Supporting Information

Copper-catalyzed stereo- and regio-selective decarbonylative alkylation and sequential amination of alkynes with aldehydes and amides

Kelu Yan,[a,*] Xiaoyu Wang,[a] Jiangwei Wen,[a] Jianjing Yang,[a] Yuanyuan Zhang,[a] Bingxin Zhou,[a] Daoshan Yang[b,c]

[a] Key Laboratory of Life-Organic Analysis of Shandong Province, School of Chemistry and Chemical Engineering, Qufu Normal University, Qufu, 273165, P. R. China.

[b] College of Chemistry and Molecular Engineering, Qingdao University of Science and Technology, Qingdao, 266042, P. R. China

[c] National Engineering Research Center of Low-Carbon Processing and Utilization of Forest Biomass, Nanjing Forestry University, Nanjing, 210037, P. R. China.

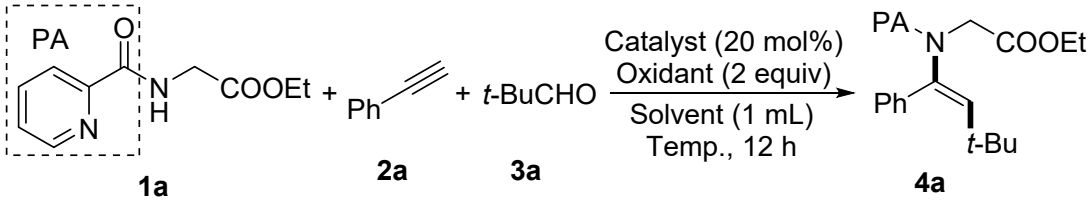
E-mail: yankl@qfnu.edu.cn

Contents

1. Experimental Section:

General Considerations. All products were prepared under argon atmosphere using standard Schlenk technique. ^{1}H, ^{13}C, and ^{19}F data were recorded with Bruker Advance III (400/500 MHz) spectrometers with tetramethylsilane as an internal standard. All chemical shifts (δ) are reported in ppm and coupling constants (*J*) in Hz. All chemical shifts are reported relative to tetramethylsilane and d-solvent peaks, respectively. Multiplicities are reported as follows: singlet (s), doublet (d), doublet of doublets (dd), triplet (t), quartet (q), and multiplet (m). Column chromatography was performed on silica gel 200–300 mesh. Analytical thin-layer chromatography (TLC) was performed on pre-coated, glass-backed silica gel plates. Visualization of the developed chromatogram was performed by UV absorbance (254 nm). High-resolution mass spectrometry (HRMS) were done on an electrospray ionization (ESI) Fourier transform mass spectrometer (FTMS, Thermo QExactive Focus). X-ray diffraction (XRD) patterns were recorded on a Rigaku smartlab system at 45 kV and 200 mA with Cu-Kα radiation. 2-Picolinamidederivatives were prepared following a literature procedure.[1] Unless otherwise noted below, all other compounds have been reported in the literature or are commercially available from Aldrich, Acros, Alfa Aesar, and Energy Chemical Company and used as received without any further purification.

2. Table S1. Optimization of the Reaction Conditions[a]



1a **2a** **3a** **4a**

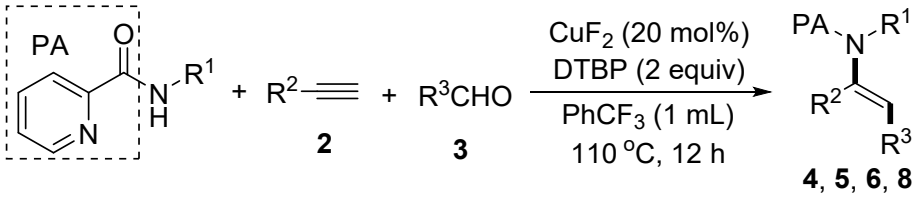
Entry	Catalyst	Oxidant	Solvent	T (°C)	Yield (%)[b]
1	CuF_2	DTBP	Toluene	100	55
2	$CuCl_2$	DTBP	Toluene	100	41
3	$CuBr_2$	DTBP	Toluene	100	35
4	$Cu(OTf)_2$	DTBP	Toluene	100	0
5	$Cu(acac)_2$	DTBP	Toluene	100	43

6	$Cu(OAc)_2$	DTBP	Toluene	100	27
7	$CuSO_4·5H_2O$	DTBP	Toluene	100	41
8	Cu_2O	DTBP	Toluene	100	50
9	CuCl	DTBP	Toluene	100	46
10	CuBr	DTBP	Toluene	100	43
11	CuI	DTBP	Toluene	100	45
12	CuF_2	DCP	Toluene	100	40
13	CuF_2	TBPB	Toluene	100	22
14	CuF_2	BPO	Toluene	100	36
15	CuF_2	TBHP	Toluene	100	13
16	CuF_2	DTBP	*o*-Xylene	100	40
17	CuF_2	DTBP	*m*-Xylene	100	44
18	CuF_2	DTBP	*p*-Xylene	100	47
19	CuF_2	DTBP	Mesitylene	100	64
20	CuF_2	DTBP	4-Chlorotoluene	100	73
21	CuF_2	DTBP	$PhCF_3$	100	77
22	CuF_2	DTBP	CH_3CN	100	30
23	CuF_2	DTBP	DCE	100	26
24	CuF_2	DTBP	1,4-Dioxane	100	20
25	CuF_2	DTBP	DMF	100	0
26	CuF_2	DTBP	$PhCF_3$	90	74
27	**CuF_2**	**DTBP**	**$PhCF_3$**	**110**	**81**
28	CuF_2	DTBP	$PhCF_3$	120	80
29	CuF_2	DTBP	$PhCF_3$	110	72[c]

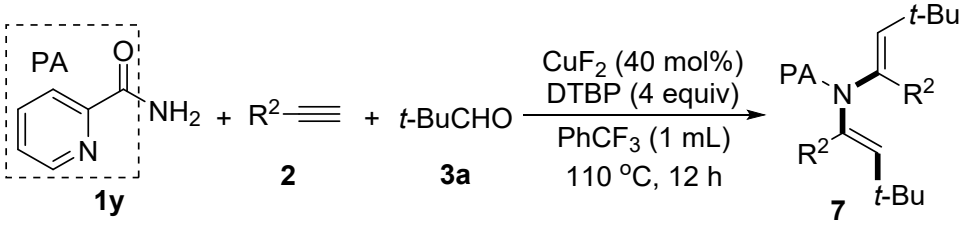
[a] Reaction conditions: **1a** (0.2 mmol), **2a** (0.4 mmol), **3a** (0.6 mmol), catalyst (20 mol%), oxidant (2 equiv) and in the solvent (1 mL) for 12 h under nitrogen atmosphere. DTBP = di-*tert*-butyl peroxide. DCP = Dicumyl peroxide. TBPB = *tert*-Butyl peroxybenzoate. BPO = Benzoyl Peroxide. TBHP = *tert*-Butyl hydroperoxide. PA = 2-Pyridylacyl. [b] Isolated yields. [c] Under air.

3. Synthetic Procedures

(a) General Procedure for the Copper-Catalyzed Preparation of 4, 5, 6, 7 and 8

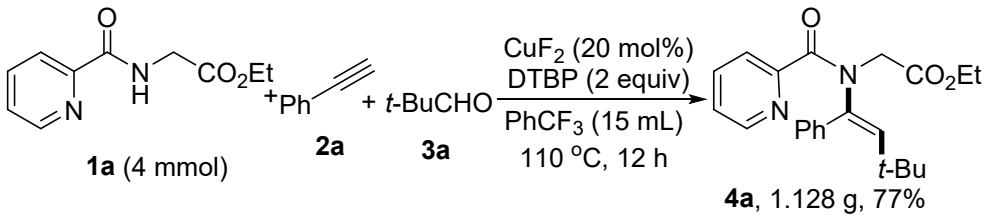


A mixture of substituted amides (**1**) (0.2 mmol, 1.0 equiv), alkynes (**2**) (0.4 mmol, 2 equiv), aldehydes (**3**) (0.6 mmol, 3.0 equiv), CuF_2 (0.04 mmol, 20 mol%), and DTBP (0.4 mmol, 2 equiv) were weighted in a Schlenk tube equipped with a stir bar. Dry $PhCF_3$ (1 mL) was added and the mixture was stirred at 110 °C in a pre-heated oil bath for 12 h under N_2 atmosphere. Then, the mixture was cooled to room temperature and concentrated in vacuo and the resulting residue was purified by column chromatography on silica gel with EtOAc/petroleum ether.



A mixture of picolinamide (**1y**) (0.2 mmol, 1.0 equiv), alkynes (**2**) (0.8 mmol, 4 equiv), pivalaldehyde (**3a**) (1.2 mmol, 6.0 equiv), CuF_2 (0.08 mmol, 40 mol%), and DTBP (0.8 mmol, 4 equiv) were weighted in a Schlenk tube equipped with a stir bar. Dry $PhCF_3$ (1 mL) was added and the mixture was stirred at 110 °C in a pre-heated oil bath for 12 h under N_2 atmosphere. Then, the mixture was cooled to room temperature and concentrated in vacuo and the resulting residue was purified by column chromatography on silica gel with EtOAc/petroleum ether.

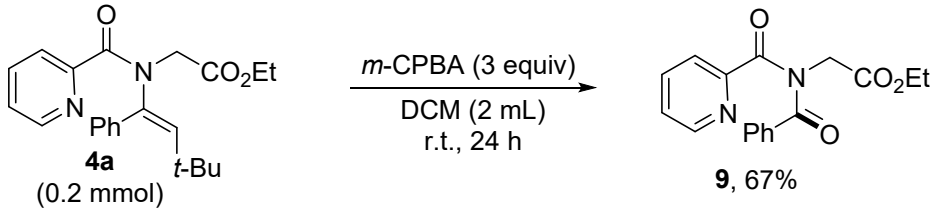
(b) Gram-Scale Preparation of 4a



A mixture of ethyl picolinoylglycinate (**1a**) (4 mmol, 1.0 equiv), phenylacetylene (**2a**) (8

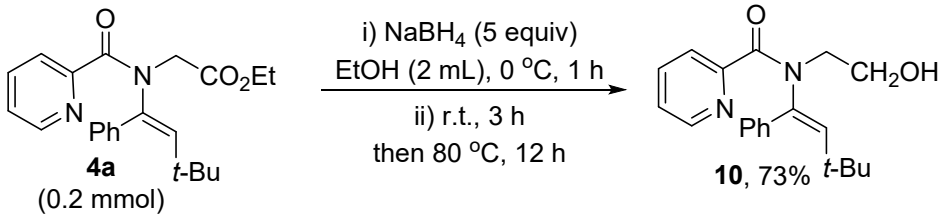
mmol, 2 equiv), pivaldehyde (**3a**) (12 mmol, 3.0 equiv), CuF_2 (20 mol%), and DTBP (2 equiv) were weighted in a Schlenk tube equipped with a stir bar. Dry $PhCF_3$ (15 mL) was added and the mixture was stirred at 110 °C in a pre-heated oil bath for 12 h under N_2 atmosphere. Then, the mixture was cooled to room temperature and concentrated in vacuo and the resulting residue was purified by flash column chromatography on silica gel with EtOAc/petroleum ether, the product **4a** was affored as a yellow solid in 77% yield (1.128 g, 3.08 mmol).

(c) Derivatization Reaction of 4a for the Preparation of 9



A mixture of ethyl (*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-picolinoylglycinate (**4a**) (0.2 mmol, 1.0 equiv), and *m*-CPBA (3 equiv) were weighted in a Schlenk tube equipped with a stir bar. Dry DCM (2 mL) was added and the mixture was stirred at room temperature for 24 h. Then, the mixture was cooled to room temperature and concentrated in vacuo and the resulting residue was purified by flash column chromatography on silica gel with EtOAc/petroleum ether, the product **9** was affored as a yellow solid in 67% yield (41.8 mg, 0.134 mmol).

(d) Derivatization Reaction of 4a for the Preparation of 10



A mixture of ethyl (*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-picolinoylglycinate (**4a**) (0.2 mmol, 1.0 equiv), and $NaBH_4$ (5 equiv) were weighted in a Schlenk tube equipped with a stir bar. Dry EtOH (2 mL) was added and the mixture was stirred at 0 °C for 1 h. Then, the mixture was stirred at room temperature for 3 h and refluxed at 80 °C for 12 h. The reaction was cooled to room temperature and concentrated in vacuo and the resulting residue was purified by flash column chromatography on silica gel with EtOAc/petroleum ether, the product **10** was affored as a yellow solid in 73% yield (47.3 mg, 0.146 mmol).

4. X-ray Crystallography of 4t

Crystal preparation of compound 4t.

Compound **4t** (25 mg) was dissolved in 5 mL of dichloromethane/*n*-hexane (v1/v2 = 1:1), and it was crystallized to give crystal as colorless prisms after the solvent was slowly volatilized in 4 days at room temperature (~ 25 °C).

CCDC-2432820 (**4t**), contain the supplementary crystallographic data. These data can be obtained free of charge from the Cambridge Crystallographic Data Centre (http://www.ccdc.cam.ac.uk/). Thermal ellipsoids are shown at the 30% level. Hydrogen atoms have been omitted for clarity. X-ray crystallographic data is available as Figure S1.

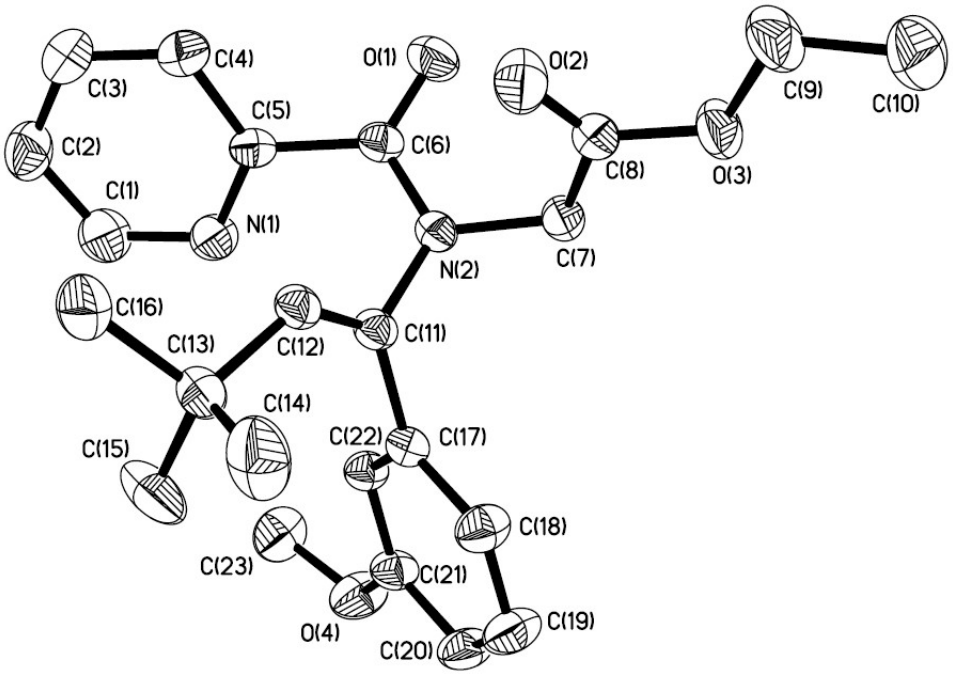


Figure S1. The molecular structure of **4t**

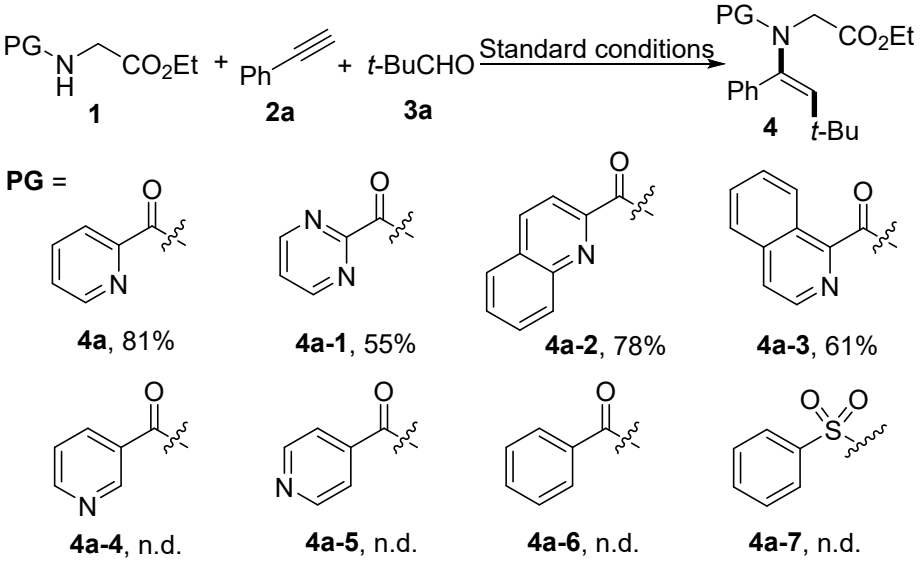
Table S1. Crystal Data and Summary of X-ray Data Collection for 4t

Empirical formula	C23H28N2O4
Formula weight	396.47
Temperature/K	273.15
Crystal system	monoclinic
Space group	P21/c
a/Å	13.6859(18)
b/Å	8.0281(10)
c/Å	20.044(2)
α/	90

β/	96.682(4)
γ/	90
Volume/Å3	2187.3(5)
Z	4
ρcalcg/cm3	1.204
μ/mm 1	0.083
F(000)	848.0
Crystal size/mm3	0.1 × 0.1 × 0.1
Radiation	MoKα (λ = 0.71076)
2Θ range for data collection/°	4.782 to 61.022
Index ranges	19 ≤ h ≤ 13, -9 ≤ k ≤ 11, -28 ≤ l ≤ 28
Reflections collected	24913
Independent reflections	6645 [Rint = 0.0838, Rsigma = 0.0910]
Data/restraints/parameters	6645/0/267
Goodness-of-fit on F2	1.009
Final R indexes [I>=2σ (I)]	R1 = 0.0668, wR2 = 0.1497
Final R indexes [all data]	R1 = 0.1734, wR2 = 0.1983
Largest diff. peak/hole / e Å-3	0.19/-0.24

5. Mechanism Research

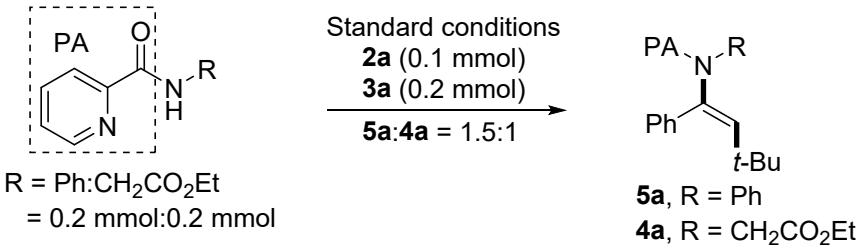
(a) The Effect of *N*-Protecting Groups



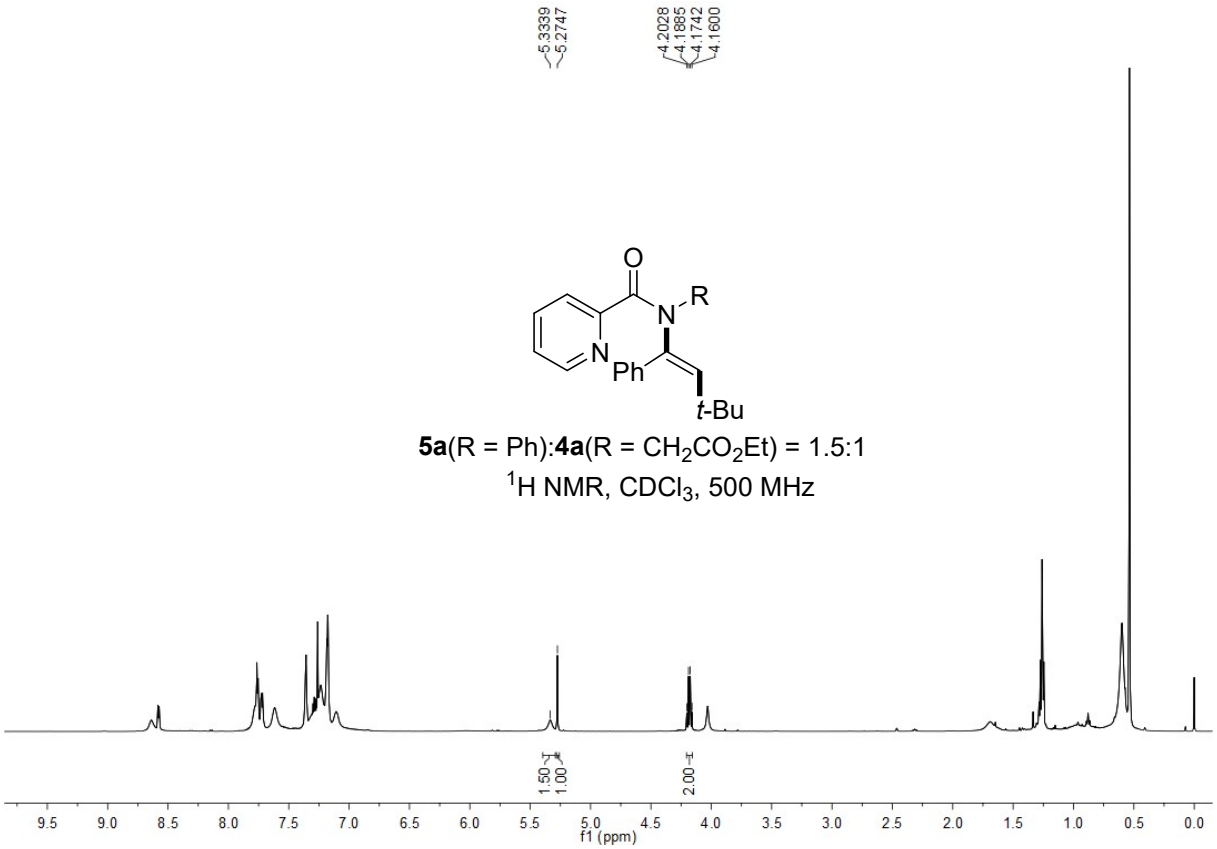
A mixture of substituted amides (**1**) (0.2 mmol, 1.0 equiv), phenylacetylene (**2a**) (0.4 mmol, 2 equiv), pivaldehyde (**3a**) (0.6 mmol, 3.0 equiv), CuF_2 (20 mol%), and DTBP (2 equiv) were weighted in a Schlenk tube equipped with a stir bar. Dry $PhCF_3$ (1 mL) was added and the mixture was stirred at 110 °C in a pre-heated oil bath for 12 h under N_2 atmosphere. Then, the

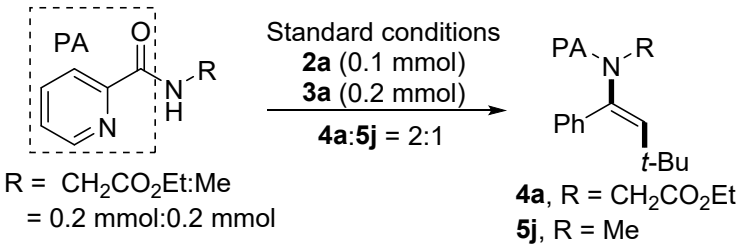
mixture was cooled to room temperature and concentrated in vacuo and the resulting residue was purified by column chromatography on silica gel with EtOAc/petroleum ether.

(b) Intermolecular Competition Experiments

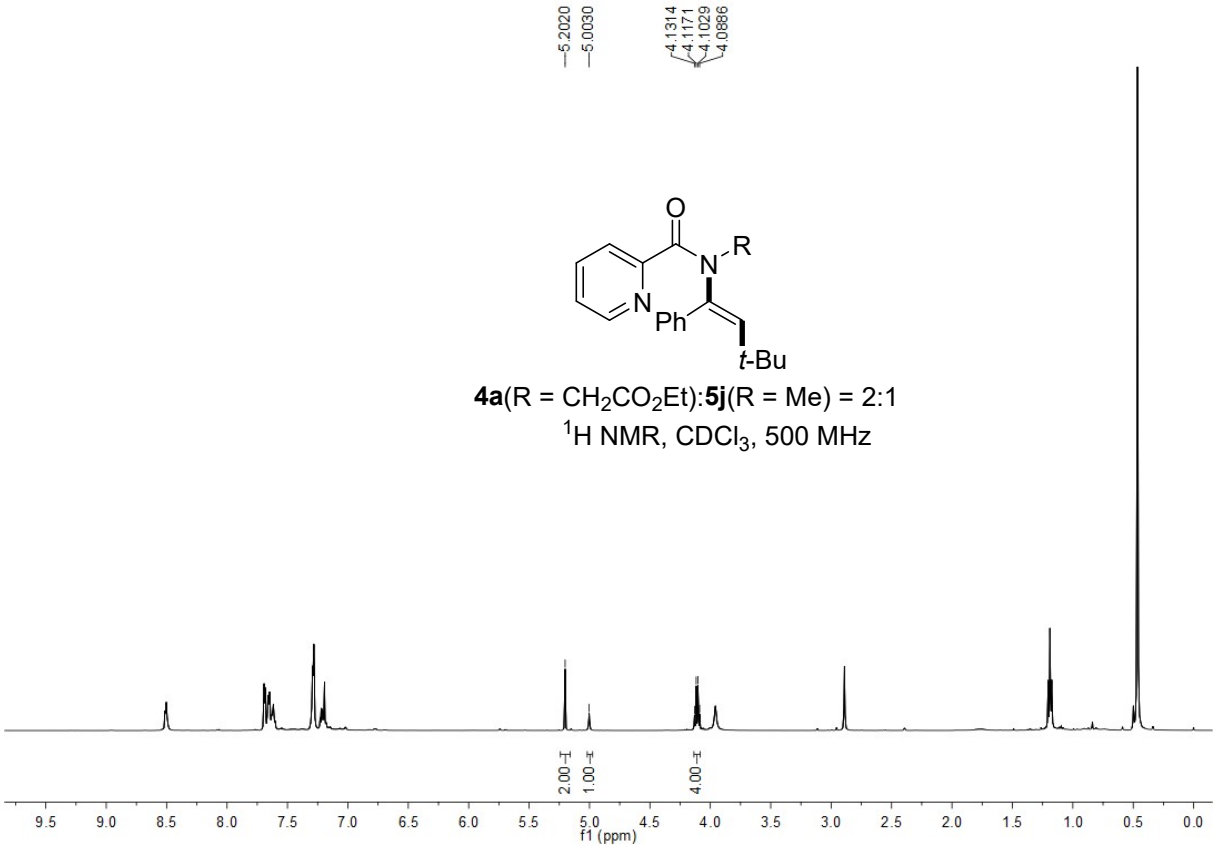


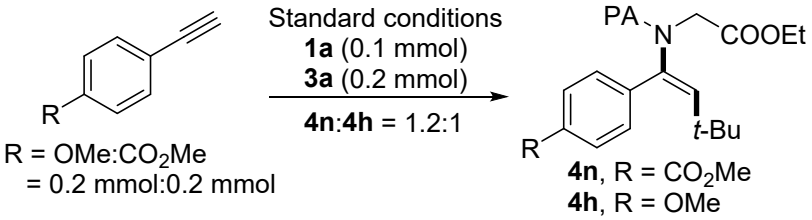
A mixture of *N*-phenylpicolinamide (39.6 mg, 0.2 mmol, 2.0 equiv), ethyl picolinoylglycinate (41.6 mg, 0.2 mmol, 2.0 equiv), phenylacetylene (**2a**) (10.2 mg, 0.1 mmol, 1.0 equiv), pivaldehyde (**3a**) (17.2 mg, 0.2 mmol, 2.0 equiv), CuF_2 (0.02 mmol, 20 mol%), and DTBP (0.2 mmol, 2 equiv) were weighted in a Schlenk tube equipped with a stir bar. Dry $PhCF_3$ (1 mL) was added and the mixture was stirred at 110 °C in a pre-heated oil bath for 12 h under N_2 atmosphere. Then, the mixture was cooled to room temperature and concentrated in vacuo and the resulting residue was purified by flash column chromatography on silica gel with EtOAc/petroleum ether to give a mixture of products **5a** and **4a** at a ratio of 1.5:1.



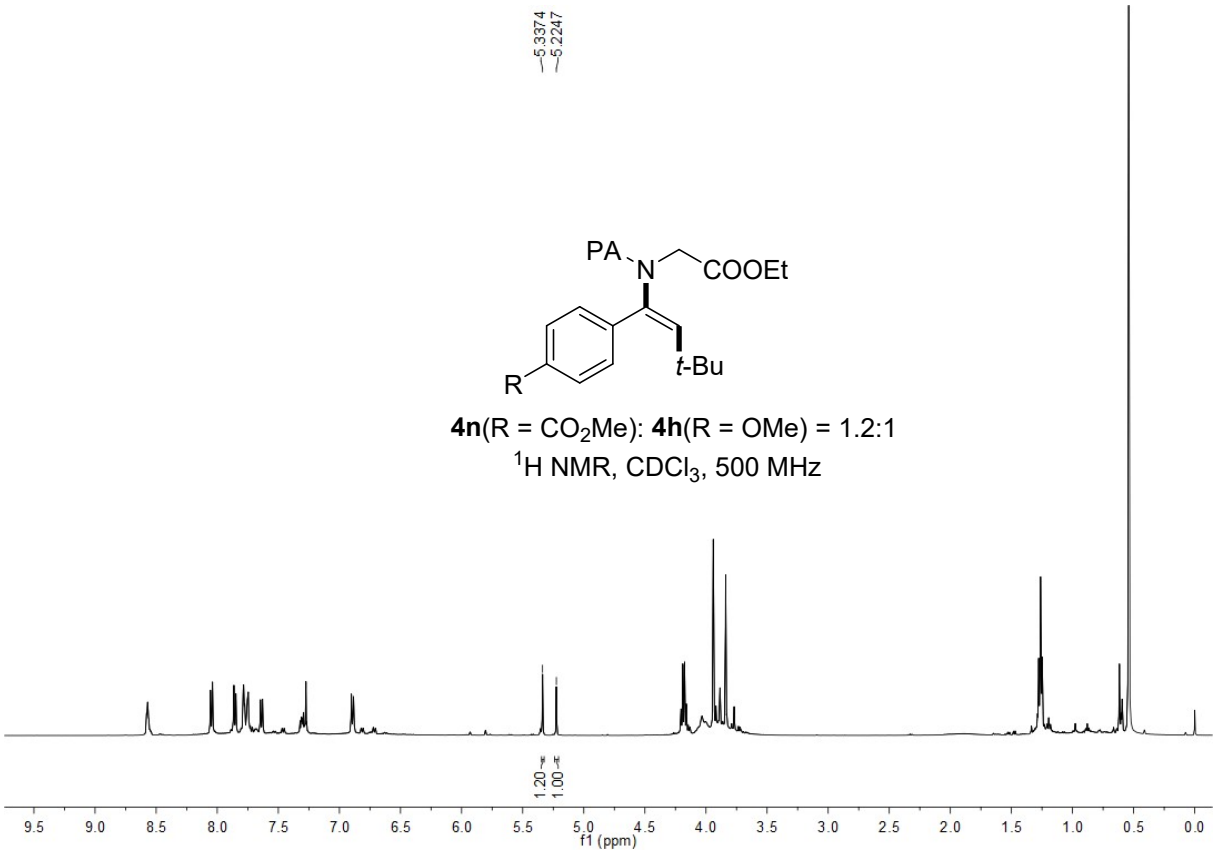


A mixture of ethyl picolinoylglycinate (41.6 mg, 0.2 mmol, 2.0 equiv), *N*-methylpicolinamide (27.2 mg, 0.2 mmol, 2.0 equiv), phenylacetylene (**2a**) (10.2 mg, 0.1 mmol, 1.0 equiv), pivaldehyde (**3a**) (17.2 mg, 0.2 mmol, 2.0 equiv), CuF_2 (0.01 mmol, 20 mol%), and DTBP (0.2 mmol, 2 equiv) were weighted in a Schlenk tube equipped with a stir bar. Dry $PhCF_3$ (1 mL) was added and the mixture was stirred at 110 °C in a pre-heated oil bath for 12 h under N_2 atmosphere. Then, the mixture was cooled to room temperature and concentrated in vacuo and the resulting residue was purified by flash column chromatography on silica gel with EtOAc/petroleum ether to give a mixture of products **4a** and **5j** at a ratio of 2:1.

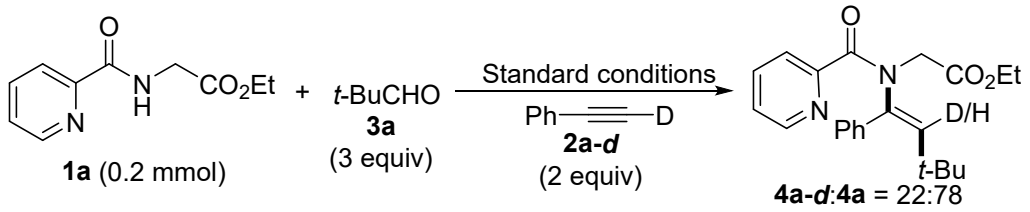




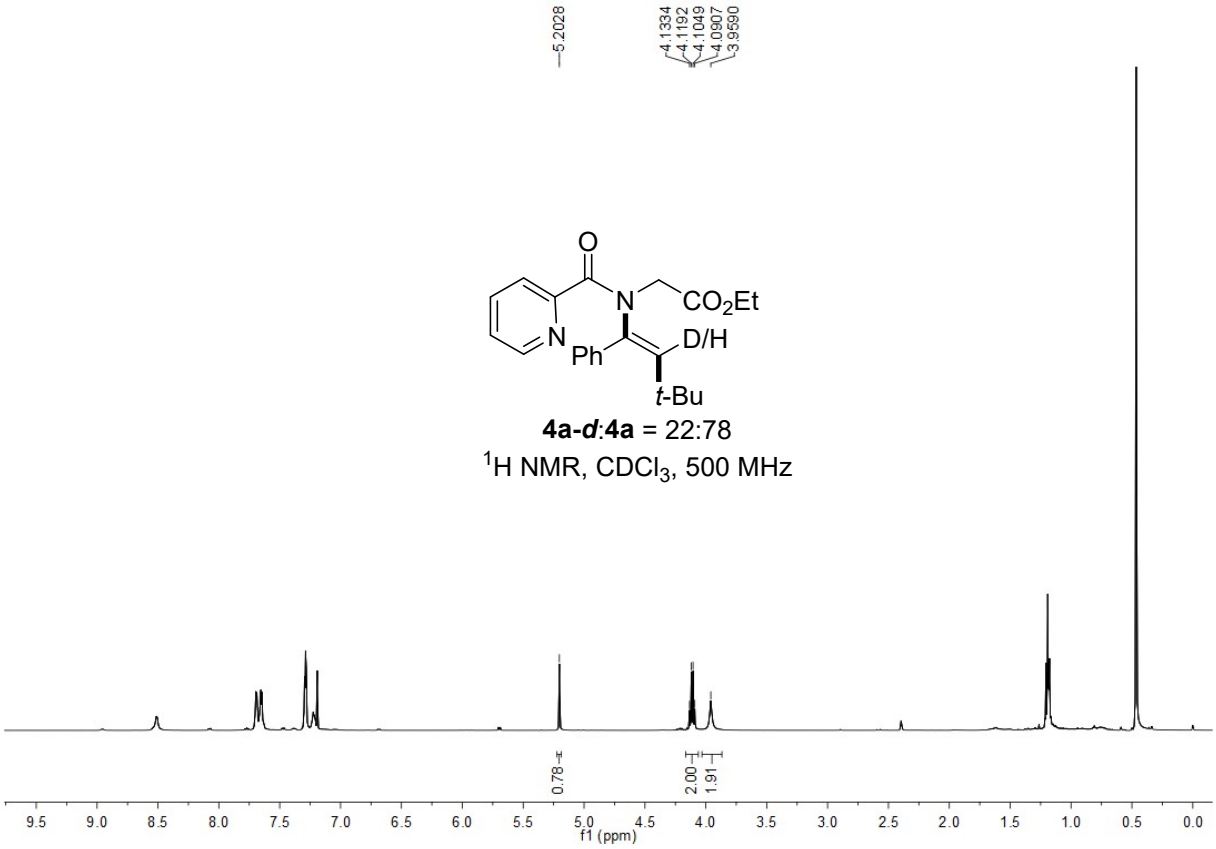
A mixture of ethyl picolinoylglycinate (**1a**) (20.8 mg, 0.1 mmol, 1.0 equiv), 1-ethynyl-4-methoxybenzene (26.4 mg, 0.2 mmol, 2.0 equiv), methyl 4-ethynylbenzoate (32.0 mg, 0.2 mmol, 2.0 equiv), pivaldehyde (**3a**) (17.2 mg, 0.2 mmol, 2.0 equiv), CuF_2 (0.01 mmol, 20 mol%), and DTBP (0.2 mmol, 2 equiv) were weighted in a Schlenk tube equipped with a stir bar. Dry $PhCF_3$ (1 mL) was added and the mixture was stirred at 110 °C in a pre-heated oil bath for 12 h under N_2 atmosphere. Then, the mixture was cooled to room temperature and concentrated in vacuo and the resulting residue was purified by flash column chromatography on silica gel with EtOAc/petroleum ether to give a mixture of products **4n** and **4h** at a ratio of 1.2:1.

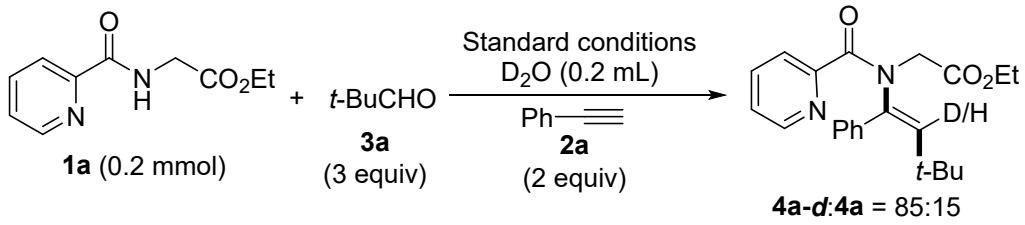


(c) Deuterium-Labeling Experiments

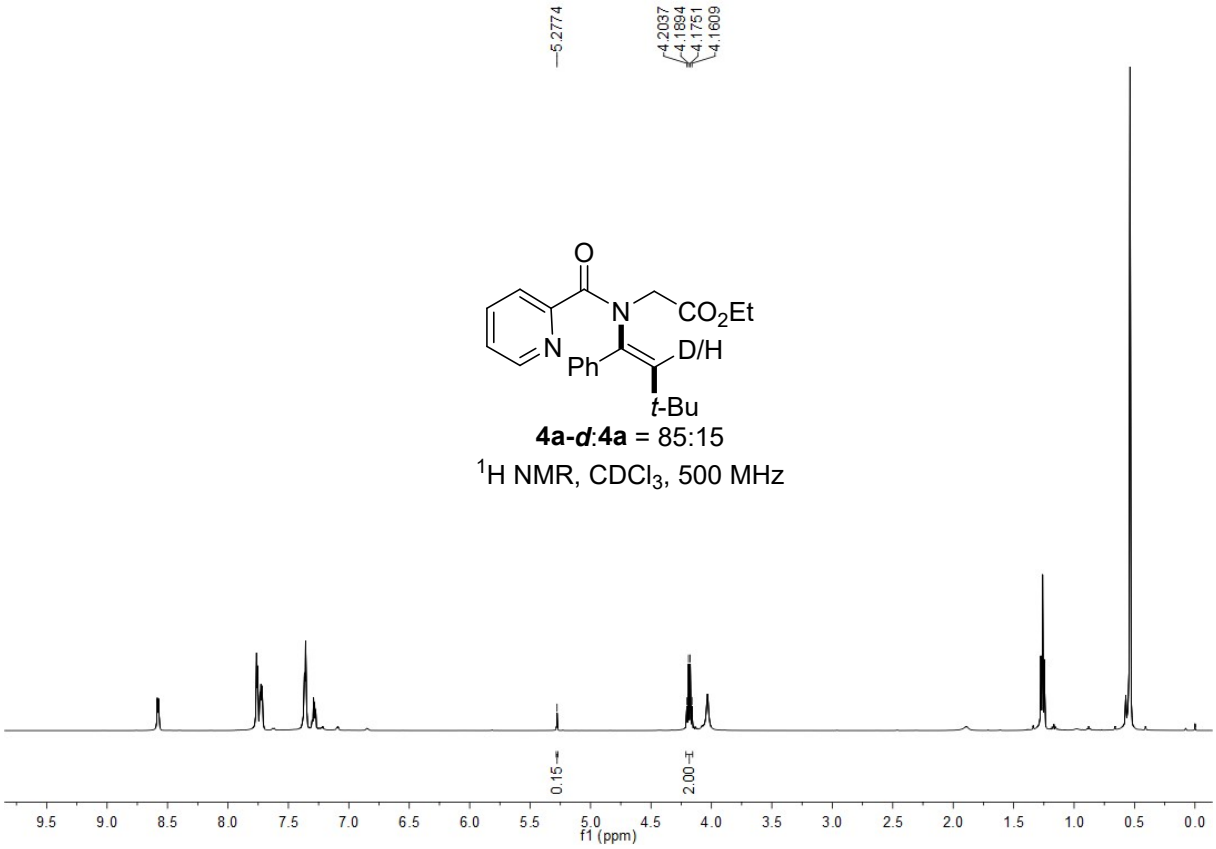


A mixture of ethyl picolinoylglycinate (**1a**) (0.2 mmol, 1.0 equiv), (ethynyl-d)benzene (**2a-*d***) (0.4 mmol, 2 equiv), pivaldehyde (**3a**) (0.6 mmol, 3.0 equiv), CuF_2 (20 mol%), and DTBP (2 equiv) were weighted in a Schlenk tube equipped with a stir bar. Dry $PhCF_3$ (1 mL) was added and the mixture was stirred at 110 °C in a pre-heated oil bath for 12 h under N_2 atmosphere. Then, the mixture was cooled to room temperature and concentrated in vacuo and the resulting residue was purified by flash column chromatography on silica gel with EtOAc/petroleum ether to give products **4a-*d*** and **4a**. The ratio of **4a-*d*** and **4a** was 22:78 according to the ^{1}H NMR.

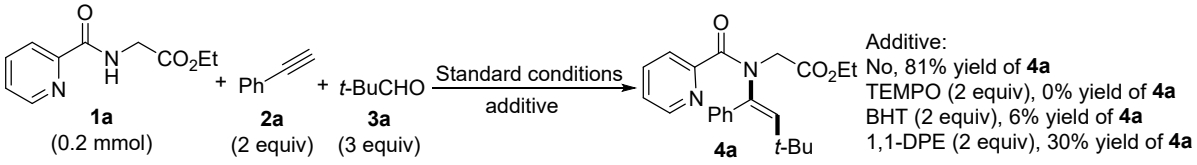


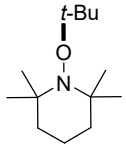


A mixture of ethyl picolinoylglycinate (**1a**) (0.2 mmol, 1.0 equiv), phenylacetylene (**2a**) (0.4 mmol, 2 equiv), pivaldehyde (**3a**) (0.6 mmol, 3.0 equiv), CuF_2 (20 mol%), and DTBP (2 equiv) and D_2O (0.2 mL) were weighted in a Schlenk tube equipped with a stir bar. Dry $PhCF_3$ (1 mL) was added and the mixture was stirred at 110 °C in a pre-heated oil bath for 12 h under N_2 atmosphere. Then, the mixture was cooled to room temperature and concentrated in vacuo and the resulting residue was purified by flash column chromatography on silica gel with EtOAc/petroleum ether to give products **4a-*d*** and **4a**. The ratio of **4a-*d*** and **4a** was 85:15 according to the ^{1}H NMR.

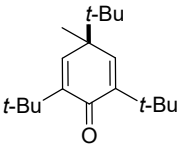


(d) Radical Scavenger Experiments

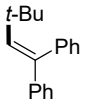




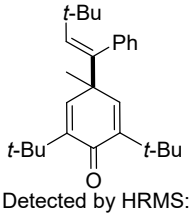
Detected by HRMS:
calculated for $C_{13}H_{28}NO$
$[M+H]^+$ 214.21654
found: 214.21613



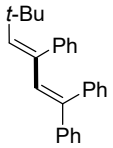
Detected by HRMS:
calculated for $C_{19}H_{32}NaO$
$[M+Na]^+$ 299.23454
found: 299.23410



Detected by HRMS:
calculated for $C_{18}H_{21}$
$[M+H]^+$ 237.16378
found: 237.16321

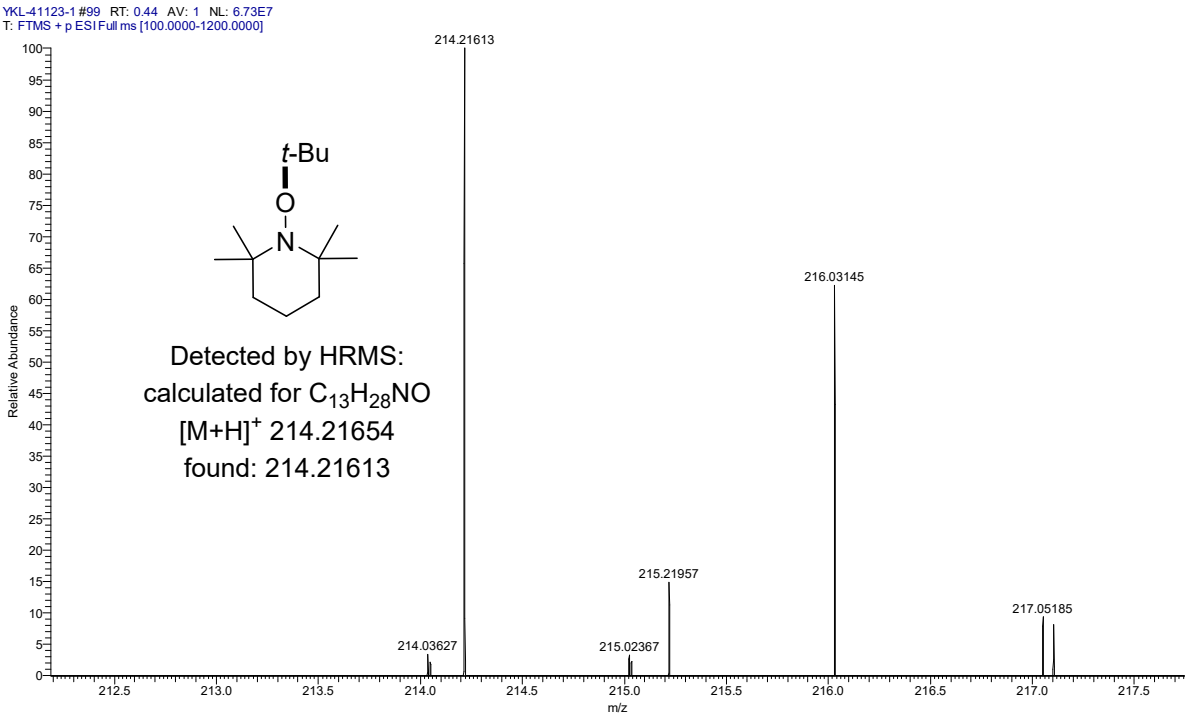


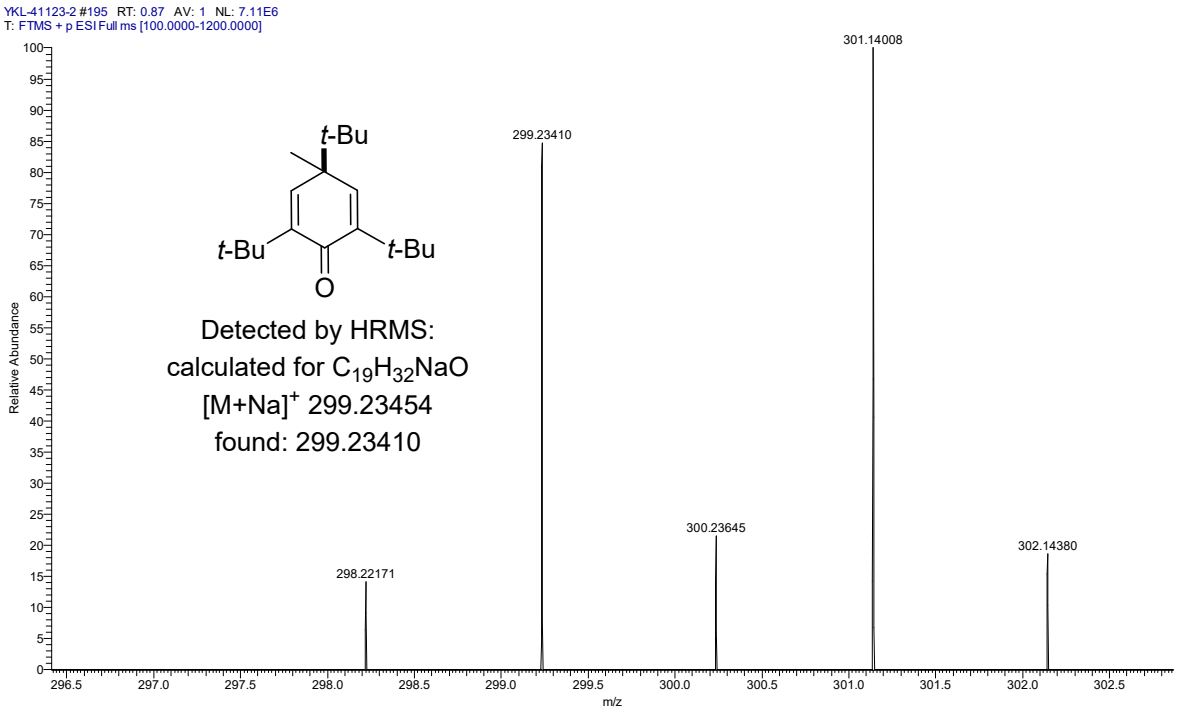
Detected by HRMS:
calculated for $C_{27}H_{38}NaO$
$[M+Na]^+$ 401.28149
found: 401.28116

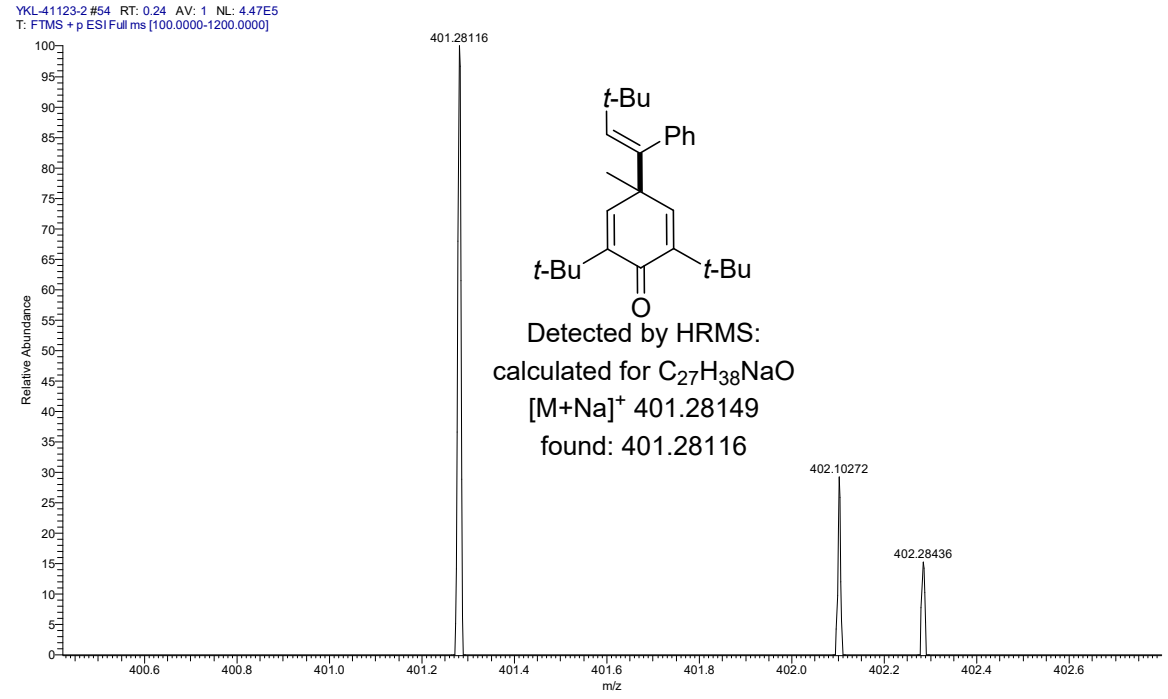


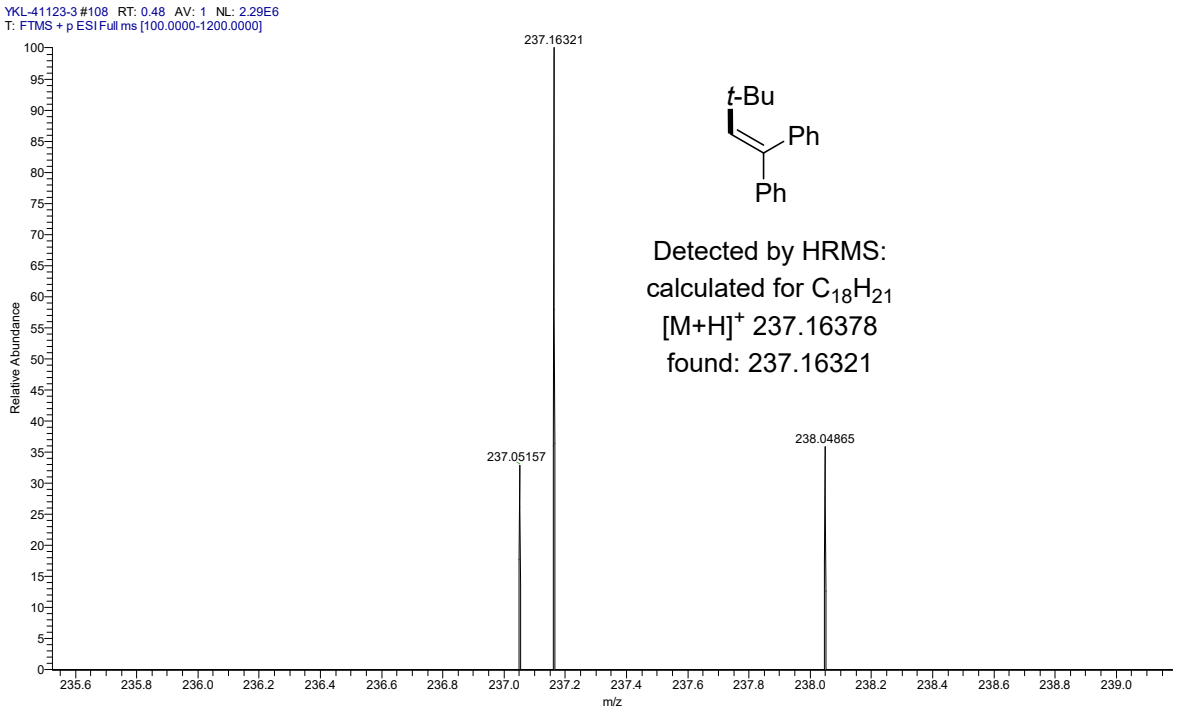
Detected by HRMS:
calculated for $C_{26}H_{27}$
$[M+H]^+$ 339.21073
found: 339.21017

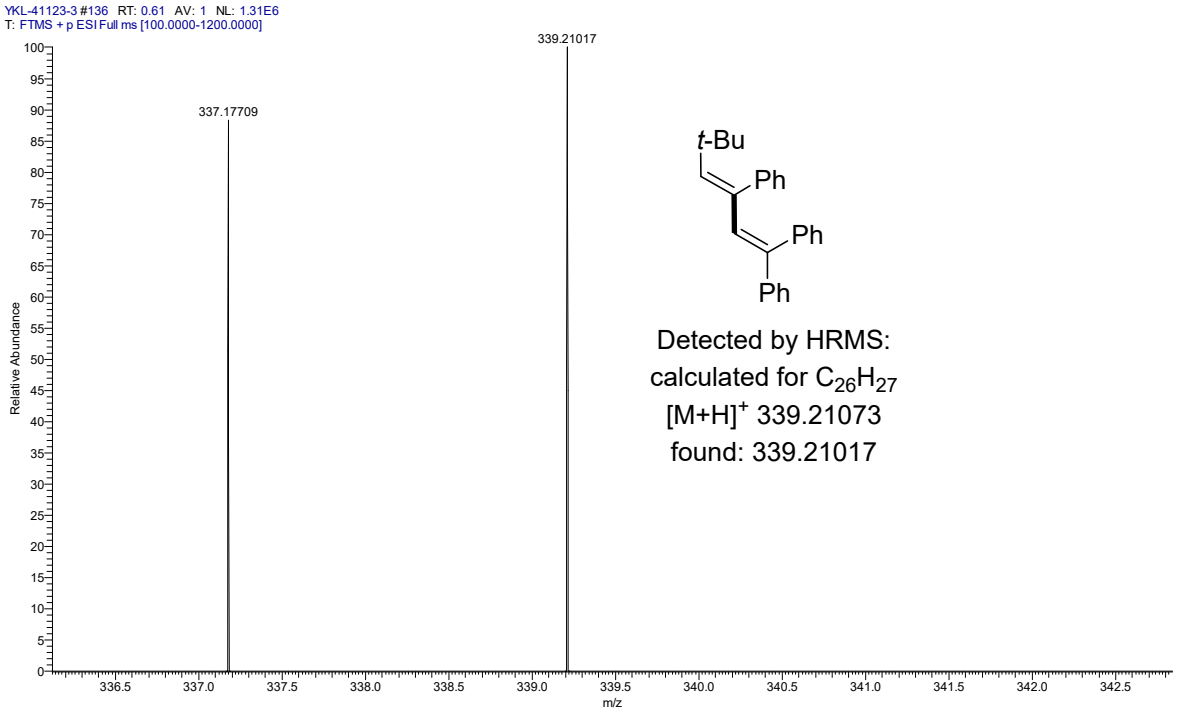
A mixture of ethyl picolinoylglycinate (**1a**) (0.2 mmol, 1.0 equiv), phenylacetylene (**2a**) (0.4 mmol, 2 equiv), pivaldehyde (**3a**) (0.6 mmol, 3.0 equiv), CuF_2 (20 mol%), and DTBP (2 equiv) and additive (0.4 mmol, 2.0 equiv) were weighted in a Schlenk tube equipped with a stir bar. Dry $PhCF_3$ (1 mL) was added and the mixture was stirred at 110 °C in a pre-heated oil bath for 12 h under N_2 atmosphere. Then, the mixture was cooled to room temperature and quenched with brine, the aqueous phase was extracted with EtOAc. The crude mixture was firstly analyzed by HRMS (High Resolution Mass Spectrometry).Then the solvent was concentrated in vacuo and the resulting residue was purified by flash column chromatography on silica gel with EtOAc/petroleum ether to give product **4a**.



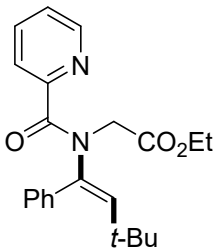

YKL-41123-2 #195 RT: 0.87 AV: 1 NL: 7.11E6
T: FTMS + p ESI Full ms [100.0000-1200.0000]
301.14008
299.23410
300.23645
302.14380
298.22171
Relative Abundance
m/z
t-Bu
t-Bu
t-Bu
O
Detected by HRMS:
calculated for C19H32NaO
[M+Na]+ 299.23454
found: 299.23410


YKL-41123-2 #54 RT: 0.24 AV: 1 NL: 4.47E5
T: FTMS + p ESI Full ms [100.0000-1200.0000]
401.28116
402.10272
402.28436
Relative Abundance
m/z
t-Bu
Ph
t-Bu
t-Bu
O
Detected by HRMS:
calculated for C27H38NaO
[M+Na]+ 401.28149
found: 401.28116



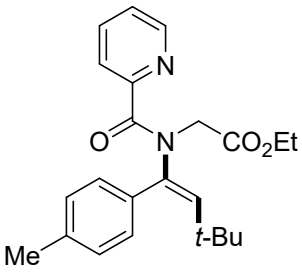


6. Characterization of Products 4, 5, 6, 7, 8, 9and 10



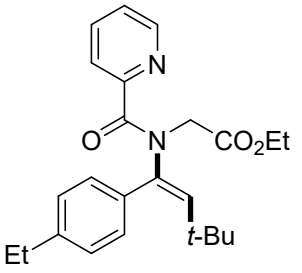
ethyl (*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-picolinoylglycinate (4a)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 81% yield (59.4 mg, 0.162 mmol). Mp: 49 – 50 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.50 (d, *J* = 4.7 Hz, 1H), 7.68 – 7.67 (m, 2H), 7.66 – 7.64 (m, 2H), 7.29 – 7.27 (m, 3H), 7.22 – 7.19 (m, 1H), 5.20 (s, 1H), 4.10 (q, *J* = 7.1 Hz, 2H), 3.96 (s, 2H), 1.17 (t, *J* = 7.2 Hz, 3H), 0.46 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.4, 168.6, 154.8, 147.9, 141.2, 137.0, 136.4, 135.8, 131.1, 128.6, 127.7, 124.0, 124.0, 60.8, 47.1, 32.3, 30.2, 14.1. **HRMS (ESI):** Calcd for $C_{22}H_{27}N_2O_3$ $[M+H]^+$ 367.2016, found: 367.2019.



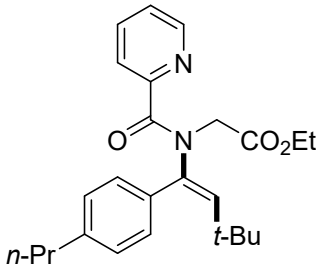
ethyl (*E*)-*N*-(3,3-dimethyl-1-(p-tolyl)but-1-en-1-yl)-*N*-picolinoylglycinate(4b)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 78% yield (59.4 mg, 0.156 mmol). Mp: 50 – 51 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.56 (d, *J* = 3.6 Hz, 1H), 7.74 (d, *J* = 3.6 Hz, 2H), 7.58 (d, *J* = 7.8 Hz, 2H), 7.29 – 7.25 (m, 1H), 7.15 (d, *J* = 7.7 Hz, 2H), 5.23 (s, 1H), 4.17 (q, *J* = 7.2 Hz, 2H), 4.01 (s, 2H), 2.36 (s, 3H), 1.25 (t, *J* = 7.1 Hz, 3H), 0.53 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.4, 168.7, 154.9, 147.9, 140.9, 138.5, 137.1, 136.4, 132.8, 131.0, 128.5, 124.0, 124.0, 60.8, 47.2, 32.3, 30.3, 21.3, 14.1. **HRMS (ESI):** Calcd for $C_{23}H_{28}N_2NaO_3$ $[M+Na]^+$ 403.1992, found: 403.1997.



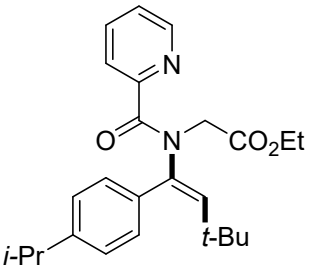
ethyl (*E*)-*N*-(1-(4-ethylphenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (4c)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 75% yield (59.2 mg, 0.150 mmol). Mp: 53 – 54 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.57 (d, *J* = 3.6 Hz, 1H), 7.74 (d, *J* = 4.1 Hz, 2H), 7.60 (d, *J* = 8.0 Hz, 2H), 7.29 – 7.26 (m, 1H), 7.18 (d, *J* = 7.9 Hz, 2H), 5.24 (s, 1H), 4.18 (q, *J* = 7.1 Hz, 2H), 4.02 (s, 2H), 2.67 (q, *J* = 7.6 Hz, 2H), 1.27 – 1.24 (m, 6H), 0.53 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.5, 168.8, 155.0, 147.9, 144.8, 140.96, 137.1, 136.4, 133.0, 131.0, 127.2, 124.0, 124.0, 60.9, 47.2, 32.4, 30.3, 28.6, 15.4, 14.2. **HRMS (ESI):** Calcd for $C_{24}H_{31}N_2O_3$ $[M+H]^+$ 395.2329, found: 395.2331.



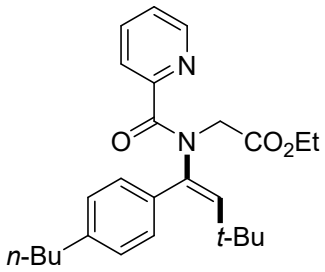
ethyl (*E*)-*N*-(3,3-dimethyl-1-(4-propylphenyl)but-1-en-1-yl)-*N*-picolinoylglycinate (4d)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 72% yield (58.8 mg, 0.144 mmol). Mp: 59 – 60 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.58 (d, *J* = 1.9 Hz, 1H), 7.74 – 7.74 (m, 2H), 7.59 (d, *J* = 7.9 Hz, 2H), 7.28 – 7.26 (m, 1H), 7.15 (d, *J* = 7.8 Hz, 2H), 5.24 (s, 1H), 4.17 (q, *J* = 7.1 Hz, 2H), 4.03 (s, 2H), 2.60 (t, *J* = 7.6 Hz, 2H), 1.71 – 1.61 (m, 2H), 1.25 (t, *J* = 7.1 Hz, 3H), 0.94 (t, *J* = 7.3 Hz, 3H), 0.53 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.4, 168.8, 154.9, 147.9, 143.2, 140.9, 137.1, 136.4, 133.0, 130.9, 127.8, 124.0, 60.9, 47.2, 37.8, 32.3, 30.2, 24.3, 14.1, 13.7. **HRMS (ESI):** Calcd for $C_{25}H_{32}N_2NaO_3$ $[M+Na]^+$ 431.2305, found: 431.2308.



ethyl (*E*)-*N*-(1-(4-isopropylphenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (4e)

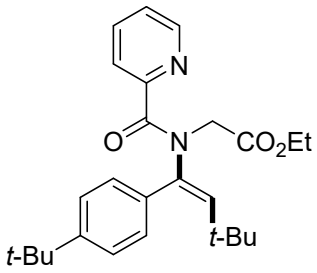
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 70% yield (57.2 mg, 0.140 mmol). Mp: 62 – 63 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.56 (d, *J* = 4.6 Hz, 1H), 7.73 (d, *J* = 4.4 Hz, 2H), 7.60 (d, *J* = 7.9 Hz, 2H), 7.29 – 7.25 (m, 1H), 7.19 (d, *J* = 7.8 Hz, 2H), 5.24 (s, 1H), 4.17 (q, *J* = 7.1 Hz, 2H), 4.02 (s, 2H), 2.94 – 2089 (m, 1H), 1.25 (t, *J* = 8.1 Hz, 9H), 0.52 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.4, 168.8, 154.9, 149.4, 147.9, 140.9, 137.1, 136.4, 133.0, 131.0, 125.8, 124.0, 124.0, 60.8, 47.2, 33.8, 32.3, 30.3, 23.9, 14.1. **HRMS (ESI):** Calcd for $C_{25}H_{32}N_2NaO_3$ $[M+Na]^+$ 431.2305, found: 431.2309.



ethyl (*E*)-*N*-(1-(4-butylphenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (4f)

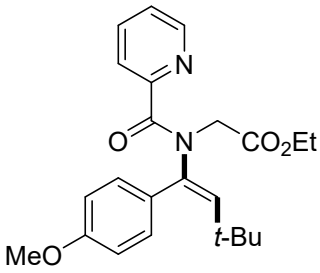
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 74%

yield (62.5 mg, 0.148 mmol). Mp: 66 – 67 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.56 (d, *J* = 4.7 Hz, 1H), 7.74 (d, *J* = 4.1 Hz, 2H), 7.59 (d, *J* = 7.9 Hz, 2H), 7.28 – 7.25 (m, 1H), 7.15 (d, *J* = 7.7 Hz, 2H), 5.23 (s, 1H), 4.21 – 4.14 (m, 2H), 4.02 (s, 2H), 2.62 (t, *J* = 7.7 Hz, 2H), 1.65 – 1.57 (m, 2H), 1.39 – 1.32 (m, 2H), 1.25 (t, *J* = 7.1 Hz, 3H), 0.93 (t, *J* = 7.3 Hz, 3H), 0.52 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.5, 168.8, 154.9, 147.9, 143.5, 140.9, 137.1, 136.4, 132.9, 130.9, 127.8, 124.0, 124.0, 60.8, 47.2, 35.4, 33.4, 32.3, 30.3, 22.3, 14.1, 13.9. **HRMS (ESI):** Calcd for $C_{26}H_{34}N_2NaO_3$ $[M+Na]^+$ 445.2462, found: 445.2458.



ethyl (*E*)-*N*-(1-(4-(tert-butyl)phenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (4g)

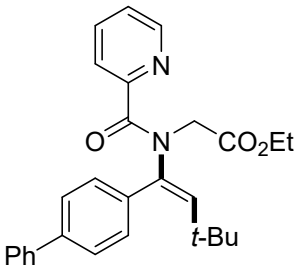
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 68% yield (57.5 mg, 0.136 mmol). Mp: 73 – 74 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.57 (d, *J* = 4.2 Hz, 1H), 7.74 (d, *J* = 4.4 Hz, 2H), 7.61 (d, *J* = 8.2 Hz, 2H), 7.36 (d, *J* = 8.2 Hz, 2H), 7.29 – 7.26 (m, 1H), 5.26 (s, 1H), 4.18 (q, *J* = 7.1 Hz, 2H), 4.04 (s, 2H), 1.34 (s, 9H), 1.26 (t, *J* = 7.1 Hz, 3H), 0.54 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.4, 168.8, 155.0, 151.7, 147.9, 141.0, 137.1, 136.3, 132.7, 130.7, 124.6, 124.0, 123.9, 60.8, 47.2, 34.6, 32.3, 31.3, 30.3, 14.1. **HRMS (ESI):** Calcd for $C_{26}H_{34}N_2NaO_3$ $[M+Na]^+$ 445.2462, found: 445.2465.



ethyl (*E*)-*N*-(1-(4-methoxyphenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (4h)

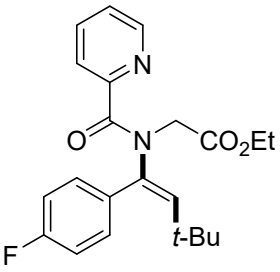
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 76% yield (60.3 mg, 0.152 mmol). Mp: 71 – 72 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.52 (d, *J* = 3.7 Hz, 1H), 7.70 (d, *J* = 3.2 Hz, 2H), 7.60 (d, *J* = 8.5 Hz, 2H), 7.25 – 7.22 (m, 1H), 6.88 – 6.83 (m, 2H), 5.18 (s, 1H), 4.17 – 4.10 (m, 2H), 4.00 (s, 2H), 3.78 (s, 3H), 1.21 (t, *J* = 7.1 Hz, 3H), 0.50 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.3, 168.6,

159.8, 154.8, 147.8, 140.6, 136.8, 136.3, 132.2, 127.9, 123.9, 113.0, 60.7, 55.1, 47.1, 32.3, 30.2, 14.0. **HRMS (ESI):** Calcd for $C_{23}H_{28}N_2NaO_4$ $[M+Na]^+$ 419.1941, found: 419.1938.



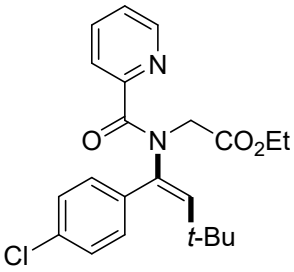
ethyl (*E*)-*N*-(1-([1,1'-biphenyl]-4-yl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (4i)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 77% yield (68.2 mg, 0.154 mmol). Mp: 96 – 97 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.59 – 8.59 (m, 1H), 7.84 – 7.73 (m, 4H), 7.65 – 7.60 (m, 4H), 7.45 (t, *J* = 7.6 Hz, 2H), 7.35 (t, *J* = 7.3 Hz, 1H), 7.29 – 7.26 (m, 1H), 5.32 (s, 1H), 4.19 (q, *J* = 7.1 Hz, 2H), 4.09 (s, 2H), 1.26 (t, *J* = 7.1 Hz, 3H), 0.59 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.5, 168.8, 154.9, 148.0, 141.5, 141.4, 140.6, 136.9, 136.5, 134.9, 131.6, 128.9, 128.7, 127.5, 127.1, 126.5, 124.2, 61.0, 47.4, 32.5, 30.4, 14.2. **HRMS (ESI):** Calcd for $C_{28}H_{30}N_2NaO_3$ $[M+Na]^+$ 465.2149, found: 465.2151.



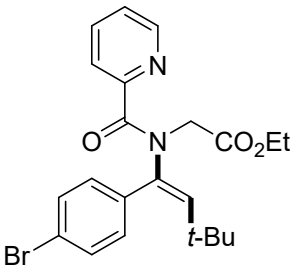
ethyl (*E*)-*N*-(1-(4-fluorophenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (4j)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 82% yield (63.1 mg, 0.164 mmol). Mp: 45 – 46 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.54 (d, *J* = 3.4 Hz, 1H), 7.74 (d, *J* = 3.3 Hz, 4H), 7.28 – 7.26 (m, 1H), 7.03 (t, *J* = 8.1 Hz, 2H), 5.25 (s, 1H), 4.16 (q, *J* = 5.8 Hz, 2H), 4.00 (s, 2H), 1.23 (t, *J* = 5.9 Hz, 3H), 0.51 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.3, 168.5, 162.8 (d, *J* = 248.2 Hz), 154.5, 147.7, 141.4, 136.5, 136.0, 132.9 (d, *J* = 8.1 Hz), 131.7 (d, *J* = 3.4 Hz), 124.1, 114.7 (d, *J* = 21.3 Hz), 60.8, 47.1, 32.3, 30.1, 14.0. **^{19}F NMR ($CDCl_3$, 471 MHz):** δ -112.6. **HRMS (ESI):** Calcd for $C_{22}H_{25}FN_2NaO_3$ $[M+Na]^+$ 407.1741, found: 407.1745.



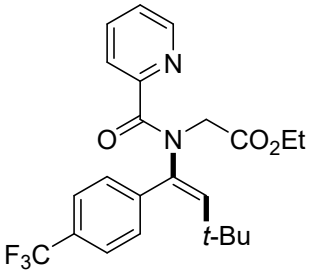
ethyl (*E*)-*N*-(1-(4-chlorophenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (4k)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 84% yield (67.4 mg, 0.168 mmol). Mp: 44 – 45 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.54 (d, *J* = 4.3 Hz, 1H), 7.75 (d, *J* = 3.8 Hz, 2H), 7.70 (d, *J* = 8.1 Hz, 2H), 7.33 (d, *J* = 8.3 Hz, 2H), 7.29 – 7.27 (m, 1H), 5.27 (s, 1H), 4.17 (q, *J* = 7.1 Hz, 2H), 3.99 (s, 2H), 1.25 (t, *J* = 7.1 Hz, 3H), 0.52 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.3, 168.5, 154.5, 147.8, 141.8, 136.6, 136.0, 134.6, 134.4, 132.5, 128.0, 124.2, 61.0, 47.2, 32.4, 30.2, 14.1. **HRMS (ESI):** Calcd for $C_{22}H_{25}ClN_2NaO_3$ $[M+Na]^+$ 423.1446, found: 423.1449.



ethyl (*E*)-*N*-(1-(4-bromophenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (4l)

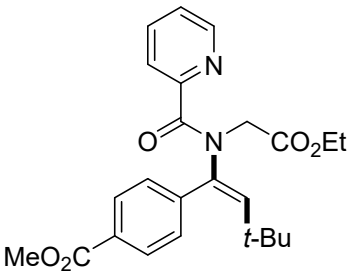
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 80% yield (71.3 mg, 0.160 mmol). Mp: 35 – 36 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.53 (d, *J* = 4.5 Hz, 1H), 7.75 (d, *J* = 4.9 Hz, 2H), 7.64 (d, *J* = 8.2 Hz, 2H), 7.49 (d, *J* = 8.4 Hz, 2H), 7.29 – 7.27 (m, 1H), 5.27 (d, *J* = 1.3 Hz, 1H), 4.16 (q, *J* = 7.1 Hz, 2H), 3.99 (s, 2H), 1.24 (t, *J* = 7.1 Hz, 3H), 0.52 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.3, 168.5, 154.5, 147.8, 141.8, 136.6, 136.0, 134.9, 132.8, 131.0, 124.2, 122.9, 61.0, 47.2, 32.4, 30.2, 14.1. **HRMS (ESI):** Calcd for $C_{22}H_{25}BrN_2NaO_3$ $[M+Na]^+$ 467.0941 and 469.0920, found: 467.0943 and 469.0920.



ethyl (*E*)-*N*-(3,3-dimethyl-1-(4-(trifluoromethyl)phenyl)but-1-en-1-yl)-*N*-picolinoylglycinate (4m)

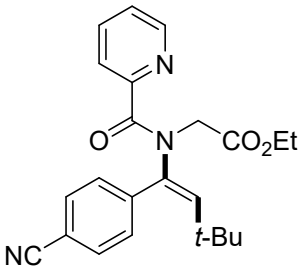
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 77% yield (66.9 mg, 0.154 mmol). Mp: 35 – 36 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.55 (d, *J* = 4.5 Hz, 1H), 7.91 (d, *J* = 8.0 Hz, 2H), 7.81 – 7.75 (m, 2H), 7.62 (d,

J = 8.0 Hz, 2H), 7.31 – 7.29 (m, 1H), 5.34 (s, 1H), 4.17 (q, J = 7.1 Hz, 2H), 3.99 (s, 2H), 1.24 (t, J = 7.1 Hz, 3H), 0.53 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.3, 168.4, 154.3, 147.8, 142.5, 139.8, 136.7, 135.8, 131.6, 130.6 (d, J = 32.5 Hz), 124.7 (d, J = 3.6 Hz), 124.4, 124.0 (d, J = 271.9 Hz), 61.0, 47.2, 32.5, 30.2, 14.1. **^{19}F NMR ($CDCl_3$, 471 MHz):** δ -62.6. **HRMS (ESI):** Calcd for $C_{23}H_{25}F_3N_2NaO_3$ $[M+Na]^+$ 457.1710, found: 457.1714.



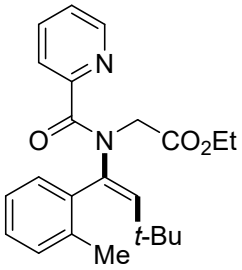
methyl (*E*)-4-(1-(*N*-(2-ethoxy-2-oxoethyl)picolinamido)-3,3-dimethylbut-1-en-1-yl)benzoate (4n)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 81% yield 68.8 mg, 0.162 mmol). Mp: 65 – 66 °C. **^{1}H NMR ($CDCl_3$, 400 MHz):** δ 8.53 (d, J = 3.9 Hz, 1H), 8.00 (d, J = 7.9 Hz, 2H), 7.82 (d, J = 7.9 Hz, 2H), 7.74 – 7.74 (m, 2H), 7.29 – 7.24 (m, 1H), 5.29 (s, 1H), 4.13 (q, J = 7.0 Hz, 2H), 3.96 (s, 2H), 3.89 (s, 3H), 1.21 (t, J = 7.1 Hz, 3H), 0.49 (s, 9H). **^{13}C NMR ($CDCl_3$, 100 MHz):** δ 169.3, 168.4, 166.7, 154.3, 147.8, 142.2, 140.7, 136.5, 136.1, 131.2, 130.2, 128.9, 124.2, 60.9, 52.1, 47.2, 32.4, 30.1, 14.0. **HRMS (ESI):** Calcd for $C_{24}H_{28}N_2NaO_5$ $[M+Na]^+$ 447.1890, found: 447.1894.



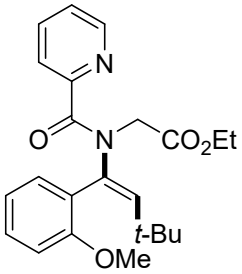
ethyl (*E*)-*N*-(1-(4-cyanophenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (4o)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 76% yield (59.5 mg, 0.152 mmol). Mp: 88 – 89 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.52 (d, J = 4.5 Hz, 1H), 7.91 (d, J = 8.1 Hz, 2H), 7.76 (d, J = 4.2 Hz, 2H), 7.64 (d, J = 8.1 Hz, 2H), 7.30 – 7.27 (m, 1H), 5.33 (s, 1H), 4.14 (q, J = 7.1 Hz, 2H), 3.94 (s, 2H), 1.22 (t, J = 7.1 Hz, 3H), 0.50 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.2, 168.2, 153.9, 147.6, 142.9, 140.9, 136.7, 135.4, 131.9, 131.5, 124.4, 124.4, 118.5, 112.3, 61.0, 47.2, 32.4, 30.1, 14.0. **HRMS (ESI):** Calcd for $C_{23}H_{25}N_3NaO_3$ $[M+Na]^+$ 414.1788, found: 414.1791.



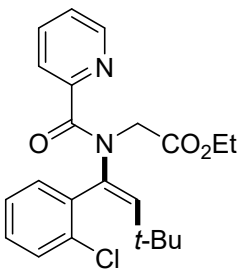
ethyl (*E*)-*N*-(3,3-dimethyl-1-(o-tolyl)but-1-en-1-yl)-*N*-picolinoylglycinate (4p)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 53% yield (40.3 mg, 0.106 mmol). Mp: 50 – 51 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.60 – 8.60 (m, 1H), 8.16 (d, *J* = 6.3 Hz, 1H), 7.76 (d, *J* = 4.1 Hz, 2H), 7.30 – 7.27 (m, 1H), 7.24 – 7.18 (m, 2H), 7.15 (d, *J* = 7.2 Hz, 1H), 5.24 (s, 1H), 4.32 (d, *J* = 17.2 Hz, 1H), 4.19 (d, *J* = 6.5 Hz, 2H), 3.67 (d, *J* = 17.1 Hz, 1H), 2.29 (s, 3H), 1.25 (t, *J* = 6.6 Hz, 3H), 0.44 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.5, 169.0, 155.2, 147.8, 140.8, 137.6, 136.6, 135.0, 132.8, 131.3, 129.5, 128.4, 125.6, 124.3, 124.0, 60.9, 46.2, 32.8, 29.1, 19.6, 14.1. **HRMS (ESI):** Calcd for $C_{23}H_{28}N_2NaO_3$ $[M+Na]^+$ 403.1992, found: 403.1996.



ethyl (*E*)-*N*-(1-(2-methoxyphenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (4q)

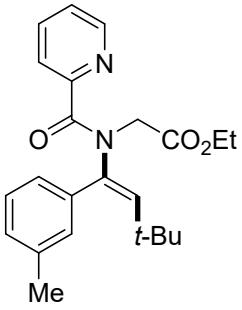
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 57% yield (45.2 mg, 0.114 mmol). Mp: 93 – 94 °C. **^{1}H NMR ($CDCl_3$, 400 MHz):** δ 8.61 (d, *J* = 4.3 Hz, 1H), 7.93 (d, *J* = 7.4 Hz, 1H), 7.73 (s, 2H), 7.31 – 7.28 (m, 2H), 6.95 (t, *J* = 7.4 Hz, 1H), 6.83 (d, *J* = 8.3 Hz, 1H), 5.32 (s, 1H), 4.37 (s, 1H), 4.16 (q, *J* = 6.6 Hz, 2H), 3.93 (s, 1H), 3.75 (s, 3H), 1.25 (t, *J* = 7.1 Hz, 3H), 0.49 (s, 9H). **^{13}C NMR ($CDCl_3$, 100 MHz):** δ 169.2, 168.8, 157.5, 155.2, 148.0, 142.6, 136.2, 132.3, 130.5, 129.8, 124.5, 123.8, 120.2, 109.8, 60.6, 54.7, 46.8, 32.4, 29.1, 14.1. **HRMS (ESI):** Calcd for $C_{23}H_{28}N_2NaO_4$ $[M+Na]^+$ 419.1941, found: 419.1939.



ethyl (*E*)-*N*-(1-(2-chlorophenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (4r)

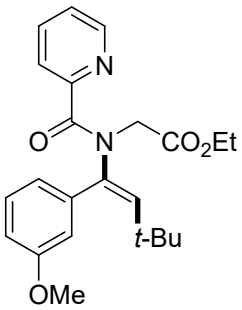
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 65% yield (52.1 mg,

0.130 mmol). Mp: 82 – 83 °C. **^{1}H NMR ($CDCl_3$, 400 MHz):** δ 8.61 (d, *J* = 4.6 Hz, 1H), 8.49 (d, *J* = 7.5 Hz, 1H), 7.78 – 7.77 (m, 2H), 7.38 – 7.28 (m, 4H), 5.32 (s, 1H), 4.41 (d, *J* = 17.2 Hz, 1H), 4.23 – 4.16 (m, 2H), 3.80 (d, *J* = 17.2 Hz, 1H), 1.26 (t, *J* = 7.1 Hz, 3H), 0.49 (s, 9H). **^{13}C NMR ($CDCl_3$, 100 MHz):** δ 169.3, 168.6, 154.8, 147.7, 143.3, 136.7, 135.2, 134.9, 133.2, 130.2, 129.8, 128.8, 126.8, 124.4, 124.2, 60.8, 46.3, 33.0, 28.7, 14.1. **HRMS (ESI):** Calcd for $C_{22}H_{25}ClN_2NaO_3$ $[M+Na]^+$ 423.1446, found: 423.1449.



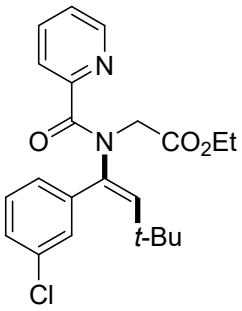
ethyl (*E*)-*N*-(3,3-dimethyl-1-(m-tolyl)but-1-en-1-yl)-*N*-picolinoylglycinate (4s)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 71% yield (54.0 mg, 0.142 mmol). Mp: 60 – 61 °C. **^{1}H NMR ($CDCl_3$, 400 MHz):** δ 8.61 (d, *J* = 4.7 Hz, 1H), 7.78 – 7.78 (m, 2H), 7.56 – 7.74 (m, 2H), 7.34 – 7.26 (m, 2H), 7.19 (d, *J* = 7.5 Hz, 1H), 5.29 (s, 1H), 4.22 (q, *J* = 7.1 Hz, 2H), 4.07 (s, 2H), 2.41 (s, 3H), 1.30 (t, *J* = 7.1 Hz, 3H), 0.58 (s, 9H). **^{13}C NMR ($CDCl_3$, 100 MHz):** δ 169.4, 168.7, 154.8, 147.9, 140.9, 137.2, 137.1, 136.3, 135.6, 131.6, 129.3, 128.1, 127.6, 124.0, 60.8, 47.1, 32.3, 30.2, 21.4, 14.1. **HRMS (ESI):** Calcd for $C_{23}H_{28}N_2NaO_3$ $[M+Na]^+$ 403.1992, found: 403.1995.



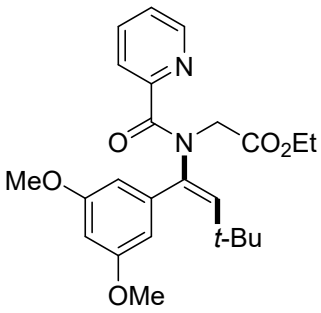
ethyl (*E*)-*N*-(1-(3-methoxyphenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (4t)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 74% yield (58.7 mg, 0.148 mmol). Mp: 78 – 79 °C. **^{1}H NMR ($CDCl_3$, 400 MHz):** δ 8.57 (d, *J* = 4.7 Hz, 1H), 7.77 – 7.75 (m, 2H), 7.50 (s, 1H), 7.30 – 7.20 (m, 3H), 6.91 (dd, *J* = 7.3, 3.0 Hz, 1H), 5.27 (s, 1H), 4.23 – 4.16 (m, 2H), 4.05 (s, 2H), 3.84 (s, 3H), 1.26 (t, *J* = 7.1 Hz, 3H), 0.55 (s, 9H). **^{13}C NMR ($CDCl_3$, 100 MHz):** δ 169.3, 168.6, 159.0, 154.7, 147.8, 141.1, 137.1, 136.7, 136.4, 128.5, 124.0, 123.7, 116.2, 114.3, 60.8, 55.1, 47.0, 32.3, 30.1, 14.0. **HRMS (ESI):** Calcd for $C_{23}H_{28}N_2NaO_4$ $[M+Na]^+$ 419.1941, found: 419.1945.



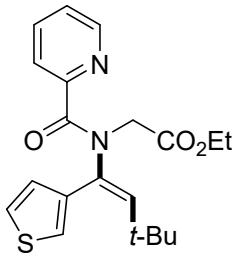
ethyl (*E*)-*N*-(1-(3-chlorophenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (4u)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 80% yield (64.1 mg, 0.160 mmol). Mp: 80 – 81 °C. **^{1}H NMR ($CDCl_3$, 400 MHz):** δ 8.56 (d, *J* = 4.6 Hz, 1H), 7.82 (s, 1H), 7.76 – 7.75 (m, 2H), 7.60 (d, *J* = 7.3 Hz, 1H), 7.34 – 7.27 (m, 3H), 5.28 (s, 1H), 4.17 (q, *J* = 7.1 Hz, 2H), 4.00 (s, 2H), 1.25 (t, *J* = 7.1 Hz, 3H), 0.53 (s, 9H). **^{13}C NMR ($CDCl_3$, 100 MHz):** δ 169.3, 168.5, 154.3, 147.8, 142.0, 137.8, 136.6, 135.8, 133.7, 131.1, 129.4, 129.0, 128.8, 124.3, 124.2, 61.0, 47.2, 32.4, 30.2, 14.1. **HRMS (ESI):** Calcd for $C_{22}H_{25}ClN_2NaO_3$ $[M+Na]^+$ 423.1446, found: 423.1449.



ethyl (*E*)-*N*-(1-(3,5-dimethoxyphenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (4v)

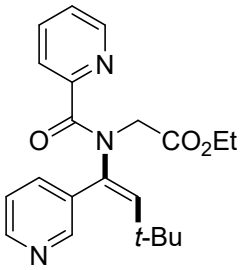
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 27% yield (23.1mg, 0.054 mmol). Mp: 54 – 55 °C. **^{1}H NMR ($CDCl_3$, 400 MHz):** δ 8.55 (d, *J* = 4.5 Hz, 1H), 7.75 (d, *J* = 4.0 Hz, 2H), 7.29 – 7.26 (m, 1H), 6.97 (s, 2H), 6.46 (s, 1H), 5.23 (s, 1H), 4.18 (q, *J* = 7.1 Hz, 2H), 4.05 (s, 2H), 3.81 (s, 6H), 1.26 (t, *J* = 7.1 Hz, 3H), 0.56 (s, 9H). **^{13}C NMR ($CDCl_3$, 100 MHz):** δ 169.3, 168.7, 160.0, 154.7, 147.7, 141.2, 137.7, 136.7, 136.4, 124.1, 109.3, 109.1, 100.5, 60.8, 55.2, 47.1, 32.3, 30.1, 14.0. **HRMS (ESI):** Calcd for $C_{24}H_{30}N_2NaO_5$ $[M+Na]^+$ 449.2047, found: 449.2051.



ethyl (*E*)-*N*-(3,3-dimethyl-1-(thiophen-3-yl)but-1-en-1-yl)-*N*-picolinoylglycinate (4w)

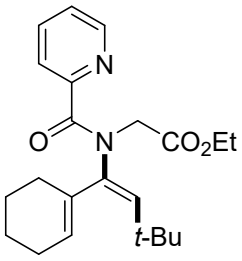
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 71% yield (52.9 mg, 0.142 mmol). Mp: 75 – 76 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.54 (d, *J* = 3.5 Hz, 1H), 7.70 (d, *J* = 6.6 Hz, 2H), 7.51 (s, 1H), 7.45 (d, *J* = 4.7 Hz, 1H), 7.29 – 7.24 (m, 2H), 5.29 (s, 1H), 4.16 (q, *J* = 7.0 Hz, 2H), 4.06 (s, 2H), 1.24 (t, *J* = 7.0 Hz, 3H), 0.55 (s, 9H). **^{13}C NMR**

($CDCl_3$, 125 MHz): δ 169.2, 168.6, 154.6, 147.9, 142.3, 136.4, 136.4, 132.3, 130.1, 127.1, 124.7, 124.0, 123.9, 60.9, 47.3, 32.2, 30.0, 14.1. **HRMS (ESI):** Calcd for $C_{20}H_{24}N_2NaO_3S$ $[M+Na]^+$ 395.1400, found: 395.1404.



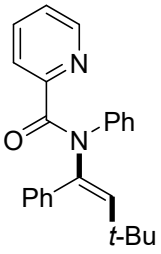
ethyl (*E*)-*N*-(3,3-dimethyl-1-(pyridin-3-yl)but-1-en-1-yl)-*N*-picolinoylglycinate (4x)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 63% yield (46.3 mg, 0.126 mmol). Mp: 28 – 29 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 9.22 – 8.44 (m, 3H), 8.37 (d, *J* = 7.5 Hz, 1H), 7.79 – 7.75 (m, 2H), 7.40 (s, 1H), 7.29 (t, *J* = 5.6 Hz, 1H), 5.39 (s, 1H), 4.16 (q, *J* = 7.1 Hz, 2H), 4.00 (s, 2H), 1.24 (t, *J* = 7.1 Hz, 3H), 0.53 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.3, 168.3, 154.1, 151.4, 149.5, 147.8, 143.3, 138.6, 136.7, 134.0, 129.5, 124.4, 61.1, 47.2, 32.6, 30.3, 14.1. **HRMS (ESI):** Calcd for $C_{21}H_{25}N_3NaO_3$ $[M+Na]^+$ 390.1788, found: 390.1791.



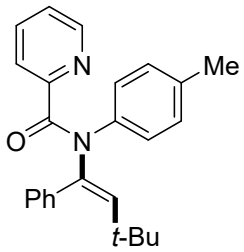
ethyl (*E*)-*N*-(1-(cyclohex-1-en-1-yl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (4y)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 49% yield (30.1 mg, 0.098 mmol). Mp: 97 – 98 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.50 (d, *J* = 4.0 Hz, 1H), 7.67 (t, *J* = 7.7 Hz, 1H), 7.57 (d, *J* = 7.7 Hz, 1H), 7.24 – 7.17 (m, 1H), 5.64 (s, 1H), 4.92 (s, 1H), 4.21 – 4.17 (m, 4H), 2.31 – 2.31 (m, 2H), 2.07 – 2.07 (m, 2H), 1.67 – 1.55 (m, 4H), 1.26 (t, *J* = 7.1 Hz, 3H), 0.65 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.8, 168.8, 155.1, 148.1, 140.0, 139.7, 136.1, 133.3, 132.8, 123.7, 123.6, 60.9, 46.9, 32.3, 30.2, 27.3, 25.5, 22.6, 21.9, 14.1. **HRMS (ESI):** Calcd for $C_{22}H_{30}N_2NaO_3$ $[M+Na]^+$ 393.2149, found: 393.2146.



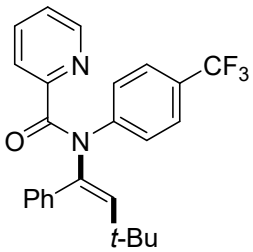
(*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-phenylpicolinamide (5a)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 81% yield (57.7 mg, 0.162 mmol). Mp: 93 – 94 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.70 – 8.51 (m, 1H), 7.74 – 7.74 (m, 2H), 7.59 – 7.59 (m, 2H), 7.25 – 7.06 (m, 9H), 5.30 (s, 1H), 0.57 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.3, 155.7, 147.9, 141.6, 139.9, 138.2, 136.5, 136.3, 131.0, 128.5, 127.9, 127.2, 126.9, 126.4, 124.1, 124.1, 32.6, 30.4. **HRMS (ESI):** Calcd for $C_{24}H_{24}N_2NaO$ $[M+Na]^+$ 379.1781, found: 379.1784.



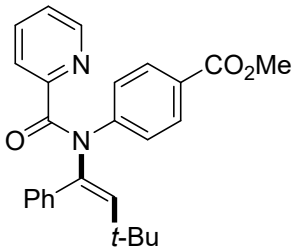
(*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-(p-tolyl)picolinamide (5b)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 77% yield (57.1 mg, 0.154 mmol). Mp: 64 – 65 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.63 (d, *J* = 0.5 Hz, 1H), 7.78 – 7.78 (m, 2H), 7.62 – 7.62 (m, 2H), 7.31 (s, 1H), 7.20 – 7.18 (m, 3H), 7.09 – 7.05 (m, 4H), 5.31 (s, 1H), 2.25 (s, 3H), 0.59 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.4, 155.9, 148.0, 141.4, 138.3, 136.5, 136.1, 131.1, 129.5, 129.3, 127.9, 127.2, 126.7, 124.1, 124.0, 119.6, 32.6, 30.4, 21.0. **HRMS (ESI):** Calcd for $C_{25}H_{26}N_2NaO$ $[M+Na]^+$ 393.1937, found: 393.1934.



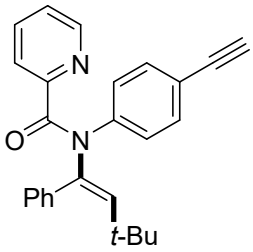
(*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-(4-(trifluoromethyl)phenyl)picolinamide (5c)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 83% yield (70.5 mg, 0.166 mmol). Mp: 64 – 65 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.60 – 8.60 (m, 1H), 7.80 – 7.56 (m, 2H), 7.64 (s, 2H), 7.50 (d, *J* = 7.9 Hz, 2H), 7.41 – 7.29 (m, 3H), 7.22 – 7.18 (m, 3H), 5.42 (s, 1H), 0.66 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.4, 154.9, 148.1, 142.6, 137.7, 136.7, 136.0, 131.0, 128.3, 128.0 (q, *J* = 32.9 Hz), 127.4, 127.0, 125.7 (q, *J* = 3.7 Hz), 124.5, 124.4, 123.9 (q, *J* = 271.9 Hz), 119.3, 32.8, 30.3. **^{19}F NMR ($CDCl_3$, 471 MHz):** δ -62.4. **HRMS (ESI):** Calcd for $C_{25}H_{23}F_3N_2NaO$ $[M+Na]^+$ 447.1655, found: 447.1652.



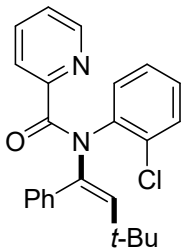
methyl (*E*)-4-(*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)picolinamido)benzoate (5d)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 80% yield (66.3 mg, 0.160 mmol). Mp: 94 – 95 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.58 – 8.58 (m, 1H), 7.90 (d, *J* = 7.6 Hz, 2H), 7.77 – 7.77 (s, 2H), 7.61 – 7.61 (s, 2H), 7.28 – 7.28 (m, 3H), 7.20 – 7.16 (m, 3H), 5.43 (s, 1H), 3.84 (s, 3H), 0.67 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.3, 166.5, 148.1, 142.4, 137.7, 136.6, 136.1, 131.0, 130.0, 128.2, 127.6, 127.3, 126.5, 124.4, 124.4, 52.0, 32.8, 30.4. **HRMS (ESI):** Calcd for $C_{26}H_{26}N_2NaO_3$ $[M+Na]^+$ 437.1836, found: 437.1838.



(*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-(4-ethynylphenyl)picolinamide (5e)

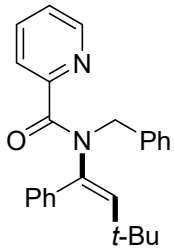
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 44% yield (33.5 mg, 0.088 mmol). Mp: 66 – 67 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.62 (d, *J* = 5.5 Hz, 1H), 7.77 – 7.77 (m, 2H), 7.62 – 7.62 (m, 2H), 7.37 – 7.31 (m, 2H), 7.22 – 7.19 (m, 6H), 5.33 (s, 1H), 3.03 (s, 1H), 0.61 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.3, 148.0, 142.0, 137.9, 136.6, 136.1, 131.0, 130.5, 130.2, 128.6, 128.1, 127.8, 127.3, 124.3, 124.3, 122.5, 83.0, 77.5, 32.7, 30.4. **HRMS (ESI):** Calcd for $C_{26}H_{24}N_2NaO$ $[M+Na]^+$ 403.1781, found: 403.1783.



(*E*)-*N*-(2-chlorophenyl)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)picolinamide (5f)

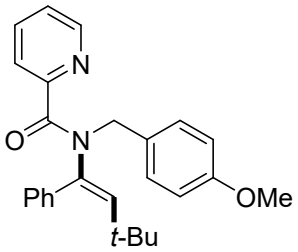
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 67% yield (52.4 mg, 0.134 mmol). Mp: 90 – 91 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.68 – 8.68 (m, 1H), 7.87 (d, *J* = 7.0 Hz, 1H), 7.80 (d, *J* = 6.7 Hz, 1H), 7.61 (m, 2H), 7.37 – 7.27 (m, 2H), 7.18 (m, 5H), 7.11 (t, *J* = 7.0 Hz, 1H), 5.36 (s, 1H), 0.58 (s, 8H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ

168.5, 155.0, 148.1, 141.3, 137.7, 137.4, 136.5, 135.8, 132.8, 130.9, 130.2, 129.3, 128.3, 128.1, 127.2, 127.0, 124.4, 124.3, 32.6, 30.3. **HRMS (ESI):** Calcd for $C_{24}H_{23}ClN_2NaO$ $[M+Na]^+$ 413.1391, found: 413.1389.



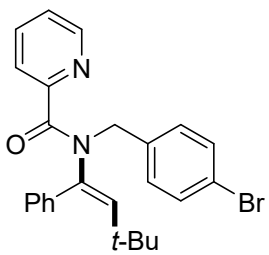
(*E*)-*N*-benzyl-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)picolinamide (5g)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 71% yield (52.6 mg, 0.142 mmol). Mp: 72 – 73 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.59 – 8.59 (m, 1H), 7.76 – 7.67 (m, 4H), 7.38 – 7.35 (m, 3H), 7.29 – 7.22 (m, 6H), 4.84 (s, 1H), 4.56 (s, 2H), 0.44 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.3, 155.7, 147.9, 142.0, 137.3, 136.6, 136.3, 136.2, 131.2, 128.9, 128.5, 128.1, 127.7, 127.0, 123.9, 123.8, 48.5, 32.4, 30.2. **HRMS (ESI):** Calcd for $C_{25}H_{26}N_2NaO$ $[M+Na]^+$ 393.1937, found: 393.1942.



(*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-(4-methoxybenzyl)picolinamide (5h)

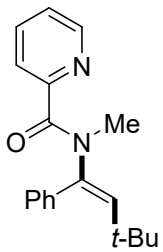
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 64% yield (51.3 mg, 0.128 mmol). Mp: 62 – 63 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.56 (d, *J* = 4.7 Hz, 1H), 7.74 – 7.67 (m, 4H), 7.38 – 7.35 (m, 3H), 7.23 (dd, *J* = 13.7, 6.8 Hz, 3H), 6.82 (d, *J* = 8.7 Hz, 2H), 4.81 (s, 1H), 4.47 (s, 2H), 3.78 (s, 3H), 0.45 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.2, 158.6, 155.8, 147.9, 141.9, 136.6, 136.3, 136.2, 131.1, 130.2, 129.5, 128.4, 127.6, 123.8, 123.7, 113.4, 55.1, 47.9, 32.3, 30.2. **HRMS (ESI):** Calcd for $C_{26}H_{28}N_2NaO_2$ $[M+Na]^+$ 423.2043, found: 423.2049.



(*E*)-*N*-(4-bromobenzyl)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)picolinamide (5i)

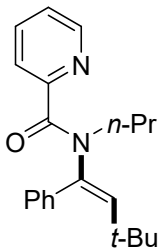
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 59% yield (53.0 mg, 0.118 mmol). Mp: 64 – 65 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.57 (d,

J = 4.6 Hz, 1H), 7.76 – 7.65 (m, 4H), 7.40 (d, *J* = 8.4 Hz, 2H), 7.38 – 7.35 (m, 3H), 7.29 – 7.26 (m, 1H), 7.14 (d, *J* = 8.3 Hz, 2H), 4.82 (s, 1H), 4.47 (s, 2H), 0.45 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.4, 155.4, 148.0, 141.9, 136.7, 136.4, 136.3, 136.0, 131.2, 131.1, 130.7, 128.6, 127.8, 123.9, 121.0, 48.0, 32.4, 30.2. **HRMS (ESI):** Calcd for $C_{25}H_{25}BrN_2NaO$ $[M+Na]^+$ 471.1043 and 473.1022, found: 471.1050 and 473,1029.



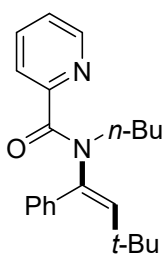
(*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-methylpicolinamide (5j)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 68% yield (40.0 mg, 0.136 mmol). Mp: 56 – 57 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.55 (d, *J* = 4.5 Hz, 1H), 7.73 – 7.69 (m, 4H), 7.37 – 7.32 (m, 3H), 7.25 – 7.24 (m, 1H), 5.06 (s, 1H), 2.95 (s, 3H), 0.52 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.4, 155.7, 147.9, 139.4, 138.8, 136.3, 136.3, 130.8, 128.4, 127.7, 123.7, 123.7, 33.7, 32.2, 30.3. **HRMS (ESI):** Calcd for $C_{19}H_{22}N_2NaO$ $[M+Na]^+$ 317.1624, found: 317.1622.



(*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-propylpicolinamide (5k)

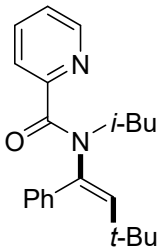
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 70% yield (45.1 mg, 0.140 mmol). Mp: 51 – 52 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.55 (d, *J* = 4.6 Hz, 1H), 7.73 – 7.66 (m, 4H), 7.40 – 7.30 (m, 3H), 7.25 – 7.21 (m, 1H), 5.01 (s, 1H), 3.28 – 3.28 (m, 2H), 1.59 – 1.51 (m, 2H), 0.85 (t, *J* = 7.4 Hz, 3H), 0.51 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.0, 156.1, 147.9, 140.7, 137.2, 136.3, 136.3, 130.8, 128.3, 127.6, 123.7, 123.6, 46.2, 32.4, 30.3, 20.3, 11.3. **HRMS (ESI):** Calcd for $C_{21}H_{26}N_2NaO$ $[M+Na]^+$ 345.1937, found: 345.1942.



(*E*)-*N*-butyl-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)picolinamide (5l)

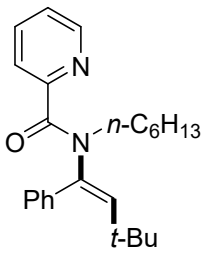
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 64% yield (43.1 mg, 0.128 mmol). Mp: 50 – 51 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.54 (d, *J* = 2.5 Hz,

1H), 7.74 – 7.64 (m, 4H), 7.36 – 7.33 (m, 3H), 7.25 – 7.20 (m, 1H), 4.99 (s, 1H), 3.31 – 3.31 (s, 2H), 1.54 – 1.47 (m, 2H), 1.30 – 1.23 (m, 2H), 0.85 (t, J = 7.4 Hz, 3H), 0.51 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 168.9, 156.0, 147.8, 140.6, 137.1, 136.3, 136.2, 130.8, 128.3, 127.6, 123.6, 123.5, 44.4, 32.3, 30.3, 29.0, 20.0, 13.7. **HRMS (ESI):** Calcd for $C_{22}H_{28}N_2NaO$ $[M+Na]^+$ 359.2094, found: 359.2091.



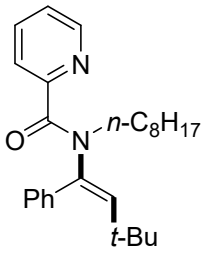
(*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-isobutylpicolinamide (5m)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 67% yield (45.1 mg, 0.134 mmol). Mp: 49 – 50 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.52 (d, J = 4.7 Hz, 1H), 7.82 (d, J = 3.7 Hz, 2H), 7.72 – 7.65 (m, 2H), 7.35 – 7.33 (m, 3H), 7.23 – 7.20 (m, 1H), 5.03 (s, 1H), 3.96 – 3.83 (m, 1H), 1.98 – 1.36 (m, 2H), 1.14 – 1.14 (m, 3H), 0.80 – 0.80 (m, 3H), 0.51 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.4, 157.0, 147.7, 141.8, 137.8, 137.5, 136.3, 131.5, 128.3, 127.3, 123.6, 123.4, 54.9, 32.4, 30.3, 17.5, 11.7. **HRMS (ESI):** Calcd for $C_{22}H_{28}N_2NaO$ $[M+Na]^+$ 359.2094, found: 359.2098.



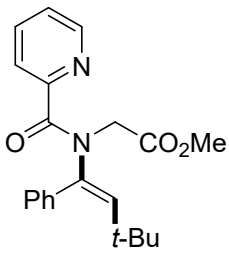
(*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-hexylpicolinamide (5n)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 61% yield (44.5 mg, 0.122 mmol). Mp: 42 – 43 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.54 (d, J = 4.7 Hz, 1H), 7.74 – 7.63 (m, 4H), 7.35 – 7.33 (m, 3H), 7.24 – 7.21 (m, 1H), 4.99 (s, 1H), 3.33 – 3.33 (m, 2H), 1.57 – 1.46 (m, 2H), 1.29 – 1.19 (m, 6H), 0.84 (t, J = 6.8 Hz, 3H), 0.51 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 168.9, 156.0, 147.8, 140.6, 137.1, 136.3, 136.2, 130.8, 128.3, 127.5, 123.6, 123.5, 44.6, 32.3, 31.4, 30.3, 26.8, 26.4, 22.4, 13.9. **HRMS (ESI):** Calcd for $C_{24}H_{32}N_2NaO$ $[M+Na]^+$ 387.2407, found: 387.2412.



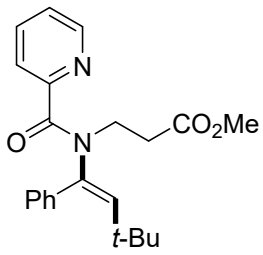
(*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-octylpicolinamide (5o)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 57% yield (44.8 mg, 0.114 mmol). Mp: 43 – 44 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.53 (d, *J* = 4.0 Hz, 1H), 7.73 – 7.65 (m, 4H), 7.34 – 7.33 (m, 3H), 7.24 – 7.20 (m, 1H), 4.99 (s, 1H), 3.31 – 3.30 (m, 2H), 1.55 – 1.48 (m, 2H), 1.27 – 1.23 (m, 10H), 0.86 (t, *J* = 6.7 Hz, 3H), 0.51 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 168.9, 156.0, 147.8, 140.6, 137.2, 136.3, 136.2, 130.8, 128.3, 127.5, 123.6, 123.5, 44.6, 32.3, 31.6, 30.3, 29.1, 29.0, 26.8, 26.7, 22.5, 14.0. **HRMS (ESI):** Calcd for $C_{26}H_{36}N_2O$ $[M+Na]^+$ 415.2720, found: 415.2724.



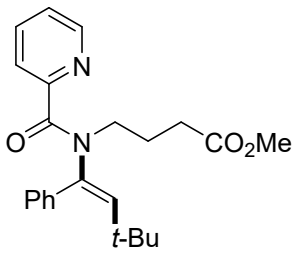
methyl (*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-picolinoylglycinate (5p)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 85% yield (59.9 mg, 0.170 mmol). Mp: 57 – 58 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.56 (s, 1H), 7.77 – 7.67 (m, 4H), 7.36 – 7.32 (m, 3H), 7.28 – 7.26 (m, 1H), 5.26 (s, 1H), 4.03 (s, 2H), 3.69 (s, 3H), 0.52 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.4, 169.1, 154.7, 147.9, 141.2, 136.9, 136.4, 135.7, 131.1, 128.6, 127.7, 124.1, 51.8, 47.0, 32.3, 30.2. **HRMS (ESI):** Calcd for $C_{21}H_{24}N_2NaO_3$ $[M+Na]^+$ 375.1679, found: 375.1683.



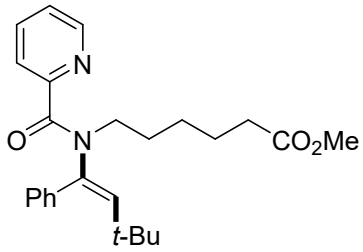
methyl (*E*)-3-(*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)picolinamido)propanoate (5q)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 67% yield (49.1 mg, 0.134 mmol). Mp: 66 – 67 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.54 (d, *J* = 4.3 Hz, 1H), 7.76 – 7.66 (m, 4H), 7.35 – 7.34 (m, 3H), 7.24 (t, *J* = 6.0 Hz, 1H), 4.99 (s, 1H), 3.63– 3.49 (m, 5H), 2.59 (t, *J* = 7.3 Hz, 2H), 0.50 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 172.0, 169.0, 155.3, 147.9, 141.0, 137.0, 136.4, 135.9, 130.9, 128.6, 127.7, 123.8, 123.8, 51.5, 41.0, 32.4, 31.8, 30.2. **HRMS (ESI):** Calcd for $C_{22}H_{26}N_2NaO_3$ $[M+Na]^+$ 389.1836, found: 389.1941.



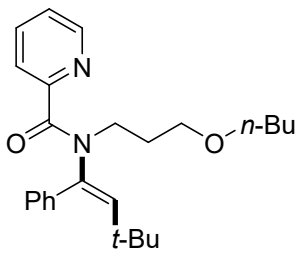
methyl (*E*)-4-(*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)picolinamido)butanoate (5r)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 65% yield (49.5 mg, 0.130 mmol). Mp: 56 – 57 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.53 (d, *J* = 4.6 Hz, 1H), 7.73 – 7.64 (m, 4H), 7.36 – 7.31 (m, 3H), 7.25 – 7.22 (m, 1H), 4.99 (s, 1H), 3.61 (s, 3H), 3.35 – 3.35 (m, 2H), 2.29 (t, *J* = 7.6 Hz, 2H), 1.88 – 1.82 (m, 2H), 0.49 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 173.4, 169.1, 155.6, 147.8, 140.8, 137.0, 136.3, 136.0, 130.8, 128.4, 127.6, 123.7, 123.7, 51.4, 43.8, 32.3, 31.3, 30.2, 22.3. **HRMS (ESI):** Calcd for $C_{23}H_{28}N_2NaO_3$ $[M+Na]^+$ 403.1992, found: 403.1997.



methyl (*E*)-6-(*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)picolinamido)hexanoate (5s)

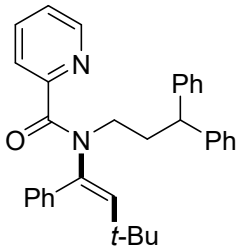
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 60% yield (49.0 mg, 0.120 mmol). Mp: 63 – 64 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.55 (d, *J* = 4.7 Hz, 1H), 7.74 – 7.65 (m, 4H), 7.38 – 7.32 (m, 3H), 7.25 – 7.19 (m, 1H), 4.99 (s, 1H), 3.64 (s, 3H), 3.32 – 3.32 (m, 2H), 2.26 (t, *J* = 7.6 Hz, 2H), 1.61 – 1.50 (m, 4H), 1.30 – 1.24 (m, 2H), 0.51 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 174.0, 169.0, 156.0, 147.9, 140.7, 137.2, 136.3, 136.3, 130.8, 128.4, 127.7, 123.7, 123.6, 51.4, 44.5, 33.9, 32.4, 30.3, 26.6, 26.3, 24.6. **HRMS (ESI):** Calcd for $C_{25}H_{32}N_2NaO_3$ $[M+Na]^+$ 431.2305, found: 431.2311.



(*E*)-*N*-(3-butoxypropyl)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)picolinamide (5t)

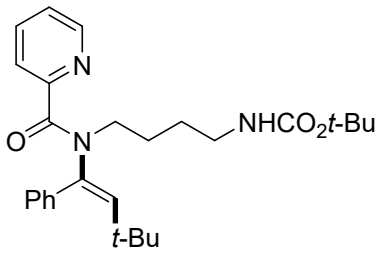
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 65% yield (51.3 mg, 0.130 mmol). Mp: 41 – 42 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ

8.56 (d, J = 4.4 Hz, 1H), 7.74 – 7.70 (m, 3H), 7.67 (d, J = 7.8 Hz, 1H), 7.36 – 7.32 (m, 3H), 7.24 (t, J = 5.0 Hz, 1H), 5.01 (s, 1H), 3.40 (t, J = 6.6 Hz, 3H), 3.34 (t, J = 6.6 Hz, 2H), 1.96 – 1.75 (m, 3H), 1.53 – 1.47 (m, 2H), 1.36 – 1.30 (m, 2H), 0.89 (t, J = 7.4 Hz, 3H), 0.51 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.1, 155.9, 147.9, 140.8, 137.2, 136.3, 136.2, 130.9, 128.4, 127.6, 123.7, 123.7, 70.5, 68.5, 42.2, 32.4, 31.8, 30.3, 27.4, 19.3, 13.9. **HRMS (ESI):** Calcd for $C_{25}H_{34}N_2NaO_2$ $[M+Na]^+$ 417.2513, found: 417.2518.



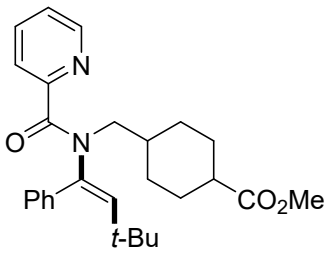
(*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-(3,3-diphenylpropyl)picolinamide (5u)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 53% yield (50.3 mg, 0.106 mmol). Mp: 44 – 45 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.60 (d, J = 4.7 Hz, 1H), 7.77 – 7.72 (m, 2H), 7.65 (d, J = 7.6 Hz, 2H), 7.40 – 7.34 (m, 3H), 7.32 – 7.26 (m, 5H), 7.24 – 7.19 (m, 6H), 5.04 (s, 1H), 3.94 (t, J = 7.8 Hz, 1H), 3.39 (s, 2H), 2.39 (q, J = 7.9 Hz, 2H), 0.57 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 168.8, 155.7, 147.7, 144.1, 140.2, 137.4, 136.2, 136.1, 130.8, 128.2, 127.6, 127.5, 127.5, 126.0, 123.6, 123.5, 48.9, 44.5, 32.4, 32.2, 30.2. **HRMS (ESI):** Calcd for $C_{33}H_{34}N_2NaO$ $[M+Na]^+$ 497.2563, found: 497.2569.



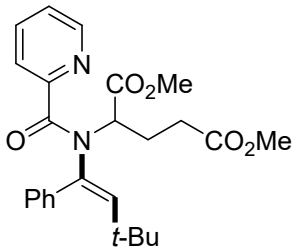
***tert*-butyl (*E*)-(4-(*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)picolinamido)butyl)carbamate (5v)**

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 59% yield (53.3 mg, 0.118 mmol). Mp: 42 – 43 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.51 (d, J = 3.9 Hz, 1H), 7.68 – 7.62 (m, 4H), 7.35 – 7.28 (m, 3H), 7.23 – 7.19 (m, 1H), 4.96 (s, 1H), 4.66 (s, 1H), 3.30 (s, 2H), 3.04 (s, 2H), 1.52 – 1.46 (m, 2H), 1.39 – 1.39 (m, 11H), 0.47 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.0, 155.8, 155.7, 147.8, 140.6, 137.0, 136.3, 136.1, 130.7, 128.4, 127.6, 123.6, 76.7, 44.2, 40.0, 32.3, 30.2, 28.3, 27.0, 24.2. **HRMS (ESI):** Calcd for $C_{27}H_{37}N_3NaO_3$ $[M+Na]^+$ 474.2727, found: 474.2731.



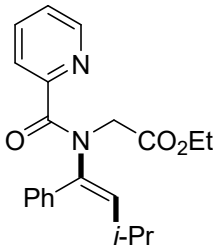
methyl (*E*)-4-((*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)picolinamido)methyl)cyclohexane-1-carboxylate (5w)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 61% yield (53.0 mg, 0.122 mmol). Mp: 45 – 46 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.54 (d, *J* = 4.7 Hz, 1H), 7.72 – 7.63 (m, 4H), 7.36 – 7.33 (m, 3H), 7.24 – 7.20 (m, 1H), 5.01 (s, 1H), 3.62 (s, 3H), 3.18 (s, 2H), 2.19 (t, *J* = 12.2 Hz, 1H), 1.94 (d, *J* = 11.3 Hz, 2H), 1.73 (d, *J* = 12.0 Hz, 2H), 1.60 – 1.54 (m, 1H), 1.38 – 1.31 (m, 2H), 0.98 (q, *J* = 12.8 Hz, 2H), 0.49 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 176.3, 169.4, 156.1, 147.8, 140.6, 137.4, 136.3, 136.1, 130.7, 128.4, 127.6, 123.6, 123.5, 51.3, 49.8, 43.0, 35.8, 32.3, 30.2, 29.6, 28.5. **HRMS (ESI):** Calcd for $C_{27}H_{34}N_2NaO_3$ $[M+Na]^+$ 457.2462, found: 457.2468.



dimethyl (*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-picolinoylglutamate (5x)

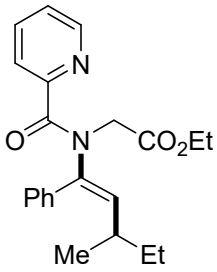
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 67% yield (58.8 mg, 0.134 mmol). Mp: 40 – 41 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.58 (d, *J* = 4.7 Hz, 1H), 7.82 – 7.69 (m, 4H), 7.38 – 7.32 (m, 3H), 7.28 (t, *J* = 5.5 Hz, 1H), 5.15 (s, 1H), 4.17 (s, 1H), 3.64 (s, 3H), 3.56 (s, 3H), 2.53 – 2.09 (m, 4H), 0.49 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 173.2, 170.6, 169.3, 155.0, 147.9, 141.9, 137.7, 136.5, 135.6, 131.6, 128.8, 127.6, 124.1, 124.0, 57.9, 52.0, 51.4, 32.4, 30.5, 30.1, 23.9. **HRMS (ESI):** Calcd for $C_{25}H_{30}N_2NaO_5$ $[M+Na]^+$ 461.2047, found: 461.2049.



ethyl (*E*)-N-(3-methyl-1-phenylbut-1-en-1-yl)-*N*-picolinoylglycinate (6a)

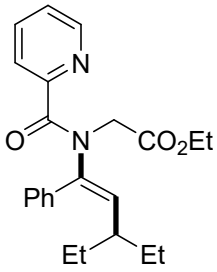
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 76% yield (53.6 mg, 0.152 mmol). Mp: 81 – 82 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.48 (d, *J* = 4.6 Hz, 1H), 7.70 (d, *J* = 4.2 Hz, 2H), 7.64 (d, *J* = 7.5 Hz, 2H), 7.39 – 7.31 (m, 3H), 7.24 – 7.22 (m, 1H), 5.10 (d, *J* = 10.7 Hz, 1H), 4.18 (q, *J* = 7.1 Hz, 2H), 4.06 (s,

2H), 2.31 (dq, *J* = 19.2, 6.5 Hz, 1H), 1.25 (t, *J* = 7.1 Hz, 3H), 0.55 (d, *J* = 6.3 Hz, 6H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.7, 168.6, 154.6, 148.2, 138.3, 137.4, 136.3, 135.0, 129.8, 128.4, 128.2, 124.1, 123.6, 60.9, 48.0, 27.4, 22.2, 14.1. **HRMS (ESI):** Calcd for $C_{21}H_{24}N_2NaO_3$ $[M+Na]^+$ 375.1679, found: 375.1684.



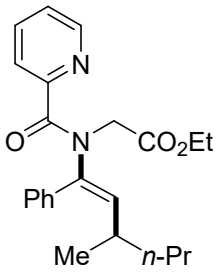
ethyl (*R*,*E*)-*N*-(3-methyl-1-phenylpent-1-en-1-yl)-*N*-picolinoylglycinate (6b)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 66% yield (48.4 mg, 0.132 mmol). Mp: 35 – 36 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.50 (d, *J* = 4.8 Hz, 1H), 7.73 – 7.68 (m, 2H), 7.66 (d, *J* = 7.0 Hz, 2H), 7.39 – 7.32 (m, 3H), 7.26 – 7.21 (m, 1H), 5.16 (d, *J* = 10.8 Hz, 1H), 4.21 – 4.13 (m, 3H), 4.02 (d, *J* = 17.0 Hz, 1H), 2.17 – 2.09 (m, 1H), 1.27 (t, *J* = 7.1 Hz, 3H), 1.01 – 0.91 (m, 2H), 0.60 (t, *J* = 7.4 Hz, 3H), 0.49 (d, *J* = 6.5 Hz, 3H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.7, 168.6, 154.6, 148.2, 138.1, 137.5, 136.4, 135.1, 129.9, 128.4, 128.2, 124.2, 123.7, 61.0, 48.1, 33.8, 29.4, 19.4, 14.2, 11.3. **HRMS (ESI):** Calcd for $C_{22}H_{26}N_2NaO_3$ $[M+Na]^+$ 389.1836, found: 389.1841.



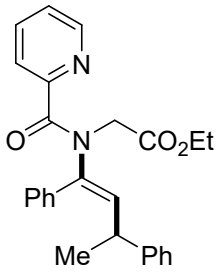
ethyl (*E*)-*N*-(3-ethyl-1-phenylpent-1-en-1-yl)-*N*-picolinoylglycinate (6c)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 72% yield (54.8 mg, 0.144 mmol). Mp: 37 – 38 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.51 (d, *J* = 4.8 Hz, 1H), 7.73 – 7.60 (m, 4H), 7.36 – 7.29 (m, 3H), 7.23 (t, *J* = 5.9 Hz, 1H), 5.23 (d, *J* = 11.0 Hz, 1H), 4.19 (q, *J* = 7.1 Hz, 2H), 4.11 (s, 2H), 2.05 – 1.95 (m, 1H), 1.26 (t, *J* = 7.2 Hz, 4H), 1.12 – 1.01 (m, 2H), 0.91 – 0.83 (m, 2H), 0.53 (t, *J* = 7.4 Hz, 6H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.6, 168.7, 154.5, 148.3, 139.1, 136.5, 136.4, 135.3, 129.9, 128.2, 128.1, 124.2, 123.7, 61.0, 48.3, 40.3, 27.0, 14.1, 11.2. **HRMS (ESI):** Calcd for $C_{23}H_{28}N_2NaO_3$ $[M+Na]^+$ 403.1992, found: 403.1997.



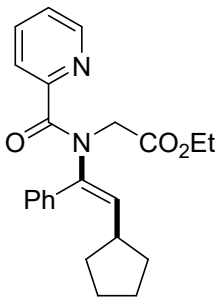
ethyl (*R*,*E*)-*N*-(3-methyl-1-phenylhex-1-en-1-yl)-*N*-picolinoylglycinate (6d)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 70% yield (53.3 mg, 0.140 mmol). Mp: 32 – 33 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.50 (d, *J* = 4.8 Hz, 1H), 7.74 – 7.61 (m, 4H), 7.39 – 7.31 (m, 3H), 7.24 (t, *J* = 6.8 Hz, 1H), 5.15 (d, *J* = 10.8 Hz, 1H), 4.19 (q, *J* = 7.1 Hz, 2H), 4.08 (q, *J* = 16.9 Hz, 2H), 2.23 – 2.17 (m, 1H), 1.26 (t, *J* = 7.1 Hz, 3H), 0.94 – 0.83 (m, 4H), 0.66 (t, *J* = 6.7 Hz, 3H), 0.52 (d, *J* = 6.4 Hz, 3H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.7, 168.6, 154.6, 148.2, 137.9, 137.7, 136.4, 135.1, 129.9, 128.3, 128.2, 124.1, 123.7, 61.0, 48.1, 39.0, 32.2, 20.0, 19.9, 14.1, 14.1. **HRMS (ESI):** Calcd for $C_{23}H_{28}N_2NaO_3$ $[M+Na]^+$ 403.1992, found: 403.1996.



ethyl (*S*,*E*)-*N*-(1,3-diphenylbut-1-en-1-yl)-*N*-picolinoylglycinate (6e)

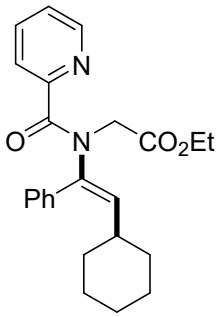
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 45% yield (37.3 mg, 0.090 mmol). Mp: 36 – 37 °C. **^{1}H NMR ($CDCl_3$, 400 MHz):** δ 8.36 (d, *J* = 4.2 Hz, 1H), 7.69 – 7.58 (m, 4H), 7.41 – 7.35 (m, 3H), 7.21 – 7.09 (m, 4H), 6.93 (d, *J* = 7.2 Hz, 2H), 5.51 (d, *J* = 10.8 Hz, 1H), 4.23 – 4.14 (m, 3H), 3.98 (d, *J* = 16.9 Hz, 1H), 3.49 – 3.41 (m, 1H), 1.25 (t, *J* = 7.2 Hz, 3H), 0.83 (d, *J* = 6.7 Hz, 3H). **^{13}C NMR ($CDCl_3$, 100 MHz):** δ 169.7, 168.6, 154.0, 148.1, 145.1, 138.6, 136.2, 134.7, 134.6, 129.9, 128.7, 128.5, 128.3, 126.6, 126.0, 124.1, 123.6, 61.0, 48.0, 38.3, 22.2, 14.1. **HRMS (ESI):** Calcd for $C_{26}H_{26}N_2NaO_3$ $[M+Na]^+$ 437.1836, found: 437.1840.



ethyl (*E*)-*N*-(2-cyclopentyl-1-phenylvinyl)-*N*-picolinoylglycinate (6f)

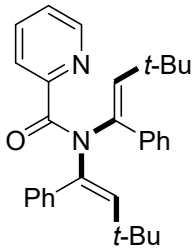
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/5) as a yellow solid in 56% yield (42.4 mg, 0.112 mmol). Mp: 35 – 36 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.47 (d, *J* = 4.7 Hz, 1H), 7.74 – 7.67 (m, 2H), 7.63 (d, *J* = 7.0 Hz, 2H), 7.40 – 7.32 (m, 3H), 7.25 – 7.22 (m, 1H), 5.19 (d, *J* = 10.6 Hz, 1H), 4.19 (q, *J* = 7.1 Hz, 2H), 4.06 (s, 2H),

2.40 – 2.35 (m, 1H), 1.48 – 1.41 (m, 2H), 1.35 – 1.35 (m, 4H), 1.26 (t, *J* = 7.1 Hz, 3H), 0.76 – 0.76 (m, 2H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.8, 168.6, 154.6, 148.2, 138.0, 136.6, 136.3, 135.0, 130.0, 128.4, 128.2, 124.0, 123.5, 61.0, 48.1, 39.0, 33.3, 25.2, 14.1. **HRMS (ESI):** Calcd for $C_{23}H_{26}N_2NaO_3$ $[M+Na]^+$ 401.1836, found: 401.1841.



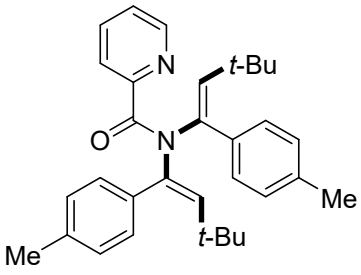
ethyl (*E*)-*N*-(2-cyclohexyl-1-phenylvinyl)-*N*-picolinoylglycinate (6g)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 51% yield (40.0 mg, 0.102 mmol). Mp: 30 – 31 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.48 (d, *J* = 4.0 Hz, 1H), 7.73 – 7.66 (m, 2H), 7.63 (d, *J* = 7.0 Hz, 2H), 7.40 – 7.33 (m, 3H), 7.23 – 7.23 (s, 1H), 5.15 (d, *J* = 10.7 Hz, 1H), 4.20 – 4.15 (m, 2H), 4.05 (s, 2H), 2.05 – 1.97 (m, 1H), 1.48 – 1.47 (m, 3H), 1.25 (t, *J* = 7.1 Hz, 3H), 1.12 – 1.10 (m, 2H), 1.02 – 0.98 (m, 3H), 0.67 – 0.65 (m, 2H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.8, 168.6, 154.5, 148.2, 137.8, 137.1, 136.3, 135.0, 129.7, 128.4, 128.2, 124.1, 123.5, 60.9, 48.1, 36.9, 32.2, 25.7, 25.1, 14.1. **HRMS (ESI):** Calcd for $C_{24}H_{28}N_2NaO_3$ $[M+Na]^+$ 415.1992, found: 415.1999.



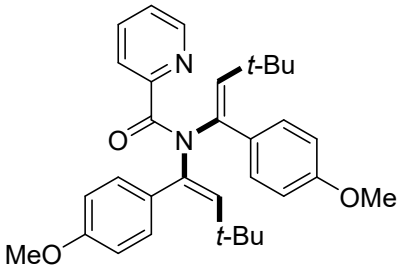
***N*,*N*-bis((*E*)-3,3-dimethyl-1-phenylbut-1-en-1-yl)picolinamide (7a)**

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 65% yield (57.0 mg, 0.130 mmol). Mp: 34 – 35 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.56 (d, *J* = 4.6 Hz, 1H), 7.80 – 7.80 (m, 2H), 7.71 – 7.65 (m, 2H), 7.35 – 7.35 (m, 3H), 7.24 – 7.21 (m, 1H), 7.19 – 7.09 (m, 5H), 5.67 (s, 1H), 4.98 (s, 1H), 0.81 (s, 9H), 0.53 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 168.7, 155.7, 147.7, 141.3, 141.0, 138.1, 137.1, 137.0, 136.3, 135.7, 132.1, 130.7, 128.1, 127.3, 127.1, 126.8, 124.3, 124.0, 32.5, 32.5, 30.9, 30.3. **HRMS (ESI):** Calcd for $C_{30}H_{34}N_2NaO$ $[M+Na]^+$ 461.2563, found: 461.2568.



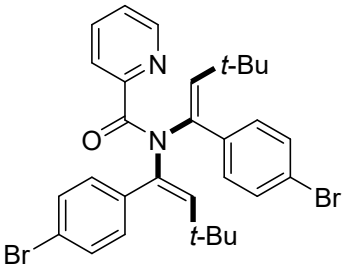
***N*,*N*-bis((*E*)-3,3-dimethyl-1-(p-tolyl)but-1-en-1-yl)picolinamide (7b)**

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 61% yield (56.9 mg, 0.122 mmol). Mp: 49 – 50 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.56 – 8.52 (m, 1H), 7.72 – 7.63 (m, 4H), 7.22 – 7.14 (m, 3H), 7.04 – 6.97 (m, 4H), 5.64 (s, 1H), 4.97 (s, 1H), 2.39 (s, 3H), 2.26 (s, 3H), 0.82 (s, 9H), 0.54 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 168.7, 155.8, 147.7, 141.0, 140.5, 138.3, 137.8, 136.8, 136.2, 135.9, 134.3, 134.0, 132.0, 130.5, 127.8, 127.5, 124.2, 123.9, 32.5, 32.4, 31.0, 30.4, 21.4, 21.2. **HRMS (ESI):** Calcd for $C_{32}H_{38}N_2NaO$ $[M+Na]^+$ 489.2876, found: 489.2883.



_N_,_N_-bis((_E_)-1-(4-methoxyphenyl)-3,3-dimethylbut-1-en-1-yl)picolinamide (7c)

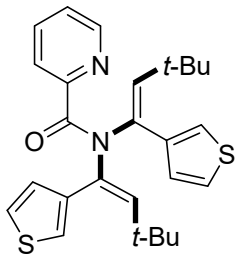
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 56% yield (55.9 mg, 0.112 mmol). Mp: 42 – 43 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.53 (d, *J* = 4.7 Hz, 1H), 7.78 – 7.62 (m, 4H), 7.22 – 7.20 (m, 1H), 7.05 (d, *J* = 8.2 Hz, 2H), 6.89 (d, *J* = 8.2 Hz, 2H), 6.71 (d, *J* = 8.3 Hz, 2H), 5.64 (s, 1H), 4.95 (s, 1H), 3.85 (s, 3H), 3.73 (s, 3H), 0.82 (s, 9H), 0.52 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 168.7, 159.4, 158.7, 155.8, 147.6, 140.9, 140.5, 138.0, 136.3, 135.7, 133.2, 131.8, 129.6, 129.4, 124.2, 123.9, 112.4, 112.2, 55.2, 55.0, 32.5, 32.5, 31.0, 30.3. **HRMS (ESI):** Calcd for $C_{32}H_{38}N_2NaO_3$ $[M+Na]^+$ 521.2775, found: 521.2777.



***N*,*N*-bis((*E*)-1-(4-bromophenyl)-3,3-dimethylbut-1-en-1-yl)picolinamide(7d)**

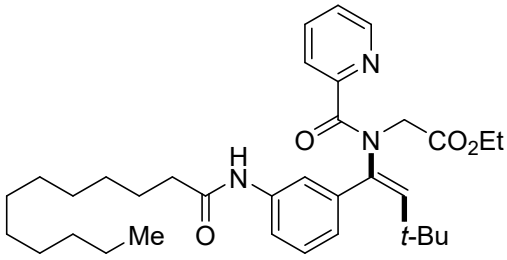
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 75% yield (89.5 mg, 0.150 mmol). Mp: 65 – 66 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.53 (d, *J* = 4.7 Hz, 1H), 7.73 – 7.68 (m, 4H), 7.52 (d, *J* = 8.1 Hz, 2H), 7.31 (d, *J* = 8.1 Hz, 2H), 7.26 – 7.23 (m, 1H), 6.97 (d, *J* = 8.0 Hz, 2H), 5.65 (s, 1H), 4.98 (s, 1H), 0.81 (s, 9H), 0.52 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 168.6, 155.0, 147.6, 142.0, 141.5, 136.9, 136.5, 135.9, 135.9, 134.5, 133.7, 132.2, 130.4, 130.1, 124.4, 124.4, 122.5,

121.7, 32.6, 32.6, 31.0, 30.3. **HRMS (ESI):** Calcd for $C_{30}H_{32}Br_2N_2NaO$ $[M+Na]^+$ 617.07736 and 619.07531, found: 617.0779 and 619.0759.



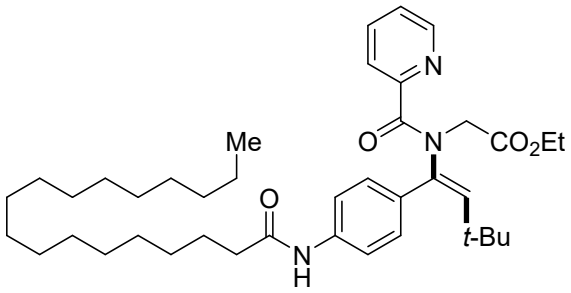
_N_,_N_-bis((_E_)-3,3-dimethyl-1-(thiophen-3-yl)but-1-en-1-yl)picolinamide (7e)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 70% yield (63.1 mg, 0.140 mmol). Mp: 34 – 35 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.54 (d, J = 4.7 Hz, 1H), 7.68 (d, J = 3.4 Hz, 2H), 7.52 (d, J = 1.4 Hz, 1H), 7.46 (d, J = 4.5 Hz, 1H), 7.26 – 7.22 (m, 2H), 7.07 (d, J = 4.0 Hz, 1H), 6.95 (s, 1H), 6.82 (d, J = 4.5 Hz, 1H), 5.71 (s, 1H), 5.00 (s, 1H), 0.87 (s, 9H), 0.56 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 168.2, 155.4, 147.7, 142.1, 141.9, 137.6, 137.1, 136.3, 133.5, 131.3, 131.0, 130.3, 127.0, 125.3, 124.1, 124.1, 123.6, 123.0, 32.4, 32.3, 30.7, 30.1. **HRMS (ESI):** Calcd for $C_{26}H_{30}N_2NaOS_2$ $[M+Na]^+$ 473.1692, found: 473.1696.



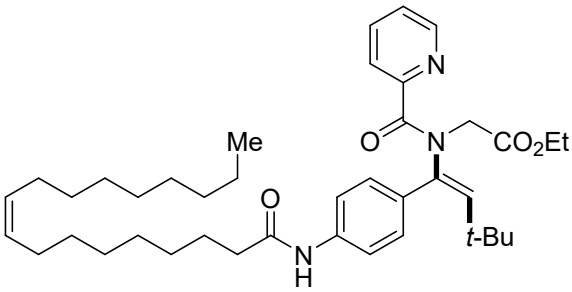
ethyl (_E_)-_N_-(1-(3-dodecanamidophenyl)-3,3-dimethylbut-1-en-1-yl)-_N_-picolinoylglycinate (8a)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/1) as a yellow solid in 73% yield (82.3 mg, 0.146 mmol). Mp: 39 – 40 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.52 (d, J = 4.7 Hz, 1H), 8.16 (s, 1H), 7.89 (s, 1H), 7.71 – 7.67 (m, 2H), 7.65 (d, J = 8.0 Hz, 1H), 7.33 (d, J = 7.5 Hz, 1H), 7.24 – 7.19 (m, 2H), 5.22 (s, 1H), 4.12 (q, J = 7.1 Hz, 2H), 3.97 (s, 2H), 2.32 (t, J = 7.6 Hz, 2H), 1.71 – 1.64 (m, 2H), 1.30 – 1.18 (m, 19H), 0.83 (t, J = 6.9 Hz, 3H), 0.50 (s, 9H). **^{13}C NMR ($CDCl_3$, 126 MHz):** δ 171.9, 169.4, 168.4, 154.4, 147.9, 141.6, 138.1, 136.4, 136.4, 136.1, 128.1, 126.4, 124.0, 123.7, 121.9, 119.9, 60.8, 47.2, 37.5, 32.3, 31.7, 30.0, 29.5, 29.4, 29.3, 29.3, 29.2, 29.1, 25.5, 22.5, 14.0, 13.9. **HRMS (ESI):** Calcd for $C_{34}H_{49}N_3NaO_4$ $[M+Na]^+$ 586.3615, found: 586.3613.



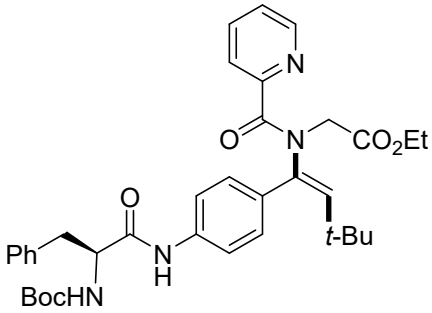
ethyl (*E*)-*N*-(3,3-dimethyl-1-(3-stearamidophenyl)but-1-en-1-yl)-*N*-picolinoylglycinate (8b)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/1) as a yellow solid in 70% yield (90.7 mg, 0.140 mmol). Mp: 47 – 48 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.52 (d, *J* = 4.7 Hz, 1H), 8.18 (s, 1H), 7.72 – 7.68 (m, 2H), 7.62 (d, *J* = 8.4 Hz, 2H), 7.56 (d, *J* = 8.4 Hz, 2H), 7.25 (t, *J* = 4.9 Hz, 1H), 5.22 (s, 1H), 4.13 (q, *J* = 7.1 Hz, 2H), 3.99 (s, 2H), 2.31 (t, *J* = 7.5 Hz, 2H), 1.69 – 1.63 (m, 2H), 1.28 – 1.20 (m, 31H), 0.83 (t, *J* = 7.1 Hz, 3H), 0.50 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 171.9, 169.6, 168.6, 154.6, 147.9, 141.2, 138.9, 136.6, 136.4, 131.6, 130.8, 124.1, 123.9, 118.7, 60.9, 47.2, 37.5, 32.3, 31.8, 30.2, 29.6, 29.5, 29.4, 29.3, 29.2, 29.2, 25.5, 22.5, 14.0, 14.0. **HRMS (ESI):** Calcd for $C_{40}H_{61}N_3NaO_4$ $[M+Na]^+$ 670.4554, found: 670.4550.



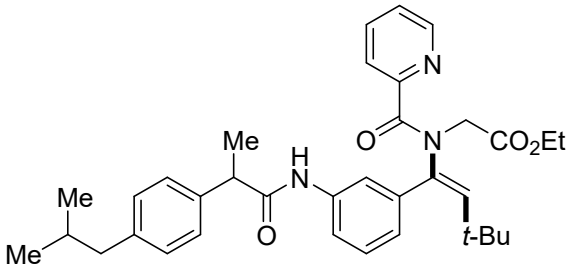
ethyl *N*-((*E*)-3,3-dimethyl-1-(4-oleamidophenyl)but-1-en-1-yl)-*N*-picolinoylglycinate (8c)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/1) as a yellow solid in 65% yield (84.0 mg, 0.130 mmol). Mp: 37 – 38 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.54 (d, *J* = 4.7 Hz, 1H), 7.79 – 7.71 (m, 3H), 7.65 (d, *J* = 8.4 Hz, 2H), 7.56 (d, *J* = 8.2 Hz, 2H), 7.29 – 7.27 (m, 1H), 5.35 – 5.32 (m, 2H), 5.25 (s, 1H), 4.16 (q, *J* = 7.1 Hz, 2H), 4.01 (s, 2H), 2.34 (t, *J* = 7.5 Hz, 2H), 2.06 – 1.95 (m, 4H), 1.74 – 1.67 (m, 2H), 1.34 – 1.22 (m, 23H), 0.87 (t, *J* = 6.9 Hz, 3H), 0.53 (s, 9H). **^{13}C NMR ($CDCl_3$, 126 MHz):** δ 171.7, 169.5, 168.6, 154.7, 147.9, 141.3, 138.7, 136.6, 136.5, 131.7, 131.1, 129.9, 129.7, 124.1, 124.0, 118.7, 60.9, 47.3, 37.7, 32.4, 31.8, 30.2, 29.7, 29.7, 29.4, 29.3, 29.2, 29.2, 29.1, 27.2, 27.1, 25.5, 22.6, 14.1, 14.0. **HRMS (ESI):** Calcd for $C_{40}H_{59}N_3NaO_4$ $[M+Na]^+$ 668.4398, found: 668.4389.



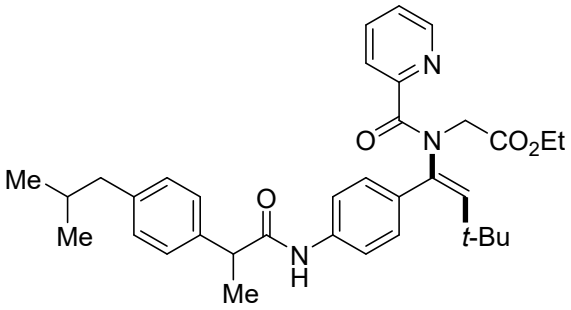
ethyl (*S*,*E*)-*N*-(1-(3-(2-((tert-butoxycarbonyl)amino)-3-phenylpropanamido)phenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (8d)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/1) as a yellow solid in 54% yield (67.9 mg, 0.108 mmol). Mp: 50 – 51 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.62 – 8.52 (m, 2H), 7.72 (d, *J* = 3.6 Hz, 2H), 7.63 (d, *J* = 8.2 Hz, 2H), 7.43 (d, *J* = 8.2 Hz, 2H), 7.26 – 7.17 (m, 6H), 5.56 (s, 1H), 5.23 (s, 1H), 4.59 (s, 1H), 4.15 (q, *J* = 7.1 Hz, 2H), 3.99 (s, 2H), 3.15 – 3.04 (m, 2H), 1.37 (s, 9H), 1.22 (t, *J* = 7.1 Hz, 3H), 0.51 (s, 9H). **^{13}C NMR ($CDCl_3$, 126 MHz):** δ 170.0, 169.4, 168.6, 155.8, 154.6, 147.8, 141.3, 137.9, 136.6, 136.5, 136.4, 131.6, 131.5, 129.2, 128.5, 126.8, 124.1, 124.0, 119.1, 80.3, 60.9, 56.5, 47.1, 38.6, 32.3, 30.2, 28.2, 14.1. **HRMS (ESI):** Calcd for $C_{36}H_{44}N_4NaO_6$ $[M+Na]^+$ 651.3153, found: 651.3151.



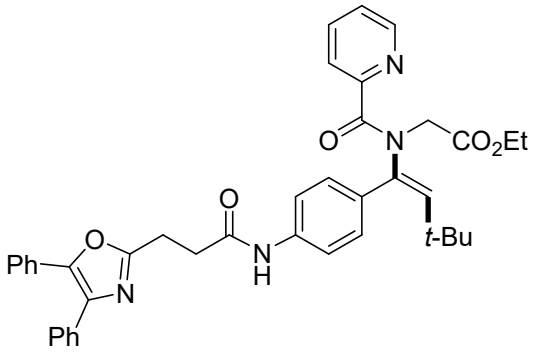
ethyl (*E*)-*N*-(1-(3-(2-(4-isobutylphenyl)propanamido)phenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (8e)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/1) as a yellow solid in 66% yield (75.2 mg, 0.132 mmol). Mp: 72 – 73 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.50 (d, *J* = 4.6 Hz, 1H), 7.80 (s, 1H), 7.76 (s, 1H), 7.71 – 7.64 (m, 2H), 7.60 (d, *J* = 8.0 Hz, 1H), 7.34 – 7.29 (m, 3H), 7.25 – 7.21 (m, 2H), 7.13 (d, *J* = 7.9 Hz, 2H), 5.25 (s, 1H), 4.14 (q, *J* = 7.1 Hz, 2H), 3.96 (s, 2H), 3.73 (q, *J* = 7.0 Hz, 1H), 2.44 (d, *J* = 7.2 Hz, 2H), 1.87 – 1.79 (m, 1H), 1.56 (d, *J* = 7.1 Hz, 3H), 1.22 (t, *J* = 7.1 Hz, 3H), 0.88 (d, *J* = 6.6 Hz, 6H), 0.51 (s, 9H). **^{13}C NMR ($CDCl_3$, 126 MHz):** δ 172.7, 169.4, 168.5, 154.4, 147.8, 141.7, 140.6, 138.3, 138.0, 136.4, 136.3, 136.2, 129.5, 128.1, 127.3, 126.7, 124.0, 123.8, 121.8, 119.8, 60.8, 47.4, 47.2, 44.9, 32.3, 30.1, 30.0, 22.2, 18.6, 14.0. **HRMS (ESI):** Calcd for $C_{35}H_{43}N_3NaO_4$ $[M+Na]^+$ 592.3146, found: 592.3142.



ethyl (*E*)-*N*-(1-(4-(2-(4-isobutylphenyl)propanamido)phenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (8f)

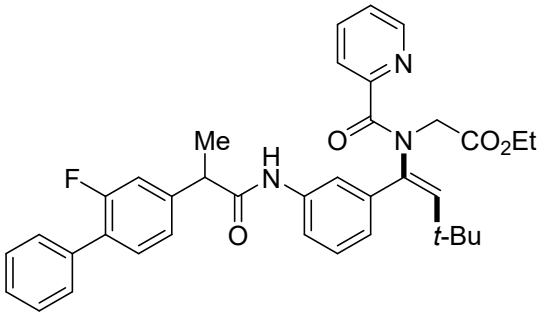
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/1) as a yellow solid in 69% yield (78.6 mg, 0.138 mmol). Mp: 52 – 53 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.52 (d, *J* = 4.4 Hz, 1H), 7.95 – 7.84 (m, 1H), 7.71 – 7.71 (m, 2H), 7.63 (d, *J* = 8.3 Hz, 2H), 7.51 (d, *J* = 5.1 Hz, 2H), 7.27 (t, *J* = 6.8 Hz, 3H), 7.14 – 7.11 (m, 2H), 5.25 (s, 1H), 4.15 (q, *J* = 7.1 Hz, 2H), 3.99 (s, 2H), 3.73 (q, *J* = 7.0 Hz, 1H), 2.45 (d, *J* = 7.1 Hz, 2H), 1.88 – 1.82 (m, 1H), 1.57 – 1.55 (m, 3H), 1.23 (t, *J* = 7.1 Hz, 3H), 0.90 (d, *J* = 6.6 Hz, 6H), 0.52 (s, 9H). **^{13}C NMR ($CDCl_3$, 126 MHz):** δ 172.8, 169.5, 168.5, 154.6, 147.8, 141.2, 140.7, 138.6, 138.1, 136.5, 136.4, 131.6, 131.0, 129.6, 127.3, 124.1, 123.9, 118.6, 60.9, 47.4, 47.1, 44.9, 32.3, 30.2, 30.0, 22.3, 18.5, 14.0. **HRMS (ESI):** Calcd for $C_{35}H_{43}N_3NaO_4$ $[M+Na]^+$ 592.3146, found: 592.3140.



ethyl (*E*)-*N*-(1-(4-(3-(4,5-diphenyloxazol-2-yl)propanamido)phenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (8g)

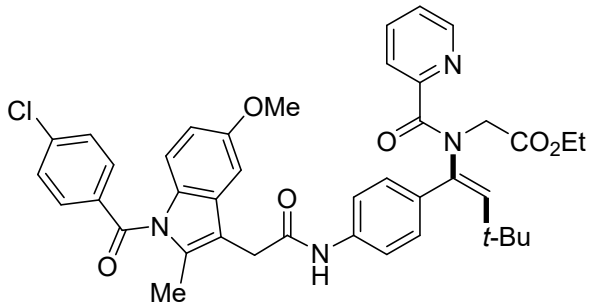
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/1) as a yellow solid in 57% yield (74.9 mg, 0.114 mmol). Mp: 53 – 54 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.97 (d, *J* = 5.7 Hz, 1H), 8.51 (d, *J* = 4.3 Hz, 1H), 7.73 – 7.67 (m, 2H), 7.63 – 7.62 (m, 4H), 7.56 – 7.54 (m, 4H), 7.37 – 7.30 (m, 6H), 7.25 – 7.21 (m, 1H), 5.24 (s, 1H), 4.14 (q, *J* = 7.1 Hz, 2H), 4.00 (s, 2H), 3.25 (t, *J* = 6.9 Hz, 2H), 2.93 (t, *J* = 6.9 Hz, 2H), 1.21 (t, *J* = 7.1 Hz, 3H), 0.51 (s, 9H). **^{13}C NMR ($CDCl_3$, 126 MHz):** δ 169.9, 169.5, 168.6, 162.4, 154.6, 147.9, 145.6, 141.2, 138.7, 136.6, 136.4, 134.7, 132.1, 131.7, 131.1, 128.6, 128.5, 128.1, 127.8, 126.4, 124.1, 123.9, 118.7, 60.9,

47.2, 33.9, 32.3, 30.2, 23.8, 14.1. **HRMS (ESI):** Calcd for $C_{40}H_{40}N_4NaO_5$ $[M+Na]^+$ 679.2891, found: 679.2886.



ethyl (*E*)-*N*-(1-(3-(2-(2-fluoro-[1,1'-biphenyl]-4-yl)propanamido)phenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (8h)

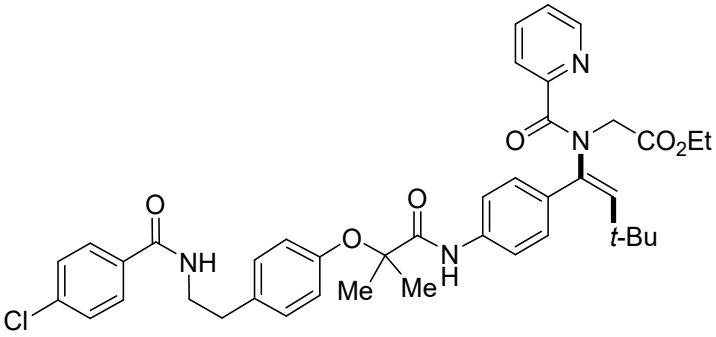
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/1) as a yellow solid in 61% yield (74.1 mg, 0.122 mmol). Mp: 63 – 64 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.56 (d, *J* = 4.5 Hz, 1H), 8.22 (s, 1H), 7.92 (s, 1H), 7.79 (d, *J* = 7.9 Hz, 1H), 7.75 – 7.69 (m, 2H), 7.57 (d, *J* = 7.9 Hz, 2H), 7.49 – 7.46 (m, 3H), 7.41 (t, *J* = 7.3 Hz, 1H), 7.36 – 7.26 (m, 5H), 5.32 (s, 1H), 4.20 (q, *J* = 7.1 Hz, 2H), 4.03 (s, 2H), 3.86 (q, *J* = 6.9 Hz, 1H), 1.66 (d, *J* = 7.0 Hz, 3H), 1.28 (t, *J* = 7.1 Hz, 3H), 0.58 (s, 9H). **^{13}C NMR ($CDCl_3$, 126 MHz):** δ 171.8, 169.4, 168.5, 159.7 (d, *J* = 248.8 Hz), 154.3, 147.9, 142.6 (d, *J* = 7.6 Hz), 141.9, 138.0, 136.6, 136.3 (d, *J* = 7.4 Hz), 135.3, 131.0 (d, *J* = 3.4 Hz), 128.8 (d, *J* = 2.7 Hz), 128.4, 128.2, 127.9 (d, *J* = 13.1 Hz), 127.7, 127.1, 124.2, 123.9, 123.6 (d, *J* = 3.2 Hz), 121.8, 120.1, 115.4 (d, *J* = 23.5 Hz), 61.0, 47.3, 32.4, 30.1, 18.8, 14.1. **^{19}F NMR ($CDCl_3$, 471 MHz):** δ -117.1. **HRMS (ESI):** Calcd for $C_{37}H_{38}FN_3NaO_4$ $[M+Na]^+$ 630.2739, found: 630.2736.



ethyl (*E*)-*N*-(1-(4-(2-(1-(4-chlorobenzoyl)-5-methoxy-2-methyl-1H-indol-3-yl)acetamido)phenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (8i)

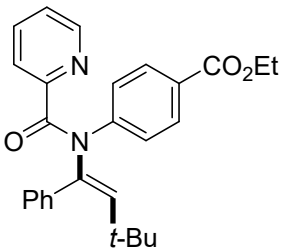
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/1) as a yellow solid in 53% yield (76.5 mg, 0.106 mmol). Mp: 100 – 101 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.52 (d, *J* = 4.7 Hz, 1H), 7.86 (s, 1H), 7.75 – 7.72 (m, 2H), 7.68 – 7.63 (m, 4H), 7.49 – 7.45 (m, 4H), 7.28 (t, *J* = 4.3 Hz, 1H), 7.00 (d, *J* = 2.4 Hz, 1H), 6.88 (d, *J* = 9.0 Hz, 1H), 6.71 (dd, *J* = 9.0, 2.5 Hz, 1H), 5.25 (s, 1H), 4.15 (q, *J* = 7.1 Hz, 2H), 3.99 (s, 2H), 3.81 – 3.80 (m, 5H), 2.44 (s, 3H), 1.24 (t,

J = 7.1 Hz, 3H), 0.52 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.5, 168.5, 168.4, 168.2, 156.2, 154.6, 147.8, 141.3, 139.4, 138.1, 136.4, 133.5, 131.7, 131.6, 131.1, 130.9, 130.3, 129.1, 124.1, 124.0, 119.0, 115.0, 112.5, 112.0, 101.0, 60.9, 55.6, 47.2, 33.1, 32.3, 30.2, 14.0, 13.3. **HRMS (ESI):** Calcd for $C_{41}H_{41}ClN_4NaO_6$ $[M+Na]^+$ 743.2607, found: 743.2601.



ethyl (*E*)-*N*-(1-(4-(2-(4-(2-(4-chlorobenzamido)ethyl)phenoxy)-2-methylpropanamido)phenyl)-3,3-dimethylbut-1-en-1-yl)-*N*-picolinoylglycinate (8j)

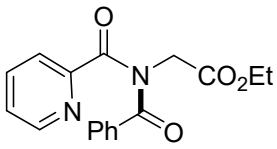
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/1) as a yellow solid in 43% yield (62.4mg, 0.086 mmol). Mp: 75 – 76 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.76 (s, 1H), 8.51 (d, J = 4.7 Hz, 1H), 7.70 – 7.59 (m, 8H), 7.29 (d, J = 8.4 Hz, 2H), 7.24 (d, J = 6.6 Hz, 1H), 7.11 (d, J = 8.4 Hz, 2H), 6.90 (d, J = 8.4 Hz, 2H), 6.83 (t, J = 4.7 Hz, 1H), 5.23 (s, 1H), 4.15 – 4.11 (m, 2H), 3.98 (s, 2H), 3.62 – 3.58 (m, 2H), 2.84 (t, J = 7.3 Hz, 2H), 1.53 (s, 6H), 1.21 (t, J = 7.1 Hz, 3H), 0.51 (s, 9H). **^{13}C NMR ($CDCl_3$, 126 MHz):** δ 173.0, 169.4, 168.5, 166.4, 154.5, 152.2, 147.8, 141.3, 137.8, 137.3, 136.4, 136.4, 134.4, 132.8, 131.7, 131.5, 129.5, 128.5, 128.3, 124.1, 123.8, 122.0, 118.9, 81.8, 60.8, 47.1, 41.2, 34.7, 32.3, 30.1, 24.8, 14.0. **HRMS (ESI):** Calcd for $C_{41}H_{45}ClN_4NaO_6$ $[M+Na]^+$ 747.2920, found: 747.2915.



ethyl (*E*)-4-(*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)picolinamido)benzoate (8k)

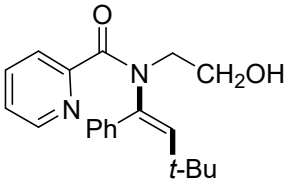
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 80% yield (68.6 mg, 0.160 mmol). Mp: 90 – 91 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.58 (s, 1H), 7.91 (d, J = 7.4 Hz, 2H), 7.77 – 7.77 (s, 2H), 7.61 – 7.61 (s, 2H), 7.34 – 7.16 (m, 6H), 5.41 (s, 1H), 4.30 (q, J = 7.1 Hz, 2H), 1.33 (t, J = 7.1 Hz, 3H), 0.66 (s, 9H). **^{13}C NMR ($CDCl_3$, 126 MHz):** δ 169.2, 166.0, 155.1, 148.0, 142.4, 137.7, 136.6, 136.1, 131.0, 130.0,

128.1, 127.9, 127.3, 126.5, 124.4, 124.3, 60.8, 32.7, 30.4, 14.2. **HRMS (ESI):** Calcd for $C_{27}H_{28}N_2NaO_3$ $[M+Na]^+$ 451.1992, found: 451.1990.



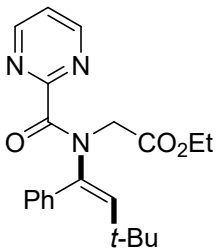
ethyl *N*-benzoyl-*N*-picolinoylglycinate (9)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 67% yield (83.7 mg, 0.268 mmol). Mp: 93 – 94 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.28 – 8.28 (m, 1H), 7.70 – 7.63 (m, 3H), 7.54 (t, *J* = 7.7 Hz, 1H), 7.19 (t, *J* = 7.4 Hz, 1H), 7.13 – 7.08 (m, 3H), 4.82 (s, 2H), 4.24 (q, *J* = 7.1 Hz, 2H), 1.28 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 173.5, 171.4, 168.9, 151.8, 148.1, 137.0, 136.6, 131.6, 128.9, 127.9, 125.7, 124.9, 61.6, 47.5, 14.1. **HRMS (ESI):** Calcd for $C_{17}H_{16}N_2NaO_4$ $[M+Na]^+$ 335.1002, found: 335.1003.



ethyl (*E*)-*N*-(2-(4-methoxyphenyl)-1-phenylvinyl)-*N*-picolinoylglycinate (10)

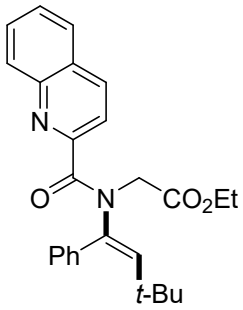
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/3) as a yellow solid in 73% yield (94.7 mg, 0.292 mmol). Mp: 57 – 58 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.57 – 8.57 (, 1H), 7.74 – 7.74 (m, 4H), 7.35 – 7.29 (m, 4H), 5.12 (s, 1H), 3.82 – 3.36 (m, 5H), 0.52 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 171.4, 154.8, 147.9, 141.1, 137.2, 136.6, 135.8, 131.1, 128.7, 127.8, 124.3, 61.3, 48.2, 32.5, 30.2. **HRMS (ESI):** Calcd for $C_{20}H_{24}N_2NaO_2$ $[M+Na]^+$ 347.1730, found: 347.1733.



ethyl (*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-(pyrimidine-2-carbonyl)glycinate (4a-1)

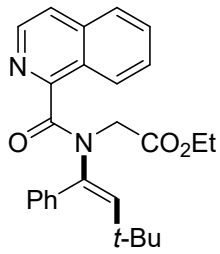
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/5) as a yellow solid in 55% yield (40.4 mg, 0.110 mmol). Mp: 38 – 39 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.81 (d, *J* = 4.9 Hz, 2H), 7.67 – 7.65 (m, 2H), 7.37 – 7.34 (m, 3H), 7.30 (t, *J* = 4.9 Hz, 1H), 5.49 (s, 1H), 4.19 – 4.15 (m, 2H), 4.06 (s, 2H), 1.25 (s, 3H), 0.53 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ

168.2, 166.8, 163.5, 156.9, 141.9, 136.4, 135.1, 131.0, 128.9, 127.9, 120.8, 61.0, 46.5, 32.5, 30.4, 14.2. **HRMS (ESI):** Calcd for $C_{21}H_{25}N_3NaO_3$ $[M+Na]^+$ 390.1788, found: 390.1790.



ethyl (*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-(quinoline-2-carbonyl)glycinate (4a-2)

The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/5) as a yellow solid in 78% yield (65.0 mg, 0.156 mmol). Mp: 82 – 83 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.40 (d, *J* = 5.7 Hz, 1H), 8.30 – 8.25 (m, 1H), 7.72 – 7.68 (m, 1H), 7.61 – 7.55 (m, 4H), 7.53 (d, *J* = 5.7 Hz, 1H), 7.26 – 7.21 (m, 3H), 5.38 (s, 1H), 4.17 (q, *J* = 7.2 Hz, 2H), 4.07 (s, 2H), 1.22 (t, *J* = 7.2 Hz, 3H), 0.09 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 168.8, 168.7, 156.2, 141.1, 140.8, 136.1, 136.0, 135.4, 130.8, 130.4, 128.6, 127.9, 127.8, 126.8, 126.7, 126.6, 120.9, 61.1, 46.7, 32.0, 29.8, 14.1. **HRMS (ESI):** Calcd for $C_{26}H_{28}N_2NaO_3$ $[M+Na]^+$ 439.1992, found: 439.1996.



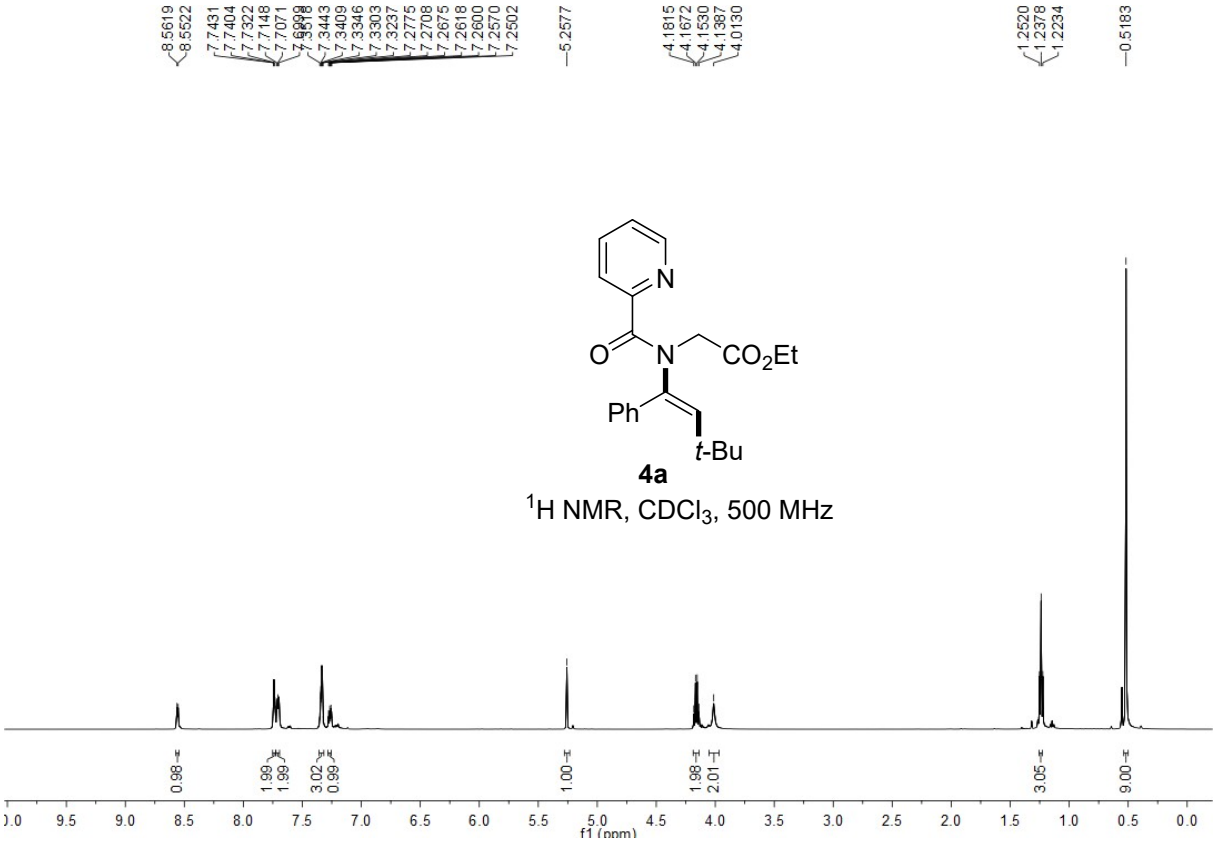
ethyl (*E*)-*N*-(3,3-dimethyl-1-phenylbut-1-en-1-yl)-*N*-(isoquinoline-1-carbonyl)glycinate (4a-3)

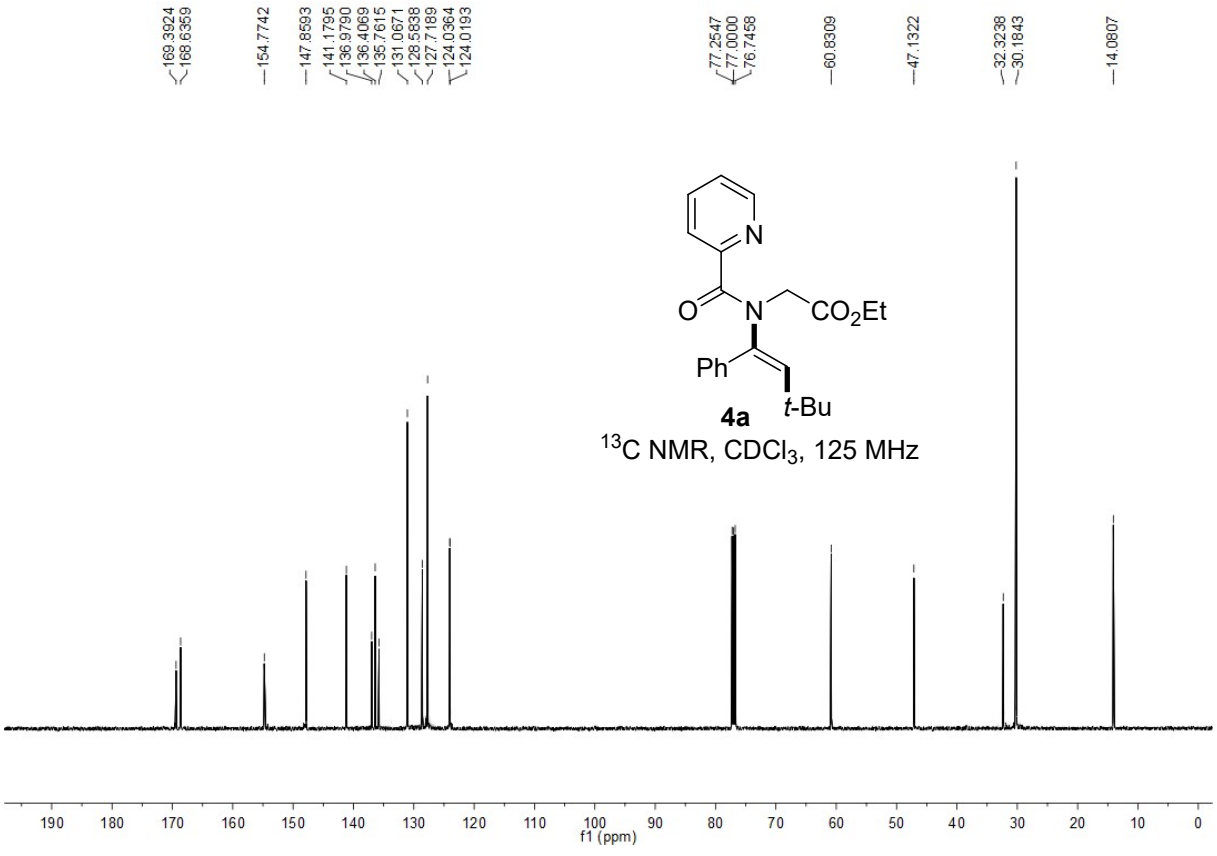
The title compound was isolated by column chromatography (eluent: EtOAc/petroleum ether = 1/5) as a yellow solid in 61% yield (50.8 mg, 0.122 mmol). Mp: 95 – 96 °C. **^{1}H NMR ($CDCl_3$, 500 MHz):** δ 8.06 (d, *J* = 8.5 Hz, 1H), 7.90 (d, *J* = 8.5 Hz, 1H), 7.73 (d, *J* = 6.4 Hz, 2H), 7.69 (d, *J* = 8.4 Hz, 1H), 7.65 (d, *J* = 8.1 Hz, 1H), 7.53 (t, *J* = 7.7 Hz, 1H), 7.37 (t, *J* = 7.5 Hz, 1H), 7.26 – 7.19 (m, 3H), 5.15 (s, 1H), 4.04 (q, *J* = 7.1 Hz, 2H), 3.94 (s, 2H), 1.10 (t, *J* = 7.1 Hz, 3H), 0.19 (s, 9H). **^{13}C NMR ($CDCl_3$, 125 MHz):** δ 169.5, 168.6, 154.1, 146.5, 141.3, 137.2, 136.5, 135.9, 131.2, 129.8, 129.5, 128.7, 127.9, 127.7, 127.5, 127.2, 121.1, 60.9, 47.2, 32.3, 30.1, 14.1. **HRMS (ESI):** Calcd for $C_{26}H_{28}N_2NaO_3$ $[M+Na]^+$ 439.1992, found: 439.1996.

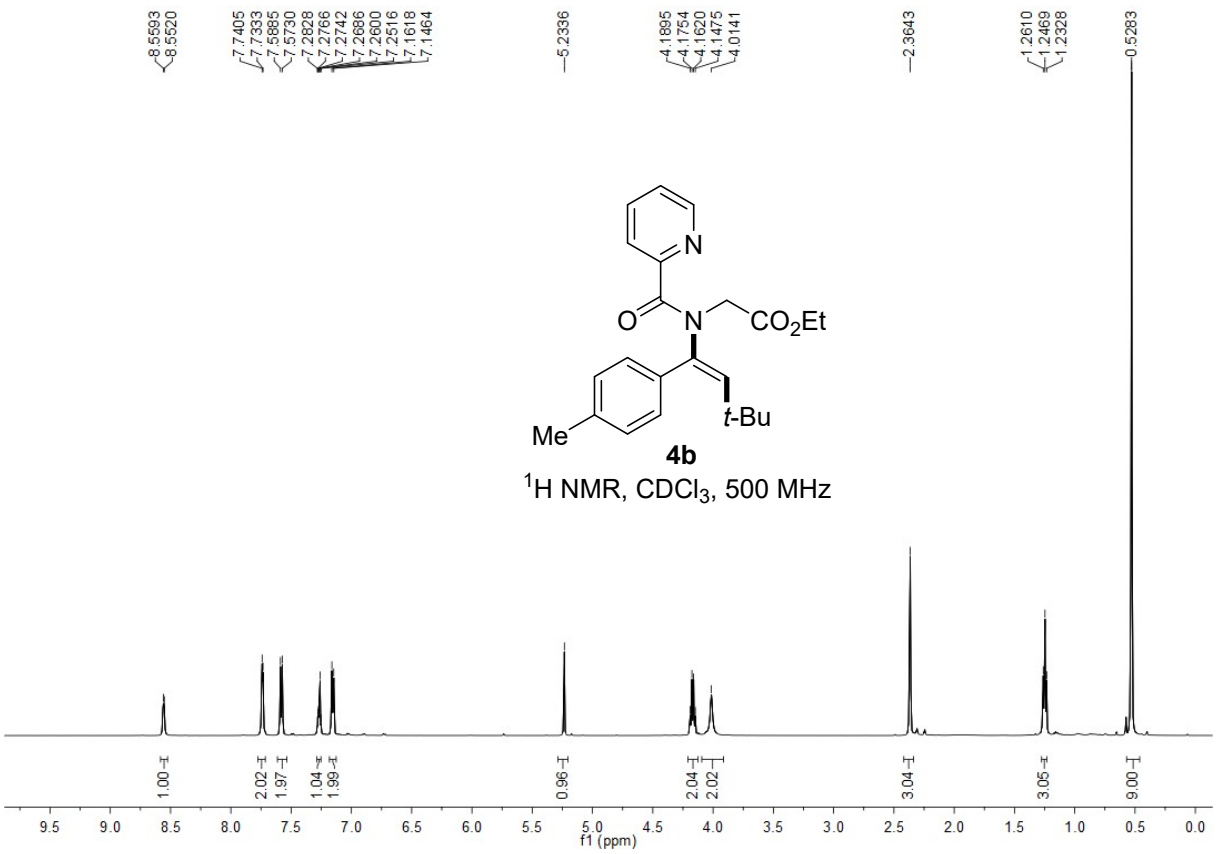
7. References:

[1] a) K. Li, G. Tan, J. Huang, F. Song, J. You, *Angew. Chem. Int. Ed.* **2013**, *52*, 12942−12945; b) M. Tan, K. Li, J. Yin, J. You, *Chem. Commun.* **2018**, *54*, 1221–1224.

8. NMR Spectra

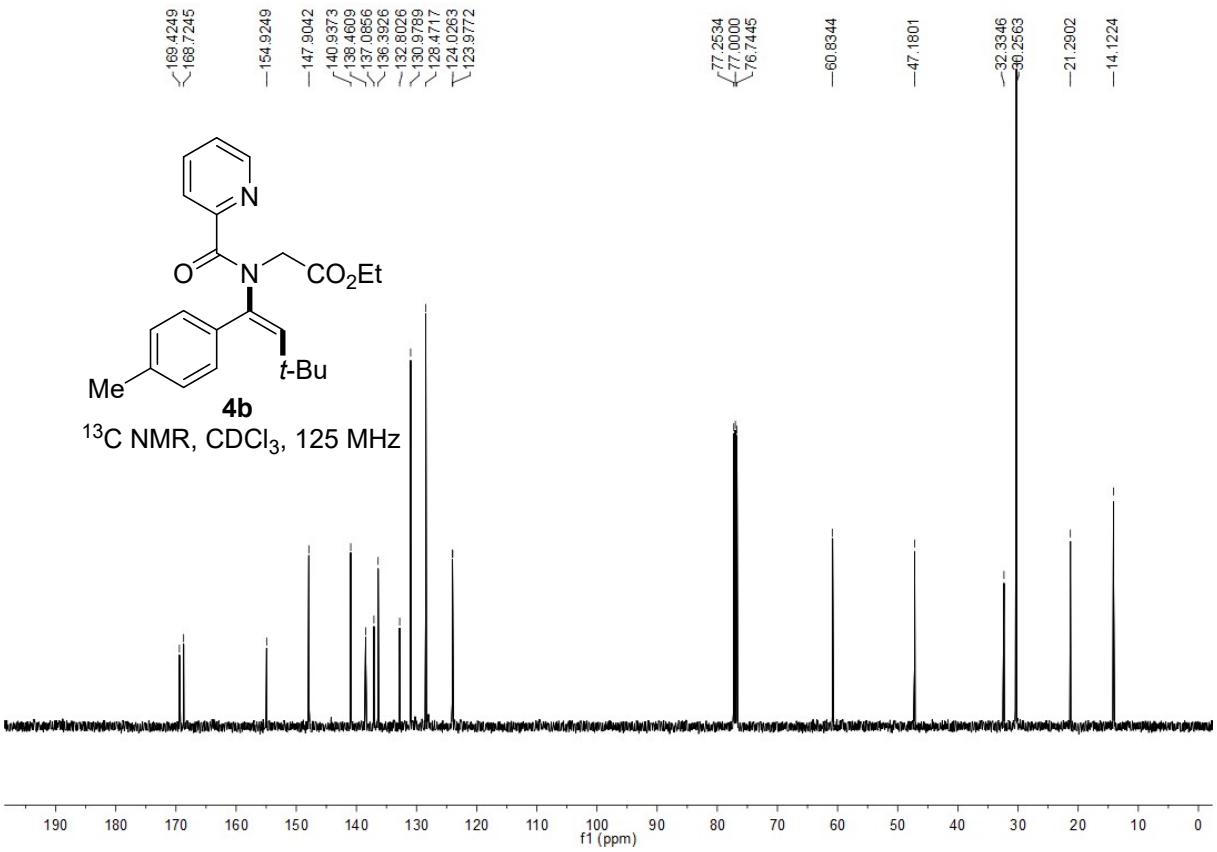






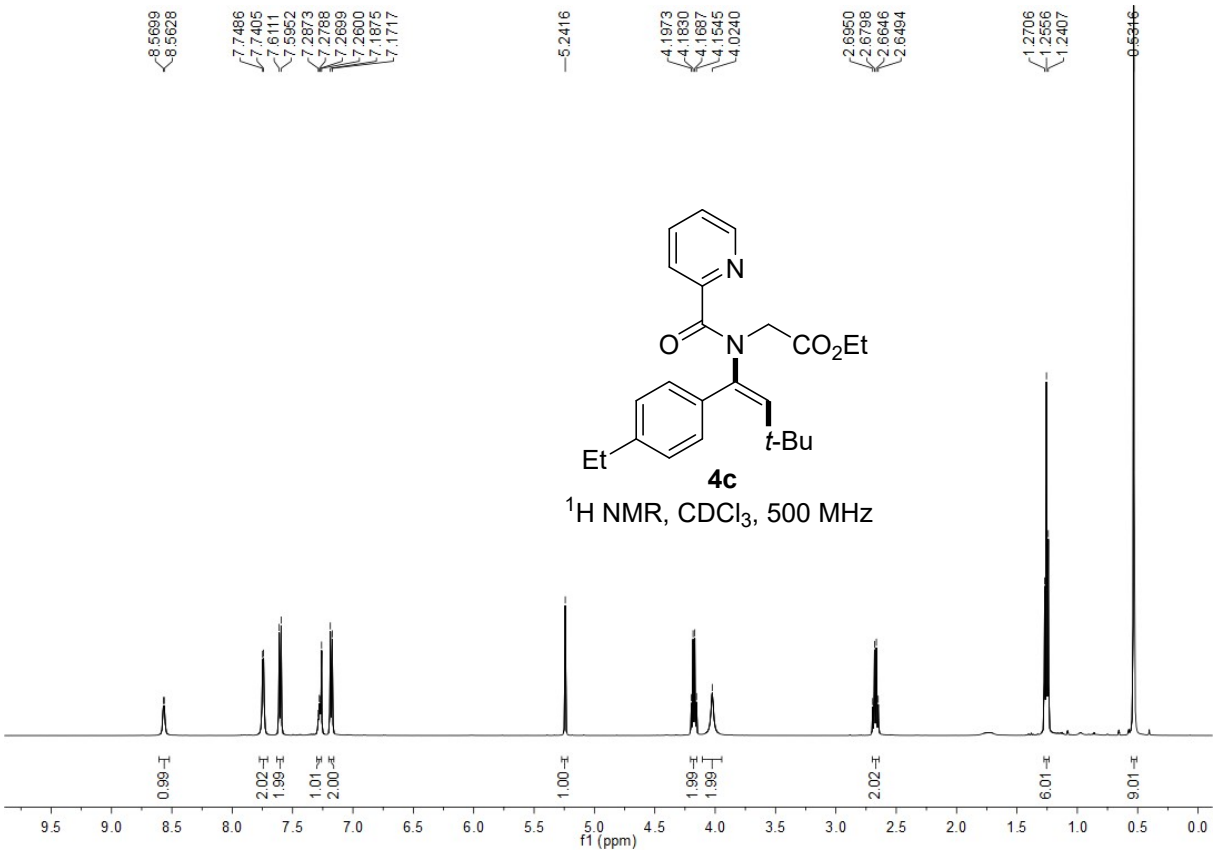
4b

^{1}H NMR, $CDCl_3$, 500 MHz



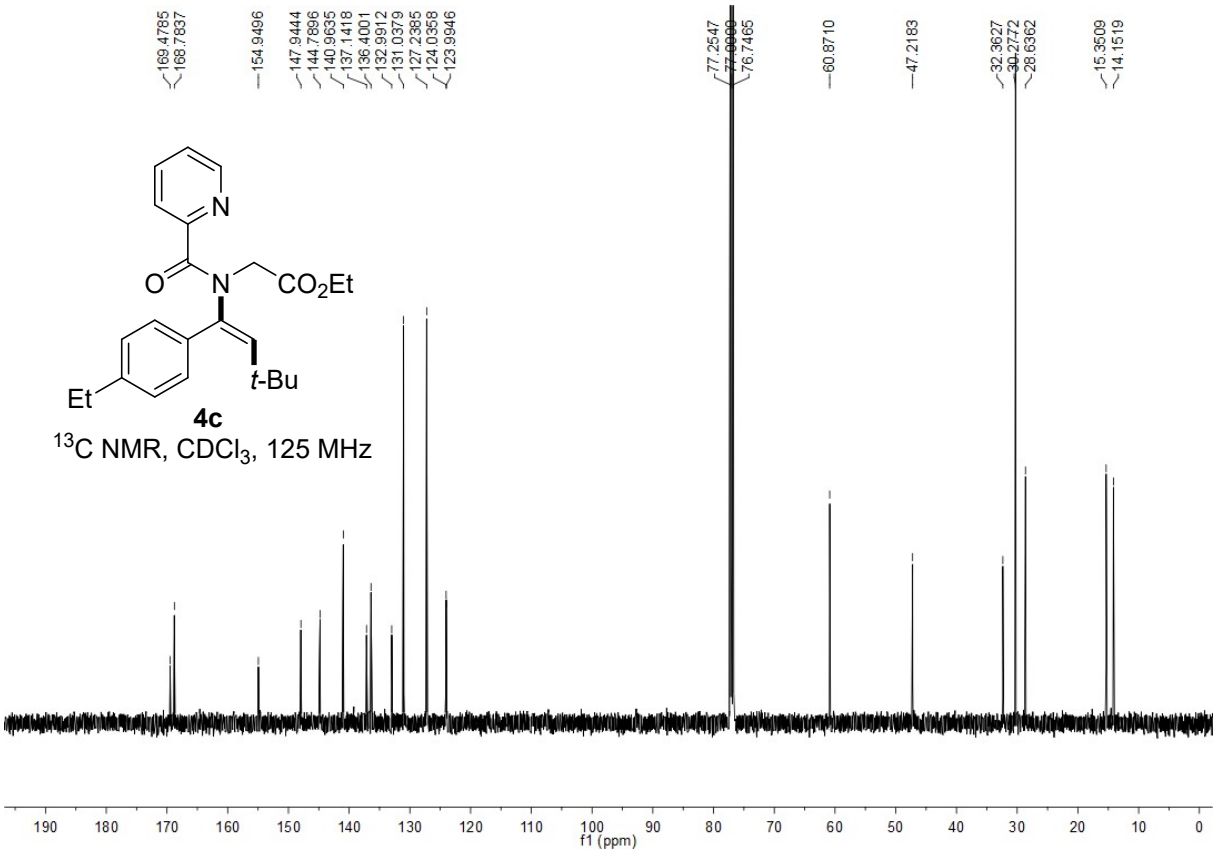
4b

^{13}C NMR, $CDCl_3$, 125 MHz



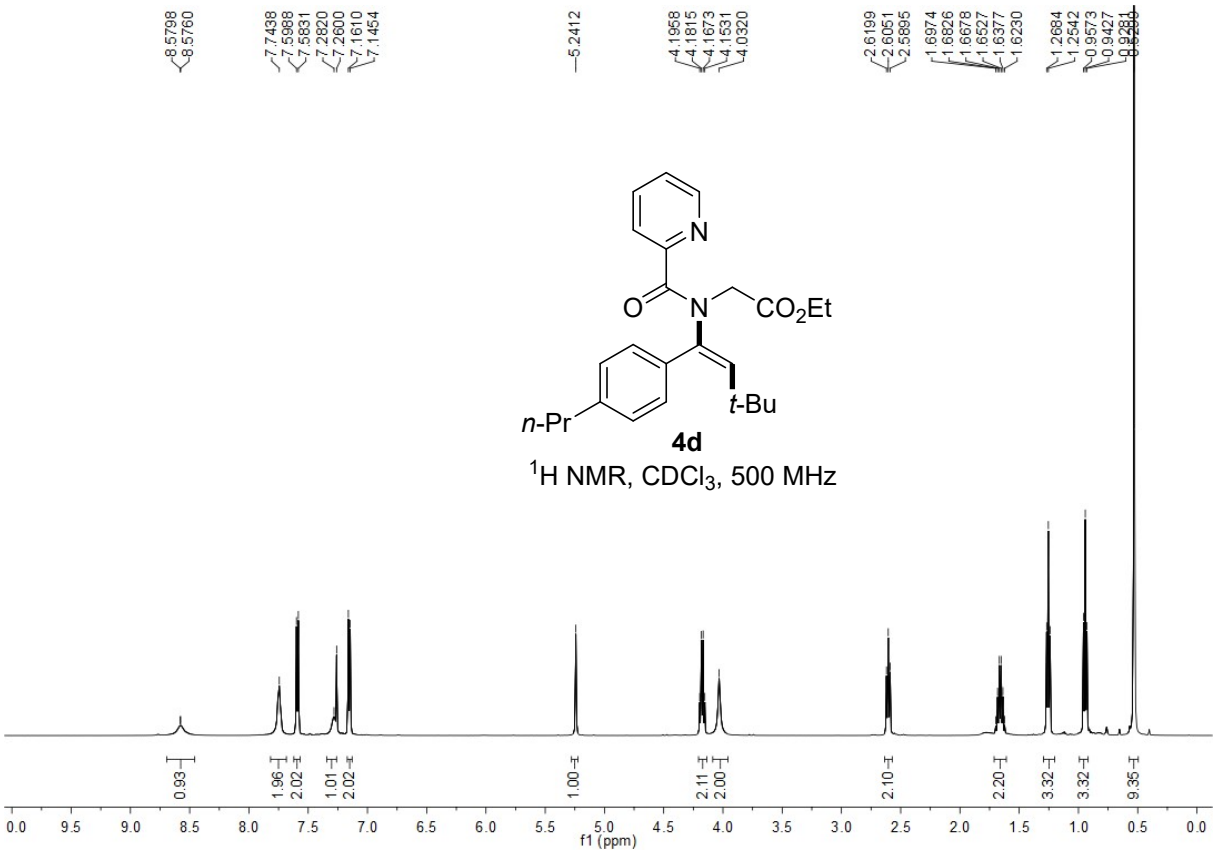
4c

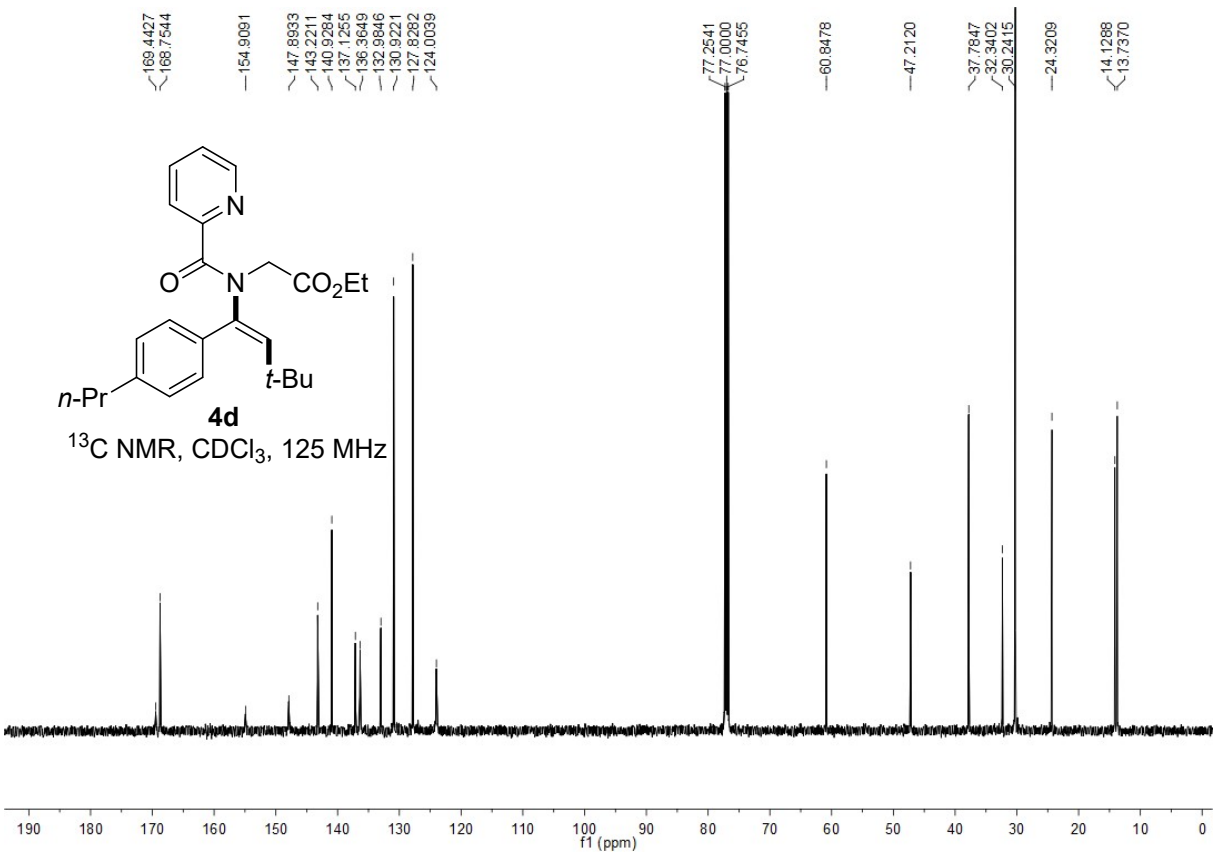
^{1}H NMR, $CDCl_3$, 500 MHz

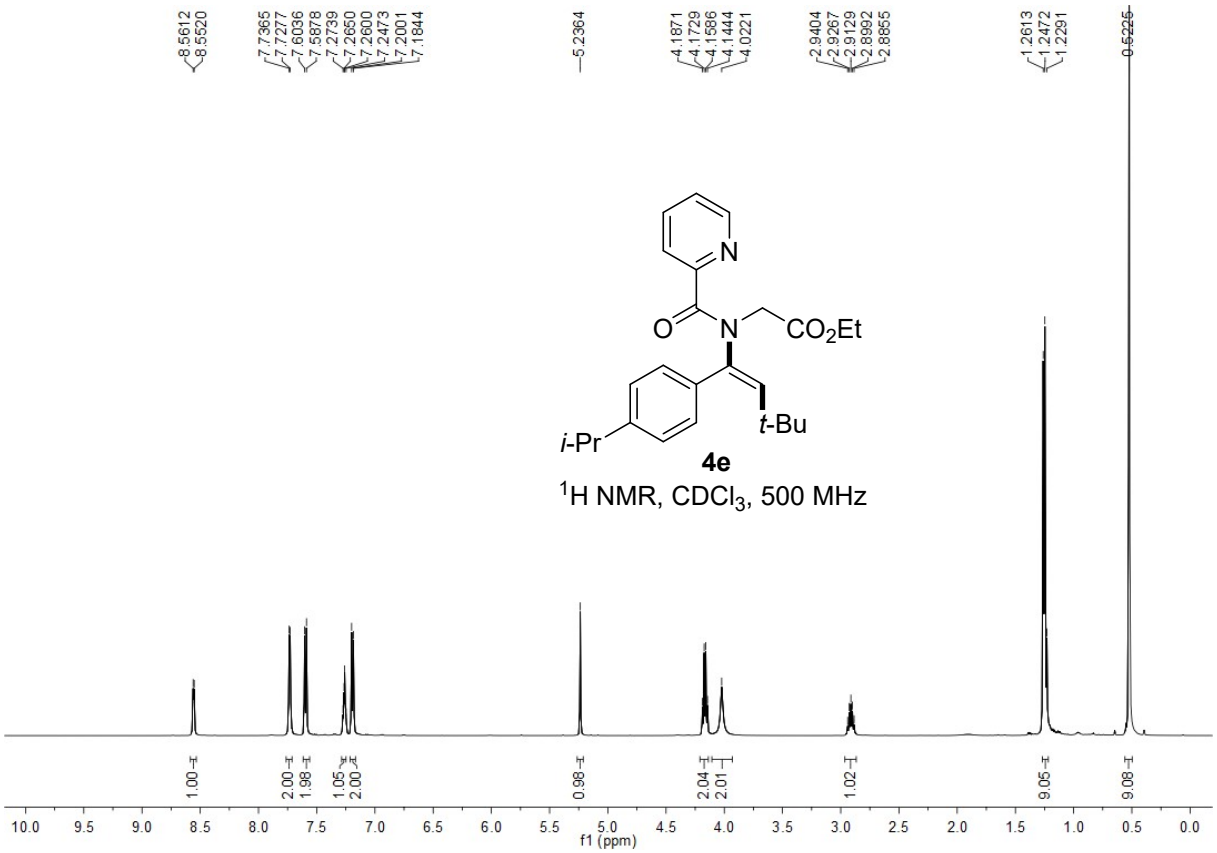


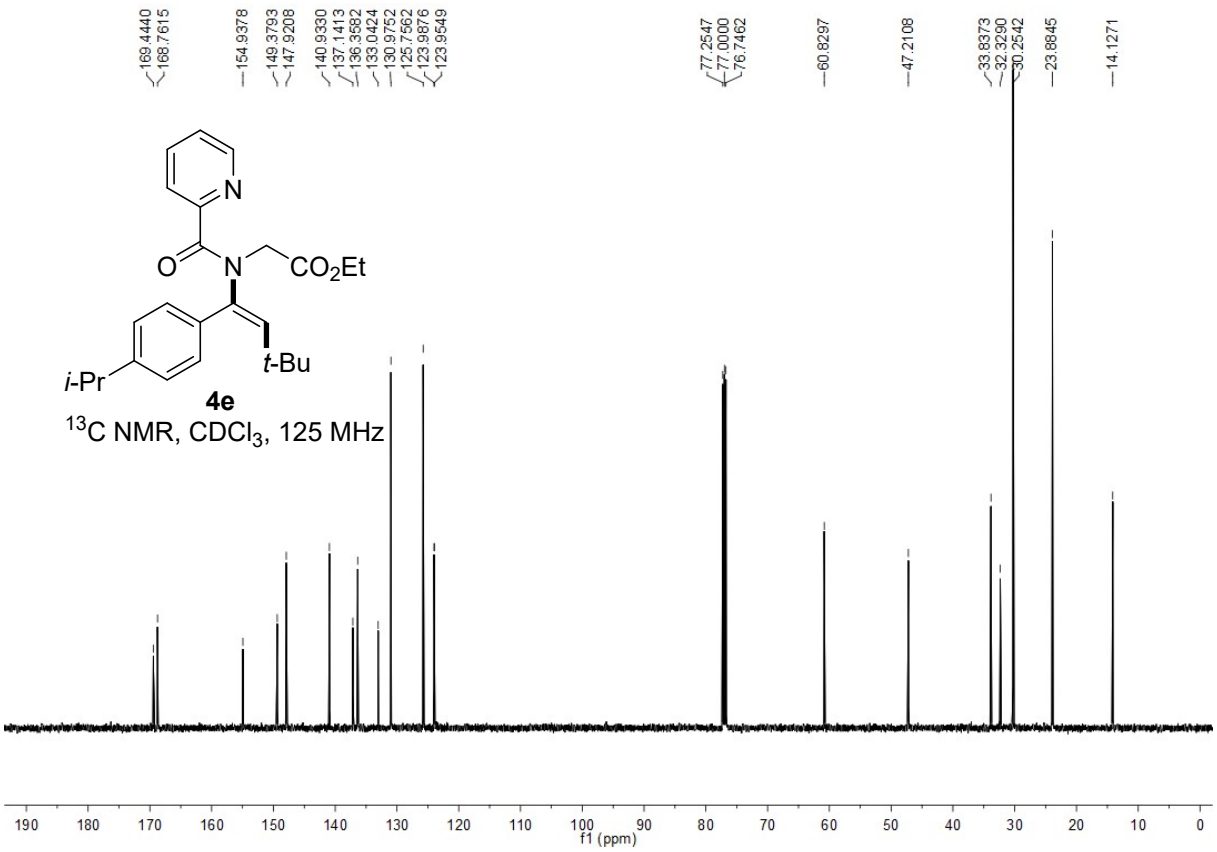
4c

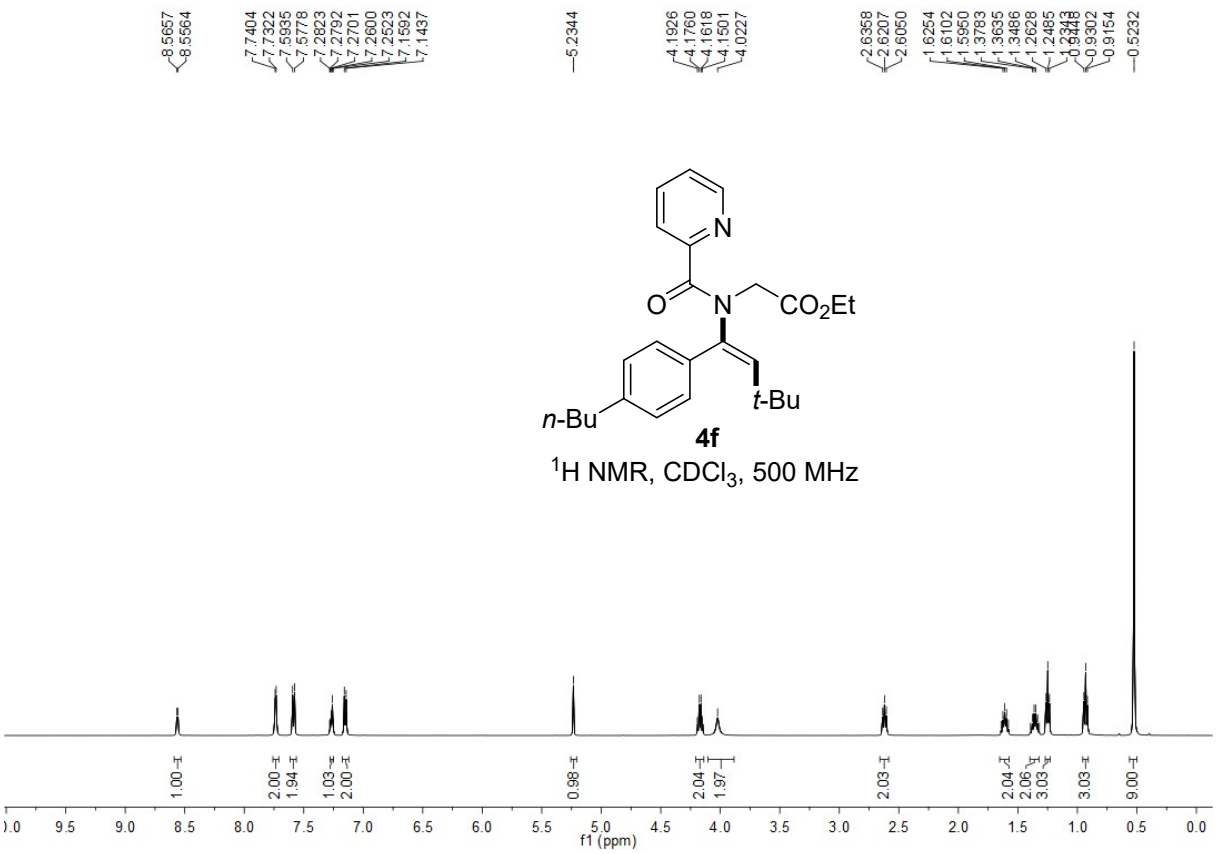
^{13}C NMR, $CDCl_3$, 125 MHz

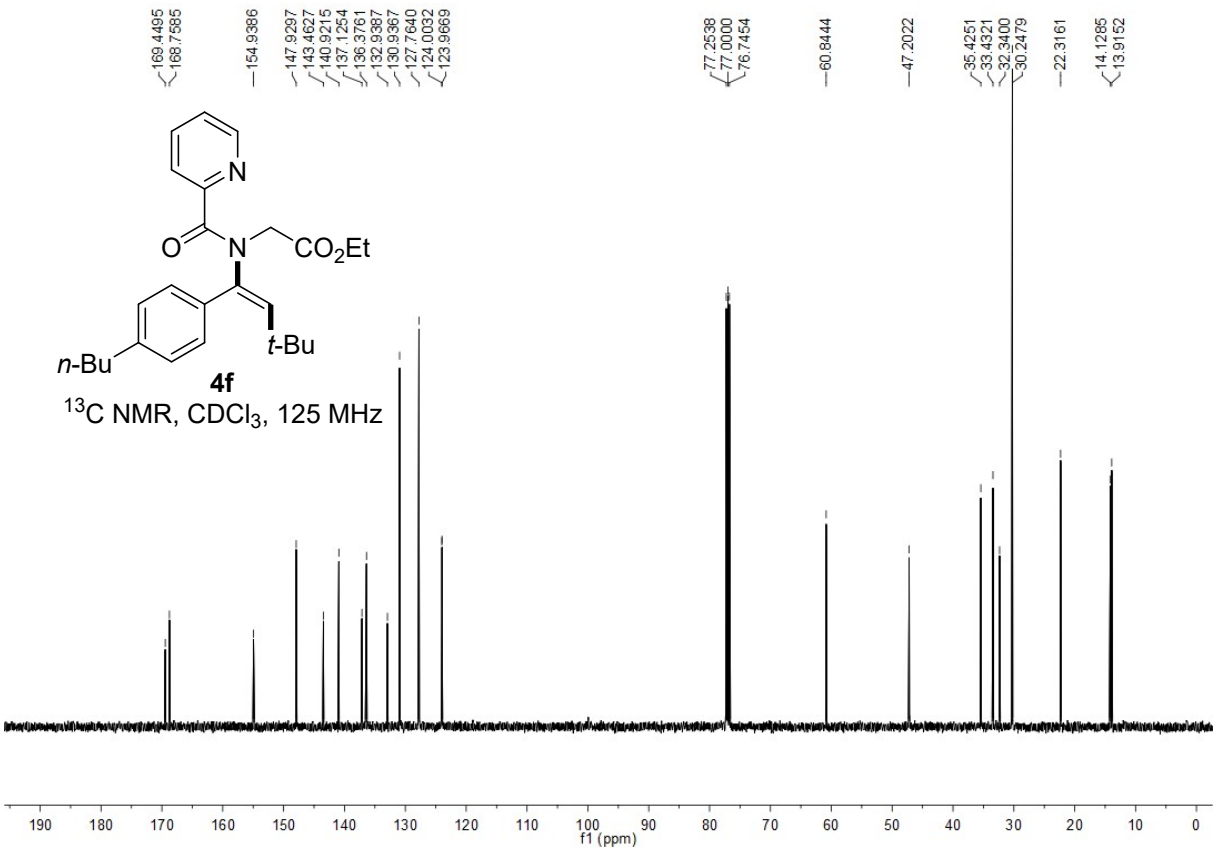

8.5798
8.5760
7.7438
7.5988
7.5831
7.2820
7.2600
7.1610
7.1454
5.2412
4.1958
4.1815
4.1673
4.1531
4.0320
2.6199
2.6051
2.5895
1.6974
1.6826
1.6678
1.6527
1.6377
1.6230
1.2684
1.2542
0.9573
0.9427
0.9281
0.9200
N
O
N
CO2Et
n-Pr
t-Bu
4d
1H NMR, CDCl3, 500 MHz
0.93
1.96
2.02
1.01
2.02
1.00
2.11
2.00
2.10
2.20
3.32
3.32
9.35
f1 (ppm)

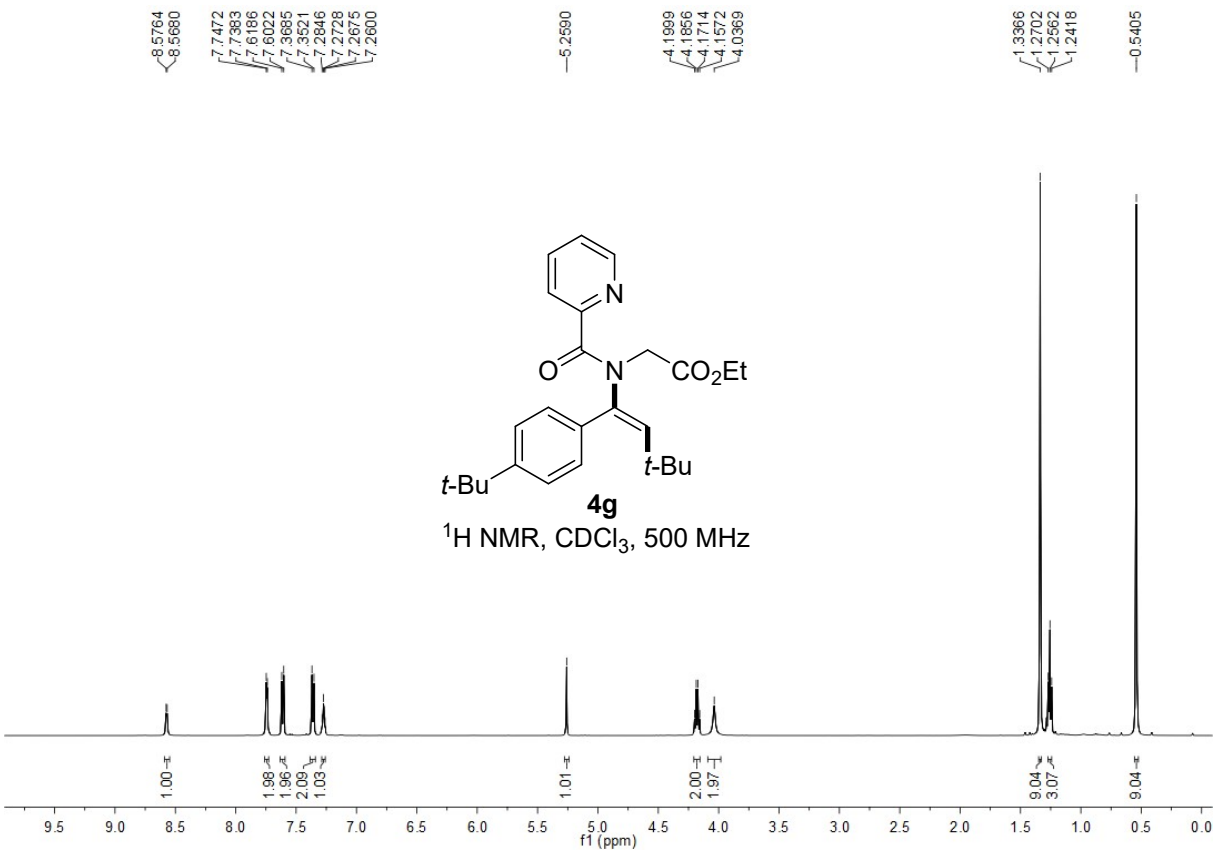

169.4427
168.7544
154.9091
147.8933
143.2211
140.9284
137.1255
136.3649
132.9846
130.9221
127.8282
124.0039
77.2541
77.0000
76.7455
60.8478
47.2120
37.7847
32.3402
30.2415
24.3209
14.1288
13.7370
N
O
N
CO2Et
n-Pr
t-Bu
4d
13C NMR, CDCl3, 125 MHz
f1 (ppm)


8.5612
8.5520
7.7365
7.7277
7.6036
7.5878
7.2739
7.2650
7.2600
7.2473
7.2001
7.1844
5.2364
4.1871
4.1729
4.1586
4.1444
4.0221
2.9404
2.9267
2.9129
2.8992
2.8855
1.2613
1.2472
1.2291
0.9225
1.00
2.00
1.98
1.05
2.00
0.98
2.04
2.01
1.02
9.05
9.08
10.0 9.5 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 0.0
f1 (ppm)
N
O
N
CO2Et
i-Pr
t-Bu
4e
1H NMR, CDCl3, 500 MHz


169.4440
168.7615
154.9378
149.3793
147.9208
140.9330
137.1413
136.3582
133.0424
130.9752
125.7562
123.9876
123.9549
77.2547
77.0000
76.7462
60.8297
47.2108
33.8373
32.3290
30.2542
23.8845
14.1271
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)
N
O
N
CO2Et
i-Pr
t-Bu
4e
13C NMR, CDCl3, 125 MHz

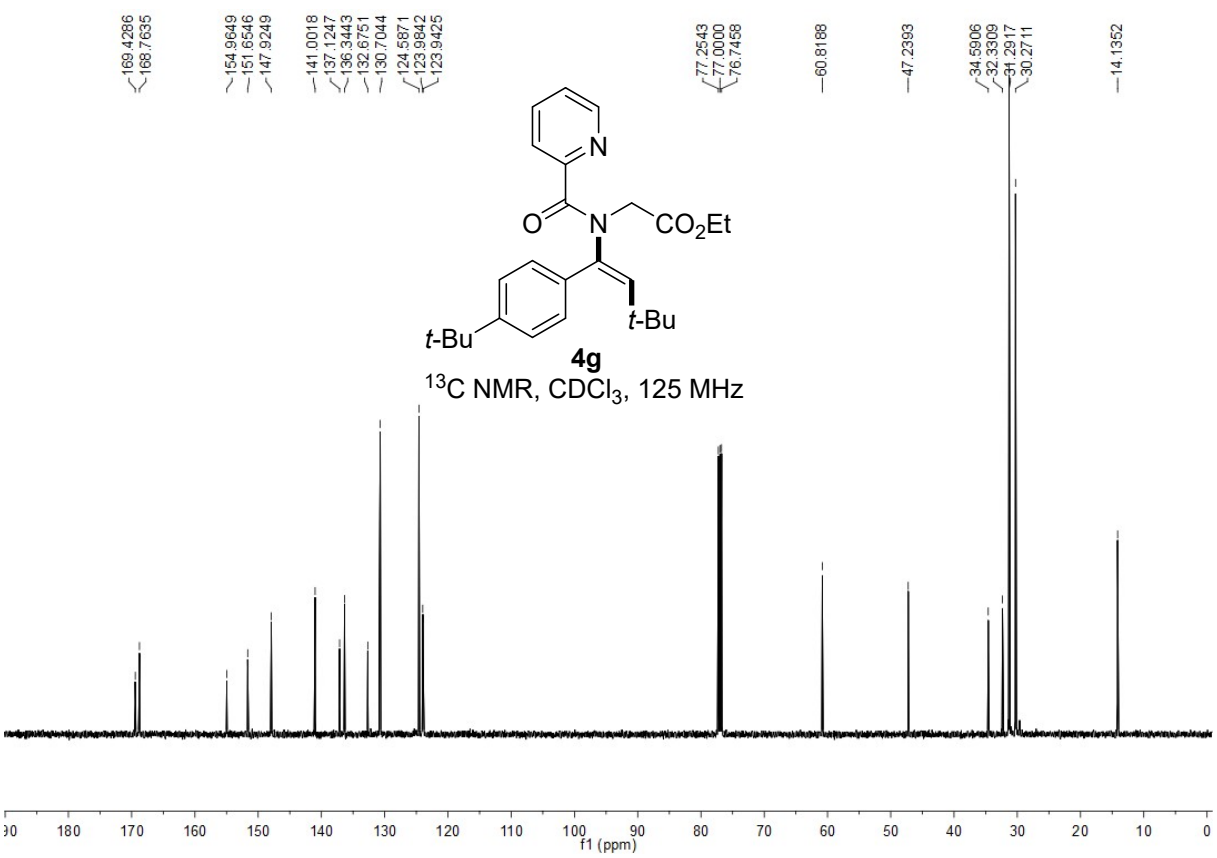

8.5657
8.5564
7.7404
7.7322
7.5935
7.5778
7.2823
7.2792
7.2701
7.2600
7.2523
7.1592
7.1437
5.2344
4.1926
4.1760
4.1618
4.1501
4.0227
2.6358
2.6207
2.6050
1.6254
1.6102
1.5950
1.3783
1.3635
1.3486
1.2628
1.2485
0.9302
0.9154
0.5232
N
O
N
CO2Et
n-Bu
t-Bu
4f
1H NMR, CDCl3, 500 MHz
1.00
2.00
1.94
1.03
2.00
0.98
2.04
1.97
2.03
2.04
2.06
3.03
3.03
9.00
f1 (ppm)


169.4495
168.7585
154.9386
147.9297
143.4627
140.9215
137.1254
136.3761
132.9387
130.9367
127.7640
124.0032
123.9669
77.2538
77.0000
76.7454
60.8444
47.2022
35.4251
33.4321
32.3400
30.2479
22.3161
14.1285
13.9152
N
O
N
CO2Et
n-Bu
t-Bu
4f
13C NMR, CDCl3, 125 MHz
f1 (ppm)



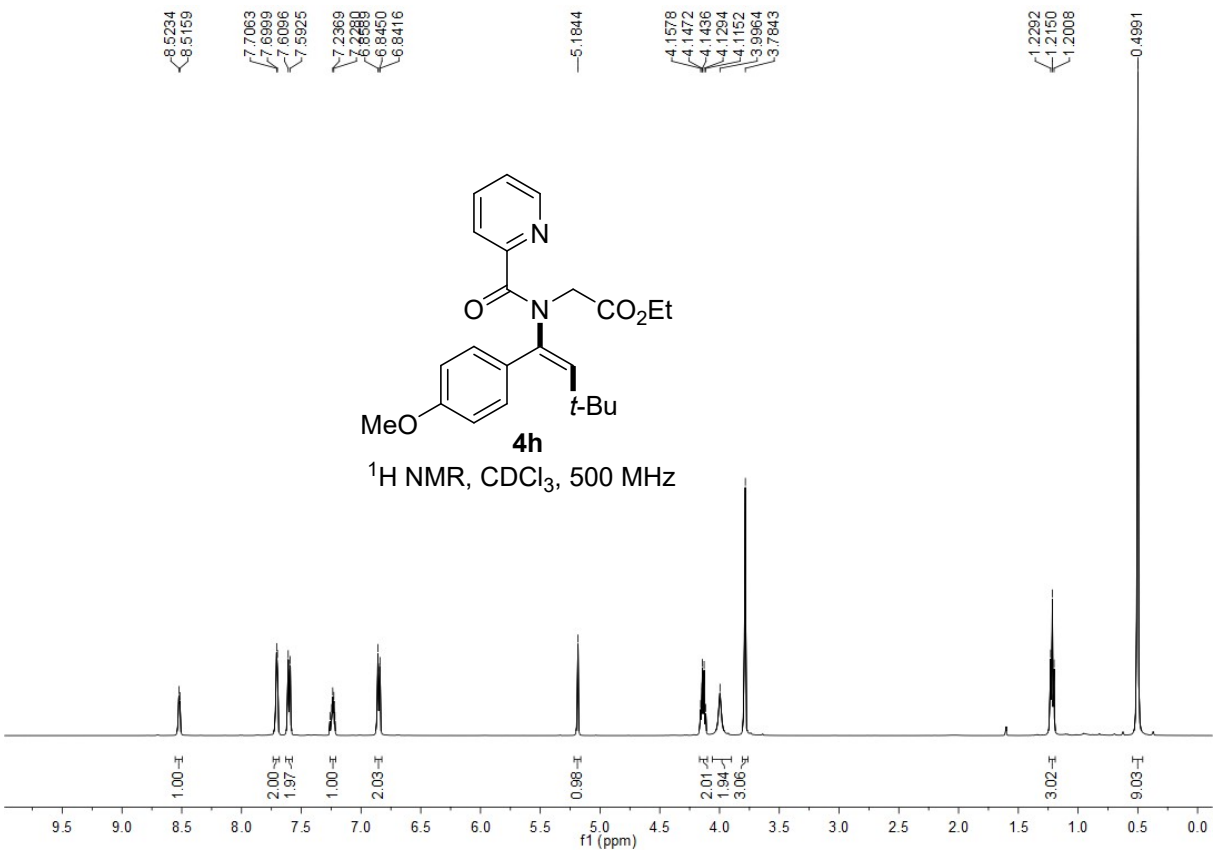
4g

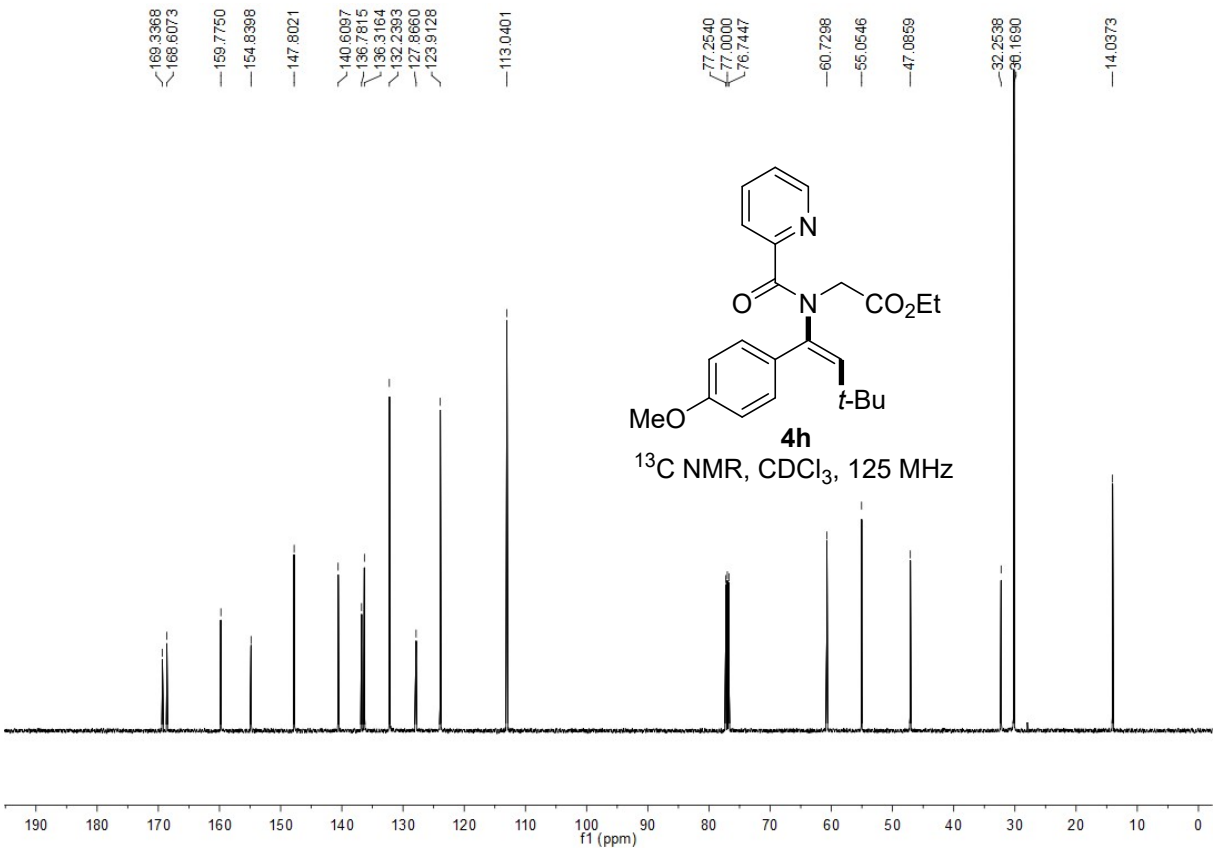
^{1}H NMR, $CDCl_3$, 500 MHz

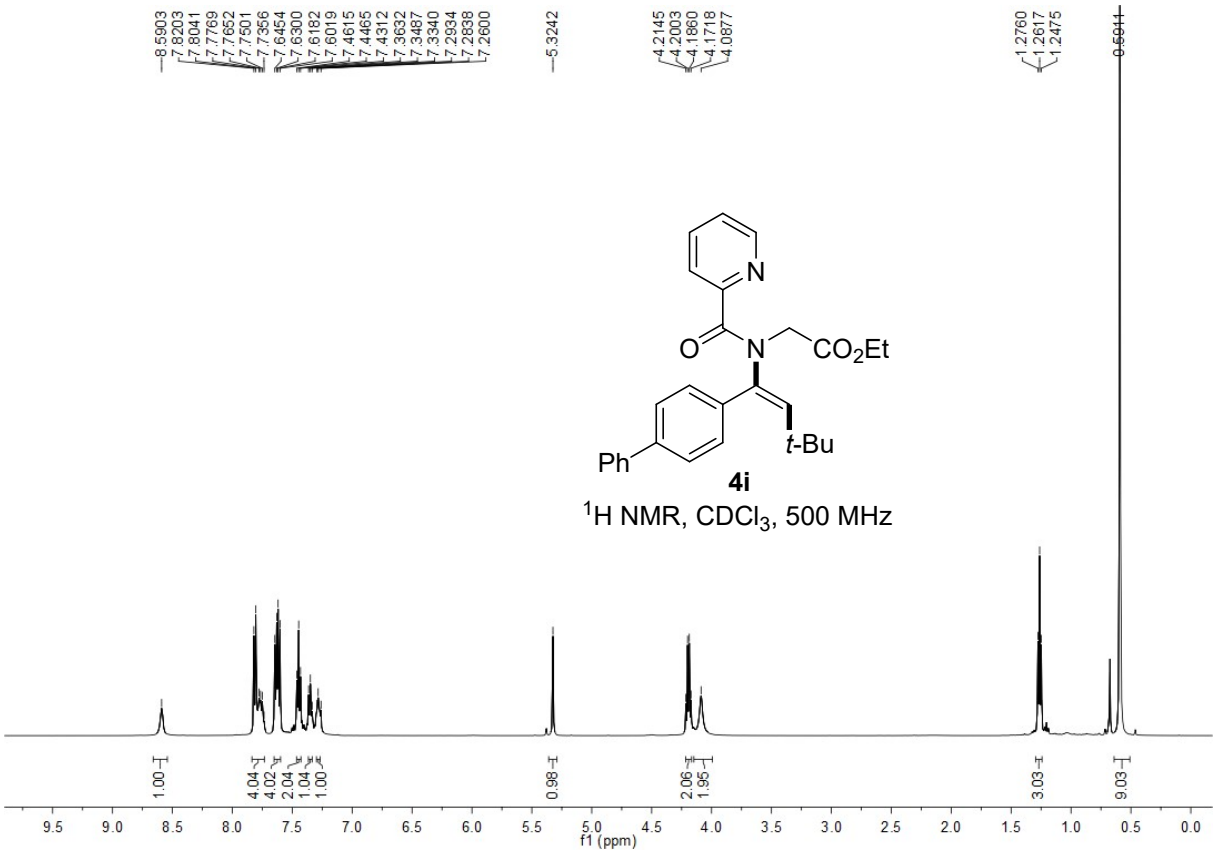


4g

^{13}C NMR, $CDCl_3$, 125 MHz

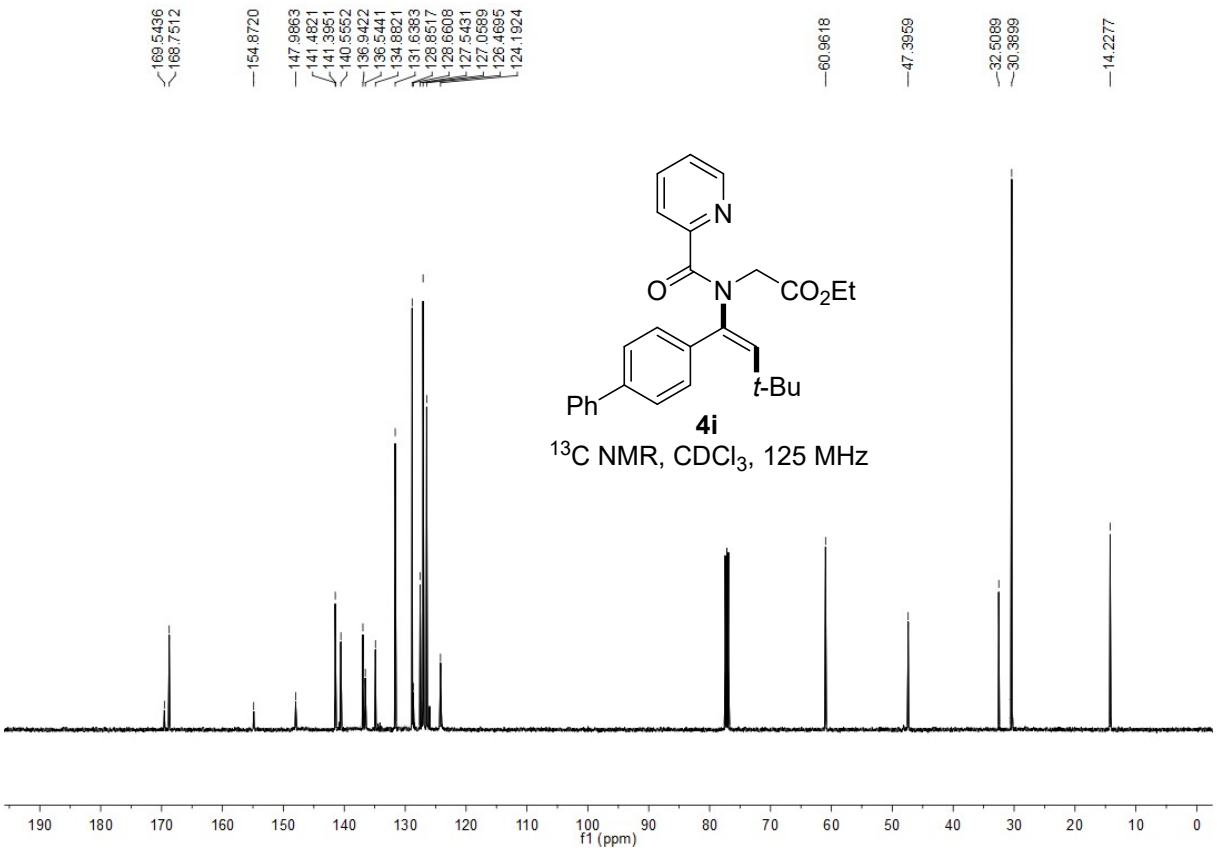

8.5234
8.5159
7.7063
7.6999
7.6096
7.5925
7.2369
6.8450
6.8416
5.1844
4.1578
4.1472
4.1436
4.1294
4.1152
3.9964
3.7843
1.2292
1.2150
1.2008
0.4991
N
O
N
CO2Et
t-Bu
MeO
4h
1H NMR, CDCl3, 500 MHz
1.00
2.00
1.97
1.00
2.03
0.98
2.01
1.94
3.06
3.02
9.03
f1 (ppm)


169.3368
168.6073
159.7750
154.8398
147.8021
140.6097
136.7815
136.3164
132.2393
127.8660
123.9128
113.0401
77.2540
77.0000
76.7447
60.7298
55.0546
47.0859
32.2538
30.1690
14.0373
N
O
N
CO2Et
t-Bu
MeO
4h
13C NMR, CDCl3, 125 MHz
f1 (ppm)



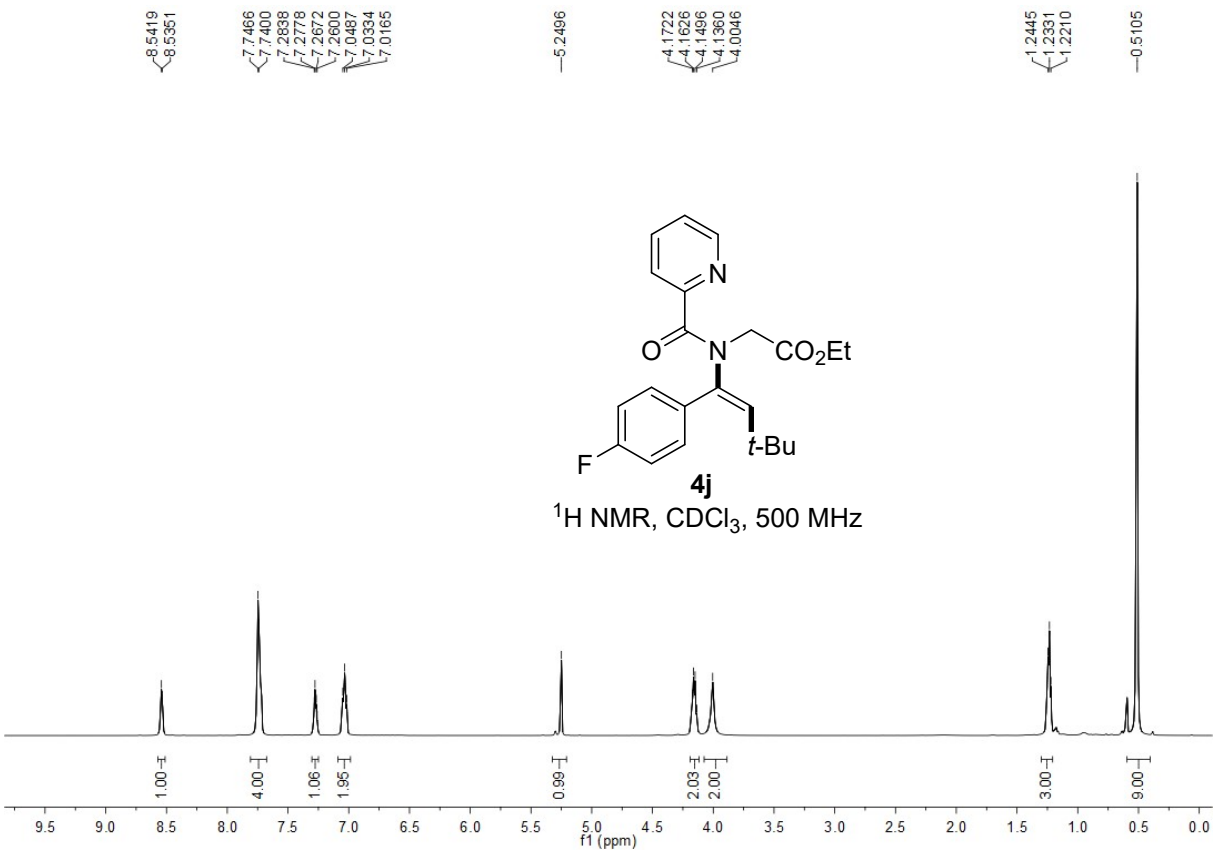
4i

^{1}H NMR, $CDCl_3$, 500 MHz



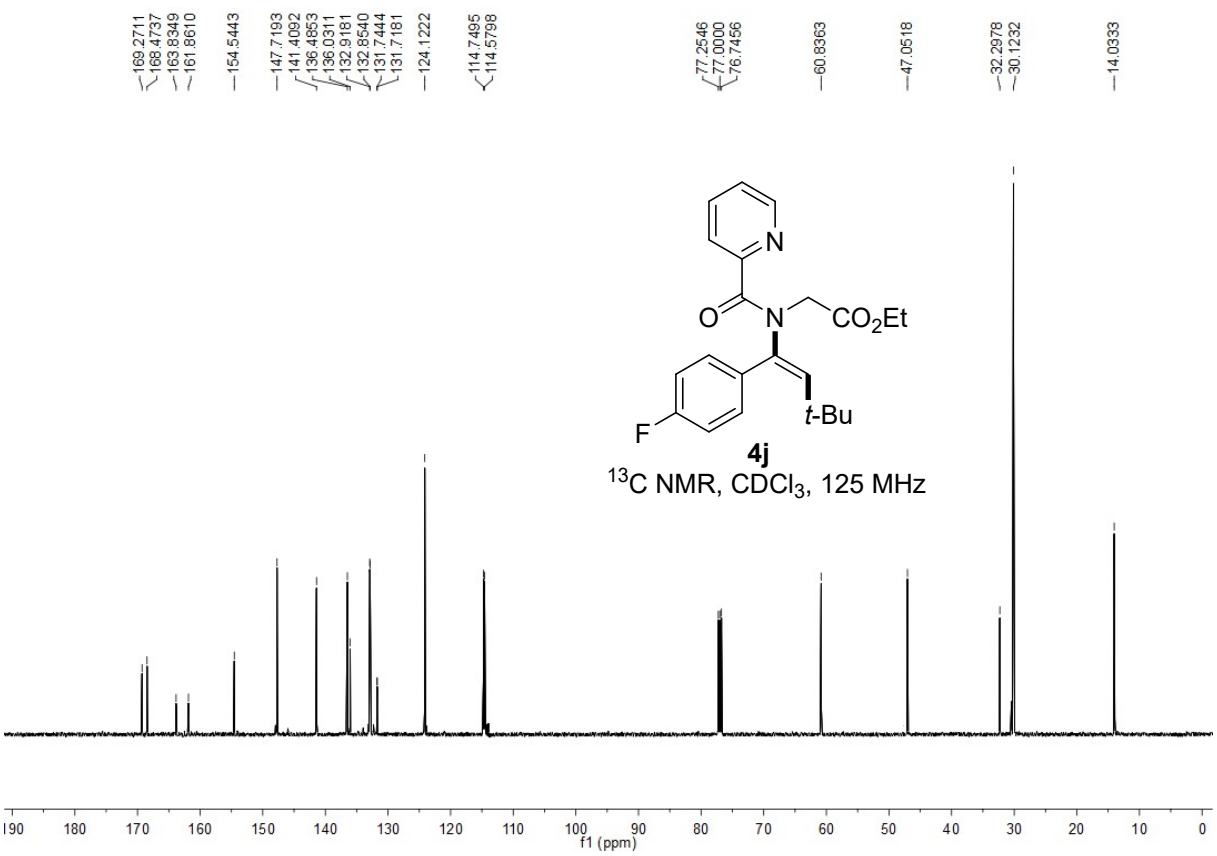
4i

^{13}C NMR, $CDCl_3$, 125 MHz



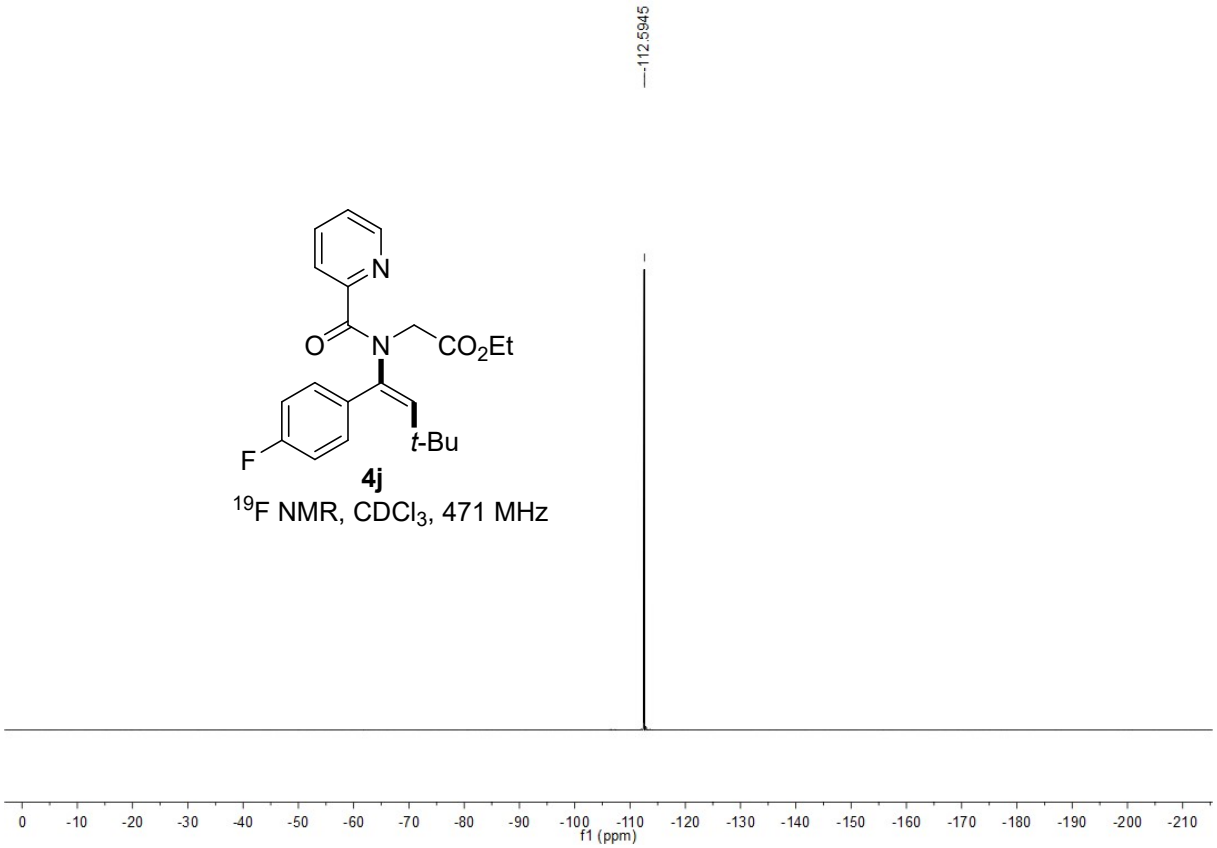
4j

^{1}H NMR, $CDCl_3$, 500 MHz



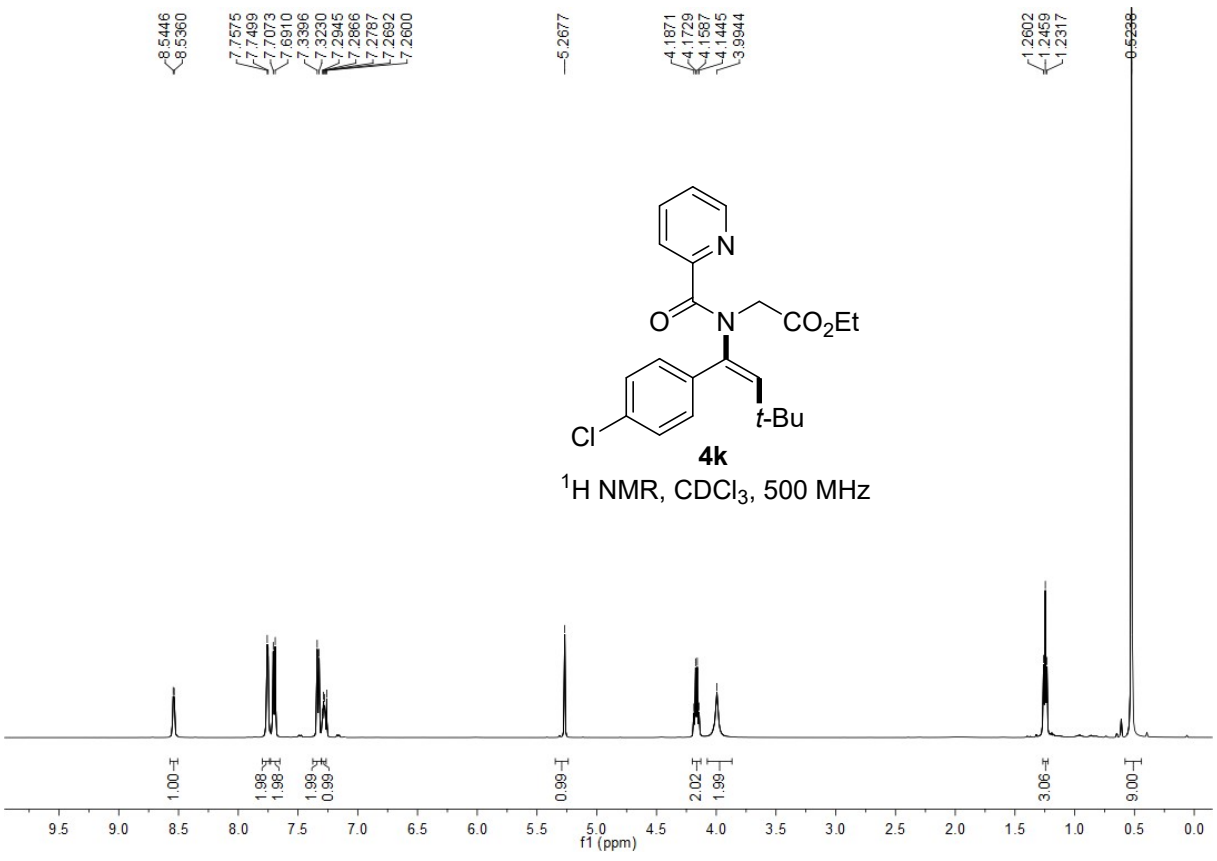
4j

^{13}C NMR, $CDCl_3$, 125 MHz



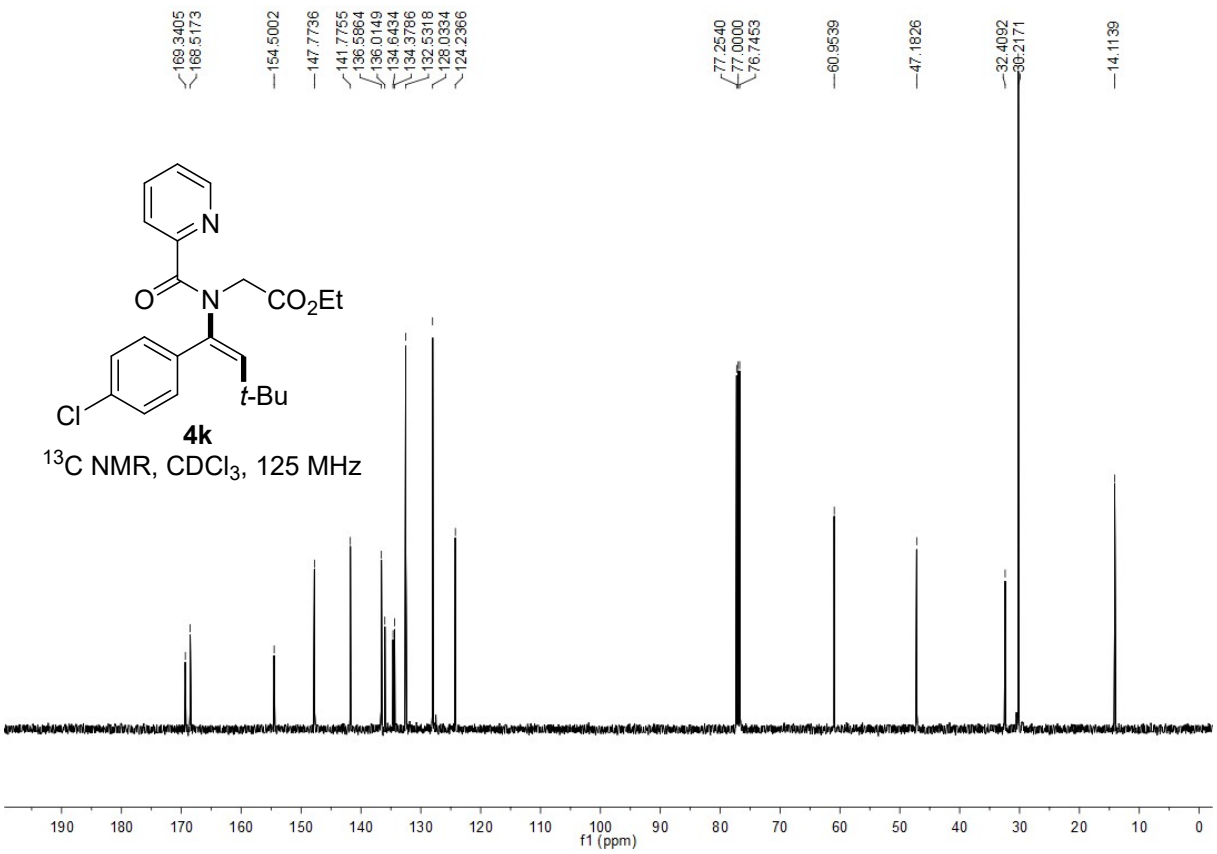
4j

^{19}F NMR, $CDCl_3$, 471 MHz



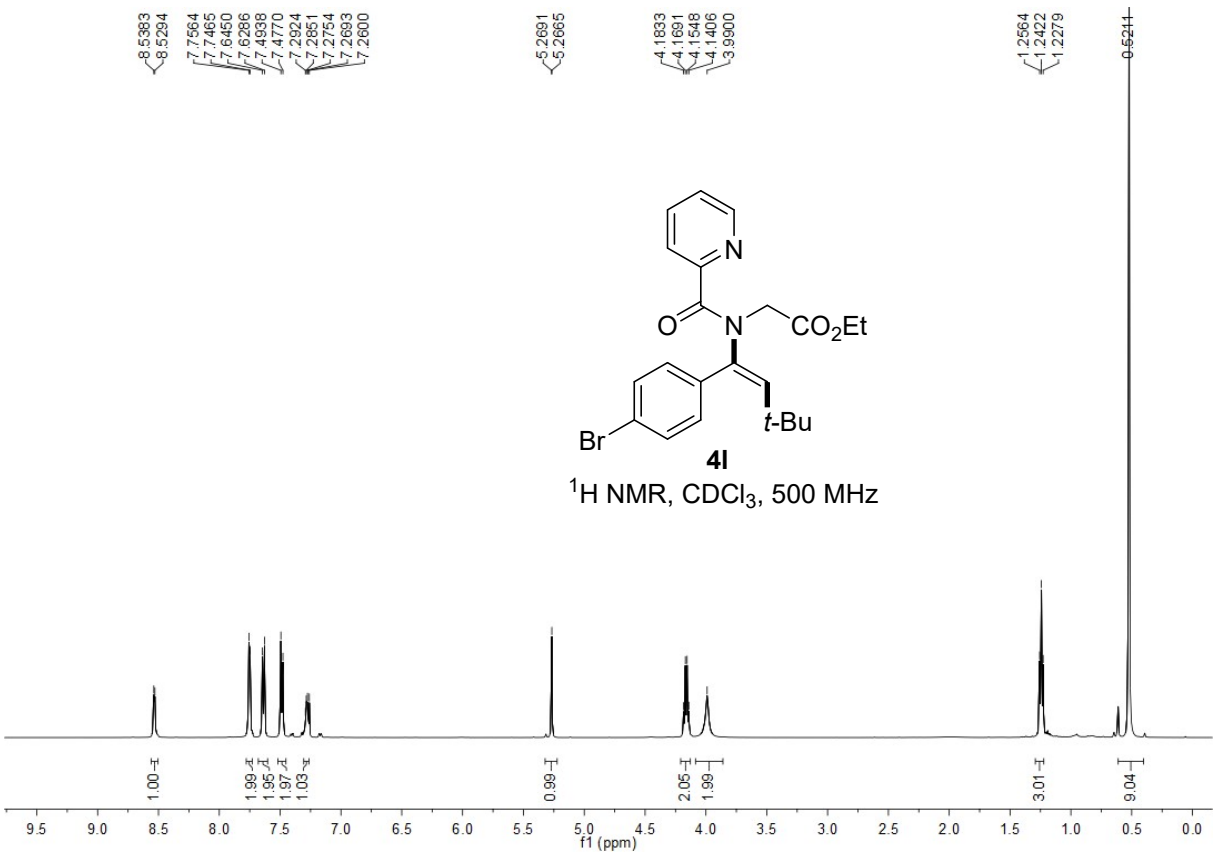
4k

^{1}H NMR, $CDCl_3$, 500 MHz



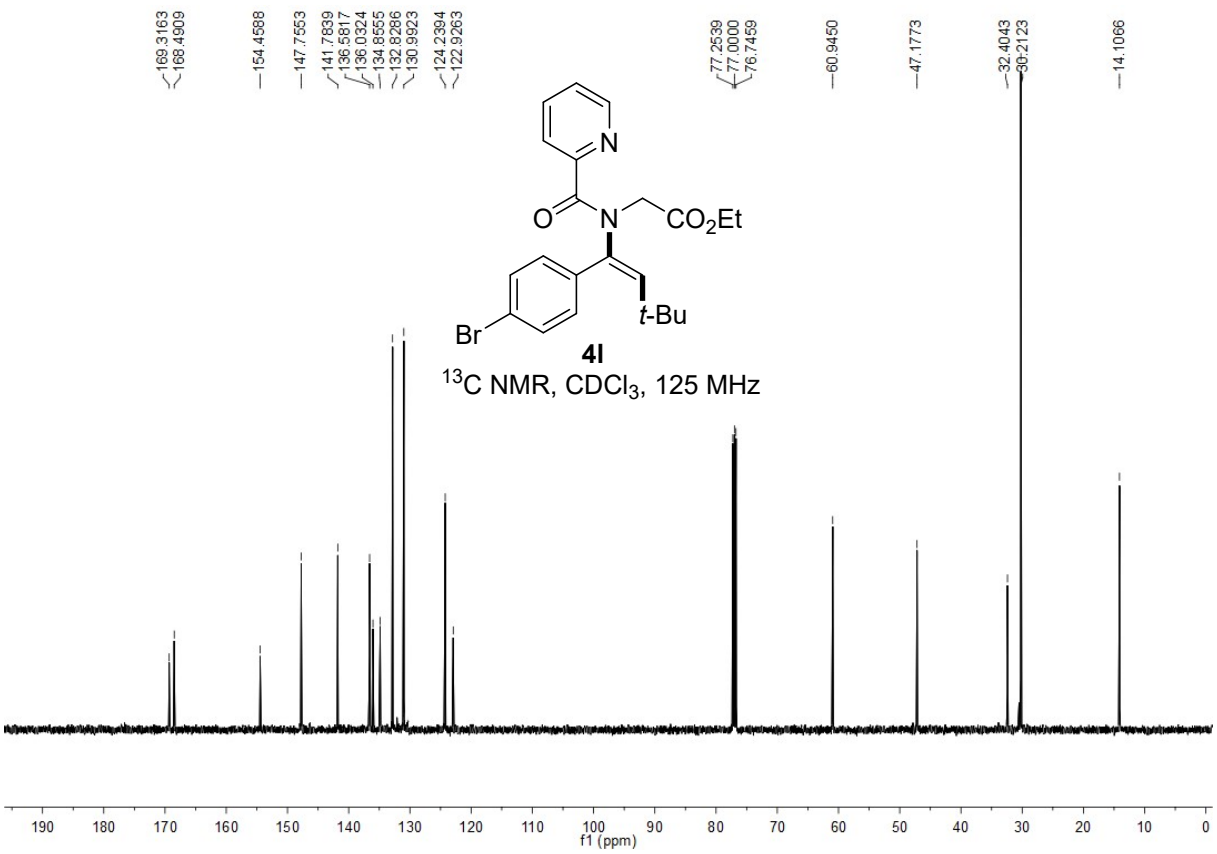
4k

^{13}C NMR, $CDCl_3$, 125 MHz



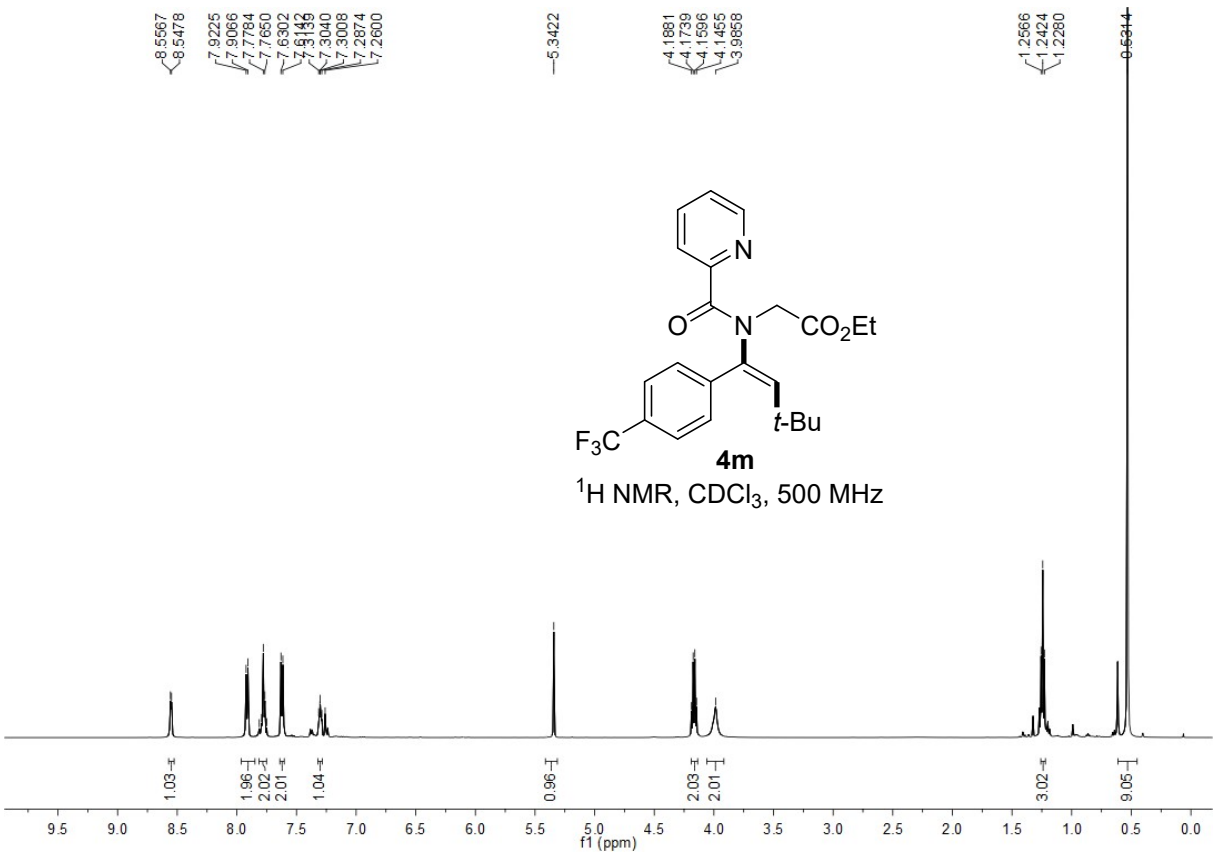
4l

^{1}H NMR, $CDCl_3$, 500 MHz



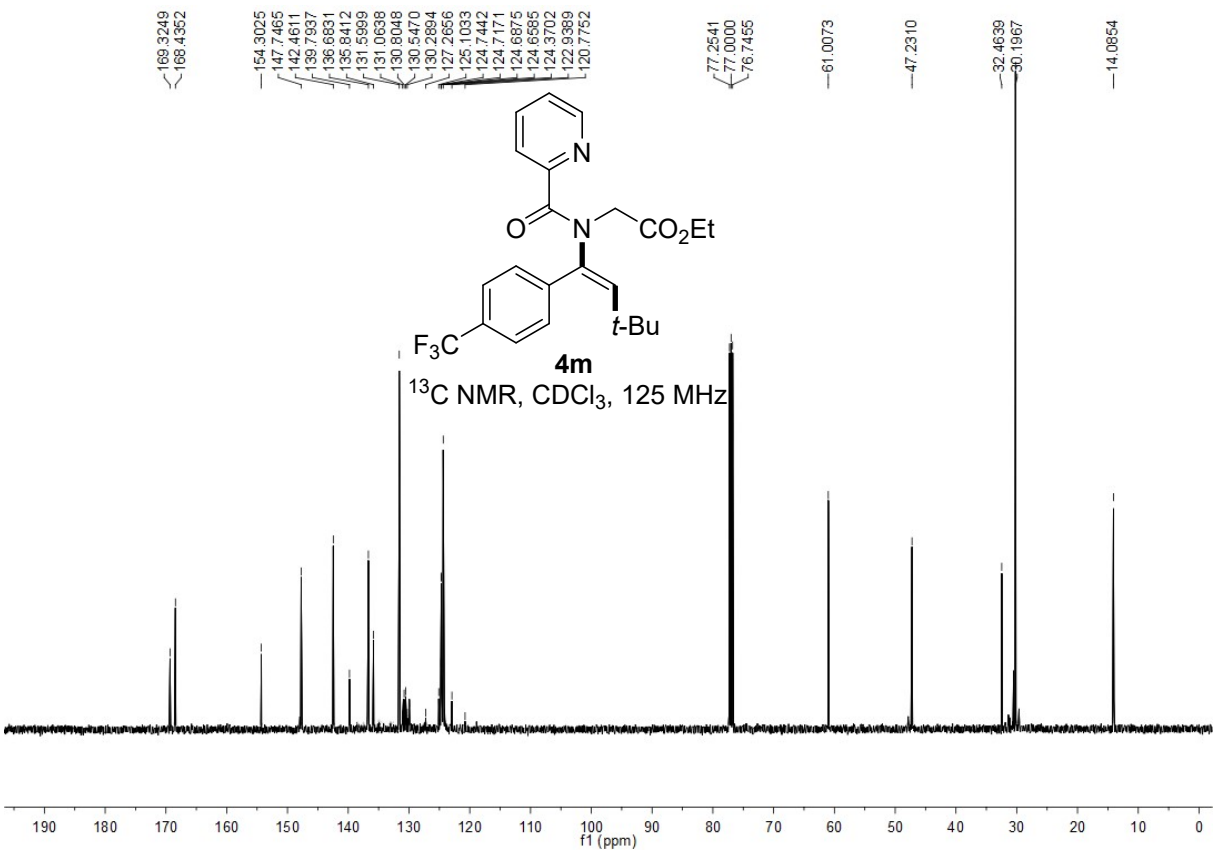
4l

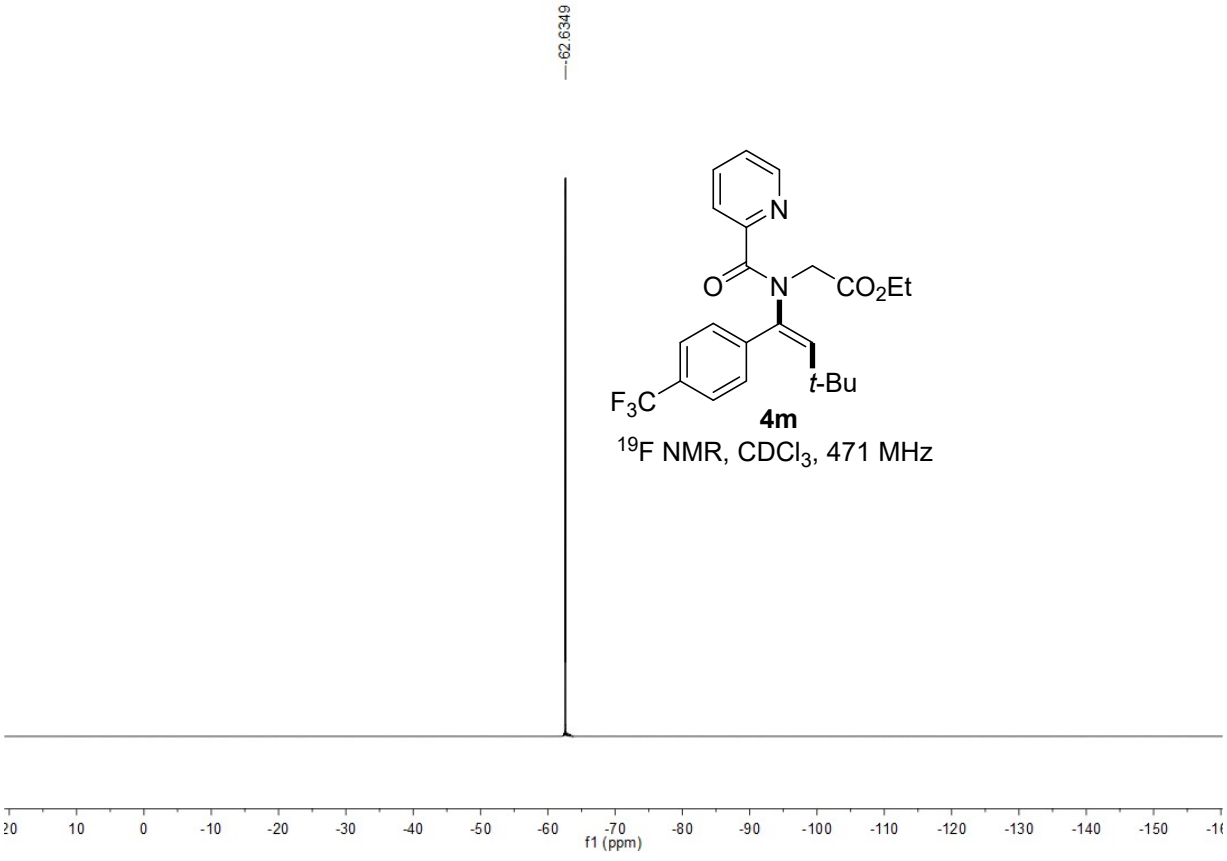
^{13}C NMR, $CDCl_3$, 125 MHz

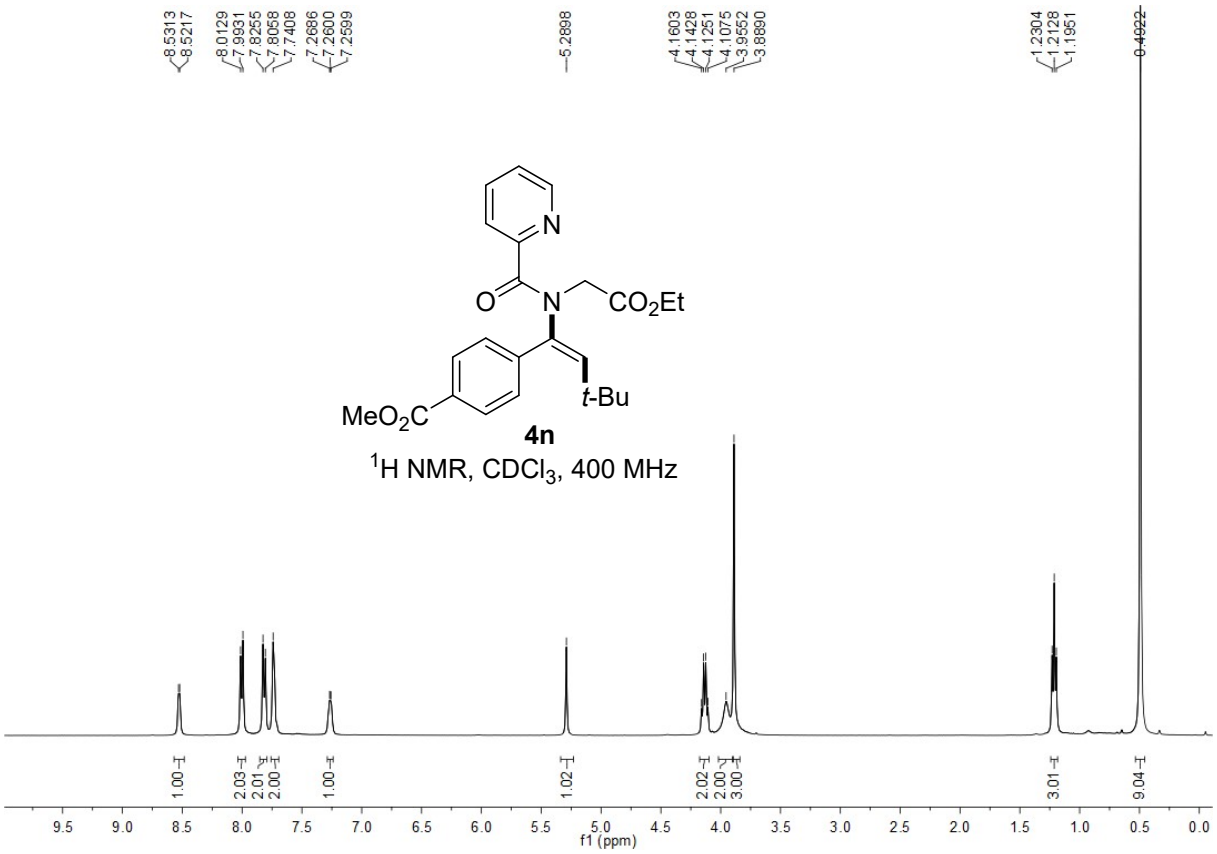


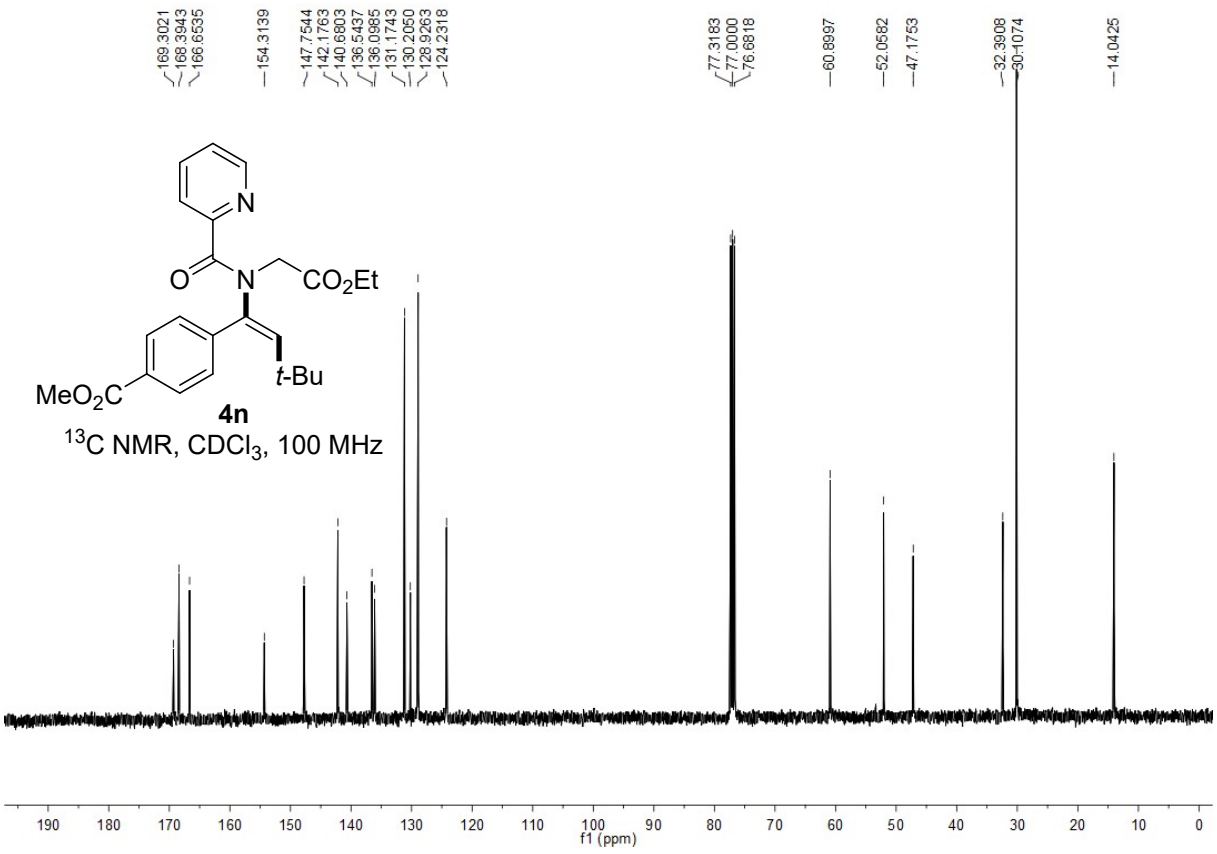
4m

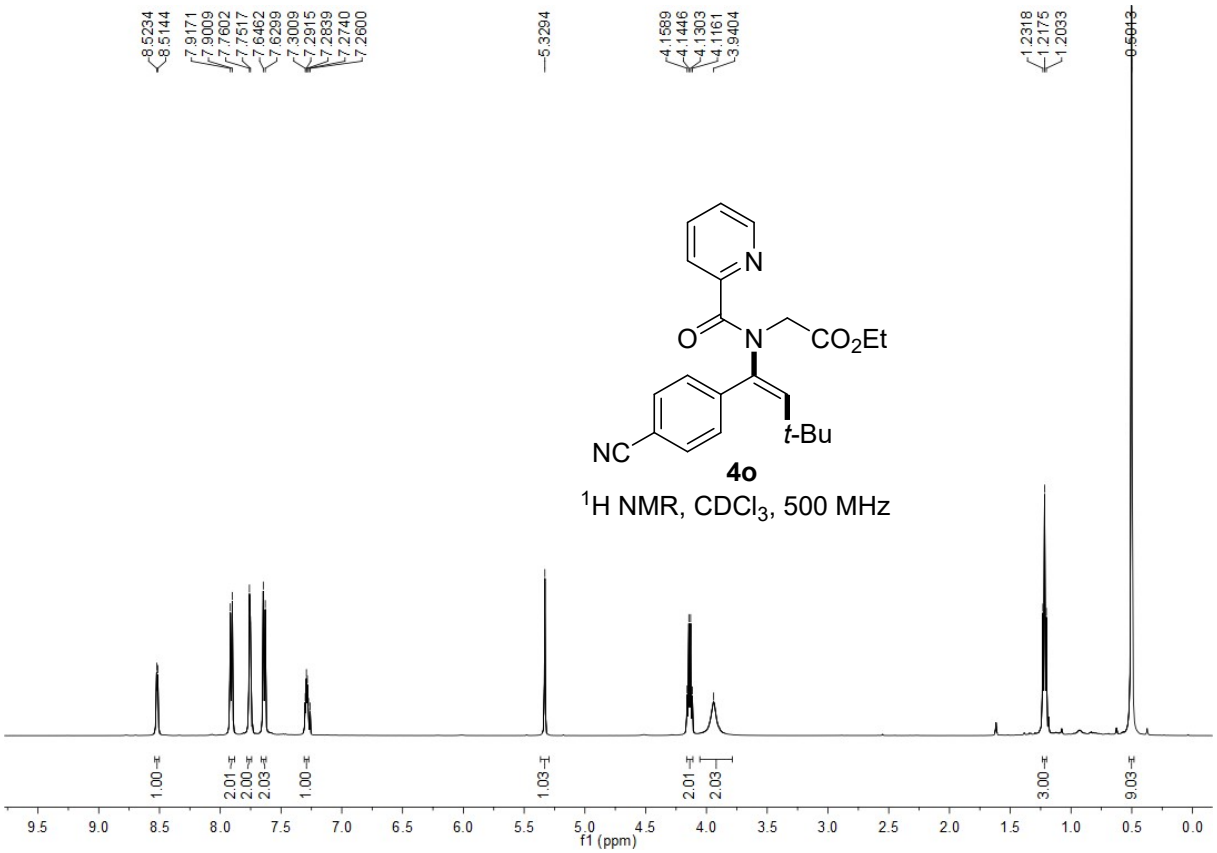
^{1}H NMR, $CDCl_3$, 500 MHz

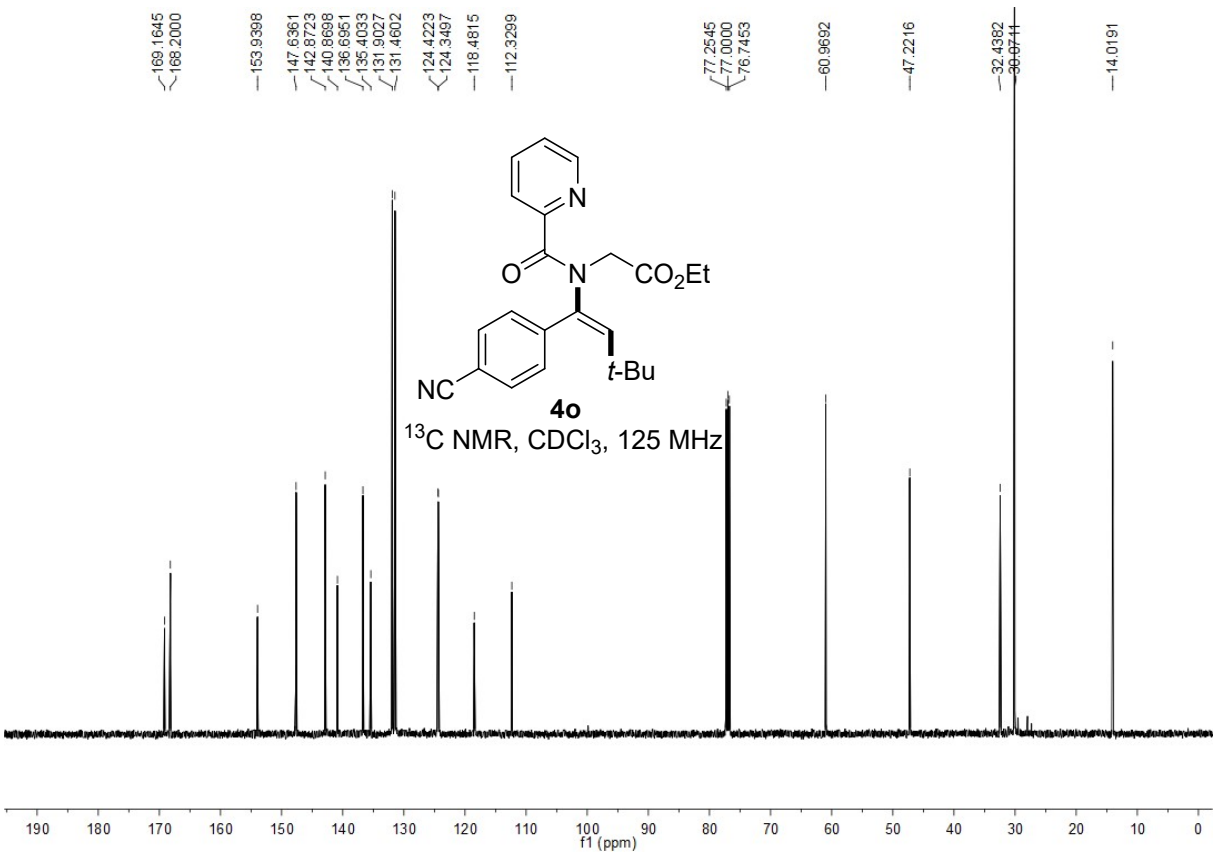

169.3249
168.4352
154.3025
147.7465
142.4611
139.7937
136.6831
135.8412
131.5999
131.0638
130.8048
130.5470
130.2894
127.2656
125.1033
124.7442
124.7171
124.6875
124.6585
124.3702
122.9389
120.7752
77.2541
77.0000
76.7455
61.0073
47.2310
32.4639
30.1967
14.0854
N
O
N
CO2Et
t-Bu
F3C
4m
13C NMR, CDCl3, 125 MHz
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

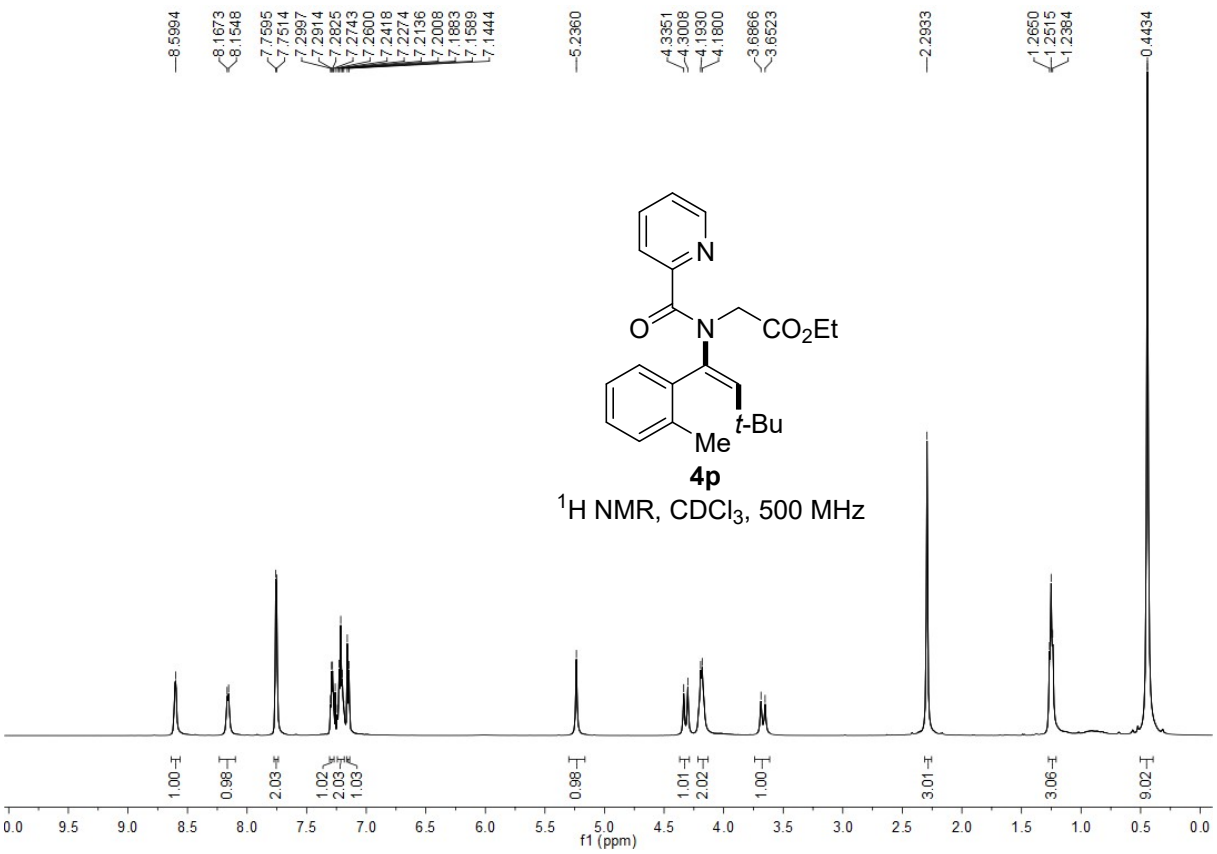

-62.6349
N
O
N
CO2Et
t-Bu
F3C
4m
19F NMR, CDCl3, 471 MHz
20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150
f1 (ppm)


8.5313
8.5217
8.0129
7.9931
7.8255
7.8058
7.7408
7.2686
7.2600
7.2599
5.2898
4.1603
4.1428
4.1251
4.1075
3.9552
3.8890
1.2304
1.2128
1.1951
0.4922
N
O
N
CO2Et
t-Bu
MeO2C
4n
1H NMR, CDCl3, 400 MHz
1.00
2.03
2.01
2.00
1.00
1.02
2.02
2.00
3.00
3.01
9.04
f1 (ppm)


169.3021
168.3943
166.6535
154.3139
147.7544
142.1763
140.6803
136.5437
136.0985
131.1743
130.2050
128.9263
124.2318
77.3183
77.0000
76.6818
60.8997
52.0582
47.1753
32.3908
30.1074
14.0425
N
O
N
CO2Et
t-Bu
MeO2C
4n
13C NMR, CDCl3, 100 MHz
f1 (ppm)

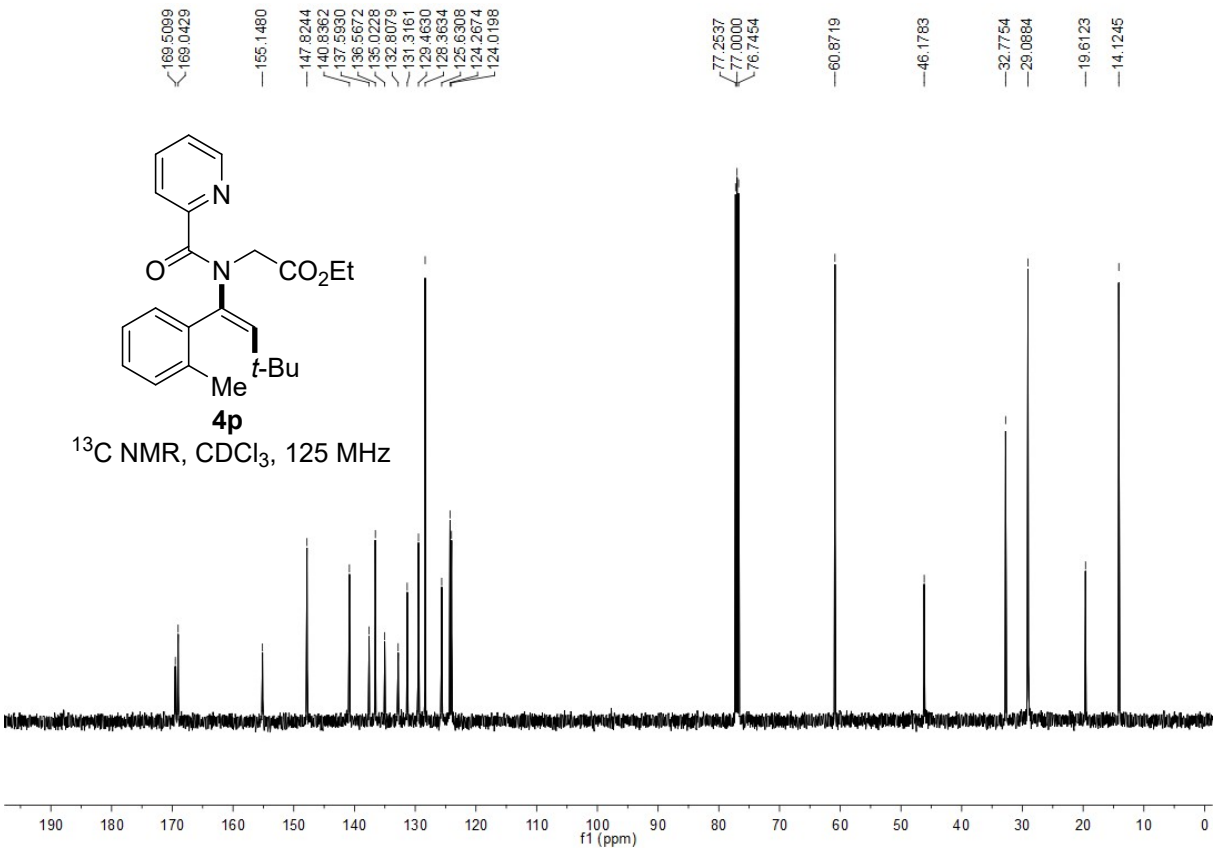

8.5234
8.5144
7.9171
7.9009
7.7602
7.7517
7.6462
7.6299
7.3009
7.2915
7.2839
7.2740
7.2600
5.3294
4.1589
4.1446
4.1303
4.1161
3.9404
1.2318
1.2175
1.2033
0.5013
N
O
N
CO2Et
t-Bu
NC
4o
1H NMR, CDCl3, 500 MHz
1.00
2.01
2.00
2.03
1.00
1.03
2.01
2.03
3.00
9.03
f1 (ppm)


169.1645
168.2000
153.9398
147.6361
142.8723
140.8698
136.6951
135.4033
131.9027
131.4602
124.4223
124.3497
118.4815
112.3299
77.2545
77.0000
76.7453
60.9692
47.2216
32.4382
30.0711
14.0191
N
O
N
CO2Et
t-Bu
NC
4o
13C NMR, CDCl3, 125 MHz
f1 (ppm)



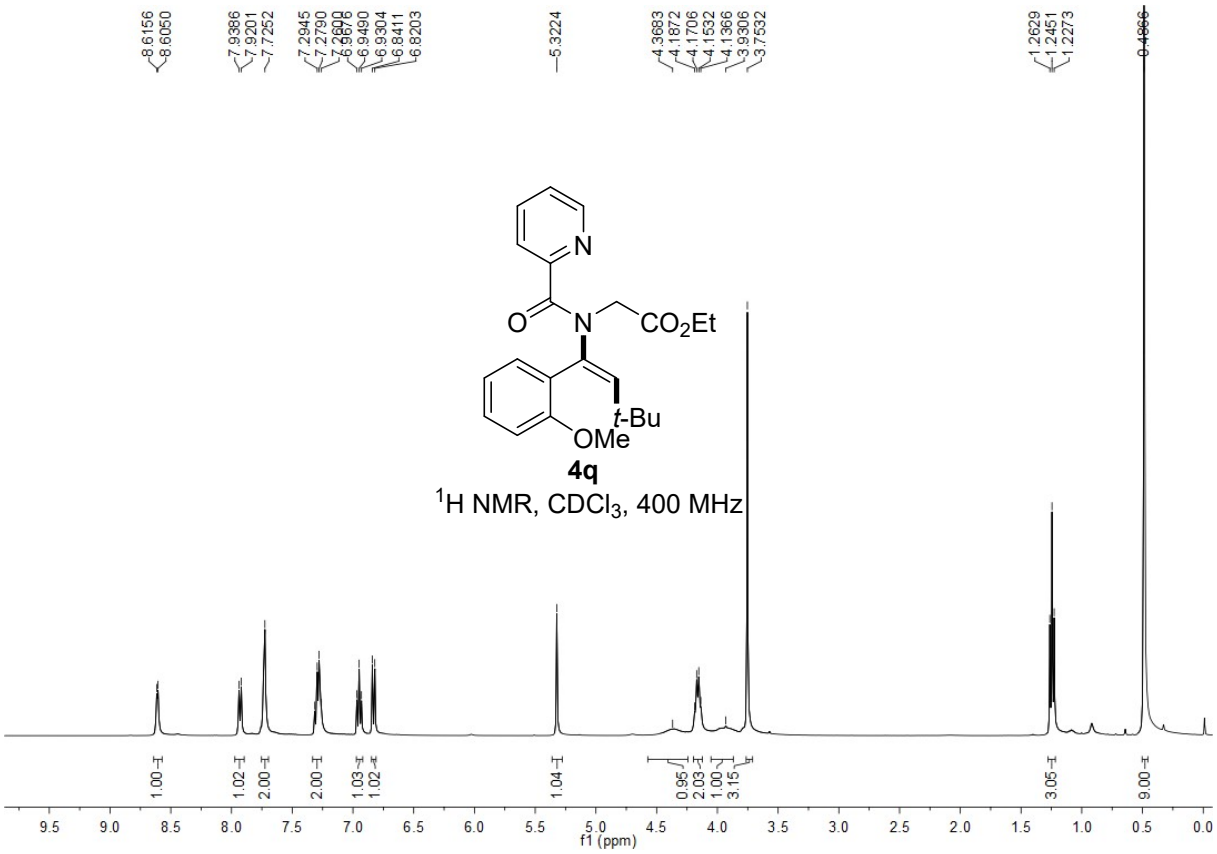
4p

^{1}H NMR, $CDCl_3$, 500 MHz



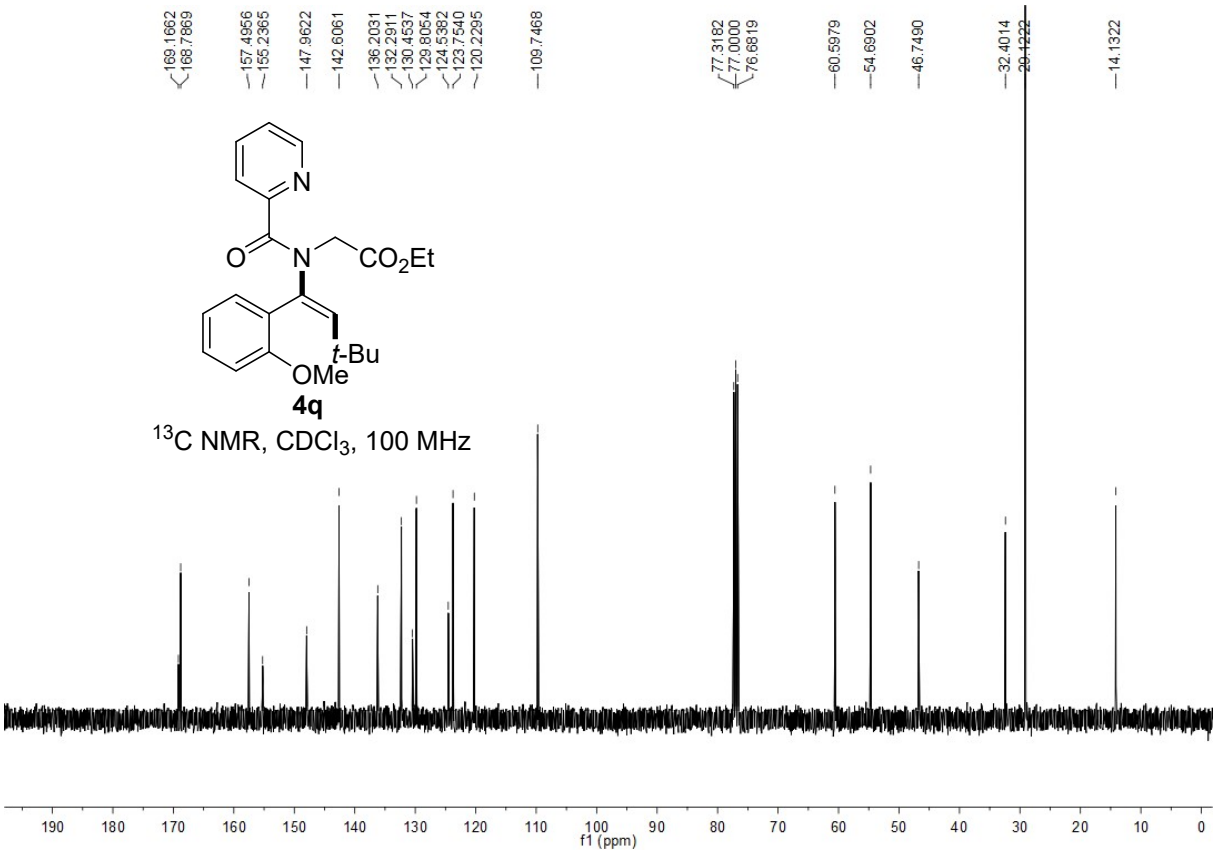
4p

^{13}C NMR, $CDCl_3$, 125 MHz



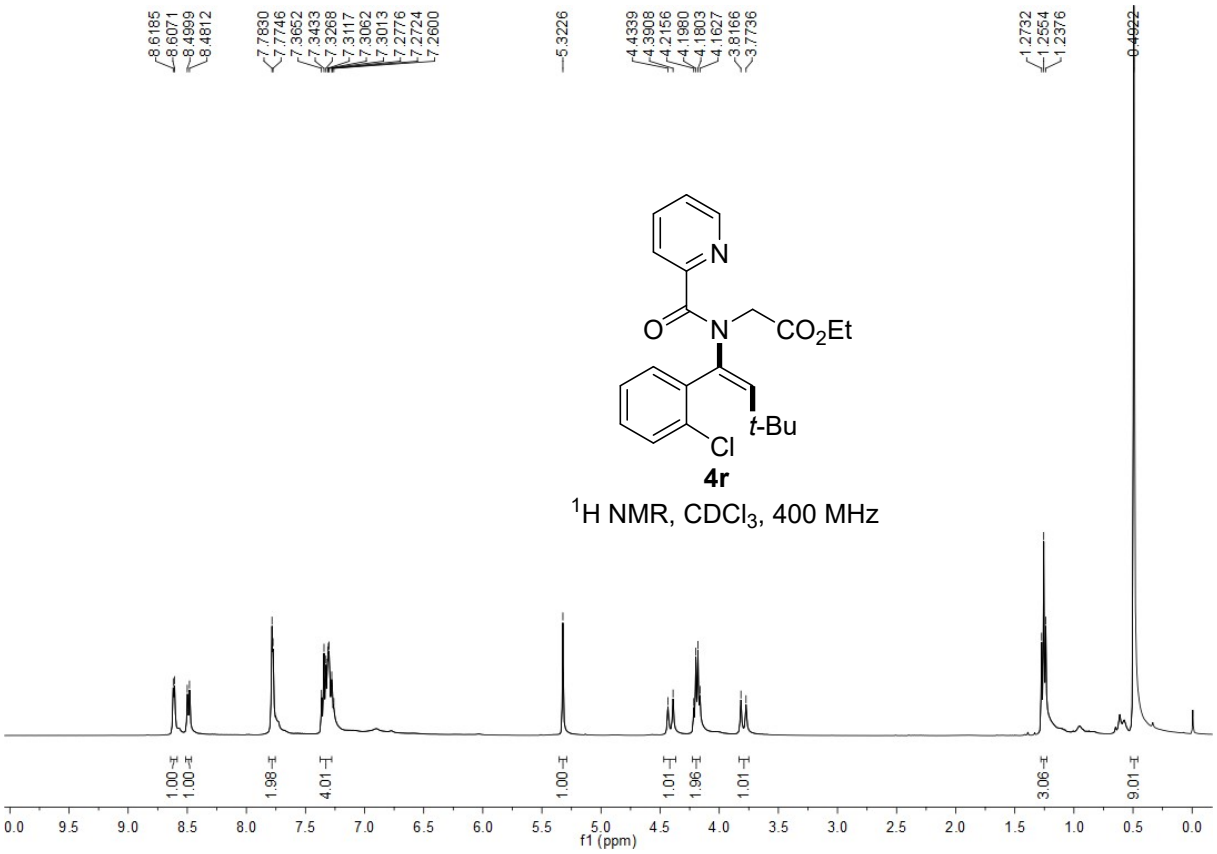
4q

^{1}H NMR, $CDCl_3$, 400 MHz



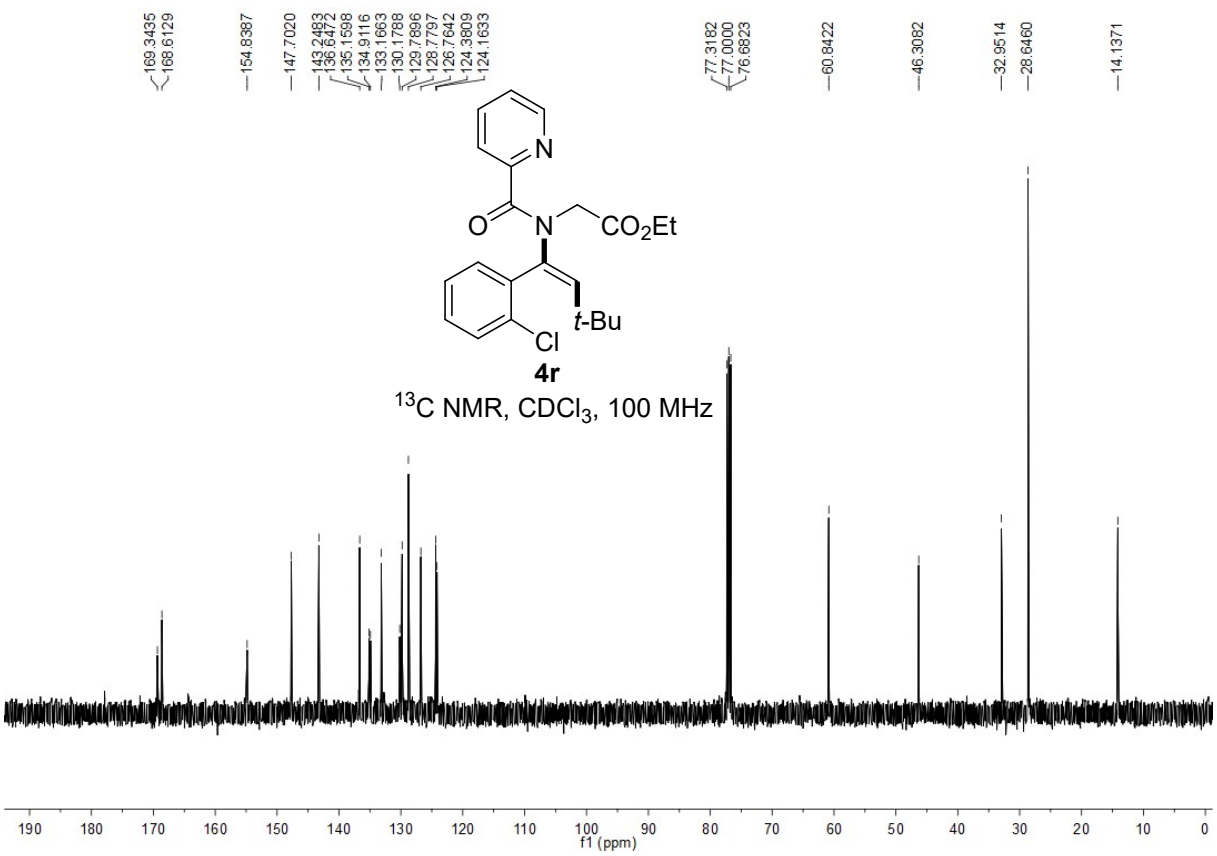
4q

^{13}C NMR, $CDCl_3$, 100 MHz



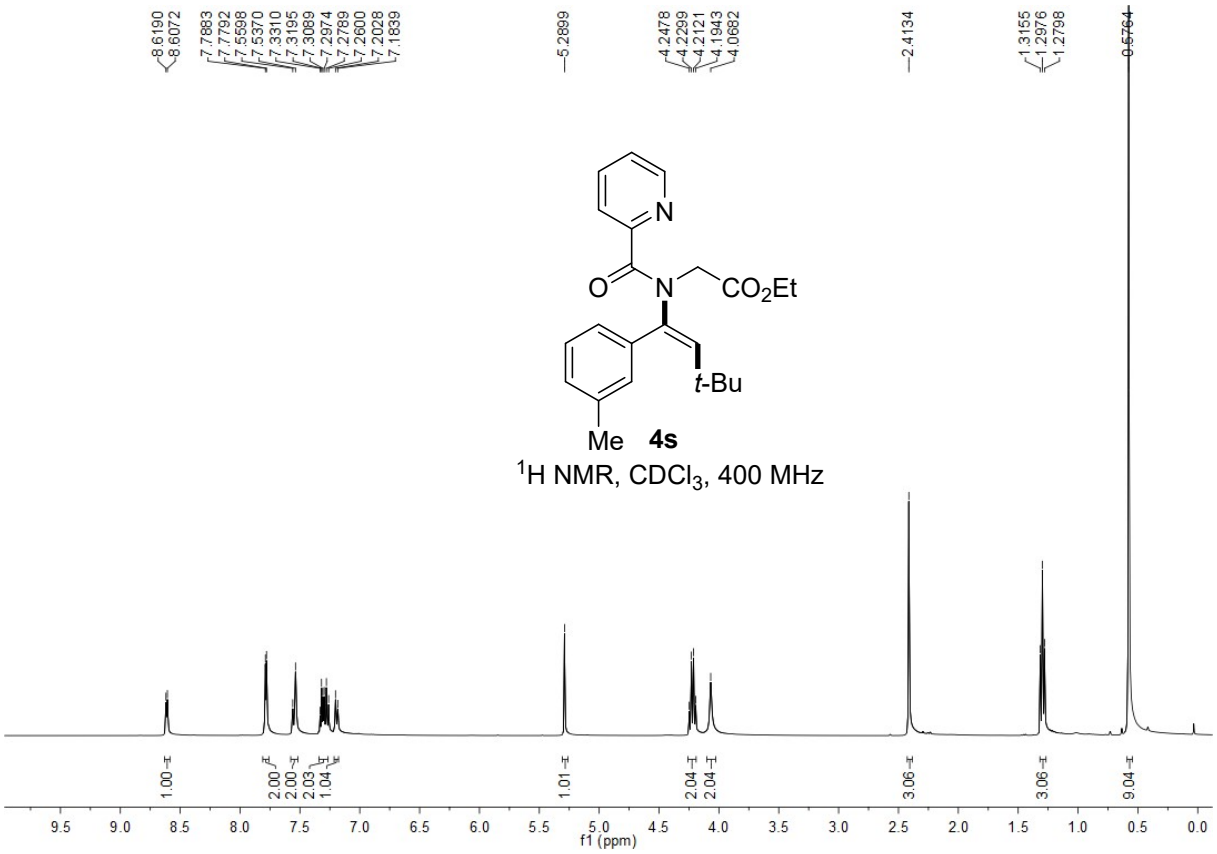
4r

^{1}H NMR, $CDCl_3$, 400 MHz

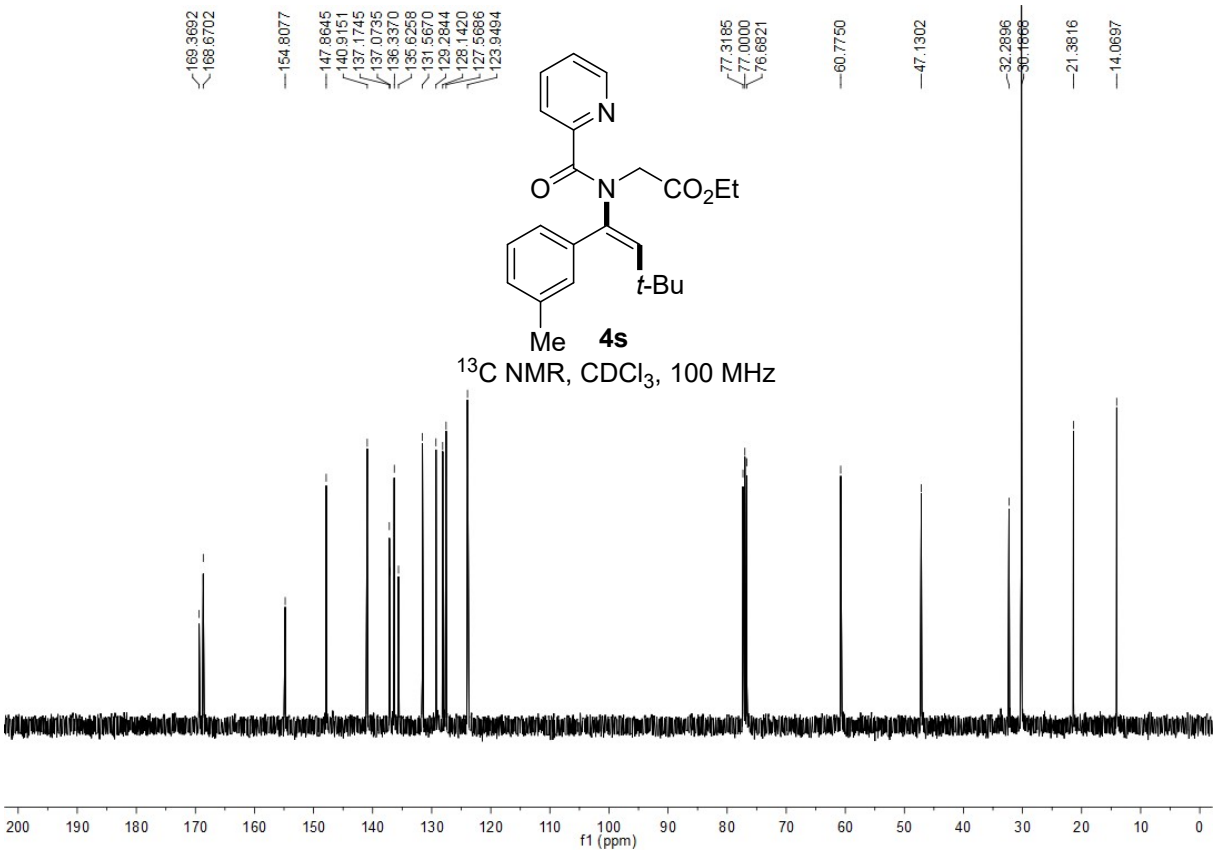


4r

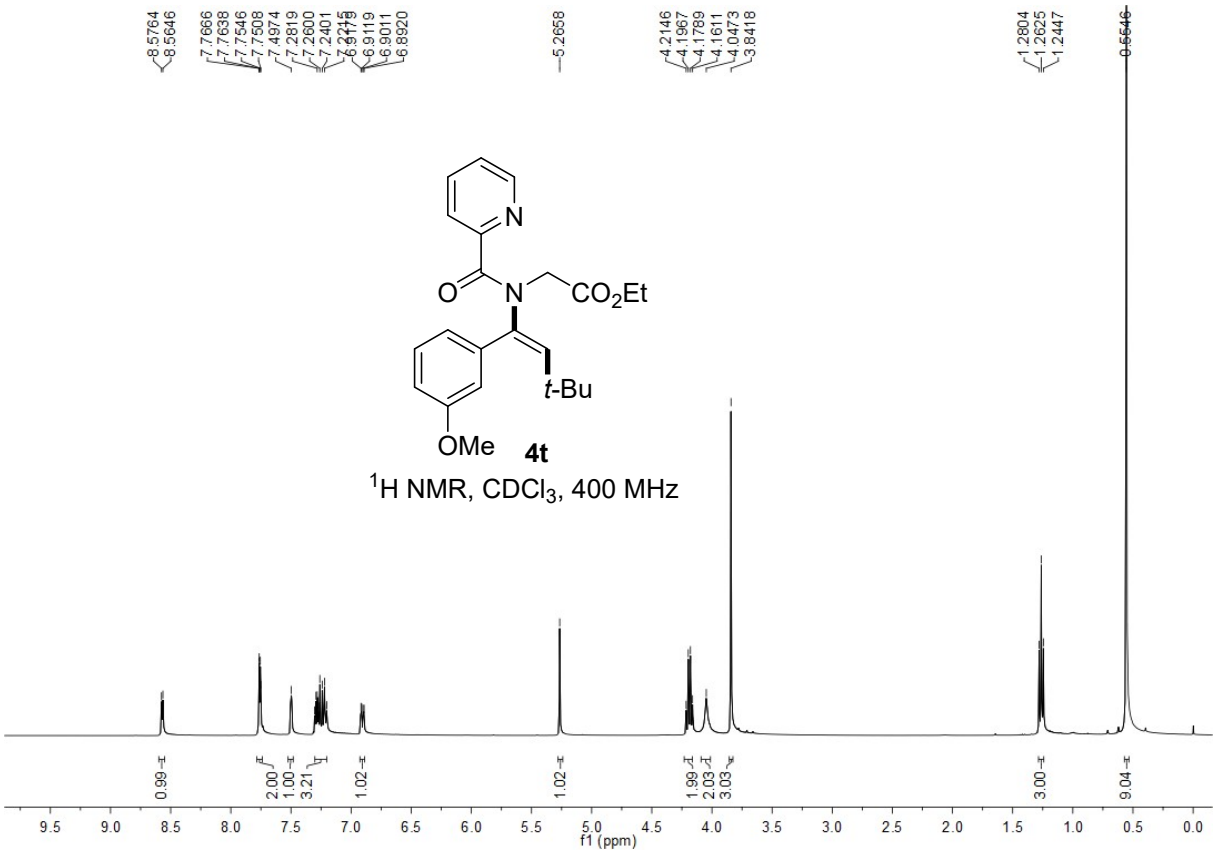
^{13}C NMR, $CDCl_3$, 100 MHz



^{1}H NMR, $CDCl_3$, 400 MHz

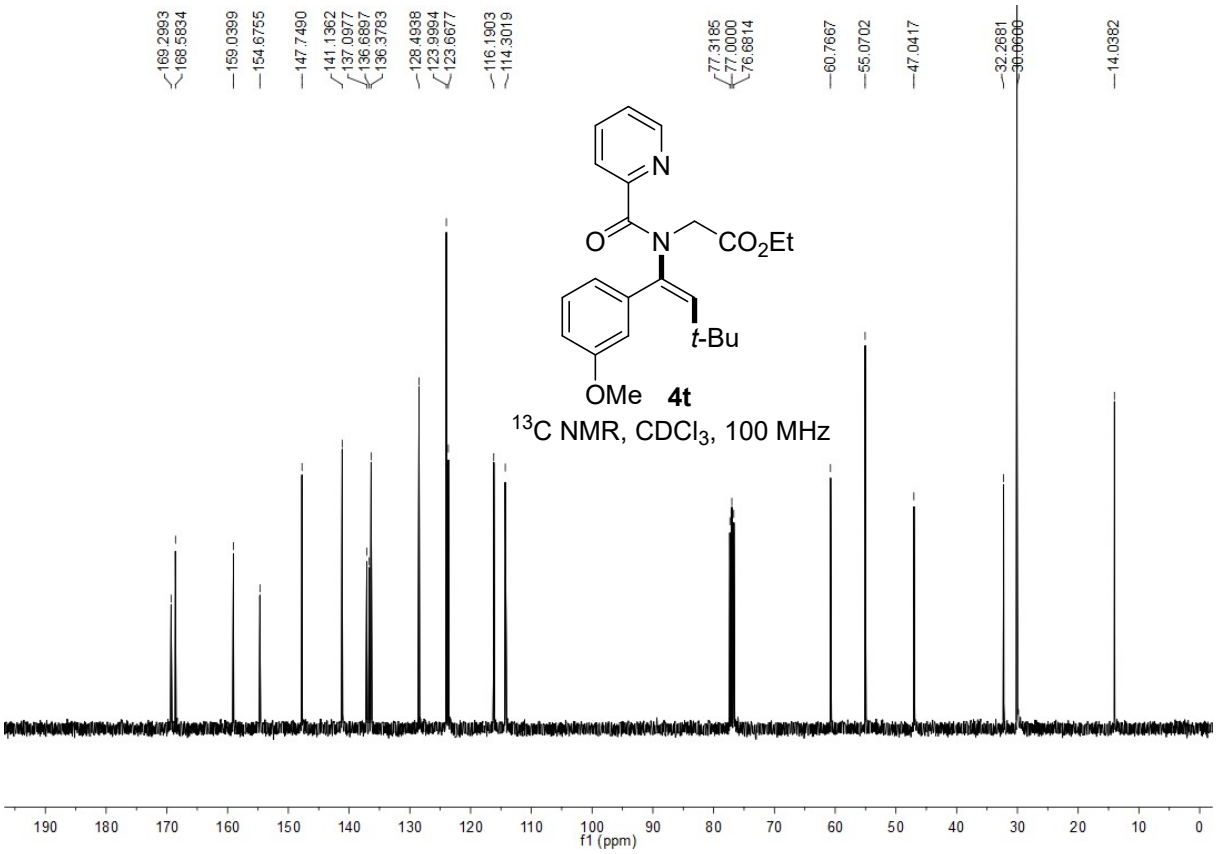


^{13}C NMR, $CDCl_3$, 100 MHz



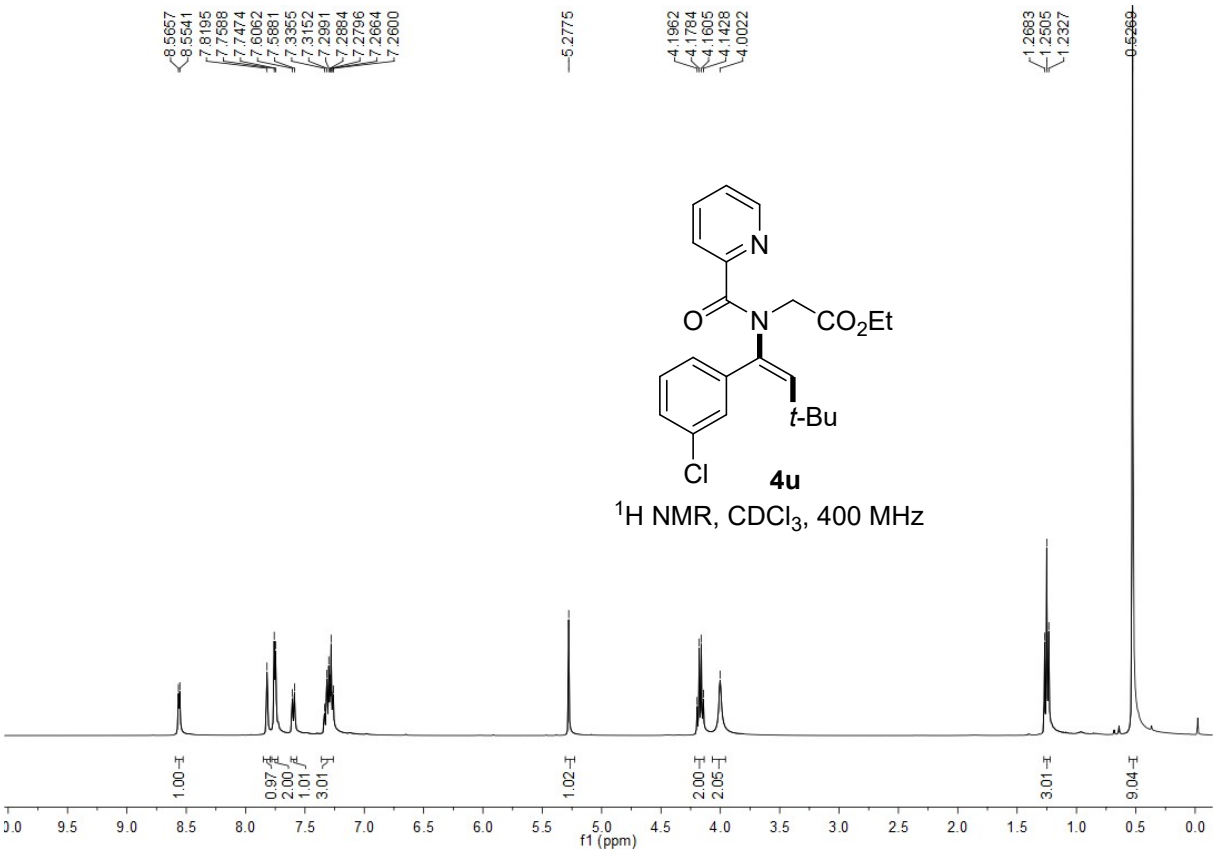
4t

^{1}H NMR, $CDCl_3$, 400 MHz



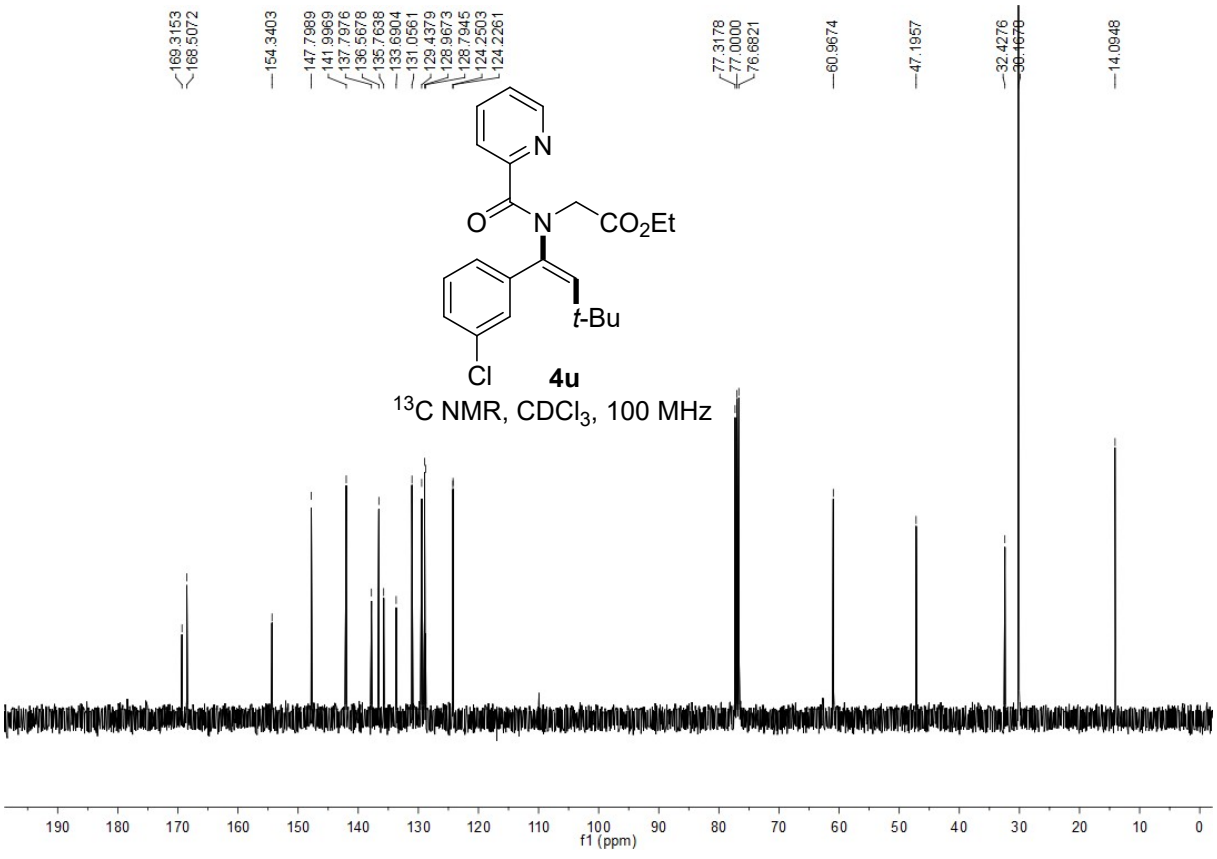
4t

^{13}C NMR, $CDCl_3$, 100 MHz



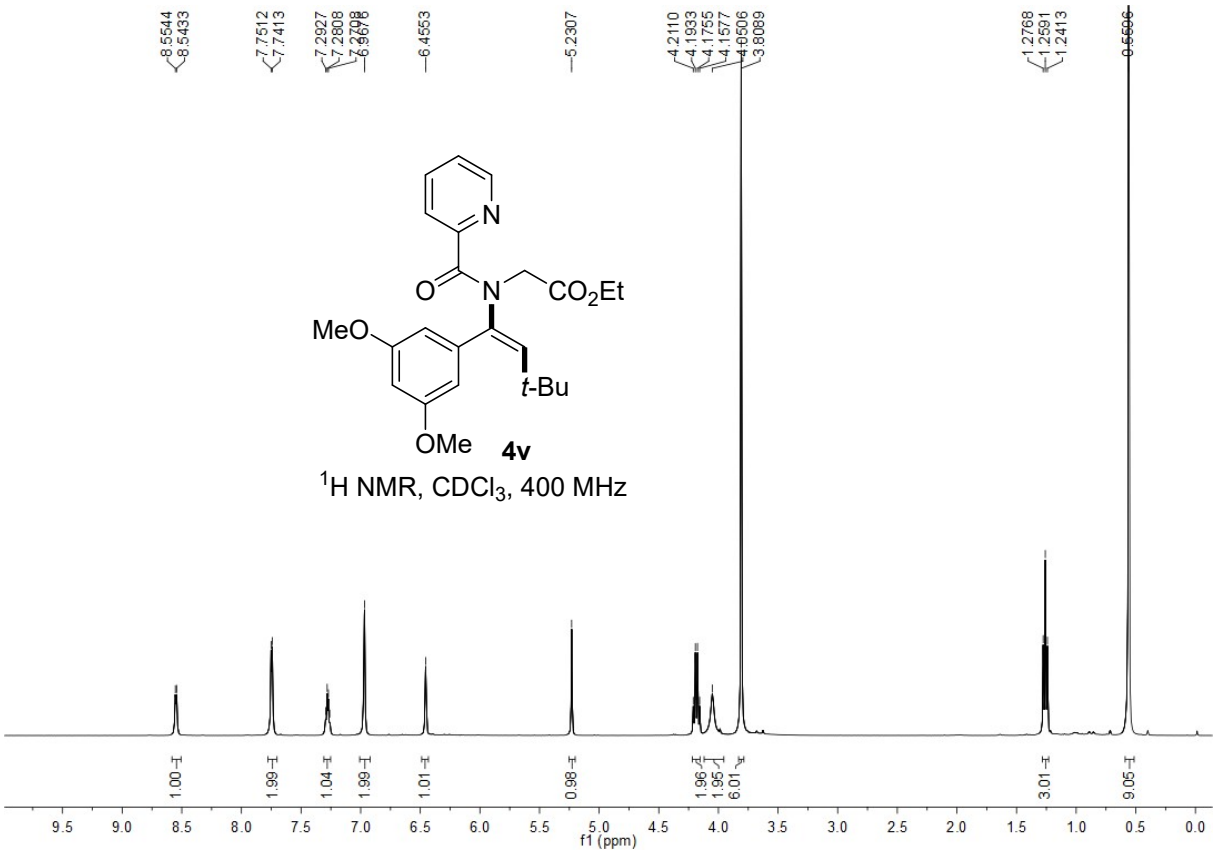
4u

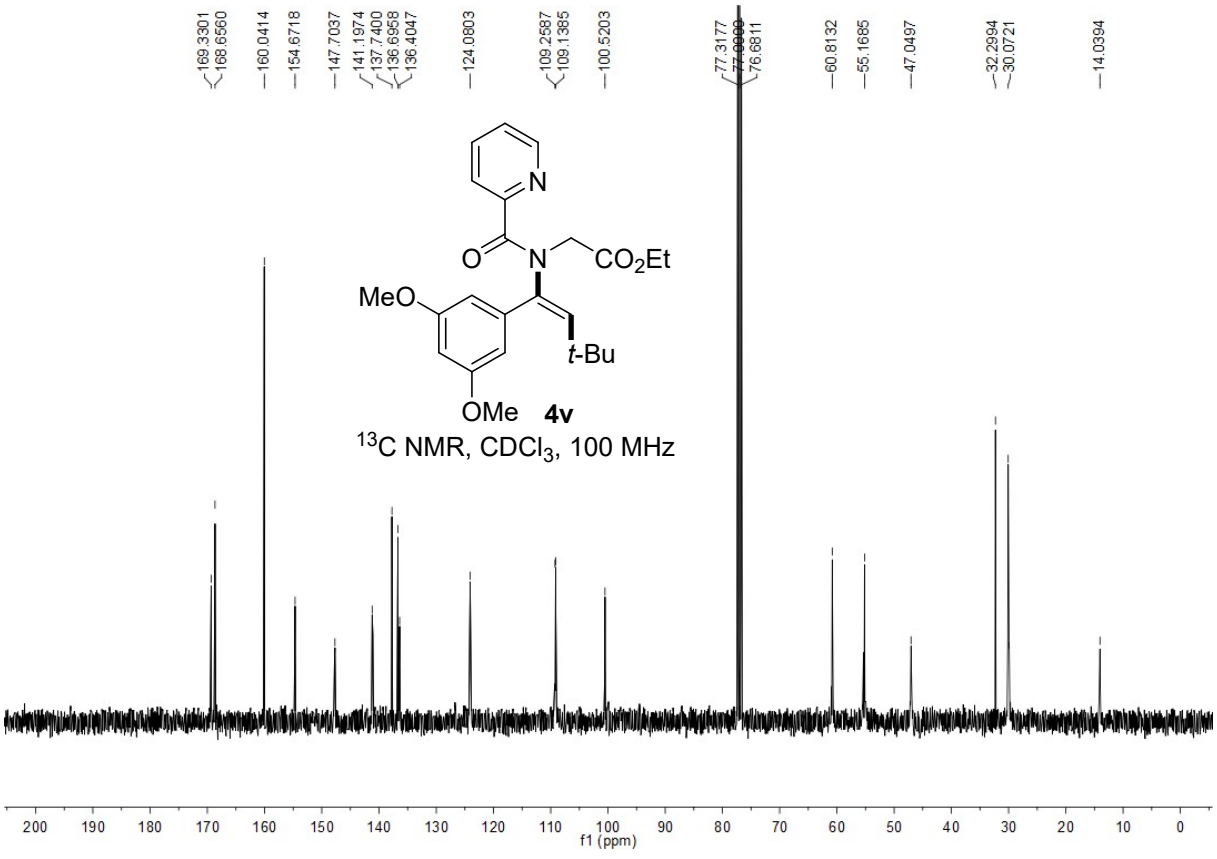
^{1}H NMR, $CDCl_3$, 400 MHz

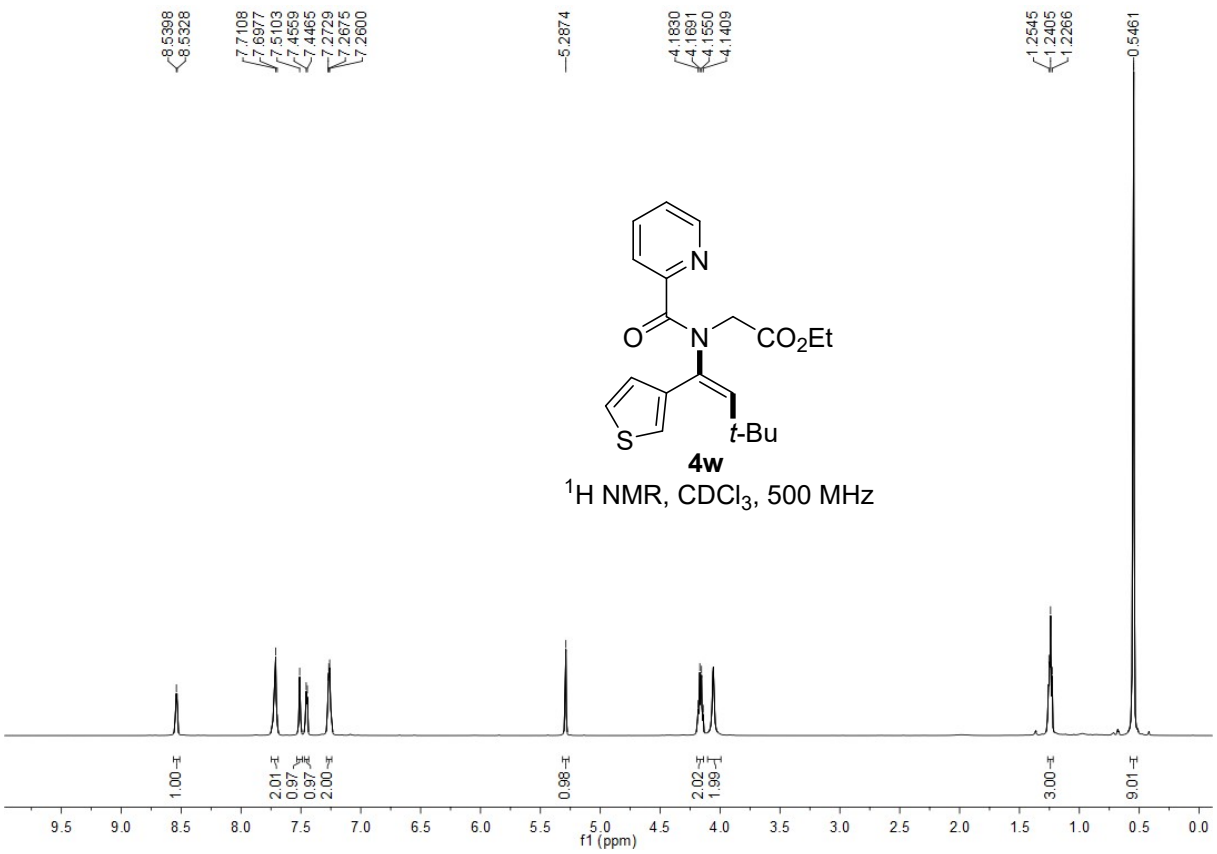


4u

^{13}C NMR, $CDCl_3$, 100 MHz

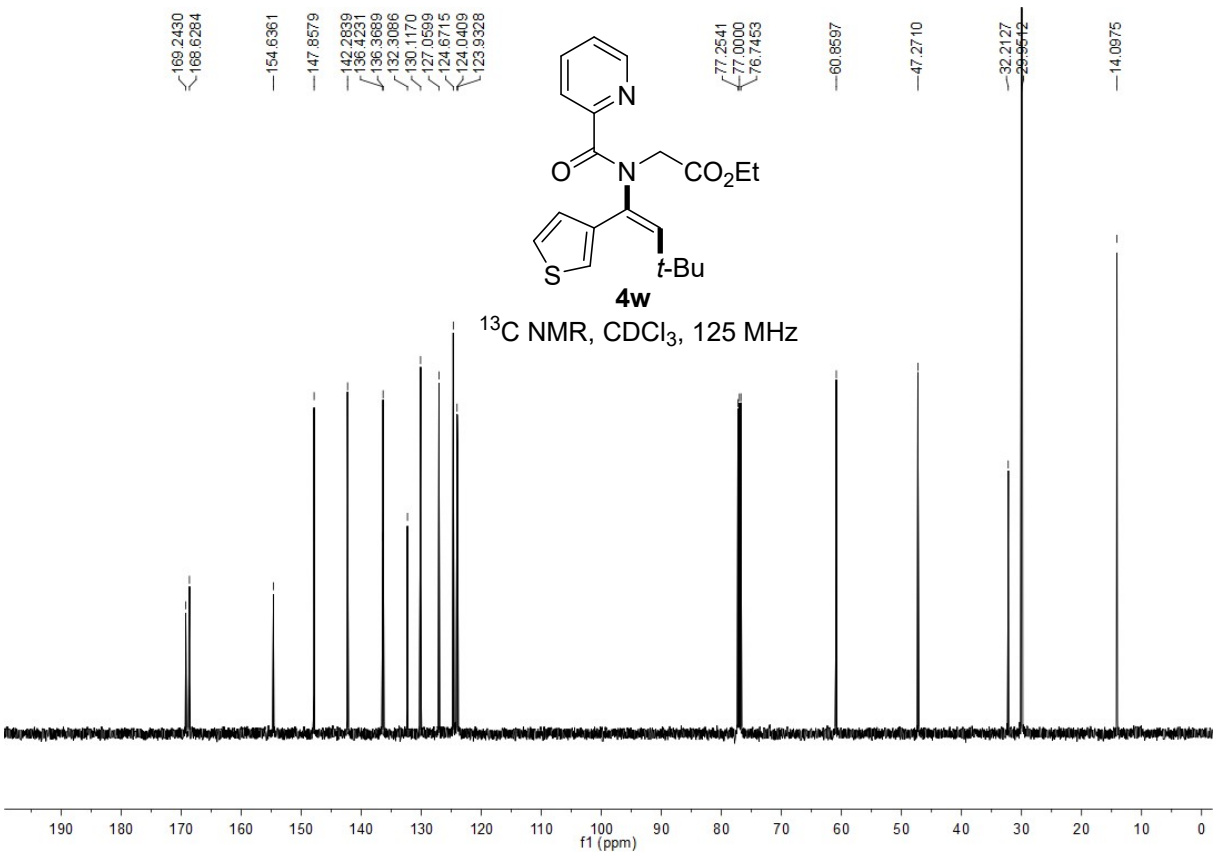

8.5544
8.5433
7.7512
7.7413
7.2927
7.2808
7.2708
6.9678
6.4553
5.2307
4.2110
4.1933
4.1755
4.1577
4.0506
3.8089
1.2768
1.2591
1.2413
0.5696
N
O
N
CO2Et
MeO
t-Bu
OMe
4v
1H NMR, CDCl3, 400 MHz
1.00
1.99
1.04
1.99
1.01
0.98
1.96
1.95
6.01
3.01
9.05
f1 (ppm)


169.3301
168.6560
160.0414
154.6718
147.7037
141.1974
137.7400
136.6958
136.4047
124.0803
109.2587
109.1385
100.5203
77.3177
77.0000
76.6811
60.8132
55.1685
47.0497
32.2994
30.0721
14.0394
N
O
N
CO2Et
MeO
t-Bu
OMe
4v
13C NMR, CDCl3, 100 MHz
f1 (ppm)



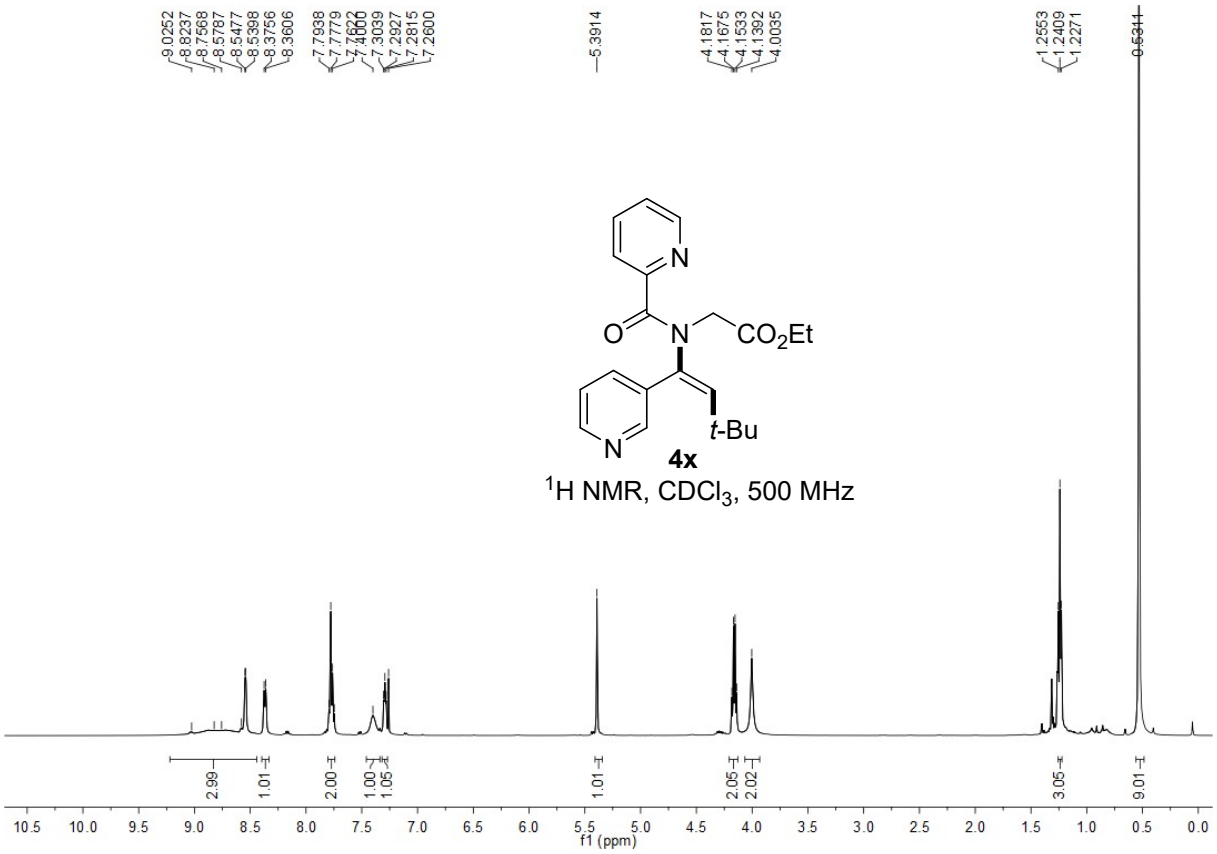
4w

^{1}H NMR, $CDCl_3$, 500 MHz



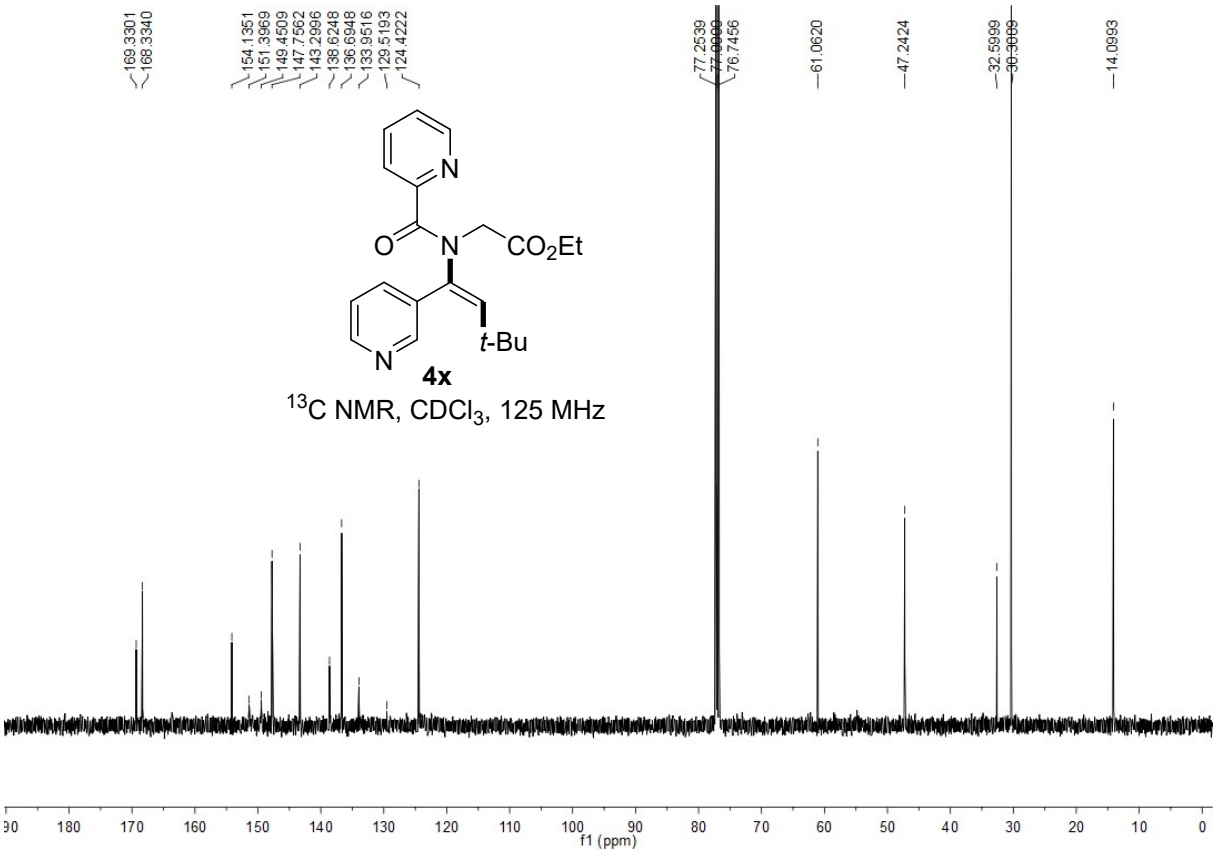
4w

^{13}C NMR, $CDCl_3$, 125 MHz



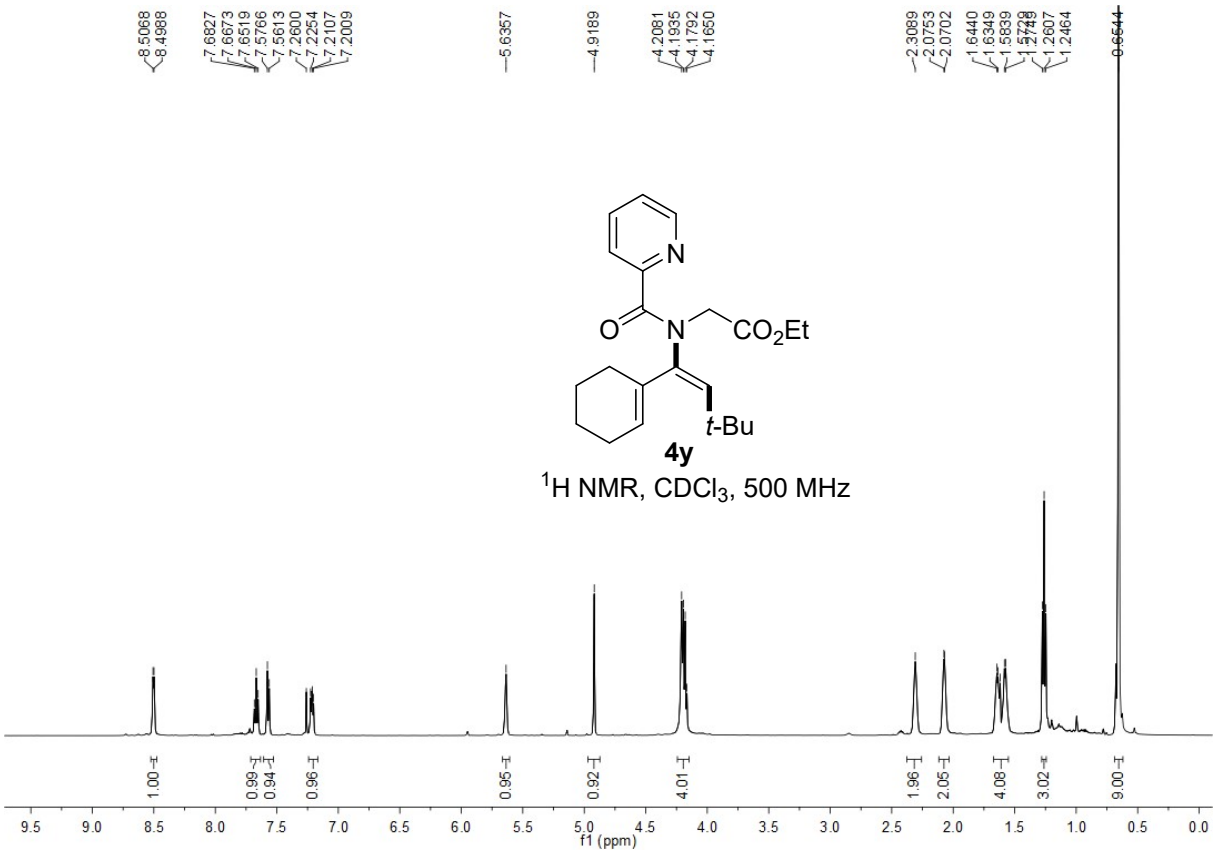
4x

^{1}H NMR, $CDCl_3$, 500 MHz



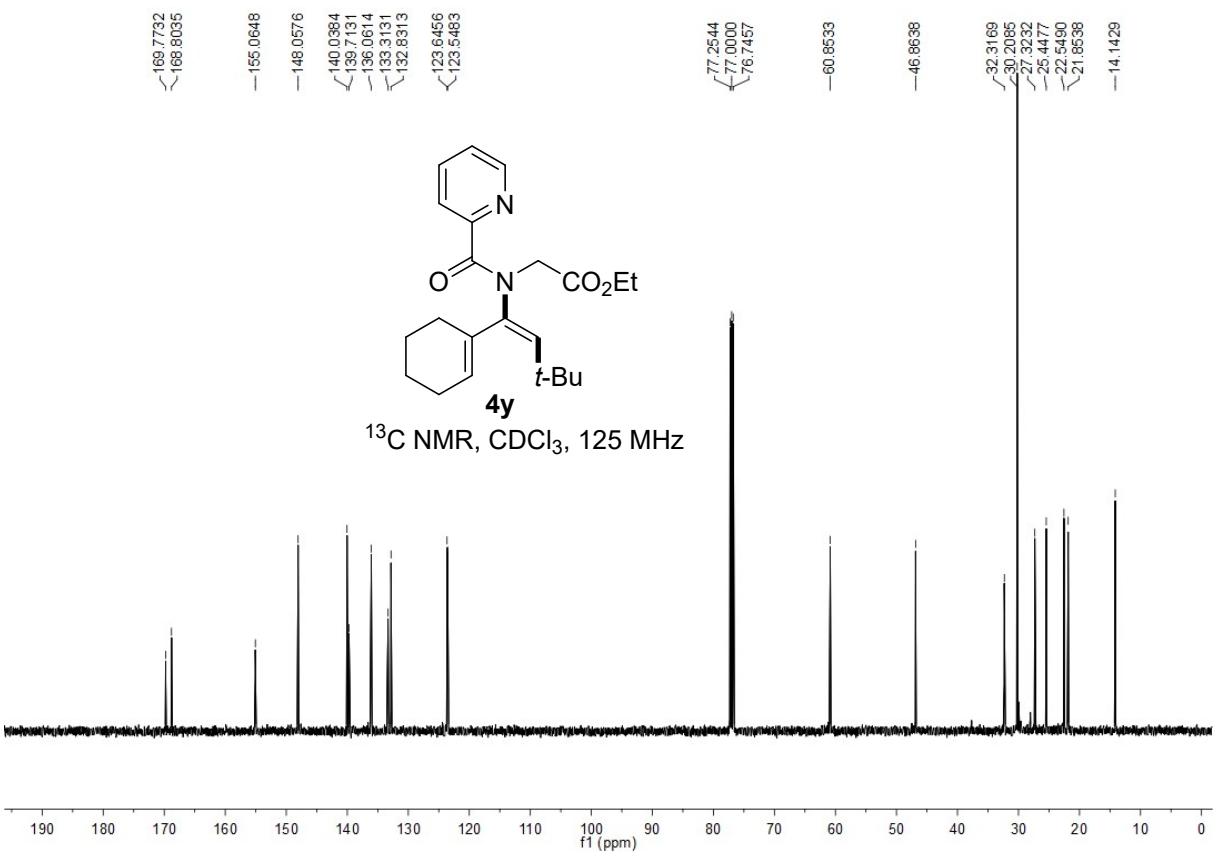
4x

^{13}C NMR, $CDCl_3$, 125 MHz



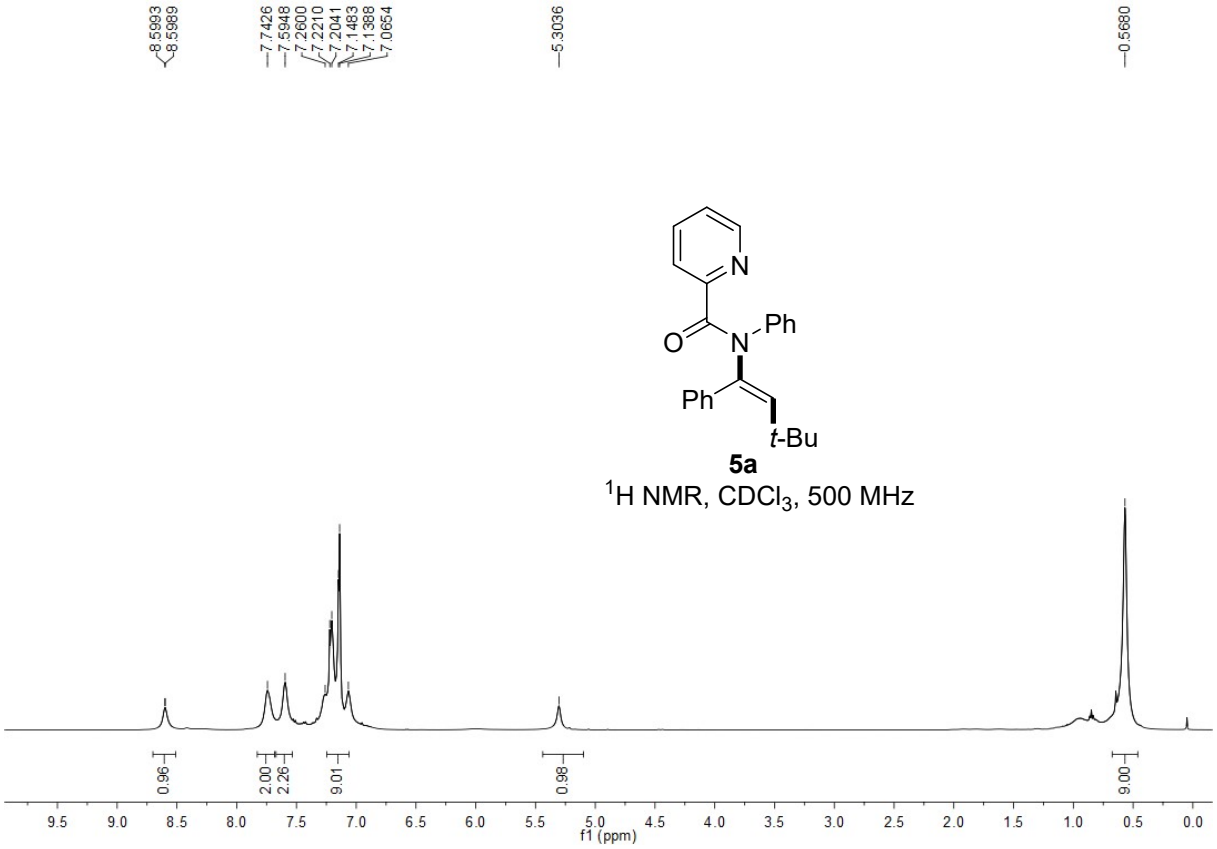
4y

^{1}H NMR, $CDCl_3$, 500 MHz



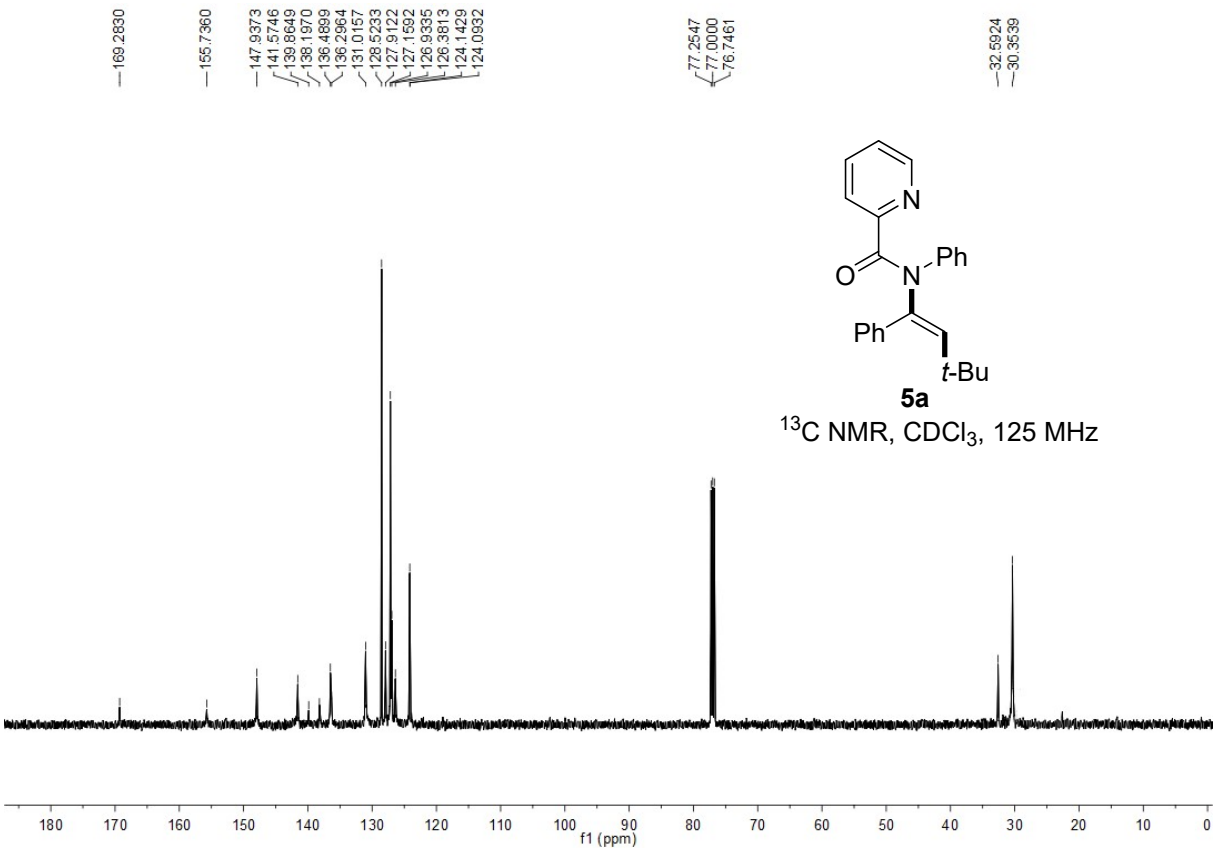
4y

^{13}C NMR, $CDCl_3$, 125 MHz



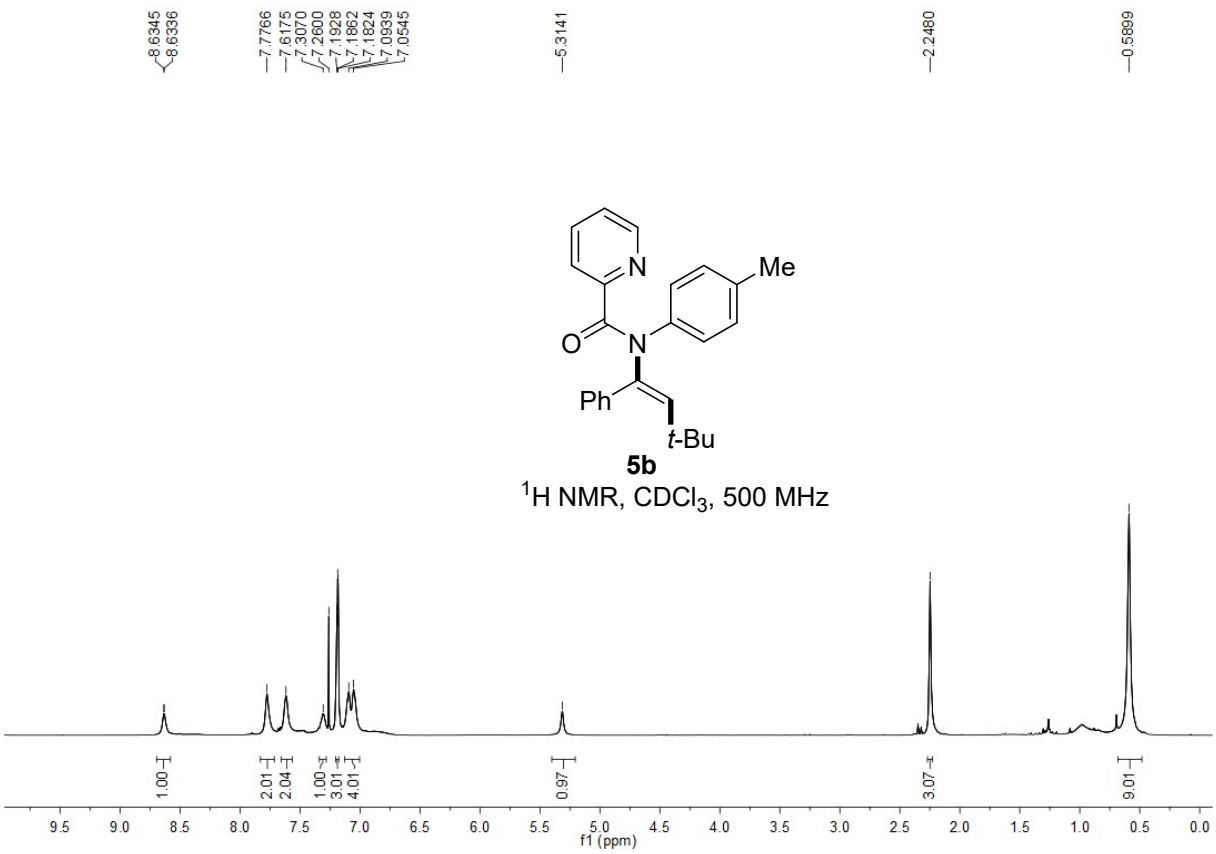
5a

^{1}H NMR, $CDCl_3$, 500 MHz



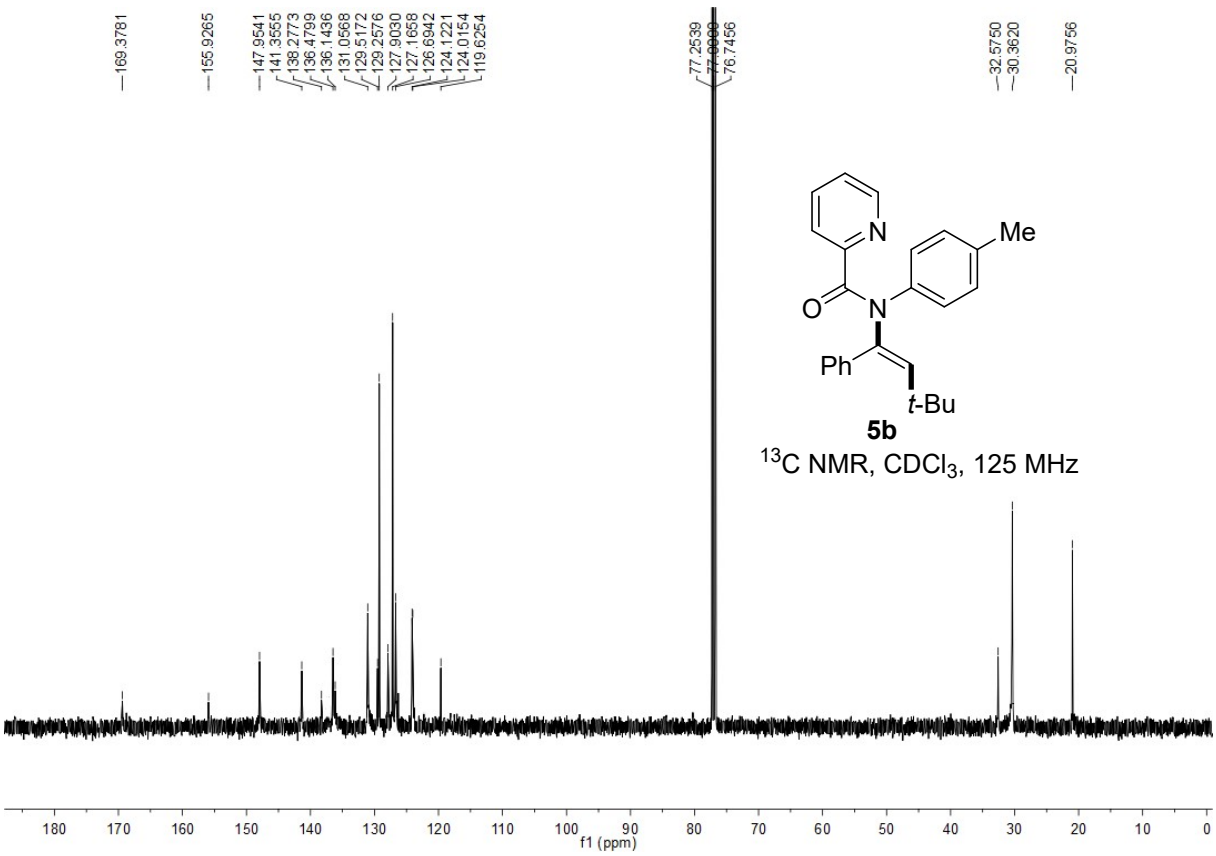
5a

^{13}C NMR, $CDCl_3$, 125 MHz



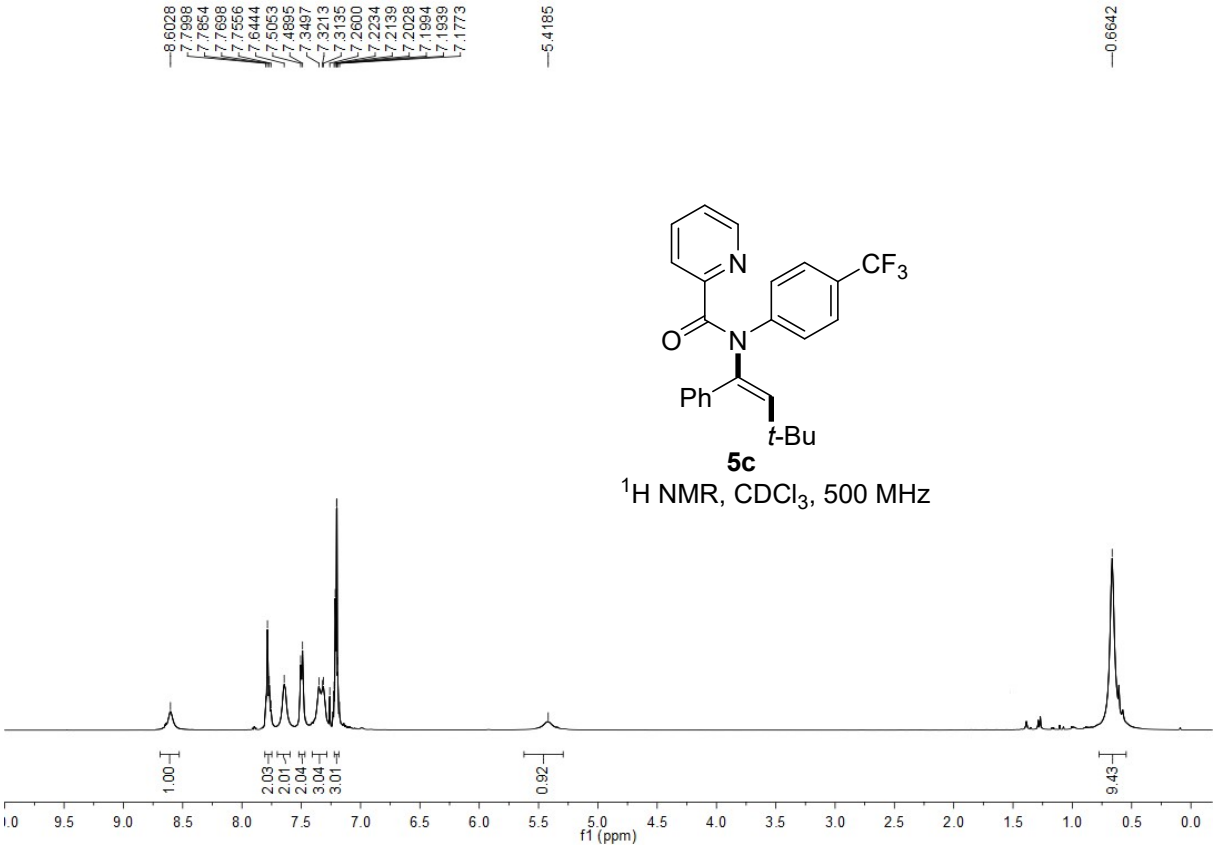
5b

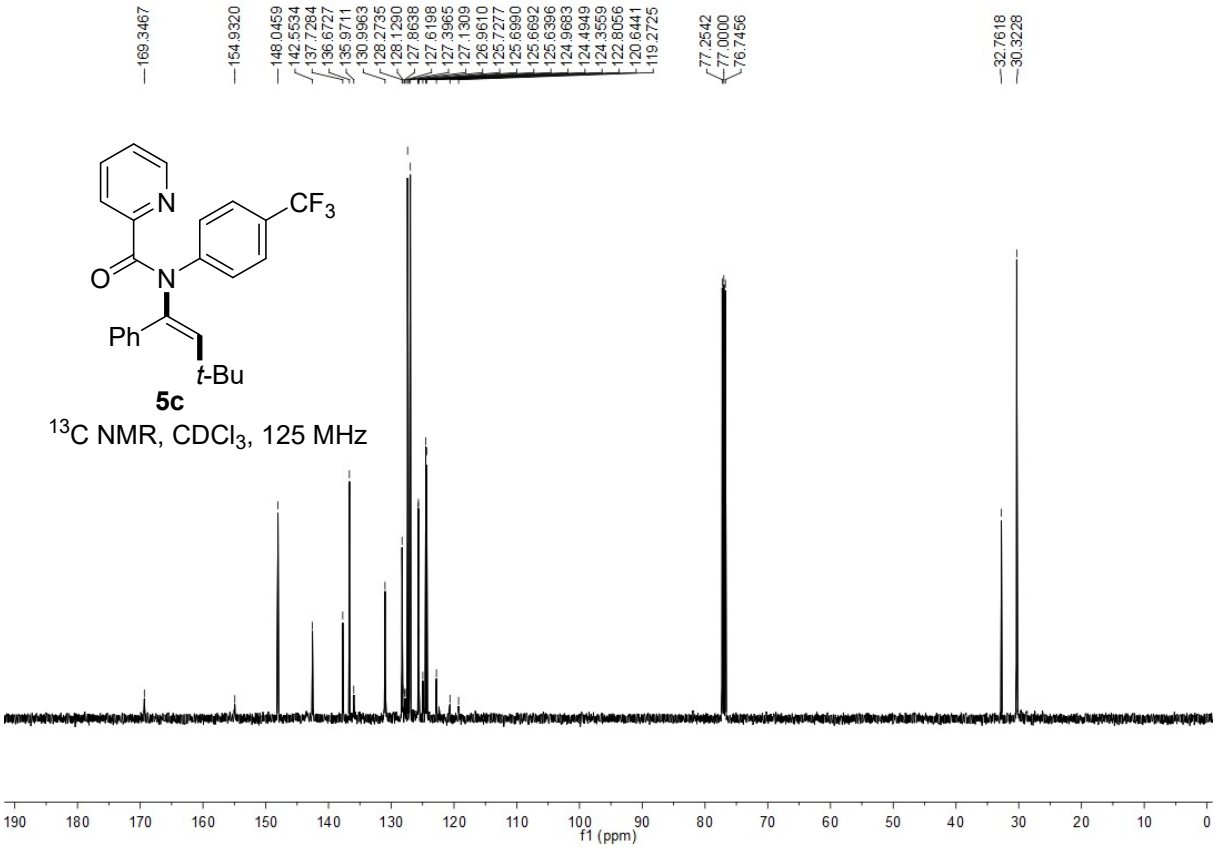
^{1}H NMR, $CDCl_3$, 500 MHz

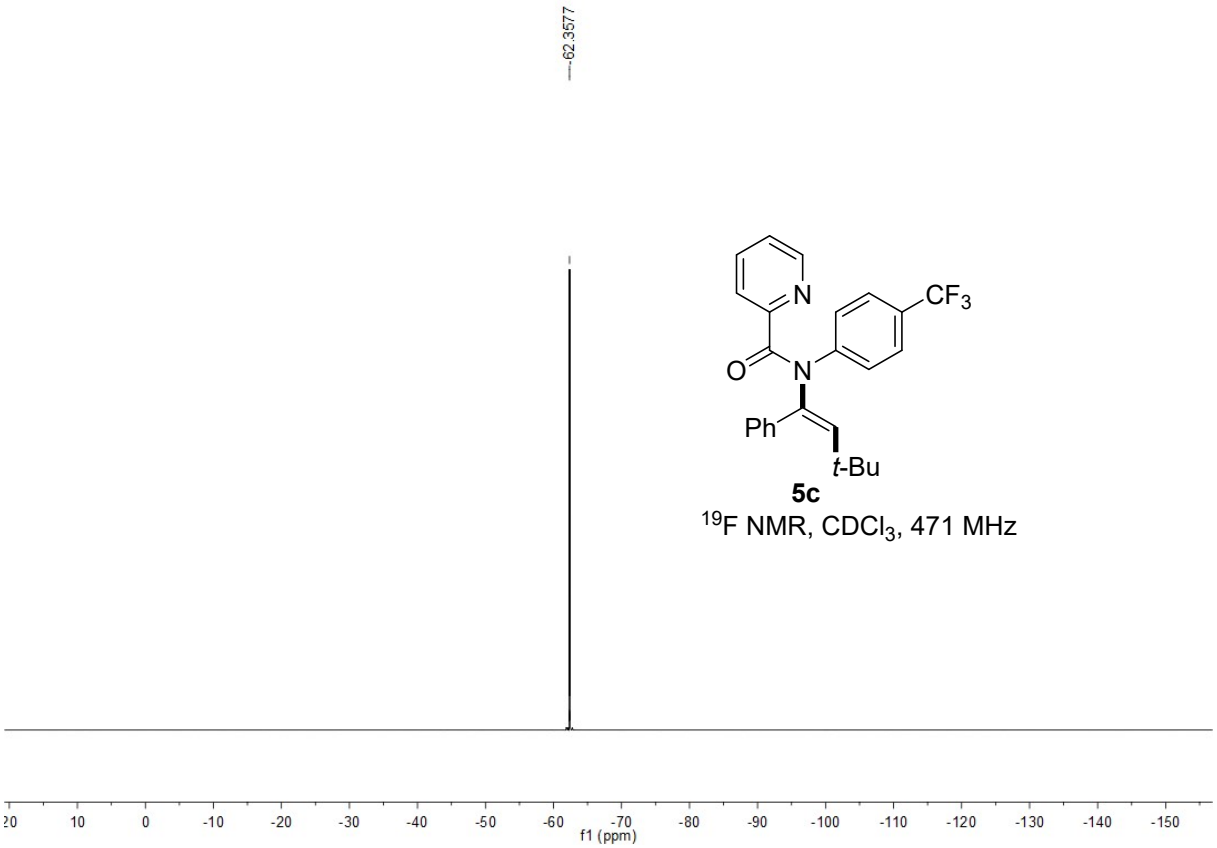


5b

^{13}C NMR, $CDCl_3$, 125 MHz

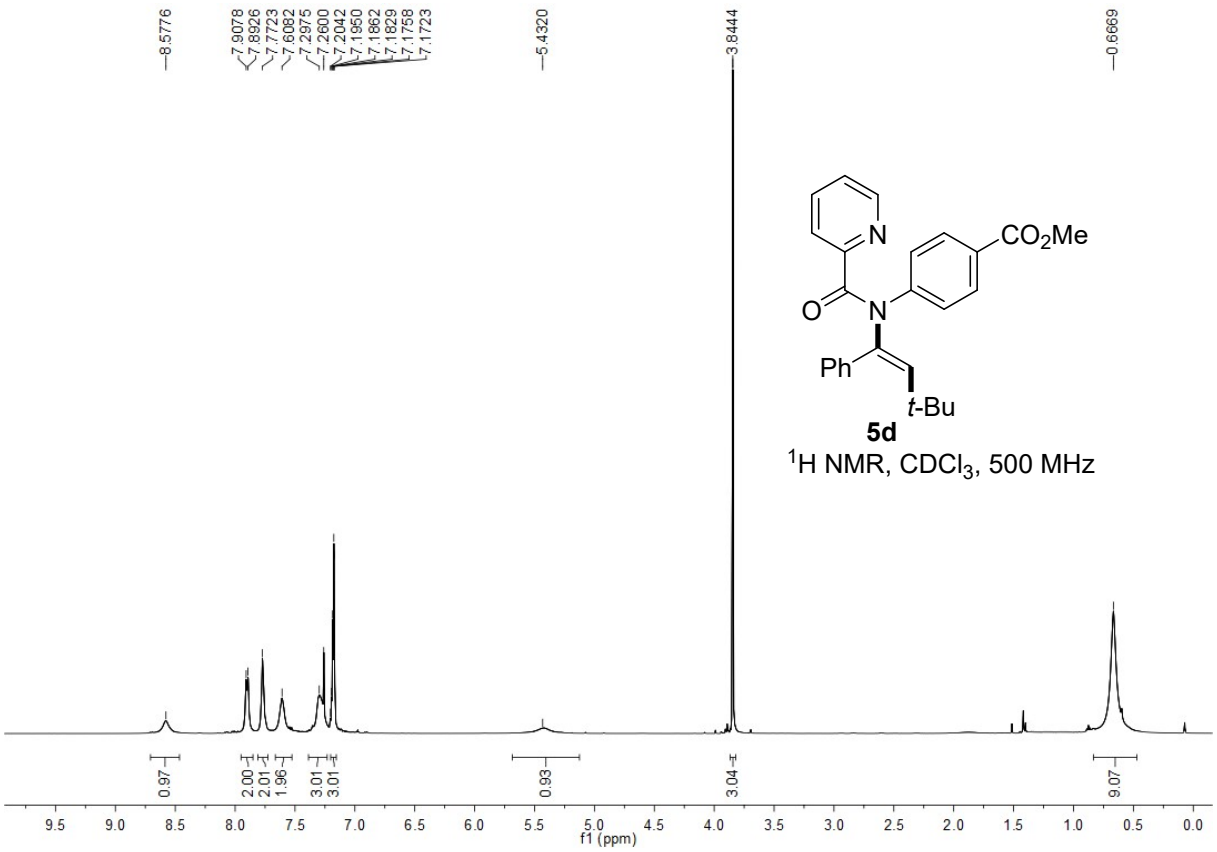

8.6028
7.7998
7.7854
7.7698
7.7556
7.6444
7.5053
7.4885
7.3497
7.3213
7.3135
7.2600
7.2234
7.2139
7.2028
7.1994
7.1939
7.1773
5.4185
0.6642
N
CF3
O
N
Ph
t-Bu
5c
1H NMR, CDCl3, 500 MHz
1.00
2.03
2.01
2.04
3.04
3.01
0.92
9.43
f1 (ppm)


169.3467
154.9320
148.0459
142.5534
137.7284
136.6727
135.9711
130.9963
128.2735
128.1290
127.8638
127.6198
127.3965
127.1309
126.9610
125.7277
125.6990
125.6692
125.6396
124.9683
124.4949
124.3559
122.8056
120.6441
119.2725
77.2542
77.0000
76.7456
32.7618
30.3228
N
CF3
O
N
Ph
t-Bu
5c
13C NMR, CDCl3, 125 MHz
f1 (ppm)



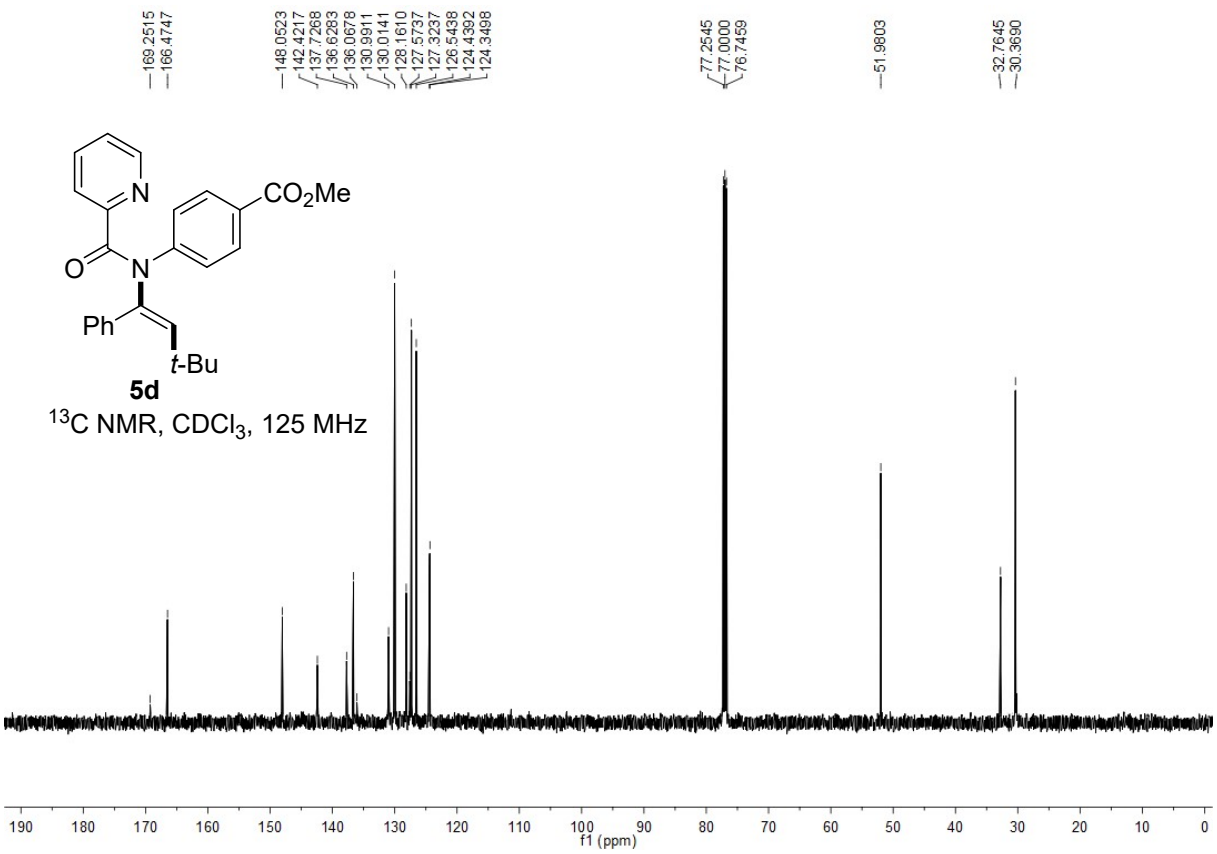
5c

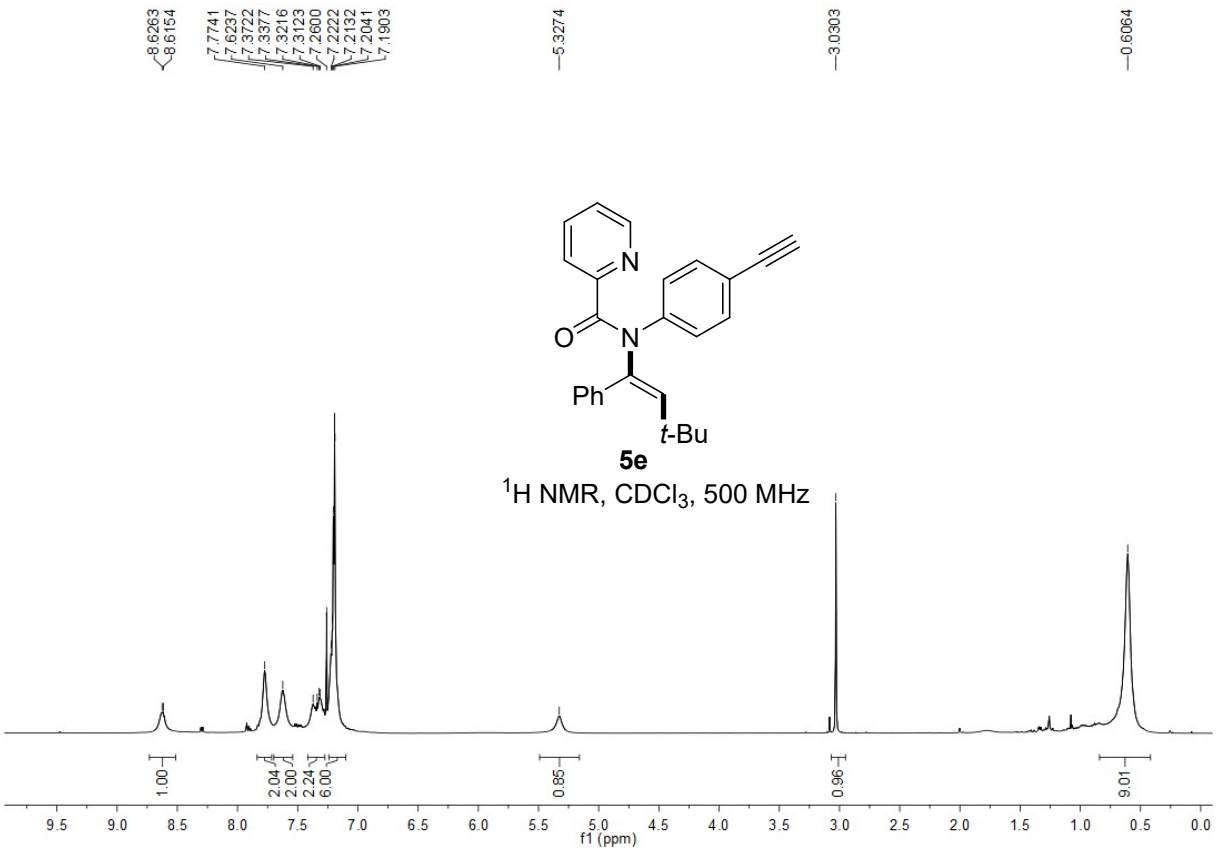
^{19}F NMR, $CDCl_3$, 471 MHz

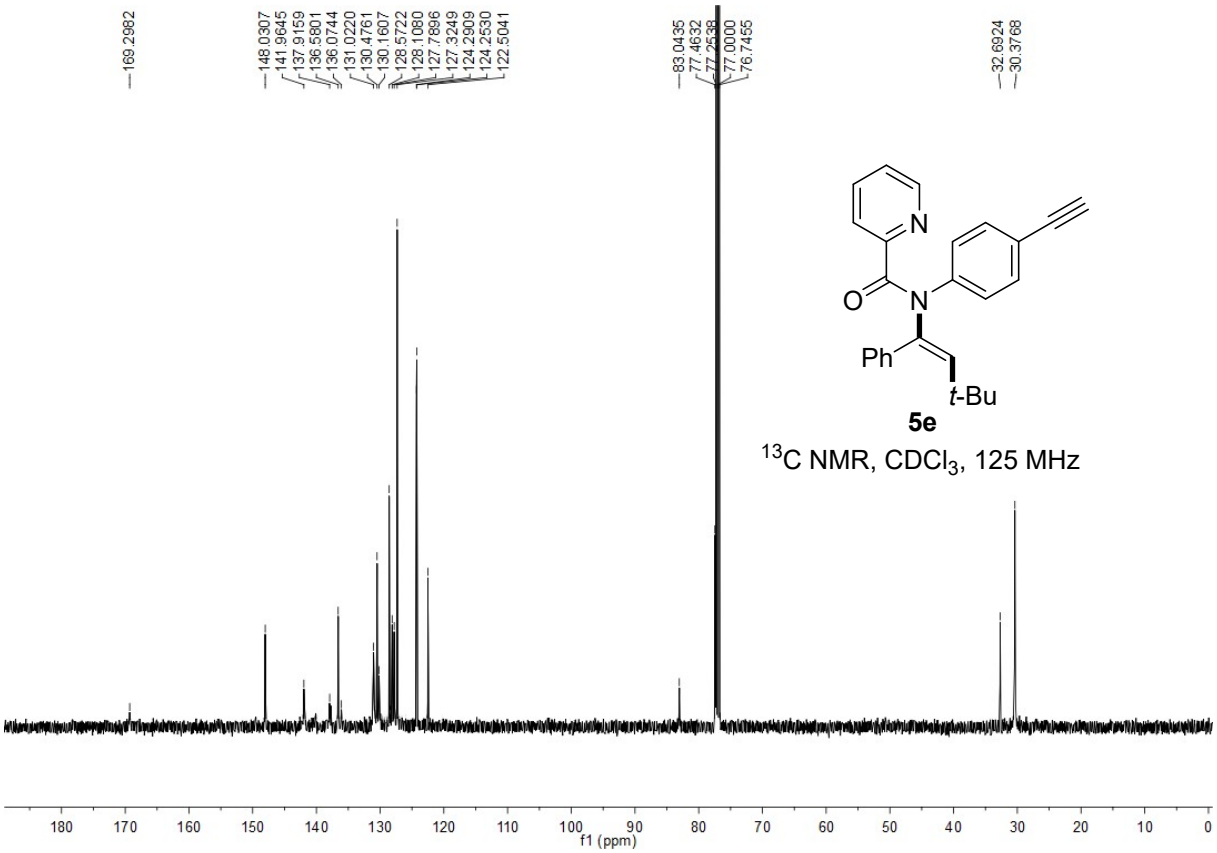


5d

^{1}H NMR, $CDCl_3$, 500 MHz

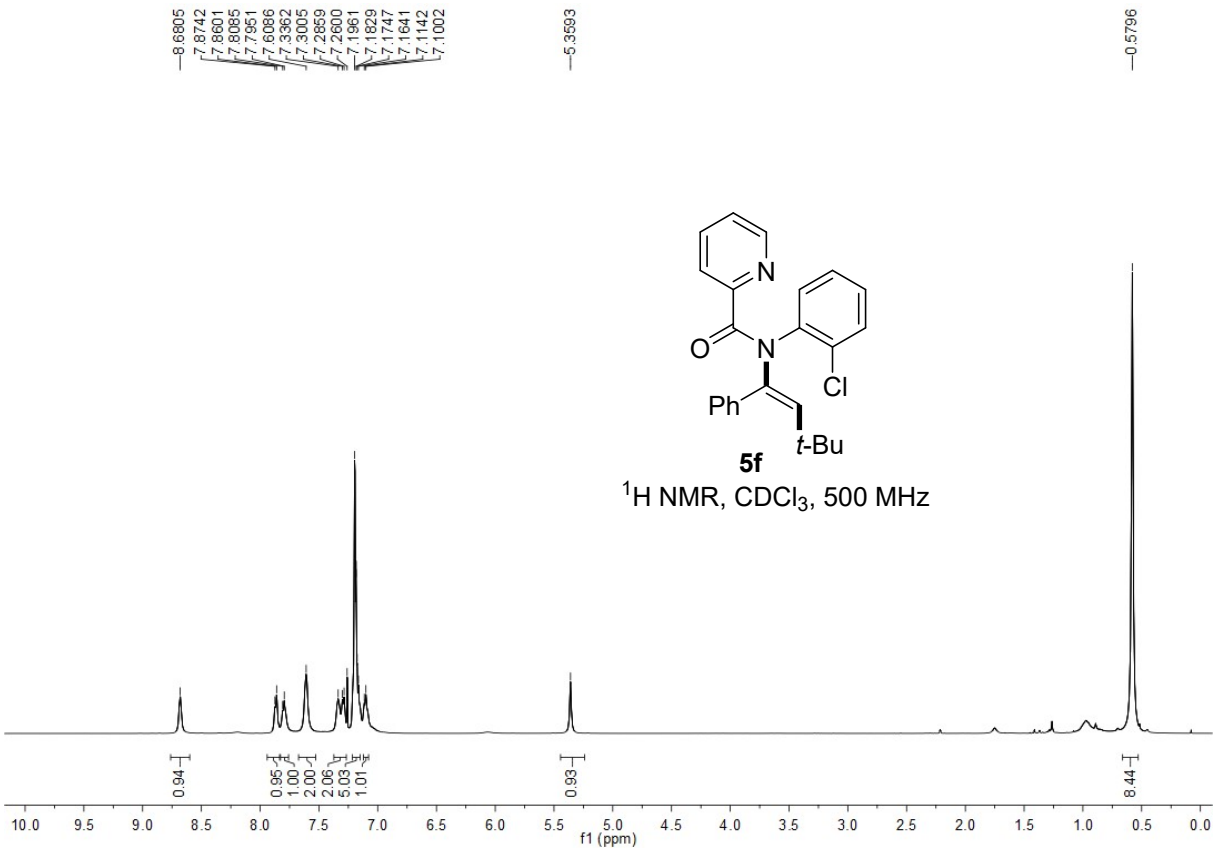

169.2515
166.4747
148.0523
142.4217
137.7268
136.6283
136.0678
130.9911
130.0141
128.1610
127.5737
127.3237
126.5438
124.4392
124.3498
77.2545
77.0000
76.7459
51.9803
32.7645
30.3690
CO2Me
N
O
N
Ph
t-Bu
5d
13C NMR, CDCl3, 125 MHz
f1 (ppm)


8.6263
8.6154
7.7741
7.6237
7.3722
7.3377
7.3216
7.3123
7.2600
7.2222
7.2132
7.2041
7.1903
5.3274
3.0303
0.6064
N
O
N
Ph
t-Bu
5e
1H NMR, CDCl3, 500 MHz
1.00
2.04
2.00
2.24
6.00
0.85
0.96
9.01
f1 (ppm)



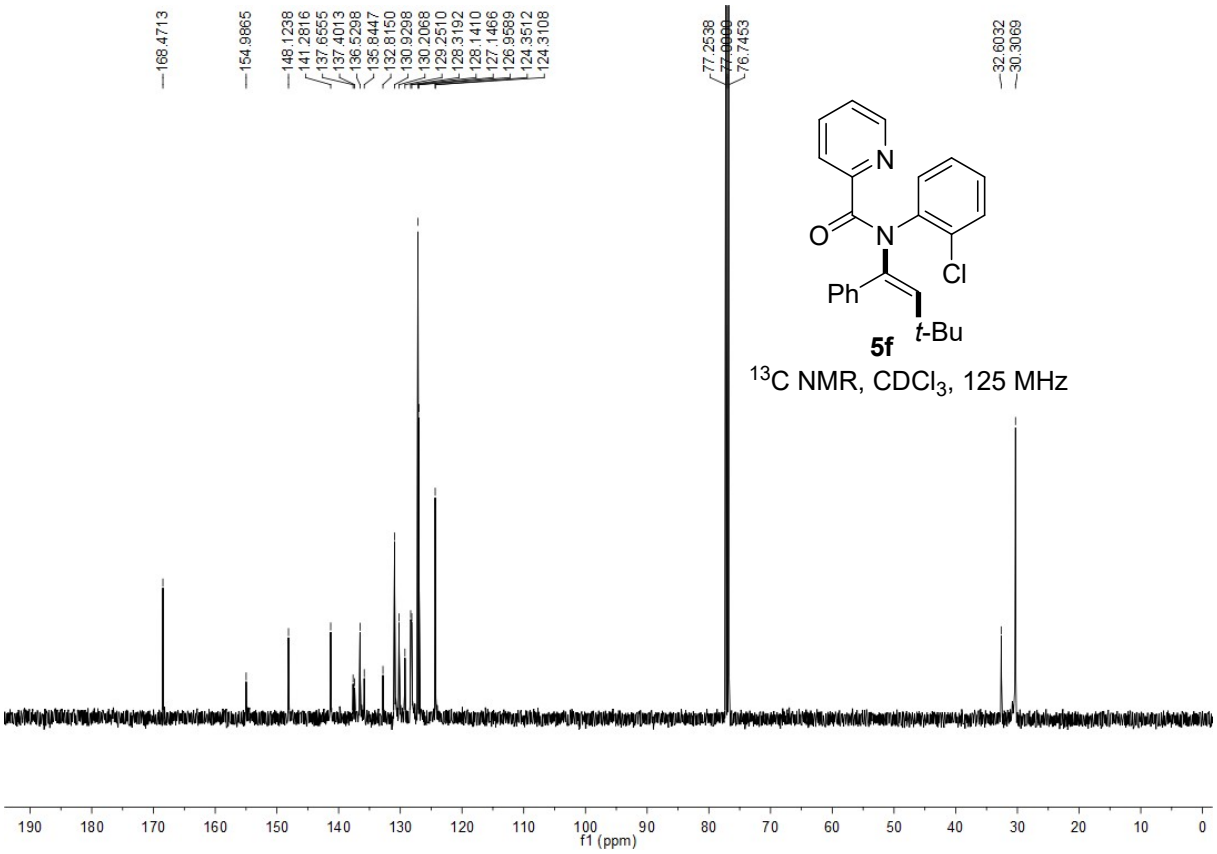
5e

^{13}C NMR, $CDCl_3$, 125 MHz



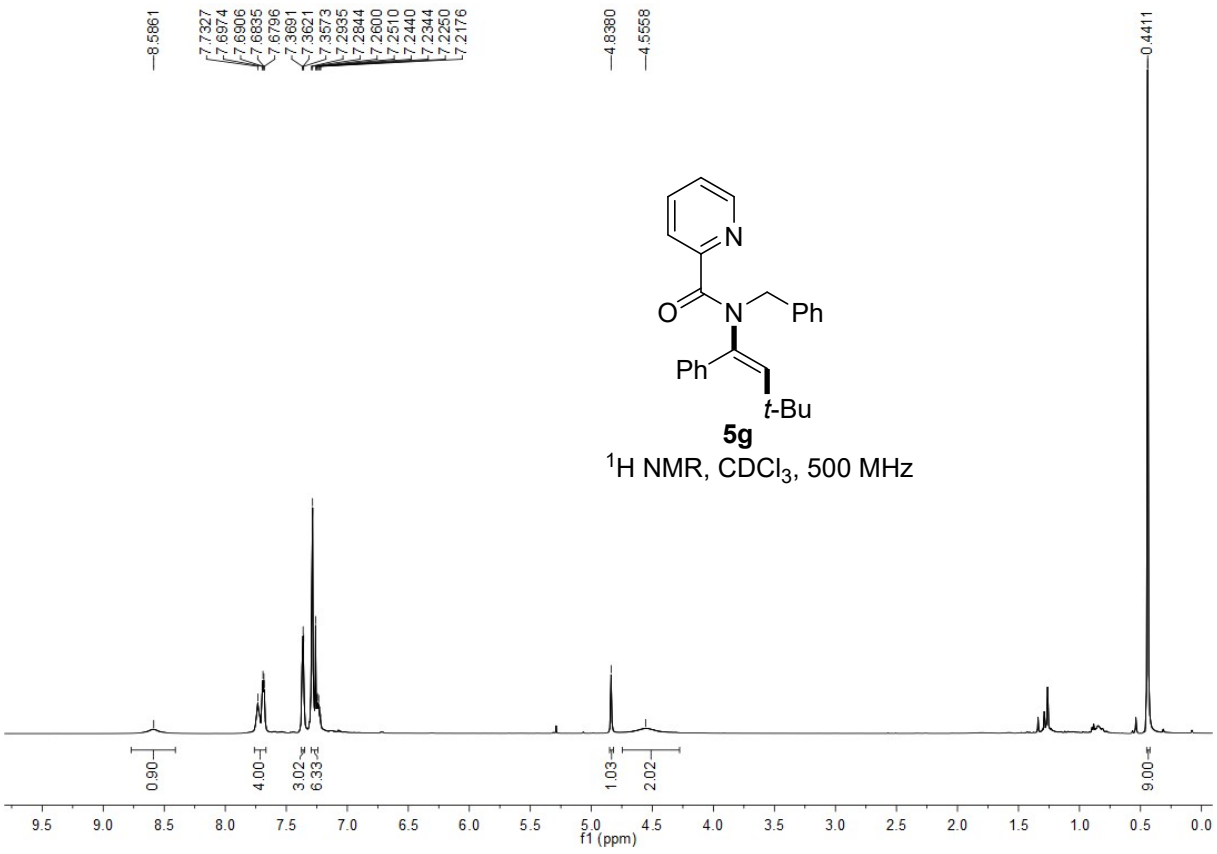
5f

^{1}H NMR, $CDCl_3$, 500 MHz



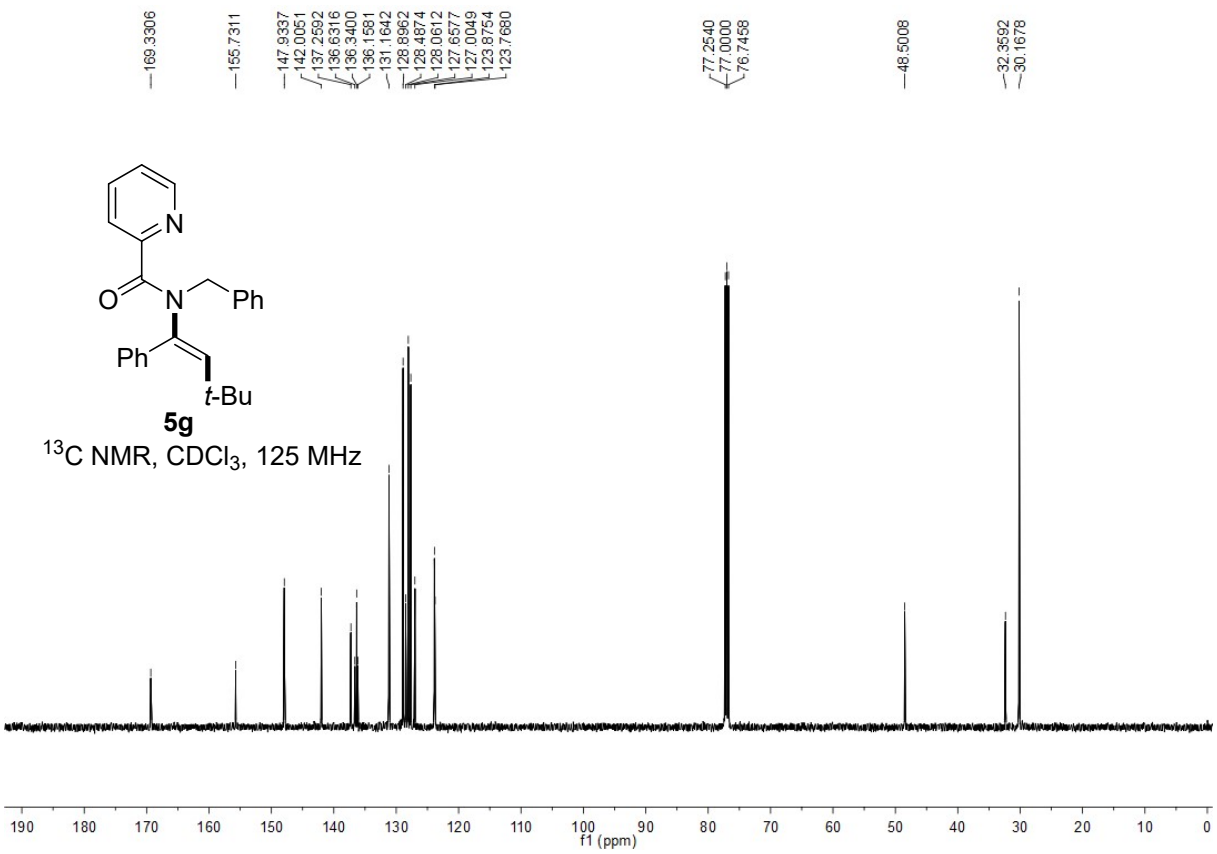
5f

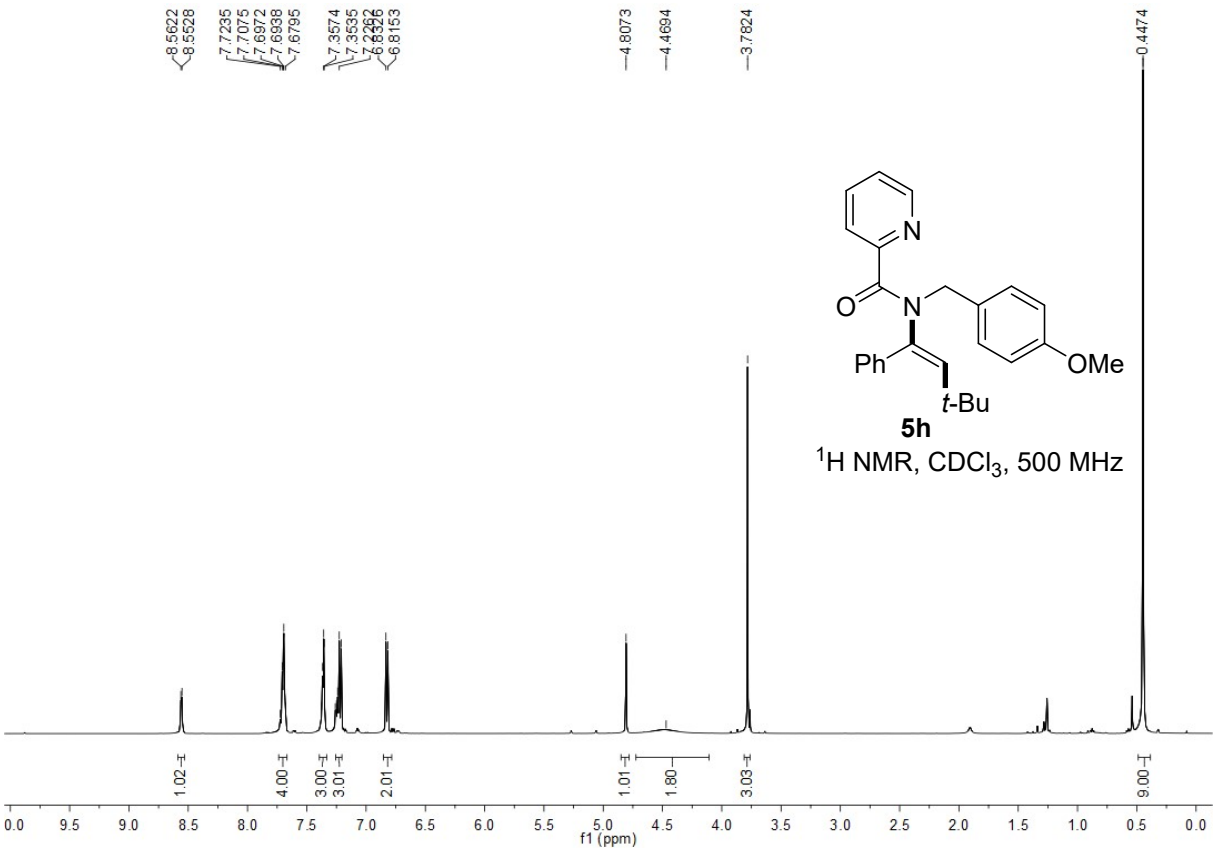
^{13}C NMR, $CDCl_3$, 125 MHz

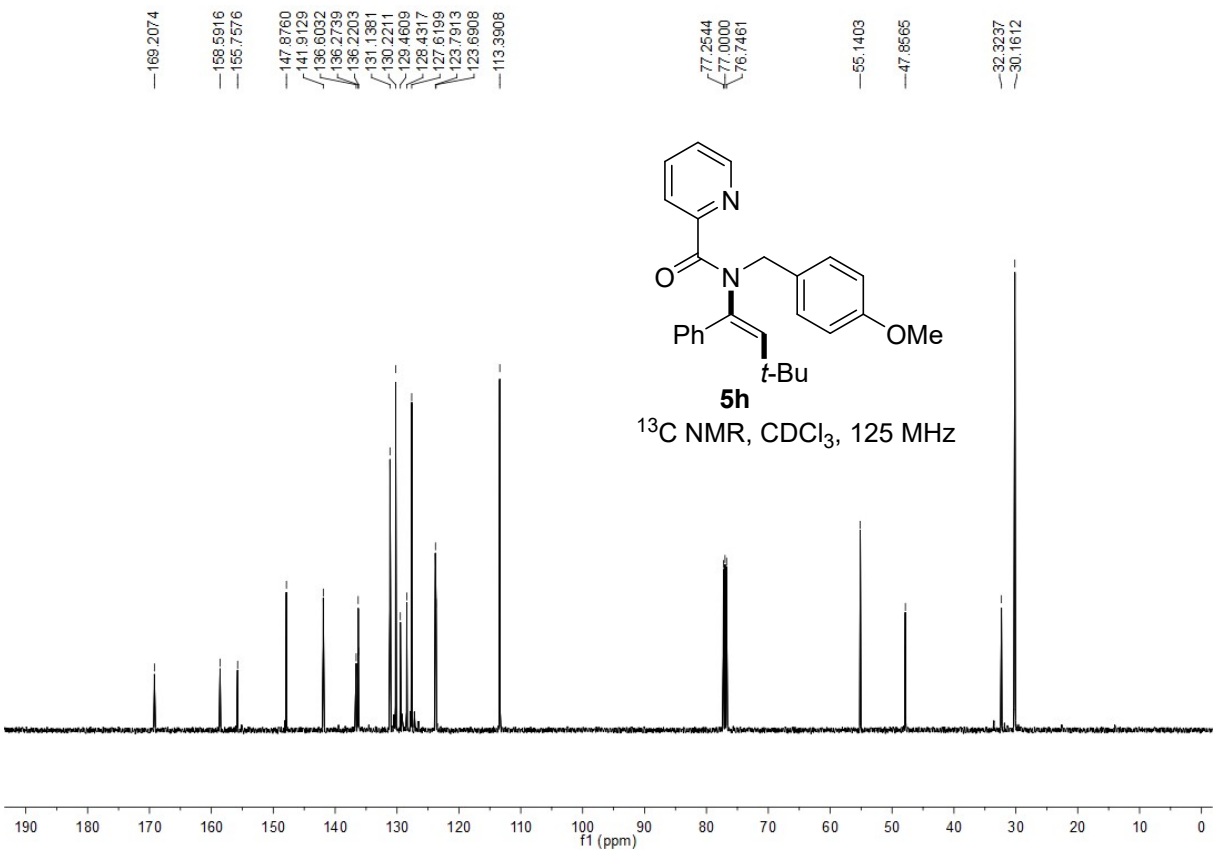


5g

^{1}H NMR, $CDCl_3$, 500 MHz

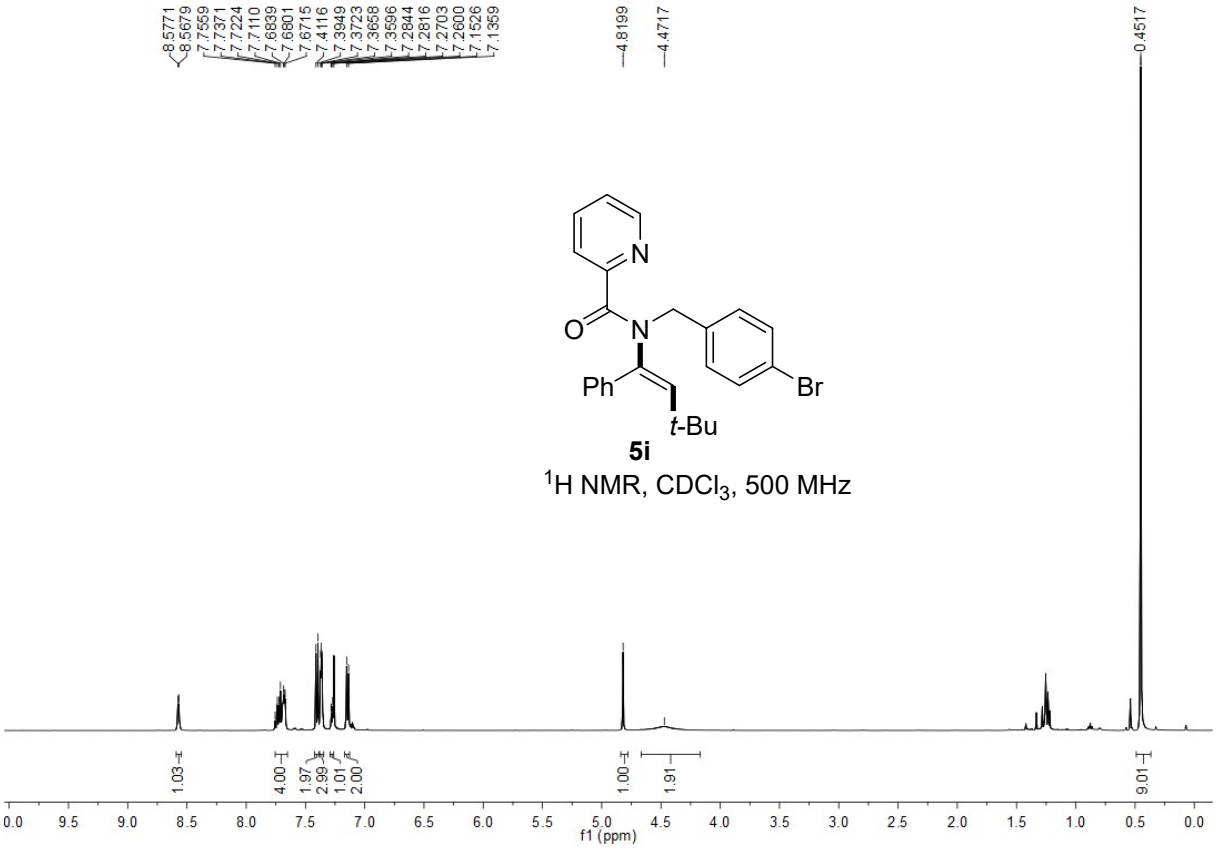

169.3306
155.7311
147.9337
142.0051
137.2592
136.6316
136.3400
136.1581
131.1642
128.8962
128.4874
128.0612
127.6577
127.0049
123.8754
123.7680
77.2540
77.0000
76.7458
48.5008
32.3592
30.1678
N
O
N
Ph
Ph
t-Bu
5g
13C NMR, CDCl3, 125 MHz
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


8.5622
8.5528
7.7235
7.7075
7.6972
7.6938
7.6795
7.3574
7.3535
7.2262
6.8326
6.8153
4.8073
4.4694
3.7824
0.4474
N
O
N
Ph
OMe
t-Bu
5h
1H NMR, CDCl3, 500 MHz
1.02
4.00
3.00
3.01
2.01
1.01
1.80
3.03
9.00
0.0 9.5 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 0.0
f1 (ppm)



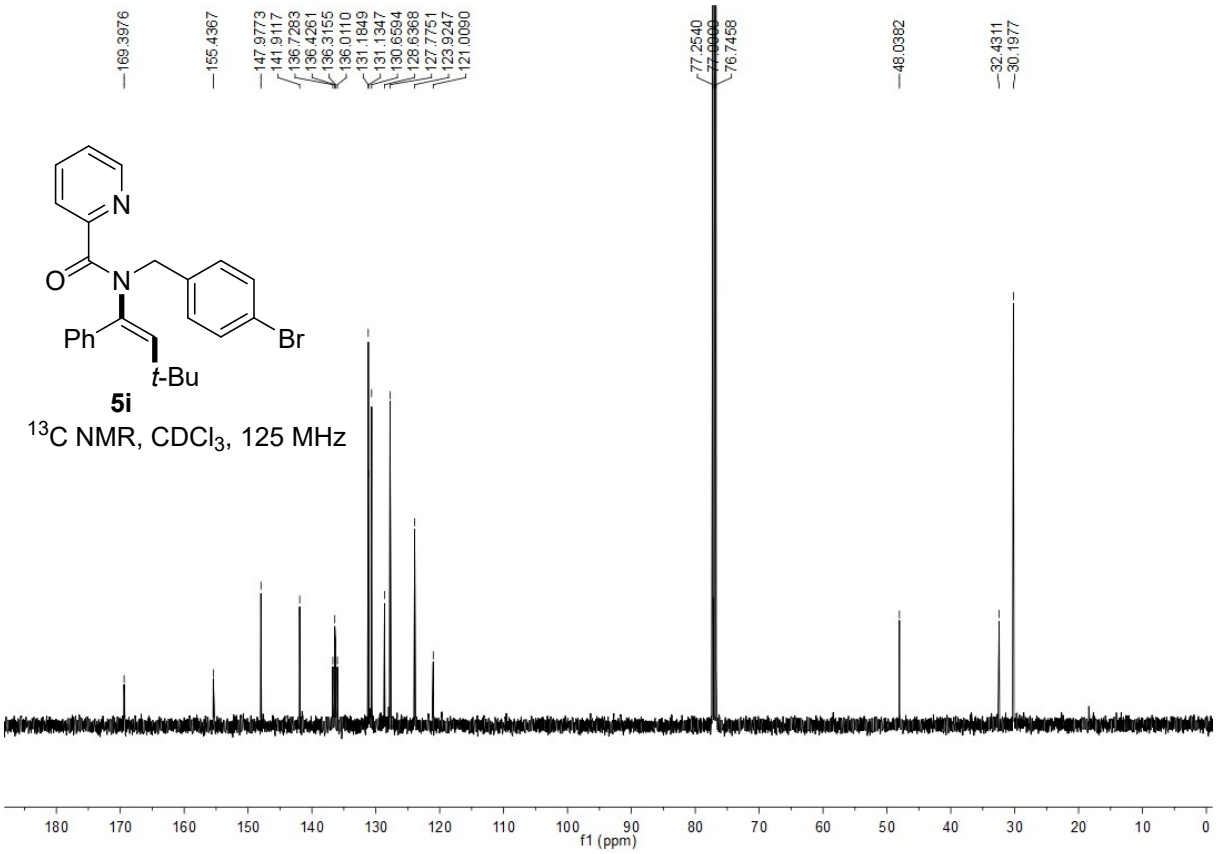
5h

^{13}C NMR, $CDCl_3$, 125 MHz



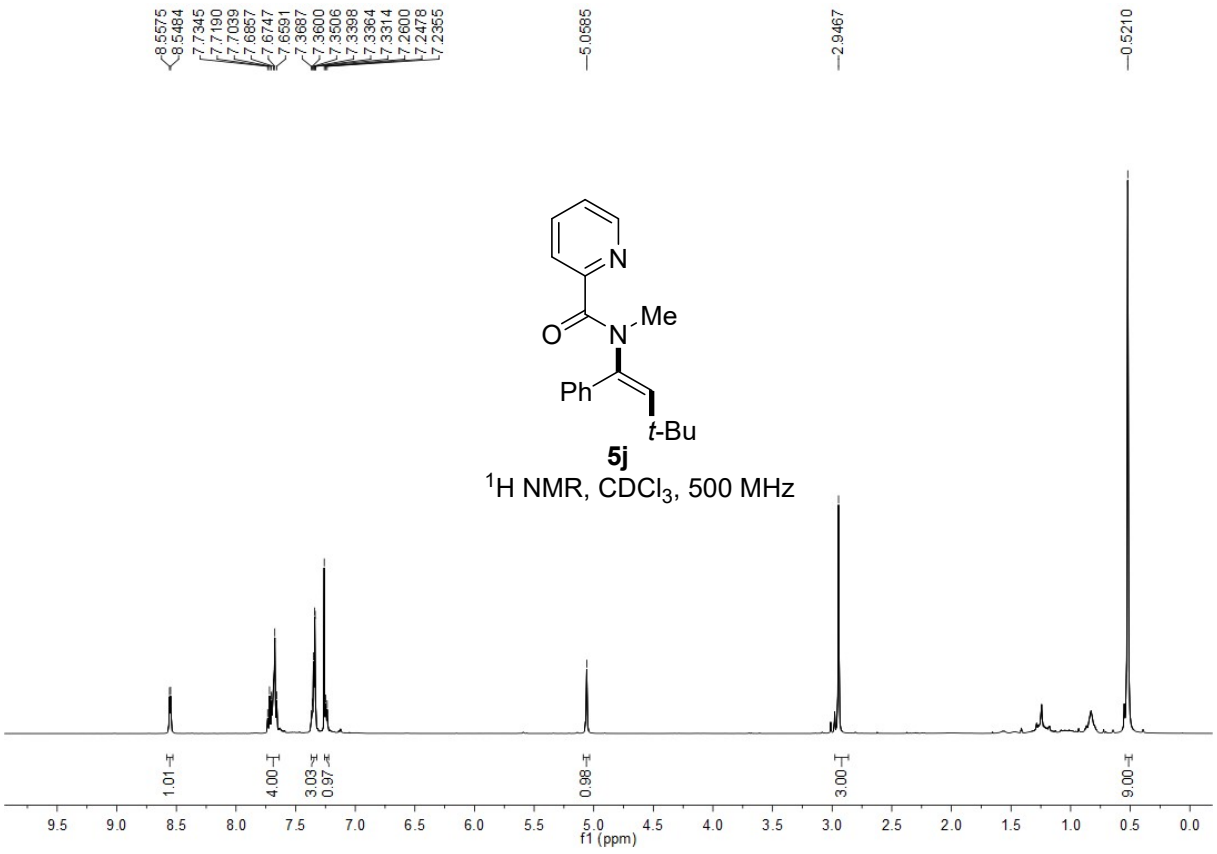
5i

^{1}H NMR, $CDCl_3$, 500 MHz



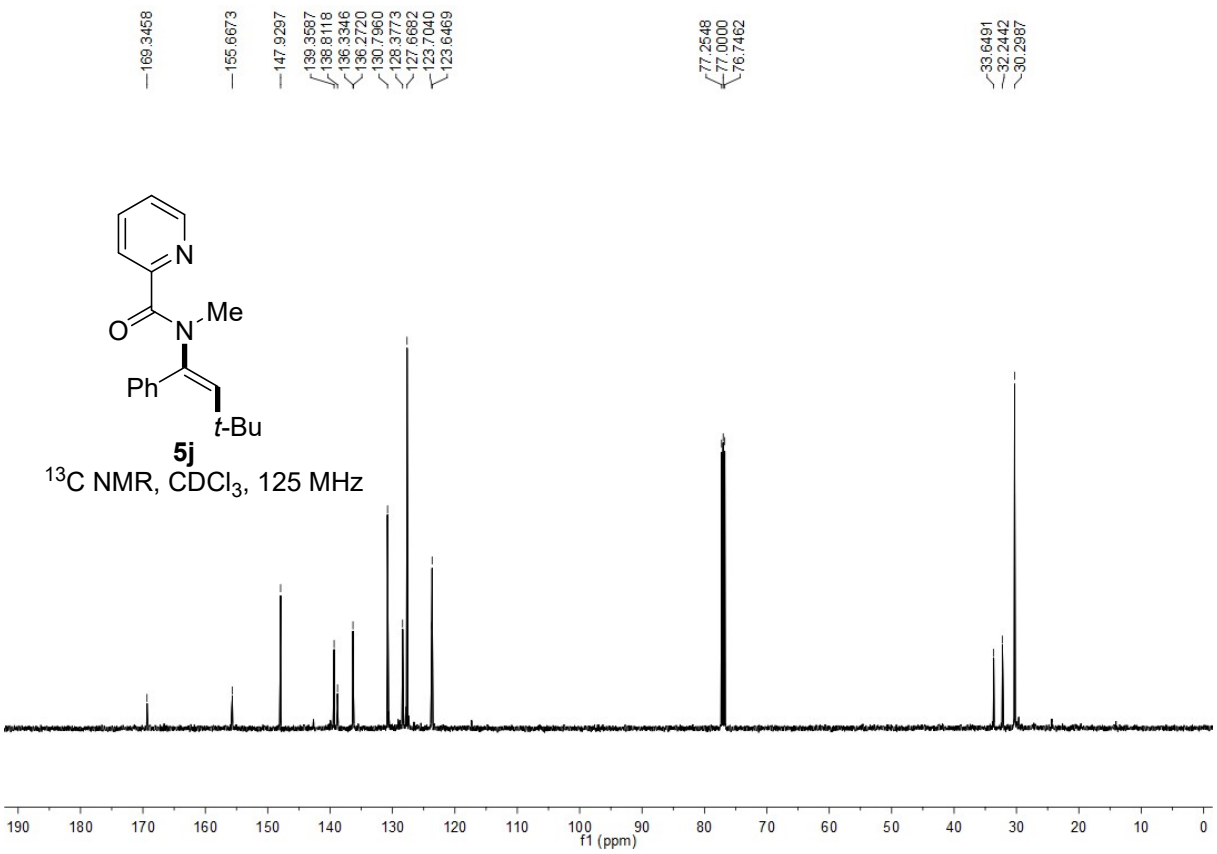
5i

^{13}C NMR, $CDCl_3$, 125 MHz



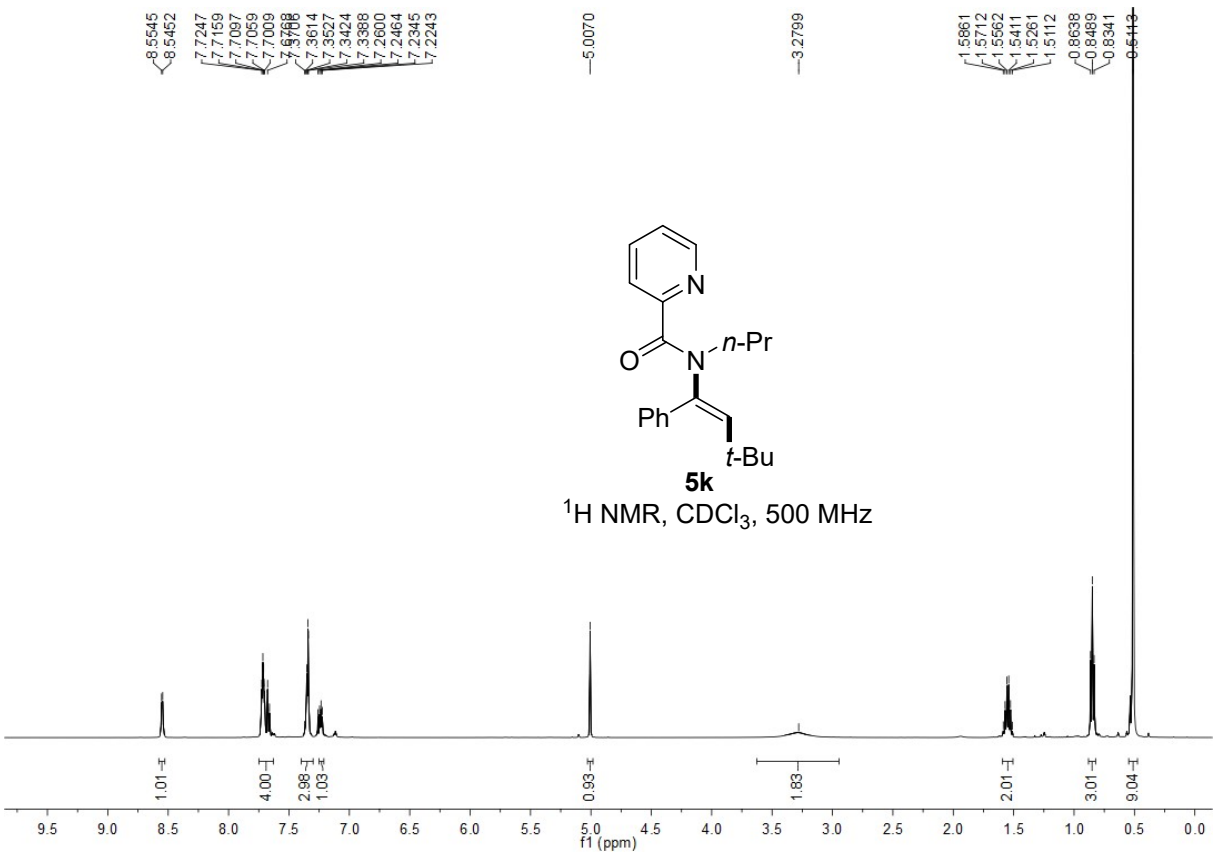
5j

^{1}H NMR, $CDCl_3$, 500 MHz



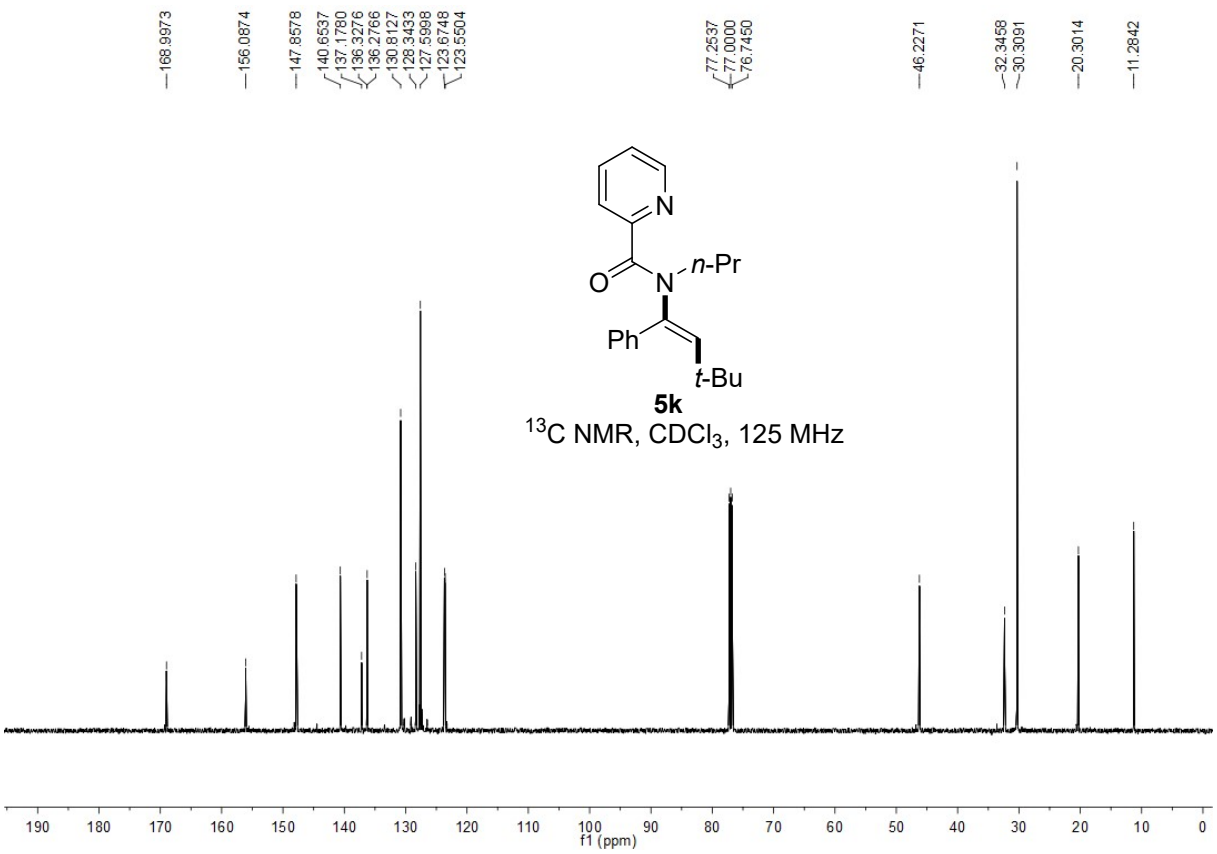
5j

^{13}C NMR, $CDCl_3$, 125 MHz



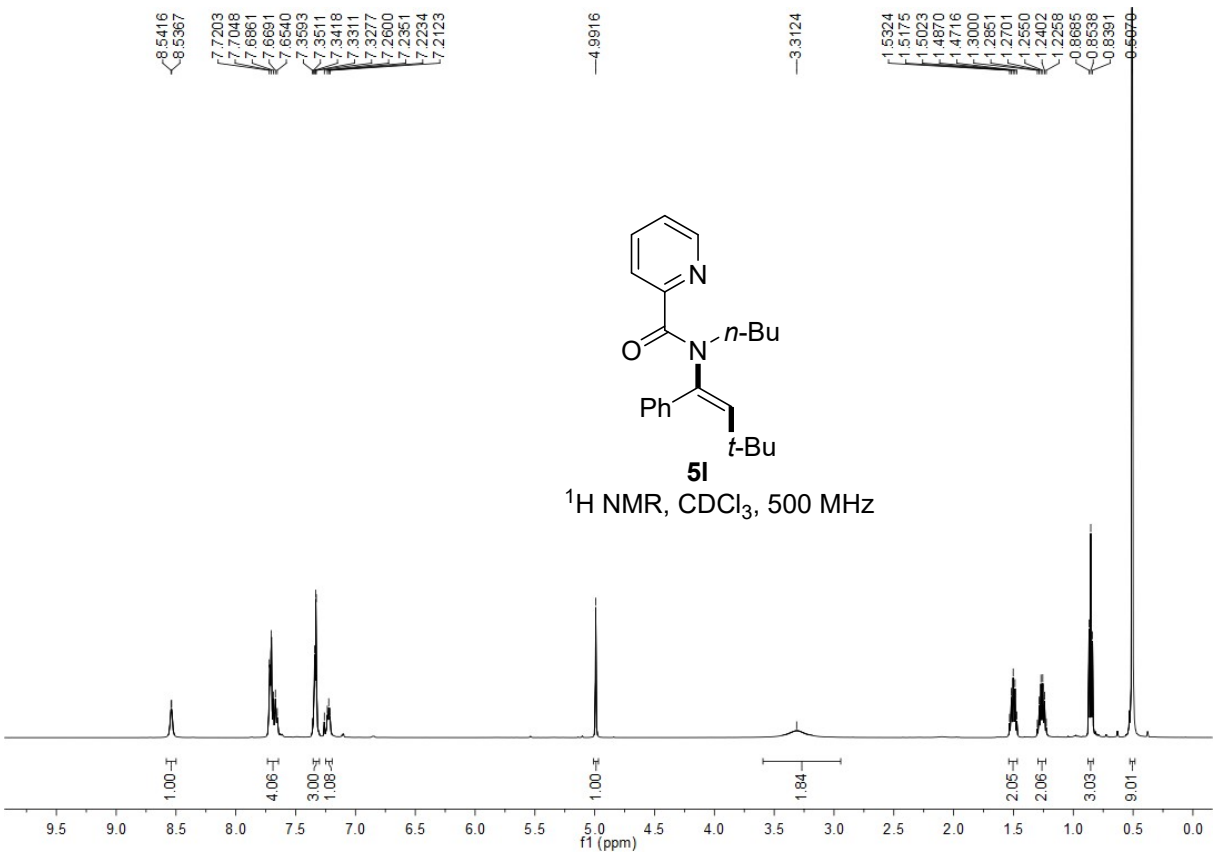
5k

^{1}H NMR, $CDCl_3$, 500 MHz



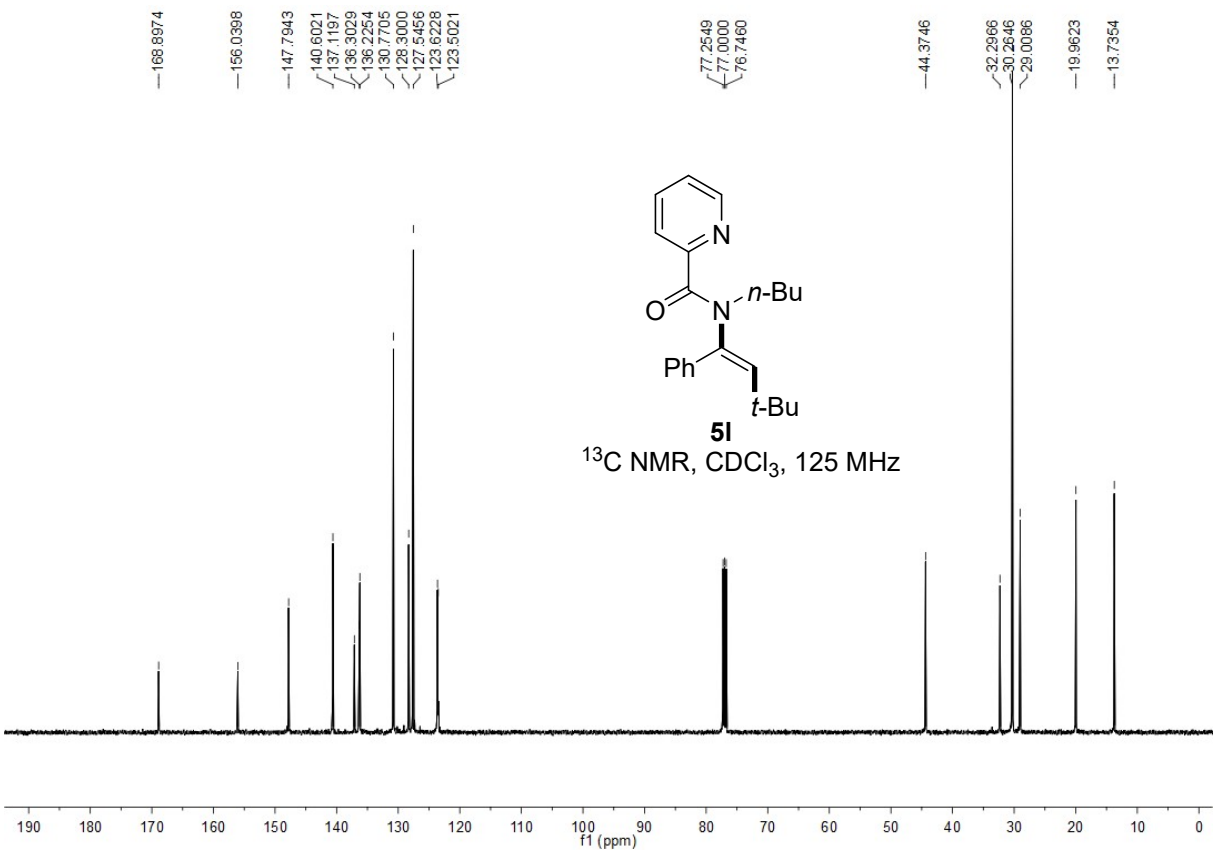
5k

^{13}C NMR, $CDCl_3$, 125 MHz



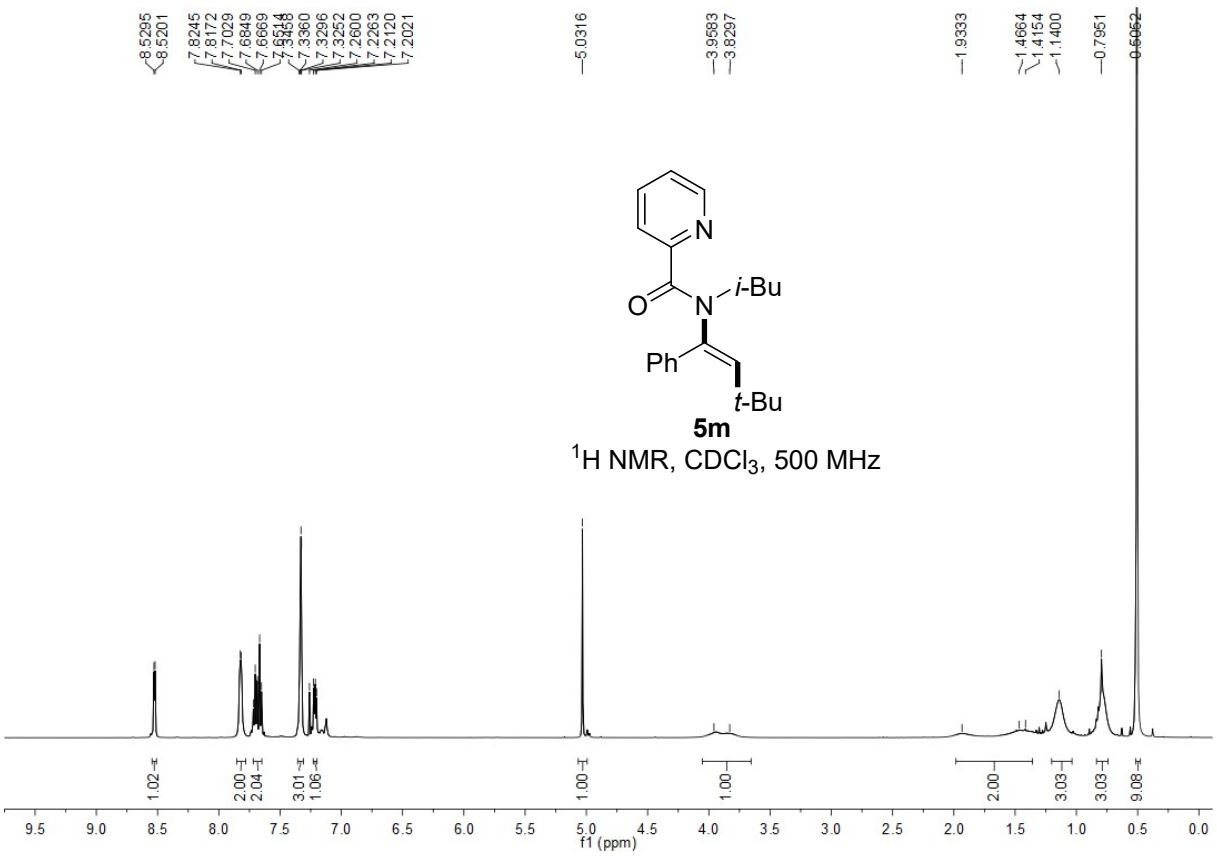
5l

^{1}H NMR, $CDCl_3$, 500 MHz



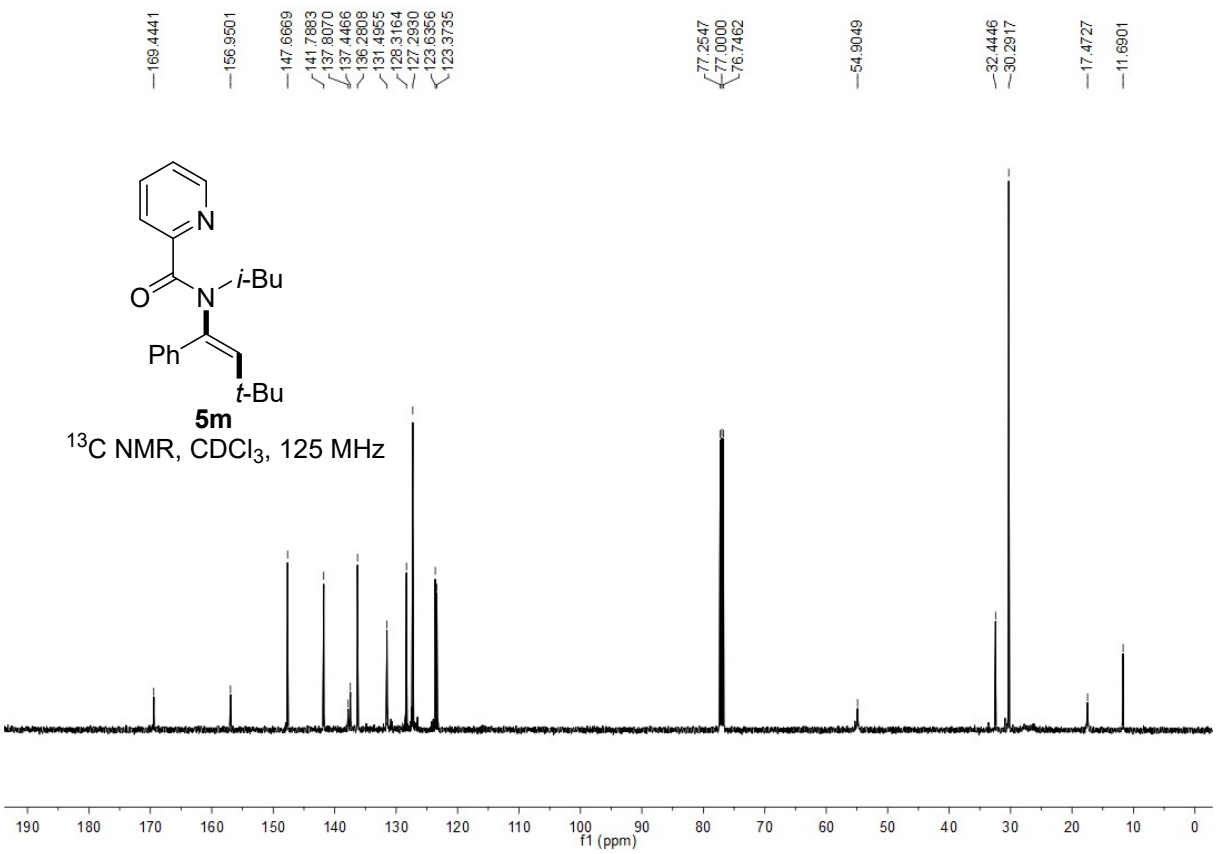
5l

^{13}C NMR, $CDCl_3$, 125 MHz



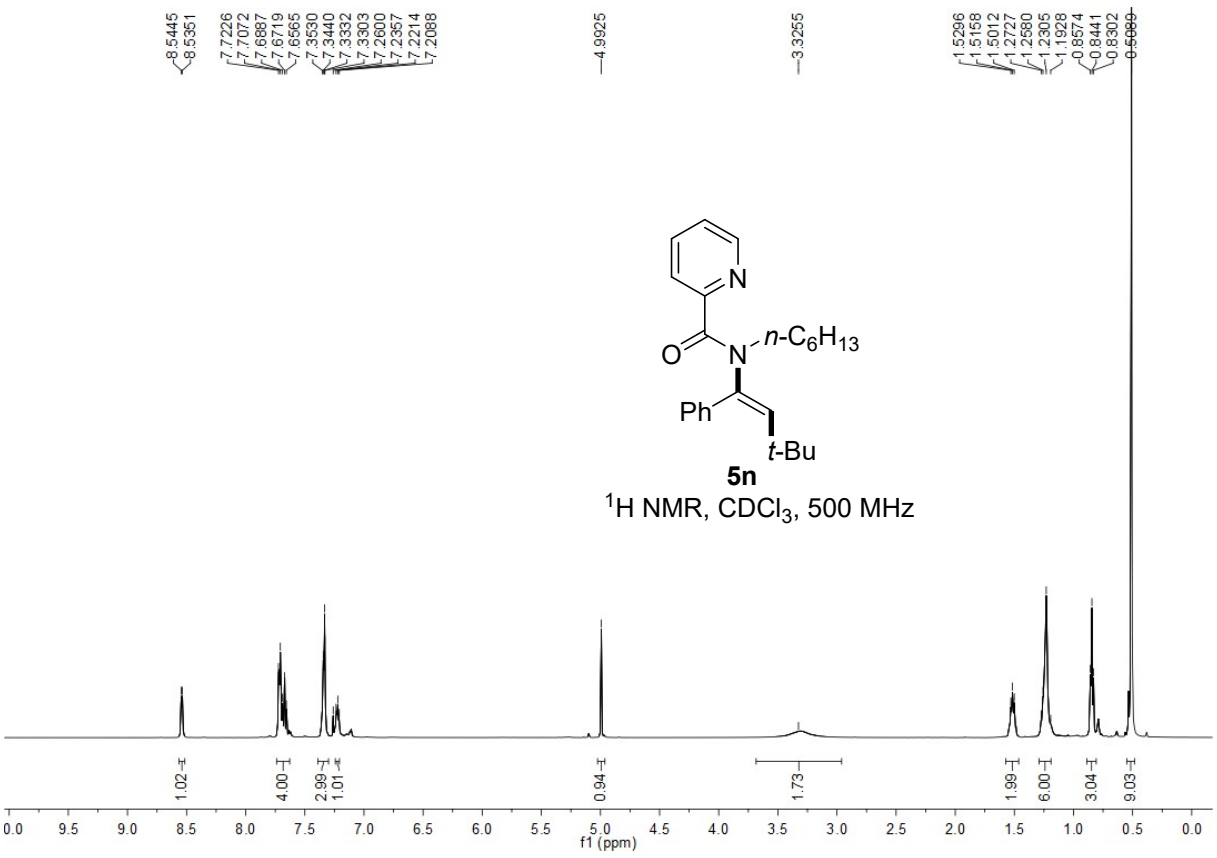
5m

^{1}H NMR, $CDCl_3$, 500 MHz



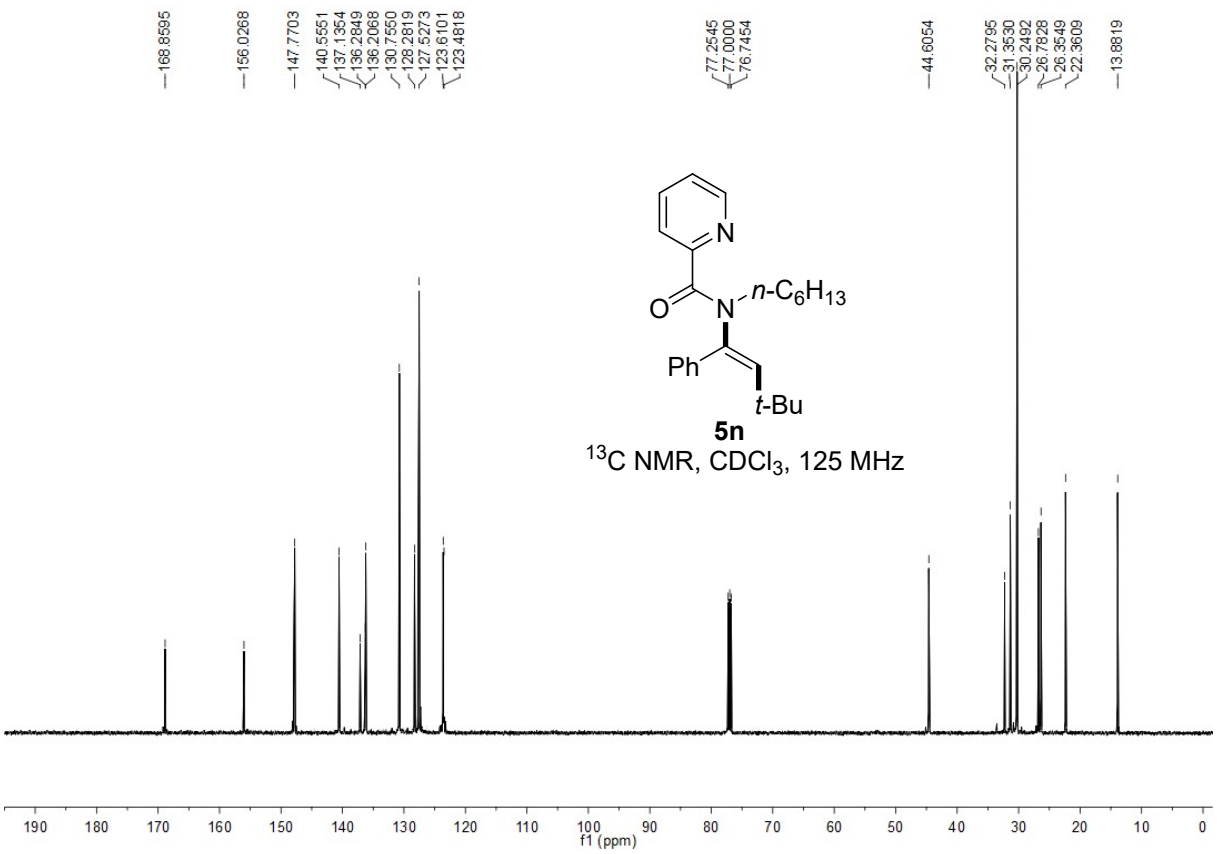
5m

^{13}C NMR, $CDCl_3$, 125 MHz



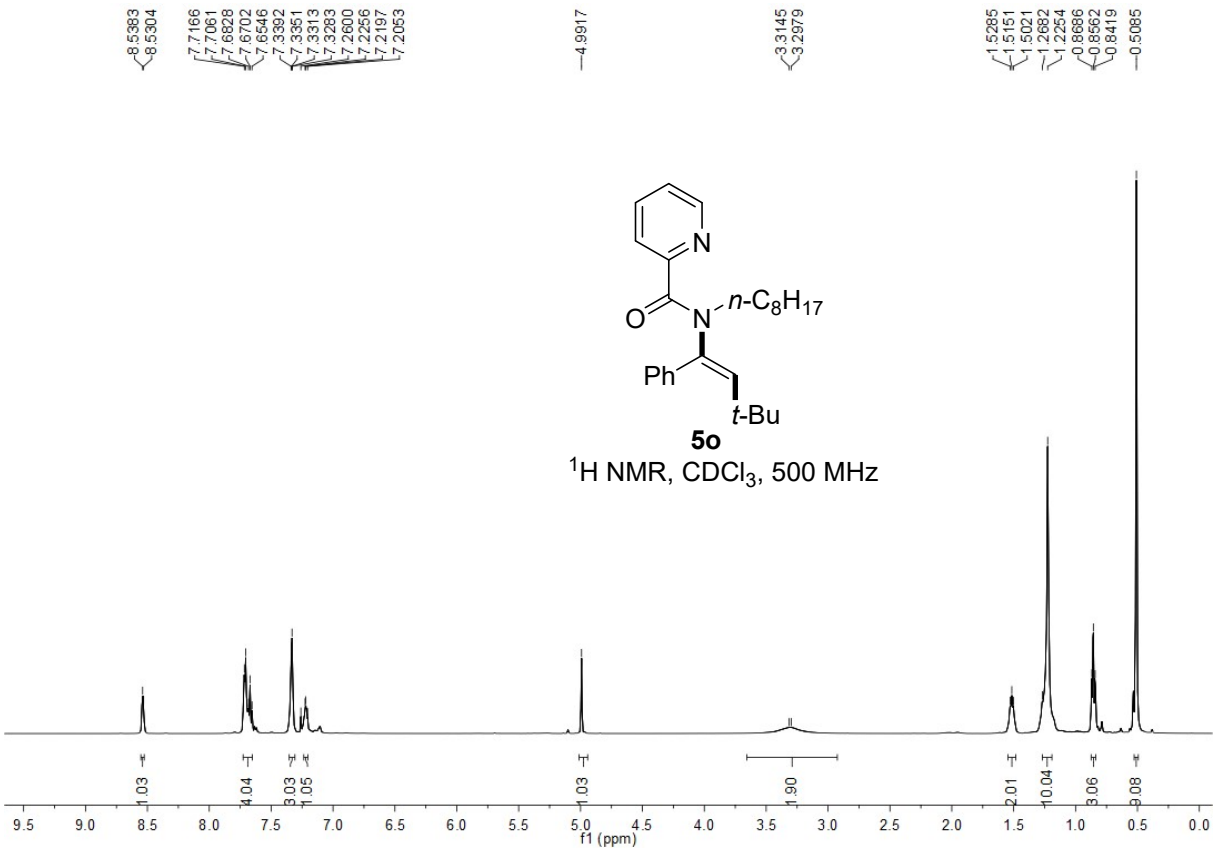
5n

^{1}H NMR, $CDCl_3$, 500 MHz



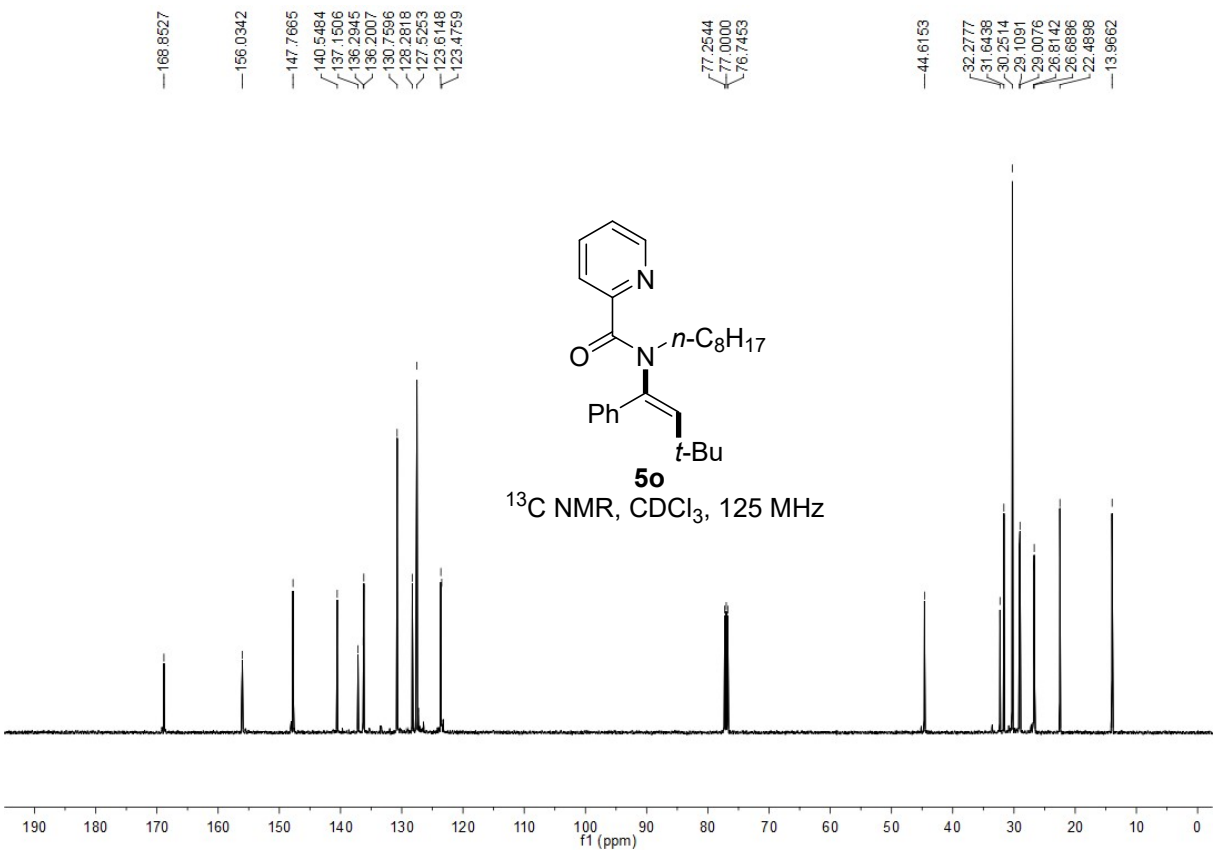
5n

^{13}C NMR, $CDCl_3$, 125 MHz



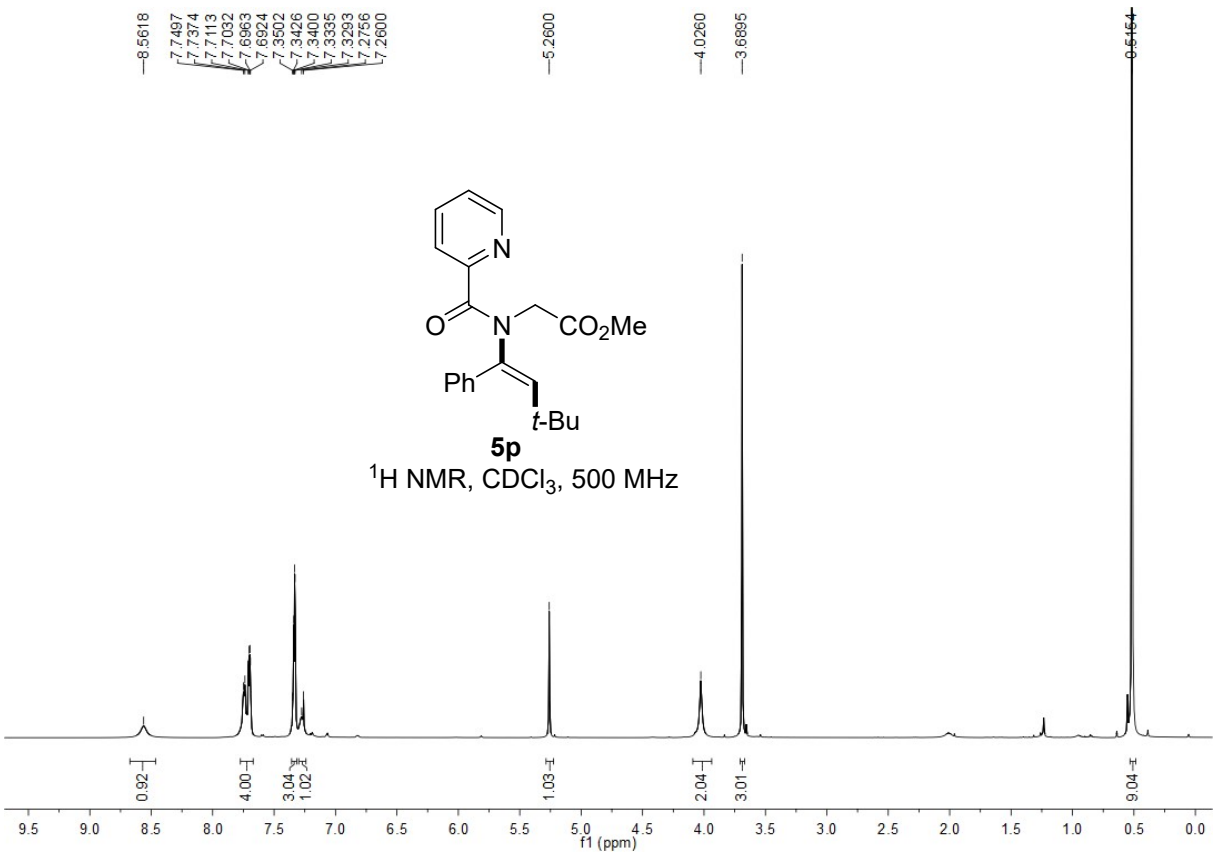
5o

^{1}H NMR, $CDCl_3$, 500 MHz



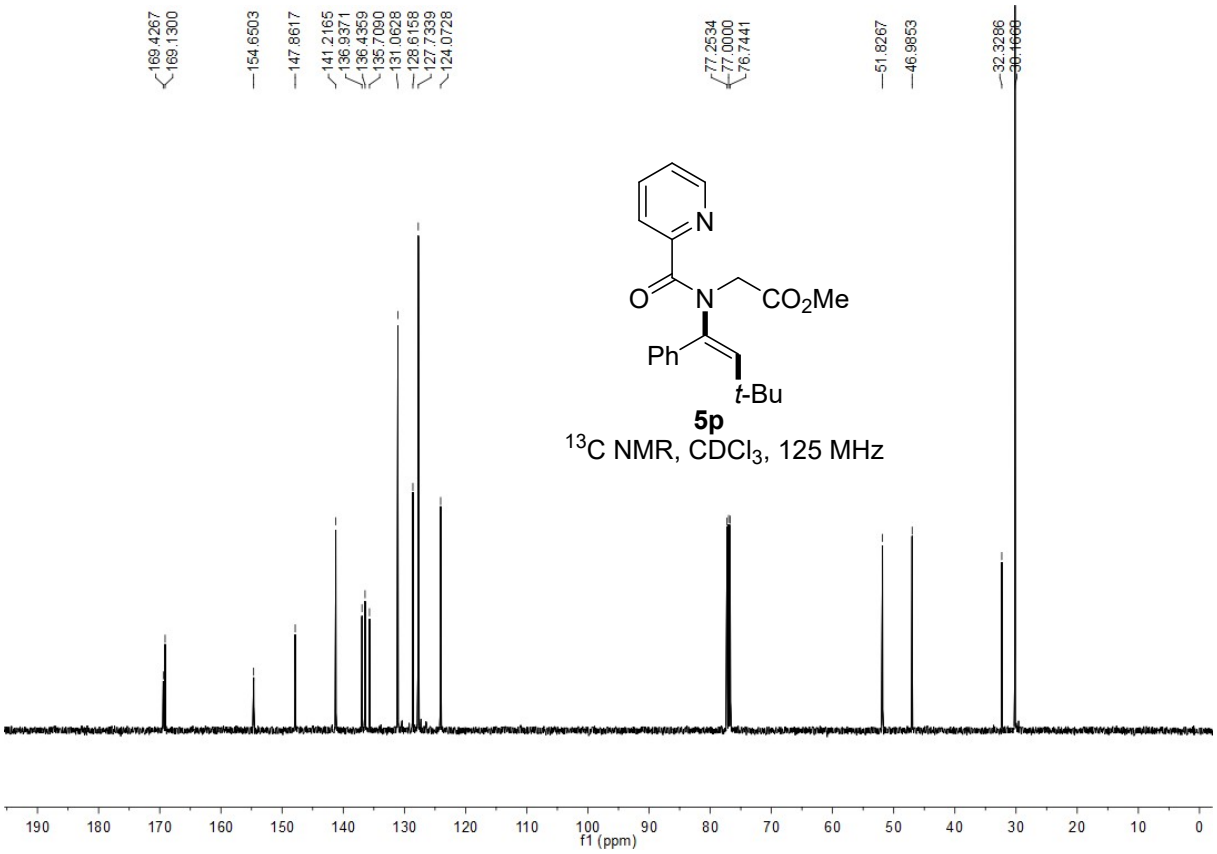
5o

^{13}C NMR, $CDCl_3$, 125 MHz



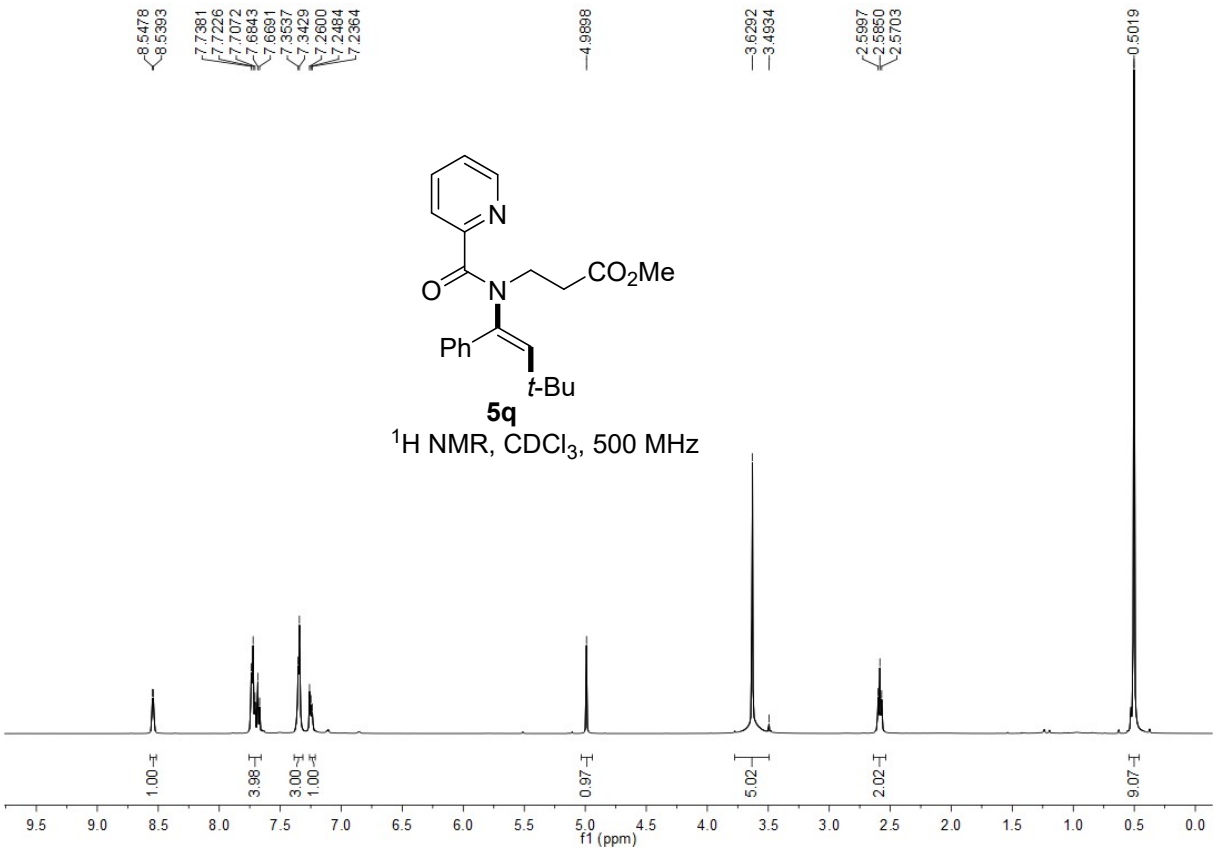
5p

^{1}H NMR, $CDCl_3$, 500 MHz



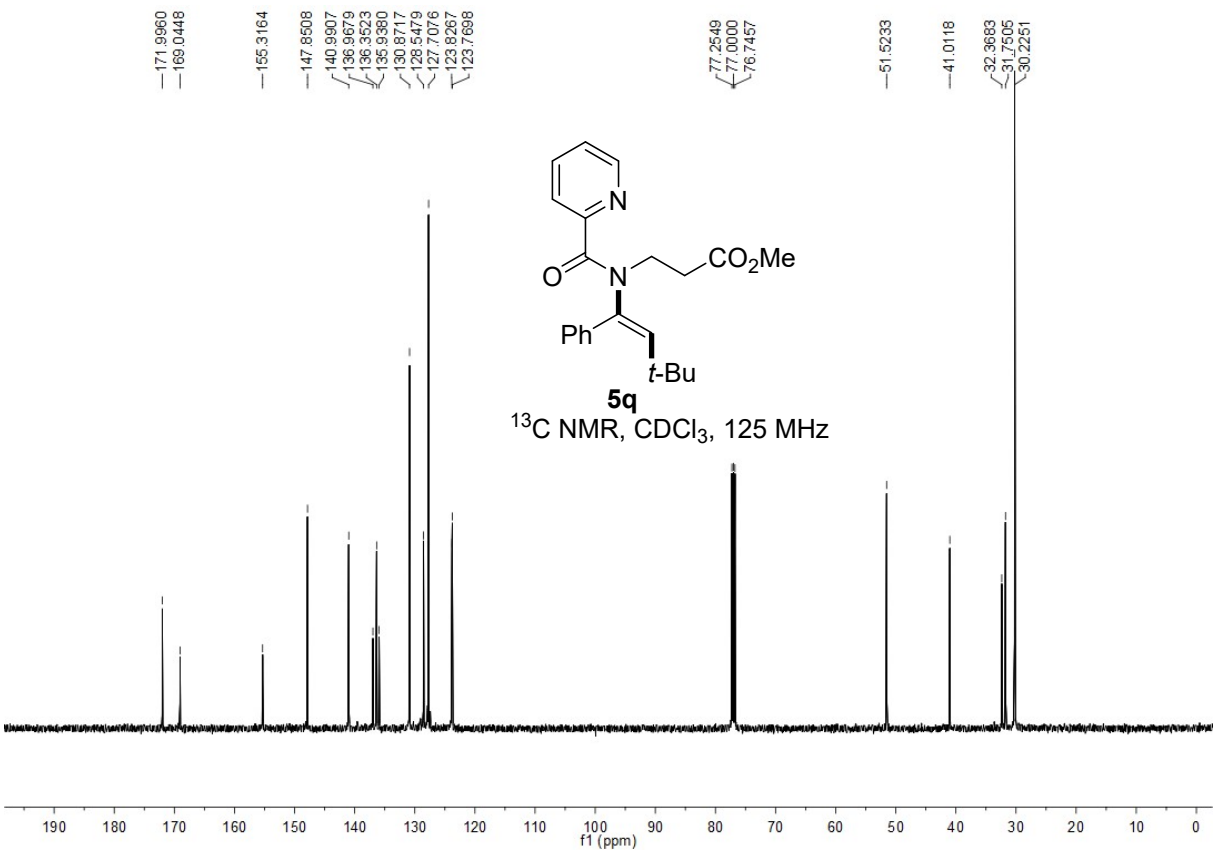
5p

^{13}C NMR, $CDCl_3$, 125 MHz



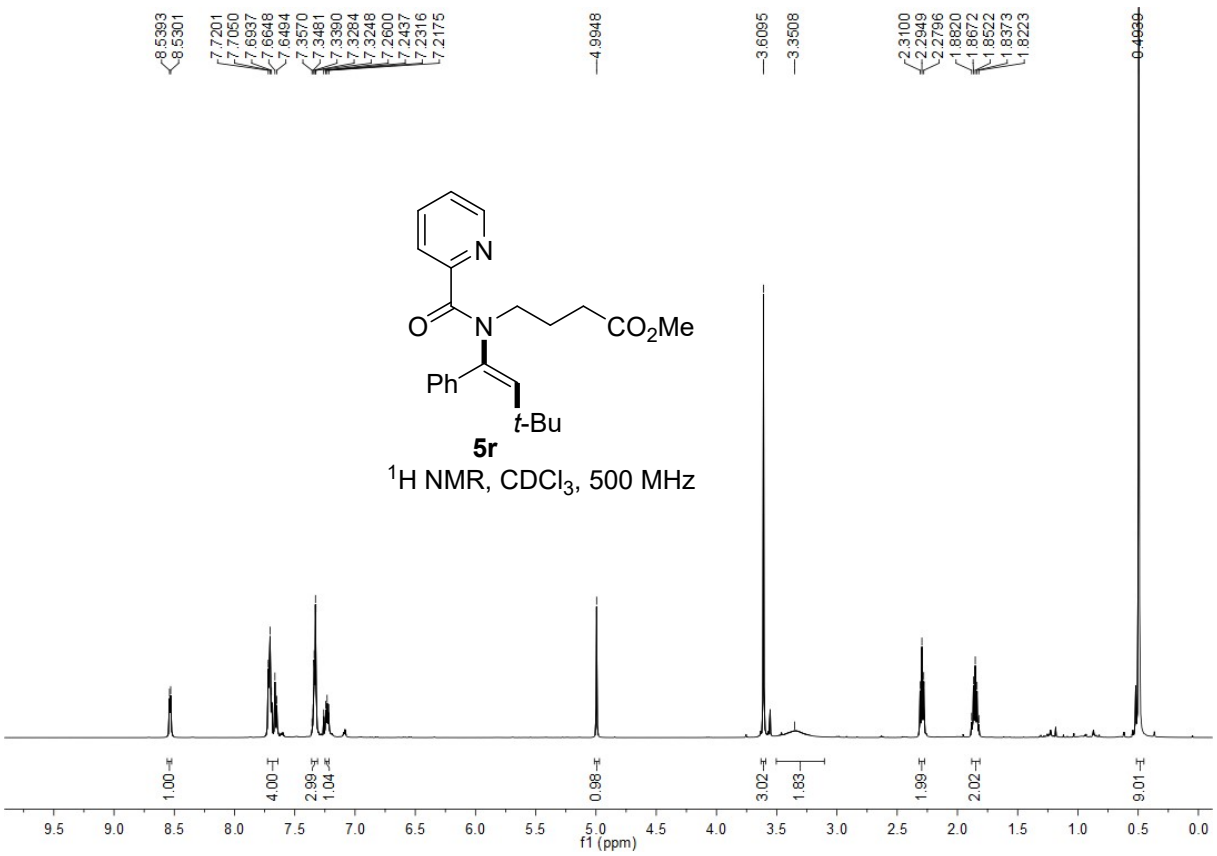
5q

^{1}H NMR, $CDCl_3$, 500 MHz



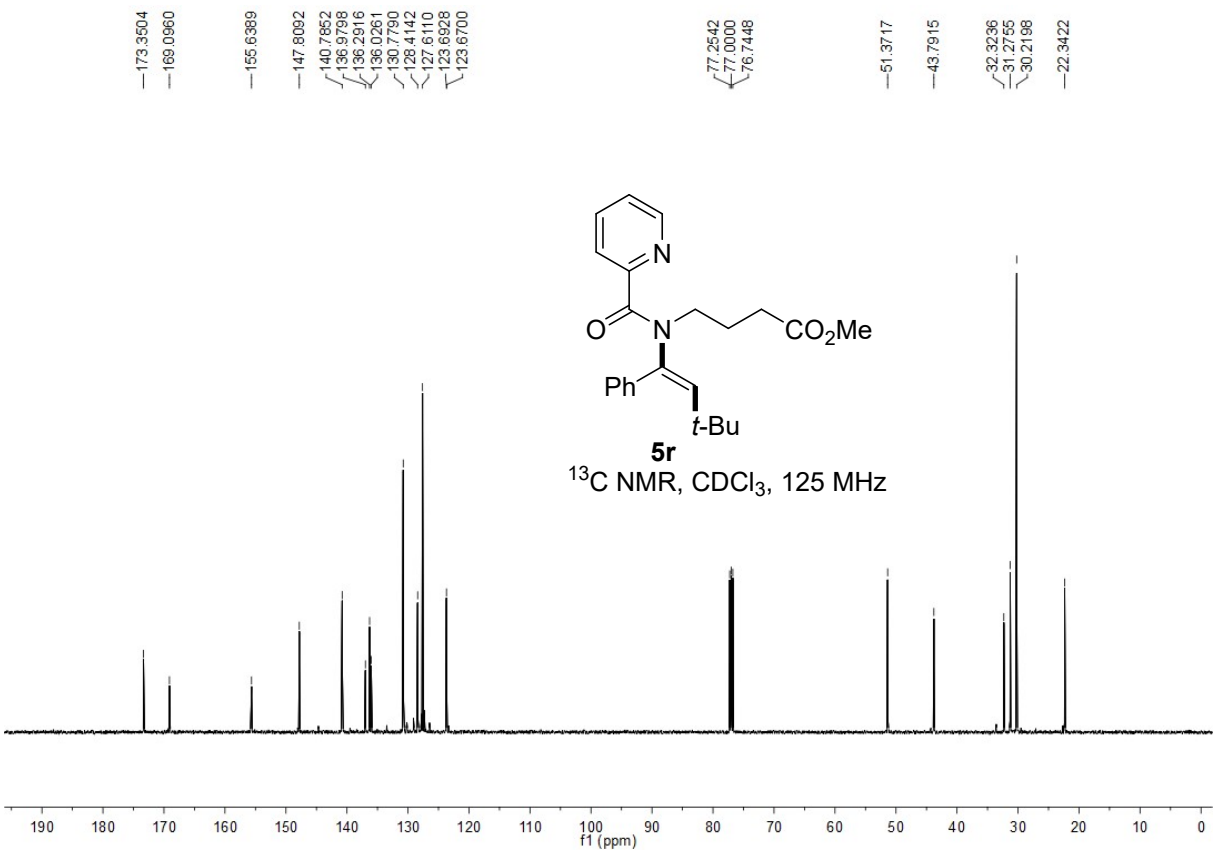
5q

^{13}C NMR, $CDCl_3$, 125 MHz



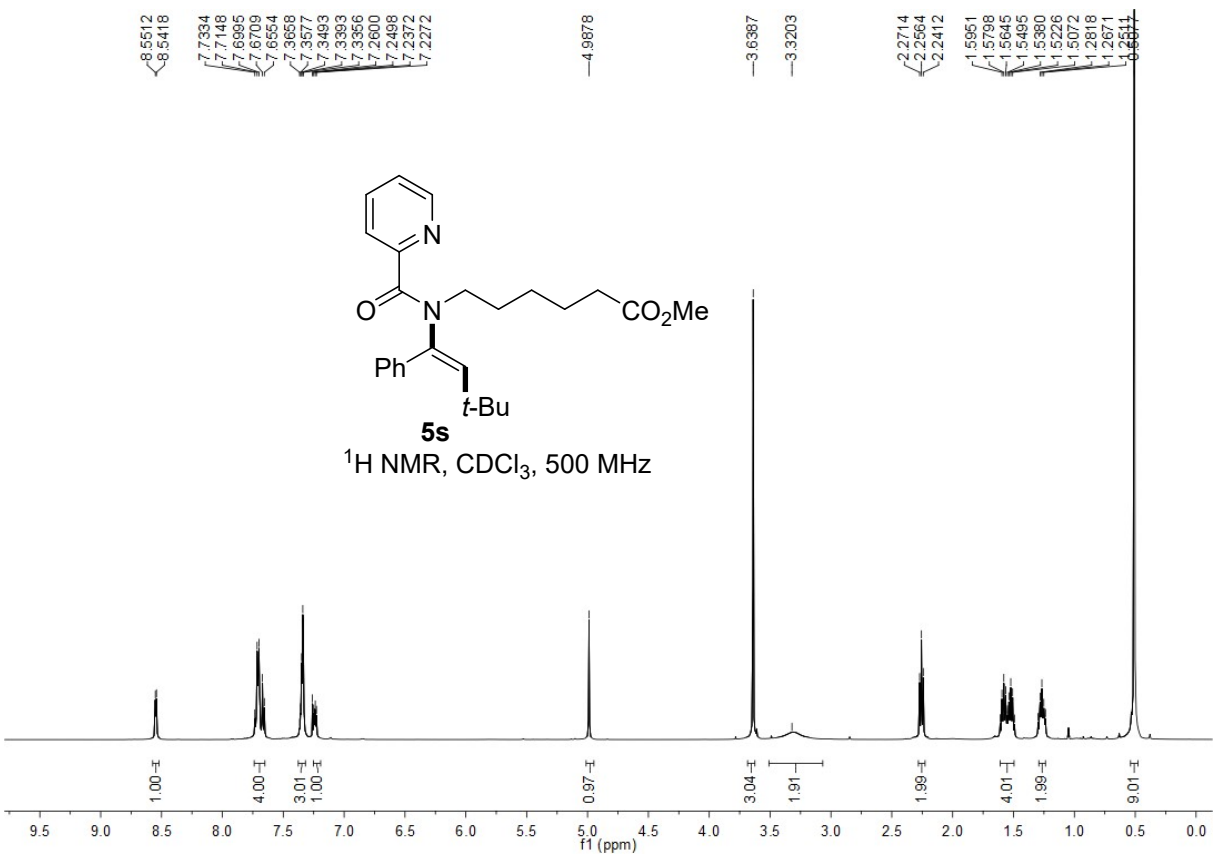
5r

^{1}H NMR, $CDCl_3$, 500 MHz



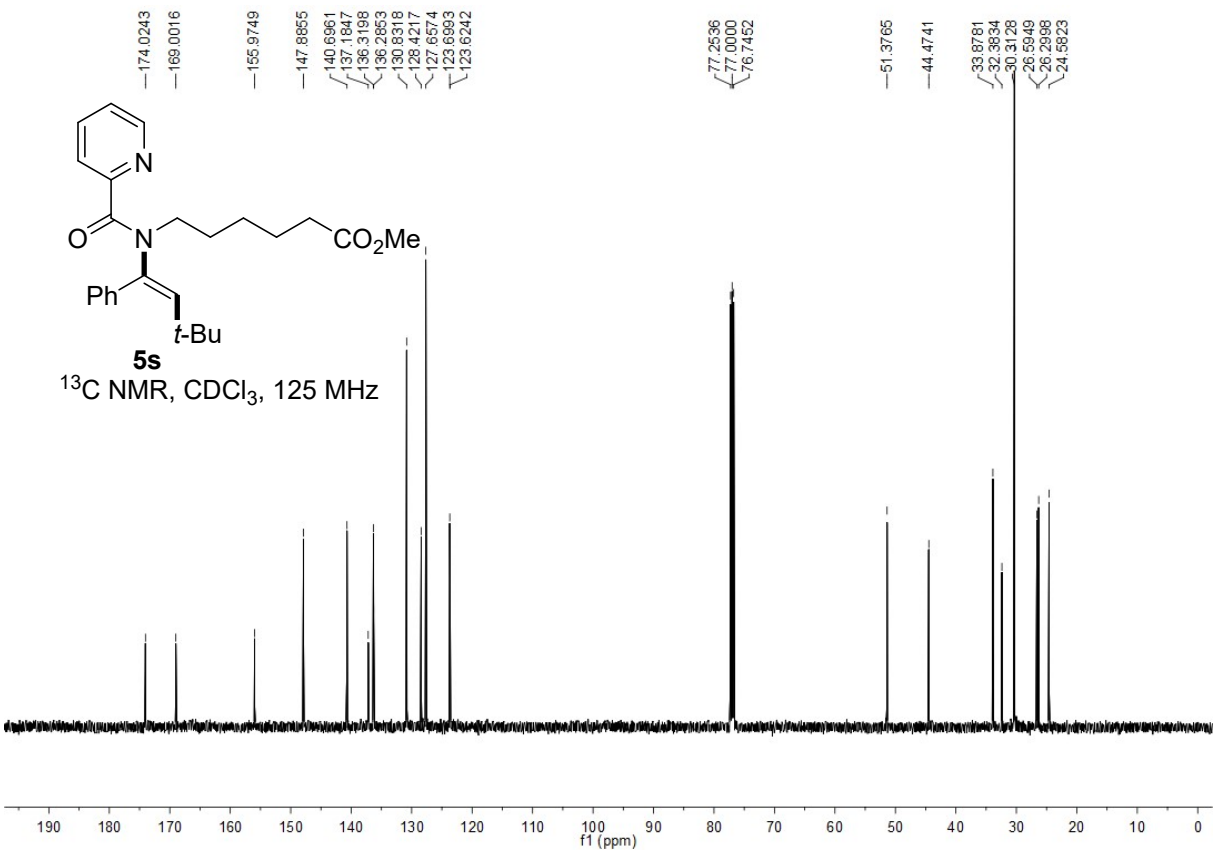
5r

^{13}C NMR, $CDCl_3$, 125 MHz



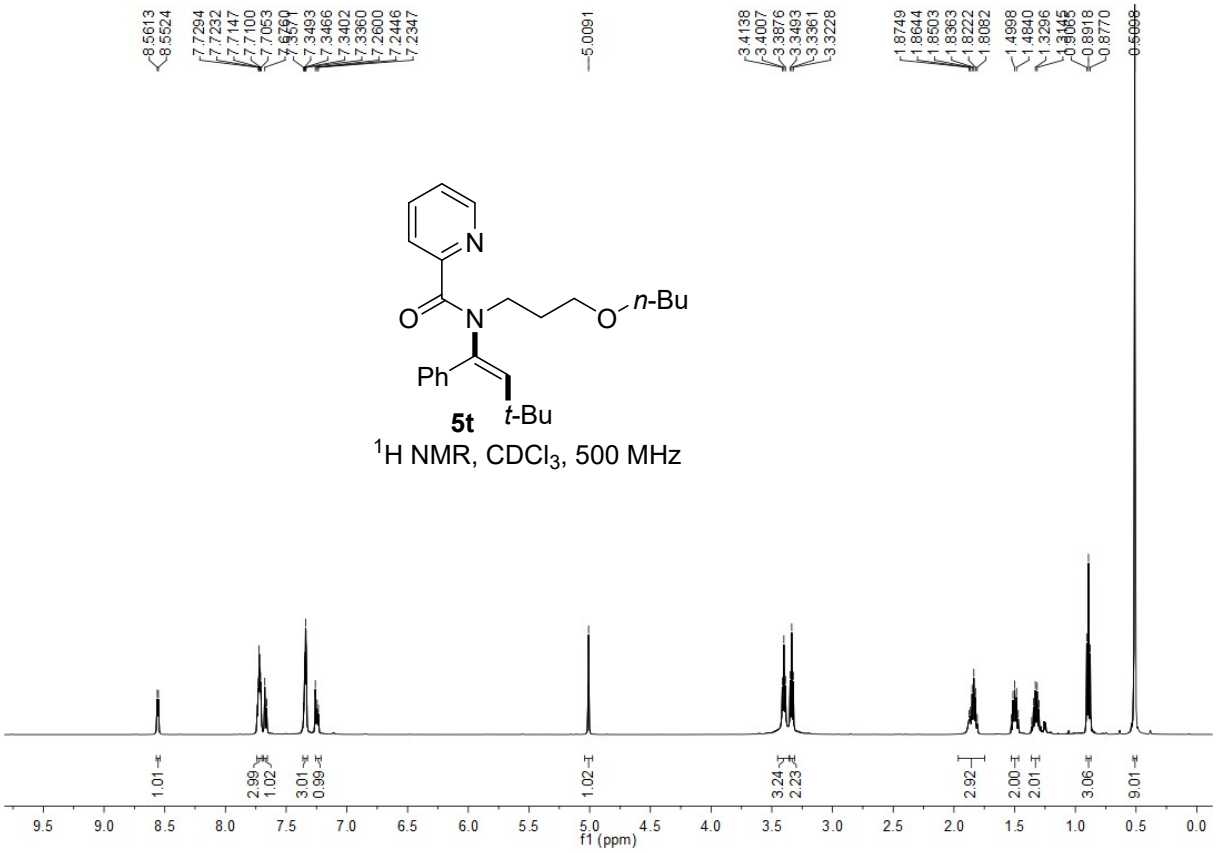
5s

^{1}H NMR, $CDCl_3$, 500 MHz



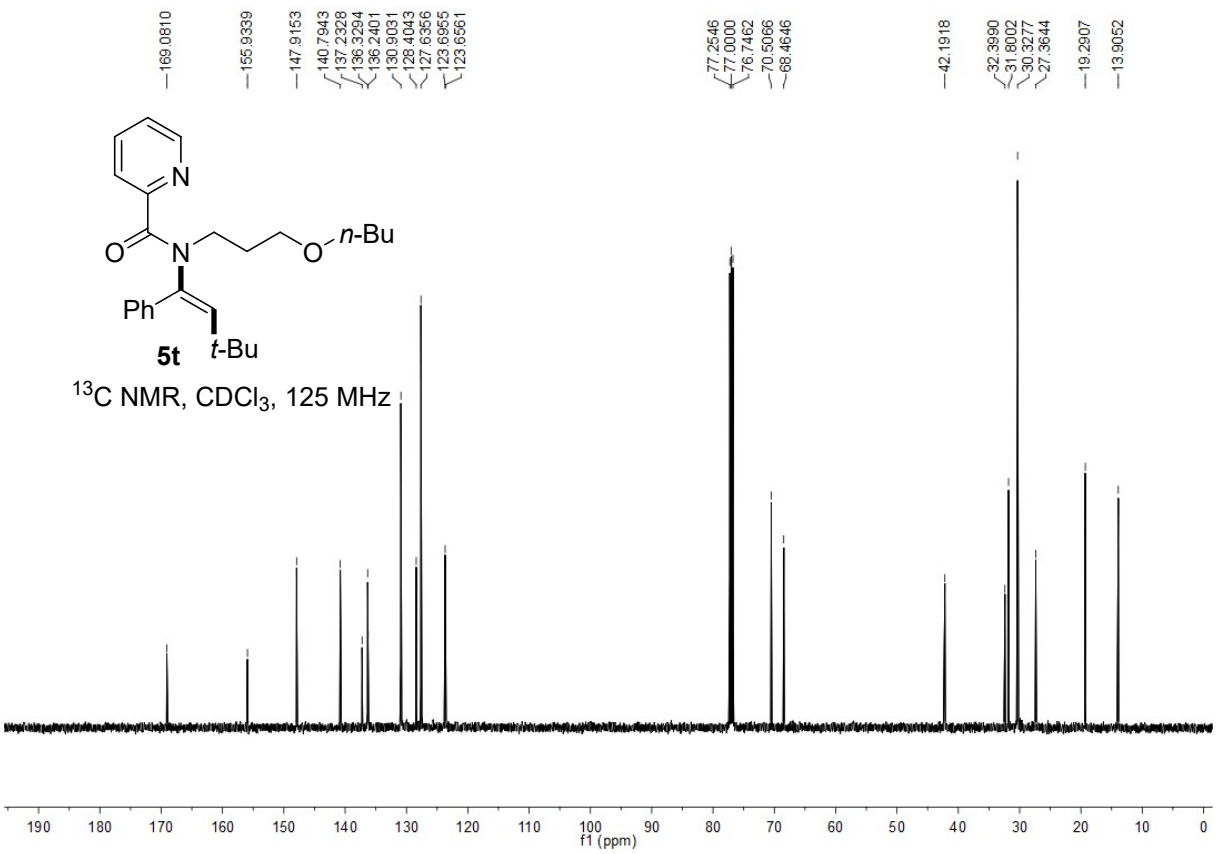
5s

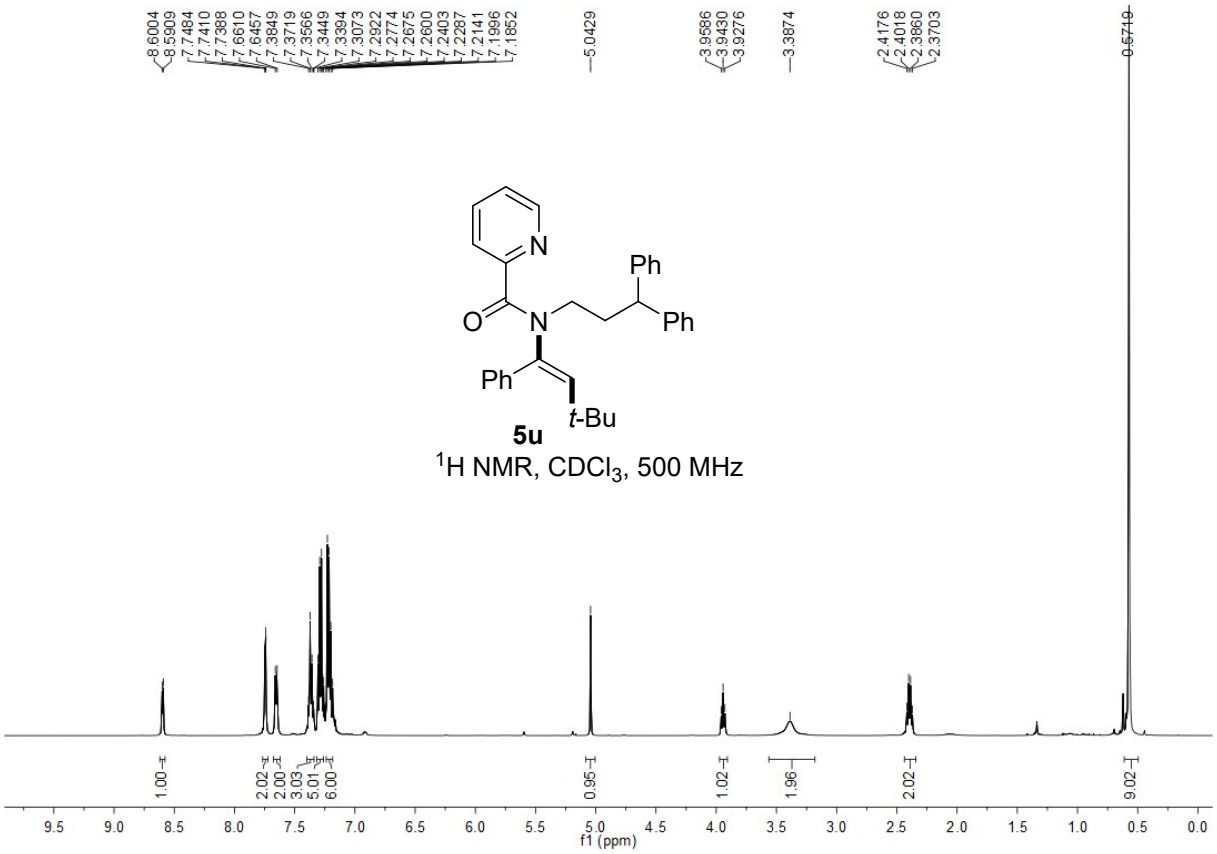
^{13}C NMR, $CDCl_3$, 125 MHz

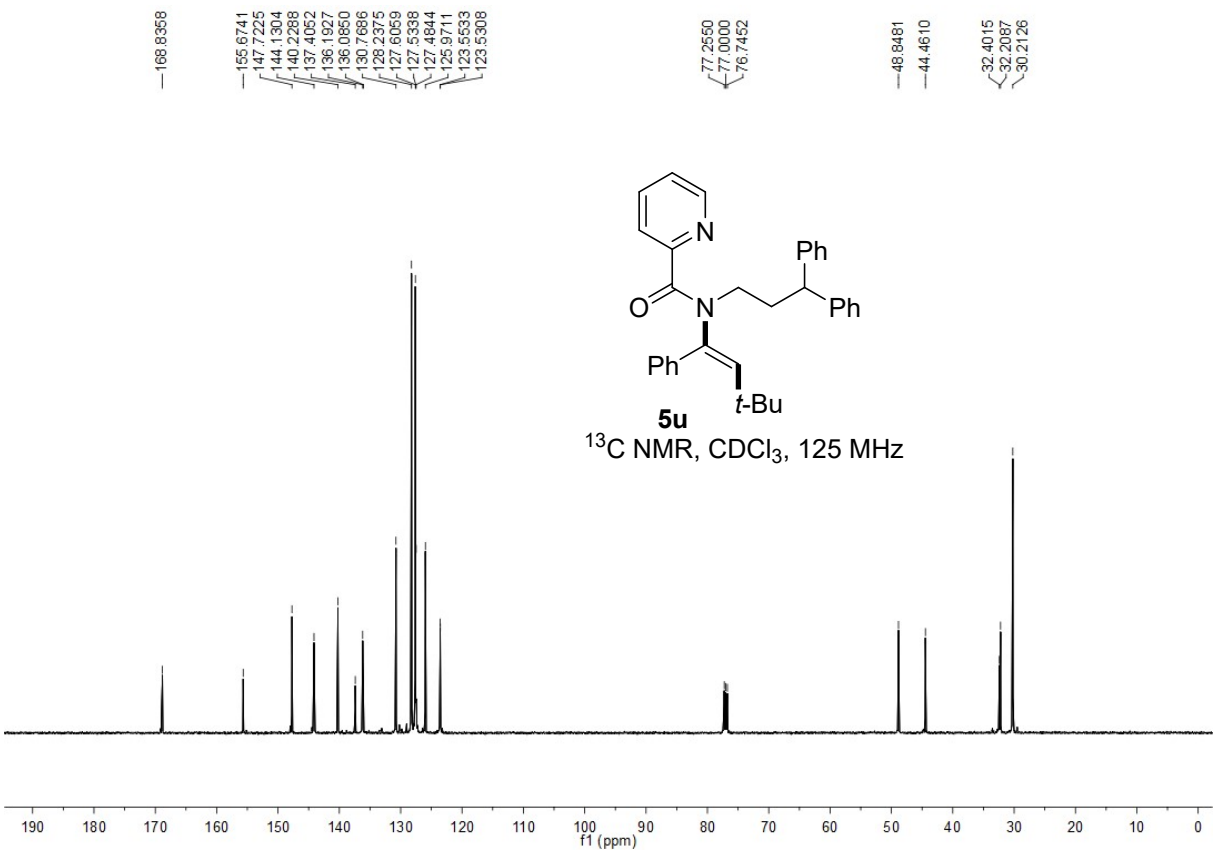


5t

^{1}H NMR, $CDCl_3$, 500 MHz

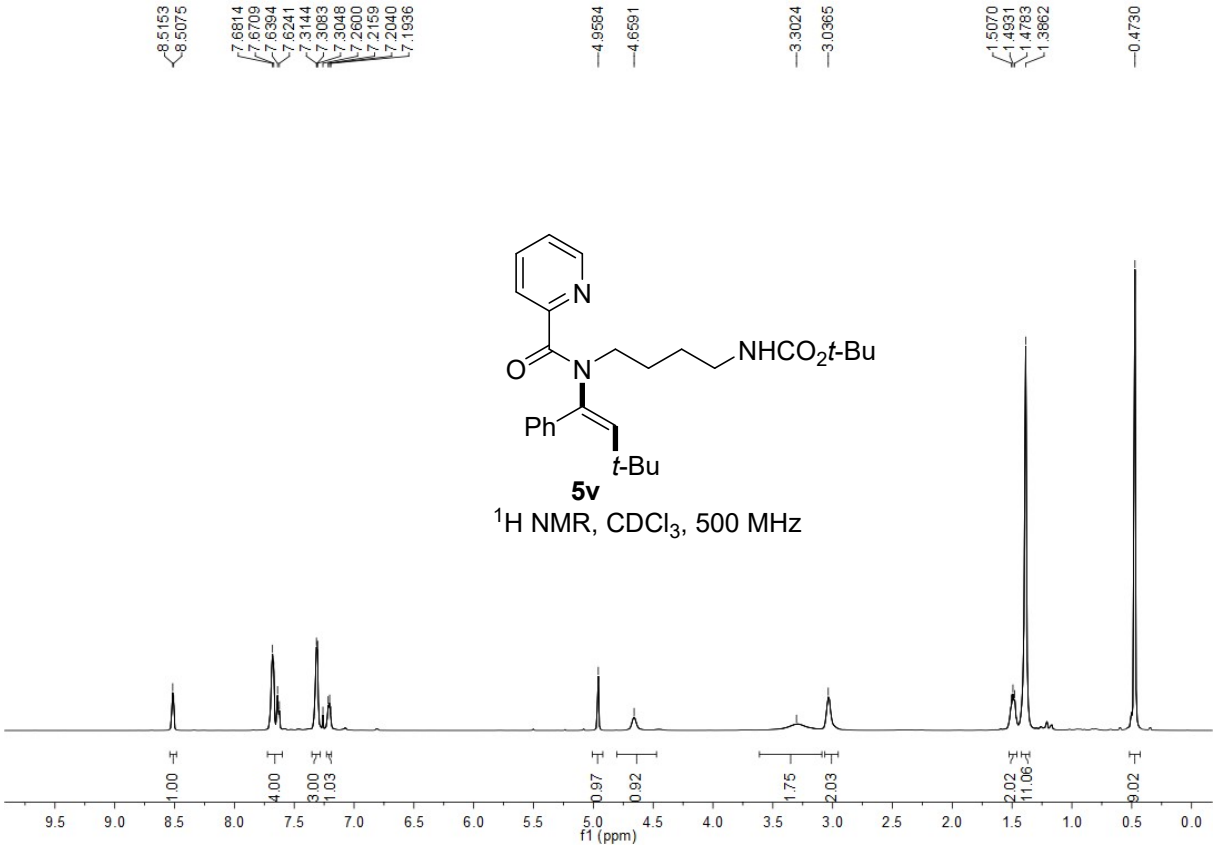

169.0810
155.9339
147.9153
140.7943
137.2328
136.3294
136.2401
130.9031
128.4043
127.6356
123.6955
123.6561
77.2546
77.0000
76.7462
70.5066
68.4646
42.1918
32.3990
31.8002
30.3277
27.3644
19.2907
13.9052
N
O
N
O
n-Bu
Ph
t-Bu
5t
13C NMR, CDCl3, 125 MHz
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


8.6004
8.5909
7.7484
7.7410
7.7388
7.6610
7.6457
7.3849
7.3719
7.3566
7.3449
7.3394
7.3073
7.2922
7.2774
7.2675
7.2600
7.2403
7.2287
7.2141
7.1996
7.1852
5.0429
3.9586
3.9430
3.9276
3.3874
2.4176
2.4018
2.3860
2.3703
0.5719
N
O
N
Ph
Ph
Ph
t-Bu
5u
1H NMR, CDCl3, 500 MHz
1.00
2.02
2.00
3.03
5.01
6.00
0.95
1.02
1.96
2.02
9.02
9.5 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 0.0
f1 (ppm)



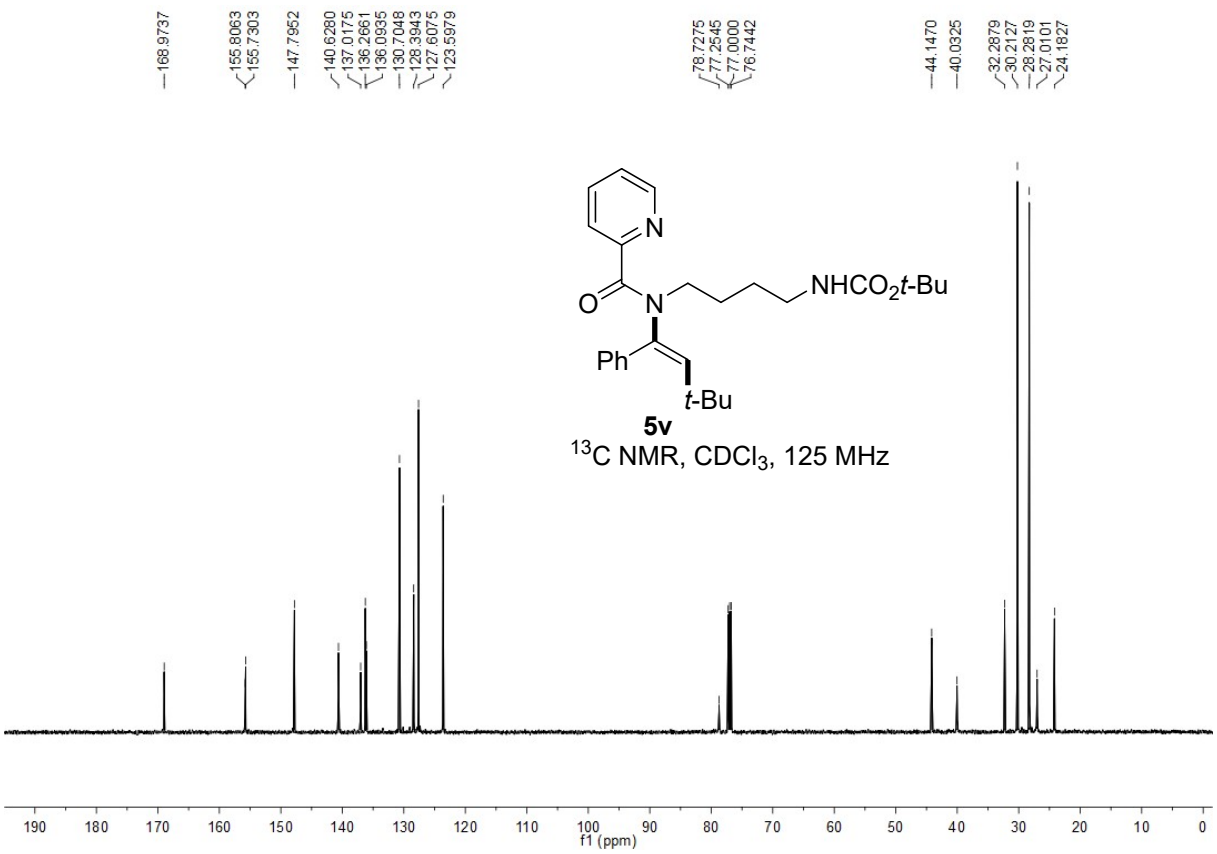
5u

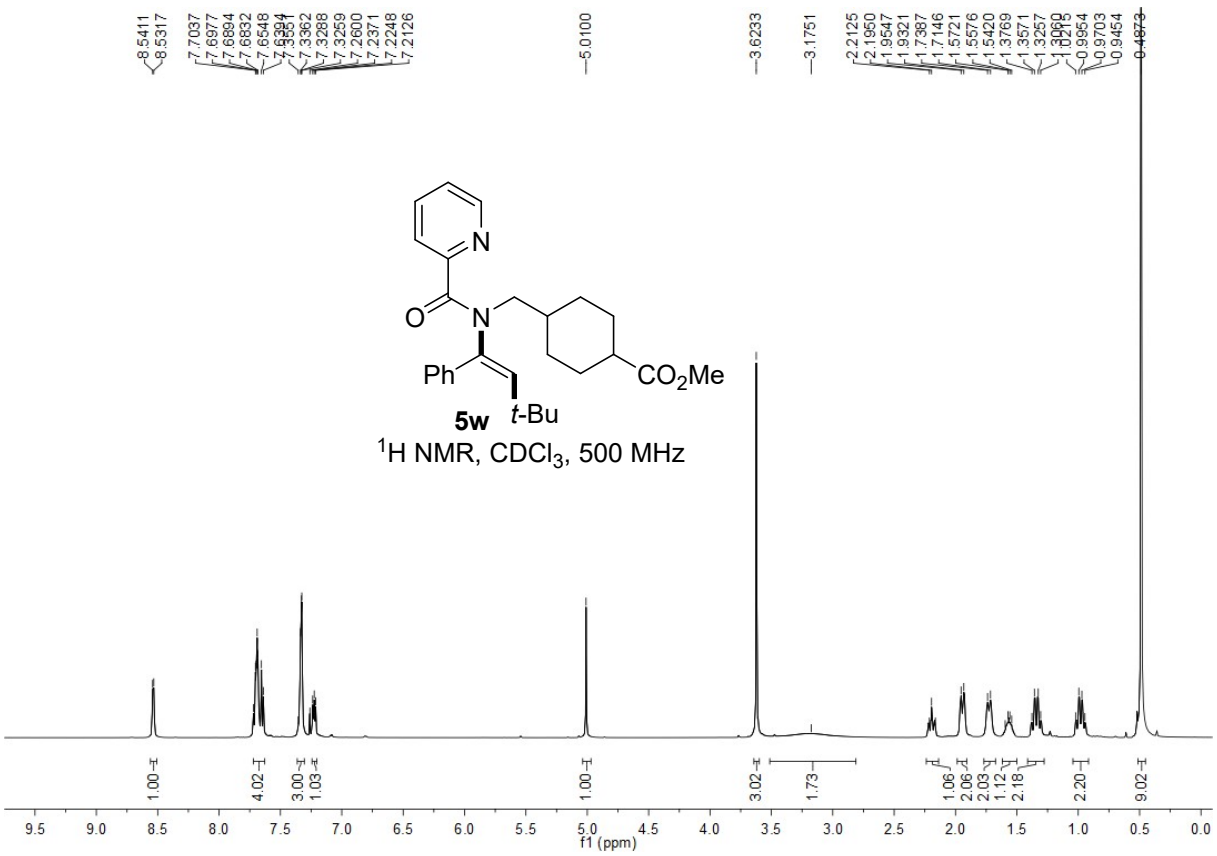
^{13}C NMR, $CDCl_3$, 125 MHz

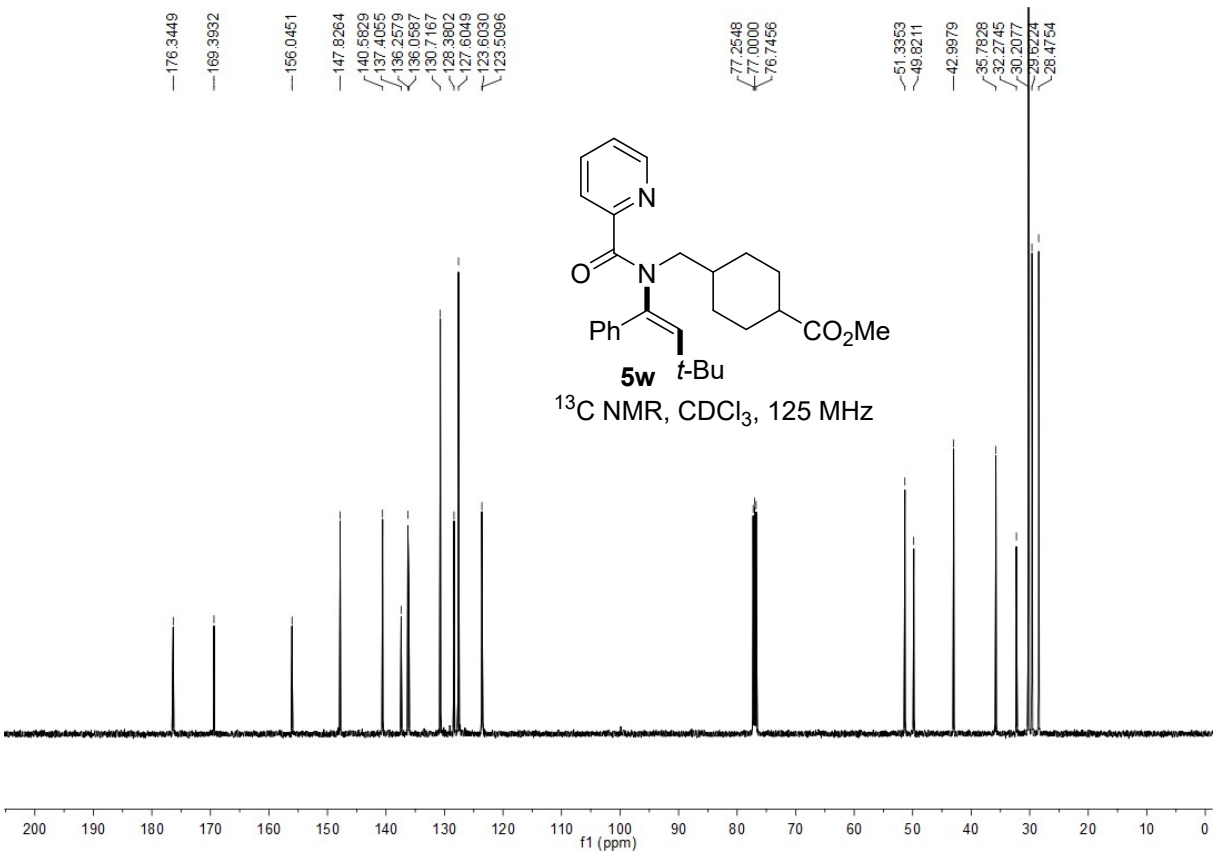


5v

^{1}H NMR, $CDCl_3$, 500 MHz

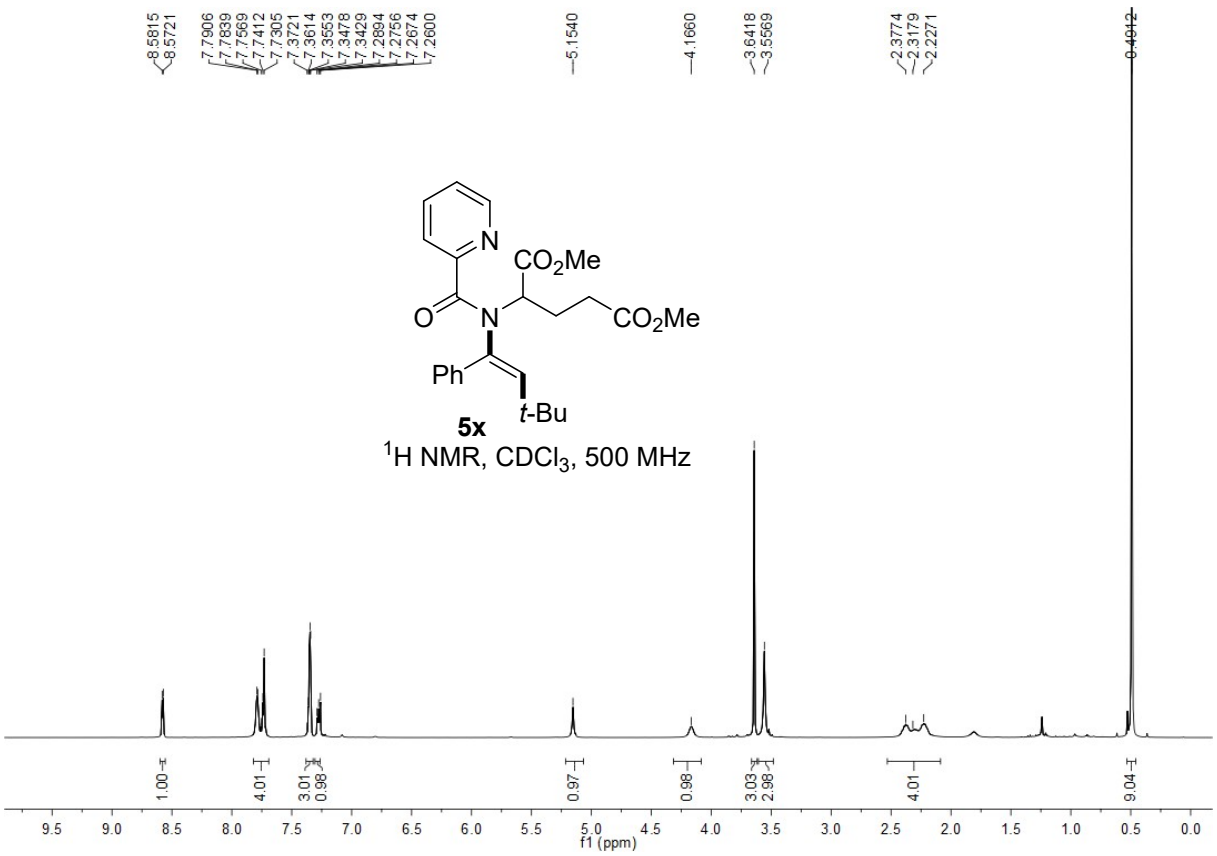

168.9737
155.8063
155.7303
147.7952
140.6280
137.0175
136.2661
136.0935
130.7048
128.3943
127.6075
123.5979
78.7275
77.2545
77.0000
76.7442
44.1470
40.0325
32.2879
30.2127
28.2819
27.0101
24.1827
N
O
N
NHCO2t-Bu
Ph
t-Bu
5v
13C NMR, CDCl3, 125 MHz
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


8.5411
8.5317
7.7037
7.6977
7.6894
7.6832
7.6548
7.3362
7.3288
7.3259
7.2600
7.2371
7.2248
7.2126
5.0100
3.6233
3.1751
2.2125
2.1950
1.9547
1.9321
1.7387
1.7146
1.5721
1.5576
1.5420
1.3769
1.3571
1.3257
0.9954
0.9703
0.9454
0.4873
N
O
N
Ph
CO2Me
t-Bu
5w
1H NMR, CDCl3, 500 MHz
1.00 4.02 3.00 1.03 1.00 3.02 1.73 1.06 2.06 2.03 1.12 2.18 2.20 9.02
9.5 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 0.0
f1 (ppm)



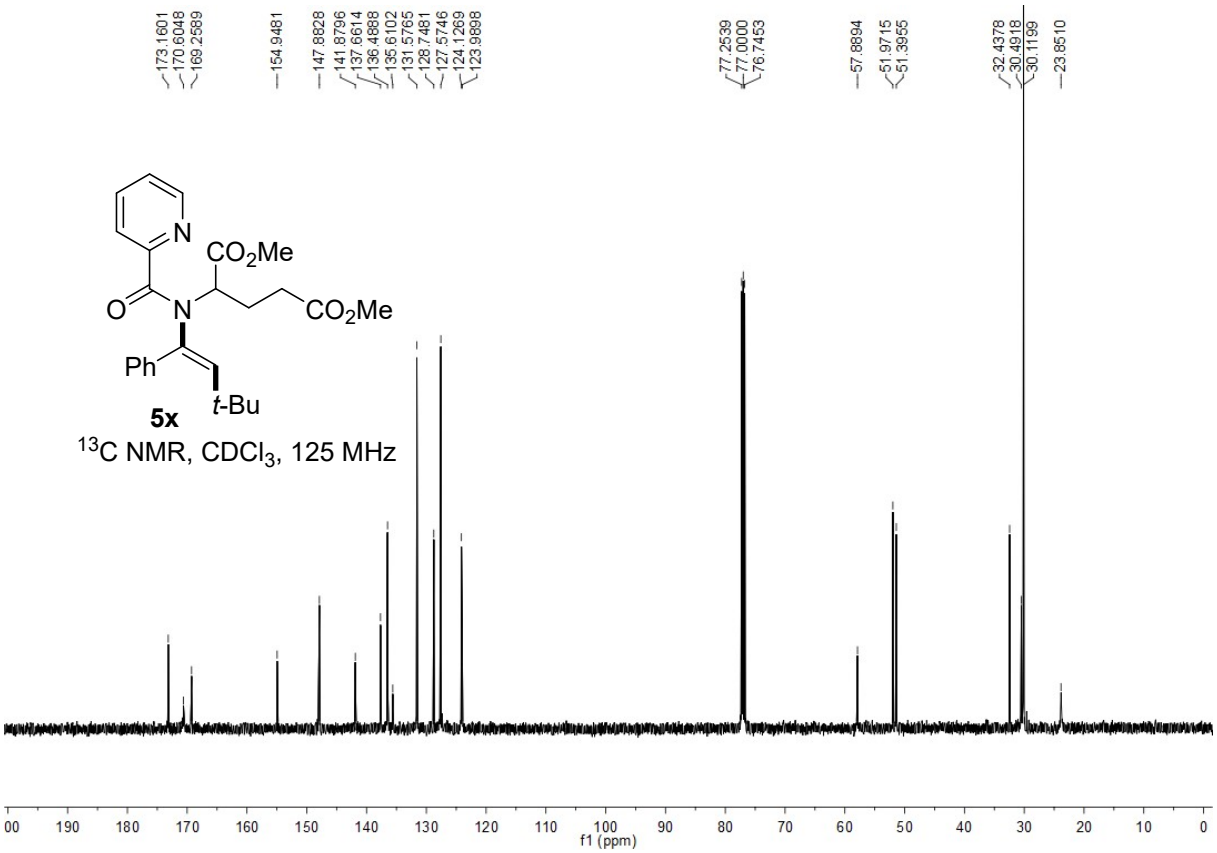
5w

^{13}C NMR, $CDCl_3$, 125 MHz



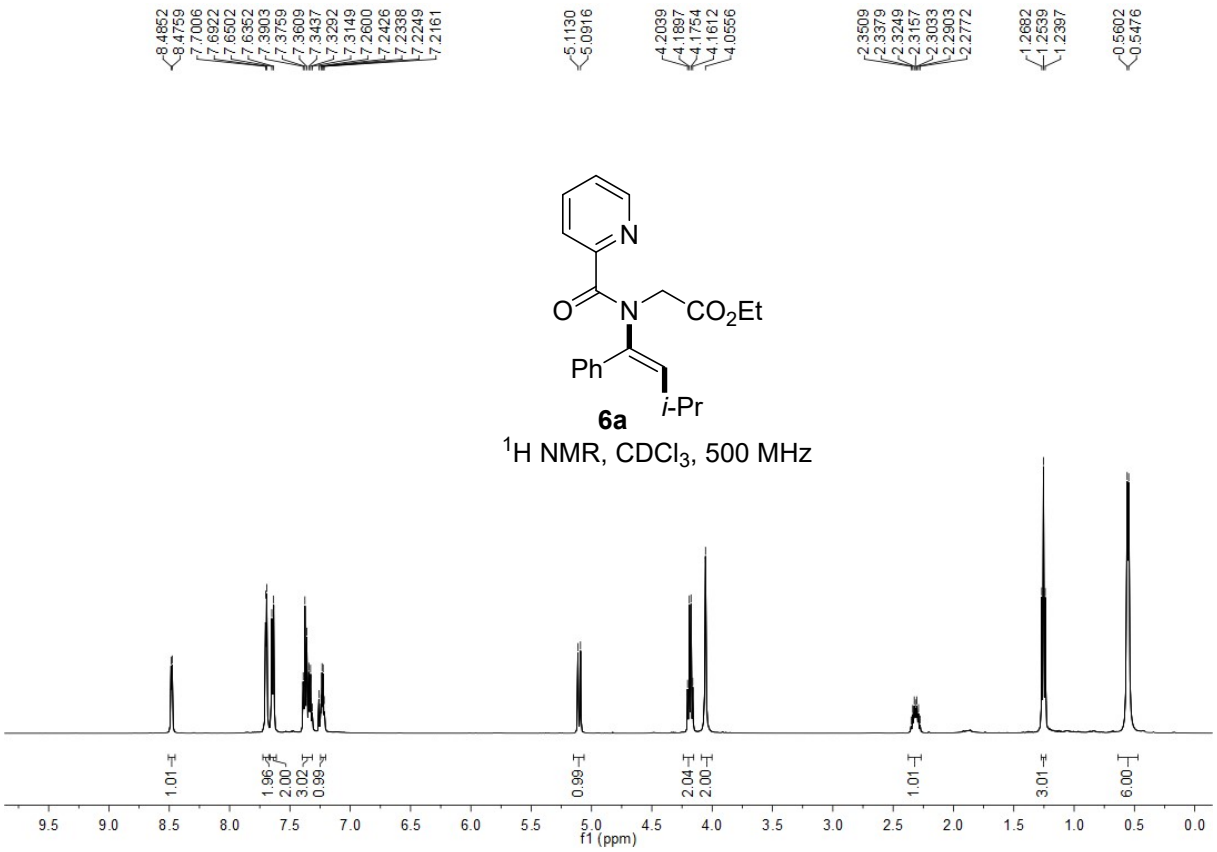
5x

^{1}H NMR, $CDCl_3$, 500 MHz



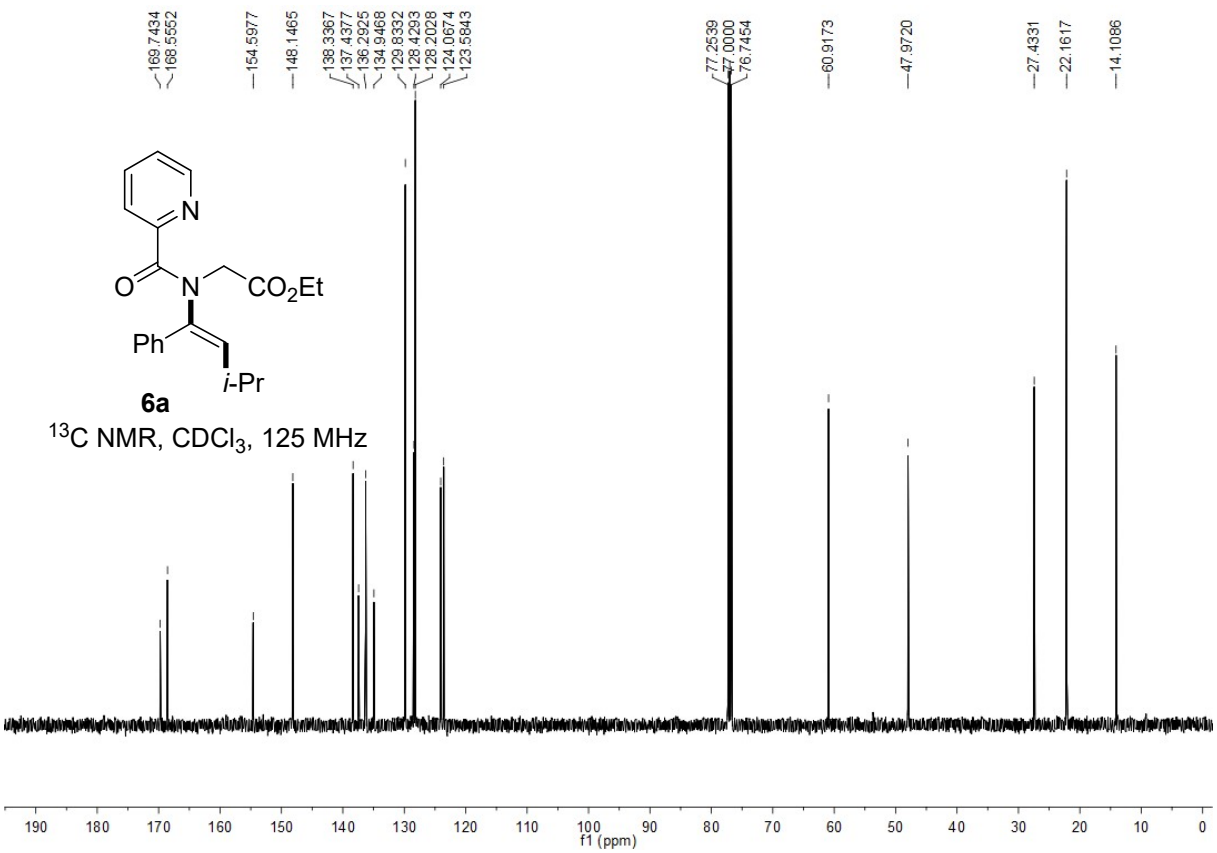
5x

^{13}C NMR, $CDCl_3$, 125 MHz



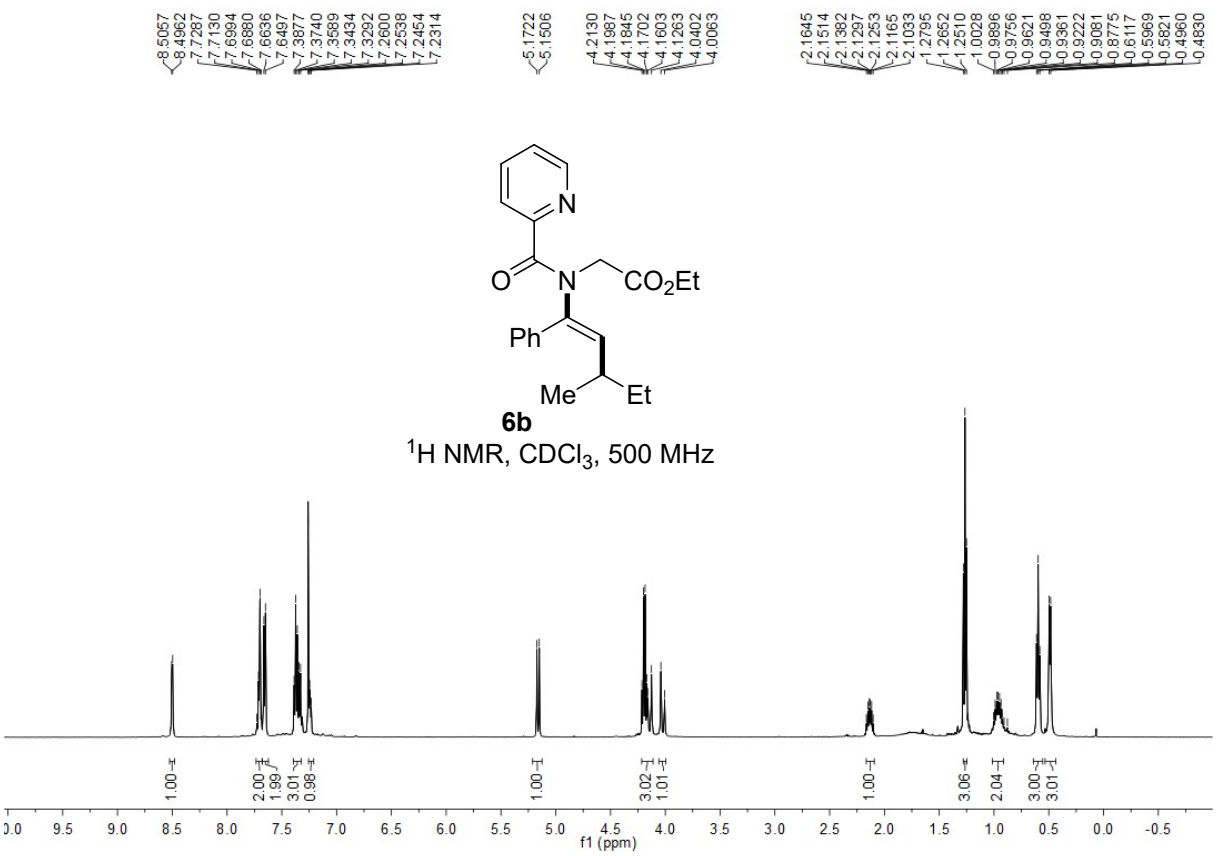
6a

^{1}H NMR, $CDCl_3$, 500 MHz



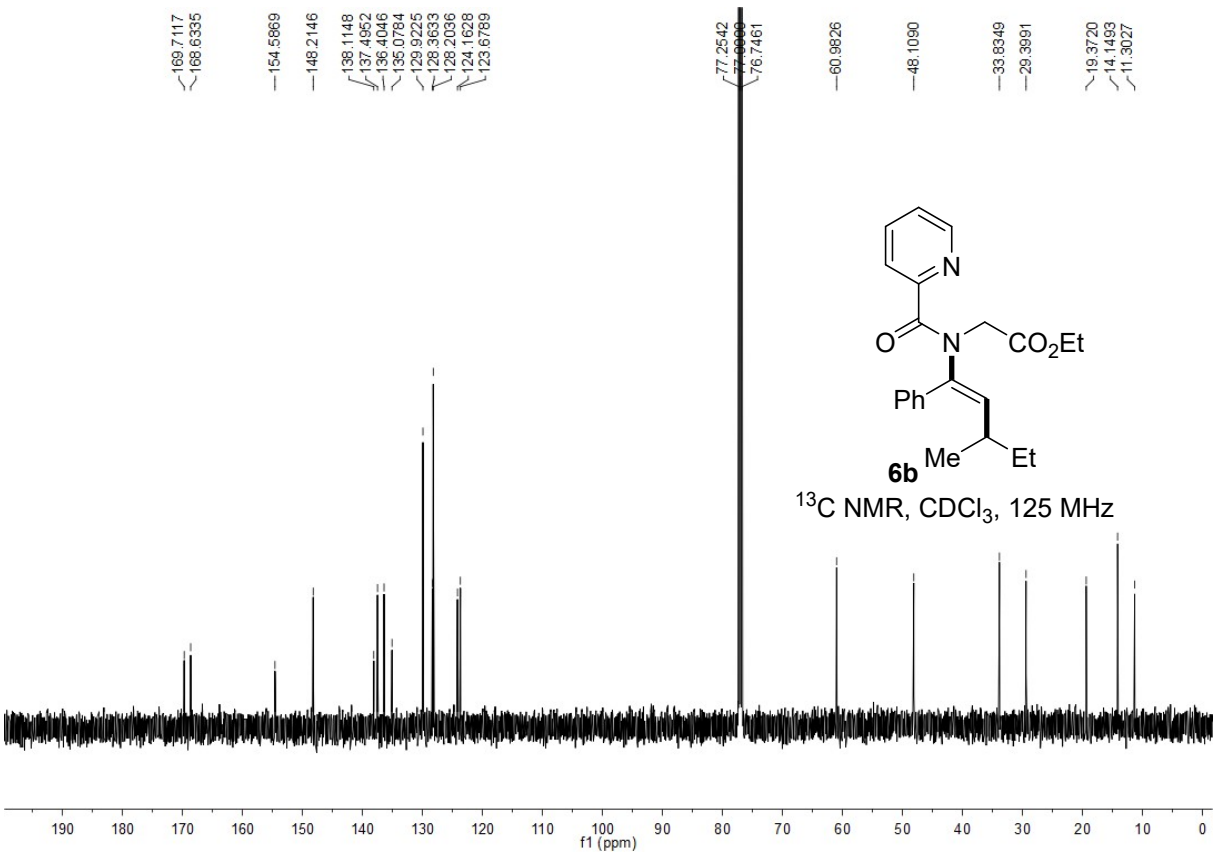
6a

^{13}C NMR, $CDCl_3$, 125 MHz

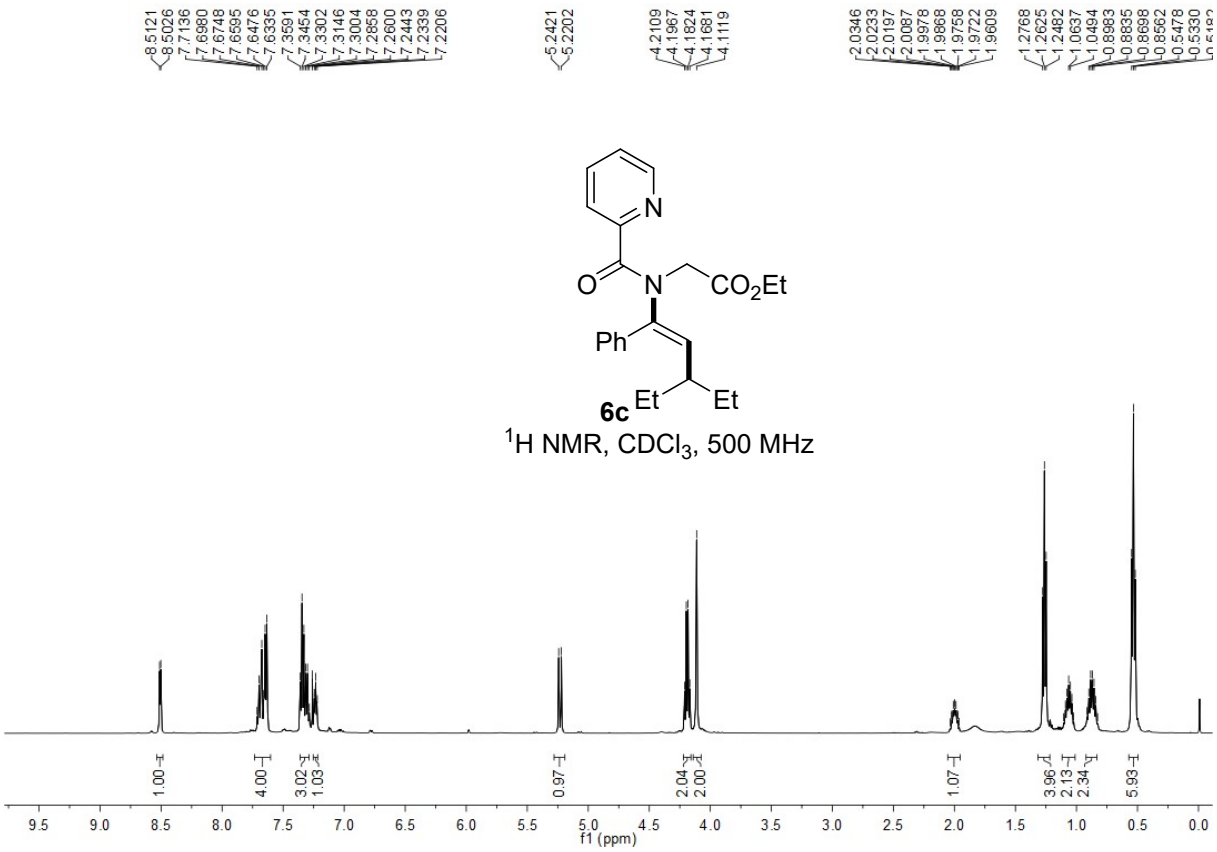


6b

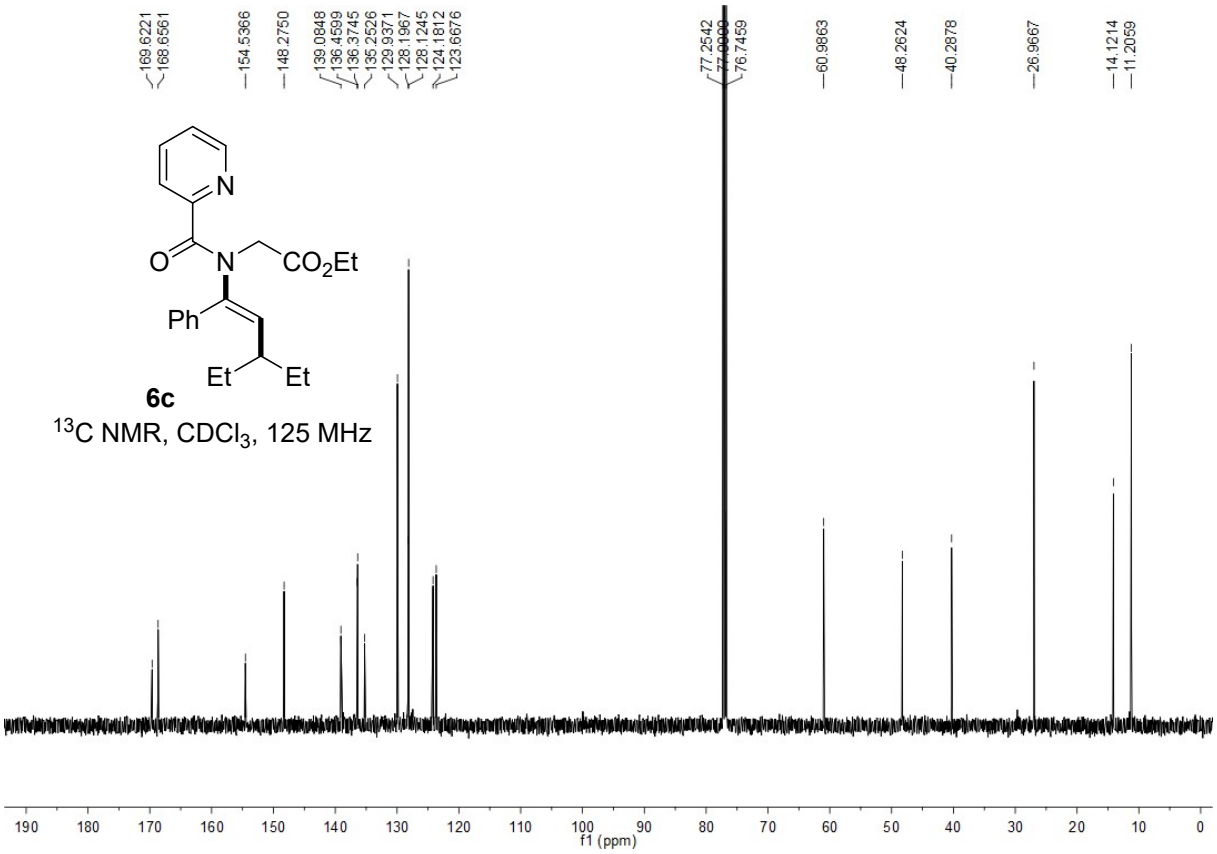
^{1}H NMR, $CDCl_3$, 500 MHz

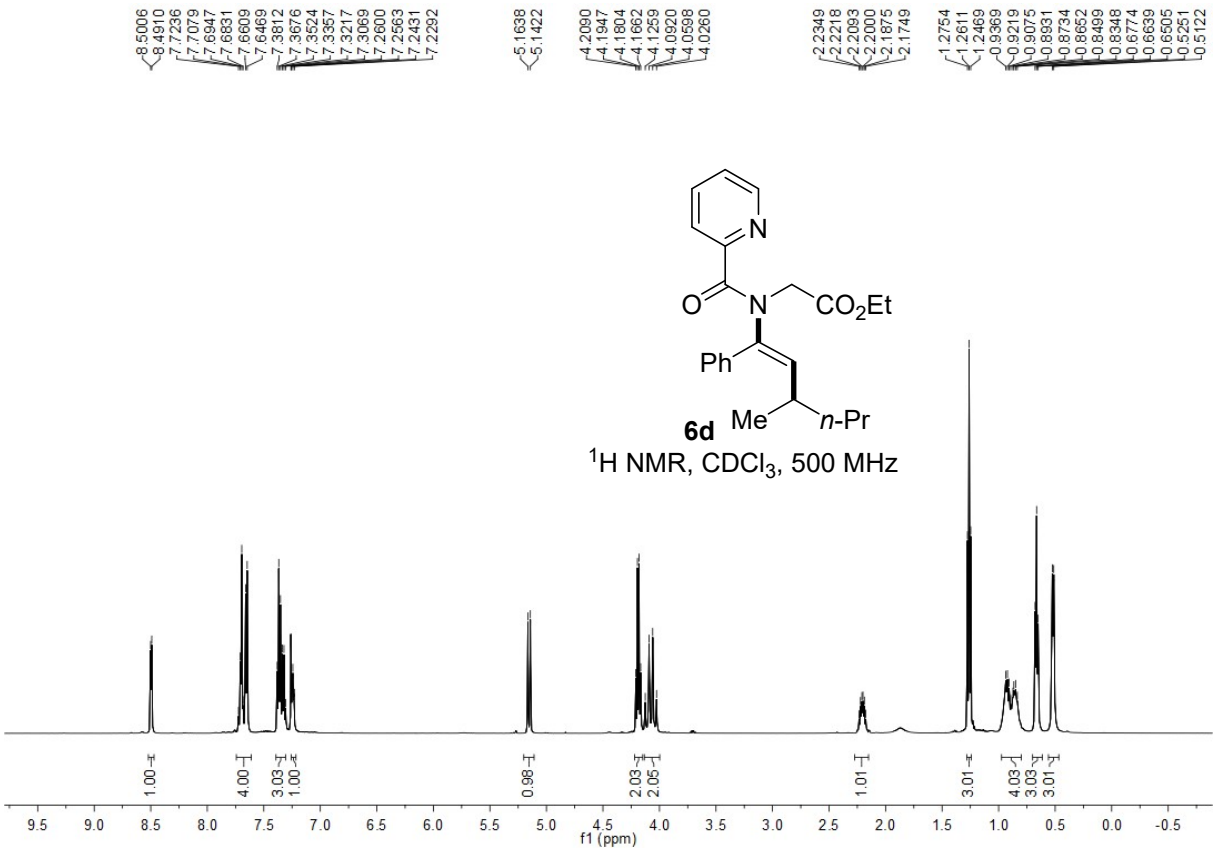


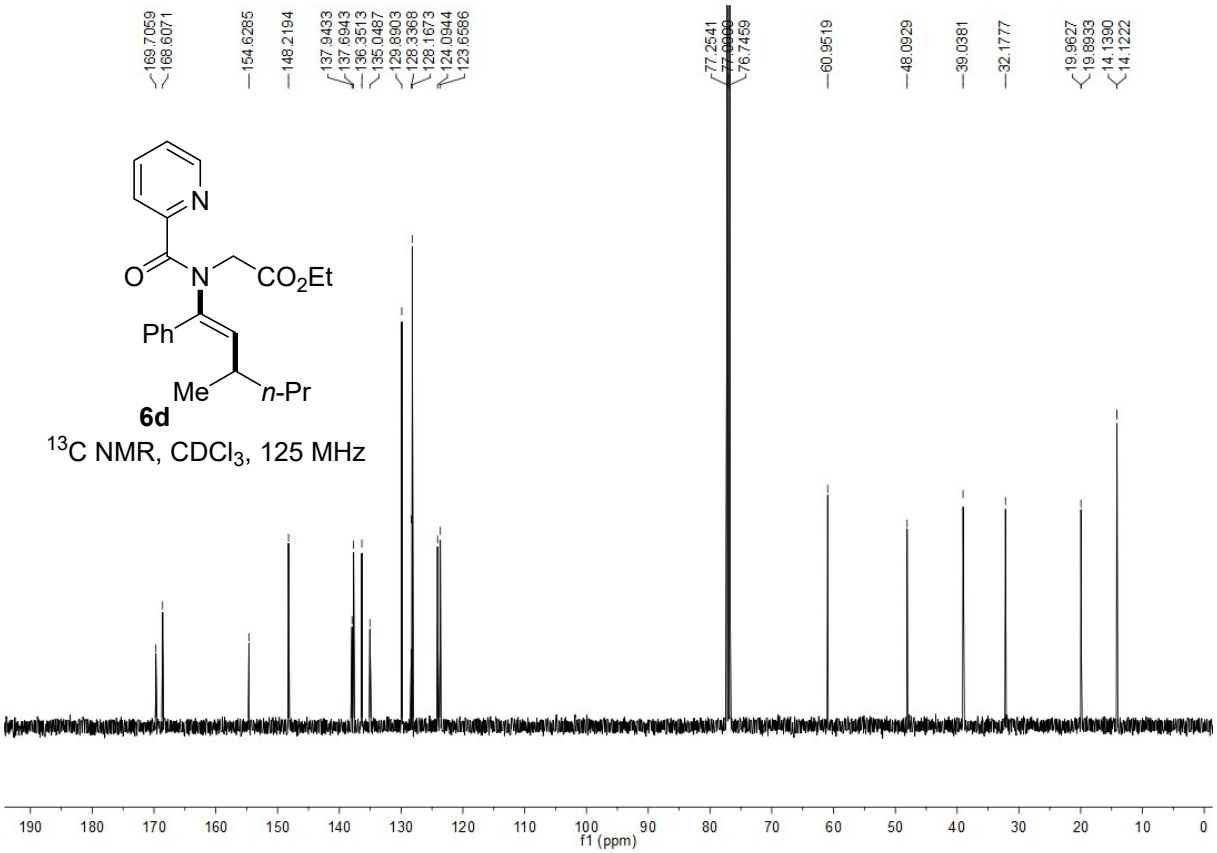
^{13}C NMR, $CDCl_3$, 125 MHz



^{1}H NMR, $CDCl_3$, 500 MHz

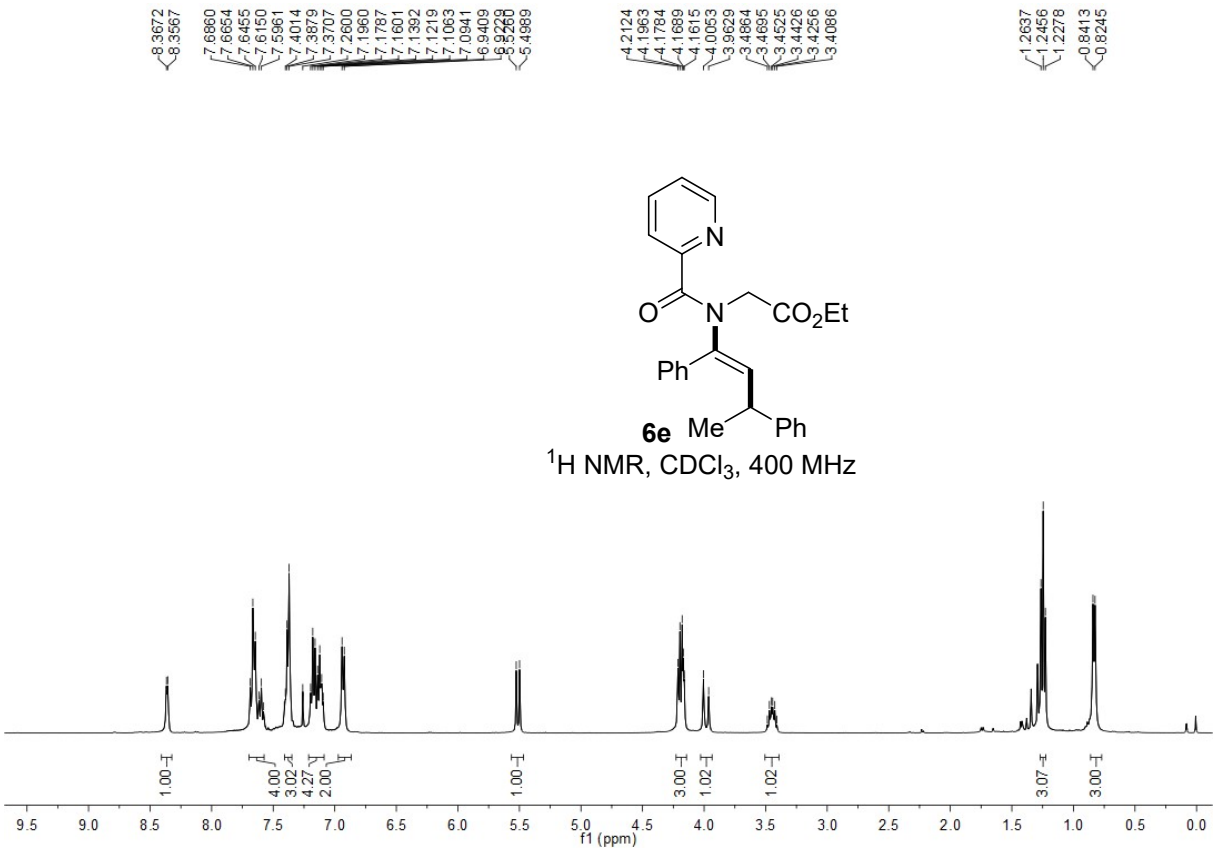

169.6221
168.6561
154.5366
148.2750
139.0848
136.4599
136.3745
135.2526
129.9371
128.1967
128.1245
124.1812
123.6676
77.2542
77.0000
76.7459
60.9863
48.2624
40.2878
26.9667
14.1214
11.2059
N
O
N
CO2Et
Ph
Et
Et
6c
13C NMR, CDCl3, 125 MHz
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


8.5006
8.4910
7.7236
7.7079
7.6947
7.6831
7.6609
7.6469
7.3812
7.3676
7.3524
7.3357
7.3217
7.3069
7.2600
7.2563
7.2431
7.2292
5.1638
5.1422
4.2090
4.1947
4.1804
4.1662
4.1259
4.0920
4.0598
4.0260
2.2349
2.2218
2.2093
2.2000
2.1875
2.1749
1.2754
1.2611
1.2469
0.9369
0.9219
0.9075
0.8931
0.8734
0.8652
0.8499
0.8348
0.6774
0.6639
0.6505
0.5251
0.5122
N
O
N
CO2Et
Ph
Me
n-Pr
6d
1H NMR, CDCl3, 500 MHz
1.00
4.00
3.03
1.00
0.98
2.03
2.05
1.01
3.01
4.03
3.03
3.01
9.5
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
0.0
-0.5
f1 (ppm)



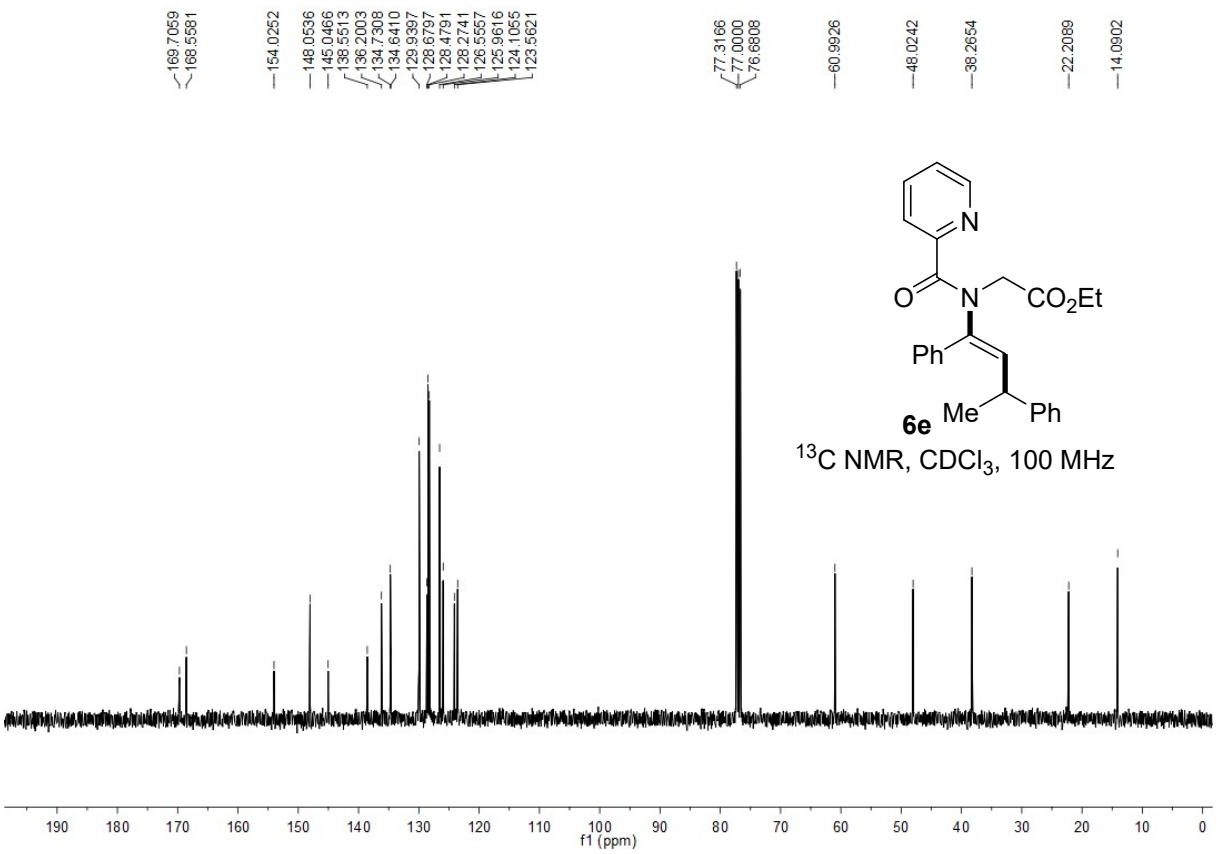
6d

^{13}C NMR, $CDCl_3$, 125 MHz



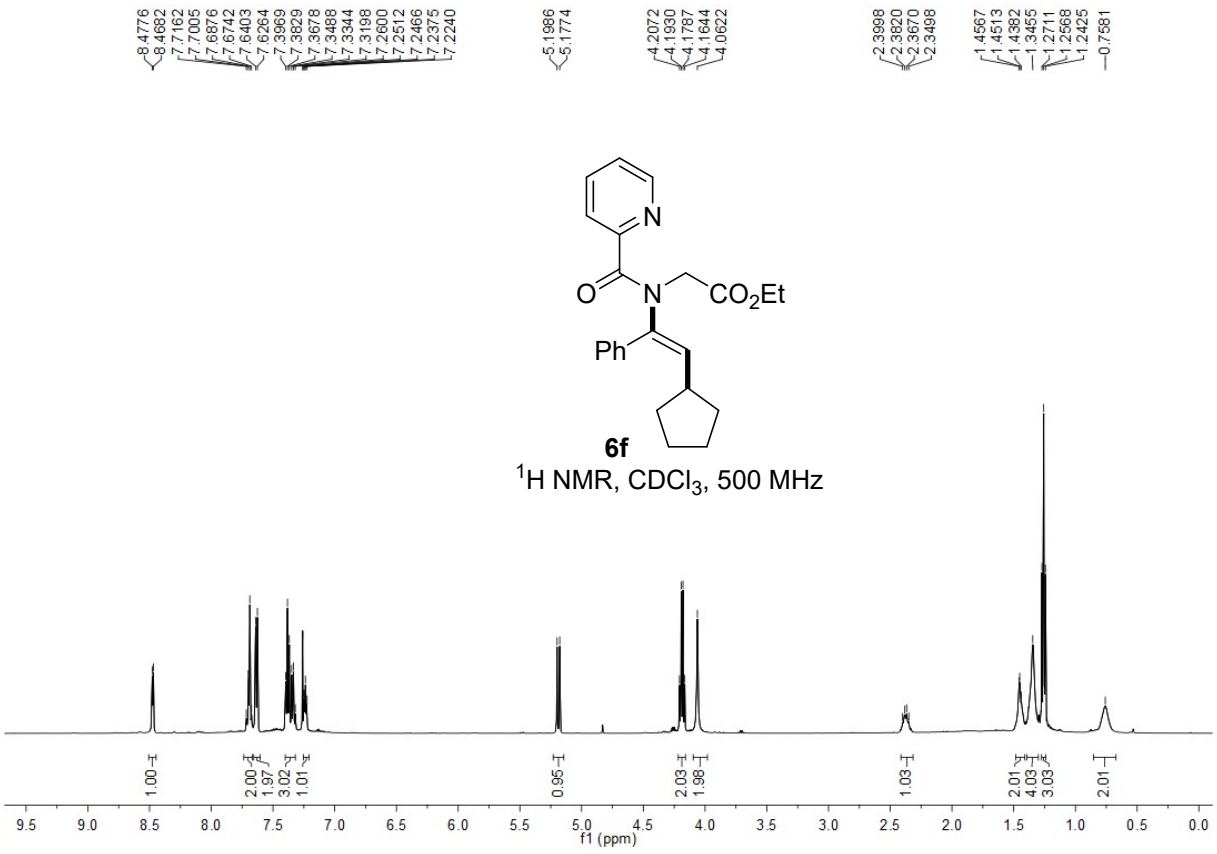
6e

^{1}H NMR, $CDCl_3$, 400 MHz



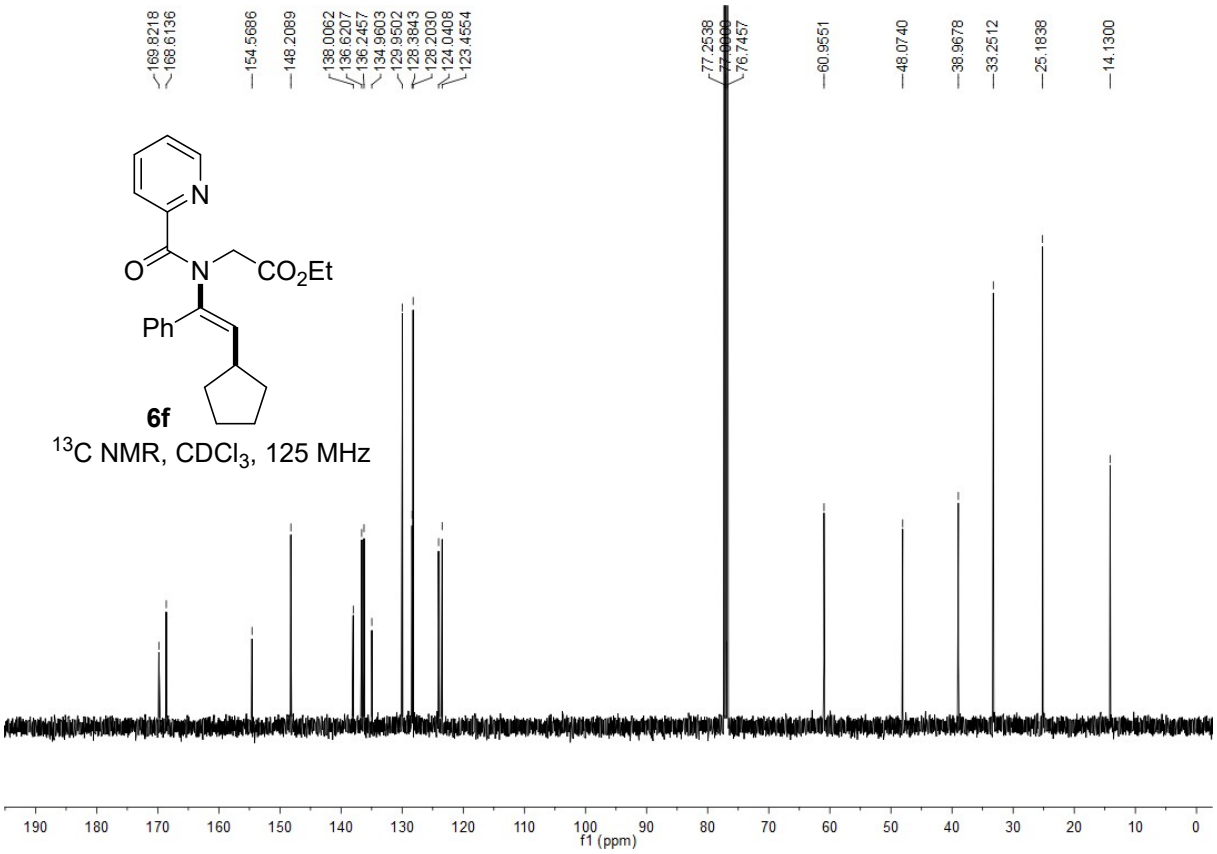
6e

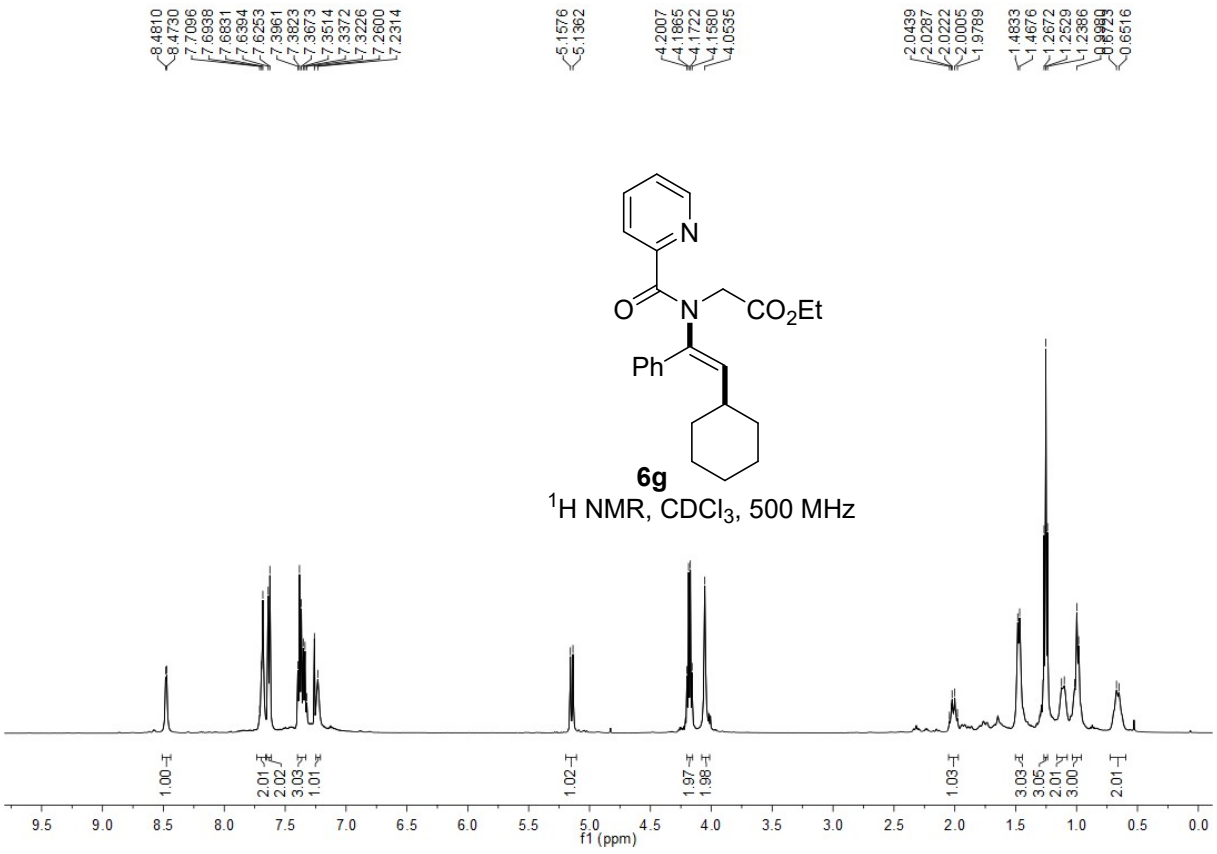
^{13}C NMR, $CDCl_3$, 100 MHz

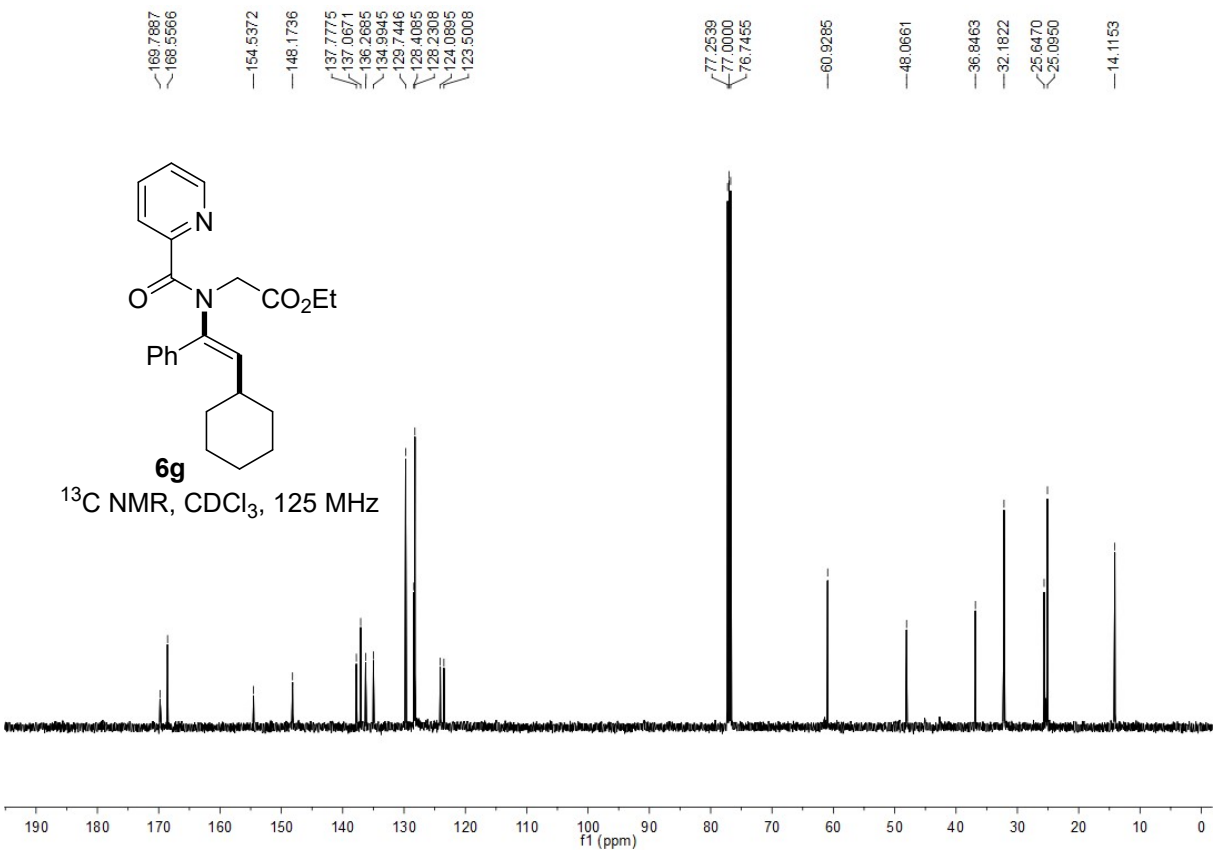


6f

^{1}H NMR, $CDCl_3$, 500 MHz

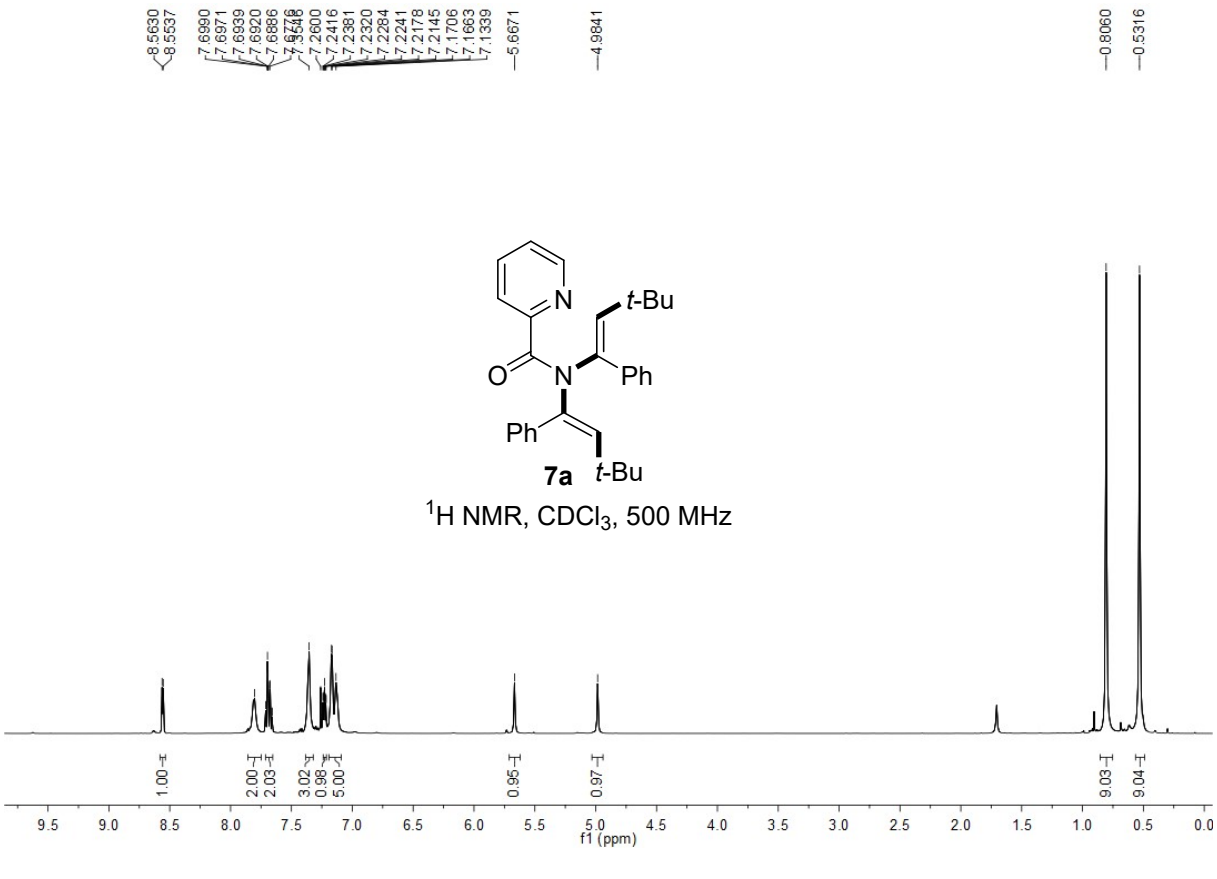

169.8218
168.6136
154.5686
148.2089
138.0062
136.6207
136.2457
134.9603
129.9502
128.3843
128.2030
124.0408
123.4554
77.2538
77.0000
76.7457
60.9551
48.0740
38.9678
33.2512
25.1838
14.1300
N
O
N
CO2Et
Ph
6f
13C NMR, CDCl3, 125 MHz
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


8.4810
8.4730
7.7096
7.6938
7.6831
7.6394
7.6253
7.3961
7.3823
7.3673
7.3514
7.3372
7.3226
7.2600
7.2314
5.1576
5.1362
4.2007
4.1865
4.1722
4.1580
4.0535
2.0439
2.0287
2.0222
2.0005
1.9789
1.4833
1.4676
1.2672
1.2529
1.2386
0.8723
0.6516
N
O
N
CO2Et
Ph
6g
1H NMR, CDCl3, 500 MHz
1.00
2.01
2.02
3.03
1.01
1.02
1.97
1.98
1.03
3.03
3.05
2.01
3.00
2.01
9.5 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 0.0
f1 (ppm)



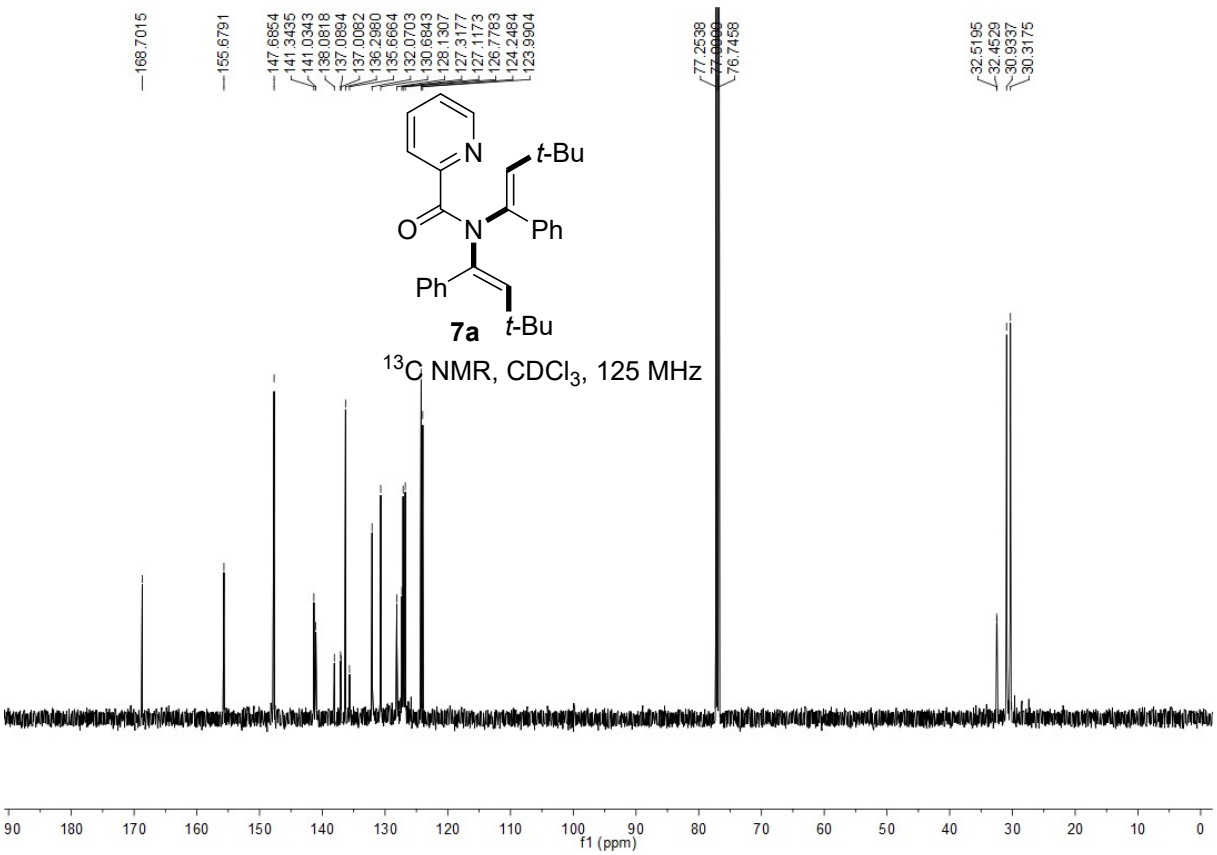
6g

^{13}C NMR, $CDCl_3$, 125 MHz



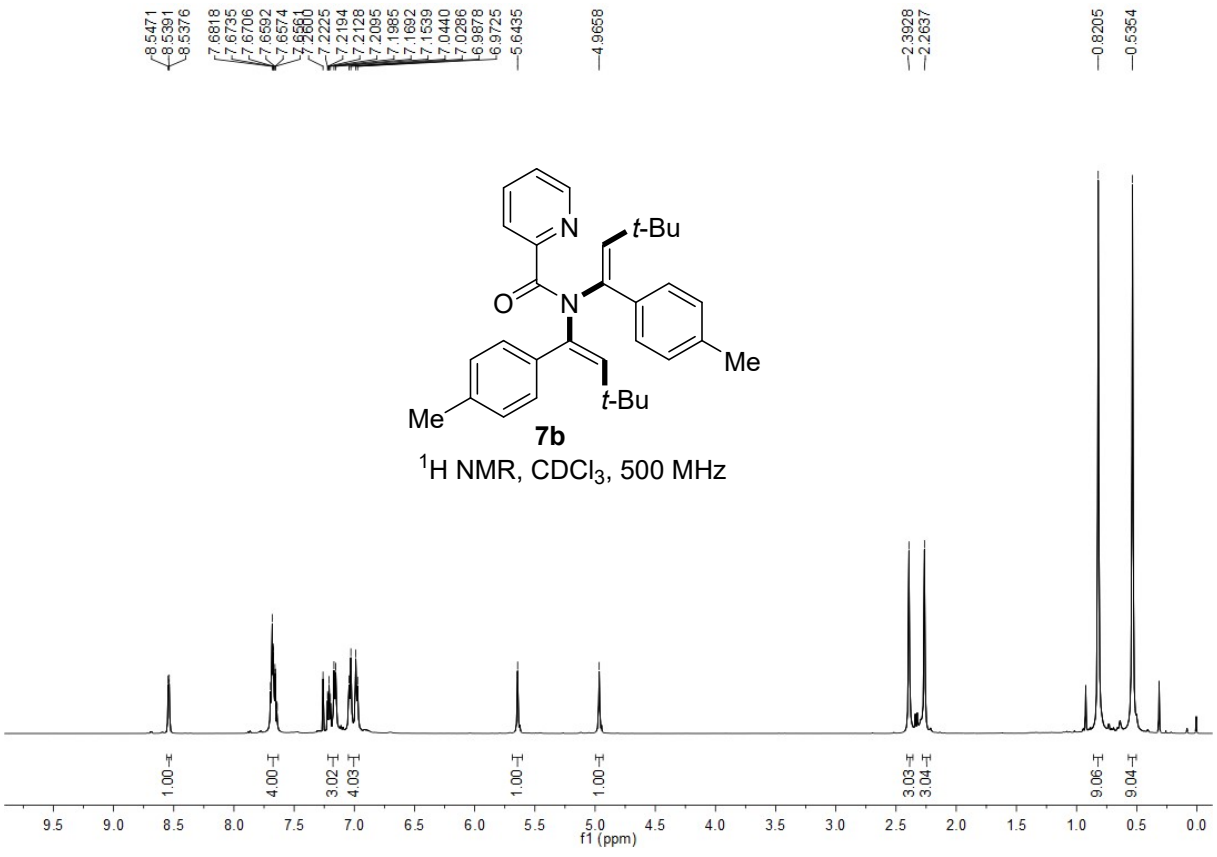
7a

^{1}H NMR, $CDCl_3$, 500 MHz



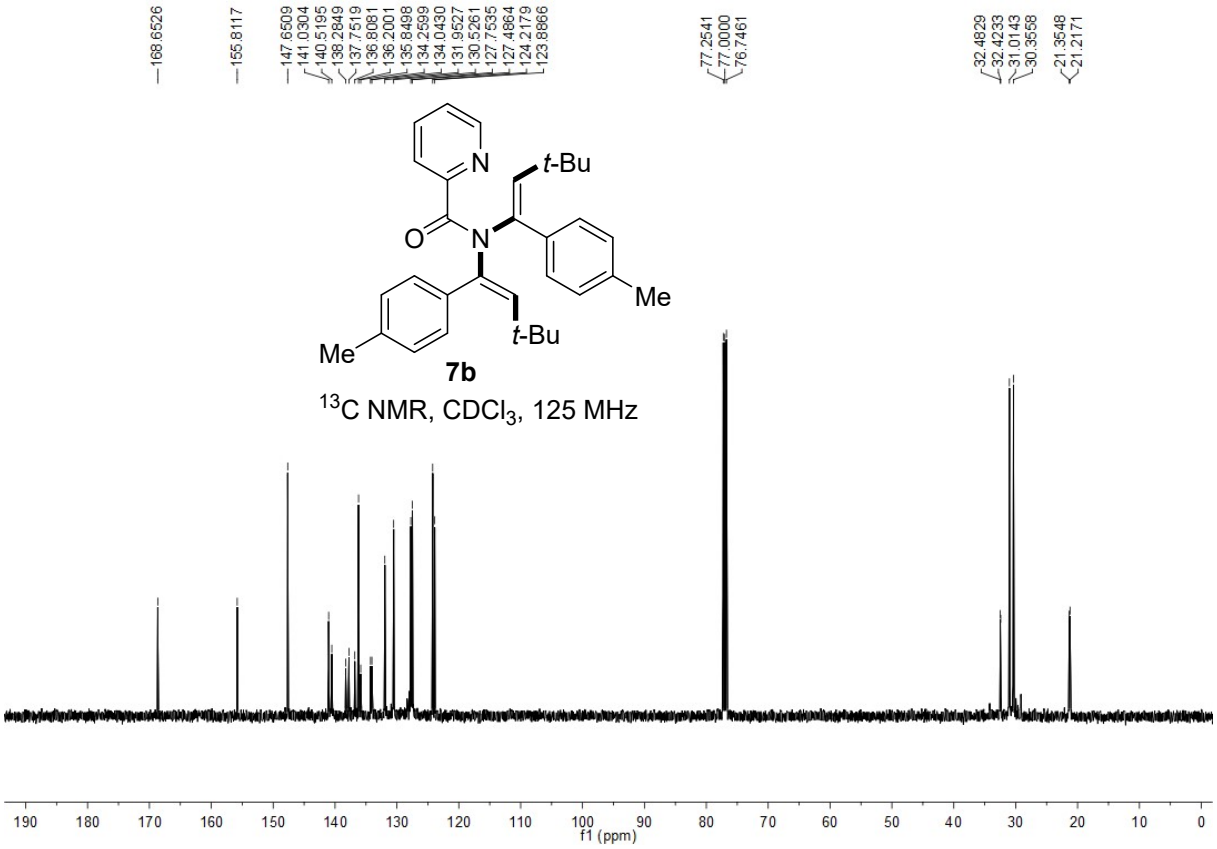
7a

^{13}C NMR, $CDCl_3$, 125 MHz



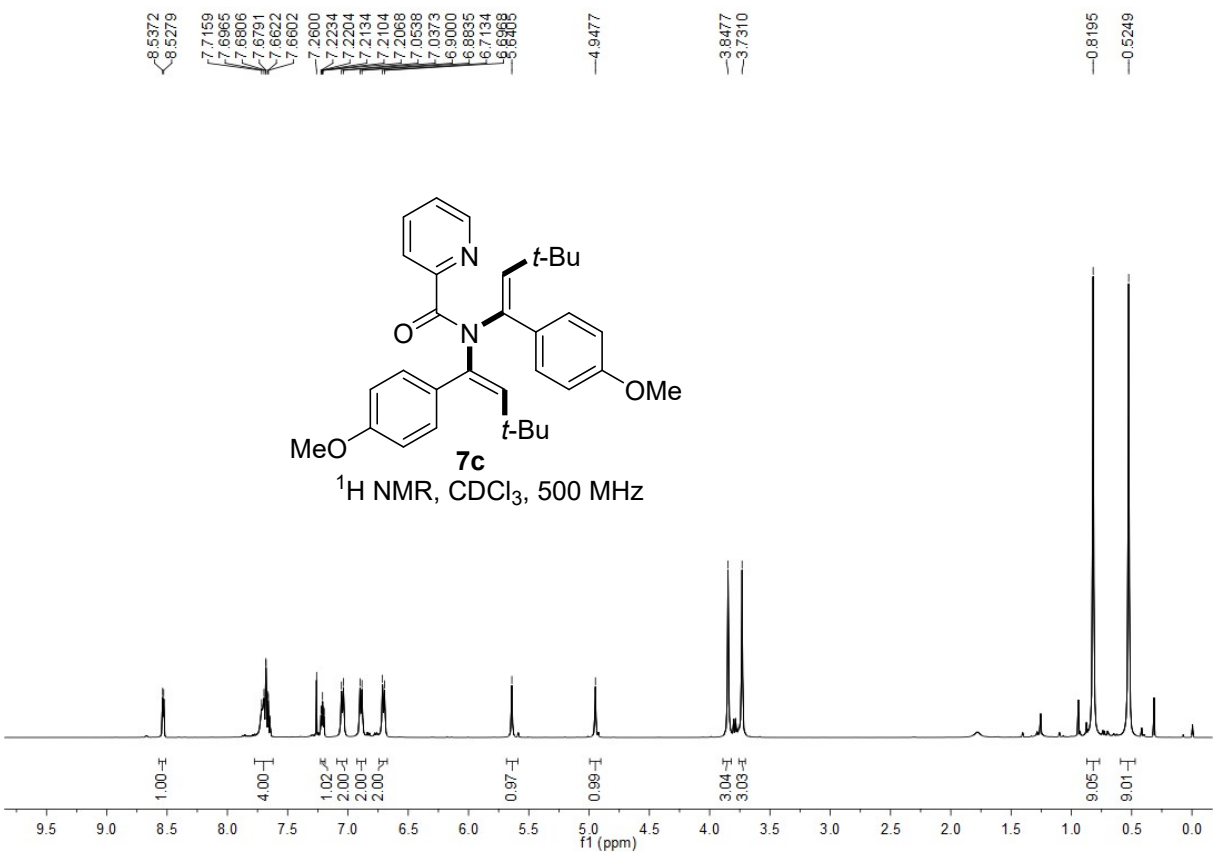
7b

^{1}H NMR, $CDCl_3$, 500 MHz



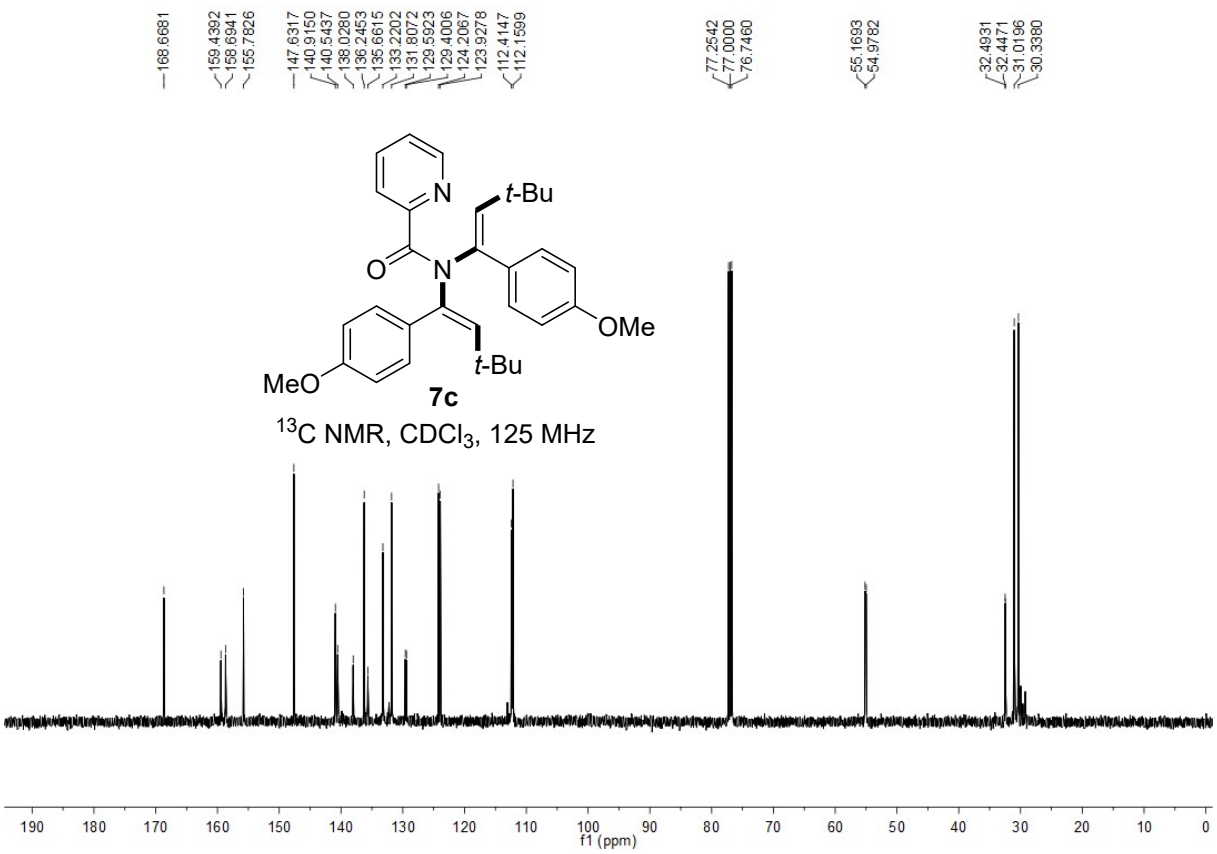
7b

^{13}C NMR, $CDCl_3$, 125 MHz



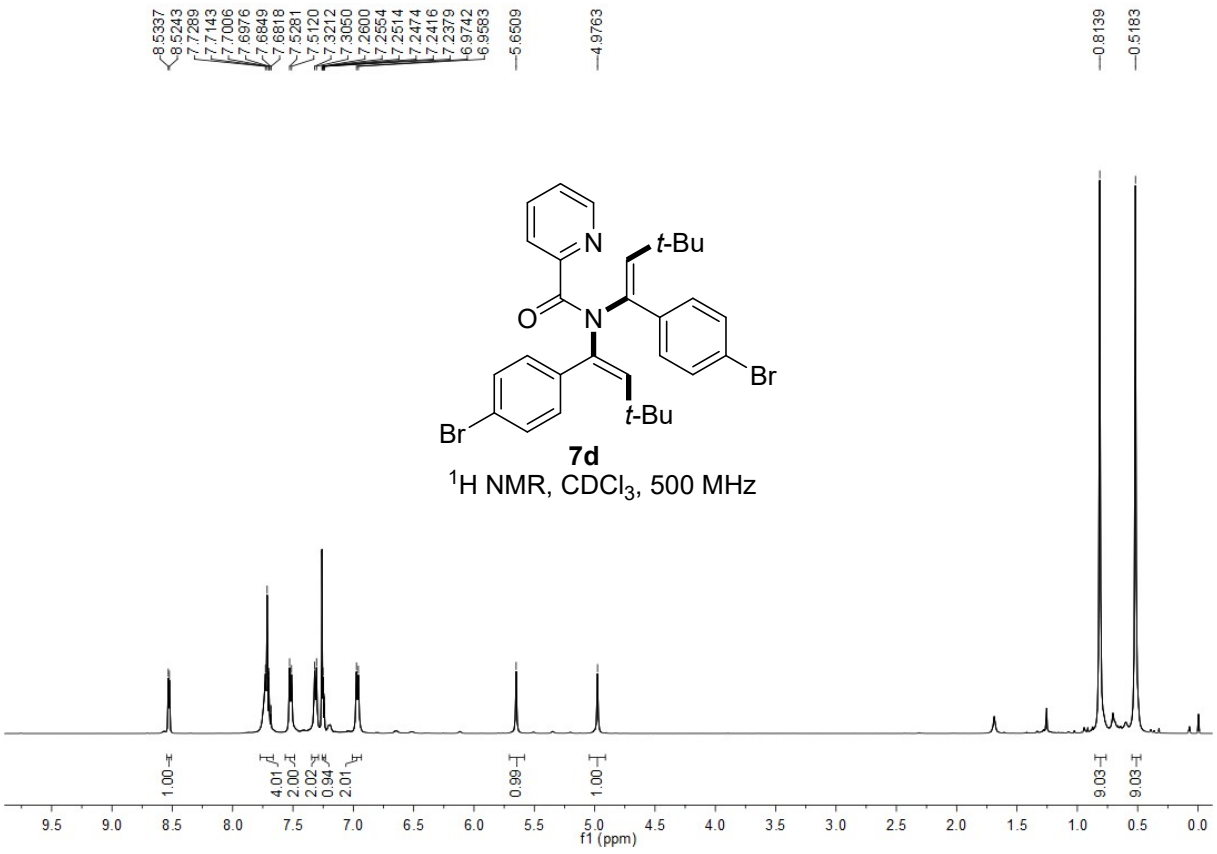
7c

^{1}H NMR, $CDCl_3$, 500 MHz



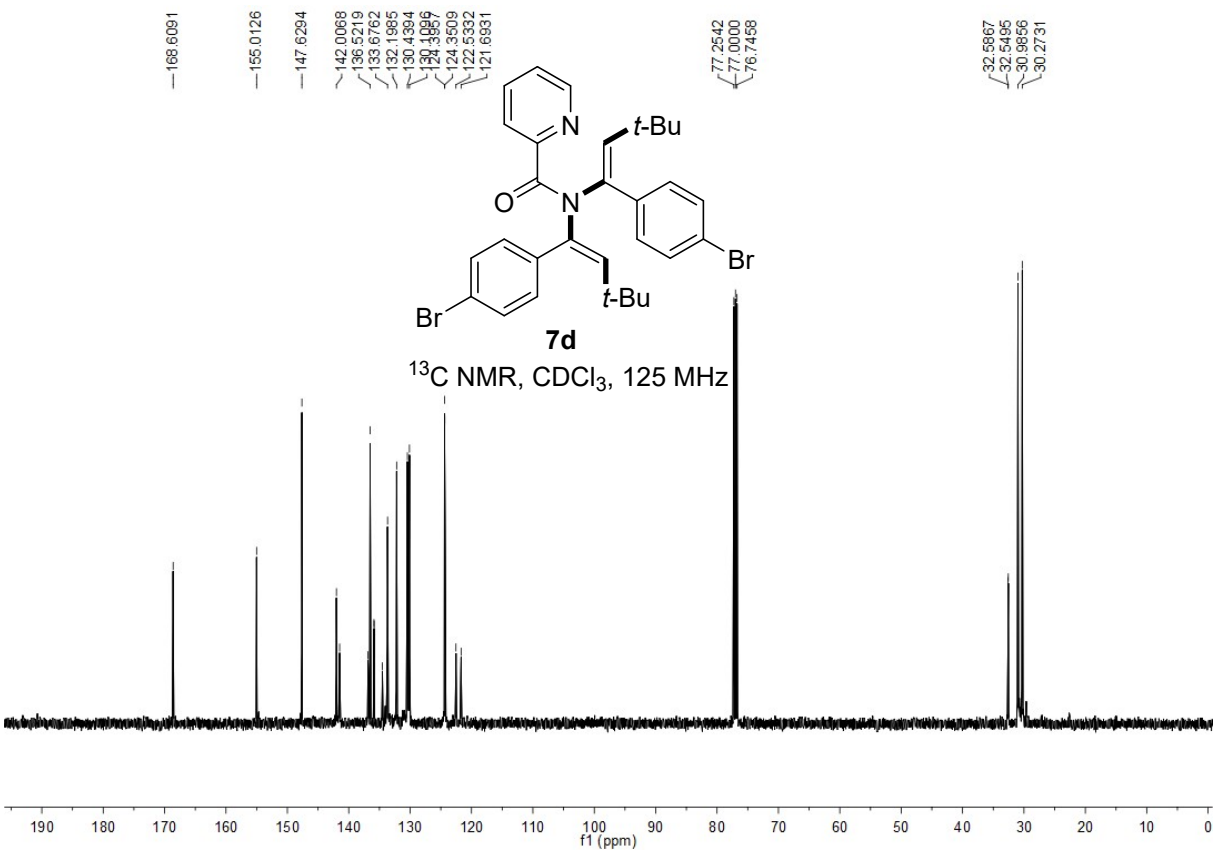
7c

^{13}C NMR, $CDCl_3$, 125 MHz



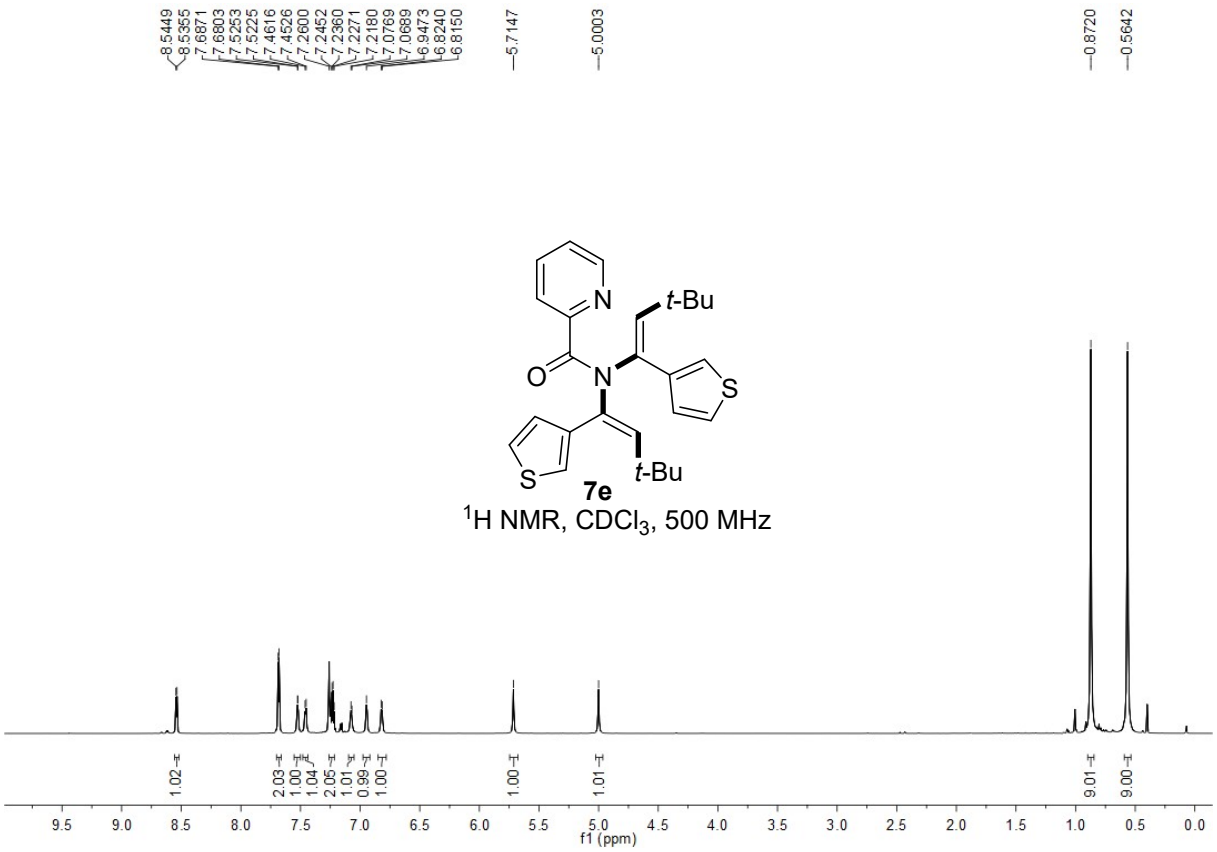
7d

^{1}H NMR, $CDCl_3$, 500 MHz



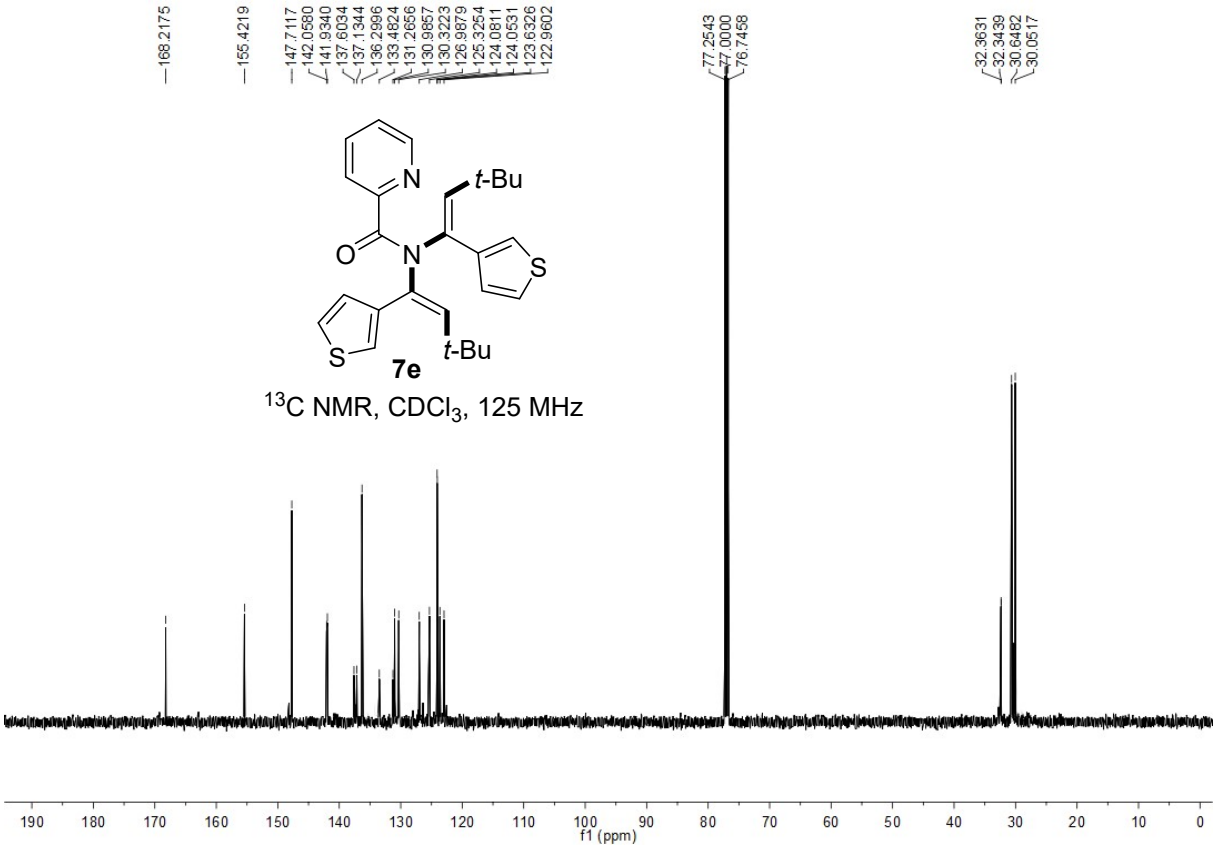
7d

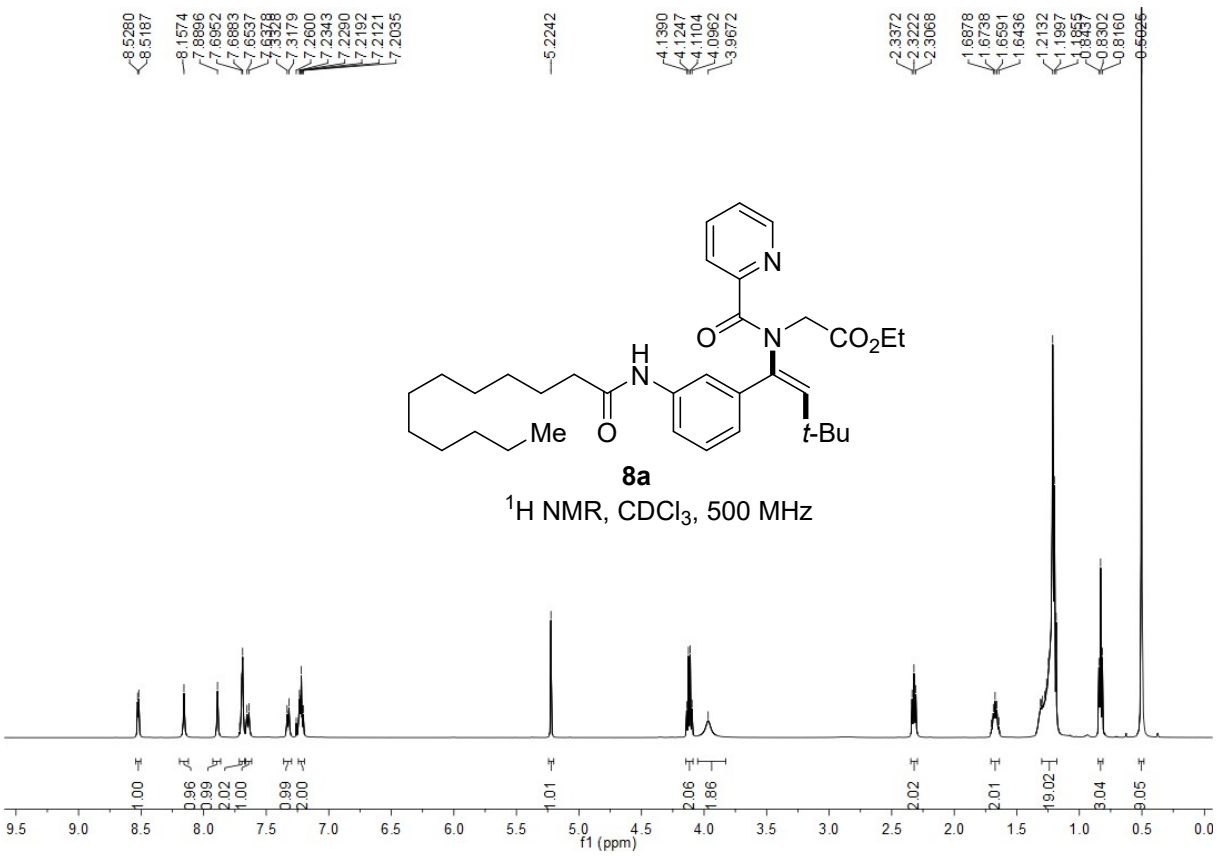
^{13}C NMR, $CDCl_3$, 125 MHz

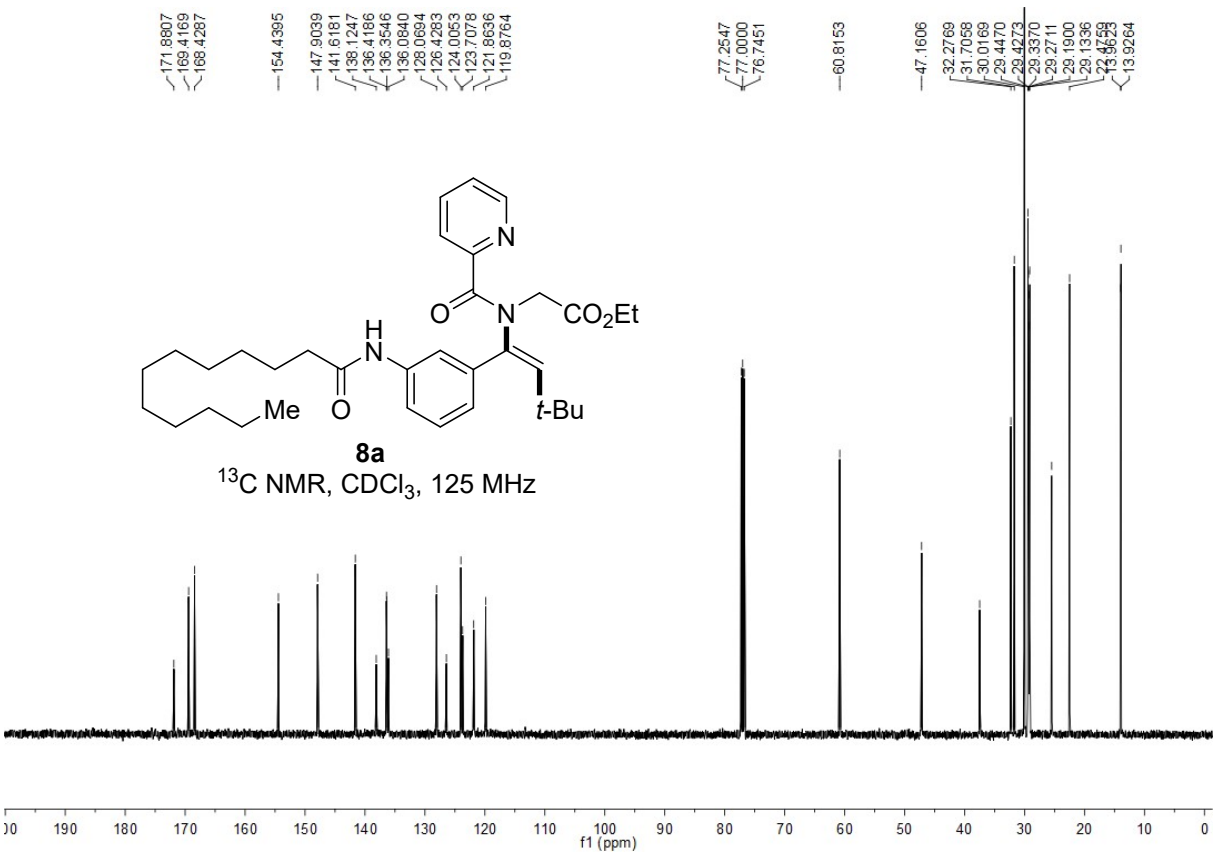


7e

^{1}H NMR, $CDCl_3$, 500 MHz

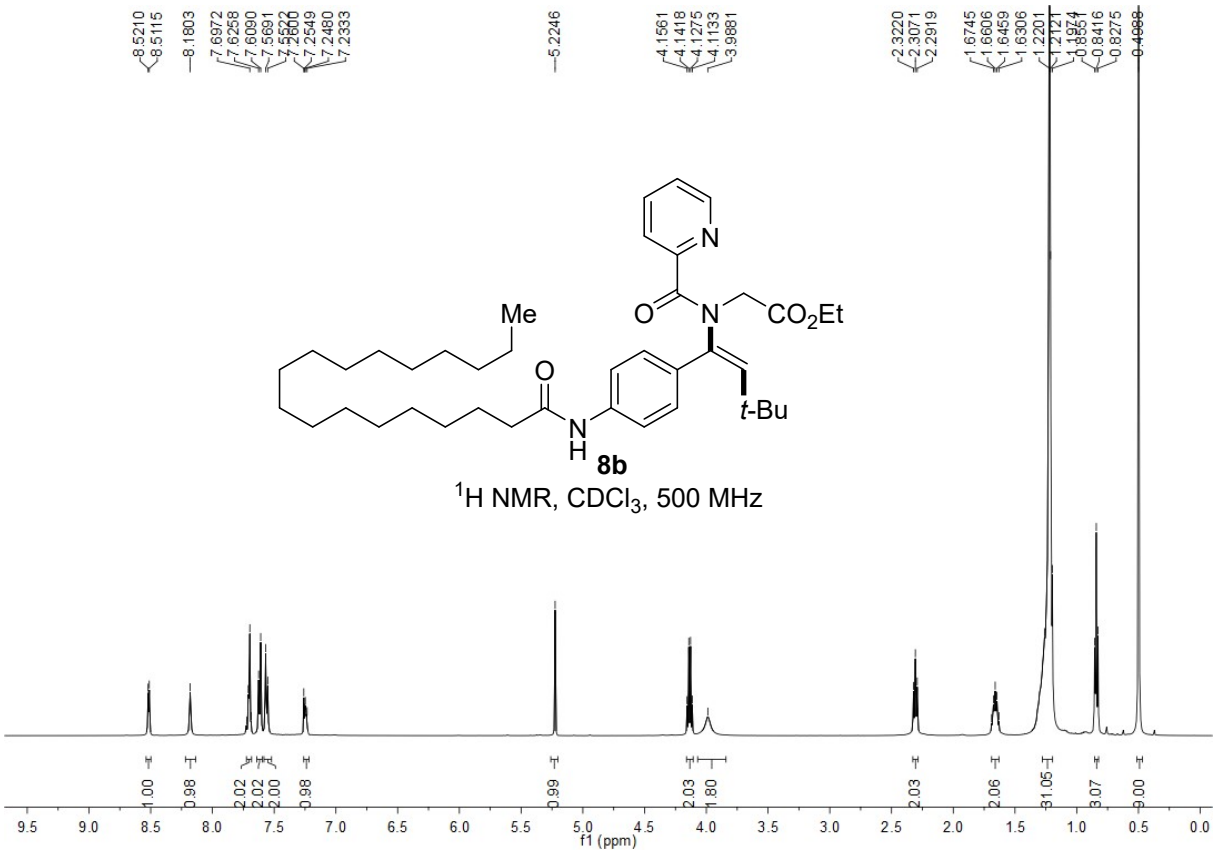

168.2175
155.4219
147.7117
142.0580
141.9340
137.6034
137.1344
136.2996
133.4824
131.2656
130.9857
130.3223
126.9879
125.3254
124.0811
124.0531
123.6326
122.9602
77.2543
77.0000
76.7458
32.3631
32.3439
30.6482
30.0517
N
O
N
S
t-Bu
S
t-Bu
7e
13C NMR, CDCl3, 125 MHz
f1 (ppm)


8.5280
8.5187
8.1574
7.8896
7.6952
7.6883
7.6537
7.3179
7.2600
7.2343
7.2290
7.2192
7.2121
7.2035
5.2242
4.1390
4.1247
4.1104
4.0962
3.9672
2.3372
2.3222
2.3068
1.6878
1.6738
1.6591
1.6436
1.2132
1.1997
0.8302
0.8160
0.5025
N
O
N
CO2Et
H
N
Me
O
t-Bu
8a
1H NMR, CDCl3, 500 MHz
1.00
0.96
0.99
2.02
1.00
0.99
2.00
1.01
2.06
1.86
2.02
2.01
19.02
3.04
9.05
f1 (ppm)



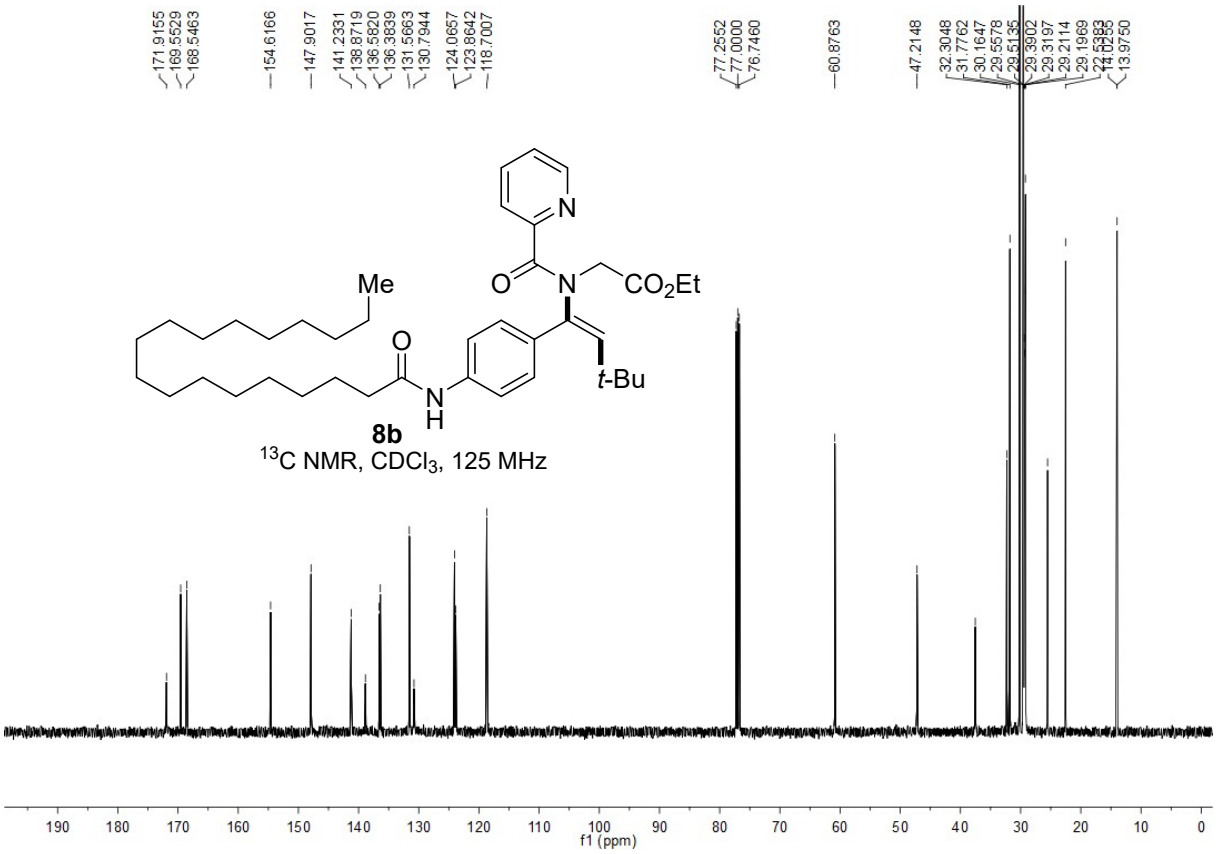
8a

^{13}C NMR, $CDCl_3$, 125 MHz



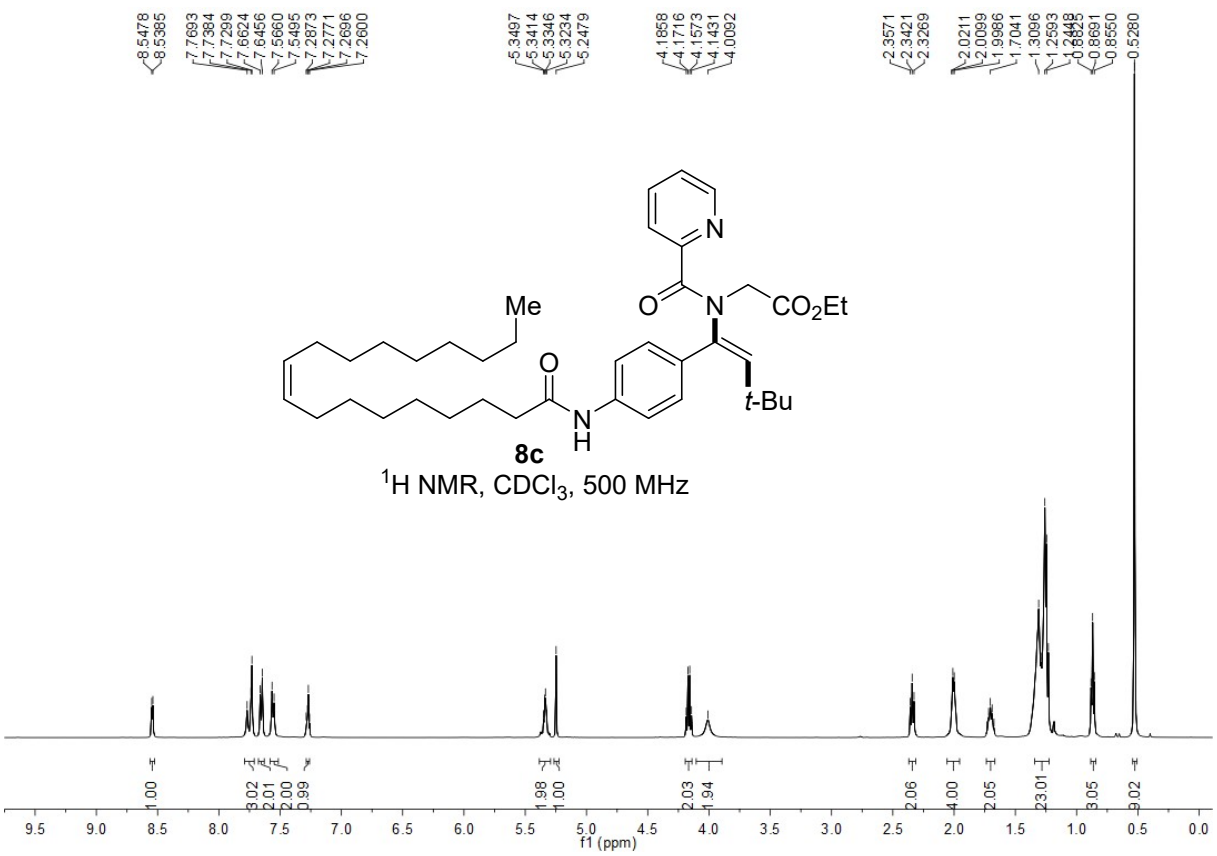
8b

^{1}H NMR, $CDCl_3$, 500 MHz



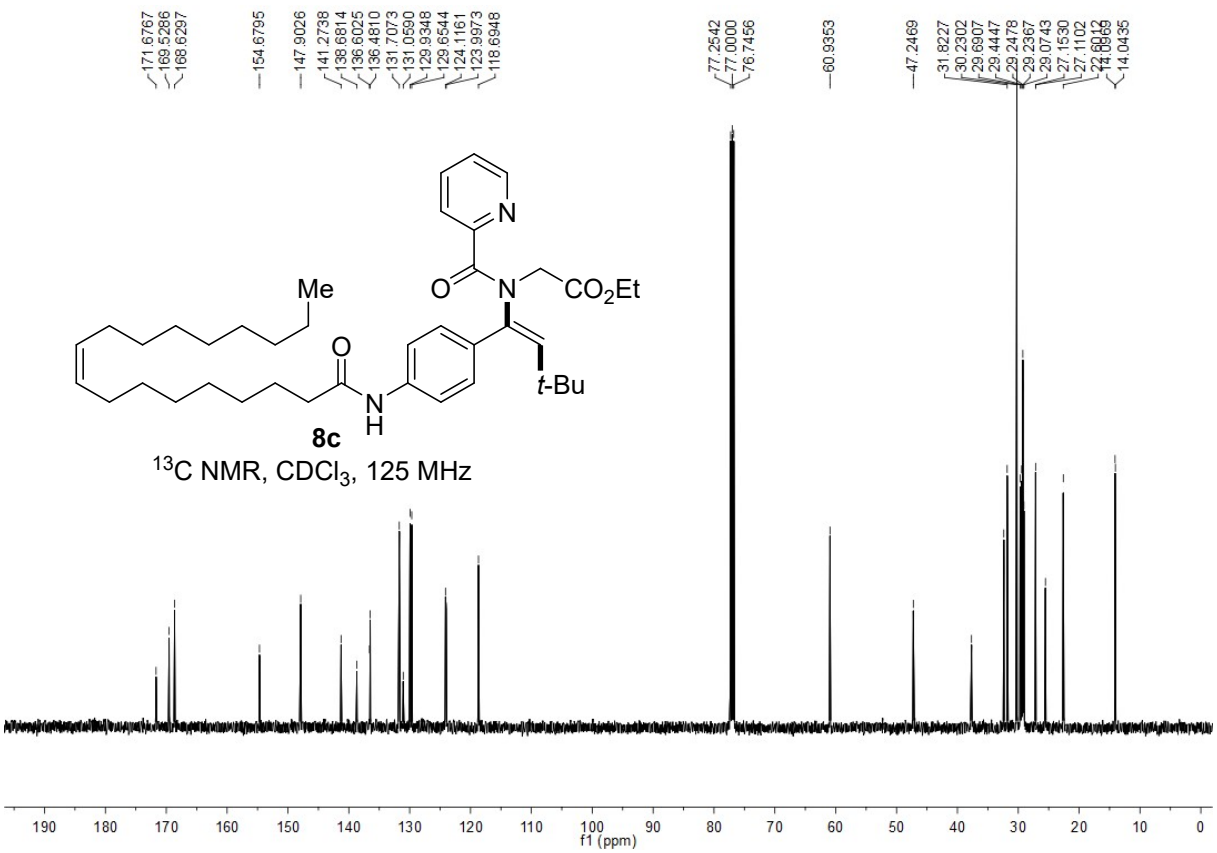
8b

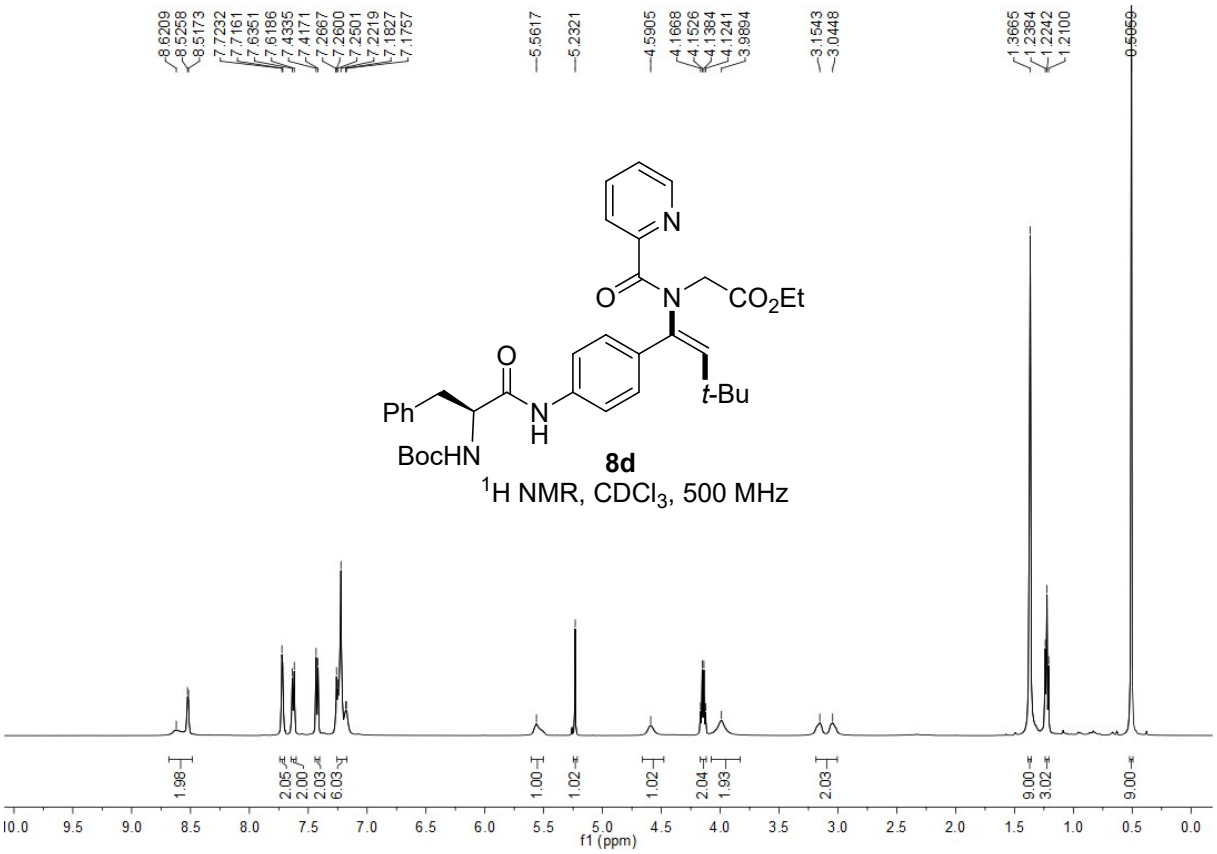
^{13}C NMR, $CDCl_3$, 125 MHz

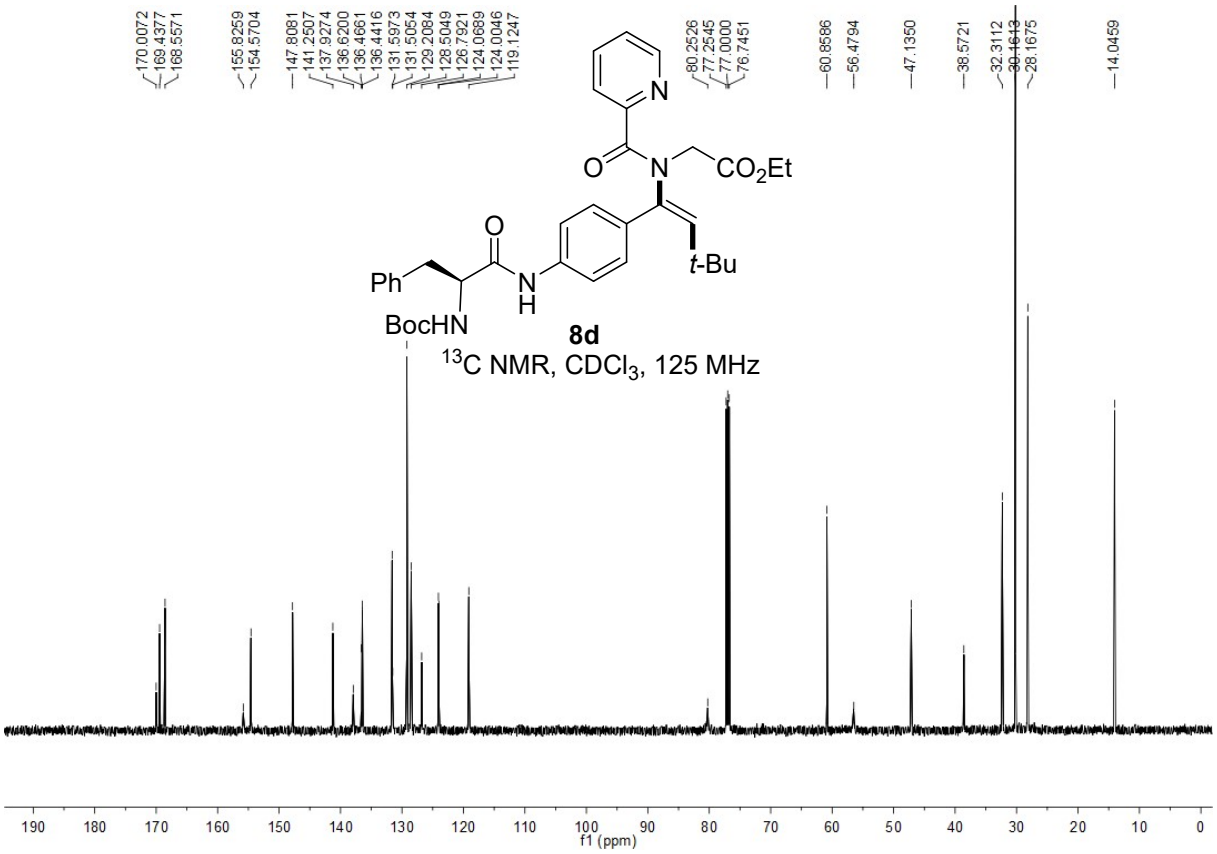


8c

^{1}H NMR, $CDCl_3$, 500 MHz

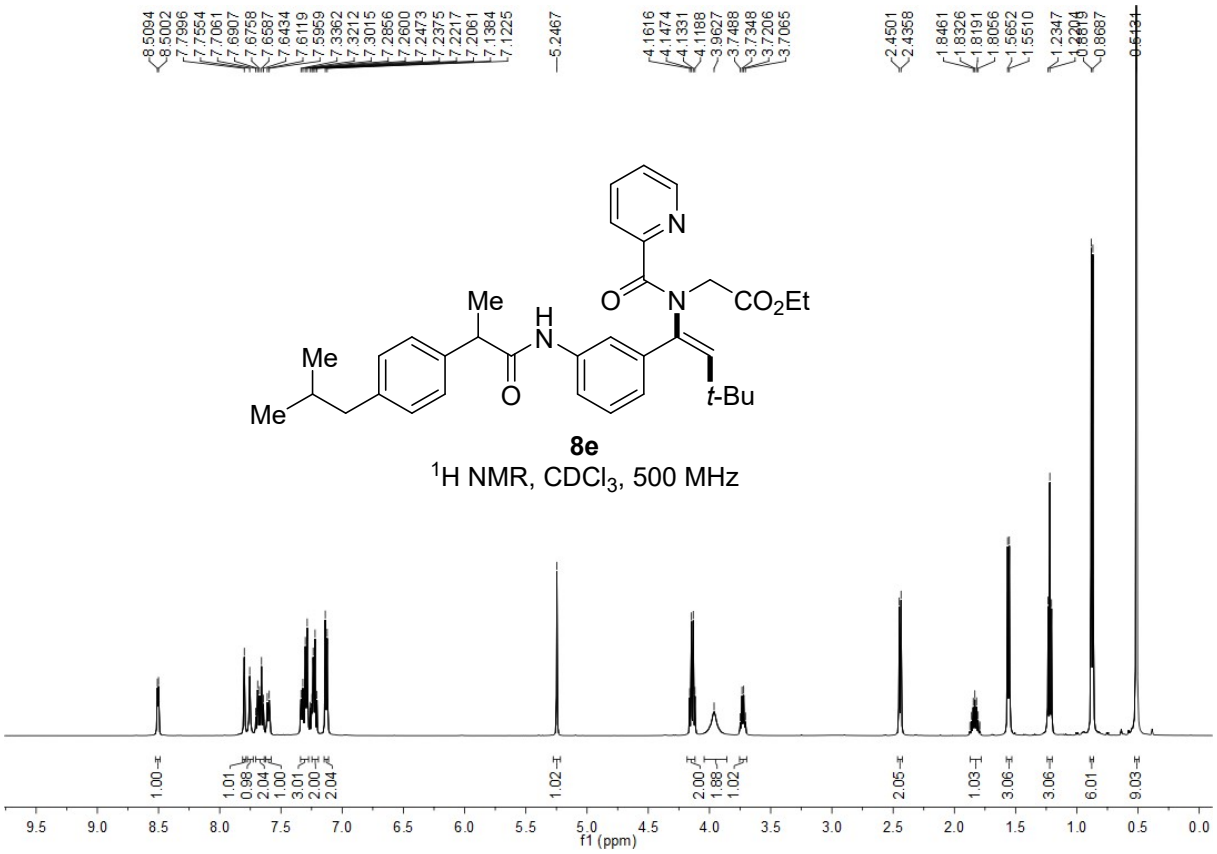

171.6767
169.5286
168.6297
154.6795
147.9026
141.2738
136.6814
136.6025
136.4810
131.7073
131.0590
129.9348
129.6544
124.1161
123.9973
118.6948
77.2542
77.0000
76.7456
60.9353
47.2469
31.8227
30.2302
29.6907
29.4447
29.2478
29.2367
29.0743
27.1530
27.1102
14.0435
Me
O
N
CO2Et
t-Bu
O
N
H
8c
13C NMR, CDCl3, 125 MHz
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


8.6209
8.5258
8.5173
7.7232
7.7161
7.6351
7.6186
7.4335
7.4171
7.2667
7.2600
7.2501
7.2219
7.1827
7.1757
5.5617
5.2321
4.5905
4.1668
4.1526
4.1384
4.1241
3.9894
3.1543
3.0448
1.3665
1.2384
1.2242
1.2100
0.5959
N
O
N
CO2Et
t-Bu
O
N
H
Ph
BocHN
8d
1H NMR, CDCl3, 500 MHz
1.98
2.05
2.00
2.03
6.03
1.00
1.02
1.02
2.04
1.93
2.03
9.00
3.02
9.00
10.0
9.5
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
0.0
f1 (ppm)



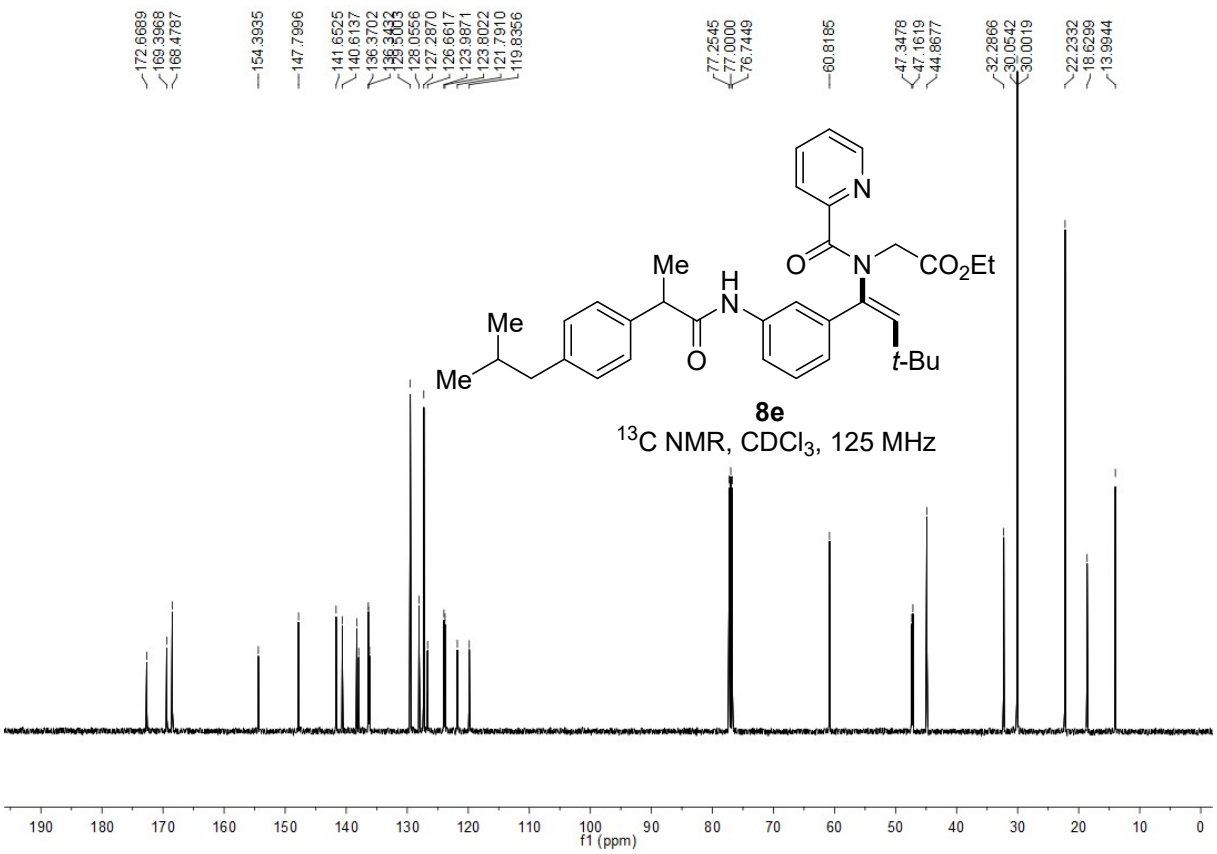
8d

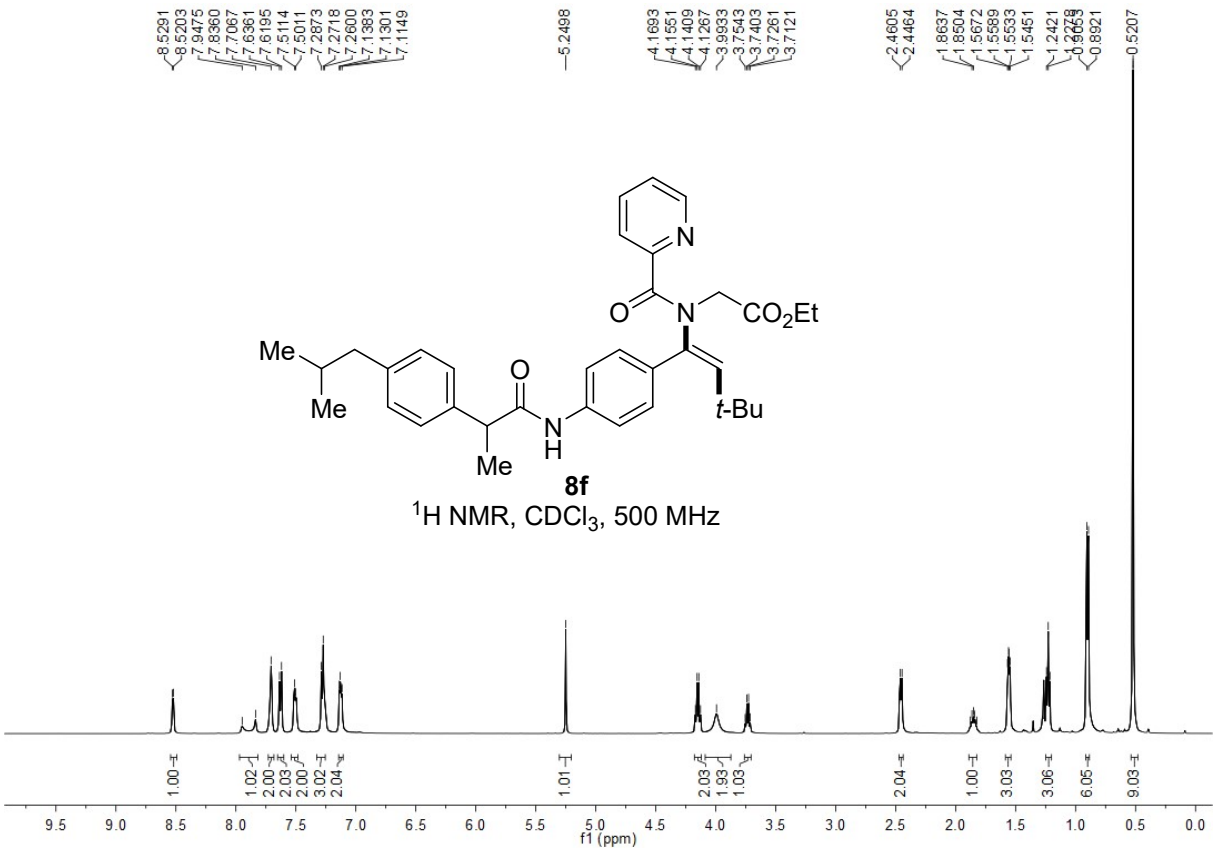
^{13}C NMR, $CDCl_3$, 125 MHz

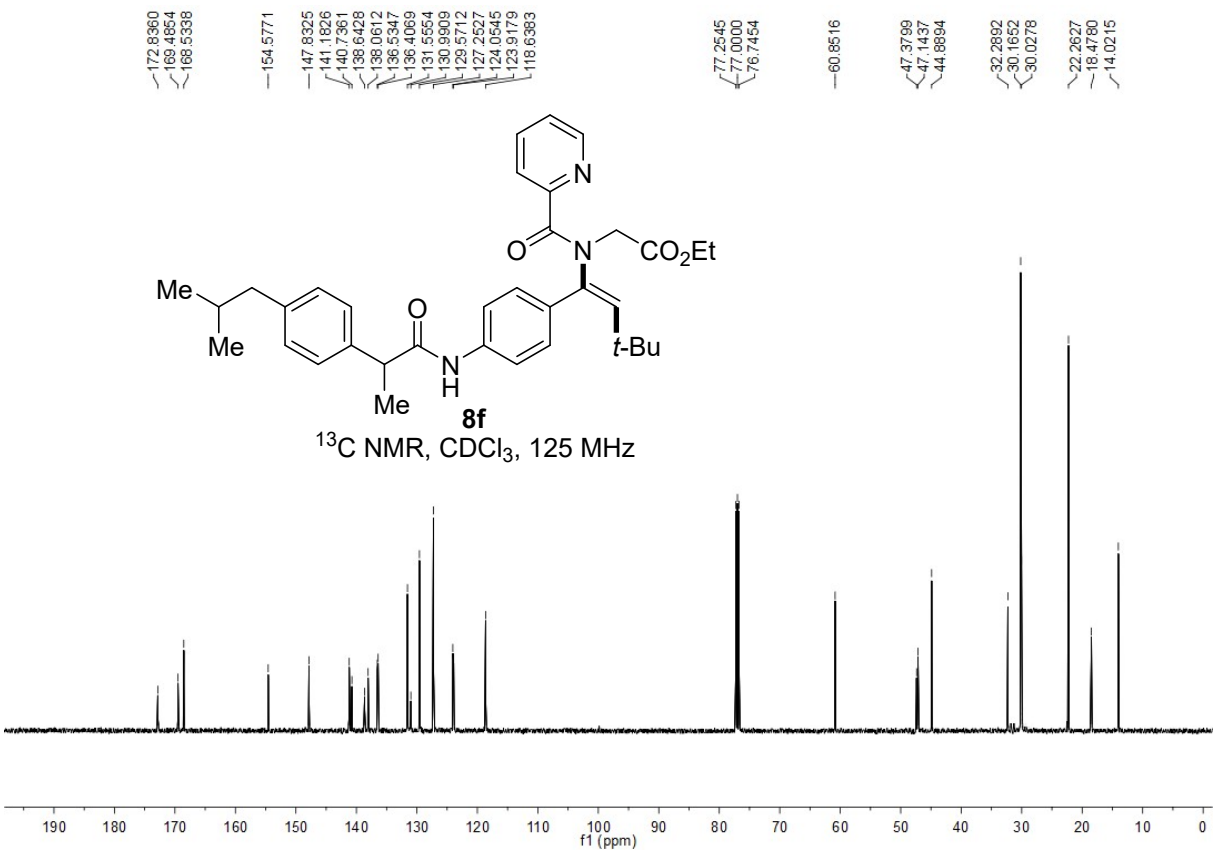


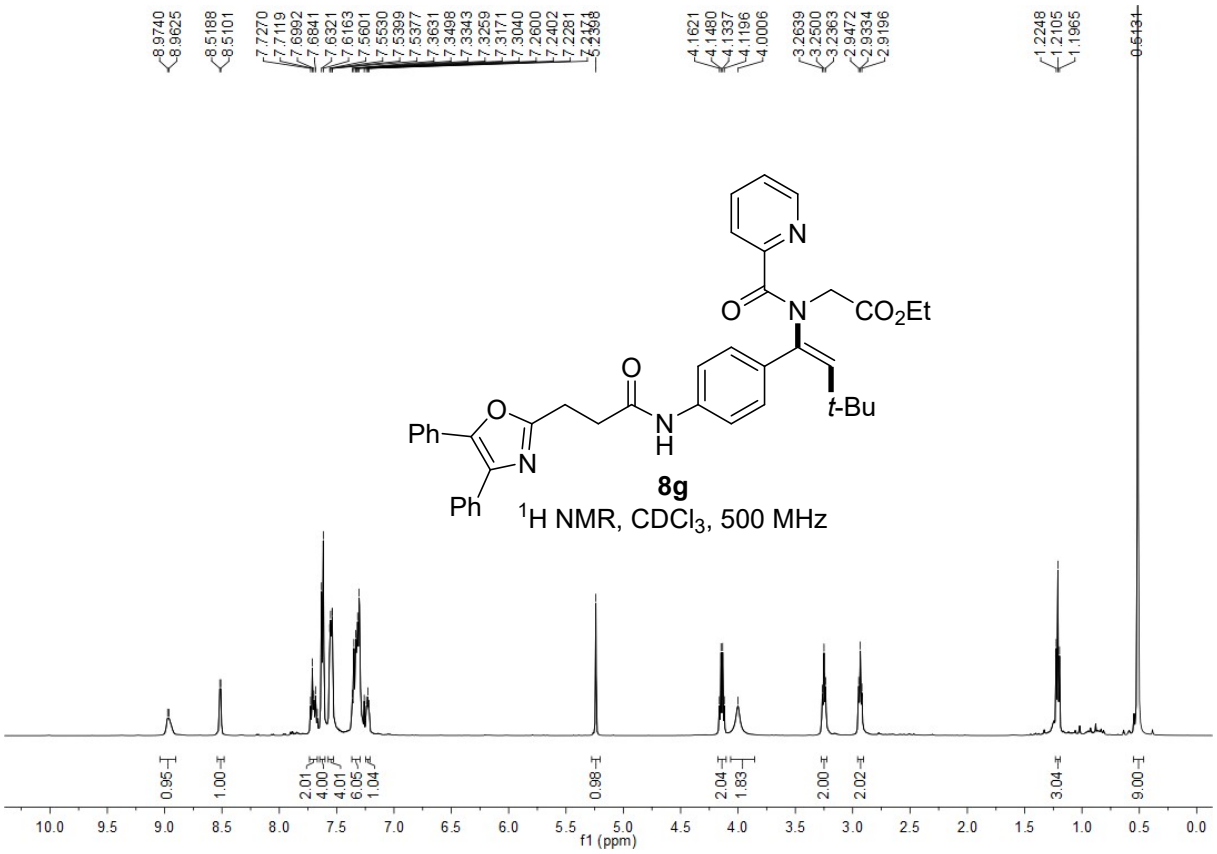
8e

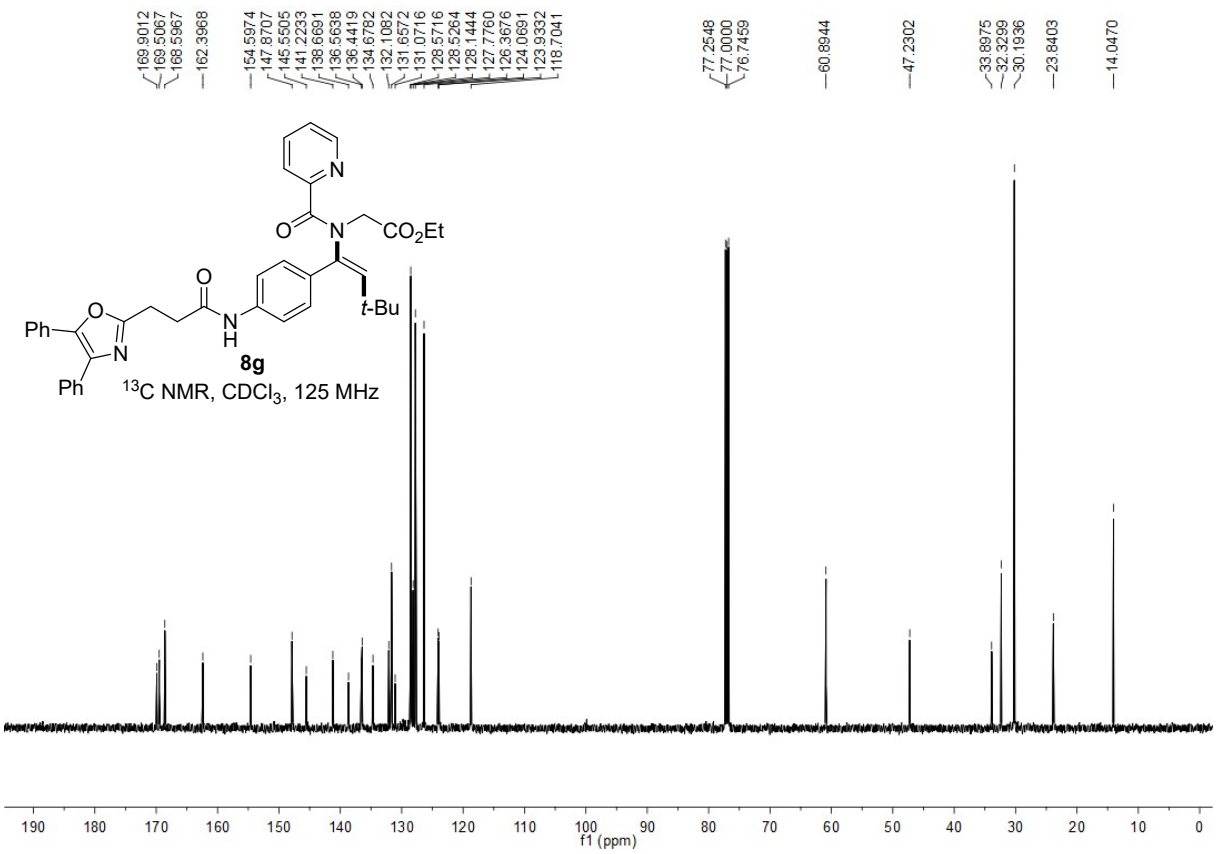
^{1}H NMR, $CDCl_3$, 500 MHz

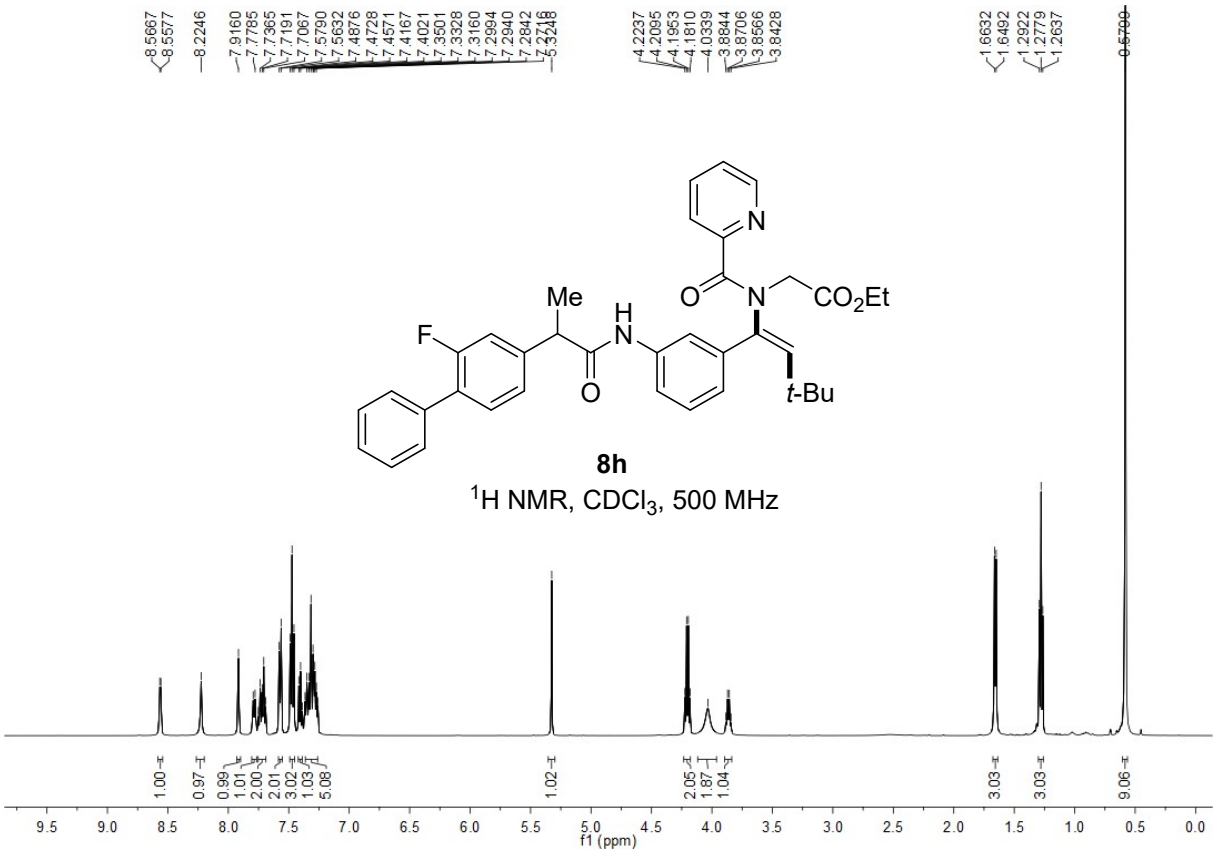

172.6689
169.3968
168.4787
154.3935
147.7996
141.6525
140.6137
136.3702
128.0556
127.2870
126.6617
123.9871
123.8022
121.7910
119.8356
77.2545
77.0000
76.7449
60.8185
47.3478
47.1619
44.8677
32.2866
30.0542
30.0019
22.2332
18.6299
13.9944
N
O
N
CO2Et
Me
H
N
Me
O
Me
t-Bu
8e
13C NMR, CDCl3, 125 MHz
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

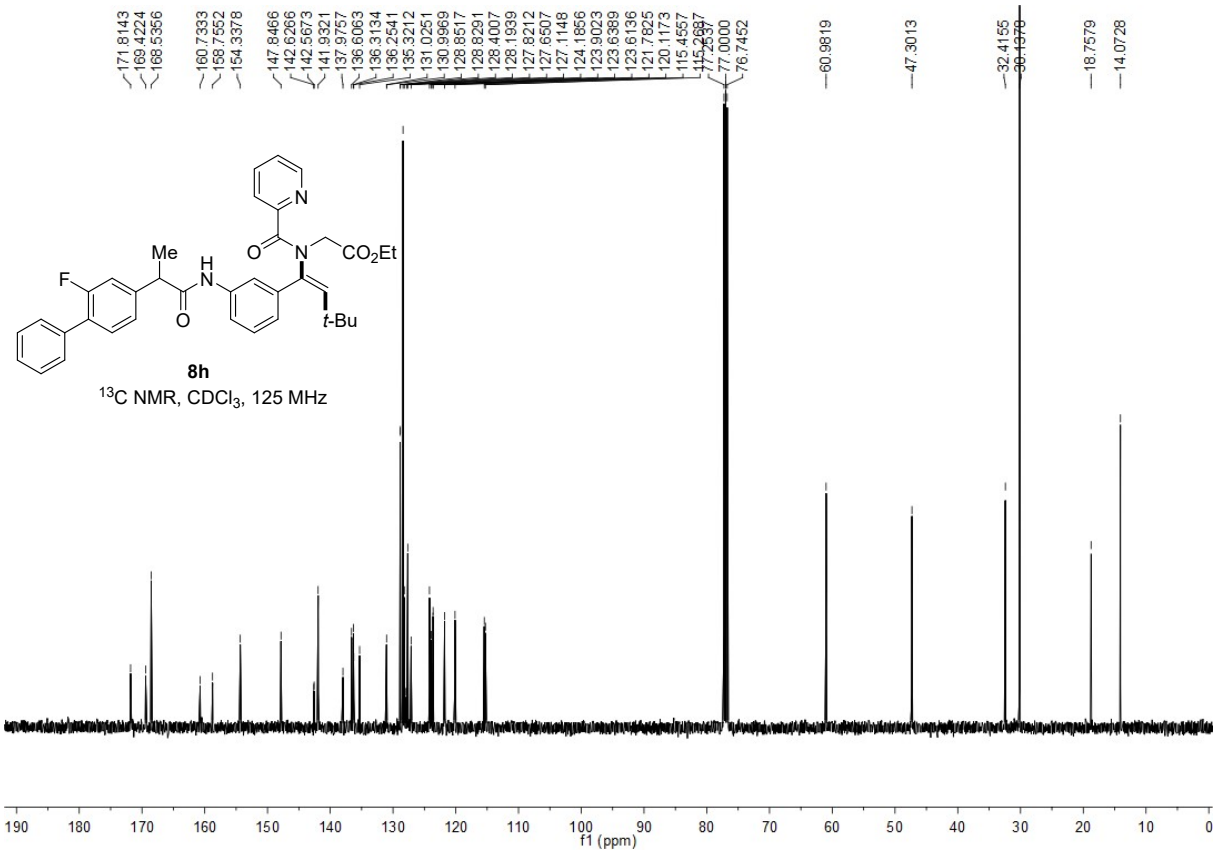

8.5291
8.5203
7.9475
7.8360
7.7067
7.6361
7.6195
7.5114
7.5011
7.2873
7.2718
7.2600
7.1383
7.1301
7.1149
5.2498
4.1693
4.1551
4.1409
4.1267
3.9933
3.7543
3.7403
3.7261
3.7121
2.4605
2.4464
1.8637
1.8504
1.5672
1.5589
1.5533
1.5451
1.2421
0.9053
0.8921
0.5207
N
O
N
CO2Et
Me
Me
O
N
H
t-Bu
Me
8f
1H NMR, CDCl3, 500 MHz
1.00
1.02
2.00
2.03
2.00
3.02
2.04
1.01
2.03
1.93
1.03
2.04
1.00
3.03
3.06
6.05
9.03
9.5
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
0.0
f1 (ppm)


172.8360
169.4854
168.5338
154.5771
147.8325
141.1826
140.7361
138.6428
138.0612
136.5347
136.4069
131.5554
130.9909
129.5712
127.2527
124.0545
123.9179
118.6383
77.2545
77.0000
76.7454
60.8516
47.3799
47.1437
44.8894
32.2892
30.1652
30.0278
22.2627
18.4780
14.0215
N
O
N
CO2Et
Me
Me
O
N
H
Me
t-Bu
8f
13C NMR, CDCl3, 125 MHz
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


8.9740
8.9625
8.5188
8.5101
7.7270
7.7119
7.6992
7.6841
7.6321
7.6163
7.5601
7.5530
7.5399
7.5377
7.3631
7.3498
7.3343
7.3259
7.3171
7.3040
7.2600
7.2402
7.2281
7.2247
5.2398
4.1621
4.1480
4.1337
4.1196
4.0006
3.2639
3.2500
3.2363
2.9472
2.9334
2.9196
1.2248
1.2105
1.1965
0.6131
N
O
N
CO2Et
O
t-Bu
O
N
H
Ph
N
Ph
8g
1H NMR, CDCl3, 500 MHz
0.95
1.00
2.01
4.00
4.01
6.05
1.04
0.98
2.04
1.83
2.00
2.02
3.04
9.00
10.0 9.5 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 0.0
f1 (ppm)

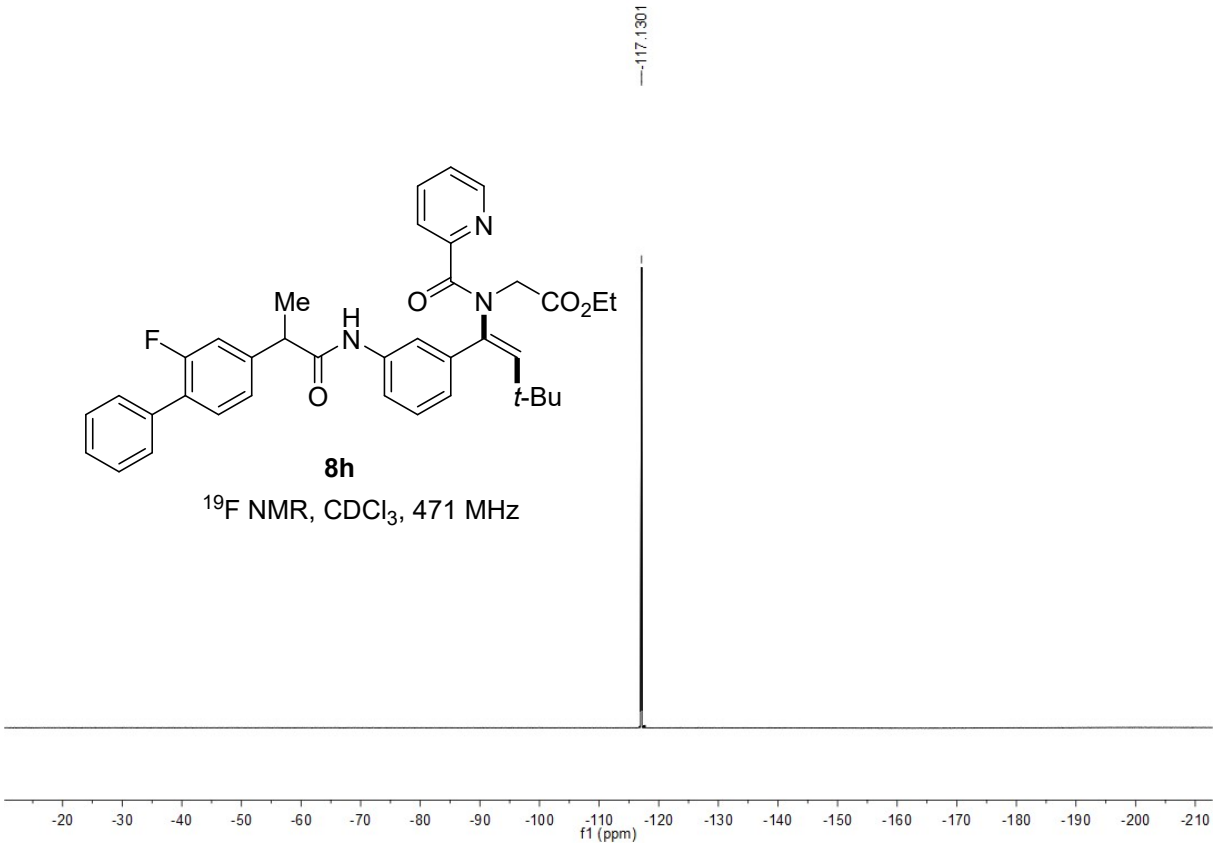

169.9012
169.5067
168.5967
162.3968
154.5974
147.8707
145.5505
141.2233
138.6691
136.5638
136.4419
134.6782
132.1082
131.6572
131.0716
128.5716
128.5264
128.1444
127.7760
126.3676
124.0691
123.9332
118.7041
77.2548
77.0000
76.7459
60.8944
47.2302
33.8975
32.3299
30.1936
23.8403
14.0470
N
O
N
CO2Et
O
N
H
t-Bu
O
Ph
N
Ph
8g
13C NMR, CDCl3, 125 MHz
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


8.5667
8.5577
8.2246
7.9160
7.7785
7.7365
7.7191
7.7067
7.5790
7.5632
7.4876
7.4728
7.4571
7.4167
7.4021
7.3501
7.3328
7.3160
7.2994
7.2940
7.2842
7.2716
5.3248
4.2237
4.2095
4.1953
4.1810
4.0339
3.8844
3.8706
3.8566
3.8428
1.6632
1.6492
1.2922
1.2779
1.2637
0.6709
N
O
N
CO2Et
Me
H
N
F
O
t-Bu
8h
1H NMR, CDCl3, 500 MHz
1.00
0.97
0.99
1.01
2.00
2.01
3.02
1.03
5.08
1.02
2.05
1.87
1.04
3.03
3.03
9.06
9.5
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
0.0
f1 (ppm)



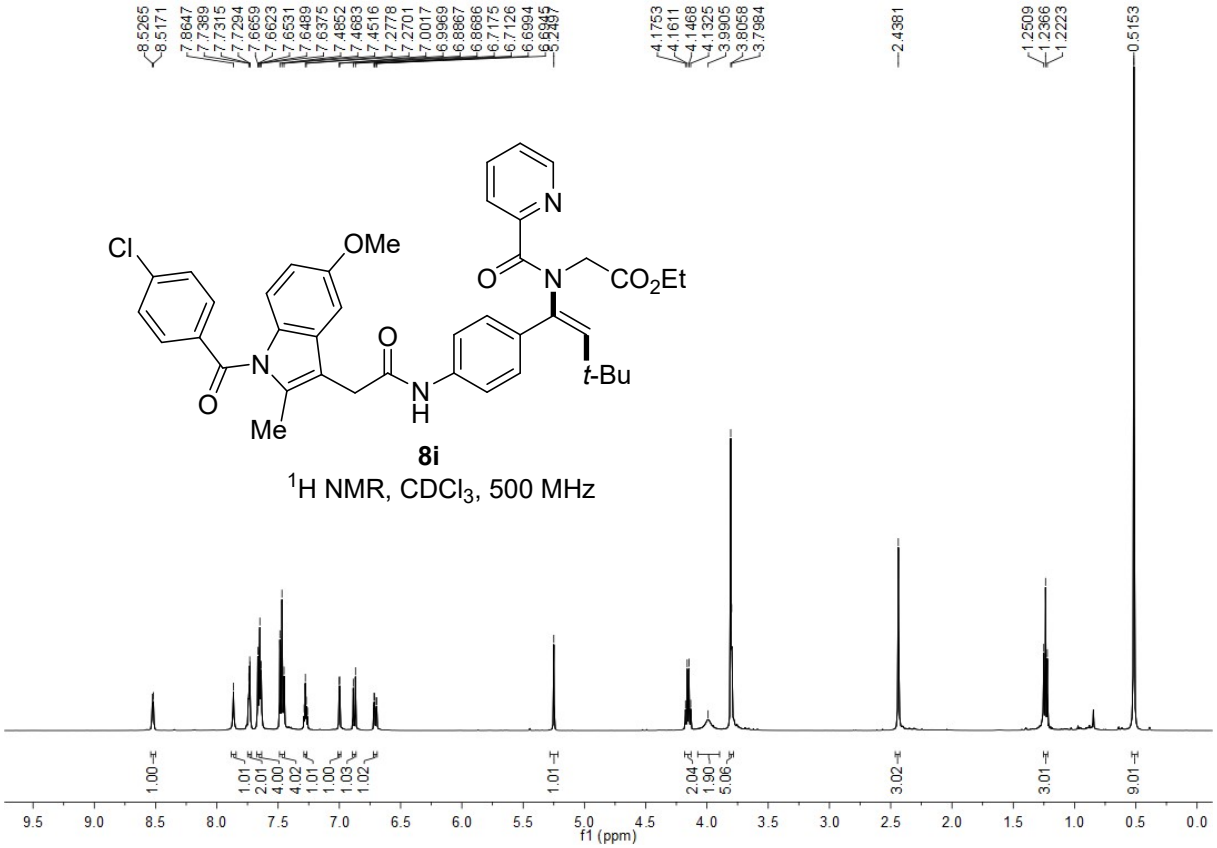
8h

^{13}C NMR, $CDCl_3$, 125 MHz



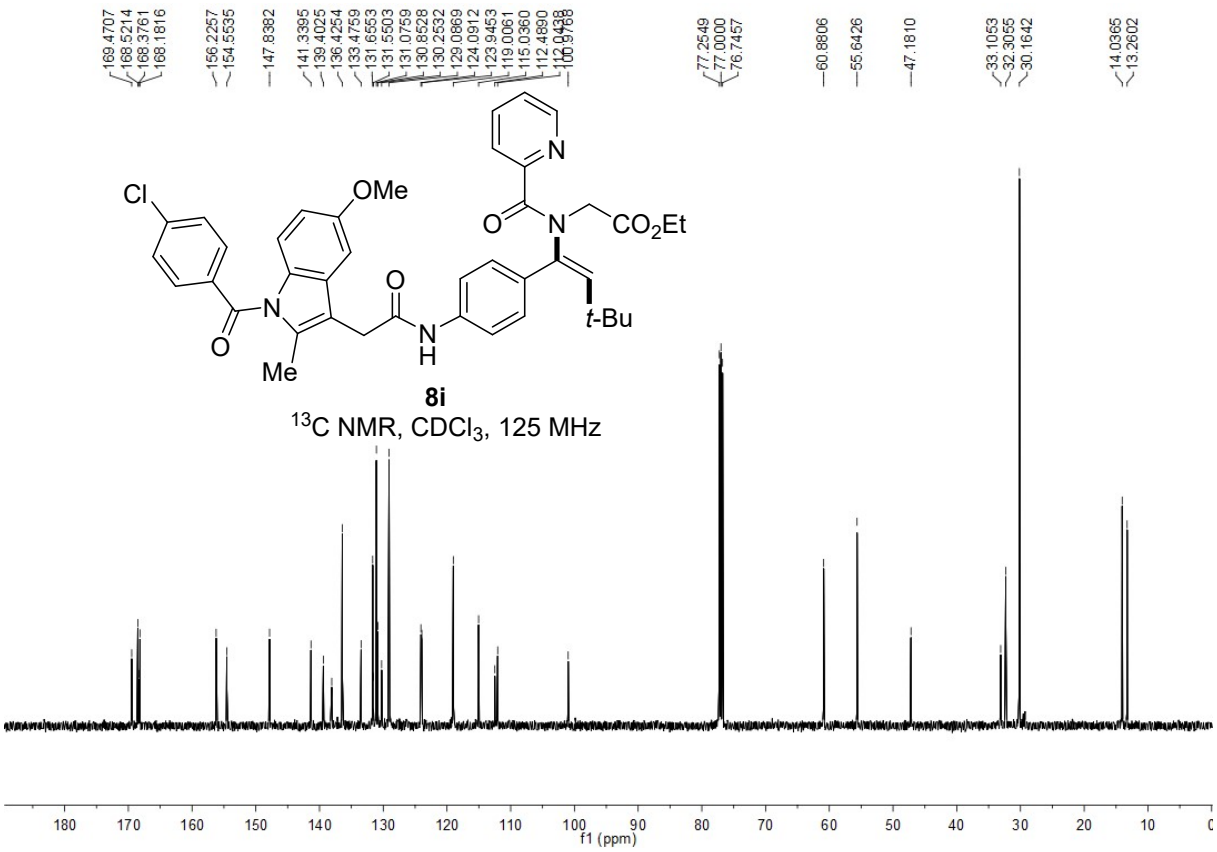
8h

^{19}F NMR, $CDCl_3$, 471 MHz



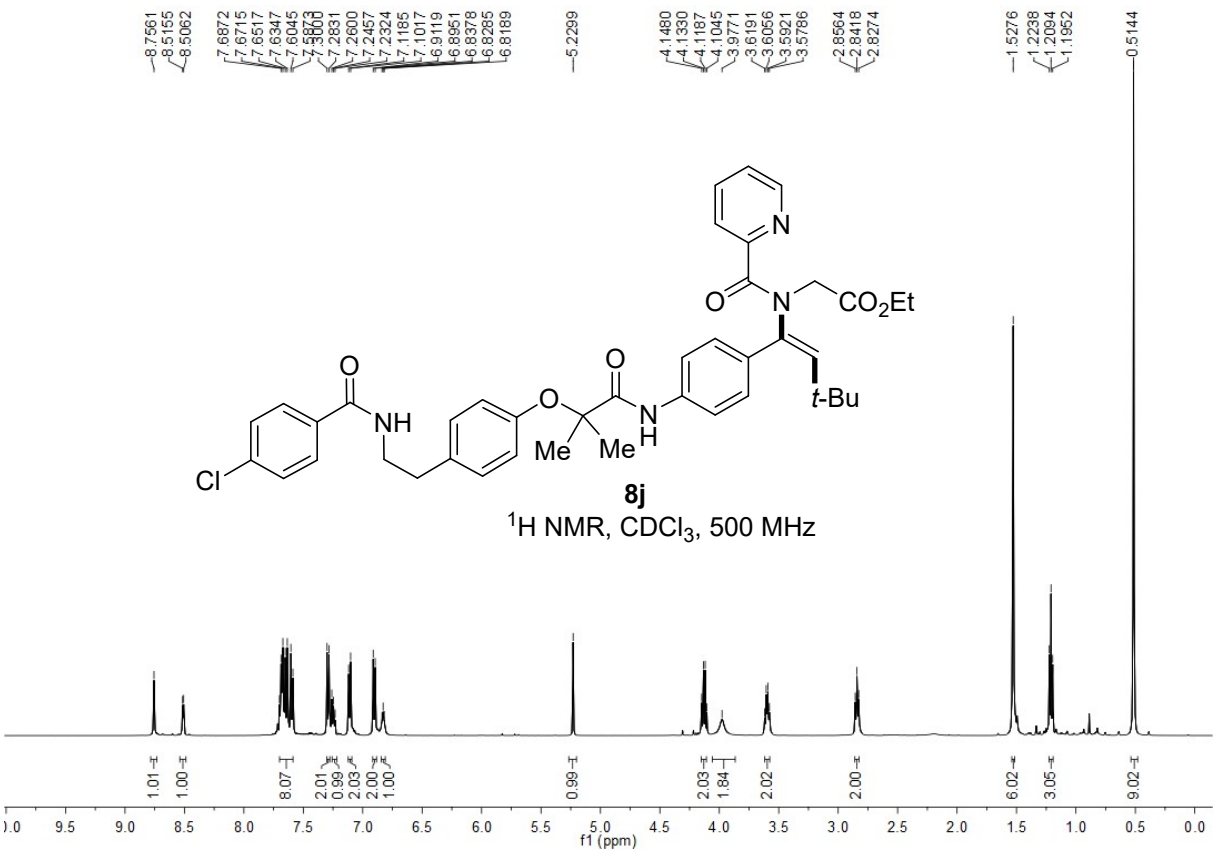
8i

^{1}H NMR, $CDCl_3$, 500 MHz



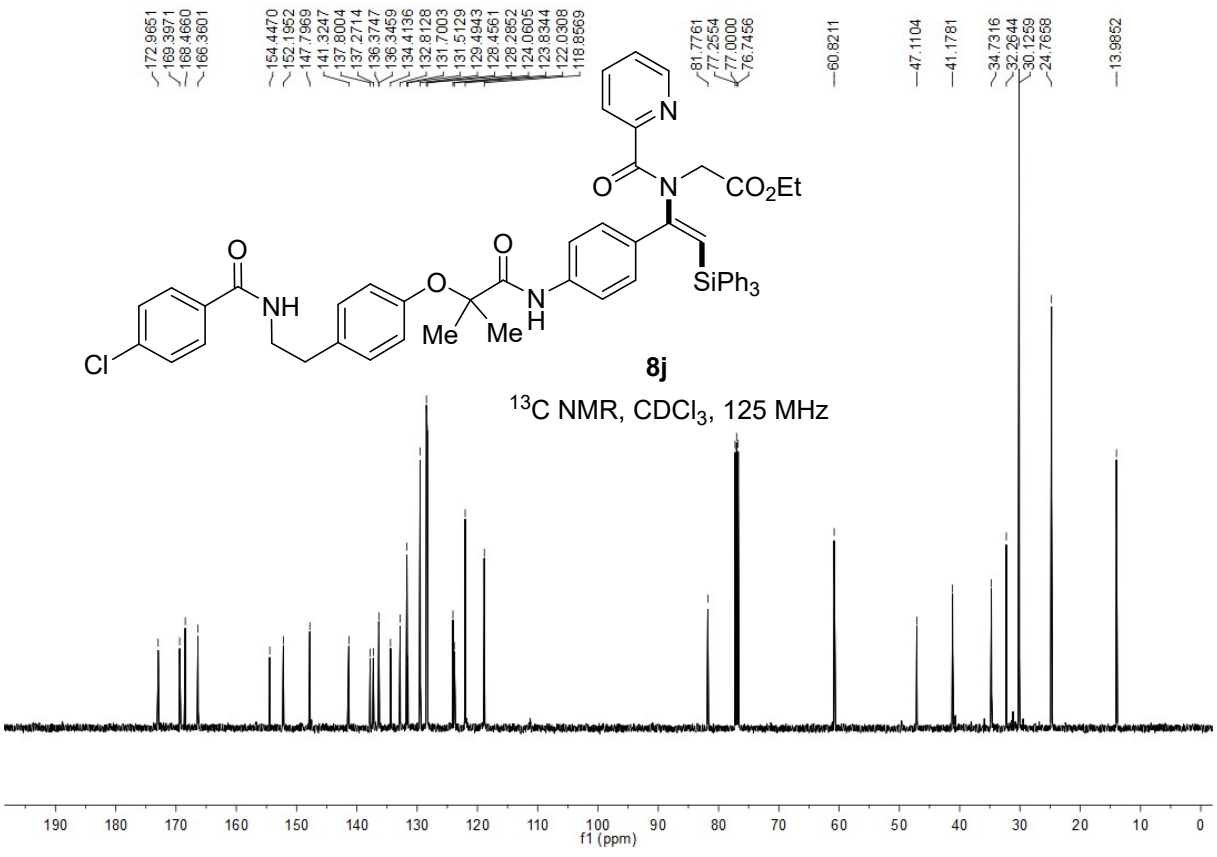
8i

^{13}C NMR, $CDCl_3$, 125 MHz



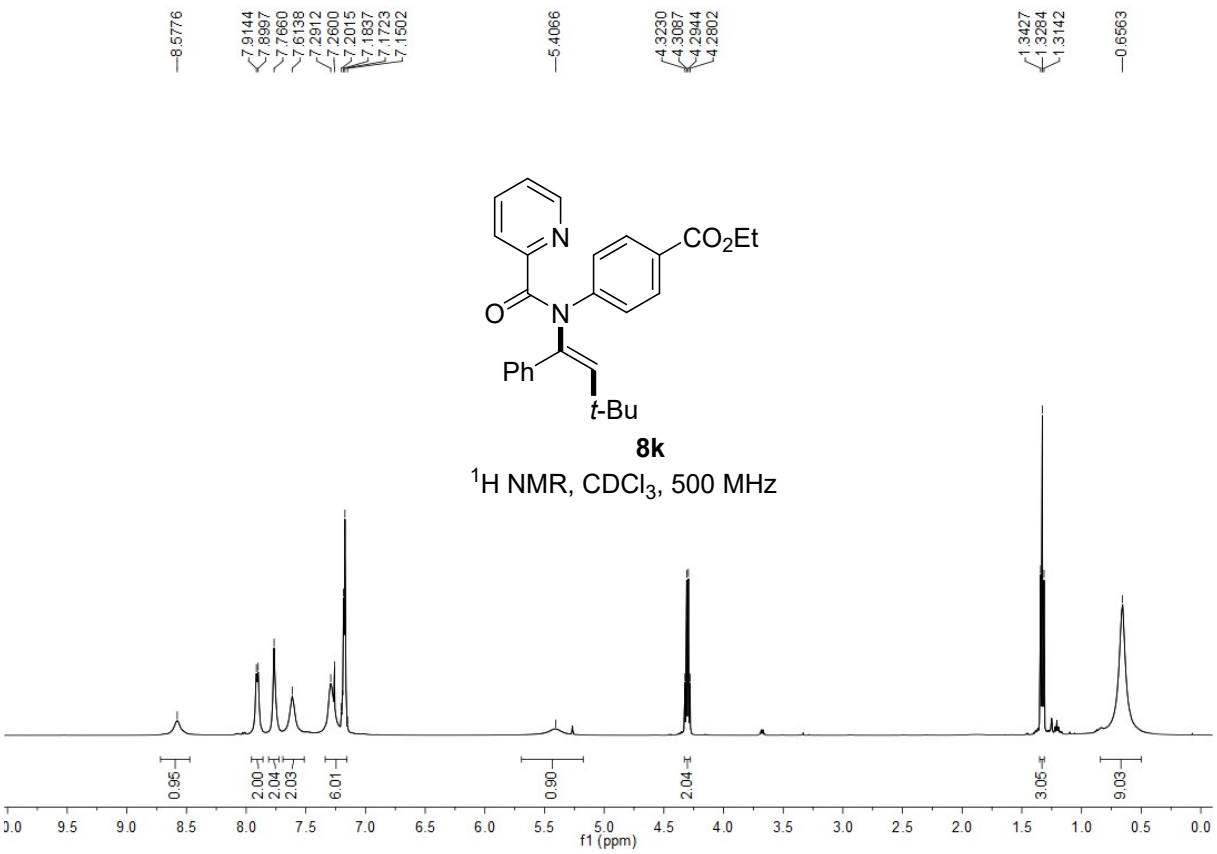
8j

^{1}H NMR, $CDCl_3$, 500 MHz



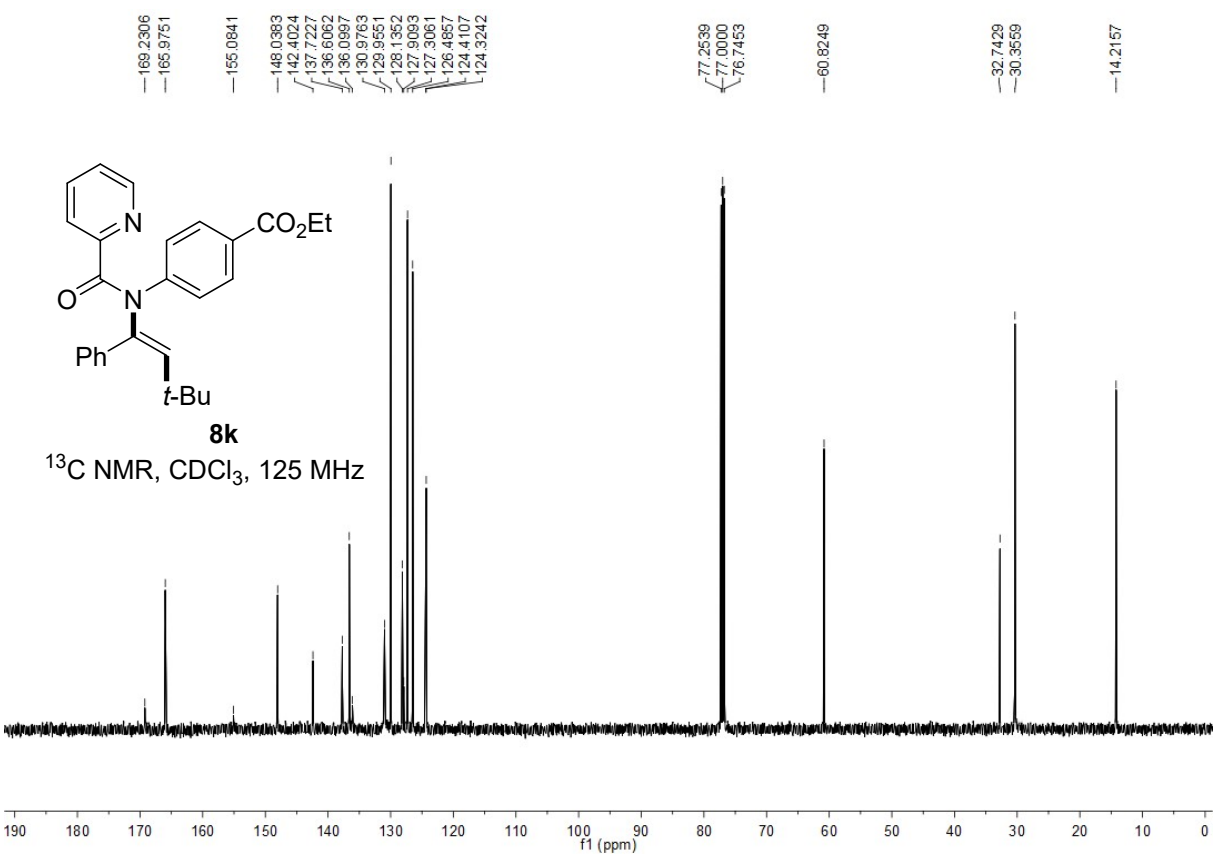
8j

^{13}C NMR, $CDCl_3$, 125 MHz



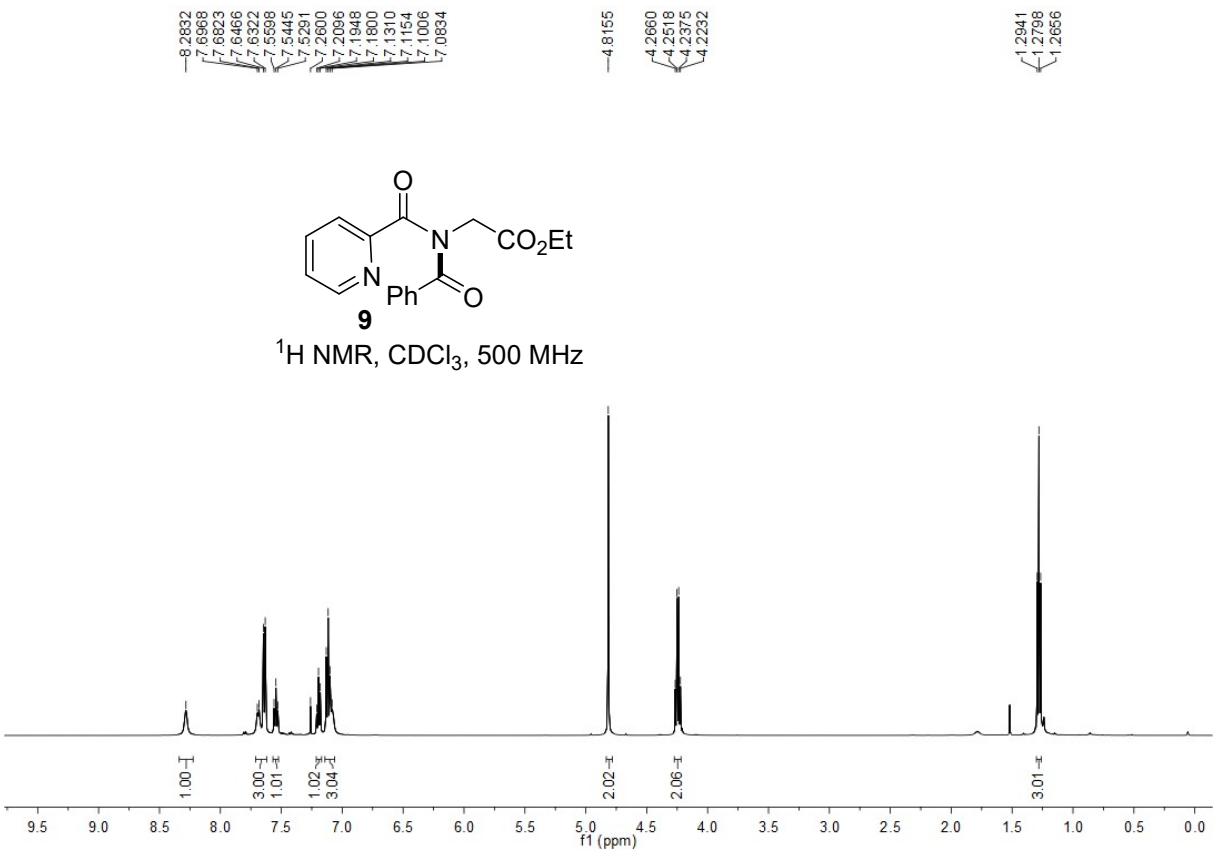
8k

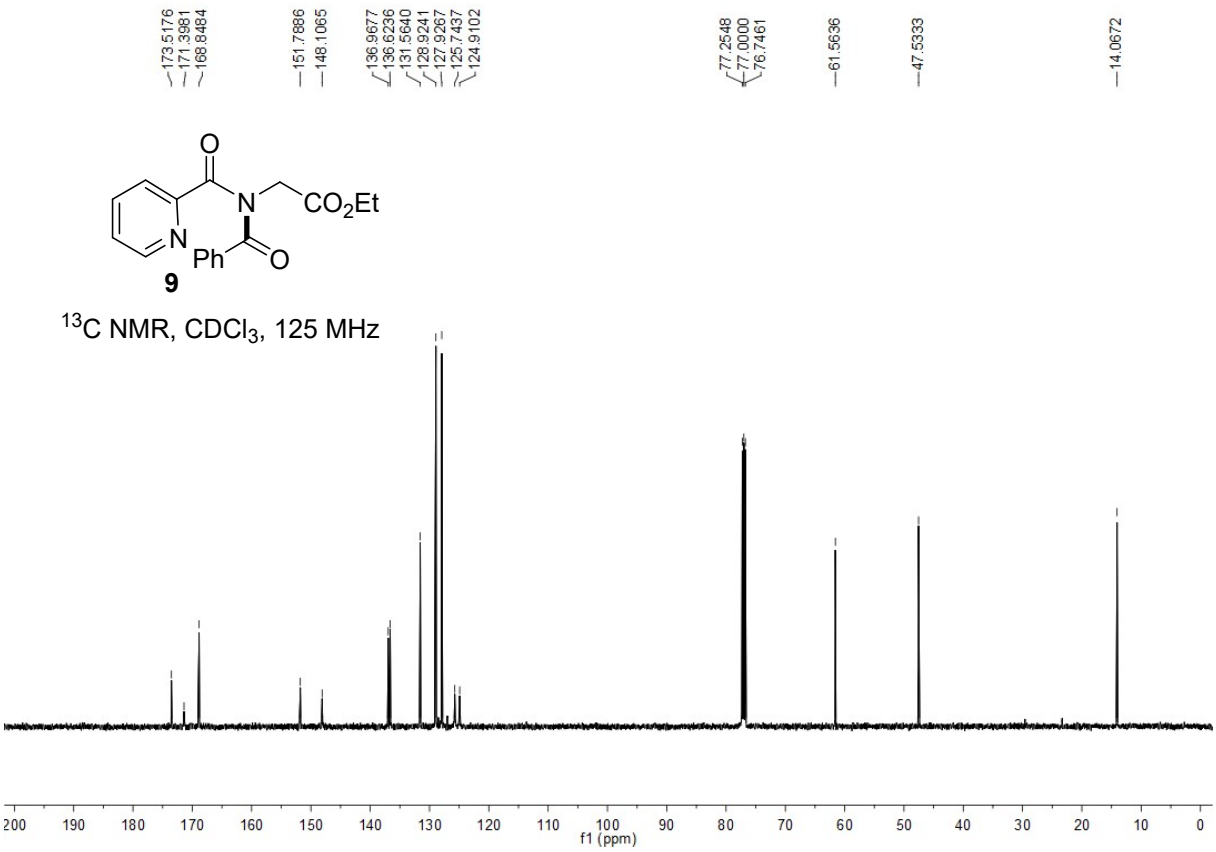
^{1}H NMR, $CDCl_3$, 500 MHz

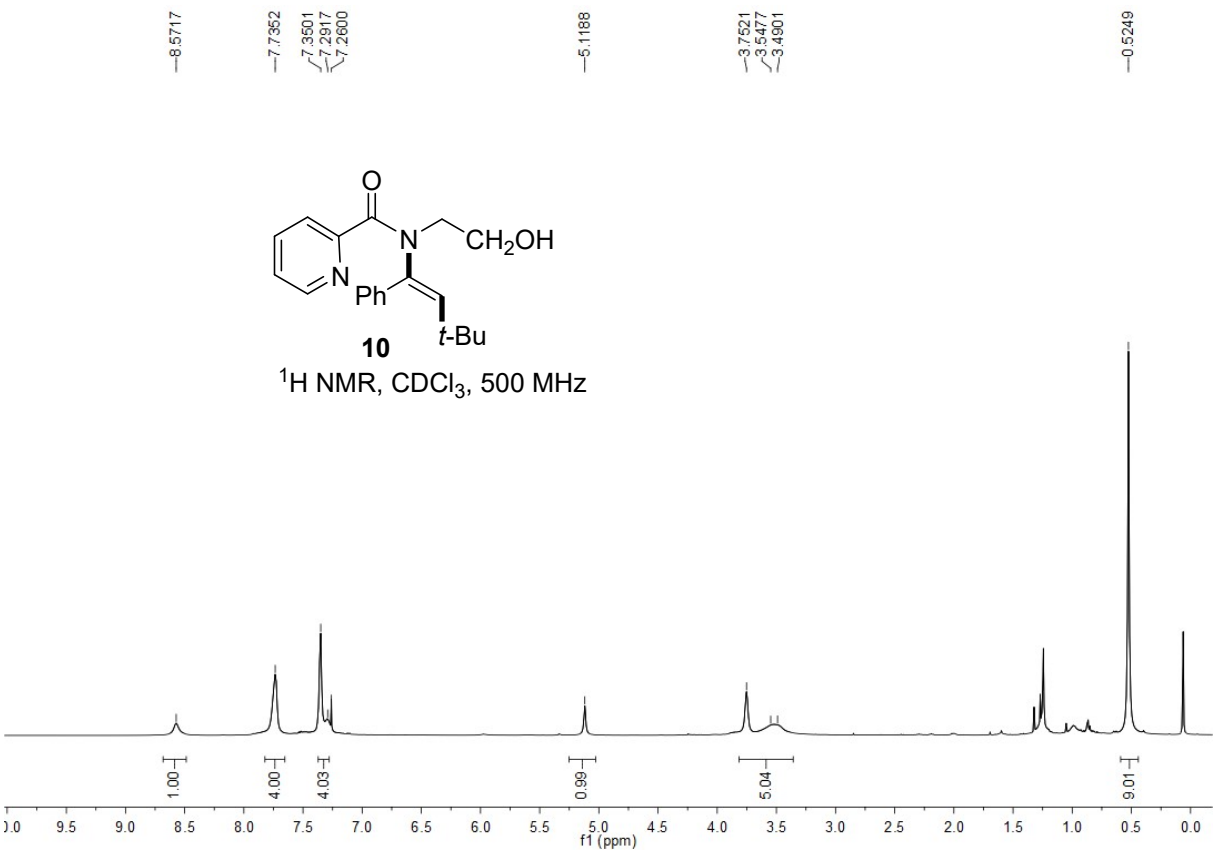


8k

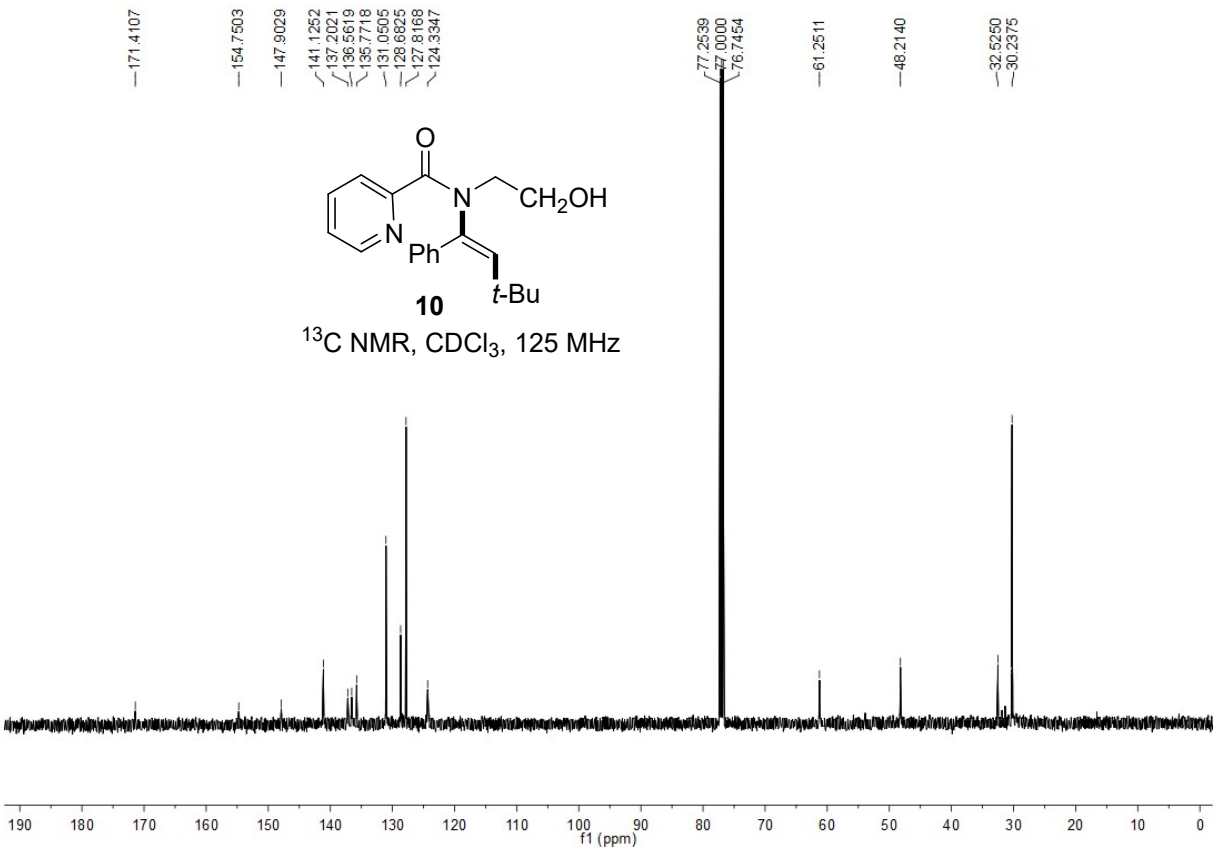
^{13}C NMR, $CDCl_3$, 125 MHz


8.2832
7.6968
7.6823
7.6466
7.6322
7.5598
7.5445
7.5291
7.2600
7.2096
7.1948
7.1800
7.1310
7.1154
7.1006
7.0834
4.8155
4.2660
4.2518
4.2375
4.2232
1.2941
1.2798
1.2656
O
N
CO2Et
N
Ph
O
9
1H NMR, CDCl3, 500 MHz
1.00
3.00
1.01
1.02
3.04
2.02
2.06
3.01
9.5 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 0.0
f1 (ppm)

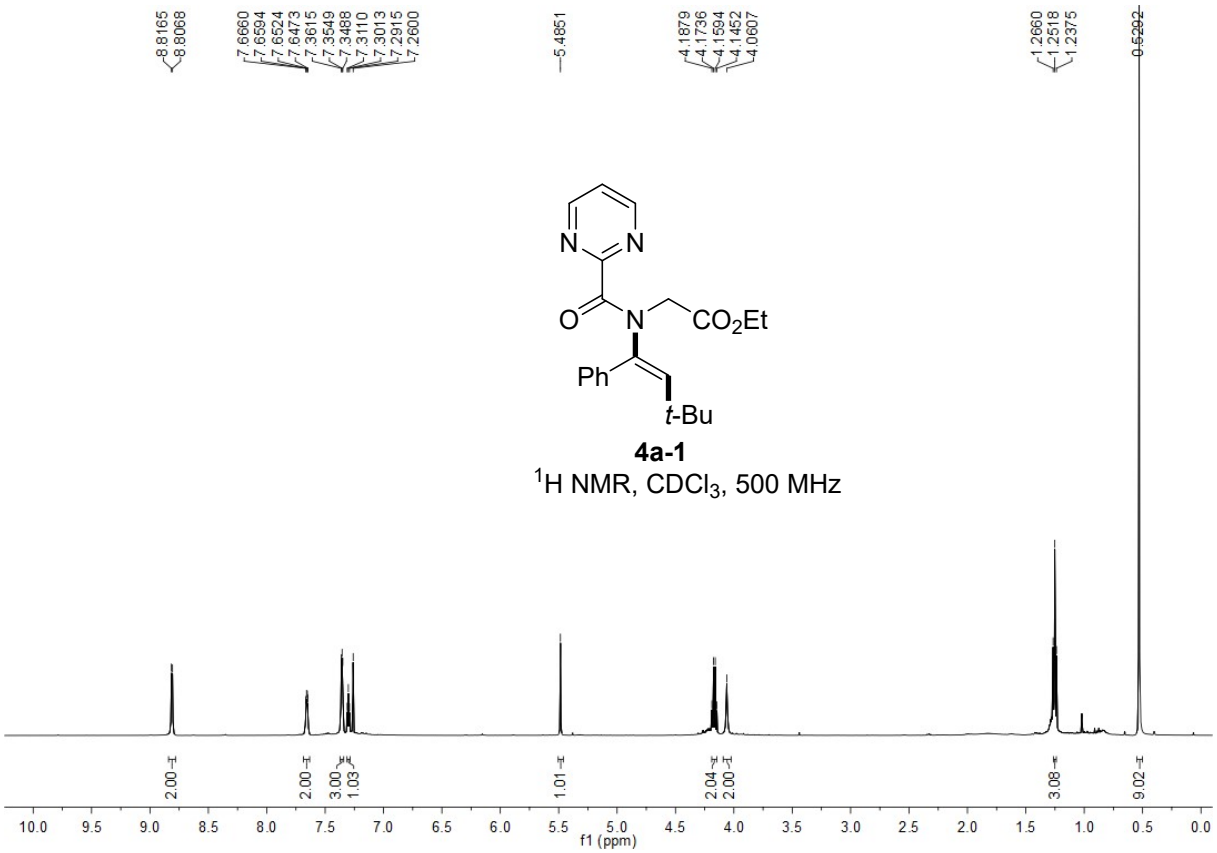

173.5176
171.3981
168.8484
151.7886
148.1065
136.9677
136.6236
131.5640
128.9241
127.9267
125.7437
124.9102
77.2548
77.0000
76.7461
61.5636
47.5333
14.0672
O
N
CO2Et
N
Ph
O
9
13C NMR, CDCl3, 125 MHz
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)



^{1}H NMR, $CDCl_3$, 500 MHz

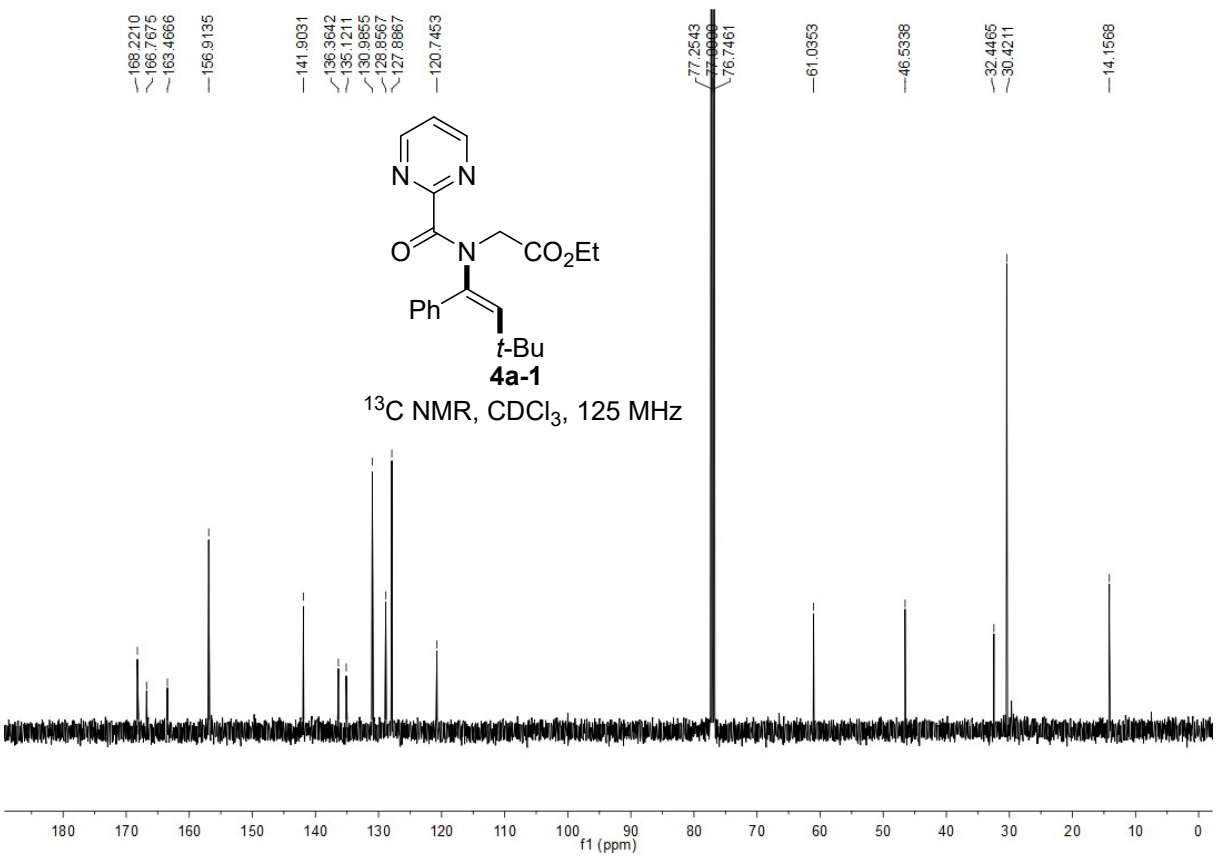


^{13}C NMR, $CDCl_3$, 125 MHz



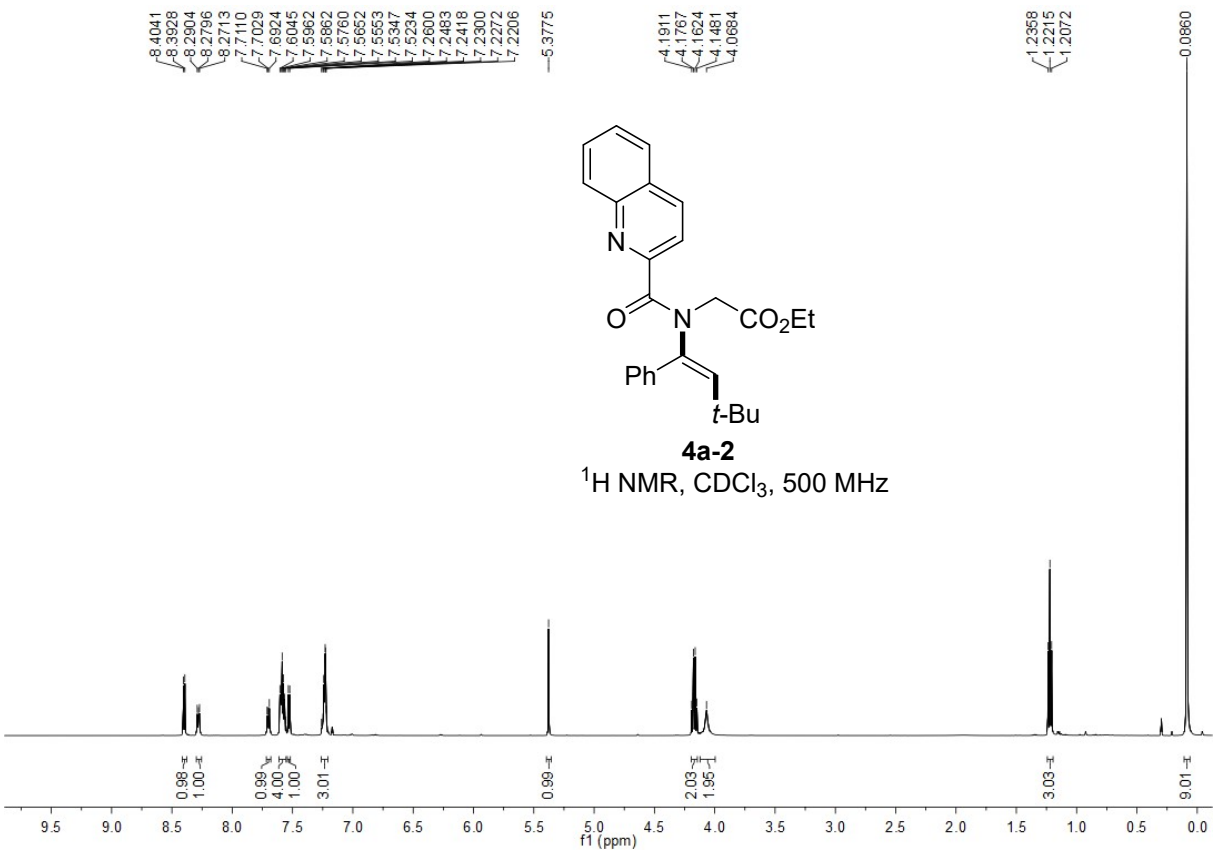
4a-1

^{1}H NMR, $CDCl_3$, 500 MHz



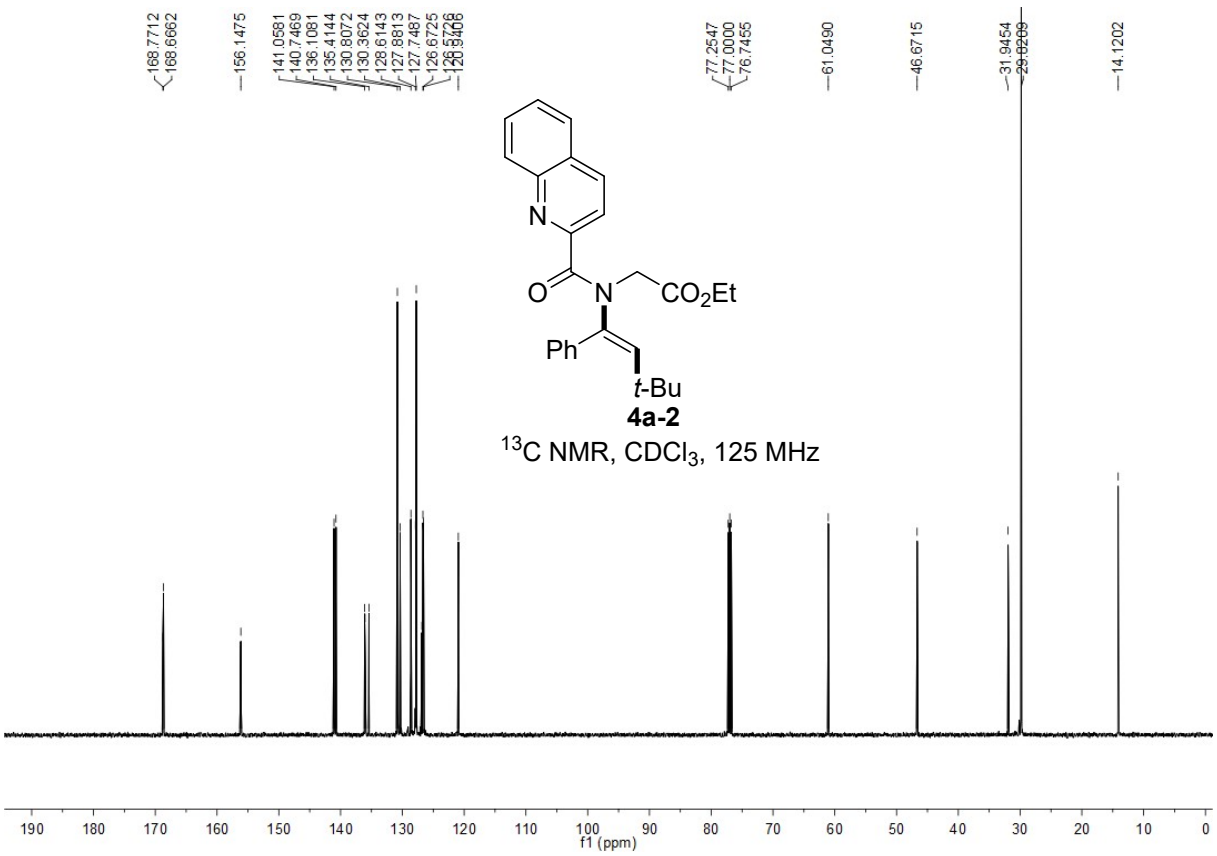
4a-1

^{13}C NMR, $CDCl_3$, 125 MHz



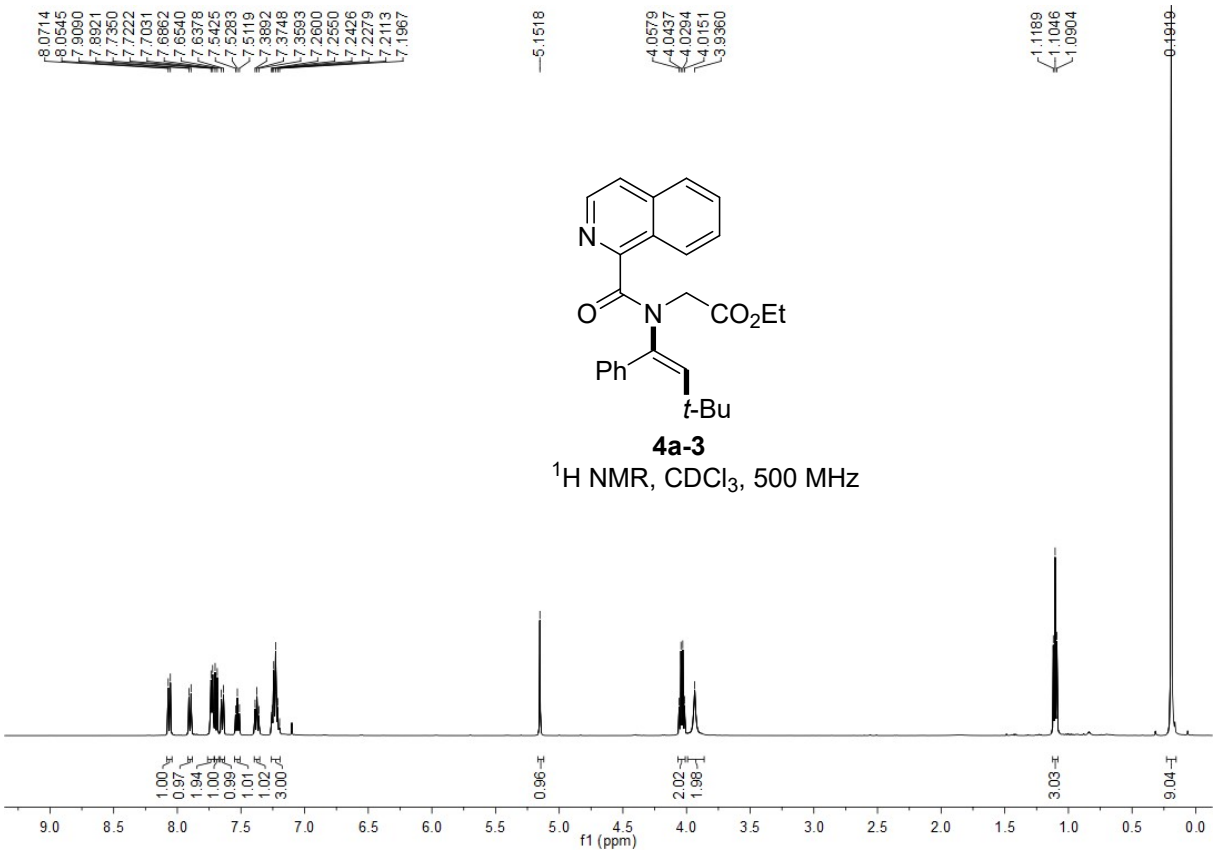
4a-2

^{1}H NMR, $CDCl_3$, 500 MHz



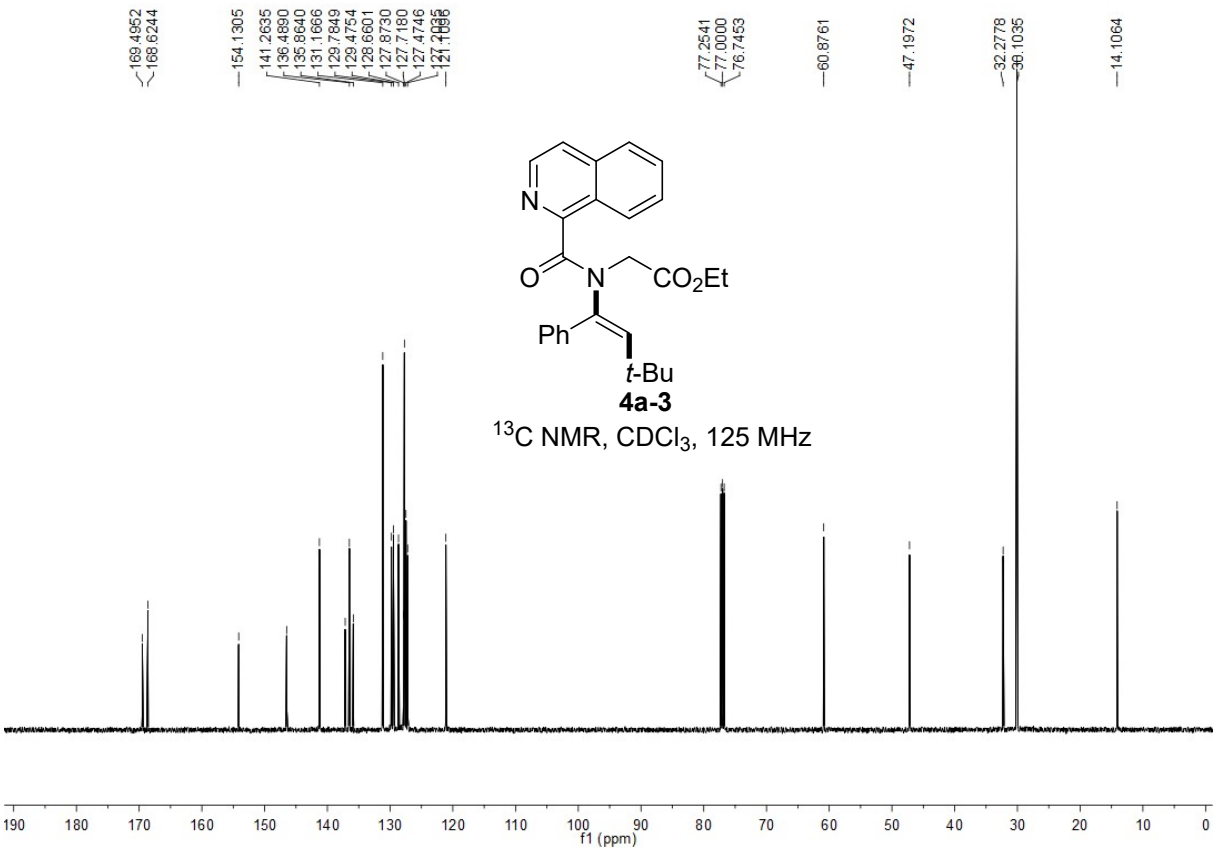
4a-2

^{13}C NMR, $CDCl_3$, 125 MHz



4a-3

^{1}H NMR, $CDCl_3$, 500 MHz



4a-3

^{13}C NMR, $CDCl_3$, 125 MHz