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Supporting Information

Lipid-Based Quaternary Ammonium Sophorolipid Amphiphiles with Antimicrobial and Transfection Activities

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Table S1. MIC and MBC values (µg/mL) for the oleic acid (OA) and petroselinic acid (PA) based quaternary ammonium sophorolipids against *E. coli* LMG 8063, *K. pneumoniae* LMG 2095, *P. aeruginosa* PAO1, *S. aureus* ATCC 6538 and *S. aureus* Mu50. The best results against the Gram-positive bacteria are highlighted in bold, the best results against Gram-negative bacteria are highlighted in bold/italic. *The value given is the $MIC_{1/2}$ value, *i.e*. the minimum inhibitory concentration at which the growth of the strain is reduced by 50%. ND = not determined.

(µg/mL)			1	4a	4b	4c	4d	5a	5b	5c	5d
OA based derivatives	***E. coli***	**MIC**	>1000	>1000	>1000	1000	500	>1000	>1000	***125***	250
	LMG 8063	**MBC**	ND	ND	ND	ND	ND	ND	ND	***125***	ND
	K. pneumoniae	**MIC**	>1000	>1000	>1000	1000	125	>1000	>1000	***62.5***	250
	LMG 2095	**MBC**	ND	ND	ND	ND	ND	ND	ND	***62.5***	ND
	P. aeruginosa	**MIC**	>1000	>1000	>1000	>1000	>1000	>1000	500*	125	500
	PAO1	**MBC**	ND	ND	ND	ND	ND	ND	ND	ND	ND
	S. aureus	**MIC**	125	7.81	7.81	**1.95**	**1.95**	**1.95**	**1.95**	15.6	31.3
	ATCC 6538	**MBC**	250	7.81	250	**3.91**	**7.81**	**7.81**	**1.95**	31.3	62.5
	S. aureus	**MIC**	250	31.3	62.5	**1.95**	**1.95**	**3.91**	**3.91**	31.3	125
	Mu50	**MBC**	1000	62.5	250	**1.95**	**3.91**	**15.6**	**15.6**	62.5	250
(µg/mL)			**7**	**11a**	**11b**	**11c**	**11d**	**12a**	**12b**	**12c**	**12d**
PA based derivatives	***E. coli***	**MIC**	>1000	>1000	>1000	1000	1000	>1000	>1000	***62.5***	***31.3***
	LMG 8063	**MBC**	ND	ND	ND	ND	ND	ND	ND	***125***	***62.5***
	K. pneumoniae	**MIC**	>1000	>1000	>1000	1000	1000	1000	>1000	***31.3***	***31.3***
	LMG 2095	**MBC**	ND	ND	ND	ND	ND	ND	ND	***125***	***125***
	P. aeruginosa	**MIC**	>1000	>1000	>1000	>1000	>1000	1000	>1000	250	125
	PAO1	**MBC**	ND	ND	ND	ND	ND	ND	ND	ND	ND
	S. aureus	**MIC**	125	62.5	125	7.81	**1.95**	7.81	15.6	7.81	15.6
	ATCC 6538	**MBC**	250	62.5	500	15.6	**1.95**	7.81	15.6	15.6	15.6
	S. aureus	**MIC**	250	500	500	7.81	**1.95**	15.6	15.6	7.81	15.6
	Mu50	**MBC**	1000	1000	>1000	7.81	**1.95**	15.6	31.3	31.3	31.3

Table S2. MIC values (µg/mL) for the deglycosylated derivatives against *S. aureus* ATCC 6538 and *S. aureus* Mu50

(µg/mL)		5a	5b	13a	13b	14a	14b
S. aureus	**MIC**	1.95	1.95	1.95	1.95	31.25	15.63
ATCC 6538	**MBC**	7.81	1.95	31.25	31.25	31.25	15.63
S. aureus	**MIC**	3.91	3.91	62.5	62.5	125	62.5
Mu50	**MBC**	15.6	15.6	62.5	62.5	125	125

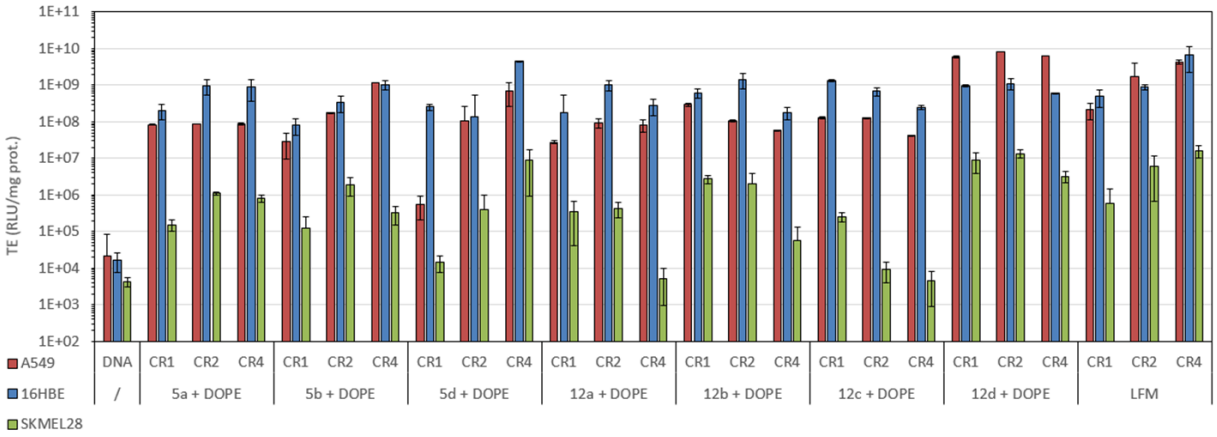


Figure S1. Transfection efficacies (TE) of deprotected quaternary ammonium sophorolipids **5** and **12** (formulated with DOPE) on three cell lines (A549, 16HBE and SKMEL28) using a luciferase-encoding pDNA. TE are expressed in RLU per mg of proteins (n = 3). Lipofectamine (LFM) and naked (uncomplexed) pDNA were used as positive and negative controls, respectively.

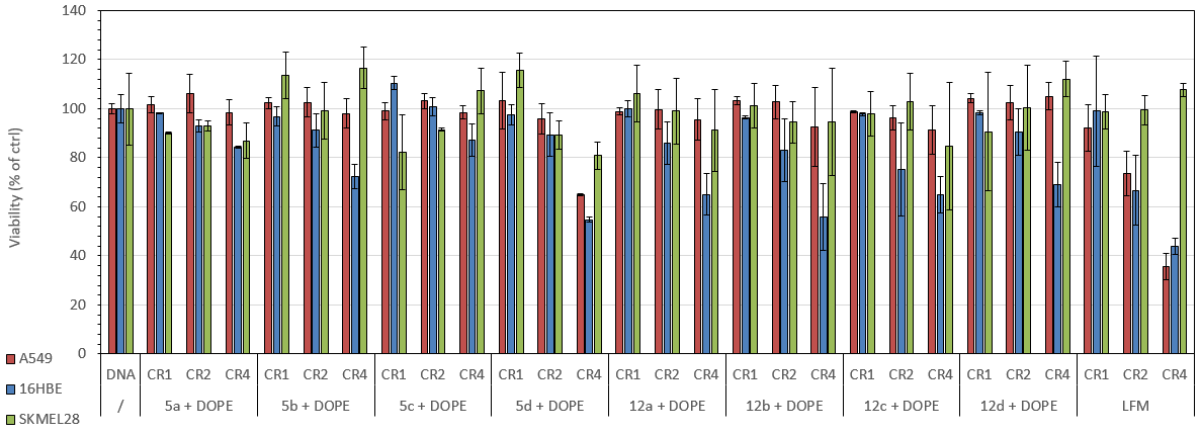
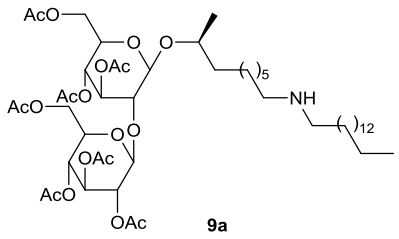


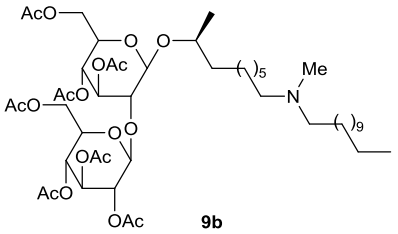
Figure S2. Cell viability determined 48 h after incubation of the cells with lipoplexes prepared with deprotected quaternary ammonium sophorolipids **5** and **12** (formulated with DOPE). Naked pDNA was used as the negative control. Values are expressed as a percentage of the viability determined with untransfected cells.

***N*-pentadecyl-(*(S)*-8-[(2",3',3",4',4",6',6"-heptaacetoxy-2'-*O*-*β*-*D*-glucopyranosyl-*β*-*D*-glucopyranosyl)-oxy])nonan-1-amine (9a):** Purification gradient: 2 CV 5% mixture A, 35 CV 5-40% mixture A, 2 CV 40% mixture A. (1.65g, 96%), viscous colorless oil.



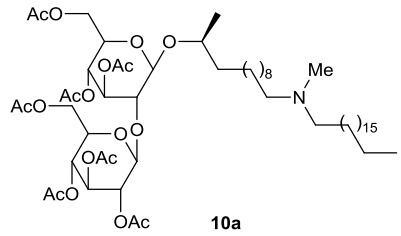
^{1}H-NMR (400 MHz, $CDCl_3$): δ_H 0.88 (3H, t, *J*=6.8 Hz, C$\underline{H}_3$CH$_2$), 1.22 (3H, d, J=6.2 Hz, C$\underline{H}_3$CH), 1.24-1.47 (33H, m, C$\underline{H}_2$CH$_3$, 15xC$\underline{H}_2$(CH$_2$)$_2$, C$\underline{H}_a$H$_b$CHCH$_3$), 1.51-1.61 (1H, m, CH$_a\underline{H}_b$CHCH$_3$), 1.69-1.80 (4H, m, 2xC$\underline{H}_2$CH$_2$N), 2.00 (6H, s, 2xC$\underline{H}_3$C=O), 2.04 (3H, s, C$\underline{H}_3$C=O), 2.04 (3H, s, C$\underline{H}_3$C=O), 2.06 (3H, s, C$\underline{H}_3$C=O), 2.08 (3H, s, C$\underline{H}_3$C=O), 2.09 (3H, s, C$\underline{H}_3$C=O), 2.91-2.97 (4H, m, 2xCH$_2$C$\underline{H}_2$N), 3.65-3.75 (4H, m, 2xC$\underline{H}$CH$_2$OAc, CH$_3$C$\underline{H}$O, C$\underline{H}$OC), 4.08-4.11 (2H, m, 2xCHC$\underline{H}_a$H$_b$OAc), 4.23-4.28 (2H, m, 2xCHCH$_a\underline{H}_b$OAc), 4.48 (1H, d, *J*=7.6 Hz, C$\underline{H}$(O)$_2$), 4.72 (1H, d, *J*=8.0 Hz, C$\underline{H}$(O)$_2$), 4.87 (1H, dxd, *J*=9.5 Hz, *J*=8.1 Hz, C$\underline{H}$OC), 4.93 (1H, dxd, *J*=9.7 Hz, *J*=9.7 Hz, C$\underline{H}$OC), 5.02 (1H, dxd, *J*=9.7 Hz, *J*=9.7 Hz, C$\underline{H}$OC), 5.13 (1H, dxd, *J*=9.9 Hz, *J*=9.9 Hz, C$\underline{H}$OC), 5.18 (1H, dxd, *J*=9.5 Hz, *J*=9.5 Hz, C$\underline{H}$OC). **^{13}C-NMR (100 MHz, $CDCl_3$):** δ_C 14.1 (C$\underline{H}_3$CH$_2$), 20.5 (C$\underline{H}_3$C=O), 20.6 (C$\underline{H}_3$C=O), 20.6 (C$\underline{H}_3$C=O), 20.7 (C$\underline{H}_3$C=O), 20.7 (C$\underline{H}_3$C=O), 20.8 (C$\underline{H}_3$C=O), 20.8 (C$\underline{H}_3$C=O), 21.5 (C$\underline{H}_3$CH), 22.7 (CH$_3$C$\underline{H}_2$), 24.7 (C$\underline{H}_2$(CH$_2$)$_2$), 26.3 (C$\underline{H}_2$CH$_2$N), 26.4 (C$\underline{H}_2$CH$_2$N), 26.5 (C$\underline{H}_2$(CH$_2$)$_2$), 26.7 (C$\underline{H}_2$(CH$_2$)$_2$), 29.1 (C$\underline{H}_2$(CH$_2$)$_2$), 29.2 (C$\underline{H}_2$(CH$_2$)$_2$), 29.3 (C$\underline{H}_2$(CH$_2$)$_2$), 29.4 (C$\underline{H}_2$(CH$_2$)$_2$), 29.5 (C$\underline{H}_2$(CH$_2$)$_2$), 29.5 (C$\underline{H}_2$(CH$_2$)$_2$), 29.6-29.7 (5xC$\underline{H}_2$(CH$_2$)$_2$), 31.9 (C$\underline{H}_2$(CH$_2$)$_2$), 36.5 (C$\underline{H}_2$CHCH$_3$), 48.3 (C$\underline{H}_2$N), 48.4 (C$\underline{H}_2$N), 62.2 (2xC$\underline{H}_2$OAc), 68.5 (C$\underline{H}$OC), 68.8 (C$\underline{H}$OC), 71.3 (C$\underline{H}$OC), 71.7 (C$\underline{H}$OC), 71.7 (C$\underline{H}$OC), 72.9 (C$\underline{H}$OC), 74.7 (C$\underline{H}$OC), 77.6 (C$\underline{H}$OC), 78.0 (C$\underline{H}$OC), 100.4 (C$\underline{H}$(O)$_2$), 101.3 (C$\underline{H}$(O)$_2$), 169.8 (CH$_3\underline{C}$=O), 169.9 (CH$_3\underline{C}$=O), 170.0 (CH$_3\underline{C}$=O), 170.0 (CH$_3\underline{C}$=O), 170.2 (CH$_3\underline{C}$=O), 170.7 (CH$_3\underline{C}$=O), 170.9 (CH$_3\underline{C}$=O).

***N*-dodecyl,*N*-methyl-(*(S)*-8-[(2”,3’,3”,4’,4”,6’,6”-heptaacetoxy-2’-*O*-*β*-*D*-glucopyranosyl-*β*-*D*-glucopyranosyl)-oxy])nonan-1-amine (9b):** Purification gradient: 2 CV 5% mixture A, 35 CV 5-40% mixture A, 2 CV 40% mixture A. (1.08 g, 63%), viscous colorless oil. **^{1}H-NMR (400 MHz, $CDCl_3$):** δ_H 0.88 (3H, t, *J*=6.8 Hz, C$\underline{H}_3$CH$_2$), 1.21 (3H, d, J=6.2 Hz, C$\underline{H}_3$CH), 1.24-1.41 (27H, m, C$\underline{H}_2$CH$_3$, 12xC$\underline{H}_2$(CH$_2$)$_2$, C$\underline{H}_a$H$_b$CHCH$_3$), 1.43-1.53 (4H, m, 2xC$\underline{H}_2$CH$_2$N), 1.56-1.63 (1H, m, CH$_a\underline{H}_b$CHCH$_3$), 1.99 (3H, s, C$\underline{H}_3$C=O), 2.00 (3H, s, C$\underline{H}_3$C=O), 2.01 (3H, s, C$\underline{H}_3$C=O), 2.03 (3H, s, C$\underline{H}_3$C=O), 2.06 (3H, s, C$\underline{H}_3$C=O), 2.08 (6H, s, 2xC$\underline{H}_3$C=O), 2.23 (3H, s, C$\underline{H}_3$N), 2.31-2.37 (4H, m, 2xCH$_2$C$\underline{H}_2$N), 3.63-3.75 (4H, m, 2xC$\underline{H}$CH$_2$OAc, CH$_3$C$\underline{H}$O, C$\underline{H}$OC), 4.07-4.10 (2H, m, 2xCHC$\underline{H}_a$H$_b$OAc), 4.22-4.29 (2H, m, 2xCHCH$_a\underline{H}_b$OAc), 4.47 (1H, d, *J*=7.6 Hz, C$\underline{H}$(O)$_2$), 4.73 (1H, d, *J*=8.0 Hz, C$\underline{H}$(O)$_2$), 4.91 (1H, dxd, *J*=9.2 Hz, *J*=9.2 Hz, C$\underline{H}$OC), 4.93 (1H, dxd, *J*=9.6 Hz, *J*=9.6 Hz, C$\underline{H}$OC), 5.06 (1H, dxd, *J*=9.5 Hz, *J*=9.5 Hz, C$\underline{H}$OC), 5.13 (1H, dxd, *J*=9.4 Hz, *J*=9.4 Hz, C$\underline{H}$OC), 5.16 (1H, dxd, *J*=9.5 Hz, *J*=9.5 Hz, C$\underline{H}$OC). **^{13}C-NMR (100 MHz, $CDCl_3$):** δ_C 14.1 (C$\underline{H}_3$CH$_2$), 20.5 (C$\underline{H}_3$C=O), 20.6 (C$\underline{H}_3$C=O), 20.6 (C$\underline{H}_3$C=O), 20.6 (C$\underline{H}_3$C=O), 20.7 (2xC$\underline{H}_3$C=O), 20.8 (C$\underline{H}_3$C=O), 21.2 (C$\underline{H}_3$CH), 22.7 (CH$_3$C$\underline{H}_2$), 25.0 (C$\underline{H}_2$(CH$_2$)$_2$), 27.0 (C$\underline{H}_2$CH$_2$N), 27.1 (C$\underline{H}_2$CH$_2$N), 27.6 (C$\underline{H}_2$(CH$_2$)$_2$), 27.7 (C$\underline{H}_2$(CH$_2$)$_2$), 29.3 (C$\underline{H}_2$(CH$_2$)$_2$), 29.6-29.7 (5xC$\underline{H}_2$(CH$_2$)$_2$), 29.7 (C$\underline{H}_2$(CH$_2$)$_2$), 29.8 (C$\underline{H}_2$(CH$_2$)$_2$), 31.9 (C$\underline{H}_2$(CH$_2$)$_2$), 36.5 (C$\underline{H}_2$CHCH$_3$), 42.1 (C$\underline{H}_3$N), 57.7 (C$\underline{H}_2$N), 57.8 (C$\underline{H}_2$N), 62.0 (C$\underline{H}_2$OAc), 62.3 (C$\underline{H}_2$OAc), 68.3 (C$\underline{H}$OC), 68.9 (C$\underline{H}$OC), 71.3 (C$\underline{H}$OC), 71.7 (C$\underline{H}$OC), 71.8 (C$\underline{H}$OC), 73.1 (C$\underline{H}$OC), 74.6 (C$\underline{H}$OC), 77.7 (C$\underline{H}$OC), 77.9 (C$\underline{H}$OC), 100.4 (C$\underline{H}$(O)$_2$), 101.1 (C$\underline{H}$(O)$_2$), 169.3 (CH$_3$C$\underline{=}$O), 169.4 (CH$_3$C$\underline{=}$O), 169.7 (CH$_3$C$\underline{=}$O), 170.0 (CH$_3$C$\underline{=}$O), 170.3 (CH$_3$C$\underline{=}$O), 170.6 (CH$_3$C$\underline{=}$O), 170.6 (CH$_3$C$\underline{=}$O).



9b

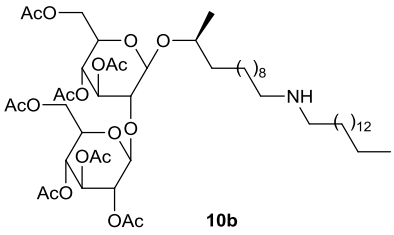
***N*-methyl,*N*-octadecyl-(*(S)*-11-[(2”,3’,3”,4’,4”,6’,6”-heptaacetoxy-2’-*O*-*β*-*D*-glucopyranosyl-*β*-*D*-glucopyranosyl)-oxy])dodecan-1-amine (10a):** Purification gradient: 2 CV 15% mixture A, 25 CV 15-60% mixture A, 2 CV 60% mixture A. (1.22 g, 46%), viscous colorless oil. **^{1}H-NMR (400 MHz, $CDCl_3$):** δ_H 0.88 (3H, t, *J* = 6.8 Hz, C$\underline{H}_3$CH$_2$), 1.22 (3H, d, *J* = 6.2 Hz, C$\underline{H}_3$CH), 1.24-1.40 (45H, m, C$\underline{H}_2$CH$_3$, 21xC$\underline{H}_2$(CH$_2$)$_2$, C$\underline{H}_a$H$_b$CHCH$_3$), 1.41-1.50 (4H, m, 2xC$\underline{H}_2$CH$_2$N), 1.56-1.66 (1H, m, CH$_a\underline{H}_b$CHCH$_3$), 1.99 (3H, s, C$\underline{H}_3$C=O), 2.00 (3H, s, C$\underline{H}_3$C=O), 2.01 (3H, s, C$\underline{H}_3$C=O), 2.03 (3H, s, C$\underline{H}_3$C=O), 2.06 (3H, s, C$\underline{H}_3$C=O), 2.08 (6H, s, 2xC$\underline{H}_3$C=O), 2.20 (3H, s, C$\underline{H}_3$N), 2.28-2.32 (4H, m, 2xCH$_2$C$\underline{H}_2$N), 3.63-3.75 (4H, m, 2xC$\underline{H}$CH$_2$OAc, CH$_3$C$\underline{H}$O, C$\underline{H}$OC), 4.06-4.10 (2H, m, 2xCHC$\underline{H}_a$H$_b$OAc), 4.23-4.32 (2H, m, 2xCHCH$_a\underline{H}_b$OAc), 4.48 (1H, d, *J* = 7.6 Hz, C$\underline{H}$(O)$_2$), 4.74 (1H, d, *J* = 8.0 Hz, C$\underline{H}$(O)$_2$), 4.89-4.96 (2H, m, 2xC$\underline{H}$OC), 5.07 (1H, dxd, *J* = 9.5 Hz, *J* = 9.5 Hz, C$\underline{H}$OC), 5.13 (1H, dxd, *J* = 9.3 Hz, *J* = 9.3 Hz, C$\underline{H}$OC), 5.17 (1H, dxd, *J* = 9.5 Hz, *J* = 9.5 Hz, C$\underline{H}$OC). **^{13}C-NMR (100 MHz, $CDCl_3$):** δ_C 14.1 (C$\underline{H}_3$CH$_2$), 20.5 (C$\underline{H}_3$C=O), 20.6 (2xC$\underline{H}_3$C=O), 20.6 (C$\underline{H}_3$C=O), 20.7 (2xC$\underline{H}_3$C=O), 20.8 (C$\underline{H}_3$C=O), 21.2 (C$\underline{H}_3$CH), 22.7 (C$\underline{H}_2$CH$_3$), 25.1 (C$\underline{H}_2$(CH$_2$)$_2$), 27.3 (C$\underline{H}_2$CH$_2$N), 27.4 (C$\underline{H}_2$CH$_2$N), 27.6



10a

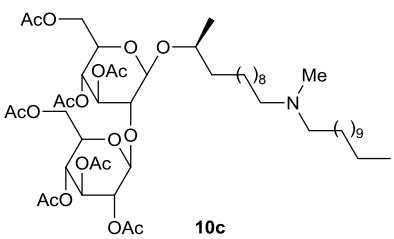
(CH_2(CH_2)$_2$), 27.7 (CH_2(CH_2)$_2$), 29.3 (CH_2(CH_2)$_2$), 29.6-29.7 (15xCH_2(CH_2)$_2$), 29.8 (CH_2(CH_2)$_2$), 31.9 (CH_2(CH_2)$_2$), 36.5 (CH_2CHCH_3), 42.3 (CH_3N), 58.0 (CH_2CH_2N), 58.0 (CH_2CH_2N), 61.9 (CH_2OAc), 62.2 (CH_2OAc), 68.2 (CHOC), 68.8 (CHOC), 71.3 (CHOC), 71.7 (CHOC), 71.8 (CHOC), 73.0 (CHOC), 74.6 (CHOC), 77.6 (CHOC), 78.0 (CHOC), 100.4 (CH(O_2)), 101.1 (CH(O_2)), 169.3 (CH_3C=O), 169.4 (CH_3C=O), 169.7 (CH_3C=O), 170.0 (CH_3C=O), 170.3 (CH_3C=O), 170.6 (CH_3C=O), 170.6 (CH_3C=O).

***N*-pentadecyl-(*(S)*-11-[(2”,3’,3”,4’,4”,6’,6”-heptaacetoxy-2’-*O*-*β*-*D*-glucopyranosyl-*β*-*D*-glucopyranosyl)-oxy])dodecan-1-amine (10b):** No purification needed. (2.30g, 91%), viscous colorless oil. **^{1}H-NMR (400 MHz, $CDCl_3$):** δ_H 0.88 (3H, t, *J*=6.8 Hz, C$H_3$$CH_2$), 1.22 (3H, d, J=6.2 Hz, CH_3CH), 1.24-1.50 (39H, m, C$H_2$$CH_3$, 18xC$H_2$($CH_2$)$_2$, C$H_a$$H_bCHCH_3$), 1.56-1.62 (1H, m, C$H_a$$H_bCHCH_3$), 1.65-1.74 (4H, m, 2xC$H_2$$CH_2$N), 1.99 (3H, s, C$H_3$C=O), 2.00 (3H, s, C$H_3$C=O), 2.02 (3H, s, C$H_3$C=O), 2.03 (3H, s, C$H_3$C=O), 2.06 (3H, s, C$H_3$C=O), 2.08 (6H, s, 2xC$H_3$C=O), 2.85-2.88 (4H, m, 2xCH_2CH_2N), 3.64-3.76 (4H, m, 2xCHCH_2OAc, CH_3CHO, CHOC), 4.06-4.10 (2H, m, 2xCHC$H_a$$H_b$OAc), 4.22-4.31 (2H, m, 2xCHC$H_a$$H_b$OAc), 4.48 (1H, d, *J*=7.6 Hz, CH(O_2)), 4.74 (1H, d, *J*=8.0 Hz, CH(O_2)), 4.88-4.92 (1H, m, CHOC), 4.93 (1H, dxd, *J*=9.9 Hz, *J*=9.9 Hz, CHOC), 5.05 (1H, dxd, *J*=9.6 Hz, *J*=9.6 Hz, CHOC), 5.13 (1H, dxd, *J*=9.4 Hz, *J*=9.4 Hz, CHOC), 5.16 (1H, dxd, *J*=9.5 Hz, *J*=9.5 Hz, CHOC), 6.01 (1H, br s, NH). **^{13}C-NMR (100 MHz, $CDCl_3$):** δ_C 14.1 (C$H_3$$CH_2$), 20.5 (C$H_3$C=O), 20.6 (C$H_3$C=O), 20.6 (2xC$H_3$C=O), 20.7 (C$H_3$C=O), 20.7 (C$H_3$C=O), 20.8 (C$H_3$C=O), 21.3 (C$H_3$CH), 22.7 ($CH_3CH_2$), 25.0 (C$H_2$($CH_2$)$_2$), 26.6 (C$H_2$$CH_2$N), 26.7 ($CH_2CH_2$N), 26.8 (C$H_2$($CH_2$)$_2$), 29.0 (C$H_2$($CH_2$)$_2$), 29.1 (C$H_2$($CH_2$)$_2$), 29.3 (2xC$H_2$($CH_2$)$_2$), 29.4 (2xC$H_2$($CH_2$)$_2$), 29.5 (C$H_2$($CH_2$)$_2$), 29.6-29.7 (8xC$H_2$($CH_2$)$_2$), 31.9 (C$H_2$($CH_2$)$_2$), 36.5 (C$H_2CHCH_3$), 48.5 (2xC$H_2$N), 62.1 (C$H_2$OAc), 62.3 (C$H_2$OAc), 68.3 (CHOC), 68.9 (CHOC), 71.3 (CHOC), 71.7 (CHOC), 71.8 (CHOC), 73.0 (CHOC), 74.6 (CHOC), 77.7 (CHOC), 77.9 (CHOC), 100.4 (CH(O_2)), 101.1 (CH(O_2)), 169.4 (CH_3C=O), 169.5 (CH_3C=O), 169.7 (CH_3C=O), 170.0 (CH_3C=O), 170.2 (CH_3C=O), 170.6 (CH_3C=O), 170.7 (CH_3C=O).



10b

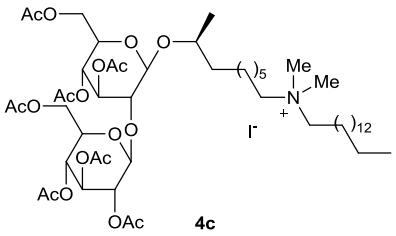
***N*-dodecyl,*N*-methyl-(*(S)*-11-[(2”,3’,3”,4’,4”,6’,6”-heptaacetoxy-2’-*O*-*β*-*D*-glucopyranosyl-*β*-*D*-glucopyranosyl)-oxy])dodecan-1-amine (10c):** Purification gradient: 2 CV 15% mixture A, 35 CV 15-70% mixture A, 2 CV 70% mixture A. (0.92 g, 37%), viscous colorless oil. **^{1}H-NMR (400 MHz, $CDCl_3$):** δ_H 0.88 (3H, t, *J* = 6.8 Hz, CH_2CH_3), 1.22 (3H, d, *J* = 6.2 Hz, CH_3CH), 1.24-1.49 (37H, m, C$H_2$$CH_3$, 15xC$H_2$($CH_2$)$_2$, C$H_a$$H_bCHCH_3$, 2xC$H_2$$CH_2$N), 1.55-1.64 (1H, m, C$H_a$$H_bCHCH_3$), 1.99 (3H, s, C$H_3$C=O), 2.00 (3H, s, C$H_3$C=O), 2.01 (3H, s, C$H_3$C=O), 2.03 (3H, s, C$H_3$C=O), 2.06 (3H, s, C$H_3$C=O), 2.08 (6H, s, 2xC$H_3$C=O), 2.19 (3H, s, C$H_3$N), 2.27-2.31 (4H, m, 2x$CH_2CH_2$N), 3.63-3.75 (4H, m, 2xCHCH_2OAc, CH_3CHO, CHOC), 4.06-4.10 (2H, m,



10c

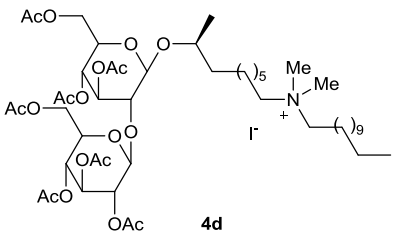
2xCHC<u>H</u>$_a$H$_b$OAc), 4.24 (1H, dxd, *J* = 12.3 Hz, *J* = 5.3 Hz, CHCH$_a$<u>H</u>$_b$OAc), 4.29 (1H, dxd, *J* = 12.3 Hz, *J* = 4.5 Hz, CHCH$_a$<u>H</u>$_b$OAc), 4.48 (1H, d, *J* = 7.6 Hz, C<u>H</u>(O)$_2$), 4.73 (1H, d, *J* = 8.0 Hz, C<u>H</u>(O)$_2$), 4.89-4.95 (2H, m, 2xC<u>H</u>OC), 5.07 (1H, dxd, *J* = 9.5 Hz, *J* = 9.5 Hz, C<u>H</u>OC), 5.13 (1H, dxd, *J* = 9.3 Hz, *J* = 9.3 Hz, C<u>H</u>OC), 5.16 (1H, dxd, *J* = 9.5 Hz, *J* = 9.5 Hz, C<u>H</u>OC). **^{13}C-NMR (100 MHz, CDCl$_3$):** δ_C 14.1 (CH$_2$<u>C</u>H$_3$), 20.5 (<u>C</u>H$_3$C=O), 20.6 (2x<u>C</u>H$_3$C=O), 20.6 (<u>C</u>H$_3$C=O), 20.7 (2x<u>C</u>H$_3$C=O), 20.8 (<u>C</u>H$_3$C=O), 21.2 (<u>C</u>H$_3$CH), 22.7 (<u>C</u>H$_2$CH$_3$), 25.1 (<u>C</u>H$_2$(CH$_2$)$_2$), 27.4 (<u>C</u>H$_2$CH$_2$N), 27.4 (<u>C</u>H$_2$CH$_2$N), 27.7 (<u>C</u>H$_2$(CH$_2$)$_2$), 27.7 (<u>C</u>H$_2$(CH$_2$)$_2$), 29.4 (<u>C</u>H$_2$(CH$_2$)$_2$), 29.6-29.7 (8x<u>C</u>H$_2$(CH$_2$)$_2$), 29.8 (<u>C</u>H$_2$(CH$_2$)$_2$), 29.9 (<u>C</u>H$_2$(CH$_2$)$_2$), 31.9 (<u>C</u>H$_2$(CH$_2$)$_2$), 36.5 (<u>C</u>H$_2$CHCH$_3$), 42.4 (<u>C</u>H$_3$N), 58.0 (CH$_2$<u>C</u>H$_2$N), 58.1 (CH$_2$<u>C</u>H$_2$N), 62.0 (<u>C</u>H$_2$OAc), 62.3 (<u>C</u>H$_2$OAc), 68.2 (<u>C</u>HOC), 68.9 (<u>C</u>HOC), 71.3 (<u>C</u>HOC), 71.7 (<u>C</u>HOC), 71.9 (<u>C</u>HOC), 73.1 (<u>C</u>HOC), 74.6 (<u>C</u>HOC), 77.7 (<u>C</u>HOC), 77.9 (<u>C</u>HOC), 100.4 (<u>C</u>H(O)$_2$), 101.1 (<u>C</u>H(O)$_2$), 169.3 (CH$_3$<u>C</u>=O), 169.5 (CH$_3$<u>C</u>=O), 169.8 (CH$_3$<u>C</u>=O), 170.1 (CH$_3$<u>C</u>=O), 170.3 (CH$_3$<u>C</u>=O), 170.6 (CH$_3$<u>C</u>=O), 170.6 (CH$_3$<u>C</u>=O).

***N*,*N*-dimethyl,*N*-pentadecyl-((*S*)-8-[(2",3',3",4',4",6',6"-heptaacetoxy-2'-*O*-β-*D*-glucopyranosyl-β-*D*-glucopyranosyl)-oxy])nonan-1-ammonium iodide (4c):** (1.11 g, 90%), yellow powder. **^{1}H-NMR (400 MHz, CDCl$_3$):** δ_H 0.88 (3H, t, *J*=6.8 Hz, C<u>H</u>$_3$CH$_2$), 1.22 (3H, d, J=6.2 Hz, CH$_3$CH), 1.24-1.47 (33H, m, C<u>H</u>$_2$CH$_3$, 15xC<u>H</u>$_2$(CH$_2$)$_2$, C<u>H</u>$_a$H$_b$CHCH$_3$), 1.51-1.63 (1H, m, CH$_a$<u>H</u>$_b$CHCH$_3$), 1.70-1.83 (4H, m, 2xC<u>H</u>$_2$CH$_2$N), 1.99 (<u>C</u>H$_3$C=O), 2.00 (<u>C</u>H$_3$C=O), 2.03 (2x<u>C</u>H$_3$C=O), 2.06 (<u>C</u>H$_3$C=O), 2.08 (<u>C</u>H$_3$C=O), 2.09 (<u>C</u>H$_3$C=O), 3.36 (6H, s, 2xC<u>H</u>$_3$N), 3.44-3.49 (2H, m, CH$_2$C<u>H</u>$_2$N), 3.52-3.56 (2H, m, CH$_2$C<u>H</u>$_2$N), 3.65-3.74 (4H, m, 2xC<u>H</u>CH$_2$OAc, CH$_3$C<u>H</u>O, C<u>H</u>OC), 4.05-4.11 (2H, m, 2xCHC<u>H</u>$_a$H$_b$OAc), 4.22-4.27 (2H, m, 2xCHCH$_a$<u>H</u>$_b$OAc), 4.47 (1H, d, *J*=7.6 Hz, C<u>H</u>(O)$_2$), 4.71 (1H, d, *J*=8.0 Hz, C<u>H</u>(O)$_2$), 4.86 (1H, dxd, *J*=9.6 Hz, *J*=8.1 Hz, C<u>H</u>OC), 4.92 (1H, dxd, *J*=9.8 Hz, *J*=9.8 Hz, C<u>H</u>OC), 5.00 (1H, dxd, *J*=9.7 Hz, *J*=9.7 Hz, C<u>H</u>OC), 5.12 (1H, dxd, *J*=9.5 Hz, *J*=9.5 Hz, C<u>H</u>OC), 5.17 (1H, dxd, *J*=9.5 Hz, *J*=9.5 Hz, C<u>H</u>OC). **^{13}C-NMR (100 MHz, CDCl$_3$):** δ_C 14.1 (<u>C</u>H$_3$CH$_2$), 20.5 (<u>C</u>H$_3$C=O), 20.6 (<u>C</u>H$_3$C=O), 20.6 (2x<u>C</u>H$_3$C=O), 20.7 (<u>C</u>H$_3$C=O), 20.8 (2x<u>C</u>H$_3$C=O), 21.5 (<u>C</u>H$_3$CH), 22.6 (CH$_3$<u>C</u>H$_2$), 22.7 (<u>C</u>H$_2$CH$_2$N), 22.8 (<u>C</u>H$_2$CH$_2$N), 24.6 (C<u>H</u>$_2$(CH$_2$)$_2$), 26.2 (C<u>H</u>$_2$(CH$_2$)$_2$), 26.2 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.2 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.3 (2xC<u>H</u>$_2$(CH$_2$)$_2$), 29.4 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.4 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.5 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.6 (5xC<u>H</u>$_2$(CH$_2$)$_2$), 31.9 (C<u>H</u>$_2$(CH$_2$)$_2$), 36.5 (<u>C</u>H$_2$CHCH$_3$), 51.4 (2x<u>C</u>H$_3$N), 62.2 (<u>C</u>H$_2$OAc), 62.3 (<u>C</u>H$_2$OAc), 64.3 (2x<u>C</u>H$_2$N), 68.5 (<u>C</u>HOC), 68.8 (<u>C</u>HOC), 71.2 (<u>C</u>HOC), 71.4 (<u>C</u>HOC), 71.6 (<u>C</u>HOC), 72.9 (<u>C</u>HOC), 74.7 (<u>C</u>HOC), 77.8 (<u>C</u>HOC), 78.0 (<u>C</u>HOC), 100.5 (<u>C</u>H(O)$_2$), 101.3 (<u>C</u>H(O)$_2$), 169.6 (2xCH$_3$<u>C</u>=O), 169.7 (CH$_3$<u>C</u>=O), 170.0 (2xCH$_3$<u>C</u>=O), 170.5 (CH$_3$<u>C</u>=O), 170.6 (CH$_3$<u>C</u>=O).



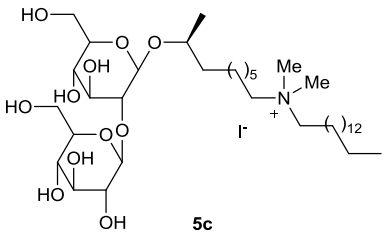
4c

***N*,*N*-dimethyl,*N*-dodecyl-((*S*)-8-[(2”,3’,3”,4’,4”,6’,6”-heptaacetoxy-2’-*O*-*β*-*D*-glucopyranosyl-*β*-*D*-glucopyranosyl)-oxy])nonan-1-ammonium iodide (4d):** (1.11 g, 90%), yellow powder. **^{1}H-NMR (400 MHz, $CDCl_3$):** δ_H 0.88 (3H, t, *J*=6.8 Hz, $C\underline{H}_3CH_2$), 1.22 (3H, d, J=6.2 Hz, $CH_3C\underline{H}$), 1.24-1.47 (27H, m, $CH_3C\underline{H}_2$, 12x$C\underline{H}_2(CH_2)_2$, $CH_aH_bCHCH_3$), 1.49-1.62 (1H, m, $CH_a\underline{H}_bCHCH_3$), 1.71-1.83 (4H, m, 2x$C\underline{H}_2CH_2N$), 1.99 ($C\underline{H}_3C=O$), 2.00 ($C\underline{H}_3C=O$), 2.03 (2x$C\underline{H}_3C=O$), 2.06 ($C\underline{H}_3C=O$), 2.08 ($C\underline{H}_3C=O$), 2.09 ($C\underline{H}_3C=O$), 3.39 (6H, s, 2x$C\underline{H}_3N$), 3.47-3.50 (2H, m, $CH_2C\underline{H}_2N$), 3.55-3.59 (2H, m, $CH_2C\underline{H}_2N$), 3.65-3.75 (4H, m, 2x$C\underline{H}CH_2OAc$, $CH_3C\underline{H}O$, $C\underline{H}OC$), 4.05-4.11 (2H, m, 2x$CHC\underline{H}_aH_bOAc$), 4.22-4.27 (2H, m, 2x$CHCH_a\underline{H}_bOAc$), 4.48 (1H, d, *J*=7.6 Hz, $C\underline{H}(O)_2$), 4.71 (1H, d, *J*=8.0 Hz, $C\underline{H}(O)_2$), 4.86 (1H, dxd, *J*=9.6 Hz, *J*=8.1 Hz, $C\underline{H}OC$), 4.93 (1H, dxd, *J*=9.8 Hz, *J*=9.8 Hz, $C\underline{H}OC$), 5.00 (1H, dxd, *J*=9.7 Hz, *J*=9.7 Hz, $C\underline{H}OC$), 5.12 (1H, dxd, *J*=9.5 Hz, *J*=9.5 Hz, $C\underline{H}OC$), 5.17 (1H, dxd, *J*=9.5 Hz, *J*=9.5 Hz, $C\underline{H}OC$). **^{13}C-NMR (100 MHz, $CDCl_3$):** δ_C 14.1 ($C\underline{H}_3CH_2$), 20.5 ($C\underline{H}_3C=O$), 20.6 ($C\underline{H}_3C=O$), 20.7 (2x$C\underline{H}_3C=O$), 20.7 ($C\underline{H}_3C=O$), 20.8 (2x$C\underline{H}_3C=O$), 21.5 ($C\underline{H}_3CH$), 22.6 ($CH_3C\underline{H}_2$), 22.7 ($C\underline{H}_2CH_2N$), 22.8 ($C\underline{H}_2CH_2N$), 24.6 ($C\underline{H}_2(CH_2)_2$), 26.2 ($C\underline{H}_2(CH_2)_2$), 26.2 ($C\underline{H}_2(CH_2)_2$), 29.2 ($C\underline{H}_2(CH_2)_2$), 29.3 ($C\underline{H}_2(CH_2)_2$), 29.3 ($C\underline{H}_2(CH_2)_2$), 29.4 ($C\underline{H}_2(CH_2)_2$), 29.4 ($C\underline{H}_2(CH_2)_2$), 29.4 ($C\underline{H}_2(CH_2)_2$), 29.5 (2x$C\underline{H}_2(CH_2)_2$), 31.8 ($C\underline{H}_2(CH_2)_2$), 36.5 ($C\underline{H}_2CHCH_3$), 51.4 (2x$C\underline{H}_3N$), 62.2 ($C\underline{H}_2OAc$), 62.3 ($C\underline{H}_2OAc$), 64.2 (2x$C\underline{H}_2N$), 68.5 ($C\underline{H}OC$), 68.8 ($C\underline{H}OC$), 71.2 ($C\underline{H}OC$), 71.4 ($C\underline{H}OC$), 71.6 ($C\underline{H}OC$), 72.9 ($C\underline{H}OC$), 74.7 ($C\underline{H}OC$), 77.8 ($C\underline{H}OC$), 78.0 ($C\underline{H}OC$), 100.5 ($C\underline{H}(O)_2$), 101.2 ($C\underline{H}(O)_2$), 169.6 (2x$CH_3\underline{C}=O$), 169.7 ($CH_3\underline{C}=O$), 170.0 (2x$CH_3\underline{C}=O$), 170.6 ($CH_3\underline{C}=O$), 170.7 ($CH_3\underline{C}=O$).



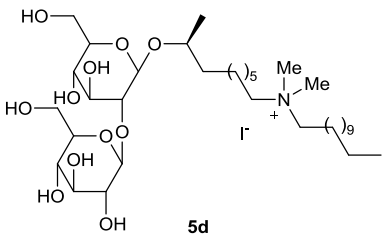
4d

***N*,*N*-dimethyl,*N*-pentadecyl-((*S*)-8-[(2’-*O*-*β*-*D*-glucopyranosyl-*β*-*D*-glucopyranosyl)-oxy])nonan-1-ammonium iodide (5c):** (0.85 g, 93%), white powder. **^{1}H-NMR (400 MHz, MeOD):** δ_H 0.97 (3H, t, *J*=6.8 Hz, $C\underline{H}_3CH_2$), 1.32 (3H, d, J=6.2 Hz, $CH_3C\underline{H}$), 1.34-1.60 (33H, m, $C\underline{H}_2CH_3$, 15x$C\underline{H}_2(CH_2)_2$, $CH_aH_bCHCH_3$), 1.62-1.72 (1H, m, $CH_a\underline{H}_bCHCH_3$), 1.79-1.89 (4H, m, 2x$C\underline{H}_2CH_2N$), 3.17 (6H, s, 2x$C\underline{H}_3N$), 3.23-3.49 (10H, m, 2x$CH_2C\underline{H}_2N$, 6x$C\underline{H}OC$), 3.53-3.57 (1H, m, $C\underline{H}OC$), 3.65 (1H, dxd, *J*=8.7 Hz, *J*=8.7 Hz, $C\underline{H}OC$), 3.70-3.75 (2H, m, 2x$CHC\underline{H}_aH_bOH$), 3.87-3.94 (3H, m, 2x$CHCH_a\underline{H}_bOH$, $C\underline{H}OC$), 4.53 (1H, d, *J*=7.7 Hz, $C\underline{H}(O)_2$), 4.75 (1H, d, *J*=7.8 Hz, $C\underline{H}(O)_2$). **^{13}C-NMR (100 MHz, MeOD):** δ_C 13.2 ($C\underline{H}_3CH_2$), 20.7 ($C\underline{H}_3CH$), 22.3 ($C\underline{H}_2CH_2N$), 22.3 ($C\underline{H}_2CH_2N$), 22.4 ($CH_3C\underline{H}_2$), 24.7 ($C\underline{H}_2(CH_2)_2$), 26.0 (2x$C\underline{H}_2(CH_2)_2$), 28.9 ($C\underline{H}_2(CH_2)_2$), 29.0 ($C\underline{H}_2(CH_2)_2$), 29.1 ($C\underline{H}_2(CH_2)_2$), 29.2 ($C\underline{H}_2(CH_2)_2$), 29.3 ($C\underline{H}_2(CH_2)_2$), 29.3 ($C\underline{H}_2(CH_2)_2$), 29.4 (5x$C\underline{H}_2(CH_2)_2$), 31.7 ($C\underline{H}_2(CH_2)_2$), 36.5 ($C\underline{H}_2CHCH_3$), 50.0 (2x$C\underline{H}_3N$), 61.4 ($C\underline{H}_2OH$), 61.7 ($C\underline{H}_2OH$), 64.1 (2x$C\underline{H}_2N$), 70.2 ($C\underline{H}OC$), 70.4 ($C\underline{H}OC$), 74.6 ($C\underline{H}OC$), 76.3 ($C\underline{H}OC$), 76.4 ($C\underline{H}OC$), 76.8 ($C\underline{H}OC$), 76.9 ($C\underline{H}OC$), 77.6 ($C\underline{H}OC$), 80.0 ($C\underline{H}OC$), 101.5 ($C\underline{H}(O)_2$), 103.0 ($C\underline{H}(O)_2$).



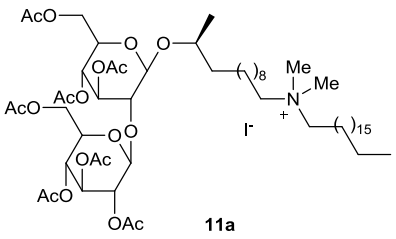
5c

***N*,*N*-dimethyl,*N*-dodecyl-(*(S)*-8-[(2'-*O*-*β*-*D*-glucopyranosyl-*β*-*D*-glucopyranosyl)-oxy])nonan-1-ammonium iodide (5d):** (0.58 g, 90%), white powder. **^{1}H-NMR (400 MHz, MeOD):** δ_H 0.95 (3H, t, *J*=6.8 Hz, C$\underline{H}_3$CH$_2$), 1.31 (3H, d, J=6.2 Hz, C$\underline{H}_3$CH), 1.33-1.58 (27H, m, C$\underline{H}_2$CH$_3$, 12xC$\underline{H}_2$(CH$_2$)$_2$, C$\underline{H}_a$H$_b$CHCH$_3$), 1.61-1.70 (1H, m, CH$_a\underline{H}_b$CHCH$_3$), 1.78-1.88 (4H, m, 2xC$\underline{H}_2$CH$_2$N), 3.16 (6H, s, 2xC$\underline{H}_3$N), 3.21-3.47 (10H, m, 2xCH$_2$C$\underline{H}_2$N, 6xC$\underline{H}$OC), 3.51-3.55 (1H, m, C$\underline{H}$OC), 3.63 (1H, dxd, *J*=8.7 Hz, *J*=8.7 Hz, C$\underline{H}$OC), 3.69-3.74 (2H, m, 2xCHC$\underline{H}_a$H$_b$OH), 3.86-3.93 (3H, m, 2xCHCH$_a\underline{H}_b$OH, C$\underline{H}$OC), 4.51 (1H, d, *J*=7.7 Hz, C$\underline{H}$(O)$_2$), 4.74 (1H, d, *J*=7.8 Hz, C$\underline{H}$(O)$_2$). **^{13}C-NMR (100 MHz, MeOD):** δ_C 13.1 (C$\underline{H}_3$CH$_2$), 20.7 (C$\underline{H}_3$CH), 22.2 (C$\underline{H}_2$CH$_2$N), 22.3 (C$\underline{H}_2$CH$_2$N), 22.3 (CH$_3$C$\underline{H}_2$), 24.7 (C$\underline{H}_2$(CH$_2$)$_2$), 26.0 (2xC$\underline{H}_2$(CH$_2$)$_2$), 28.9 (C$\underline{H}_2$(CH$_2$)$_2$), 29.0 (C$\underline{H}_2$(CH$_2$)$_2$), 29.2 (C$\underline{H}_2$(CH$_2$)$_2$), 29.2 (C$\underline{H}_2$(CH$_2$)$_2$), 29.3 (C$\underline{H}_2$(CH$_2$)$_2$), 29.3 (C$\underline{H}_2$(CH$_2$)$_2$), 29.4 (2xC$\underline{H}_2$(CH$_2$)$_2$), 31.7 (C$\underline{H}_2$(CH$_2$)$_2$), 36.5 (C$\underline{H}_2$CHCH$_3$), 50.0 (2xC$\underline{H}_3$N), 61.4 (C$\underline{H}_2$OH), 61.6 (C$\underline{H}_2$OH), 64.1 (2xC$\underline{H}_2$N), 70.2 (C$\underline{H}$OC), 70.5 (C$\underline{H}$OC), 74.6 (C$\underline{H}$OC), 76.4 (2xC$\underline{H}$OC), 76.8 (C$\underline{H}$OC), 77.0 (C$\underline{H}$OC), 77.6 (C$\underline{H}$OC), 80.0 (C$\underline{H}$OC), 101.5 (C$\underline{H}$(O)$_2$), 103.0 (C$\underline{H}$(O)$_2$).



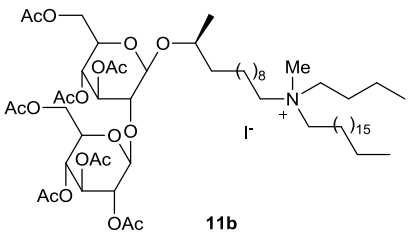
5d

***N*,*N*-dimethyl,*N*-octadecyl-(*(S)*-11-[(2",3',3",4',4",6',6"-heptaacetoxy-2'-*O*-*β*-*D*-glucopyranosyl-*β*-*D*-glucopyranosyl)-oxy])dodecan-1-ammonium iodide (11a):** (0.57 g, 99%), orange-yellow powder. **mp:** 52°C. **^{1}H-NMR (400 MHz, CDCl$_3$):** δ_H 0.88 (3H, t, *J* = 6.8 Hz C$\underline{H}_3$CH$_2$), 1.22 (3H, d, *J* = 6.2 Hz, C$\underline{H}_3$CH), 1.24-1.44 (45H, m, C$\underline{H}_2$CH$_3$, 21xC$\underline{H}_2$(CH$_2$)$_2$, C$\underline{H}_a$H$_b$CHCH$_3$), 1.53-1.63 (1H, m, CH$_a\underline{H}_b$CHCH$_3$), 1.69-1.78 (4H, m, 2xC$\underline{H}_2$CH$_2$N), 1.99 (3H, s, C$\underline{H}_3$C=O), 2.00 (3H, s, C$\underline{H}_3$C=O), 2.03 (3H, s, C$\underline{H}_3$C=O), 2.04 (3H, s, C$\underline{H}_3$C=O), 2.06 (3H, s, C$\underline{H}_3$C=O), 2.08 (6H, s, 2xC$\underline{H}_3$C=O), 3.40 (6H, s, 2xC$\underline{H}_3$N), 3.48-3.57 (4H, m, 2xCH$_2$C$\underline{H}_2$N), 3.64-3.73 (4H, m, 2xC$\underline{H}$CH$_2$OAc, CH$_3$C$\underline{H}$O, C$\underline{H}$OC), 4.05-4.10 (2H, m, 2xCHC$\underline{H}_a$H$_b$OAc), 4.23-4.30 (2H, m, 2xCH$_a\underline{H}_b$OAc), 4.48 (1H, d, *J* = 7.7 Hz, C$\underline{H}$(O)$_2$), 4.74 (1H, d, *J* = 8.0 Hz, C$\underline{H}$(O)$_2$), 4.90 (1H, dxd, *J* = 9.4 Hz, *J* = 8.1 Hz, C$\underline{H}$OC), 4.93 (1H, dxd, *J* = 9.8 Hz, *J* = 9.8 Hz, C$\underline{H}$OC), 5.05 (1H, dxd, *J* = 9.6 Hz, *J* = 9.6 Hz, C$\underline{H}$OC), 5.13 (1H, dxd, *J* = 9.4 Hz, *J* = 9.4 Hz, C$\underline{H}$OC), 5.17 (1H, dxd, *J* = 9.5 Hz, *J* = 9.5 Hz, C$\underline{H}$OC). **^{13}C-NMR (100 MHz, CDCl$_3$):** δ_C 14.1 (C$\underline{H}_3$CH$_2$), 20.5 (C$\underline{H}_3$C=O), 20.6 (C$\underline{H}_3$C=O), 20.6 (2xC$\underline{H}_3$C=O), 20.7 (C$\underline{H}_3$C=O), 20.8 (C$\underline{H}_3$C=O), 20.8 (C$\underline{H}_3$C=O), 21.2 (C$\underline{H}_3$CH), 22.6 (C$\underline{H}_2$CH$_3$), 22.7 (C$\underline{H}_2$CH$_2$N), 22.8 (C$\underline{H}_2$CH$_2$N), 24.9 (C$\underline{H}_2$(CH$_2$)$_2$), 26.1 (C$\underline{H}_2$(CH$_2$)$_2$), 26.1 (C$\underline{H}_2$(CH$_2$)$_2$), 29.1 (C$\underline{H}_2$(CH$_2$)$_2$), 29.2 (C$\underline{H}_2$(CH$_2$)$_2$), 29.3 (C$\underline{H}_2$(CH$_2$)$_2$), 29.3 (C$\underline{H}_2$(CH$_2$)$_2$), 29.4 (C$\underline{H}_2$(CH$_2$)$_2$), 29.4 (C$\underline{H}_2$(CH$_2$)$_2$), 29.4 (C$\underline{H}_2$(CH$_2$)$_2$), 29.6 (10xC$\underline{H}_2$(CH$_2$)$_2$), 31.9 (C$\underline{H}_2$(CH$_2$)$_2$), 36.4 (C$\underline{H}_2$CHCH$_3$), 51.5 (2xC$\underline{H}_3$N), 62.0 (C$\underline{H}_2$OAc), 62.2 (C$\underline{H}_2$OAc), 64.1 (2xCH$_2$C$\underline{H}_2$N), 68.2 (C$\underline{H}$OC), 68.8 (C$\underline{H}$OC), 71.2 (C$\underline{H}$OC), 71.6 (C$\underline{H}$OC), 71.8 (C$\underline{H}$OC), 73.0 (C$\underline{H}$OC), 74.6 (C$\underline{H}$OC), 77.6 (C$\underline{H}$OC), 77.9 (C$\underline{H}$OC), 100.3 (C$\underline{H}$(O)$_2$), 101.1 (C$\underline{H}$(O)$_2$), 169.4 (CH$_3$C=O), 169.5 (CH$_3$C=O), 169.7 (CH$_3$C=O), 170.0 (CH$_3$C=O), 170.2 (CH$_3$C=O), 170.6 (CH$_3$C=O), 170.6 (CH$_3$C=O).



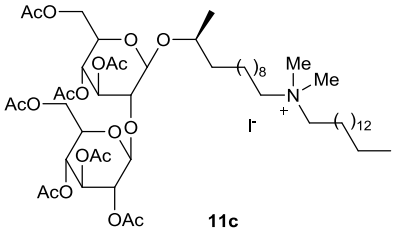
11a

***N*-butyl,*N*-methyl,*N*-octadecyl-((*S*)-11-[(2”,3’,3”,4’,4”,6’,6”-heptaacetoxy-2’-*O*-β-*D*-glucopyranosyl-β-*D*-glucopyranosyl)-oxy])dodecan-1-ammonium iodide (11b):** (0.57 g, 97%), viscous orange-yellow oil. **^{1}H-NMR (400 MHz, $CDCl_3$):** δ_H 0.88 (3H, t, *J* = 6.8 Hz, C$\underline{H}_3$CH$_2$), 1.02 (3H, t, *J* = 7.3 Hz, C$\underline{H}_3$CH$_2$), 1.22 (3H, d, *J* = 6.2 Hz, C$\underline{H}_3$CH), 1.24-1.52 (47H, m, 2xC$\underline{H}_2$CH$_3$, 21xC$\underline{H}_2$(CH$_2$)$_2$, CH$_a$H$_b$CHCH$_3$), 1.55-1.63 (1H, m, CH$_a$H$_b$CHCH$_3$), 1.67-1.75 (6H, m, 3xC$\underline{H}_2$CH$_2$N), 1.99 (3H, s, C$\underline{H}_3$C=O), 2.00 (3H, s, C$\underline{H}_3$C=O), 2.02 (3H, s, C$\underline{H}_3$C=O), 2.04 (3H, s, C$\underline{H}_3$C=O), 2.06 (3H, s, C$\underline{H}_3$C=O), 2.08 (6H, s, 2xC$\underline{H}_3$C=O), 3.33 (3H, s, C$\underline{H}_3$N), 3.40-3.52 (6H, m, 3xCH$_2$C$\underline{H}_2$N), 3.64-3.75 (4H, m, 2xC$\underline{H}$CH$_2$OAc, CH$_3$C$\underline{H}$O, C$\underline{H}$OC), 4.05-4.10 (2H, m, 2xCHC$\underline{H}_a$H$_b$OAc), 4.23-4.30 (2H, m 2xCHCH$_a$$\underline{H}_b$OAc), 4.48 (1H, d, *J* = 7.6 Hz, C$\underline{H}$(O)$_2$), 4.73 (1H, d, *J* = 8.0 Hz, C$\underline{H}$(O)$_2$), 4.90 (1H, dxd, *J* = 9.4 Hz, *J* = 8.1 Hz, C$\underline{H}$OC), 4.93 (1H, dxd, *J* = 9.8 Hz, *J* = 9.8 Hz, C$\underline{H}$OC), 5.05 (1H, dxd, *J* = 9.6 Hz, *J* = 9.6 Hz, C$\underline{H}$OC), 5.13 (1H, dxd, *J* = 9.4 Hz, *J* = 9.4 Hz, C$\underline{H}$OC), 5.17 (1H, dxd, *J* = 9.5 Hz, *J* = 9.5 Hz, C$\underline{H}$OC). **^{13}C-NMR (100 MHz, $CDCl_3$):** δ_C 13.8 (C$\underline{H}_3$CH$_2$), 14.1 (C$\underline{H}_3$CH$_2$), 19.7 (CH$_3$C$\underline{H}_2$), 20.5 (C$\underline{H}_3$C=O), 20.6 (C$\underline{H}_3$C=O), 20.6 (2xC$\underline{H}_3$C=O), 20.7 (C$\underline{H}_3$C=O), 20.8 (C$\underline{H}_3$C=O), 20.8 (C$\underline{H}_3$C=O), 21.3 (C$\underline{H}_3$CH), 22.5 (C$\underline{H}_2$CH$_2$N), 22.5 (C$\underline{H}_2$CH$_2$N), 22.7 (C$\underline{H}_2$CH$_3$), 24.4 (C$\underline{H}_2$CH$_2$N), 25.0 (C$\underline{H}_2$(CH$_2$)$_2$), 26.3 (2xC$\underline{H}_2$(CH$_2$)$_2$), 29.1 (C$\underline{H}_2$(CH$_2$)$_2$), 29.2 (C$\underline{H}_2$(CH$_2$)$_2$), 29.3 (2xC$\underline{H}_2$(CH$_2$)$_2$), 29.4 (C$\underline{H}_2$(CH$_2$)$_2$), 29.5 (2xC$\underline{H}_2$(CH$_2$)$_2$), 29.6 (C$\underline{H}_2$(CH$_2$)$_2$), 29.6-29.7 (9xC$\underline{H}_2$(CH$_2$)$_2$), 31.9 (C$\underline{H}_2$(CH$_2$)$_2$, 36.5 (C$\underline{H}_2$CHCH$_3$), 49.2 (C$\underline{H}_3$N), 61.6 (C$\underline{H}_2$N), 61.7 (C$\underline{H}_2$N), 61.8 (C$\underline{H}_2$N), 62.1 (C$\underline{H}_2$OAc), 62.2 (C$\underline{H}_2$OAc), 68.3 (C$\underline{H}$OC), 68.8 (C$\underline{H}$OC), 71.2 (C$\underline{H}$OC), 71.6 (C$\underline{H}$OC), 71.8 (C$\underline{H}$OC), 73.0 (C$\underline{H}$OC), 74.6 (C$\underline{H}$OC), 77.7 (C$\underline{H}$OC), 77.9 (C$\underline{H}$OC), 100.4 (C$\underline{H}$(O)$_2$), 101.1 (C$\underline{H}$(O)$_2$), 169.4 (CH$_3$C=O), 169.5 (CH$_3$C=O), 169.7 (CH$_3$C=O), 170.0 (CH$_3$C=O), 170.2 (CH$_3$C=O), 170.6 (CH$_3$C=O), 170.6 (CH$_3$C=O).



11b

***N*,*N*-dimethyl,*N*-pentadecyl-((*S*)-11-[(2”,3’,3”,4’,4”,6’,6”-heptaacetoxy-2’-*O*-β-*D*-glucopyranosyl-β-*D*-glucopyranosyl)-oxy])dodecan-1-ammonium iodide (11c):** (0.30 g, 92%), yellow powder. **^{1}H-NMR (400 MHz, $CDCl_3$):** δ_H 0.88 (3H, t, *J*=6.8 Hz, C$\underline{H}_3$CH$_2$), 1.22 (3H, d, J=6.2 Hz, C$\underline{H}_3$CH), 1.24-1.50 (39H, m, C$\underline{H}_2$CH$_3$, 18xC$\underline{H}_2$(CH$_2$)$_2$, CH$_a$H$_b$CHCH$_3$), 1.54-1.63 (1H, m, CH$_a$H$_b$CHCH$_3$), 1.68-1.77 (4H, m, 2xC$\underline{H}_2$CH$_2$N), 1.99 (3H, s, C$\underline{H}_3$C=O), 2.00 (3H, s, C$\underline{H}_3$C=O), 2.02 (3H, s, C$\underline{H}_3$C=O), 2.03 (3H, s, C$\underline{H}_3$C=O), 2.06 (3H, s, C$\underline{H}_3$C=O), 2.08 (6H, s, 2xC$\underline{H}_3$C=O), 3.37 (6H, s, 2xC$\underline{H}_3$N), 3.44-3.55 (4H, m, 2xCH$_2$C$\underline{H}_2$N), 3.64-3.76 (4H, m, 2xC$\underline{H}$CH$_2$OAc, CH$_3$C$\underline{H}$O, C$\underline{H}$OC), 4.06-4.10 (2H, m, 2xCHC$\underline{H}_a$H$_b$OAc), 4.22-4.30 (2H, m, 2xCHCH$_a$$\underline{H}_b$OAc), 4.48 (1H, d, *J*=7.6 Hz, C$\underline{H}$(O)$_2$), 4.73 (1H, d, *J*=8.0 Hz, C$\underline{H}$(O)$_2$), 4.90 (1H, dxd, *J*=9.4 Hz, *J*=8.1 Hz, C$\underline{H}$OC), 4.93 (1H, dxd, *J*=9.7 Hz, *J*=9.7 Hz, C$\underline{H}$OC), 5.04 (1H, dxd, *J*=9.6 Hz, *J*=9.6 Hz, C$\underline{H}$OC), 5.13 (1H, dxd, *J*=9.4 Hz, *J*=9.4 Hz, C$\underline{H}$OC), 5.16 (1H, dxd, *J*=9.5 Hz, *J*=9.5 Hz, C$\underline{H}$OC). **^{13}C-NMR (100 MHz, $CDCl_3$):** δ_C 14.1 (C$\underline{H}_3$CH$_2$), 20.5 (C$\underline{H}_3$C=O), 20.6 (C$\underline{H}_3$C=O), 20.6 (2xC$\underline{H}_3$C=O), 20.7 (C$\underline{H}_3$C=O), 20.7 (C$\underline{H}_3$C=O), 20.8 (C$\underline{H}_3$C=O), 21.3



11c

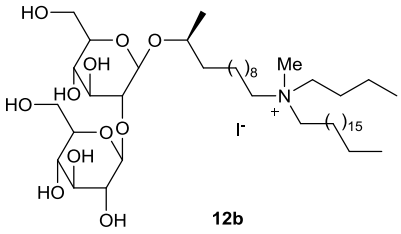
(C<u>H</u>$_3$CH), 22.6 (CH$_3$C<u>H</u>$_2$), 22.7 (C<u>H</u>$_2$CH$_2$N), 22.8 (C<u>H</u>$_2$CH$_2$N), 25.0 (C<u>H</u>$_2$(CH$_2$)$_2$), 26.1 (C<u>H</u>$_2$(CH$_2$)$_2$), 26.2 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.1 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.2 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.3 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.3 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.4 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.4 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.4 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.6 (7xC<u>H</u>$_2$(CH$_2$)$_2$), 31.9 (C<u>H</u>$_2$(CH$_2$)$_2$), 36.5 (C<u>H</u>$_2$CHCH$_3$), 51.5 (2xC<u>H</u>$_3$N), 62.1 (C<u>H</u>$_2$OAc), 62.2 (C<u>H</u>$_2$OAc), 64.2 (2xC<u>H</u>$_2$N), 68.3 (C<u>H</u>OC), 68.8 (C<u>H</u>OC), 71.2 (C<u>H</u>OC), 71.6 (C<u>H</u>OC), 71.8 (C<u>H</u>OC), 73.0 (C<u>H</u>OC), 74.6 (C<u>H</u>OC), 77.7 (C<u>H</u>OC), 77.9 (C<u>H</u>OC), 100.4 (C<u>H</u>(O)$_2$), 101.1 (C<u>H</u>(O)$_2$), 169.4 (CH$_3$C=O), 169.5 (CH$_3$C=O), 169.7 (CH$_3$C=O), 170.0 (CH$_3$C=O), 170.2 (CH$_3$C=O), 170.6 (CH$_3$C=O), 170.6 (CH$_3$C=O).

***N*,*N*-dimethyl,*N*-dodecyl-(*(S)*-11-[(2”,3’,3”,4’,4”,6’,6”-heptaacetoxy-2’-*O*-*β*-*D*-glucopyranosyl-*β*-*D*-glucopyranosyl)-oxy])dodecan-1-ammonium iodide (11d):** (0.58 g, 99%), viscous yellow oil. **^{1}H-NMR (400 MHz, CDCl$_3$):** δ_H 0.88 (3H, t, *J* = 6.8 Hz CH$_2$C<u>H</u>$_3$), 1.22 (3H, d, *J* = 6.2 Hz, C<u>H</u>$_3$CH), 1.24-1.44 (33H, m, C<u>H</u>$_2$CH$_3$, 15xC<u>H</u>$_2$(CH$_2$)$_2$, C<u>H</u>$_a$H$_b$CHCH$_3$), 1.54-1.63 (1H, m, CH$_a$<u>H</u>$_b$CHCH$_3$), 1.68-1.77 (4H, m, 2xC<u>H</u>$_2$CH$_2$N), 1.99 (3H, s, C<u>H</u>$_3$C=O), 2.00 (3H, s, C<u>H</u>$_3$C=O), 2.02 (3H, s, C<u>H</u>$_3$C=O), 2.03 (3H, s, C<u>H</u>$_3$C=O), 2.06 (3H, s, C<u>H</u>$_3$C=O), 2.08 (6H, s, 2xC<u>H</u>$_3$C=O), 3.40 (6H, s, 2xC<u>H</u>$_3$N), 3.48-3.57 (4H, m, 2xCH$_2$C<u>H</u>$_2$N), 3.63-3.75 (4H, m, 2xC<u>H</u>CH$_2$OAc, CH$_3$C<u>H</u>O, C<u>H</u>OC), 4.07 (1H, dxd, *J* = 12.2 Hz, *J* = 2.5 Hz, CHC<u>H</u>$_a$H$_b$OAc), 4.08 (1H, dxd, *J* = 12.1 Hz, *J* = 2.4 Hz, CHC<u>H</u>$_a$H$_b$OAc), 4.24 (1H, dxd, *J* = 12.0 Hz, *J* = 5.0 Hz, CHCH$_a$<u>H</u>$_b$OAc), 4.27 (1H, dxd, *J* = 12.2 Hz, *J* = 4.8 Hz, CHCH$_a$<u>H</u>$_b$OAc), 4.48 (1H, d, *J* = 7.6 Hz, C<u>H</u>(O)$_2$), 4.73 (1H, d, *J* = 8.0 Hz, C<u>H</u>(O)$_2$), 4.90 (1H, dxd, *J* = 9.3 Hz, *J* = 8.2 Hz, C<u>H</u>OC), 4.93 (1H, dxd, *J* = 9.8 Hz, *J* = 9.8 Hz, C<u>H</u>OC), 5.04 (1H, dxd, *J* = 9.6 Hz, *J* = 9.6 Hz, C<u>H</u>OC), 5.13 (1H, dxd, *J* = 9.4 Hz, *J* = 9.4 Hz, C<u>H</u>OC), 5.16 (1H, dxd, *J* = 9.5 Hz, *J* = 9.5 Hz, C<u>H</u>OC). **^{13}C-NMR (100 MHz, CDCl$_3$):** δ_C 14.1 (CH$_2$C<u>H</u>$_3$), 20.5 (C<u>H</u>$_3$C=O), 20.6 (C<u>H</u>$_3$C=O), 20.6 (2xC<u>H</u>$_3$C=O), 20.7 (C<u>H</u>$_3$C=O), 20.8 (C<u>H</u>$_3$C=O), 20.8 (C<u>H</u>$_3$C=O), 21.3 (C<u>H</u>$_3$CH), 22.7 (C<u>H</u>$_2$CH$_3$), 22.7 (C<u>H</u>$_2$CH$_2$N), 22.8 (C<u>H</u>$_2$CH$_2$N), 25.0 (C<u>H</u>$_2$(CH$_2$)$_2$), 26.1 (C<u>H</u>$_2$(CH$_2$)$_2$), 26.2 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.1 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.2 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.3 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.3 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.4 (C<u>H</u>$_2$(CH$_2$)$_2$), 29.4 (2xC<u>H</u>$_2$(CH$_2$)$_2$), 29.6 (3xC<u>H</u>$_2$(CH$_2$)$_2$), 29.7 (C<u>H</u>$_2$(CH$_2$)$_2$), 31.9 (C<u>H</u>$_2$(CH$_2$)$_2$), 36.5 (C<u>H</u>$_2$CHCH$_3$), 51.5 (2xC<u>H</u>$_3$N), 62.1 (C<u>H</u>$_2$OAc), 62.3 (C<u>H</u>$_2$OAc), 64.2 (2xCH$_2$C<u>H</u>$_2$N), 68.3 (C<u>H</u>OC), 68.9 (C<u>H</u>OC), 71.3 (C<u>H</u>OC), 71.6 (C<u>H</u>OC), 71.8 (C<u>H</u>OC), 73.0 (C<u>H</u>OC), 74.6 (C<u>H</u>OC), 77.7 (C<u>H</u>OC), 77.9 (C<u>H</u>OC), 100.4 (C<u>H</u>(O)$_2$), 101.1 (C<u>H</u>(O)$_2$), 169.4 (CH$_3$C=O), 169.5 (CH$_3$C=O), 169.7 (CH$_3$C=O), 170.0 (CH$_3$C=O), 170.2 (CH$_3$C=O), 170.6 (CH$_3$C=O), 170.6 (CH$_3$C=O).

***N*,*N*-dimethyl,*N*-octadecyl-(*(S)*-11-[(2’-*O*-*β*-*D*-glucopyranosyl-*β*-*D*-glucopyranosyl)-oxy])dodecan-1-ammonium iodide (12a):** (0.17 g, 70%), white powder. **^{1}H-NMR (400 MHz, MeOD):** δ_H 0.92 (3H, t, *J* = 6.6 Hz C<u>H</u>$_3$CH$_2$), 1.27 (3H, d, *J* = 6.2 Hz, C<u>H</u>$_3$CH), 1.29-1.54 (45H, m, C<u>H</u>$_2$CH$_3$, 21xC<u>H</u>$_2$(CH$_2$)$_2$, C<u>H</u>$_a$H$_b$CHCH$_3$), 1.57-1.66 (1H, m,

$CH_a\underline{H}_bCHCH_3$), 1.74-1.83 (4H, m, 2x$C\underline{H}_2CH_2N$), 3.09 (6H, s, 2x$C\underline{H}_3N$), 3.22-3.36 (9H, m, 2x$CH_2C\underline{H}_2N$, 5x$C\underline{H}OC$), 3.40 (1H, dxd, *J* = 8.6 Hz, *J* = 8.6 Hz, $\underline{CHOC}$), 3.47 (1H, dxd, *J* = 8.4 Hz, *J* = 8.4 Hz, $C\underline{H}OC$), 3.57 (1H, dxd, *J* = 8.6 Hz, *J* = 8.6 Hz, $C\underline{H}OC$), 3.65-3.70 (2H, m, 2x$CHC\underline{H}_aH_bOH$), 3.81-3.90 (3H, m, 2x$CHCH_a\underline{H}_bOH$, $C\underline{H}OC$), 4.46 (1H, d, *J* = 7.7 Hz, $C\underline{H}(O)_2$), 4.67 (1H, d, *J* = 7.8 Hz, $C\underline{H}(O)_2$). **^{13}C-NMR (100 MHz, MeOD):** δ_C 13.1 ($\underline{C}H_3CH_2$), 20.6 ($\underline{C}H_3CH$), 22.2 (2x$\underline{C}H_2CH_2N$), 22.3 ($\underline{C}H_2CH_3$), 24.8 ($\underline{C}H_2(CH_2)_2$), 26.0 (2x$\underline{C}H_2(CH_2)_2$), 28.8 (2x$\underline{C}H_2(CH_2)_2$), 29.1 ($\underline{C}H_2(CH_2)_2$), 29.2 ($\underline{C}H_2(CH_2)_2$), 29.2 ($\underline{C}H_2(CH_2)_2$), 29.4 (11x$\underline{C}H_2(CH_2)_2$), 29.5 ($\underline{C}H_2(CH_2)_2$), 31.7 ($\underline{C}H_2(CH_2)_2$), 36.5 ($\underline{C}H_2CHCH_3$), 49.9 (2x$\underline{C}H_3N$), 61.4 ($\underline{C}H_2OH$), 61.7 ($\underline{C}H_2OH$), 64.0 (2x$CH_2\underline{C}H_2N$), 70.1 ($\underline{C}HOC$), 70.5 ($\underline{C}HOC$), 74.5 ($\underline{C}HOC$), 76.4 (2x$\underline{C}HOC$), 76.9 (2x$\underline{C}HOC$), 77.6 ($\underline{C}HOC$), 80.4 ($\underline{C}HOC$), 101.5 ($\underline{C}H(O)_2$), 103.3 ($\underline{C}H(O)_2$).

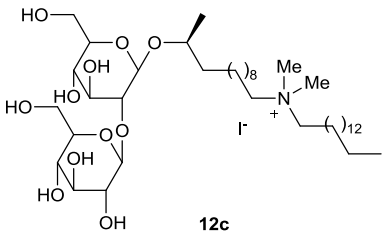
***N*-butyl,*N*-dimethyl,*N*-octadecyl-(*(S)*-11-[(2'-*O*-*β*-*D*-glucopyranosyl-*β*-*D*-glucopyranosyl)-oxy])dodecan-1-ammonium iodide (12b):** (0.05 g, 19%), white powder. **^{1}H-NMR (400 MHz, MeOD):**



12b

δ_H 0.95 (3H, t, *J* = 6.8 Hz $C\underline{H}_3CH_2$), 1.07 (3H, t, *J* = 7.3 Hz $C\underline{H}_3CH_2$), 1.30 (3H, d, *J* = 6.2 Hz, $C\underline{H}_3CH$), 1.32-1.56 (47H, m, 2x$C\underline{H}_2CH_3$, 21x$C\underline{H}_2(CH_2)_2$, $C\underline{H}_aH_bCHCH_3$), 1.60-1.69 (1H, m, $CH_a\underline{H}_bCHCH_3$), 1.71-1.83 (6H, m, 3x$C\underline{H}_2CH_2N$), 3.09 (3H, s, $C\underline{H}_3N$), 3.26-3.39 (11H, m, 3x$CH_2C\underline{H}_2N$, 5x$C\underline{H}OC$), 3.43 (1H, dxd, *J* = 8.6 Hz, *J* = 8.6 Hz, $C\underline{H}OC$), 3.50 (1H, dxd, *J* = 8.4 Hz, *J* = 8.4 Hz, $C\underline{H}OC$), 3.60 (1H, dxd, *J* = 8.6 Hz, *J* = 8.6 Hz, $C\underline{H}OC$), 3.67-3.73 (2H, m, 2x$CHC\underline{H}_aH_bOH$), 3.83-3.92 (3H, m, 2x$CHCH_a\underline{H}_bOH$, $C\underline{H}OC$), 4.50 (1H, d, *J* = 7.6 Hz, $C\underline{H}(O)_2$), 4.69 (1H, d, *J* = 7.8 Hz, $C\underline{H}(O)_2$). **^{13}C-NMR (100 MHz, MeOD):** δ_C 12.7 ($\underline{C}H_3CH_2$), 13.1 ($\underline{C}H_3CH_2$), 19.4 ($CH_3\underline{C}H_2$), 20.6 ($\underline{C}H_3CH$), 21.9 (2x$\underline{C}H_2CH_2N$), 22.4 ($\underline{C}H_2CH_3$), 23.9 ($\underline{C}H_2CH_2N$), 24.9 ($\underline{C}H_2(CH_2)_2$), 26.0 (2x$\underline{C}H_2(CH_2)_2$), 28.8 (2x$\underline{C}H_2(CH_2)_2$), 29.1-29.6 (15x$\underline{C}H_2(CH_2)_2$), 31.7 ($\underline{C}H_2(CH_2)_2$), 36.5 ($\underline{C}H_2CHCH_3$), 47.5 ($\underline{C}H_3N$), 61.2-61.7 (3x$CH_2\underline{C}H_2N$, 2x$\underline{C}H_2OH$), 70.1 ($\underline{C}HOC$), 70.5 ($\underline{C}HOC$), 74.5 ($\underline{C}HOC$), 76.4 (3x$\underline{C}HOC$), 76.9 ($\underline{C}HOC$), 77.6 ($\underline{C}HOC$), 80.5 ($\underline{C}HOC$), 101.4 ($\underline{C}H(O)_2$), 103.3 ($\underline{C}H(O)_2$).

***N*,*N*-dimethyl,*N*-pentadecyl-(*(S)*-11-[(2'-*O*-*β*-*D*-glucopyranosyl-*β*-*D*-glucopyranosyl)-oxy])dodecan-1-ammonium iodide (12c):** (0.72 g, 90%); white powder. **^{1}H-NMR (400 MHz, MeOD):** δ_H 0.95 (3H, t, *J*=6.8

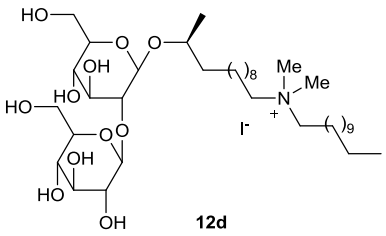


12c

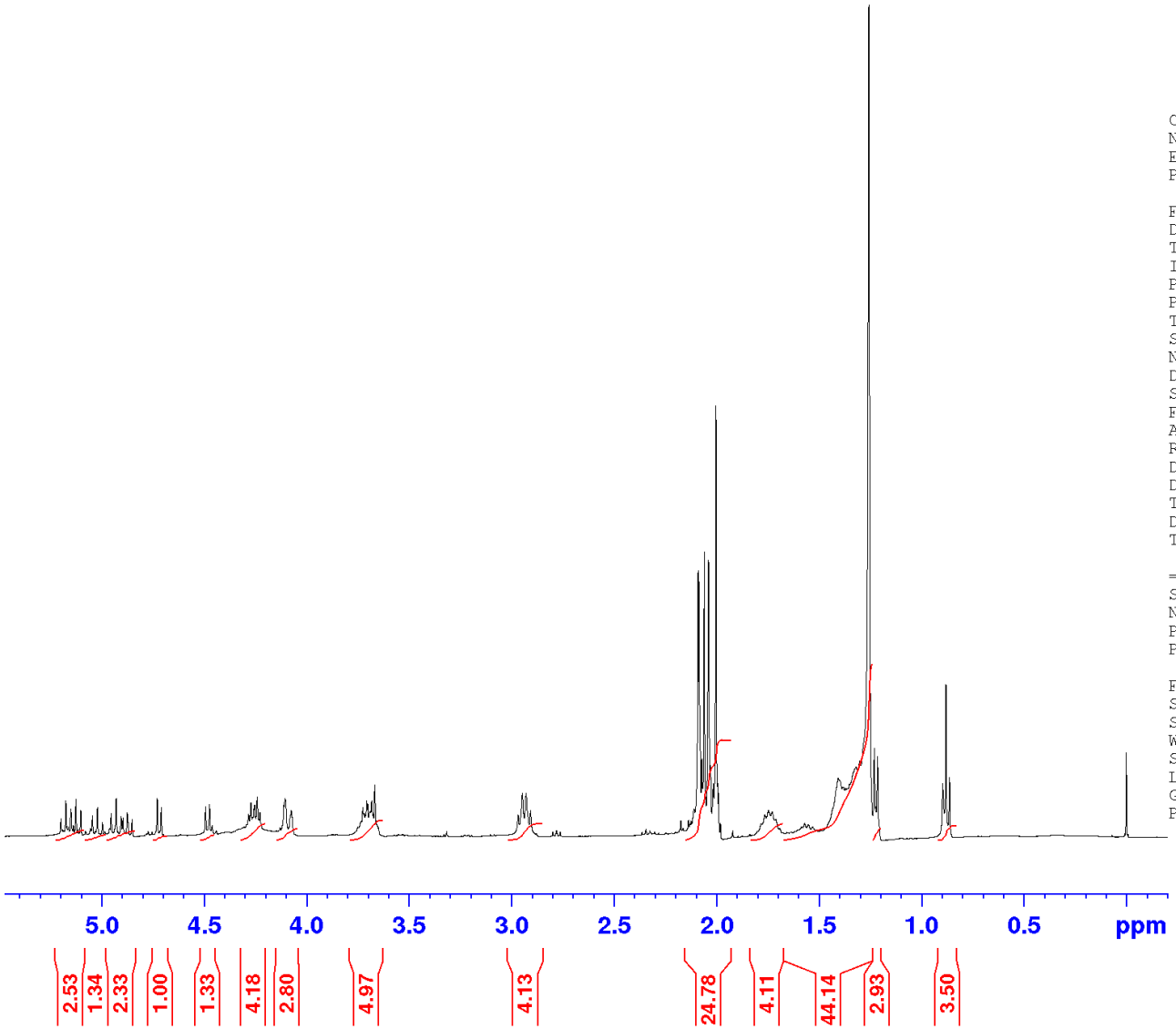
Hz, $C\underline{H}_3CH_2$), 1.30 (3H, d, J=6.2 Hz, $C\underline{H}_3CH$), 1.33-1.57 (39H, m, $C\underline{H}_2CH_3$, 18x$C\underline{H}_2(CH_2)_2$, $C\underline{H}_aH_bCHCH_3$), 1.60-1.70 (1H, m, $CH_a\underline{H}_bCHCH_3$), 1.75-1.86 (4H, m, 2x$C\underline{H}_2CH_2N$), 3.14 (6H, s, 2x$C\underline{H}_3N$), 3.26-3.40 (9H, m, 2x$CH_2C\underline{H}_2N$, 5x$C\underline{H}OC$), 3.44 (1H, dxd, *J*=8.9 Hz, *J*=8.9 Hz, $C\underline{H}OC$), 3.48-3.53 (1H, m, $C\underline{H}OC$), 3.61 (1H, dxd, *J*=8.7 Hz, *J*=8.7 Hz, $C\underline{H}OC$), 3.68-3.74 (2H, m, 2x$CHC\underline{H}_aH_bOH$), 3.85-3.92 (3H, m, 2x$CHCH_a\underline{H}_bOH$, $C\underline{H}OC$), 4.50 (1H, d, *J*=7.7 Hz, $C\underline{H}(O)_2$), 4.70 (1H, d, *J*=7.8 Hz, $C\underline{H}(O)_2$). **^{13}C-NMR (100 MHz, MeOD):** δ_C 13.1 ($\underline{C}H_3CH_2$), 20.6 ($\underline{C}H_3CH$), 22.2 (2x$\underline{C}H_2CH_2N$), 22.4 ($CH_3\underline{C}H_2$), 24.8 ($C\underline{H}_2(CH_2)_2$), 26.0 ($C\underline{H}_2(CH_2)_2$), 28.8 ($C\underline{H}_2(CH_2)_2$), 28.8

($C\underline{H}_2(CH_2)_2$), 29.1 ($C\underline{H}_2(CH_2)_2$), 29.2 ($C\underline{H}_2(CH_2)_2$), 29.2 ($C\underline{H}_2(CH_2)_2$), 29.3 ($C\underline{H}_2(CH_2)_2$), 29.4 (8x$C\underline{H}_2(CH_2)_2$), 29.5 ($C\underline{H}_2(CH_2)_2$), 31.7 ($C\underline{H}_2(CH_2)_2$), 36.5 ($\underline{C}H_2CHCH_3$), 50.0 (2x$\underline{C}H_3N$), 61.4 ($\underline{C}H_2OH$), 61.7 ($\underline{C}H_2OH$), 64.0 (2x$\underline{C}H_2N$), 70.1 ($\underline{C}HOC$), 70.5 ($\underline{C}HOC$), 74.5 ($\underline{C}HOC$), 76.4 (2x$\underline{C}HOC$), 76.9 (2x$\underline{C}HOC$), 77.6 ($\underline{C}HOC$), 80.5 ($\underline{C}HOC$), 101.4 ($\underline{C}H(O)_2$), 103.3 ($\underline{C}H(O)_2$).

***N*,*N*-dimethyl,*N*-dodecyl-(*(S)*-11-[(2'-*O*-*β*-*D*-glucopyranosyl-*β*-*D*-glucopyranosyl)-oxy])dodecan-1-ammonium iodide (12d):** (0.26 g, 88%), wit poeder. **^{1}H-NMR (400 MHz, MeOD):** δ_H 0.94 (3H, t, *J* = 6.8 Hz $CH_2C\underline{H}_3$), 1.29 (3H, d, *J* = 6.2 Hz, $C\underline{H}_3CH$), 1.32-1.54 (33H, m, $C\underline{H}_2CH_3$, 15x$C\underline{H}_2(CH_2)_2$, $C\underline{H}_aH_bCHCH_3$), 1.60-1.69 (1H, m, $CH_a\underline{H}_bCHCH_3$), 1.77-1.85 (4H, m, 2x$C\underline{H}_2CH_2N$), 3.13 (6H, s, 2x$C\underline{H}_3N$), 3.25-3.38 (9H, m, 2x$CH_2C\underline{H}_2N$, 5x$C\underline{H}OC$), 3.42 (1H, dxd, *J* = 8.8 Hz, *J* = 8.8 Hz, $C\underline{H}OC$), 3.50 (1H, dxd, *J* = 9.0 Hz, *J* = 7.9 Hz, $C\underline{H}OC$), 3.60 (1H, dxd, *J* = 8.7 Hz, *J* = 8.7 Hz, $C\underline{H}OC$), 3.67-3.72 (2H, m, 2x$CHC\underline{H}_aH_bOH$), 3.84-3.91 (3H, m, 2x$CHCH_a\underline{H}_bOH$, $C\underline{H}OC$), 4.49 (1H, d, *J* = 7.7 Hz, $C\underline{H}(O)_2$), 4.69 (1H, d, *J* = 7.8 Hz, $C\underline{H}(O)_2$). **^{13}C-NMR (100 MHz, MeOD):** δ_C 13.1 (CH2$C\underline{H}_3$), 20.6 ($\underline{C}H_3CH$), 22.2 (2x$\underline{C}H_2CH_2N$), 22.3 ($\underline{C}H_2CH_3$), 24.8 ($\underline{C}H_2(CH_2)_2$), 26.0 (2x$\underline{C}H_2(CH_2)_2$), 28.8 ($\underline{C}H_2(CH_2)_2$), 28.8 ($\underline{C}H_2(CH_2)_2$), 29.1 ($\underline{C}H_2(CH_2)_2$), 29.1 (2x$\underline{C}H_2(CH_2)_2$), 29.2 (2x$\underline{C}H_2(CH_2)_2$), 29.4 (3x$\underline{C}H_2(CH_2)_2$), 29.5 ($\underline{C}H_2(CH_2)_2$), 31.7 ($\underline{C}H_2(CH_2)_2$), 36.5 ($\underline{C}H_2CHCH_3$), 49.9 (2x$\underline{C}H_3N$), 61.4 ($\underline{C}H_2OH$), 61.7 ($\underline{C}H_2OH$), 64.0 (2x$CH_2\underline{C}H_2N$), 70.1 ($\underline{C}HOC$), 70.5 ($\underline{C}HOC$), 74.5 ($\underline{C}HOC$), 76.4 (2x$\underline{C}HOC$), 76.9 (2x$\underline{C}HOC$), 77.6 ($\underline{C}HOC$), 80.4 ($\underline{C}HOC$), 101.5 ($\underline{C}H(O)_2$), 103.2 ($\underline{C}H(O)_2$).



12d

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PROCNO                    1

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PULPROG               zg30
TD                   65536
SOLVENT              CDCl3
NS                       8
DS                       2
SWH              6393.862 Hz
FIDRES           0.097563 Hz
AQ               5.1249151 sec
RG                    30.95
DW                  78.200 usec
DE                   6.50 usec
TE                  298.2 K
D1              1.00000000 sec
TD0                       1

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NUC1                     1H
P1                    7.10 usec
PLW1           31.62299919 W

F2 - Processing parameters
SI                   65536
SF             400.1300032 MHz
WDW                      EM
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GB        0
PC                    1.00
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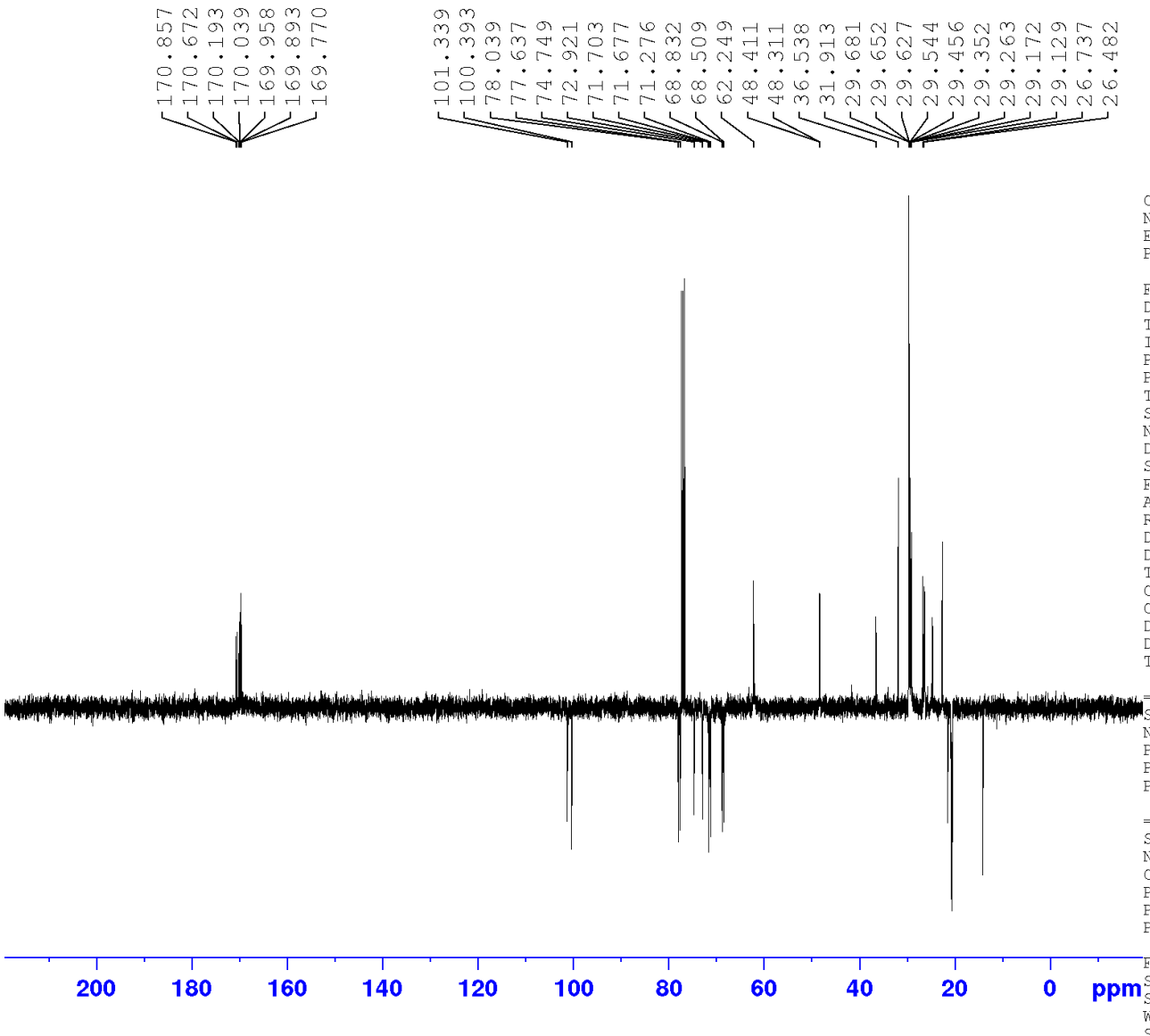
Figure S3. ^{1}H-NMR **9a**

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Current Data Parameters
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EXPNO                     8
PROCNO                    1

F2 - Acquisition Parameters
Date_              20160705
Time                  12.35
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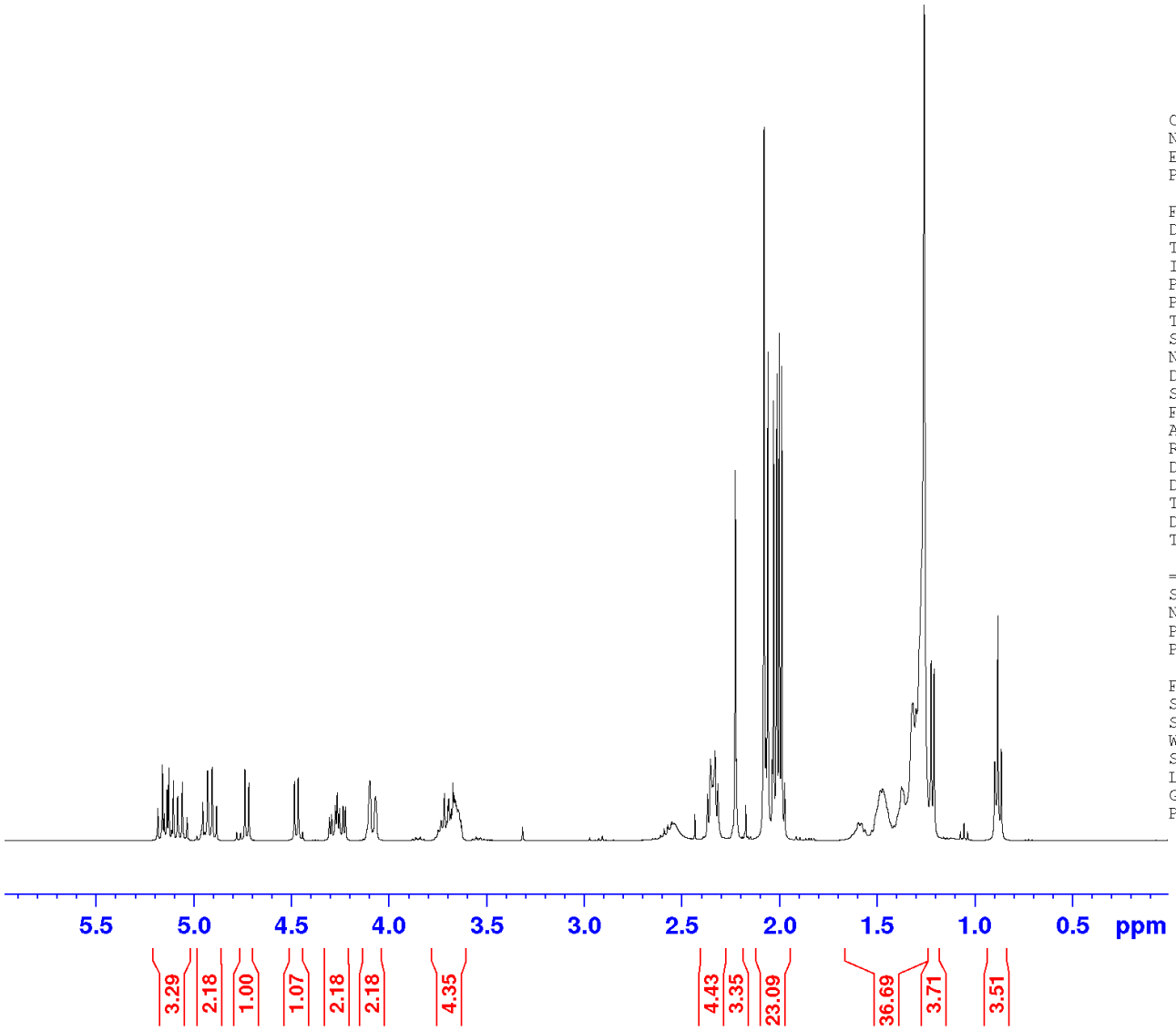
PROBHD    5 mm PABBO BB/
PULPROG                jmod
TD                    65536
SOLVENT               CDCl3
NS                      256
DS                        4
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   200.14
DW                   20.800 usec
DE                    6.50 usec
TE                   298.0 K
CNST2           145.0000000
CNST11            1.0000000
D1                2.00000000 sec
D20               0.00689655 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                    7.95 usec
P2                   15.90 usec
PLW1          100.00000000 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                    1H
CPDPRG[2             waltz16
PCPD2                 90.00 usec
PLW2             31.62299919 W
PLW12             0.19682001 W

F2 - Processing parameters
SI                      32768
SF              100.6127690 MHz
WDW                        EM
SSB          0
LB                     1.00 Hz
GB           0
PC                     1.40
```

Figure S4. ^{13}C-NMR **9a**

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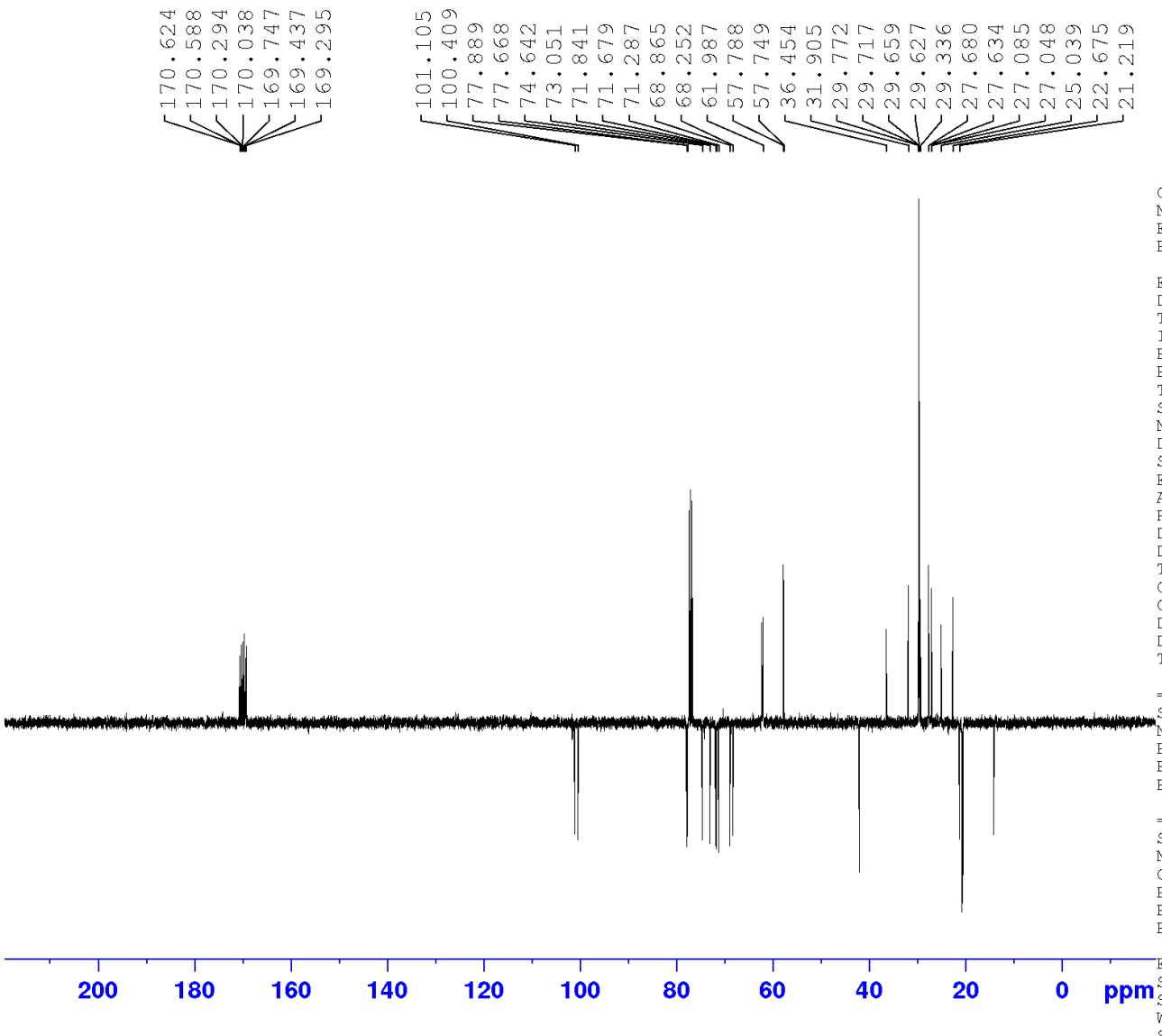
Current Data Parameters
NAME                 EDE710
EXPNO                    12
PROCNO                    1

F2 - Acquisition Parameters
Date_              20160706
Time                  16.35
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG               zg30
TD                   65536
SOLVENT              CDCl3
NS                       8
DS                       2
SWH               6393.862 Hz
FIDRES             0.097563 Hz
AQ                5.1249151 sec
RG                   30.95
DW                  78.200 usec
DE                   6.50 usec
TE                  298.3 K
D1              1.00000000 sec
TD0                      1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                    1H
P1                    7.10 usec
PLW1           31.62299919 W

F2 - Processing parameters
SI                   65536
SF              400.1300023 MHz
WDW                     EM
SSB       0
LB                    0.30 Hz
GB        0
PC                    1.00
```

Figure S5. ^{1}H-NMR **9b**

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Current Data Parameters
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EXPNO                    13
PROCNO                    1

F2 - Acquisition Parameters
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Time                  18.32
INSTRUM               spect
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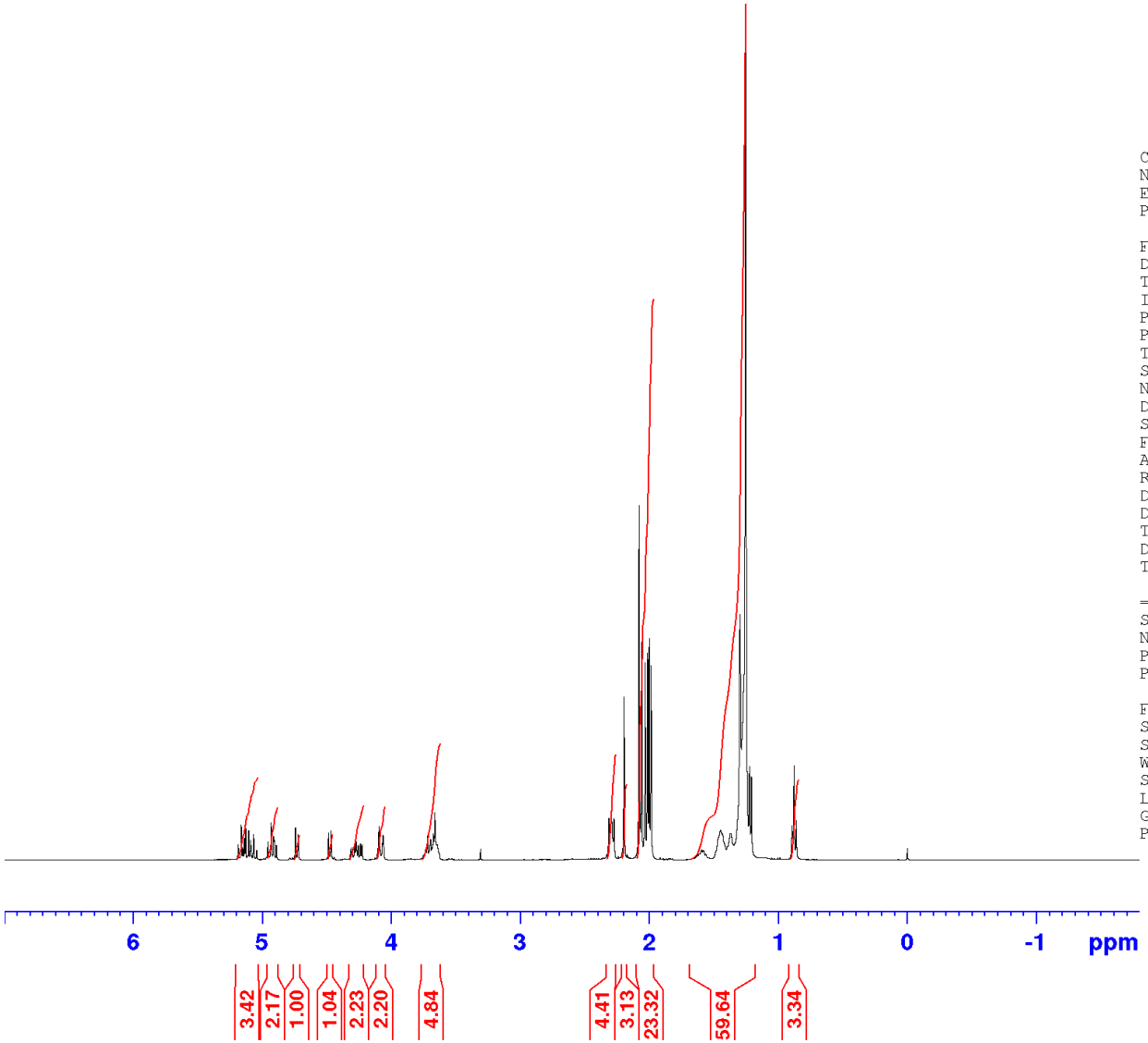
PULPROG               jmod
TD                   65536
SOLVENT              CDCl3
NS                     256
DS                       4
SWH             24038.461 Hz
FIDRES           0.366798 Hz
AQ               1.3631488 sec
RG                  200.14
DW                  20.800 usec
DE                   6.50 usec
TE                  298.3 K
CNST2          145.0000000
CNST11           1.0000000
D1               2.00000000 sec
D20              0.00689655 sec
TD0                      1

======== CHANNEL f1 ========
SFO1           100.6228298 MHz
NUC1                   13C
P1                    7.95 usec
P2                   15.90 usec
PLW1          100.00000000 W

======== CHANNEL f2 ========
SFO2           400.1316005 MHz
NUC2                   1H
CPDPRG[2           waltz16
PCPD2                90.00 usec
PLW2           31.62299919 W
PLW12           0.19682001 W

F2 - Processing parameters
SI                    32768
SF             100.6127690 MHz
WDW                      EM
SSB       0
LB                    1.00 Hz
GB        0
PC                    1.40
```

Figure S6. ^{13}C-NMR **9b**



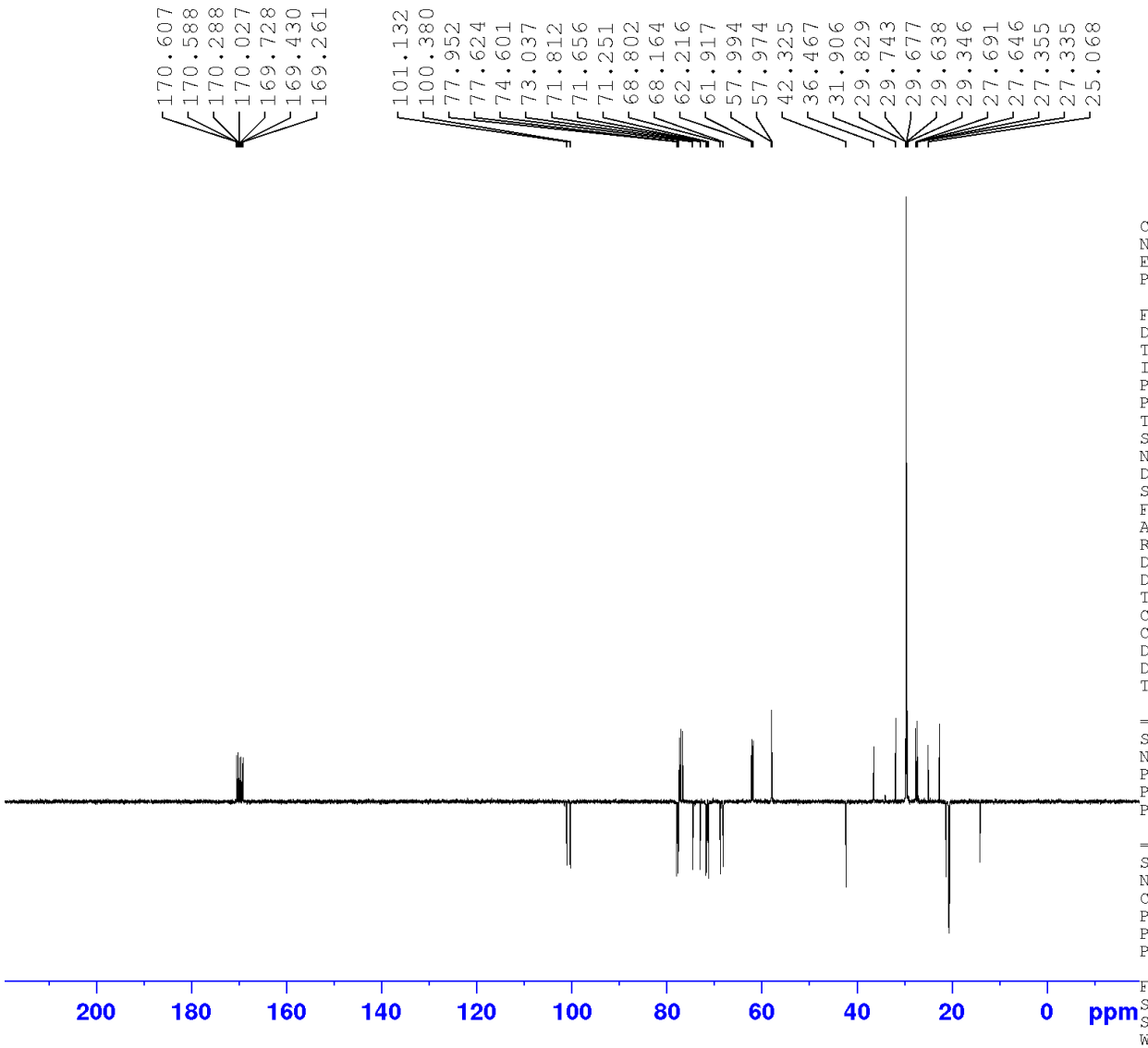

```
Current Data Parameters
NAME                  JE038
EXPNO                     7
PROCNO                    1

F2 - Acquisition Parameters
Date_              20160128
Time                  10.19
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                zg30
TD                    65536
SOLVENT               CDCl3
NS                        8
DS                        2
SWH                6393.862 Hz
FIDRES              0.097563 Hz
AQ                 5.1249151 sec
RG                    15.62
DW                   78.200 usec
DE                    6.50 usec
TE                   292.7 K
D1              1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                     7.08 usec
PLW1           31.62299919 W

F2 - Processing parameters
SI                     524288
SF              400.1299938 MHz
WDW                       no
SSB          0
LB           0 Hz
GB           0
PC                     1.00
```

Figure S7. ^{1}H-NMR **10a**




```
Current Data Parameters
NAME                  JE038
EXPNO                     6
PROCNO                    1

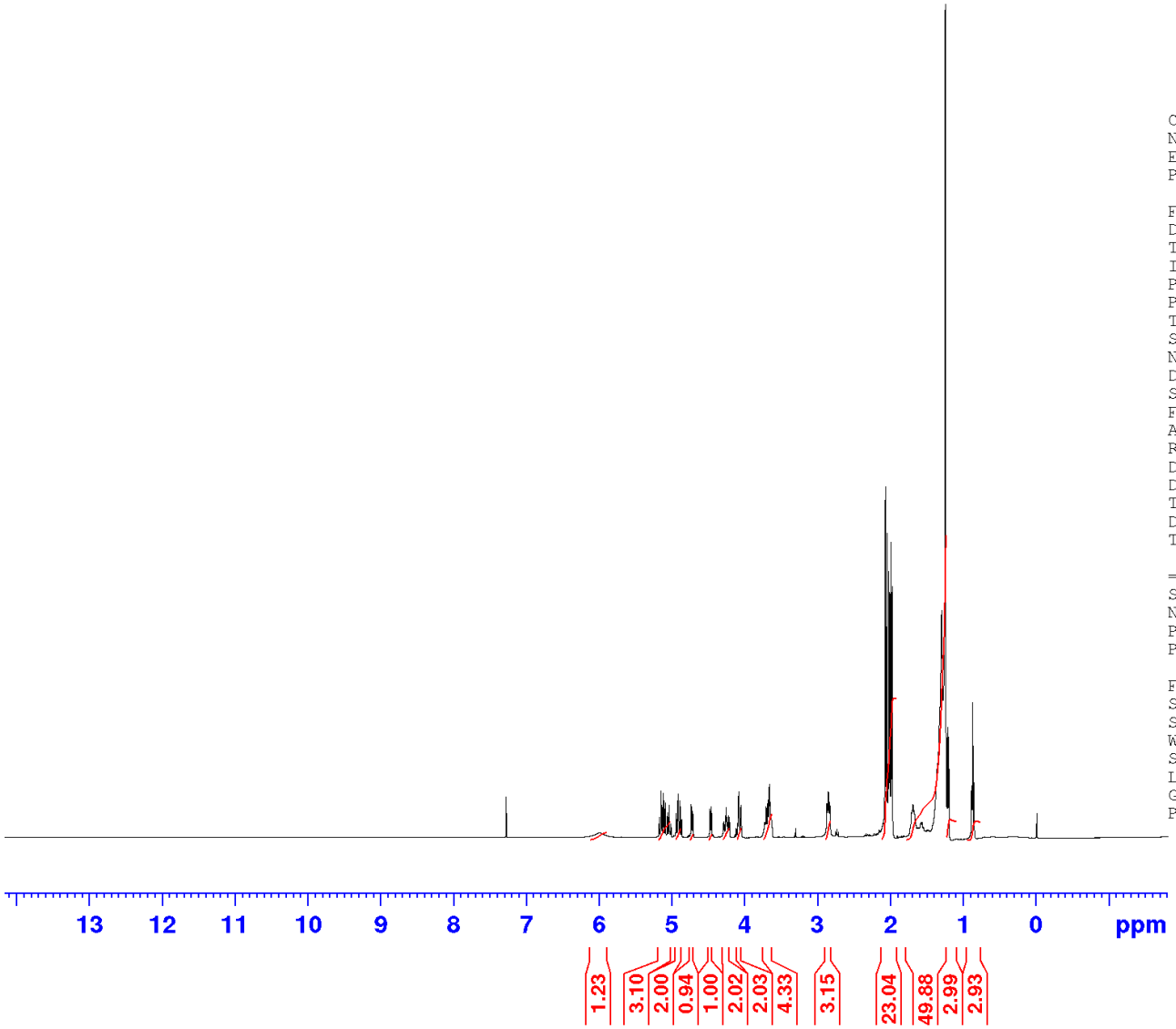
F2 - Acquisition Parameters
Date_              20160128
Time                   9.35
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                jmod
TD                    65536
SOLVENT               CDCl3
NS                      172
DS                        4
SWH              24038.461 Hz
FIDRES            0.366798 Hz
AQ               1.3631488 sec
RG                   200.14
DW                   20.800 usec
DE                    6.50 usec
TE                   294.1 K
CNST2           145.0000000
CNST11            1.0000000
D1               2.00000000 sec
D20              0.00689655 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                    7.96 usec
P2                   15.92 usec
PLW1          100.00000000 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                    1H
CPDPRG[2             waltz16
PCPD2                 90.00 usec
PLW2             31.62299919 W
PLW12             0.19570000 W

F2 - Processing parameters
SI                      32768
SF              100.6127690 MHz
WDW                        EM
SSB          0
LB                    1.00 Hz
GB           0
PC                    1.40
```

Figure S8. ^{13}C-NMR **10a**




```
Current Data Parameters
NAME                  JE070
EXPNO                     3
PROCNO                    1

F2 - Acquisition Parameters
Date_              20160401
Time                  17.26
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                zg30
TD                    65536
SOLVENT               CDCl3
NS                        8
DS                        2
SWH              6393.862 Hz
FIDRES            0.097563 Hz
AQ               5.1249151 sec
RG                    18.94
DW                  78.200 usec
DE                   6.50 usec
TE                  298.0 K
D1              1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1           400.1324710 MHz
NUC1                     1H
P1                    7.08 usec
PLW1           31.62299919 W

F2 - Processing parameters
SI                    65536
SF             400.1299976 MHz
WDW                      EM
SSB       0
LB                    0.30 Hz
GB        0
PC                    1.00
```

Figure S9. ^{1}H-NMR **10b**

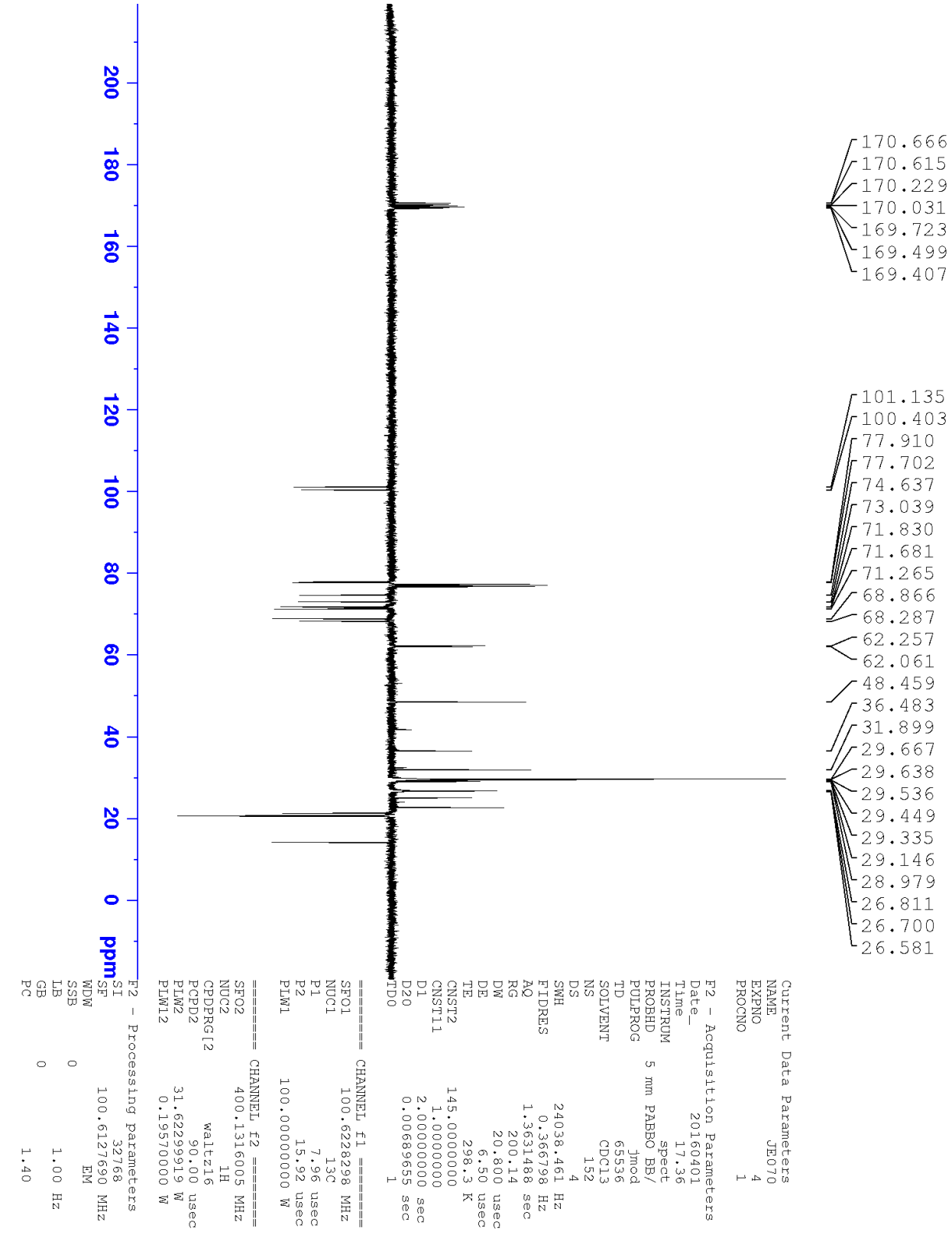
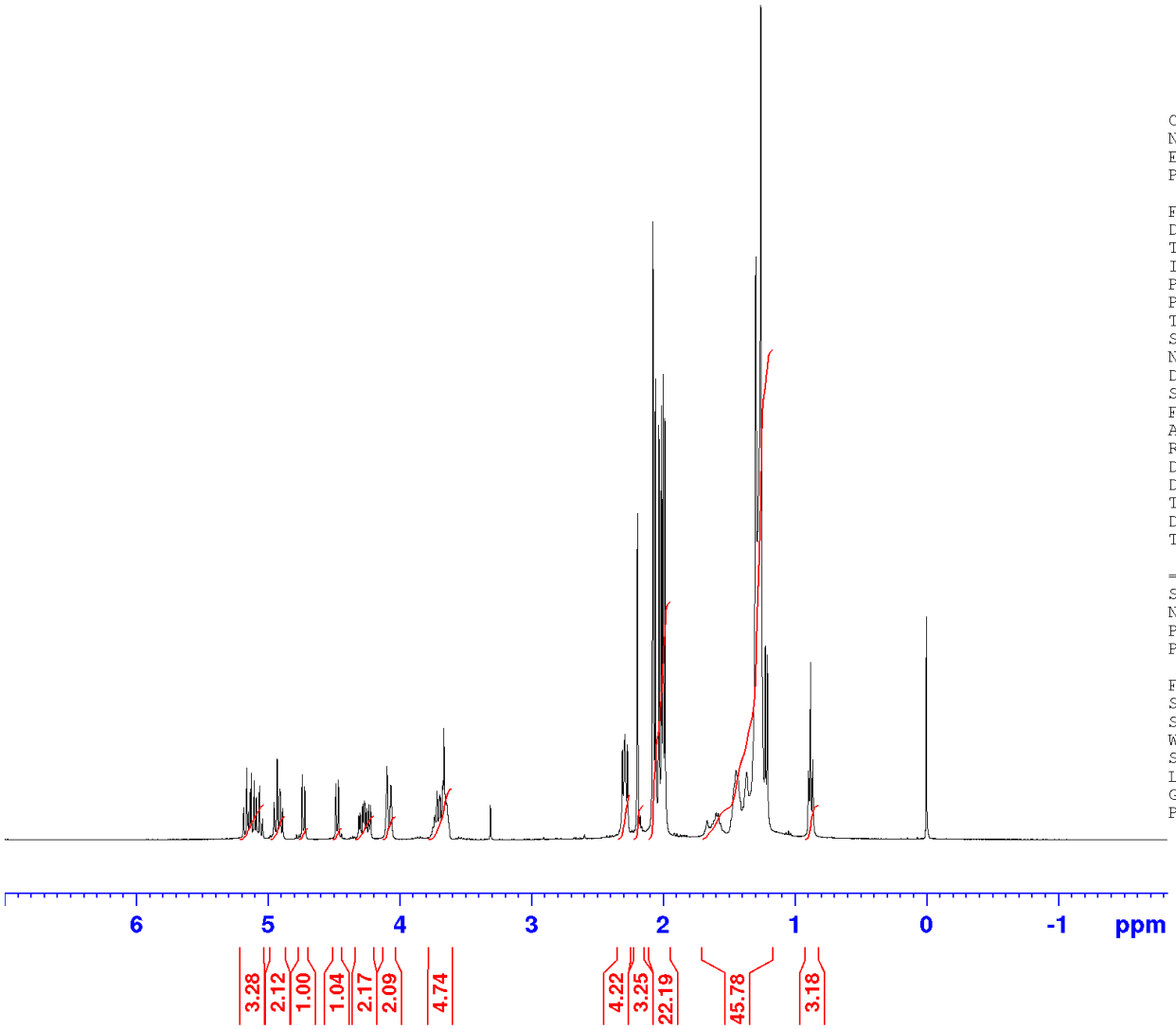


Figure S10. ^{13}C-NMR **10b**




```
Current Data Parameters
NAME                  JE072
EXPNO                     7
PROCNO                    1

F2 - Acquisition Parameters
Date_              20160422
Time                  13.01
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                zg30
TD                    65536
SOLVENT               CDCl3
NS                        8
DS                        2
SWH                6393.862 Hz
FIDRES              0.097563 Hz
AQ                 5.1249151 sec
RG                     80.42
DW                    78.200 usec
DE                     6.50 usec
TE                    298.2 K
D1              1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                     7.08 usec
PLW1           31.62299919 W

F2 - Processing parameters
SI                    65536
SF              400.1300073 MHz
WDW                      EM
SSB       0
LB                     0.30 Hz
GB        0
PC                     1.00
```

Figure S11. ^{1}H-NMR **10c**

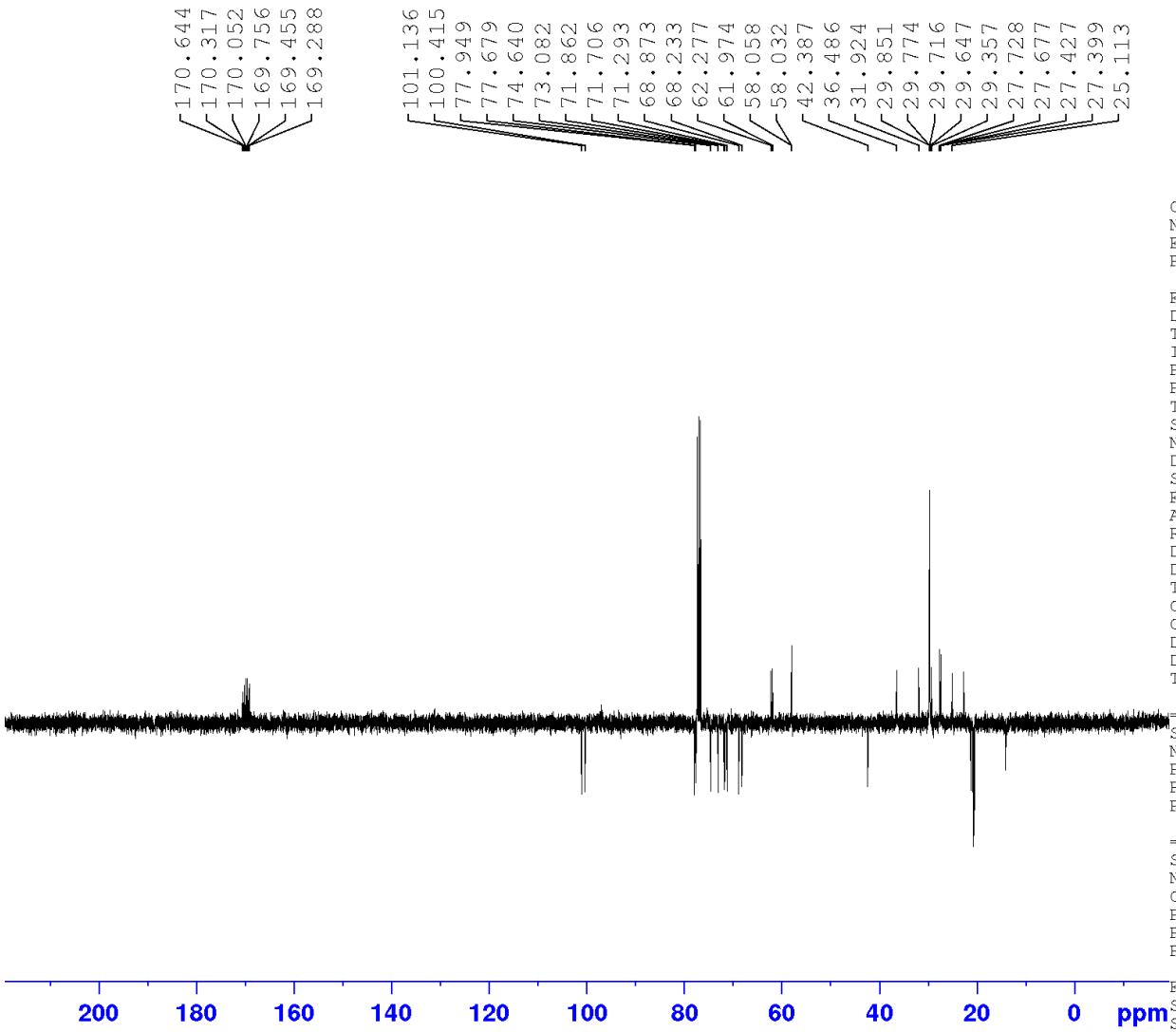
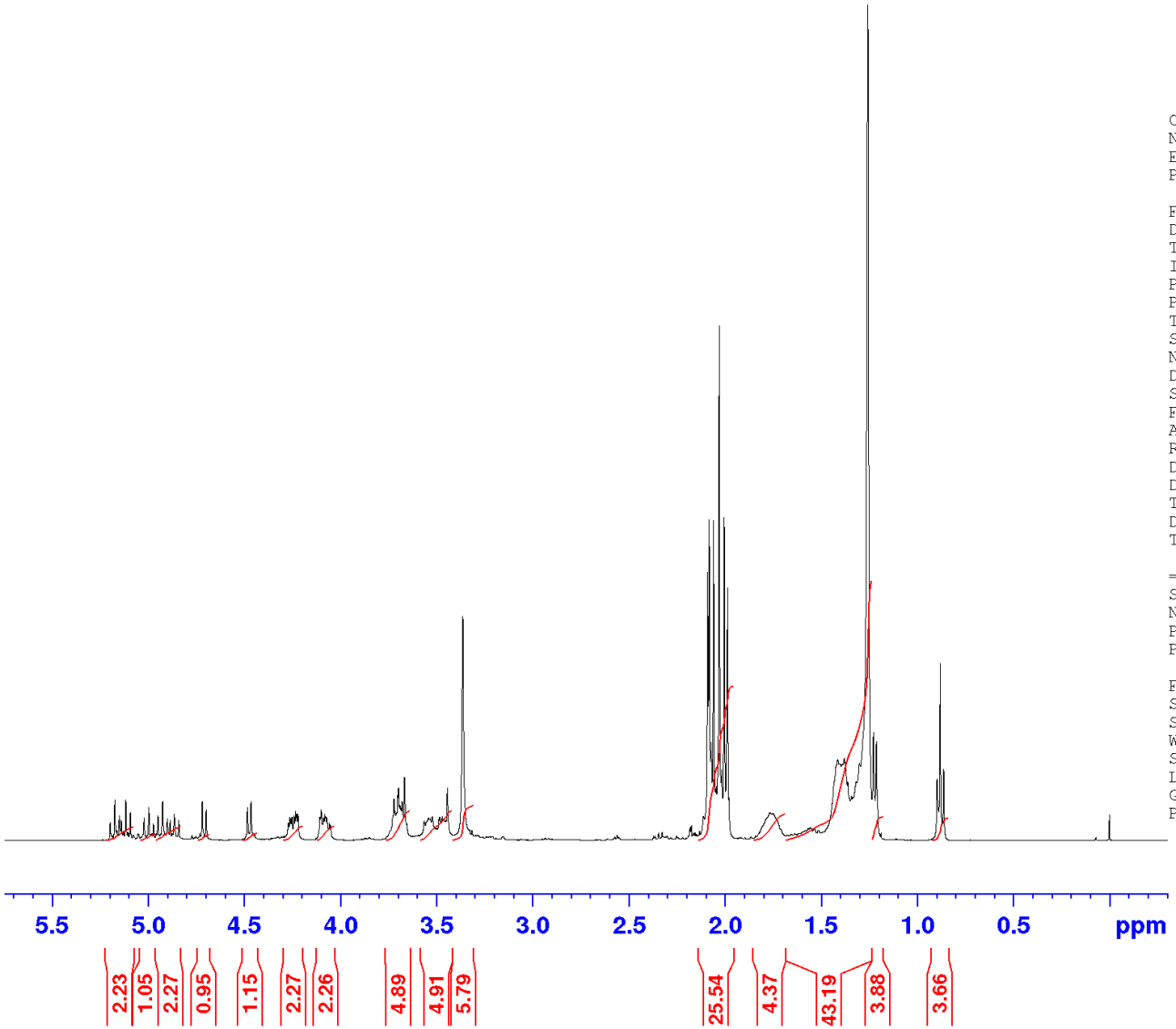


Figure S12. ^{13}C-NMR **10c**




```
Current Data Parameters
NAME                 EDE718
EXPNO                     3
PROCNO                    1

F2 - Acquisition Parameters
Date_              20160706
Time                 16.49
INSTRUM              spect
PROBHD    5 mm PABBO BB/
PULPROG              zg30
TD                  65536
SOLVENT             CDCl3
NS                      8
DS                      2
SWH              6393.862 Hz
FIDRES           0.097563 Hz
AQ               5.1249151 sec
RG                   16.92
DW                 78.200 usec
DE                  6.50 usec
TE                 298.0 K
D1              1.00000000 sec
TD0                     1

======== CHANNEL f1 ========
SFO1           400.1324710 MHz
NUC1                   1H
P1                   7.10 usec
PLW1           31.62299919 W

F2 - Processing parameters
SI                  65536
SF             400.1299826 MHz
WDW                    EM
SSB       0
LB                   0.30 Hz
GB        0
PC                   1.00
```

Figure S13. ^{1}H-NMR **4c**

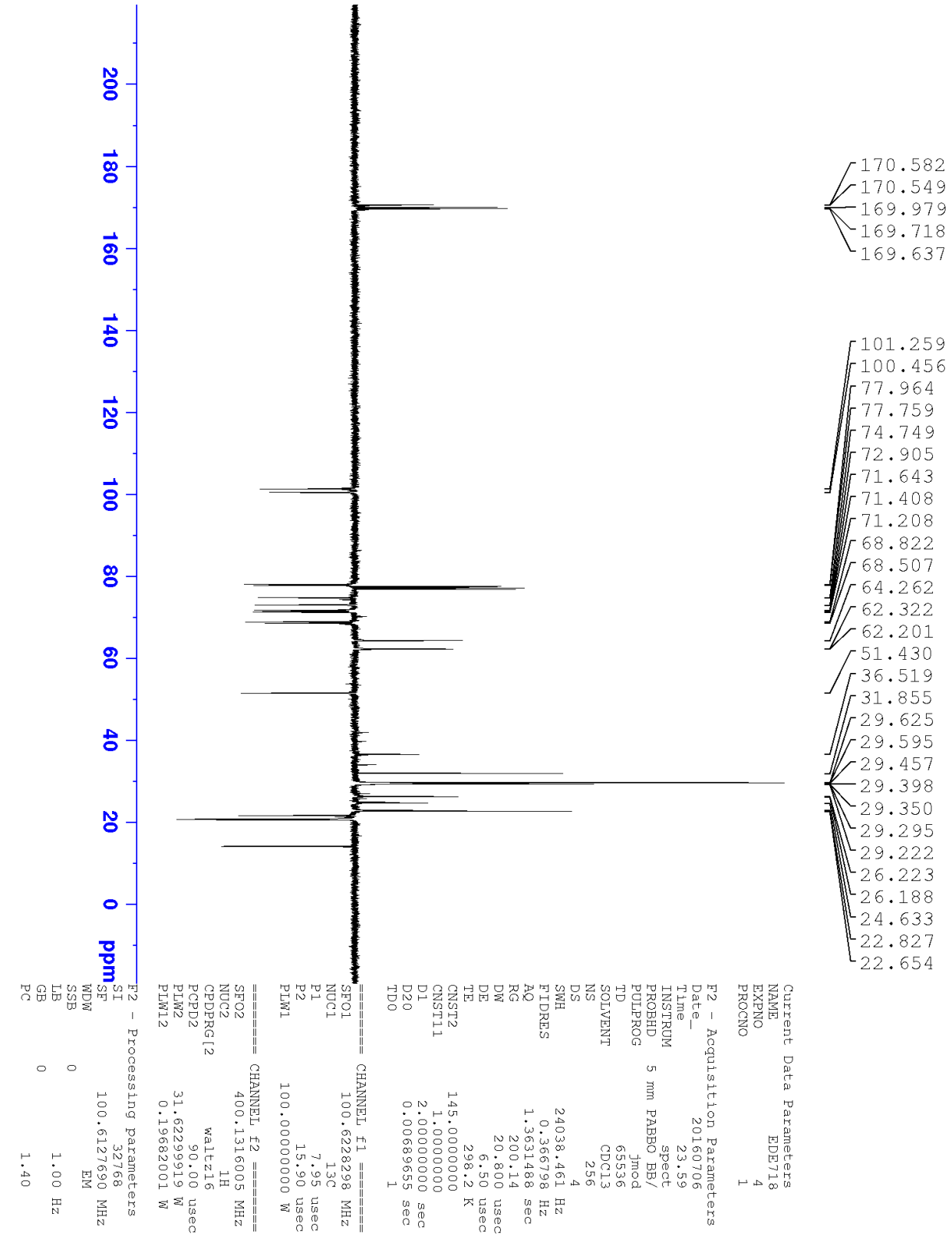
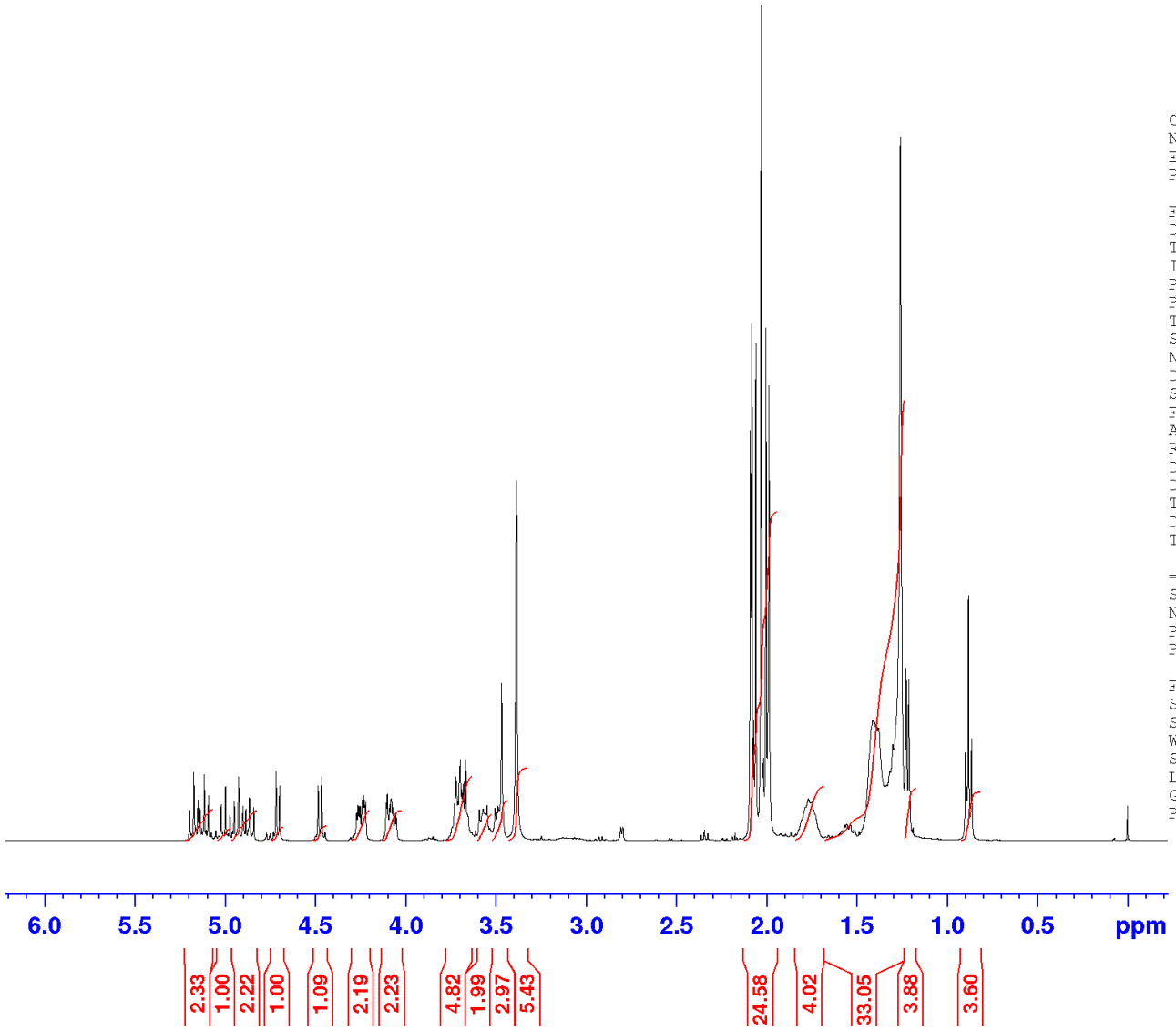


Figure S14. ^{13}C-NMR **4c**




```
Current Data Parameters
NAME                 EDE719
EXPNO                     4
PROCNO                    1

F2 - Acquisition Parameters
Date_              20160706
Time                  16.54
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                zg30
TD                    65536
SOLVENT               CDCl3
NS                        8
DS                        2
SWH              6393.862 Hz
FIDRES           0.097563 Hz
AQ               5.1249151 sec
RG                    18.94
DW                  78.200 usec
DE                   6.50 usec
TE                  298.3 K
D1              1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1           400.1324710 MHz
NUC1                     1H
P1                    7.10 usec
PLW1           31.62299919 W

F2 - Processing parameters
SI                    65536
SF             400.1299817 MHz
WDW                      EM
SSB       0
LB                    0.30 Hz
GB        0
PC                    1.00
```

Figure S15. ^{1}H-NMR **4d**

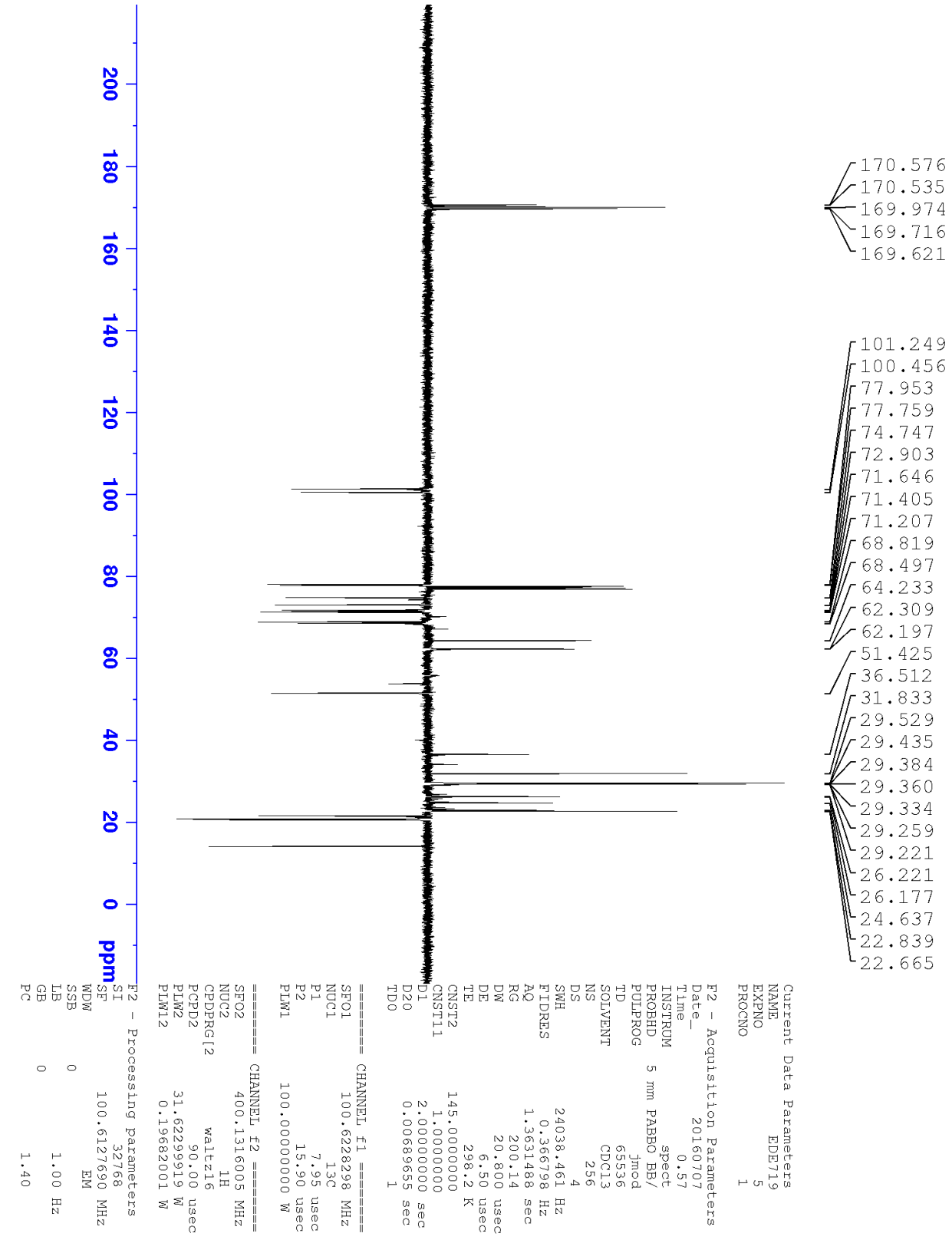
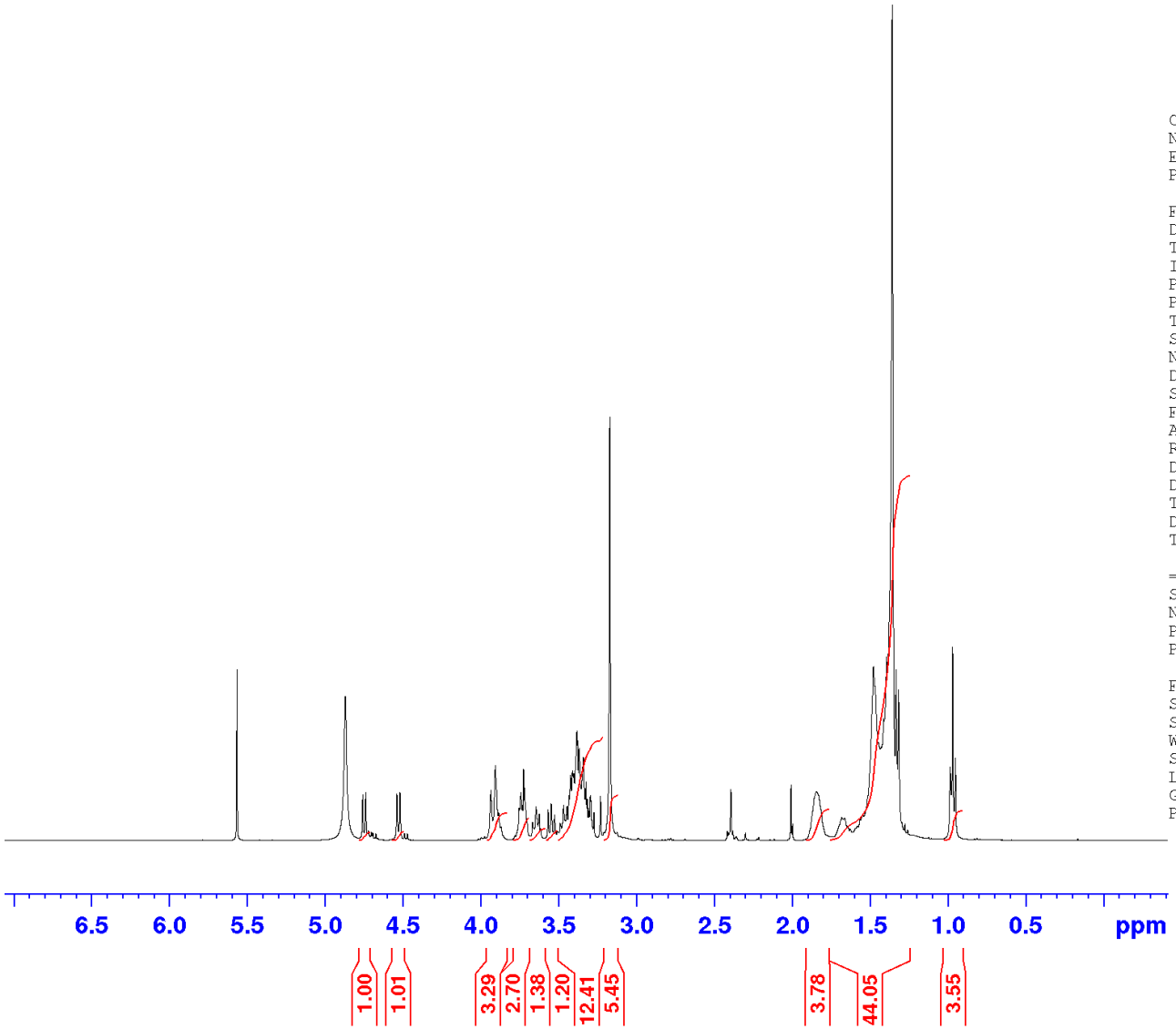


Figure S16. ^{13}C-NMR **4d**




```
Current Data Parameters
NAME                 EDE722
EXPNO                     7
PROCNO                    1

F2 - Acquisition Parameters
Date_              20160714
Time                  10.18
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                zg30
TD                    65536
SOLVENT                MeOD
NS                        8
DS                        2
SWH               6393.862 Hz
FIDRES             0.097563 Hz
AQ                5.1249151 sec
RG                    15.62
DW                   78.200 usec
DE                    6.50 usec
TE                   298.2 K
D1              1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                    1H
P1                    7.10 usec
PLW1           31.62299919 W

F2 - Processing parameters
SI                    65536
SF              400.1299800 MHz
WDW                     EM
SSB       0
LB                    0.30 Hz
GB        0
PC                    1.00
```

Figure S17. ^{1}H-NMR **5c**

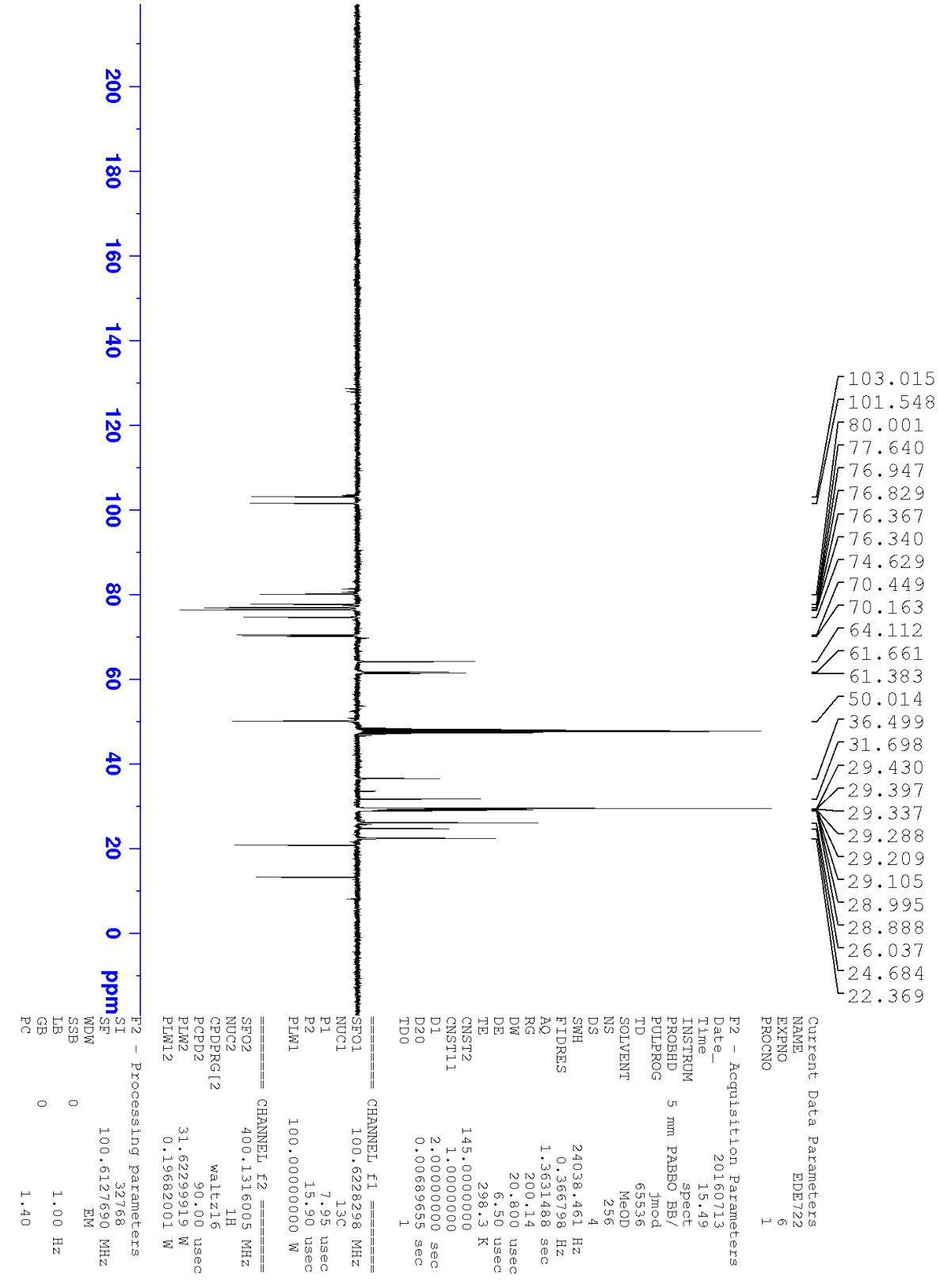
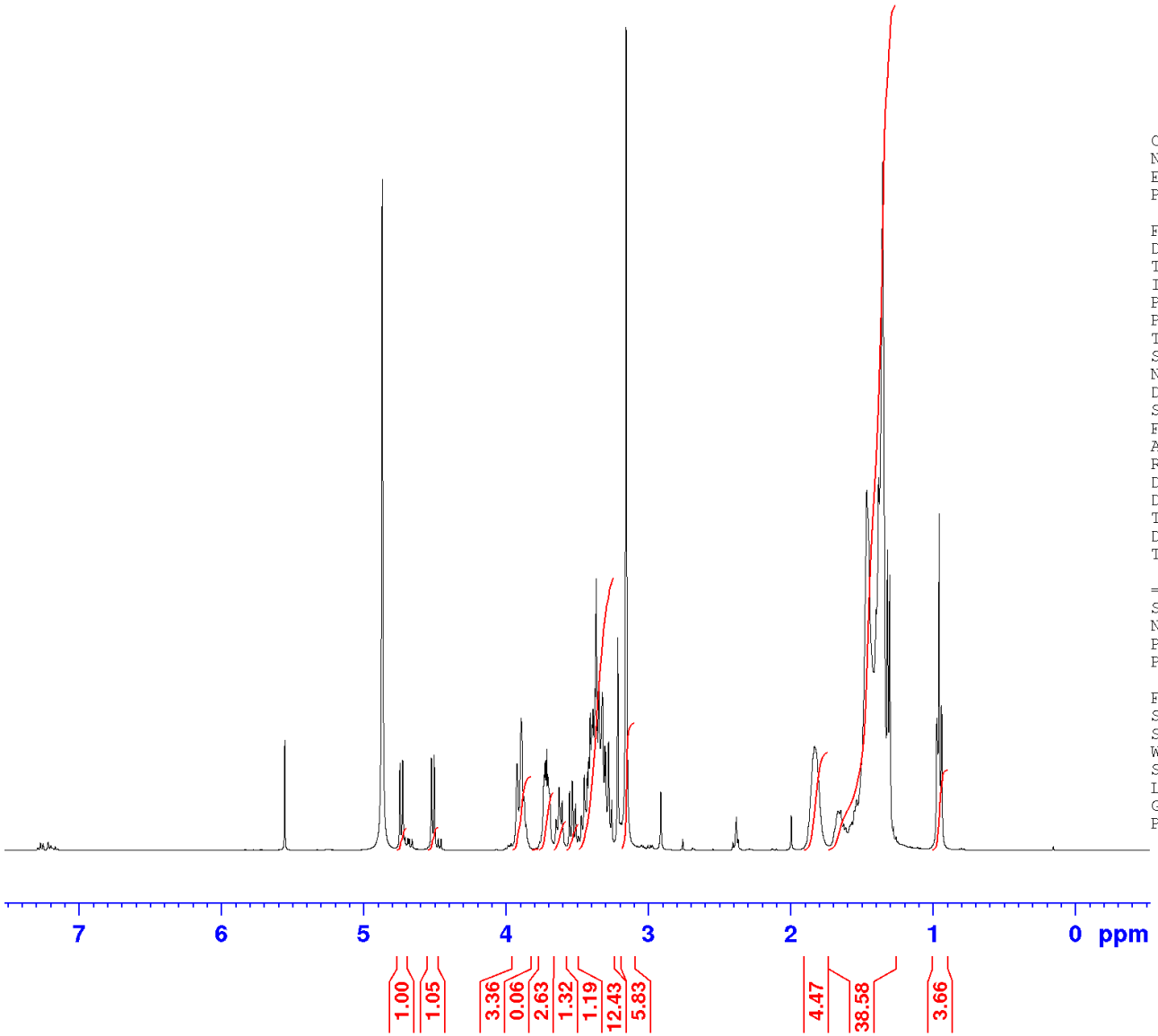


Figure S18. ^{13}C-NMR **5c**



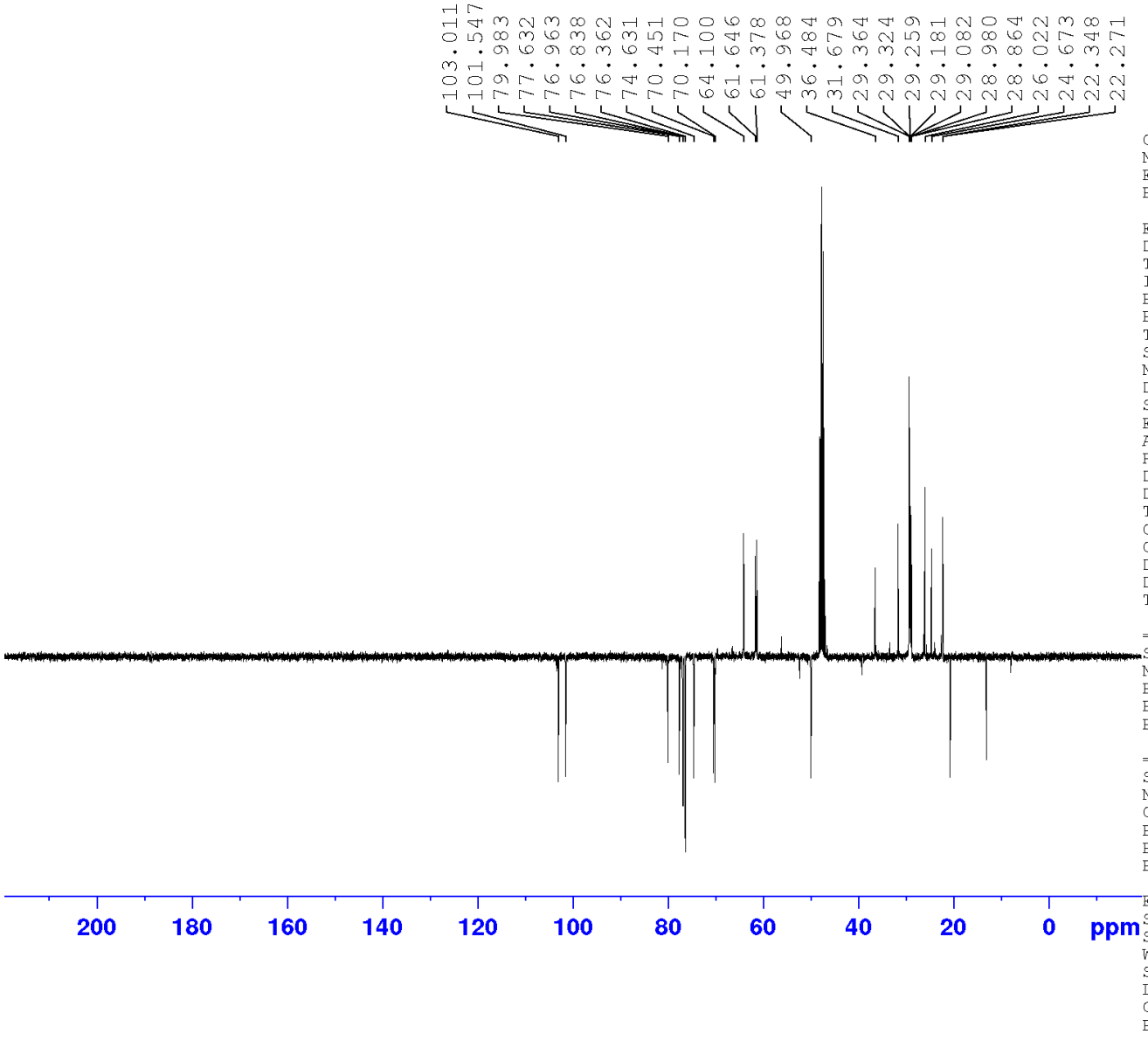

```
Current Data Parameters
NAME                 EDE721
EXPNO                     8
PROCNO                    1

F2 - Acquisition Parameters
Date_              20160714
Time                 10.08
INSTRUM              spect
PROBHD    5 mm PABBO BB/
PULPROG               zg30
TD                   65536
SOLVENT               MeOD
NS                        8
DS                        2
SWH               6393.862 Hz
FIDRES             0.097563 Hz
AQ                5.1249151 sec
RG                   30.95
DW                  78.200 usec
DE                   6.50 usec
TE                  298.3 K
D1              1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                    1H
P1                    7.10 usec
PLW1           31.62299919 W

F2 - Processing parameters
SI                   65536
SF              400.1299850 MHz
WDW                     EM
SSB       0
LB                    0.30 Hz
GB        0
PC                    1.00
```

Figure S19. ^{1}H-NMR **5d**




```
Current Data Parameters
NAME                 EDE721
EXPNO                     7
PROCNO                    1

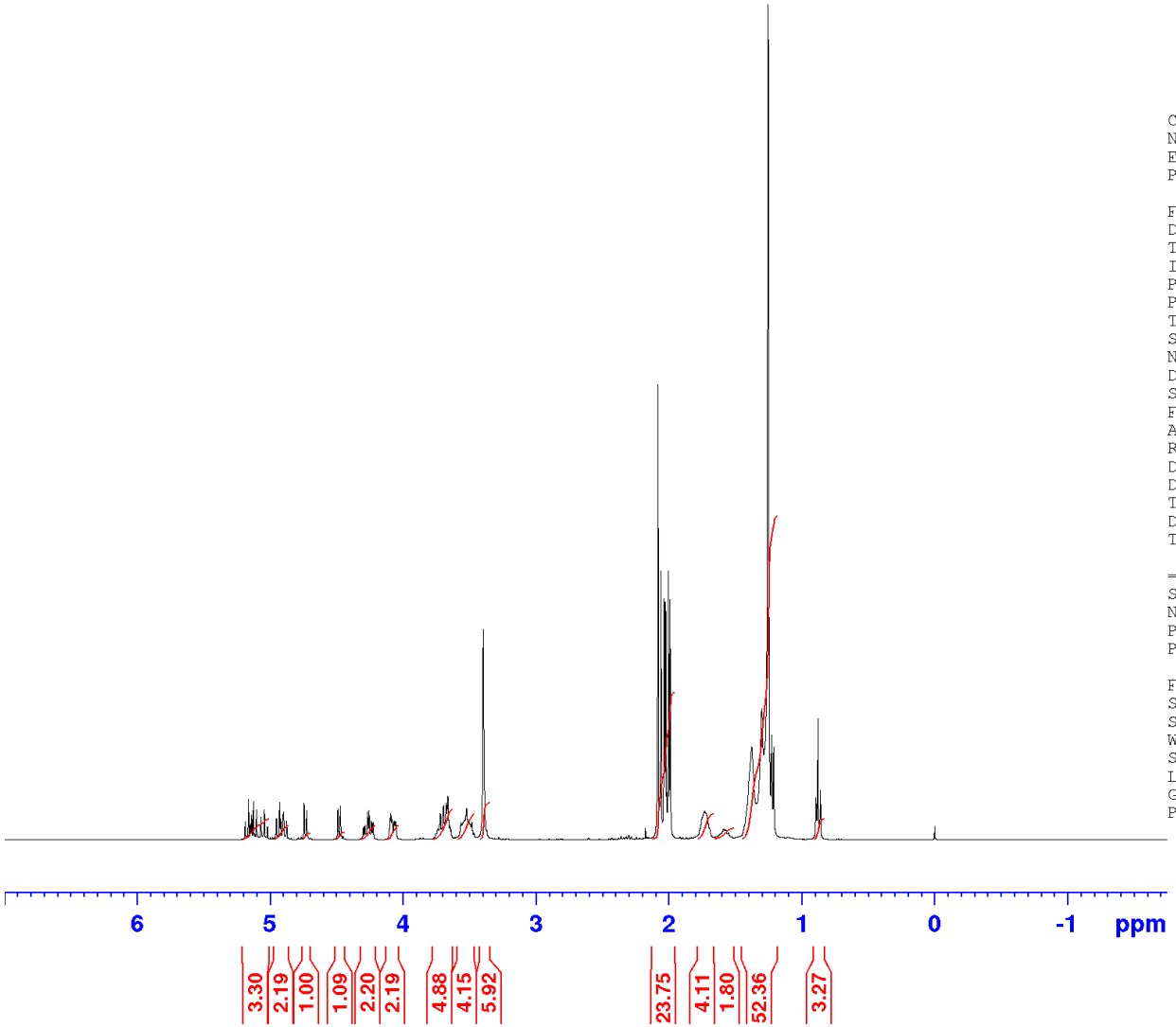
F2 - Acquisition Parameters
Date_              20160713
Time                  15.32
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                jmod
TD                    65536
SOLVENT                MeOD
NS                      256
DS                        4
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   200.14
DW                   20.800 usec
DE                    6.50 usec
TE                   298.3 K
CNST2            145.0000000
CNST11             1.0000000
D1                2.00000000 sec
D20               0.00689655 sec
TD0                       1

======== CHANNEL f1 ========
SFO1             100.6228298 MHz
NUC1                     13C
P1                     7.95 usec
P2                    15.90 usec
PLW1           100.00000000 W

======== CHANNEL f2 ========
SFO2             400.1316005 MHz
NUC2                     1H
CPDPRG[2             waltz16
PCPD2                 90.00 usec
PLW2             31.62299919 W
PLW12             0.19682001 W

F2 - Processing parameters
SI                       32768
SF               100.6127690 MHz
WDW                         EM
SSB          0
LB                     1.00 Hz
GB           0
PC                     1.40
```

Figure S20. ^{13}C-NMR **5d**



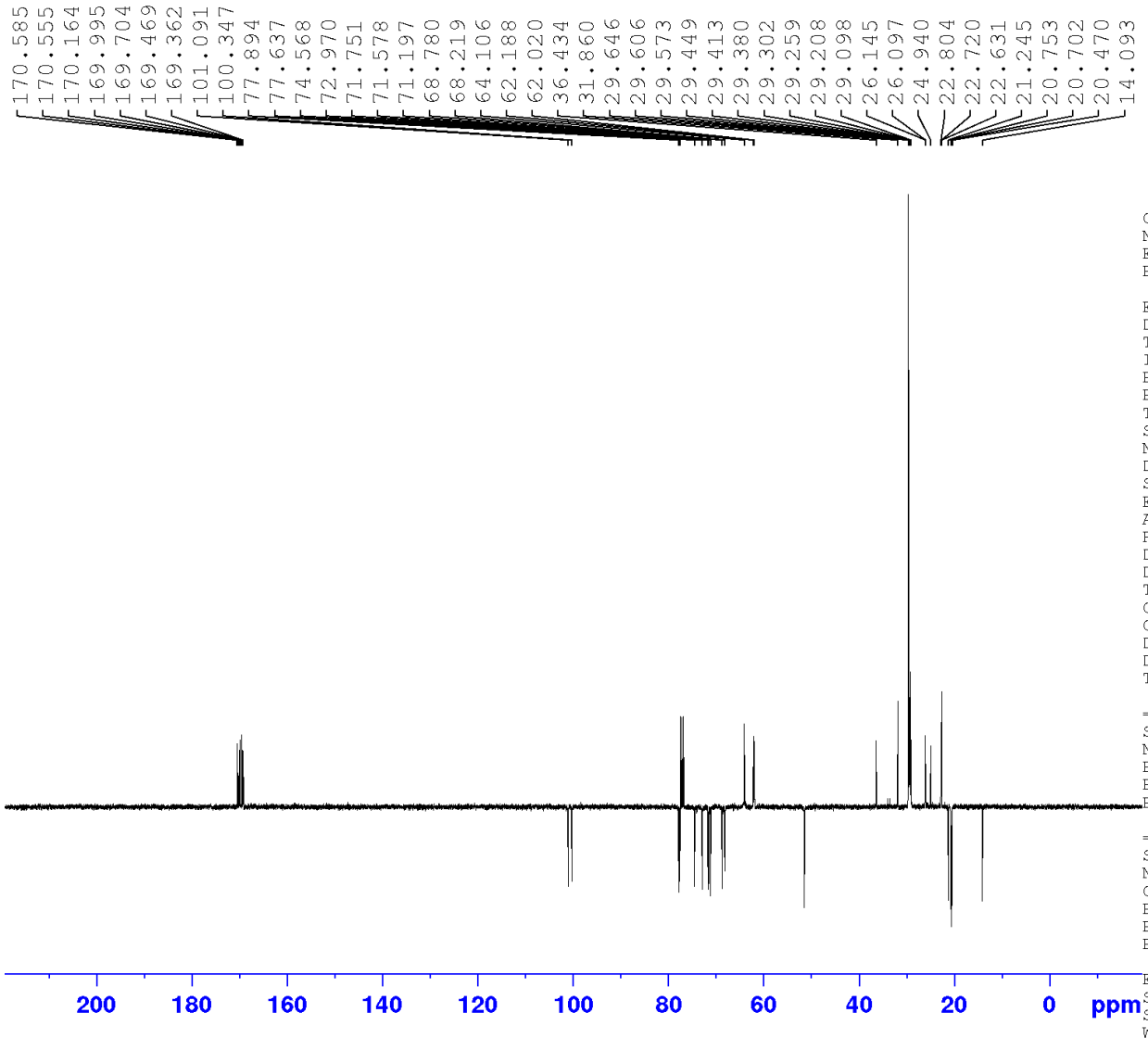

```
Current Data Parameters
NAME                  JE045
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20160208
Time                   9.30
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                zg30
TD                    65536
SOLVENT               CDCl3
NS                        8
DS                        2
SWH                6393.862 Hz
FIDRES            0.097563 Hz
AQ                5.1249151 sec
RG                    13.45
DW                   78.200 usec
DE                    6.50 usec
TE                   292.5 K
D1              1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1           400.1324710 MHz
NUC1                     1H
P1                    7.08 usec
PLW1           31.62299919 W

F2 - Processing parameters
SI                    65536
SF             400.1299762 MHz
WDW                      EM
SSB       0
LB                    0.30 Hz
GB        0
PC                    1.00
```

Figure S21. ^{1}H-NMR **11a**




```
Current Data Parameters
NAME                  JE045
EXPNO                     1
PROCNO                    1

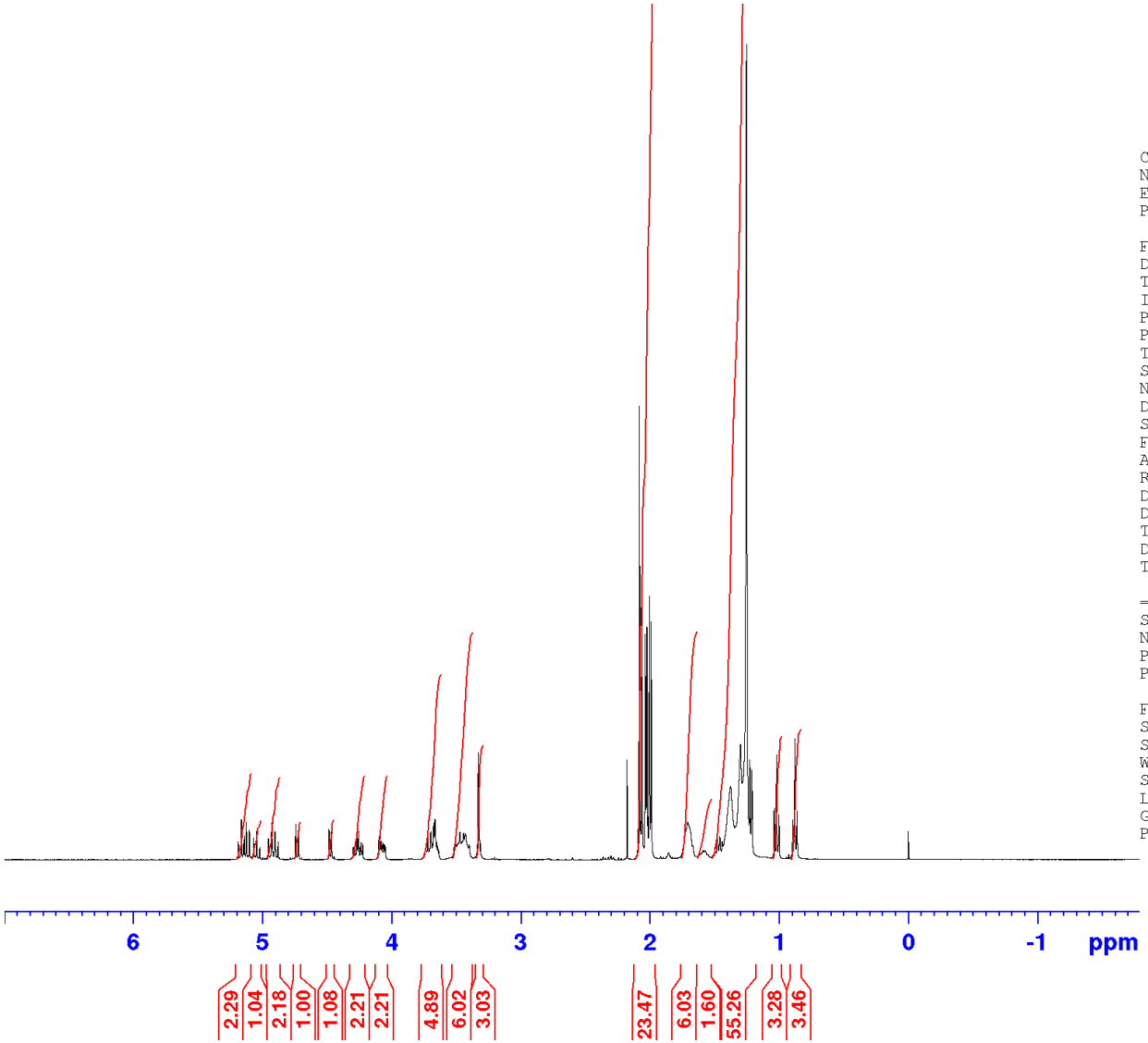
F2 - Acquisition Parameters
Date_              20160205
Time                  18.30
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                jmod
TD                    65536
SOLVENT               CDCl3
NS                      172
DS                        4
SWH              24038.461 Hz
FIDRES            0.366798 Hz
AQ               1.3631488 sec
RG                   200.14
DW                   20.800 usec
DE                    6.50 usec
TE                   294.4 K
CNST2           145.0000000
CNST11            1.0000000
D1               2.00000000 sec
D20              0.00689655 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                    7.96 usec
P2                   15.92 usec
PLW1          100.00000000 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                    1H
CPDPRG[2             waltz16
PCPD2                 90.00 usec
PLW2            31.62299919 W
PLW12            0.19570000 W

F2 - Processing parameters
SI                    32768
SF              100.6127690 MHz
WDW                     EM
SSB          0
LB                    1.00 Hz
GB           0
PC                    1.40
```

Figure S22. ^{13}C-NMR **11a**




```
Current Data Parameters
NAME                  JE045
EXPNO                     8
PROCNO                    1

F2 - Acquisition Parameters
Date_              20160209
Time                   7.53
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                zg30
TD                    65536
SOLVENT               CDCl3
NS                        8
DS                        2
SWH                6393.862 Hz
FIDRES            0.097563 Hz
AQ                5.1249151 sec
RG                    18.94
DW                   78.200 usec
DE                    6.50 usec
TE                   292.3 K
D1              1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1           400.1324710 MHz
NUC1                     1H
P1                    7.08 usec
PLW1           31.62299919 W

F2 - Processing parameters
SI                     524288
SF             400.1299909 MHz
WDW                      no
SSB       0
LB        0 Hz
GB        0
PC                    1.00
```

Figure S23. ^{1}H-NMR **11b**

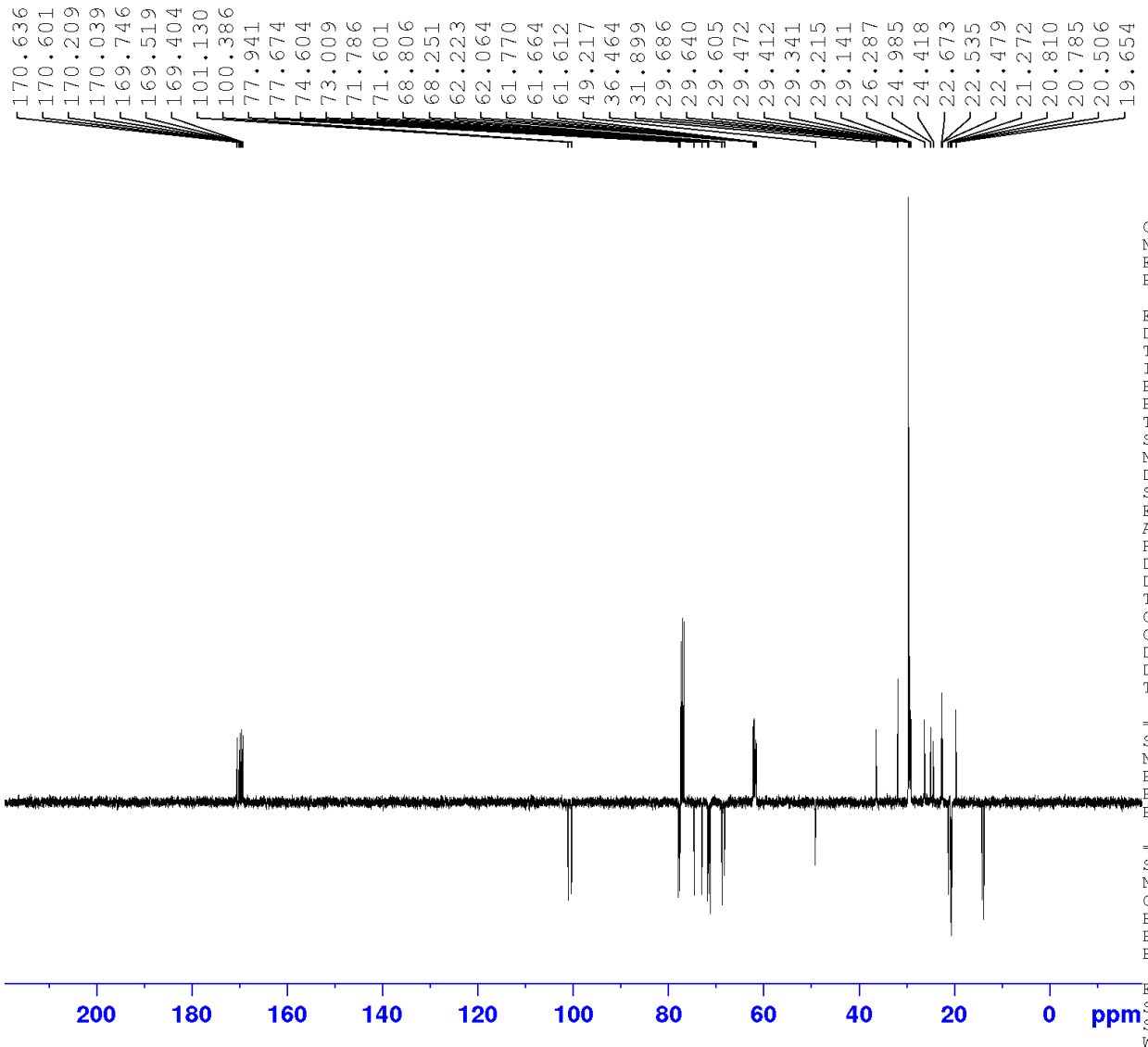
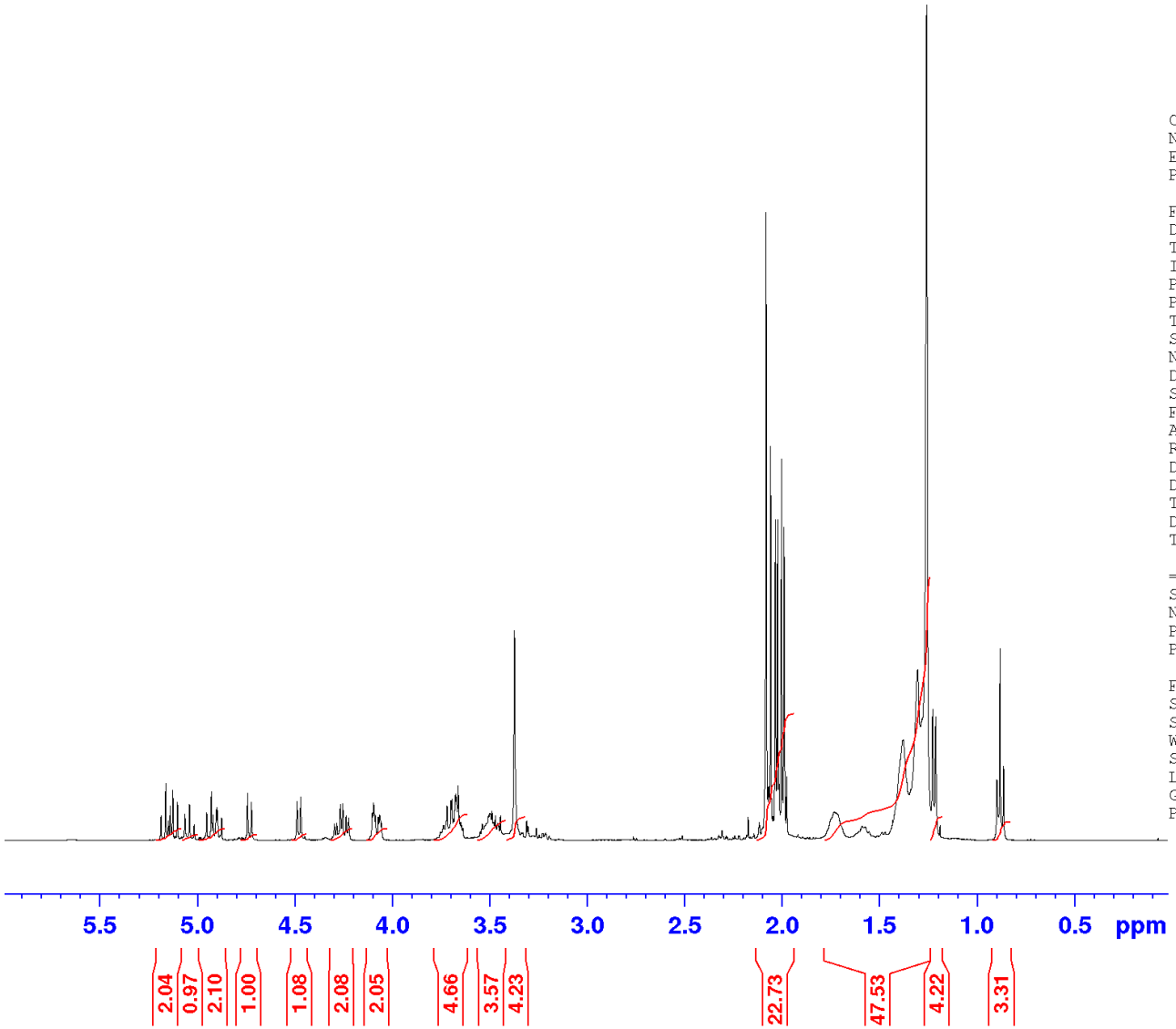


Figure S24. ^{13}C-NMR **11b**



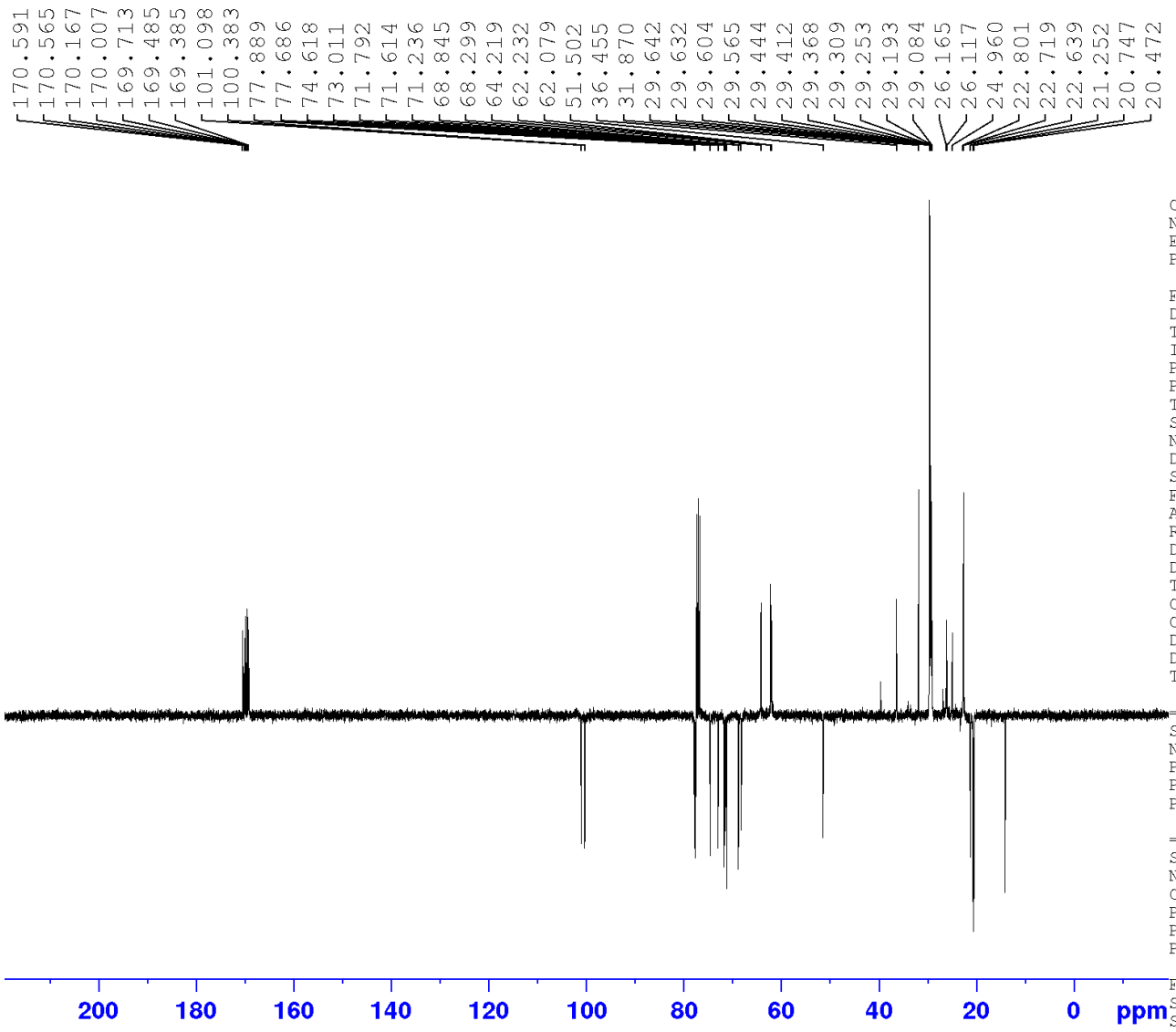

```
Current Data Parameters
NAME                 EDE709
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_              20160706
Time                 16.44
INSTRUM              spect
PROBHD    5 mm PABBO BB/
PULPROG               zg30
TD                   65536
SOLVENT              CDCl3
NS                       8
DS                       2
SWH               6393.862 Hz
FIDRES             0.097563 Hz
AQ                5.1249151 sec
RG                   16.92
DW                  78.200 usec
DE                   6.50 usec
TE                  298.3 K
D1              1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                    1H
P1                    7.10 usec
PLW1           31.62299919 W

F2 - Processing parameters
SI                   65536
SF              400.1299878 MHz
WDW                     no
SSB       0
LB        0 Hz
GB        0
PC                    1.00
```

Figure S25. ^{1}H-NMR **11c**




```
Current Data Parameters
NAME                 EDE709
EXPNO                     2
PROCNO                    1

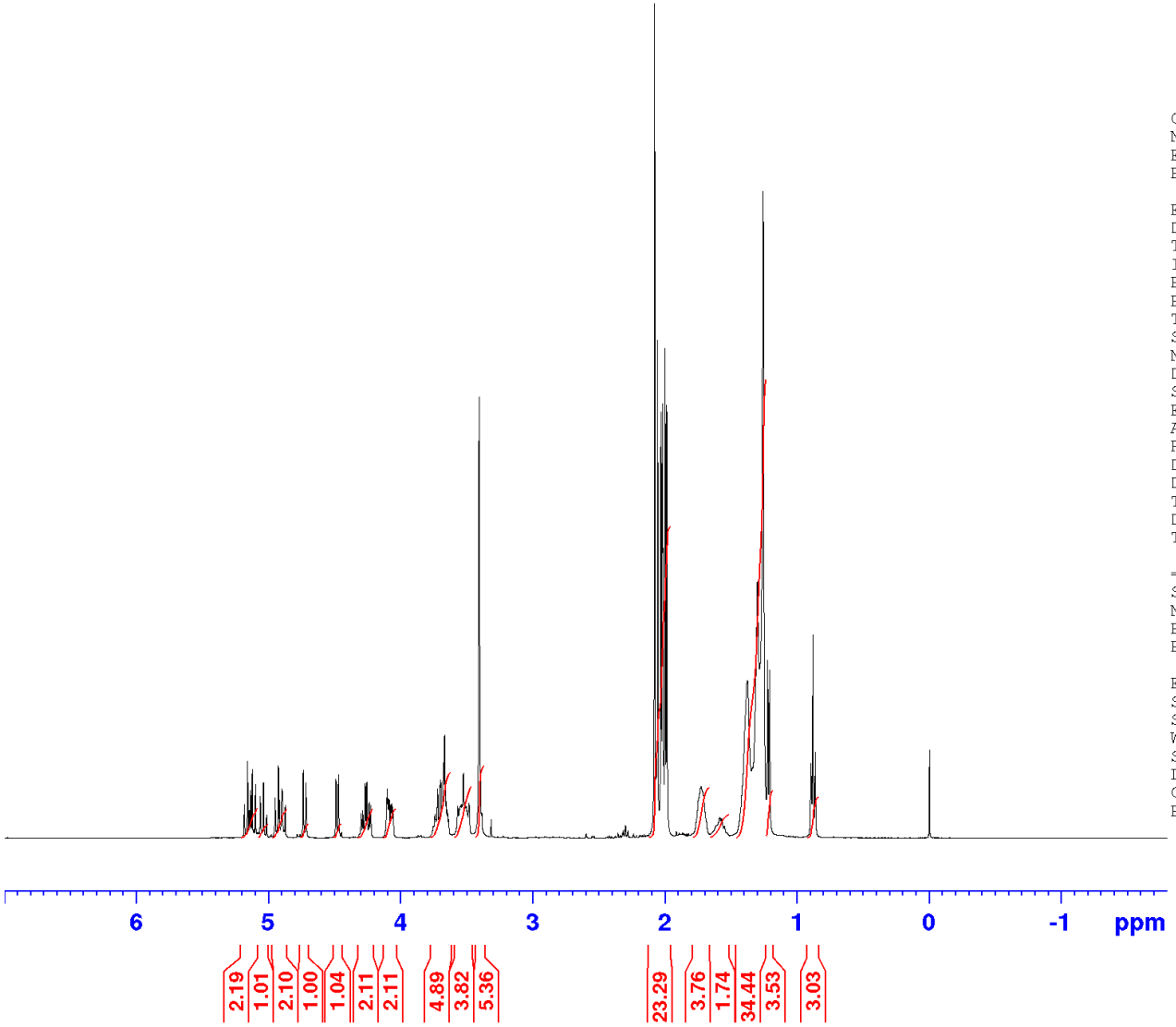
F2 - Acquisition Parameters
Date_              20160706
Time                  23.02
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                jmod
TD                    65536
SOLVENT               CDCl3
NS                      256
DS                        4
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   200.14
DW                   20.800 usec
DE                    6.50 usec
TE                   298.1 K
CNST2           145.0000000
CNST11            1.0000000
D1                2.00000000 sec
D20               0.00689655 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                    7.95 usec
P2                   15.90 usec
PLW1          100.00000000 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                    1H
CPDPRG[2             waltz16
PCPD2                90.00 usec
PLW2            31.62299919 W
PLW12            0.19682001 W

F2 - Processing parameters
SI                      32768
SF              100.6127690 MHz
WDW                        EM
SSB          0
LB                    1.00 Hz
GB           0
PC                    1.40
```

Figure S26. ^{13}C-NMR **11c**



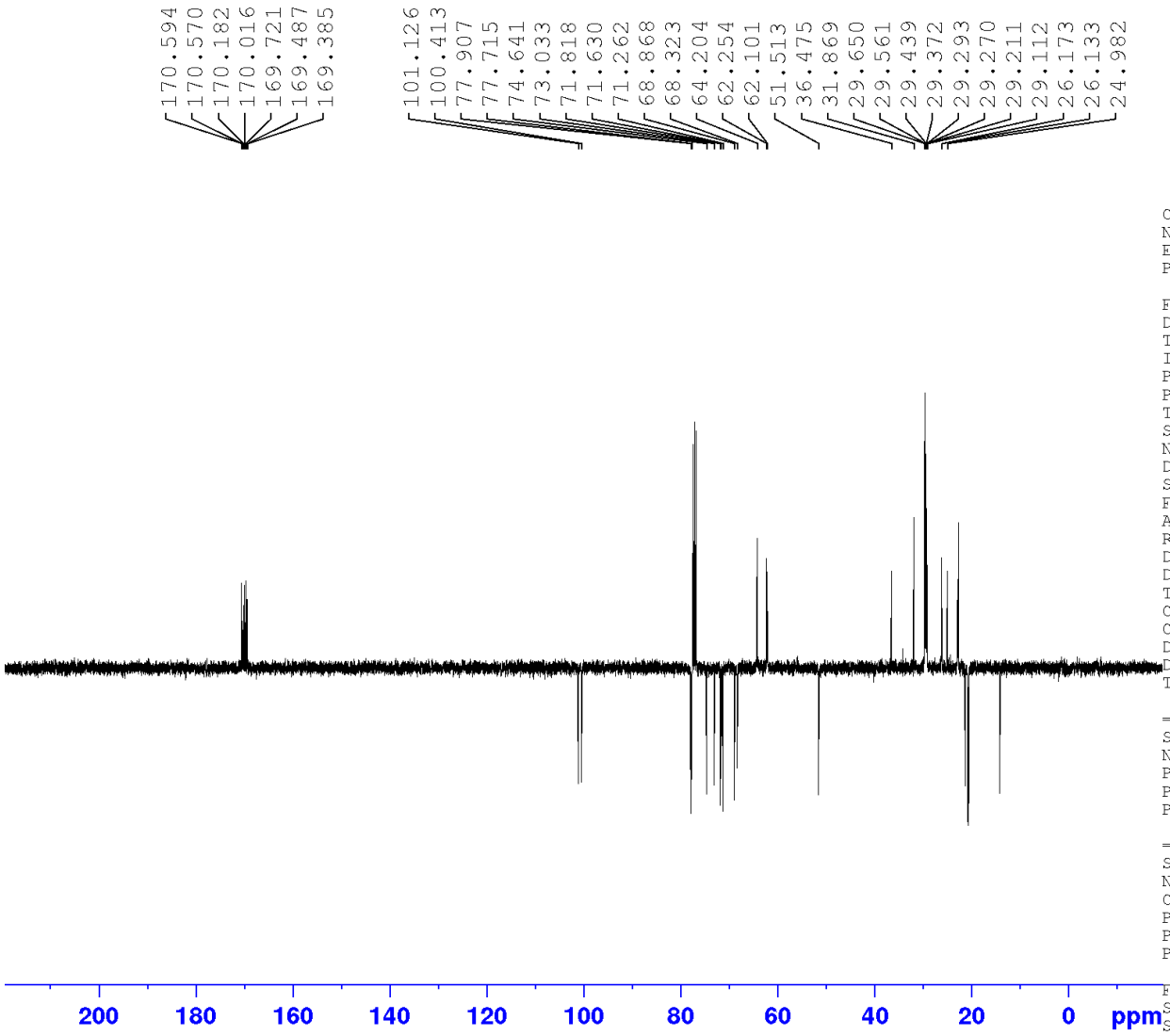

```
Current Data Parameters
NAME                  JE073
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_              20160426
Time                  11.46
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                zg30
TD                    65536
SOLVENT               CDCl3
NS                        8
DS                        2
SWH                6393.862 Hz
FIDRES              0.097563 Hz
AQ                 5.1249151 sec
RG                    30.95
DW                   78.200 usec
DE                    6.50 usec
TE                   298.1 K
D1                1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                     7.08 usec
PLW1           31.62299919 W

F2 - Processing parameters
SI                    65536
SF              400.1299957 MHz
WDW                      EM
SSB          0
LB                    0.30 Hz
GB           0
PC                    1.00
```

Figure S27. ^{1}H-NMR **11d**




```
Current Data Parameters
NAME                  JE073
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20160426
Time                  11.57
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                jmod
TD                    65536
SOLVENT               CDCl3
NS                      172
DS                        4
SWH              24038.461 Hz
FIDRES            0.366798 Hz
AQ               1.3631488 sec
RG                   200.14
DW                   20.800 usec
DE                    6.50 usec
TE                   298.2 K
CNST2           145.0000000
CNST11            1.0000000
D1               2.00000000 sec
D20              0.00689655 sec
TD0                       1

======== CHANNEL f1 ========
SFO1           100.6228298 MHz
NUC1                    13C
P1                    7.96 usec
P2                   15.92 usec
PLW1          100.00000000 W

======== CHANNEL f2 ========
SFO2           400.1316005 MHz
NUC2                    1H
CPDPRG[2             waltz16
PCPD2                 90.00 usec
PLW2           31.62299919 W
PLW12           0.19570000 W

F2 - Processing parameters
SI                    32768
SF             100.6127690 MHz
WDW                      EM
SSB          0
LB                    1.00 Hz
GB           0
PC                    1.40
```

Figure S28. ^{13}C-NMR **11d**

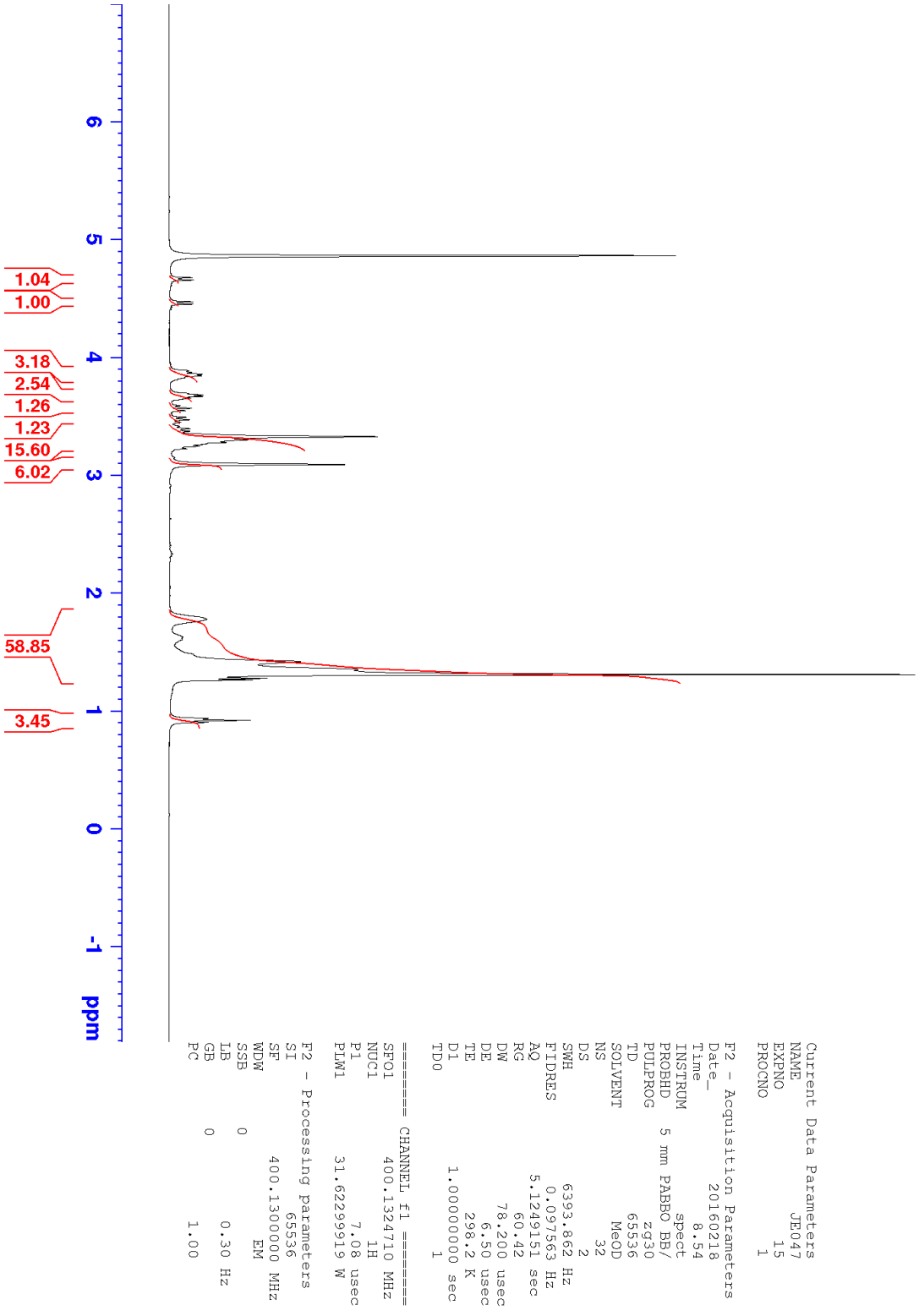


Figure S29. ^{1}H-NMR **12a**

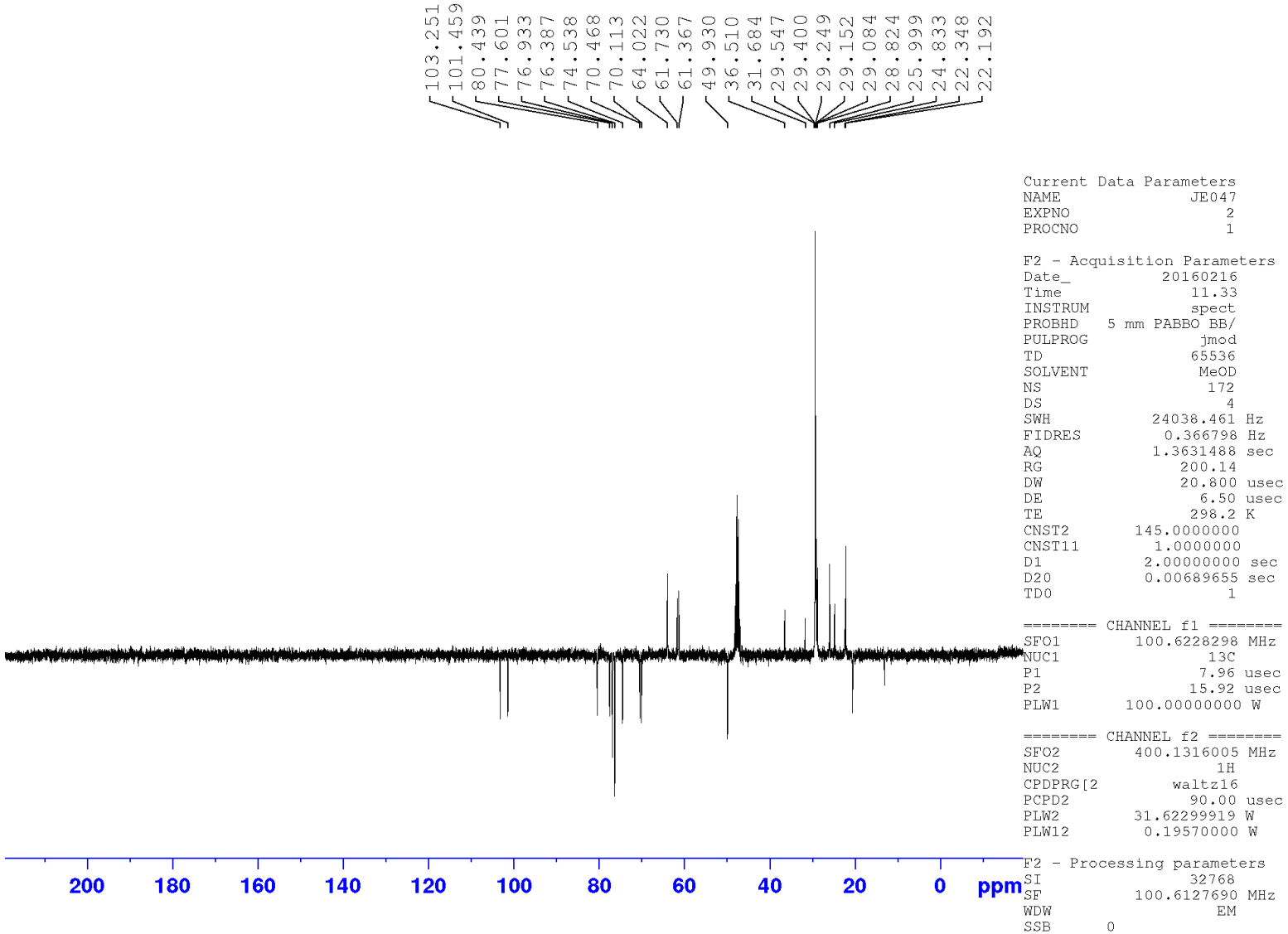
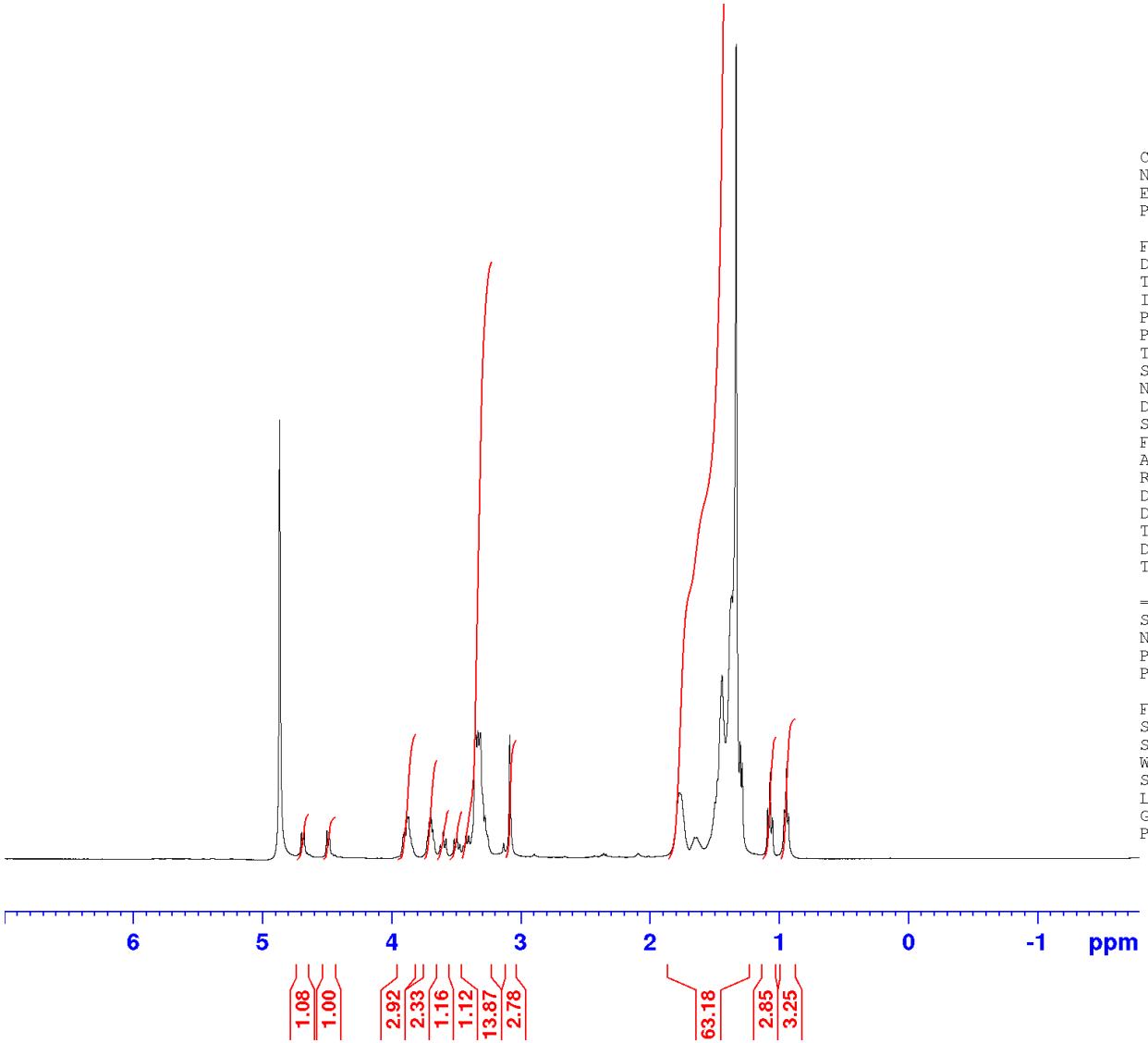


Figure S30. ^{13}C-NMR **12a**



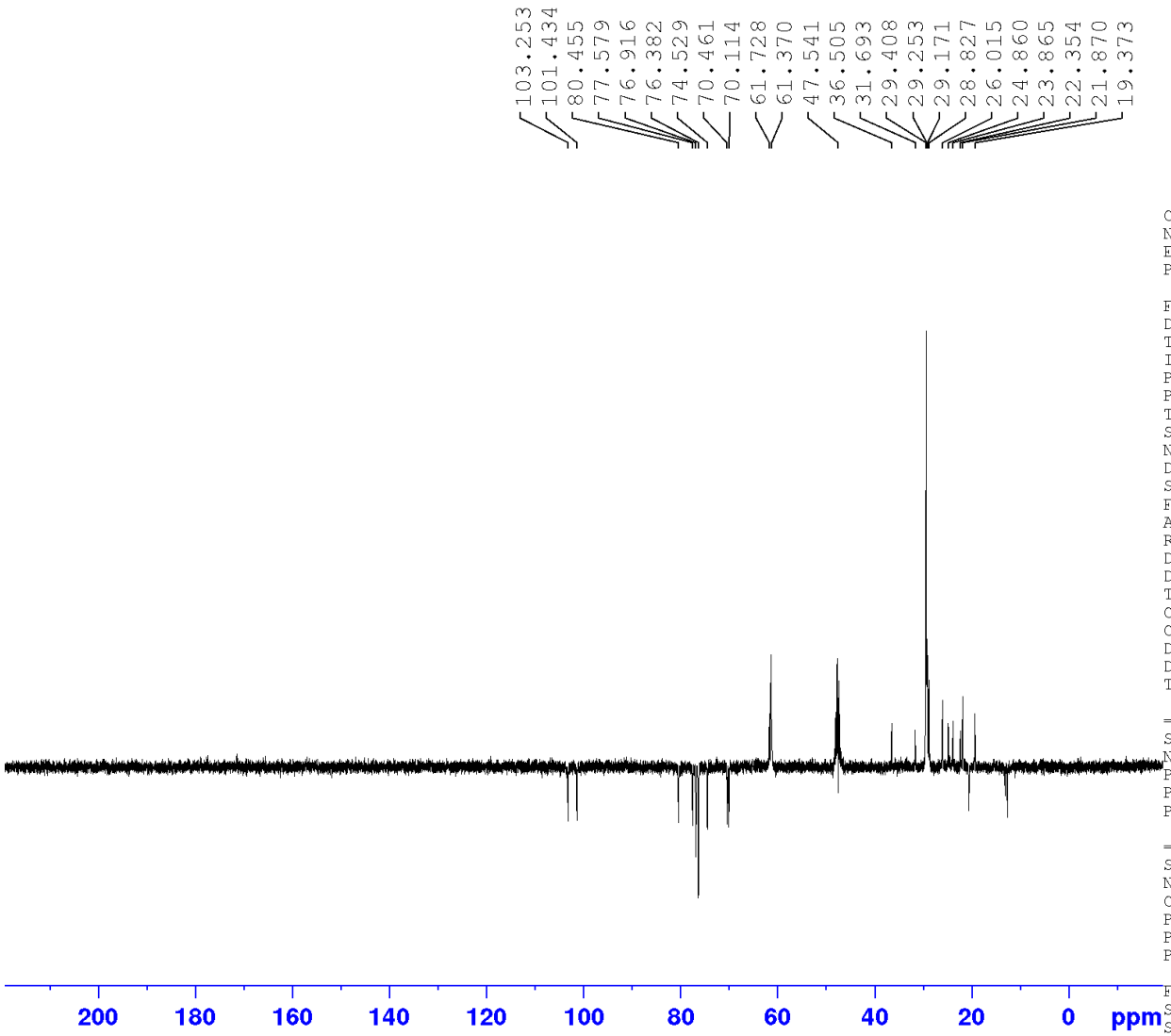

```
Current Data Parameters
NAME                  JE047
EXPNO                     9
PROCNO                    1

F2 - Acquisition Parameters
Date_              20160216
Time                  17.05
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                zg30
TD                    65536
SOLVENT                MeOD
NS                       32
DS                        2
SWH                6393.862 Hz
FIDRES            0.097563 Hz
AQ                5.1249151 sec
RG                    18.94
DW                   78.200 usec
DE                    6.50 usec
TE                   298.2 K
D1              1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1           400.1324710 MHz
NUC1                     1H
P1                    7.08 usec
PLW1           31.62299919 W

F2 - Processing parameters
SI                    262144
SF             400.1299896 MHz
WDW                      no
SSB          0
LB           0 Hz
GB           0
PC                    1.00
```

Figure S31. ^{1}H-NMR **12b**




```
Current Data Parameters
NAME                  JE047
EXPNO                     6
PROCNO                    1

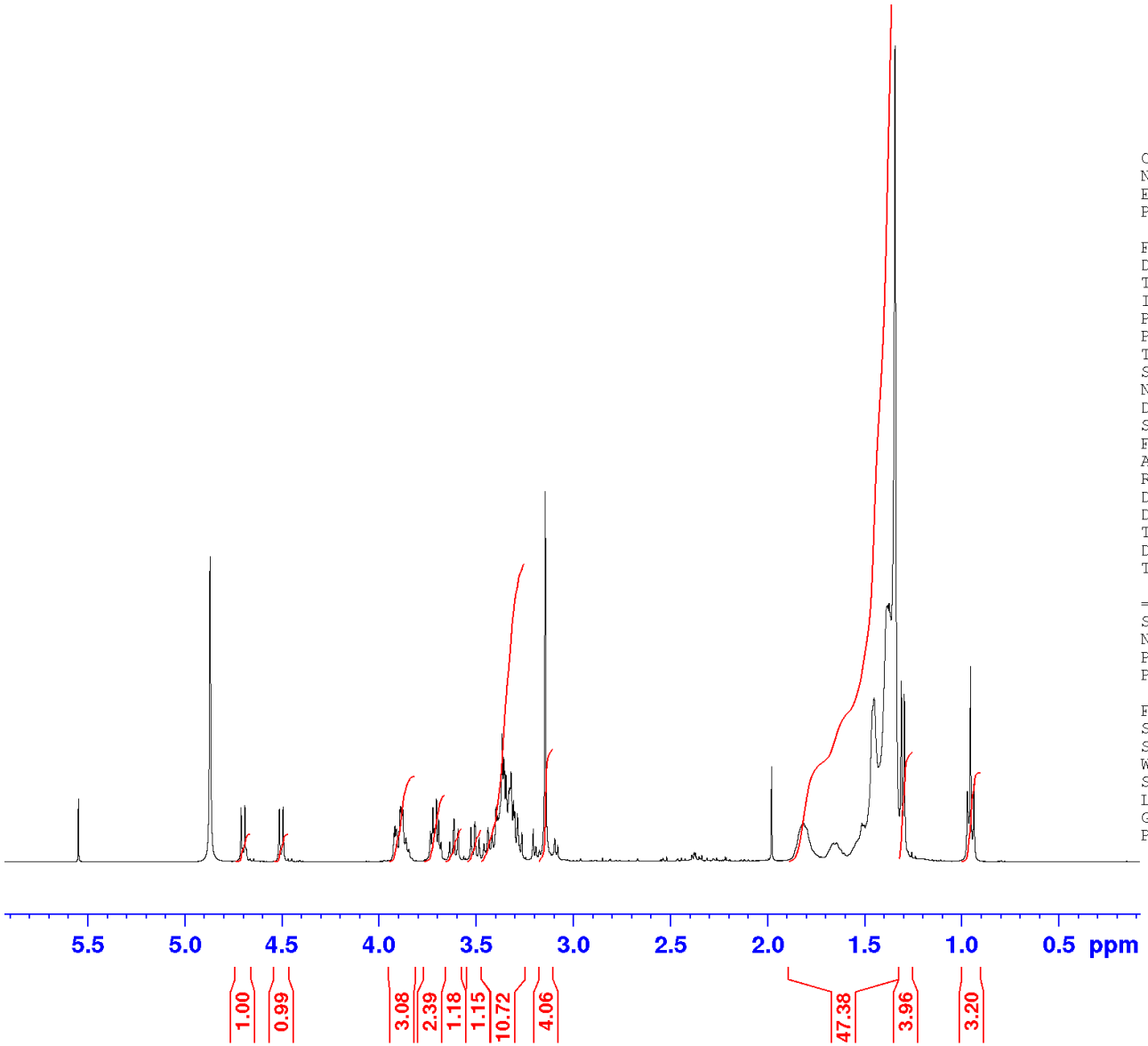
F2 - Acquisition Parameters
Date_              20160216
Time                  13.48
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG               jmod
TD                   65536
SOLVENT               MeOD
NS                     172
DS                       4
SWH             24038.461 Hz
FIDRES           0.366798 Hz
AQ               1.3631488 sec
RG                  200.14
DW                  20.800 usec
DE                   6.50 usec
TE                  298.2 K
CNST2          145.0000000
CNST11           1.0000000
D1               2.00000000 sec
D20              0.00689655 sec
TD0                      1

======== CHANNEL f1 ========
SFO1           100.6228298 MHz
NUC1                   13C
P1                    7.96 usec
P2                   15.92 usec
PLW1          100.00000000 W

======== CHANNEL f2 ========
SFO2           400.1316005 MHz
NUC2                   1H
CPDPRG[2           waltz16
PCPD2                90.00 usec
PLW2           31.62299919 W
PLW12           0.19570000 W

F2 - Processing parameters
SI                    32768
SF             100.6127690 MHz
WDW                     EM
SSB       0
LB                    1.00 Hz
GB        0
PC                    1.40
```

Figure S32. ^{13}C-NMR **12b**



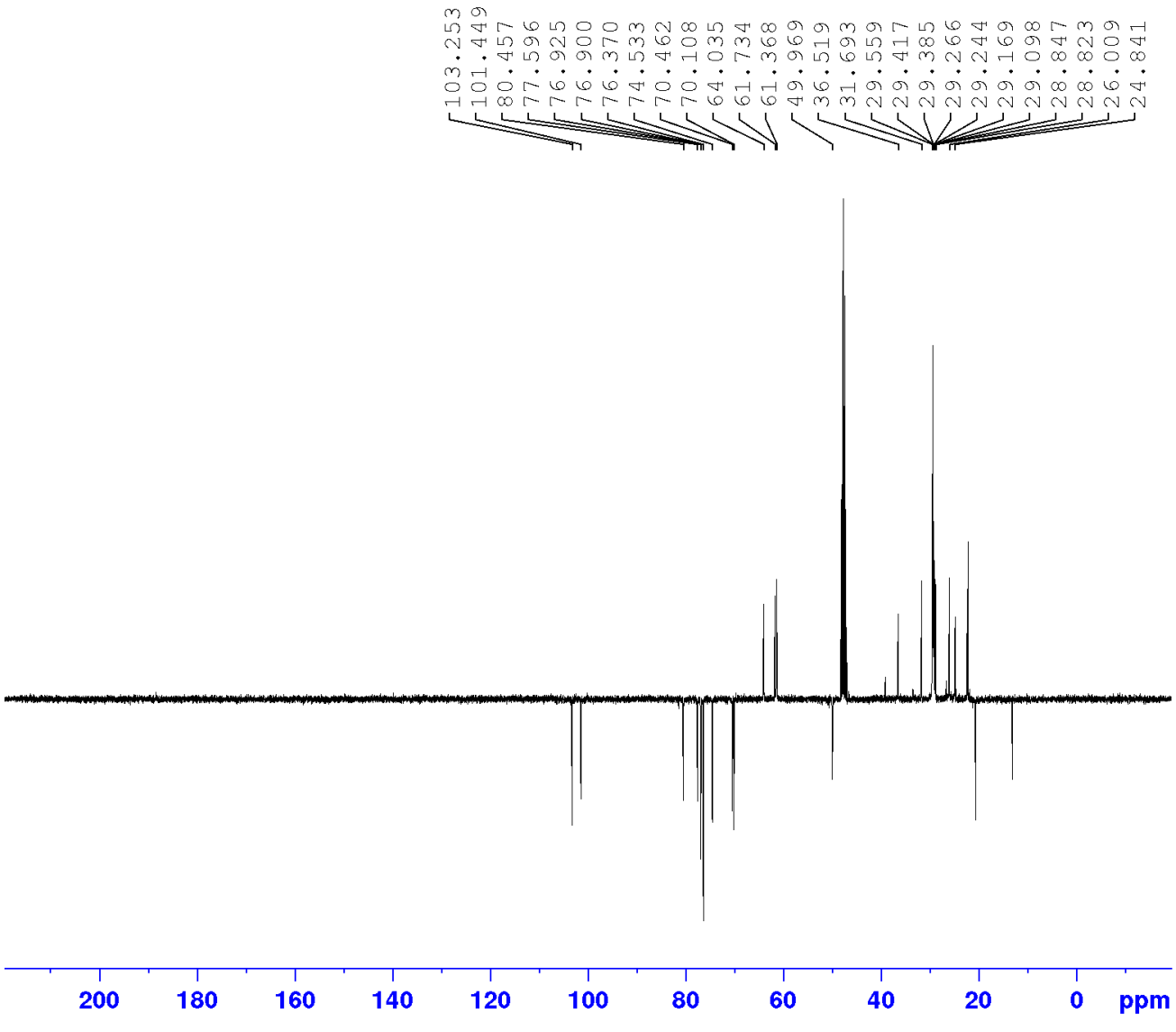

```
Current Data Parameters
NAME                 EDE724
EXPNO                     7
PROCNO                    1

F2 - Acquisition Parameters
Date_              20160714
Time                  10.28
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG               zg30
TD                   65536
SOLVENT               MeOD
NS                       8
DS                       2
SWH               6393.862 Hz
FIDRES             0.097563 Hz
AQ                5.1249151 sec
RG                   16.92
DW                  78.200 usec
DE                   6.50 usec
TE                  298.3 K
D1              1.00000000 sec
TD0                      1

======== CHANNEL f1 ========
SFO1           400.1324710 MHz
NUC1                    1H
P1                   7.10 usec
PLW1           31.62299919 W

F2 - Processing parameters
SI                  262144
SF             400.1299867 MHz
WDW                    no
SSB       0
LB        0 Hz
GB        0
PC                   1.00
```

Figure S33. ^{1}H-NMR **12c**




```
Current Data Parameters
NAME                 EDE724
EXPNO                     6
PROCNO                    1

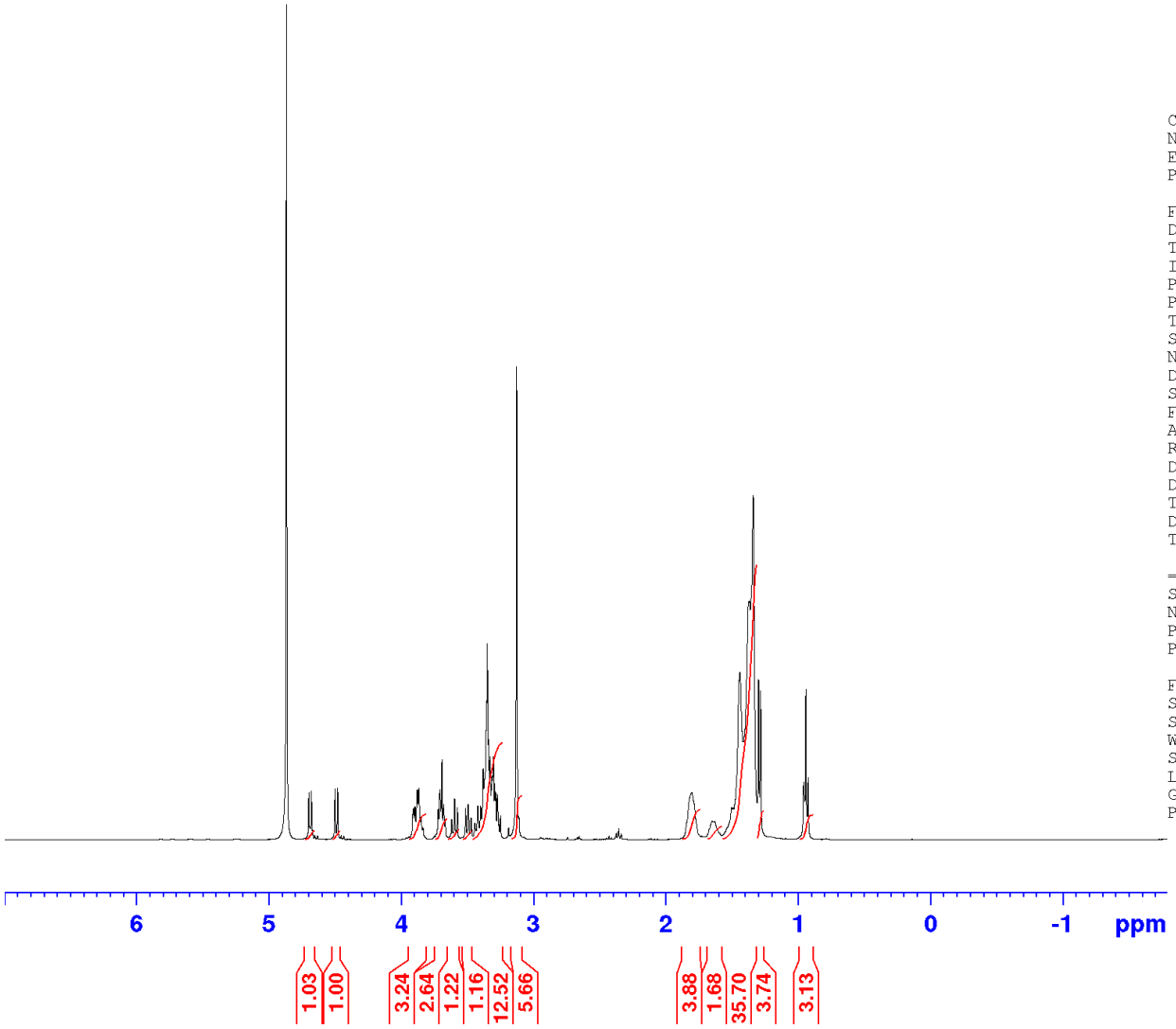
F2 - Acquisition Parameters
Date_              20160713
Time                  17.05
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                jmod
TD                    65536
SOLVENT                MeOD
NS                      256
DS                        4
SWH              24038.461 Hz
FIDRES            0.366798 Hz
AQ               1.3631488 sec
RG                   200.14
DW                   20.800 usec
DE                    6.50 usec
TE                   298.0 K
CNST2           145.0000000
CNST11            1.0000000
D1               2.00000000 sec
D20              0.00689655 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                    7.95 usec
P2                   15.90 usec
PLW1          100.00000000 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                    1H
CPDPRG[2             waltz16
PCPD2                 90.00 usec
PLW2            31.62299919 W
PLW12            0.19682001 W

F2 - Processing parameters
SI                      32768
SF              100.6127690 MHz
WDW                        EM
SSB          0
LB                    1.00 Hz
GB           0
PC                    1.40
```

Figure S34. ^{13}C-NMR **12c**




```
Current Data Parameters
NAME                  JE074
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_              20160427
Time                 13.51
INSTRUM              spect
PROBHD    5 mm PABBO BB/
PULPROG               zg30
TD                   65536
SOLVENT               MeOD
NS                        8
DS                        2
SWH               6393.862 Hz
FIDRES             0.097563 Hz
AQ                5.1249151 sec
RG                   30.95
DW                  78.200 usec
DE                   6.50 usec
TE                  298.3 K
D1              1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1           400.1324710 MHz
NUC1                     1H
P1                    7.08 usec
PLW1           31.62299919 W

F2 - Processing parameters
SI                   65536
SF             400.1299906 MHz
WDW                     EM
SSB       0
LB                    0.30 Hz
GB        0
PC                    1.00
```

Figure S35. ^{1}H-NMR **12d**

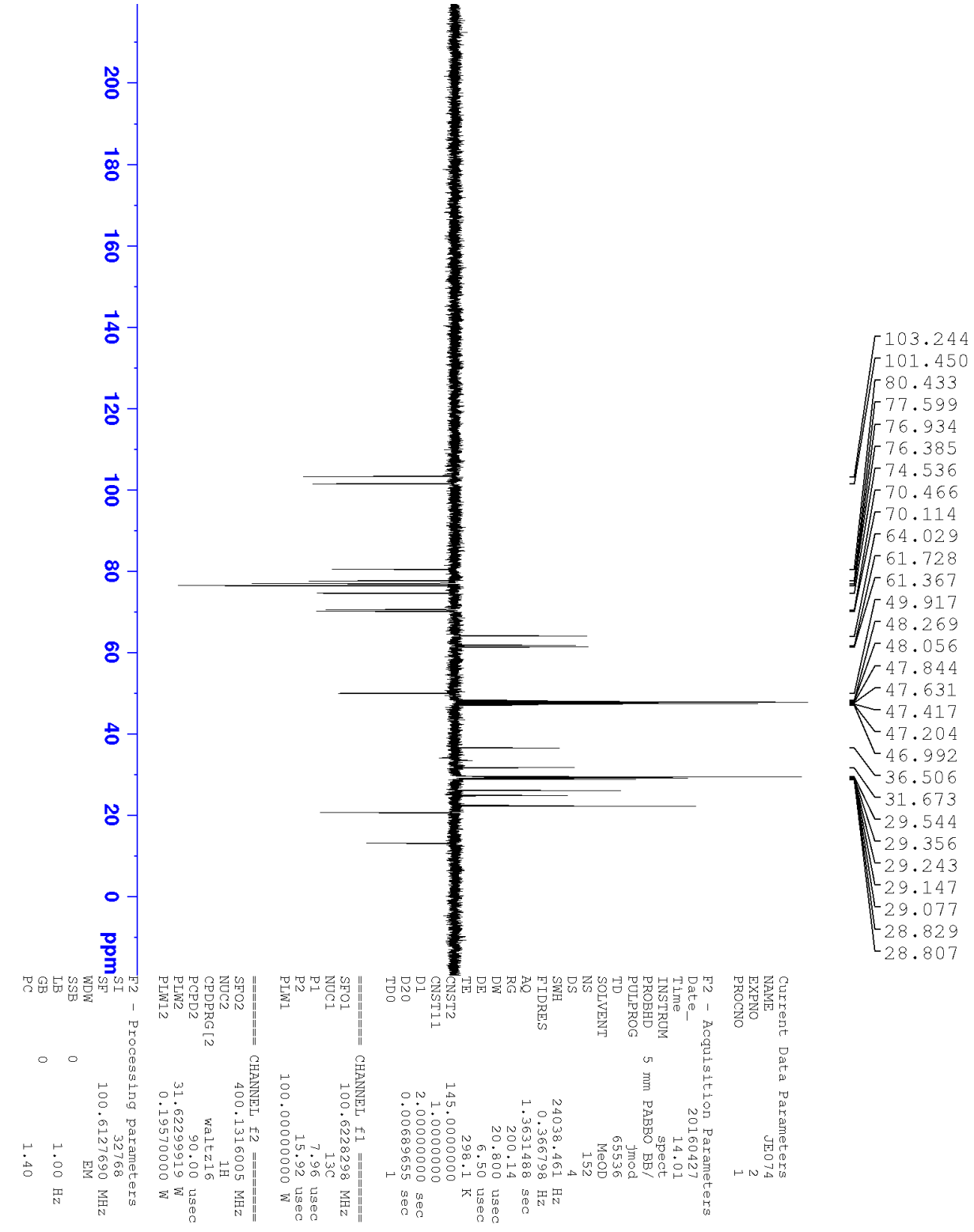


Figure S36. ^{13}C-NMR **12d**