

# **Bromide-Mediated C-H Bond Functionalization: Intermolecular Annulation of Phenylethanone Derivatives with Alkynes for the Synthesis of 1-Naphthols**

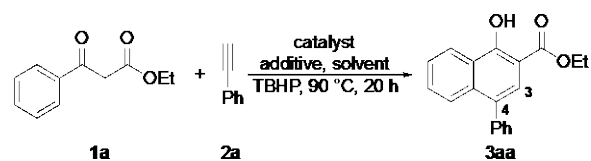
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## **Supporting Information**

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**Table 1S. Optimization of reaction conditions<sup>a</sup>**

entry	catalyst	additive	solvent	yield (%)
1	I <sub>2</sub>	-	dioxane	trace
2	PhI	-	dioxane	0
3	Bu <sub>4</sub> NI	-	dioxane	0
4	NIS	-	dioxane	0
5	NCS	-	dioxane	0
8	PhBr	-	dioxane	10

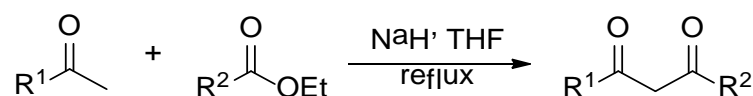
<sup>a</sup>Reaction conditions: **1a** (0.5 mmol), **2a** (0.75 mmol), catalyst (20 mol %), additive (0.15 mmol), and TBHP (3.5 equiv, 70% aq) in 1,4-dioxane (2.0 mL) under air, isolated yield.

## 2. Experimental Section

### (i) General Remarks

<sup>1</sup>H NMR and <sup>13</sup>C NMR spectra were recorded on a Bruker AVANCE AV400 (400MHz for H and 100MHz for C). Signal positions were recorded in ppm with the abbreviations s, d, t, and m denoting singlet, doublet, triplet, and multiplet respectively. NMR spectra were recorded in CDCl<sub>3</sub>, and chemical shifts were referenced to internal standard Si(CH<sub>3</sub>)<sub>4</sub> at 0.0 ppm or residual CHCl<sub>3</sub> at 7.26 ppm for <sup>1</sup>H and 77.0 ppm for <sup>13</sup>C. All coupling constants J were quoted in Hz. Data were reported as follows: chemical shift, multiplicity, coupling constant and integration. HRMS were measured using Q-TOF LC-MS and the ESI-FTICR technique. Reactions were monitored by thin-layer chromatography (TLC) on 0.25mm silica gel glass plates coated with 60 F<sub>254</sub>. Column chromatography was performed on silica gel (200-300 mesh) using petroleum ether (60-90°C) as eluant. Commercially available ethyl benzoylacetate and phenylacetylene were purchased from Alfa Aesar, J&K or Aldrich and were used as received without further purification.

### (ii) Representative Procedure for the Preparation of β-ketoester<sup>[1]</sup>



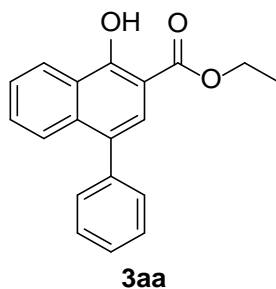
To a suspension of sodium hydride (0.67g, 28 mmol, 2.8 equiv) and diethyl carbonate

(2.36g, 20 mmol, 2.0 equiv) in dry THF (distilled from sodium/benzophenone immediately before used) was added a solution of substituted acetophenone (10mmol, 1.0 equiv) in dry THF dropwise under reflux. The mixture was refluxed for 2-3h, then quenched with dilute aqueous acetic acid. The mixture was extracted with ethyl acetate for 3 times, and the combined organic phase was washed with brine, dried with anhydrous Na<sub>2</sub>SO<sub>4</sub>, filtrated, and concentrated under reduced pressure. The residue was purified on a silica gel column to afford substituted ethyl benzoylacetate (petroleum ether /ethyl acetate, 30:1, v/v).

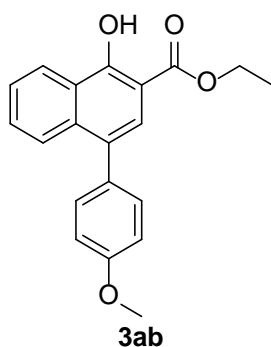
**(iii) Representative Procedure for the Synthesis of 1-naphthol**

A 100 mL round flask equipped with a stir bar was charged with ethyl benzoylacetate **1a** (5.0 mmol, 0.9 mL, 1.0 equiv), phenylacetylene **2a** (10.0 mmol, 1.1 mL, 2.0 equiv), NBP (1.0 mmol, 0.23 g, 0.2 equiv), BEA (1.5 mmol, 0.31 g, 0.3 equiv), TBHP (70% aqueous, 17.5 mmol, 2.4 mL, 3.5 equiv) in 1, 4-dioxane (20 mL) / EtOH (20 mL). The reaction mixture was stirred at 90 °C for 20 h. After cooled to room temperature, the solvent was removed under reduced pressure, and the residue was purified with silica gel column chromatography with petroleum ether: ethyl acetate (6:1) as eluent to give the desired product ethyl 1-hydroxy-4-phenyl-2-naphthoate **3aa** (1.13 g, 75%).

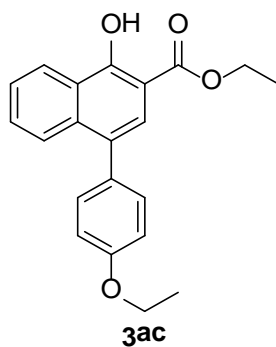
### 3. The Characterization of Products



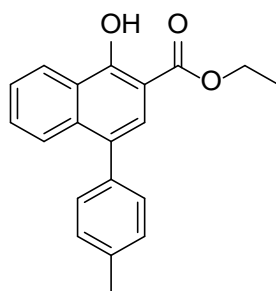
**Ethyl 1-hydroxy-4-phenyl-2-naphthoate (3aa).**<sup>[2]</sup> pale-yellow solid (124.3 mg, 85%). mp: 118-119 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.09 (s, 1H), 8.53 – 8.44 (m, 1H), 7.84 – 7.76 (m, 1H), 7.73 (s, 1H), 7.56 – 7.50 (m, 2H), 7.46 (d, *J* = 6.6 Hz, 4H), 7.41 (dt, *J* = 6.5, 2.8 Hz, 1H), 4.43 (q, *J* = 7.1 Hz, 2H), 1.41 (t, *J* = 7.1 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 171.1, 160.4, 140.2, 135.5, 131.2, 130.2, 129.4, 128.4, 127.2, 125.9, 125.7, 125.0, 125.0, 124.2, 105.4, 61.5, 14.3; HRMS[ESI]: calculated for C<sub>19</sub>H<sub>15</sub>O<sub>3</sub><sup>-</sup>[M-H]: 291.1027, found 291.1021.



**Ethyl 1-hydroxy-4-(4-methoxyphenyl)-2-naphthoate (3ab).**<sup>[2a, 2c]</sup> pale-yellow solid (101.6 mg, 63%). mp: 141-143 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.06 (s, 1H), 8.54 – 8.45 (m, 1H), 7.85 – 7.77 (m, 1H), 7.71 (s, 1H), 7.57 – 7.50 (m, 4H), 7.37 (d, *J* = 8.5 Hz, 2H), 7.02 (d, *J* = 8.5 Hz, 2H), 4.44 (q, *J* = 7.1 Hz, 2H), 3.88 (s, 3H), 1.42 (t, *J* = 7.1 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 171.1, 160.2, 158.9, 135.8, 132.5, 131.23, 130.8, 129.3, 125.9, 125.6, 125.0, 124.8, 124.1, 113.8, 105.4, 61.5, 55.4, 14.3; HRMS[ESI]: calculated for C<sub>20</sub>H<sub>17</sub>O<sub>4</sub><sup>-</sup>[M-H]: 321.1132, found 321.1130.

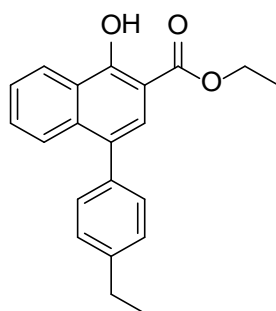


**Ethyl 4-(4-ethoxyphenyl)-1-hydroxy-2-naphthoate (3ac).** pale-yellow solid (60.8 mg, 36%). mp: 135-136 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.06 (s, 1H), 8.52 – 8.45 (m, 1H), 7.86 – 7.78 (m, 1H), 7.71 (s, 1H), 7.57 – 7.50 (m, 2H), 7.36 (d, *J* = 8.5 Hz, 2H), 7.00 (d, *J* = 8.5 Hz, 2H), 4.44 (q, *J* = 7.1 Hz, 2H), 4.11 (q, *J* = 7.0 Hz, 2H), 1.47 (t, *J* = 7.0 Hz, 3H), 1.42 (t, *J* = 7.1 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 171.2, 160.16, 158.3, 135.8, 132.4, 131.2, 130.9, 129.3, 129.0, 125.6, 125.0, 124.8, 124.1, 114.3, 105.4, 63.6, 61.5, 15.0, 14.3; HRMS[ESI]: calculated for C<sub>21</sub>H<sub>19</sub>O<sub>4</sub><sup>-</sup>[M-H]<sup>-</sup>: 335.1289, found 335.1291.



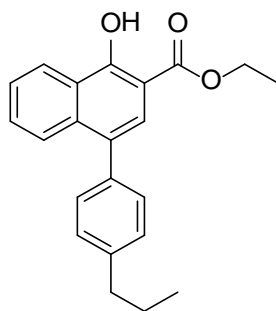
**3ad**

**Ethyl 1-hydroxy-4-(p-tolyl)-2-naphthoate (3ad).**<sup>[2c, 3]</sup> pale-yellow solid (122.6 mg, 80%). mp: 95-96 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.05 (s, 1H), 8.53 – 8.45 (m, 1H), 7.85 – 7.78 (m, 1H), 7.72 (s, 1H), 7.52 (dt, *J* = 10.0, 6.0 Hz, 2H), 7.34 (d, *J* = 7.9 Hz, 2H), 7.28 (d, *J* = 7.8 Hz, 2H), 4.43 (q, *J* = 7.1 Hz, 2H), 2.44 (s, 3H), 1.40 (t, *J* = 7.1 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 171.1, 160.3, 137.3, 136.9, 135.6, 131.1, 130.1, 129.3, 129.07, 126.0, 125.6, 125.0, 124.9, 124.1, 105.4, 61.5, 21.3, 14.3; HRMS[ESI]: calculated for C<sub>20</sub>H<sub>17</sub>O<sub>3</sub><sup>-</sup>[M-H]<sup>-</sup>: 305.1183, found 305.1178.



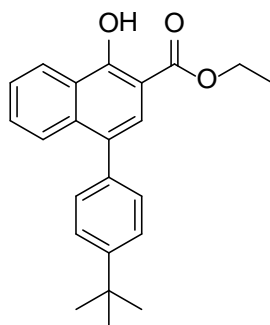
**3ae**

**Ethyl 4-(4-ethylphenyl)-1-hydroxy-2-naphthoate(3ae).** pale-yellow solid (125.6 mg, 78%). mp: 110-112 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.05 (s, 1H), 8.52 – 8.46 (m, 1H), 7.87 – 7.80 (m, 1H), 7.73 (s, 1H), 7.57 – 7.50 (m, 2H), 7.38 (d, *J* = 8.0 Hz, 2H), 7.31 (d, *J* = 7.9 Hz, 2H), 4.44 (q, *J* = 7.1 Hz, 2H), 2.75 (q, *J* = 7.6 Hz, 2H), 1.42 (t, *J* = 7.1 Hz, 3H), 1.33 (t, *J* = 7.6 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 171.1, 160.3, 143.24, 137.5, 135.6, 131.2, 130.1, 129.3, 127.8, 126.0, 125.6, 125.0, 124.9, 124.1, 105.41, 61.5, 28.7, 15.6, 14.3; HRMS[ESI]: calculated for C<sub>21</sub>H<sub>19</sub>O<sub>3</sub><sup>-</sup>[M-H]<sup>-</sup>: 319.1340, found 319.1339.



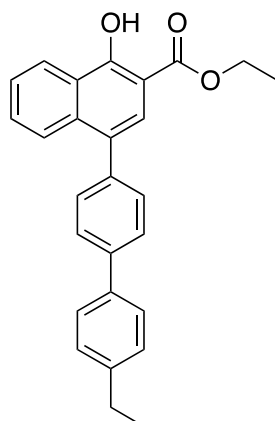
**3af**

**Ethyl 1-hydroxy-4-(4-propylphenyl)-2-naphthoate (3af).** pale-yellow solid (130.5 mg, 78%). mp: 85-87 °C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  12.06 (s, 1H), 8.53 – 8.46 (m, 1H), 7.87 – 7.80 (m, 1H), 7.73 (s, 1H), 7.57 – 7.49 (m, 2H), 7.36 (d,  $J = 8.0$  Hz, 2H), 7.28 (d,  $J = 8.0$  Hz, 2H), 4.43 (q,  $J = 7.1$  Hz, 2H), 2.72 – 2.63 (m, 2H), 1.73 (h,  $J = 7.4$  Hz, 2H), 1.41 (t,  $J = 7.1$  Hz, 3H), 1.01 (t,  $J = 7.3$  Hz, 3H);  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ )  $\delta$  171.2, 160.3, 141.7, 137.5, 135.6, 131.2, 130.0, 129.3, 128.5, 126.0, 125.6, 125.0, 124.9, 124.1, 105.4, 61.5, 37.86, 24.6, 14.3, 14.0; HRMS[ESI]: calculated for  $\text{C}_{22}\text{H}_{21}\text{O}_3$  [M-H] $^-$ : 333.1496, found 333.1498.



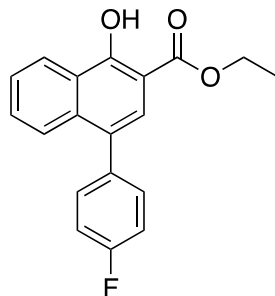
**3ag**

**Ethyl 4-(4-(*tert*-butyl)phenyl)-1-hydroxy-2-naphthoate (3ag).**<sup>[3]</sup> pale-yellow solid (148.2 mg, 85%). mp: 151-152 °C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  12.07 (s, 1H), 8.52 – 8.46 (m, 1H), 7.89 – 7.83 (m, 1H), 7.75 (s, 1H), 7.56 – 7.52 (m, 2H), 7.50 (d,  $J = 8.2$  Hz, 2H), 7.40 (d,  $J = 8.2$  Hz, 2H), 4.43 (q,  $J = 7.1$  Hz, 2H), 1.41 (t, 7.2 Hz, 3H), 1.40 (s, 12H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  171.2, 160.3, 150.1, 137.2, 135.6, 131.1, 129.9, 129.3, 126.1, 125.6, 125.3, 125.0, 124.9, 124.1, 105.4, 61.5, 34.7, 31.5, 14.3; HRMS[ESI]: calculated for  $\text{C}_{23}\text{H}_{23}\text{O}_3$  [M-H] $^-$ : 347.1653, found 347.1657.



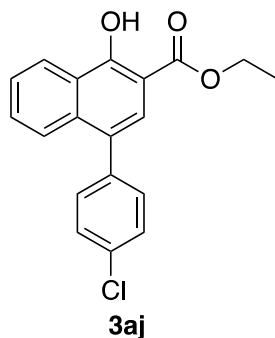
**3ah**

**Ethyl 4-(4'-ethyl-[1,1'-biphenyl]-4-yl)-1-hydroxy-2-naphthoate (3ah).** white solid (139.2 mg, 70%). mp: 163-165°C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  12.14 (s, 1H), 8.57 – 8.52 (m, 1H), 7.95 – 7.91 (m, 1H), 7.82 (s, 1H), 7.74 (d,  $J = 8.3$  Hz, 2H), 7.64 (d,  $J = 8.0$  Hz, 2H), 7.63 – 7.58 (m, 2H), 7.56 (d,  $J = 8.2$  Hz, 2H), 7.36 (d,  $J = 8.1$  Hz, 2H), 4.49 (q,  $J = 7.1$  Hz, 2H), 2.76 (q,  $J = 7.6$  Hz, 2H), 1.46 (t,  $J = 7.1$  Hz, 3H), 1.34 (t,  $J = 7.6$  Hz, 3H);  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ )  $\delta$  170.1, 159.4, 142.5, 139.0, 137.8, 137.1, 134.5, 129.7, 129.5, 128.4, 127.4, 126.0, 125.9, 124.9, 124.7, 124.0, 123.9, 123.1, 104.4, 60.5, 27.5, 14.6, 13.3; HRMS[ESI]: calculated for  $\text{C}_{27}\text{H}_{23}\text{O}_3$  [M-H] $^-$ : 395.1653, found 395.1649.

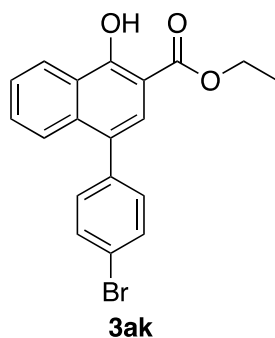


**3ai**

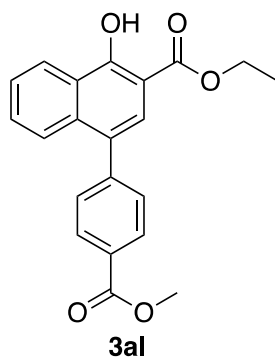
**Ethyl 4-(4-fluorophenyl)-1-hydroxy-2-naphthoate (3ai).**<sup>[2a, 3]</sup> pale-yellow solid (114.7 mg, 74%). mp: 90-92 °C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  12.10 (s, 1H), 8.55 – 8.44 (m, 1H), 7.78 – 7.71 (m, 1H), 7.69 (s, 1H), 7.59 – 7.50 (m, 2H), 7.40 (dd,  $J = 8.1$ , 5.5 Hz, 2H), 7.16 (t,  $J = 8.5$  Hz, 2H), 4.45 (q,  $J = 7.1$  Hz, 2H), 1.43 (t,  $J = 7.1$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  171.0, 163.5, 161.0, 160.5, 136.1, 135.5, 131.8, 130.0, 129.5, 125.8, 125.6, 125.0, 124.2, 115.2, 105.3, 61.6, 14.3; HRMS[ESI]: calculated for  $\text{C}_{19}\text{H}_{14}\text{FO}_3$  [M-H] $^-$ : 309.0932, found 309.0934.



**Ethyl 4-(4-chlorophenyl)-1-hydroxy-2-naphthoate(3aj).**<sup>[2a, 2c, 3]</sup> white solid (125.4 mg, 77%). mp: 113-115 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.09 (s, 4H), 8.53 – 8.46 (m, 1H), 7.78 – 7.70 (m, 1H), 7.69 (s, 1H), 7.64 – 7.57 (m, 2H), 7.58 – 7.51 (m, 2H), 7.36 – 7.29 (m, 2H), 4.45 (q, *J* = 7.1 Hz, 2H), 1.43 (t, *J* = 7.1 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 171.0, 160.6, 139.1, 135.2, 131.8, 131.5, 129.8, 129.6, 125.8, 125.5, 125.1, 125.0, 124.3, 121.4, 105.4, 61.6, 14.3; calculated for C<sub>19</sub>H<sub>14</sub><sup>37</sup>ClO<sub>3</sub><sup>-</sup>[M-H]<sup>-</sup>: 327.0608, found 327.0610.

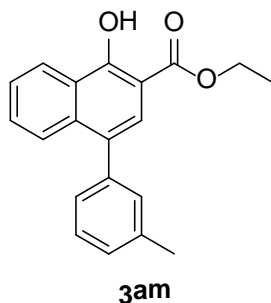


**Ethyl 4-(4-bromophenyl)-1-hydroxy-2-naphthoate (3ak).**<sup>[3]</sup> pale-yellow solid (143.3mg, 78%). mp: 119-121 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.10 (s, 1H), 8.53 – 8.45 (m, 1H), 7.77 – 7.71 (m, 1H), 7.69 (s, 1H), 7.63 – 7.58 (m, 2H), 7.57 – 7.51 (m, 2H), 7.35 – 7.28 (m, 2H), 4.44 (q, *J* = 7.1 Hz, 2H), 1.42 (t, *J* = 7.1 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 171.0, 160.6, 139.1, 135.2, 131.8, 131.5, 129.8, 129.6, 125.8, 125.5, 125.0, 125.0, 124.3, 121.4, 105.4, 77.4, 77.1, 76.7, 61.6, 14.3.

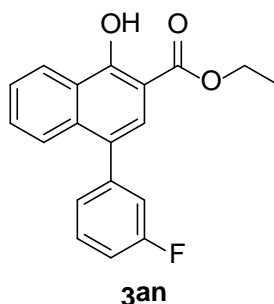


**Ethyl 1-hydroxy-4-(4-(methoxycarbonyl)phenyl)-2-naphthoate (3al).** white solid (151.6 mg, 87%). mp: 123-125 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.14 (s, 1H), 8.55

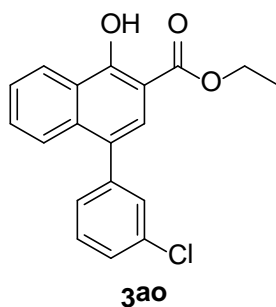
– 8.47 (m, 1H), 8.15 (d,  $J = 8.0$  Hz, 2H), 7.79 – 7.71 (m, 2H), 7.58 – 7.51 (m, 4H), 4.46 (q,  $J = 7.1$  Hz, 2H), 3.97 (s, 3H), 1.43 (t,  $J = 7.1$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  170.9, 167.0, 160.8, 145.0, 135.0, 130.2, 130.0, 129.7, 129.0, 125.9, 125.5, 125.1, 125.0, 124.3, 105.4, 77.4, 77.1, 76.7, 61.6, 52.2, 14.3; HRMS[ESI]: calculated for  $\text{C}_{21}\text{H}_{19}\text{O}_5^+[\text{M}+\text{H}]^+$ : 351.1227, found 351.1227.



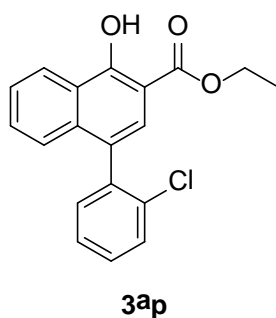
**Ethyl 1-hydroxy-4-(*m*-tolyl)-2-naphthoate (3am).**<sup>[3]</sup> pale-yellow solid (121.7 mg, 79%), mp: 111-113 °C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  12.07 (s, 1H), 8.56 – 8.46 (m, 1H), 7.85 – 7.77 (m, 1H), 7.72 (s, 1H), 7.58 – 7.50 (m, 2H), 7.36 (t,  $J = 7.5$  Hz, 1H), 7.31 – 7.20 (m, 3H), 4.44 (q,  $J = 7.1$  Hz, 2H), 2.43 (s, 3H), 1.42 (t,  $J = 7.1$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  171.1, 160.3, 140.2, 138.0, 135.6, 131.3, 130.9, 129.4, 128.2, 128.0, 127.3, 126.0, 125.6, 125.0, 124.8, 124.1, 105.4, 61.5, 21.5, 14.3. ; HRMS[ESI]: calculated for  $\text{C}_{20}\text{H}_{17}\text{O}_3^-[\text{M}-\text{H}]^-$ : 305.1183, found 305.1186.



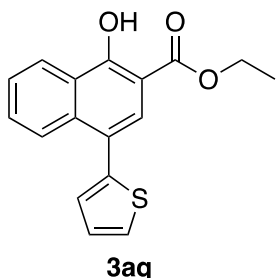
**Ethyl 4-(3-fluorophenyl)-1-hydroxy-2-naphthoate (3an).** pale-yellow solid (112.6 mg, 73%). mp: 133-135 °C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  12.11 (s, 1H), 8.54 – 8.46 (m, 1H), 7.82 – 7.75 (m, 1H), 7.72 (s, 1H), 7.60 – 7.52 (m, 2H), 7.43 (td,  $J = 7.9, 6.2$  Hz, 1H), 7.26 – 7.22 (m, 1H), 7.20 – 7.09 (m, 2H), 4.46 (q,  $J = 7.1$  Hz, 2H), 1.44 (t,  $J = 7.1$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  171.0, 162.8 (d,  $J = 244.9$  Hz), 160.7, 142.4 (d,  $J = 7.5$  Hz), 135.2, 129.8, 129.8, 129.6, 126.0, 126.0, 125.9, 125.5, 125.0, 124.2, 117.2 (d,  $J = 20.7$  Hz), 114.1 (d,  $J = 21.2$  Hz), 105.3, 61.6, 14.3; HRMS[ESI]: calculated for  $\text{C}_{19}\text{H}_{14}\text{FO}_3^-[\text{M}-\text{H}]^-$ : 309.0932, found 309.0934.



**Ethyl 4-(3-chlorophenyl)-1-hydroxy-2-naphthoate (3ao).**<sup>[3]</sup> white solid (123.8 mg, 76%). mp: 139-141 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.12 (s, 1H), 8.53 – 8.47 (m, 1H), 7.78 – 7.73 (m, 1H), 7.70 (s, 1H), 7.60 – 7.52 (m, 2H), 7.45 (s, 1H), 7.42 – 7.37 (m, 2H), 7.36 – 7.30 (m, 1H), 4.46 (q, *J* = 7.1 Hz, 2H), 1.44 (t, *J* = 7.1 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 171.0, 160.8, 142.0, 135.2, 134.3, 130.2, 129.7, 129.6, 129.6, 128.5, 127.4, 125.9, 125.5, 125.1, 125.0, 124.2, 105.3, 61.6, 14.3; HRMS[ESI]: calculated for C<sub>19</sub>H<sub>14</sub><sup>35</sup>ClO<sub>3</sub><sup>-</sup>[M-H]<sup>-</sup>: 325.0637, found 325.0639; calculated for C<sub>19</sub>H<sub>14</sub><sup>37</sup>ClO<sub>3</sub><sup>-</sup>[M-H]<sup>-</sup>: 327.0608, found 327.0609.

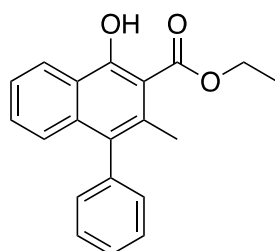


**Ethyl 4-(2-chlorophenyl)-1-hydroxy-2-naphthoate (3ap).** pale-yellow solid (136.2 mg, 83%). mp: 114-115 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.16 (s, 1H), 8.54 – 8.46 (m, 1H), 7.70 (s, 1H), 7.57 – 7.50 (m, 4H), 7.43 – 7.33 (m, 4H), 4.44 (q, *J* = 7.1 Hz, 2H), 1.42 (t, *J* = 7.1 Hz, 4H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 171.0, 160.9, 138.7, 135.4, 134.6, 132.5, 129.6, 129.1, 128.3, 126.8, 125.8, 125.8, 125.3, 124.8, 124.2, 105.3, 61.6, 14.3; HRMS[ESI]: calculated for C<sub>19</sub>H<sub>14</sub><sup>35</sup>ClO<sub>3</sub><sup>-</sup>[M-H]<sup>-</sup>: 325.0637, found 325.0640; calculated for C<sub>19</sub>H<sub>14</sub><sup>37</sup>ClO<sub>3</sub><sup>-</sup>[M-H]<sup>-</sup>: 327.0608, found 327.0610.



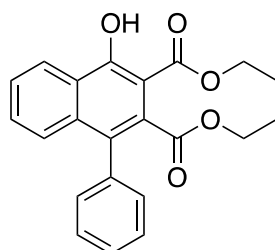
**Ethyl 1-hydroxy-4-(thiophen-2-yl)-2-naphthoate (3aq).** pale-yellow solid (91.4 mg, 61%). mp: 112-113 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.14 (s, 1H), 8.52 – 8.46 (m, 1H), 8.11 – 8.04 (m, 1H), 7.88 (s, 1H), 7.66 – 7.51 (m, 2H), 7.41 (dd, *J* = 4.4, 2.0 Hz, 1H), 7.20 – 7.13 (m, 2H), 4.46 (q, *J* = 7.1 Hz, 2H), 1.44 (t, *J* = 7.1 Hz, 3H); <sup>13</sup>C NMR

(100 MHz, CDCl<sub>3</sub>)  $\delta$  170.9, 160.9, 141.2, 135.8, 129.8, 127.4, 127.2, 126.5, 125.9, 125.7, 125.4, 125.1, 124.1, 123.2, 105.4, 61.6, 14.3; HRMS[ESI]: calculated for C<sub>17</sub>H<sub>13</sub>O<sub>3</sub>S<sup>-</sup>[M-H]<sup>-</sup>: 297.0591, found 297.0595.



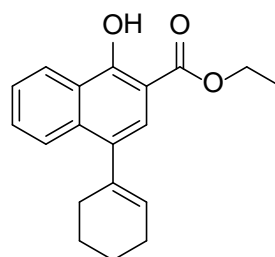
**3ar**

**Ethyl 1-hydroxy-3-methyl-4-phenyl-2-naphthoate (3ar).**<sup>[2a]</sup> white solid (38.5 mg, 25%). mp: 118-120 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  12.56 (s, 1H), 8.53 – 8.40 (m, 1H), 7.51 – 7.38 (m, 5H), 7.26 – 7.15 (m, 3H), 4.48 (q, *J* = 6.7 Hz, 2H), 2.35 (s, 3H), 1.43 (t, *J* = 6.8 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  172.8, 161.2, 140.2, 135.9, 132.2, 131.2, 130.7, 129.3, 128.5, 127.0, 126.2, 124.8, 123.8, 123.4, 107.0, 61.7, 21.3, 14.2; HRMS[ESI]: calculated for C<sub>20</sub>H<sub>18</sub>O<sub>3</sub><sup>+</sup>[M+H]<sup>+</sup>: 307.1329, found 307.1327.



**3as**

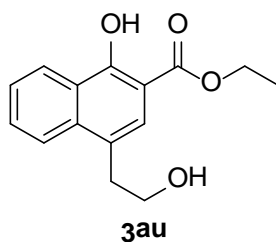
**Diethyl 1-hydroxy-4-phenyl-2,3-dicarboxylate (3as).**<sup>[3]</sup> colorless solid (70.1 mg, 19%). mp: 105-107 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  12.54 (s, 1H), 8.49 (d, *J* = 7.9 Hz, 1H), 7.59 – 7.49 (m, 2H), 7.41 (d, *J* = 10.4 Hz, 4H), 7.32 (d, *J* = 6.2 Hz, 2H), 4.42 (q, *J* = 7.0 Hz, 2H), 3.95 (q, *J* = 7.0 Hz, 2H), 1.36 (t, *J* = 7.1 Hz, 3H), 0.93 (t, *J* = 7.0 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  170.2, 168.5, 161.2, 136.8, 135.6, 131.0, 130.0, 130.0, 129.3, 127.9, 127.8, 126.7, 126.6, 124.9, 124.0, 102.0, 62.2, 60.9, 13.9, 13.6; HRMS[ESI]: calculated for C<sub>22</sub>H<sub>20</sub>O<sub>5</sub><sup>+</sup>[M+H]<sup>+</sup>: 365.1384, found 365.1389.



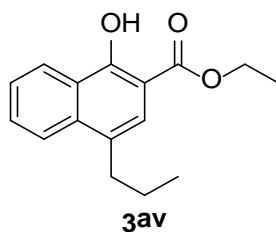
**3at**

**Ethyl 4-(cyclohex-1-en-1-yl)-1-hydroxy-2-naphthoate (3at).** pale-yellow solid (69.6

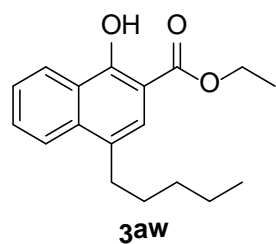
mg, 47%). mp: 87-88 °C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  11.97 (s, 1H), 8.43 (d,  $J = 8.3$  Hz, 1H), 7.89 (d,  $J = 8.4$  Hz, 1H), 7.60 – 7.54 (m, 2H), 7.52 – 7.46 (m, 1H), 5.74 (s, 1H), 4.44 (q,  $J = 7.1$  Hz, 2H), 2.37 – 2.29 (m, 2H), 2.29 – 2.20 (m, 2H), 1.89 – 1.78 (m, 2H), 1.82 – 1.71 (m, 2H), 1.45 (t,  $J = 7.1$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  171.2, 159.8, 137.2, 135.5, 133.9, 129.0, 127.6, 125.7, 125.4, 125.0, 124.1, 122.7, 105.21, 61.4, 31.1, 25.6, 23.2, 22.3, 14.4; HRMS[ESI]: calculated for  $\text{C}_{19}\text{H}_{19}\text{O}_3$  [M-H] $^-$ : 295.1340, found 295.1341.



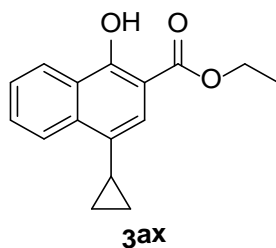
**Ethyl 1-hydroxy-4-(2-hydroxyethyl)-2-naphthoate (3au).**<sup>[2a]</sup> pale-yellow solid (74.5 mg, 57%). mp: 88-89 °C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  11.95 (s, 1H), 8.45 (d,  $J = 8.3$  Hz, 1H), 7.94 (d,  $J = 8.4$  Hz, 1H), 7.68 – 7.59 (m, 2H), 7.57 – 7.48 (m, 1H), 4.43 (q,  $J = 7.1$  Hz, 2H), 3.94 (t,  $J = 6.6$  Hz, 2H), 3.22 (t,  $J = 6.6$  Hz, 2H), 1.65 (s, 1H), 1.44 (t,  $J = 7.1$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  170.9, 160.1, 135.8, 129.5, 125.5, 125.3, 124.9, 124.6, 124.5, 123.6, 105.3, 62.8, 61.5, 35.7, 14.3; HRMS[ESI]: calculated for  $\text{C}_{15}\text{H}_{15}\text{O}_4$  [M-H] $^-$ : 259.0976, found 259.0980.



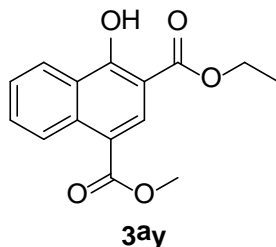
**Ethyl 1-hydroxy-4-propyl-2-naphthoate (3av).** Pale yellow liquid (11.8 mg, 9%).  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  11.90 (s, 1H), 8.48 – 8.43 (m, 2H), 7.94 (d,  $J = 8.4$  Hz, 1H), 7.67 – 7.58 (m, 2H), 7.59 (s, 1H), 7.56 – 7.47 (m, 1H), 4.46 (q,  $J = 7.1$  Hz, 2H), 2.96 – 2.89 (m, 2H), 1.80 – 1.69 (m, 2H), 1.46 (t,  $J = 7.1$  Hz, 3H), 1.03 (t,  $J = 7.3$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  171.1, 159.6, 135.8, 129.1, 129.0, 125.2, 125.2, 124.5, 123.8, 123.4, 105.2, 61.3, 34.7, 23.8, 14.3, 14.2; HRMS[ESI]: calculated for  $\text{C}_{16}\text{H}_{17}\text{O}_3$  [M-H] $^-$ : 257.1183, found 257.1185.



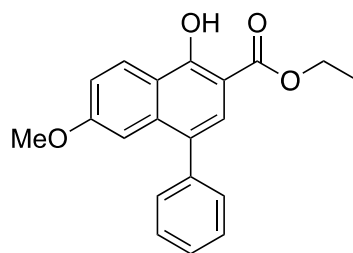
**Ethyl 1-hydroxy-4-pentyl-2-naphthoate (3aw).**<sup>[3]</sup> pale yellow liquid (18.5 mg, 13%). <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 11.90 (s, 1H), 8.45 (d, *J* = 8.3 Hz, 1H), 7.94 (d, *J* = 8.4 Hz, 1H), 7.67 – 7.58 (m, 1H), 7.59 (s, 1H), 7.56 – 7.47 (m, 1H), 4.46 (q, *J* = 7.1 Hz, 2H), 2.98 – 2.89 (m, 3H), 1.77 – 1.65 (m, 2H), 1.46 (t, *J* = 7.1 Hz, 4H), 1.46 – 1.32 (m, 2H), 0.92 (t, *J* = 6.9 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 171.1, 159.5, 135.8, 129.3, 129.1, 125.2, 125.2, 124.5, 123.8, 123.3, 105.2, 61.3, 32.6, 32.0, 30.5, 22.6, 14.3, 14.1; HRMS[ESI]: calculated for C<sub>18</sub>H<sub>21</sub>O<sub>3</sub><sup>-</sup>[M-H]<sup>-</sup>: 285.1496, found 285.1503.



**Ethyl 4-cyclopropyl-1-hydroxy-2-naphthoate (3ax).** pale-yellow solid (29.3 mg, 23%). mp: 72-74 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 11.96 (s, 1H), 8.48 – 8.40 (m, 1H), 8.36 – 8.31 (m, 1H), 7.72 – 7.62 (m, 1H), 7.60 – 7.50 (m, 2H), 4.45 (q, *J* = 7.1 Hz, 2H), 2.23 – 2.11 (m, 1H), 1.46 (t, *J* = 7.1 Hz, 3H), 1.07 – 0.97 (m, 2H), 0.77 – 0.66 (m, 2H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 171.1, 159.9, 137.3, 129.5, 129.2, 125.5, 124.9, 124.4, 124.3, 122.2, 105.0, 61.3, 14.3, 12.9, 6.0; HRMS[ESI]: calculated for C<sub>16</sub>H<sub>15</sub>O<sub>3</sub><sup>-</sup>[M-H]<sup>-</sup>: 255.1027, found 255.1030.

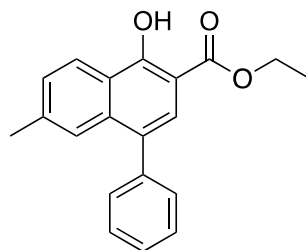


**3-Ethyl 1-methyl 4-hydroxynaphthalene-1,3-dicarboxylate (3ay).** pale-yellow solid (27.1 mg, 20%). mp: 91-93 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.51 (s, 1H), 9.03 – 8.98 (m, 1H), 8.63 (s, 1H), 8.52 – 8.45 (m, 1H), 7.76 – 7.71 (m, 1H), 7.62 – 7.53 (m, 1H), 4.50 (q, *J* = 7.1 Hz, 2H), 3.99 (s, 3H), 1.49 (t, *J* = 7.1 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 170.6, 164.3, 135.1, 131.0, 130.7, 126.1, 126.0, 125.1, 124.1, 117.6, 104.8, 61.9, 52.0, 14.3; HRMS[ESI]: calculated for C<sub>15</sub>H<sub>13</sub>O<sub>5</sub><sup>-</sup>[M-H]<sup>-</sup>: 273.0769, found 273.0776.



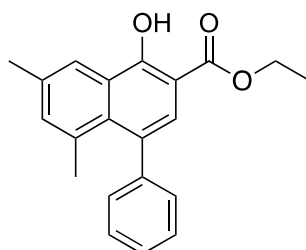
**3ba**

**Ethyl 1-hydroxy-6-methoxy-4-phenyl-2-naphthoate (3ba).**<sup>[3]</sup> pale-yellow solid (124.9 mg, 78%). mp:108-109 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.11 (s, 1H), 8.45 (d, *J* = 9.1 Hz, 1H), 7.75 (s, 1H), 7.56 – 7.50 (m, 4H), 7.49 – 7.44 (m, 1H), 7.24 – 7.17 (m, 2H), 4.48 (q, *J* = 7.1 Hz, 2H), 3.81 (s, 3H), 1.46 (t, *J* = 7.1 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 170.1, 159.5, 159.4, 139.4, 136.4, 129.0, 127.4, 126.1, 124.9, 124.8, 118.7, 116.1, 104.2, 102.8, 60.2, 54.2, 13.2; HRMS[ESI]: calculated for C<sub>20</sub>H<sub>17</sub>O<sub>4</sub>[M-H]<sup>-</sup>: 321.1132, found 321.1129.



**3ca**

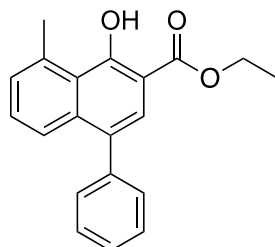
**Ethyl 1-hydroxy-6-methyl-4-phenyl-2-naphthoate (3ca).**<sup>[3]</sup> pale-yellow solid (117 mg, 76%). mp: 112-113 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.04 (s, 1H), 8.39 (d, *J* = 8.5 Hz, 1H), 7.69 (s, 1H), 7.56 (s, 1H), 7.52 – 7.40 (m, 5H), 7.37 (d, *J* = 8.4 Hz, 1H), 4.44 (q, *J* = 7.1 Hz, 2H), 2.44 (s, 3H), 1.41 (t, *J* = 7.1 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 171.2, 160.4, 140.4, 139.8, 135.8, 130.6, 130.2, 128.3, 127.8, 127.1, 125.1, 125.1, 124.0, 123.1, 104.7, 61.4, 22.1, 14.3; HRMS[ESI]: calculated for C<sub>20</sub>H<sub>17</sub>O<sub>3</sub>[M-H]<sup>-</sup>: 305.1183, found 305.1184.



**3da**

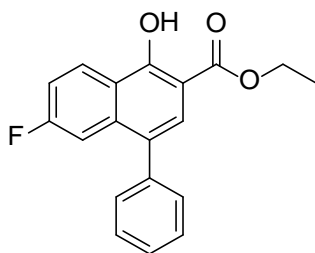
**Ethyl 1-hydroxy-5,7-dimethyl-4-phenyl-2-naphthoate (3da).** pale-yellow solid (129.7 mg, 81%). mp: 153-155 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 11.99 (s, 1H), 8.21 (s, 1H), 7.53 (s, 1H), 7.40 – 7.35 (m, 3H), 7.34 – 7.28 (m, 2H), 7.20 (s, 1H), 4.42 (q, *J*

= 7.1 Hz, 2H), 2.49 (s, 3H), 1.94 (s, 3H), 1.39 (t,  $J = 7.1$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  171.0, 160.1, 144.7, 135.4, 135.2, 132.8, 131.2, 129.9, 127.7, 126.7, 126.3, 126.1, 121.6, 104.6, 61.4, 24.7, 21.3, 14.3; HRMS[ESI]: calculated for  $\text{C}_{21}\text{H}_{19}\text{O}_3$  [M-H] $^-$ : 319.1340, found 319.1337.



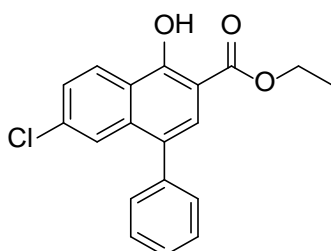
**3ea**

**Ethyl 1-hydroxy-8-methyl-4-phenyl-2-naphthoate(3ea).** pale-yellow solid (59.3 mg, 39%). mp: 111-113 °C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  12.64 (s, 1H), 7.70 (s, 1H), 7.58 (d,  $J = 8.4$  Hz, 1H), 7.49 – 7.39 (m, 5H), 7.37 – 7.32 (m, 1H), 7.25 (d,  $J = 7.3$  Hz, 1H), 4.43 (q,  $J = 7.1$  Hz, 2H), 3.03 (s, 3H), 1.41 (t,  $J = 7.1$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  171.7, 163.7, 141.0, 138.6, 137.5, 131.3, 130.3, 129.0, 128.9, 128.3, 127.1, 125.1, 124.5, 124.4, 105.6, 61.4, 25.5, 14.3; HRMS[ESI]: calculated for  $\text{C}_{20}\text{H}_{19}\text{O}_3$  [M+H] $^+$ : 307.1329, found 307.1322.



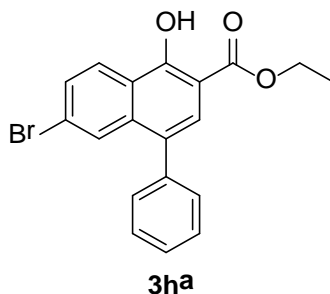
**3fa**

**Ethyl 6-fluoro-1-hydroxy-4-phenyl-2-naphthoate (3fa).**<sup>[3]</sup> pale-yellow solid (117.6 mg, 76%). mp: 107-109 °C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  12.11 (s, 1H), 8.53 – 8.47 (m, 1H), 7.76 (s, 1H), 7.47 – 7.52 (m, 2H), 7.46 – 7.39 (m, 4H), 7.31 – 7.24 (m, 1H), 4.45 (q,  $J = 7.1$  Hz, 2H), 1.42 (t,  $J = 7.1$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  171.0, 163.3 (d,  $J = 249.6$  Hz), 160.3, 139.7, 137.3 (d,  $J = 9.8$  Hz), 130.6 (d,  $J = 5.3$  Hz), 130.0, 128.5, 127.5, 127.2 (d,  $J = 9.0$  Hz), 126.2, 121.9, 115.6 (d,  $J = 25.0$  Hz), 109.9 (d,  $J = 22.7$  Hz), 105.1, 61.6, 14.3; HRMS[ESI]: calculated for  $\text{C}_{19}\text{H}_{14}\text{FO}_3$  [M-H] $^-$ : 309.0932, found 309.0929.

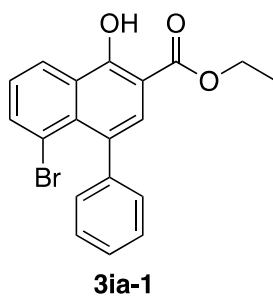


**3ga**

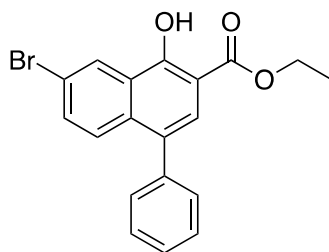
**Ethyl 6-chloro-1-hydroxy-4-phenyl-2-naphthoate (3ga).** pale-yellow solid (126.9 mg, 78%). mp: 106-107 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.08 (s, 1H), 8.41 (d, *J* = 8.9 Hz, 1H), 7.83 – 7.71 (m, 2H), 7.52 – 7.39 (m, 6H), 4.44 (q, *J* = 7.2 Hz, 2H), 1.42 (t, *J* = 7.1 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 170.9, 160.2, 139.5, 136.4, 136.0, 130.4, 130.1, 128.6, 127.5, 126.5, 126.3, 125.9, 124.9, 123.3, 105.7, 61.7, 14.3; HRMS[ESI]: calculated for C<sub>19</sub>H<sub>14</sub><sup>35</sup>ClO<sub>3</sub><sup>-</sup>[M-H]<sup>-</sup>: 325.0637, found 325.0637.



**Ethyl 6-bromo-1-hydroxy-4-phenyl-2-naphthoate (3ha).** pale-yellow solid (139.6 mg, 75%). mp: 116-118 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.06 (s, 1H), 8.33 (d, *J* = 8.9 Hz, 1H), 7.93 (d, *J* = 1.9 Hz, 1H), 7.74 (s, 1H), 7.59 (dd, *J* = 8.9, 1.9 Hz, 1H), 7.53 – 7.39 (m, 5H), 4.44 (q, *J* = 7.1 Hz, 2H), 1.42 (t, *J* = 7.1 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 170.8, 160.2, 139.5, 136.6, 130.3, 130.1, 129.1, 128.6, 128.1, 127.5, 126.3, 125.9, 124.7, 123.5, 105.8, 61.7, 14.3; HRMS[ESI]: calculated for C<sub>19</sub>H<sub>14</sub><sup>79</sup>BrO<sub>3</sub><sup>-</sup>[M-H]<sup>-</sup>: 369.0132, found 369.0138; calculated for C<sub>19</sub>H<sub>14</sub><sup>81</sup>BrO<sub>3</sub><sup>-</sup>[M-H]<sup>-</sup>: 371.0111, found 371.0118.

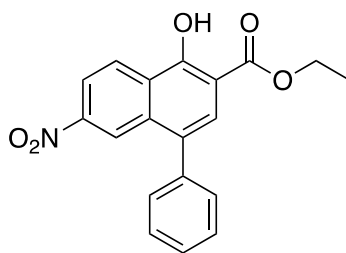


**Ethyl 5-bromo-1-hydroxy-4-phenyl-2-naphthoate (3ia-1).** light yellow solid (48.2 mg, 26%). mp: 125-127 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.03 (s, 1H), 8.63 (d, *J* = 2.1 Hz, 1H), 7.74 (s, 1H), 7.66 (d, *J* = 9.0 Hz, 1H), 7.59 (dd, *J* = 9.0, 2.1 Hz, 1H), 7.51 – 7.41 (m, 5H), 4.45 (q, *J* = 7.1 Hz, 2H), 1.43 (t, *J* = 7.2 Hz, 3H). <sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) δ 170.8, 159.2, 139.6, 133.9, 132.6, 131.1, 130.1, 128.5, 127.7, 127.5, 126.5, 126.2, 125.4, 120.0, 106.4, 61.7, 14.3; isomers' mixtures of **3ia-1** and **3ia-2**: HRMS[ESI]: calculated for C<sub>19</sub>H<sub>14</sub><sup>79</sup>BrO<sub>3</sub><sup>-</sup>[M-H]<sup>-</sup>: 369.0132, found 369.0140; calculated for C<sub>19</sub>H<sub>14</sub><sup>81</sup>BrO<sub>3</sub><sup>-</sup>[M-H]<sup>-</sup>: 371.0111, found 371.0119.



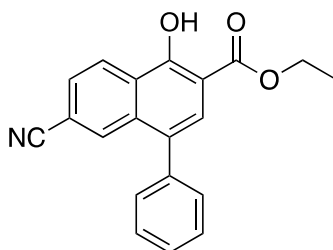
**3ia-2**

**Ethyl 7-bromo-1-hydroxy-4-phenyl-2-naphthoate(3ia-2).** light yellow solid (96.5 mg, 52%). mp: 120-122 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.08 (s, 1H), 8.55 (dd, *J* = 8.4, 1.4 Hz, 1H), 7.88 (dd, *J* = 7.5, 1.3 Hz, 1H), 7.73 (s, 1H), 7.41 – 7.30 (m, 6H), 4.44 (q, *J* = 7.1 Hz, 2H), 1.41 (t, *J* = 7.1 Hz, 3H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 170.6, 160.1, 142.5, 137.1, 133.1, 130.9, 130.5, 129.0, 127.6, 127.5, 126.9, 126.0, 124.2, 120.1, 105.4, 61.8, 14.3; isomers' mixtures of **3ia-1** and **3ia-2**: HRMS[ESI]: calculated for C<sub>19</sub>H<sub>14</sub><sup>79</sup>BrO<sub>3</sub><sup>-</sup>[M-H]<sup>-</sup>: 369.0132, found 369.0140; calculated for C<sub>19</sub>H<sub>14</sub><sup>81</sup>BrO<sub>3</sub><sup>-</sup>[M-H]<sup>-</sup>: 371.0111, found 371.0119.



**3ja**

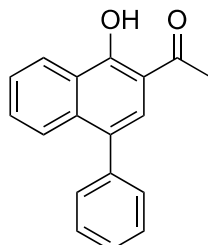
**Ethyl 1-hydroxy-6-nitro-4-phenyl-2-naphthoate (3ja).** yellow solid (14.5 mg, 9%). mp: 173-175 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.13 (s, 1H), 8.73 (s, 1H), 8.64 (d, *J* = 9.2 Hz, 1H), 8.31 – 8.23 (m, 1H), 7.90 (s, 1H), 7.59 – 7.47 (m, 3H), 7.48 – 7.43 (m, 2H), 4.50 (q, *J* = 7.1 Hz, 2H), 1.45 (t, *J* = 7.2 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 170.5, 159.5, 148.0, 138.6, 134.7, 132.8, 130.0, 128.9, 128.0, 127.7, 127.1, 126.3, 122.3, 118.9, 108.4, 62.1, 14.2; HRMS[ESI]: calculated for C<sub>19</sub>H<sub>16</sub>NO<sub>5</sub><sup>+</sup>[M+H]<sup>+</sup>: 338.1023, found 338.1027.



**3ka**

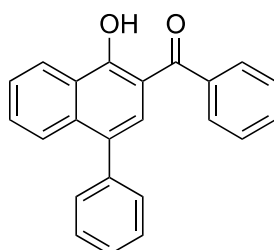
**Ethyl 6-cyano-1-hydroxy-4-phenyl-2-naphthoate (3ka).** pale-yellow solid (50.5 mg, 32%). mp: 158-159 °C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 12.11 (s, 1H), 8.57 (d, *J* = 8.6 Hz, 1H), 8.22 – 8.14 (m, 1H), 7.86 (s, 1H), 7.70 – 7.63 (m, 1H), 7.55 – 7.45 (m, 3H),

7.44 – 7.39 (m, 2H), 4.48 (q,  $J = 7.1$  Hz, 2H), 1.44 (t,  $J = 7.2$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  170.5, 159.5, 138.7, 134.5, 131.8, 131.4, 130.0, 128.8, 127.9, 126.7, 126.6, 126.3, 125.5, 118.9, 112.7, 107.9, 62.0, 14.2; HRMS[ESI]: calculated for  $\text{C}_{20}\text{H}_{16}\text{NO}_3^+[\text{M}+\text{H}]^+$ : 318.1125, found 318.11132.



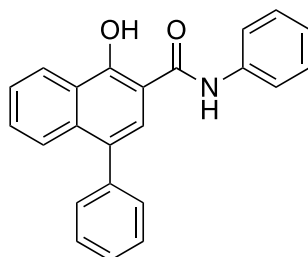
**3la**

**1-(1-Hydroxy-4-phenylnaphthalen-2-yl)ethanone (3la).**<sup>[2a]</sup> yellow solid (105.1 mg, 80%). mp: 173-174 °C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  14.01 (s, 1H), 8.61 – 8.55 (m, 1H), 7.83 – 7.77 (m, 1H), 7.60 – 7.54 (m, 3H), 7.53 – 7.43 (m, 5H), 2.70 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  204.5, 161.9, 140.1, 135.8, 131.0, 130.2, 128.5, 127.4, 125.9, 125.5, 125.4, 124.7, 112.8, 27.0; HRMS[ESI]: calculated for  $\text{C}_{18}\text{H}_{13}\text{O}_2^-[\text{M}-\text{H}]^-$ : 261.0921, found 261.0926.



**3ma**

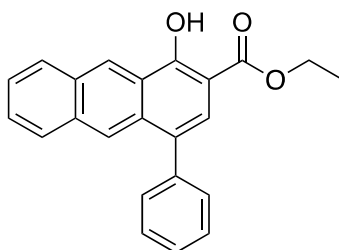
**(1-Hydroxy-4-phenylnaphthalen-2-yl)(phenyl)methanone (3ma).**<sup>[2a]</sup> yellow solid (115.1 mg, 71%). mp: 151-152 °C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  13.88 (s, 1H), 8.61 – 8.46 (m, 1H), 7.73 – 7.69 (m, 1H), 7.67 – 7.60 (m, 2H), 7.54 – 7.35 (m, 7H), 7.35 – 7.28 (m, 4H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  201.5, 163.4, 140.0, 138.2, 135.8, 131.7, 130.6, 130.5, 130.2, 129.1, 128.5, 128.4, 127.7, 127.3, 126.0, 125.5, 124.8, 112.2; HRMS[ESI]: calculated for  $\text{C}_{23}\text{H}_{15}\text{O}_2^-[\text{M}-\text{H}]^-$ : 323.1078, found 323.1075.



**3na**

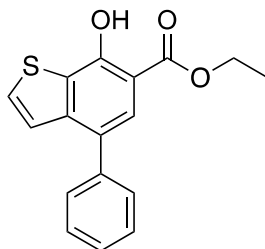
**1-Hydroxy-N-4-diphenyl-2-naphthamide (3na).** pale-yellow solid (141.5 mg, 83%). mp: 178-179 °C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  13.63 (s, 1H), 8.62 – 8.54 (m, 1H),

8.05 (s, 1H), 7.89 – 7.81 (m, 1H), 7.65 – 7.56 (m, 4H), 7.56 – 7.51 (m, 4H), 7.51 – 7.45 (m, 1H), 7.45 – 7.37 (m, 3H), 7.23 (t,  $J = 7.5$  Hz, 1H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  168.0, 159.7, 139.0, 135.6, 133.7, 130.1, 129.1, 128.2, 128.1, 127.4, 126.4, 124.9, 124.8, 124.3, 123.1, 120.4, 120.3, 105.3; HRMS[ESI]: calculated for  $\text{C}_{23}\text{H}_{16}\text{NO}_2^-[\text{M-H}]^-$ : 338.1187, found 338.1193.



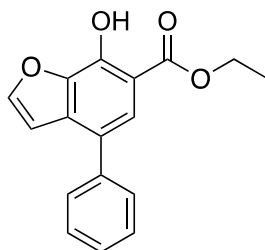
**3oa**

**Ethyl 1-hydroxy-4-phenylanthracene-2-carboxylate (3oa).**<sup>[3]</sup> pale-yellow solid (128.5 mg, 75%). mp: 146-147 °C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  11.87 (s, 1H), 8.43 (d,  $J = 9.0$  Hz, 1H), 7.87 – 7.83 (m, 1H), 7.83 – 7.79 (m, 2H), 7.73 (d,  $J = 8.7$  Hz, 1H), 7.49 – 7.42 (m, 4H), 7.42 – 7.37 (m, 2H), 7.13 – 7.07 (m, 1H), 4.46 (q,  $J = 7.1$  Hz, 2H), 1.43 (t,  $J = 7.1$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  170.8, 159.3, 144.9, 134.8, 133.6, 131.3, 129.8, 129.3, 129.2, 129.0, 128.7, 128.5, 127.4, 127.2, 127.0, 124.9, 123.9, 120.9, 106.9, 61.6, 14.3; HRMS[ESI]: calculated for  $\text{C}_{23}\text{H}_{17}\text{O}_3^-[\text{M-H}]^-$ : 341.1183, found 341.1185.



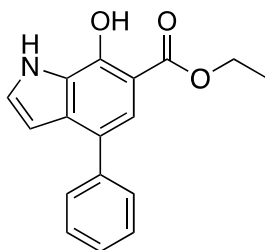
**3pa**

**Ethyl 7-hydroxy-4-phenyl-3a,7a-dihydrobenzo[b]thiophene-6-carboxylate (3pa).** pale-yellow solid (116.1 mg, 78%). mp: 146-147°C;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  11.62 (s, 1H), 7.78 (s, 1H), 7.64 (d,  $J = 5.3$  Hz, 1H), 7.53 (d,  $J = 7.5$  Hz, 2H), 7.50 – 7.44 (t,  $J = 7.5$  Hz, 2H), 7.45 – 7.36 (m, 2H), 4.45 (q,  $J = 7.1$  Hz, 2H), 1.43 (t,  $J = 7.1$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  170.9, 157.1, 144.0, 140.2, 131.1, 129.3, 129.0, 128.6, 128.4, 127.3, 125.4, 124.1, 106.5, 61.6, 14.3; HRMS[ESI]: calculated for  $\text{C}_{17}\text{H}_{15}\text{O}_3\text{S}^+[\text{M+H}]^+$ : 299.0736, found 299.0736.



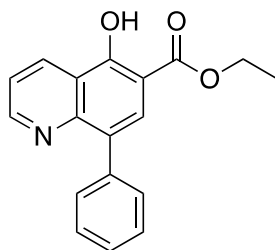
**3qa**

**Ethyl 7-hydroxy-4-phenylbenzofuran-6-carboxylate (3qa).** pale-yellow liquid (80.0 mg, 58%).  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  11.38 (s, 1H), 7.84 – 7.77 (m, 2H), 7.58 (d,  $J = 8.3$  Hz, 2H), 7.48 (t,  $J = 7.6$  Hz, 2H), 7.41 – 7.36 (m, 1H), 6.95 (d,  $J = 2.0$  Hz, 1H), 4.46 (q,  $J = 7.1$  Hz, 2H), 1.44 (t,  $J = 7.1$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  170.9, 148.1, 147.9, 143.3, 139.3, 132.6, 128.8, 128.2, 127.3, 125.9, 124.1, 123.0, 108.3, 107.0, 61.6, 14.3; HRMS[ESI]: calculated for  $\text{C}_{17}\text{H}_{15}\text{O}_4^+[\text{M}+\text{H}]^+$ : 283.0965, found 283.0964.



**3ra**

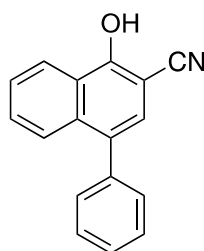
**Ethyl 7-hydroxy-4-phenyl-1H-indole-6-carboxylate (3ra).** pale-yellow solid (50.3 mg, 35%). mp: 150-152 °C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  11.50 (s, 1H), 8.85 (s, 1H), 7.66 (d,  $J = 7.6$  Hz, 2H), 7.59 (s, 1H), 7.50 – 7.42 (t,  $J = 7.5$  Hz, 2H), 7.39 – 7.32 (m, 2H), 6.70 (s, 1H), 4.43 (q,  $J = 7.1$  Hz, 2H), 1.42 (t,  $J = 7.1$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  171.6, 149.3, 140.5, 131.9, 128.6, 128.5, 127.0, 126.8, 125.9, 125.2, 119.6, 104.7, 103.5, 61.1, 14.4; HRMS[ESI]: calculated for  $\text{C}_{17}\text{H}_{16}\text{NO}_3^+[\text{M}+\text{H}]^+$ : 282.1125, found 282.1130.



**3sa**

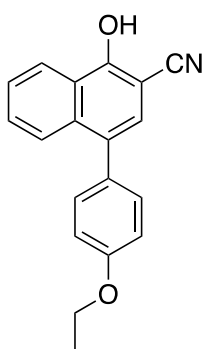
**Ethyl 5-hydroxy-8-phenylquinoline-6-carboxylate (3sa).** yellow solid (80mg, 54%). mp: 117-119°C;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  12.06 (s, 1H), 9.02 – 9.01 (m, 1H), 8.78 (d,  $J = 8.3$  Hz, 1H), 8.05 (s, 1H), 7.65 (d,  $J = 7.5$  Hz, 2H), 7.51 – 7.38 (m, 4H), 4.48 (q,  $J = 7.1$  Hz, 2H), 1.45 (t,  $J = 7.2$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  170.7, 160.0, 152.8, 149.2, 139.0, 132.7, 131.9, 130.5, 128.6, 128.1, 127.3,

120.6, 120.4, 106.3, 61.9, 14.3; HRMS[ESI]: calculated for  $C_{18}H_{16}NO_3^+[M+H]^+$ : 294.1125, found 294.1125.



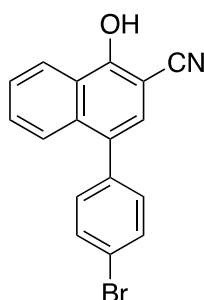
**3ta**

**1-Hydroxy-4-phenyl-2-naphthonitrile (3ta).** pale-yellow solid (68.7 mg, 56%). mp: 98-101°C;  $^1H$  NMR (400 MHz, DMSO- $d_6$ )  $\delta$  11.61 (s, 1H), 8.49 – 8.40 (m, 1H), 7.80 – 7.72 (m, 1H), 7.69 – 7.59 (m, 2H), 7.52 – 7.39 (m, 6H);  $^{13}C$  NMR (100 MHz, DMSO)  $\delta$  158.4, 139.0, 134.4, 132.7, 130.3, 130.0, 129.0, 128.0, 127.5, 126.9, 126.2, 125.3, 123.8, 118.1, 93.9; HRMS[ESI]: calculated for  $C_{17}H_{10}NO[M-H]^-$ : 244.0768, found 244.0775.



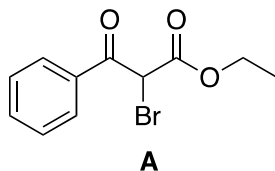
**3tc**

**4-(4-Ethoxyphenyl)-1-hydroxy-2-naphthonitrile (3tc).** yellow solid (82.3 mg, 57%). mp: 96-98°C;  $^1H$  NMR (400 MHz, DMSO- $d_6$ )  $\delta$  11.53 (s, 1H), 8.42 (s, 1H), 7.83 – 7.72 (m, 1H), 7.64 (d,  $J = 7.2$  Hz, 2H), 7.45 – 7.28 (m, 3H), 7.03 (d,  $J = 8.0$  Hz, 2H), 4.07 (q,  $J = 6.7$  Hz, 2H), 1.36 (t,  $J = 6.7$  Hz, 3H).  $^{13}C$  NMR (100 MHz, DMSO- $d_6$ )  $\delta$  158.49, 158.08, 134.63, 132.48, 131.46, 130.98, 129.93, 127.26, 126.87, 126.35, 125.35, 123.75, 118.20, 114.85, 93.86, 63.54, 15.16.



**3tk**

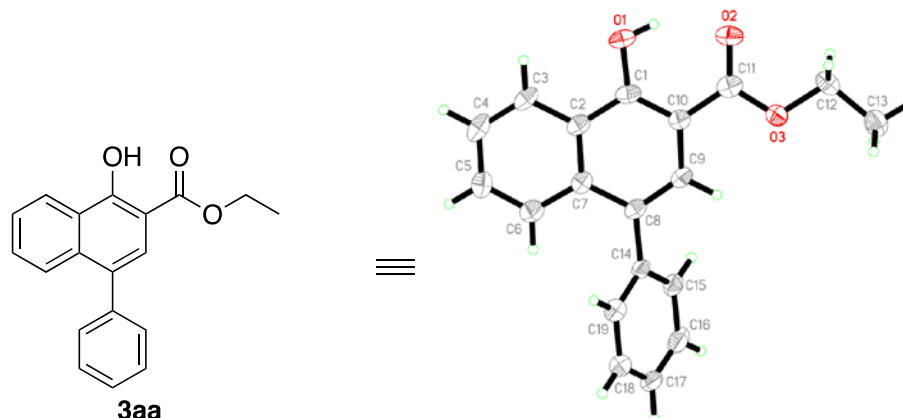
**4-(4-Bromophenyl)-1-hydroxy-2-naphthonitrile (3tk)**, yellow solid (97.2 mg, 60%). mp: 121-123°C;  $^1\text{H}$  NMR (400 MHz,  $\text{DMSO-}d_6$ )  $\delta$  11.69 (s, 1H), 8.56 – 8.37 (dd,  $J = 6.6, 3.5$  Hz, 1H), 7.84 – 7.64 (m, 5H), 7.53 – 7.36 (m, 3H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{DMSO-}d_6$ )  $\delta$  158.64, 138.20, 134.16, 132.53, 131.95, 131.33, 130.26, 127.66, 127.06, 126.05, 125.33, 123.85, 121.53, 118.04, 93.88.



**Ethyl 2-benzoyl-2-bromoacetate A.**<sup>[2a]</sup>  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  8.00 (dd,  $J = 8.4, 1.3$  Hz, 2H), 7.63 (m, 1H), 7.50 (t,  $J = 7.7$  Hz, 2H), 5.66 (s, 1H), 4.29 (q,  $J = 7.1$  Hz, 2H), 1.25 (t,  $J = 7.1$  Hz, 3H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  188.1, 165.2, 134.3, 133.4, 129.2, 128.9, 63.3, 46.4, 13.9; HRMS[ESI]: calculated for  $\text{C}_{11}\text{H}_{12}^{79}\text{BrO}_3^+[\text{M}+\text{H}]^+$ : 270.9964, found 270.9965; calculated for  $\text{C}_{11}\text{H}_{12}^{81}\text{BrO}_3^+[\text{M}+\text{H}]^+$ : 272.9944, found 272.9945.

## 4. X-Ray Crystal Data for Compound 3aa

The structure was solved and refined using the programs XS (Sheldrick, 2008) and ShelXL (Sheldrick, 2015) respectively. The program X-Seed (Barbour, 1999) was used as an interface to the SHELX programs, and to prepare the figures.



**Table 1. Crystal data and structure refinement for shelx.**

Identification code	shelx
Empirical formula	C <sub>19</sub> H <sub>16</sub> O <sub>3</sub>
Formula weight	292.32
Temperature	113(2) K
Wavelength	0.71073 Å
Crystal system, space group	Triclinic, P-1
Unit cell dimensions	
a = 7.415(4) Å	
b = 10.694(6) Å	
c = 19.852(9) Å	
$\alpha$ = 94.049(8) deg.	
$\beta$ = 91.638(11) deg.	
$\gamma$ = 110.006(6) deg.	
Volume	1473.2(13) Å <sup>3</sup>
Z, Calculated density	4, 1.318 Mg/m <sup>3</sup>
Absorption coefficient	0.089 mm <sup>-1</sup>
F(000)	616
Crystal size	0.20 x 0.18 x 0.10 mm
Theta range for data collection	2.03 to 27.86 deg.
Limiting indices	-9<=h<=9, -14<=k<=14, -26<=l<=22
Reflections collected / unique	15459 / 6906 [R(int) = 0.0471]
Completeness to theta = 27.86	98.4 %
Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	0.9912 and 0.9825
Refinement method	Full-matrix least-squares on F <sup>2</sup>
Data / restraints / parameters	6906 / 0 / 401
Goodness-of-fit on F <sup>2</sup>	1.050

Final R indices [ $I > 2\sigma(I)$ ] R1 = 0.0372, wR2 = 0.0741  
 R indices (all data) R1 = 0.0656, wR2 = 0.0788  
 Largest diff. peak and hole 0.249 and -0.241 e. $\text{\AA}^{-3}$

**Table 2. Atomic coordinates ( $\times 10^4$ ) and equivalent isotropic displacement parameters ( $\text{\AA}^2 \times 10^3$ ) for shelx. U(eq) is defined as one third of the trace of the orthogonalized  $U_{ij}$  tensor.**

atom	x	y	z	U(eq)
O(1)	7007(2)	-2355(1)	9349(1)	27(1)
O(2)	6027(2)	-1783(1)	10541(1)	26(1)
O(3)	6789(2)	383(1)	10922(1)	21(1)
O(4)	8647(2)	11238(1)	5888(1)	30(1)
O(5)	10158(2)	13147(1)	5123(1)	32(1)
O(6)	9477(2)	12748(1)	3999(1)	26(1)
C(1)	7728(2)	-1014(2)	9308(1)	20(1)
C(2)	8556(2)	-570(2)	8687(1)	19(1)
C(3)	8590(2)	-1507(2)	8147(1)	23(1)
C(4)	9251(2)	-1076(2)	7537(1)	26(1)
C(5)	9912(2)	299(2)	7442(1)	24(1)
C(6)	9951(2)	1222(2)	7961(1)	23(1)
C(7)	9287(2)	820(2)	8605(1)	18(1)
C(8)	9228(2)	1769(2)	9151(1)	17(1)
C(9)	8410(2)	1291(2)	9732(1)	19(1)
C(10)	7634(2)	-92(2)	9824(1)	18(1)
C(11)	6749(2)	-589(2)	10450(1)	21(1)
C(12)	5904(2)	-75(2)	11550(1)	25(1)
C(13)	6069(2)	1155(2)	12010(1)	28(1)
C(14)	9937(2)	3234(2)	9082(1)	18(1)
C(15)	8703(2)	3956(2)	9187(1)	22(1)
C(16)	9321(3)	5321(2)	9117(1)	28(1)
C(17)	11183(3)	5984(2)	8936(1)	31(1)
C(18)	12437(3)	5281(2)	8845(1)	31(1)
C(19)	11825(2)	3921(2)	8918(1)	25(1)
C(20)	7916(2)	10463(2)	5307(1)	22(1)
C(21)	6794(2)	9108(2)	5374(1)	20(1)
C(22)	6423(2)	8609(2)	6019(1)	27(1)
C(23)	5313(2)	7312(2)	6082(1)	29(1)
C(24)	4502(2)	6442(2)	5502(1)	28(1)
C(25)	4847(2)	6900(2)	4870(1)	24(1)
C(26)	6016(2)	8232(2)	4785(1)	19(1)
C(27)	6380(2)	8738(2)	4129(1)	19(1)
C(28)	7405(2)	10063(2)	4092(1)	20(1)
C(29)	8200(2)	10956(2)	4674(1)	20(1)
C(30)	9363(2)	12366(2)	4629(1)	25(1)

C(31)	10573(3)	14153(2)	3930(1)	37(1)
C(32)	10007(3)	14481(2)	3249(1)	50(1)
C(33)	5696(2)	7814(2)	3501(1)	20(1)
C(34)	4376(2)	7989(2)	3035(1)	23(1)
C(35)	3781(2)	7147(2)	2444(1)	26(1)
C(36)	4501(2)	6122(2)	2307(1)	27(1)
C(37)	5821(2)	5939(2)	2766(1)	27(1)
C(38)	6400(2)	6776(2)	3358(1)	25(1)

**Table 3. Bond lengths [Å] and angles [deg] for shelx.**

atom	length
O(1)-C(1)	1.3570(19)
O(1)-H(1)	0.8400
O(2)-C(11)	1.2338(19)
O(3)-C(11)	1.3412(18)
O(3)-C(12)	1.4636(18)
O(4)-C(20)	1.3542(17)
O(4)-H(4)	0.8400
O(5)-C(30)	1.2331(18)
O(6)-C(30)	1.3383(19)
O(6)-C(31)	1.4626(19)
C(1)-C(10)	1.391(2)
C(1)-C(2)	1.431(2)
C(2)-C(3)	1.421(2)
C(2)-C(7)	1.421(2)
C(3)-C(4)	1.372(2)
C(3)-H(3)	0.9500
C(4)-C(5)	1.411(2)
C(4)-H(4A)	0.9500
C(5)-C(6)	1.369(2)
C(5)-H(5)	0.9500
C(6)-C(7)	1.425(2)
C(6)-H(6)	0.9500
C(7)-C(8)	1.4428(19)
C(8)-C(9)	1.368(2)
C(8)-C(14)	1.491(2)
C(9)-C(10)	1.419(2)
C(9)-H(9)	0.9500
C(10)-C(11)	1.469(2)
C(12)-C(13)	1.515(2)
C(12)-H(12A)	0.9900
C(12)-H(12B)	0.9900
C(13)-H(13A)	0.9800
C(13)-H(13B)	0.9800

C(13)-H(13C)	0.9800
C(14)-C(15)	1.396(2)
C(14)-C(19)	1.400(2)
C(15)-C(16)	1.391(2)
C(15)-H(15)	0.9500
C(16)-C(17)	1.389(2)
C(16)-H(16)	0.9500
C(17)-C(18)	1.390(2)
C(17)-H(17)	0.9500
C(18)-C(19)	1.387(2)
C(18)-H(18)	0.9500
C(19)-H(19)	0.9500
C(20)-C(29)	1.391(2)
C(20)-C(21)	1.420(2)
C(21)-C(26)	1.419(2)
C(21)-C(22)	1.420(2)
C(22)-C(23)	1.366(2)
C(22)-H(22)	0.9500
C(23)-C(24)	1.407(2)
C(23)-H(23)	0.9500
C(24)-C(25)	1.379(2)
C(24)-H(24)	0.9500
C(25)-C(26)	1.416(2)
C(25)-H(25)	0.9500
C(26)-C(27)	1.443(2)
C(27)-C(28)	1.368(2)
C(27)-C(33)	1.495(2)
C(28)-C(29)	1.4187(19)
C(28)-H(28)	0.9500
C(29)-C(30)	1.470(2)
C(31)-C(32)	1.504(2)
C(31)-H(31A)	0.9900
C(31)-H(31B)	0.9900
C(32)-H(32A)	0.9800
C(32)-H(32B)	0.9800
C(32)-H(32C)	0.9800
C(33)-C(34)	1.395(2)
C(33)-C(38)	1.396(2)
C(34)-C(35)	1.389(2)
C(34)-H(34)	0.9500
C(35)-C(36)	1.389(2)
C(35)-H(35)	0.9500
C(36)-C(37)	1.390(2)
C(36)-H(36)	0.9500

C(37)-C(38)	1.387(2)
C(37)-H(37)	0.9500
C(38)-H(38)	0.9500
atom-atom-atom	angle
C(1)-O(1)-H(1)	109.5
C(11)-O(3)-C(12)	115.22(13)
C(20)-O(4)-H(4)	109.5
C(30)-O(6)-C(31)	116.21(13)
O(1)-C(1)-C(10)	123.20(14)
O(1)-C(1)-C(2)	116.55(14)
C(10)-C(1)-C(2)	120.21(15)
C(3)-C(2)-C(7)	120.04(15)
C(3)-C(2)-C(1)	120.62(15)
C(7)-C(2)-C(1)	119.30(14)
C(4)-C(3)-C(2)	120.17(16)
C(4)-C(3)-H(3)	119.9
C(2)-C(3)-H(3)	119.9
C(3)-C(4)-C(5)	120.24(15)
C(3)-C(4)-H(4A)	119.9
C(5)-C(4)-H(4A)	119.9
C(6)-C(5)-C(4)	120.57(15)
C(6)-C(5)-H(5)	119.7
C(4)-C(5)-H(5)	119.7
C(5)-C(6)-C(7)	121.08(16)
C(5)-C(6)-H(6)	119.5
C(7)-C(6)-H(6)	119.5
C(2)-C(7)-C(6)	117.81(14)
C(2)-C(7)-C(8)	119.97(14)
C(6)-C(7)-C(8)	122.10(15)
C(9)-C(8)-C(7)	118.36(15)
C(9)-C(8)-C(14)	119.73(14)
C(7)-C(8)-C(14)	121.83(13)
C(8)-C(9)-C(10)	122.94(14)
C(8)-C(9)-H(9)	118.5
C(10)-C(9)-H(9)	118.5
C(1)-C(10)-C(9)	119.18(14)
C(1)-C(10)-C(11)	118.55(15)
C(9)-C(10)-C(11)	122.27(14)
O(2)-C(11)-O(3)	122.30(15)
O(2)-C(11)-C(10)	124.00(15)
O(3)-C(11)-C(10)	113.70(15)
O(3)-C(12)-C(13)	107.30(14)
O(3)-C(12)-H(12A)	110.3
C(13)-C(12)-H(12A)	110.3

O(3)-C(12)-H(12B)	110.3
C(13)-C(12)-H(12B)	110.3
H(12A)-C(12)-H(12B)	108.5
C(12)-C(13)-H(13A)	109.5
C(12)-C(13)-H(13B)	109.5
H(13A)-C(13)-H(13B)	109.5
C(12)-C(13)-H(13C)	109.5
H(13A)-C(13)-H(13C)	109.5
H(13B)-C(13)-H(13C)	109.5
C(15)-C(14)-C(19)	118.45(16)
C(15)-C(14)-C(8)	119.66(15)
C(19)-C(14)-C(8)	121.89(14)
C(16)-C(15)-C(14)	120.79(16)
C(16)-C(15)-H(15)	119.6
C(14)-C(15)-H(15)	119.6
C(17)-C(16)-C(15)	120.17(16)
C(17)-C(16)-H(16)	119.9
C(15)-C(16)-H(16)	119.9
C(16)-C(17)-C(18)	119.51(17)
C(16)-C(17)-H(17)	120.2
C(18)-C(17)-H(17)	120.2
C(19)-C(18)-C(17)	120.36(17)
C(19)-C(18)-H(18)	119.8
C(17)-C(18)-H(18)	119.8
C(18)-C(19)-C(14)	120.68(16)
C(18)-C(19)-H(19)	119.7
C(14)-C(19)-H(19)	119.7
O(4)-C(20)-C(29)	122.54(16)
O(4)-C(20)-C(21)	116.52(14)
C(29)-C(20)-C(21)	120.93(14)
C(26)-C(21)-C(20)	119.52(14)
C(26)-C(21)-C(22)	119.06(16)
C(20)-C(21)-C(22)	121.42(15)
C(23)-C(22)-C(21)	121.24(15)
C(23)-C(22)-H(22)	119.4
C(21)-C(22)-H(22)	119.4
C(22)-C(23)-C(24)	120.17(15)
C(22)-C(23)-H(23)	119.9
C(24)-C(23)-H(23)	119.9
C(25)-C(24)-C(23)	119.72(17)
C(25)-C(24)-H(24)	120.1
C(23)-C(24)-H(24)	120.1
C(24)-C(25)-C(26)	121.64(15)
C(24)-C(25)-H(25)	119.2

C(26)-C(25)-H(25)	119.2
C(25)-C(26)-C(21)	118.14(14)
C(25)-C(26)-C(27)	122.63(14)
C(21)-C(26)-C(27)	119.19(15)
C(28)-C(27)-C(26)	119.05(14)
C(28)-C(27)-C(33)	120.75(14)
C(26)-C(27)-C(33)	120.17(15)
C(27)-C(28)-C(29)	122.68(14)
C(27)-C(28)-H(28)	118.7
C(29)-C(28)-H(28)	118.7
C(20)-C(29)-C(28)	118.54(15)
C(20)-C(29)-C(30)	119.05(14)
C(28)-C(29)-C(30)	122.38(14)
O(5)-C(30)-O(6)	122.10(16)
O(5)-C(30)-C(29)	123.83(16)
O(6)-C(30)-C(29)	114.07(14)
O(6)-C(31)-C(32)	107.68(14)
O(6)-C(31)-H(31A)	110.2
C(32)-C(31)-H(31A)	110.2
O(6)-C(31)-H(31B)	110.2
C(32)-C(31)-H(31B)	110.2
H(31A)-C(31)-H(31B)	108.5
C(31)-C(32)-H(32A)	109.5
C(31)-C(32)-H(32B)	109.5
H(32A)-C(32)-H(32B)	109.5
C(31)-C(32)-H(32C)	109.5
H(32A)-C(32)-H(32C)	109.5
H(32B)-C(32)-H(32C)	109.5
C(34)-C(33)-C(38)	118.25(14)
C(34)-C(33)-C(27)	120.92(14)
C(38)-C(33)-C(27)	120.81(14)
C(35)-C(34)-C(33)	120.70(15)
C(35)-C(34)-H(34)	119.7
C(33)-C(34)-H(34)	119.7
C(36)-C(35)-C(34)	120.37(15)
C(36)-C(35)-H(35)	119.8
C(34)-C(35)-H(35)	119.8
C(35)-C(36)-C(37)	119.54(15)
C(35)-C(36)-H(36)	120.2
C(37)-C(36)-H(36)	120.2
C(38)-C(37)-C(36)	119.87(16)
C(38)-C(37)-H(37)	120.1
C(36)-C(37)-H(37)	120.1
C(37)-C(38)-C(33)	121.27(15)

C(37)-C(38)-H(38) 119.4

C(33)-C(38)-H(38) 119.4

Symmetry transformations used to generate equivalent atoms:

**Table 4.** Anisotropic displacement parameters ( $\text{\AA}^2 \times 10^3$ ) for shelx. The anisotropic displacement factor exponent takes the form:  $-2\pi^2 [h^2a^{*2}U_{11}+\dots+2hka^*b^*U_{12}]$

atom	U11	U22	U33	U23	U13	U12
O(1)	32(1)	13(1)	33(1)	1(1)	2(1)	4(1)
O(2)	26(1)	18(1)	34(1)	6(1)	2(1)	5(1)
O(3)	21(1)	21(1)	21(1)	3(1)	3(1)	5(1)
O(4)	33(1)	24(1)	28(1)	-8(1)	-5(1)	6(1)
O(5)	31(1)	21(1)	38(1)	-10(1)	-7(1)	5(1)
O(6)	29(1)	14(1)	33(1)	0(1)	3(1)	2(1)
C(1)	15(1)	15(1)	29(1)	2(1)	-4(1)	5(1)
C(2)	16(1)	17(1)	23(1)	-2(1)	-4(1)	6(1)
C(3)	24(1)	18(1)	27(1)	-6(1)	-5(1)	11(1)
C(4)	28(1)	27(1)	27(1)	-10(1)	-6(1)	15(1)
C(5)	24(1)	30(1)	21(1)	-2(1)	1(1)	13(1)
C(6)	19(1)	21(1)	27(1)	-1(1)	-1(1)	7(1)
C(7)	15(1)	20(1)	20(1)	-2(1)	-3(1)	8(1)
C(8)	16(1)	16(1)	20(1)	-1(1)	-3(1)	7(1)
C(9)	17(1)	16(1)	22(1)	-3(1)	-2(1)	6(1)
C(10)	15(1)	17(1)	21(1)	1(1)	-1(1)	6(1)
C(11)	14(1)	22(1)	28(1)	1(1)	-5(1)	7(1)
C(12)	22(1)	28(1)	23(1)	8(1)	4(1)	5(1)
C(13)	24(1)	34(1)	25(1)	4(1)	5(1)	8(1)
C(14)	24(1)	15(1)	14(1)	-1(1)	-1(1)	5(1)
C(15)	28(1)	20(1)	17(1)	-1(1)	0(1)	8(1)
C(16)	45(1)	23(1)	20(1)	-3(1)	0(1)	17(1)
C(17)	54(1)	15(1)	20(1)	0(1)	6(1)	7(1)
C(18)	38(1)	22(1)	25(1)	-2(1)	8(1)	1(1)
C(19)	28(1)	22(1)	24(1)	-1(1)	4(1)	8(1)
C(20)	18(1)	22(1)	25(1)	-8(1)	-4(1)	9(1)
C(21)	18(1)	23(1)	21(1)	-1(1)	0(1)	10(1)
C(22)	27(1)	30(1)	23(1)	-2(1)	-2(1)	12(1)
C(23)	33(1)	34(1)	24(1)	7(1)	4(1)	14(1)
C(24)	28(1)	23(1)	33(1)	4(1)	8(1)	7(1)
C(25)	21(1)	22(1)	28(1)	-2(1)	1(1)	6(1)
C(26)	18(1)	18(1)	23(1)	0(1)	2(1)	8(1)
C(27)	19(1)	18(1)	20(1)	-2(1)	-1(1)	7(1)
C(28)	21(1)	20(1)	21(1)	-1(1)	2(1)	9(1)
C(29)	16(1)	17(1)	26(1)	-2(1)	0(1)	6(1)

C(30)	19(1)	19(1)	35(1)	-4(1)	0(1)	8(1)
C(31)	32(1)	11(1)	60(1)	-1(1)	7(1)	-1(1)
C(32)	59(2)	27(1)	58(1)	16(1)	17(1)	5(1)
C(33)	21(1)	15(1)	20(1)	1(1)	4(1)	2(1)
C(34)	28(1)	19(1)	24(1)	2(1)	4(1)	9(1)
C(35)	27(1)	27(1)	21(1)	3(1)	0(1)	7(1)
C(36)	32(1)	26(1)	20(1)	-3(1)	3(1)	6(1)
C(37)	33(1)	20(1)	28(1)	-2(1)	2(1)	10(1)
C(38)	28(1)	23(1)	24(1)	-2(1)	-4(1)	9(1)

**Table 5. Hydrogen coordinates (  $\times 10^4$ ) and isotropic displacement parameters ( $\text{\AA}^2 \times 10^3$ ) for shelx.**

atom	x	y	z	U(eq)
H(1)	6543	-2515	9727	41
H(4)	9247	12024	5798	45
H(3)	8155	-2433	8210	27
H(4A)	9263	-1706	7176	32
H(5)	10334	588	7013	29
H(6)	10429	2145	7891	27
H(9)	8358	1913	10090	22
H(12A)	6576	-612	11767	30
H(12B)	4537	-637	11457	30
H(13A)	7429	1692	12107	42
H(13B)	5465	884	12434	42
H(13C)	5420	1686	11787	42
H(15)	7425	3510	9308	26
H(16)	8468	5801	9192	34
H(17)	11595	6911	8876	37
H(18)	13720	5734	8732	37
H(19)	12696	3451	8857	30
H(22)	6958	9188	6415	32
H(23)	5087	6997	6518	35
H(24)	3721	5542	5546	34
H(25)	4287	6308	4481	29
H(28)	7593	10398	3660	24
H(31A)	11969	14308	3964	44
H(31B)	10282	14727	4293	44
H(32A)	10344	13930	2893	74
H(32B)	10691	15427	3194	74
H(32C)	8618	14300	3216	74
H(34)	3880	8690	3122	28
H(35)	2875	7274	2132	31
H(36)	4095	5549	1902	32

H(37)	6325	5243	2675	32
H(38)	7293	6639	3671	30

**Table 6. Torsion angles [deg] for shelx.**

A----B----C----D	angle
O(1)-C(1)-C(2)-C(3)	0.4(2)
C(10)-C(1)-C(2)-C(3)	-177.55(14)
O(1)-C(1)-C(2)-C(7)	178.27(13)
C(10)-C(1)-C(2)-C(7)	0.3(2)
C(7)-C(2)-C(3)-C(4)	-2.9(2)
C(1)-C(2)-C(3)-C(4)	174.94(14)
C(2)-C(3)-C(4)-C(5)	0.4(2)
C(3)-C(4)-C(5)-C(6)	1.7(2)
C(4)-C(5)-C(6)-C(7)	-1.4(2)
C(3)-C(2)-C(7)-C(6)	3.1(2)
C(1)-C(2)-C(7)-C(6)	-174.76(14)
C(3)-C(2)-C(7)-C(8)	179.20(14)
C(1)-C(2)-C(7)-C(8)	1.4(2)
C(5)-C(6)-C(7)-C(2)	-1.0(2)
C(5)-C(6)-C(7)-C(8)	-176.98(14)
C(2)-C(7)-C(8)-C(9)	-1.8(2)
C(6)-C(7)-C(8)-C(9)	174.17(13)
C(2)-C(7)-C(8)-C(14)	-178.58(13)
C(6)-C(7)-C(8)-C(14)	-2.6(2)
C(7)-C(8)-C(9)-C(10)	0.6(2)
C(14)-C(8)-C(9)-C(10)	177.45(13)
O(1)-C(1)-C(10)-C(9)	-179.32(13)
C(2)-C(1)-C(10)-C(9)	-1.5(2)
O(1)-C(1)-C(10)-C(11)	1.3(2)
C(2)-C(1)-C(10)-C(11)	179.17(14)
C(8)-C(9)-C(10)-C(1)	1.1(2)
C(8)-C(9)-C(10)-C(11)	-179.61(14)
C(12)-O(3)-C(11)-O(2)	-0.4(2)
C(12)-O(3)-C(11)-C(10)	179.48(12)
C(1)-C(10)-C(11)-O(2)	-2.2(2)
C(9)-C(10)-C(11)-O(2)	178.47(14)
C(1)-C(10)-C(11)-O(3)	177.94(13)
C(9)-C(10)-C(11)-O(3)	-1.4(2)
C(11)-O(3)-C(12)-C(13)	-179.29(12)
C(9)-C(8)-C(14)-C(15)	-53.91(19)
C(7)-C(8)-C(14)-C(15)	122.86(16)
C(9)-C(8)-C(14)-C(19)	125.70(16)
C(7)-C(8)-C(14)-C(19)	-57.5(2)

C(19)-C(14)-C(15)-C(16)	1.3(2)
C(8)-C(14)-C(15)-C(16)	-179.05(12)
C(14)-C(15)-C(16)-C(17)	0.4(2)
C(15)-C(16)-C(17)-C(18)	-1.7(2)
C(16)-C(17)-C(18)-C(19)	1.4(2)
C(17)-C(18)-C(19)-C(14)	0.3(2)
C(15)-C(14)-C(19)-C(18)	-1.6(2)
C(8)-C(14)-C(19)-C(18)	178.75(13)
O(4)-C(20)-C(21)-C(26)	-178.71(13)
C(29)-C(20)-C(21)-C(26)	2.5(2)
O(4)-C(20)-C(21)-C(22)	1.6(2)
C(29)-C(20)-C(21)-C(22)	-177.18(14)
C(26)-C(21)-C(22)-C(23)	-1.0(2)
C(20)-C(21)-C(22)-C(23)	178.73(15)
C(21)-C(22)-C(23)-C(24)	-0.3(2)
C(22)-C(23)-C(24)-C(25)	0.6(2)
C(23)-C(24)-C(25)-C(26)	0.5(2)
C(24)-C(25)-C(26)-C(21)	-1.7(2)
C(24)-C(25)-C(26)-C(27)	-179.30(15)
C(20)-C(21)-C(26)-C(25)	-177.76(14)
C(22)-C(21)-C(26)-C(25)	2.0(2)
C(20)-C(21)-C(26)-C(27)	-0.1(2)
C(22)-C(21)-C(26)-C(27)	179.61(14)
C(25)-C(26)-C(27)-C(28)	175.10(14)
C(21)-C(26)-C(27)-C(28)	-2.4(2)
C(25)-C(26)-C(27)-C(33)	-6.8(2)
C(21)-C(26)-C(27)-C(33)	175.65(13)
C(26)-C(27)-C(28)-C(29)	2.7(2)
C(33)-C(27)-C(28)-C(29)	-175.38(13)
O(4)-C(20)-C(29)-C(28)	178.97(13)
C(21)-C(20)-C(29)-C(28)	-2.4(2)
O(4)-C(20)-C(29)-C(30)	1.0(2)
C(21)-C(20)-C(29)-C(30)	179.67(13)
C(27)-C(28)-C(29)-C(20)	-0.3(2)
C(27)-C(28)-C(29)-C(30)	177.59(14)
C(31)-O(6)-C(30)-O(5)	-1.0(2)
C(31)-O(6)-C(30)-C(29)	178.32(12)
C(20)-C(29)-C(30)-O(5)	1.9(2)
C(28)-C(29)-C(30)-O(5)	-175.96(14)
C(20)-C(29)-C(30)-O(6)	-177.32(13)
C(28)-C(29)-C(30)-O(6)	4.8(2)
C(30)-O(6)-C(31)-C(32)	-161.81(14)
C(28)-C(27)-C(33)-C(34)	-63.5(2)
C(26)-C(27)-C(33)-C(34)	118.41(17)

C(28)-C(27)-C(33)-C(38)	114.73(19)
C(26)-C(27)-C(33)-C(38)	-63.3(2)
C(38)-C(33)-C(34)-C(35)	0.1(2)
C(27)-C(33)-C(34)-C(35)	178.40(15)
C(33)-C(34)-C(35)-C(36)	-0.4(3)
C(34)-C(35)-C(36)-C(37)	0.2(3)
C(35)-C(36)-C(37)-C(38)	0.3(3)
C(36)-C(37)-C(38)-C(33)	-0.6(3)
C(34)-C(33)-C(38)-C(37)	0.4(3)
C(27)-C(33)-C(38)-C(37)	-177.92(14)

Symmetry transformations used to generate equivalent atoms.

**Table 7. Hydrogen bonds for shelx [Å and deg.].**

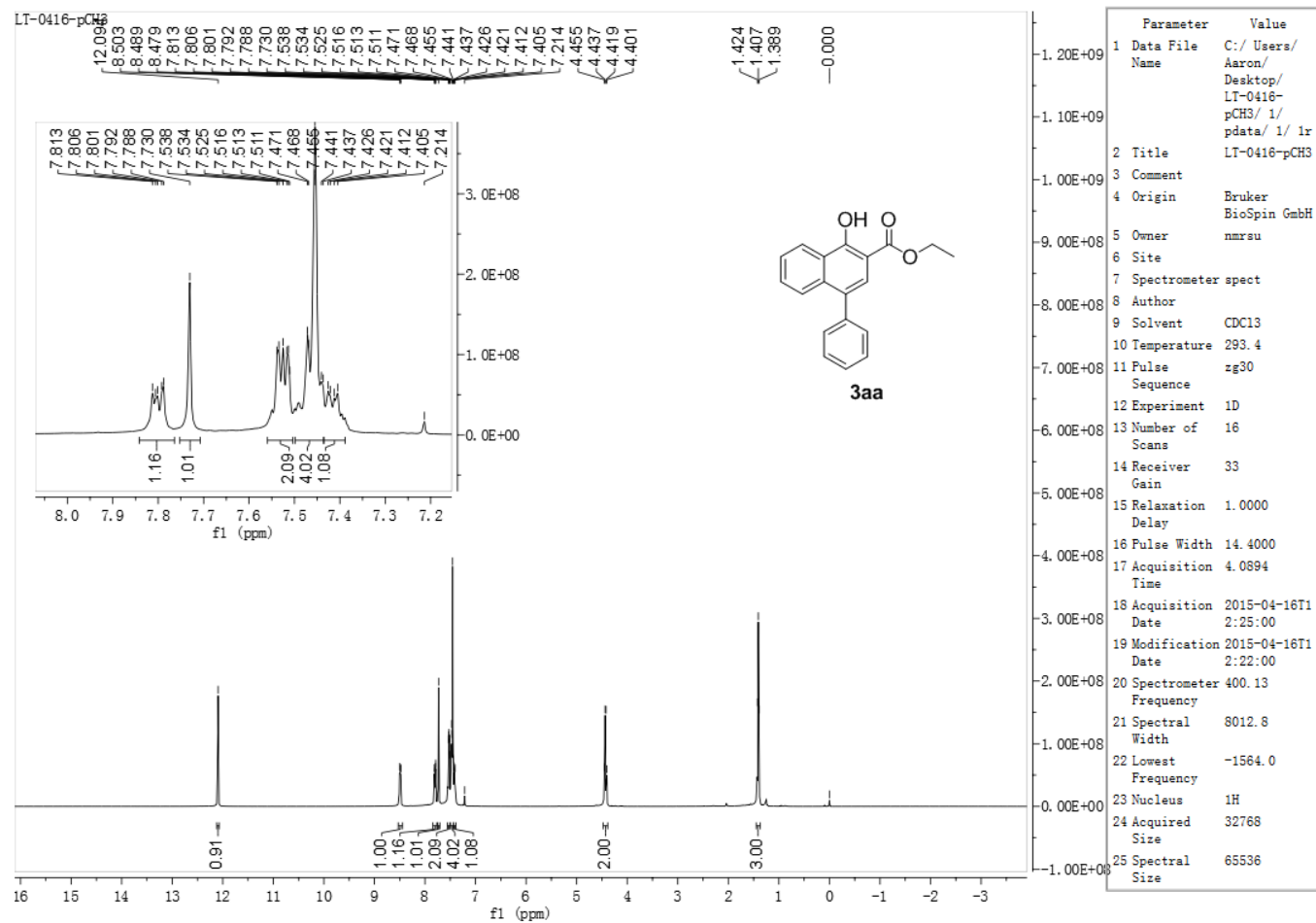
D-H...A	d(D-H)	d(H...A)	d(D...A)	<(DHA)
O(1)-H(1)...O(2)	0.84	1.85	2.5895(17)	145.6
O(4)-H(4)...O(5)	0.84	1.85	2.5888(18)	146.0

Symmetry transformations used to generate equivalent atoms.

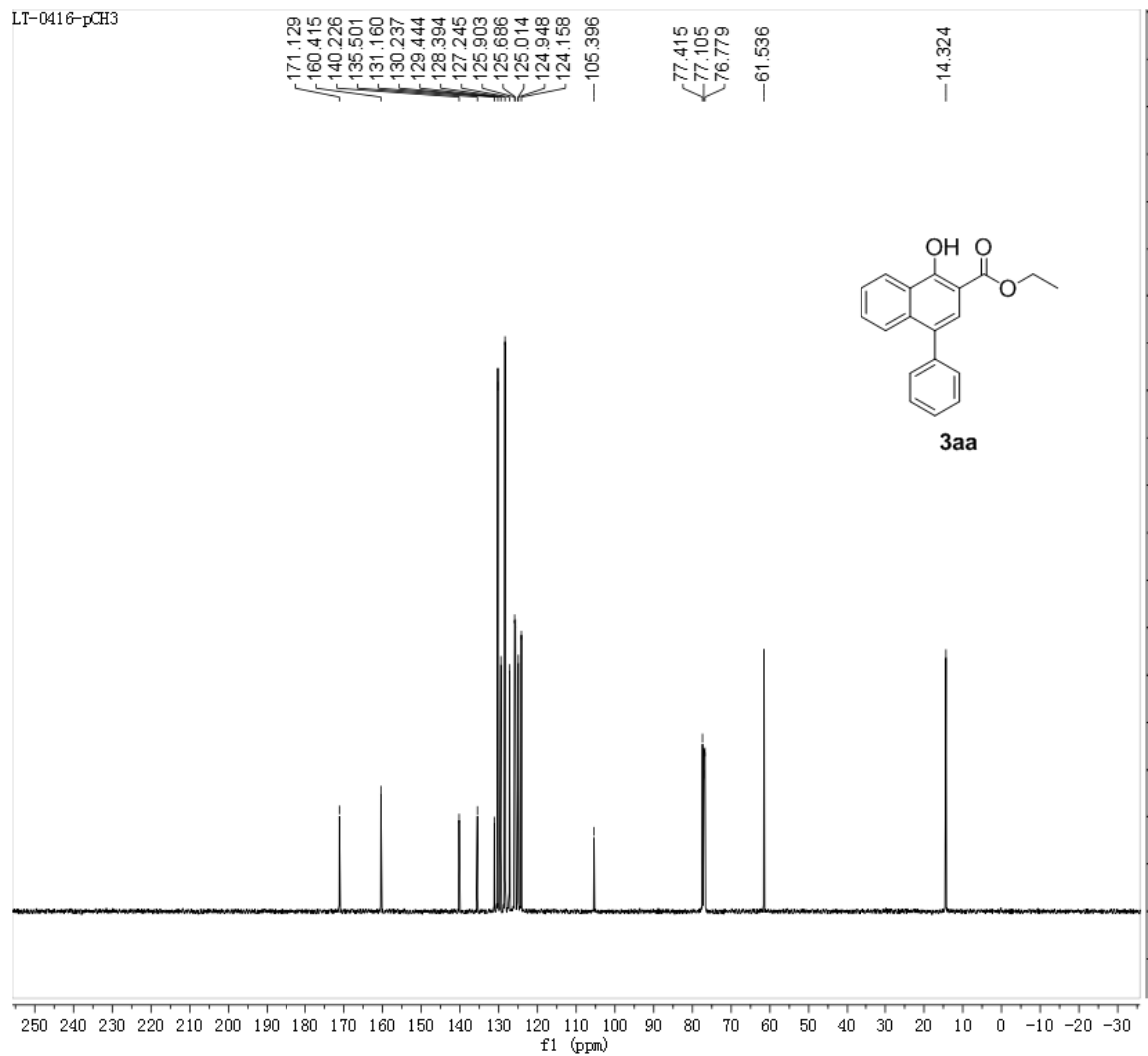
## 5. Reference

- [1] Y. Jiang, X. Chen, Y. Zheng, Z. Xue, C. Shu, W. Yuan, X. Zhang, *Angew. Chem. Int. Ed.* **2011**, *50*, 7304.
- [2] a) H. Jiang, Y. Cheng, Y. Zhang, S. Yu, *Org. Lett.* **2013**, *15*, 4884; b) S. Kalogiannis, S. Spyroudis, *J. Org. Chem.* **1990**, *55*, 5041; c) S. A. Shahzad, C. Vivant, T. Wirth, *Org. Lett.* **2010**, *12*, 1364.
- [3] G. Naresh, R. Kant, T. Narender, *Org. Lett.* **2015**, *17*, 3446.

**6. NMR and HRMS Spectra of Products 3 and Intermediate A  
Ethyl 1-hydroxy-4-phenyl-2-naphthoate (3aa).**



LT-0416-pCH3

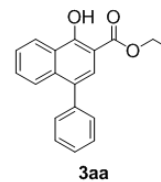
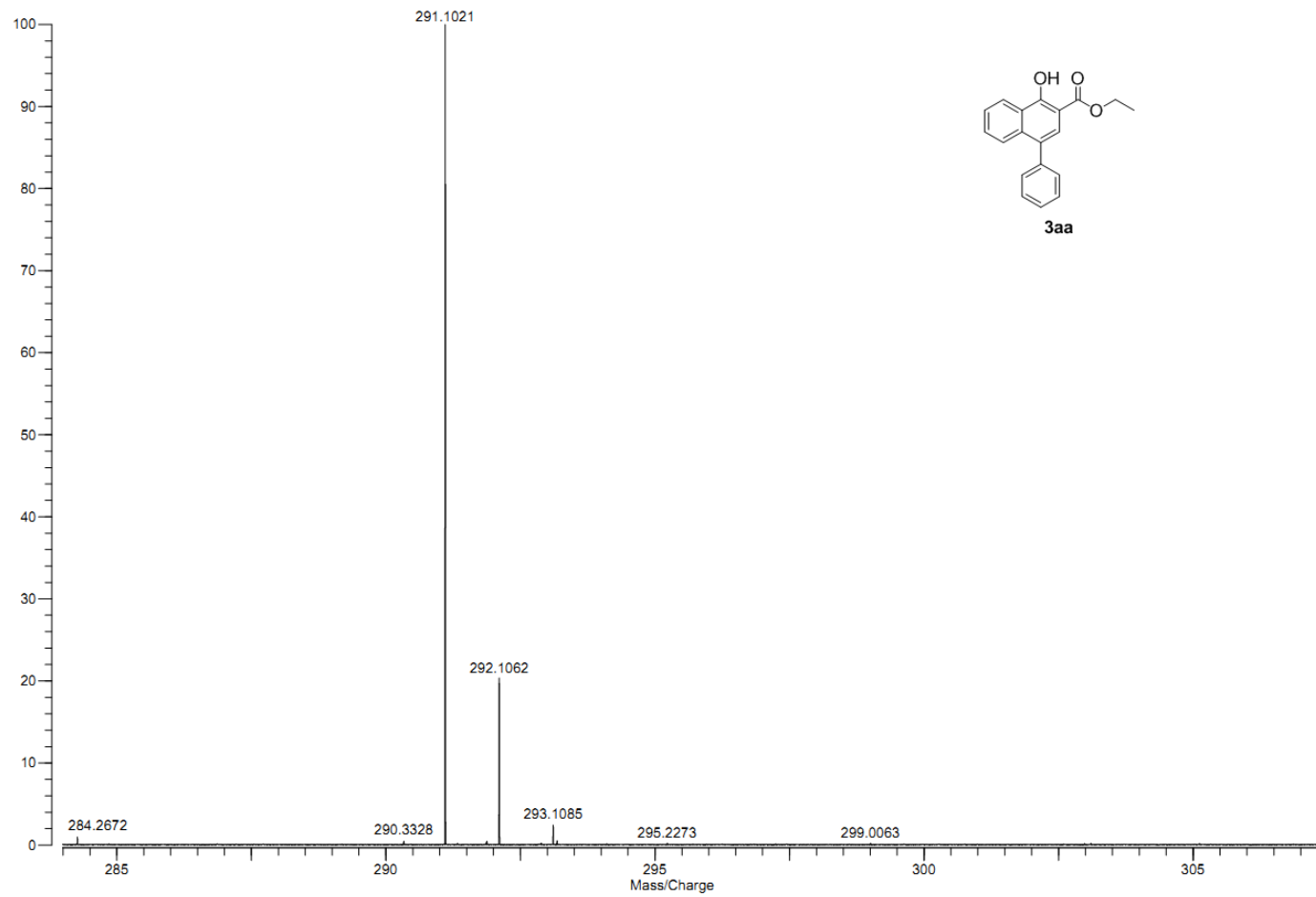


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5 Owner	nrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	293.7
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Number of Scans	1024
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16 Pulse Width	9.5000
17 Acquisition Time	0.4999
18 Acquisition Date	2015-04-16T12:28:00
19 Modification Date	2015-04-16T12:50:00
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21 Spectral Width	35714.3
22 Lowest Frequency	-7796.8
23 Nucleus	13C
24 Acquired Size	17855
25 Spectral Size	32768

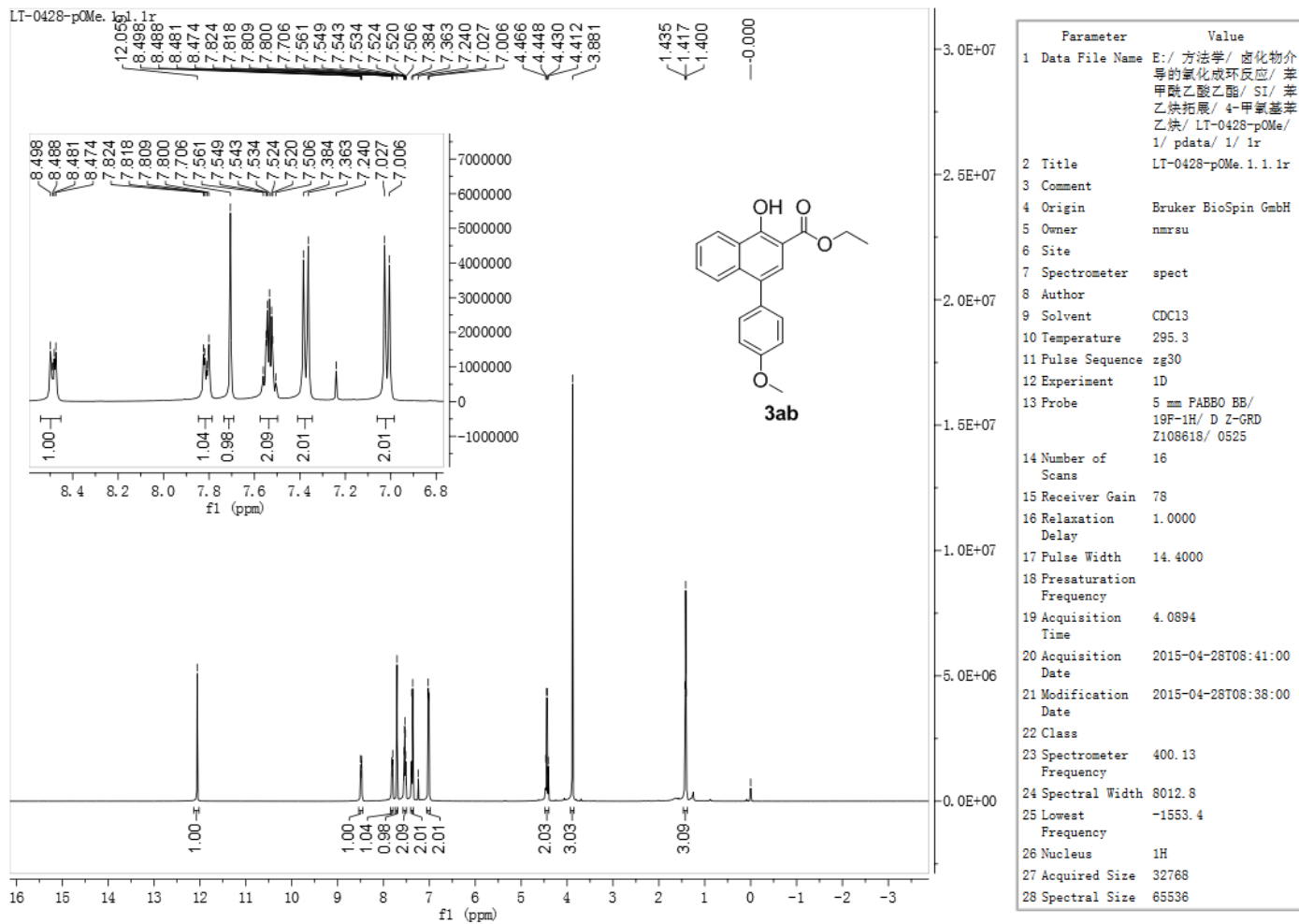
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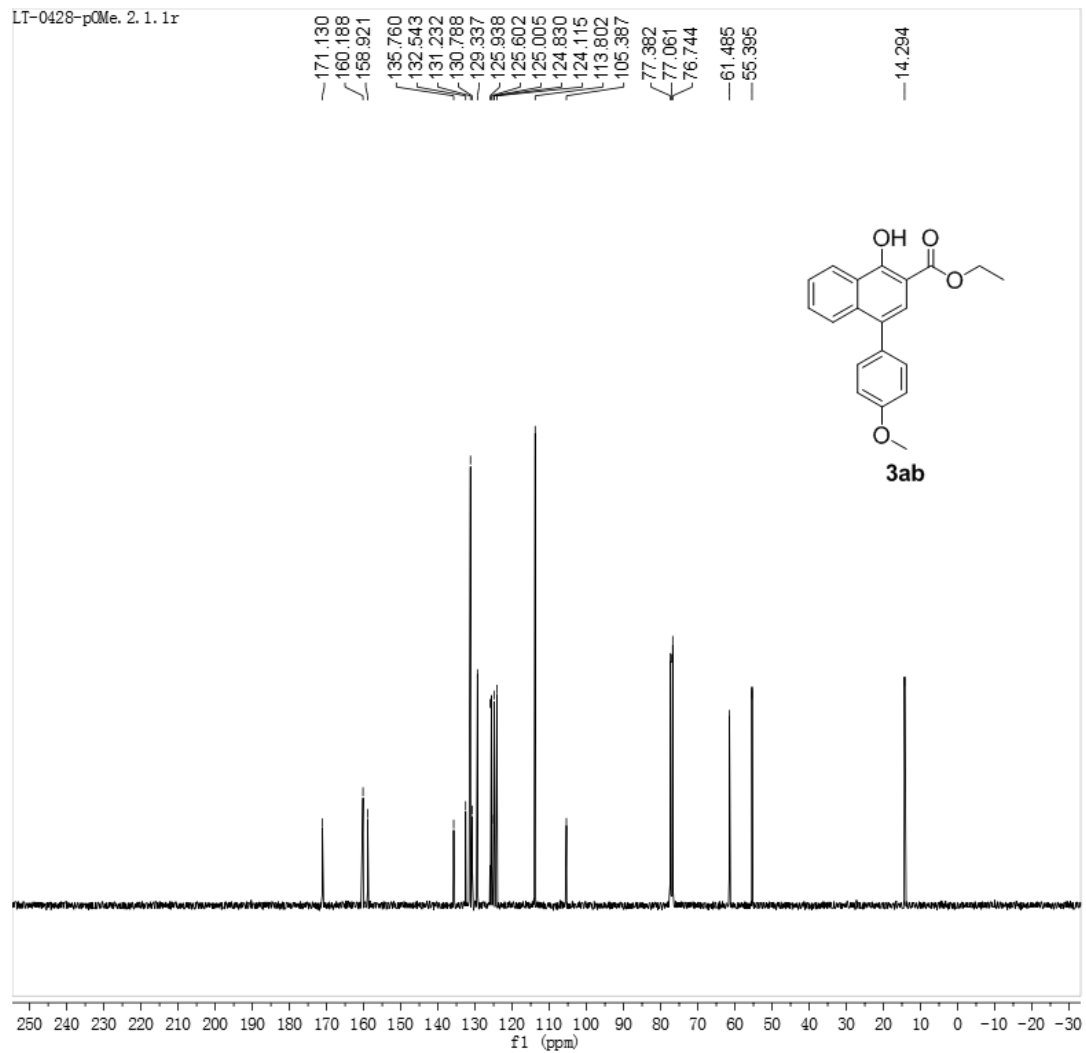
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**Ethyl 1-hydroxy-4-(4-methoxyphenyl)-2-naphthoate(3ab).**



LT-0428-pOMe. 2. 1. 1r

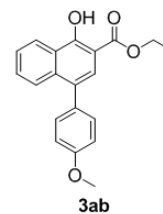
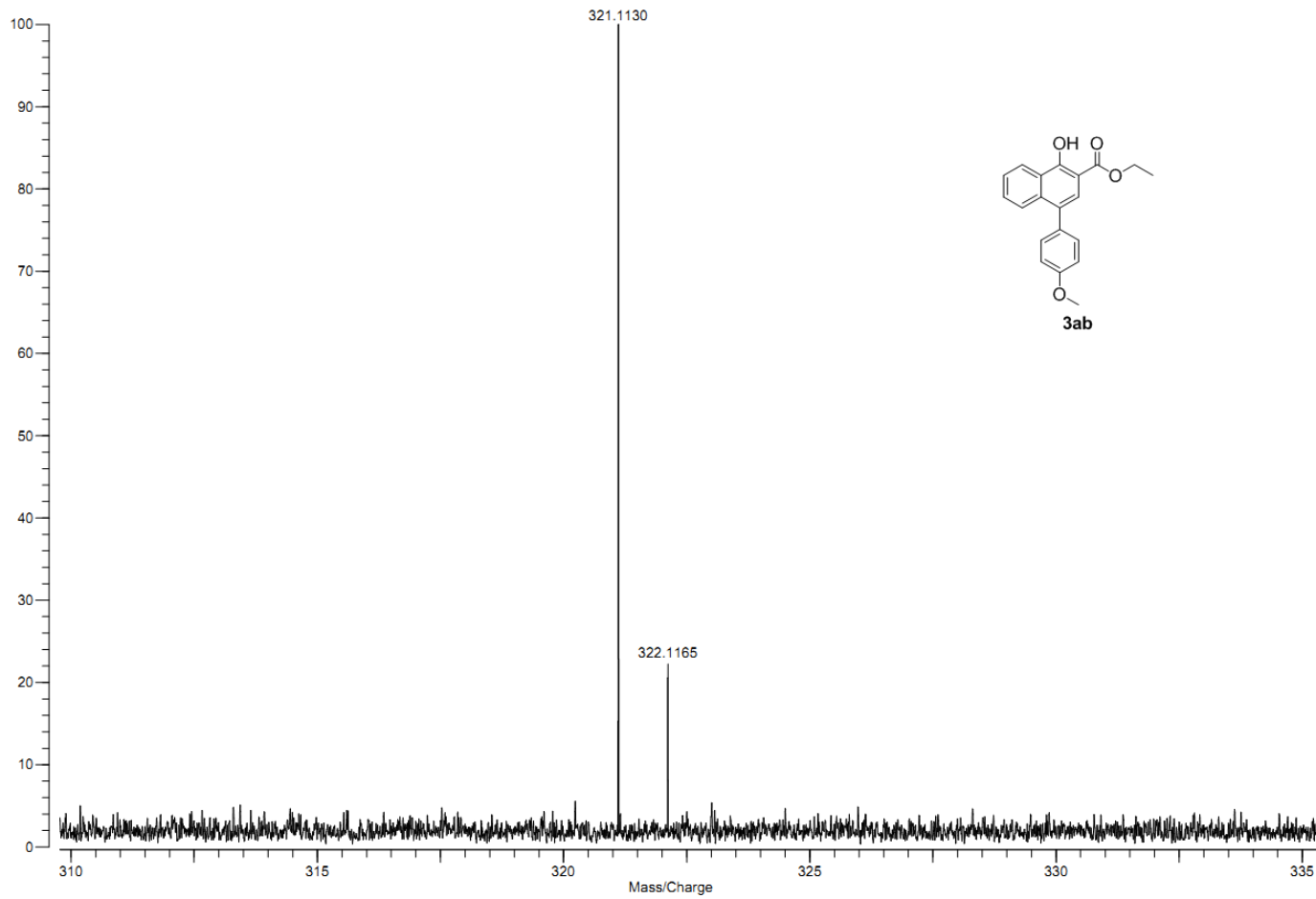


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3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
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12 Experiment	1D
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14 Number of Scans	729
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26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

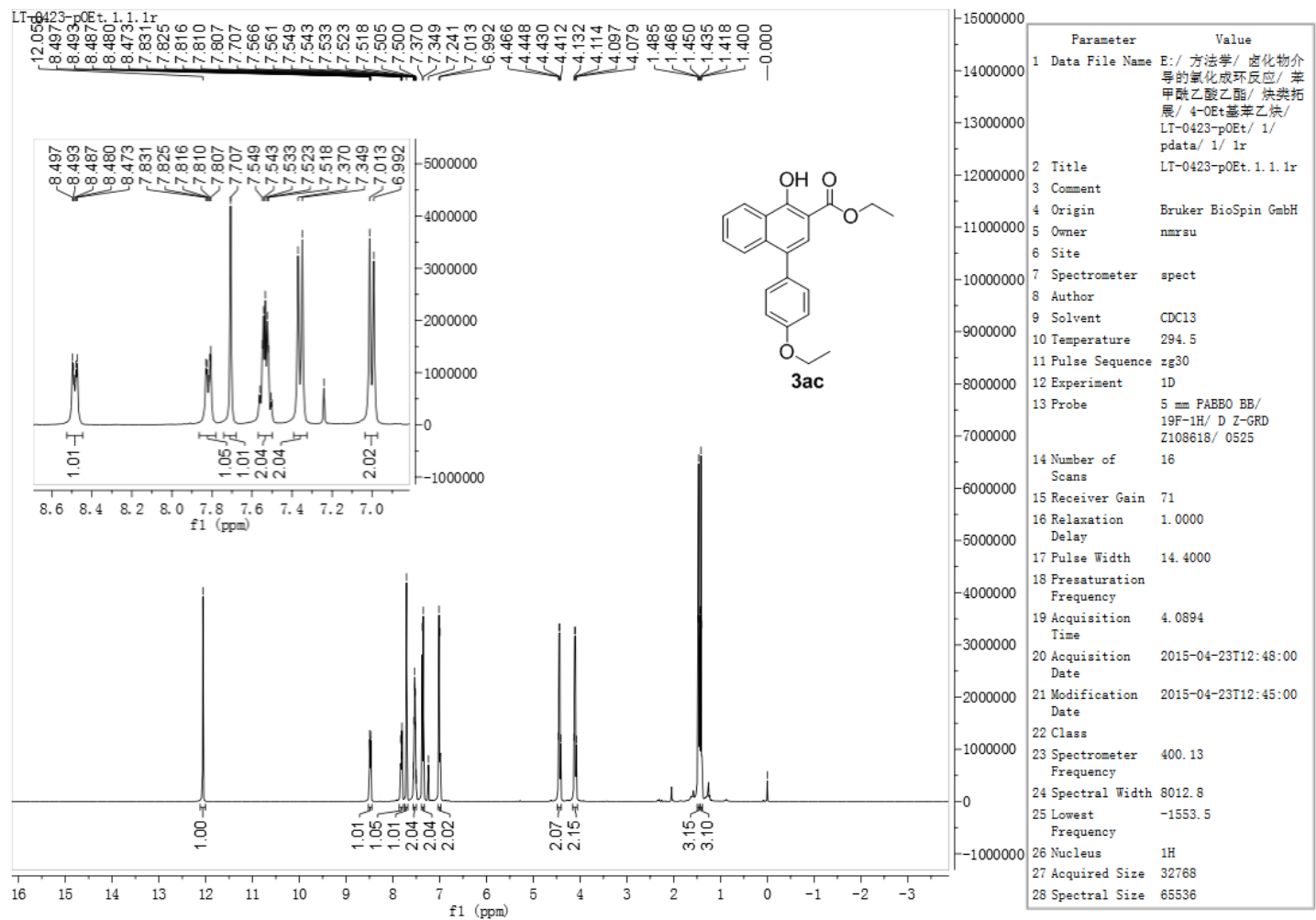
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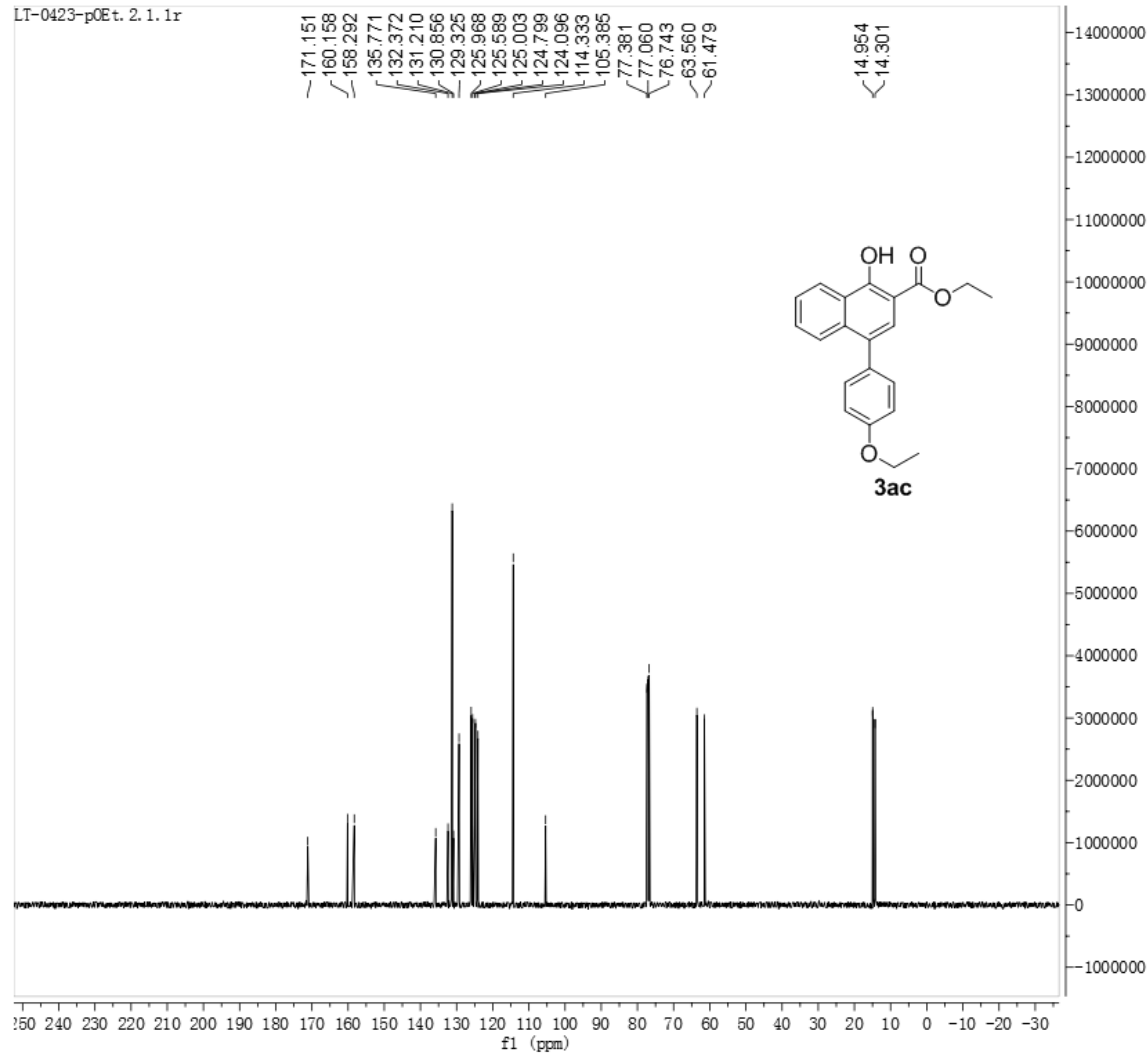
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Ethyl 4-(4-ethoxyphenyl)-1-hydroxy-2-naphthoate(3ac).



LT-0423-pOEt. 2.1.1r

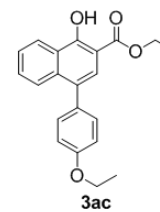
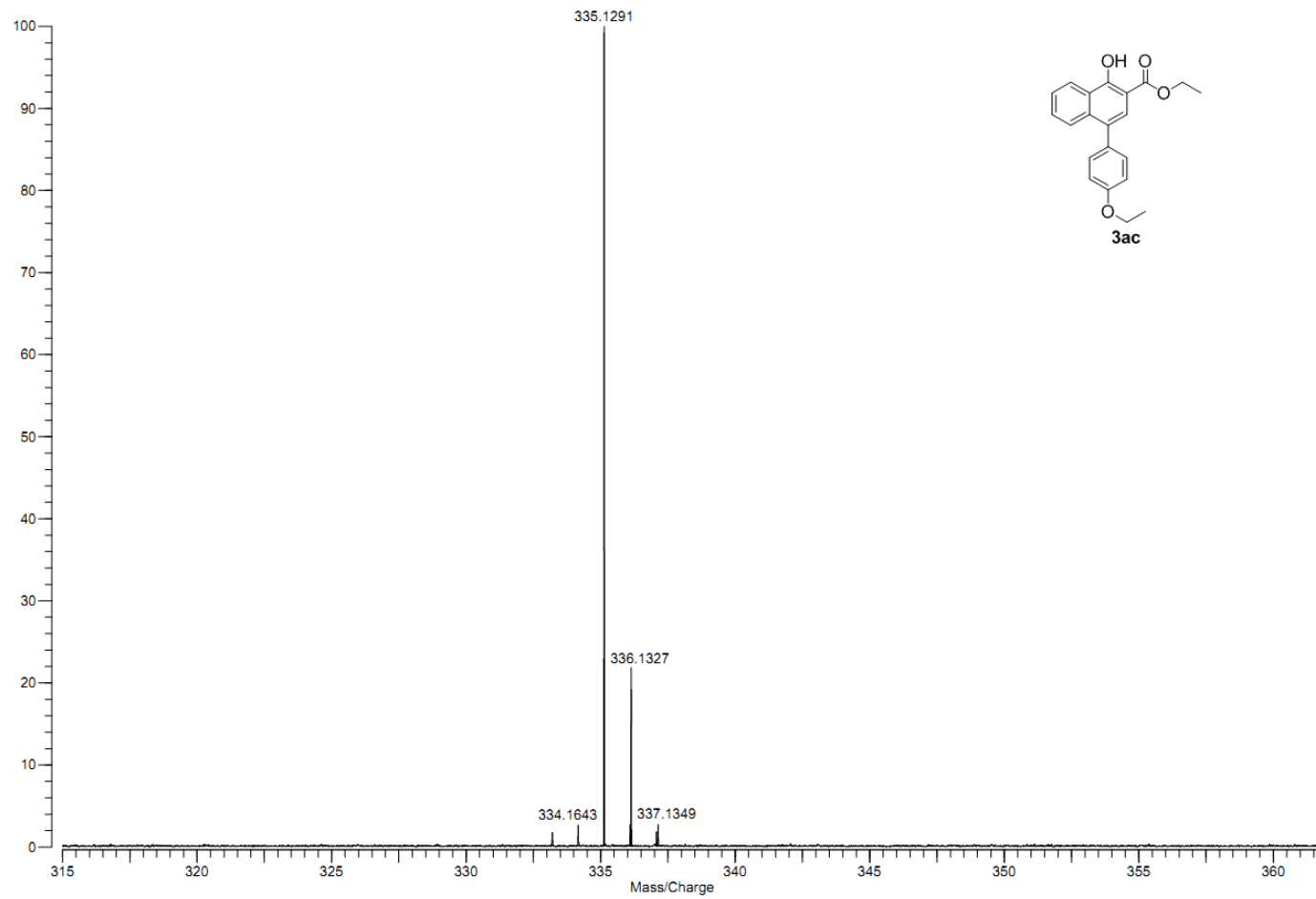


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7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
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22 Class	
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25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

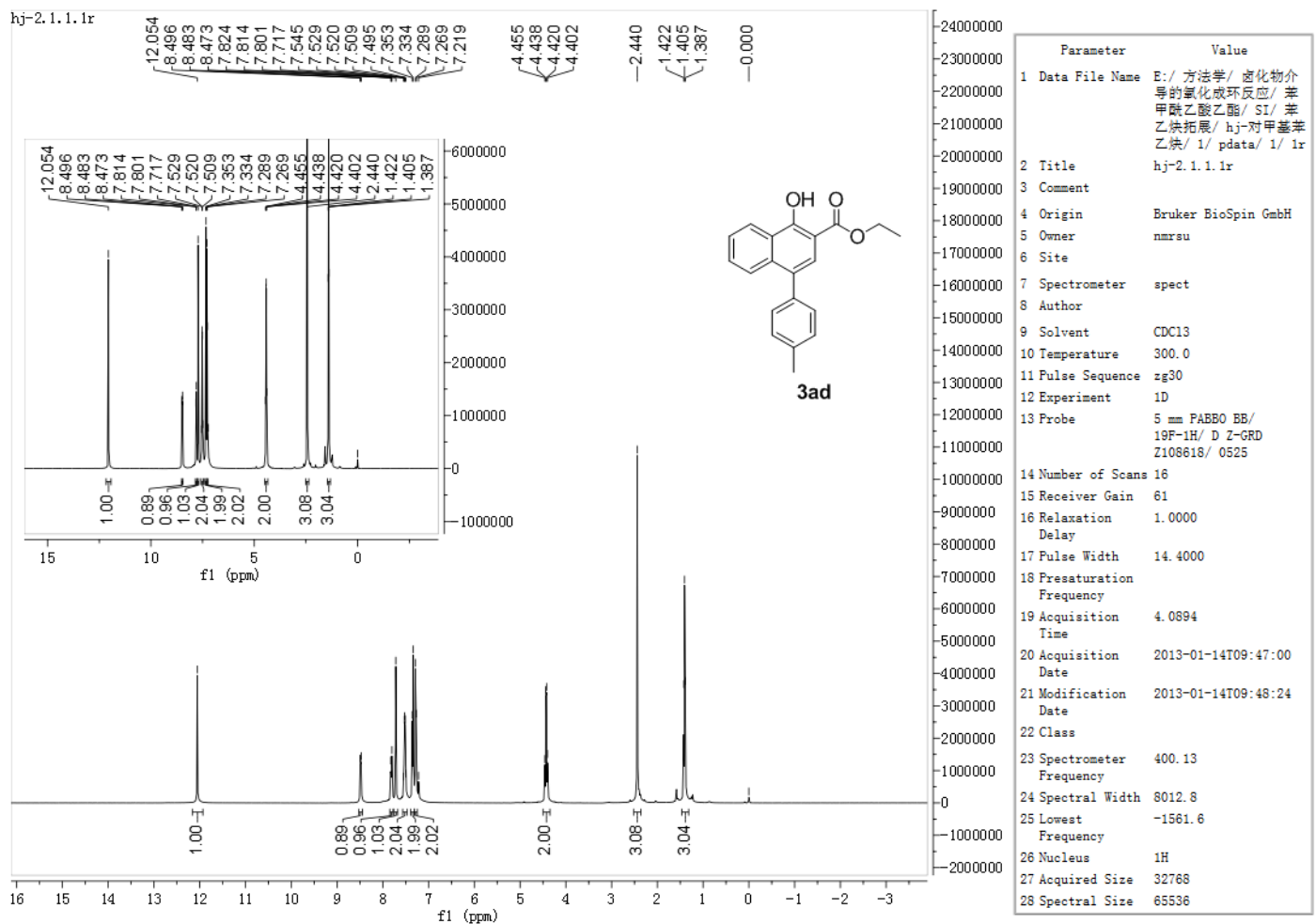
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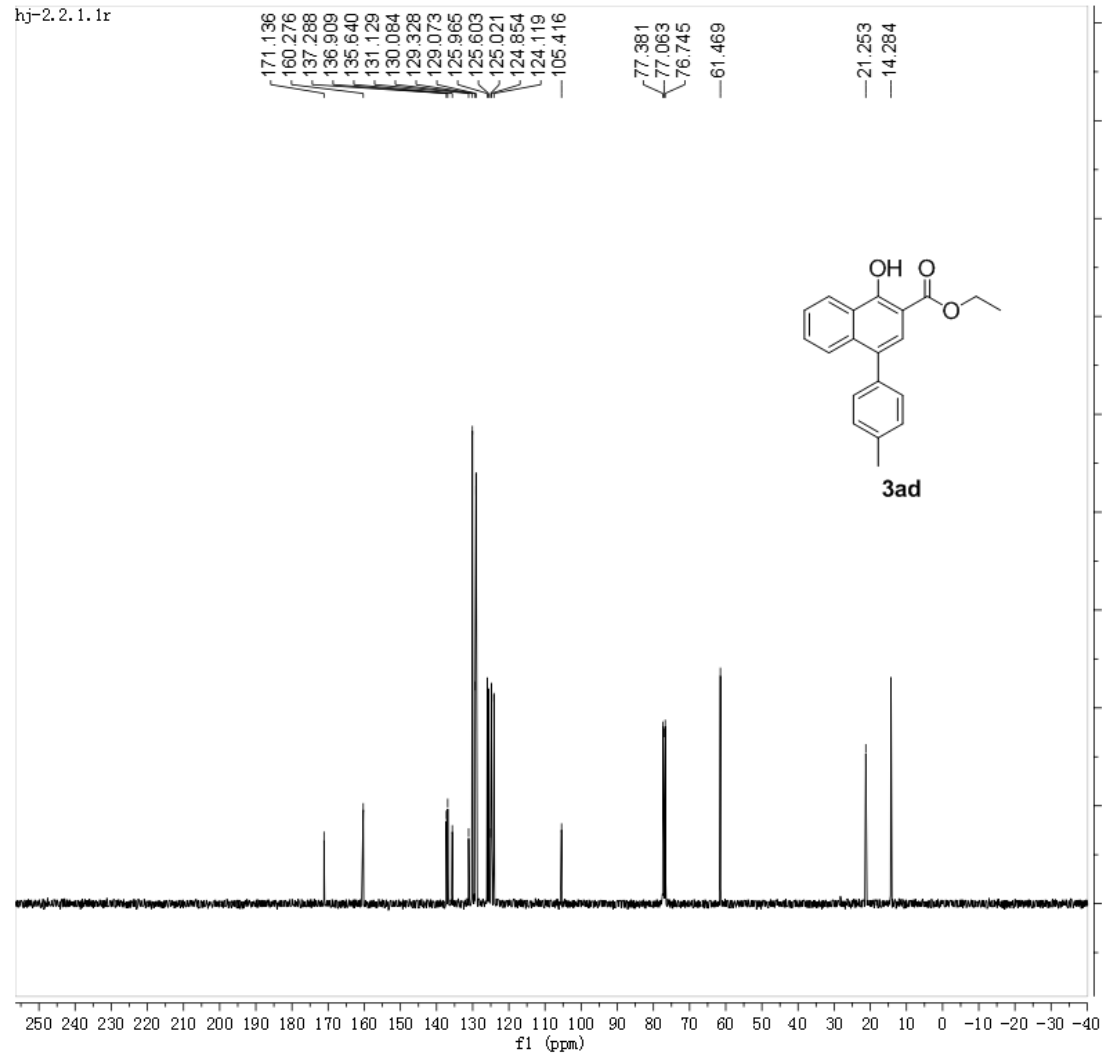
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# Ethyl 1-hydroxy-4-(p-tolyl)-2-naphthoate(3ad).



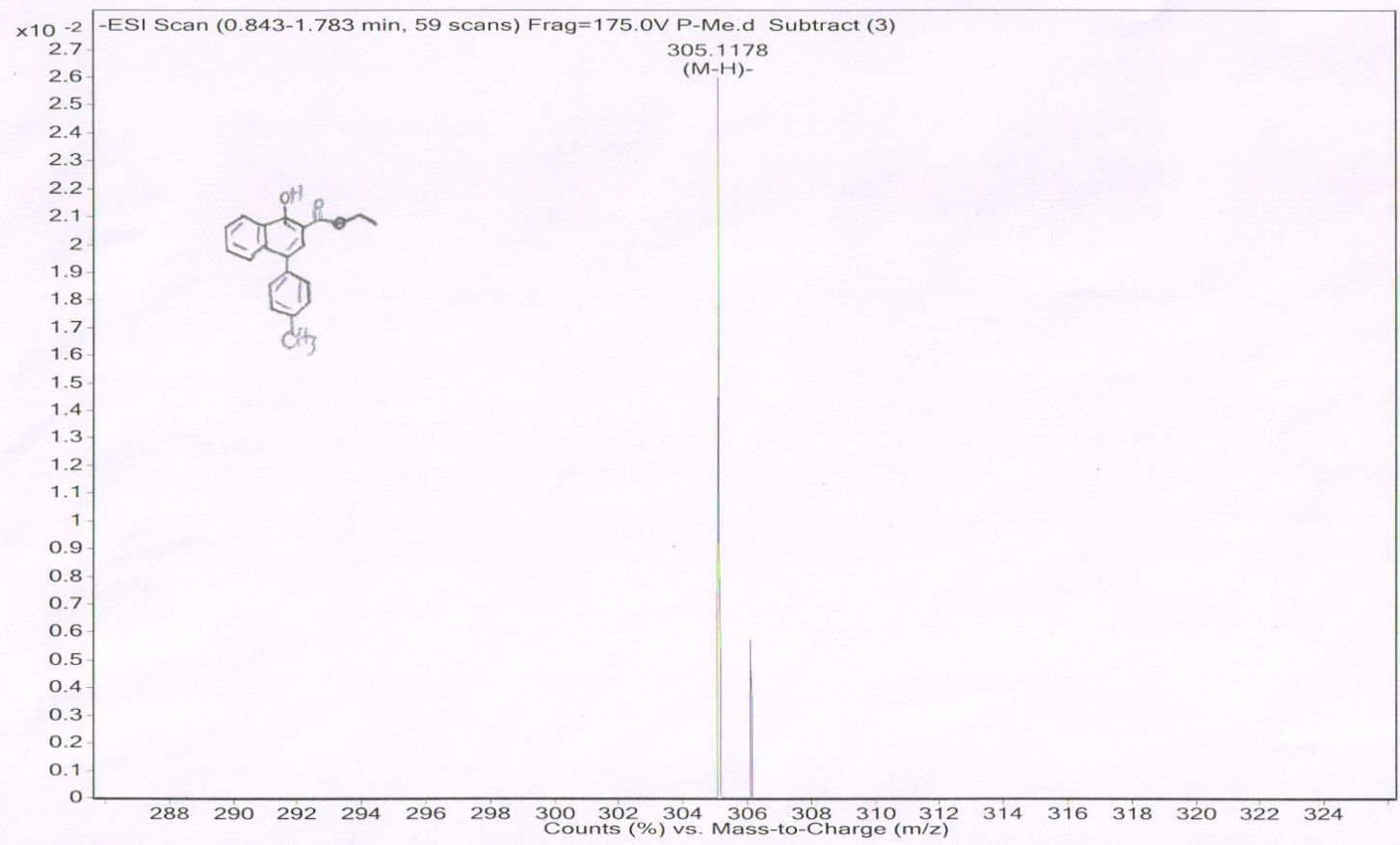
hj-2.2.1.1r



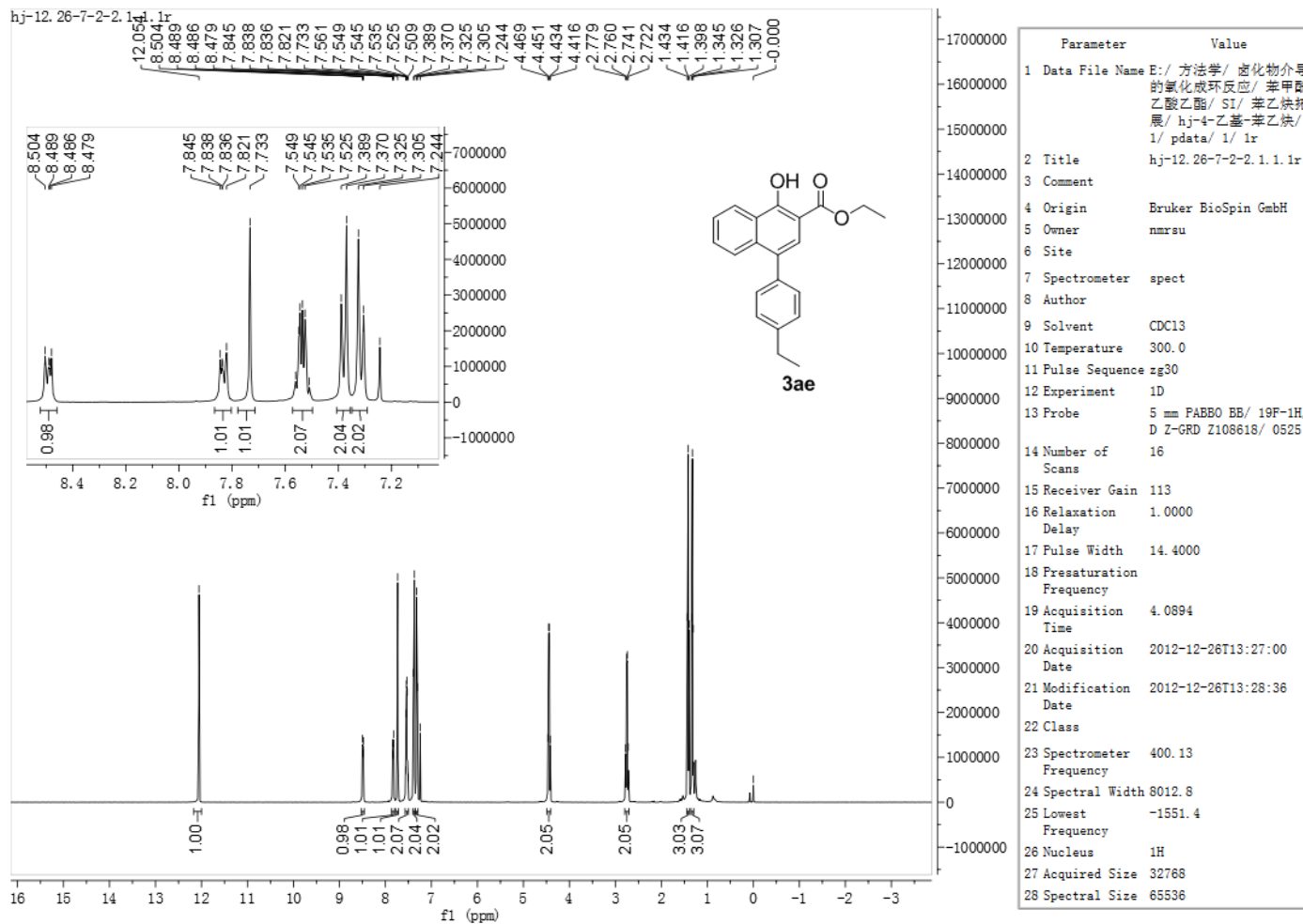
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5 Owner	nmrau
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26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

305.1183

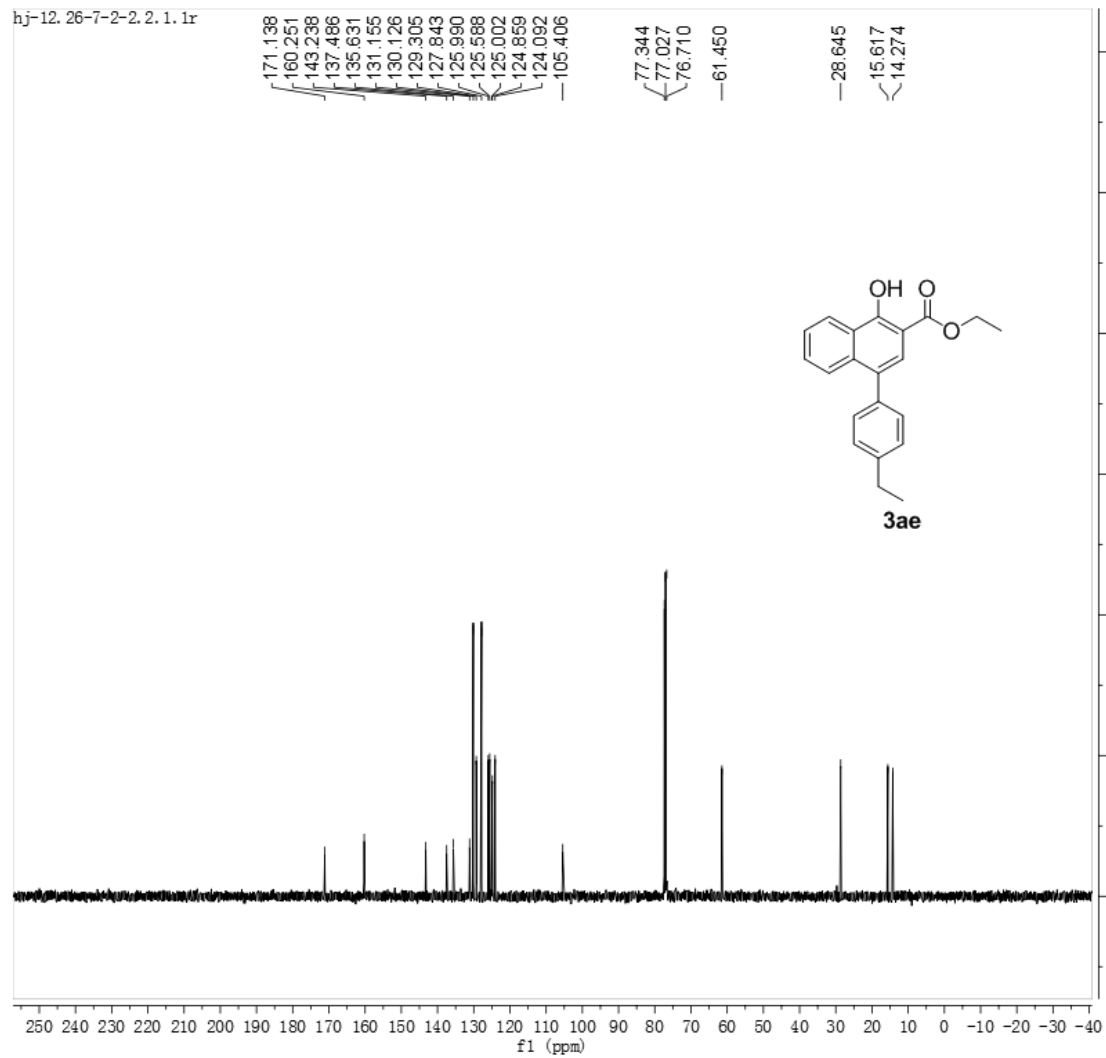
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### Ethyl 4-(4-ethylphenyl)-1-hydroxy-2-naphthoate(3ae).



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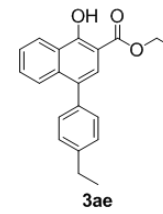
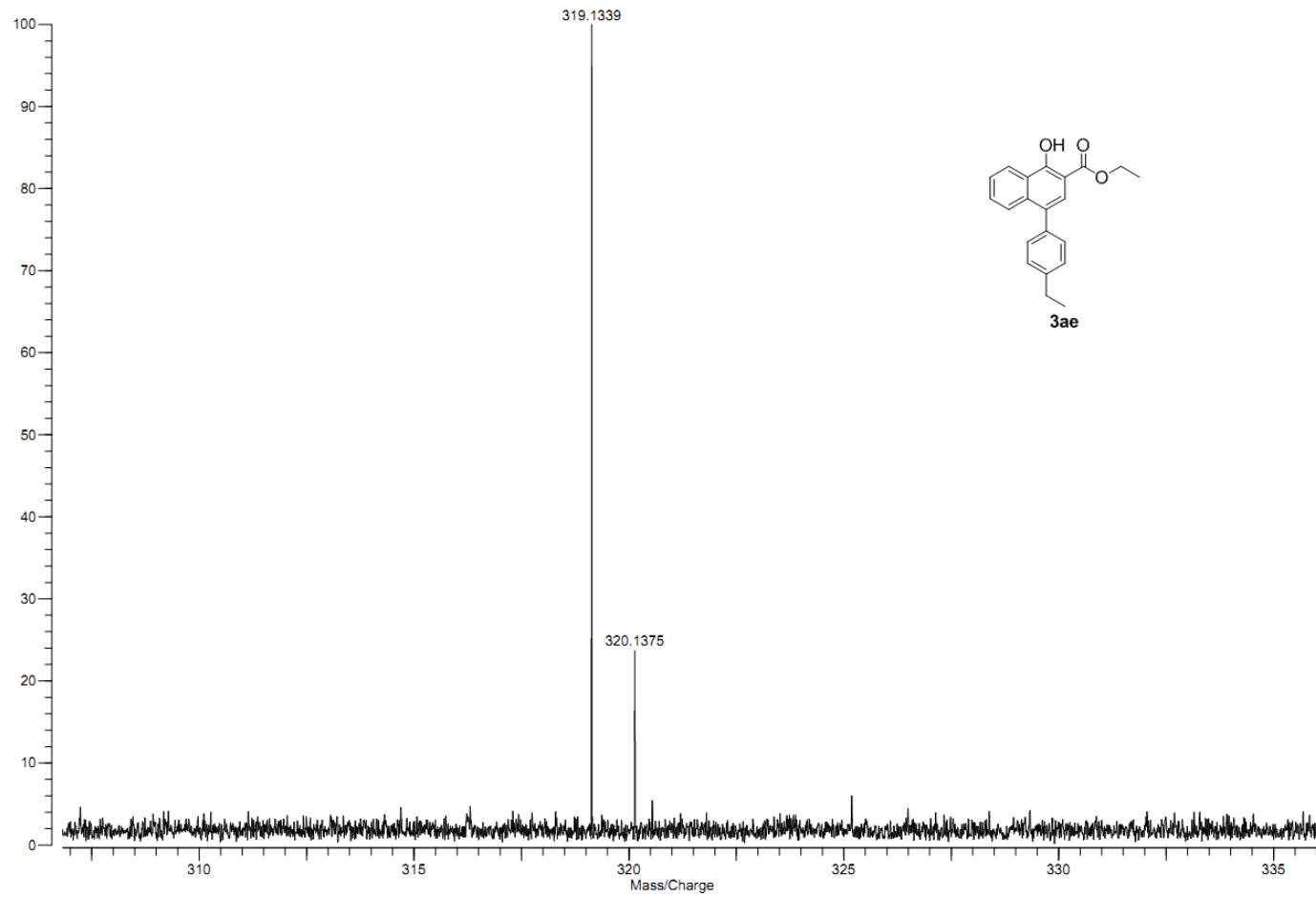


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25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

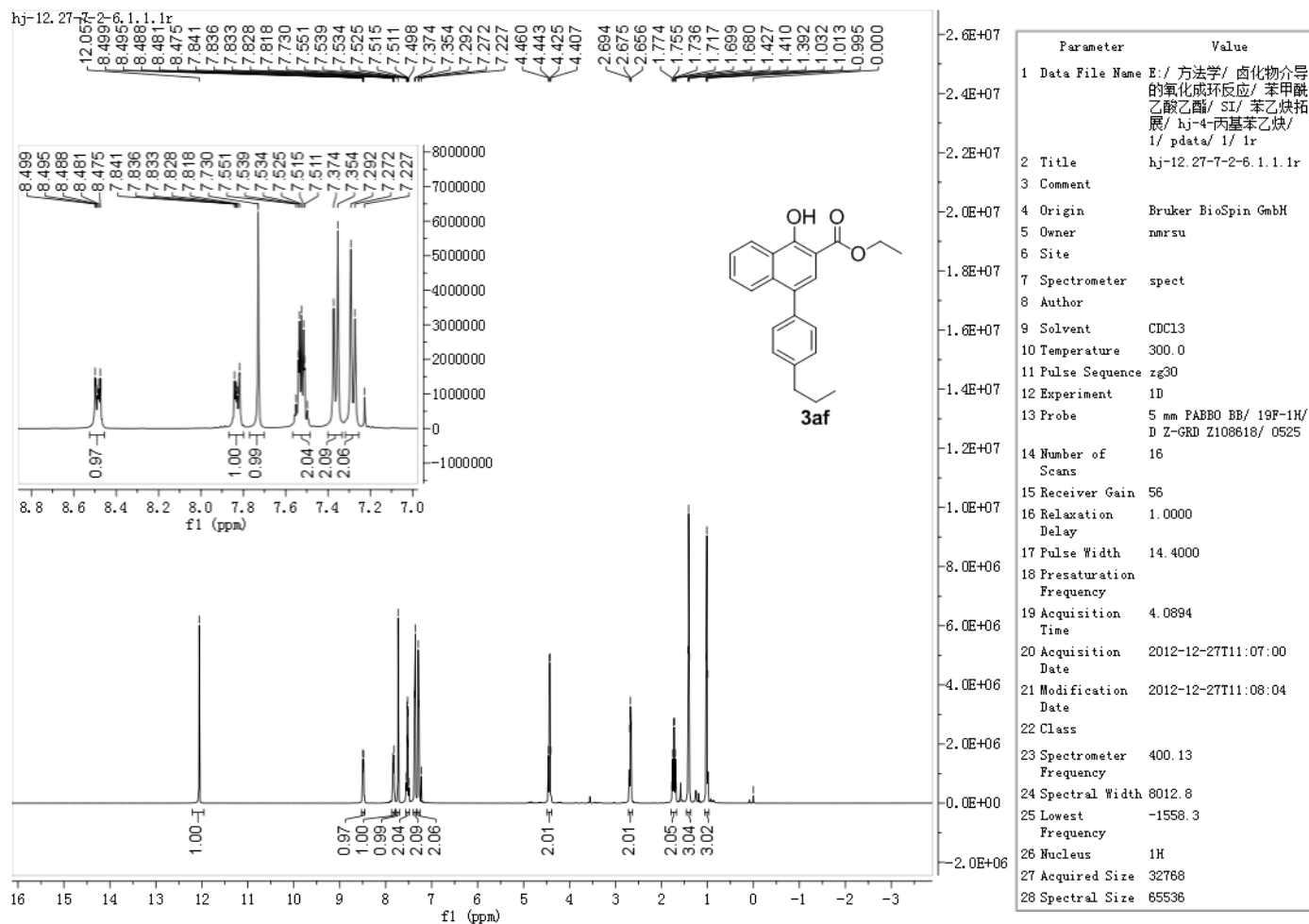
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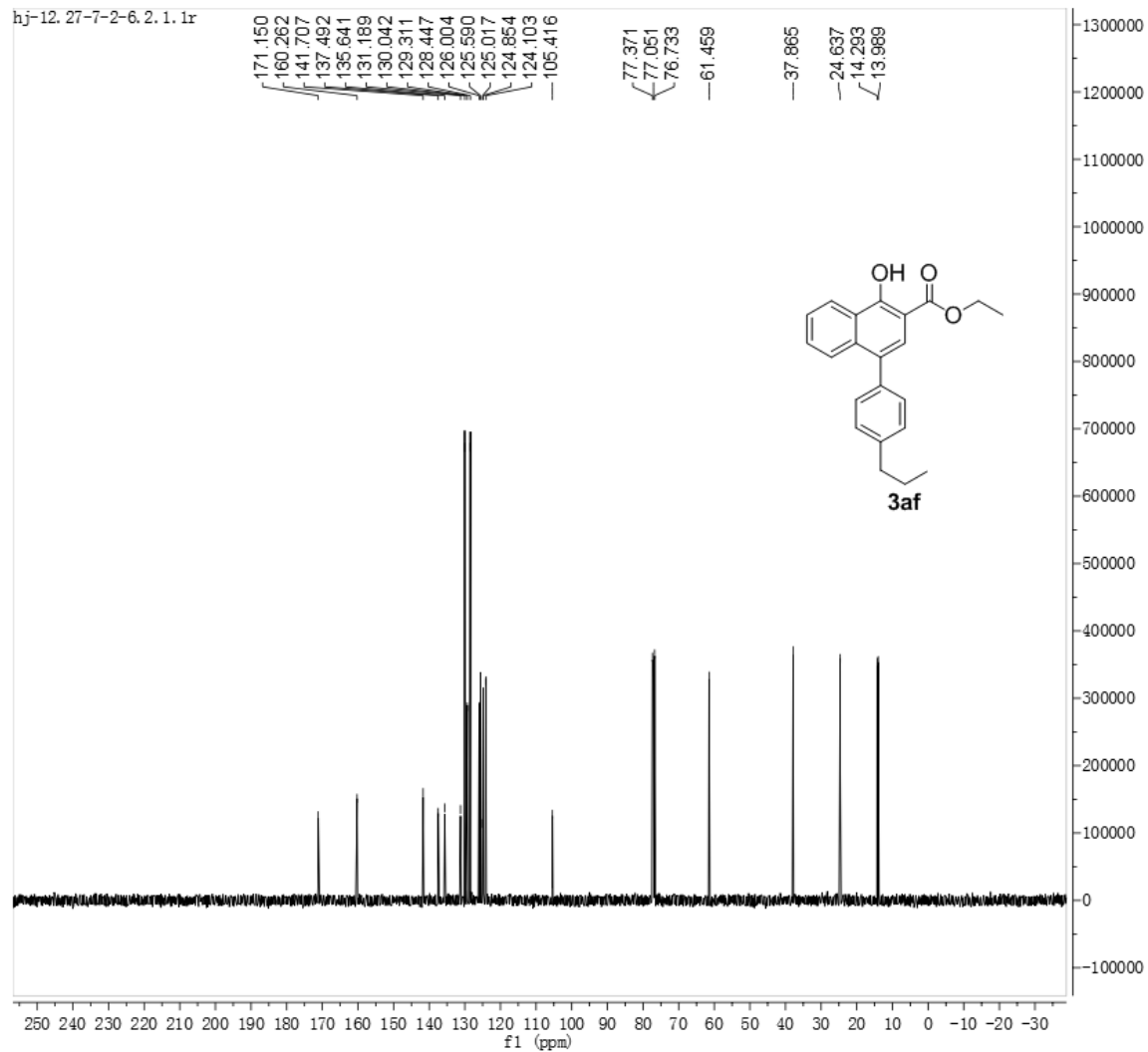
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### Ethyl 1-hydroxy-4-(4-propylphenyl)-2-naphthoate(3af).



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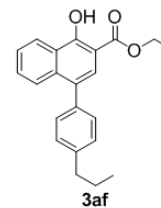
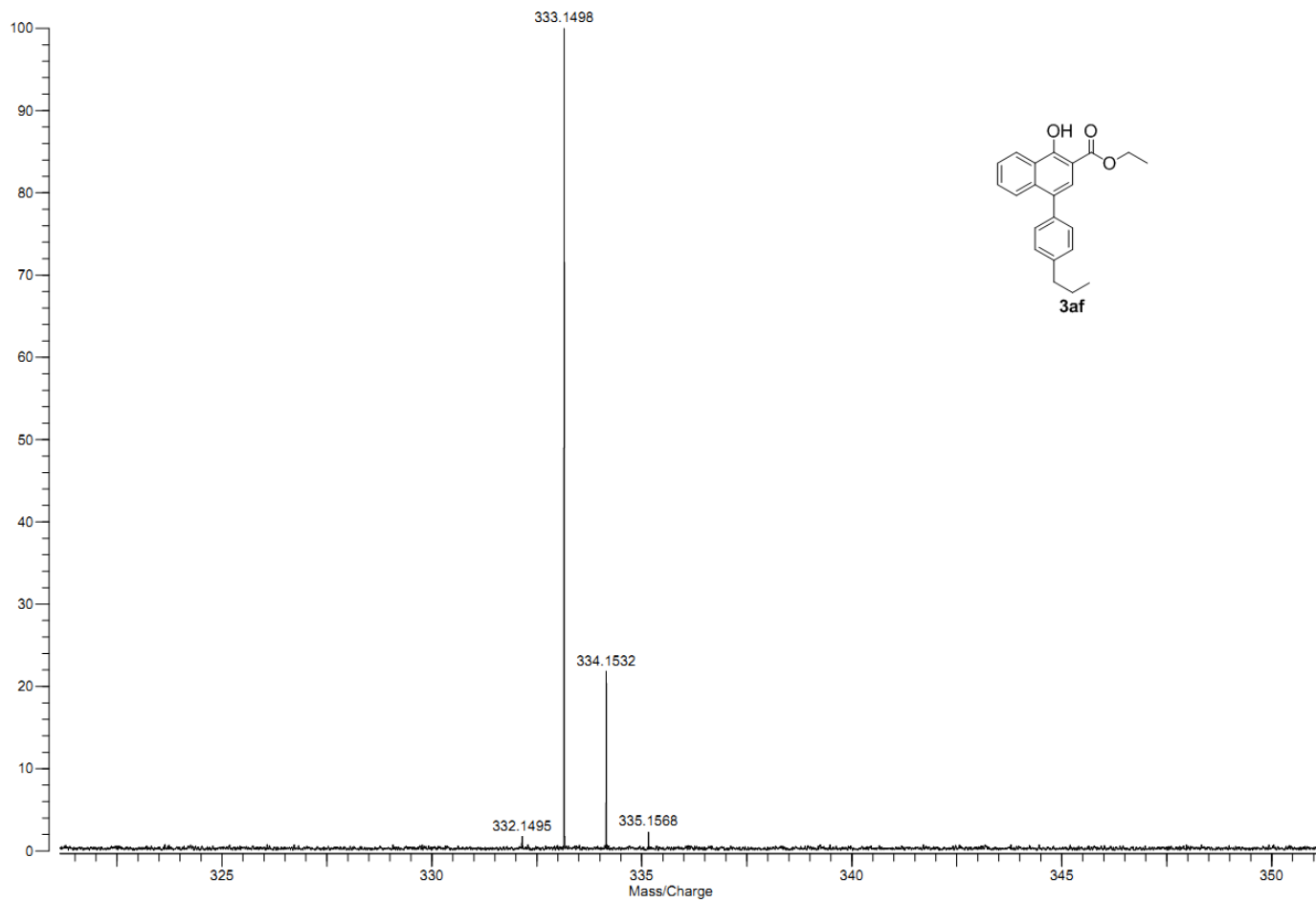


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22 Class	
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25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

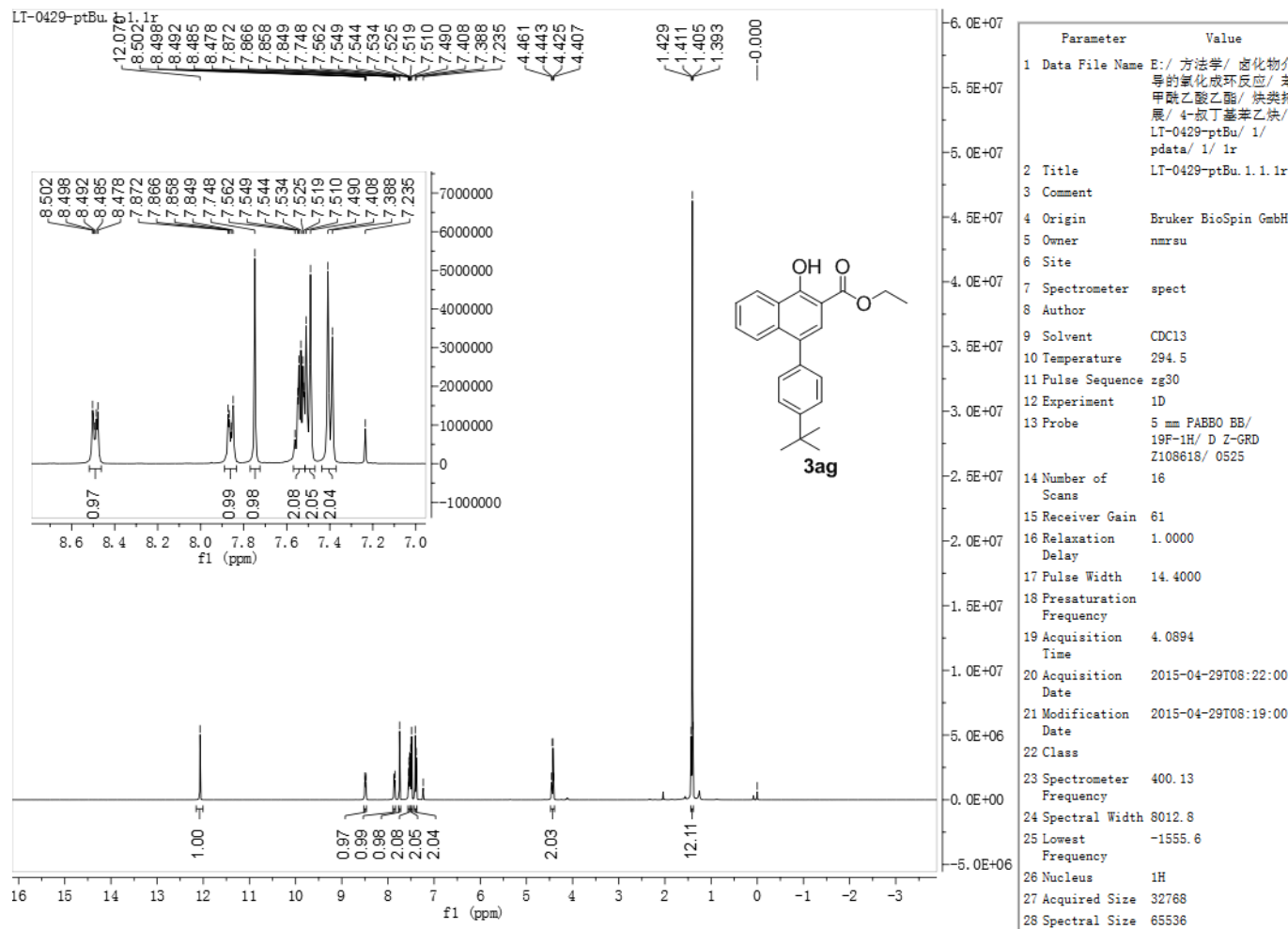
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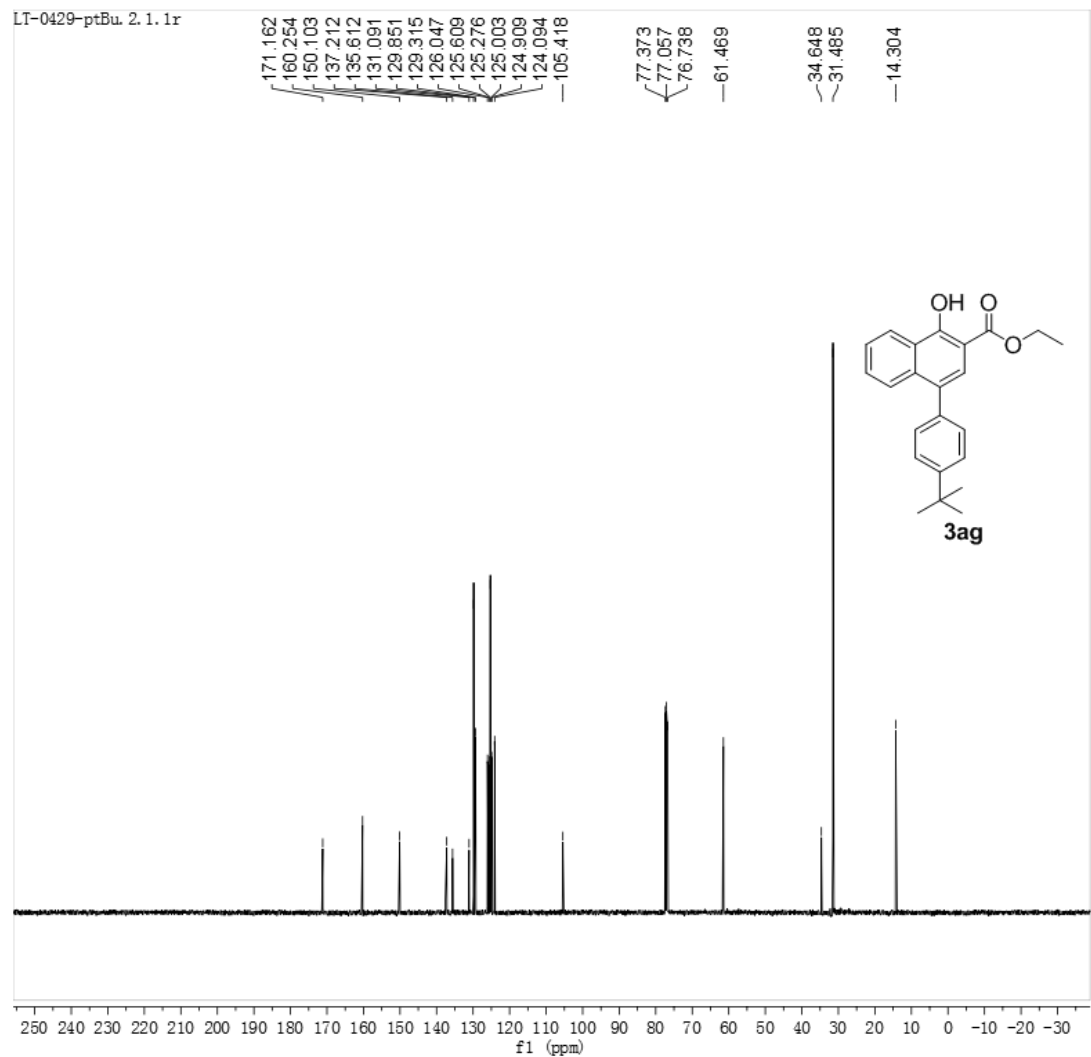
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Ethyl 4-(4-(*tert*-butyl)phenyl)-1-hydroxy-2-naphthoate(3ag).



LT-0429-ptBu. 2.1.1r

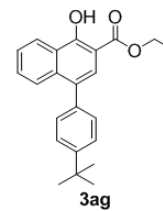
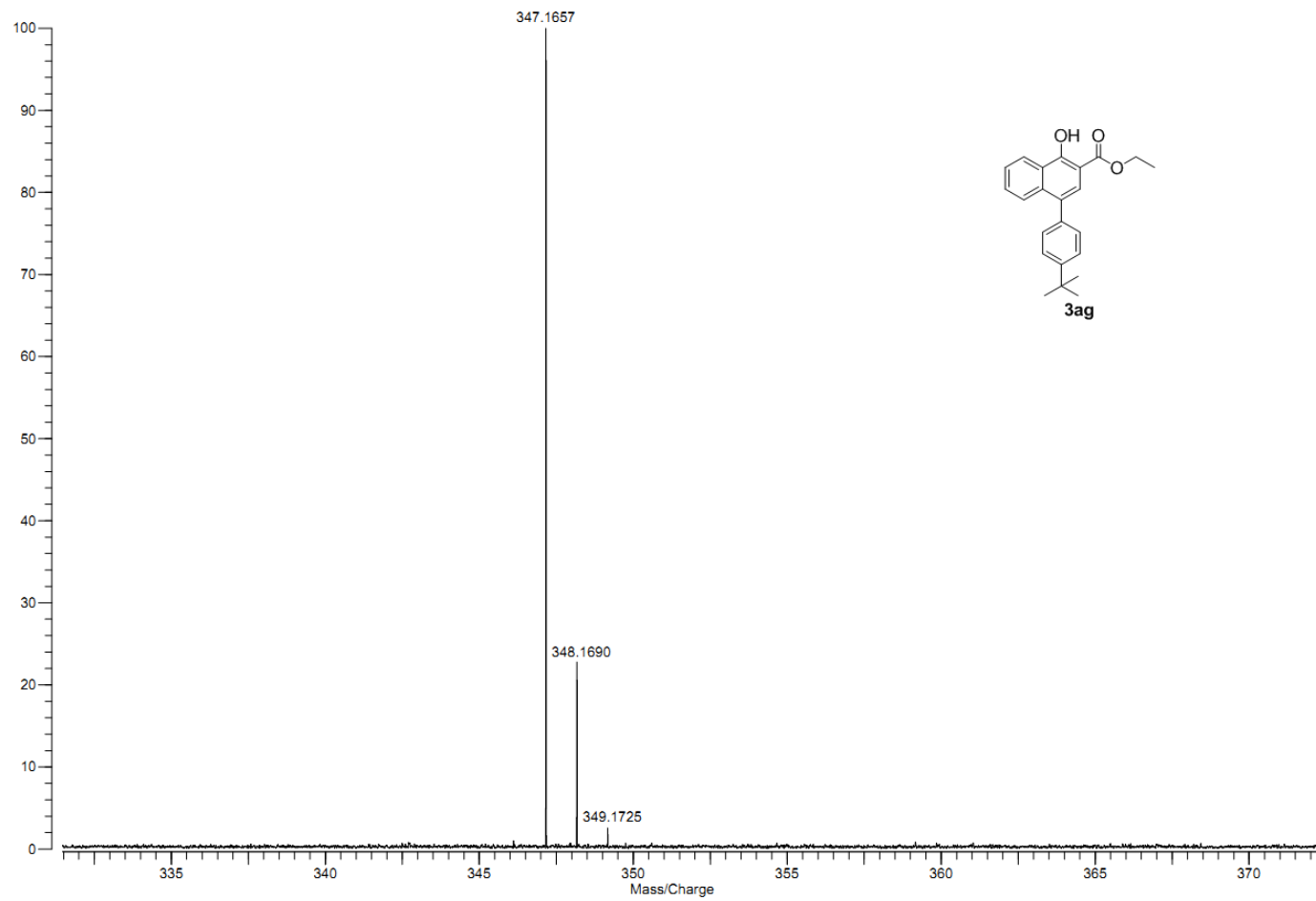


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8 Author	
9 Solvent	CDC13
10 Temperature	294.6
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	666
15 Receiver Gain	100
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2015-04-29T08:24:00
21 Modification Date	2015-04-29T08:37:00
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

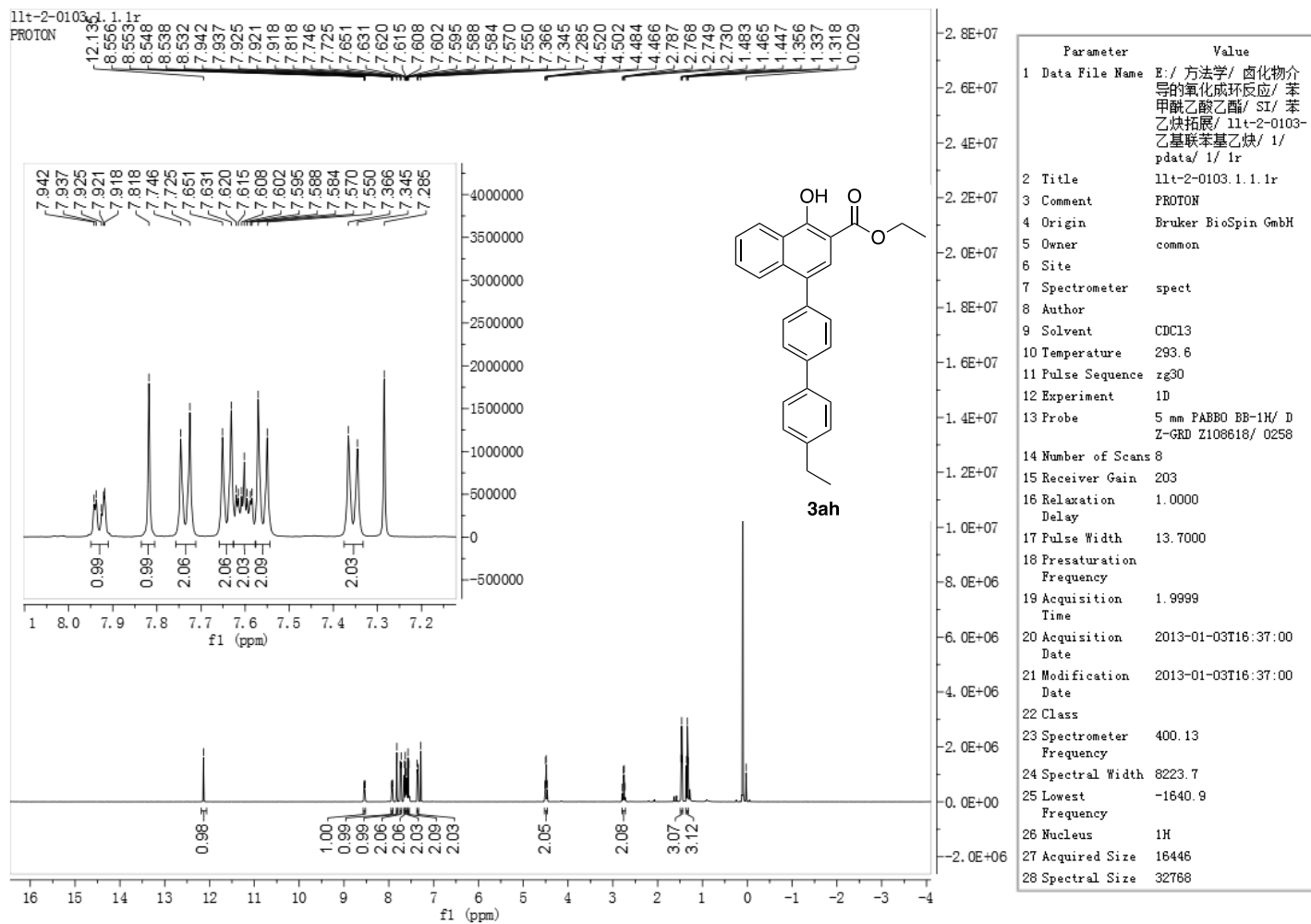
Varian QFT-ESI  
File: P-tBu\_ESI.trans

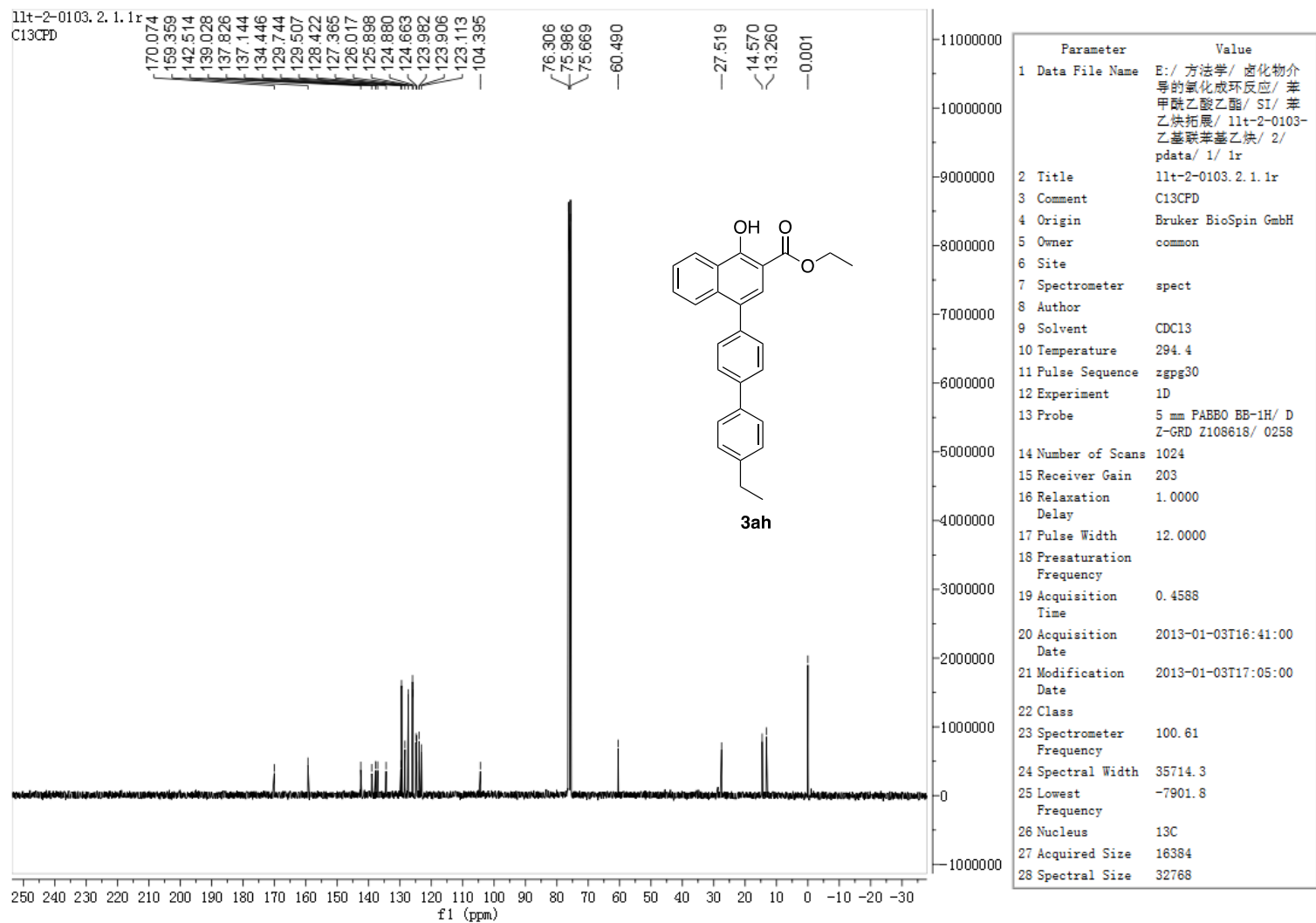
Mode: Negative  
Scans: 1

Date: 17-DEC-2012  
Time: 11:44:45  
Scale: 10.7279



**Ethyl 4-(4'-ethyl-[1,1'-biphenyl]-4-yl)-1-hydroxy-2-naphthoate(3ah).**

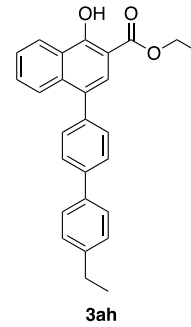
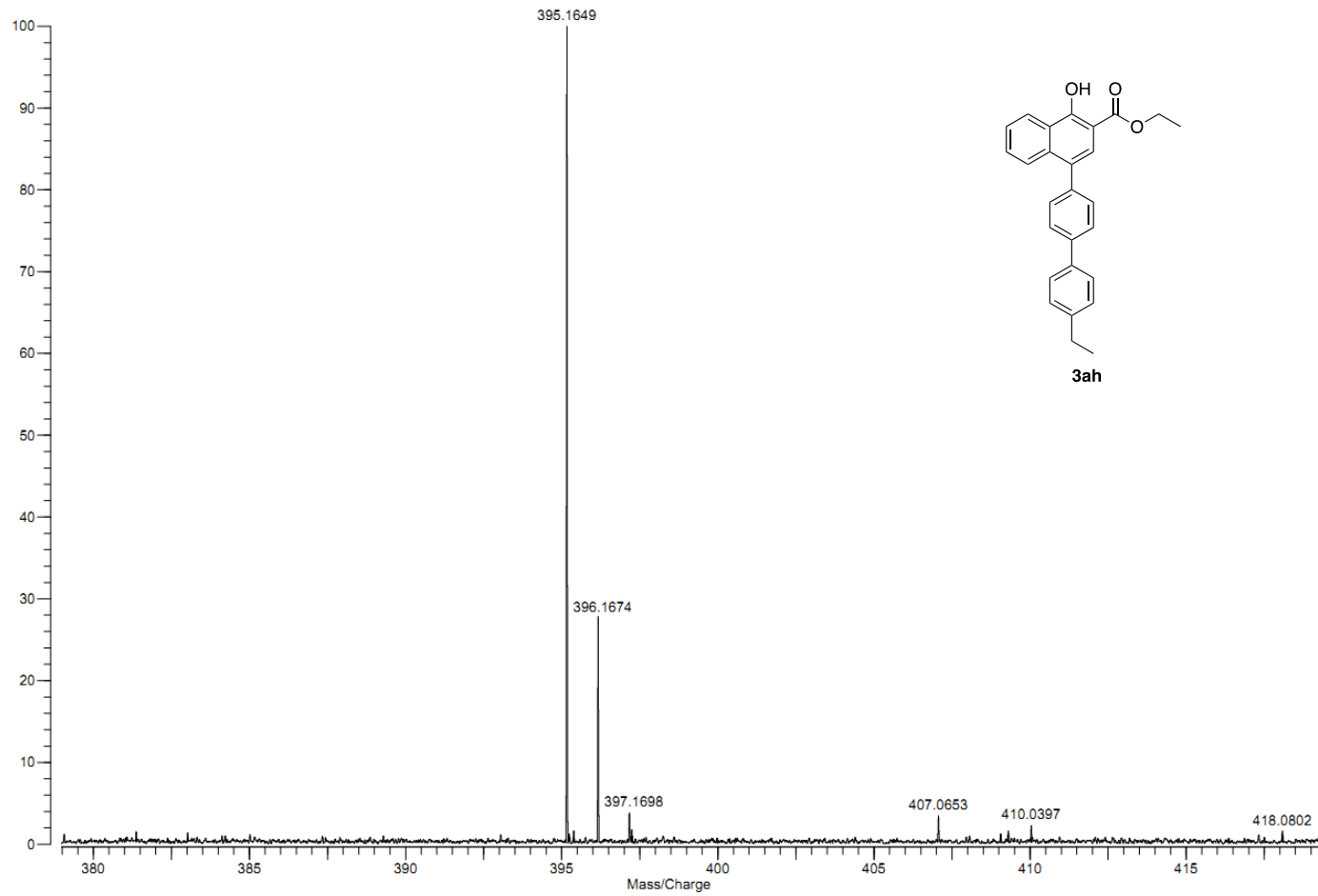




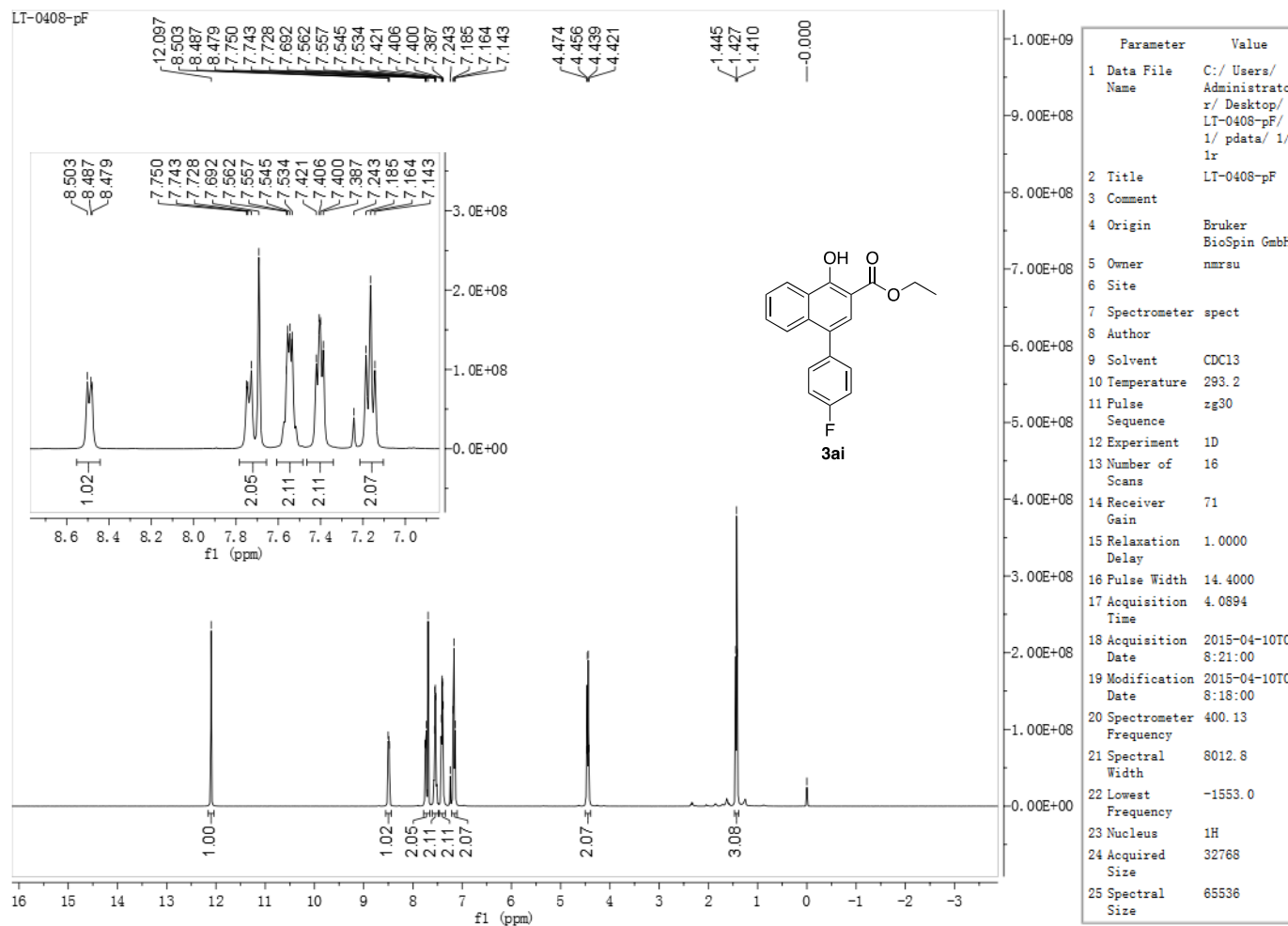
Varian QFT-ESI  
File: p33-2\_ESI.trans

Mode: Negative  
Scans: 1

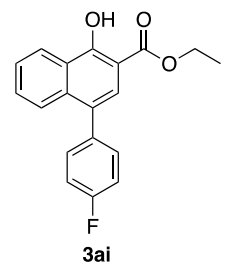
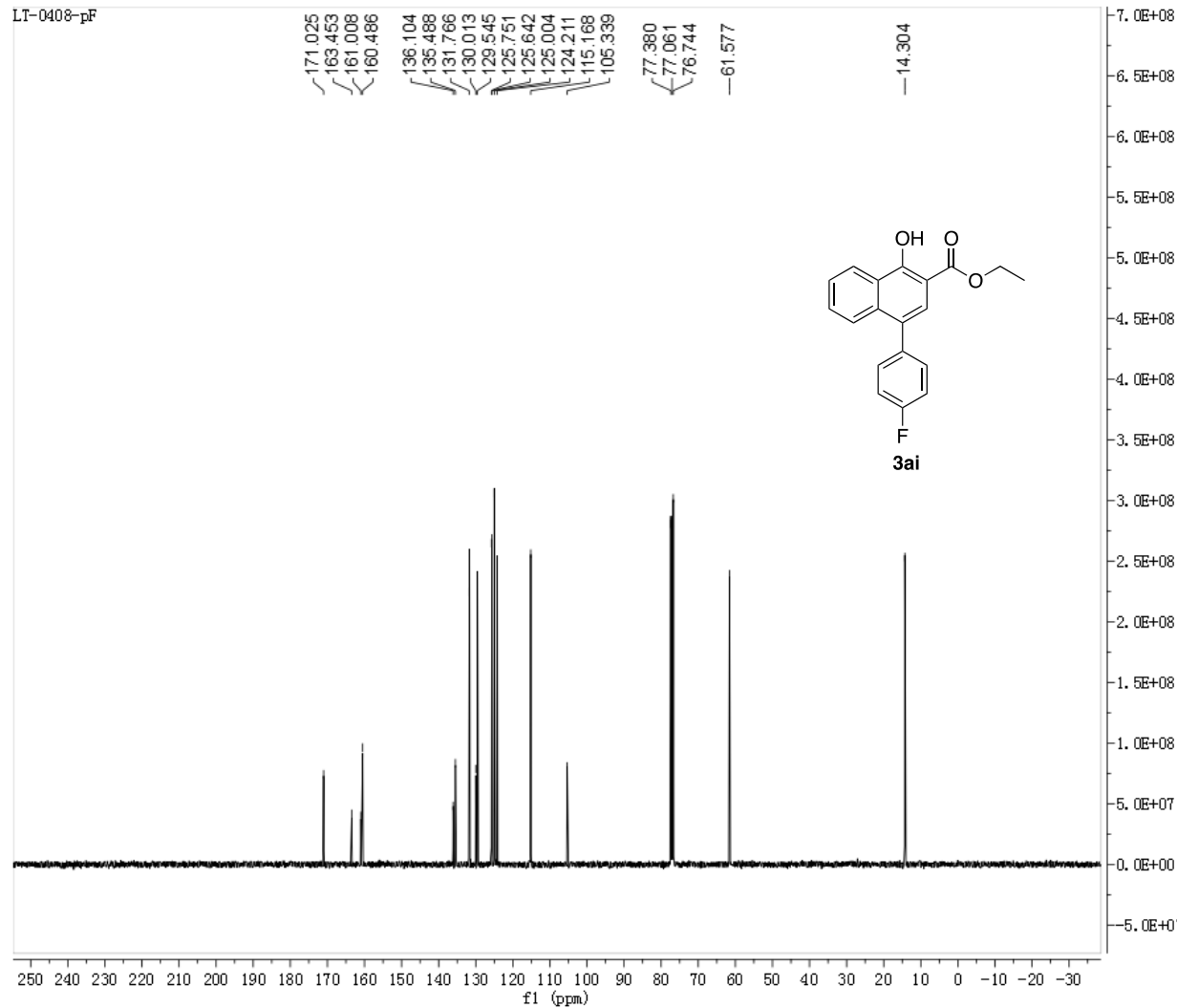
Date: 08-JAN-2013  
Time: 10:50:47  
Scale: 10.2439



**Ethyl 4-(4-fluorophenyl)-1-hydroxy-2-naphthoate(3ai).**



LT-0408-pF

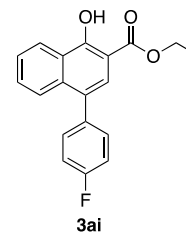
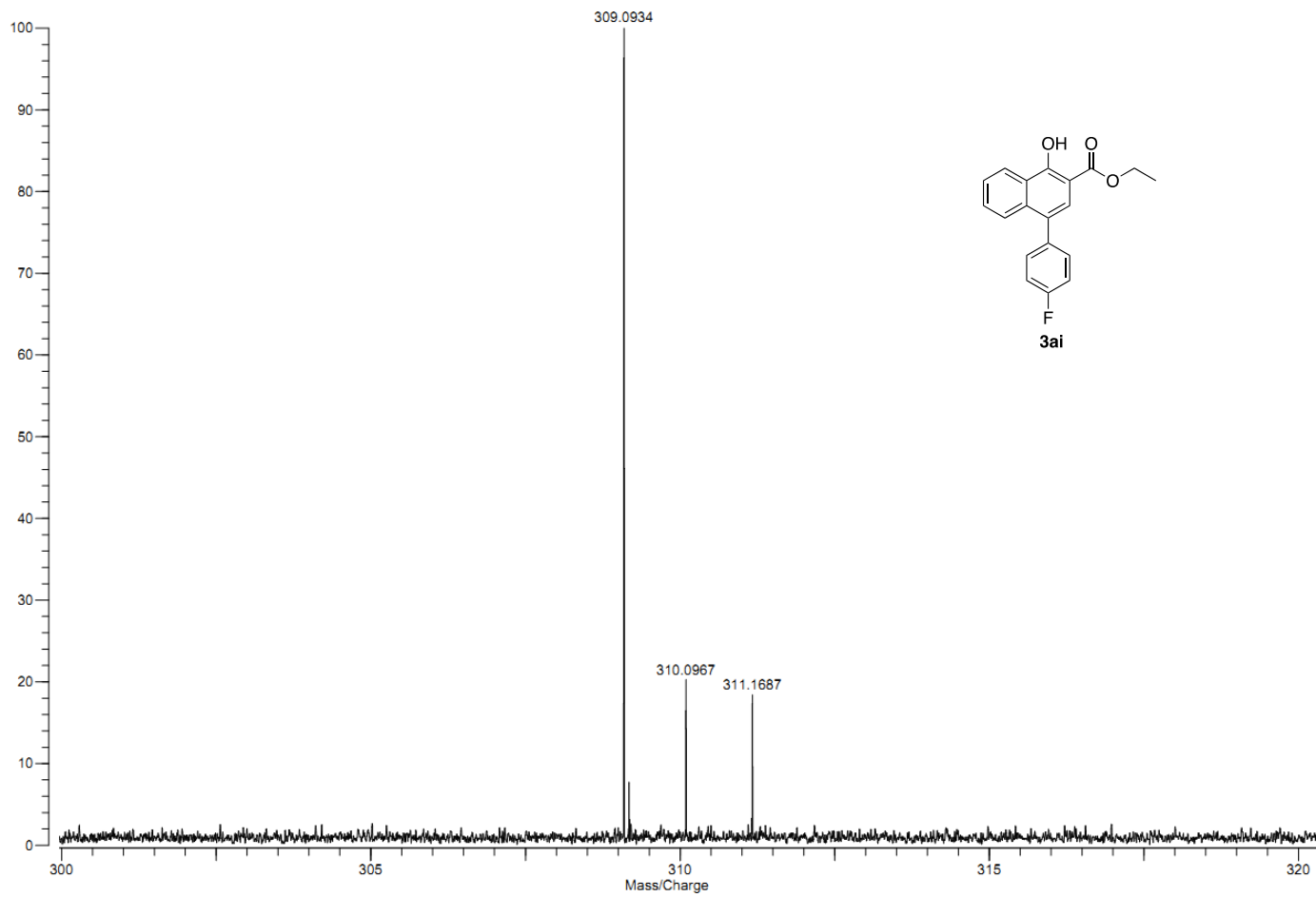


Parameter	Value
1 Data File Name	C:/ Users/ Administrato r/ Desktop/ LT-0408-pF/ 2/ pdata/ 1/ 1r
2 Title	LT-0408-pF
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	294.4
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Number of Scans	944
14 Receiver Gain	159
15 Relaxation Delay	1.0000
16 Pulse Width	9.5000
17 Acquisition Time	0.4999
18 Acquisition Date	2015-04-10T0 8:48:00
19 Modification Date	2015-04-10T0 8:44:00
20 Spectrometer Frequency	100.61
21 Spectral Width	35714.3
22 Lowest Frequency	-7796.8
23 Nucleus	13C
24 Acquired Size	17855
25 Spectral Size	32768

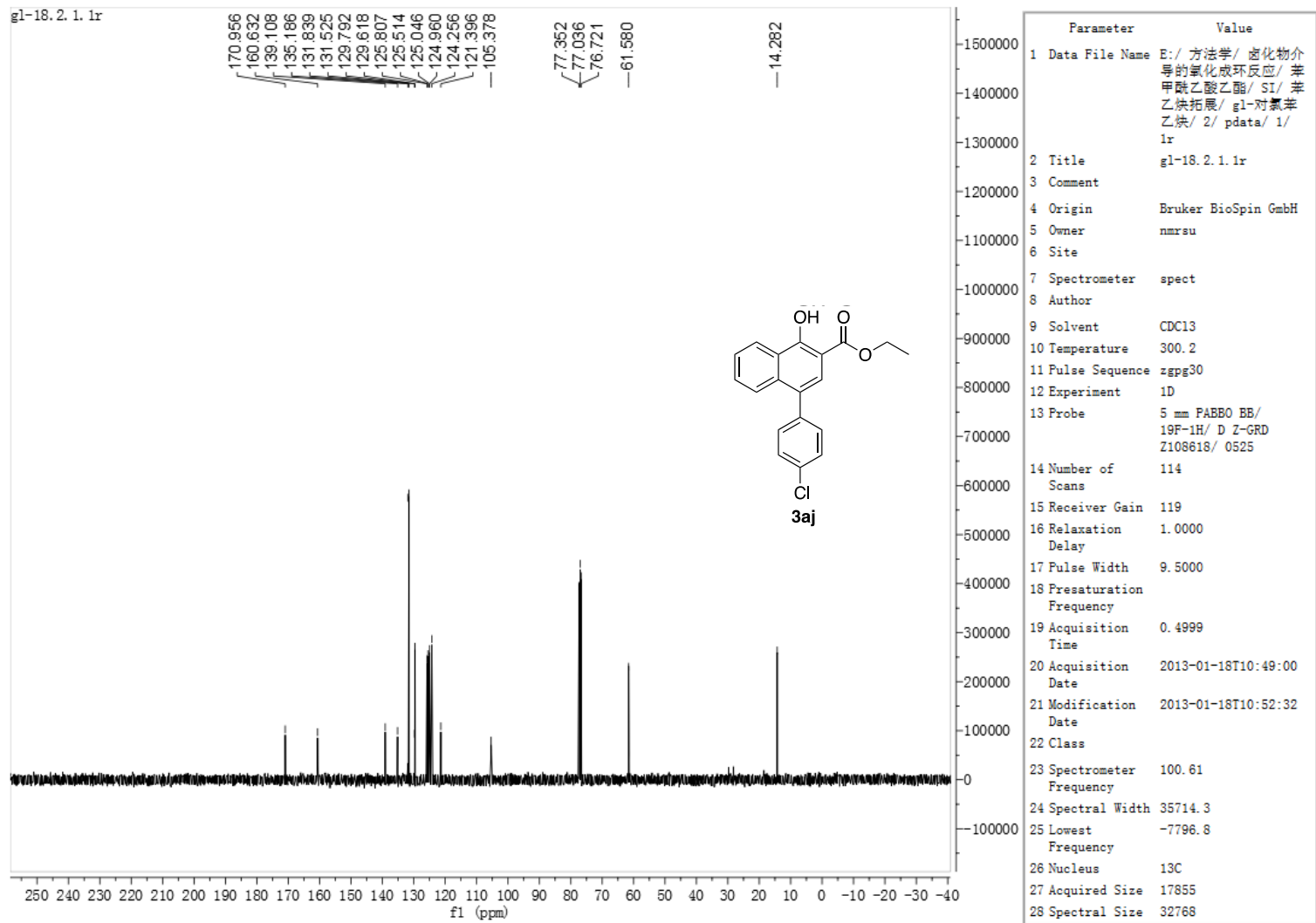
Varian QFT-ESI  
File: P42-2\_ESI.trans

Mode: Negative  
Scans: 1

Date: 12-DEC-2012  
Time: 09:22:17  
Scale: 39.0051



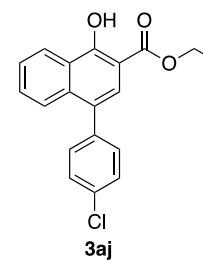
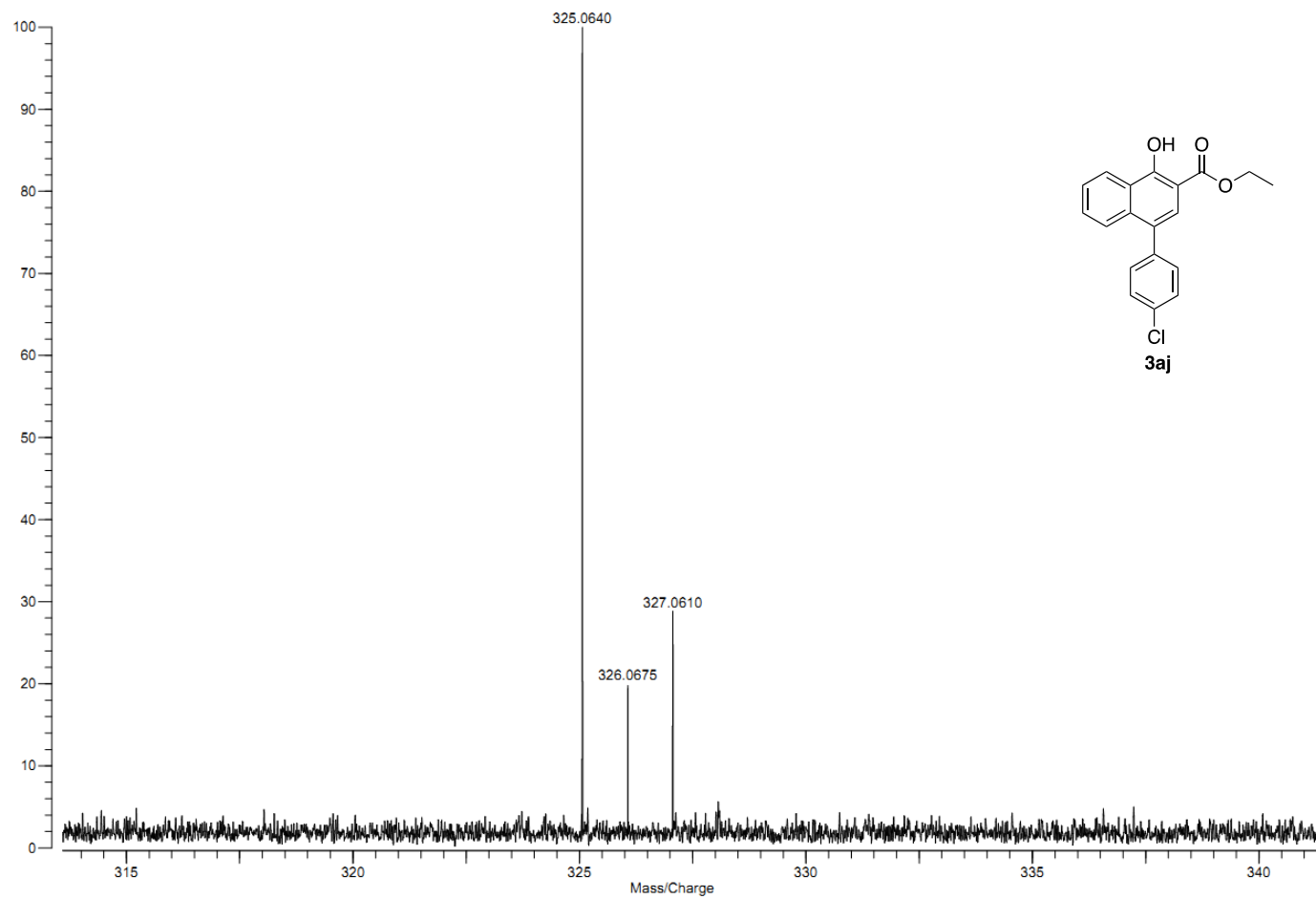




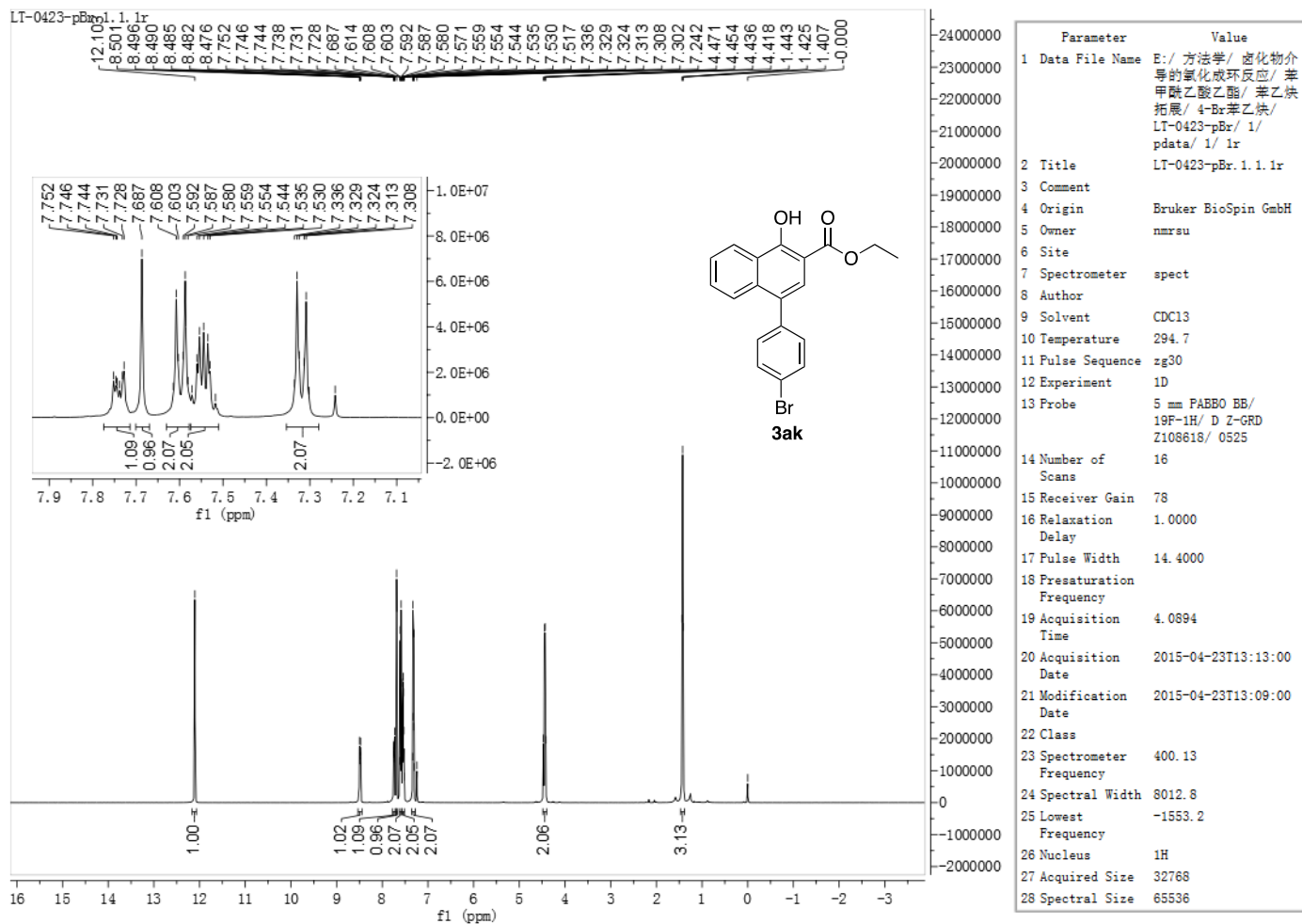
Varian QFT-ESI  
File: P-Cl\_ESI.trans

Mode: Negative  
Scans: 1

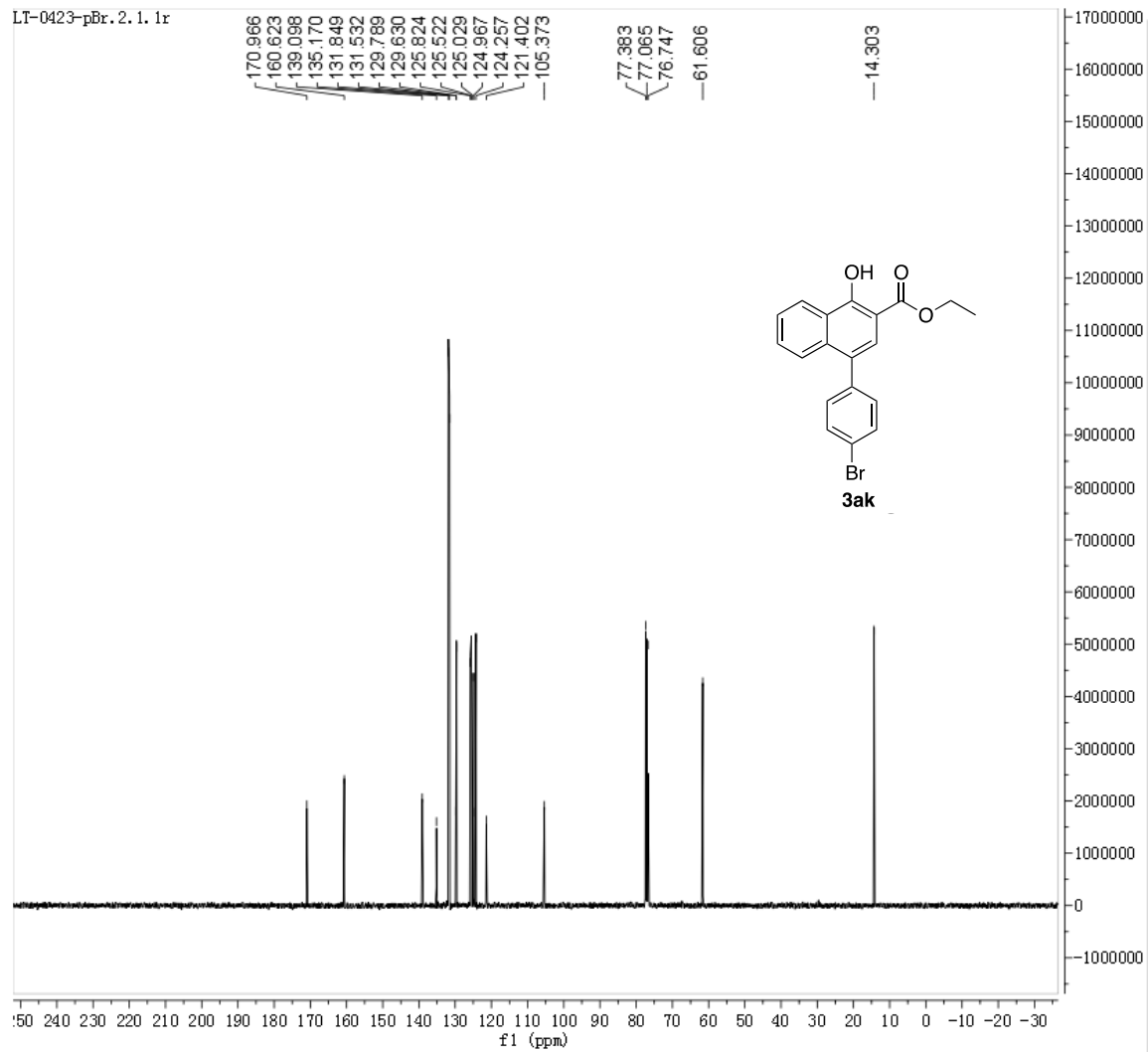
Date: 19-DEC-2012  
Time: 11:21:55  
Scale: 72.7209



### Ethyl 4-(4-bromophenyl)-1-hydroxy-2-naphthoate(3ak).

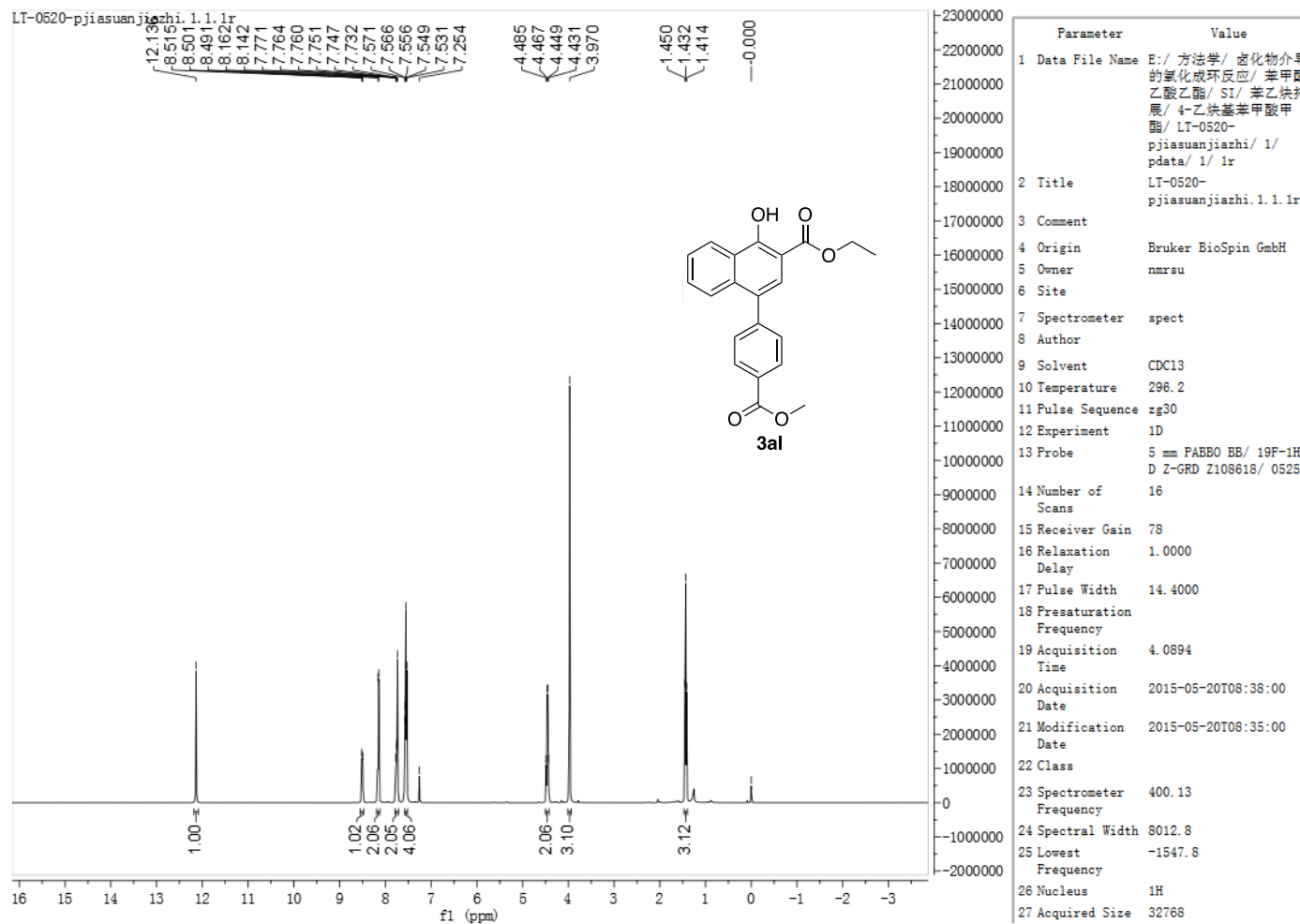


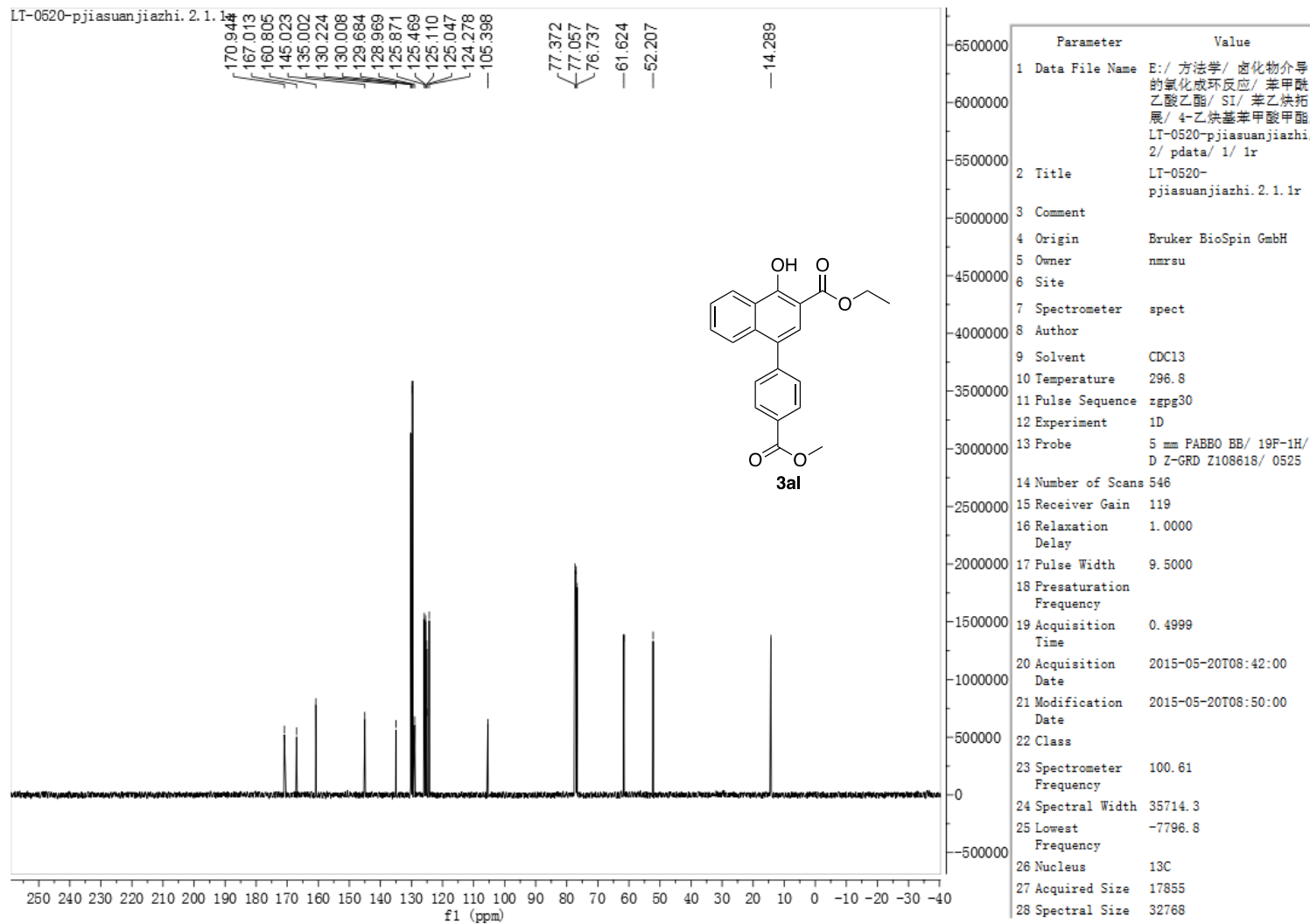
LT-0423-pBr. 2. 1. 1r



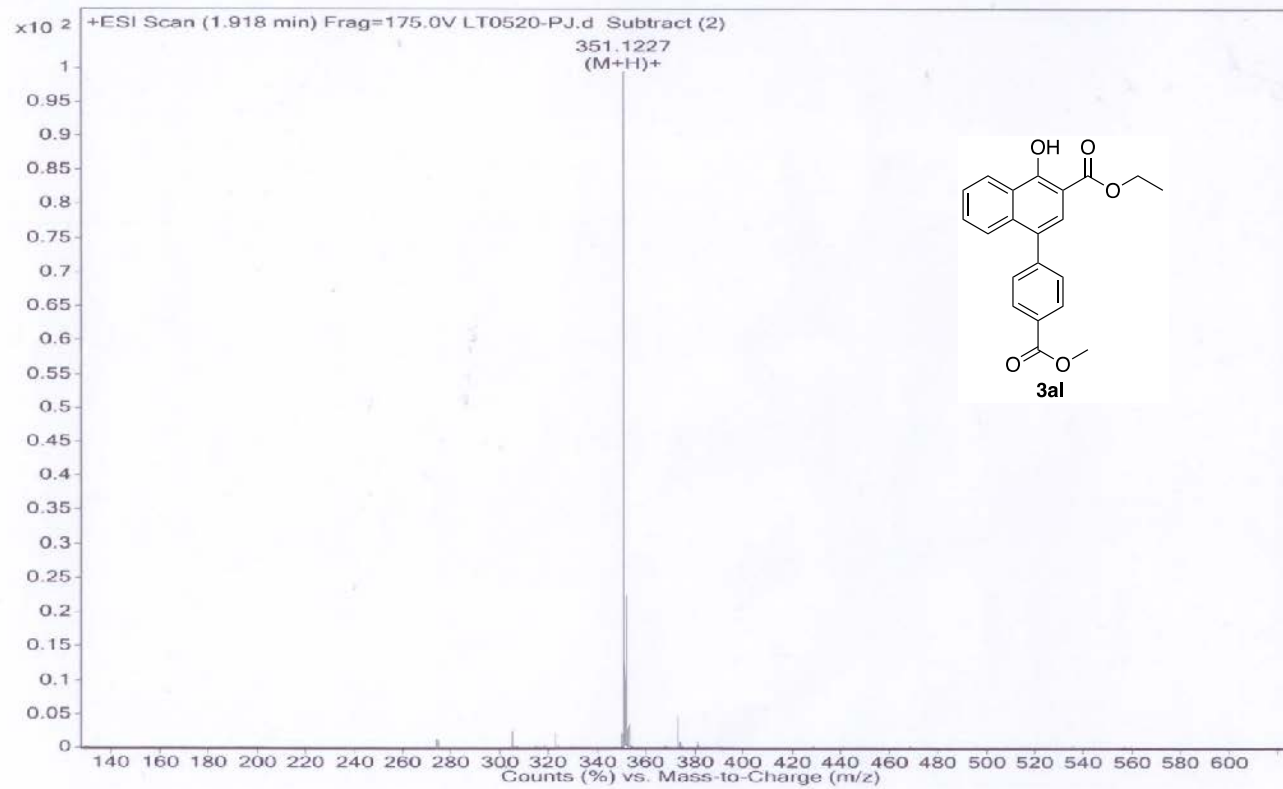
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1 Data File Name	E:/ 方法学/ 卤化物介导的氧化成环反应/ 苯甲酸乙酯/ 苯乙炔拓展/ 4-Br苯乙炔/ LT-0423-pBr/ 2/ pdata/ 1/ 1r
2 Title	LT-0423-pBr. 2. 1. 1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrau
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDC13
10 Temperature	295.6
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD 2108618/ 0525
14 Number of Scans	955
15 Receiver Gain	200
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2015-04-23T13:22:00
21 Modification Date	2015-04-23T13:35:00
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

Ethyl 1-hydroxy-4-(4-(methoxycarbonyl)phenyl)-2-naphthoate(3al).

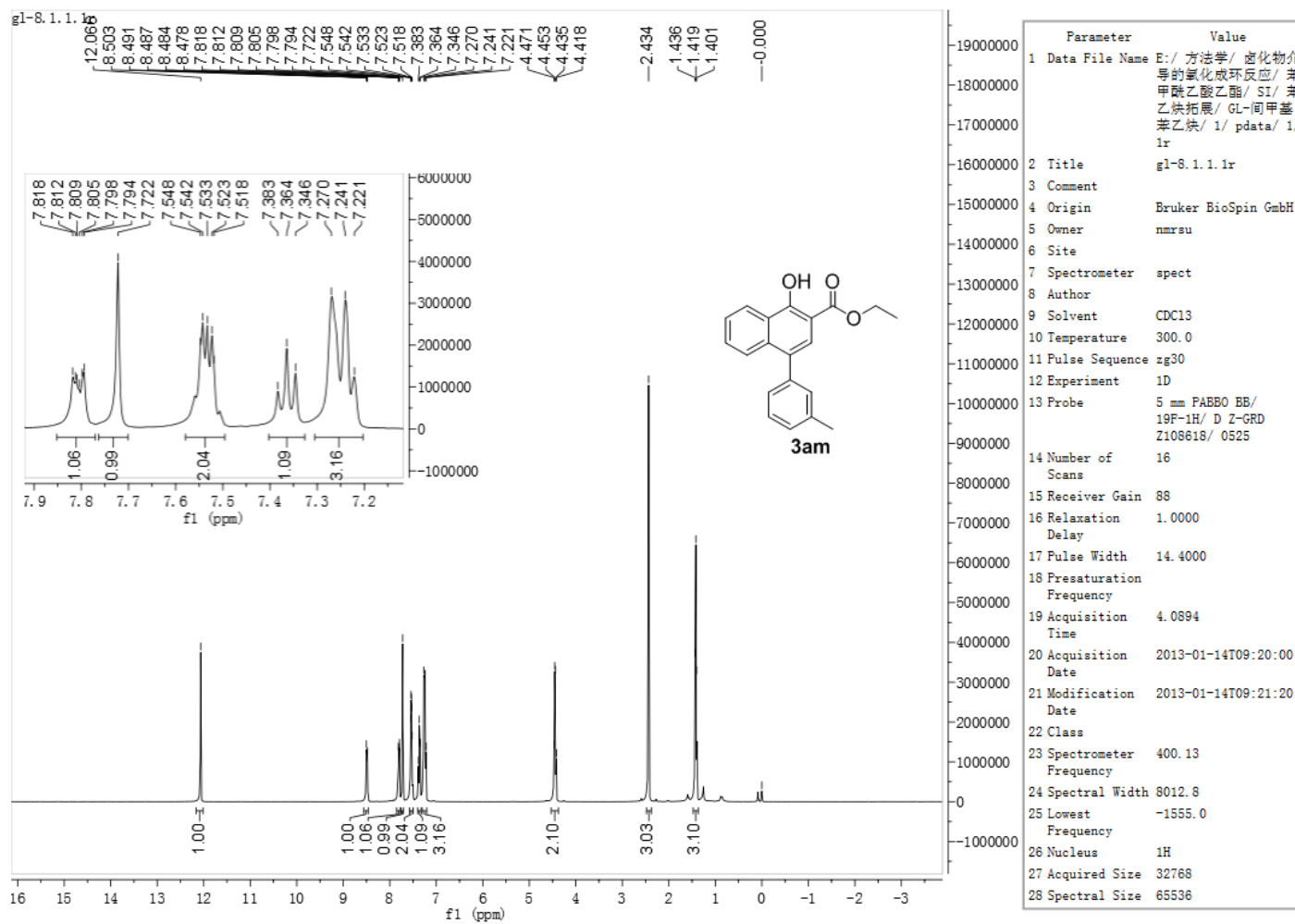


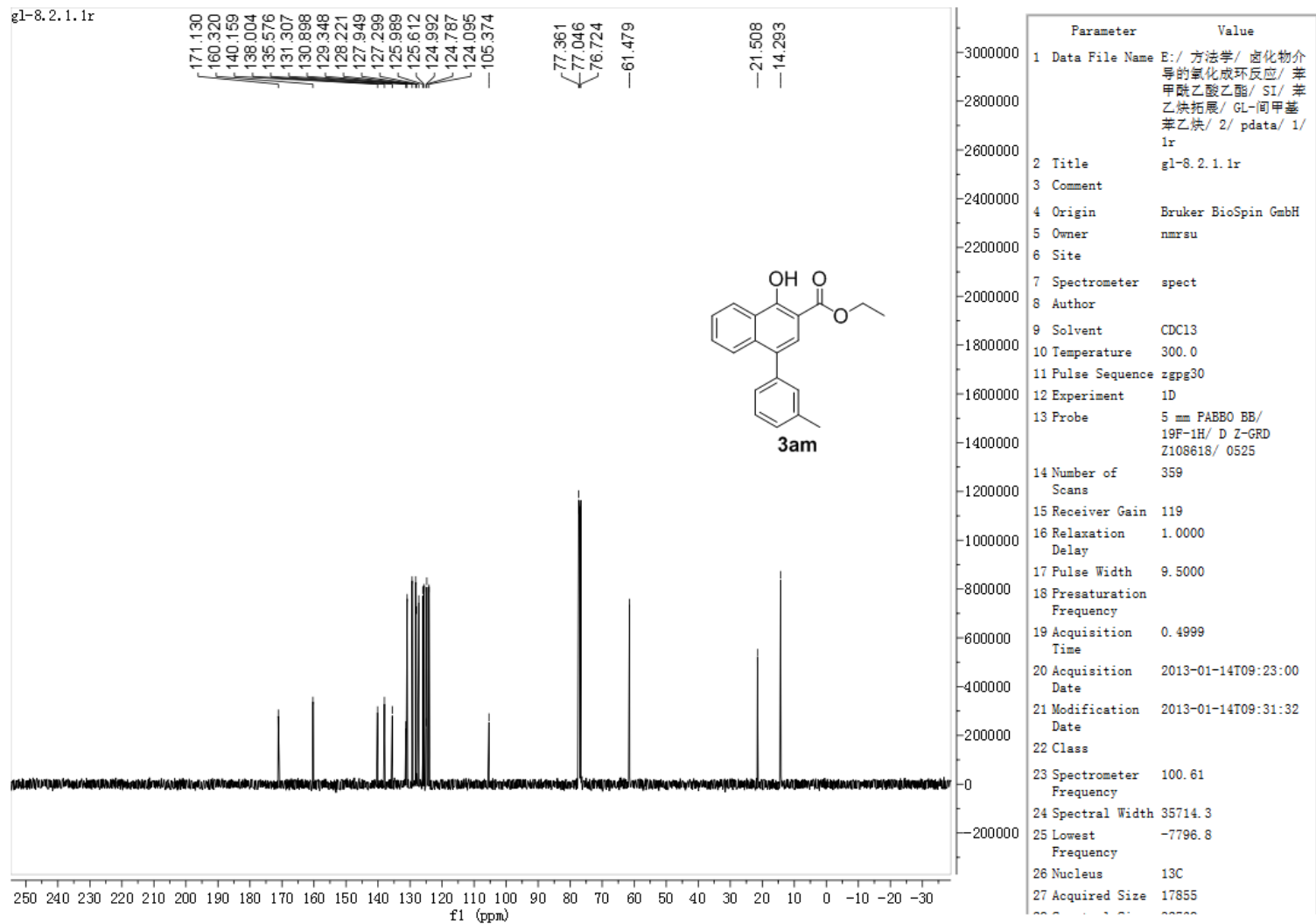


Sample Name	lc/ms	Position	P1-A4	Instrument Name	Instrument 1	User Name	
Inj Vol	-1	InjPosition		SampleType	Sample	IRM Calibration Status	Some Ions Missed
Data Filename	LT0520-PJ.d	ACQ Method	chen-ms.m	Comment		Acquired Time	6/8/2015 11:06:42 AM



Ethyl 1-hydroxy-4-(*m*-tolyl)-2-naphthoate(3am).

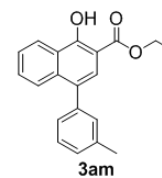
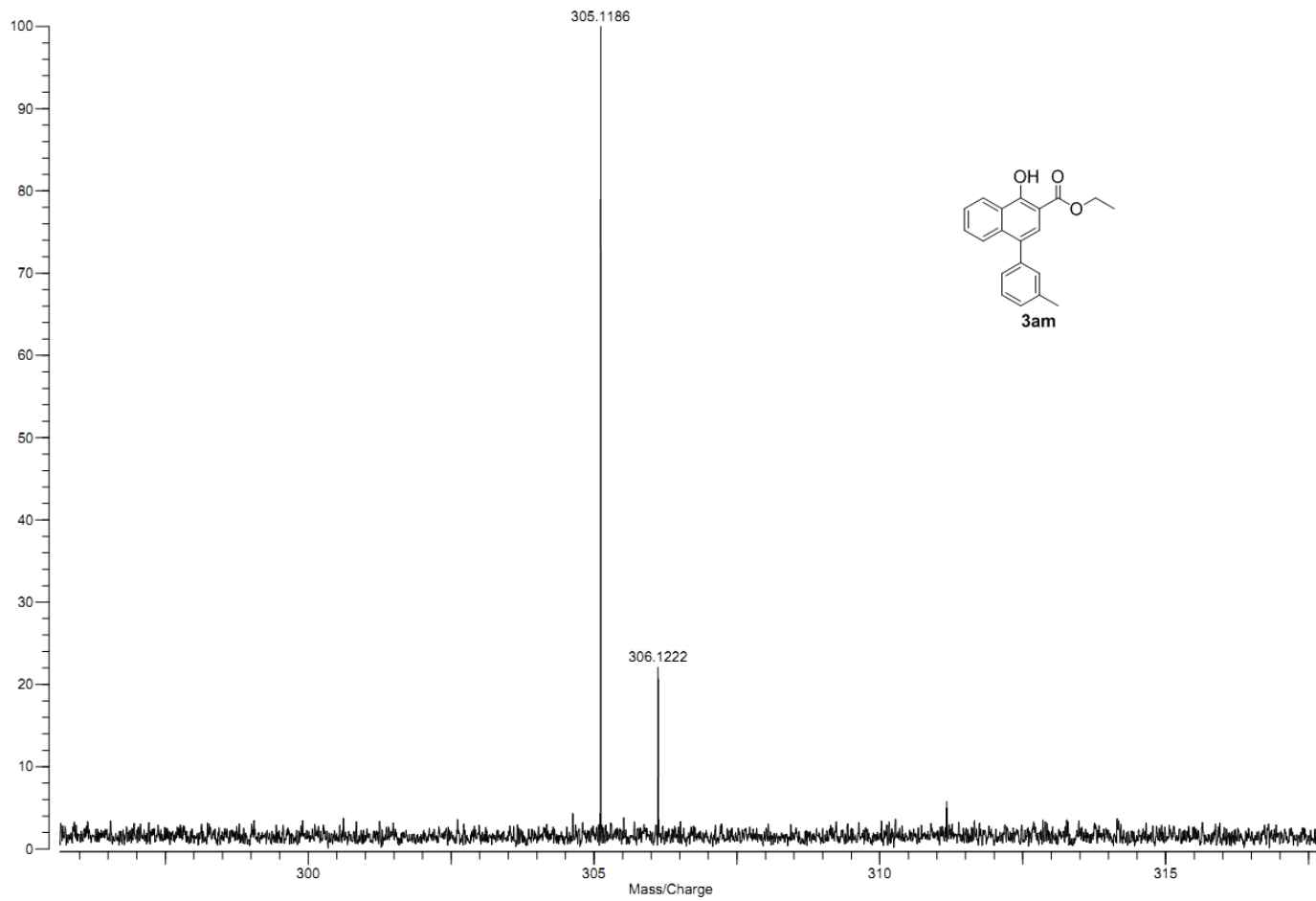




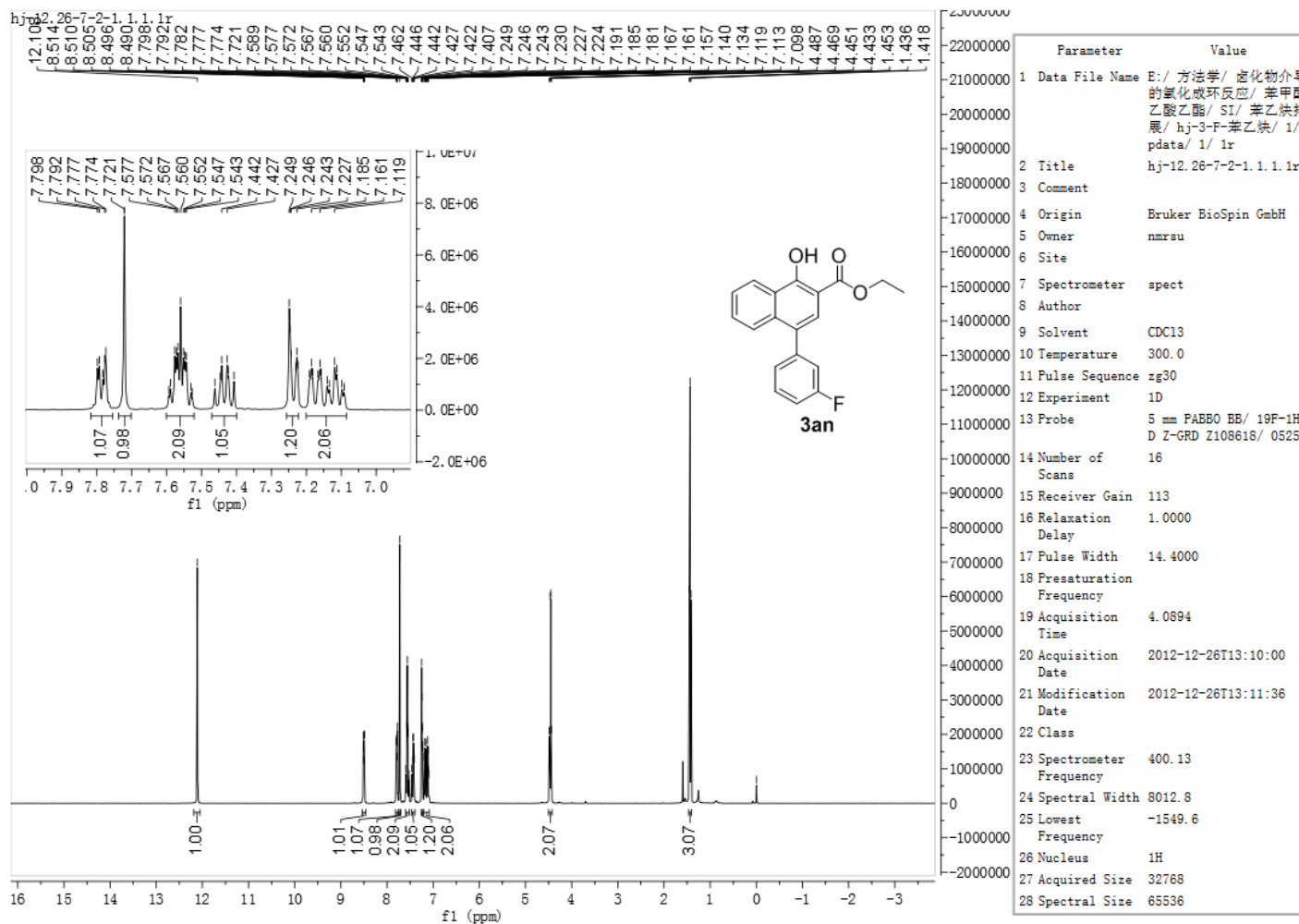
Varian QFT-ESI  
File: 7-3-B\_ESI.trans

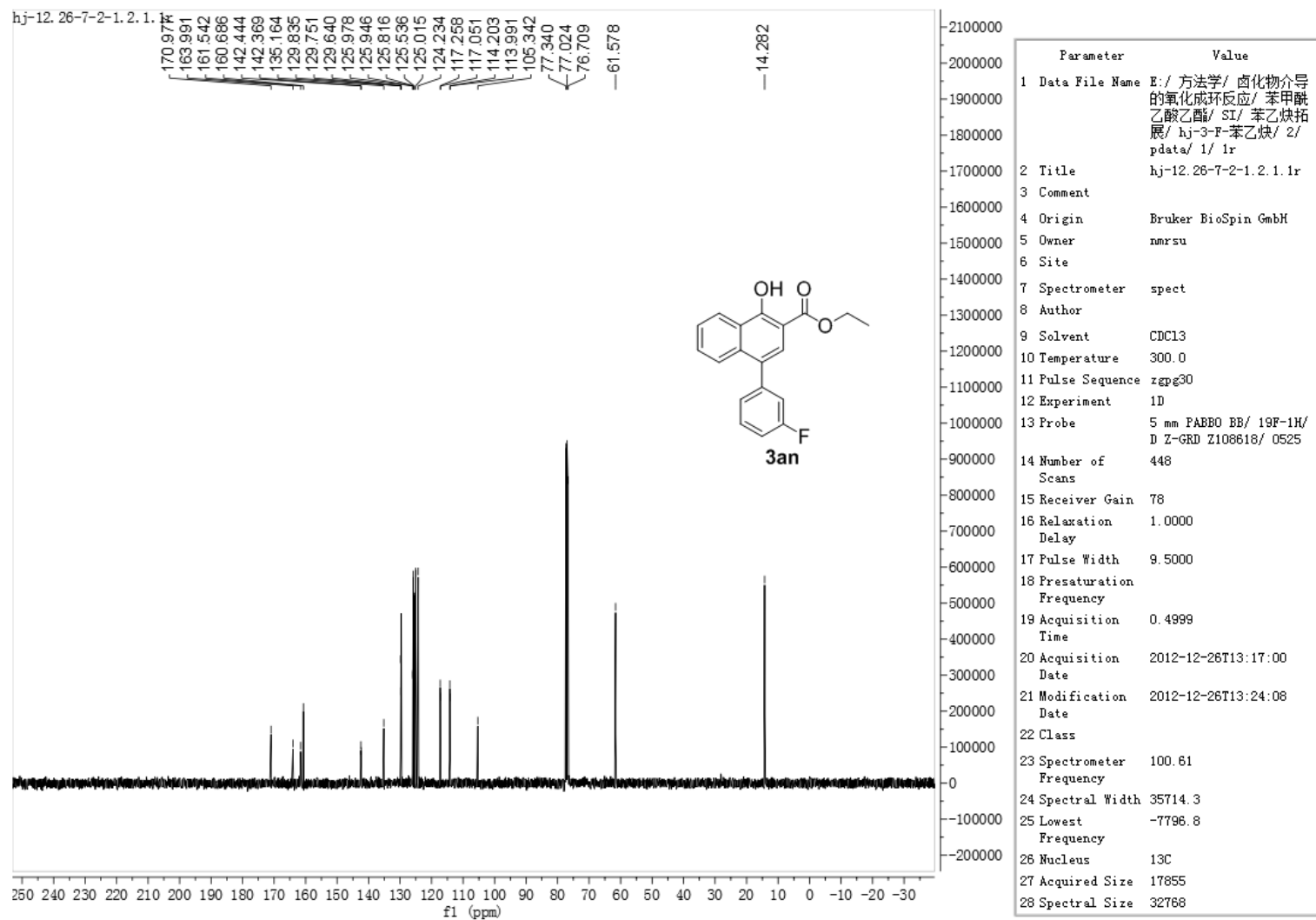
Mode: Negative  
Scans: 1

Date: 29-DEC-2012  
Time: 09:59:08  
Scale: 62.5119



**Ethyl 4-(3-fluorophenyl)-1-hydroxy-2-naphthoate(3an).**

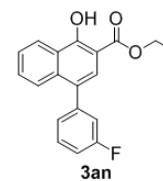
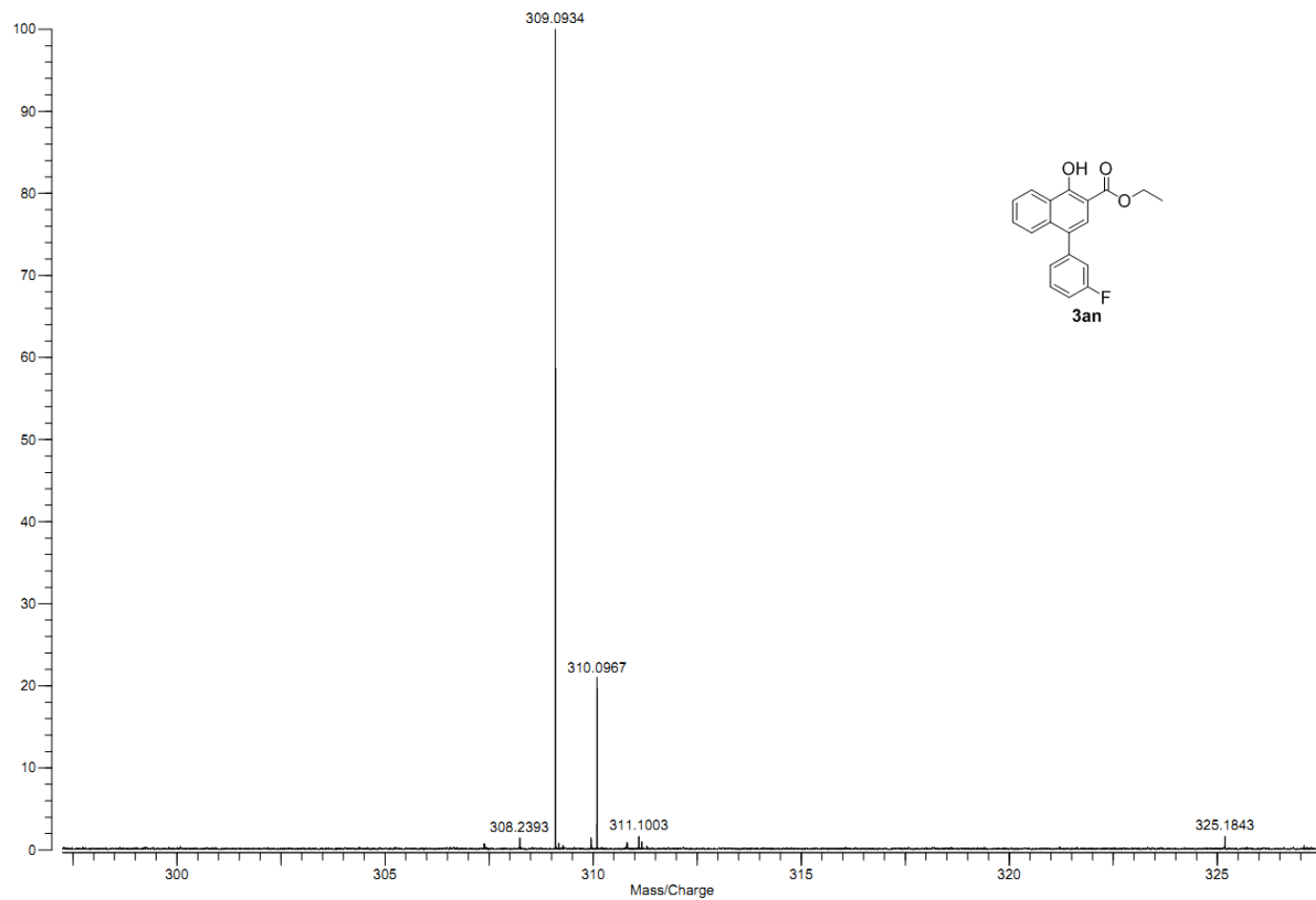




Varian QFT-ESI  
File: 7-2-B\_ESI.trans

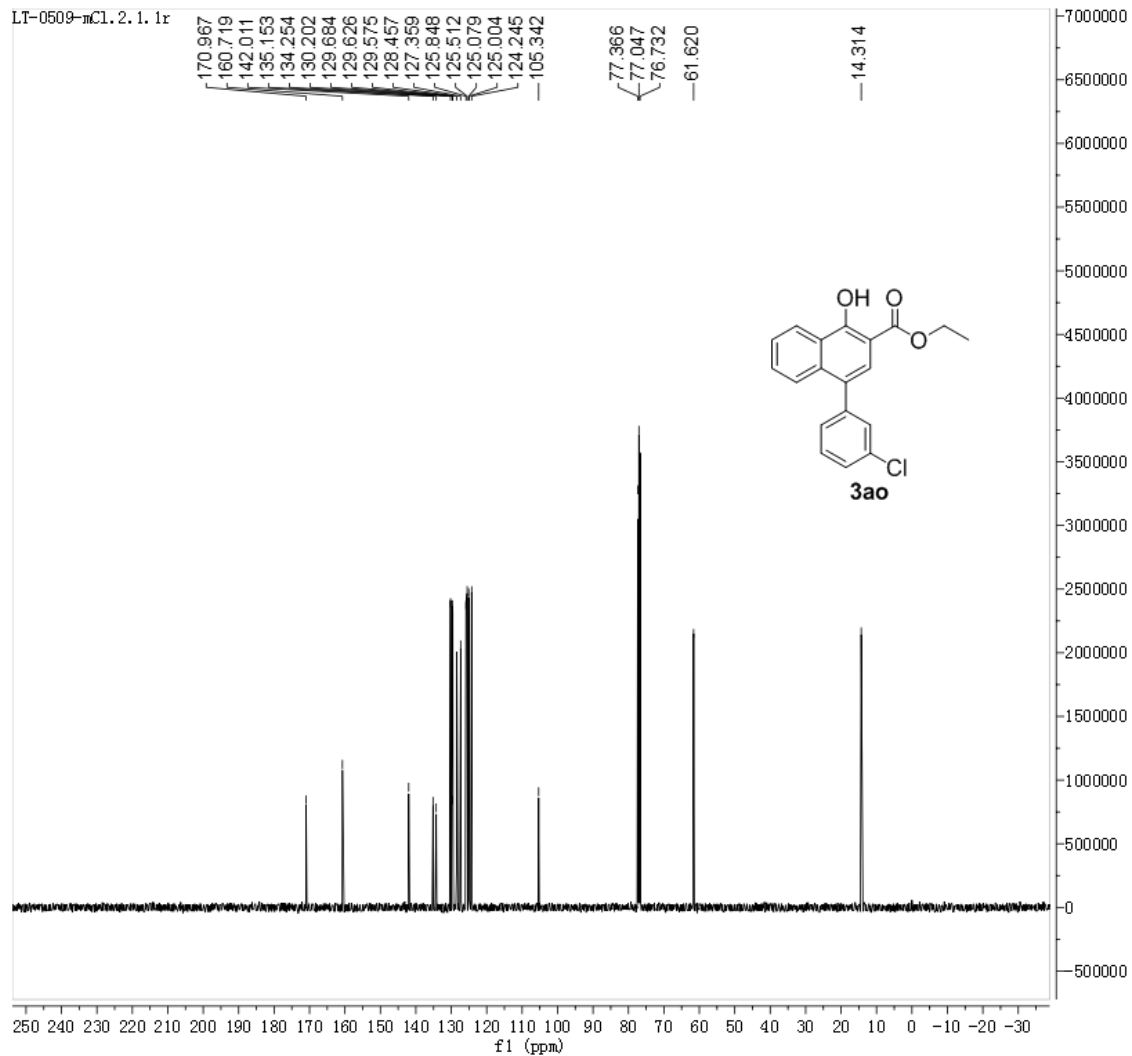
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Scans: 1

Date: 28-DEC-2012  
Time: 09:25:30  
Scale: 5.4560





LT-0509-mCl.2.1.1r

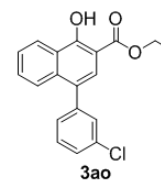
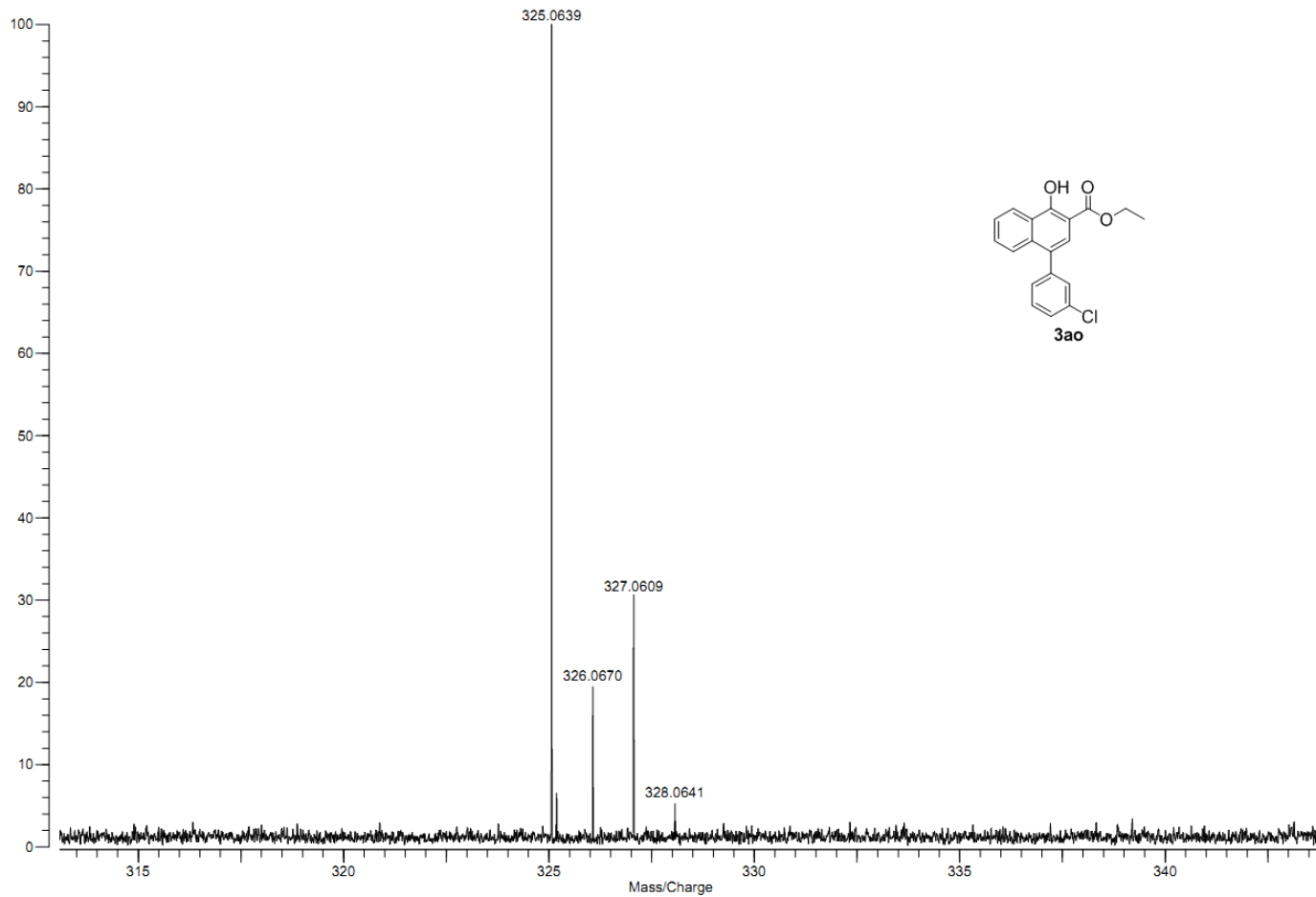


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1 Data File Name	E:/ 方法学/ 卤化物介导的氧化成环反应/ 苯甲酰乙酸乙酯/ 炔类拓展/ 3-Cl苯乙炔/ LT-0509-mCl/ 2/ pdata/ 1/ 1r
2 Title	LT-0509-mCl.2.1.1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	295.7
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	818
15 Receiver Gain	119
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2015-05-09T18:56:00
21 Modification Date	2015-05-09T19:01:00
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855

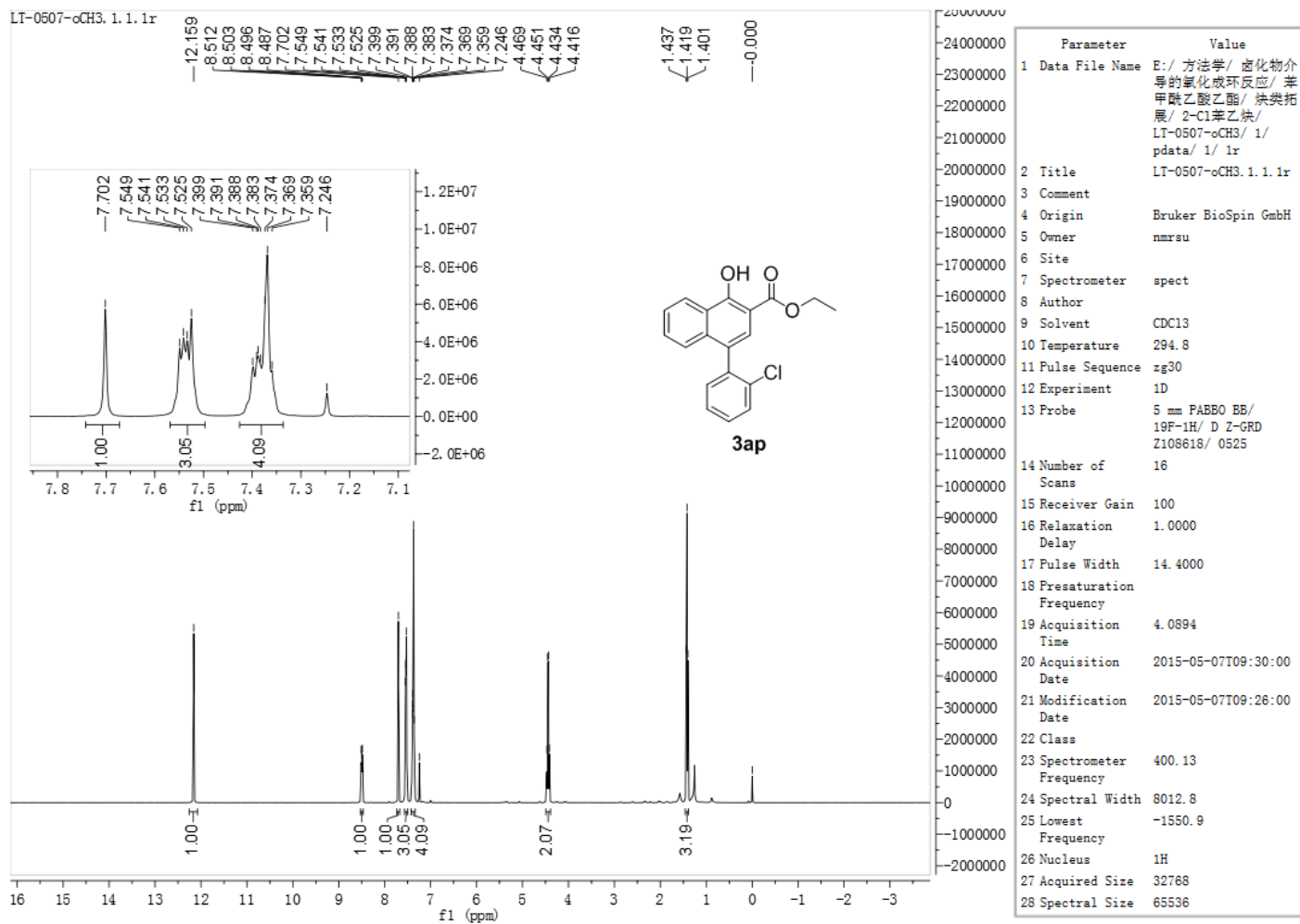
Varian QFT-ESI  
File: 7-3-C\_ESI.trans

Mode: Negative  
Scans: 1

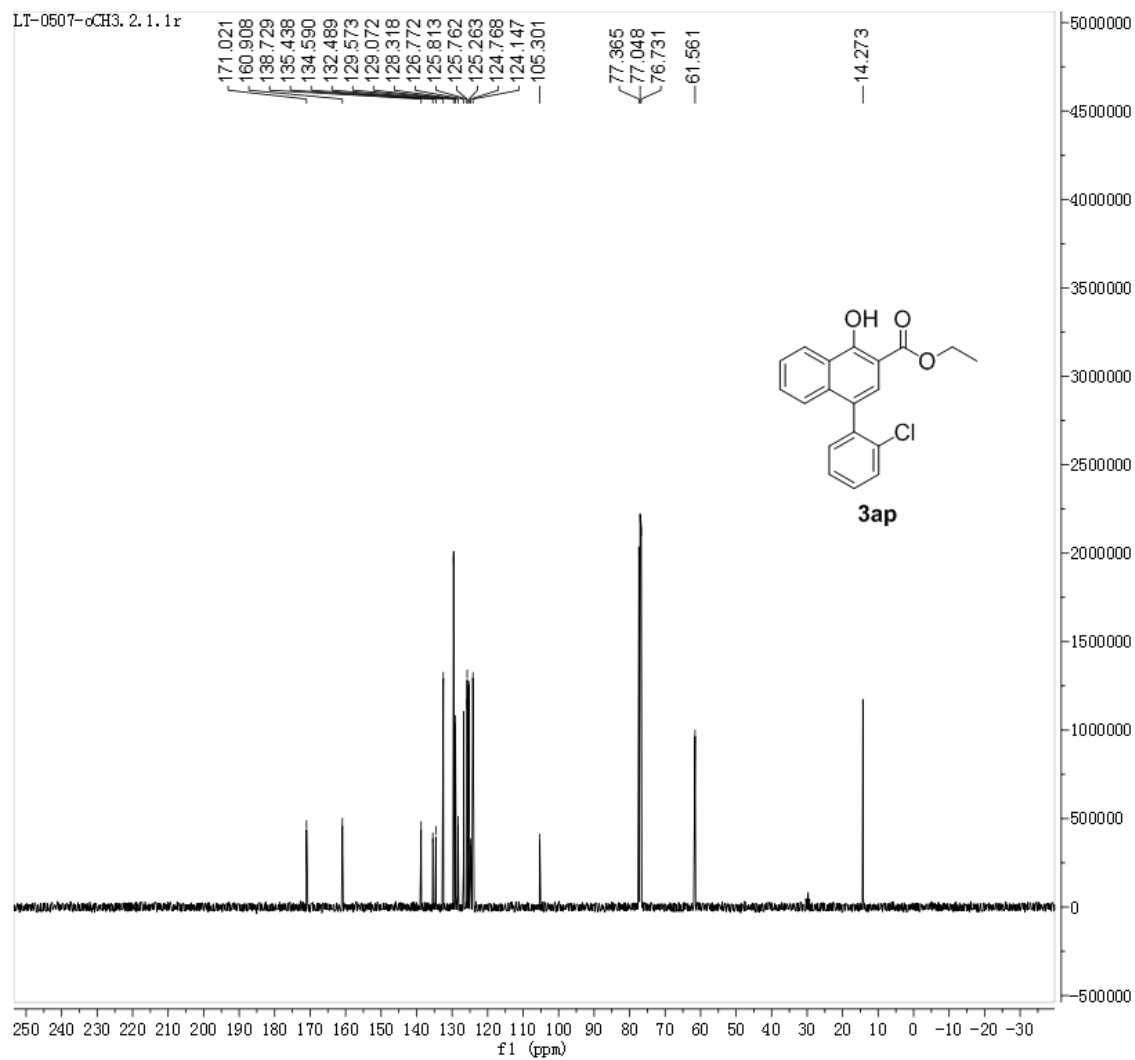
Date: 29-DEC-2012  
Time: 09:57:25  
Scale: 45.5117



# Ethyl 4-(2-chlorophenyl)-1-hydroxy-2-naphthoate(3ap).



LT-0507-oCH3. 2.1.1r

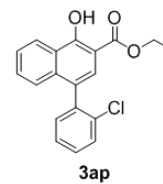
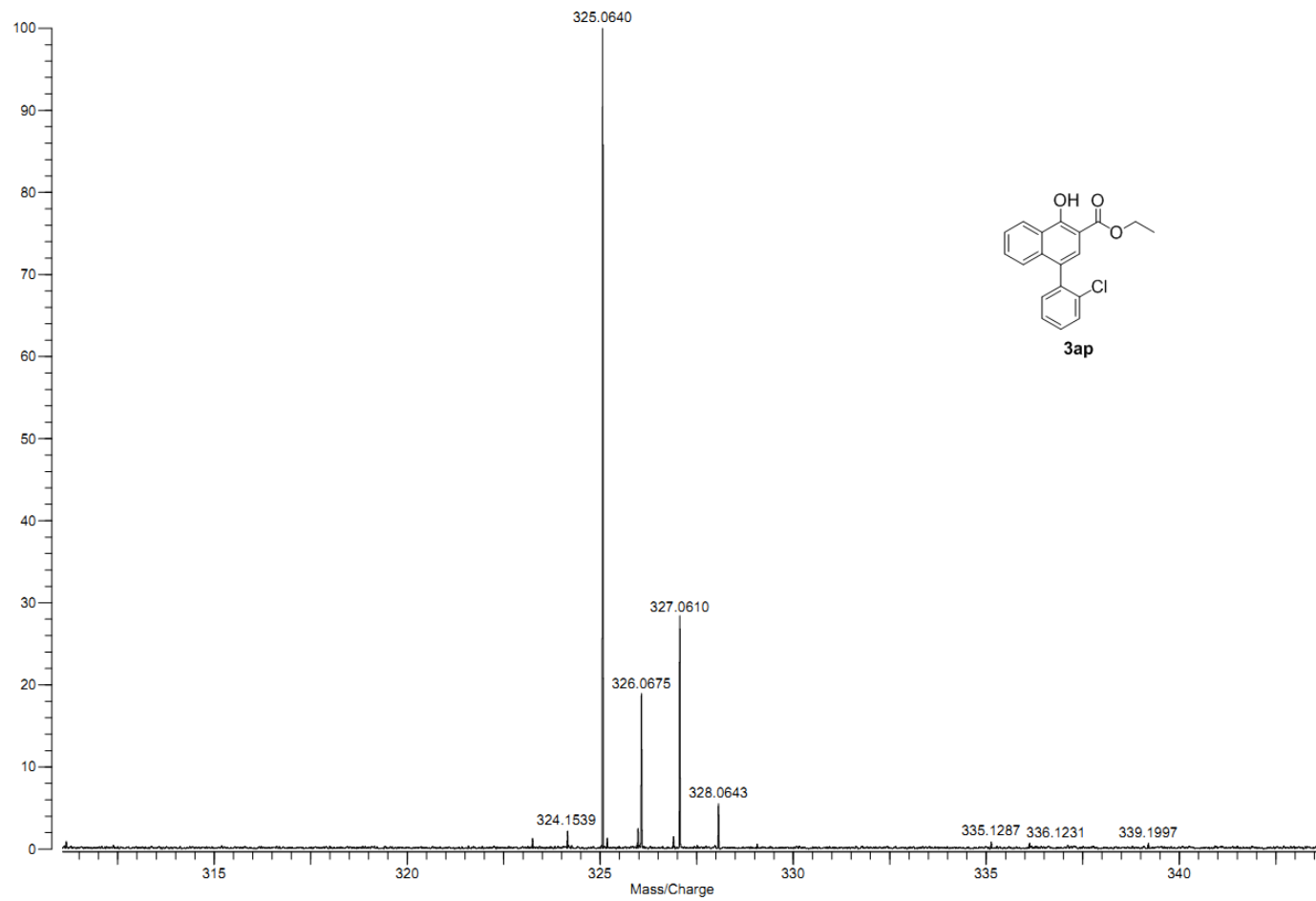


Parameter	Value
1 Data File Name	E:/ 方法学/ 卤化物介 导的氧化成环反应/ 苯 甲酰乙酸乙酯/ 炔类拓 展/ 2-Cl苯乙炔/ LT-0507-oCH3/ 2/ pdata/ 1/ 1r
2 Title	LT-0507-oCH3. 2.1.1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	294.8
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	532
15 Receiver Gain	113
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2015-05-07T09:32:00
21 Modification Date	2015-05-07T09:41:00
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

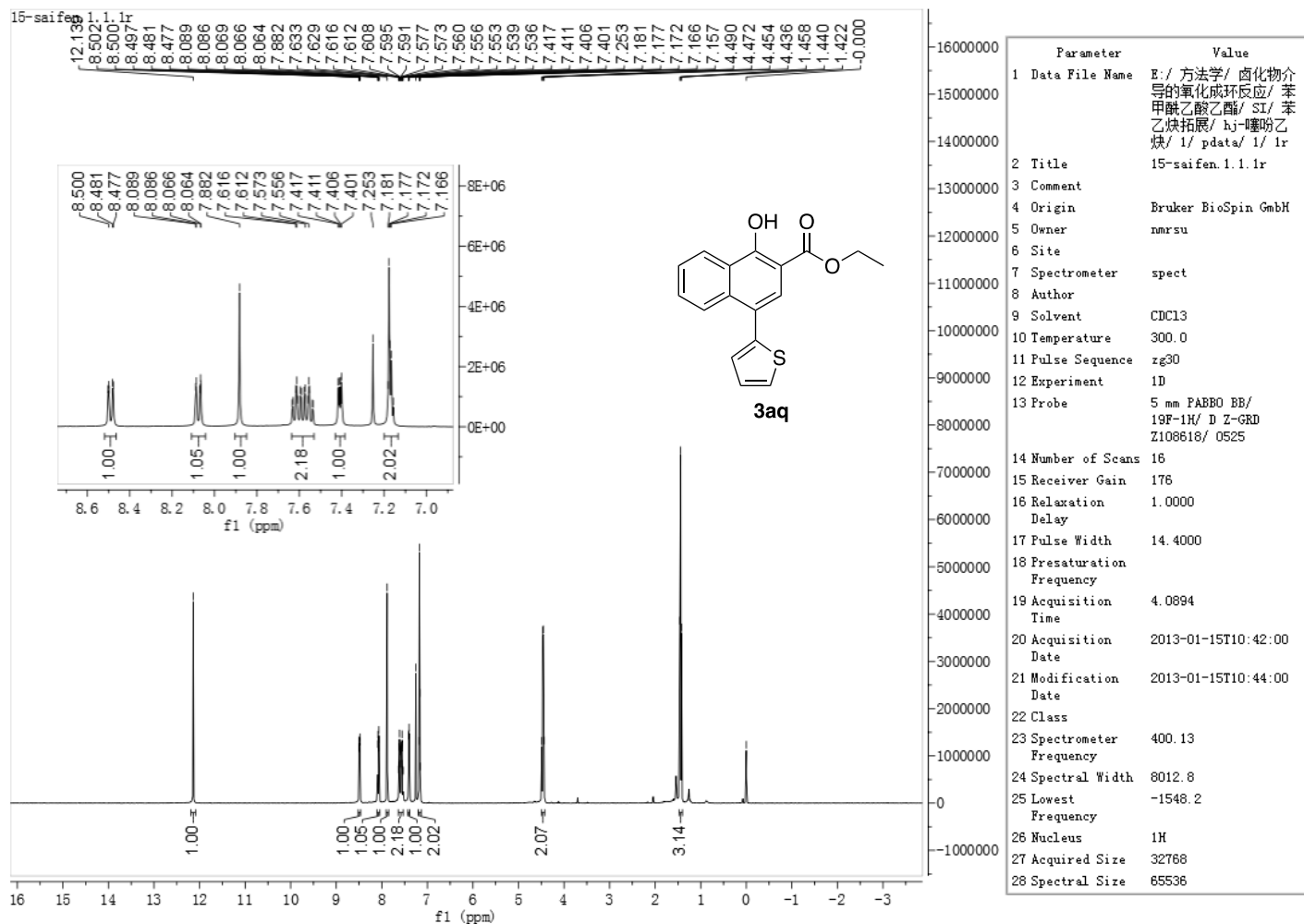
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Mode: Negative  
Scans: 1

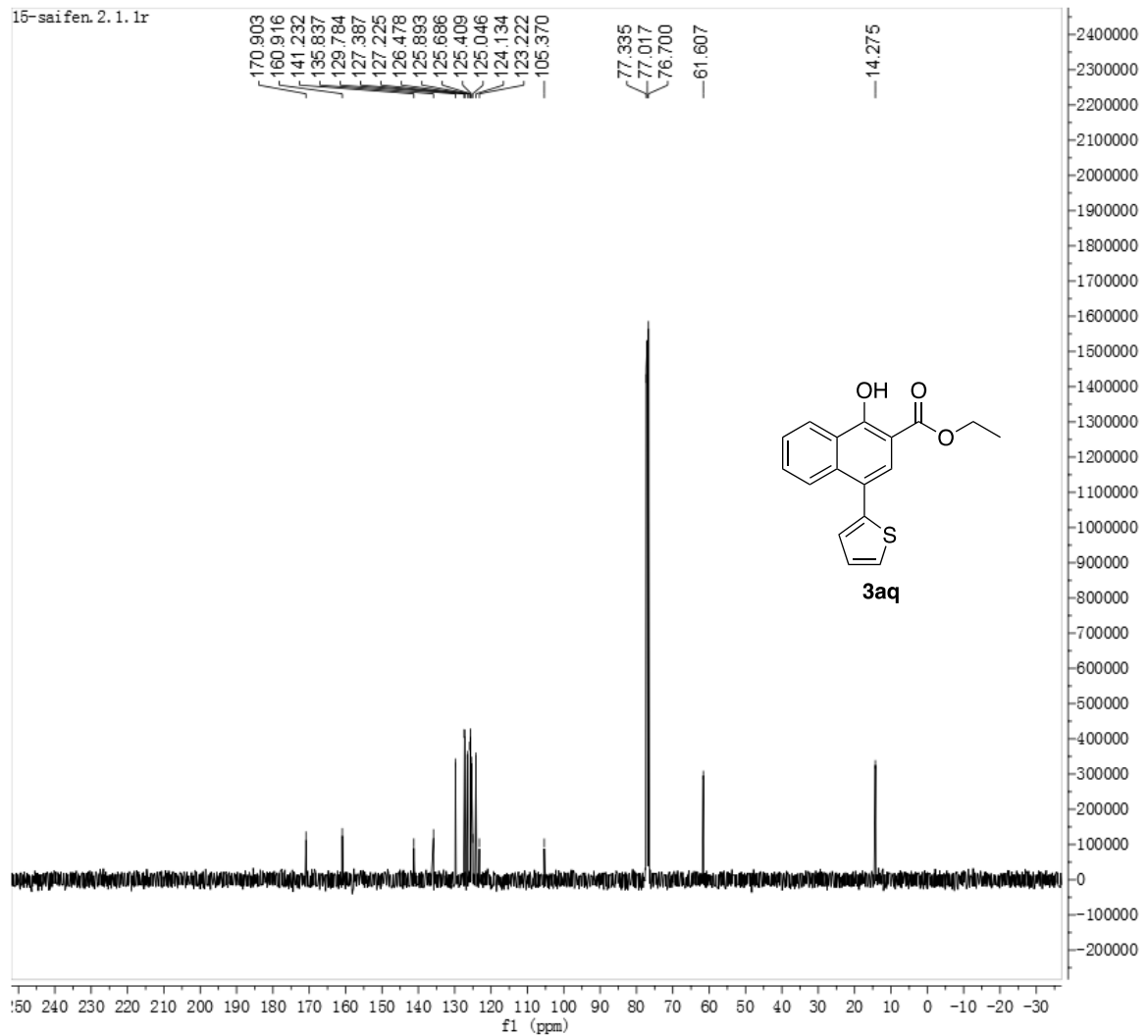
Date: 08-JAN-2013  
Time: 10:49:25  
Scale: 4.6513



**Ethyl 1-hydroxy-4-(thiophen-2-yl)-2-naphthoate(3aq).**



15-saifen. 2. 1. 1r

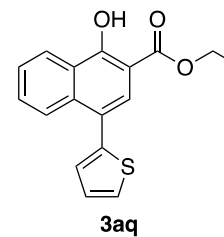
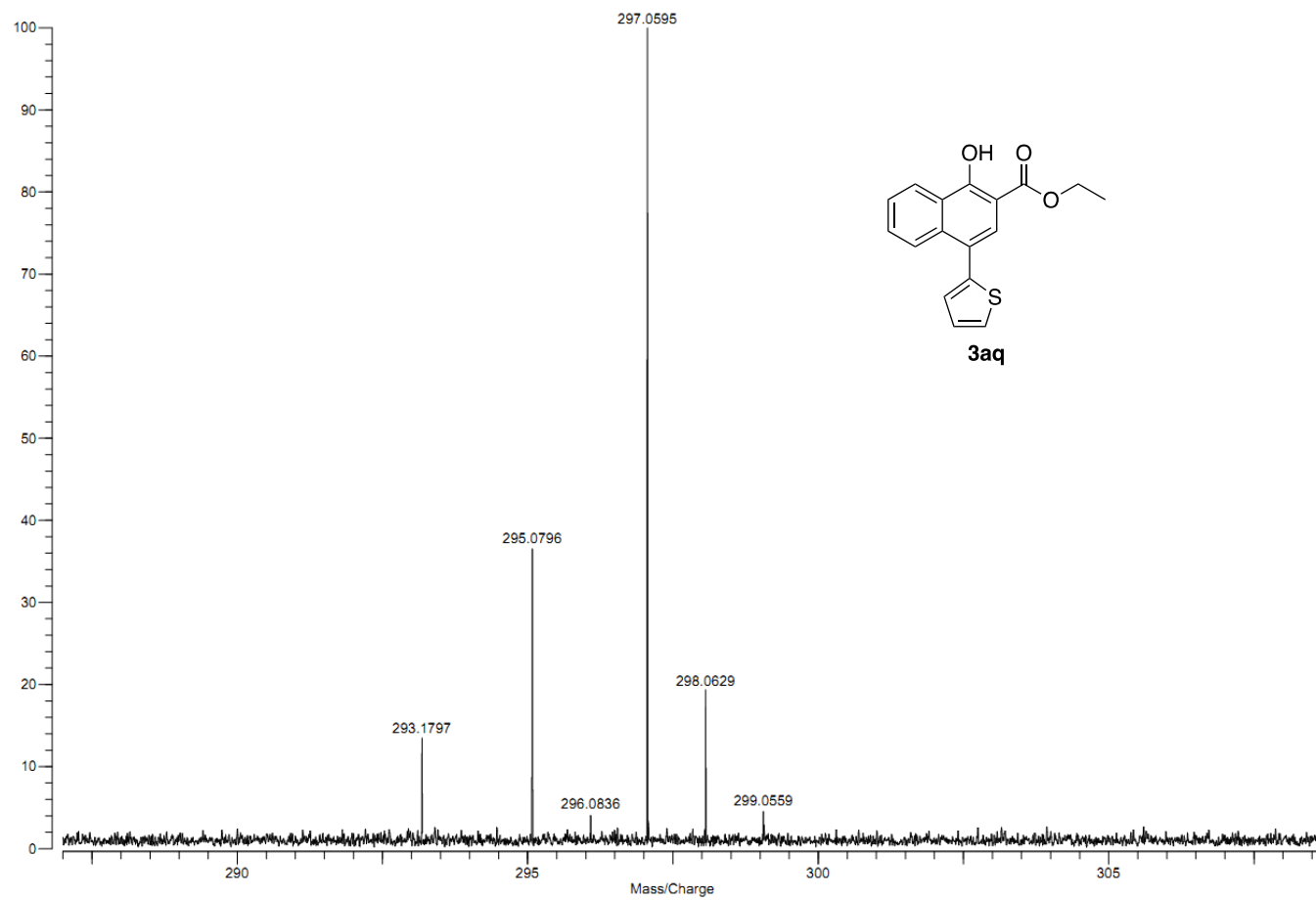


Parameter	Value
1 Data File Name	E:/ 方法学/ 卤化物介 导的氧化成环反应/ 苯 甲酰乙酸乙酯/ SI/ 苯 乙炔拓展/ hj-噻吩乙 炔/ 2/ pdata/ 1/ 1r
2 Title	15-saifen. 2. 1. 1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDC13
10 Temperature	300.1
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	487
15 Receiver Gain	119
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2013-01-15T10:44:00
21 Modification Date	2013-01-15T10:57:00
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855

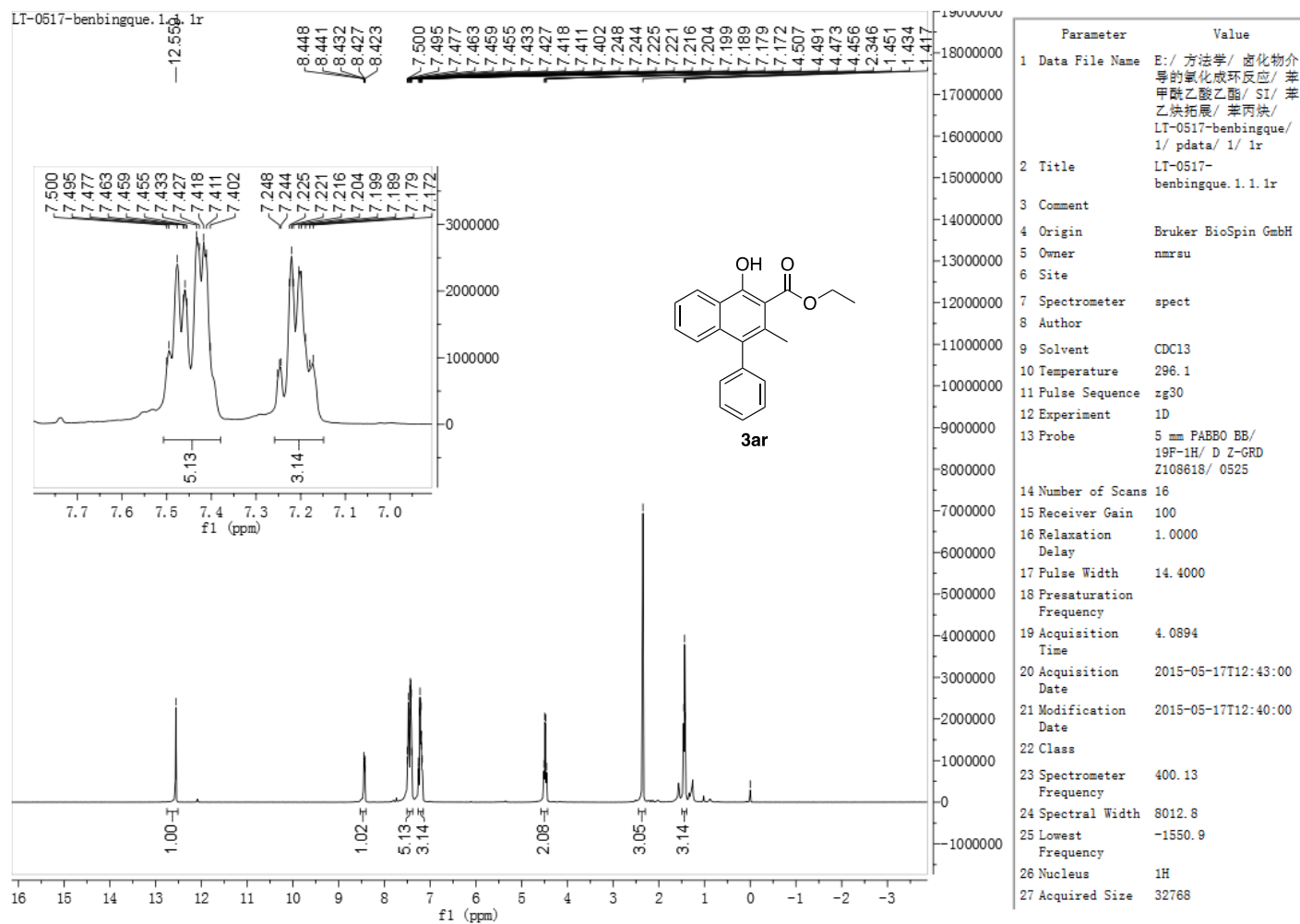
Varian QFT-ESI  
File: HJ-1219\_ESI.trans

Mode: Negative  
Scans: 1

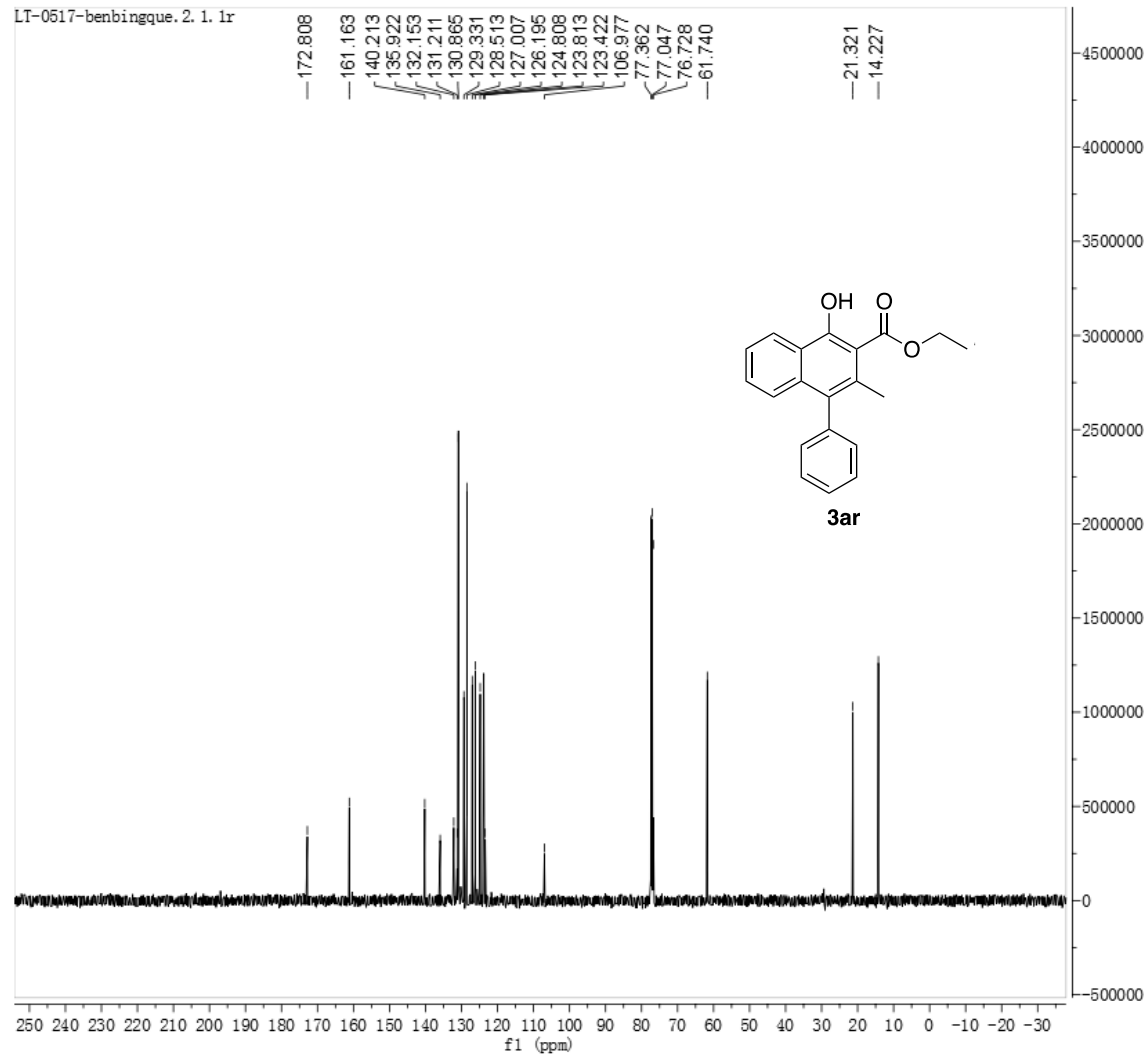
Date: 19-DEC-2012  
Time: 11:19:23  
Scale: 41.5176



Ethyl 1-hydroxy-3-methyl-4-phenyl-2-naphthoate(3ar).

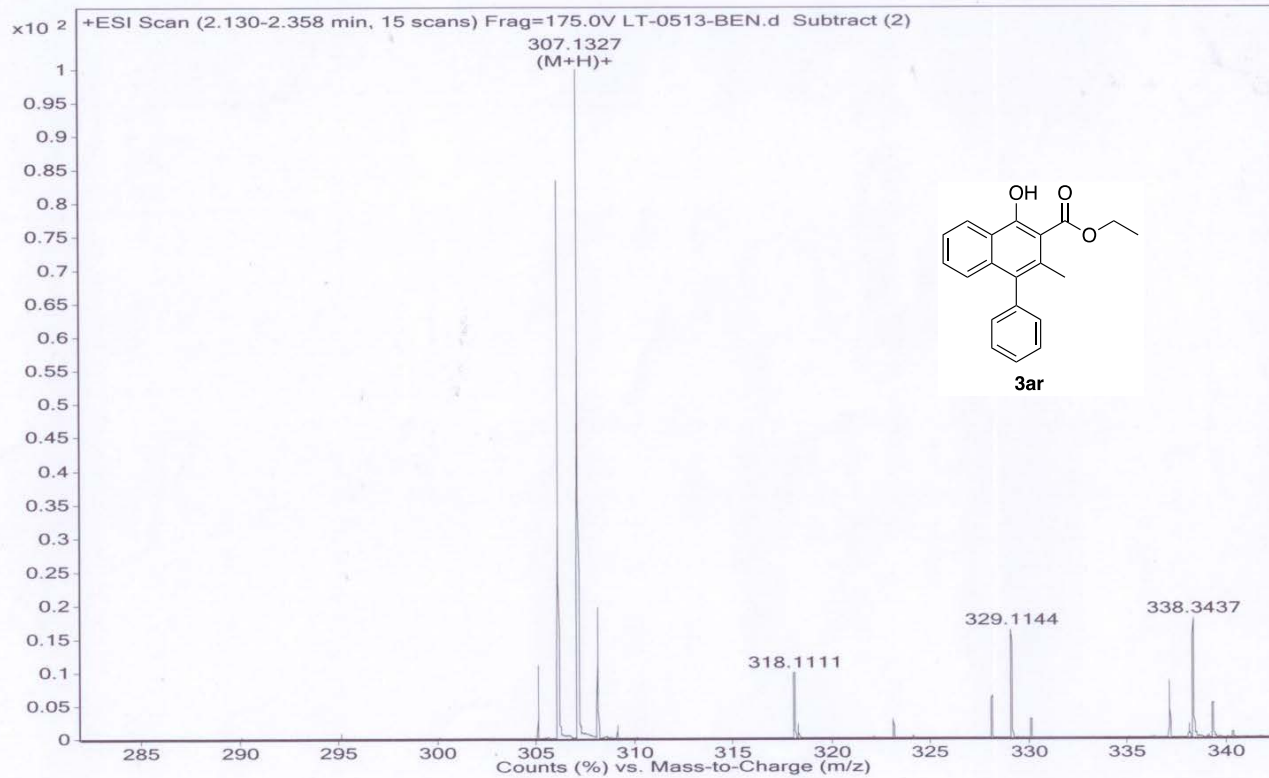


LT-0517-benbingque.2.1.1r

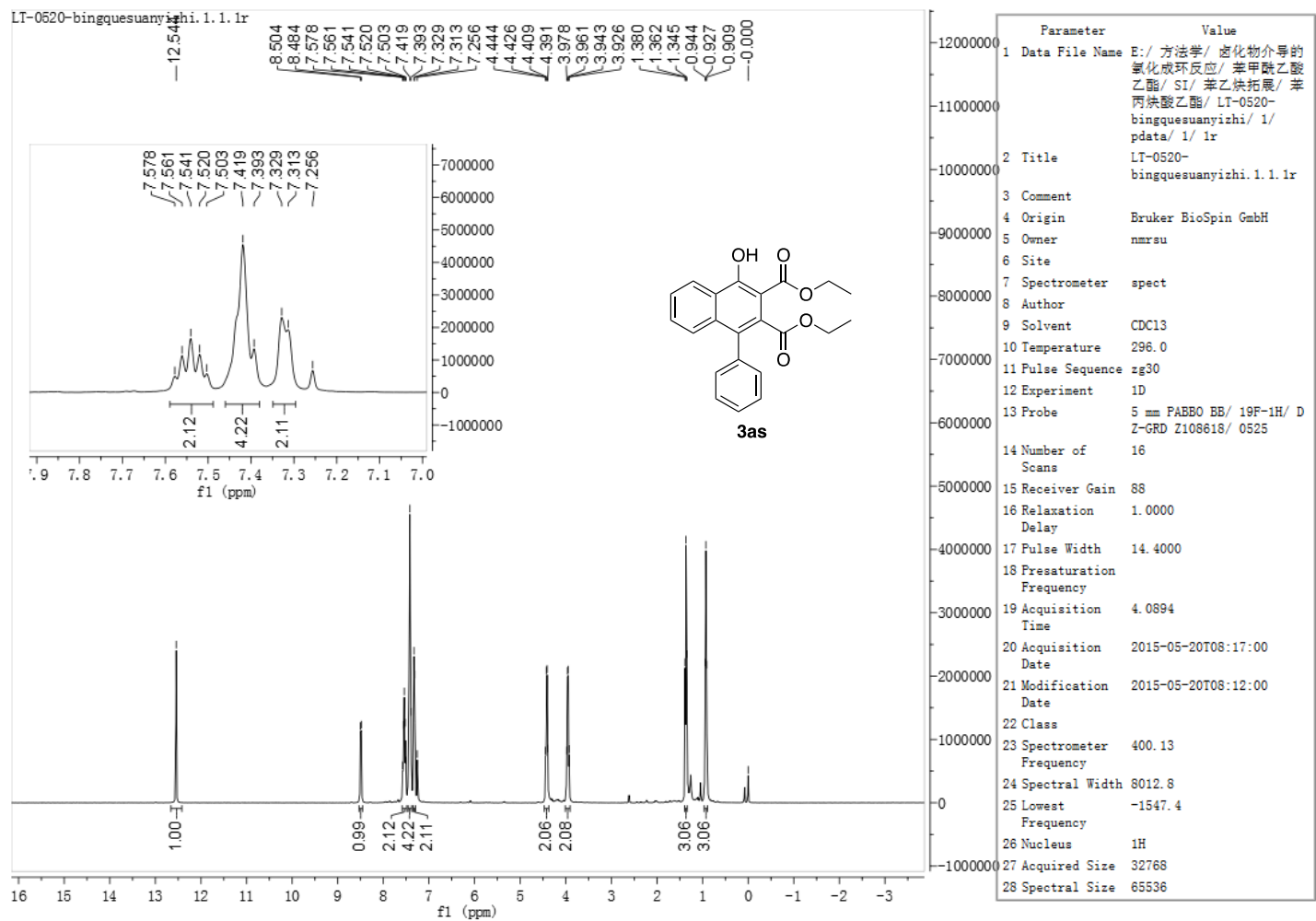


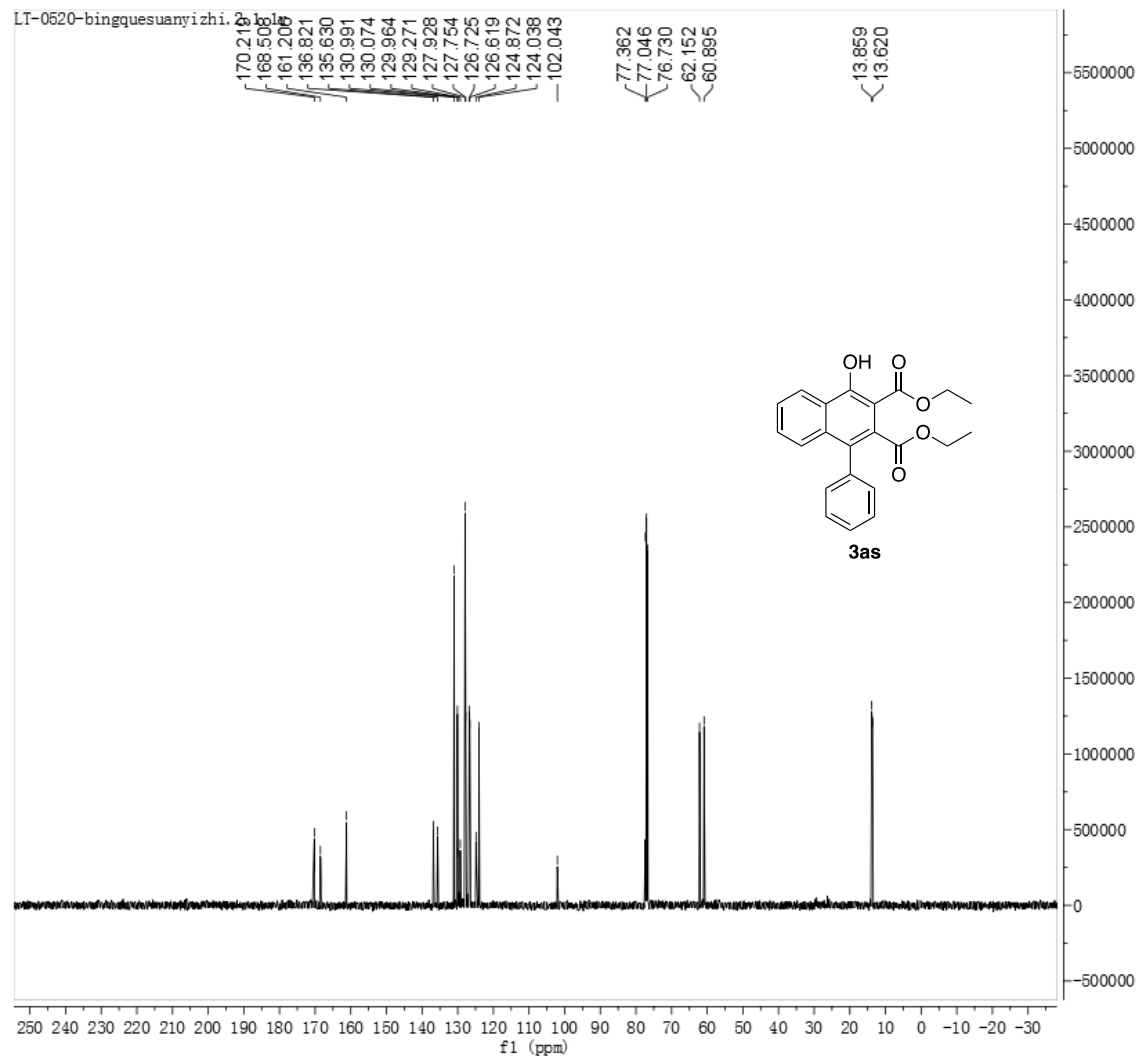
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2 Title	LT-0517- benbingque.2.1.1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDC13
10 Temperature	296.3
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm FAEBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	740
15 Receiver Gain	119
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2015-05-17T12:46:00
21 Modification Date	2015-05-17T13:00:00
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855

Sample Name	lc/ms	Position	P1-B1	Instrument Name	Instrument 1	User Name	
Inj Vol	-1	InjPosition		SampleType	Sample	IRM Calibration Status	Some Ions Missed
Data Filename	LT-0513-BEN.d	ACQ Method	chen-ms.m	Comment		Acquired Time	6/8/2015 11:35:10 AM



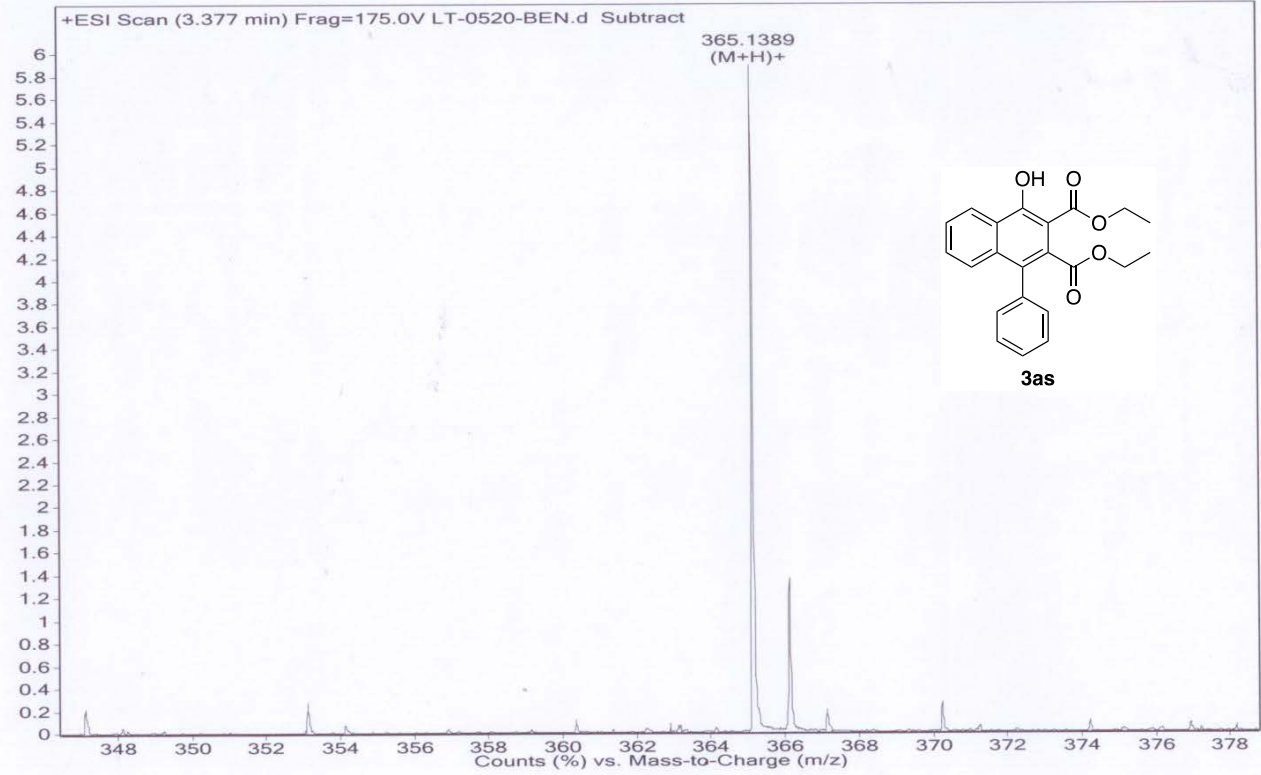
Diethyl 1-hydroxy-4-phenylanthracene-2,3-dicarboxylate(3as).



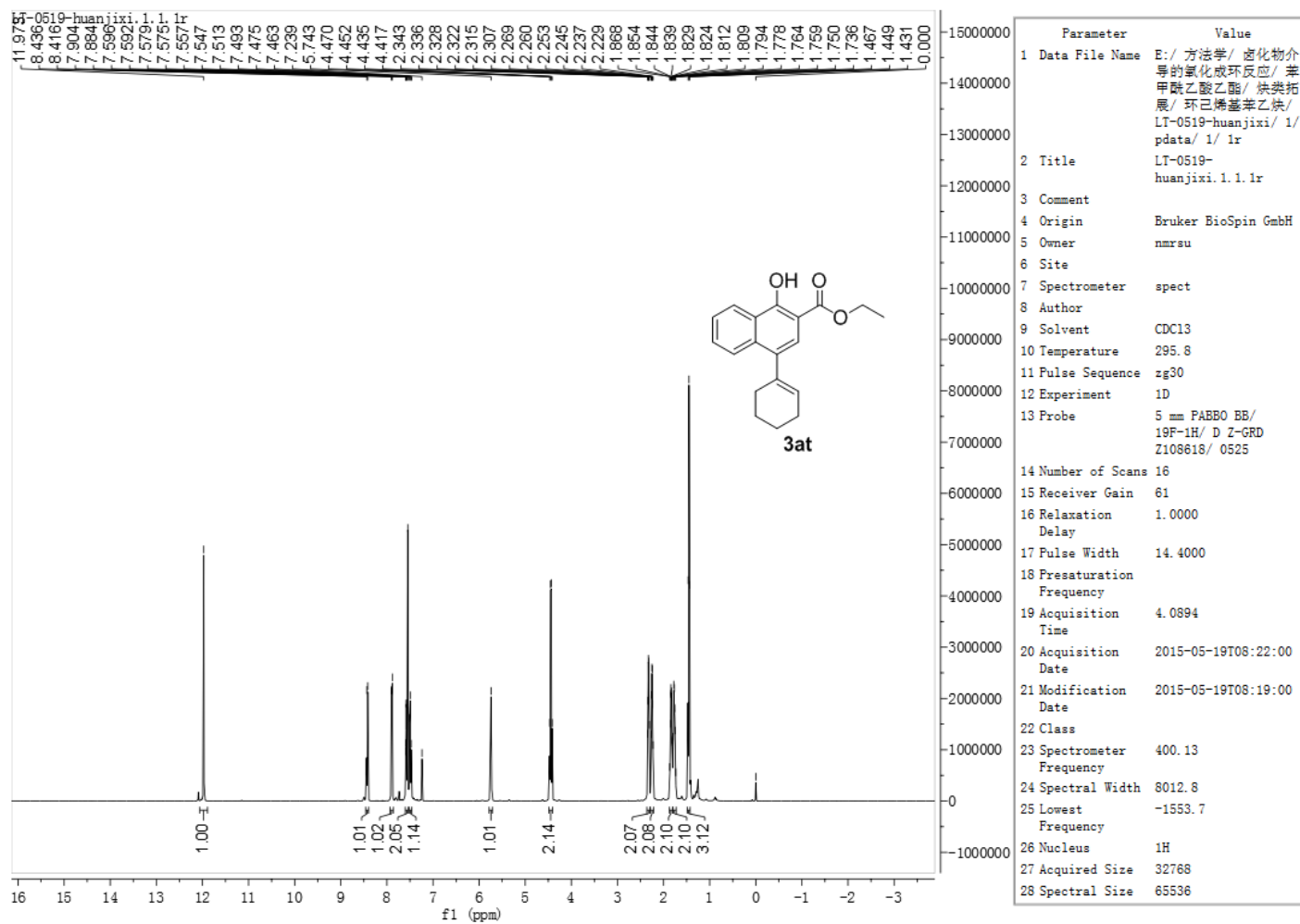


Parameter	Value
1 Data File Name	E:/ 方法学/ 卤化物介导的氯化成环反应/ 苯甲酸乙酯/ SI/ 苯乙炔拓展/ 苯丙炔酸乙酯/ LT-0520-bingquesuanyizhi/ 2/ pdata/ 1/ 1r
2 Title	LT-0520-bingquesuanyizhi. 2. 1. 1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDC13
10 Temperature	297.0
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	641
15 Receiver Gain	119
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2015-05-20T08:25:00
21 Modification Date	2015-05-20T08:30:00
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

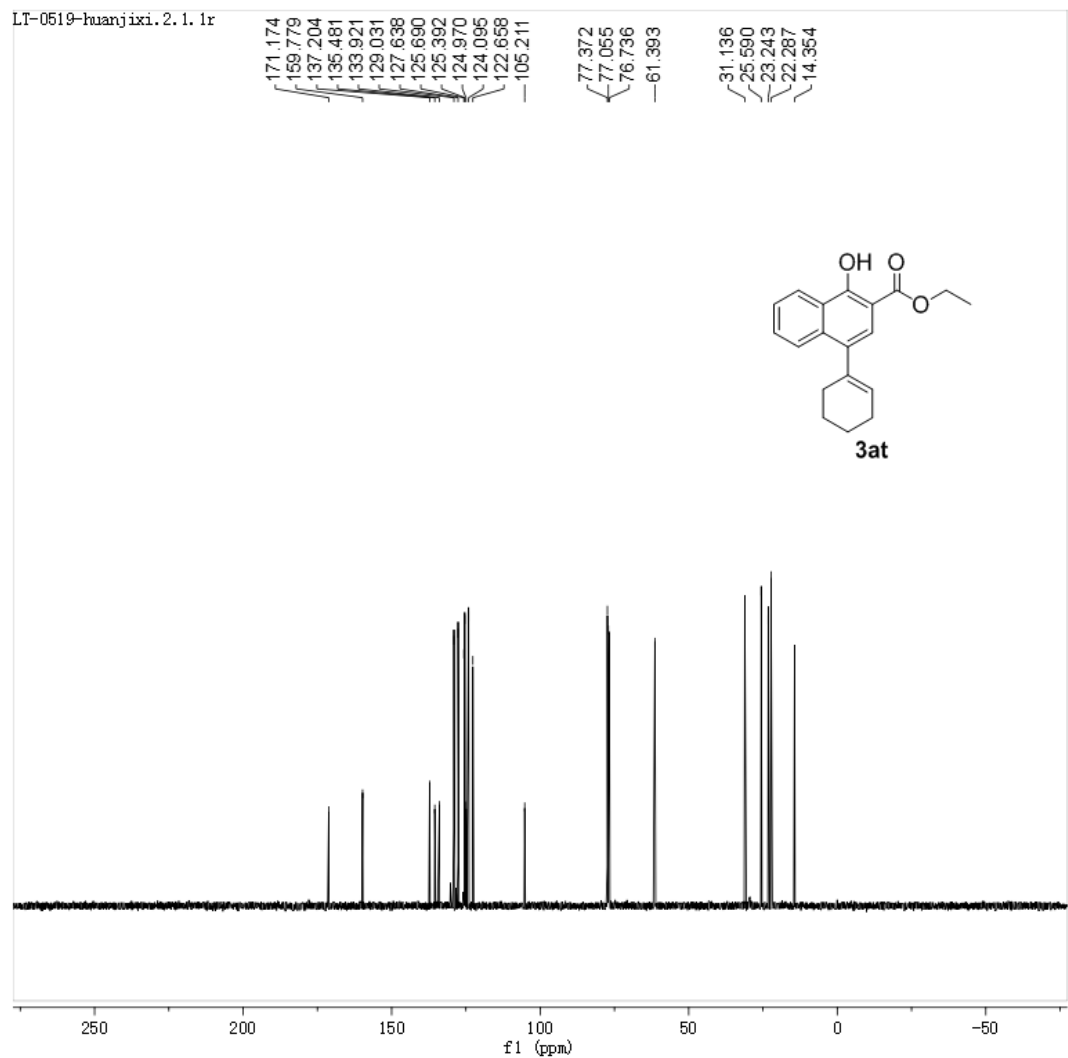
Sample Name	lc/ms	Position	P1-A5	Instrument Name	Instrument 1	User Name	
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Data Filename	LT-0520-BEN.d	ACQ Method	chen-ms.m	Comment		Acquired Time	6/8/2015 11:11:28 AM



**Ethyl 4-(cyclohex-1-en-1-yl)-1-hydroxy-2-naphthoate(3at).**



LT-0519-huanjixi.2.1.1r

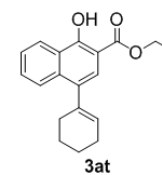
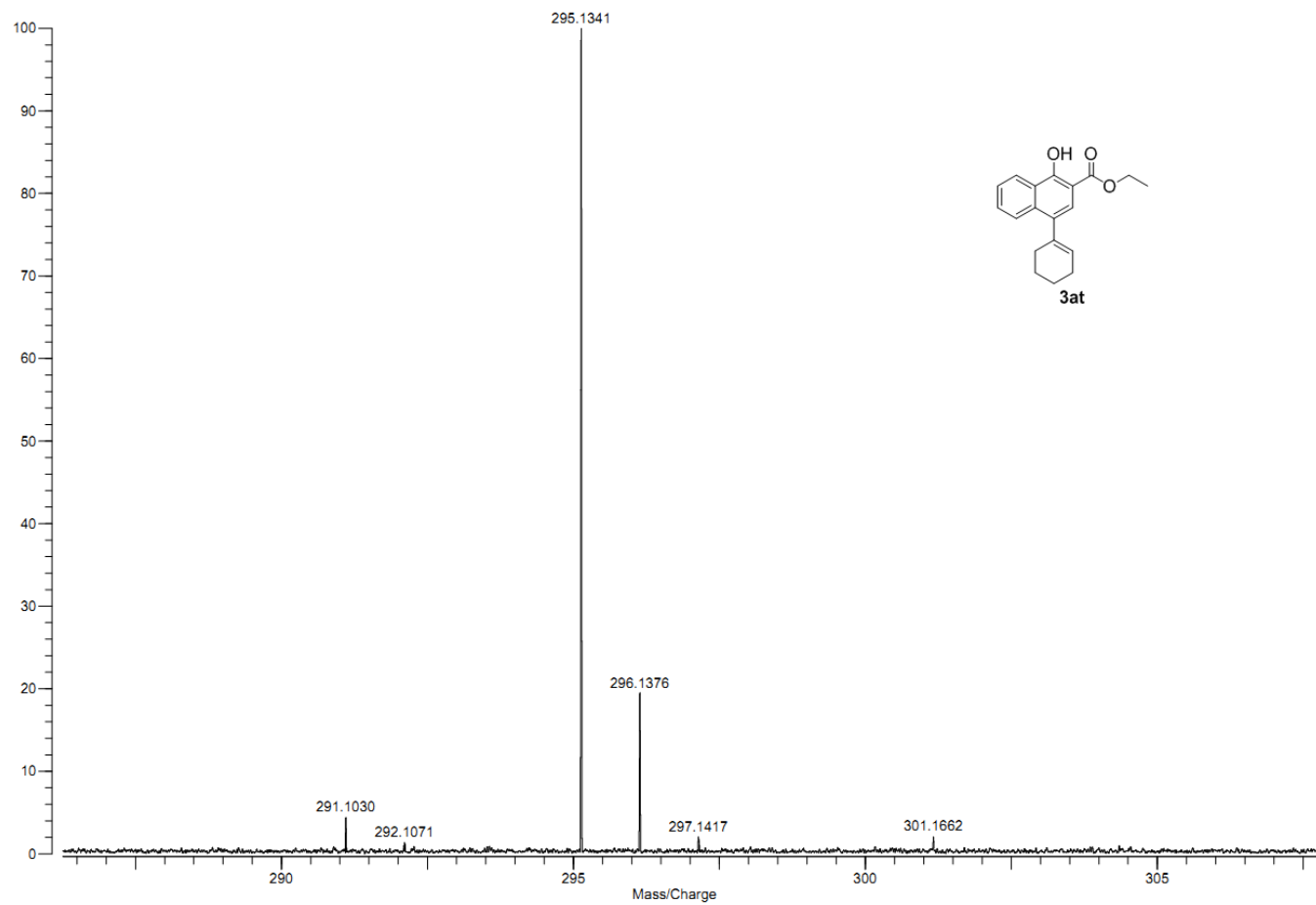


Parameter	Value
1 Data File Name	E:/ 方法学/ 卤化物介 导的氧化成环反应/ 苯 甲酰乙酸乙酯/ 炔类拓 展/ 环己烯基苯乙炔/ LT-0519-huanjixi/ 2/ pdata/ 1/ 1r
2 Title	LT-0519- huanjixi.2.1.1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	295.9
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	446
15 Receiver Gain	113
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2015-05-19T08:24:00
21 Modification Date	2015-05-19T08:31:00
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855

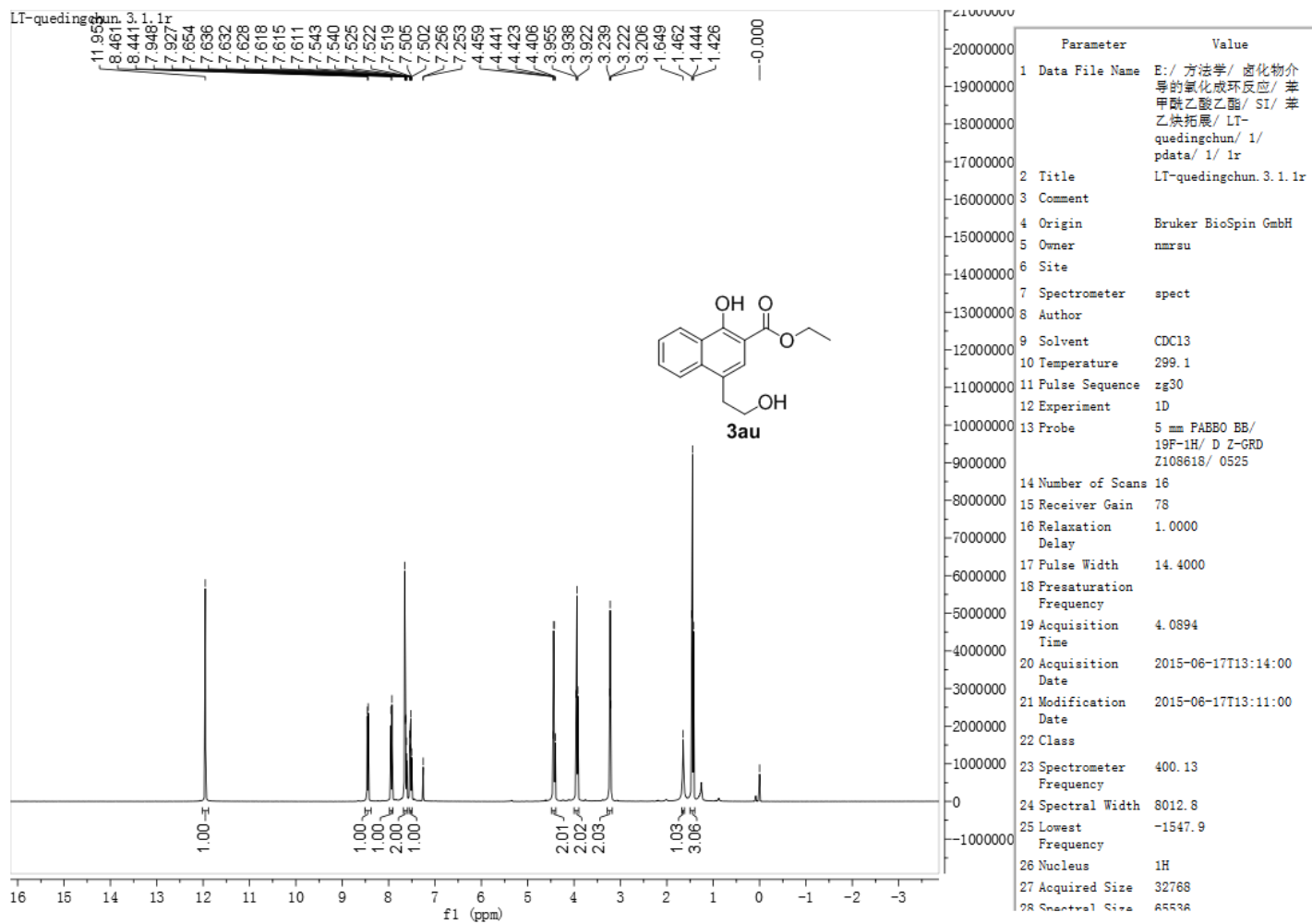
Varian QFT-ESI  
File: p33-3\_ESI.trans

Mode: Negative  
Scans: 1

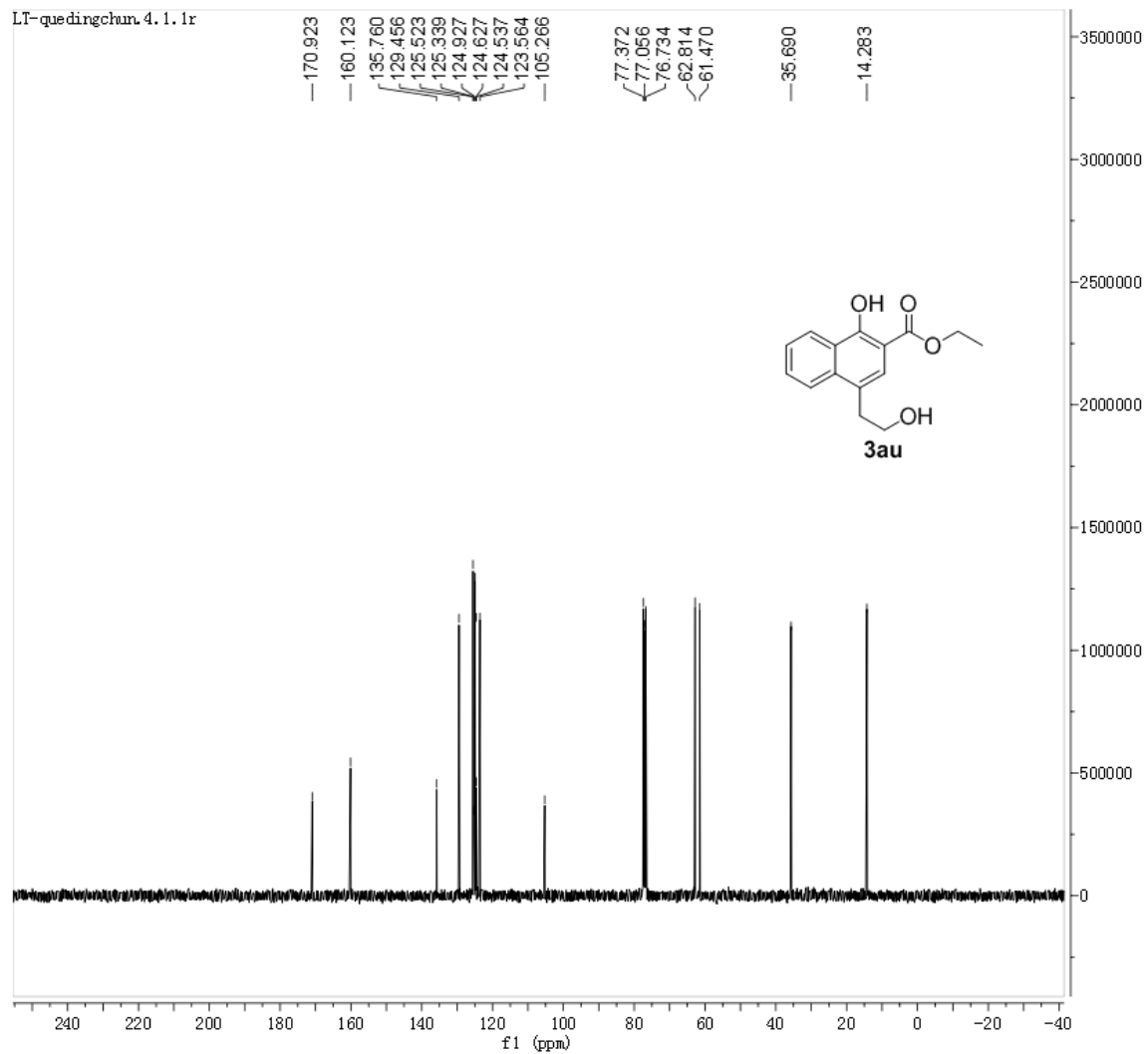
Date: 08-JAN-2013  
Time: 10:44:32  
Scale: 10.4316



**Ethyl 1-hydroxy-4-(2-hydroxyethyl)-2-naphthoate(3au).**



LT-quedingchun.4.1.1r

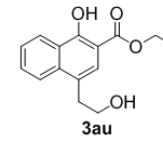
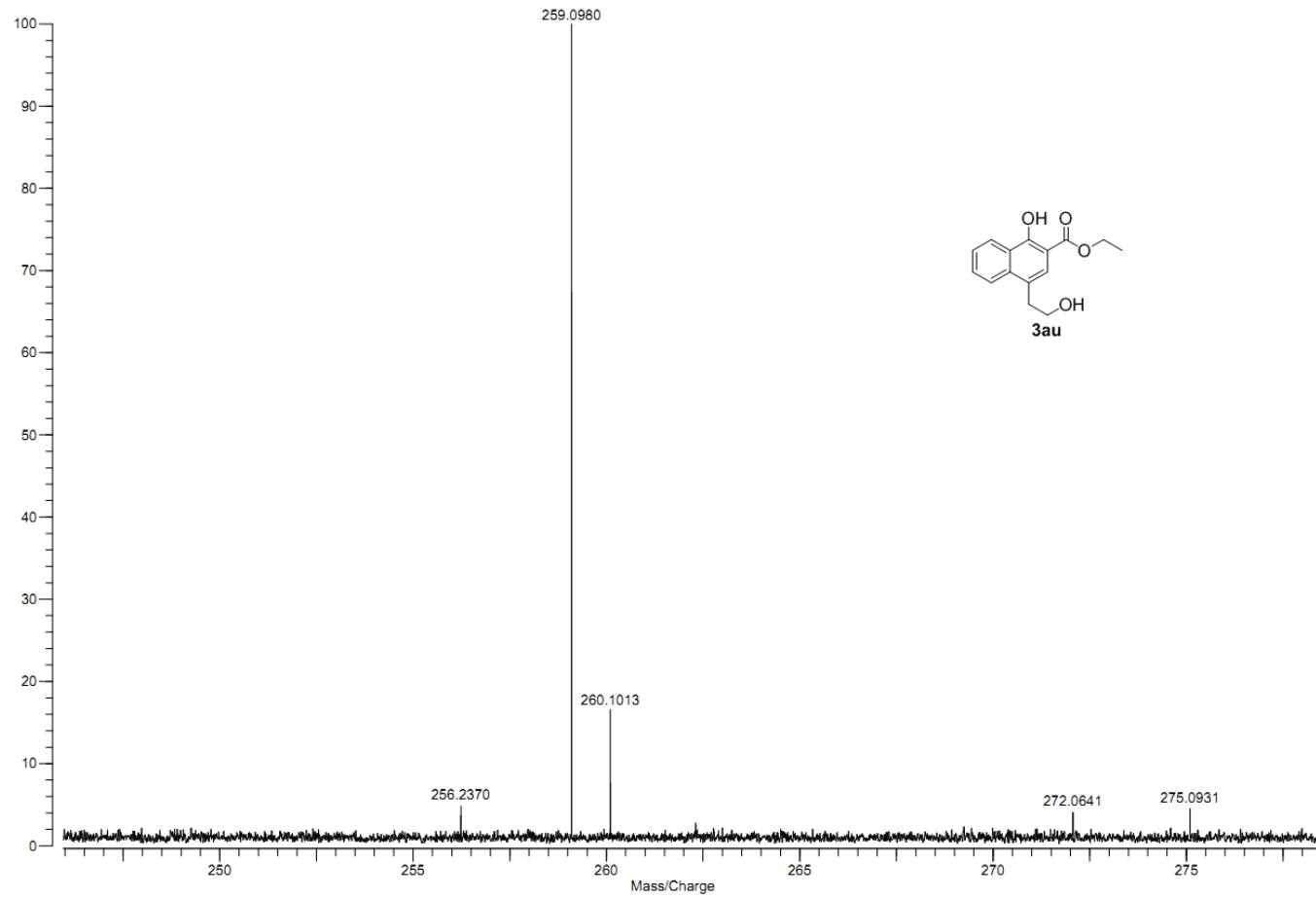


Parameter	Value
1 Data File Name	E:/ 方法学/ 卤化物介 导的氯化成环反应/ 苯 甲酸乙酸乙酯/ SI/ 苯 乙炔拓展/ LT- quedingchun/ 2/ pdata/ 1/ 1r
2 Title	LT-quedingchun.4.1.1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmsau
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	299.6
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	364
15 Receiver Gain	133
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2015-06-17T13:17:00
21 Modification Date	2015-06-17T13:21:00
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

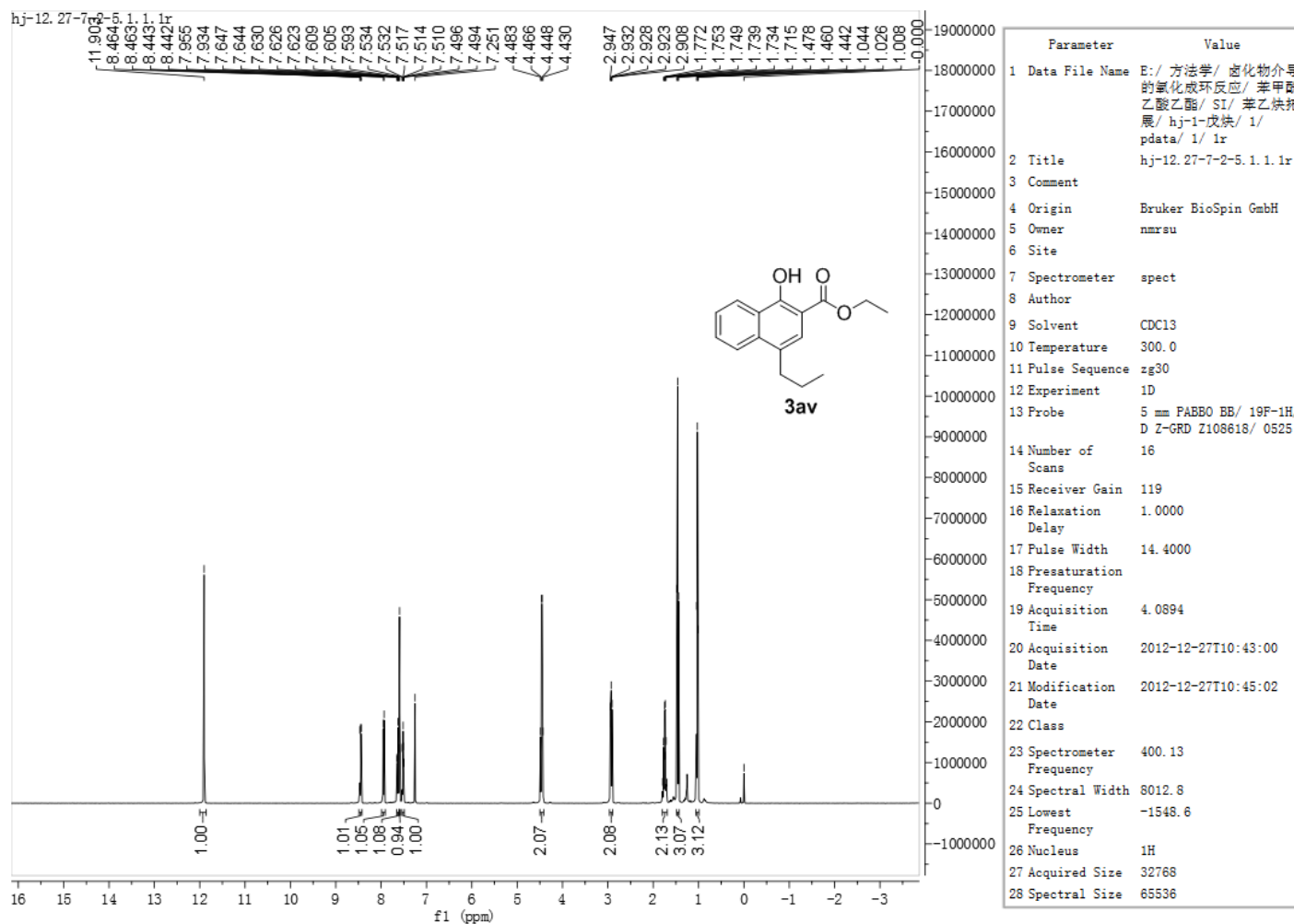
Varian QFT-ESI  
File: 259\_ESI.trans

Mode: Negative  
Scans: 1

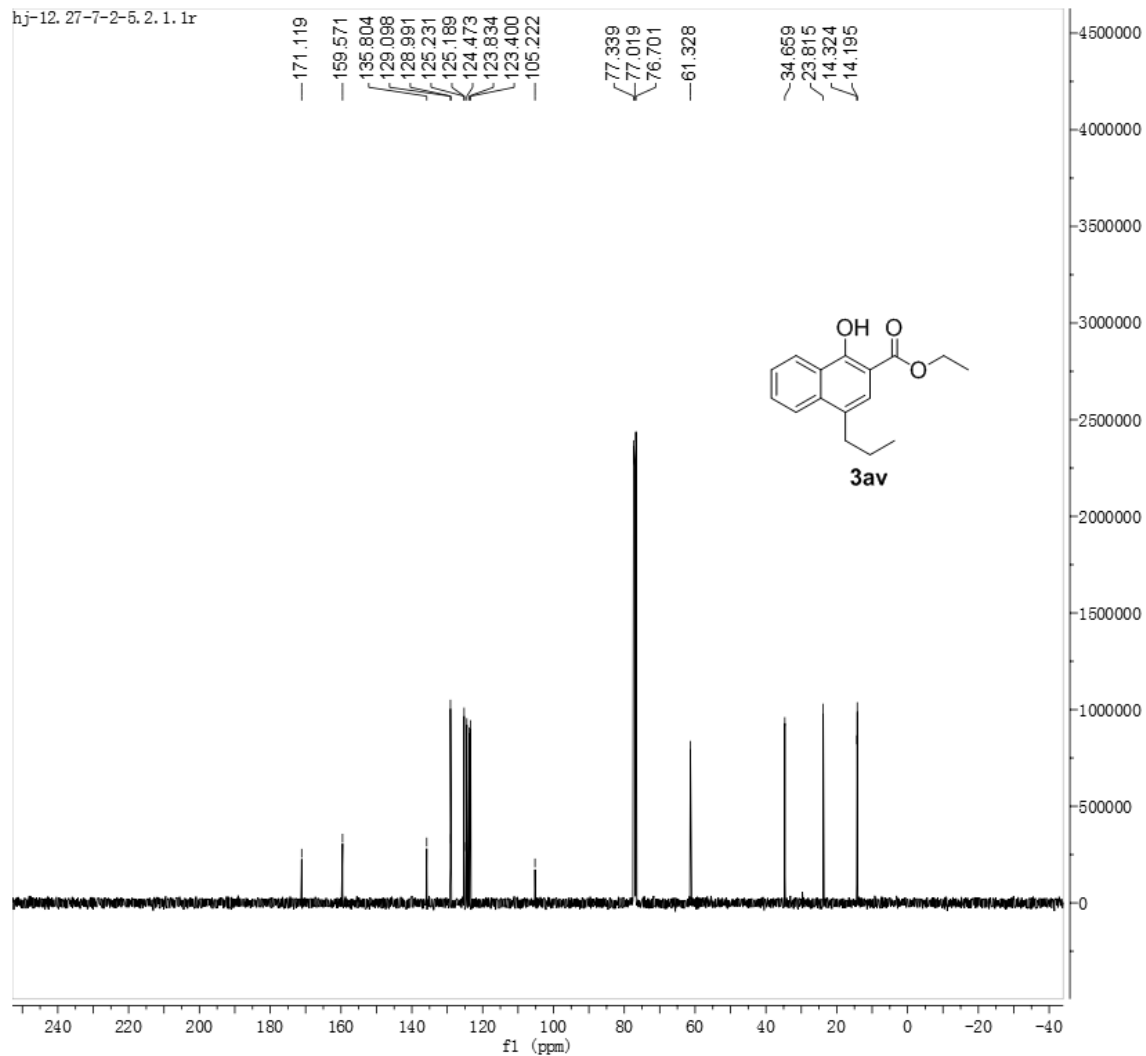
Date: 20-DEC-2012  
Time: 15:08:31  
Scale: 36.7183



# Ethyl 1-hydroxy-4-propyl-2-naphthoate(3av).



hj-12.27-7-2-5.2.1.1r

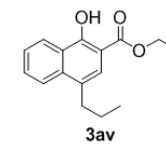
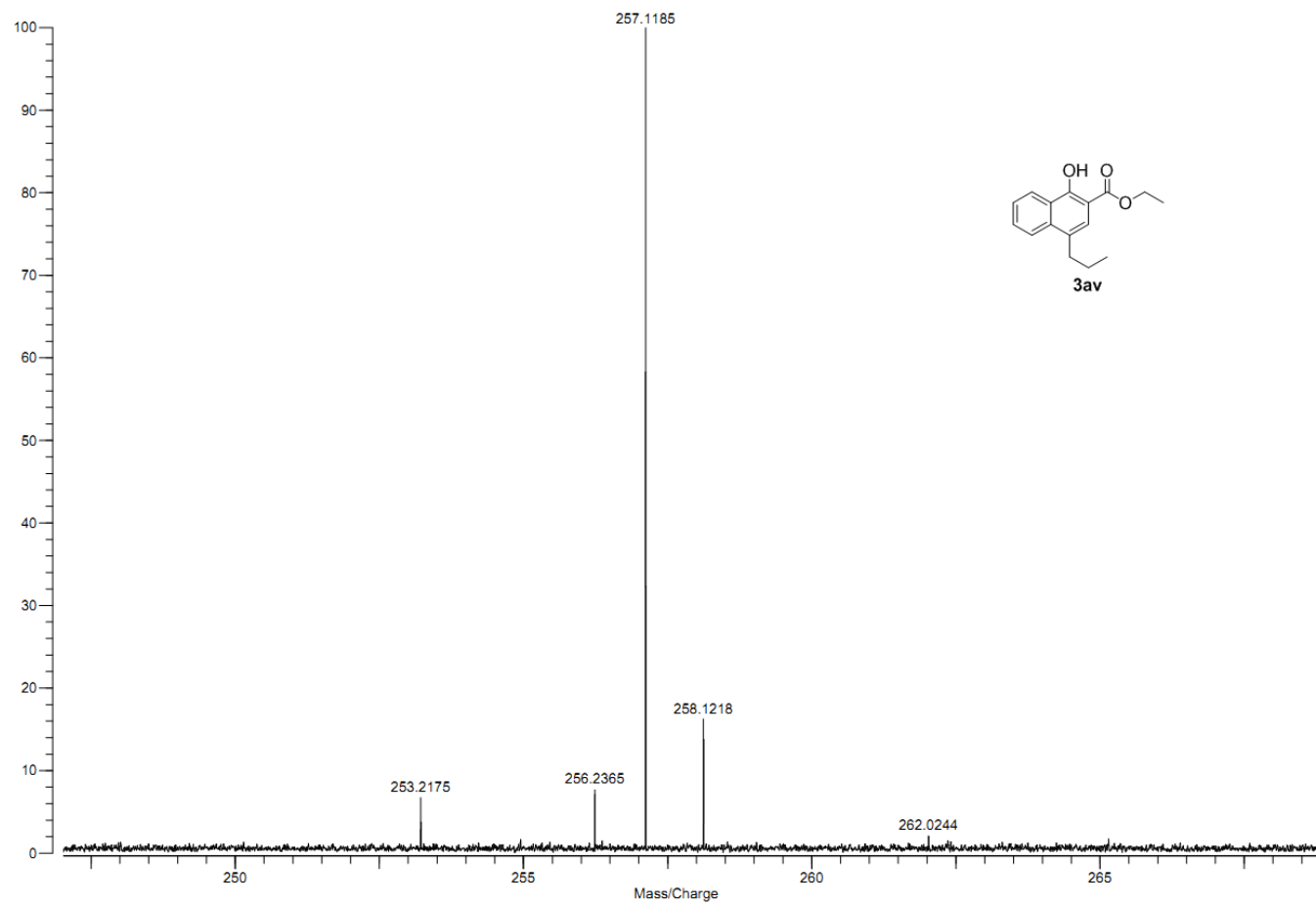


Parameter	Value
1 Data File Name	E:/ 方法学/ 卤化物介导的氯化成环反应/ 苯甲酰乙酸乙酯/ S1/ 苯乙炔拓展/ hj-1-戊炔/ 2/ pdata/ 1/ 1r
2 Title	hj-12.27-7-2-5.2.1.1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDC13
10 Temperature	300.0
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	649
15 Receiver Gain	119
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2012-12-27T10:46:00
21 Modification Date	2012-12-27T11:02:44
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

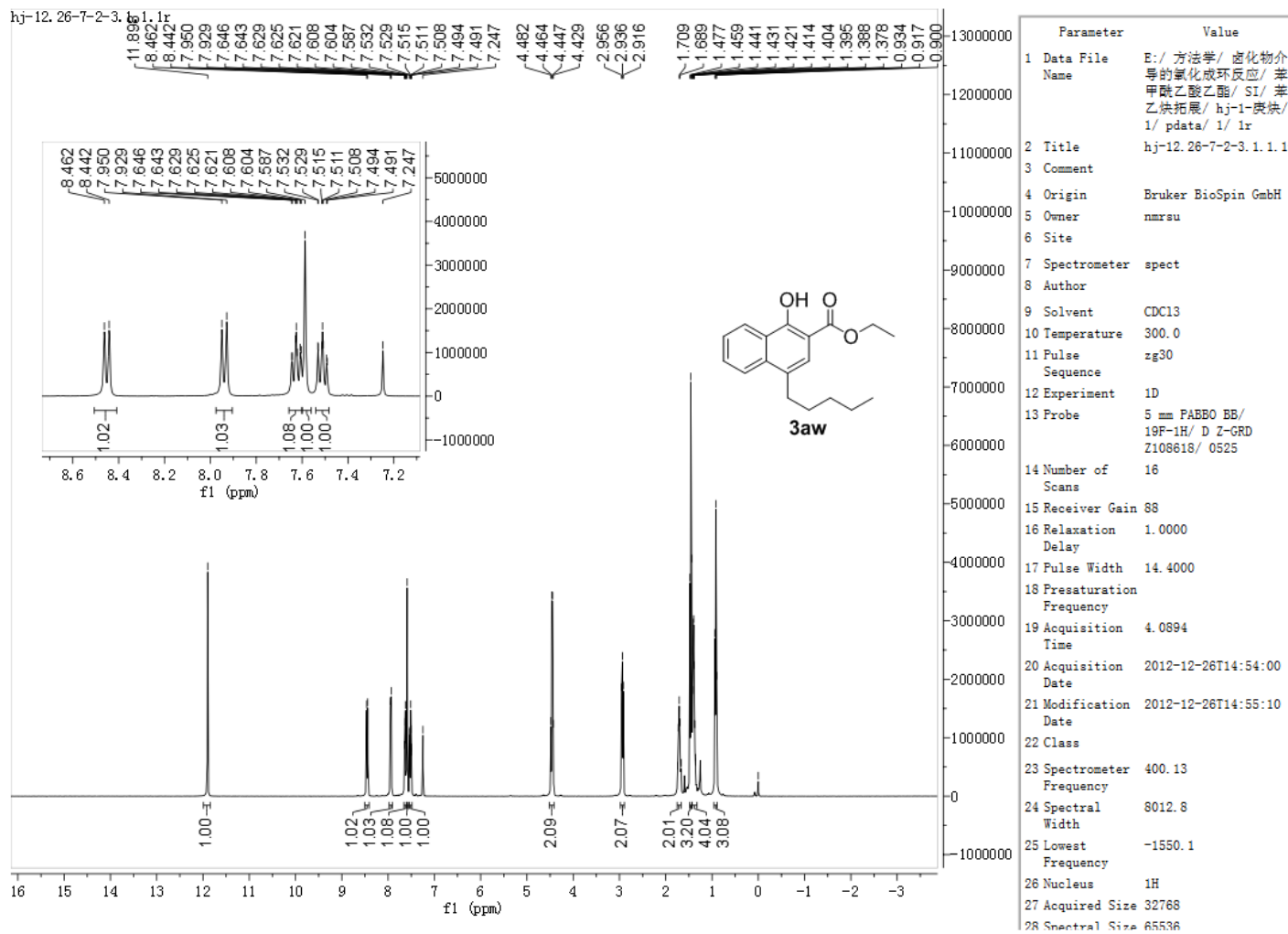
Varian QFT-ESI  
File: 7-2-F\_ESI.trans

Mode: Positive  
Scans: 1

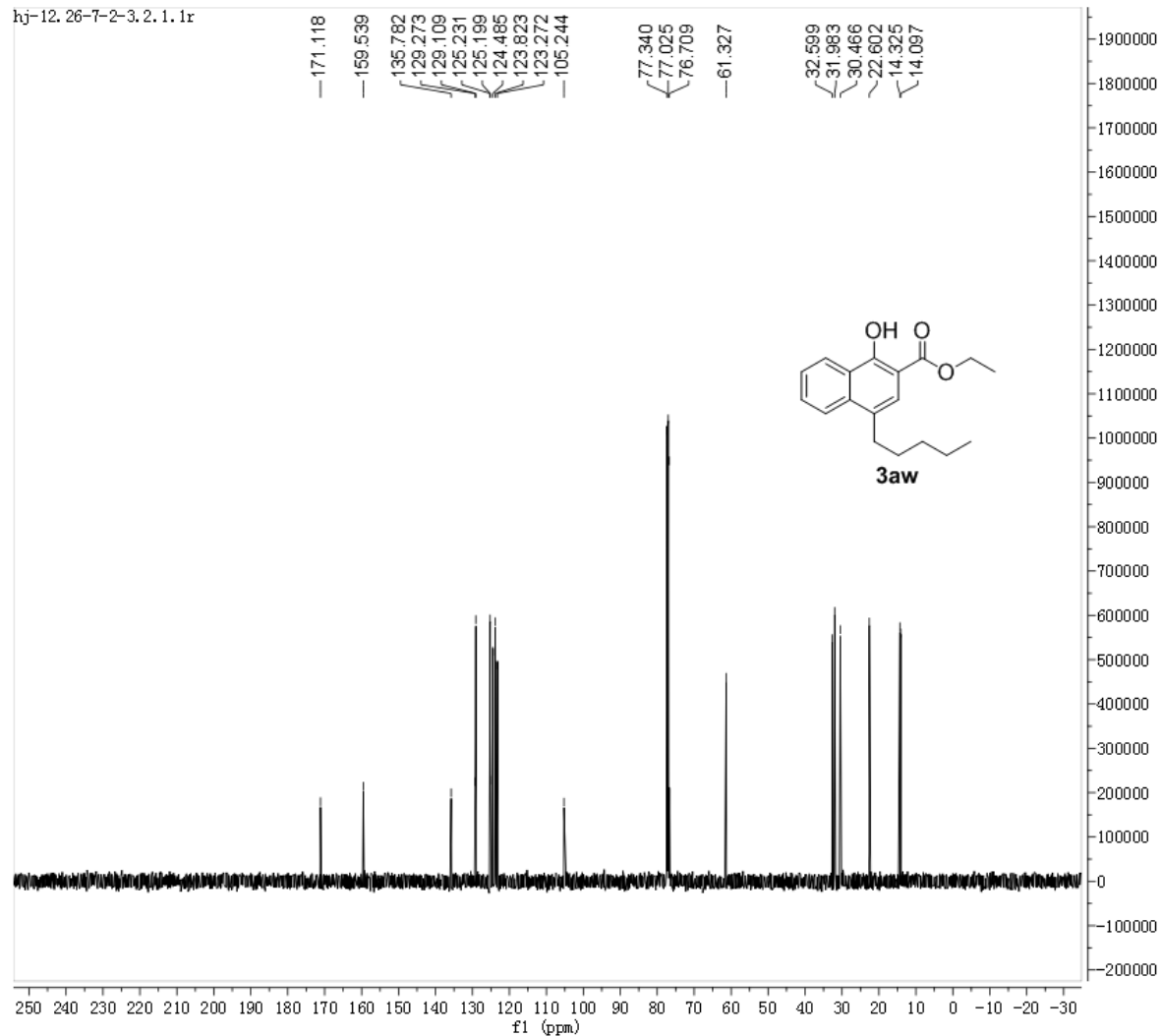
Date: 28-DEC-2012  
Time: 09:18:09  
Scale: 22.7276



**Ethyl 1-hydroxy-4-pentyl-2-naphthoate(3aw).**



hj-12.26-7-2-3.2.1.1r

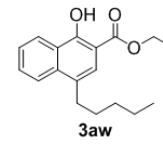
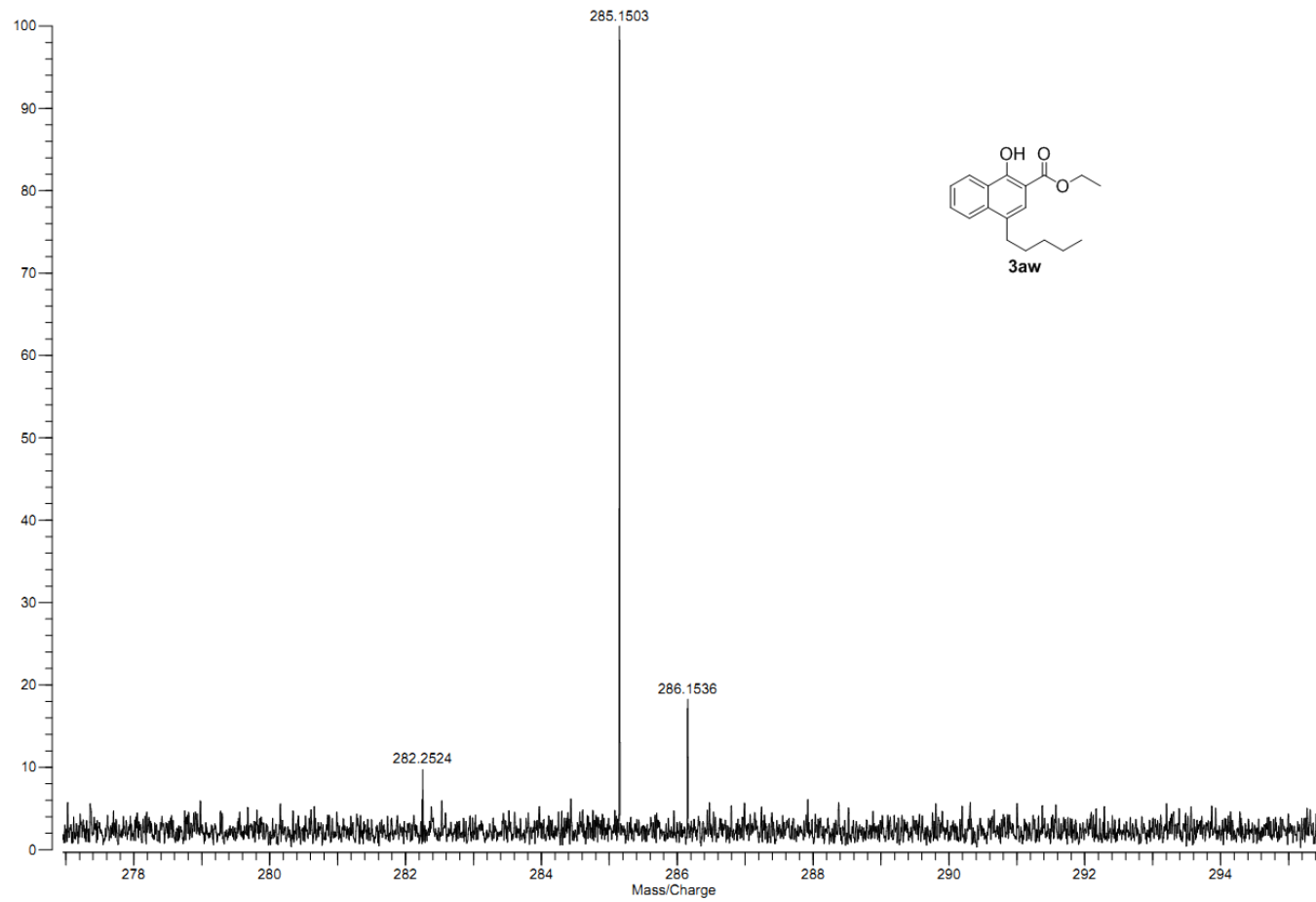


Parameter	Value
1 Data File Name	E:/ 方法学/ 卤化物介导的氧化成环反应/ 苯甲酰乙酸乙酯/ SI/ 苯乙炔拓展/ hj-1-庚炔/ 2/ pdata/ 1/ 1r
2 Title	hj-12.26-7-2-3.2.1.1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	300.0
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	280
15 Receiver Gain	119
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2012-12-26T15:02:00
21 Modification Date	2012-12-26T15:05:54
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

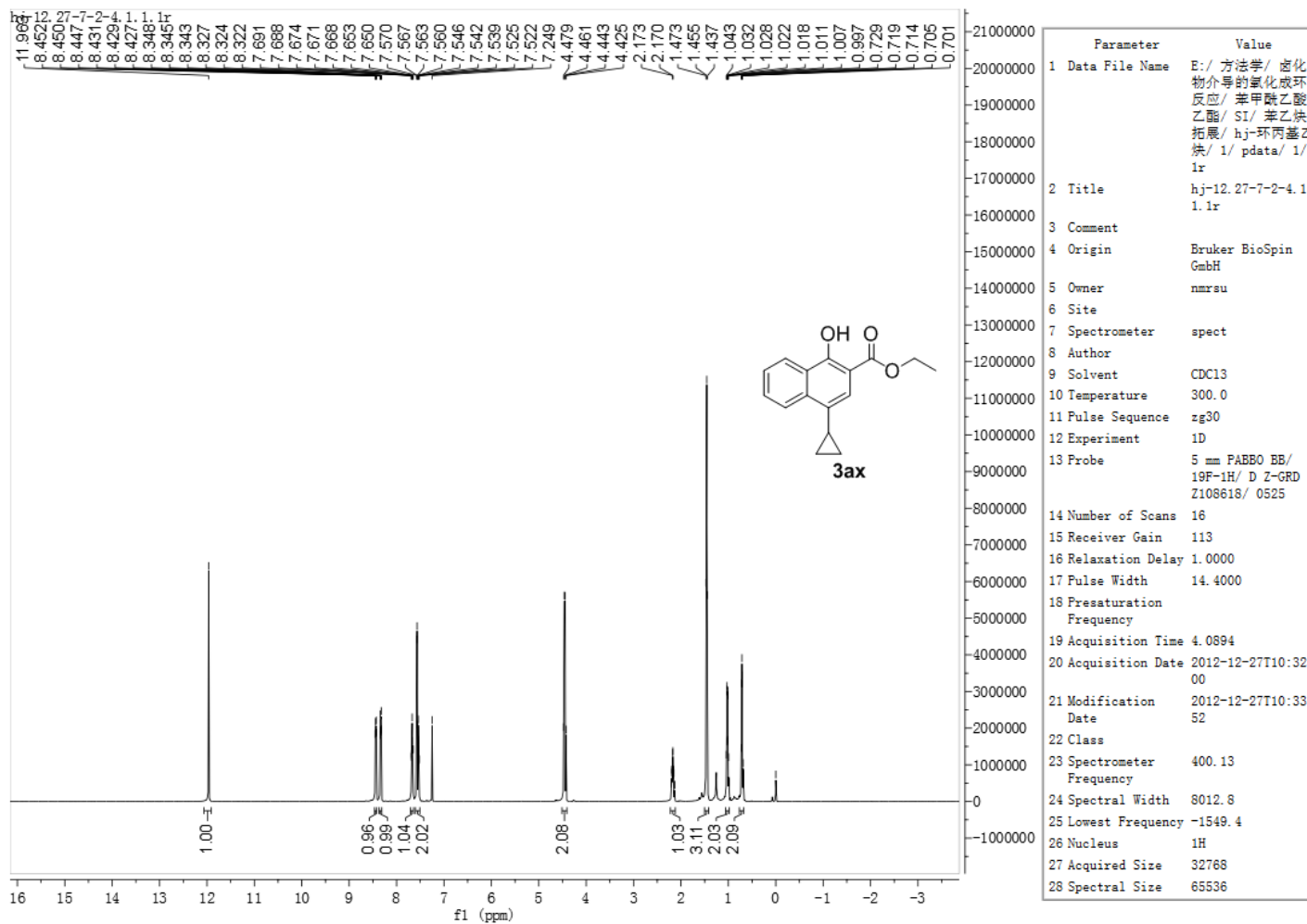
Varian QFT-ESI  
File: 7-2-D\_ESI.trans

Mode: Negative  
Scans: 1

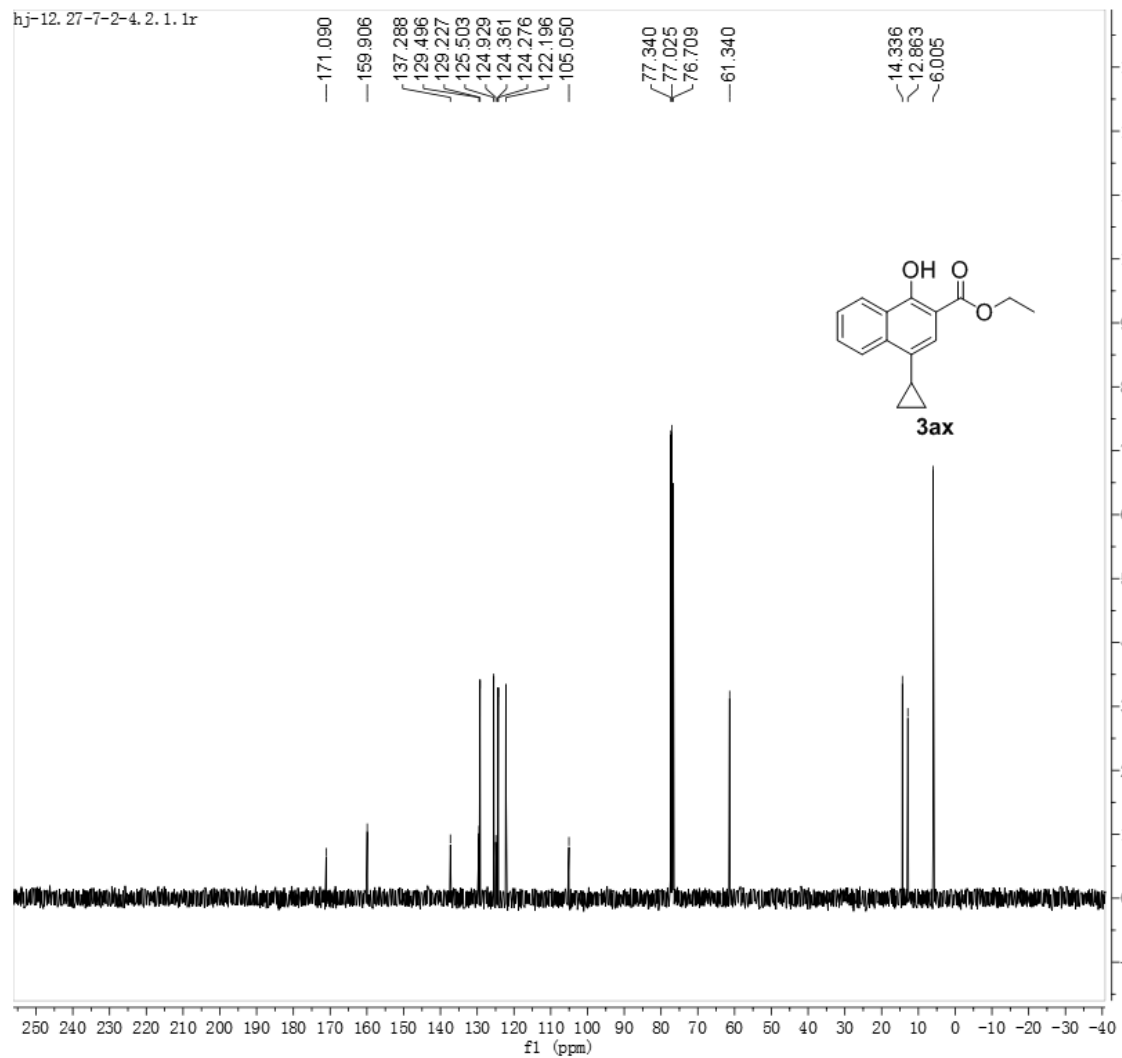
Date: 28-DEC-2012  
Time: 09:21:43  
Scale: 95.7789



**Ethyl 4-cyclopropyl-1-hydroxy-2-naphthoate(3ax).**



hj-12. 27-7-2-4. 2. 1. 1r

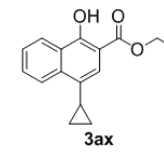
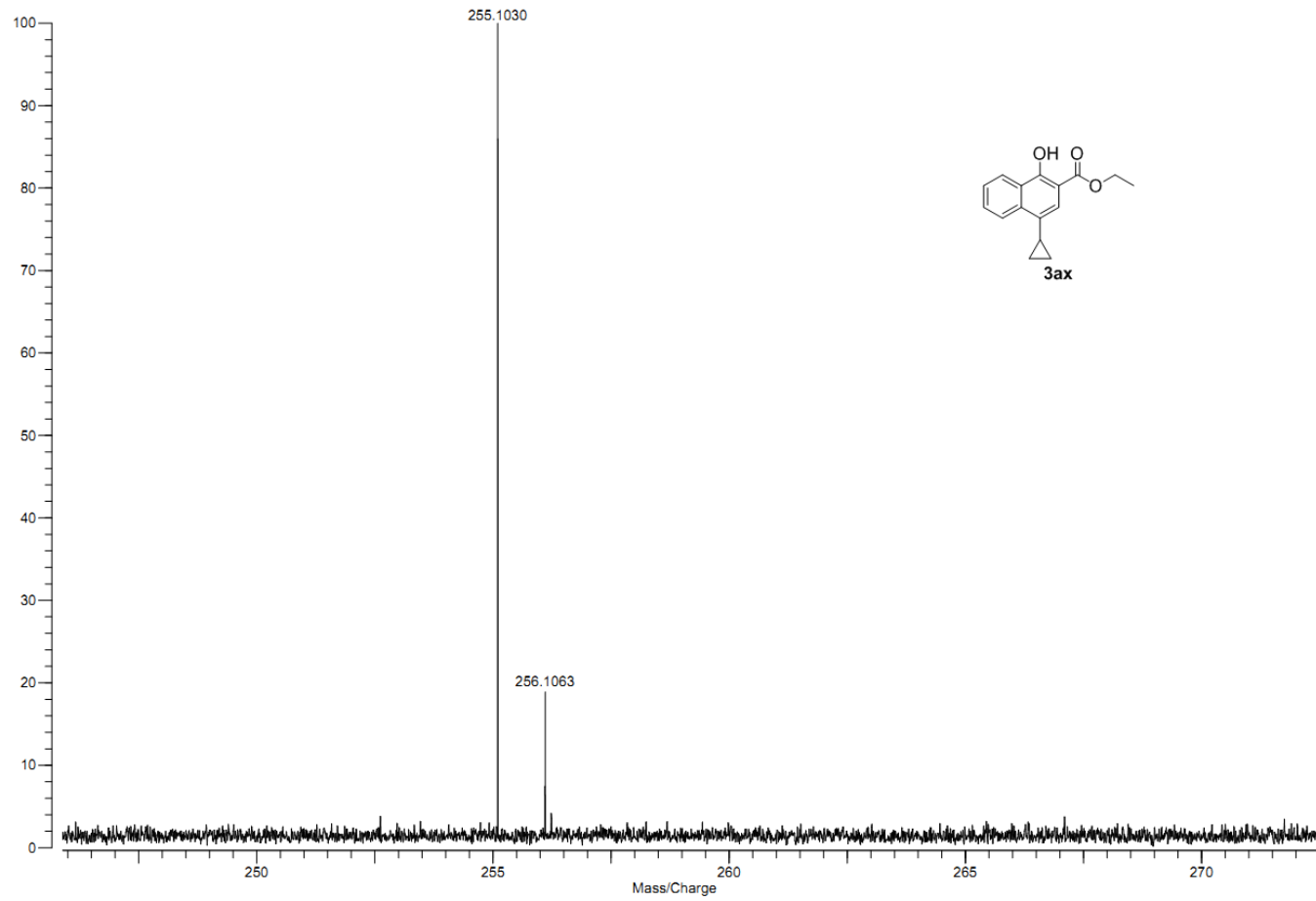


Parameter	Value
1 Data File Name	E:/ 方法学/ 卤化物介导的氧化成环反应/ 苯甲酸乙酯/ SI/ 苯乙炔拓展/ hj-环丙基乙炔/ 2/ pdata/ 1/ 1r
2 Title	hj-12. 27-7-2-4. 2. 1. 1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	300.0
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	201
15 Receiver Gain	113
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2012-12-27T10:37:00
21 Modification Date	2012-12-27T10:39:56
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

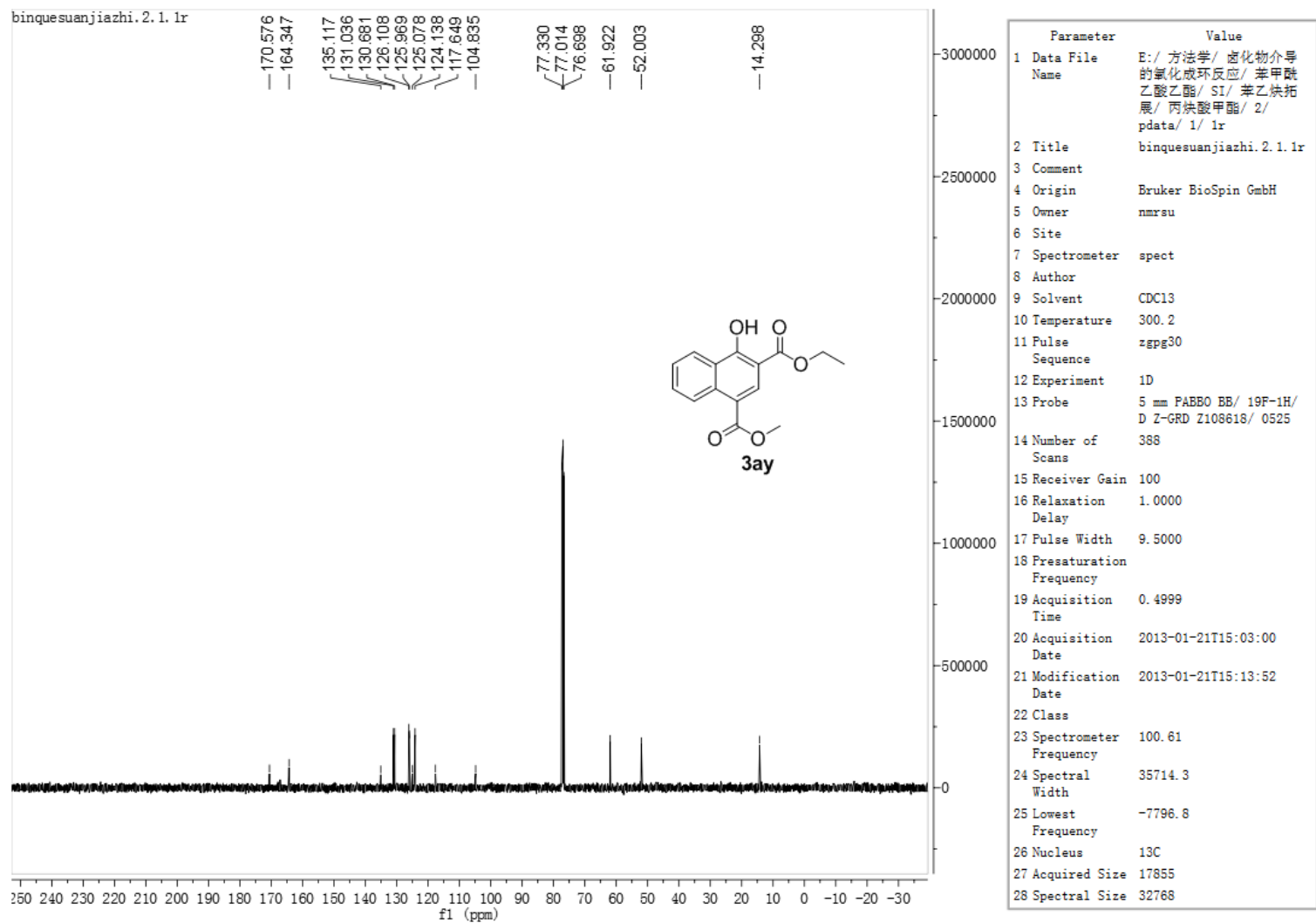
Varian QFT-ESI  
File: 7-2-E\_ESI.trans

Mode: Negative  
Scans: 1

Date: 28-DEC-2012  
Time: 09:20:11  
Scale: 54,1102



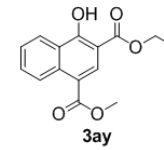
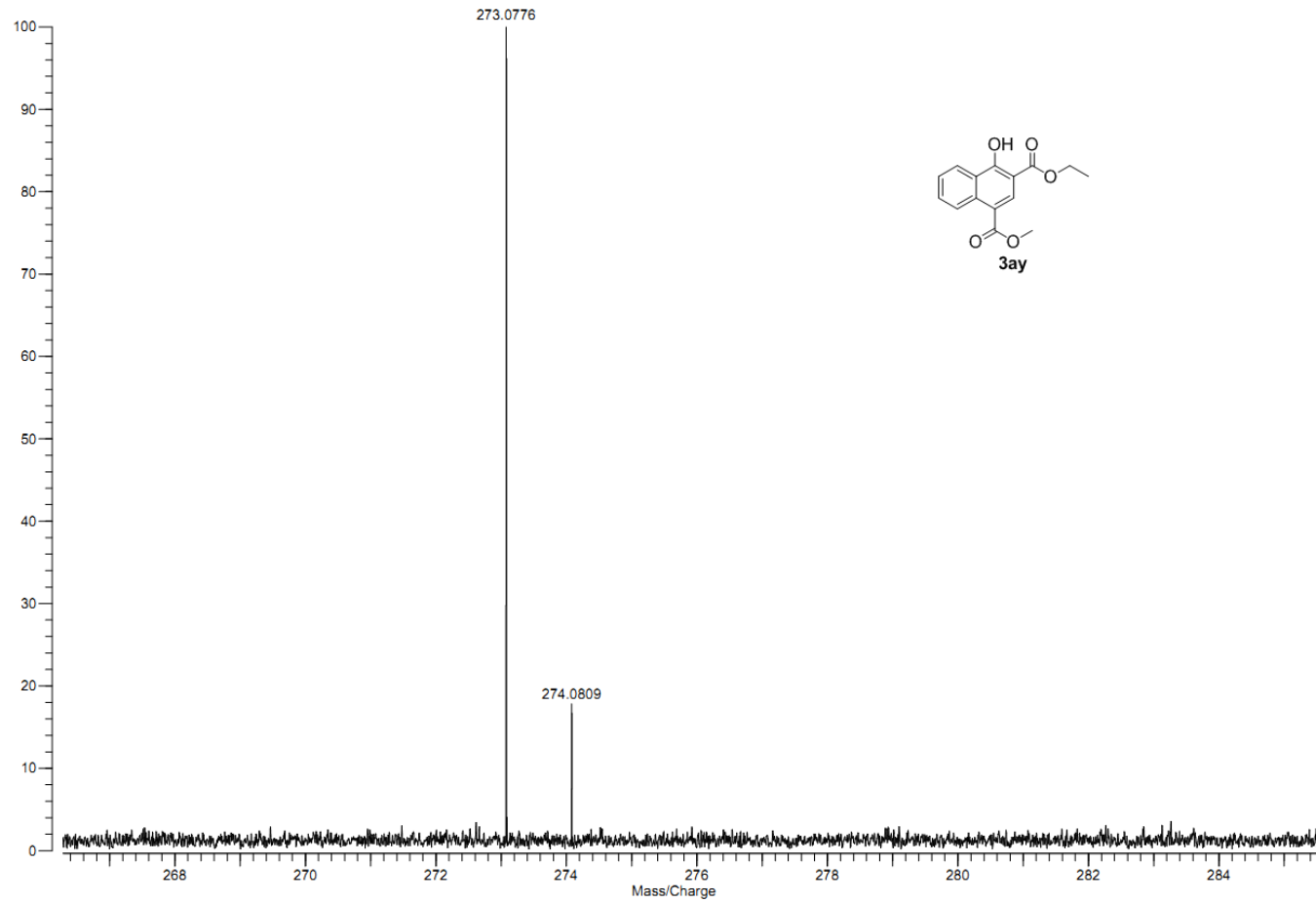




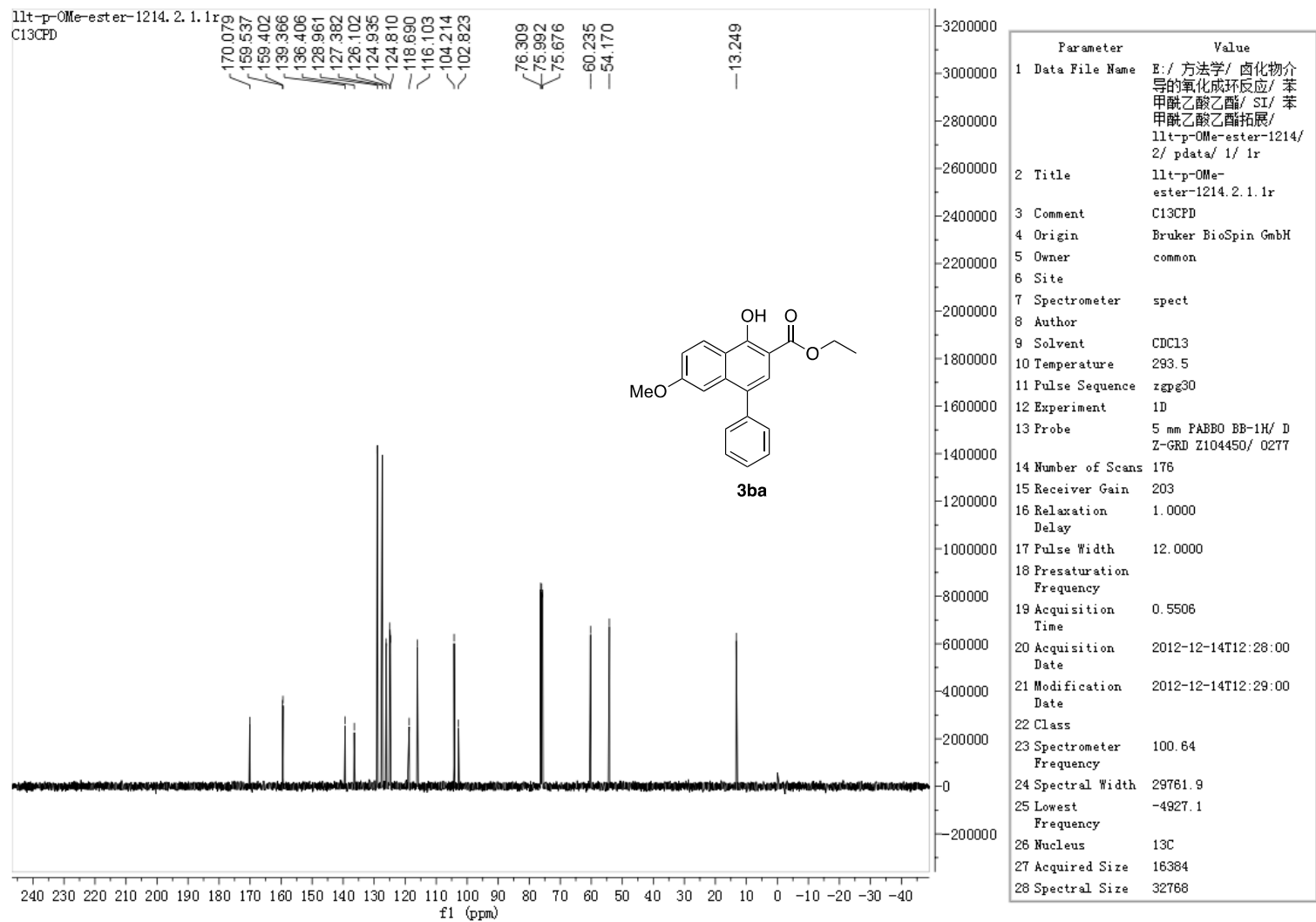
Varian QFT-ESI  
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Mode: Negative  
Scans: 1

Date: 29-DEC-2012  
Time: 09:55:24  
Scale: 50.2983



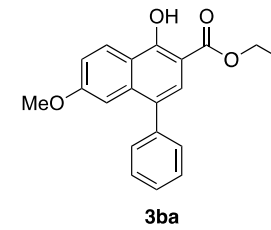
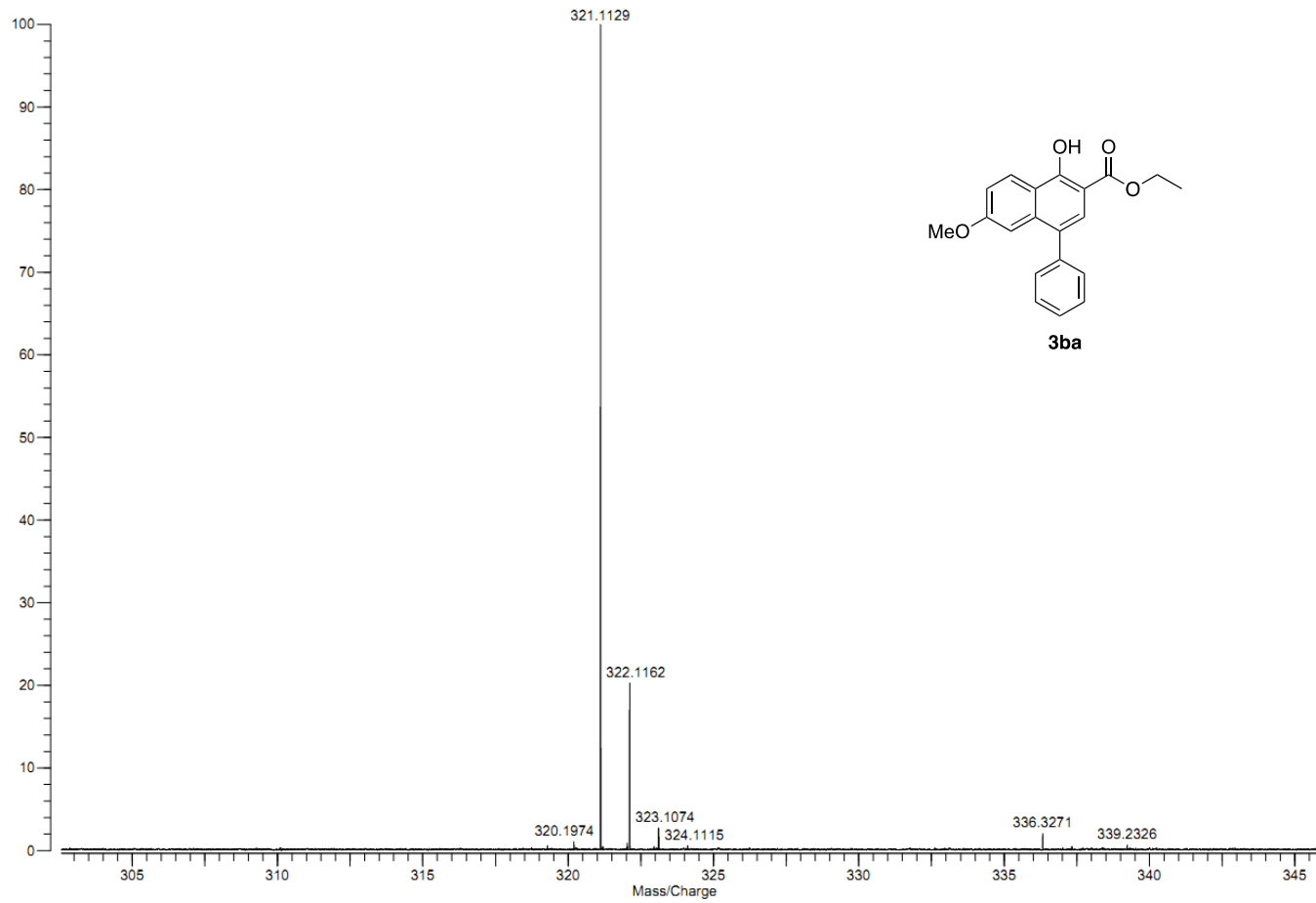




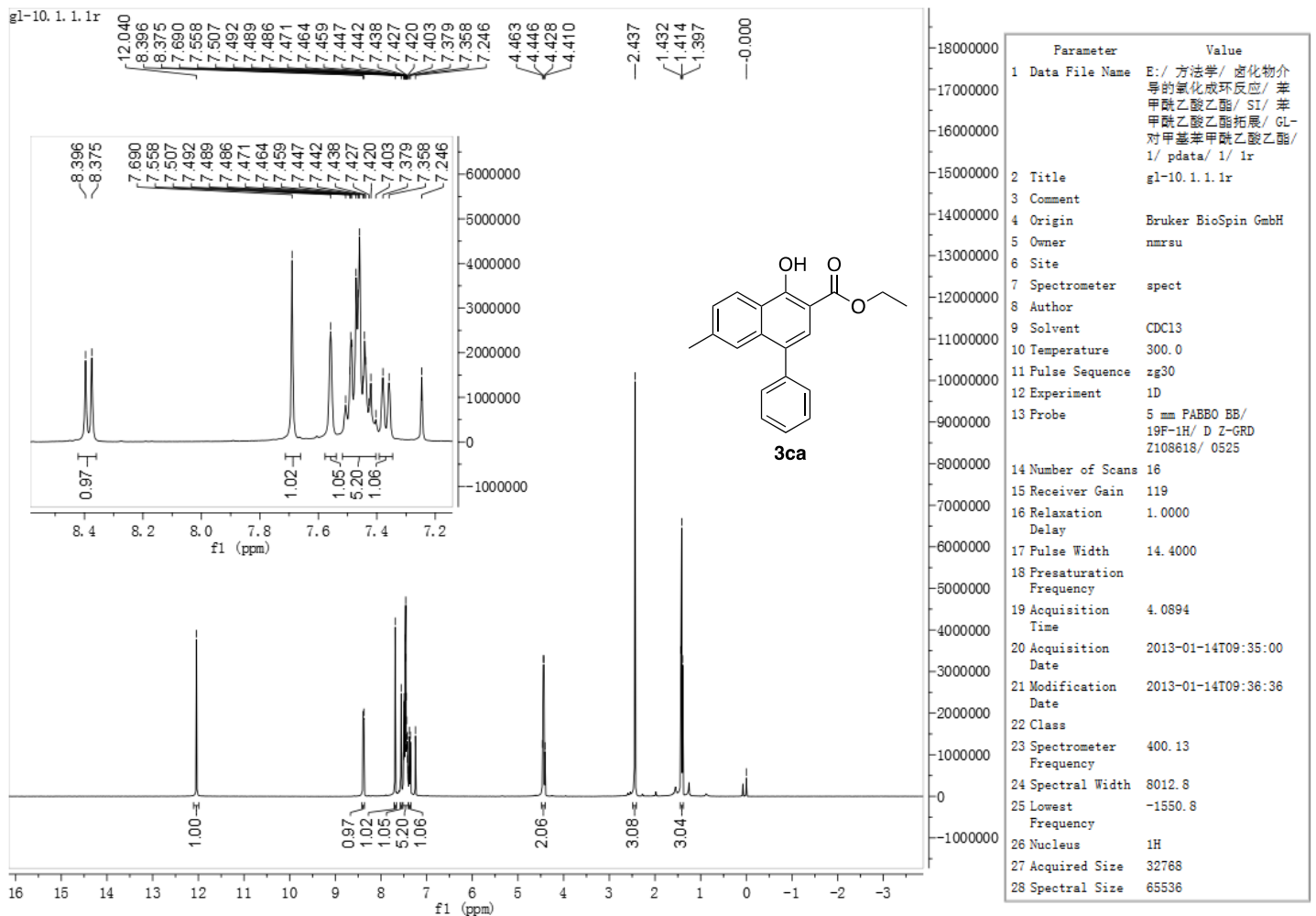
Varian QFT-ESI  
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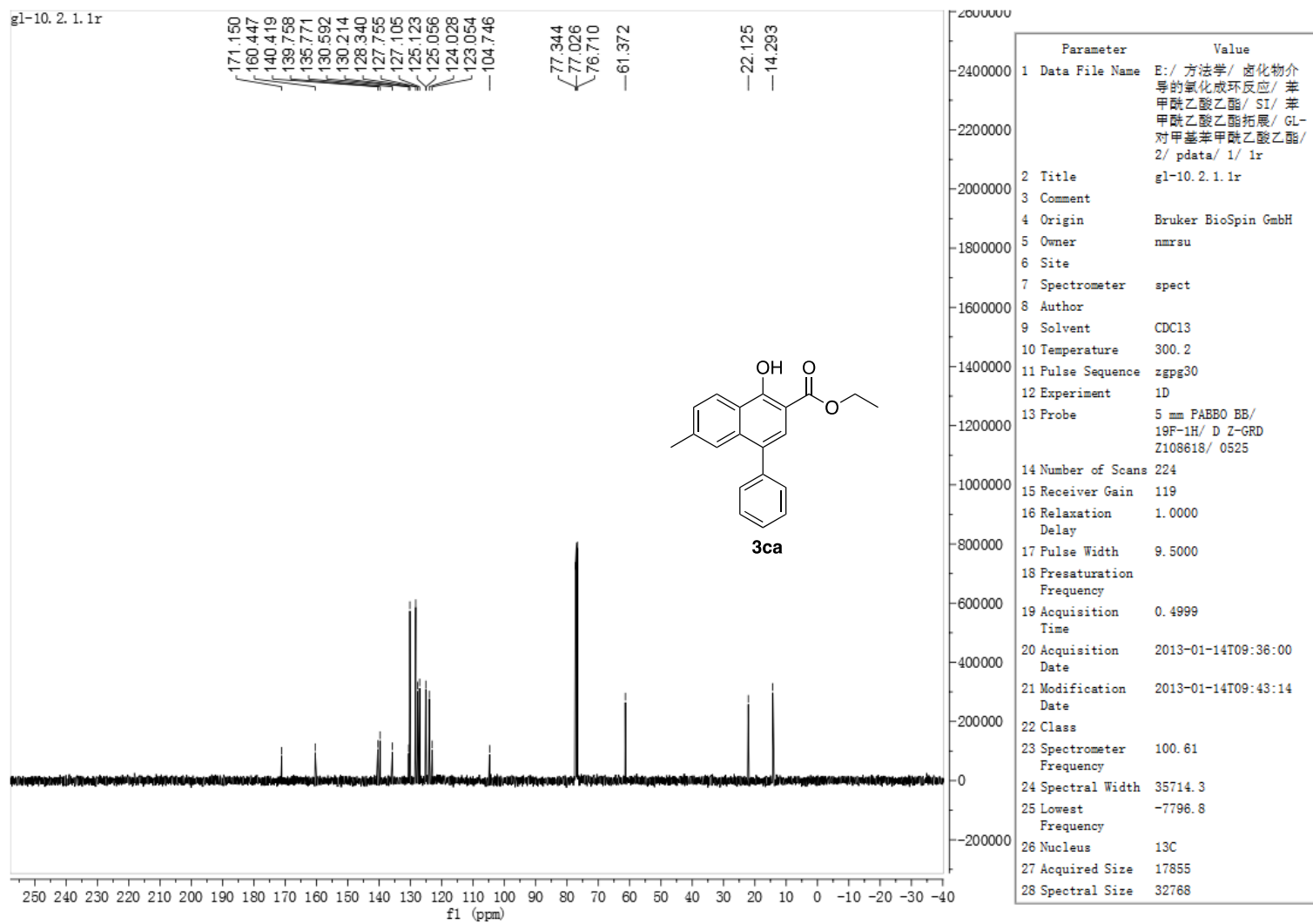
Mode: Negative  
Scans: 1

Date: 17-DEC-2012  
Time: 11:41:57  
Scale: 5.0595



**Ethyl 1-hydroxy-6-methyl-4-phenyl-2-naphthoate(3ca).**

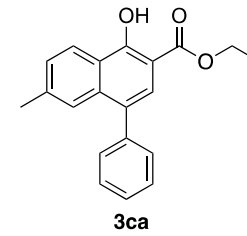
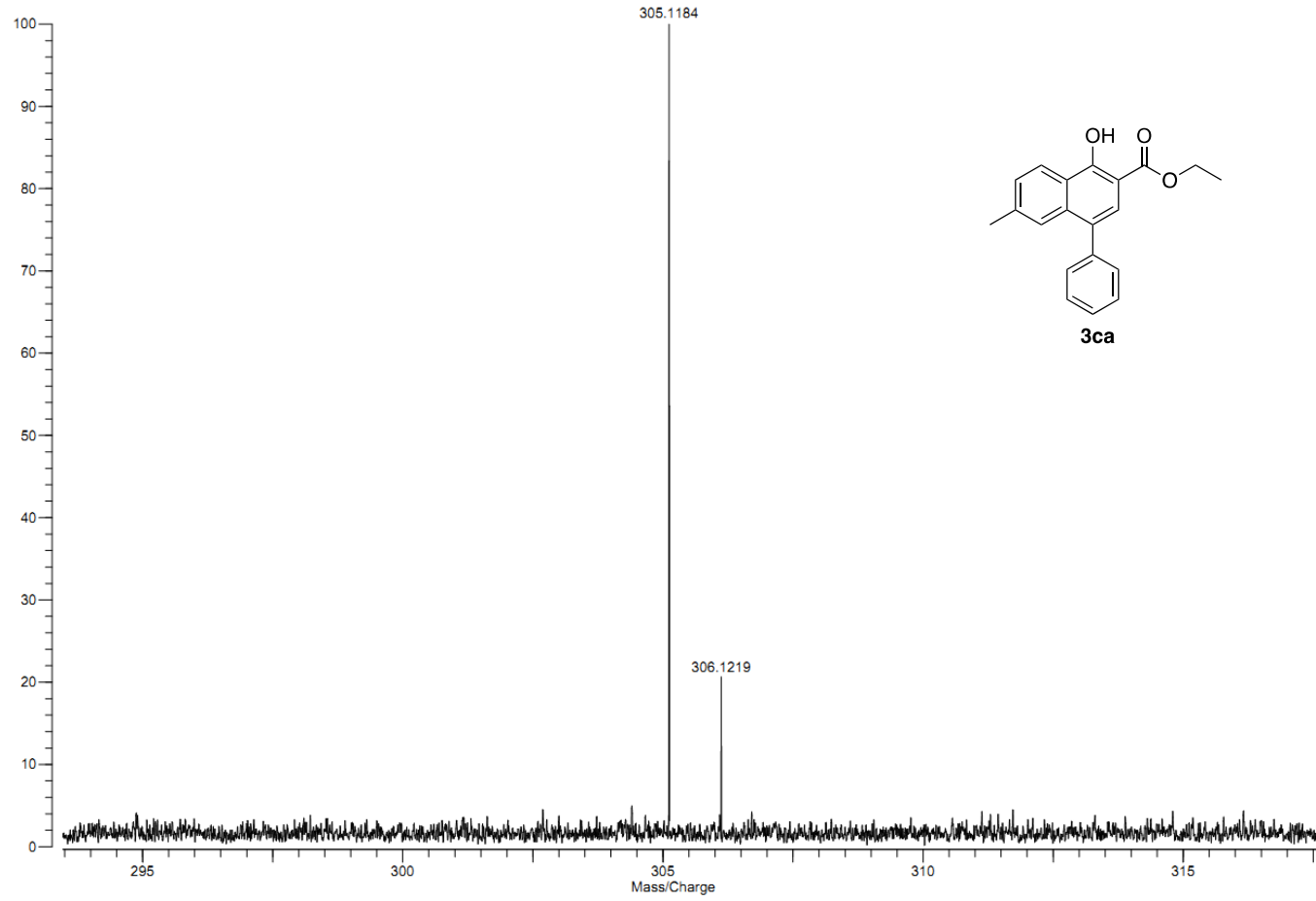




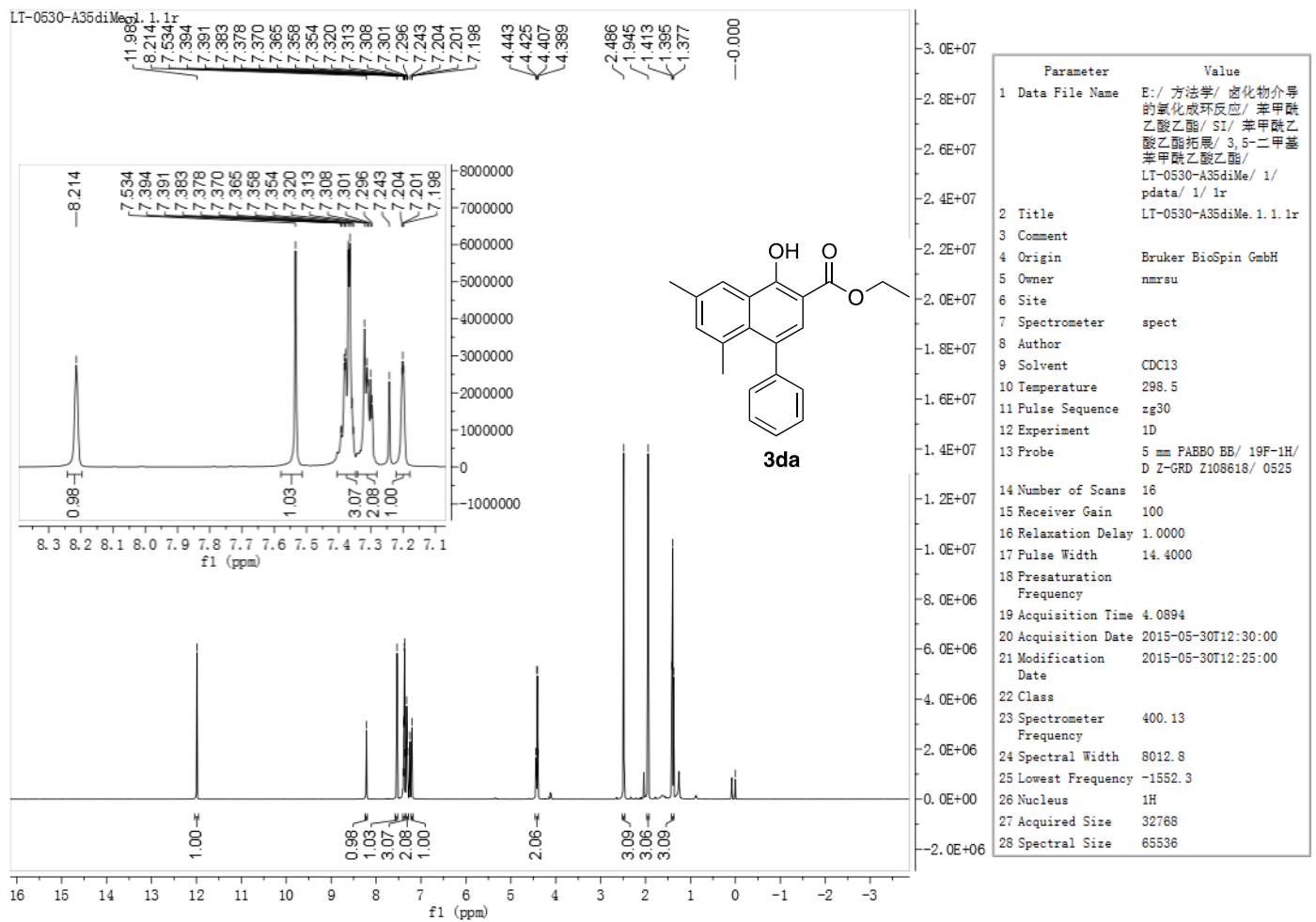
Varian QFT-ESI  
File: 306\_ESI.trans

Mode: Negative  
Scans: 1

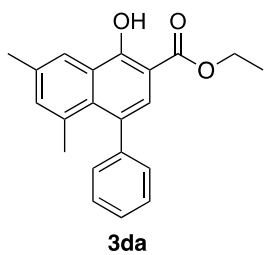
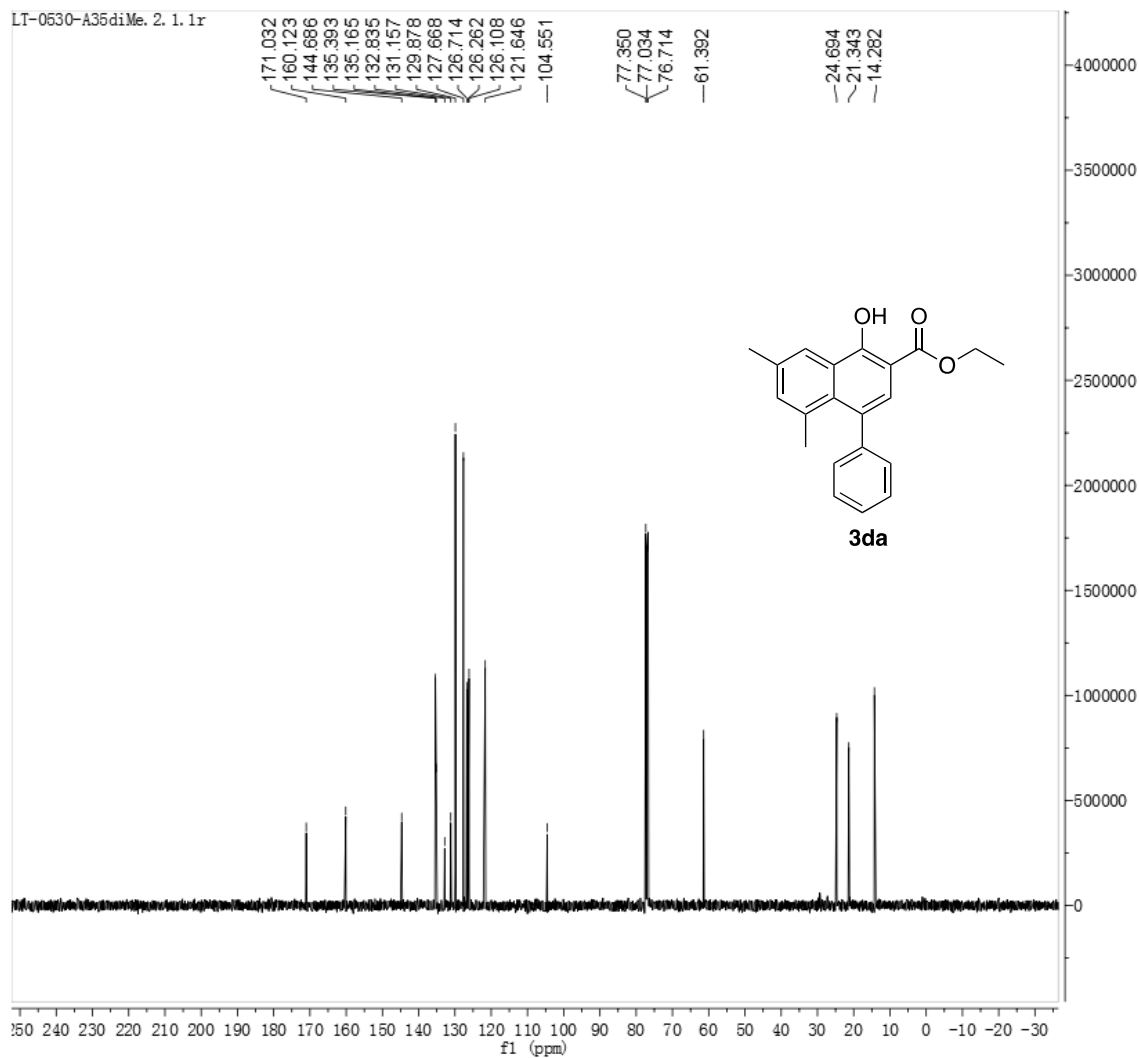
Date: 20-DEC-2012  
Time: 15:11:28  
Scale: 65.3582



**Ethyl 1-hydroxy-5,7-dimethyl-4-phenyl-2-naphthoate(3da).**



LT-0530-A35diMe. 2. 1. 1r

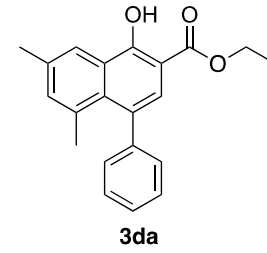
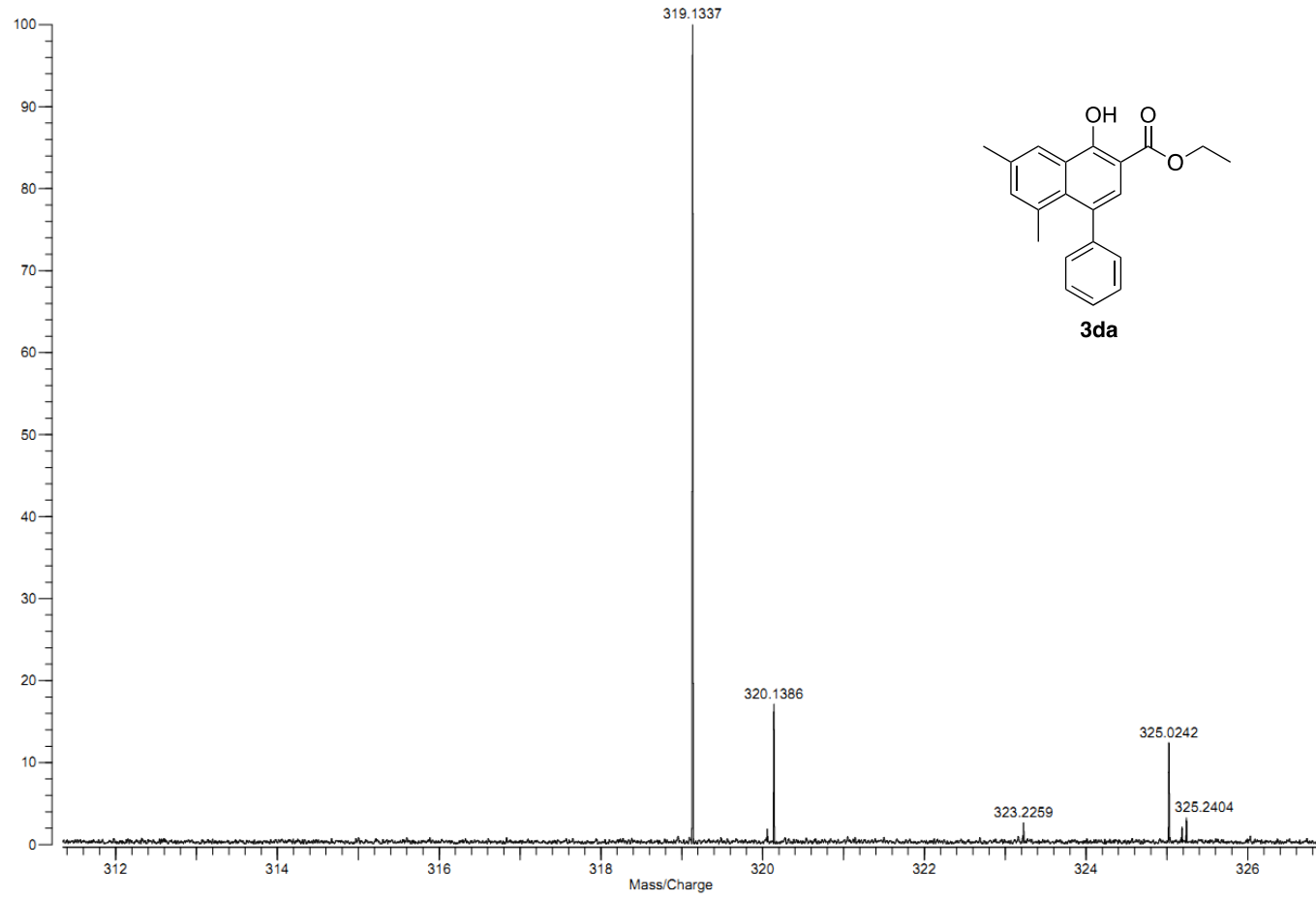


Parameter	Value
1 Data File Name	E:/ 方法学/ 卤化物介导的氯化成环反应/ 苯甲酸乙酯/ S1/ 苯甲酸乙酯乙酯拓展/ 3,5-二甲苯苯甲酸乙酯乙酯/ LT-0530-A35diMe/ 2/ pdata/ 1/ 1r
2 Title	LT-0530-A35diMe. 2. 1. 1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDC13
10 Temperature	298.5
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	474
15 Receiver Gain	133
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2015-05-30T12:31:00
21 Modification Date	2015-05-30T12:39:00
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

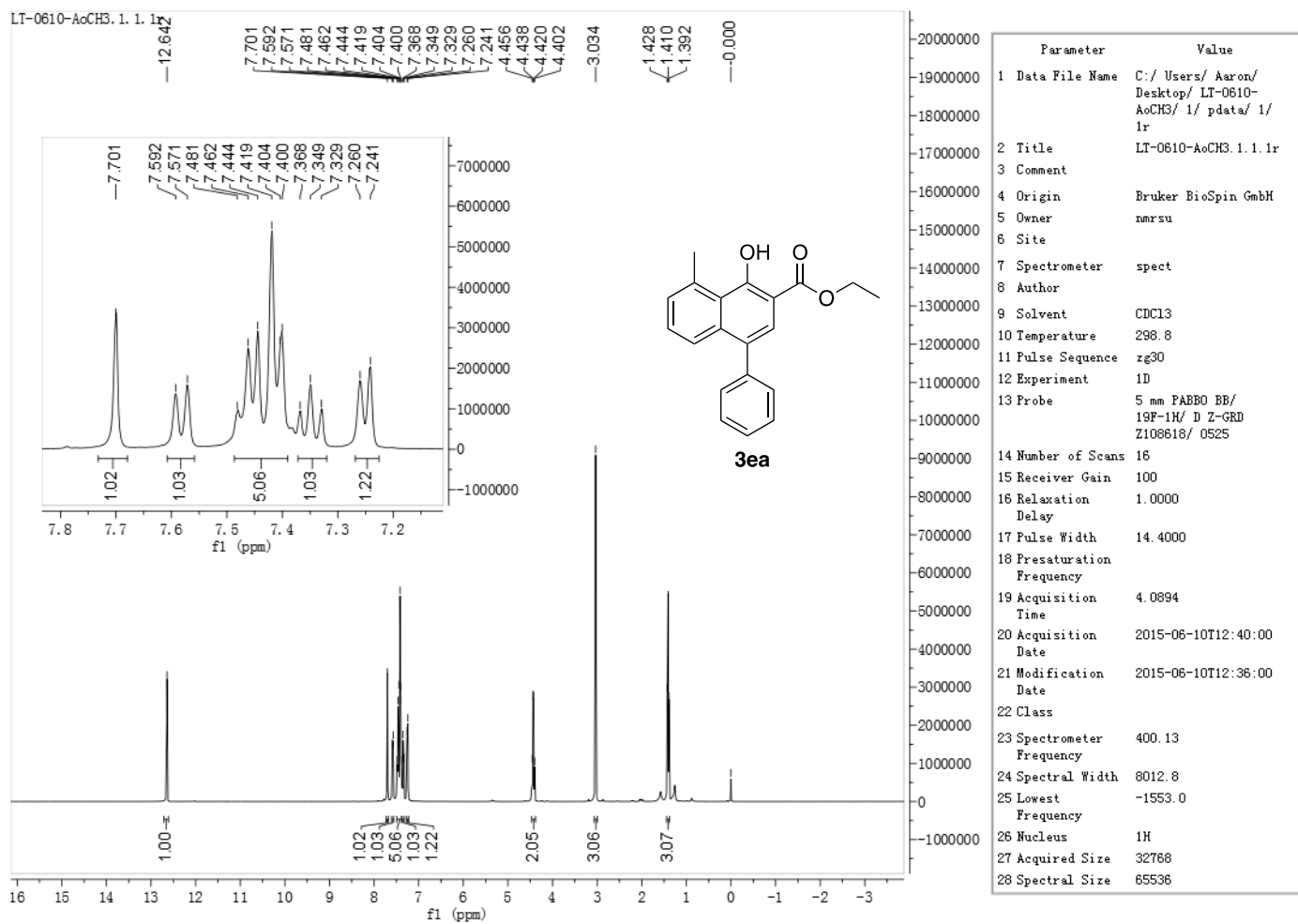
Varian QFT-ESI  
File: dime\_ESI.trans

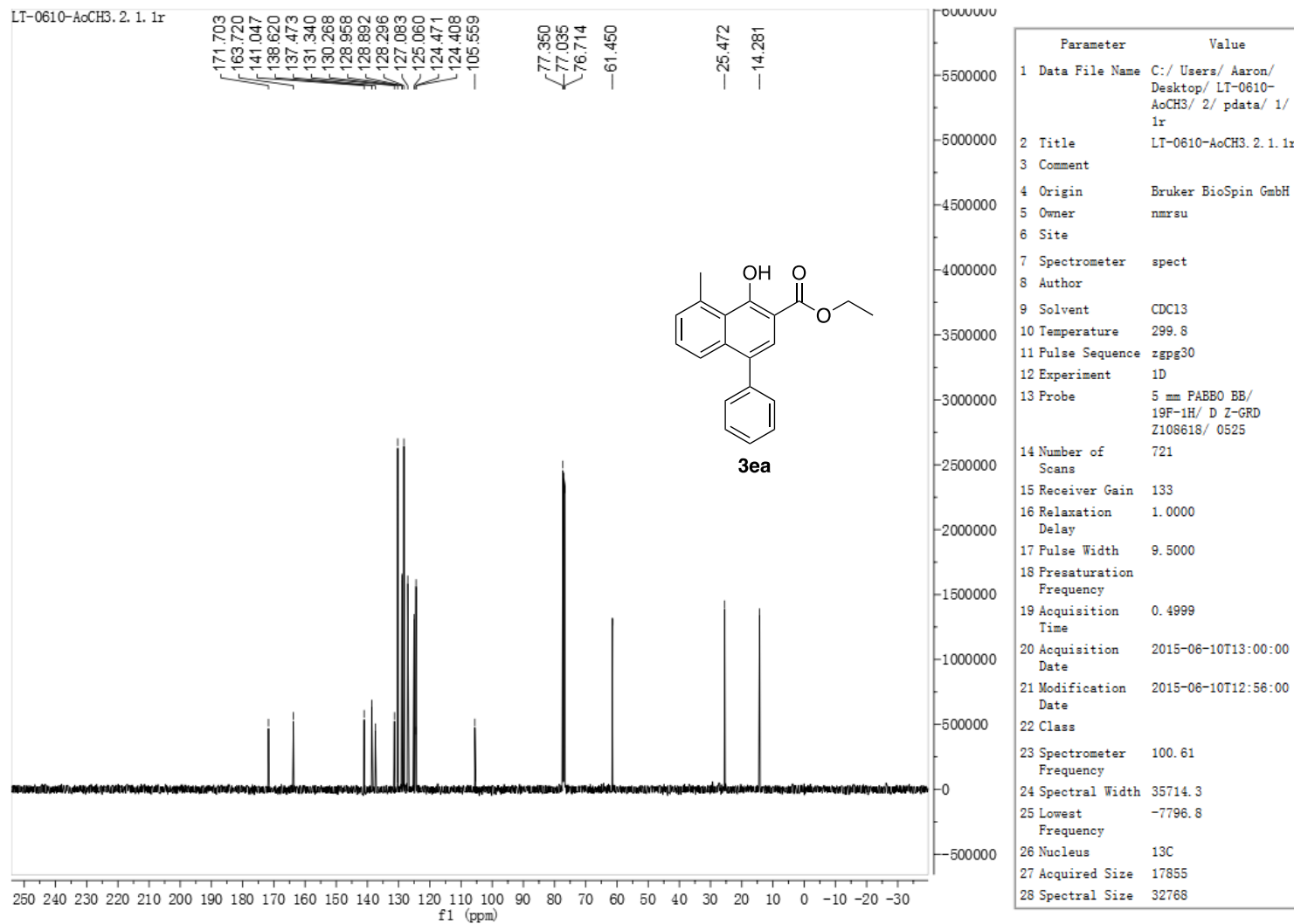
Mode: Negative  
Scans: 1

Date: 27-FEB-2013  
Time: 16:19:16  
Scale: 14.3430

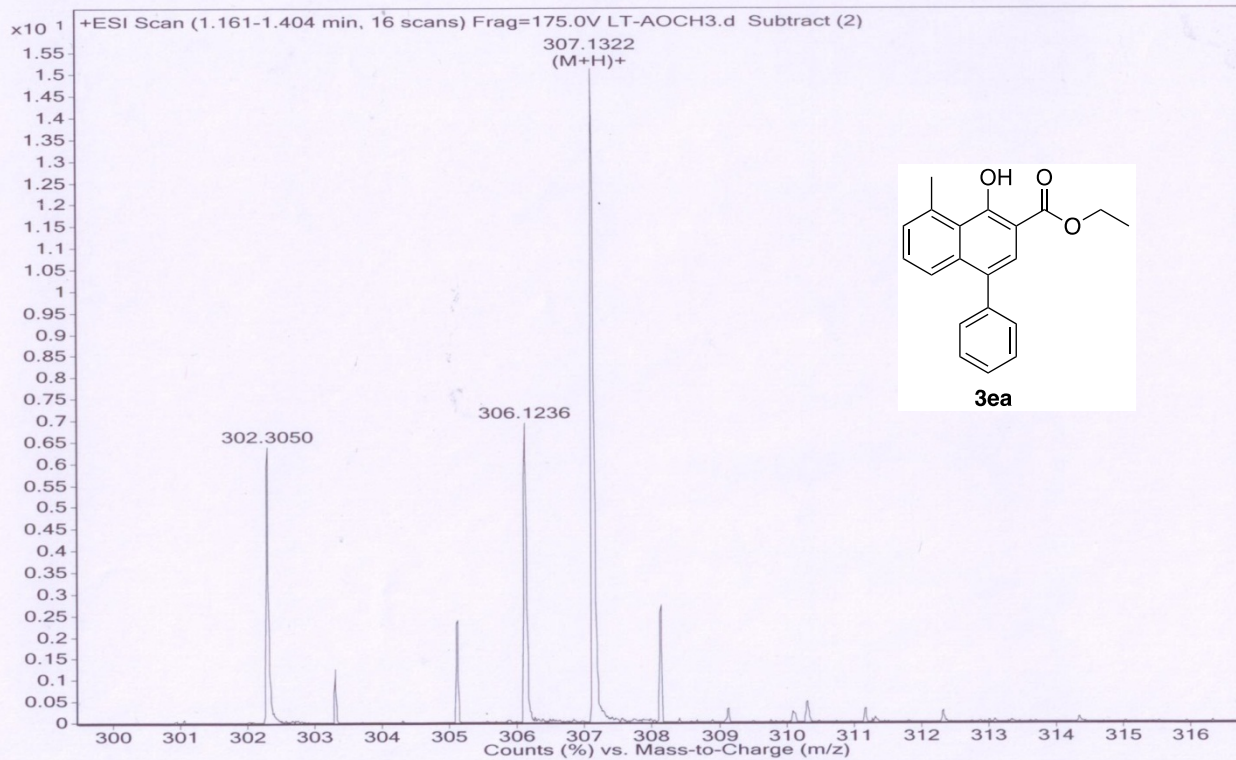


**Ethyl 1-hydroxy-8-methyl-4-phenyl-2-naphthoate(3ea).**

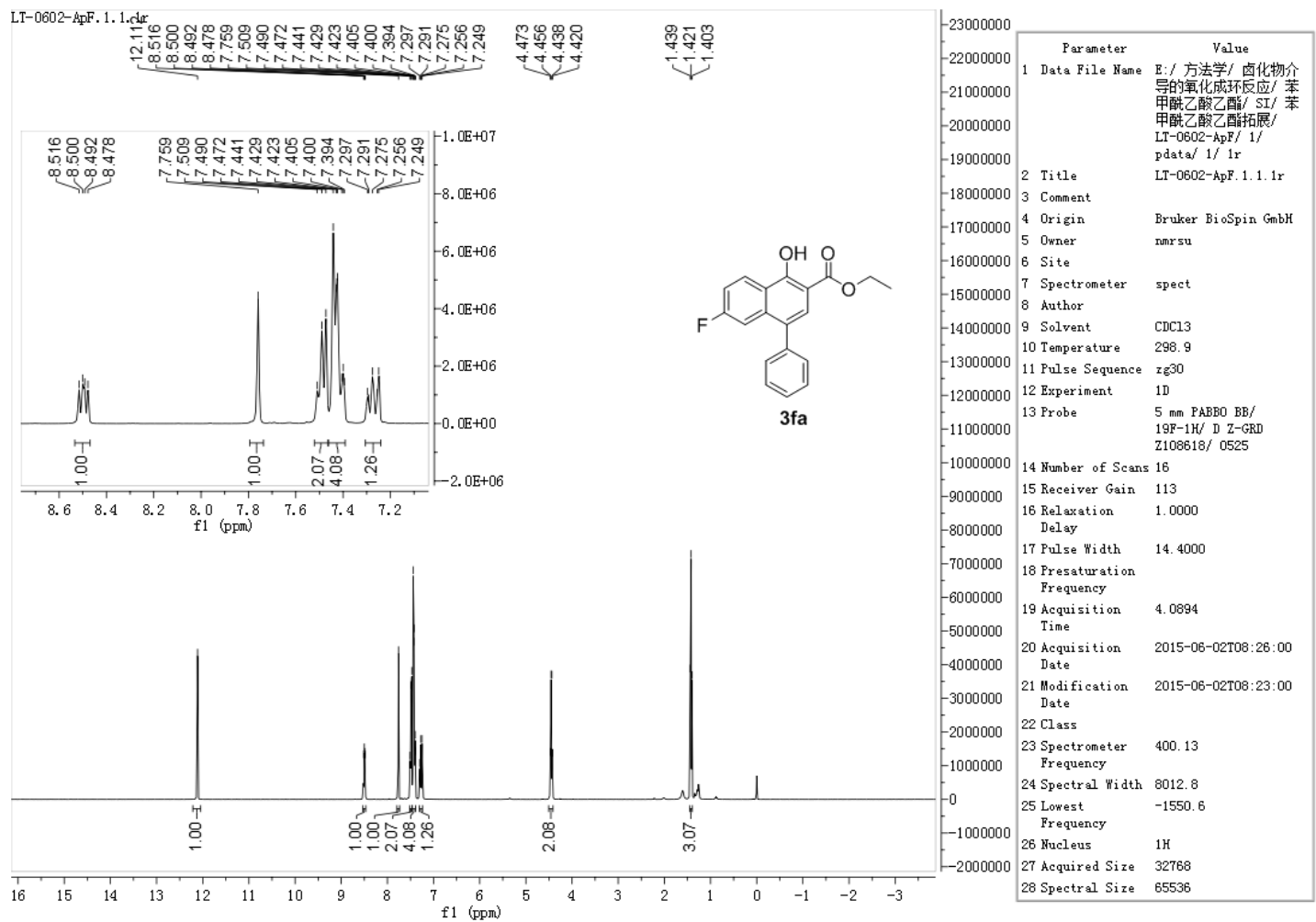


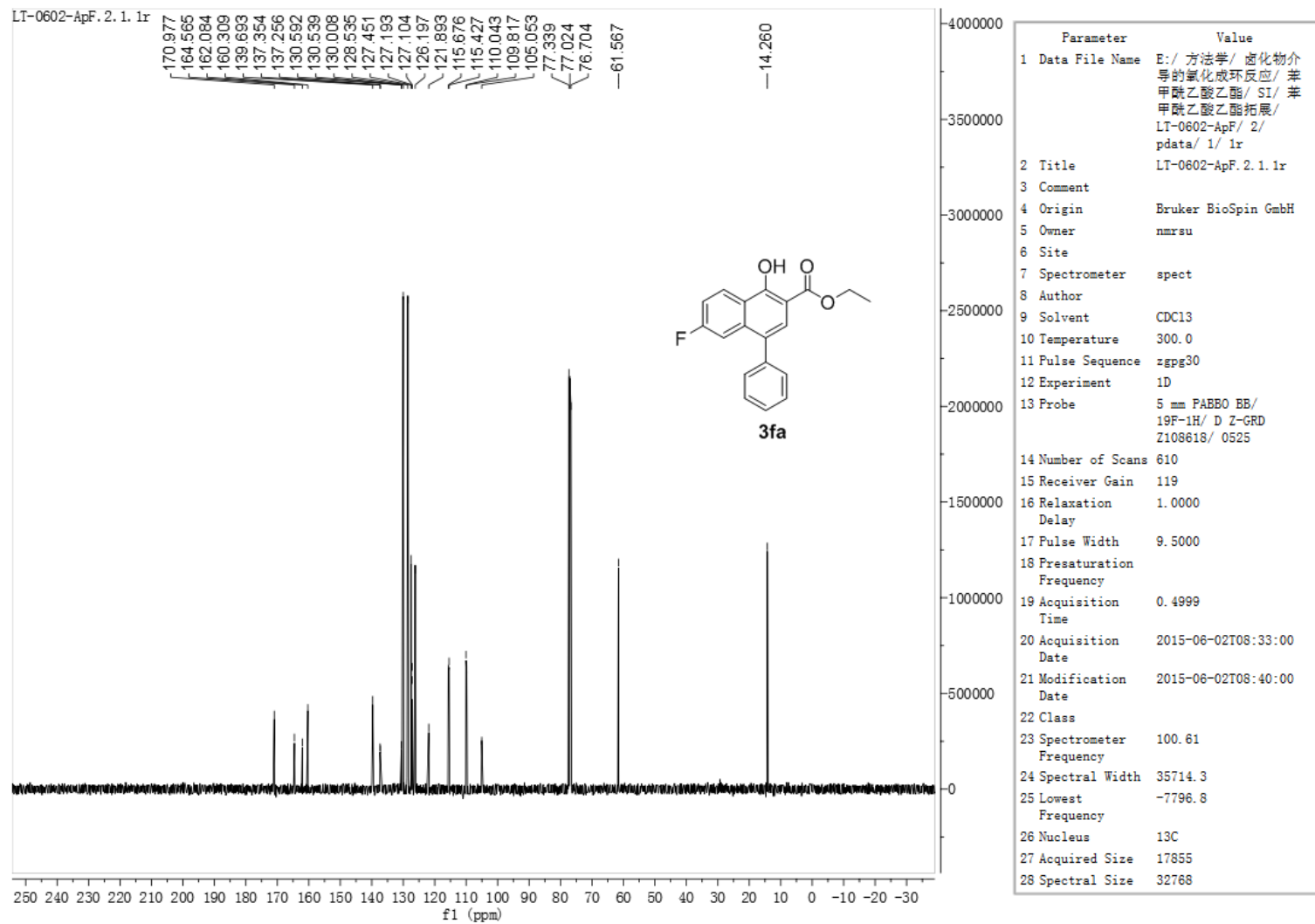


Sample Name	Sample60	Position	P2-A6	Instrument Name	Instrument 1	User Name	
Inj Vol	-1	InjPosition		SampleType	Sample	IRM Calibration Status	Some Ions Missed
Data Filename	LT-AOCH3.d	ACQ Method	chen-ms.m	Comment		Acquired Time	11/16/2015 10:53:25 PM



### Ethyl 6-fluoro-1-hydroxy-4-phenyl-2-naphthoate(3fa).

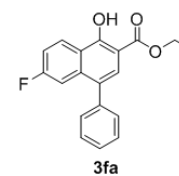
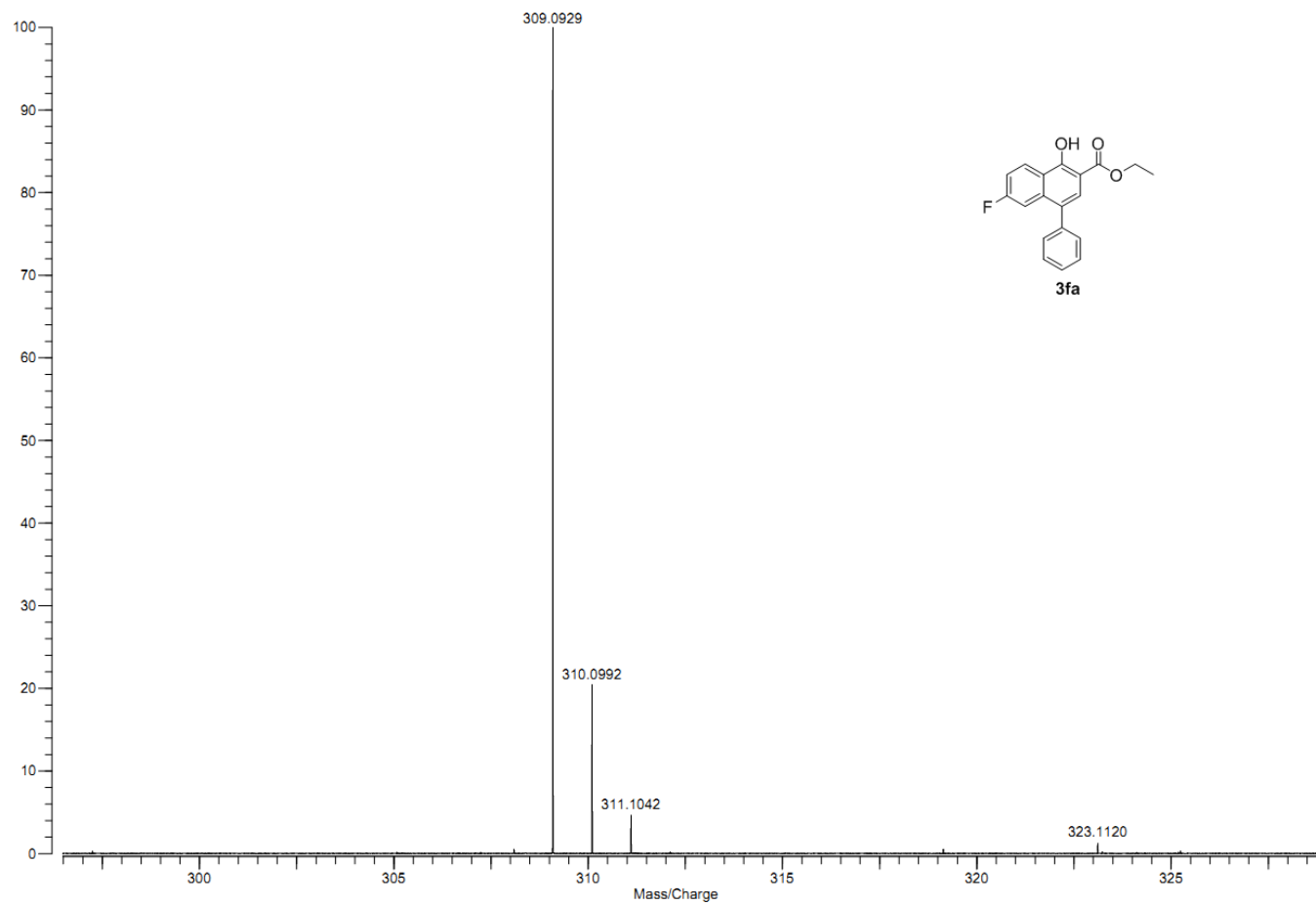




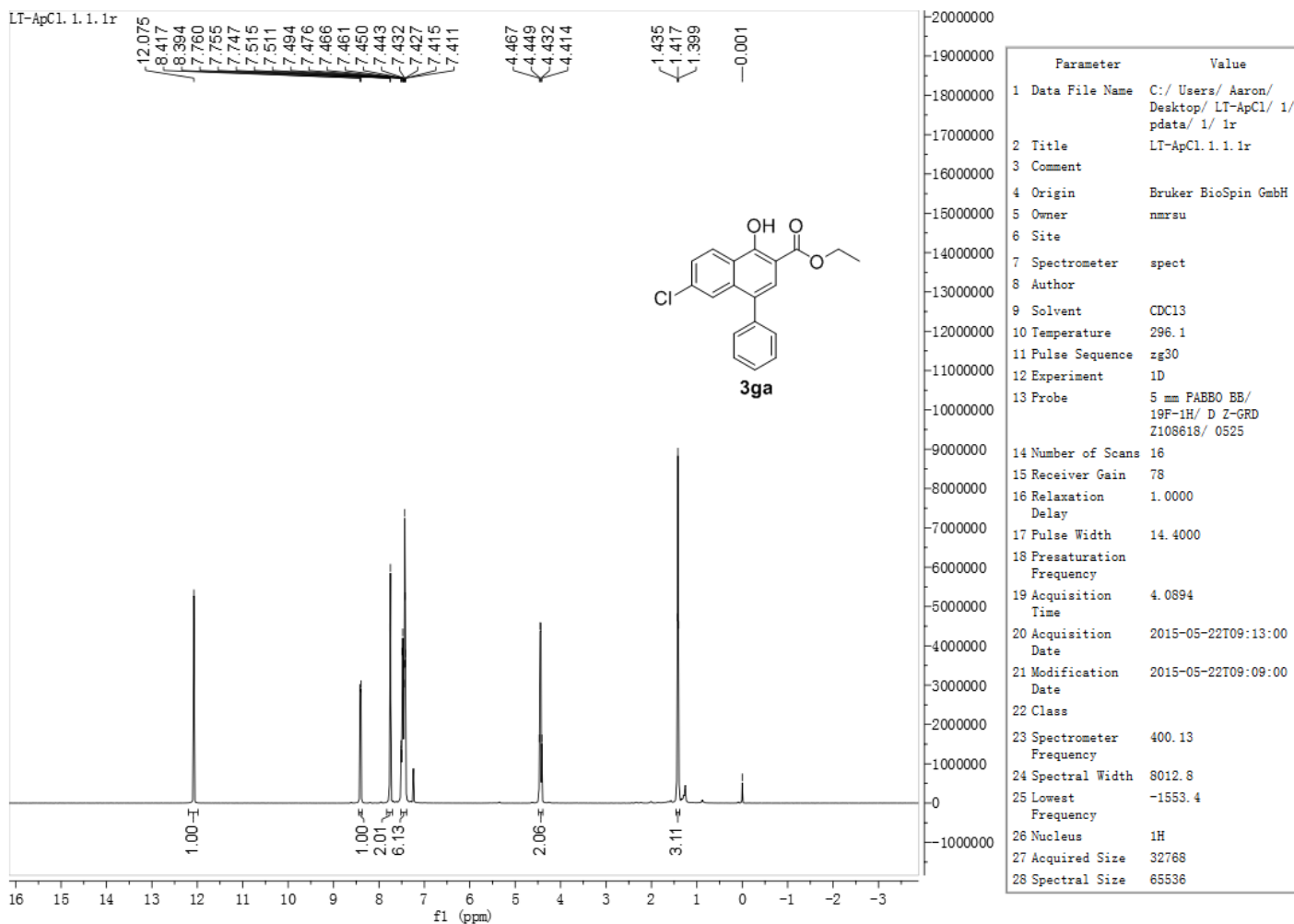
Varian QFT-ESI  
File: P-F-ester\_ESI.trans

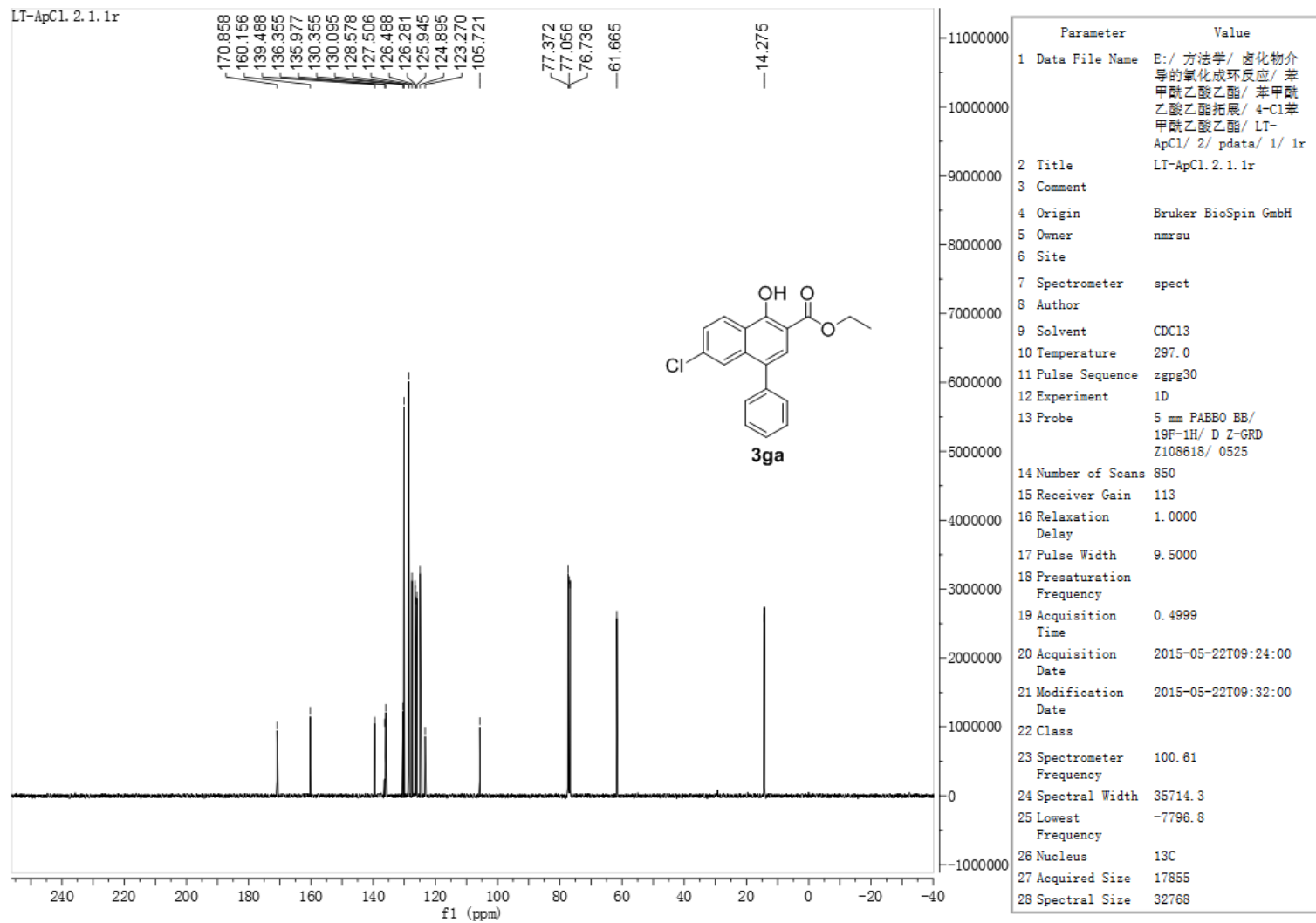
Mode: Negative  
Scans: 1

Date: 27-FEB-2013  
Time: 16:21:28  
Scale: 0.6487



**Ethyl 6-chloro-1-hydroxy-4-phenyl-2-naphthoate(3ga).**

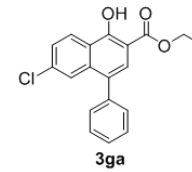
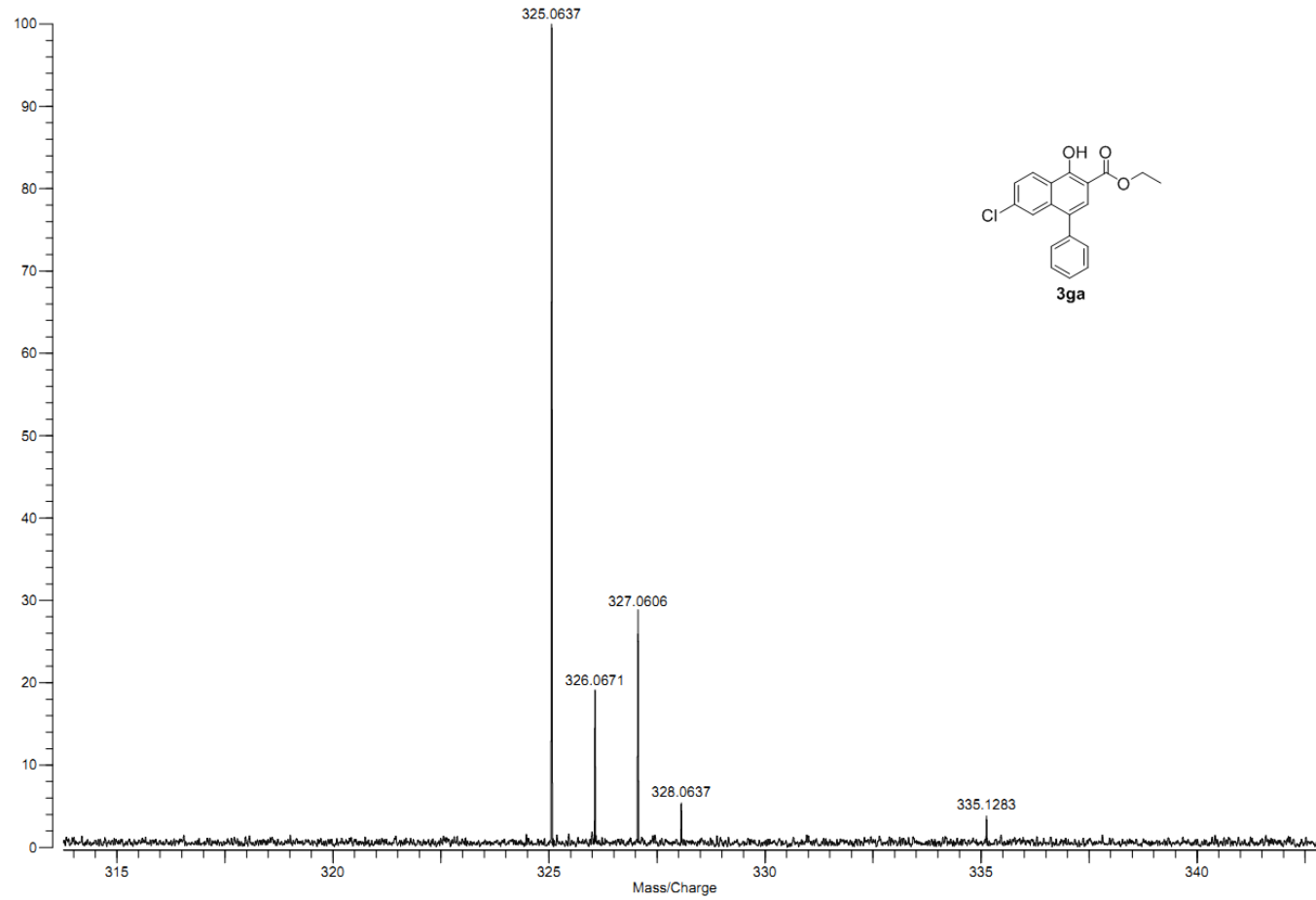




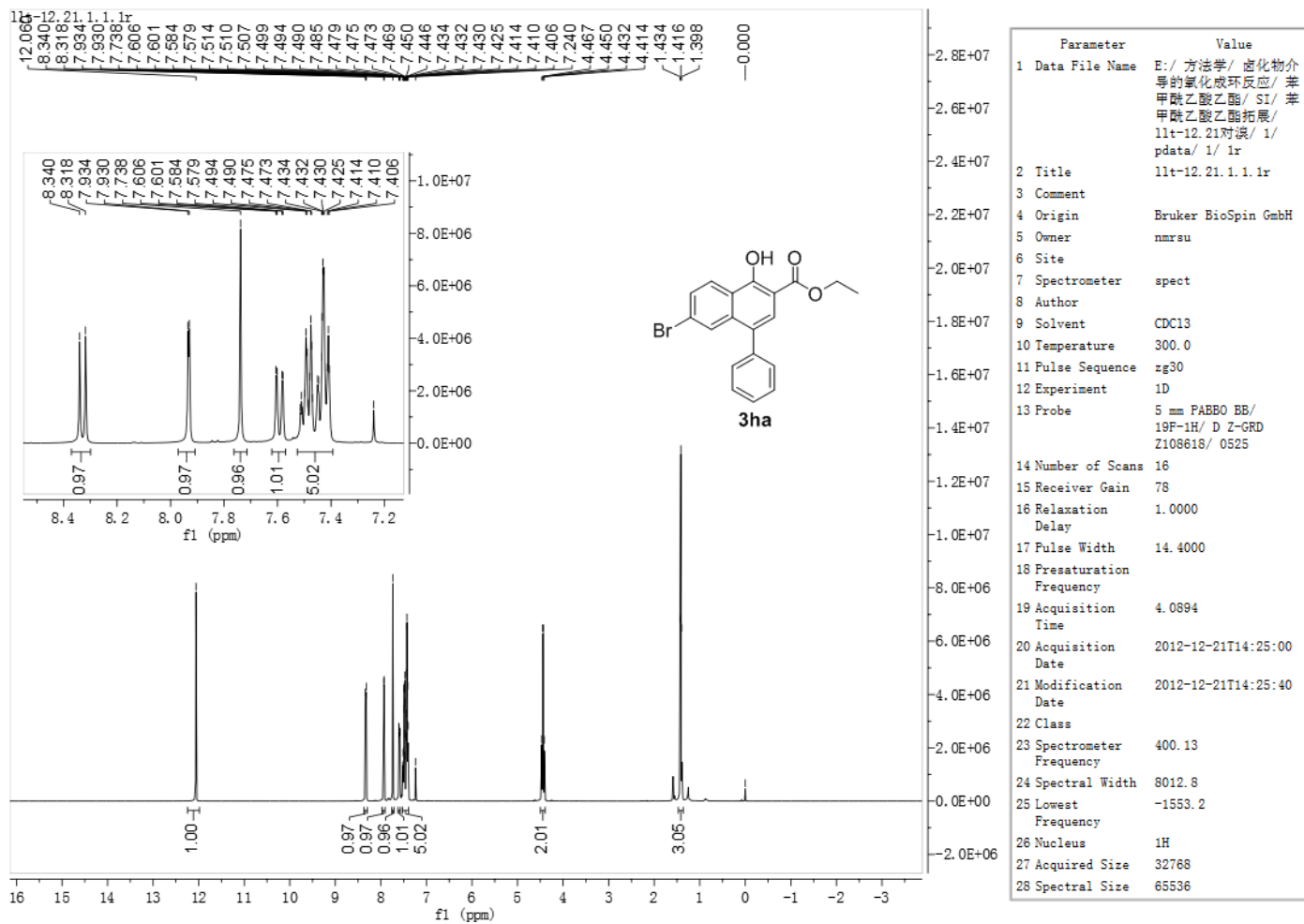
Varian QFT-ESI  
File: p33-7\_ESI.trans

Mode: Negative  
Scans: 1

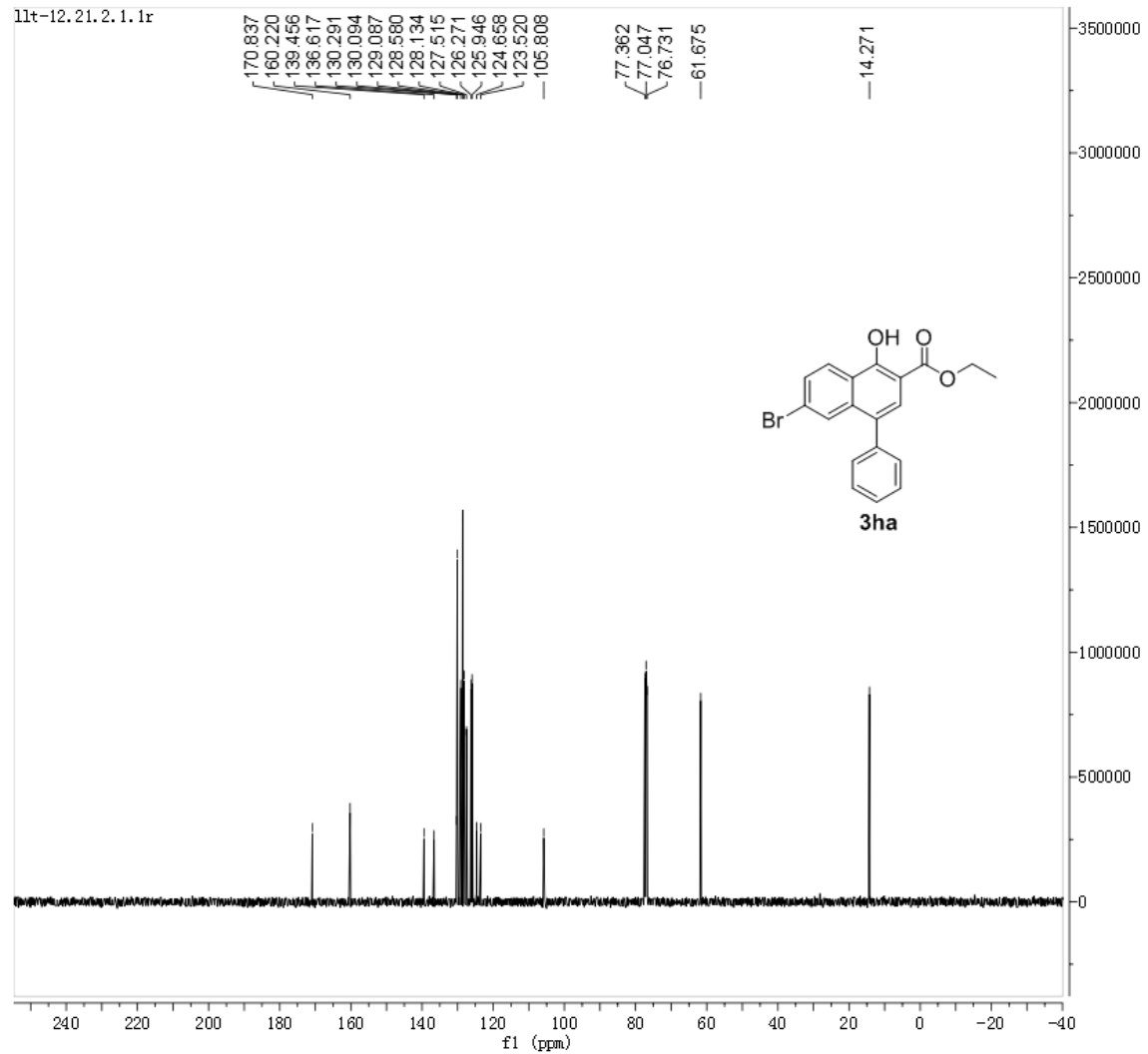
Date: 08-JAN-2013  
Time: 10:48:33  
Scale: 18.0445



**Ethyl 6-bromo-1-hydroxy-4-phenyl-2-naphthoate(3ha).**



11t-12.21.2.1.1r

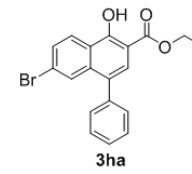
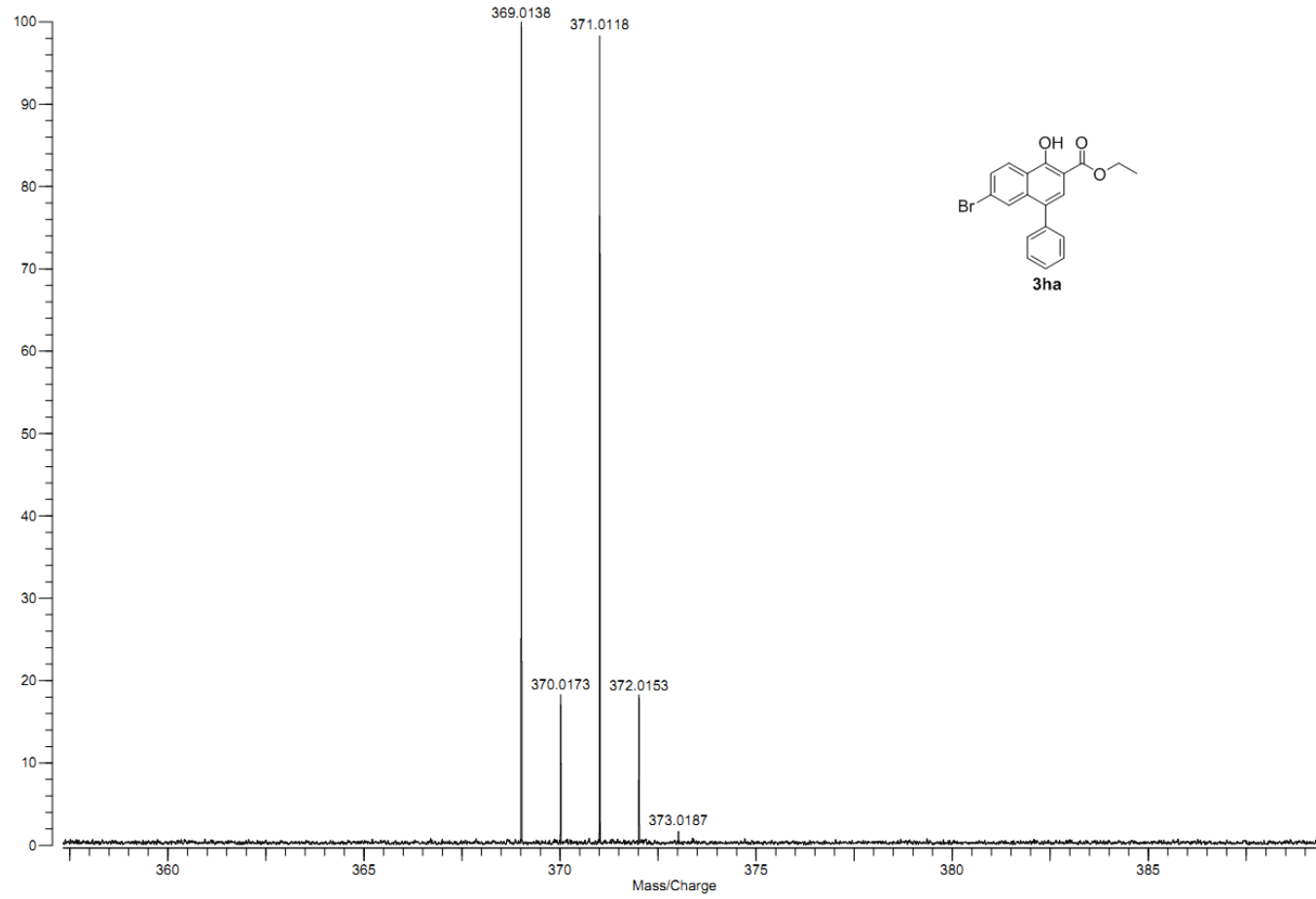


Parameter	Value
1 Data File Name	E:/ 方法学/ 卤化物介 导的氧化成环反应/ 苯 甲酰乙酸乙酯/ SI/ 苯 甲酰乙酸乙酯拓展/ 11t-12.21对溴/ 2/ pdata/ 1/ 1r
2 Title	11t-12.21.2.1.1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	300.0
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	254
15 Receiver Gain	119
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2012-12-21T14:32:00
21 Modification Date	2012-12-21T14:33:08
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17655
28 Spectral Size	32768

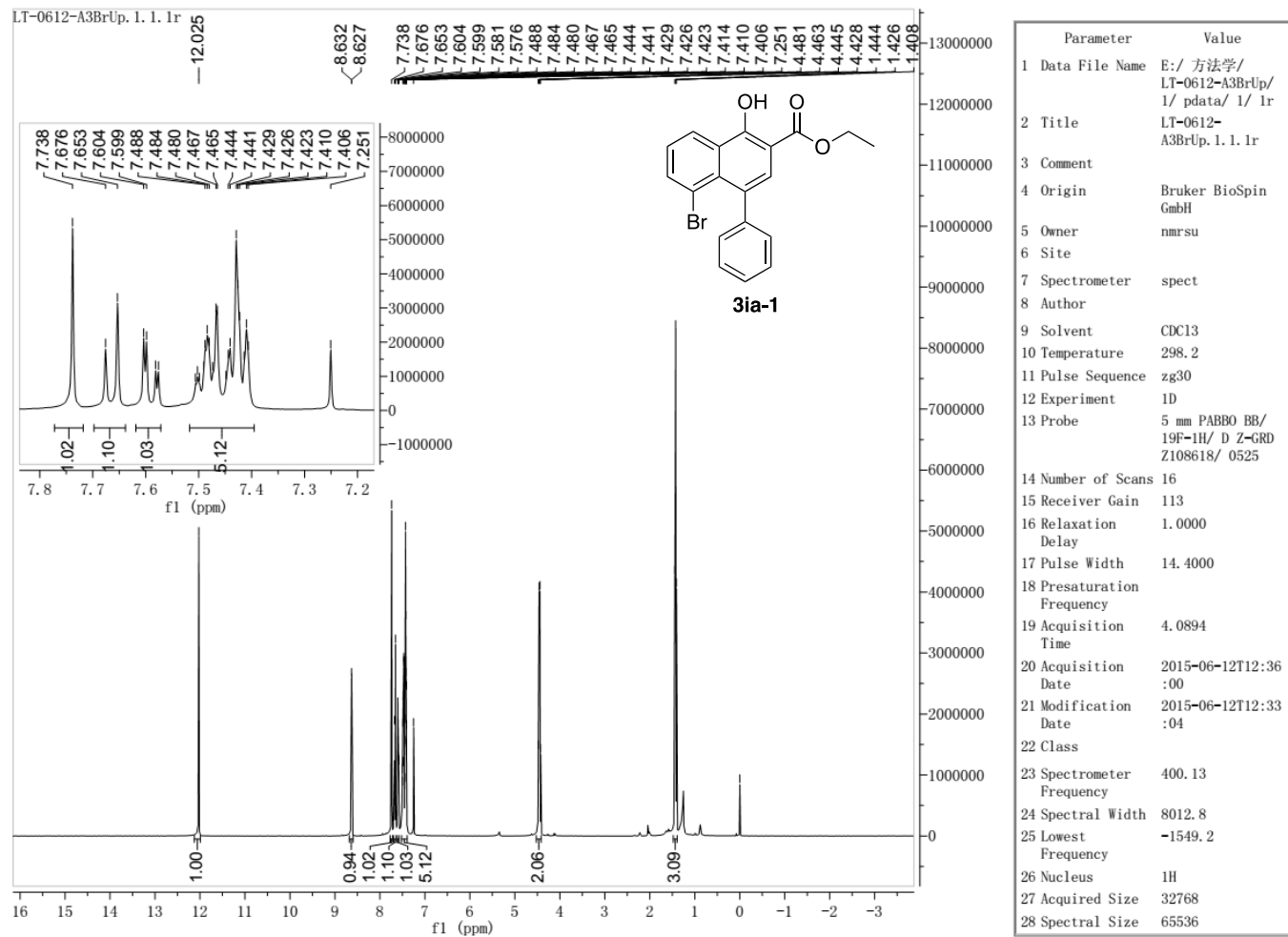
Varian QFT-ESI  
File: 370\_ESI.trans

Mode: Negative  
Scans: 1

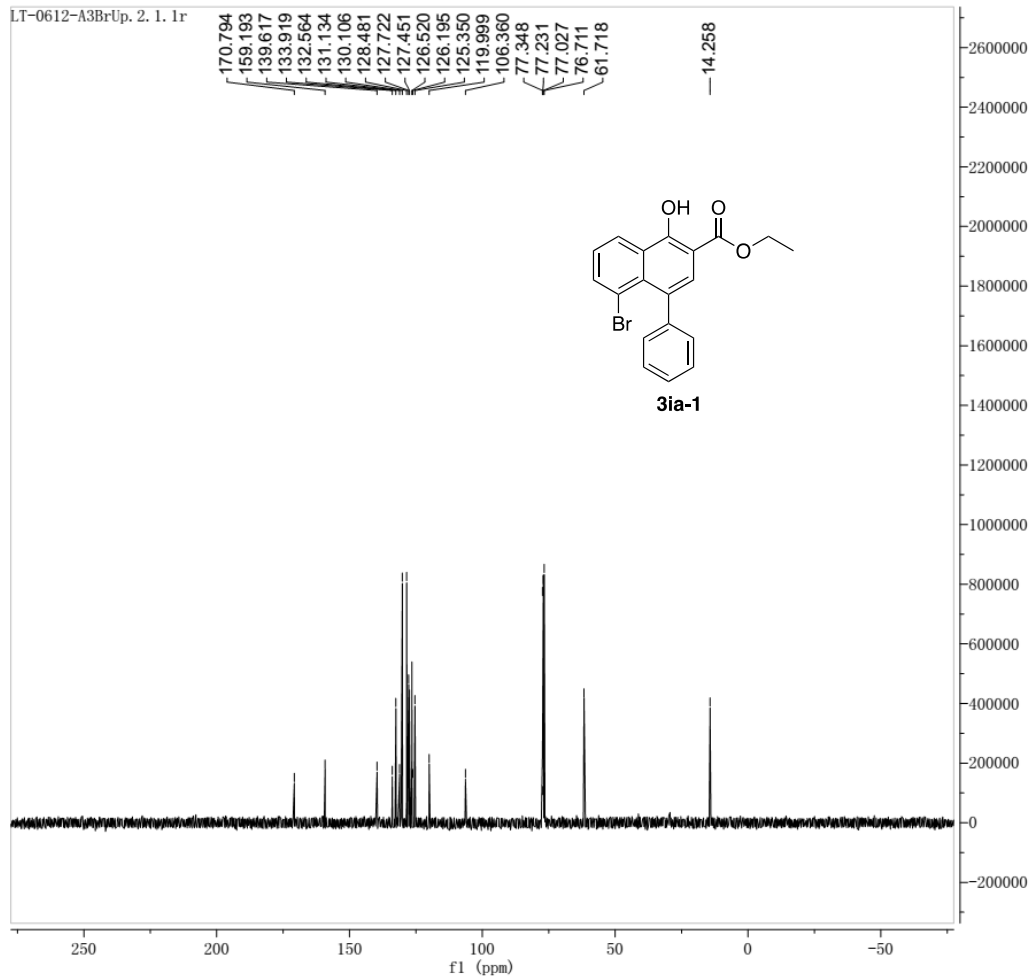
Date: 21-DEC-2012  
Time: 15:17:20  
Scale: 12.5458



**Ethyl 5-bromo-1-hydroxy-4-phenyl-2-naphthoate(3ia-1).**



LT-0612-A3BrUp. 2. 1. 1r

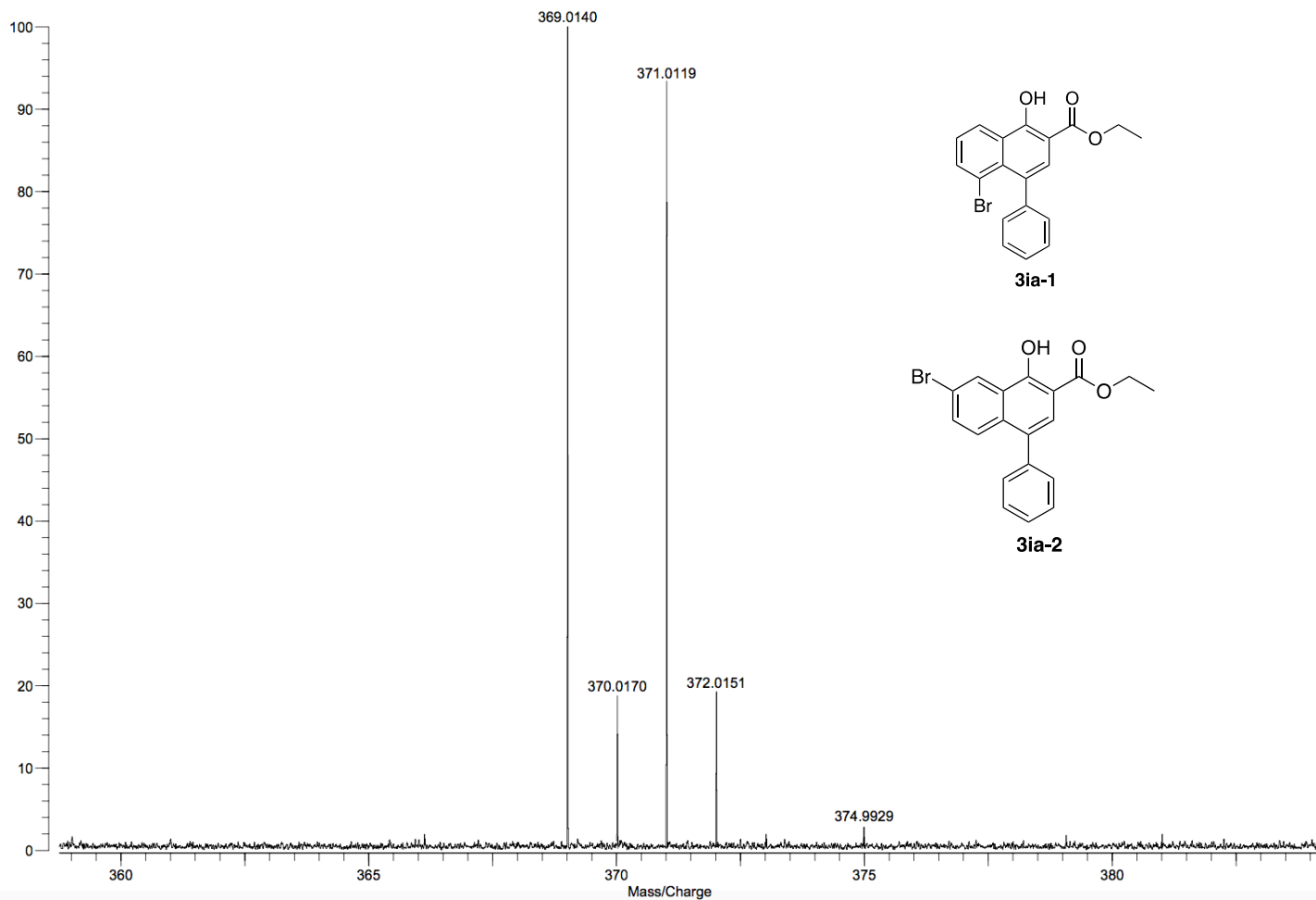


Parameter	Value
1 Data File Name	E:/ 方法学/ LT-0612-A3BrUp/ 2/ pdata/ 1/ 1r
2 Title	LT-0612-A3BrUp. 2. 1. 1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	299.1
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BR/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	336
15 Receiver Gain	113
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2015-06-12T12:41:00
21 Modification Date	2015-06-12T12:42:38
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

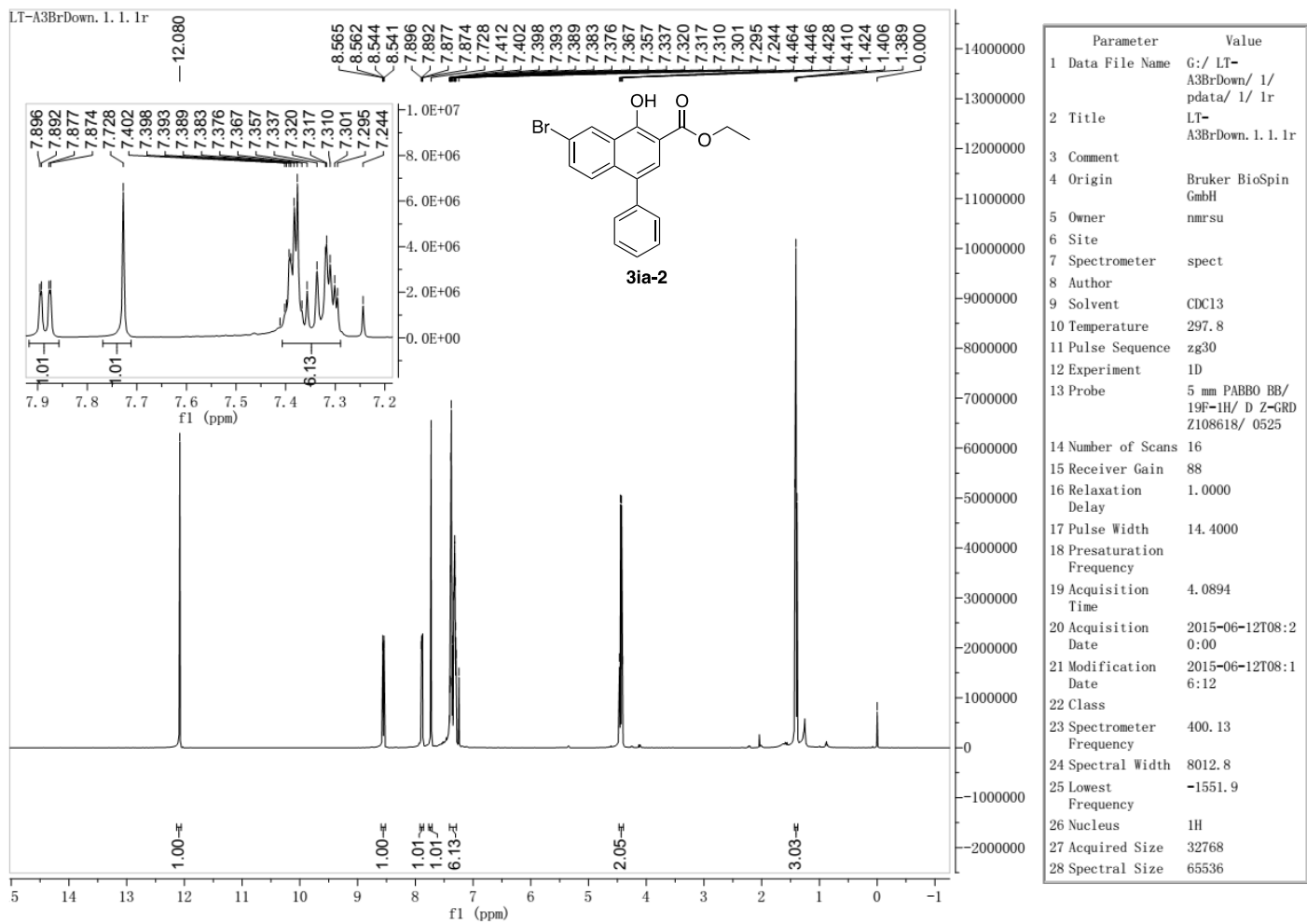
Varian QFT-ESI  
File: P-Br-2\_ESI.trans

Mode: Negative  
Scans: 1

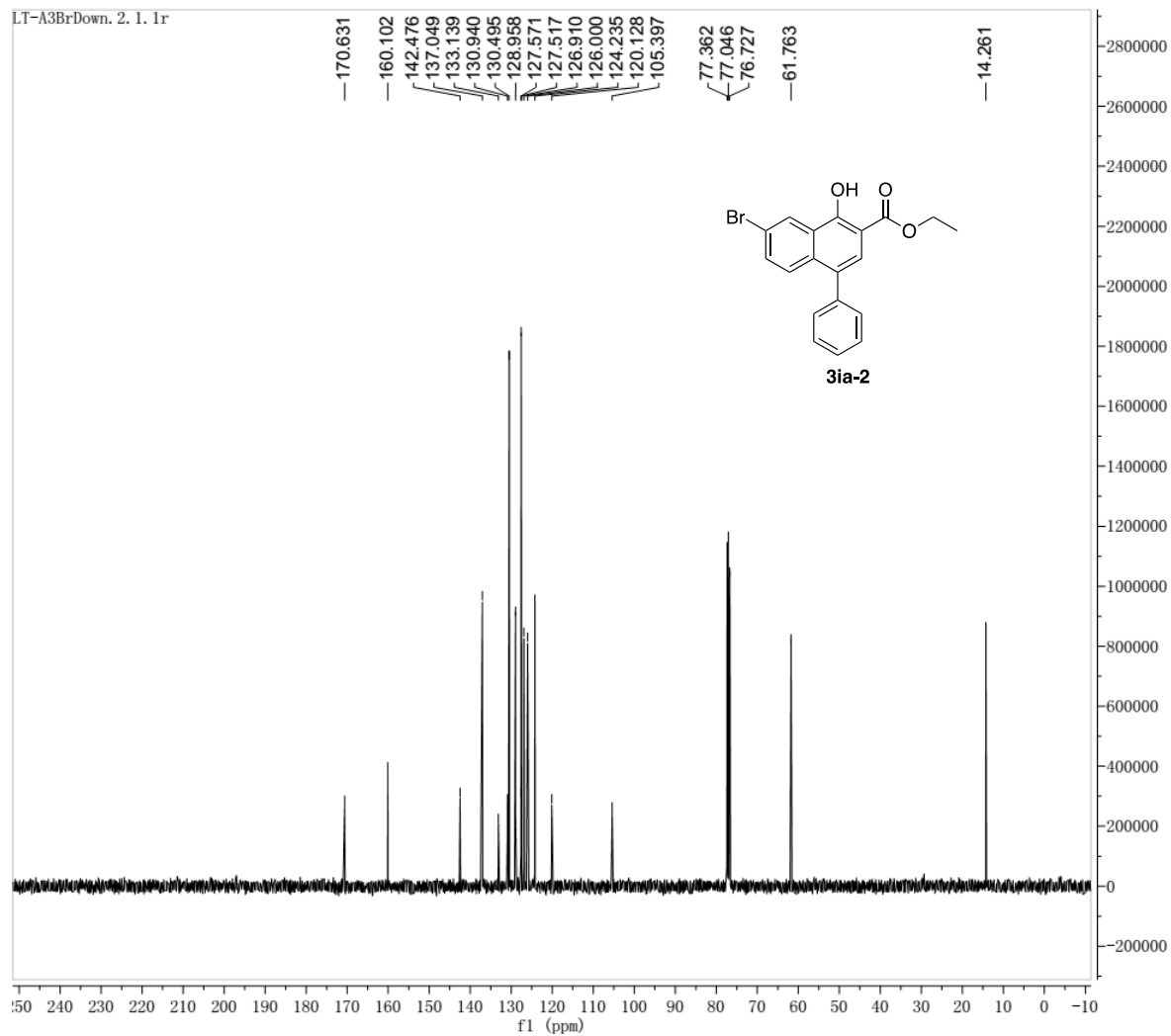
Date: 12-DEC-2012  
Time: 09:16:59  
Scale: 20.4338



**Ethyl 7-bromo-1-hydroxy-4-phenyl-2-naphthoate(3ia-2).**

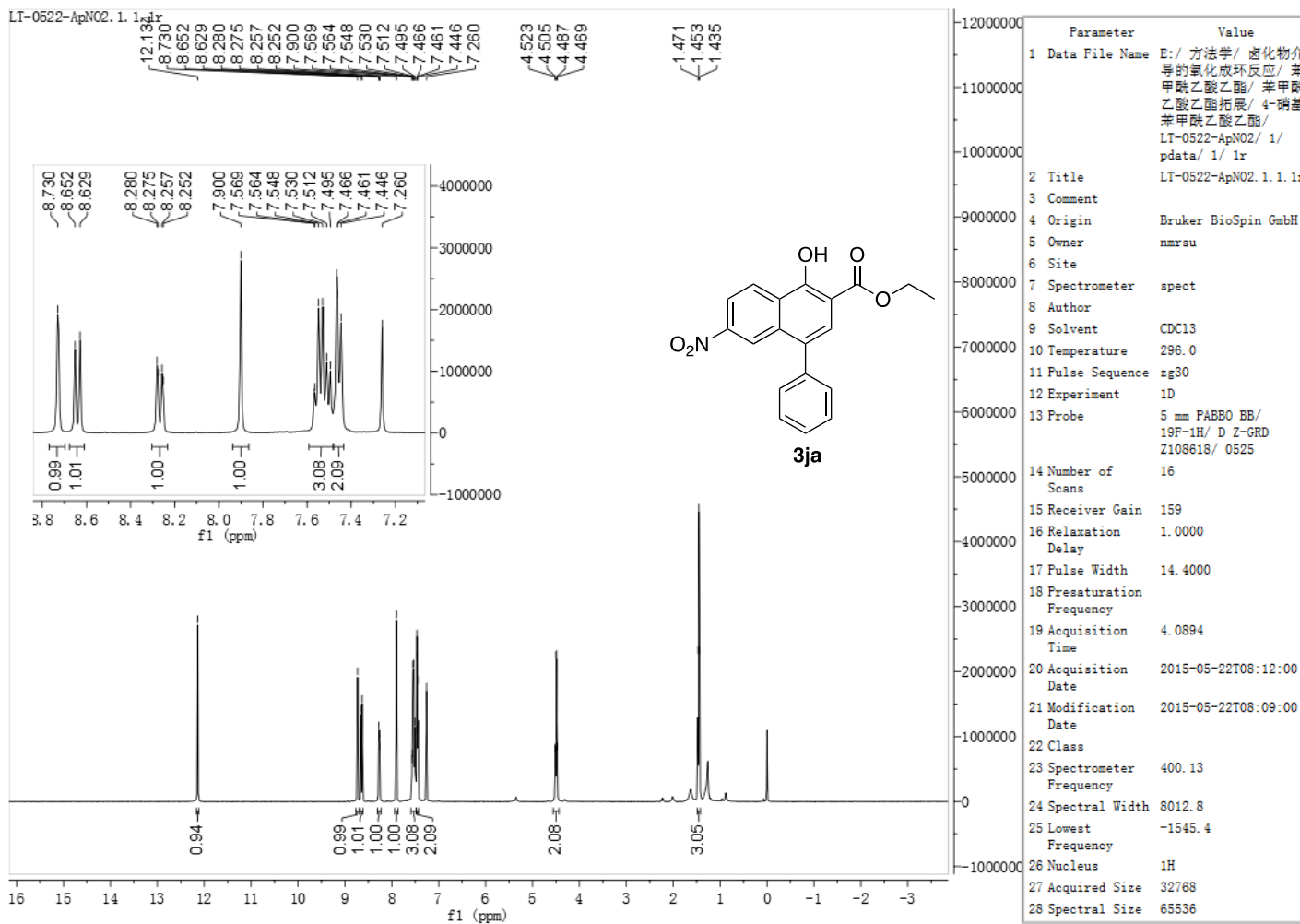


Parameter	Value
1 Data File Name	G:/ LT-A3BrDown/ 1/ pdata/ 1/ 1r
2 Title	LT-A3BrDown.1.1.1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	297.8
11 Pulse Sequence	zg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	16
15 Receiver Gain	88
16 Relaxation Delay	1.0000
17 Pulse Width	14.4000
18 Presaturation Frequency	
19 Acquisition Time	4.0894
20 Acquisition Date	2015-06-12T08:20:00
21 Modification Date	2015-06-12T08:16:12
22 Class	
23 Spectrometer Frequency	400.13
24 Spectral Width	8012.8
25 Lowest Frequency	-1551.9
26 Nucleus	1H
27 Acquired Size	32768
28 Spectral Size	65536

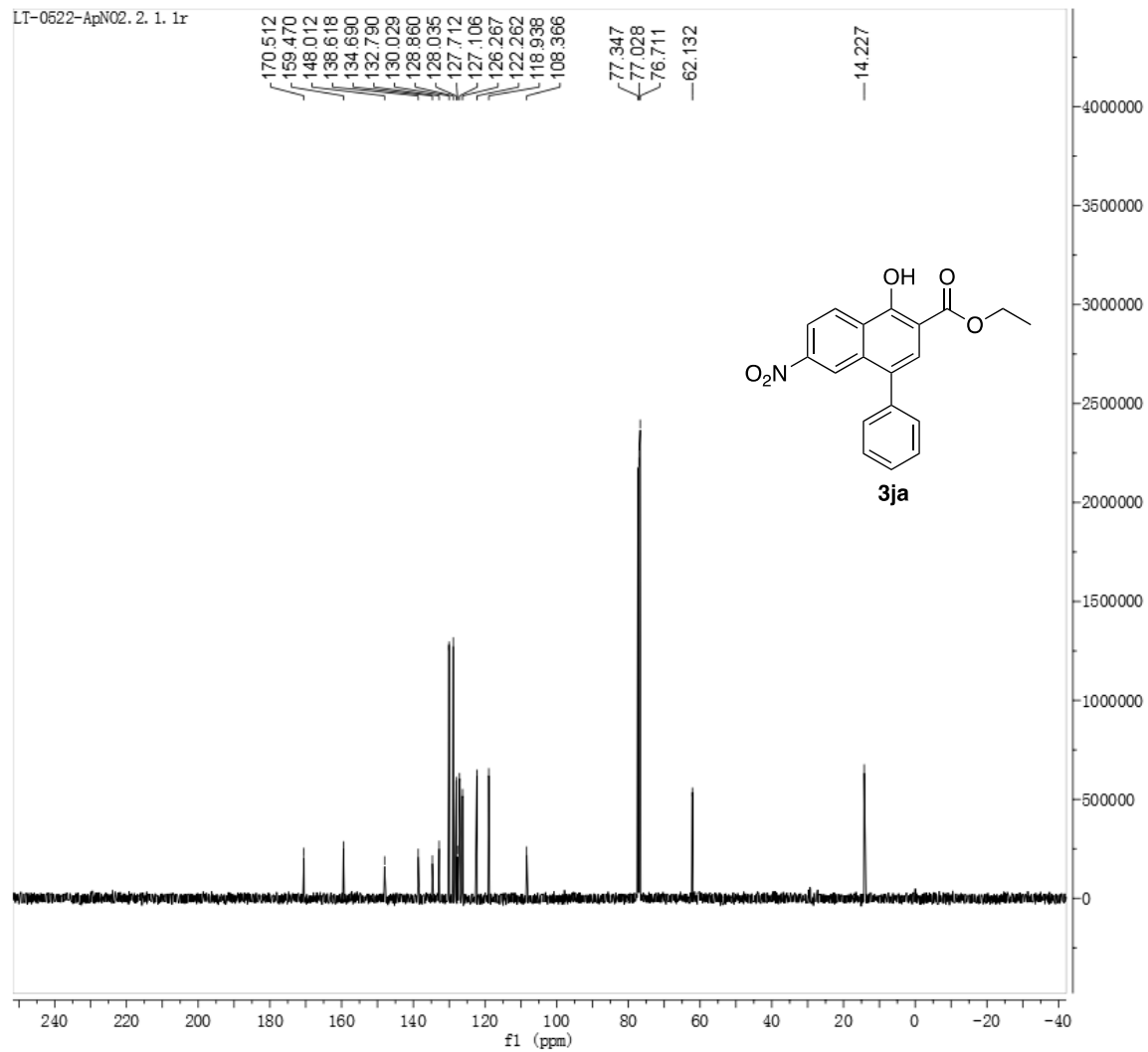


Parameter	Value
1 Data File Name	G:/ LT-A3BrDown/ 2/ pdata/ 1/ 1r
2 Title	LT-A3BrDown. 2. 1. 1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	298.9
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	349
15 Receiver Gain	133
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2015-06-12T08:28:00
21 Modification Date	2015-06-12T08:26:06
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

Ethyl 1-hydroxy-6-nitro-4-phenyl-2-naphthoate(3ja).

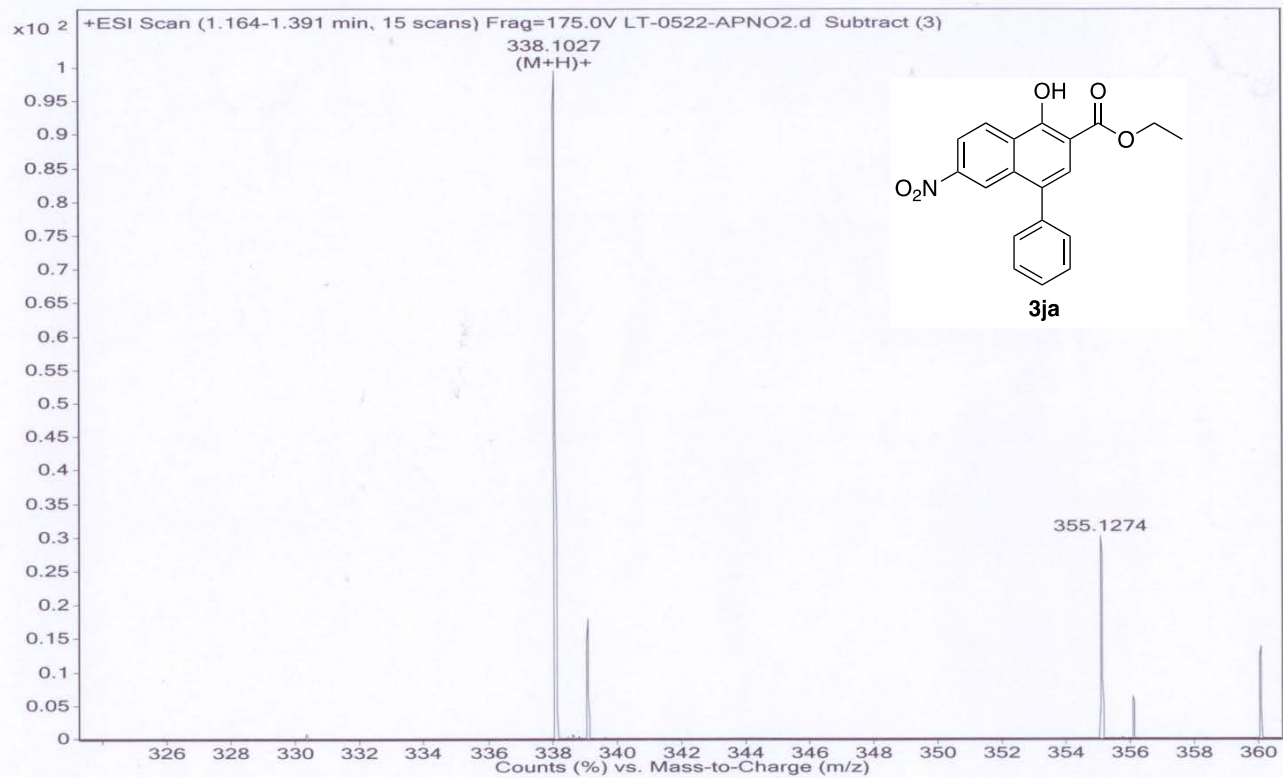


LT-0522-ApNO2.2.1.1r

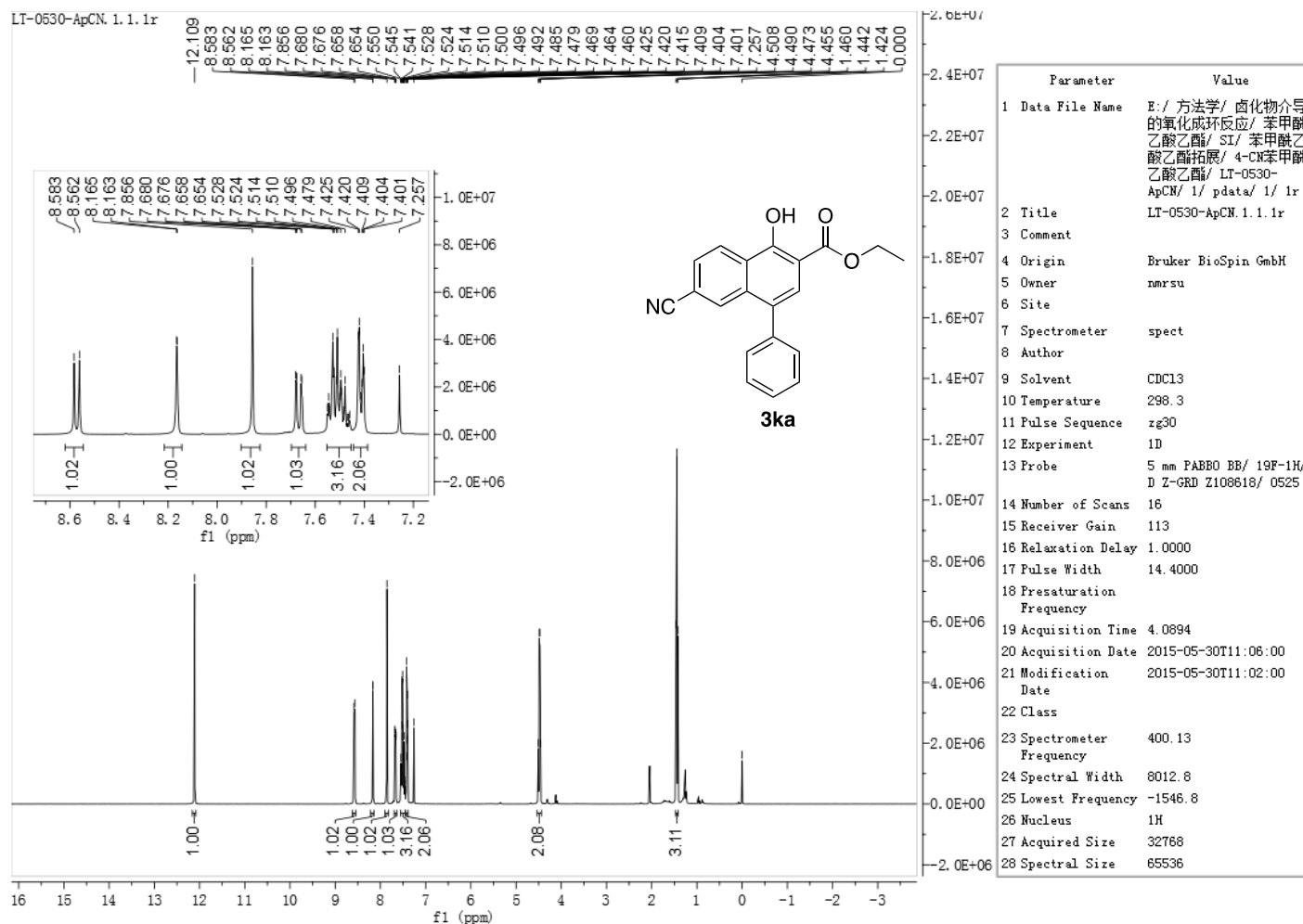


Parameter	Value
1 Data File Name	E:/ 方法学/ 卤化物介 导的氧化成环反应/ 苯 甲酸乙酯乙醚/ 苯甲酸 乙酯乙醚拓展/ 4-硝基 苯甲酸乙酯乙醚/ LT-0522-ApNO2/ 2/ pdata/ 1/ 1r
2 Title	LT-0522-ApNO2.2.1.1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDC13
10 Temperature	297.1
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D 2-GRD Z108618/ 0525
14 Number of Scans	720
15 Receiver Gain	113
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2015-05-22T08:28:00
21 Modification Date	2015-05-22T08:29:00
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	39768

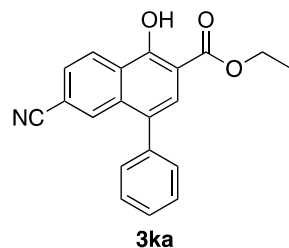
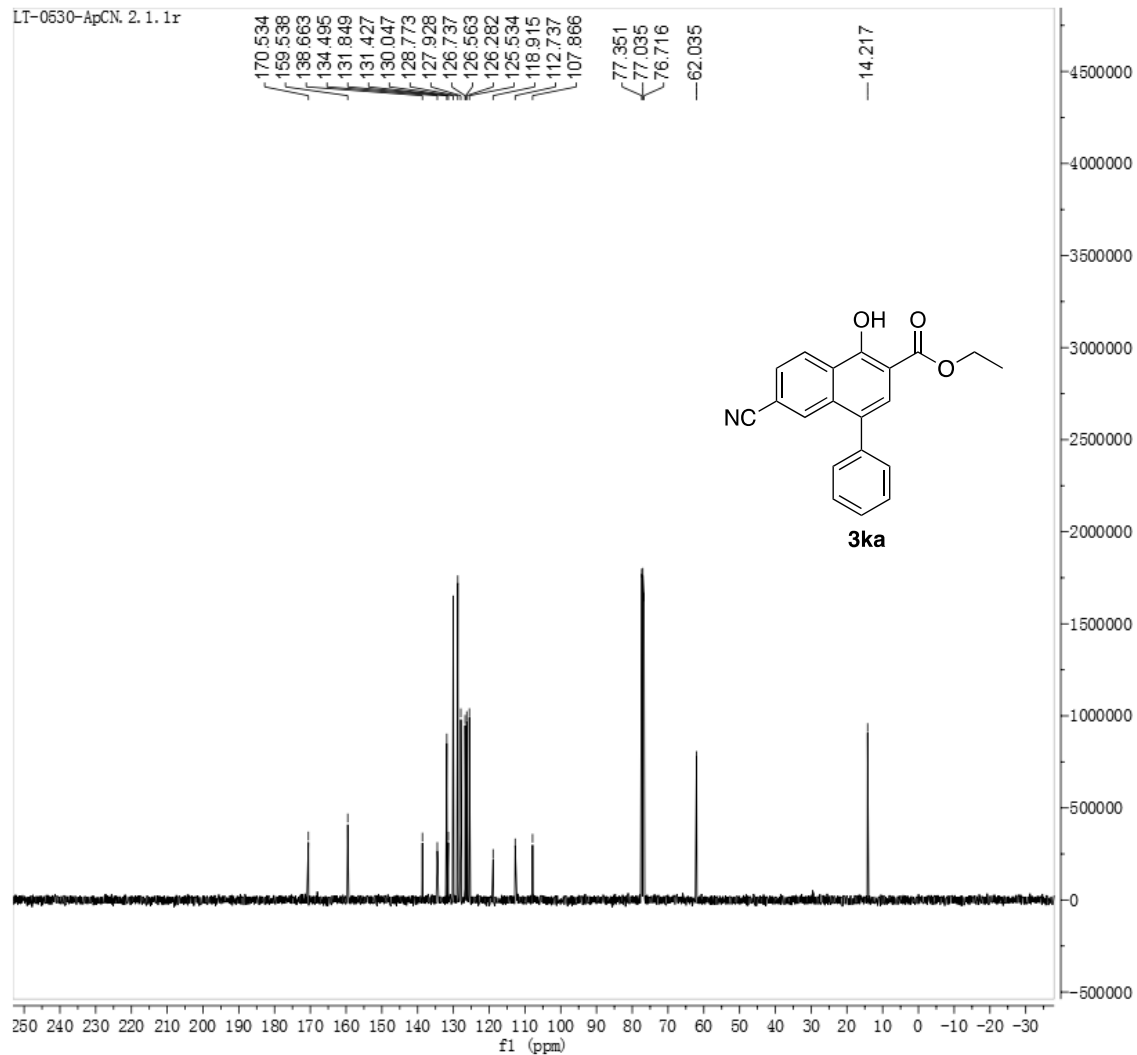
Sample Name	lc/ms	Position	P1-A3	Instrument Name	Instrument 1	User Name	
Inj Vol	-1	InjPosition		SampleType	Sample	IRM Calibration Status	Some Ions Missed
Data Filename	LT-0522-APNO2.d	ACQ Method	chen-ms.m	Comment		Acquired Time	6/8/2015 11:01:58 AM



Ethyl 6-cyano-1-hydroxy-4-phenyl-2-naphthoate(3ka).

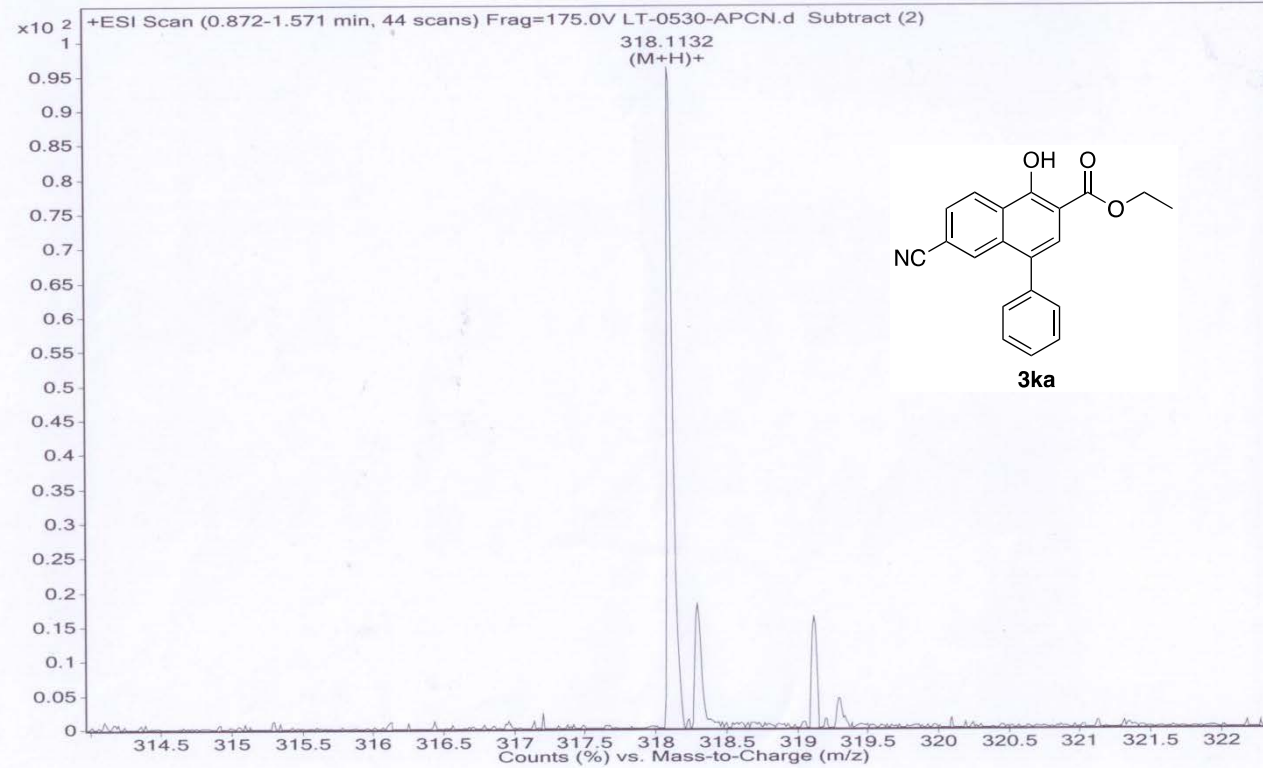


LT-0530-ApCN. 2. 1. 1r

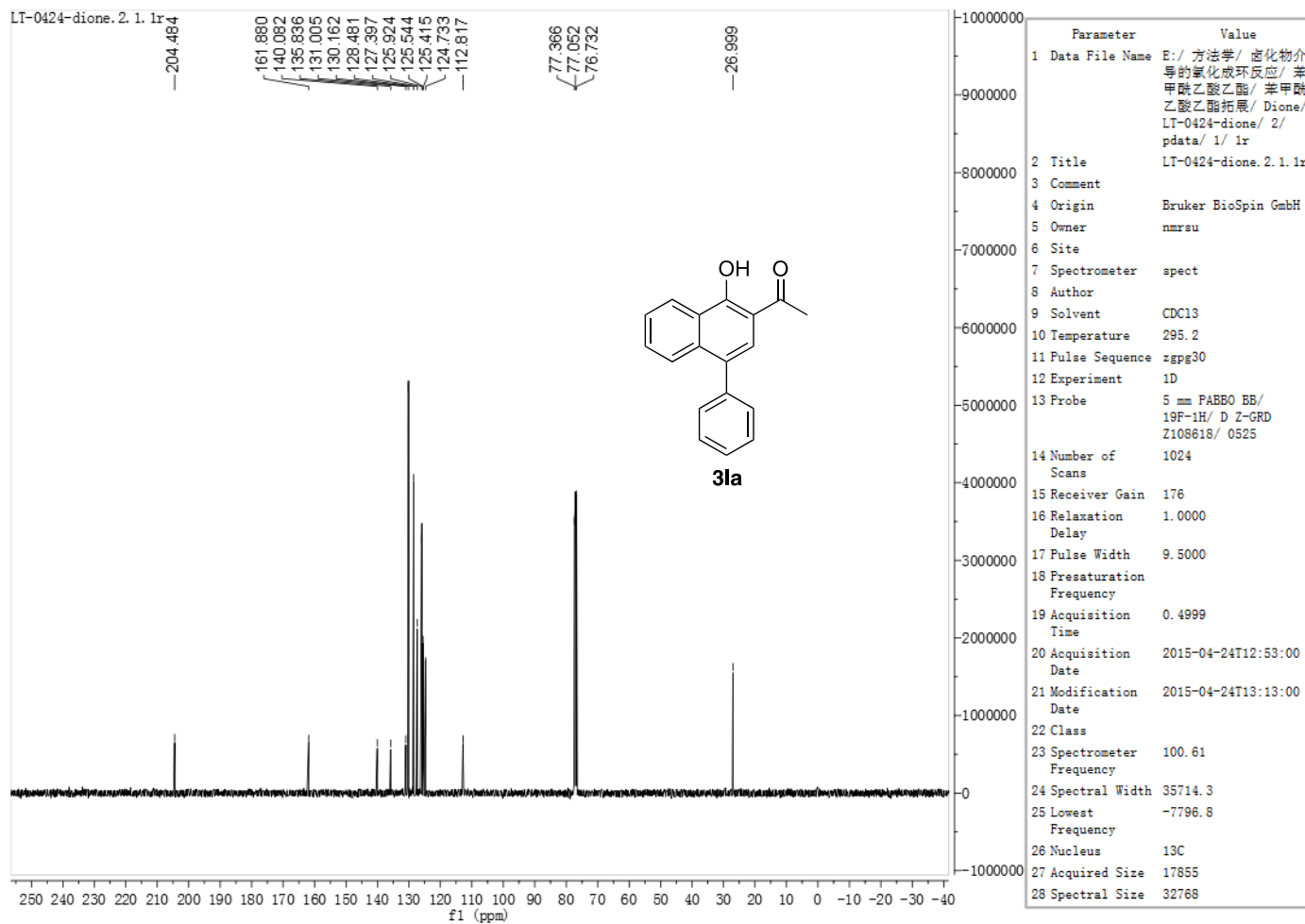


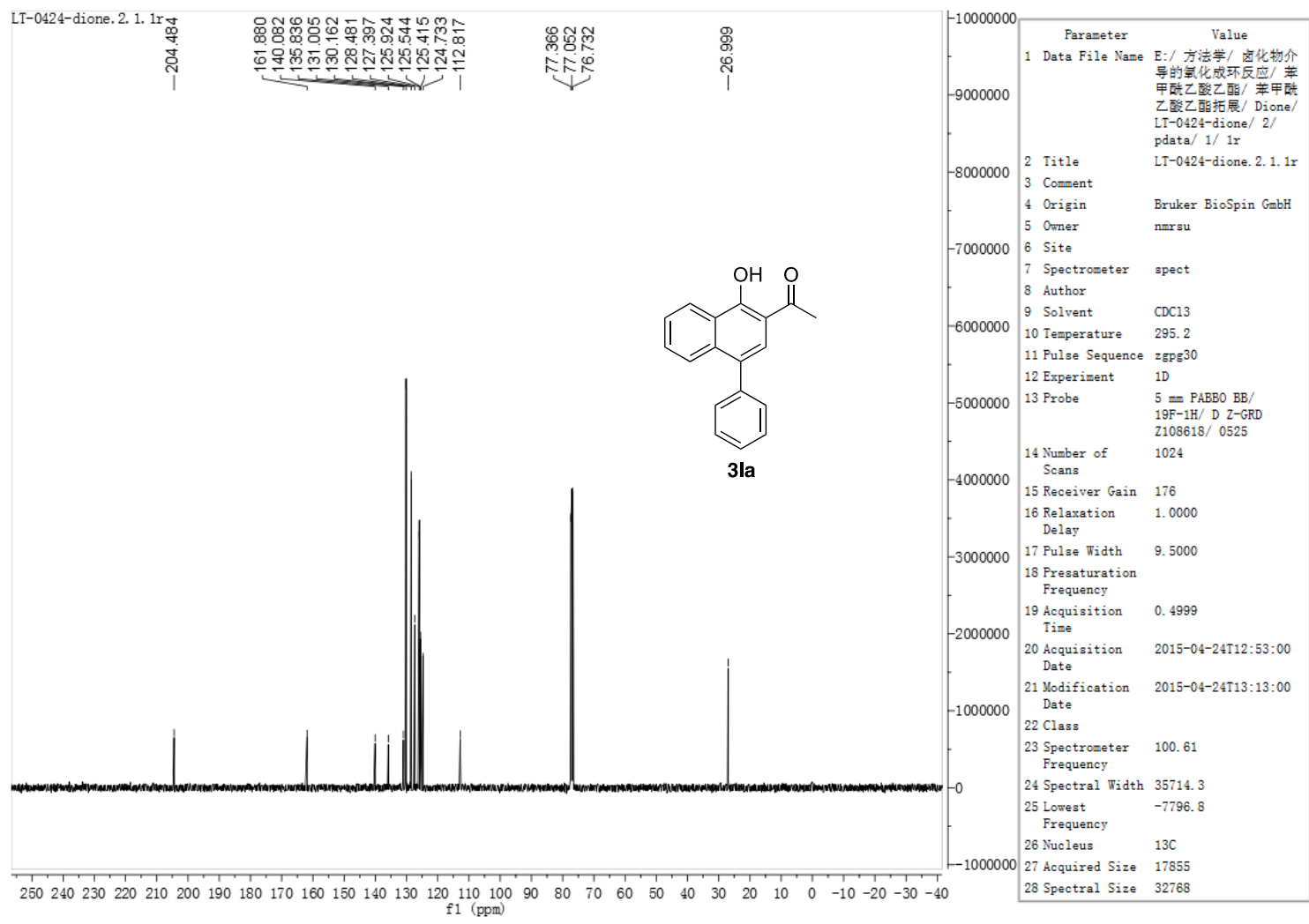
Parameter	Value
1 Data File Name	E:/ 方法学/ 卤化物介 导的氯化成环反应/ 苯 甲酰乙酸乙酯/ SI/ 苯 甲酰乙酸乙酯拓展/ 4- CN苯甲酰乙酸乙酯/ LT-0530-ApCN/ 2/ pdata/ 1/ 1r
2 Title	LT-0530-ApCN. 2. 1. 1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	298.6
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	451
15 Receiver Gain	133
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2015-05-30T11:08:00
21 Modification Date	2015-05-30T11:14:00
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

Sample Name	A12	Position	P1-B3	Instrument Name	Instrument 1	User Name	
Inj Vol	-1	InjPosition		SampleType	Sample	IRM Calibration Status	All Ions Missed
Data Filename	LT-0530-APCN.d	ACQ Method	chen-ms.m	Comment		Acquired Time	6/26/2015 5:01:05 PM



# 1-(1-hydroxy-4-phenylnaphthalen-2-yl)ethanone (3la).

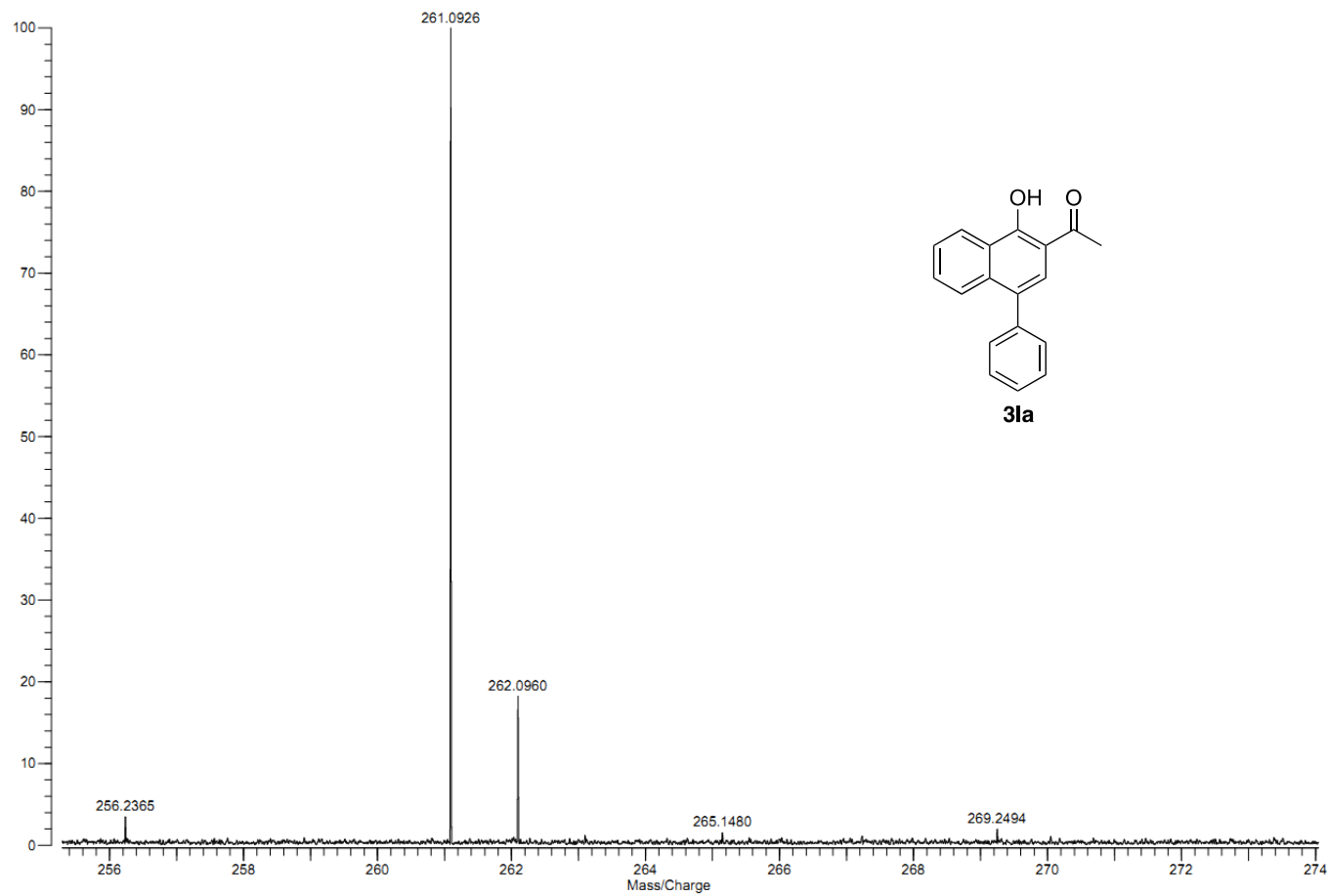




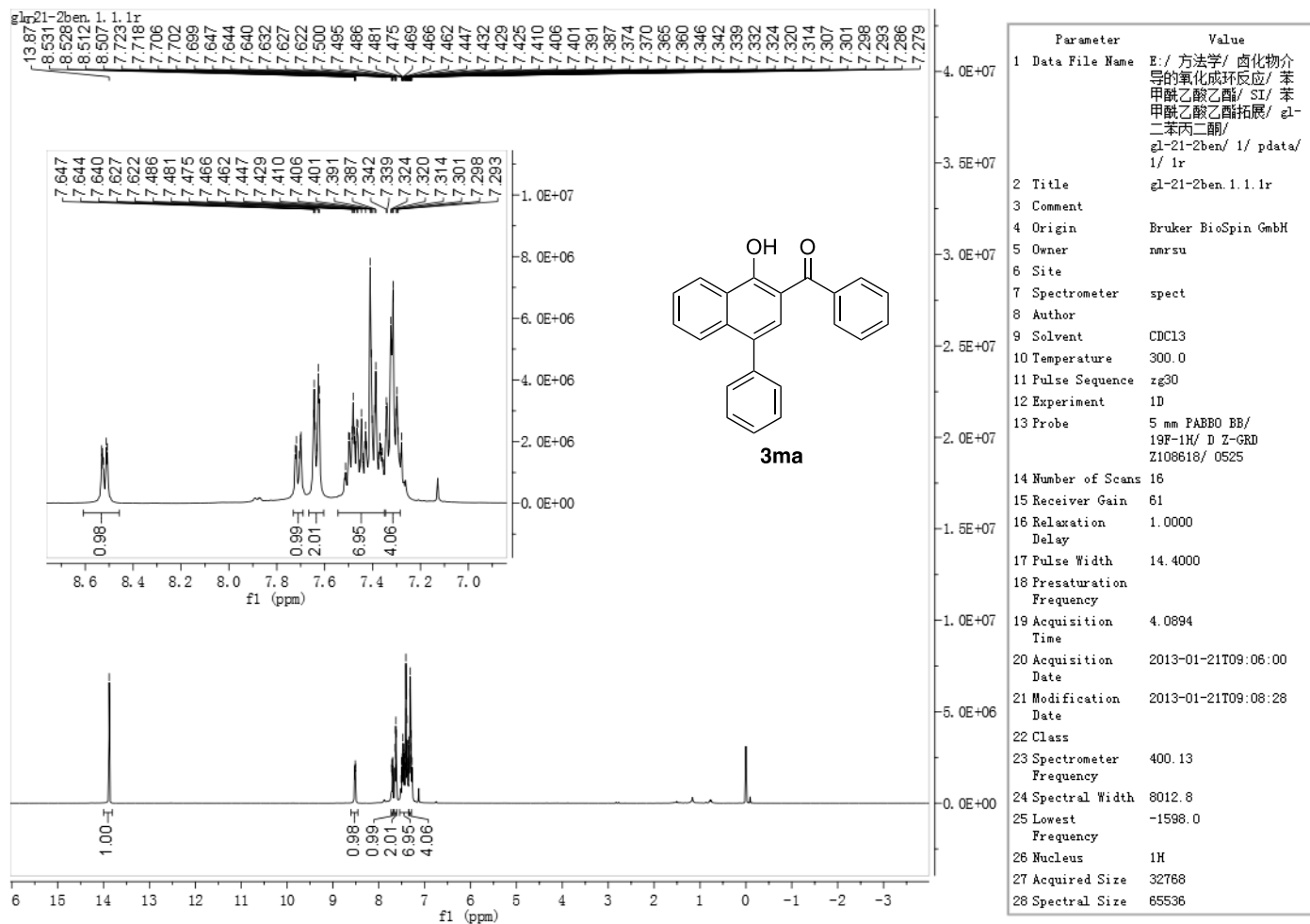
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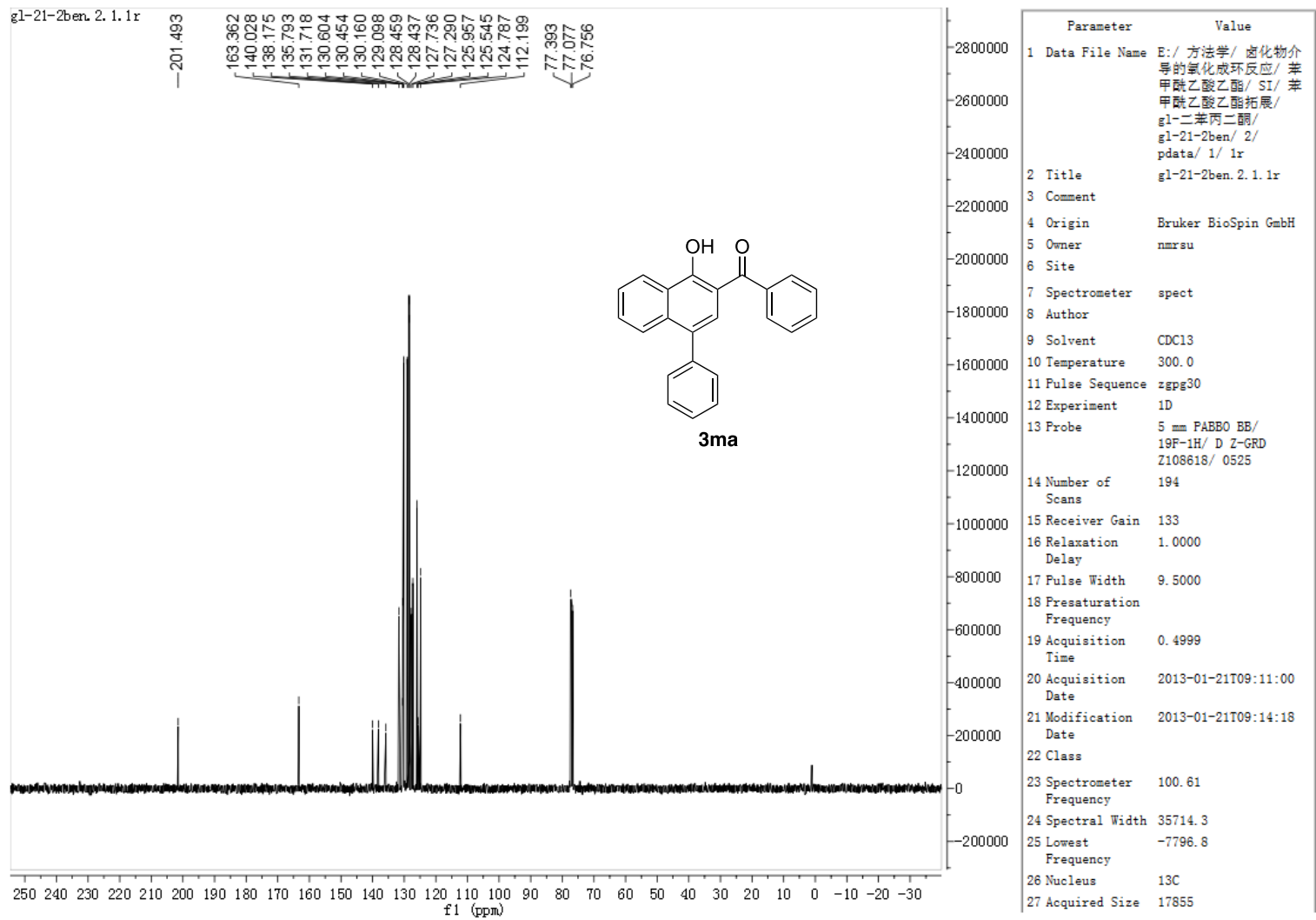
Mode: Negative  
Scans: 1

Date: 15-JAN-2013  
Time: 16:10:06  
Scale: 11.6798



**(1-hydroxy-4-phenylphthalen-2-yl)(phenyl)methanone(3ma).**

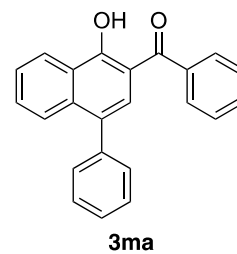
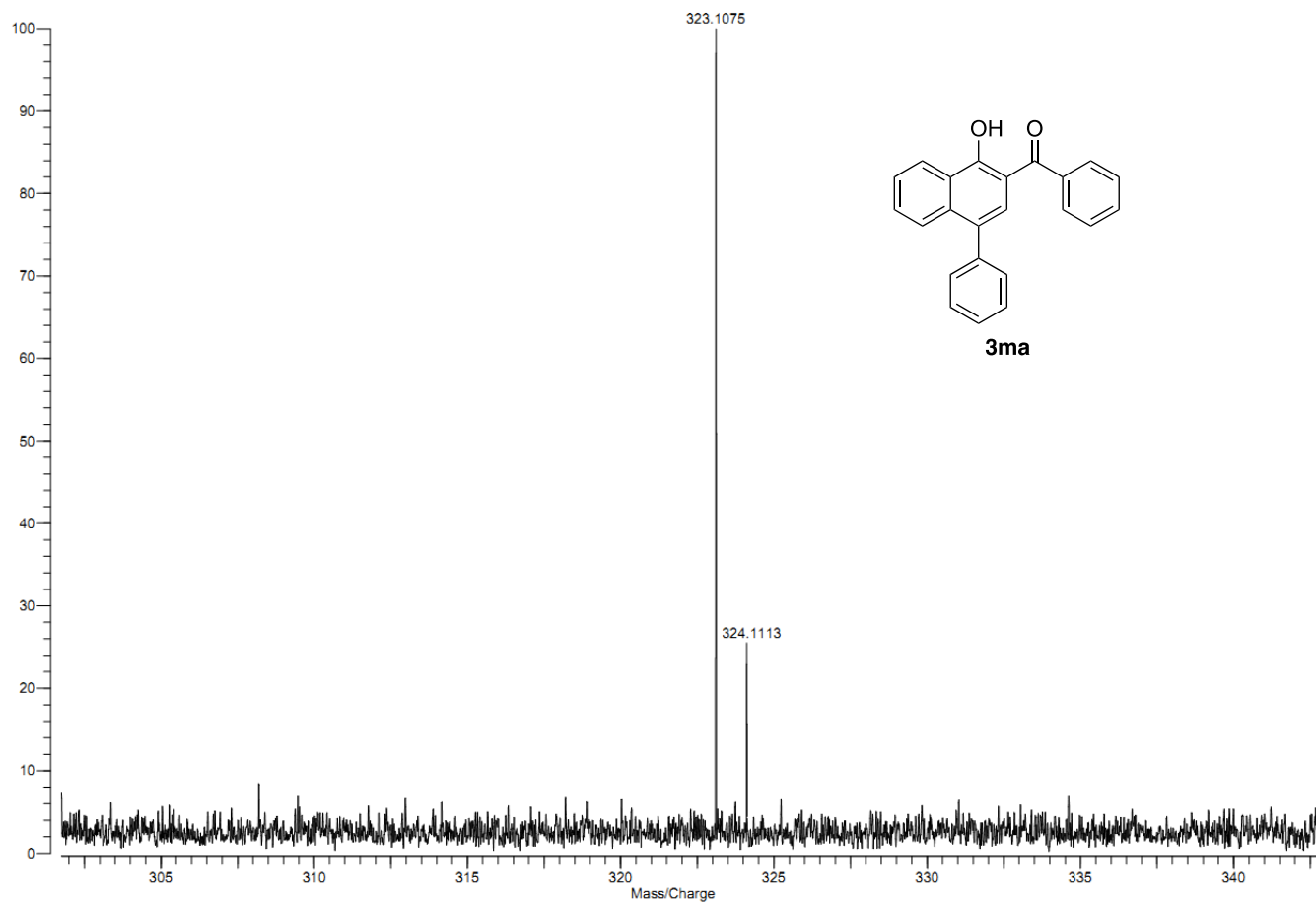




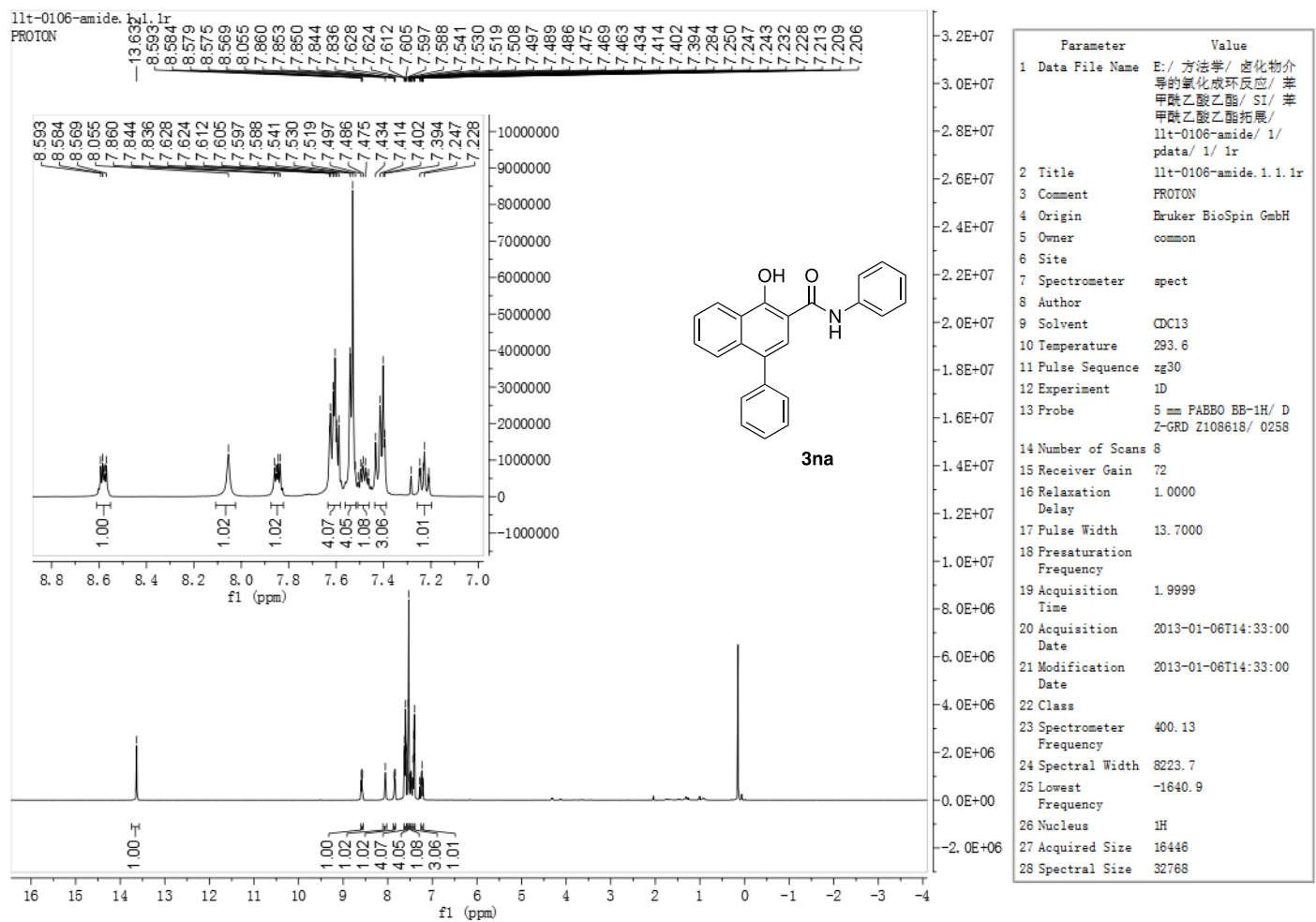
Varian QFT-ESI  
File: hj-2\_ESI.trans

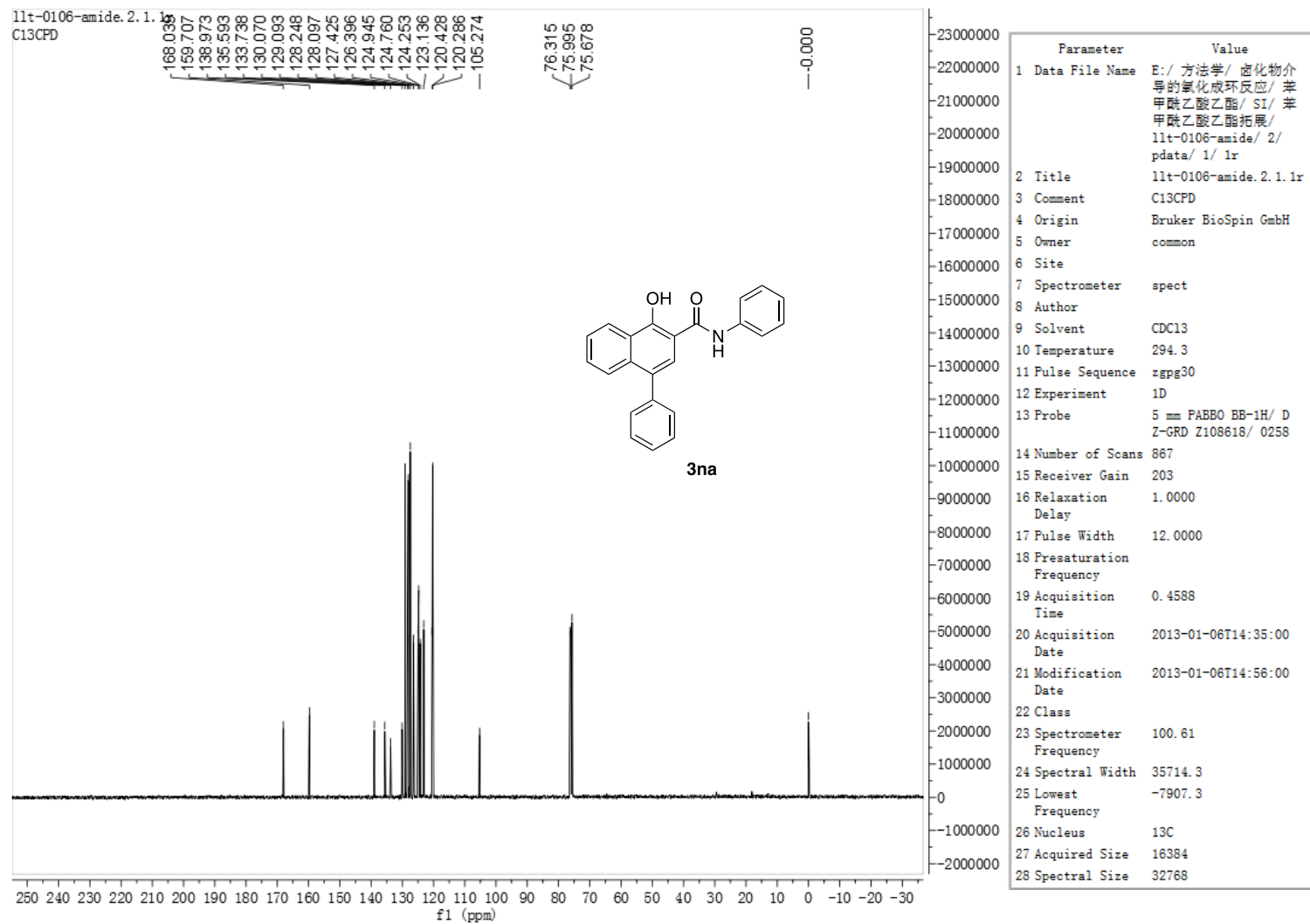
Mode: Negative  
Scans: 1

Date: 15-JAN-2013  
Time: 16:08:14  
Scale: 75.5743



**1-hydroxy-*N*,4-diphenyl-2-naphthamide(3na).**

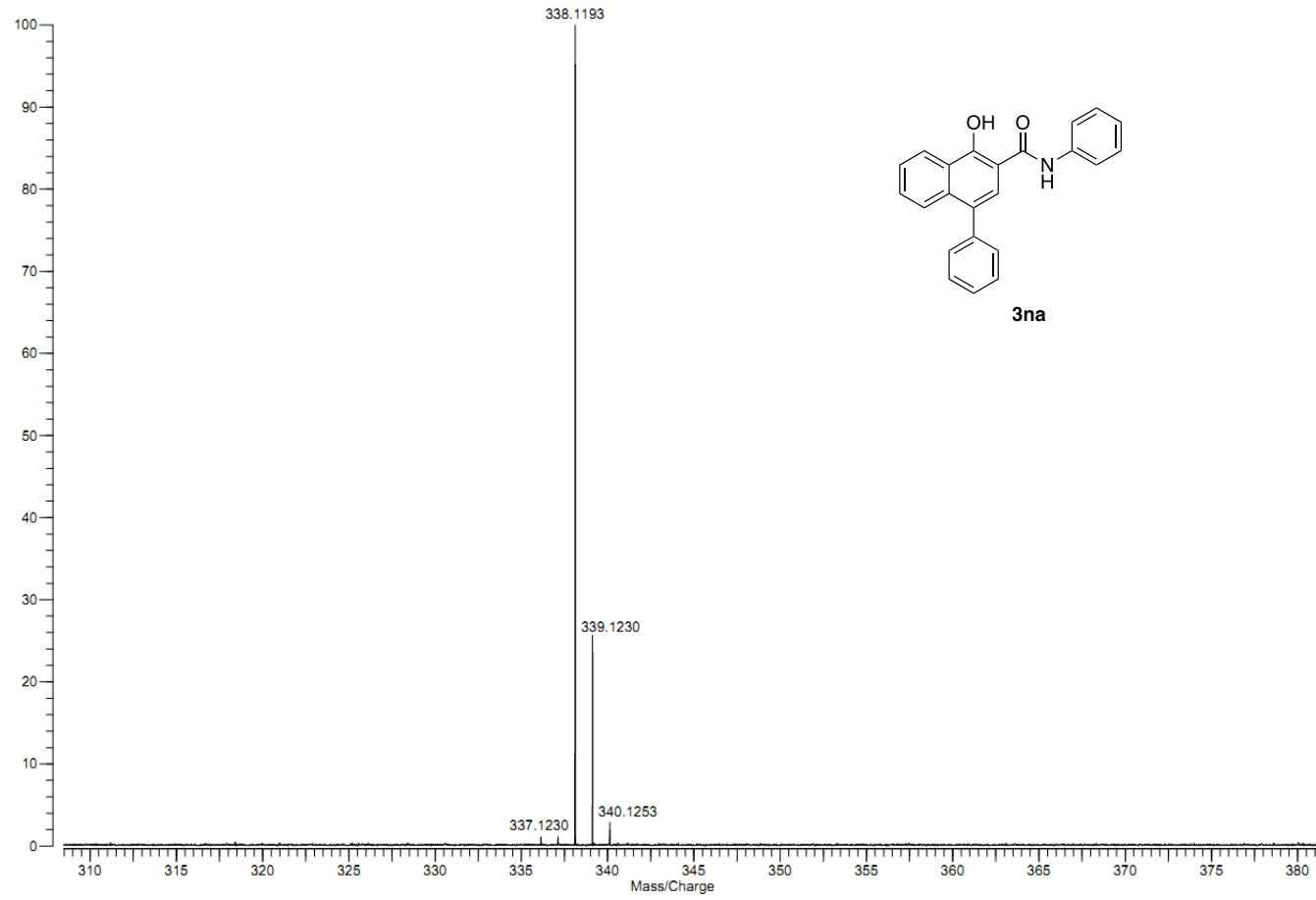




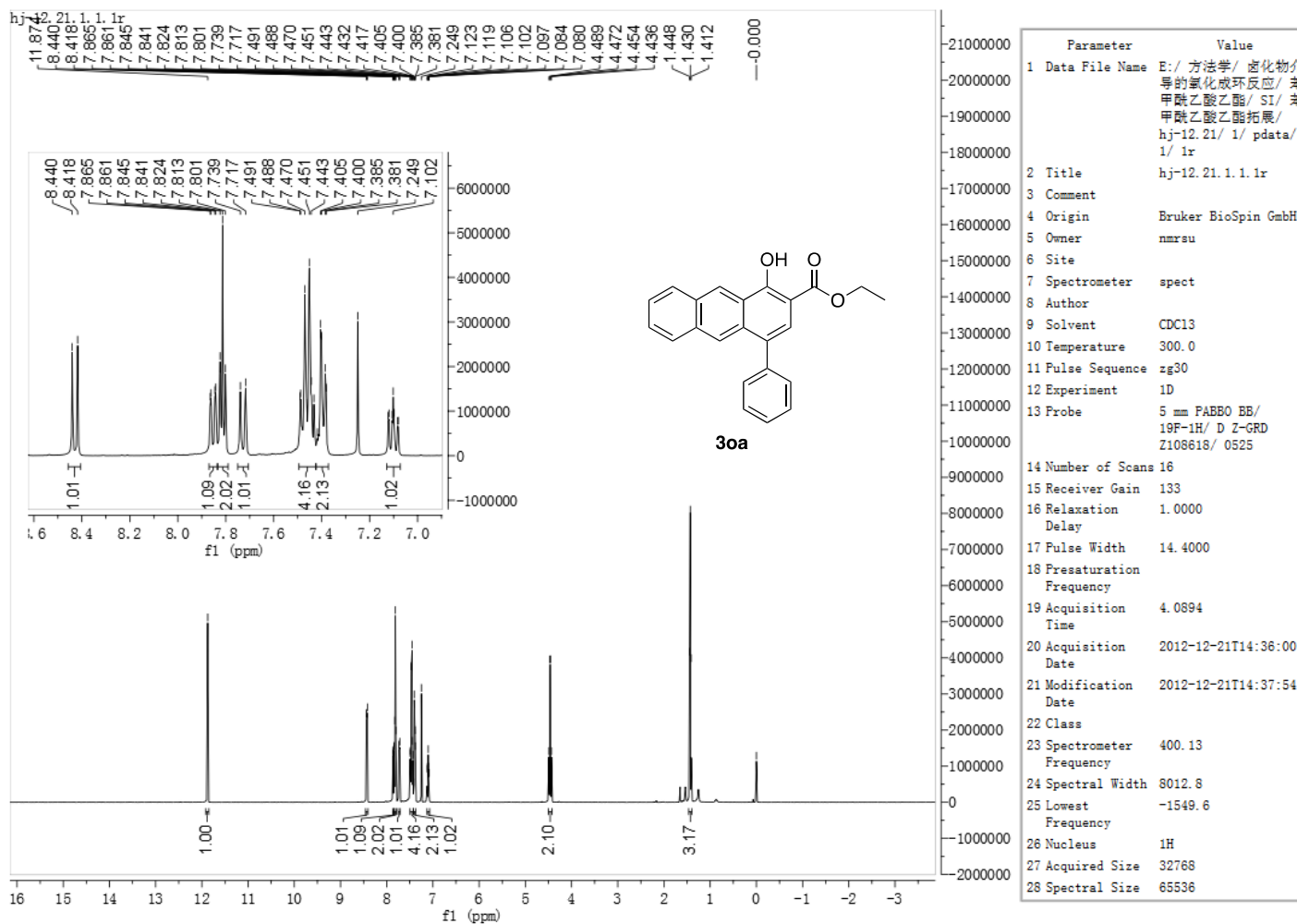
Varian QFT-ESI  
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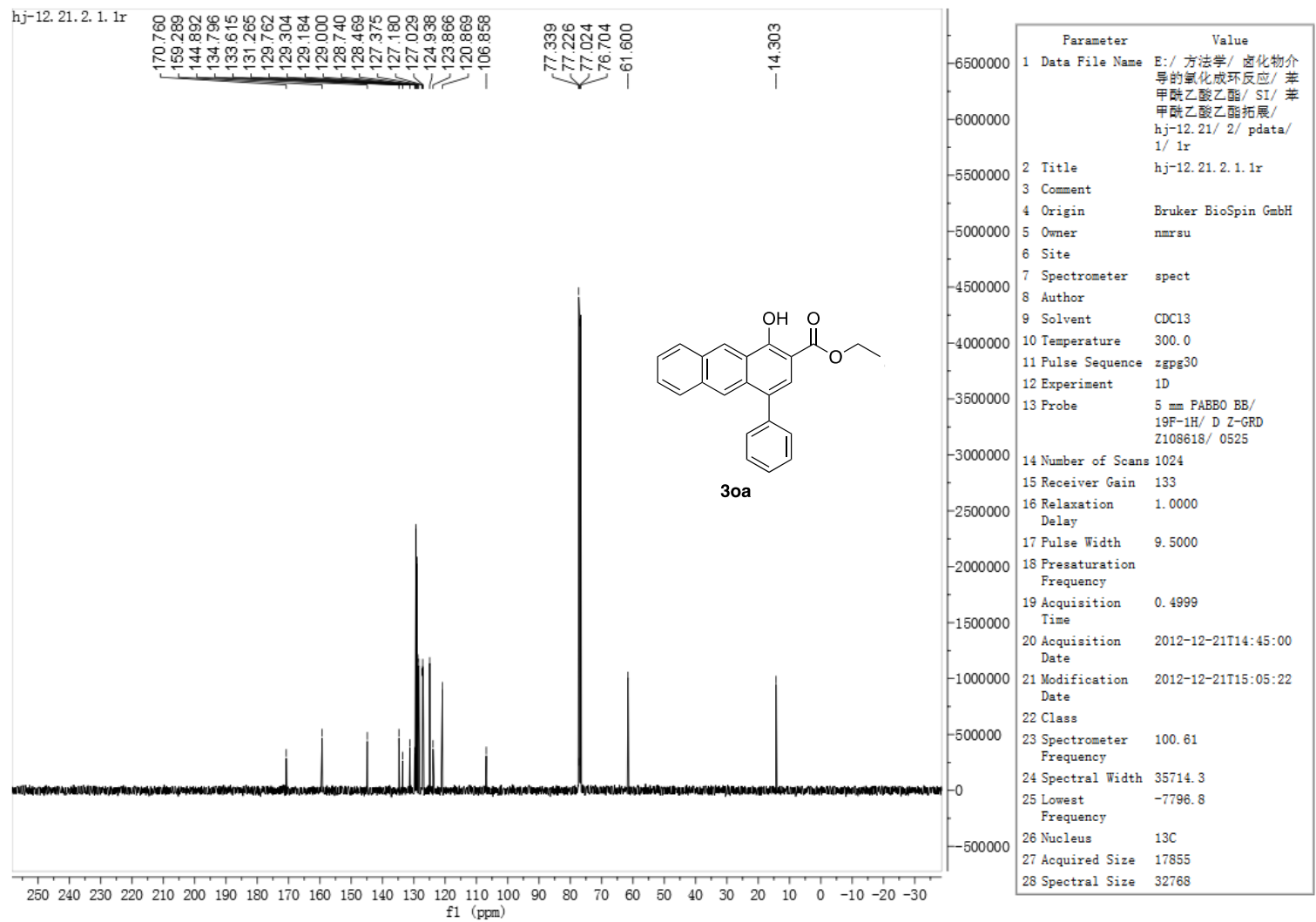
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Scans: 1

Date: 08-JAN-2013  
Time: 12:05:51  
Scale: 3.5741



**Ethyl 1-hydroxy-4-phenylanthracene-2-carboxylate(3oa).**

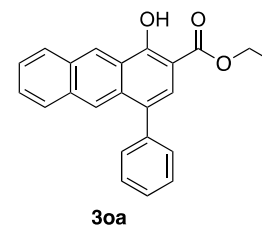
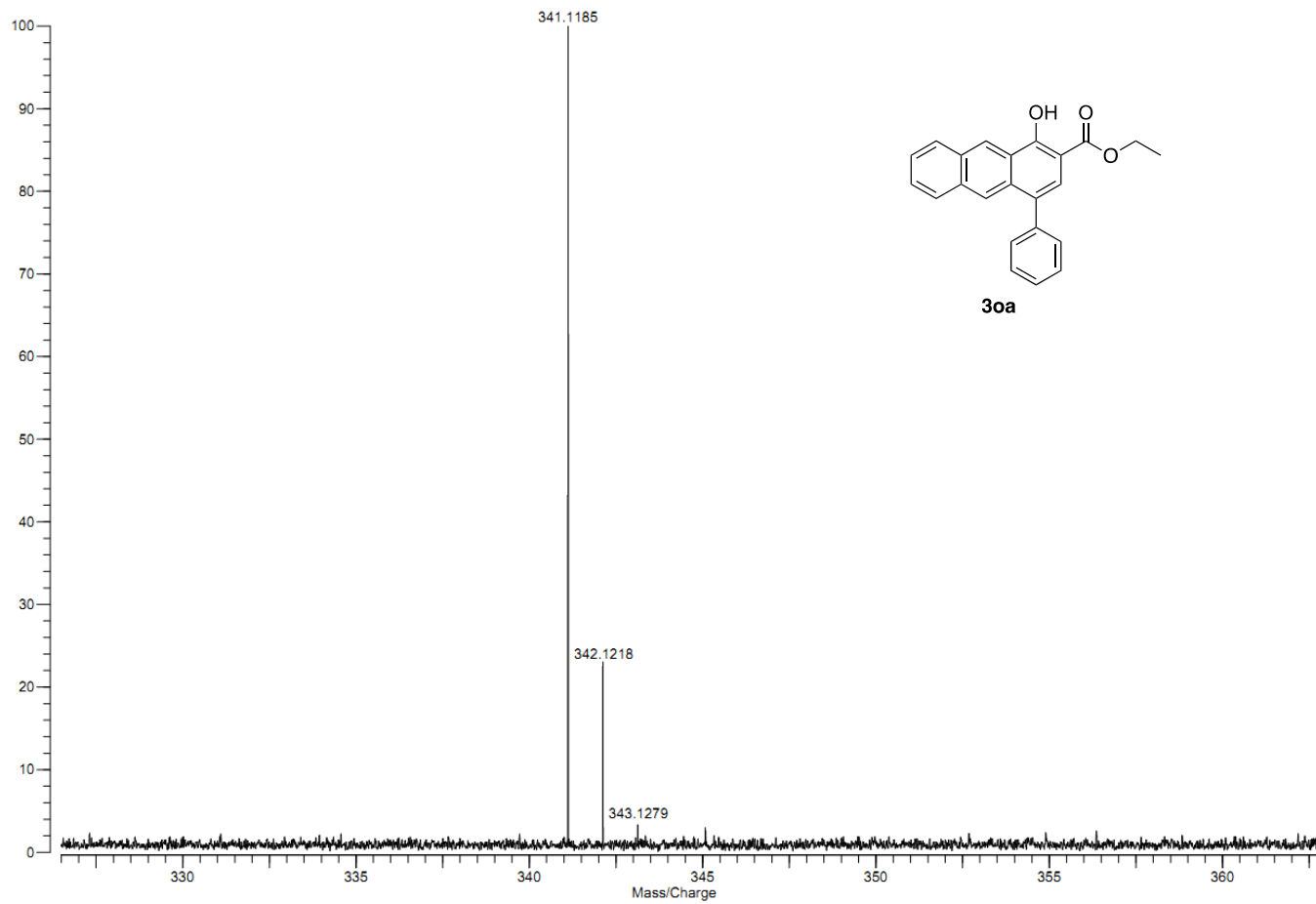




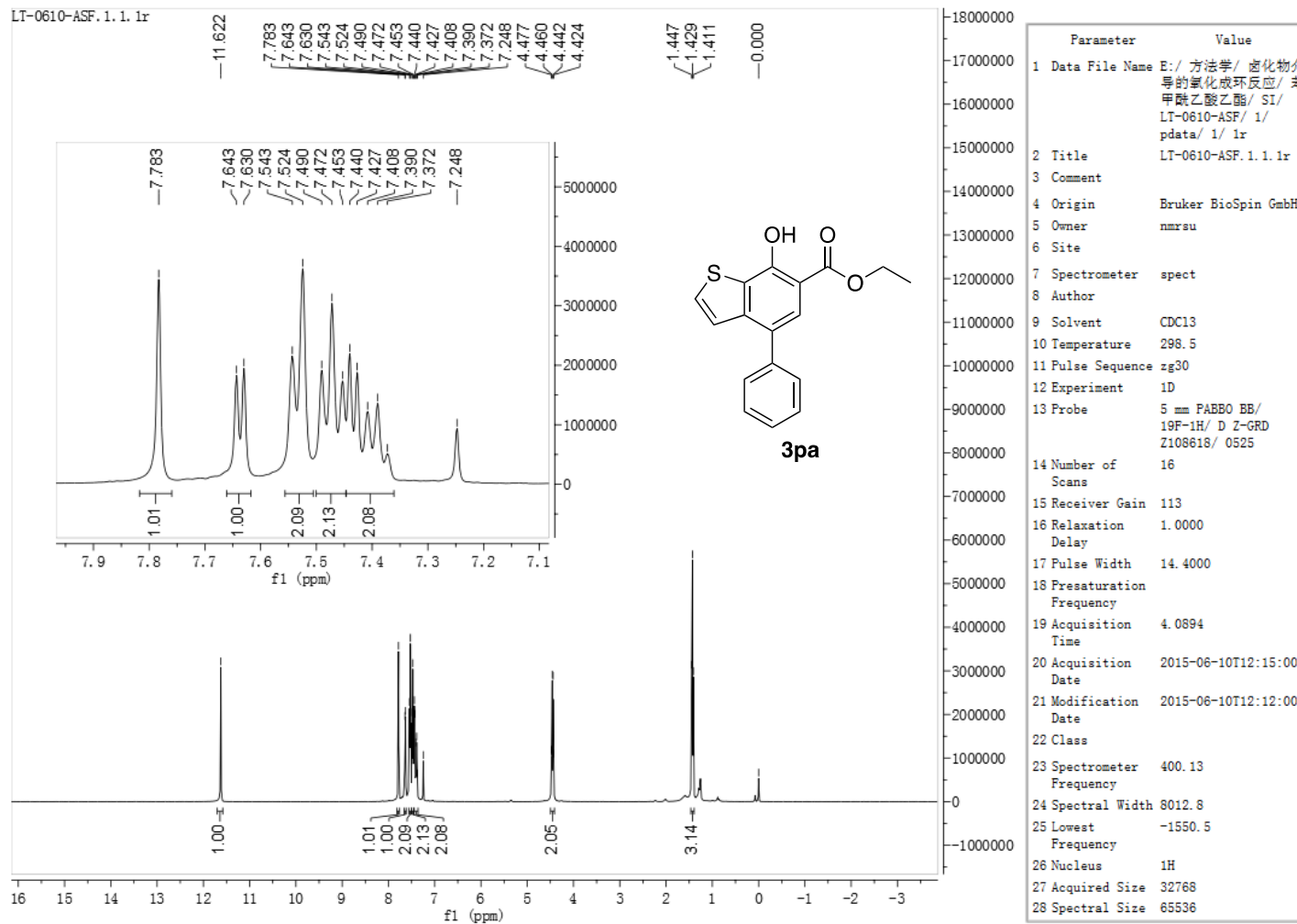
Varian QFT-ESI  
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Mode: Negative  
Scans: 1

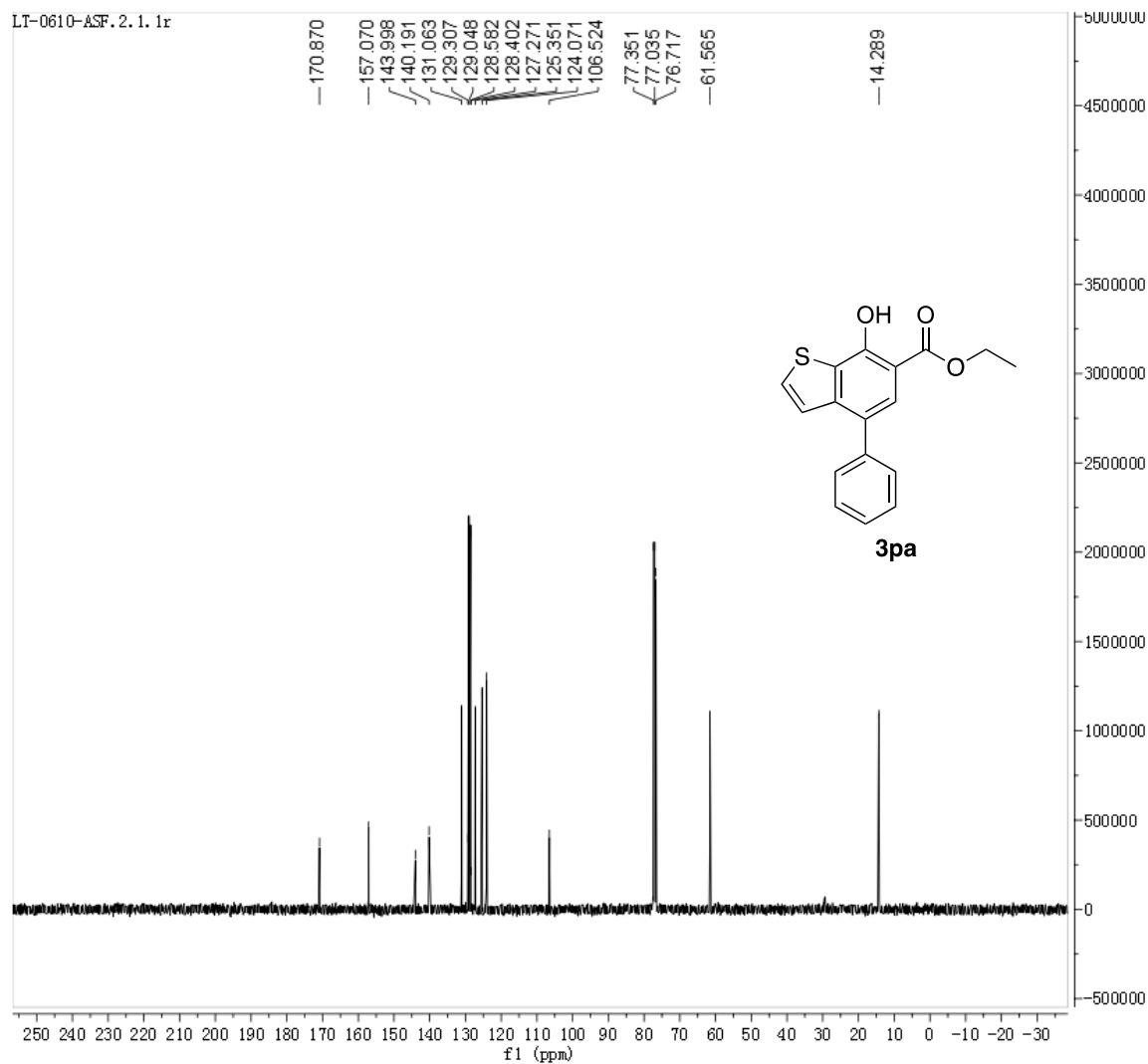
Date: 21-DEC-2012  
Time: 15:18:51  
Scale: 34.6137



Ethyl 7-hydroxy-4-phenyl-3a,7a-dihydrobenzo[b]thiophene-6-carboxylate(3pa).

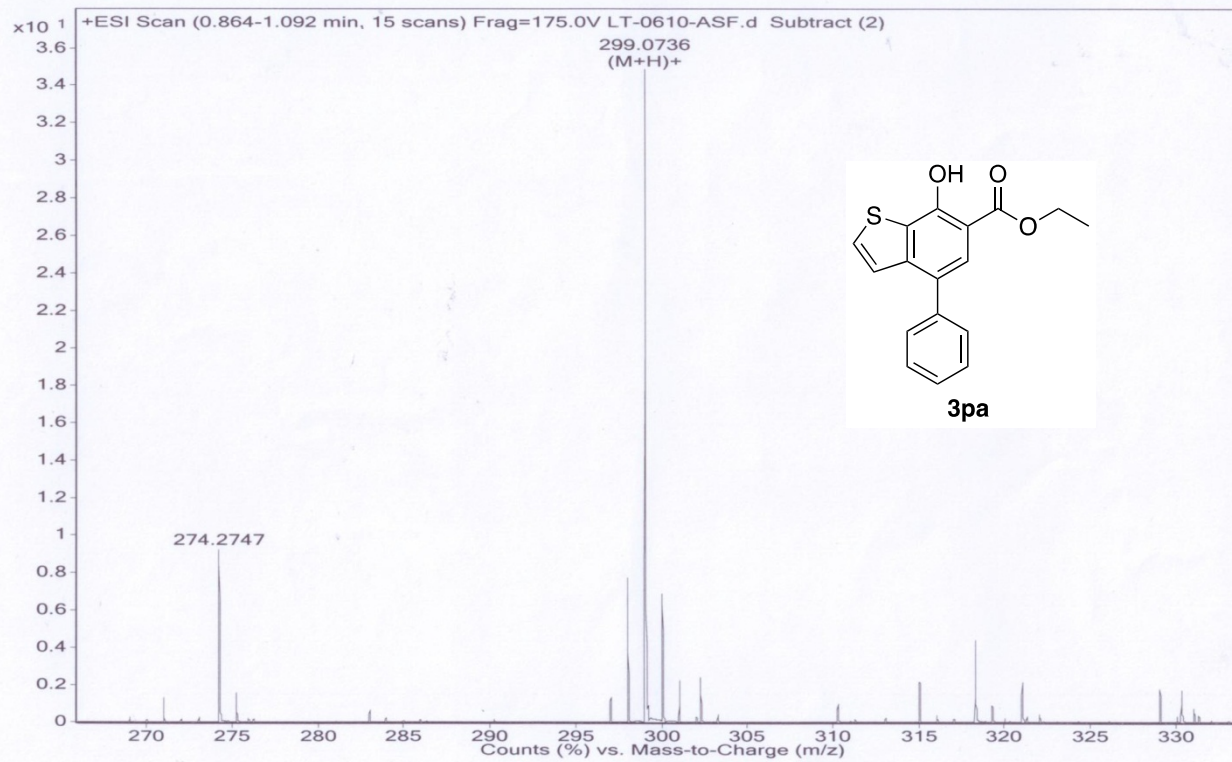


LT-0610-ASF. 2. 1. 1r

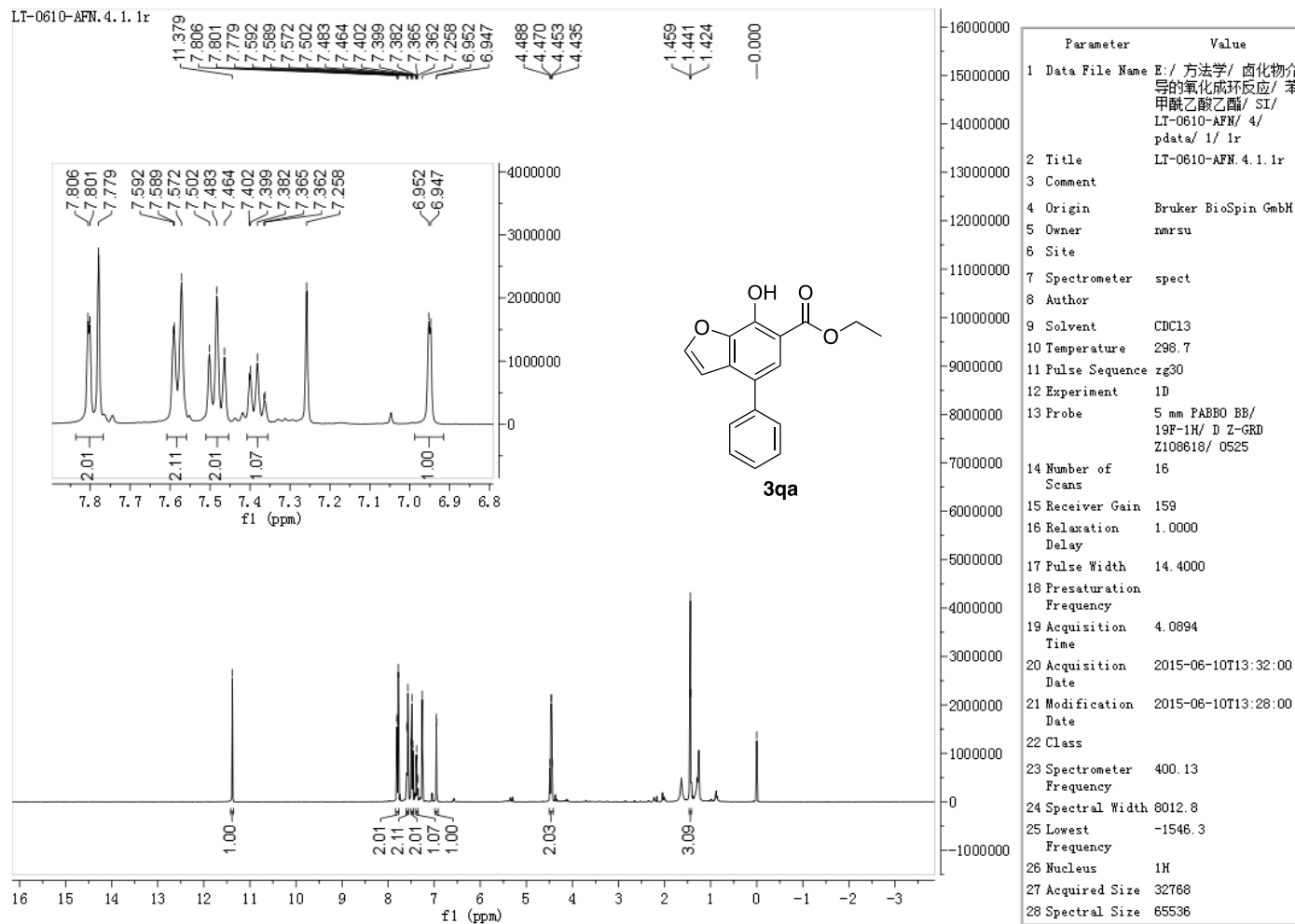


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1 Data File Name	E:/ 方法学/ 卤化物介 导的氧化成环反应/ 苯 甲酰乙酸乙酯/ SI/ LT-0610-ASF/ 2/ pdata/ 1/ 1r
2 Title	LT-0610-ASF. 2. 1. 1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	299.8
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	723
15 Receiver Gain	119
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2015-06-10T12:33:00
21 Modification Date	2015-06-10T12:31:00
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

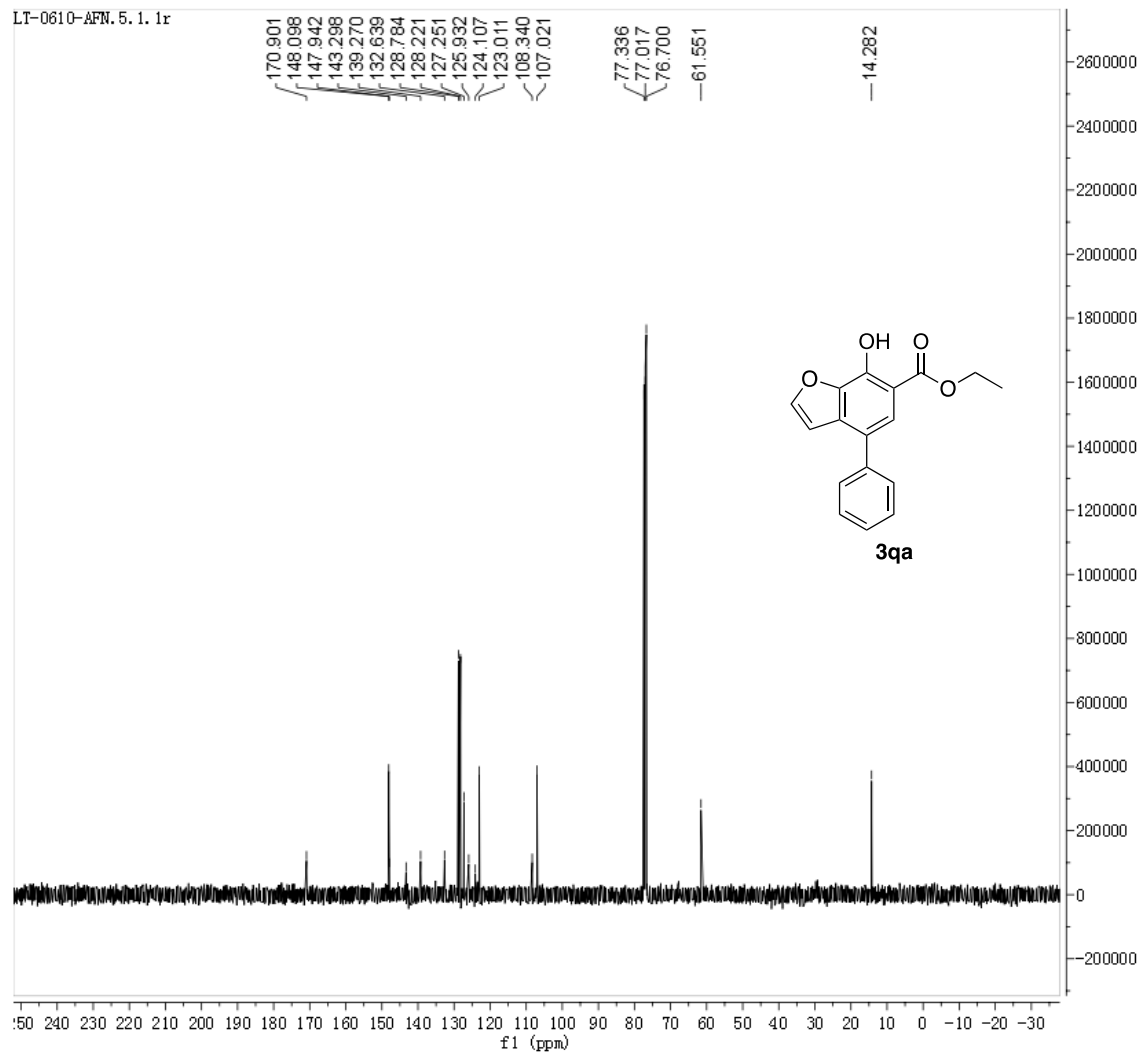
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Inj Vol	-1	InjPosition		SampleType	Sample	IRM Calibration Status	Some Ions Missed
Data Filename	LT-0610-ASF.d	ACQ Method	chen-ms.m	Comment		Acquired Time	6/15/2015 10:30:15 AM



Ethyl 7-hydroxy-4-phenylbenzofuran-6-carboxylate(3qa).

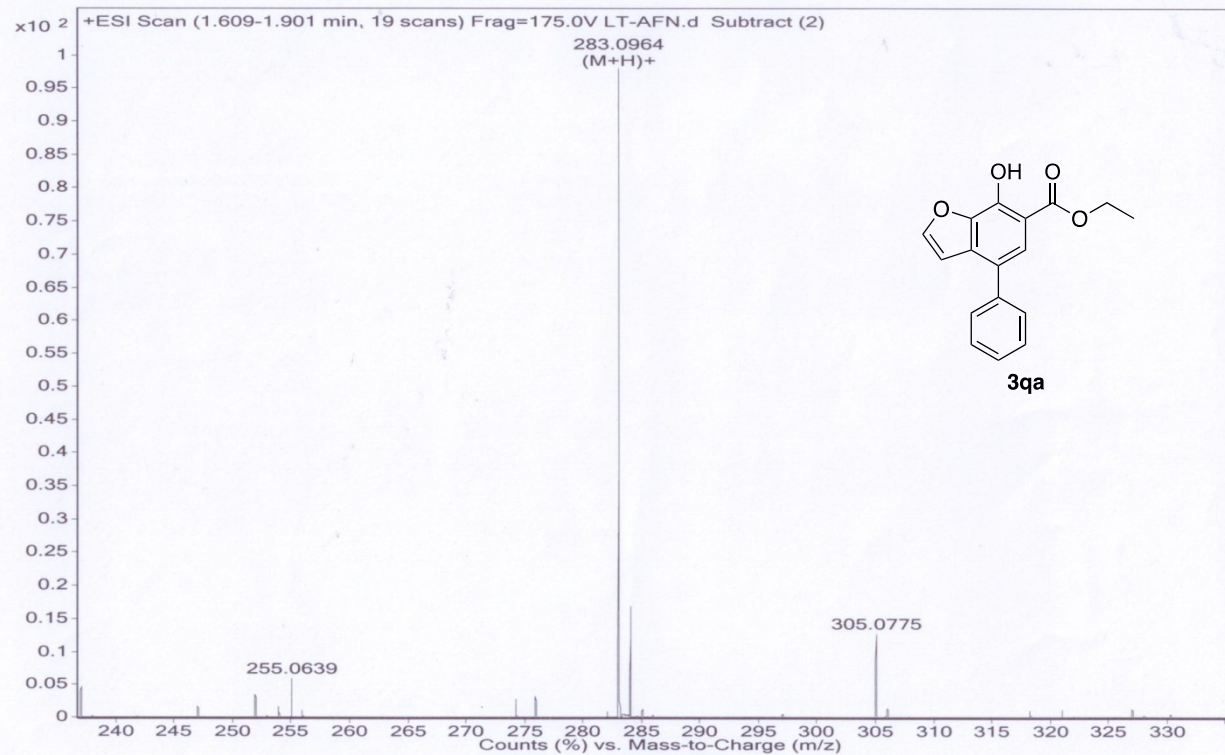


LT-0610-AFN.5.1.1r

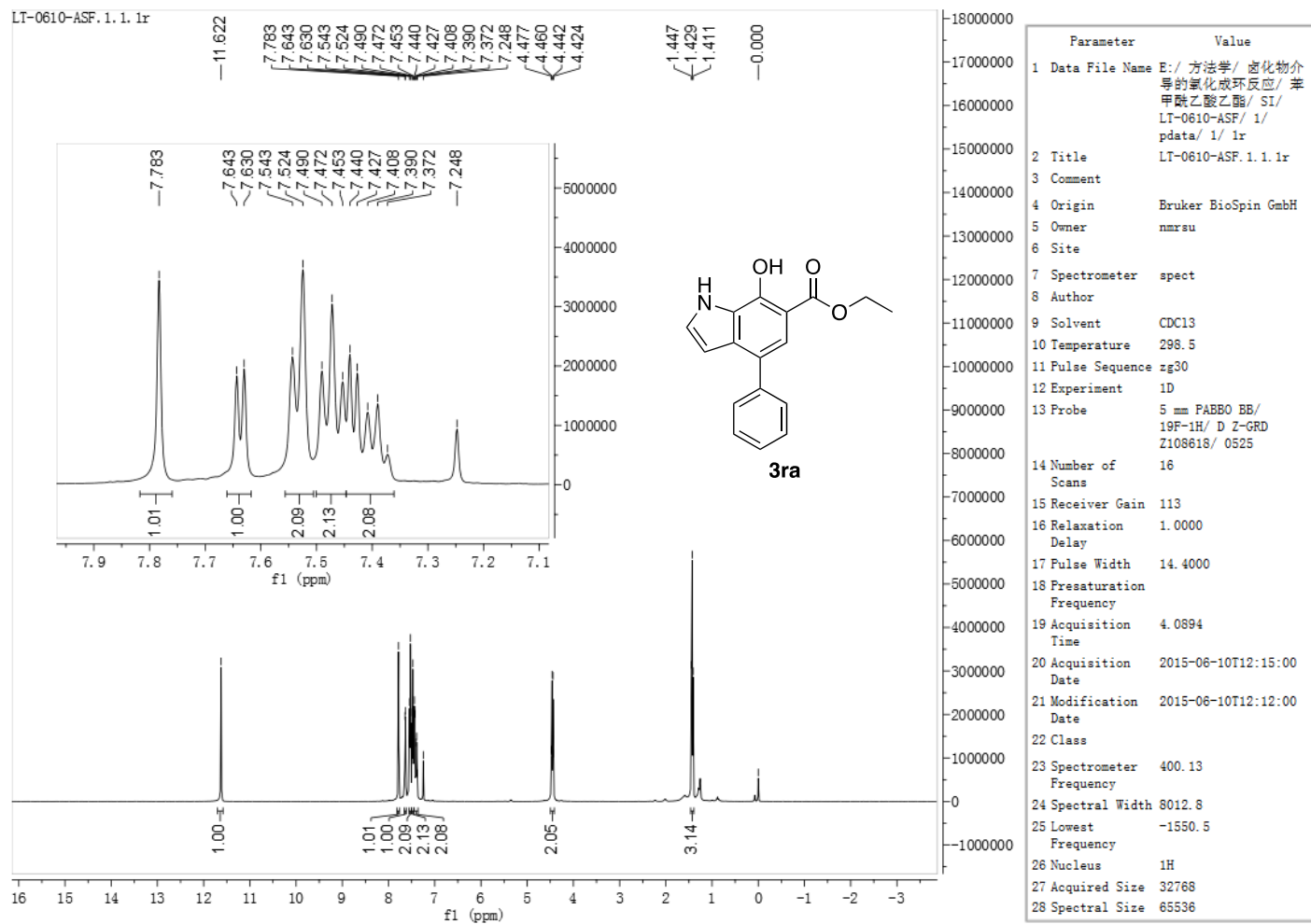


Parameter	Value
1 Data File Name	E:/ 方法学/ 卤化物介 导的氧化成环反应/ 苯 甲酰乙酸乙酯/ SI/ LT-0610-AFN/ 5/ pdata/ 1/ 1r
2 Title	LT-0610-AFN.5.1.1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDC13
10 Temperature	299.2
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	382
15 Receiver Gain	159
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2015-06-10T13:34:00
21 Modification Date	2015-06-10T13:39:00
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

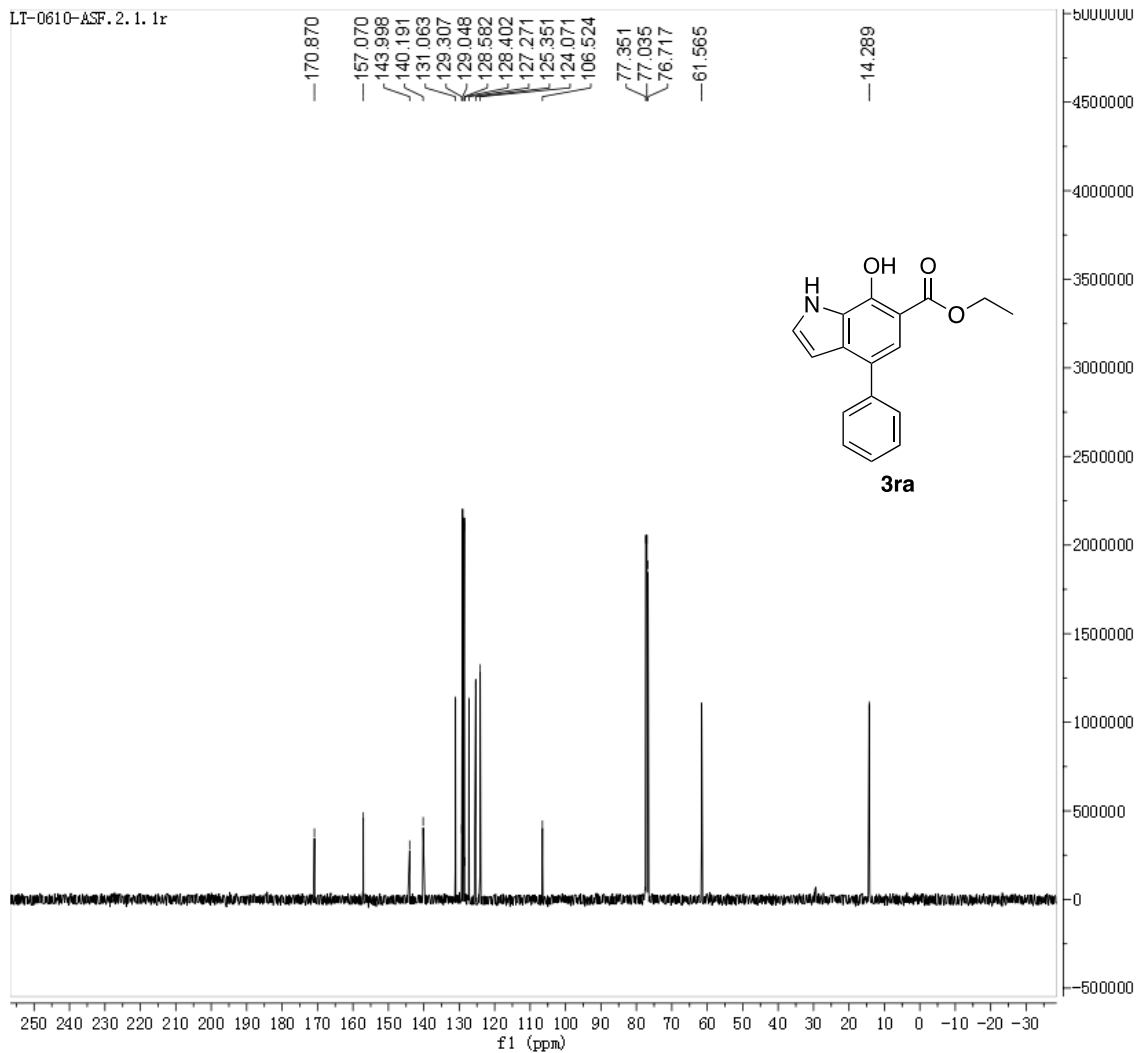
Sample Name	lc/ms	Position	P1-A1	Instrument Name	Instrument 1	User Name	
Inj Vol	-1	InjPosition		SampleType	Sample	IRM Calibration Status	Some Ions Missed
Data Filename	LT-AFN.d	ACQ Method	chen-ms.m	Comment		Acquired Time	6/15/2015 10:25:29 AM



**Ethyl 7-hydroxy-4-phenyl-1H-indole-6-carboxylate(3ra).**

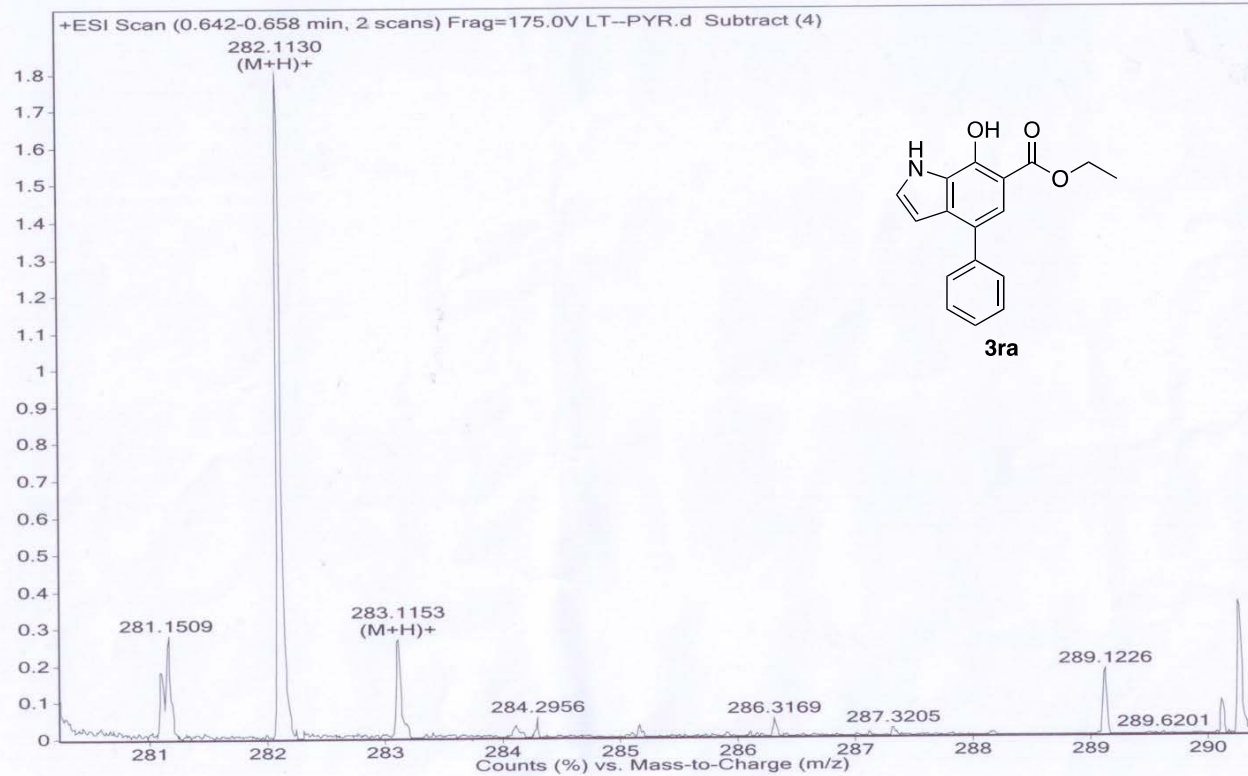


LT-0610-ASF.2.1.1r

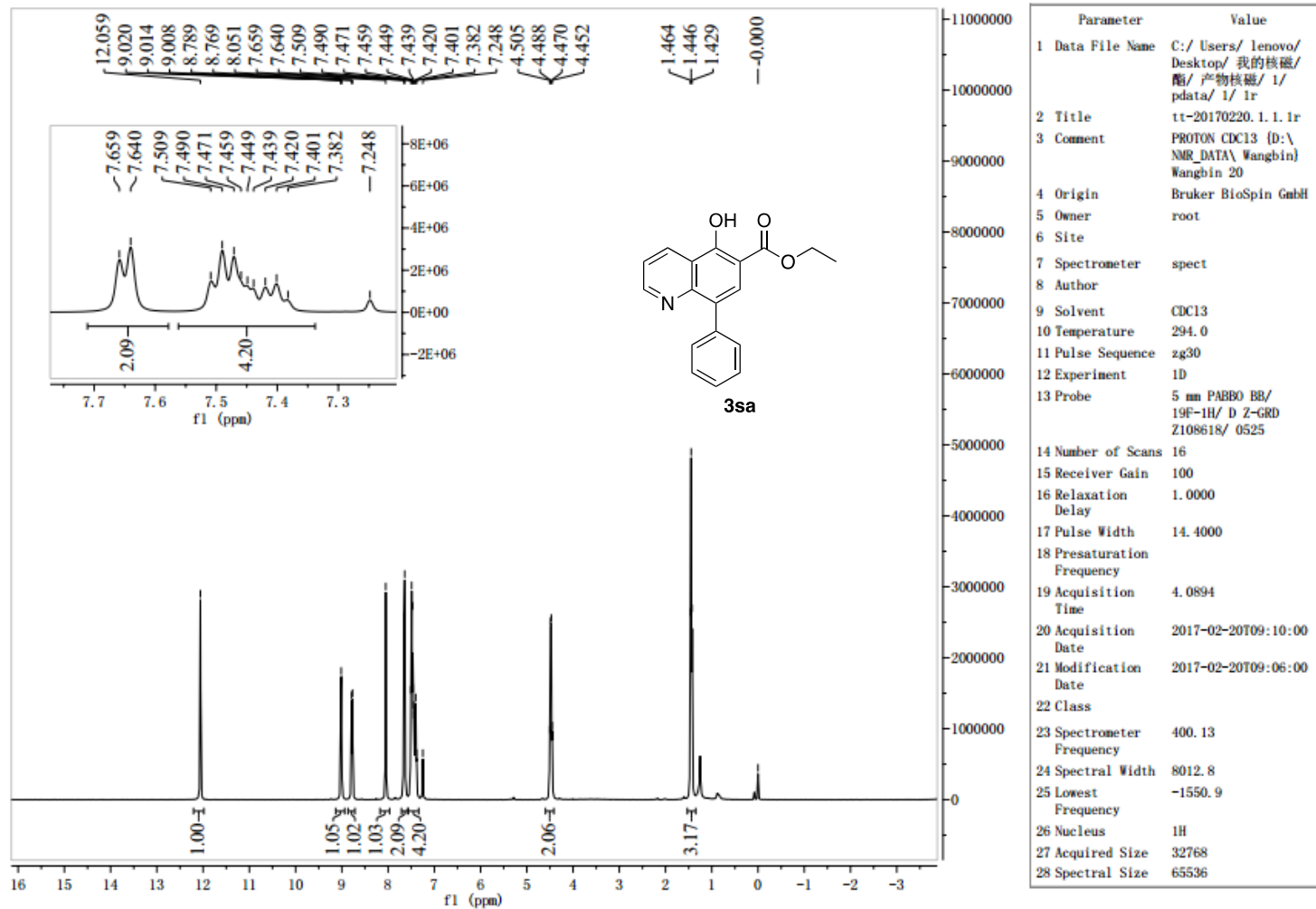


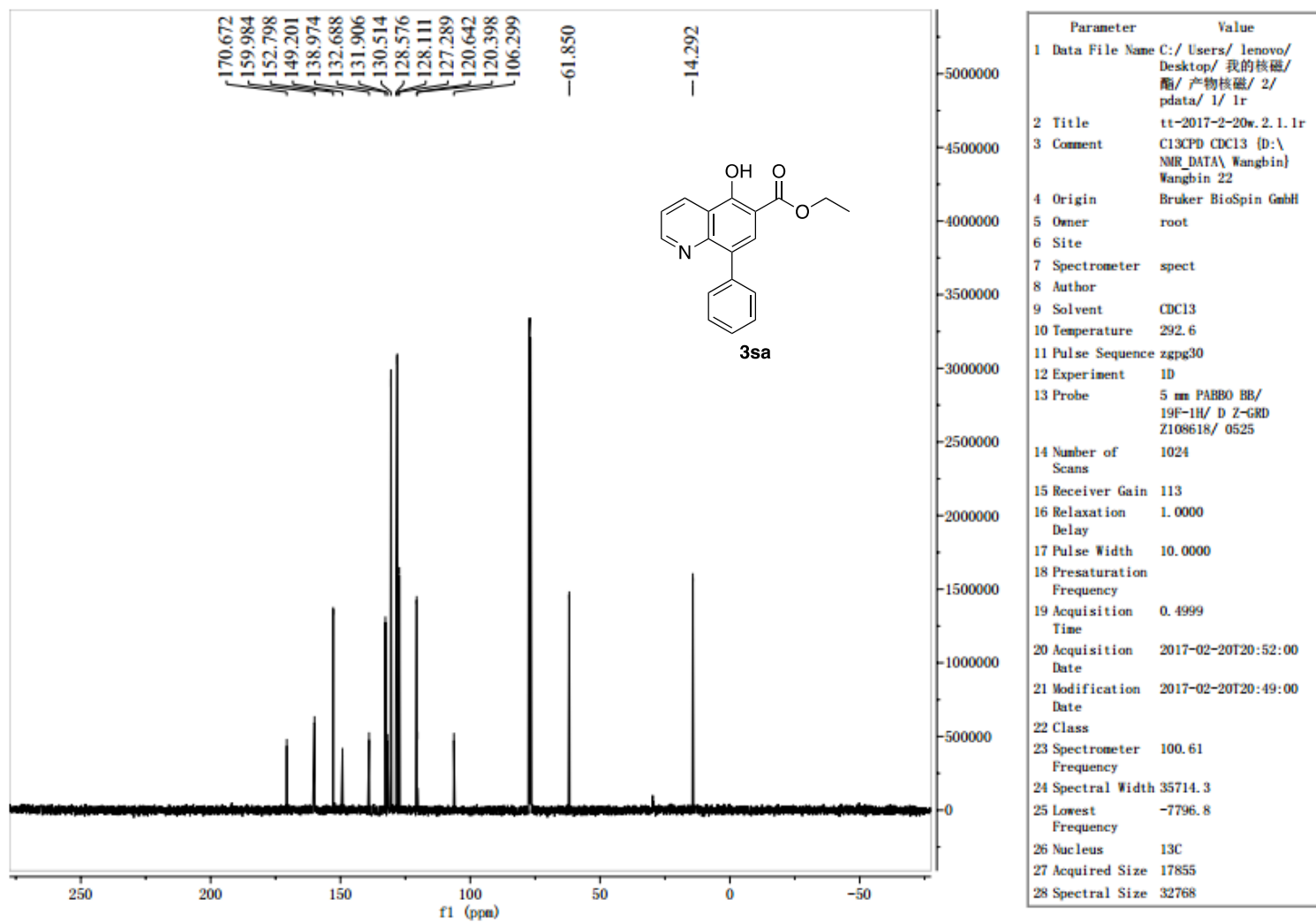
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1 Data File Name	E:/ 方法学/ 虚化物介 导的氧化成环反应/ 苯 甲酰乙酸乙酯/ SI/ LT-0610-ASF/ 2/ pdata/ 1/ 1r
2 Title	LT-0610-ASF.2.1.1r
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDC13
10 Temperature	299.8
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	723
15 Receiver Gain	119
16 Relaxation Delay	1.0000
17 Pulse Width	9.5000
18 Presaturation Frequency	
19 Acquisition Time	0.4999
20 Acquisition Date	2015-06-10T12:33:00
21 Modification Date	2015-06-10T12:31:00
22 Class	
23 Spectrometer Frequency	100.61
24 Spectral Width	35714.3
25 Lowest Frequency	-7796.6
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

Sample Name	A11	Position	P1-B2	Instrument Name	Instrument 1	User Name	
Inj Vol	-1	InjPosition		SampleType	Sample	IRM Calibration Status	Some Ions Missed
Data Filename	LT-PYR.d	ACQ Method	chen-ms.m	Comment		Acquired Time	6/26/2015 4:56:18 PM

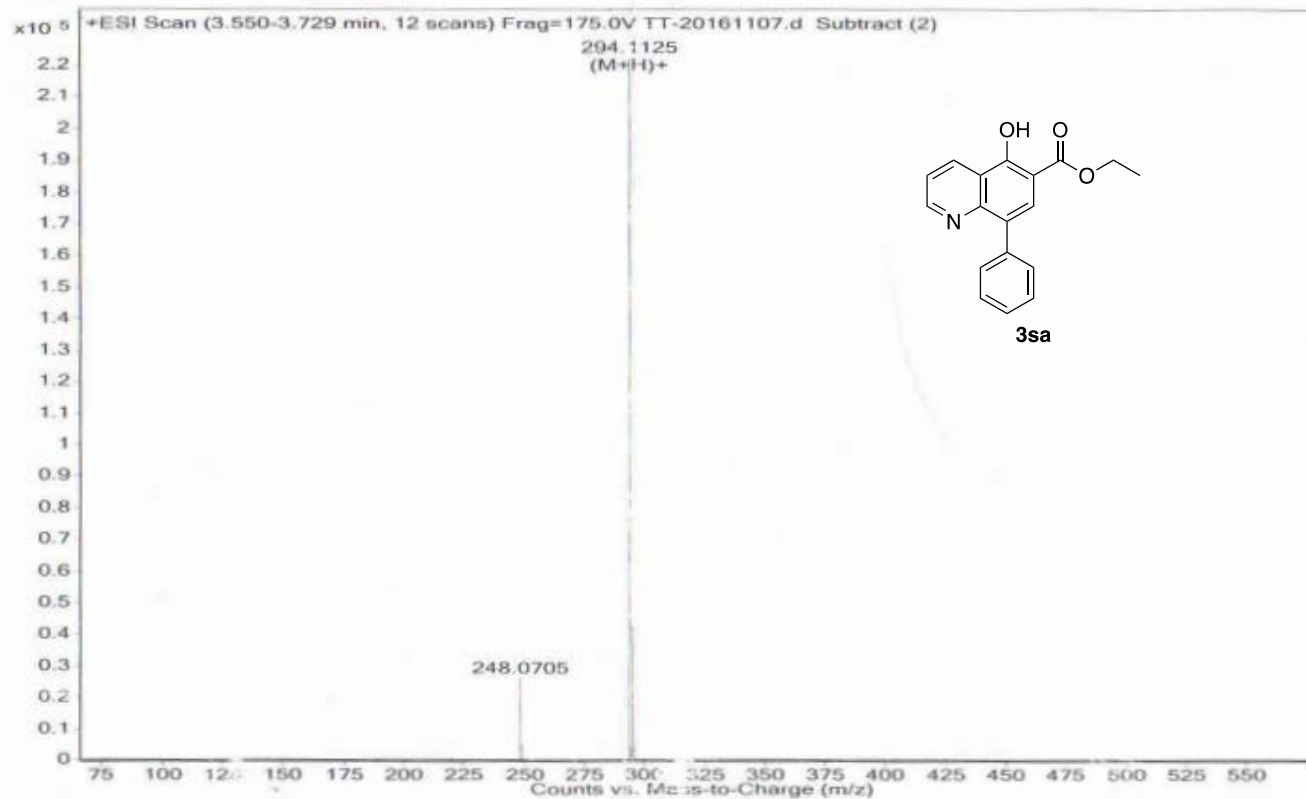


Ethyl 5-hydroxy-8-phenylquinoline-6-carboxylate(3sa).

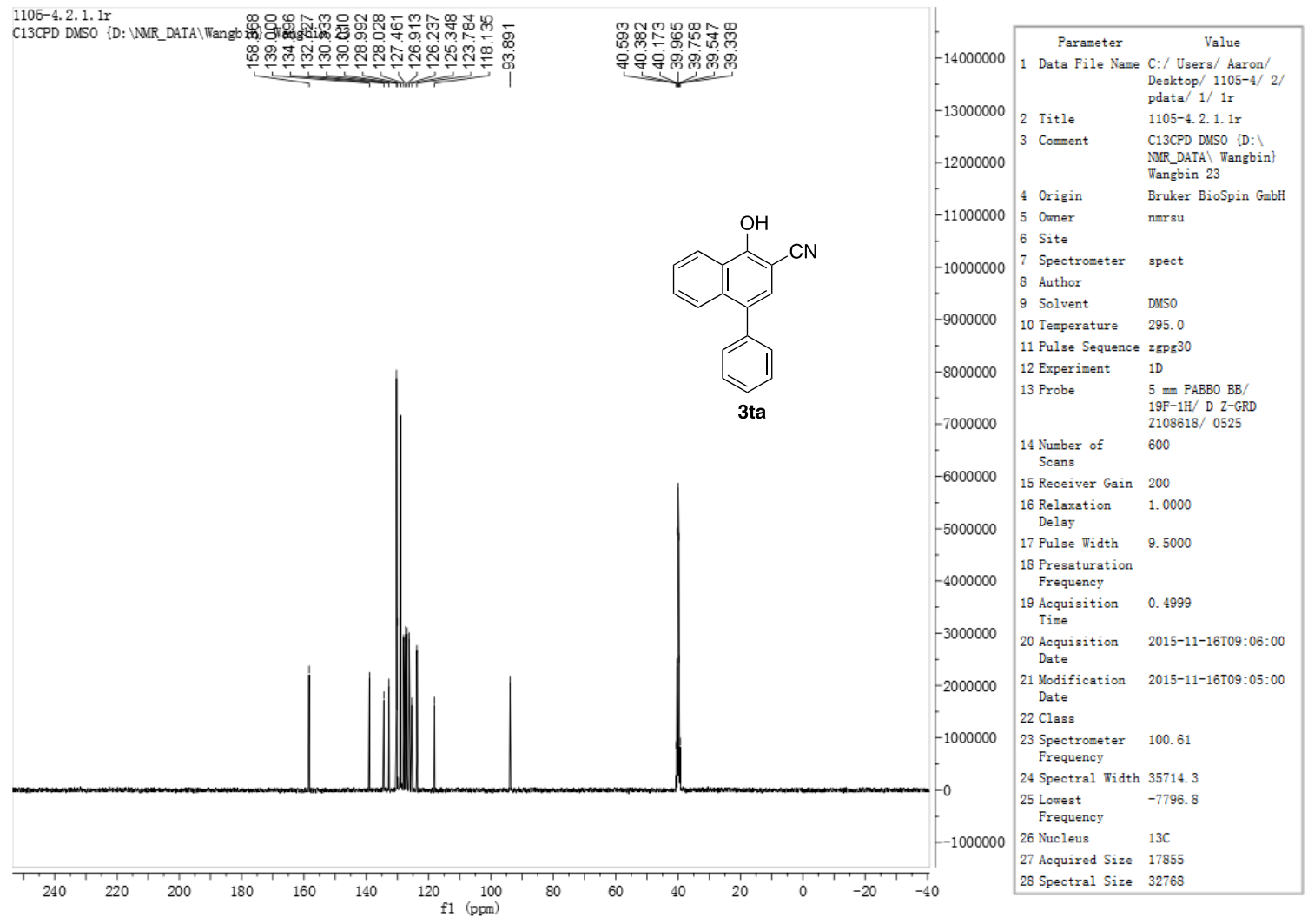




Sample Name	Sample7	Position	PI-A7	Instrument Name	Instrument 1	User Name	
Inj Vol	-1	InjPosition		SampleType	Sample	IRM Calibration Status	Some Ions Missed
Data Filename	TT-20161107.d	ACQ Method	chem-ms.m	Comment		Acquired Time	11/16/2016 5:20:22 PM





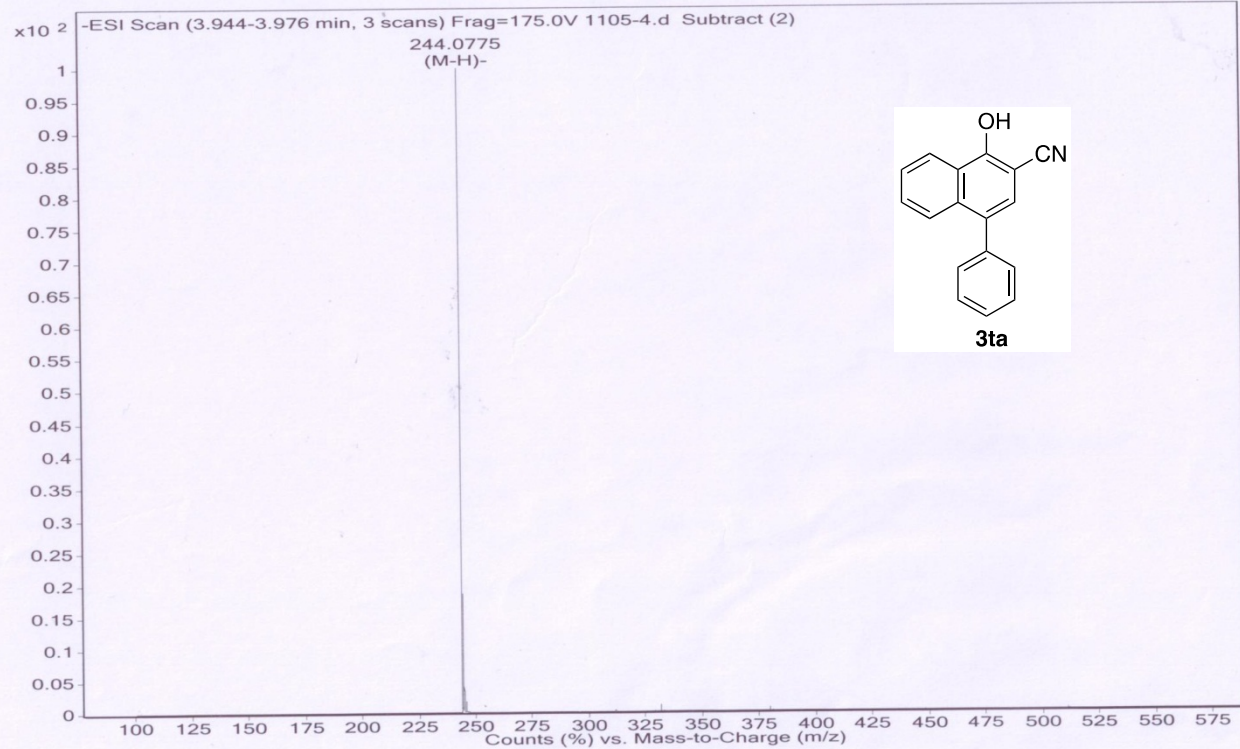


Sample Name lc/ms  
Inj Vol 1  
Data Filename 1105-4.d

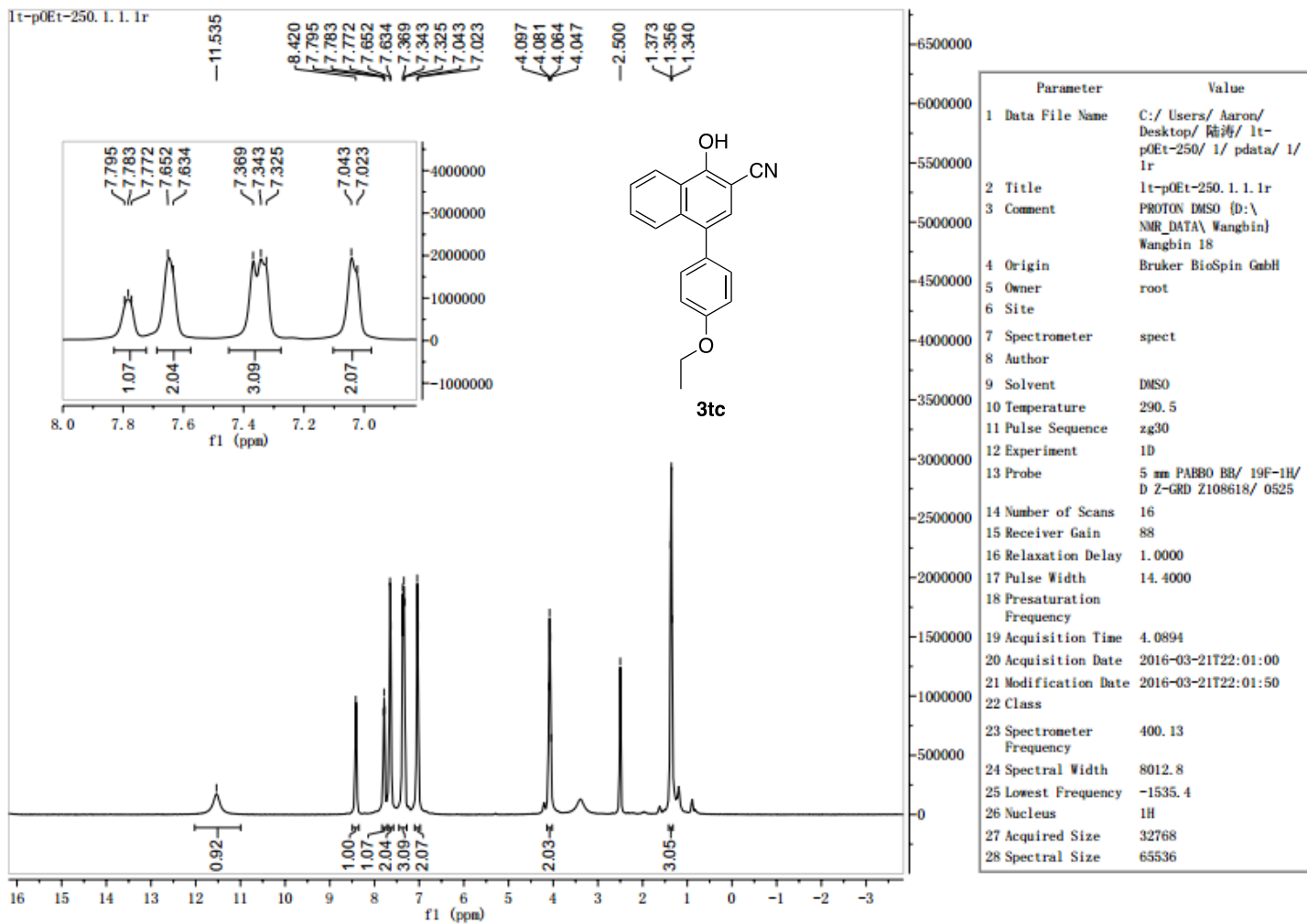
Position P1-A2  
InjPosition  
ACQ Method chen-ms.m

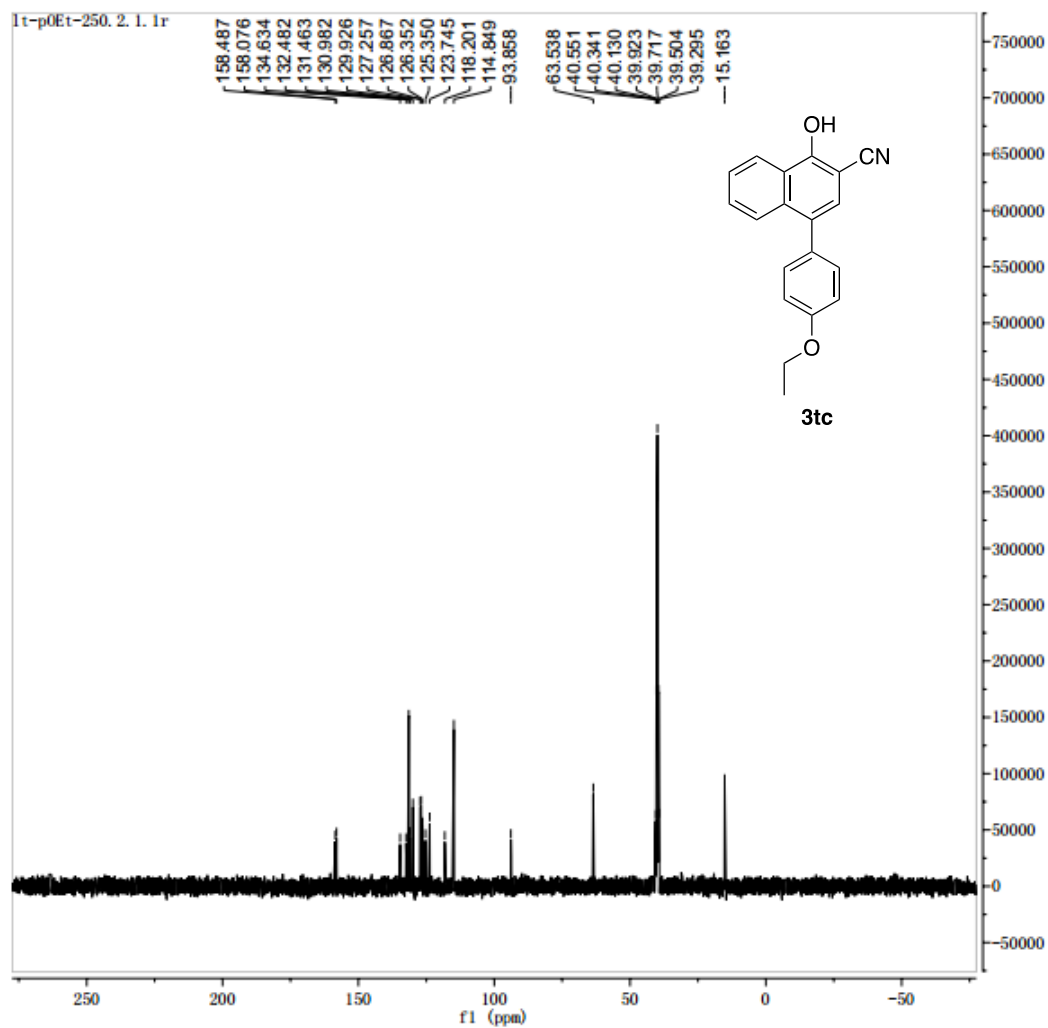
Instrument Name Instrument 1  
SampleType Sample  
Comment

User Name  
IRM Calibration Status Some Ions Missed  
Acquired Time 11/23/2015 2:33:54 PM



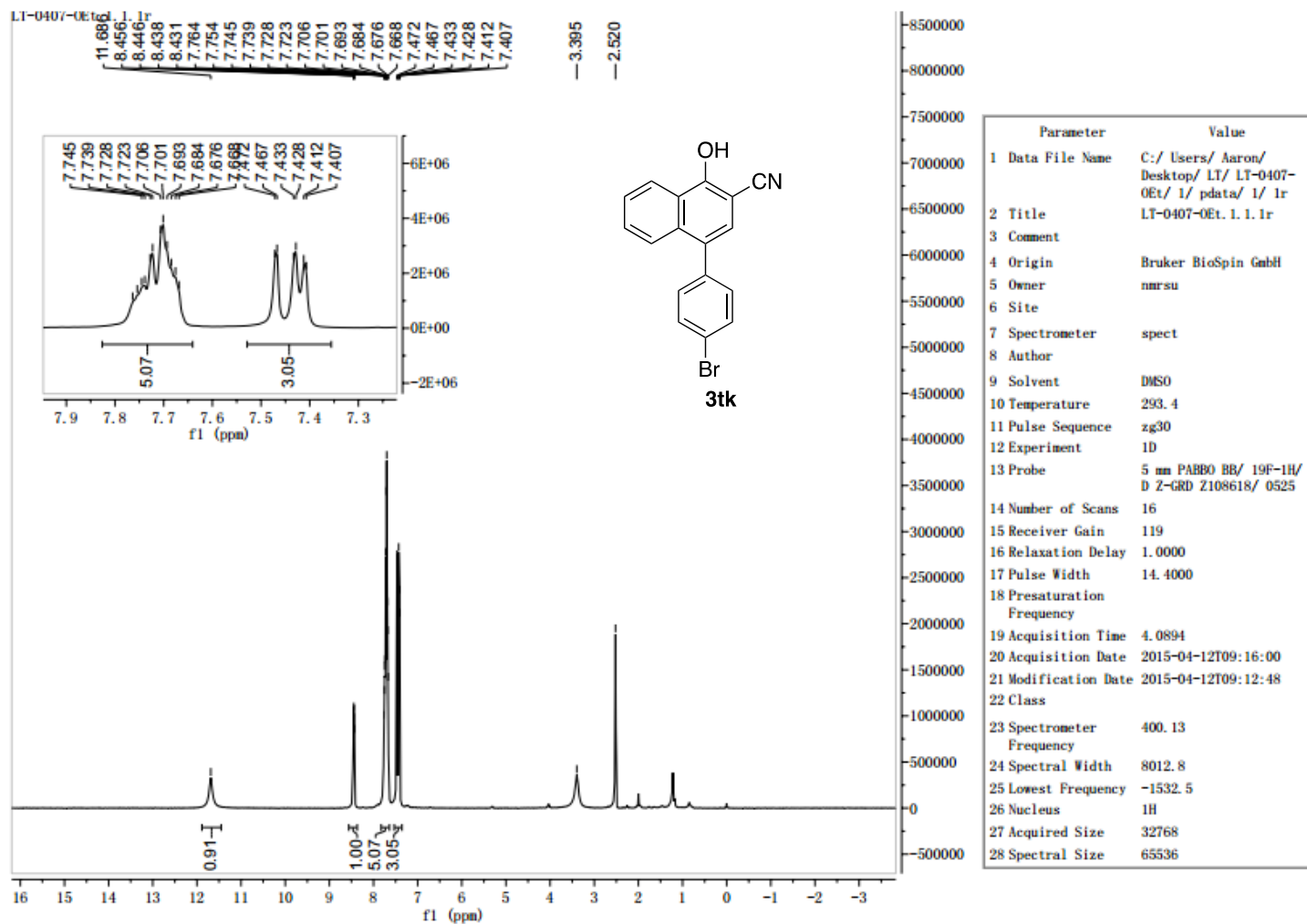
4-(4-Ethoxyphenyl)-1-hydroxy-2-naphthonitrile (**3tc**).

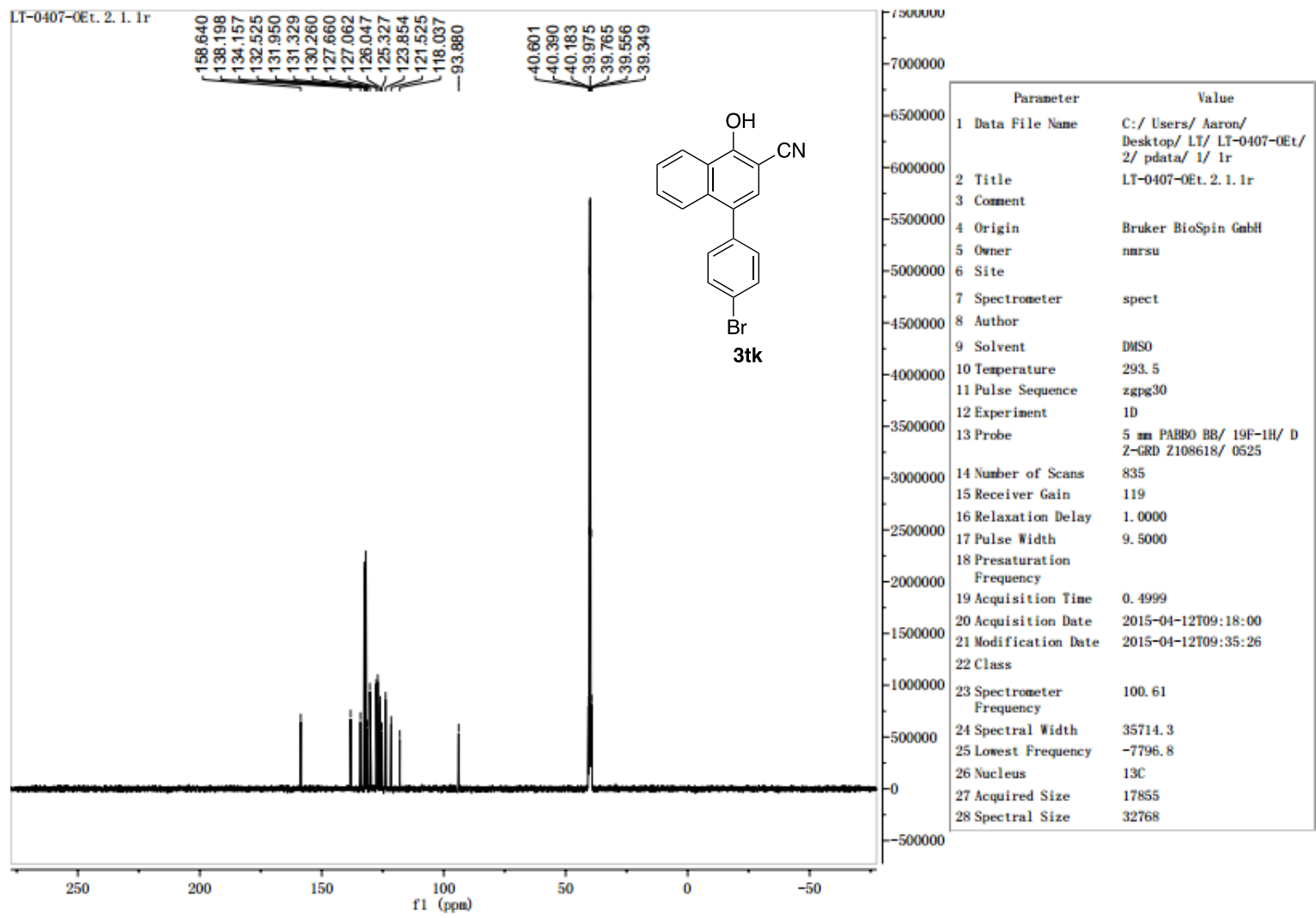




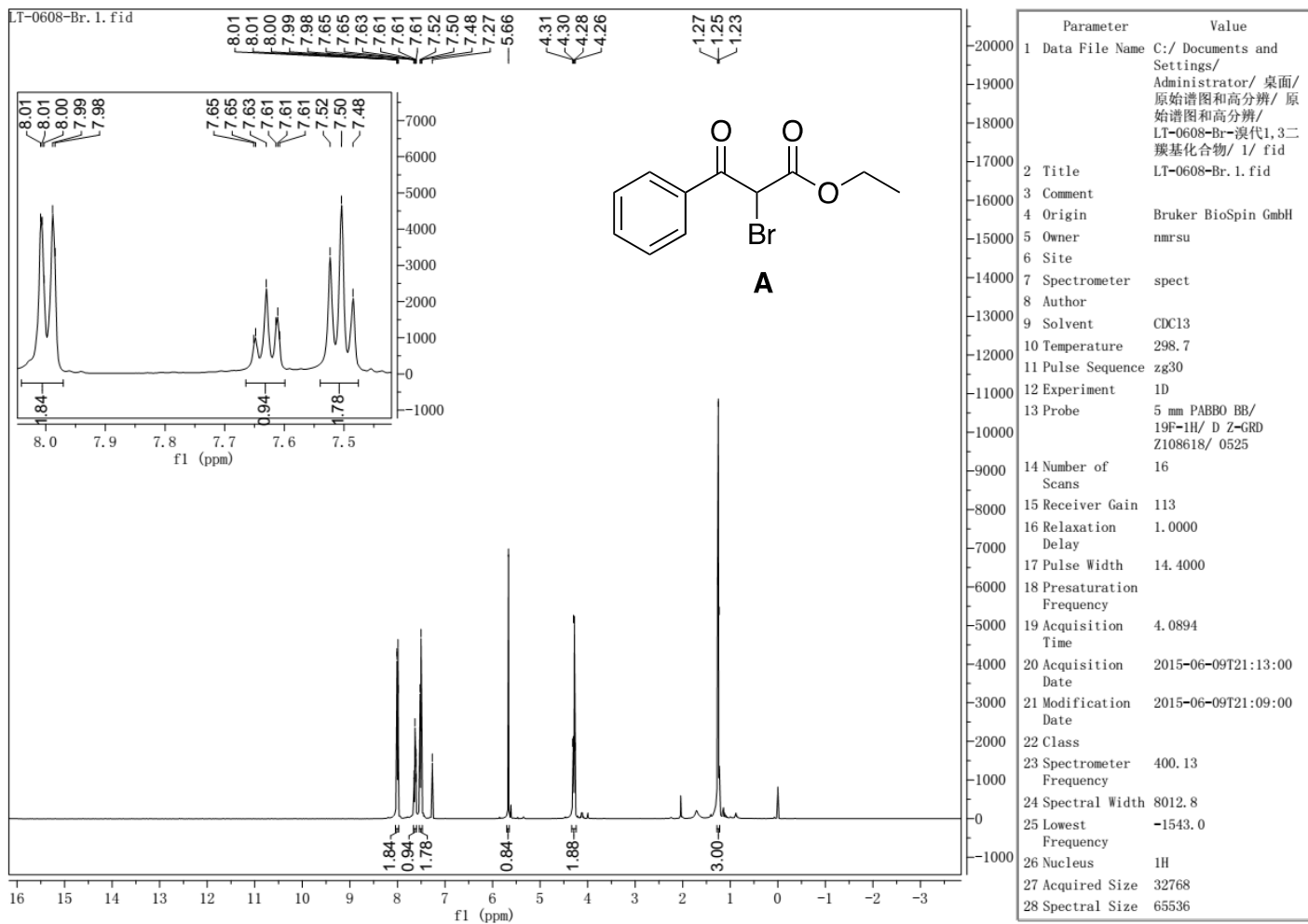
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1 Data File Name	C:/ Users/ Aaron/ Desktop/ 陆涛/ 1t-p0Et-250/ 2/ pdata/ 1/ 1r
2 Title	1t-p0Et-250. 2. 1. 1r
3 Comment	C13CPD DMSO (D:\ NMR_DATA\ Wangbin) Wangbin 18
4 Origin	Bruker BioSpin GmbH
5 Owner	root
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	DMSO
10 Temperature	290. 8
11 Pulse Sequence	zgpg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	61
15 Receiver Gain	113
16 Relaxation Delay	1. 0000
17 Pulse Width	10. 0000
18 Presaturation Frequency	
19 Acquisition Time	0. 4999
20 Acquisition Date	2016-03-21T22:02:00
21 Modification Date	2016-03-21T22:04:12
22 Class	
23 Spectrometer Frequency	100. 61
24 Spectral Width	35714. 3
25 Lowest Frequency	-7796. 8
26 Nucleus	13C
27 Acquired Size	17855
28 Spectral Size	32768

4-(4-Bromophenyl)-1-hydroxy-2-naphthonitrile (3tk).

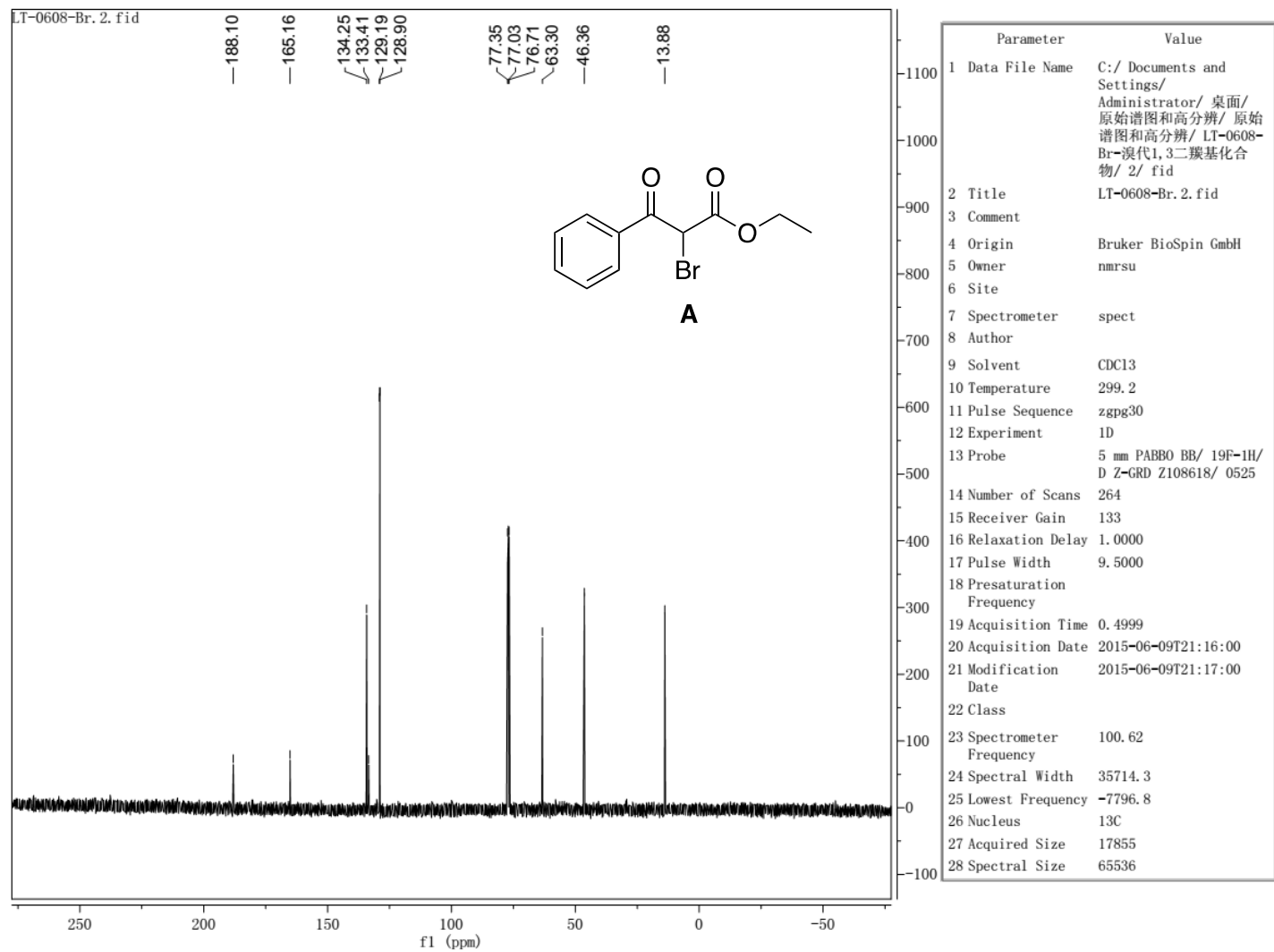




# Ethyl 2-benzoyl-2-bromoacetate A



Parameter	Value
1 Data File Name	C:/ Documents and Settings/Administrator/ 桌面/ 原始谱图和高分辨/ 原始谱图和高分辨/ LT-0608-Br-溴代1,3二羧基化合物/ 1/ fid
2 Title	LT-0608-Br. 1. fid
3 Comment	
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDC13
10 Temperature	298.7
11 Pulse Sequence	zg30
12 Experiment	1D
13 Probe	5 mm PABBO BB/ 19F-1H/ D Z-GRD Z108618/ 0525
14 Number of Scans	16
15 Receiver Gain	113
16 Relaxation Delay	1.0000
17 Pulse Width	14.4000
18 Presaturation Frequency	
19 Acquisition Time	4.0894
20 Acquisition Date	2015-06-09T21:13:00
21 Modification Date	2015-06-09T21:09:00
22 Class	
23 Spectrometer Frequency	400.13
24 Spectral Width	8012.8
25 Lowest Frequency	-1543.0
26 Nucleus	1H
27 Acquired Size	32768
28 Spectral Size	65536



Sample Name	lc/ms	Position	P1-B3	Instrument Name	Instrument 1	User Name	
Inj Vol	1	InjPosition		SampleType	Sample	IRM Calibration Status	Some Ions Missed
Data Filename	0608-DOWN.d	ACQ Method	chen-ms.m	Comment		Acquired Time	11/26/2015 11:54:42 AM

