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Supporting Information for

Gold-catalyzed π-directed regioselective cyclization of bis(*o*-alkynyl benzyl alcohols): a rapid access to dihydroisobenzofuran derivatives

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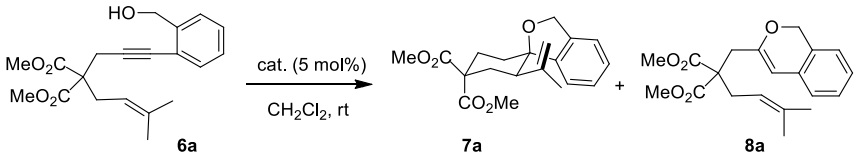
Contents

-The details for the reaction of enynol 6a by gold catalysis.

A variety of gold catalysts were screened. As seen from the below Table 1, $Ph_3PAuNTf_2$ was proved to be effective and selective.

Table 1. Effects of the Catalysts[a]

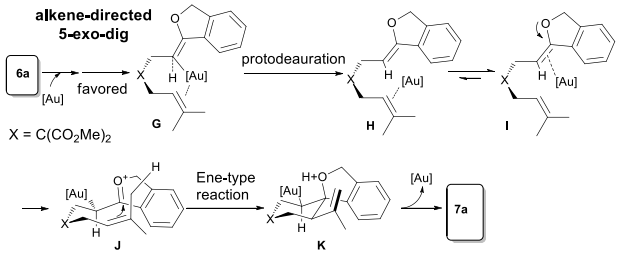


6a 7a 8a

Entry	catalyst	Time (h)	Yield of **7a**+**8a** (%)[b]	**7a**/**8a**[c]
1	PPh_3AuNTf_2	1	92	>20/1
2	$(o\text{-}CH_3C_6H_4)_3P\ AuNTf_2$	3	75	8/1
3	$(p\text{-}CH_3OC_6H_4)_3P\ AuNTf_2$	2	82	14/1
4	$(2,4\text{-}^tBu_2C_6H_4O)_3P\ AuNTf_2$	1	60	5/1
5	$Cy_3PAuNTf_2$	6	81	1.2/1
6	CyJohnPhos $AuNTf_2$	6	86	1/2
7	XPhos $AuNTf_2$	2	79	1/4
8	JohnPhos$AuNTf_2$	1	92	0/1
9	IPr$AuNTf_2$	2	73	1/15

[a] All reactions were performed using **6a** (0.1 mmol), catalyst (5 mol%) in CH_2Cl_2 (1 mL) at room temperature unless otherwise noted. [b] Yield of isolated products (**7a**+**8a**) via column chromatography. [c] Judged by ^1H NMR spectroscopic analysis of the crude products.

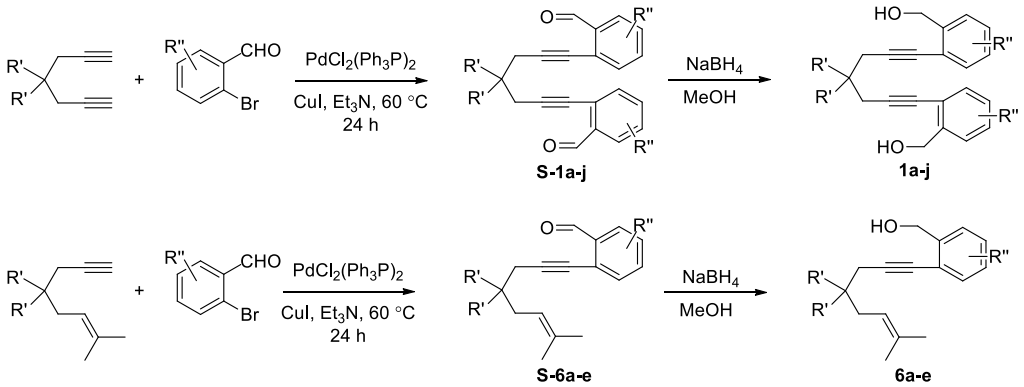
A possible mechanism for this reaction is shown in Scheme 1. Initially, the coordination of a gold catalyst to the alkyne and then 5-exo-dig cyclization could give intermediate **G**, which led to complex **H** by protodeauration. Complex **I** could be equilibrium with complex **H**. The aurated complex **J** can be formed by tautomerization of the enol ether **I**, followed by an Ene type reaction by a chair-like conformation to afford the complex **K**. After protodeauration, the desired product **7a** can be provided.



Scheme 1 Possible mechanism for the formation of **7a**.

-Synthesis of the substrates 1a-1j and 6a-e.

General route



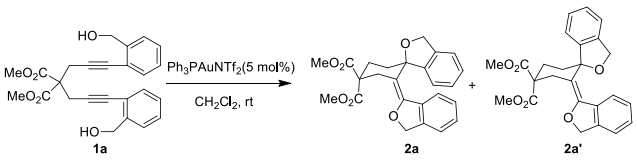
A schlenk flask charged with a stirring bar and $PdCl_2(Ph_3P)_2$ (4 mol%) was evacuated and filled with argon three times, then Et_3N (6 mL), the diyne (2 mmol) and *o*-bromoarylaldehyde (4.4 mmol) was added successively. The mixture was stirred at room temperature for 2 minutes before CuI (4 mol%) was added. The resulting reaction mixture was stirred at 60 ℃ for 24 hours and quenched with aqueous NH_4Cl (6 mL), extracted with EtOAc (3 x 15 mL), washed by brine (6 mL), the organic phase was dried over $MgSO_4$, and then filtered. After removal of the solvent, the residue was purified by flash column chromatography (silica gel 300 mesh: petrol ether/ethyl acetate = 20:1) to give the pure **S-1a-j** in 55-90% yields without further optimization.

The **S-6a-e** was obtained from the reaction of the corresponding enyne (3 mmol), *o*-bromoarylaldehyde (2 mmol), $PdCl_2(Ph_3P)_2$ (2 mol%) and CuI (2 mol%) in Et_3N (6 mL) in 45-85% yields usually without further optimization.

To a solution of the above dialdehyde **S-1a-j** (1 mmol) in methanol (3 mL) at -10 ℃, $NaBH_4$ (2.1 eq) was added in batchs. The reaction was stirred for additional 10 minutes at the same temperature and then quenched with water (1 mL). The resulting mixture was extracted with EtOAc (3 X 10 mL). The organic phase was combined and washed with brine (10 mL), dried over $MgSO_4$, and filtered. After removal of the solvent under reduced pressure, the residue was purified by flash column chromatography (silica gel 300 mesh: petrol ether/ethyl acetate = 3:1) to give the pure **1a-j** in 35-70% yields.

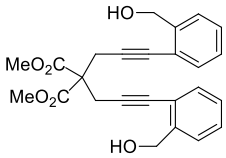
The substrate **6a-e** was obtained from the reaction of the corresponding aldehyde **S-6a-e** (1 mmol) and $NaBH_4$ (1.05 eq) in methanol in 40-85% yields.

-Typical procedure for gold catalysis.



To a solution of the substrate **1a** (0.2 mmol) in dichloromethane (2 mL), $Ph_3PAuNTf_2$ (5 mol%) was added. The resulting solution was stirred at room temperature. After finishing the reaction, the solvent was removed. The crude residue was purified by flash column chromatography on silica gel (petrol ether/ethyl acetate = 20:1) to give the desired product **2a** in 84% yield with a 14/1 mixture of the isomers (**2a**/**2a'** = 14/1).

-Characterization for the substrates 1a-1j and 6a-e.

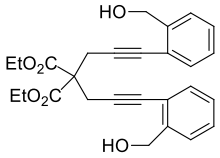


1a

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.40 (dd, *J* = 7.5, 7.5 Hz, 4H), 7.31 (ddd, *J* = 7.5, 7.5, 1.3 Hz, 2H), 7.23 (ddd, *J* = 7.5, 7.5, 1.4 Hz, 2H), 4.75 (s, 4H), 3.83 (s, 6H), 3.32 (s, 4H), 2.52 (b, 2H).

^{13}C NMR (100 M, $CDCl_3$): δ 169.7, 142.6, 132.5, 128.6, 127.7, 127.5, 121.3, 88.3, 81.7, 63.9, 56.9, 53.4, 24.3.

HRMS (ESI) calcd. For $C_{25}H_{25}O_6$ $(M + H)^+$: 421.1646, Found: 421.1650.

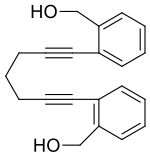


1b

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.44-7.37 (m, 4H), 7.30 (ddd, *J* = 7.5, 7.5, 1.3 Hz, 2H), 7.22 (ddd, *J* = 7.5, 7.4, 1.2 Hz, 2H), 4.75 (s, 4H), 4.29 (q, *J* = 7.1 Hz, 4H), 3.31 (s, 4H), 2.60 (b, 2H), 1.29 (t, *J* = 7.1 Hz, 6H).

^{13}C NMR (100 M, $CDCl_3$): δ 169.3, 142.6, 132.5, 128.5, 127.8, 127.4, 121.4, 88.5, 81.6, 63.9, 62.3, 56.8, 24.2, 14.0.

HRMS (ESI) calcd. For $C_{27}H_{29}O_6$ $(M + H)^+$: 449.1959, Found: 449.1959.

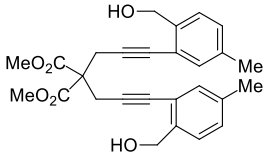


1c

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.42 (d, *J* = 7.6 Hz, 2H), 7.39 (d, *J* = 7.4 Hz, 2H), 7.29 (ddd, *J* = 7.5, 7.4, 1.2 Hz, 2H), 7.22 (ddd, *J* = 7.5, 7.5, 1.3 Hz, 2H), 4.80 (s, 4H), 2.67 (t, *J* = 6.9 Hz, 4H), 2.30 (b, 2H), 1.93 (quint, *J* = 6.9 Hz, 2H).

^{13}C NMR (100 M, $CDCl_3$): δ 142.4, 132.2, 128.1, 127.4, 127.3, 121.9, 93.8, 79.1, 64.0, 27.5, 18.6.

HRMS (ESI) calcd. For $C_{21}H_{21}O_2$ $(M + H)^+$: 305.1536, Found: 305.1537.

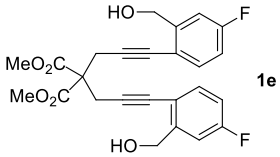


1d

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.26 (d, *J* = 7.8 Hz, 2H), 7.22 (s, 2H), 7.10 (d, *J* = 7.8 Hz, 2H), 4.70 (s, 4H), 3.82 (s, 6H), 3.31 (s, 4H), 2.35 (b, 2H), 2.30 (s, 6H).

^{13}C NMR (100 M, $CDCl_3$): δ 169.7, 139.8, 137.2, 133.0, 129.4, 127.8, 121.2, 87.8, 81.9, 63.7, 57.0, 53.3, 24.3, 20.8.

HRMS (ESI) calcd. For $C_{27}H_{29}O_6$ $(M + H)^+$: 449.1959, Found: 449.1960.

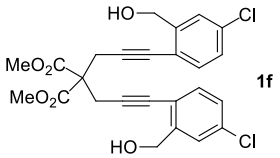


1e

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.37 (dd, *J* = 8.5, 5.6 Hz, 2H), 7.15 (dd, *J* = 9.3, 2.6 Hz, 2H), 6.91 (dd, *J* = 8.5, 8.3, 2.6 Hz, 2H), 4.73 (d, *J* = 5.3 Hz, 4H), 3.82 (s, 6H), 3.29 (s, 4H), 2.43 (t, *J* = 5.3 Hz, 2H).

^{13}C NMR (100 M, $CDCl_3$): δ 169.6, 162.7 (d, *J* = 248.5 Hz), 145.4 (d, *J* = 7.3 Hz), 134.2 (d, *J* = 8.2 Hz), 116.9 (d, *J* = 2.6 Hz), 114.6 (d, *J* = 18.2 Hz), 114.4 (d, *J* = 17.5 Hz), 88.0, 80.7, 63.4, 56.9, 53.3, 24.3.

HRMS (ESI) calcd. For $C_{25}H_{23}F_2O_6$ $(M + H)^+$: 457.1457, Found: 457.1460.

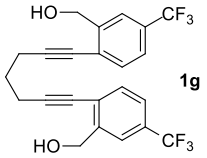


1f

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.40 (d, *J* = 2.0 Hz, 2H), 7.30 (d, *J* = 8.2 Hz, 2H), 7.18 (dd, *J* = 8.2, 2.0 Hz, 2H), 4.70 (s, 4H), 3.81 (s, 6H), 3.28 (s, 4H), 2.72 (b, 2H).

^{13}C NMR (100 M, $CDCl_3$): δ 169.6, 144.4, 134.6, 133.5, 127.6, 127.5, 119.4, 89.2, 80.7, 63.2, 56.7, 53.4, 24.3.

HRMS (ESI) calcd. For $C_{25}H_{23}Cl_2O_6$ $(M + H)^+$: 489.0866, Found: 489.0865.

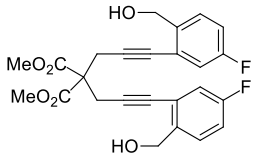


1g

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.72 (s, 2H), 7.50 (d, *J* = 8.1 Hz, 2H), 7.47 (dd, *J* = 8.2, 1.3 Hz, 2H), 4.86 (s, 4H), 2.70 (t, *J* = 6.9 Hz, 4H), 2.33 (b, 2H), 1.96 (quint, *J* = 6.9 Hz, 2H).

^{13}C NMR (100 M, $CDCl_3$): δ 143.2, 132.4, 129.9 (q, *J* = 32.3 Hz), 125.2, 124.0 (q, *J* = 3.8 Hz) 123.7 (q, *J* = 3.7 Hz), 122.5, 96.4, 78.1, 63.3, 27.2, 18.7.

HRMS (ESI) calcd. For $C_{23}H_{19}F_6O_2$ $(M + H)^+$: 441.1284, Found: 441.1286.

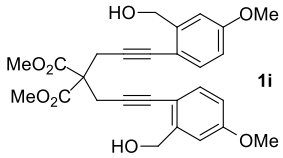


1h

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.35 (dd, *J* = 8.5, 5.8 Hz, 2H), 7.09 (dd, *J* = 9.1, 2.7 Hz, 2H), 7.00 (ddd, *J* = 8.5, 8.4, 2.7 Hz, 2H), 4.70 (s, 4H), 3.83 (s, 6H), 3.30 (s, 4H), 2.54 (b, 2H).

^{13}C NMR (100 M, $CDCl_3$): δ 169.5, 161.7 (d, *J* = 245.2 Hz), 138.6 (d, *J* = 3.0 Hz), 129.6 (d, *J* = 8.6 Hz), 123.2 (d, *J* = 9.6 Hz), 119.1 (d, *J* = 22.9 Hz), 115.8 (d, *J* = 21.0 Hz), 89.2, 80.8 (d, *J* = 3.0 Hz), 63.2, 56.8, 53.4, 24.3.

HRMS (ESI) calcd. For $C_{25}H_{23}F_2O_6$ $(M + H)^+$: 457.1457, Found: 457.1460.

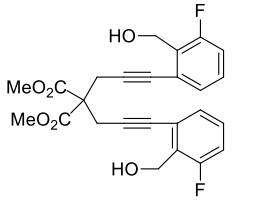


1i

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.33 (d, *J* = 8.5 Hz, 2H), 6.95 (d, *J* = 2.6 Hz, 2H), 6.75 (dd, *J* = 8.5, 2.6 Hz, 2H), 4.72 (s, 4H), 3.812 (s, 6H), 3.810 (s, 6H), 3.29 (s, 4H), 2.54 (b, 2H).

^{13}C NMR (100 M, $CDCl_3$): δ 169.8, 159.8, 144.4, 133.8, 113.3, 113.2, 113.0, 86.8, 81.5, 64.0, 57.0, 55.3, 53.3, 24.3.

HRMS (ESI) calcd. For $C_{27}H_{29}O_8$ $(M + H)^+$: 481.1857, Found: 481.1856

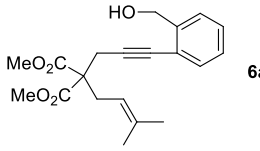


1j

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.24-7.17 (m, 4H), 7.07-7.00 (m, 2H), 4.81 (s, 4H), 3.84 (s, 6H), 3.32 (s, 4H), 2.58 (b, 2H).

^{13}C NMR (100 M, $CDCl_3$): δ 169.6, 161.0 (d, *J* = 245.6 Hz), 129.5 (d, *J* = 16.5 Hz), 129.3 (d, *J* = 9.4 Hz), 128.5 (d, *J* = 3.2 Hz), 124.6 (d, *J* = 5.4 Hz), 116.0 (d, *J* = 22.8 Hz), 88.7, 81.1 (d, *J* = 4.0 Hz), 56.8, 56.7 (d, *J* = 4.9 Hz), 53.5, 24.4.

HRMS (ESI) calcd. For $C_{25}H_{23}F_2O_6$ $(M + H)^+$: 457.1457, Found: 457.1457.



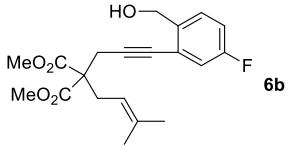
6a

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.41-7.36 (m, 2H), 7.29 (ddd, *J* = 7.6, 7.5, 1.2 Hz, 1H), 7.22 (ddd, *J* = 7.6, 7.4, 1.2 Hz, 1H), 4.94 (tt, *J* = 7.7, 1.3 Hz, 1H),

4.73 (d, *J* = 6.3 Hz, 2H), 3.76 (s, 6H), 3.03 (s, 2H), 2.83 (d, *J* = 7.7 Hz, 2H), 2.55 (t, *J* = 6.3 Hz, 1H), 1.71 (s, 3H), 1.66 (s, 3H).

^{13}C NMR (100 M, $CDCl_3$): δ 170.8, 142.6, 137.1, 132.4, 128.4, 127.8, 127.5, 121.7, 116.9, 89.4, 81.1, 64.0, 57.5, 52.8, 31.1, 26.1, 23.8, 18.0.

HRMS (ESI) calcd. For $C_{20}H_{25}O_5$ $(M + H)^+$: 345.1697, Found: 345.1698.

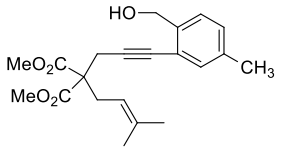


6b

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.34 (dd, *J* = 8.5, 5.8 Hz, 1H), 7.07 (dd, *J* = 9.2, 2.7 Hz, 1H), 6.98 (ddd, *J* = 8.5, 8.4, 2.7 Hz, 1H), 4.94 (tt, *J* = 7.7, 1.4 Hz, 1H), 4.68 (s, 2H), 3.76 (s, 6H), 3.02 (s, 2H), 2.81 (d, *J* = 7.7 Hz, 2H), 2.57 (b, 1H), 1.71 (s, 3H), 1.65 (s, 3H).

^{13}C NMR (100 M, $CDCl_3$): δ 170.8, 161.7 (d, *J* = 244.8 Hz), 138.7 (d, *J* = 3.0 Hz), 137.2, 129.6 (d, *J* = 8.6 Hz), 123.5 (d, *J* = 9.7 Hz), 119.0 (d, *J* = 22.8 Hz), 116.8, 115.5 (d, *J* = 21.1 Hz), 90.5, 80.1 (d, *J* = 3.2 Hz), 63.2, 57.4, 52.8, 31.2, 26.0, 23.8, 18.0.

HRMS (ESI) calcd. For $C_{20}H_{24}FO_5$ $(M + H)^+$: 363.1602, Found: 363.1601.

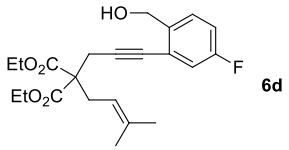


6c

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.25 (d, *J* = 8.0 Hz, 1H), 7.20 (s, 1H), 7.09 (d, *J* = 8.0 Hz, 1H), 4.95 (tt, *J* = 7.7, 1.3 Hz, 1H), 4.68 (s, 2H), 3.76 (s, 6H), 3.02 (s, 2H), 2.83 (d, *J* = 7.7 Hz, 2H), 2.51 (b, 1H), 2.30 (s, 3H), 1.71 (s, 3H), 1.66 (s, 3H).

^{13}C NMR (100 M, $CDCl_3$): δ 170.8, 139.8, 137.2, 137.1, 132.9, 129.2, 127.9, 121.6, 116.9, 88.8, 81.2, 63.8, 57.5, 52.8, 31.1, 26.1, 23.8, 20.9, 18.0.

HRMS (ESI) calcd. For $C_{21}H_{27}O_5$ $(M + H)^+$: 359.1853, Found: 359.1856.



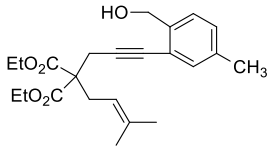
6d

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.34 (dd, *J* = 8.5, 5.8 Hz, 1H), 7.07 (dd, *J* = 9.2, 2.7 Hz, 1H), 6.98 (ddd, *J* = 8.5, 8.4, 2.7 Hz, 1H), 4.96 (tt, *J* = 7.6, 1.4 Hz, 1H), 4.69 (s, 2H), 4.23 (dq, *J* = 7.1, 1.8 Hz, 4H), 3.02 (s, 2H), 2.81 (d, *J* = 7.6 Hz, 2H), 1.71 (s, 3H), 1.66 (s, 3H), 1.65 (b, 1H), 1.26 (t, *J* = 7.1 Hz, 6H).

^{13}C NMR (100 M, $CDCl_3$): δ 170.4, 161.7 (d, *J* = 244.6 Hz), 138.7 (d, *J* = 3.2 Hz), 136.9, 129.7 (d, *J* = 8.7 Hz), 123.7 (d, *J* = 9.9 Hz), 118.9 (d, *J* = 22.8 Hz), 116.9, 115.4 (d, *J* = 21.0 Hz), 90.7, 80.1

(d, *J* = 2.9 Hz), 63.3, 61.7, 57.3, 31.0, 26.1, 23.7, 18.0, 14.0.

HRMS (ESI) calcd. For $C_{22}H_{28}FO_5$ $(M + H)^+$: 391.1915, Found: 391.1921.



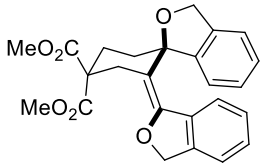
6e

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.25 (d, *J* = 7.8 Hz, 1H), 7.20 (s, 1H), 7.09 (d, *J* = 7.8 Hz, 1H), 4.97 (tt, *J* = 7.7, 1.3 Hz, 1H), 4.69 (s, 2H), 4.22 (dq, *J* = 7.1, 2.1 Hz, 4H), 3.02 (s, 2H), 2.83 (d, *J* = 7.6 Hz, 2H), 2.56 (b, 1H), 2.30 (s, 3H), 1.71 (s, 3H), 1.67 (s, 3H), 1.26 (t, *J* = 7.1 Hz, 6H).

^{13}C NMR (100 M, $CDCl_3$): δ 170.4, 139.8, 137.2, 136.7, 132.9, 129.1, 128.0, 121.7, 117.1, 89.1, 81.2, 63.8, 61.6, 57.4, 31.0, 26.0, 23.7, 20.8, 18.0, 14.0.

HRMS (ESI) calcd. For $C_{23}H_{31}O_5$ $(M + H)^+$: 387.2166, Found: 387.2168.

-Characterization for the products 2a-2g, 2h and 7a-e, 8a.



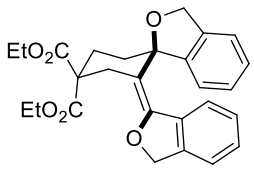
2a/2a' = 14/1

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.59 (d, *J* = 7.8 Hz, 1H), 7.39-7.33 (m, 1H), 7.32-7.27 (m, 1H), 7.25-7.16 (m, 4H), 6.89 (d, *J* = 7.6 Hz, 1H), 5.27 (d, *J* = 12.5 Hz, 1H), 5.11 (d, *J* = 12.5 Hz, 1H), 4.96 (d, *J* = 12.6 Hz, 1H), 4.43 (d, *J* = 12.6 Hz, 1H), 3.68 (s, 3H), 3.51 (s, 3H), 3.20-3.08 (m, 1H), 2.99-2.91 (m, 1H), 2.50-2.38 (m, 2H), 2.33 (d, *J* = 17.8 Hz, 1H), 2.12-2.02 (m, 1H).

^{13}C NMR (100 M, $CDCl_3$): δ 172.3, 171.1, 140.5, 140.0, 138.8, 134.1, 131.2, 128.9, 127.7, 127.3, 127.2, 126.8, 126.6, 122.4, 121.0, 114.9, 71.6, 66.6, 53.2, 52.7, 52.3, 33.7, 30.0, 28.0.

HRMS (ESI) calcd. For $C_{25}H_{25}O_6$ $(M + H)^+$: 421.1646, Found: 421.1646.

H+



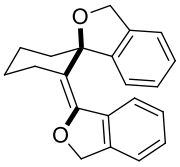
2b/2b' = 14/1

The product was obtained as colorless oil; **^{1}H NMR** (500 M, $CDCl_3$): δ 7.59 (d, *J* = 8.0 Hz, 1H), 7.38-7.32 (m, 1H), 7.31-7.15 (m, 5H), 6.90 (d, *J* = 7.7 Hz, 1H), 5.26 (d, *J* = 12.6 Hz, 1H), 5.10 (d, *J* = 12.6 Hz, 1H), 4.96 (d, *J* = 12.6 Hz, 1H), 4.43 (d, *J* = 12.6 Hz, 1H), 4.14 (q, *J* = 7.1 Hz, 2H),

4.13-4.07 (m, 1H), 3.89-3.81 (m, 1H), 3.23-3.12 (m, 1H), 2.98 (dd, *J* = 18.1, 2.4 Hz, 1H), 2.49-2.36 (m, 2H), 2.31 (d, *J* = 17.9 Hz, 1H), 2.11-2.01 (m, 1H), 1.20 (t, *J* = 7.1 Hz, 3H), 1.06 (t, *J* = 7.1 Hz, 3H).

^{13}C NMR (125.8 M, $CDCl_3$): δ 171.9, 170.8, 140.5, 140.1, 140.0, 138.9, 134.2, 131.3, 128.9, 127.7, 127.4, 127.2, 126.7, 126.6, 122.3, 120.9, 114.9, 71.6, 66.6, 61.4, 61.1, 53.1, 33.5, 30.0, 27.9, 14.0, 13.9.

HRMS (ESI) calcd. For $C_{27}H_{29}O_6$ $(M + H)^+$: 449.1959, Found: 449.1964.

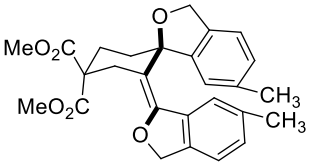


2c/2c' = 10/1

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.70 (d, *J* = 7.7 Hz, 1H), 7.22-7.15 (m, 3H), 7.14-7.06 (m, 3H), 7.03 (d, *J* = 7.1 Hz, 1H), 5.01 (d, *J* = 12.3 Hz, 1H), 4.96 (d, *J* = 16.2 Hz, 1H), 4.91 (d, *J* = 16.2 Hz, 1H), 4.82 (d, *J* = 12.3 Hz, 1H), 3.87 (d, *J* = 17.0 Hz, 1H), 2.51 (d, *J* = 17.0 Hz, 1H), 2.34-2.29 (m, 2H), 2.26 (ddd, *J* = 14.1, 6.3, 2.5 Hz, 1H), 1.95-1.82 (m, 1H), 1.74-1.64 (m, 1H), 1.50-1.37 (m, 1H).

^{13}C NMR (100 M, $CDCl_3$): δ 157.0, 133.5, 133.1, 130.4, 129.5, 129.2, 127.7, 126.5, 125.8, 125.5, 124.2, 123.9, 123.6, 113.4, 73.4, 68.6, 62.4, 36.3, 31.0, 28.4, 17.2.

HRMS (ESI) calcd. For $C_{21}H_{21}O_2$ $(M + H)^+$: 305.1536, Found: 305.1540.

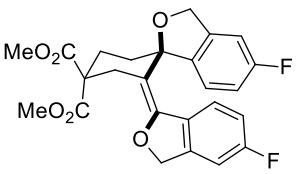


2d/2d' = 10/1

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.42 (s, 1H), 7.12-7.07 (m, 3H), 7.03 (d, *J* = 7.7 Hz, 1H), 6.67 (s, 1H), 5.22 (d, *J* = 12.3 Hz, 1H), 5.06 (d, *J* = 12.3 Hz, 1H), 4.91 (d, *J* = 12.6 Hz, 1H), 4.39 (d, *J* = 12.6 Hz, 1H), 3.68 (s, 3H), 3.49 (s, 3H), 3.24-3.11 (m, 1H), 2.95 (dd, *J* = 17.6, 2.1 Hz, 1H), 2.50-2.37 (m, 2H), 2.40 (s, 3H), 2.37-2.28 (m, 1H), 2.26 (s, 3H), 2.11-2.01 (m, 1H).

^{13}C NMR (100 M, $CDCl_3$): δ 172.3, 171.2, 140.2, 138.6, 137.8, 137.2, 137.1, 137.0, 134.0, 131.1, 129.9, 128.0, 127.4, 126.6, 122.6, 120.7, 114.9, 71.5, 66.3, 53.2, 52.7, 52.2, 33.7, 29.9, 28.0, 21.5, 21.2.

HRMS (ESI) calcd. For $C_{27}H_{29}O_6$ $(M + H)^+$: 449.1959, Found: 449.1958.



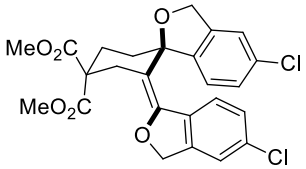
2e/2e' = 10/1

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.53 (dd, *J* = 8.8, 5.5 Hz,

1H), 7.04 (ddd, *J* = 8.6, 8.5, 2.8 Hz, 1H), 6.95-6.83 (m, 4H), 5.21 (d, *J* = 13.0 Hz, 1H), 5.05 (d, *J* = 13.0 Hz, 1H), 4.91 (d, *J* = 12.8 Hz, 1H), 4.36 (d, *J* = 12.8 Hz, 1H), 3.69 (s, 3H), 3.56 (s, 3H), 3.11-2.99 (m, 1H), 2.89 (dd, *J* = 17.8, 2.9 Hz, 1H), 2.47-2.37 (m, 2H), 2.30 (d, *J* = 17.6 Hz, 1H), 2.12-2.03 (m, 1H).

^{13}C NMR (100 M, $CDCl_3$): δ 172.1, 171.0, 163.6 (d, *J* = 245.0 Hz), 161.1 (d, *J* = 246.9 Hz), 142.6 (d, *J* = 7.0 Hz), 142.4 (d, *J* = 8.9 Hz), 135.6 (d, *J* = 2.1 Hz), 134.8 (d, *J* = 4.1 Hz), 134.2 (d, *J* = 13.7 Hz), 133.4 (d, *J* = 2.0 Hz), 130.6, 129.1 (dd, *J* = 20.2, 8.3 Hz), 124.0 (d, *J* = 9.5 Hz), 114.6 (dd, *J* = 34.4, 23.3 Hz), 114.5, 113.5 (d, *J* = 21.3 Hz), 108.2 (d, *J* = 23.9 Hz), 71.8 (d, *J* = 2.5 Hz), 66.0, 53.2, 52.7, 52.4, 33.6, 30.2, 27.9.

HRMS (ESI) calcd. For $C_{25}H_{23}F_2O_6$ $(M + H)^+$: 457.1457, Found: 457.1459.

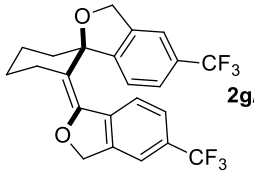


2f/2f' = 5/1

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.49 (d, *J* = 8.5 Hz, 1H), 7.31 (dd, *J* = 8.5, 2.3 Hz, 1H), 7.23 (d, *J* = 1.0 Hz, 1H), 7.21-7.16 (m, 2H), 6.83 (d, *J* = 8.1 Hz, 1H), 5.20 (d, *J* = 13.0 Hz, 1H), 5.05 (d, *J* = 13.0 Hz, 1H), 4.89 (d, *J* = 12.8 Hz, 1H), 4.36 (d, *J* = 12.8 Hz, 1H), 3.68 (s, 3H), 3.56 (s, 3H), 3.10-2.98 (m, 1H), 2.88 (dd, *J* = 17.8, 2.6 Hz, 1H), 2.46-2.36 (m, 2H), 2.28 (d, *J* = 17.8 Hz, 1H), 2.11-2.01 (m, 1H).

^{13}C NMR (100 M, $CDCl_3$): δ 172.0, 171.0, 142.1, 142.0, 138.5, 137.1, 135.0, 134.1, 132.5, 130.7, 128.7, 127.8, 127.7, 126.6, 123.6, 121.4, 114.5, 71.0, 66.0, 53.1, 52.8, 52.5, 33.7, 30.0, 27.8.

HRMS (ESI) calcd. For $C_{25}H_{23}Cl_2O_6$ $(M + H)^+$: 489.0866, Found: 489.0870.

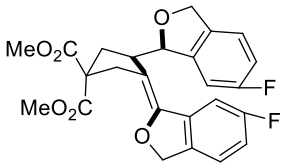


2g/2g' = 14/1

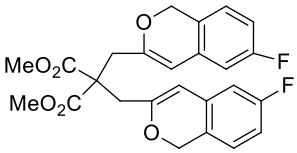
The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.74 (d, *J* = 8.3 Hz, 1H), 7.45 (d, *J* = 8.0 Hz, 1H), 7.41 (d, *J* = 8.3 Hz, 1H), 7.37 (s, 1H), 7.30 (s, 1H), 7.21 (d, *J* = 8.0 Hz, 1H), 5.08 (d, *J* = 12.5 Hz, 1H), 5.00 (d, *J* = 16.2 Hz, 1H), 4.94 (d, *J* = 16.2 Hz, 1H), 4.84 (d, *J* = 12.5 Hz, 1H), 3.81 (d, *J* = 17.4 Hz, 1H), 2.59 (d, *J* = 17.4 Hz, 1H), 2.37-2.31 (m, 2H), 2.24 (ddd, *J* = 14.0, 6.2, 2.4 Hz, 1H), 1.95-1.82 (m, 1H), 1.72-1.67 (m, 1H), 1.50-1.40 (m, 1H).

^{13}C NMR (100 M, $CDCl_3$): δ 159.6, 136.9, 134.1, 133.8, 130.0, 129.4, 128.5 (d, *J* = 32.6 Hz), 127.5 (d, *J* = 32.2 Hz), 125.5 (d, *J* = 12.0 Hz), 124.7 (q, *J* = 3.7 Hz), 123.4, 123.3 (q, *J* = 3.7 Hz), 122.8 (d, *J* = 12.2 Hz), 121.3 (q, *J* = 3.8 Hz), 120.9 (q, *J* = 3.8 Hz), 112.7, 73.2, 68.2, 62.1, 36.3, 30.9, 28.4, 16.9.

HRMS (ESI) calcd. For $C_{23}H_{19}F_6O_2$ $(M + H)^+$: 441.1284, Found: 441.1284.



2h/2h'' = 16/1

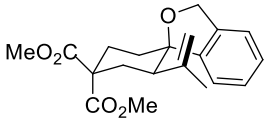


2h''

The product was obtained as colorless oil; **^{1}H NMR** (500 M, $CDCl_3$): δ 7.41 (dd, *J* = 8.3, 6.0 Hz, 1H), 7.21 (dd, *J* = 8.3, 4.7 Hz, 1H), 7.07-6.86 (m, 2H), 6.90 (dd, *J* = 9.5, 2.2 Hz, 1H), 6.82 (dd, *J* = 8.0, 1.8 Hz, 1H), 6.72 (s, 1H), 5.14 (d, *J* = 12.3 Hz, 1H), 5.01 (d, *J* = 12.3 Hz, 1H), 4.89 (d, *J* = 12.8 Hz, 1H), 4.46 (d, *J* = 12.8 Hz, 1H), 3.71 (s, 3H), 3.66 (s, 3H), 3.35 (d, *J* = 14.4 Hz, 1H), 3.05 (d, *J* = 14.4 Hz, 1H), 2.84 (dd, *J* = 8.1, 7.8 Hz, 1H), 2.42 (dd, *J* = 13.6, 10.0 Hz, 1H), 1.67 (dd, *J* = 13.8, 7.0 Hz, 1H).

^{13}C NMR (125.8 M, $CDCl_3$): δ 171.6, 171.5, 162.8 (d, *J* = 246.1 Hz), 161.9 (d, *J* = 247.3 Hz), 143.8, 142.9 (d, *J* = 7.7 Hz), 139.2 (d, *J* = 8.2 Hz), 135.2 (d, *J* = 1.4 Hz), 133.3 (d, *J* = 8.7 Hz), 132.3 (d, *J* = 2.4 Hz), 124.3 (d, *J* = 1.5 Hz), 122.5 (d, *J* = 8.6 Hz), 116.2 (d, *J* = 23.4 Hz), 114.8 (d, *J* = 21.6 Hz), 114.2 (d, *J* = 20.9 Hz), 109.0 (d, *J* = 23.6 Hz), 107.1 (d, *J* = 2.6 Hz), 71.6, 64.1, 58.0, 52.8, 52.7, 47.0, 44.8, 38.2.

HRMS (ESI) calcd. For $C_{25}H_{23}F_2O_6$ $(M + H)^+$: 457.1457, Found: 457.1458.

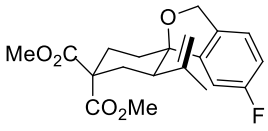


7a

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.25-7.20 (m, 2H), 7.16-7.12 (m, 1H), 7.06-7.02 (m, 1H), 5.03 (s, 2H), 4.69 (b, 1H), 4.61 (dd, *J* = 1.6, 1.6 Hz, 1H), 3.82 (s, 3H), 3.74 (s, 3H), 2.49 (dd, *J* = 13.1, 2.8 Hz, 1H), 2.41 (dd, *J* = 13.0, 12.6 Hz, 1H), 2.36-2.24 (m, 3H), 1.84-1.76 (m, 2H), 1.43 (s, 3H).

^{13}C NMR (100 M, $CDCl_3$): δ 172.4, 171.8, 145.2, 143.8, 138.9, 127.5, 126.9, 121.4, 120.9, 113.7, 88.6, 72.1, 55.0, 52.7, 52.6, 48.5, 36.0, 32.8, 27.2, 23.0.

HRMS (ESI) calcd. For $C_{20}H_{25}O_5$ $(M + H)^+$: 345.1697, Found: 345.1701.

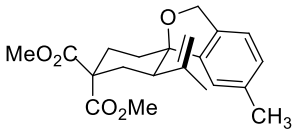


7b

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.07 (dd, *J* = 8.2, 4.8 Hz, 1H), 6.92 (ddd, *J* = 8.8, 8.5, 2.3 Hz, 1H), 6.72 (dd, *J* = 8.5, 2.3 Hz, 1H), 4.98 (s, 2H), 4.70 (b, 1H), 4.64 (dd, *J* = 1.6, 1.6 Hz 1H), 3.82 (s, 3H), 3.74 (s, 3H), 2.46 (dd, *J* = 13.0, 2.6 Hz, 1H), 2.39 (dd, *J* = 12.4, 12.9 Hz, 1H), 2.36-2.22 (m, 3H), 1.80-1.73 (m, 2H), 1.47 (s, 3H).

^{13}C NMR (100 M, $CDCl_3$): δ 172.3, 171.6, 162.5 (d, *J* = 242.7 Hz), 146.3 (d, *J* = 7.5 Hz), 144.9, 134.1 (d, *J* = 1.6 Hz), 122.1 (d, *J* = 8.8 Hz), 114.7 (d, *J* = 22.8 Hz), 114.0, 108.5 (d, *J* = 23.2 Hz), 88.6, 71.7, 54.9, 52.7, 52.6, 48.4, 35.8, 32.6, 27.1, 22.8.

HRMS (ESI) calcd. For $C_{20}H_{24}FO_5$ $(M + H)^+$: 363.1602, Found: 363.1600.

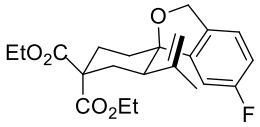


7c

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.04 (d, *J* = 8.3 Hz, 1H), 7.01 (d, *J* = 8.1 Hz, 1H), 6.83 (s, 1H), 4.98 (s, 2H), 4.70 (b, 1H), 4.62 (dd, *J* = 1.8, 1.6 Hz 1H), 3.83 (s, 3H), 3.74 (s, 3H), 2.47 (dd, *J* = 13.2, 2.7 Hz 1H), 2.40 (dd, *J* = 13.0, 12.4 Hz 1H), 2.34 (s, 3H), 2.32-2.20 (m, 3H), 1.81-1.74 (m, 2H), 1.43 (s, 3H).

^{13}C NMR (100 M, $CDCl_3$): δ 172.5, 171.8, 145.3, 144.1, 136.6, 136.0, 128.4, 121.9, 120.6, 113.6, 88.4, 72.0, 55.0, 52.7, 52.6, 48.4, 36.0, 32.8, 27.2, 23.1, 21.3.

HRMS (ESI) calcd. For $C_{21}H_{27}O_5$ $(M + H)^+$: 359.1853, Found: 359.1855.

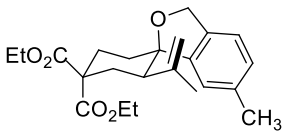


7d

The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.07 (dd, *J* = 8.2, 4.8 Hz, 1H), 6.92 (ddd, *J* = 8.8, 8.6, 2.3 Hz, 1H), 6.72 (dd, *J* = 7.7, 2.3 Hz, 1H), 4.98 (s, 2H), 4.71 (b, 1H), 4.64 (dd, *J* = 1.6, 1.5 Hz 1H), 4.37-4.21 (m, 2H), 4.19 (q, *J* = 7.1 Hz, 2H), 2.49 (dd, *J* = 13.0, 3.4 Hz, 1H), 2.38 (dd, *J* = 13.0, 13.0 Hz, 1H), 2.34-2.17 (m, 3H), 1.82-1.78 (m, 1H), 1.77 (d, *J* = 3.6 Hz, 1H), 1.48 (s, 3H), 1.31 (t, *J* = 7.1 Hz, 3H), 1.26 (t, *J* = 7.1 Hz, 3H).

^{13}C NMR (100 M, $CDCl_3$): δ 171.9, 171.2, 162.5 (d, *J* = 242.4 Hz), 146.4 (d, *J* = 7.1 Hz), 145.0, 134.2 (d, *J* = 2.5 Hz), 122.1 (d, *J* = 8.8 Hz), 114.7 (d, *J* = 22.7 Hz), 113.9, 108.5 (d, *J* = 23.2 Hz), 88.6, 71.7, 61.4, 61.2, 54.8, 48.4, 35.8, 32.6, 27.0, 22.8, 14.2, 14.1.

HRMS (ESI) calcd. For $C_{22}H_{28}FO_5$ $(M + H)^+$: 391.1915, Found: 391.1915.



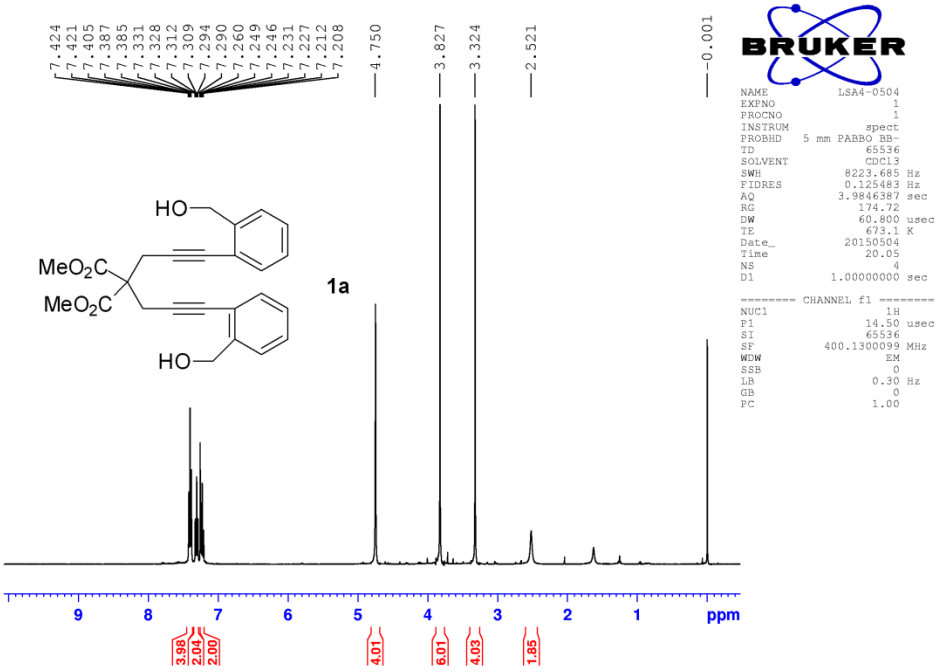
7e

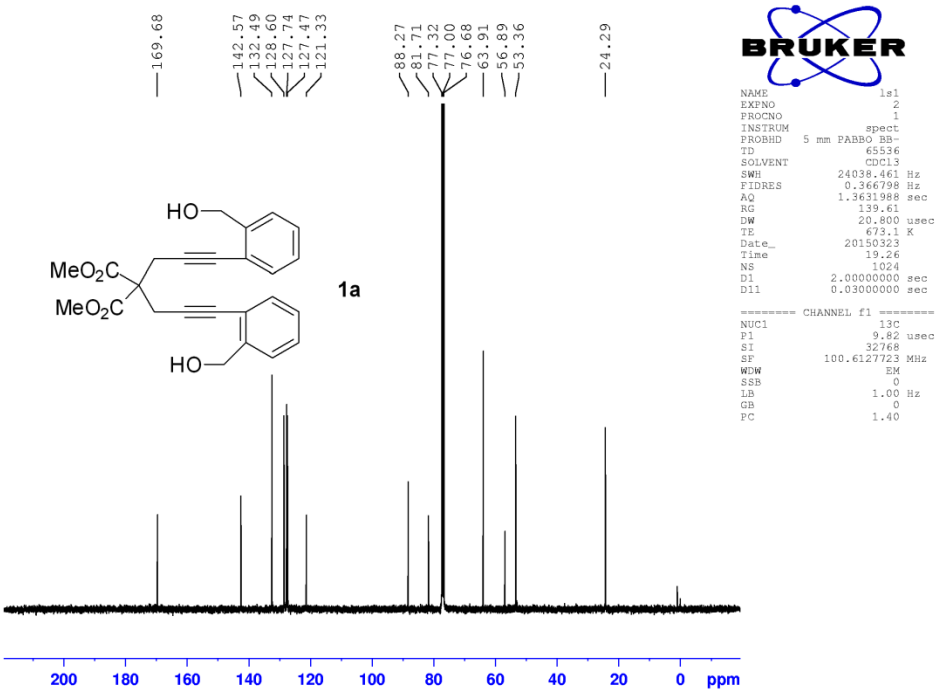
The product was obtained as colorless oil; **^{1}H NMR** (400 M, $CDCl_3$): δ 7.06-6.99 (m, 2H), 6.82 (s, 1H), 4.98 (s, 2H), 4.70 (b, 1H), 4.61 (dd, *J* = 1.8, 1.6 Hz, 1H), 4.37-4.21 (m, 2H), 4.19 (q, *J* = 7.1 Hz, 2H), 2.50 (dd, *J* = 13.1, 3.3 Hz, 1H), 2.39 (dd, *J* = 13.0, 13.0 Hz 1H), 2.34 (s, 3H), 2.31-2.18 (m, 3H), 1.87-1.72 (m, 2H), 1.44 (s, 3H), 1.31 (t, *J* = 7.1 Hz, 3H), 1.26 (t, *J* = 7.1 Hz, 3H).

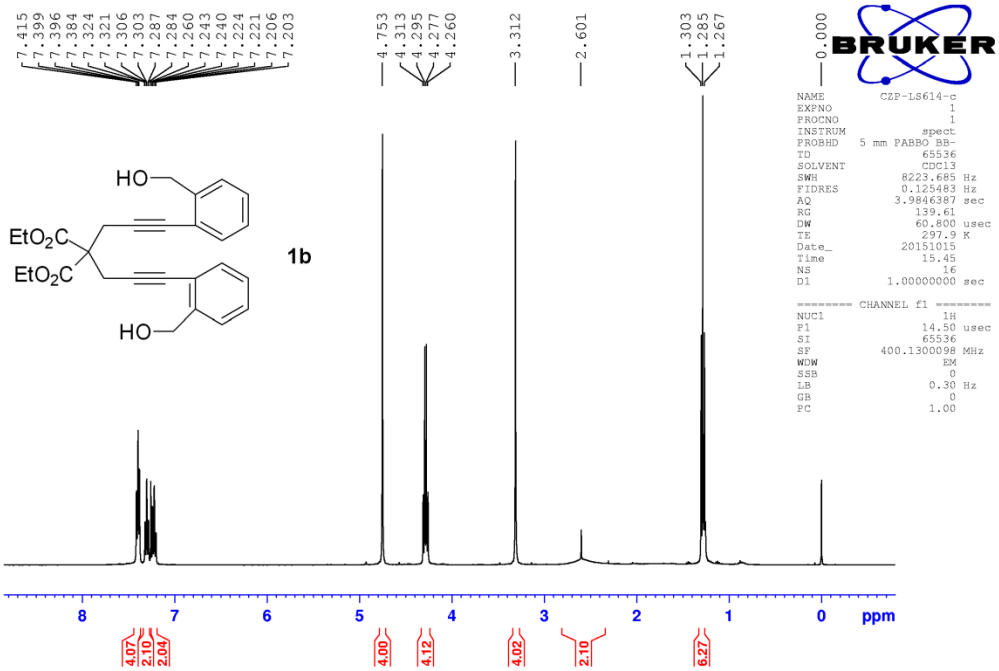
^{13}C NMR (100 M, $CDCl_3$): δ 172.0, 171.3, 145.5, 144.3, 136.6, 136.1, 128.4, 121.9, 120.6, 113.4, 88.5, 72.0, 61.3, 61.1, 55.0, 48.4, 36.0, 32.8, 27.2, 23.0, 21.3, 14.2, 14.1.

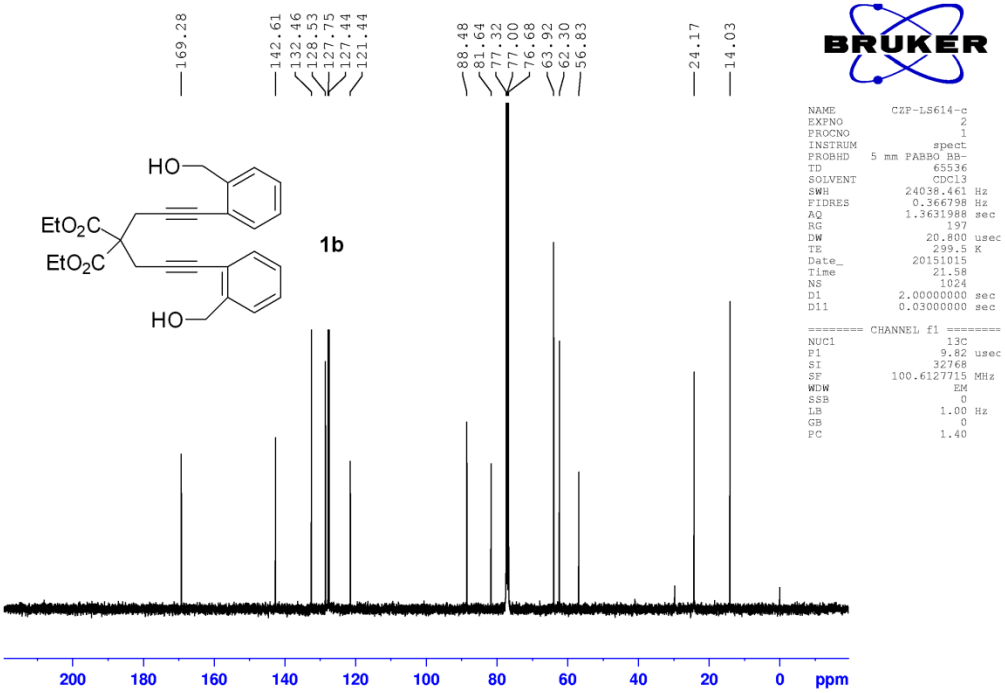
HRMS (ESI) calcd. For $C_{23}H_{31}O_5$ $(M + H)^+$: 387.2166, Found: 387.2164.

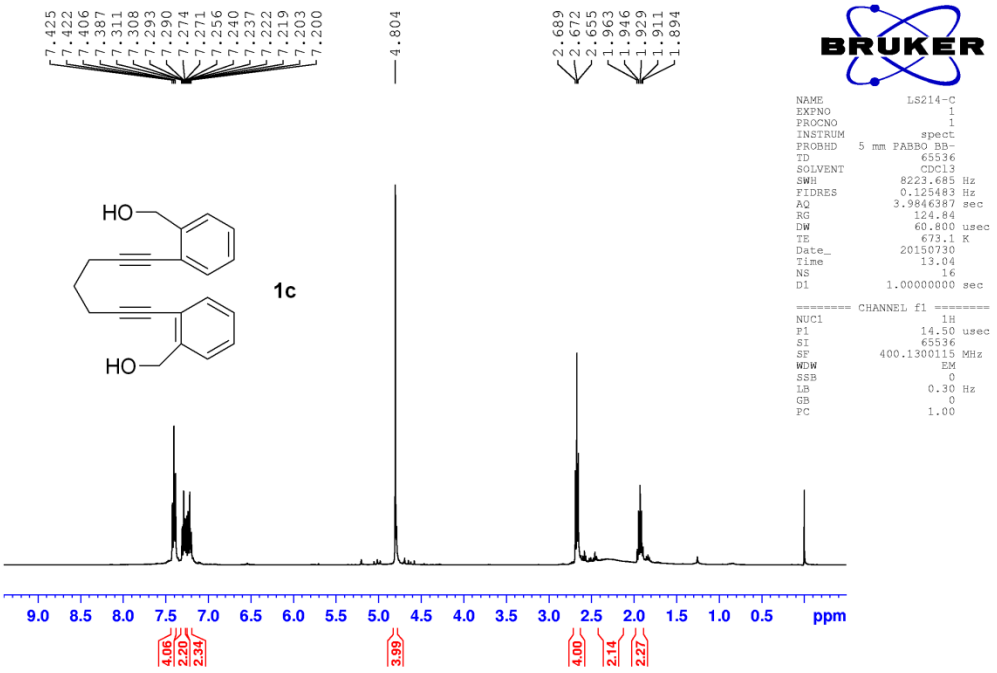
-Copies of NMR spectra.

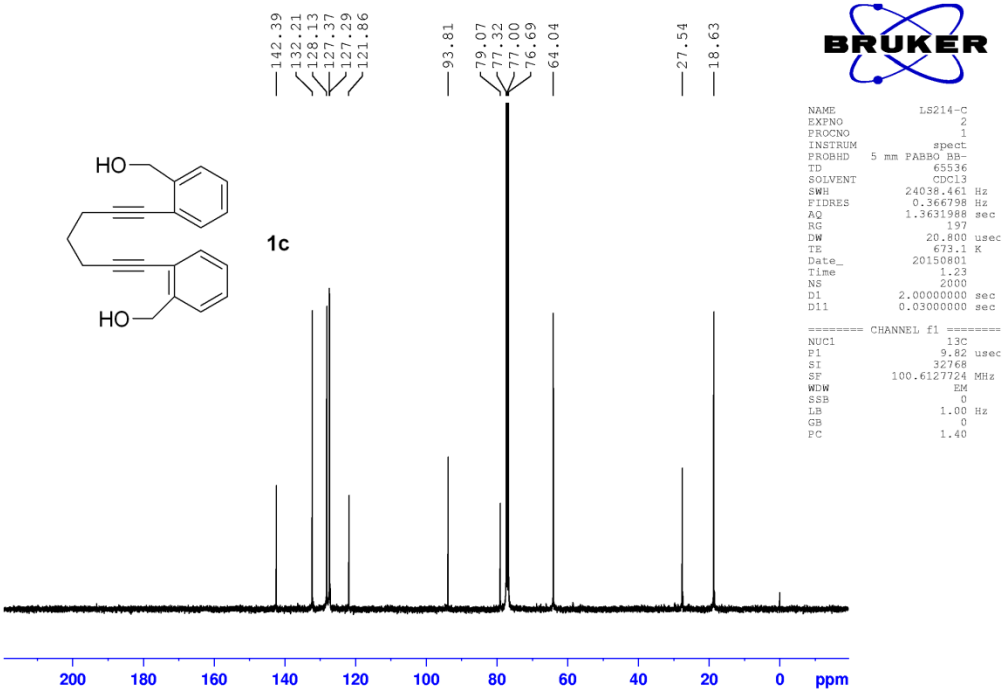


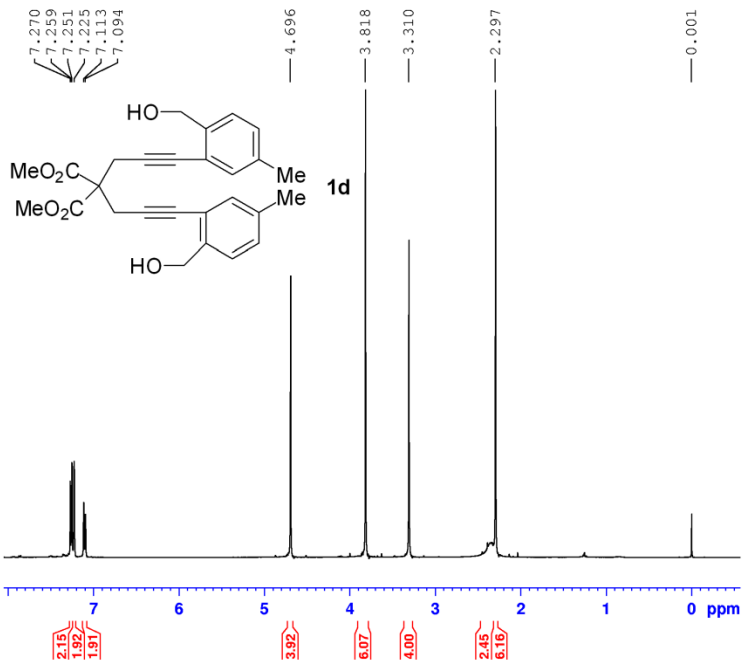



7.415
7.399
7.396
7.384
7.324
7.321
7.306
7.303
7.287
7.284
7.260
7.243
7.240
7.224
7.221
7.206
7.203
4.753
4.313
4.295
4.277
4.260
3.312
2.601
1.303
1.285
1.267
0.000
BRUKER
NAME CZP-LS614-c
EXPNO 1
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 8223.685 Hz
FIDRES 0.125483 Hz
AQ 3.9846387 sec
RG 139.61
DW 60.800 usec
TE 297.9 K
Date_ 20151015
Time 15.45
NS 16
D1 1.00000000 sec
======== CHANNEL f1 ========
NUC1 1H
P1 14.50 usec
SI 65536
SF 400.1300098 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00
HO
EtO2C
EtO2C
HO
1b
8
7
6
5
4
3
2
1
0
ppm
4.07
2.10
2.04
4.00
4.12
4.02
2.10
6.27

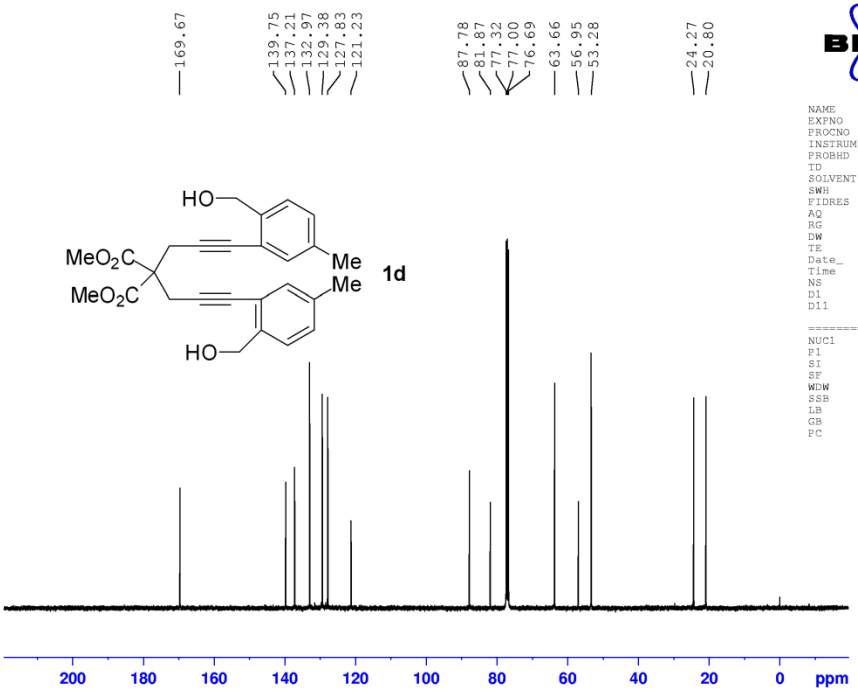

169.28
142.61
132.46
128.53
127.75
127.44
121.44
88.48
81.64
77.32
77.00
76.68
63.92
62.30
56.83
24.17
14.03
BRUKER
NAME CZP-LS614-c
EXPNO 2
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 197
DW 20.800 usec
TE 299.5 K
Date_ 20151015
Time 21.58
NS 1024
D1 2.00000000 sec
D11 0.03000000 sec
======== CHANNEL f1 ========
NUC1 13C
P1 9.82 usec
SI 32768
SF 100.6127715 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
HO
EtO2C
EtO2C
HO
1b
200
180
160
140
120
100
80
60
40
20
0
ppm


7.425
7.422
7.406
7.387
7.311
7.308
7.293
7.290
7.274
7.271
7.256
7.240
7.237
7.222
7.219
7.203
7.200
4.804
2.689
2.672
2.655
1.963
1.946
1.929
1.911
1.894
HO
HO
1c
BRUKER
NAME LS214-C
EXPNO 1
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 8223.685 Hz
FIDRES 0.125483 Hz
AQ 3.9846387 sec
RG 124.84
DW 60.800 usec
TE 673.1 K
Date_ 20150730
Time 13.04
NS 16
D1 1.00000000 sec
======== CHANNEL f1 ========
NUC1 1H
P1 14.50 usec
SI 65536
SF 400.1300115 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
4.06
2.20
2.34
3.99
4.00
2.14
2.27

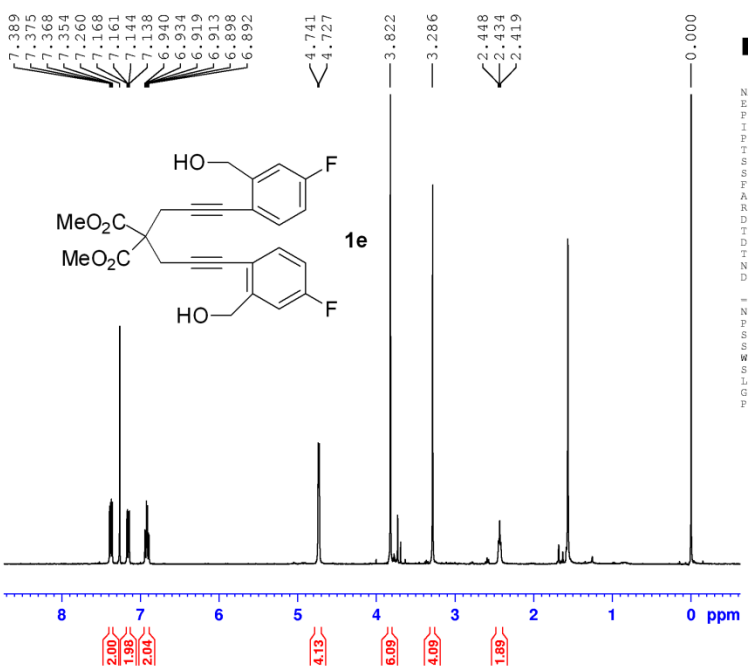

142.39
132.21
128.13
127.37
127.29
121.86
93.81
79.07
77.32
77.00
76.69
64.04
27.54
18.63
HO
HO
1c
BRUKER
NAME LS214-C
EXPNO 2
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 197
DW 20.800 usec
TE 673.1 K
Date_ 20150801
Time 1.23
NS 2000
D1 2.00000000 sec
D11 0.03000000 sec
======== CHANNEL f1 ========
NUC1 13C
P1 9.82 usec
SI 32768
SF 100.6127724 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
200 180 160 140 120 100 80 60 40 20 0 ppm



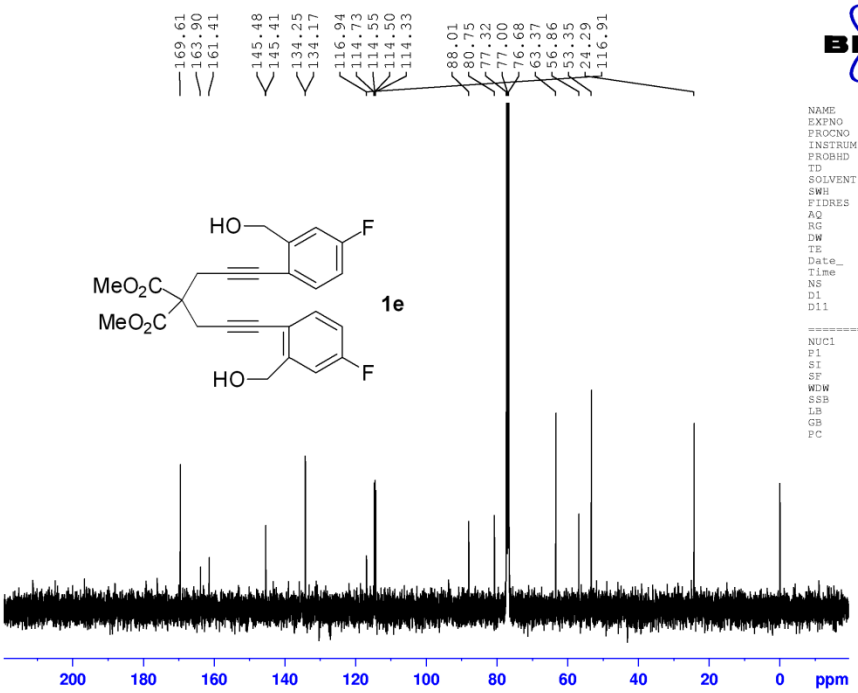

```
NAME                  LSE4
EXPNO                    1
PROCNO                   1
INSTRUM               spect
PROBHD   5 mm PABBO BB-
TD                   65536
SOLVENT              CDCl3
SWH               8223.685 Hz
FIDRES           0.125483 Hz
AQ               3.9846387 sec
RG                   85.21
DW                60.800 usec
TE                673.1 K
Date_             20150601
Time                 19.17
NS                       4
D1             1.00000000 sec

======== CHANNEL f1 ========
NUC1                   1H
P1                 14.50 usec
SI                   65536
SF          400.1300102 MHz
WDW                    EM
SSB                     0
LB                 0.30 Hz
GB                      0
PC                   1.00
```



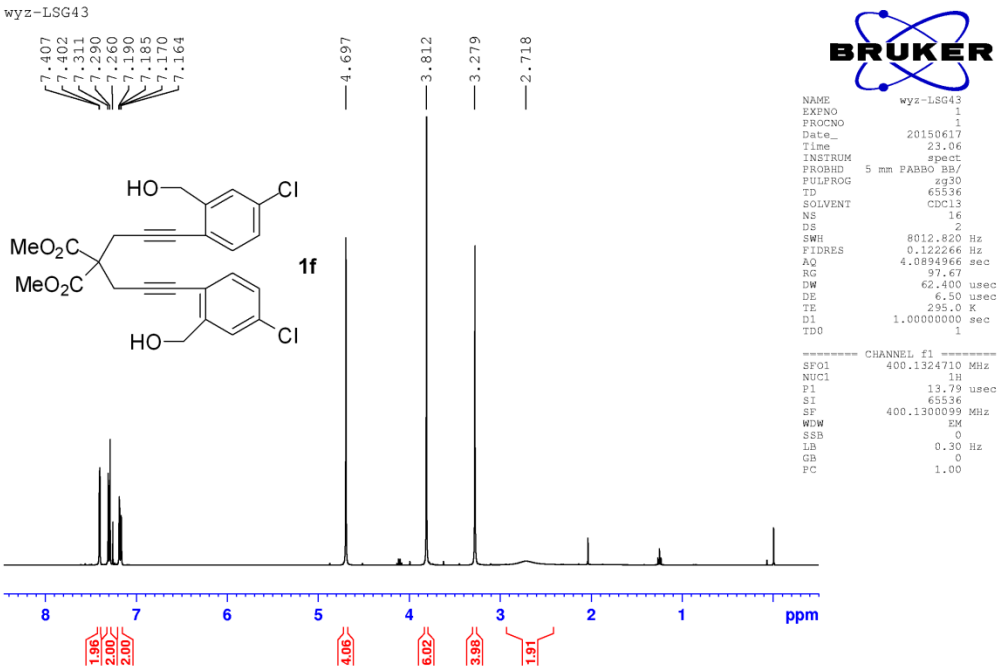

```
NAME                  LSE4
EXPNO                    2
PROCNO                   1
INSTRUM               spect
PROBHD   5 mm PABBO BB-
TD                   65536
SOLVENT              CDCl3
SWH              24038.461 Hz
FIDRES           0.366798 Hz
AQ               1.3631988 sec
RG                     197
DW                20.800 usec
TE                673.1 K
Date_             20150602
Time                 19.54
NS                    1024
D1             2.00000000 sec
D11            0.03000000 sec

======== CHANNEL f1 ========
NUC1                   13C
P1                  9.82 usec
SI                   32768
SF          100.6127723 MHz
WDW                    EM
SSB                     0
LB                 1.00 Hz
GB                      0
PC                   1.40
```

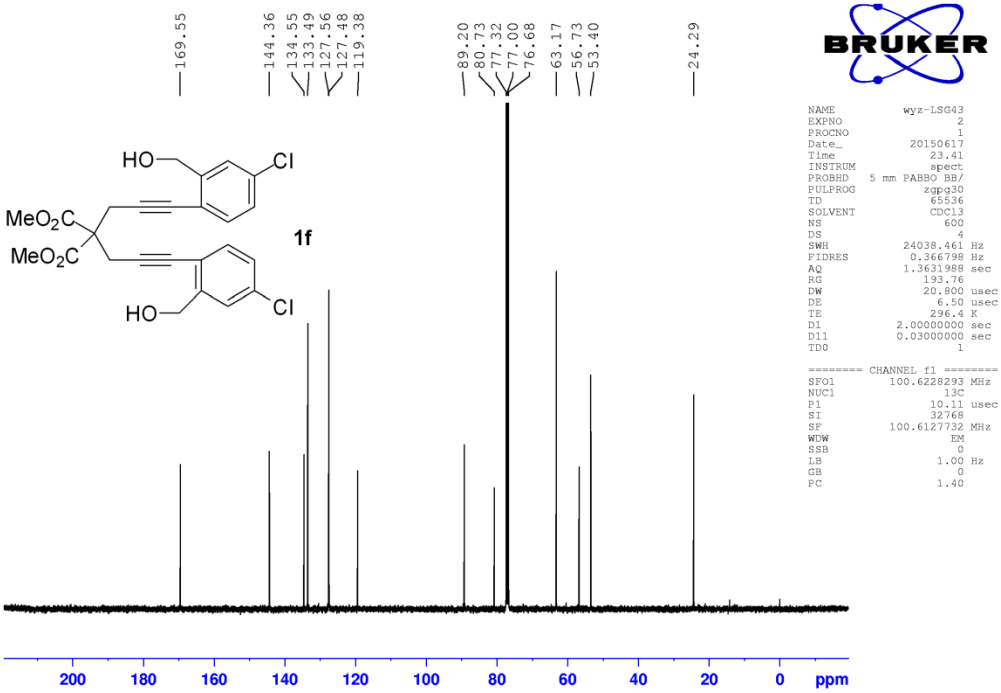


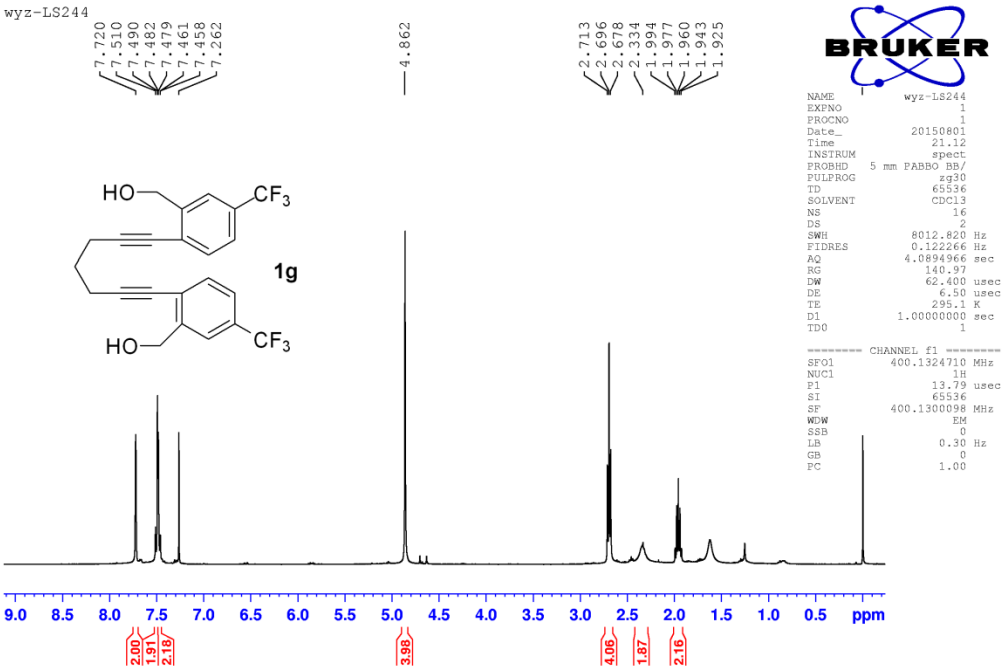

```
NAME                LSC4-C
EXPNO                    1
PROCNO                   1
INSTRUM              spect
PROBHD    5 mm PABBO BB-
TD                   65536
SOLVENT              CDCl3
SWH               8223.685 Hz
FIDRES            0.125483 Hz
AQ                3.9846387 sec
RG                     197
DW                  60.800 usec
TE                  673.1 K
Date_              20150522
Time                 15.31
NS                      16
D1              1.00000000 sec

======== CHANNEL f1 ========
NUC1                   1H
P1                  14.50 usec
SI                   65536
SF             400.1300098 MHz
WDW                    EM
SSB                     0
LB                   0.30 Hz
GB                      0
PC                   1.00
```

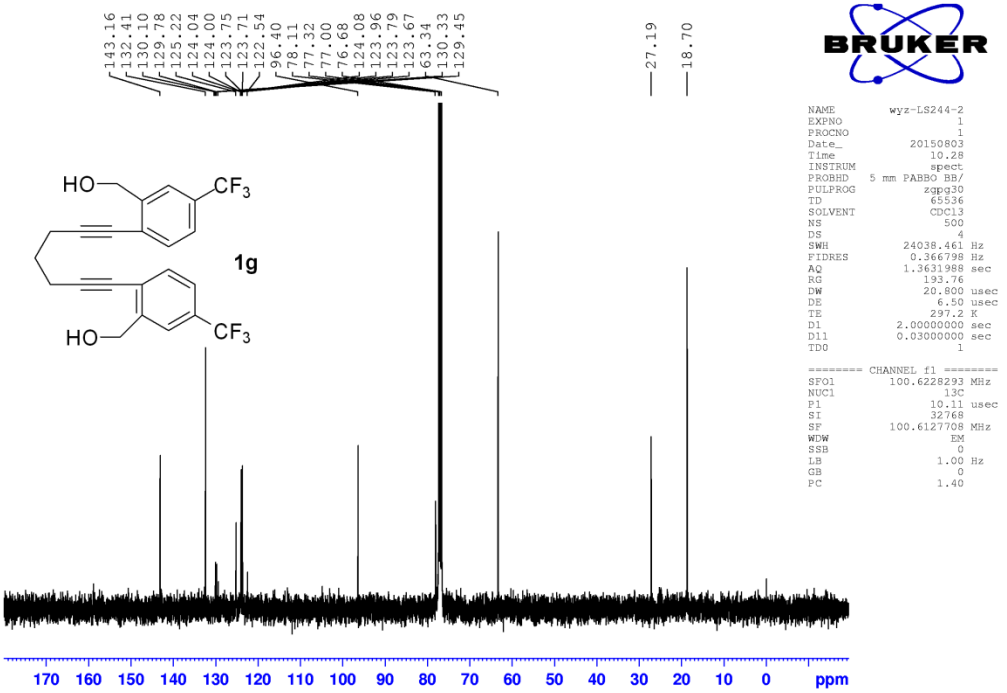


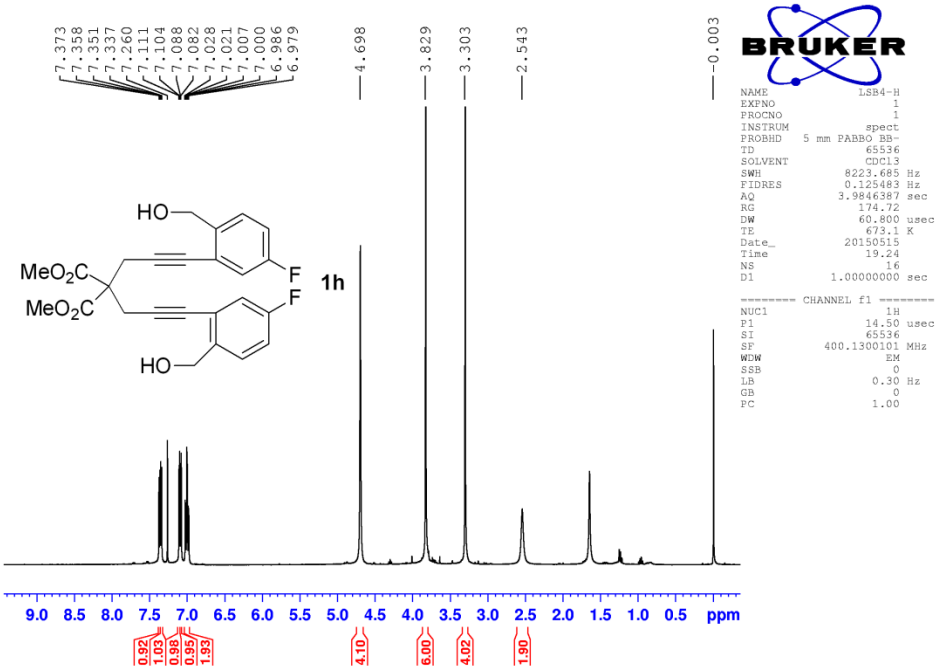

```
NAME                LSC4-C
EXPNO                    2
PROCNO                   1
INSTRUM              spect
PROBHD    5 mm PABBO BB-
TD                   65536
SOLVENT              CDCl3
SWH              24038.461 Hz
FIDRES            0.366798 Hz
AQ                1.3631988 sec
RG                   139.61
DW                  20.800 usec
TE                  673.1 K
Date_              20150525
Time                 23.04
NS                    1024
D1              2.00000000 sec
D11             0.03000000 sec

======== CHANNEL f1 ========
NUC1                   13C
P1                   9.82 usec
SI                   32768
SF            100.6127681 MHz
WDW                    EM
SSB                     0
LB                   1.00 Hz
GB                      0
PC                   1.40
```


wyz-LSG43
7.407
7.402
7.311
7.290
7.260
7.190
7.185
7.170
7.164
4.697
3.812
3.279
2.718
HO
Cl
MeO2C
MeO2C
1f
HO
Cl
8
7
6
5
4
3
2
1
ppm
1.96
2.00
2.00
4.06
6.02
3.98
1.91
BRUKER
NAME wyz-LSG43
EXPNO 1
PROCNO 1
Date_ 20150617
Time 23.06
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 97.67
DW 62.400 usec
DE 6.50 usec
TE 295.0 K
D1 1.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 13.79 usec
SI 65536
SF 400.1300099 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00


169.55
144.36
134.55
133.49
127.56
127.48
119.38
89.20
80.73
77.32
77.00
76.68
63.17
56.73
53.40
24.29
HO
Cl
MeO2C
MeO2C
1f
HO
Cl
200
180
160
140
120
100
80
60
40
20
0
ppm
BRUKER
NAME wyz-LSG43
EXPNO 2
PROCNO 1
Date_ 20150617
Time 23.41
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 600
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 193.76
DW 20.800 usec
DE 6.50 usec
TE 296.4 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6228293 MHz
NUC1 13C
P1 10.11 usec
SI 32768
SF 100.6127732 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

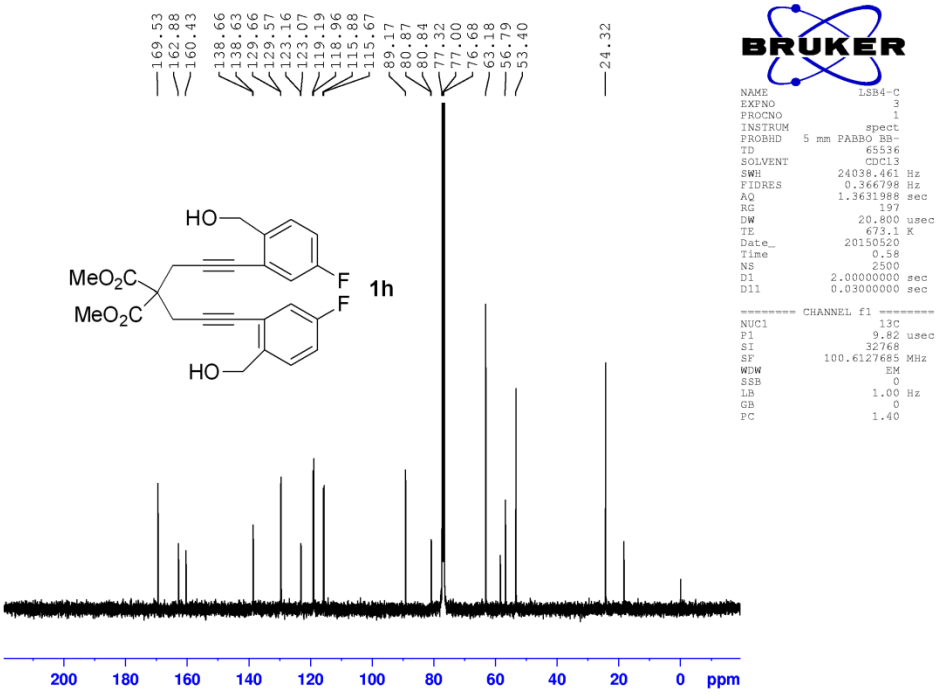

wyz-LS244
7.720
7.510
7.490
7.482
7.479
7.461
7.458
7.262
4.862
2.713
2.696
2.678
2.334
1.994
1.977
1.960
1.943
1.925
HO
CF3
1g
HO
CF3
NAME wyz-LS244
EXPNO 1
PROCNO 1
Date_ 20150801
Time 21.12
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 140.97
DW 62.400 usec
DE 6.50 usec
TE 295.1 K
D1 1.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 13.79 usec
SI 65536
SF 400.1300098 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
2.00
1.91
2.18
3.98
4.06
1.87
2.16


143.16
132.41
130.10
129.78
125.22
124.04
124.00
123.75
123.71
122.54
96.40
78.11
77.32
77.00
76.68
124.08
123.96
123.79
123.67
63.34
130.33
129.45
27.19
18.70
HO
CF3
1g
HO
CF3
NAME wyz-LS244-2
EXPNO 1
PROCNO 1
Date_ 20150803
Time 10.28
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 500
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 193.76
DW 20.800 usec
DE 6.50 usec
TE 297.2 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6228293 MHz
NUC1 13C
P1 10.11 usec
SI 32768
SF 100.6127708 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm



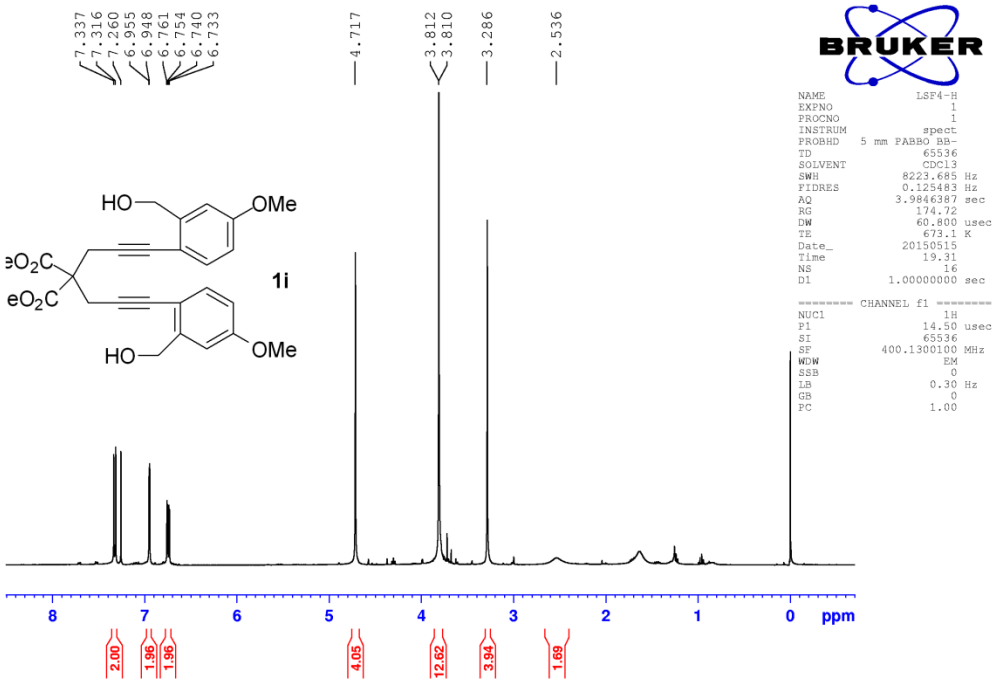
BRUKER

```
NAME                LSB4-H
EXPNO                    1
PROCNO                   1
INSTRUM              spect
PROBHD    5 mm PABBO BB-
TD                   65536
SOLVENT              CDCl3
SWH              8223.685 Hz
FIDRES           0.125483 Hz
AQ               3.9846387 sec
RG                  174.72
DW                60.800 usec
TE                  673.1 K
Date_            20150515
Time                19.24
NS                     16
D1            1.00000000 sec

======== CHANNEL f1 ========
NUC1                   1H
P1                 14.50 usec
SI                  65536
SF           400.1300101 MHz
WDW                    EM
SSB                     0
LB                 0.30 Hz
GB                      0
PC                   1.00
```

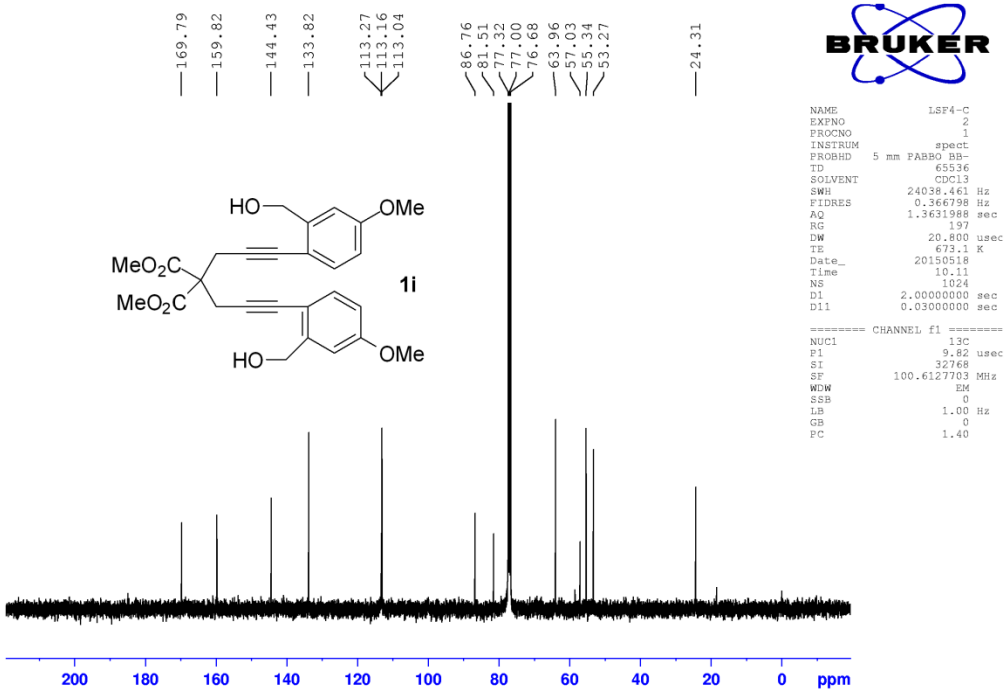


BRUKER

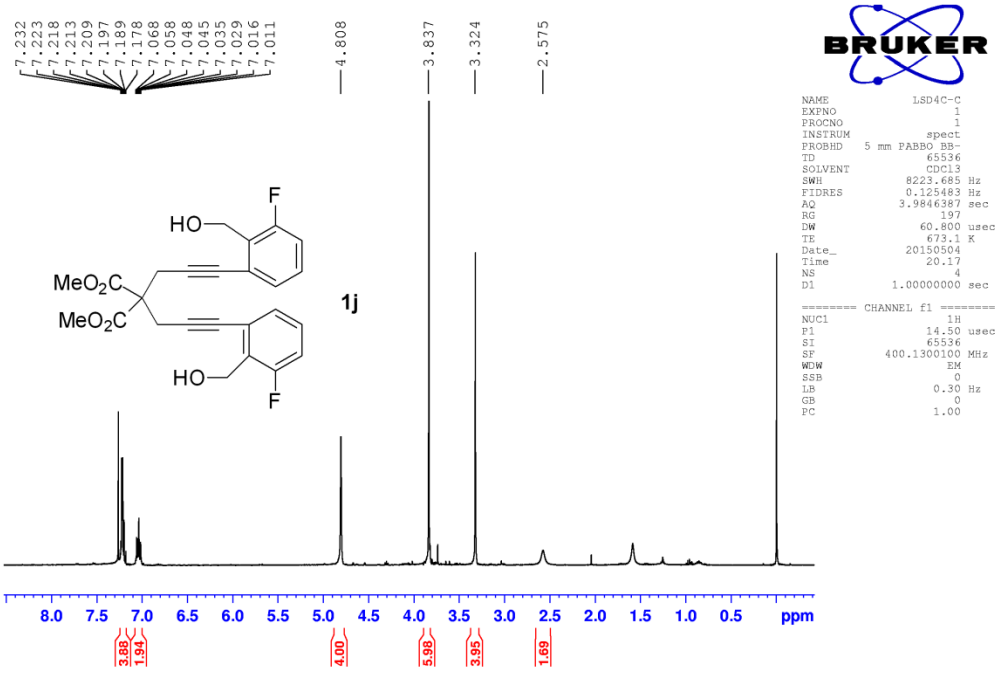
```
NAME                LSB4-C
EXPNO                    3
PROCNO                   1
INSTRUM              spect
PROBHD    5 mm PABBO BB-
TD                   65536
SOLVENT              CDCl3
SWH             24038.461 Hz
FIDRES           0.366798 Hz
AQ               1.3631988 sec
RG                     197
DW                20.800 usec
TE                  673.1 K
Date_            20150520
Time                 0.58
NS                   2500
D1            2.00000000 sec
D11           0.03000000 sec

======== CHANNEL f1 ========
NUC1                   13C
P1                  9.82 usec
SI                   32768
SF           100.6127685 MHz
WDW                    EM
SSB                     0
LB                 1.00 Hz
GB                      0
PC                   1.40
```




```
NAME                LSF4-H
EXPNO                    1
PROCNO                   1
INSTRUM              spect
PROBHD    5 mm PABBO BB-
TD                   65536
SOLVENT              CDCl3
SWH               8223.685 Hz
FIDRES            0.125483 Hz
AQ                3.9846387 sec
RG                   174.72
DW                 60.800 usec
TE                   673.1 K
Date_             20150515
Time                 19.31
NS                      16
D1              1.00000000 sec

======== CHANNEL f1 ========
NUC1                    1H
P1                 14.50 usec
SI                   65536
SF           400.1300100 MHz
WDW                     EM
SSB                      0
LB                  0.30 Hz
GB                       0
PC                    1.00
```

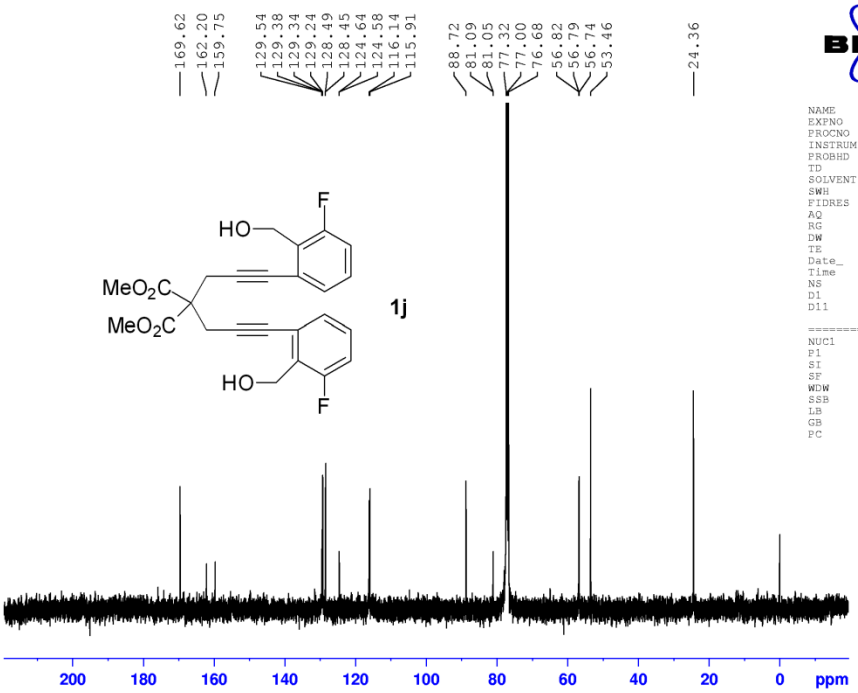



```
NAME                LSF4-C
EXPNO                    2
PROCNO                   1
INSTRUM              spect
PROBHD    5 mm PABBO BB-
TD                   65536
SOLVENT              CDCl3
SWH              24038.461 Hz
FIDRES            0.366798 Hz
AQ                1.3631988 sec
RG                     197
DW                 20.800 usec
TE                   673.1 K
Date_             20150518
Time                 10.11
NS                     1024
D1              2.00000000 sec
D11             0.03000000 sec

======== CHANNEL f1 ========
NUC1                   13C
P1                  9.82 usec
SI                   32768
SF           100.6127703 MHz
WDW                     EM
SSB                      0
LB                  1.00 Hz
GB                       0
PC                    1.40
```



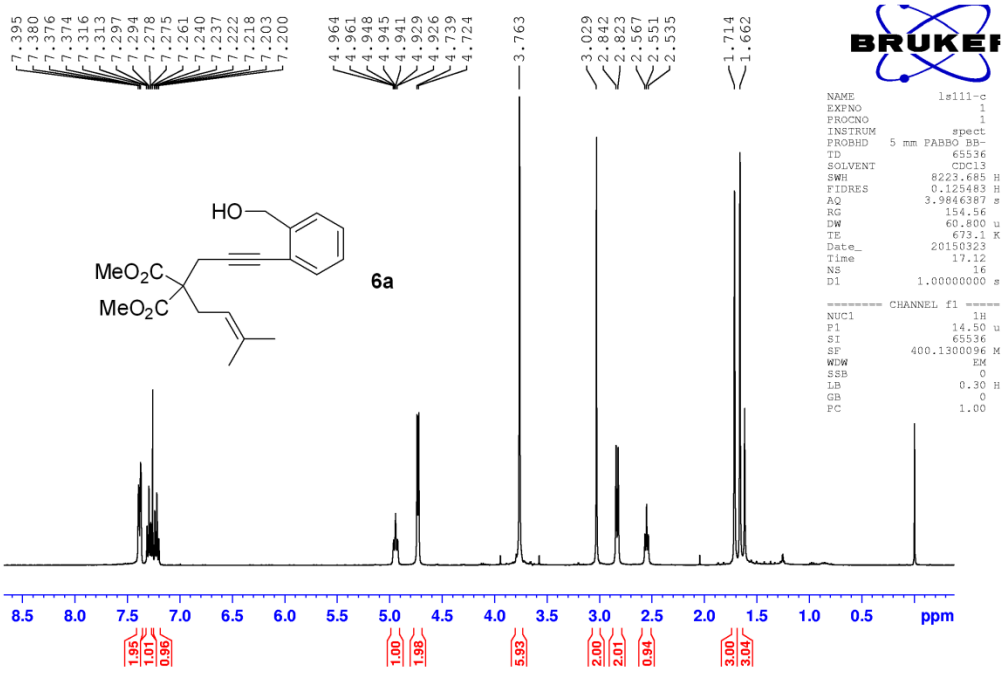
BRUKER

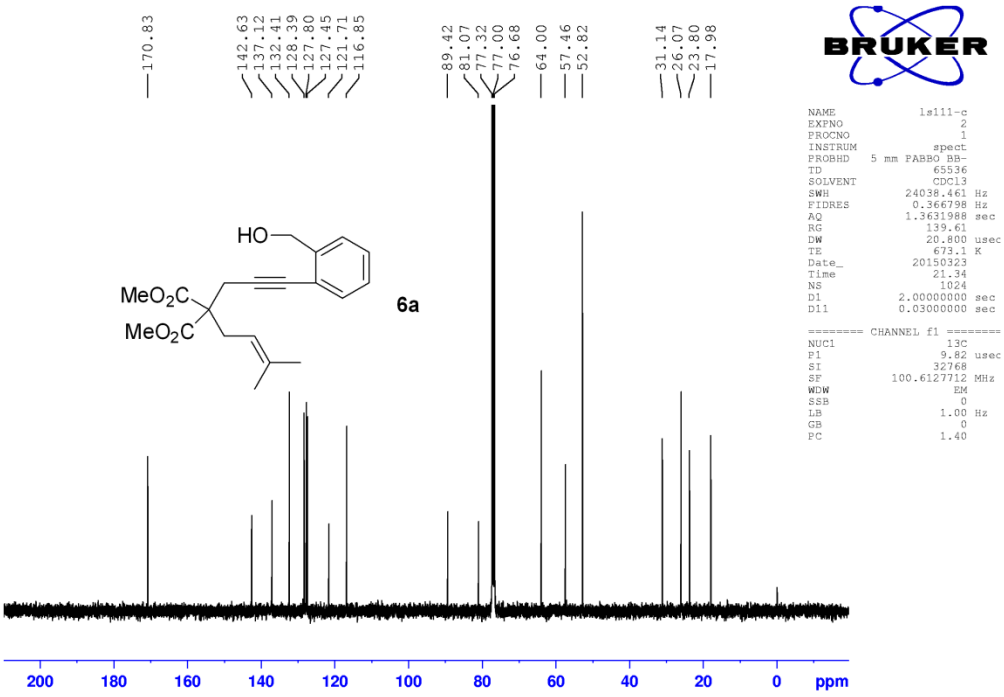
NAME	LSD4C-C
EXPNO	1
PROCNO	1
INSTRUM	spect
PROBHD	5 mm PABBO BB-
TD	65536
SOLVENT	CDCl3
SWH	8223.685 Hz
FIDRES	0.125483 Hz
AQ	3.9846387 sec
RG	197
DW	60.800 usec
TE	673.1 K
Date_	20150504
Time	20.17
NS	4
D1	1.00000000 sec
======== CHANNEL f1 ========	
NUC1	1H
P1	14.50 usec
SI	65536
SF	400.1300100 MHz
WDW	EM
SSB	0
LB	0.30 Hz
GB	0
PC	1.00

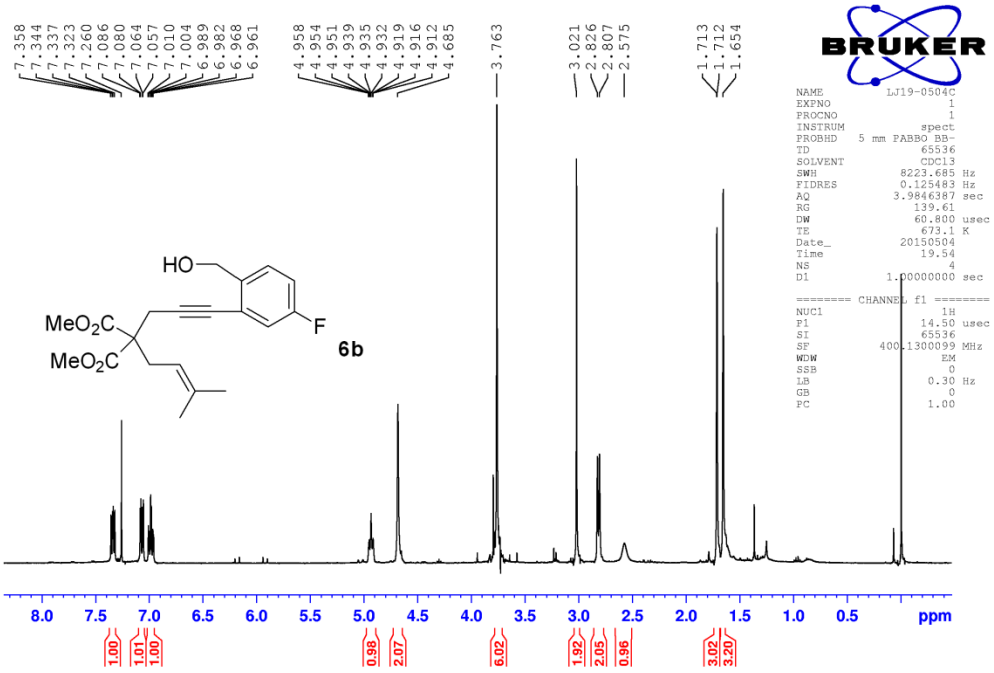


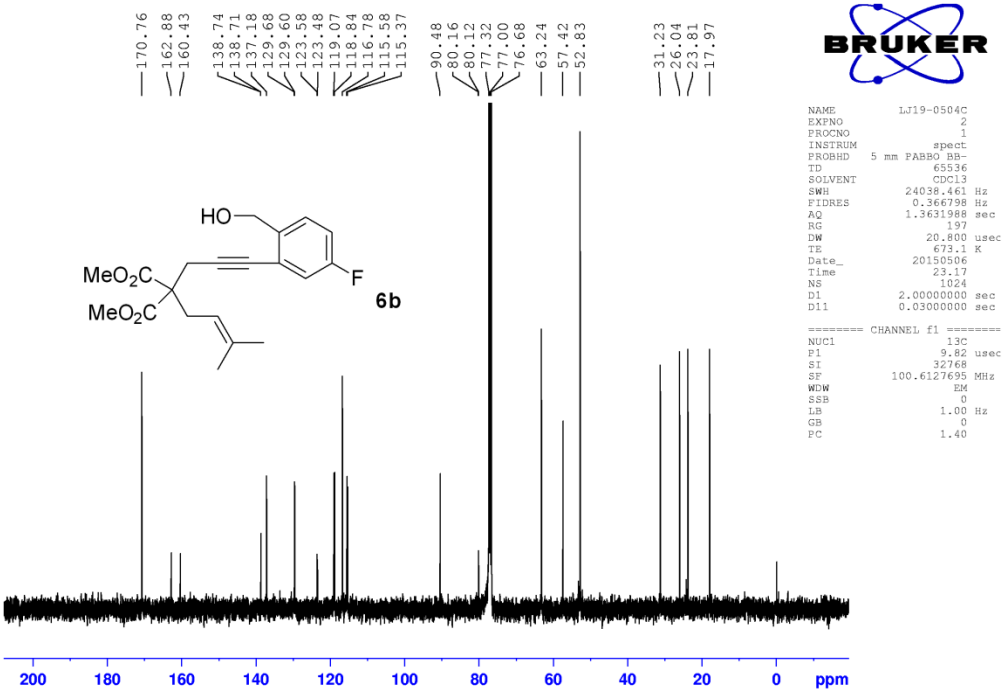
BRUKER

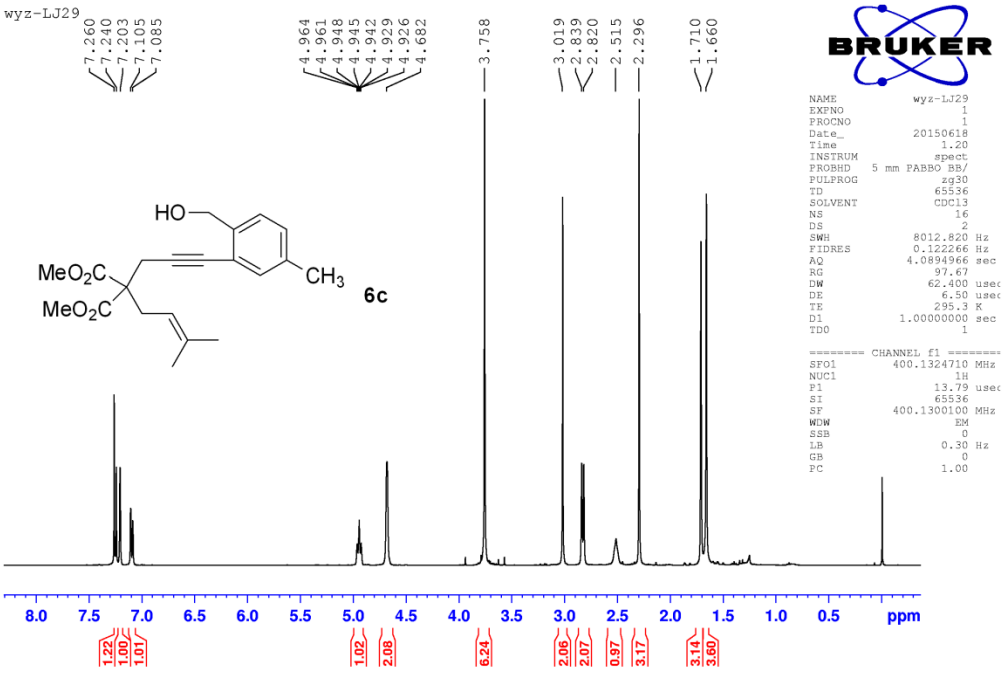
NAME	LSD4C-C
EXPNO	3
PROCNO	4
INSTRUM	spect
PROBHD	5 mm PABBO BB-
TD	65536
SOLVENT	CDCl3
SWH	24038.461 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	197
DW	20.800 usec
TE	673.1 K
Date_	20150507
Time	9.10
NS	1024
D1	2.00000000 sec
D11	0.03000000 sec
======== CHANNEL f1 ========	
NUC1	13C
P1	9.82 usec
SI	32768
SF	100.6127694 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40


7.395
7.380
7.376
7.374
7.316
7.313
7.297
7.294
7.278
7.275
7.261
7.240
7.237
7.222
7.218
7.203
7.200
4.964
4.961
4.948
4.945
4.941
4.929
4.926
4.739
4.724
3.763
3.029
2.842
2.823
2.567
2.551
2.535
1.714
1.662
HO
MeO2C
MeO2C
6a
NAME ls111-c
EXPNO 1
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 8223.685 H
FIDRES 0.125483 H
AQ 3.9846387 s
RG 154.56
DW 60.800 u
TE 673.1 K
Date_ 20150323
Time 17.12
NS 16
D1 1.00000000 s
CHANNEL f1
NUC1 1H
P1 14.50 u
SI 65536
SF 400.1300096 M
WDW EM
SSB 0
LB 0.30 H
GB 0
PC 1.00
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
1.95 1.01 0.96 1.00 1.98 5.93 2.00 2.01 0.94 3.00 3.04

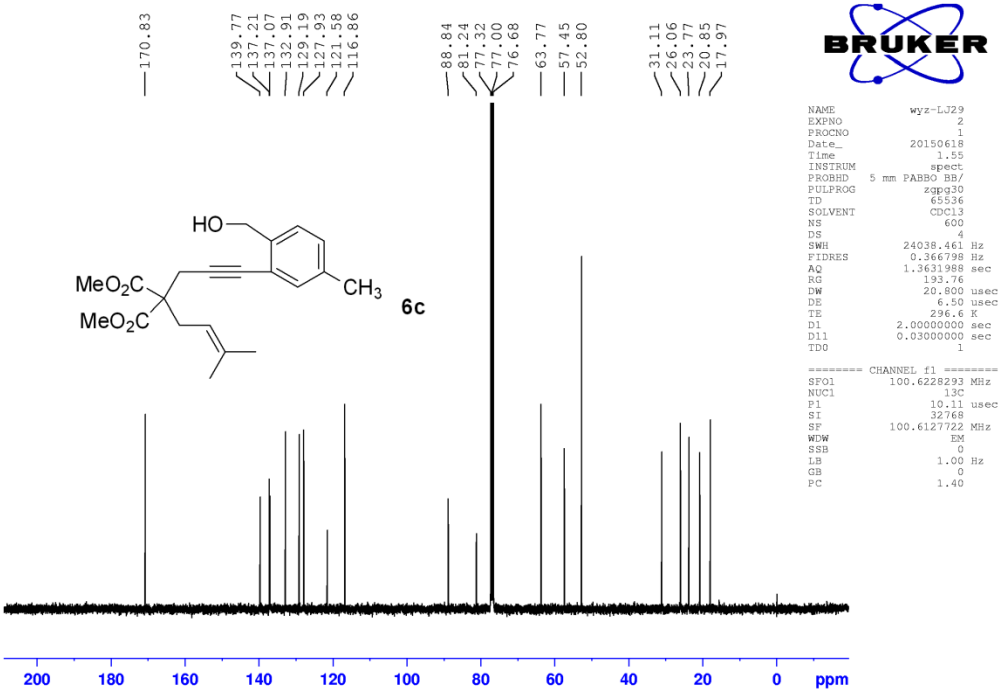

170.83
142.63
137.12
132.41
128.39
127.80
127.45
121.71
116.85
89.42
81.07
77.32
77.00
76.68
64.00
57.46
52.82
31.14
26.07
23.80
17.98
HO
MeO2C
MeO2C
6a
NAME ls111-c
EXPNO 2
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 139.61
DW 20.800 usec
TE 673.1 K
Date_ 20150323
Time 21.34
NS 1024
D1 2.00000000 sec
D11 0.03000000 sec
CHANNEL f1
NUC1 13C
P1 9.82 usec
SI 32768
SF 100.6127712 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
200 180 160 140 120 100 80 60 40 20 0 ppm


7.358
7.344
7.337
7.323
7.260
7.086
7.080
7.064
7.057
7.010
7.004
6.989
6.982
6.968
6.961
4.958
4.954
4.951
4.939
4.935
4.932
4.919
4.916
4.912
4.685
3.763
3.021
2.826
2.807
2.575
1.713
1.712
1.654
HO
MeO2C
MeO2C
F
6b
BRUKER
NAME LJ19-0504C
EXPNO 1
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 8223.685 Hz
FIDRES 0.125483 Hz
AQ 3.9846387 sec
RG 139.61
DW 60.800 usec
TE 673.1 K
Date_ 20150504
Time 19.54
NS 4
D1 1.00000000 sec
======== CHANNEL f1 ========
NUC1 1H
P1 14.50 usec
SI 65536
SF 400.1300099 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
1.00 1.01 1.00 0.98 2.07 6.02 1.92 2.05 0.96 3.02 3.20

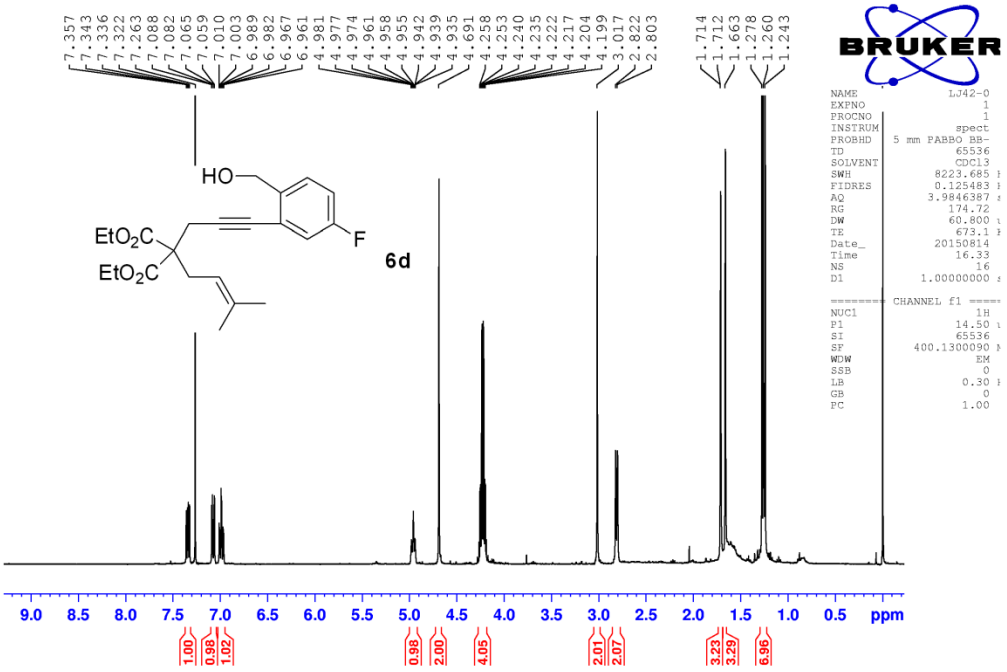

170.76
162.88
160.43
138.74
138.71
137.18
129.68
129.60
123.58
123.48
119.07
118.84
116.78
115.58
115.37
90.48
80.16
80.12
77.32
77.00
76.68
63.24
57.42
52.83
31.23
26.04
23.81
17.97
HO
MeO2C
MeO2C
F
6b
BRUKER
NAME LJ19-0504C
EXPNO 2
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 197
DW 20.800 usec
TE 673.1 K
Date_ 20150506
Time 23.17
NS 1024
D1 2.00000000 sec
D11 0.03000000 sec
======== CHANNEL f1 ========
NUC1 13C
P1 9.82 usec
SI 32768
SF 100.6127695 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
200 180 160 140 120 100 80 60 40 20 0 ppm

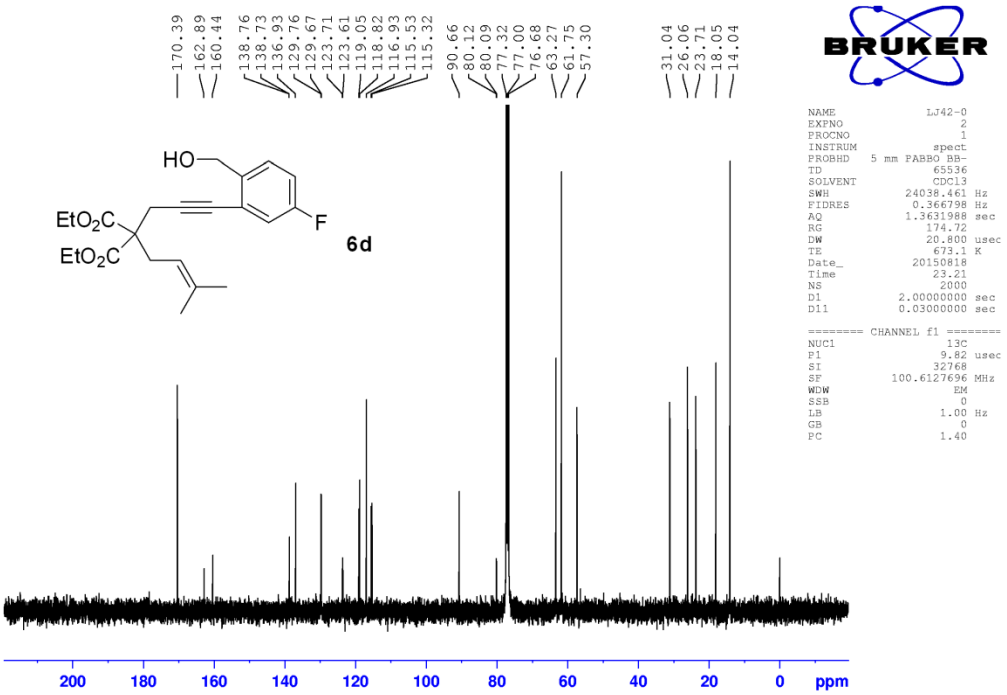


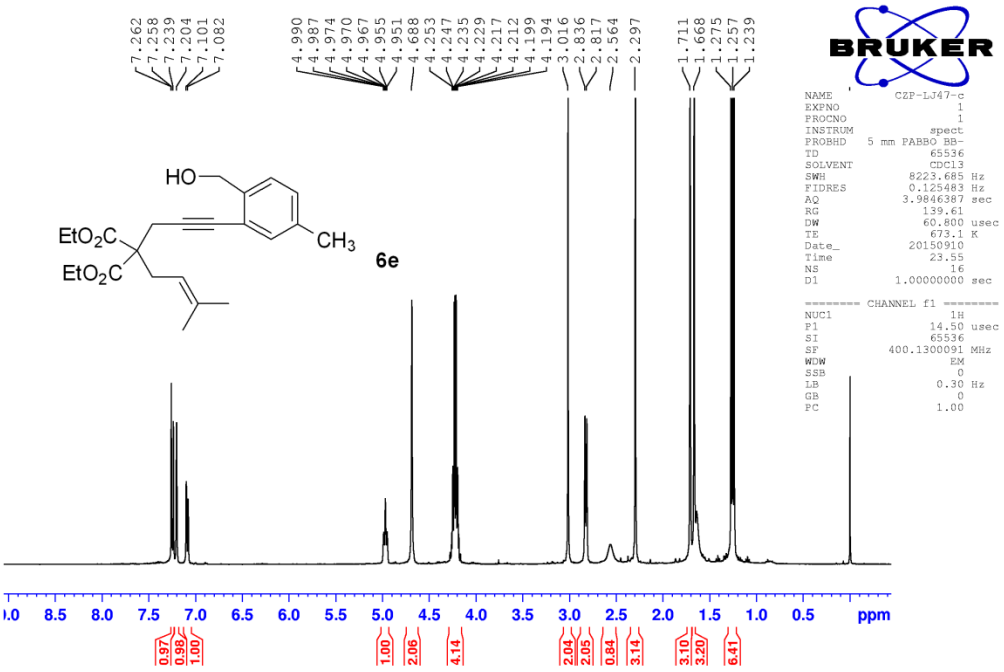

```
NAME                wyz-LJ29
EXPNO                      1
PROCNO                     1
Date_               20150618
Time                   1.20
INSTRUM                spect
PROBHD   5 mm PABBO BB/
PULPROG                zg30
TD                    65536
SOLVENT               CDCl3
NS                        16
DS                         2
SWH                8012.820 Hz
FIDRES            0.122266 Hz
AQ                4.0894966 sec
RG                    97.67
DW                   62.400 usec
DE                    6.50 usec
TE                   295.3 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1             400.1324710 MHz
NUC1                       1H
P1                    13.79 usec
SI                        65536
SF               400.1300100 MHz
WDW                       EM
SSB                        0
LB                    0.30 Hz
GB                         0
PC                    1.00
```

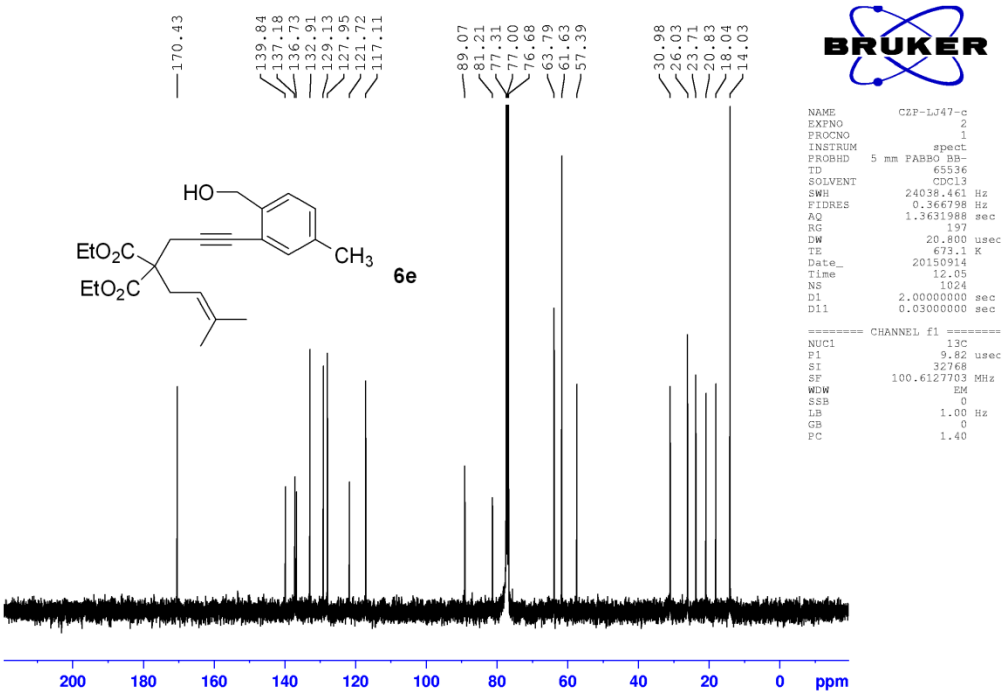


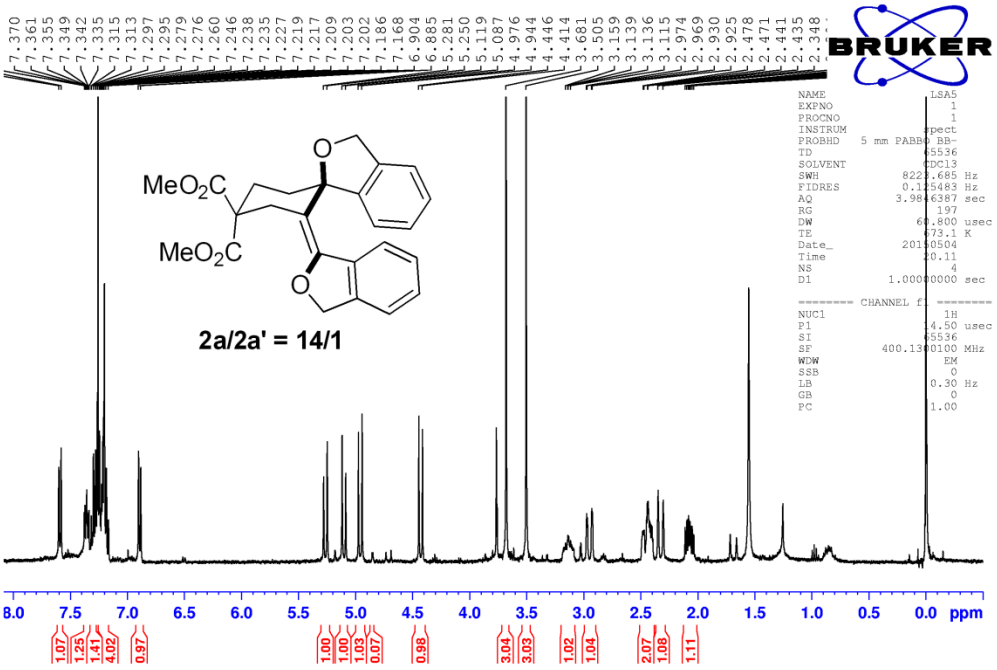

```
NAME                wyz-LJ29
EXPNO                      2
PROCNO                     1
Date_               20150618
Time                   1.55
INSTRUM                spect
PROBHD   5 mm PABBO BB/
PULPROG             zgpg30
TD                    65536
SOLVENT               CDCl3
NS                       600
DS                         4
SWH               24038.461 Hz
FIDRES            0.366798 Hz
AQ                1.3631988 sec
RG                   193.76
DW                   20.800 usec
DE                    6.50 usec
TE                   296.6 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1             100.6228293 MHz
NUC1                       13C
P1                    10.11 usec
SI                        32768
SF               100.6127722 MHz
WDW                       EM
SSB                        0
LB                    1.00 Hz
GB                         0
PC                    1.40
```

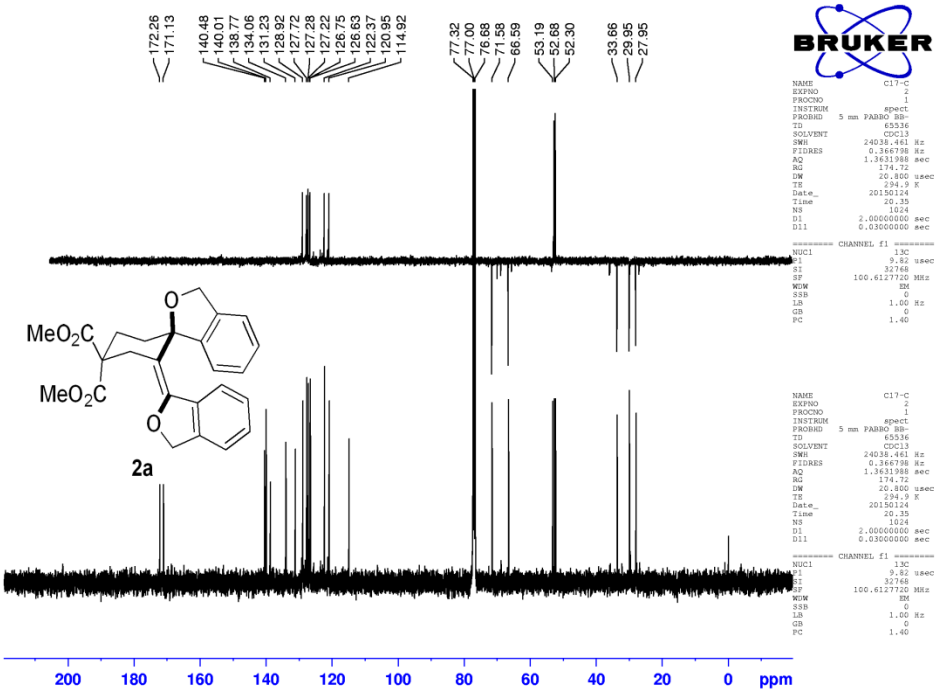

7.357
7.343
7.336
7.322
7.263
7.088
7.082
7.065
7.059
7.010
7.003
6.989
6.982
6.967
6.961
4.981
4.977
4.974
4.961
4.958
4.955
4.942
4.939
4.935
4.691
4.258
4.253
4.240
4.235
4.222
4.217
4.204
4.199
3.017
2.822
2.803
1.714
1.712
1.663
1.278
1.260
1.243
HO
F
EtO2C
EtO2C
6d
BRUKER
NAME LJ42-0
EXPNO 1
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 8223.685
FIDRES 0.125483
AQ 3.9846387
RG 174.72
DW 60.800
TE 673.1
Date_ 20150814
Time 16.33
NS 16
D1 1.00000000
CHANNEL f1
NUC1 1H
P1 14.50
SI 65536
SF 400.1300090
WDW EM
SSB 0
LB 0.30
GB 0
PC 1.00
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
1.00
0.98
1.02
0.98
2.00
4.05
2.01
2.07
3.23
3.29
6.96

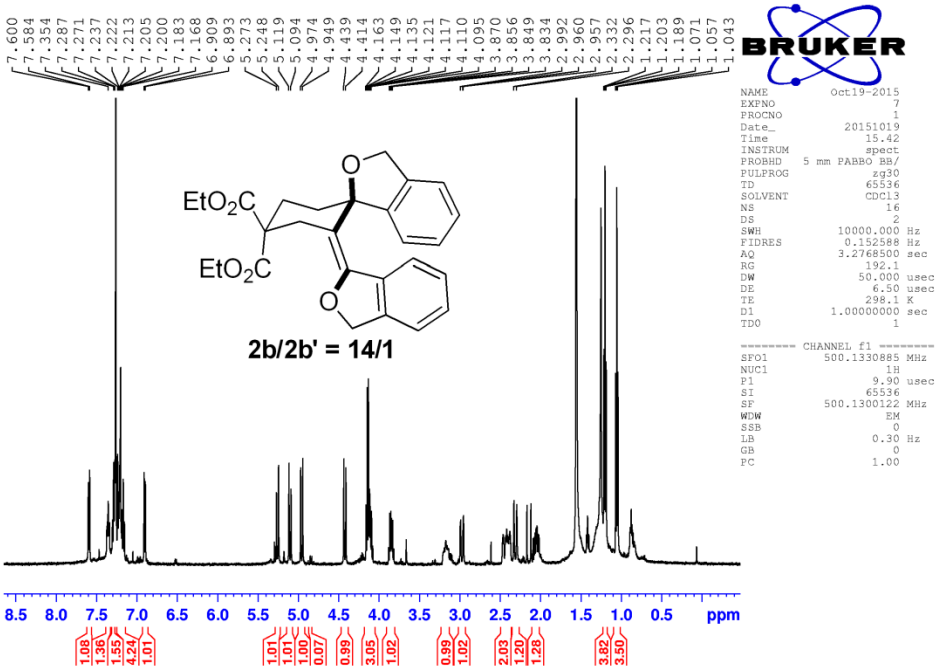

170.39
162.89
160.44
138.76
138.73
136.93
129.76
129.67
123.71
123.61
119.05
118.82
116.93
115.53
115.32
90.66
80.12
80.09
77.32
77.00
76.68
63.27
61.75
57.30
31.04
26.06
23.71
18.05
14.04
HO
F
EtO2C
EtO2C
6d
BRUKER
NAME LJ42-0
EXPNO 2
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 174.72
DW 20.800 usec
TE 673.1 K
Date_ 20150818
Time 23.21
NS 2000
D1 2.00000000 sec
D11 0.03000000 sec
CHANNEL f1
NUC1 13C
P1 9.82 usec
SI 32768
SF 100.6127696 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
200 180 160 140 120 100 80 60 40 20 0 ppm

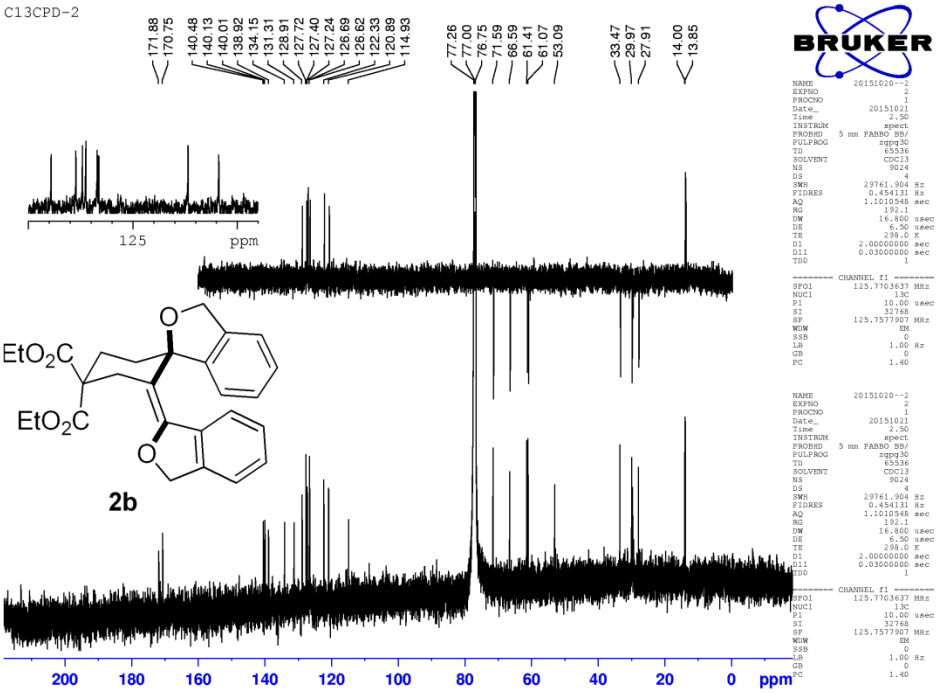

7.262
7.258
7.239
7.204
7.101
7.082
4.990
4.987
4.974
4.970
4.967
4.955
4.951
4.688
4.253
4.247
4.235
4.229
4.217
4.212
4.199
4.194
3.016
2.836
2.817
2.564
2.297
1.711
1.668
1.275
1.257
1.239
HO
EtO2C
EtO2C
CH3
6e
BRUKER
NAME CZP-LJ47-c
EXPNO 1
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 8223.685 Hz
FIDRES 0.125483 Hz
AQ 3.9846387 sec
RG 139.61
DW 60.800 usec
TE 673.1 K
Date_ 20150910
Time 23.55
NS 16
D1 1.00000000 sec
CHANNEL f1
NUC1 1H
P1 14.50 usec
SI 65536
SF 400.1300091 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00
ppm
0.97
0.98
1.00
1.00
2.06
4.14
2.04
2.05
0.84
3.14
3.10
3.20
6.41

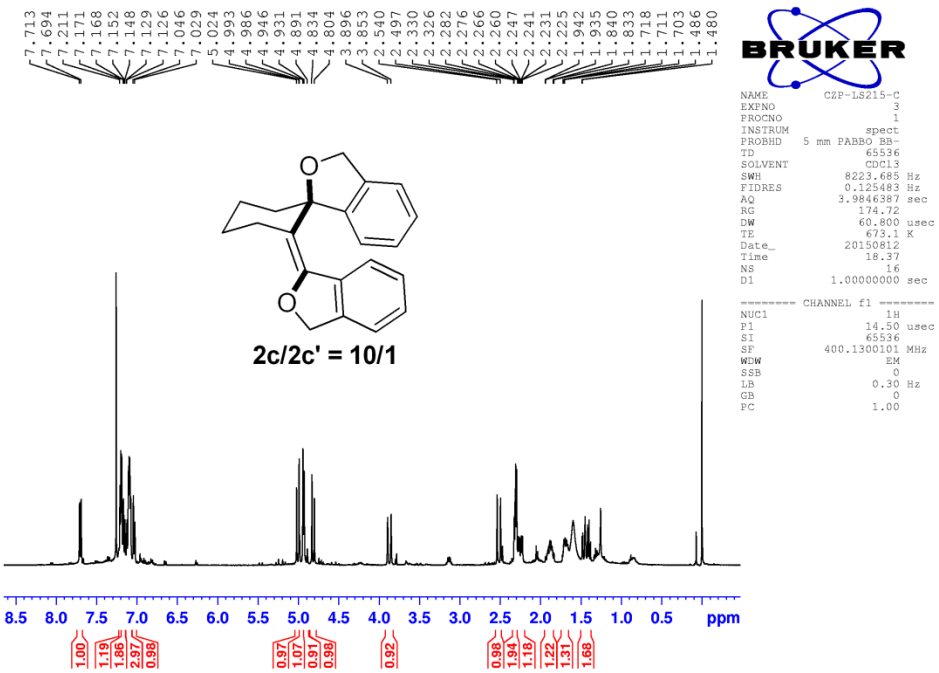

170.43
139.84
137.18
136.73
132.91
129.13
127.95
121.72
117.11
89.07
81.21
77.31
77.00
76.68
63.79
61.63
57.39
30.98
26.03
23.71
20.83
18.04
14.03
HO
EtO2C
EtO2C
CH3
6e
BRUKER
NAME CZP-LJ47-c
EXPNO 2
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 197
DW 20.800 usec
TE 673.1 K
Date_ 20150914
Time 12.05
NS 1024
D1 2.00000000 sec
D11 0.03000000 sec
CHANNEL f1
NUC1 13C
P1 9.82 usec
SI 32768
SF 100.6127703 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
ppm

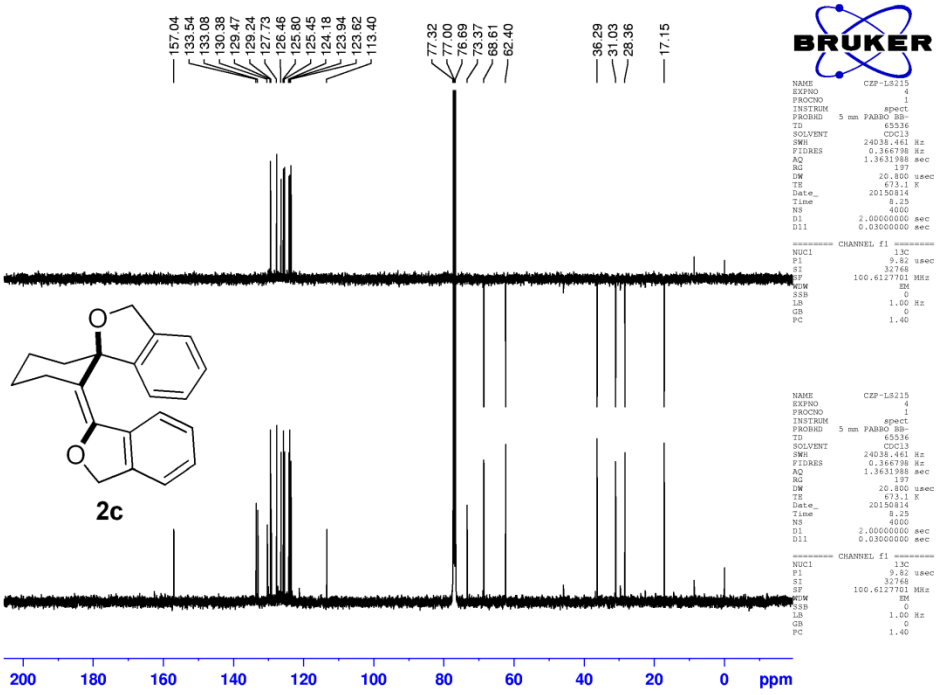

7.370 7.361 7.355 7.349 7.342 7.335 7.315 7.313 7.297 7.295 7.279 7.276 7.260 7.246 7.238 7.235 7.227 7.219 7.217 7.209 7.203 7.202 7.196 7.168 6.904 6.885 5.281 5.250 5.119 5.087 4.976 4.944 4.446 4.414 3.681 3.505 3.159 3.139 3.136 3.115 2.974 2.969 2.930 2.925 2.478 2.471 2.441 2.435 2.348
BRUKER
MeO2C
MeO2C
2a/2a' = 14/1
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 ppm
1.07 1.25 1.41 4.02 0.97 1.00 1.00 1.03 0.07 0.98 3.04 3.03 1.02 1.04 2.07 1.08 1.11

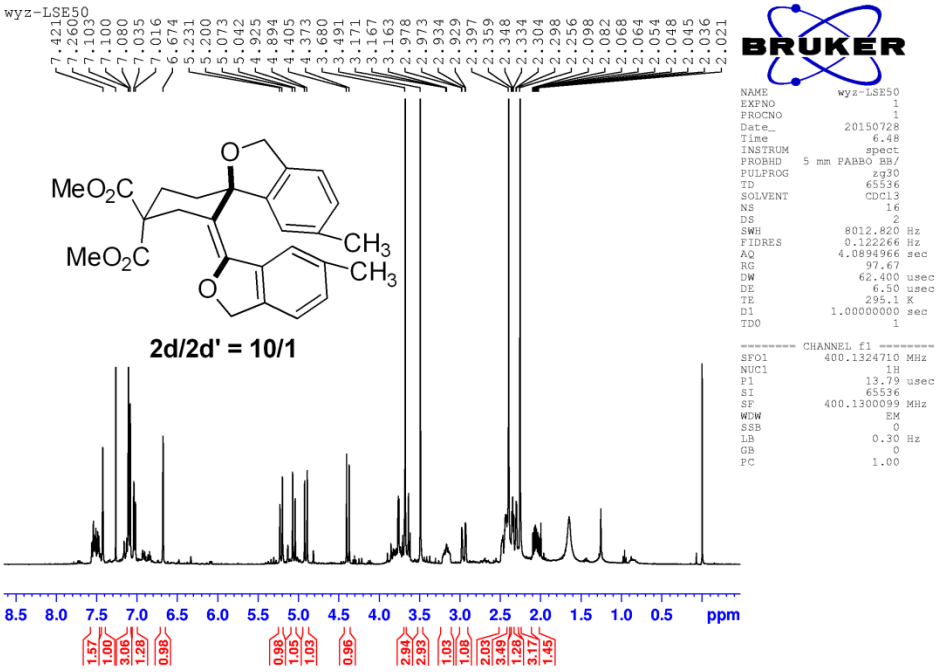

172.26 171.13 140.48 140.01 138.77 134.06 131.23 128.92 127.72 127.28 127.22 126.75 126.63 122.37 120.95 114.92 77.32 77.00 76.68 71.58 66.59 53.19 52.68 52.30 33.66 29.95 27.95
BRUKER
MeO2C
MeO2C
2a
200 180 160 140 120 100 80 60 40 20 0 ppm

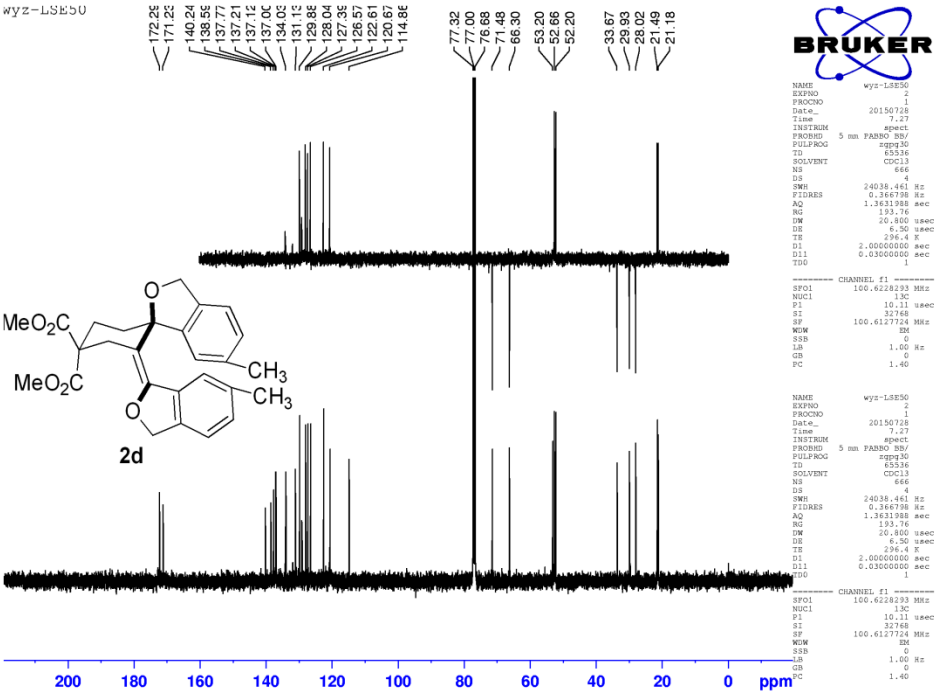

7.600
7.584
7.354
7.287
7.271
7.237
7.222
7.213
7.205
7.200
7.183
7.168
7.099
6.893
5.273
5.248
5.119
5.094
4.974
4.949
4.439
4.414
4.163
4.149
4.135
4.121
4.117
4.110
4.095
3.870
3.856
3.849
3.834
2.992
2.960
2.957
2.332
2.296
1.217
1.203
1.189
1.071
1.057
1.043
EtO2C
EtO2C
O
O
2b/2b' = 14/1
BRUKER
NAME Oct19-2015
EXPNO 7
PROCNO 1
Date_ 20151019
Time 15.42
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 10000.000 Hz
FIDRES 0.152588 Hz
AQ 3.27680500 sec
RG 192.1
DW 50.000 usec
DE 6.50 usec
TE 298.1 K
D1 1.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 500.1330885 MHz
NUC1 1H
P1 9.90 usec
SI 65536
SF 500.1300122 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
1.08
1.36
1.55
4.24
1.01
1.01
1.01
1.00
0.07
0.99
3.05
1.02
0.99
1.02
2.03
1.20
1.28
3.82
3.50

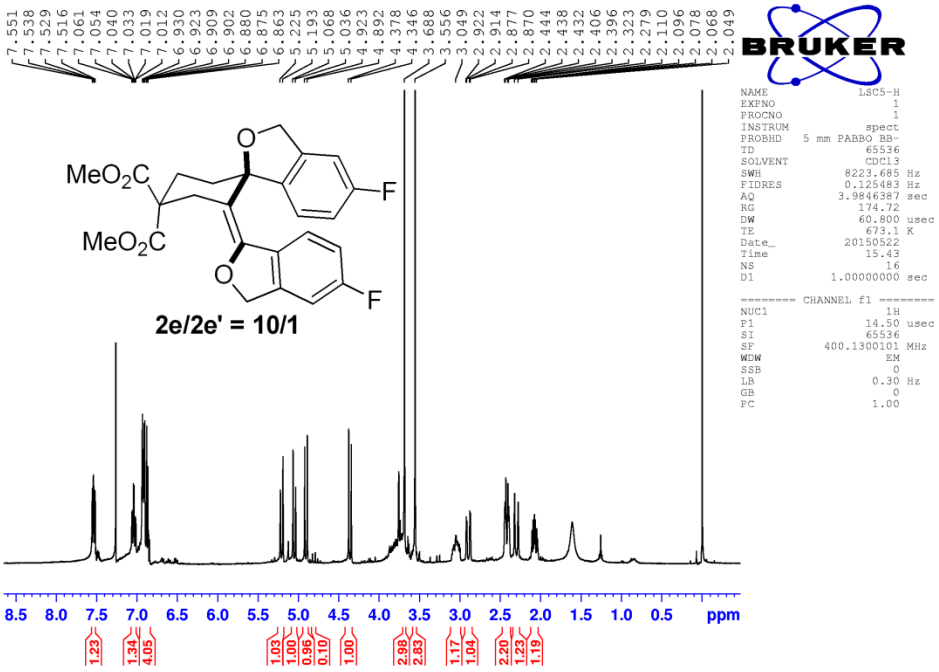

C13CPD-2
171.88
170.75
140.48
140.13
140.01
138.92
134.15
131.31
128.91
127.72
127.40
127.24
126.69
126.62
122.33
120.89
114.93
77.26
77.00
76.75
71.59
66.59
61.41
61.07
53.09
33.47
29.97
27.91
14.00
13.85
125
ppm
EtO2C
EtO2C
O
O
2b
BRUKER
NAME 20151020--2
EXPNO 2
PROCNO 1
Date_ 20151021
Time 2.50
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 9024
DS 4
SWH 29761.904 Hz
FIDRES 0.454131 Hz
AQ 1.1010548 sec
RG 192.1
DW 16.800 usec
DE 6.50 usec
TE 298.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 125.7703637 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 125.7577907 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
NAME 20151020--2
EXPNO 2
PROCNO 1
Date_ 20151021
Time 2.50
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 9024
DS 4
SWH 29761.904 Hz
FIDRES 0.454131 Hz
AQ 1.1010548 sec
RG 192.1
DW 16.800 usec
DE 6.50 usec
TE 298.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 125.7703637 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 125.7577907 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
200 180 160 140 120 100 80 60 40 20 0 ppm

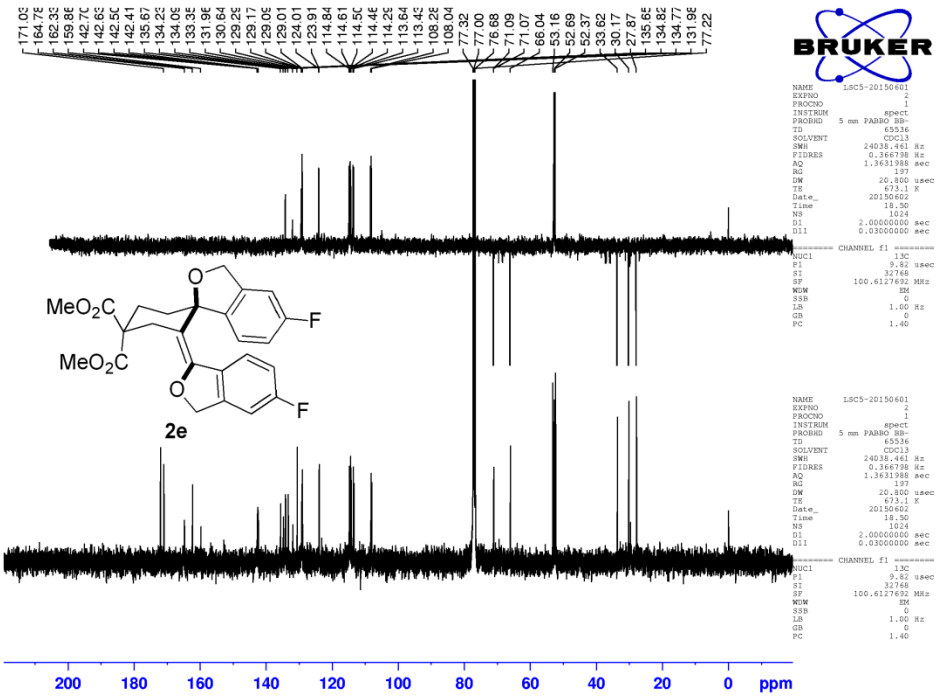

7.713
7.694
7.211
7.171
7.168
7.152
7.148
7.129
7.126
7.046
7.029
5.024
4.993
4.986
4.946
4.931
4.891
4.834
4.804
3.896
3.853
3.540
2.497
2.330
2.326
2.282
2.276
2.266
2.260
2.247
2.241
2.231
2.225
1.942
1.935
1.840
1.833
1.718
1.711
1.703
1.486
1.480
BRUKER
NAME CZP-LS215-C
EXPNO 3
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 8223.685 Hz
FIDRES 0.125483 Hz
AQ 3.9846387 sec
RG 174.72
DW 60.800 usec
TE 673.1 K
Date_ 20150812
Time 18.37
NS 16
D1 1.00000000 sec
======== CHANNEL f1 ========
NUC1 1H
P1 14.50 usec
SI 65536
SF 400.1300101 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00
2c/2c' = 10/1
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
1.00 1.19 1.86 2.97 0.98 0.97 1.07 0.91 0.98 0.92 0.98 1.94 1.18 1.22 1.31 1.68

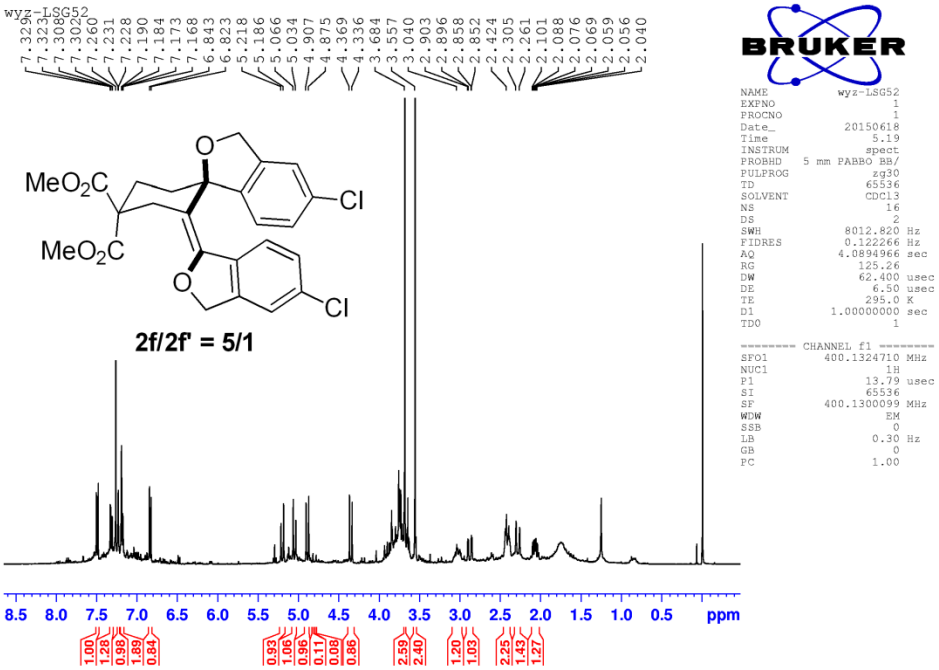

157.04
133.54
133.08
130.38
129.47
129.24
127.73
126.46
125.80
125.45
124.18
123.94
123.62
113.40
77.32
77.00
76.69
73.37
68.61
62.40
36.29
31.03
28.36
17.15
BRUKER
NAME CZP-LS215
EXPNO 4
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 197
DW 20.800 usec
TE 673.1 K
Date_ 20150814
Time 8.25
NS 4000
D1 2.00000000 sec
D11 0.03000000 sec
======== CHANNEL f1 ========
NUC1 13C
P1 9.82 usec
SI 32768
SF 100.6127701 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
2c
200 180 160 140 120 100 80 60 40 20 0 ppm

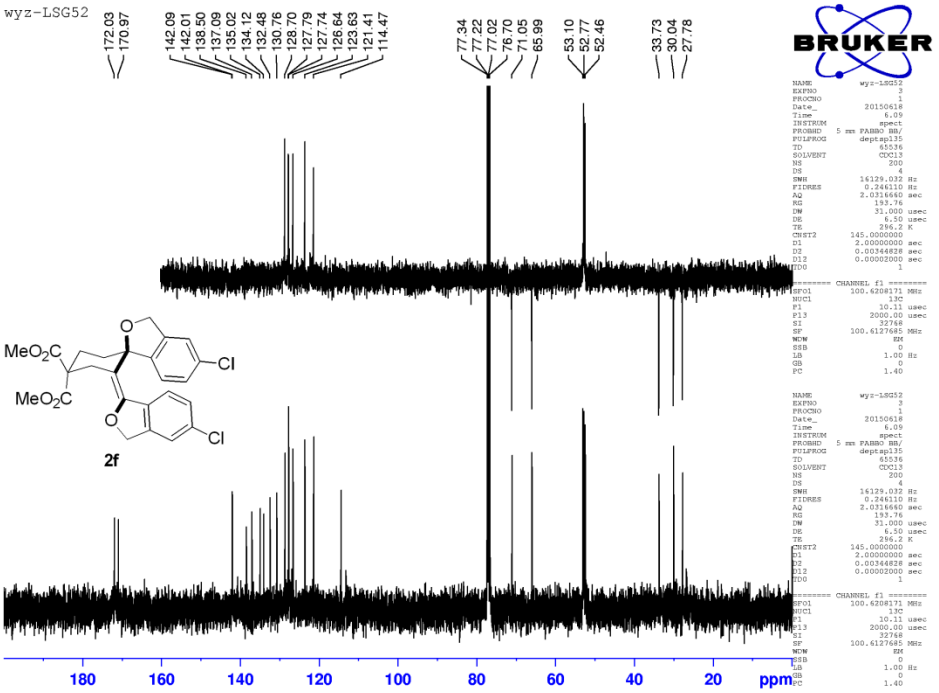

wyz-LSE50
7.421 7.260 7.103 7.100 7.080 7.035 7.016 6.674 5.231 5.200 5.073 5.042 4.925 4.894 4.405 4.373 3.680 3.491 3.171 3.167 3.163 2.978 2.973 2.934 2.929 2.397 2.359 2.348 2.334 2.304 2.298 2.256 2.098 2.082 2.068 2.064 2.054 2.048 2.045 2.036 2.021
MeO2C
MeO2C
CH3
CH3
O
O
2d/2d' = 10/1
BRUKER
NAME wyz-LSE50
EXPNO 1
PROCNO 1
Date_ 20150728
Time 6.48
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 97.67
DW 62.400 usec
DE 6.50 usec
TE 295.1 K
D1 1.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 13.79 usec
SI 65536
SF 400.1300099 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
1.57 1.00 3.06 1.28 0.98 0.98 1.05 1.03 0.96 2.94 2.93 1.03 1.08 2.03 3.49 1.28 3.17 1.45

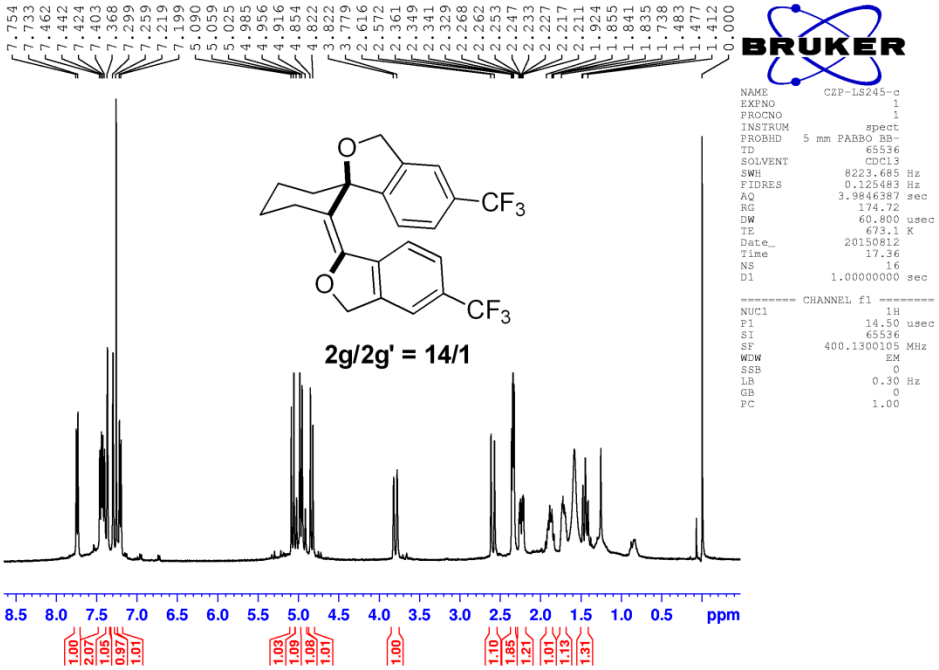

wyz-LSE50
172.25 171.22 140.24 138.55 137.77 137.21 137.12 137.00 134.03 131.12 129.86 128.04 127.35 126.57 122.61 120.67 114.88
77.32 77.00 76.68 71.48 66.30 53.20 52.66 52.20 33.67 29.93 28.02 21.49 21.18
MeO2C
MeO2C
CH3
CH3
O
O
2d
BRUKER
NAME wyz-LSE50
EXPNO 2
PROCNO 1
Date_ 20150728
Time 7.27
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 666
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 193.76
DW 20.800 usec
DE 6.50 usec
TE 296.4 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6228293 MHz
NUC1 13C
P1 10.11 usec
SI 32768
SF 100.6127724 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
200 180 160 140 120 100 80 60 40 20 0 ppm

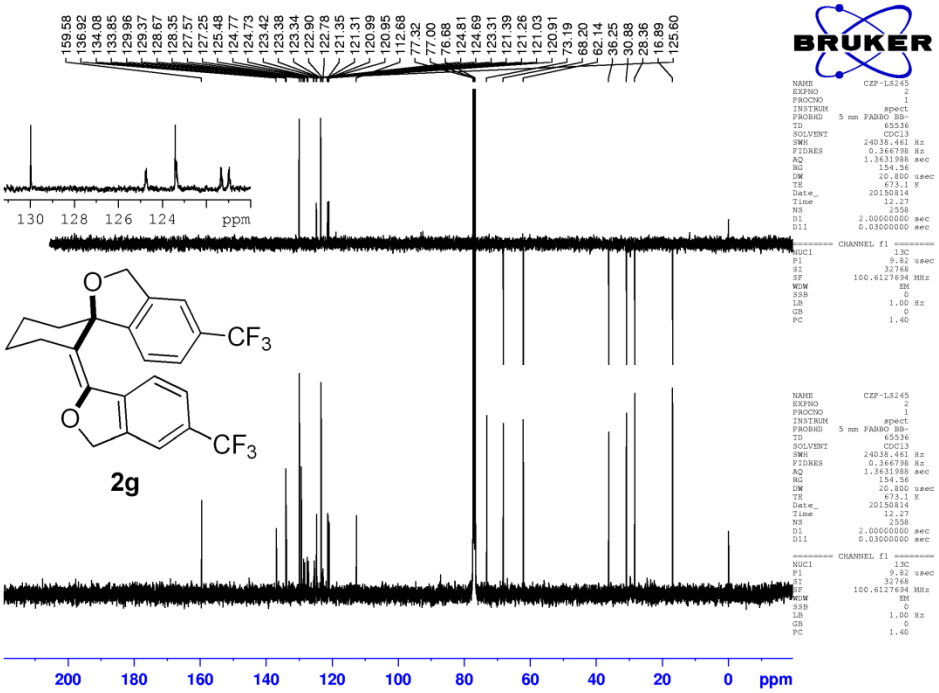

7.551
7.538
7.529
7.516
7.061
7.054
7.040
7.033
7.019
7.012
6.930
6.923
6.909
6.902
6.880
6.875
6.863
5.225
5.193
5.068
5.036
4.923
4.892
4.378
4.346
3.688
3.556
3.049
2.922
2.914
2.877
2.870
2.444
2.438
2.432
2.406
2.396
2.323
2.279
2.110
2.096
2.078
2.068
2.049
BRUKER
NAME LSC5-H
EXPNO 1
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 8223.685 Hz
FIDRES 0.125483 Hz
AQ 3.9846387 sec
RG 174.72
DW 60.800 usec
TE 673.1 K
Date_ 20150522
Time 15.43
NS 16
D1 1.00000000 sec
CHANNEL f1
NUC1 1H
P1 14.50 usec
SI 65536
SF 400.1300101 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00
MeO2C
MeO2C
F
F
2e/2e' = 10/1
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
1.23
1.34
4.05
1.03
1.00
0.96
0.10
1.00
2.98
2.83
1.17
1.04
2.20
1.23
1.19

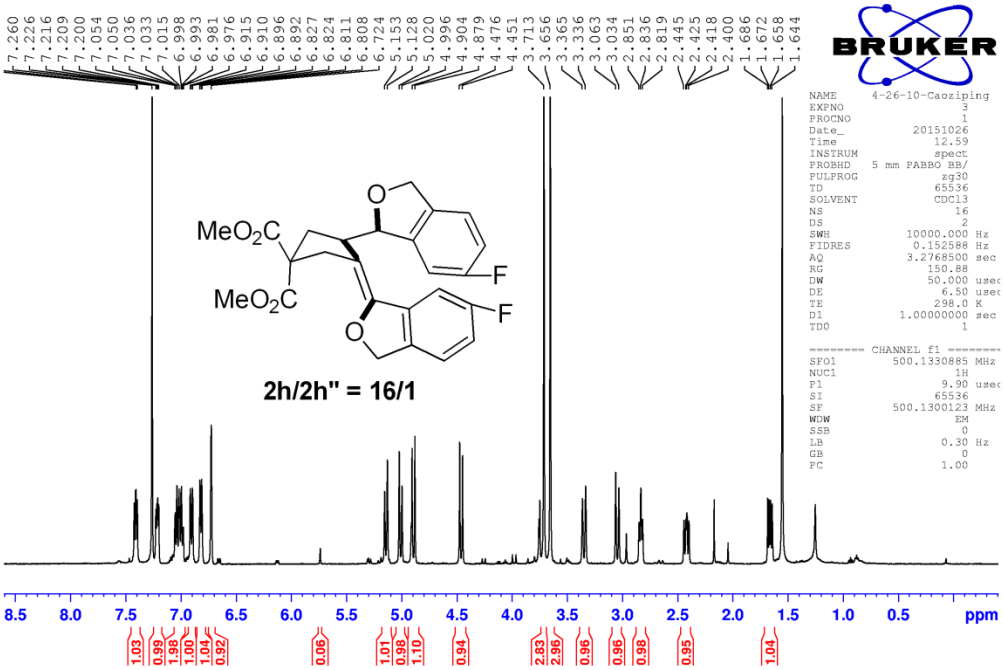

171.03
164.78
162.33
159.88
142.76
142.66
142.56
142.41
135.67
134.22
134.05
133.35
131.98
130.64
129.25
129.17
129.05
129.01
124.01
123.91
114.84
114.61
114.50
114.44
114.25
113.64
113.45
108.28
108.04
77.32
77.00
76.68
71.09
71.07
66.04
53.16
52.69
52.37
33.62
30.17
27.87
135.65
134.82
134.77
131.98
77.22
BRUKER
NAME LSC5-20150601
EXPNO 2
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 197
DW 20.800 usec
TE 673.1 K
Date_ 20150602
Time 18.50
NS 1024
D1 2.00000000 sec
D11 0.03000000 sec
CHANNEL f1
NUC1 13C
P1 9.82 usec
SI 32768
SF 100.6127692 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
MeO2C
MeO2C
F
F
2e
200 180 160 140 120 100 80 60 40 20 0 ppm

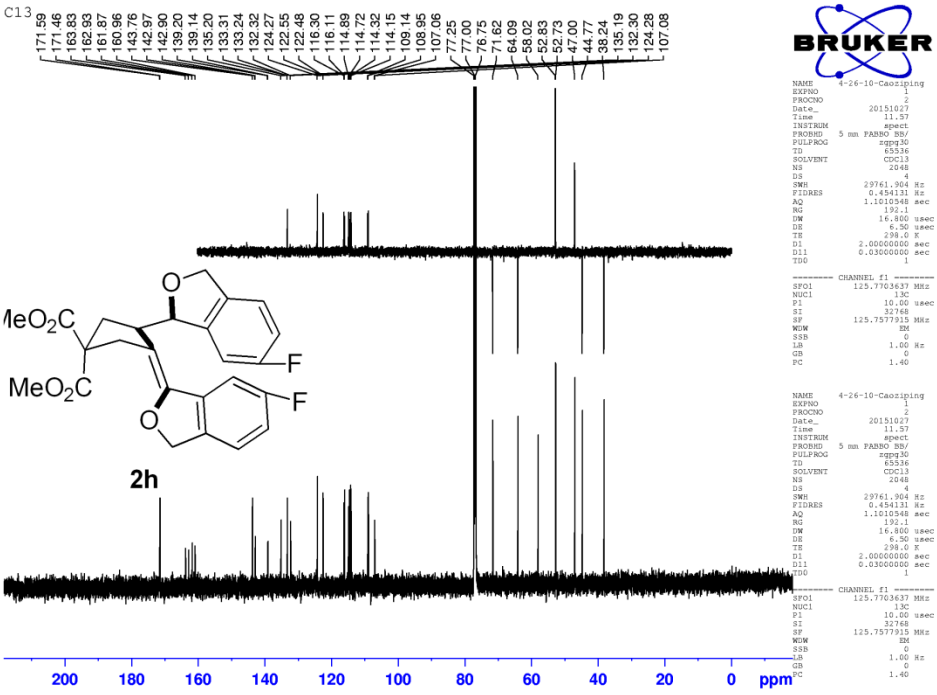

wyz-LSG52
7.329
7.323
7.308
7.302
7.260
7.231
7.228
7.190
7.184
7.173
7.168
6.843
6.823
5.218
5.186
5.066
5.034
4.907
4.875
4.369
4.336
3.684
3.557
3.040
2.903
2.896
2.858
2.852
2.424
2.305
2.261
2.101
2.088
2.076
2.069
2.059
2.056
2.040
MeO2C
MeO2C
Cl
Cl
2f/2f' = 5/1
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
1.00 1.28 0.98 1.89 0.84
0.93 1.06 0.96 0.11 0.08 0.86
2.59 2.40
1.20 1.03
2.25 1.43 1.27
BRUKER
NAME wyz-LSG52
EXPNO 1
PROCNO 1
Date_ 20150618
Time 5.19
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 125.26
DW 62.400 usec
DE 6.50 usec
TE 295.0 K
D1 1.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 13.79 usec
SI 65536
SF 400.1300099 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

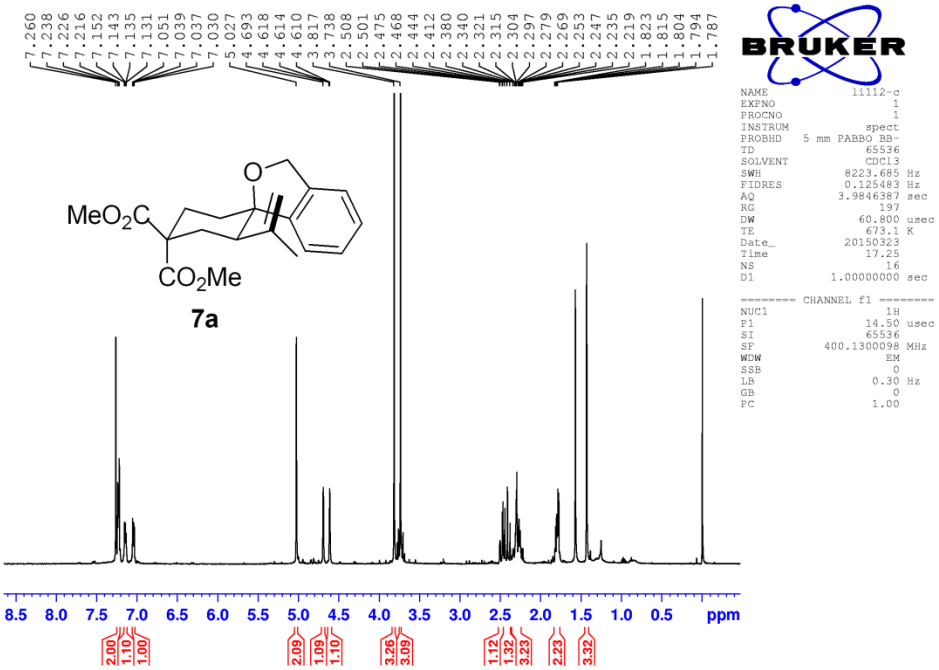

wyz-LSG52
172.03
170.97
142.09
142.01
138.50
137.09
135.02
134.12
132.48
130.76
128.70
127.79
127.74
126.64
123.63
121.41
114.47
77.34
77.22
77.02
76.70
71.05
65.99
53.10
52.77
52.46
33.73
30.04
27.78
MeO2C
MeO2C
Cl
Cl
2f
180 160 140 120 100 80 60 40 20 ppm
BRUKER
NAME wyz-LSG52
EXPNO 3
PROCNO 1
Date_ 20150618
Time 6.09
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG deptsp135
TD 65536
SOLVENT CDCl3
NS 200
DS 4
SWH 16129.032 Hz
FIDRES 0.246110 Hz
AQ 2.0316660 sec
RG 193.76
DW 31.000 usec
DE 6.50 usec
TE 296.2 K
CNST2 145.0000000
D1 2.00000000 sec
D2 0.00344828 sec
D12 0.00002000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6208171 MHz
NUC1 13C
P1 10.11 usec
P13 2000.00 usec
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
NAME wyz-LSG52
EXPNO 3
PROCNO 1
Date_ 20150618
Time 6.09
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG deptsp135
TD 65536
SOLVENT CDCl3
NS 200
DS 4
SWH 16129.032 Hz
FIDRES 0.246110 Hz
AQ 2.0316660 sec
RG 193.76
DW 31.000 usec
DE 6.50 usec
TE 296.2 K
CNST2 145.0000000
D1 2.00000000 sec
D2 0.00344828 sec
D12 0.00002000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6208171 MHz
NUC1 13C
P1 10.11 usec
P13 2000.00 usec
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40


7.754
7.733
7.462
7.442
7.424
7.403
7.368
7.299
7.259
7.219
7.199
5.090
5.059
5.025
4.985
4.956
4.916
4.854
4.822
3.822
3.779
2.616
2.572
2.361
2.349
2.341
2.329
2.268
2.262
2.253
2.247
2.233
2.227
2.217
2.211
1.924
1.855
1.841
1.835
1.738
1.483
1.477
1.412
0.000
BRUKER
NAME CZP-LS245-c
EXPNO 1
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 8223.685 Hz
FIDRES 0.125483 Hz
AQ 3.9846387 sec
RG 174.72
DW 60.800 usec
TE 673.1 K
Date_ 20150812
Time 17.36
NS 16
D1 1.00000000 sec
CHANNEL f1
NUC1 1H
P1 14.50 usec
SI 65536
SF 400.1300105 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00
CF3
CF3
2g/2g' = 14/1
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
1.00 2.07 1.05 0.97 1.01 1.03 1.09 1.08 1.01 1.00 1.10 1.85 1.21 1.01 1.13 1.31


159.58
136.92
134.08
133.85
129.96
129.37
128.67
128.35
127.57
127.25
125.48
124.77
124.73
123.42
123.38
123.34
122.90
122.78
121.35
121.31
120.99
120.95
112.68
77.32
77.00
76.68
124.81
124.69
123.31
121.39
121.26
121.03
120.91
73.19
68.20
62.14
36.25
30.88
28.36
16.89
125.60
130 128 126 124 ppm
BRUKER
NAME CZP-LS245
EXPNO 2
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 154.56
DW 20.800 usec
TE 673.1 K
Date_ 20150814
Time 12.27
NS 2558
D1 2.00000000 sec
D11 0.03000000 sec
CHANNEL f1
NUC1 13C
P1 9.82 usec
SI 32768
SF 100.6127694 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
CF3
CF3
2g
200 180 160 140 120 100 80 60 40 20 0 ppm

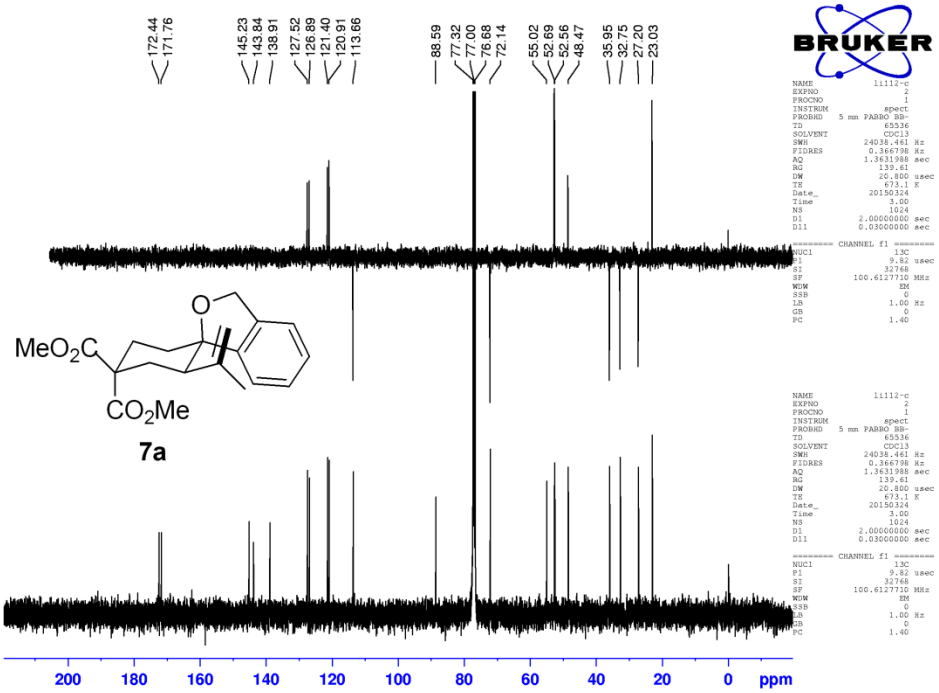

7.260
7.226
7.216
7.209
7.200
7.054
7.050
7.036
7.033
7.015
6.998
6.993
6.981
6.976
6.915
6.910
6.896
6.892
6.827
6.824
6.811
6.808
6.724
5.153
5.128
5.020
4.996
4.904
4.879
4.476
4.451
3.713
3.656
3.365
3.336
3.063
3.034
2.851
2.836
2.819
2.445
2.425
2.418
2.400
1.686
1.672
1.658
1.644
BRUKER
NAME 4-26-10-Caoziping
EXPNO 3
PROCNO 1
Date_ 20151026
Time 12.59
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 10000.000 Hz
FIDRES 0.152588 Hz
AQ 3.2768500 sec
RG 150.88
DW 50.000 usec
DE 6.50 usec
TE 298.0 K
D1 1.00000000 sec
TD0 1
CHANNEL f1
SFO1 500.1330885 MHz
NUC1 1H
P1 9.90 usec
SI 65536
SF 500.1300123 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00
MeO2C
MeO2C
O
O
F
F
2h/2h" = 16/1
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
1.03 0.99 1.98 1.00 1.04 0.92 0.06 1.01 0.98 1.10 0.94 2.83 2.96 0.96 0.96 0.98 0.95 1.04


C13
171.59
171.46
163.83
162.93
161.87
160.96
143.76
142.97
142.90
139.20
139.14
135.20
133.31
133.24
132.32
124.27
122.55
122.48
116.30
116.11
114.89
114.72
114.32
114.15
109.14
108.95
107.06
77.25
77.00
76.75
71.62
64.09
58.02
52.83
52.73
47.00
44.77
38.24
135.19
132.30
124.28
107.08
BRUKER
NAME 4-26-10-Caoziping
EXPNO 1
PROCNO 2
Date_ 20151027
Time 11.57
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 2048
DS 4
SWH 29761.904 Hz
FIDRES 0.454131 Hz
AQ 1.1010548 sec
RG 192.1
DW 16.800 usec
DE 6.50 usec
TE 298.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
CHANNEL f1
SFO1 125.7703637 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 125.7577915 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
MeO2C
MeO2C
O
O
F
F
2h
200 180 160 140 120 100 80 60 40 20 0 ppm



BRUKER

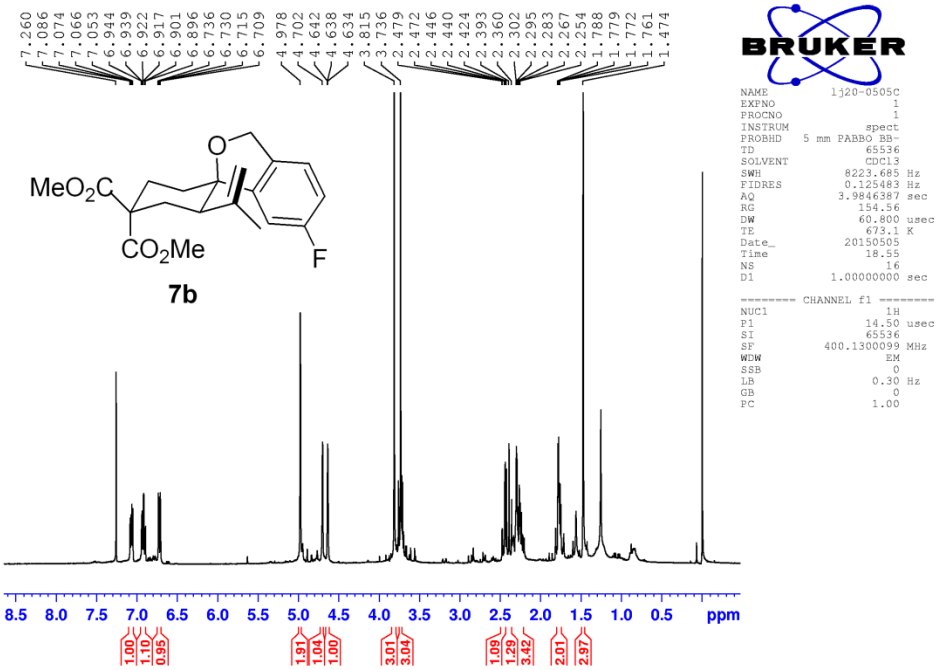
```
NAME                11112-c
EXPNO                     1
PROCNO                    1
INSTRUM               spect
PROBHD    5 mm PABBO BB-
TD                    65536
SOLVENT               CDCl3
SWH                8223.685 Hz
FIDRES             0.125483 Hz
AQ                 3.9846387 sec
RG                      197
DW                   60.800 usec
TE                   673.1 K
Date_              20150323
Time                  17.25
NS                       16
D1                 1.00000000 sec

======== CHANNEL f1 ========
NUC1                    1H
P1                   14.50 usec
SI                    65536
SF              400.1300098 MHz
WDW                     EM
SSB                      0
LB                    0.30 Hz
GB                       0
PC                    1.00
```



BRUKER

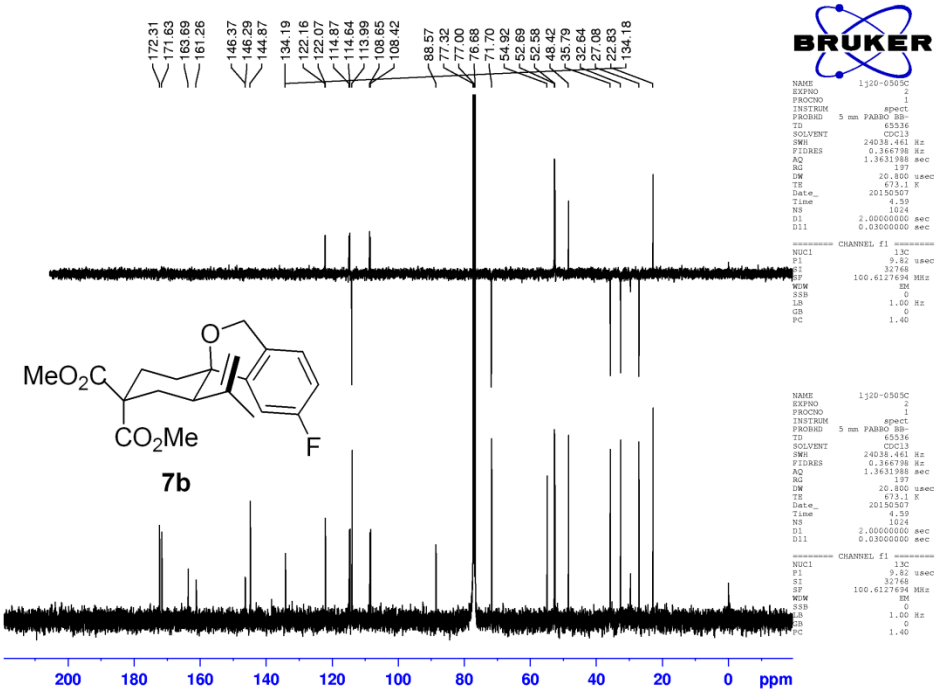
```
NAME                11112-c
EXPNO                     2
PROCNO                    1
INSTRUM               spect
PROBHD    5 mm PABBO BB-
TD                    65536
SOLVENT               CDCl3
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                 1.3631988 sec
RG                    139.61
DW                   20.800 usec
TE                   673.1 K
Date_              20150324
Time                    3.00
NS                      1024
D1                 2.00000000 sec
D11                0.03000000 sec

======== CHANNEL f1 ========
NUC1                    13C
P1                    9.82 usec
SI                    32768
SF              100.6127710 MHz
WDW                     EM
SSB                      0
LB                    1.00 Hz
GB                       0
PC                    1.40
```


```
NAME                11112-c
EXPNO                     2
PROCNO                    1
INSTRUM               spect
PROBHD    5 mm PABBO BB-
TD                    65536
SOLVENT               CDCl3
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                 1.3631988 sec
RG                    139.61
DW                   20.800 usec
TE                   673.1 K
Date_              20150324
Time                    3.00
NS                      1024
D1                 2.00000000 sec
D11                0.03000000 sec

======== CHANNEL f1 ========
NUC1                    13C
P1                    9.82 usec
SI                    32768
SF              100.6127710 MHz
WDW                     EM
SSB                      0
LB                    1.00 Hz
GB                       0
PC                    1.40
```



BRUKER

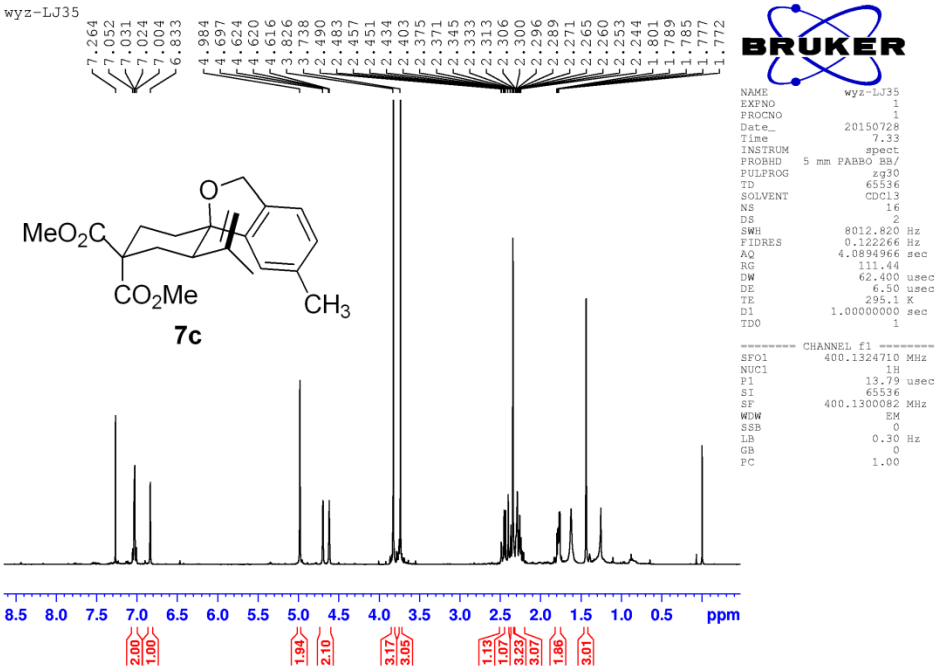
```
NAME                1j20-0505C
EXPNO                        1
PROCNO                       1
INSTRUM                  spect
PROBHD     5 mm PABBO BB-
TD                       65536
SOLVENT                  CDCl3
SWH                 8223.685 Hz
FIDRES              0.125483 Hz
AQ                  3.9846387 sec
RG                      154.56
DW                      60.800 usec
TE                      673.1 K
Date_                20150505
Time                    18.55
NS                          16
D1                  1.00000000 sec

======== CHANNEL f1 ========
NUC1                        1H
P1                      14.50 usec
SI                       65536
SF                400.1300099 MHz
WDW                         EM
SSB                          0
LB                      0.30 Hz
GB                           0
PC                      1.00
```

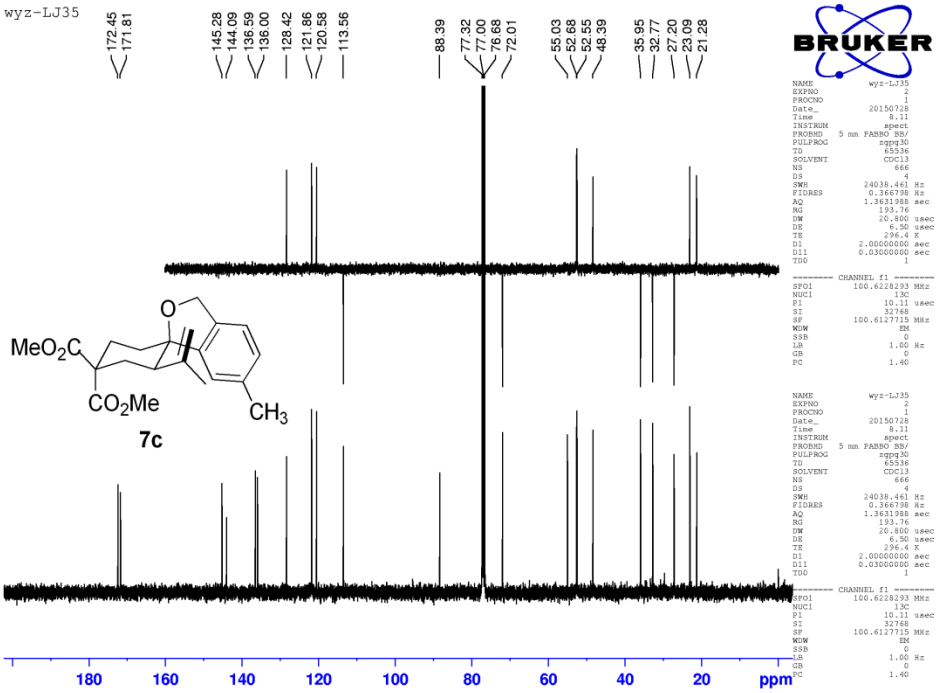


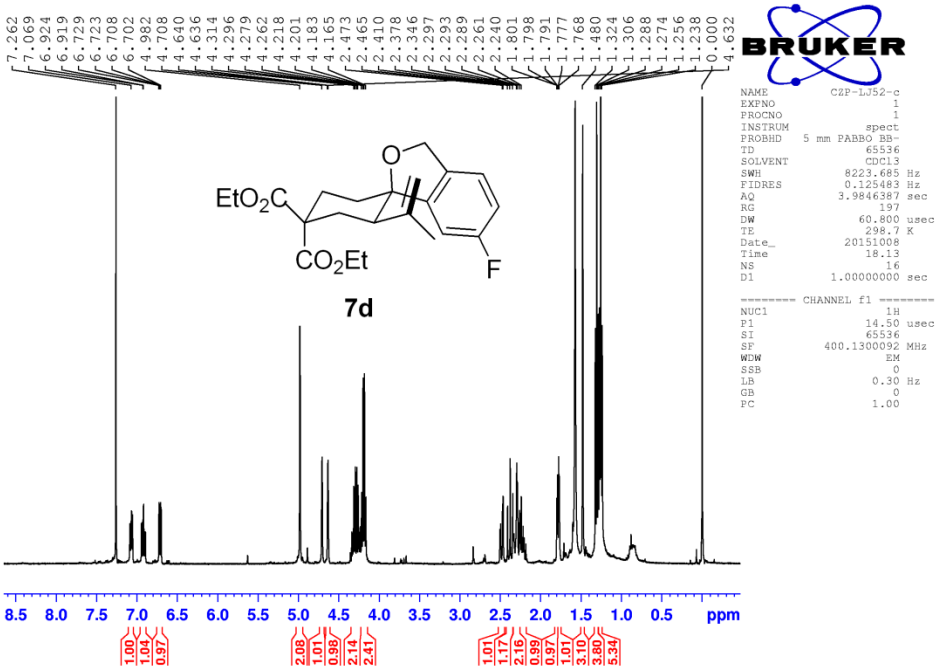
BRUKER

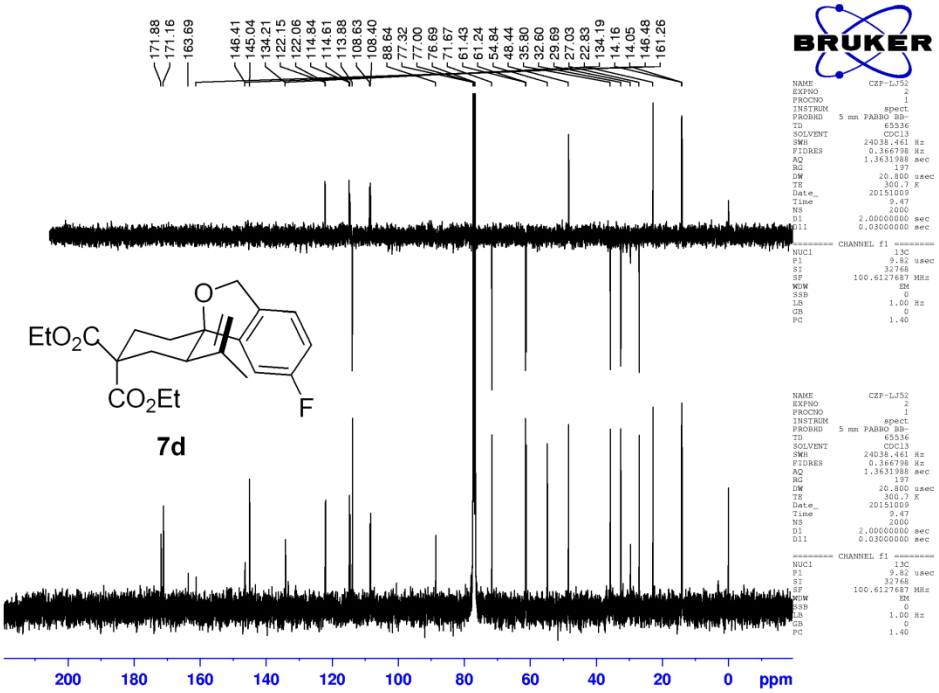
```
NAME                1j20-0505C
EXPNO                        2
PROCNO                       1
INSTRUM                  spect
PROBHD     5 mm PABBO BB-
TD                       65536
SOLVENT                  CDCl3
SWH                24038.461 Hz
FIDRES              0.366798 Hz
AQ                  1.3631988 sec
RG                         197
DW                      20.800 usec
TE                      673.1 K
Date_                20150507
Time                     4.59
NS                       1024
D1                  2.00000000 sec
D11                 0.03000000 sec

======== CHANNEL f1 ========
NUC1                       13C
P1                       9.82 usec
SI                       32768
SF                100.6127694 MHz
WDW                         EM
SSB                          0
LB                      1.00 Hz
GB                           0
PC                      1.40
```

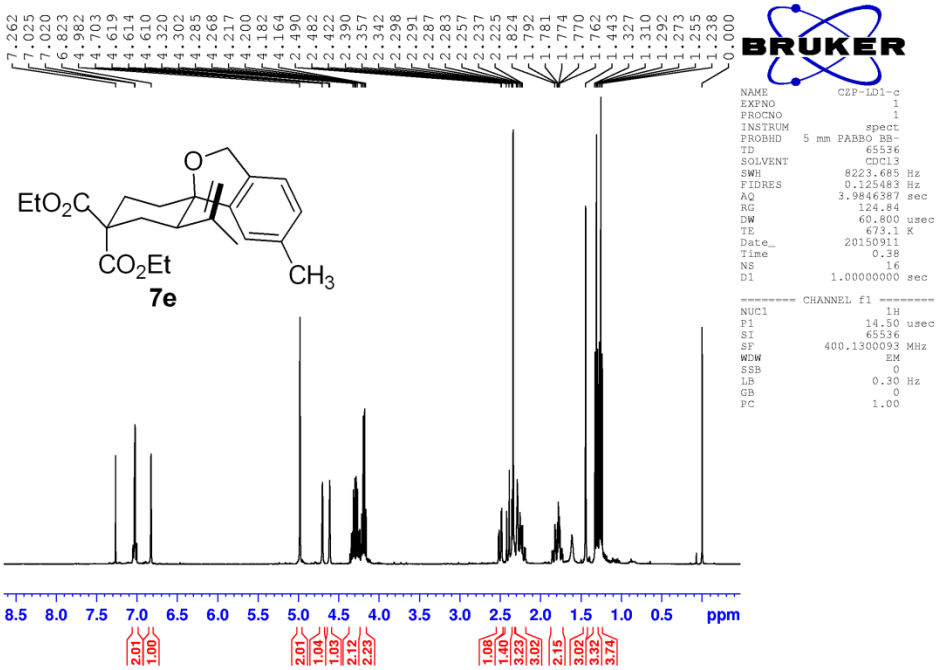

```
NAME                1j20-0505C
EXPNO                        2
PROCNO                       1
INSTRUM                  spect
PROBHD     5 mm PABBO BB-
TD                       65536
SOLVENT                  CDCl3
SWH                24038.461 Hz
FIDRES              0.366798 Hz
AQ                  1.3631988 sec
RG                         197
DW                      20.800 usec
TE                      673.1 K
Date_                20150507
Time                     4.59
NS                       1024
D1                  2.00000000 sec
D11                 0.03000000 sec

======== CHANNEL f1 ========
NUC1                       13C
P1                       9.82 usec
SI                       32768
SF                100.6127694 MHz
WDW                         EM
SSB                          0
LB                      1.00 Hz
GB                           0
PC                      1.40
```

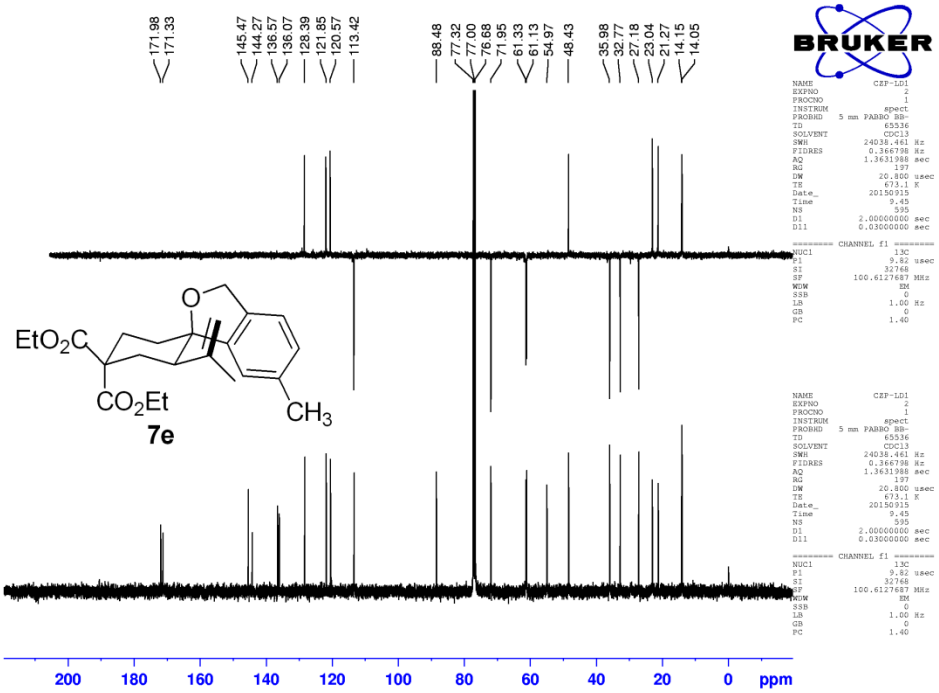

wyz-LJ35
7.264
7.052
7.031
7.024
7.004
6.833
4.984
4.697
4.624
4.620
4.616
3.826
3.738
2.490
2.483
2.457
2.451
2.434
2.403
2.375
2.371
2.345
2.333
2.313
2.306
2.300
2.296
2.289
2.271
2.265
2.260
2.253
2.244
1.801
1.789
1.785
1.777
1.772
BRUKER
NAME wyz-LJ35
EXPNO 1
PROCNO 1
Date_ 20150728
Time 7.33
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 111.44
DW 62.400 usec
DE 6.50 usec
TE 295.1 K
D1 1.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 13.79 usec
SI 65536
SF 400.1300082 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00
MeO2C
CO2Me
CH3
O
7c
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
2.00
1.00
1.94
2.10
3.17
3.05
1.13
1.07
3.23
3.07
1.86
3.01


wyz-LJ35
172.45
171.81
145.28
144.09
136.59
136.00
128.42
121.86
120.58
113.56
88.39
77.32
77.00
76.68
72.01
55.03
52.68
52.55
48.39
35.95
32.77
27.20
23.09
21.28
BRUKER
NAME wyz-LJ35
EXPNO 2
PROCNO 1
Date_ 20150728
Time 8.11
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 666
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 193.76
DW 20.800 usec
DE 6.50 usec
TE 296.4 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6228293 MHz
NUC1 13C
P1 10.11 usec
SI 32768
SF 100.6127715 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
MeO2C
CO2Me
CH3
O
7c
180 160 140 120 100 80 60 40 20 ppm


7.262
7.069
6.924
6.919
6.729
6.723
6.708
6.702
4.982
4.708
4.640
4.636
4.314
4.296
4.279
4.262
4.218
4.201
4.183
4.165
2.473
2.465
2.410
2.378
2.346
2.297
2.293
2.289
2.261
2.240
1.801
1.798
1.791
1.777
1.768
1.480
1.324
1.306
1.288
1.274
1.256
1.238
0.000
4.632
BRUKER
NAME CZP-LJ52-c
EXPNO 1
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 8223.685 Hz
FIDRES 0.125483 Hz
AQ 3.9846387 sec
RG 197
DW 60.800 usec
TE 298.7 K
Date_ 20151008
Time 18.13
NS 16
D1 1.00000000 sec
======== CHANNEL f1 ========
NUC1 1H
P1 14.50 usec
SI 65536
SF 400.1300092 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00
EtO2C
CO2Et
O
F
7d
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
1.00 1.04 0.97 2.08 1.01 0.98 2.14 2.41 1.01 1.17 2.16 0.99 0.97 1.01 3.10 3.80 5.34


171.88
171.16
163.69
146.41
145.04
134.21
122.15
122.06
114.84
114.61
113.88
108.63
108.40
88.64
77.32
77.00
76.69
71.67
61.43
61.24
54.84
48.44
35.80
32.60
29.69
27.03
22.83
134.19
14.16
14.05
146.48
161.26
BRUKER
NAME CZP-LJ52
EXPNO 2
PROCNO 1
INSTRUM spect
PROBHD 5 mm PABBO BB-
TD 65536
SOLVENT CDCl3
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 197
DW 20.800 usec
TE 300.7 K
Date_ 20151009
Time 9.47
NS 2000
D1 2.00000000 sec
D11 0.03000000 sec
======== CHANNEL f1 ========
NUC1 13C
P1 9.82 usec
SI 32768
SF 100.6127687 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
EtO2C
CO2Et
O
F
7d
200 180 160 140 120 100 80 60 40 20 0 ppm


7.262
7.025
7.020
6.823
4.982
4.703
4.619
4.614
4.610
4.320
4.302
4.285
4.268
4.217
4.200
4.182
4.164
2.490
2.482
2.422
2.390
2.357
2.342
2.298
2.291
2.287
2.283
2.257
2.237
2.225
1.824
1.792
1.781
1.774
1.770
1.762
1.443
1.327
1.310
1.292
1.273
1.255
1.238
0.000
EtO2C
CO2Et
CH3
7e
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
2.01 1.00 2.01 1.04 1.03 2.12 2.23 1.08 1.40 3.23 3.02 2.15 3.02 3.32 3.74


171.98
171.33
145.47
144.27
136.57
136.07
128.39
121.85
120.57
113.42
88.48
77.32
77.00
76.68
71.95
61.33
61.13
54.97
48.43
35.98
32.77
27.18
23.04
21.27
14.15
14.05
EtO2C
CO2Et
CH3
7e
200 180 160 140 120 100 80 60 40 20 0 ppm