

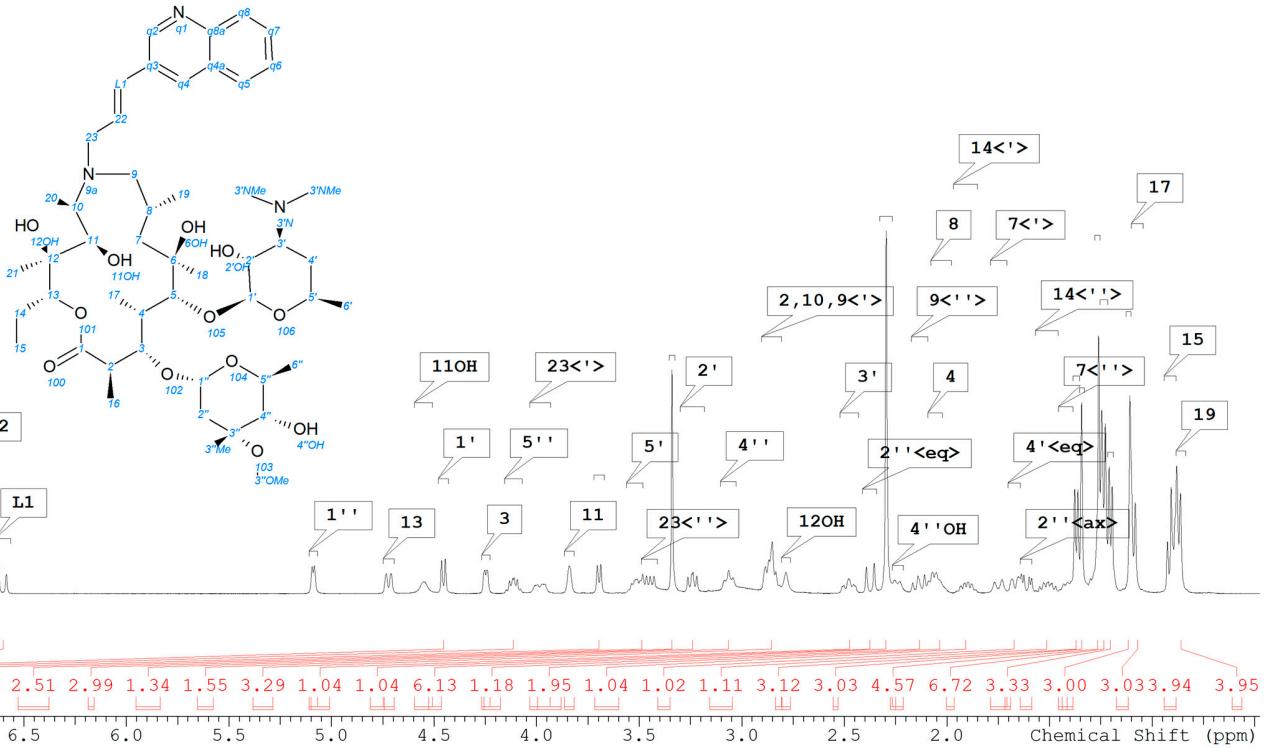
Supplementary Information

New Bicyclic Azalide Macrolides Obtained by Tandem Palladium Catalysed Allylic Alkylation/Conjugated Addition Reaction

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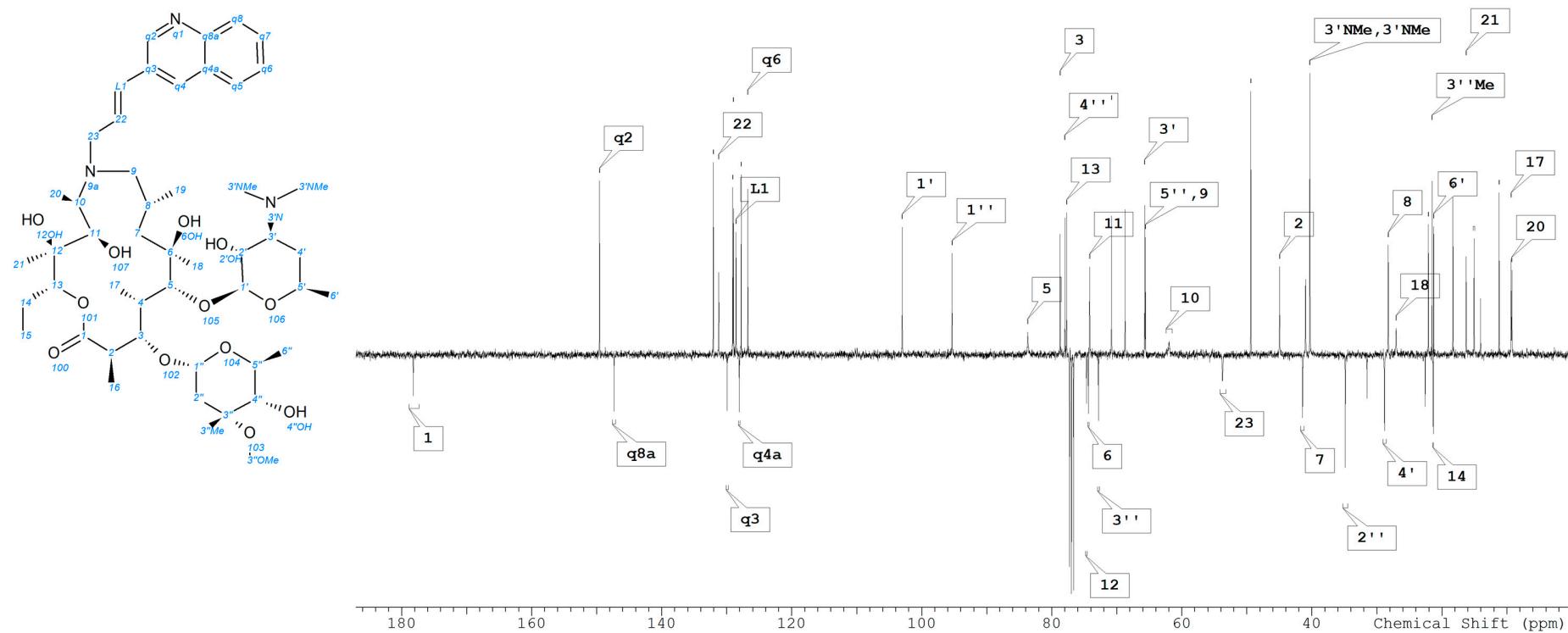
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Table S1. Comparison of $^3J_{\text{H,H}}$ coupling constants for azithromycin, 3 , 10a and 10b in CDCl_3 at 25 °C; *overlapped, the largest difference marked in red	20

Solvent	CHLOROFORM-d
Pulse Sequence	zg
Temperature (degree C)	25.000
Acquisition Time (sec)	8.6508
Number of Transients	16
Points Count	65536
Sweep Width (Hz)	7575.64
Spectrum Offset (Hz)	3196.8706
Original Points Count	65536
Nucleus	1H
Frequency (MHz)	400.1300



Shift1 (ppm)	H's	Type	J (Hz)	Atom1	Multiplet1	Shift1 (ppm)	H's	Type	J (Hz)	Atom1	Multiplet1	Shift1 (ppm)	H's	Type	J (Hz)	Atom1	Multiplet1
0.872	3.000	br d	7.1	19	M01	2.140	1.000	dd	11.0, 10.5	9<">	M38	4.456	1.000	d	7.2	1'	M22
0.908	3.000	t	7.4	15	M45	2.243	1.000	br d	10.2	4"OH	M10	4.553	1.000	m	-	11OH	M23
1.092	3.000	d	7.3	17	M02	2.297	6.000	s	-	3'NMe, 3"NM	M37	4.723	1.000	br dd	9.4, 1.6	13	M24
1.109	3.000	s	-	21	M44	2.375	1.000	d	15.0	2"<eq>	M36	5.090	1.000	br d	4.6	1"	M25
1.203	3.000	d	6.1	6'	M03	2.479	1.000	ddd	12.9, 9.8, 3.6	3'	M11	6.606	1.000	d	16.0	L1	M26
1.238	7.000	br d	6.9	4' <ax>, 20, 16</ax>	M42	2.786	1.000	br s	-	12OH	M12	6.718	1.000	ddd	16.0, 7.0, 6.0	22	M27
1.261	3.000	s	-	3"Me	M43	2.858	3.000	m	-	2, 10, 9<">	M35	7.516	1.000	t	7.2	q6	M28
1.344	3.000	s	-	18	M04	3.064	1.000	br t	8.6	4"	M13	7.654	1.000	t	7.6	q7	M29
1.370	3.000	d	6.1	6"	M40	3.242	1.000	br dd	9.8, 7.5	2'	M14	7.786	1.000	d	8.2	q5	M30
1.422	1.000	dd	15.7, 7.4	7<">	M41	3.341	3.000	s	-	3"OMe	M15	8.064	1.000	d	8.3	q8	M31
1.510	1.000	ddq	14.6, 9.3, 7.4	14<">	M05	3.457	1.000	br dd	14.4, 7.4	23<">	M16	8.126	1.000	s	-	q4	M32
1.613	1.000	dd	15.2, 4.8	2" <ax></ax>	M06	3.516	1.000	dq	10.4, 6.0	5'	M34	8.972	1.000	s	-	q2	M33
1.668	1.000	br ddd	12.9, 2.0	4' <eq></eq>	M39	3.697	1.000	d	6.7	5	M17						
1.750	1.000	br d	14.2	7<'>	M07	3.842	1.000	d	1.2	11	M18						
1.907	1.000	dqd	14.4, 7.7, 1.4	14<">	M08	3.985	1.000	br dd	13.8, 4.9	23<">	M19						
2.029	1.000	m	-	8	M46	4.115	1.000	dq	9.6, 6.0	5"	M20						
2.062	1.000	br q	7.4	4	M09	4.249	1.000	br dd	4.0, 1.6	3	M21						

Figure S1. ^1H spectrum, structure, numbering and assignment of **3** in CDCl_3 at 25 °C



Shift1 (ppm)	C's	Type	Atom1	Multiplet1	Shift1 (ppm)	C's	Type	Atom1	Multiplet1	Shift1 (ppm)	C's	Type	Atom1	Multiplet1	Shift1 (ppm)	C's	Type	Atom1	Multiplet1
9.258	1.000	s	20	M01	40.989	1.000	s		M14	78.014	1.000	s	4"	M23	149.586	1.000	s	q2	M36
9.389	1.000	s	17	M02	41.441	1.000	s	7	M45	78.744	1.000	s	3	M24	178.240	1.000	s	1	M37
11.212	1.000	s	15	M03	44.985	1.000	s	2	M15	83.716	1.000	br s	5	M26					
15.076	1.000	s	16	M04	49.403	1.000	s	3"OMe	M16	95.353	1.000	s	1"	M27					
16.286	1.000	s	21	M06	53.778	1.000	br s	23	M44	103.024	1.000	s	1'	M28					
18.328	1.000	s	6"	M07	61.959	1.000	br s	10	M43	126.778	1.000	s	q6	M29					
21.317	1.000	s	6'	M08	65.619	2.000	s	5", 9	M17	127.799	1.000	s	q5	M30					
21.347	1.000	s	14	M48	65.736	1.000	s	3'	M18	128.076	1.000	s	q4a	M40					
21.536	1.000	s	3'Me	M09	68.755	1.000	s	5'	M19	128.601	1.000	s	L1	M31					
22.105	1.000	s	19	M10	70.840	1.000	s	2'	M20	128.980	1.000	s	q7	M32					
27.048	1.000	s	18	M11	72.838	1.000	s	3"	M42	129.112	1.000	s	q8	M33					
28.273	1.000	s	8	M12	74.179	1.000	s	11	M21	129.957	1.000	s	q3	M39					
28.857	1.000	s	4'	M47	74.383	1.000	s	6	M41	131.255	1.000	s	22	M34					
34.894	1.000	s	2"	M46	74.675	1.000	s	12	M25	132.087	1.000	s	q4	M35					
40.333	2.000	s	3'NMe, 3'NMe	M13	77.752	1.000	s	13	M22	147.354	1.000	s	q8a	M38					

Figure S2. ^{13}C -DEPTq spectrum, structure, numbering and assignment of **3** in CDCl_3 at 25 °C

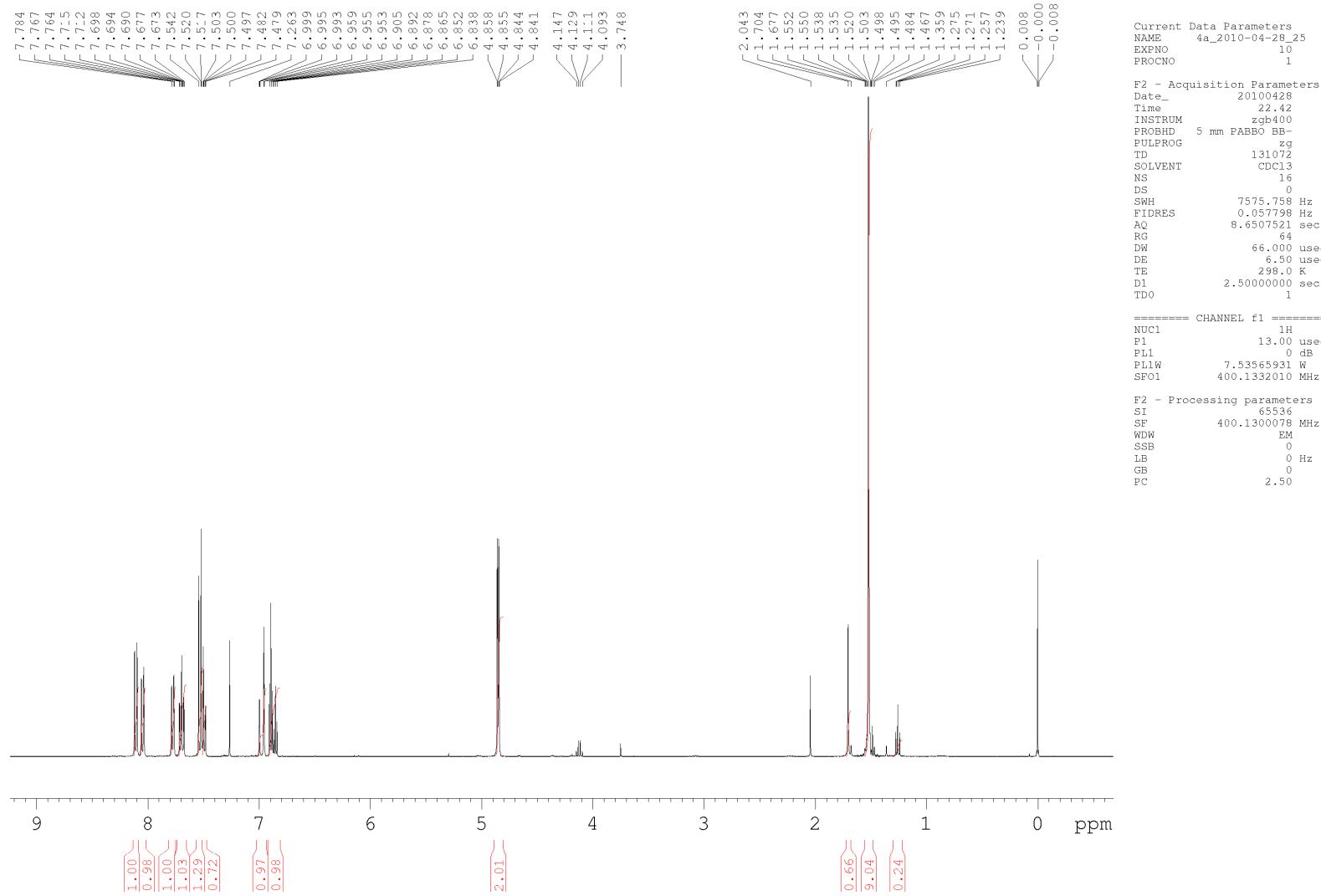


Figure S3. ¹H spectrum of **8a** in CDCl₃ at 25 °C

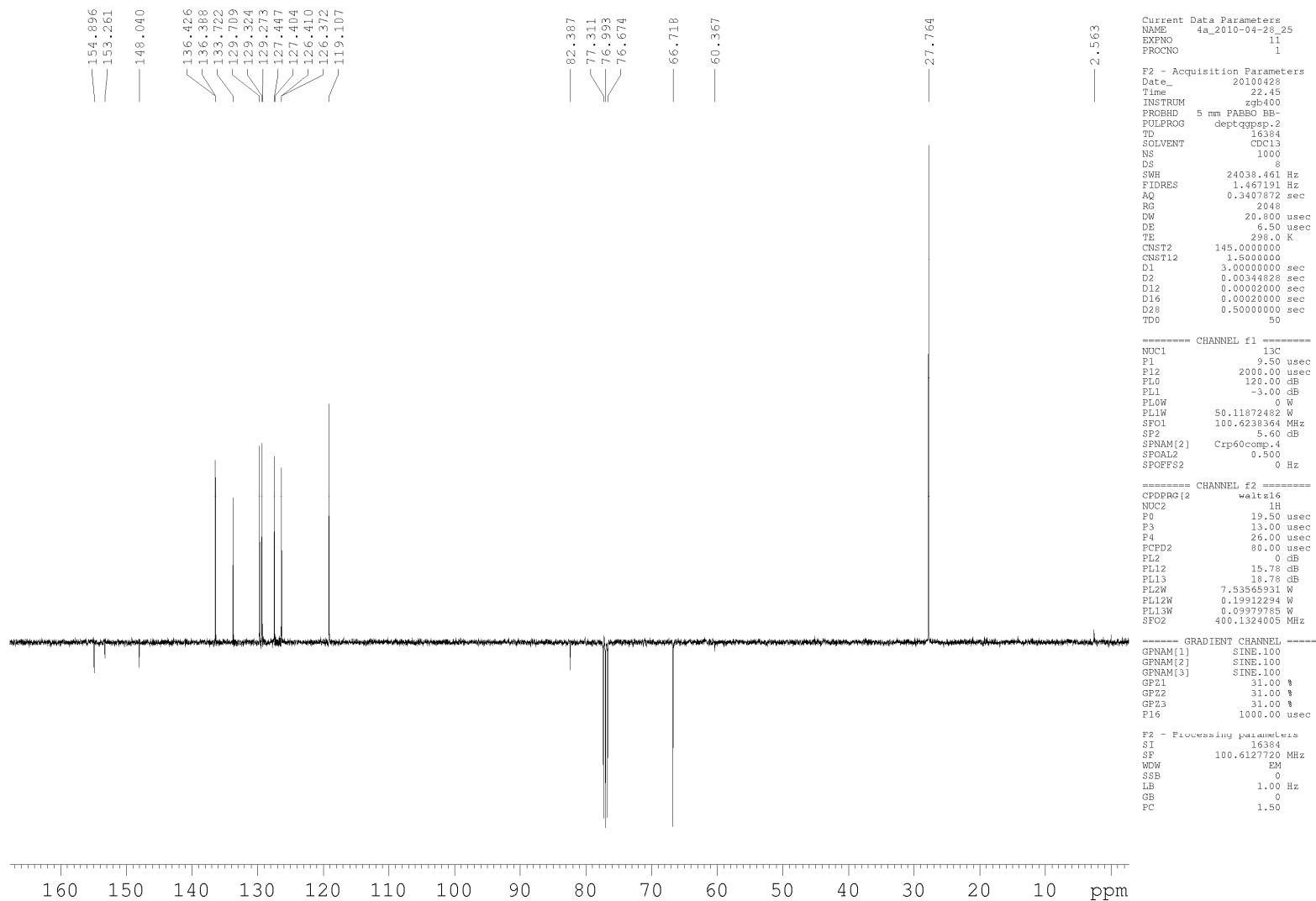
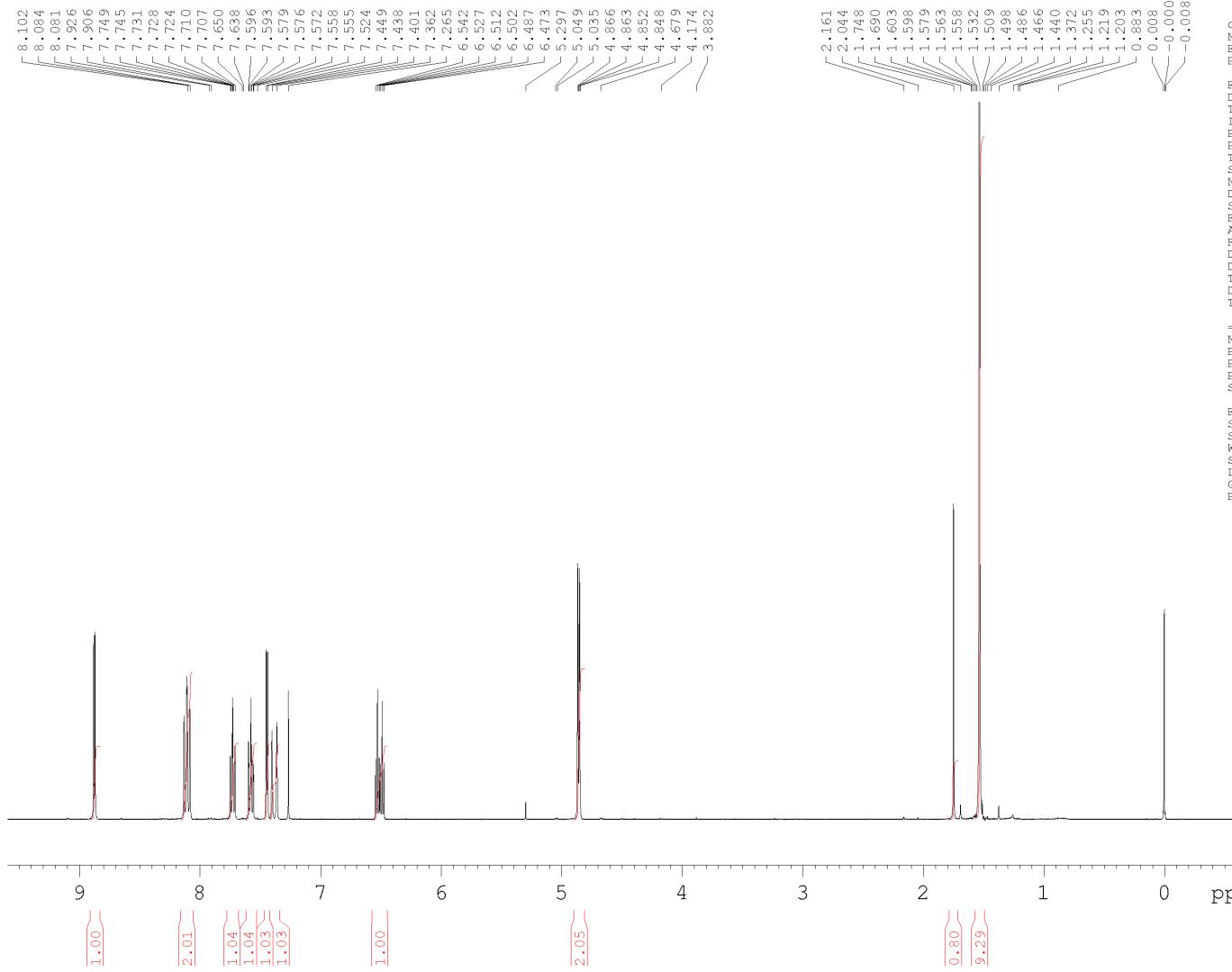


Figure S4. ¹³C--DEPTq spectrum of **8a** in CDCl₃ at 25 °C



Current Data Parameters
NAME 4b_2010-04-27_9
EXPNO 10
PROCNO 1

P2 - Acquisition Parameters
Date 20100427
Time 14.33
INSTRUM zg400
PROBHD 5 mm PABBO BB-
PULPROG zg
TD 131072
SOLVENT CDCl₃
NS 16
DS 0
SWH 7575.758 Hz
FIDRES 0.057798 Hz
AQ 8.6507521 sec
RG 64
DW 66.000 usec
DE 6.50 usec
TE 298.0 K
D1 2.5000000 sec
TDO 1

===== CHANNEL f1 =====
NUC1 1H
P1 13.00 usec
PL1 0 dB
PL1W 7.53565931 W
SF01 400.1332010 MHz

P2 - Processing parameters
SI 65536
SF 400.1300070 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 2.50

Figure S5. ¹H spectrum of **8b** in CDCl_3 at 25 °C

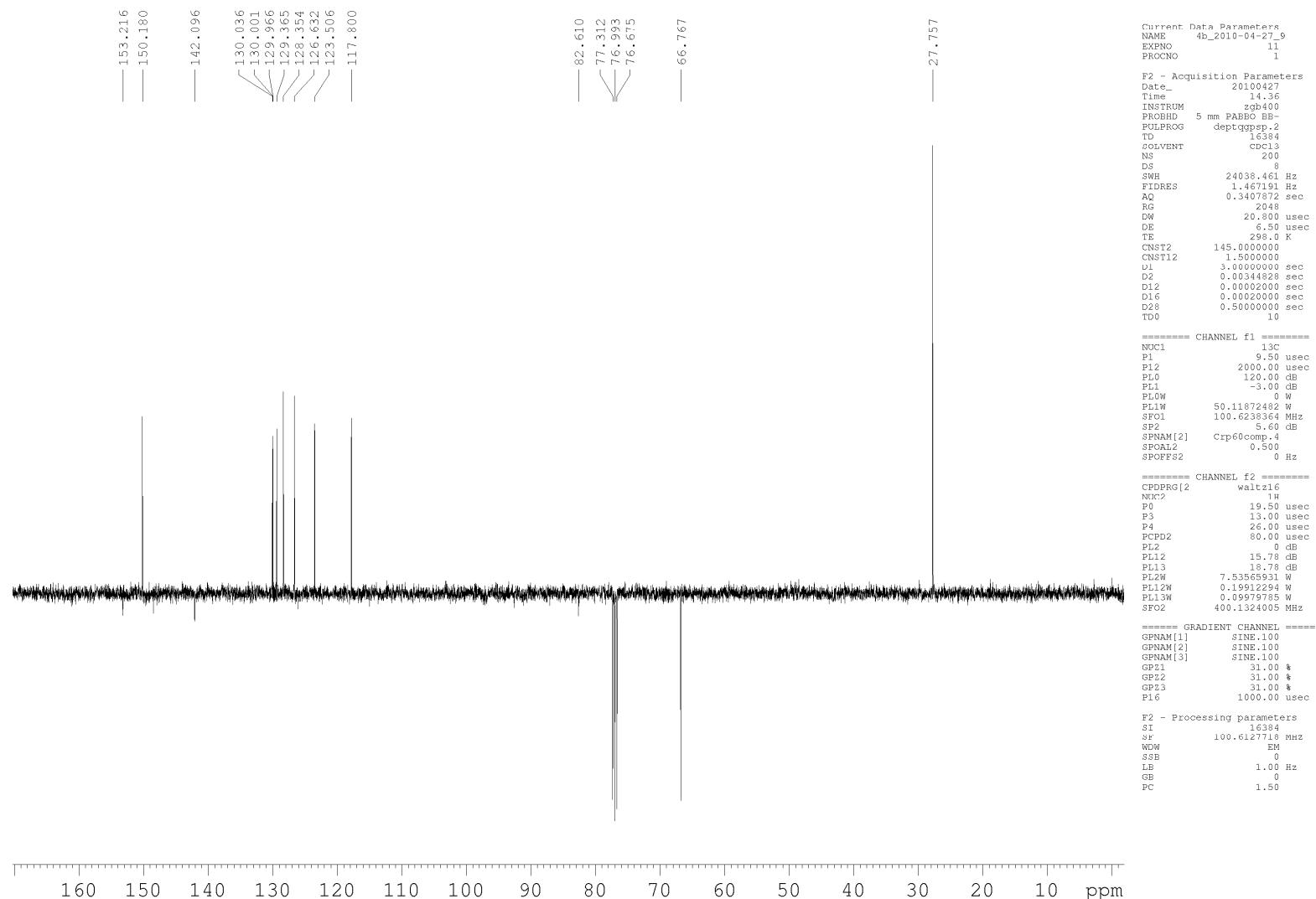
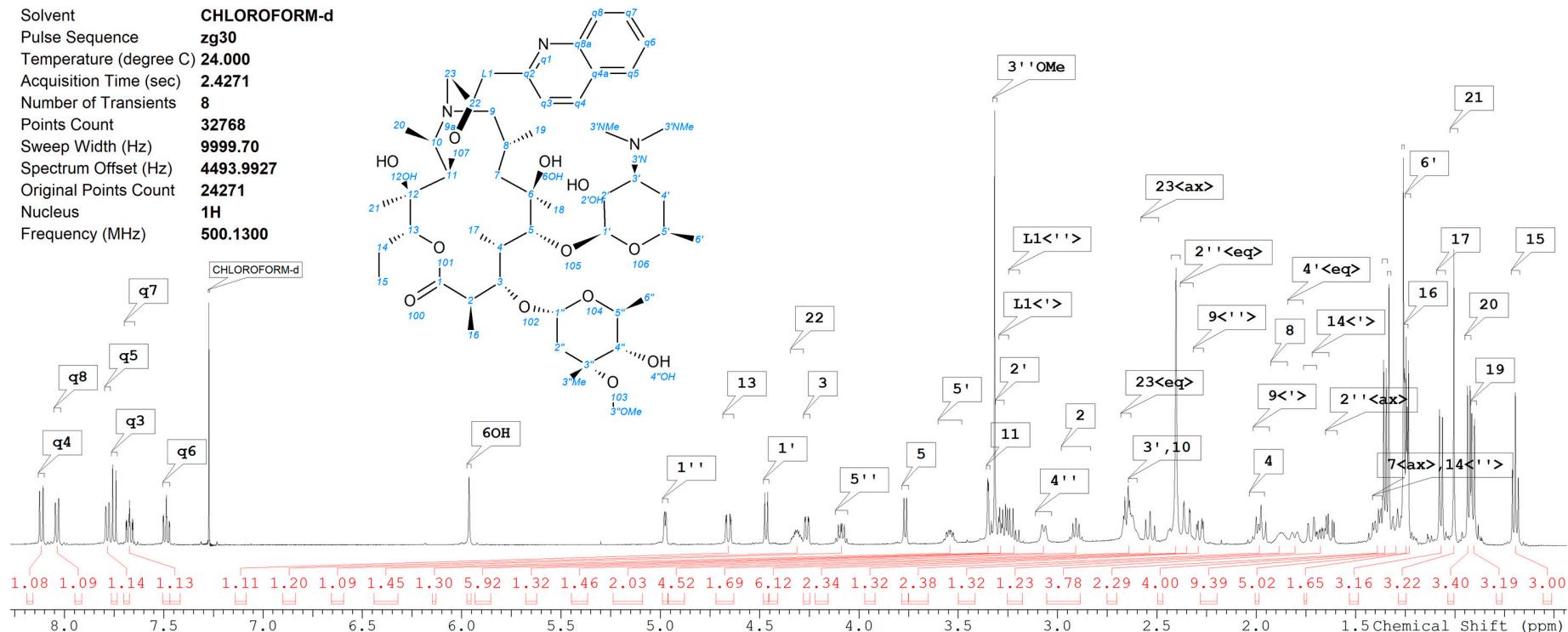


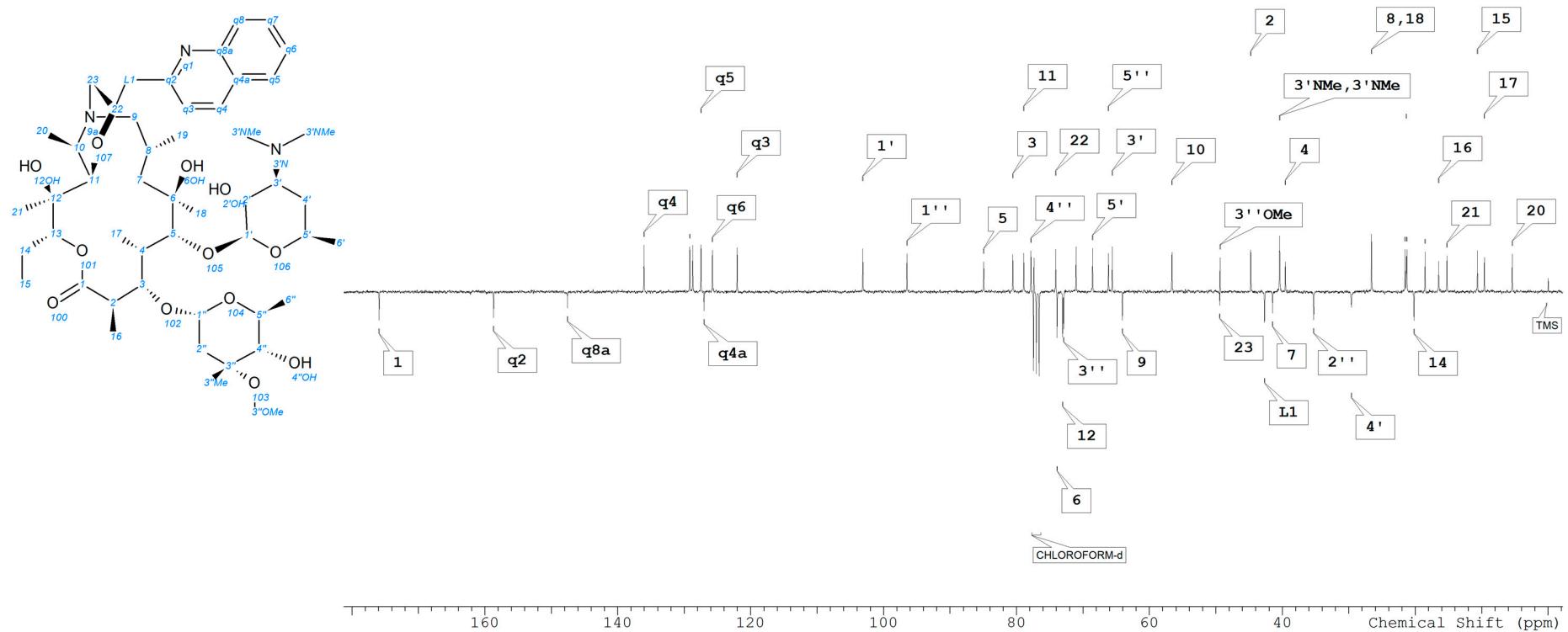
Figure S6. ^{13}C -DEPT q spectrum of **8b** in CDCl_3 at $25\text{ }^\circ\text{C}$

Solvent	CHLOROFORM-d
Pulse Sequence	zg30
Temperature (degree C)	24.000
Acquisition Time (sec)	2.4271
Number of Transients	8
Points Count	32768
Sweep Width (Hz)	9999.70
Spectrum Offset (Hz)	4493.9927
Original Points Count	24271
Nucleus	1H
Frequency (MHz)	500.1300



Shift1 (ppm)	H's	Type	J (Hz)	Atom1	Multiplet1	Shift1 (ppm)	H's	Type	J (Hz)	Atom1	Multiplet1	Shift1 (ppm)	H's	Type	J (Hz)	Atom1	Multiplet1
0.696	3.000	t	7.5	15	M01	1.872	1.000	m	-	8	M47	3.543	1.000	dqd	10.2, 6.4, 2.1	5'	M15
0.909	3.000	d	7.0	19	M02	1.977	1.000	br t	12.1	9<'>	M08	3.768	1.000	d	7.0	5	M16
0.930	3.000	d	6.4	20	M38	1.988	1.000	quind	7.5, 1.8	4	M48	4.089	1.000	dq	8.8, 6.2	5"	M17
1.006	3.000	s	-	21	M03	2.284	1.000	dd	12.5, 3.4	9<">	M09	4.264	1.000	dd	8.7, 1.8	3	M18
1.071	3.000	d	7.3	17	M04	2.350	1.000	br dd	14.6, 1.5	2"<eq>	M36	4.315	1.000	br dddd	10.7, 8.2, 4.9, 2.9	22	M29
1.240	3.000	br d	6.1	6'	M05	2.404	6.000	s	-	3'NMe, 3'NMe	M35	4.468	1.000	d	7.3	1'	M19
1.248	3.000	br d	7.3	16	M39	2.535	1.000	dd	11.6, 10.7	23<ax>	M10	4.659	1.000	dd	11.1, 2.0	13	M20
1.260	3.000	s	-	3'"Me	M40	2.624	2.000	m	-	3', 10	M11	4.976	1.000	dd	4.6, 1.4	1"	M21
1.301	1.000	td	11.3, 10.2	4'<ax>	M43	2.654	1.000	dd	11.6, 3.1	23<eq>	M34	5.964	1.000	s	-	6OH	M22
1.333	3.000	s	-	18	M06	2.909	1.000	dq	8.7, 7.2	2	M12	7.487	1.000	ddd	8.1, 7.0, 1.1	q6	M23
1.353	3.000	d	6.1	6"	M41	3.070	1.000	br d	8.5	4"	M13	7.673	1.000	ddd	8.4, 6.9, 1.5	q7	M24
1.389	2.000	m	-	7<ax>, 14<">	M42	3.219	1.000	dd	15.0, 8.2	L1<">	M14	7.750	1.000	d	8.5	q3	M25
1.628	1.000	dd	15.0, 4.9	2"<ax>	M07	3.273	1.000	dd	14.0, 4.9	L1<'>	M31	7.784	1.000	dd	8.2, 0.9	q5	M28
1.674	1.000	dqd	14.4, 7.5, 1.8	14<'>	M45	3.295	1.000	dd	10.4, 7.6	2'	M33	8.039	1.000	d	8.2	q8	M26
1.726	1.000	d	14.6	7<eq>	M37	3.317	3.000	s	-	3'"OMe	M32	8.117	1.000	d	8.5	q4	M27
1.807	1.000	ddd	12.5, 4.0, 2.1	4'<eq>	M44	3.351	1.000	d	1.8	11	M30						

Figure S7. ^1H spectrum, structure, numbering and assignment of **10a** in CDCl_3 at 25 °C



Shift1 (ppm)	C's	Type	Atom1	Multiplet1	Shift1 (ppm)	C's	Type	Atom1	Multiplet1
5.421	1.000	s	20	M02	41.490	1.000	s	7	M17
9.607	1.000	s	17	M03	42.687	1.000	s	L1	M18
10.662	1.000	s	15	M04	44.773	1.000	s	2	M19
15.253	1.000	s	21	M05	49.379	1.000	s	3''OMe	M20
16.498	1.000	s	16	M06	49.419	1.000	s	23	M21
18.551	1.000	s	6"	M07	56.634	1.000	s	10	M22
20.201	1.000	s	14	M08	64.080	1.000	s	9	M23
21.279	1.000	s	6'	M09	65.618	1.000	s	3'	M24
21.350	1.000	s	19	M10	66.189	1.000	s	5"	M25
21.548	1.000	s	3'Me	M11	68.583	1.000	s	5'	M26
26.591	2.000	s	8, 18	M12	71.065	1.000	s	2'	M27
29.636	1.000	s	4'	M13	72.920	1.000	s	3"	M28
35.313	1.000	s	2"	M14	73.079	1.000	s	12	M29
39.563	1.000	s	4	M15	73.904	1.000	s	6	M30
40.427	2.000	s	3'NMe, 3'NMe	M16	74.118	1.000	s	22	M31

Shift1 (ppm)	C's	Type	Atom1	Multiplet1	Shift1 (ppm)	C's	Type	Atom1	Multiplet1	Shift1 (ppm)	C's	Type	Atom1	Multiplet1
77.392	1.000	s	13	M48	77.844	1.000	s	4"	M32	158.728	1.000	s	q2	M46
78.923	1.000	s	11	M33	80.564	1.000	s	3	M34	175.934	1.000	s	1	M47

Solvent **CHLOROFORM-d**
Pulse Sequence **jmod**
Temperature (degree C) **26.160**
Acquisition Time (sec) **1.6712**
Number of Transients **2425**
Points Count **32768**
Sweep Width (Hz) **19607.25**
Spectrum Offset (Hz) **9027.3271**
Original Points Count **32768**
Nucleus **13C**
Frequency (MHz) **75.4678**

Figure S8. ^{13}C -DEPTq spectrum, structure, numbering and assignment of **10a** in CDCl_3 at 25°C

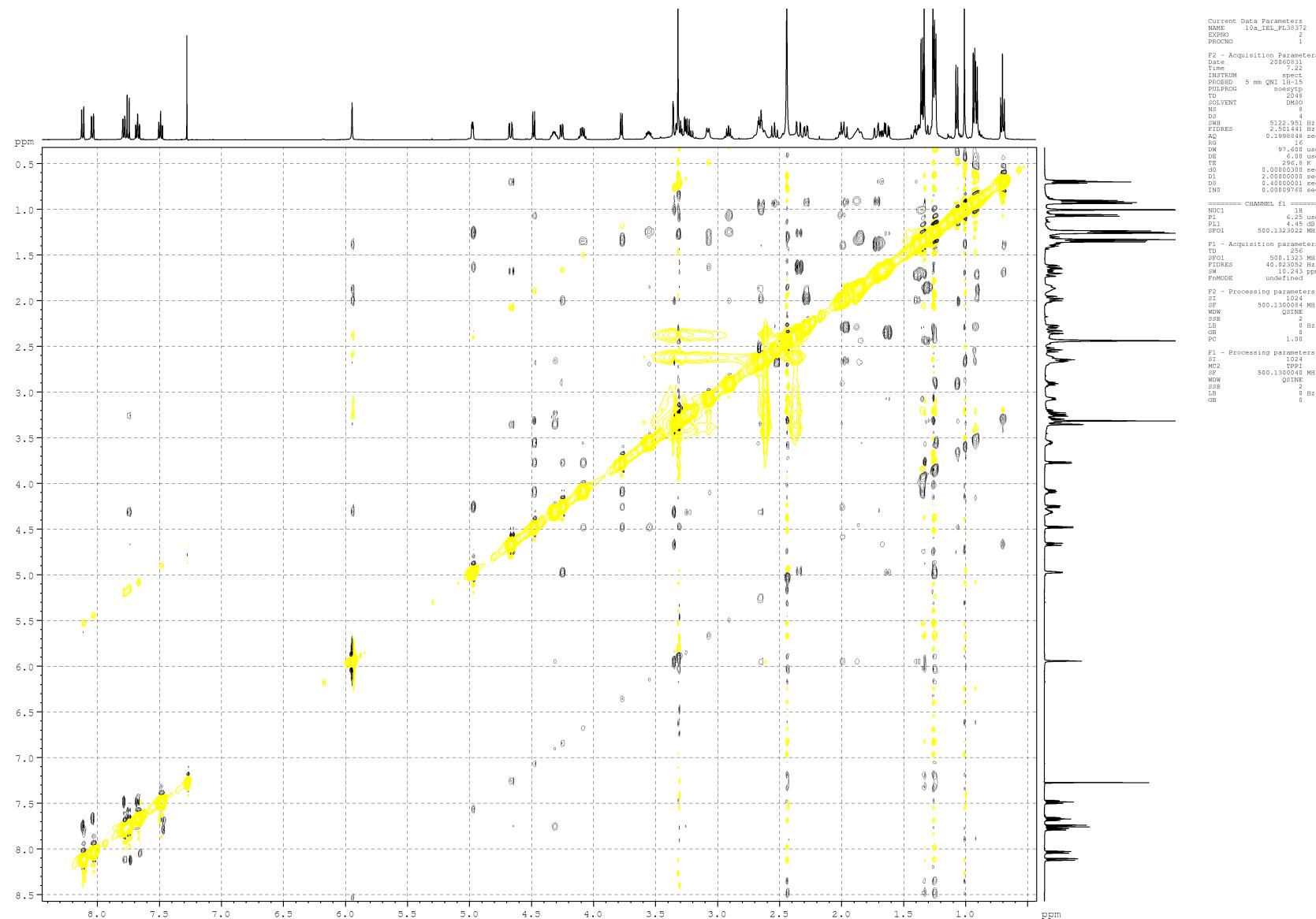
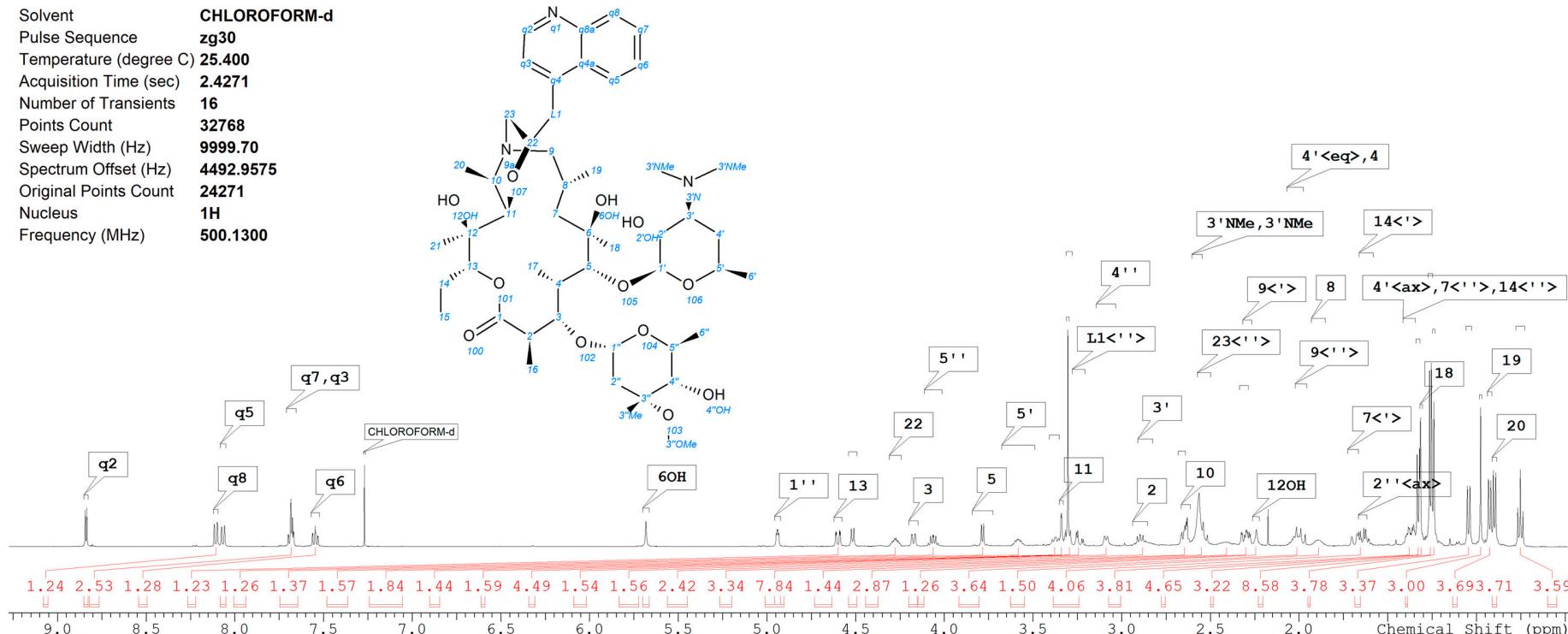


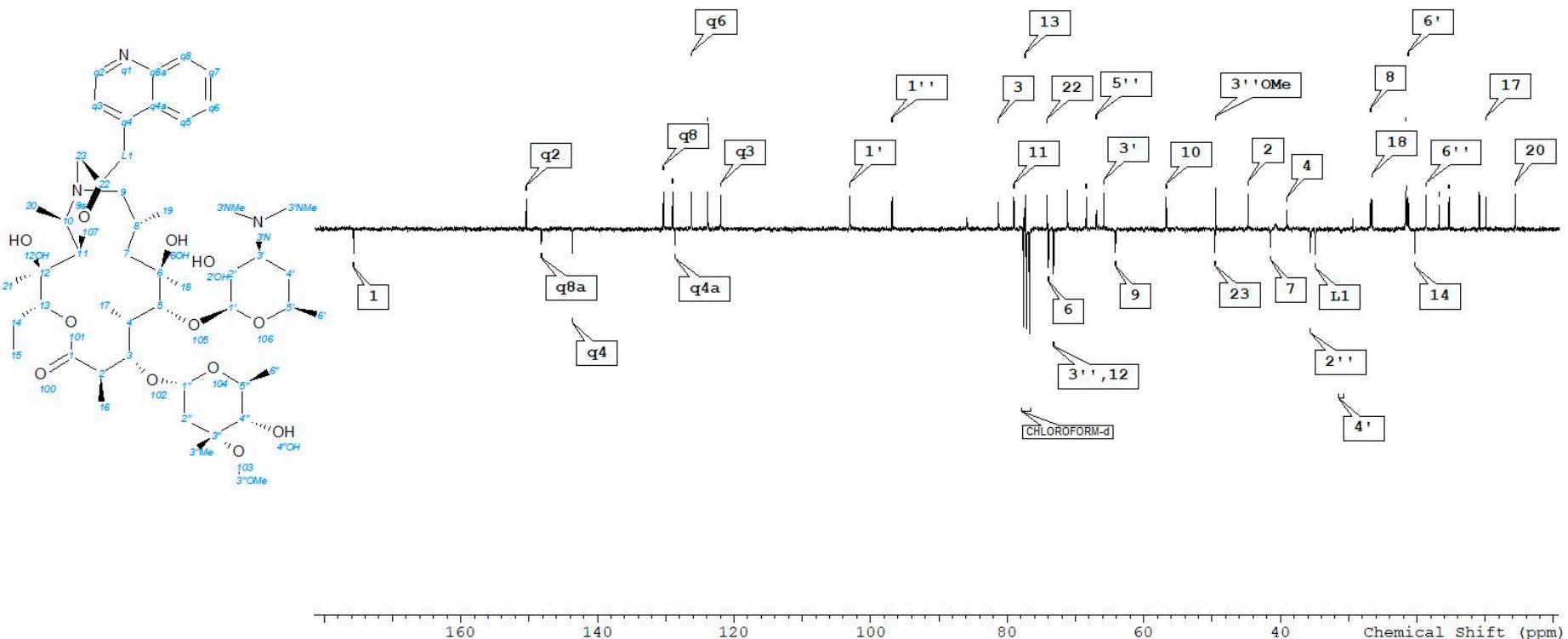
Figure S9. NOESY spectrum of **10a** in CDCl_3 at 25 °C

Solvent CHLOROFORM-d
 Pulse Sequence zg30
 Temperature (degree C) 25.400
 Acquisition Time (sec) 2.4271
 Number of Transients 16
 Points Count 32768
 Sweep Width (Hz) 9999.70
 Spectrum Offset (Hz) 4492.9575
 Original Points Count 24271
 Nucleus 1H
 Frequency (MHz) 500.1300



Shift1 (ppm)	H's	Type	J (Hz)	Atom1	Multiplet1	Shift1 (ppm)	H's	Type	J (Hz)	Atom1	Multiplet1	Shift1 (ppm)	H's	Type	J (Hz)	Atom1	Multiplet1
0.753	3.000	t	7.3	15	M01	2.242	1.000	br s	-	12OH	M13	3.585	1.000	dqd	10.2, 6.1, 2.0	5'	M20
0.899	3.000	br d	6.4	20	M02	2.292	1.000	br dd	12.4, 3.5	9<>	M42	3.786	1.000	d	6.1	5	M21
0.927	3.000	br d	7.0	19	M34	2.310	1.000	br dd	14.6, 2.4	2"<eq>	M12	4.064	1.000	dq	8.8, 6.4	5"	M22
0.978	3.000	s	-	21	M03	2.410	1.000	m	-		M14	4.175	1.000	dd	9.0, 1.7	3	M23
1.045	3.000	d	7.3	17	M04	2.542	1.000	t	11.6	23<>	M40	4.278	1.000	ddt	10.8, 7.2, 3.7	22	M24
1.241	3.000	s	-	3'Me	M06	2.565	6.000	br s	-	3'NMe, 3'NMe	M41	4.518	1.000	d	7.3	1'	M25
1.260	6.000	d	5.2	16, 6'	M47	2.644	1.000	br s	-	10	M16	4.601	1.000	dd	11.1, 2.0	13	M26
1.316	3.000	s	-	18	M08	2.656	1.000	dd	8.5, 3.1	23<>	M15	4.941	1.000	dd	4.3, 2.4	1"	M27
1.329	3.000	d	6.4	6"	M46	2.842	1.000	br s	-	3'	M17	5.683	1.000	s	-	6OH	M28
1.373	3.000	m	-	4'<ax>, 7<">, 14<">	M07	2.897	1.000	dq	9.2, 7.3	2	M39	7.548	1.000	ddd	8.2, 7.0, 1.2	q6	M29
1.630	1.000	dqd	14.4, 7.3, 1.8	14<">	M45	3.089	1.000	br d	7.9	4"	M18	7.682	2.000	m	-	q7, q3	M30
1.645	1.000	dd	14.8, 4.7	2"<ax>	M44	3.237	1.000	dd	15.6, 4.0	L1<">	M19	8.068	1.000	d	8.2	q5	M31
1.688	1.000	br dd	14.8, 1.1	7<">	M09	3.304	3.000	s	-	3'OMe	M38	8.109	1.000	d	7.6	q8	M32
1.891	1.000	m	-	8	M10	3.305	1.000	d	15.0	L1<">	M37	8.840	1.000	d	4.6	q2	M33
1.991	1.000	t	12.5	9<">	M11	3.341	1.000	d	1.8	11	M36						
2.026	2.000	m	-	4'<eq>, 4	M43	3.375	1.000	br dd	9.9, 7.5	2'	M35						

Figure S10. ^1H spectrum, structure, numbering and assignment of **10b** in CDCl_3 at 25 °C



Shift1 (ppm)	C's	Type	Atom1	Multiplet1	Shift1 (ppm)	C's	Type	Atom1	Multiplet1	Shift1 (ppm)	C's	Type	Atom1	Multiplet1	Shift1 (ppm)	C's	Type	Atom1	Multiplet1
5.576	1.000	s	20	M01	39.013	1.000	s	4	M16	74.106	1.000	s	22	M32	150.383	1.000	s	q2	M46
9.905	1.000	s	17	M02	40.722	2.000	s	3'NMe, 3'NMe	M18	77.333	1.000	s	13	M48	175.677	1.000	s	1	M47
10.873	1.000	s	15	M03	41.439	1.000	s	7	M19	79.030	1.000	s	11	M33					
15.289	1.000	s	21	M04	44.714	1.000	s	2	M20	81.258	1.000	s	3	M34					
16.764	1.000	s	16	M05	49.439	1.000	s	3''OMe	M21	85.873	1.000	s		M35					
18.651	1.000	s	6"	M06	49.574	1.000	s	23	M22	96.823	1.000	s	1"	M36					
20.300	1.000	s	14	M07	56.694	1.000	s	10	M23	103.023	1.000	s	1'	M37					
21.252	1.000	s	6'	M08	64.132	1.000	s	9	M24	121.974	1.000	s	q3	M38					
21.482	1.000	s	19	M09	65.836	1.000	s	3'	M25	123.837	1.000	s	q5	M39					
21.648	1.000	s	3''Me	M10	66.899	1.000	s	5"	M26	126.240	1.000	s	q6	M40					
26.572	1.000	s	18	M11	68.413	1.000	s	5'	M27	128.642	1.000	s	q4a	M41					
26.762	1.000	s	8	M12	71.173	1.000	s	2'	M28	128.959	1.000	s	q7	M42					
31.145	1.000	m	4'	M13	73.209	1.000	s		M29	130.299	1.000	s	q8	M43					
34.890	1.000	s	L1	M14	73.209	2.000	s	3", 12	M30	143.668	1.000	s	q4	M44					
35.579	1.000	s	2"	M15	73.924	1.000	s	6	M31	148.179	1.000	s	q8a	M45					

Solvent **CHLOROFORM-d**
Pulse Sequence **jmod**
Temperature (degree C) **25.160**
Acquisition Time (sec) **1.6712**
Number of Transients **2068**
Points Count **32768**
Sweep Width (Hz) **19607.25**
Spectrum Offset (Hz) **9037.8359**
Original Points Count **32768**
Nucleus **13C**
Frequency (MHz) **75.4677**

Figure S11. ^{13}C -DEPTq spectrum, structure, numbering and assignment of **10b** in CDCl_3 at 25 °C

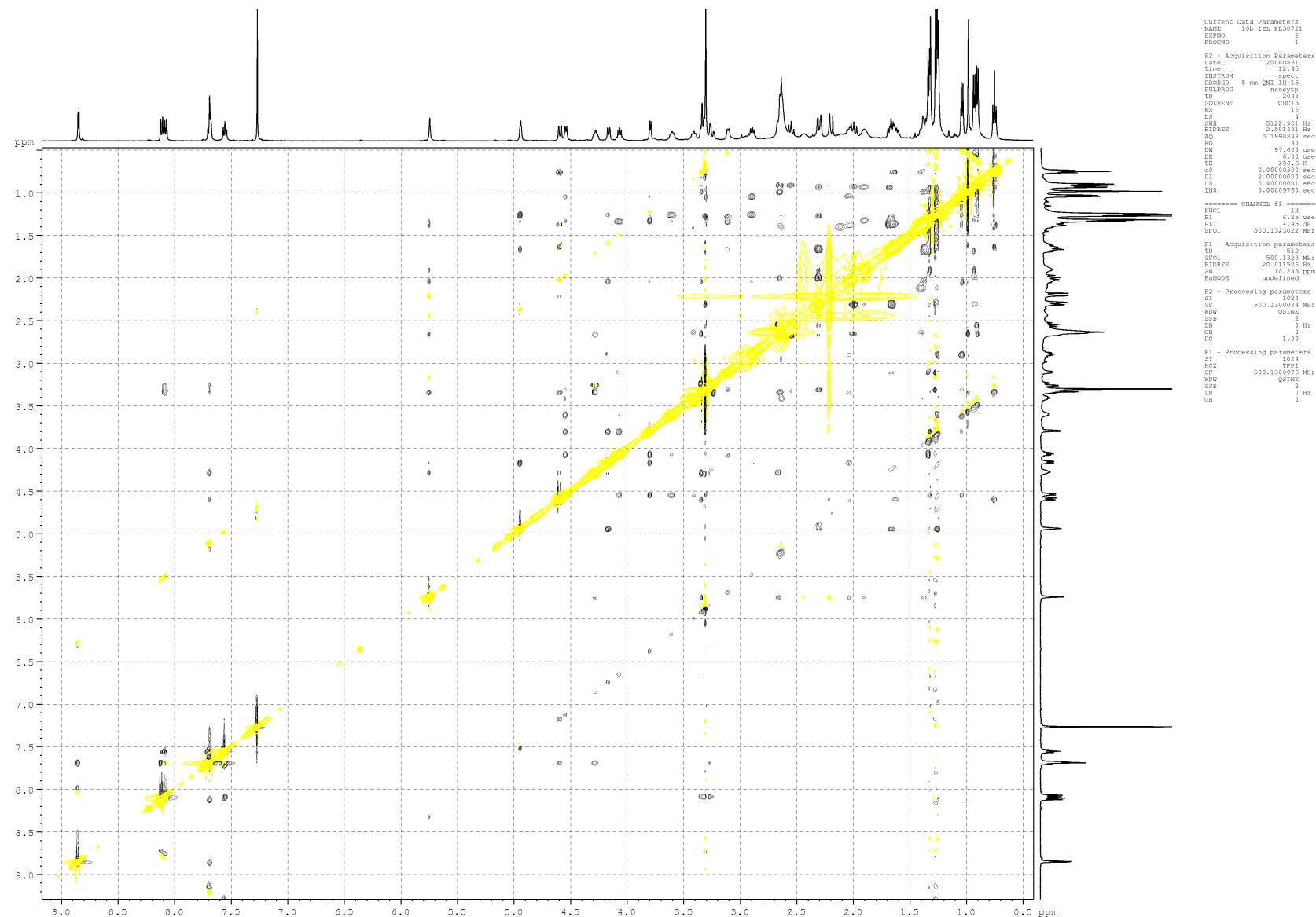


Figure S12. NOESY spectrum of **10b** in CDCl_3 at 25 °C

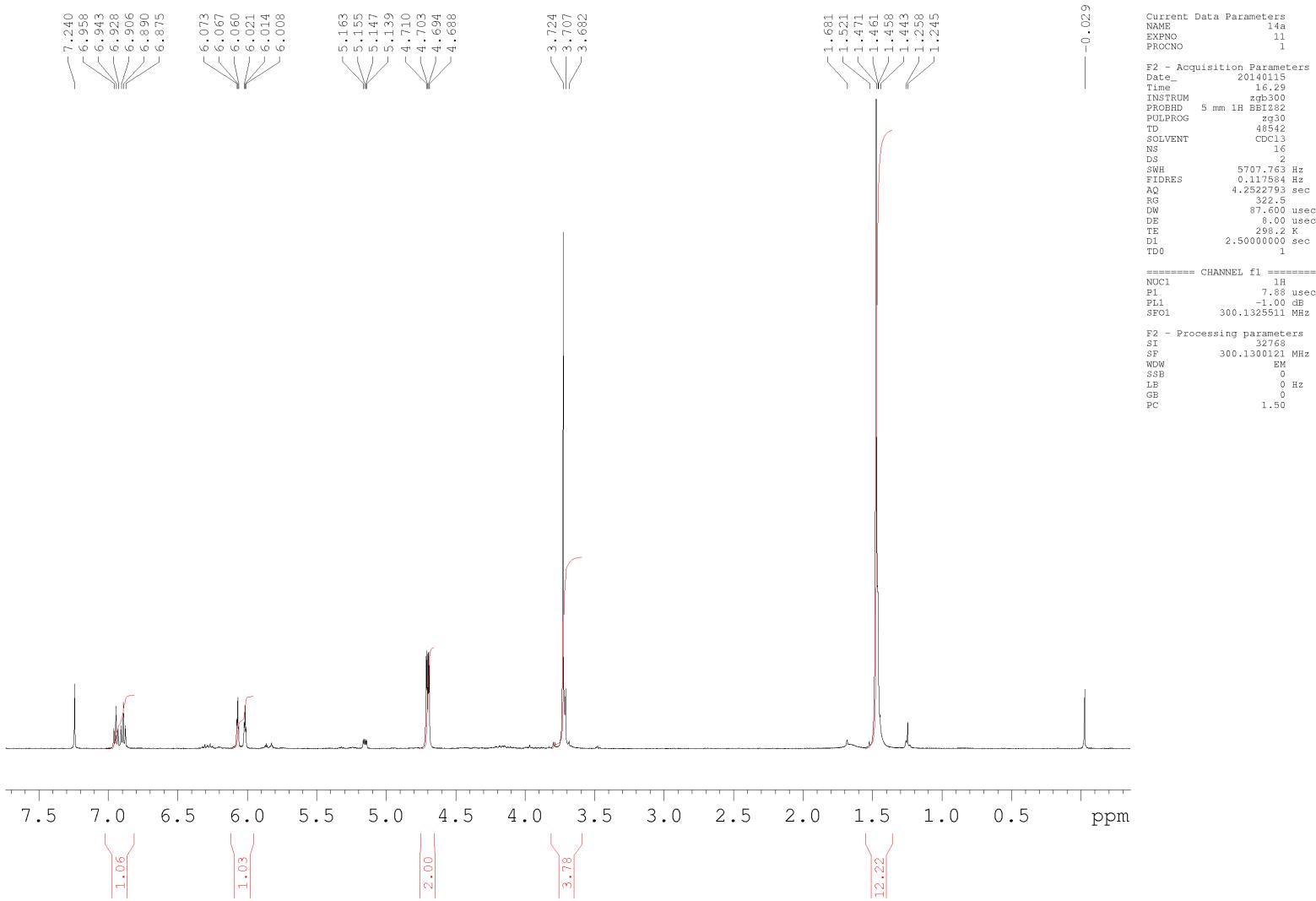


Figure S13. ^1H spectrum of **14a** in CDCl_3 at 25 °C

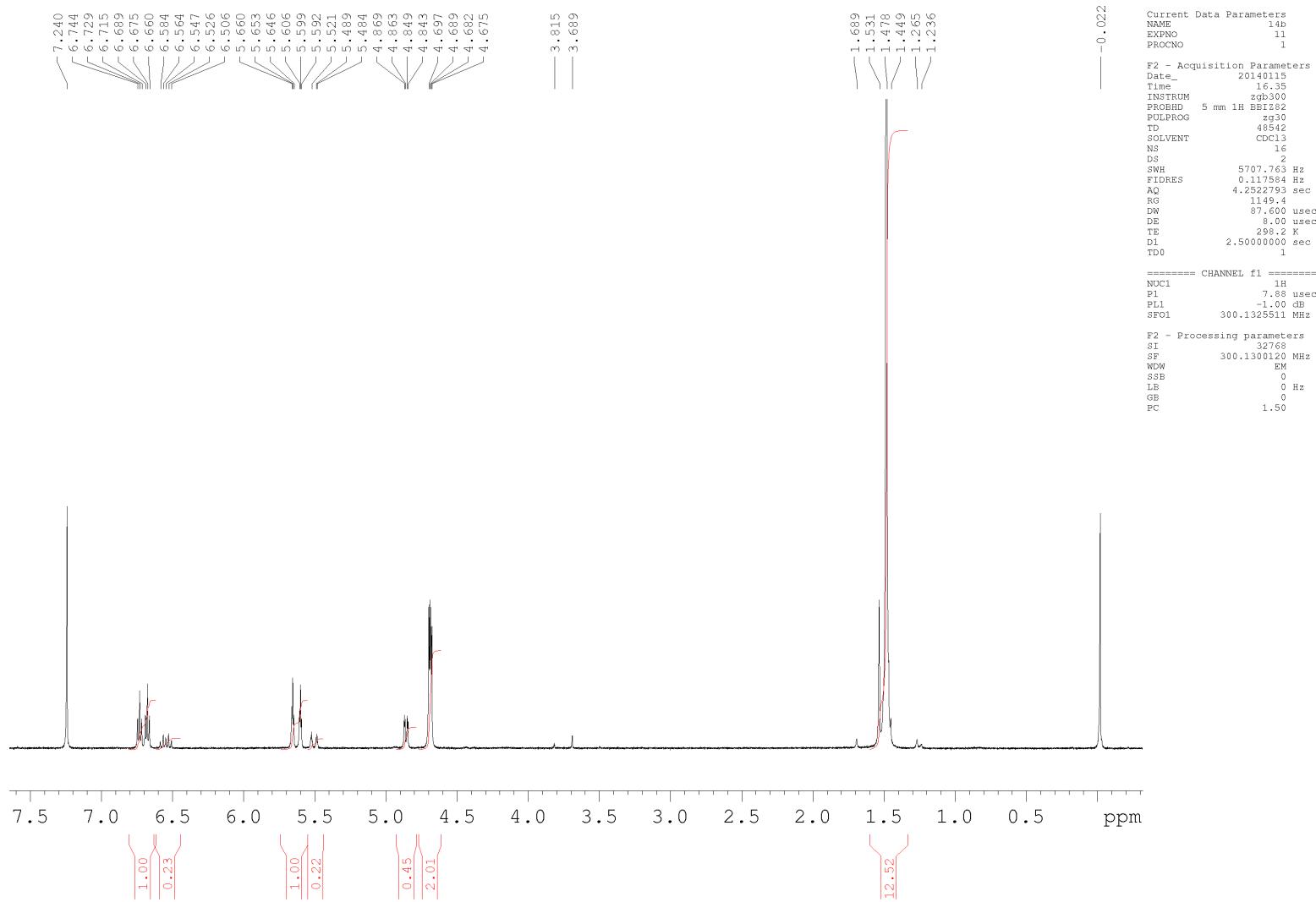


Figure S14. ¹H spectrum of **14b** in CDCl₃ at 25 °C

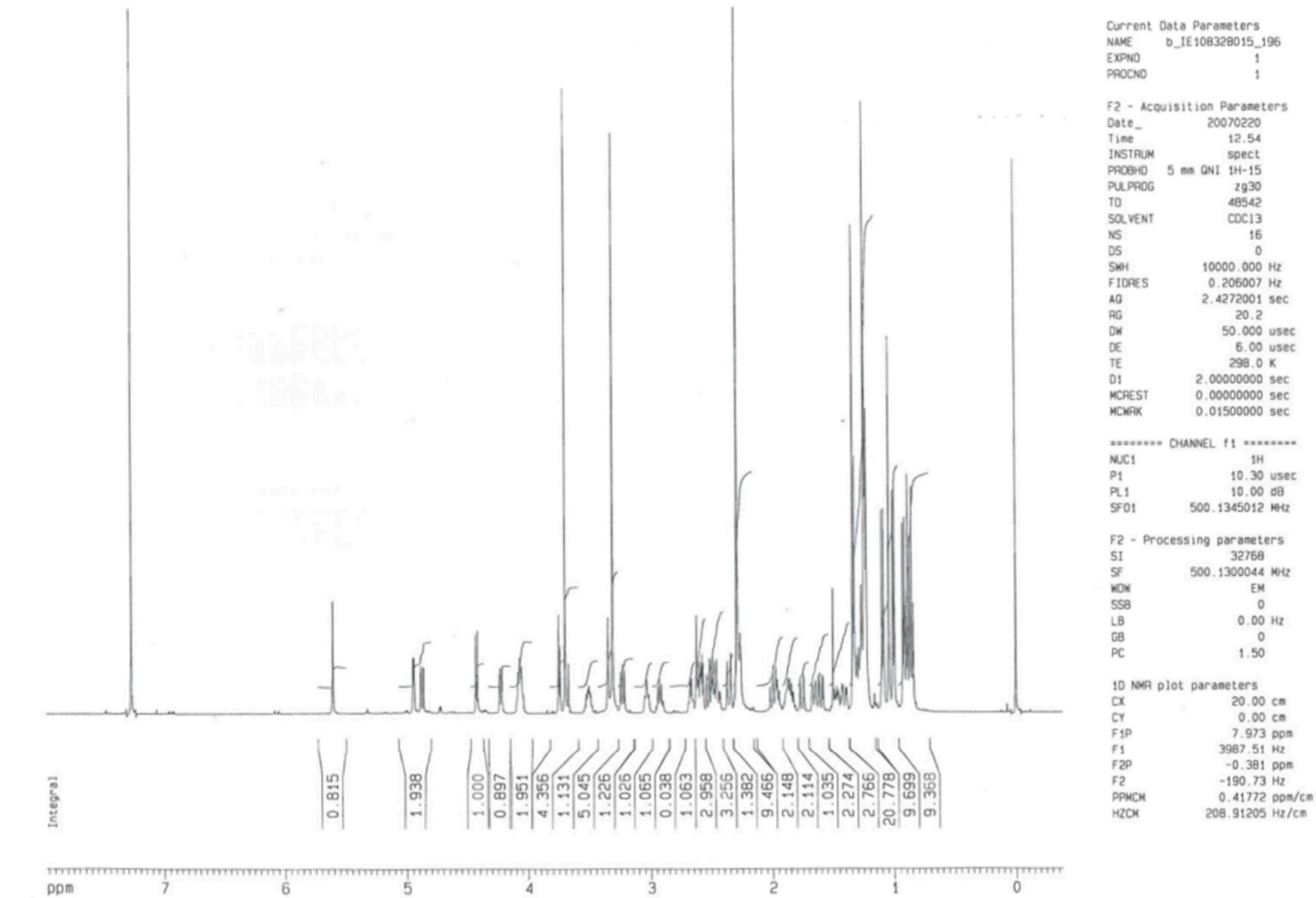


Figure S15. ¹H spectrum of **15a** in CDCl₃ at 25 °C

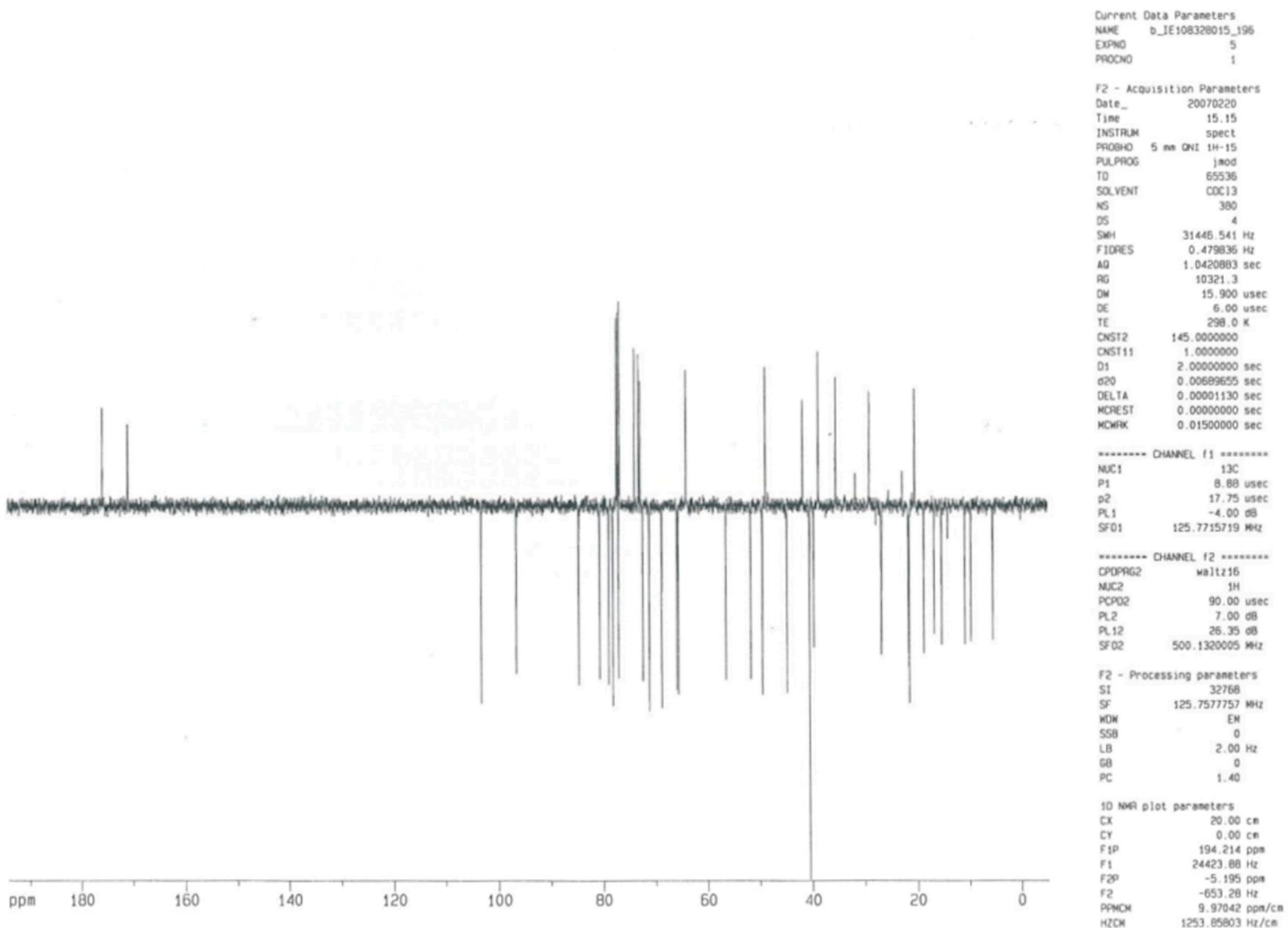


Figure S16. ^{13}C -APT spectrum of **15a** in CDCl_3 at 25 °C

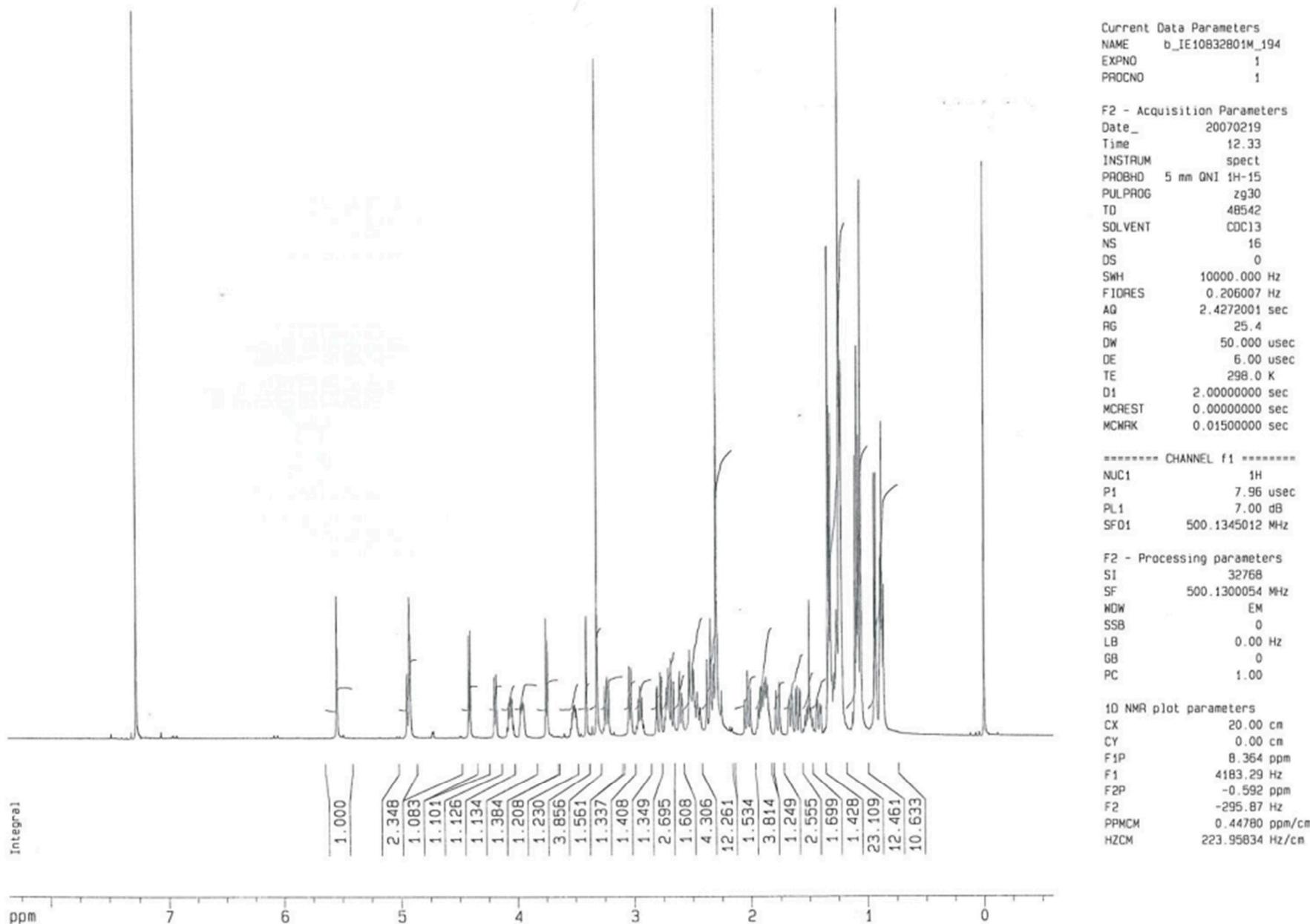
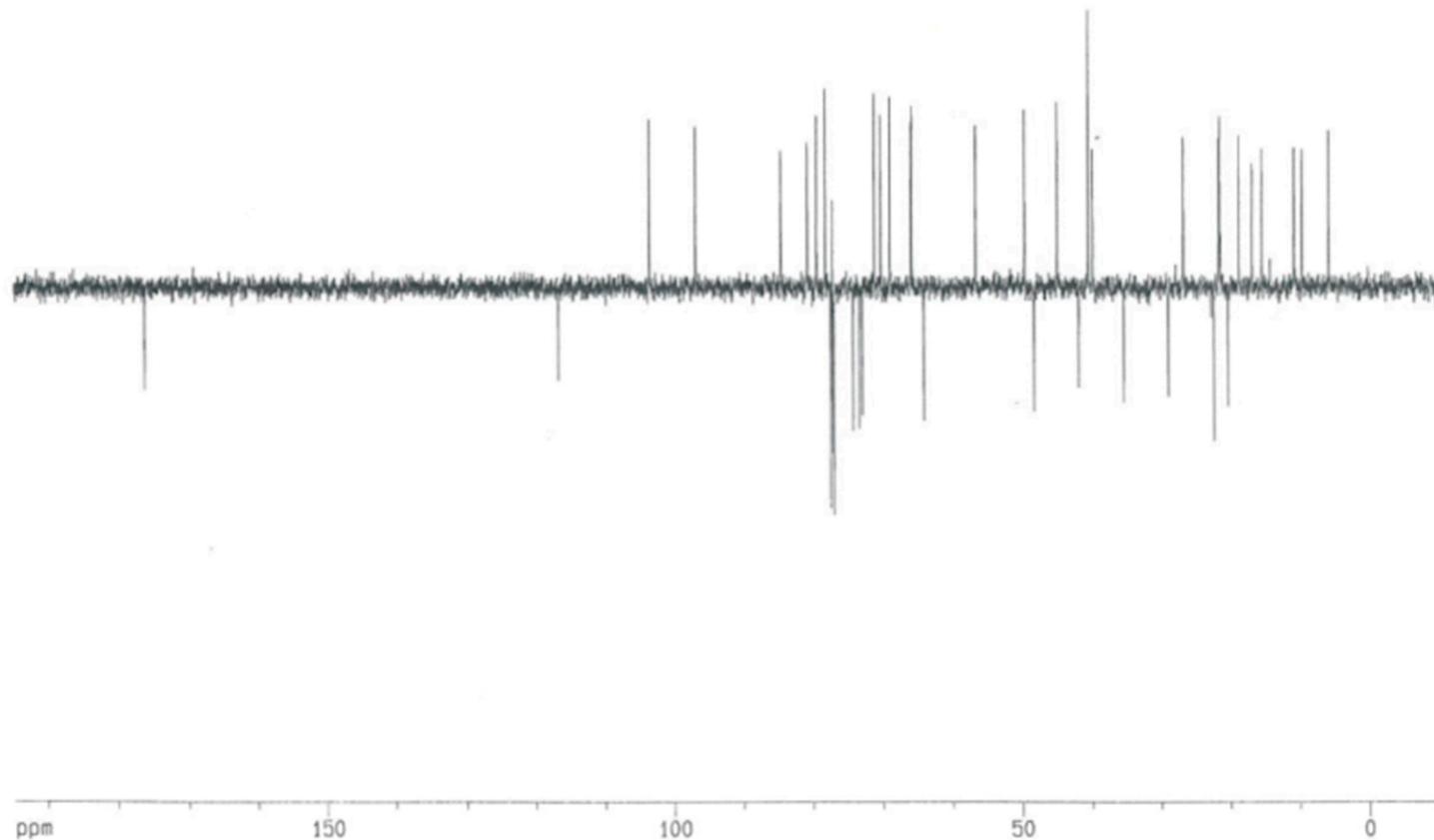


Figure S17. ^1H spectrum of **15b** in CDCl_3 at 25 °C



Current Data Parameters
 NAME b_JE10832801M_194
 EXPNO 5
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20070219
 Time 15.09
 INSTRUM spect
 PROBHD 5 mm QNI 1H-15
 PULPROG jmod
 TD 65536
 SOLVENT CDCl3
 NS 177
 DS 4
 SWH 31446.541 Hz
 FIDRES 0.479836 Hz
 AQ 1.0420883 sec
 RG 4597.6
 DM 15.900 usec
 DE 6.00 usec
 TE 298.0 K
 CNST2 145.000000
 CNST11 1.000000
 D1 2.0000000 sec
 d20 0.00689655 sec
 DELTA 0.00001130 sec
 MCREST 0.0000000 sec
 MCWRK 0.0150000 sec

***** CHANNEL f1 *****
 NUC1 13C
 P1 8.88 usec
 p2 17.75 usec
 PL1 -4.00 dB
 SF01 125.7715719 MHz

***** CHANNEL f2 *****
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 90.00 usec
 PL2 7.00 dB
 PL12 26.35 dB
 SF02 500.1320005 MHz

F2 - Processing parameters
 S1 32768
 SF 125.7577818 MHz
 MDW EM
 SSB 0
 LB 2.00 Hz
 GB 0
 PC 1.40

1D NMR plot parameters
 CX 20.00 cm
 CY 0.00 cm
 F1P 194.744 ppm
 F1 24490.63 Hz
 F2P -10.452 ppm
 F2 -1314.46 Hz
 PPMCH 10.25984 ppm/cm

Figure S18. ^{13}C -APT spectrum of **15b** in CDCl_3 at 25 °C

Table S1. Comparison of $^3J_{H,H}$ coupling constants for azithromycin, **3**, **10a** and **10b** in $CDCl_3$ at 25 °C;
*overlapped, the largest difference marked in red

Atom	azithromycin	3	10a	10b	Atom	azithromycin	3	10a	10b
2, 3	4.0	4.1	8.7	9.0	2, 16	7.5	6.9	7.2	7.3
3, 4	2.0	1.6	1.8	1.7	4, 17	7.5	7.3	7.3	7.3
4, 5	7.5	6.7	7.0	6.1	8, 19	6.5	7.1	7.0	7.0
7a, 8	< 1	< 1	< 1	1.1	10, 20	6.8	6.9	6.4	6.4
7b, 8	*	7.4	*	*	14, 15	7.5	7.4	7.5	7.3
8, 9a	< 1	*	< 1	3.5	5', 6'	6.1	6.0	6.4	6.1
8, 9b	11.0	11.0	12.1	12.5	5'', 6''	6.3	6.0	6.2	6.4
10, 11	1.2	1.2	1.8	1.8					
13, 14a	2.8	1.6	2.0	2.0	11, 11 OH	6.6	< 1	-	-
13, 14b	9.8	9.4	11.1	11.1	2', 2' OH	+	n/a	n/a	n/a
22, 23eq	-	4.9	2.9	3.7	4'', 4'' OH	10.5	10.2	n/a	n/a
22, 23ax	-	7.4	10.7	10.8					
22, L1a	-	16.0	4.9	7.2	7a, 7b	14.7	14.2	14.5	14.7
22, L1b	-	-	8.2	4.0	9a, 9b	11.0	10.5	12.1	12.5
q2, q3	-	-	4.6		14a, 14b	14.4	14.5	14.4	14.4
q3, q4	-	-	8.5	-	4'a, 4'b	12.6	13.0	12.5	*
q5, q6	-	8.2	8.2	7.0	2''a, 2''b	15.2	15.0	14.7	14.7
q6, q7	-	7.6	6.9	8.2	23a, 23b	-	14.5	11.6	8.5
q7, q8	-	8.3	8.2	7.6	L1a, L1b	-	-	15.0	15.6
1', 2'	7.3	7.2	7.3	7.3					
2', 3'	10.3	9.8	10.4	9.9					
3', 4'a	3.8	3.6	4.0	*					
3', 4'b	12.2	13.0	12.0	*					
4'a, 5'	1.9	< 1	2.1	2.0					
4'b, 5'	11.0	10.4	10.2	10.2					
1'', 2''a	< 1	< 1	1.4	2.4					
1'', 2''b	5.0	4.6	4.6	4.3					
4'', 5''	9.6	9.6	8.8	8.8					