A Comparative Study of C_2-symmetric and C_1-symmetric Hydroxamic Acids in Vanadium-Catalyzed Asymmetric Epoxidation of Allylic Alcohols

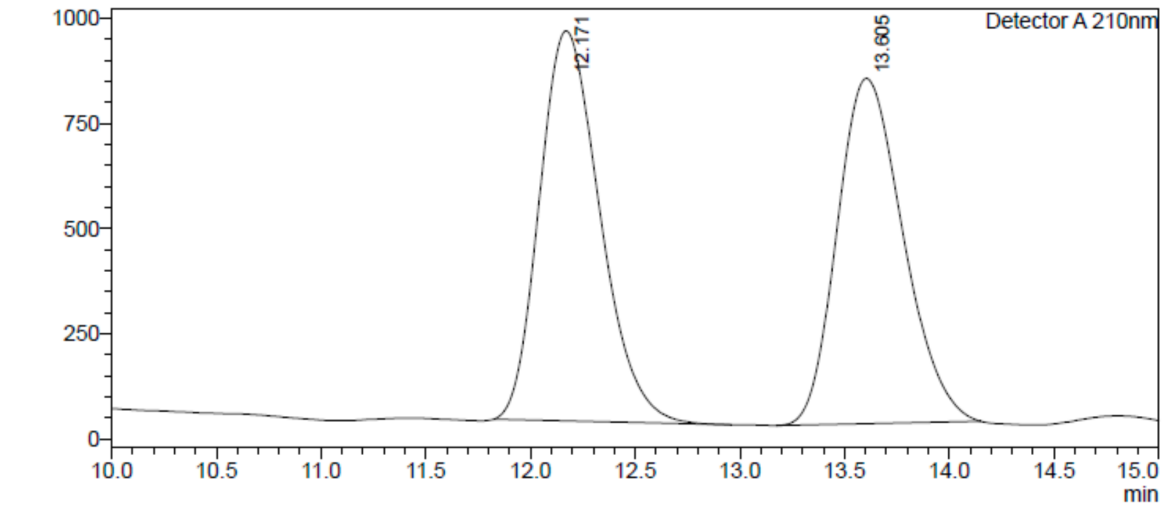
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Supporting Information

1. Representative HPLC Chromatograms

Chromatogram HPLC of 9 racemic CHIRALCEL OD-H, Hex/IPA = 90/10, 1 mL/min, 210 nm

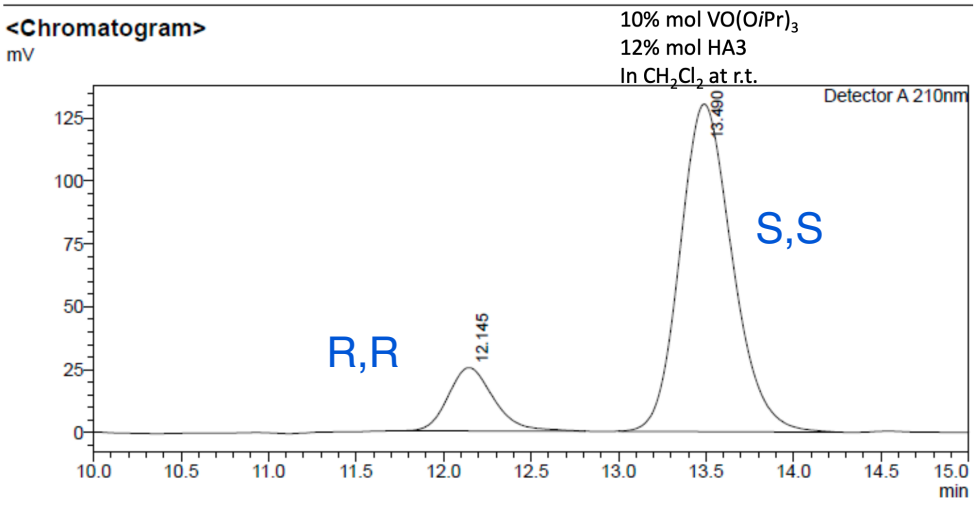


<Peak Table>

Detector A 210nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	12.171	18661496	927515	50.906		M	
2	13.605	17997342	821301	49.094		M	
Total		36658838	1748816	*e.e.*= 0%= racemic			

Chromatogram HPLC of 9 enantiomeric CHIRALCEL OD-H, Hex/IPA = 90/10, 1 mL/min, 210 nm

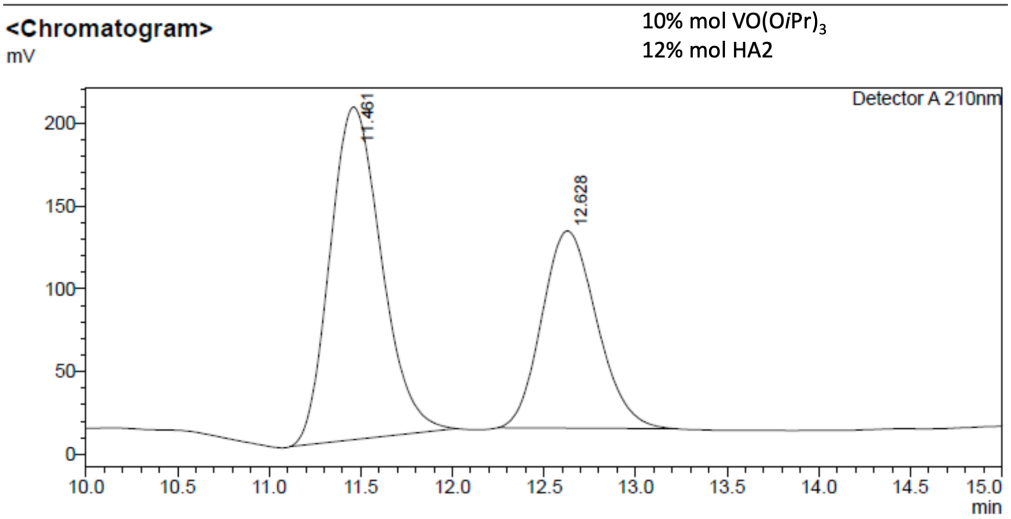


<Peak Table>

Detector A 210nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	12.145	453176	25129	14.335		M	
2	13.490	2708160	130212	85.665		M	
Total		3161335	155341	*e.e.*= 71%			

Chromatogram HPLC of 9 enantiomeric CHIRALCEL OD-H, Hex/IPA = 90/10, 1 mL/min, 210 nm



<Peak Table>

Detector A 210nm

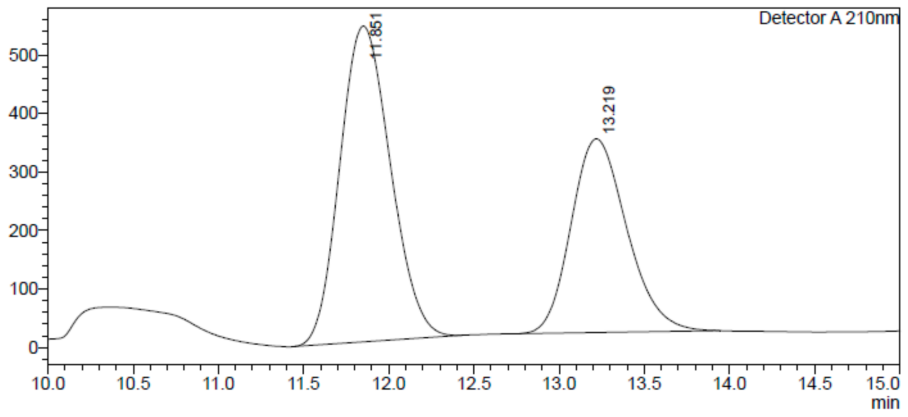
Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	11.461	3924456	200866	61.220		M	
2	12.628	2485994	119039	38.780		M	
Total		6410450	319906	*e.e.*= 22%			

Chromatogram HPLC of 9 enantiomeric CHIRALCEL OD-H, Hex/IPA = 90/10, 1 mL/min, 210 nm

<Chromatogram>

mV

10% mol $VO(acac)_2$
12% mol HA2



<Peak Table>

Detector A 210nm

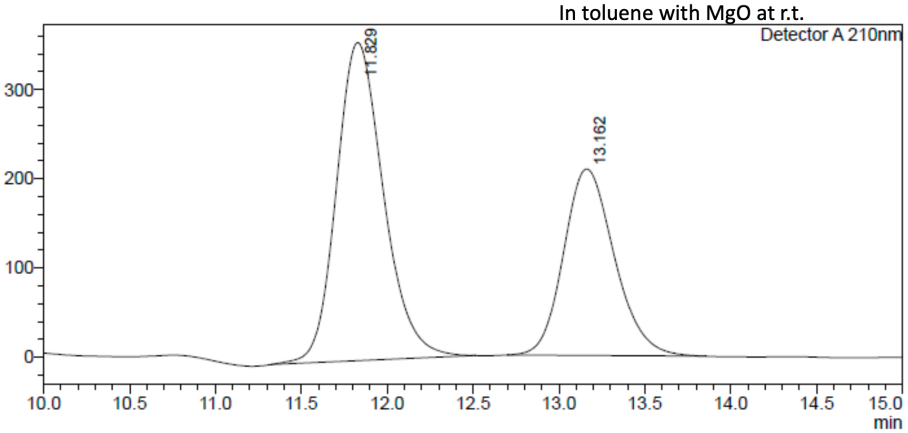
Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	11.851	11157872	539761	59.688		M	
2	13.219	7535745	330939	40.312		M	
Total		18693617	870700	*e.e.*= 19%			

Chromatogram HPLC of 9 enantiomeric CHIRALCEL OD-H, Hex/IPA = 90/10, 1 mL/min, 210 nm

<Chromatogram>

mV

10% mol $VO(O\mathit{i}Pr)_3$
12% mol HA2
In toluene with MgO at r.t.

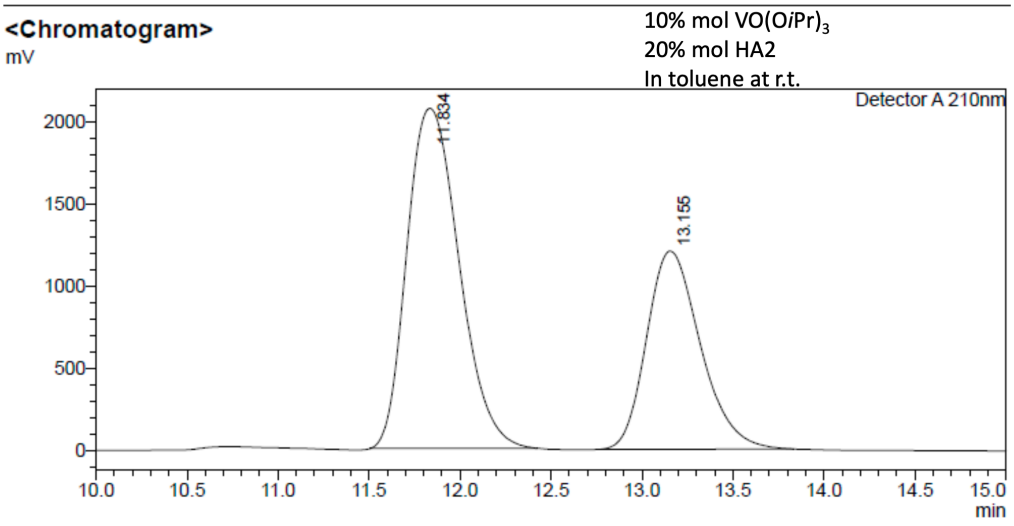


<Peak Table>

Detector A 210nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	11.829	6812377	356575	61.273		M	
2	13.162	4305695	209123	38.727		M	
Total		11118073	565699	*e.e.*= 22%			

Chromatogram HPLC of 9 enantiomeric CHIRALCEL OD-H, Hex/IPA = 90/10, 1 mL/min, 210 nm

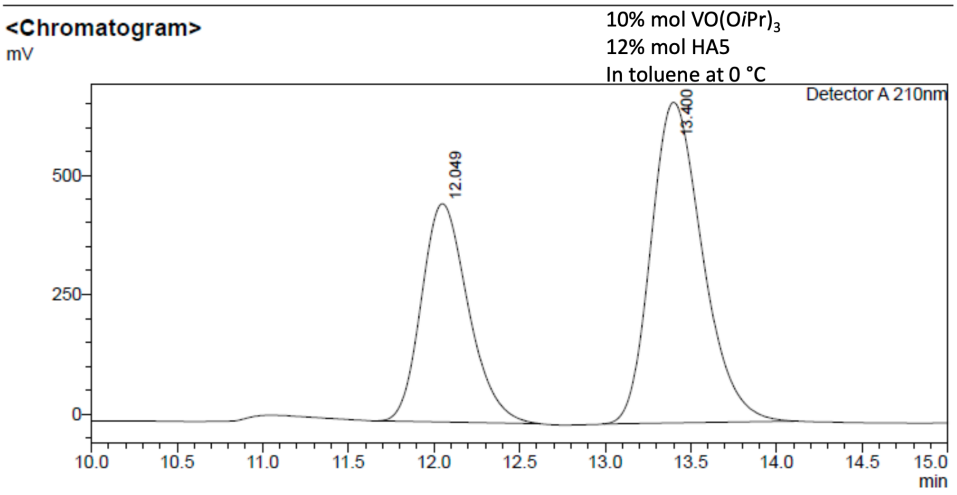


<Peak Table>

Detector A 210nm

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1	11.834	41290648	2068263	62.470		M	
2	13.155	24806559	1205512	37.530		M	
Total		66097207	3273775	*e.e.*= 25%			

Chromatogram HPLC of 9 enantiomeric CHIRALCEL OD-H, Hex/IPA = 90/10, 1 mL/min, 210 nm



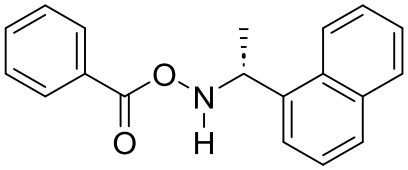
<Peak Table>

Detector A 210nm

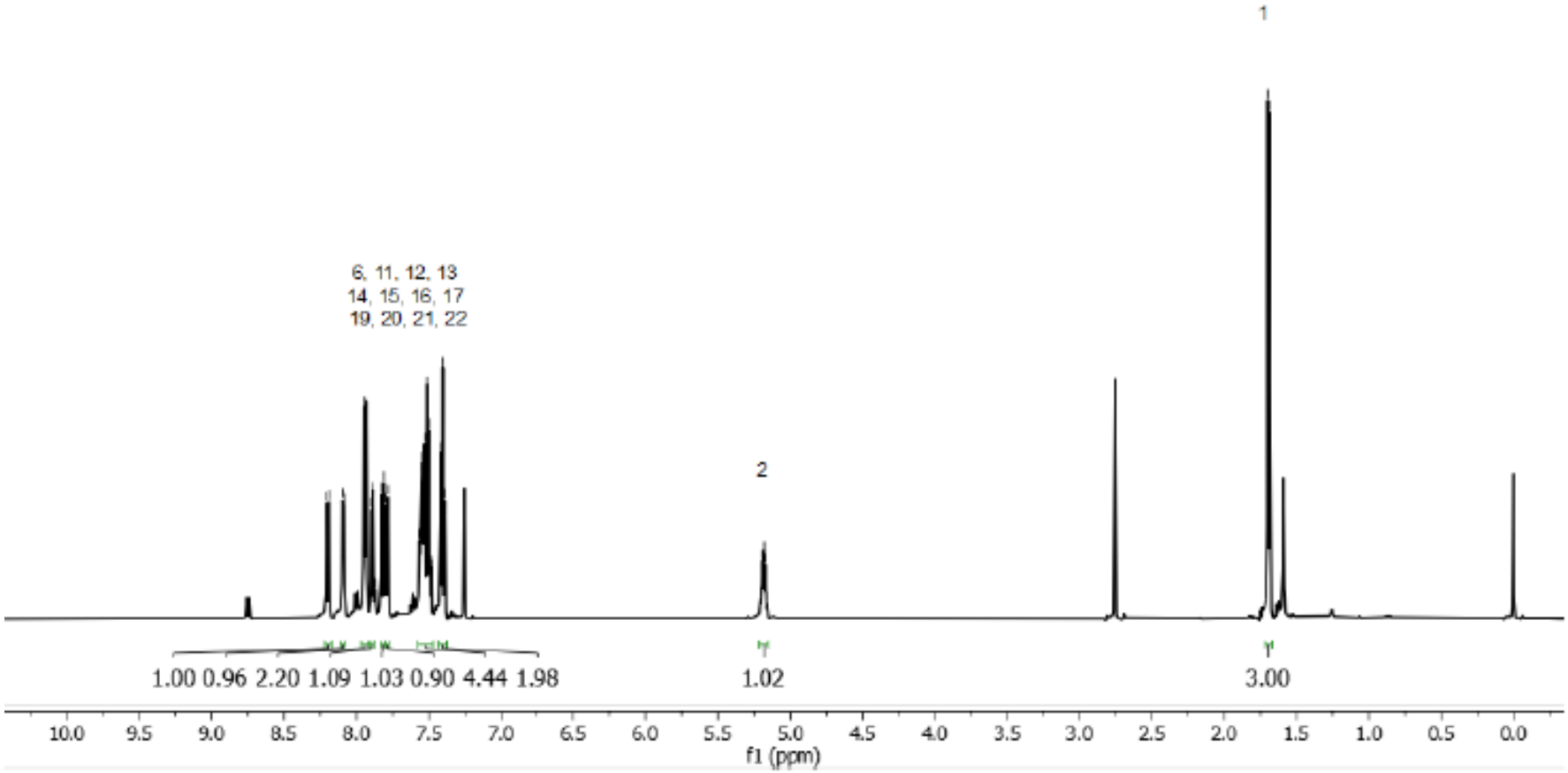
Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	12.049	8706211	456794	38.214		M	
2	13.400	14076538	671330	61.786		M	
Total		22782749	1128124	*e.e.*= 23%			

^{1}H NMR Spectrum (500 MHz, $CDCl_3$, 25 °C) of 1a

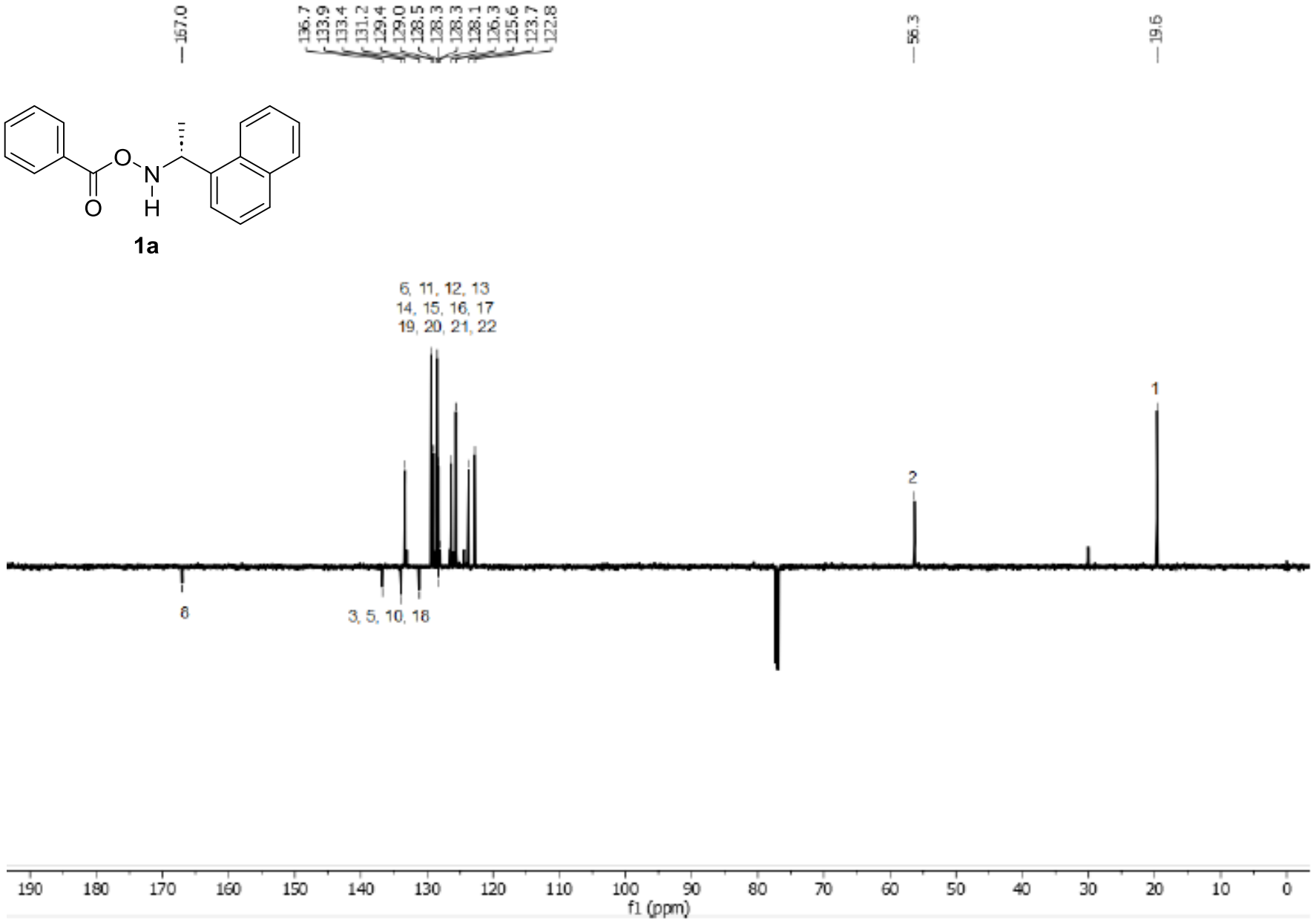




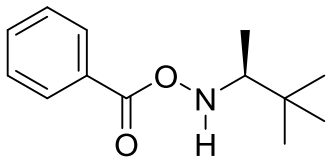
1a



DEPTQ135 NMR Spectrum (500 MHz, $CDCl_3$, 25 °C) of 1a

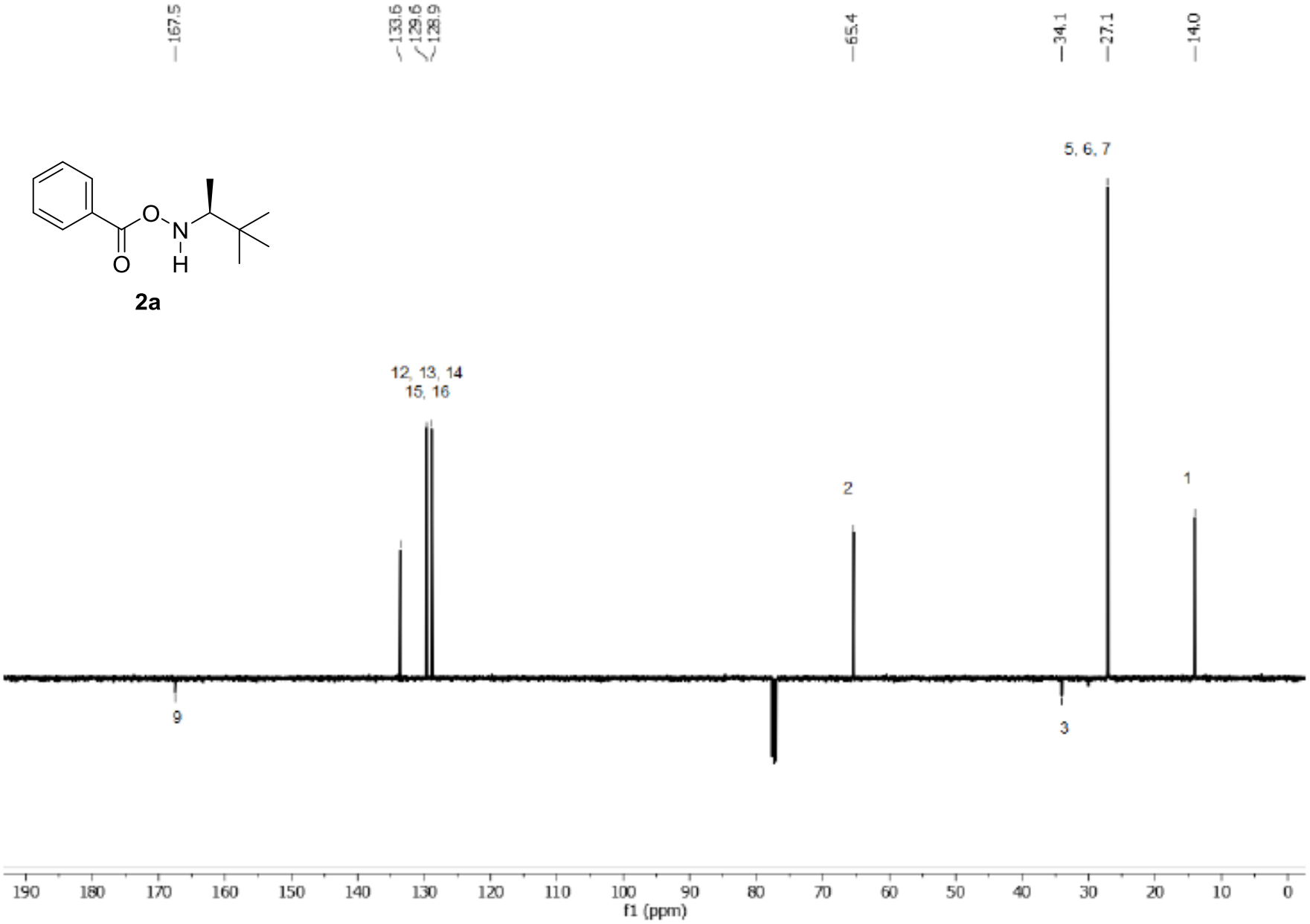


^{1}H NMR Spectrum (500 MHz, $CDCl_3$, 25 °C) of 2a



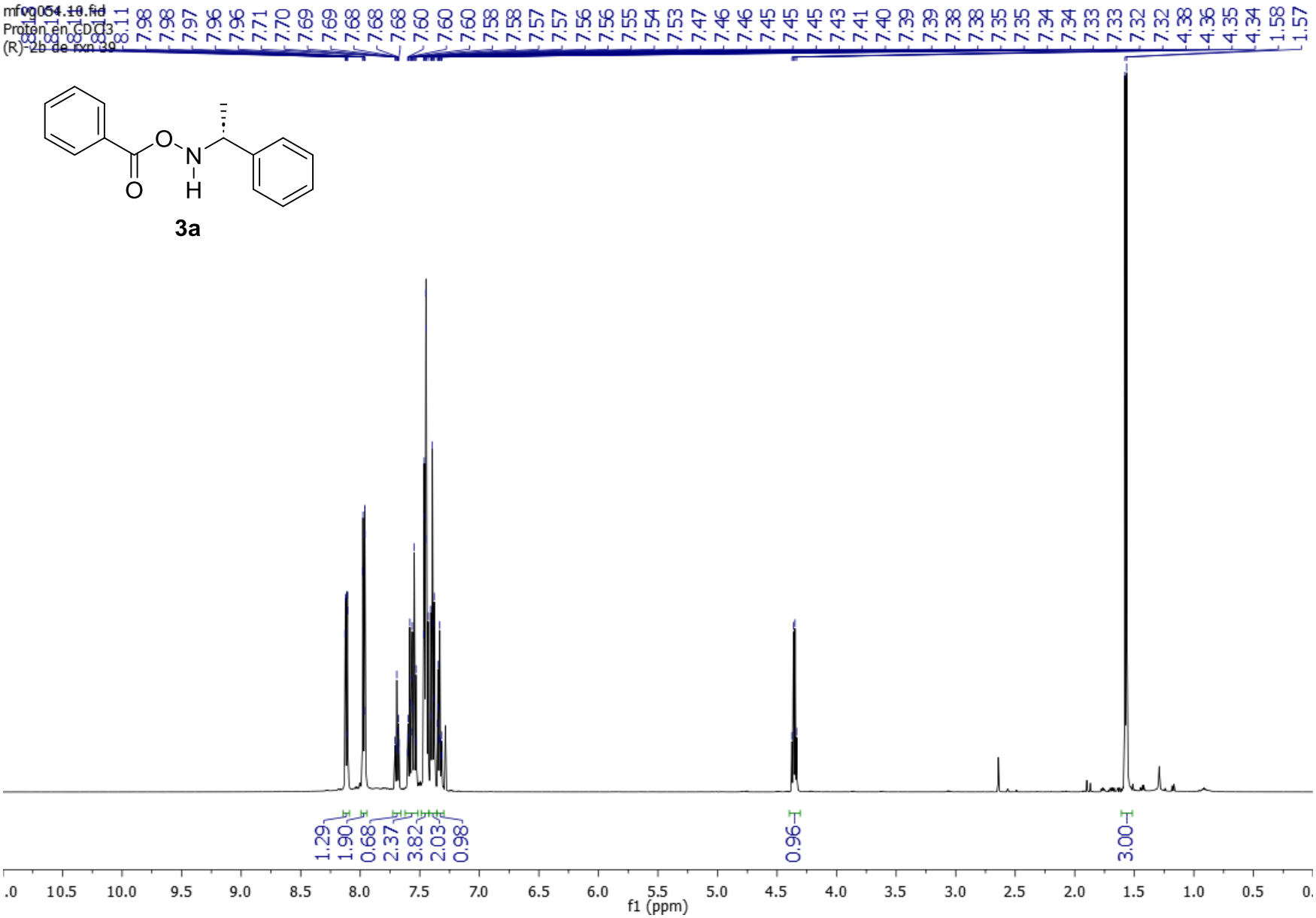
2a

DEPTQ135 NMR Spectrum (500 MHz, $CDCl_3$, 25 °C) of 2a

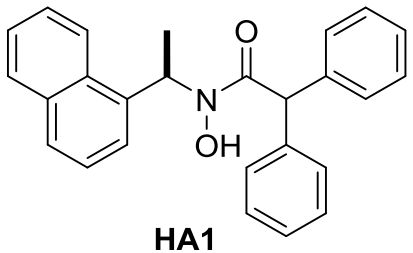


2a

^{1}H NMR Spectrum (500 MHz, $CDCl_3$, 25 °C) of 3a

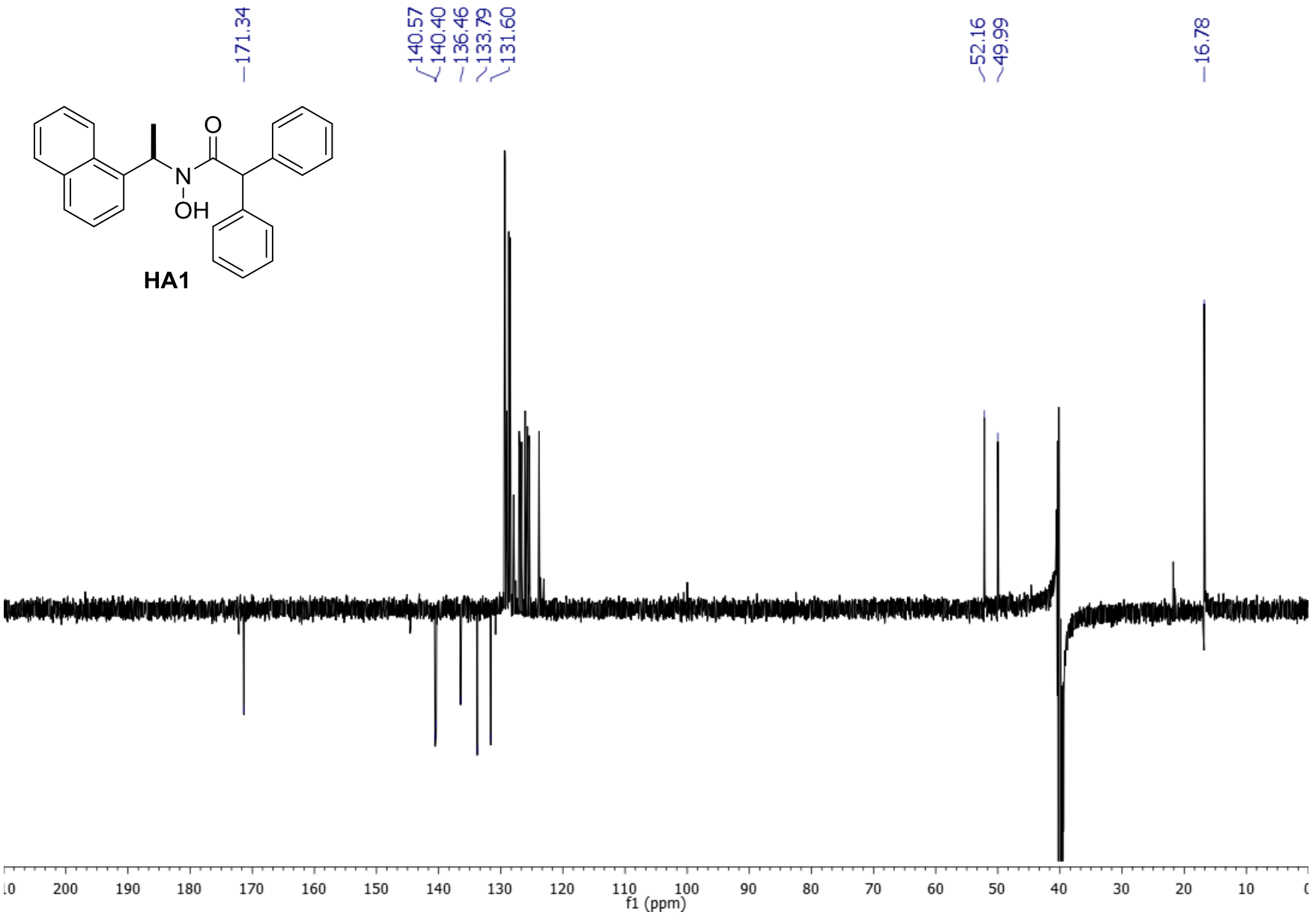


^{1}H NMR Spectrum (500 MHz, DMSO-d_6, 25 °C) of HA1

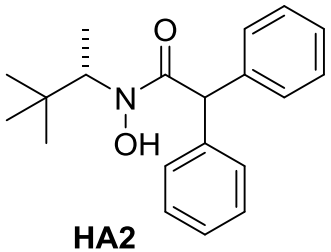


HA1

DEPTQ135 NMR Spectrum (500 MHz, DMSO-d_6, 25 °C) of HA1

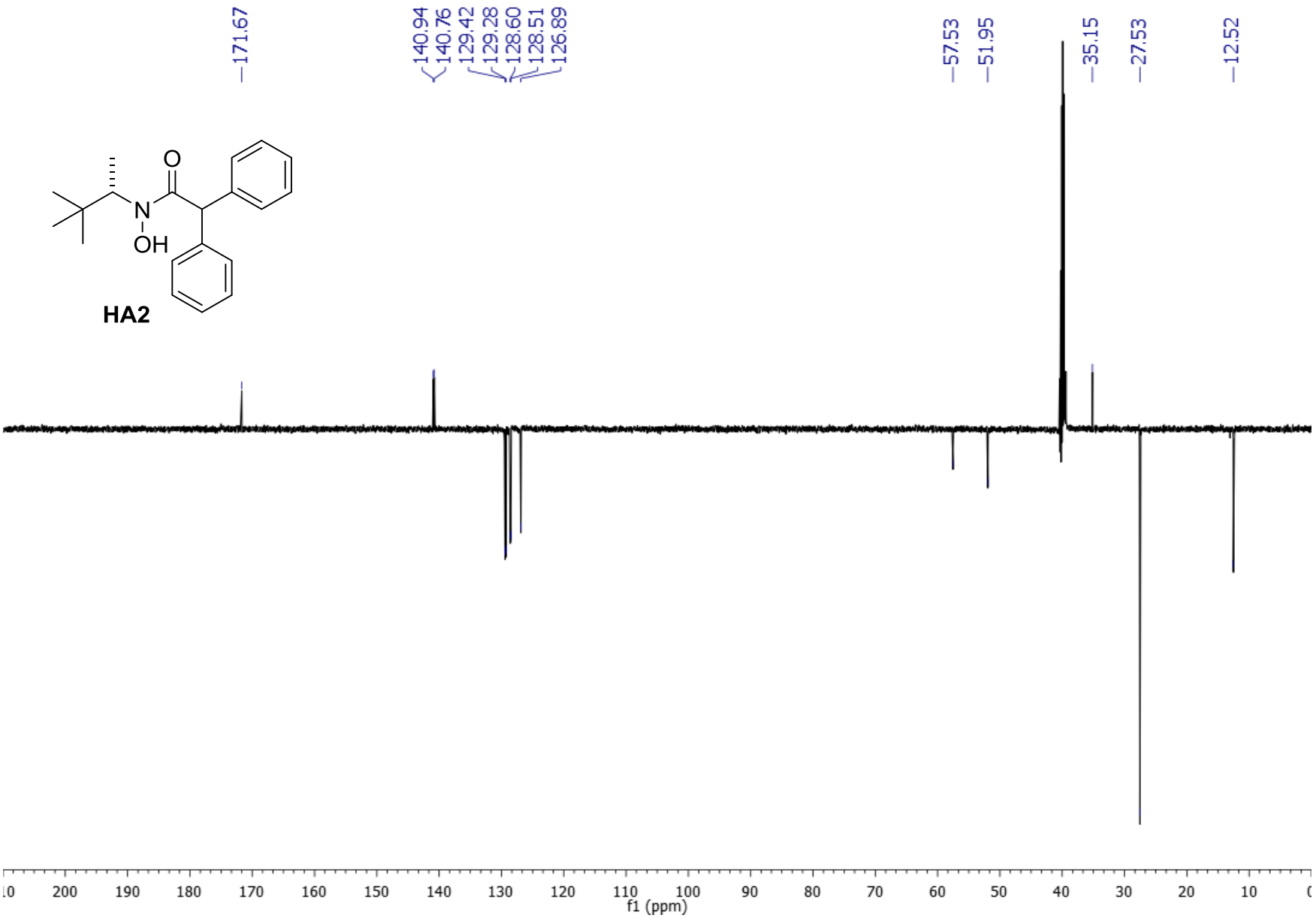


^{1}H NMR Spectrum (500 MHz, DMSO-d_6, 25 °C) of HA2

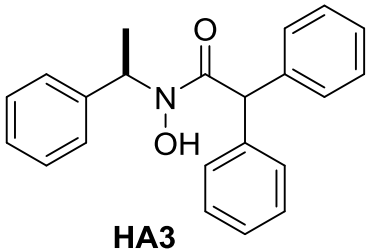


HA2

DEPTQ135 NMR Spectrum (500 MHz, DMSO-d_6, 25 °C) of HA2

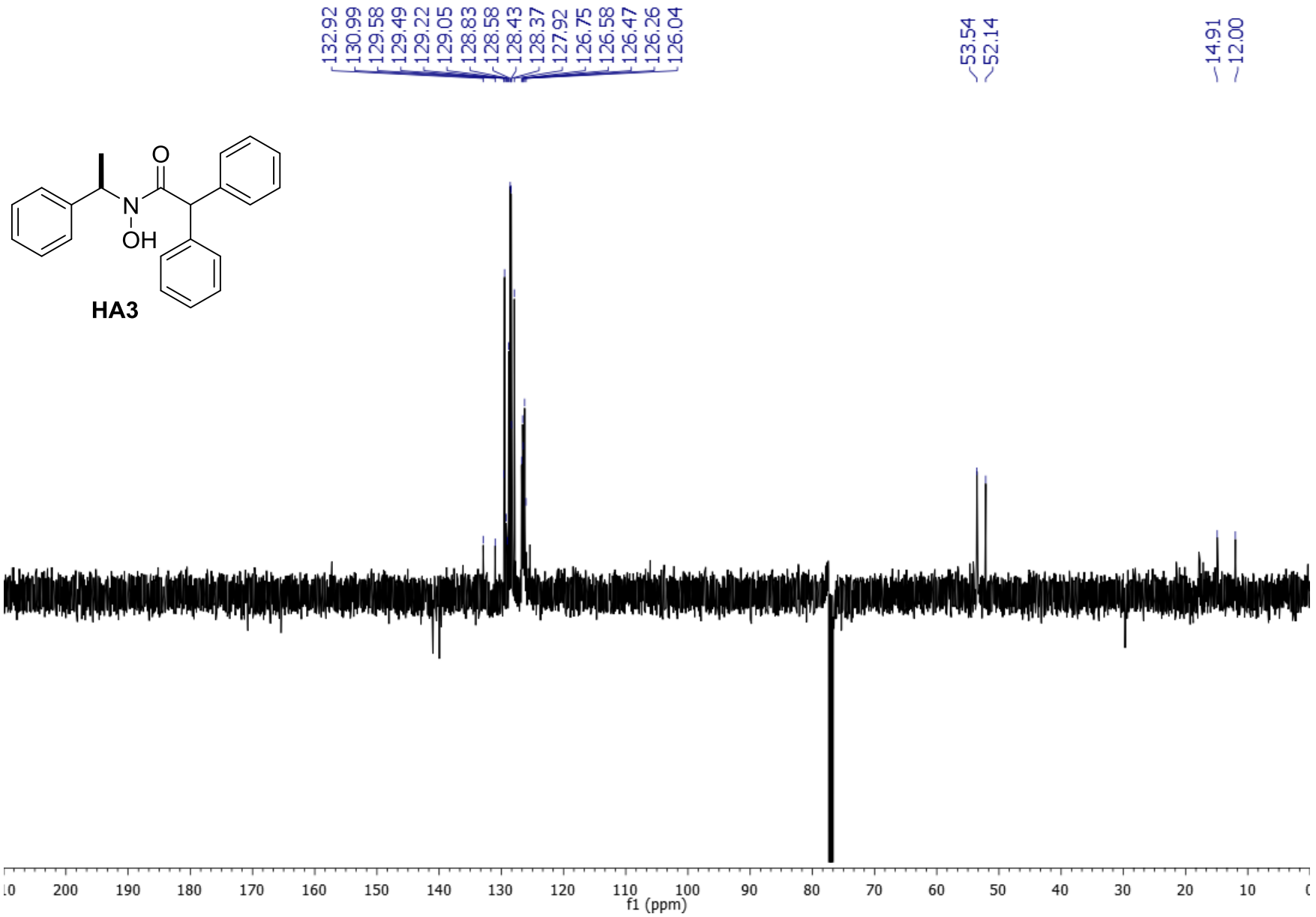


^{1}H NMR Spectrum (500 MHz, $CDCl_3$, 25 °C) of HA3

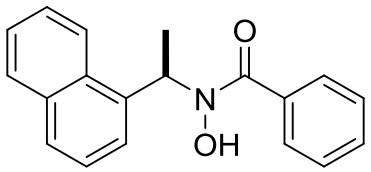


HA3

DEPTQ135 NMR Spectrum (500 MHz, $CDCl_3$, 25 °C) of HA3

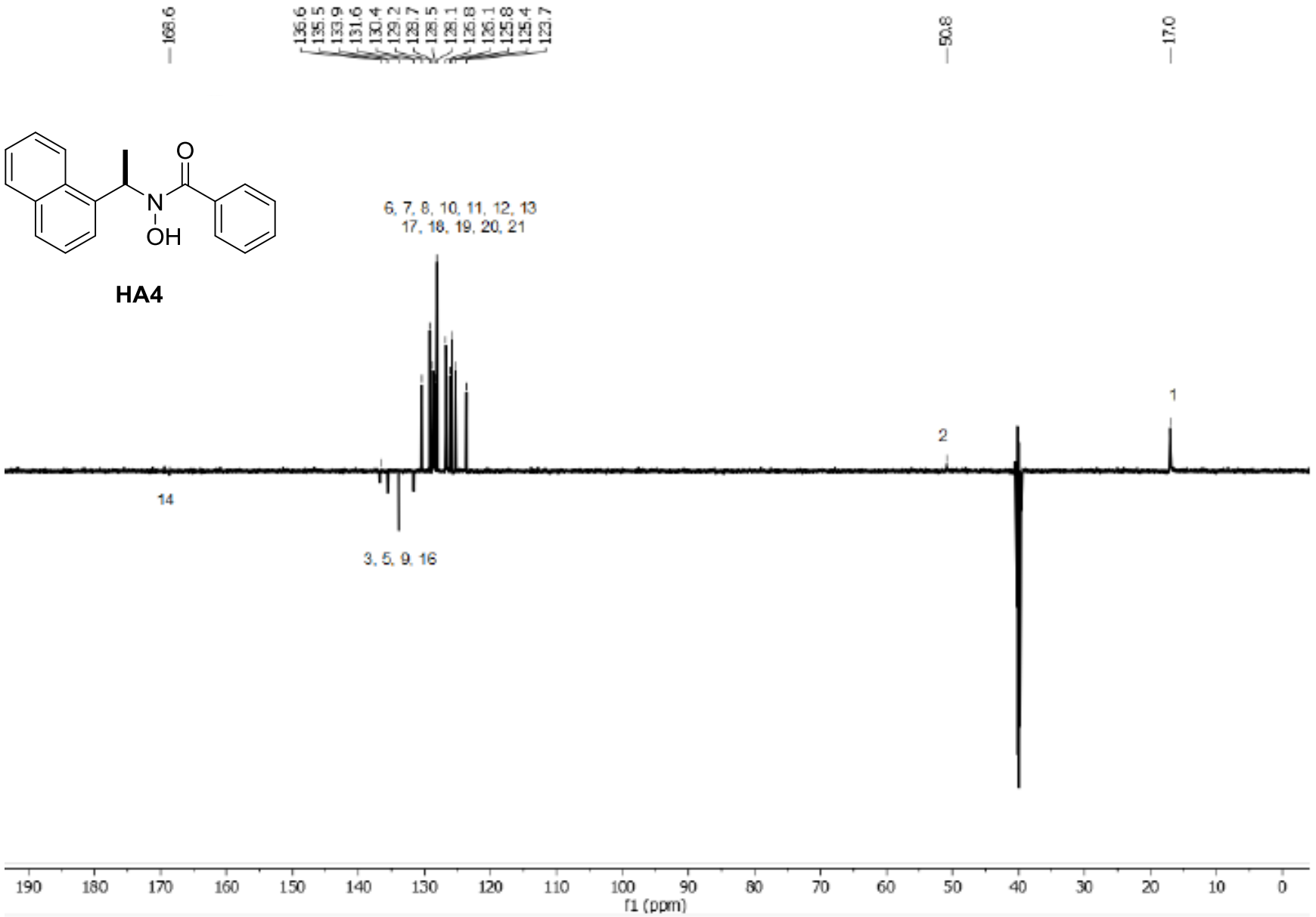


^{1}H NMR Spectrum (500 MHz, DMSO-d_6, 25 °C) of HA4

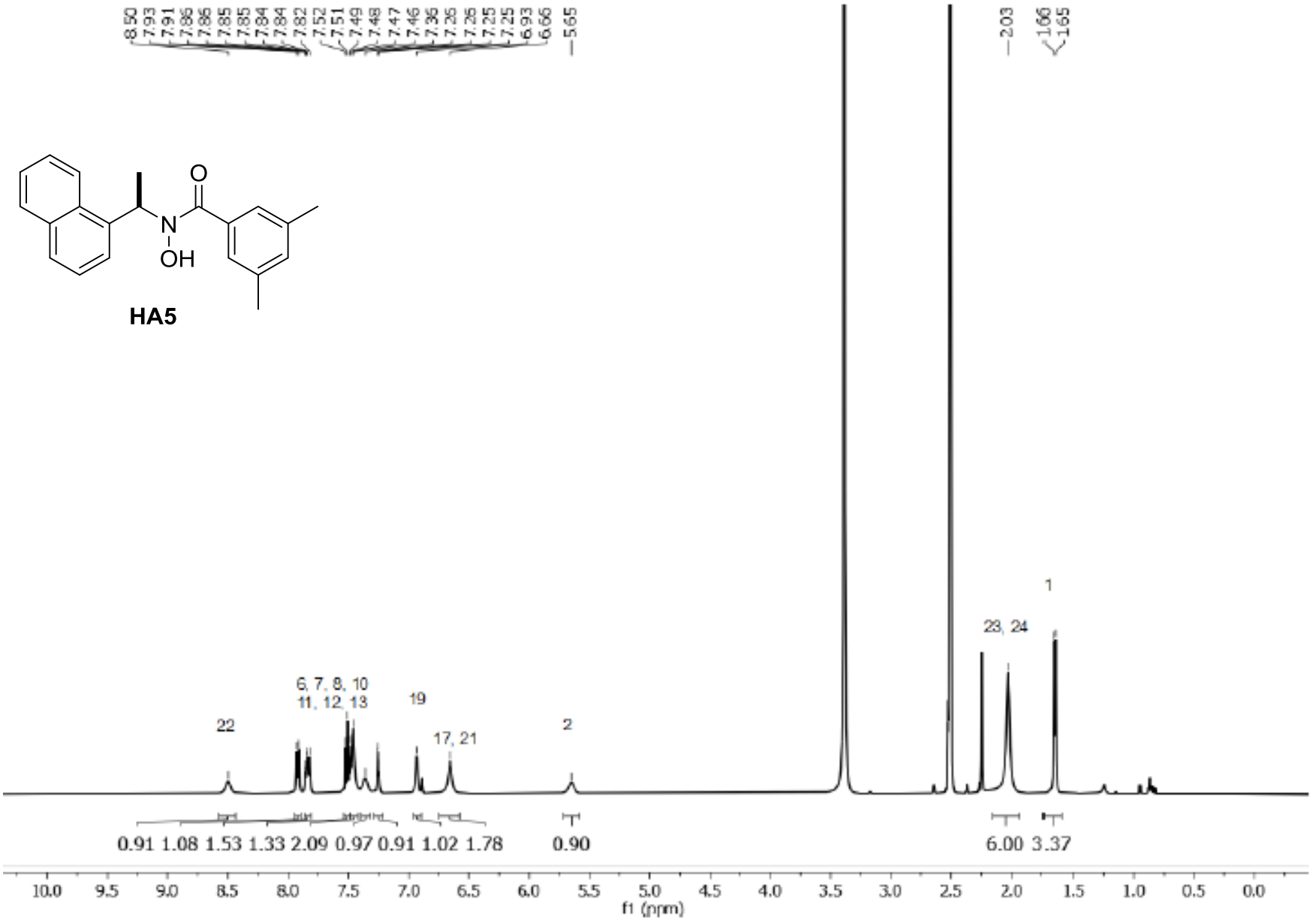


HA4

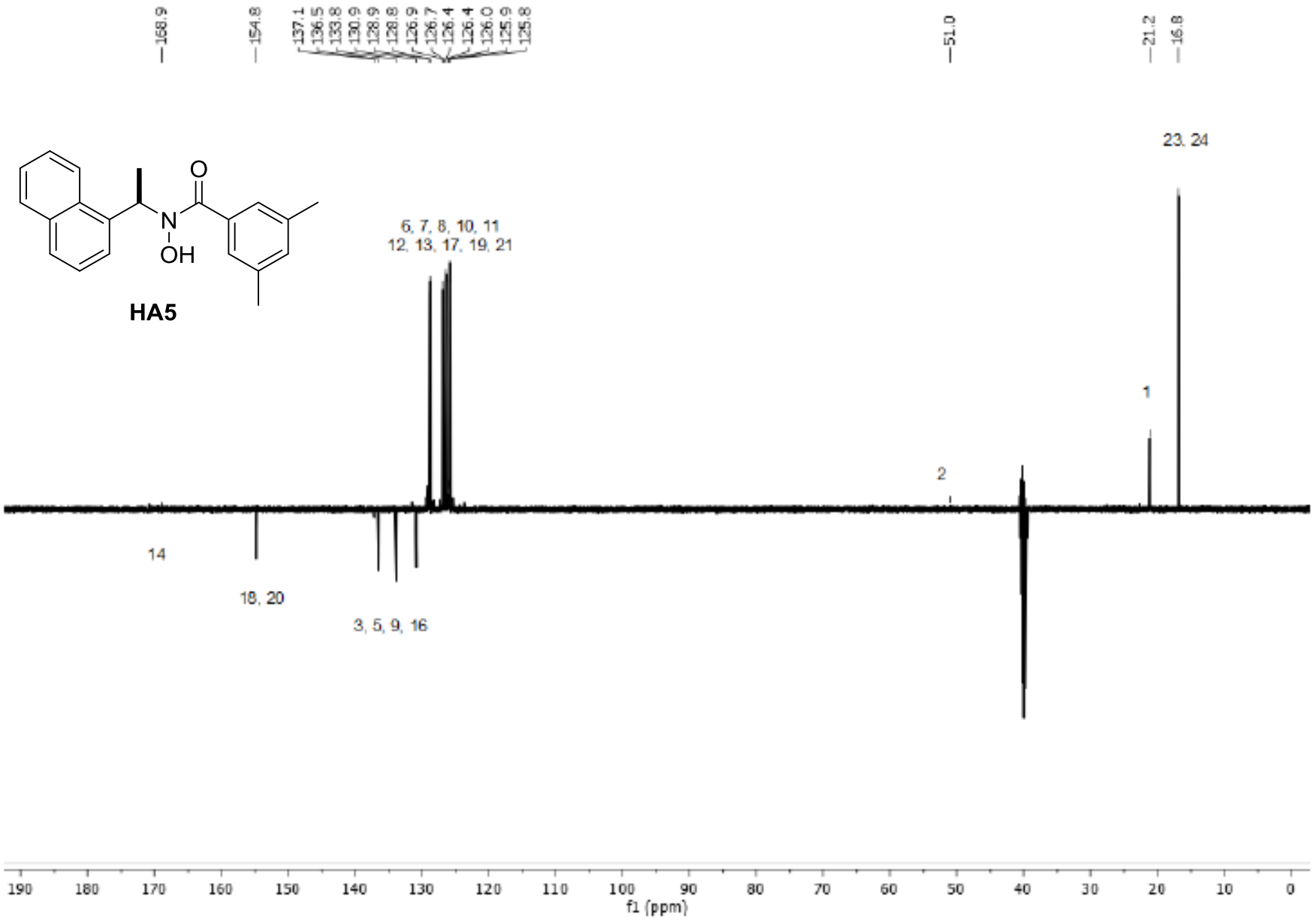
DEPTQ135 NMR Spectrum (500 MHz, DMSO-d_6, 25 °C) of HA4



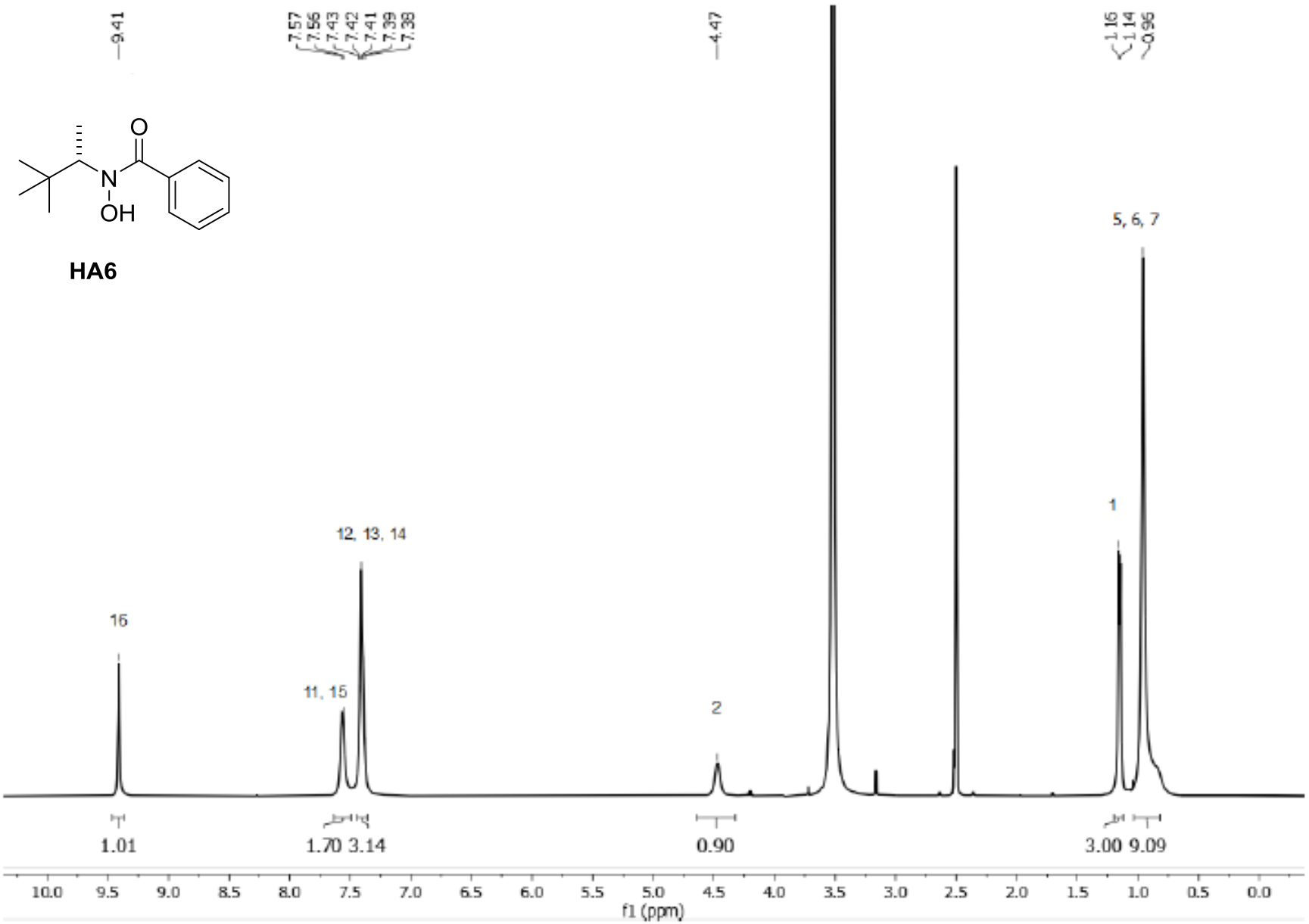
^{1}H NMR Spectrum (500 MHz, DMSO-d_6, 25 °C) of HA5



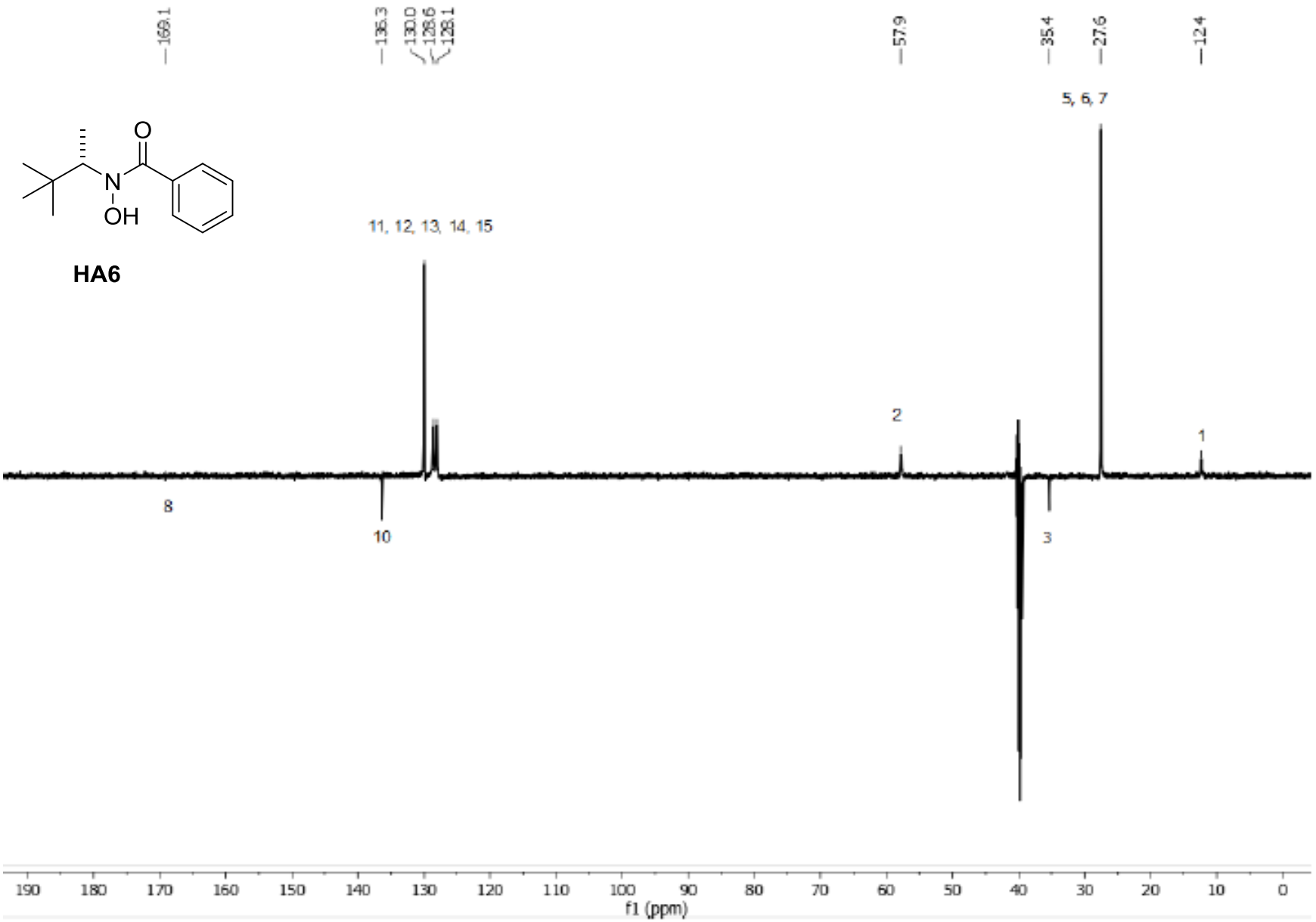
DEPTQ135 NMR Spectrum (500 MHz, DMSO-d_6, 25 °C) of HA5



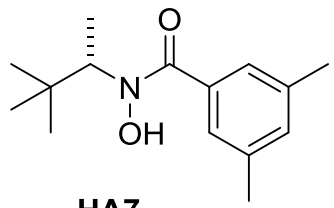
^{1}H NMR Spectrum (500 MHz, DMSO-d_6, 50 °C) of HA6



DEPTQ135 NMR Spectrum (500 MHz, DMSO-d_6, 50 °C) of HA6



^{1}H NMR Spectrum (500 MHz, DMSO-d_6, 50 °C) of HA7



HA7

DEPTQ135 NMR Spectrum (500 MHz, DMSO-d_6, 50 °C) of HA7

