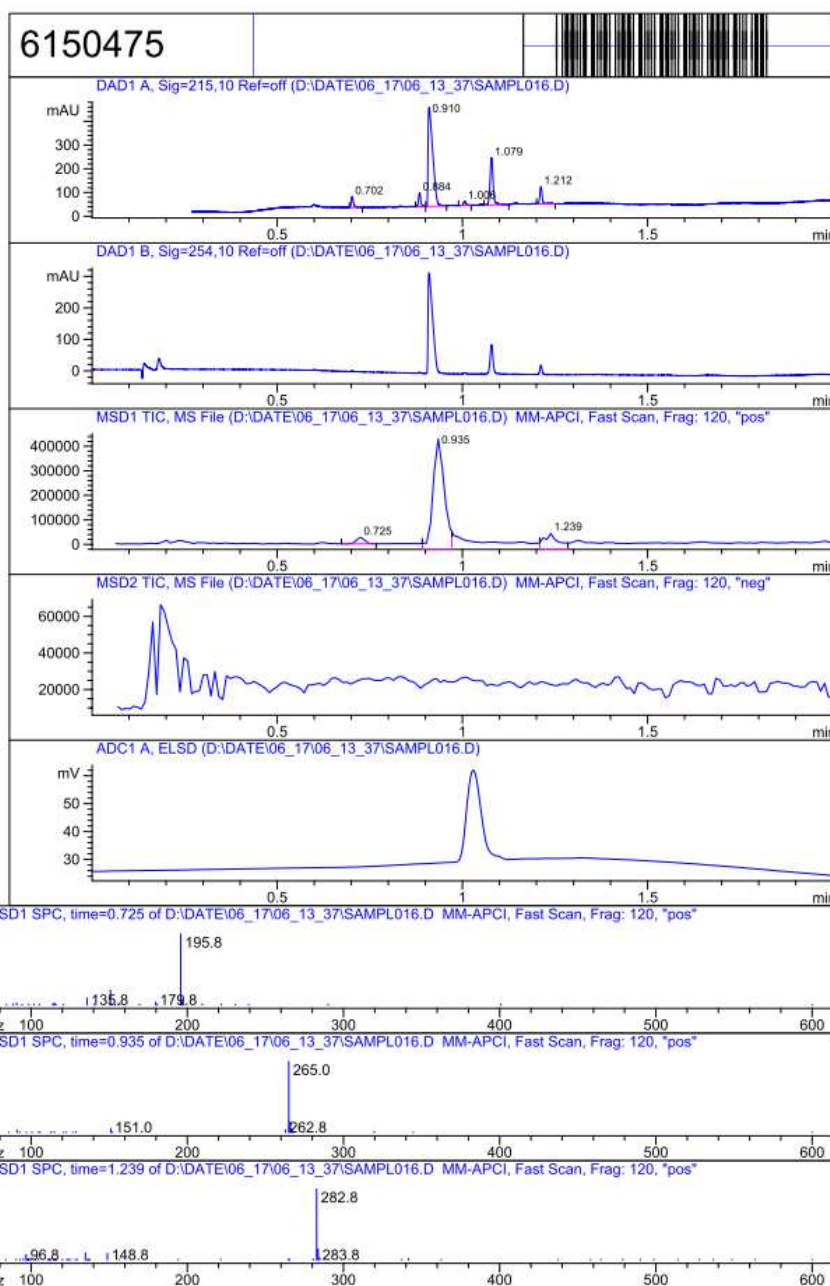
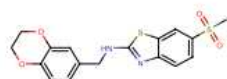


Figure S14. Entry 14, in Table 1: peaks were assigned to the product (rt 0.91 min) and the aldehyde (rt 1.08 min).

MaxPeak: 84.24%
Ret_Time: 1.198 min



Mol Wt 376.45
Exact Mass 376.06

#	Time	Area%
1	0.730	7.36
2	0.925	1.25
3	1.046	4.43
4	1.198	84.24
5	1.231	2.72

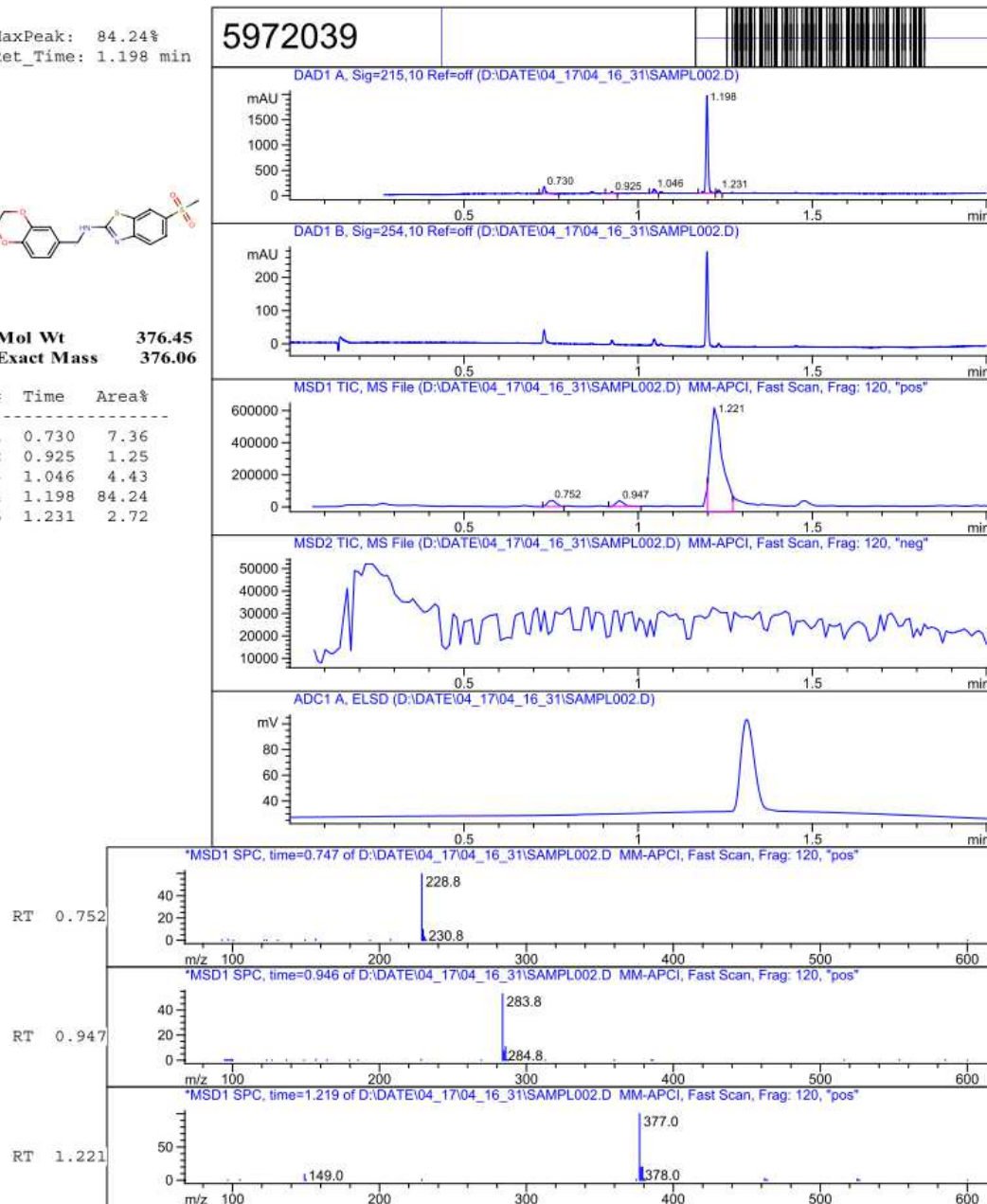
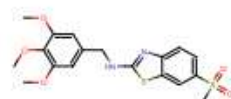


Figure S15. Entry 15, in Table 1: peaks were assigned to the starting amine (rt 0.73 min), the aldehyde (1.05 min), and the product (rt 1.2 min).

MaxPeak: 82.62%
Ret_Time: 1.174 min



Mol Wt 408.49
Exact Mass 408.09

#	Time	Area%
1	0.730	7.39
2	0.892	1.72
3	1.080	8.27
4	1.174	82.62

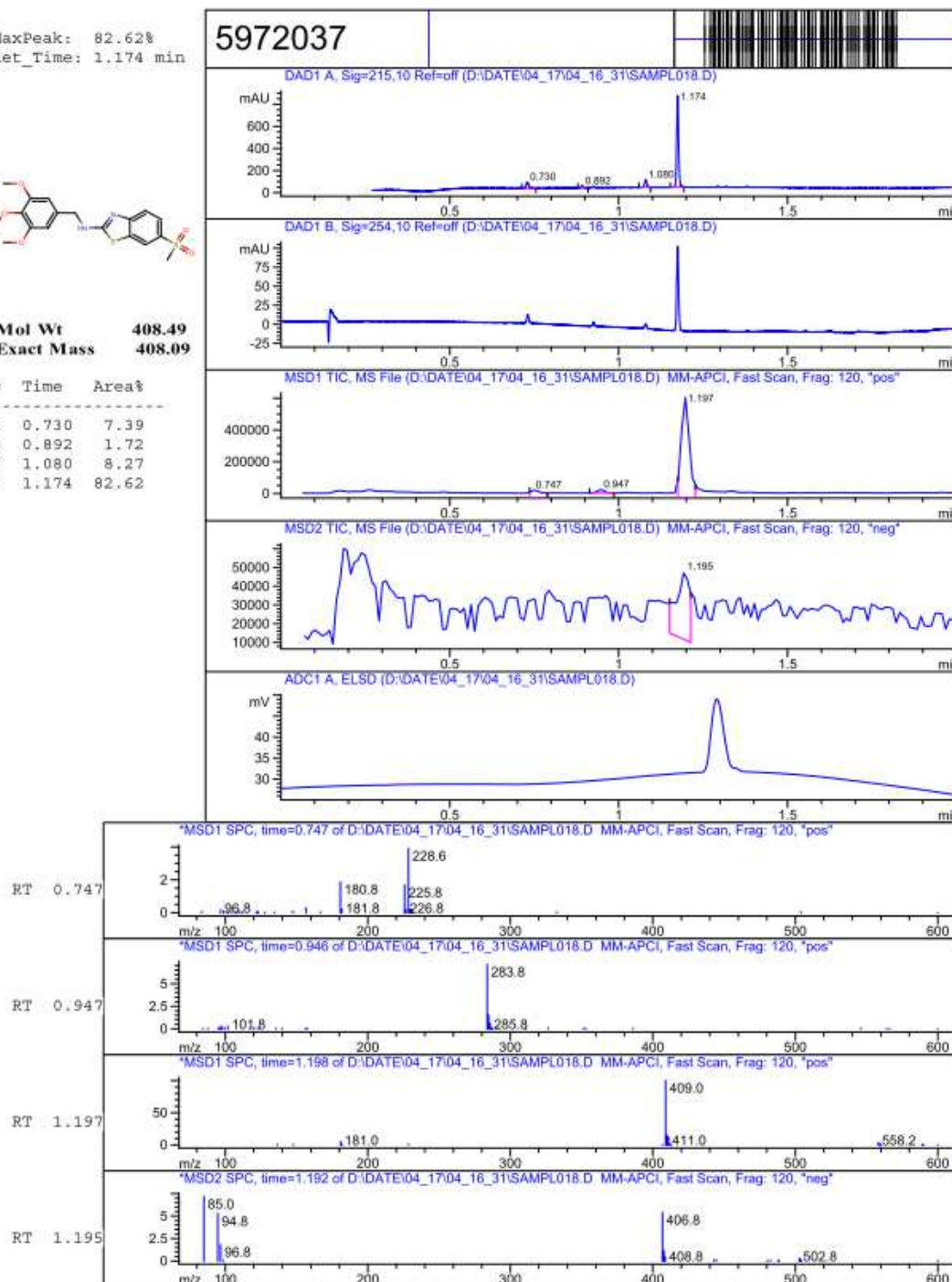
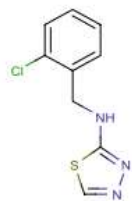


Figure S 16. Entry 16, in Table 1: peaks were assigned to the starting amine (rt 0.73 min), the aldehyde (1.08 min), and the product (rt 1.17 min).

MaxPeak: 100.00%
Ret_Time: 1.049 min



Mol Wt 225.7
Exact Mass 225.02

#	Time	Area%
1	1.049	100.00

5971987

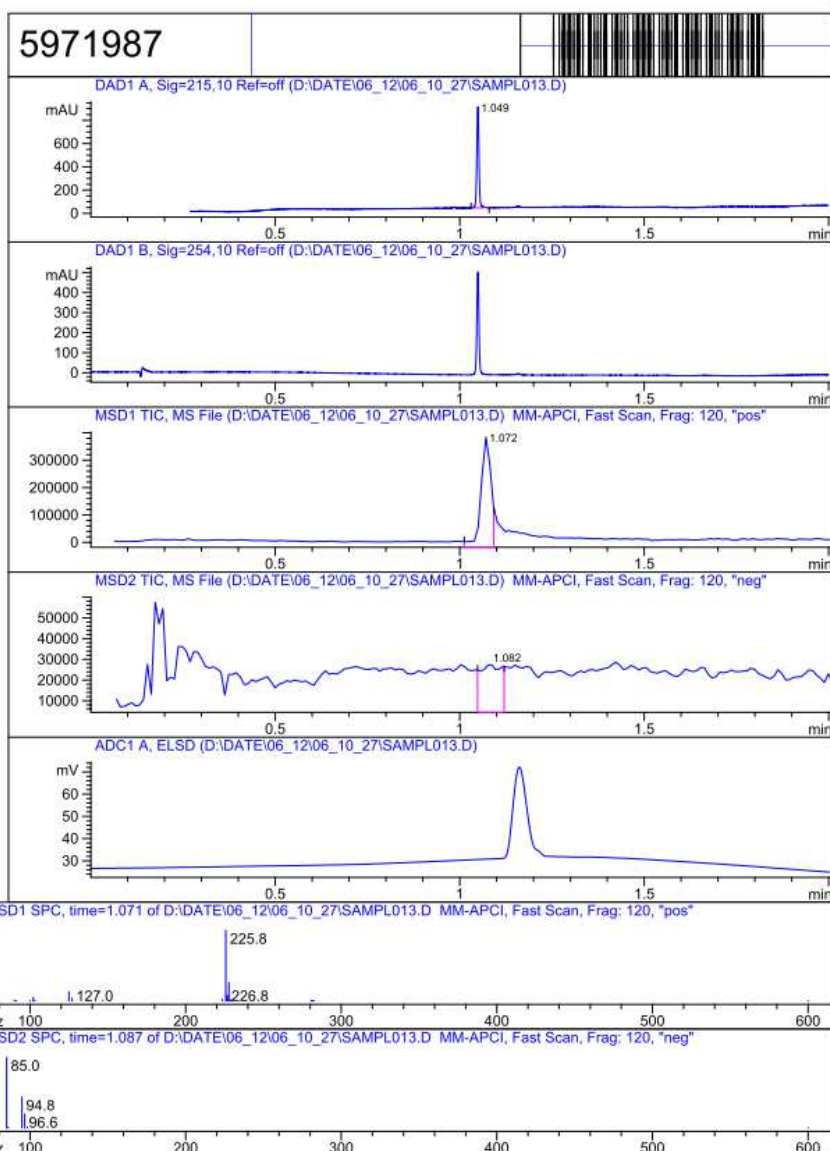
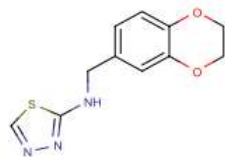


Figure S17. Entry 17, in Table 1: peak was assigned to the product (rt 1.05 min).

MaxPeak: 88.86%
Ret_Time: 0.964 min



Mol Wt 249.29
Exact Mass 249.06

#	Time	Area%
1	0.964	88.86
2	1.006	11.14

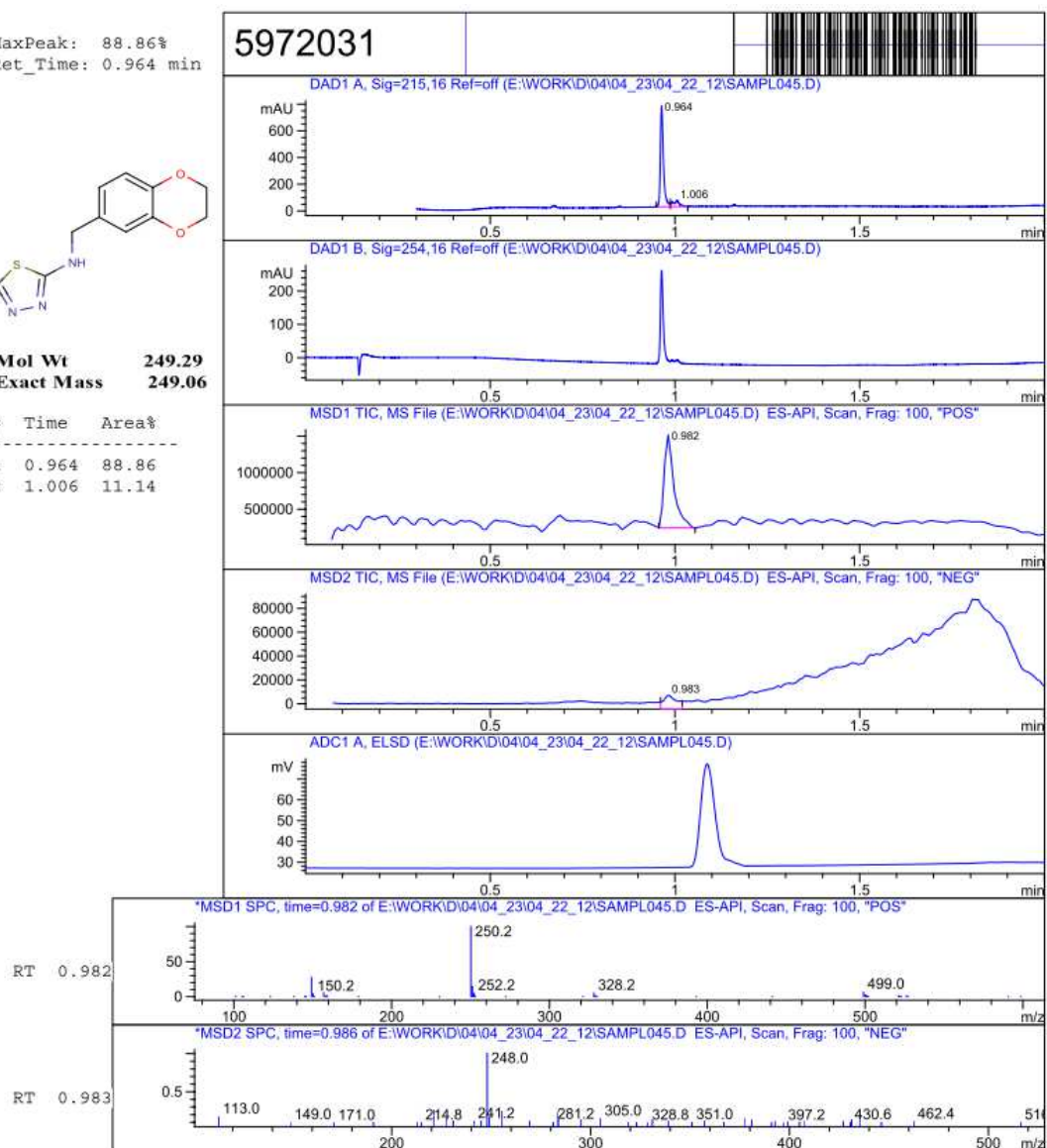
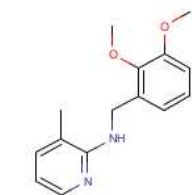


Figure S18. Entry 18, in Table 1: peaks were assigned to the product (rt 0.96 min) and the aldehyde (rt 1.01 min).

MaxPeak: 60.58%
Ret_Time: 0.837 min



Mol Wt 258.32
Exact Mass 258.16

#	Time	Area%
1	0.816	2.86
2	0.837	60.58
3	0.983	34.20
4	1.068	2.35

6150456

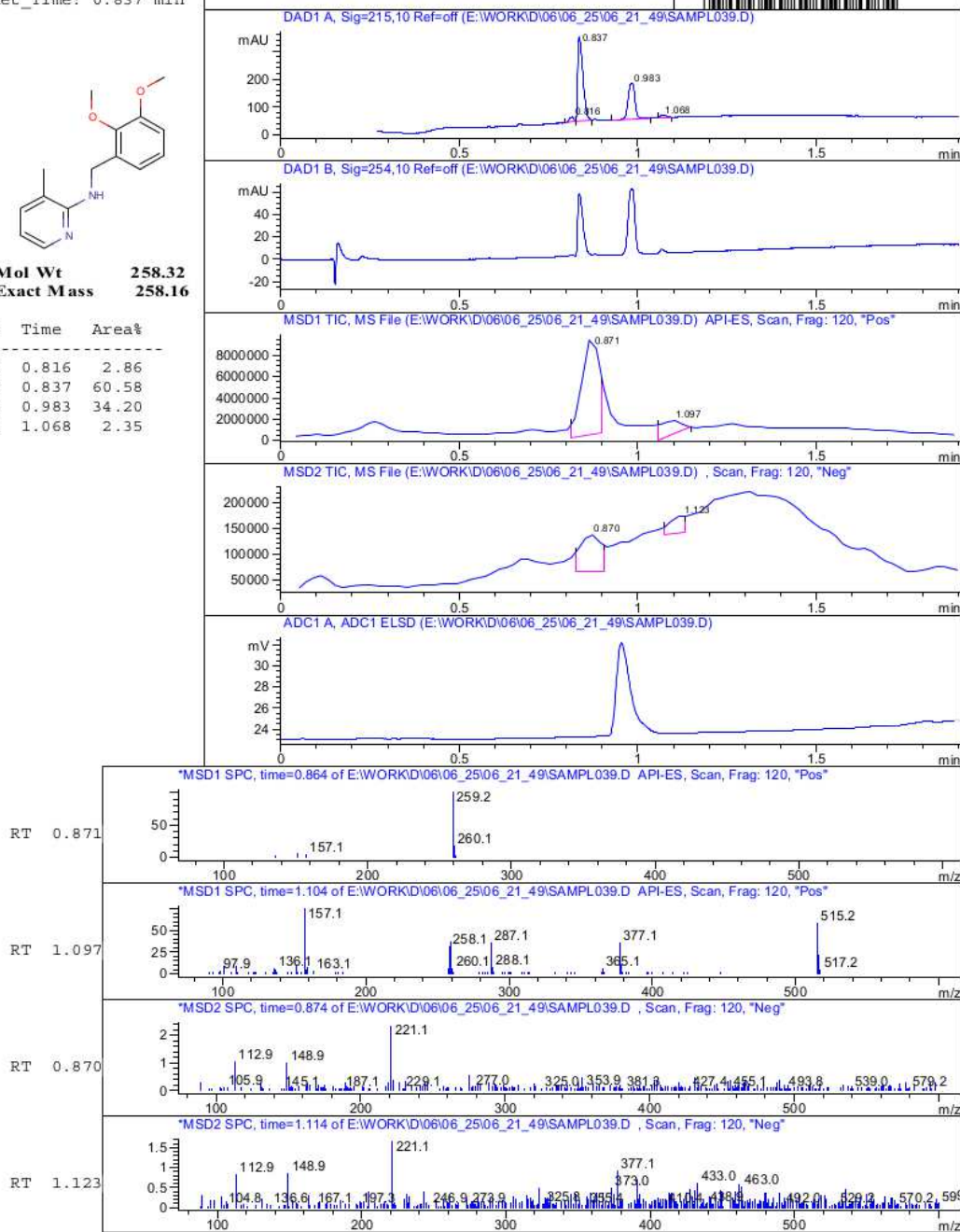
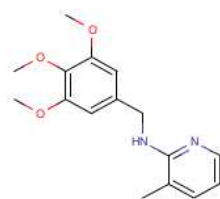


Figure S19. Entry 19, in Table 1: peaks were assigned to the product (rt 0.87 min), the aldehyde (rt 0.98 min), and the intermediate imine (rt 1.07 min).

MaxPeak: 57.93%
Ret_Time: 0.825 min



Mol Wt 288.34
Exact Mass 288.17

#	Time	Area%
1	0.688	2.18
2	0.825	57.93
3	0.849	5.86
4	1.030	30.32
5	1.216	3.71

6150454

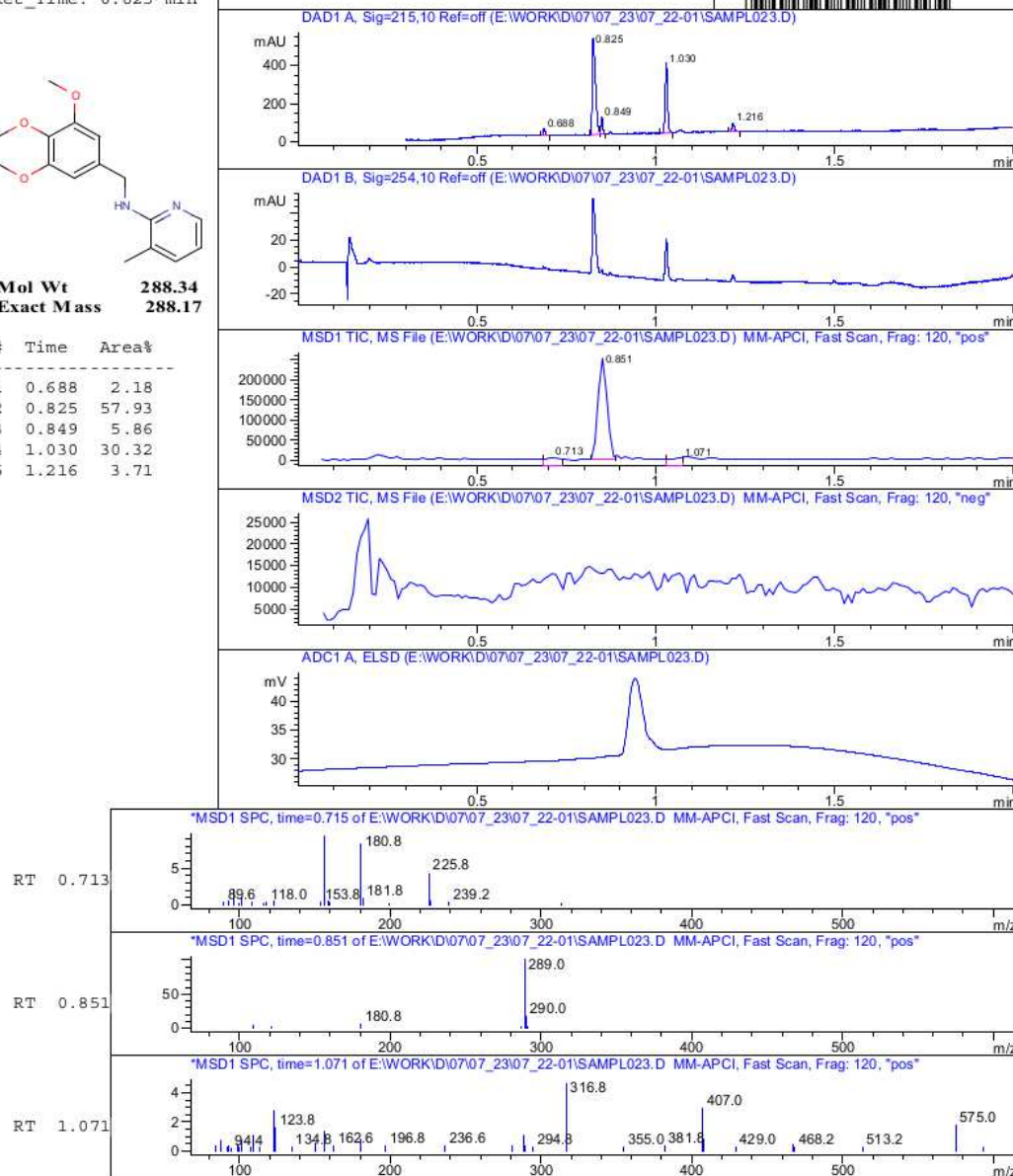


Figure S20. Entry 20, in Table 1: peaks were assigned to the product (rt 0.83 min) and the aldehyde (rt 1.03 min).

MaxPeak: 92.67%
Ret_Time: 0.660 min



Mol Wt 301.38
Exact Mass 301.21

#	Time	Area%
1	0.660	92.67
2	0.703	1.69
3	0.742	1.34
4	0.784	1.11
5	0.921	1.72
6	1.091	1.48

RT 0.685

5972021

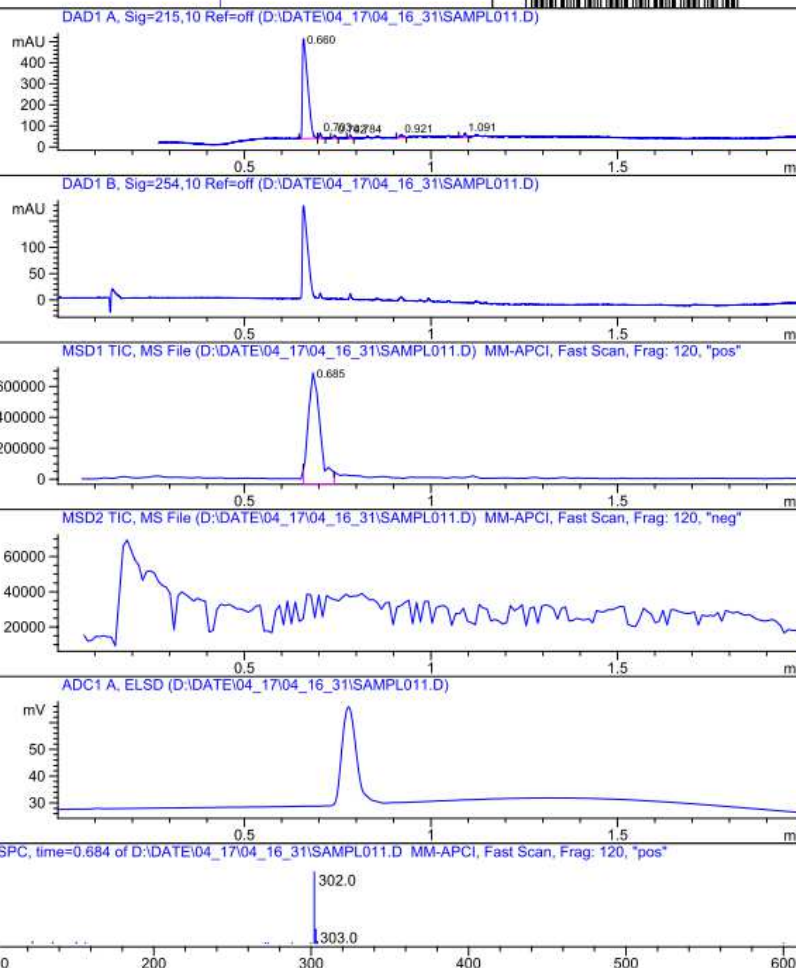
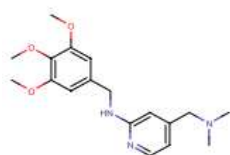


Figure S21. Entry 21, in Table 1: peak was assigned to the product (rt 0.66 min).

MaxPeak: 98.61%
Ret_Time: 0.671 min



Mol Wt 331.41
Exact Mass 331.22

#	Time	Area%
1	0.671	98.61
2	0.726	1.39

5972018

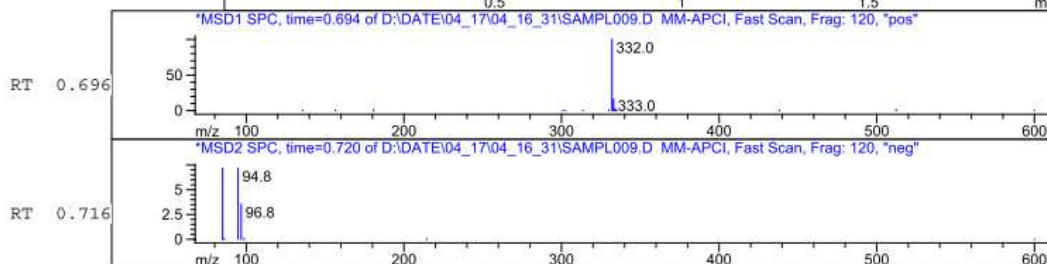
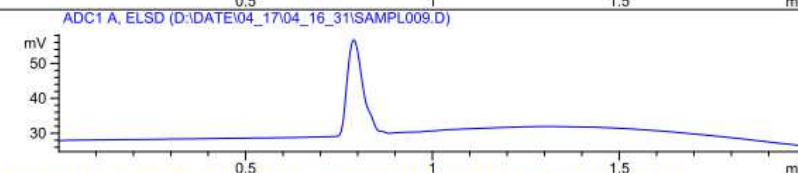
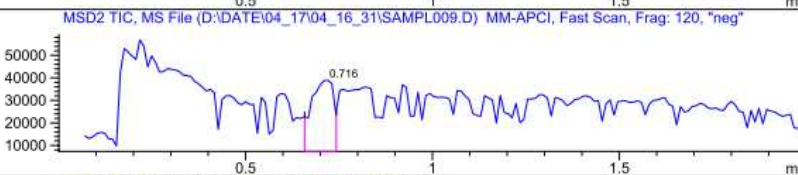
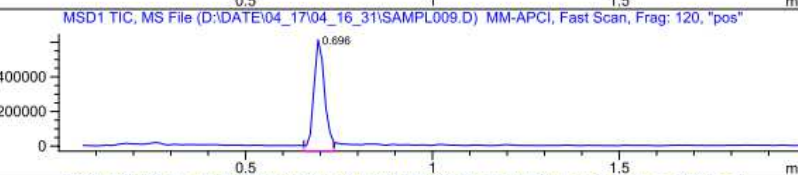
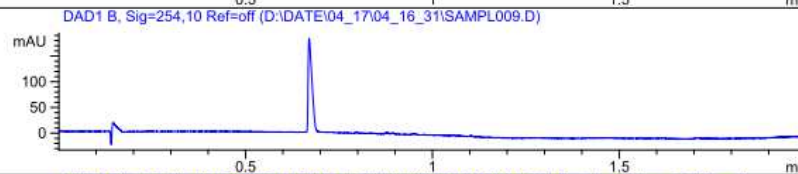
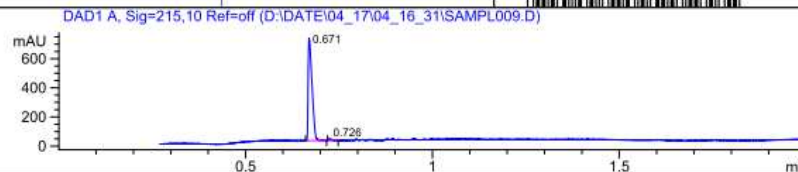
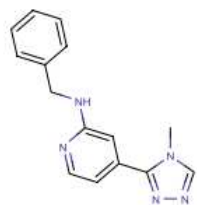


Figure S22. Entry 22, in Table 1: peak was assigned to the product (rt 0.67 min).

MaxPeak: 100.00%
Ret_Time: 0.730 min



Mol Wt 265.31
Exact Mass 265.15

#	Time	Area%
1	0.730	100.00

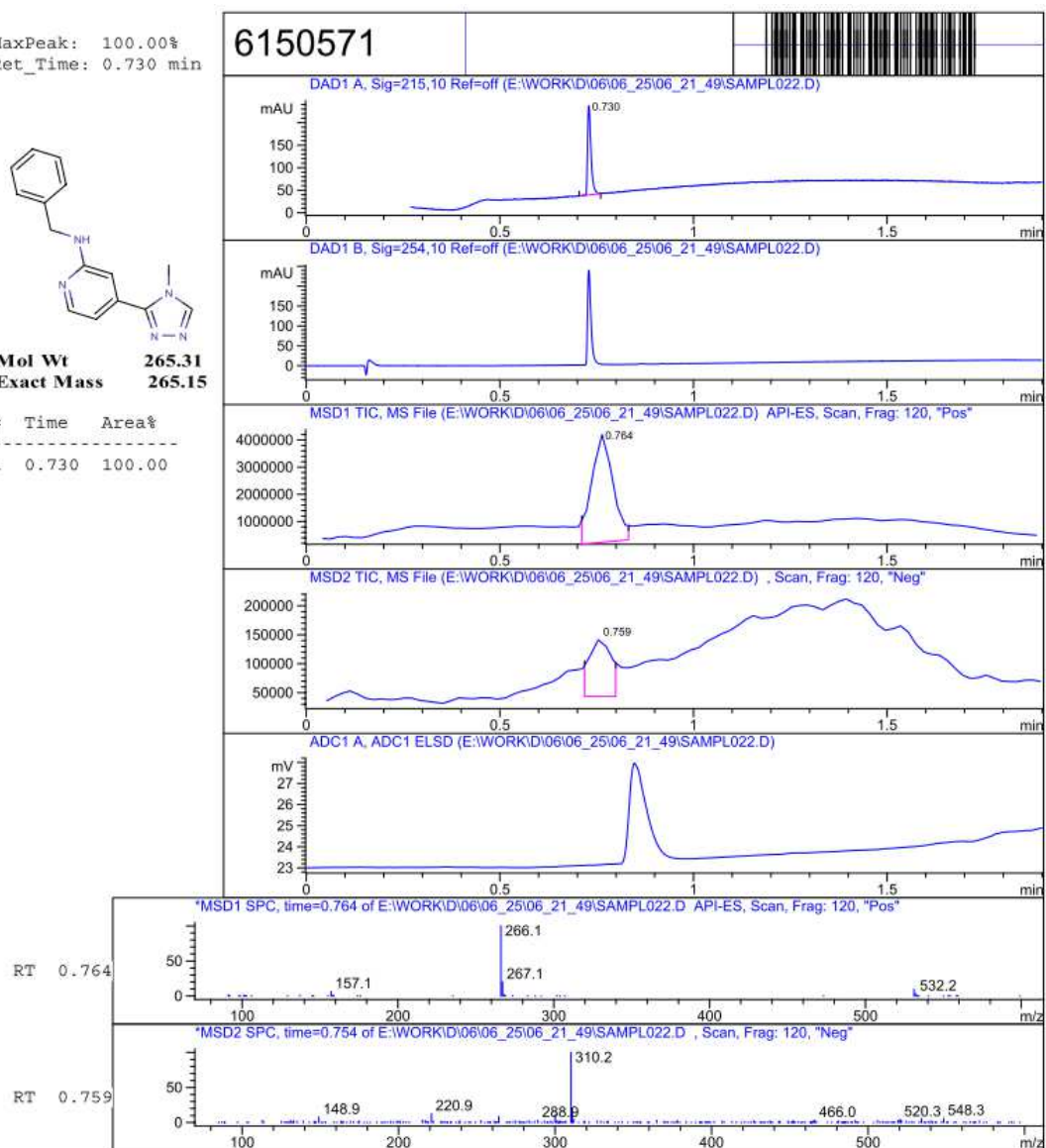
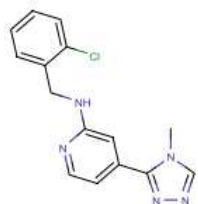


Figure S23. Entry 23, in Table 1: peak was assigned to the product (rt 0.73 min).

MaxPeak: 77.91%
Ret_Time: 0.856 min



Mol Wt 299.76
Exact Mass 299.11

#	Time	Area%
1	0.856	77.91
2	0.987	13.00
3	1.101	2.01
4	1.161	3.61
5	1.376	3.46

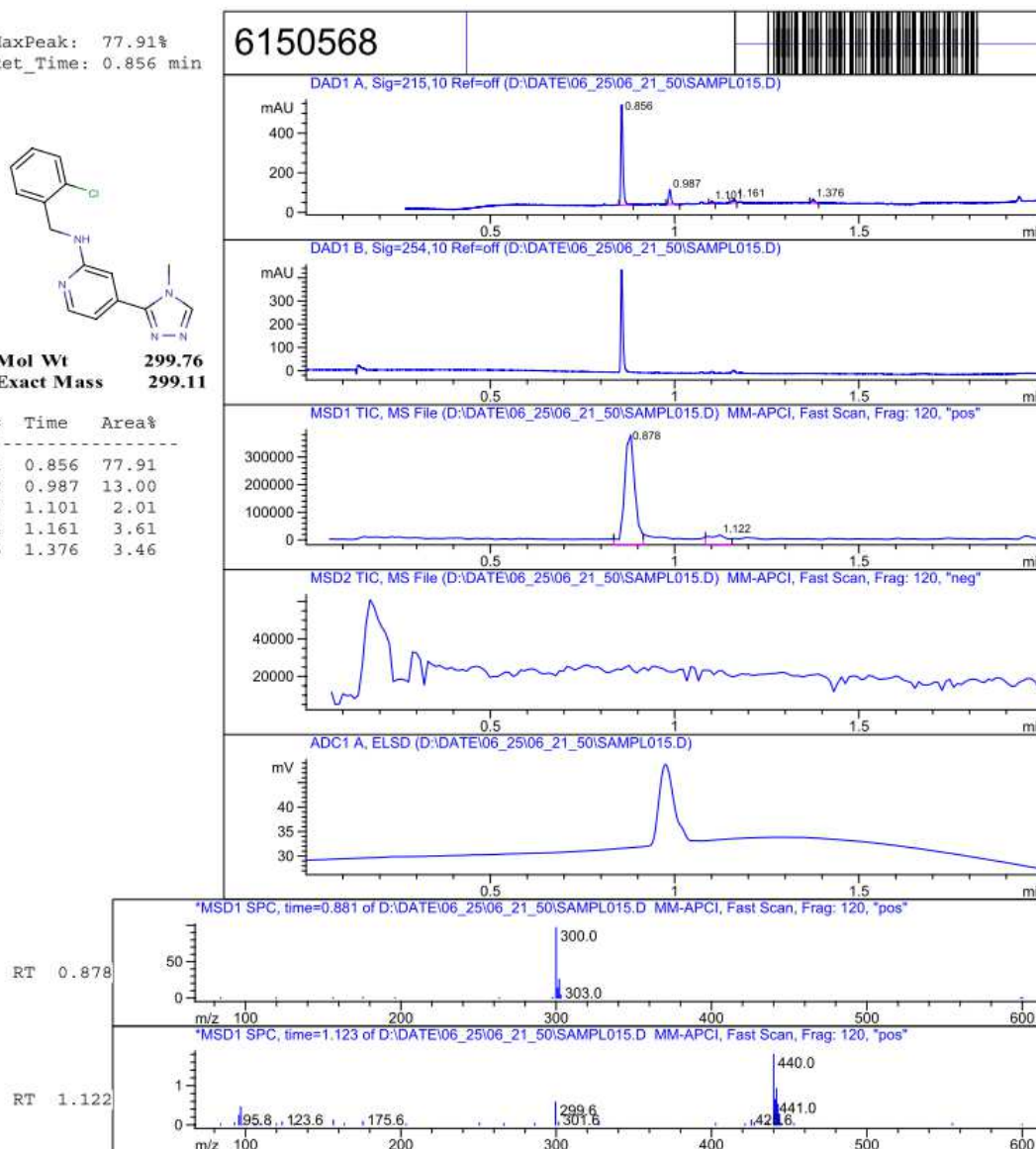


Figure S24. Entry 24, in Table 1: peaks were assigned to the product (rt 0.86 min), the aldehyde (0.99 min), and the tertiary amine (1.1 min).

MaxPeak: 96.56%
Ret_Time: 1.253 min



Mol Wt 353.21
Exact Mass 352.06

#	Time	Area%
1	0.728	2.02
2	0.996	1.42
3	1.253	96.56

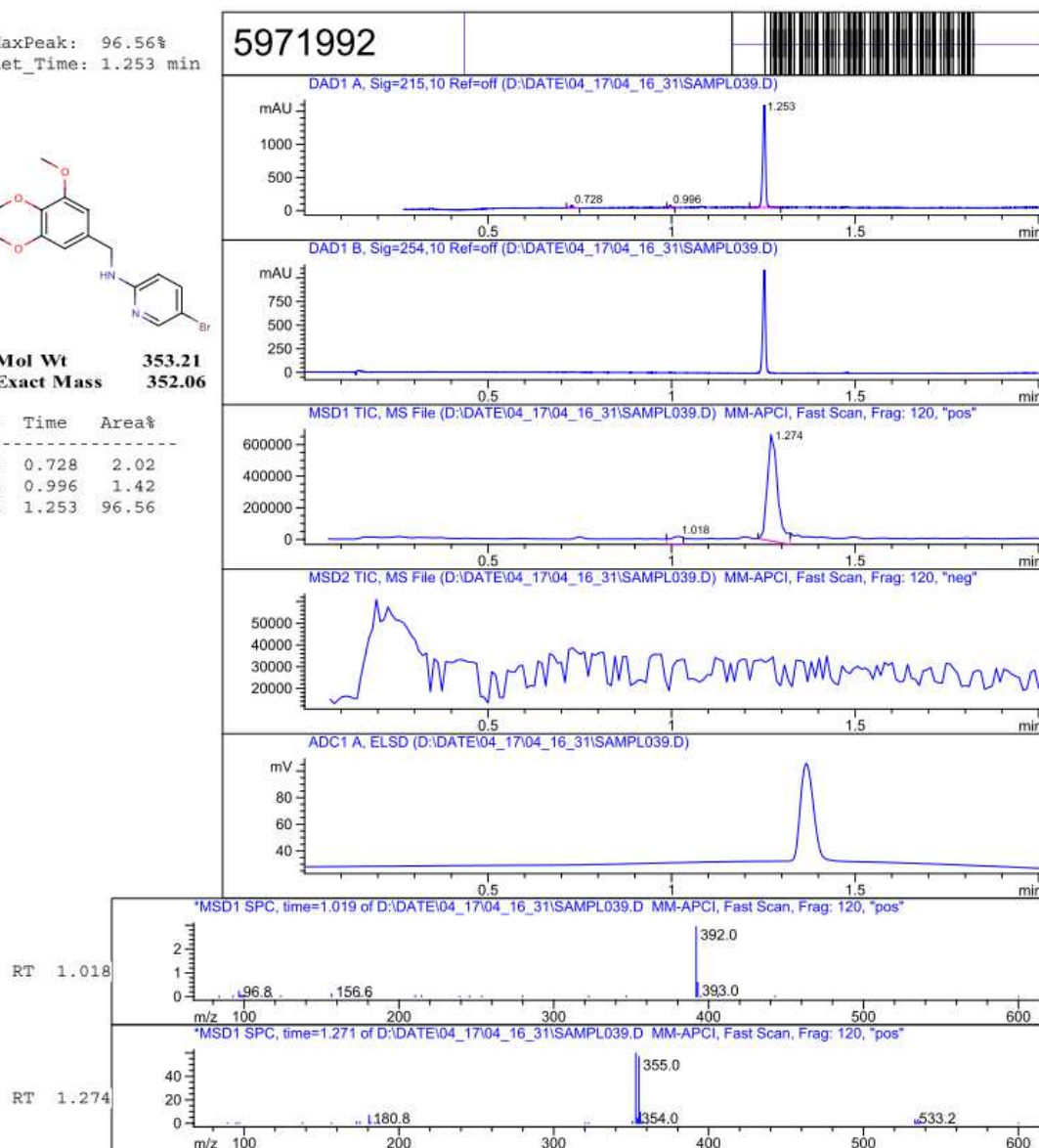
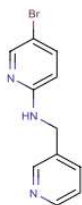


Figure S25. Entry 25, in Table 1: peak was assigned to the product (rt 1.25 min).

MaxPeak: 52.95%
Ret_Time: 0.781 min



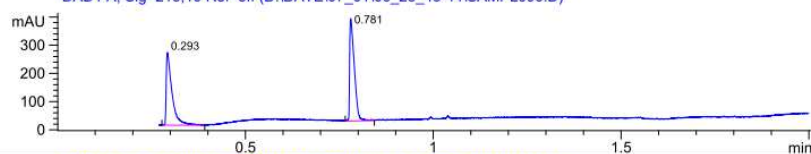
Mol Wt 264.12
Exact Mass 263.02

#	Time	Area%
1	0.293	47.05
2	0.781	52.95

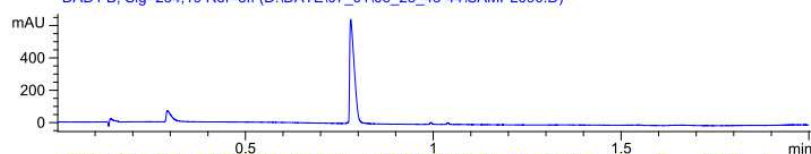
5971970



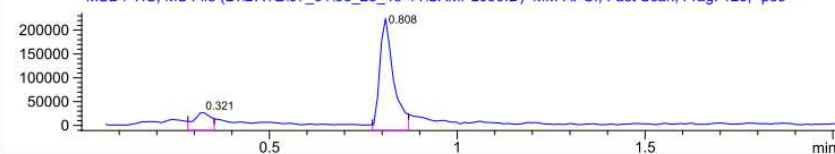
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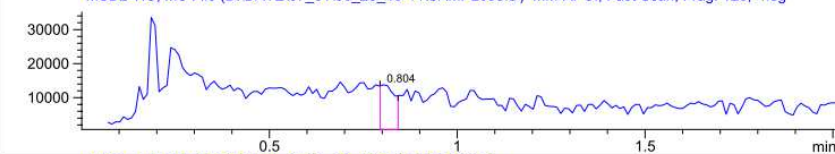
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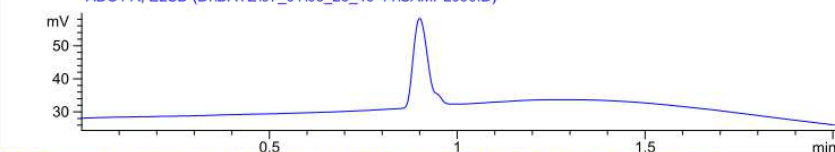
MSD1 TIC, MS File (D:\DATE\07_01\06_28_43-44\SAMPL090.D) MM-APCI, Fast Scan, Frag: 120, "pos"



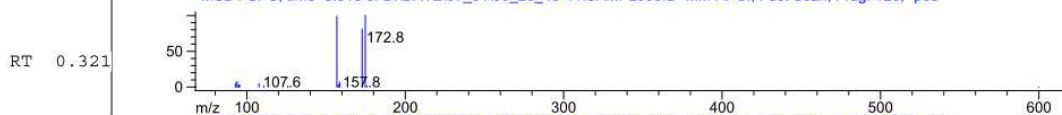
MSD2 TIC, MS File (D:\DATE\07_01\06_28_43-44\SAMPL090.D) MM-APCI, Fast Scan, Frag: 120, "neg"



ADC1 A, ELSD (D:\DATE\07_01\06_28_43-44\SAMPL090.D)



*MSD1 SPC, time=0.316 of D:\DATE\07_01\06_28_43-44\SAMPL090.D MM-APCI, Fast Scan, Frag: 120, "pos"



*MSD1 SPC, time=0.809 of D:\DATE\07_01\06_28_43-44\SAMPL090.D MM-APCI, Fast Scan, Frag: 120, "pos"

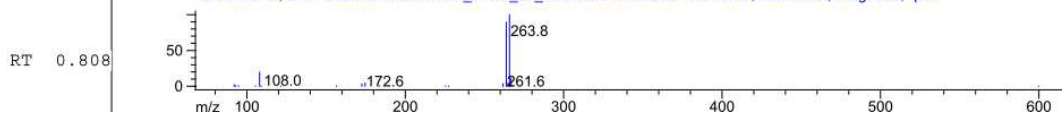
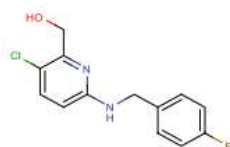


Figure S26. Entry 26, in Table 1: peaks were assigned to the starting amine (rt 0.29 min) and the product (rt 0.78 min).

MaxPeak: 91.56%
Ret_Time: 1.116 min



Mol Wt 266.7
Exact Mass 266.08

#	Time	Area%
1	0.731	3.74
2	1.116	91.56
3	1.345	4.71

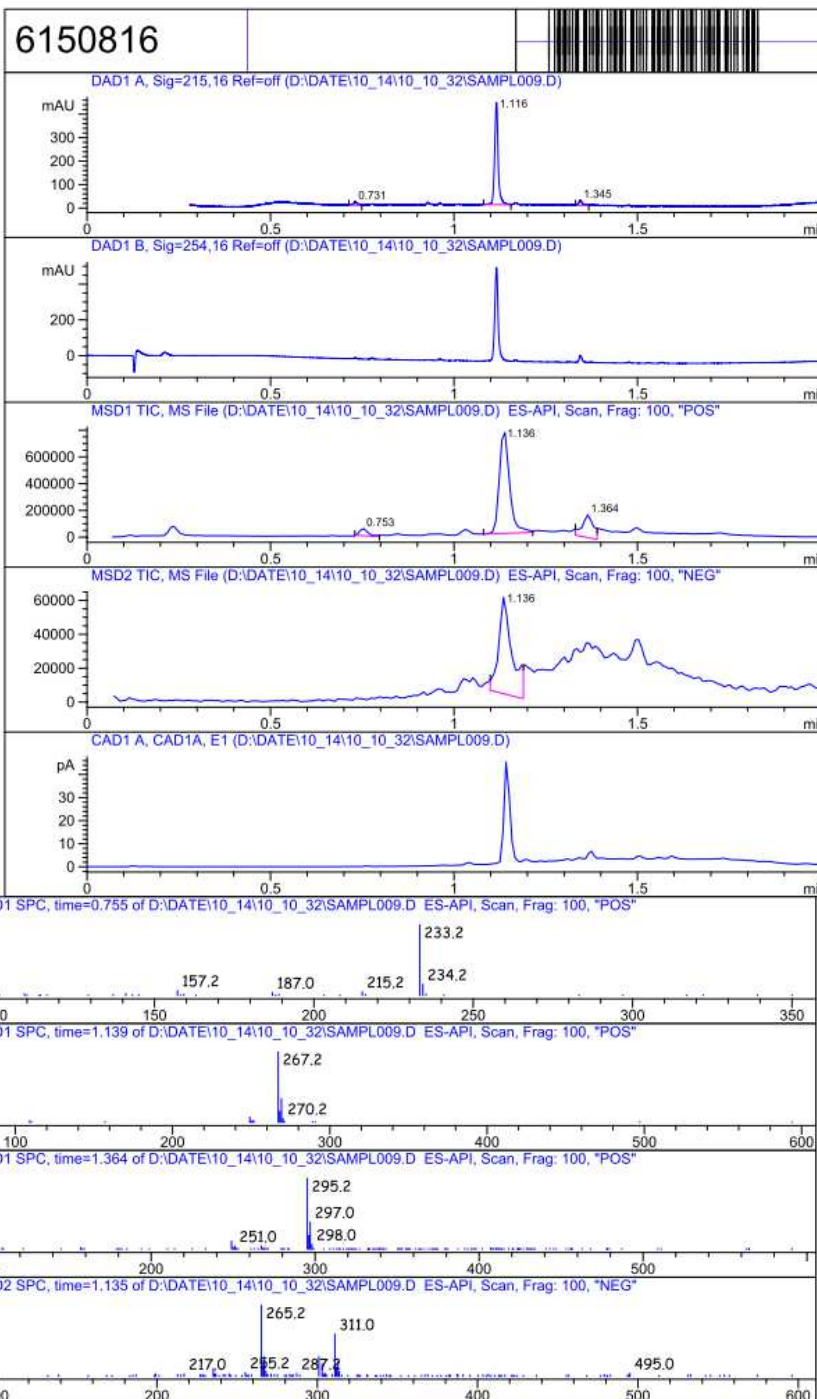
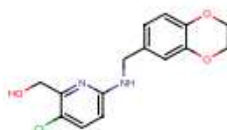


Figure S27. Entry 27, in Table 1: peak was assigned to the product (rt 1.12 min).

MaxPeak: 56.37%
Ret_Time: 1.103 min

6150814



Mol Wt 306.74
Exact Mass 306.09

#	Time	Area%
1	0.394	7.63
2	0.688	3.15
3	1.030	32.85
4	1.103	56.37

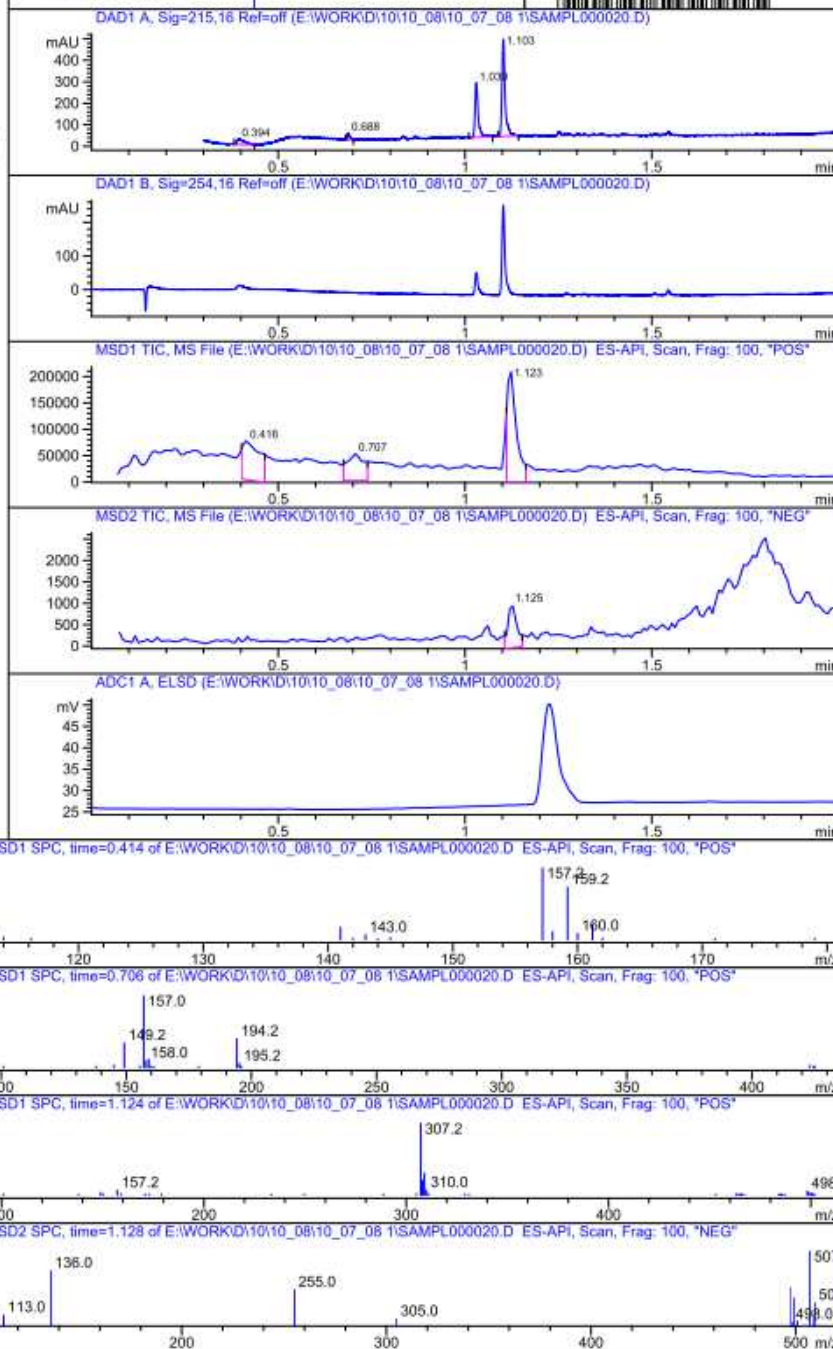
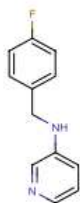


Figure S28. Entry 28, in Table 1: peaks were assigned to the aldehyde (rt 1.03 min) and the product (rt 1.1 min).

MaxPeak: 100.00%
Ret_Time: 0.777 min



Mol Wt 202.23
Exact Mass 202.11

#	Time	Area%
1	0.777	100.00

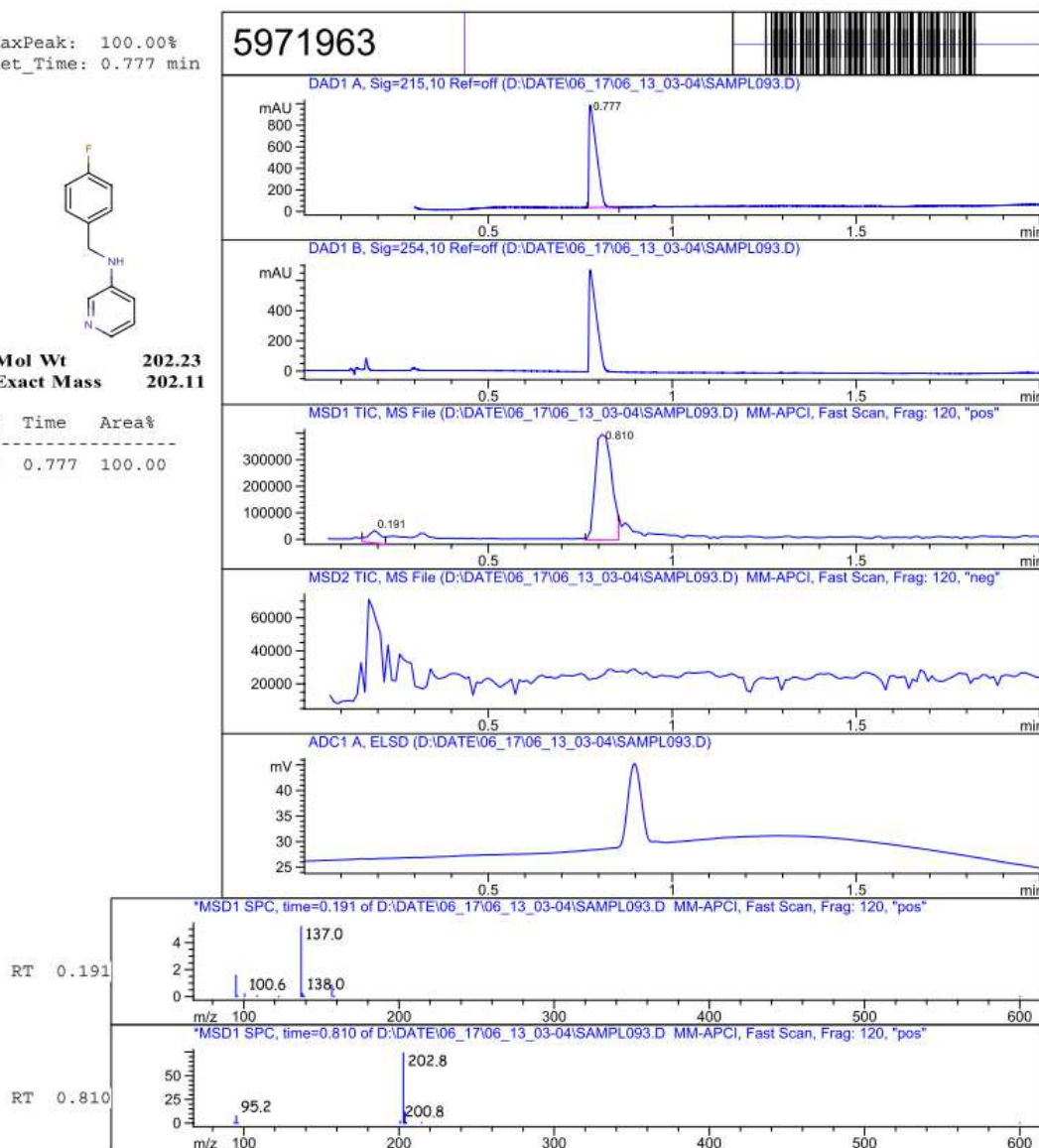
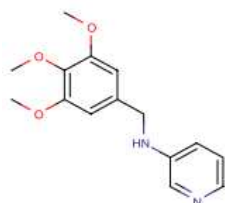


Figure S29. Entry 29, in Table 1: peak was assigned to the product (rt 0.78 min).

MaxPeak: 94.78%
Ret_Time: 0.825 min



Mol Wt 274.32
Exact Mass 274.15

#	Time	Area%
1	0.730	2.01
2	0.825	94.78
3	1.082	3.22

5971962

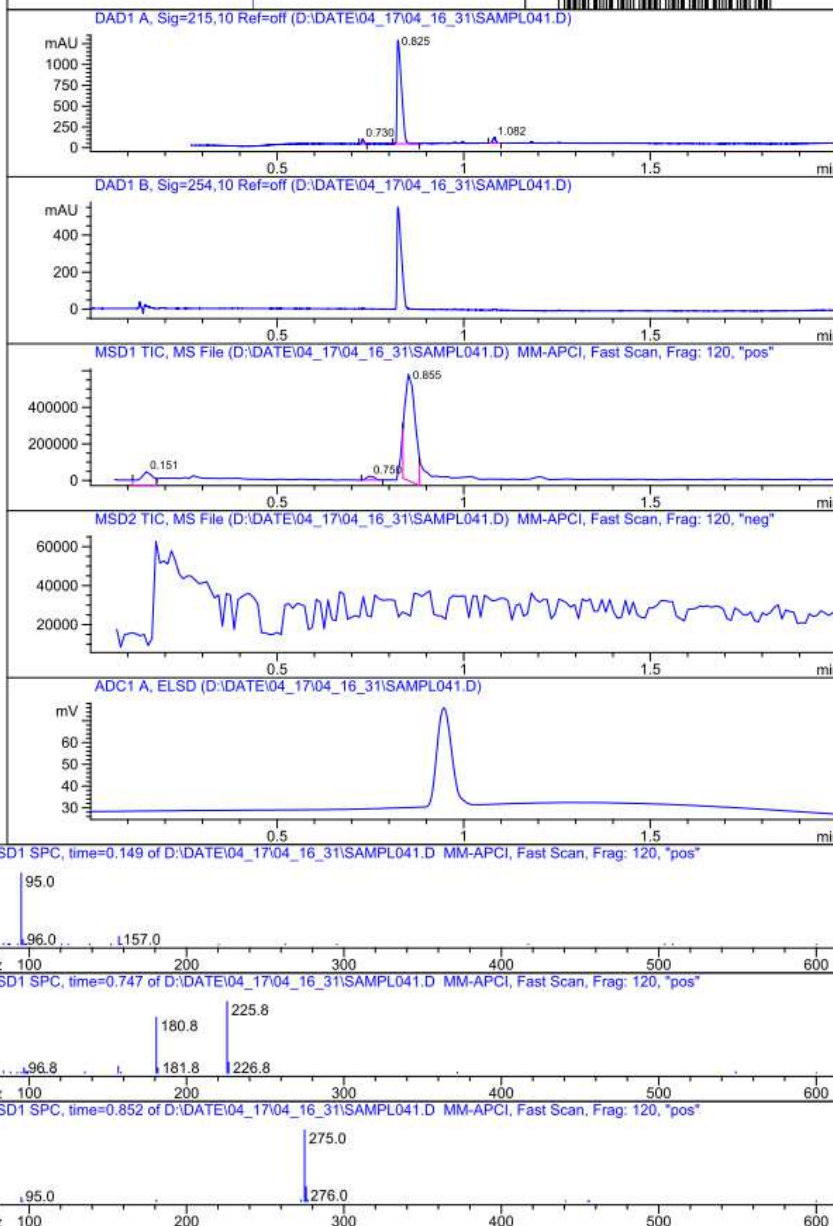


Figure S30. Entry 30, in Table 1: peaks were assigned to the product (rt 0.83 min) and the aldehyde (rt 1.08 min).

MaxPeak: 81.49%
Ret_Time: 0.859 min



Mol Wt 256.3
Exact Mass 256.14

#	Time	Area%
1	0.859	81.49
2	0.902	3.33
3	0.969	13.21
4	1.162	1.97

6150479

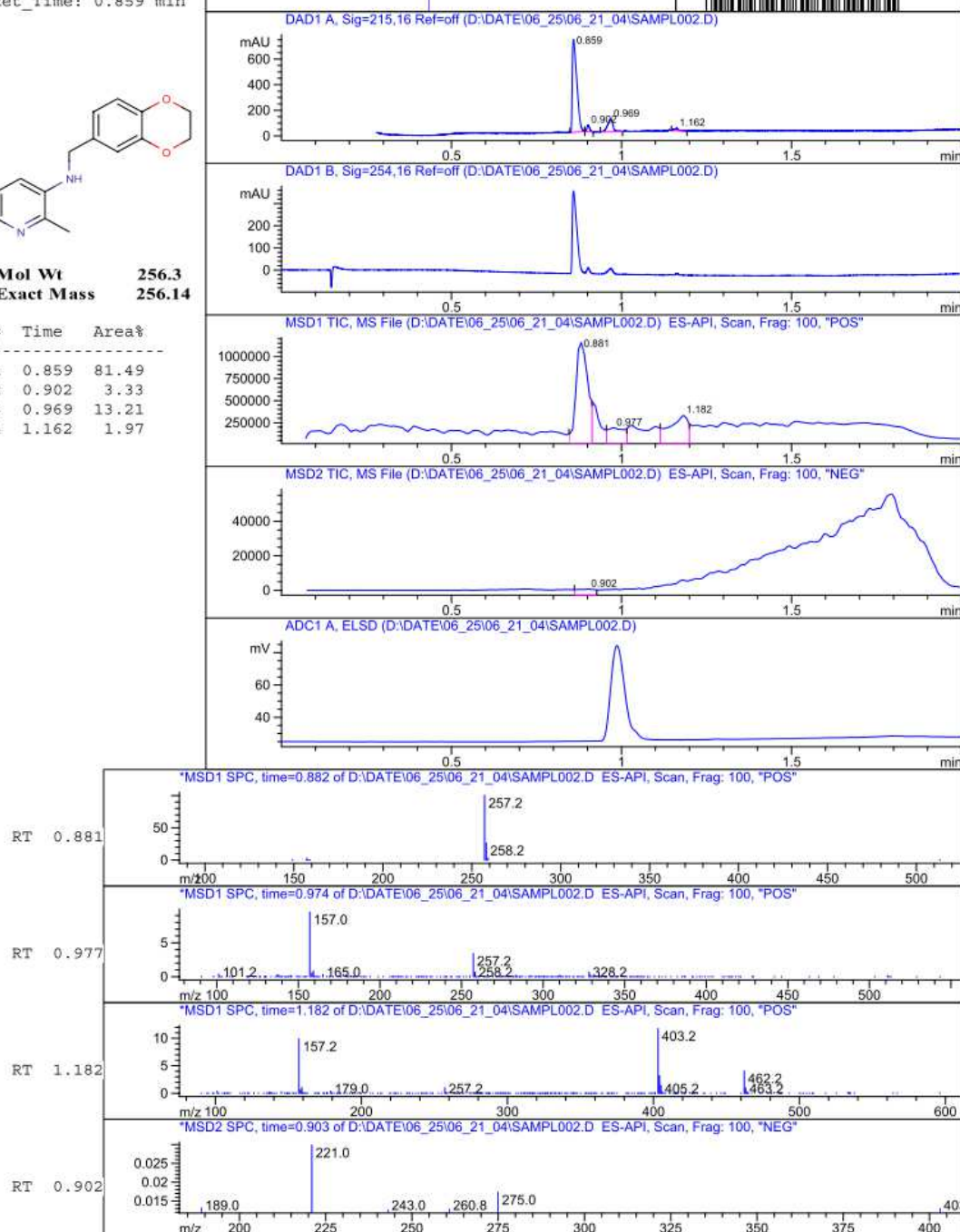
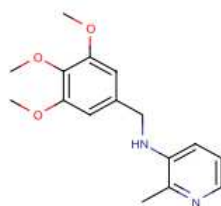


Figure S31. Entry 31, in Table 1: peaks were assigned to the product (rt 0.86 min), the aldehyde (rt 0.97 min), and the tertiary amine (rt 1.16 min).

MaxPeak: 81.83%
Ret_Time: 0.825 min



Mol Wt 288.34
Exact Mass 288.17

#	Time	Area%
1	0.825	81.83
2	1.040	17.41
3	1.097	0.76

6150480

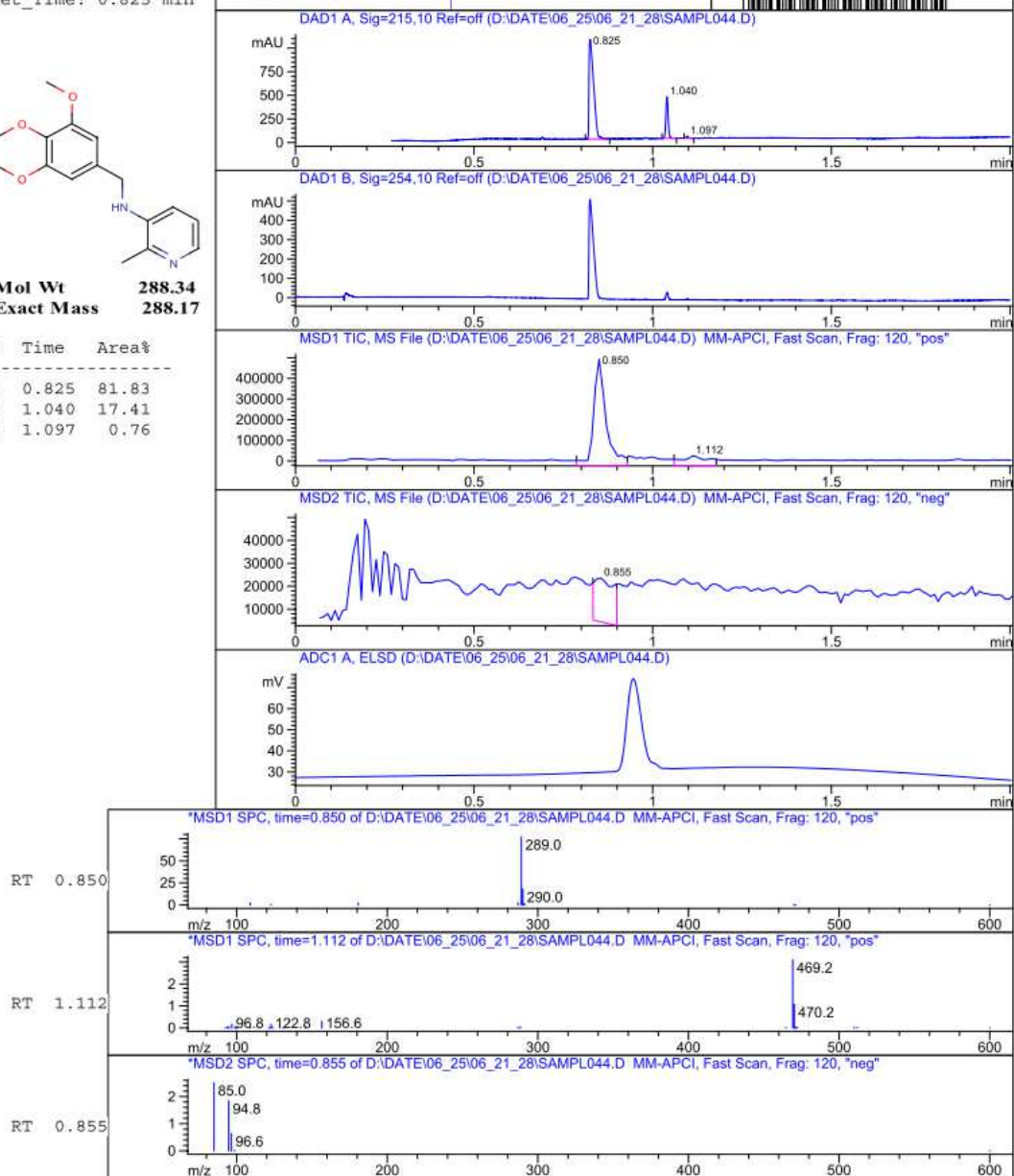
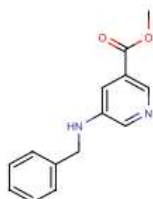


Figure S32. Entry 32, in Table 1: peaks were assigned to the product (rt 0.83 min), the aldehyde (rt 1.04 min), and the tertiary amine (rt 1.1 min).

MaxPeak: 100.00%
Ret_Time: 1.016 min



Mol Wt 242.27
Exact Mass 242.12

#	Time	Area%
1	1.016	100.00

6150732

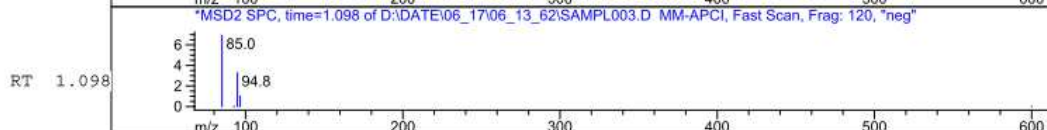
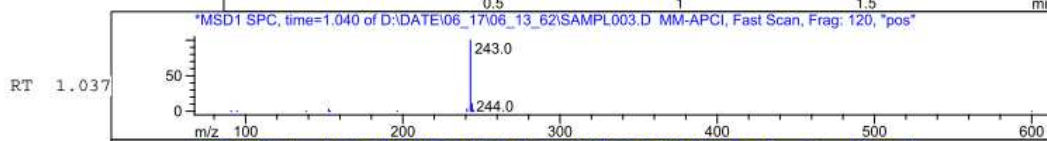
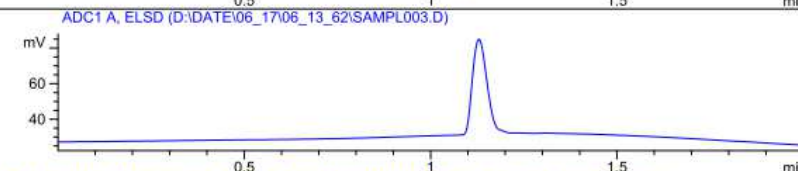
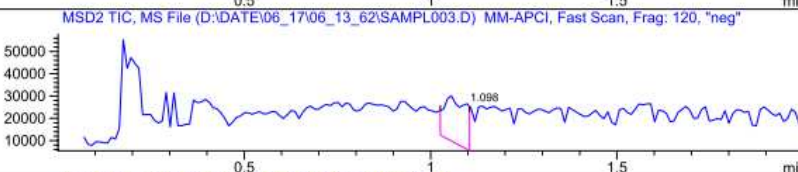
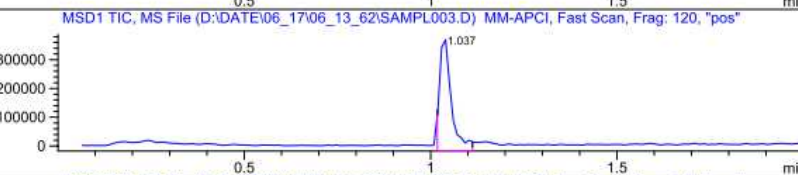
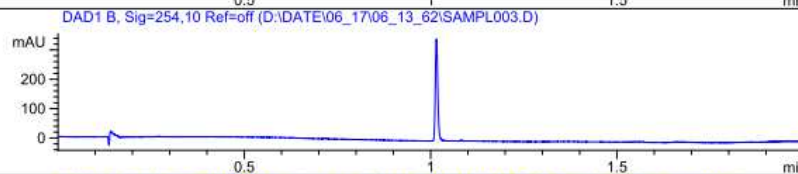
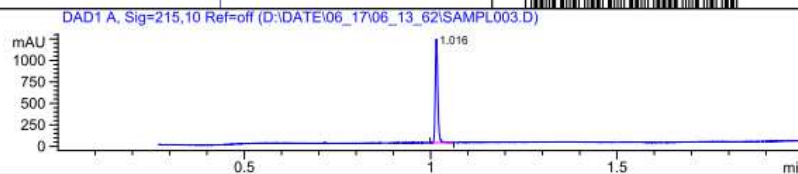
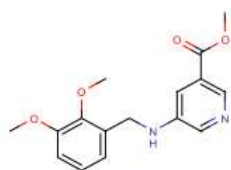


Figure S33. Entry 33, in Table 1: peak was assigned to the product (rt 1.02 min).

MaxPeak: 71.80%
Ret_Time: 1.043 min

6150733



Mol Wt 302.32
Exact Mass 302.14

#	Time	Area%
1	1.043	71.80
2	1.069	28.20

RT 0.286

RT 1.066

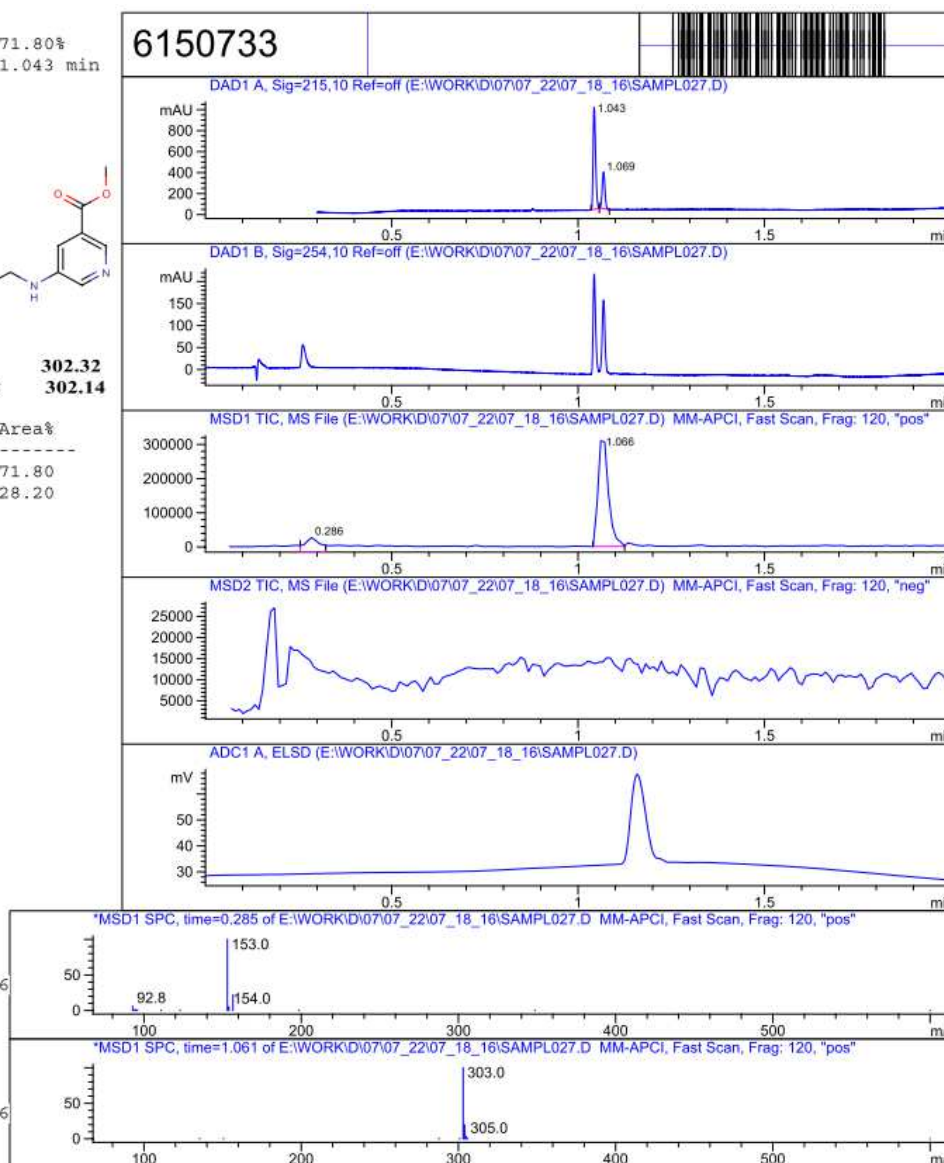
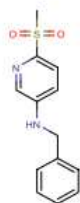


Figure S34. Entry 34, in Table 1: peaks were assigned to the starting amine (rt 0.26 min), the product (rt 1.04 min), and the aldehyde (rt 1.07 min).

MaxPeak: 90.23%
Ret_Time: 1.034 min

6150426



Mol Wt 262.33
Exact Mass 262.09

#	Time	Area%
1	0.453	9.77
2	1.034	90.23

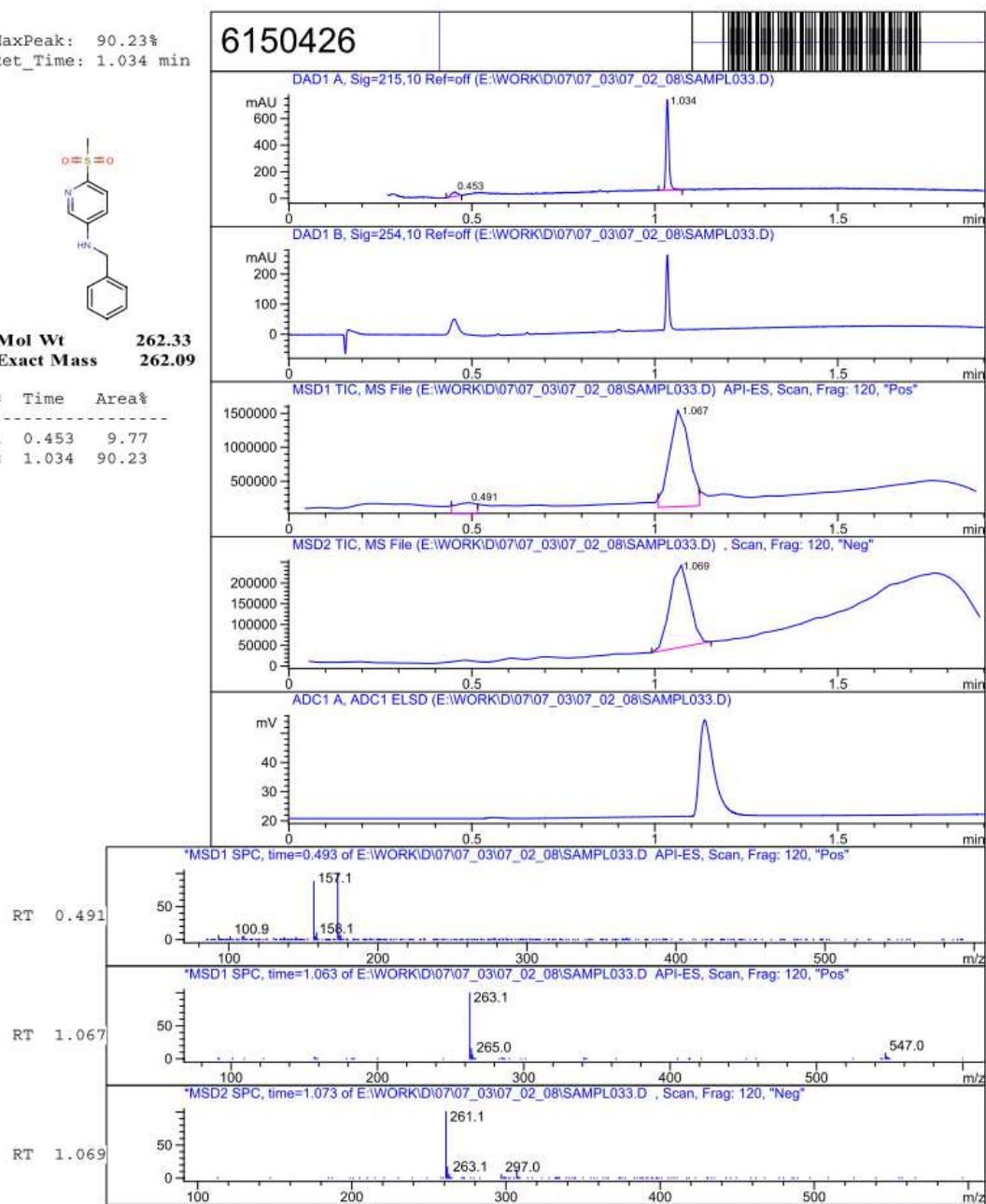
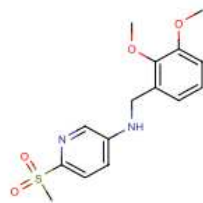


Figure S35. Entry 35, in Table 1: peaks were assigned to the starting amine (rt 0.45 min) and the product (rt 1.03 min).

MaxPeak: 75.52%
Ret_Time: 1.109 min



Mol Wt 322.38
Exact Mass 322.11

#	Time	Area%
1	0.341	4.86
2	0.704	1.44
3	0.885	3.20
4	1.080	14.98
5	1.109	75.52

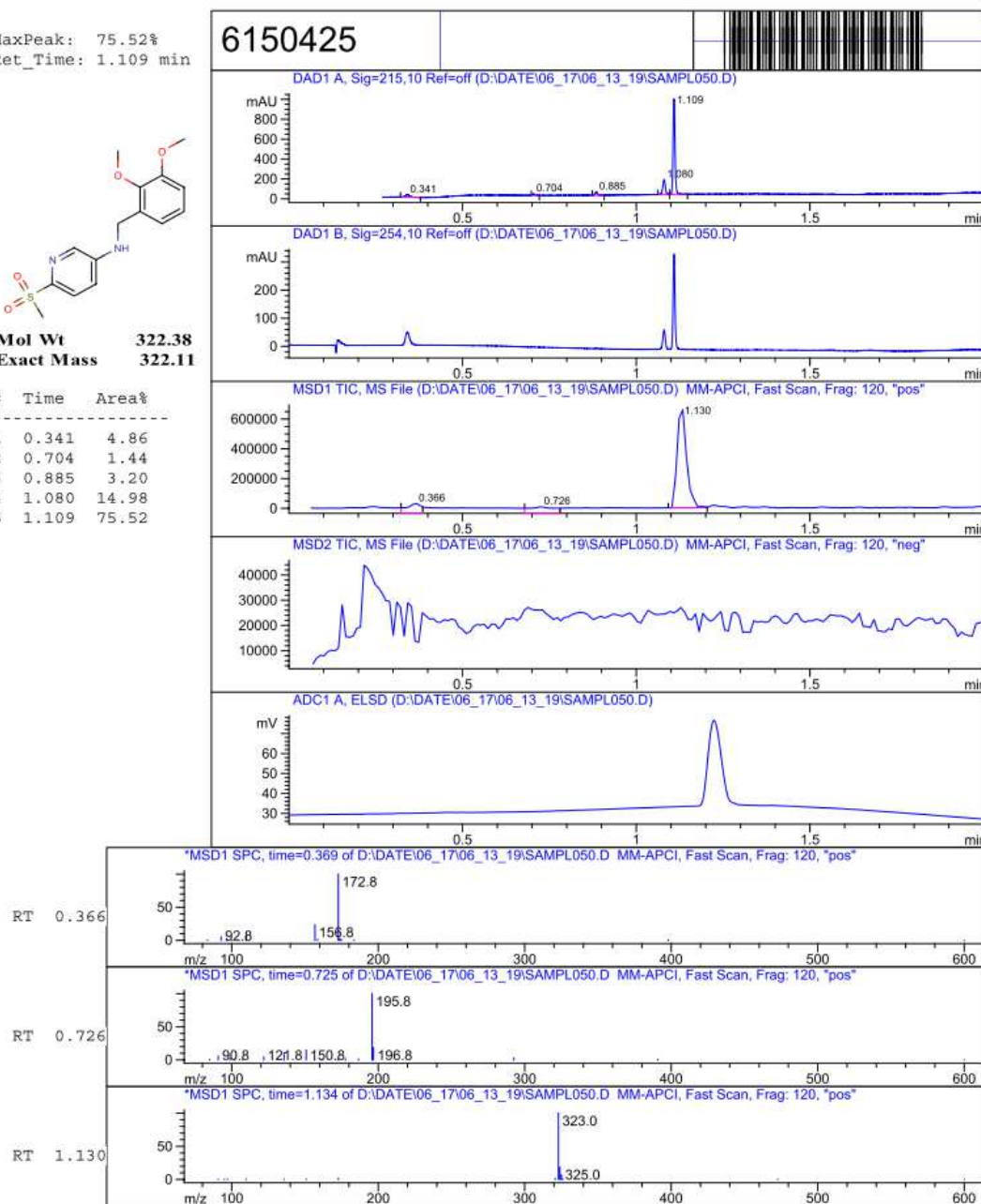
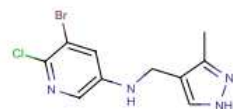


Figure S36. Entry 36, in Table 1: peaks were assigned to the starting amine (rt 0.34 min), the aldehyde (rt 1.08 min), and the product (rt 1.11 min).

MaxPeak: 79.93%
Ret_Time: 1.127 min



Mol Wt 301.57
Exact Mass 301.99

#	Time	Area%
1	1.000	15.07
2	1.043	4.99
3	1.127	79.93

6150738

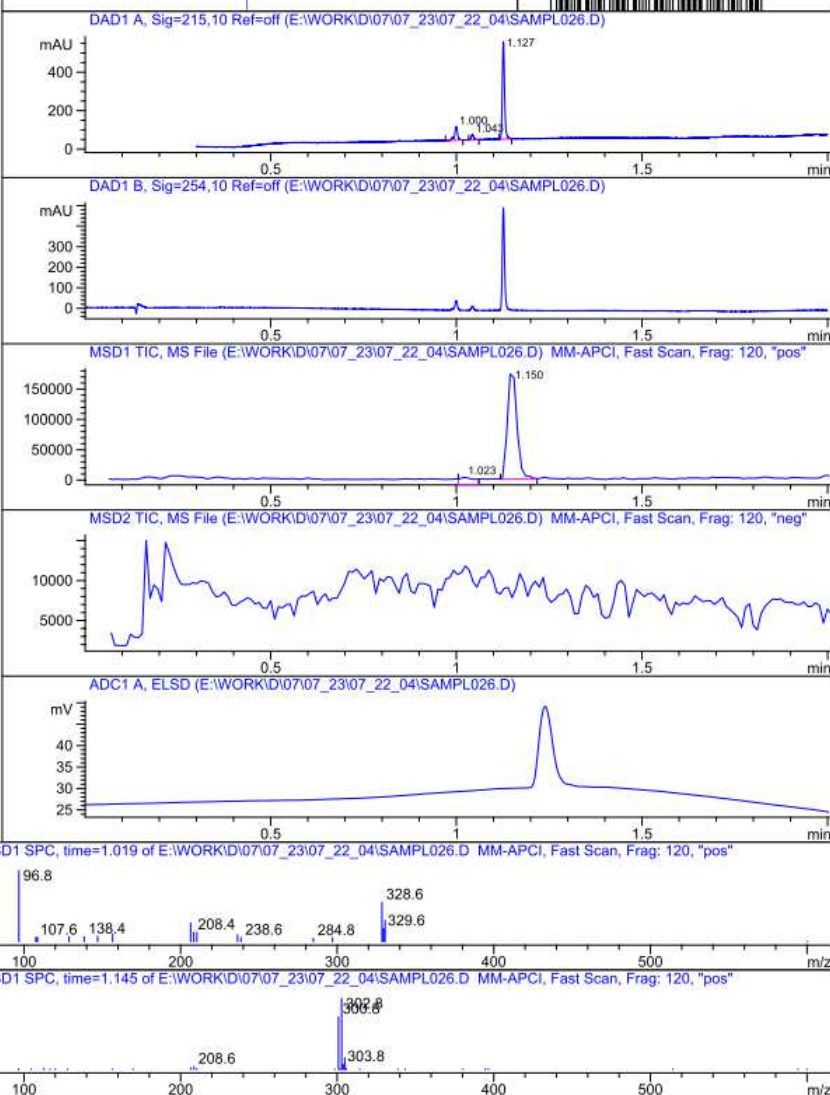
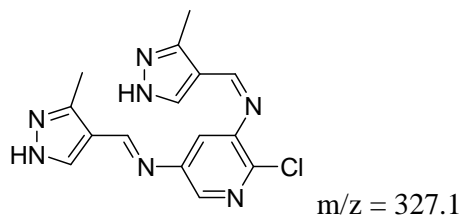
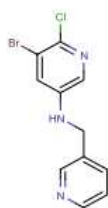


Figure S37. Entry 37, in Table 1: peaks were assigned to the side product (rt 1.00 min) and the product (rt 1.13 min).

Possible structure of the side product



MaxPeak: 77.86%
Ret_Time: 0.901 min



Mol Wt 298.57
Exact Mass 298.98

#	Time	Area%
1	0.901	77.86
2	0.988	22.14

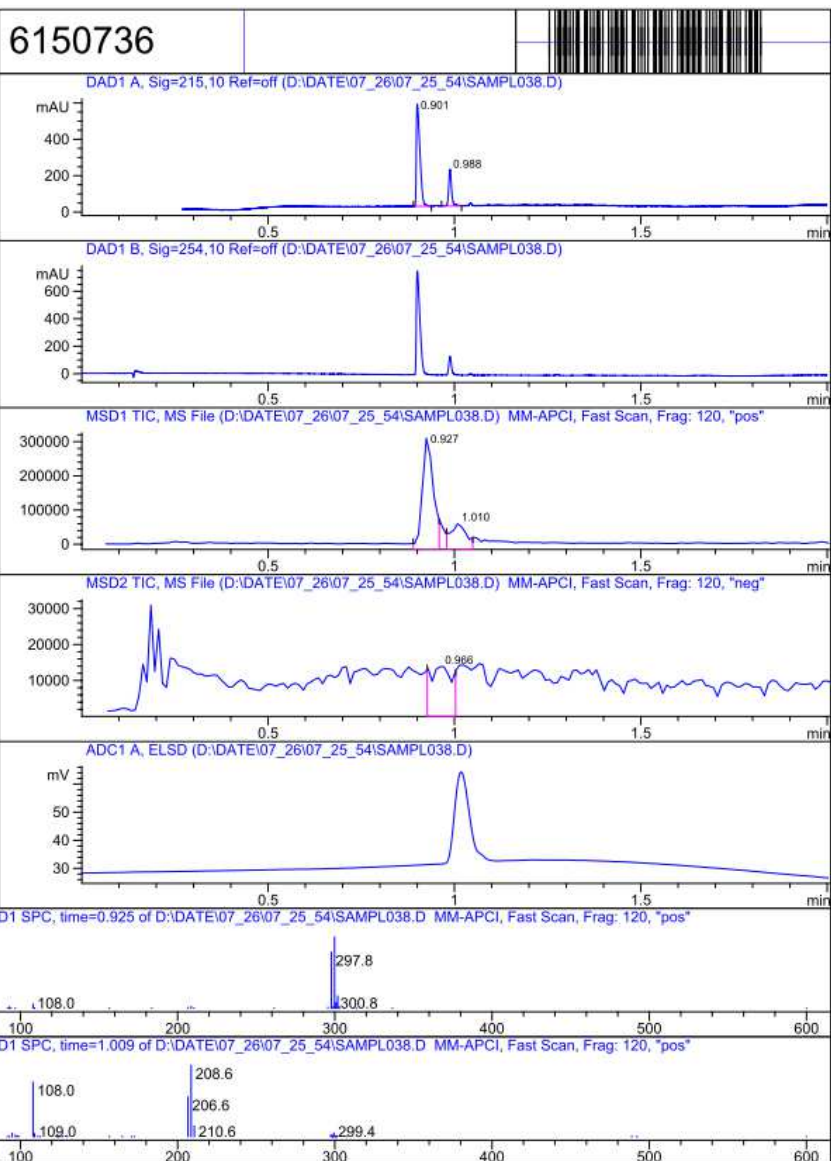
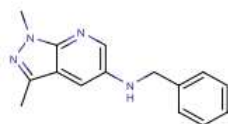


Figure S38. Entry 38, in Table 1: peaks were assigned to the product (rt 0.90 min) and the starting amine (rt 0.99 min).

MaxPeak: 46.42%
Ret_Time: 1.164 min



Mol Wt 252.31
Exact Mass 252.16

#	Time	Area%
1	0.579	35.85
2	0.766	9.17
3	0.842	8.56
4	1.164	46.42

6150439

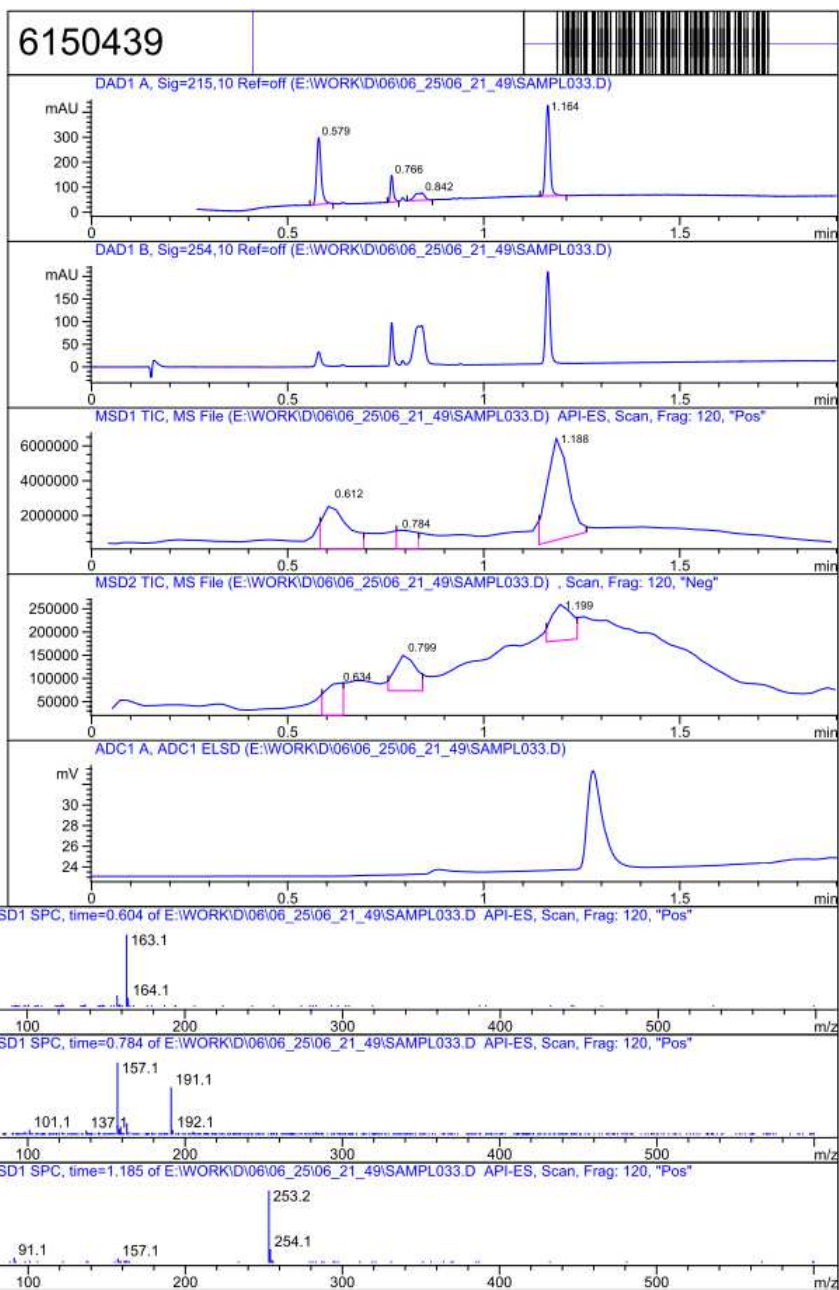
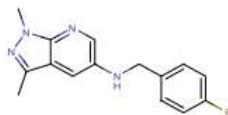


Figure S39. Entry 39, in Table 1: peaks were assigned to the starting amine (rt 0.61 min), the acylated starting amine (rt 0.77 min), the aldehyde (rt 0.84 min), and the product (rt 1.16 min).

MaxPeak: 44.41%
Ret_Time: 0.581 min



Mol Wt 270.3
Exact Mass 270.15

#	Time	Area%
1	0.581	44.41
2	0.766	4.30
3	0.878	18.31
4	1.185	32.98

6150436

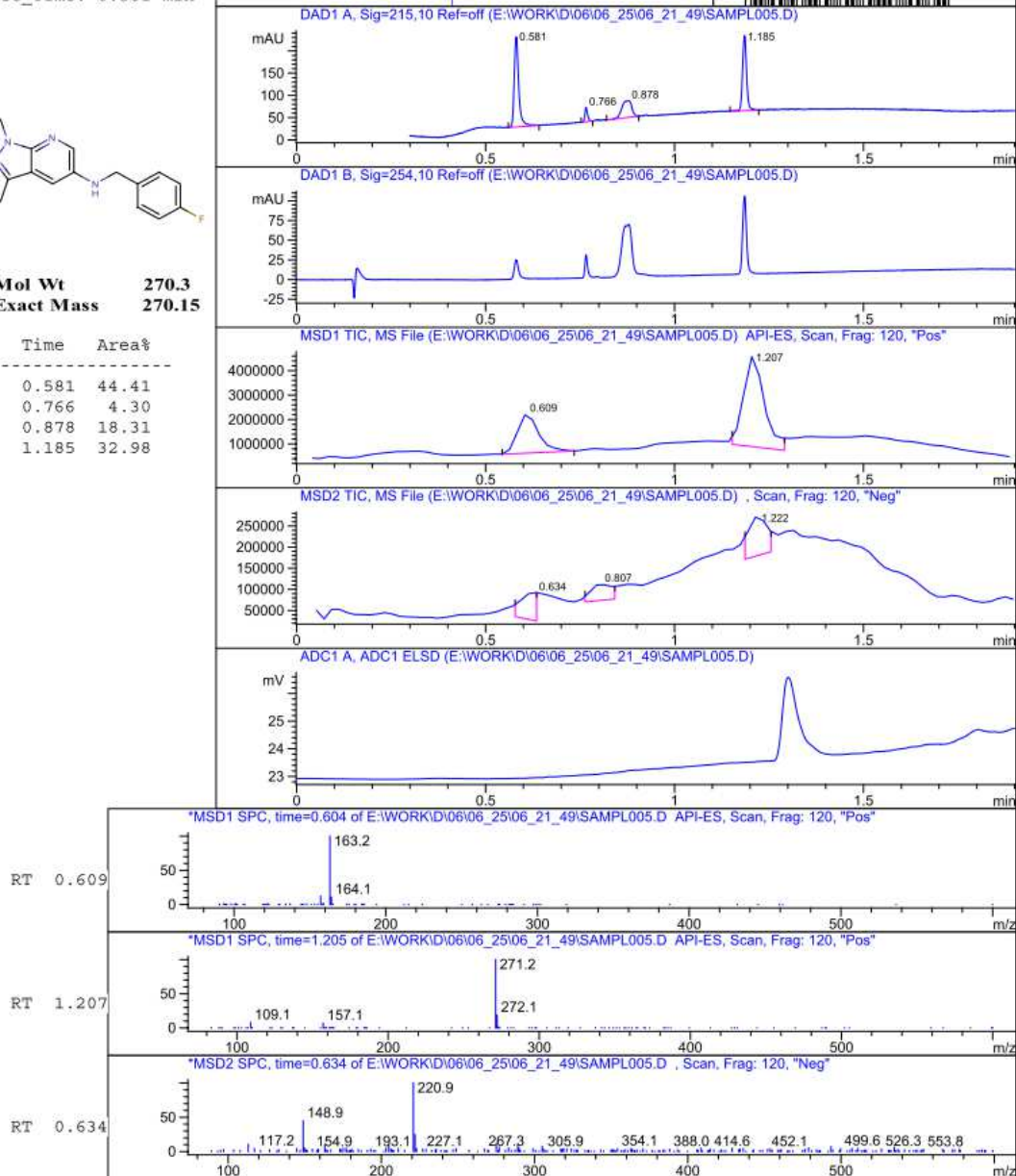
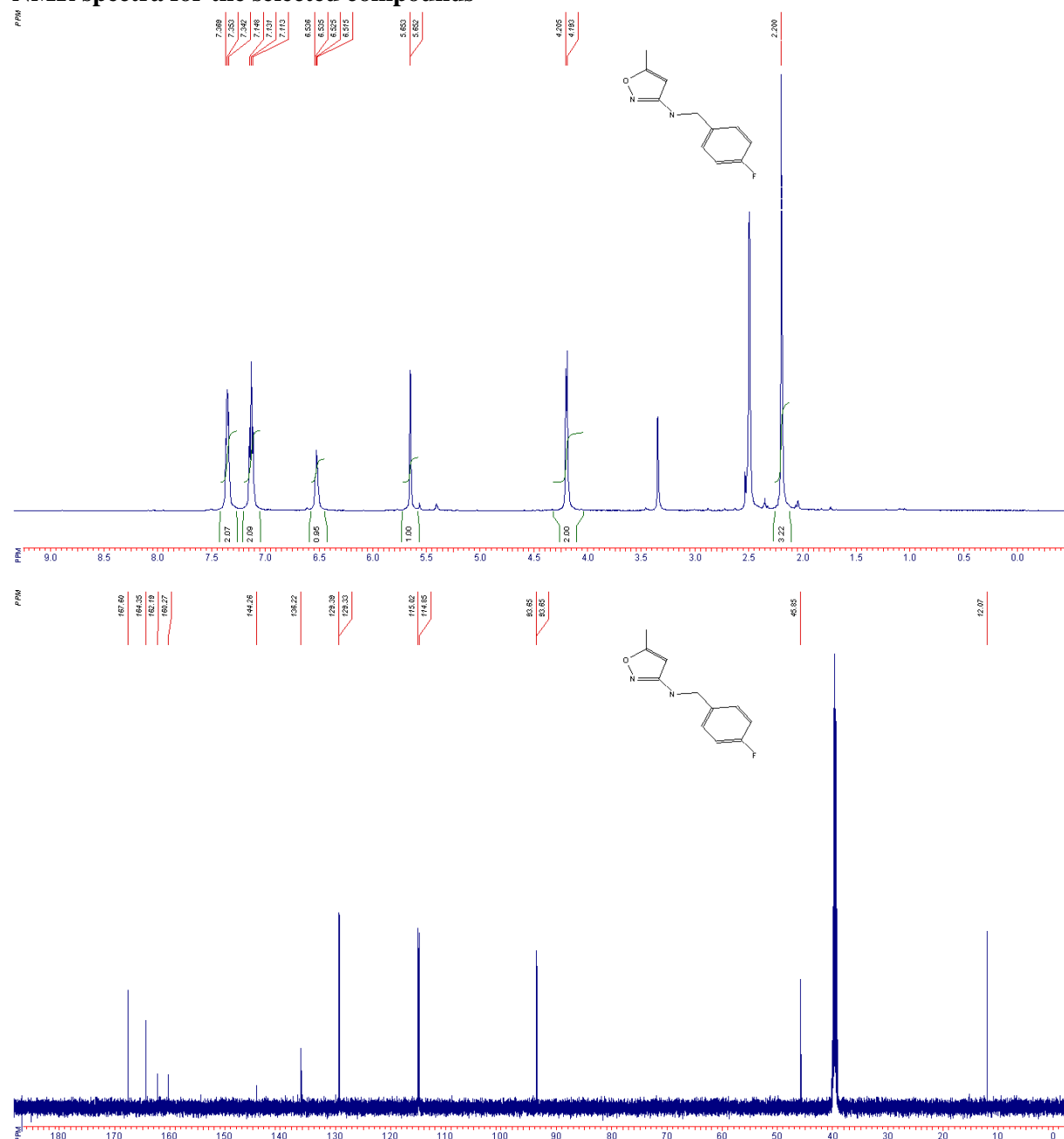
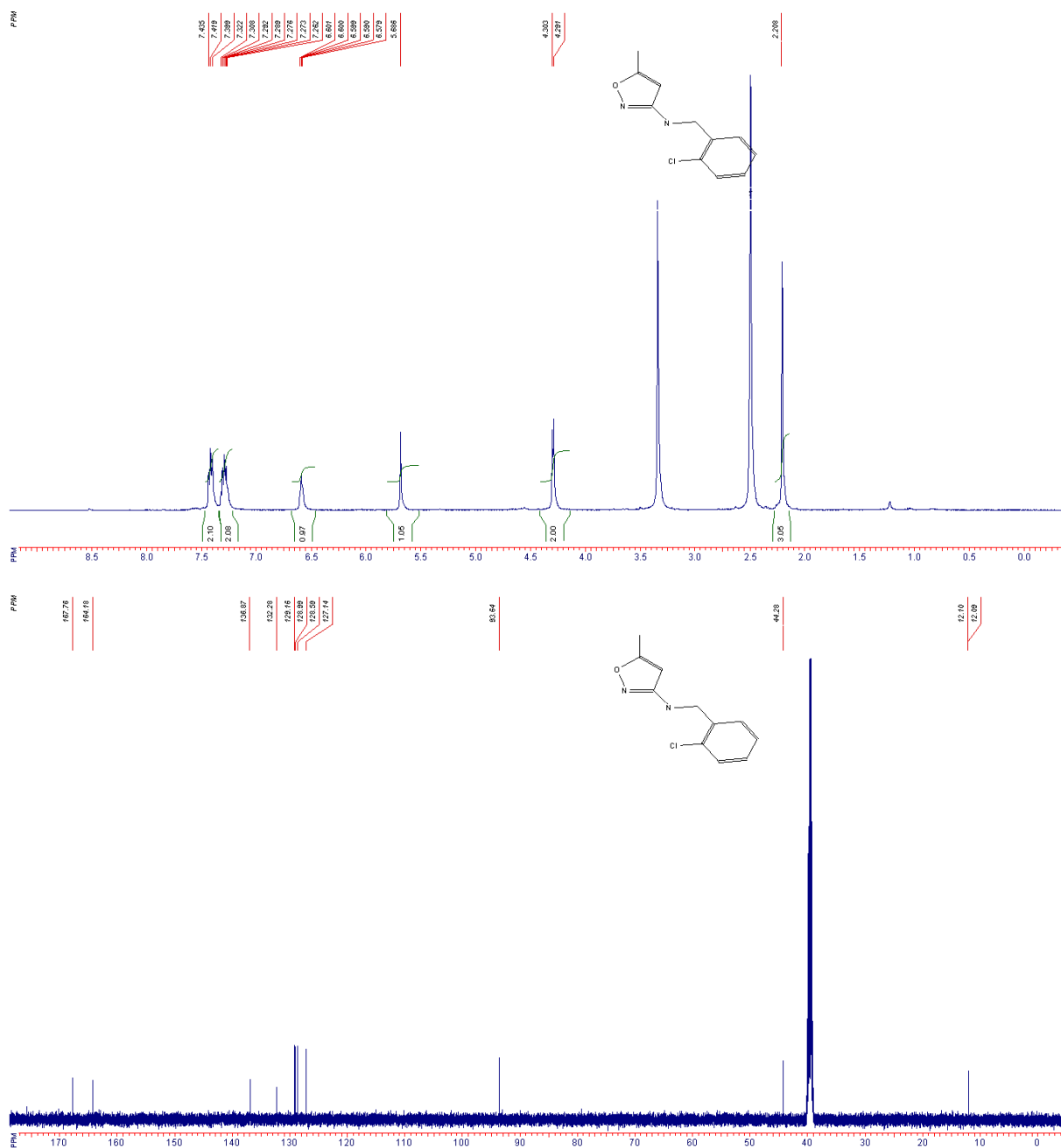


Figure S40. Entry 40, in Table 1: peaks were assigned to the starting amine (rt 0.58 min), the aldehyde (rt 0.88 min), and the product (rt 1.19g min).

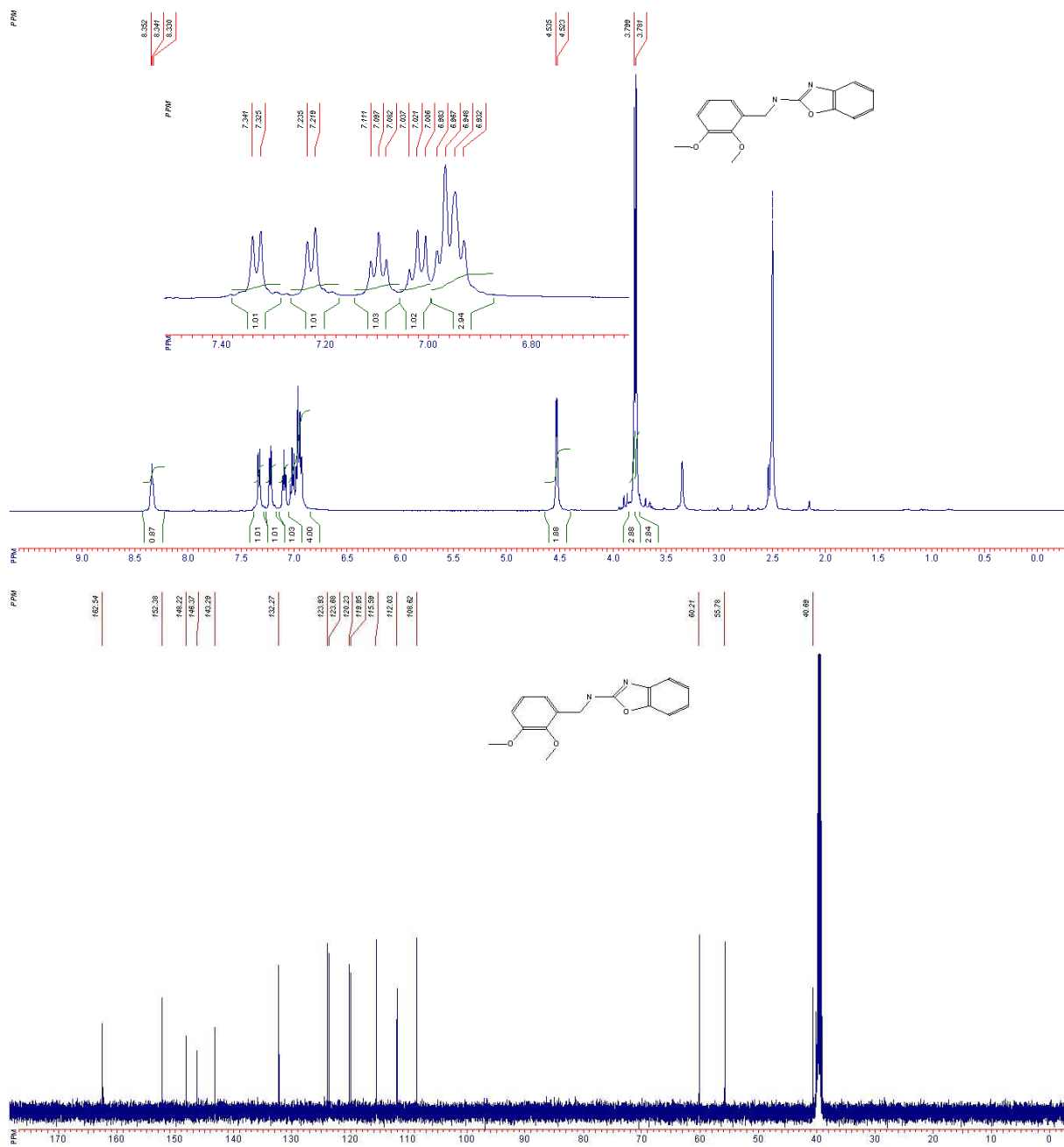
NMR spectra for the selected compounds



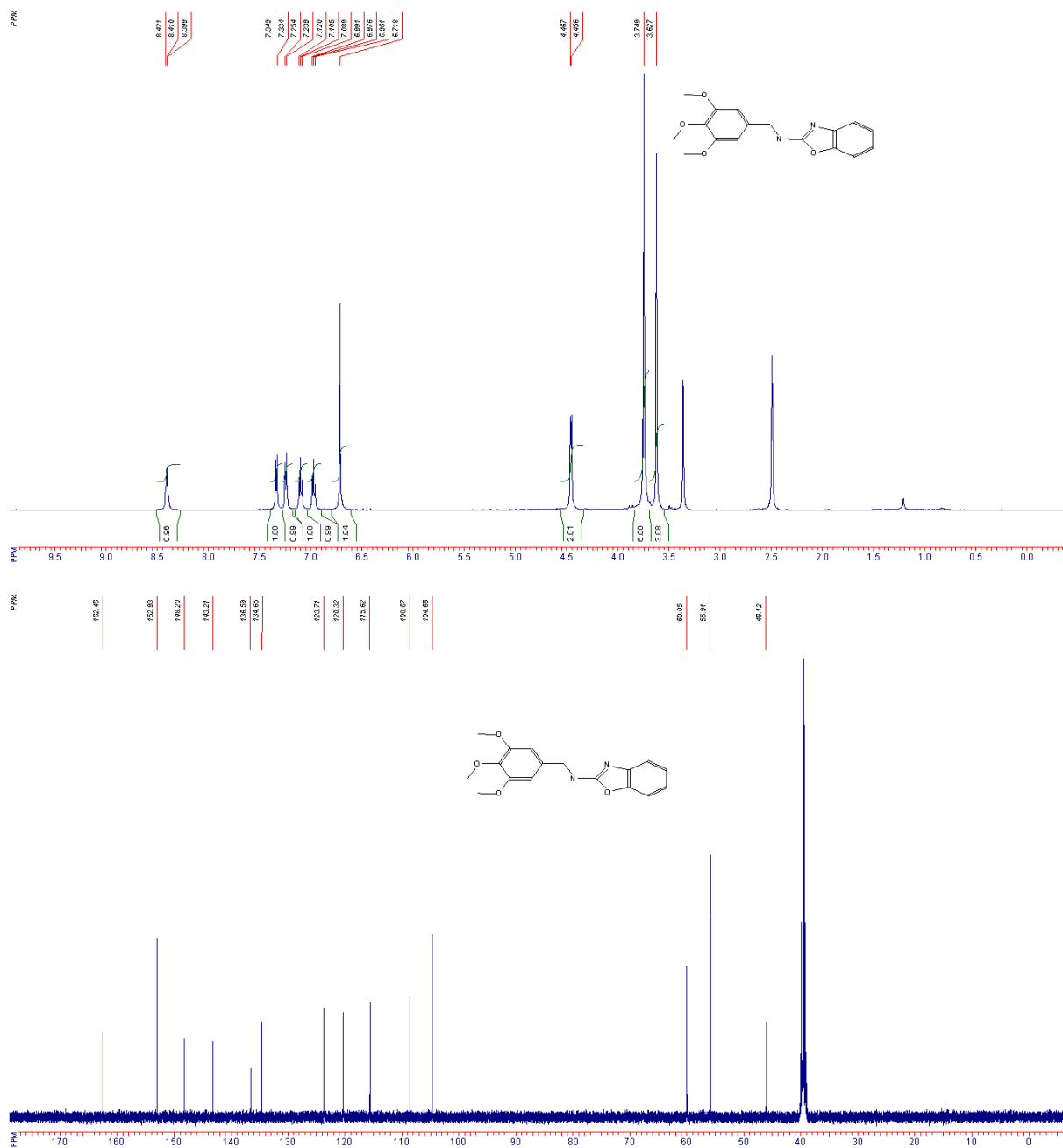
Entry 1, in Table 1



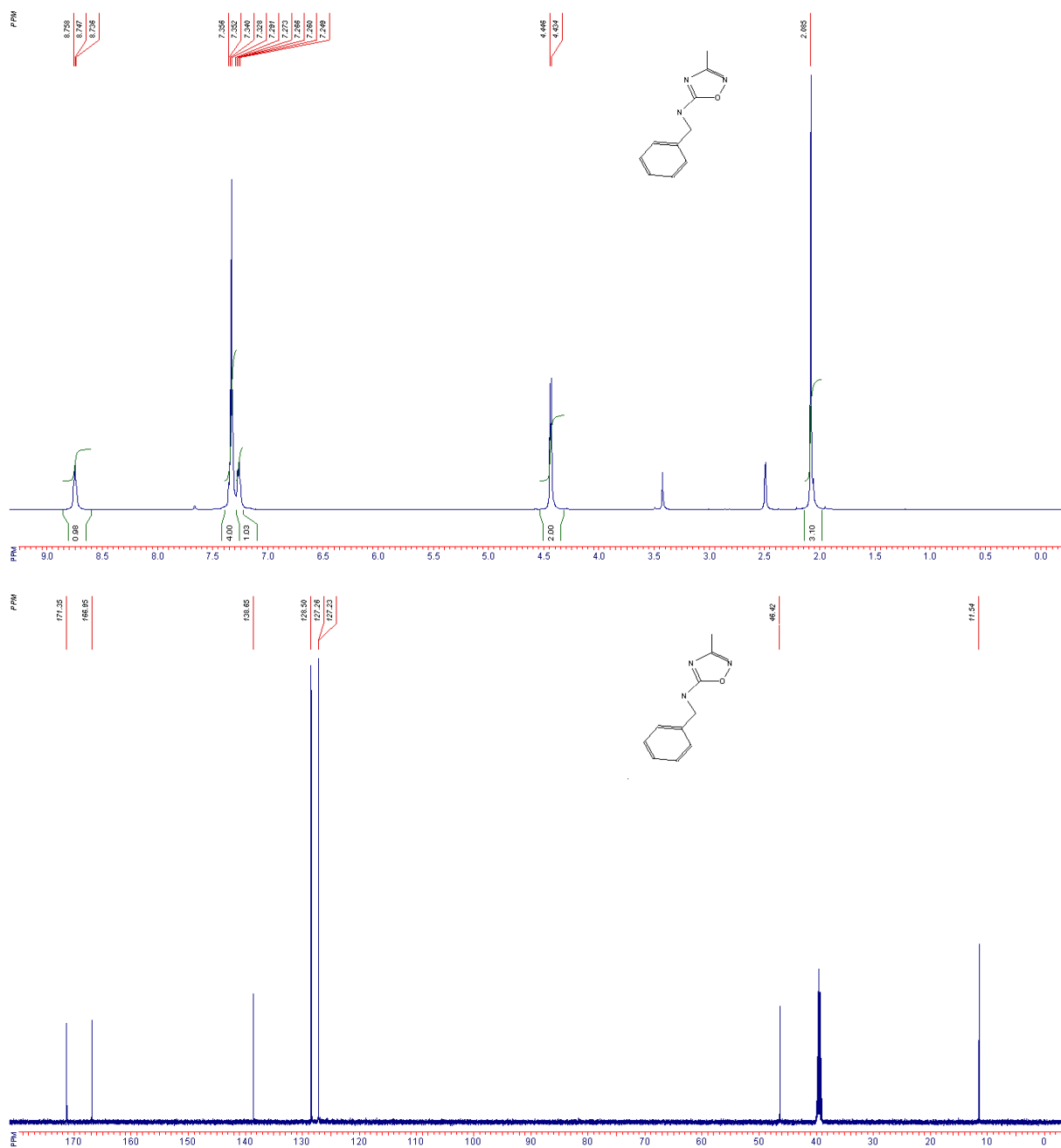
Entry 2, in Table 1



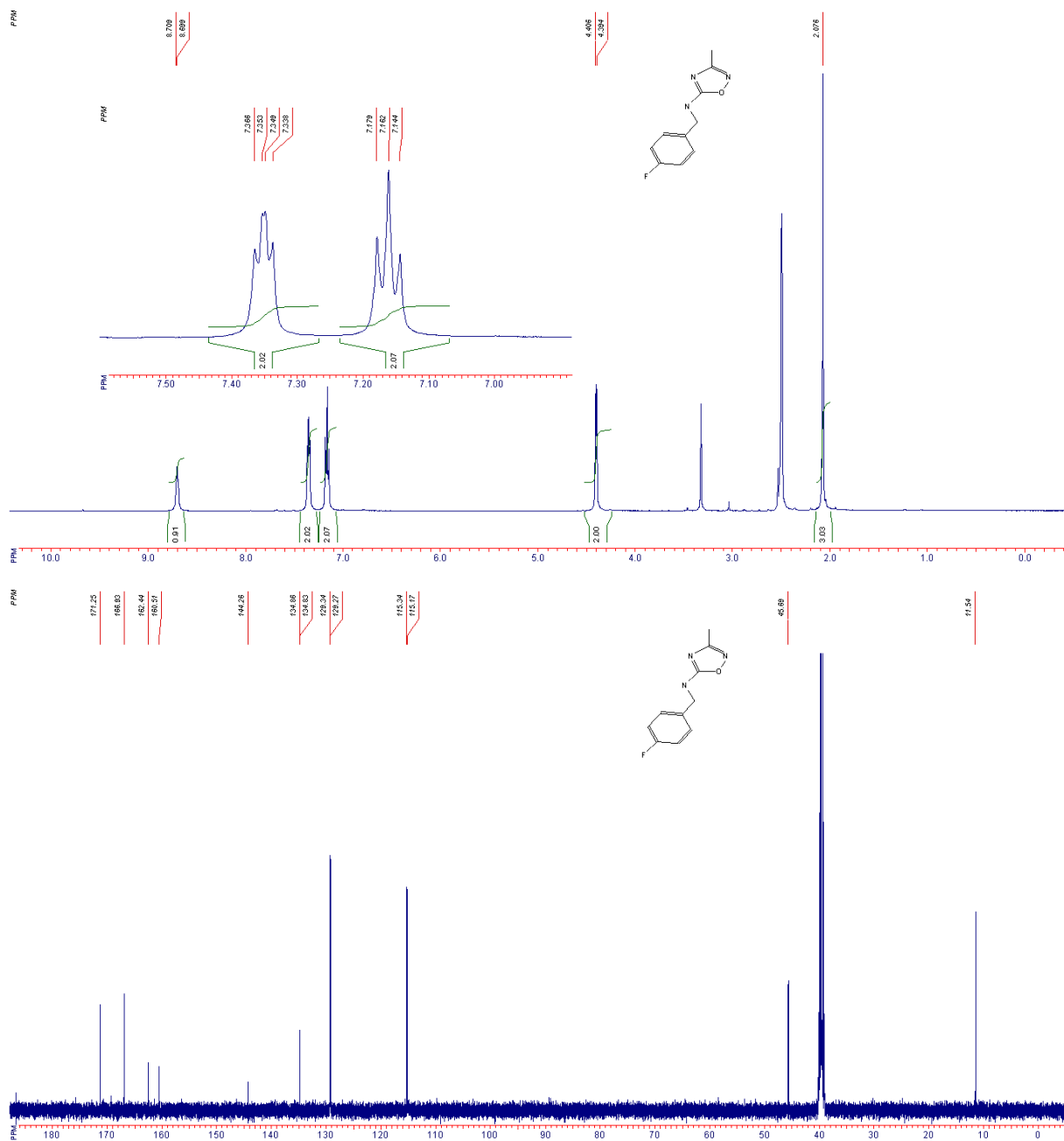
Entry 3, in Table 1



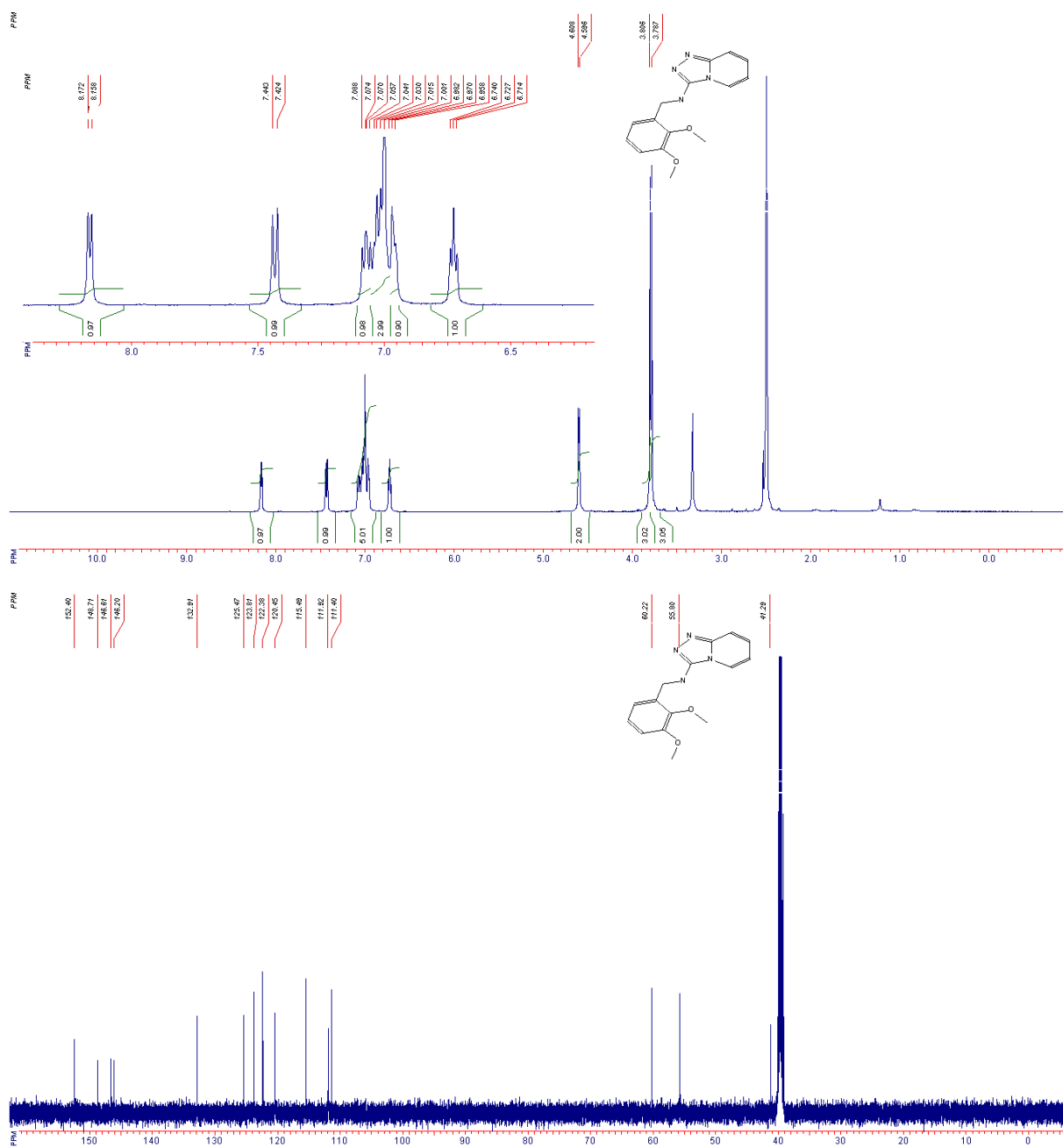
Entry 4, in Table 1



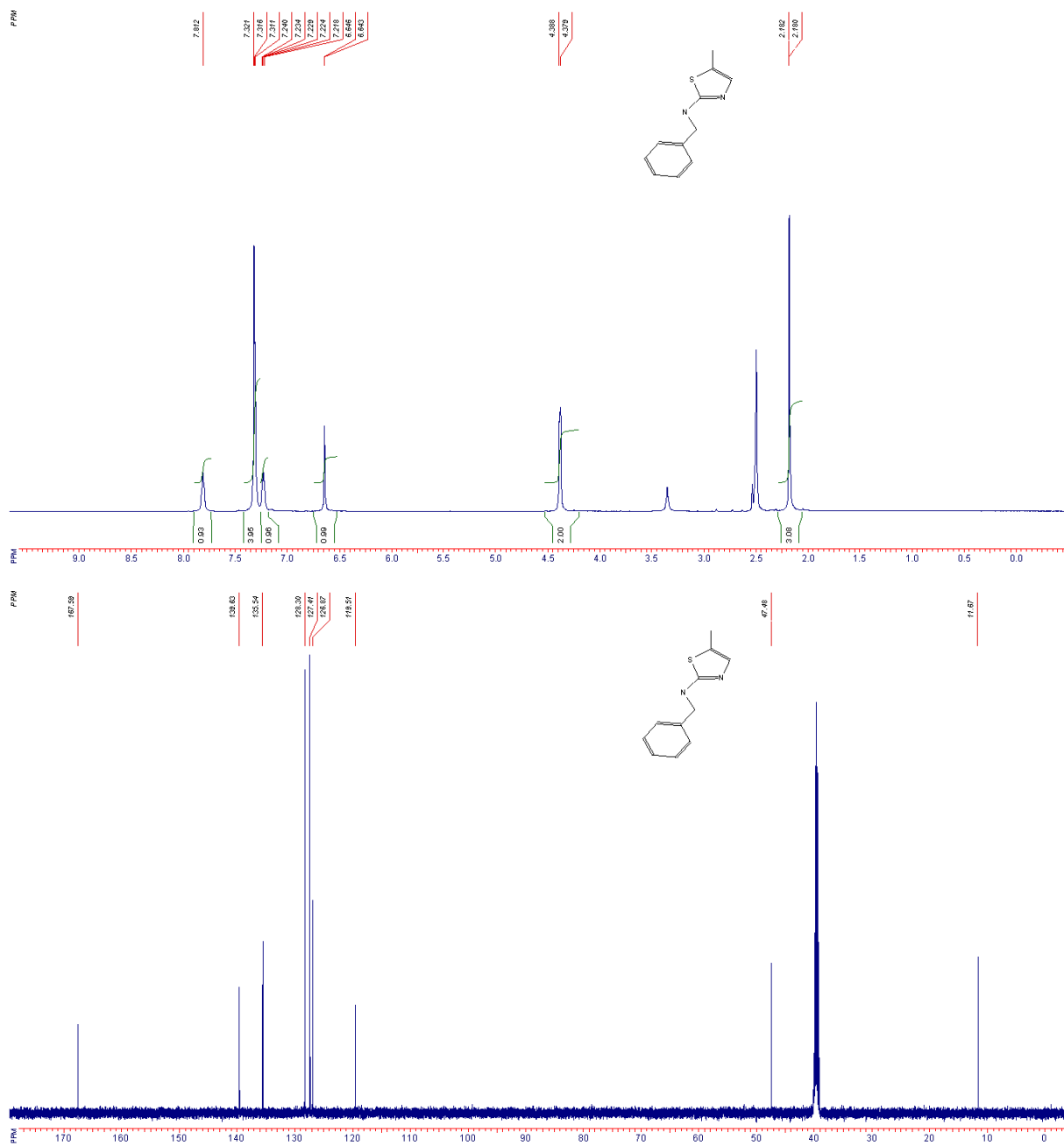
Entry 5, in Table 1



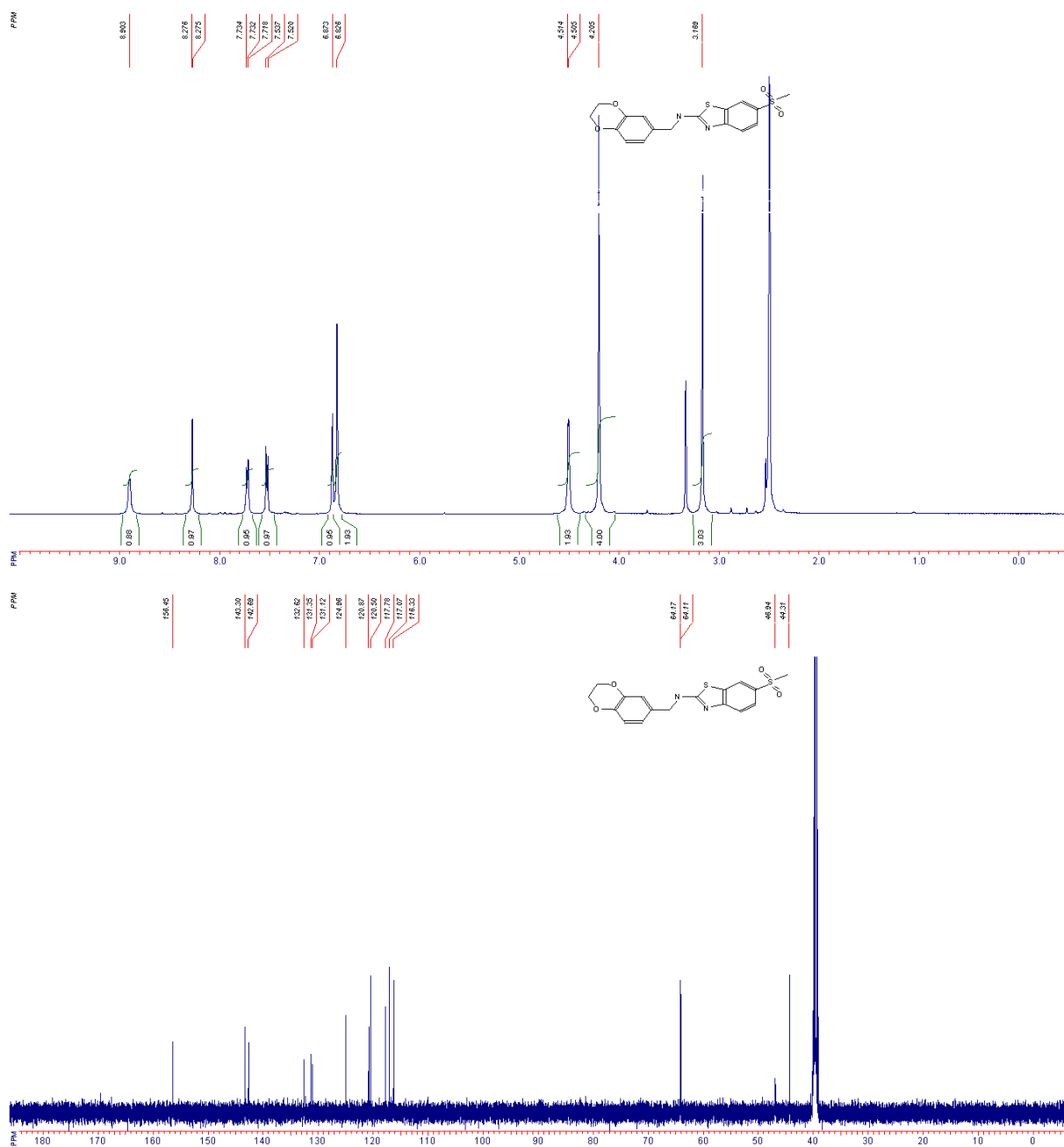
Entry 6, in Table 1



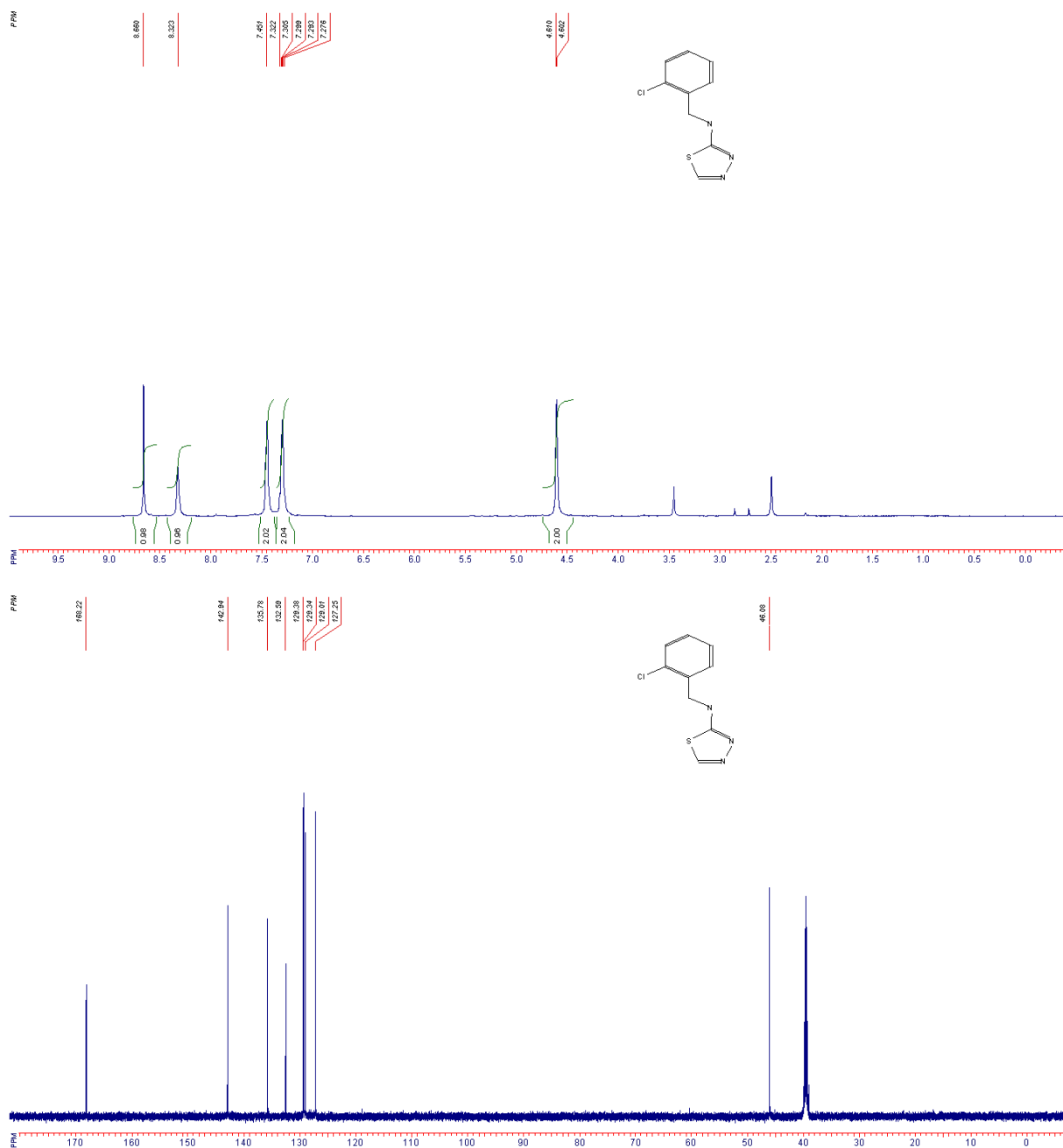
Entry 11, in Table 1



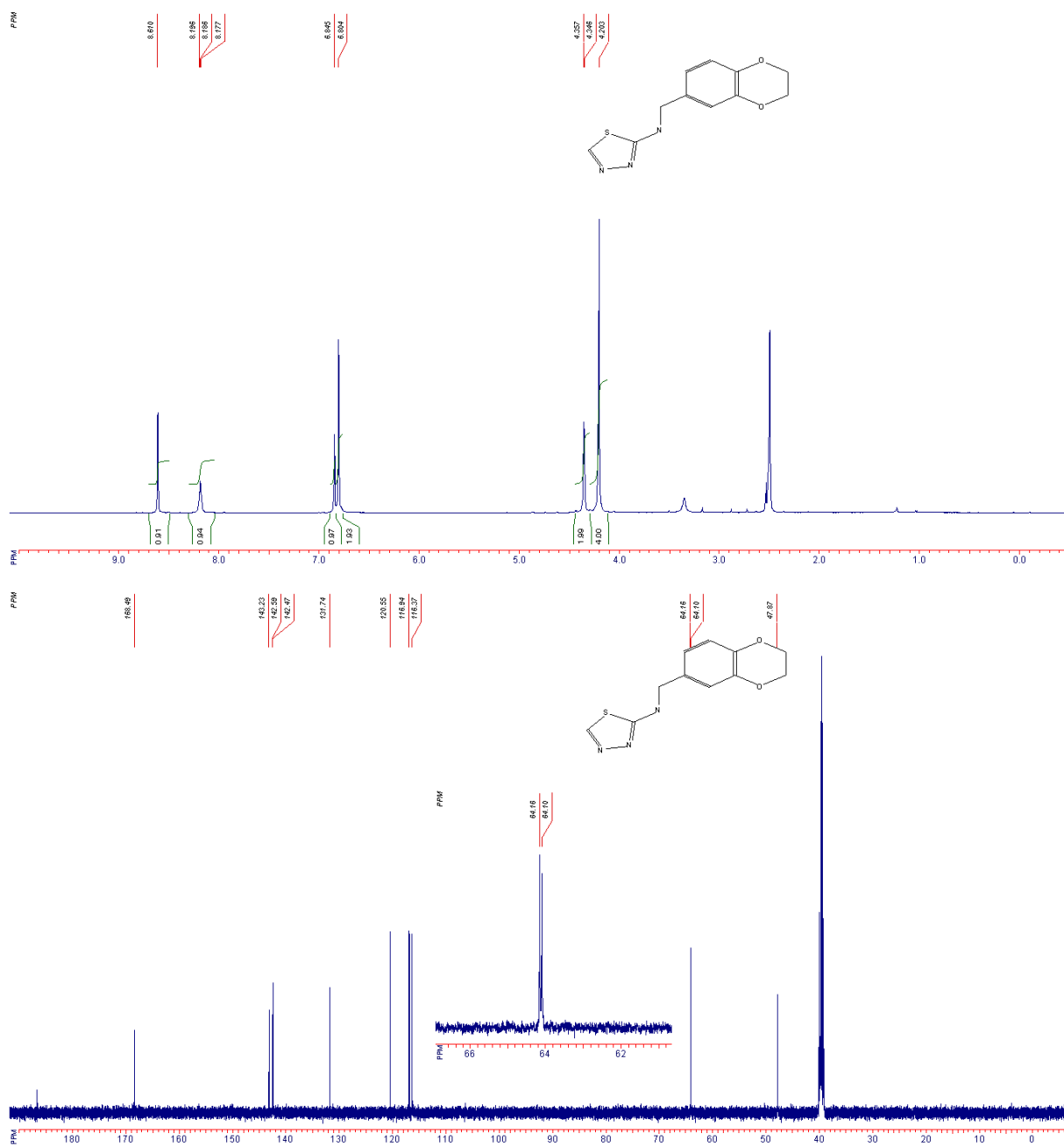
Entry 13, in Table 1



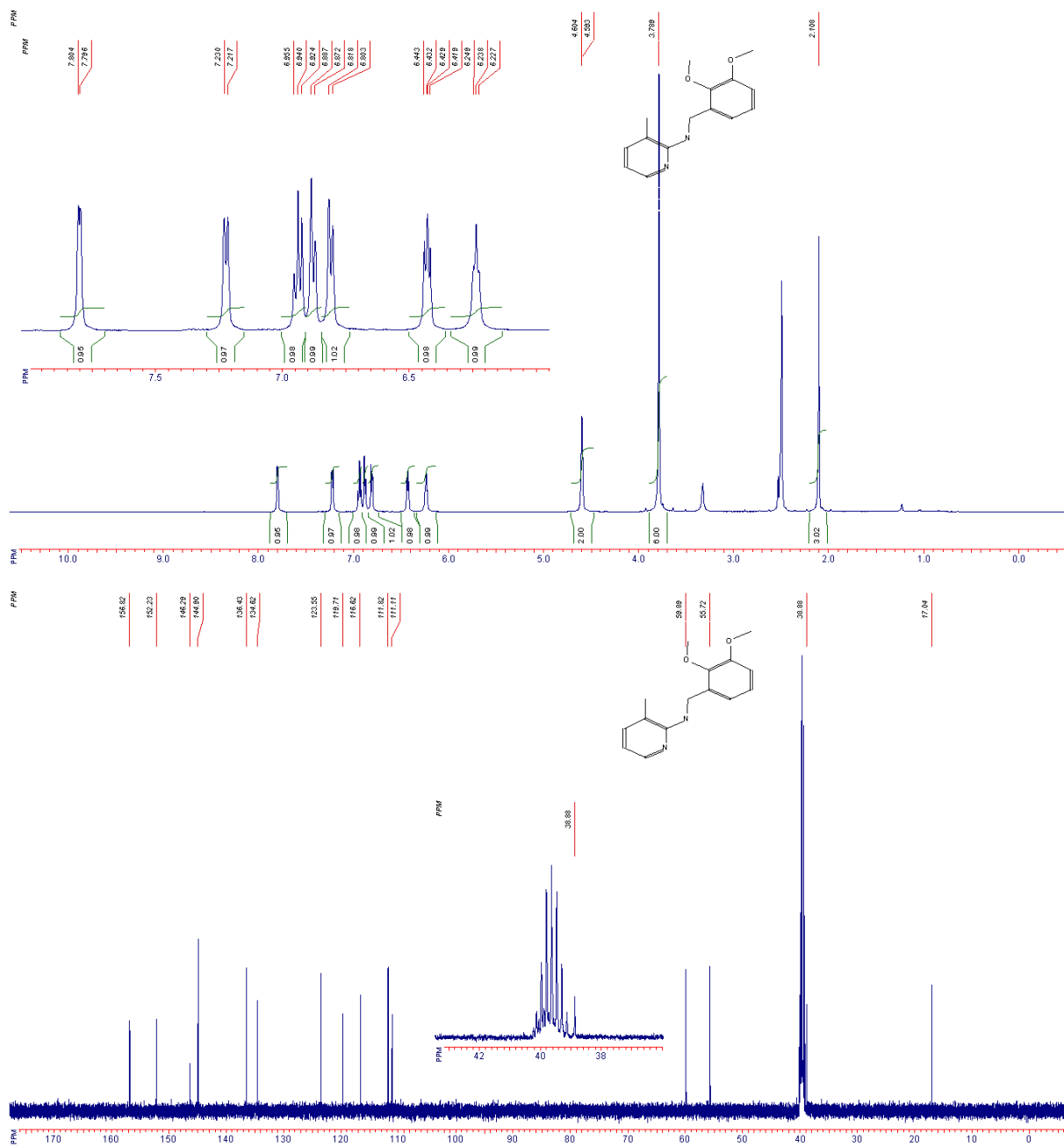
Entry 15, in Table 1



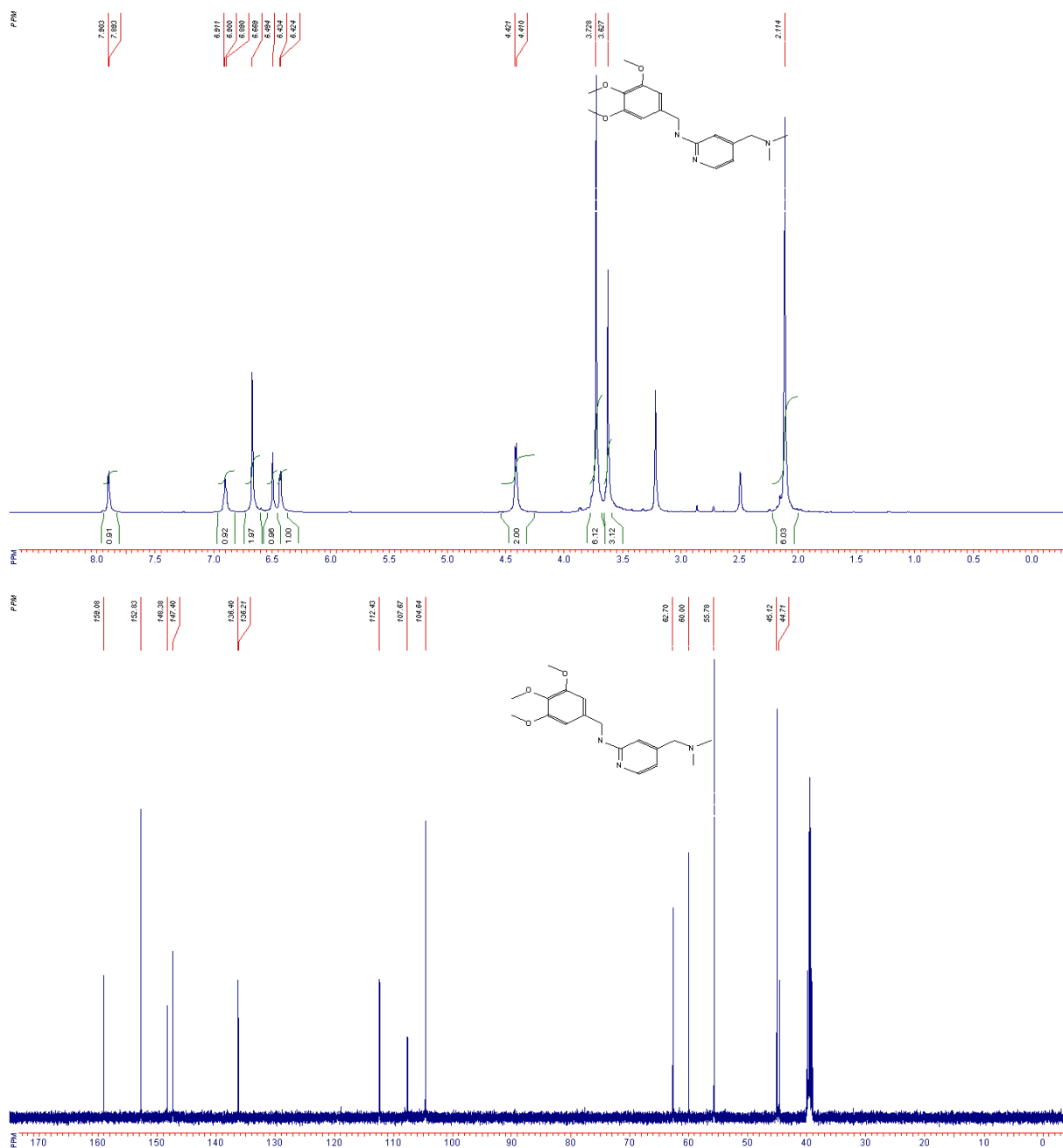
Entry 17, in Table 1



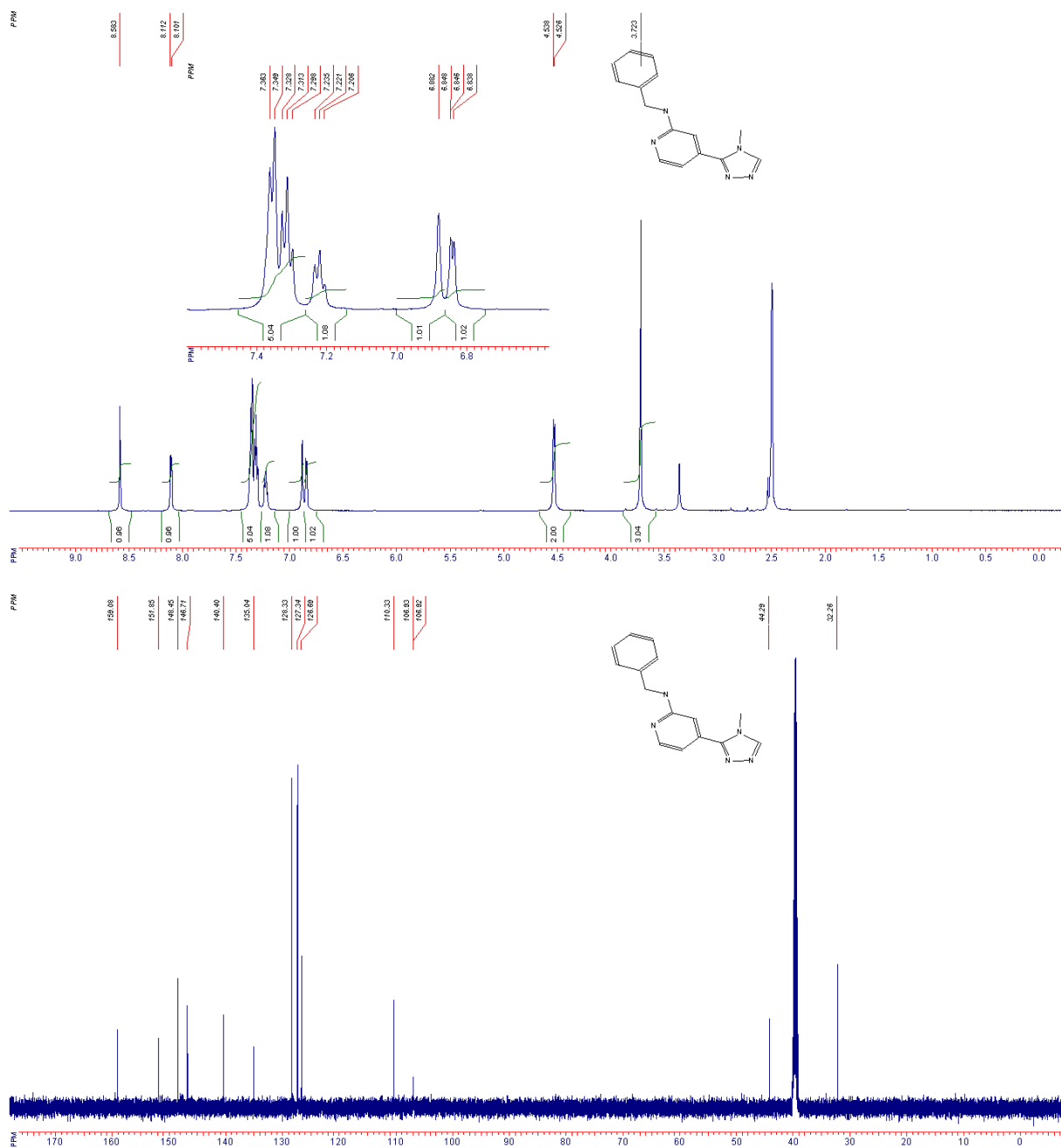
Entry 18, in Table 1



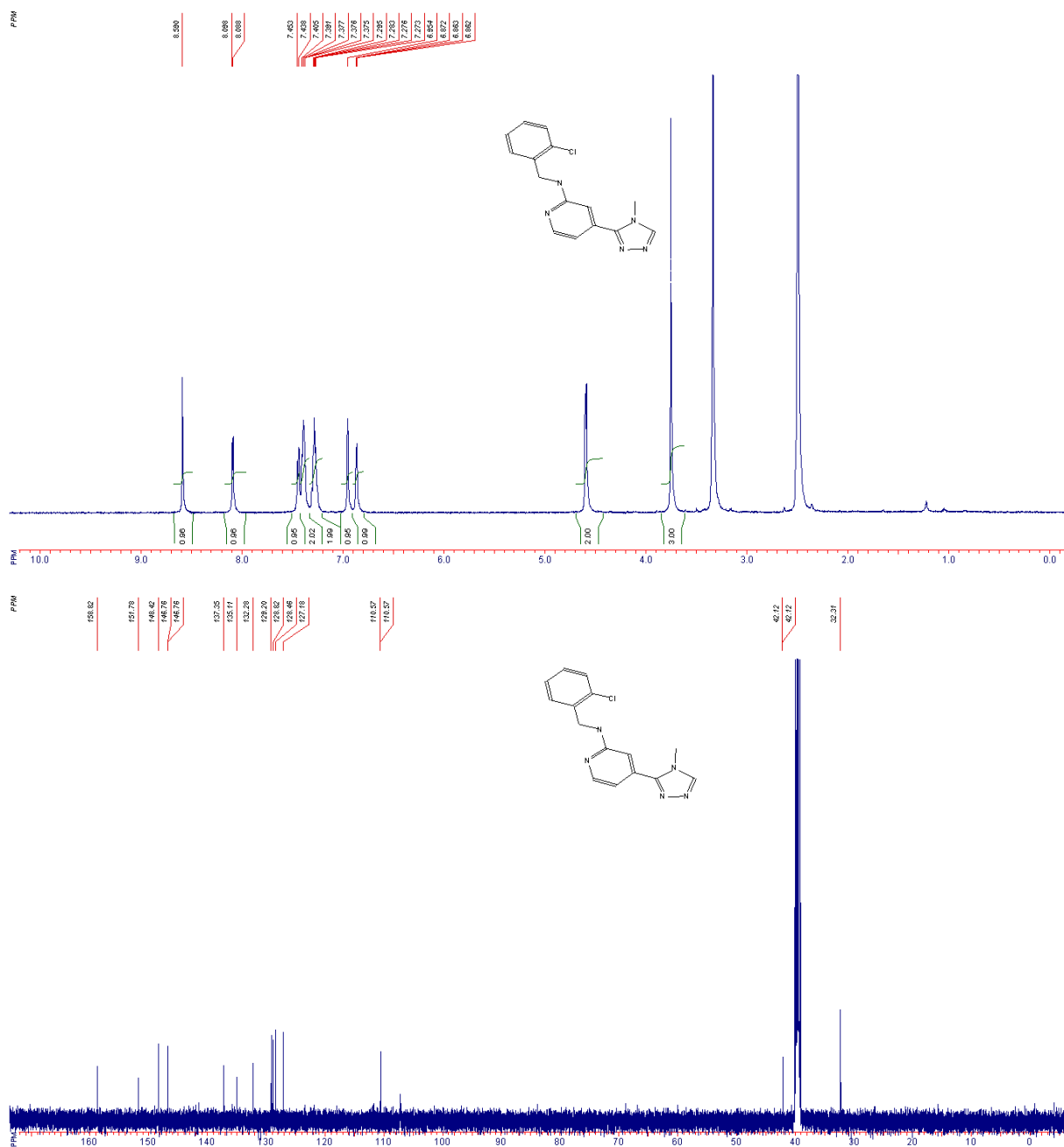
Entry 19, in Table 1



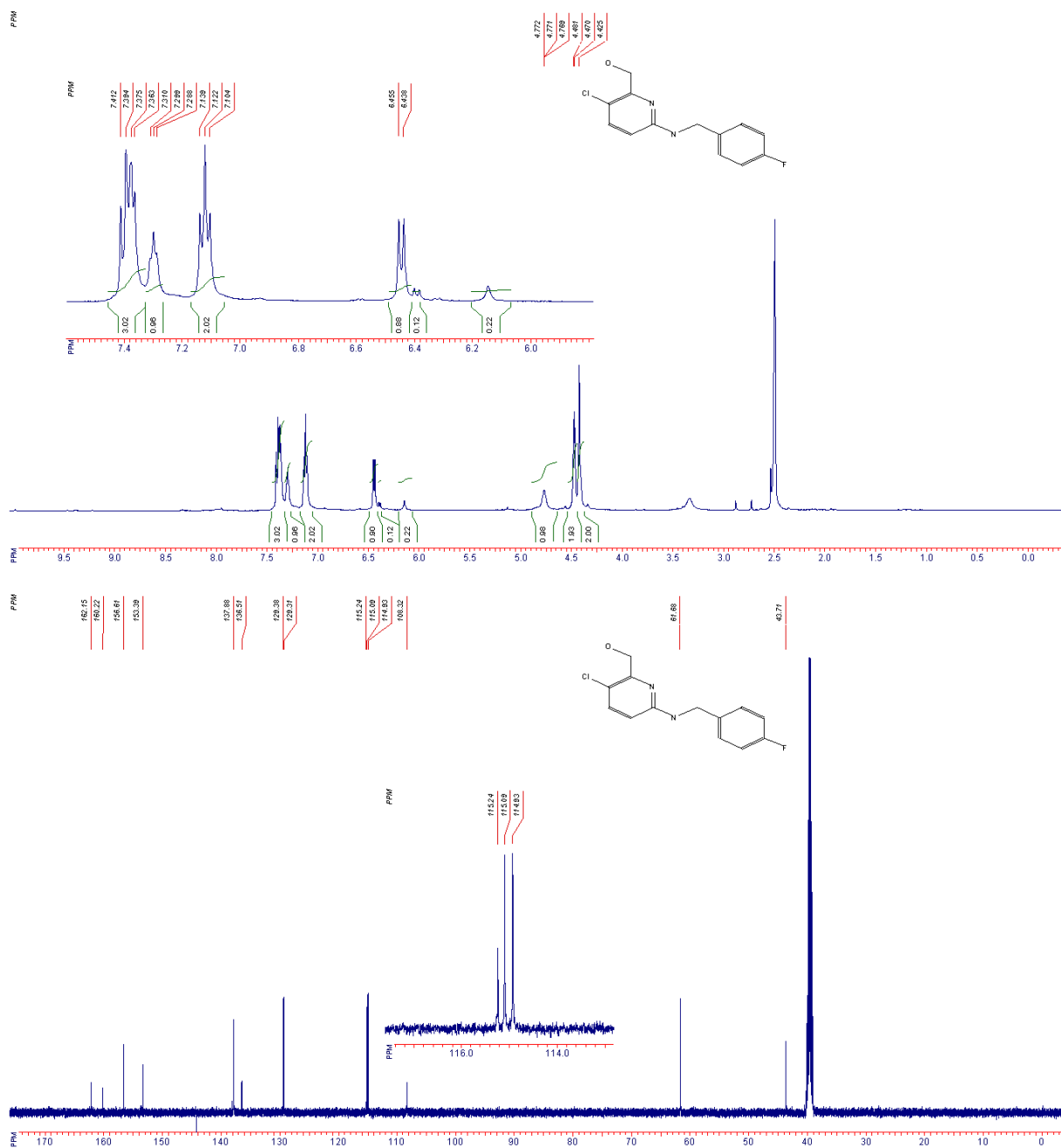
Entry 22, in Table 1



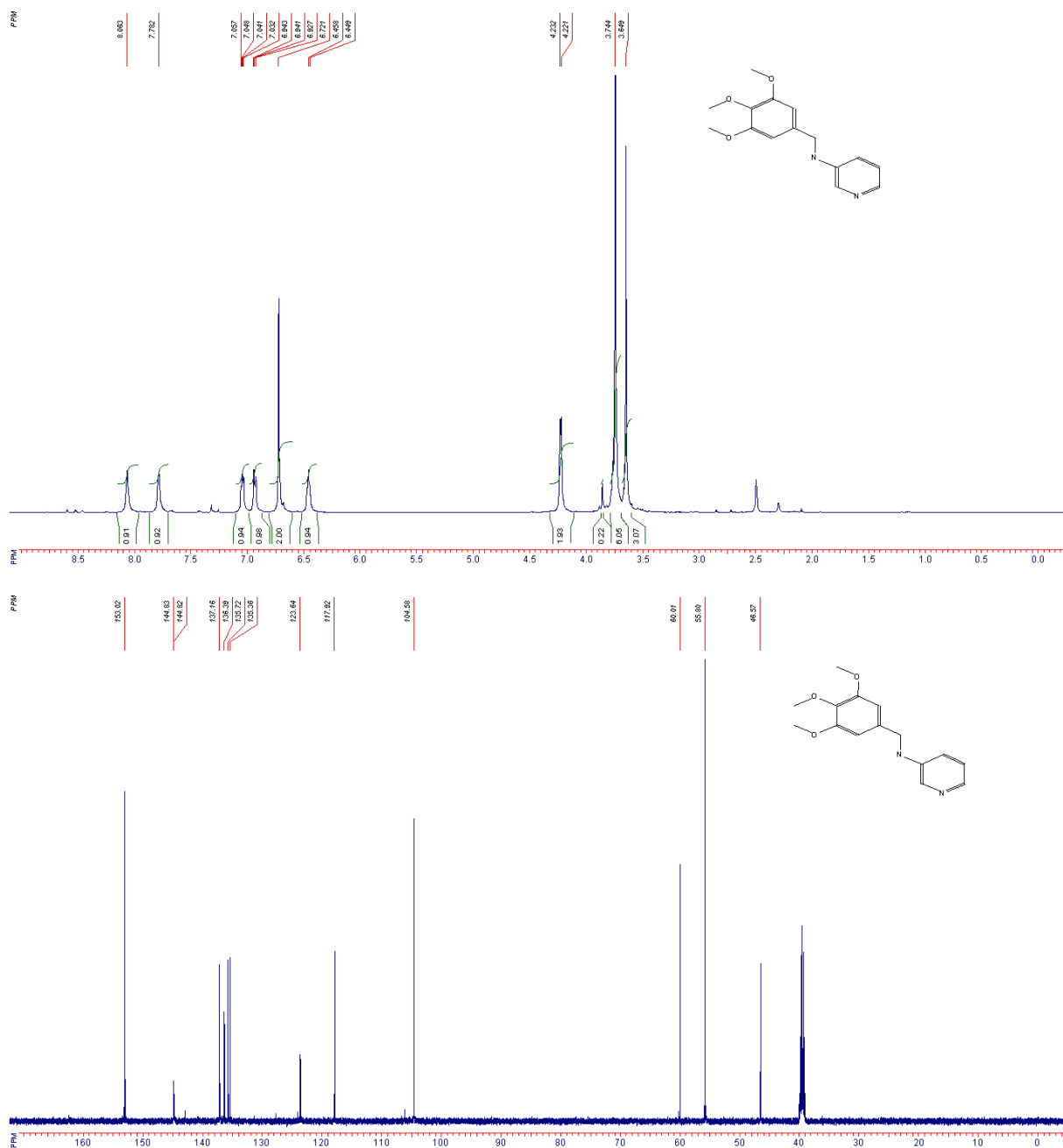
Entry 23, in Table 1



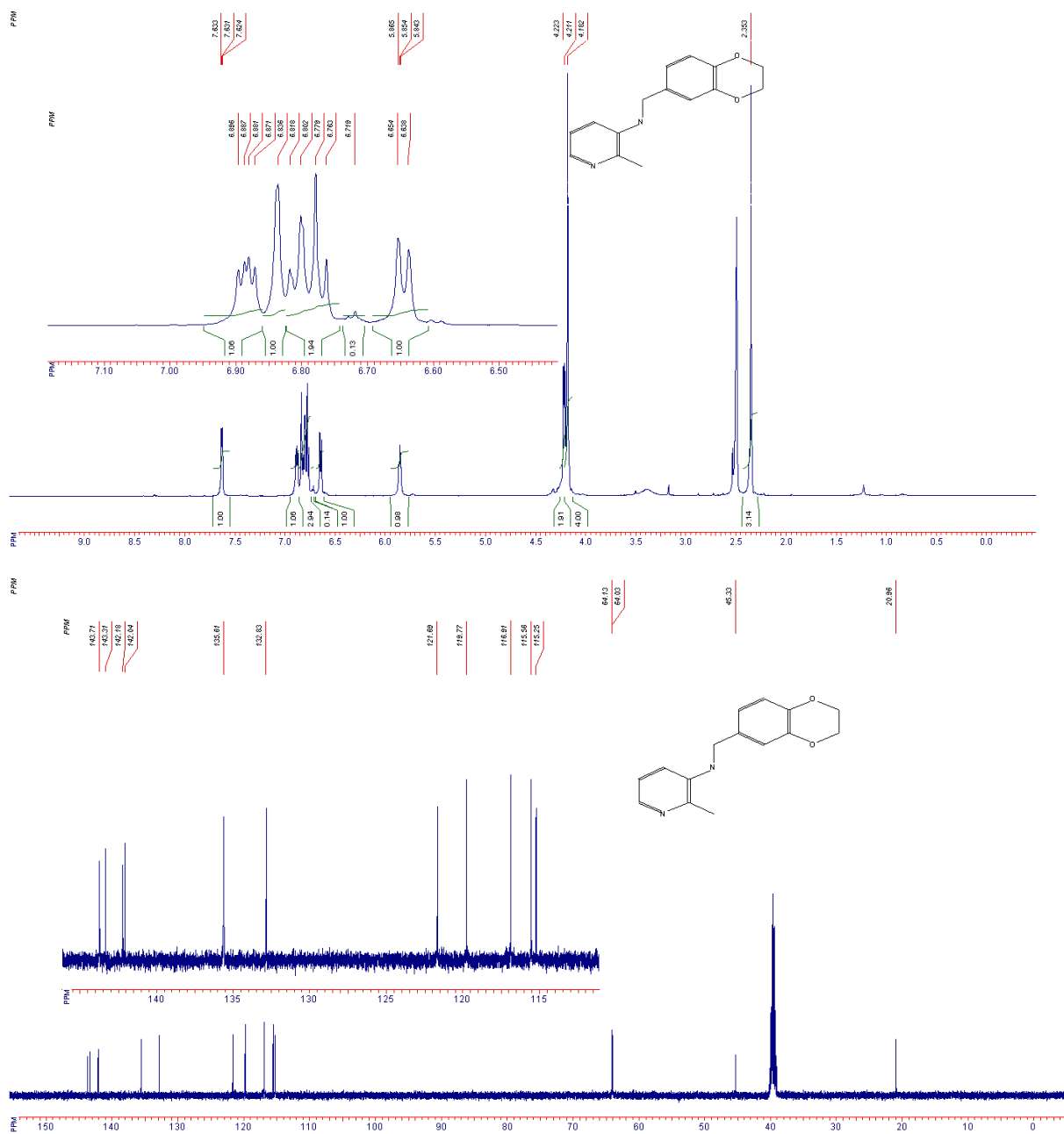
Entry 24, in Table 1



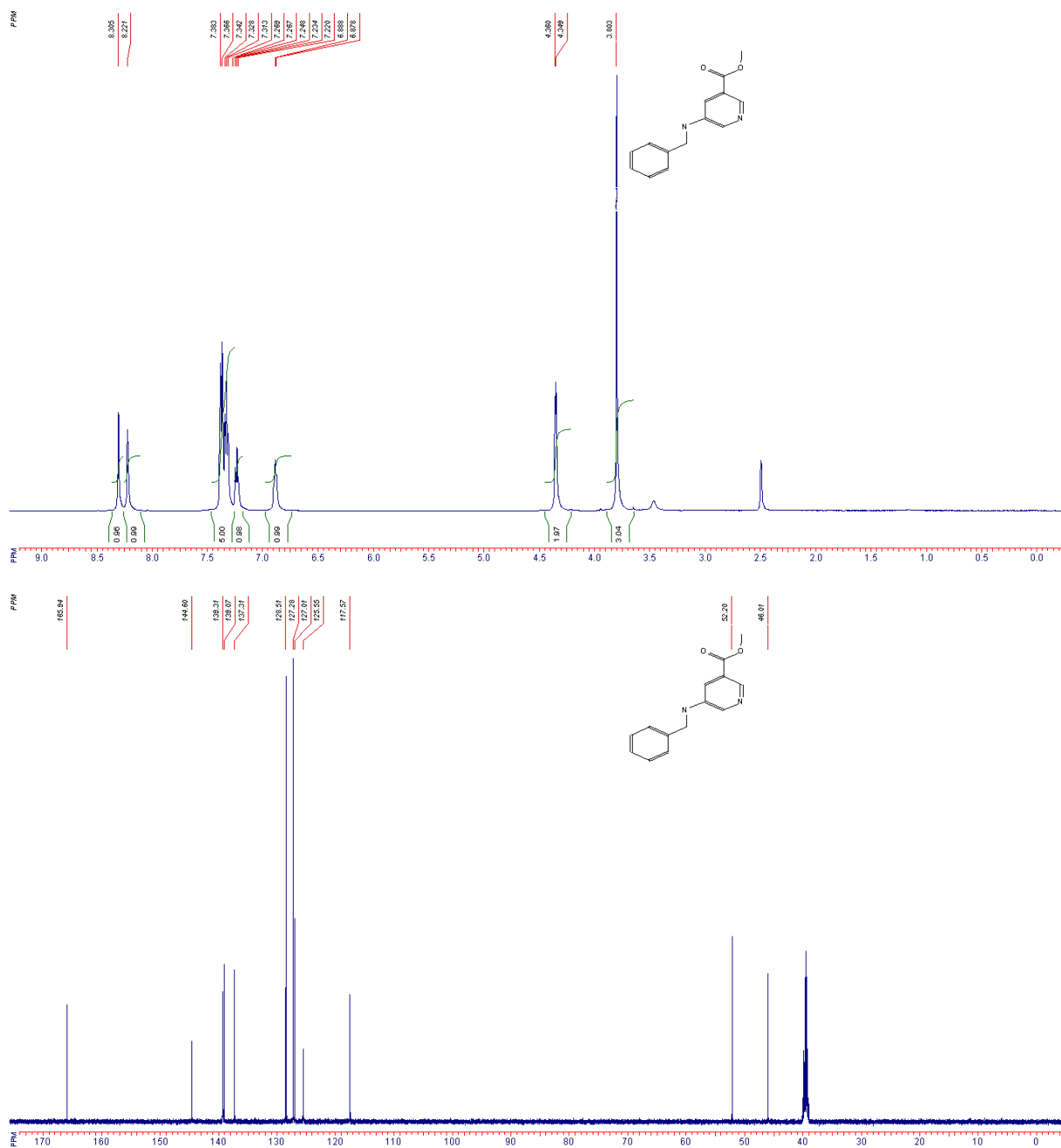
Entry 27, in Table 1



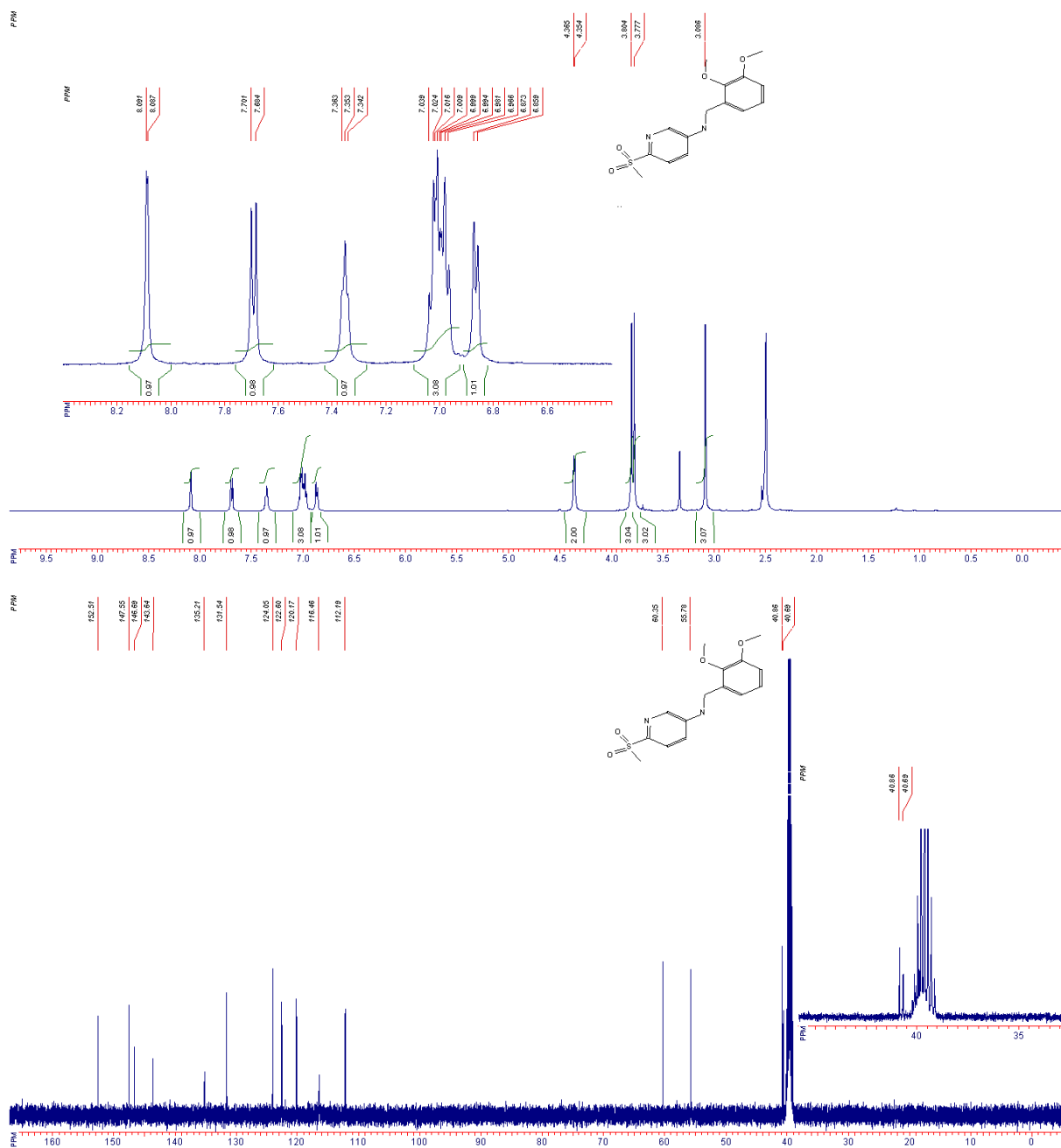
Entry 30, in Table 1



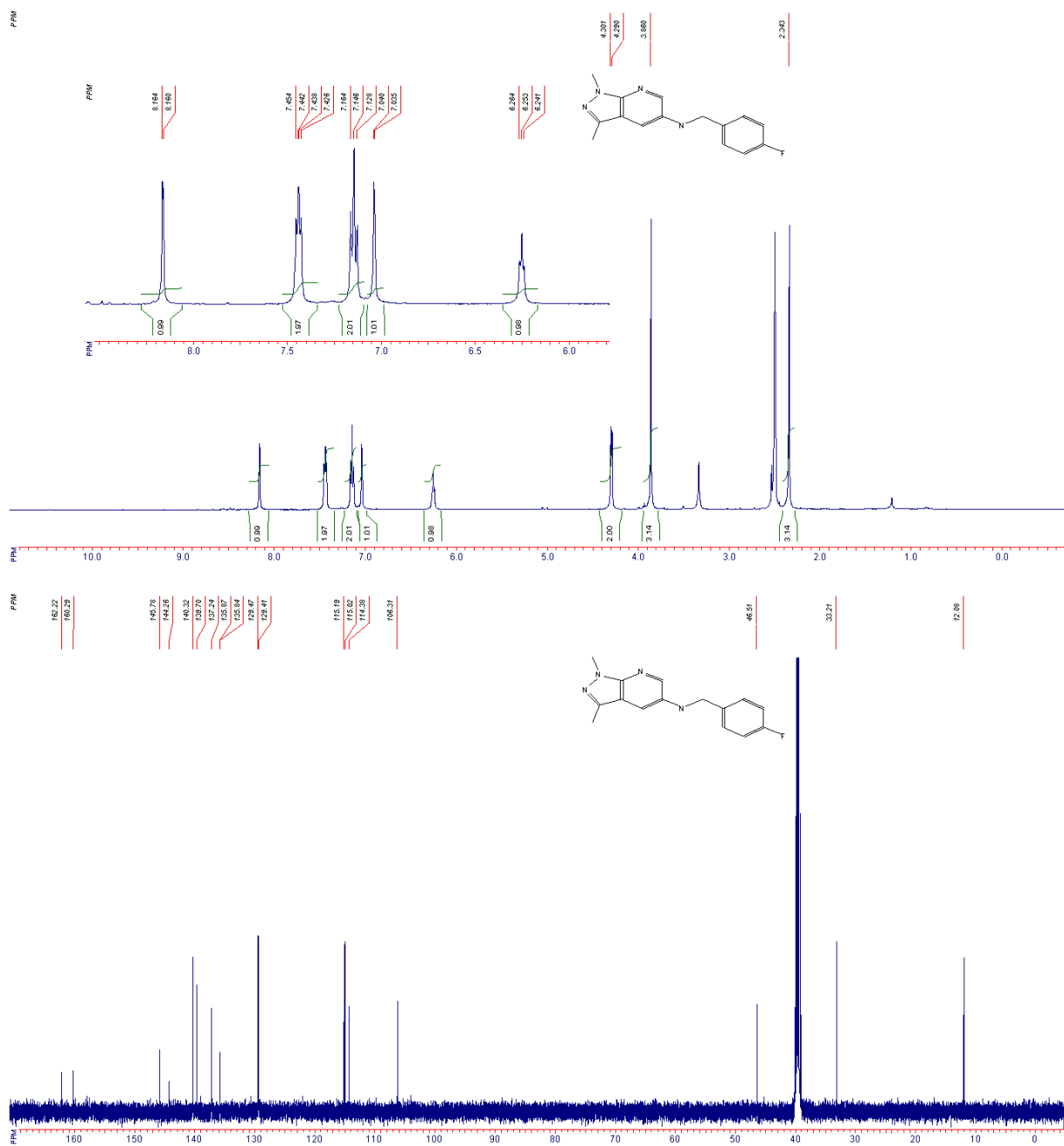
Entry 31, in Table 1



Entry 33, in Table 1



Entry 36, in Table 1



Entry 40, in Table 1