Supporting Information

Base-Mediated Ketenimine Formation from *N*-Sulfonylthioimidates for the Synthesis of 5-Amino-1-Vinyl/Aryl-1,2,3-Triazoles

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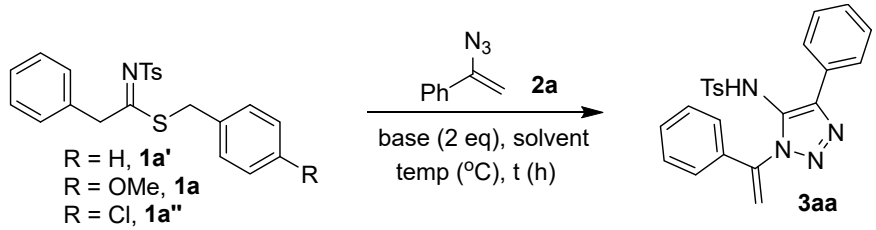
Table of contents

General information

All reactions were performed under nitrogen atmosphere. ^{1}H NMR and ^{13}C NMR spectra were reported on Varian 400 MHz and Jeol 400 MHz NMR spectrometer with $CDCl_3$、CD_3OD、*d*$_6$-DMSO、*d*$_6$-acetone as the solvent. Chemical shifts were reported in parts per million (ppm) relative to residual solvent peak ($CDCl_3$ δ H = 7.26 ppm, δ C = 77.16 ppm; CD_3OD δ H = 3.31 ppm, δ C = 49.15 ppm; *d*$_6$-DMSO δ H = 2.49 ppm, δ C = 39.15 ppm; *d*$_6$-Acetone δ H = 2.05 ppm, δ C = 29.92 ppm) and were used as internal standard, α,α,α-trifluorotoluene in deuteron benzene (δ -63.9 ppm in ^{19}F NMR). The IR spectra were measured on a Thermo Scientific Nicolet ATR-Diamond. Thin layer chromatography (TLC) was performed on pre-coated glass plates of Silica Gel 60 F_{254} (0.25 mm, E. Merck); TLC plates were visualized under UV light (254 or 365 nm) and by treatment with potassium permanganate ($KMnO_4$) or phosphomolybdic acid staining solution followed by heating. Flash column chromatography was carried out by using Silica Gel 60 (230–400 mesh, E. Merck). High resolution mass spectrometry (HRMS) data were recorded on an EI spectrometer. Melting points were measured by Electrothermo (UK) "Mel- emp" type melting point apparatus and are uncorrected. The following abbreviations were used to indicate splitting patterns of multiplicities: s = singlet, d = doublet, t = triplet, q = quartet, quin. = quintet, sext = sextet, dd = doublet of doublets, dt = doublet of triplets, td = triplet of doublets, ddd = doublet of doublet of doublets, brs = broad single, m = multiplet. Coupling constants (*J*) are reported in Hz. Yields of products refer to chromatographically purified products unless otherwise stated. All terminal alkyne and thiol reagents were purchase from Sigma Aldrich, Alfa Aesar, Merck, or TCI. The compounds **1a′** and **1a″** were prepared by our previous work.[1] All vinyl azides (**2a**-**2i**)[2] and aryl azides (**4a**-**4i**)[3] were known compounds and synthesized by reported methods.[2-3] All these compounds were used as received, unless otherwise stated.

Table S1. Optimized Conditions



entry	**2a** (equiv)	base	solvent	time(h)	temp (°C)	yield[a]
1	2	DBU	THF	12	50	33%
2	2	DBU	ACN	12	50	31%
3	2	DBU	1,4-Dioxane	12	50	25%
4	2	DBU	Toluene	12	50	23%
5	2	DBU	DMF	12	50	44%
6	2	DBU	DMF	6	50	50%
7	2	——	DMF	12	50	——[b]
8	3	DBU	DMF	6	50	60%
9	3	K_2CO_3	DMF	6	50	55%
10	3	Cs_2CO_3	DMF	6	50	62%
11	3	K_3PO_4	DMF	6	50	66%
12	3	K_3PO_4	DMSO	6	50	73%
13	3	K_3PO_4	DMSO	6	80	80%
14	3	K_3PO_4	DMSO	6	90	78%
15	1.5	K_3PO_4	DMSO	6	80	40%
16	3	K_3PO_4	DMSO	6	80	47%[c]
17	3	K_3PO_4	DMSO	6	80	85%[d]
18	3	K_3PO_4	DMSO	6	80	58%[e]

Reaction conditions: **1a'** (1.0 equiv), **2a**, and base (2.0 equiv) under nitrogen atmosphere. [a] Isolated yield. [b] No desired product formation, only starting material **1a'** was recovered. [c] K_3PO_4 was ued 1.5 equiv in reaction conditions. [d] Use of **1a** as substrate (R = OMe). [e] Use of **1a''** as substrate (R = Cl)

General Procedure I: For *N*-sulfonylthioimidate (1) synthesis[1]

To a solution of phenyl acetylene (50.0 mg, 0.489 mmol, 1.0 equiv) in DCM (1.6 mL) was added *p*-toluenesulfonyl azide (116.0 mg, 0.587 mmol, 1.2 equiv), DMAP (60.0 mg, 0.489 mmol, 1.0 equiv) and CuI (19.0 mg, 0.098 mmol, 0.2 equiv). The resulting solution was stirred at room temperature under nitrogen atmosphere for 1 h. Then 4-methoxybenzyl thiol (227.0 mg, 1.467 mmol, 3.0 equiv) was added to the reaction mixture and stirred for several hours until the reaction was complete as indicated by TLC. The mixture was extracted with DCM for three times and the combined organic phase was washed with brine, dried over $MgSO_4$, filtered and concentrated. The crude products were purified by flash column chromatography to afford the desired product **1a** (153.8 mg, 74%) as a yellow solid. The products of **1b-1l** were synthesized by following general procedure I

General Procedure II: For 5-amino-1-vinyl-1,2,3-triazole (3) synthesis

To a solution of thioimidate **1a** (50.0 mg, 0.117 mmol, 1 equiv) and potassium phosphate (51.0 mg, 0.235 mmol, 2 equiv) in DMSO (0.39 mL) was added vinyl azide **2a** (51.0 mg, 0.351 mmol, 3 equiv), the resulting reaction mixture was stirred at 80 ^oC under nitrogen atmosphere for several hours until the reaction was completed as indicated by TLC. The mixture was extracted with DCM for three times and the combined organic phase was washed with 2N HCl solution and brine, dried over $MgSO_4$, filtered and concentrated. The crude product was purified by flash column chromatography to afford the desired products **3aa** (41.4 mg, 85%) as a white solid. The products of **3ba-3la**, **3ab-3ai**, **3cb-3cc**, and **3hb-3hc** were synthesized by following general procedure II.

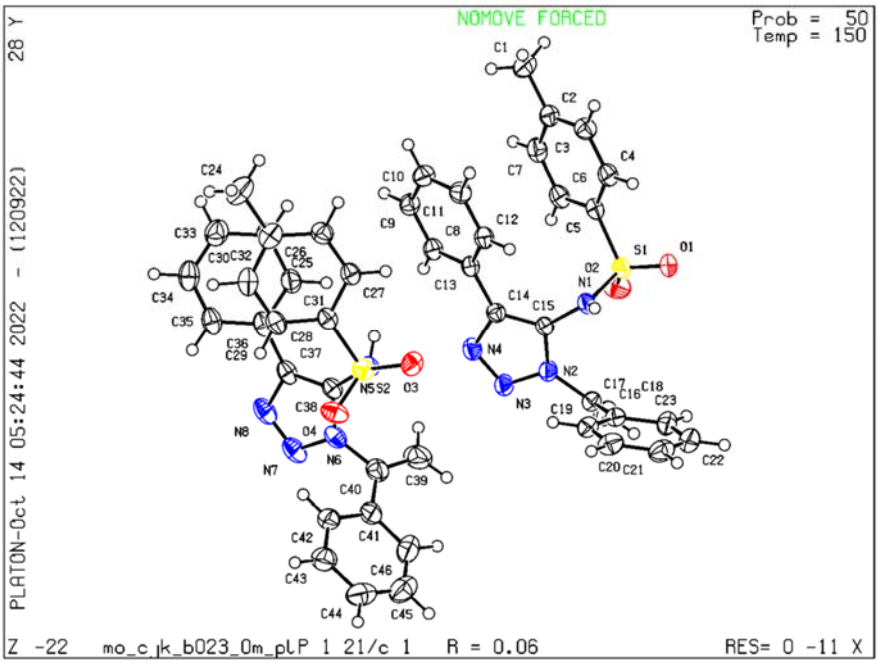
General Procedure III: For 5-amino-1-aryl-1,2,3-triazole (5) synthesis

To a solution of *N*-sulfonylthioimidate **1a′** (100.0 mg, 0.253 mmol, 1 equiv) and potassium phosphate (107.4 mg, 0.506 mmol, 2 equiv) in DMSO (0.84 mL) was added azidobenzene **4a** (90.3 mg, 0.759 mmol, 3 equiv), the resulting reaction mixture was stirred at 80 ºC under nitrogen atmosphere for 8 hours until the reaction was completed as indicated by TLC. The mixture was extracted with DCM for three times and the combined organic phase was washed with 2N HCl solution and brine, dried over $MgSO_4$, filtered and concentrated. The crude product were purified by flash column chromatography to afford the desired products **5aa** (69.2 mg, 70%) as a white solid. The products of **5ab-5ai** were synthesized by following general procedure III.

X-ray Crystallographic Studies and the X-ray Data of 3aa and 6

Single crystals of compounds **3aa** and **6** suitable for X-ray diffraction measurements were mounted on the Bruker D8 VENTURE and the unit cell was determined using Bruker SMART APEX 3 software suite to employ graphite-monochromated Mo-Kα radiation (λ = 0.71073 Å), and intensity data were collected with ω scans. The data collection and reduction were performed with the CrysAlisPro software, and the absorptions were corrected by the SCALE3 ABSPACK multiscan method. The space-group determination was based on a check of the Laue symmetry and systematic absences, and it was confirmed using the structure solution. The structure was solved and refined with the Olex2 1.2-ac21 package. Anisotropic thermal parameters were used for all non-H atoms, and fixed isotropic parameters were used for H atoms. CCDC numbers of 2216076 for compound **3aa** and 2201717 for compound **6** contain the supplementary crystallographic data for this paper, respectively. Both of the checkCIF reports are given below:

For compound 3aa, CCDC No: 2216076



Datablock: mo_cjk_b023_0m_pl

Bond precision: C-C = 0.0053 A Wavelength=0.71076

Cell: a=11.4274(6) b=25.1111(16) c=14.2863(10)
alpha=90 beta=91.378(2) gamma=90
Temperature: 150 K

	Calculated	Reported
Volume	4098.3(4)	4098.3(4)
Space group	P 21/c	P 1 21/c 1
Hall group	-P 2ybc	-P 2ybc
Moiety formula	C23 H20 N4 O2 S	2(C23 H20 N4 O2 S)
Sum formula	C23 H20 N4 O2 S	C46 H40 N8 O4 S2
Mr	416.49	832.98
Dx,g cm-3	1.350	1.350
Z	8	4
Mu (mm-1)	0.186	0.186
F000	1744.0	1744.0
F000'	1745.63	
h,k,lmax	14,31,17	14,31,17
Nref	8410	8390
Tmin,Tmax		0.706,0.745
Tmin'		

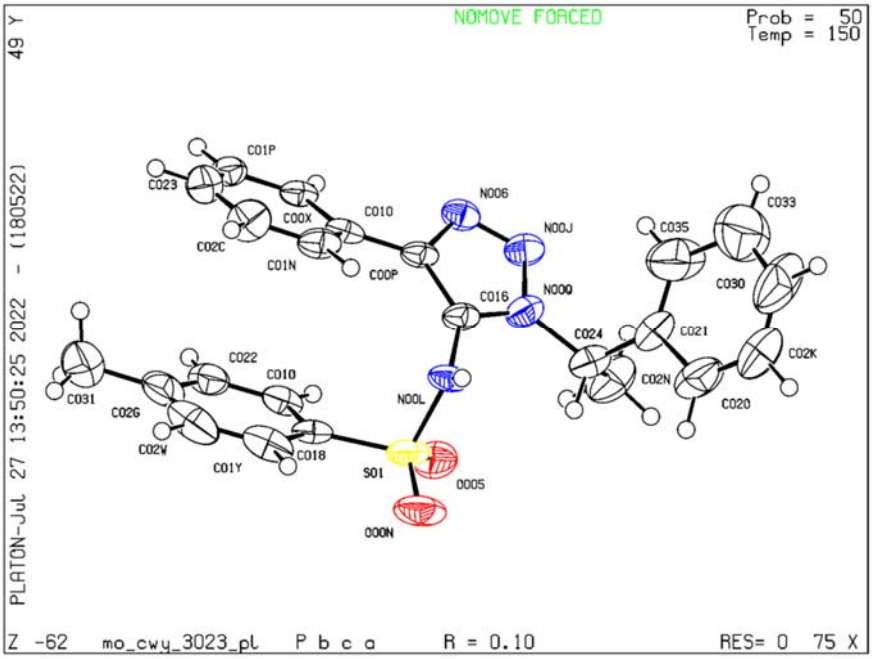
Correction method= # Reported T Limits: Tmin=0.706 Tmax=0.745
AbsCorr = NONE

Data completeness= 0.998 Theta(max)= 26.404

R(reflections)= 0.0570(5598) wR2(reflections)= 0.2077(8390)

S = 1.215 Npar= 543

For compound 6, CCDC No: 2201719



Datablock: mo_cwy_3023_pl

Bond precision: C-C = 0.0097 A Wavelength=0.71076

Cell: a=14.496(2) b=11.4484(18) c=25.707(5)
alpha=90 beta=90 gamma=90
Temperature: 150 K

	Calculated	Reported
Volume	4266.2(12)	4266.2(12)
Space group	P b c a	P b c a
Hall group	-P 2ac 2ab	-P 2ac 2ab
Moiety formula	C23 H22 N4 O2 S	C23 H22 N4 O2 S
Sum formula	C23 H22 N4 O2 S	C23 H22 N4 O2 S
Mr	418.51	418.50
Dx,g cm-3	1.303	1.303
Z	8	8
Mu (mm-1)	0.179	0.179
F000	1760.0	1760.0
F000'	1761.63	
h,k,lmax	17,13,30	17,13,30
Nref	3753	3669
Tmin,Tmax		
Tmin'		

Correction method= Not given

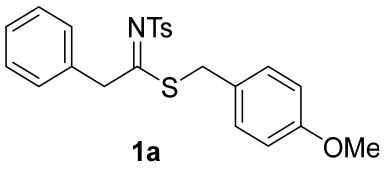
Data completeness= 0.978 Theta(max)= 24.995

R(reflections)= 0.0980(2275) wR2(reflections)= 0.2433(3669)

S = 1.007 Npar= 273

Characterization Data:

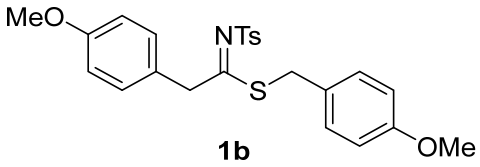
4-Methoxybenzyl (*E*)-2-phenyl-*N*-tosylethanimidothioate (1a)[1]



1a

Following the General Procedure I, using phenylacetylene (50.0 mg, 0.489 mmol), tosyl azide (116 mg, 0.587 mmol) and 4-methoxybenzylthiol (227.0 mg, 1.469 mmol). The crude was purified by column chromatography (hexane/EtOAc, 5/1) to afford **1a** (153.8 mg, 74% yield) as a yellow solid；^{1}H NMR (400 MHz, $CDCl_3$) δ 7.87 (d, *J* =8.2 Hz, 2H), 7.35-7.31 (m, 7H), 7.00 (d, *J* = 8.6 Hz, 2H), 6.71 (d, *J* = 8.6 Hz, 2H), 4.45 (s, 2H), 3.95 (s, 2H), 3.76 (s, 3H), 2.46 (s, 3H)；^{13}C NMR (100 MHz, $CDCl_3$) δ 188.8 (C), 159.1 (C), 143.7 (C), 138.7 (C), 133.9 (C), 130.4 (CH×3), 129.6 (CH×2), 128.7 (CH×2), 127.8 (CH×2), 127.2 (CH×2), 127.1 (C), 114.0 (CH×2), 55.3 (CH_3), 44.3 (CH_2), 36.0 (CH_2), 21.7 (CH_3).

4-Methoxybenzyl (*E*)-2-(4-methoxyphenyl)-*N*-tosylethanimidothioate (1b)

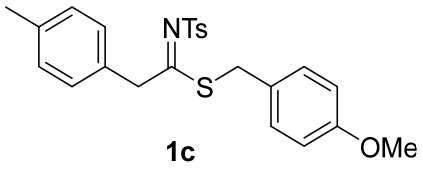


1b

Following the General Procedure I, using 1-ethynyl-4-methoxybenzene (50.0 mg, 0.378 mmol), tosyl azide (90.0 mg, 0.454 mmol) and 4-methoxybenzylthiol (175.0 mg, 1.134 mmol). The crude was purified by column chromatography (hexane/EtOAc, 5/1) to afford **1b** (99.7 mg, 58% yield) as a white solid. m.p. 119-120 °C；^{1}H NMR (400 MHz, $CDCl_3$) δ 7.88 (d, *J* = 8.2 Hz, 2H), 7.35 (d, *J* = 8.2 Hz, 2H), 7.24 (d, *J* = 8.6 Hz, 2H), 7.00 (d, *J* = 8.6 Hz, 2H), 6.86 (d, *J* = 8.6 Hz, 2H), 6.71 (d, *J* = 8.6 Hz, 2H), 4.38 (s, 2H), 3.93 (s, 2H), 3.79 (s, 3H), 3.75 (s, 3H), 2.46 (s, 3H)；^{13}C NMR (100 MHz,

$CDCl_3$) δ 189.8 (C), 159.3 (C), 159.0 (C), 143.6 (C), 138.8 (C), 131.6 (CH×2), 130.4 (CH×2), 129.6 (CH×2), 127.1 (CH×2, C), 125.8 (C), 114.1 (CH×2), 114.0 (CH×2), 55.3 (CH_3×2), 43.6, (CH_2) 36.1(CH_2), 21.7 (CH_3)；IR (ATR) ν 2971, 2935, 2842, 1561, 1509, 1471, 1441, 1289, 1249, 1151, 1087, 1029；HRMS (EI) m/z：$[M+H]^+$ calcd. for $C_{24}H_{25}NO_4S_2$: 455.1225, found: 455.1234.

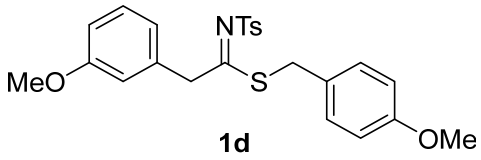
4-Methoxybenzyl (*E*)-2-(*p*-tolyl)-*N*-tosylethanimidothioate (1c)



1c

Following the General Procedure I, using 1-ethynyl-4-methylbenzene (50.0 mg, 0.430 mmol), tosyl azide (102.0 mg, 0.517 mmol) and 4-methoxybenzylthiol (199.0 mg, 1.291 mmol). The crude was purified by column chromatography (hexane/EtOAc, 5/1) to afford **1c** (98.2 mg, 52% yield) as a white solid. m.p. 108-110 ºC；^{1}H NMR (400 MHz, $CDCl_3$) δ 7.86 (d, *J* = 8.1 Hz, 2H), 7.34 (d, *J* = 8.2 Hz, 2H), 7.20 (d, *J* = 7.8 Hz, 2H), 7.13 (d, *J* = 8.1 Hz, 2H), 7.00 (d, *J* = 8.6 Hz, 2H), 6.70 (d, *J* = 8.6 Hz, 2H), 4.40 (s, 2H), 3.93 (s, 2H), 3.75 (s, 3H), 2.45 (s, 3H), 2.33 (s, 3H)；^{13}C NMR (100 MHz, $CDCl_3$) δ 189.5 (C), 159.1 (C), 143.6 (C), 138.8 (C), 137.7 (C), 130.8 (C), 130.4 (CH×2), 130.3 (CH×2), 129.6 (CH×2), 129.4 (CH×2), 127.2 (CH×2, C), 114.0 (CH×2), 55.3 (CH_3), 44.0 (CH_2), 36.0 (CH_2), 21.7 (CH_3), 21.3 (CH_3)；IR (ATR) ν 3000, 2981, 2911, 1607, 1532, 1505, 1310, 1287, 1236, 1149, 1088, 1032；HRMS (EI) m/z：$[M+H]^+$ calcd. for $C_{24}H_{25}NO_3S_2$: 439.1276, found: 439.1268.

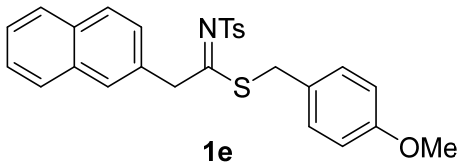
4-Methoxybenzyl (*E*)-2-(3-methoxyphenyl)-*N*-tosylethanimidothioate (1d)



1d

Following the General Procedure I, using 1-ethynyl-3-methoxybenzene (50.0 mg, 0.378 mmol), tosyl azide (90.0 mg, 0.454 mmol) and 4-methoxybenzylthiol (175.0 mg, 1.135 mmol). The crude was purified by column chromatography (hexane/EtOAc, 5/1) to afford **1d** (103.0 mg, 60% yield) as a white solid. m.p. 76-77 °C；^{1}H NMR (400 MHz, $CDCl_3$) δ 7.86 (d, *J* = 8.3 Hz, 2H), 7.34 (d, *J* = 8.0 Hz, 2H), 7.24 (t, *J* = 7.8 Hz, 1H), 7.00 (d, *J* = 8.7 Hz, 2H), 6.90 (d, *J* = 7.6 Hz, 1H), 6.86-6.82 (m, 2H), 6.71 (d, *J* = 8.7 Hz, 2H), 4.40 (s, 2H), 3.95 (s, 2H), 3.78 (s, 3H), 3.76 (s, 3H), 2.46 (2, 3H)；^{13}C NMR (100 MHz, $CDCl_3$) δ 188.3 (C), 159.6 (C), 158.9 (C), 143.5 (C), 138.5 (C), 135.1 (C), 130.2 (CH×2), 129.5 (CH), 129.4 (CH×2), 126.9 (CH×2, C), 122.5 (CH), 115.5 (CH), 113.8 (CH×2), 113.3 (CH), 55.1 (CH_3×2), 44.1 (CH_2), 35.6 (CH_2), 21.5 (CH_3)；IR (ATR) ν 2964, 2912, 2841, 1610, 1583, 1552, 1511, 1488, 1313, 1265, 1247, 1154, 1079, 1047, 1029；HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{24}H_{25}NO_4S_2$: 455.1225, found: 455.1217

4-Methoxybenzyl (*E*)-2-(naphthalen-2-yl)-*N*-tosylethanimidothioate (1e)

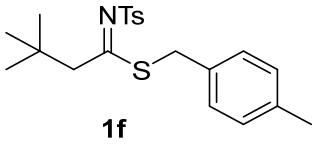


1e

Following the General Procedure I, using 2-ethynylnaphthalene (50.0 mg, 0.328 mmol), tosyl azide (78.0 mg, 0.394 mmol) and 4-methoxybenzylthiol (152.0 mg, 0.986 mmol). The crude was purified by column chromatography (hexane/EtOAc, 5/1) to afford **1e** (93.5 mg, 60% yield) as a white solid. m.p. 104-106 °C；^{1}H NMR (400 MHz, $CDCl_3$) δ 7.89 (d, *J* = 8.2 Hz, 2H), 7.83-7.77 (m, 3H), 7.74 (s, 1H), 7.49-7.46 (m, 2H), 7.43 (dd,

J = 8.4, 1.2 Hz, 1H), 7.33 (d, *J* = 8.1 Hz, 2H), 7.00 (d, *J* = 8.6 Hz, 2H), 6.70 (d, *J* = 8.6 Hz, 2H), 4.61 (s, 2H), 3.96 (s, 2H), 3.75 (2, 3H), 2.45 (s, 3H)；^{13}C NMR (100 MHz, $CDCl_3$) δ 188.8 (C), 159.1 (C), 143.7 (C), 138.6 (C), 133.4 (C), 132.8 (C), 131.3 (C), 130.4 (CH×2), 129.6 (CH×2), 129.4 (CH), 128.4 (CH), 128.0 (CH), 127.9 (CH), 127.8 (CH), 127.2 (CH×2), 127.1 (C), 126.4 (CH), 126.3 (CH), 114.0 (CH×2), 55.3 (CH_3), 44.4 (CH_2), 36.1 (CH_2), 21.7 (CH_3)；IR (ATR) ν 3234, 3058, 2911, 1722, 1550, 1510, 1440, 1300, 1245, 1157, 1081, 1034；HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{27}H_{25}NO_3S_2$: 475.1276, found: 475.1270

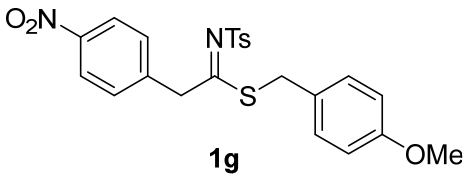
4-Methylbenzyl (*E*)-3,3-dimethyl-*N*-tosylbutanimidothioate (1f)[1]



1f

Following the General Procedure I, using 3,3-dimethylbut-1-yne (300.0 mg, 3.652 mmol), tosyl azide (864.0 mg, 4.382 mmol) and *p*-tolylmethanethiol (1515.0 mg, 10.956 mmol). The crude was purified by column chromatography (hexane/EtOAc, 5/1) to afford **1f** (298.4 mg, 21% yield) as a white solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.84 (d, *J* = 8.3 Hz, 2H), 7.31 (d, *J* =8.3 Hz, 2H), 7.00 (s, 4H), 4.05 (s, 2H), 3.10 (s, 2H), 2.45 (s, 3H), 2.30 (s, 3H), 1.14 (s, 9H)；^{13}C NMR (100 MHz, $CDCl_3$) δ 187.3 (C), 143.4 (C), 139.1 (C), 137.3 (C), 132.6 (C), 129.5 (CH×2), 129.3 (CH×2), 128.9 (CH×2), 127.1 (CH×2), 50.3 (CH_2), 36.1 (CH_2), 32.5 (C), 30.5 (CH_3×3), 21.7 (CH_3), 21.2 (CH_3).

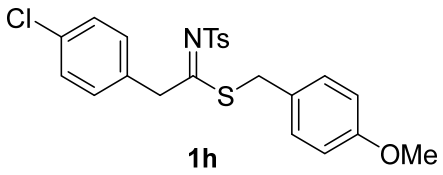
4-Methoxybenzyl (*E*)-2-(4-nitrophenyl)-*N*-tosylethanimidothioate (1g)



1g

Following the General Procedure I, using 1-ethynyl-4-nitrobenzene (50.0 mg, 0.340 mmol), tosyl azide (80.0 mg, 0.408 mmol) and 4-methoxybenzylthiol (157.0 mg, 1.020 mmol). The crude was purified by column chromatography (hexane/EtOAc, 5/1) to afford **1g** (86.3 mg, 54% yield) as an orange solid. m.p. 110-111 °C；^{1}H NMR (400 MHz, $CDCl_3$) δ 8.18 (d, *J* = 8.6 Hz, 2H), 7.85 (d, *J* = 8.3 Hz, 2H), 7.52 (d, *J* = 8.6 Hz, 2H), 7.35 (d, *J* = 8.2 Hz, 2H), 7.00 (d, *J* = 8.6 Hz, 2H), 6.72 (d, *J* = 8.6 Hz, 2H), 4.53 (s, 2H), 3.99 (s, 2H), 3.76 (s, 3H), 2.46 (s, 3H)；^{13}C NMR (100 MHz, $CDCl_3$) δ 185.4 (C), 159.2 (C), 147.5 (C), 144.1 (C), 141.5 (C), 138.2 (C), 131.0 (CH×2), 130.4 (CH×2), 129.7 (CH×2), 127.2 (CH×2), 126.6 (C), 123.9 (CH×2), 114.1 (CH×2), 55.4 (CH_3), 43.7 (CH_2), 36.2 (CH_2), 21.7 (CH_3)；IR (ATR) ν 2926, 2855, 1557, 1343, 1316, 1243, 1149, 1086, 1032；HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{23}H_{22}N_2O_5S_2$: 470.0970, found: 470.0979.

4-Methoxybenzyl (*E*)-2-(4-chlorophenyl)-*N*-tosylethanimidothioate (1h)

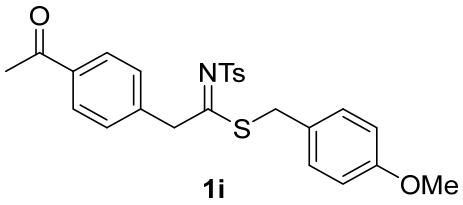


1h

Following the General Procedure I, using 1-chloro-4-ethynylbenzene (50.0 mg, 0.366 mmol), tosyl azide (87.0 mg, 0.439 mmol) and 4-methoxybenzylthiol (169.0 mg, 1.098 mmol). The crude was purified by column chromatography (hexane/EtOAc, 5/1) to afford **1h** (102.5 mg, 61% yield) as a white solid. m.p. 111-113 °C；^{1}H NMR (400 MHz, $CDCl_3$) δ 7.85 (d, *J* = 8.3 Hz, 2H), 7.34 (d, *J* = 8.0 Hz, 2H), 7.30-7.24 (m, 4H), 7.00 (d, *J* = 8.8 Hz, 2H), 6.72 (d, *J* = 8.7 Hz, 2H), 4.40 (s, 2H), 3.95 (s, 2H), 3.76 (s, 3H), 2.46 (s, 3H)；^{13}C NMR (100 MHz, $CDCl_3$) δ 187.7 (C), 159.1 (C), 143.7 (C), 138.4 (C), 133.8 (C), 132.4 (C), 131.6 (CH×2), 130.3 (CH×2), 129.5 (CH×2), 128.8 (CH×2), 127.1 (CH×2), 126.9 (C), 114.0 (CH×2), 55.3 (CH_3), 43.5 (CH_2), 36.0 (CH_2), 21.7

(CH_3); IR (ATR) ν 2914, 2838, 1607, 1537, 1508, 1312, 1238, 1151, 1088, 1033, 1017; HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{23}H_{22}ClNO_3S_2$: 459.0730, found: 459.0735

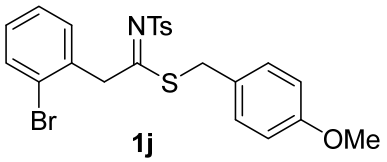
4-Methoxybenzyl (*E*)-2-(4-acetylphenyl)-*N*-tosylethanimidothioate (1i)



1i

Following the General Procedure I, using 1-(4-ethynylphenyl)ethan-1-one (50.0 mg, 0.347 mmol), tosyl azide (82.0 mg, 0.416 mmol) and 4-methoxybenzylthiol (160.0 mg, 1.040 mmol). The crude was purified by column chromatography (hexane/EtOAc, 5/1) to afford **1i** (105.3 mg, 65% yield) as a yellow solid. m.p. 112-114 °C ; ^1H NMR (400 MHz, $CDCl_3$) δ 7.92 (d, *J* = 8.2 Hz, 2H), 7.86 (d, *J* = 8.3 Hz, 2H), 7.44 (d, *J* = 8.2 Hz, 2H), 7.35 (d, *J* = 8.1 Hz, 2H), 7.00 (d, *J* = 8.6 Hz, 2H), 6.71 (d, *J* = 8.7 Hz, 2H), 4.49 (s, 2H), 3.96 (s, 2H), 3.76 (s, 3H), 2.59 (s, 3H), 2.46 (s, 3H) ; ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.8 (C), 186.9 (C), 159.1 (C), 143.9 (C), 139.3 (C), 138.4 (C), 136.5 (C), 130.5 (CH×2), 130.4 (CH×2), 129.6 (CH×2), 128.8 (CH×2), 127.2 (CH×2), 126.8 (C), 114.1 (CH×2), 55.3 (CH_3), 44.1 (CH_2), 36.1 (CH_2), 26.8 (CH_3), 21.7 (CH_3) ; IR (ATR) ν 3034, 2995, 2926, 1683, 1607, 1561, 1512, 1413, 1312, 1252, 1086, 1041, 1021 ; HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{25}H_{25}NO_4S_2$: 467.1225, found: 467.1226

4-Methoxybenzyl (*E*)-2-(2-bromophenyl)-*N*-tosylethanimidothioate (1j)

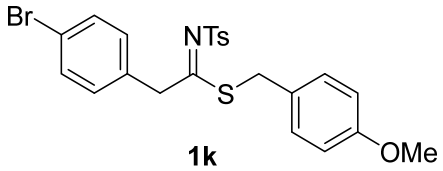


1j

Following the General Procedure I, using 1-bromo-2-ethynylbenzene (50.0 mg, 0.276 mmol), tosyl azide (65.0 mg, 0.331 mmol) and 4-methoxybenzylthiol (128.0 mg, 0.829

mmol). The crude was purified by column chromatography (hexane/EtOAc, 5/1) to afford **1j** (80.5 mg, 58% yield) as a white solid. m.p. 89-91 ºC；^{1}H NMR (400 MHz, $CDCl_3$) δ 7.93 (d, *J* = 8.2 Hz, 2H), 7.57 (d, *J* = 8.0 Hz, 1H), 7.38 (d, *J* = 8.1 Hz, 2H), 7.33-7.28 (m, 2H), 7.21 (td, *J* = 7.8, 1.8 Hz, 1H), 7.05 (d, *J* = 8.6 Hz, 2H), 6.74 (d, *J* = 8.6 Hz, 2H), 4.60 (s, 2H), 4.00 (s, 2H), 3.77 (s, 3H), 2.48 (s, 3H)；^{13}C NMR (100 MHz, $CDCl_3$) δ 188.0 (C), 159.0 (C), 143.7 (C), 138.4 (C), 133.8 (C), 133.0 (CH), 132.5 (CH), 130.3 (CH×2), 129.7 (CH), 129.5 (CH×2), 127.6 (CH), 127.2 (CH×2), 126.9 (C), 126.0 (C), 113.9 (CH×2), 55.2 (CH_3), 44.9 (CH_2), 35.9 (CH_2), 21.7 (CH_3)；IR (ATR) ν 2934, 2836, 1543, 1511, 1319, 1303, 1248, 1152, 1087, 1028；HRMS (EI) m/z：$[M+H]^+$ calcd. for $C_{23}H_{22}BrNO_3S_2$: 503.0224, found: 503.0221

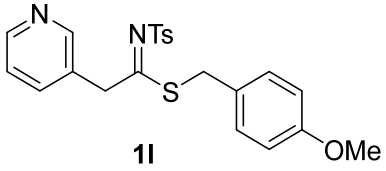
4-Methoxybenzyl (*E*)-2-(4-bromophenyl)-*N*-tosylethanimidothioate (1k)



1k

Following the General Procedure I, using 1-bromo-4-ethynylbenzene (50.0 mg, 0.276 mmol), tosyl azide (65.0 mg, 0.331 mmol) and 4-methoxybenzylthiol (128.0 mg, 0.829 mmol). The crude was purified by column chromatography (hexane/EtOAc, 5/1) to afford **1k** (76.3 mg, 55% yield) as a white solid. m.p. 93-94 ºC；^{1}H NMR (400 MHz, $CDCl_3$) δ；7.86 (d, *J* = 8.3 Hz, 2H), 7.44 (d, *J* = 8.4 Hz, 2H), 7.35 (d, *J* = 8.1 Hz, 2H), 7.21 (d, *J* = 8.3 Hz, 2H), 7.00 (d, *J* = 8.6 Hz, 2H), 6.72 (d, *J* = 8.7 Hz, 2H), 4.39 (s, 2H), 3.96 (s, 2H), 3.75 (s, 3H), 2.45 (s, 3H)；^{13}C NMR (100 MHz, $CDCl_3$) δ 187.6 (C), 159.1 (C), 143.8 (C), 138.5 (C), 133.0 (C), 132.0 (CH×2), 131.9 (CH×2), 130.4 (CH×2), 129.6 (CH×2), 127.2 (CH×2), 126.9 (C), 122.0 (C), 114.1 (CH×2), 55.4 (CH_3), 43.6 (CH_2), 36.1 (CH_2), 21.8 (CH_3)；IR (ATR) ν 2927, 2837, 1566, 1509, 1315, 1242, 1154, 1087, 1035, 1012；HRMS (EI) m/z：$[M+H]^+$ calcd. for $C_{23}H_{22}BrNO_3S_2$: 503.0224, found: 503.0230

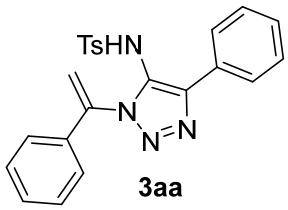
4-Methoxybenzyl (*E*)-2-(pyridin-3-yl)-*N*-tosylethanimidothioate (1l)



1l

Following the General Procedure I, using 3-ethynylpyridine (50.0 mg, 0.485 mmol), tosyl azide (115.0 mg, 0.582 mmol) and 4-methoxybenzylthiol (224.0 mg, 1.455 mmol). The crude was purified by column chromatography (hexane/EtOAc, 1/1) to afford **1l** (140.5 mg, 68% yield) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.57 (d, *J* = 1.8 Hz, 1H), 8.55-8.53 (m, 1H), 7.84 (d, *J* = 8.3 Hz, 2H), 7.69 (d, *J* = 7.9 Hz, 1H), 7.34 (d, *J* = 8.0 Hz, 2H), 7.27-7.24 (m, 1H), 7.00 (d, *J* = 8.7 Hz), 6.71 (d, *J* = 8.7 Hz, 2H), 4.44 (s, 2H), 3.97 (s, 2H), 3.75 (s, 3H), 2.46 (s, 3H)；^{13}C NMR (100 MHz, $CDCl_3$) δ 186.8 (C), 159.2 (C), 151.1 (CH), 149.1 (CH), 143.9 (C), 138.4 (C), 137.7 (CH), 130.4 (CH×2), 130.0 (C), 129.7 (CH×2), 127.2 (CH×2), 126.8 (C), 123.6 (CH), 114.1 (CH×2), 55.4 (CH_3), 41.5 (CH_2), 36.2 (CH_2), 21.8 (CH_3)；IR (ATR) ν 3035, 2925, 2838, 1715, 1551, 1511, 1426, 1302, 1248, 1153, 1087, 1030；HRMS (EI) m/z: $[M+H]^+$ calcd. for $C_{22}H_{22}N_2O_3S_2$: 426.1072, found: 426.1078

4-Methyl-*N*-(4-phenyl-1-(1-phenylvinyl)-1H-1,2,3-triazol-5-yl)benzenesulfonamide (3aa)



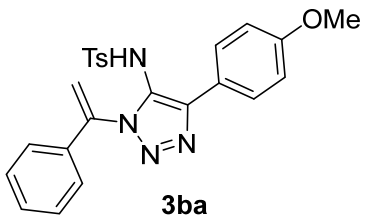
3aa

Following the General Procedure II, using 4-methoxybenzyl (*E*)-2-phenyl-*N*-tosylethanimidothioate **1a** (50.0 mg, 0.117 mmol), tripotassium phosphate (51.0 mg, 0.235 mmol) and (1-azidovinyl)benzene **2a** (51.2 mg, 0.352 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3aa** (41.4 mg, 85%

yield) as a white solid. m.p. 188-190 ºC；^{1}H NMR (400 MHz, d_6-DMSO) δ 10.68 (br, 1H), 7.58 (d, *J* = 7.2 Hz, 2H), 7.44-7.39 (m, 3H), 7.33 (d, *J* = 8.1 Hz, 2H), 7.27-7.16 (m, 5H), 6.98 (d, *J* = 8.0 Hz, 2H), 6.15 (s, 1H), 5.61 (s, 1H), 2.19 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 143.4, 141.5, 140.1, 137.2, 134.7, 129.3 (CH×2), 129.3, 129.1, 128.6 (CH×2), 128.2 (CH×2), 128.1, 127.8, 126.4 (CH×2), 126.1 (CH×2), 125.9 (CH×2), 115.5, 20.9；IR (ATR) ν 3257, 3032, 2922, 2827, 2773, 1596, 1495, 1447, 1407, 1372, 1341, 1240, 1164, 1092；HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{23}H_{20}N_4O_2S$: 416.1307, found: 416.1300.

Gram scale synthetic method of product 3aa: To a solution of thioimidate **1a** (1.0 g, 2.35 mmol, 1 equiv) and potassium phosphate (998.0 mg, 4.7 mmol, 2 equiv) in DMSO (7.83 mL) was added vinyl azide **2a** (1.02 g, 7.05 mmol, 3 equiv), the resulting reaction mixture was stirred at 80 ºC under nitrogen atmosphere for several hours until the reaction was completed as indicated by TLC. The mixture was extracted with DCM for three times and the combined organic phase was washed with 2N HCl solution and brine, dried over $MgSO_4$, filtered and concentrated. The crude product was purified by flash column chromatography to afford the desired products **3aa** (684.5 mg, 70%) as a white solid.

***N*-(4-(4-Methoxyphenyl)-1-(1-phenylvinyl)-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (3ba)**

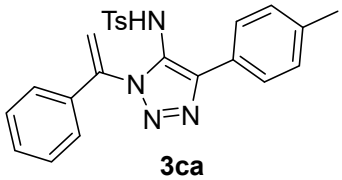


3ba

Following the General Procedure II, using 4-methoxybenzyl (*E*)-2-(4-methoxyphenyl)-*N*-tosylethanimidothioate **1b** (50.0 mg, 0.110 mmol), tripotassium phosphate (46.7 mg,

0.22 mmol) and (1-azidovinyl)benzene **2a** (47.8 mg, 0.329 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3ba** (34.4 mg, 70% yield) as a white solid. m.p. 199-200 ºC；^{1}H NMR (400 MHz, d_6-DMSO) δ 10.59 (br, 1H), 7.49 (d, *J* = 8.8 Hz, 2H), 7.43-7.38 (m, 3H), 7.33 (d, *J* = 8.2 Hz, 2H), 7.20-7.18 (m, 2H), 7.01 (d, *J* = 8.2 Hz, 2H), 6.76 (d, *J* = 8.8 Hz, 2H), 6.13 (s, 1H), 5.59 (s, 1H), 3.77 (s, 3H), 2.20 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 159.1, 143.3, 141.5, 140.1, 137.4, 134.8, 129.3 (CH×3), 128.6 (CH×2), 127.6 (CH×2), 127.3, 126.4 (CH×2), 125.9 (CH×2), 121.6, 115.3, 113.7 (CH×2), 55.1, 20.8；IR (ATR) ν 3000, 2837, 2762, 1620, 1514, 1446, 1375, 1341, 1305, 1251, 1162, 1090；HRMS (EI) m/z : $[M+H]^+$ calcd. for : $C_{24}H_{22}N_4O_3S$: 446.1413, found: 446.1411.

4-Methyl-*N*-(1-(1-phenylvinyl)-4-(*p*-tolyl)-1H-1,2,3-triazol-5-yl)benzenesulfonamide (3ca)

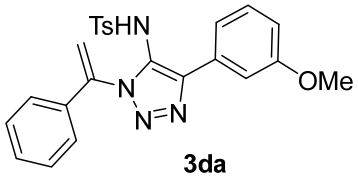


3ca

Following the General Procedure II, using 4-methoxybenzyl (*E*)-2-(p-tolyl)-*N*-tosylethanimidothioate **1c** (50.0 mg, 0.114 mmol), tripotassium phosphate (48.4 mg, 0.228 mmol) and (1-azidovinyl)benzene **2a** (49.8 mg, 0.343 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3ca** (39.3 mg, 80% yield) as a yellow solid. m.p. 173-174 ºC；^{1}H NMR (400 MHz, d_6-DMSO) δ 10.59 (br, 1H), 7.41 (d, *J* = 7.0 Hz, 2H), 7.39-7.34 (m, 3H), 7.28 (d, *J* = 7.0 Hz, 2H), 7.17-7.174(m, 2H), 6.96 (t, *J* = 8.8 Hz, 4H), 6.10 (s, 1H), 5.55 (s, 1H), 2.25 (s, 3H), 2.17 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 143.4, 141.6, 140.1, 137.4, 137.3, 134.8, 129.3 (CH×3), 128.8 (CH×2), 128.6 (CH×2), 127.8, 126.4 (CH×2), 126.3, 126.1 (CH×2), 125.9 (CH×2), 115.4, 20.9, 20.9；IR (ATR) ν 3261, 3035, 2922, 2831, 2777, 1595, 1514, 1376,

1341, 1238, 1159, 1089；HRMS (EI) m/z : $[M+H]^+$ calcd. for: $C_{24}H_{22}N_4O_2S$: 430.1463, found: 430.1461.

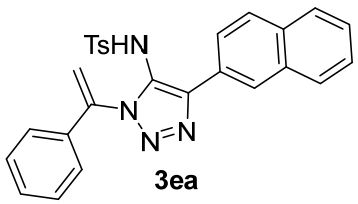
_N_-(4-(3-Methoxyphenyl)-1-(1-phenylvinyl)-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (3da)



3da

Following the General Procedure II, using 4-methoxybenzyl (*E*)-2-(3-methoxyphenyl)-*N*-tosylethanimidothioate **1d** (50.0 mg, 0.110 mmol), tripotassium phosphate (46.7 mg, 0.22 mmol) and (1-azidovinyl)benzene **2a** (47.8 mg, 0.329 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3da** (37.3 mg, 76% yield) as a yellow solid. m.p. 67-69 ºC；^{1}H NMR (400 MHz, $CDCl_3$) δ 7.40-7.32 (m, 5H), 7.19-7.11 (m, 4H), 7.08 (t, *J* = 8.1 Hz, 1H), 6.96 (d, *J* = 8.0 Hz, 2H), 6.78 (dd, *J* = 8.1, 1.5 Hz, 1H), 6.59 (br, 1H), 5.72 (s, 1H), 5.59 (s, 1H), 3.75 (s, 3H), 2.29 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 159.0, 143.3, 141.5, 140.1, 137.1, 134.8, 130.4, 129.3 (CH×4), 128.6 (CH×2), 128.2, 126.4 (CH×2), 125.9 (CH×2), 118.7, 115.6, 113.9, 111.2, 55.1, 20.9；IR (ATR) ν 3244, 3063, 3000, 2959, 2927, 2836, 1585, 1495, 1447, 1370, 1335, 1292, 1243, 1162, 1091, 1050；HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{24}H_{22}N_4O_3S$: 446.1413, found: 446.1411.

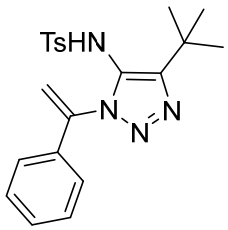
4-Methyl-_N_-(4-(naphthalen-2-yl)-1-(1-phenylvinyl)-1H-1,2,3-triazol-5-yl)benzenesulfonamide (3ea)



3ea

Following the General Procedure II, using 4-methoxybenzyl (*E*)-2-(naphthalen-2-yl)-*N*-tosylethanimidothioate **1e** (50.0 mg, 0.105 mmol), tripotassium phosphate (44.6 mg, 0.21 mmol) and (1-azidovinyl)benzene **2a** (45.8 mg, 0.315 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3ea** (37.2 mg, 76% yield) as a white solid. m.p. 204-205 ºC；^{1}H NMR (400 MHz, d$_6$-DMSO) δ 7.98 (s, 1H), 7.86-7.81 (m, 1H), 7.73-7.64 (m, 3H), 7.48-7.46 (m, 2H), 7.40-7.38 (m, 3H), 7.27 (d, *J* = 8.2 Hz, 2H), 7.23-7.21 (m, 2H), 6.66 (d, *J* = 8.2 Hz, 2H), 6.17 (s, 1H), 5.64 (s, 1H), 1.72 (s, 3H)；^{13}C NMR (100 MHz, d$_6$-DMSO) δ 143.2, 141.3, 140.2, 137.4, 134.9, 132.6, 132.4, 129.3, 129.1 (CH×2), 128.7, 128.6 (CH×2), 128.1, 127.7, 127.5, 126.6, 126.3 (CH×3), 126.2, 126.0 (CH×2), 125.2, 124.0, 115.5, 20.5；IR (ATR) ν 3000, 2926, 2824, 2755, 1580, 1421, 1345, 1248, 1163, 1092, 1019；HRMS (EI) m/z：$[M+H]^+$ calcd. for $C_{27}H_{22}N_4O_2S$: 466.1463, found: 466.1471.

_N_-(4-(tert-Butyl)-1-(1-phenylvinyl)-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (3fa)

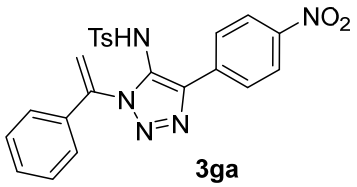


3fa

Following the General Procedure II, using 4-methylbenzyl (*E*)-3,3-dimethyl-*N*-tosylbutanimidothioate **1f** (50.0 mg, 0.128 mmol), tripotassium phosphate (54.3 mg, 0.256 mmol) and (1-azidovinyl)benzene **2a** (55.9 mg, 0.385 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3fa** (34.0 mg, 67% yield) as a white solid. m.p. 77-79 ºC；^{1}H NMR (400 MHz, d$_6$-DMSO) δ 10.13 (s, 1H), 7.42 (d, *J* = 8.1 Hz, 2H), 7.32-7.25 (m, 3H), 7.11 (d, *J* = 8.0 Hz, 2H), 6.90 (d, *J* = 7.3

Hz, 2H), 5.74 (s, 1H), 5.29 (s, 1H), 2.24 (s, 3H), 1.26 (s, 9H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 150.5, 143.2, 140.0, 138.1, 134.5, 129.3 (CH×2), 129.1, 128.2 (CH×2), 126.8, 126.6 (CH×2), 125.7 (CH×2), 114.6, 31.4, 39.8, 21.0；IR (ATR) ν 3247, 3065, 2960, 2871, 1567, 1447, 1394, 1337, 1271, 1157, 1091, 1021；HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{21}H_{24}N_4O_2S$: 396.1620, found: 396.1617.

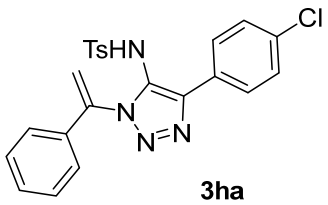
4-Methyl-*N*-(4-(4-nitrophenyl)-1-(1-phenylvinyl)-1H-1,2,3-triazol-5-yl)benzenesulfonamide (3ga)



3ga

Following the General Procedure II, using 4-methoxybenzyl (*E*)-2-(4-nitrophenyl)-*N*-tosylethanimidothioate **1g** (50.0 mg, 0.106 mmol), tripotassium phosphate (45.0 mg, 0.212 mmol) and (1-azidovinyl)benzene **2a** (46.3 mg, 0.319 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3ga** (27.4 mg, 56% yield) as a white solid. m.p. 205-206 °C；^{1}H NMR (400 MHz, d_6-DMSO) δ 10.91 (br, 1H), 8.04 (d, *J* = 8.7 Hz, 2H), 7.77 (d, *J* = 8.8 Hz, 2H), 7.43-7.42 (m, 3H), 7.33 (d, *J* = 8.1 Hz, 2H), 7.24-7.22 (m, 2H), 6.98 (d, *J* = 8.1 Hz, 2H), 6.24 (s, 1H), 5.67 (s, 1H), 2.10 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 146.4, 143.7, 139.9, 139.5, 137.1, 135.7, 134.6, 129.8, 129.4 (CH×2), 128.7 (CH×2), 127.1 (CH×2), 126.6 (CH×2), 126.0 (CH×2), 123.5 (CH×2), 116.0, 20.6；IR (ATR) ν 3000, 2937, 2829, 2755, 1601, 1574,1516, 1420, 1344, 1263, 1239, 1166, 1094；HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{23}H_{19}N_5O_4S$: 461.1158, found: 461.1161.

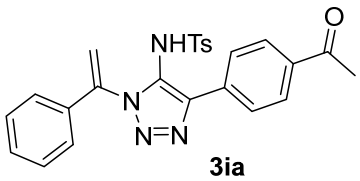
***N*-(4-(4-Chlorophenyl)-1-(1-phenylvinyl)-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (3ha)**



3ha

Following the General Procedure II, using 4-methoxybenzyl (*E*)-2-(4-chlorophenyl)-*N*-tosylethanimidothioate **1h** (50.0 mg, 0.109 mmol), tripotassium phosphate (46.3 mg, 0.218 mmol) and (1-azidovinyl)benzene **2a** (47.5 mg, 0.326 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3ha** (31.9 mg, 65% yield) as a yellow solid. m.p. 189-191 °C；^{1}H NMR (400 MHz, d_6-DMSO) δ 10.73 (br, 1H), 7.52 (d, *J* = 8.4 Hz, 2H), 7.43 -7.41 (m, 3H), 7.32 (d, *J* = 8.0 Hz, 2H), 7.26 – 7.21 (m, 4H), 7.01 (d, *J* = 7.9 Hz, 2H), 6.20 (s, 1H), 5.63 (s, 1H), 2.24 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 143.7, 140.5, 140.0, 137.3, 134.7, 132.7, 129.3 (CH×3), 128.6 (CH×2), 128.5, 128.3 (CH×2), 128.0, 127.8 (CH×2), 126.5 (CH×2), 125.9 (CH×2), 115.7, 21.0；IR (ATR) ν 3109, 3067, 2925, 2829, 1633, 1597, 1494, 1367, 1336, 1163, 1087；HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{23}H_{19}ClN_4O_2S$: 450.0917, found: 450.0912.

***N*-(4-(4-Acetylphenyl)-1-(1-phenylvinyl)-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (3ia)**

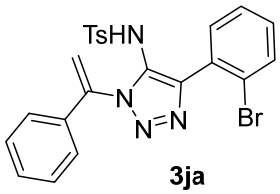


3ia

Following the General Procedure II, using 4-methoxybenzyl (*E*)-2-(4-acetylphenyl)-*N*-tosylethanimidothioate **1i** (50.0 mg, 0.107 mmol), tripotassium phosphate (45.4 mg, 0.214 mmol) and (1-azidovinyl)benzene **2a** (46.6 mg, 0.321 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3ia** (33.4 mg, 68%

yield) as a white solid. m.p. 193-194 ºC；^{1}H NMR (400 MHz, d_6-DMSO) δ 10.82 (br, 1H), 7.78 (d, *J* = 8.4 Hz, 2H), 7.68 (d, *J* = 8.3 Hz, 2H), 7.43-7.41 (m, 3H), 7.32 (d, *J* = 8.2 Hz, 2H), 7.23-7.21 (m, 2H), 6.97 (d, *J* = 8.1 Hz, 2H), 6.20 (s, 1H), 5.64 (s, 1H), 2.59 (s, 3H), 2.10 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 197.4, 143.5, 140.5, 140.0, 137.1, 135.7, 134.7, 133.6, 129.4 (CH×3), 129.1, 128.6 (CH×2), 128.1 (CH×2), 126.5 (CH×2), 126.1 (CH×2), 125.9 (CH×2), 115.8, 26.7, 20.7；IR (ATR) ν 3133, 3061, 2964, 2928, 2858, 1674, 1614, 1404, 1361, 1265, 1166, 1094；HRMS (EI) m/z：$[M+H]^+$ calcd. for $C_{25}H_{22}N_4O_3S$: 458.1413, found: 458.1418.

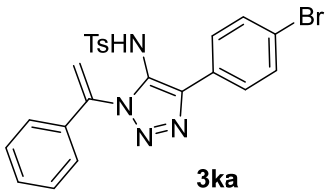
***N*-(4-(2-Bromophenyl)-1-(1-phenylvinyl)-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (3ja)**



3ja

Following the General Procedure II, using 4-methoxybenzyl (*E*)-2-(2-bromophenyl)-*N*-tosylethanimidothioate **1j** (50.0 mg, 0.099 mmol), tripotassium phosphate (42.0 mg, 0.198 mmol) and (1-azidovinyl)benzene **2a** (43.1 mg, 0.297 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3ja** (36.8 mg, 75% yield) as a yellow solid. m.p. 81-83 ºC；^{1}H NMR (400 MHz, d_6-DMSO) δ 10.65 (br, 1H), 7.51-7.47 (m, 1H), 7.44-7.41 (m, 3H), 7.29 (d, *J* = 8.2 Hz, 2H), 7.25-7.19 (m, 5H), 6.97 (d, *J* = 8.0 Hz, 2H), 6.25 (s, 1H), 5.63 (s, 1H), 2.23 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 142.9, 141.5, 139.5, 137.0, 134.8, 132.7, 131.8, 130.1 (CH, C), 129.7, 129.3, 129.2 (CH×2), 128.6 (CH×2), 127.3, 126.0 (CH×2), 125.8 (CH×2), 122.9, 115.7, 21.0；IR (ATR) ν 3202, 3078, 2921, 2854, 1667, 1599, 1478, 1446, 1365, 1338, 1158, 1091, 1046, 1028；HRMS (EI) m/z：$[M+H]^+$ calcd. for $C_{23}H_{19}BrN_4O_2S$: 494.0412, found: 494.0406.

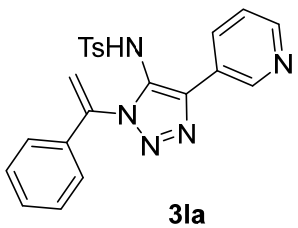
_N_-(4-(4-Bromophenyl)-1-(1-phenylvinyl)-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (3ka)



3ka

Following the General Procedure II, using 4-methoxybenzyl (*E*)-2-(4-bromophenyl)-*N*-tosylethanimidothioate **1k** (50.0 mg, 0.099 mmol), tripotassium phosphate (42.0 mg, 0.198 mmol) and (1-azidovinyl)benzene **2a** (43.1 mg, 0.297 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3ka** (34.3 mg, 70% yield) as a yellow solid. m.p. 200-201 °C；^{1}H NMR (400 MHz, d_6-DMSO) δ 10.73 (br, 1H), 7.47-7.41 (m, 5H), 7.38 (d, *J* = 8.4 Hz, 2H), 7.32 (d, *J* = 8.1 Hz, 2H), 7.22 (m, 2H), 7.01 (d, *J* = 8.0 Hz, 2H), 6.20 (s, 1H), 5.63 (s, 1H), 2.25 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 143.7, 140.5, 140.0, 137.2, 134.7, 131.2 (CH×2), 129.3 (CH×3), 128.6 (CH×2), 128.5, 128.4, 128.1 (CH×2), 126.5 (CH×2), 126.0 (CH×2), 121.3, 115.7, 21.1；IR (ATR) ν 3108, 3057, 2923, 2851, 1598, 1489, 1398, 1367, 1335, 1258；HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{23}H_{19}BrN_4O_2S$: 494.0412, found: 494.0403.

4-Methyl-_N_-(1-(1-phenylvinyl)-4-(pyridin-3-yl)-1H-1,2,3-triazol-5-yl)benzenesulfonamide (3la)

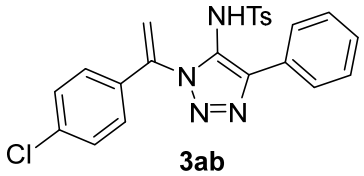


3la

Following the General Procedure II, using 4-methoxybenzyl (*E*)-2-(pyridin-3-yl)-*N*-tosylethanimidothioate **1i** (50.0 mg, 0.117 mmol), tripotassium phosphate (49.7 mg, 0.234 mmol) and (1-azidovinyl)benzene **2a** (51.1 mg, 0.352 mmol). The crude was

purified by column chromatography (hexane/EtOAc, 3:1) to afford **3ia** (29.3 mg, 60% yield) as a yellow solid. m.p. 183-185 ºC ; ^{1}H NMR (400 MHz, d$_6$-DMSO) δ 8.77 (s, 1H), 8.44 (s, 1H), 7.86 (d, *J* = 7.2 Hz, 1H), 7.42 (s, 3H), 7.33 (d, *J* = 7.6 Hz, 2H), 7.22 (s, 3H), 6.97 (d, *J* = 7.6 Hz, 2H), 6.18 (s, 1H), 5.63 (s, 1H), 2.18 (s, 3H) ; ^{13}C NMR (100 MHz, d$_6$-DMSO) δ 148.5, 146.9, 143.5, 140.0, 139.0, 136.9, 134.7, 133.3, 129.4 (CH×2), 129.3, 129.2, 128.6 (CH×2), 126.5 (CH×2), 125.9 (CH×2), 125.3, 123.2, 115.7, 20.9 ; IR (ATR) ν 3061, 2925, 2853, 1709, 1599, 1447, 1342, 1259, 1164, 1091 ; HRMS (ESI) m/z : $[M+H]^+$ calcd. for $C_{22}H_{19}N_5O_2S$: 417.1259, found: 417.1253.

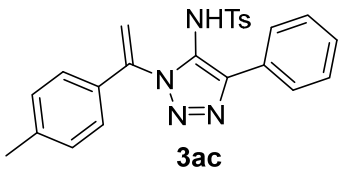
***N*-(1-(1-(4-Chlorophenyl)vinyl)-4-phenyl-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (3ab)**



3ab

Following the General Procedure II, using 4-methoxybenzyl (*E*)-2-phenyl-*N*-tosylethanimidothioate **1a** (50.0 mg, 0.117 mmol), tripotassium phosphate (49.7 mg, 0.234 mmol) and 1-(1-azidovinyl)-4-chlorobenzene **2b** (63.2 mg, 0.352 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3ab** (38.0 mg, 72% yield) as a white solid. m.p. 189-190 ºC ; ^{1}H NMR (400 MHz, d$_6$-DMSO) δ 10.69 (br, 1H), 7.58 (d, *J* = 8.3 Hz, 2H), 7.47 (d, *J* = 8.7 Hz, 2H), 7.32 (d, *J* = 8.3 Hz, 2H), 7.26 -7.17 (m, 5H), 6.97 (d, *J* = 8.0 Hz, 2H), 6.17 (d, *J* = 1.7 Hz, 1H), 5.63 (d, *J* = 1.7 Hz, 1H), 2.19 (s, 3H) ; ^{13}C NMR (100 MHz, d$_6$-DMSO) δ 143.5, 141.6, 139.0, 137.0, 134.0, 133.5, 129.4 (CH×2), 129.0, 128.6 (CH×2), 128.3 (CH×2), 128.0, 127.9, 127.8 (CH×2), 126.5 (CH×2), 126.1 (CH×2), 116.1, 20.9 ; IR (ATR) ν 3229, 3070, 2918, 1598, 1492, 1398, 1369, 1170, 1088, 1014 ; HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{23}H_{19}ClN_4O_2S$: 450.0917, found: 450.0927.

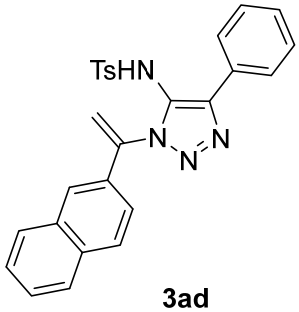
4-Methyl-*N*-(4-phenyl-1-(1-(*p*-tolyl)vinyl)-1H-1,2,3-triazol-5-yl)benzenesulfonamide (3ac)



3ac

Following the General Procedure II, using **1a** (50.0 mg, 0.117 mmol), tripotassium phosphate (49.7 mg, 0.234 mmol) and 1-(1-azidovinyl)-4-methylbenzene **2c** (56.0 mg, 0.352 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3ac** (40.3 mg, 80% yield) as a white solid. m.p. 139-141 °C；^{1}H NMR (400 MHz, d_6-DMSO) δ 10.64 (br, 1H), 7.57 (d, *J* = 7.3 Hz, 2H), 7.31 (d, *J* = 8.1 Hz, 2H), 7.26 – 7.18 (m, 5H), 7.05 (d, *J* = 8.0 Hz, 2H), 6.97 (d, *J* = 8.1 Hz, 2H), 6.08 (s, 1H), 5.52 (s, 1H), 2.34 (s, 3H), 2.19 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 143.3, 141.4, 140.0, 138.9, 137.2, 132.0, 129.3, (CH×2) 129.2, 129.1 (CH×2), 128.2 (CH×2), 128.1, 127.7, 126.4 (CH×2), 126.1 (CH×2), 125.8 (CH×2), 114.5, 20.9, 20.8；IR (ATR) ν 3269, 3032, 2922, 2824, 2742, 1598, 1495, 1342, 1240, 1165, 1092；HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{24}H_{22}N_4O_2S$: 430.1463, found: 430.1458.

4-Methyl-*N*-(1-(1-(naphthalen-2-yl)vinyl)-4-phenyl-1H-1,2,3-triazol-5-yl)benzenesulfonamide (3ad)

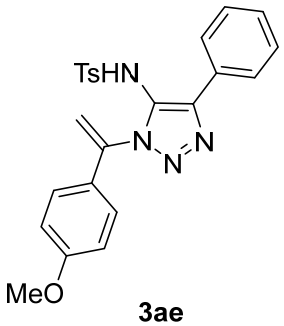


3ad

Following the General Procedure II, using **1a** (50.0 mg, 0.117 mmol), tripotassium phosphate (49.7 mg, 0.234 mmol) and 2-(1-azidovinyl)naphthalene **2d** (68.7 mg, 0.352

mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3ad** (49.1 mg, 90% yield) as an orange solid. m.p. 188-189 ºC；^{1}H NMR (400 MHz, d_6-DMSO) δ 10.68 (br, 1H), 7.94 (d, *J* = 8.4 Hz, 2H), 7.92 - 7.87 (m, 1H), 7.69-7.65 (m, 2H), 7.58 - 7.51 (m, 3H), 7.45 (dd, *J* = 8.7, 1.9 Hz, 1H), 7.34 (d, *J* = 8.3 Hz, 2H), 7.30 -7.22 (m, 3H), 6.92 (d, *J* = 8.0 Hz, 2H), 6.29 (d, *J* = 1.5 Hz, 1H), 5.71 (d, *J* = 1.5 Hz, 1H), 2.10 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 143.4, 141.6, 140.1 137.1, 133.1, 132.5, 132.0, 129.3, 129.7, 128.6, 128.3, 128.2, 128.1, 127.8, 127.5, 127.0, 126.7, 126.5, 126.2, 125.3, 123.4, 116.2, 20.8；IR (ATR) ν 3059, 2922, 1636, 1598, 1495, 1402, 1340, 1250, 1162, 1092；HRMS (EI) m/z：$[M+H]^+$ calcd. for $C_{27}H_{22}N_4O_2S$: 466.1463, found: 466.1467.

***N*-(1-(1-(4-Methoxyphenyl)vinyl)-4-phenyl-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (3ae)**

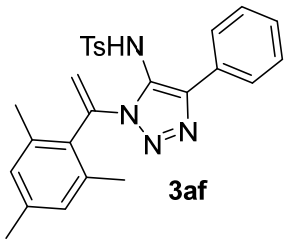


3ae

Following the General Procedure II, using **1a** (50.0 mg, 0.117 mmol), tripotassium phosphate (49.7 mg, 0.234 mmol) and 1-(1-azidovinyl)-4-methoxybenzene **2e** (61.7 mg, 0.352 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3ae** (26.1 mg, 50% yield) as a yellow solid. m.p. 149-151 ºC；^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (dd, *J* = 7.9, 1.4 Hz, 2H), 7.34 (d, *J* = 8.3 Hz, 2H), 7.27 - 7.15 (m, 3H), 7.04 (d, *J* = 8.7 Hz, 2H), 6.96 (d, *J* = 8.3 Hz, 2H), 6.85 (d, *J* = 8.8 Hz, 2H), 5.55 (d, *J* = 1.0 Hz, 1H), 5.40 (d, *J* = 1.0 Hz, 1H), 3.80 (s, 3H), 2.28 (s, 3H)；^{13}C NMR (100 MHz, $CDCl_3$) δ 160.9, 144.6, 143.0, 140.4, 136.0, 129.6 (CH×2), 129.1, 128.4 (CH×2),

128.3, 127.6 (CH×2), 127.5 (CH×2), 127.0, 126.8 (CH×2, C), 114.5 (CH×2), 113.0, 55.5, 21.6；IR (ATR) ν 3067, 3000, 2934, 2833, 1642, 1606, 1512,1424, 1341, 1250, 1164, 1091, 1030；HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{24}H_{22}N_4O_3S$: 446.1413, found: 446.1421.

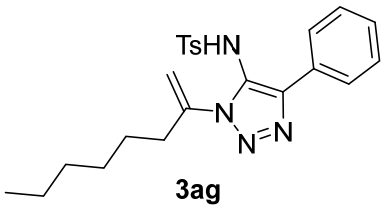
_N_-(1-(1-Mesitylvinyl)-4-phenyl-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (3af)



3af

Following the General Procedure II, using **1a** (50.0 mg, 0.117 mmol), tripotassium phosphate (49.7 mg, 0.234 mmol) and 2-(1-azidovinyl)-1,3,5-trimethylbenzene **2f** (65.9 mg, 0.352 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3af** (39.7 mg, 74% yield) as a white solid. m.p. 227-228 ºC. ^{1}H NMR (400 MHz, d_6-DMSO) δ 10.48 (br, 1H), 7.34 (d, *J* = 7.5 Hz, 2H), 7.26 (d, *J* = 8.1 Hz, 2H), 7.15 (t, *J* = 7.3 Hz, 1H), 7.04 (t, *J* = 7.6 Hz, 2H), 6.94 - 6.87 (m, 4H), 6.33 (s, 1H), 5.44 (s, 1H), 2.26 (s, 3H), 2.16 (s, 3H), 2.13 (s, 6H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 143.4, 142.2, 139.2, 137.7, 137.2, 136.7, 132.1, 129.3 (CH×2), 129.0, 128.6 (CH×2), 128.0 (CH×2), 127.3, 127.1, 126.5 (CH×2), 126.4 (CH×2), 114.6, 20.9, 20.7, 19.8 (CH_3×2)；IR (ATR) ν 3133, 2998, 2966, 2922, 2857, 2814, 2739, 1648, 1495, 1427, 1266, 1166, 1092, 1054. HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{26}H_{26}N_4O_2S$: 458.1776, found: 458.1773.

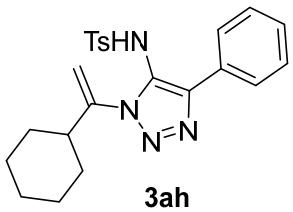
4-Methyl-*N*-(1-(oct-1-en-2-yl)-4-phenyl-1H-1,2,3-triazol-5-yl)benzenesulfonamide (3ag)



3ag

Following the General Procedure II, using **1a** (50.0 mg, 0.117 mmol), tripotassium phosphate (49.7 mg, 0.234 mmol) and 2-azidooct-1-ene **2g** (53.9 mg, 0.352 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3ag** (27.3 mg, 55% yield) as a white solid. m.p. 137-138 ºC；^{1}H NMR (400 MHz, $CDCl_3$) δ 7.38 - 7.28 (m, 4H), 7.16 (t, *J* = 7.3 Hz, 1H), 7.08 (t, *J* = 7.4 Hz, 2H), 6.88 (d, *J* = 8.0 Hz, 2H), 5.34 (s, 1H), 5.26 (s, 1H), 2.59 (t, *J* = 7.6 Hz, 2H), 2.26 (s, 3H), 1.53 – 1.48 (m, 2H), 1.41-1.23 (m, 6H), 0.89 (t, *J* = 6.8 Hz, 3H)；^{13}C NMR (100 MHz, $CDCl_3$) δ 144.5, 143.1, 142.7, 135.8, 129.5 (CH×2), 129.1, 128.4 (CH×2), 128.0, 127.4 (CH×2), 126.9 (CH×2), 126.1, 112.1, 34.5, 31.7, 28.8, 26.6, 22.7, 21.6, 14.2；IR (ATR) ν 3060, 2961, 2921, 2854, 1670, 1596, 1493, 1434, 1342, 1291, 1165, 1088；HRMS (EI) m/z: $[M+H]^+$ calcd. for $C_{23}H_{28}N_4O_2S$: 424.1933, found: 424.1938.

***N*-(1-(1-Cyclohexylvinyl)-4-phenyl-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (3ah)**

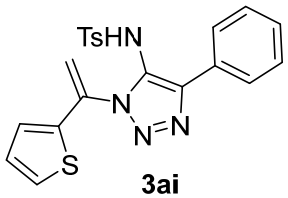


3ah

Following the General Procedure II, using **1a** (50.0 mg, 0.117 mmol), tripotassium phosphate (49.7 mg, 0.234 mmol) and (1-azidovinyl)cyclohexane **2h** (53.2 mg, 0.352 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to

afford **3ah** (19.8 mg, 40% yield) as a white solid. m.p. 199-200 ºC；^{1}H NMR (400 MHz, d_6-DMSO) δ 10.60 (br, 1H), 7.52 (d, *J* = 6.9 Hz, 2H), 7.36 (d, *J* = 8.2 Hz, 2H), 7.24-7.15 (m, 3H), 7.06 (d, *J* = 8.2 Hz, 2H), 5.33 (s, 1H), 5.26 (s, 1H), 2.53 – 2.46 (m, 1H), 2.23 (s, 3H), 1.69 – 1.54 (m, 5H), 1.24 - 0.99 (m, 6H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 146.5, 143.4, 141.8, 137.5, 129.4 (CH×2), 129.3, 128.2 (CH×2), 127.7, 127.0, 126.5 (CH×2), 126.2 (CH×2), 111.8 (CH_2), 41.2, 30.4, 25.7, 20.9. IR (ATR) ν 3059, 2924, 2854, 1656, 1496, 1451, 1423, 1346, 1165, 1091. HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{23}H_{26}N_4O_2S$: 422.1776, found: 422.1767.

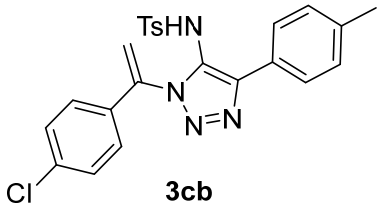
4-Methyl-*N*-(4-phenyl-1-(1-(thiophen-2-yl)vinyl)-1H-1,2,3-triazol-5-yl)benzenesulfonamide (3ai)



3ai

Following the General Procedure II, using **1a** (50.0 mg, 0.117 mmol), tripotassium phosphate (49.7 mg, 0.234 mmol) and 2-(1-azidovinyl)thiophene **2i** (53.2 mg, 0.352 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3ai** (26.2 mg, 53% yield) as a brown solid. m.p. 165-167 ºC；^{1}H NMR (400 MHz, d_6-DMSO) δ 10.74 (br, 1H), 7.63 – 7.60 (m, 3H), 7.33 (d, *J* = 8.2 Hz, 2H), 7.28 - 7.20 (m, 3H), 7.06 (dd, *J* = 5.0, 3.8 Hz, 1H), 6.99 (d, *J* = 8.1 Hz, 2H), 6.89 - 6.84 (m, 1H), 5.96 (s, 1H), 5.45 (s, 1H), 2.21 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 143.4, 141.4, 138.1, 137.1, 134.7, 129.3 (CH×2), 129.1, 128.3 (CH×2), 127.9, 127.8 (CH, C), 127.7, 126.8, 126.4 (CH×2), 126.2 (CH×2), 113.9, 20.9. IR (ATR) ν 3112, 3039, 2922, 2850, 1630, 1498, 1435, 1372, 1337, 1234, 1163, 1090. HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{21}H_{18}N_4O_2S_2$: 422.0817, found: 422.0868.

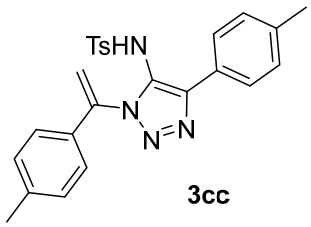
***N*-(1-(1-(4-Chlorophenyl)vinyl)-4-(*p*-tolyl)-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (3cb)**



3cb

Following the General Procedure II, using 4-methoxybenzyl (*Z*)-2-(p-tolyl)-*N*-tosylethanimidothioate **1c** (50.0 mg, 0.114 mmol), tripotassium phosphate (48.4 mg, 0.228 mmol) and 1-(1-azidovinyl)-4-chlorobenzene **2b** (61.2 mg, 0.341mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3cb** (43.5 mg, 82% yield) as a white solid. m.p. 202-203 °C. ^{1}H NMR (400 MHz, d$_6$-DMSO) δ 10.64 (br, 1H), 7.48 - 7.44 (m, 4H), 7.32 (d, *J* = 8.1 Hz, 2H), 7.20 (d, *J* = 8.5 Hz, 2H), 7.02 (d, *J*= 8.0 Hz, 2H), 6.99 (d, *J* = 8.1 Hz, 2H), 6.17 (s, 1H), 5.62 (s, 1H), 2.29 (s, 3H), 2.21 (s, 3H)；^{13}C NMR (100 MHz, d$_6$-DMSO) δ 143.4, 141.6, 139.0, 137.4, 137.3, 133.9, 133.6, 129.2 (CH×2), 128.8 (CH×2), 128.6 (CH×2), 127.8 (CH×2, C), 126.4 (CH×2), 126.3, 126.1 (CH×2), 116.0, 20.9, 20.9. IR (ATR) ν 3239, 3129, 2945, 1651, 1585, 1489, 1398, 1367, 1333, 1238, 1164, 1093. HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{24}H_{21}ClN_4O_2S$: 464.1074, found: 464.1080.

4-Methyl-*N*-(4-(p-tolyl)-1-(1-(*p*-tolyl)vinyl)-1H-1,2,3-triazol-5-yl)benzenesulfonamide (3cc)

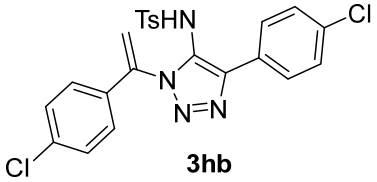


3cc

Following the General Procedure II, using **1c** (50.0 mg, 0.114 mmol), tripotassium phosphate (48.4 mg, 0.228 mmol) and 1-(1-azidovinyl)-4-methylbenzene **2c** (54.3 mg,

0.341 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3cc** (35.5 mg, 70% yield) as an orange solid. m.p. 186-187 °C. ^{1}H NMR (400 MHz, d_6-DMSO) δ 10.59 (br, 1H), 7.45 (d, *J* = 8.1 Hz, 2H), 7.31 (d, *J* = 8.2 Hz, 2H), 7.21 (d, *J* = 8.1 Hz, 2H), 7.07 (d, *J* = 8.2 Hz, 2H), 7.01 - 6.96 (m, 4H), 6.07 (s, 1H), 5.52 (s, 1H), 2.34 (s, 3H), 2.29 (s, 3H), 2.21 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 143.4, 141.6, 140.1, 138.9, 137.4, 137.3, 132.0, 129.2 (CH×2), 129.1 (CH×2), 128.8 (CH×2), 127.7, 126.4 (CH×2), 126.4, 126.1 (CH×2), 125.8 (CH×2), 114.4, 20.9, 20.9, 20.8. IR (ATR) ν 3000, 2922, 2826, 2758, 1641, 1586, 1511, 1448, 1343, 1256, 1163, 1091. HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{25}H_{24}N_4O_2S$: 444.1620, found: 444.1629.

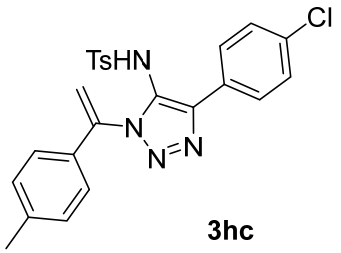
***N*-(4-(4-Chlorophenyl)-1-(1-(4-chlorophenyl)vinyl)-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (3hb)**



3hb

Following the General Procedure II, using **1h** (50.0 mg, 0.109 mmol), tripotassium phosphate (46.3 mg, 0.218 mmol) and 1-(1-azidovinyl)-4-chlorobenzene **2b** (58.6 mg, 0.326 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3hb** (31.7 mg, 60% yield) as a white solid. m.p. 206-207 °C. ^{1}H NMR (400 MHz, d_6-DMSO) δ 10.75 (br, 1H), 7.53 (d, *J* = 8.4 Hz, 2H), 7.48 (d, *J* = 8.5 Hz, 2H), 7.32 (d, *J* = 8.0 Hz, 2H), 7.25 (d, *J* = 8.7 Hz, 2H), 7.23 (d, *J* = 8.7 Hz, 2H), 7.00 (d, *J* = 8.0 Hz, 2H), 6.23 (s, 1H), 5.67 (s, 1H), 2.23 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 143.7, 140.5, 138.9, 137.1, 134.0, 133.5, 132.8, 129.3 (CH×2), 128.6 (CH×2), 128.4, 128.3 (CH×2), 127.9, 127.8 (CH×4), 126.5 (CH×2), 116.3, 21.0. IR (ATR) ν 3053, 3972, 2923, 2826, 2751, 1644, 1596, 1489, 1367, 1165, 1086. HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{23}H_{18}Cl_2N_4O_2S$: 484.0528, found: 484.0520.

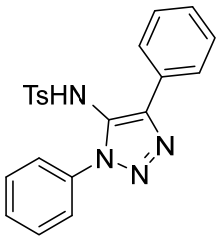
***N*-(4-(4-Chlorophenyl)-1-(1-(*p*-tolyl)vinyl)-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (3hc)**



3hc

Following the General Procedure II, using 4-methoxybenzyl (*Z*)-2-(4-chlorophenyl)-*N*-tosylethanimidothioate **1h** (50.0 mg, 0.109 mmol), tripotassium phosphate (46.3 mg, 0.218 mmol) and 1-(1-azidovinyl)-4-methylbenzene **2c** (51.9 mg, 0.326 mmol). The crude was purified by column chromatography (hexane/EtOAc, 3:1) to afford **3hc** (32.4 mg, 64% yield) as a yellow solid. m.p. 191-192 ºC. ^{1}H NMR (400 MHz, d$_6$-DMSO) δ 10.68 (br, 1H), 7.52 (d, *J* = 8.4 Hz, 2H), 7.31 (d, *J* = 8.0 Hz, 2H), 7.24 - 7.21 (m, 4H), 7.09 (d, *J* = 8.0 Hz, 2H), 7.00 (d, *J* = 8.3 Hz, 2H), 6.12 (s, 1H), 5.56 (s, 1H), 2.34 (s, 3H), 2.24 (s, 3H)；^{13}C NMR (100 MHz, d$_6$-DMSO) δ 144.7, 140.5, 140.0, 139.0, 137.3, 132.7, 132.0, 129.3 (CH×2), 129.2 (CH×2), 128.4, 128.3 (CH×2), 128.0, 127.8 (CH×2), 126.5 (CH×2), 125.8 (CH×2), 114.7, 21.0, 20.8. IR (ATR) ν 3031, 2920, 2836, 2782, 1641, 1610, 1493, 1340, 1250, 1163, 1090. HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{24}H_{21}ClN_4O_2S$: 464.1074, found: 464.1068.

***N*-(1,4-Diphenyl-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (5aa)**

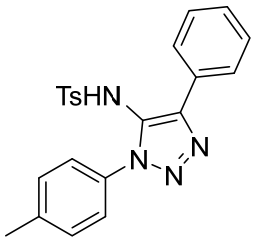


5aa

Following the General Procedure III, using *N*-sulfonylthioimidate **1a′** (100.0 mg, 0.253 mmol), tripotassium phosphate (107.4 mg, 0.506 mmol) and azidobenzene **4a** (90.3 mg,

0.758 mmol). The crude was purified by column chromatography (hexane/EtOAc, 4:1) to afford **5aa** (69.2 mg, 70% yield) as a white solid. m.p. 235-236 °C. ^{1}H NMR (400 MHz, d-acetone) δ 9.28 (br, 1H), 7.79 – 7.76 (m, 2H), 7.62 – 7.56 (m, 2H), 7.55 – 7.51 (m, , 3H), 7.34 – 7.23 (m, 5H), 6.99 (d, *J* = 7.9 Hz, 2H), 2.29 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 143.5, 142.4, 136.9, 135.1, 129.5 (CH×2), 129.4, 129.3, 128.5, 128.1, 127.3, 126.3, 126.3, 124.8, 21.0. IR (ATR) ν 3261, 1699, 1601, 1373, 1336, 1161, 830, 725, 695. HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{21}H_{18}N_4O_2S$: 390.1150, found: 390.1156.

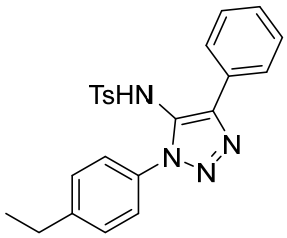
4-Methyl-*N*-(4-phenyl-1-(p-tolyl)-1H-1,2,3-triazol-5-yl)benzenesulfonamide (5ab)



5ab

Following the General Produce III, using benzyl (Z)-2-phenyl-N-tosylethanimidothioate **1a′** (100.0 mg, 0.253 mmol), tripotassium phosphate (107.4 mg, 0.506 mmol) and 1-azido-4-methylbenzene **4b** (100.9 mg, 0.758 mmol) and DMSO (0.843 ml, 0.3M). The crude was purified by column chromatography (hexane/EtOAc, 4:1) to afford **5ab** (75.7 mg, 74% yield) as a white solid. m.p. 212-213 °C. ^{1}H NMR (400 MHz, d-acetone) δ 9.25 (br, 1H), 7.83 – 7.78 (m, 2H), 7.43 (d, *J* = 8.3 Hz, 2H), 7.31 – 7.28 (m, 7H), 7.01 (d, *J* = 8.0 Hz, 2H), 2.44 (s, 3H), 2.31 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 144.4, 143.3, 140.4, 137.5, 133.0, 130.5, 130.1, 129.7, 129.3, 129.0, 128.0, 126.9, 126.8, 125.2, 21.6, 21.4. IR (ATR) ν 3049, 1512, 1340, 1165, 1093, 986, 817, 727, 697, 656. HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{22}H_{20}N_4O_2S$: 404.1307, found: 404.1302.

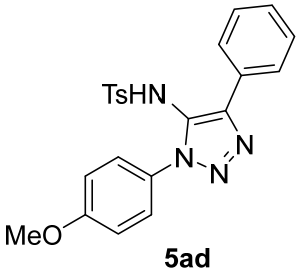
***N*-(1-(4-Ethylphenyl)-4-phenyl-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (5ac)**



5ac

Following the General Procedure III, using benzyl (Z)-2-phenyl-N-tosylethanimidothioate **1a′** (100.0 mg, 0.253 mmol), tripotassium phosphate (107.4 mg, 0.506 mmol) and 1-azido-4-ethylbenzene **4c** (111.6 mg, 0.758 mmol). The crude was purified by column chromatography (hexane/EtOAc, 4:1) to afford **5ac** (75.2 mg, 71% yield) as a white solid. m.p. 213-214 ºC. ^{1}H NMR (400 MHz, d_6-DMSO) δ 10.78 (br, 1H), 7.78 – 7.70 (m, 2H), 7.40 (d, *J* = 8.4 Hz, 2H), 7.33 – 7.28 (m, 5H), 7.21 (d, *J* = 8.3 Hz, 2H), 6.95 (d, *J* = 8.0 Hz, 2H), 2.69 (q, *J* = 7.6 Hz, 2H), 2.23 (s, 3H), 1.24 (t, *J* = 7.6 Hz, 3H). ; ^{13}C NMR (100 MHz, d_6-DMSO) δ 145.2, 143.2, 142.3, 137.0, 132.7, 129.4, 129.3, 128.4, 128.4, 127.9, 127.1, 126.1 (CH×2), 124.6, 27.8, 20.9, 15.3. IR (ATR) ν 3057, 1735, 1596, 1569, 1514, 1341, 1165, 1091, 986, 880, 838, 815, 724, 693, 661. HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{23}H_{22}N_4O_2S$: 418.1463, found: 418.1461.

***N*-(1-(4-Methoxyphenyl)-4-phenyl-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (5ad)**

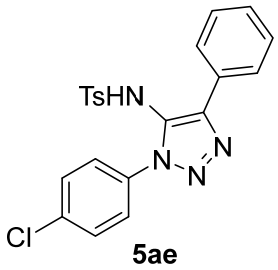


5ad

Following the General Procedure III, benzyl (Z)-2-phenyl-N-tosylethanimidothioate **1a′** (100.0 mg, 0.253 mmol), tripotassium phosphate (107.4 mg, 0.506 mmol) and 1-azido-4-methoxybenzene **4d** (113.1 mg, 0.758 mmol). The crude was purified by column

chromatography (hexane/EtOAc, 4:1) to afford **5ad** (75.5 mg, 71% yield) as a white solid. m.p. 203-204 ºC. ^{1}H NMR (400 MHz, d-acetone) δ 7.83 – 7.76 (m, 2H), 7.46 (d, *J* = 9.1 Hz, 2H), 7.34 – 7.26 (m, 5H), 7.04 – 6.98 (m, 4H), 3.90 (s, 3H), 2.30 (s, 3H). ; ^{13}C NMR (100 MHz, d_6-DMSO) δ 159.8, 143.2, 142.1, 137.2, 129.4, 129.4, 128.4, 127.9, 127.9, 127.3, 126.2, 126.2, 126.1, 114.3, 55.6, 20.9. IR (ATR) ν 3241, 1598, 1515, 1252, 1164, 815, 693, 1489. HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{22}H_{20}N_4O_3S$: 420.1256, found: 420.1253.

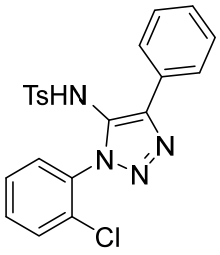
_N_-(1-(4-Chlorophenyl)-4-phenyl-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (5ae)



5ae

Following the General Procedure III, using benzyl (Z)-2-phenyl-N-tosylethanimidothioate **1a′** (100.0 mg, 0.253 mmol), tripotassium phosphate (107.4 mg, 0.506 mmol) and 1-azido-4-chlorobenzene **4e** (116.4mg, 0.758 mmol). The crude was purified by column chromatography (hexane/EtOAc, 4:1) to afford **5ae** (70.9 mg, 66% yield) as a white solid. m.p. 238-239 ºC. ^{1}H NMR (400 MHz, d-acetone) δ 7.84 – 7.80 (m, 2H), 7.62 – 7.58 (m, 2H), 7.55 – 7.51 (m, 2H), 7.35 – 7.29 (m, 5H), 7.03 (d, *J* = 8.0, 2H), 2.33 (s, 3H). ; ^{13}C NMR (100 MHz, d_6-DMSO) δ 143.5, 142.4, 136.9, 134.2, 133.7, 129.4, 129.3, 129.1, 128.4, 128.1, 127.3, 126.3, 126.1 (CH×2), 21.0. IR (ATR) ν 3061, 1743, 1580, 1492, 1405, 1339, 1163, 1091, 985, 832, 724, 695, 655. HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{21}H_{17}ClN_4O_2S$: 424.0761, found: 424.0756.

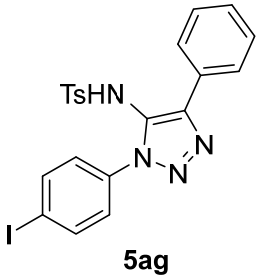
***N*-(1-(2-Chlorophenyl)-4-phenyl-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (5af)**



5af

Following the General Procedure III, using benzyl (Z)-2-phenyl-N-tosylethanimidothioate **1a′** (100.0 mg, 0.253 mmol), tripotassium phosphate (107.4 mg, 0.506 mmol) and 1-azido-2-chlorobenzene **4f** (116.4 mg, 0.758 mmol). The crude was purified by column chromatography (hexane/EtOAc, 4:1) to afford **5af** (80.6 mg, 75% yield) as a white solid. m.p. 195-196 ºC. ^{1}H NMR (400 MHz, d-acetone) δ ^{1}H NMR (400 MHz, d-acetone) δ 9.31 (s, 1H), 7.73 (dd, *J* = 7.6, 1.9 Hz, 2H), 7.65 – 7.62 (m, 2H), 7.58 – 7.53 (m, 1H), 7.35 (d, *J* = 8.4 Hz, 2H), 7.30 – 7.24 (m, 3H), 7.03 (d, *J* = 8.3 Hz, 2H), 2.29 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 143.4, 141.1, 136.8, 132.4, 132.0, 130.4, 130.1, 129.4 (CH×2), 129.0, 128.8, 128.3, 127.9, 127.9, 126.2, 126.1, 20.9. IR (ATR) ν 3043, 1589, 1489, 1341, 1159, 1087, 875, 758, 694. HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{21}H_{17}ClN_4O_2S$: 424.0761, found: 424.0764.

***N*-(1-(4-Iodophenyl)-4-phenyl-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (5ag)**

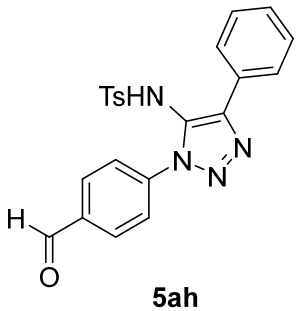


5ag

Following the General Procedure III, using benzyl (Z)-2-phenyl-N-tosylethanimidothioate **1a′** (100.0 mg, 0.253 mmol), tripotassium phosphate (107.4 mg, 0.506 mmol) and 1-azido-4-iodobenzene **4g** (185.7 mg, 0.758 mmol). The crude was

purified by column chromatography (hexane/EtOAc, 4:1) to afford **5ag** (111.0 mg, 85% yield) as a white solid. m.p. 238-239 ºC. ^{1}H NMR (400 MHz, d-acetone) δ 7.88 – 7.82 (m, 4H), 7.40 – 7.36 (m, 2H), 7.35 – 7.28 (m, 5H), 7.04 (d, *J* = 7.9 Hz, 2H), 2.36 (s, 3H) ; ^{13}C NMR (100 MHz, d_6-DMSO) δ 143.5, 142.5, 138.0, 136.9, 134.6, 129.4, 129.2, 128.4, 128.1, 127.1, 126.4, 126.2, 126.1, 96.0, 21.2. IR (ATR) ν 3076, 1743, 1592, 1489, 1403, 1339, 1157, 1088, 984, 884, 821, 723, 690, 653. HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{21}H_{17}IN_4O_2S$: 516.0117, found: 516.0120.

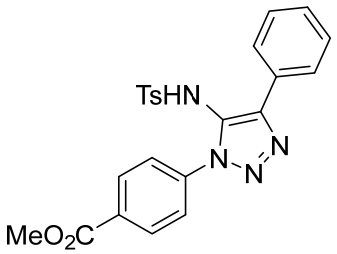
***N*-(1-(4-Formylphenyl)-4-phenyl-1H-1,2,3-triazol-5-yl)-4-methylbenzenesulfonamide (5ah)**



5ah

Following the General Procedure III, benzyl (Z)-2-phenyl-N-tosylethanimidothioate **1a′** (100.0 mg, 0.253 mmol), tripotassium phosphate (107.4 mg, 0.506 mmol) and 4-azidobenzaldehyde **4h** (111.5 mg, 0.758 mmol). The crude was purified by column chromatography (hexane/EtOAc, 4:1) to afford **5ah** (85.8 mg, 81% yield) as a white solid. m.p. 219-220 ºC. ^{1}H NMR (400 MHz, d-acetone) δ 10.16 (s, 1H), 8.08 – 8.06 (d, *J* = 8.6 Hz, 2H), 7.86 (d, *J* = 8.4 Hz, 2H), 7.82 – 7.78 (m, 2H), 7.34 – 7.29 (m, 5H), 6.99 (d, *J* = 8.0 Hz, 2H), 2.26 (s, 3H) ; ^{13}C NMR (100 MHz, d_6-DMSO) δ 192.4, 143.5, 142.7, 139.3, 136.7, 136.2, 130.4, 129.4, 129.0, 128.4, 128.2, 127.3, 126.2, 126.2, 125.0, 20.9. IR (ATR) ν 3083, 3972, 1699, 1602, 1372, 1339, 1161, 1093, 987, 725, 695, 657. HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{22}H_{18}N_4O_3S$: 418.1100, found: 418.1102.

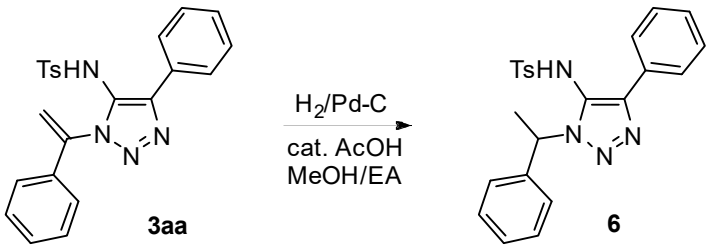
Methyl 4-(5-((4-methylphenyl)sulfonamido)-4-phenyl-1H-1,2,3-triazol-1-yl)benzoate (5ai)



5ai

Following the General Procedure III, using benzyl (Z)-2-phenyl-N-tosylethanimidothioate **1a′** (100.0 mg, 0.253 mmol), tripotassium phosphate (107.4 mg, 0.506 mmol) and methyl 4-azidobenzoate **4i** (134.3 mg, 0.758 mmol). The crude was purified by column chromatography (hexane/EtOAc, 4:1) to afford **5ai** (86.2 mg, 76% yield) as a yellow solid. m.p. 238-239 °C. ^{1}H NMR (400 MHz, d-acetone) δ 9.47 (s, 1H), 8.10 (d, *J* = 8.5 Hz, 2H), 7.84 – 7.81 (m, 2H), 7.75 (d, *J* = 8.5 Hz, 2H), 7.37 – 7.27 (m, 5H), 6.98 (d, *J* = 8.1 Hz, 2H), 3.97 (s, 3H), 2.26 (s, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 165.9, 143.9, 143.1, 138.8, 137.3, 130.6, 130.4, 129.8, 129.3, 128.9, 128.7, 127.9, 126.6, 126.4, 125.0, 53.0, 21.1. IR (ATR) ν 3291, 2919, 2850, 1614, 1531, 1236, 1094, 770, 668. HRMS (EI) m/z : $[M+H]^+$ calcd. for $C_{23}H_{20}N_4O_4S$: 448.1205, found: 448.1201.

4-Methyl-*N*-(4-phenyl-1-(1-phenylethyl)-1H-1,2,3-triazol-5-yl)benzenesulfonamide (6)

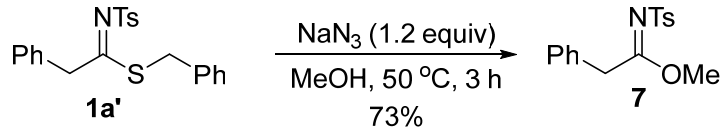


To a solution of the 4-methyl-*N*-(4-phenyl-1-(1-phenylvinyl)-1H-1,2,3-triazol-5-yl)benzenesulfonamide **3aa** (50 mg, 0.120 mmol, 1.0 equiv) in cosolvent MeOH/EA

(1/2, 0.3M) was added Pd/C catalyst (10%wt, 5.0 mg). The resulting solution was stirred at room temperature under hydrogen balloon for 24 hours. After the reaction was completed, the mixture was filtered by celite and extracted with DCM for three times and the combined organic phase was washed with brine, dried over $MgSO_4$, filtered and concentrated. The crude was purified by flash column chromatography to afford the desired product **6** (30.2 mg, 60%). ^{1}H NMR (400 MHz, d_6-DMSO) δ 10.72 (s, 1H), 7.41-7.35 (m, 4H), 7.33 (t, *J* = 6.8 Hz, 5H), 7.17 (t, *J* = 7.3 Hz, 1H), 7.10 (t, *J* = 7.3 Hz, 2H), 6.99 (d, *J* = 8.1 Hz, 2H), 5.90 (q, *J* = 7.0 Hz, 1H), 2.18 (s, 3H), 1.91 (d, *J* = 7.0 Hz, 3H)；^{13}C NMR (100 MHz, d_6-DMSO) δ 144.2, 141.7, 140.9, 136.7, 130.0 (CH×2), 129.8, 129.2 (CH×2), 128.5 (CH×2, CH), 127.9, 127.2, 127.1 (CH×2), 127.0 (CH×2), 126.5 (CH×2), 56.8, 21.8, 21.4. IR (ATR) ν 3088, 3059, 3034, 2990, 2924, 2812, 2743, 1586, 1495, 1451, 1420, 1339, 1240, 1164, 1090, 1066. HRMS (EI) m/z: $[M+H]^+$ calcd. for $C_{23}H_{22}N_4O_2S$: 418.1463, found: 418.1455.

Methyl (Z)-2-phenyl-N-tosylacetimidate (7)[4]

(b)



(0.126 mmol, 1 equiv)

To a solution of *N*-thioimidate **1a′** (50.0 mg, 0.126 mmol, 1 equiv) in MeOH (0.42 mL, 0.3 M) was added NaN_3 (9.9 mg, 0.152 mmol, 1.2 equiv) and stirred at 50 °C under nitrogen atmosphere. The resulting reaction mixture was reacted for 3 hours until the reaction was complete as indicated by TLC. After the reaction was completed, the mixture was extracted with EtOAc for three times and the combined organic layer was washed with brine, dried over $MgSO_4$, filtered and concentrated. The crude product was purified by column chromatography (hex/EtOAc = 4/1) to afford **7** (27.8 mg, 73%) as

a white solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.84 (d, *J* = 8.3 Hz, 2H), 7.37-7.26 (m, 7H), 4.26 (s, 2H), 3.71 (s, 3H), 2.43 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.6, 143.2, 138.9, 133.5, 129.6 (CH×2), 129.3 (CH×2), 128.6 (CH×2), 127.2, 126.7 (CH×2), 55.7, 39.5, 21.5.

References:

1. J.-Y. Wu, W.-J. Liao, X.-Y. Lin, C.-F. Liang, *Org. Biomol. Chem*., 2020, **18**, 8881.
2. (a) R. R. Donthiri, V. Pappula, N. K. Reddy, D. Bairagi, S. Adimurthy, *J. Org. Chem*., 2014, **79**, 11277; (b) B. Nie, W. Q. Wu, W. Zeng, Q. Ren, J. Zhang, Y. Zhang, H. Jiang, *Adv. Synth. Catal.*, 2020, **362**, 1362.
3. (a) A. C. A. Muraca, C. Raminelli, *ACS Omega*, 2020, **5**, 2240; (b) Y.-S. Li, C.-F. Liang, *J. Chin. Chem. Soc*., 2022, **69**, 849.
4. E. J. Yoo, I. Bae, S. H. Cho, H. Han, S. Chang, *Org. Lett*., 2006, **8**, 1347.

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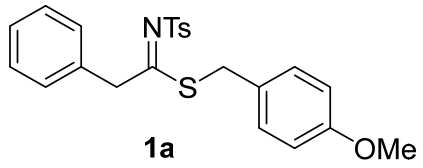
Lowest Frequency	-1198.8
Nucleus	Proton



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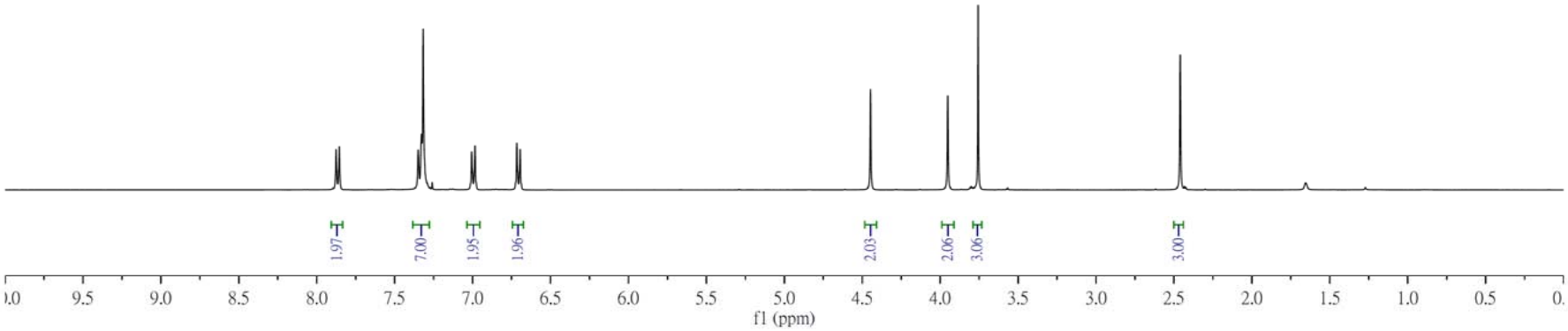

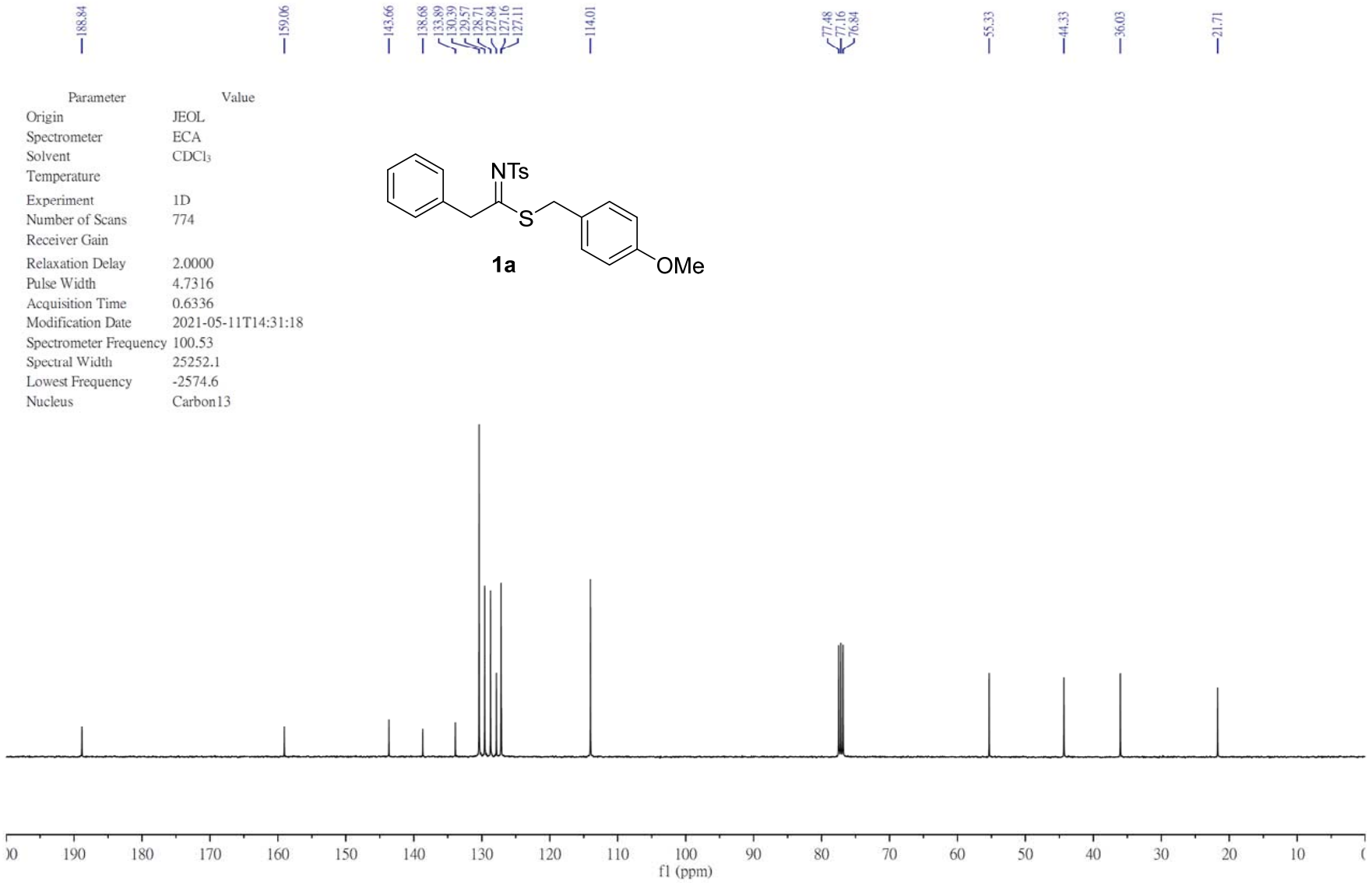
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77.16
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36.03
21.71
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Spectrometer ECA
Solvent CDCl3
Temperature
Experiment 1D
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Relaxation Delay 2.0000
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NTs
S
OMe
1a
f1 (ppm)

Parameter	Value
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Spectrometer	ECA
Solvent	$CDCl_3$
Temperature	
Experiment	1D
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Receiver Gain	
Relaxation Delay	2.0000
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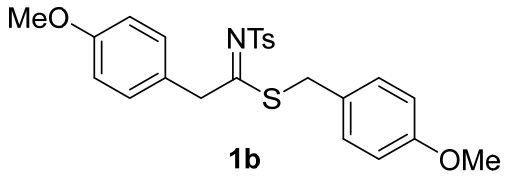
Lowest Frequency	-1198.8
Nucleus	Proton



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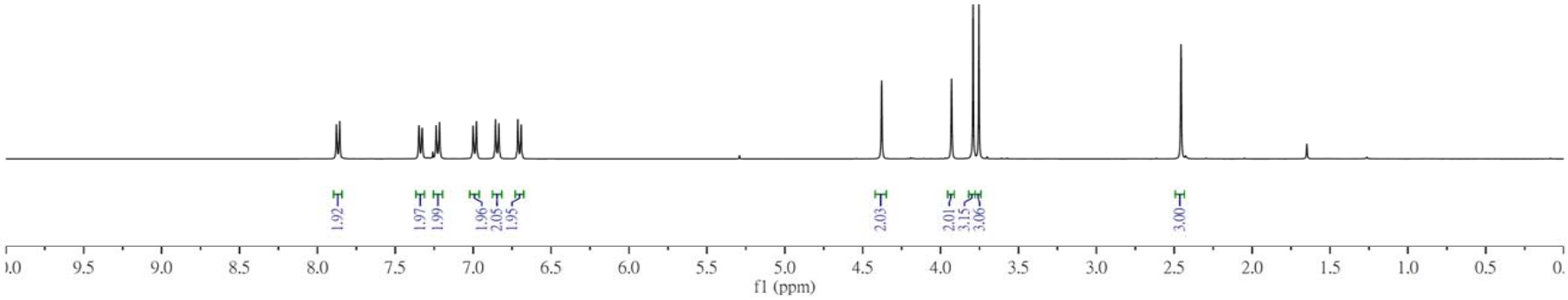

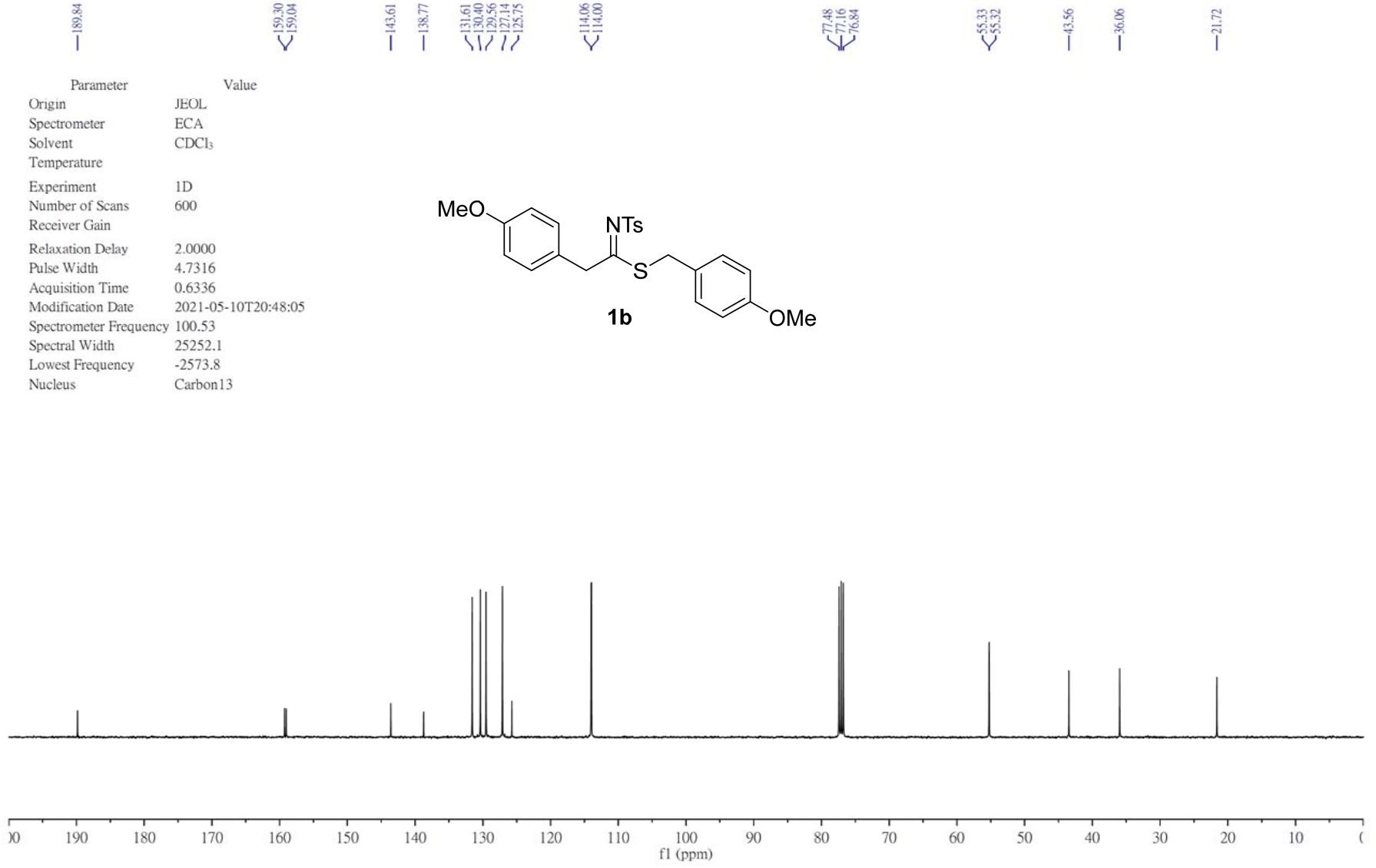
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Spectrometer ECA
Solvent CDCl3
Temperature
Experiment 1D
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NTs
S
OMe
1b
f1 (ppm)

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Pulse Width	0.0000
Acquisition Time	2.5575
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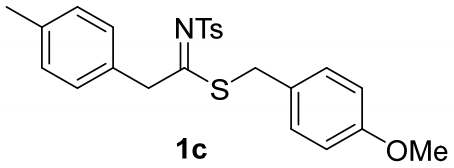
Nucleus	1H



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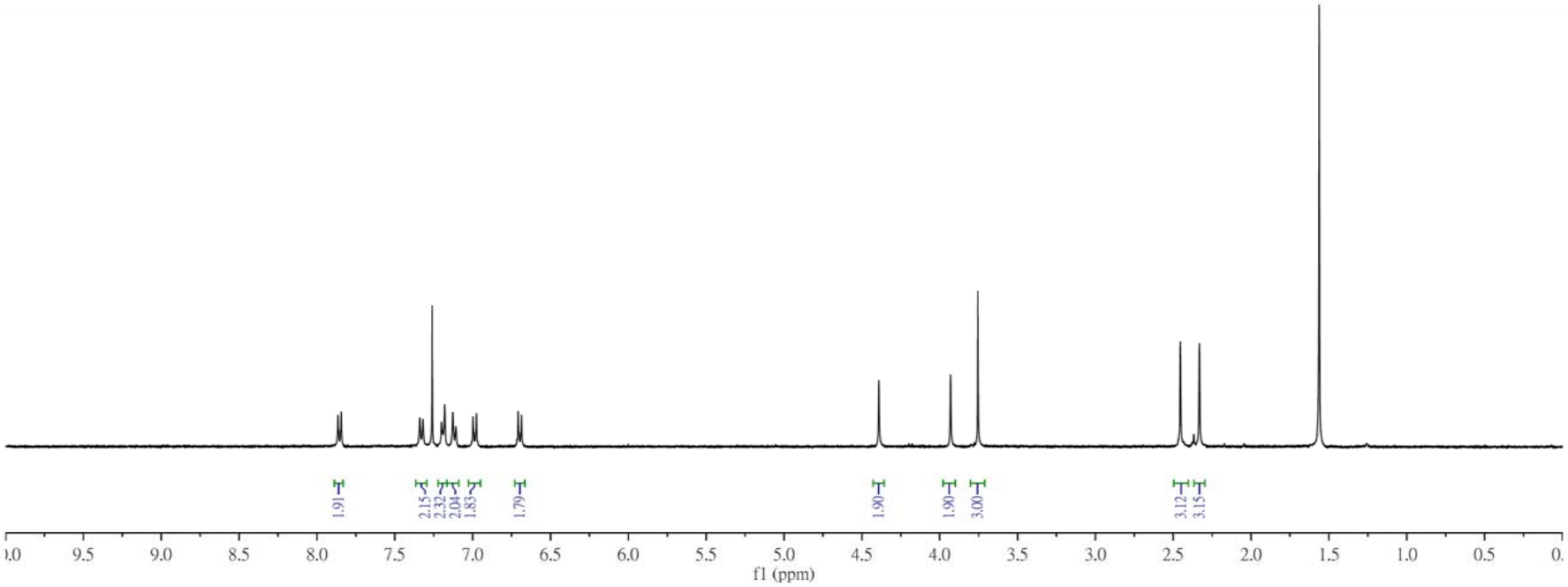

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Temperature	
Experiment	1D
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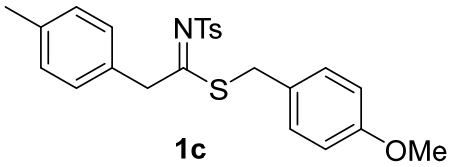
Lowest Frequency	-2573.5
Nucleus	Carbon13



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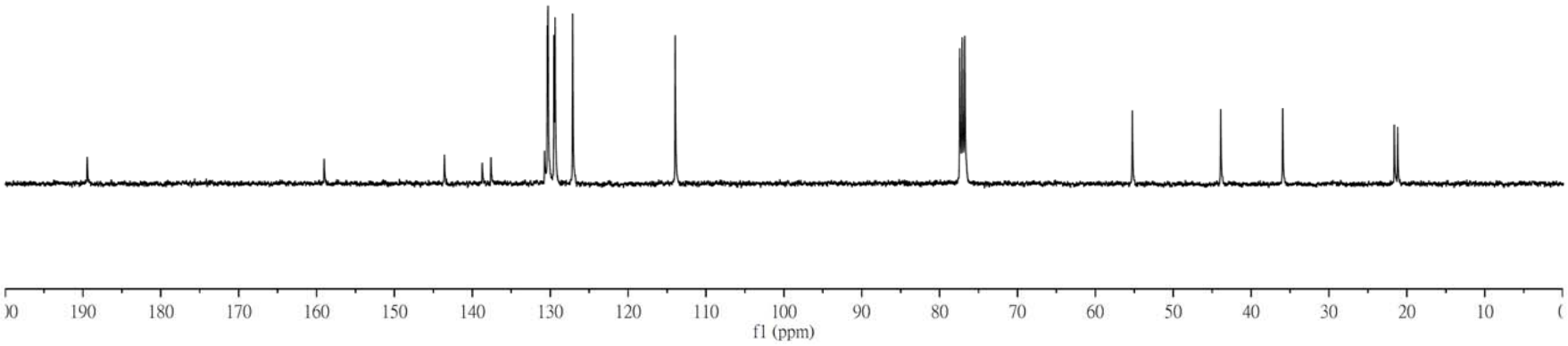

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Temperature	20.0
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Experiment	1D
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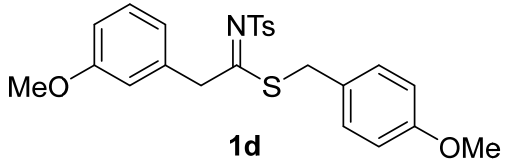
Nucleus	1H



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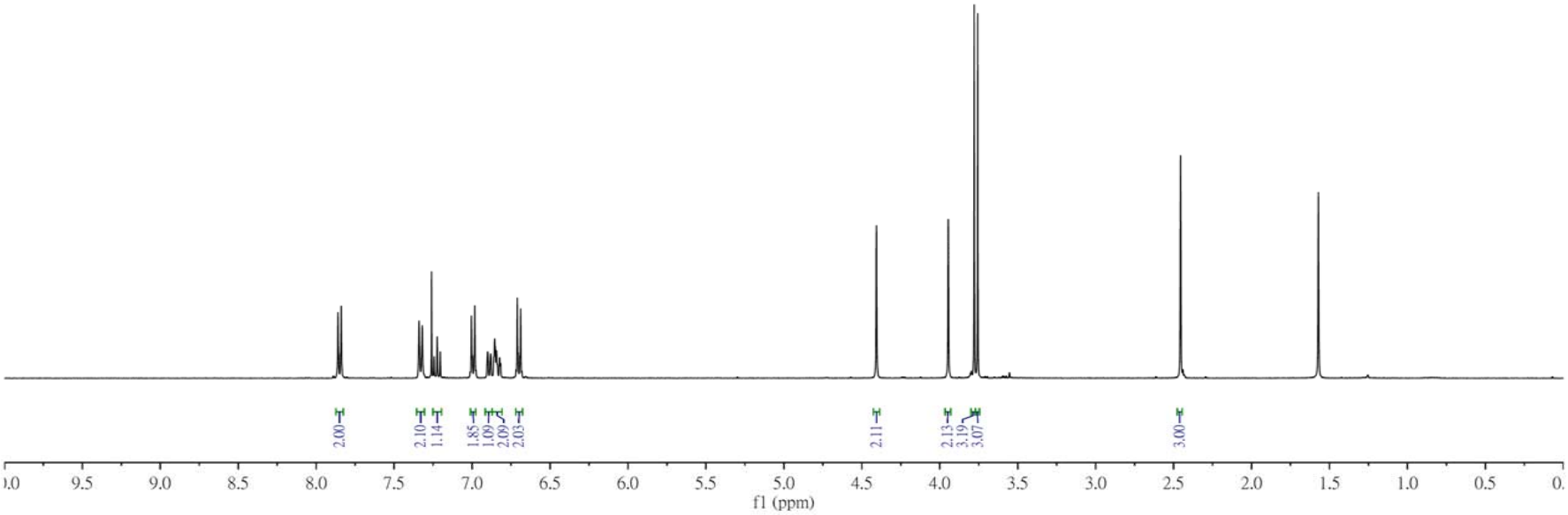

Parameter	Value
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Temperature	
Experiment	1D
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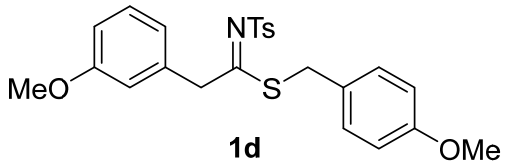
Nucleus	Carbon13



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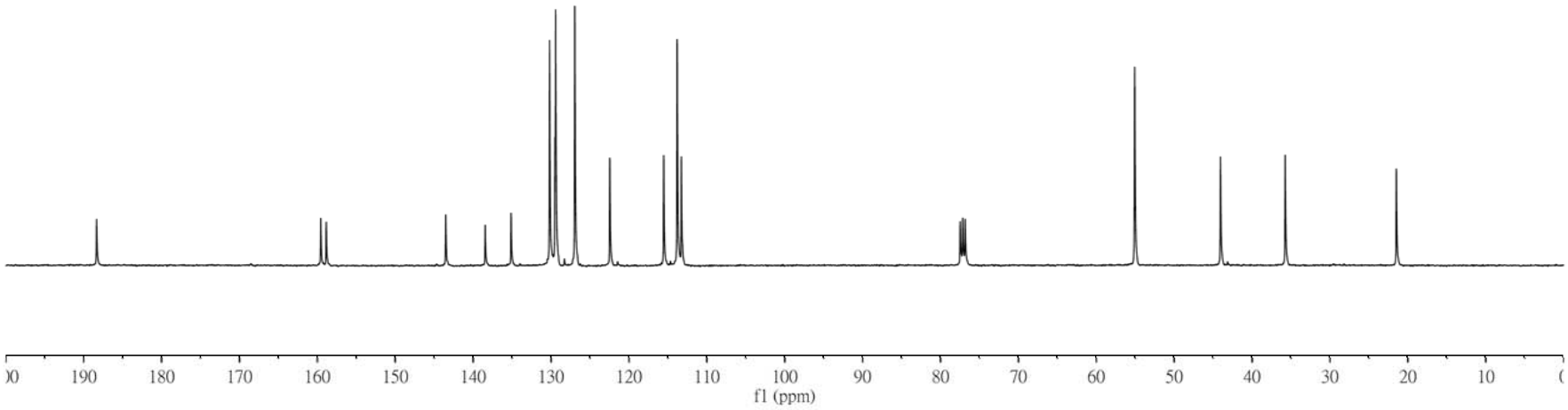

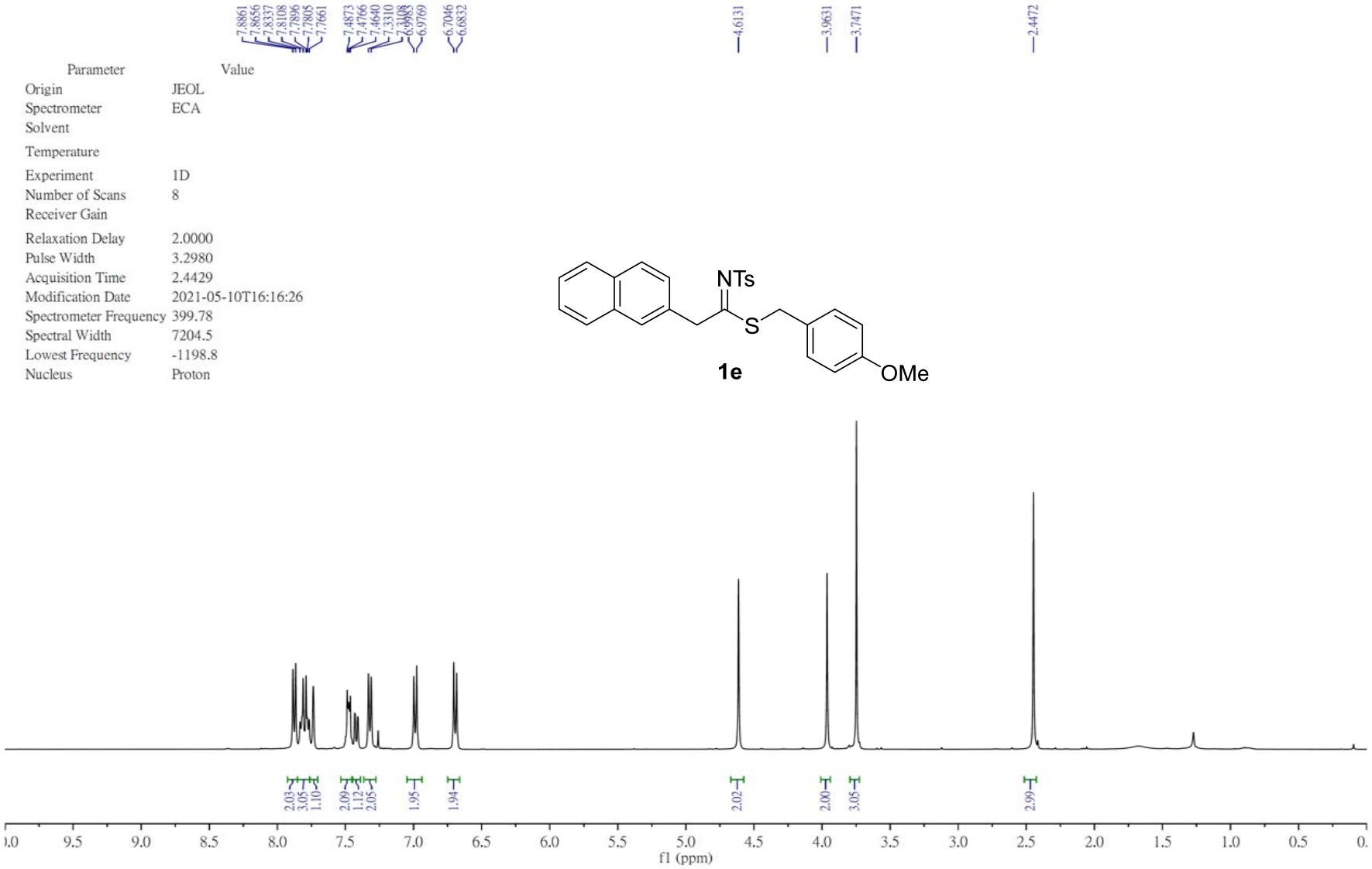
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Spectrometer ECA
Solvent
Temperature
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NTs
S
OMe
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2.99
f1 (ppm)

Parameter	Value
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Temperature	
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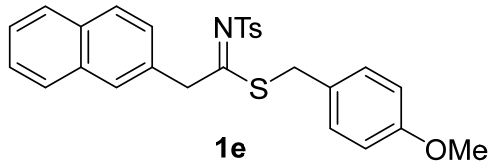
Nucleus	Carbon13



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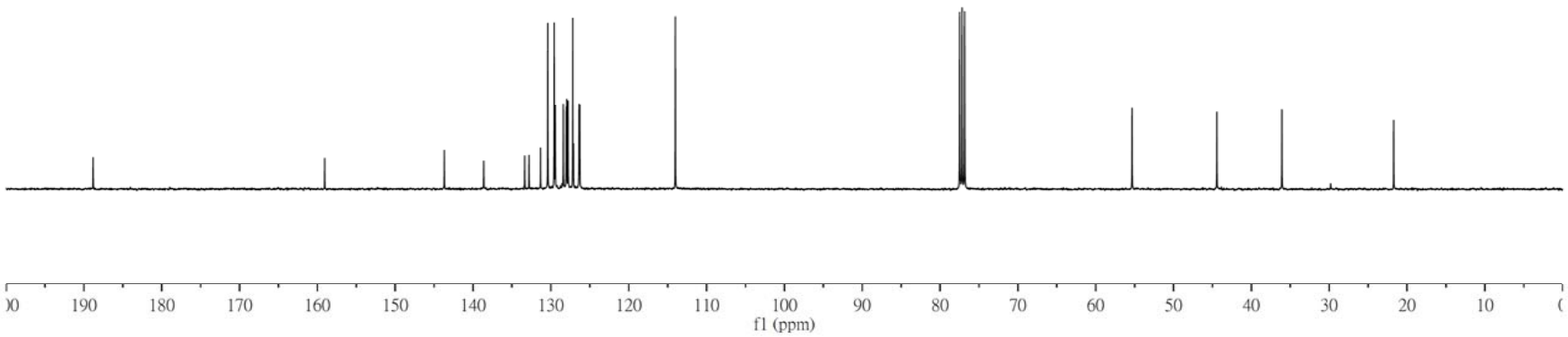

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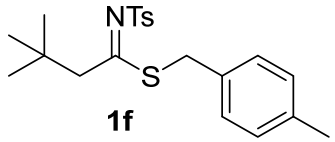
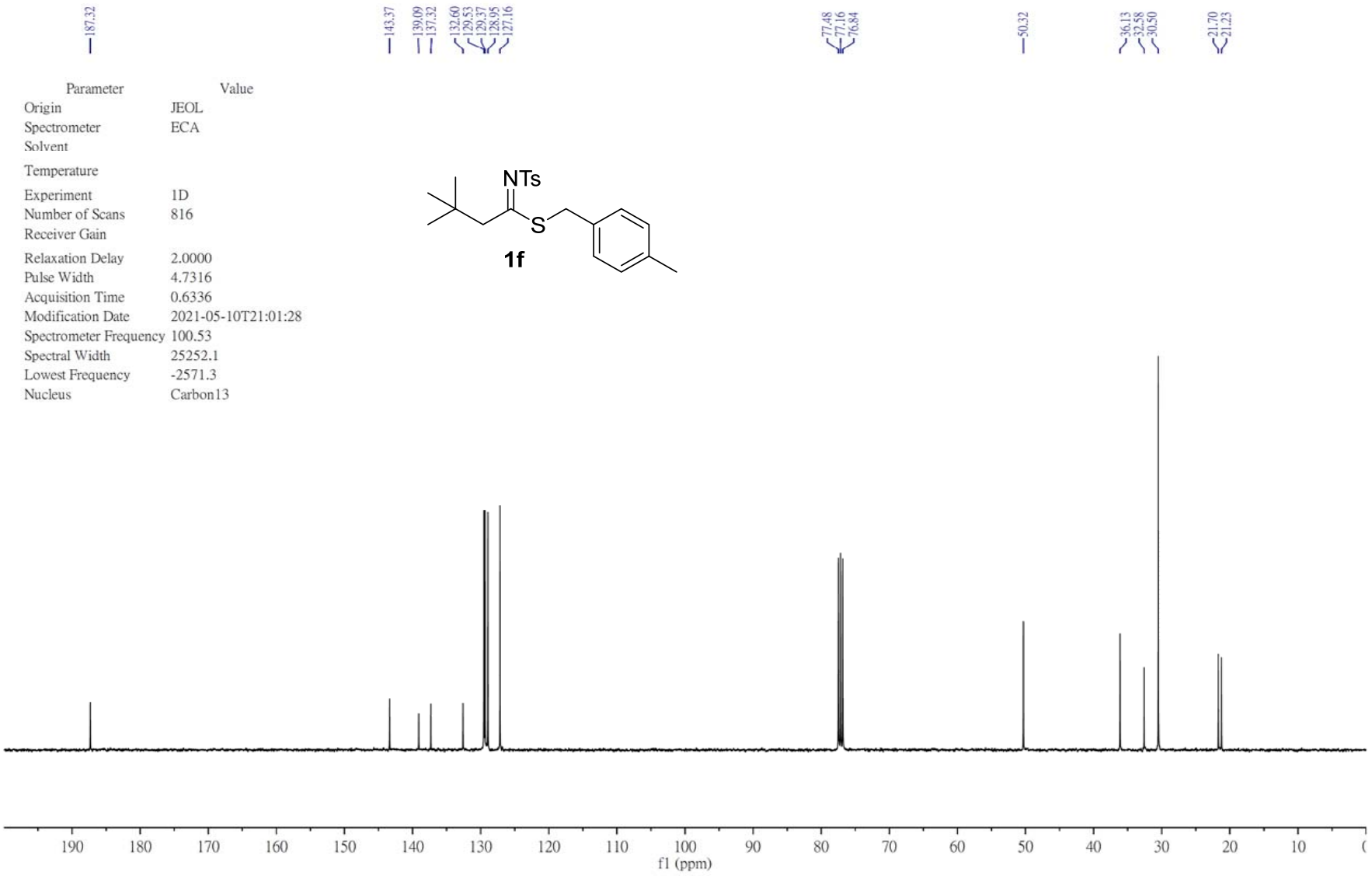
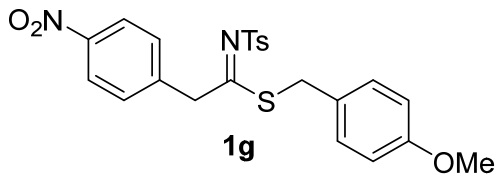
Lowest Frequency	-1198.8
Nucleus	Proton



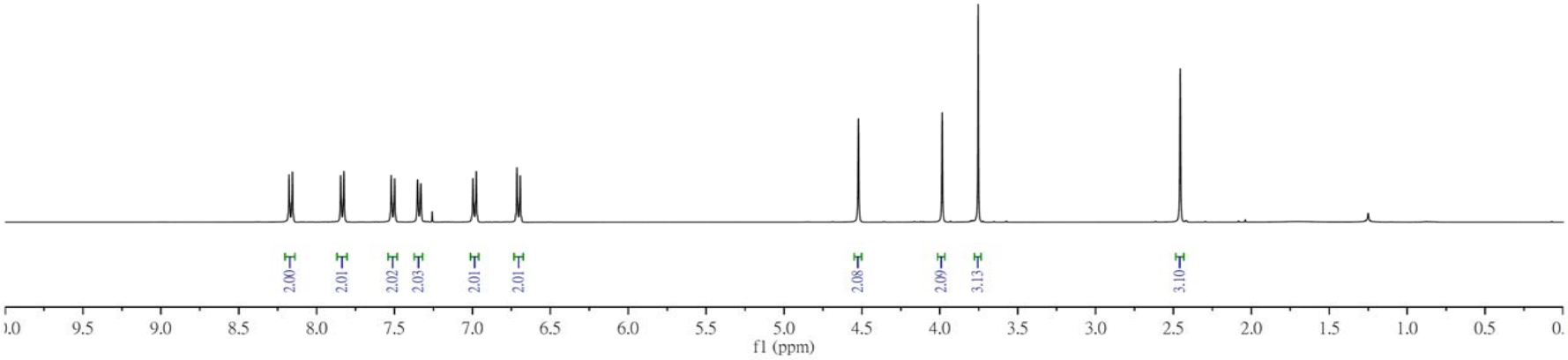
1f

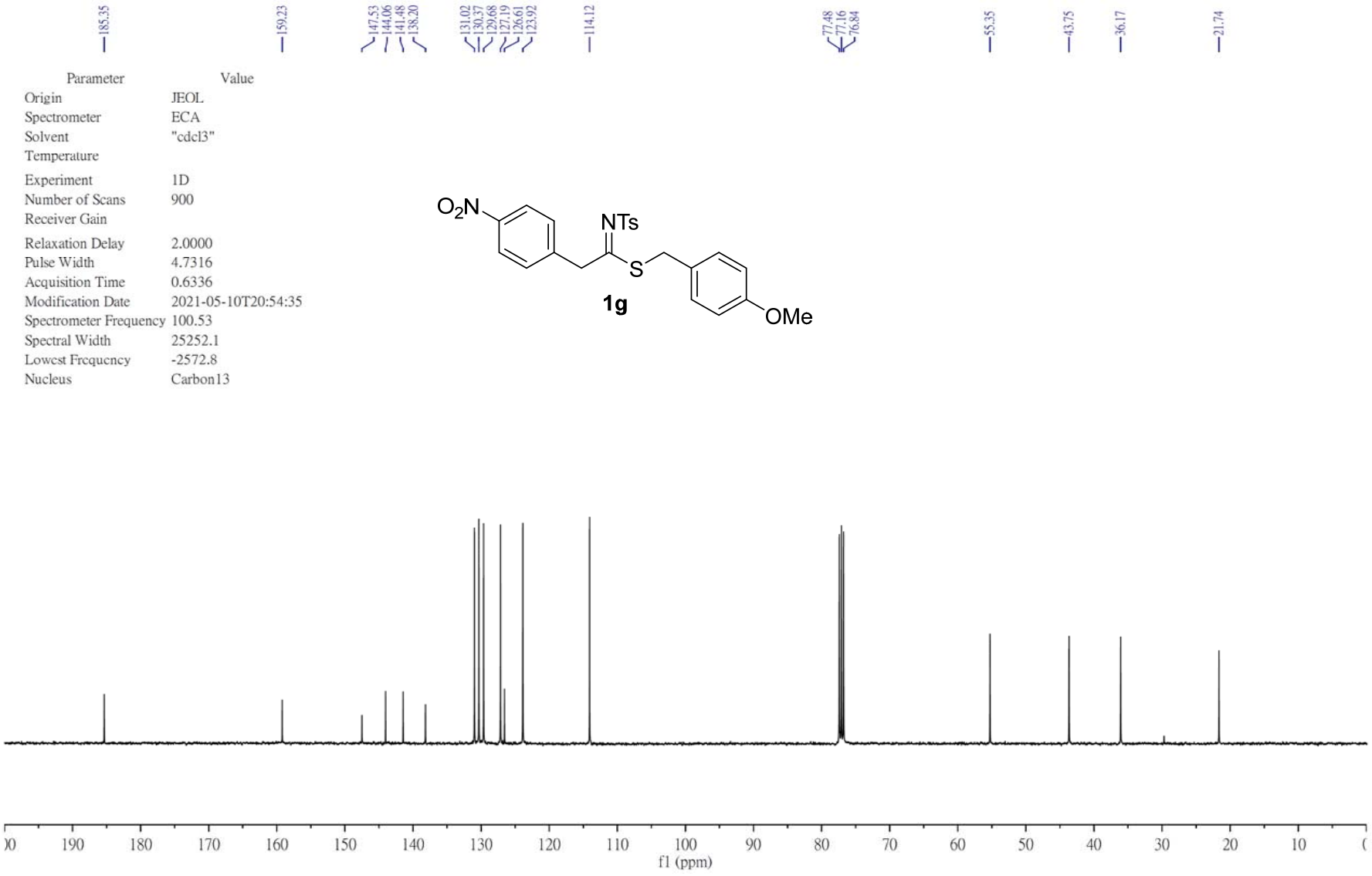

187.32
143.37
139.09
137.32
132.60
129.53
129.37
128.95
127.16
77.48
77.16
76.84
50.32
36.13
32.58
30.50
21.70
21.23
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent
Temperature
Experiment 1D
Number of Scans 816
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T21:01:28
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2571.3
Nucleus Carbon13
NTs
S
1f
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

Parameter	Value
Origin	JEOL
Spectrometer	ECA
Solvent	"cdcl3"
Temperature	
Experiment	1D
Number of Scans	8
Receiver Gain	
Relaxation Delay	2.0000
Pulse Width	3.2980
Acquisition Time	2.4429
Modification Date	2021-05-10T16:21:31
Spectrometer Frequency	399.78
Spectral Width	7204.5
Lowest Frequency	-1198.8
Nucleus	Proton

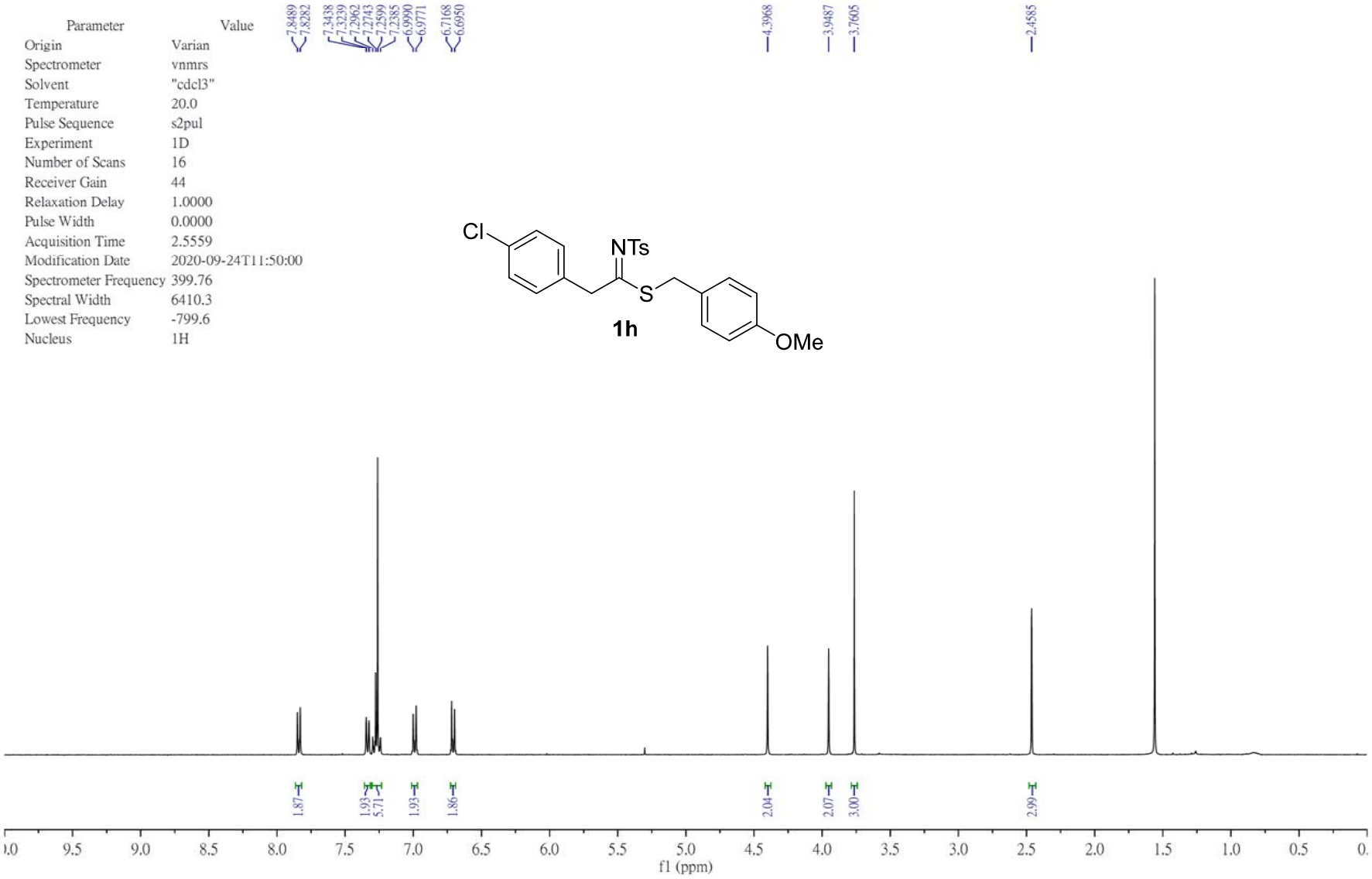


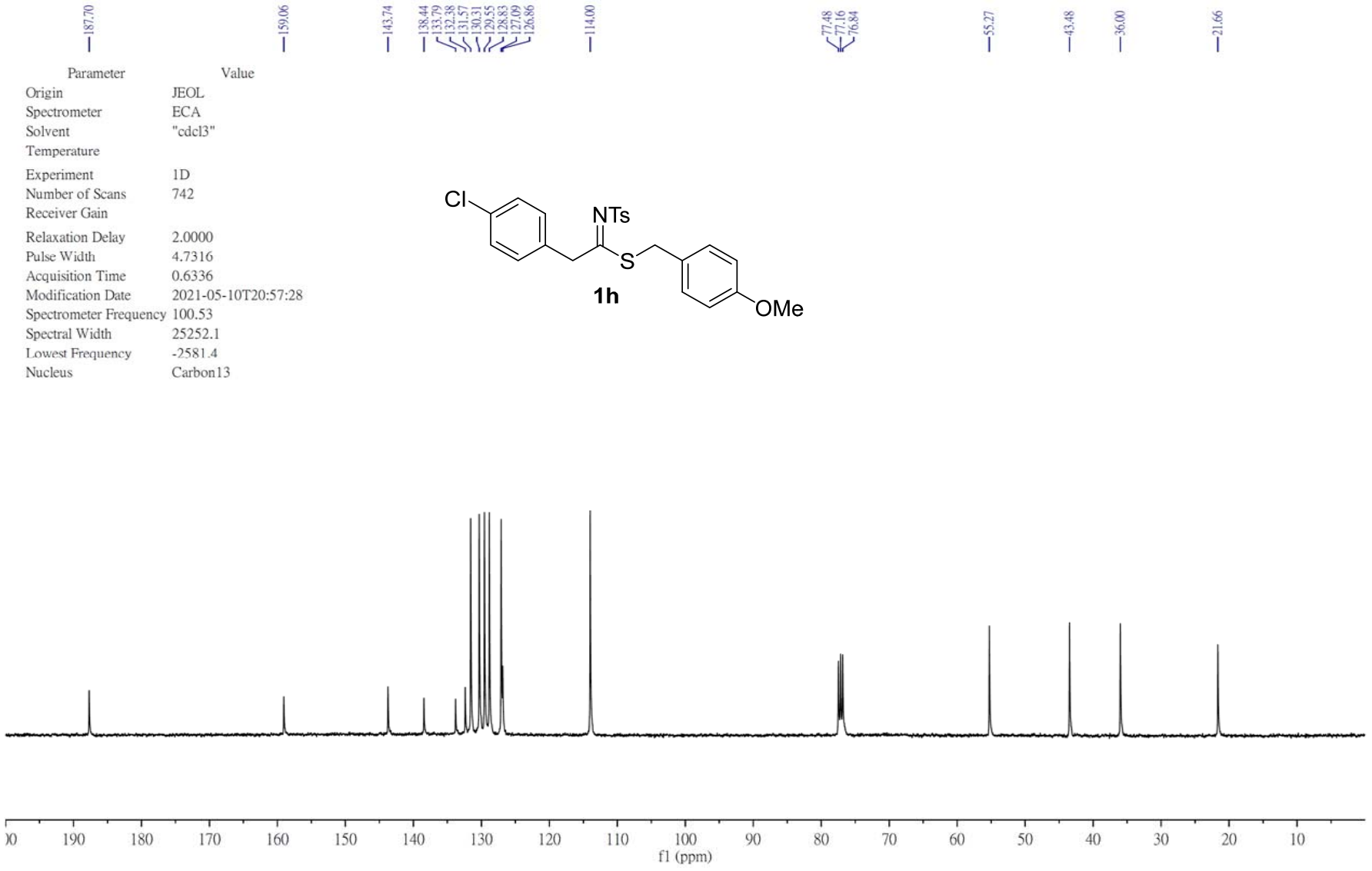
1g



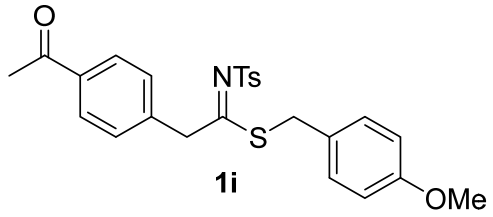

185.35
159.23
147.53
144.06
141.48
138.20
131.02
130.37
129.68
127.19
126.61
123.92
114.12
77.48
77.16
76.84
55.35
43.75
36.17
21.74
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent "cdcl3"
Temperature
Experiment 1D
Number of Scans 900
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T20:54:35
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2572.8
Nucleus Carbon13
O2N
NTs
S
OMe
1g
f1 (ppm)

Parameter	Value
Origin	Varian
Spectrometer	vnmrs
Solvent	"cdcl3"
Temperature	20.0
Pulse Sequence	s2pul
Experiment	1D
Number of Scans	16
Receiver Gain	44
Relaxation Delay	1.0000
Pulse Width	0.0000
Acquisition Time	2.5559
Modification Date	2020-09-24T11:50:00
Spectrometer Frequency	399.76
Spectral Width	6410.3
Lowest Frequency	-799.6
Nucleus	1H



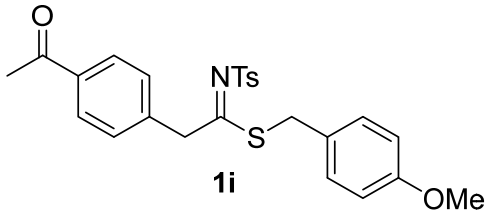

187.70
159.06
143.74
138.44
133.79
132.38
131.57
130.31
129.55
128.83
127.09
126.86
114.00
77.48
77.16
76.84
55.27
43.48
36.00
21.66
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent "cdcl3"
Temperature
Experiment 1D
Number of Scans 742
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T20:57:28
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2581.4
Nucleus Carbon13
Cl
NTs
S
OMe
1h
f1 (ppm)

Parameter	Value
Origin	Varian
Spectrometer	vnmrs
Solvent	"cdcl3"
Temperature	20.0
Pulse Sequence	s2pul
Experiment	1D
Number of Scans	32
Receiver Gain	50
Relaxation Delay	1.0000
Pulse Width	0.0000
Acquisition Time	2.5559
Modification Date	2021-05-10T22:56:00
Spectrometer Frequency	399.76
Spectral Width	6410.3
Lowest Frequency	-799.4
Nucleus	1H

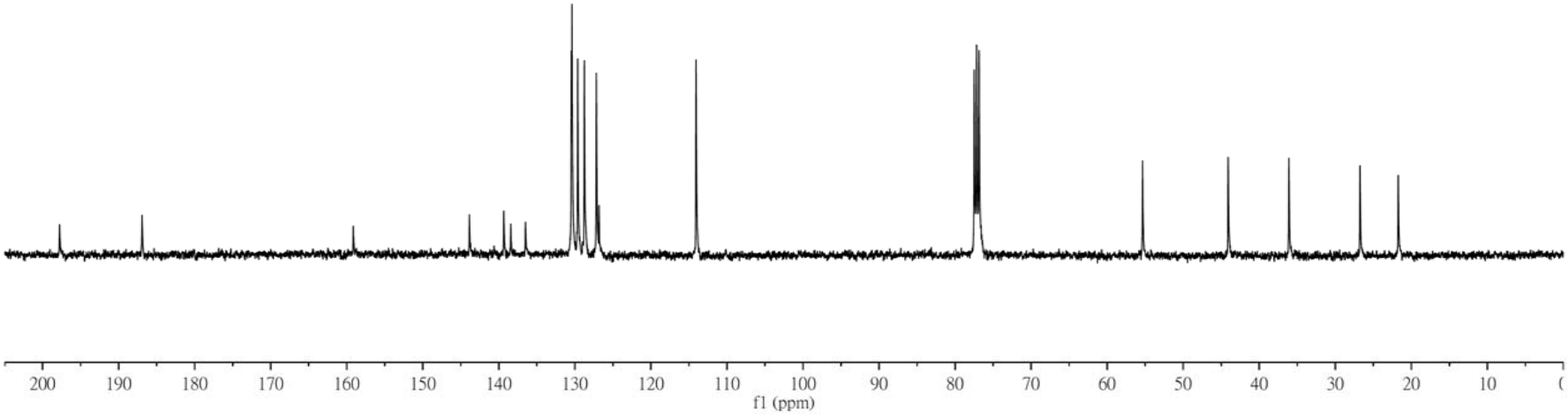


1i

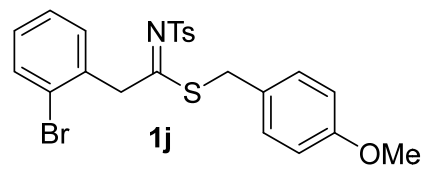
Parameter	Value
Origin	JEOL
Spectrometer	ECA
Solvent	"cdcl3"
Temperature	
Experiment	1D
Number of Scans	795
Receiver Gain	
Relaxation Delay	2.0000
Pulse Width	4.7316
Acquisition Time	0.6336
Modification Date	2021-05-10T23:21:06
Spectrometer Frequency	100.53
Spectral Width	25252.1
Lowest Frequency	-2573.1
Nucleus	Carbon13



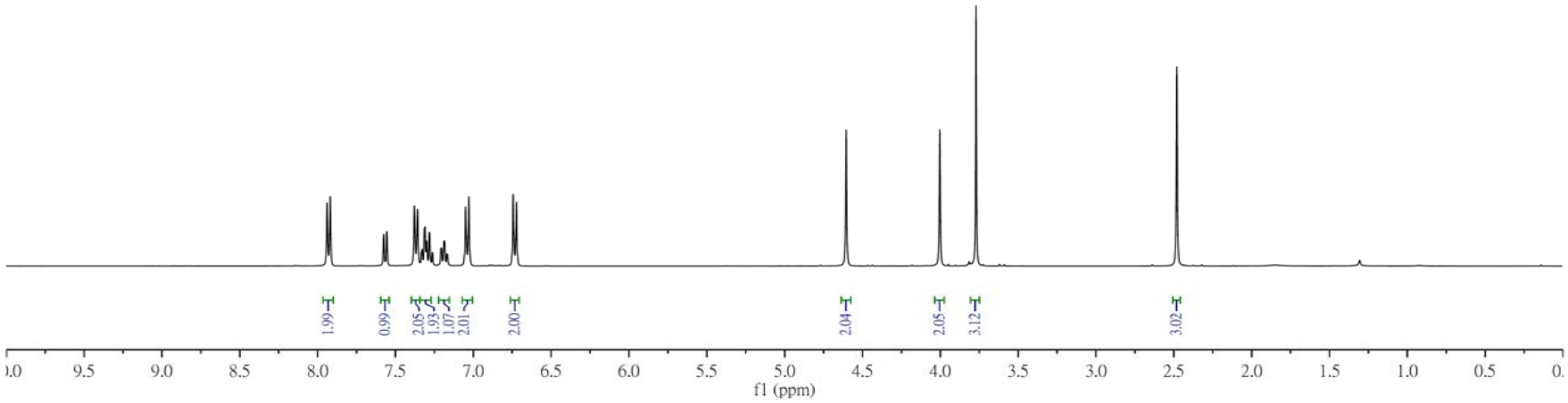
1i

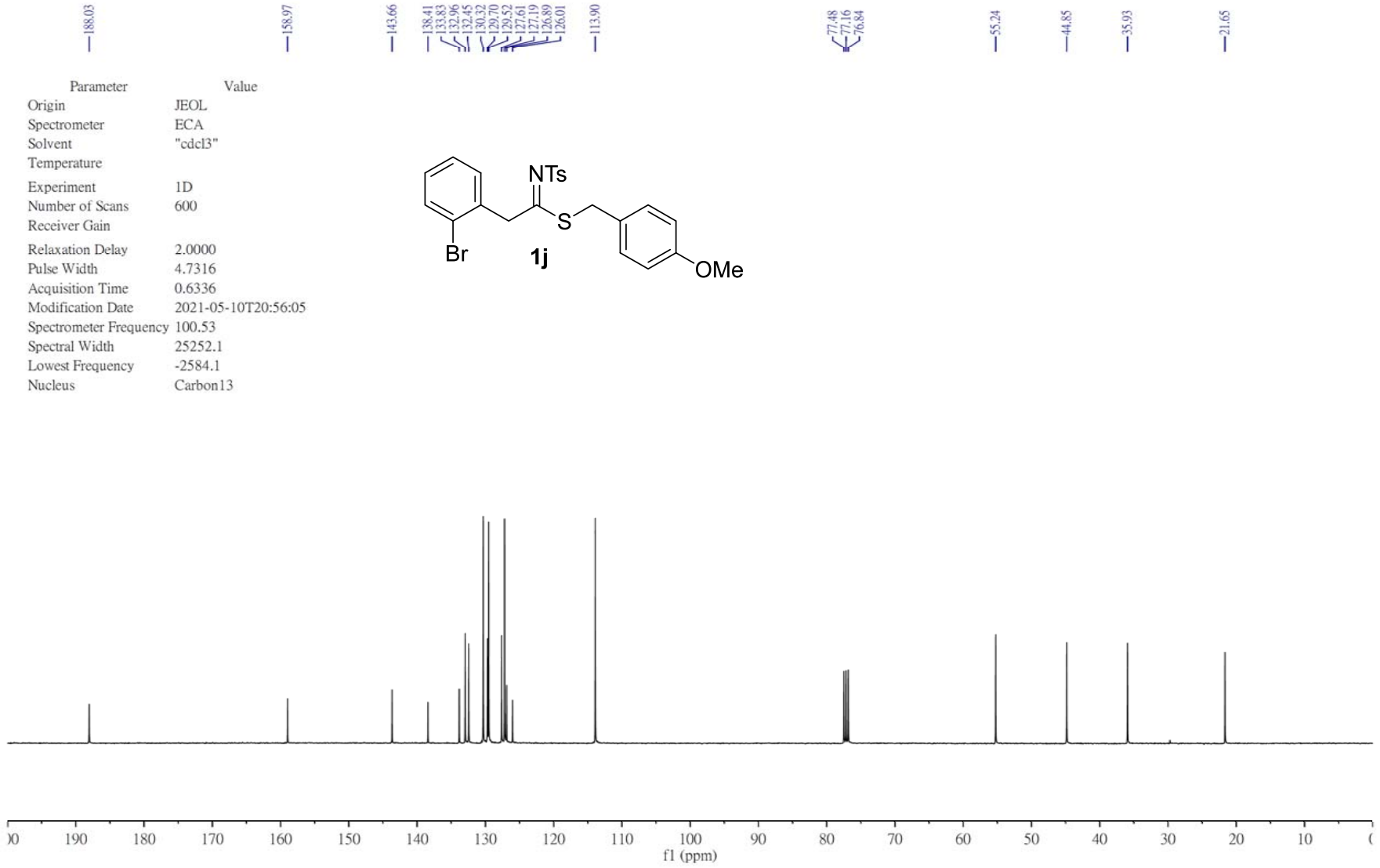


Parameter	Value
Origin	JEOL
Spectrometer	ECA
Solvent	"cdcl3"
Temperature	
Experiment	1D
Number of Scans	8
Receiver Gain	
Relaxation Delay	2.0000
Pulse Width	3.2980
Acquisition Time	2.4429
Modification Date	2021-05-10T16:25:37
Spectrometer Frequency	399.78
Spectral Width	7204.5
Lowest Frequency	-1188.8
Nucleus	Proton

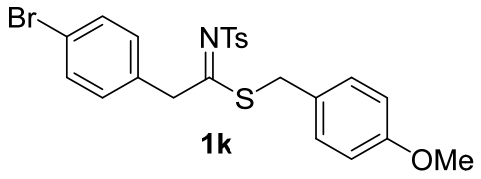


1j

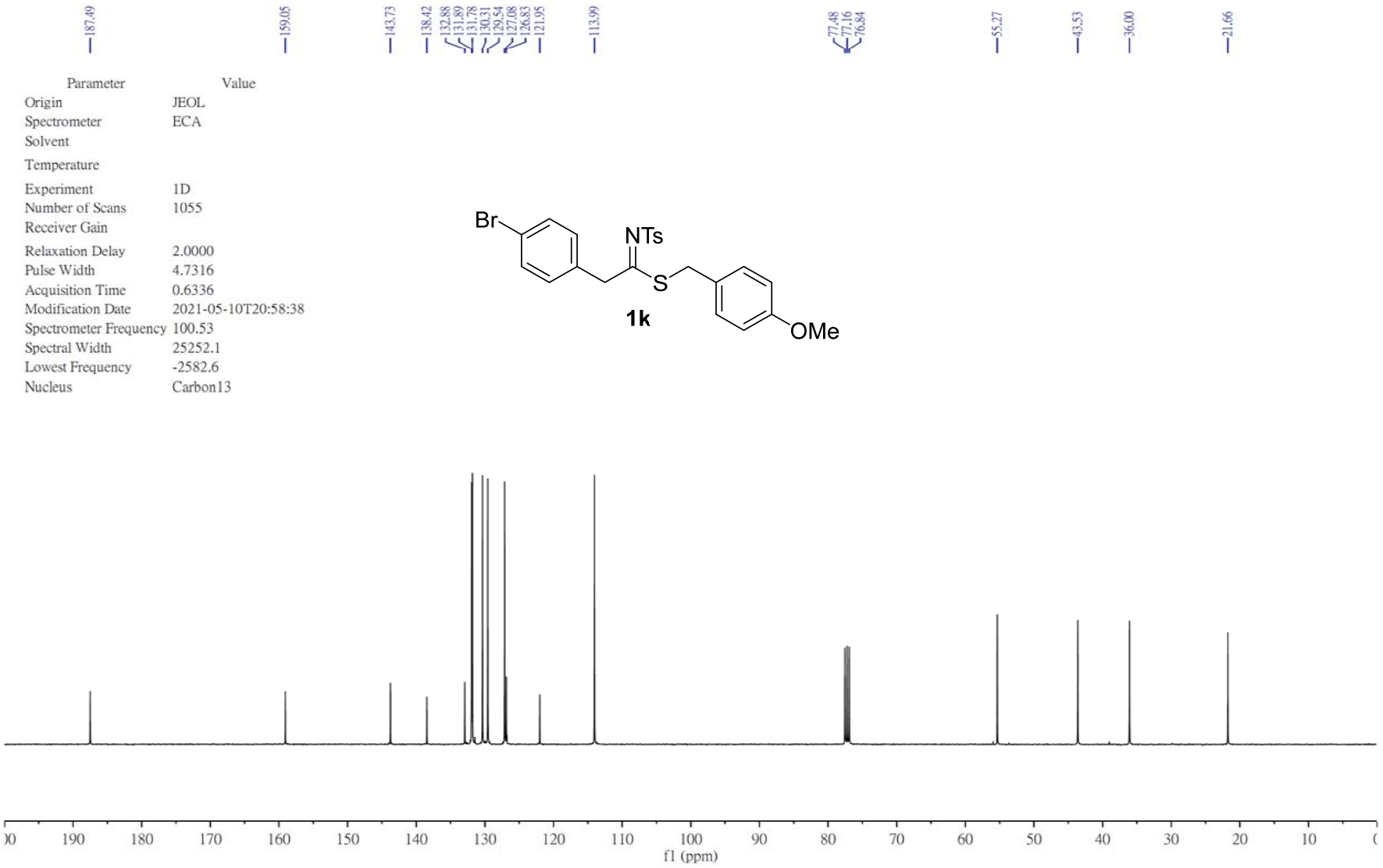


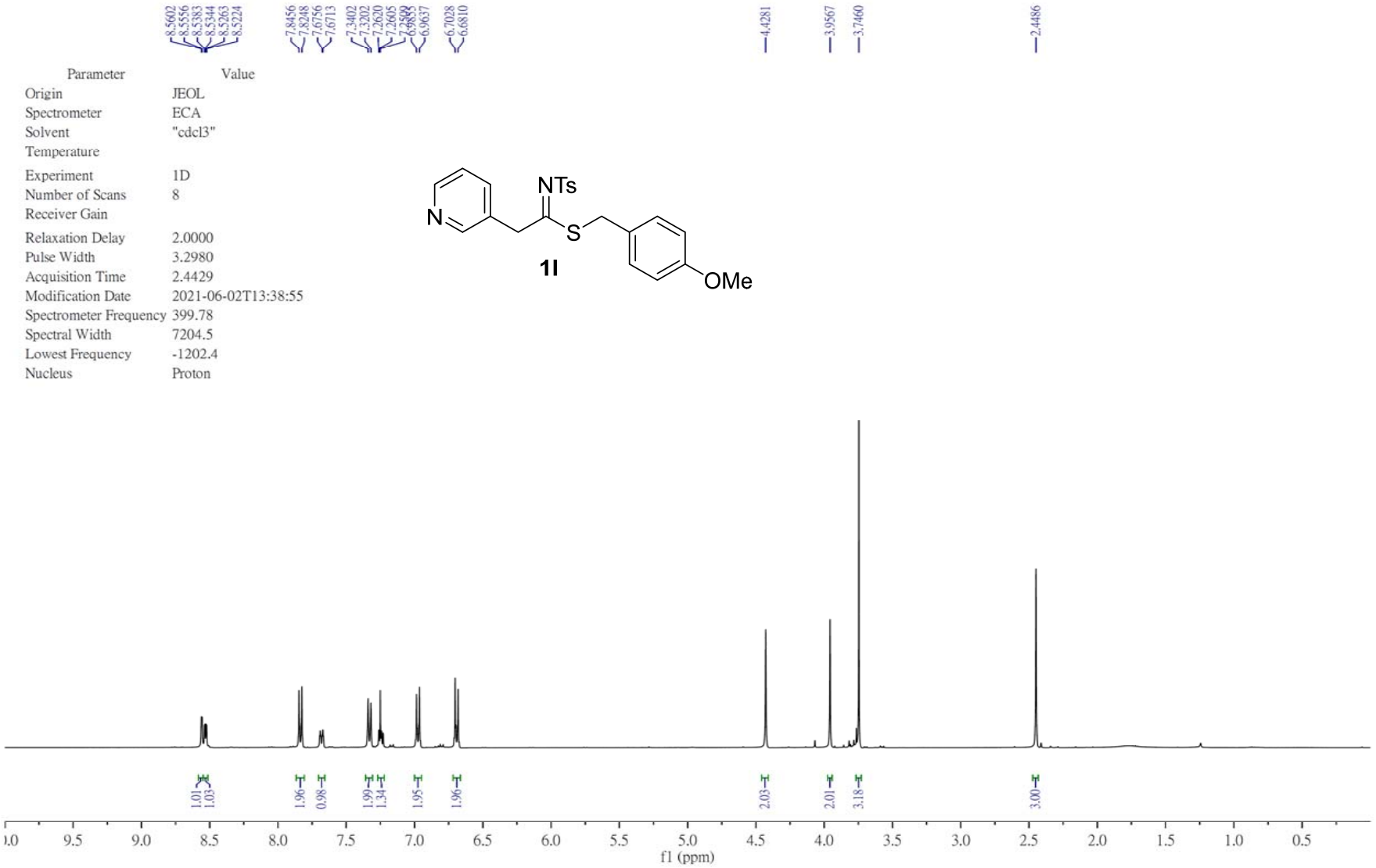

188.03
158.97
143.66
138.41
133.83
132.96
132.45
130.32
129.70
129.52
127.61
127.19
126.89
126.01
113.90
77.48
77.16
76.84
55.24
44.85
35.93
21.65
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent "cdcl3"
Temperature
Experiment 1D
Number of Scans 600
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T20:56:05
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2584.1
Nucleus Carbon13
NTs
S
Br
1j
OMe
f1 (ppm)

Parameter	Value
Origin	JEOL
Spectrometer	ECA
Solvent	"cdcl3"
Temperature	
Experiment	1D
Number of Scans	8
Receiver Gain	
Relaxation Delay	2.0000
Pulse Width	3.2980
Acquisition Time	2.4429
Modification Date	2021-05-10T16:51:00
Spectrometer Frequency	399.78
Spectral Width	7204.5
Lowest Frequency	-1198.4
Nucleus	Proton

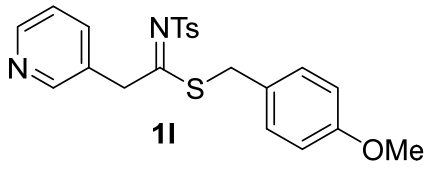


1k

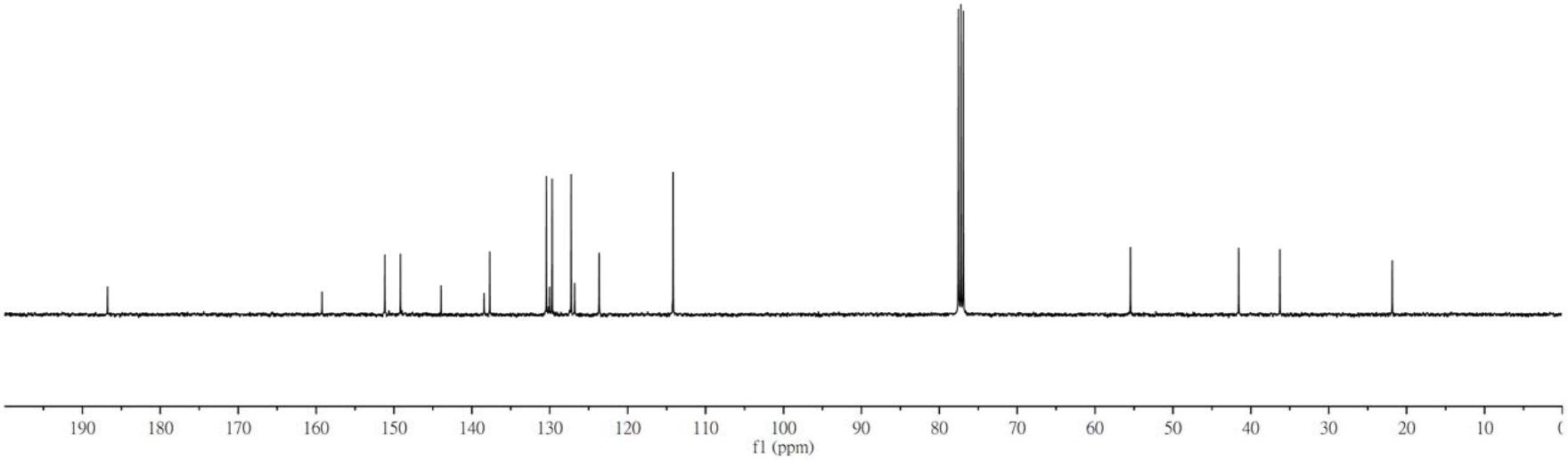

187.49
159.05
143.73
138.42
132.88
131.89
131.78
130.31
129.54
127.08
126.83
121.95
113.99
77.48
77.16
76.84
55.27
43.53
36.00
21.66
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent
Temperature
Experiment 1D
Number of Scans 1055
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T20:58:38
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2582.6
Nucleus Carbon13
Br
NTs
S
OMe
1k
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

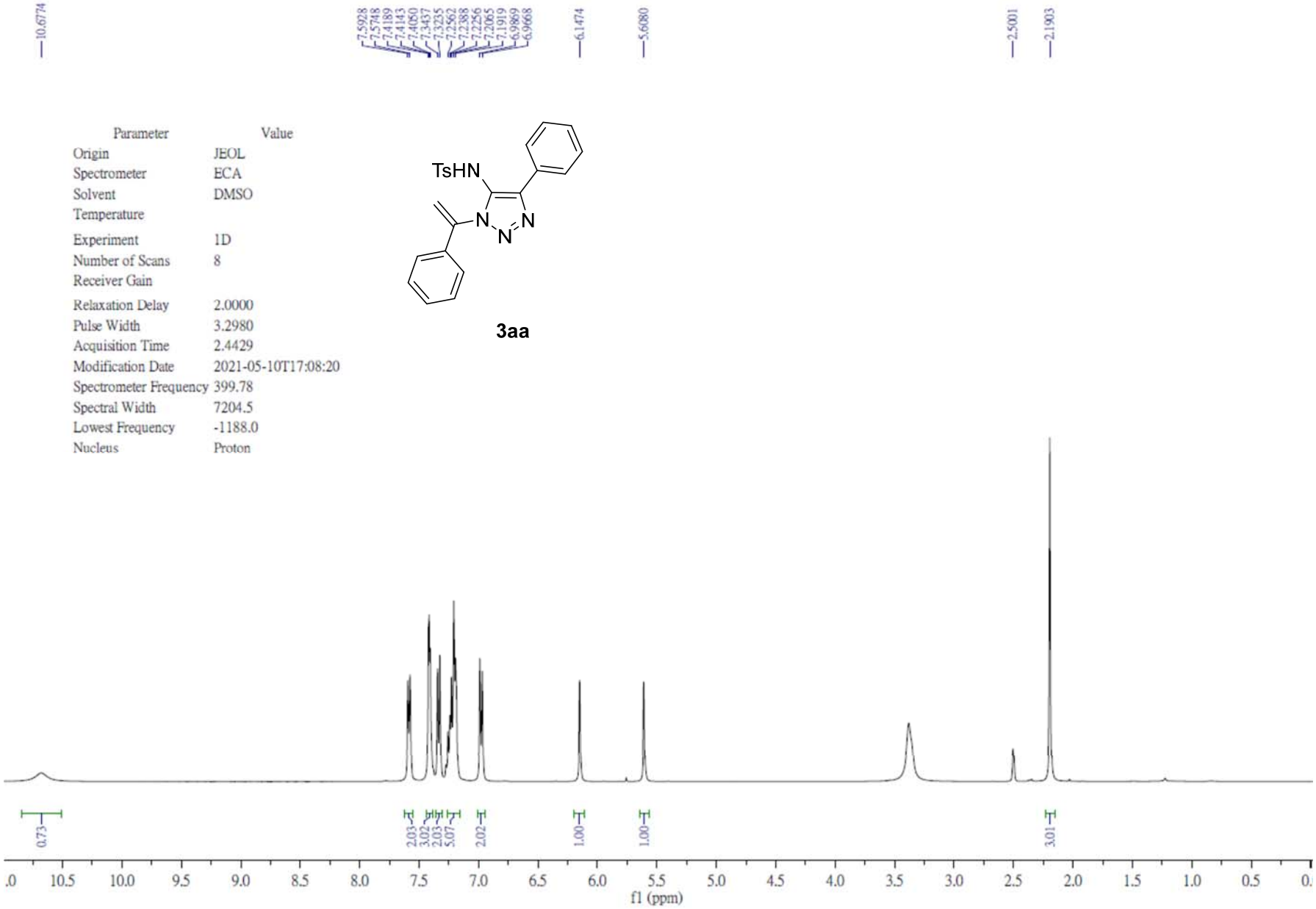

8.5602
8.5556
8.5383
8.5344
8.5263
8.5224
7.8456
7.8248
7.6756
7.6713
7.3402
7.3202
7.2620
7.2605
6.9637
6.7028
6.6810
4.4281
3.9567
3.7460
2.4486
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent "cdcl3"
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-06-02T13:38:55
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1202.4
Nucleus Proton
NTs
N
S
OMe
1l
1.01
1.03
1.96
0.98
1.99
1.34
1.95
1.96
2.03
2.01
3.18
3.00
f1 (ppm)

Parameter	Value
Origin	JEOL
Spectrometer	ECA
Solvent	"cdcl3"
Temperature	
Experiment	1D
Number of Scans	1000
Receiver Gain	
Relaxation Delay	2.0000
Pulse Width	4.7316
Acquisition Time	0.6336
Modification Date	2021-06-02T13:39:03
Spectrometer Frequency	100.53
Spectral Width	25252.1
Lowest Frequency	-2569.8
Nucleus	Carbon13

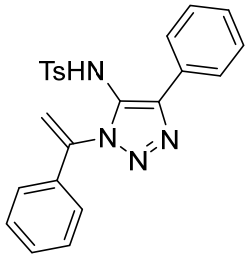


1l

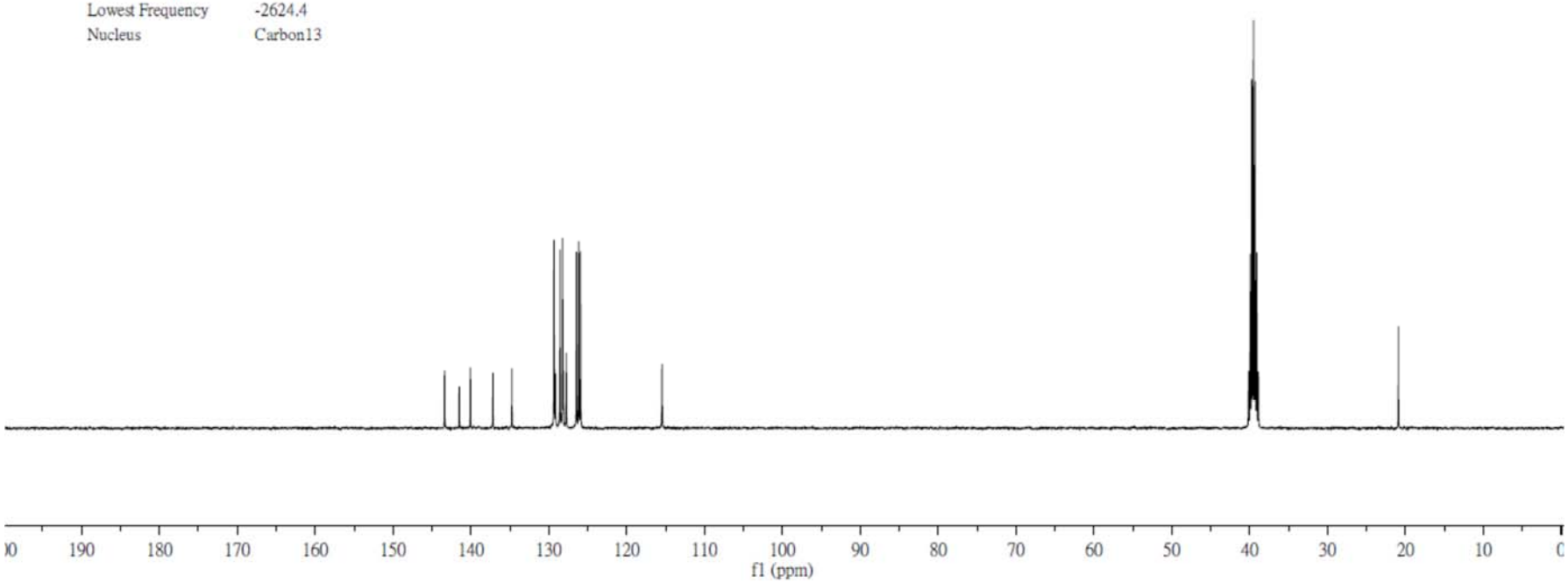


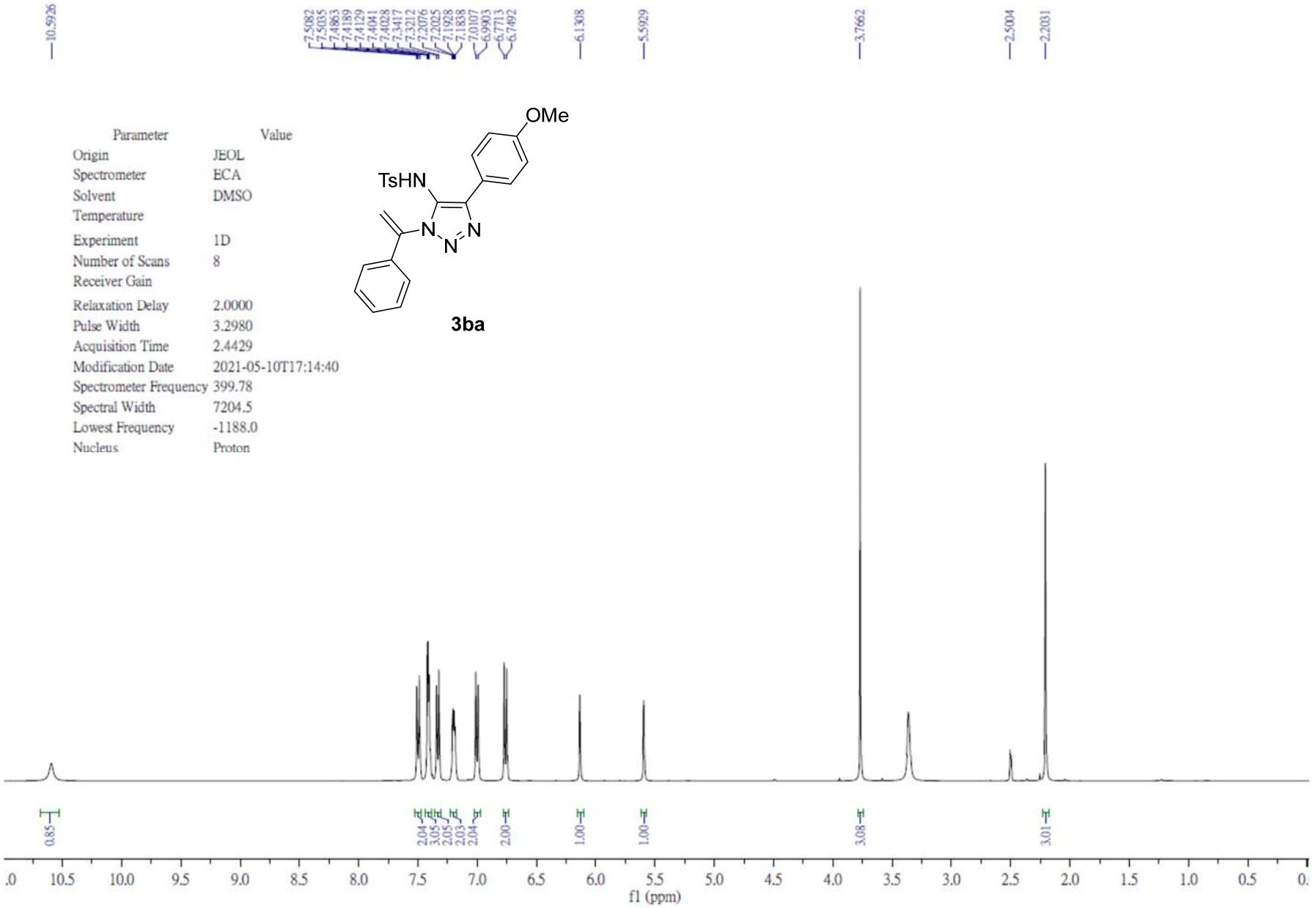

10.6774
7.5928
7.5748
7.4189
7.4143
7.4050
7.3437
7.3235
7.2962
7.2388
7.2256
7.2065
7.1919
6.9869
6.9668
6.1474
5.6080
2.5001
2.1903
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-10T17:08:20
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1188.0
Nucleus Proton
TsHN
N
N
N
3aa
0.73
2.03
3.02
2.03
5.07
2.02
1.00
1.00
3.01
f1 (ppm)

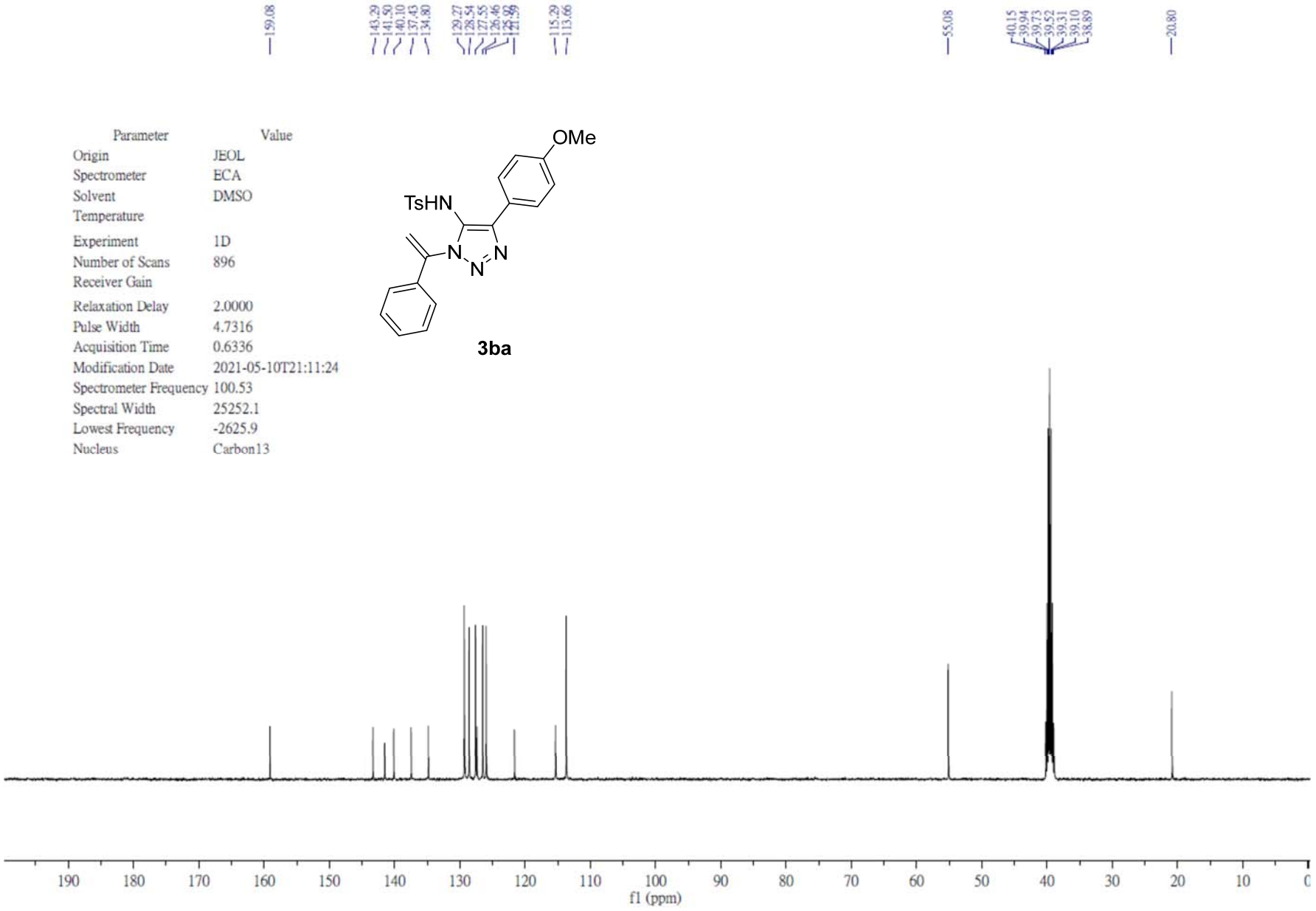
Parameter	Value
Origin	JEOL
Spectrometer	ECA
Solvent	DMSO
Temperature	
Experiment	1D
Number of Scans	819
Receiver Gain	
Relaxation Delay	2.0000
Pulse Width	4.7316
Acquisition Time	0.6336
Modification Date	2021-04-26T15:10:20
Spectrometer Frequency	100.53
Spectral Width	25252.1
Lowest Frequency	-2624.4
Nucleus	Carbon13

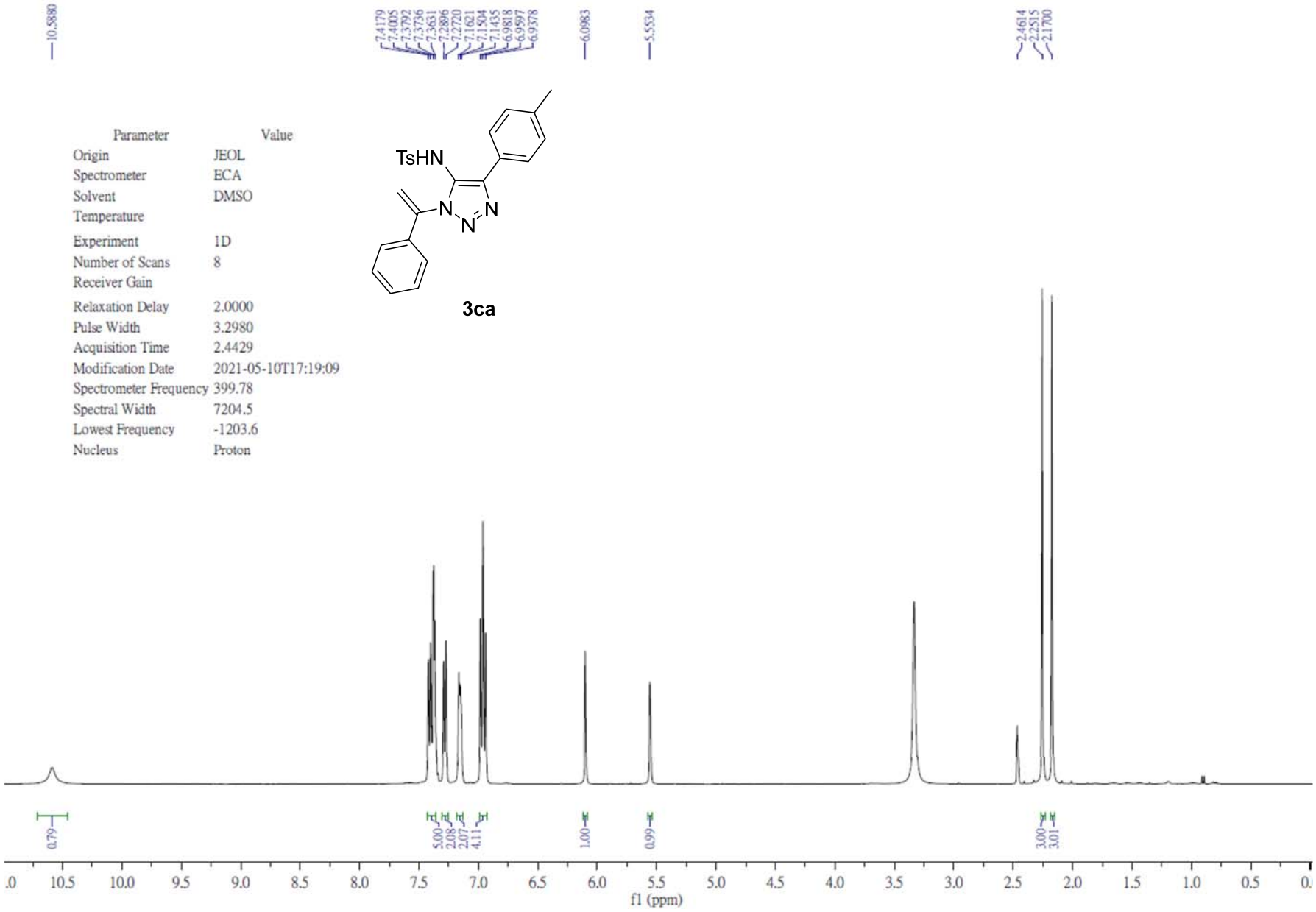


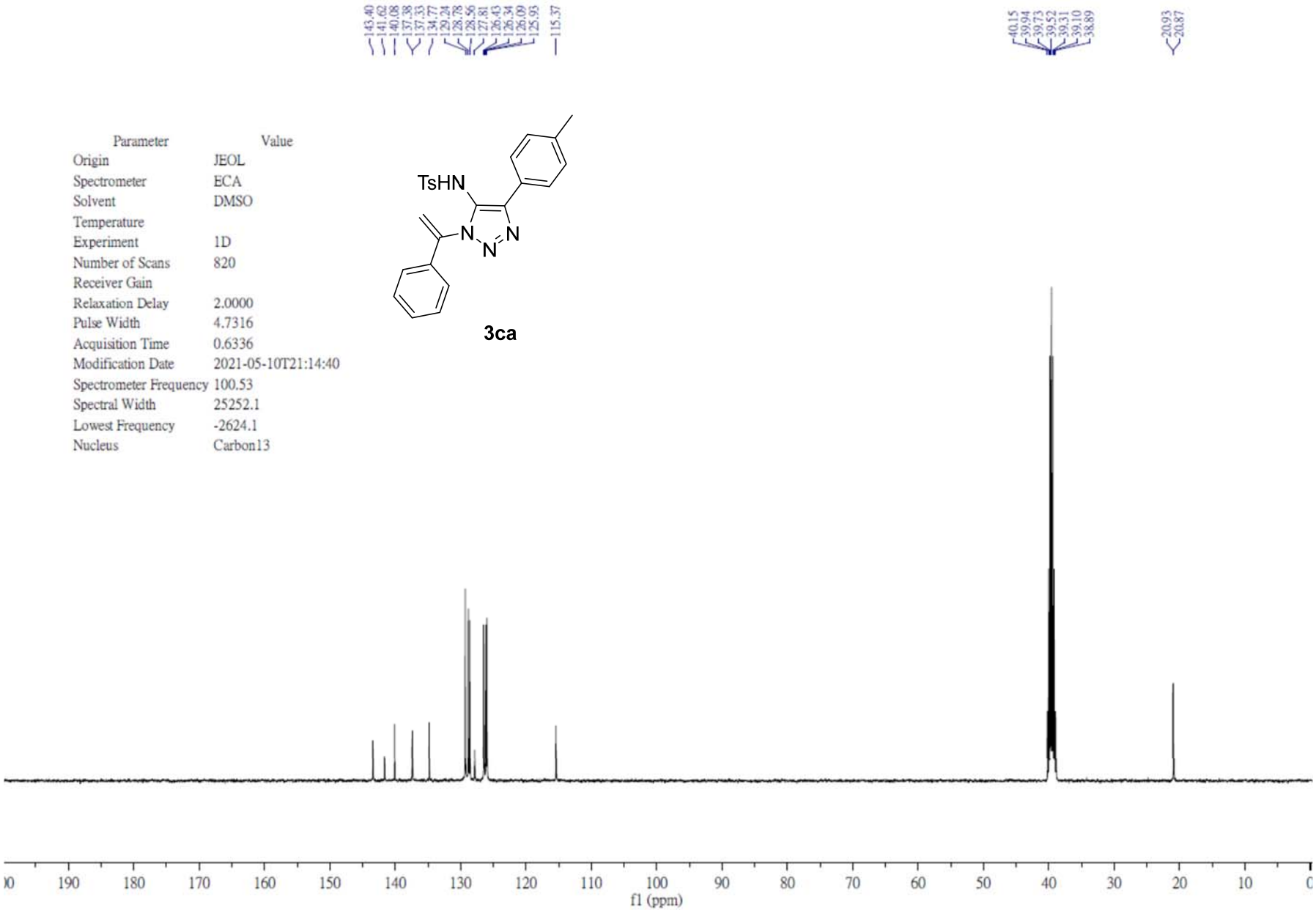
3aa



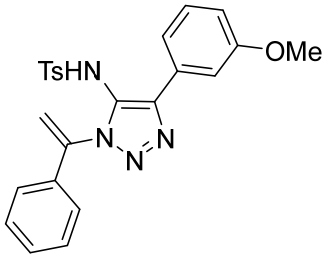

10.5926
7.5082
7.5035
7.4863
7.4189
7.4129
7.4041
7.4028
7.3417
7.3212
7.2076
7.2025
7.1928
7.1838
7.0107
6.9903
6.7713
6.7492
6.1308
5.5929
3.7662
2.5004
2.2031
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-10T17:14:40
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1188.0
Nucleus Proton
OMe
TsHN
N
N
N
3ba
0.85
2.04
3.05
2.05
2.03
2.04
2.00
1.00
1.00
3.08
3.01
f1 (ppm)


159.08
143.29
141.50
140.10
137.43
134.80
129.27
128.54
127.55
126.46
125.99
121.59
115.29
113.66
55.08
40.15
39.94
39.73
39.52
39.31
39.10
38.89
20.80
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 896
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T21:11:24
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2625.9
Nucleus Carbon13
OMe
TsHN
N
N
N
3ba
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

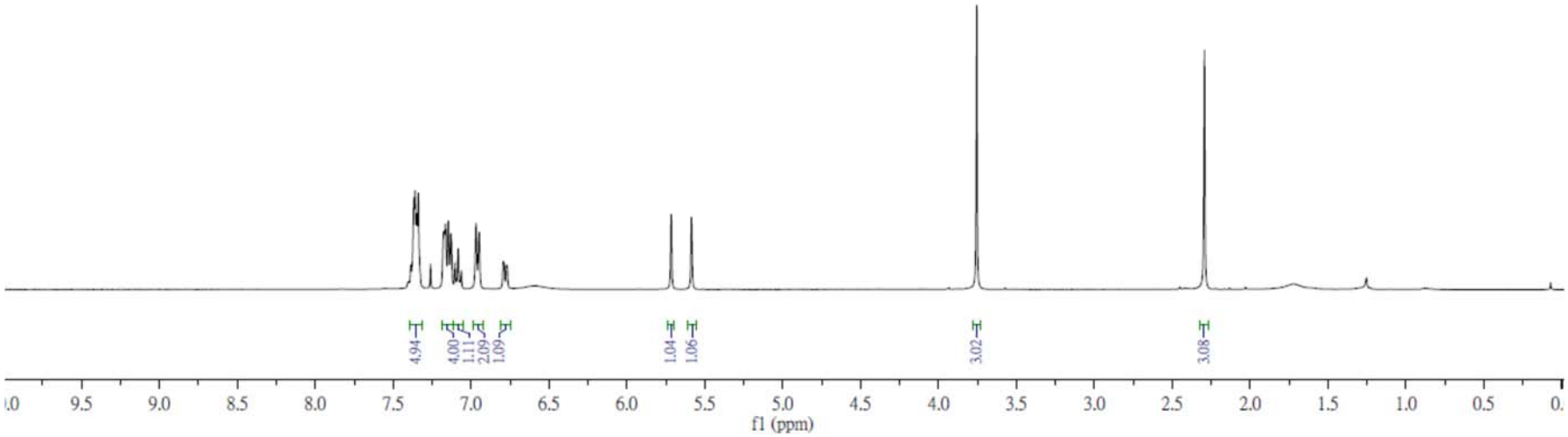

10.5880
7.4179
7.4005
7.3792
7.3736
7.3631
7.2896
7.2720
7.1621
7.1504
7.1435
6.9818
6.9597
6.9378
6.0983
5.5534
2.4614
2.2515
2.1700
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-10T17:19:09
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1203.6
Nucleus Proton
TsHN
N
N
N
3ca
0.79
5.00
2.08
2.07
4.11
1.00
0.99
3.00
3.01
f1 (ppm)


143.40
141.62
140.08
137.38
137.33
134.77
129.24
128.78
128.56
127.81
126.43
126.34
126.09
125.93
115.37
40.15
39.94
39.73
39.52
39.31
39.10
38.89
20.93
20.87
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 820
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T21:14:40
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2624.1
Nucleus Carbon13
TsHN
N
N
N
3ca
f1 (ppm)

Parameter	Value
Origin	Varian
Spectrometer	vnmrs
Solvent	"cdcl3"
Temperature	20.0
Pulse Sequence	s2pul
Experiment	1D
Number of Scans	16
Receiver Gain	30
Relaxation Delay	1.0000
Pulse Width	0.0000
Acquisition Time	2.5559
Spectrometer Frequency	399.76
Spectral Width	6410.3
Lowest Frequency	-799.4
Nucleus	1H

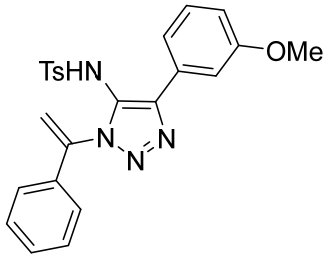


3da

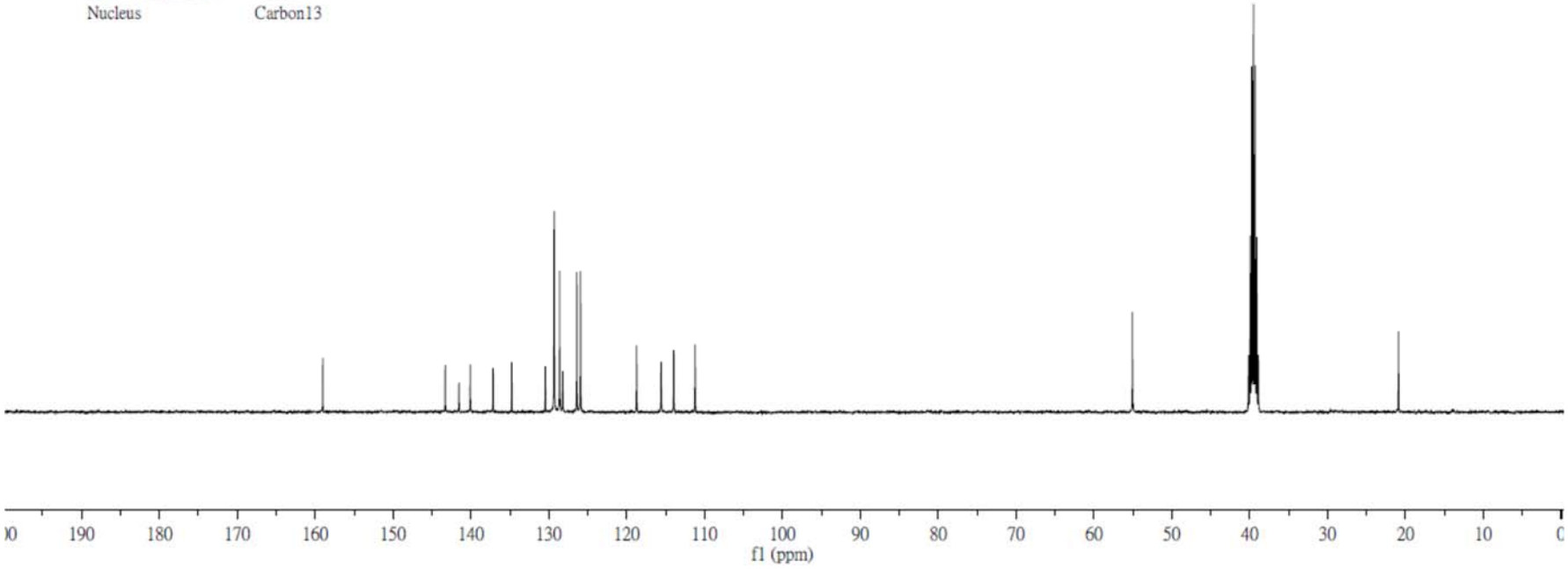


159.01
143.30
141.53
140.09
137.15
134.76
130.44
129.30
128.61
128.20
126.39
125.92
118.72
115.58
113.95
111.20
55.06
40.15
39.94
39.73
39.52
39.31
39.10
38.89
20.91

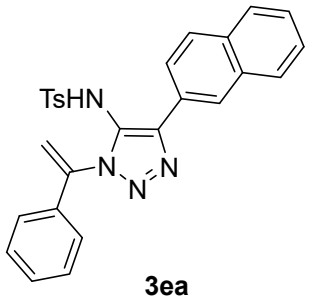
Parameter	Value
Origin	JEOL
Spectrometer	ECA
Solvent	DMSO
Temperature	
Experiment	1D
Number of Scans	661
Receiver Gain	
Relaxation Delay	2.0000
Pulse Width	4.7316
Acquisition Time	0.6336
Modification Date	2021-05-10T23:42:02
Spectrometer Frequency	100.53
Spectral Width	25252.1
Lowest Frequency	-2622.9
Nucleus	Carbon13



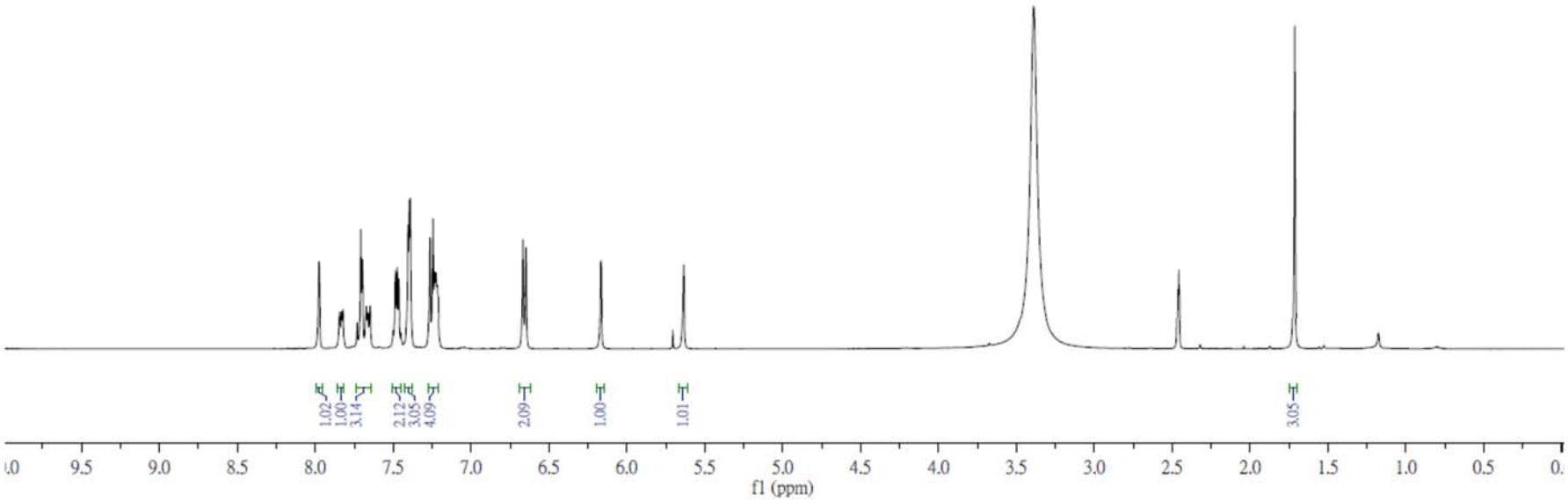
3da

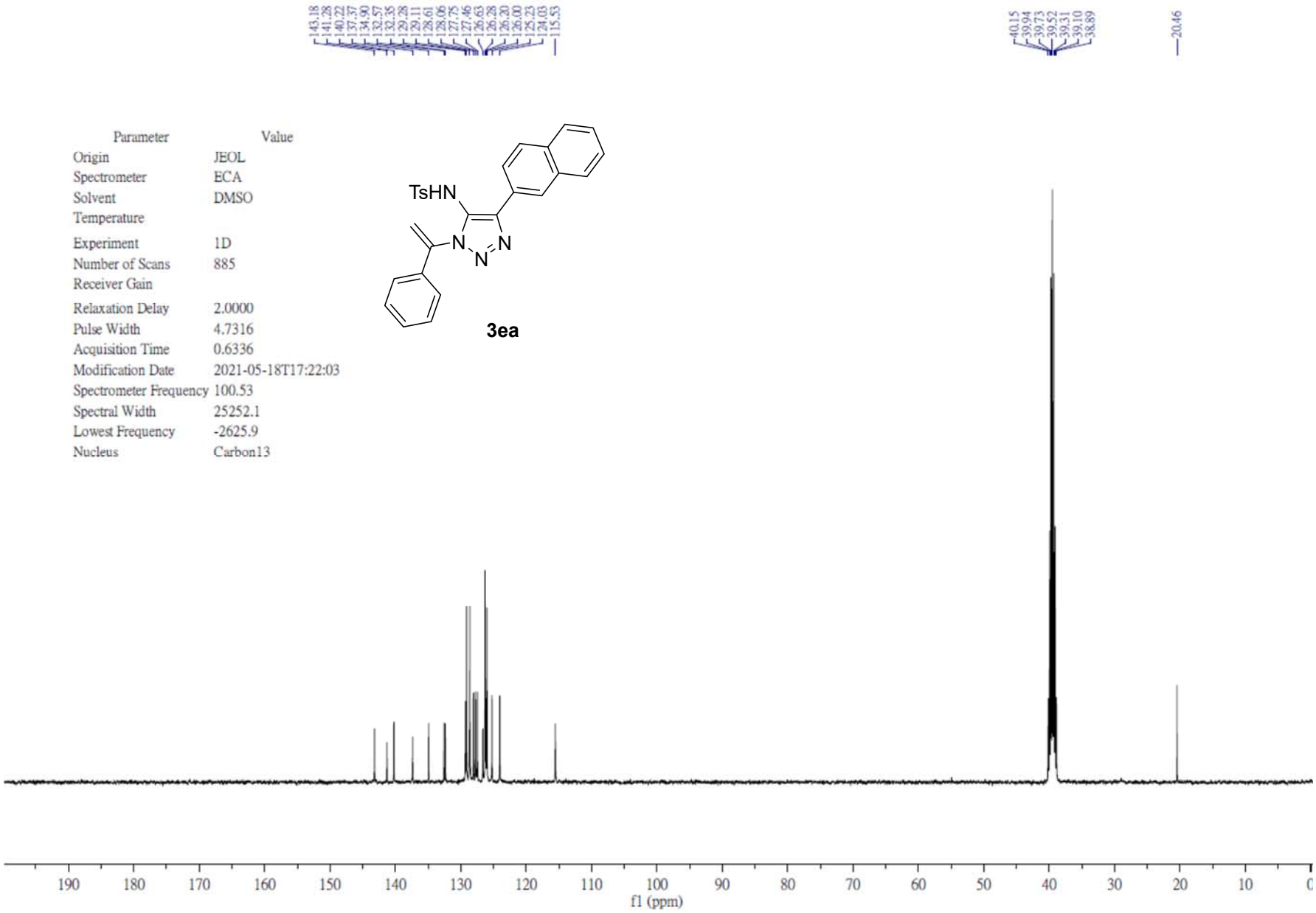


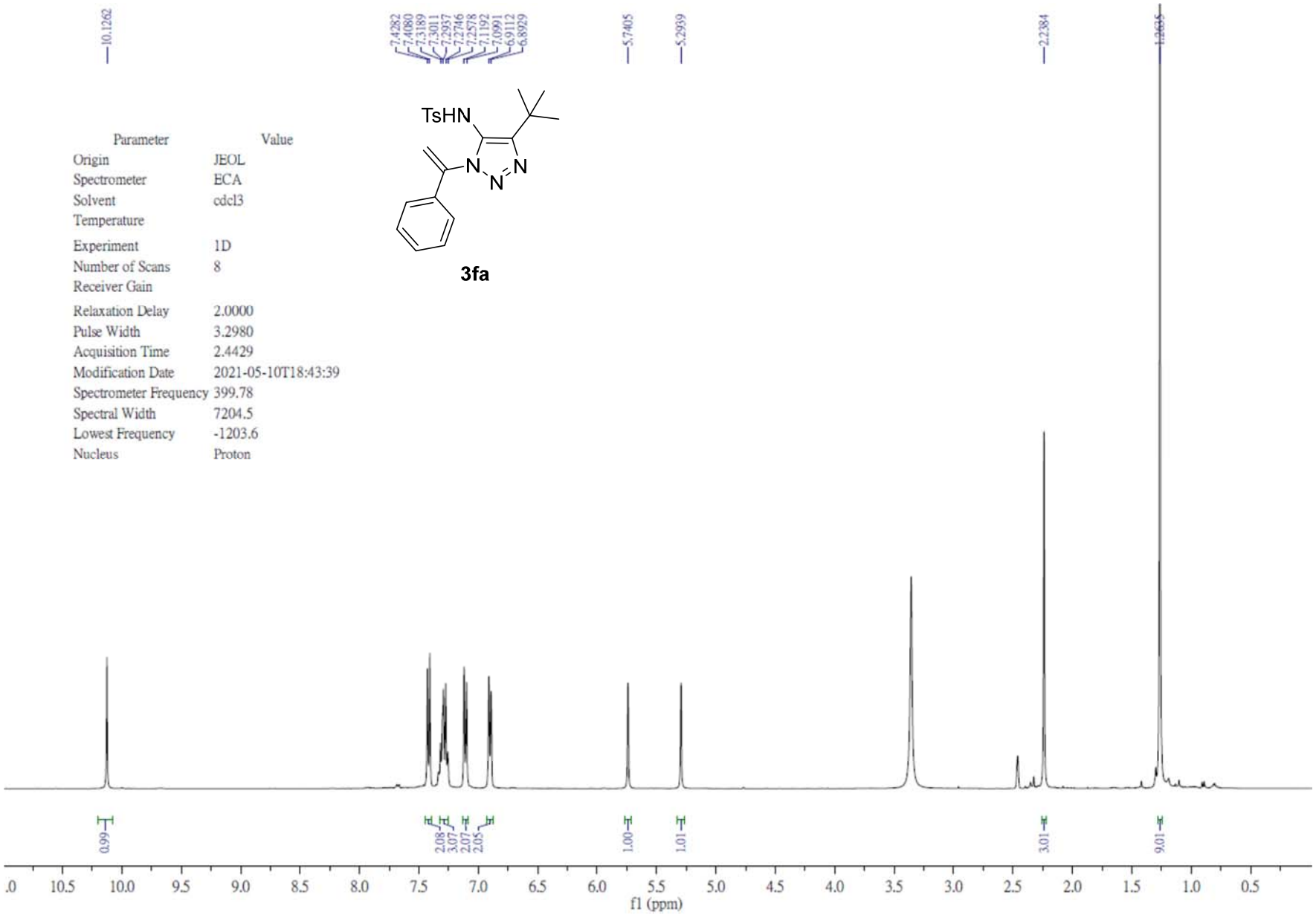
Parameter	Value
Origin	JEOL
Spectrometer	ECA
Solvent	DMSO
Temperature	
Experiment	1D
Number of Scans	8
Receiver Gain	
Relaxation Delay	2.0000
Pulse Width	3.2980
Acquisition Time	2.4429
Modification Date	2021-05-18T17:20:13
Spectrometer Frequency	399.78
Spectral Width	7204.5
Lowest Frequency	-1203.6
Nucleus	Proton

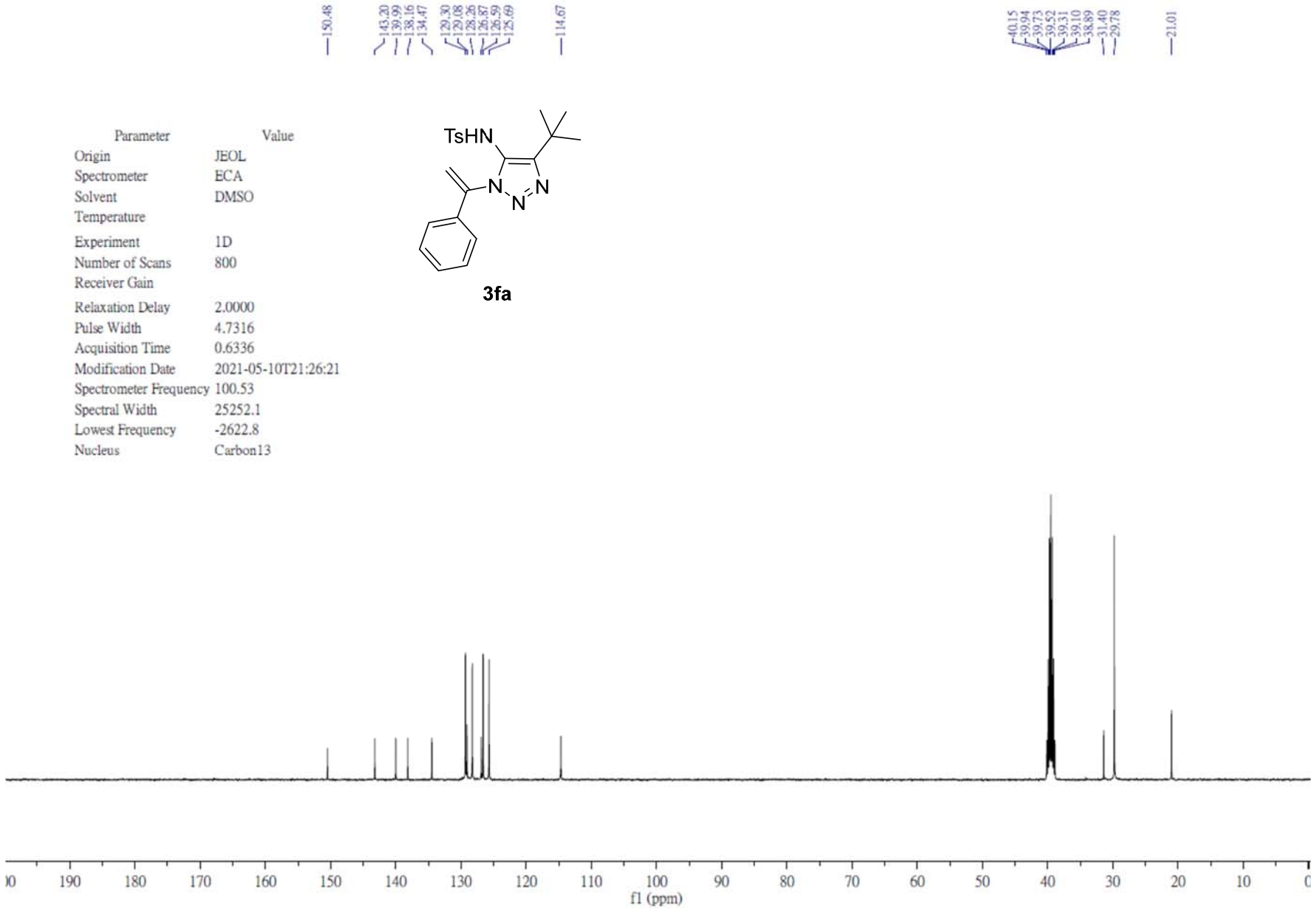


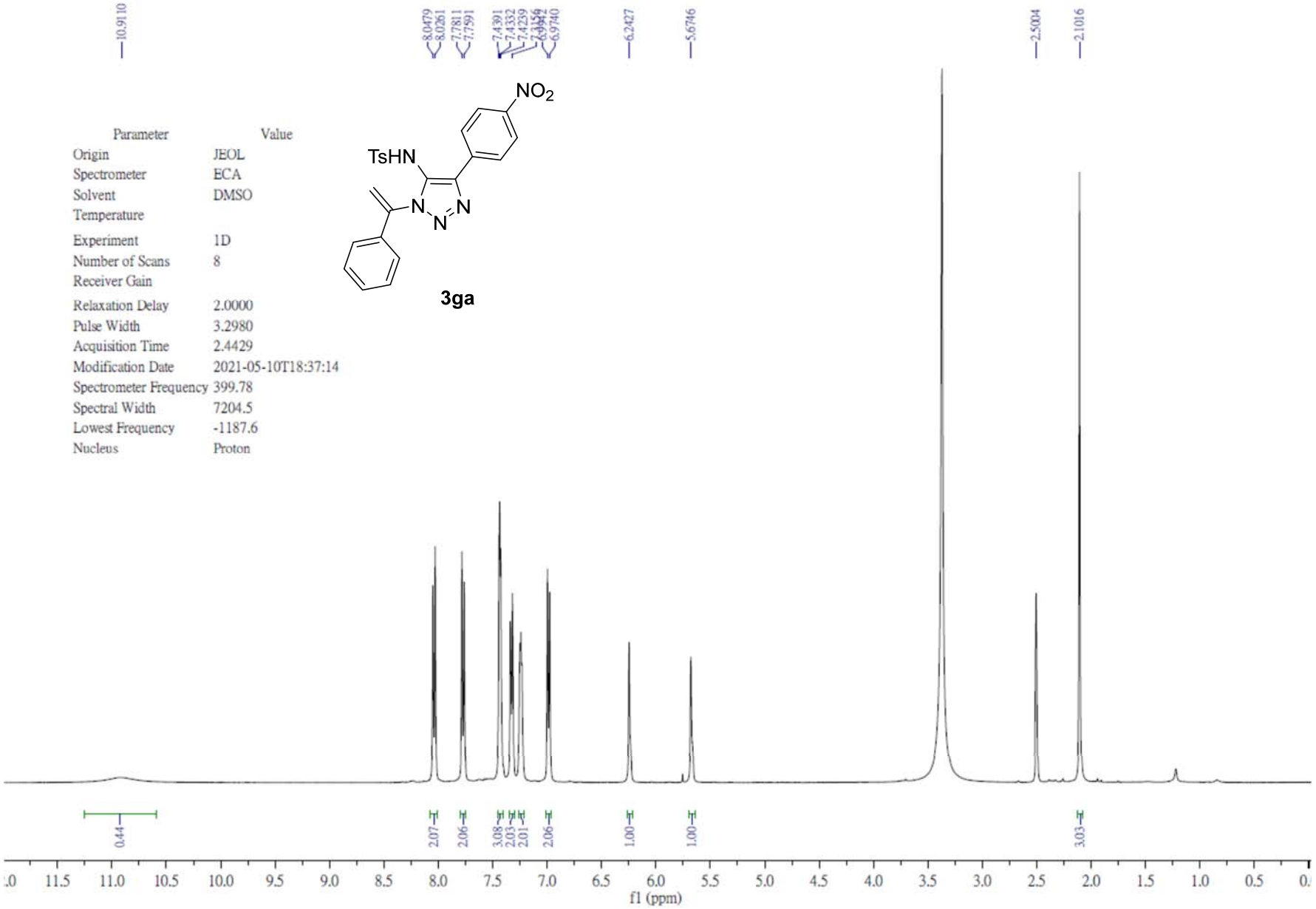
3ea

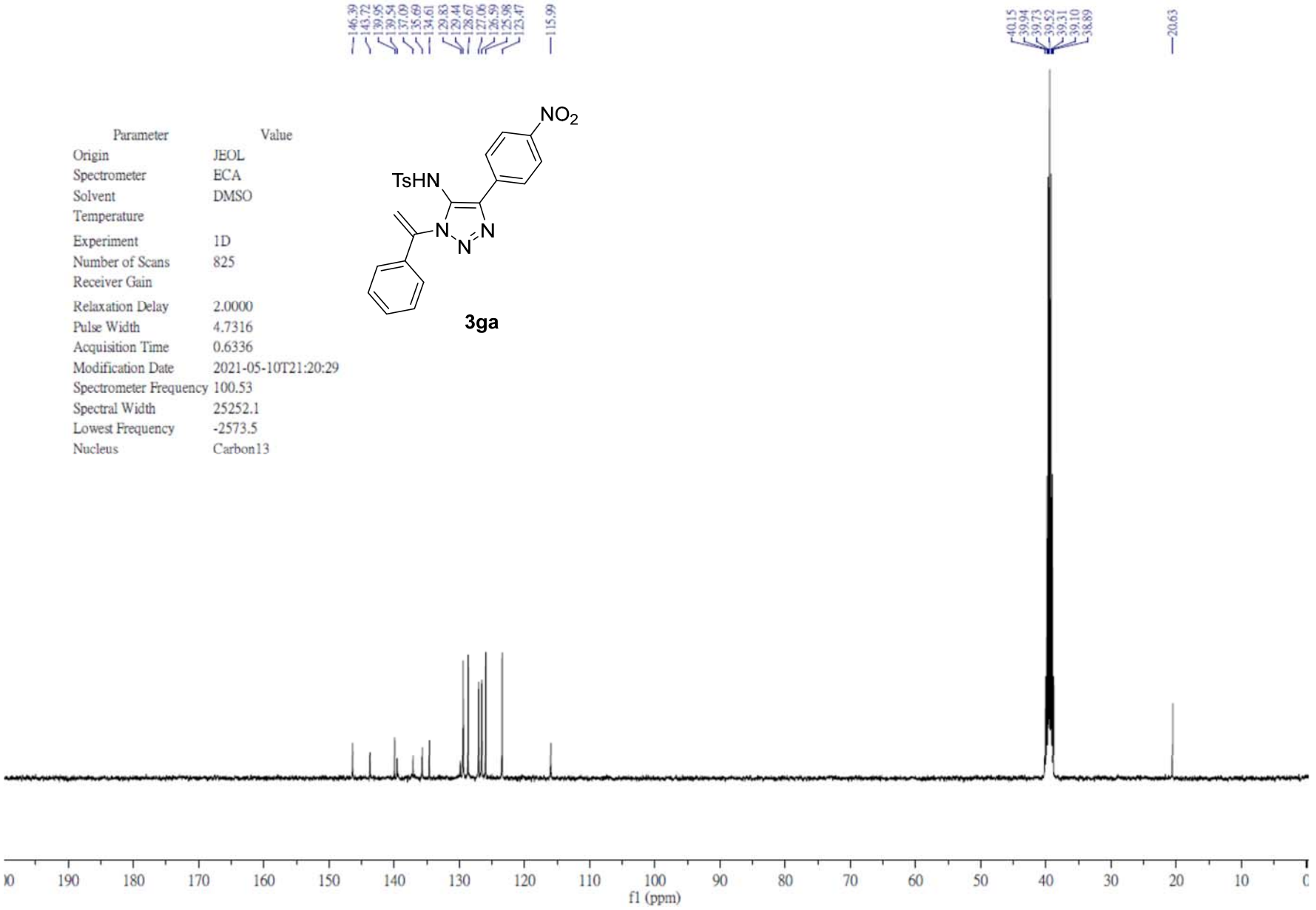


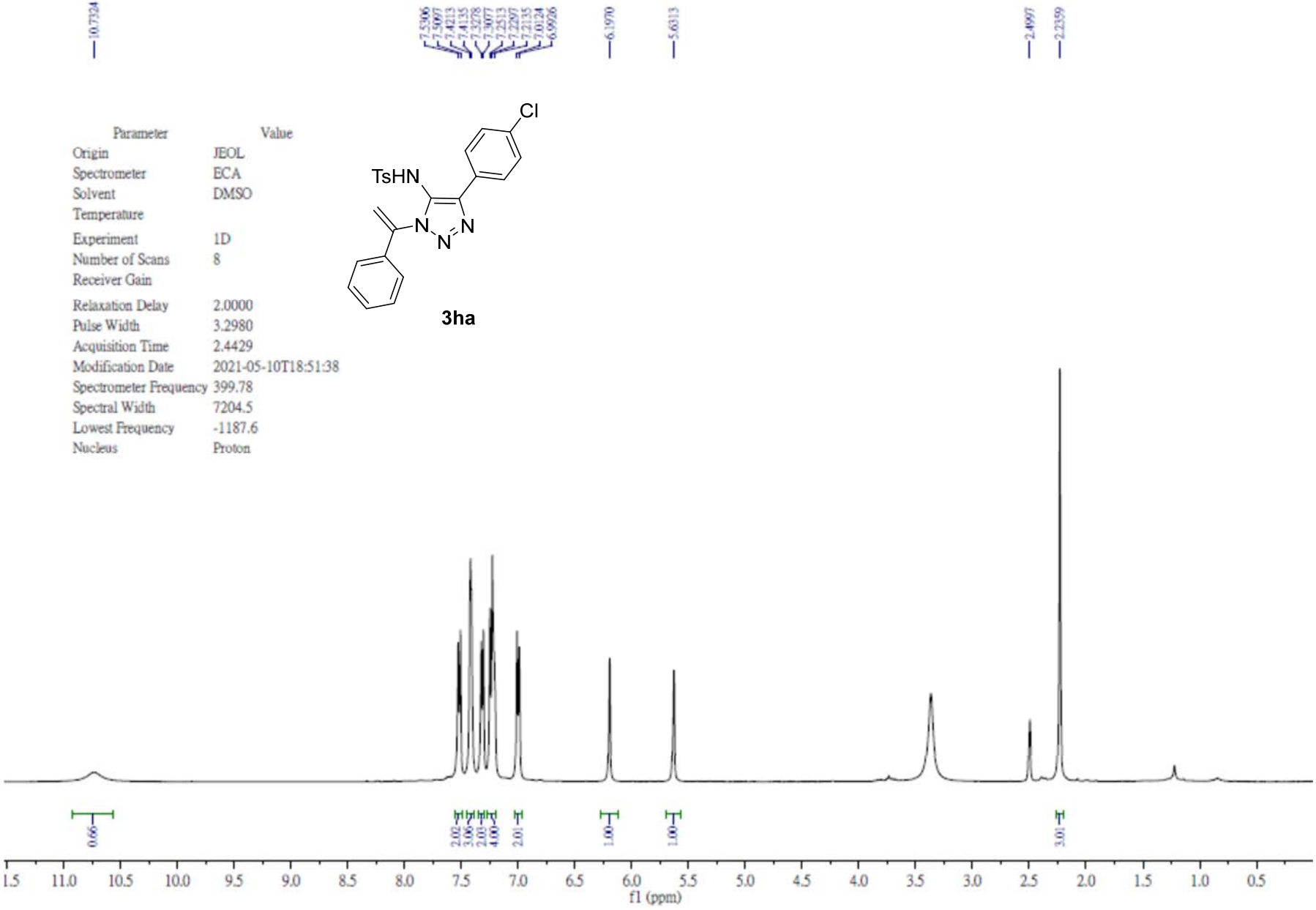

143.18
141.28
140.22
137.37
134.90
132.57
132.35
129.28
129.11
128.61
128.06
127.75
127.46
126.63
126.28
126.20
126.00
125.23
124.03
115.53
40.15
39.94
39.73
39.52
39.31
39.10
38.89
20.46
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 885
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-18T17:22:03
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2625.9
Nucleus Carbon13
TsHN
N
N
N
3ea
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

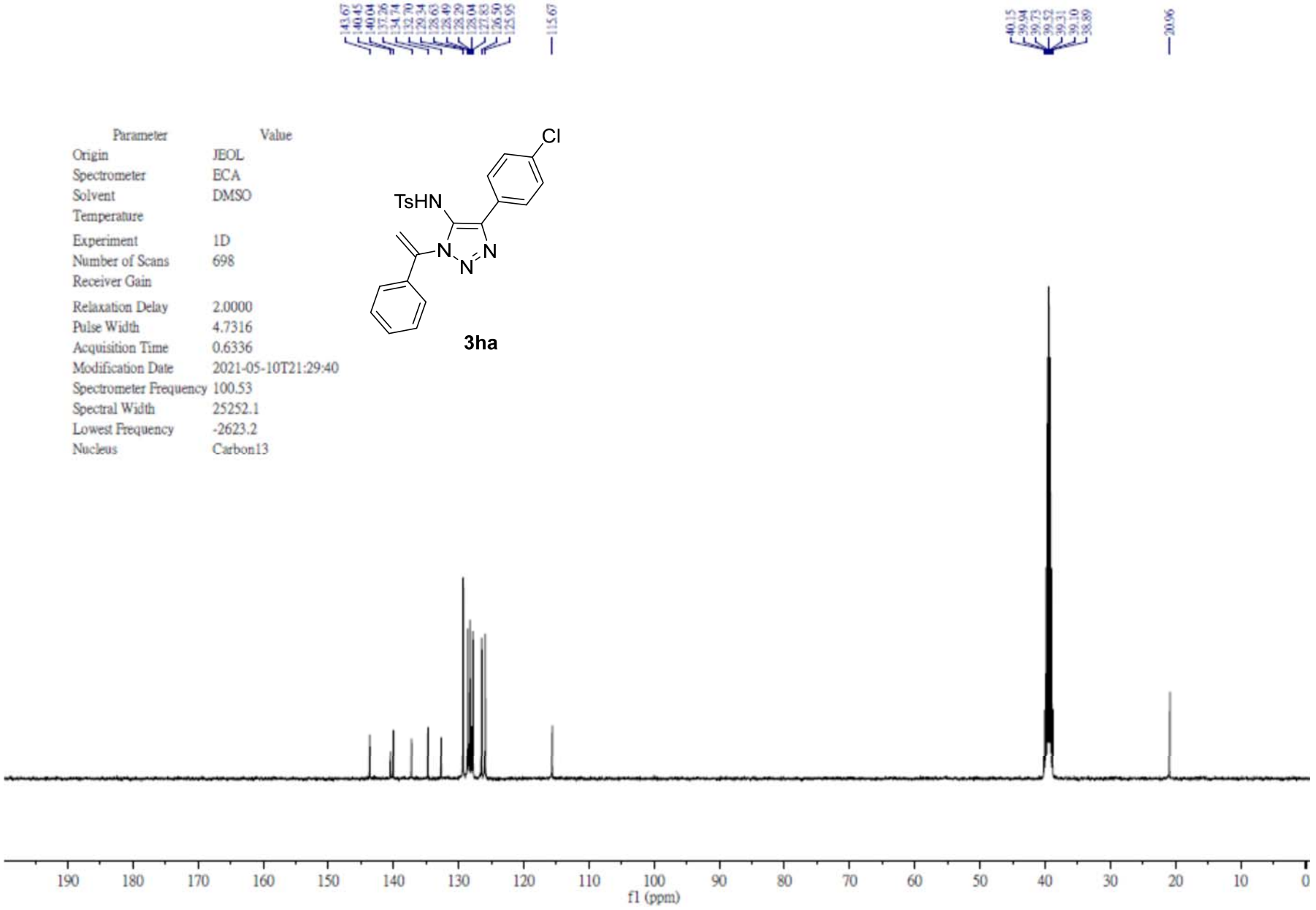

10.1262
7.4282
7.4080
7.3189
7.3011
7.2937
7.2746
7.2578
7.1192
7.0991
6.9112
6.8929
5.7405
5.2939
2.2384
1.2635
TsHN
N
N
N
3fa
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent cdcl3
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-10T18:43:39
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1203.6
Nucleus Proton
0.99
2.08
3.07
2.07
2.05
1.00
1.01
3.01
9.01
f1 (ppm)

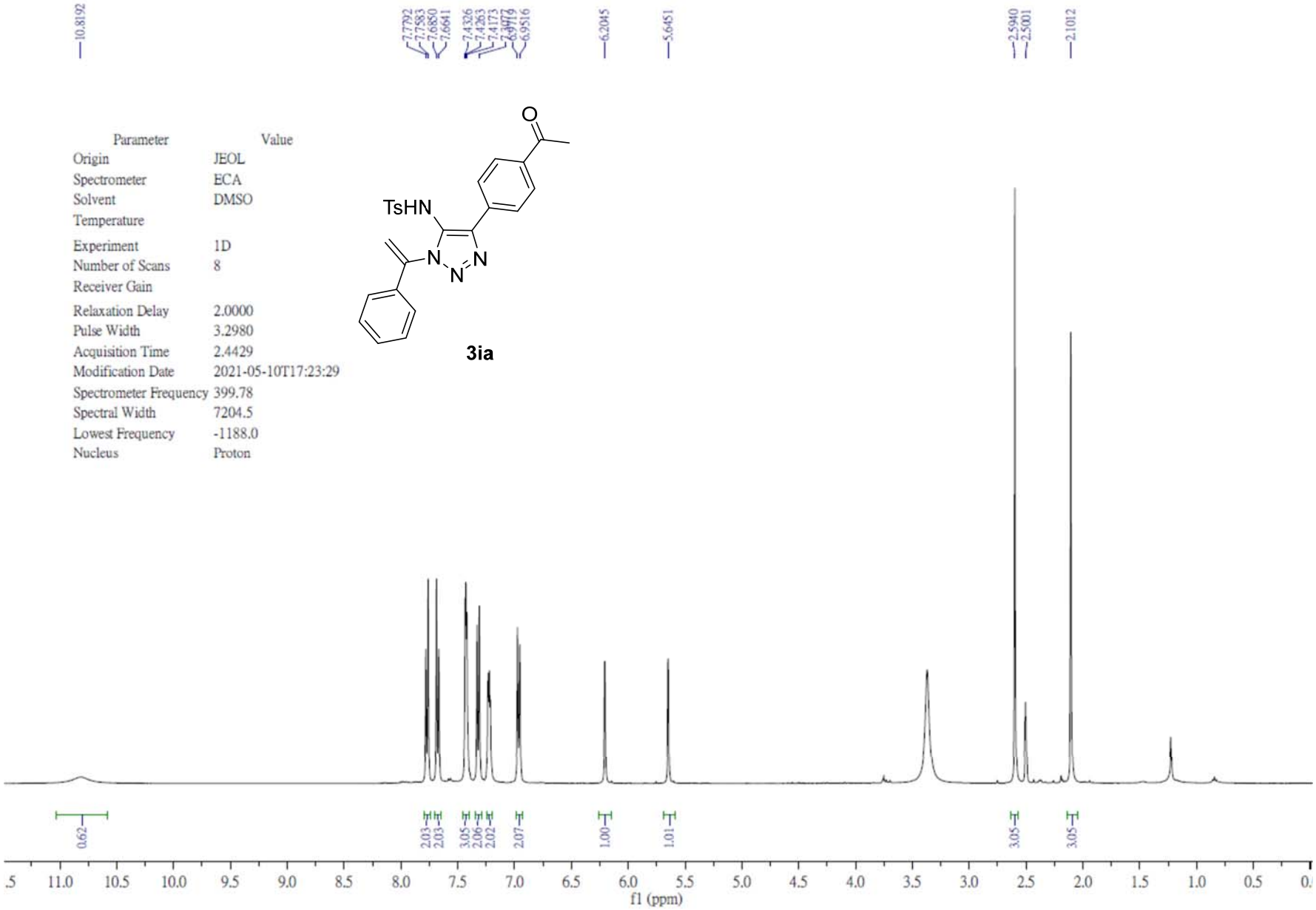

150.48
143.20
139.99
138.16
134.47
129.30
129.08
128.26
126.87
126.59
125.69
114.67
40.15
39.94
39.73
39.52
39.31
39.10
38.89
31.40
29.78
21.01
TsHN
N
N
N
3fa
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 800
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T21:26:21
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2622.8
Nucleus Carbon13
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

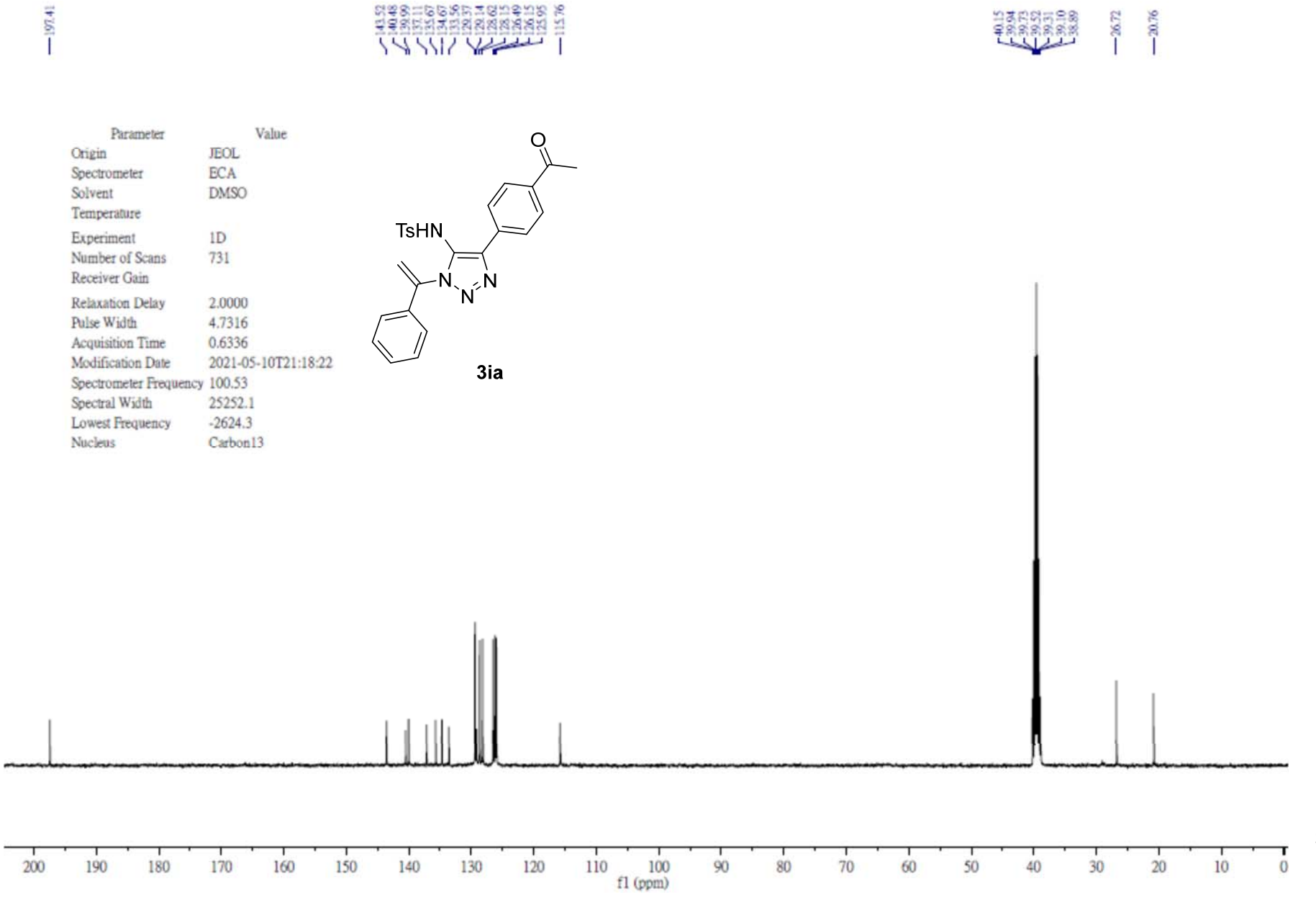

10.9110
8.0479
8.0261
7.7811
7.7591
7.4391
7.4332
7.4239
6.9740
6.2427
5.6746
2.5004
2.1016
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-10T18:37:14
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1187.6
Nucleus Proton
NO2
TsHN
N
N
N
3ga
0.44
2.07
2.06
3.08
2.03
2.01
2.06
1.00
1.00
3.03
f1 (ppm)

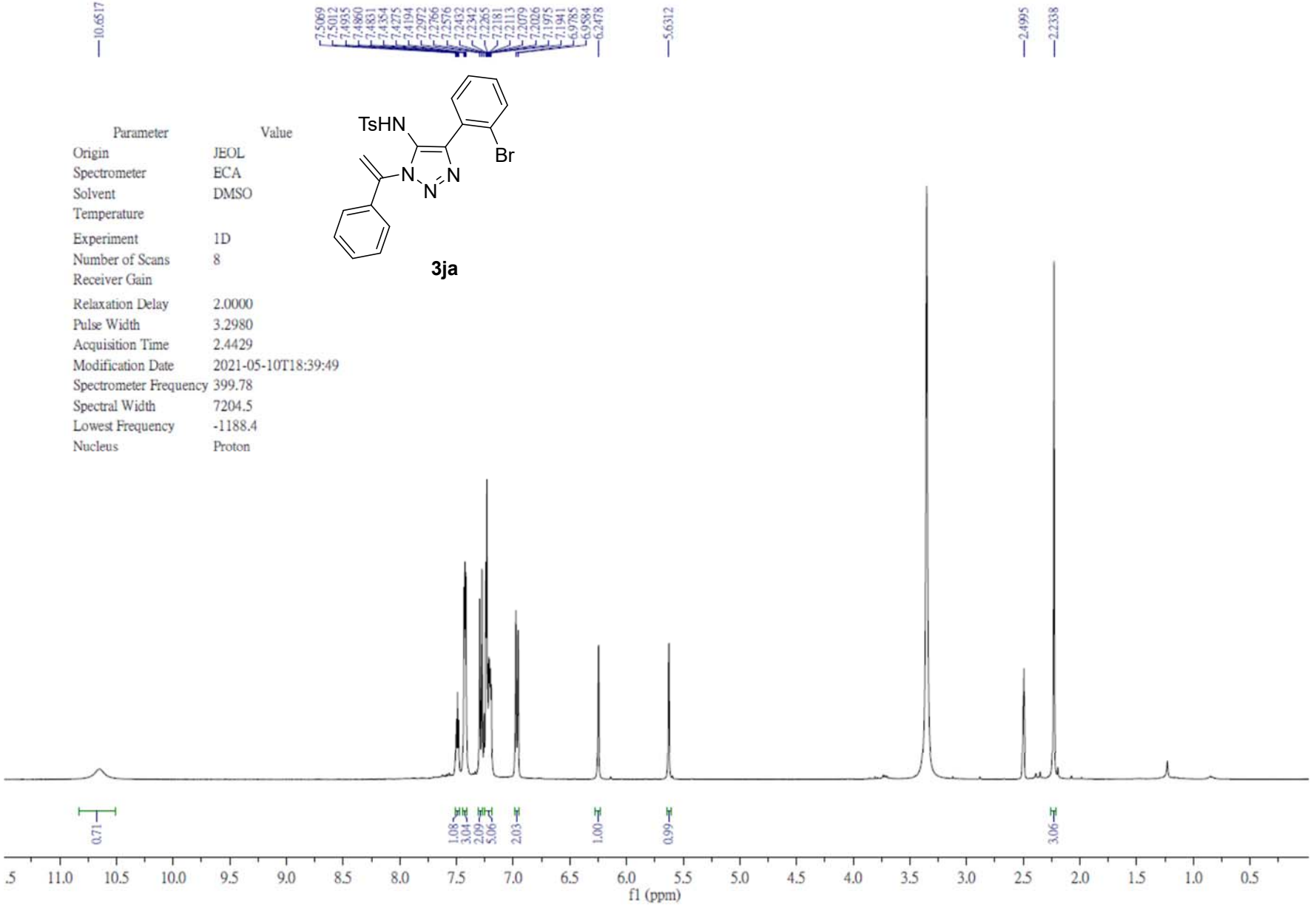

146.39
143.72
139.95
139.54
137.09
135.69
134.61
129.83
129.44
128.67
127.06
126.59
125.98
123.47
115.99
40.15
39.94
39.73
39.52
39.31
39.10
38.89
20.63
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 825
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T21:20:29
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2573.5
Nucleus Carbon13
TsHN
NO2
N
N
N
3ga
f1 (ppm)

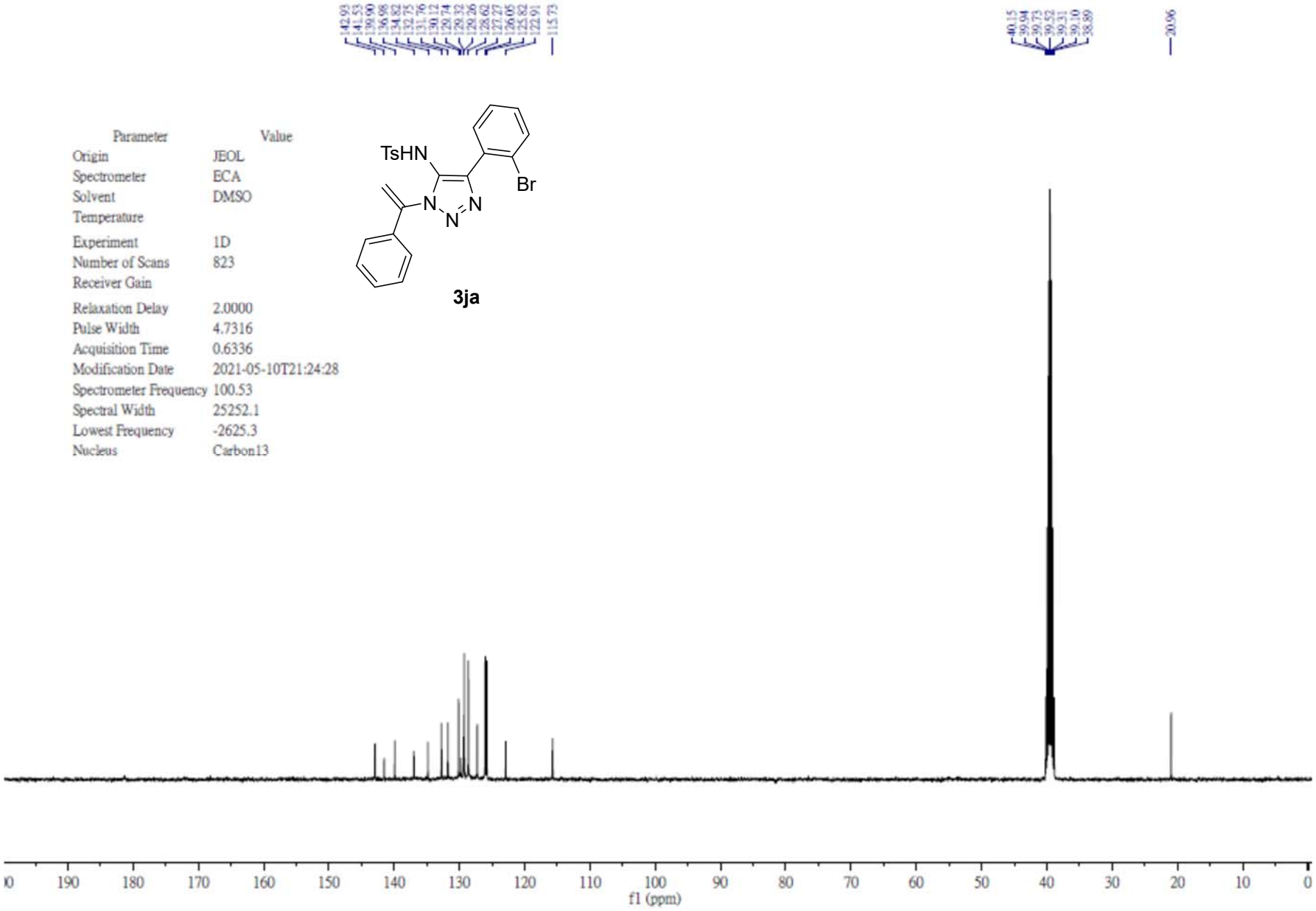

10.7324
7.5906
7.5097
7.4213
7.4135
7.3278
7.3077
7.2513
7.2297
7.2135
7.0124
6.9926
6.1970
5.6313
2.4997
2.2359
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-10T18:51:38
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1187.6
Nucleus Proton
Cl
TsHN
N
N
N
3ha
0.66
2.02
3.06
2.03
4.00
2.01
1.00
1.00
3.01
1.5 11.0 10.5 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
f1 (ppm)

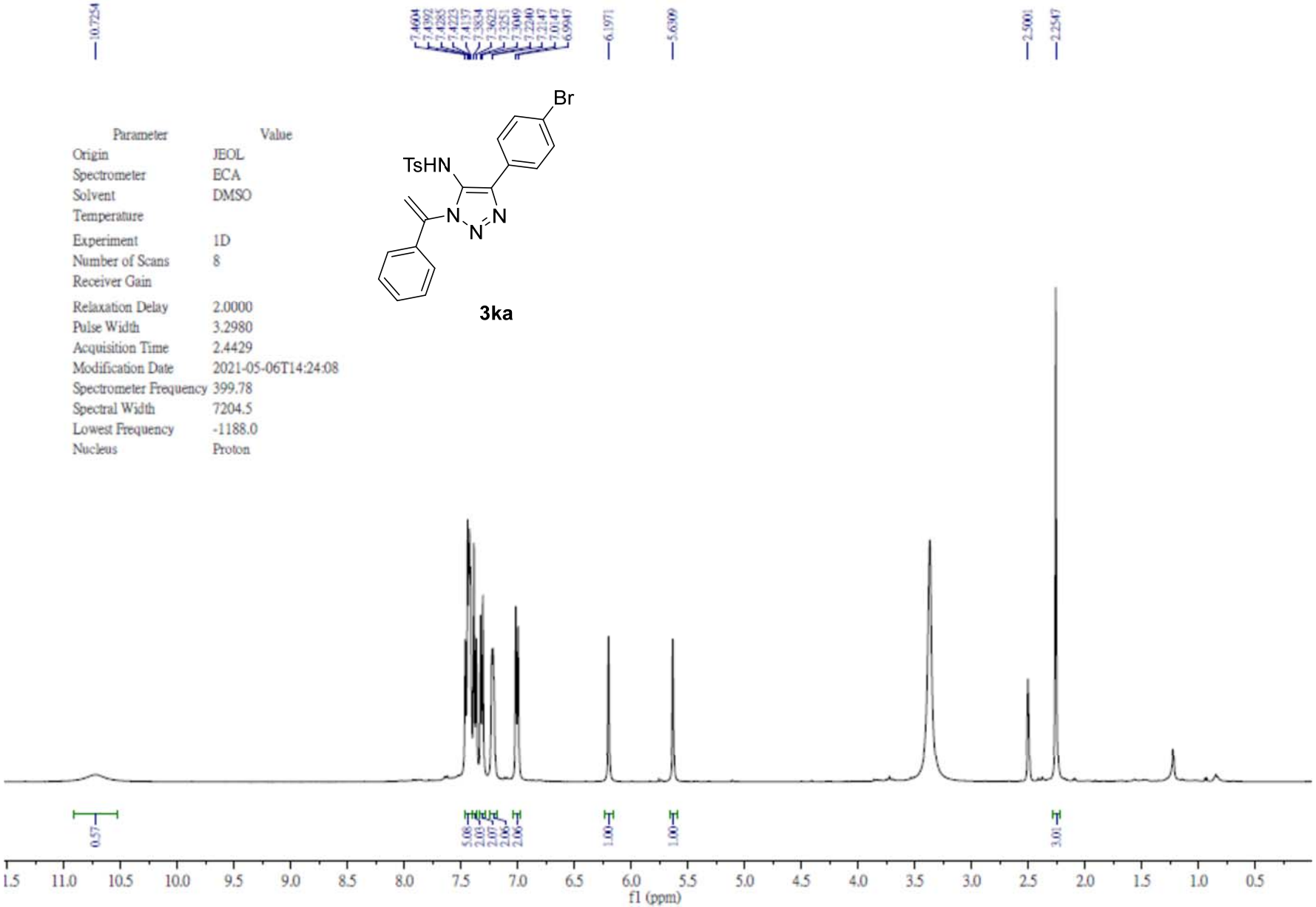

143.67
140.45
140.04
137.26
134.74
132.70
129.34
128.63
128.49
128.29
128.04
127.83
126.50
125.95
115.67
40.15
39.94
39.73
39.52
39.31
39.10
38.89
20.96
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 698
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T21:29:40
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2623.2
Nucleus Carbon13
Cl
TsHN
N
N
N
3ha
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

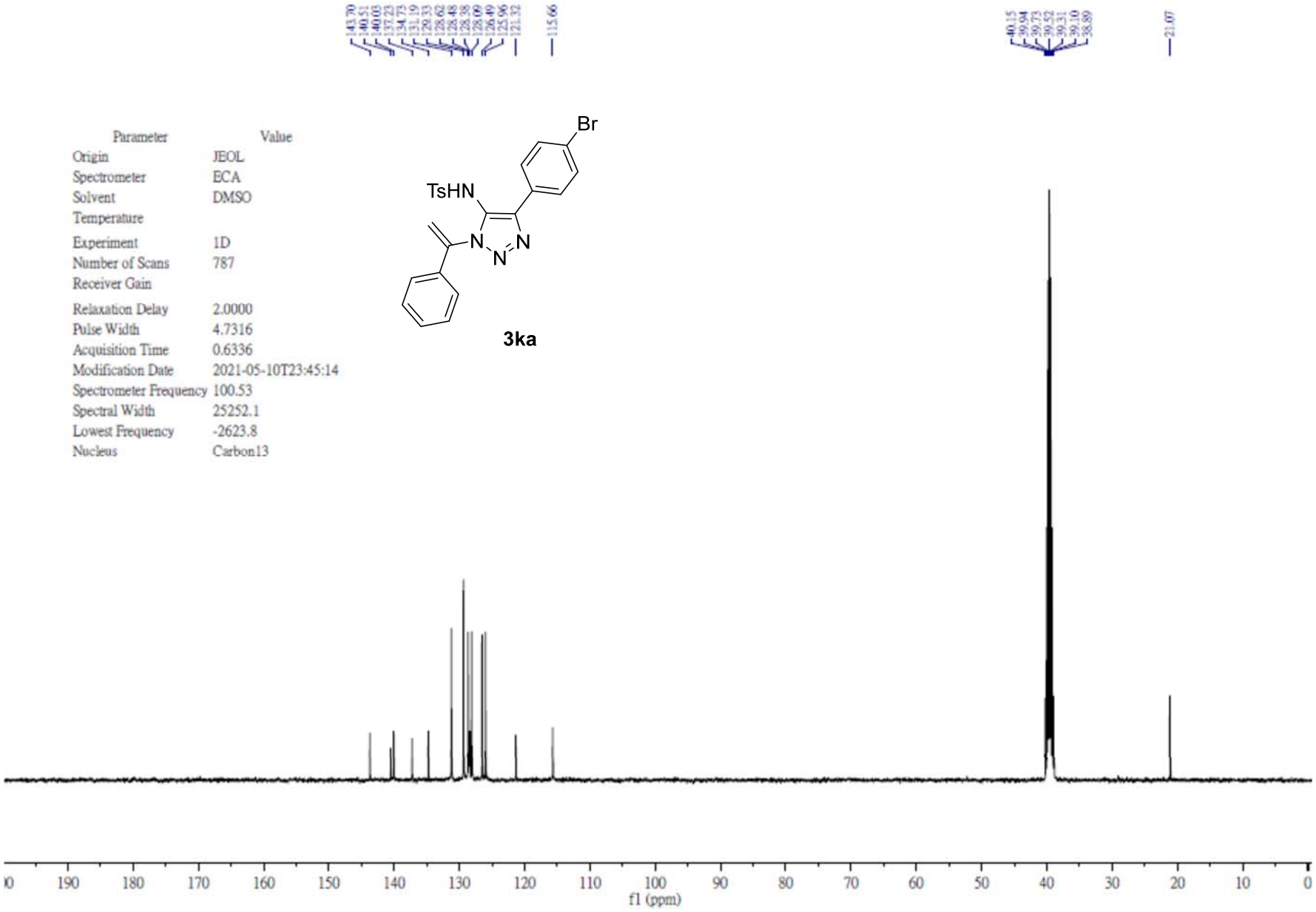

10.8192
7.7792
7.7583
7.6850
7.6641
7.4326
7.4263
7.4173
6.9516
6.2045
5.6451
2.5940
2.5001
2.1012
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-10T17:23:29
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1188.0
Nucleus Proton
TsHN
O
N
N
N
3ia
0.62
2.03
2.03
3.05
2.06
2.02
2.07
1.00
1.01
3.05
3.05
f1 (ppm)

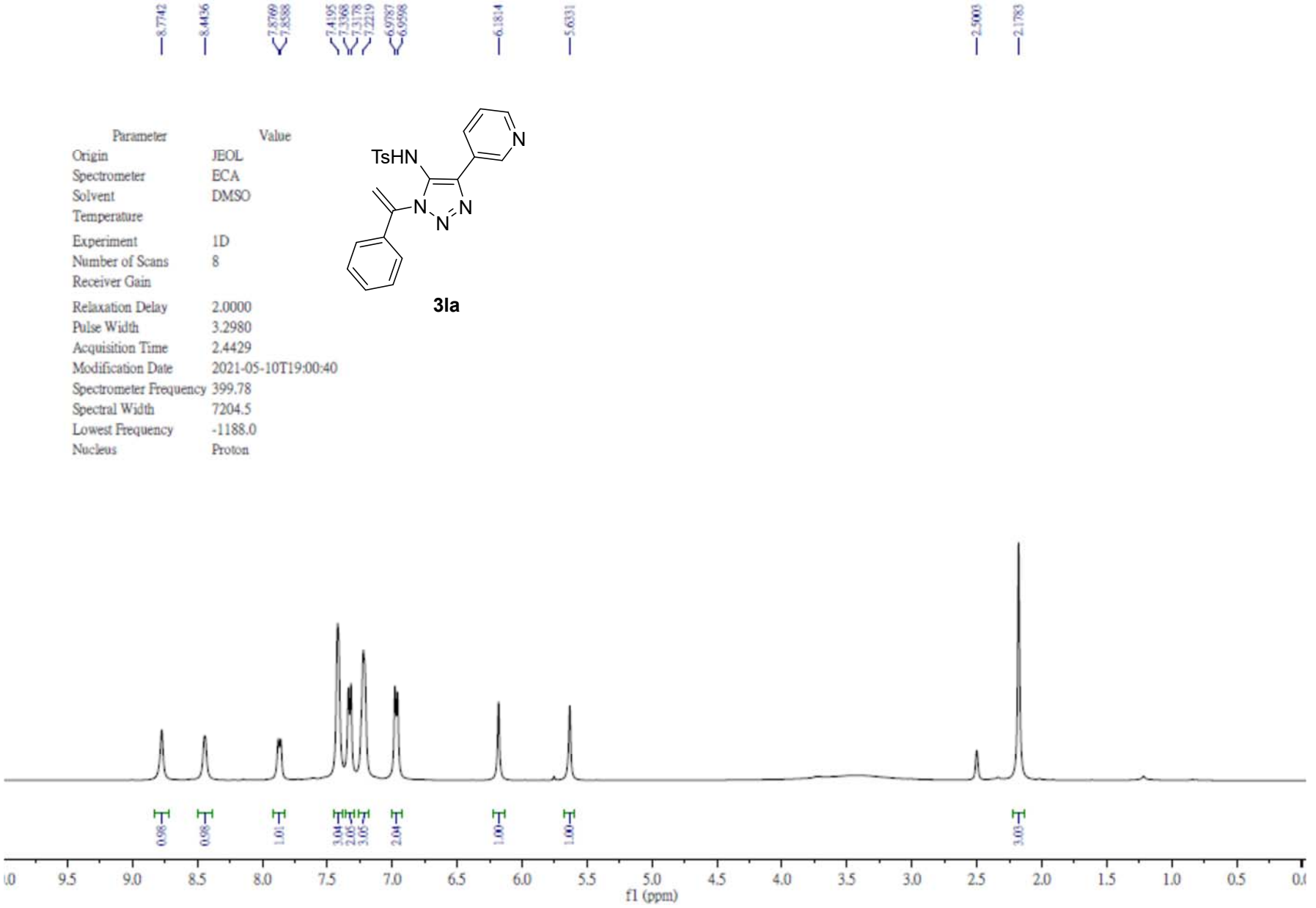

197.41
143.52
140.48
139.99
137.11
135.67
134.67
133.56
129.37
129.14
128.62
128.15
126.49
126.15
125.95
115.76
40.15
39.94
39.73
39.52
39.31
39.10
38.89
26.72
20.76
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 731
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T21:18:22
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2624.3
Nucleus Carbon13
TsHN
O
N
N
N
3ia
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


10.6517
7.5069
7.5012
7.4955
7.4860
7.4831
7.4354
7.4275
7.4194
7.2972
7.2766
7.2576
7.2432
7.2342
7.2265
7.2181
7.2113
7.2079
7.2026
7.1975
7.1941
6.9785
6.9584
6.2478
5.6312
2.4995
2.2338
TsHN
Br
N
N
N
3ja
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-10T18:39:49
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1188.4
Nucleus Proton
0.71
1.08
3.04
2.09
5.06
2.03
1.00
0.99
3.06
f1 (ppm)

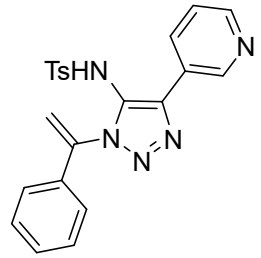

142.93
141.53
139.90
136.98
134.82
132.75
131.76
130.12
129.74
129.32
129.26
128.62
127.27
126.05
125.82
122.91
115.73
40.15
39.94
39.73
39.52
39.31
39.10
38.89
20.96
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 823
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T21:24:28
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2625.3
Nucleus Carbon13
TsHN
Br
N
N
N
3ja
f1 (ppm)


10.7254
7.4604
7.4392
7.4285
7.4223
7.4137
7.3834
7.3623
7.3251
7.3049
7.2246
7.2147
7.0147
6.9947
6.1971
5.6309
2.5001
2.2547
Br
TsHN
N
N
N
3ka
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-06T14:24:08
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1188.0
Nucleus Proton
0.57
5.08
2.03
2.07
2.06
2.06
1.00
1.00
3.01
f1 (ppm)

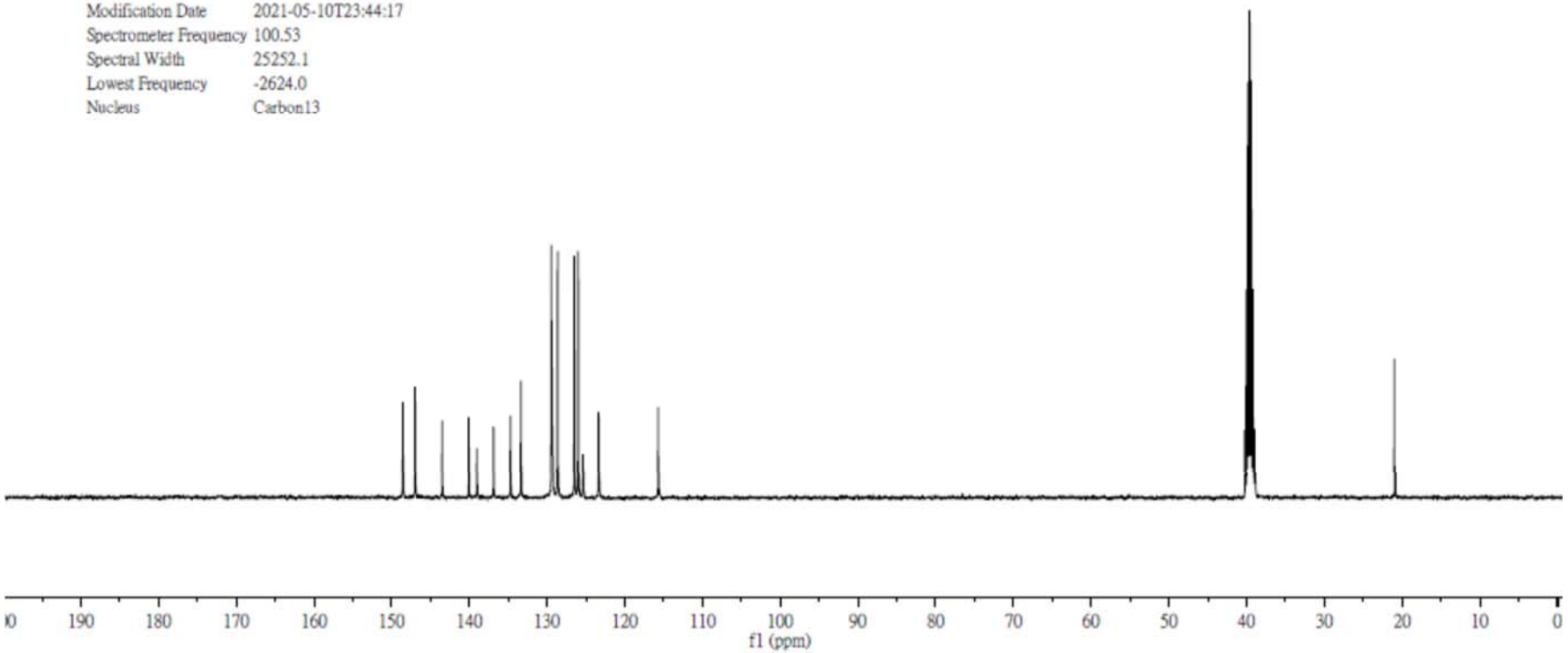

143.70
140.51
140.03
137.23
134.73
131.19
129.33
128.62
128.48
128.38
128.09
126.49
125.96
121.32
115.66
40.15
39.94
39.73
39.52
39.31
39.10
38.89
21.07
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 787
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T23:45:14
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2623.8
Nucleus Carbon13
Br
TsHN
N
N
N
3ka
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

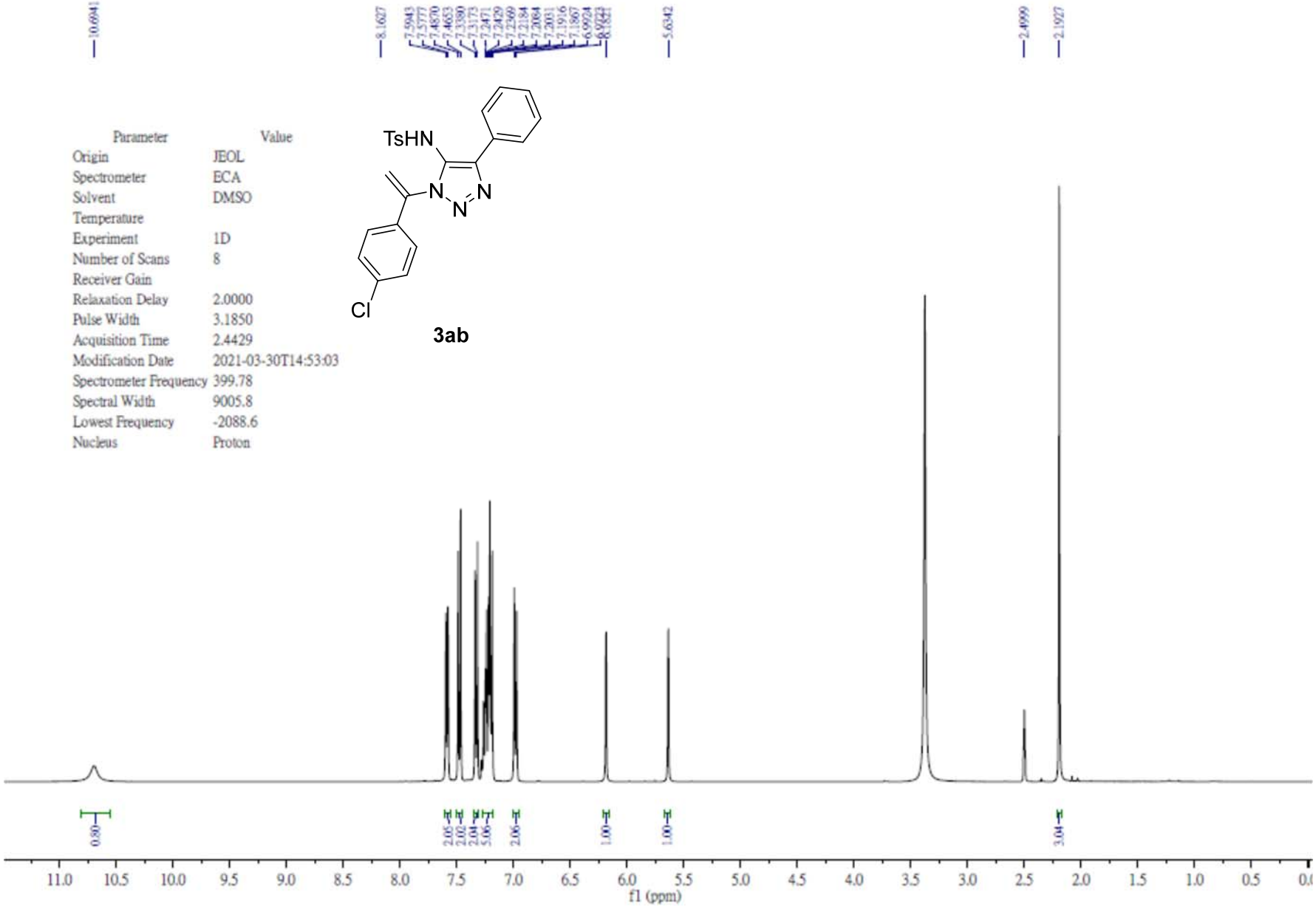

8.7742
8.4436
7.8769
7.8588
7.4195
7.3368
7.3178
7.2219
6.9787
6.9598
6.1814
5.6331
2.5003
2.1783
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-10T19:00:40
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1188.0
Nucleus Proton
TsHN
N
N
N
N
3Ia
0.98
0.98
1.01
3.04
2.05
3.05
2.04
1.00
1.00
3.03
f1 (ppm)

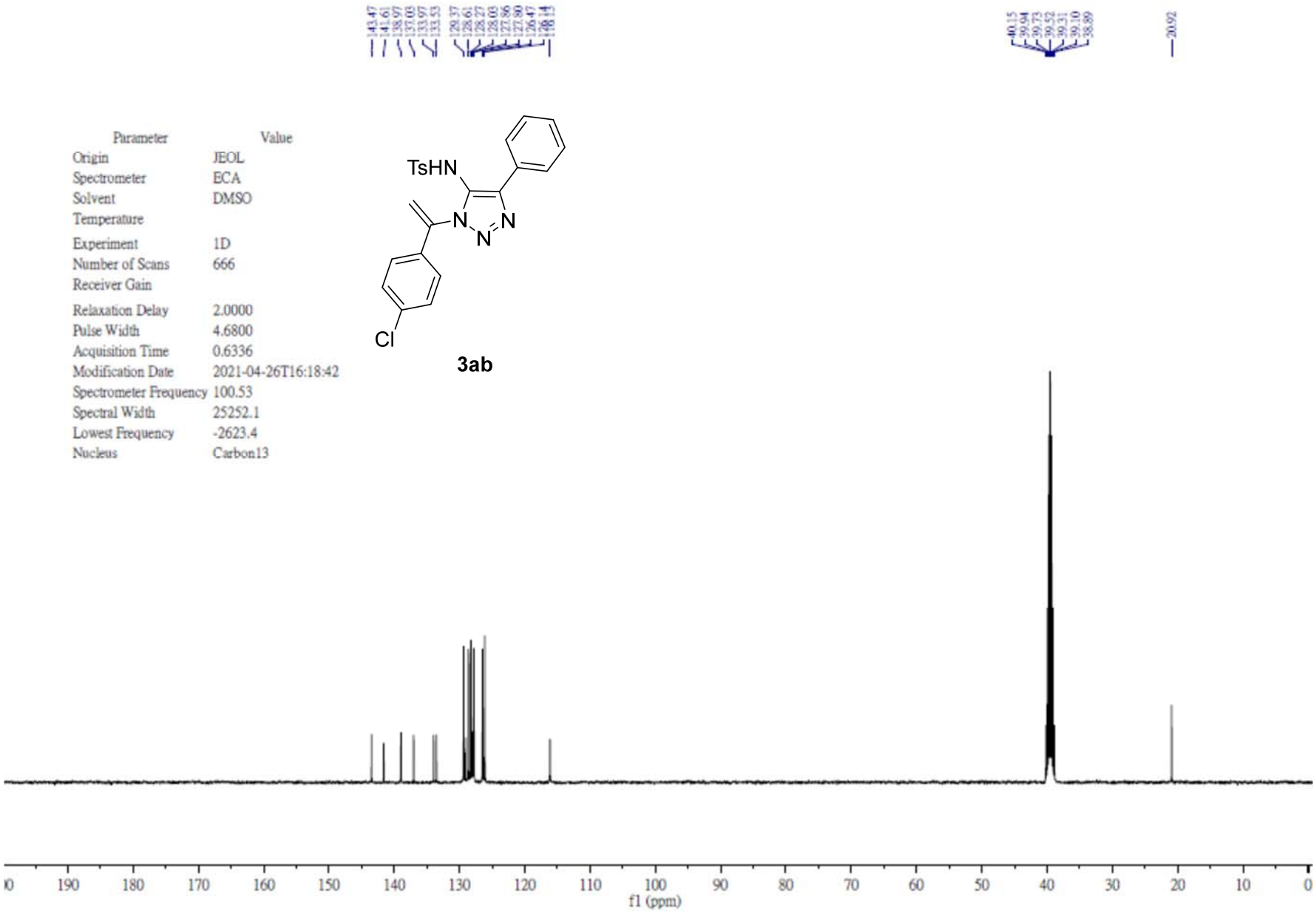
Parameter	Value
Origin	JEOL
Spectrometer	ECA
Solvent	DMSO
Temperature	
Experiment	1D
Number of Scans	763
Receiver Gain	
Relaxation Delay	2.0000
Pulse Width	4.7316
Acquisition Time	0.6336
Modification Date	2021-05-10T23:44:17
Spectrometer Frequency	100.53
Spectral Width	25252.1
Lowest Frequency	-2624.0
Nucleus	Carbon13

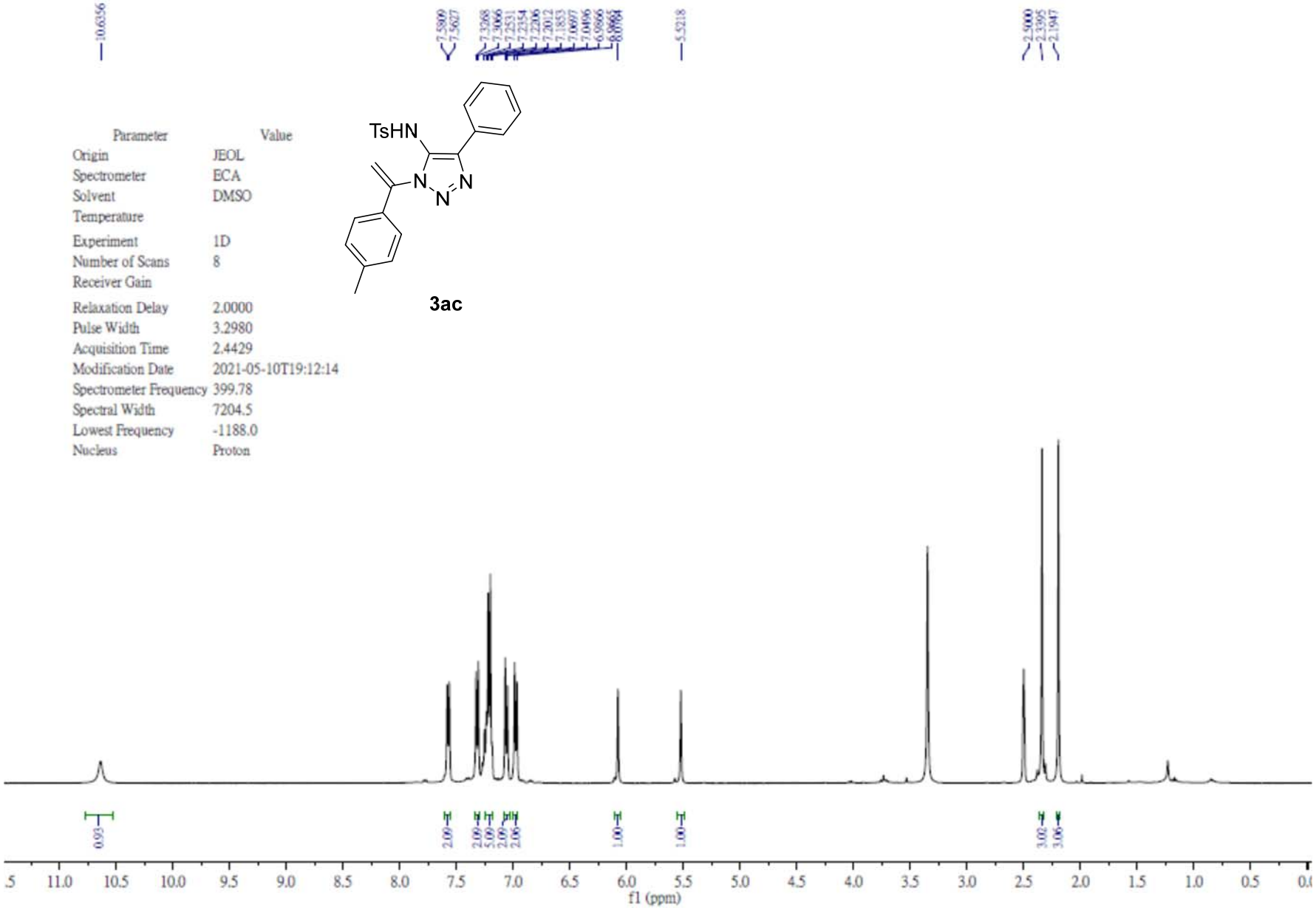


3Ia

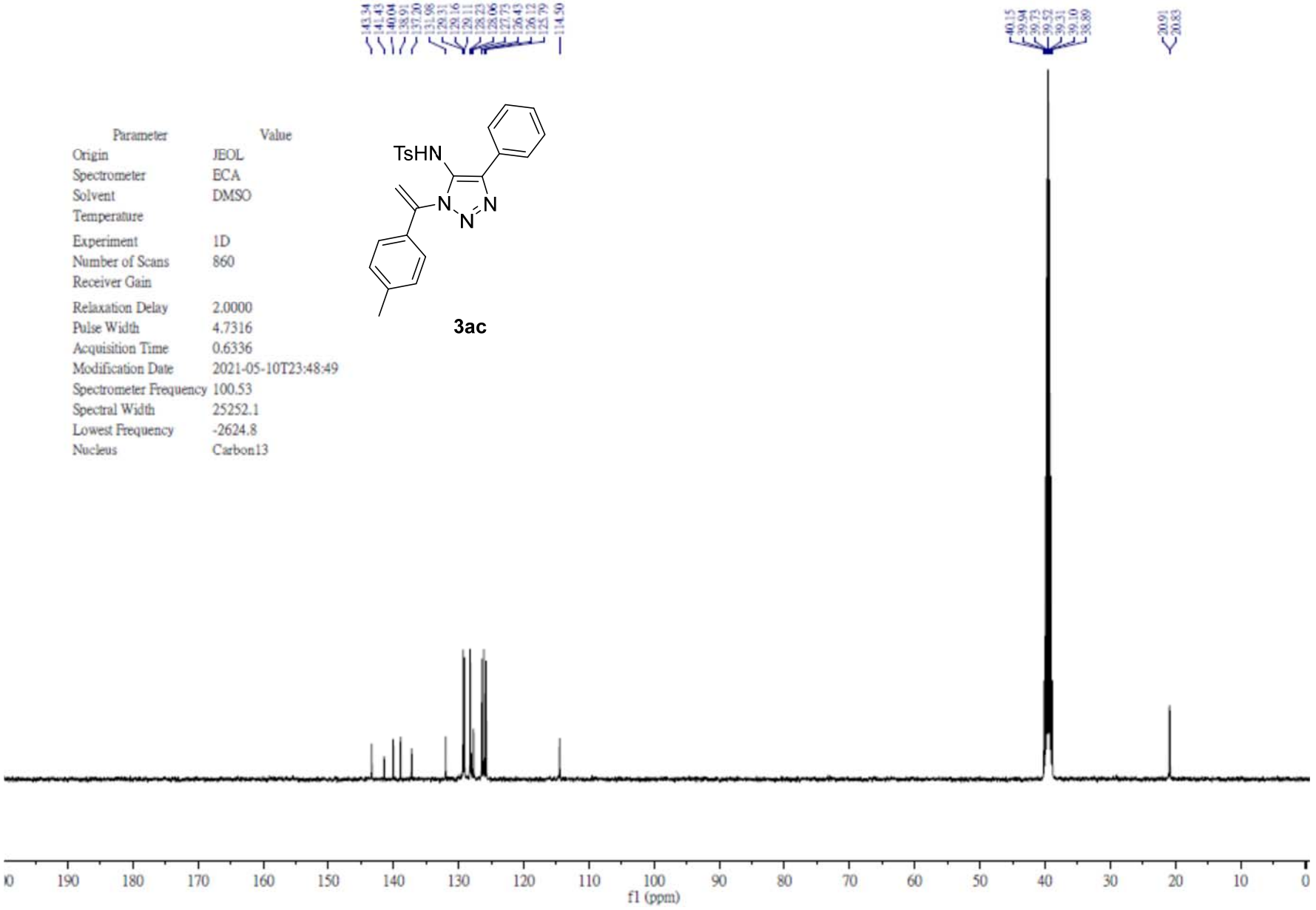


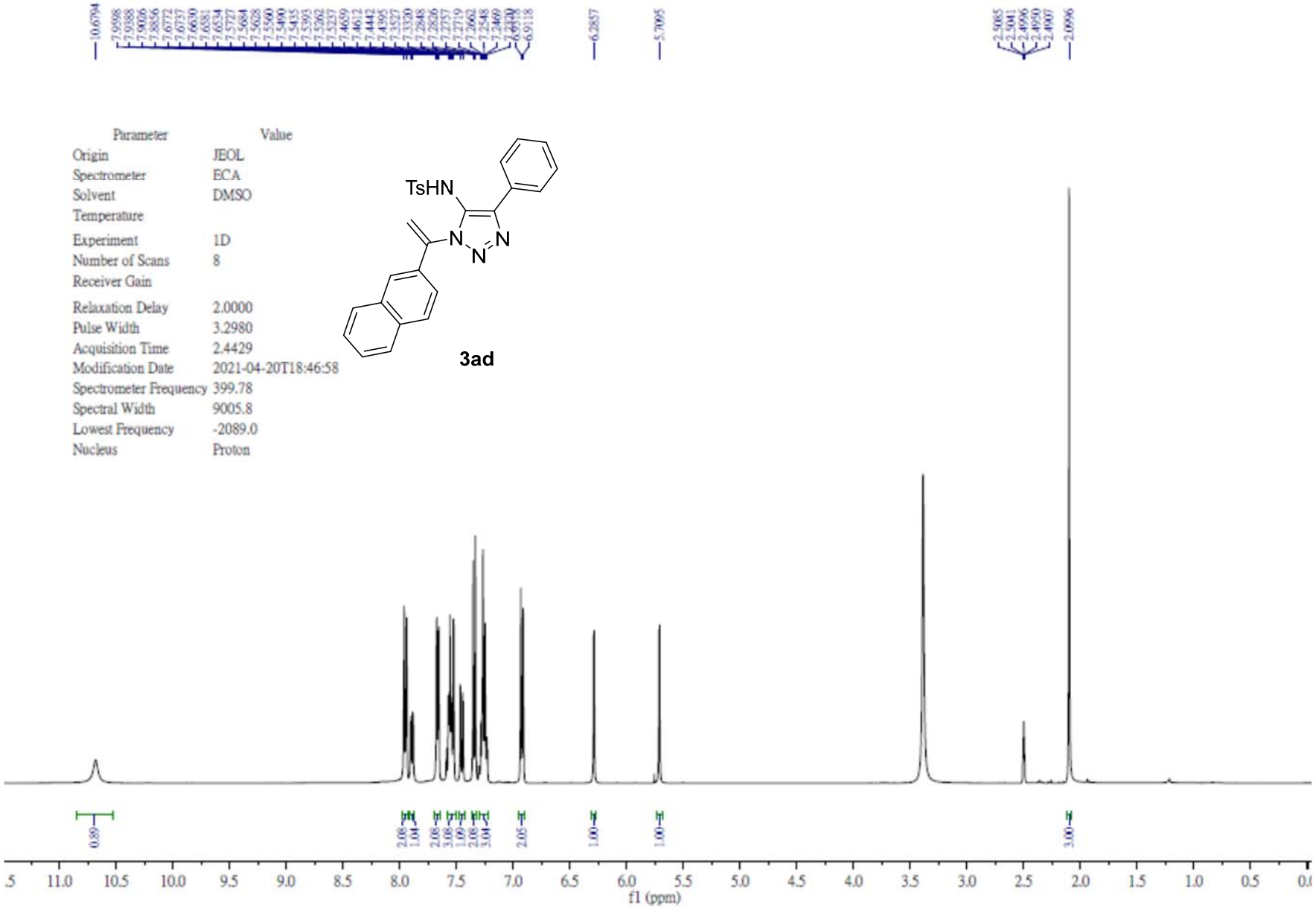

10.6941
8.1627
7.5943
7.5777
7.4870
7.4653
7.3380
7.3173
7.2471
7.2429
7.2369
7.2184
7.2064
7.2031
7.1916
7.1867
6.9924
5.6342
2.4999
2.1927
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.1850
Acquisition Time 2.4429
Modification Date 2021-03-30T14:53:03
Spectrometer Frequency 399.78
Spectral Width 9005.8
Lowest Frequency -2088.6
Nucleus Proton
TsHN
N
N
N
Cl
3ab
0.80
2.05
2.02
2.04
5.06
2.06
1.00
1.00
3.04
11.0
10.5
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
f1 (ppm)

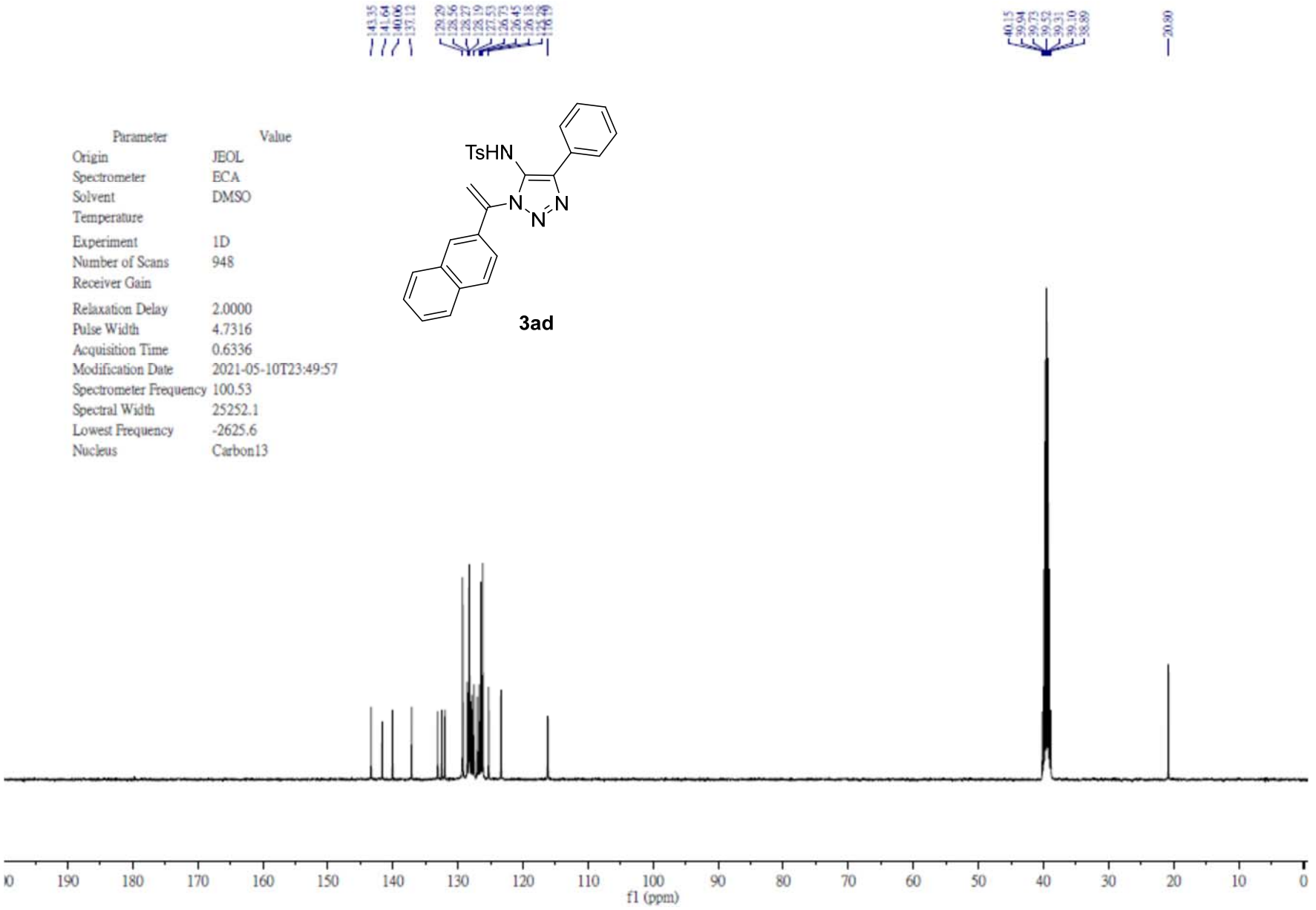

143.47
141.61
138.97
137.05
133.97
133.53
129.37
128.61
128.27
128.05
127.86
127.90
126.47
126.14
126.13
40.15
39.94
39.73
39.52
39.31
39.10
38.89
20.92
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 666
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.6800
Acquisition Time 0.6336
Modification Date 2021-04-26T16:18:42
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2623.4
Nucleus Carbon13
TsHN
N
N
N
Cl
3ab
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

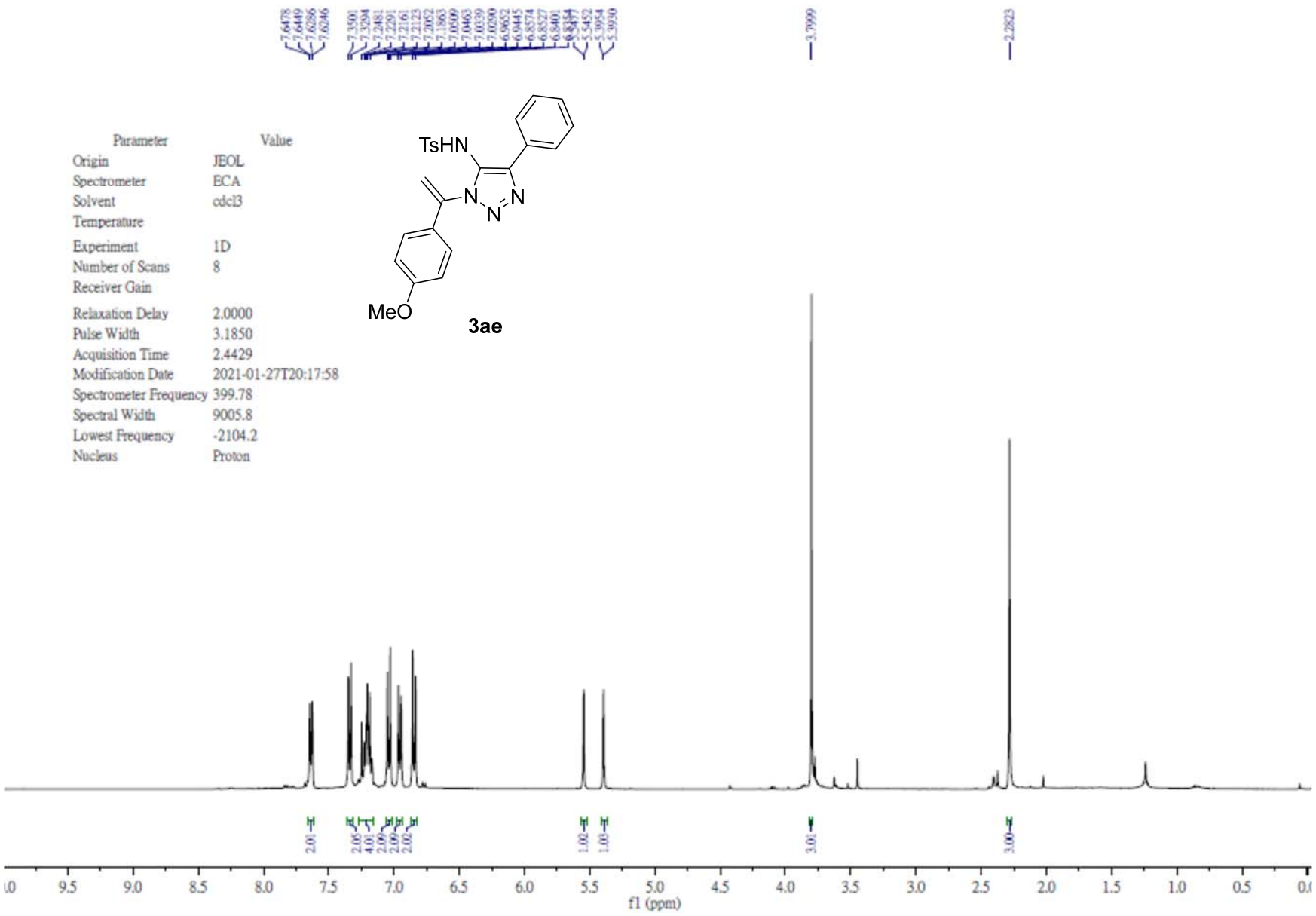

10.6356
7.5909
7.5627
7.3268
7.3066
7.2531
7.2354
7.2206
7.2012
7.1853
7.0997
7.0496
6.9966
5.5218
2.5000
2.3395
2.1947
TsHN
N
N
N
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-10T19:12:14
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1188.0
Nucleus Proton
0.93
2.09
2.09
5.09
2.06
2.06
1.00
1.00
3.02
3.06
f1 (ppm)

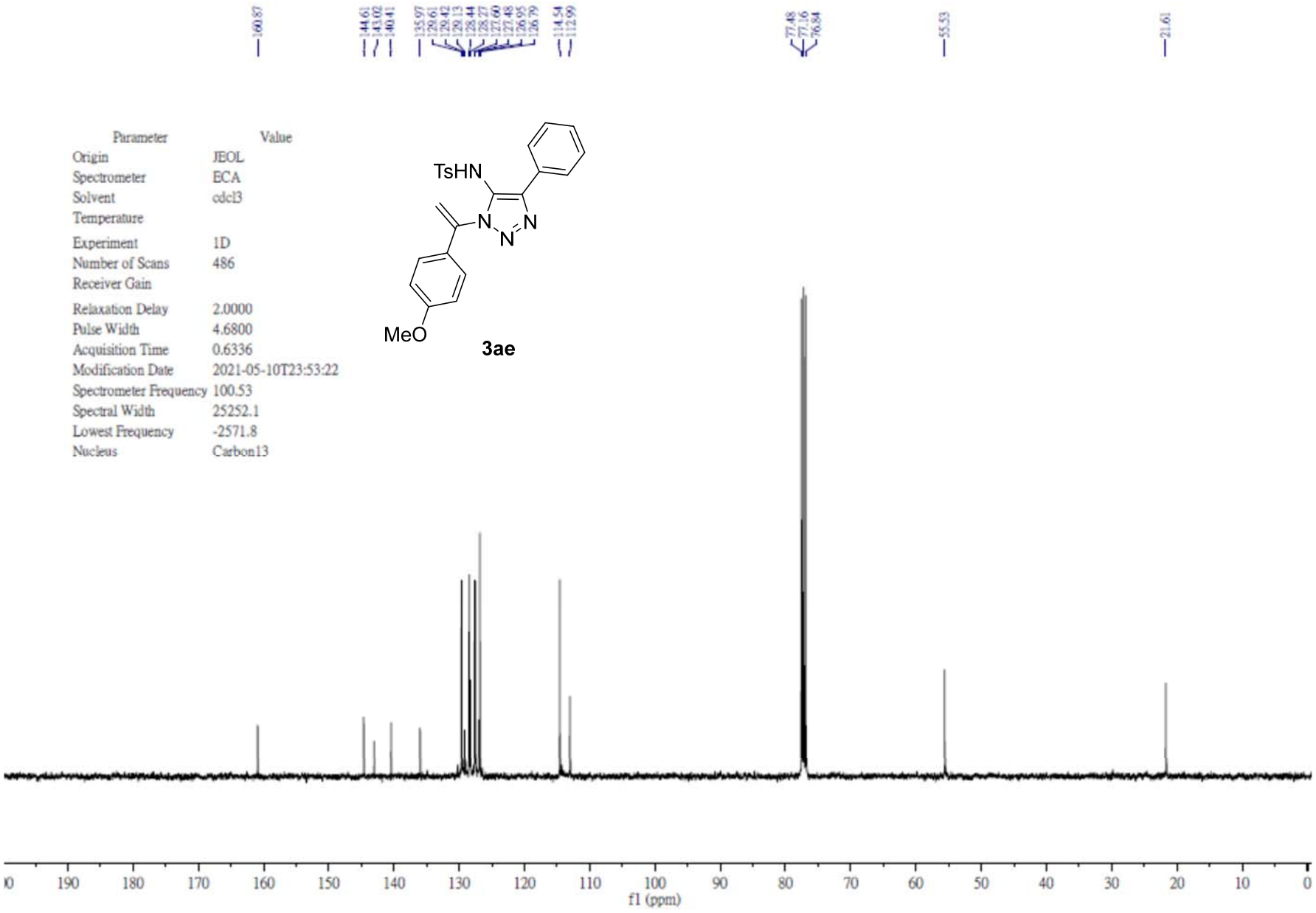
3ac

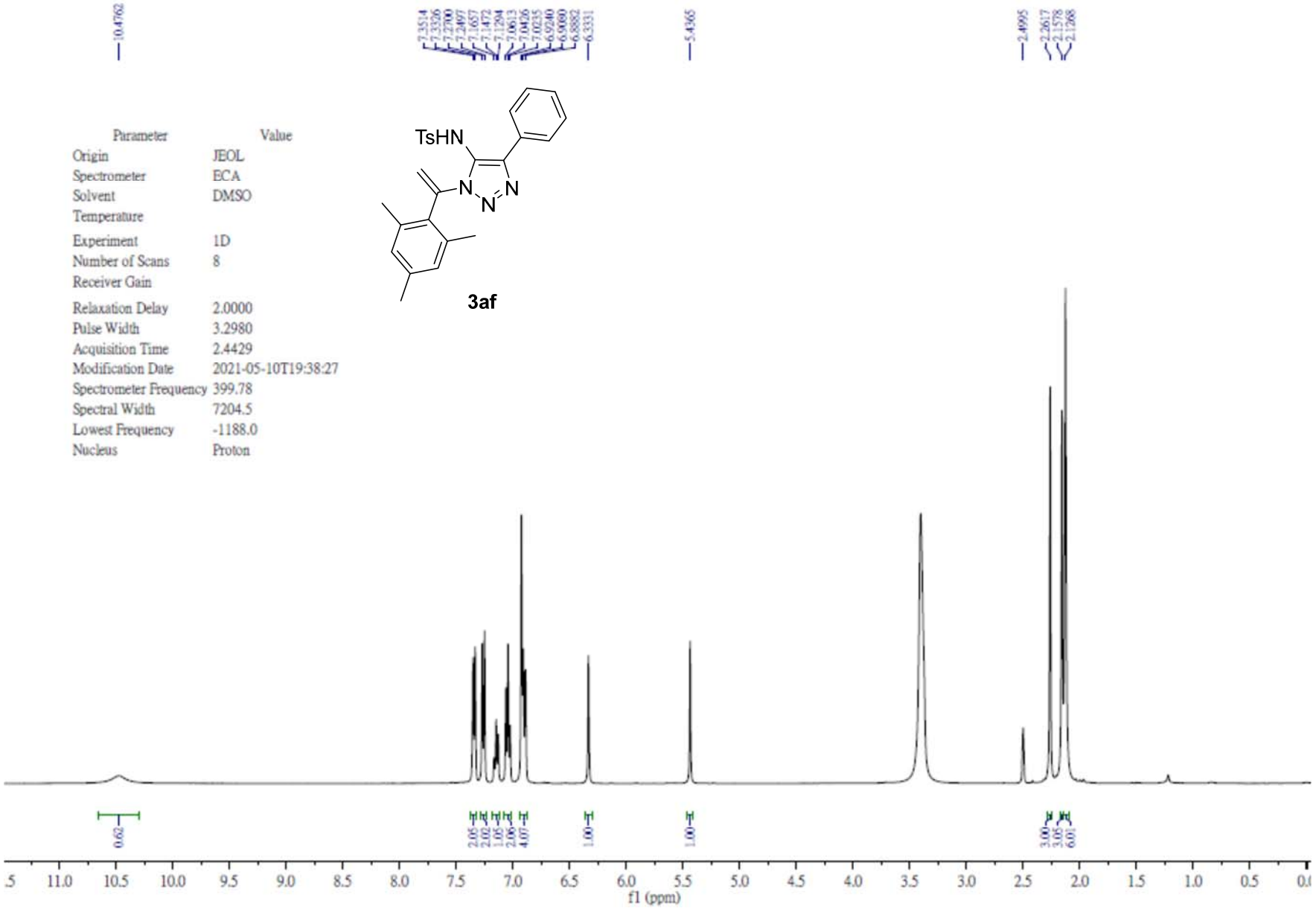

143.34
141.43
140.04
138.91
137.20
131.98
129.31
129.16
129.11
128.23
128.06
127.73
126.43
126.12
125.79
114.50
40.15
39.94
39.73
39.52
39.31
39.10
38.89
20.91
20.83
TsHN
N
N
N
3ac
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 860
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T23:48:49
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2624.8
Nucleus Carbon13
0 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

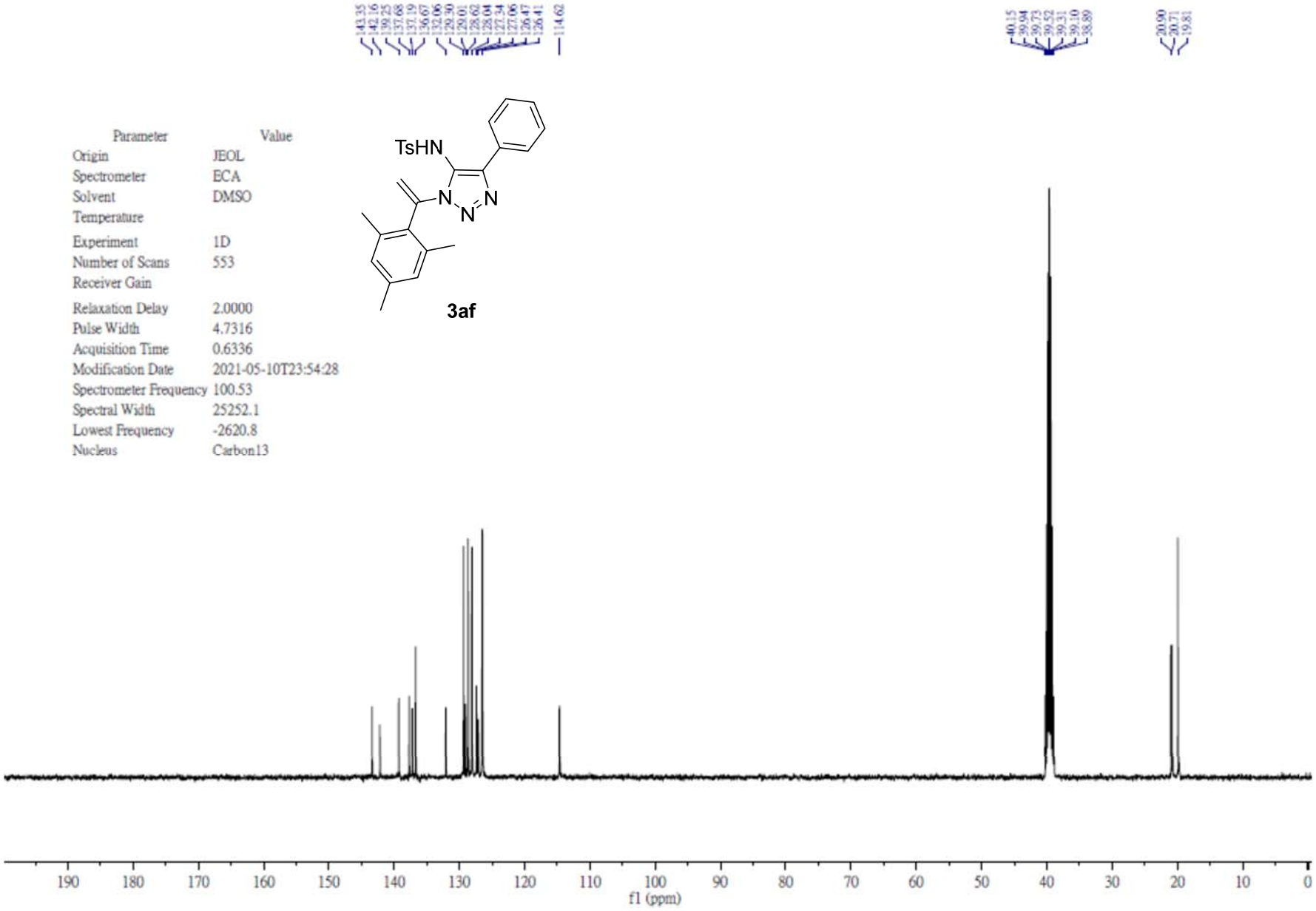

10.6794
7.9598
7.9388
7.9006
7.8836
7.6772
7.6757
7.6630
7.6581
7.6534
7.5727
7.5684
7.5628
7.5500
7.5490
7.5435
7.5393
7.5262
7.5237
7.4659
7.4612
7.4442
7.4395
7.3527
7.3320
7.2848
7.2826
7.2757
7.2719
7.2662
7.2548
7.2469
6.9118
6.2857
5.7095
2.5085
2.5041
2.4996
2.4950
2.4907
2.0996
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-04-20T18:46:58
Spectrometer Frequency 399.78
Spectral Width 9005.8
Lowest Frequency -2089.0
Nucleus Proton
TsHN
N
N
N
3ad
0.89
2.08
1.04
2.08
3.08
1.09
2.08
3.04
2.05
1.00
1.00
3.00
11.0
10.5
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
f1 (ppm)


143.35
141.64
140.06
137.12
129.29
128.56
128.27
126.19
125.53
126.73
126.45
126.18
40.15
39.94
39.73
39.52
39.31
39.10
38.89
20.90
TsHN
N
N
N
3ad
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 948
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T23:49:57
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2625.6
Nucleus Carbon13
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

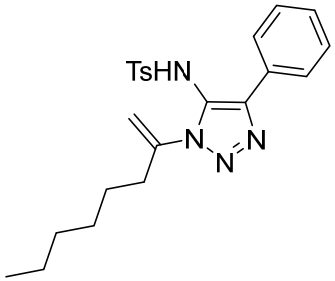

7.6478
7.6449
7.6286
7.6246
7.3501
7.3294
7.2481
7.2291
7.2161
7.2123
7.2052
7.1863
7.0069
7.0463
7.0039
7.0290
6.9652
6.9445
6.8574
6.8527
6.8401
6.8314
5.5452
5.3954
5.3930
3.7999
2.2823
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent cdcl3
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.1850
Acquisition Time 2.4429
Modification Date 2021-01-27T20:17:58
Spectrometer Frequency 399.78
Spectral Width 9005.8
Lowest Frequency -2104.2
Nucleus Proton
TsHN
N
N
N
MeO
3ae
2.01
2.05
4.01
2.09
2.09
2.02
1.02
1.03
3.01
3.00
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
f1 (ppm)


160.87
144.61
143.02
140.41
135.97
129.61
129.42
129.13
128.44
128.27
127.60
127.48
126.95
126.79
114.54
112.99
77.48
77.16
76.84
55.53
21.61
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent cdcl3
Temperature
Experiment 1D
Number of Scans 486
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.6800
Acquisition Time 0.6336
Modification Date 2021-05-10T23:53:22
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2571.8
Nucleus Carbon13
TsHN
N
N
N
MeO
3ae
f1 (ppm)

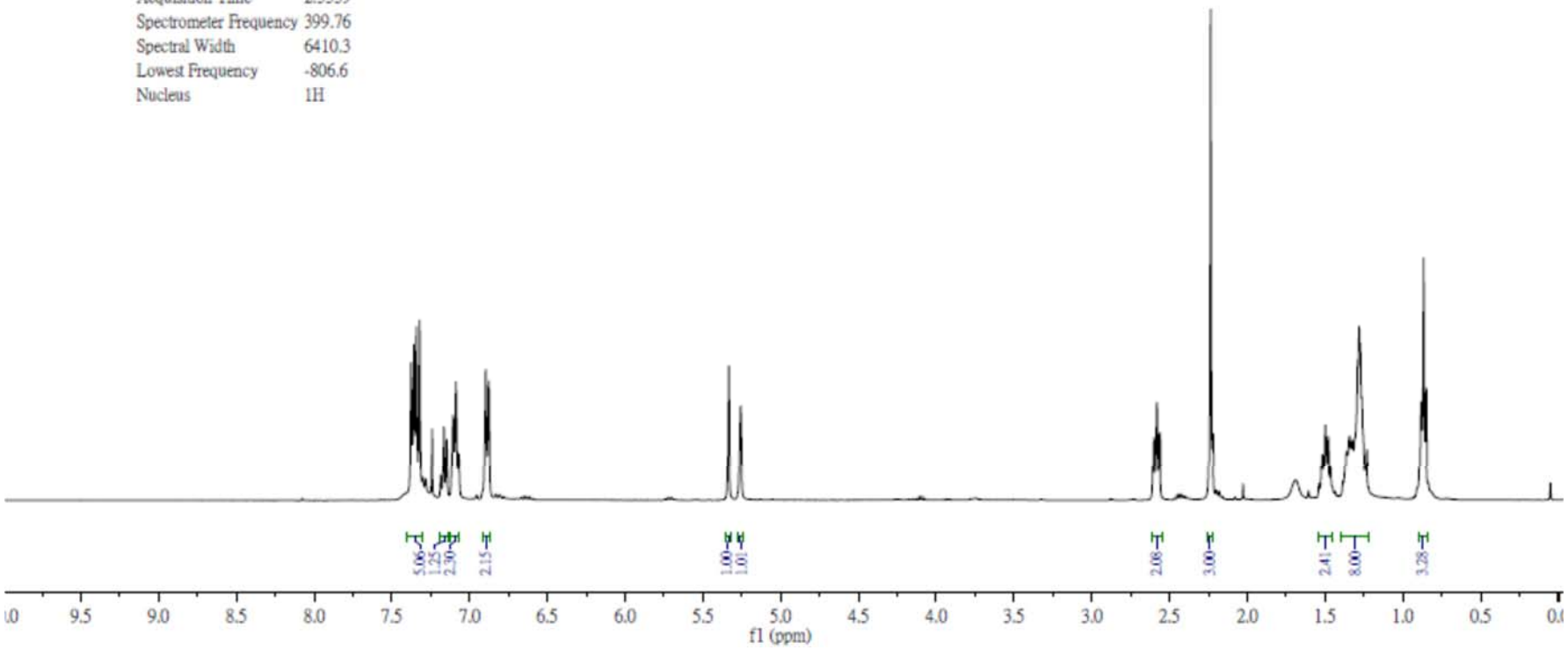

10.4762
7.3514
7.3326
7.2700
7.2497
7.1657
7.1472
7.1294
7.0613
7.0426
7.0235
6.9240
6.9060
6.8882
6.3331
5.4365
2.4995
2.2617
2.1578
2.1268
TsHN
N
N
N
3af
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-10T19:38:27
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1188.0
Nucleus Proton
0.62
2.05
2.02
1.03
2.06
4.07
1.00
1.00
3.00
3.05
6.01
f1 (ppm)

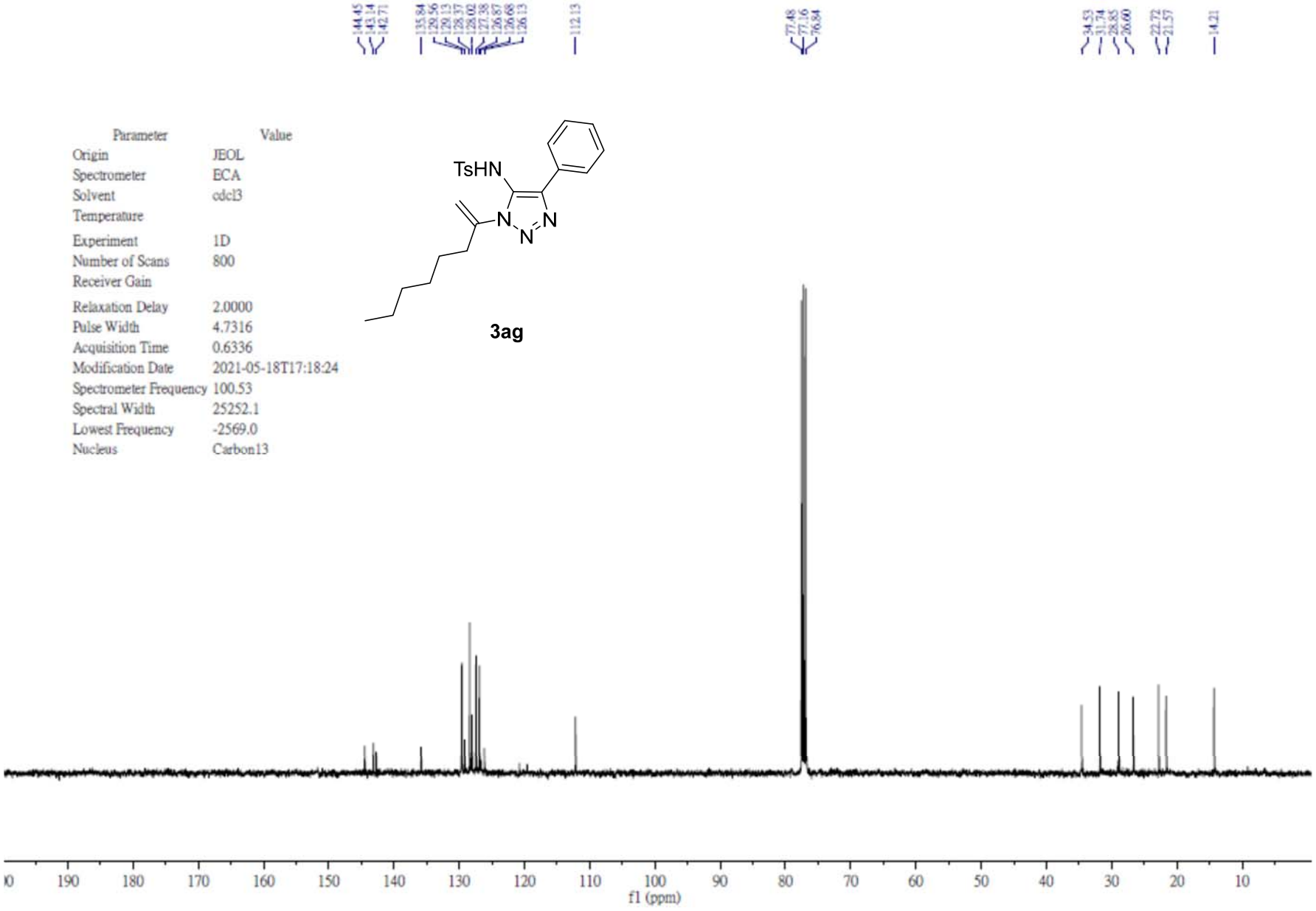

143.35
142.16
139.25
137.68
137.19
136.67
132.06
129.90
129.01
128.62
128.04
127.54
127.06
126.47
126.41
114.62
40.15
39.94
39.73
39.52
39.31
39.10
38.89
20.90
20.71
19.81
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 553
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T23:54:28
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2620.8
Nucleus Carbon13
TsHN
N
N
N
3af
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

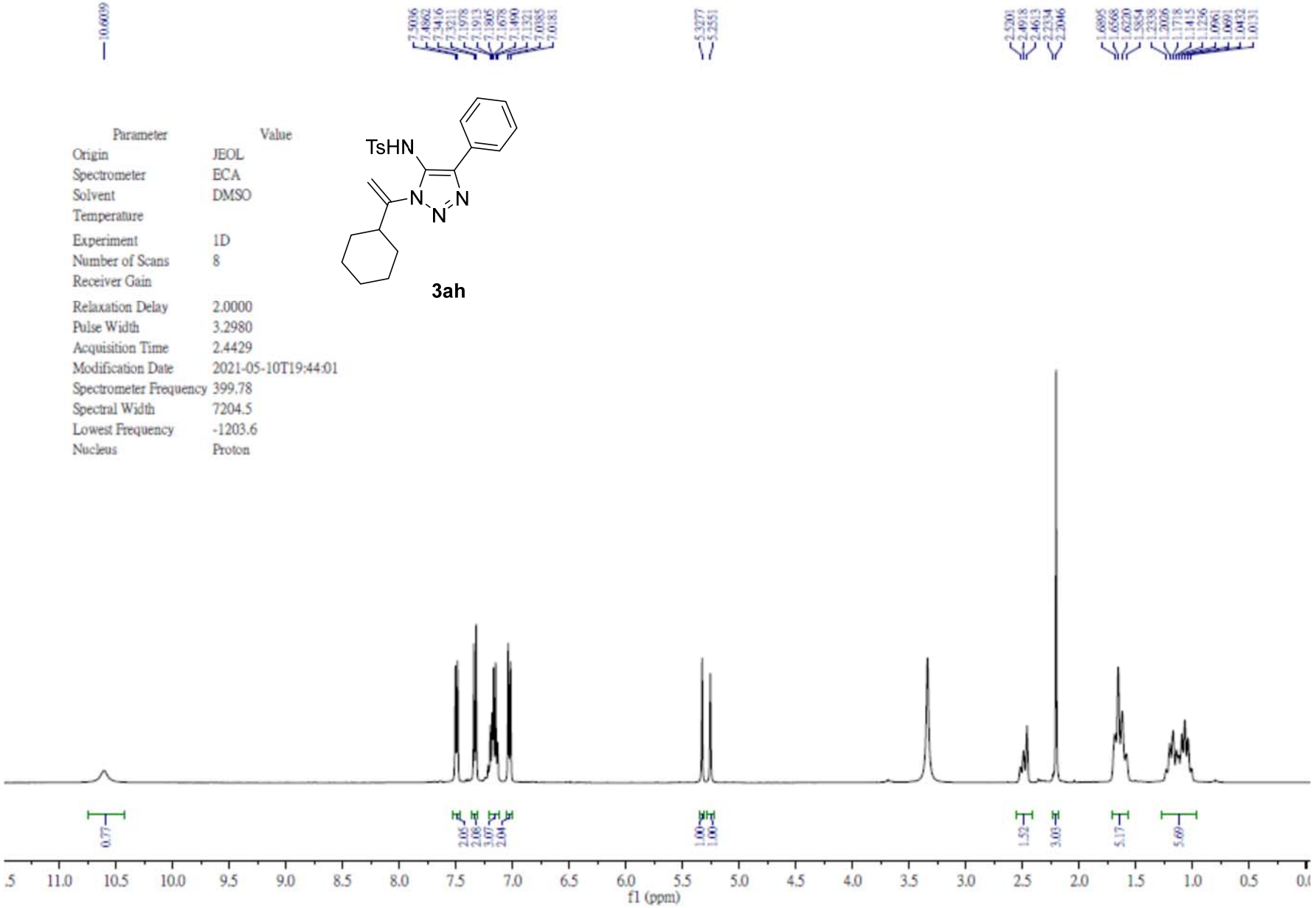
Parameter	Value
Origin	Varian
Spectrometer	vnmrs
Solvent	"cdcl3"
Temperature	20.0
Pulse Sequence	s2pul
Experiment	1D
Number of Scans	68
Receiver Gain	30
Relaxation Delay	1.0000
Pulse Width	0.0000
Acquisition Time	2.5559
Spectrometer Frequency	399.76
Spectral Width	6410.3
Lowest Frequency	-806.6
Nucleus	1H



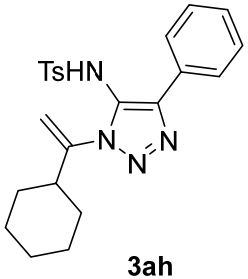
3ag



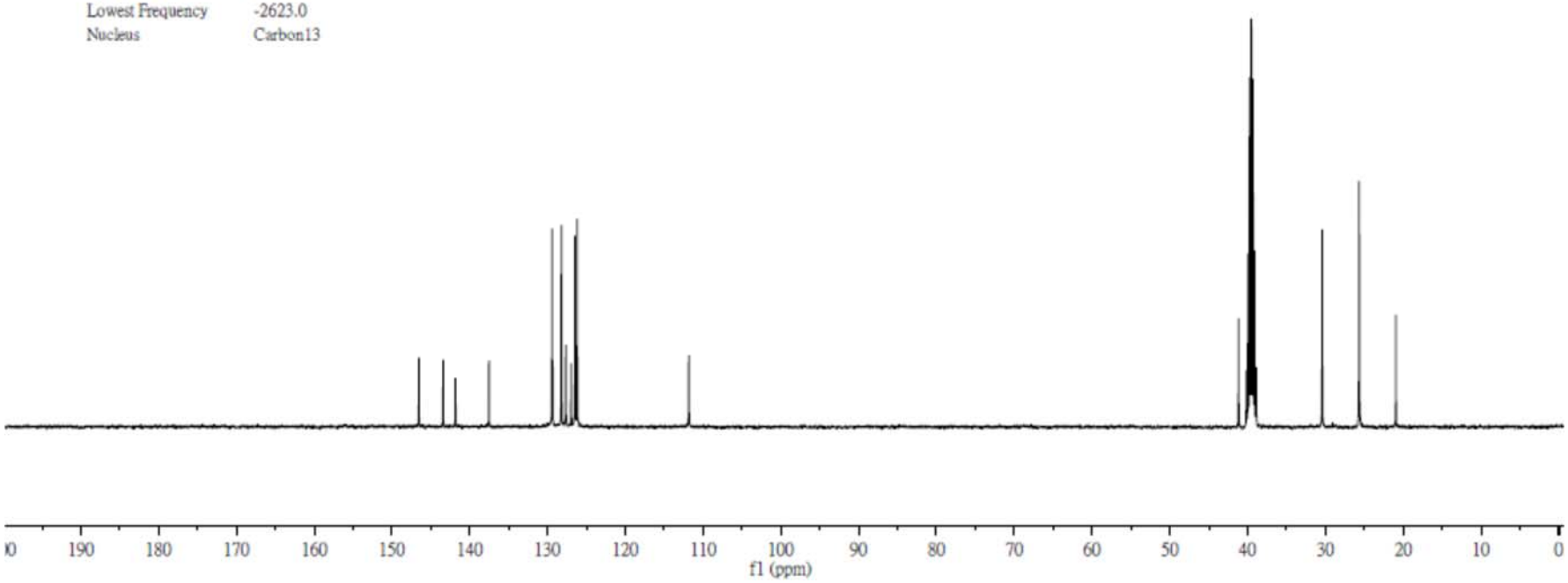

144.45
143.14
142.71
135.84
129.56
129.13
128.37
128.02
127.38
126.87
126.68
126.13
112.13
77.48
77.16
76.84
34.53
31.74
28.85
26.60
22.72
21.57
14.21
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent cdcl3
Temperature
Experiment 1D
Number of Scans 800
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-18T17:18:24
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2569.0
Nucleus Carbon13
TsHN
N
N
N
3ag
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

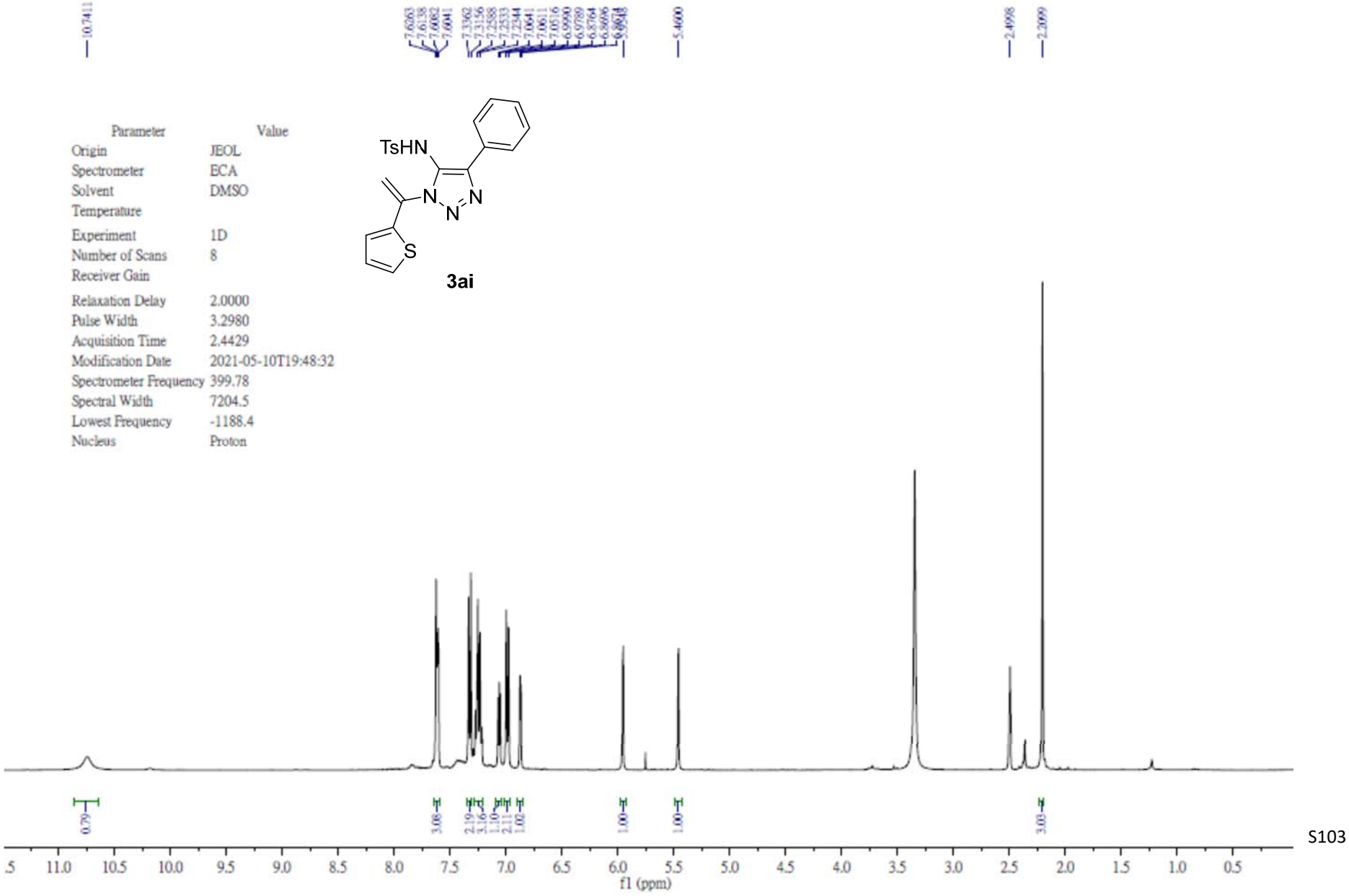

10.6039
7.5066
7.4862
7.3416
7.3211
7.1978
7.1913
7.1805
7.1678
7.1490
7.1321
7.0385
7.0181
5.3277
5.2551
2.5201
2.4918
2.4613
2.2354
2.2046
1.6895
1.6668
1.6220
1.5854
1.2338
1.2066
1.1718
1.1415
1.1236
1.1061
1.0691
1.0432
1.0131
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-10T19:44:01
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1203.6
Nucleus Proton
TsHN
N
N
N
3ah
0.77
2.05
2.06
3.07
2.04
1.00
1.00
1.52
3.03
5.17
5.69
f1 (ppm)

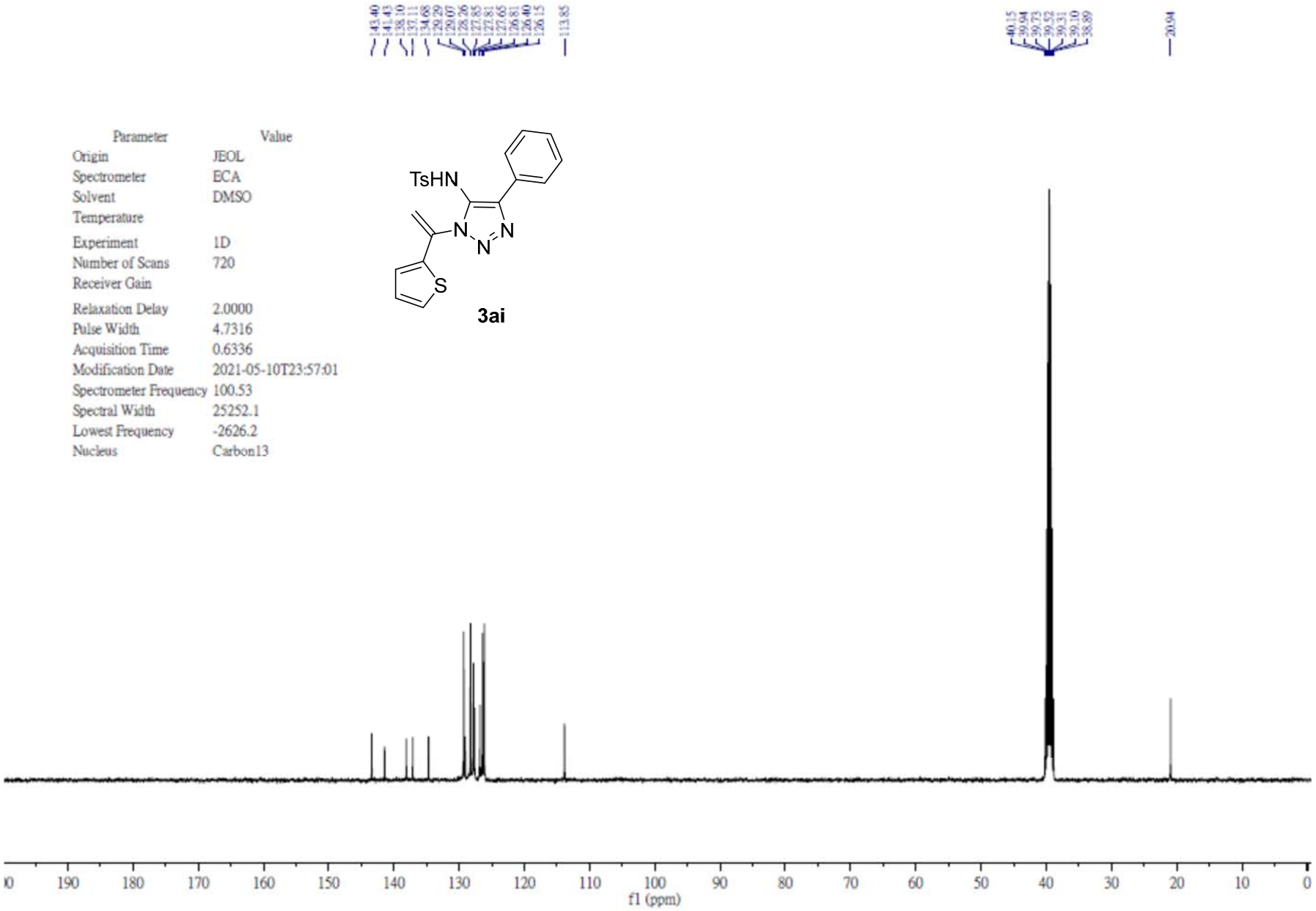
Parameter	Value
Origin	JEOL
Spectrometer	ECA
Solvent	DMSO
Temperature	
Experiment	1D
Number of Scans	600
Receiver Gain	
Relaxation Delay	2.0000
Pulse Width	4.7316
Acquisition Time	0.6336
Modification Date	2021-05-10T23:56:05
Spectrometer Frequency	100.53
Spectral Width	25252.1
Lowest Frequency	-2623.0
Nucleus	Carbon13

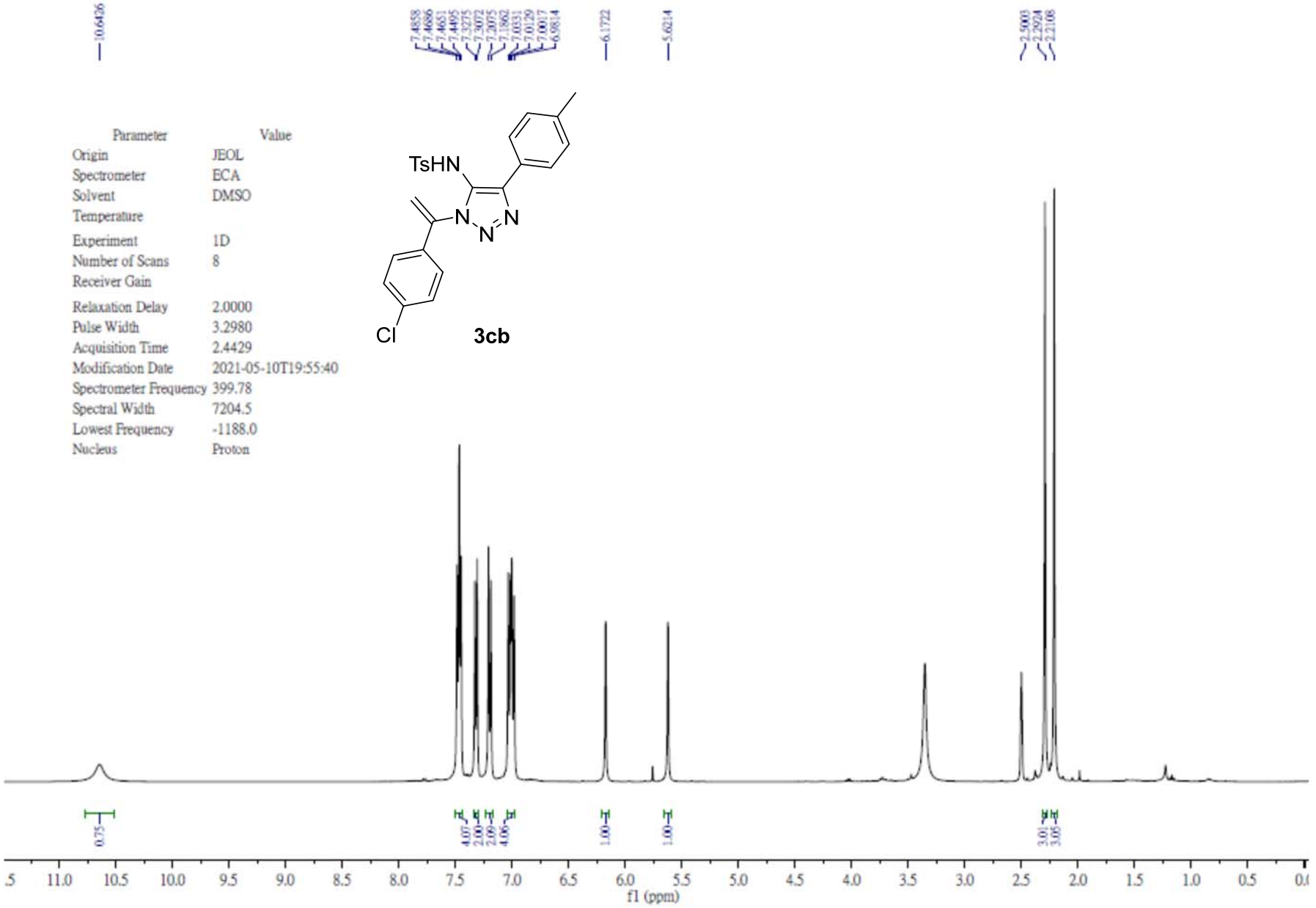


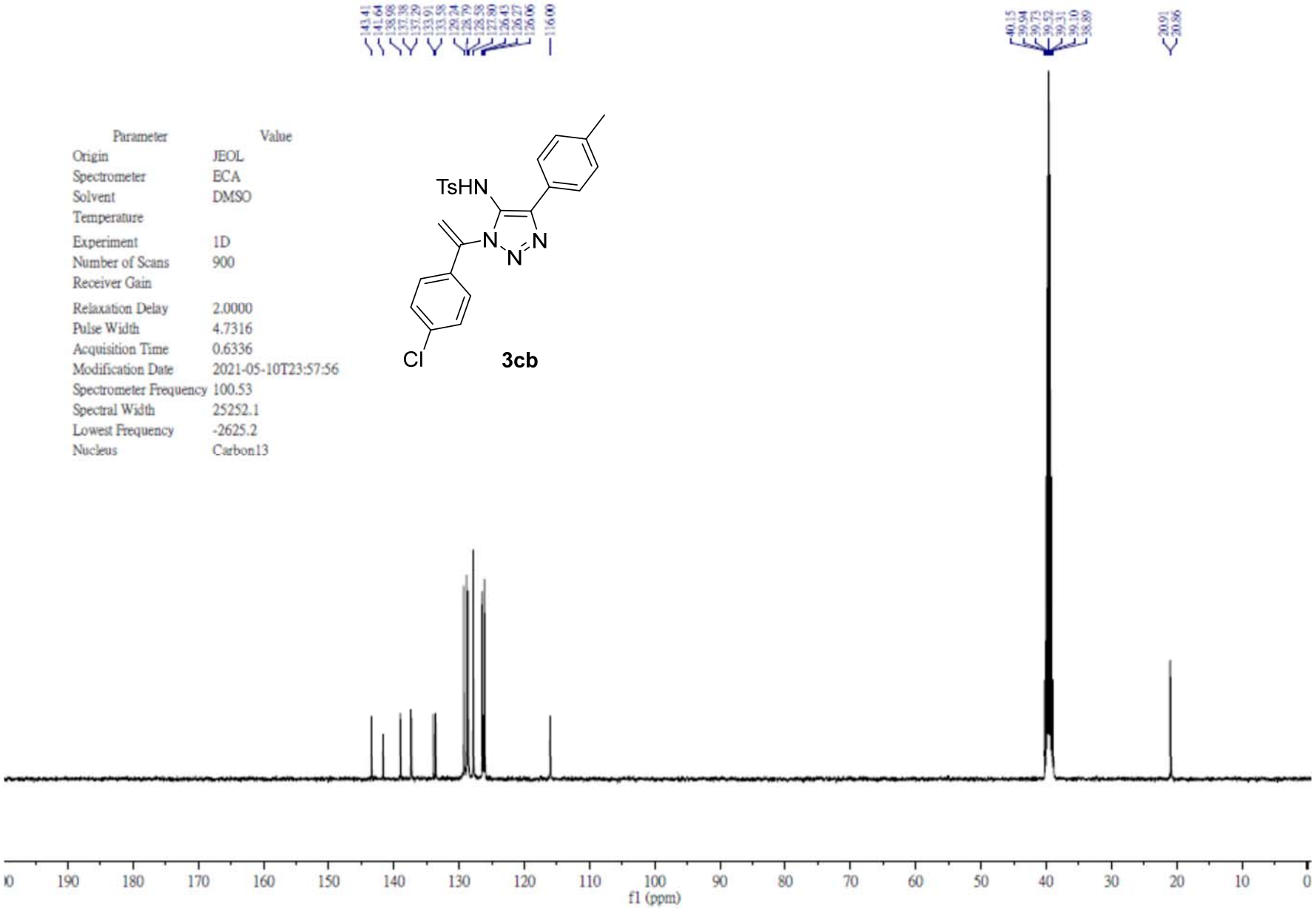
3ah

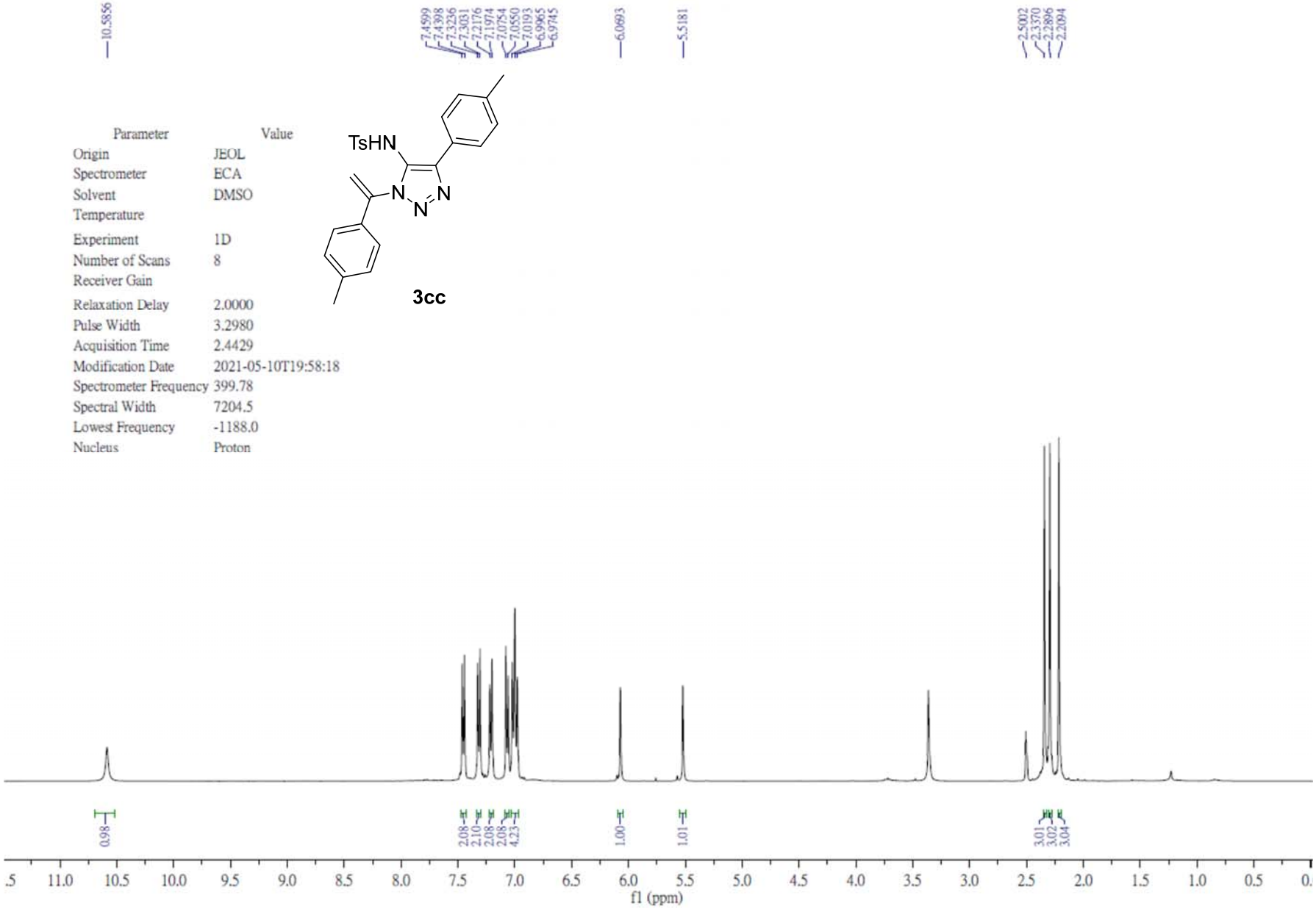


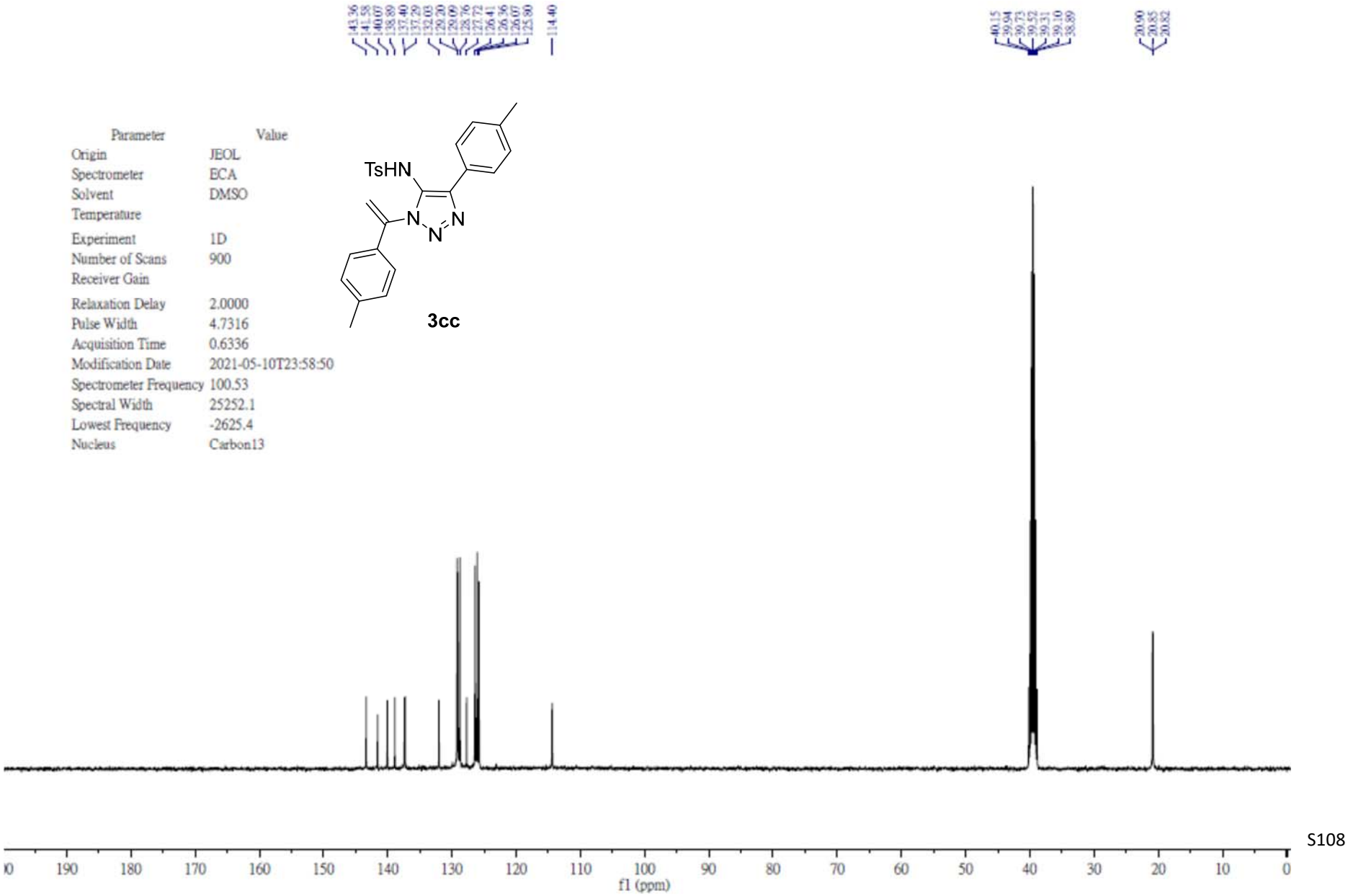

10.7411
7.6263
7.6138
7.6062
7.6041
7.3362
7.3156
7.2588
7.2533
7.2344
7.1064
7.0611
7.0516
6.9990
6.9789
6.8764
6.8696
5.4600
2.4998
2.2099
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-10T19:48:32
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1188.4
Nucleus Proton
TsHN
N
N
N
S
3ai
0.79
3.08
2.19
3.16
1.10
2.11
1.02
1.00
1.00
3.03
f1 (ppm)

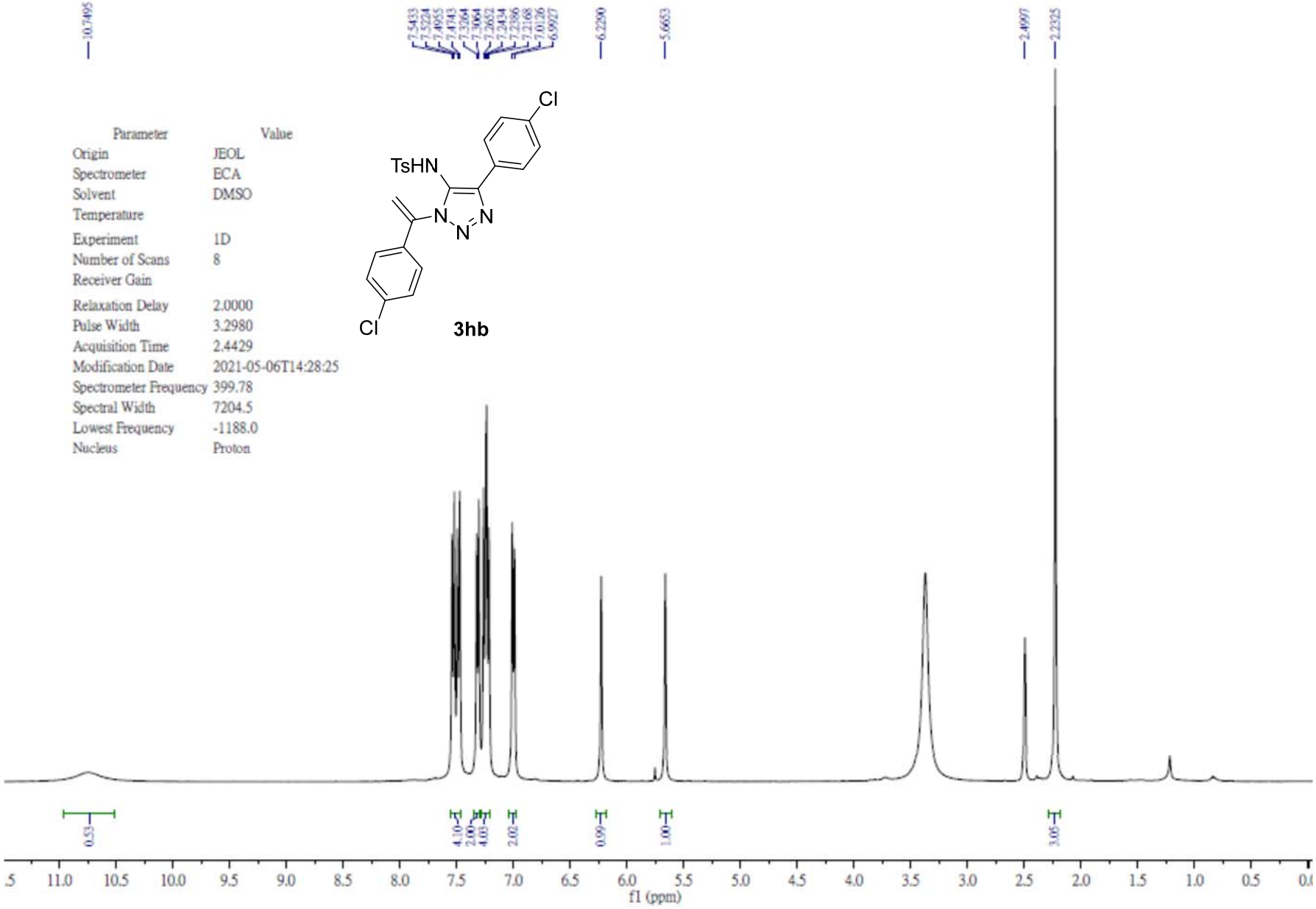

143.40
141.43
138.10
137.11
134.68
129.29
129.07
128.26
127.85
127.81
127.65
126.81
126.40
126.15
113.85
40.15
39.94
39.73
39.52
39.31
39.10
38.89
20.94
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 720
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T23:57:01
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2626.2
Nucleus Carbon13
TsHN
N
N
N
S
3ai
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

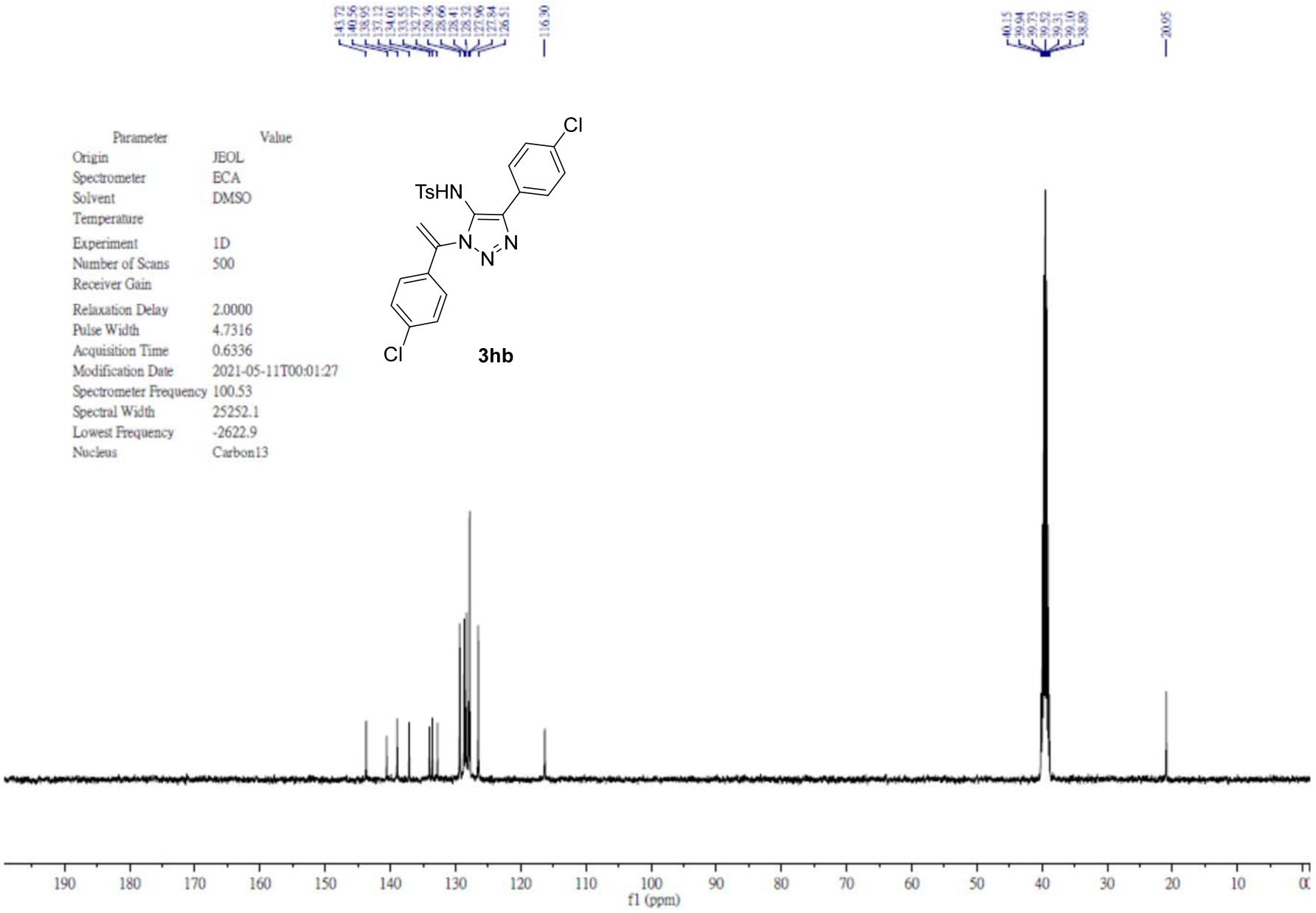

10.6426
7.4858
7.4686
7.4651
7.4495
7.3275
7.3072
7.2075
7.1862
7.0331
7.0129
7.0017
6.9814
6.1722
5.6214
2.5003
2.2924
2.2108
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-10T19:55:40
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1188.0
Nucleus Proton
TsHN
N
N
N
Cl
3cb
0.75
4.07
2.00
2.09
4.06
1.00
1.00
3.01
3.05
f1 (ppm)

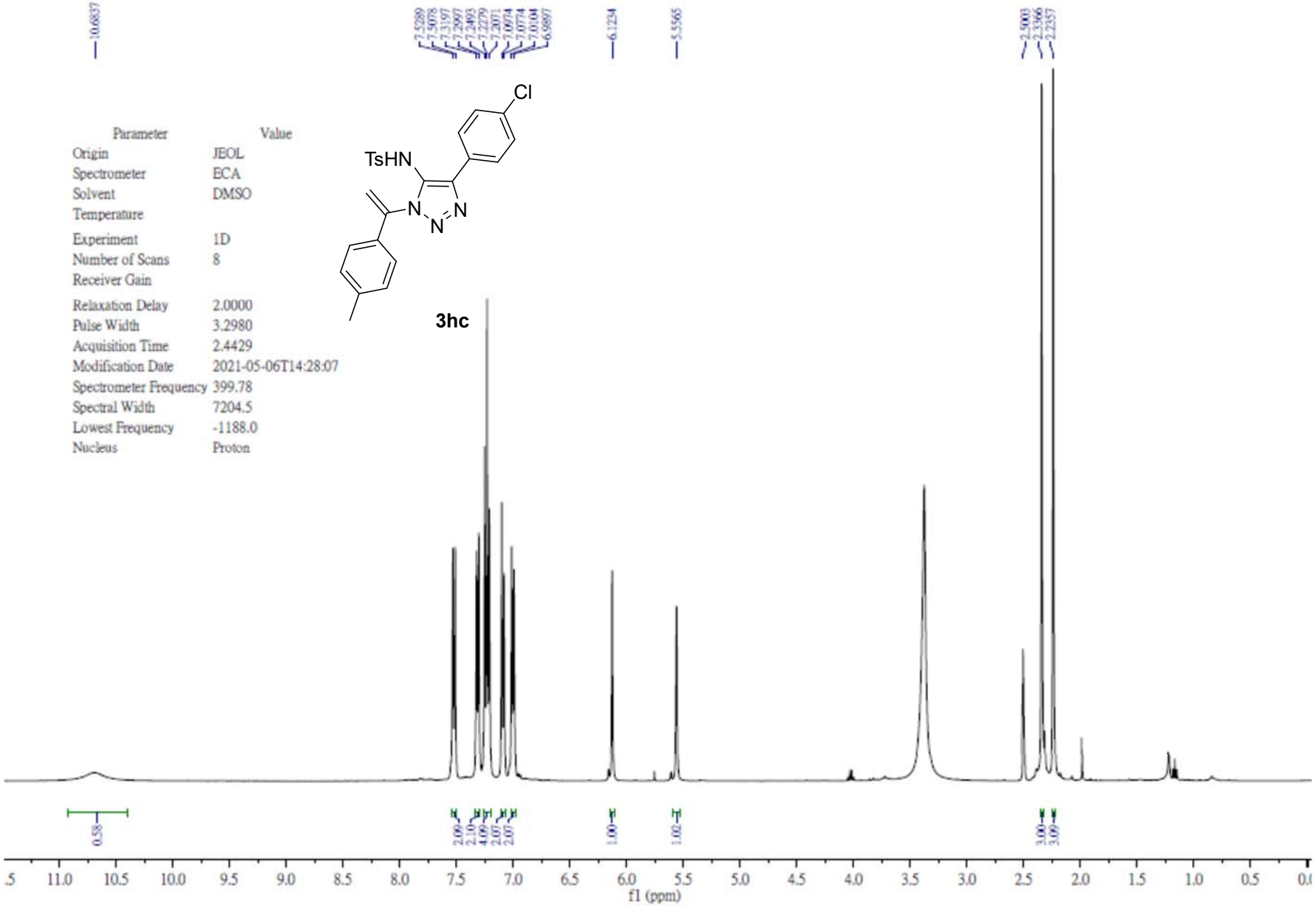

143.41
141.64
138.98
137.38
137.29
133.91
133.58
129.24
128.79
128.58
127.90
126.43
126.27
126.06
16.00
40.15
39.94
39.73
39.52
39.31
39.10
38.89
20.91
20.86
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 900
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T23:57:56
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2625.2
Nucleus Carbon13
TsHN
N
N
N
Cl
3cb
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


10.5856
7.4599
7.4398
7.3256
7.3031
7.2176
7.1974
7.0754
7.0550
7.0193
6.9965
6.9745
6.0693
5.5181
2.5002
2.3370
2.2896
2.2094
TsHN
N
N
N
3cc
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-10T19:58:18
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1188.0
Nucleus Proton
0.98
2.08
2.10
2.08
2.08
4.23
1.00
1.01
3.01
3.02
3.04
f1 (ppm)

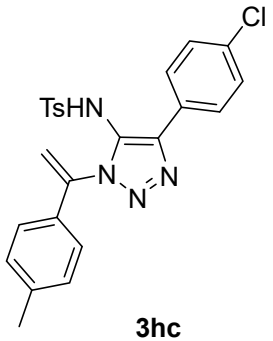

143.36
141.58
140.07
138.89
137.40
137.29
132.03
129.20
129.09
128.76
127.72
126.41
126.36
126.07
125.90
114.40
40.15
39.94
39.73
39.52
39.31
39.10
38.89
20.90
20.85
20.82
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 900
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-10T23:58:50
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2625.4
Nucleus Carbon13
TsHN
N
N
N
3cc
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


10.7495
7.5433
7.5224
7.4955
7.4743
7.3364
7.3064
7.2652
7.2434
7.2386
7.2168
7.0126
6.9927
6.2290
5.6653
2.4997
2.2325
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-06T14:28:25
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1188.0
Nucleus Proton
TsHN
Cl
Cl
N
N
N
3hb
0.53
4.10
2.00
4.03
2.02
0.99
1.00
3.05
f1 (ppm)

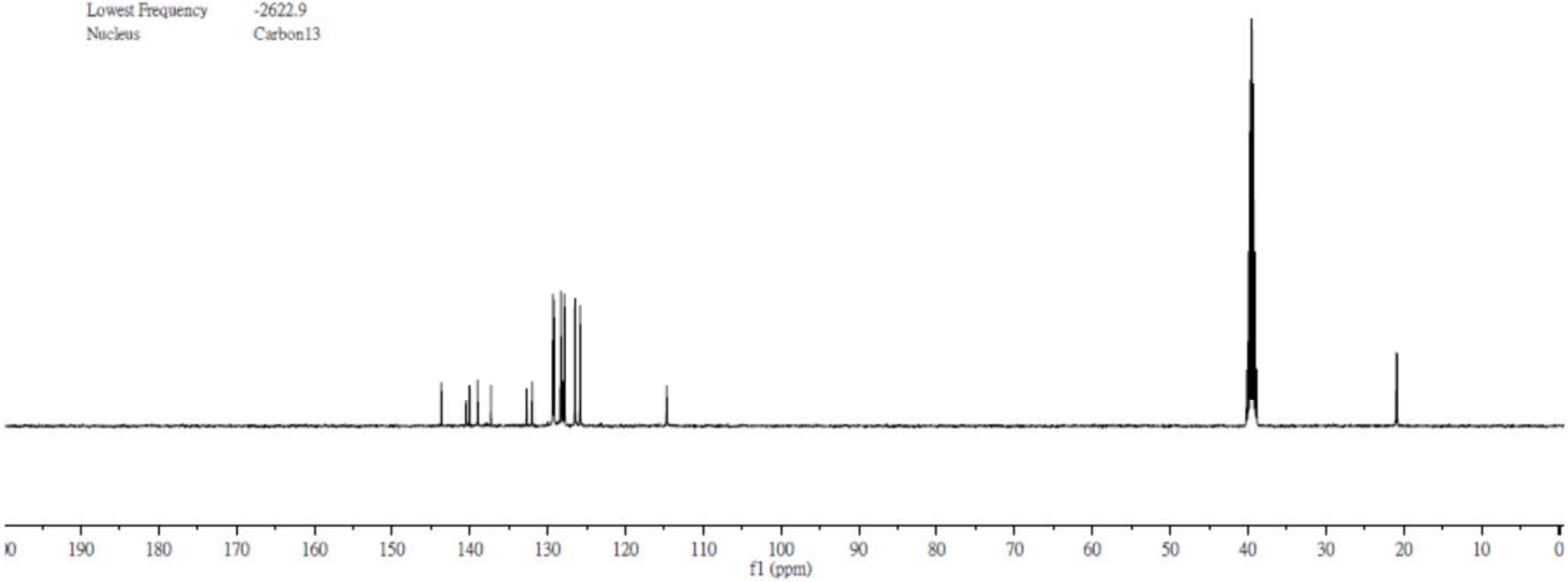

143.72
140.56
138.95
137.12
134.01
133.55
132.77
129.36
128.66
128.41
128.32
127.96
127.84
126.51
116.30
40.15
39.94
39.73
39.52
39.31
39.10
38.89
20.95
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 500
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.7316
Acquisition Time 0.6336
Modification Date 2021-05-11T00:01:27
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2622.9
Nucleus Carbon13
TsHN
N
N
N
Cl
Cl
3hb
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

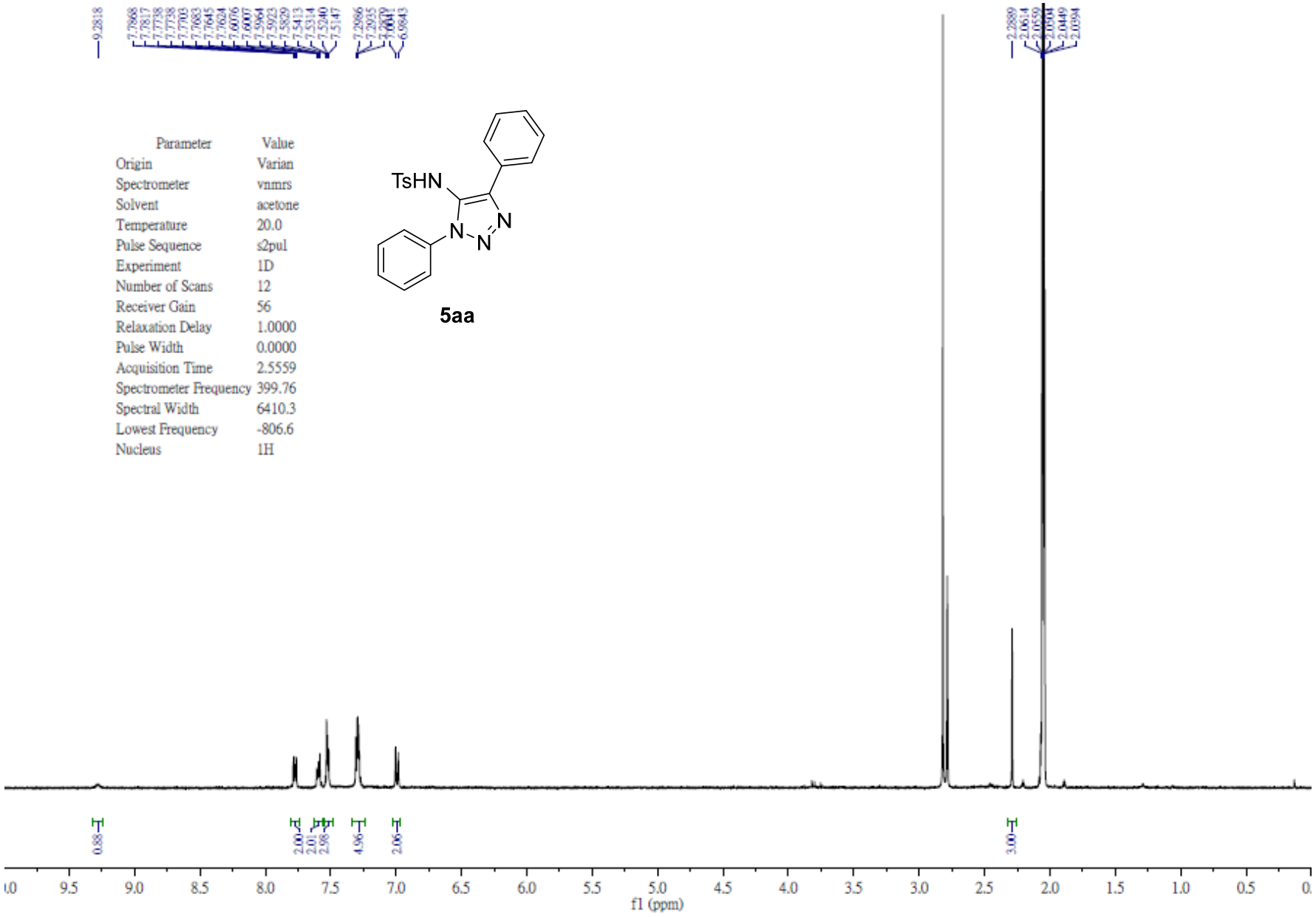

10.6837
7.5289
7.5078
7.3197
7.2997
7.2493
7.2279
7.2071
7.0974
7.0774
7.0104
6.9897
6.1234
5.5565
2.5003
2.3366
2.2357
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-05-06T14:28:07
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1188.0
Nucleus Proton
TsHN
Cl
N
N
N
3hc
0.58
2.09
2.10
4.09
2.07
2.07
1.00
1.02
3.00
3.09
f1 (ppm)

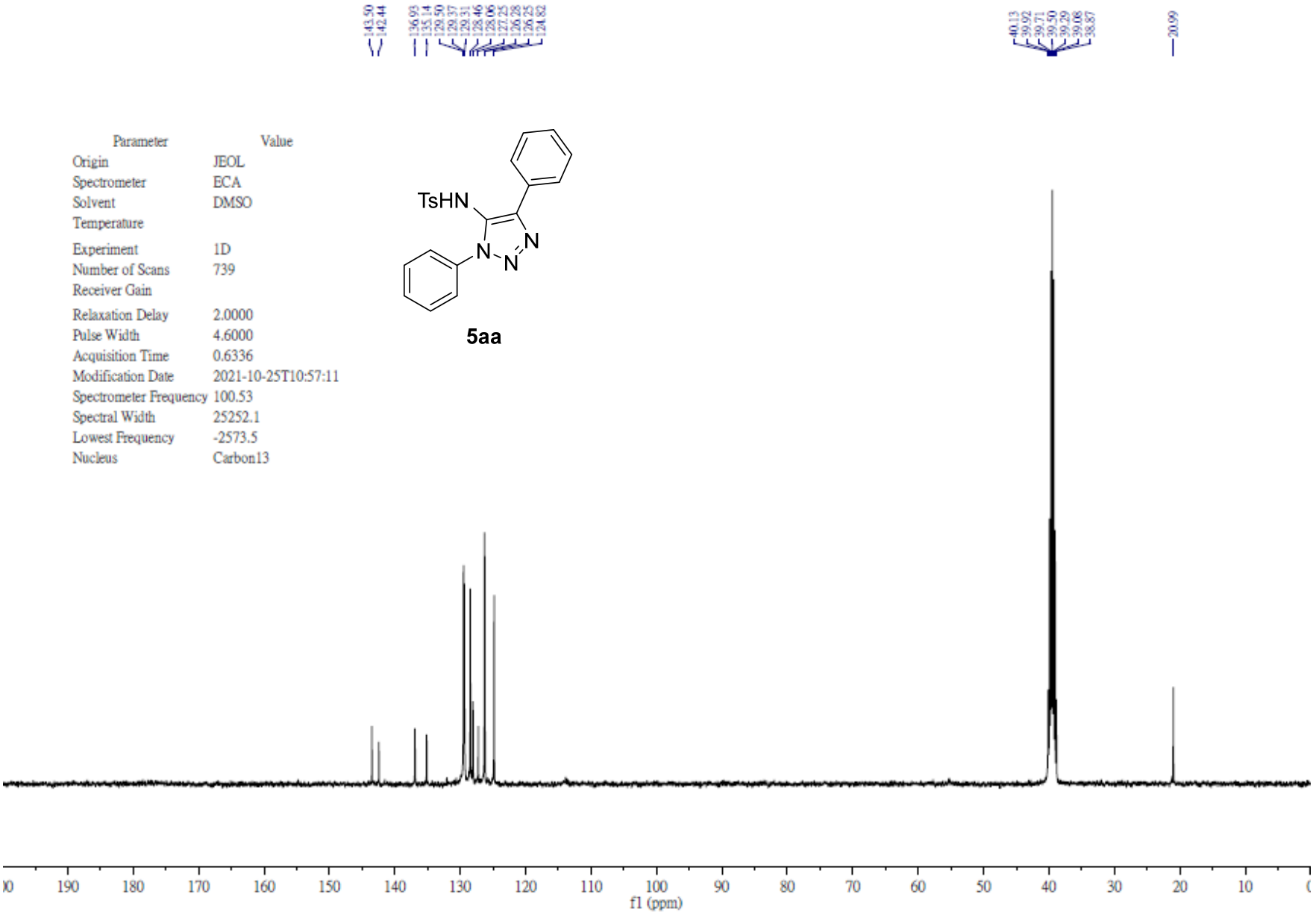
Parameter	Value
Origin	JEOL
Spectrometer	ECA
Solvent	DMSO
Temperature	
Experiment	1D
Number of Scans	851
Receiver Gain	
Relaxation Delay	2.0000
Pulse Width	4.7316
Acquisition Time	0.6336
Modification Date	2021-05-10T23:59:43
Spectrometer Frequency	100.53
Spectral Width	25252.1
Lowest Frequency	-2622.9
Nucleus	Carbon13

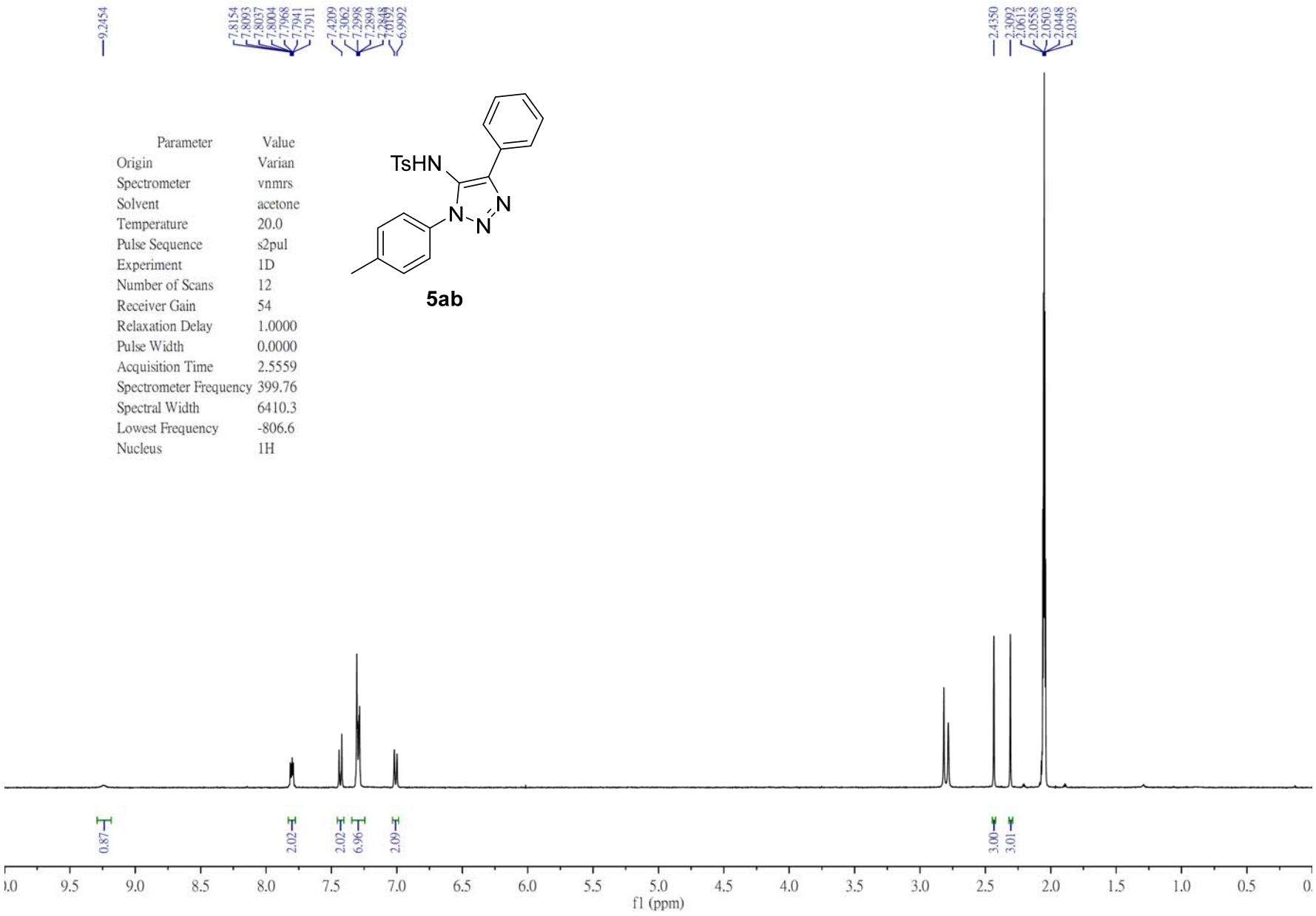


3hc

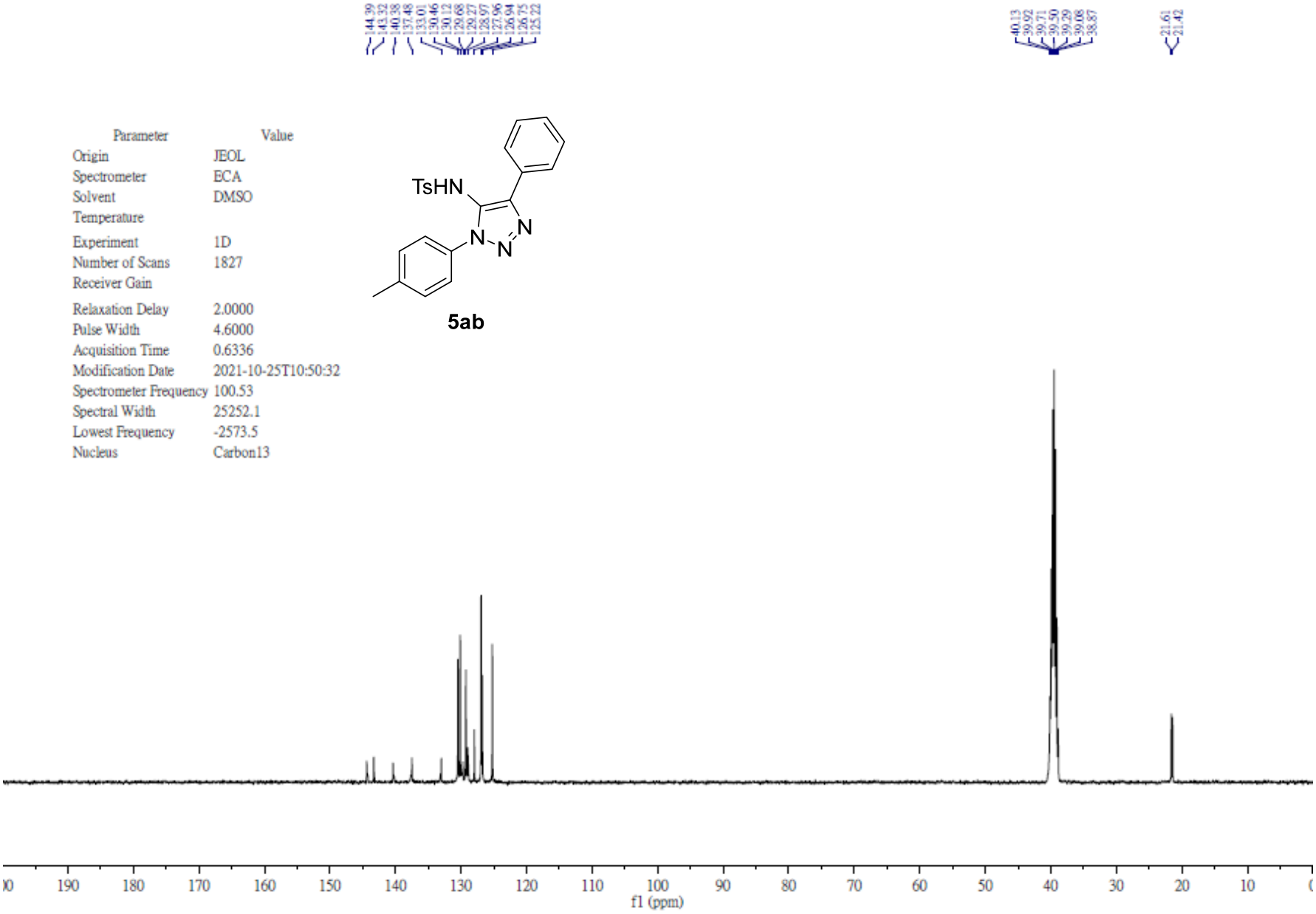



9.2818
7.7868
7.7817
7.7738
7.7708
7.7683
7.7645
7.7624
7.6076
7.6007
7.5964
7.5923
7.5829
7.5413
7.5334
7.5240
7.5147
7.2986
7.2935
7.0641
6.9943
2.2889
2.0614
2.0559
2.0504
2.0449
2.0394
Parameter Value
Origin Varian
Spectrometer vnmrs
Solvent acetone
Temperature 20.0
Pulse Sequence s2pul
Experiment 1D
Number of Scans 12
Receiver Gain 56
Relaxation Delay 1.0000
Pulse Width 0.0000
Acquisition Time 2.5559
Spectrometer Frequency 399.76
Spectral Width 6410.3
Lowest Frequency -806.6
Nucleus 1H
TsHN
N
N
N
5aa
0.88
2.00
2.01
2.98
4.86
2.06
3.00
f1 (ppm)

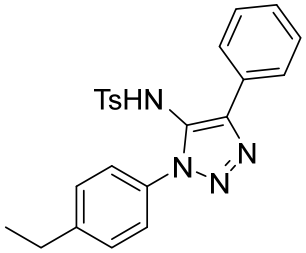

143.50
142.44
136.93
135.14
129.50
129.37
129.31
128.46
128.06
127.25
126.28
126.25
124.82
40.13
39.92
39.71
39.50
39.29
39.08
38.87
20.99
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 739
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.6000
Acquisition Time 0.6336
Modification Date 2021-10-25T10:57:11
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2573.5
Nucleus Carbon13
TsHN
N
N
N
5aa
f1 (ppm)



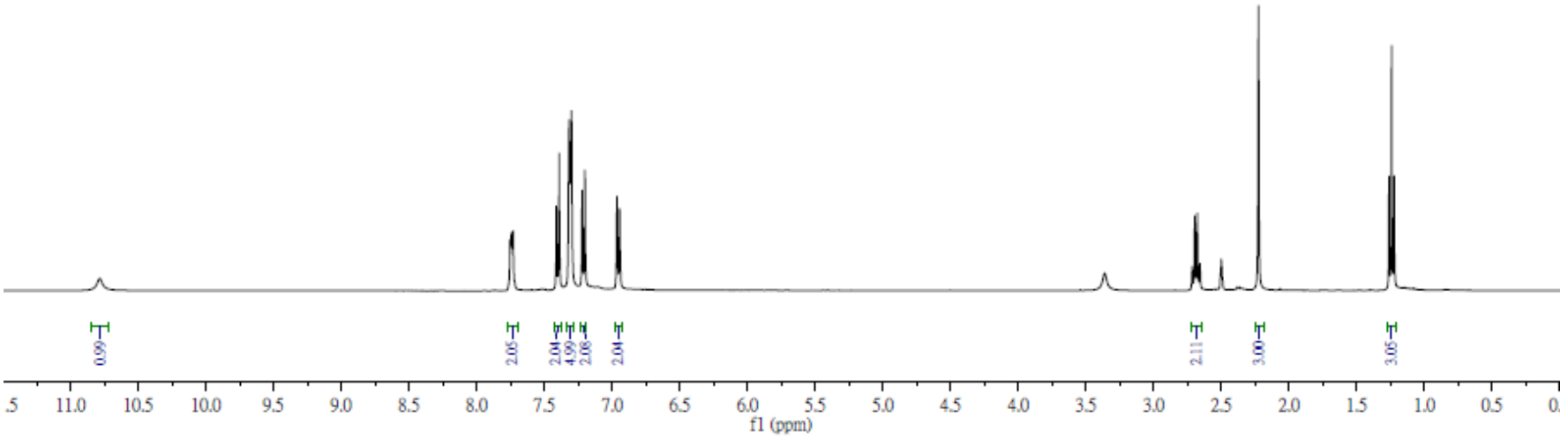
Parameter	Value
Origin	Varian
Spectrometer	vnmrs
Solvent	acetone
Temperature	20.0
Pulse Sequence	s2pul
Experiment	1D
Number of Scans	12
Receiver Gain	54
Relaxation Delay	1.0000
Pulse Width	0.0000
Acquisition Time	2.5559
Spectrometer Frequency	399.76
Spectral Width	6410.3
Lowest Frequency	-806.6
Nucleus	1H


144.39
143.32
140.38
137.48
133.01
130.46
130.12
129.68
129.27
128.97
127.96
126.94
126.75
125.22
40.13
39.92
39.71
39.50
39.29
39.08
38.87
21.61
21.42
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 1827
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.6000
Acquisition Time 0.6336
Modification Date 2021-10-25T10:50:32
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2573.5
Nucleus Carbon13
TsHN
N
N
N
5ab
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

Parameter	Value
Origin	Varian
Spectrometer	vnmrs
Solvent	dmso
Temperature	20.0
Pulse Sequence	s2pul
Experiment	1D
Number of Scans	12
Receiver Gain	30
Relaxation Delay	1.0000
Pulse Width	0.0000
Acquisition Time	2.5559
Spectrometer Frequency	399.76
Spectral Width	6410.3
Lowest Frequency	-806.6
Nucleus	1H



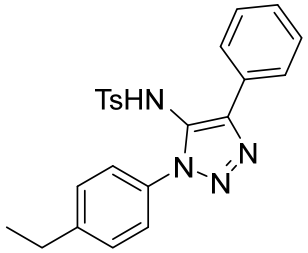
5ac



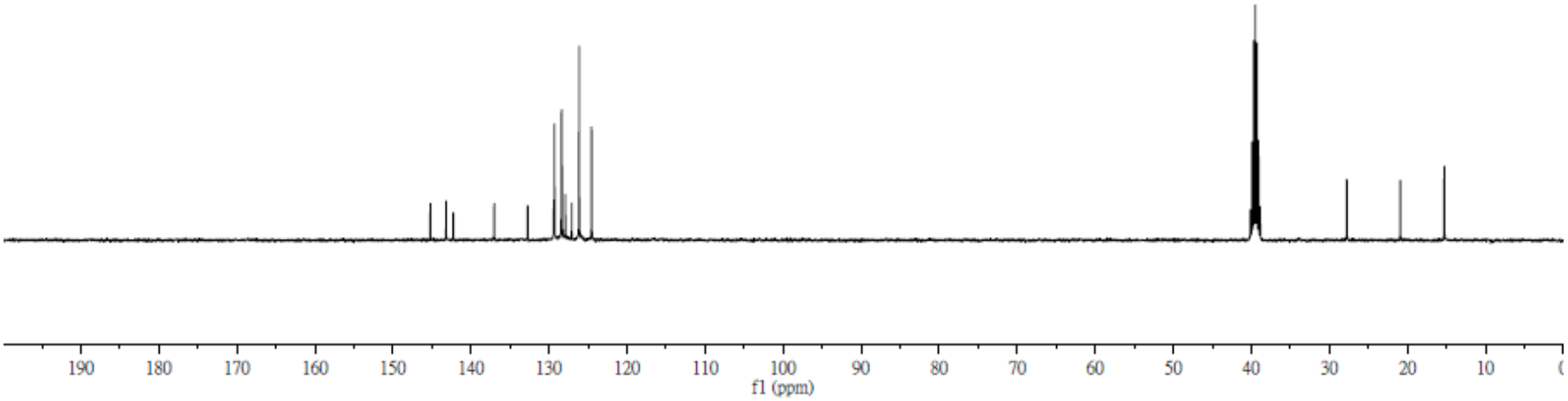
145.21
143.19
142.26
137.02
132.73
129.38
129.30
128.40
128.35
127.90
127.08
126.14
124.55

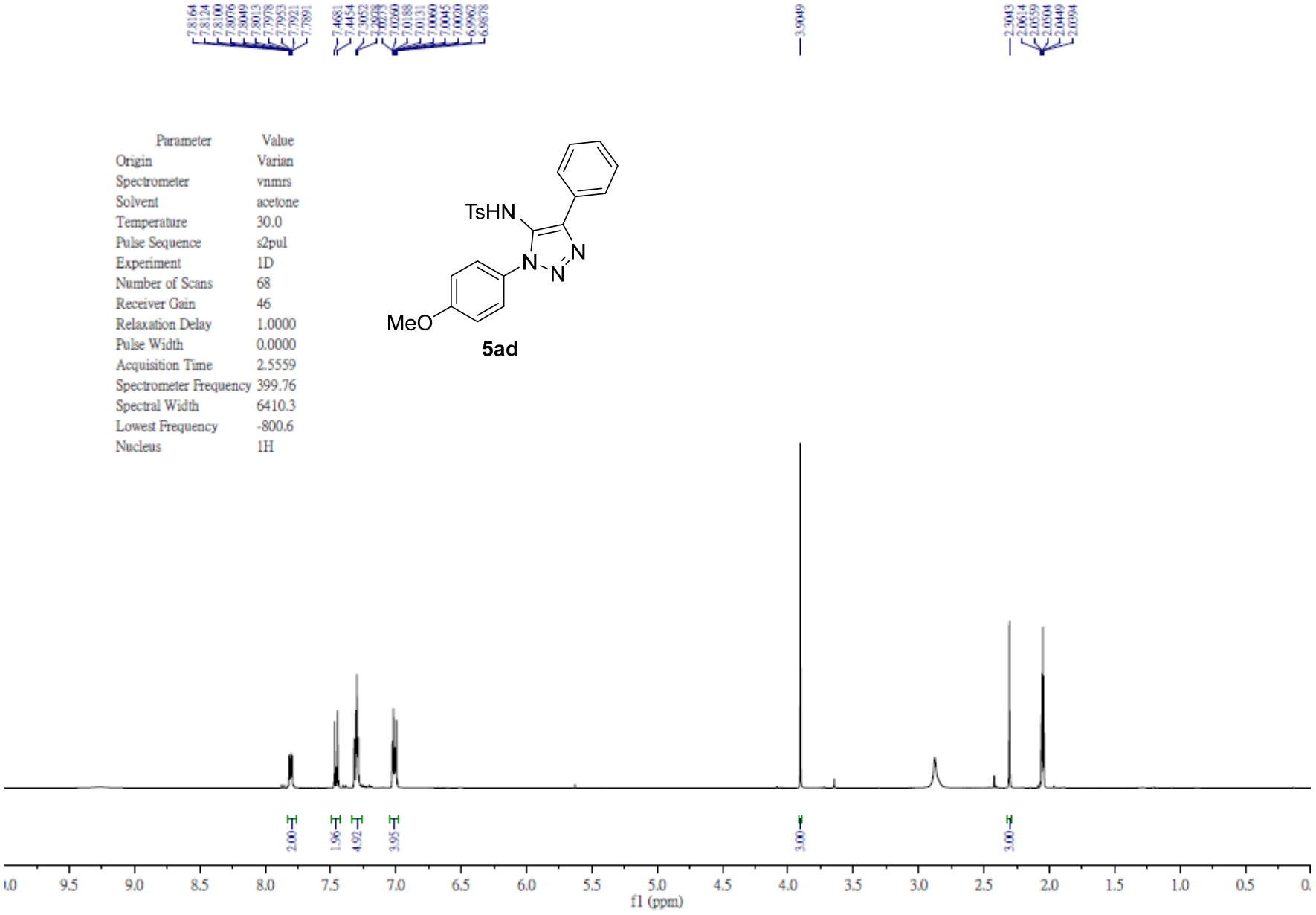
40.13
39.92
39.71
39.50
39.29
39.08
38.87
27.76
20.91
15.27

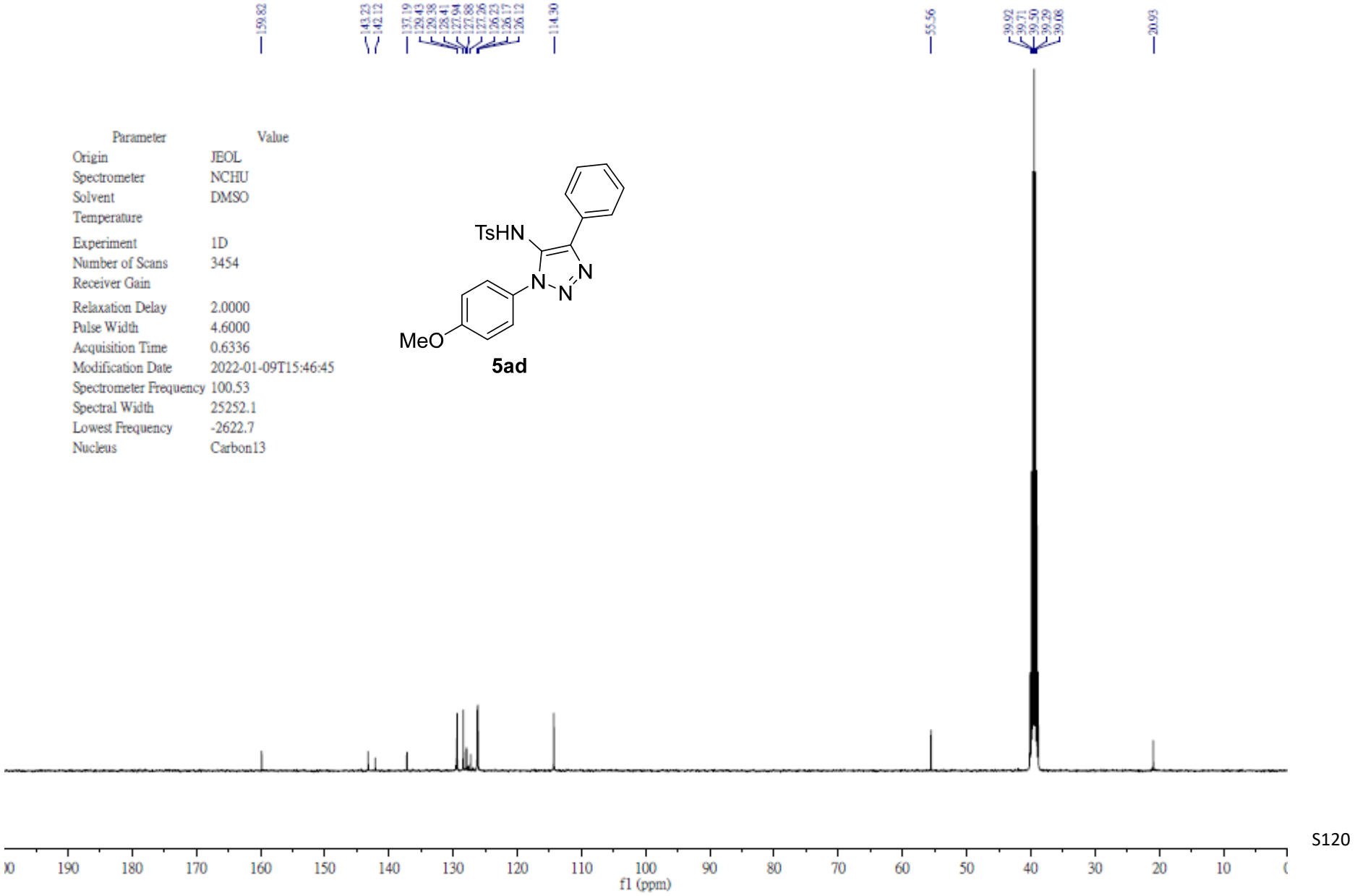
Parameter	Value
Origin	JEOL
Spectrometer	ECA
Solvent	DMSO
Temperature	
Experiment	1D
Number of Scans	184
Receiver Gain	
Relaxation Delay	2.0000
Pulse Width	4.6000
Acquisition Time	0.6336
Modification Date	2021-10-24T18:37:17
Spectrometer Frequency	100.53
Spectral Width	25252.1
Lowest Frequency	-2573.5
Nucleus	Carbon13

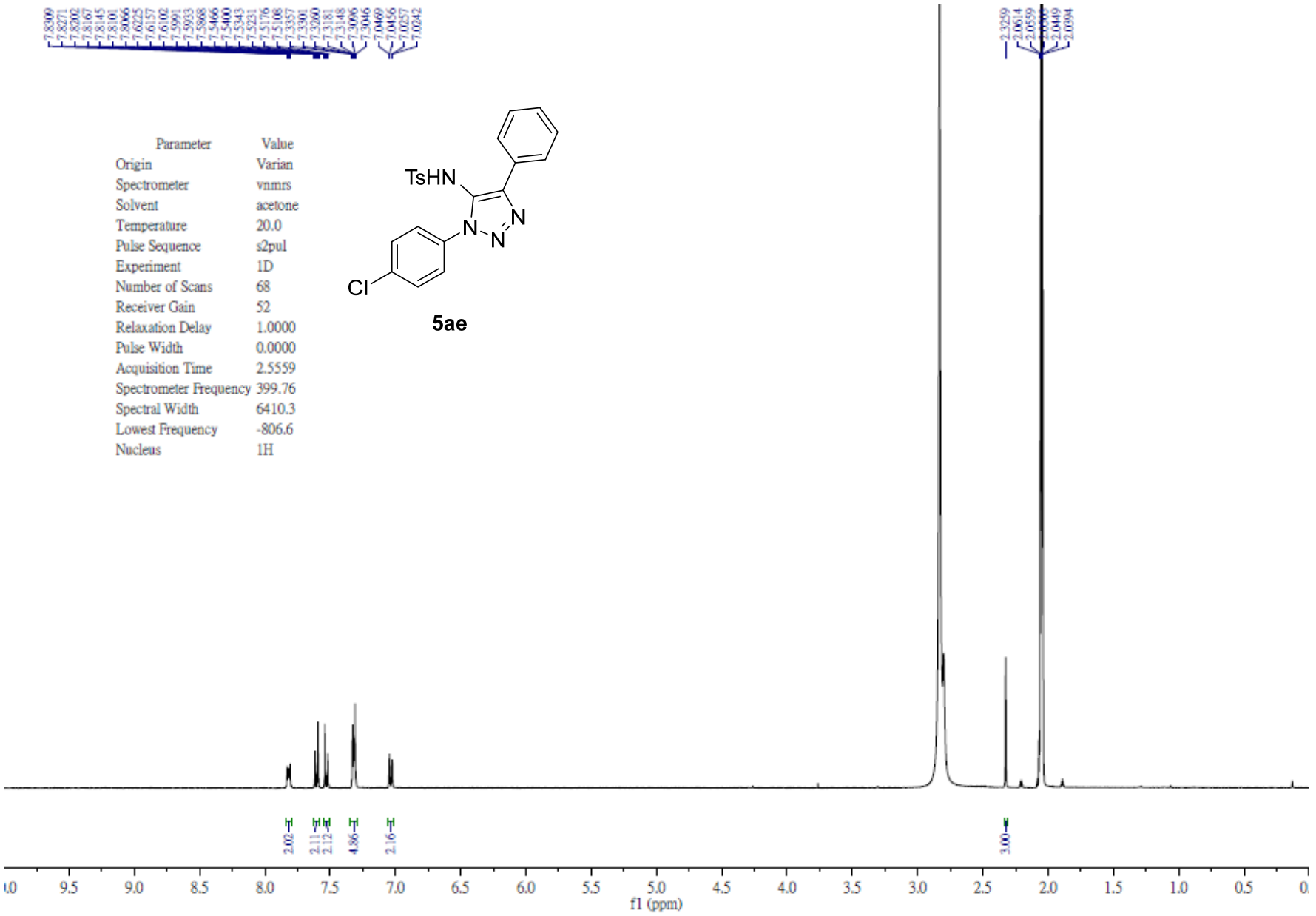


5ac




7.8164
7.8124
7.8100
7.8076
7.8049
7.8013
7.7978
7.7953
7.7921
7.7891
7.4681
7.4454
7.3052
7.0260
7.0188
7.0131
7.0060
7.0045
7.0030
6.9962
6.9878
3.9049
2.3043
2.0614
2.0559
2.0504
2.0449
2.0394
Parameter Value
Origin Varian
Spectrometer vnmrs
Solvent acetone
Temperature 30.0
Pulse Sequence s2pul
Experiment 1D
Number of Scans 68
Receiver Gain 46
Relaxation Delay 1.0000
Pulse Width 0.0000
Acquisition Time 2.5559
Spectrometer Frequency 399.76
Spectral Width 6410.3
Lowest Frequency -800.6
Nucleus 1H
TsHN
N
N
N
MeO
5ad
2.00
1.96
4.92
3.05
3.00
3.00
f1 (ppm)


159.82
143.23
142.12
137.19
129.43
129.38
128.41
127.94
127.88
127.26
126.23
126.17
126.12
114.30
55.56
39.92
39.71
39.50
39.29
39.08
20.93
Parameter Value
Origin JEOL
Spectrometer NCHU
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 3454
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.6000
Acquisition Time 0.6336
Modification Date 2022-01-09T15:46:45
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2622.7
Nucleus Carbon13
TsHN
N
N
N
MeO
5ad
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)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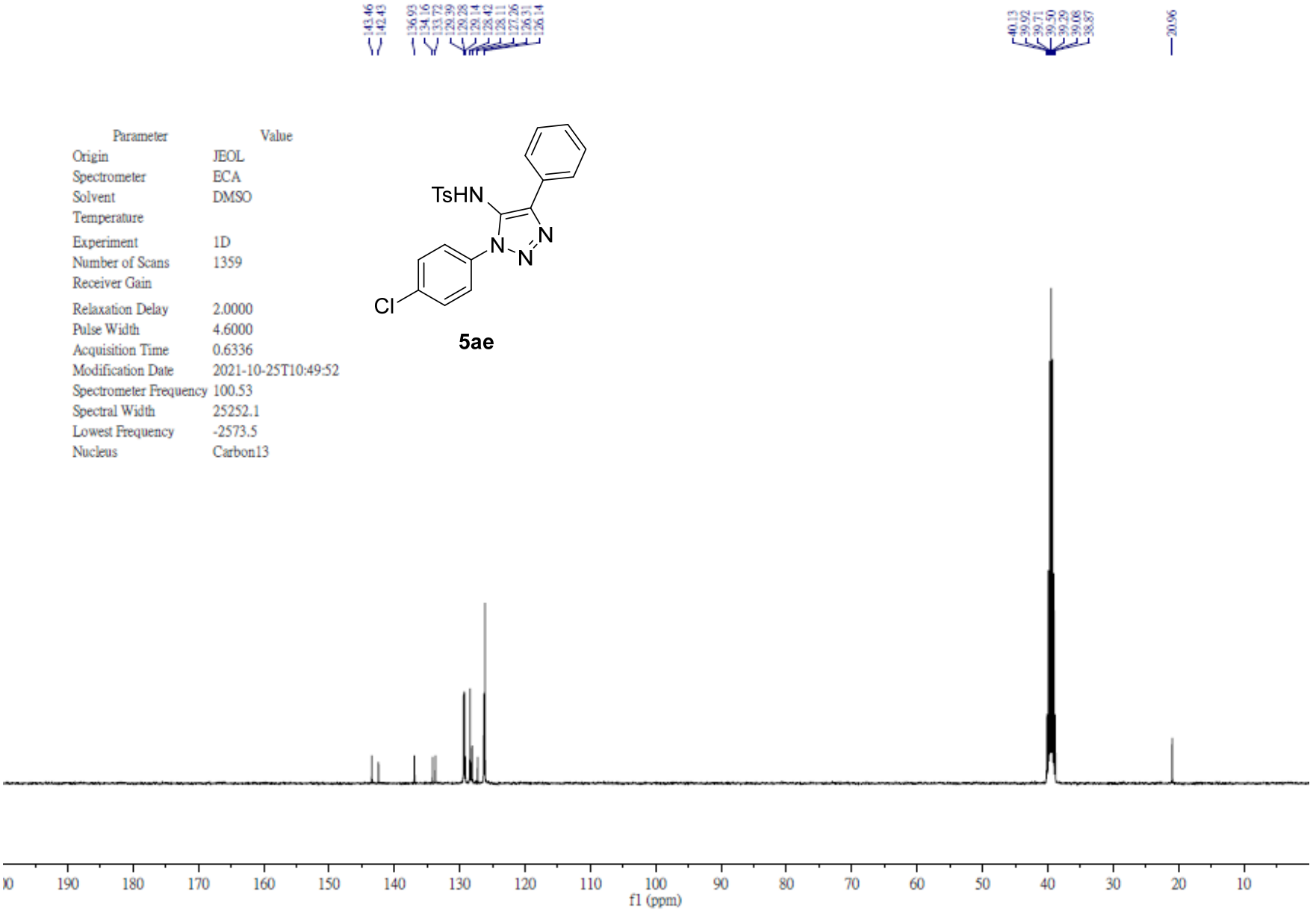
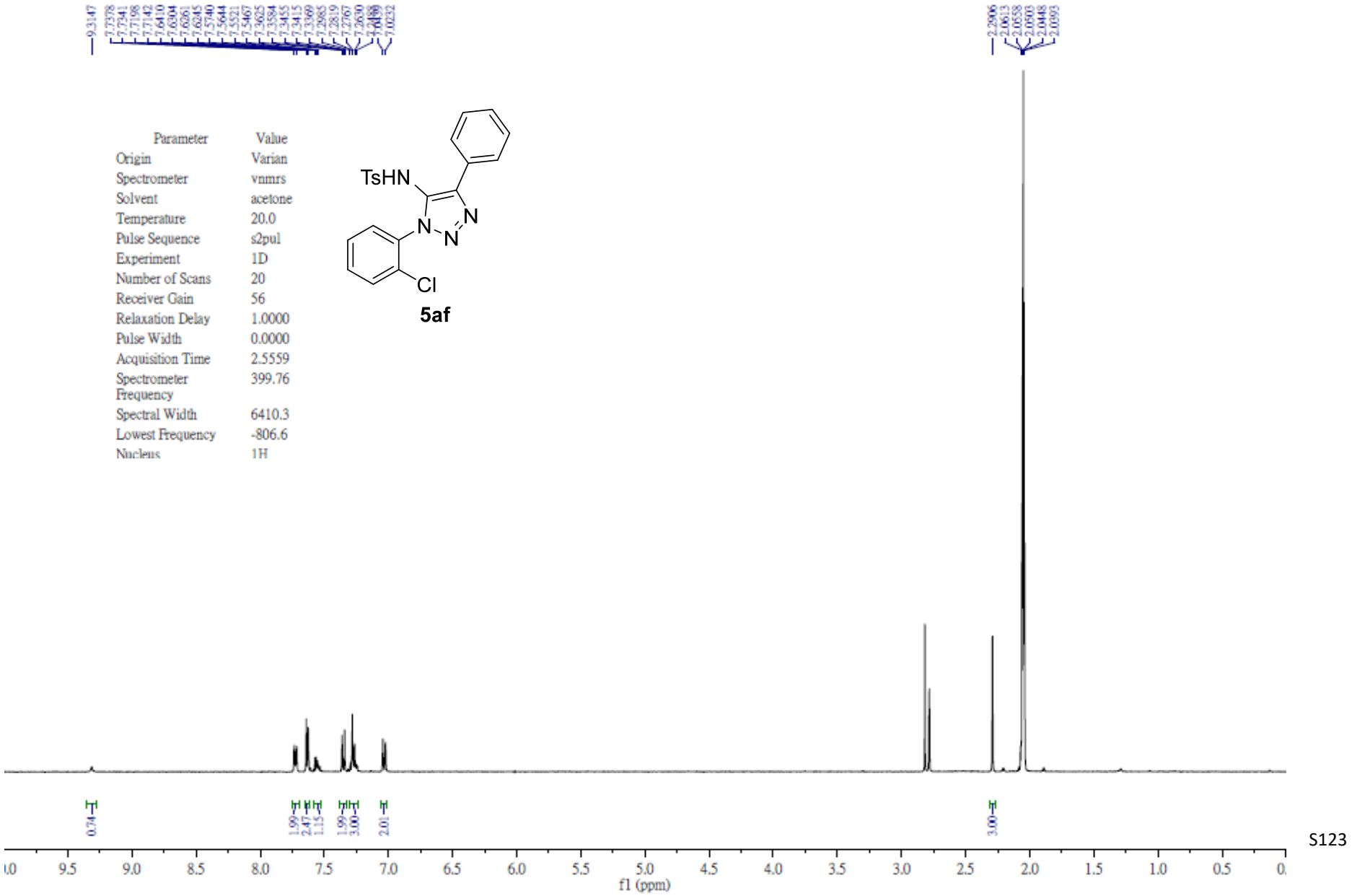
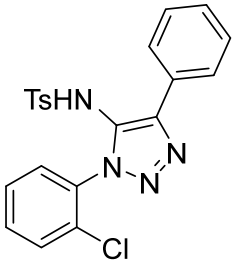
7.8271
7.8202
7.8167
7.8145
7.8101
7.8066
7.6225
7.6157
7.6102
7.5991
7.5933
7.5868
7.5466
7.5400
7.5343
7.5231
7.5176
7.5108
7.3357
7.3301
7.3260
7.3181
7.3148
7.3096
7.3046
7.0469
7.0456
7.0257
7.0242
2.3259
2.0614
2.0559
2.0449
2.0394
Parameter Value
Origin Varian
Spectrometer vnmrs
Solvent acetone
Temperature 20.0
Pulse Sequence s2pul
Experiment 1D
Number of Scans 68
Receiver Gain 52
Relaxation Delay 1.0000
Pulse Width 0.0000
Acquisition Time 2.5559
Spectrometer Frequency 399.76
Spectral Width 6410.3
Lowest Frequency -806.6
Nucleus 1H
TsHN
N
N
N
Cl
5ae
2.02
2.11
2.12
4.86
2.16
3.00
f1 (ppm)

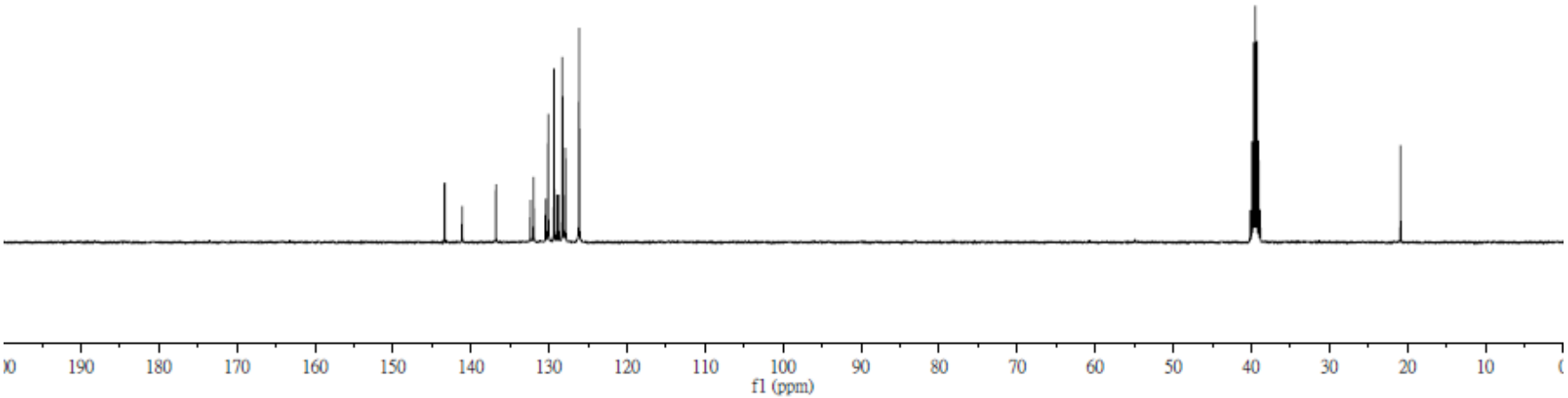

143.46
142.43
136.93
134.16
133.72
129.39
129.28
129.14
128.42
128.11
127.26
126.31
126.14
40.13
39.92
39.71
39.50
39.29
39.08
38.87
20.96
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 1359
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.6000
Acquisition Time 0.6336
Modification Date 2021-10-25T10:49:52
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2573.5
Nucleus Carbon13
TsHN
N
N
N
Cl
5ae
f1 (ppm)

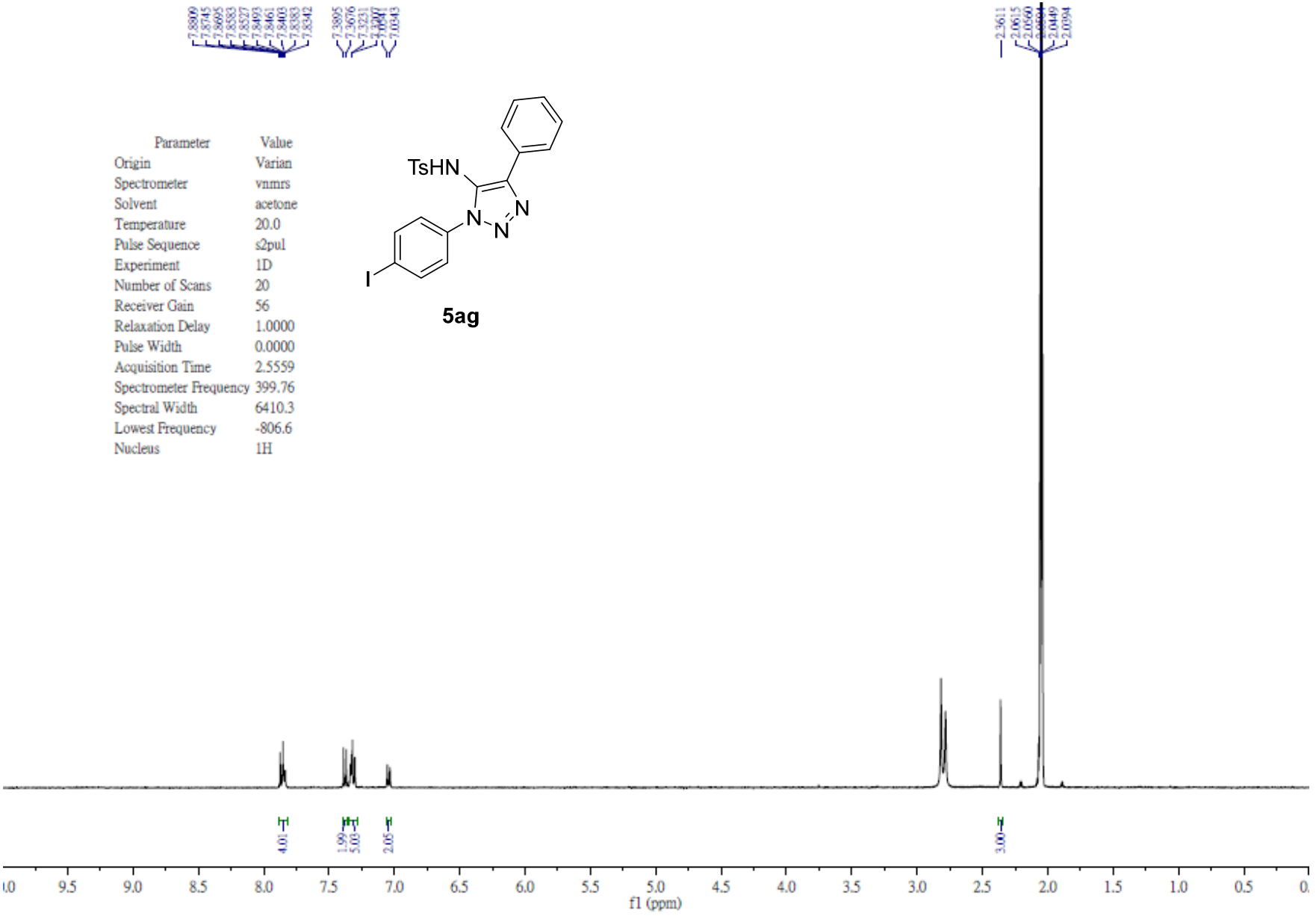

9.3147
7.7378
7.7341
7.7198
7.7142
7.6410
7.6304
7.6261
7.6245
7.5740
7.5644
7.5521
7.5467
7.3625
7.3584
7.3455
7.3415
7.3369
7.2985
7.2819
7.2767
7.2630
7.1232
7.1022
2.2906
2.0613
2.0558
2.0503
2.0448
2.0393
TsHN
N
N
N
Cl
5af
Parameter Value
Origin Varian
Spectrometer vnmrs
Solvent acetone
Temperature 20.0
Pulse Sequence s2pul
Experiment 1D
Number of Scans 20
Receiver Gain 56
Relaxation Delay 1.0000
Pulse Width 0.0000
Acquisition Time 2.5559
Spectrometer Frequency 399.76
Spectral Width 6410.3
Lowest Frequency -806.6
Nucleus 1H
0.74
1.99
2.47
1.15
1.99
3.00
2.01
3.00
f1 (ppm)

Parameter	Value
Origin	JEOL
Spectrometer	ECA
Solvent	DMSO
Temperature	
Experiment	1D
Number of Scans	339
Receiver Gain	
Relaxation Delay	2.0000
Pulse Width	4.6000
Acquisition Time	0.6336
Modification Date	2021-10-24T18:36:06
Spectrometer Frequency	100.53
Spectral Width	25252.1
Lowest Frequency	-2573.5
Nucleus	Carbon13



5af




7.8809
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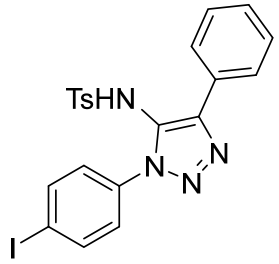
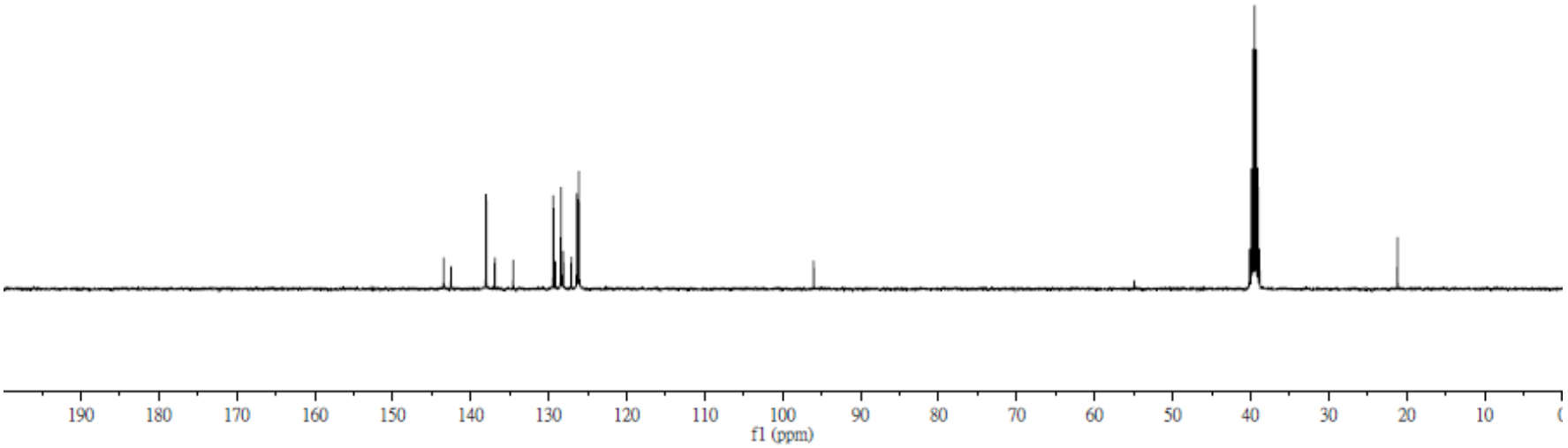
7.8695
7.8583
7.8527
7.8493
7.8461
7.8403
7.8383
7.8342
7.3695
7.3676
7.3231
7.0647
7.0543
2.3611
2.0615
2.0560
2.0449
2.0394
TsHN
N
N
N
I
5ag
Parameter Value
Origin Varian
Spectrometer vnmrs
Solvent acetone
Temperature 20.0
Pulse Sequence s2pul
Experiment 1D
Number of Scans 20
Receiver Gain 56
Relaxation Delay 1.0000
Pulse Width 0.0000
Acquisition Time 2.5559
Spectrometer Frequency 399.76
Spectral Width 6410.3
Lowest Frequency -806.6
Nucleus 1H
4.01
1.99
5.03
2.05
3.00
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
f1 (ppm)

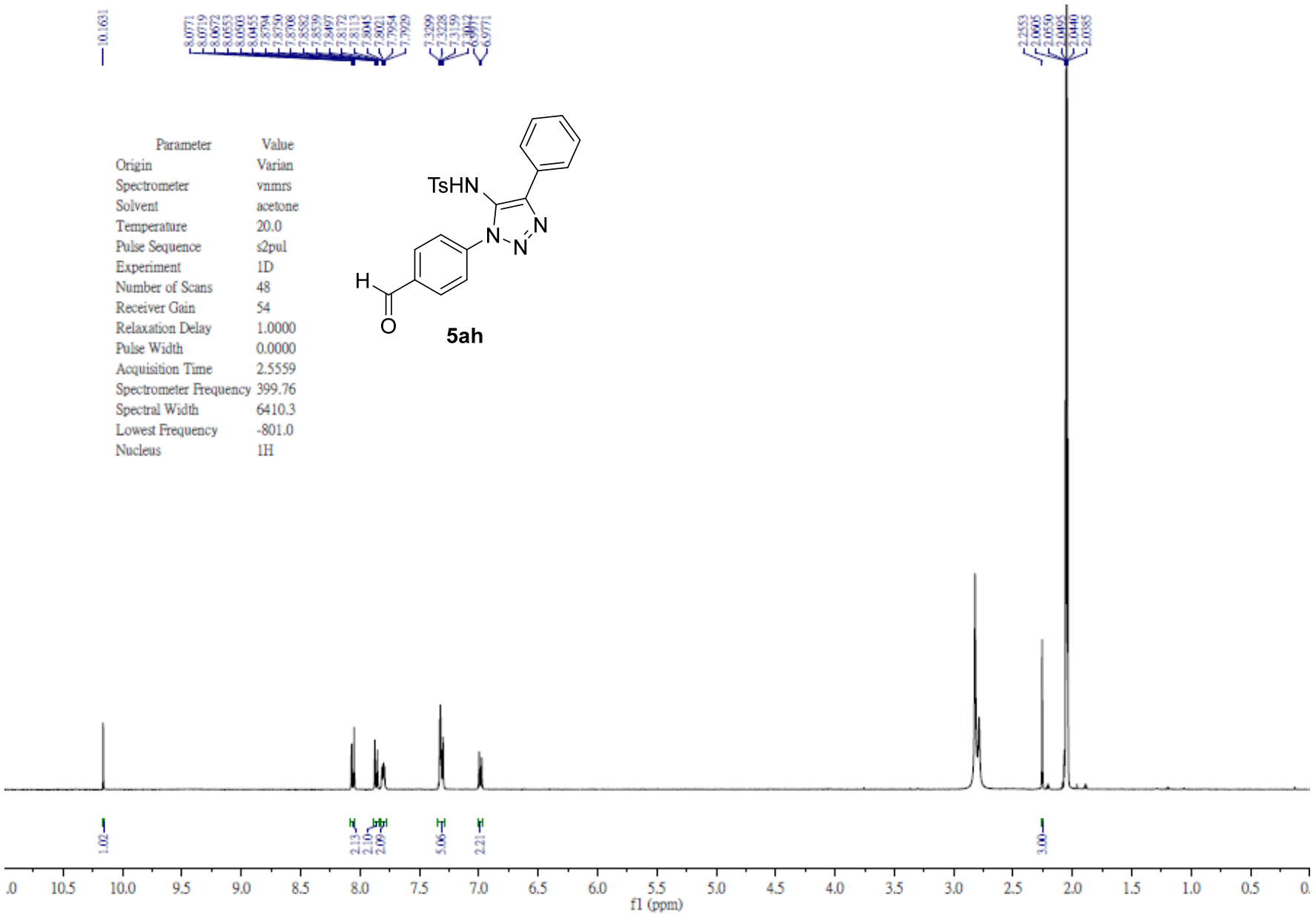
143.46
142.52
138.03
136.91
134.55
129.40
129.17
128.43
128.12
127.10
126.40
126.15
126.11
96.02
40.13
39.92
39.71
39.50
39.29
39.08
38.87
21.17

Parameter	Value
Origin	JEOL
Spectrometer	ECA
Solvent	DMSO
Temperature	
Experiment	1D
Number of Scans	266
Receiver Gain	
Relaxation Delay	2.0000
Pulse Width	4.6000
Acquisition Time	0.6336
Modification Date	2021-10-24T18:37:02
Spectrometer Frequency	100.53
Spectral Width	25252.1
Lowest Frequency	-2573.5
Nucleus	Carbon13



5ag

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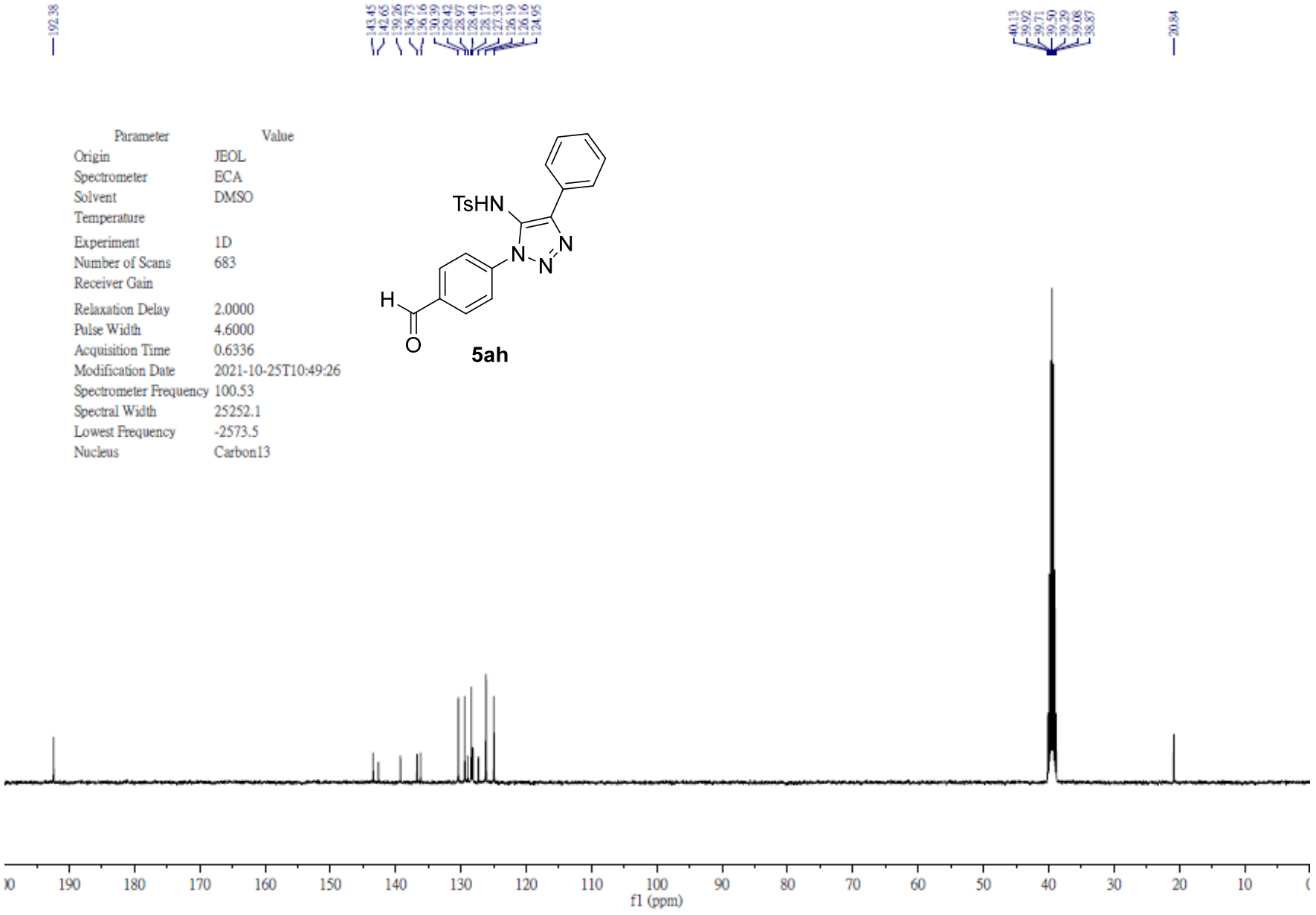
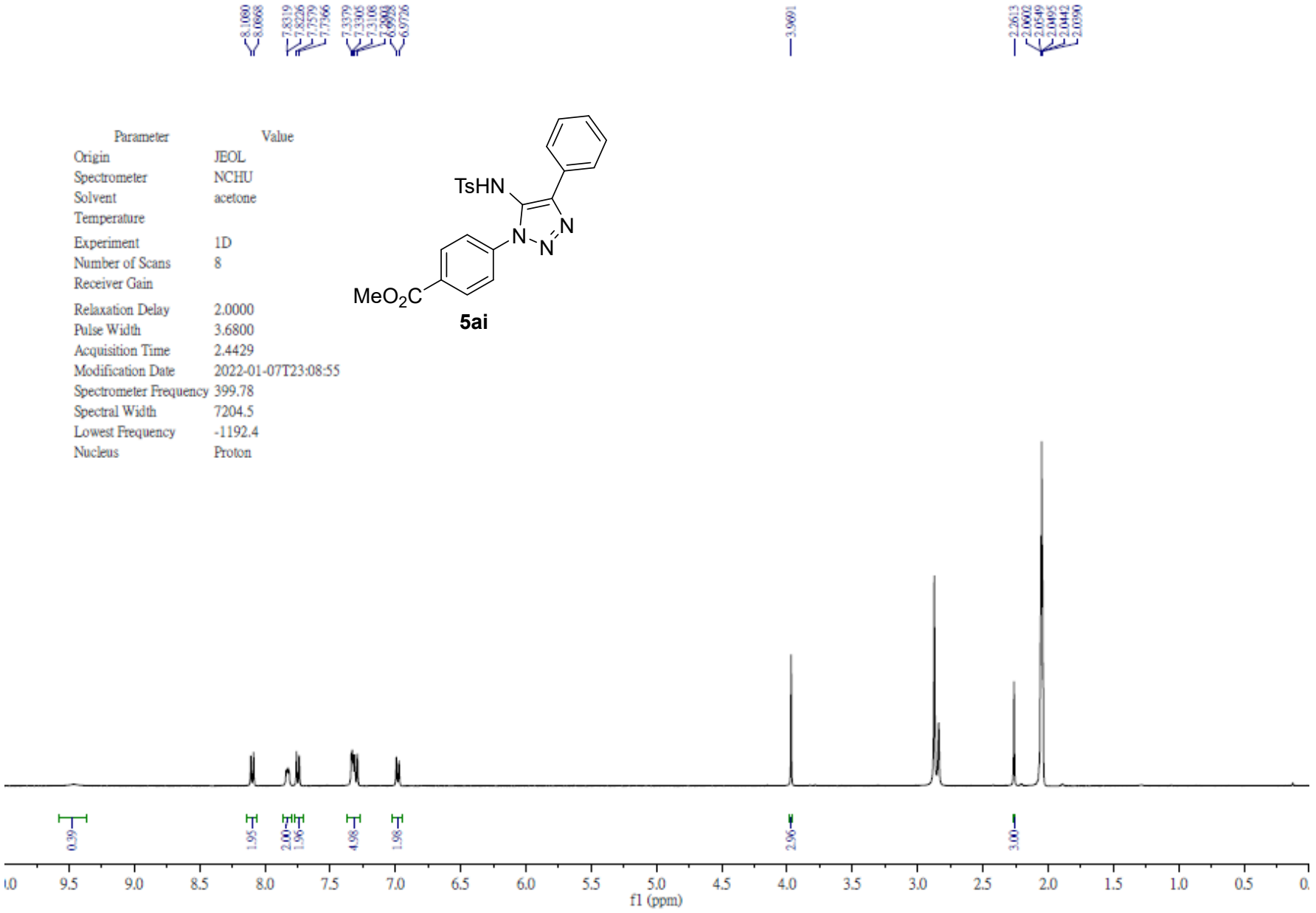
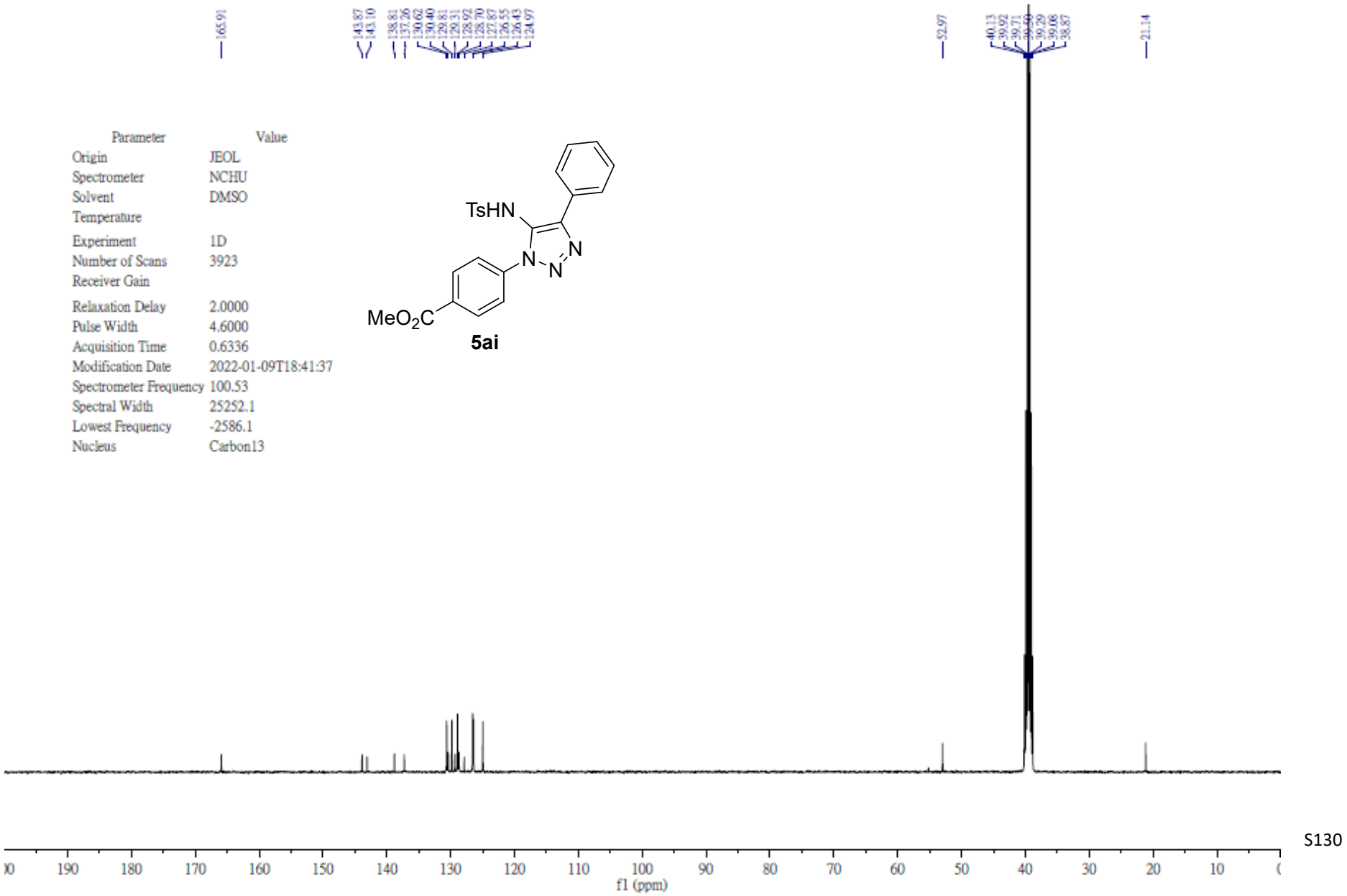
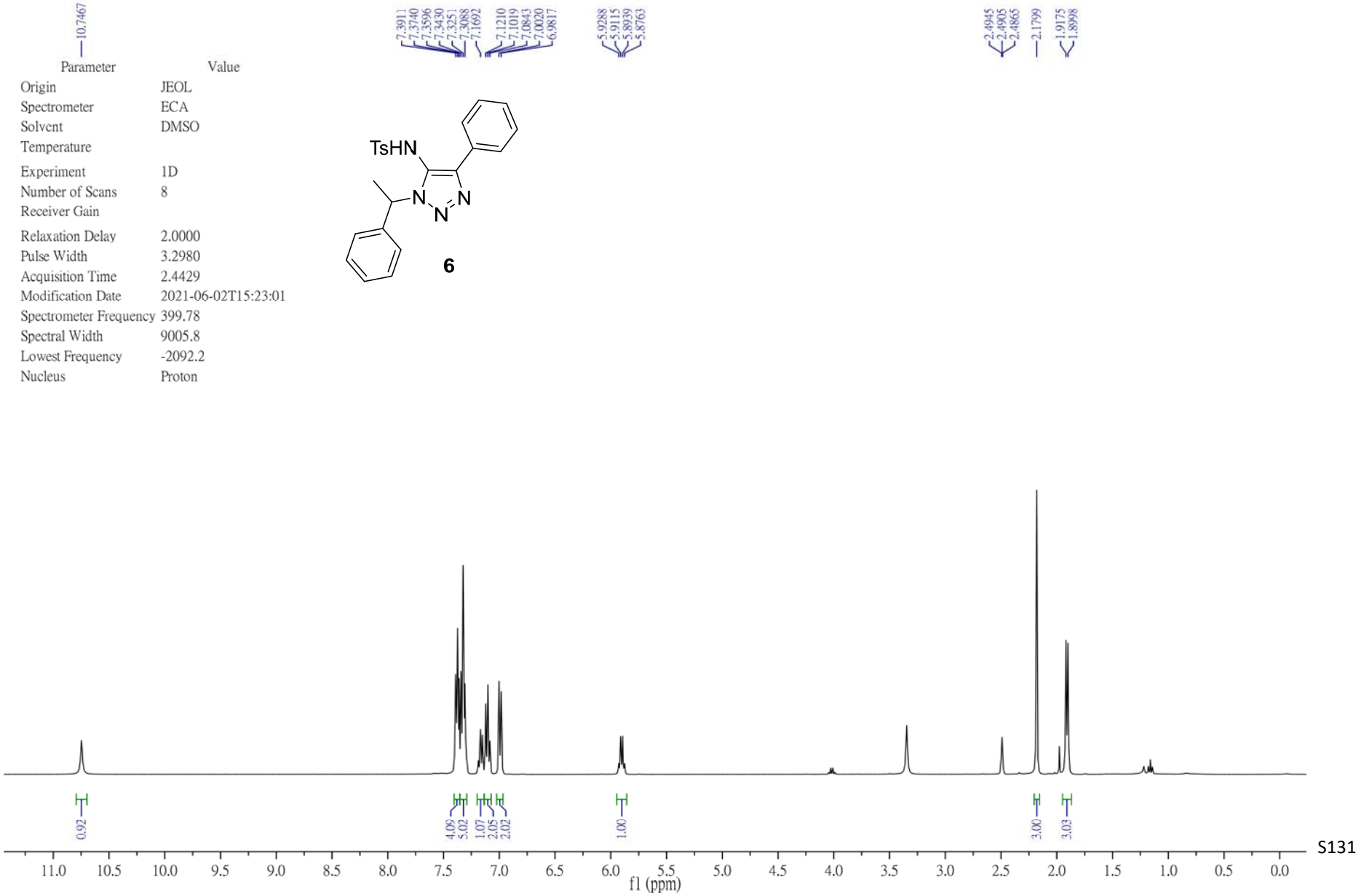
8.0719
8.0672
8.0653
8.0503
8.0455
7.8794
7.8750
7.8706
7.8582
7.8539
7.8497
7.8172
7.8113
7.8045
7.8021
7.7954
7.7929
7.3299
7.3228
7.3159
6.9771
2.2553
2.0005
2.0050
2.0095
2.0140
2.0185
Parameter Value
Origin Varian
Spectrometer vnmrs
Solvent acetone
Temperature 20.0
Pulse Sequence s2pul
Experiment 1D
Number of Scans 48
Receiver Gain 54
Relaxation Delay 1.0000
Pulse Width 0.0000
Acquisition Time 2.5559
Spectrometer Frequency 399.76
Spectral Width 6410.3
Lowest Frequency -801.0
Nucleus 1H
TsHN
N
N
N
H
O
5ah
1.02
2.13
2.10
2.09
5.06
2.21
3.00
f1 (ppm)


192.38
143.45
142.65
139.26
136.73
136.16
130.39
129.42
128.97
128.42
128.17
127.33
126.19
126.16
124.95
40.13
39.92
39.71
39.50
39.29
39.06
38.87
20.84
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 683
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.6000
Acquisition Time 0.6336
Modification Date 2021-10-25T10:49:26
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2573.5
Nucleus Carbon13
TsHN
N
N
N
H
O
5ah
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)


8.1060
8.0668
7.8319
7.8226
7.7579
7.7366
7.3379
7.3305
7.3106
6.9928
6.9726
3.9691
2.2613
2.0602
2.0549
2.0495
2.0442
2.0390
Parameter Value
Origin JEOL
Spectrometer NCHU
Solvent acetone
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.6800
Acquisition Time 2.4429
Modification Date 2022-01-07T23:08:55
Spectrometer Frequency 399.78
Spectral Width 7204.5
Lowest Frequency -1192.4
Nucleus Proton
TsHN
N
N
N
MeO2C
5ai
0.59
1.95
2.00
1.96
4.98
1.98
2.96
3.00
f1 (ppm)


165.91
143.87
143.10
138.81
137.26
130.62
130.40
129.81
129.31
128.92
128.70
127.87
126.55
126.43
124.97
52.97
40.13
39.92
39.71
39.50
39.29
39.08
38.87
21.14
Parameter Value
Origin JEOL
Spectrometer NCHU
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 3923
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 4.6000
Acquisition Time 0.6336
Modification Date 2022-01-09T18:41:37
Spectrometer Frequency 100.53
Spectral Width 25252.1
Lowest Frequency -2586.1
Nucleus Carbon13
TsHN
N
N
N
MeO2C
5ai
f1 (ppm)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7.3911
7.3740
7.3596
7.3430
7.3251
7.3088
7.1692
7.1210
7.1019
7.0843
7.0020
6.9817
5.9288
5.9115
5.8939
5.8763
2.4945
2.4905
2.4865
2.1799
1.9175
1.8998
Parameter Value
Origin JEOL
Spectrometer ECA
Solvent DMSO
Temperature
Experiment 1D
Number of Scans 8
Receiver Gain
Relaxation Delay 2.0000
Pulse Width 3.2980
Acquisition Time 2.4429
Modification Date 2021-06-02T15:23:01
Spectrometer Frequency 399.78
Spectral Width 9005.8
Lowest Frequency -2092.2
Nucleus Proton
TsHN
N
N
N
6
0.92
4.09
5.02
1.07
2.05
2.02
1.00
3.00
3.03
11.0
10.5
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)

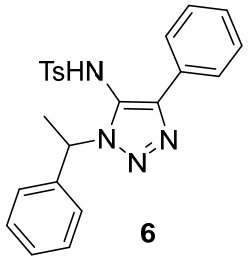
Parameter	Value
Origin	JEOL
Spectrometer	ECA
Solvent	DMSO
Temperature	
Experiment	1D
Number of Scans	371
Receiver Gain	
Relaxation Delay	2.0000
Pulse Width	4.7316
Acquisition Time	0.6336
Modification Date	2021-06-02T15:40:16
Spectrometer Frequency	100.53
Spectral Width	31565.7
Lowest Frequency	-5730.7
Nucleus	Carbon13

144.2286
141.6533
140.9165
136.7130
130.0054
129.7817
129.2423
128.5133
127.8783
127.2159
127.0522
127.0365
126.5168

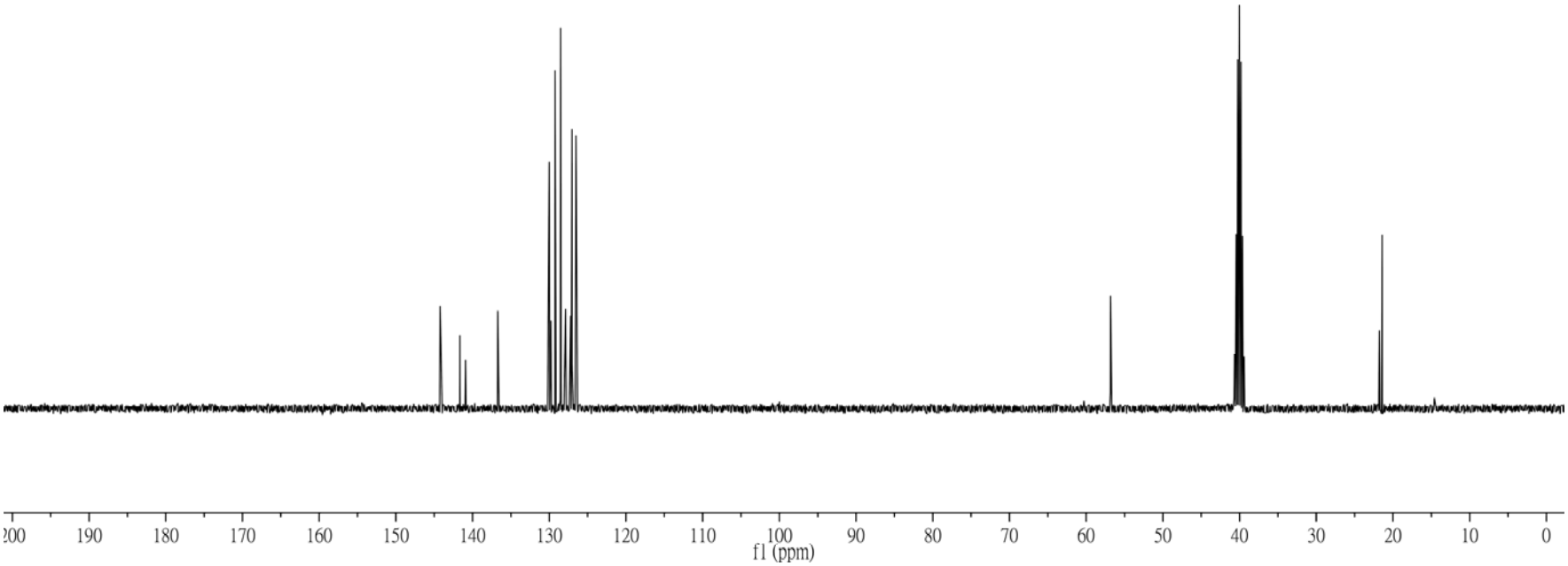
56.8219

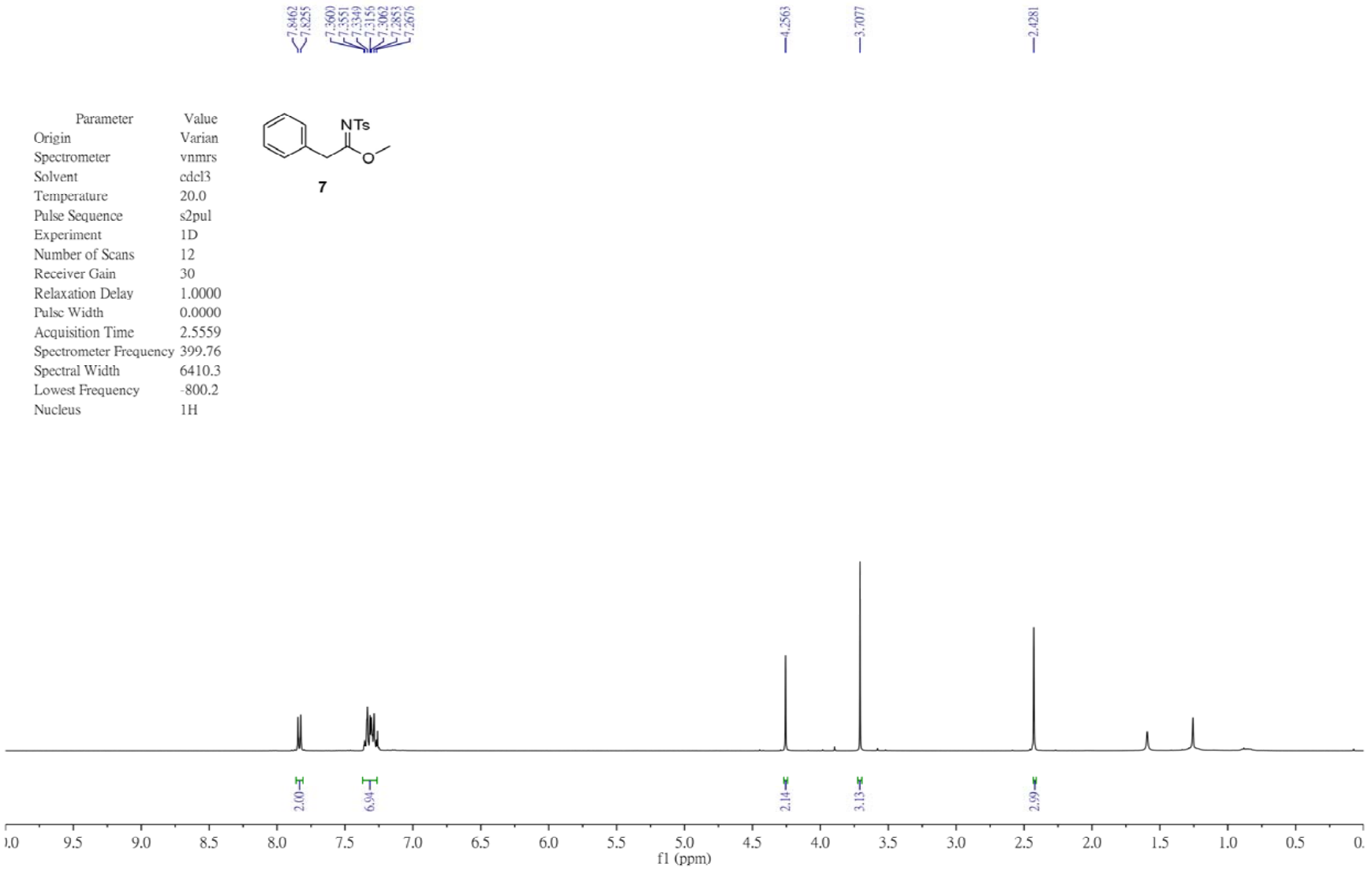
40.6557
40.4471
40.2387
40.0299
39.8209
39.6116
39.4028

21.7717
21.4090



6

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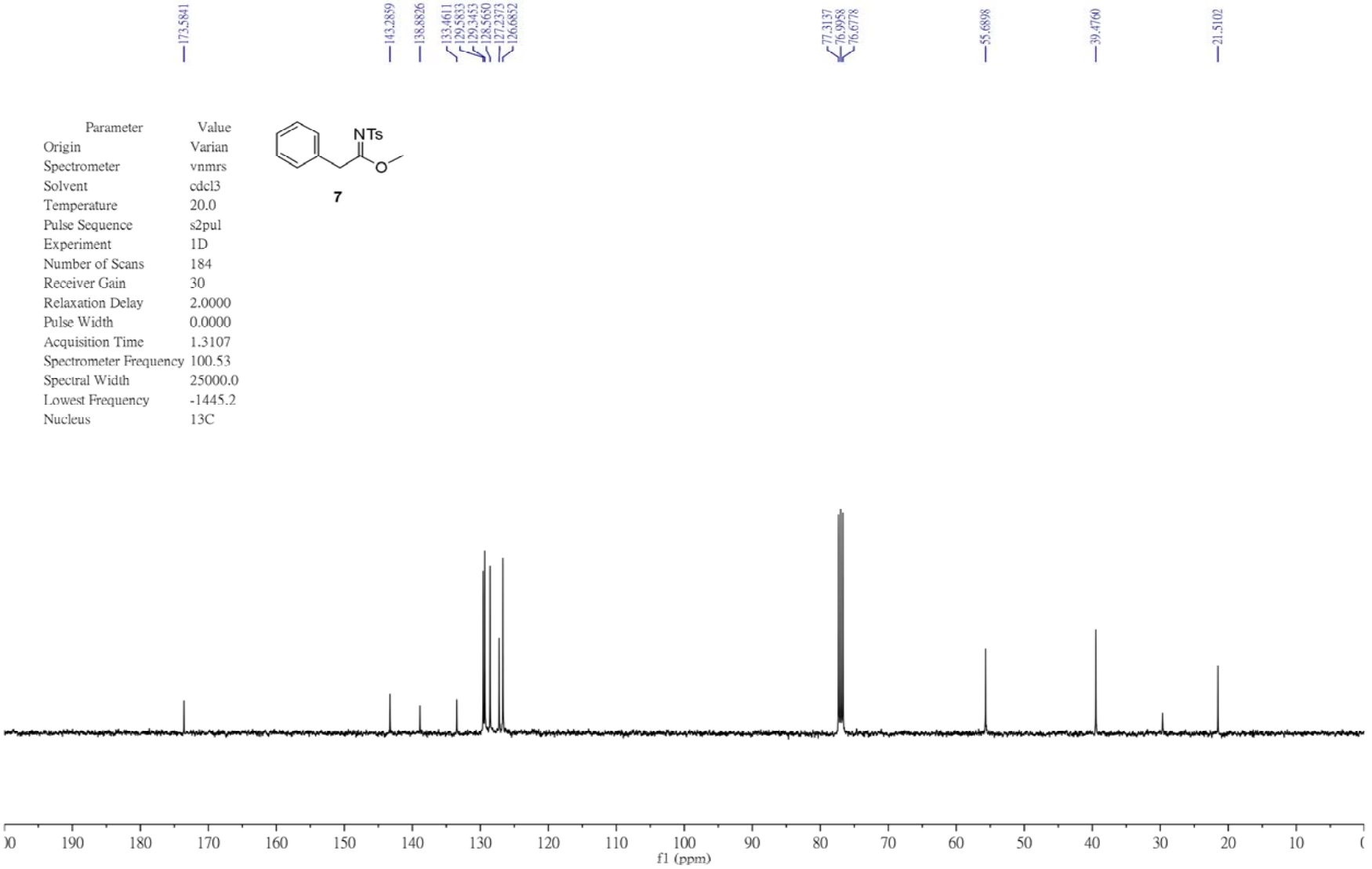
7.8255
7.3600
7.3551
7.3349
7.3156
7.3062
7.2853
7.2676
4.2563
3.7077
2.4281
NTs
O
7
Parameter Value
Origin Varian
Spectrometer vnmrs
Solvent cdcl3
Temperature 20.0
Pulse Sequence s2pul
Experiment 1D
Number of Scans 12
Receiver Gain 30
Relaxation Delay 1.0000
Pulse Width 0.0000
Acquisition Time 2.5559
Spectrometer Frequency 399.76
Spectral Width 6410.3
Lowest Frequency -800.2
Nucleus 1H
2.00
6.94
2.14
3.13
2.99
f1 (ppm)


173.5841
143.2859
138.8826
133.4611
129.5833
129.3453
128.5650
127.2373
126.6852
77.3137
76.9958
76.6778
55.6898
39.4760
21.5102
Parameter Value
Origin Varian
Spectrometer vnmrs
Solvent cdcl3
Temperature 20.0
Pulse Sequence s2pul
Experiment 1D
Number of Scans 184
Receiver Gain 30
Relaxation Delay 2.0000
Pulse Width 0.0000
Acquisition Time 1.3107
Spectrometer Frequency 100.53
Spectral Width 25000.0
Lowest Frequency -1445.2
Nucleus 13C
NTs
O
7
f1 (ppm)

d-acetone
solent blank