

# Supporting Information

## Silver Salts and DBU Cooperatively Catalyzed Nucleophilic Addition / Cyclization of Propargylic Alcohols with Trifluoromethyl Ketones

Jingjing Wang,\* Wei-Guang Kong, Feng Li, Jie Liu, Qin Shen, Lantao Liu, and  
Wen-Xian Zhao\*

*College of Chemistry and Chemical Engineering, Shangqiu Normal University, 298*

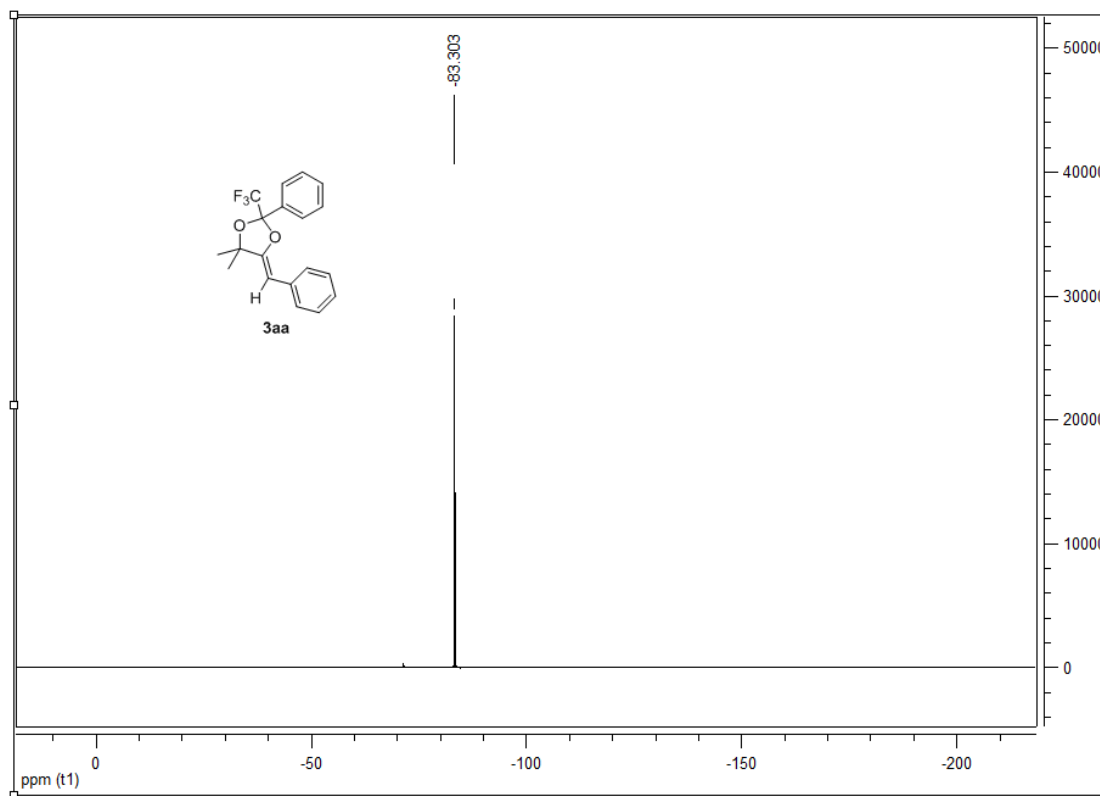
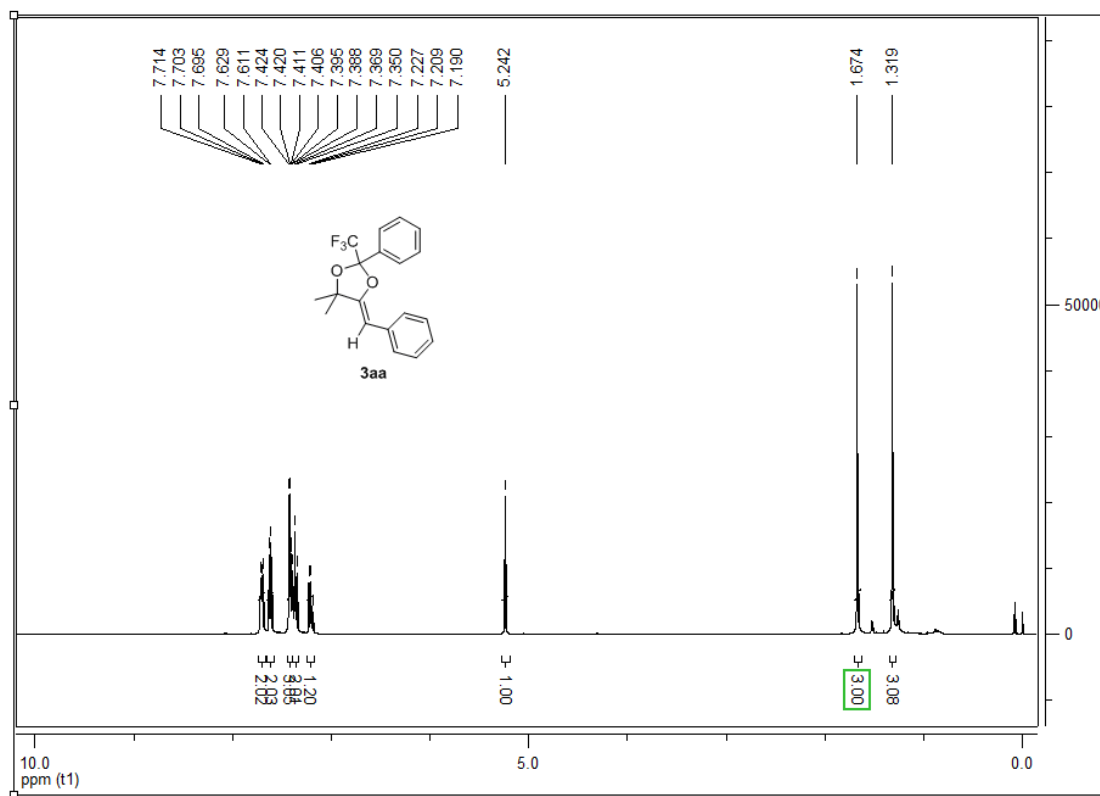
*Wenhua Road, Shangqiu, Henan 476000, China*

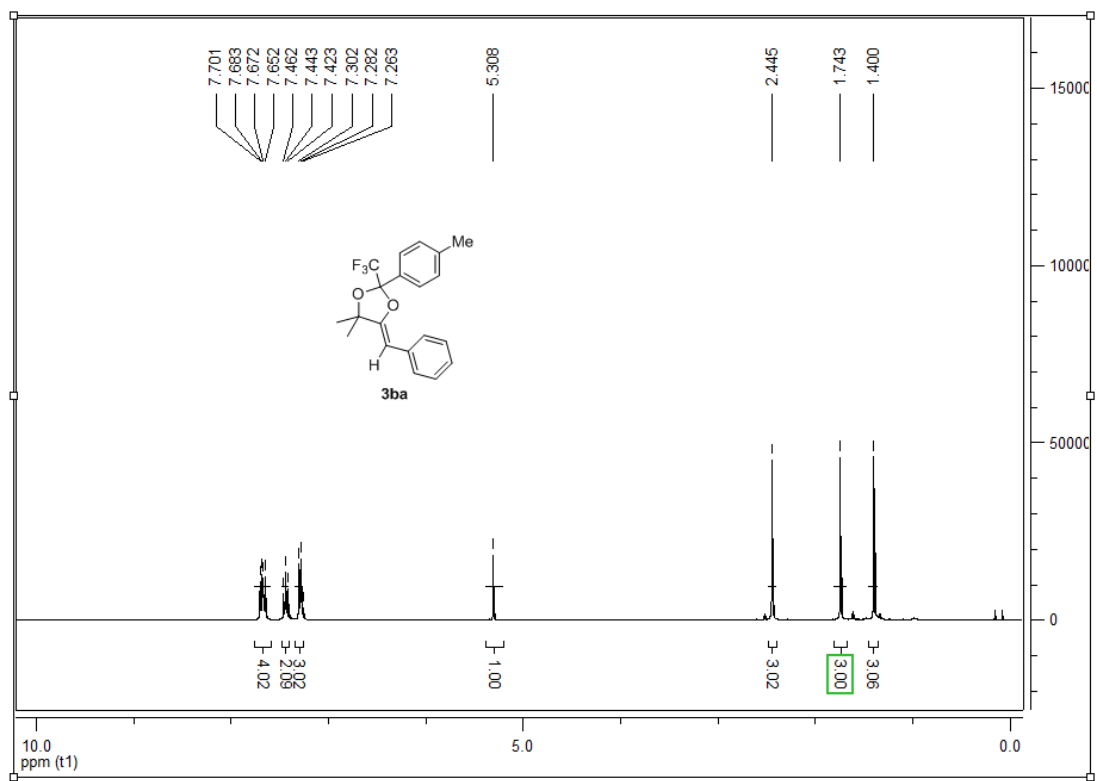
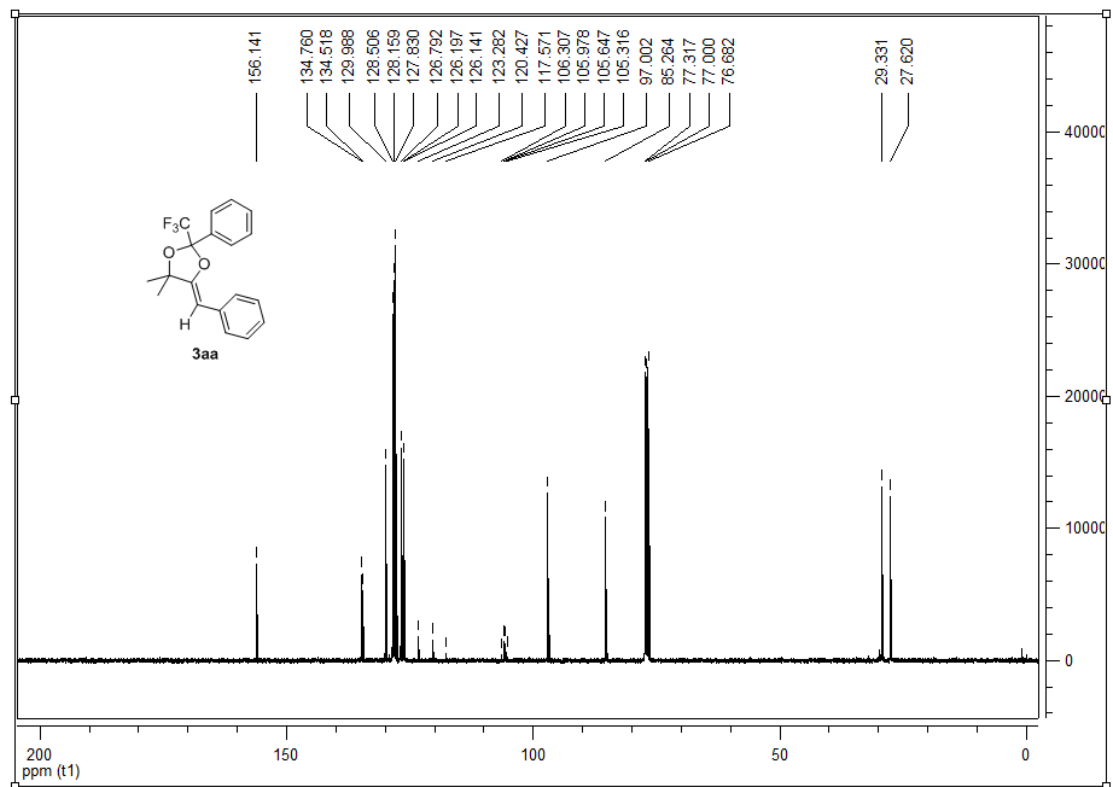
*Email: [wangjingjing0918@163.com](mailto:wangjingjing0918@163.com)*

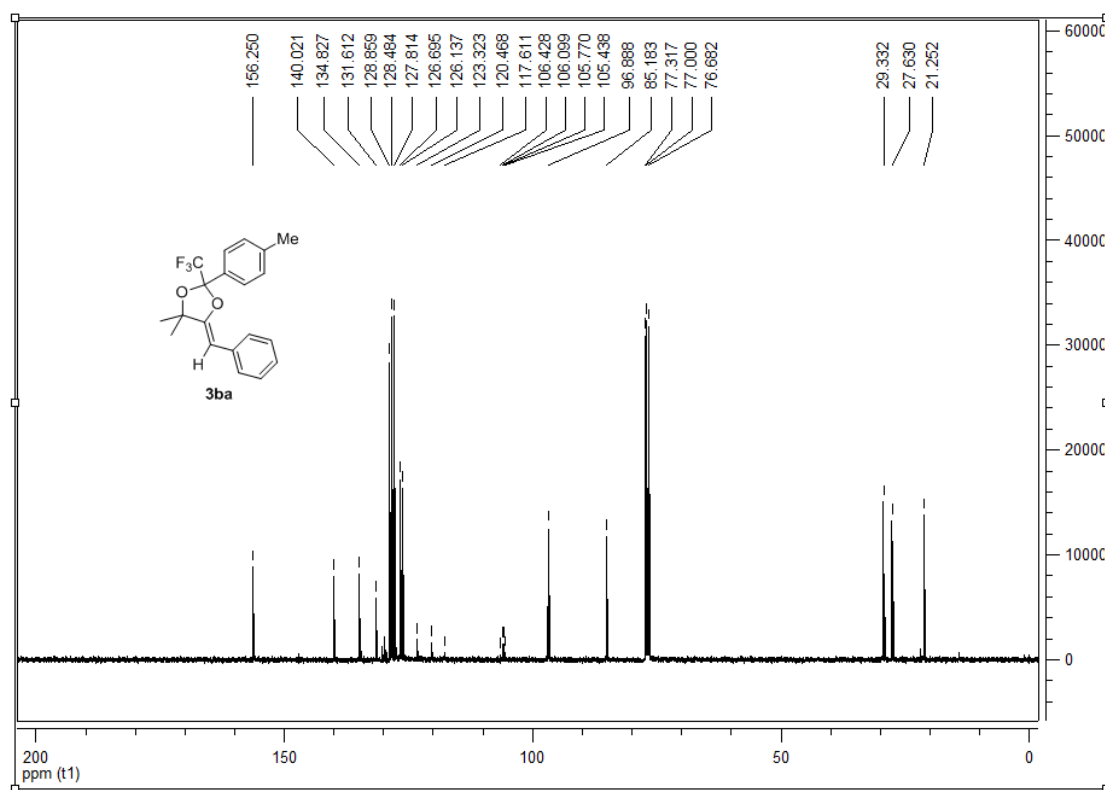
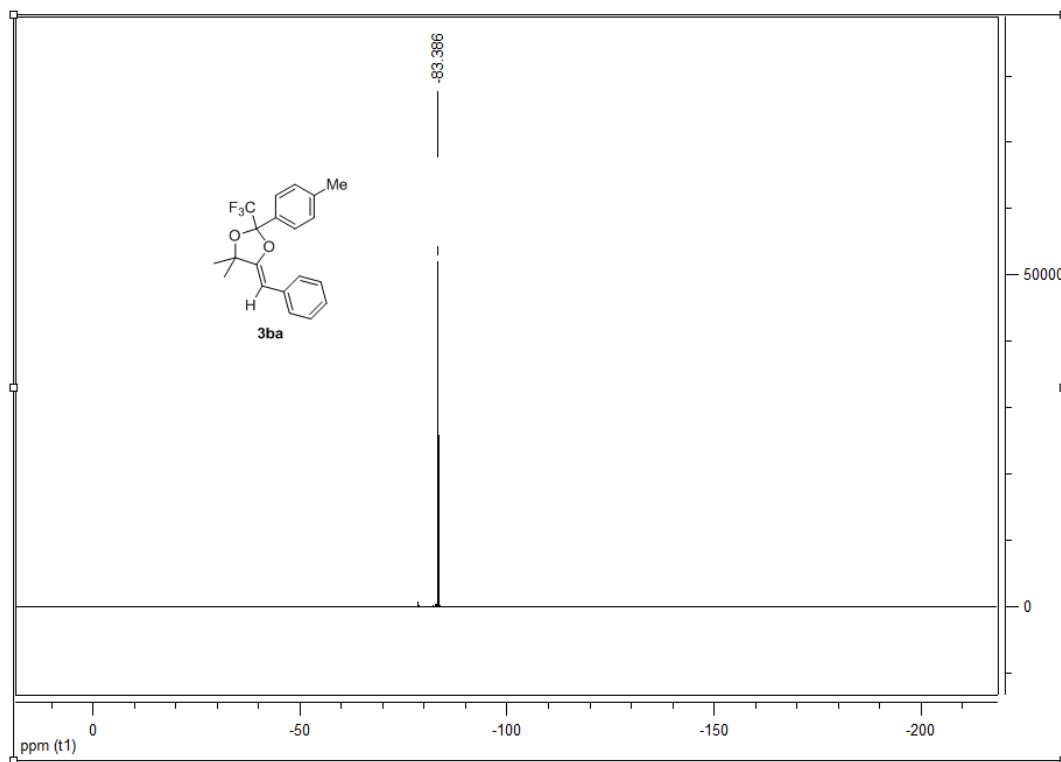
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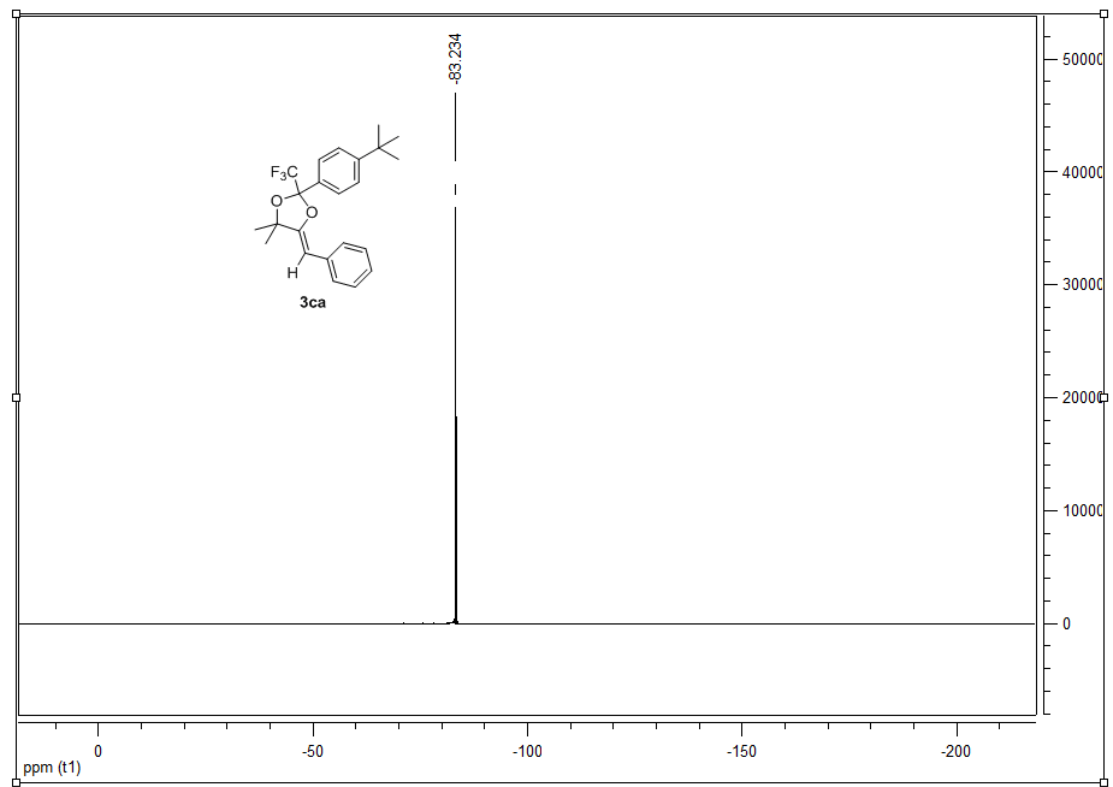
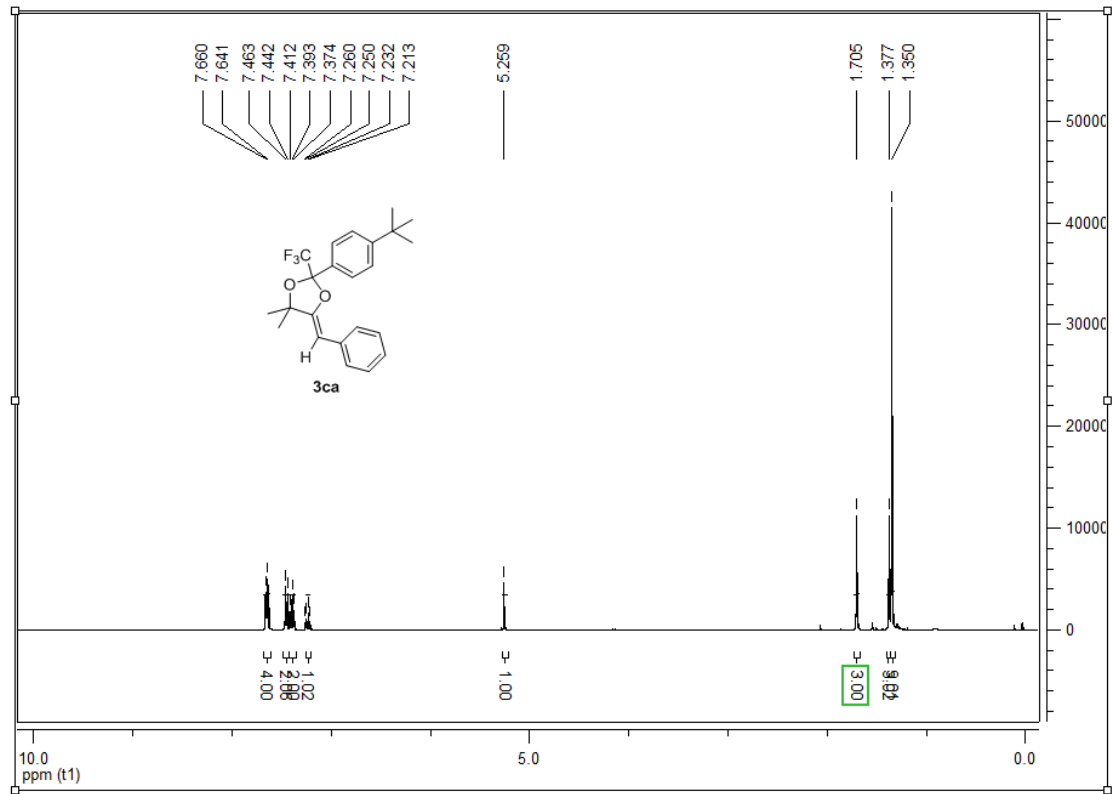
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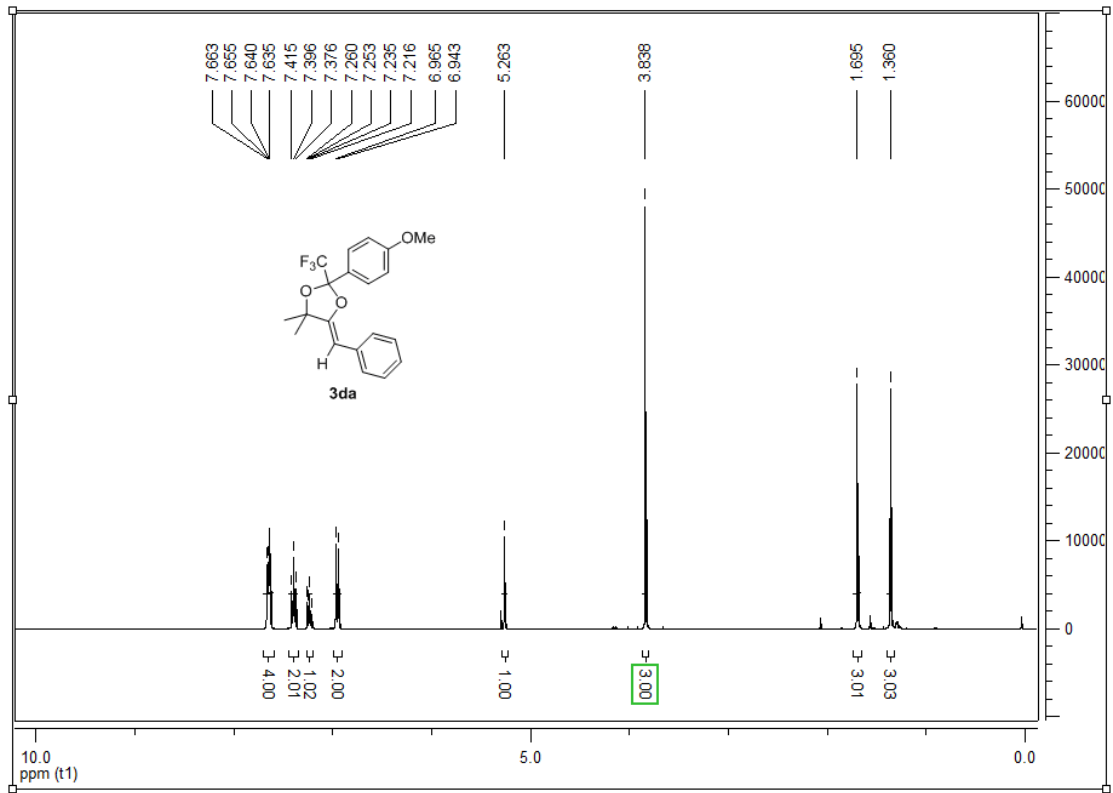
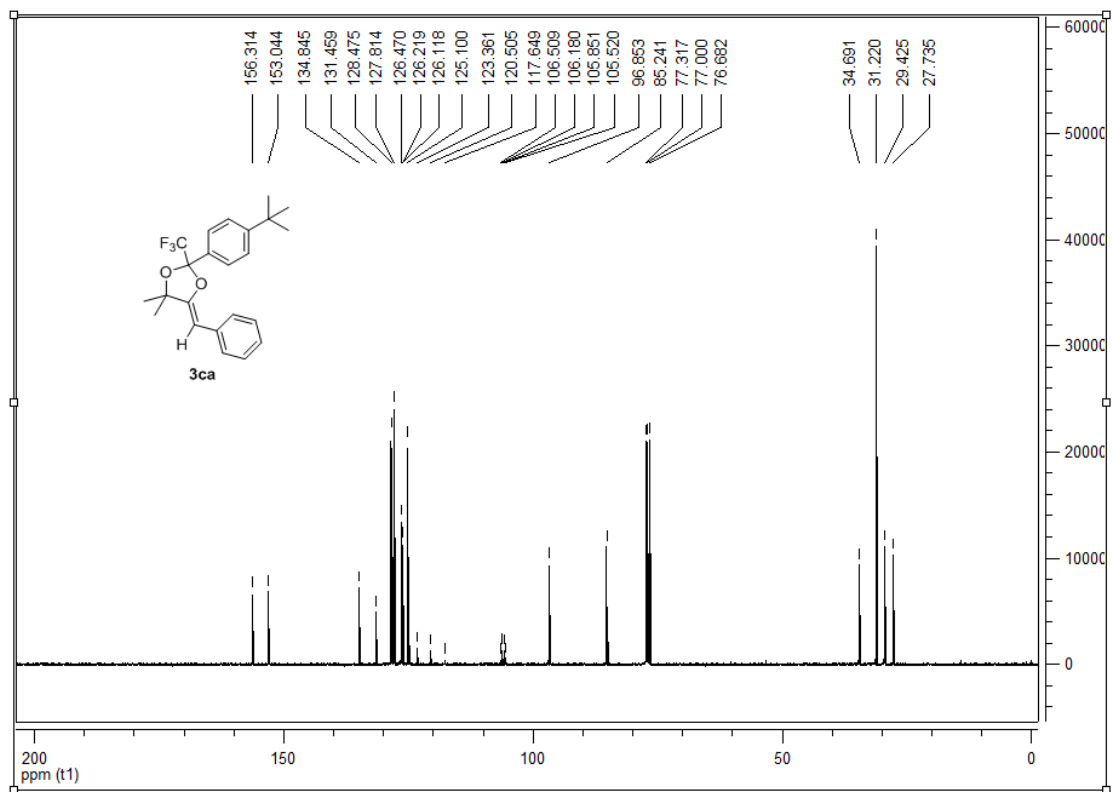
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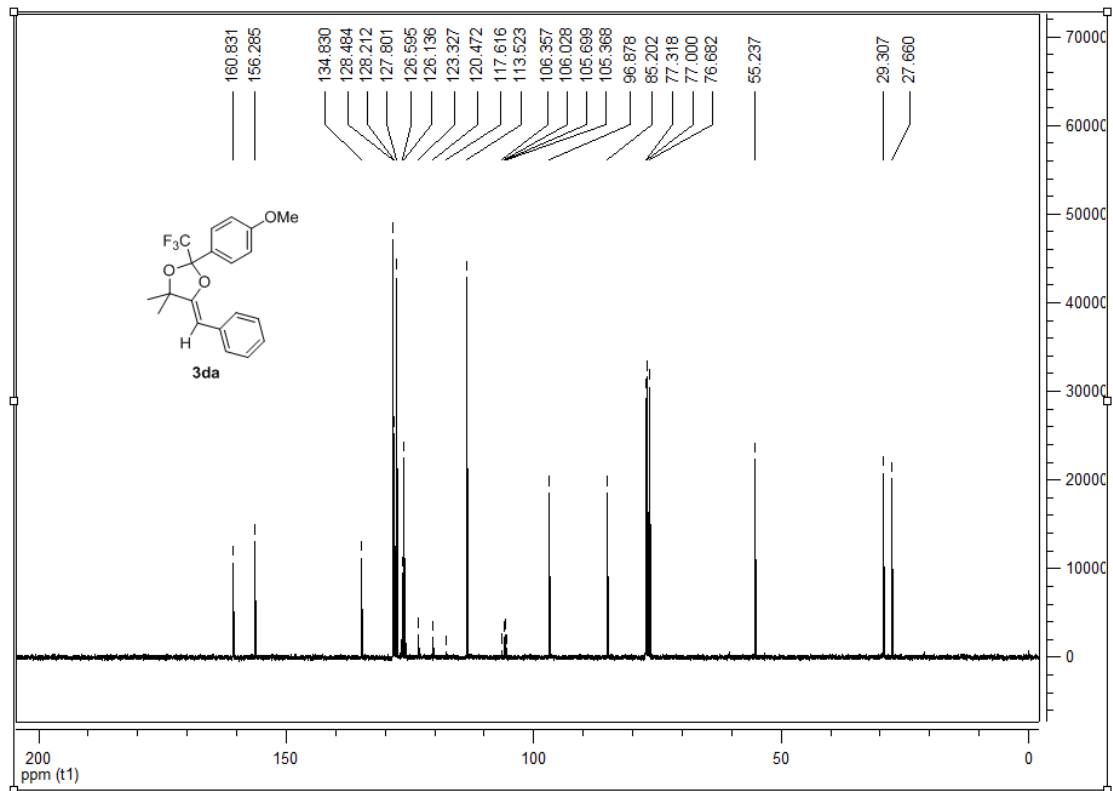
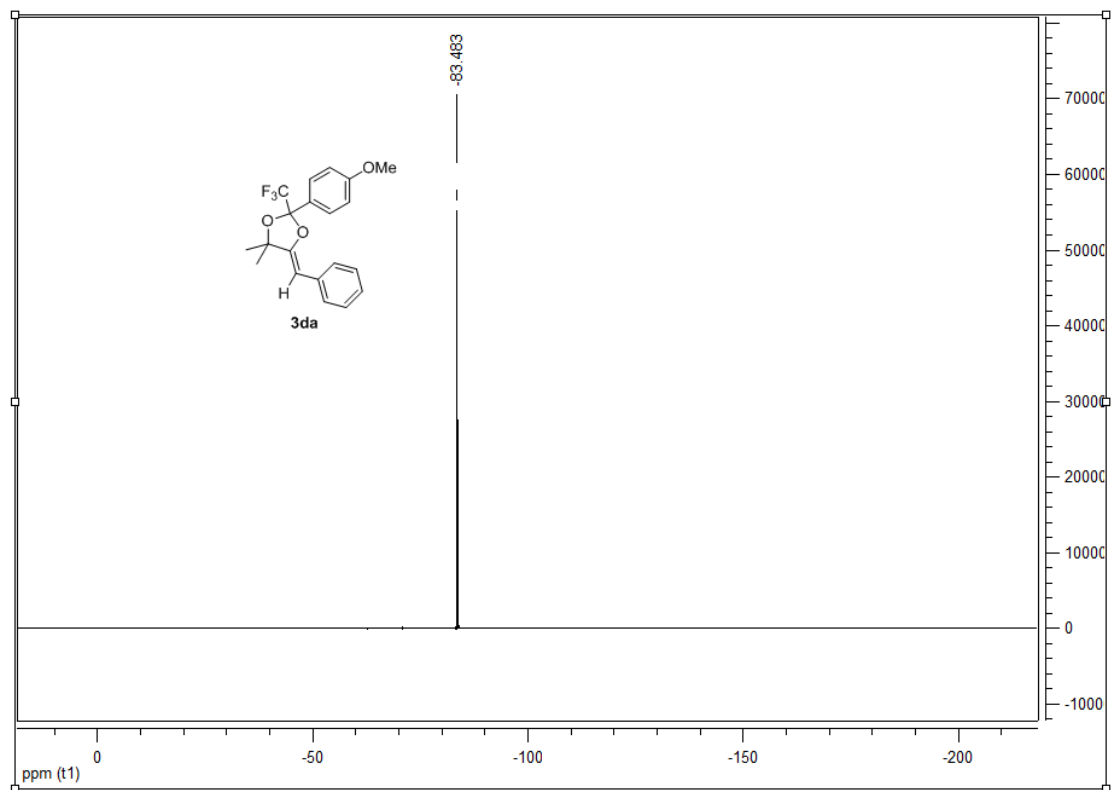


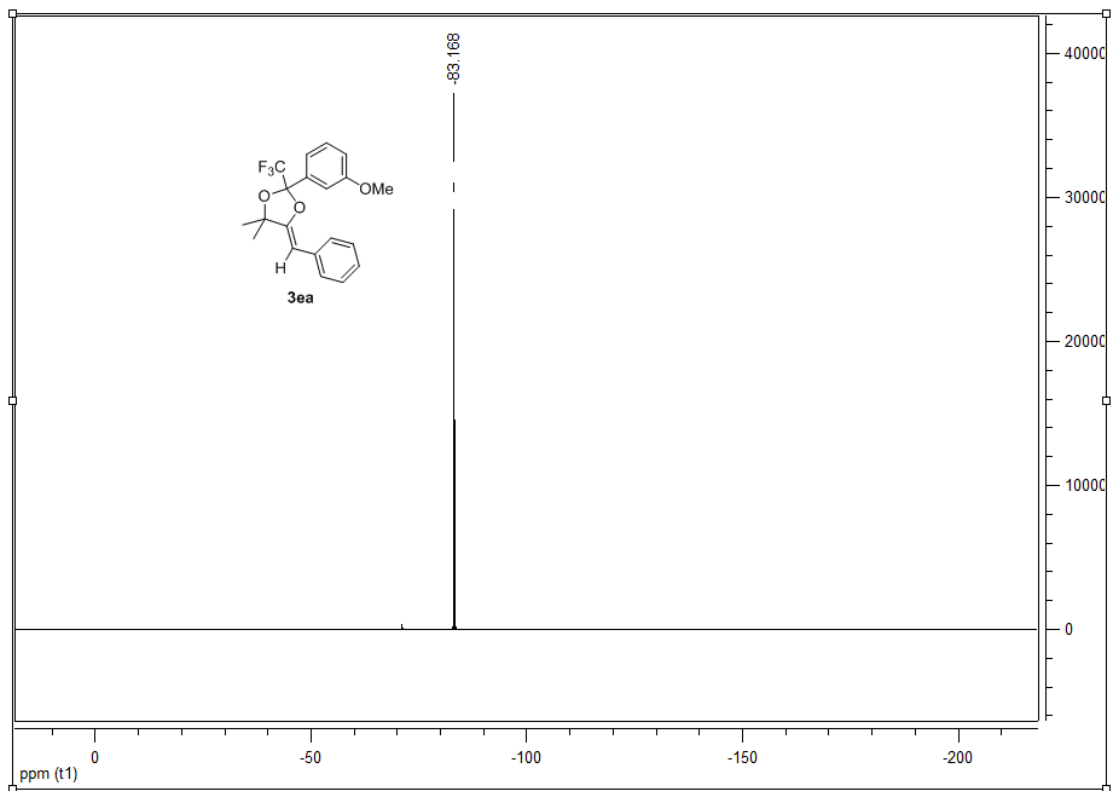
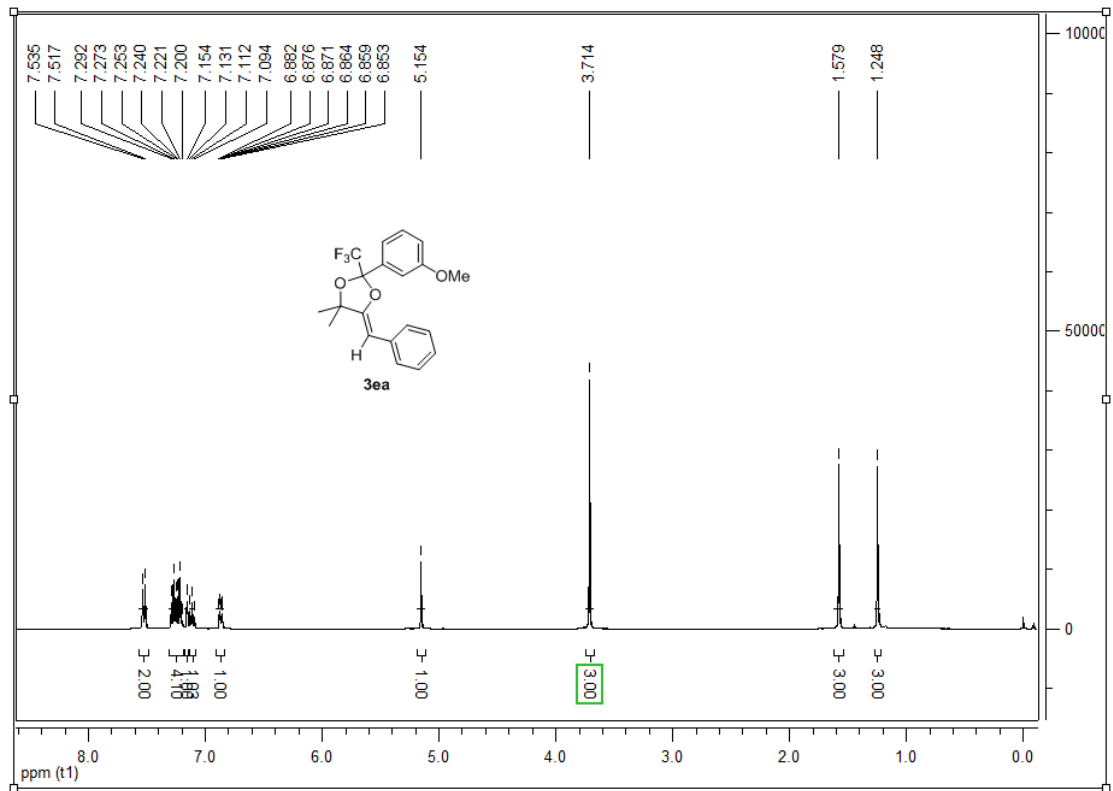




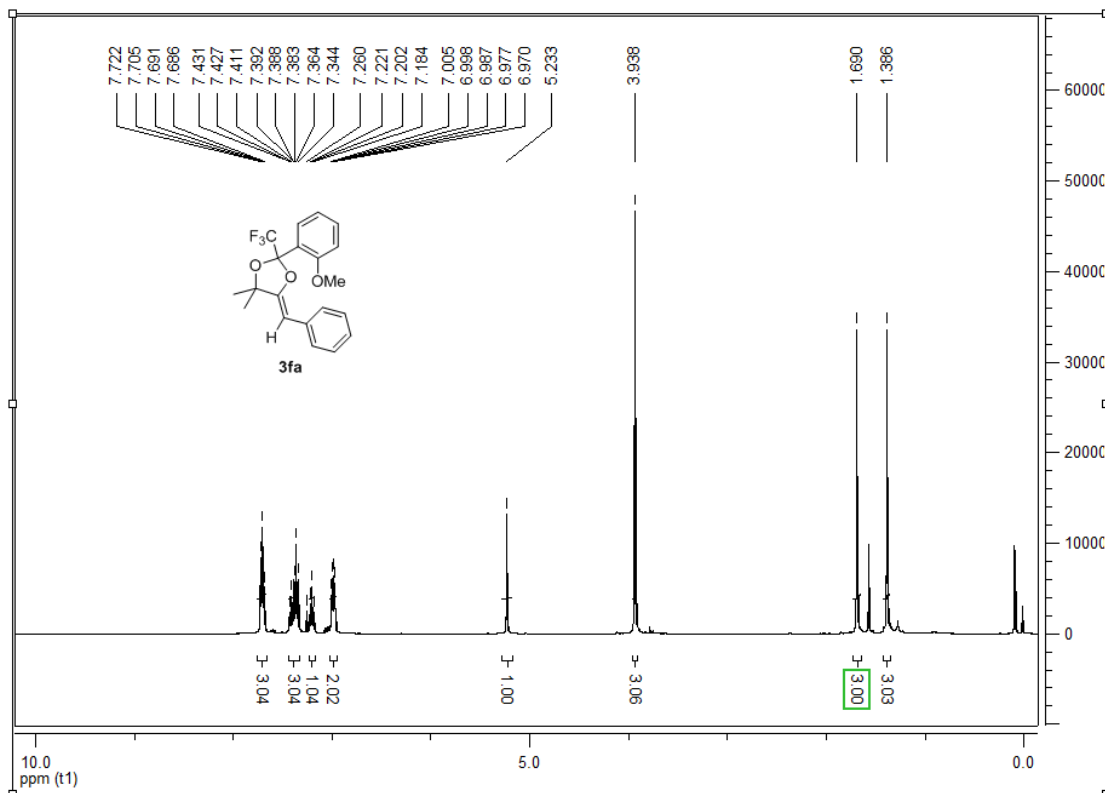
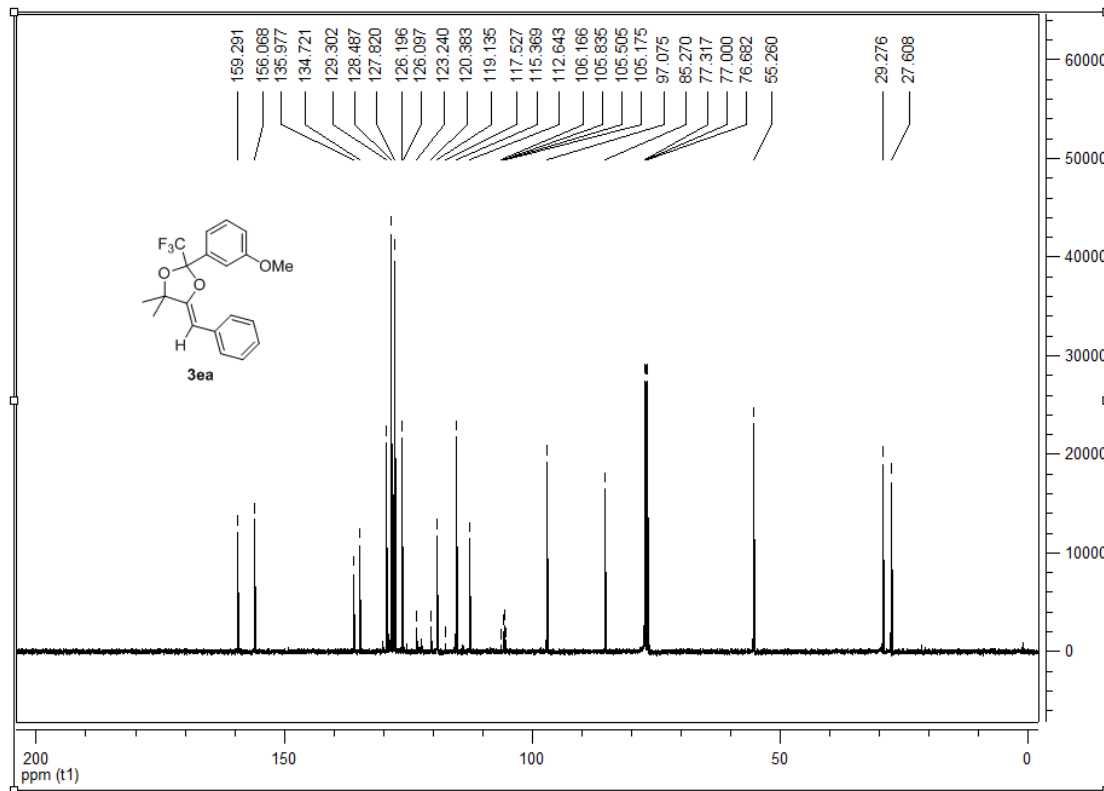


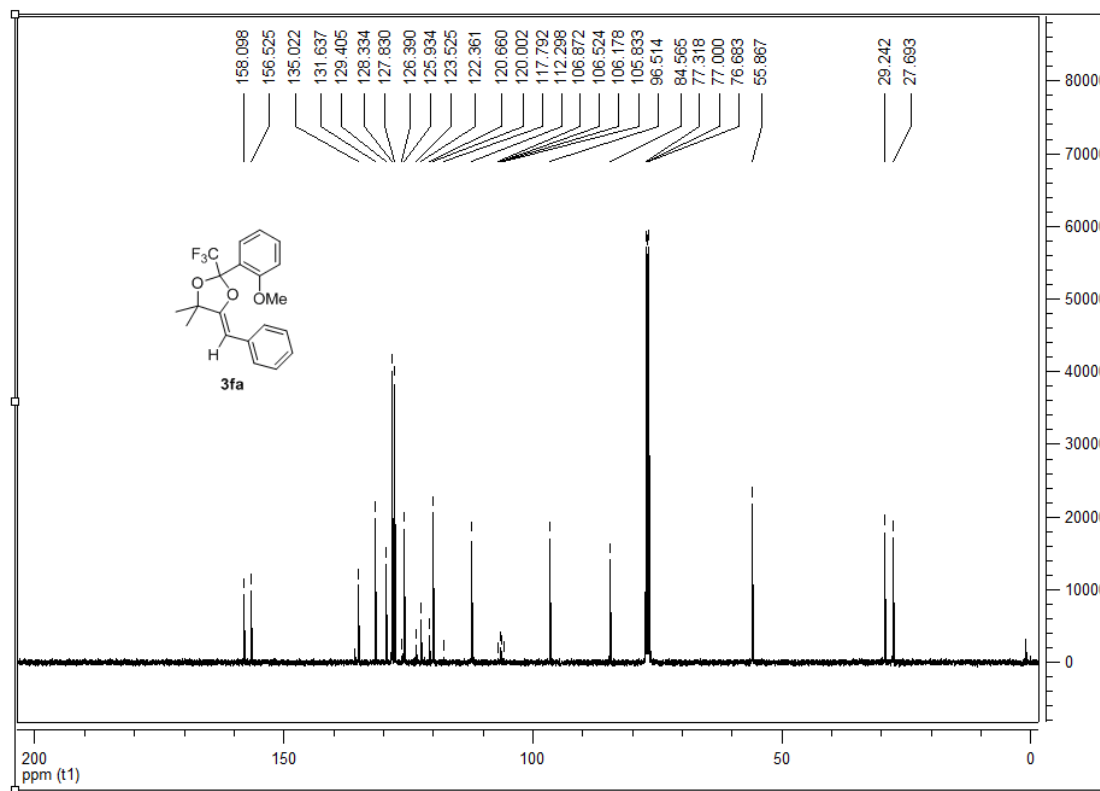
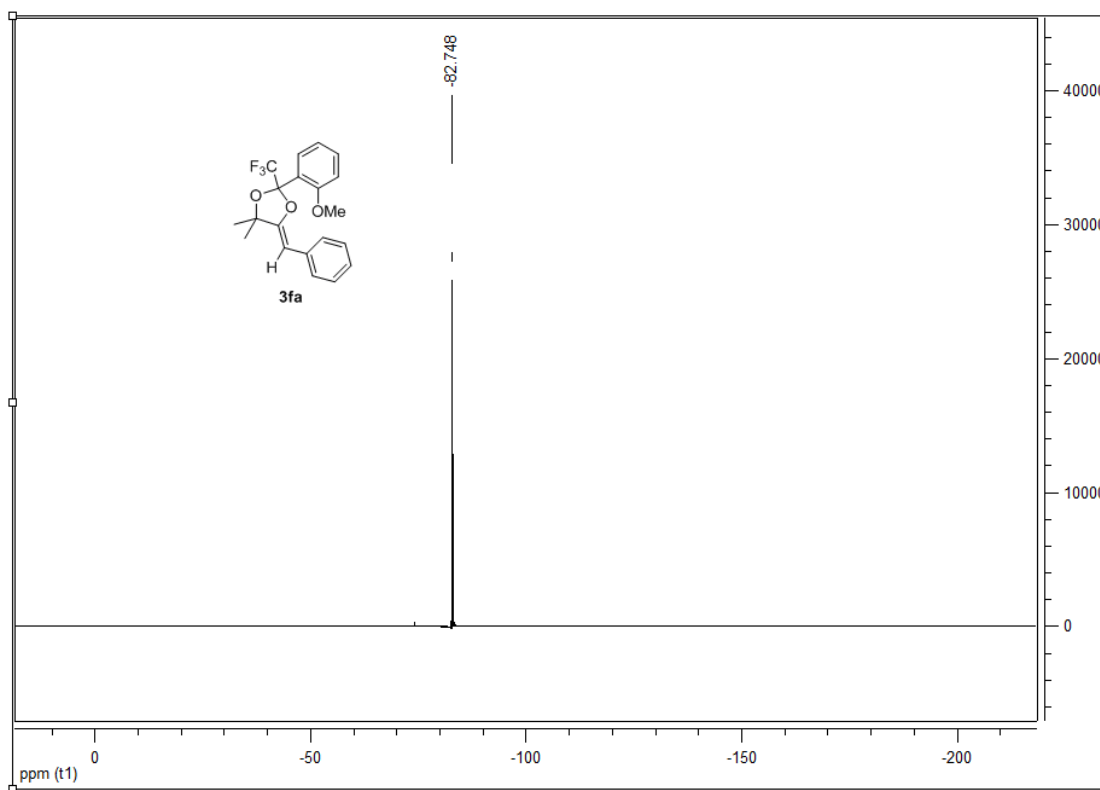


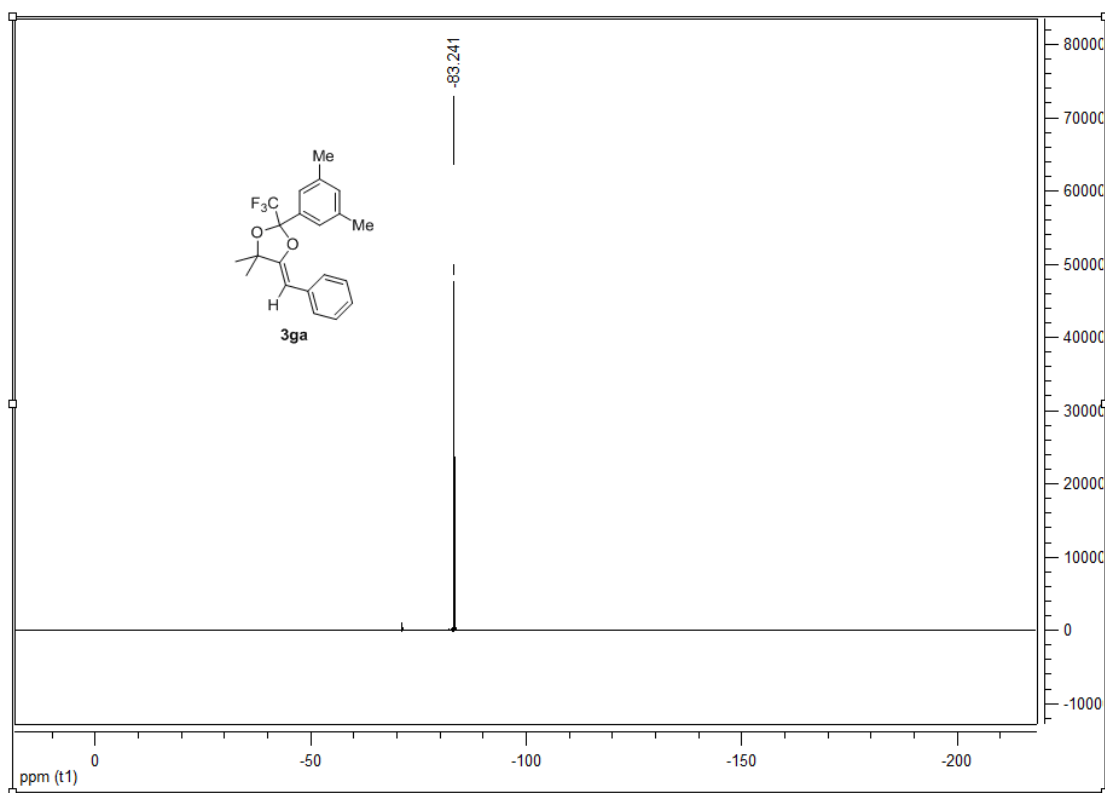
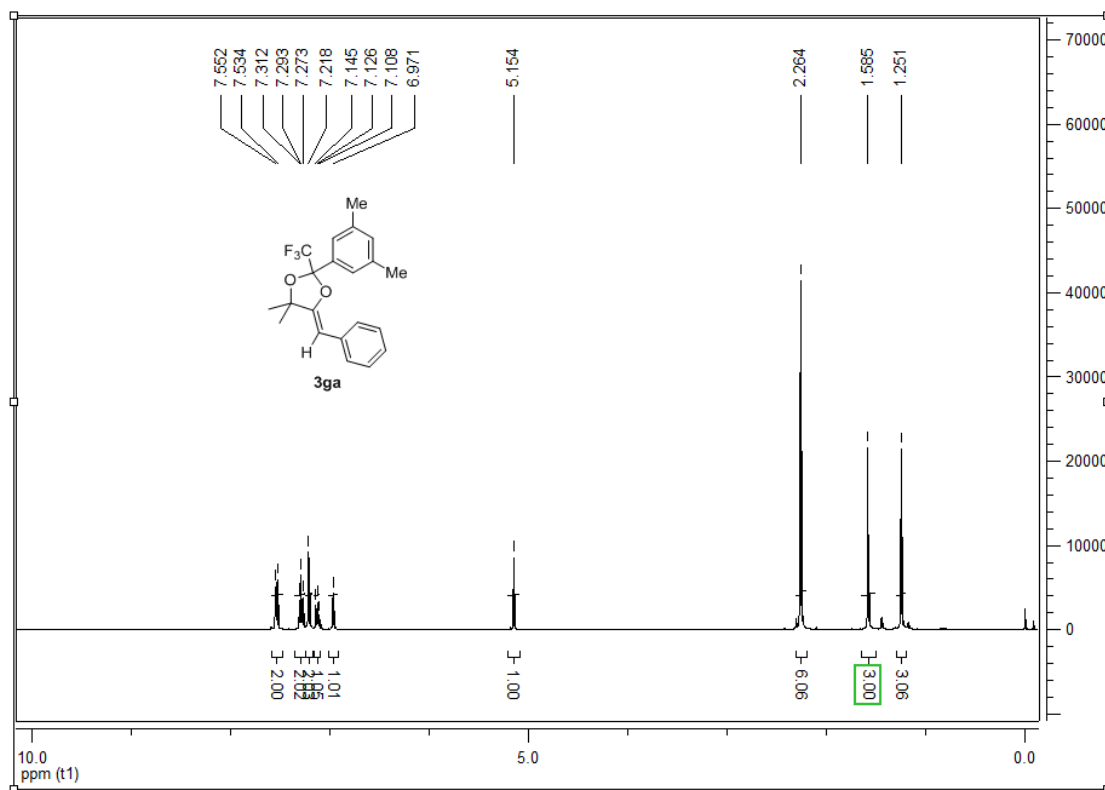


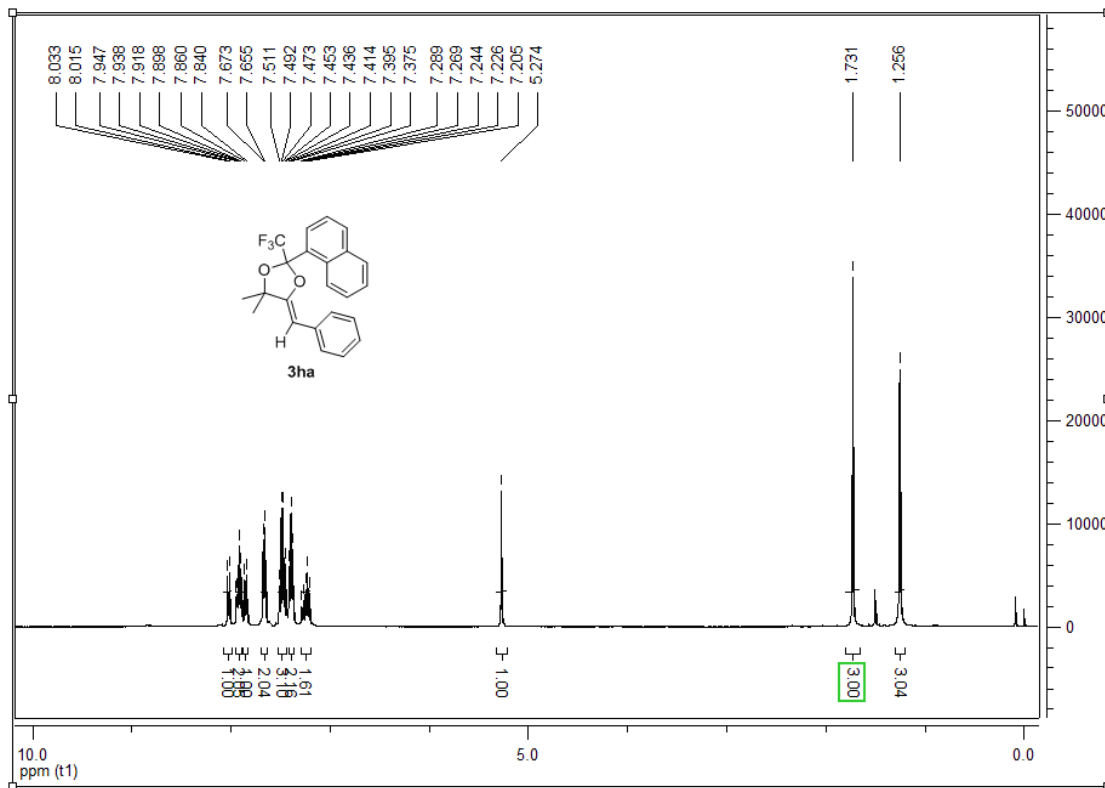
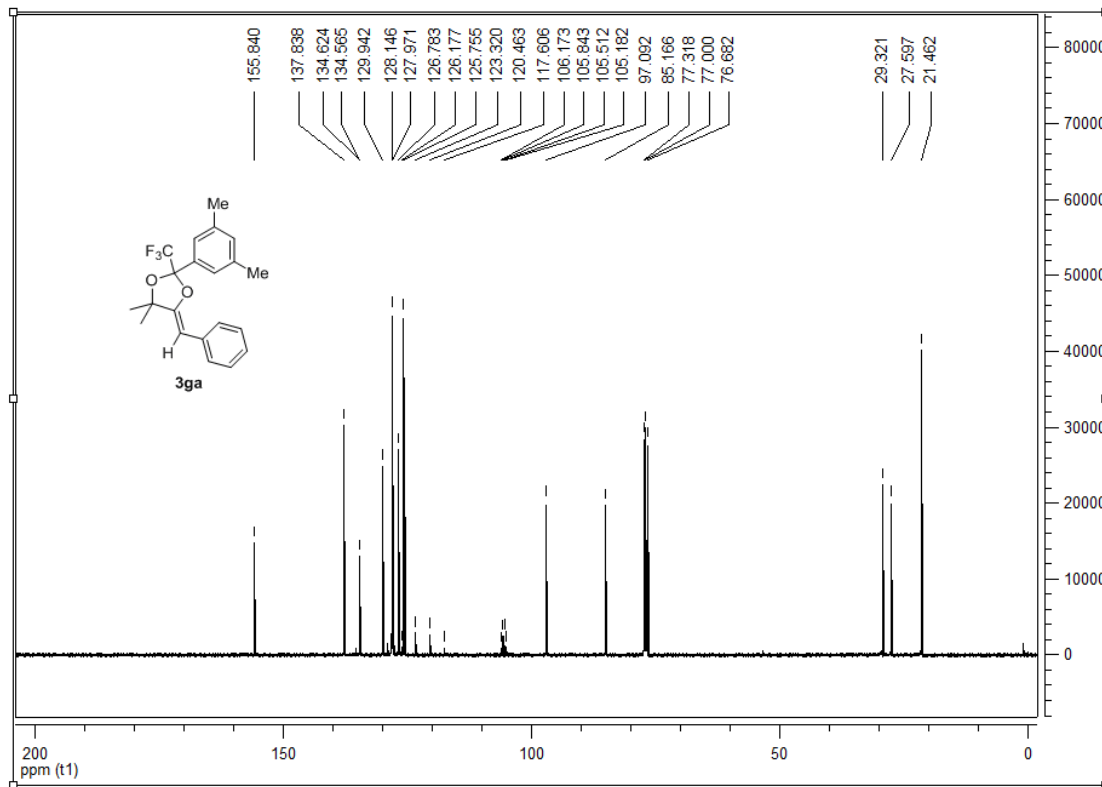


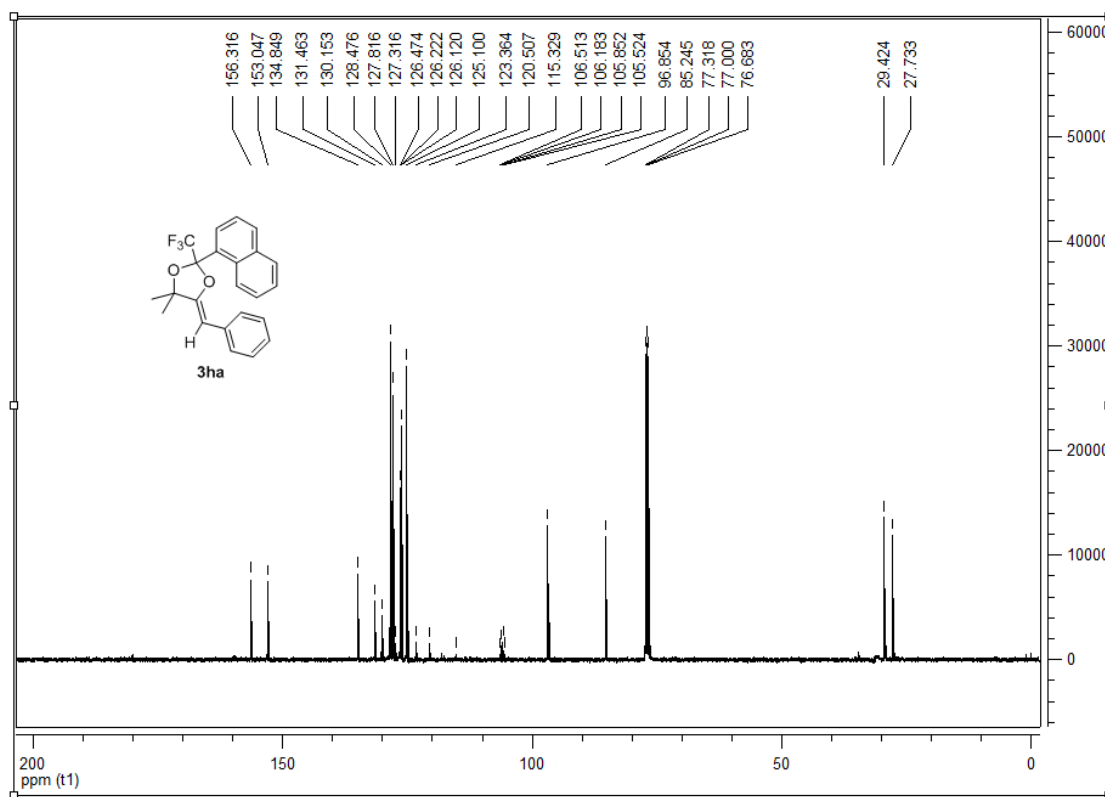
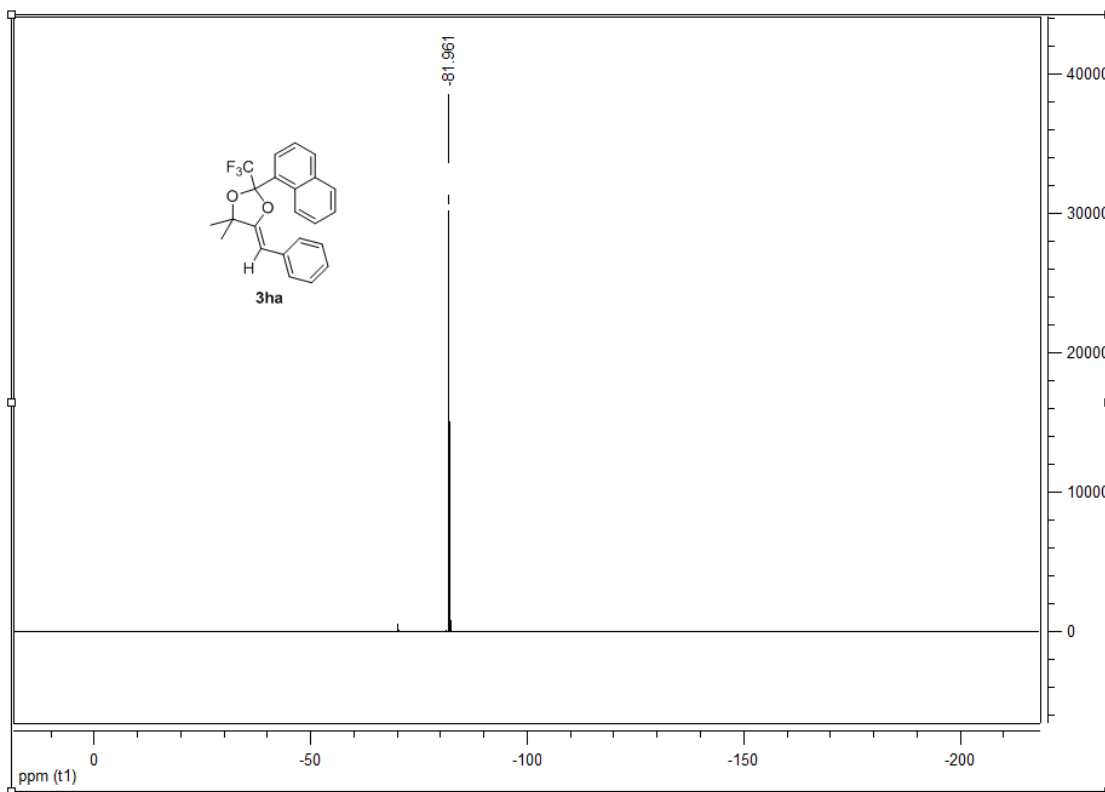


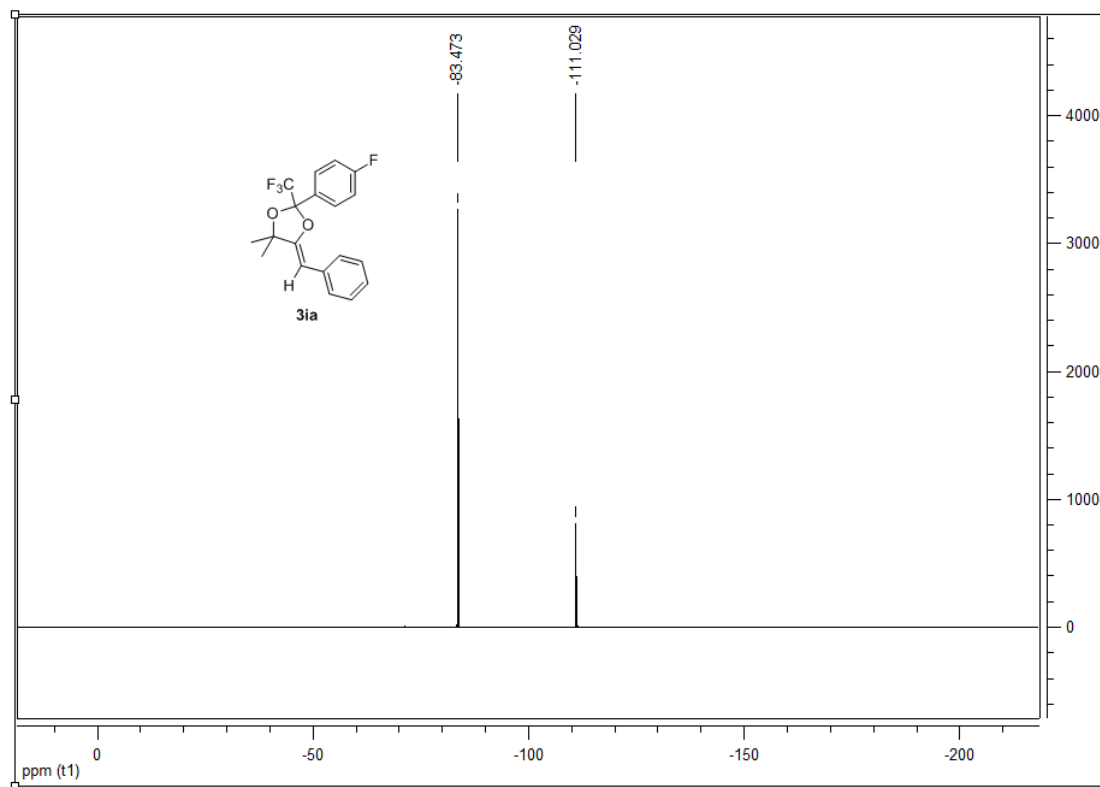
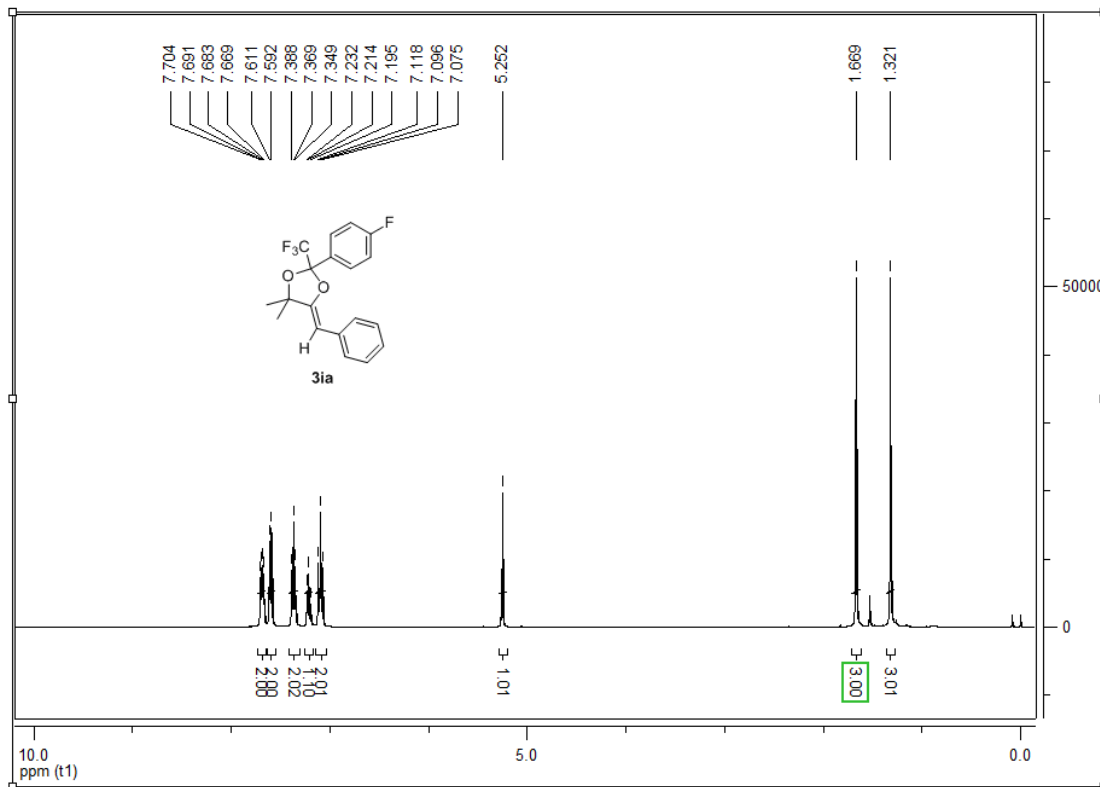


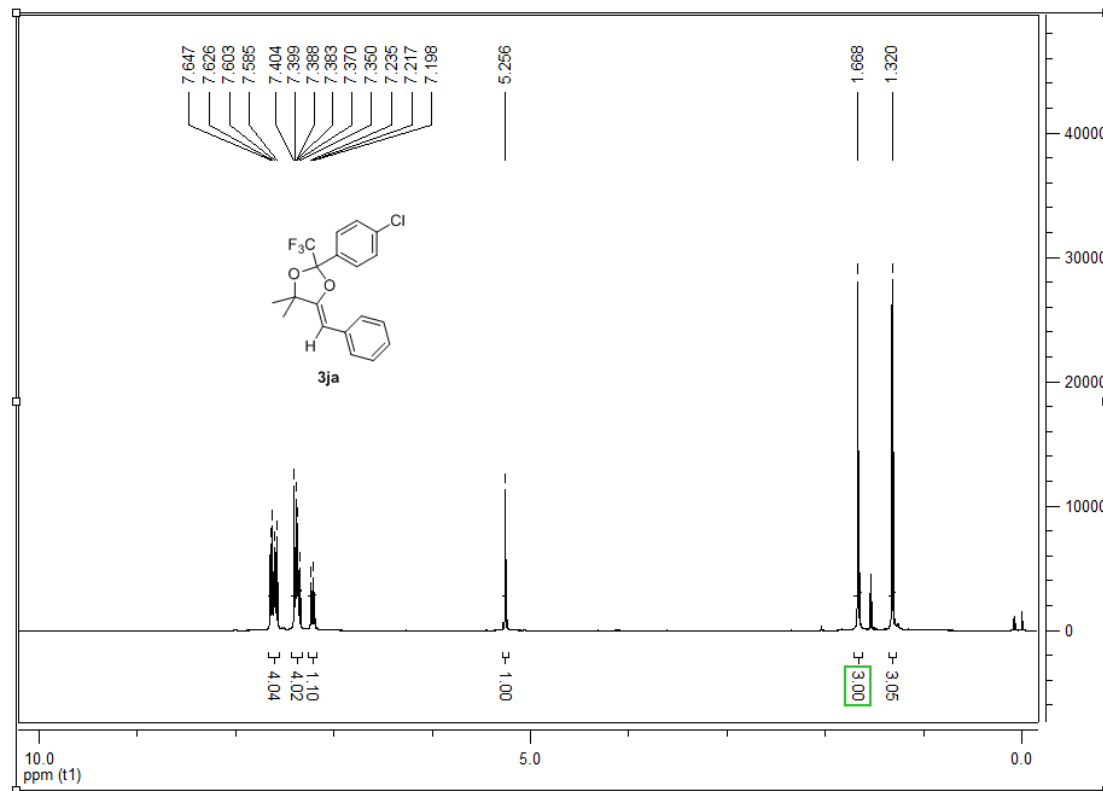
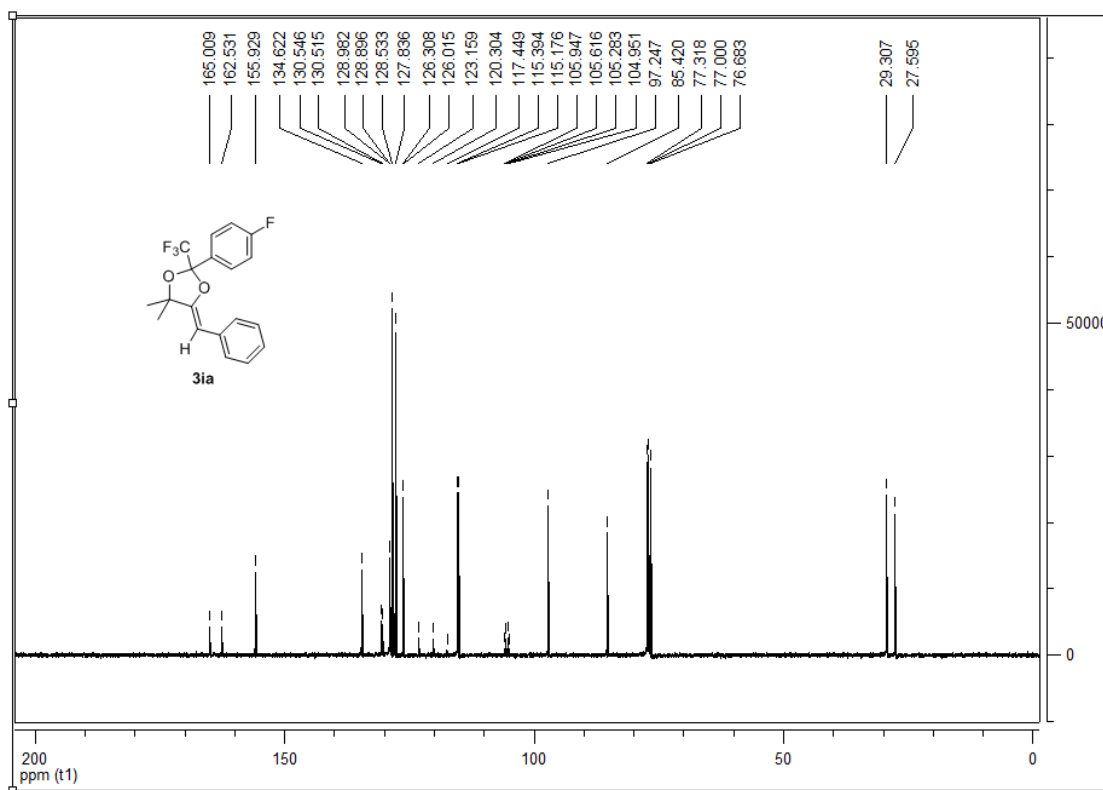


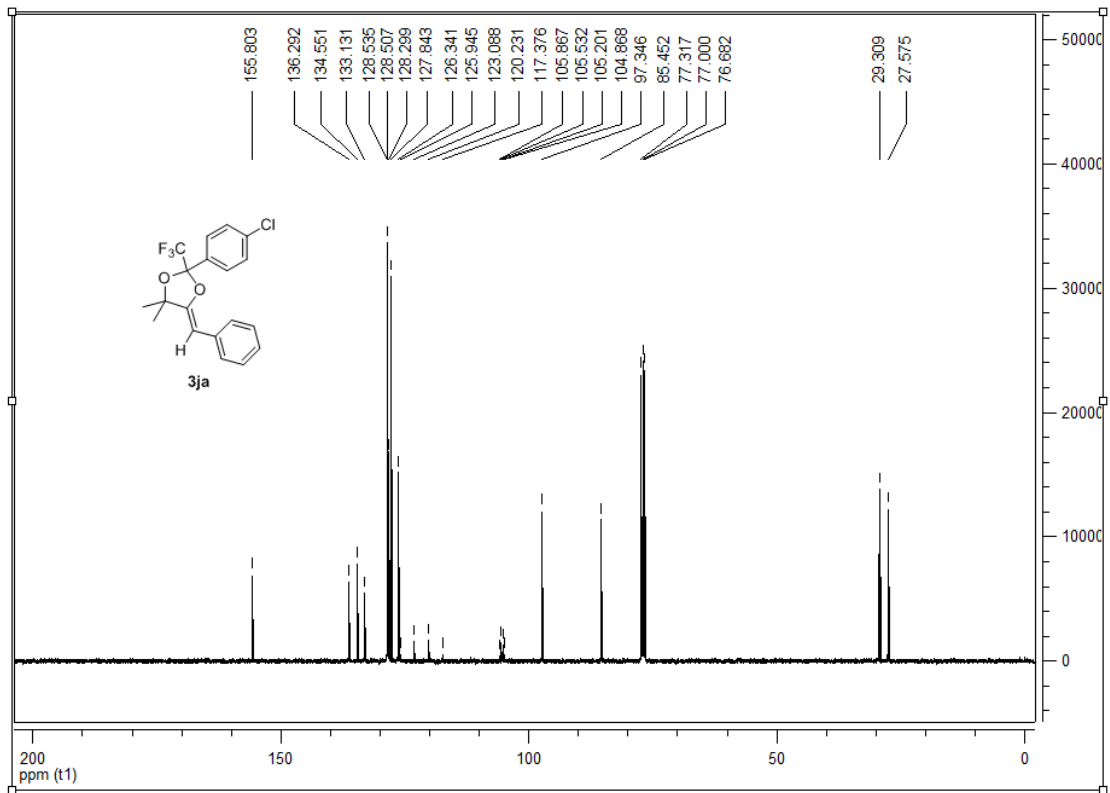
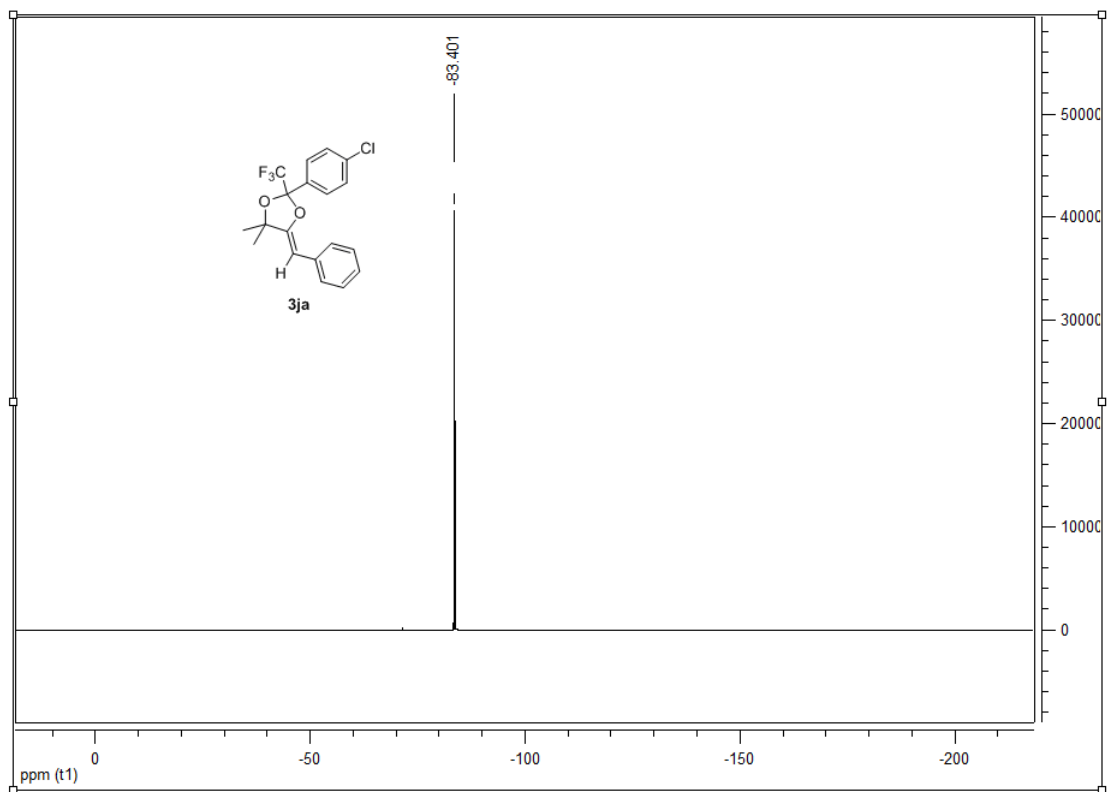




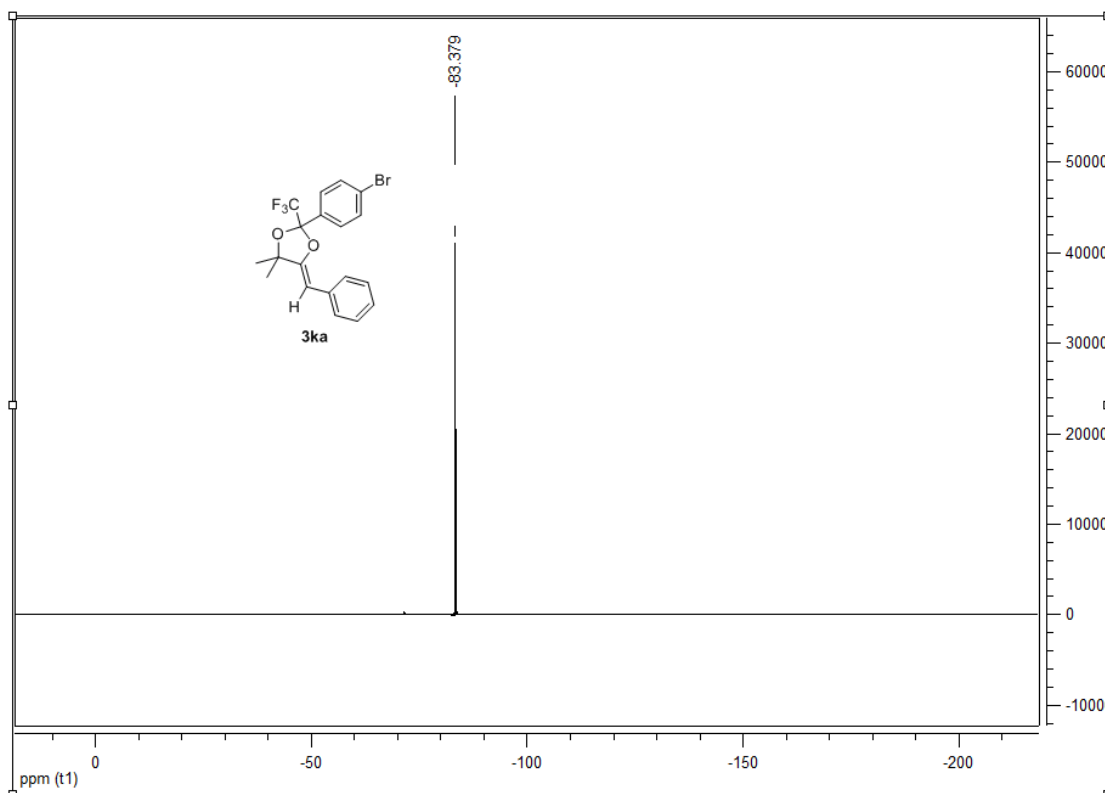
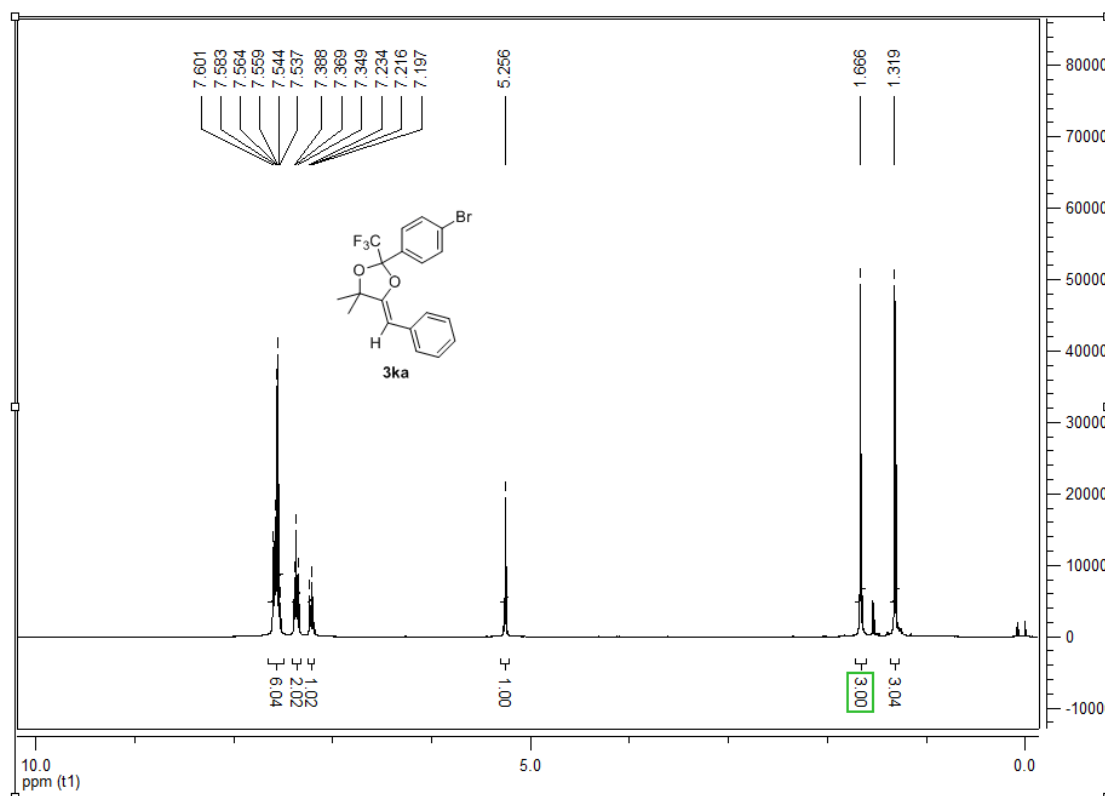


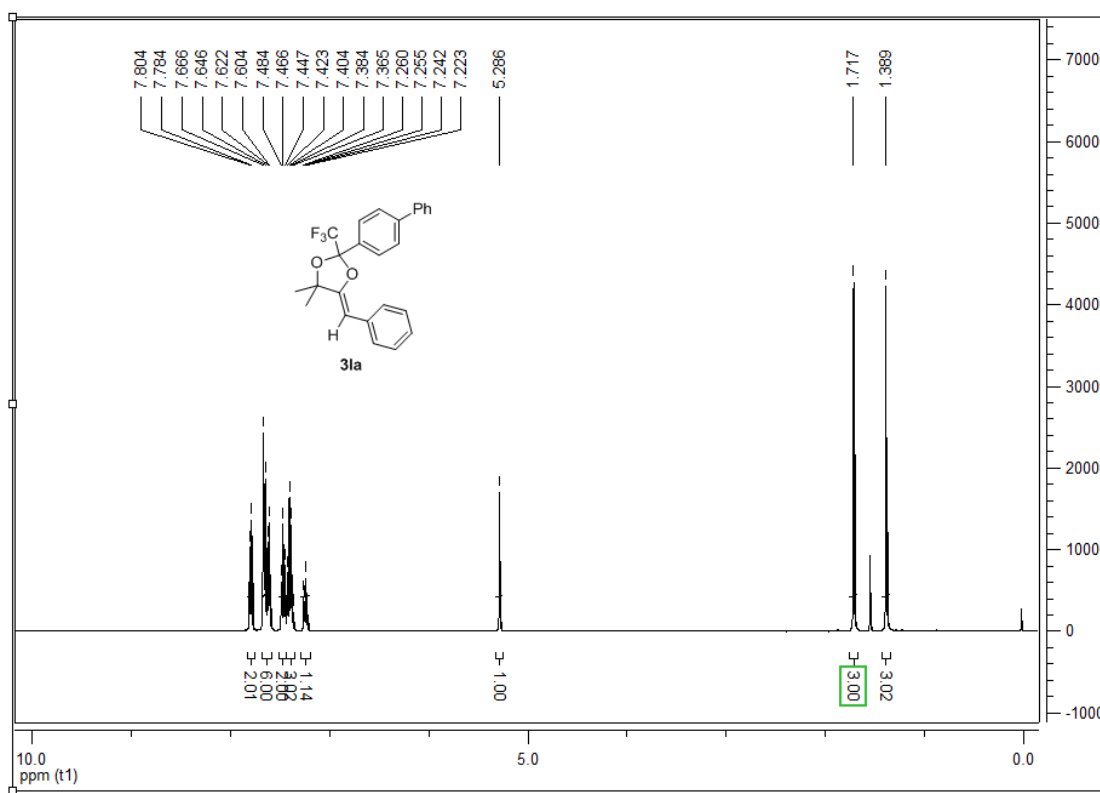
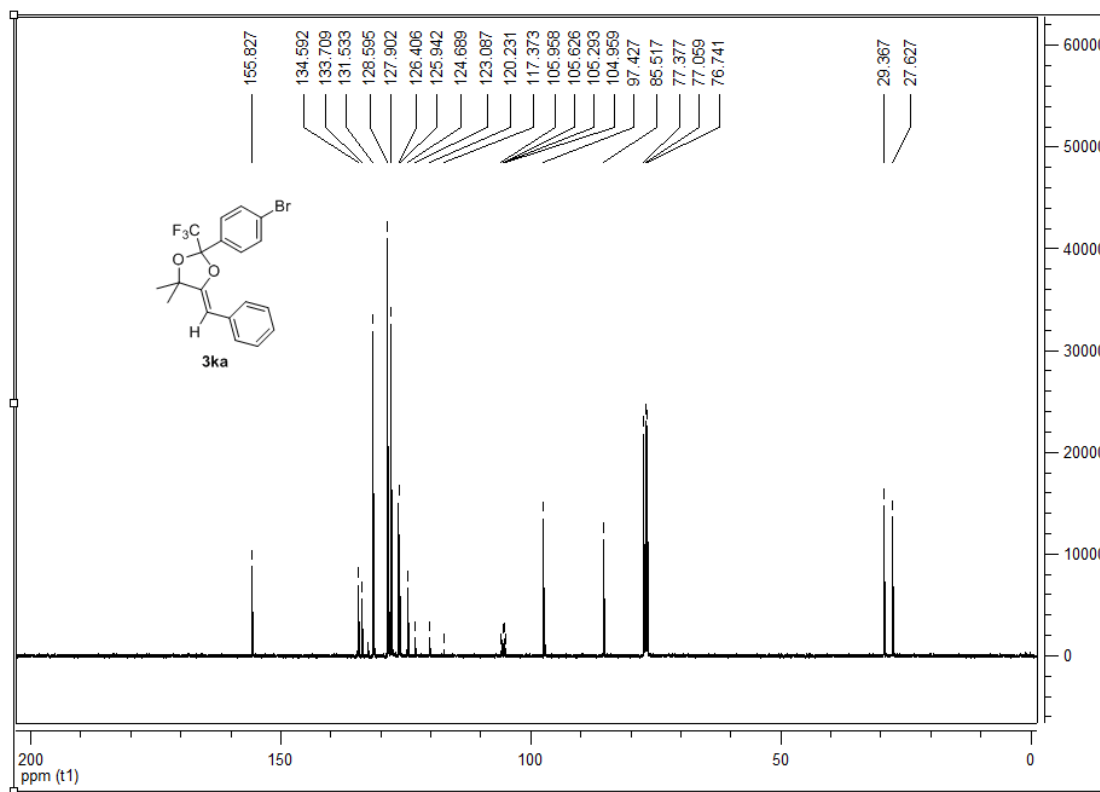


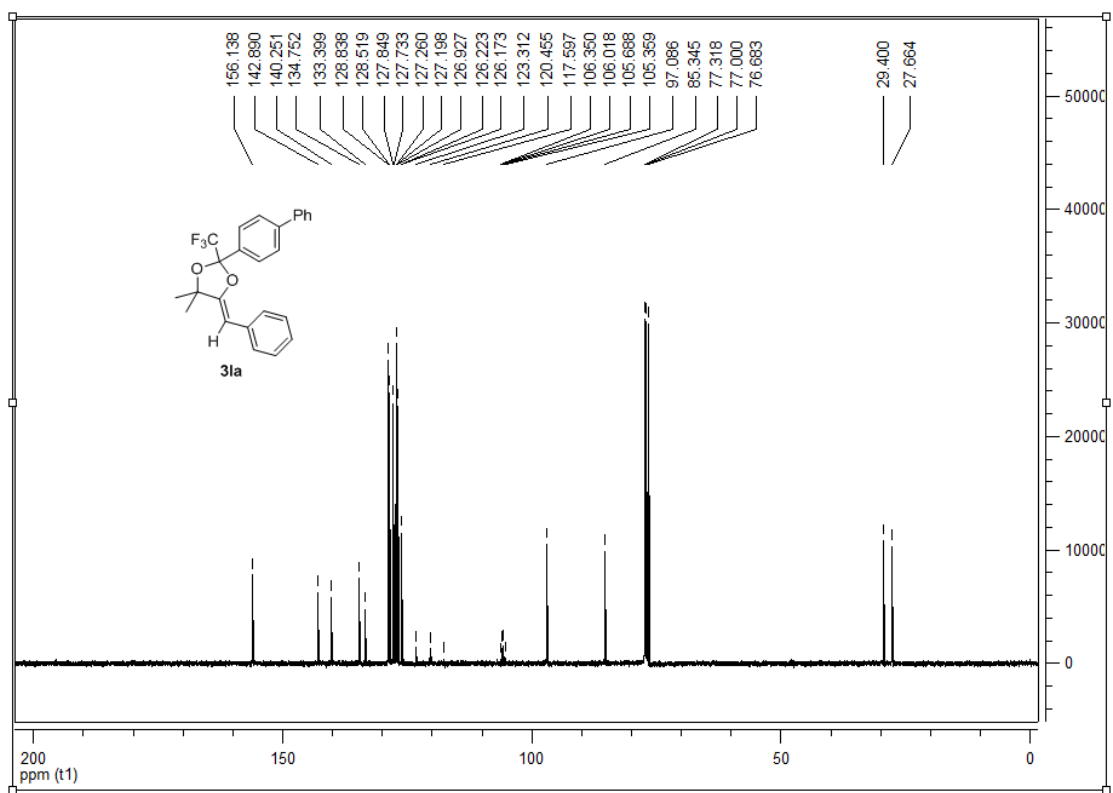
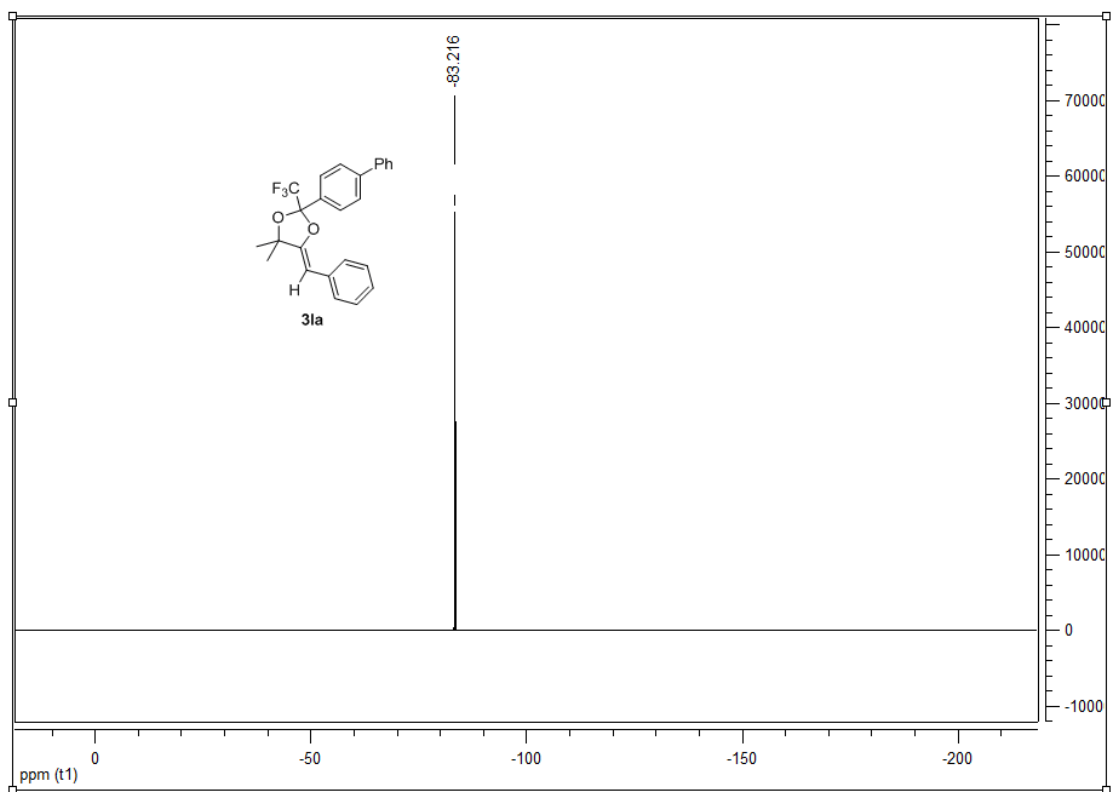


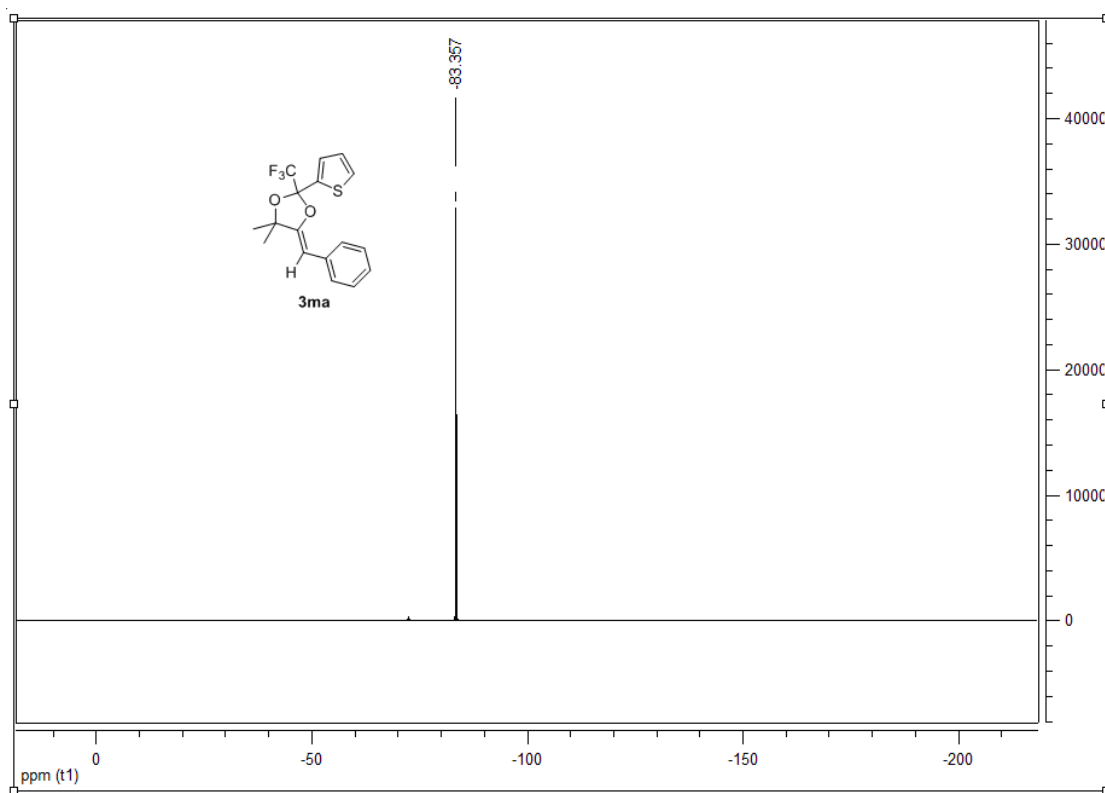
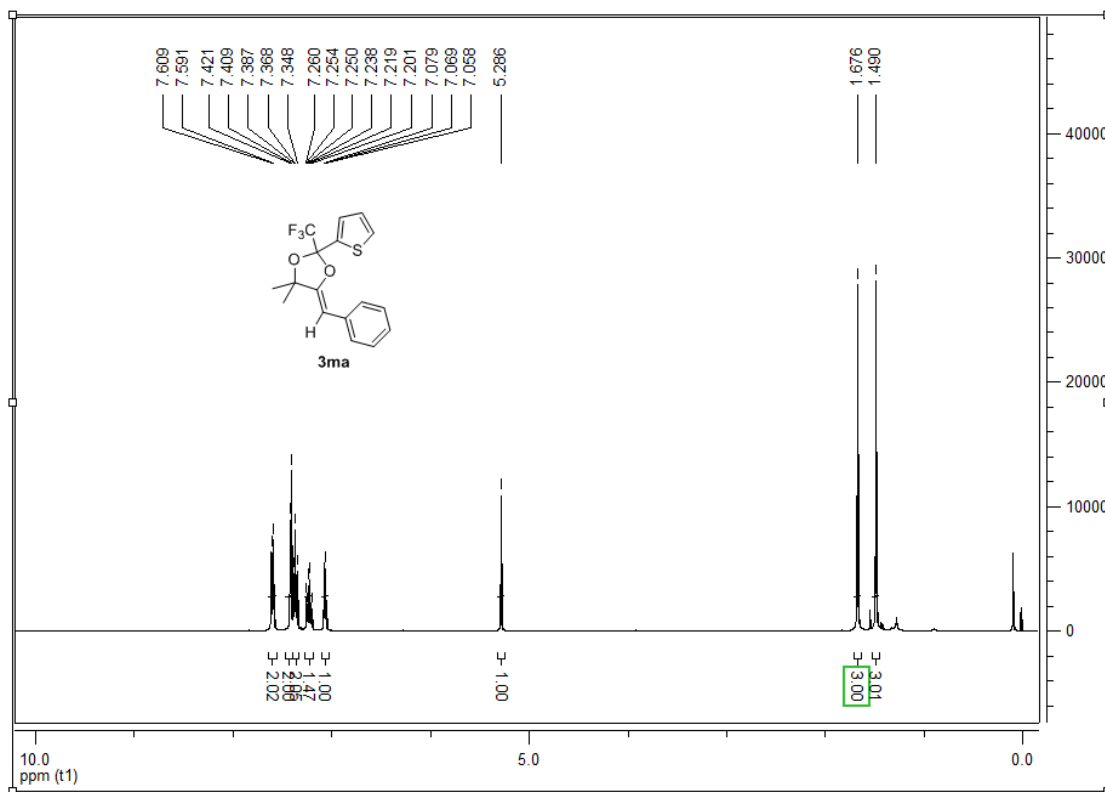


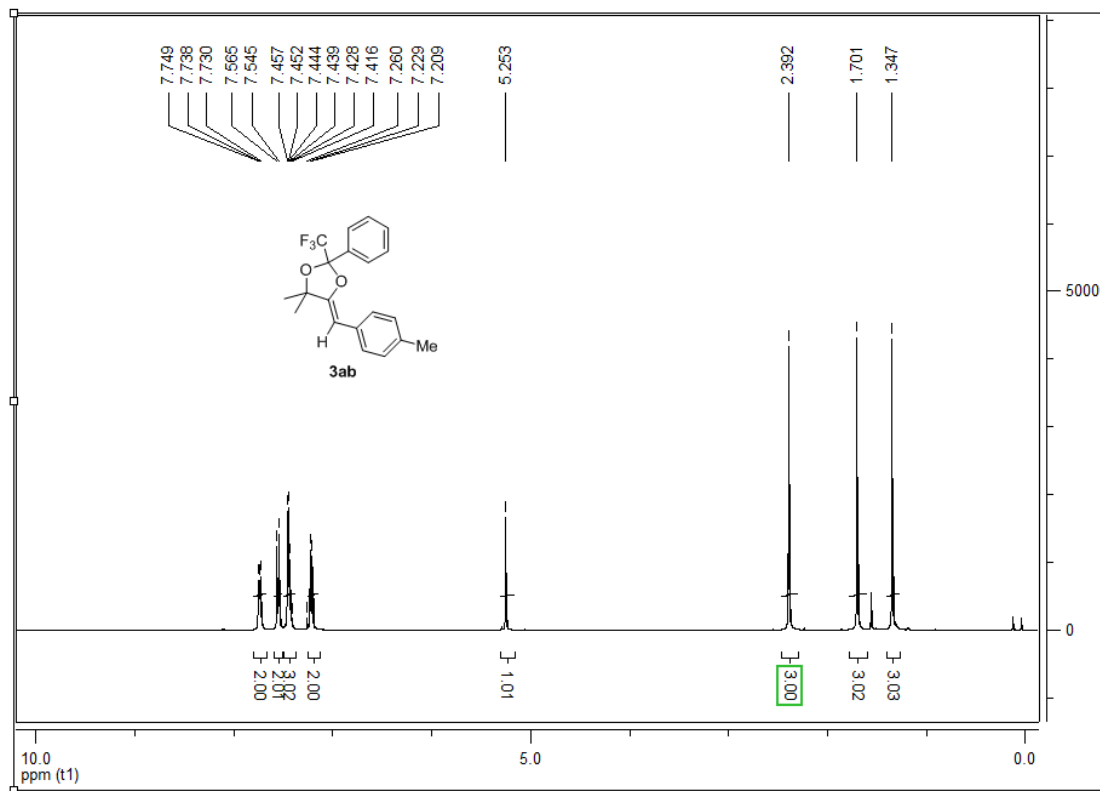
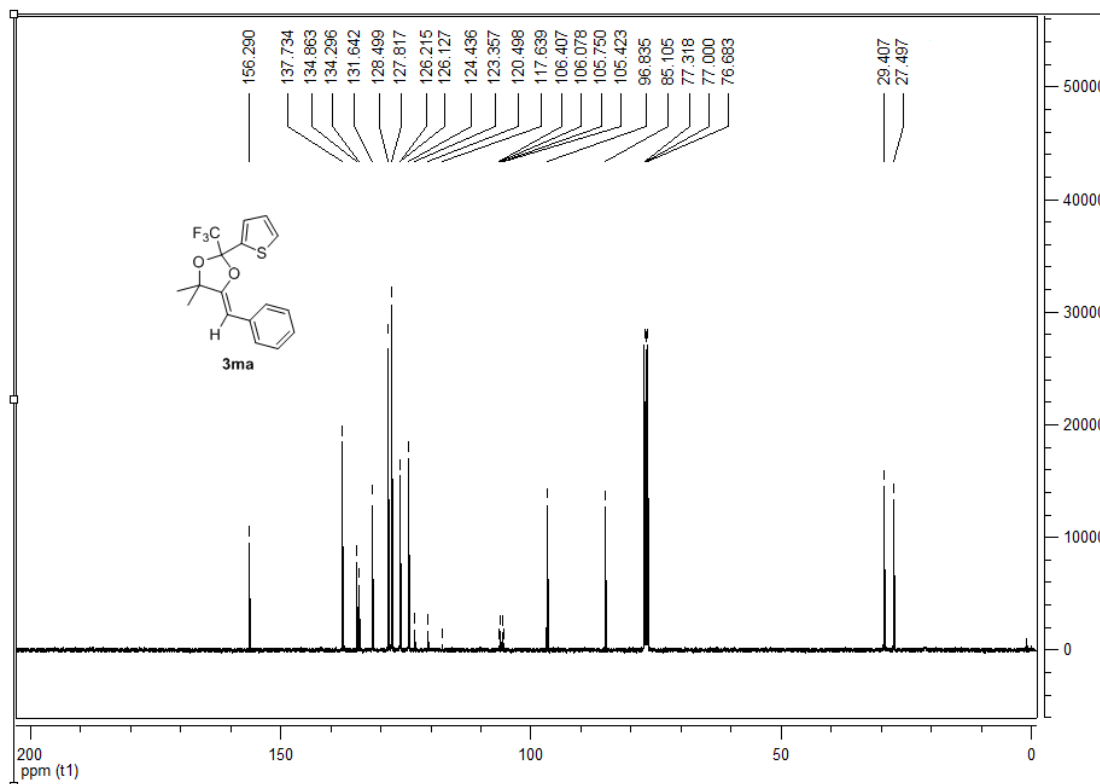


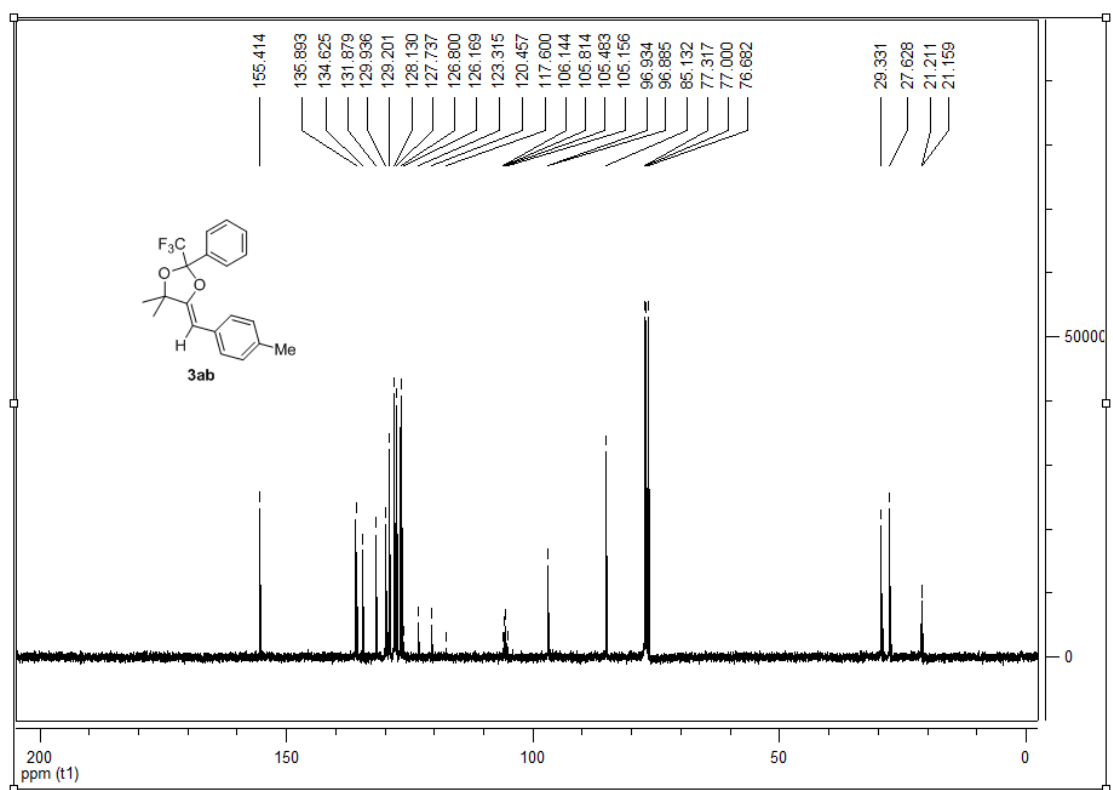
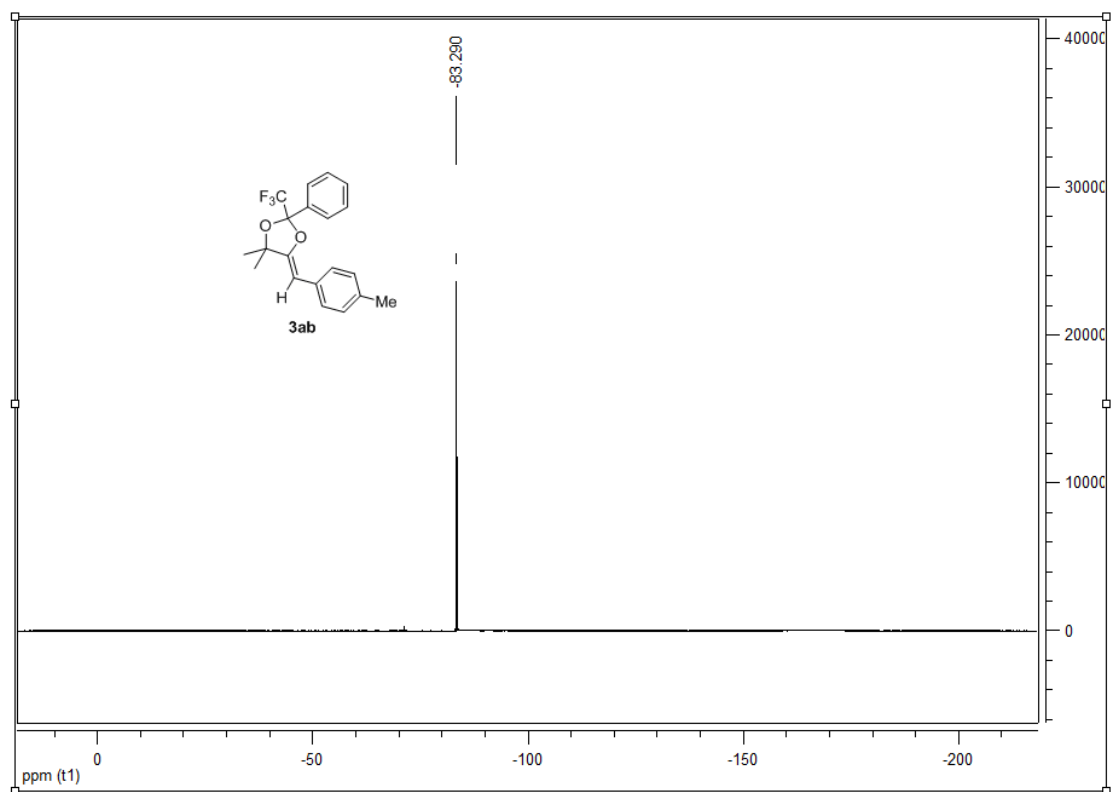


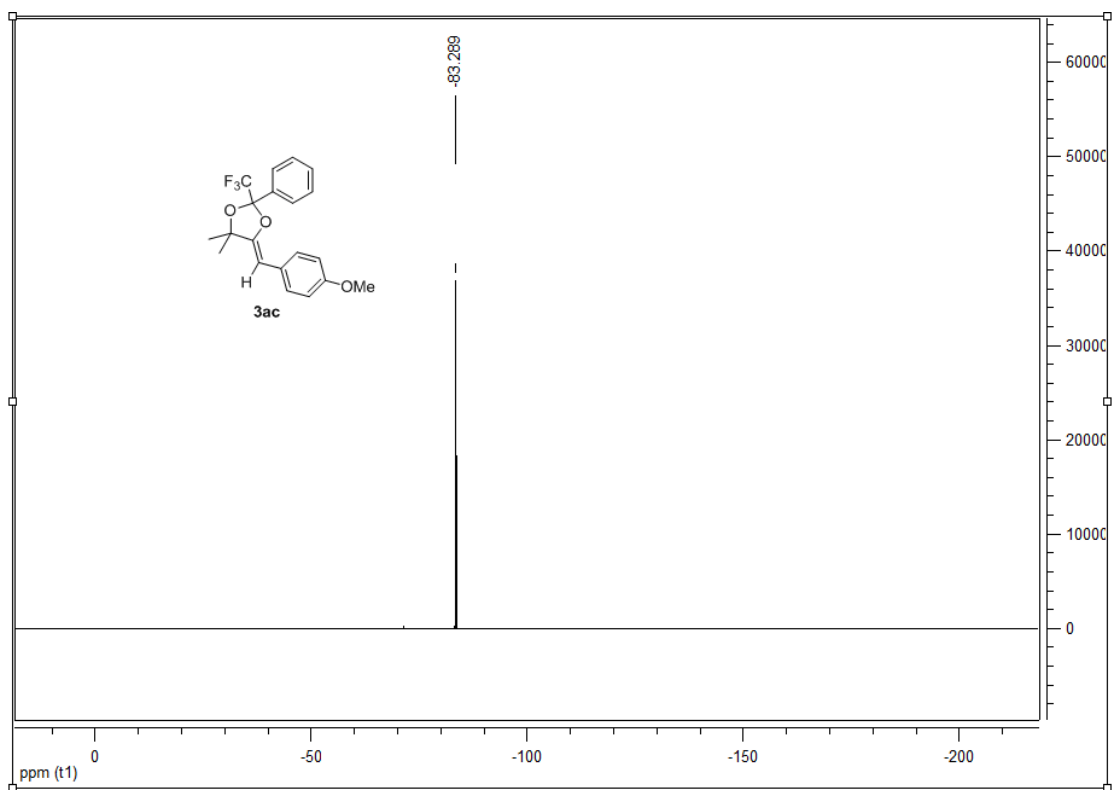
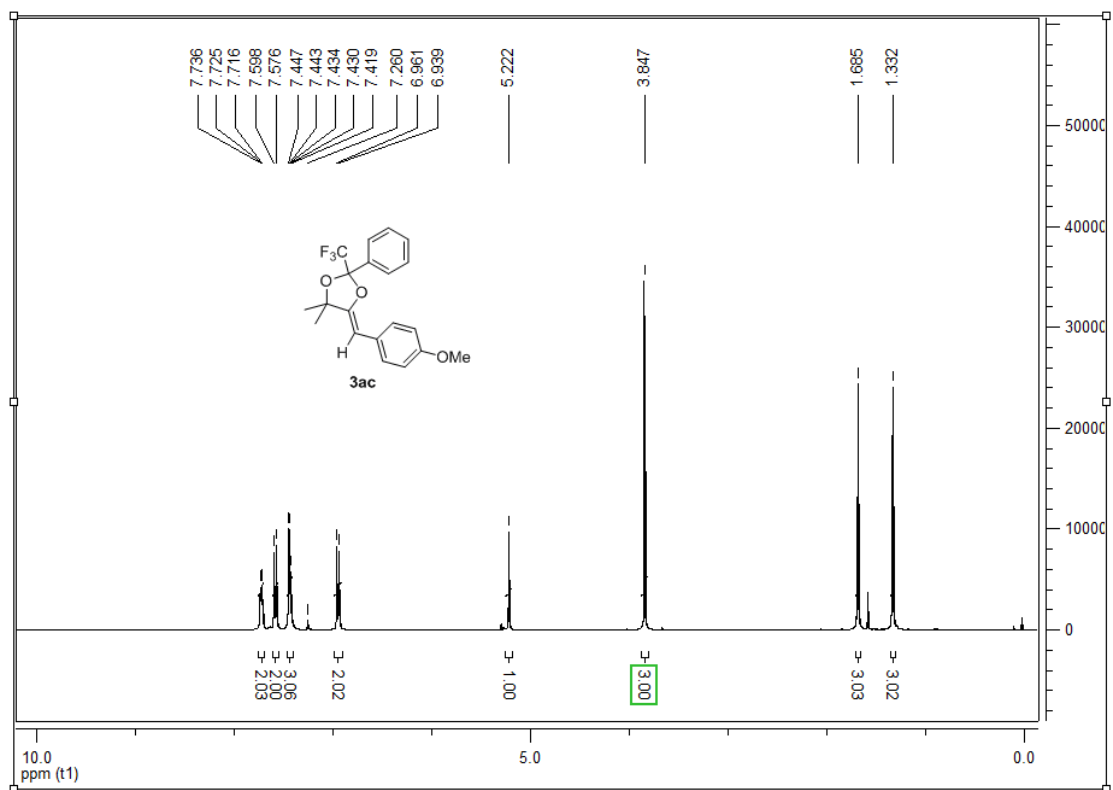


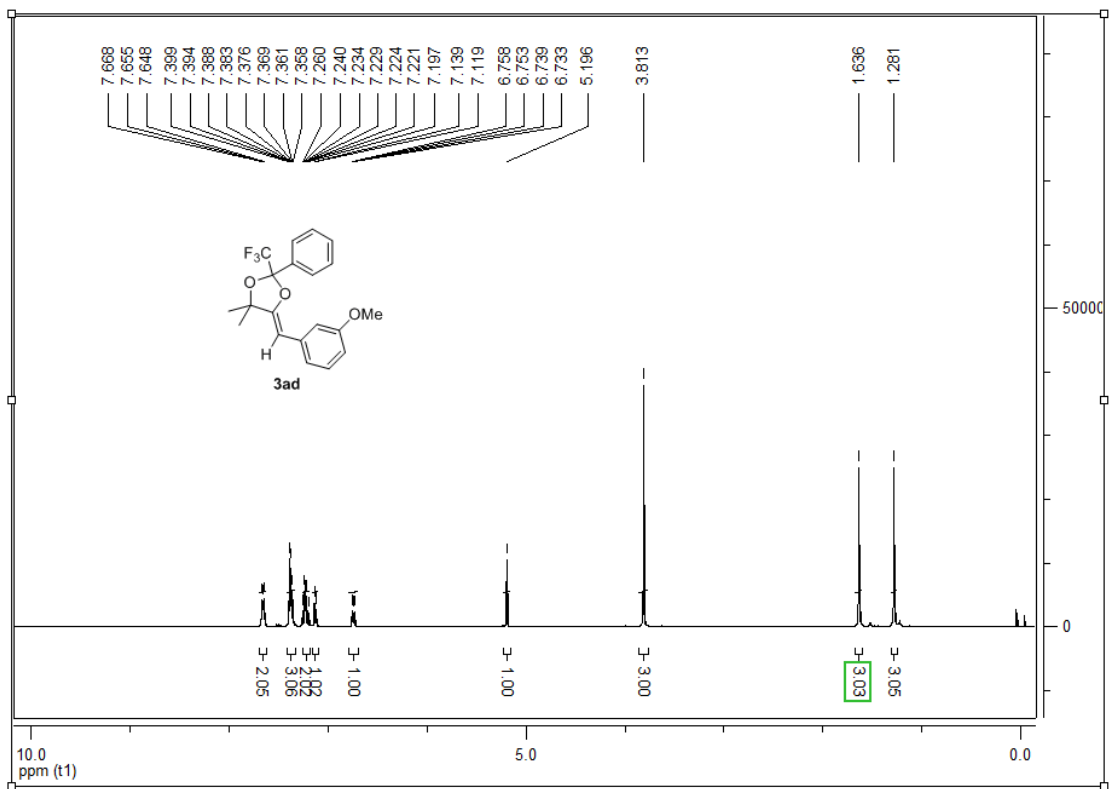
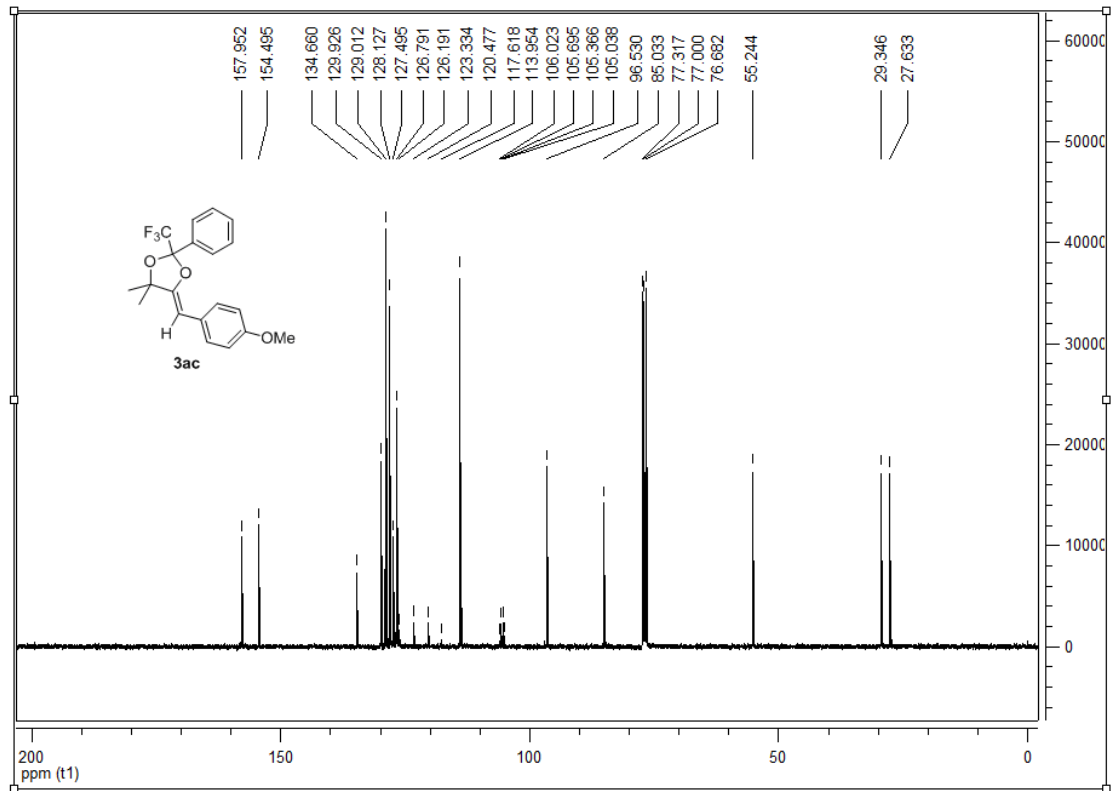




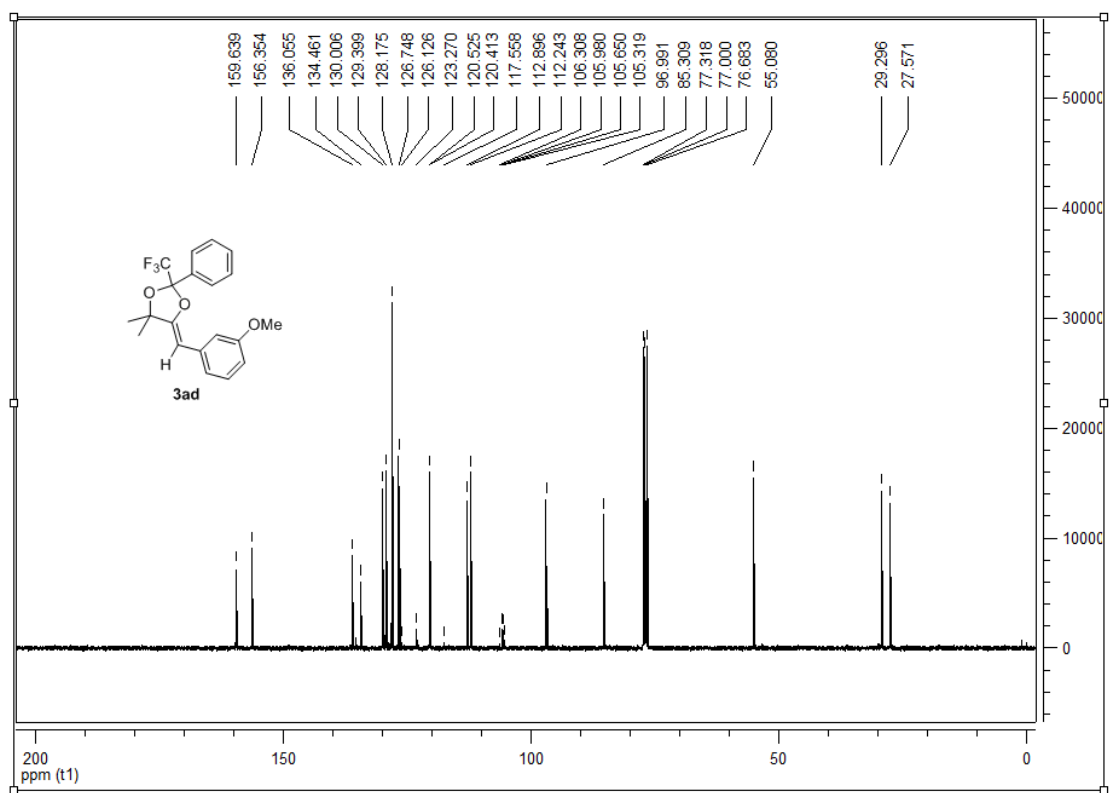
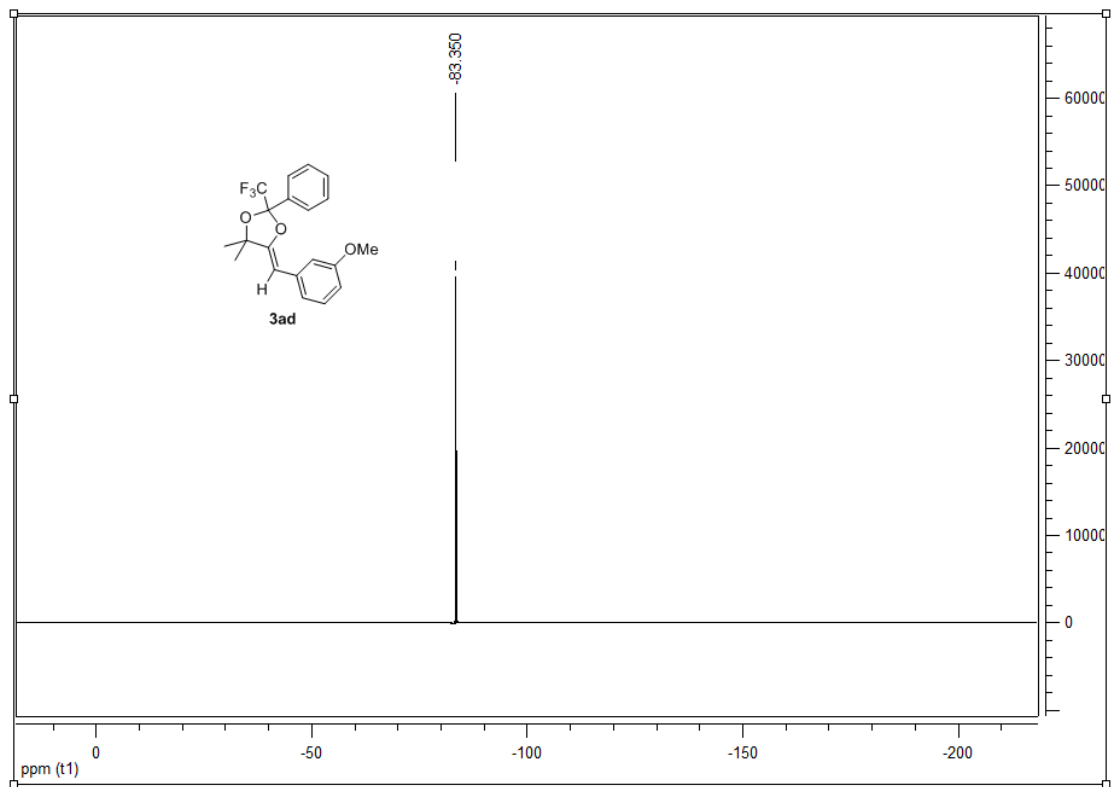


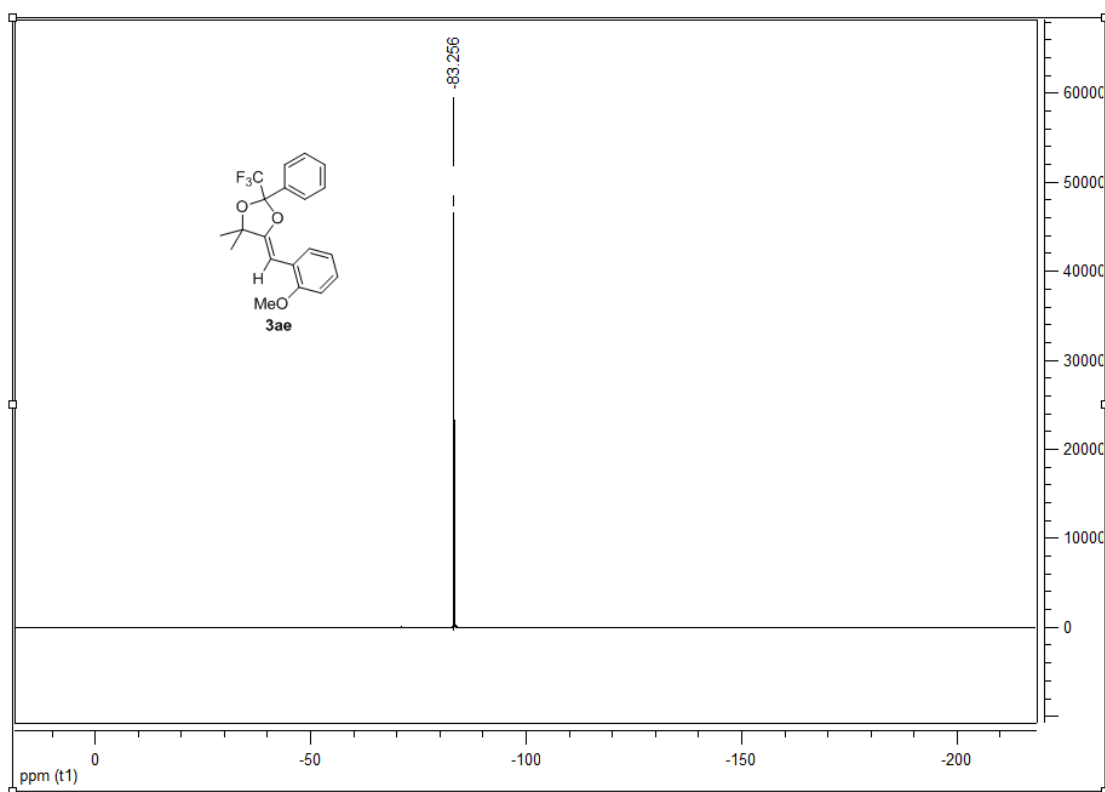
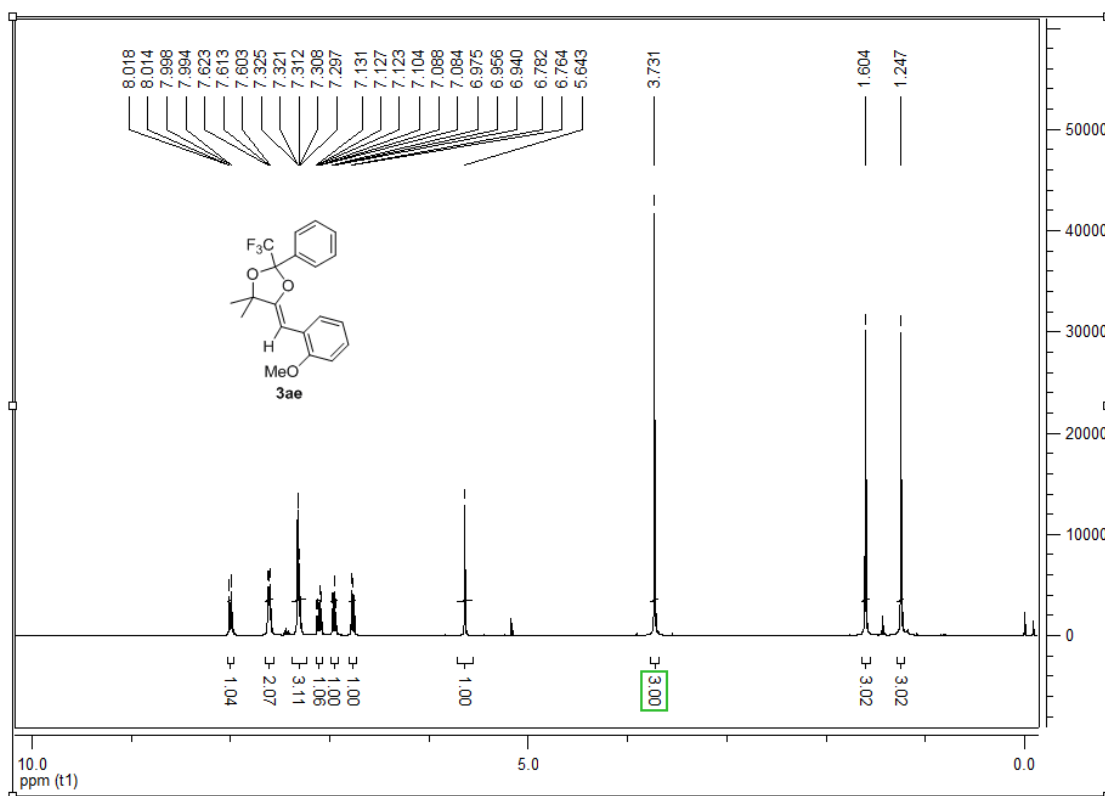


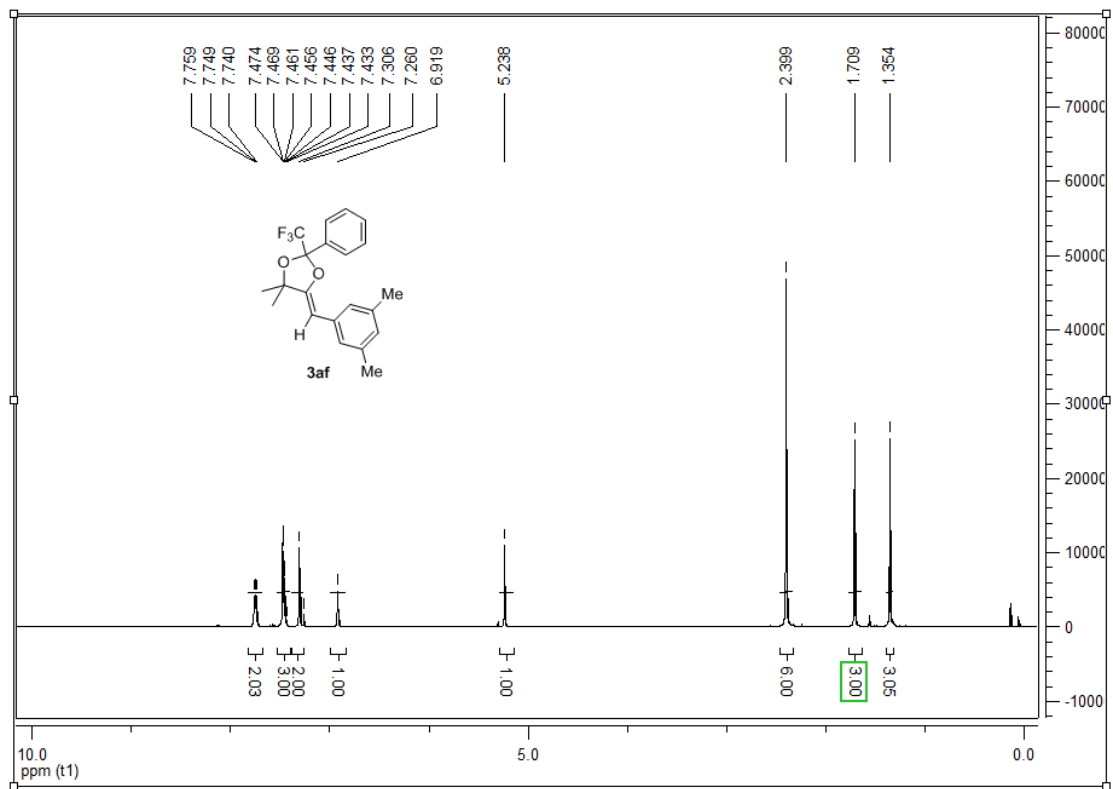
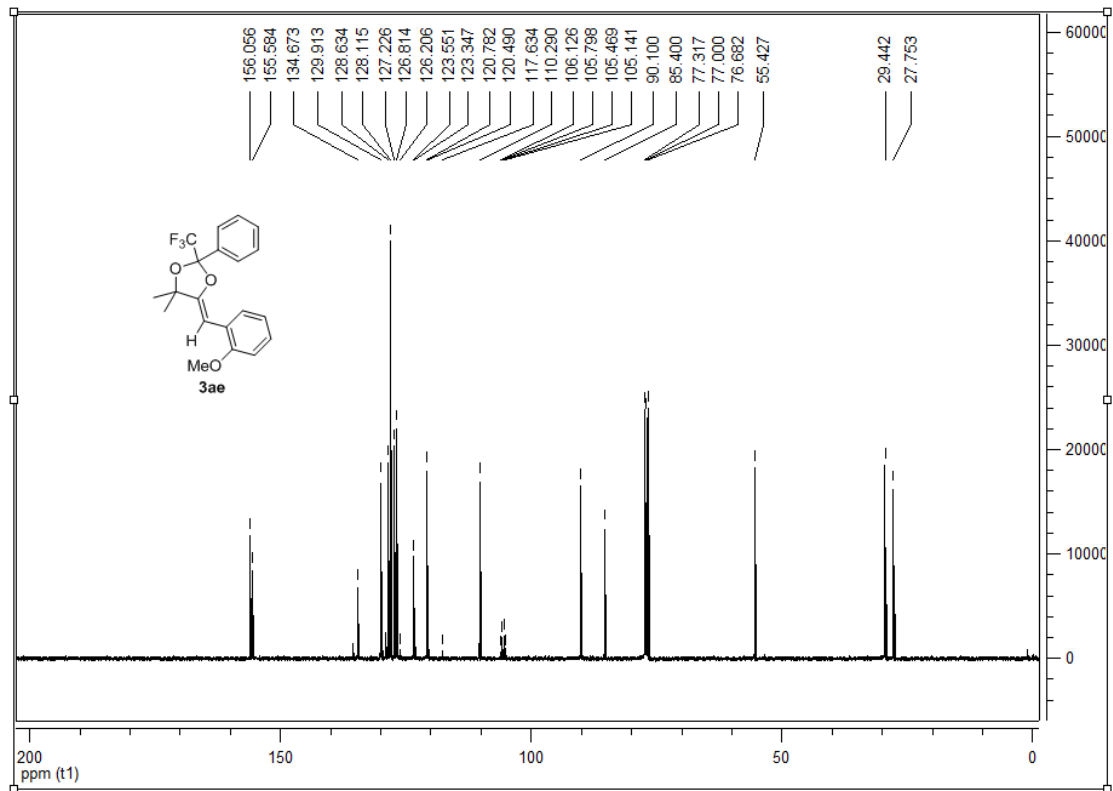


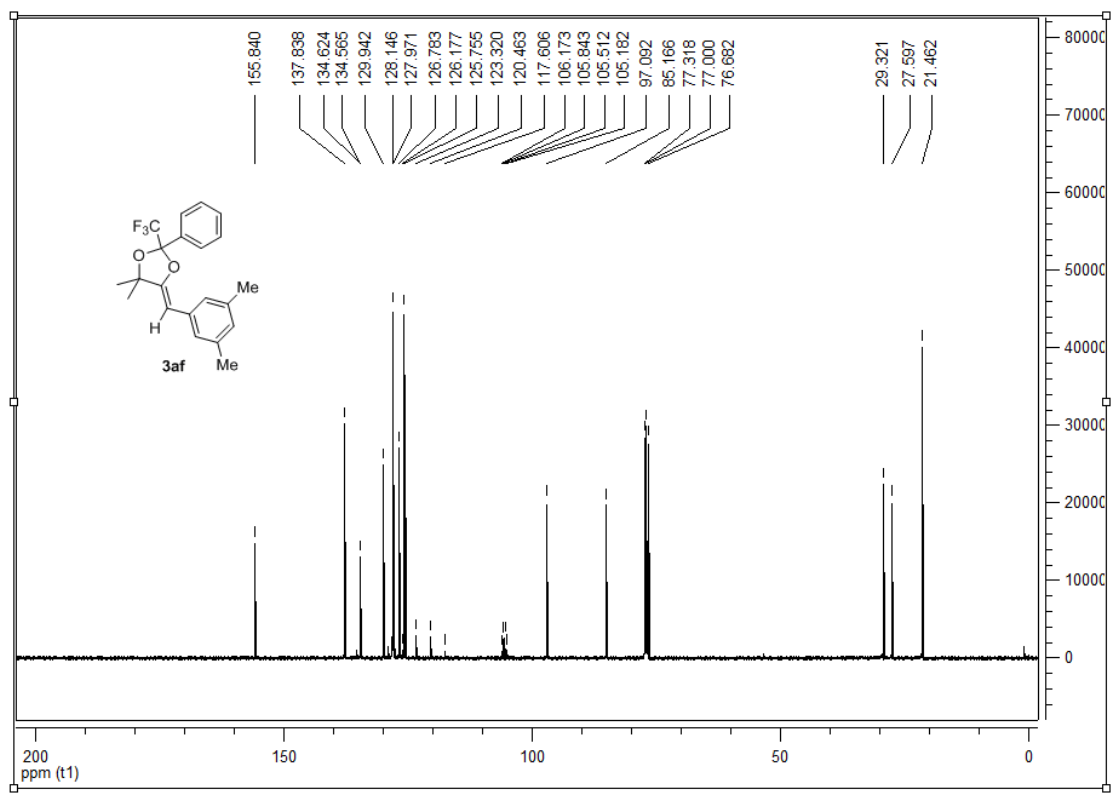
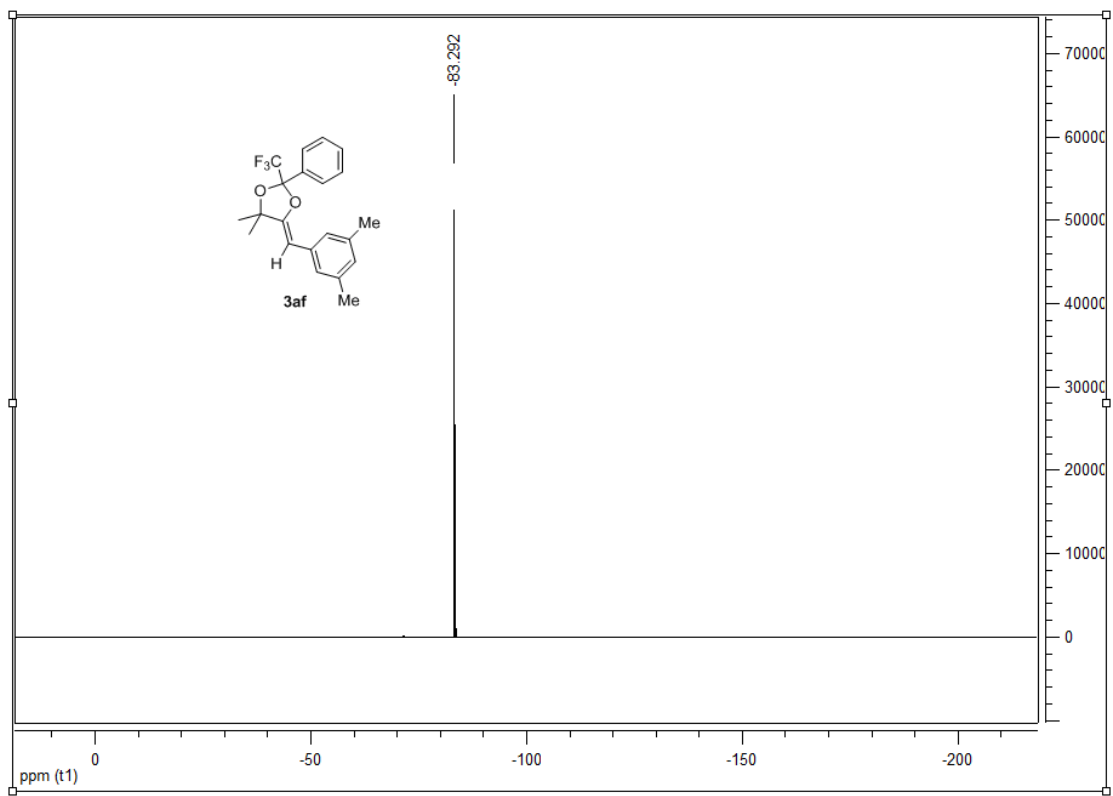


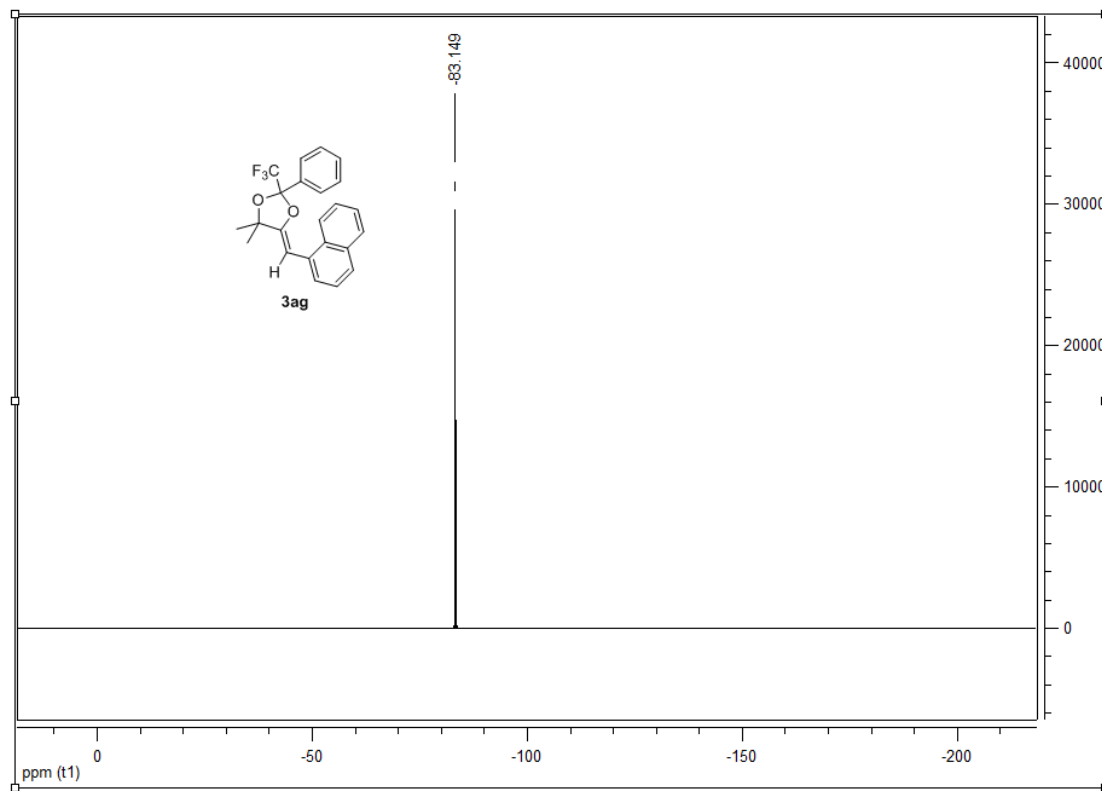
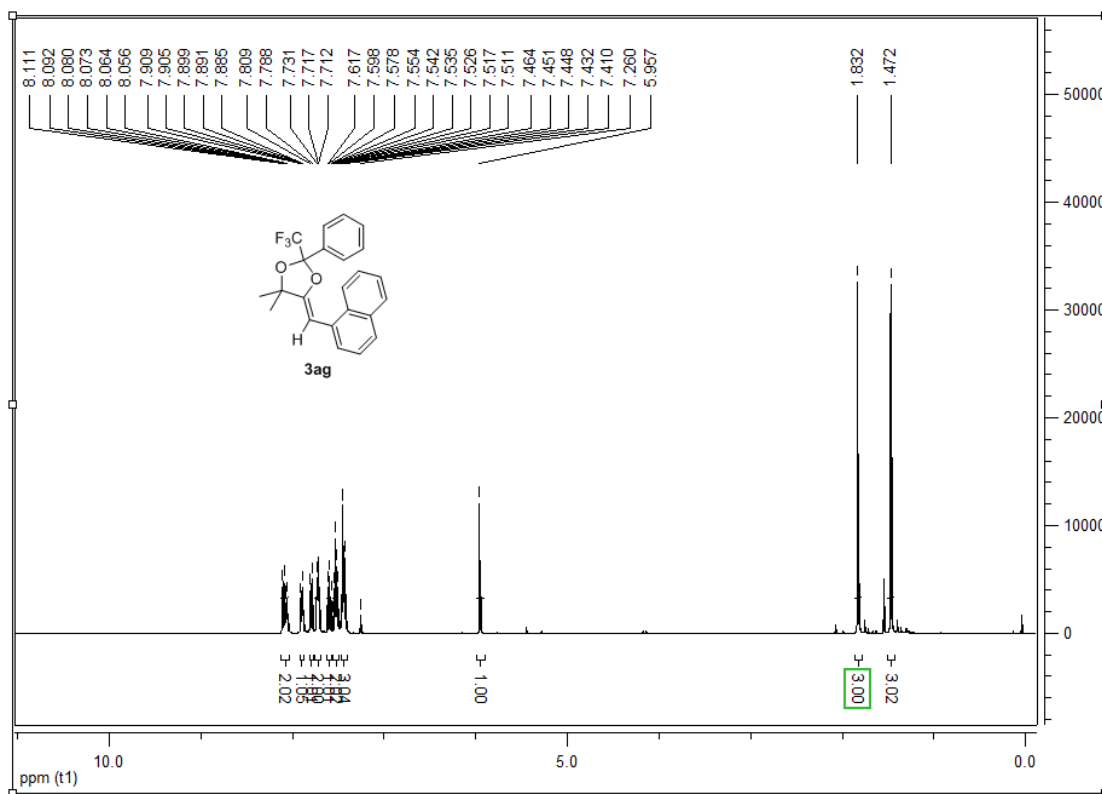


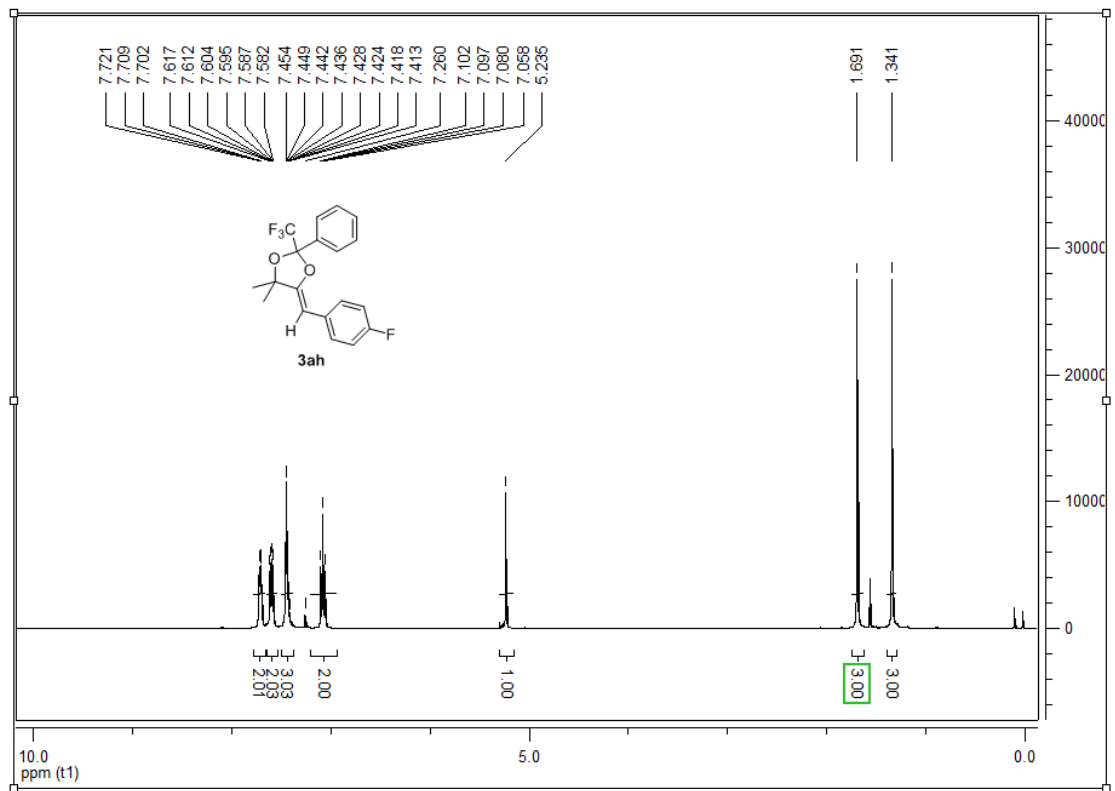
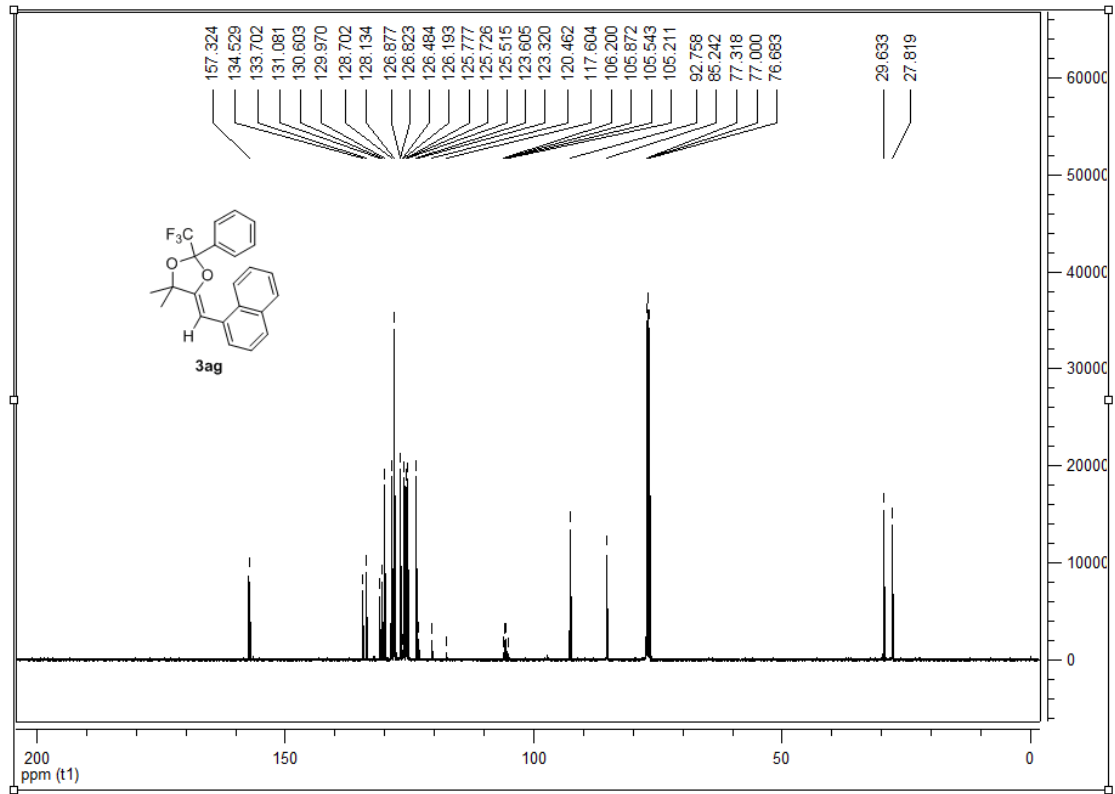


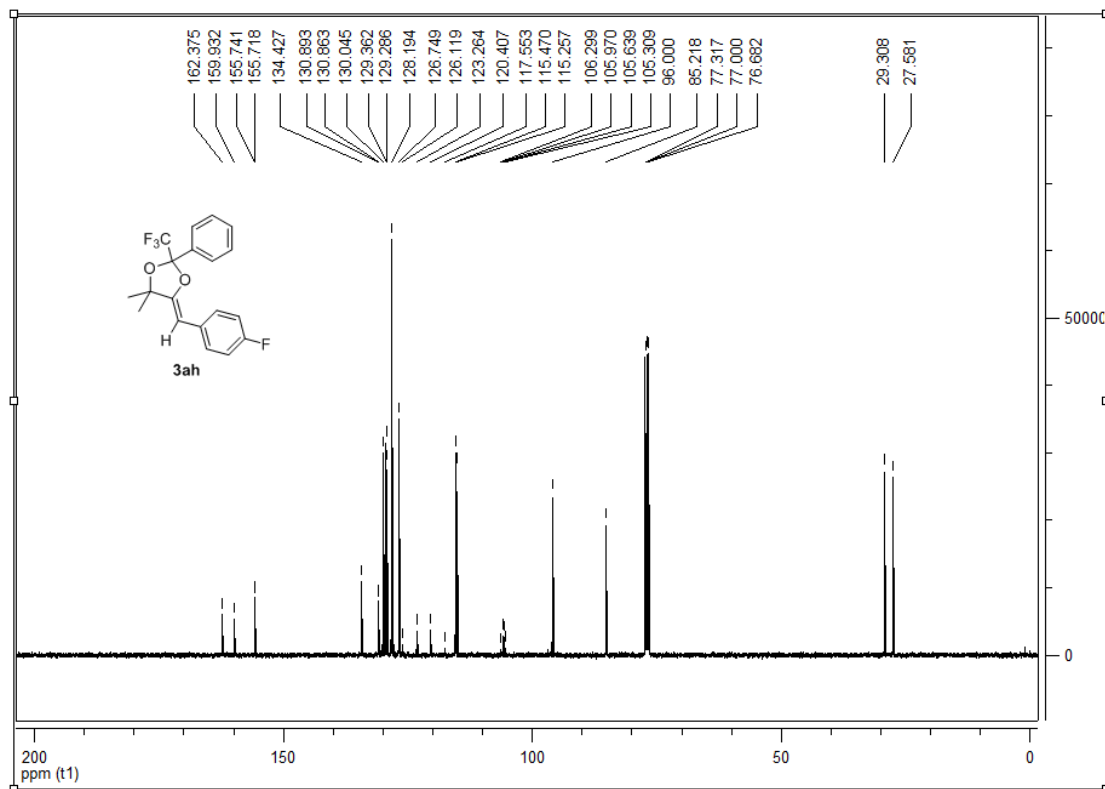
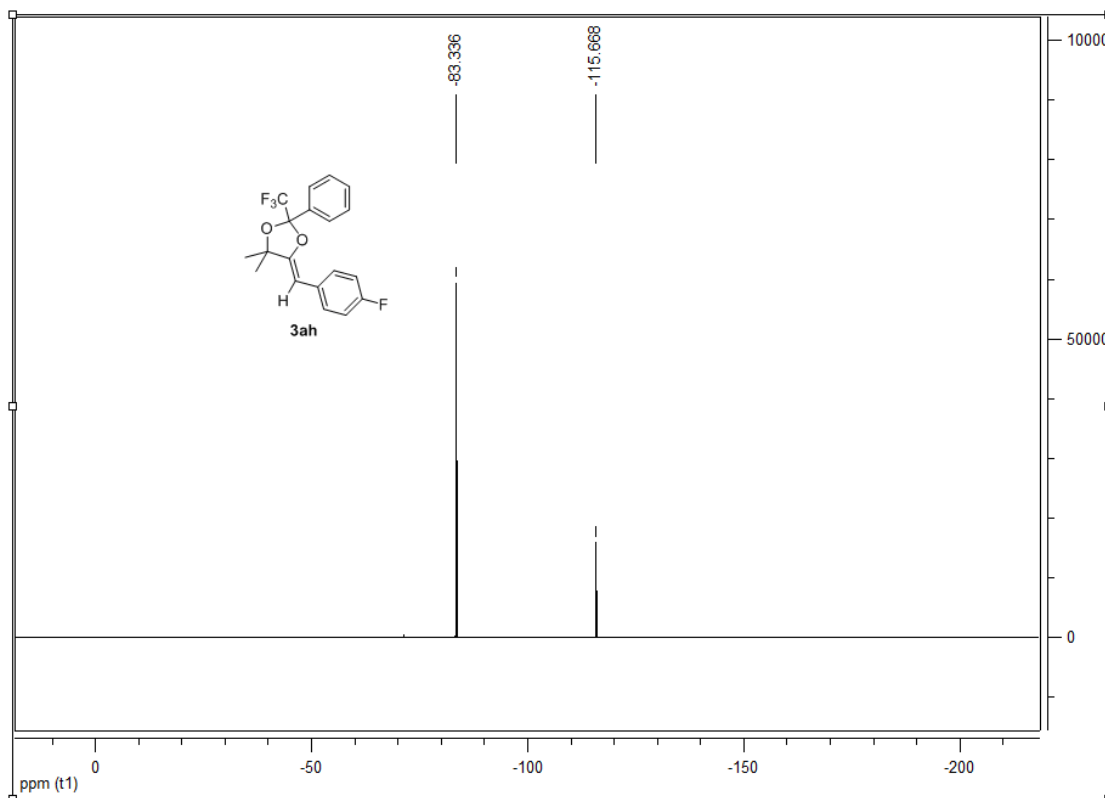


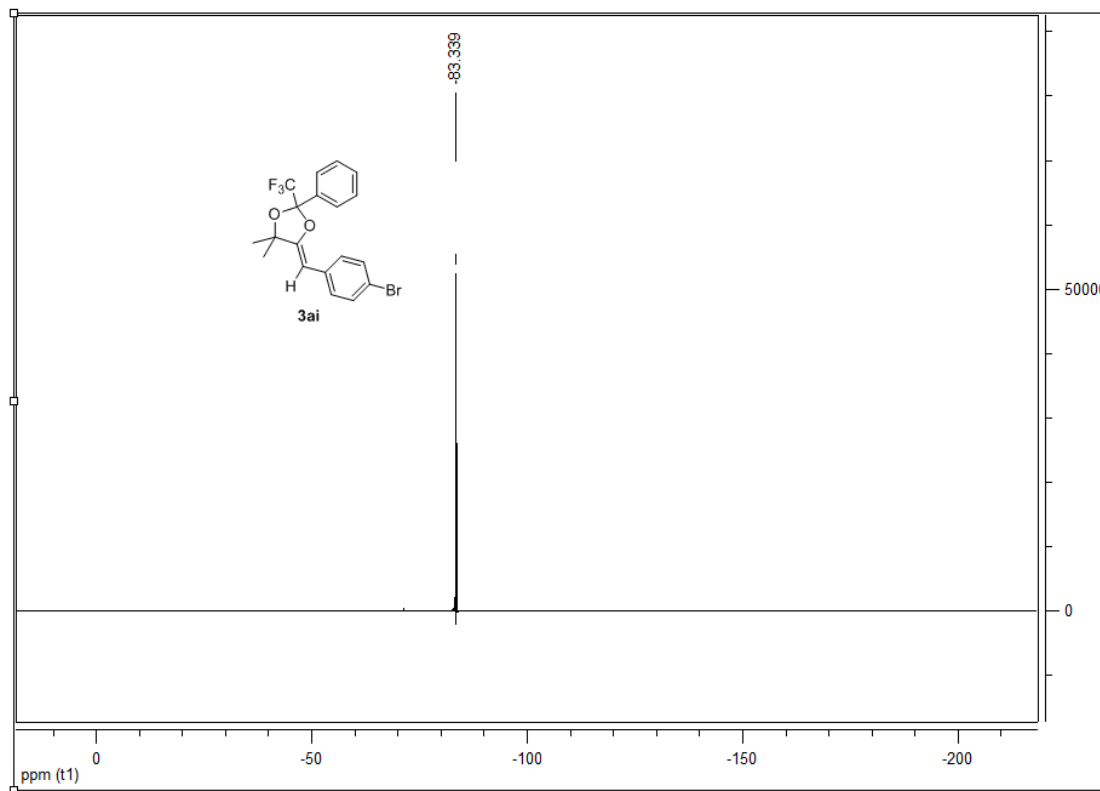
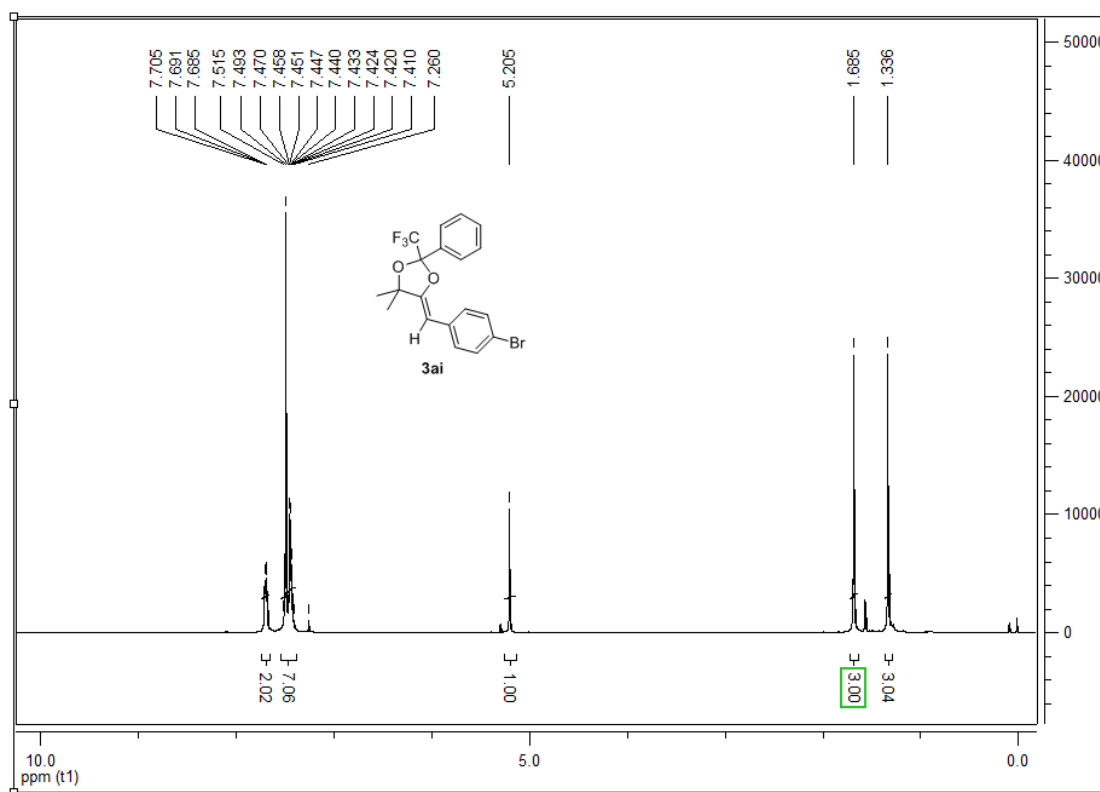




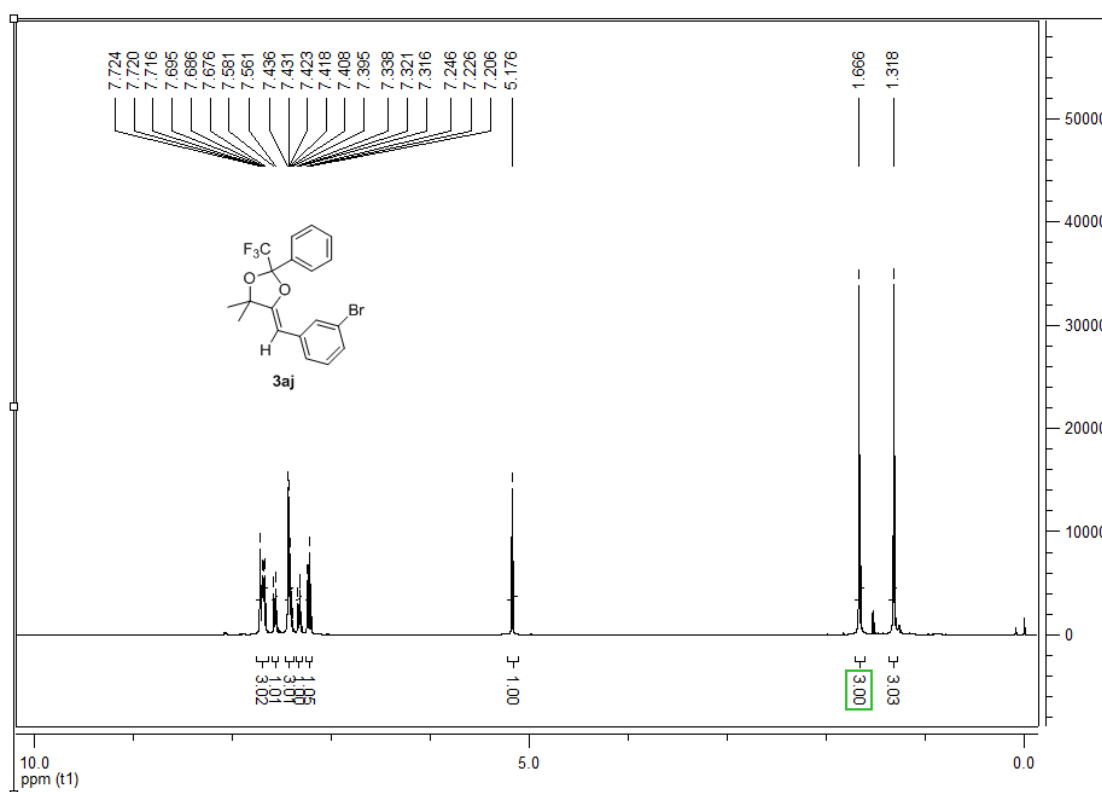
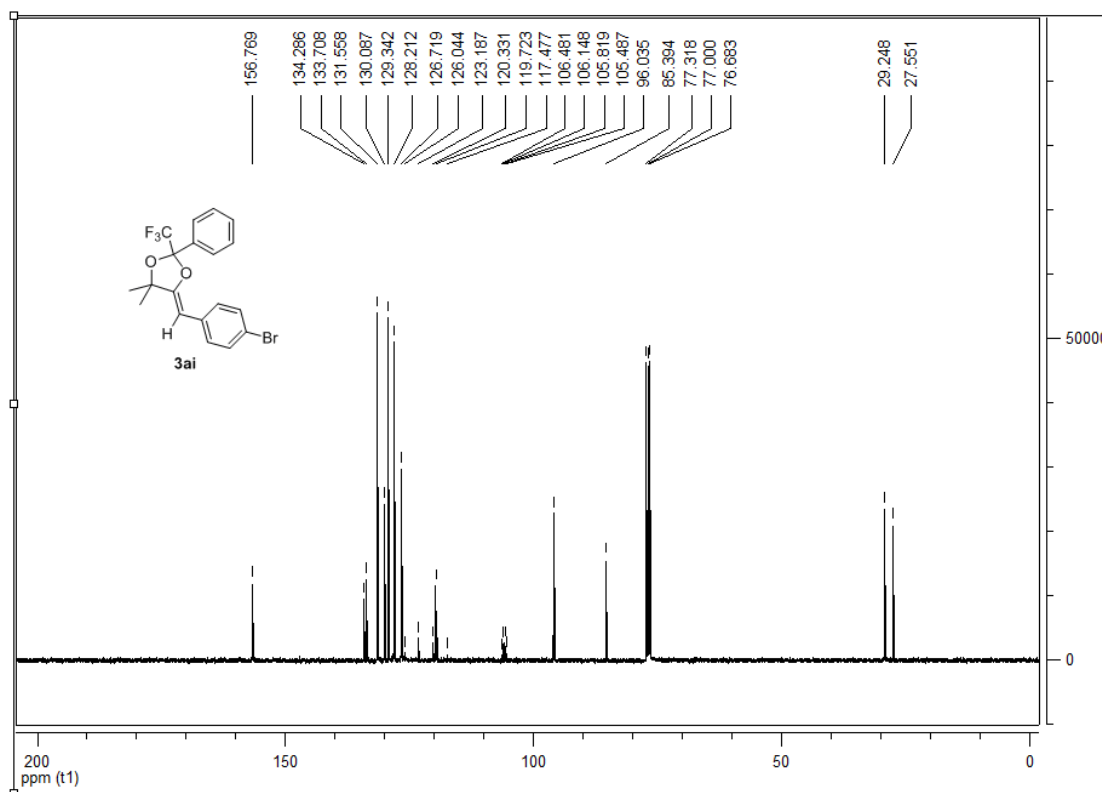


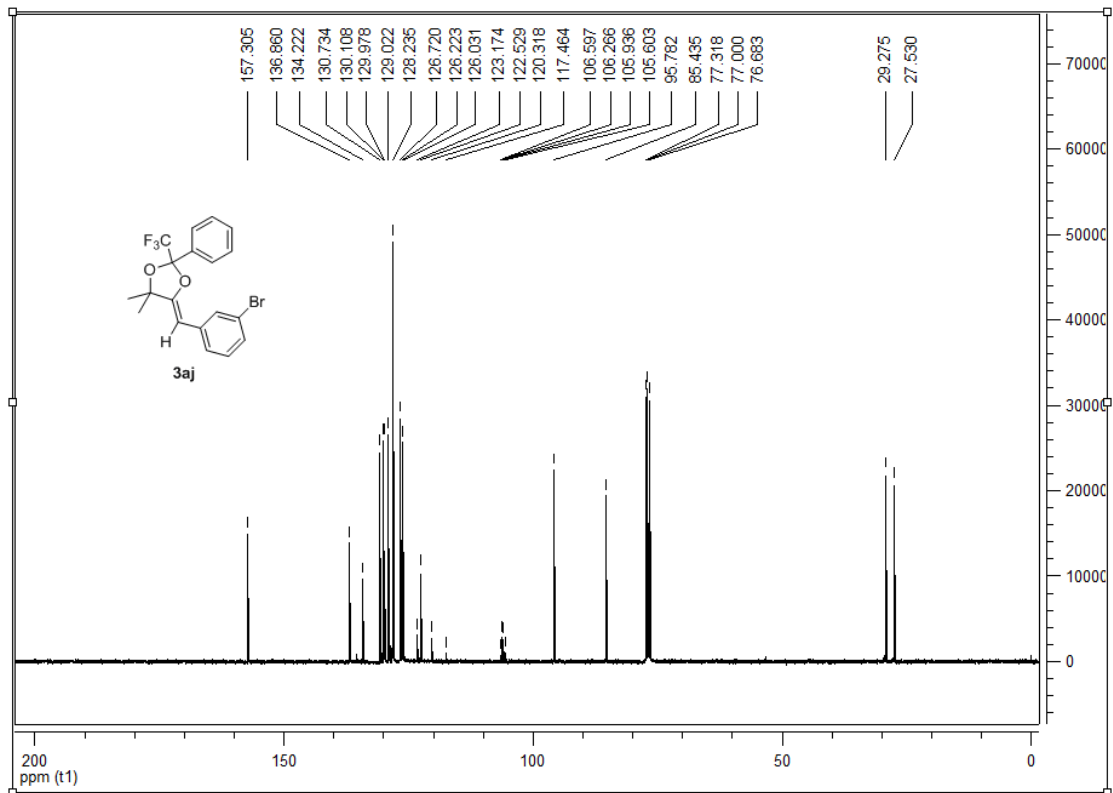
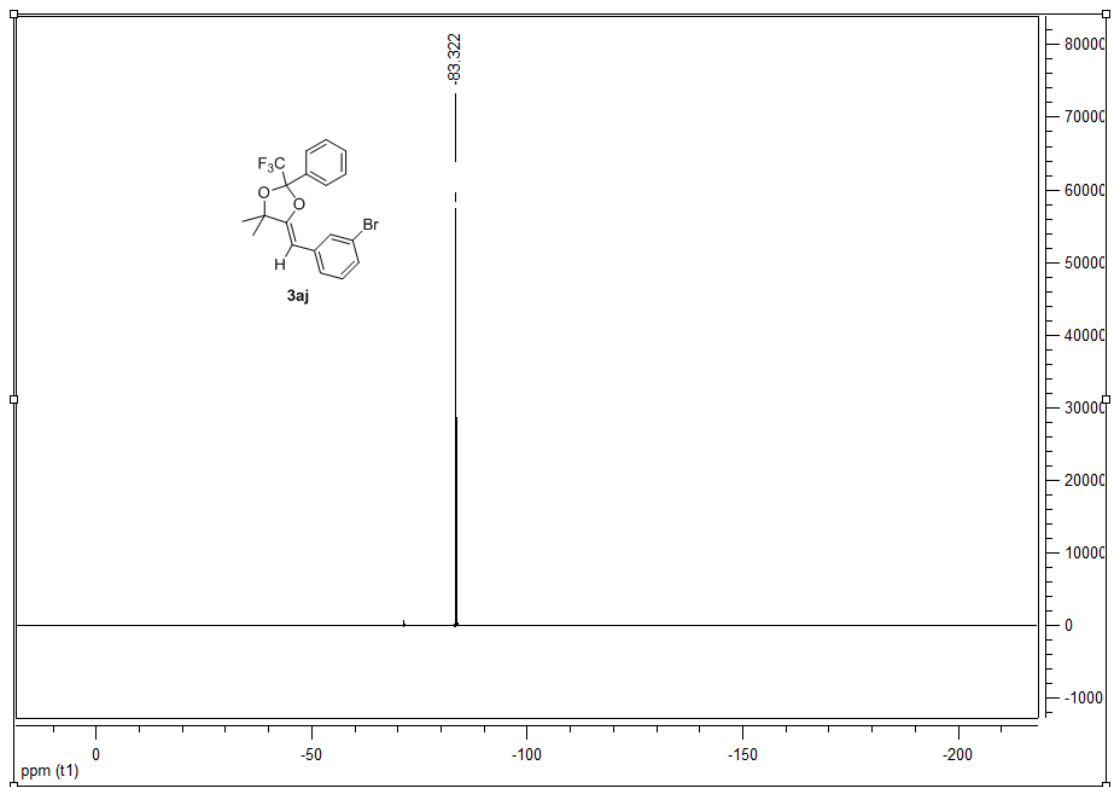


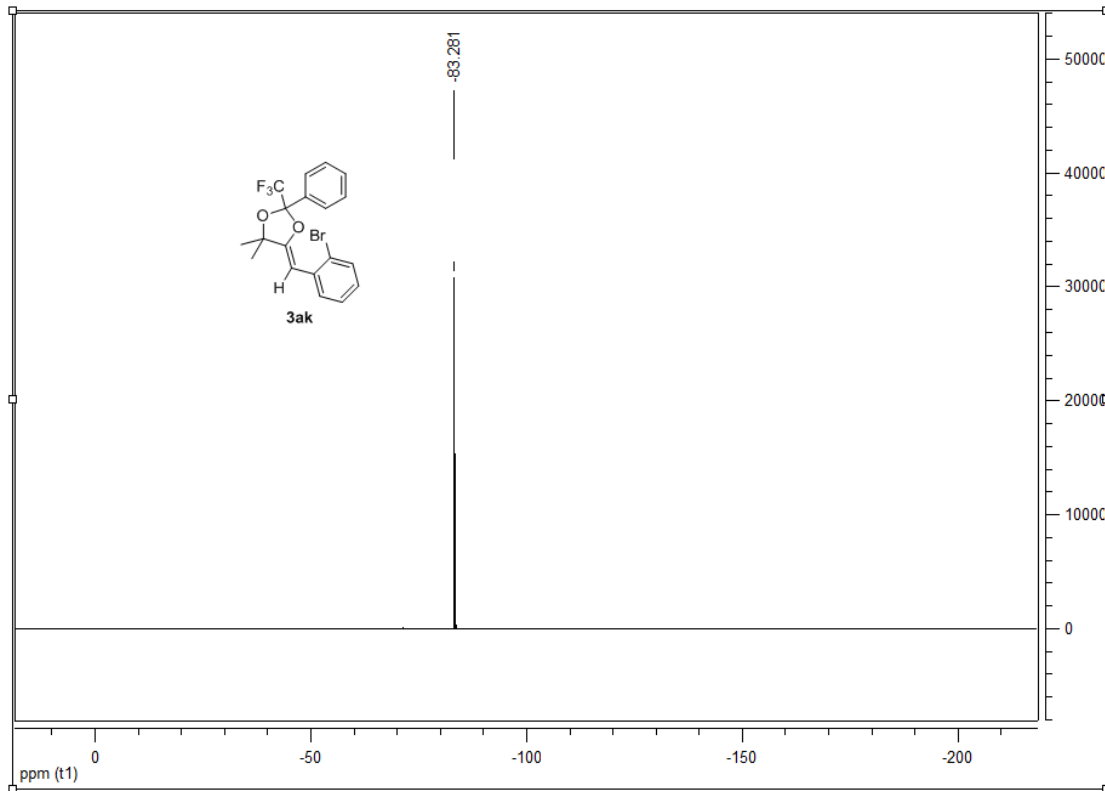
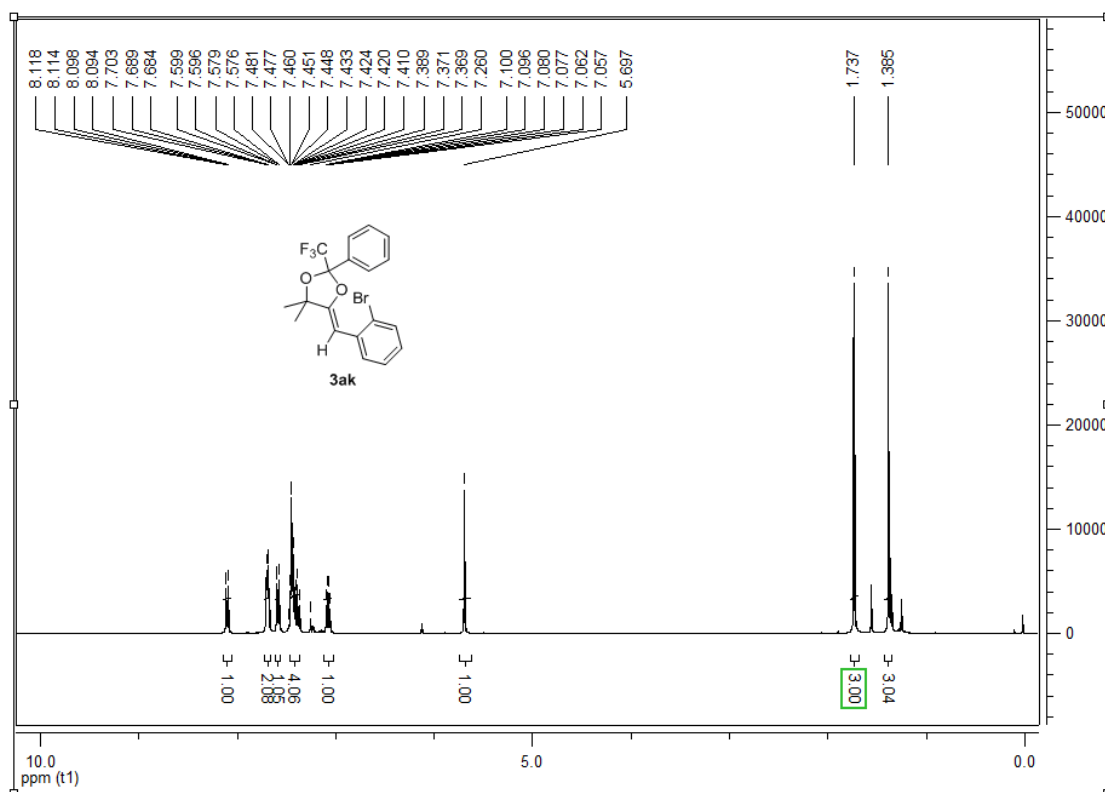


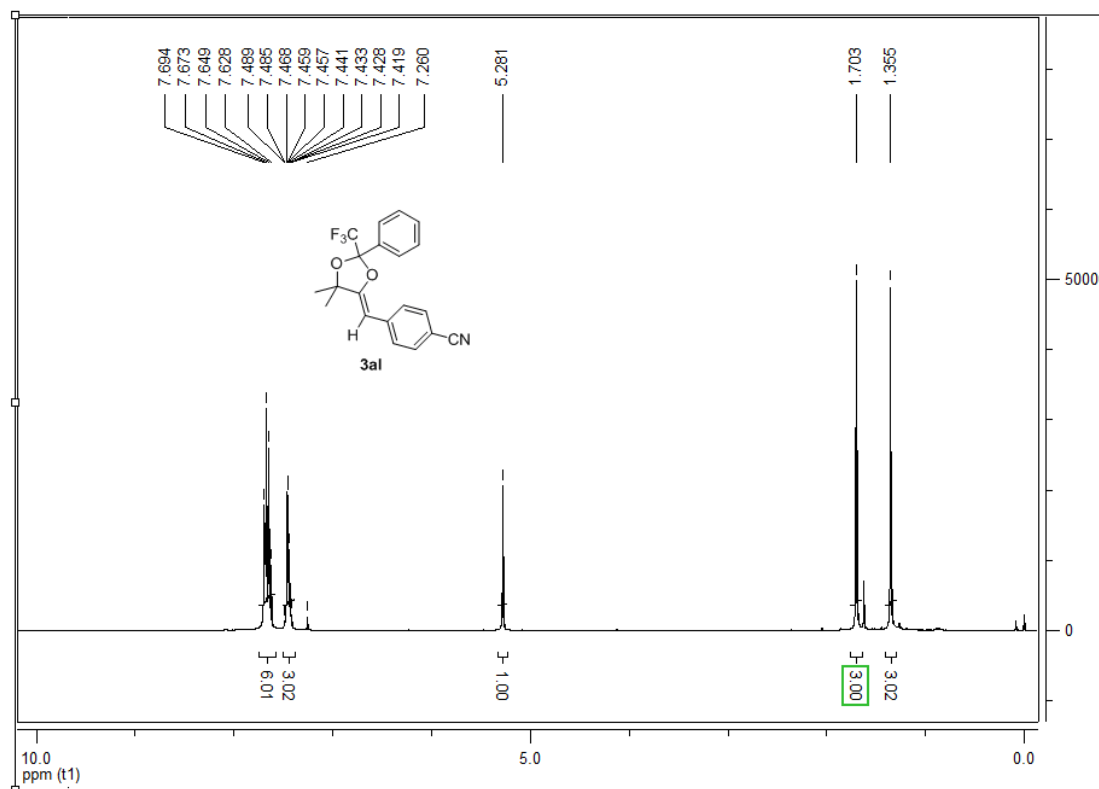
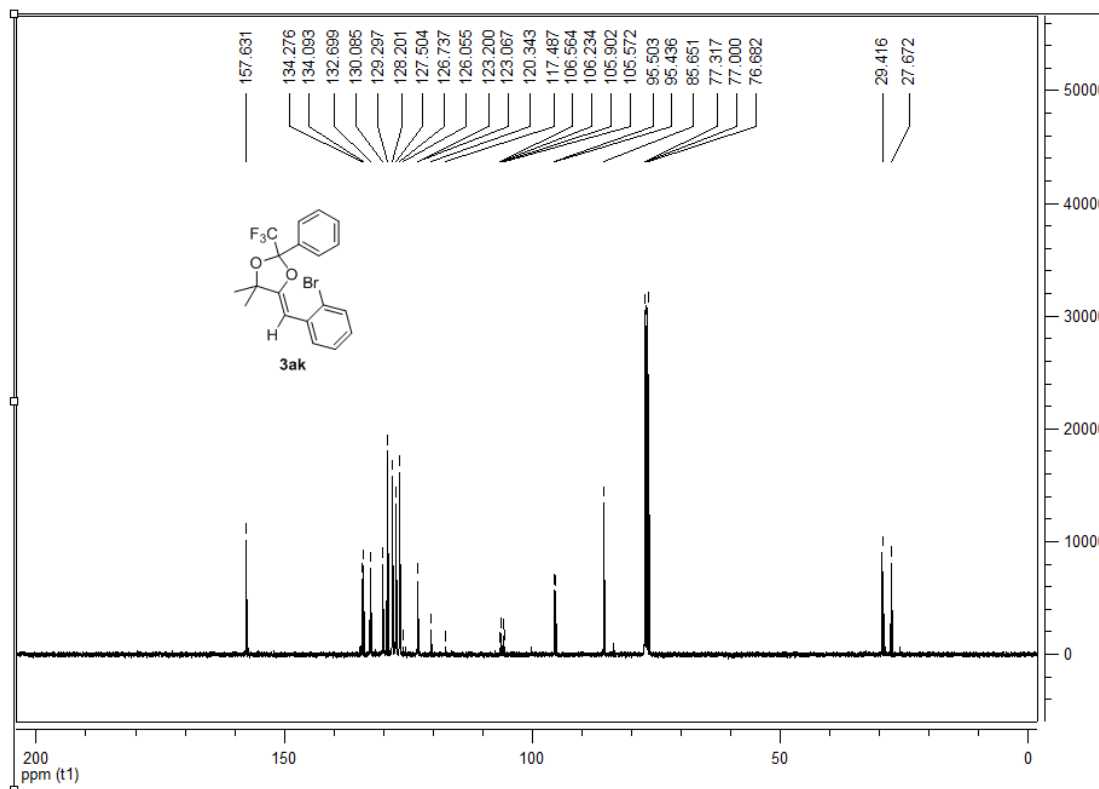


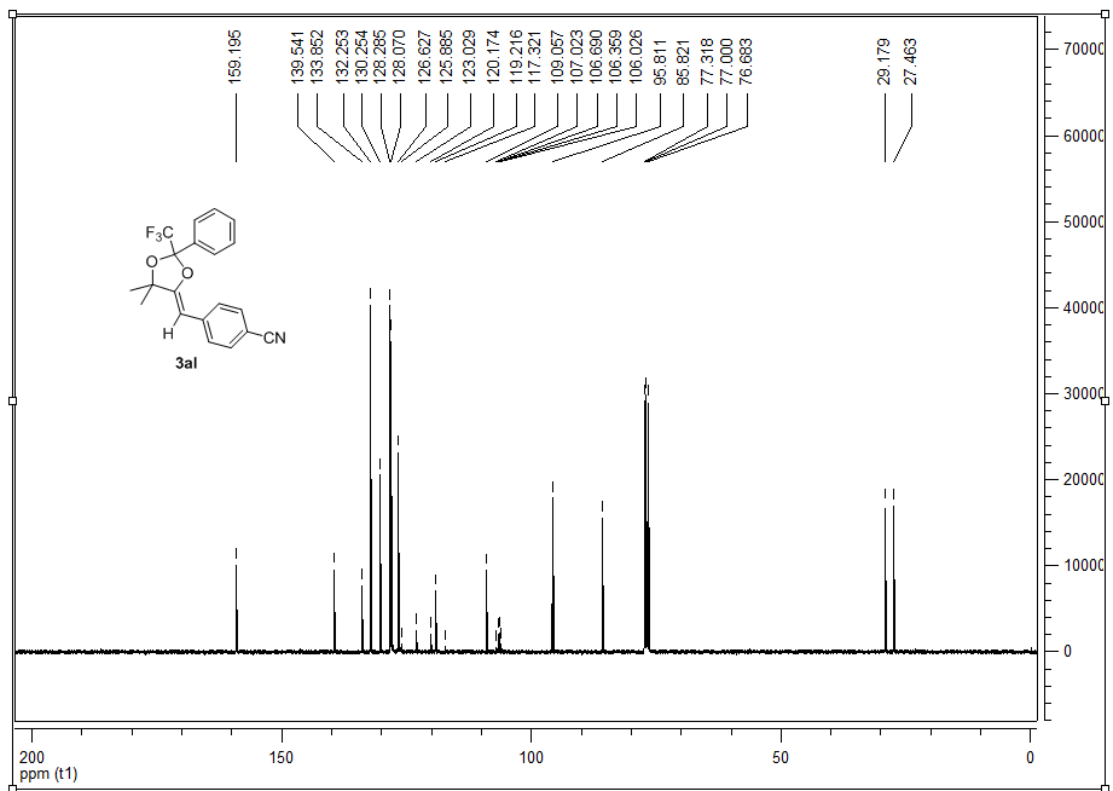
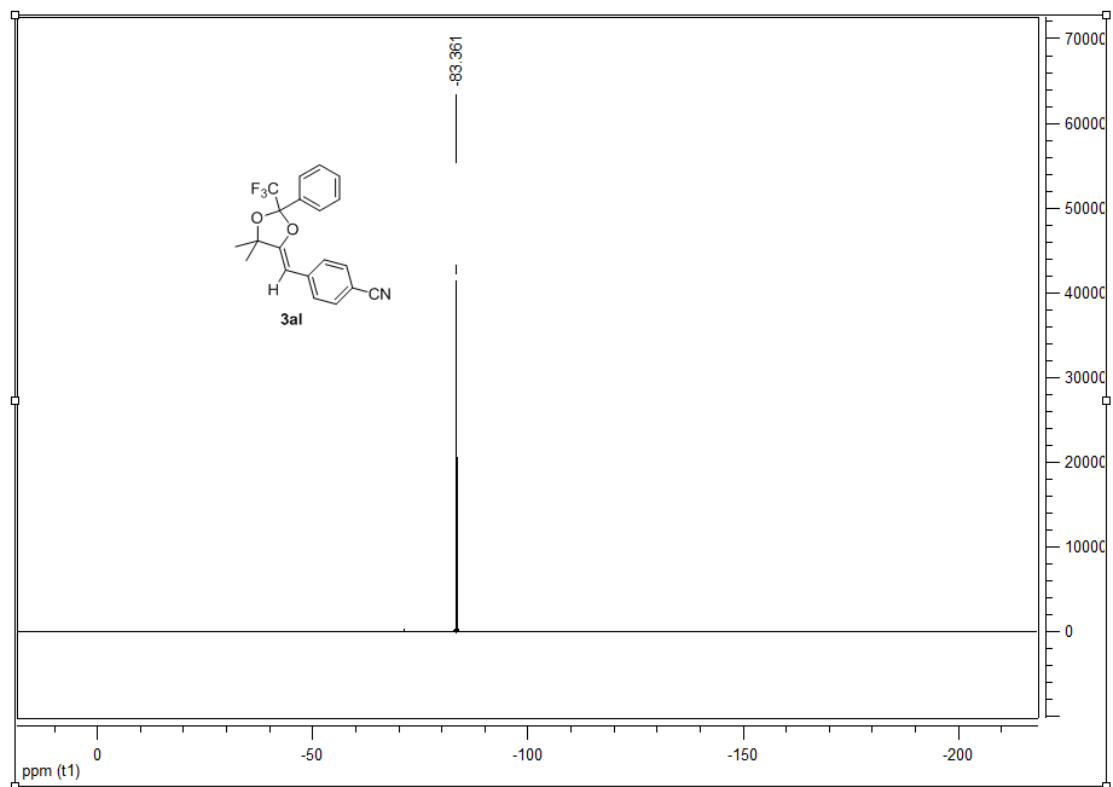


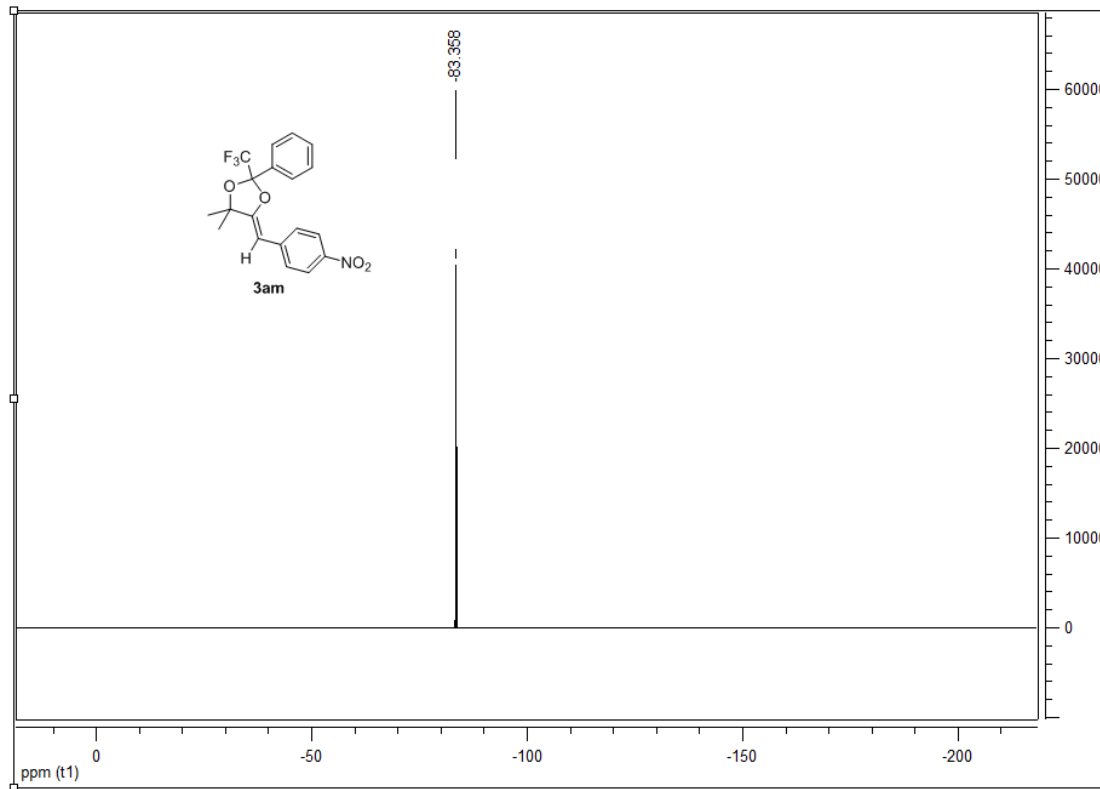
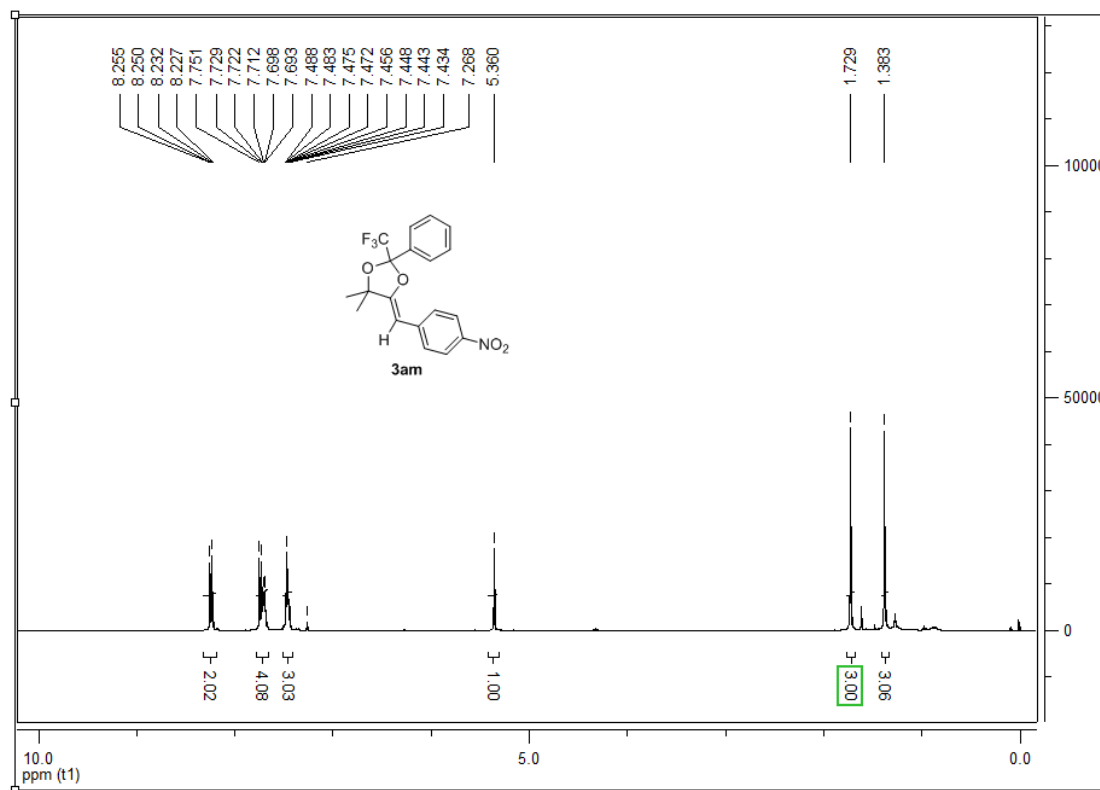


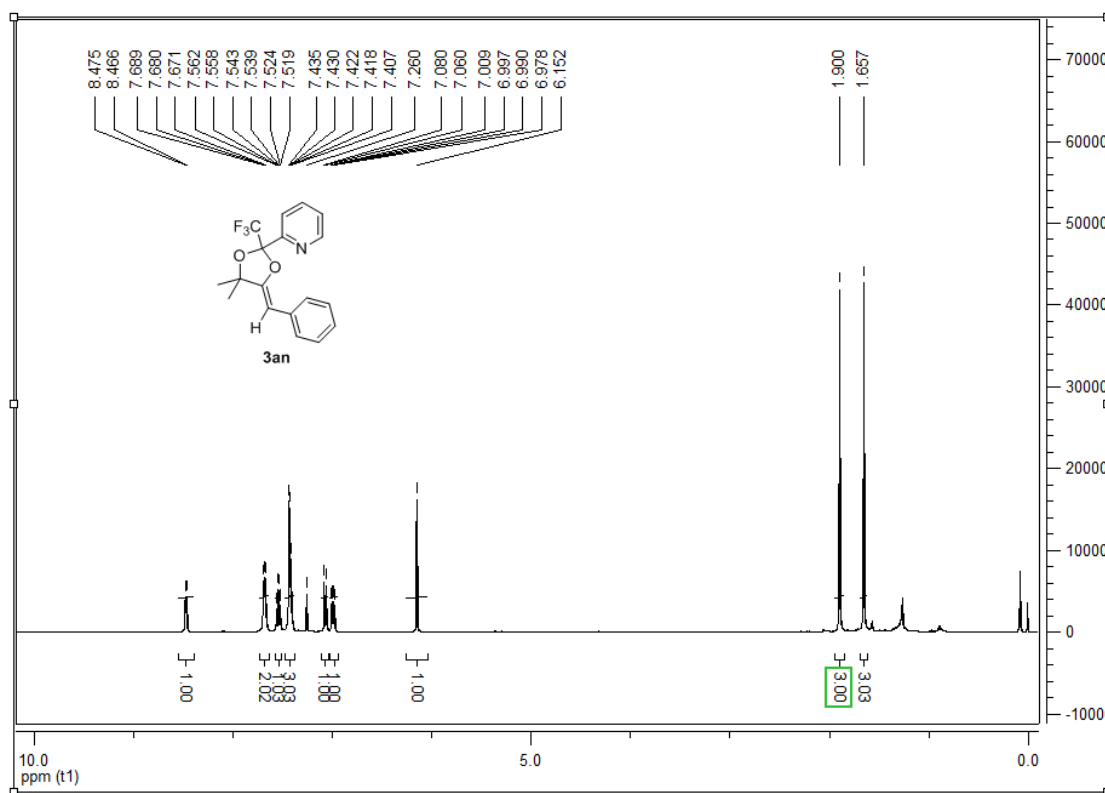
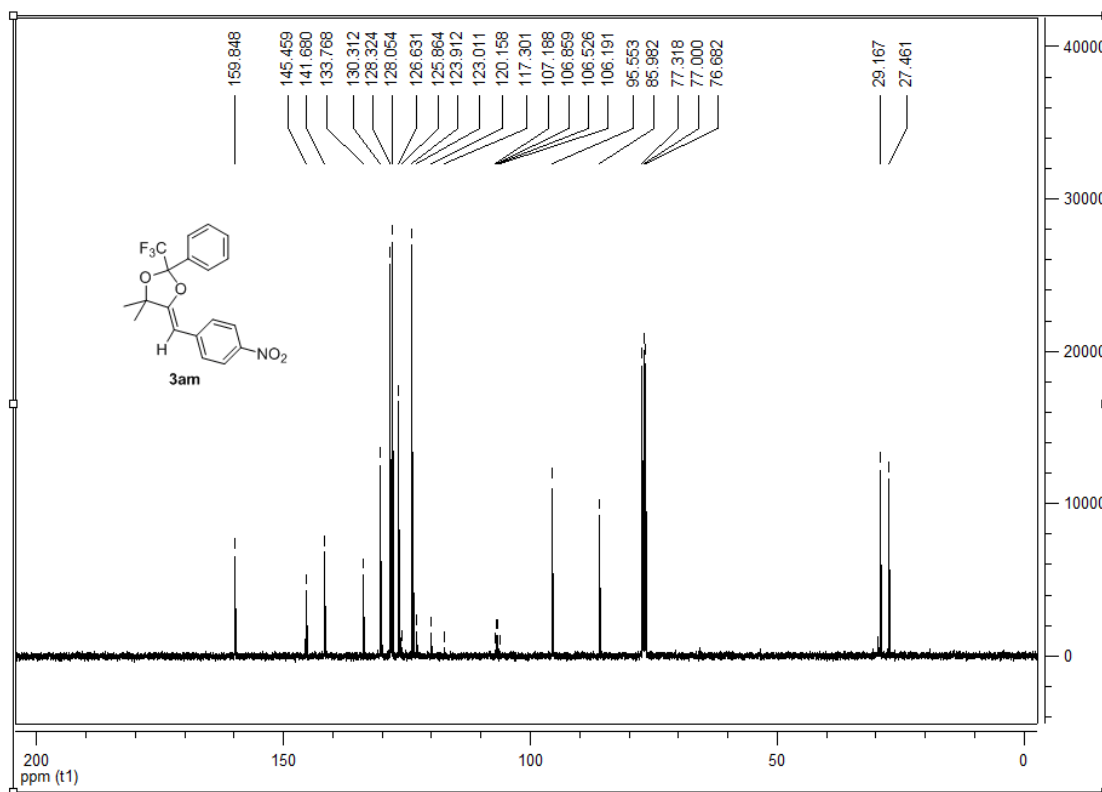


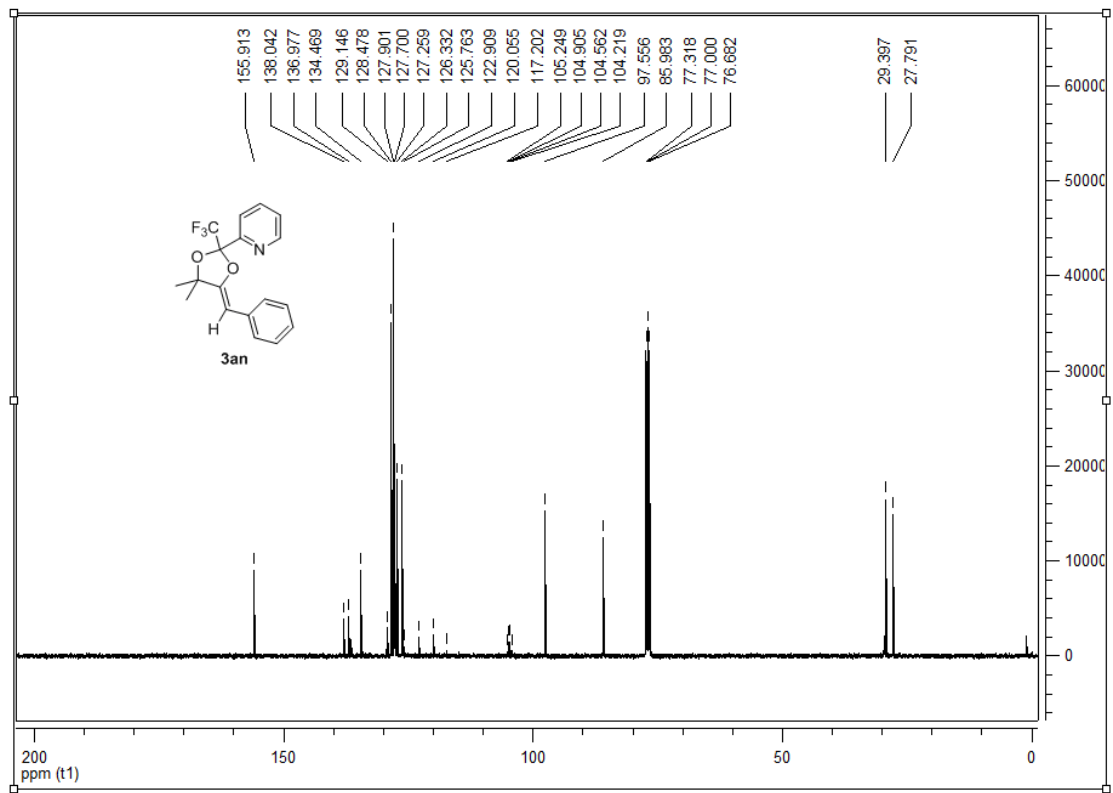
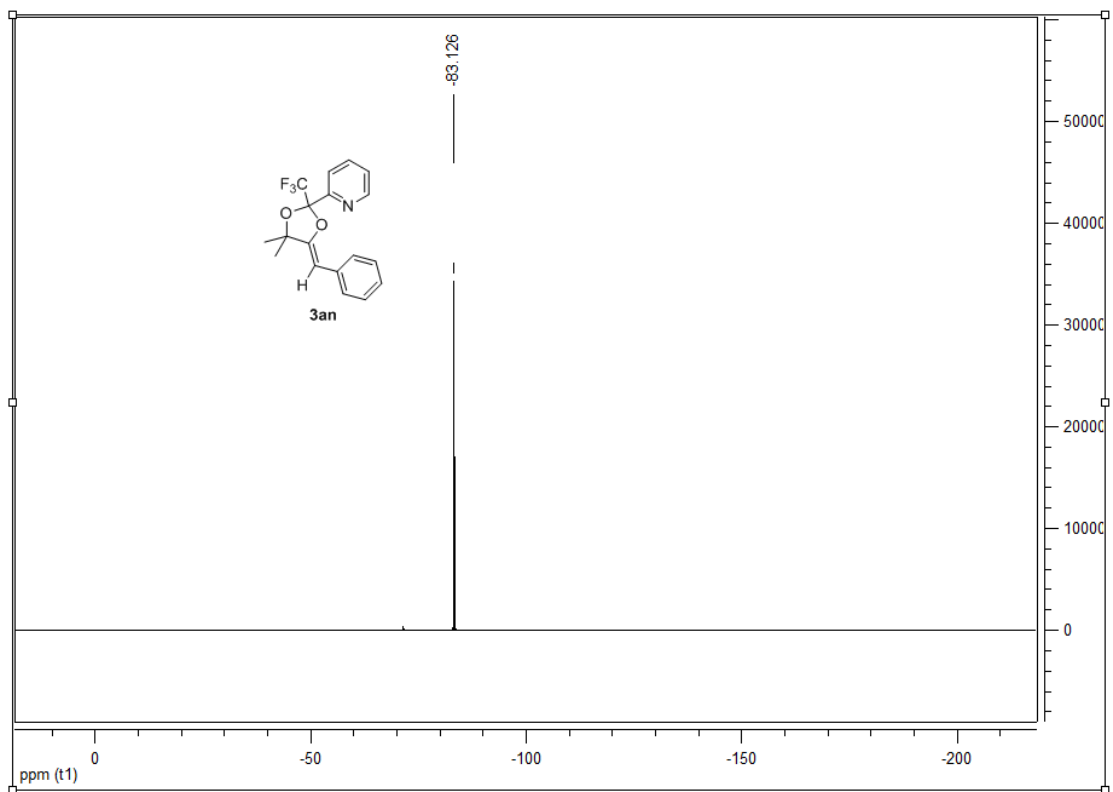




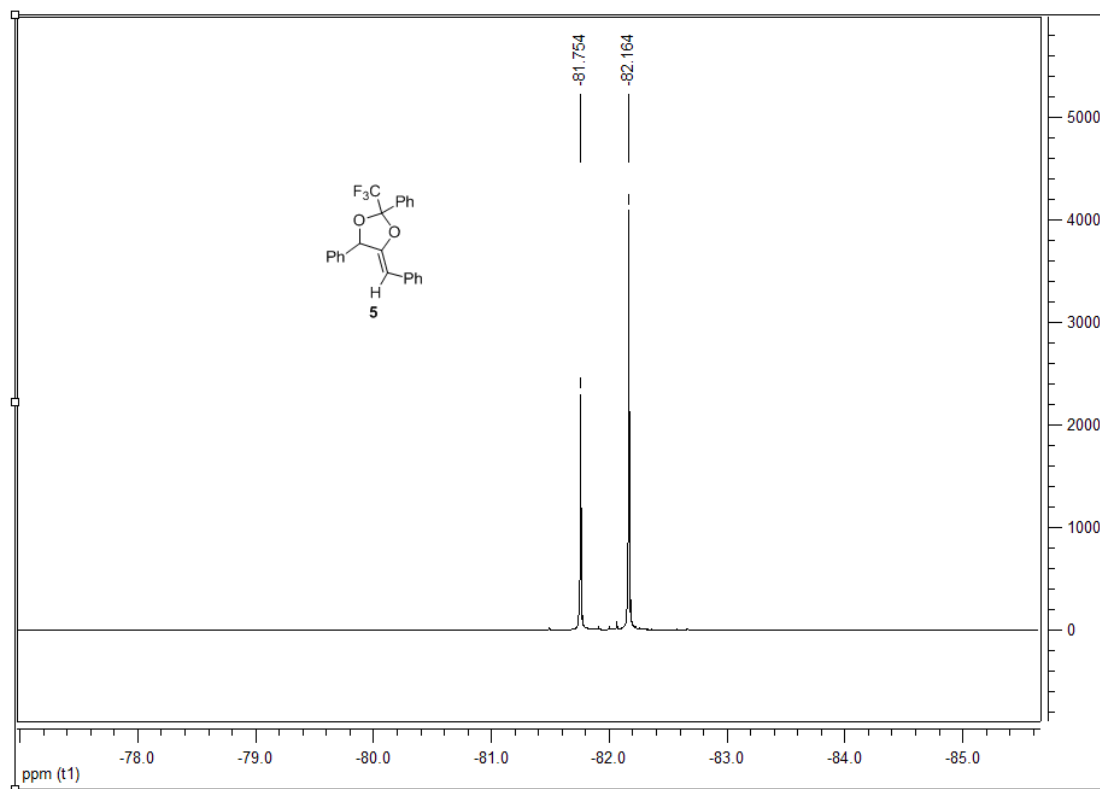
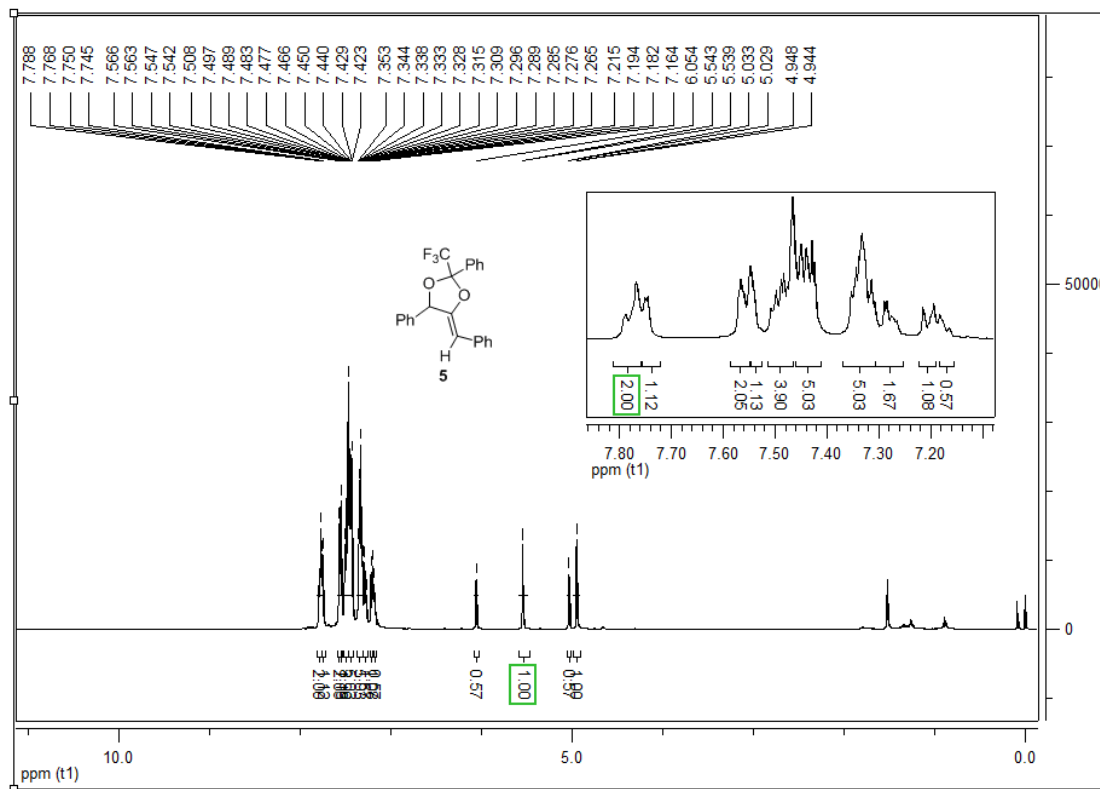


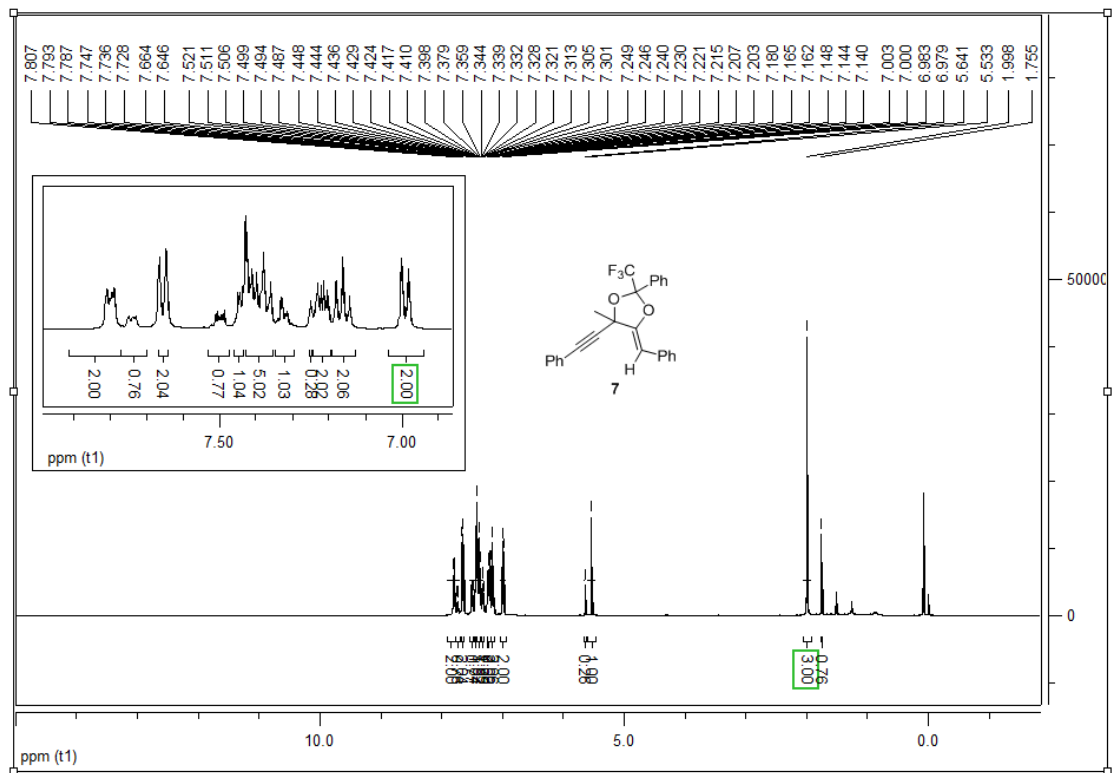
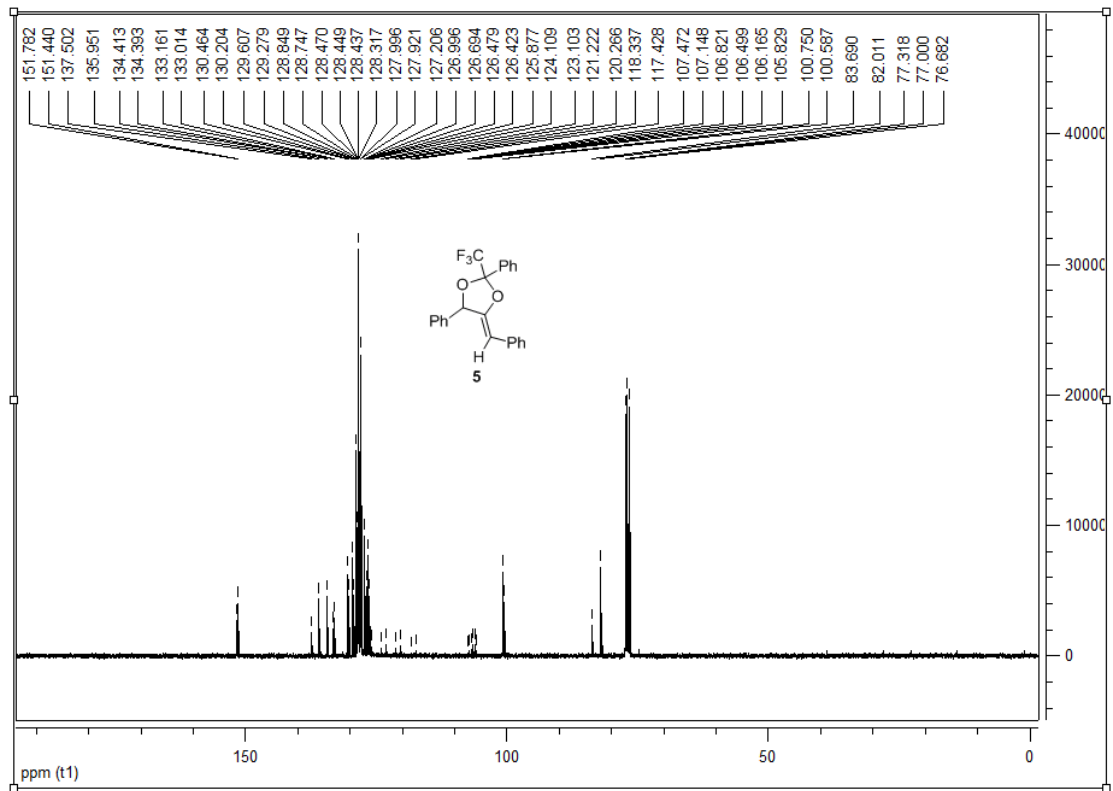


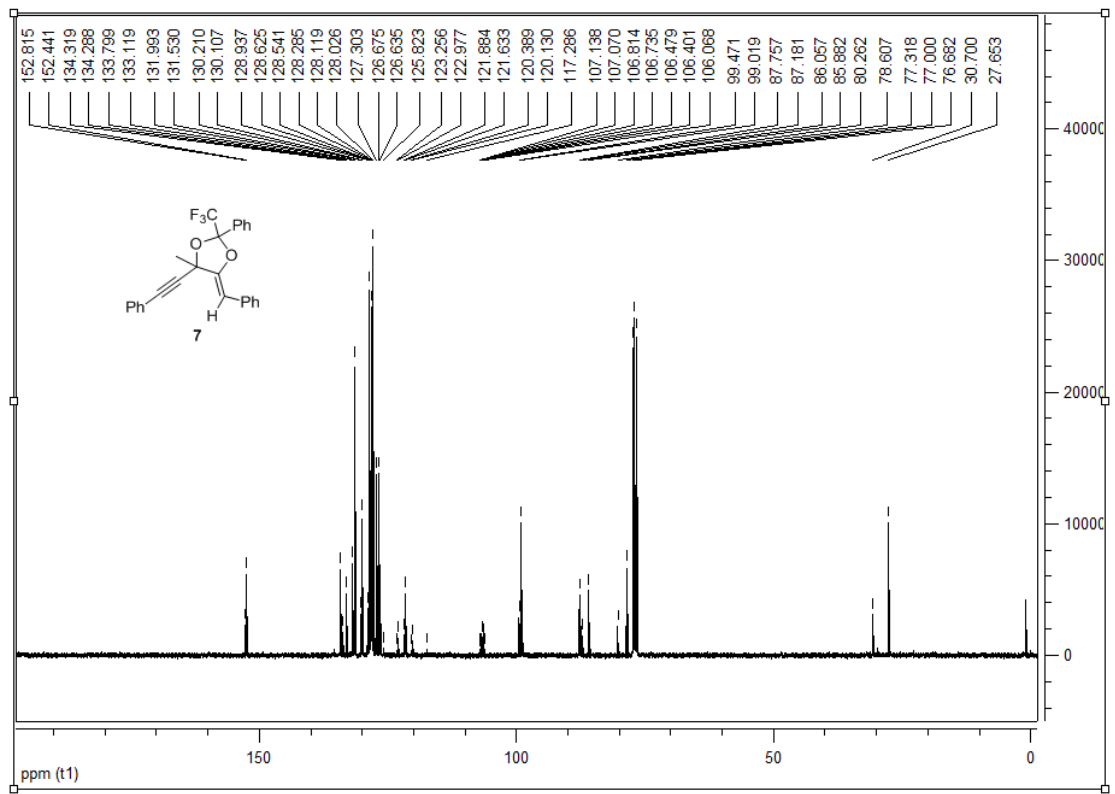
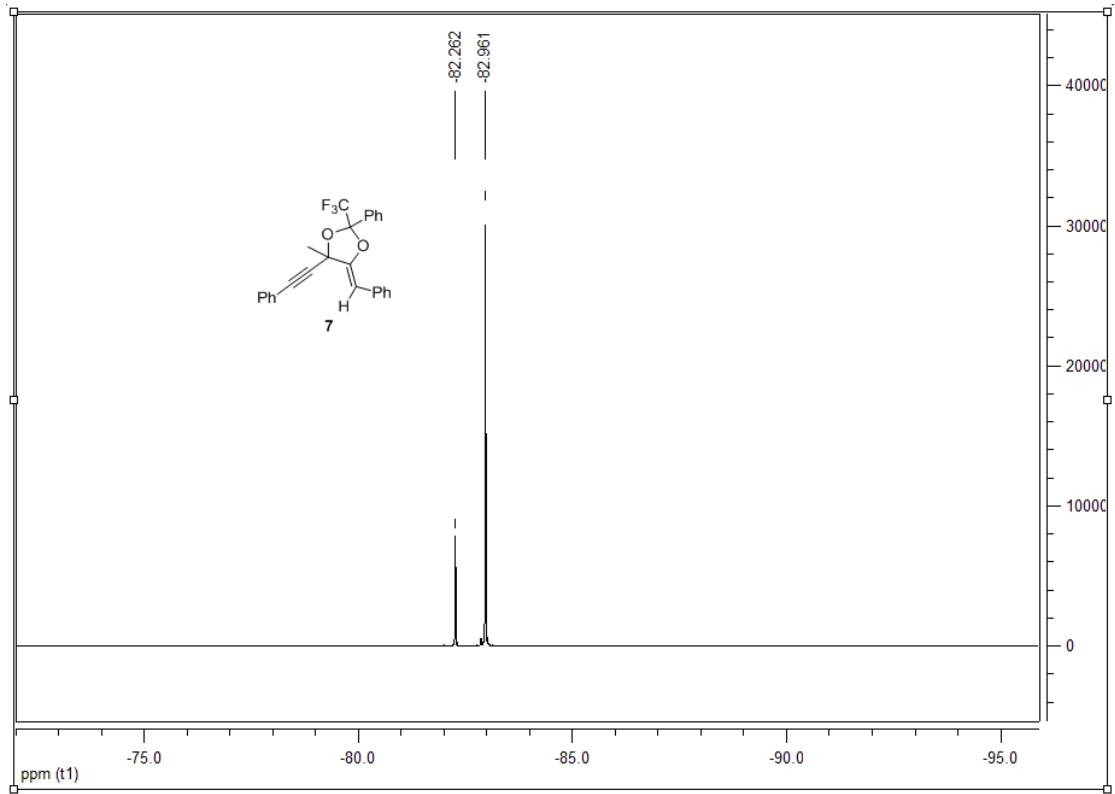












### X-Ray Analysis for the product **3ia**:

CCDC 1045554-1045555 contains the supplementary crystallographic data for the product **3ia**. These data can be obtained free of charge from The Cambridge Crystallographic Data Center via [www.ccdc.cam.ac.uk/data\\_request/cif](http://www.ccdc.cam.ac.uk/data_request/cif).

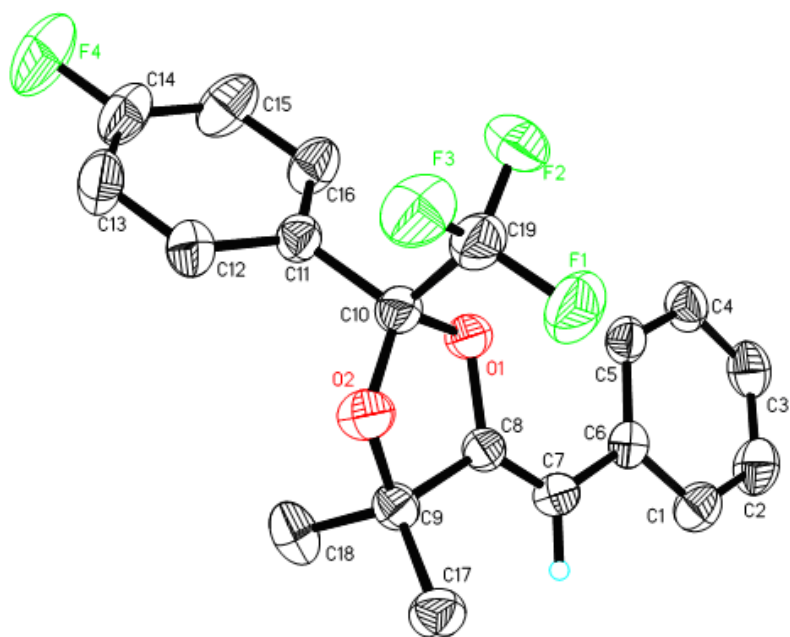


Table 1 Crystal data and structure refinement for 20150104.

Identification code	20150104
Empirical formula	C <sub>19</sub> H <sub>16</sub> F <sub>4</sub> O <sub>2</sub>
Formula weight	352.32
Temperature/K	291.15
Crystal system	orthorhombic
Space group	P212121
a/Å	8.7578(4)
b/Å	10.8532(6)
c/Å	18.2457(9)
α /°	90.00
β /°	90.00

$\gamma / ^\circ$	90.00
Volume/ $\text{\AA}^3$	1734.27(15)
Z	4
$\rho$ calcg/cm <sup>3</sup>	1.349
$\mu$ /mm-1	0.996
F(000)	728.0
Crystal size/mm <sup>3</sup>	0.2 $\times$ 0.17 $\times$ 0.16
Radiation	CuK $\alpha$ ( $\lambda$ = 1.54184)
2 $\Theta$ range for data collection/ $^\circ$	9.48 to 144.64
Index ranges	-10 $\leq$ h $\leq$ 9, -11 $\leq$ k $\leq$ 13, -22 $\leq$ l $\leq$ 22
Reflections collected	10669
Independent reflections	3423 [ $R_{\text{int}}$ = 0.0335, $R_{\text{sigma}}$ = 0.0336]
Data/restraints/parameters	3423/0/229
Goodness-of-fit on F <sup>2</sup>	1.038
Final R indexes [ $I \geq 2 \sigma(I)$ ]	R1 = 0.0390, wR2 = 0.0970
Final R indexes [all data]	R1 = 0.0438, wR2 = 0.1014
Largest diff. peak/hole / e $\text{\AA}^{-3}$	0.14/-0.16
Flack parameter	-0.06(17)

Table 2 Fractional Atomic Coordinates ( $\times 10^4$ ) and Equivalent Isotropic Displacement Parameters ( $\text{\AA}^2 \times 10^3$ ) for 20150104.  $U_{\text{eq}}$  is defined as 1/3 of of the trace of the orthogonalised UIJ tensor.

Atom	x	y	z	U(eq)
F1	6726(2)	5846.6(19)	6764.0(9)	108.8(6)
F2	5009.3(16)	4892.9(19)	7371.3(10)	105.4(6)
F3	6145(2)	6442.3(15)	7846.6(9)	99.7(5)
F4	5888(3)	2872(2)	10519.8(9)	138.5(9)

O1	7744.4(15)	3607.5(13)	7238.8(7)	58.6(3)
O2	8922.3(16)	5269.1(13)	7750.7(8)	63.7(4)
C1	9339(3)	1764(2)	5233.5(12)	69.1(5)
C2	8618(3)	860(2)	4820.4(13)	81.3(7)
C3	7269(3)	363(2)	5049.1(12)	77.8(6)
C4	6612(3)	784(2)	5684.2(12)	69.7(6)
C5	7303(2)	1691.3(19)	6096.7(10)	60.1(5)
C6	8701(2)	2192.0(16)	5883.7(10)	53.1(4)
C7	9561(2)	3096.6(17)	6318.1(10)	54.5(4)
C8	9155.4(19)	3711.9(16)	6913.0(9)	48.6(4)
C9	10097(2)	4569.1(17)	7376.5(10)	51.6(4)
C10	7576(2)	4593.7(18)	7748(1)	54.2(4)
C11	7122(2)	4104.9(18)	8496(1)	54.1(4)
C12	7634(3)	4705(3)	9112.9(12)	74.7(6)
C13	7207(4)	4292(3)	9801.7(13)	88.6(8)
C14	6303(4)	3283(3)	9851.0(13)	86.8(8)
C15	5780(4)	2677(2)	9252.6(15)	91.0(9)
C16	6192(3)	3099(2)	8563.0(12)	72.9(6)
C17	11064(2)	5482(2)	6956.0(12)	66.2(5)
C18	11033(3)	3855(2)	7936.4(14)	78.1(6)
C19	6342(3)	5446(3)	7429.6(13)	76.5(6)

Table 3 Anisotropic Displacement Parameters ( $\text{\AA}^2 \times 10^3$ ) for 20150104. The Anisotropic displacement factor exponent takes the form:  $-2 \pi^2 [h^2 a^{*2} U^{11} + 2hka^* b^* U^{12} + \dots]$ .

Atom	U11	U22	U33	U23	U13	U12
F1	117.0(13)	136.4(15)	73.1(9)	39.2(10)	13.1(9)	28.4(11)
F2	60.0(7)	148.3(16)	107.9(12)	22.2(11)	-12.5(8)	6.9(9)

F3	113.2(12)	84.4(9)	101.5(11)	8.1(9)	19.6(10)	36.1(9)
F4	207(2)	142.8(16)	65.3(9)	33.8(10)	35.2(13)	21.9(17)
O1	53.4(6)	69.7(8)	52.7(7)	-13.9(6)	4.5(5)	-12.7(6)
O2	62.3(7)	59.3(7)	69.4(8)	-15.2(7)	9.7(6)	-9.1(6)
C1	77.6(14)	68.8(12)	60.9(11)	-5.8(9)	7.7(10)	0(1)
C2	103.4(18)	83.9(15)	56.8(12)	-20.9(11)	-0.7(12)	4.6(15)
C3	96.4(16)	71.5(13)	65.5(12)	-13(1)	-20.1(12)	-6.4(13)
C4	75.4(13)	72.8(13)	60.9(12)	-3.3(9)	-12.2(10)	-13.3(11)
C5	67.6(11)	65.8(11)	46.8(9)	-1.6(8)	-4.0(8)	-6.7(9)
C6	62.5(10)	50.6(9)	46.1(8)	-0.4(7)	-3.7(8)	2.6(8)
C7	52.6(9)	55.2(10)	55.6(9)	-0.5(8)	6.0(8)	-2.2(8)
C8	48.6(8)	48.3(8)	48.9(8)	2.9(7)	-1.4(7)	-2.4(7)
C9	51.8(9)	47.4(9)	55.7(10)	-1.1(7)	-3.3(7)	-2.9(7)
C10	53.8(9)	58.4(10)	50.5(9)	-5.7(8)	2.8(7)	-2.7(8)
C11	56.0(9)	58(1)	48.3(9)	-2.9(7)	0.6(7)	6.5(8)
C12	74.3(13)	92.2(15)	57.5(11)	-10.2(11)	-5.1(10)	-9.9(12)
C13	100.3(18)	117(2)	49.0(11)	-8.4(12)	-7.9(12)	9.1(17)
C14	113(2)	94.0(17)	53.5(12)	15.0(12)	17.5(13)	23.0(17)
C15	128(2)	65.7(13)	79.5(16)	6.6(11)	31.9(16)	-12.3(14)
C16	94.5(16)	65.0(12)	59.0(11)	-8.2(9)	11.9(11)	-13.0(11)
C17	65.9(11)	64.9(11)	67.6(12)	-2.7(9)	7.0(9)	-15.8(9)
C18	85.4(15)	67.4(12)	81.4(14)	3.7(11)	-31.6(13)	-4.7(11)
C19	74.4(14)	89.9(15)	65.1(13)	15.3(12)	7.6(10)	13.1(13)

Table 4 Bond Lengths for 20150104.

Atom	Atom	Length/Å	Atom	Atom	Length/Å
F1	C19	1.333(3)	C6	C7	1.470(3)
F2	C19	1.317(3)	C7	C8	1.323(3)

F3	C19	1.333(3)	C8	C9	1.503(2)
F4	C14	1.349(3)	C9	C17	1.513(3)
O1	C8	1.376(2)	C9	C18	1.522(3)
O1	C10	1.425(2)	C10	C11	1.517(2)
O2	C9	1.450(2)	C10	C19	1.537(3)
O2	C10	1.388(2)	C11	C12	1.375(3)
C1	C2	1.389(3)	C11	C16	1.368(3)
C1	C6	1.391(3)	C12	C13	1.386(3)
C2	C3	1.365(4)	C13	C14	1.354(4)
C3	C4	1.372(3)	C14	C15	1.354(4)
C4	C5	1.379(3)	C15	C16	1.387(3)
C5	C6	1.395(3)			

Table 5 Bond Angles for 20150104.

Atom	Atom	Atom	Angle/	Atom	Atom	Atom	Angle/
C8	O1	C10	108.23(14)	O1	C10	C19	106.18(16)
C10	O2	C9	108.91(13)	O2	C10	O1	108.12(14)
C2	C1	C6	121.1(2)	O2	C10	C11	113.81(16)
C3	C2	C1	120.5(2)	O2	C10	C19	106.30(17)
C2	C3	C4	119.3(2)	C11	C10	C19	111.49(16)
C3	C4	C5	121.0(2)	C12	C11	C10	119.03(19)
C4	C5	C6	120.7(2)	C16	C11	C10	121.02(18)
C1	C6	C5	117.39(19)	C16	C11	C12	119.9(2)
C1	C6	C7	118.49(19)	C11	C12	C13	120.0(2)
C5	C6	C7	124.07(17)	C14	C13	C12	118.7(2)
C8	C7	C6	129.94(18)	F4	C14	C13	119.0(3)
O1	C8	C9	107.48(14)	F4	C14	C15	118.5(3)
C7	C8	O1	123.65(16)	C13	C14	C15	122.5(2)



C7	C8	C9	128.80(16)	C14	C15	C16	118.9(3)
O2	C9	C8	101.55(14)	C11	C16	C15	120.0(2)
O2	C9	C17	107.04(16)	F1	C19	F3	106.8(2)
O2	C9	C18	109.45(17)	F1	C19	C10	111.29(19)
C8	C9	C17	115.28(16)	F2	C19	F1	107.4(2)
C8	C9	C18	110.96(16)	F2	C19	F3	107.5(2)
C17	C9	C18	111.86(18)	F2	C19	C10	112.3(2)
O1	C10	C11	110.55(15)	F3	C19	C10	111.3(2)

Table 6 Torsion Angles for 20150104.

A	B	C	D	Angle/	A	B	C	D	Angle/
F4	C14	C15	C16	179.6(3)	C7	C8	C9	C17	44.4(3)
O1	C8	C9	O2	-23.39(18)	C7	C8	C9	C18	-84.1(3)
O1	C8	C9	C17	-138.68(17)	C8	O1	C10	O2	-2.4(2)
O1	C8	C9	C18	92.9(2)	C8	O1	C10	C11	-127.61(16)
O1	C10	C11	C12	146.84(19)	C8	O1	C10	C19	111.31(17)
O1	C10	C11	C16	-34.6(3)	C9	O2	C10	O1	-13.3(2)
O1	C10	C19	F1	-57.8(3)	C9	O2	C10	C11	109.96(17)
O1	C10	C19	F2	62.6(2)	C9	O2	C10	C19	-126.93(16)
O1	C10	C19	F3	-176.80(17)	C10	O1	C8	C7	-166.40(18)
O2	C10	C11	C12	24.9(3)	C10	O1	C8	C9	16.48(19)
O2	C10	C11	C16	-156.49(19)	C10	O2	C9	C8	22.01(19)
O2	C10	C19	F1	57.2(3)	C10	O2	C9	C17	143.24(16)
O2	C10	C19	F2	177.56(19)	C10	O2	C9	C18	-95.34(19)
O2	C10	C19	F3	-61.8(2)	C10	C11	C12	C13	178.6(2)
C1	C2	C3	C4	1.4(4)	C10	C11	C16	C15	-179.3(2)
C1	C6	C7	C8	173.7(2)	C11	C10	C19	F1	-178.3(2)
C2	C1	C6	C5	-1.0(3)	C11	C10	C19	F2	-57.9(3)

C2	C1	C6	C7	176.5(2)	C11	C10	C19	F3	62.7(2)
C2	C3	C4	C5	-0.7(4)	C11	C12	C13	C14	0.9(4)
C3	C4	C5	C6	-0.9(3)	C12	C11	C16	C15	-0.7(4)
C4	C5	C6	C1	1.7(3)	C12	C13	C14	F4	179.7(3)
C4	C5	C6	C7	-175.55(19)	C12	C13	C14	C15	-1.2(5)
C5	C6	C7	C8	-9.1(3)	C13	C14	C15	C16	0.4(5)
C6	C1	C2	C3	-0.6(4)	C14	C15	C16	C11	0.5(4)
C6	C7	C8	O1	-1.1(3)	C16	C11	C12	C13	0.0(4)
C6	C7	C8	C9	175.41(18)	C19	C10	C11	C12	-95.3(2)
C7	C8	C9	O2	159.69(19)	C19	C10	C11	C16	83.3(2)

Table 7 Hydrogen Atom Coordinates ( $\text{\AA} \times 10^4$ ) and Isotropic Displacement Parameters ( $\text{\AA}^2 \times 10^3$ ) for 20150104.

Atom	x	y	z	U(eq)
H1	10262	2089	5073	83
H2	9058	592	4385	98
H3	6799	-255	4777	93
H4	5688	453	5839	84
H5	6831	1972	6522	72
H7	10542	3262	6149	65
H12	8266	5389	9068	90
H13	7534	4699	10222	106
H15	5154	1990	9303	109
H16	5836	2698	8146	87
H17A	10443	5894	6598	99
H17B	11879	5054	6714	99
H17C	11483	6077	7289	99
H18A	11457	4417	8288	117

H18B	11844	3426	7691	117
H18C	10388	3272	8183	117