4-Hydroxybenzyl-substituted Amino Acid Derivatives from *Gastrodia elata*

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Supporting Information

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List of Content

Isolation of the Known Compounds. Fraction C2-1 (52.5 g) was chromatographed over silica gel and eluted with a gradient of MeOH (0−100%) in $CHCl_3$ yielded C2-1-1−C2-1-6. Subfraction C2-1-1 (9.5 g) were further separated by Sephadex LH-20 (CH_3OH-H_2O, 1:1) to yield subfractions C2-1-1-1−C2-1-1-8, and C2-1-1-2 (45 mg) was subjected to RP-HPLC (C_{18} column, 2.0 mL/min), using CH_3OH-H_2O (14:86) containing 0.1% TFA as the mobile phase, to yield bis-[(4-hydroxybenzyl)sulfide] (10 mg, t_R = 43.2 min). Subfraction C2-1-2 (7.2 g) was chromatographed over silica gel and eluted with a gradient of MeOH (0−100%) in $CHCl_3$ to afford subfractions C2-1-2-1− C2-1-2-5. Of these, C2-1-2-1 (230 mg) was separated by silica gel CC ($CHCl_3$-MeOH, 10:1), and purified by RP HPLC (45% MeOH in H_2O, C_{18} column, 2.0 mL/min) to give ethyl (+)-(*2S*)-2-hydroxy-3-(4-hydroxyphenyl)propanoate (10 mg, t_R = 20.2 min) and 1-(4-hydroxyphenyl)propane-1,2-dione (4.3 mg, t_R = 24.5 min). Subfraction C2-1-2-3 (1.8 g) was separated by flash chromatography over RP silica gel and eluted with a gradient of MeOH (0−50%) in H_2O to give C2-1-2-3-1− C2-1-2-3-7. C2-1-2-3-1 (200 mg) was crystallized in MeOH to afford 1-ethyl citrate (130 mg), and the parent solution was separated by CC over HW-40C (MeOH) to afford 4-(hydroxymethyl)-5-nitrobenzene-1,2-diol (4.5 mg). C2-1-2-3-3 (0.5 g) was chromatographed over MCI (50% MeOH in H_2O), and purified by RP HPLC (40% MeOH in H_2O, containing 0.1% TFA, C_{18} colum, 2.0 ml/min) to yield (–)-(*6R*)-6,7-dihydroxy-3,7-dimethyloct-2(*Z*)-enoic acid (2.5 mg, t_R = 24.1 min) and 6-ethyl citrate (5.3 mg, t_R = 26.2 min).

Subfraction C3-1-4-4-2 (26 mg) was separated by CC over HW-40F (MeOH) to give C3-1-4-4-2-1−C3-1-4-4-2-2, which were separately purified by RP HPLC using 25% MeOH in H_2O (containing 0.1% TFA) to afford cyclo[glycine-L-*S*-(4″-hydroxybenzyl)cysteine] (2 mg, t_R = 32.3 min, C_{18} column, 2.0 mL/min) from C3-1-4-4-2-1, and using 8% MeOH in H_2O (containing 0.1% TFA) to afford (–)-4-*β*-D-glucopyranosyl-(1→6)-*β*-D-glucopyranosyloxybenzyl alcohol (3.1 mg, t_R = 36.2 min, C_{18} column, 2.0 mL/min) from C3-1-4-4-2-2. Subfraction of C3-5-2 was separated by CC over Sephadex LH-20 (CH_3OH-H_2O, 1:1) to afford C3-5-2-1−C3-5-2-4. Of these, C-3-5-2-4 was subjected to RP-HPLC purification using CH_3OH-H_2O (15:85, containing 0.1% TFA, Ph column, 2.0 mL/min) to afford parishin E (6 mg, t_R = 28.1 min) and 2-[4-*O*-(*β*-D-glucopyranosyl)benzyl]

citrate (16.2 mg, t_R = 33.4 min).

HPLC–ESIMS Analysis of the Aqueous and a CH_3CN-eluted Fraction. The aqueous extract of *Gastrodia elata* rhizomes and a CH_3CN-eluted fraction, which was prepared by chromatography of the aqueous extract (50 mg) over a reversed-phase C_{18} silica gel (2 g) by successive elution with H_2O (300 mL) and CH_3CN (100 mL), were analyzed by HPLC–ESIMS using the ion extraction method. Sample analyses were performed on an Agilent 1100 series LC/MSD trap (Agilent Technologies, Waldbronn, Germany) equipped with an ESI source. A Zorbax SB-Aq C_{18} column (4.6× 150 mm, 5 μm; Agilent, USA) with an inline filter was used for separation: flow rate was 1.0 mL min^{-1}; approximately 50% of the elution inlet into the mass spectrometer by splitting through a T-piece; column temperature at 25 °C. The crude aqueous extract was analyzed under an isocratic elution with 15% CH_3CN in H_2O containing 0.1% TFA. The CH_3CN-eluted fraction was analyzed using a programed elution of solvents A (H_2O containing 0.1% TFA) and B (CH_3CN): 15% B in A for 30 min, increasing B from 30% to 45% in 30–45 min, and then system re-equilibration with A for 10 min.

Compounds **1** and **2** were observed in the crude aqueous extract (Figures S125–S126), and compound **3** in the MeCN-eluted fraction (Figures S127).

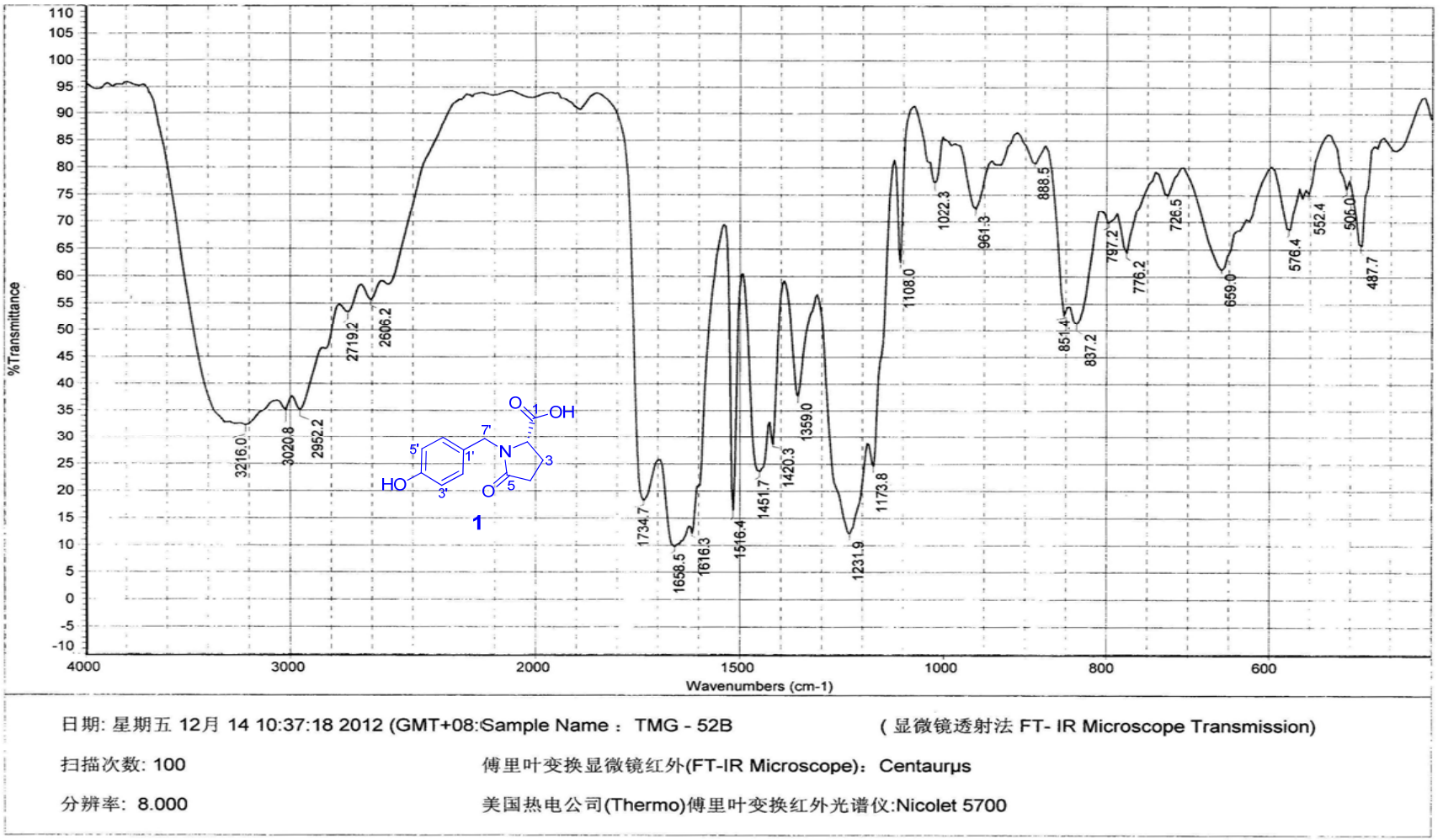


Figure S1. The IR Spectrum of Compound **1**

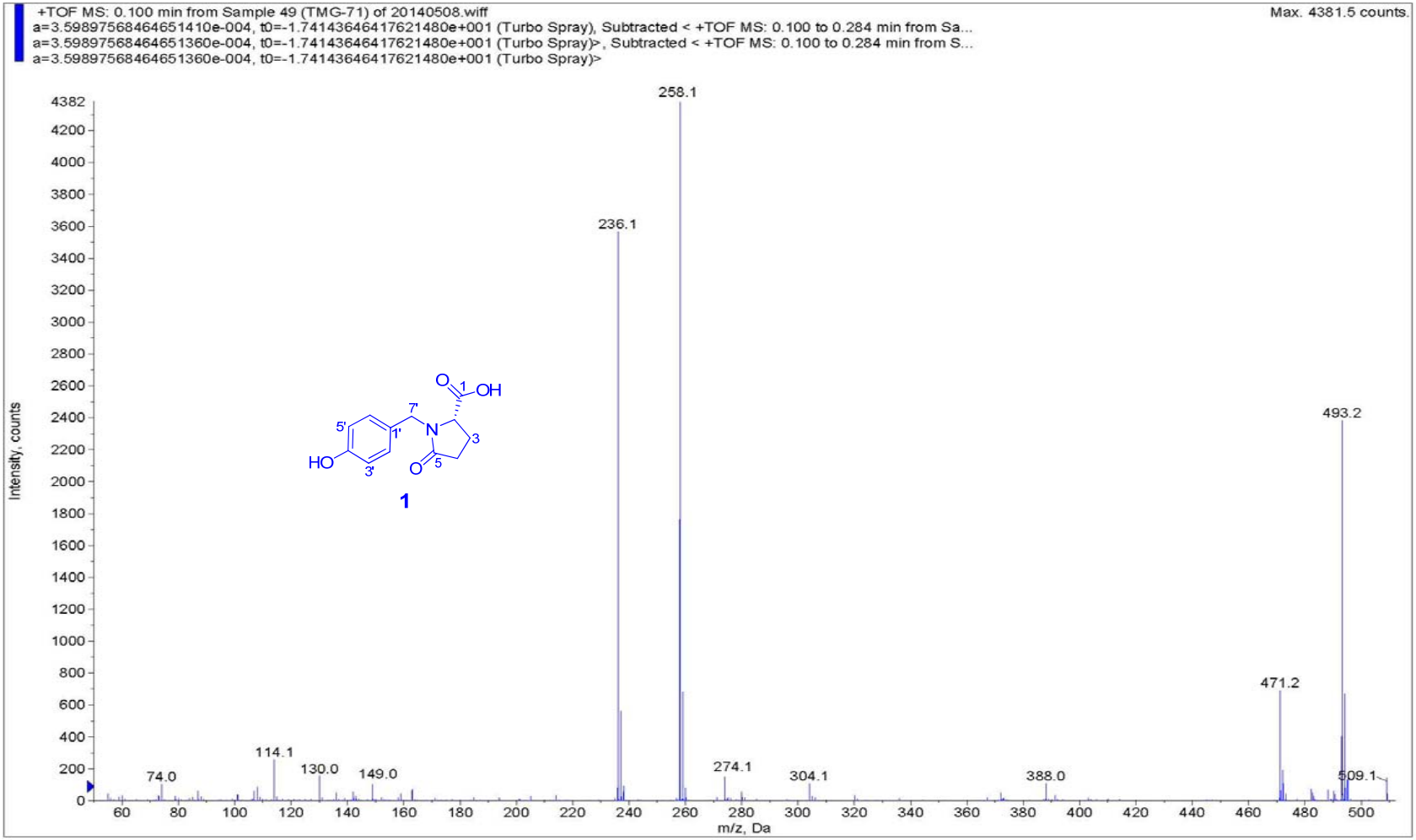
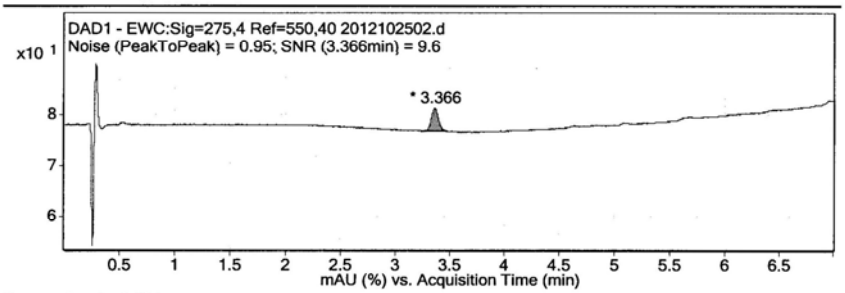


Figure S2. The (+)-ESIMS Spectrum of Compound **1**

Qualitative Analysis Report

Data Filename	2012102502.d	**Sample Name**	TMG-66
Sample Type	Sample	**Position**	P1-D6
Instrument Name	Instrument 1	**User Name**	
Acq Method		**IRM Calibration Status**	Some Ions Missed
DA Method	TEST LCMS.m	**Comment**	

User Chromatograms



Integration Peak List

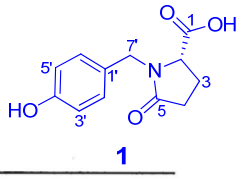
Peak	Start	RT	End	Height	Area	Area %	Signal To Noise
1	3.275	3.366	3.481	2.04	9.124	100	9.6

Noise Measurements

Noise Type	Signal Definition	Noise Multiplier	Noise Value
Peak-to-Peak	Area	1	0.951028824

Noise Regions

Start	End
1	2
5	6
8.6	9.4
9.8	11



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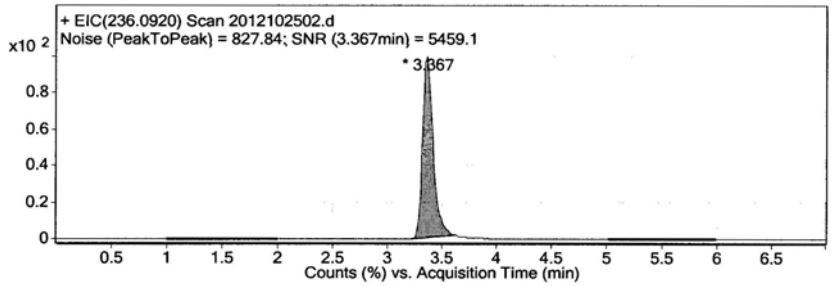
Fragmentor Voltage 135 **Collision Energy** 0 **Ionization Mode** ESI



Integration Peak List

Peak	Start	RT	End	Height	Area	Area %	Signal To Noise
1	3.222	3.367	3.625	671400	4519238	100	5459.1

Noise Measurements

Noise Type	Signal Definition	Noise Multiplier	Noise Value
Peak-to-Peak	Area	1	827.8362427

Noise Regions

Start	End
1	2
5	6
8.6	9.4
9.8	11

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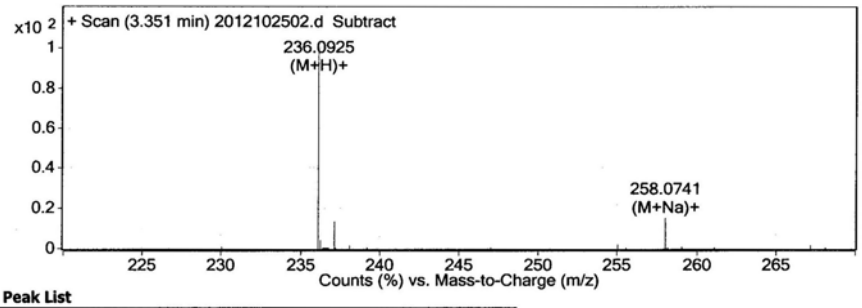
Figure S3. The (+)-HRESIMS Report of Compound **1**, Page 1

Qualitative Analysis Report

User Spectra

Fragmentor Voltage	Collision Energy	Ionization Mode
135	0	Esi



Peak List

m/z	z	Abund	Formula	Ion
107.0499		57617		
236.0925	1	653650	C12 H14 N O4	(M+H)+
237.0975	1	87698	C12 H14 N O4	(M+H)+
258.0741		97314	C12 H13 N Na O4	(M+Na)+
471.1773		75679		
493.159		103444		

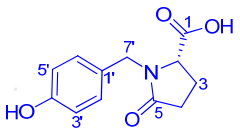
Formula Calculator Element Limits

Element	Min	Max
C	3	100
H	0	500
O	0	90
N	0	4
S	0	2
Cl	0	0
Br	0	1

Formula Calculator Results

Formula	Best	Mass	Tgt Mass	Diff (ppm)	Ion Species	Score
C12 H13 N O4	TRUE	235.0849	235.0845	-1.79	C12 H13 N Na O4	96.45
C12 H13 N O4	TRUE	235.0853	235.0845	-3.4	C12 H14 N O4	99.52

--- End Of Report ---



1

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Figure S4. The (+)-HRESIMS Report of Compound **1**, Page 2

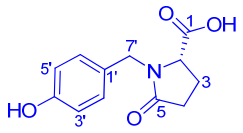
MS Formula Results: + Scan (3.351 min) Sub (2012102502.d)

m/z	Ion	Formula	Abundance
236.0925	(M+H)+	C12 H14 N O4	653650.1

Best	Formula (M)	Ion Formula	Calc m/z	Score	Cross S	Mass	Calc Mass	Diff (ppm)	Abs Diff (ppm)	Abund Match	Spacing Mat	Mass Match	m/z	DBE
☑	C12 H13 N O4	C12 H14 N O4	236.0917	99.52		235.0853	235.0845	-3.4	3.4	99.99	98.67	99.67	236.0925	7

m/z	Ion	Formula	Abundance
258.0741	(M+Na)+	C12 H13 N Na O4	97313.6

Best	Formula (M)	Ion Formula	Calc m/z	Score	Cross S	Mass	Calc Mass	Diff (ppm)	Abs Diff (ppm)	Abund Match	Spacing Mat	Mass Match	m/z	DBE
☑	C12 H13 N O4	C12 H13 N Na O4	258.0737	96.45		235.0849	235.0845	-1.79	1.79	96.68	89.22	99.92	258.0741	7



1

Figure S5. The (+)-HRESIMS Report of Compound **1**, Page 3

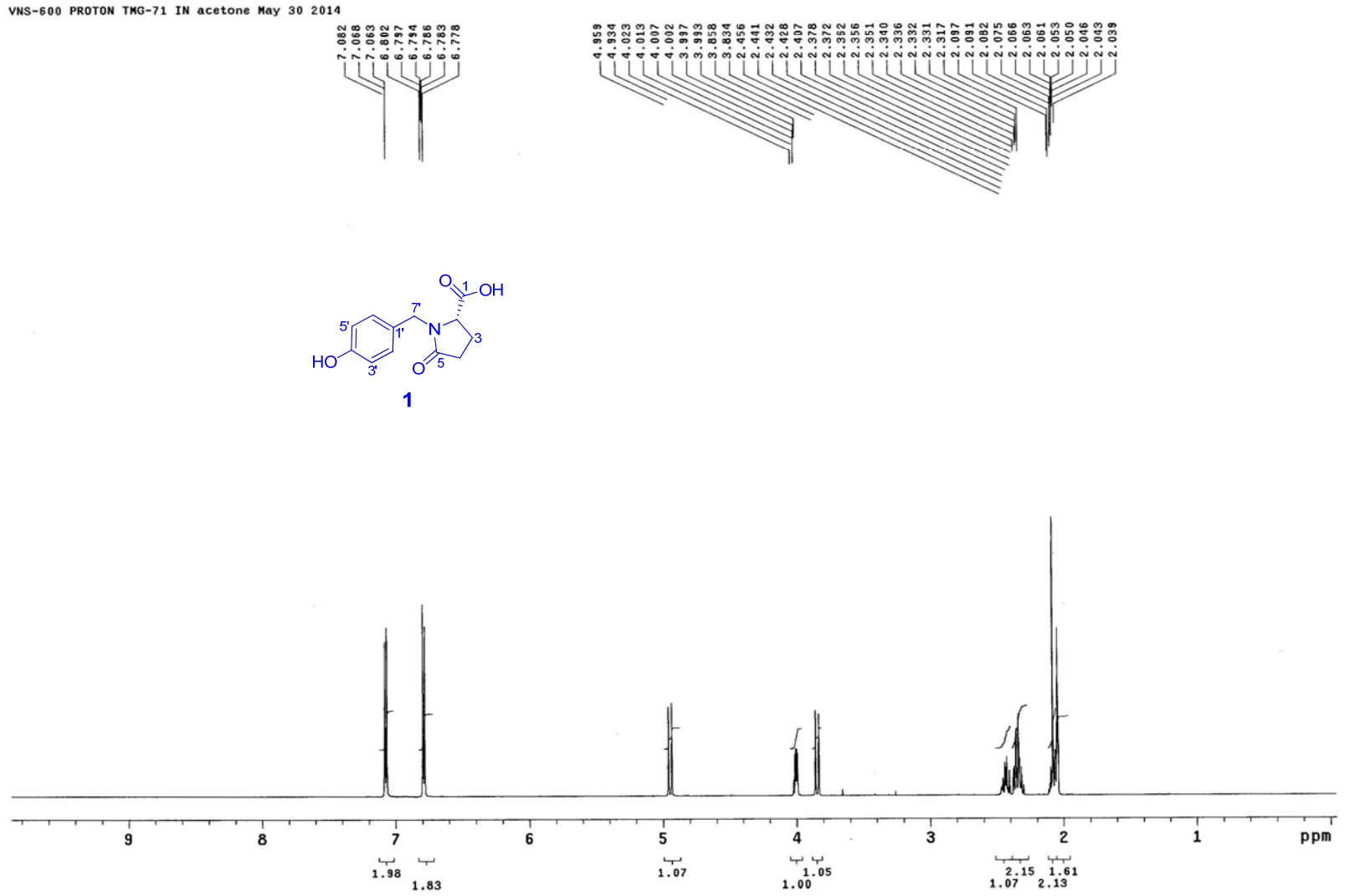


Figure S6. The ^{1}H NMR Spectrum of Compound **1** in Me_2CO-d_6 (600 MHz)

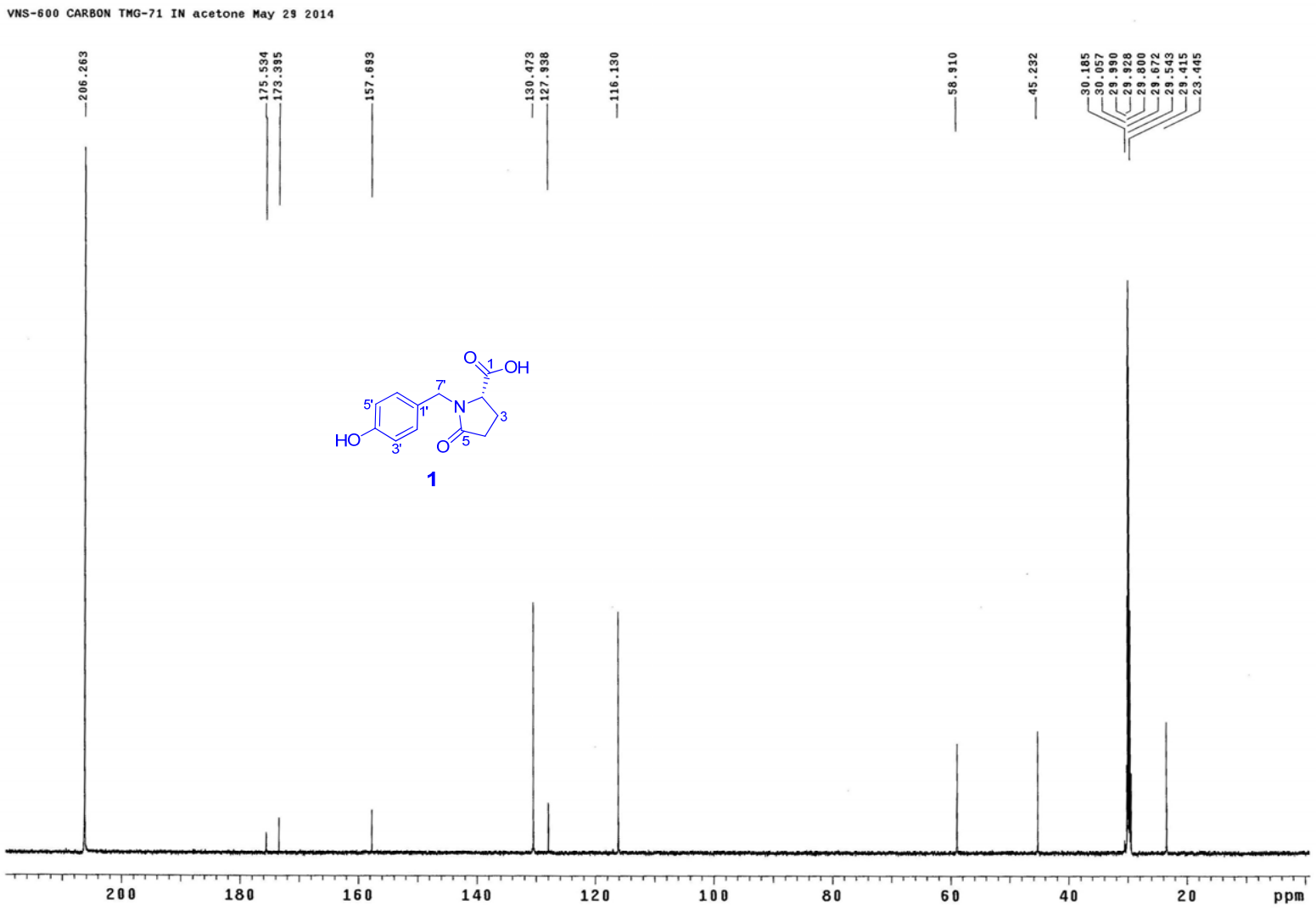


Figure S7. The ^{13}C NMR Spectrum of Compound **1** in Me_2CO-d_6 (150 MHz)

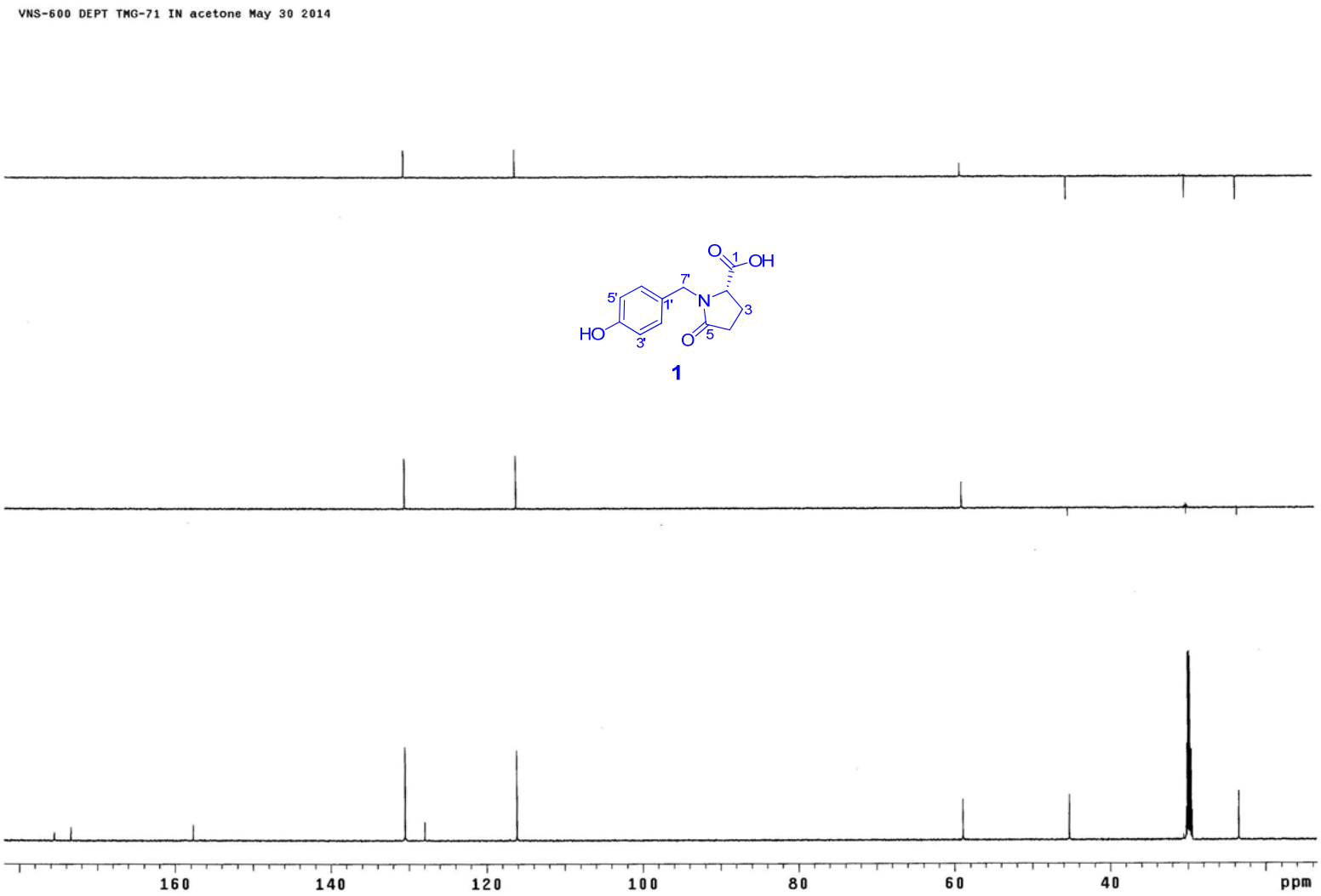


Figure S8. The DEPT Spectrum of Compound **1** in Me_2CO-d_6 (150 MHz)

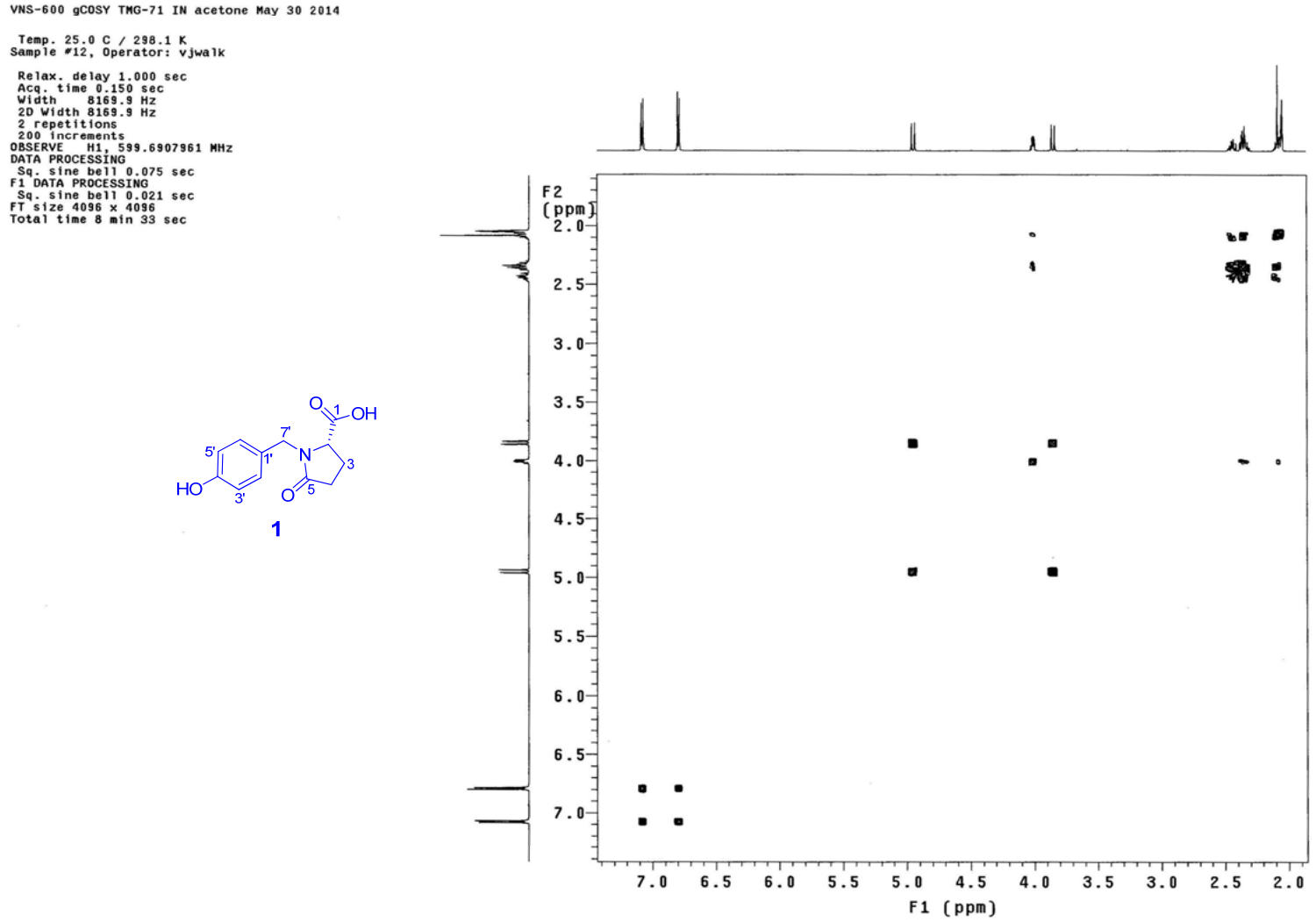


Figure S9. The ^{1}H-^{1}H gCOSY Spectrum of Compound **1** in Me_2CO-d_6 (600 MHz)

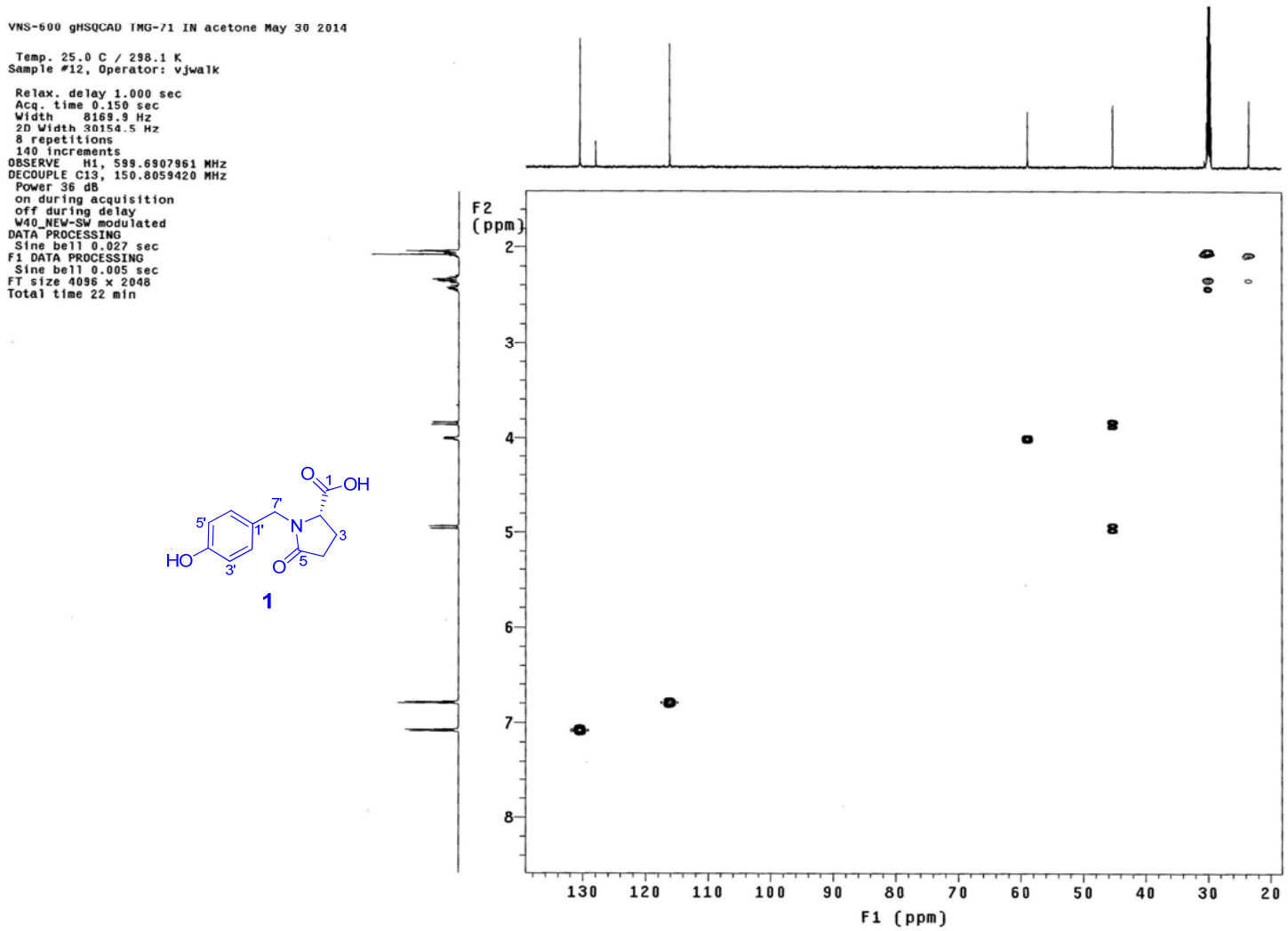


Figure S10. The gHSQC Spectrum of Compound **1** in Me_2CO-d_6 (600 MHz)

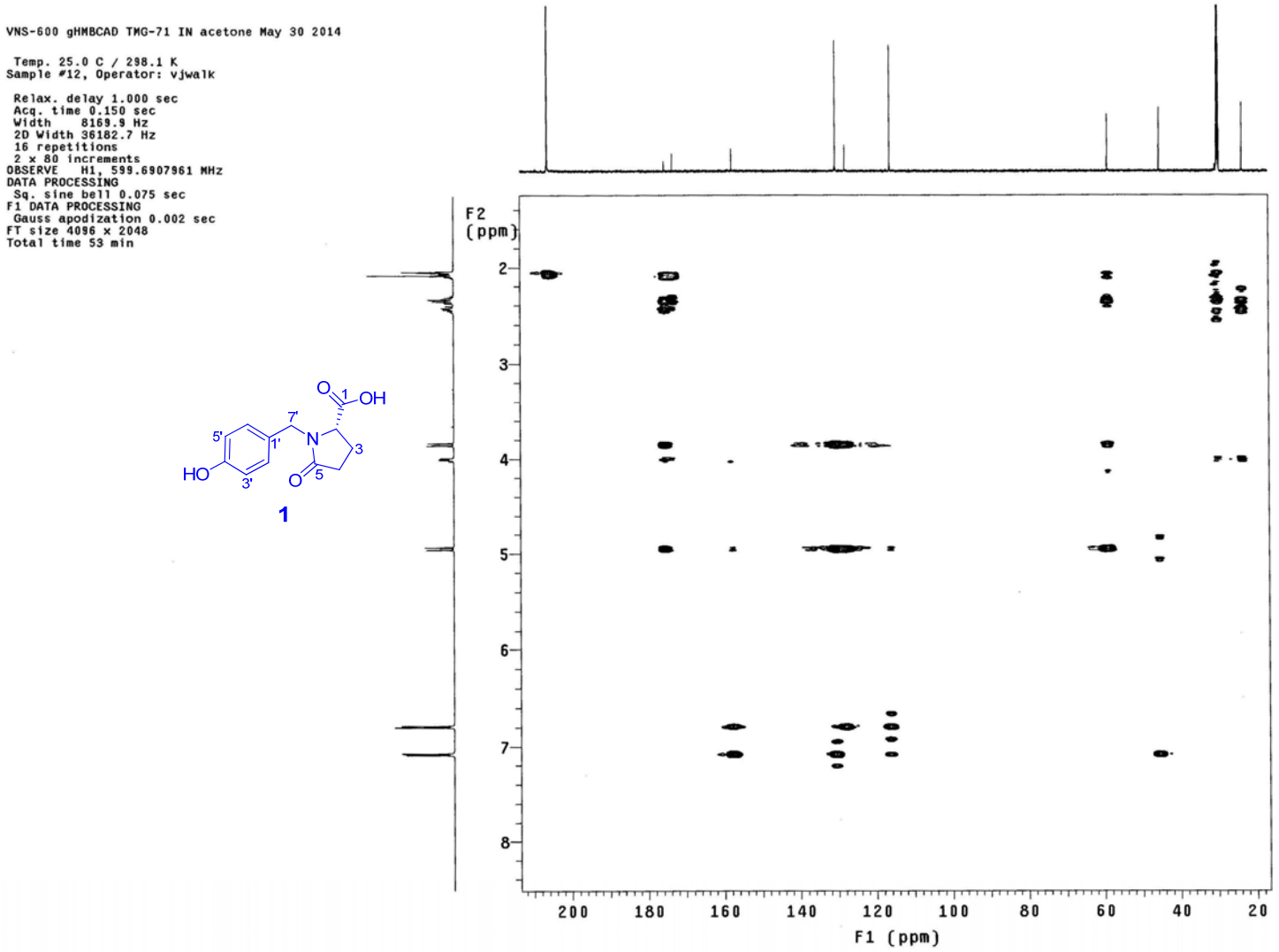


Figure S11. The gHMBC Spectrum of Compound **1** in Me_2CO-d_6 (600 MHz)

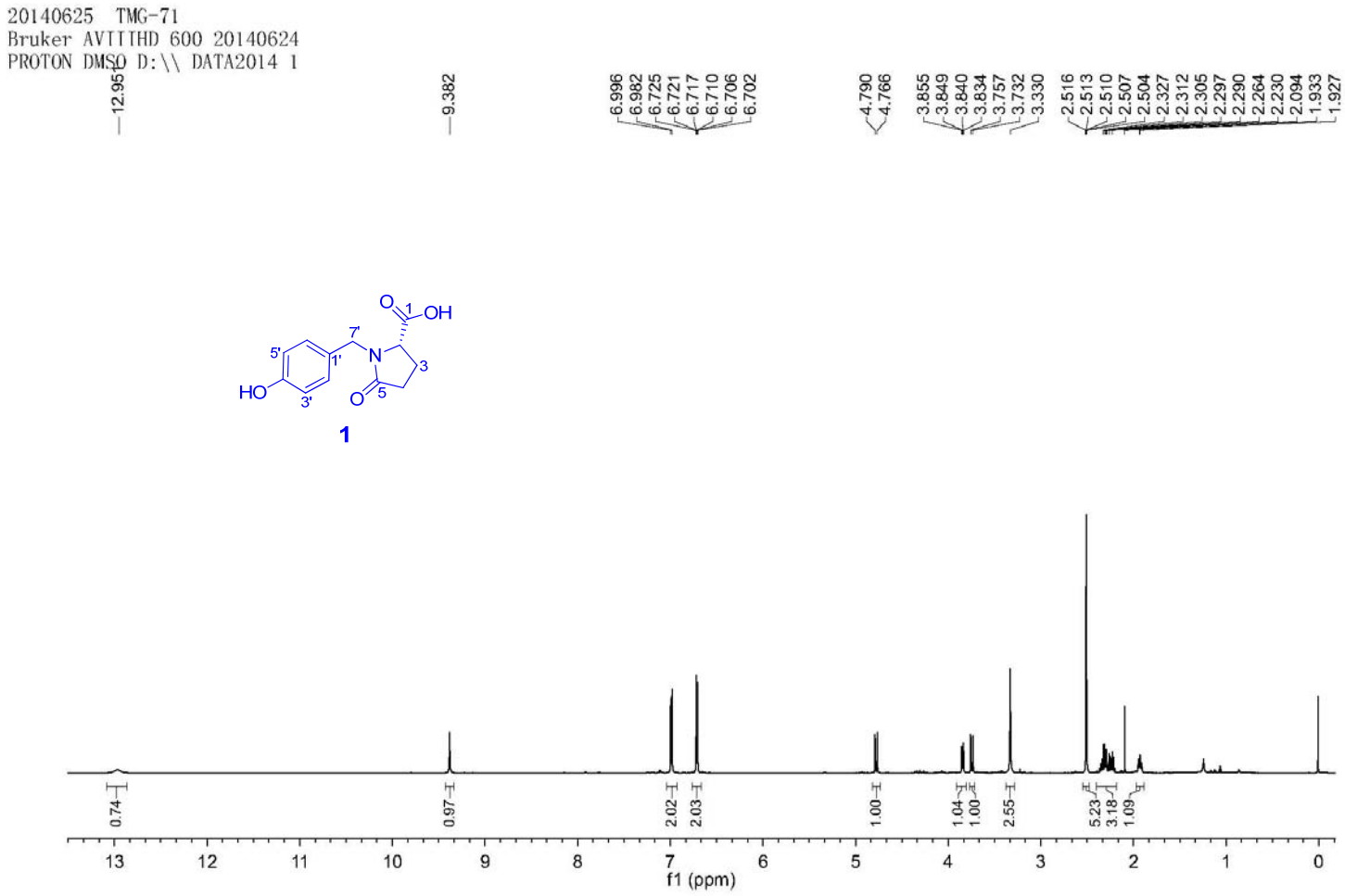


Figure S12. The ^{1}H NMR Spectrum of Compound **1** in DMSO-d_6 (600 MHz)

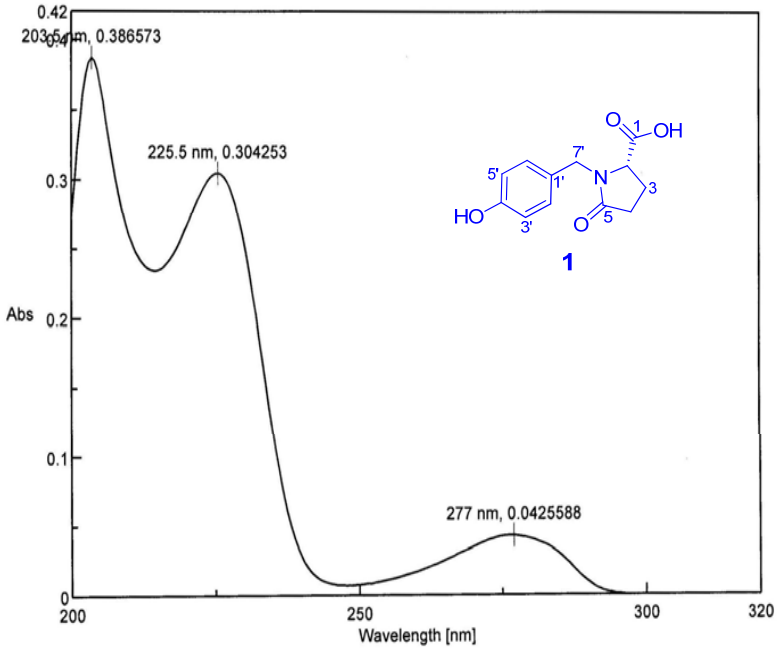


Figure S13. The UV Spectrum of Compound **1** in MeOH

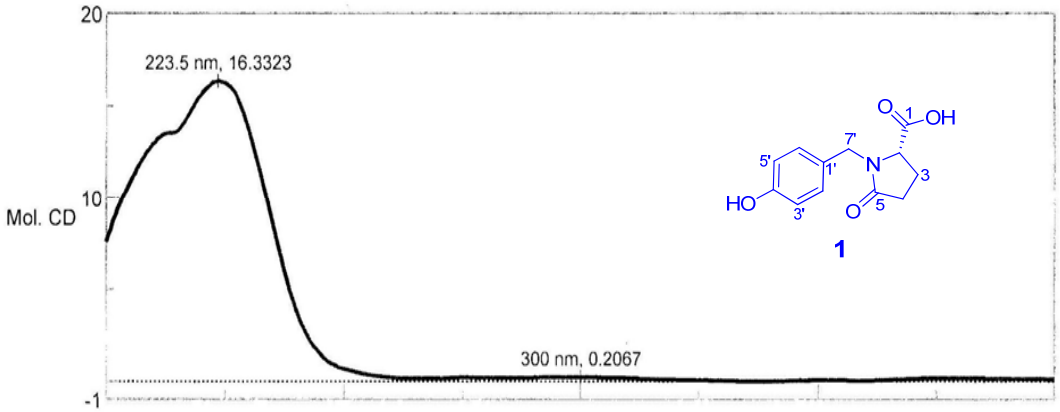


Figure S14. The CD Spectrum of Compound **1** in MeOH

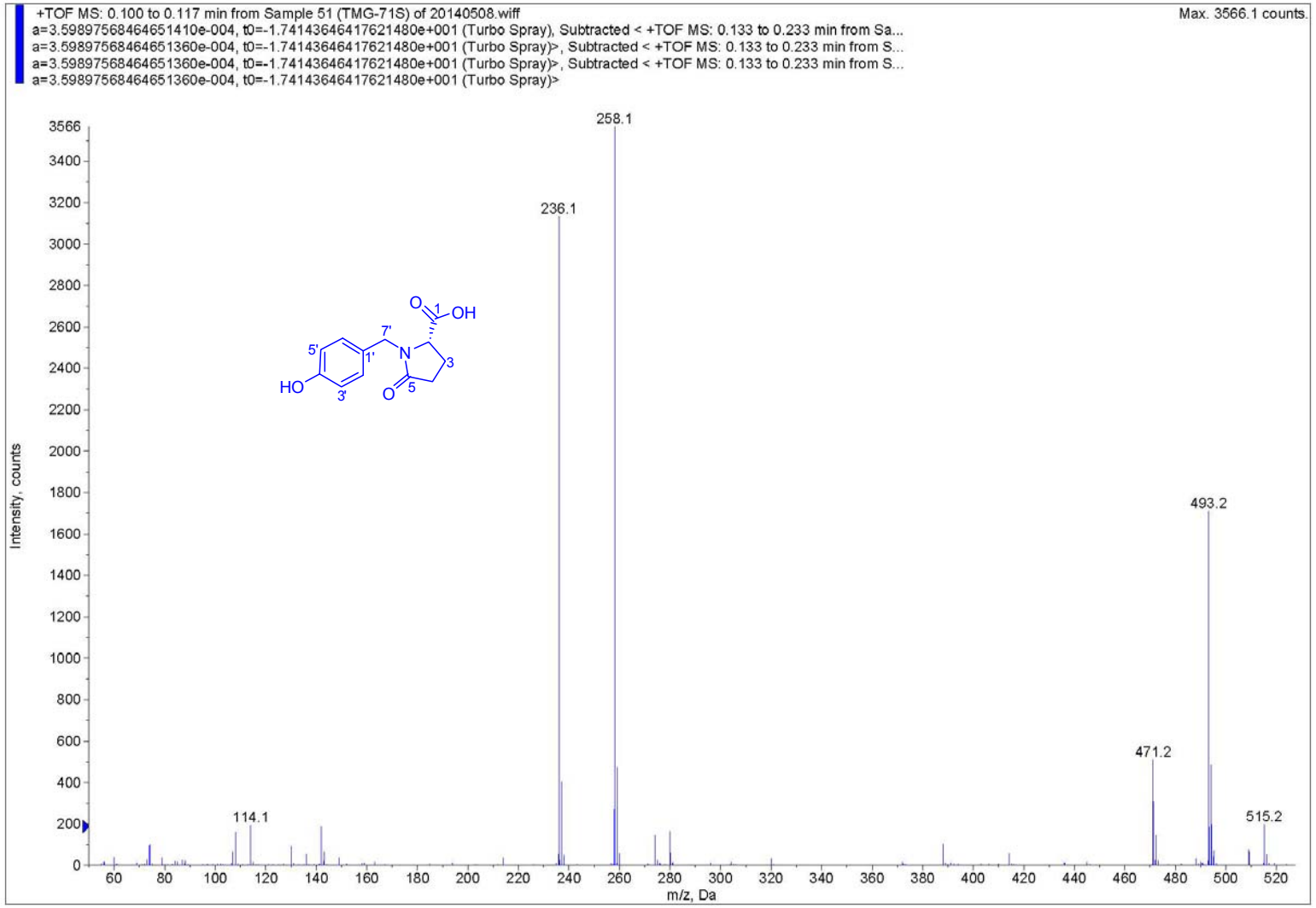


Figure S15. The (+)-ESIMS Spectrum of the Synthesized (+)-(*S*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate (**1**)

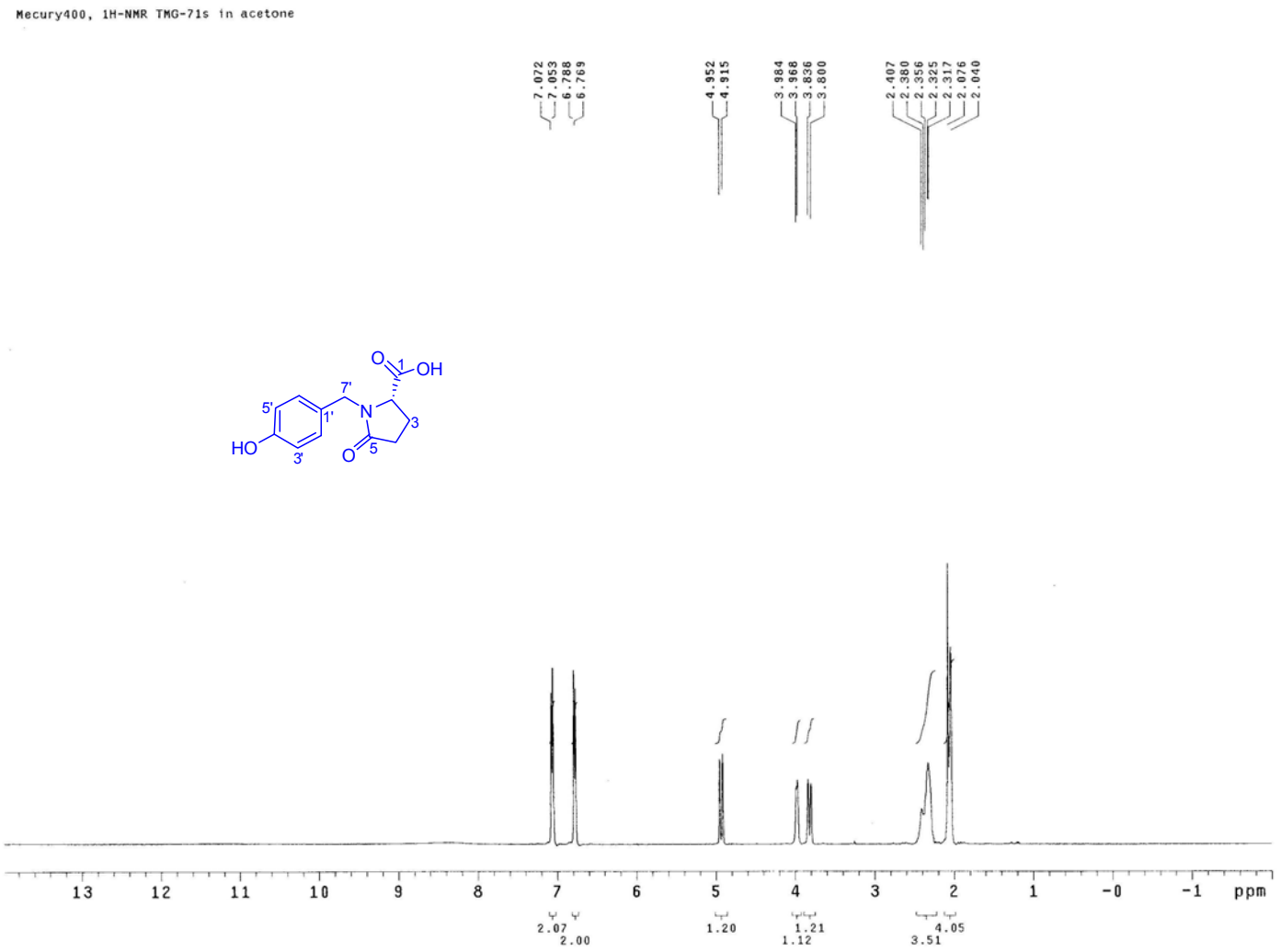


Figure S16. The ^{1}H NMR Spectrum of the Synthesized (+)-(*S*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate (**1**) in Me_2CO-d_6 (400 MHz)

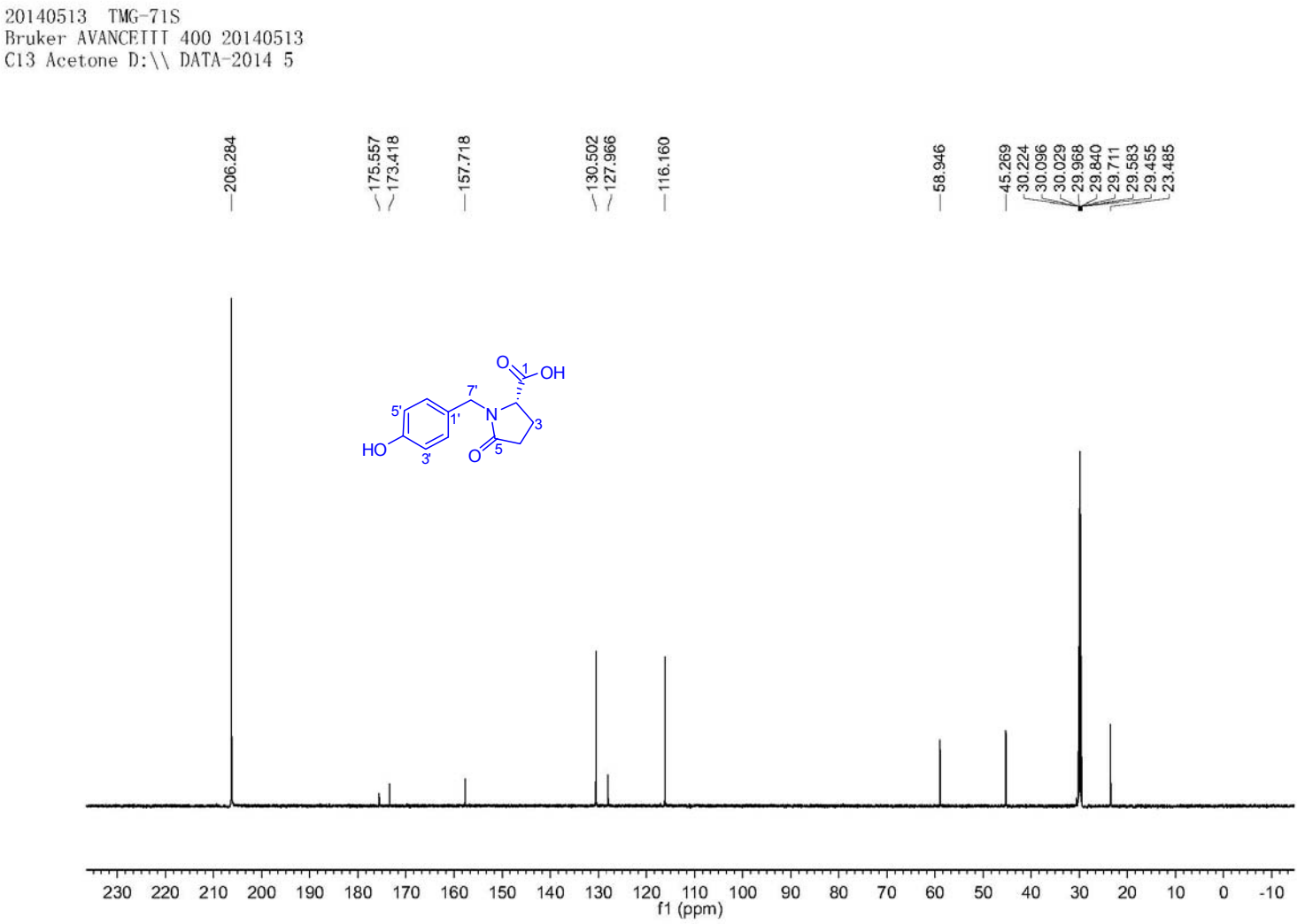


Figure S17. The ^{13}C NMR Spectrum of the Synthesized (+)-(*S*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate (**1**) in Me_2CO-d_6 (100 MHz)

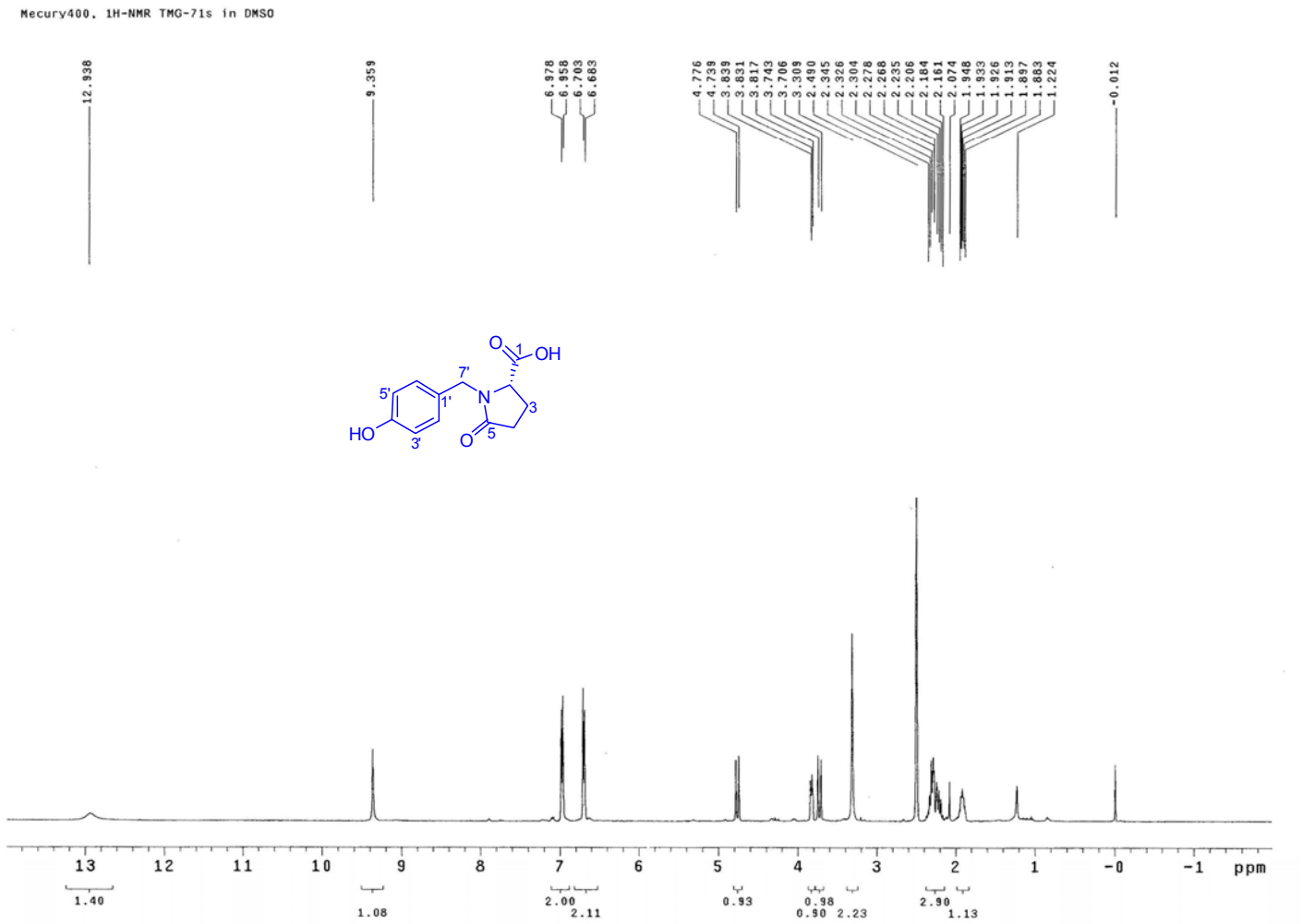


Figure S18. The ^{1}H NMR Spectrum of the Synthesized (+)-(*S*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate (**1**) in DMSO-d_6 (400 MHz)

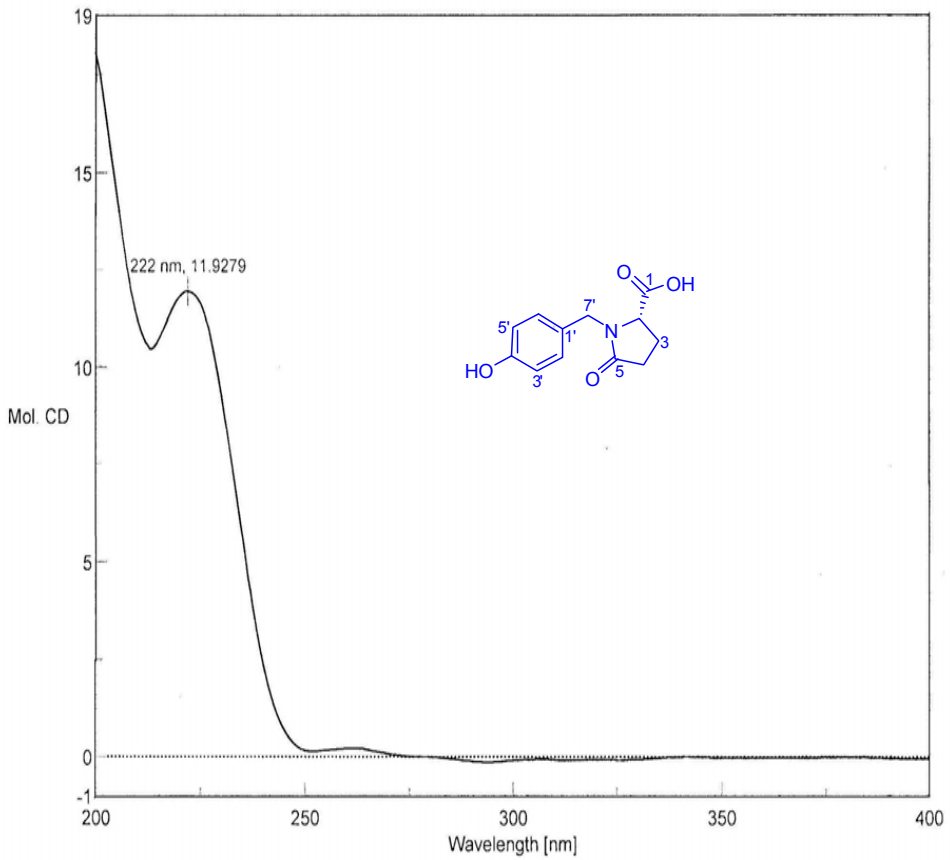


Figure S19. The CD Spectrum of the Synthesized (+)-(*S*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate (**1**) in MeOH

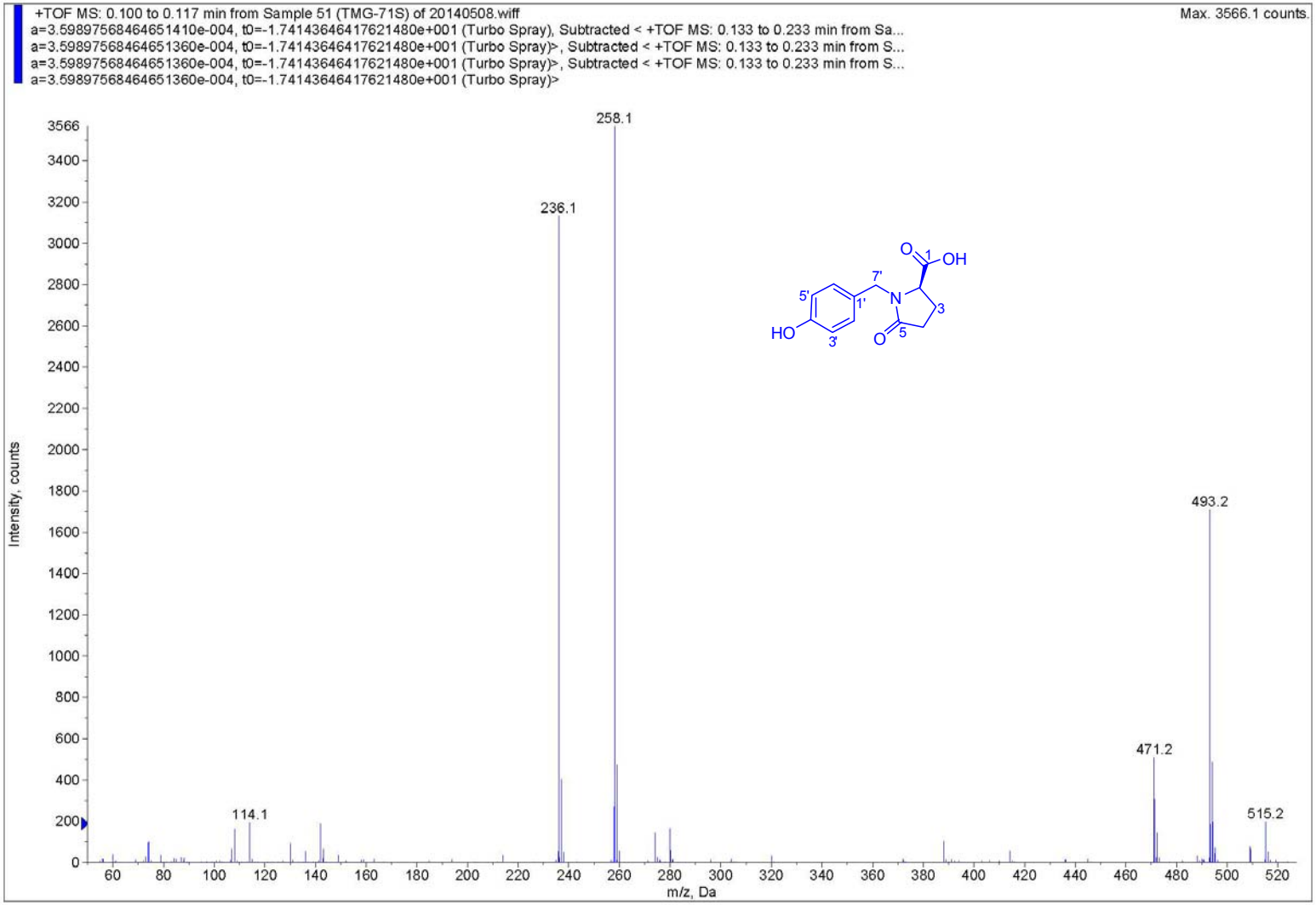


Figure S20. The (+)-ESIMS Spectrum of the Synthesized (–)-(*R*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate

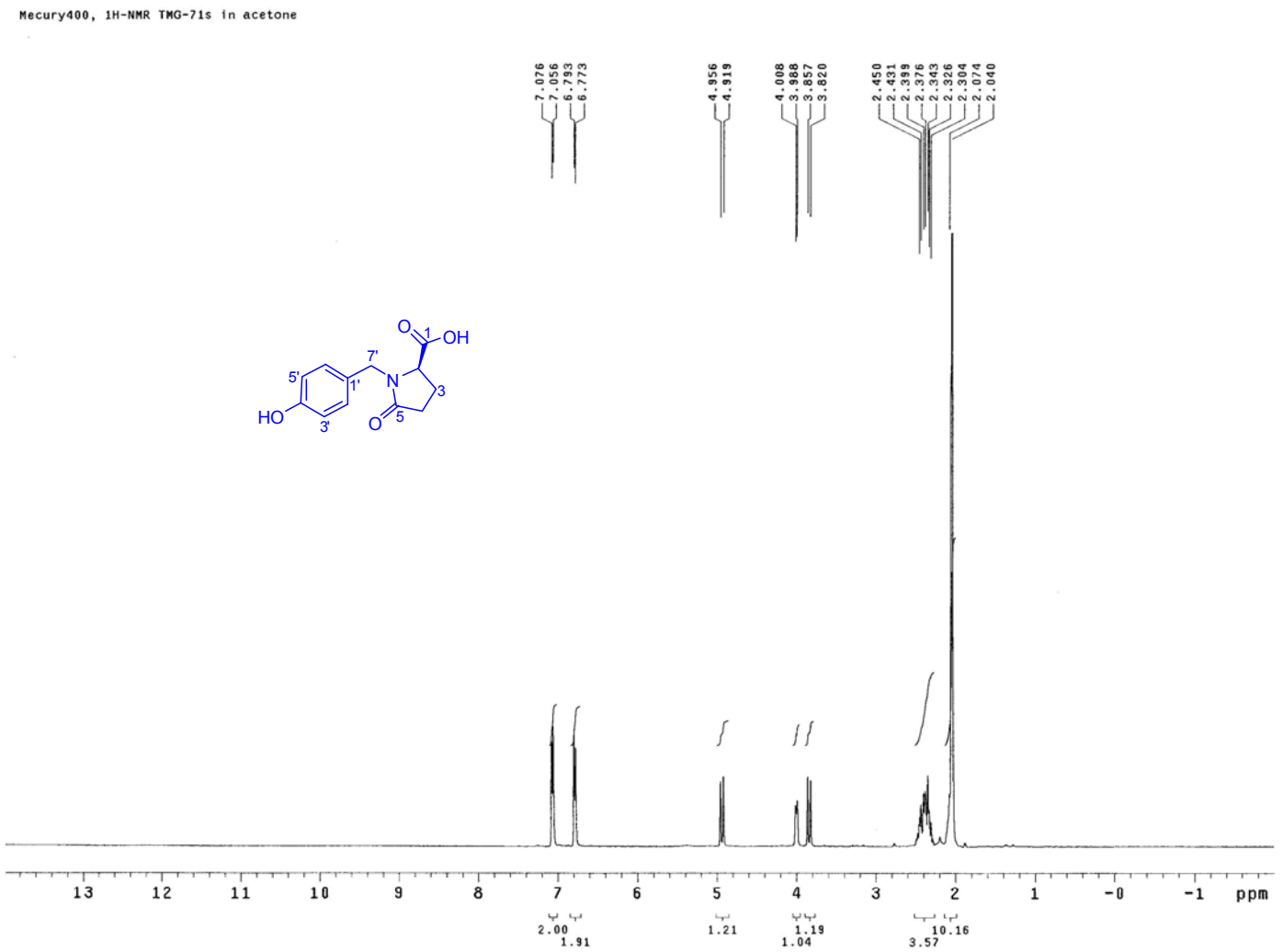


Figure S21. The ^{1}H NMR Spectrum of the Synthesized (−)-(*R*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate in Me_2CO-d_6 (400 MHz)

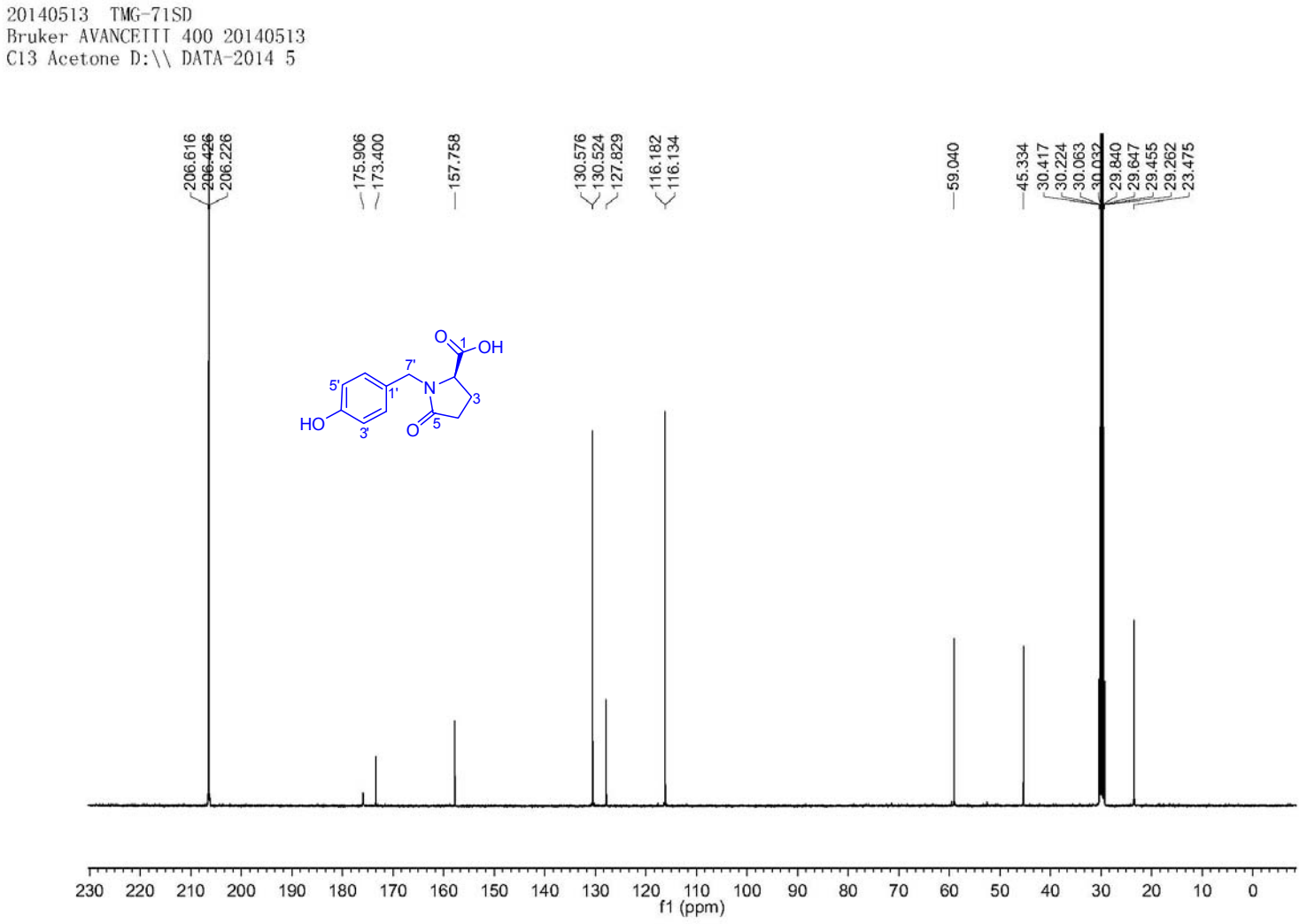


Figure S22. The ^{13}C NMR Spectrum of the Synthesized (–)-(*R*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate in Me_2CO-d_6 (100 MHz)

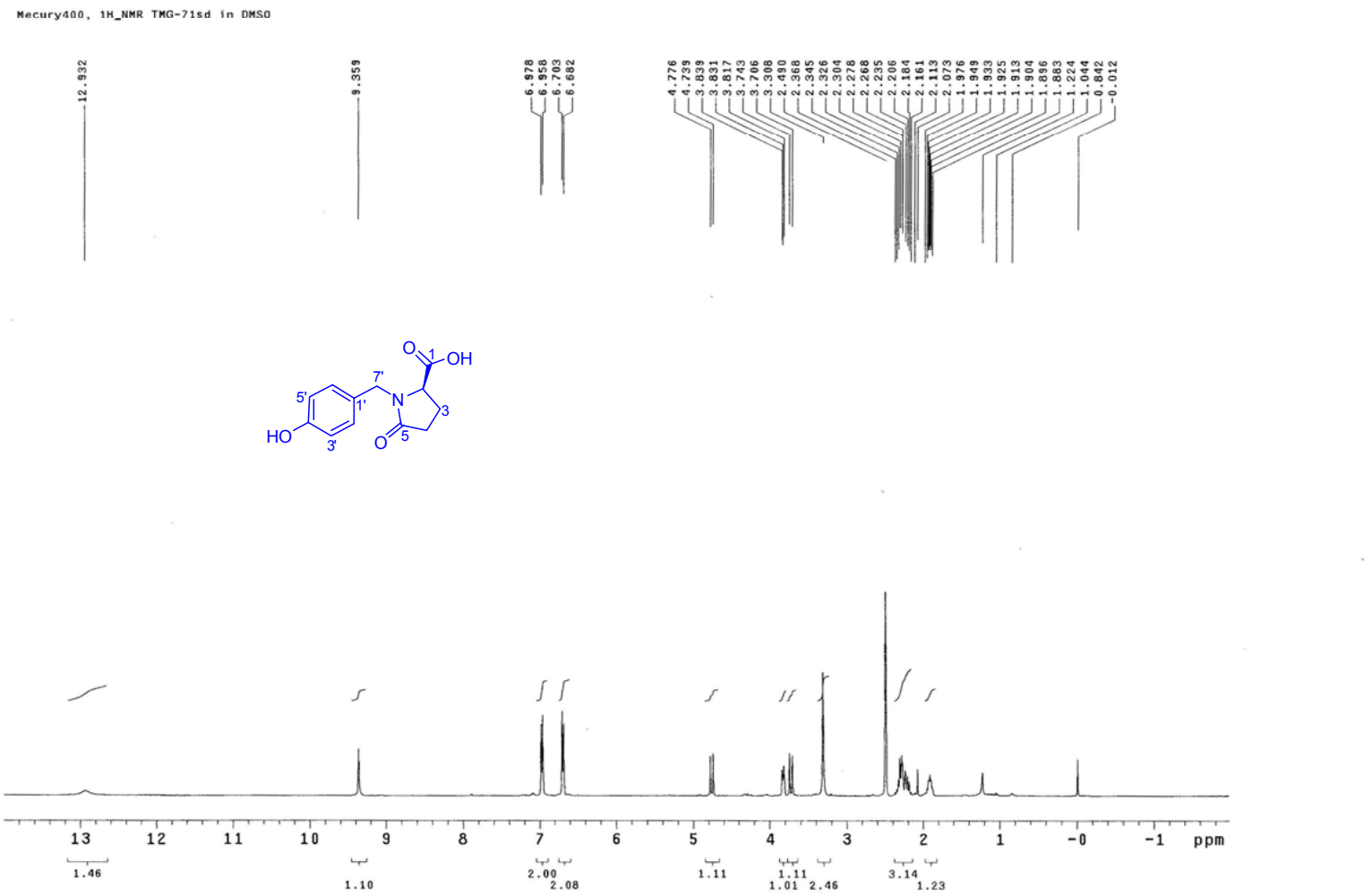


Figure S23. The ^{1}H NMR Spectrum of the Synthesized (–)-(*R*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate in DMSO-d_6 (400 MHz)

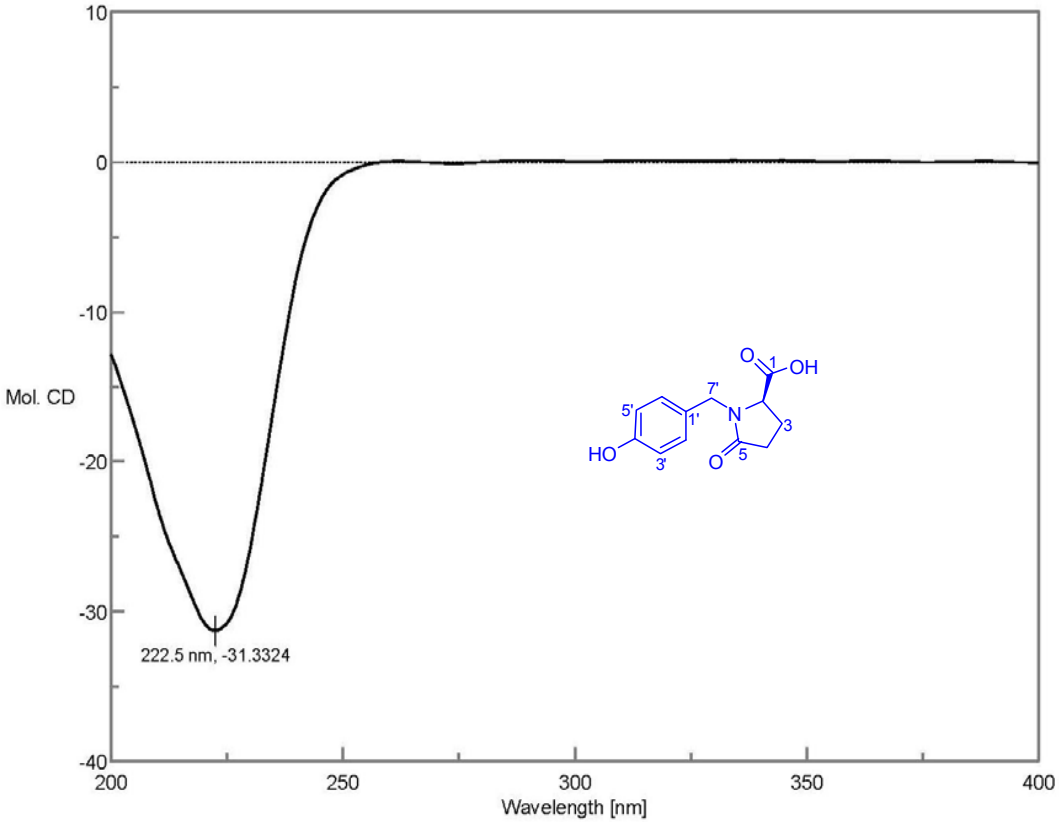


Figure S24. The CD Spectrum of the Synthesized (–)-(*R*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate in MeOH

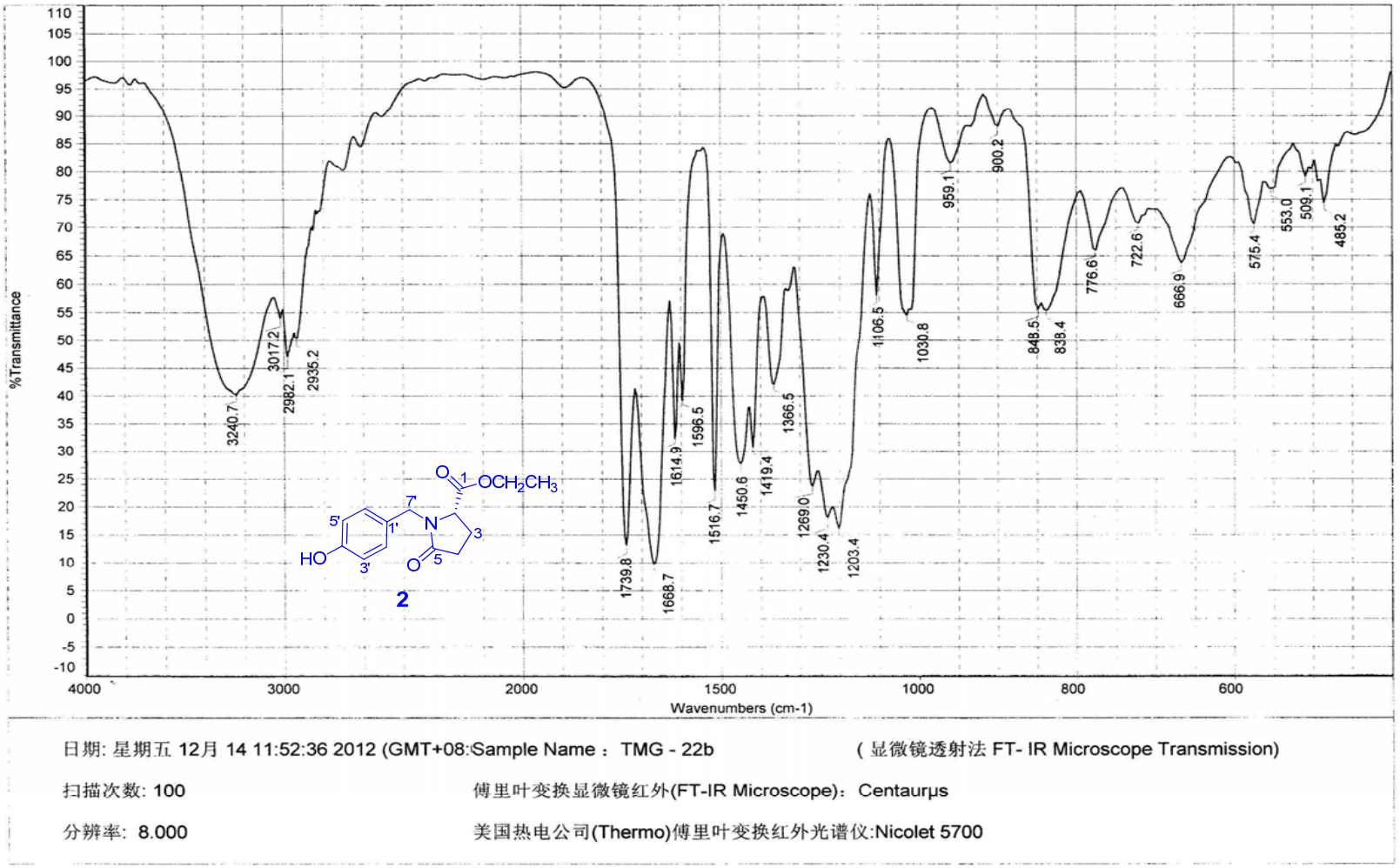


Figure S25. The IR Spectrum of Compound **2**

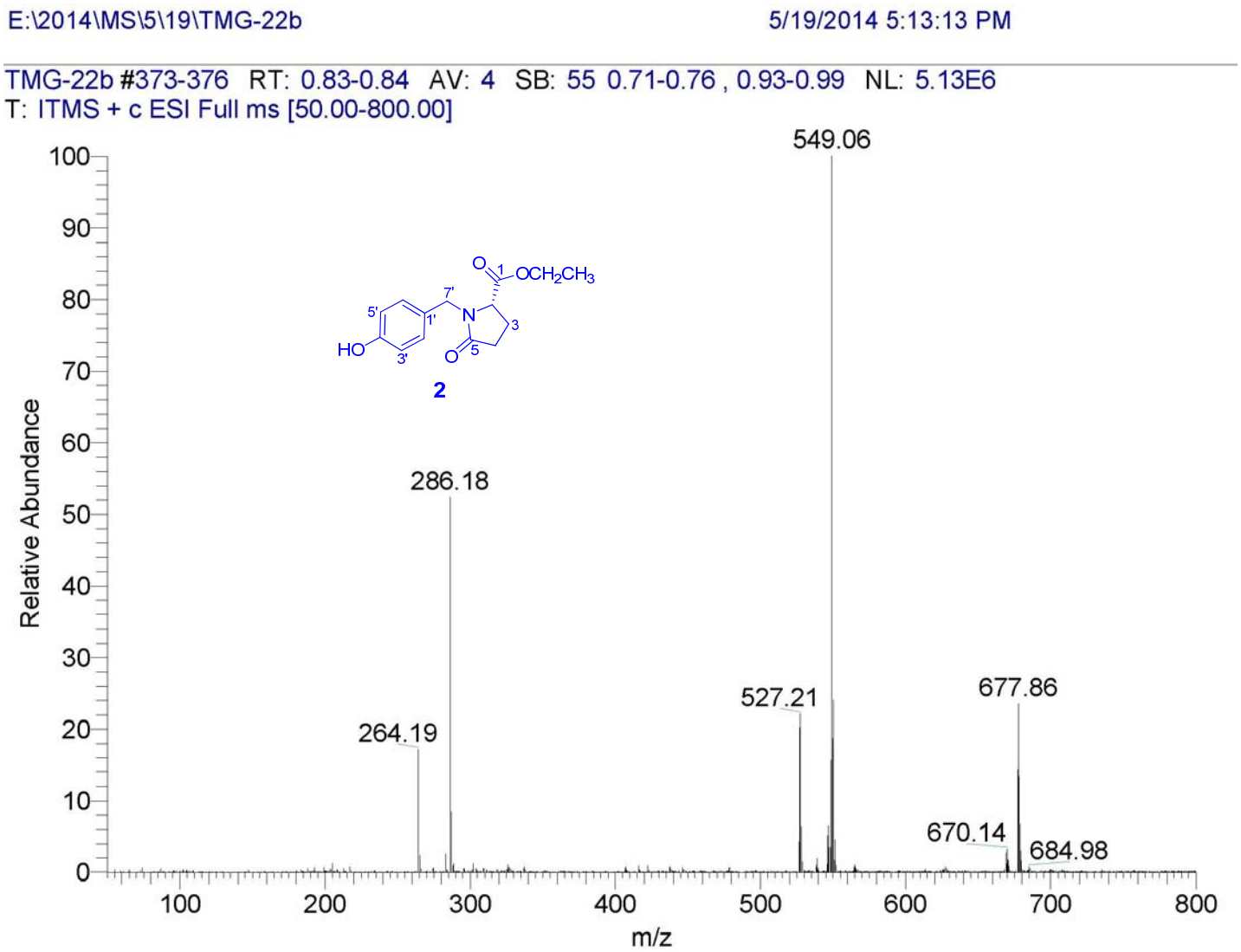
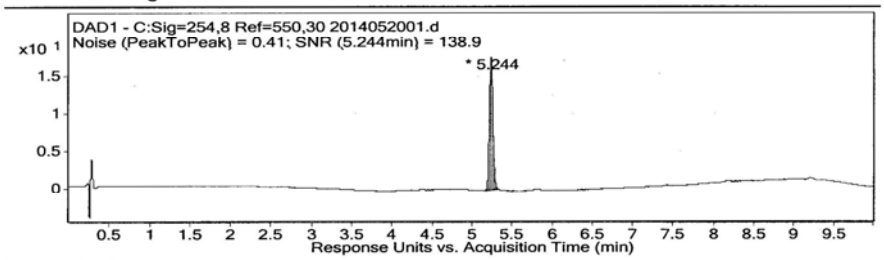


Figure S26. The (+)-ESIMS Spectrum of Compound **2**

Qualitative Analysis Report

Data Filename	2014052001.d	**Sample Name**	TMG-22b
Sample Type	Sample	**Position**	P1-C2
Instrument Name	Instrument 1	**User Name**	
Acq Method		**IRM Calibration Status**	
DA Method	TEST LCMS.m	**Comment**	

User Chromatograms



Integration Peak List

Peak	Start	RT	End	Height	Area	Area %	Signal To Noise
1	5.158	5.244	5.331	17.68	56.38	100	138.9

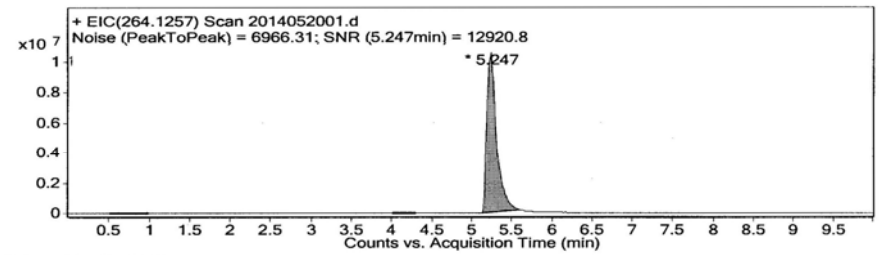
Noise Measurements

Noise Type	Signal Definition	Noise Multiplier	Noise Value
Peak-to-Peak	Area	1	0.405788422

Noise Regions

Start	End
0.5	1
4	4.3
9.99	11

Fragmentor Voltage 135 **Collision Energy** 0 **Ionization Mode** ESI



Integration Peak List

Peak	Start	RT	End	Height	Area	Area %	Signal To Noise
1	5.134	5.247	5.601	10530697	90010129	100	12920.8

Noise Measurements

Noise Type	Signal Definition	Noise Multiplier	Noise Value
Peak-to-Peak	Area	1	6966.310547

Noise Regions

Start	End
0.5	1
4	4.3
9.99	11

User Spectra

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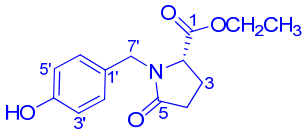
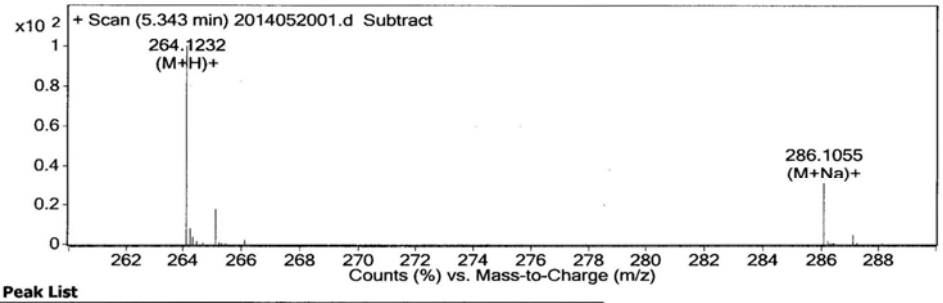


2

Figure S27. The (+)-HRESIMS Report of Compound **2**, Page 1

Qualitative Analysis Report

Fragmentor Voltage	Collision Energy	Ionization Mode
135	0	Esi



Peak List

m/z	z	Abund	Formula	Ion
264.1232	1	3051864	C14 H18 N O4	(M+H)+
264.2593		247535		
265.1269	1	537857	C14 H18 N O4	(M+H)+
286.1055	1	944559	C14 H17 N Na O4	(M+Na)+
287.1087	1	154073	C14 H17 N Na O4	(M+Na)+
527.2398	1	623166		
528.2426	1	205437		
549.2218	1	1819492		
550.2257	1	627933		

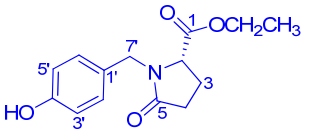
Formula Calculator Element Limits

Element	Min	Max
C	3	100
H	0	500
O	0	90
N	0	5
S	0	2
Cl	0	0
Br	0	0
Si	0	0
F	0	0
P	0	0

Formula Calculator Results

Formula	Best	Mass	Tgt Mass	Diff (ppm)	Ion Species	Score
C14 H17 N O4	TRUE	263.1159	263.1158	-0.6	C14 H18 N O4	99.87
C15 H13 N5		263.1159	263.1171	4.47	C15 H14 N5	99.6
C14 H17 N O4	TRUE	263.1163	263.1158	-1.99	C14 H17 N Na O4	99.94
C15 H13 N5		263.1163	263.1171	3.08	C15 H13 N5 Na	99.71

--- End Of Report ---



2

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Figure S28. The (+)-HRESIMS Report of Compound **2**, Page 2

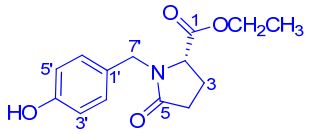
MS Formula Results: + Scan (5.343 min) Sub (2014052001.d)

m/z	Ion	Formula	Abundance
264.1232	(M+H)+	C14 H18 N O4	3051863.8

Best	Formula (M)	Ion Formula	Calc m/z	Score	Cross S	Mass	Calc Mass	Diff (ppm)	Abs Diff (ppm)	Abund Match	Spacing Mat	Mass Match	m/z	DBE
☑	C14 H17 N O4	C14 H18 N O4	264.123	99.87		263.1159	263.1158	-0.6	0.6	99.61	99.94	99.99	264.1232	7
☐	C15 H13 N5	C15 H14 N5	264.1244	99.6		263.1159	263.1171	4.47	4.47	99.85	99.69	99.4	264.1232	12

m/z	Ion	Formula	Abundance
286.1055	(M+Na)+	C14 H17 N Na O4	944559.3

Best	Formula (M)	Ion Formula	Calc m/z	Score	Cross S	Mass	Calc Mass	Diff (ppm)	Abs Diff (ppm)	Abund Match	Spacing Mat	Mass Match	m/z	DBE
☑	C14 H17 N O4	C14 H17 N Na O4	286.105	99.94		263.1163	263.1158	-1.99	1.99	99.97	100	99.9	286.1055	7
☐	C15 H13 N5	C15 H13 N5 Na	286.1063	99.71		263.1163	263.1171	3.08	3.08	99.45	99.95	99.75	286.1055	12



2

Figure S29. The (+)-HRESIMS Report of Compound **2**, Page 3

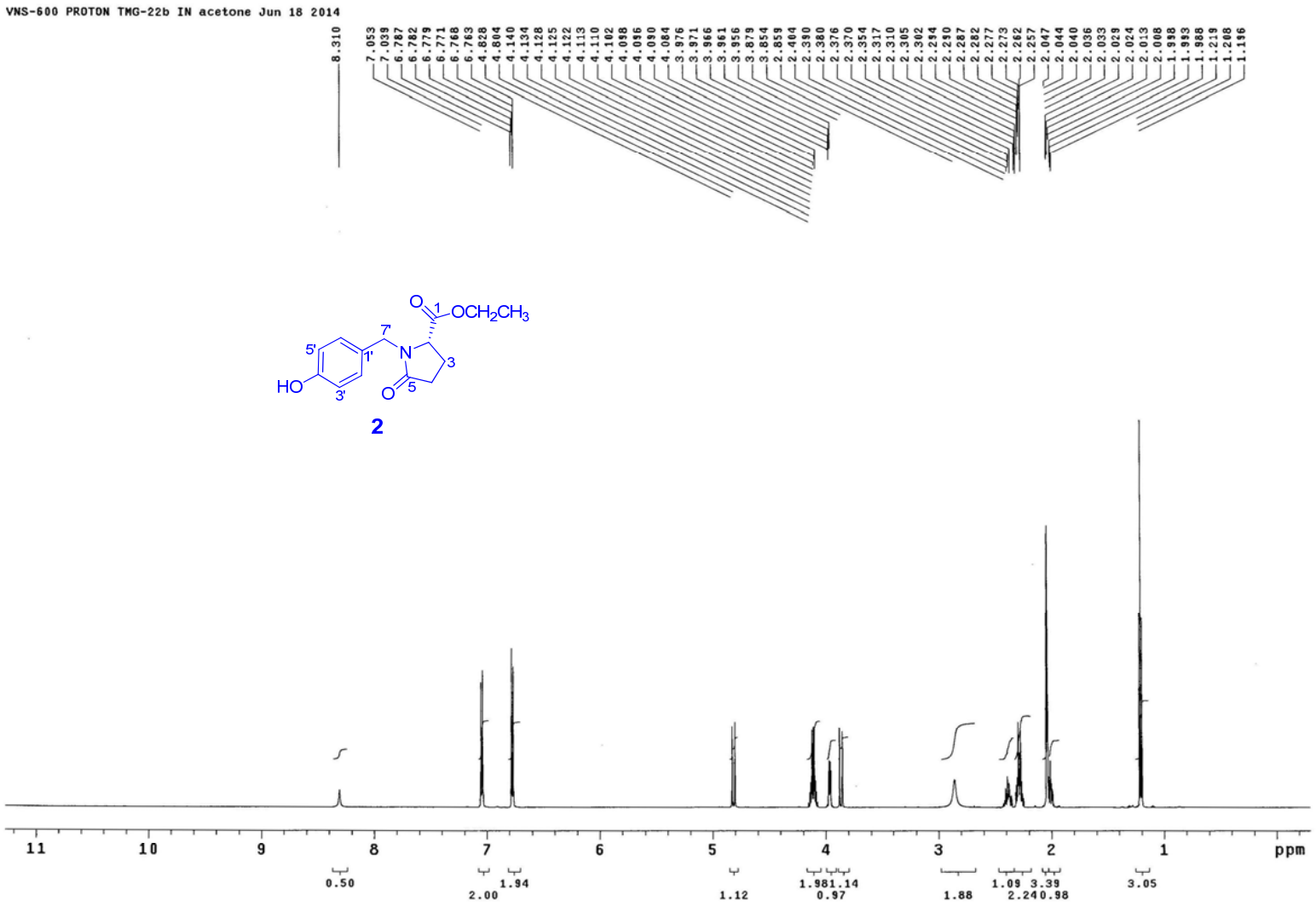
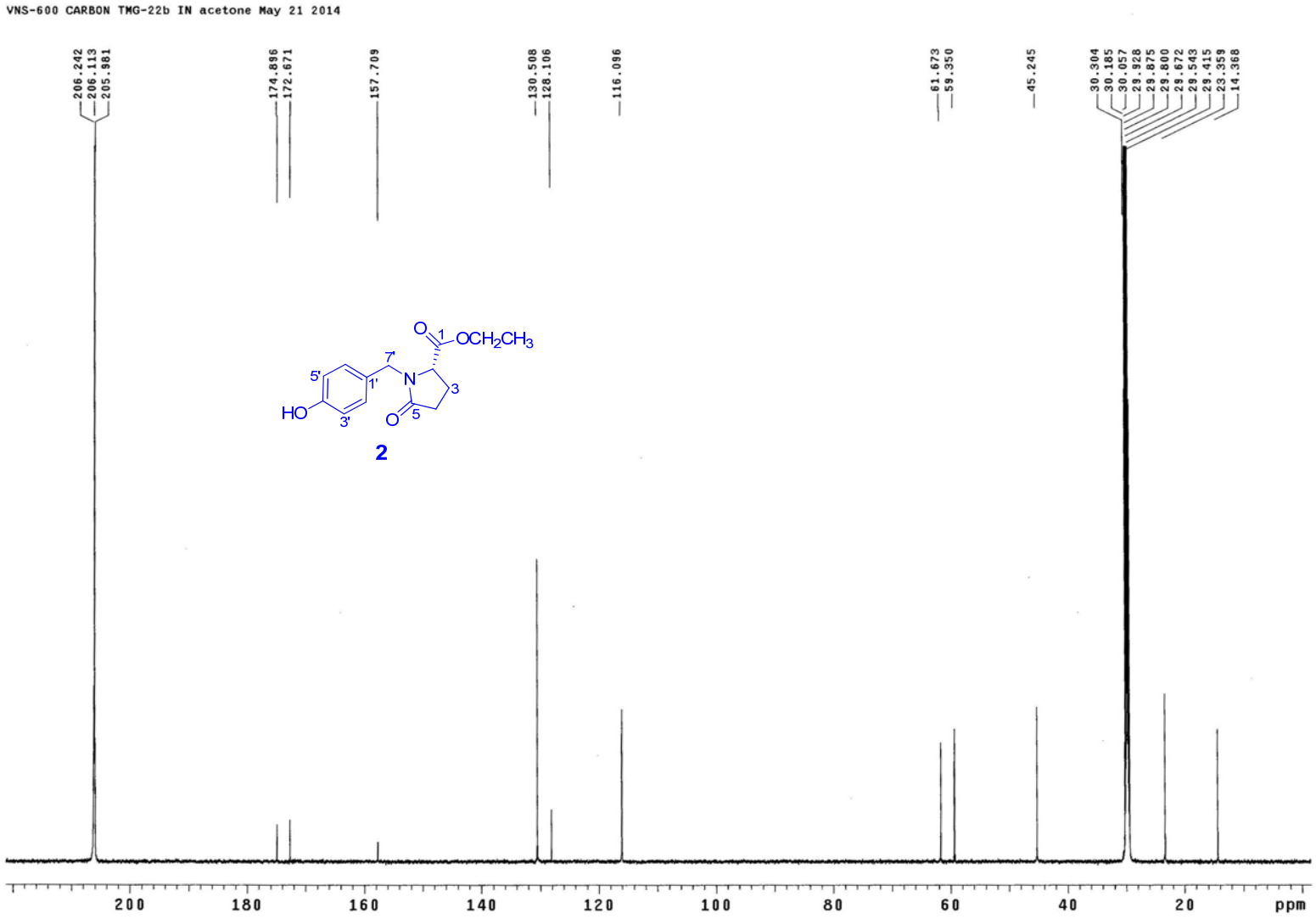


Figure S30. The ^{1}H NMR Spectrum of Compound **2** in Me_2CO-d_6 (600 MHz)



2

Figure S31. The ^{13}C NMR Spectrum of Compound **2** in Me_2CO-d_6 (150 MHz)

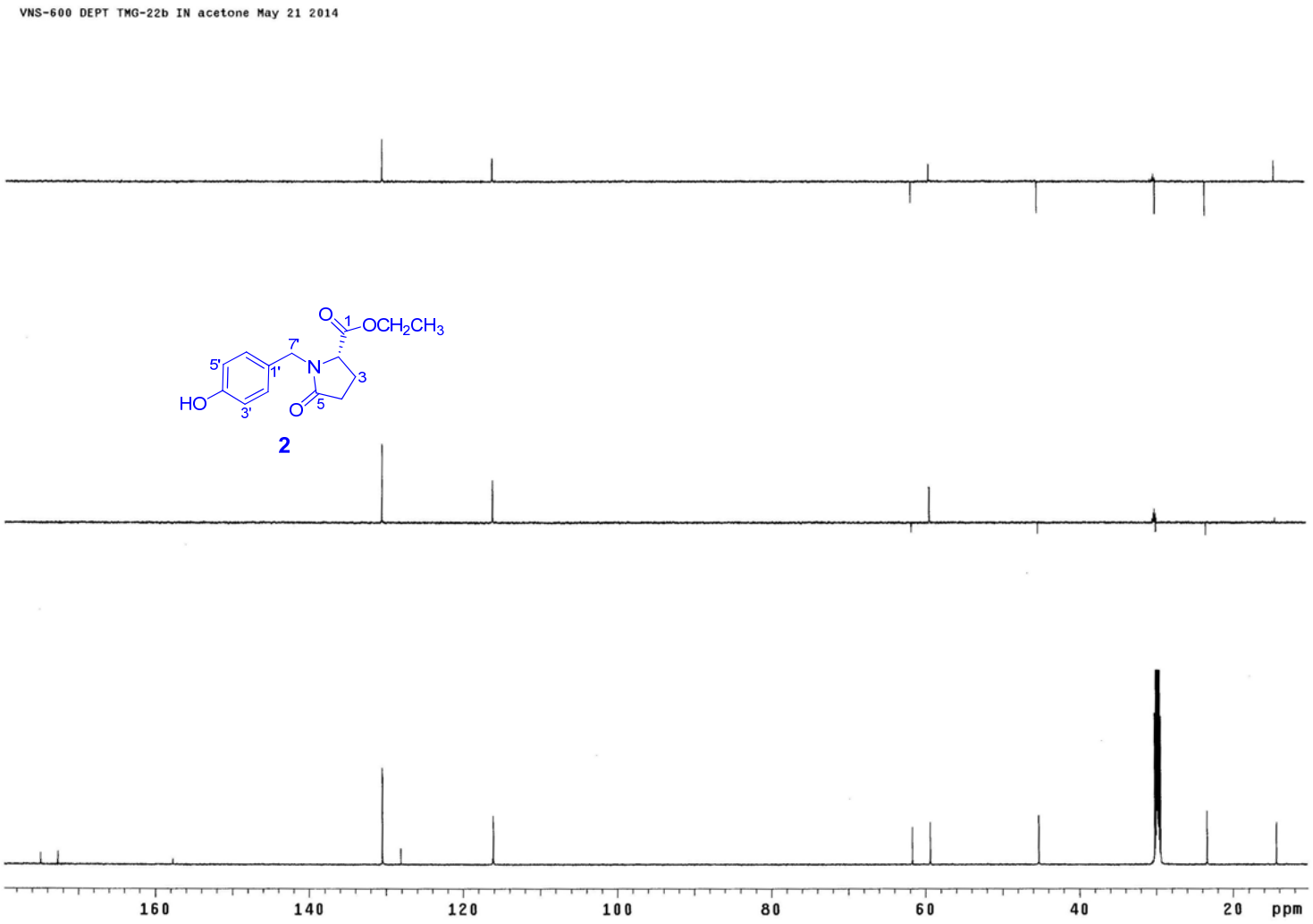


Figure S32. The DEPT Spectrum of Compound **2** in Me_2CO-d_6 (150 MHz)

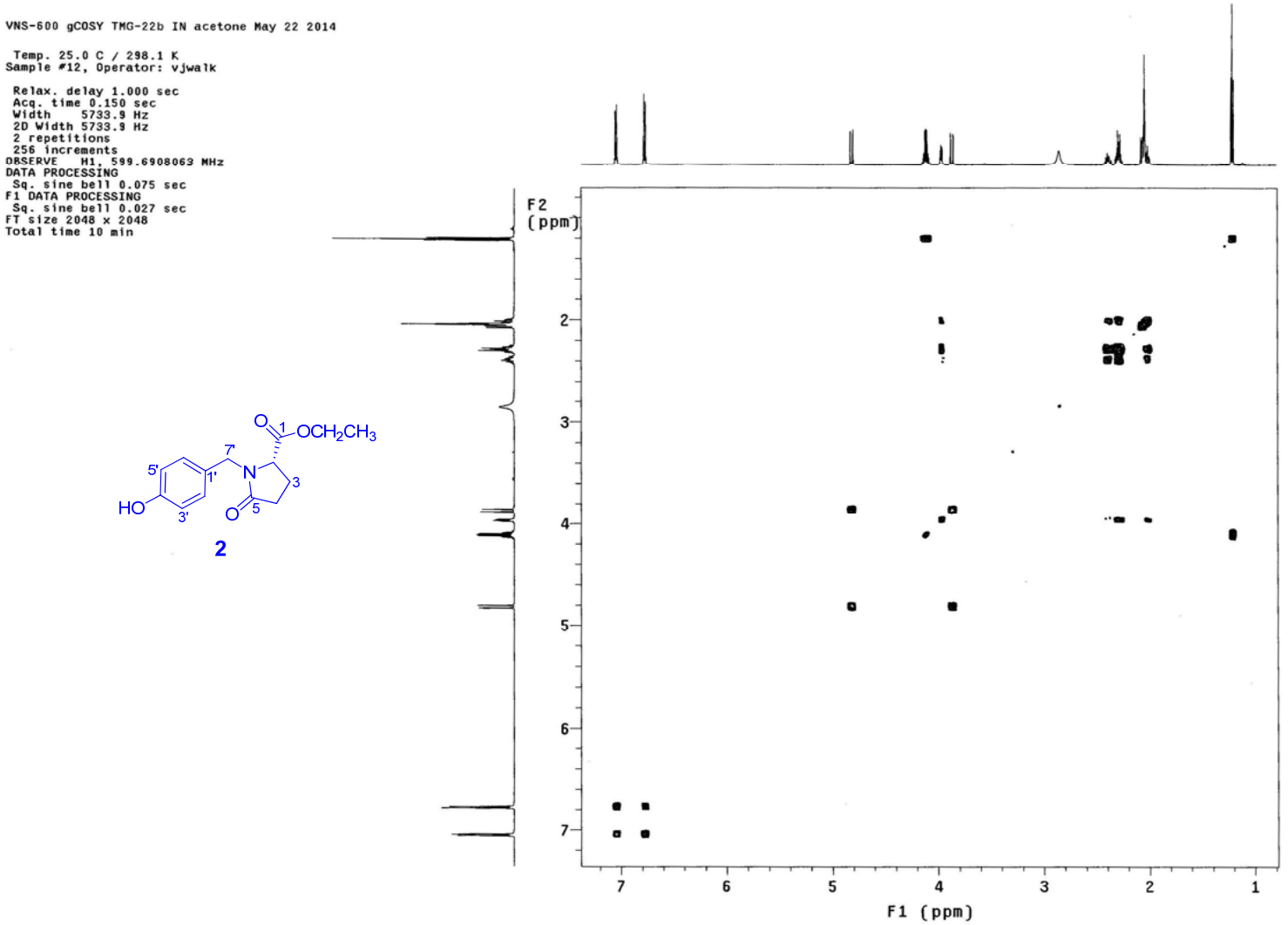


Figure S33. The ^{1}H-^{1}H gCOSY Spectrum of Compound **2** in Me_2CO-d_6 (600 MHz)

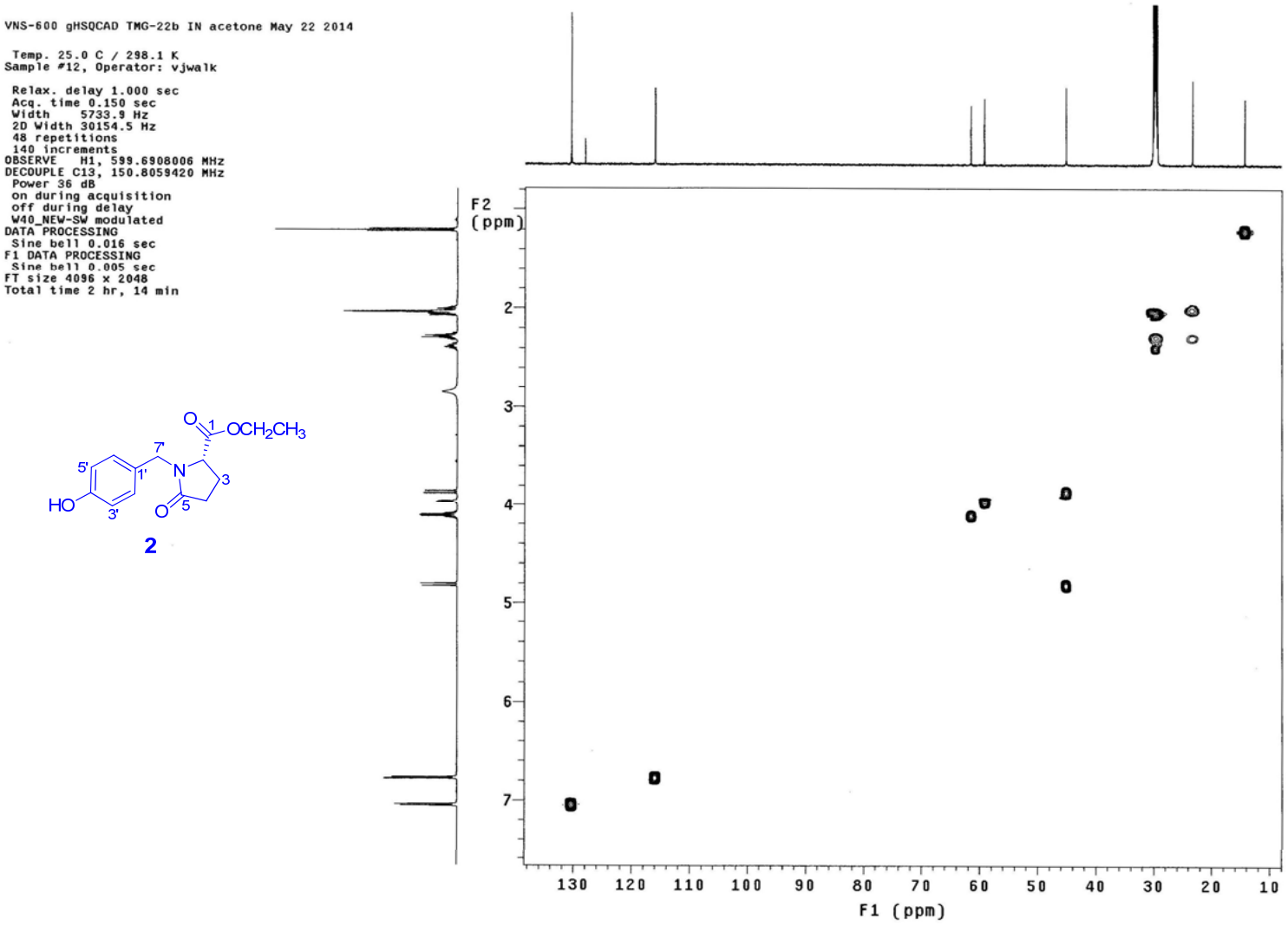


Figure S34. The gHSQC Spectrum of Compound **2** in Me_2CO-d_6 (600 MHz)

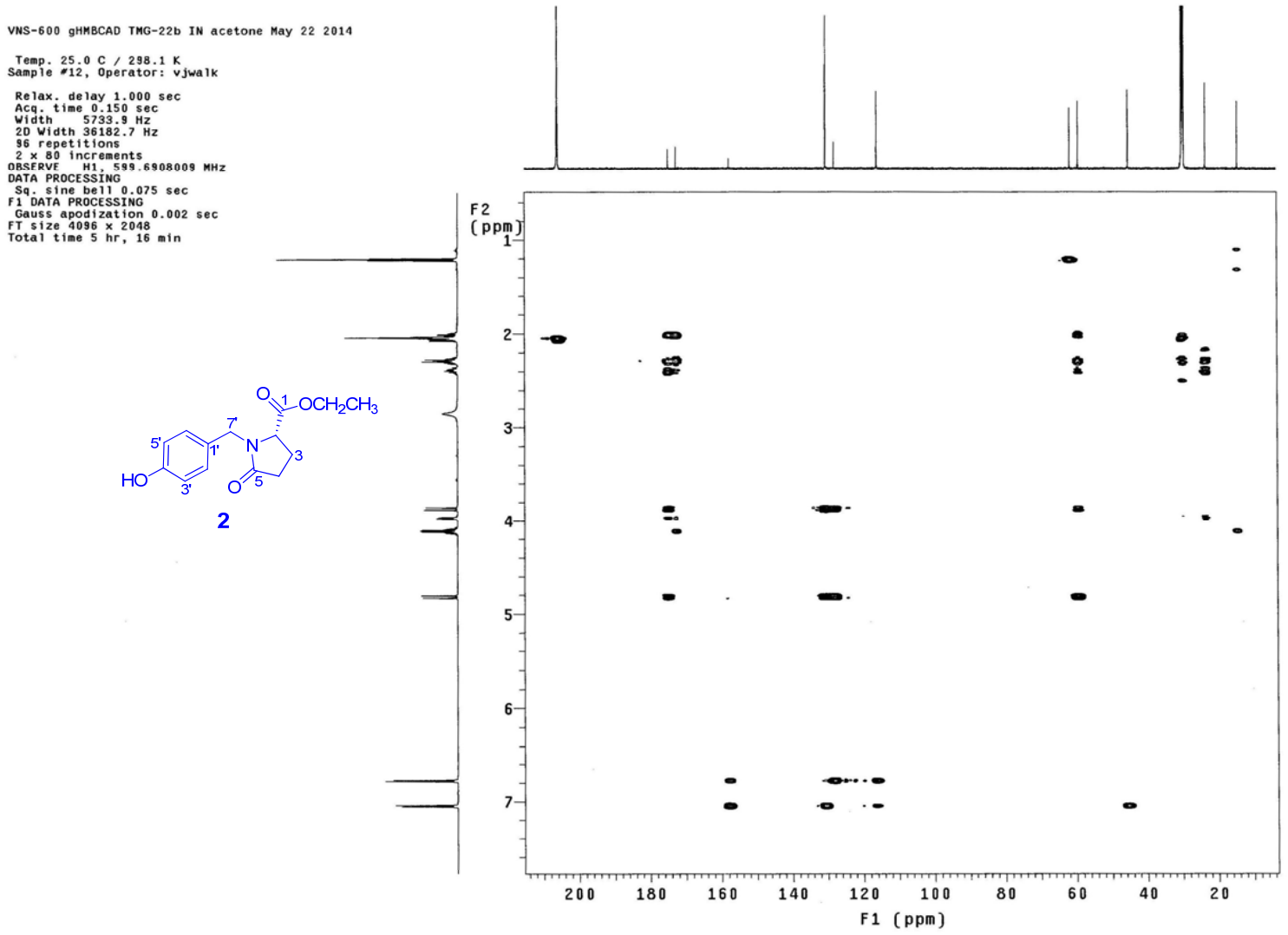


Figure S35. The gHMBC Spectrum of Compound **2** in Me_2CO-d_6 (600 MHz)

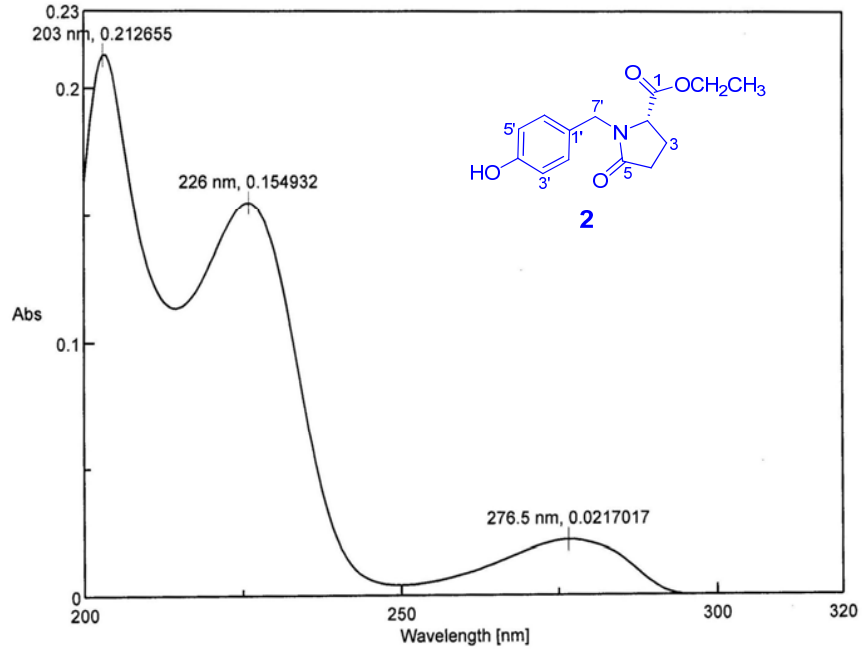


Figure S36. The UV Spectrum of Compound **2** in MeOH

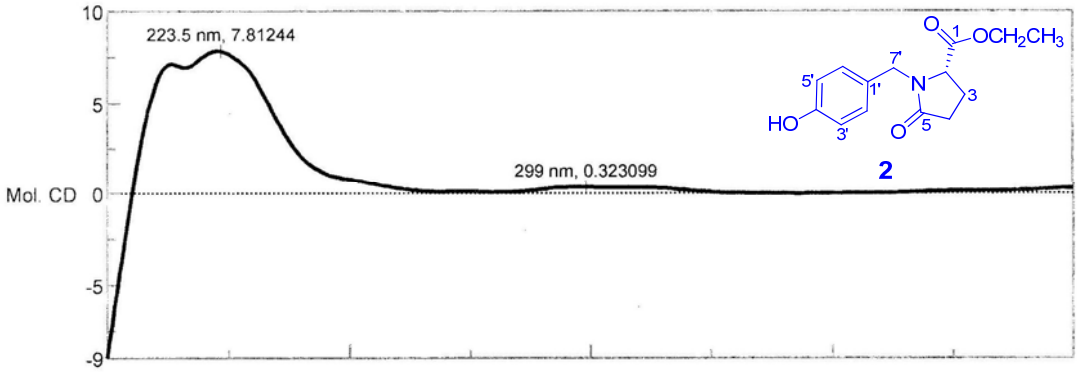


Figure S37. The CD Spectrum of Compound **2** in MeOH

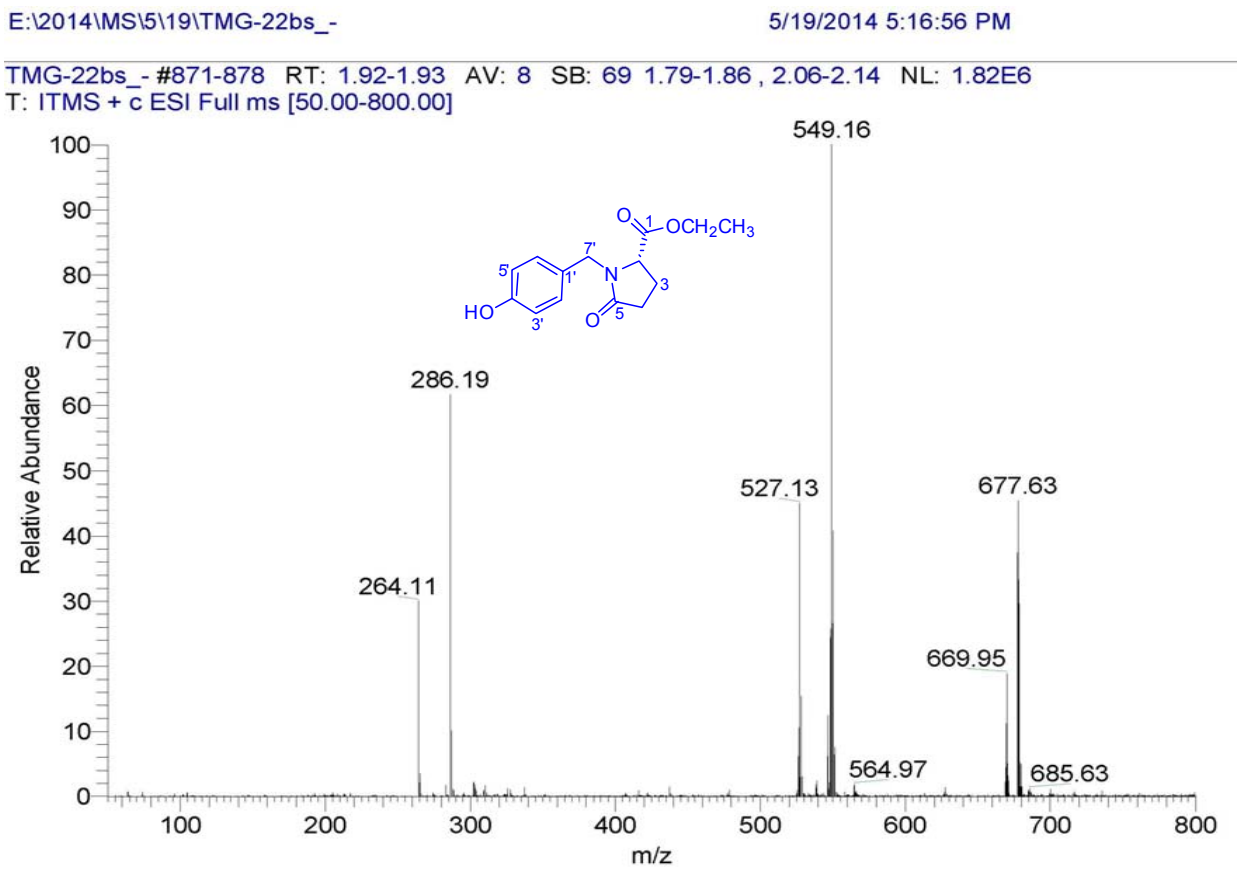


Figure S38. The (+)-ESIMS Spectrum of the Synthesized Ethyl (+)-(*S*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate (**2**)

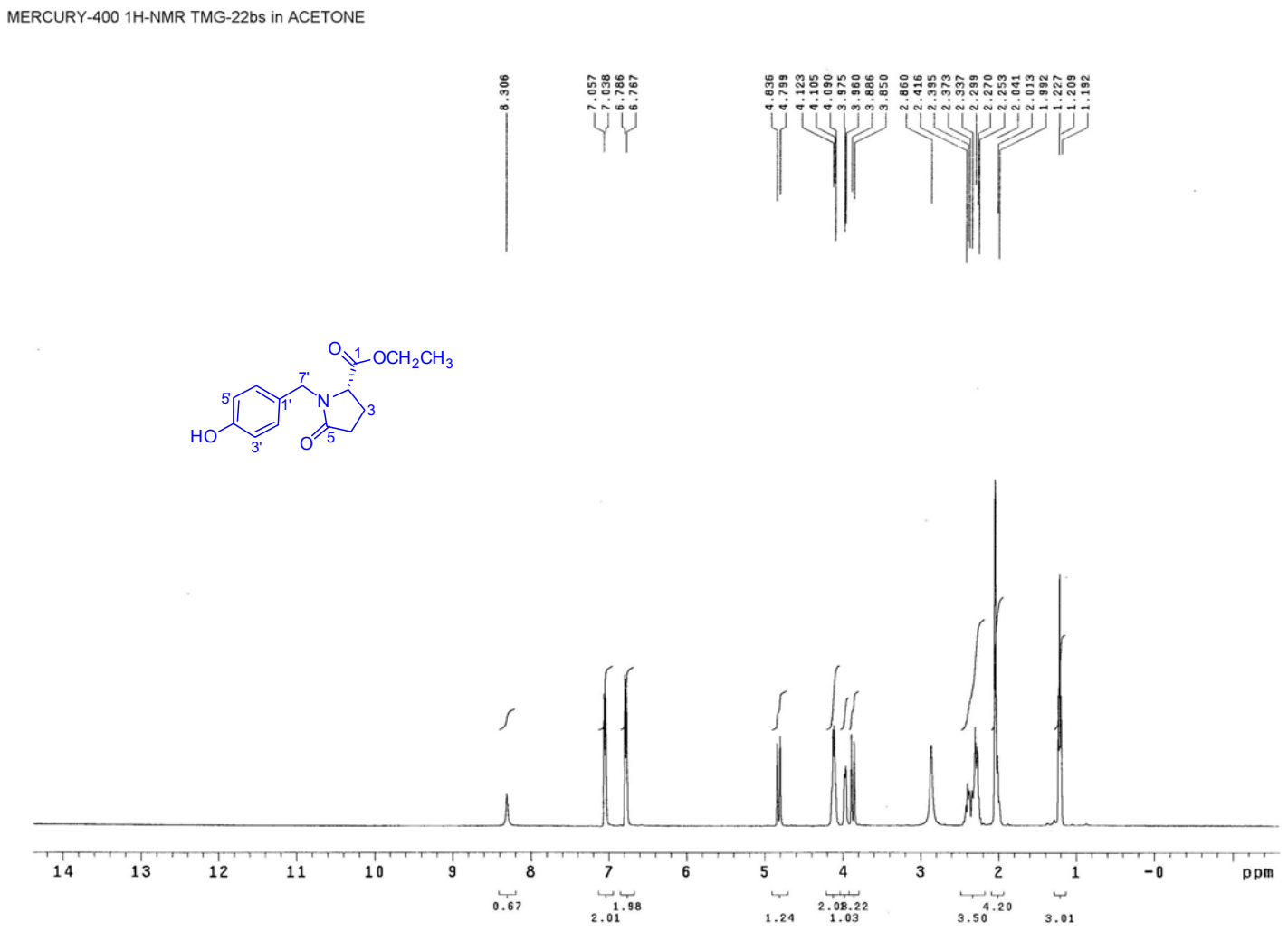


Figure S39. The ^{1}H NMR Spectrum of the Synthesized Ethyl (+)-(*S*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate (**2**) in Me_2CO-d_6 (400 MHz)

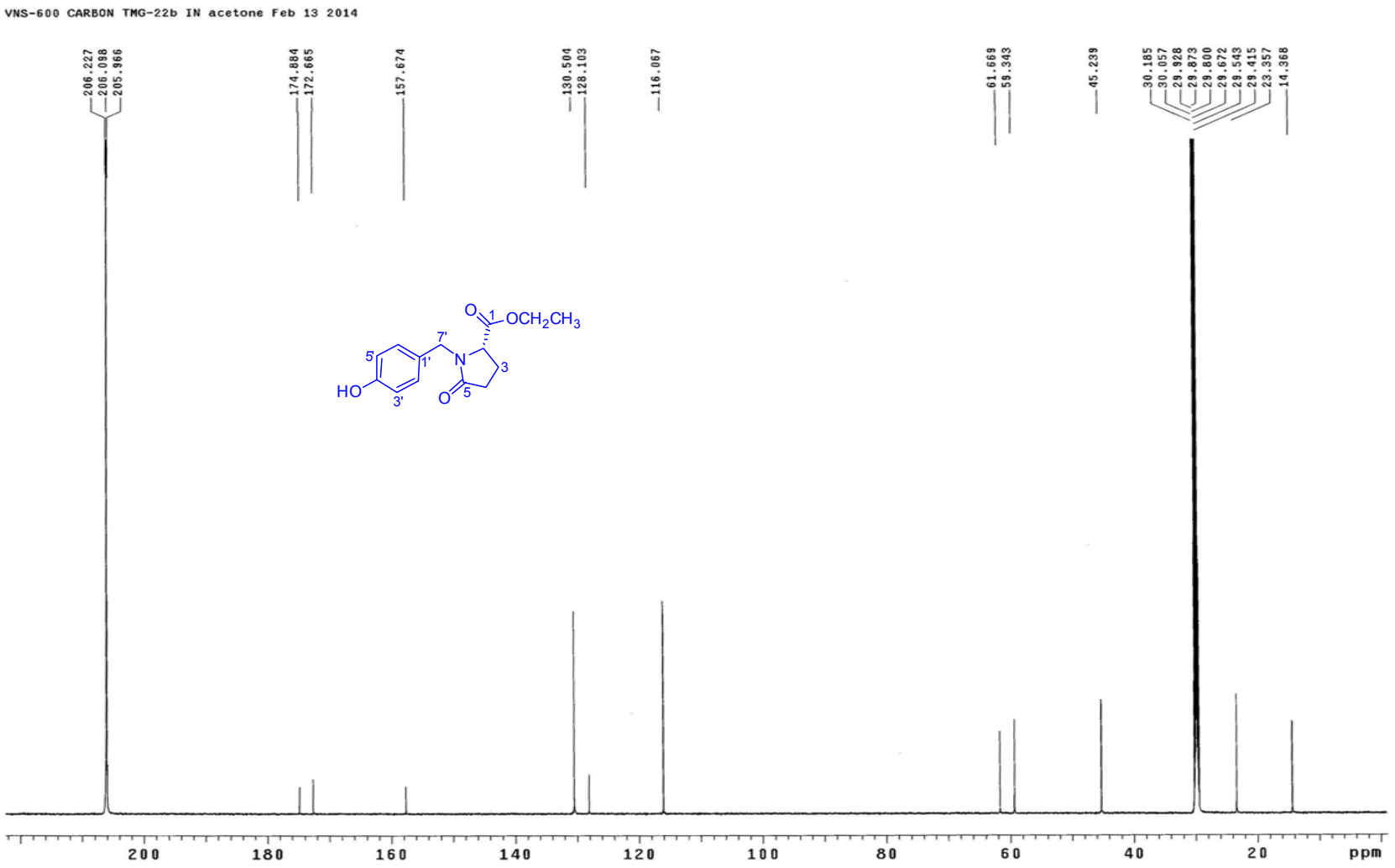


Figure S40. The ^{13}C NMR Spectrum of the Synthesized Ethyl (+)-(*S*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate (**2**) in Me_2CO-d_6 (150 MHz)

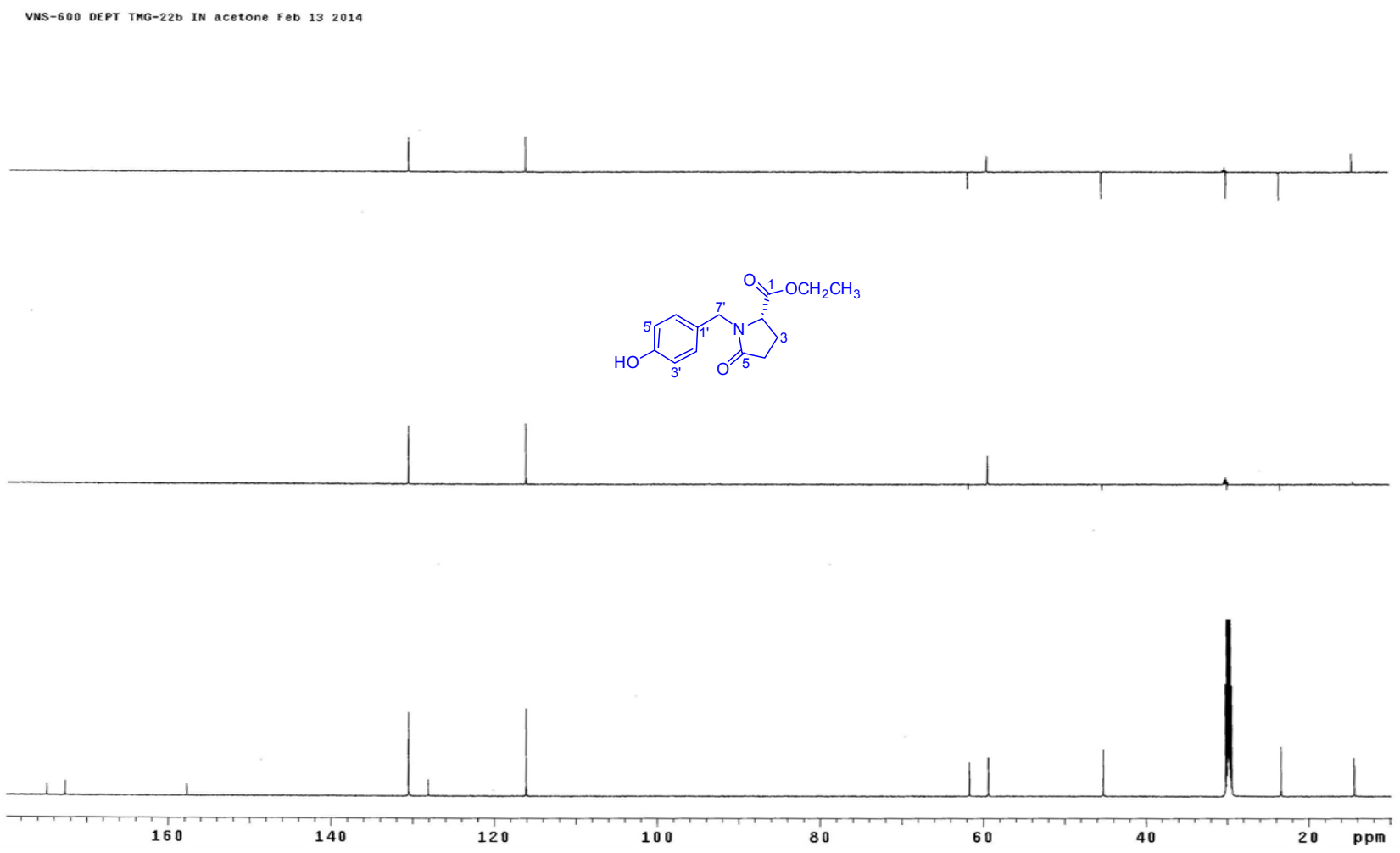


Figure S41. The DEPT Spectrum of the Synthesized Ethyl (+)-(*S*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate (**2**) in Me_2CO-d_6 (150 MHz)

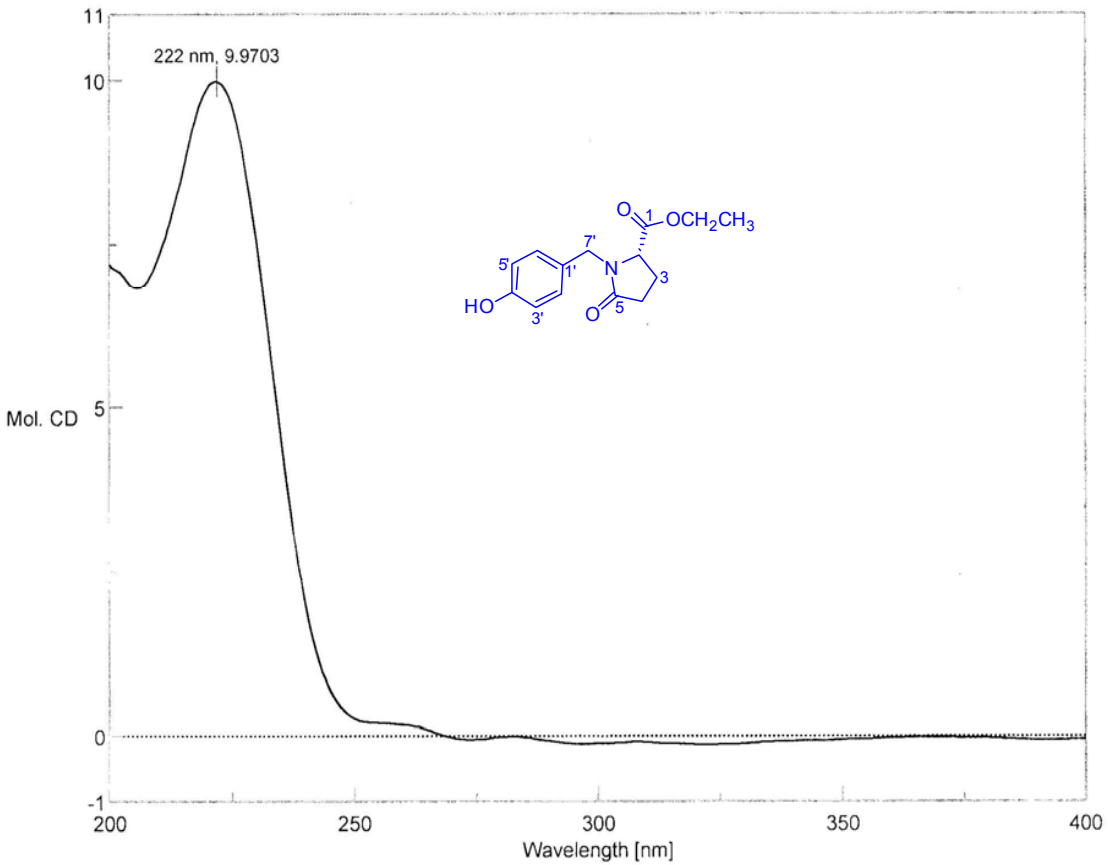


Figure S42. The CD Spectrum of the Synthesized Ethyl (+)-(*S*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate (**2**) in MeOH

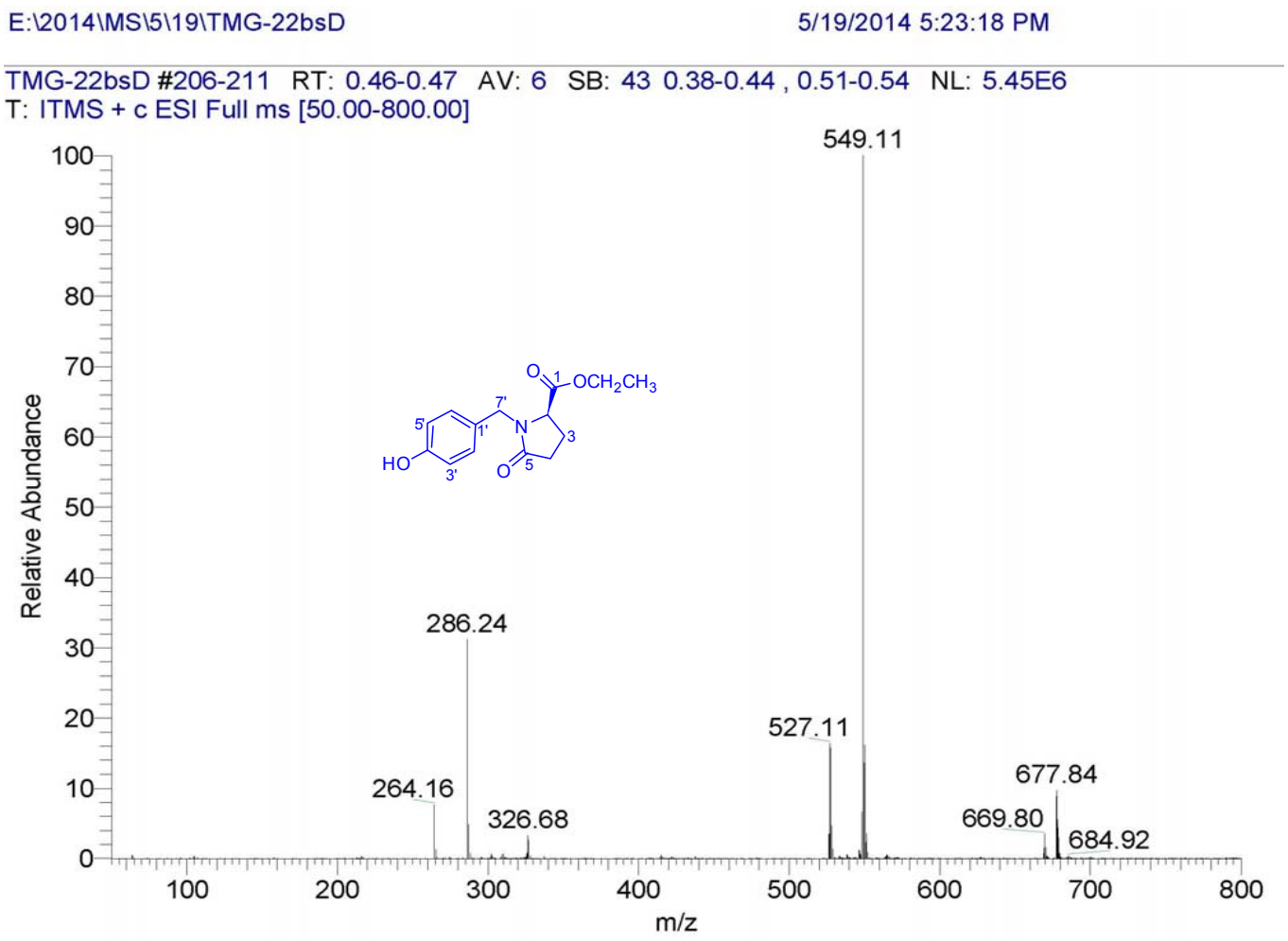


Figure S43. The (+)-ESIMS Spectrum of the Synthesized Ethyl (−)-(*R*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate

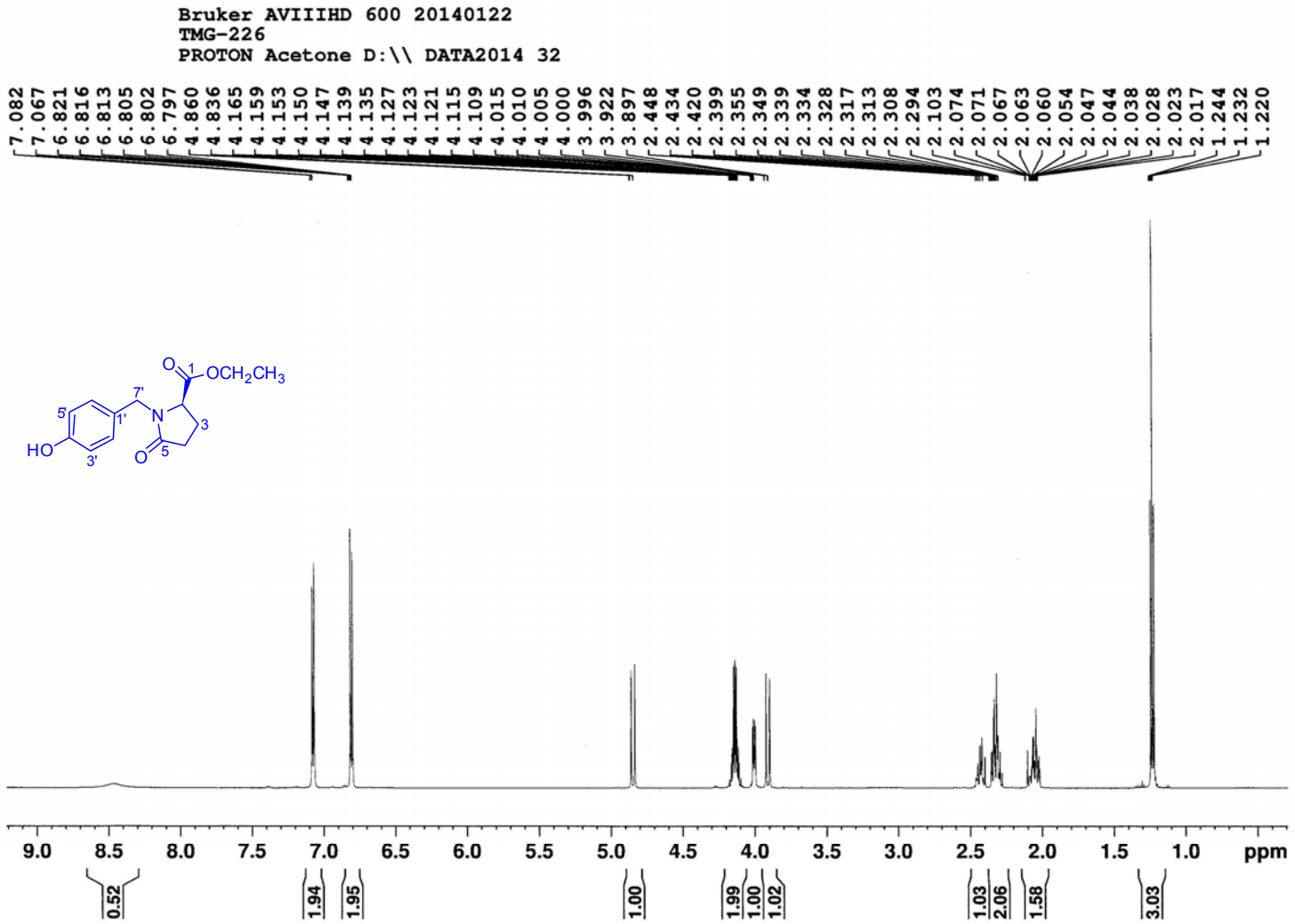


Figure S44. The ^{1}H NMR Spectrum of the Synthesized Ethyl (−)-(*R*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate in Me_2CO-d_6 (600 MHz)

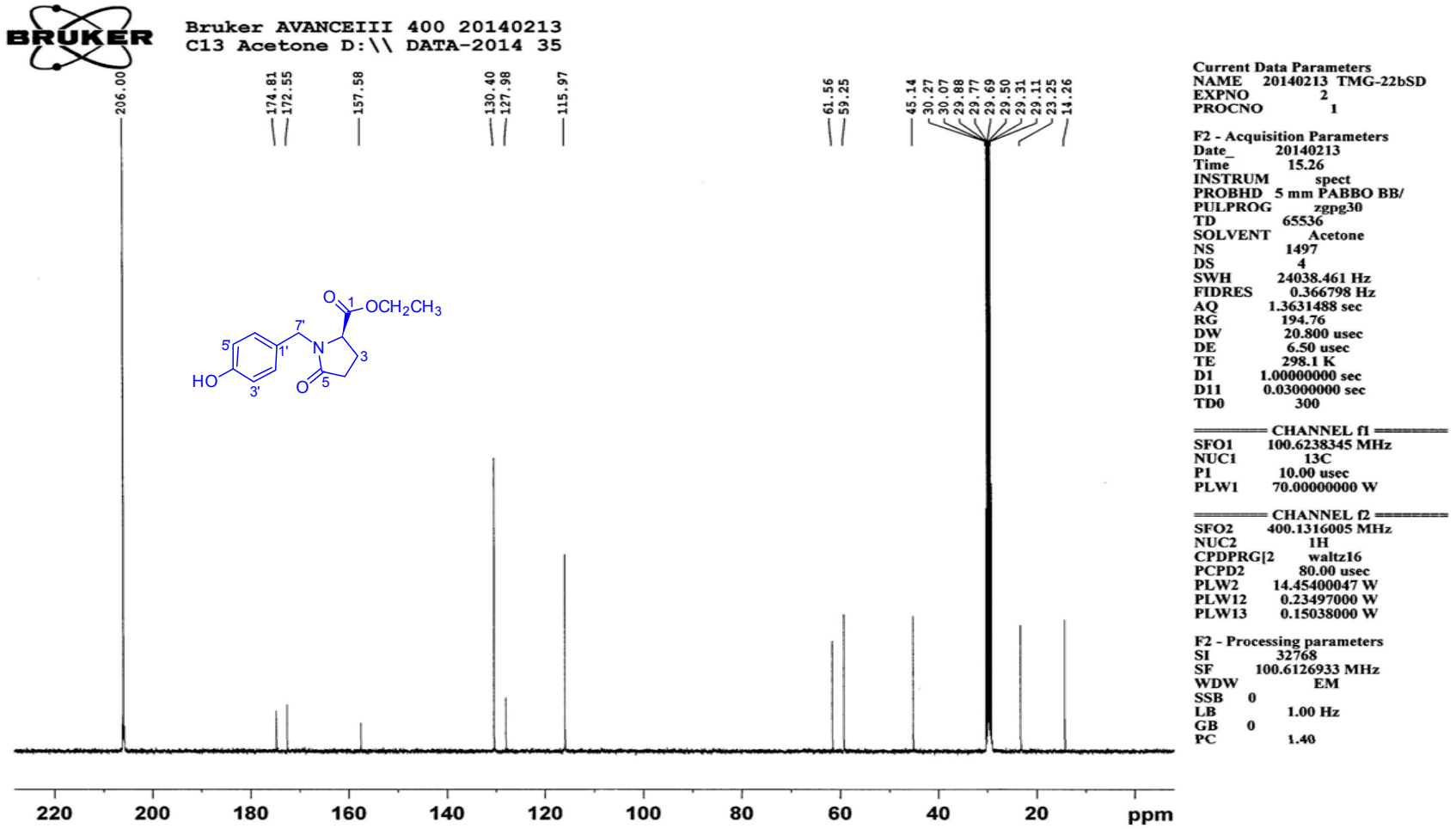


Figure S45. The ^{13}C NMR Spectrum of the Synthesized Ethyl (−)-(*R*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate in Me_2CO-d_6 (100 MHz)

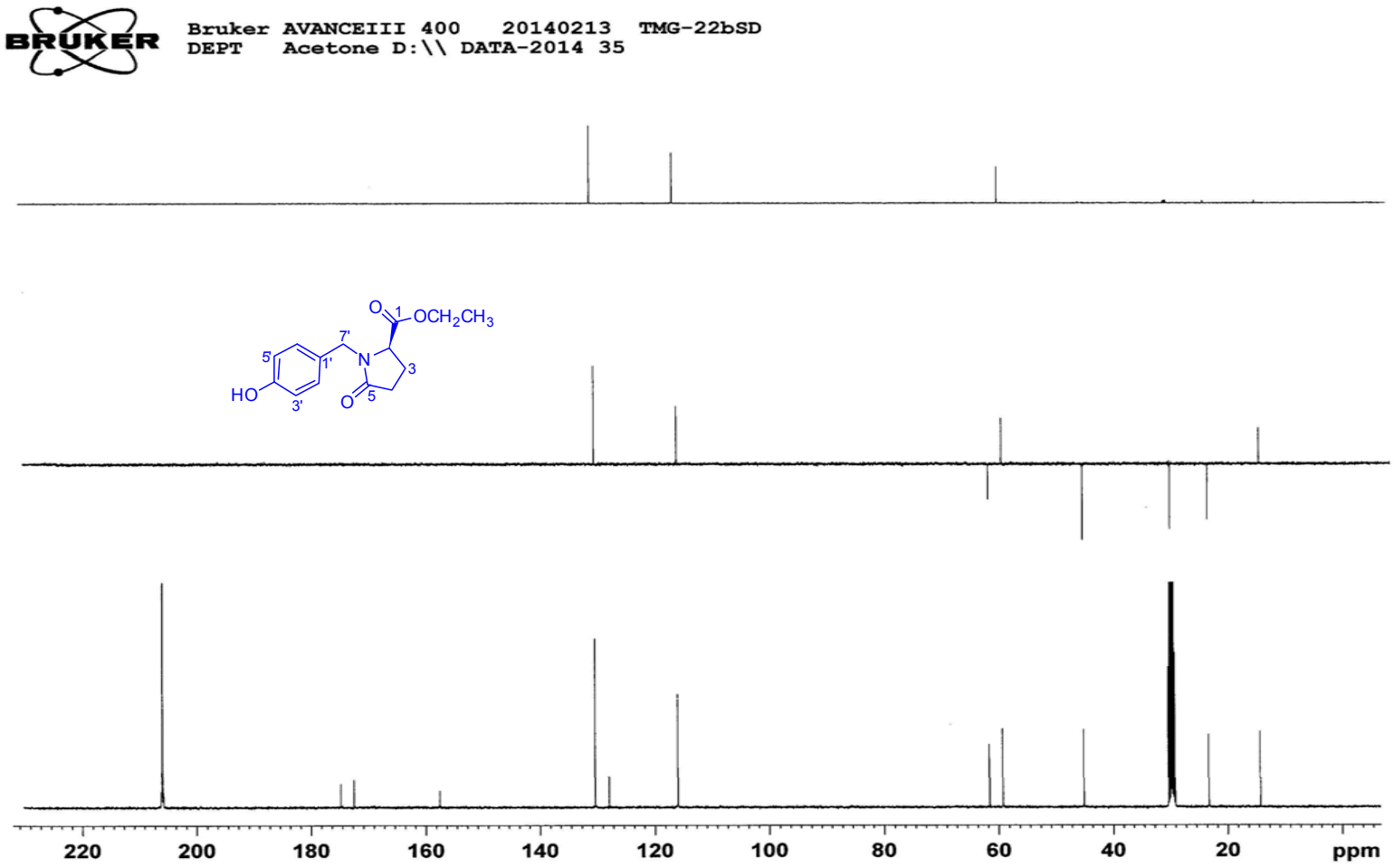


Figure S46. The DEPT Spectrum of the Synthesized Ethyl (−)-(*R*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate in Me_2CO-d_6 (100 MHz)

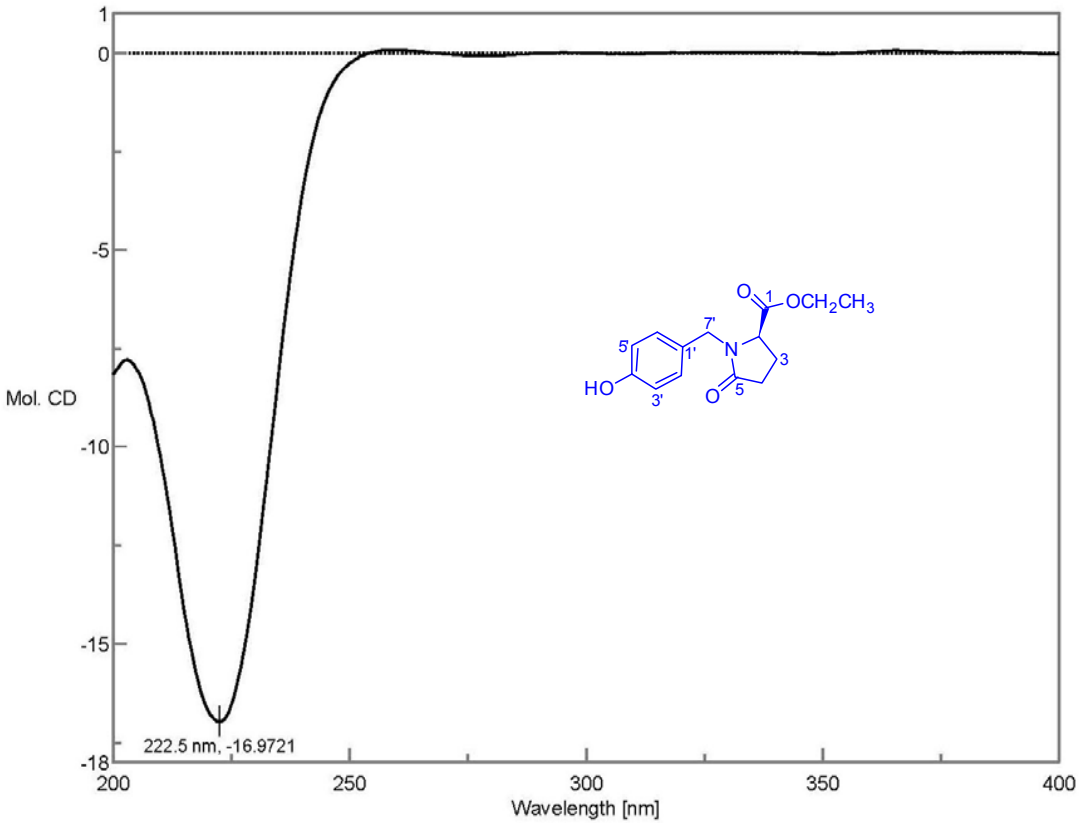


Figure S47. The CD Spectrum of the Synthesized Ethyl (−)-(*R*)-[*N*-(4′-Hydroxybenzyl)]pyroglutamate in MeOH

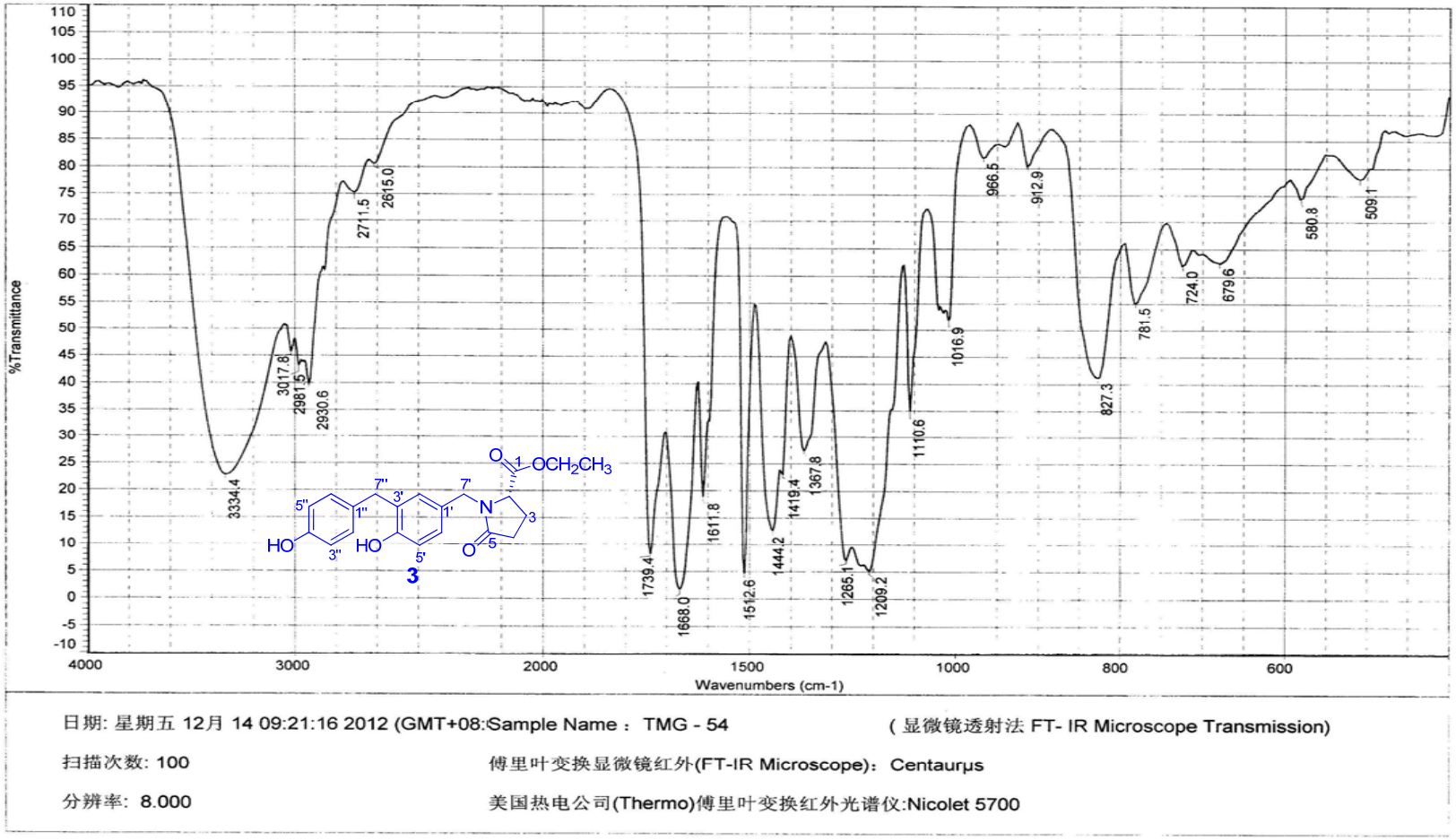


Figure S48. The IR Spectrum of Compound **3**

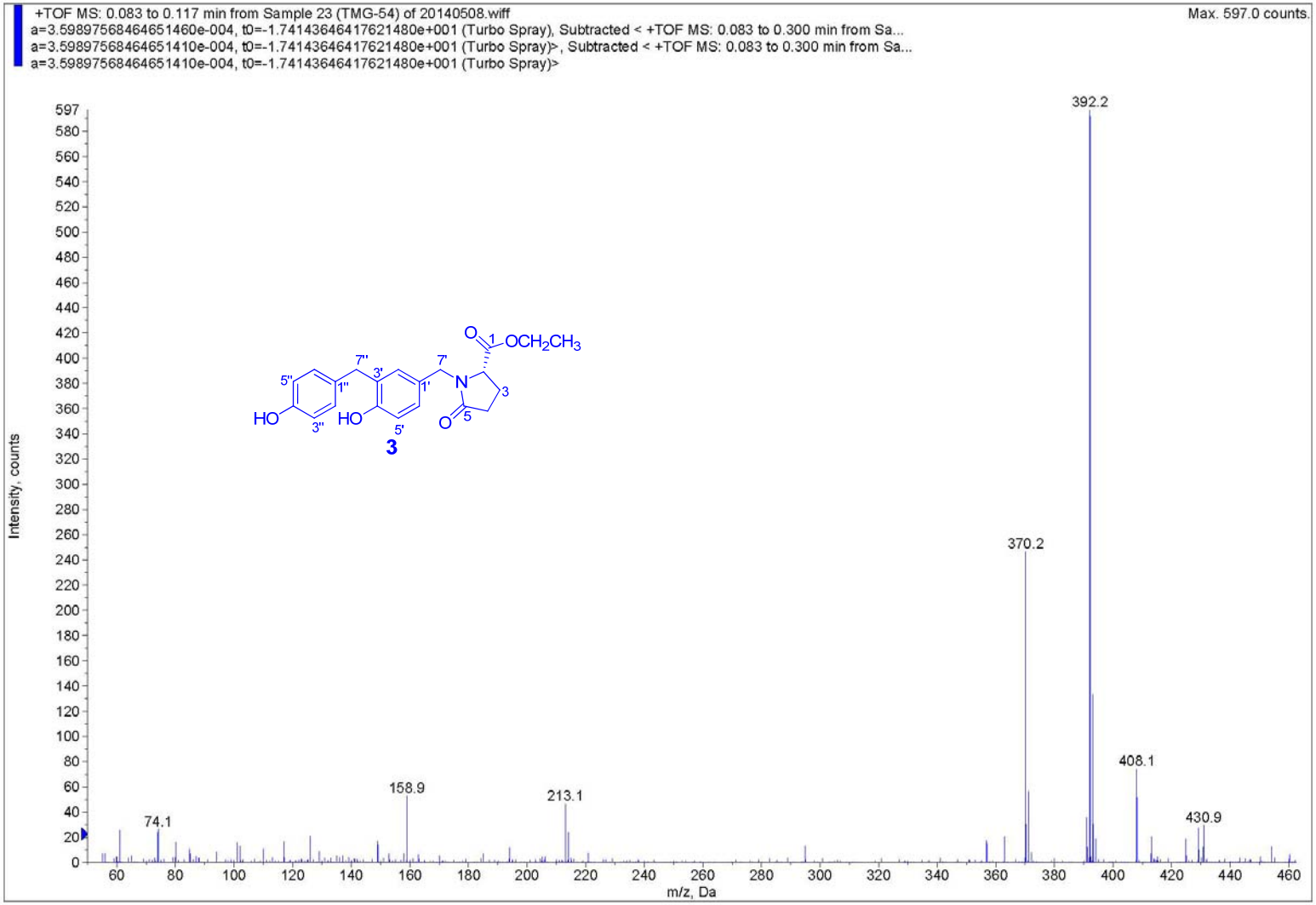


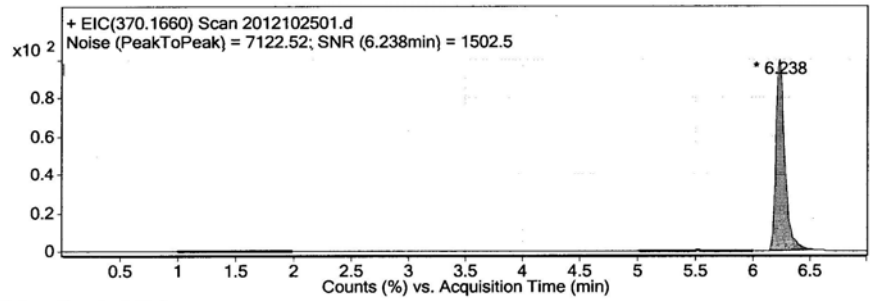
Figure S49. The (+)-ESIMS Spectrum of Compound **3**

Qualitative Analysis Report

Data Filename	2012102501.d	**Sample Name**	TMG-54
Sample Type	Sample	**Position**	P1-D5
Instrument Name	Instrument 1	**User Name**	
Acq Method		**IRM Calibration Status**	Some Ions Missed
DA Method	TEST LCMS.m	**Comment**	

User Chromatograms

Fragmentor Voltage 135 **Collision Energy** 0 **Ionization Mode** ESI



Integration Peak List

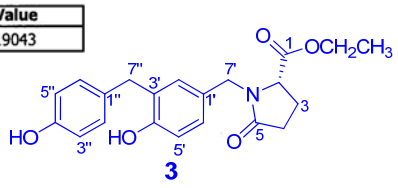
Peak	Start	RT	End	Height	Area	Area %	Signal To Noise
1	6.142	6.238	6.528	1911669	10701722	100	1502.5

Noise Measurements

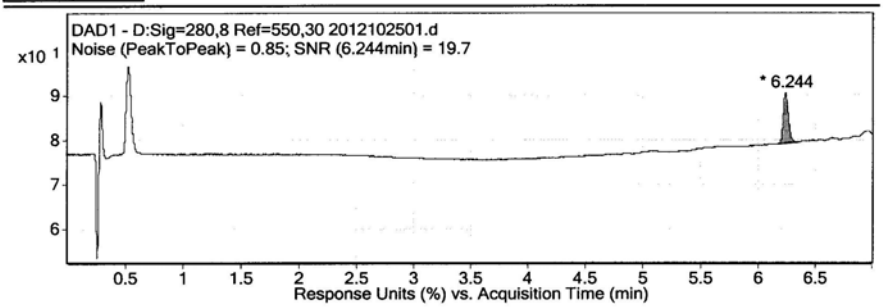
Noise Type	Signal Definition	Noise Multiplier	Noise Value
Peak-to-Peak	Area	1	7122.519043

Noise Regions

Start	End
1	2
5	6
8.6	9.4
9.8	11



3



Integration Peak List

Peak	Start	RT	End	Height	Area	Area %	Signal To Noise
1	6.17	6.244	6.364	5.33	16.66	100	19.7

Noise Measurements

Noise Type	Signal Definition	Noise Multiplier	Noise Value
Peak-to-Peak	Area	1	0.845432281

Noise Regions

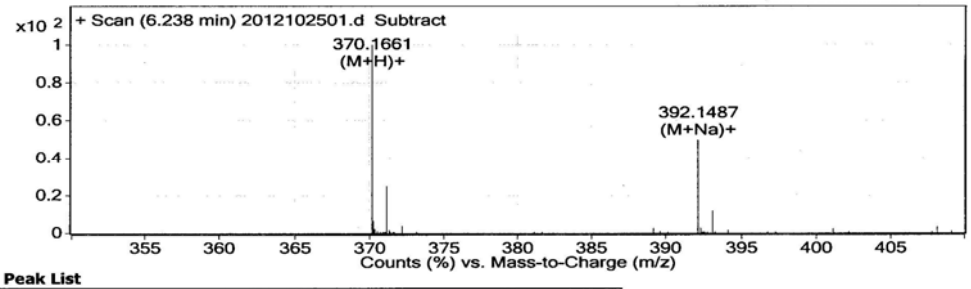
Start	End
1	2
8.6	9.4
9.8	11

User Spectra

Figure S50. The (+)-HRESIMS Report of Compound **3**, Page 1

Qualitative Analysis Report

Fragmentor Voltage	Collision Energy	Ionization Mode
135	0	Esi



Peak List

m/z	z	Abund	Formula	Ion
370.1661	1	1916112	C21 H24 N O5	(M+H)+
370.328		127040		
371.17	1	480516	C21 H24 N O5	(M+H)+
392.1487	1	952095	C21 H23 N Na O5	(M+Na)+
393.1516	1	233075	C21 H23 N Na O5	(M+Na)+
429.2397		164907		
739.325	1	233104		
740.3281	1	109783		
761.308	1	638908		
762.3107	1	302903		

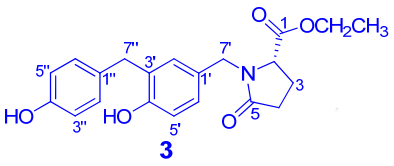
Formula Calculator Element Limits

Element	Min	Max
C	3	100
H	0	500
O	0	90
N	0	4
S	0	2
Cl	0	0
Br	0	1

Formula Calculator Results

Formula	Best	Mass	Tgt Mass	Diff (ppm)	Ion Species	Score
C21 H23 N O5	TRUE	369.1588	369.1576	-3.31	C21 H24 N O5	99.75
C18 H27 N O5 S		369.1588	369.161	5.82	C18 H28 N O5 S	98.08
C21 H23 N O5	TRUE	369.1595	369.1576	-5.08	C21 H23 N Na O5	99.61
C18 H27 N O5 S		369.1595	369.161	4.04	C18 H27 N Na O5 S	98.51

--- End Of Report ---



3

Figure S51. The (+)-HRESIMS Report of Compound **3**, Page 2

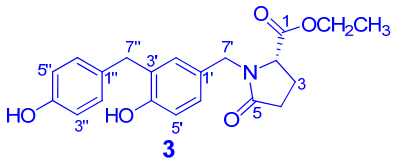
MS Formula Results: + Scan (6.238 min) Sub (2012102501.d)

m/z	Ion	Formula	Abundance
370.1661	(M+H)+	C21 H24 N O5	1916112.4

Best	Formula (M)	Ion Formula	Calc m/z	Score	Cross S	Mass	Calc Mass	Diff (ppm)	Abs Diff (ppm)	Abund Match	Spacing Mat	Mass Match	m/z	DBE
☑	C21 H23 N O5	C21 H24 N O5	370.1649	99.75		369.1588	369.1576	-3.31	3.31	99.78	99.94	99.65	370.1661	11
☐	C18 H27 N O5 S	C18 H28 N O5 S	370.1683	98.08		369.1588	369.161	5.82	5.82	95.61	99.38	98.91	370.1661	6

m/z	Ion	Formula	Abundance
392.1487	(M+Na)+	C21 H23 N Na O5	952094.6

Best	Formula (M)	Ion Formula	Calc m/z	Score	Cross S	Mass	Calc Mass	Diff (ppm)	Abs Diff (ppm)	Abund Match	Spacing Mat	Mass Match	m/z	DBE
☑	C21 H23 N O5	C21 H23 N Na O5	392.1468	99.61		369.1595	369.1576	-5.08	5.08	99.91	99.97	99.25	392.1487	11
☐	C18 H27 N O5 S	C18 H27 N Na O5 S	392.1502	98.51		369.1595	369.161	4.04	4.04	95.87	99.64	99.52	392.1487	6



3

Figure S52. The (+)-HRESIMS Report of Compound **3**, Page 3

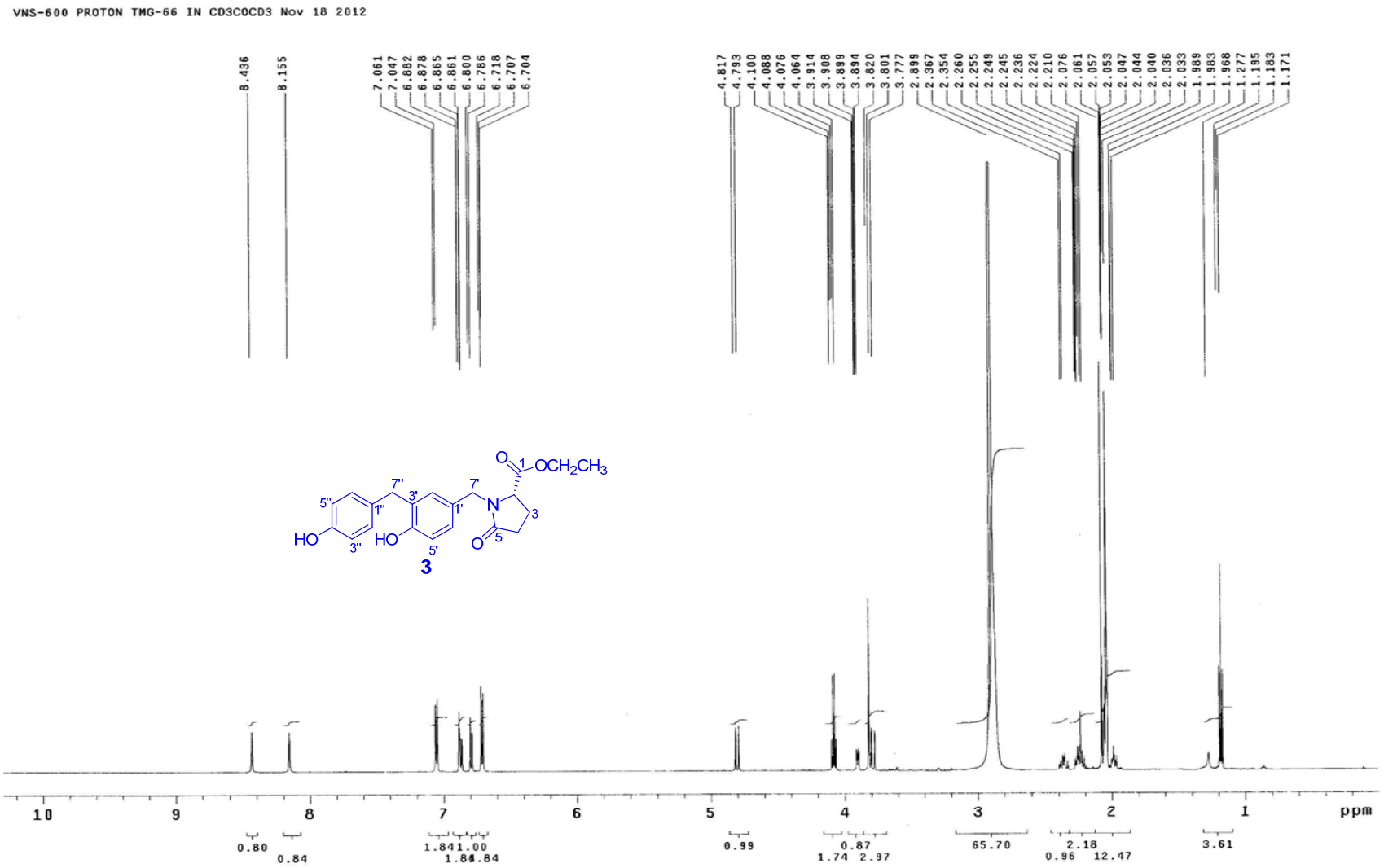


Figure S53. The ^{1}H NMR Spectrum of Compound **3** in Me_2CO-d_6 (600 MHz)

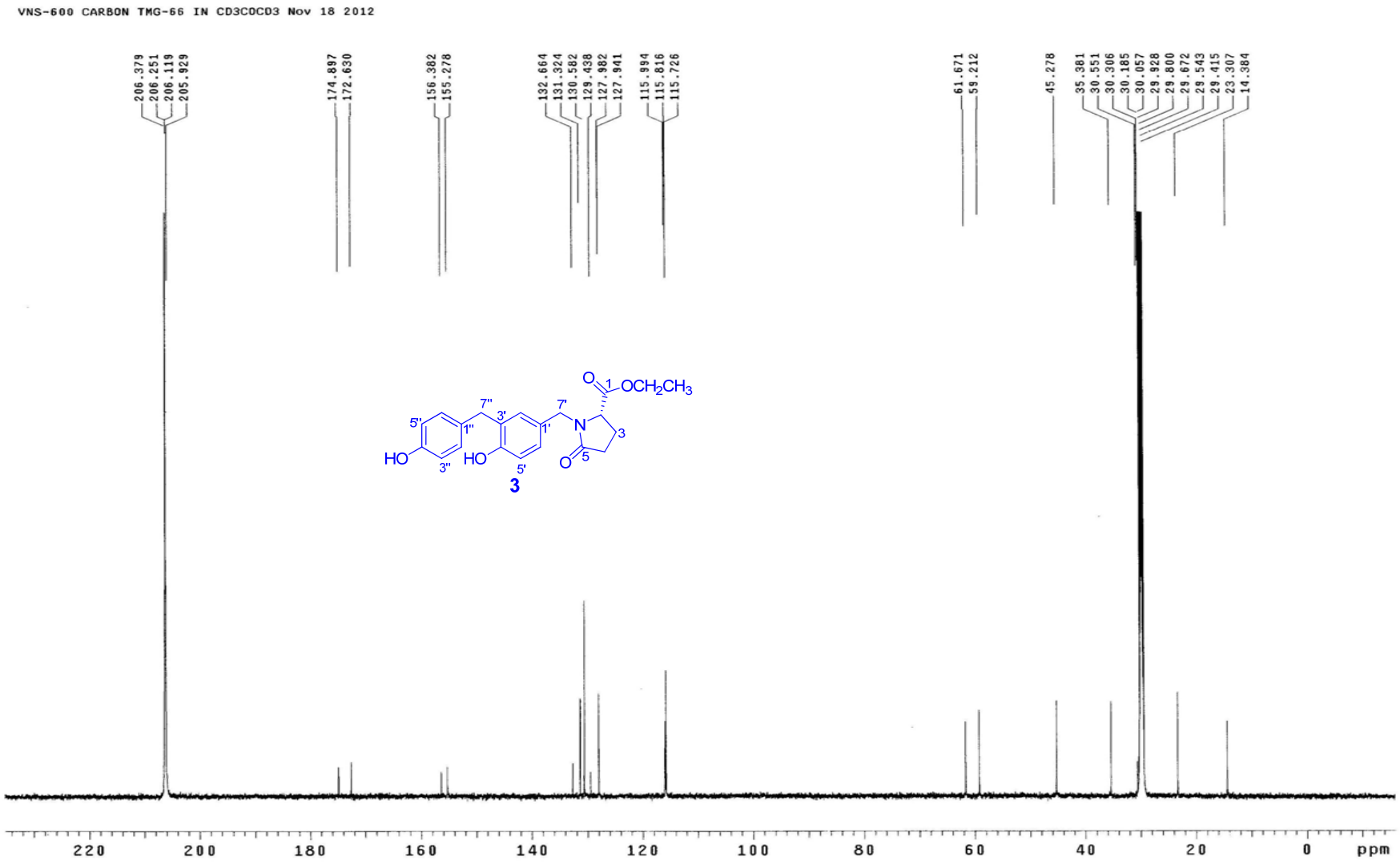


Figure S54. The ^{13}C NMR Spectrum of Compound **3** in Me_2CO-d_6 (150 MHz)

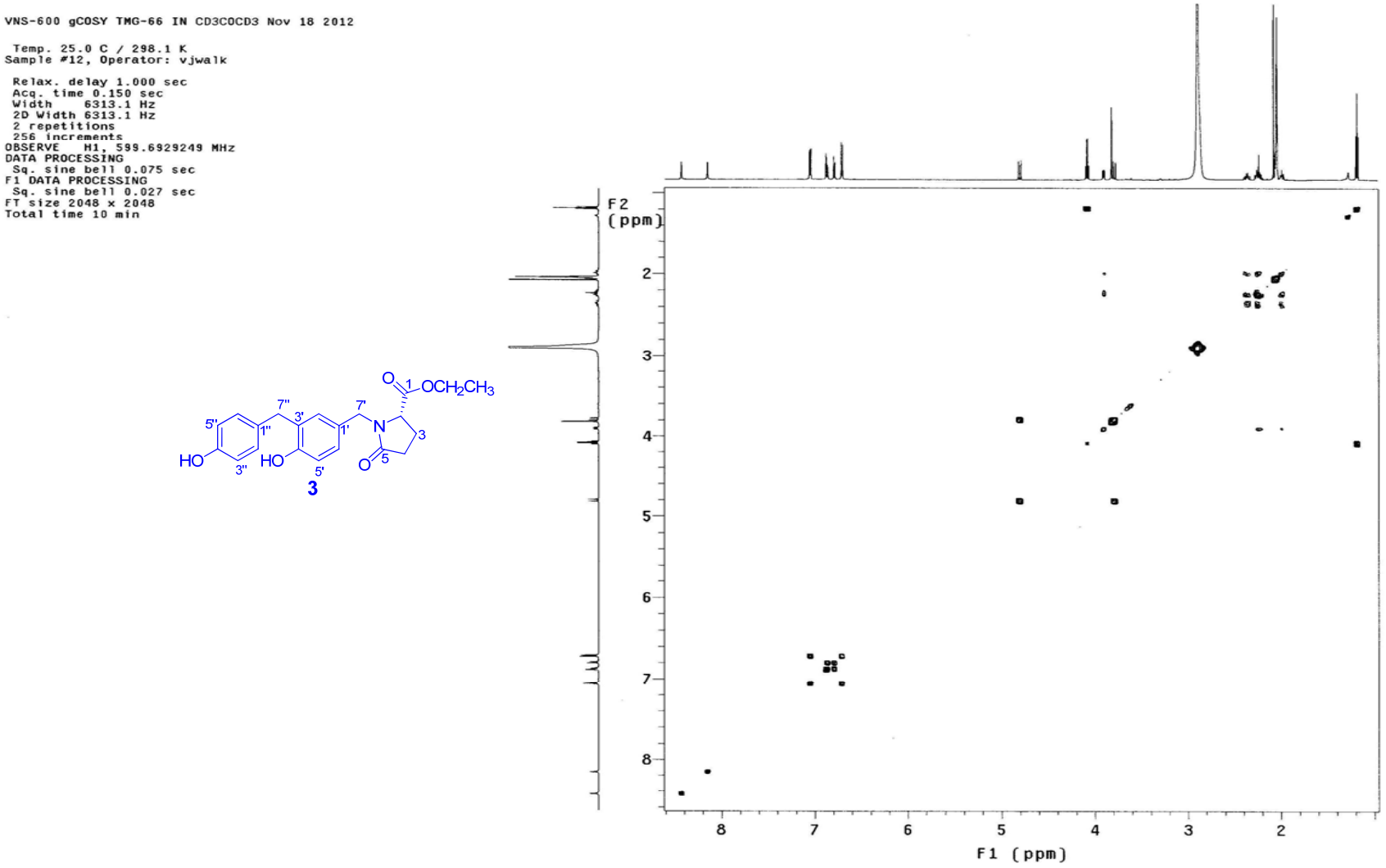


Figure S55. The ^{1}H-^{1}H gCOSY Spectrum of **3** in Me_2CO-d_6 (600 MHz)

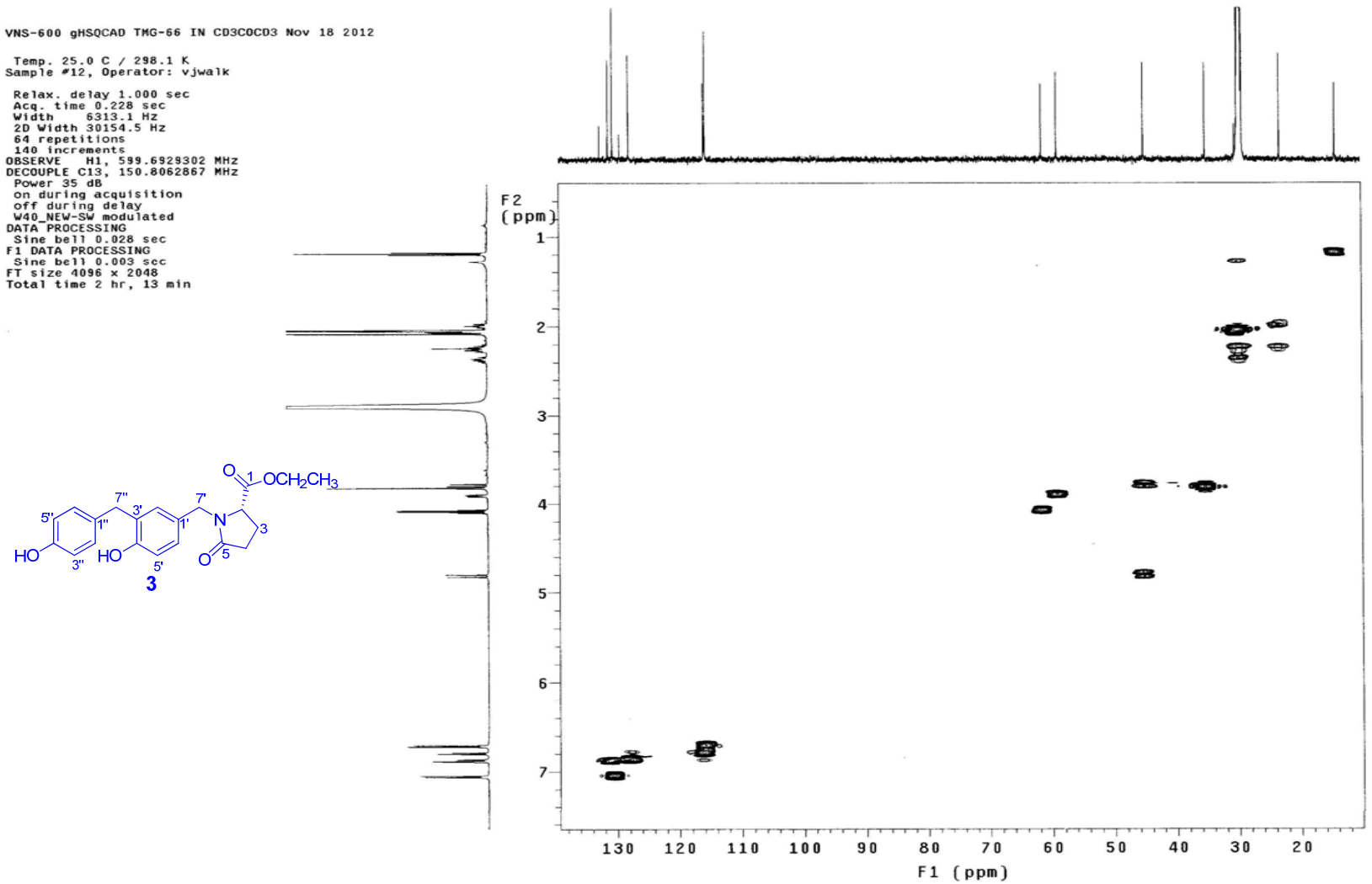


Figure S56. The gHSQC Spectrum of Compound **3** in Me_2CO-d_6 (600 MHz)

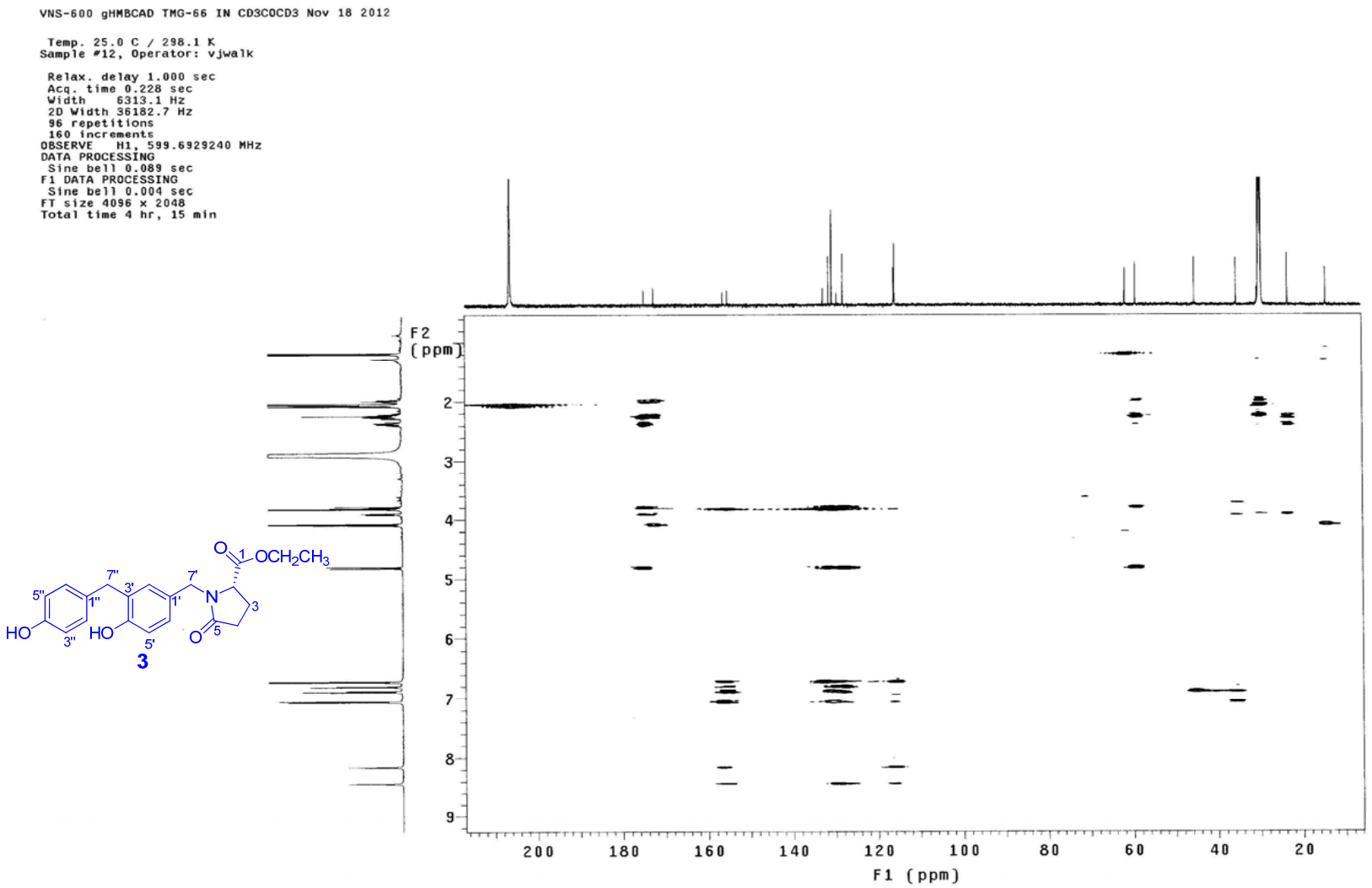


Figure S57. The gHMBC Spectrum of Compound **3** in Me_2CO-d_6 (600 MHz)

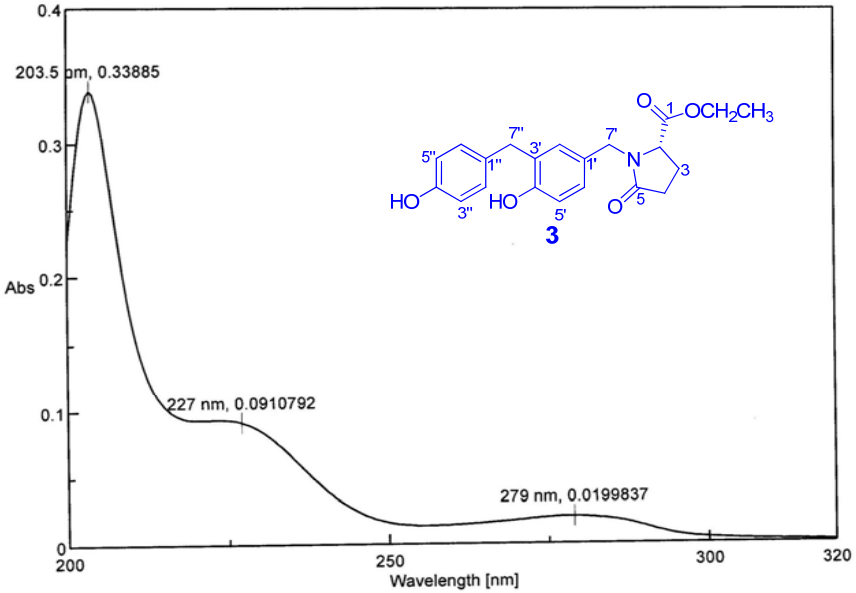


Figure S58. The UV Spectrum of Compound **3** in MeOH

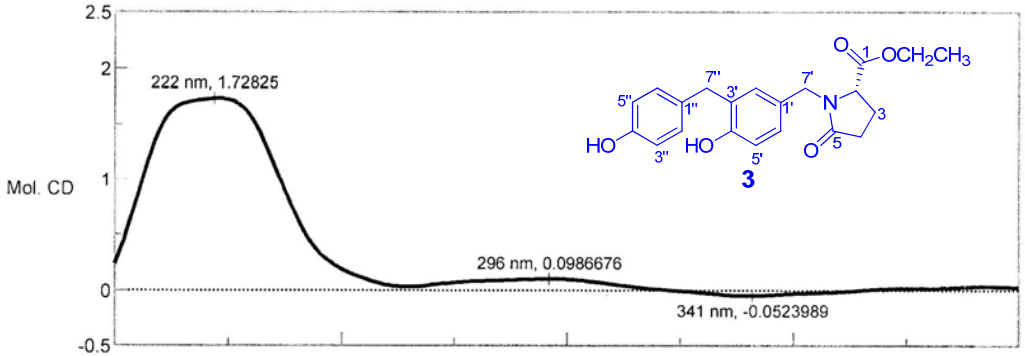


Figure S59. The CD Spectrum of Compound **3** in MeOH

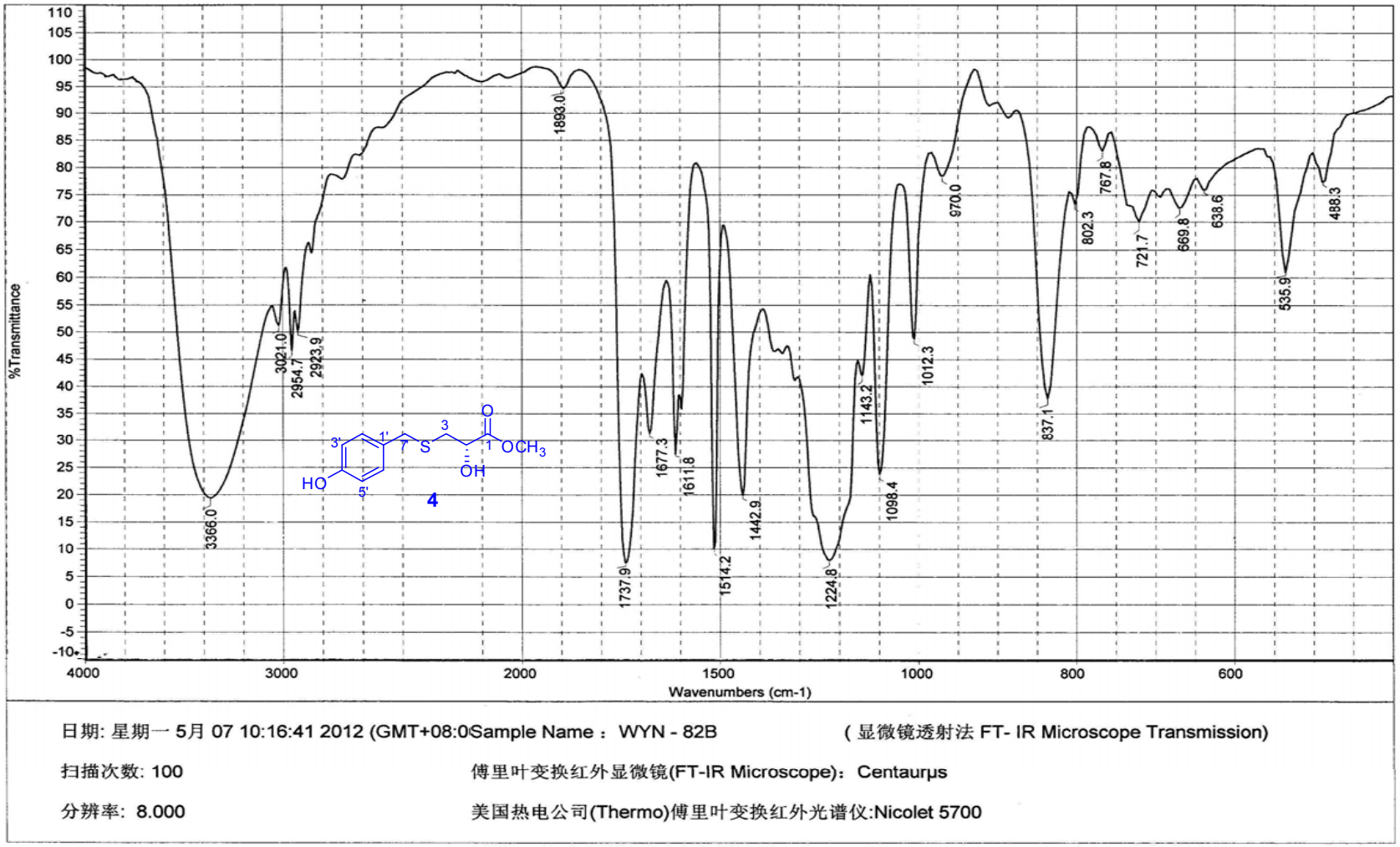


Figure S60. The IR Spectrum of Compound **4**

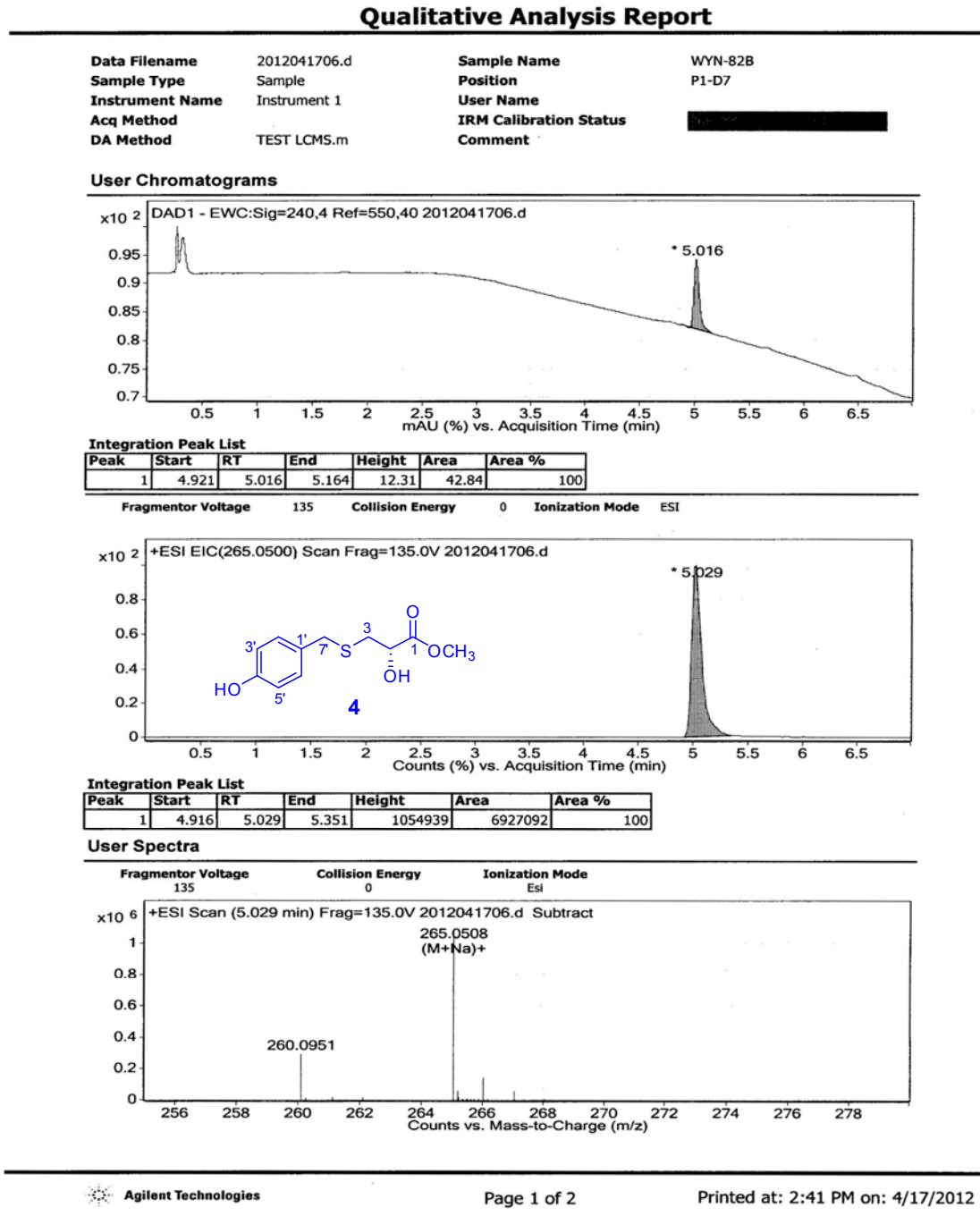


Figure S61. The (+)-HRESIMS Report of Compound **4**, Page 1

Qualitative Analysis Report

Peak List

m/z	z	Abund	Formula	Ion
107.0434		156050		
260.0951		294656		
265.0508	1	1058089	C11 H14 Na O4 S	(M+Na)+
265.1919		56419		
266.0534	1	145574	C11 H14 Na O4 S	(M+Na)+
267.0487	1	59855	C11 H14 Na O4 S	(M+Na)+
507.1122		199488		

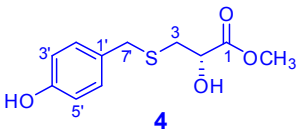
Formula Calculator Element Limits

Element	Min	Max
C	3	100
H	0	120
O	0	30
N	0	4
S	0	3
Cl	0	0

Formula Calculator Results

Formula	Best	Mass	Tgt Mass	Diff (ppm)	Ion Species	Score
C11 H14 O4 S	TRUE	242.0615	242.0613	-1.11	C11 H14 Na O4 S	99.92
C12 H10 N4 S		242.0615	242.0626	4.41	C12 H10 N4 Na S	99.67
C7 H14 O9		242.0615	242.0638	9.24	C7 H14 Na O9	96.67
C15 H6 N4		242.0615	242.0592	-9.51	C15 H6 N4 Na	96.57

--- End Of Report ---



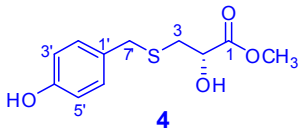
4

Figure S62. The (+)-HRESIMS Report of Compound **4**, Page 2

MS Formula Results: + Scan (5.029 min) Sub (2012041706.d)

m/z	Ion	Formula	Abundance
265.0508	(M+Na)+	C11 H14 Na O4 S	1058088.6

Best	Formula (M)	Ion Formula	Calc m/z	Score	Cross S	Mass	Calc Mass	Diff (ppm)	Abs Diff (ppm)	Abund Match	Spacing Mat	Mass Match	m/z	DBE
☑	C11 H14 O4 S	C11 H14 Na O4 S	265.0505	99.92		242.0615	242.0613	-1.11	1.11	99.87	99.88	99.97	265.0508	5
☐	C12 H10 N4 S	C12 H10 N4 Na S	265.0518	99.67		242.0615	242.0626	4.41	4.41	99.66	100	99.51	265.0508	10
☐	C7 H14 O9	C7 H14 Na O9	265.053	96.67		242.0615	242.0638	9.24	9.24	93.93	97.55	97.87	265.0508	1
☐	C15 H6 N4	C15 H6 N4 Na	265.0485	96.57		242.0615	242.0592	-9.51	9.51	94.18	97.08	97.75	265.0508	15



4

Figure S63. The (+)-HRESIMS Report of Compound **4**, Page 3

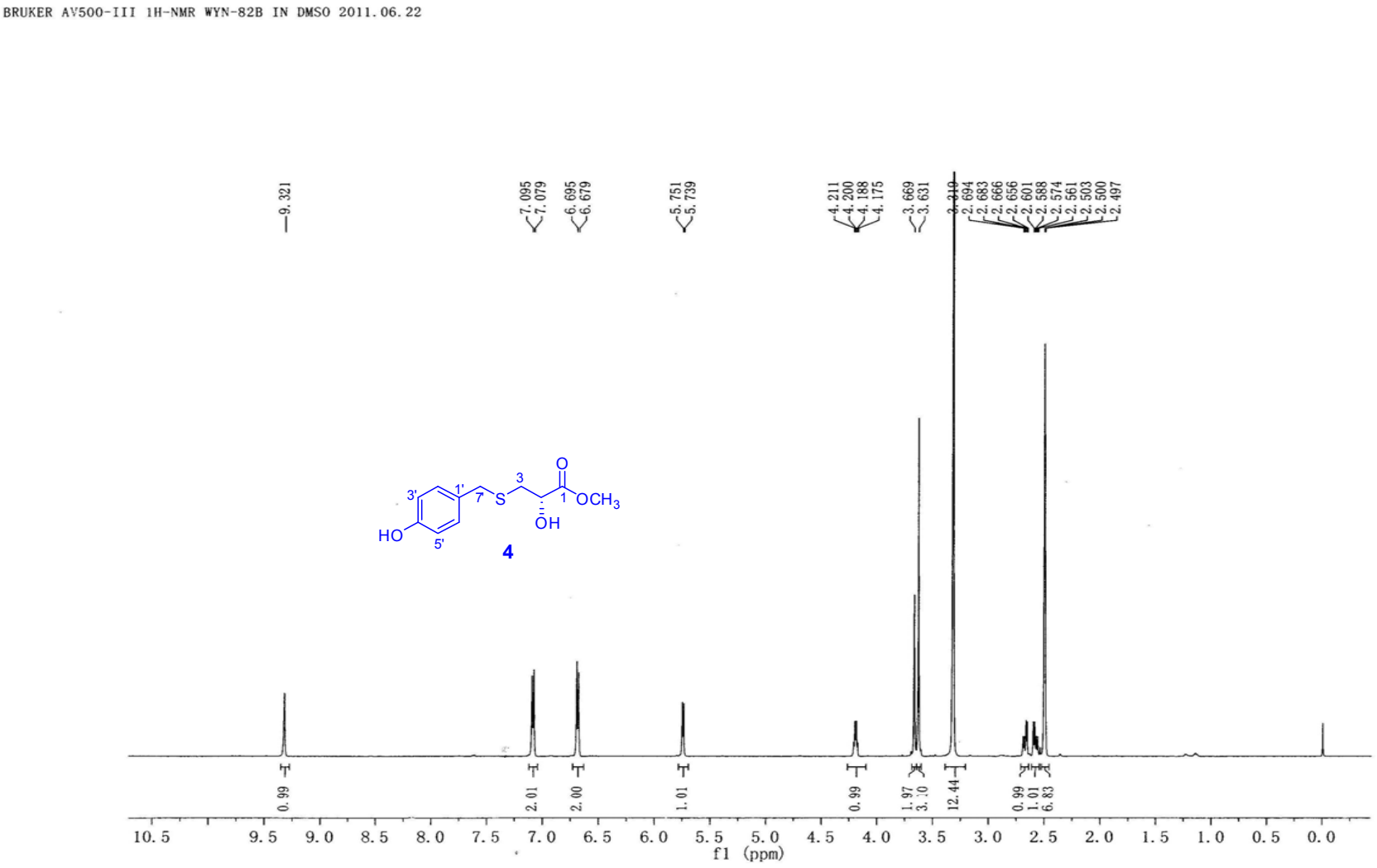


Figure S64. The ^{1}H NMR Spectrum of Compound **4** in DMSO-d_6 (500 MHz)

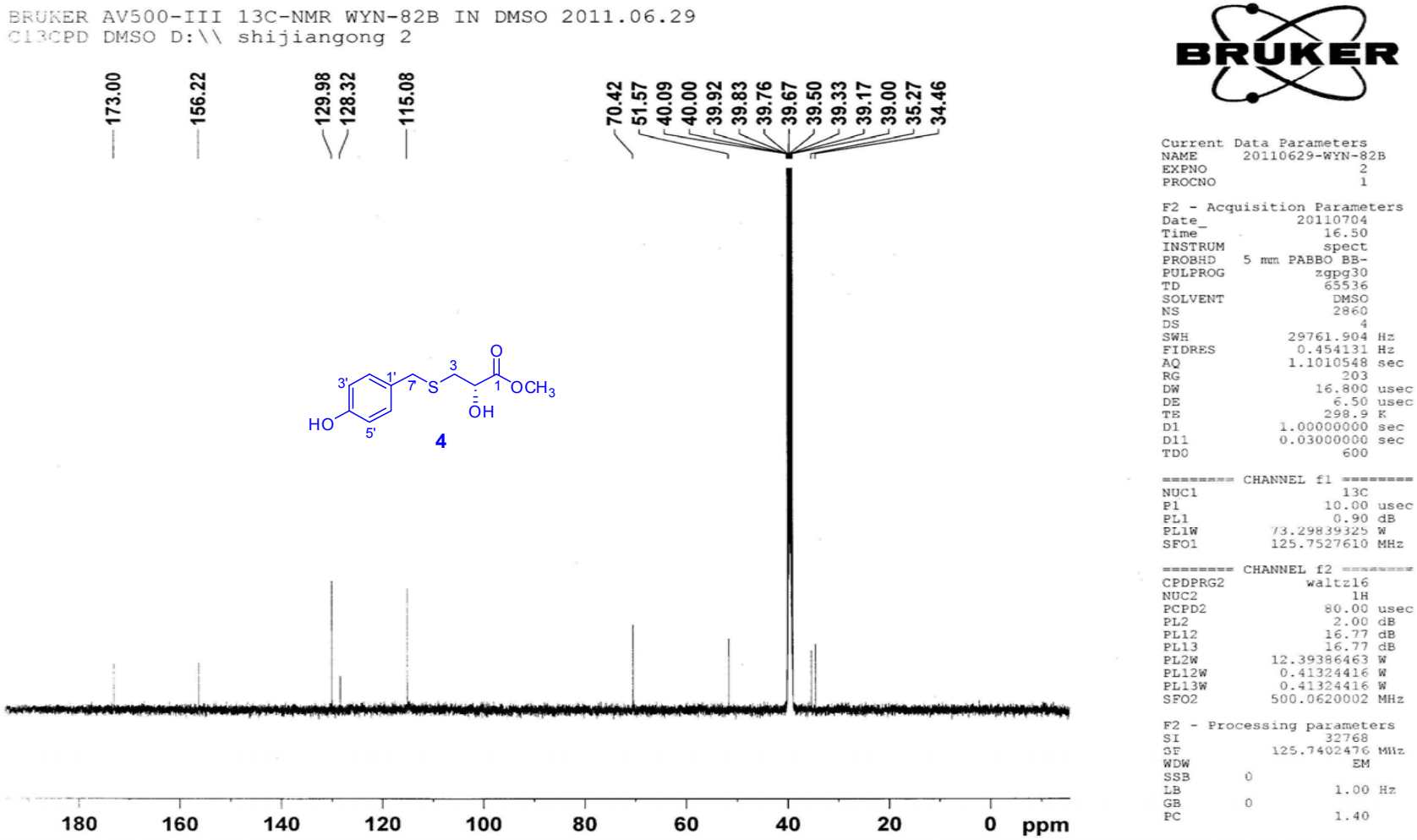


Figure S65. The ^{13}C NMR Spectrum of Compound **4** in DMSO-d_6 (125 MHz)

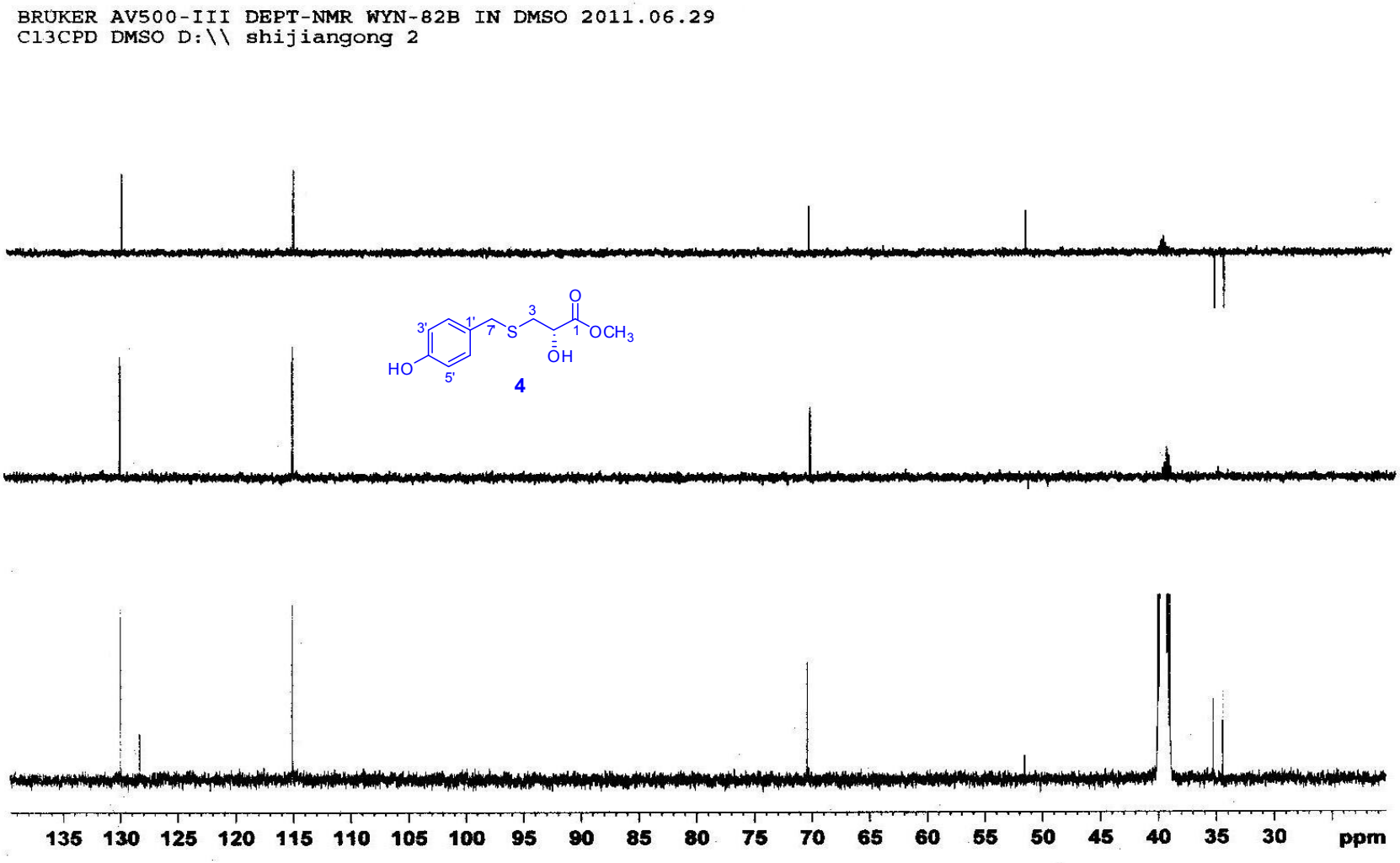


Figure S66. The DEPT Spectrum of Compound **4** in DMSO-d_6 (125 MHz)

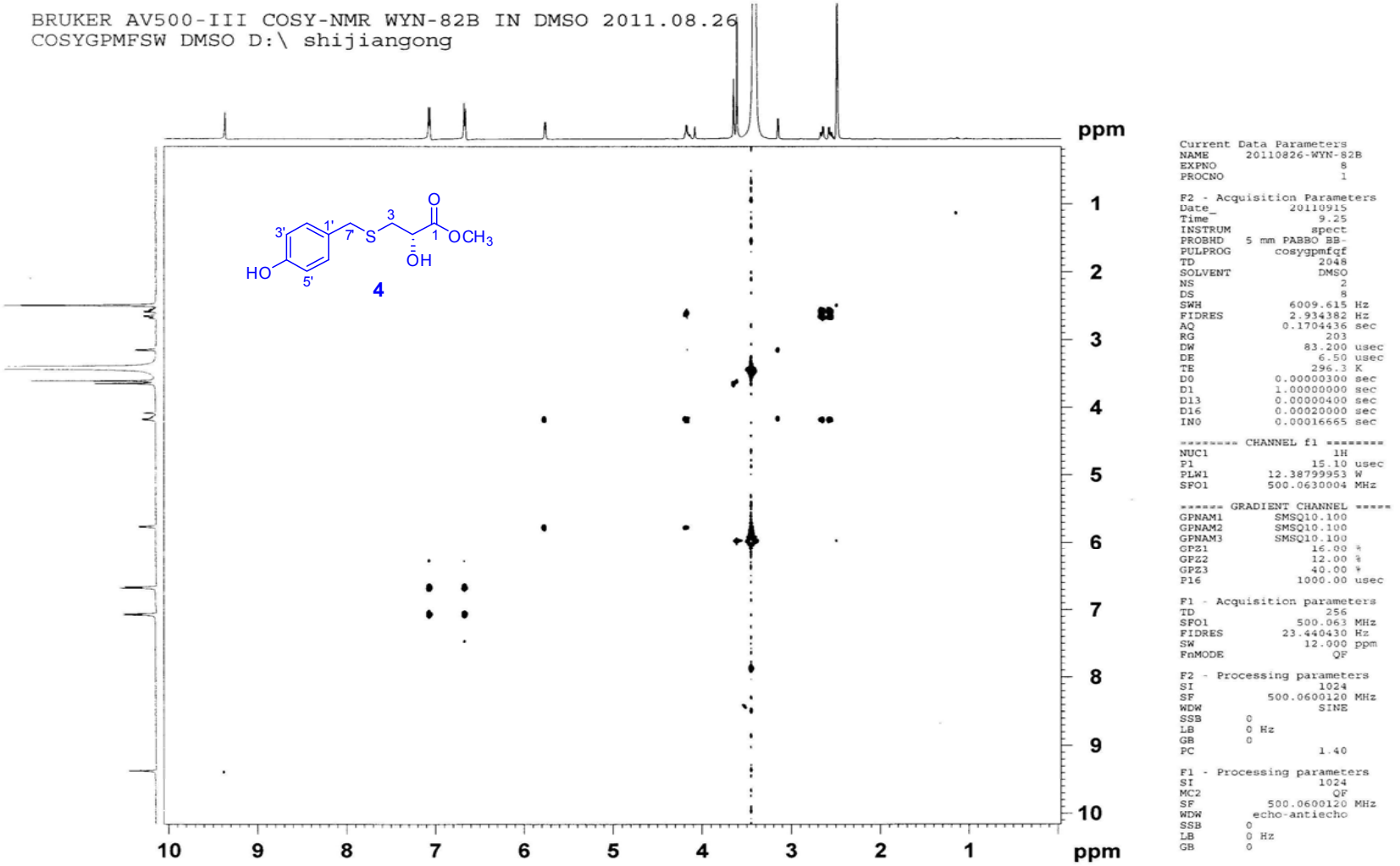


Figure S67. The ^{1}H-^{1}H COSY Spectrum of Compound **4** in DMSO-d_6 (500 MHz)

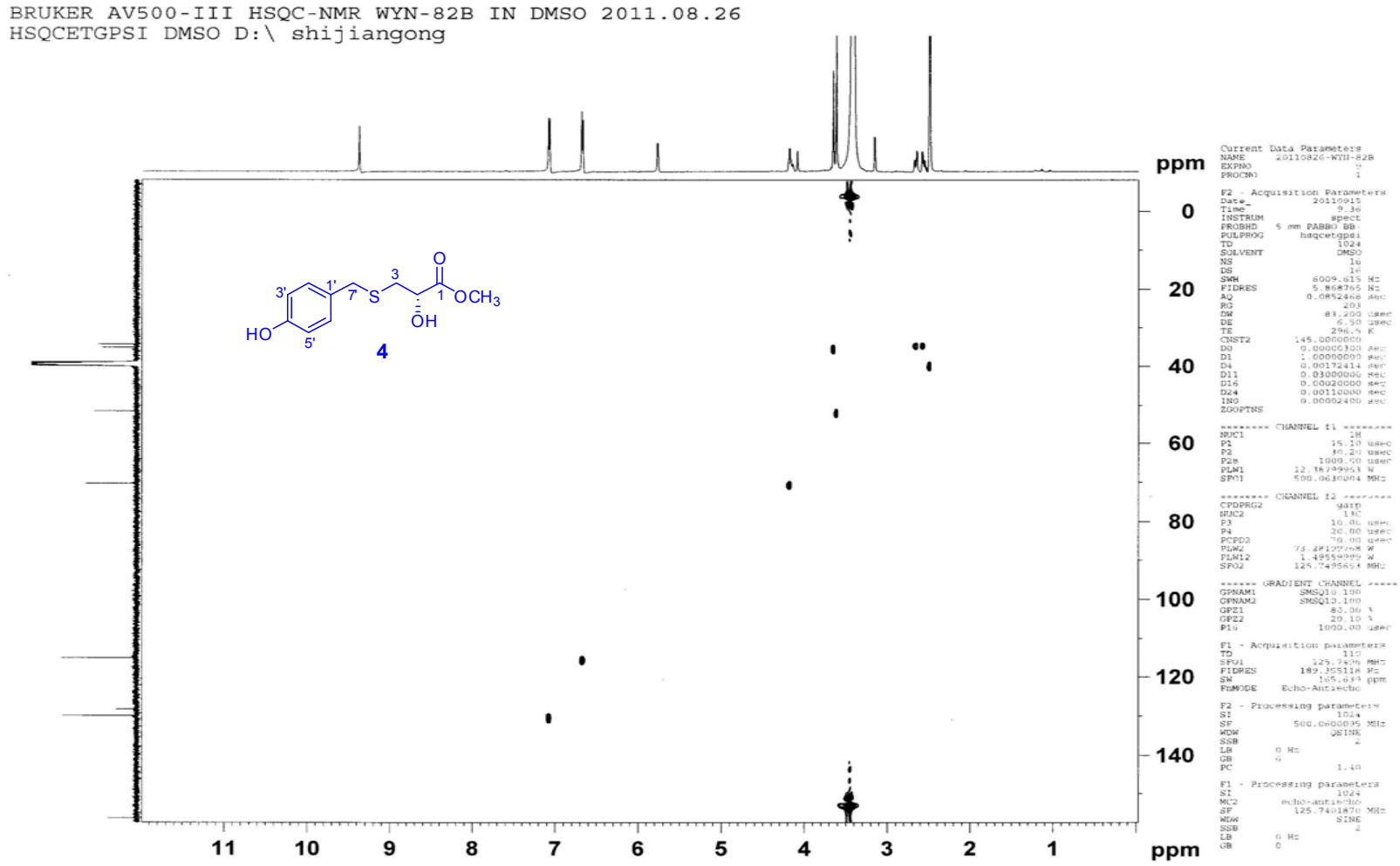


Figure S68. The HSQC Spectrum of Compound **4** in DMSO-d_6 (500 MHz)

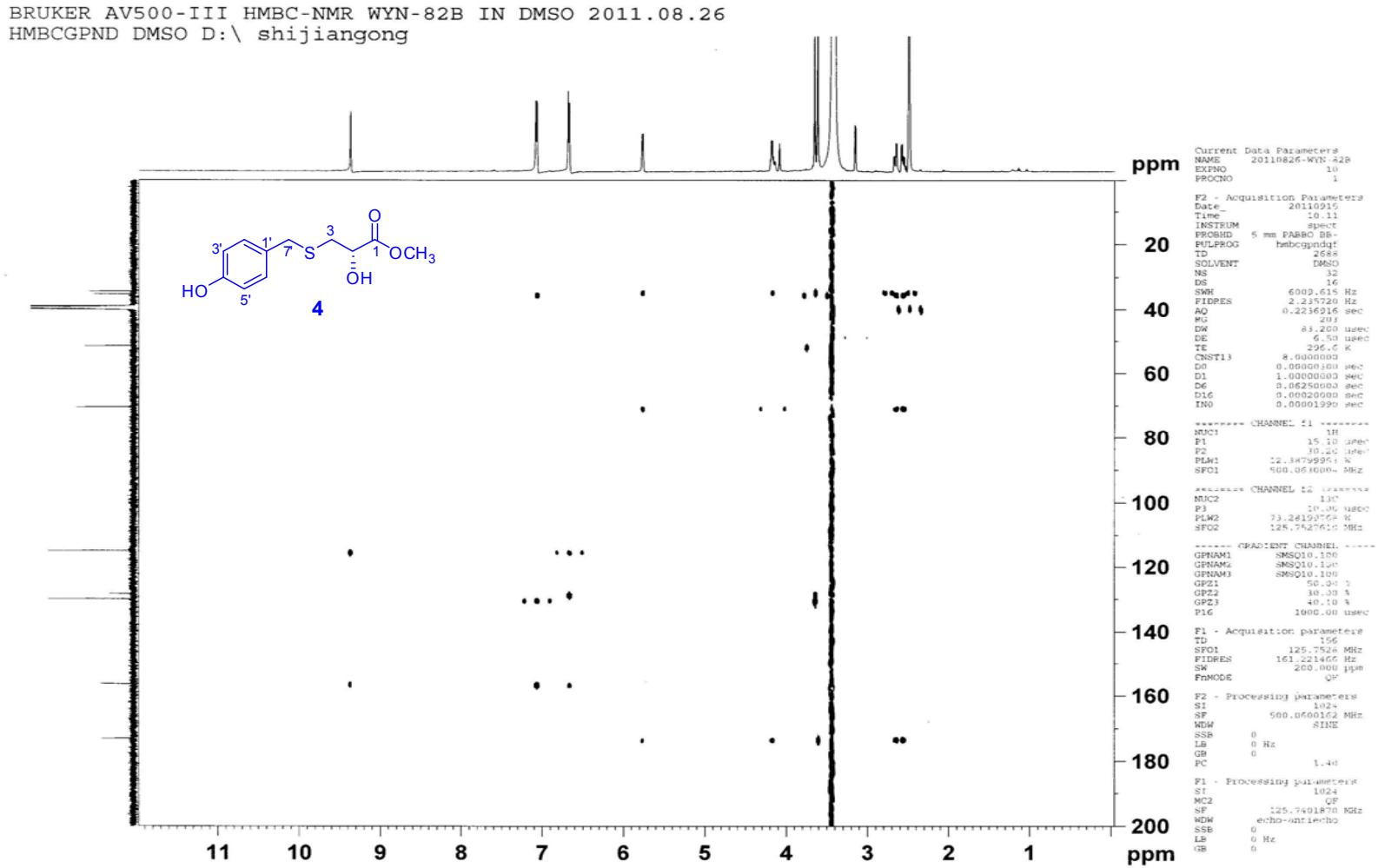


Figure S69. The HMBC Spectrum of Compound **4** in DMSO-d_6 (500 MHz)

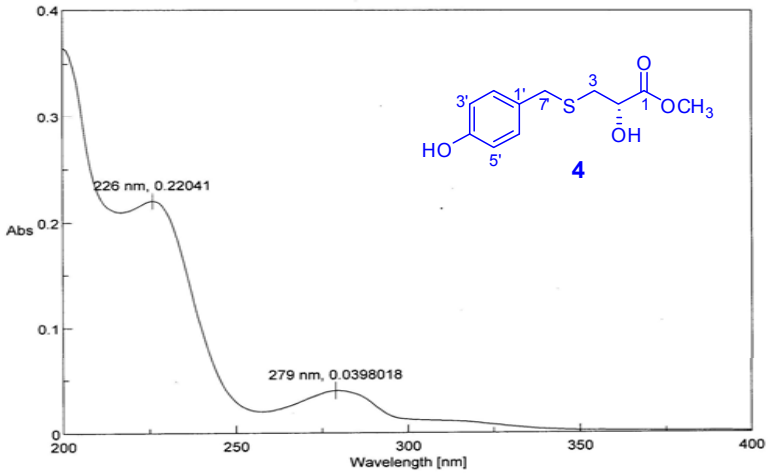


Figure S70. The UV Spectrum of Compound **4** in MeOH

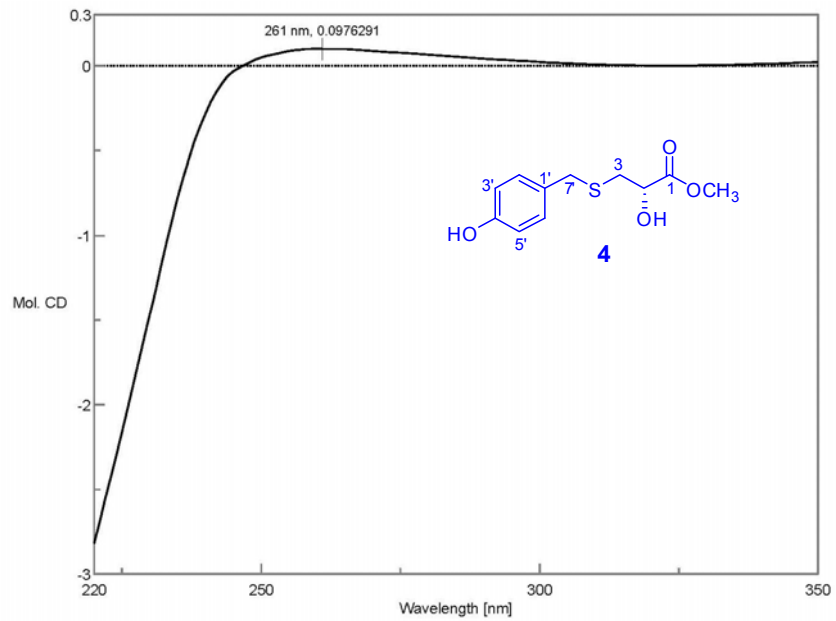


Figure S71. The CD Spectrum of Compound **4** in CH_2Cl_2

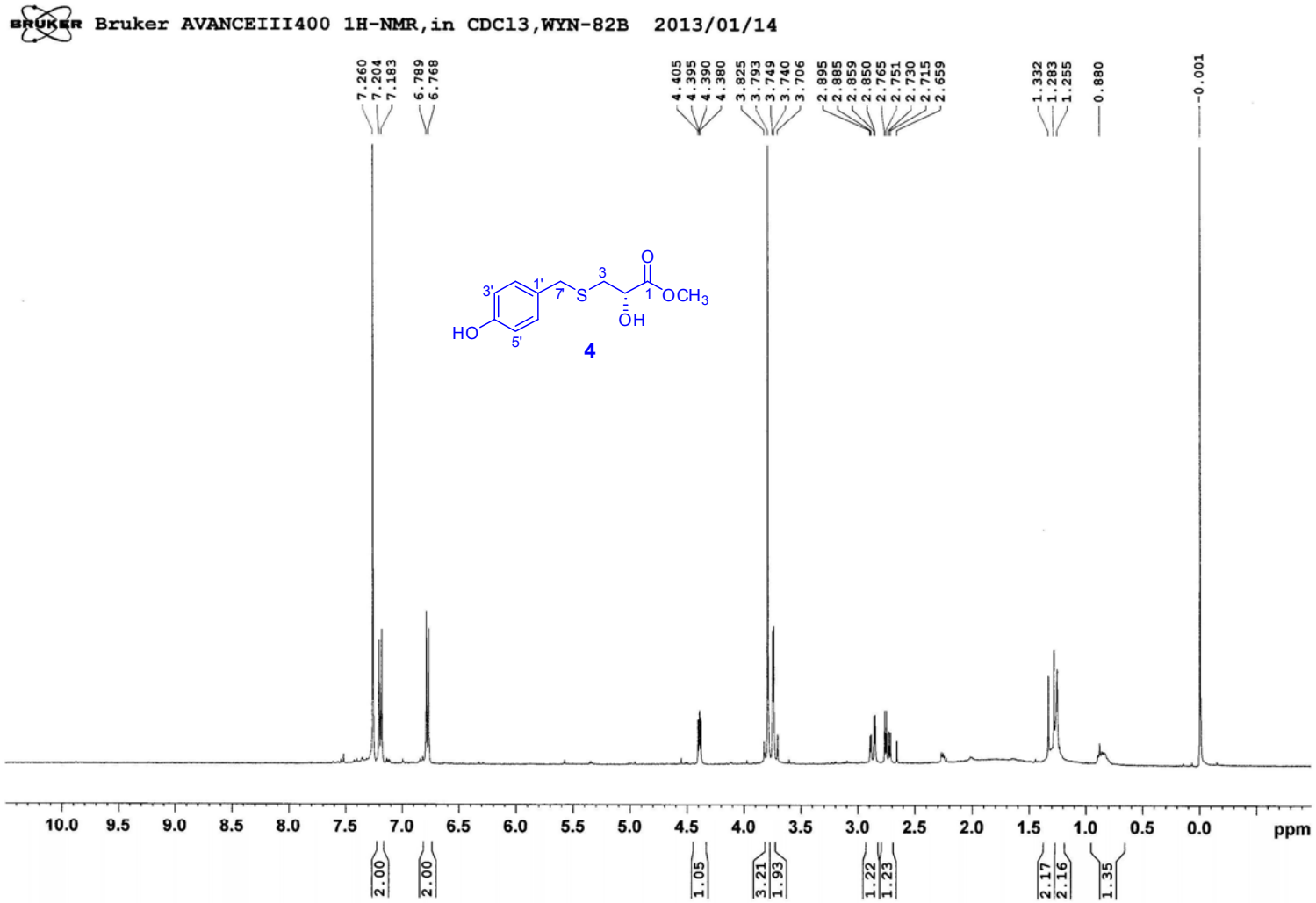


Figure S72. The ^{1}H NMR Spectrum of Compound **4** in CD_3Cl (400 MHz)

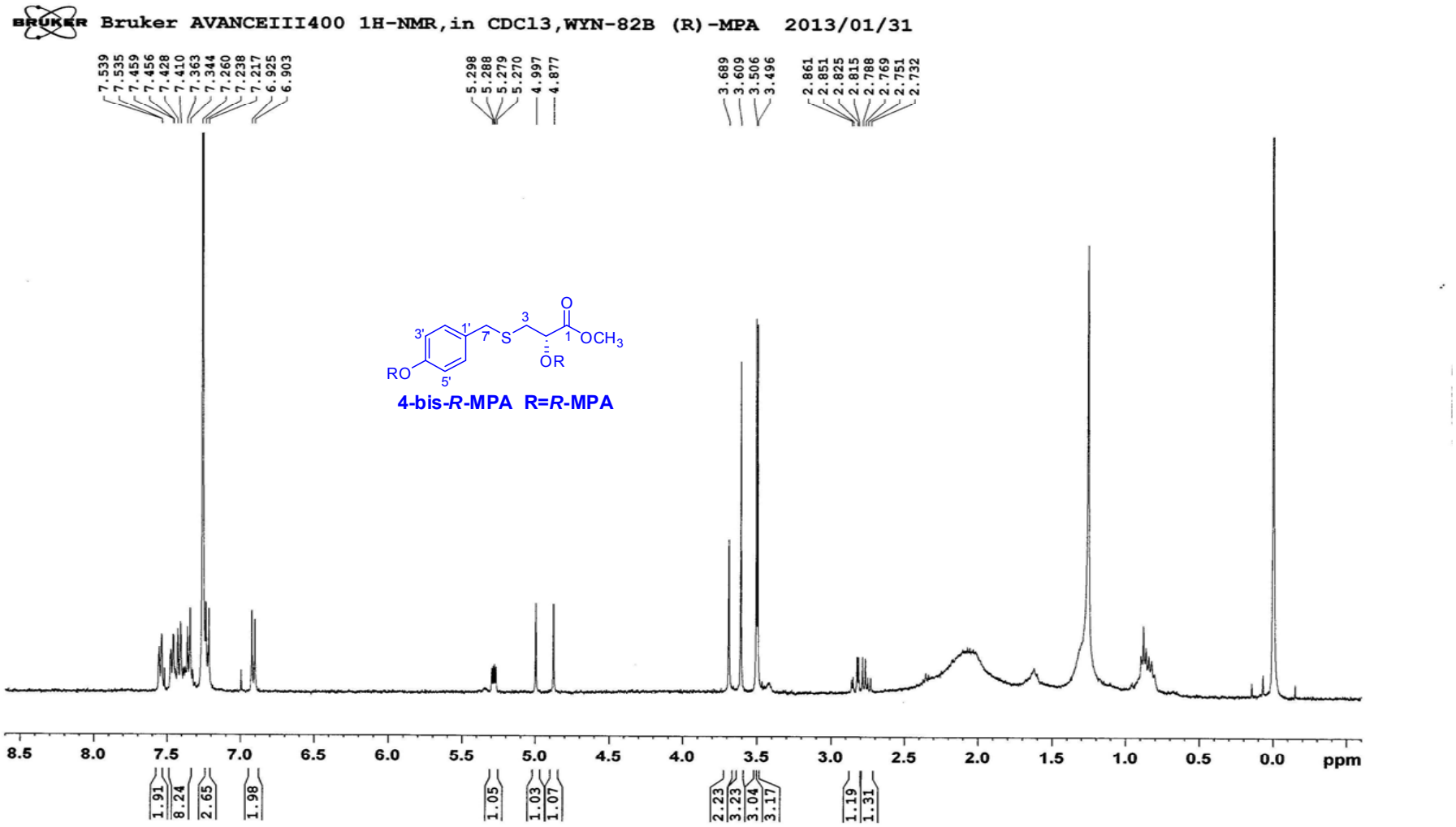


Figure S73. The ^{1}H NMR Spectrum of Compound **4**-bis-(*R*)-MPA in CD_3Cl (400 MHz)

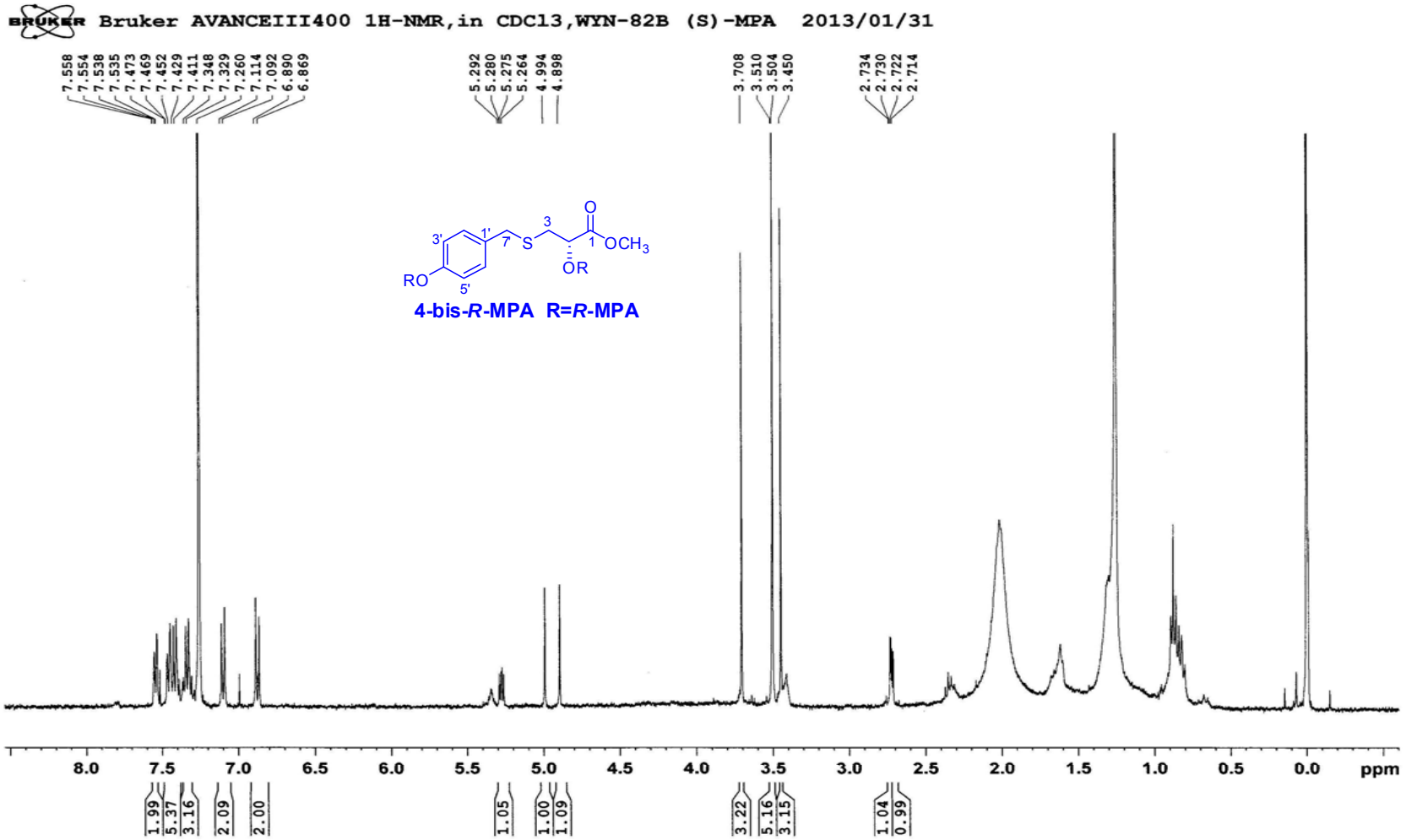


Figure S74. The ^{1}H NMR Spectrum of Compound **4**-bis-(*S*)-MPA in CD_3Cl (400 MHz)

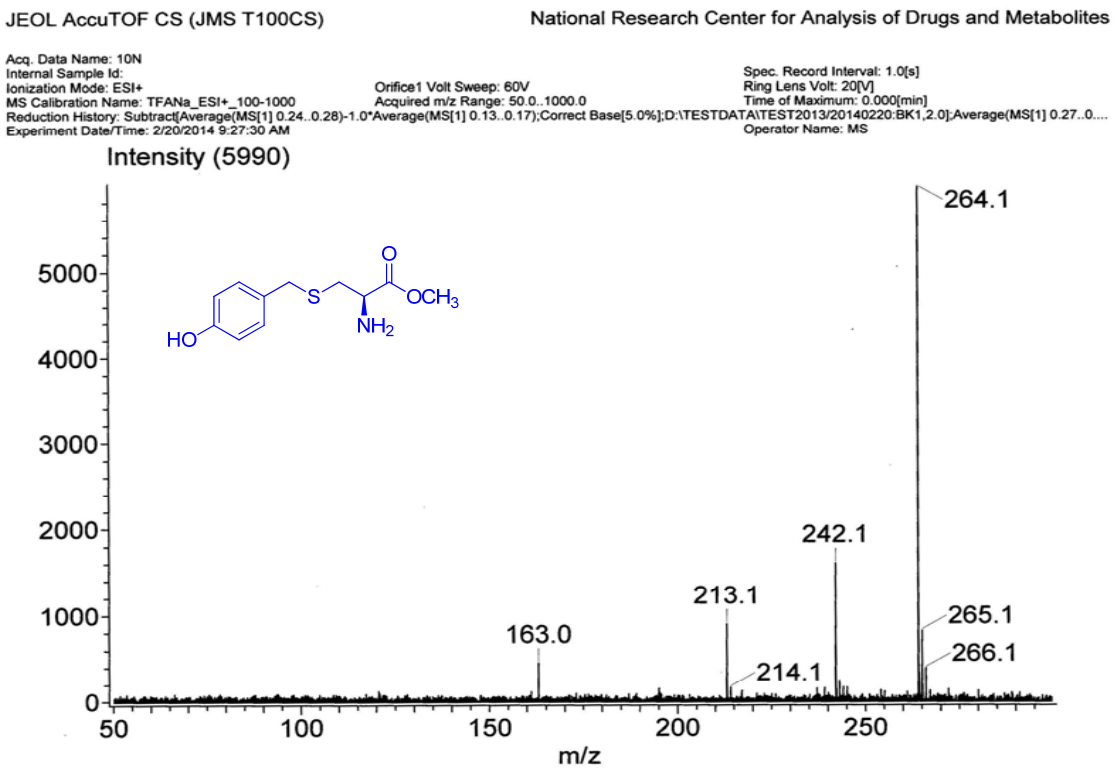


Figure S75. The (+)-ESIMS Spectrum of the Synthesized Methyl *S*-(4′-Hydroxybenzyl)-L-cysteinate

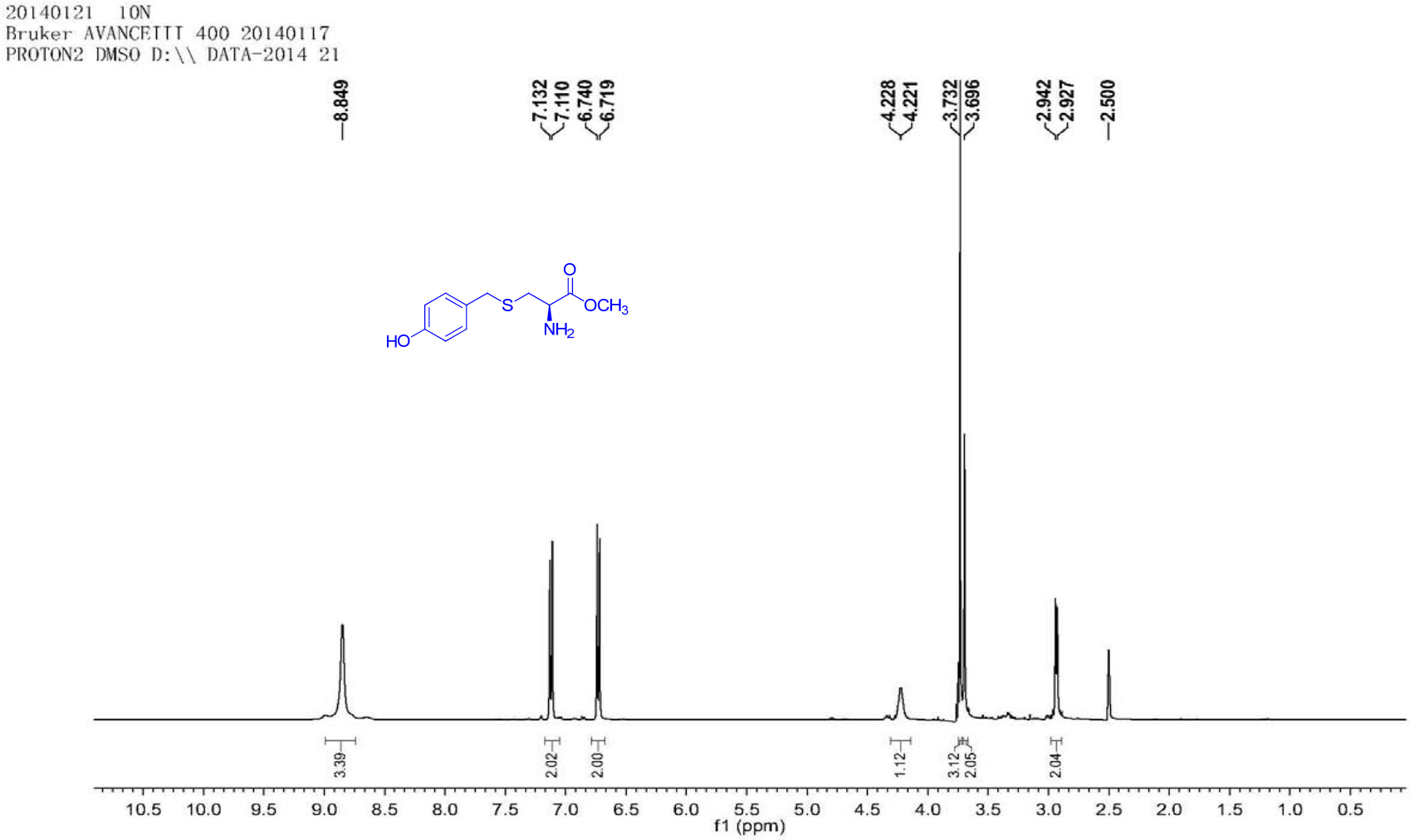


Figure S76. The ^{1}H NMR Spectrum of the Synthesized Methyl *S*-(4′-Hydroxybenzyl)-L-cysteinate in DMSO-d_6 (400 MHz)

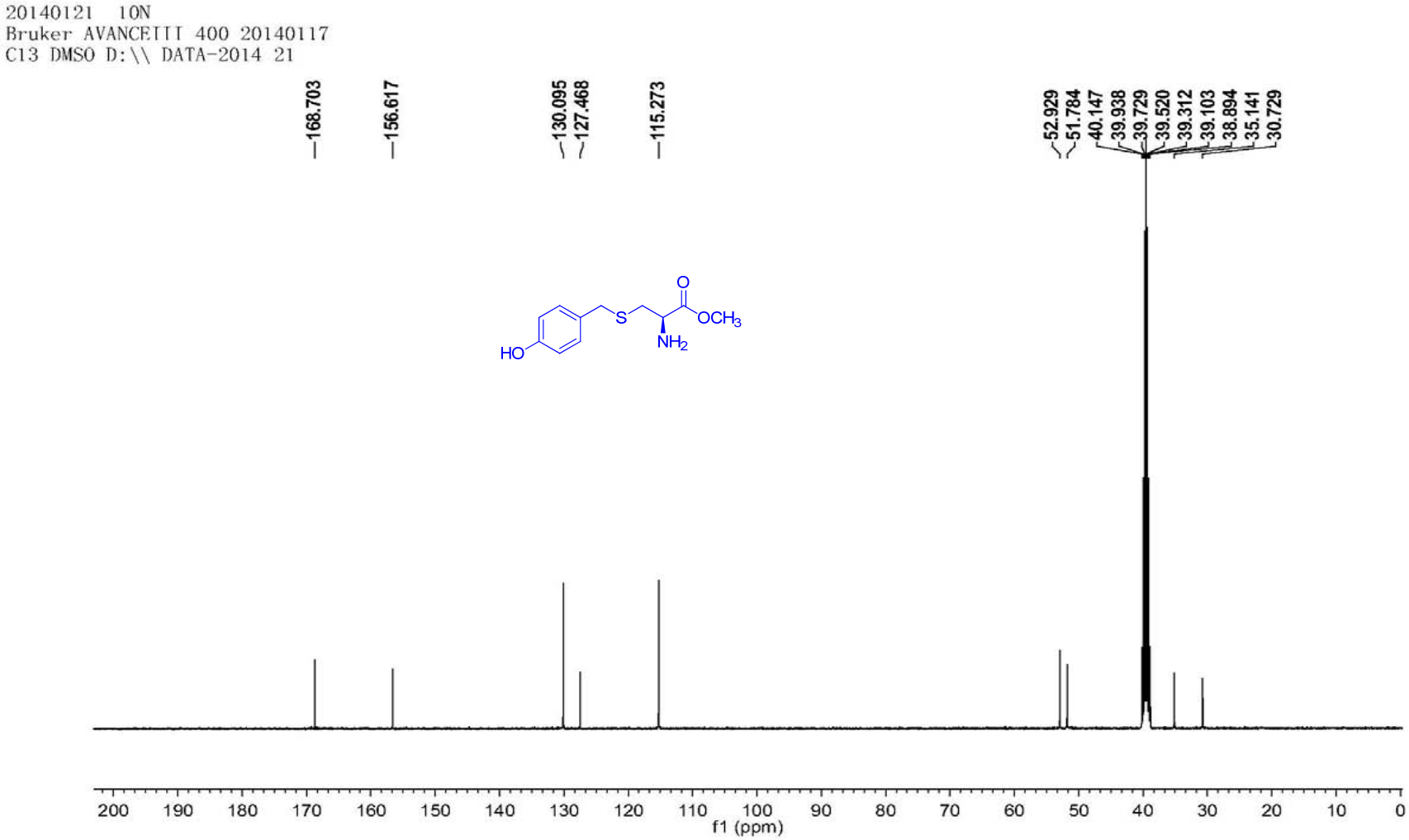


Figure S77. The ^{13}C NMR Spectrum of the Synthesized Methyl *S*-(4′-Hydroxybenzyl)-L-cysteinate in DMSO-d_6 (100 MHz)

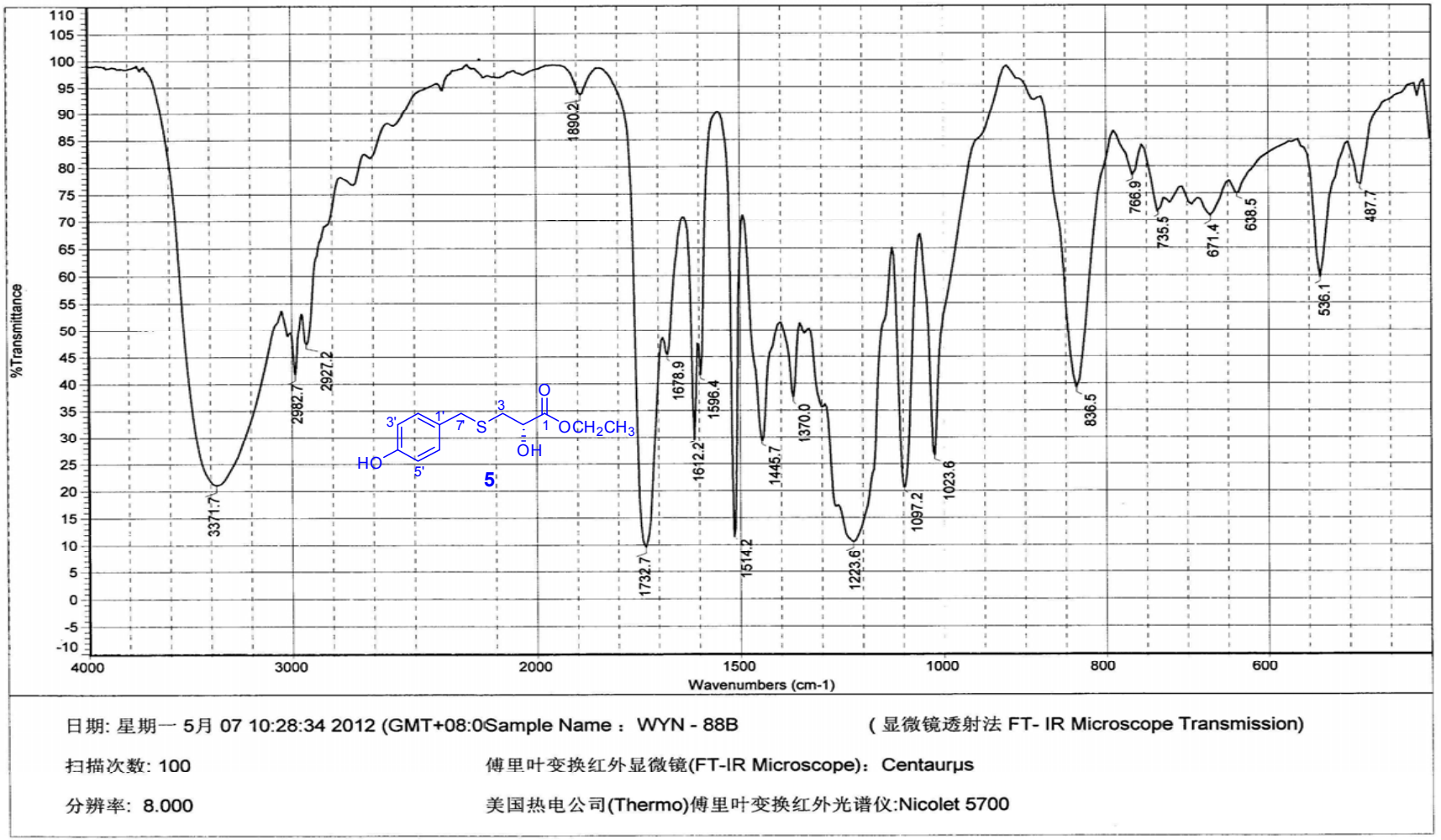


Figure S78. The IR Spectrum of Compound **5**

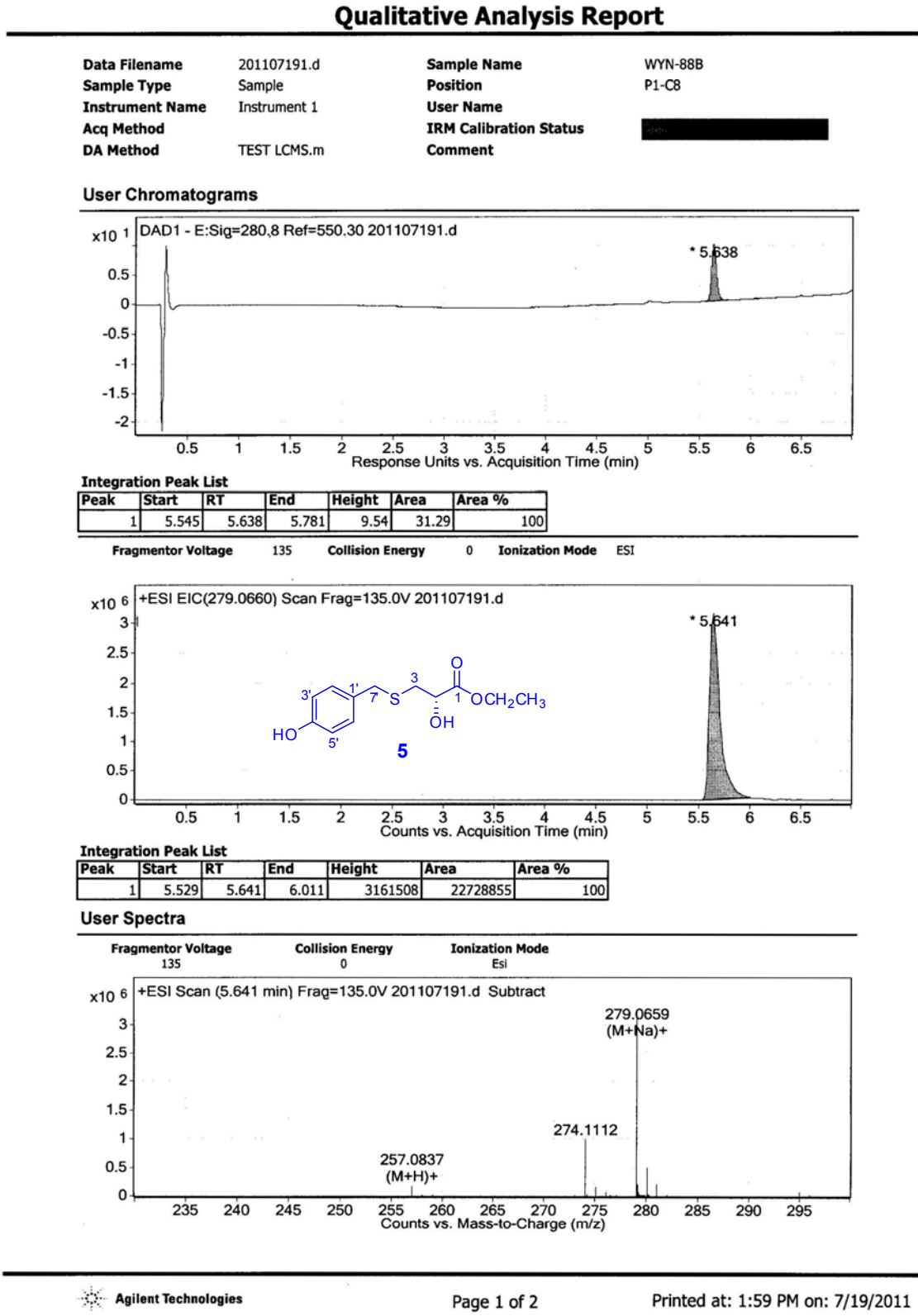


Figure S79. The (+)-HRESIMS Report of Compound **5**, Page 1

Qualitative Analysis Report

Peak List

m/z	z	Abund	Formula	Ion
107.0431		440910		
257.0837		175008	C12 H17 O4 S	(M+H)+
274.1112		970918		
279.0659	1	3167434	C12 H16 Na O4 S	(M+Na)+
279.2106		205954		
280.0695	1	495496	C12 H16 Na O4 S	(M+Na)+
281.0647	1	210903	C12 H16 Na O4 S	(M+Na)+
535.1441	1	854594		
536.1466	1	251982		

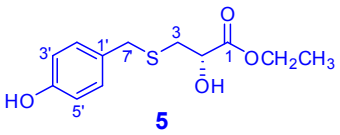
Formula Calculator Element Limits

Element	Min	Max
C	3	100
H	0	120
O	0	30
N	0	5
S	0	5
Cl	0	0

Formula Calculator Results

Formula	Best	Mass	Tgt Mass	Diff (ppm)	Ion Species	Score
C12 H16 O4 S	TRUE	256.0767	256.0769	0.79	C12 H16 Na O4 S	99.9
C13 H12 N4 S		256.0767	256.0783	6	C13 H12 N4 Na S	99.41
C16 H8 N4		256.0767	256.0749	-7.15	C16 H8 N4 Na	96.91
C12 H16 O4 S	TRUE	256.0764	256.0769	2.07	C12 H17 O4 S	99.47
C13 H12 N4 S		256.0764	256.0783	7.29	C13 H13 N4 S	98.5
C16 H8 N4		256.0764	256.0749	-5.85	C16 H9 N4	93.87

--- End Of Report ---



5

Figure S80. The (+)-HRESIMS Report of Compound **5**, Page 2

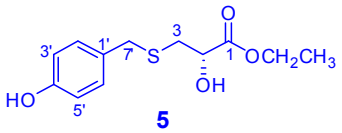
MS Formula Results: + Scan (5.641 min) Sub (201107191.d)

m/z	Ion	Formula	Abundance
257.0837	(M+H)+	C12 H17 O4 S	175008.1

Best	Formula (M)	Ion Formula	Calc m/z	Score	Cross S	Mass	Calc Mass	Diff (ppm)	Abs Diff (ppm)	Abund Match	Spacing Mat	Mass Match	m/z	DBE
☑	C12 H16 O4 S	C12 H17 O4 S	257.0842	99.47		256.0764	256.0769	2.07	2.07	99.02	99.21	99.87	257.0837	5
☐	C13 H12 N4 S	C13 H13 N4 S	257.0855	98.5		256.0764	256.0783	7.29	7.29	97.76	99.51	98.43	257.0837	10
☐	C16 H8 N4	C16 H9 N4	257.0822	93.87		256.0764	256.0749	-5.85	5.85	88.7	89.85	98.99	257.0837	15

m/z	Ion	Formula	Abundance
279.0659	(M+Na)+	C12 H16 Na O4 S	3167433.8

Best	Formula (M)	Ion Formula	Calc m/z	Score	Cross S	Mass	Calc Mass	Diff (ppm)	Abs Diff (ppm)	Abund Match	Spacing Mat	Mass Match	m/z	DBE
☑	C12 H16 O4 S	C12 H16 Na O4 S	279.0662	99.9		256.0767	256.0769	0.79	0.79	99.7	99.95	99.98	279.0659	5
☐	C13 H12 N4 S	C13 H12 N4 Na S	279.0675	99.41		256.0767	256.0783	6	6	99.75	99.67	99.08	279.0659	10
☐	C16 H8 N4	C16 H8 N4 Na	279.0641	96.91		256.0767	256.0749	-7.15	7.15	93.94	96.93	98.69	279.0659	15



5

Figure S81. The (+)-HRESIMS Report of Compound **5**, Page 3

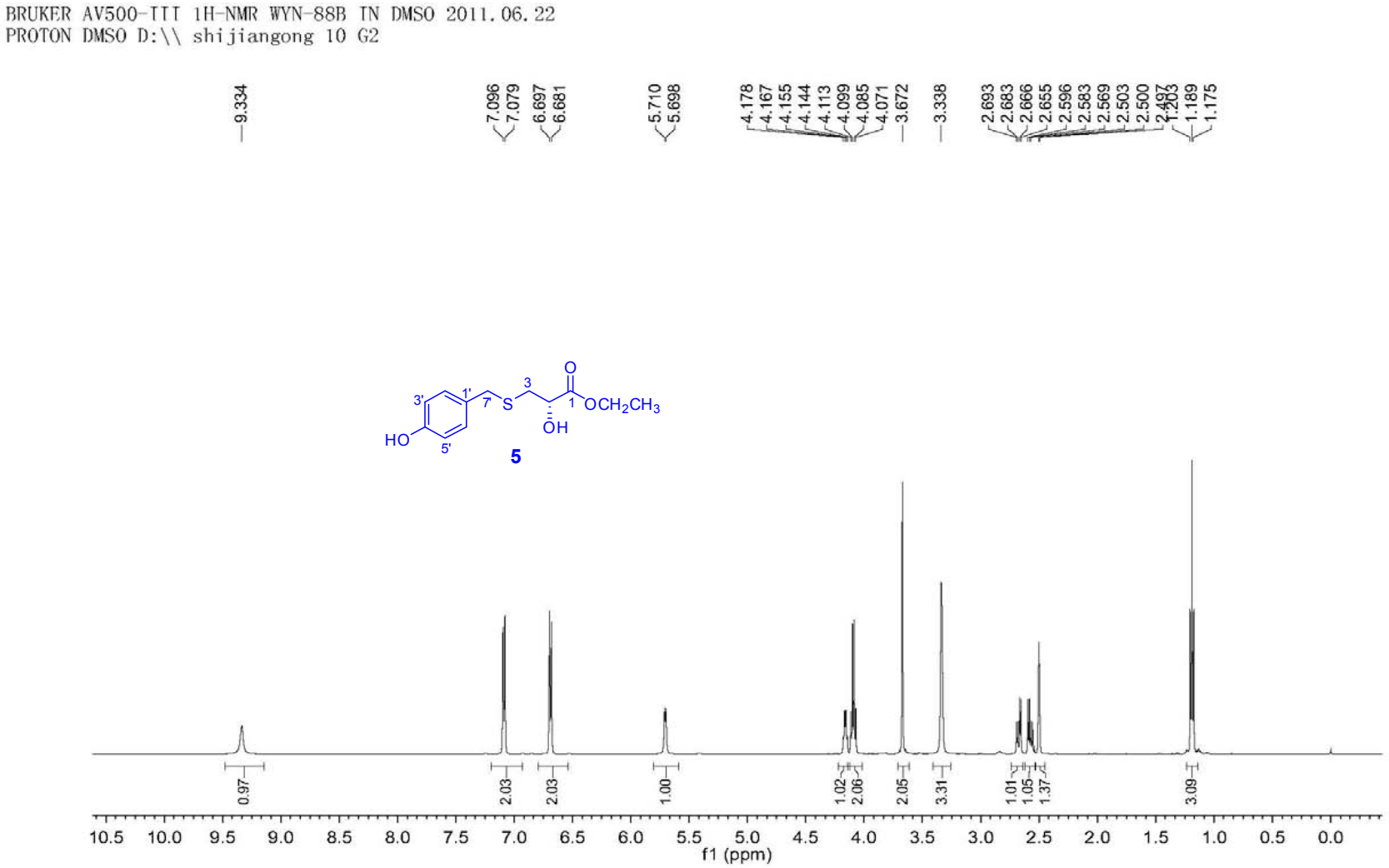
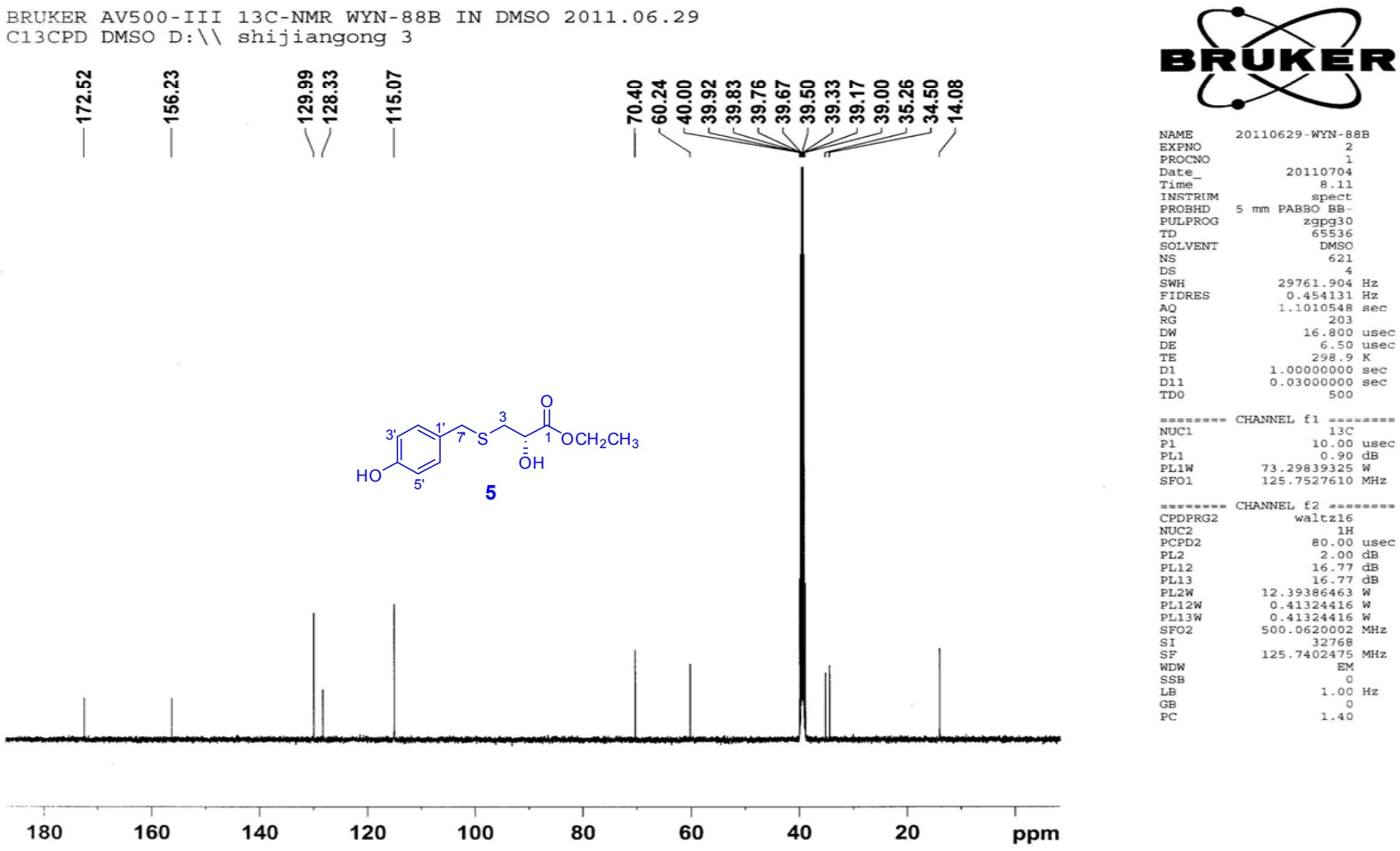


Figure S82. The ^{1}H NMR Spectrum of Compound **5** in DMSO-d_6 (500 MHz)

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PROCNO                       1
Date_                 20110704
Time                      8.11
INSTRUM                  spect
PROBHD    5 mm PABBO BB-
PULPROG                zgpg30
TD                      65536
SOLVENT                  DMSO
NS                        621
DS                          4
SWH                 29761.904 Hz
FIDRES              0.454131 Hz
AQ                  1.1010548 sec
RG                        203
DW                     16.800 usec
DE                      6.50 usec
TE                     298.9 K
D1                  1.00000000 sec
D11                 0.03000000 sec
TD0                       500

======== CHANNEL f1 ========
NUC1                      13C
P1                     10.00 usec
PL1                     0.90 dB
PL1W               73.29839325 W
SFO1               125.7527610 MHz

======== CHANNEL f2 ========
CPDPRG2                waltz16
NUC2                       1H
PCPD2                  80.00 usec
PL2                     2.00 dB
PL12                   16.77 dB
PL13                   16.77 dB
PL2W               12.39386463 W
PL12W               0.41324416 W
PL13W               0.41324416 W
SFO2               500.0620002 MHz
SI                       32768
SF                 125.7402475 MHz
WDW                         EM
SSB                          0
LB                      1.00 Hz
GB                           0
PC                      1.40
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Figure S83. The ^{13}C NMR Spectrum of Compound **5** in DMSO-d_6 (125 MHz)

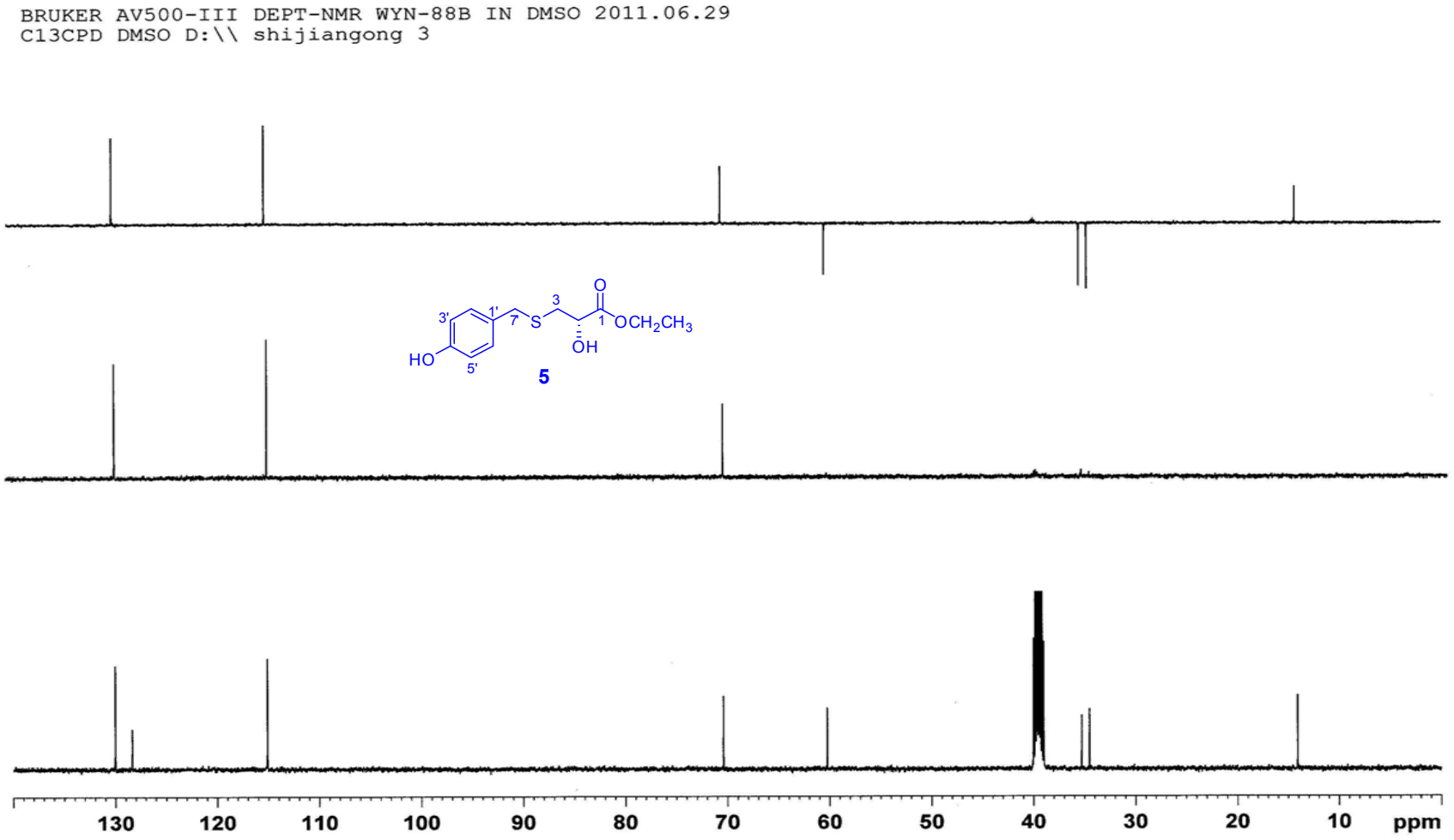


Figure S84. The DEPT Spectrum of Compound **5** in DMSO-d_6 (125 MHz)

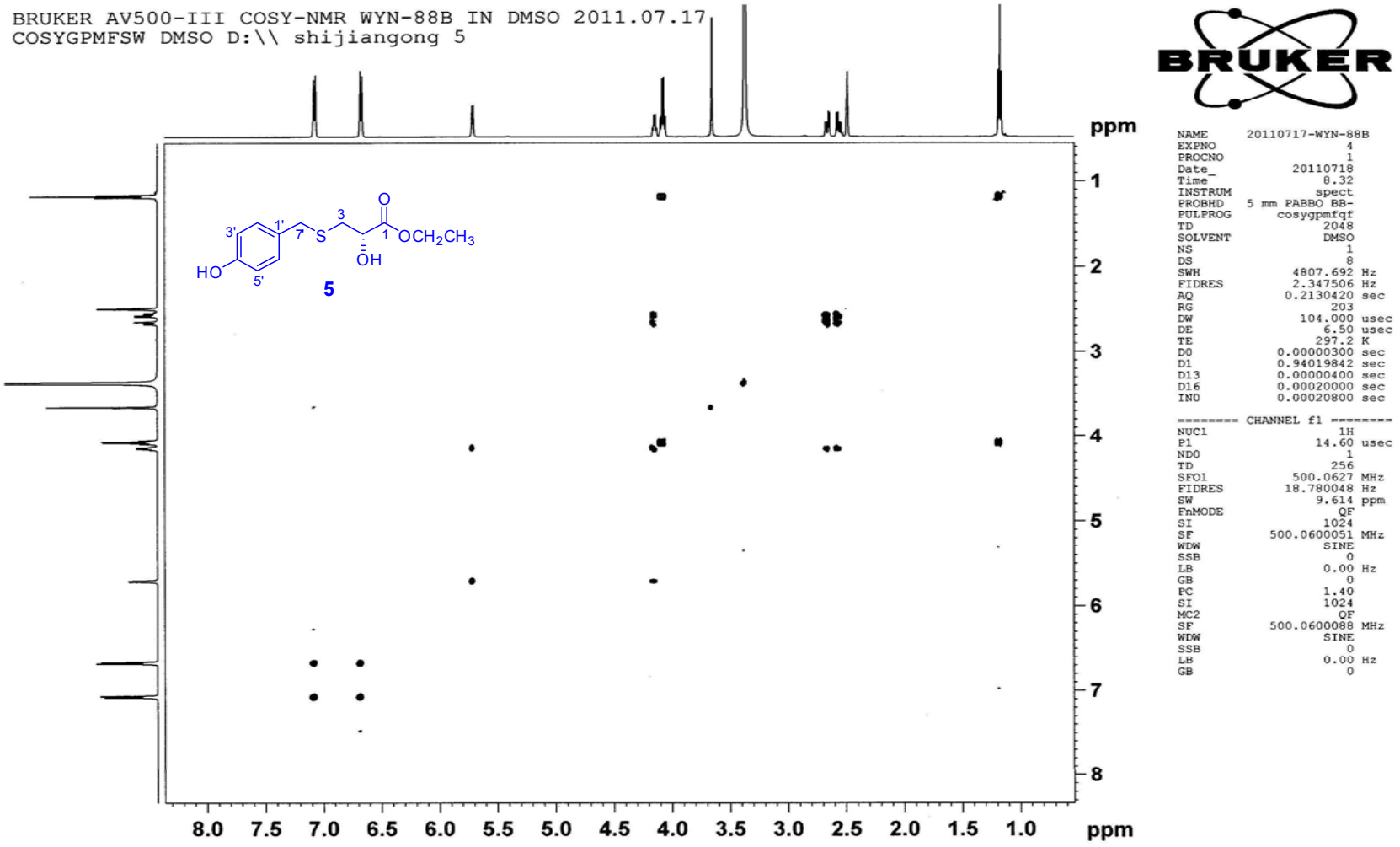


Figure S85. The ^{1}H-^{1}H COSY Spectrum of Compound **5** in DMSO-d_6 (500 MHz)

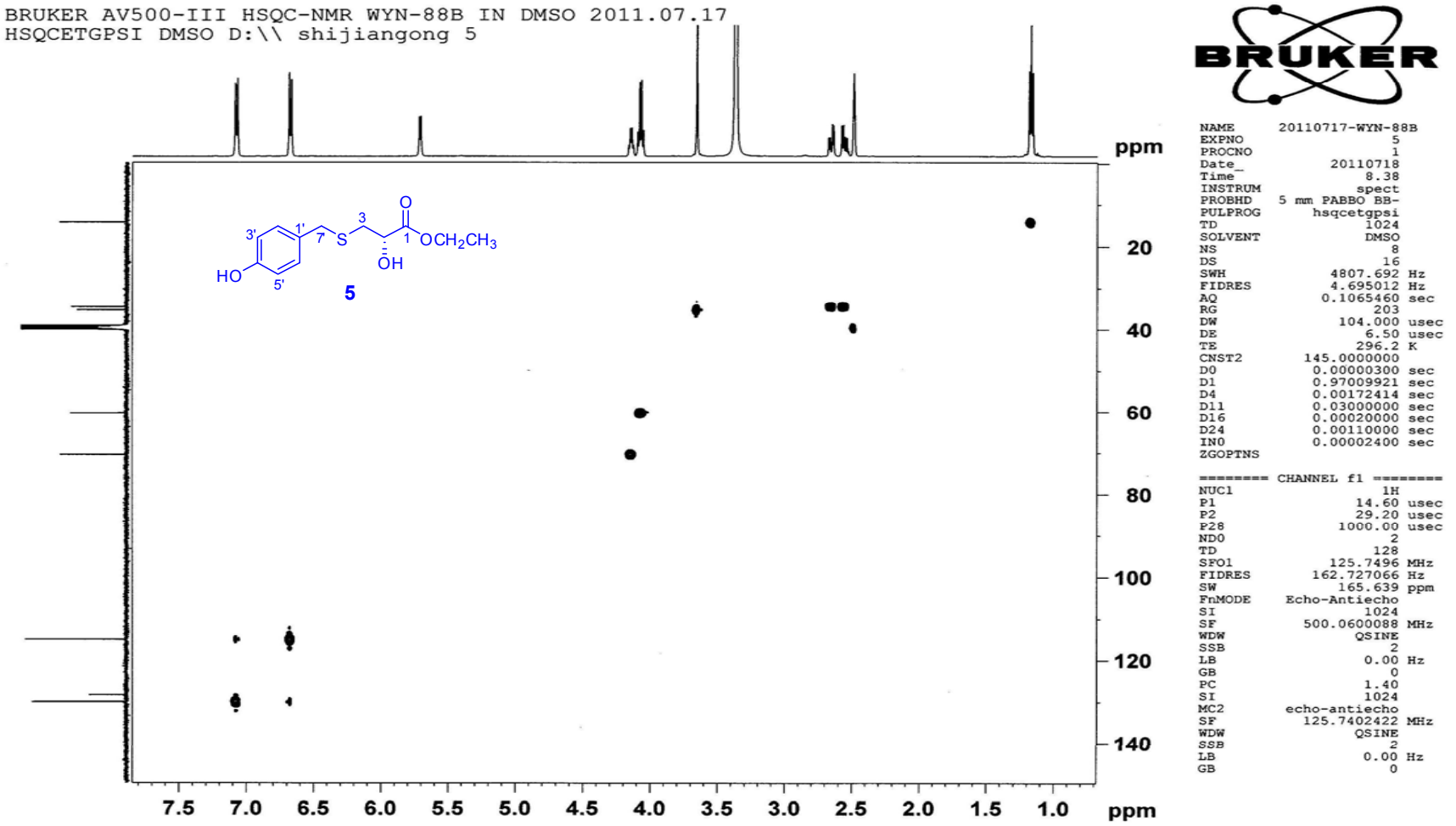


Figure S86. The HSQC Spectrum of Compound **5** in DMSO-d_6 (500 MHz)

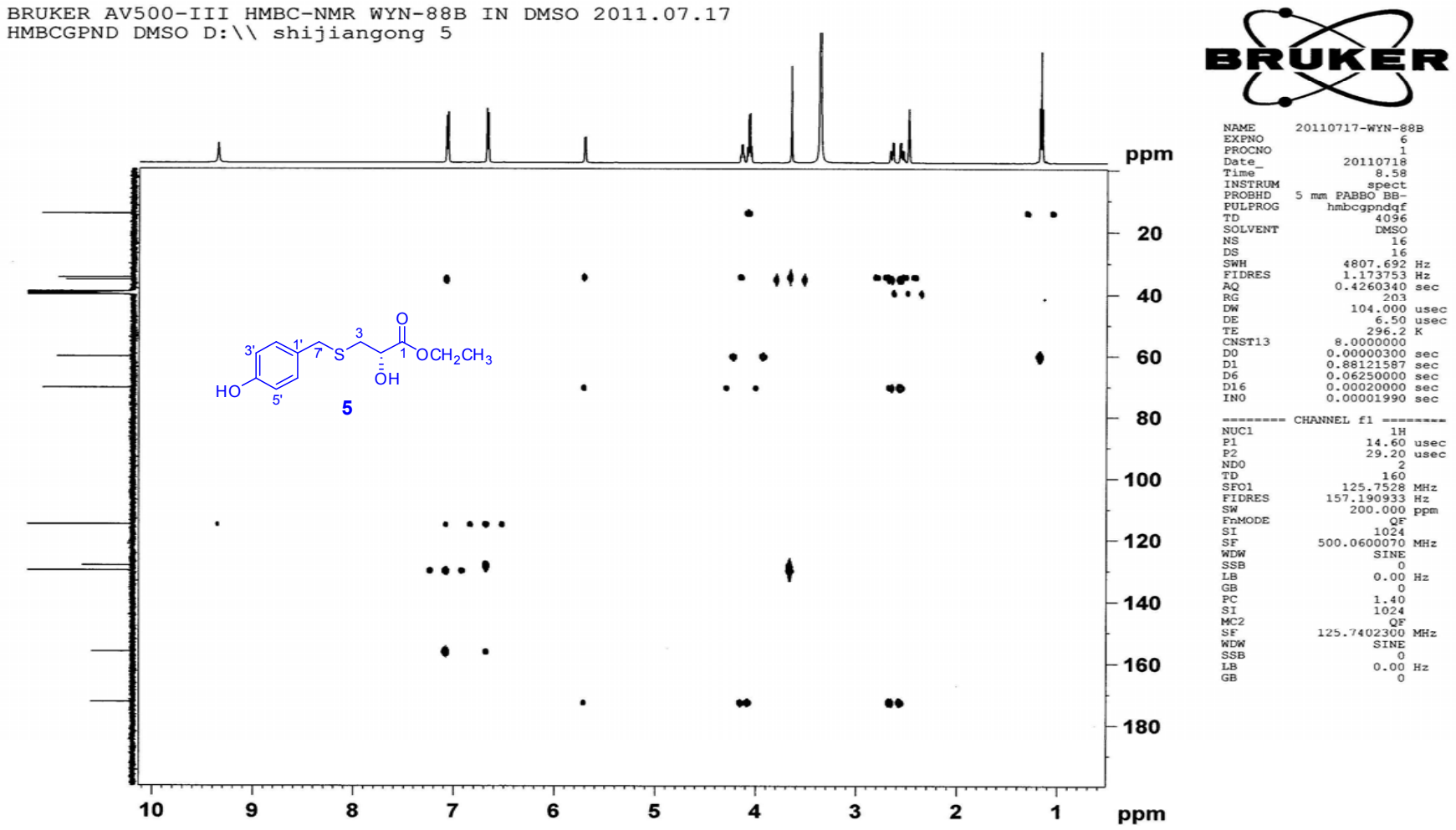


Figure S87. The HMBC Spectrum of Compound **5** in DMSO-d_6 (500 MHz)

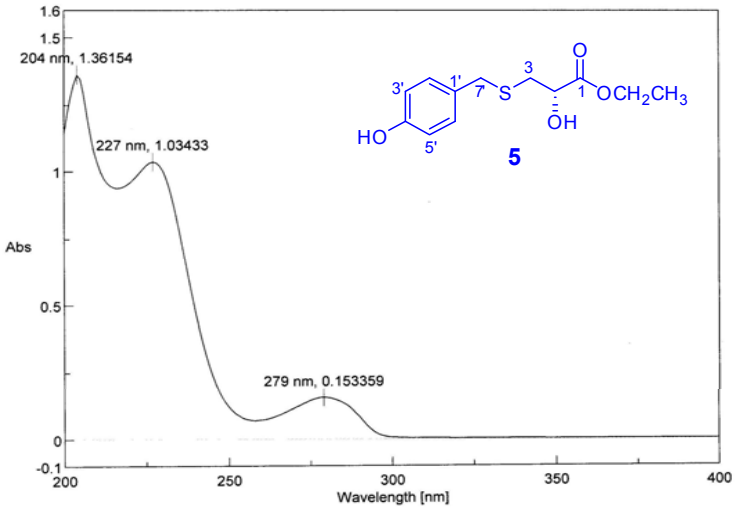


Figure S88. The UV Spectrum of Compound **5** in MeOH

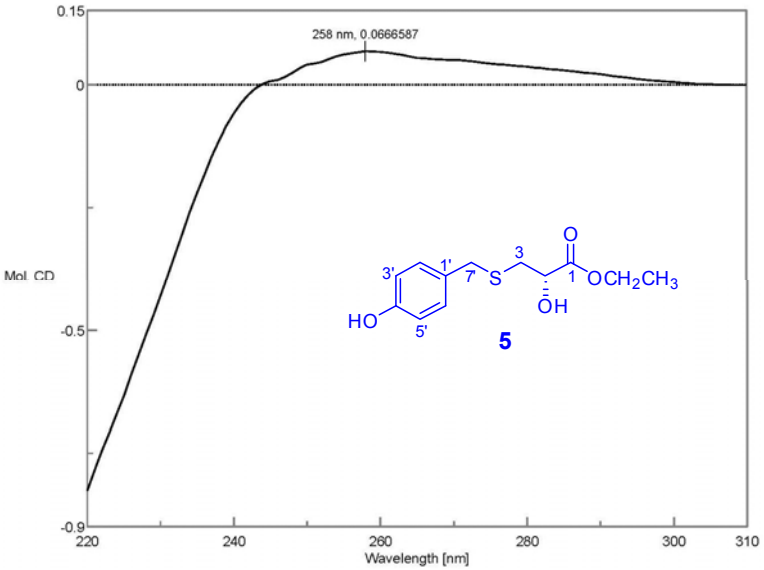


Figure S89. The CD Spectrum of Compound **5** in CH_2Cl_2

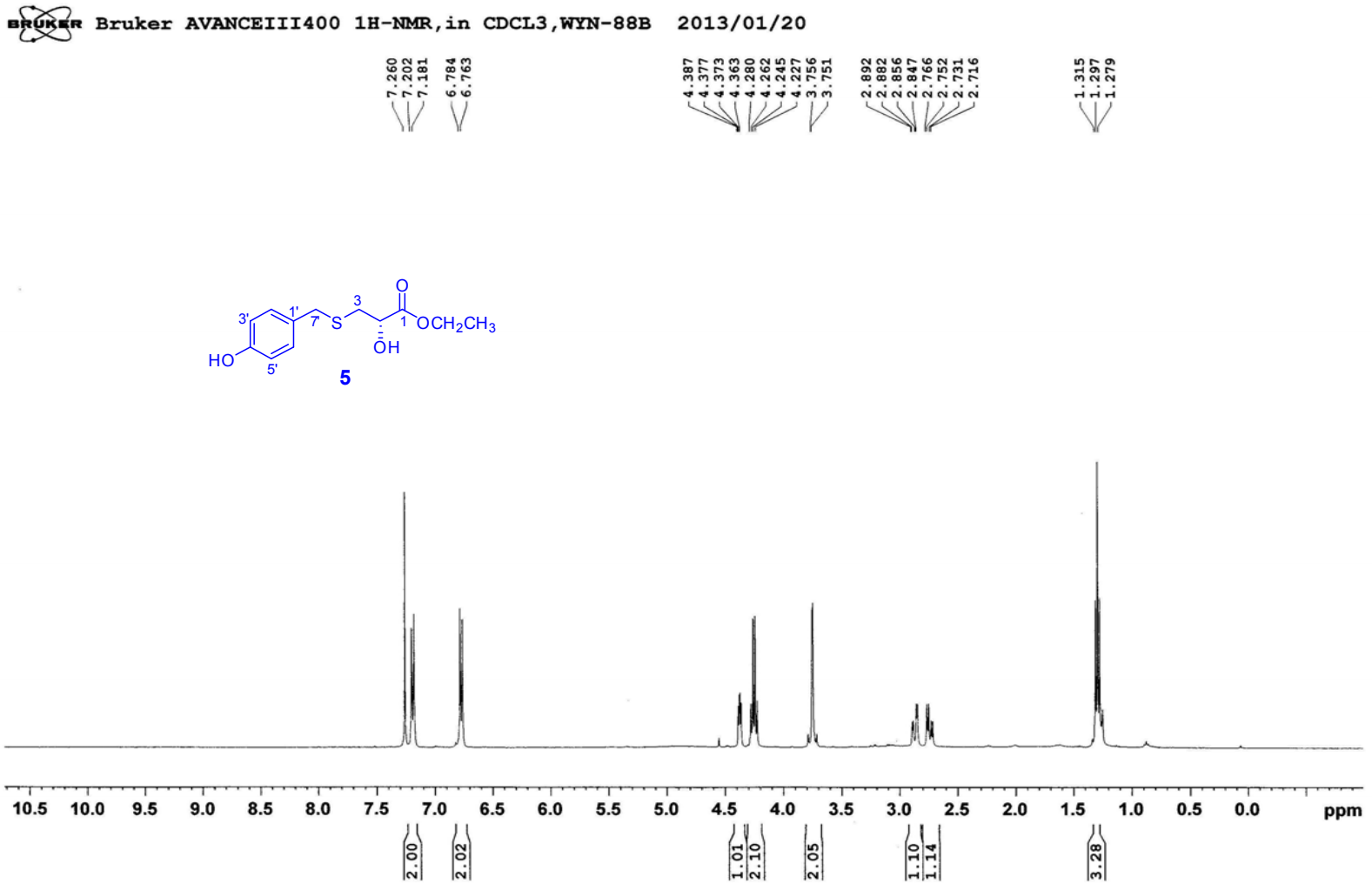


Figure S90. The ^{1}H NMR Spectrum of Compound **5** in CD_3Cl (400 MHz)

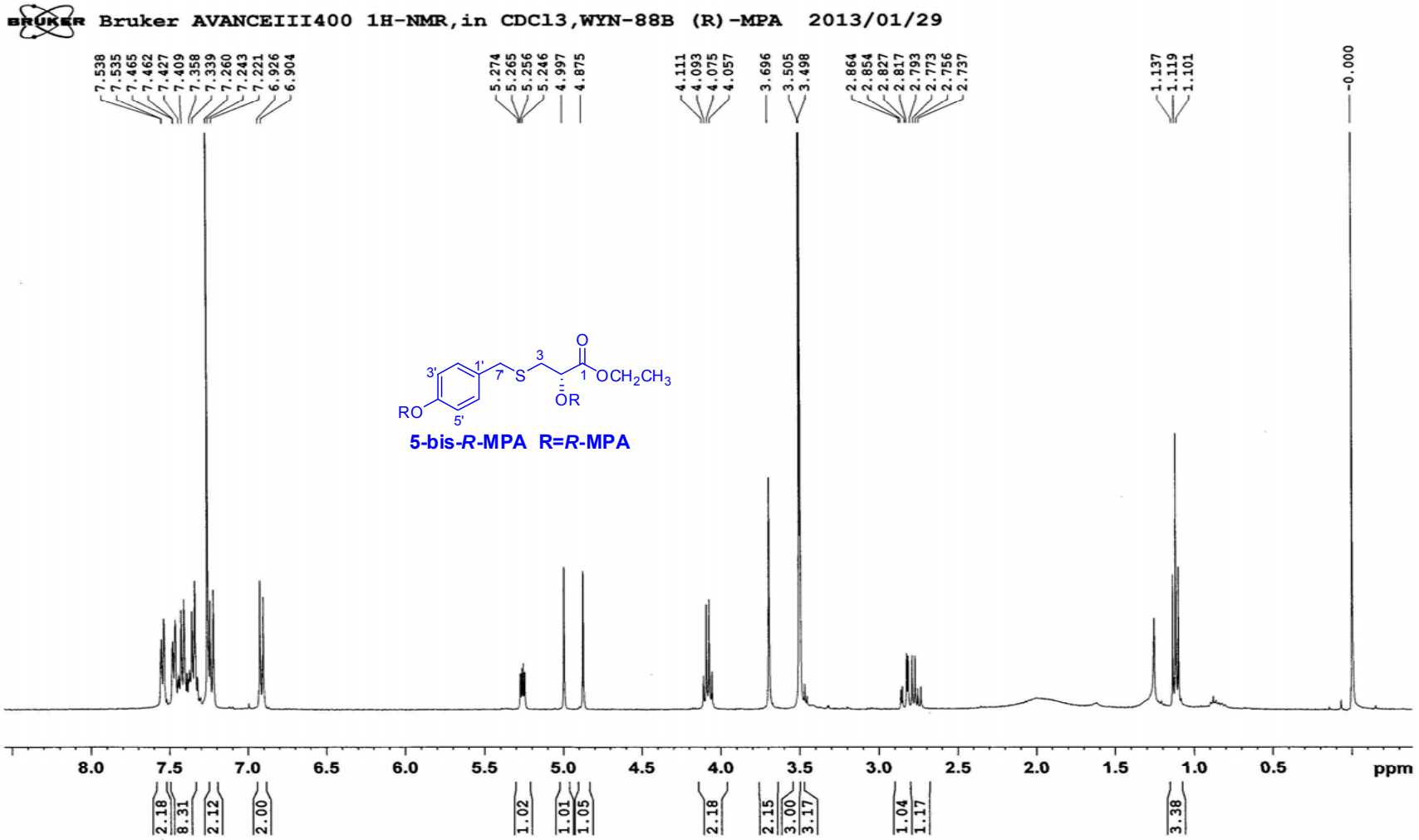


Figure S91. The ^{1}H NMR Spectrum of Compound **5**-bis-(*R*)-MPA in CD_3Cl (400 MHz)

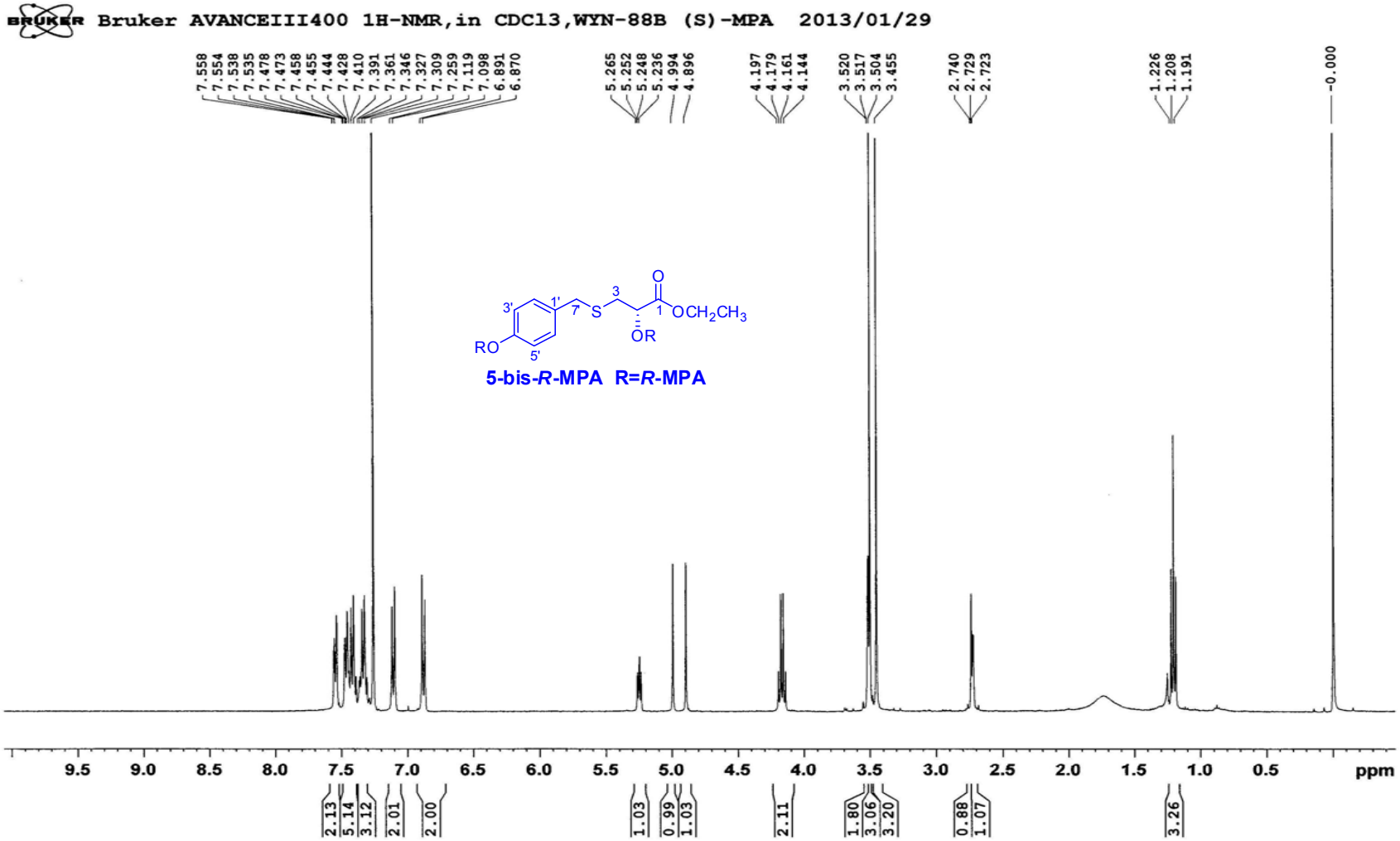


Figure S92. The ^{1}H NMR Spectrum of Compound **5**-bis-(*S*)-MPA in CD_3Cl (400 MHz)

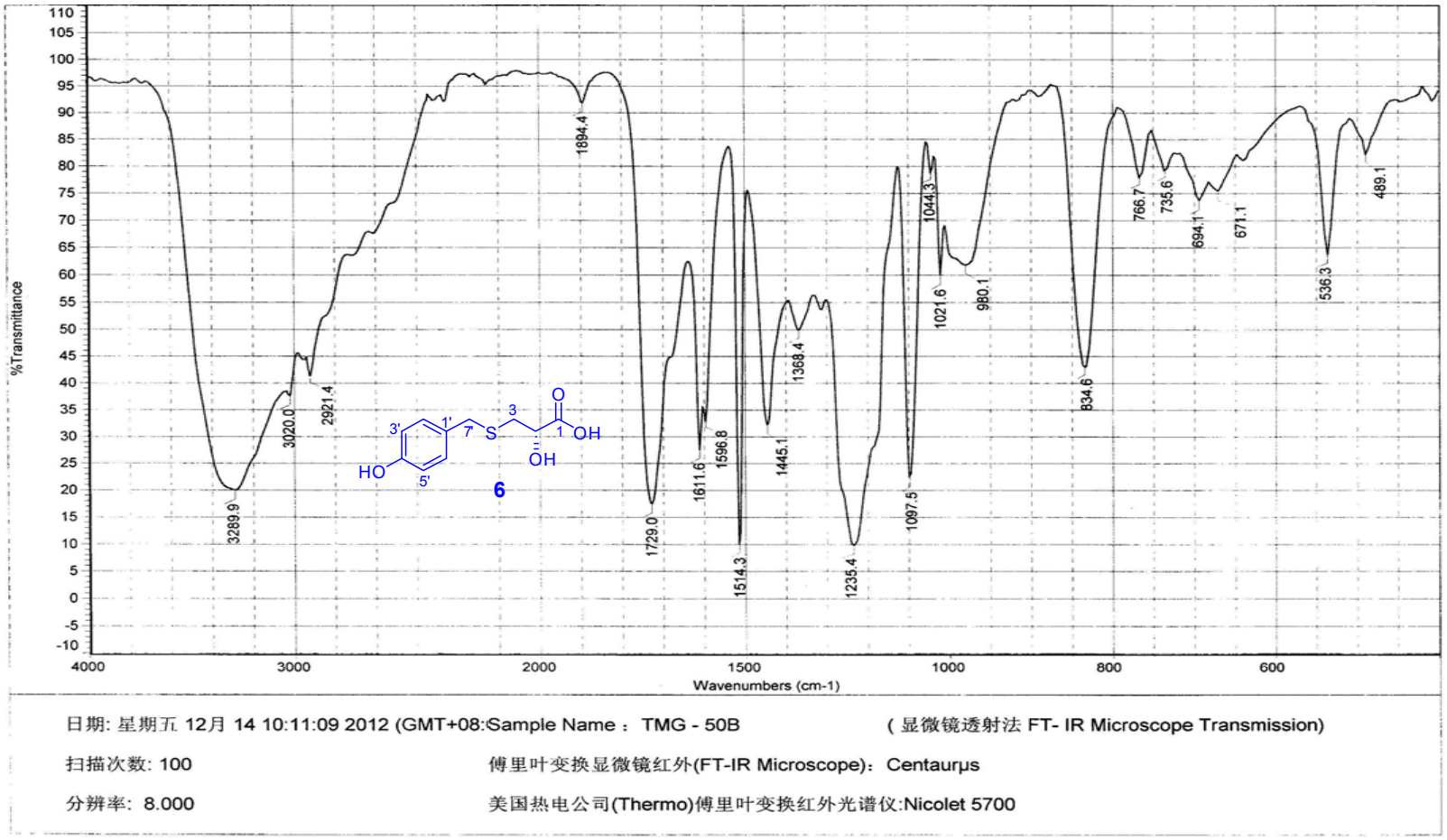


Figure S93. The IR Spectrum of Compound **6**

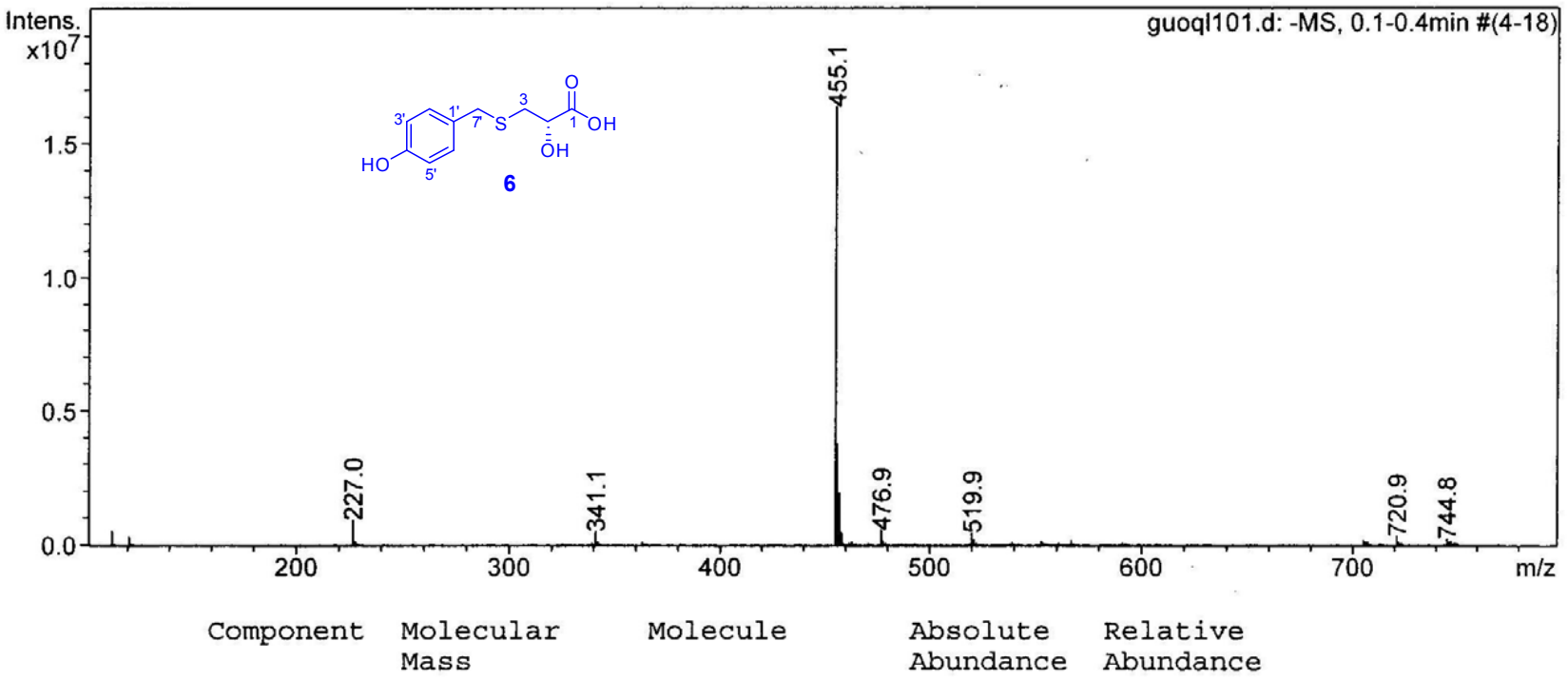


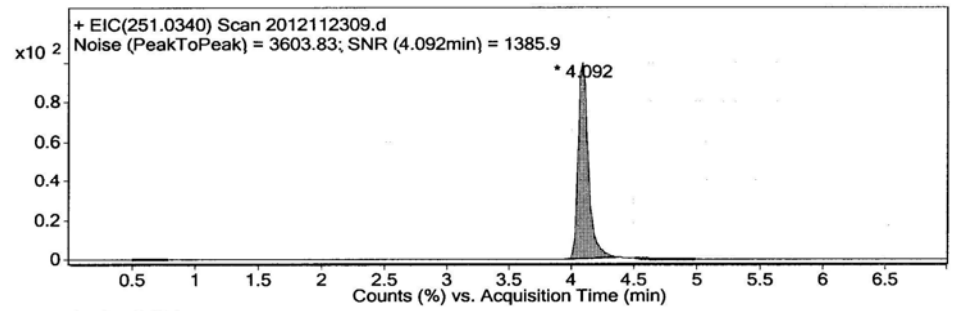
Figure S94. The (−)-ESIMS Spectrum of Compound **6**

Qualitative Analysis Report

Data Filename	2012112309.d	**Sample Name**	TMG-50B
Sample Type	Sample	**Position**	P1-E2
Instrument Name	Instrument 1	**User Name**	
Acq Method		**IRM Calibration Status**	[redacted]
DA Method	TEST LCMS.m	**Comment**	

User Chromatograms

Fragmentor Voltage 135 **Collision Energy** 0 **Ionization Mode** ESI



Integration Peak List

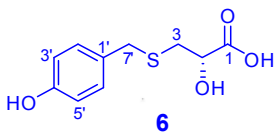
Peak	Start	RT	End	Height	Area	Area %	Signal To Noise
1	3.947	4.092	4.382	867130	4994421	100	1385.9

Noise Measurements

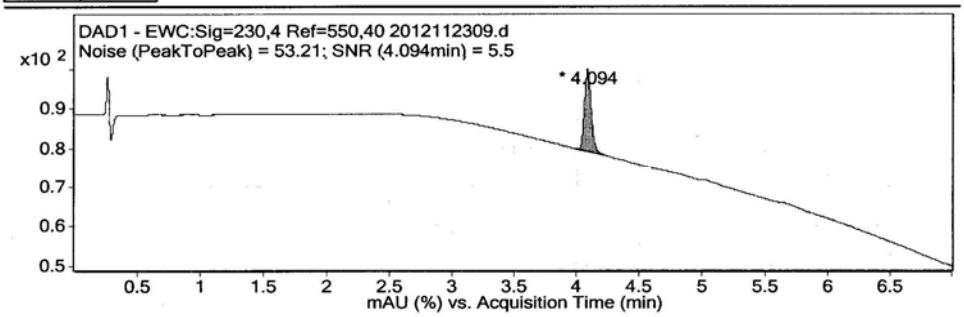
Noise Type	Signal Definition	Noise Multiplier	Noise Value
Peak-to-Peak	Area	1	3603.830811

Noise Regions

Start	End
0.5	0.8
4.5	5
8.6	9.4
9.8	11



6



Integration Peak List

Peak	Start	RT	End	Height	Area	Area %	Signal To Noise
1	3.98	4.094	4.224	76.98	292.021	100	5.5

Noise Measurements

Noise Type	Signal Definition	Noise Multiplier	Noise Value
Peak-to-Peak	Area	1	53.21118164

Noise Regions

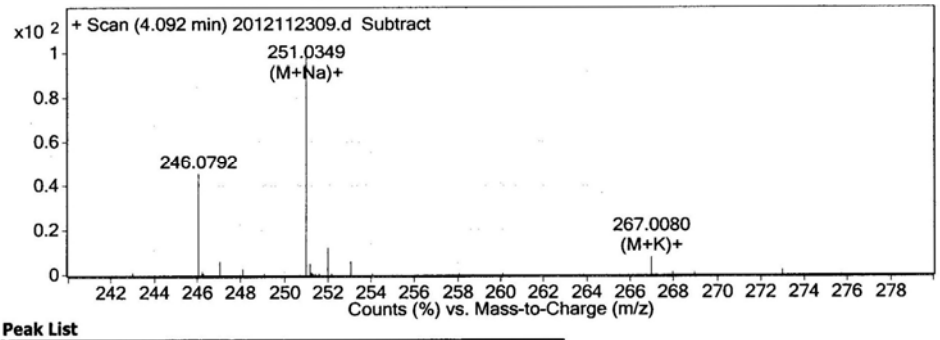
Start	End
0.5	0.8
4.5	5
8.6	9.4
9.8	11

Figure S95. The (+)-HRESIMS Report of Compound **6**, Page 1

Qualitative Analysis Report

User Spectra

Fragmentor Voltage	Collision Energy	Ionization Mode
135	0	Esi



Peak List

m/z	z	Abund	Formula	Ion
107.0492		499117		
246.0792	1	395457		
247.0823	1	51766		
251.0349	1	869821	C10 H12 Na O4 S	(M+Na)+
251.1709		44696		
252.0375	1	104046	C10 H12 Na O4 S	(M+Na)+
253.0324	1	49455	C10 H12 Na O4 S	(M+Na)+
267.008		63868	C10 H12 K O4 S	(M+K)+
335.0937		87329		
476.0714		47936		

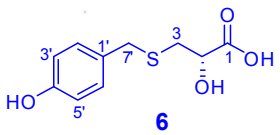
Formula Calculator Element Limits

Element	Min	Max
C	3	100
H	0	500
O	0	90
N	0	4
S	0	2
Cl	0	0
Br	0	1

Formula Calculator Results

Formula	Best	Mass	Tgt Mass	Diff (ppm)	Ion Species	Score
C10 H12 O4 S	TRUE	228.0457	228.0456	-0.3	C10 H12 Na O4 S	99.96
C11 H8 N4 S		228.0457	228.047	5.56	C11 H8 N4 Na S	99.42
C10 H12 O4 S	TRUE	228.0448	228.0456	3.52	C10 H12 K O4 S	99.72
C11 H8 N4 S		228.0448	228.047	9.38	C11 H8 K N4 S	98.64

--- End Of Report ---



6

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Figure S96. The (+)-HRESIMS Report of Compound **6**, Page 2

MS Formula Results: + Scan (4.092 min) Sub (2012112309.d)

m/z	Ion	Formula	Abundance
251.0349	(M+Na)+	C10 H12 Na O4 S	869820.9

Best	Formula (M)	Ion Formula	Calc m/z	Score	Cross S	Mass	Calc Mass	Diff (ppm)	Abs Diff (ppm)	Abund Match	Spacing Mat	Mass Match	m/z	DBE
☑	C10 H12 O4 S	C10 H12 Na O4 S	251.0349	99.96		228.0457	228.0456	-0.3	0.3	99.99	99.87	100	251.0349	5
☐	C11 H8 N4 S	C11 H8 N4 Na S	251.0362	99.42		228.0457	228.047	5.56	5.56	99.23	100	99.24	251.0349	10

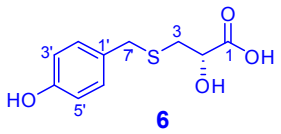

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Figure S97. The (+)-HRESIMS Report of Compound **6**, Page 3

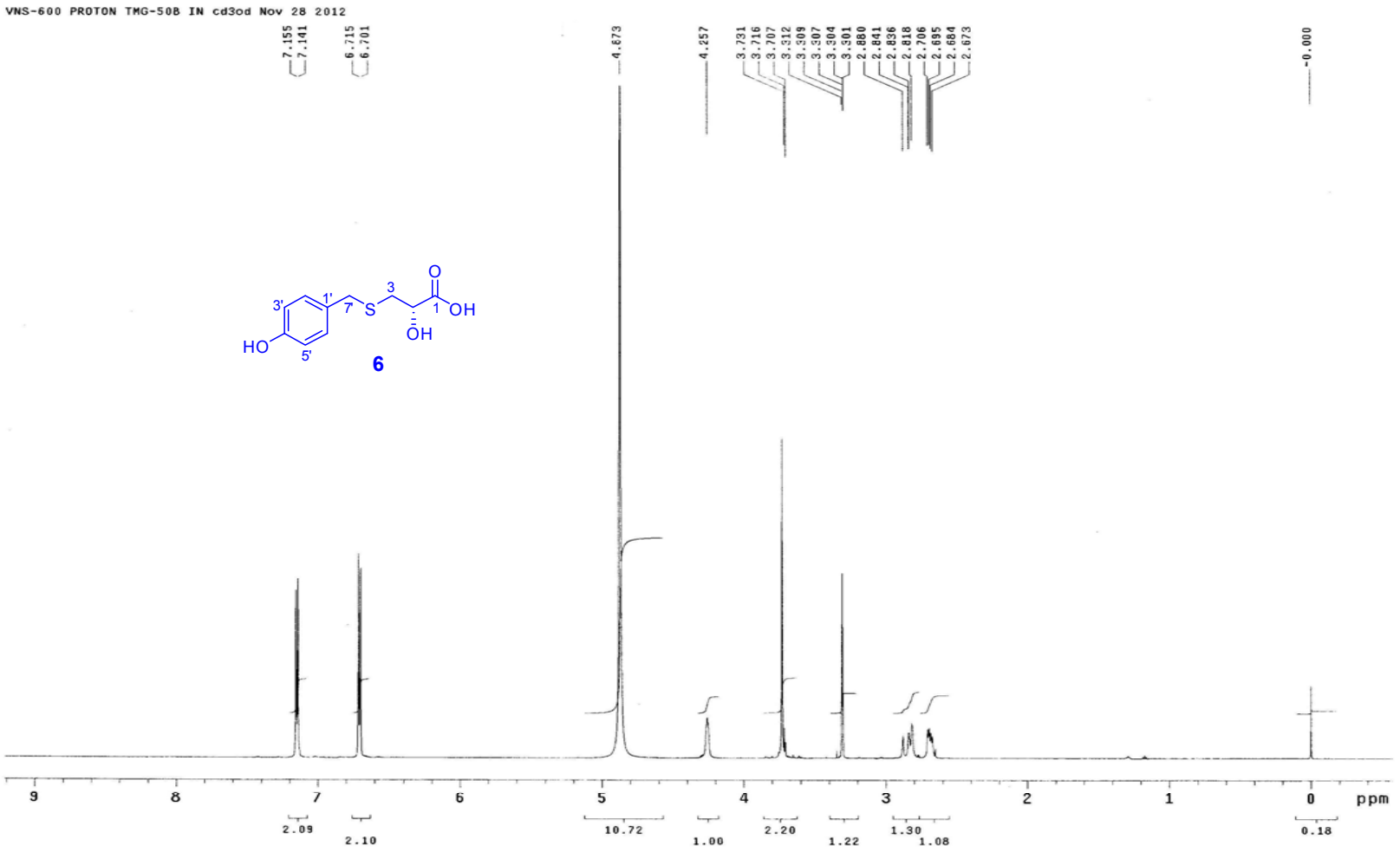

Figure S98. The ^{1}H NMR Spectrum of Compound **6** in MeOH-d_4 (600 MHz)

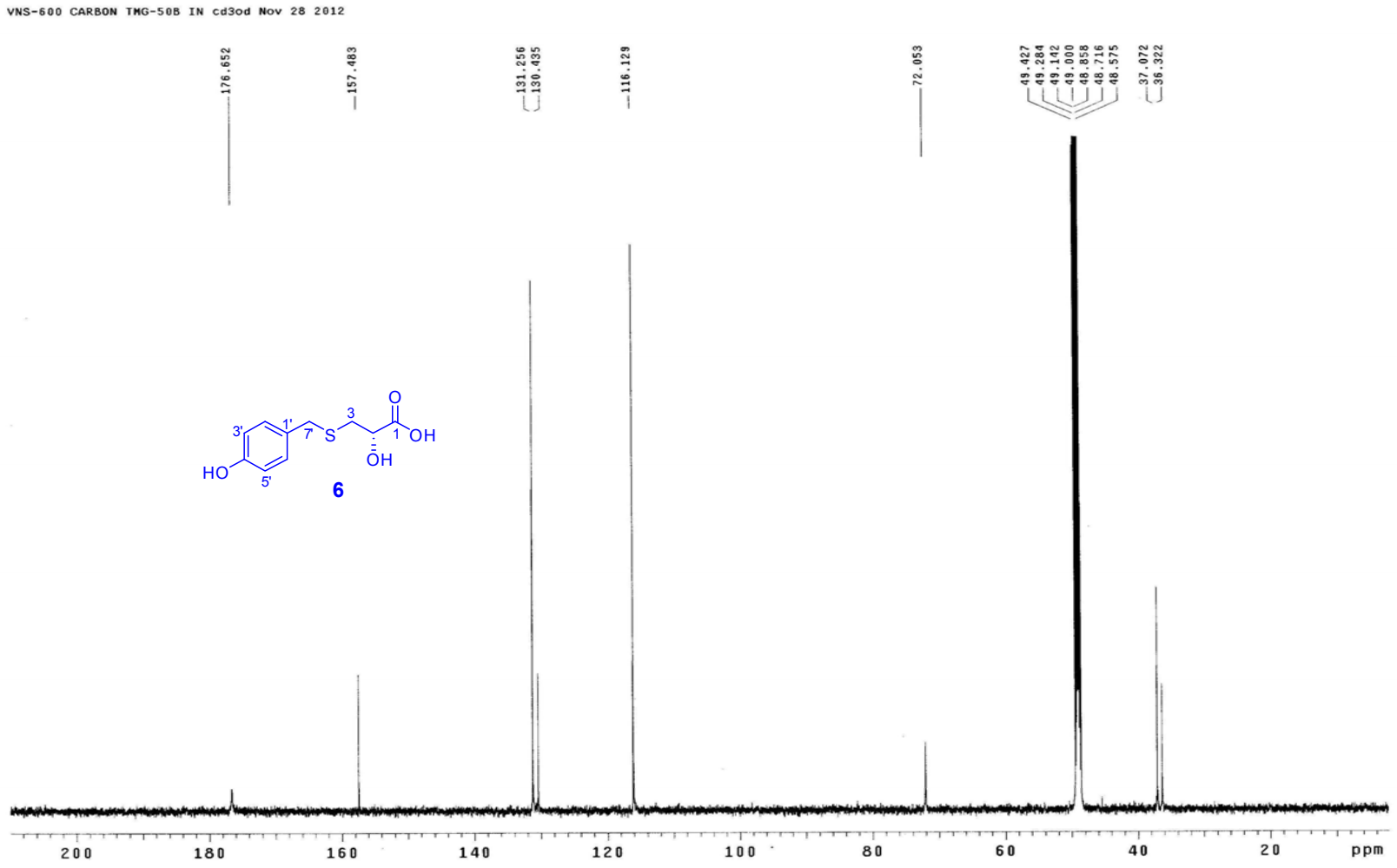

Figure S99. The ^{13}C NMR Spectrum of Compound **6** in MeOH-d_4 (150 MHz)

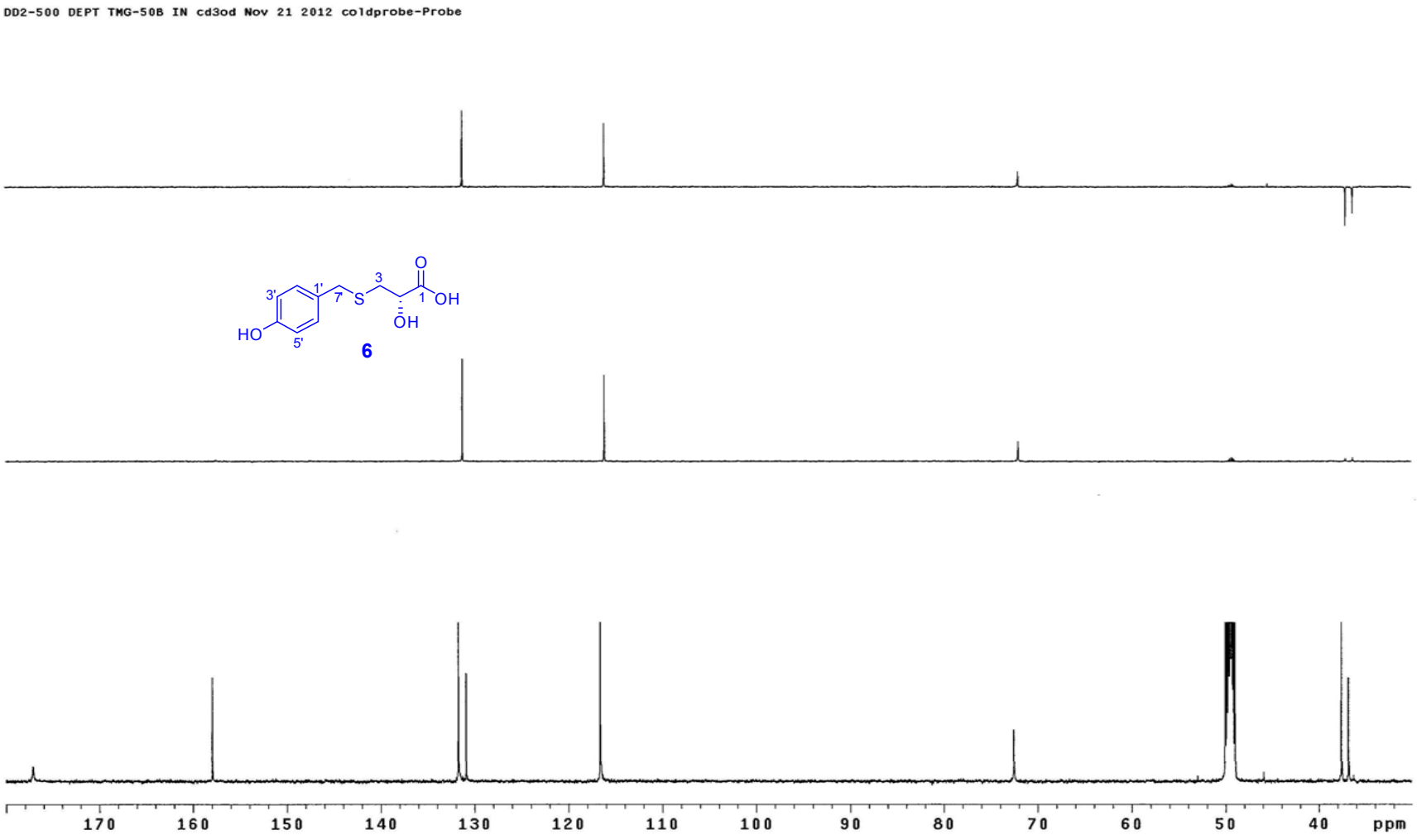

Figure S100. The DEPT Spectrum of Compound **6** in MeOH-d_4 (150 MHz)

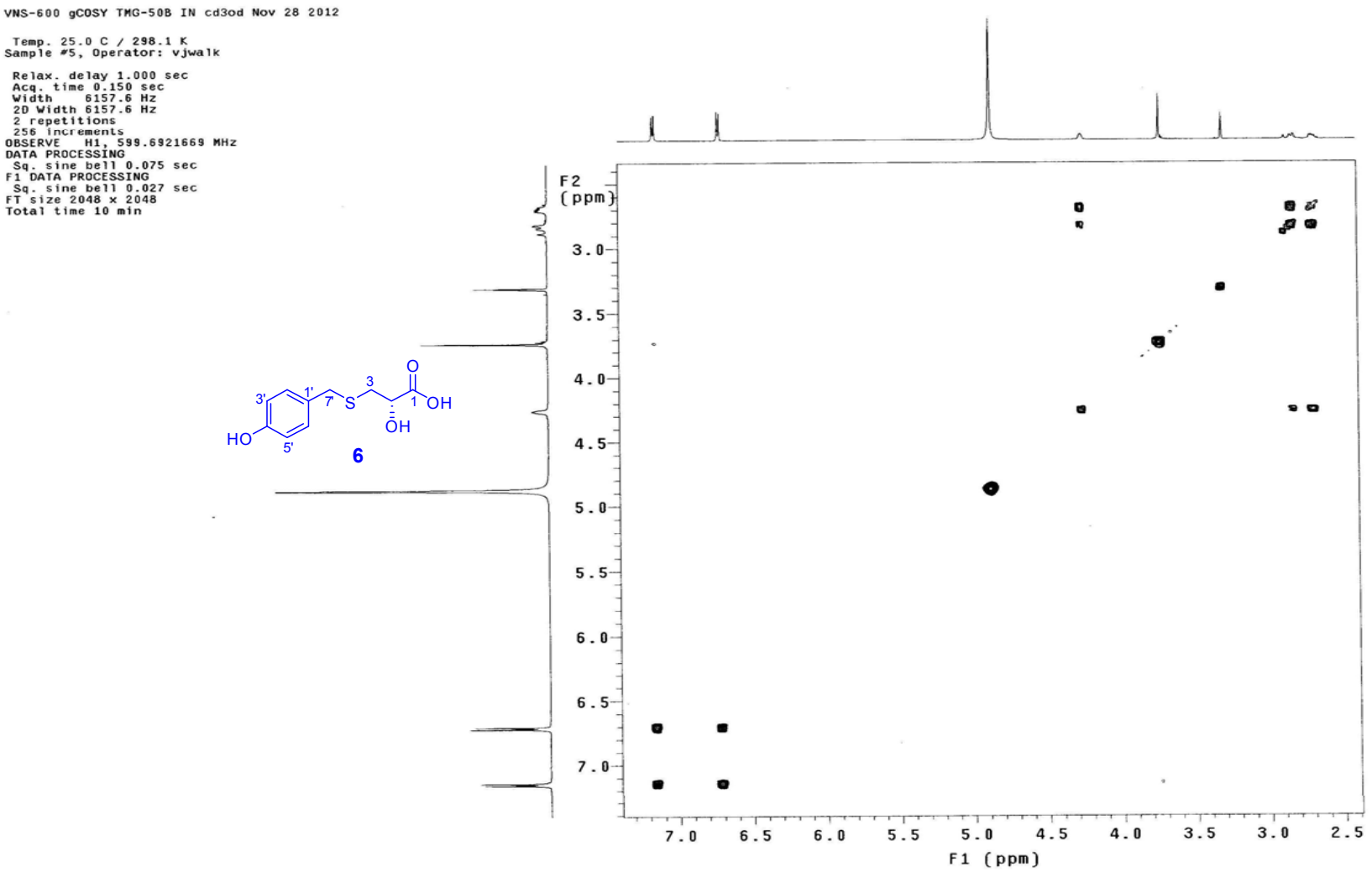

Figure S101. The ^{1}H-^{1}H gCOSY Spectrum of **6** in MeOH-d_4 (600 MHz)

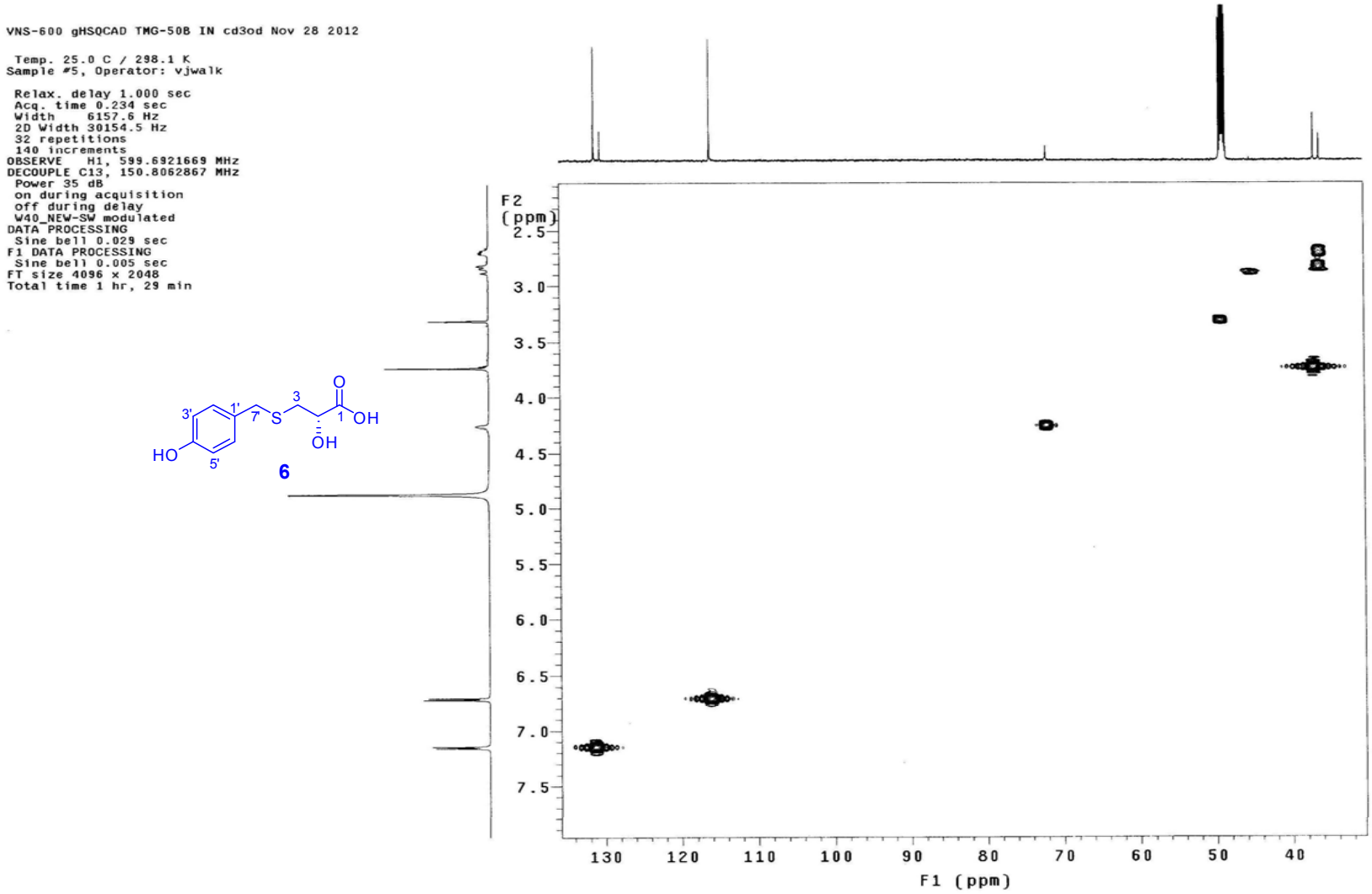

Figure S102. The gHSQC Spectrum of Compound **6** in MeOH-d_4 (600 MHz)

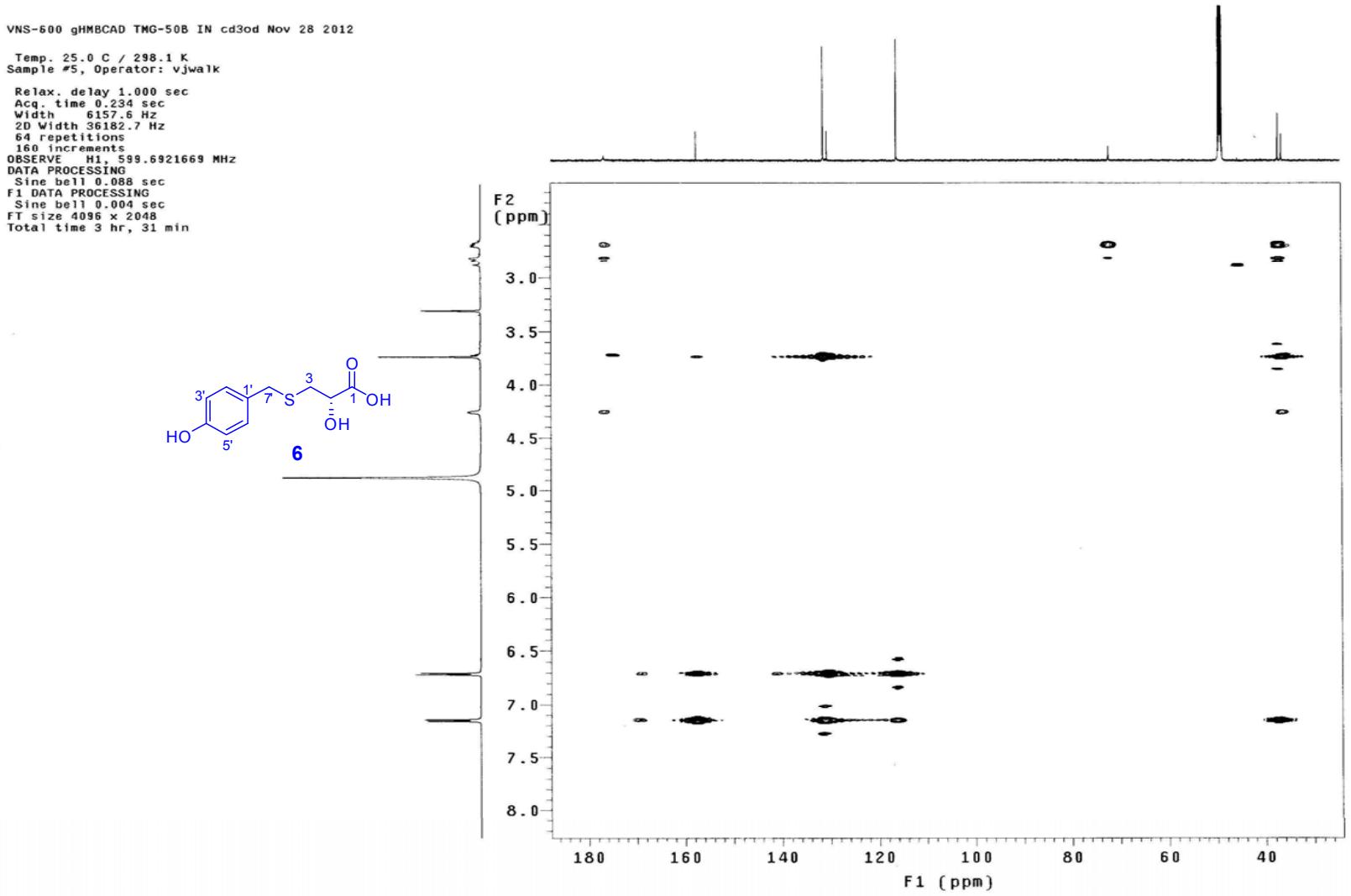

Figure S103. The gHMBC Spectrum of Compound **6** in MeOH-d_4 (600 MHz)

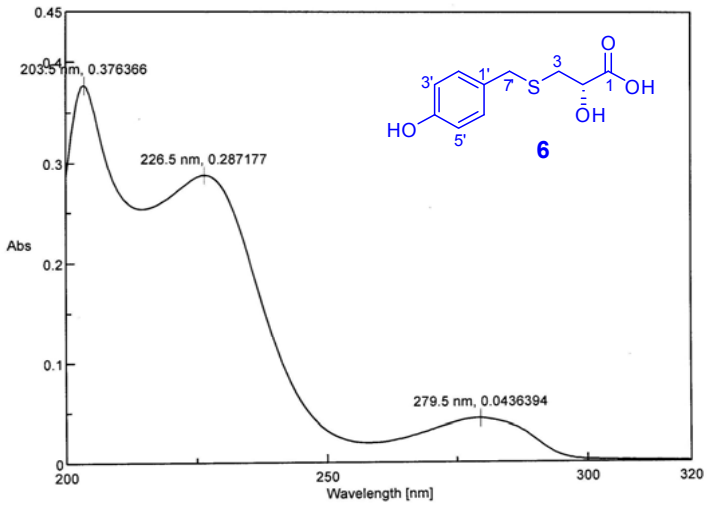

Figure S104. The UV Spectrum of Compound **6** in MeOH

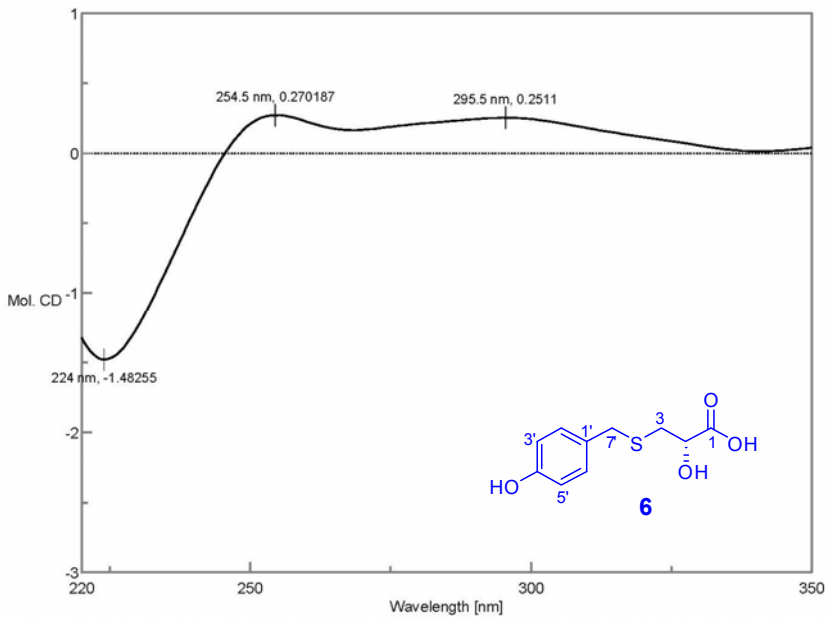

Figure S105. The CD Spectrum of Compound **6** in MeOH

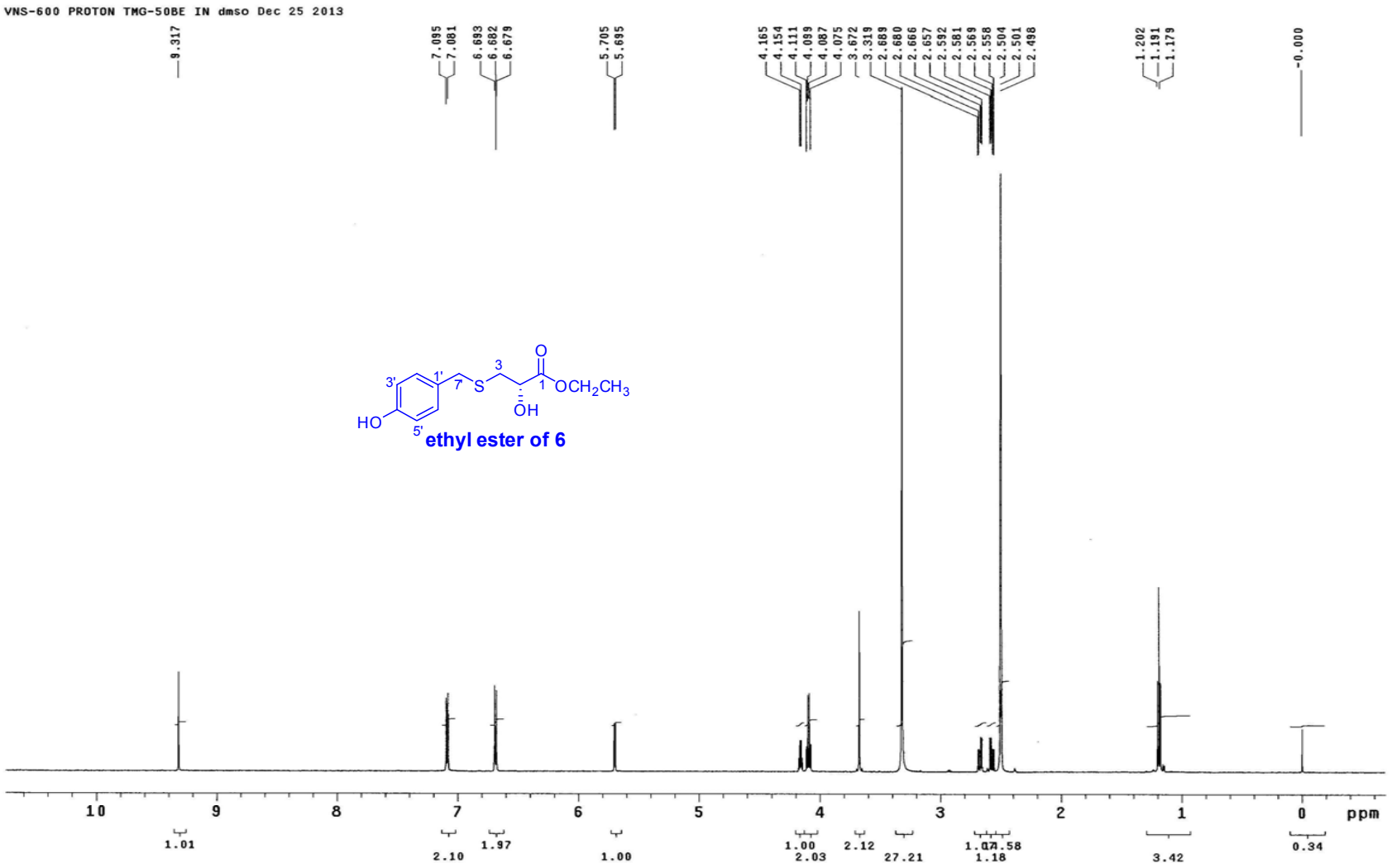

Figure S106. The ^{1}H NMR Spectrum of the Ethyl Ester of Compound **6** in DMSO-d_6 (600 MHz)

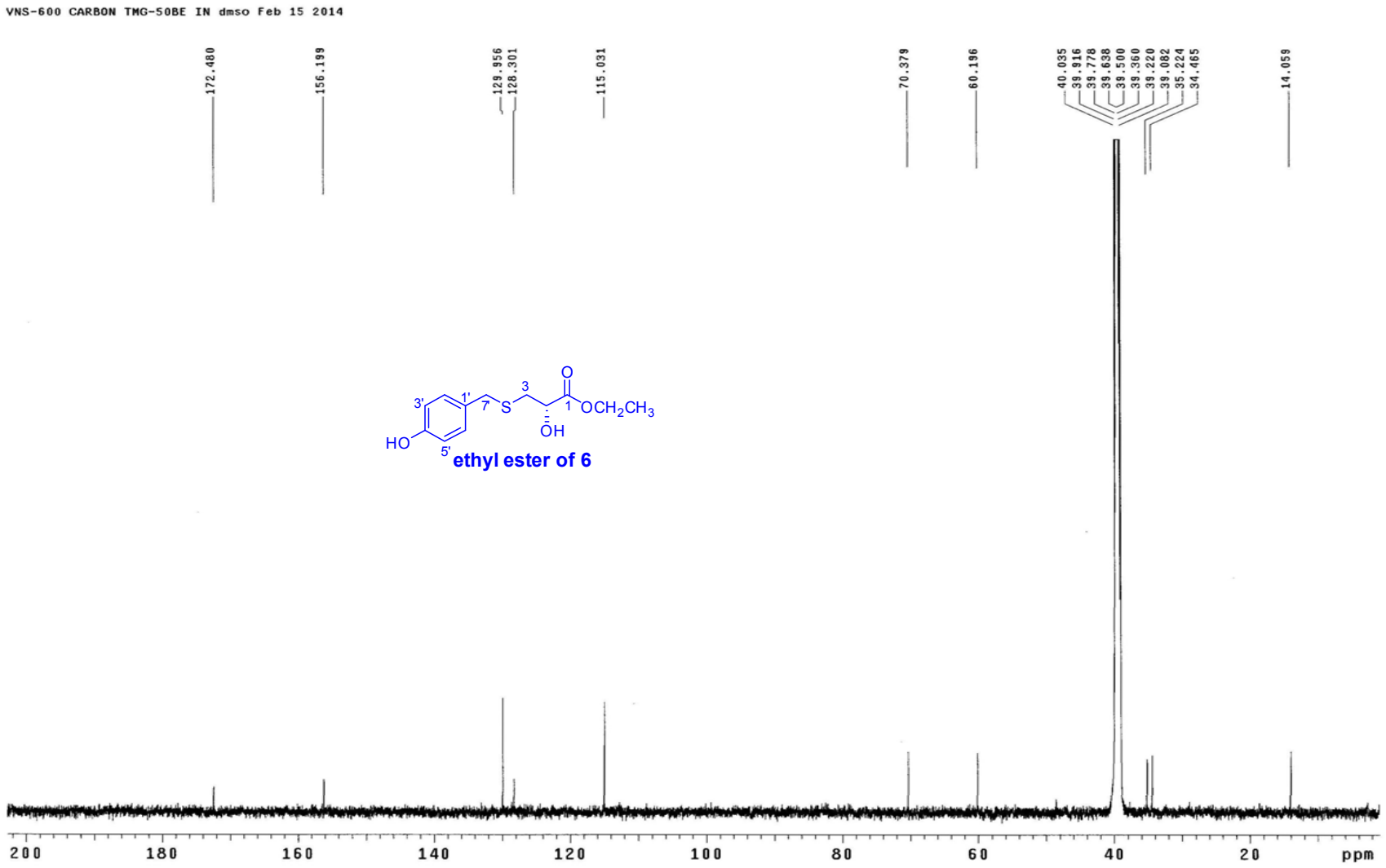

Figure S107. The ^{13}C NMR Spectrum of the Ethyl Ester of **6** in DMSO-d_6 (150 MHz)

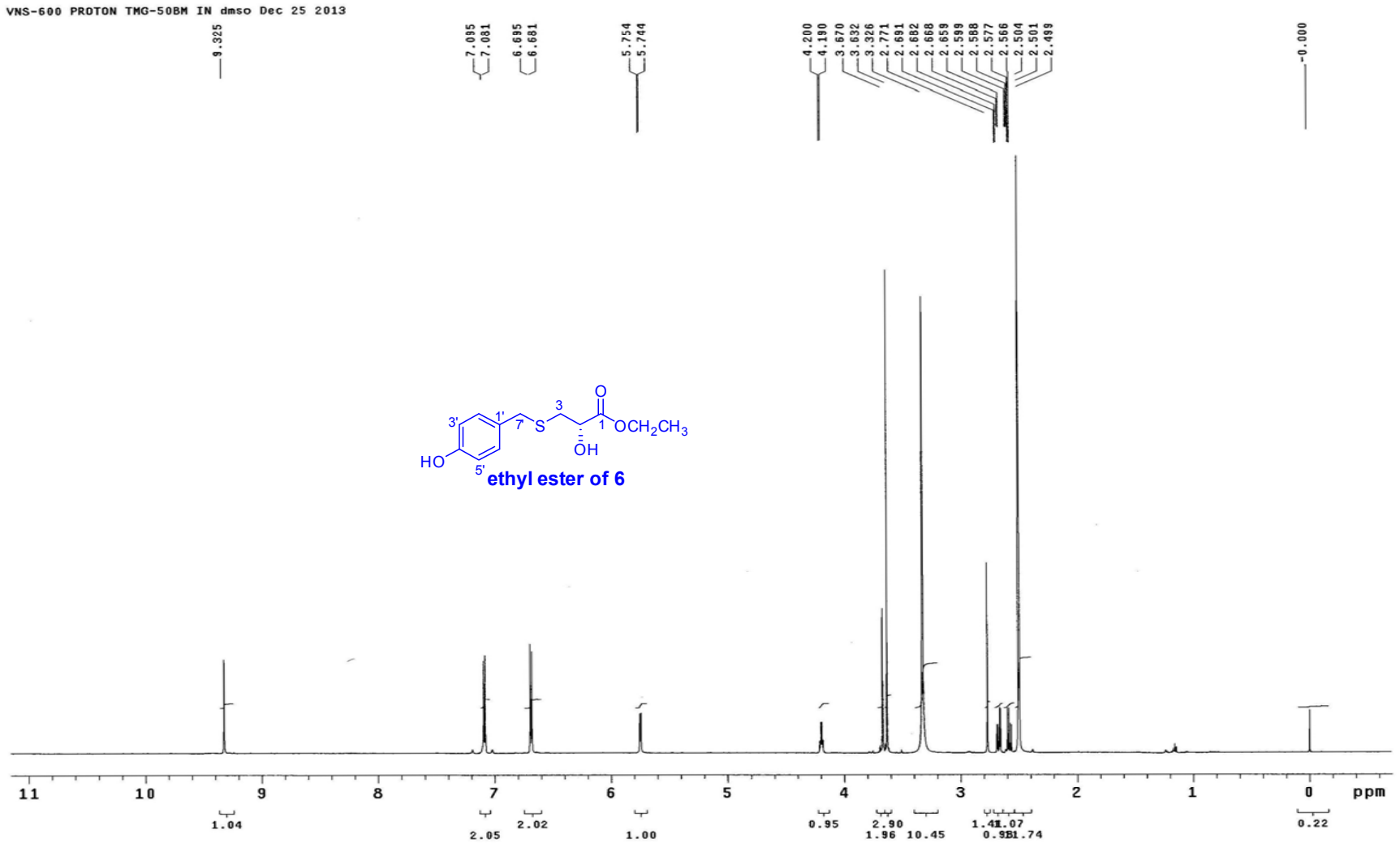

Figure S108. The ^{1}H NMR Spectrum of the Methyl Ester of Compound **6** in DMSO-d_6 (600 MHz)

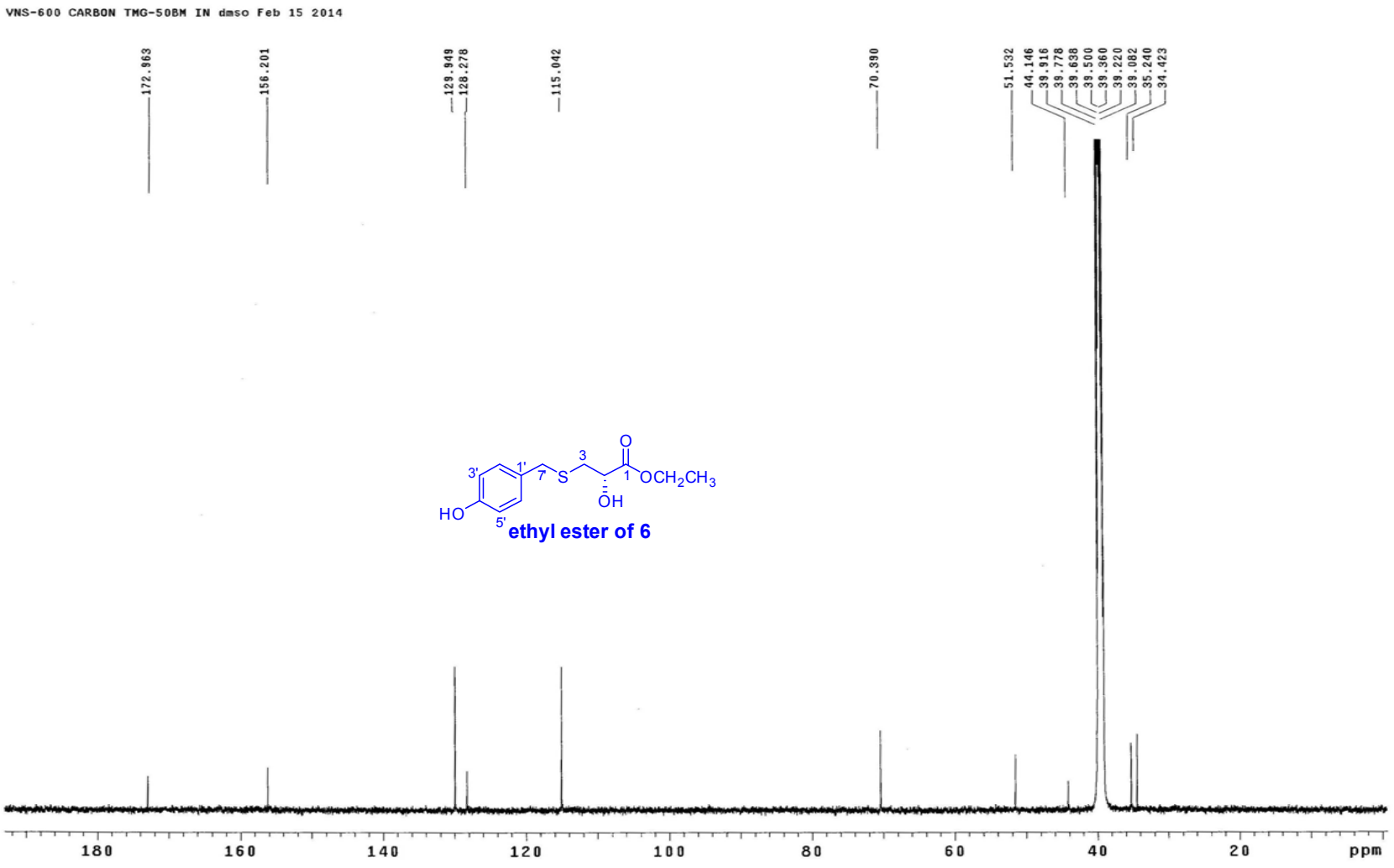

Figure S109. The ^{13}C NMR Spectrum of the Methyl Ester of Compound **6** in DMSO-d_6 (150 MHz)

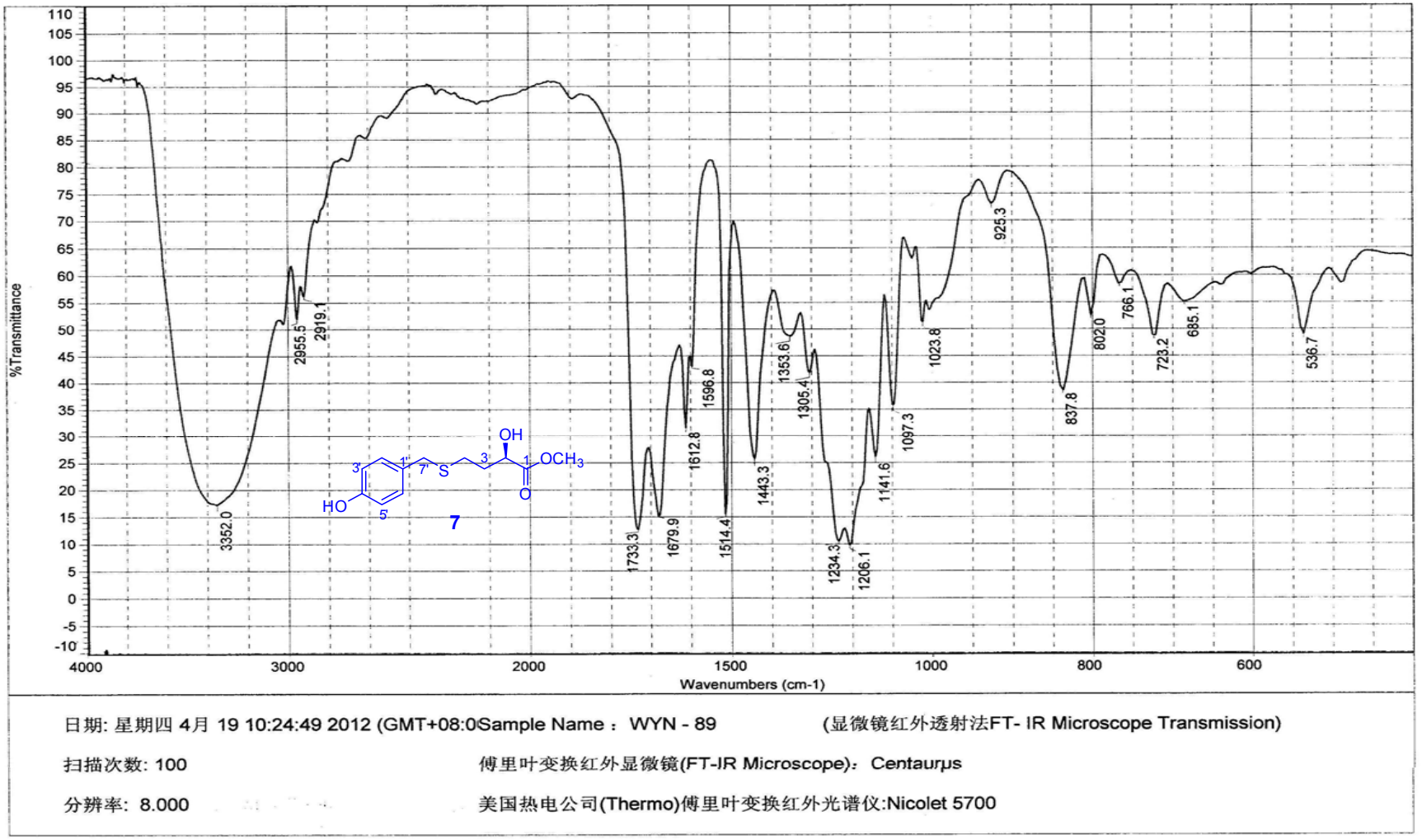

Figure S110. The IR Spectrum of Compound **7**

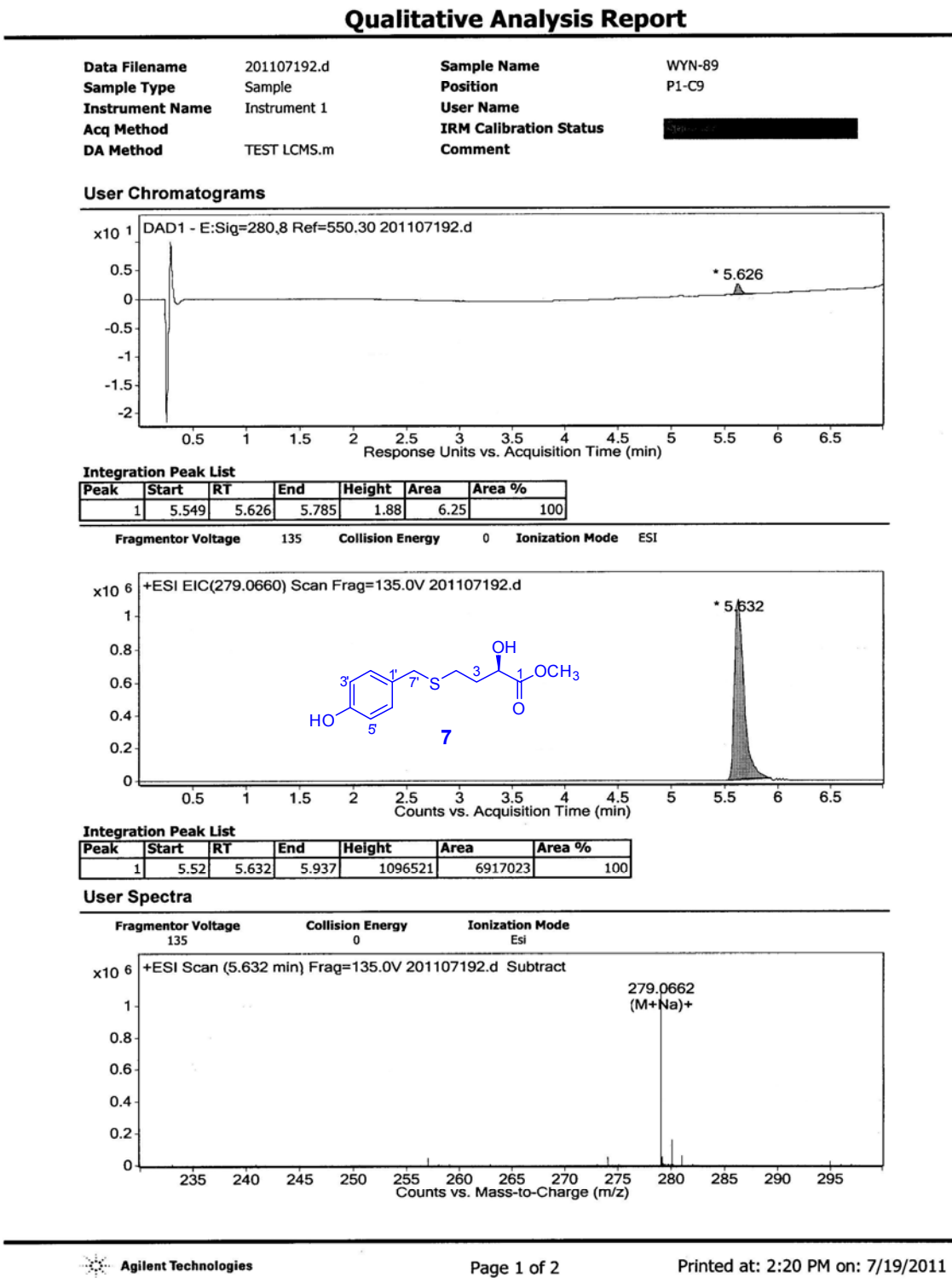

Figure S111. The (+)-HRESIMS Report of Compound **7**, Page 1

Qualitative Analysis Report

Peak List

m/z	z	Abund	Formula	Ion
107.042		89810		
279.0662	1	1098965	C12 H16 Na O4 S	(M+Na)+
280.0694	1	160145	C12 H16 Na O4 S	(M+Na)+
281.0651	1	62389	C12 H16 Na O4 S	(M+Na)+

Formula Calculator Element Limits

Element	Min	Max
C	3	100
H	0	120
O	0	30
N	0	5
S	0	5
Cl	0	0

Formula Calculator Results

Formula	Best	Mass	Tgt Mass	Diff (ppm)	Ion Species	Score
C12 H16 O4 S	TRUE	256.077	256.0769	-0.22	C12 H16 Na O4 S	99.97
C13 H12 N4 S		256.077	256.0783	4.99	C13 H12 N4 Na S	99.54
C16 H8 N4		256.077	256.0749	-8.16	C16 H8 N4 Na	97.02
C8 H16 O9		256.077	256.0794	9.56	C8 H16 Na O9	96.99

--- End Of Report ---

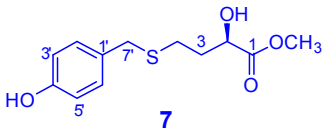

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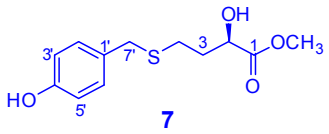
Figure S112. The (+)-HRESIMS Report of Compound **7**, Page 2

MS Formula Results: + Scan (5.632 min) Sub (201107192.d)

m/z	Ion	Formula	Abundance
279.0662	(M+Na)+	C12 H16 Na O4 S	1098964.5

Best	Formula (M)	Ion Formula	Calc m/z	Score	Cross S	Mass	Calc Mass	Diff (ppm)	Abs Diff (ppm)	Abund Match	Spacing Mat	Mass Match	m/z	DBE
☑	C12 H16 O4 S	C12 H16 Na O4 S	279.0662	99.97		256.077	256.0769	-0.22	0.22	99.91	99.99	100	279.0662	5
☐	C13 H12 N4 S	C13 H12 N4 Na S	279.0675	99.54		256.077	256.0783	4.99	4.99	99.56	99.86	99.36	279.0662	10
☐	C16 H8 N4	C16 H8 N4 Na	279.0641	97.02		256.077	256.0749	-8.16	8.16	94.15	97.9	98.3	279.0662	15
☐	C8 H16 O9	C8 H16 Na O9	279.0687	96.99		256.077	256.0794	9.56	9.56	94.63	98.46	97.67	279.0662	1



7

Figure S113. The (+)-HRESIMS Report of Compound **7**, Page 3

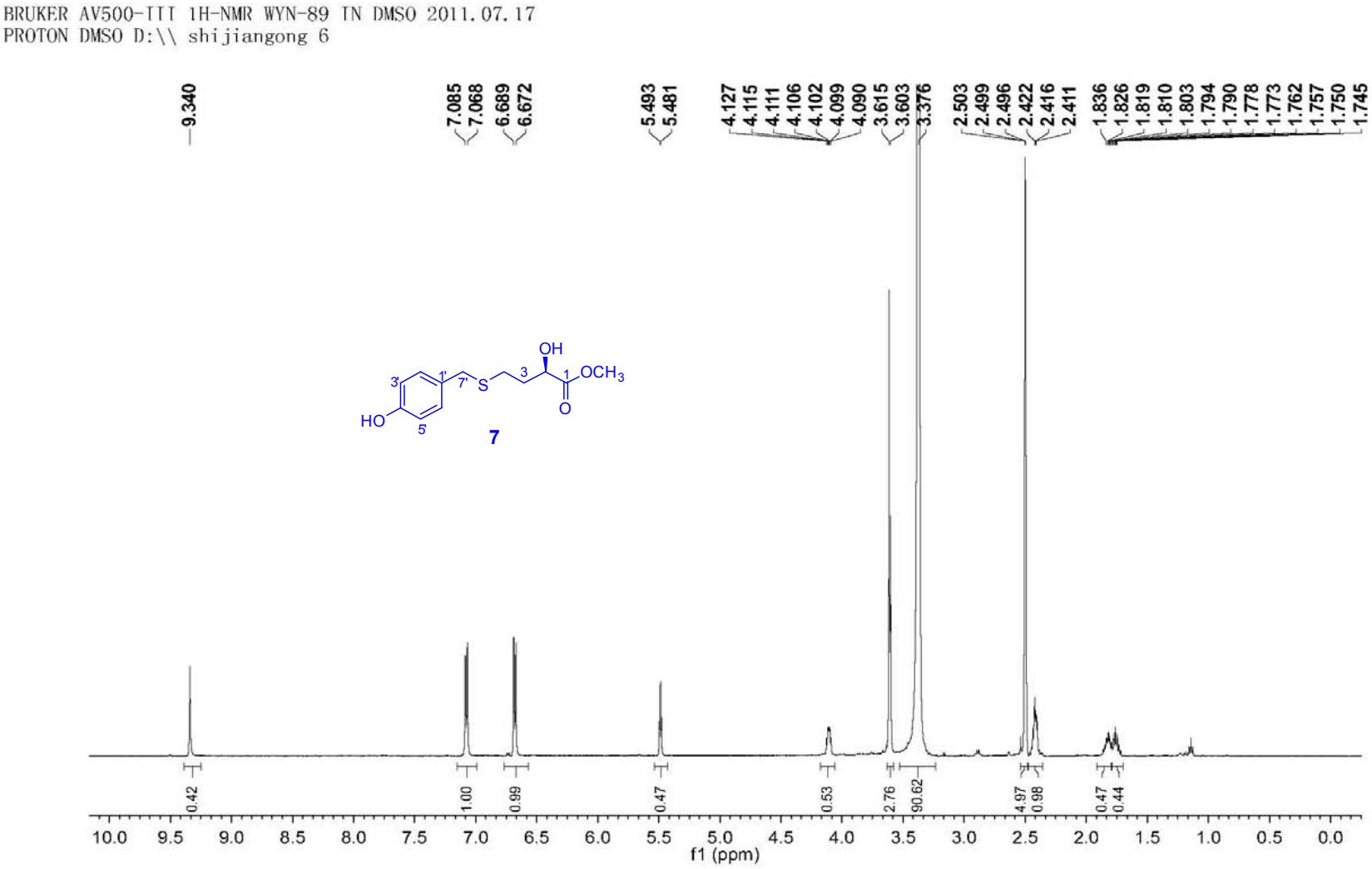


Figure S114. The ^{1}H NMR Spectrum of Compound **7** in DMSO-d_6 (500 MHz)

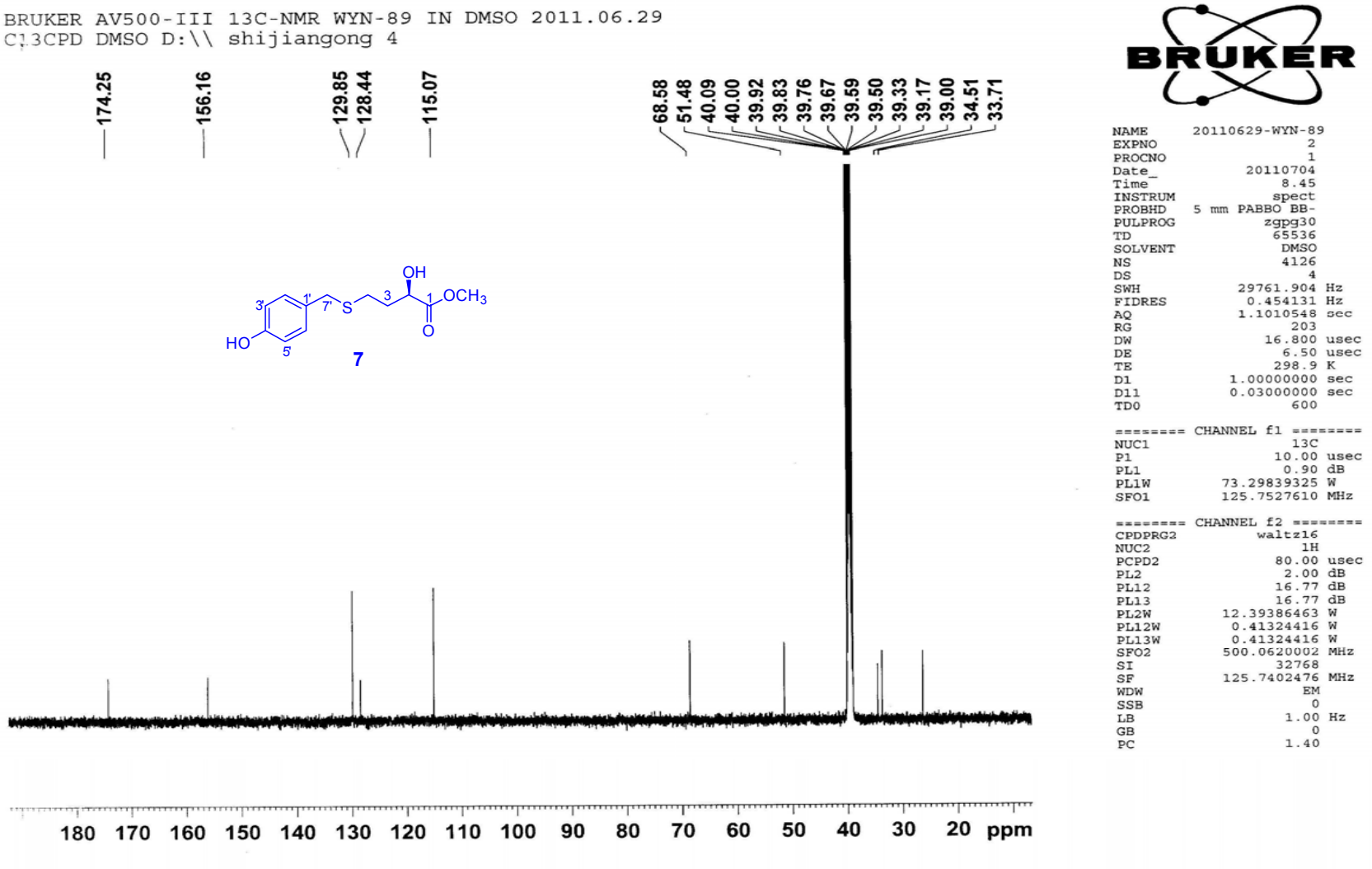


Figure S115. The ^{13}C NMR Spectrum of Compound **7** in DMSO-d_6 (125 MHz)

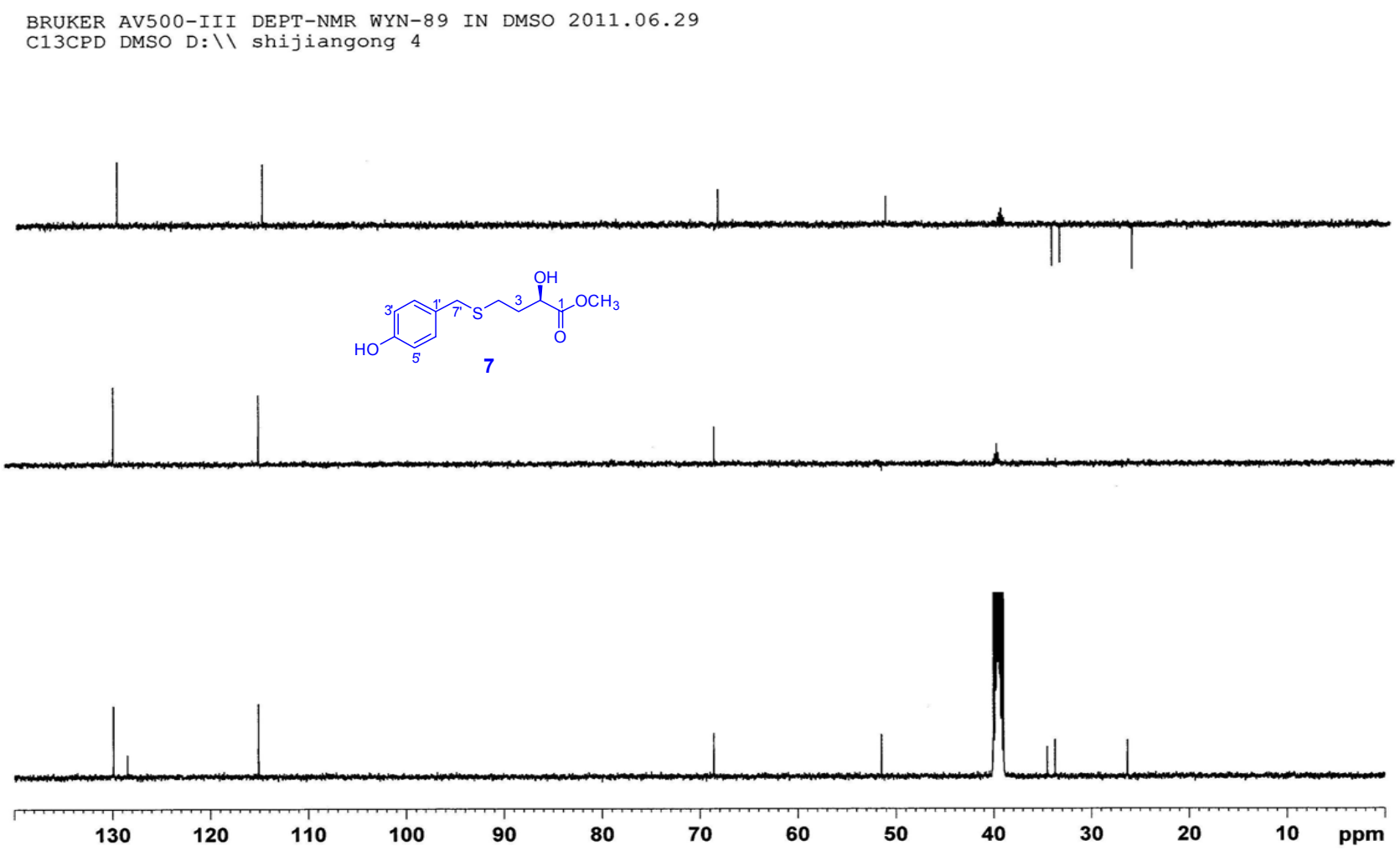


Figure S116. The DEPT Spectrum of Compound **7** in DMSO-d_6 (125 MHz)

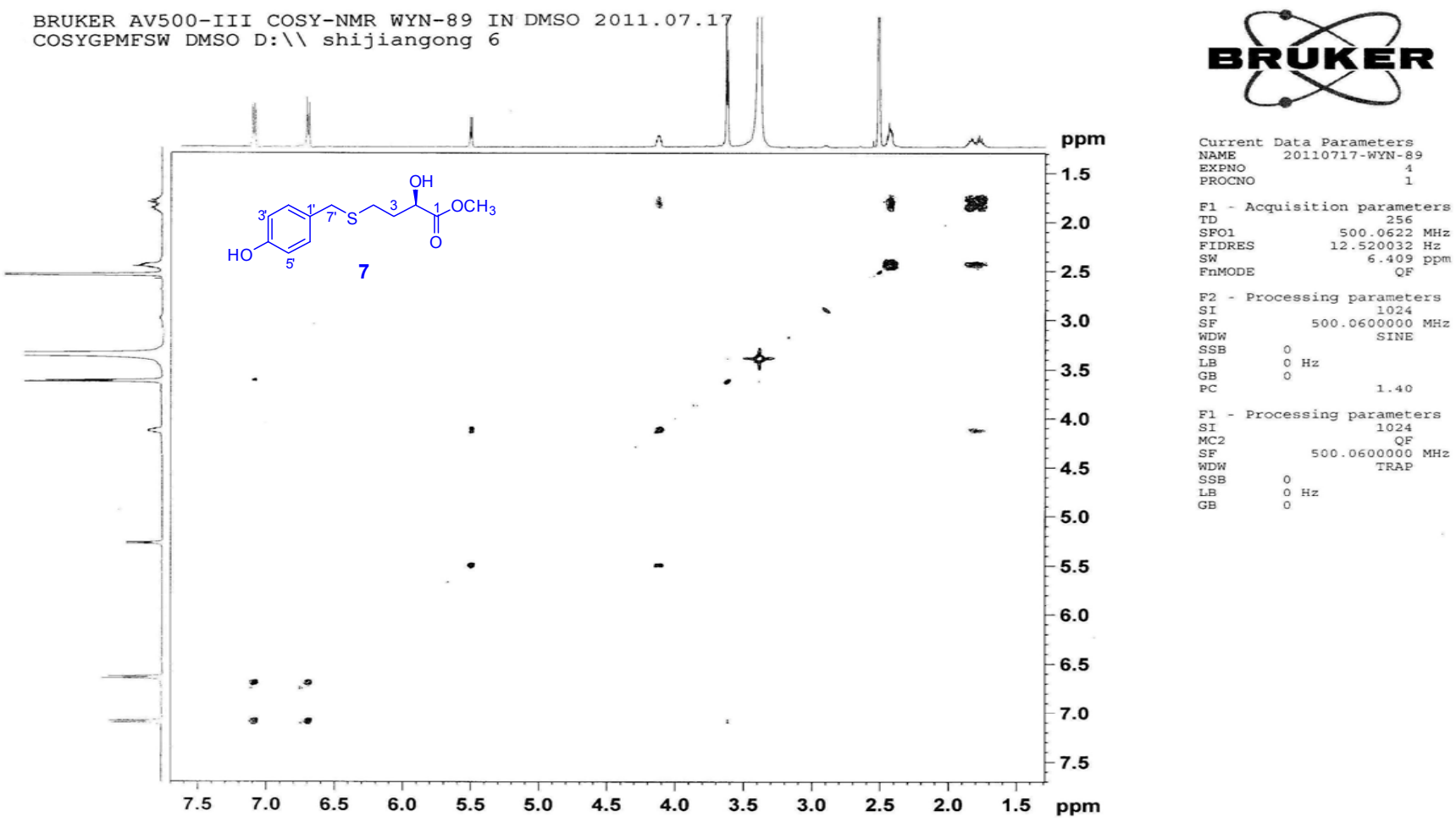


Figure S117. The ^{1}H-^{1}H COSY Spectrum of Compound **7** in DMSO-d_6 (500 MHz)

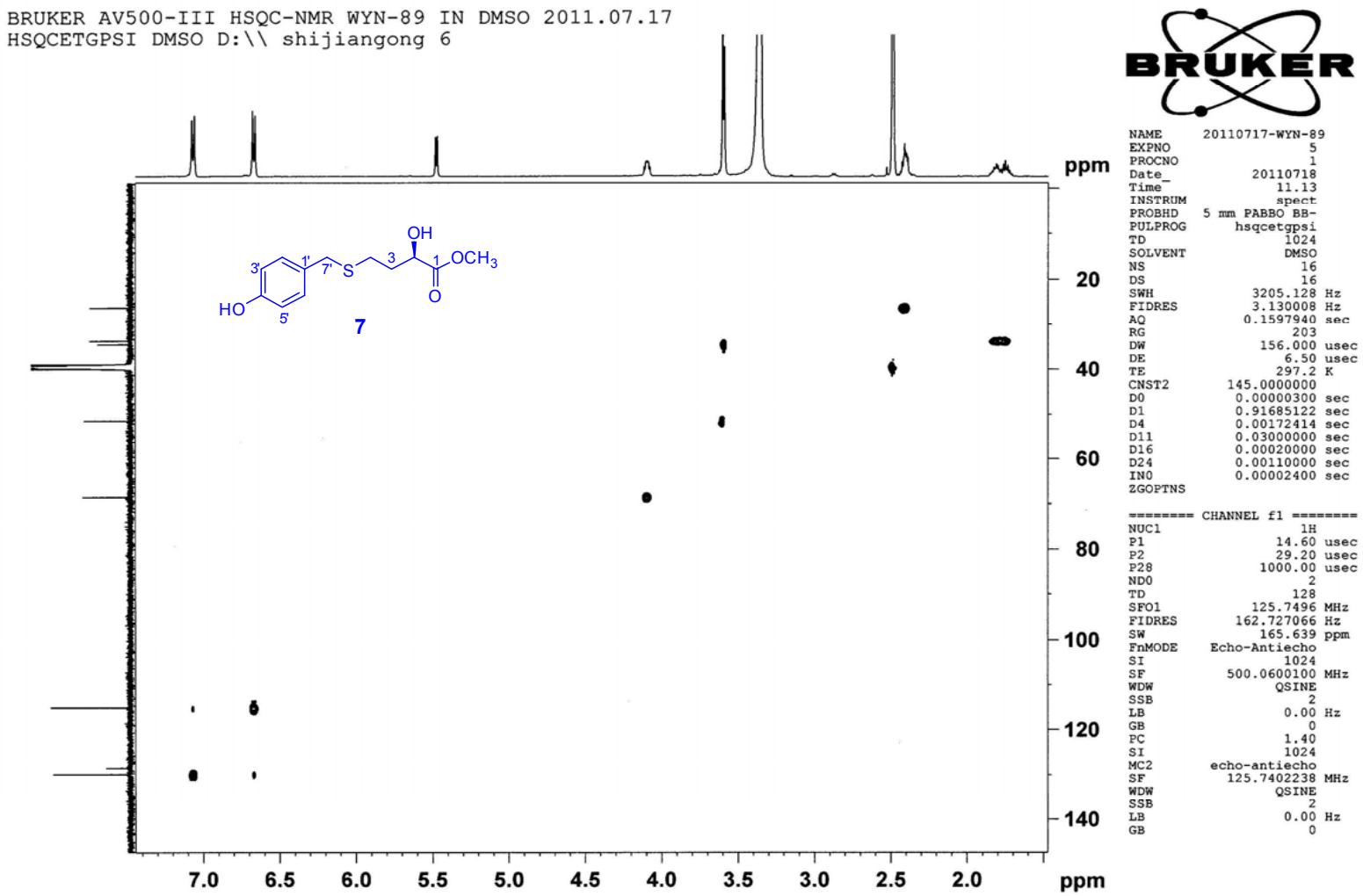


Figure S118. The HSQC Spectrum of Compound **7** in DMSO-d_6 (500 MHz)

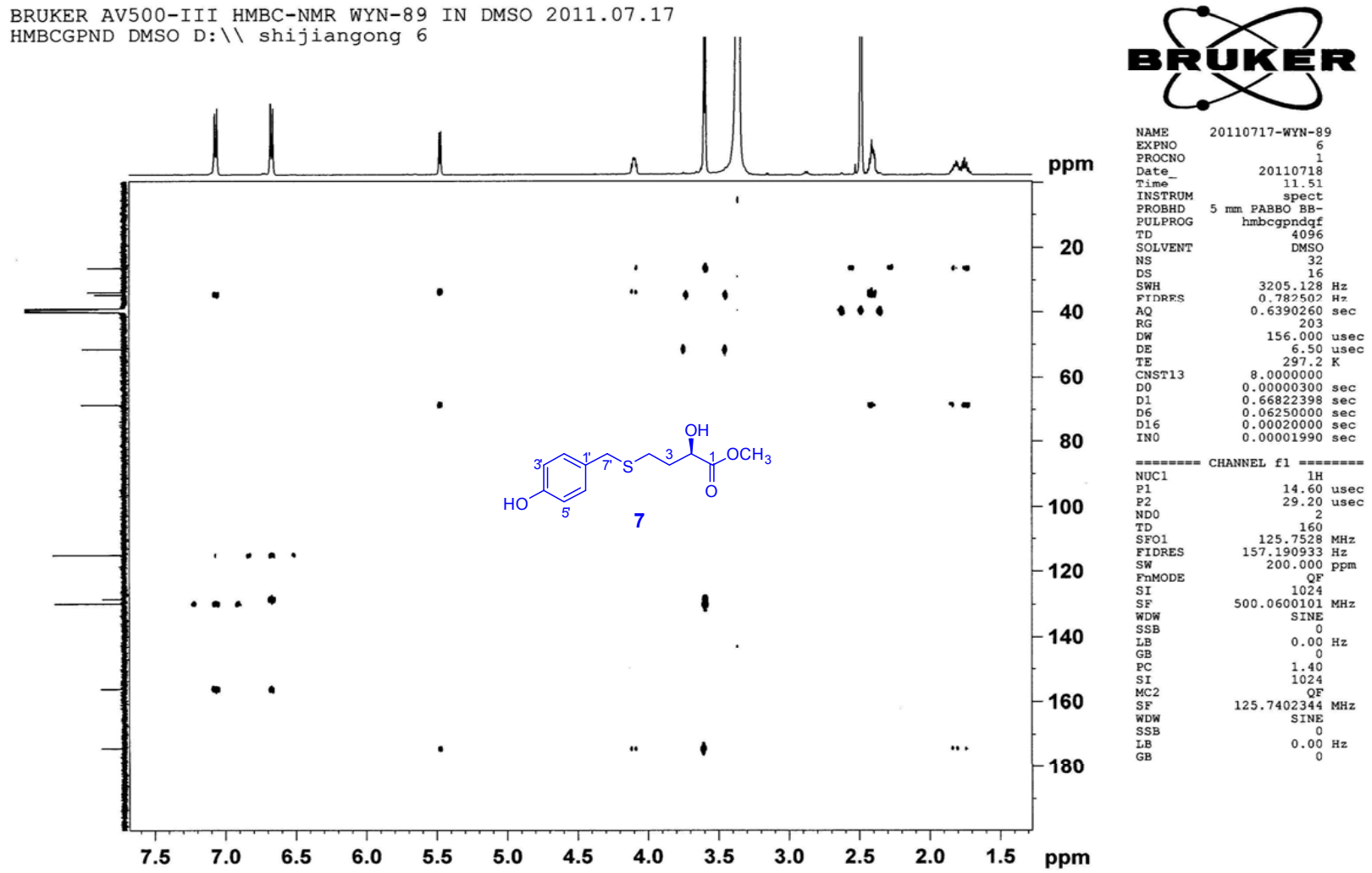


Figure S119. The HMBC Spectrum of Compound **7** in DMSO-d_6 (500 MHz)

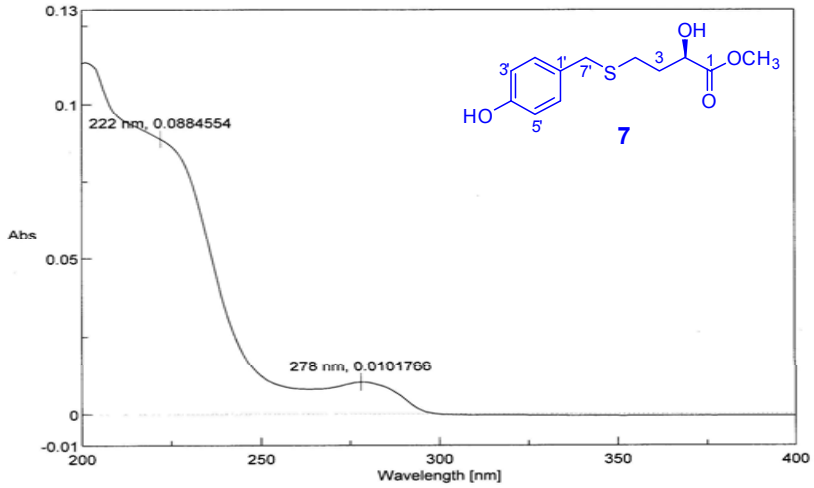


Figure S120. The UV Spectrum of Compound **7** in MeOH

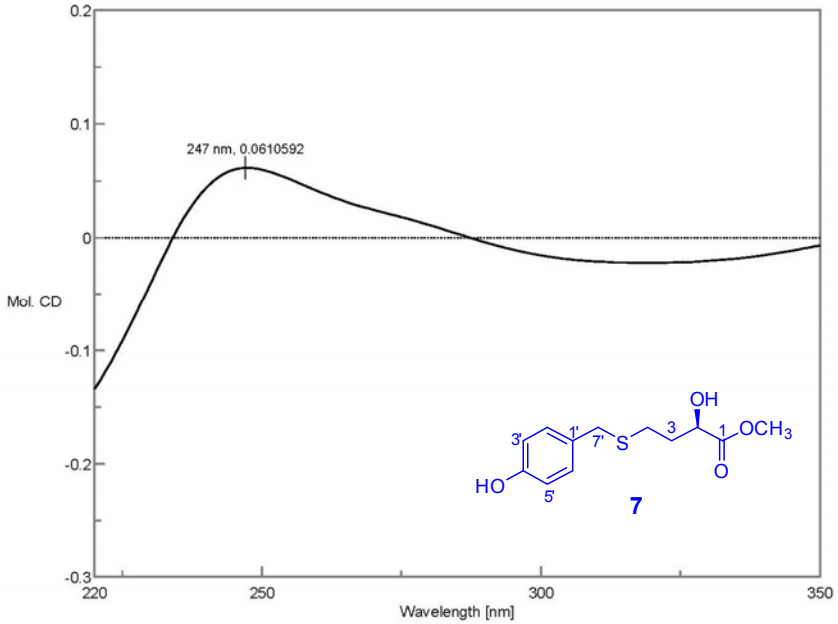


Figure S121. The CD Spectrum of Compound **7** in CH_2Cl_2

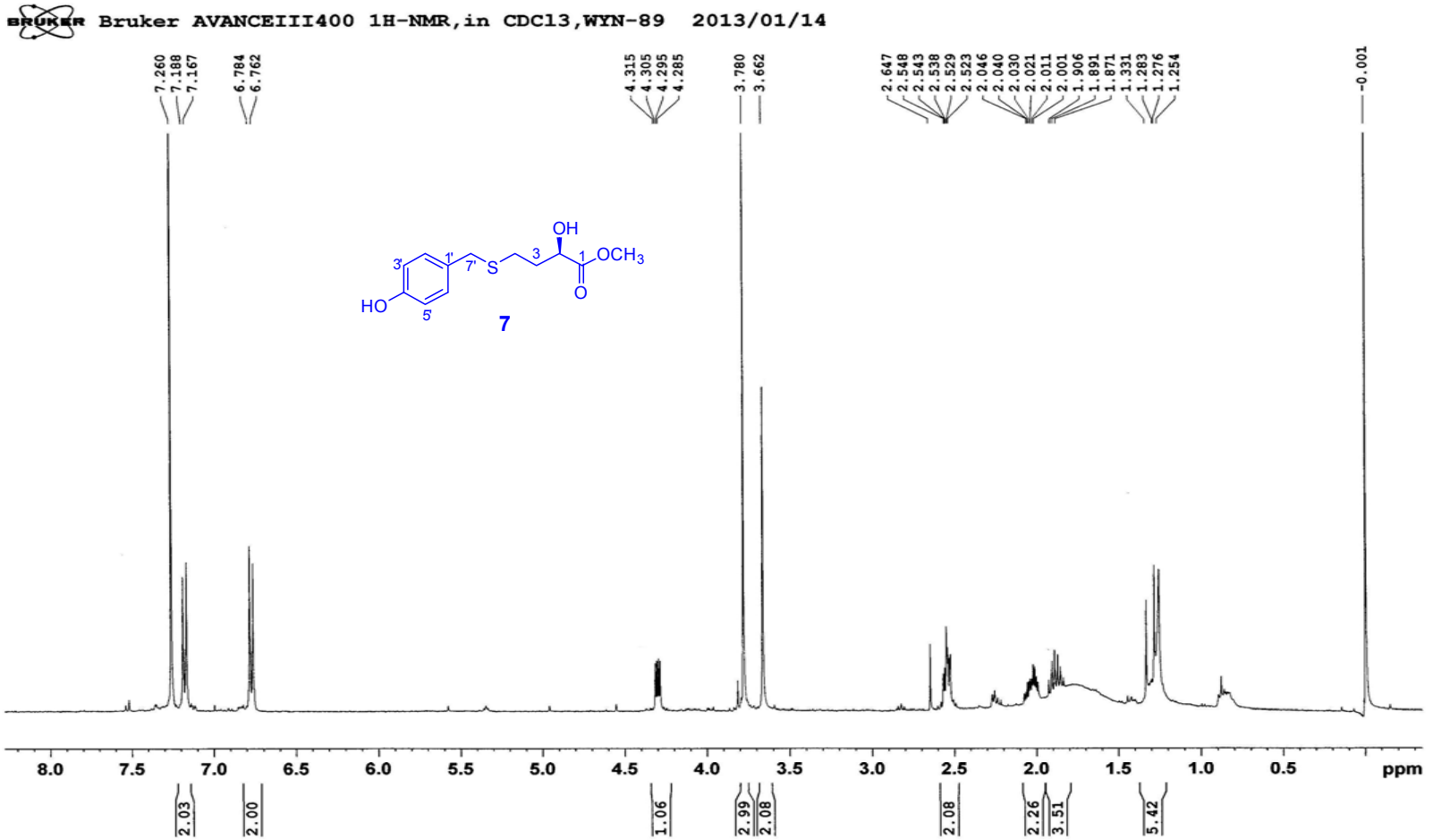


Figure S122. The ^{1}H NMR Spectrum of Compound **7** in CD_3Cl (400 MHz)

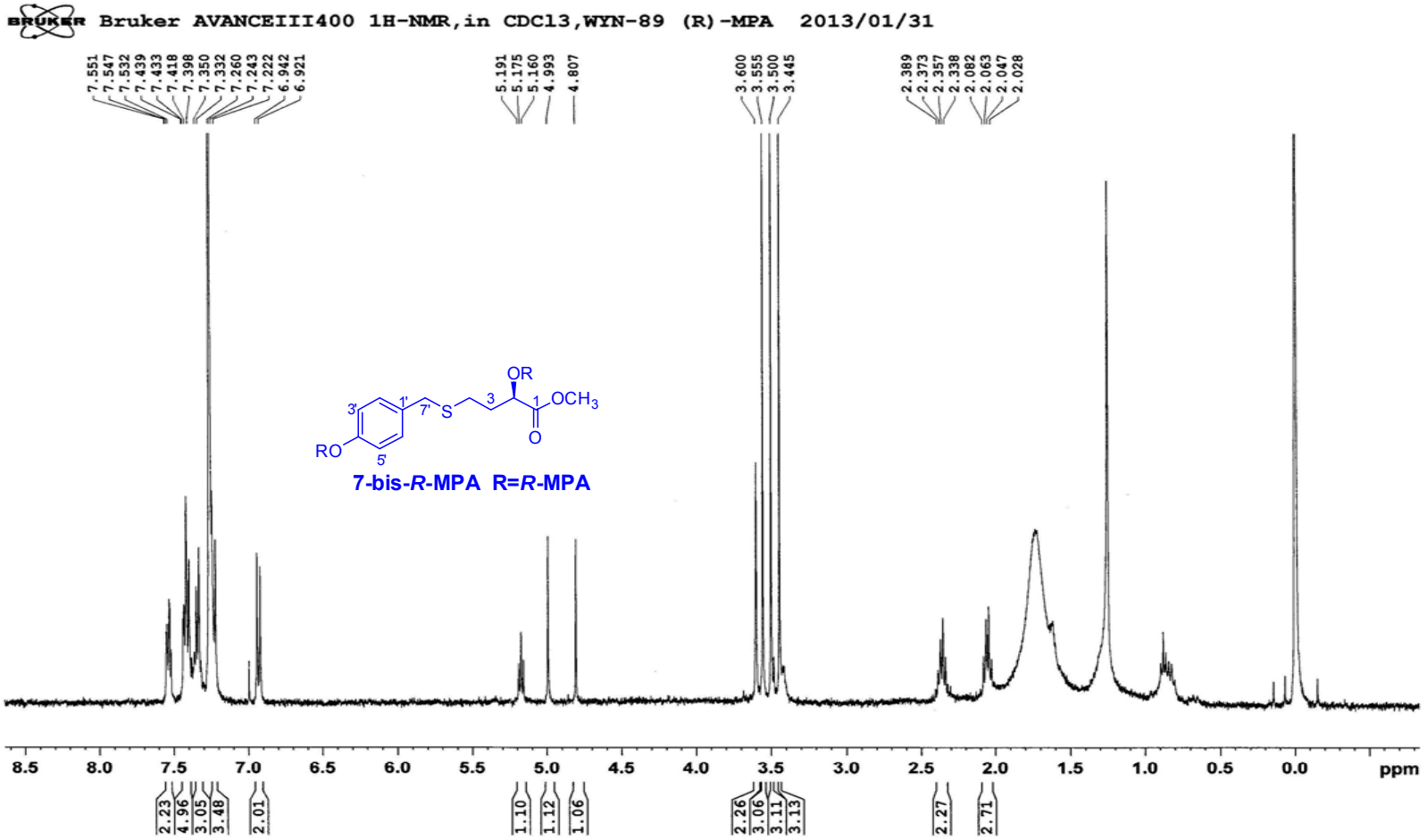


Figure S123. The ^{1}H NMR Spectrum of Compound **7**-bis-(*R*)-MPA in CD_3Cl (400 MHz)

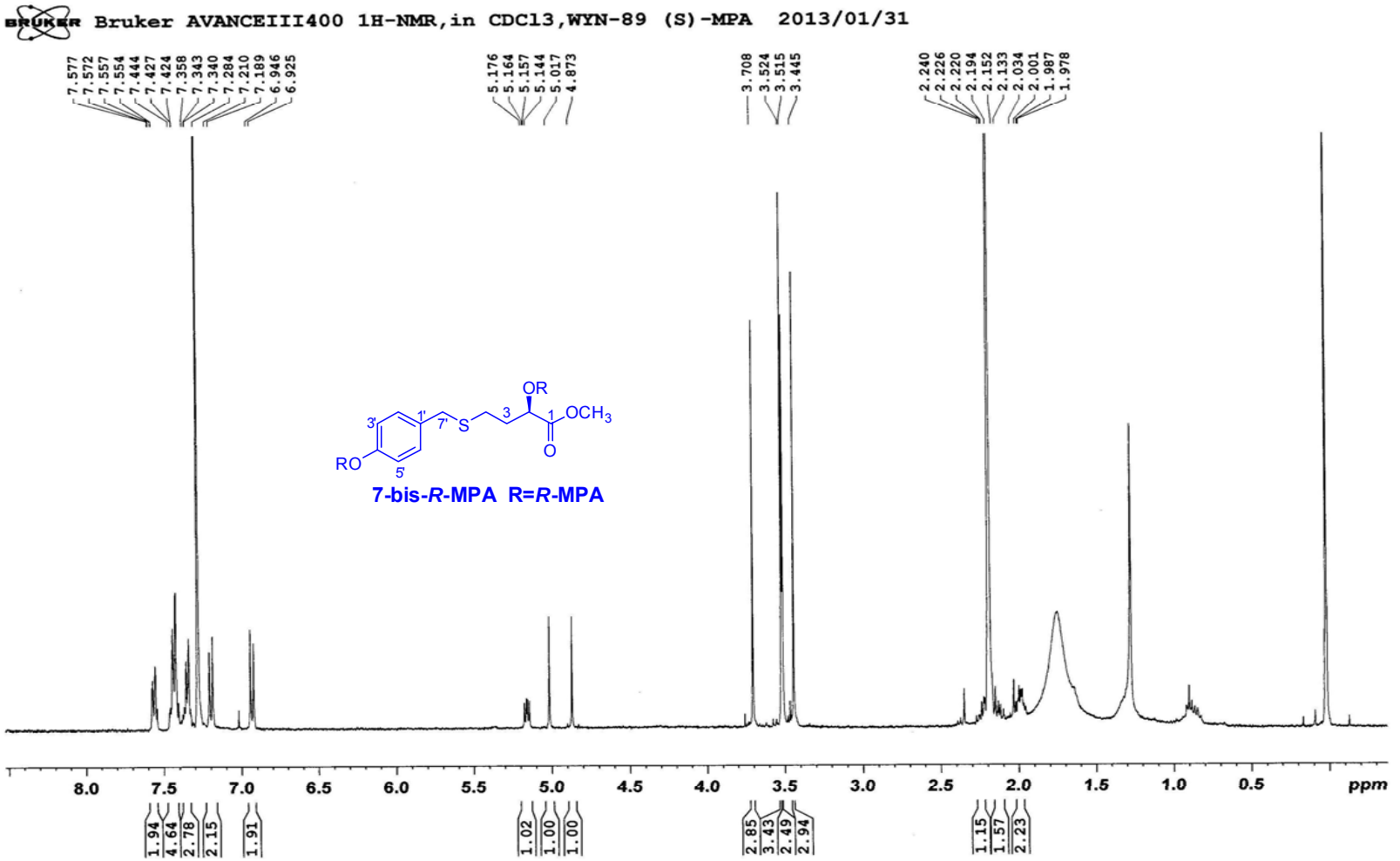


Figure S124. The ^{1}H NMR Spectrum of Compound **7**-bis-(*S*)-MPA in CD_3Cl (400 MHz)

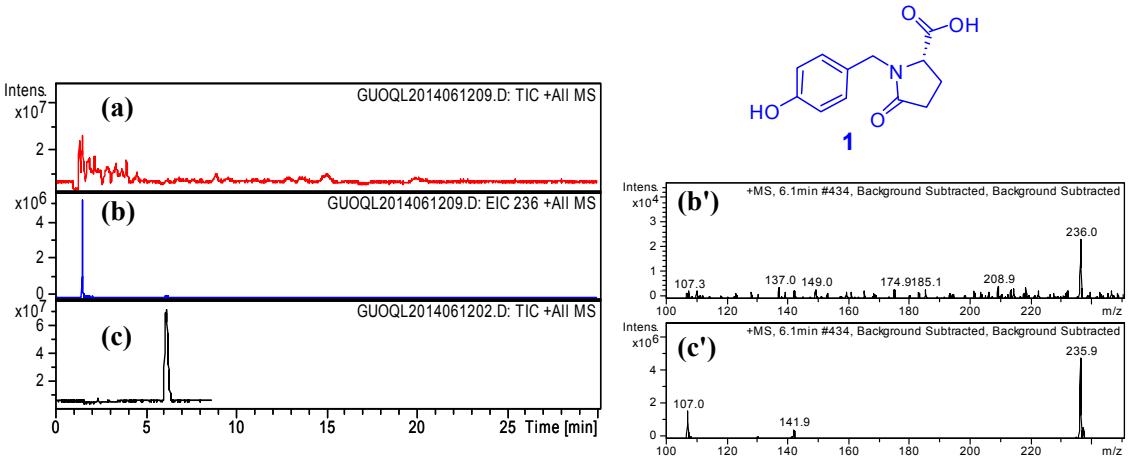


Figure S125. (a) TIC of the aqueous extract of *Gastrodia elata* Blume rhizomes; (b) The extracted ion chromatogram of *m/z* 236 from the aqueous extract TIC; (c) TIC of compound **1**; (b') The (+)-ESIMS of the extracted ion; (c') The (+)-ESIMS of compound **1**.

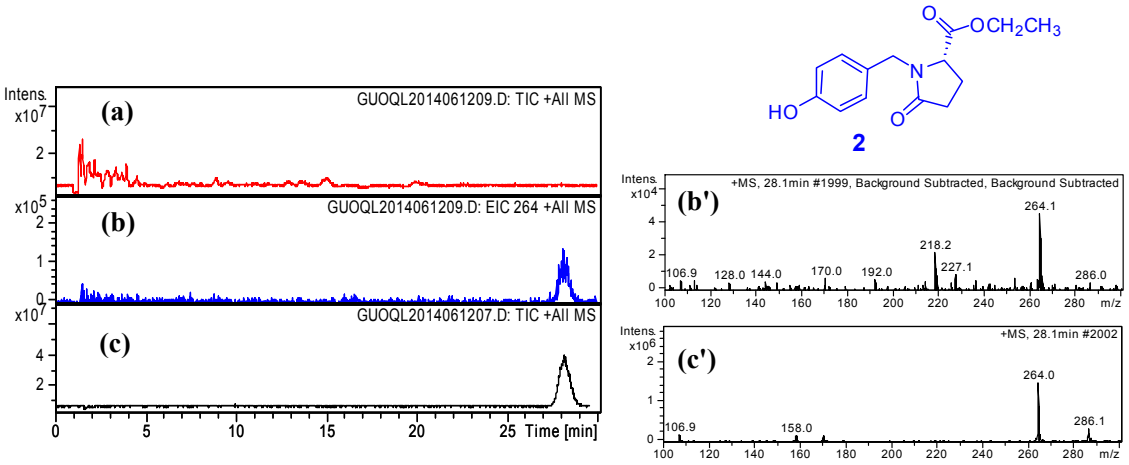


Figure S340. (a) TIC of the aqueous extract of *Gastrodia elata* Blume rhizomes; (b) The extracted ion chromatogram of *m/z* 264 from the aqueous extract TIC; (c) TIC of compound **2**; (b') The (+)-ESIMS of the extracted ion; (c') The (+)-ESIMS of compound **2**.

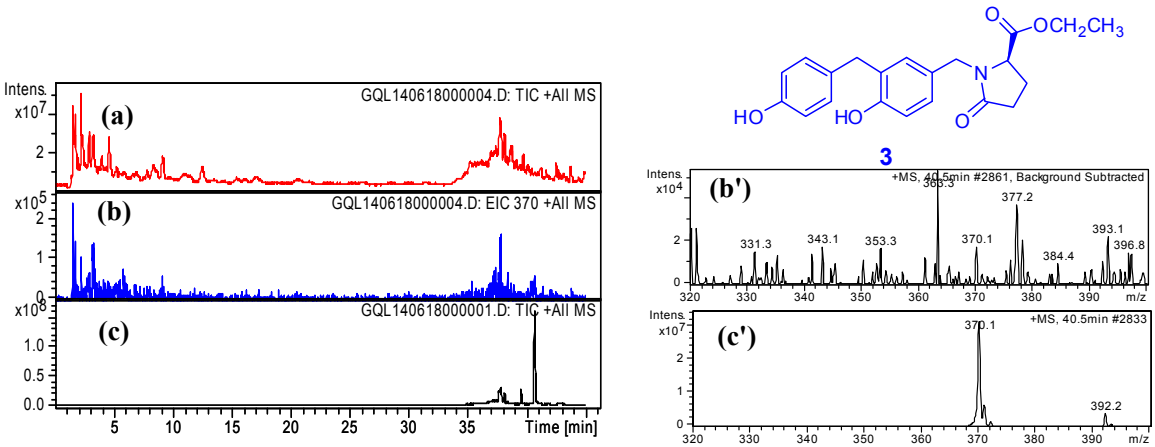


Figure S343. (a) TIC of the CH_3CN-eluted fraction; (b) The extracted ion chromatogram of *m/z* 370 from TIC of the CH_3CN-eluted fraction; (c) TIC of compound **3**; (b') The (+)-ESIMS of the extracted ion; (c') The (+)-ESIMS of compound **3**.