

**Regio- and Stereoselective Synthesis of Spiropyrrolidine- Oxindole and  
Bis-spiropyrrolizidine- Oxindole Grafted Macrocycles Through  
[3+2] Cycloaddition of AzomethinYlide**

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*Department of Organic Chemistry, University of Madras, Guindy Campus*

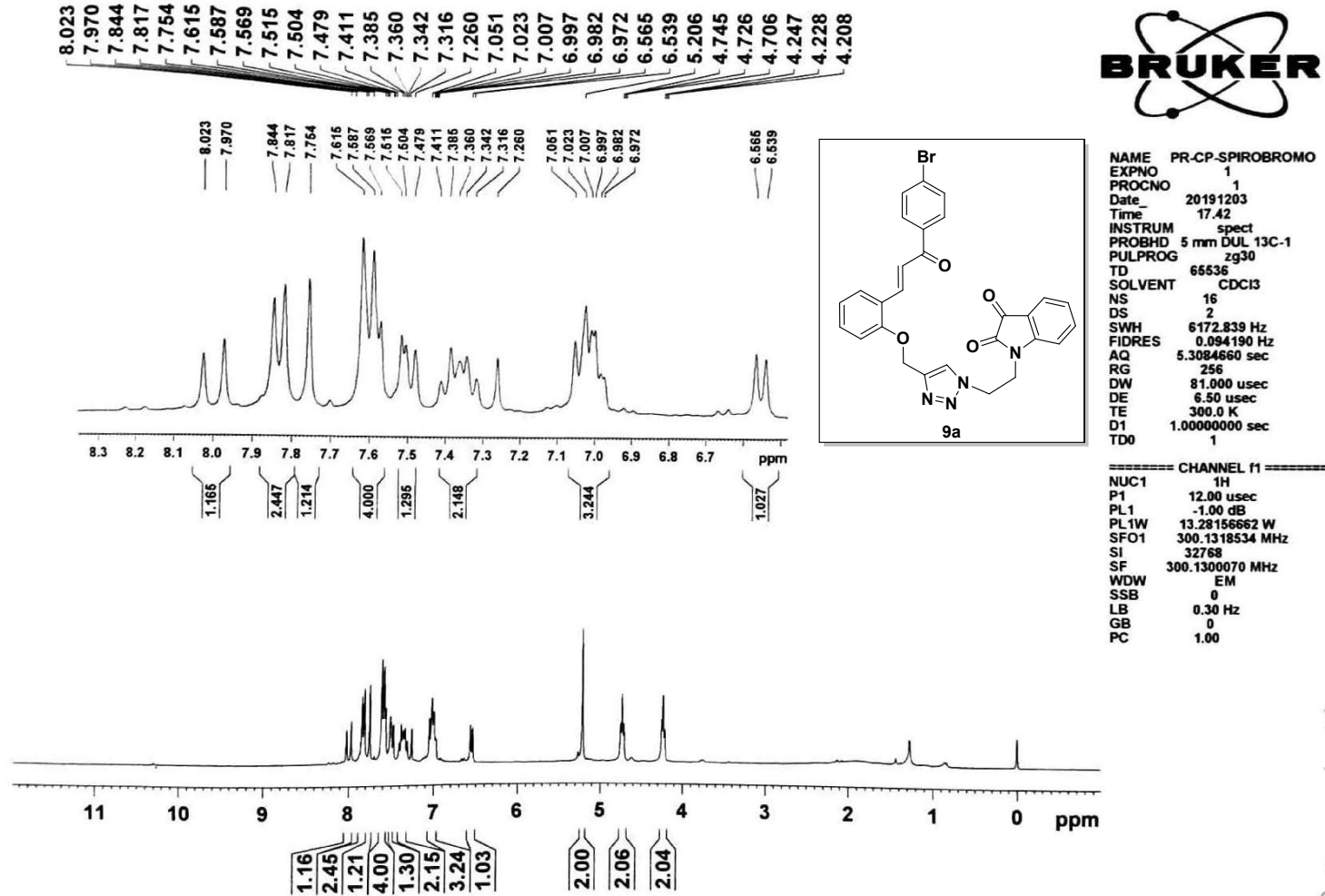
*Chennai – 600 025, Tamil Nadu, India*

\*Corresponding Author: Tel No: +91 44 2220 2814; E-Mail: perumalrajakumar@gmail.com

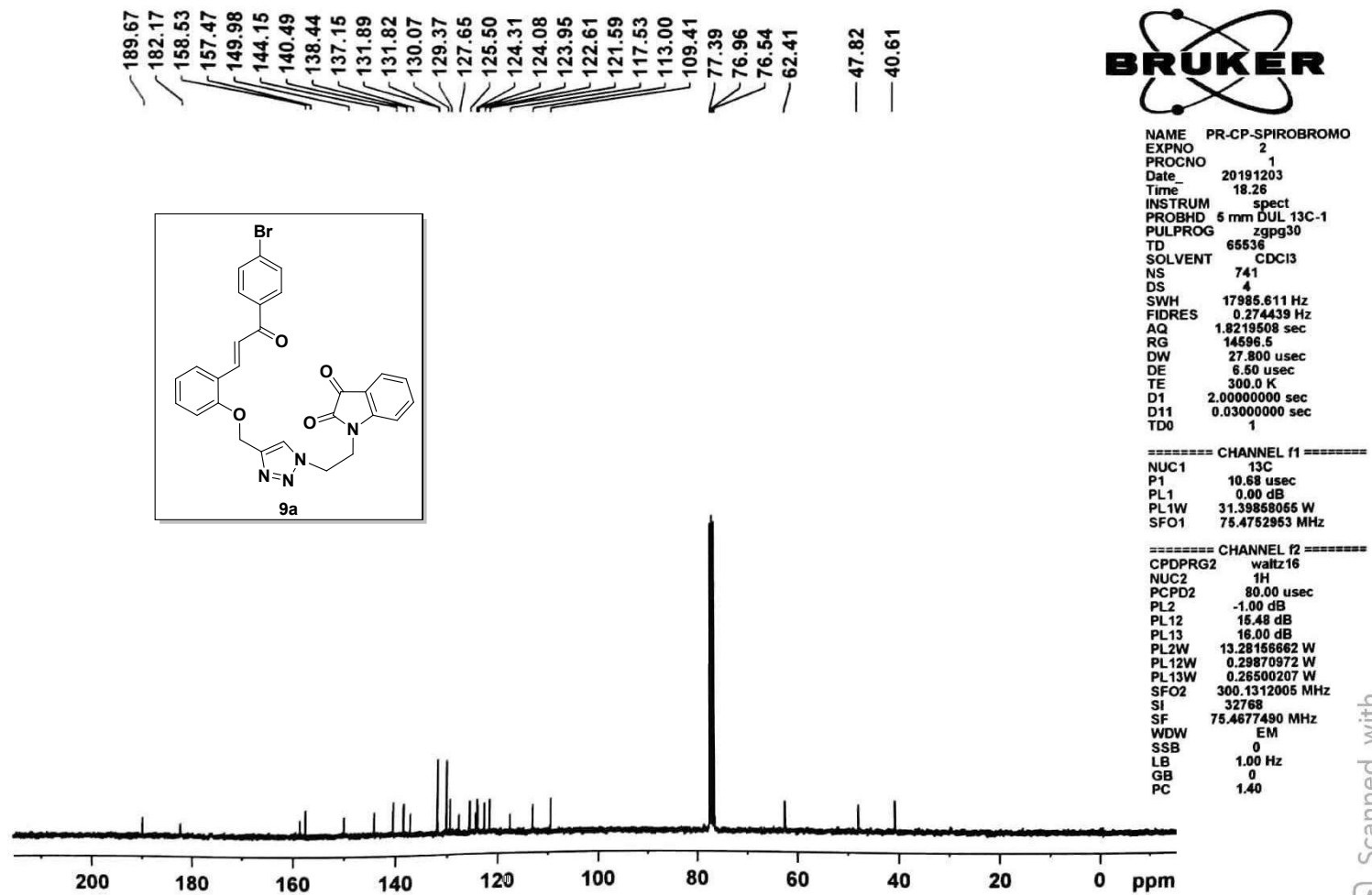
**Supporting Information**

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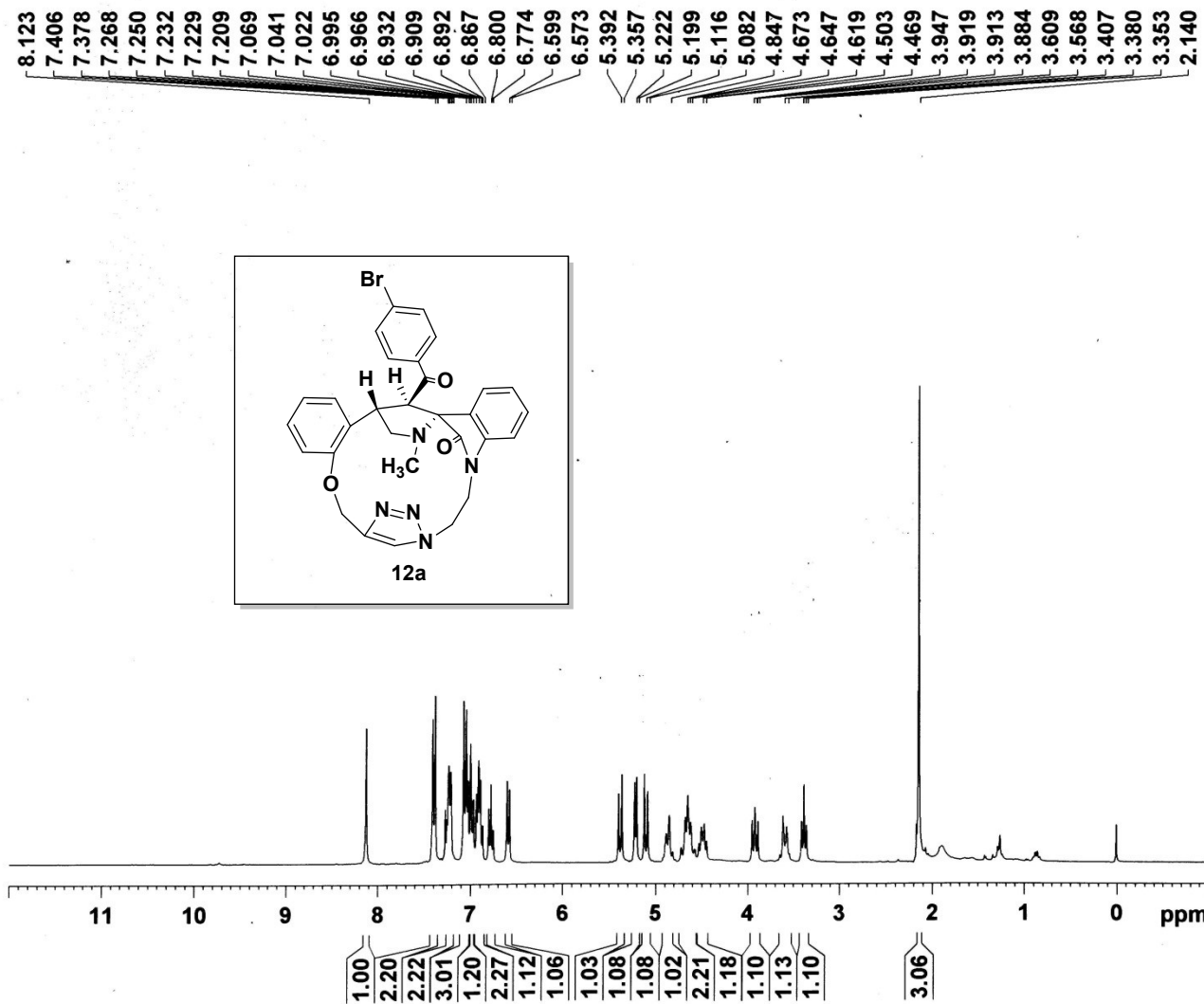
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<sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) spectrum of chalcone isatin 9a



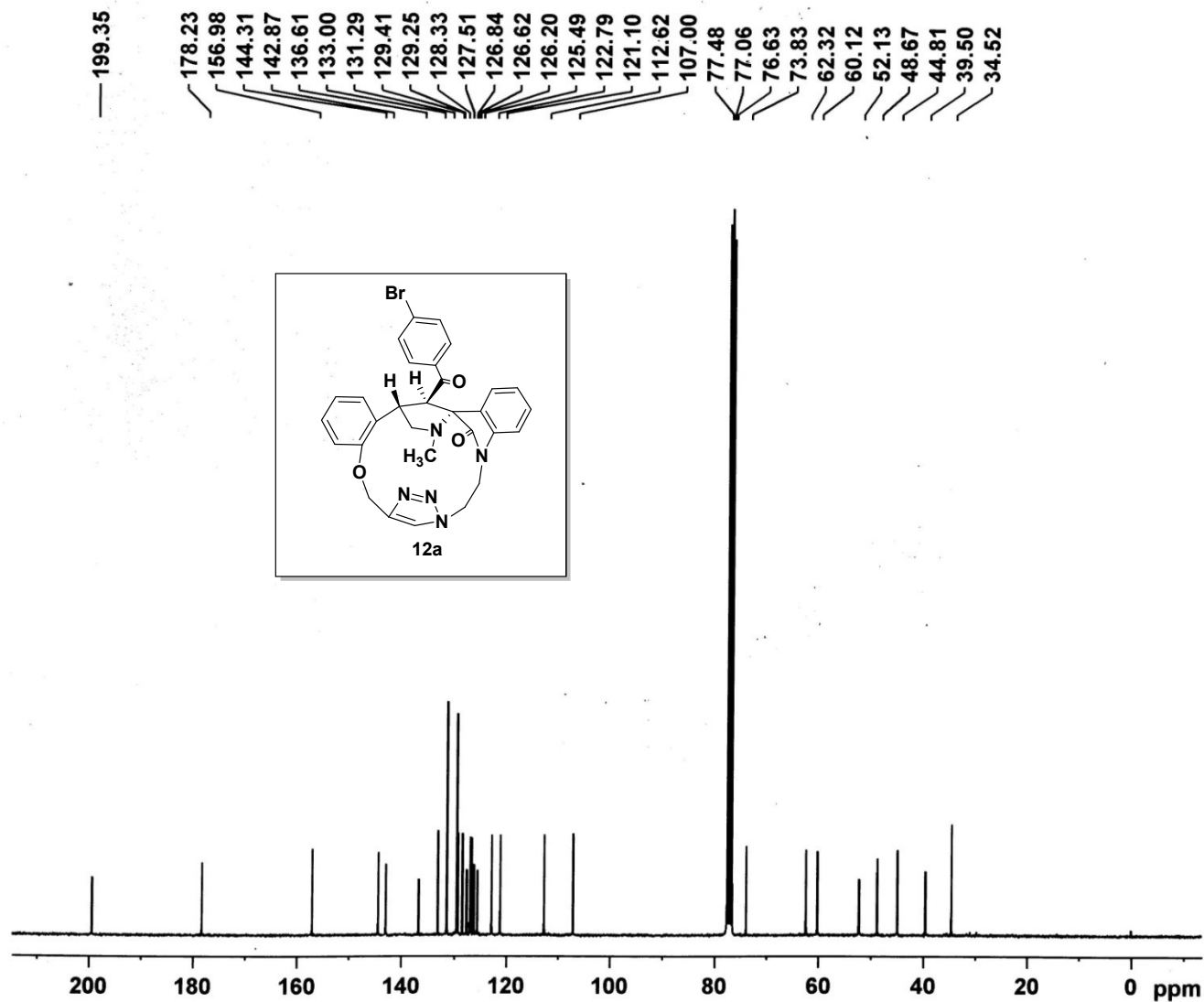
**<sup>13</sup>C NMR (CDCl<sub>3</sub>, 75MHz) spectrum of chalcone isatin 9a**



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 PULPROG zg30  
 TD 65536  
 SOLVENT CDCl<sub>3</sub>  
 NS 16  
 DS 2  
 SWH 6172.839 Hz  
 FIDRES 0.094190 Hz  
 AQ 5.3084660 sec  
 RG 90.5  
 DW 81.000 usec  
 DE 6.00 usec  
 TE 300.0 K  
 D1 1.00000000 sec  
 TD0 1

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 PL1 0.00 dB  
 SFO1 300.1318534 MHz  
 SI 32768  
 SF 300.1300034 MHz  
 WDW EM  
 SSB 0  
 LB 0.30 Hz  
 GB 0  
 PC 1.00

**<sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12a**

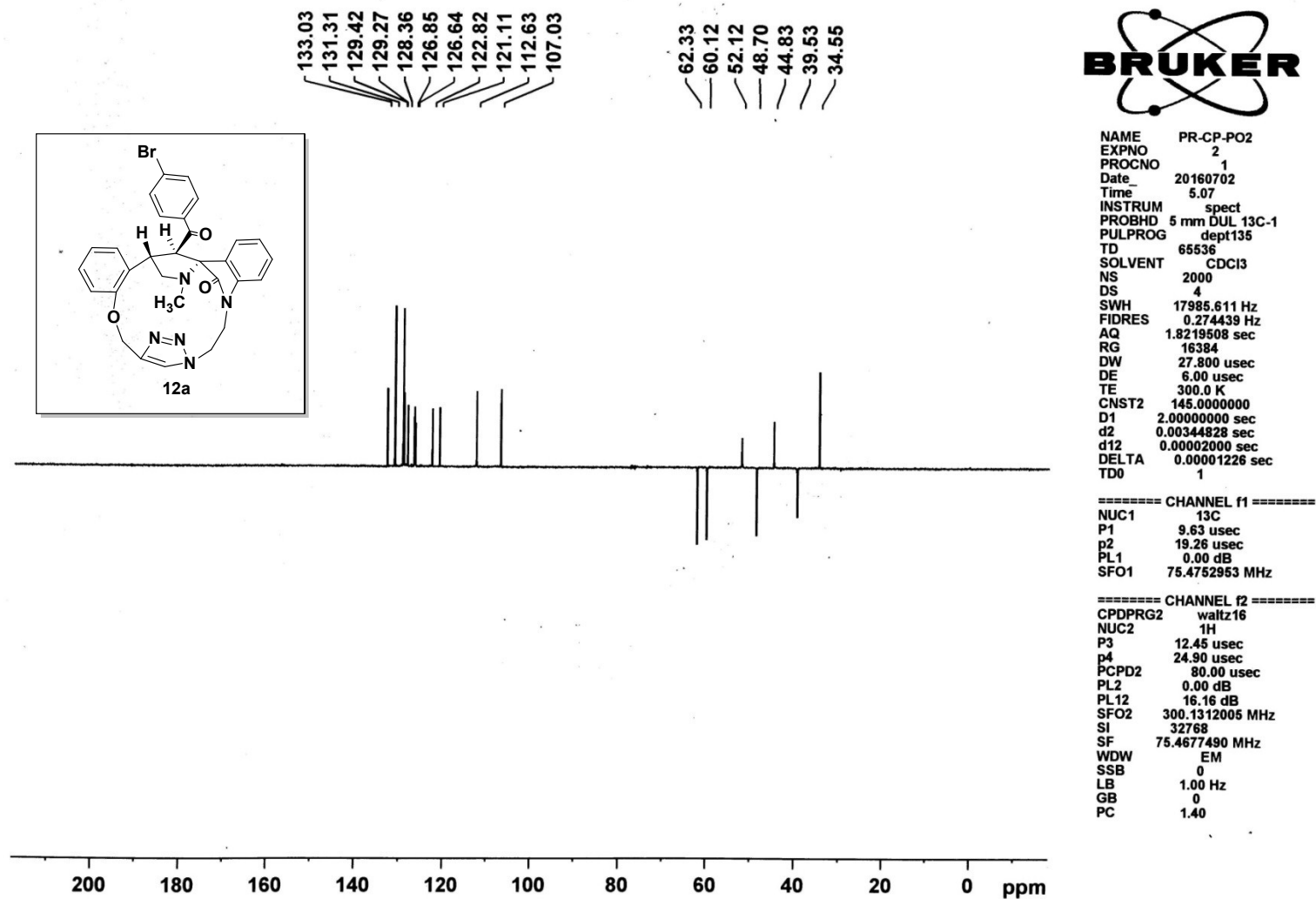


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 PULPROG zgpg30  
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 SOLVENT CDCl3  
 NS 6127  
 DS 4  
 SWH 17985.611 Hz  
 FIDRES 0.274439 Hz  
 AQ 1.8219508 sec  
 RG 10321.3  
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 d11 0.0300000 sec  
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 TD0 1

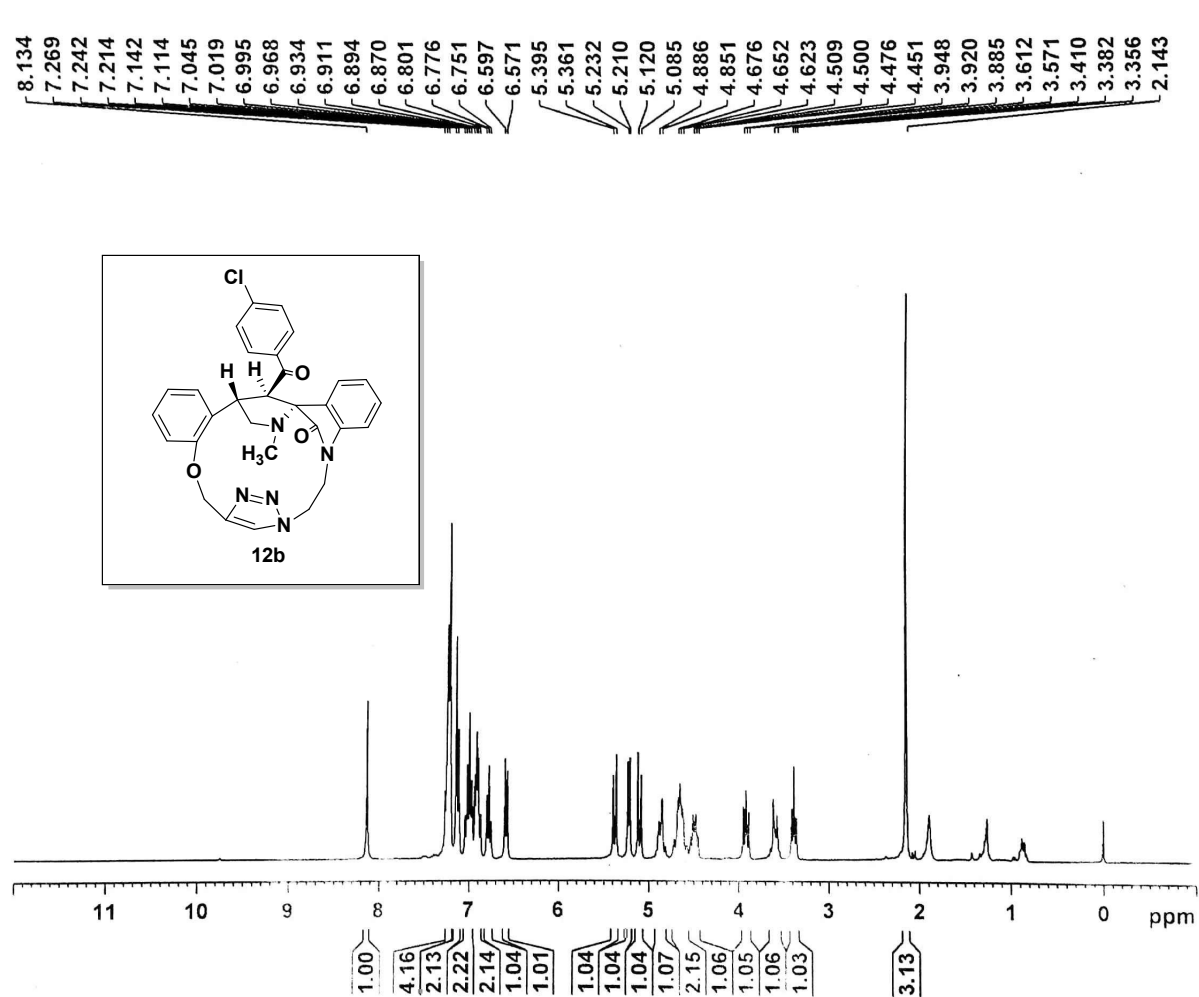
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 PL1 0.00 dB  
 SFO1 75.4752953 MHz

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 NUC2 1H  
 PCPD2 80.00 usec  
 PL2 0.00 dB  
 PL12 16.16 dB  
 PL13 16.00 dB  
 SFO2 300.1312005 MHz  
 SI 32768  
 SF 75.4677499 MHz  
 WDW EM  
 SSB 0  
 LB 1.00 Hz  
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 PC 1.40

<sup>13</sup>C NMR (CDCl<sub>3</sub>, 75MHz) spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12a



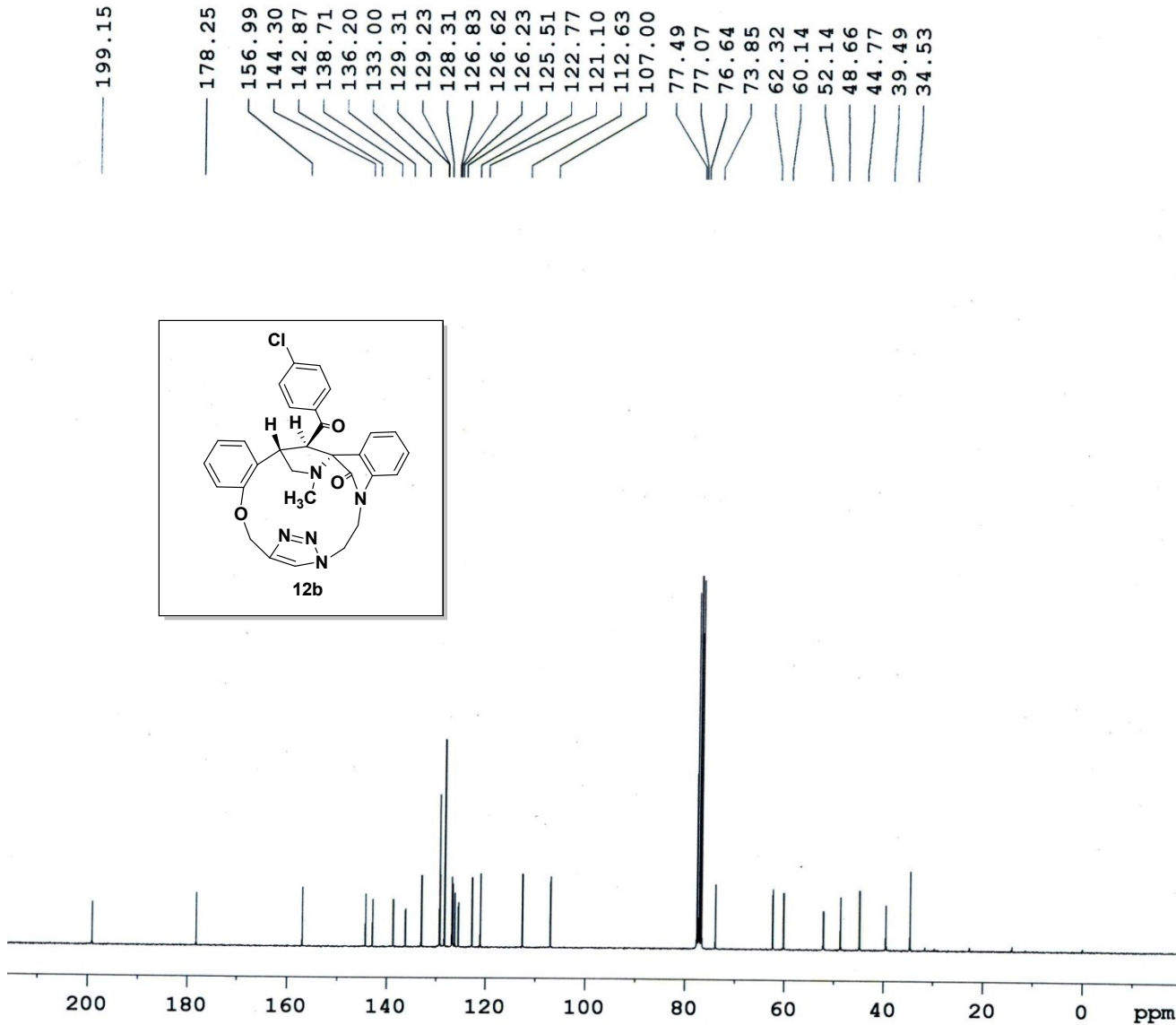
**<sup>13</sup>C (DEPT135) NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12a**



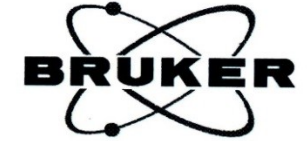
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 PULPROG zg30  
 TD 65536  
 SOLVENT CDCl3  
 NS 16  
 DS 2  
 SWH 6172.839 Hz  
 FIDRES 0.094190 Hz  
 AQ 5.3084660 sec  
 RG 90.5  
 DW 81.000 usec  
 DE 6.00 usec  
 TE 300.0 K  
 D1 1.00000000 sec  
 TD0 1

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 SF 300.1300031 MHz  
 WDW EM  
 SSB 0  
 LB 0.30 Hz  
 GB 0  
 PC 1.00

<sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12b



199.15  
178.25  
156.99  
144.30  
142.87  
138.71  
136.20  
133.00  
129.31  
129.23  
128.31  
126.83  
126.62  
126.23  
125.51  
122.77  
121.10  
112.63  
107.00  
77.49  
77.07  
76.64  
73.85  
62.32  
60.14  
52.14  
48.66  
44.77  
39.49  
34.53



Current Data Parameters  
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PROCNO 1

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TD 65536  
SOLVENT CDCl3  
NS 7749  
DS 4  
SWH 17985.611 Hz  
FIDRES 0.274439 Hz  
AQ 1.8219508 sec  
RG 1824.6  
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DELTA 1.89999998 sec  
TD0 1

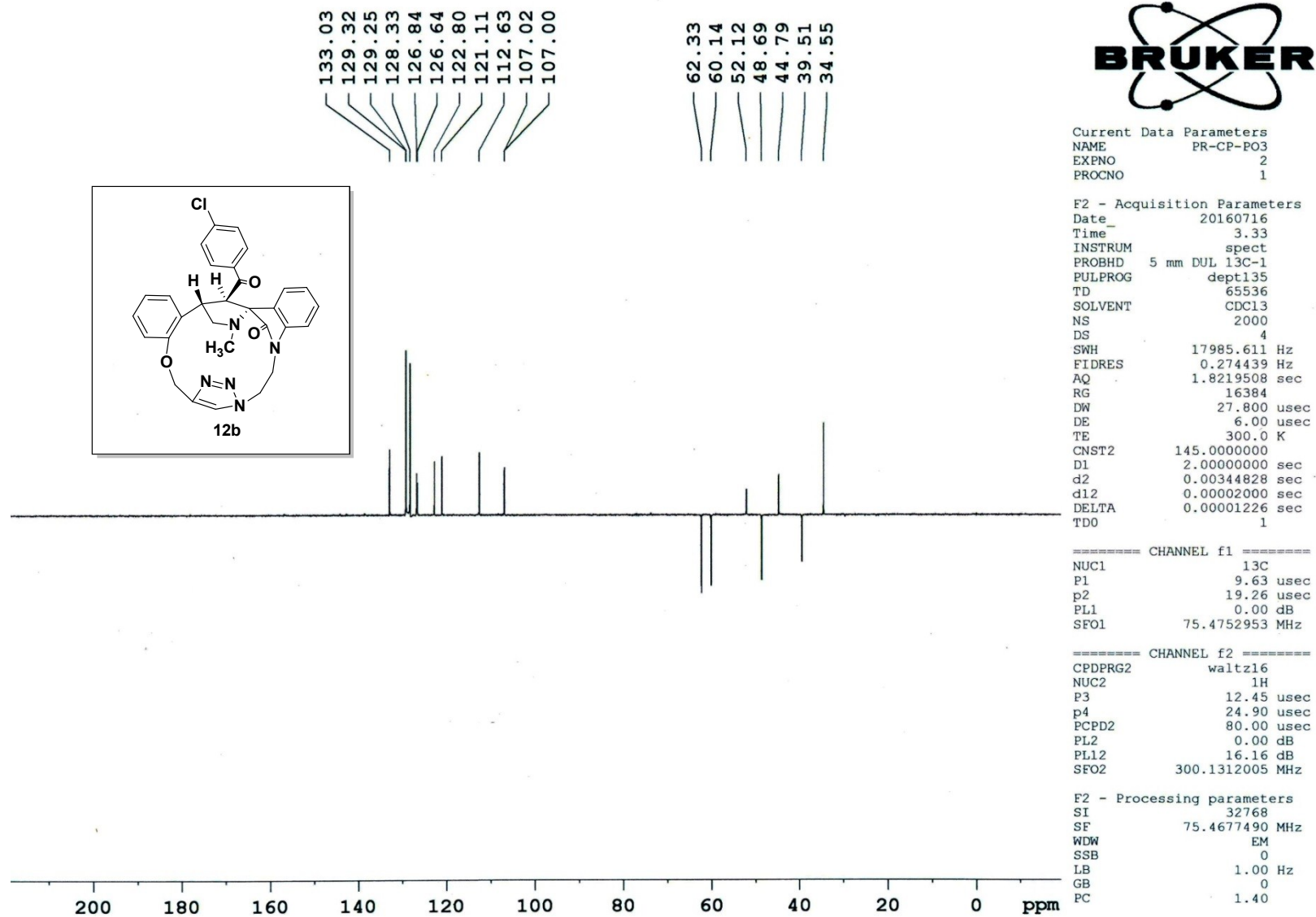
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PL13 16.00 dB  
SFO2 300.1312005 MHz

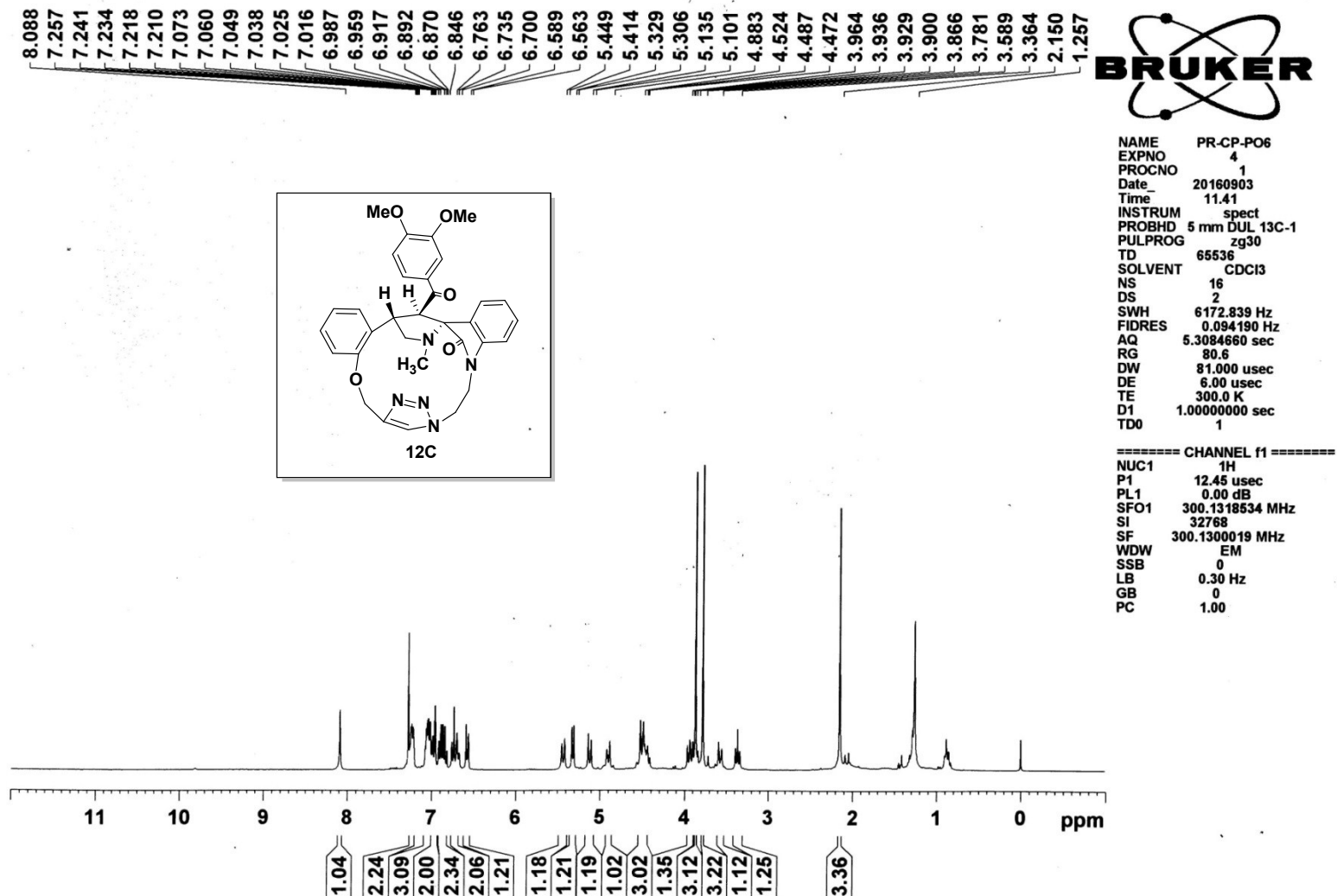
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PC 1.40

<sup>13</sup>C NMR (CDCl<sub>3</sub>, 75MHz) spectrum of Spiro pyrrolidine -oxindole grafted macrocycle 12b

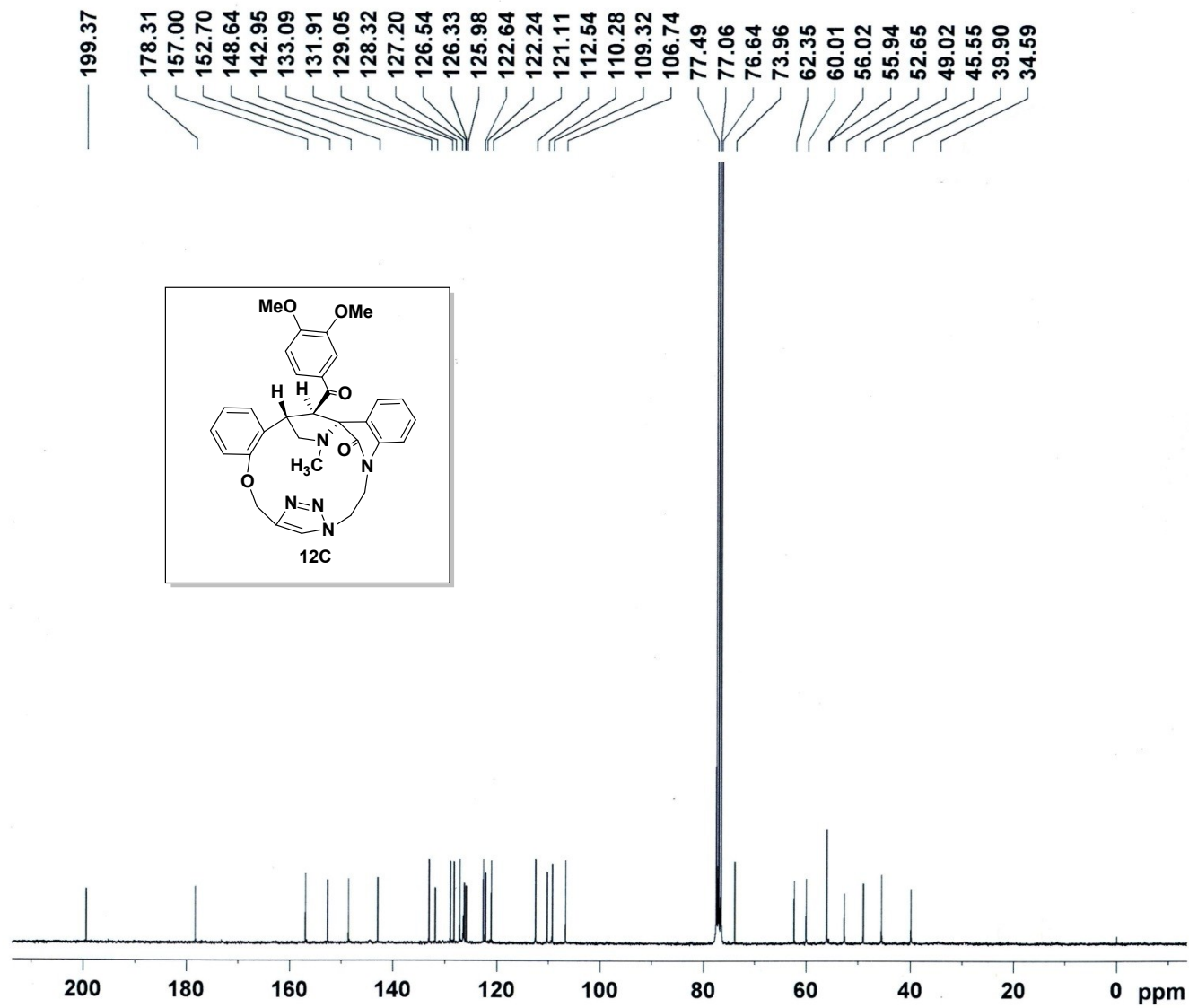




**<sup>13</sup>C (DEPT135) NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12b**



<sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12c



Current Data Parameters  
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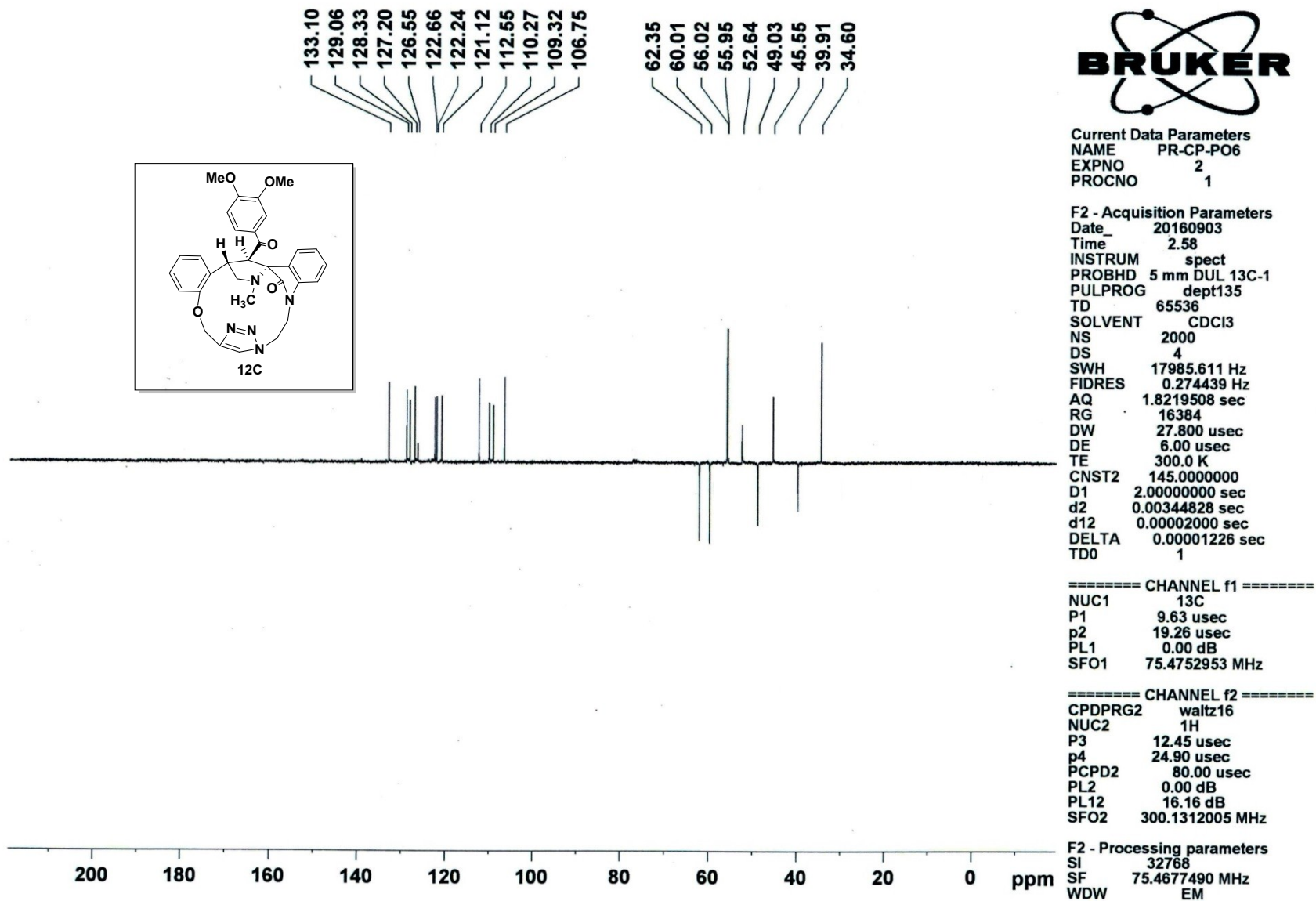
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 SOLVENT CDCl3  
 NS 8000  
 DS 4  
 SWH 17985.611 Hz  
 FIDRES 0.274439 Hz  
 AQ 1.8219508 sec  
 RG 10321.3  
 DW 27.800 usec  
 DE 6.00 usec  
 TE 300.0 K  
 D1 2.00000000 sec  
 d11 0.03000000 sec  
 DELTA 1.89999998 sec  
 TD0 1

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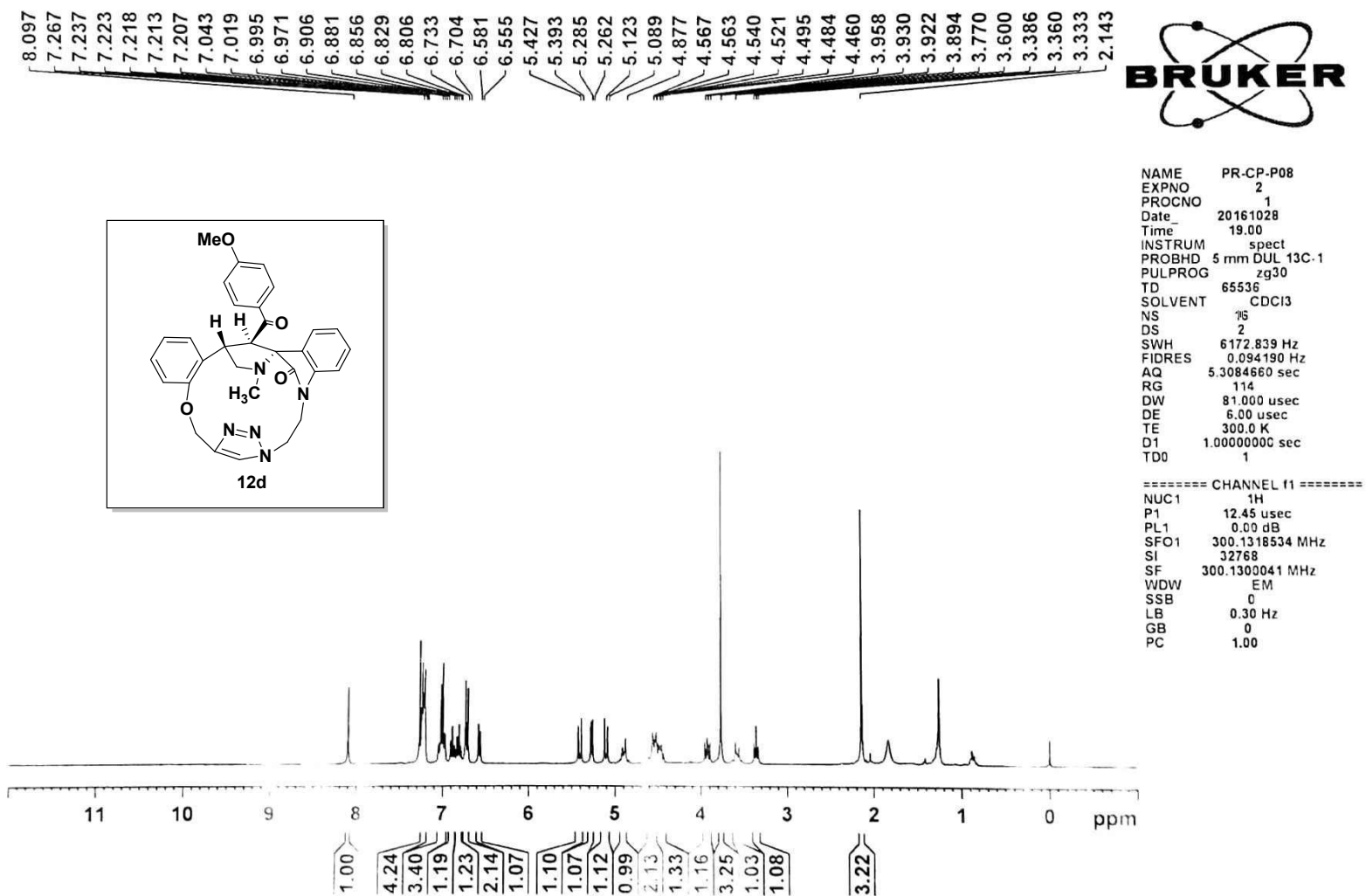
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 PL12 16.16 dB  
 PL13 16.00 dB  
 SFO2 300.1312005 MHz

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 LB 1.00 Hz  
 GB 0  
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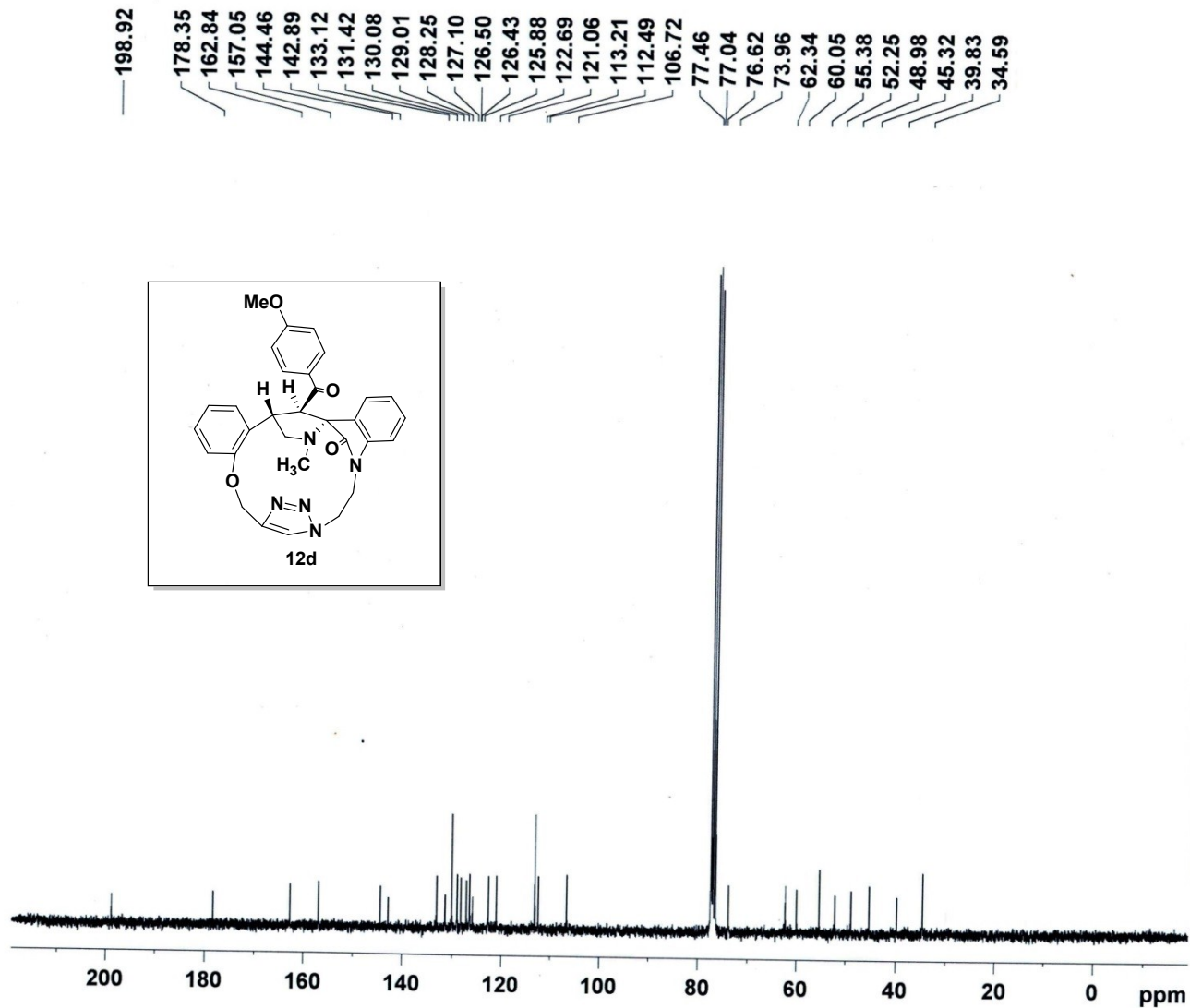
<sup>13</sup>C NMR (CDCl<sub>3</sub>, 75MHz) spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12c



**<sup>13</sup>C (DEPT135) NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12c**



**<sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) spectrum of Spiropyrrolidine-oxindole grafted macrocycle 12d**



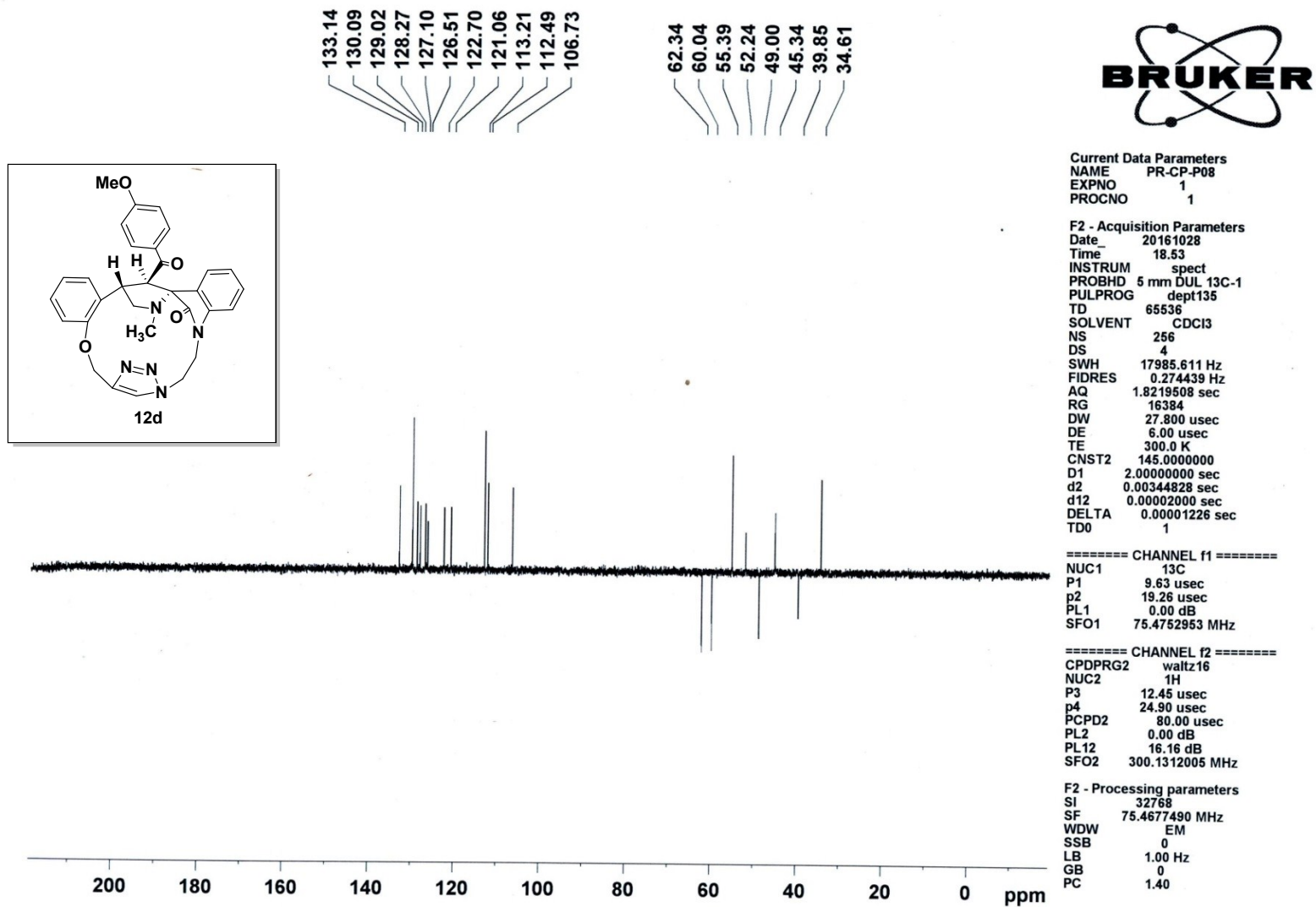
<sup>13</sup>C NMR (CDCl<sub>3</sub>, 75MHz) spectrum of Spiro[pyrrolidine -oxindole] grafted macrocycle 12d



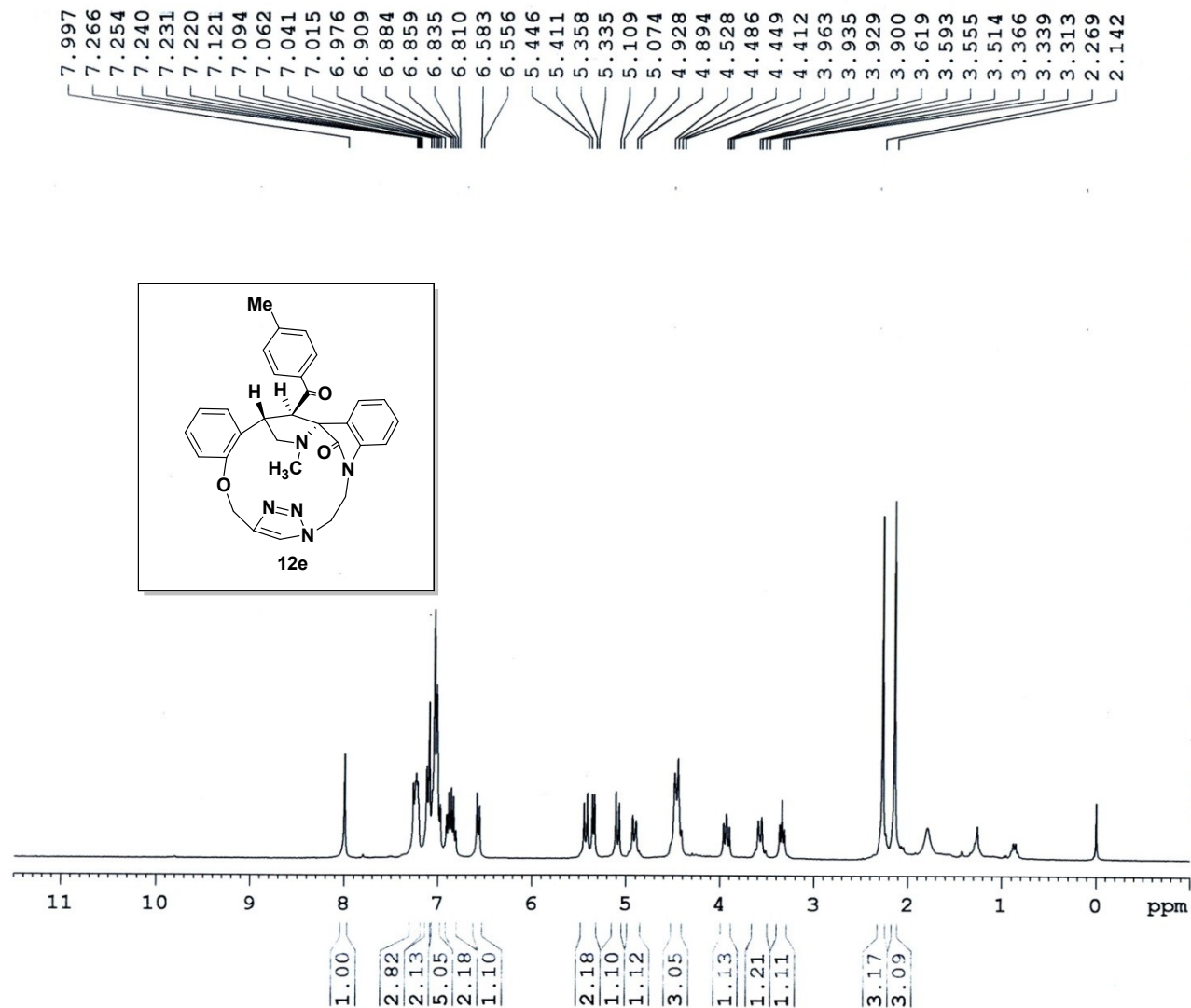
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PULPROG zgpg30  
TD 65536  
SOLVENT CDCl3  
NS 657  
DS 4  
SWH 17985.611 Hz  
FIDRES 0.274439 Hz  
AQ 1.8219508 sec  
RG 1290.2  
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DE 6.50 usec  
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D1 2.00000000 sec  
D11 0.03000000 sec  
TD0 1

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PL1 0.00 dB  
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SFO1 75.4752953 MHz

===== CHANNEL f2 =====  
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NUC2 1H  
PCPD2 80.00 usec  
PL2 0.00 dB  
PL12 16.16 dB  
PL13 16.00 dB  
PL2W 10.54992294 W  
PL12W 0.25541672 W  
PL13W 0.26500207 W  
SFO2 300.1312005 MHz  
SI 32768  
SF 75.4677490 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40



$^{13}\text{C}$  (DEPT135) NMR ( $\text{CDCl}_3$ , 75MHz) Spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12d



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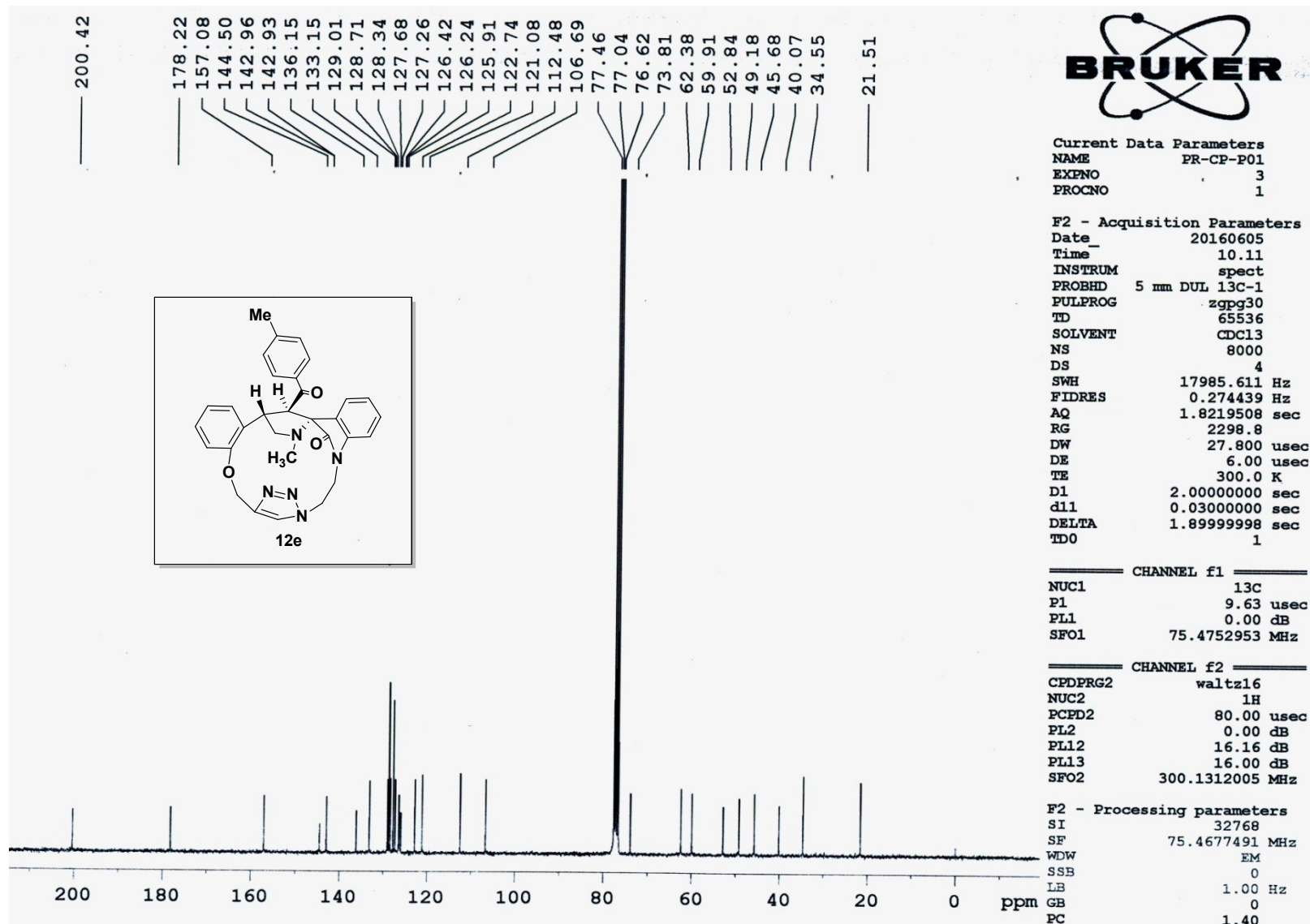
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 NS 16  
 DS 2  
 SWH 6172.839 Hz  
 FIDRES 0.094190 Hz  
 AQ 5.3084660 sec  
 RG 128  
 DW 81.000 usec  
 DE 6.00 usec  
 TE 300.0 K  
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 TD0 1

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 PL1 0.00 dB  
 SFO1 300.1318534 MHz

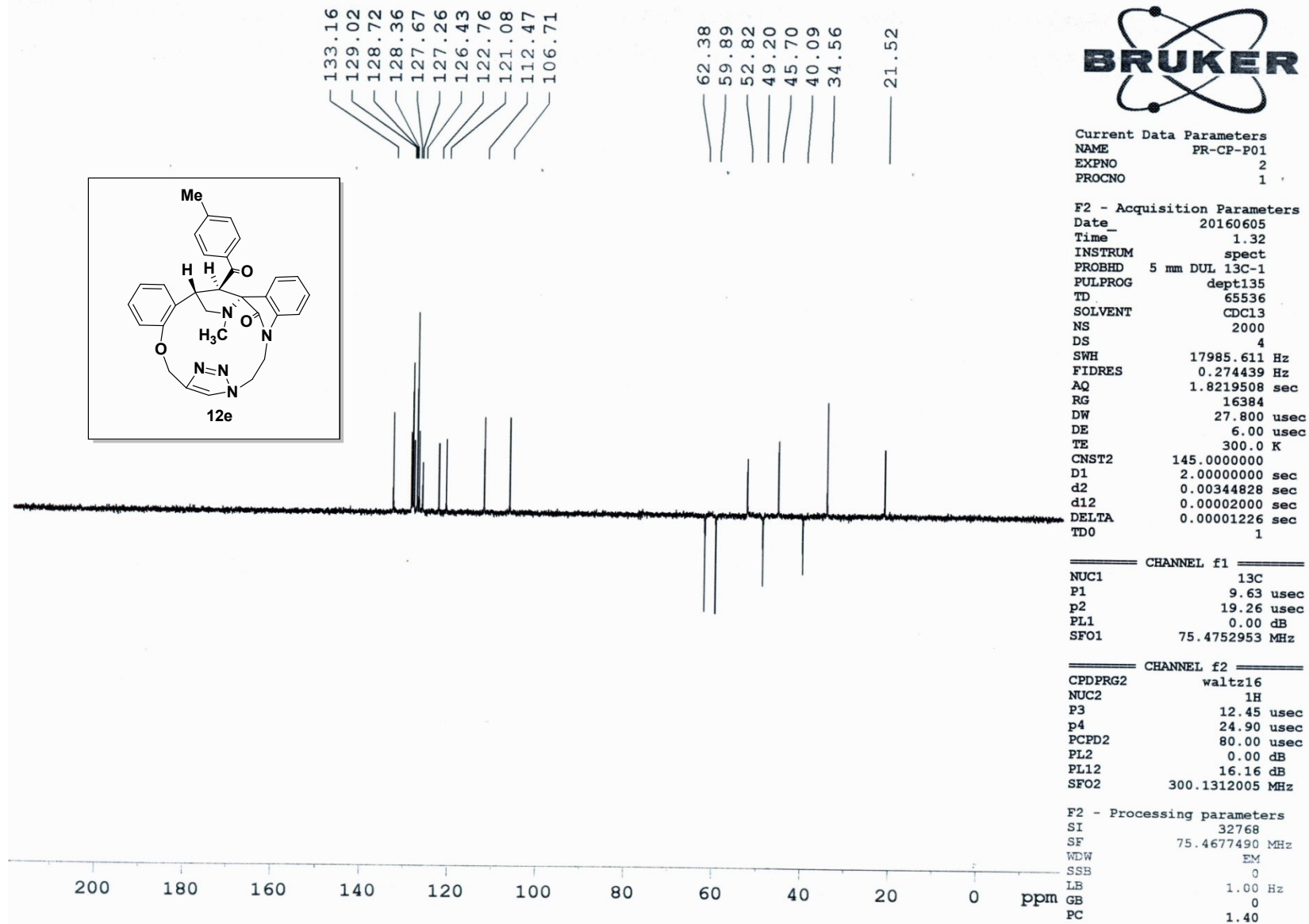
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<sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) spectrum of Spiropyrrolidine-oxindole grafted macrocycle 12e

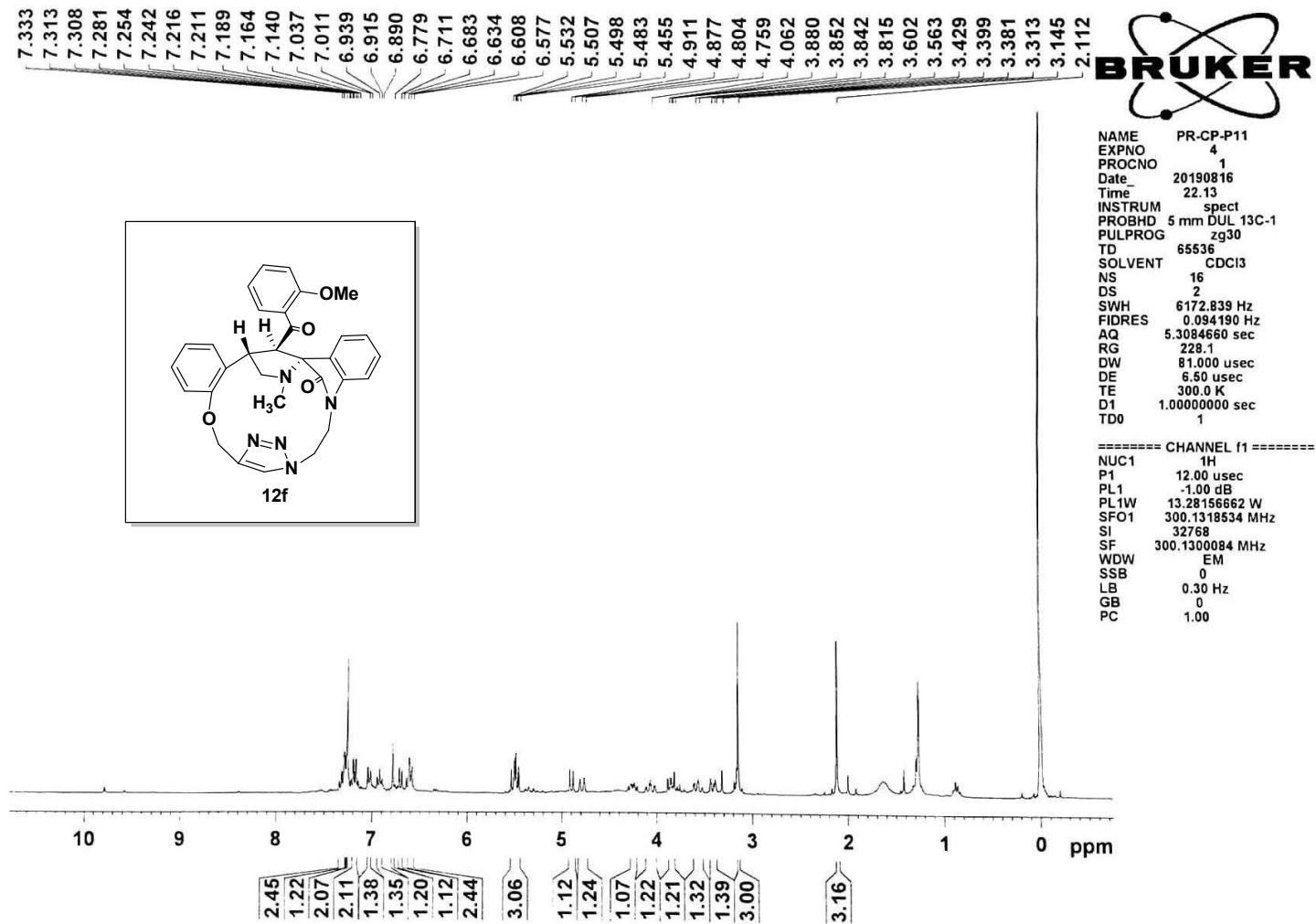




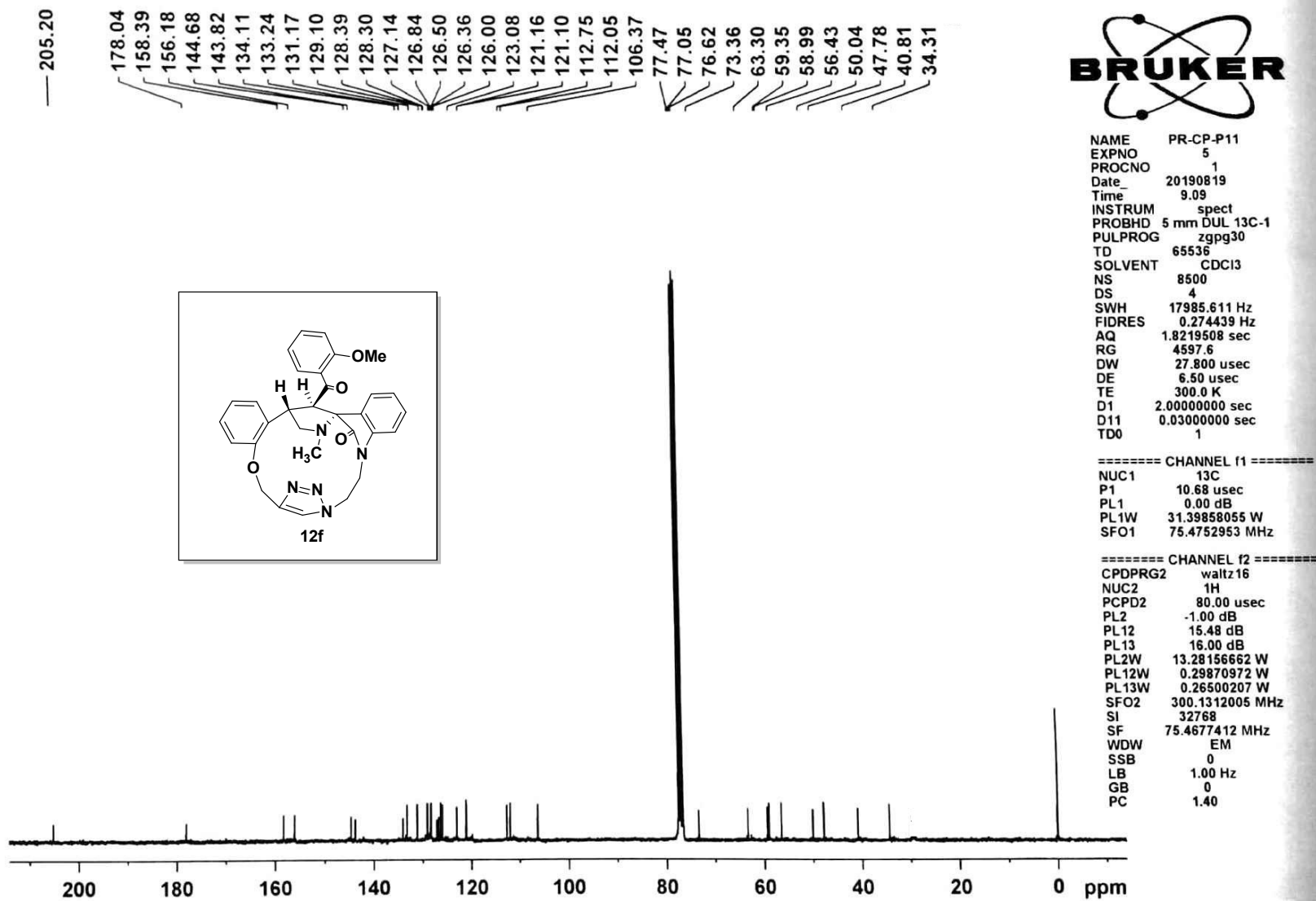
**<sup>13</sup>C NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12e**



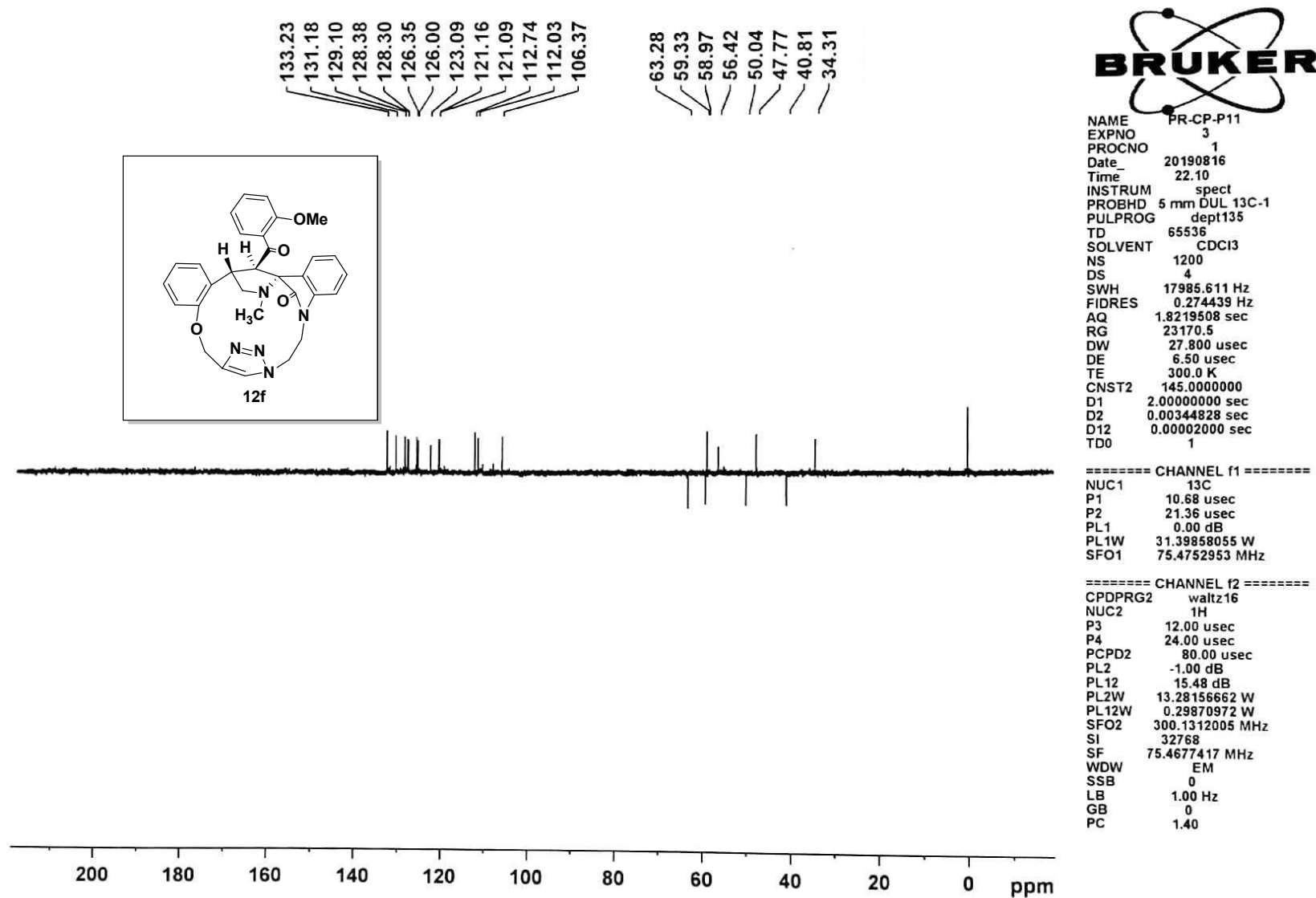
**<sup>13</sup>C (DEPT135) NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12e**



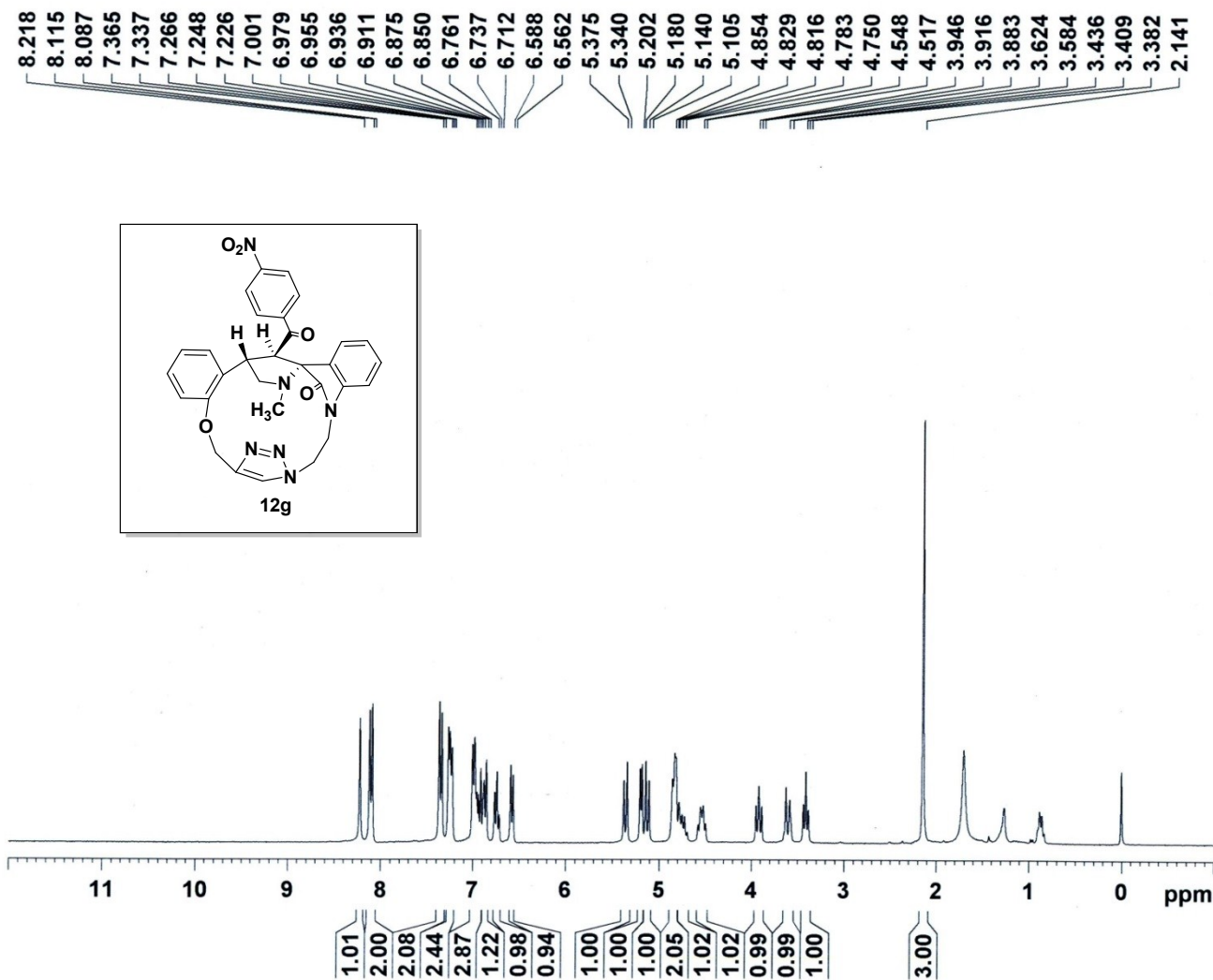
$^1\text{H}$  NMR (300MHz,  $\text{CDCl}_3$ ) spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12f



$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75MHz) spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12f



<sup>13</sup>C (DEPT135) NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12f



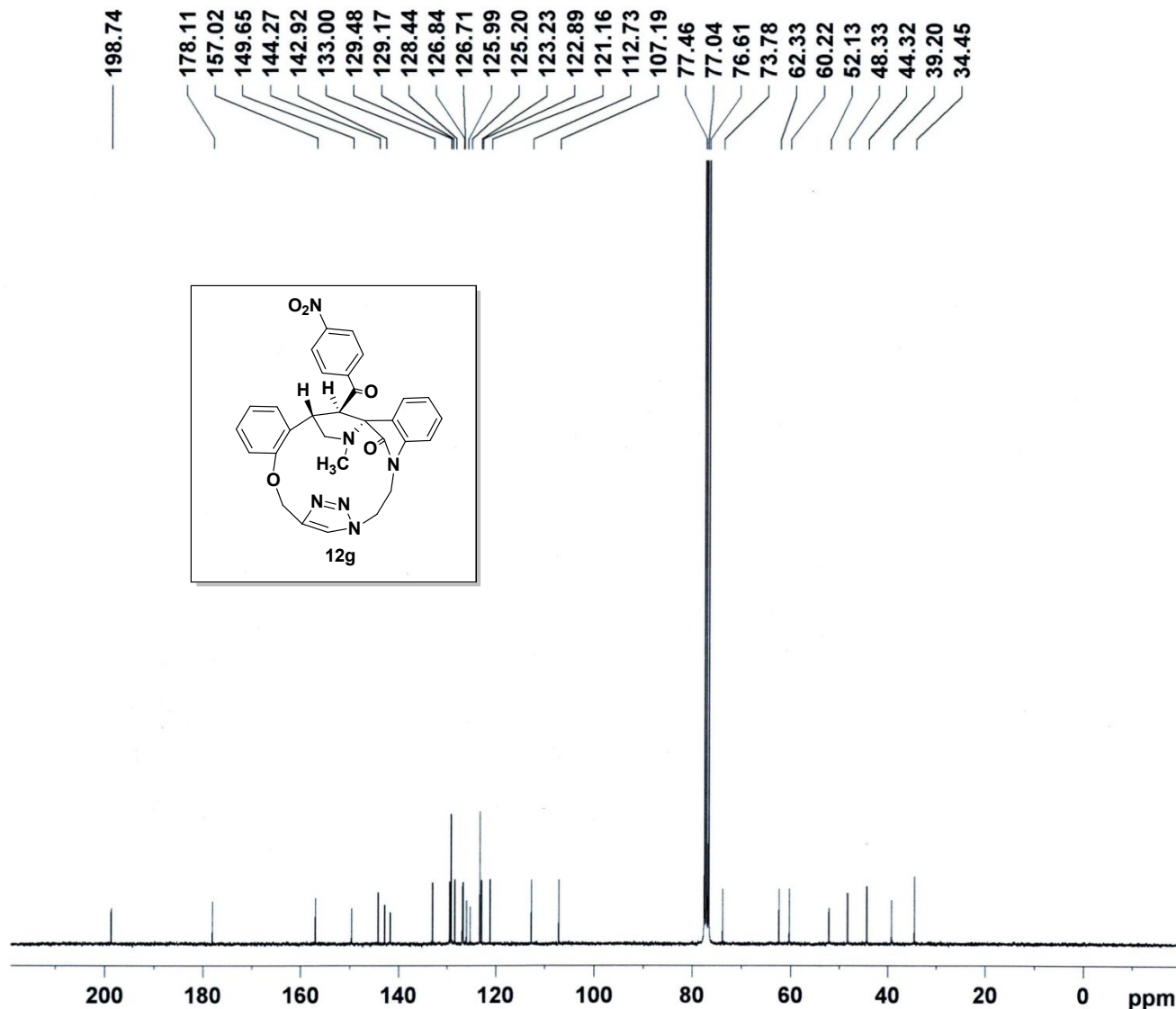
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 SOLVENT CDCl3  
 NS 16  
 DS 2  
 SWH 6172.839 Hz  
 FIDRES 0.094190 Hz  
 AQ 5.3084660 sec  
 RG 181  
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 TE 300.0 K  
 D1 1.00000000 sec  
 TD0 1

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F2 - Processing parameters  
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 LB 0.30 Hz  
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<sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12g



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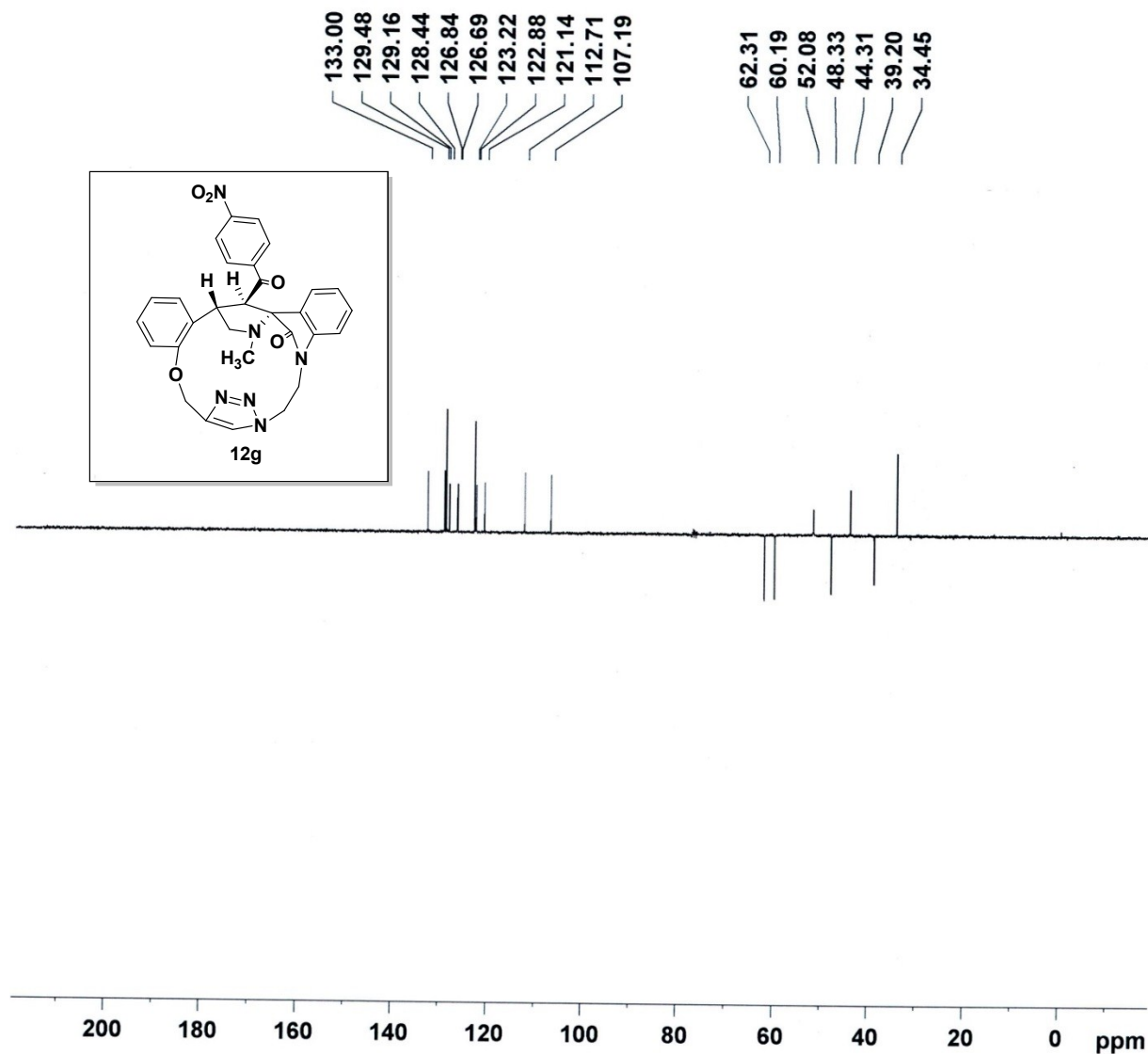
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 SOLVENT CDCl3  
 NS 8000  
 DS 4  
 SWH 17985.611 Hz  
 FIDRES 0.274439 Hz  
 AQ 1.8219508 sec  
 RG 4597.6  
 DW 27.800 usec  
 DE 6.00 usec  
 TE 300.0 K  
 D1 2.00000000 sec  
 d11 0.03000000 sec  
 DELTA 1.89999998 sec  
 TD0 1

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 P1 9.63 usec  
 PL1 0.00 dB  
 SFO1 75.4752953 MHz

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 NUC2 1H  
 PCPD2 80.00 usec  
 PL2 0.00 dB  
 PL12 16.16 dB  
 PL13 16.00 dB  
 SFO2 300.1312005 MHz

F2 - Processing parameters  
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 WDW EM  
 SSB 0  
 LB 1.00 Hz  
 GB 0  
 PC 1.40

$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75MHz) spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12g



Current Data Parameters  
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 PROCNO 1

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 SOLVENT CDCl3  
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 DS 4  
 SWH 17985.611 Hz  
 FIDRES 0.274439 Hz  
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 DELTA 0.00001226 sec  
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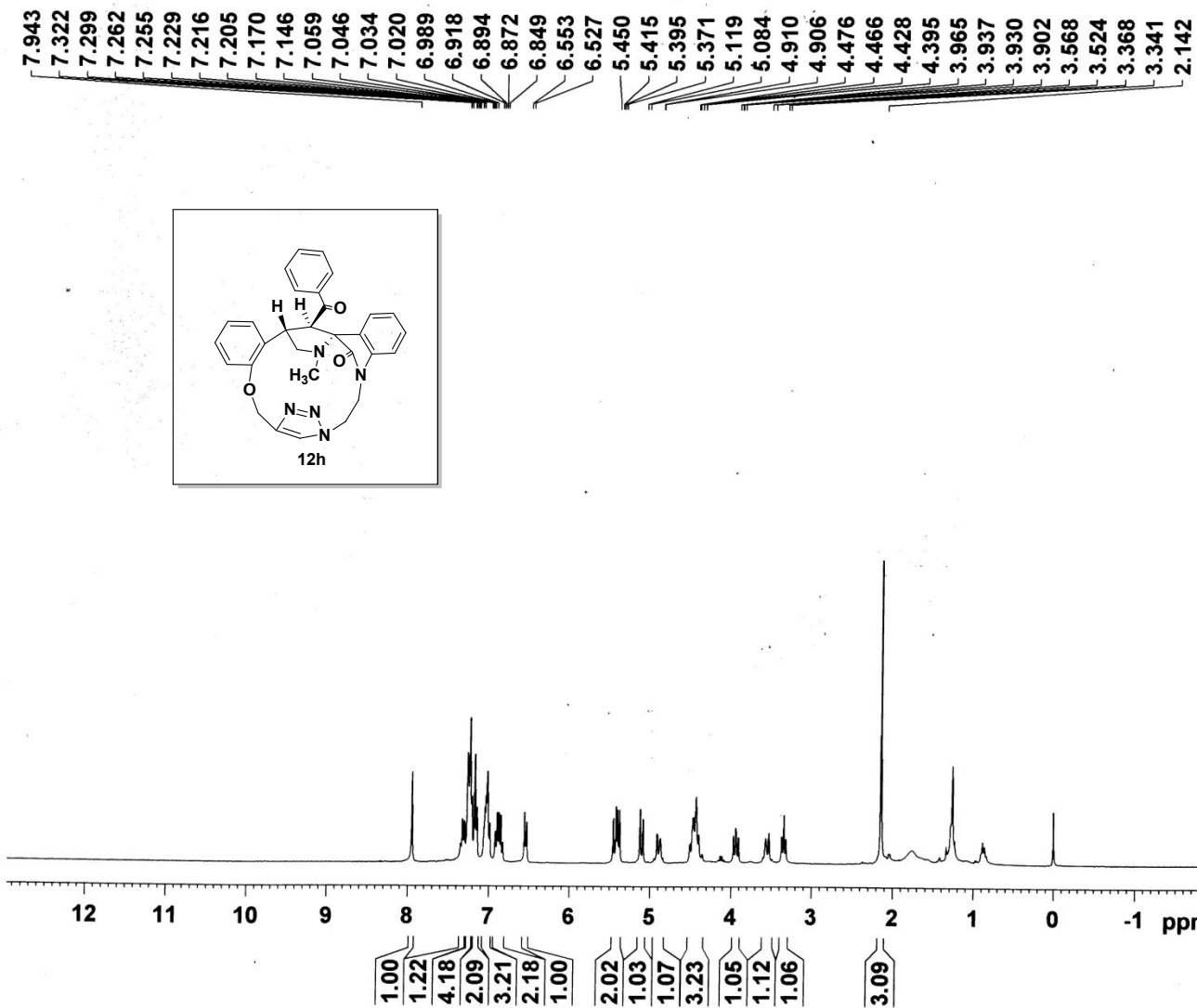
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 p4 24.90 usec  
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 PL2 0.00 dB  
 PL12 16.16 dB  
 SFO2 300.1312005 MHz

F2 - Processing parameters  
 SI 32768  
 SF 75.4677496 MHz  
 WDW EM  
 SSB 0  
 LB 1.00 Hz  
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$^{13}\text{C}$  (DEPT135) NMR ( $\text{CDCl}_3$ , 75MHz) Spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12g

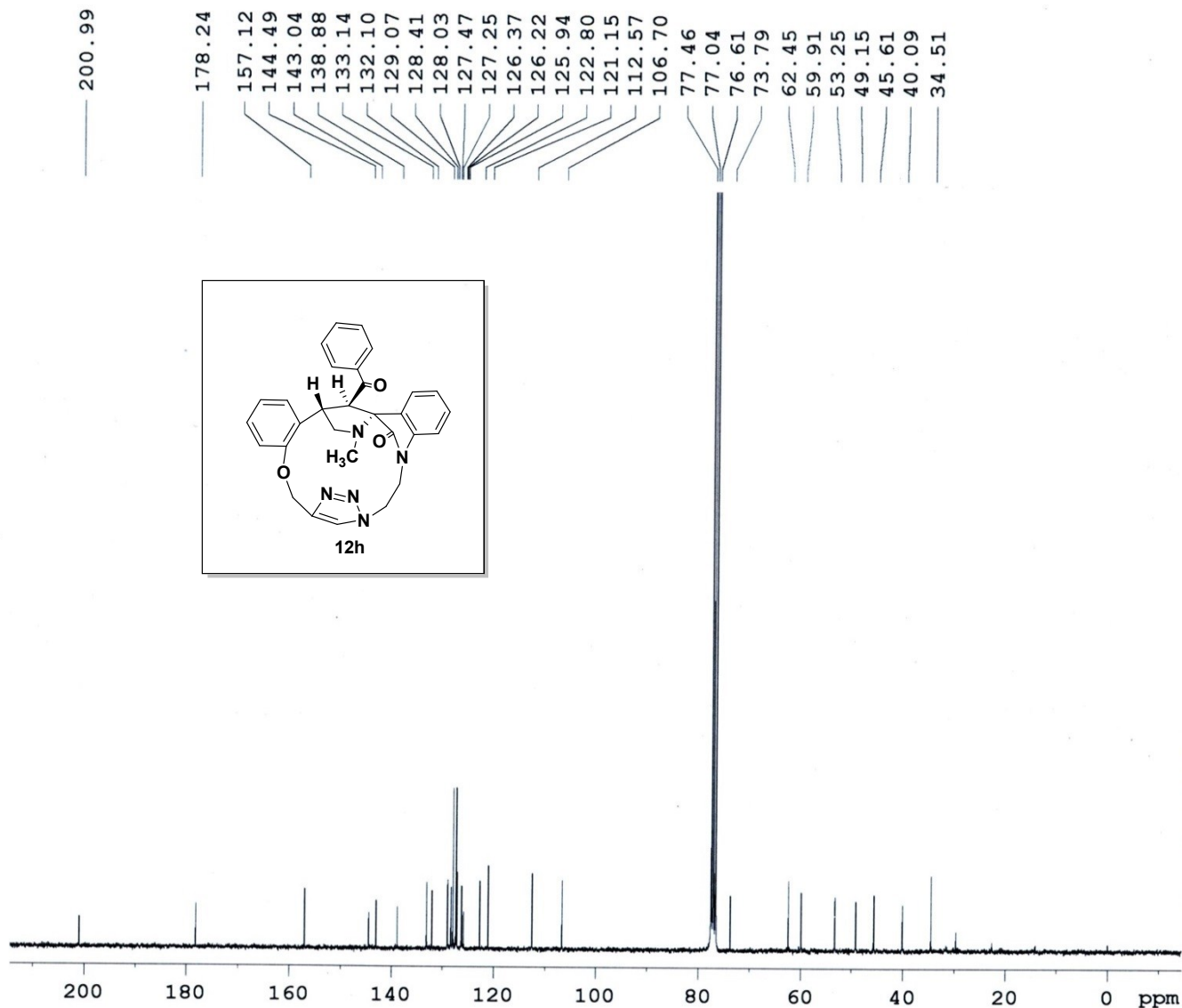




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 SOLVENT CDCl3  
 NS 16  
 DS 2  
 SWH 6172.839 Hz  
 FIDRES 0.094190 Hz  
 AQ 5.3084660 sec  
 RG 181  
 DW 81.000 usec  
 DE 6.00 usec  
 TE 300.0 K  
 D1 1.0000000 sec  
 TD0 1

===== CHANNEL f1 =====  
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<sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12h



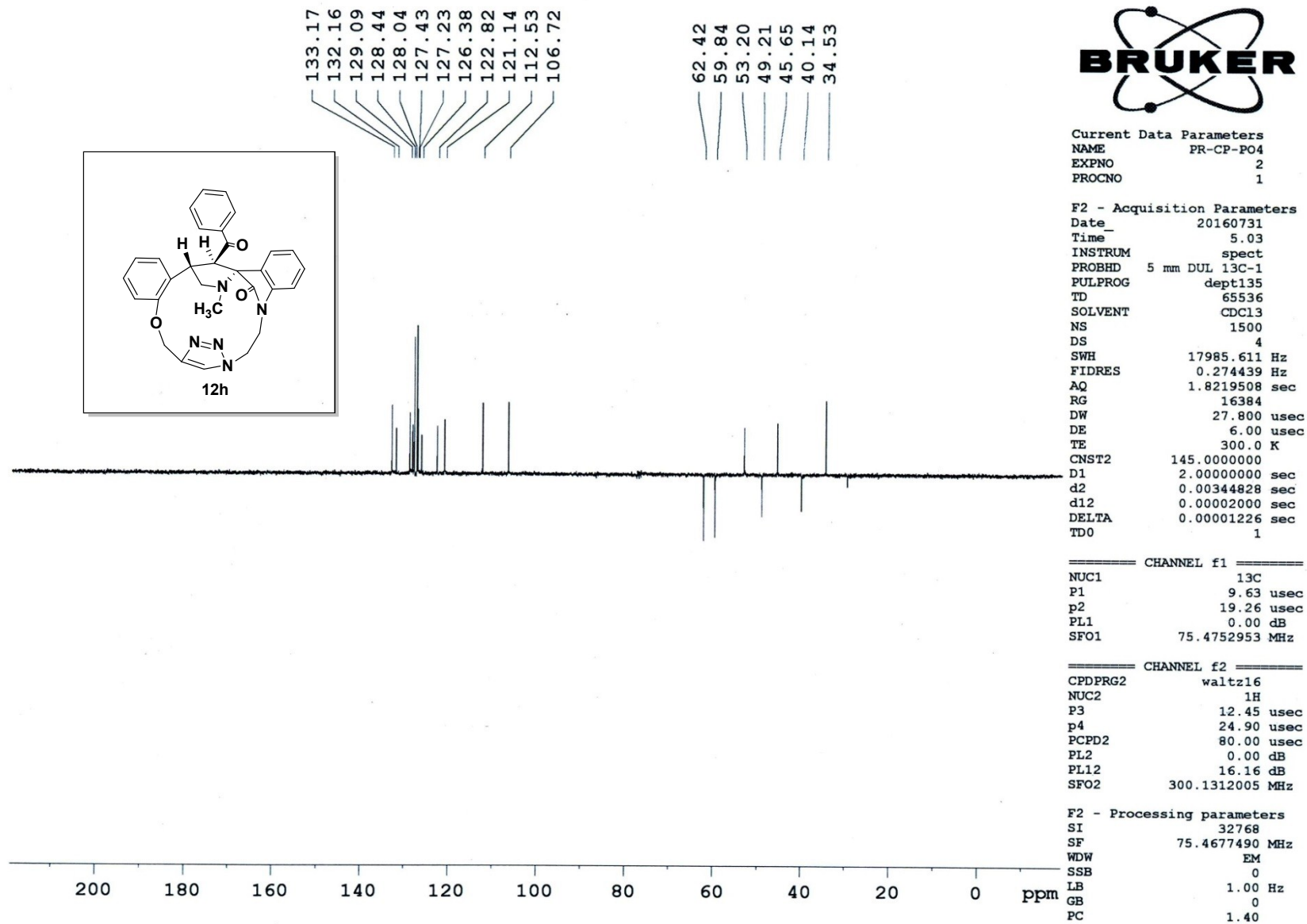
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 PROCNO 1

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 DS 4  
 SWH 17985.611 Hz  
 FIDRES 0.274439 Hz  
 AQ 1.8219508 sec  
 RG 912.3  
 DW 27.800 usec  
 DE 6.00 usec  
 TE 300.0 K  
 D1 2.00000000 sec  
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 DELTA 1.89999998 sec  
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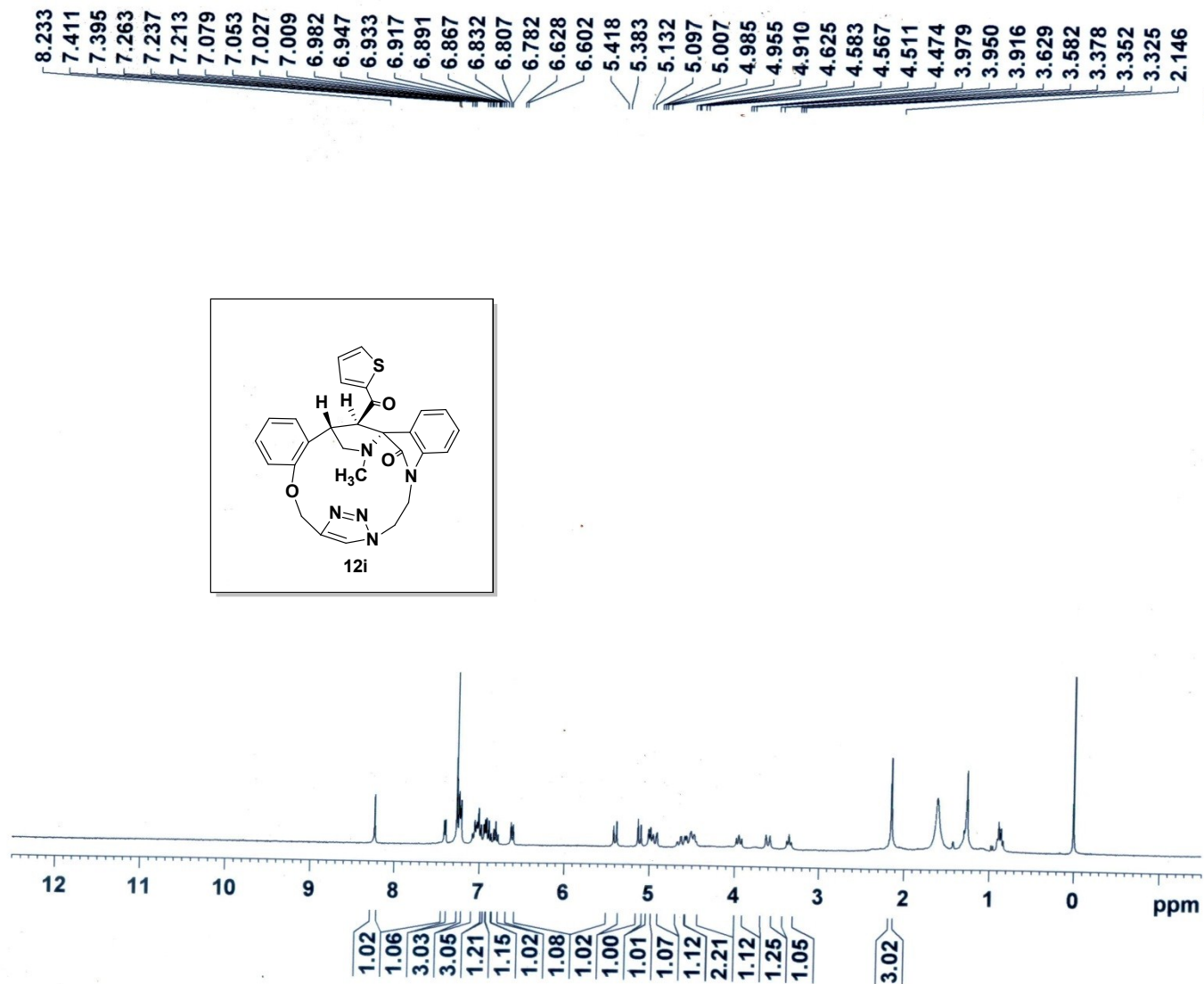
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 PL1 0.00 dB  
 SFO1 75.4752953 MHz

===== CHANNEL f2 =====  
 CPDPRG2 waltz16  
 NUC2 1H  
 PCPD2 80.00 usec  
 PL2 0.00 dB  
 PL12 16.16 dB  
 PL13 16.00 dB  
 SFO2 300.1312005 MHz

F2 - Processing parameters  
 SI 32768  
 SF 75.4677479 MHz  
 WDW EM  
 SSB 0  
 LB 1.00 Hz  
 GB 0  
 PC 1.40



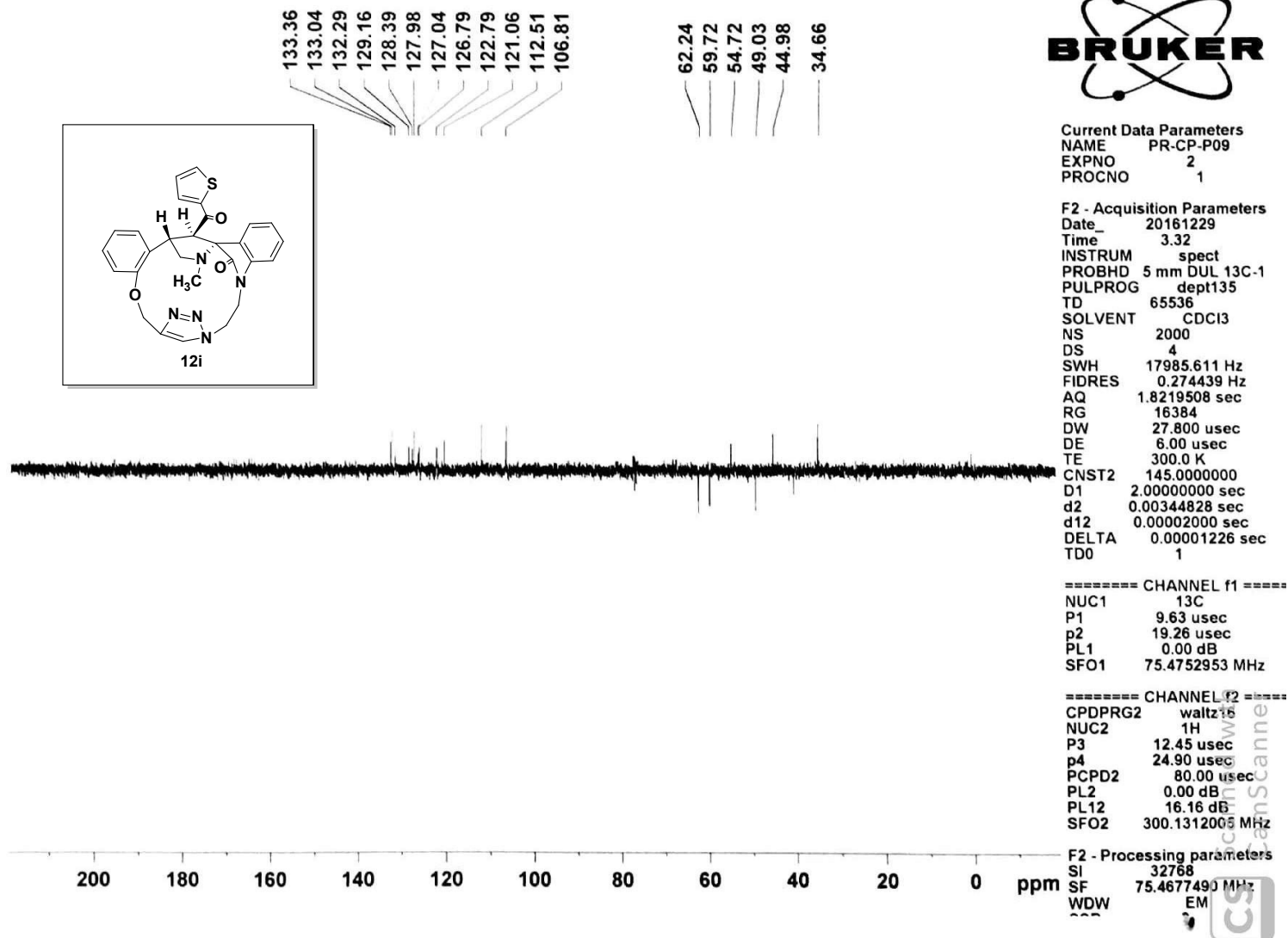
C (DEPT135) NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12h



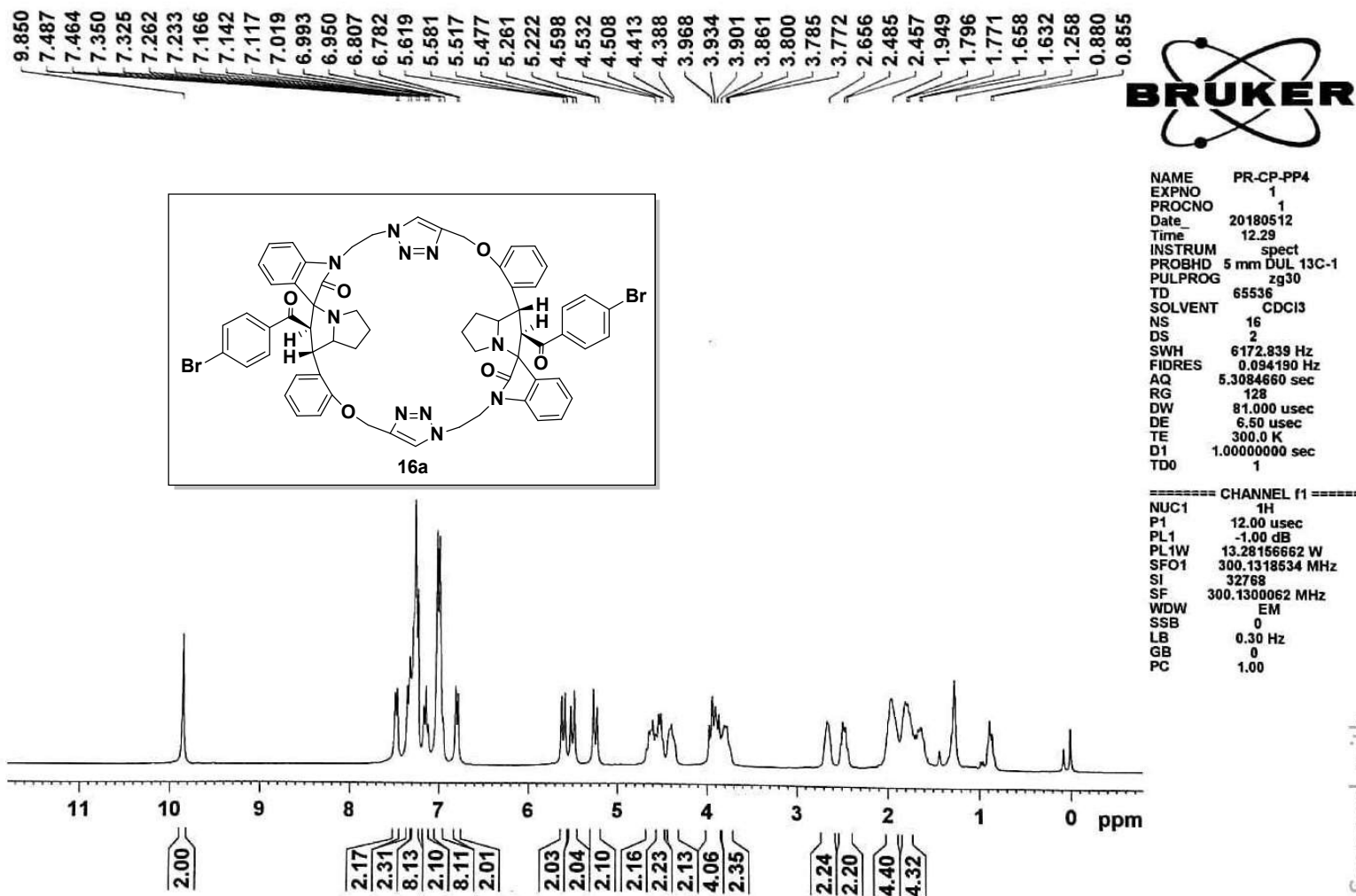
NAME PR-CP-P09  
 EXPNO 4  
 PROCNO 1  
 Date\_ 20161229  
 Time 11.42  
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 PROBHD 5 mm DUL 13C-1  
 PULPROG zg30  
 TD 65536  
 SOLVENT CDCl<sub>3</sub>  
 NS 16  
 DS 2  
 SWH 6172.839 Hz  
 FIDRES 0.094190 Hz  
 AQ 5.3084660 sec  
 RG 406.4  
 DW 81.000 usec  
 DE 6.00 usec  
 TE 300.0 K  
 D1 1.00000000 sec  
 TD0 1

===== CHANNEL f1 =====  
 NUC1 1H  
 P1 12.45 usec  
 PL1 0.00 dB  
 SFO1 300.1318534 MHz  
 SI 32768  
 SF 300.1300054 MHz  
 WDW EM  
 SSB 0  
 LB 0.30 Hz  
 GB 0  
 PC 1.00

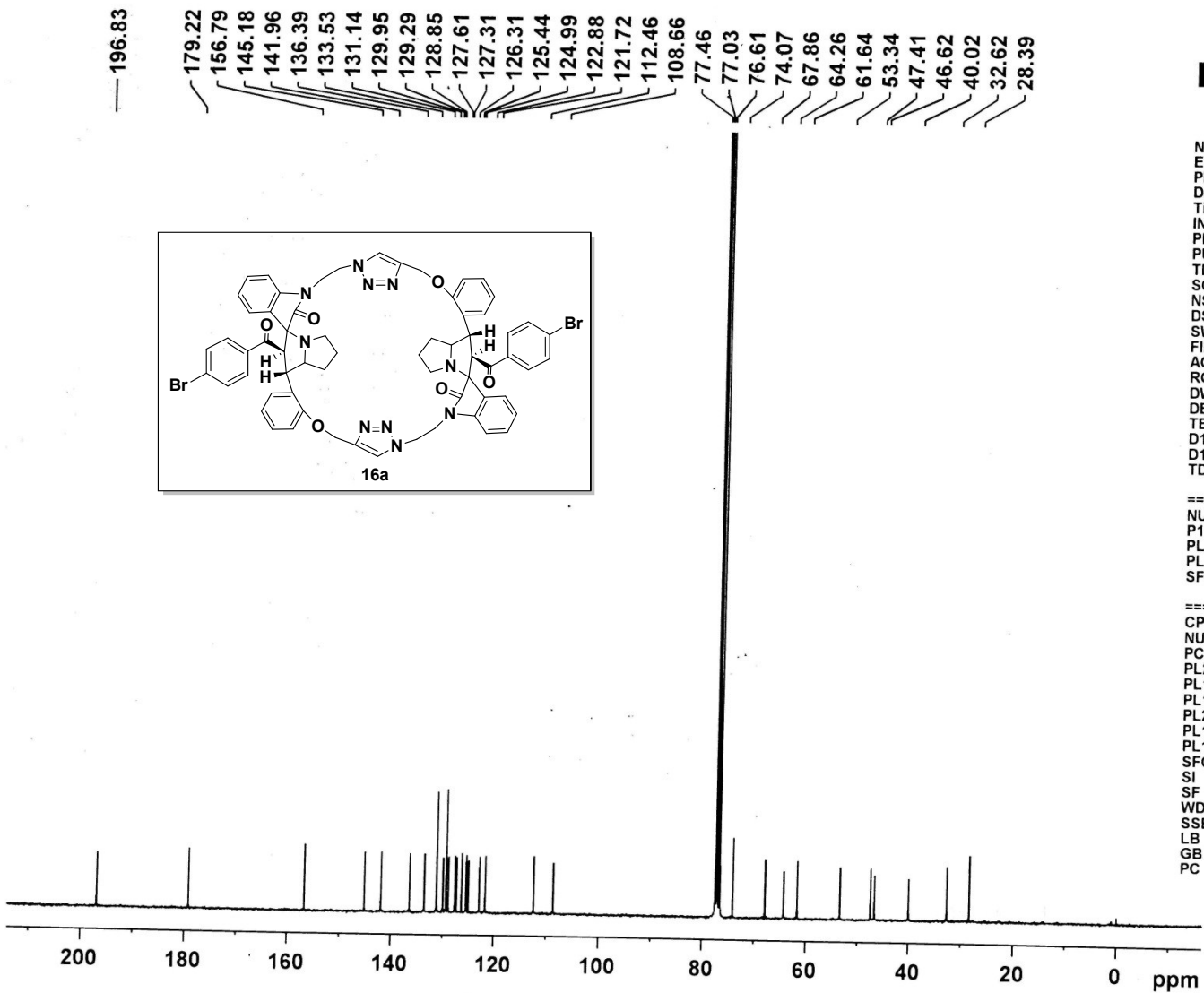
<sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12i



<sup>13</sup>C (DEPT135) NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Spiropyrrolidine -oxindole grafted macrocycle 12i



<sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 16a

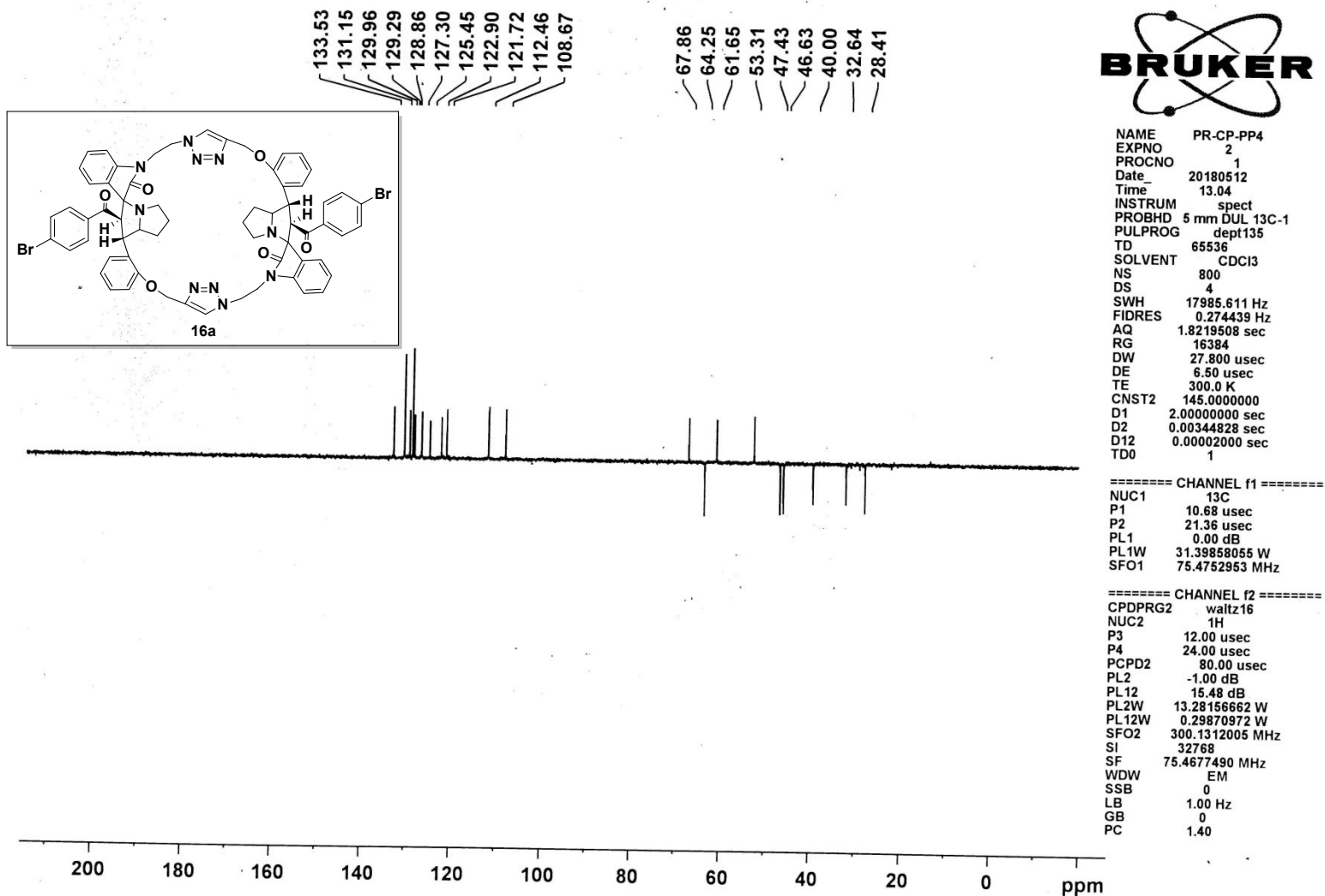


NAME PR-CP-PP4  
 EXPNO 3  
 PROCNO 1  
 Date\_ 20180512  
 Time\_ 22.54  
 INSTRUM spect  
 PROBHD 5 mm DUL 13C-1  
 PULPROG zgpg30  
 TD 65536  
 SOLVENT CDCl3  
 NS 8000  
 DS 4  
 SWH 17985.611 Hz  
 FIDRES 0.274439 Hz  
 AQ 1.8219508 sec  
 RG 1625.5  
 DW 27.800 usec  
 DE 6.50 usec  
 TE 300.0 K  
 D1 2.00000000 sec  
 D11 0.03000000 sec  
 TD0 1

===== CHANNEL f1 =====  
 NUC1 13C  
 P1 10.68 usec  
 PL1 0.00 dB  
 PL1W 31.39858055 W  
 SFO1 75.4752953 MHz

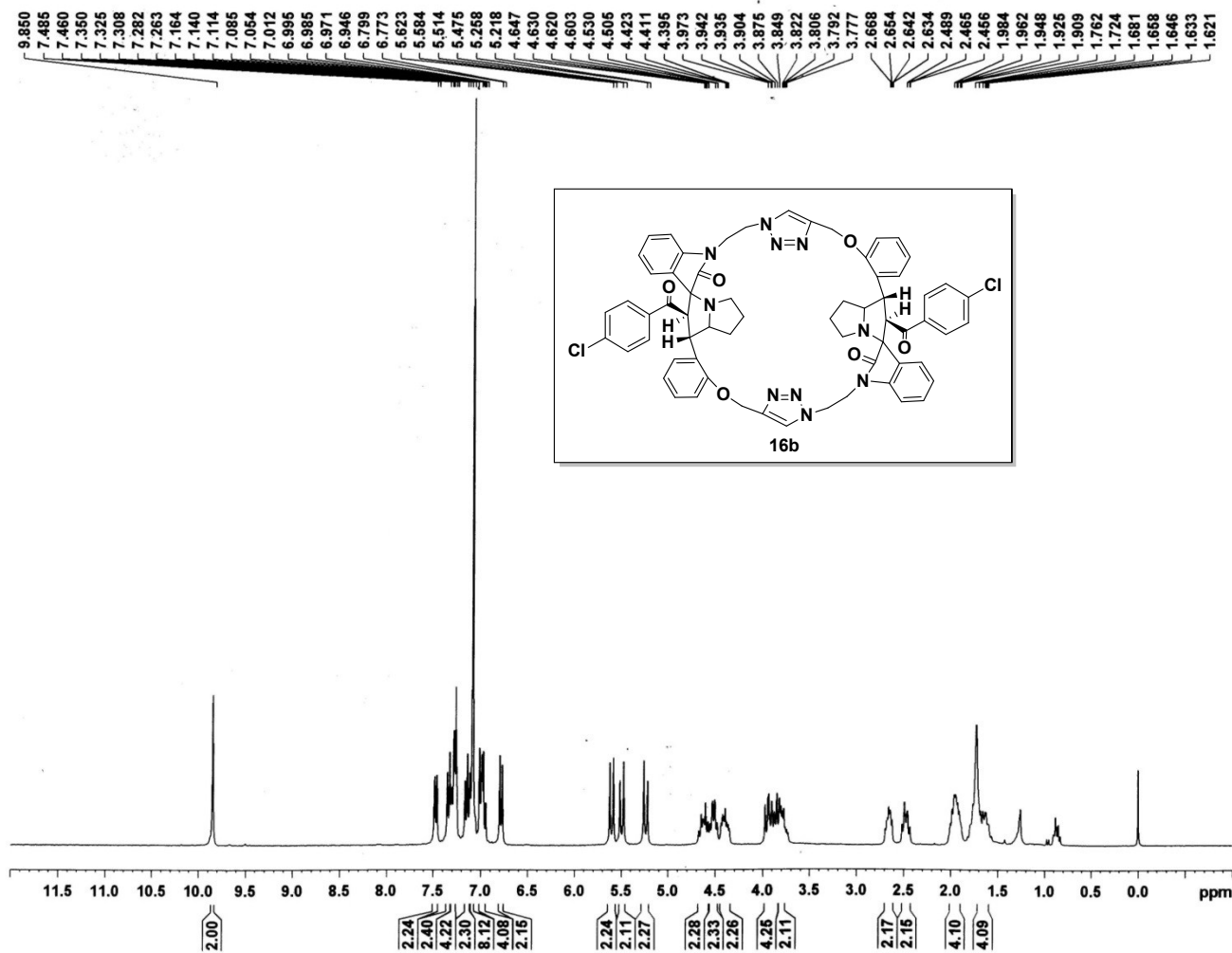
===== CHANNEL f2 =====  
 CPDPRG2 waltz16  
 NUC2 1H  
 PCPD2 80.00 usec  
 PL2 -1.00 dB  
 PL12 15.48 dB  
 PL13 16.00 dB  
 PL2W 13.28156662 W  
 PL12W 0.29870972 W  
 PL13W 0.26500207 W  
 SFO2 300.1312005 MHz  
 SI 32768  
 SF 75.4677490 MHz  
 WDW EM  
 SSB 0  
 LB 1.00 Hz  
 GB 0  
 PC 1.40

**<sup>13</sup>C NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 16a**



**<sup>13</sup>C (DEPT135) NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 16a**

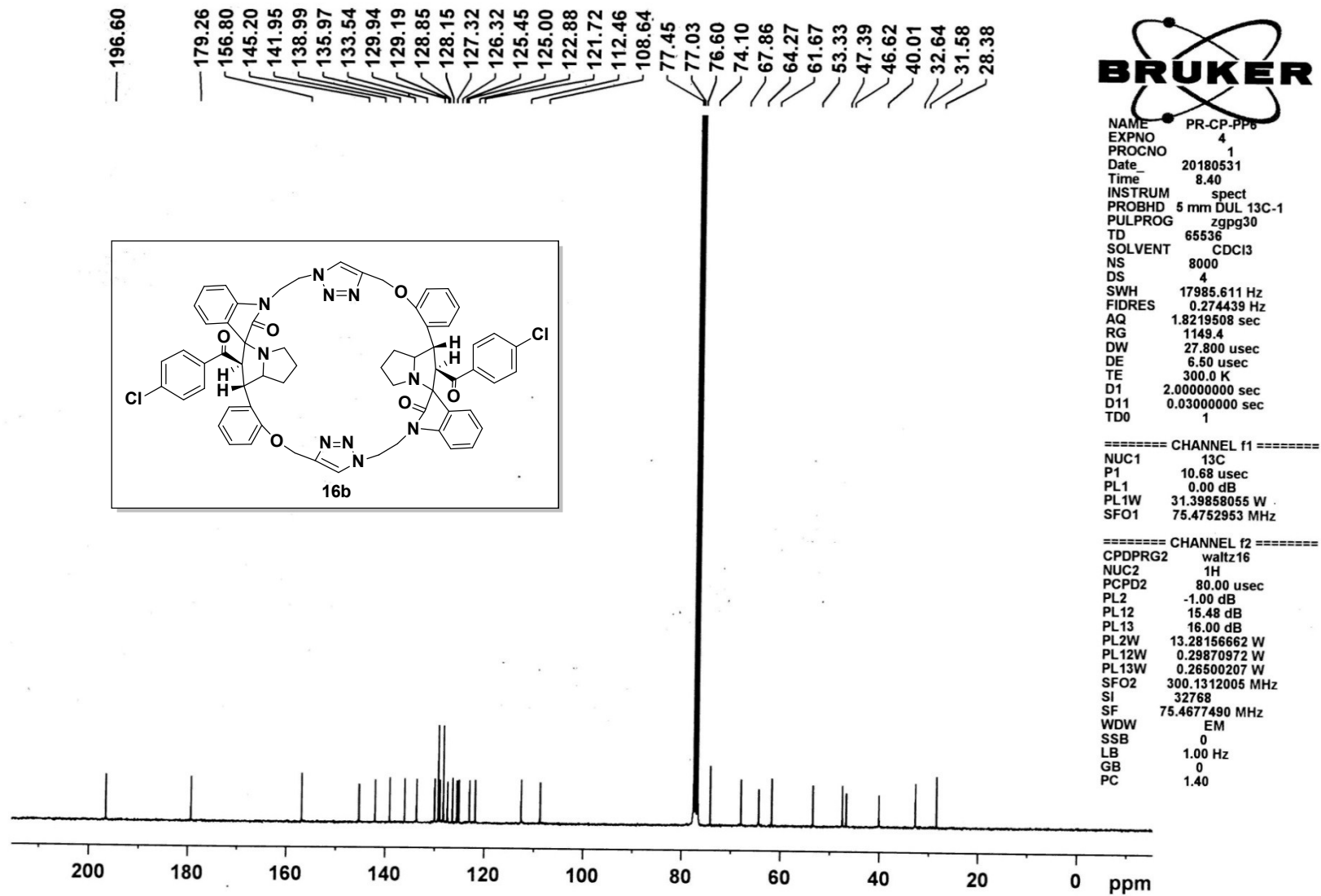




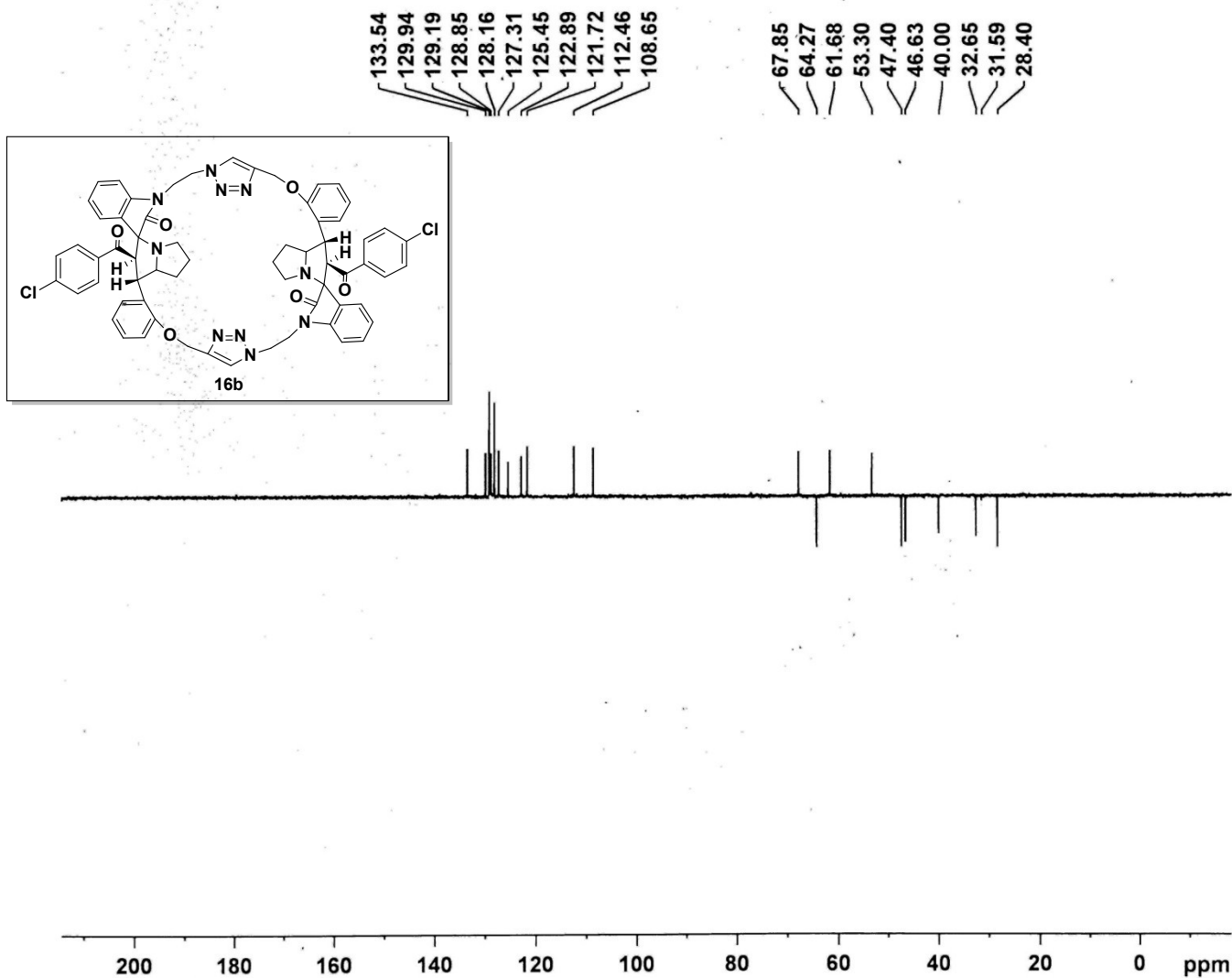
NAME PR-CP-PP6  
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 PROCNO 1  
 Date\_ 20180531  
 Time 9.47  
 INSTRUM spect  
 PROBHD 5 mm DUL 13C-1  
 PULPROG zg30  
 TD 65536  
 SOLVENT CDCl3  
 NS 16  
 DS 2  
 SWH 6172.839 Hz  
 FIDRES 0.094190 Hz  
 AQ 5.3084660 sec  
 RG 161.3  
 DW 81.000 usec  
 DE 6.50 usec  
 TE 300.0 K  
 D1 1.00000000 sec  
 TD0 1

===== CHANNEL f1 =====  
 NUC1 1H  
 P1 12.00 usec  
 PL1 -1.00 dB  
 PL1W 13.28156682 W  
 SFO1 300.1318534 MHz  
 SI 32768  
 SF 300.1300062 MHz  
 WDW EM  
 SSB 0  
 LB 0.30 Hz  
 GB 0  
 PC 1.00

<sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 16b



**<sup>13</sup>C NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 16b**

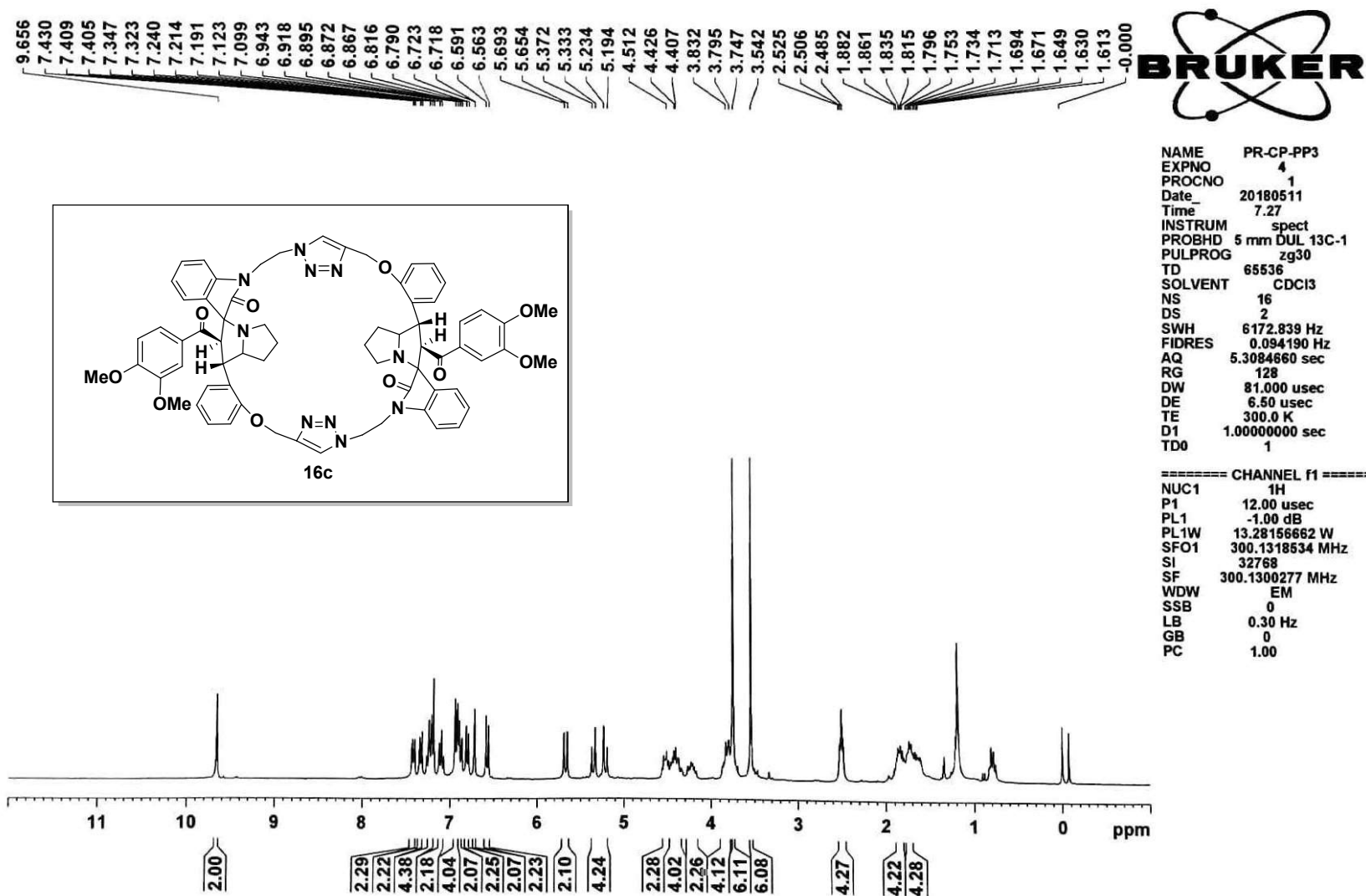


NAME PR-CP-PP6  
 EXPNO 5  
 PROCNO 1  
 Date\_ 20180531  
 Time 9.45  
 INSTRUM spect  
 PROBHD 5 mm DUL 13C-1  
 PULPROG dept135  
 TD 65536  
 SOLVENT CDCl3  
 NS 1000  
 DS 4  
 SWH 17985.611 Hz  
 FIDRES 0.274439 Hz  
 AQ 1.8219508 sec  
 RG 16384  
 DW 27.800 usec  
 DE 6.50 usec  
 TE 300.0 K  
 CNST2 145.000000  
 D1 2.00000000 sec  
 D2 0.00344828 sec  
 D12 0.00002000 sec  
 TD0 1

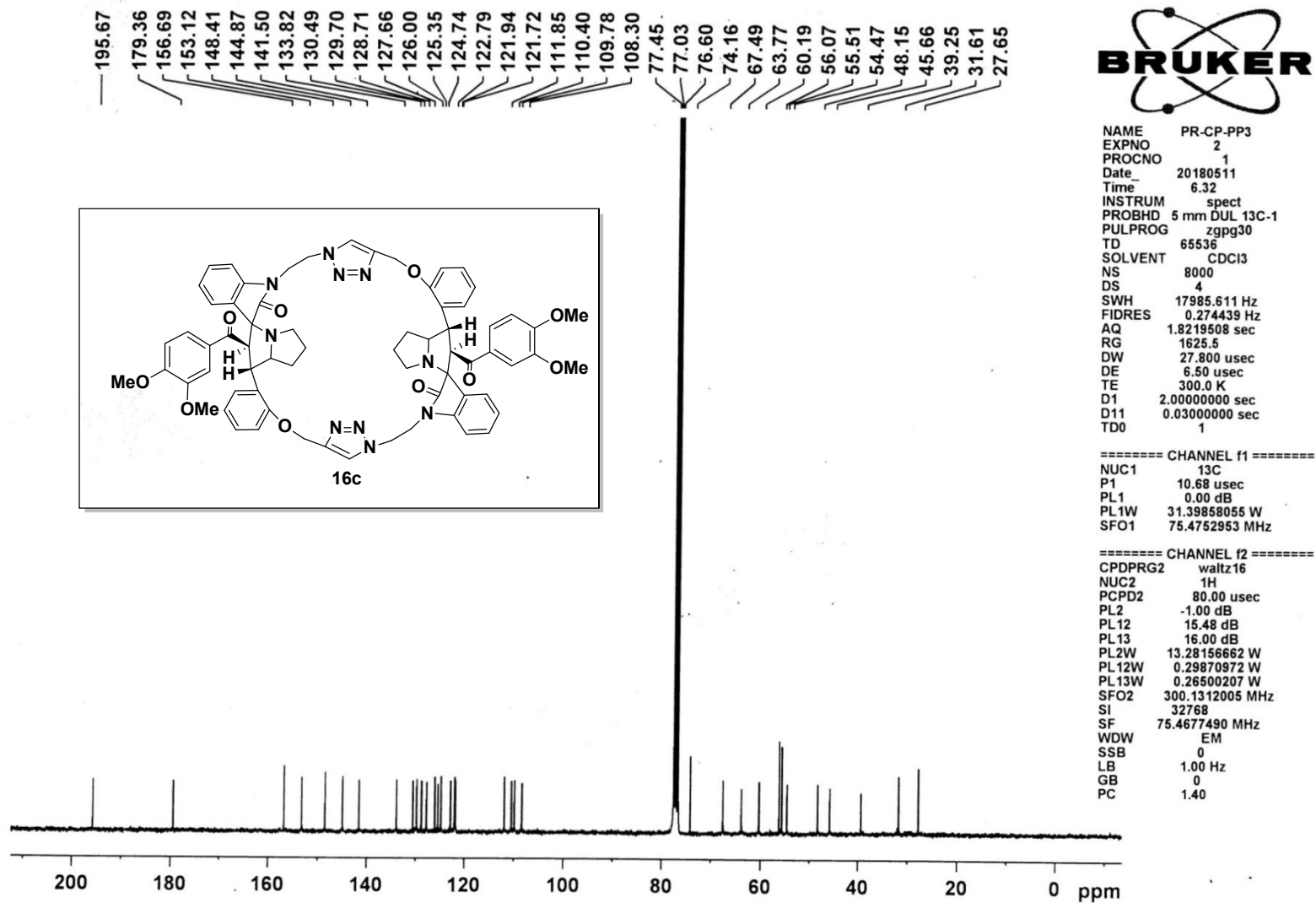
===== CHANNEL f1 =====  
 NUC1 13C  
 P1 10.68 usec  
 P2 21.36 usec  
 PL1 0.00 dB  
 PL1W 31.39858055 W  
 SFO1 75.4752953 MHz

===== CHANNEL f2 =====  
 CPDPRG2 waltz16  
 NUC2 1H  
 P3 12.00 usec  
 P4 24.00 usec  
 PCPD2 80.00 usec  
 PL2 -1.00 dB  
 PL12 15.48 dB  
 PL2W 13.28156662 W  
 PL12W 0.29870972 W  
 SFO2 300.1312005 MHz  
 SI 32768  
 SF 75.4677490 MHz  
 WDW EM  
 SSB 0  
 LB 1.00 Hz  
 GB 0  
 PC 1.40

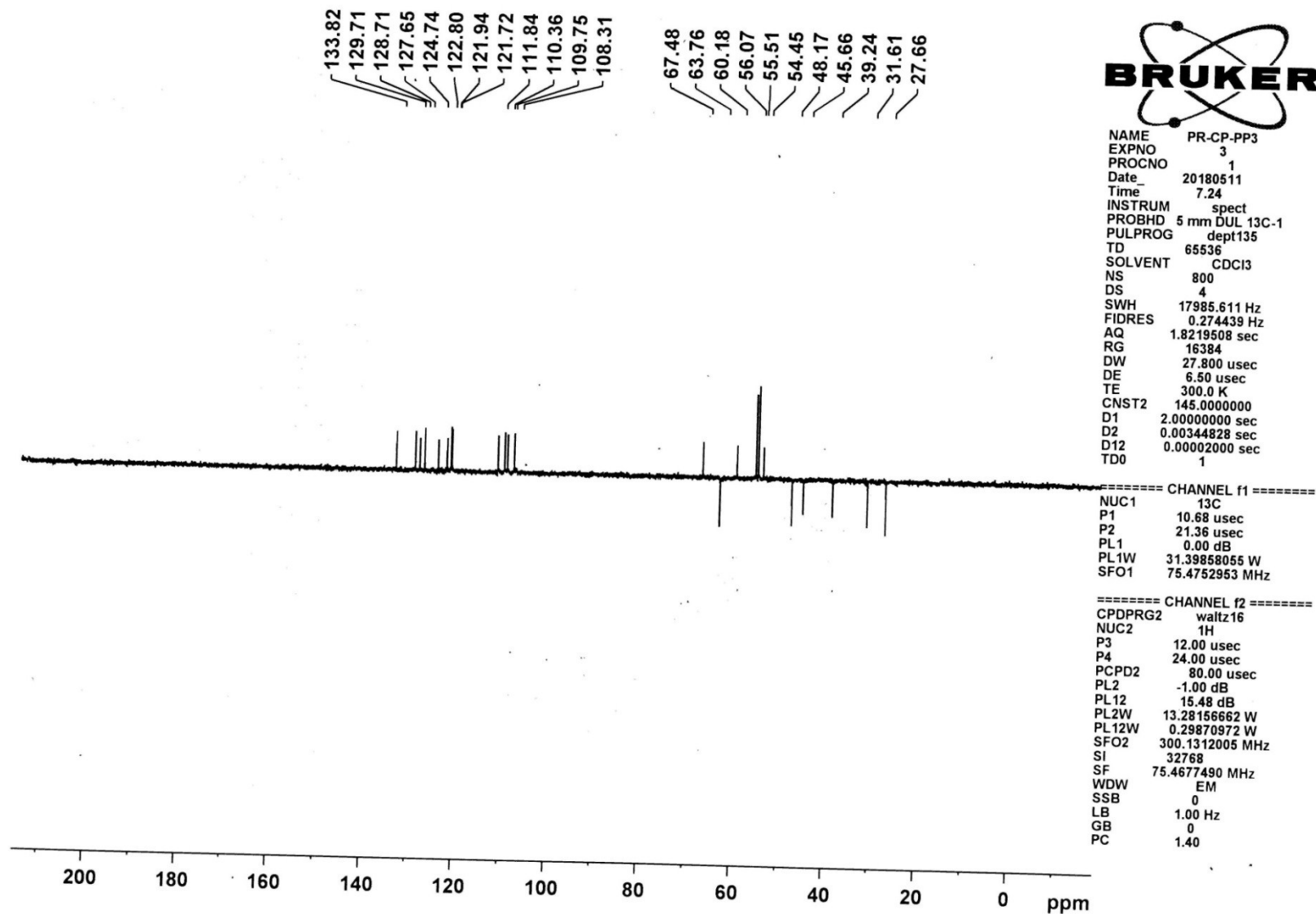
<sup>13</sup>C (DEPT135) NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 16b



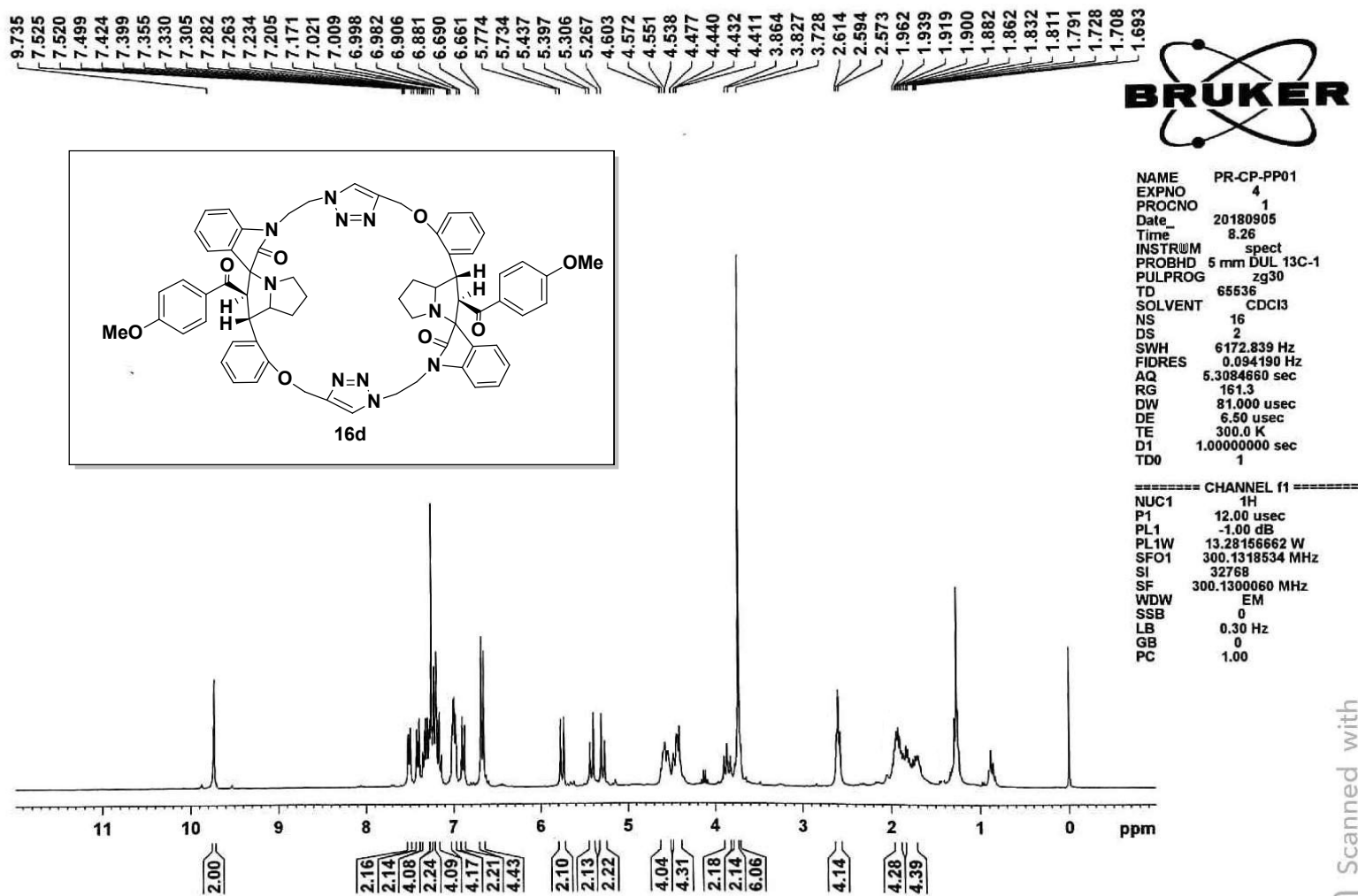
<sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 16c



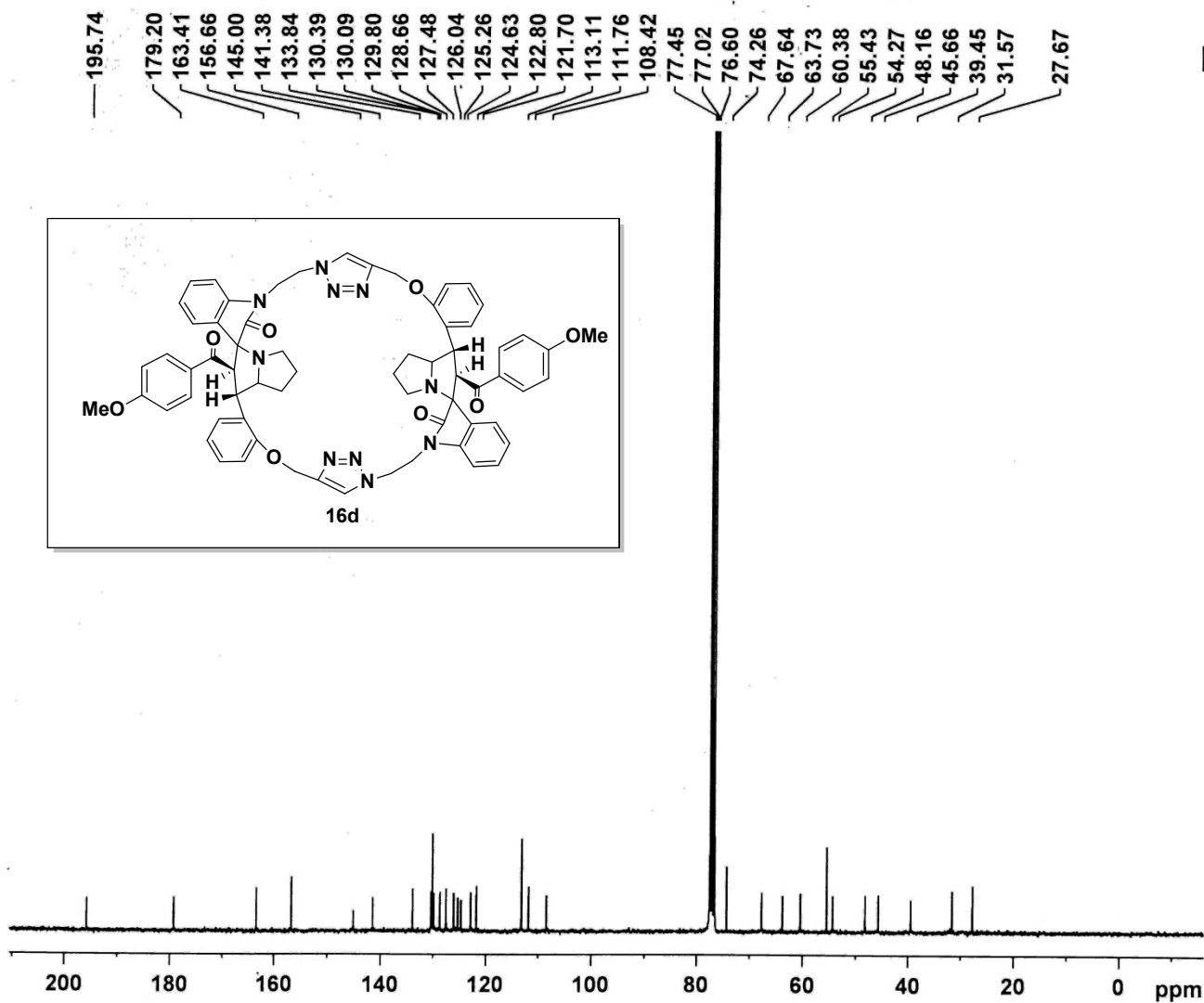
**<sup>13</sup>C NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Bis-spiropyrrolizidine -oxindole grafted macrocycle 16c**



$^{13}\text{C}$  (DEPT135) NMR ( $\text{CDCl}_3$ , 75MHz) Spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 16c



<sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 16d



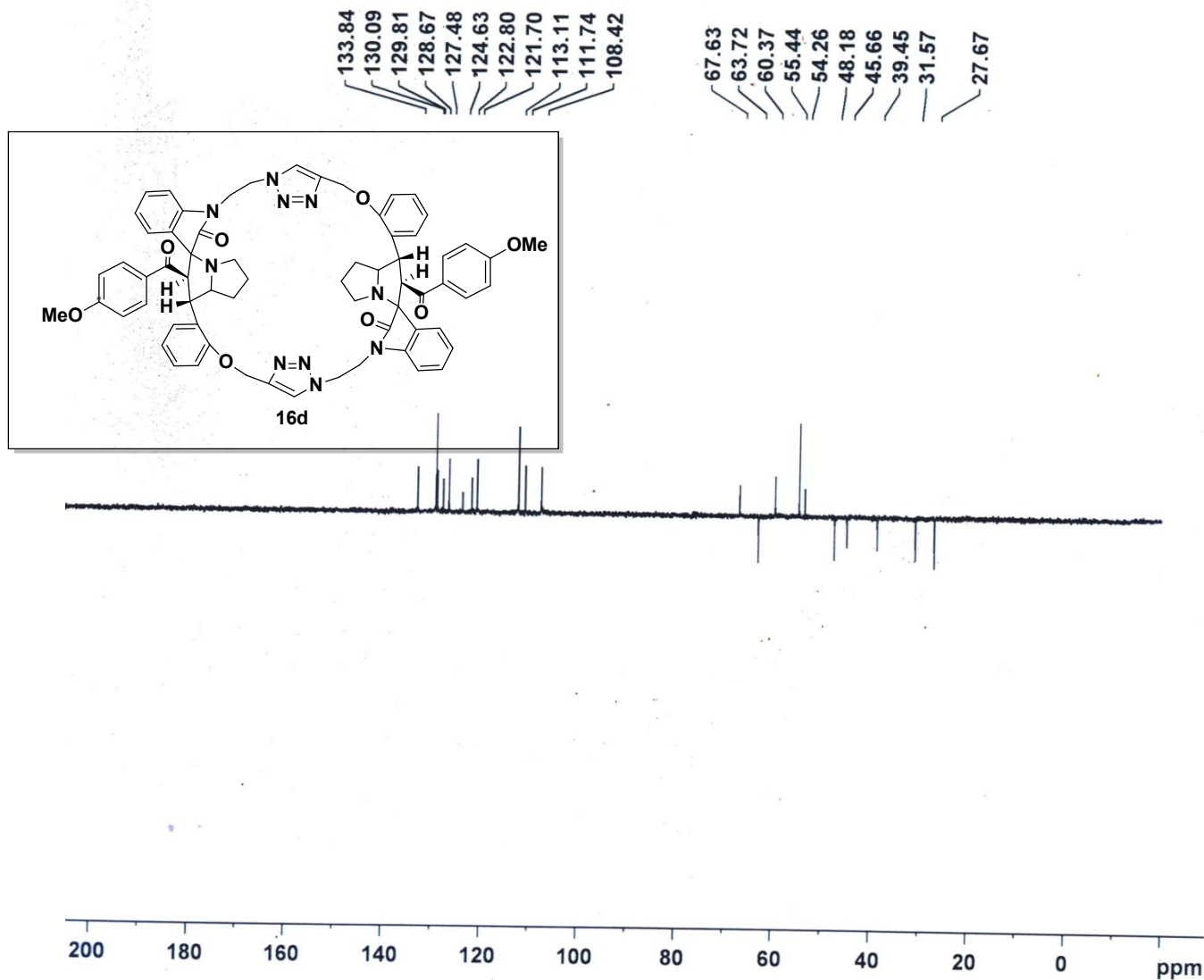
NAME PR-CP-PP01  
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 PROCNO 1  
 Date 20180905  
 Time 7.02  
 INSTRUM spect  
 PROBHD 5 mm DUL 13C-1  
 PULPROG zgpg30  
 TD 65536  
 SOLVENT CDCl3  
 NS 8000  
 DS 4  
 SWH 17985.611 Hz  
 FIDRES 0.274439 Hz  
 AQ 1.8219508 sec  
 RG 2896.3  
 DW 27.800 usec  
 DE 6.50 usec  
 TE 300.0 K  
 D1 2.0000000 sec  
 D11 0.0300000 sec  
 TD0 1

===== CHANNEL f1 =====  
 NUC1 13C  
 P1 10.68 usec  
 PL1 0.00 dB  
 PL1W 31.39858055 W  
 SFO1 75.4752953 MHz

===== CHANNEL f2 =====  
 CPDPRG2 waltz16  
 NUC2 1H  
 PCPD2 80.00 usec  
 PL2 -1.00 dB  
 PL12 15.48 dB  
 PL13 16.00 dB  
 PL2W 13.28156662 W  
 PL12W 0.29870972 W  
 PL13W 0.26500207 W  
 SFO2 300.1312005 MHz  
 SI 32768  
 SF 75.4677490 MHz  
 WDW EM  
 SSB 0  
 LB 1.00 Hz  
 GB 0  
 PC 1.40

**<sup>13</sup>C NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 15d**



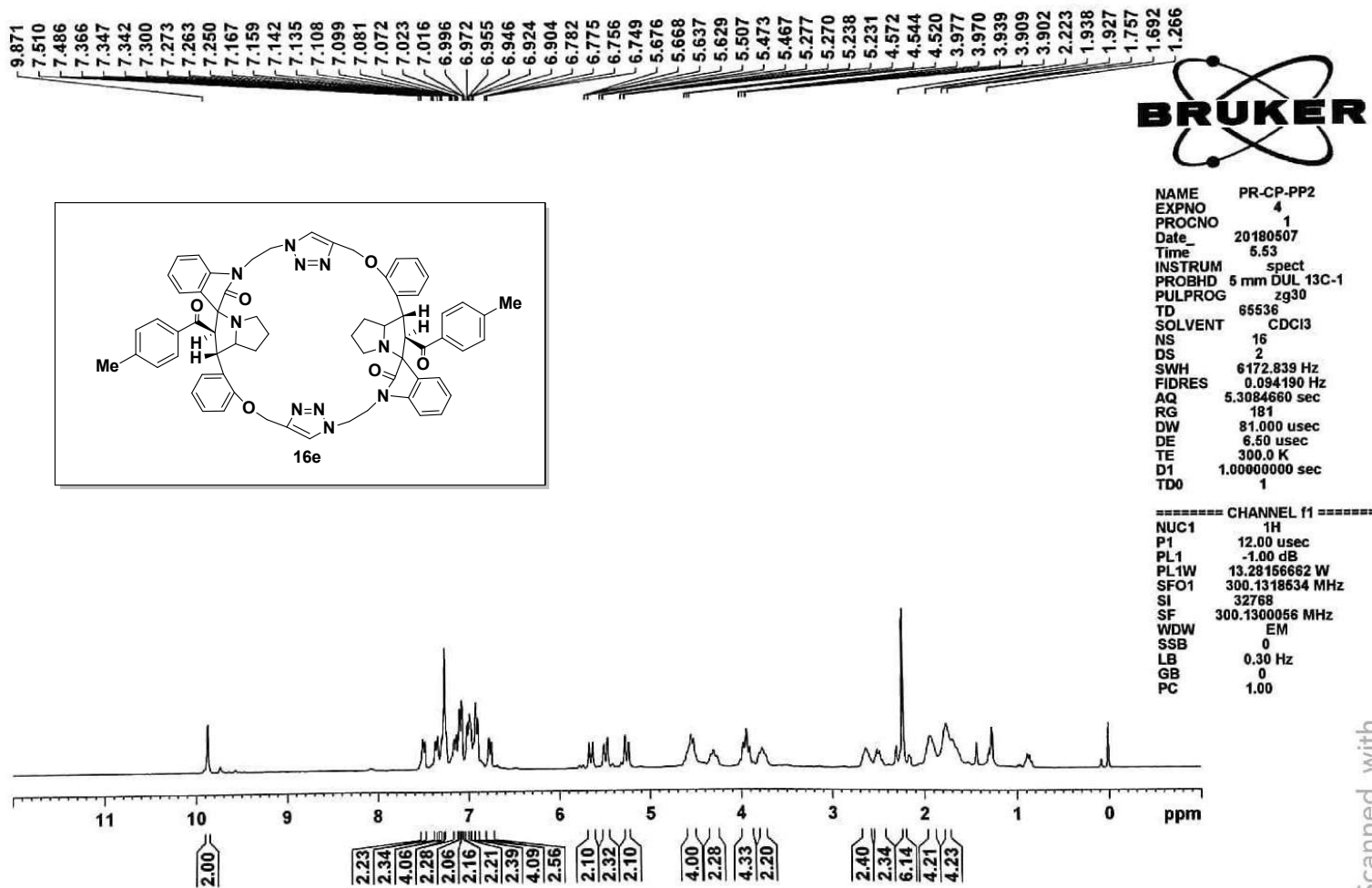


NAME PR-CP-PP01  
 EXPNO 3  
 PROCNO 1  
 Date\_ 20180905  
 Time 8.23  
 INSTRUM spect  
 PROBHD 5 mm DUL 13C-1  
 PULPROG dept135  
 TD 65536  
 SOLVENT CDCl3  
 NS 1250  
 DS 4  
 SWH 17985.611 Hz  
 FIDRES 0.274439 Hz  
 AQ 1.8219508 sec  
 RG 16384  
 DW 27.800 usec  
 DE 6.50 usec  
 TE 300.0 K  
 CNST2 145.0000000  
 D1 2.00000000 sec  
 D2 0.00344828 sec  
 D12 0.00002000 sec  
 TD0 1

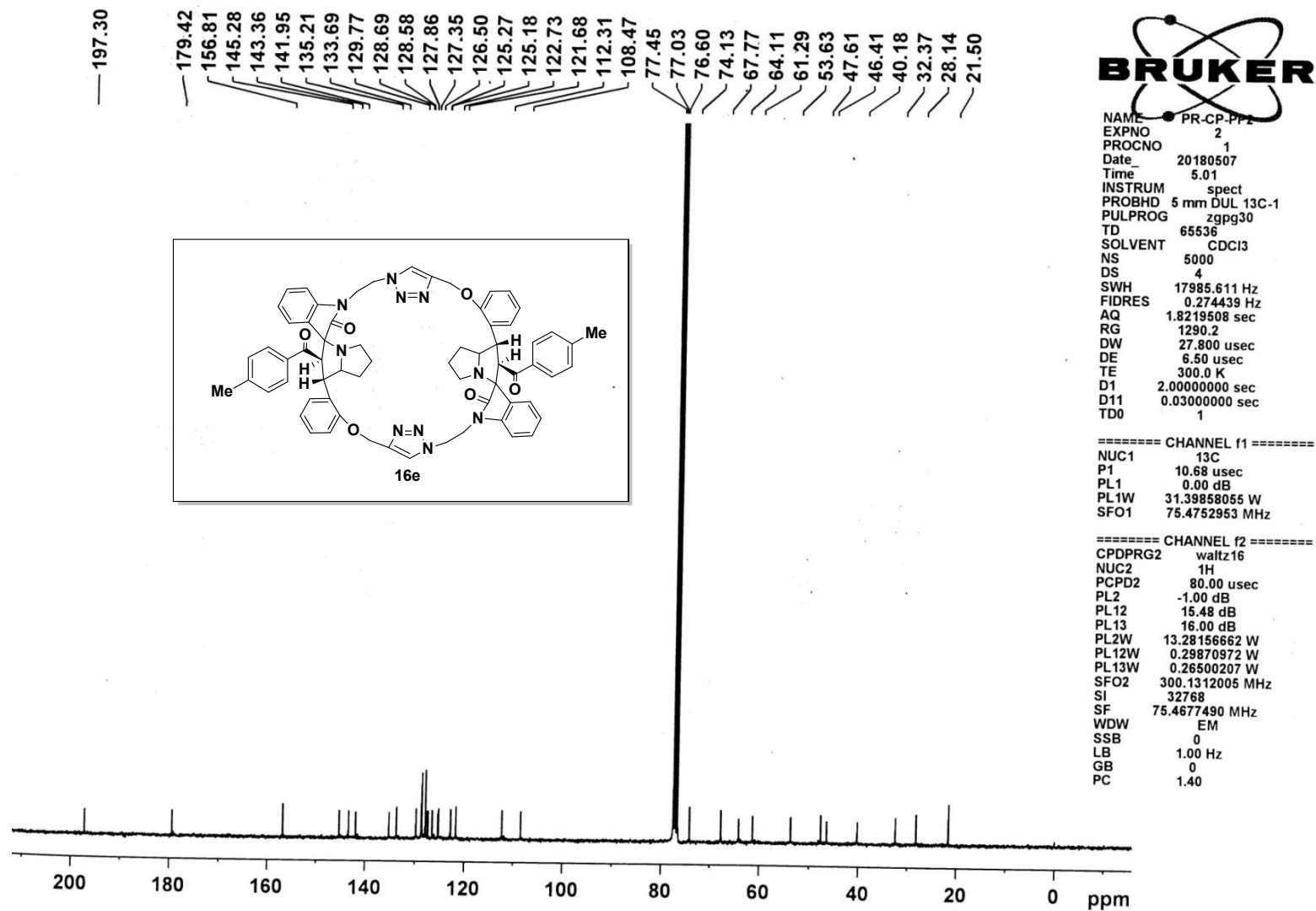
===== CHANNEL f1 =====  
 NUC1 13C  
 P1 10.68 usec  
 P2 21.36 usec  
 PL1 0.00 dB  
 PL1W 31.39858055 W  
 SFO1 75.4752953 MHz

===== CHANNEL f2 =====  
 CPDPRG2 waltz16  
 NUC2 1H  
 P3 12.00 usec  
 P4 24.00 usec  
 PCPD2 80.00 usec  
 PL2 -1.00 dB  
 PL12 15.48 dB  
 PL2W 13.28156662 W  
 PL12W 0.29870972 W  
 SFO2 300.1312005 MHz  
 SI 32768  
 SF 75.4677490 MHz  
 WDW EM  
 SSB 0  
 LB 1.00 Hz  
 GB 0  
 PC 1.40

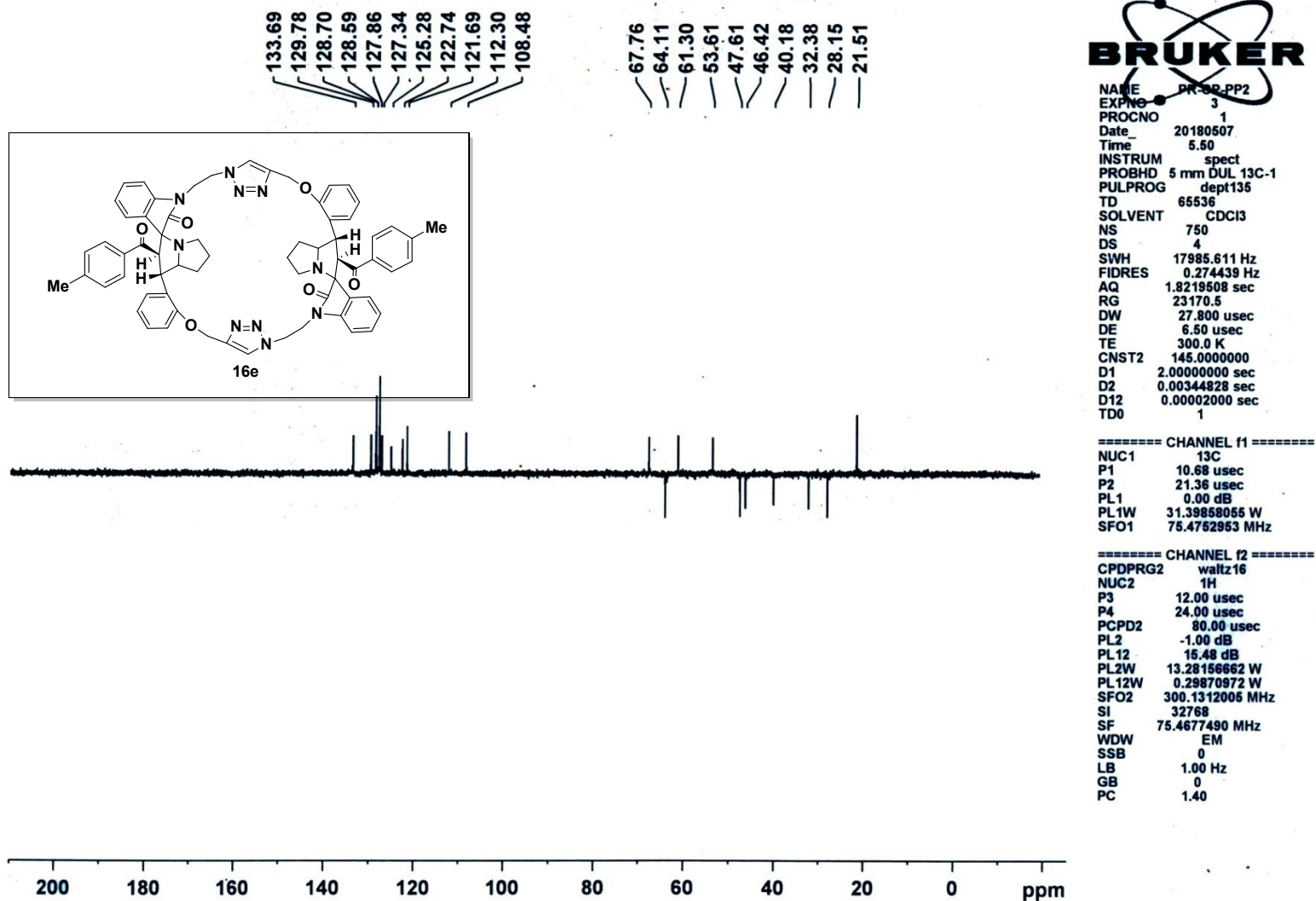
<sup>13</sup>C (DEPT135) NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 15d



<sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 15e

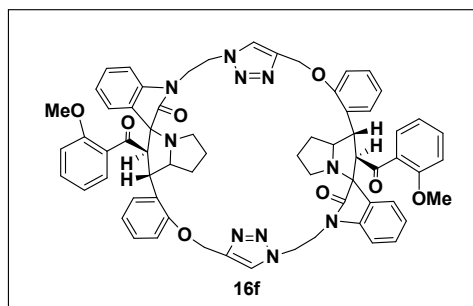


$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75MHz) Spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 15e



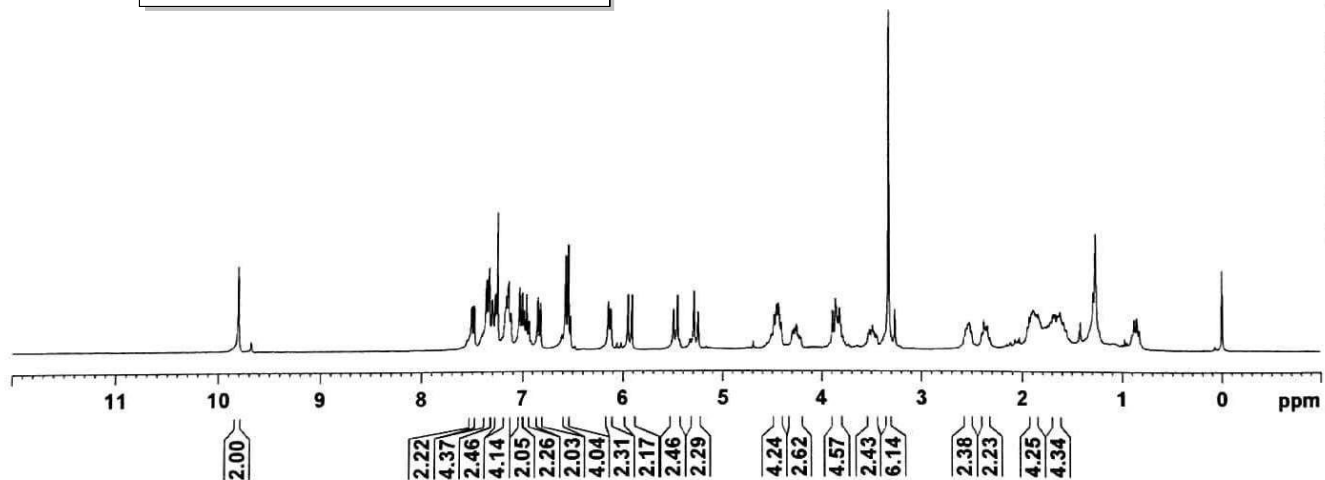
**<sup>13</sup>C (DEPT135) NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Bis-spiropyrrrolidine -oxindole grafted macrocycle 15e**

9.806  
7.510  
7.486  
7.363  
7.337  
7.304  
7.273  
7.254  
7.166  
7.142  
7.127  
7.122  
7.033  
7.005  
6.989  
6.964  
6.940  
6.853  
6.827  
6.575  
6.549  
6.526  
6.147  
6.125  
5.953  
5.914  
5.497  
5.457  
5.290  
5.250  
4.481  
4.455  
4.436  
3.890  
3.860  
3.851  
3.820  
3.327  
2.525  
2.378  
1.928  
1.905  
1.891  
1.862  
1.853  
1.837  
1.715  
1.688  
1.671  
1.647  
1.619  
1.594



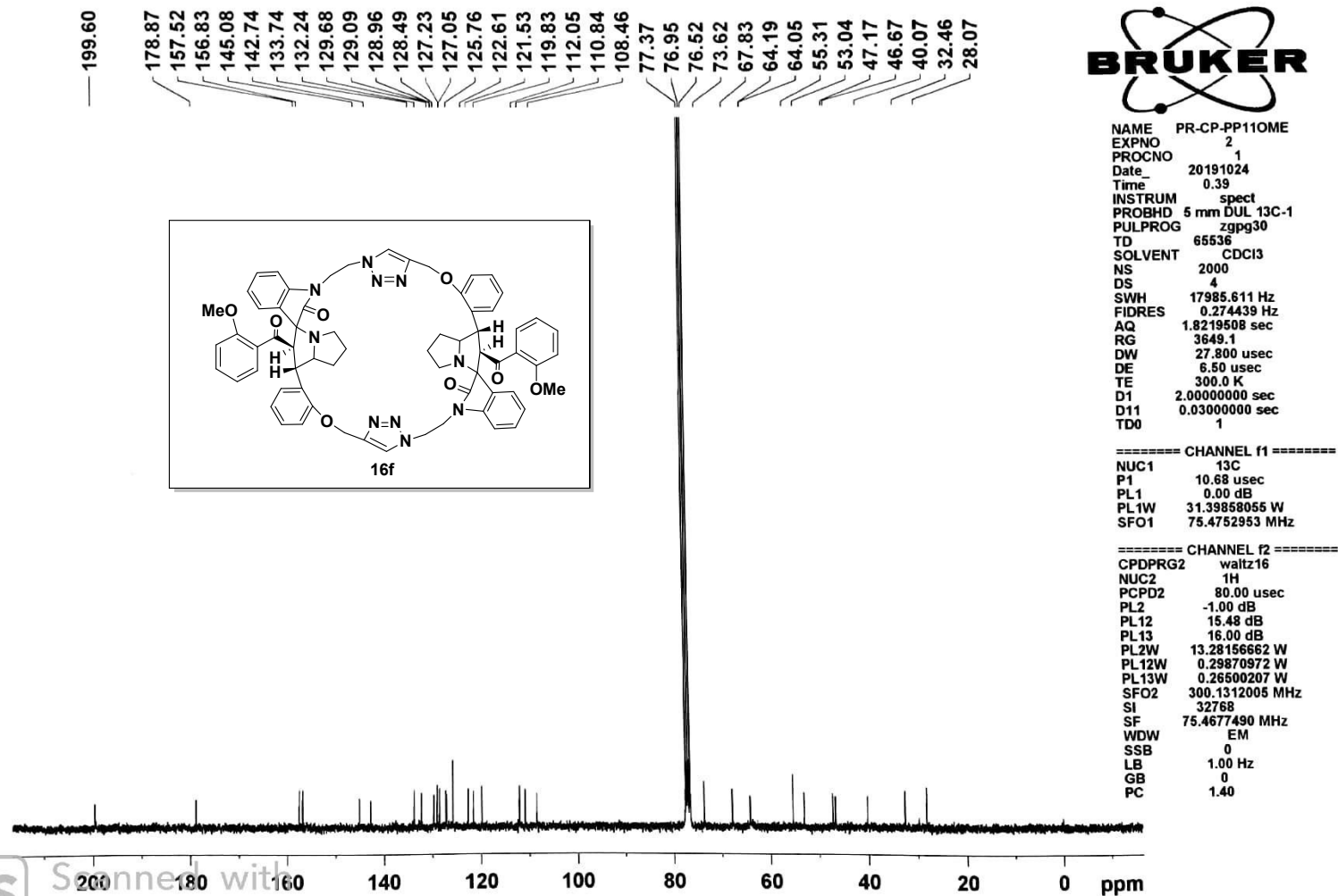
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PROCNO 1  
Date\_ 20191024  
Time 1.14  
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PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 16  
DS 2  
SWH 6172.839 Hz  
FIDRES 0.094190 Hz  
AQ 5.3084660 sec  
RG 228.1  
DW 81.000 usec  
DE 6.50 usec  
TE 300.0 K  
D1 1.00000000 sec  
TD0 1

===== CHANNEL f1 =====  
NUC1 1H  
P1 12.00 usec  
PL1 -1.00 dB  
PL1W 13.28156662 W  
SFO1 300.1318534 MHz  
SI 32768  
SF 300.1300084 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

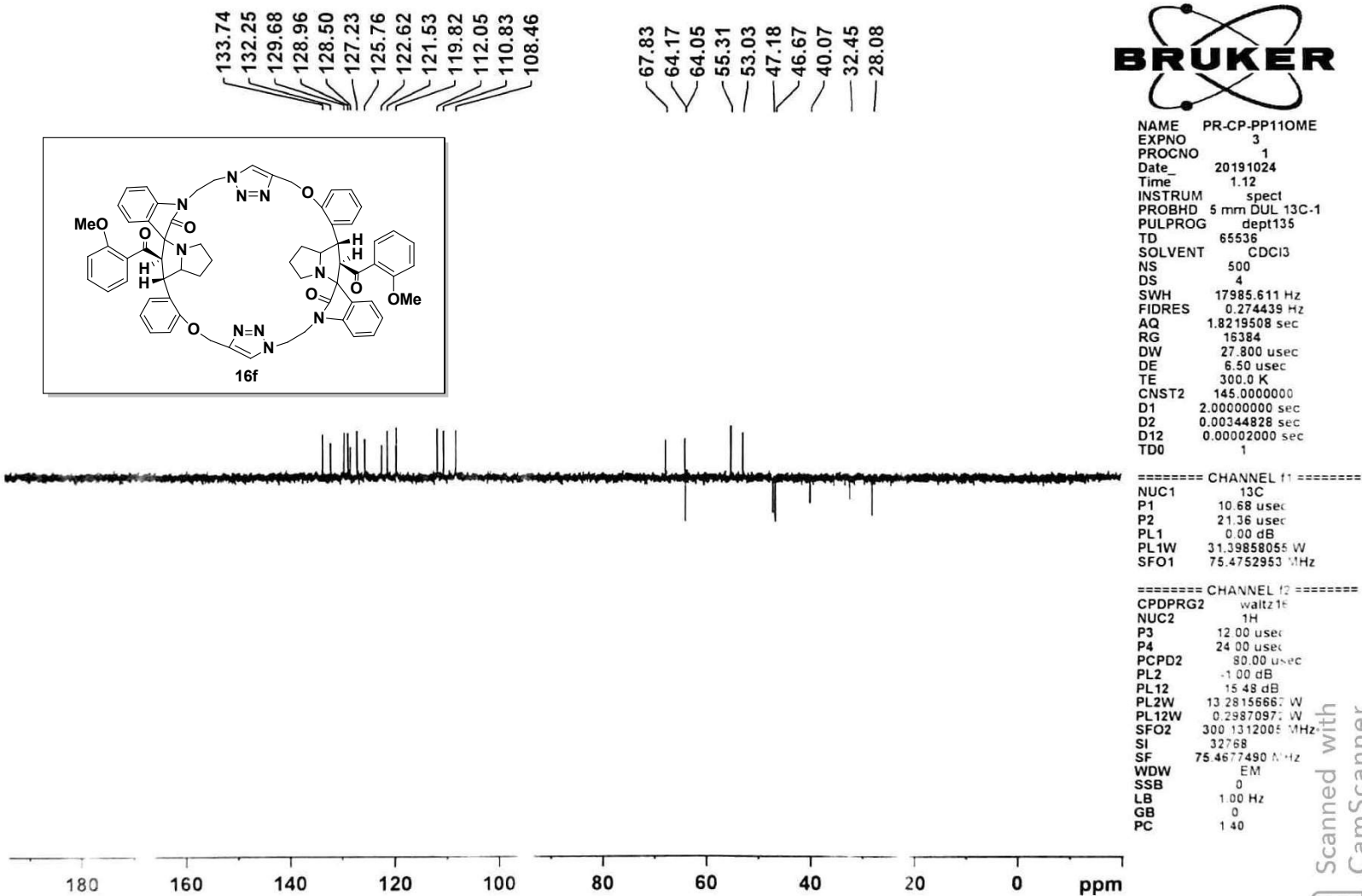


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**<sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 16f**

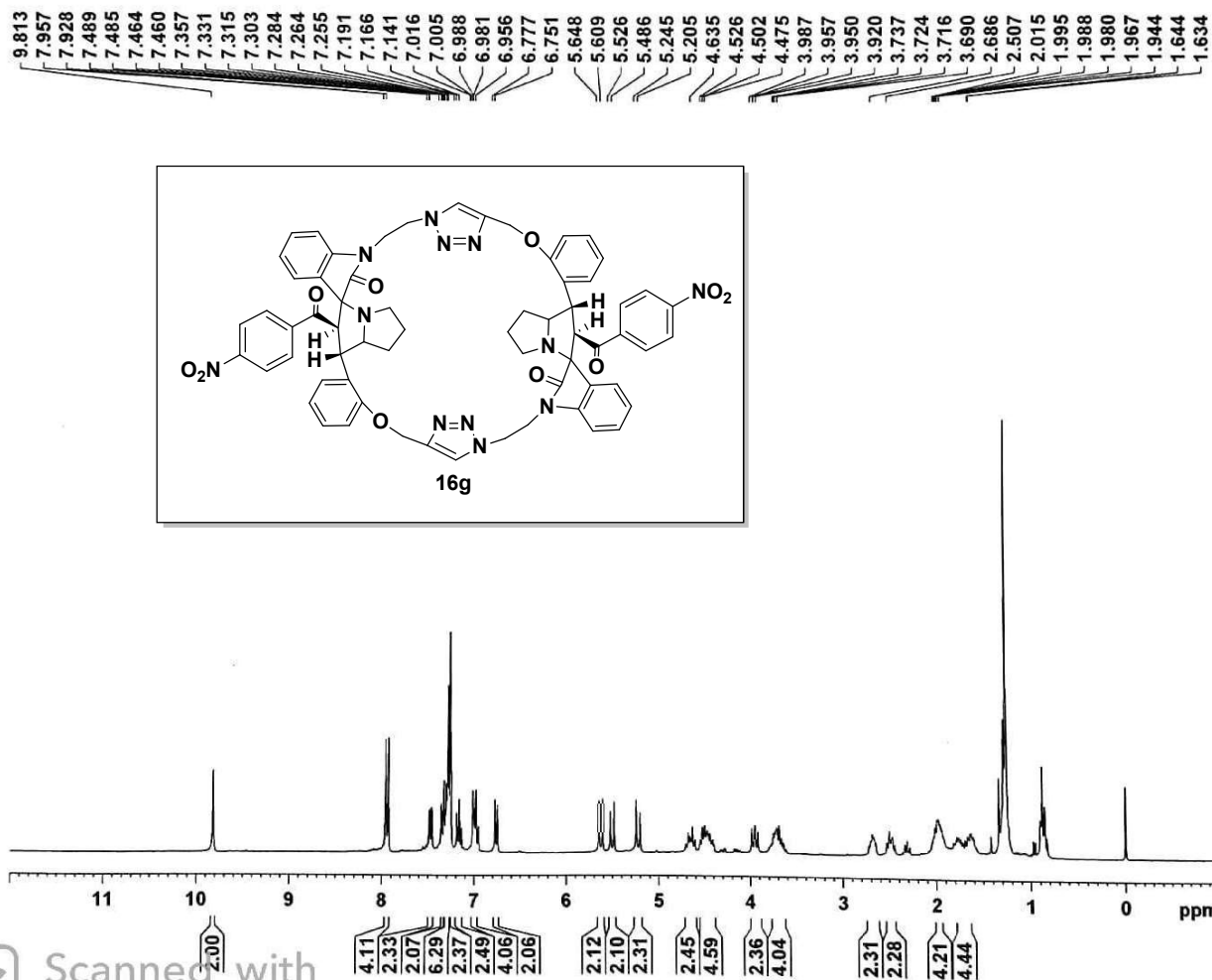


**<sup>13</sup>C NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Bis-spiropyrrolizidine -oxindole grafted macrocycle 15f**



**<sup>13</sup>C (DEPT135) NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Bis-spiropyrrolizidine -oxindole grafted macrocycle 15f**





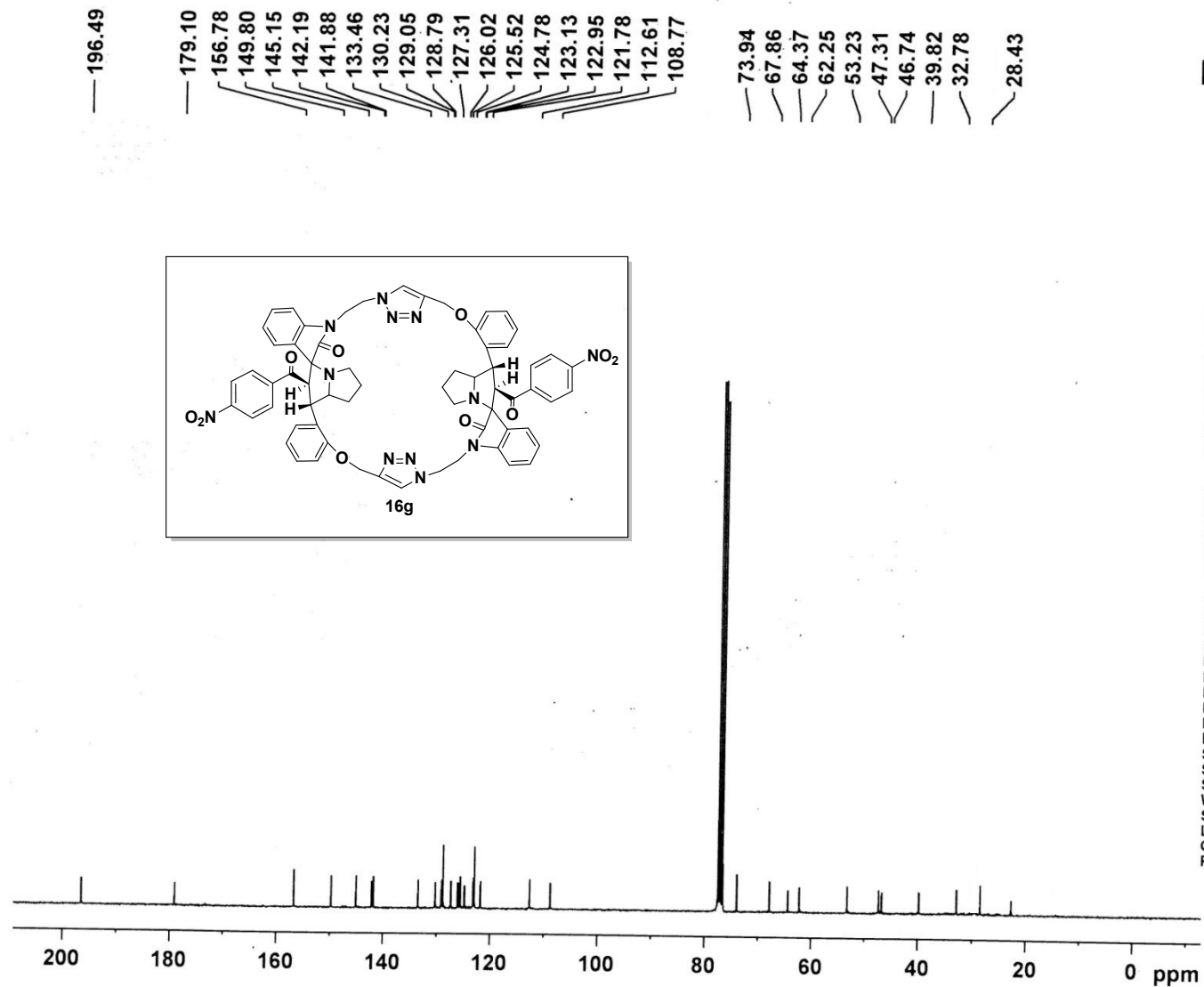
NAME PR-CP-PP9  
 EXPNO 11  
 PROCNO 1  
 Date\_ 20181004  
 Time 8.06  
 INSTRUM spect  
 PROBHD 5 mm DUL 13C-1  
 PULPROG zg30  
 TD 65536  
 SOLVENT CDCl3  
 NS 16  
 DS 2  
 SWH 6172.839 Hz  
 FIDRES 0.094190 Hz  
 AQ 5.3084660 sec  
 RG 90.5  
 DW 81.000 usec  
 DE 6.50 usec  
 TE 300.0 K  
 D1 1.00000000 sec  
 TD0 1

===== CHANNEL f1 =====  
 NUC1 1H  
 P1 12.00 usec  
 PL1 -1.00 dB  
 PL1W 13.28156662 W  
 SFO1 300.1318534 MHz  
 SI 32768  
 SF 300.1300056 MHz  
 WDW EM  
 SSB 0  
 LB 0.30 Hz  
 GB 0  
 PC 1.00



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<sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 15g

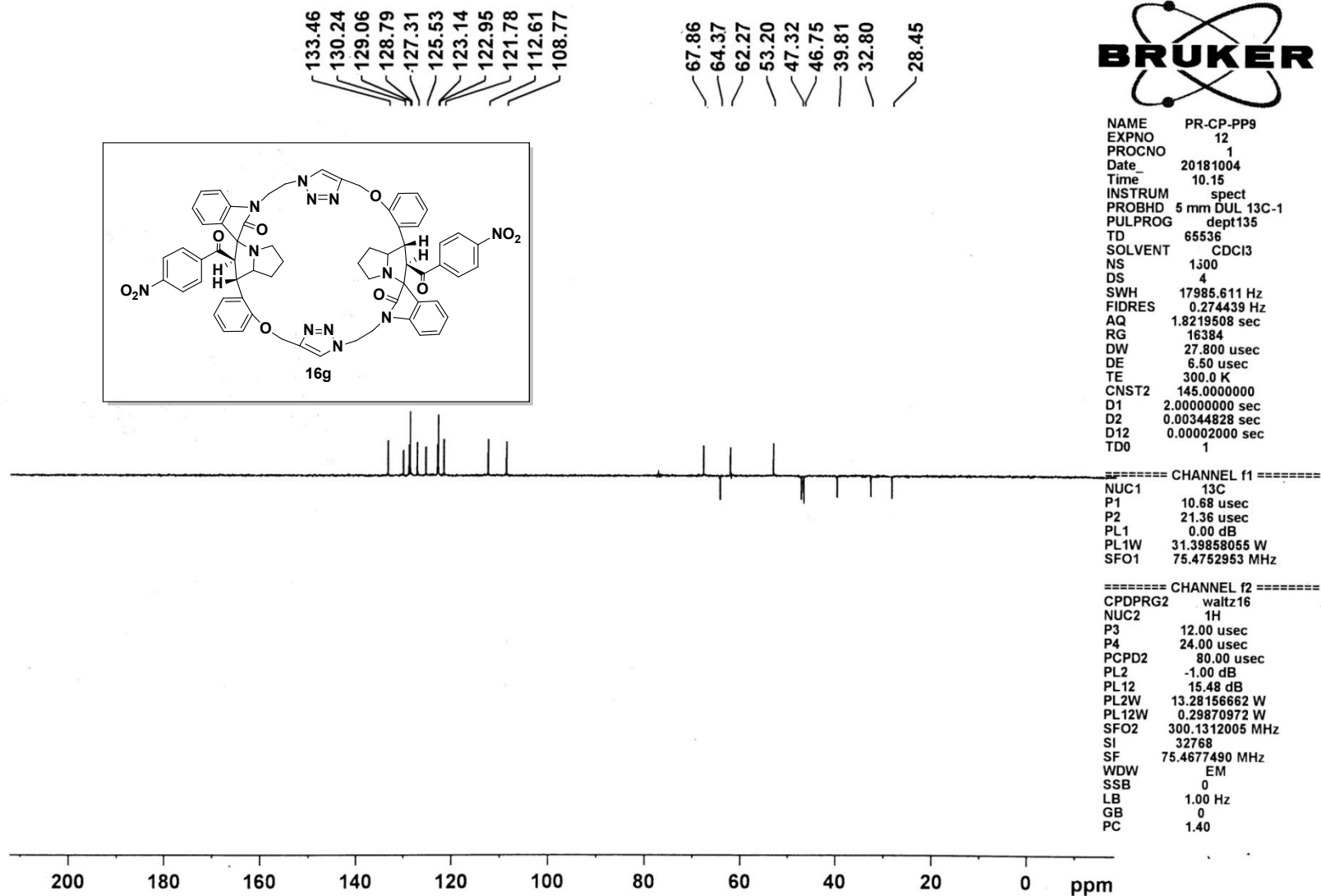


NAME PR-CP-PP9  
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 PROCNO 1  
 Date\_ 20181004  
 Time 8.03  
 INSTRUM spect  
 PROBHD 5 mm DUL 13C-1  
 PULPROG zgpg30  
 TD 65536  
 SOLVENT CDCl3  
 NS 8000  
 DS 4  
 SWH 17985.611 Hz  
 FIDRES 0.274439 Hz  
 AQ 1.8219508 sec  
 RG 4096  
 DW 27.800 usec  
 DE 6.50 usec  
 TE 300.0 K  
 D1 2.0000000 sec  
 D11 0.0300000 sec  
 TD0 1

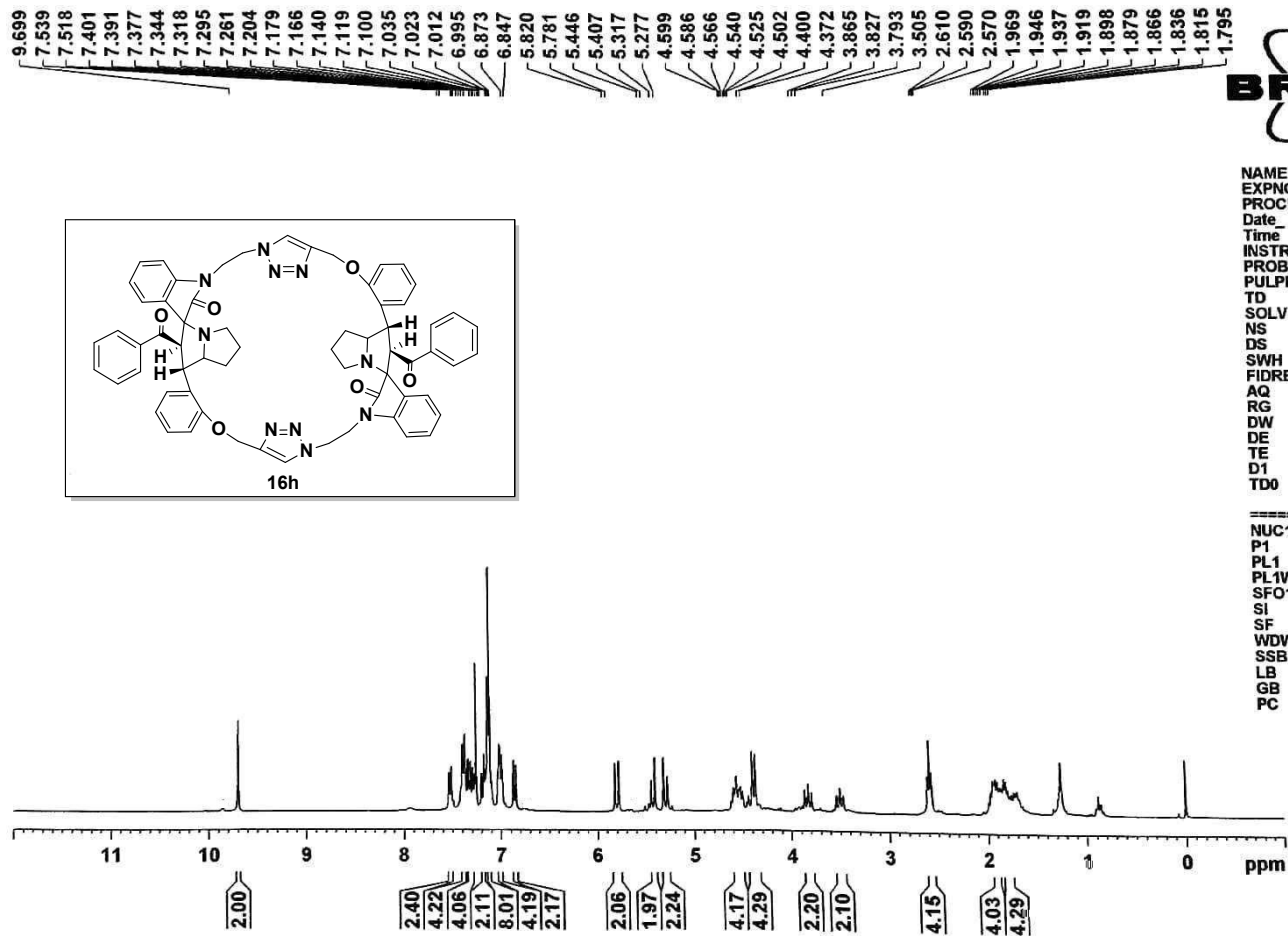
===== CHANNEL f1 =====  
 NUC1 13C  
 P1 10.68 usec  
 PL1 0.00 dB  
 PL1W 31.39858055 W  
 SFO1 75.4752953 MHz

===== CHANNEL f2 =====  
 CPDPRG2 waltz16  
 NUC2 1H  
 PCPD2 80.00 usec  
 PL2 -1.00 dB  
 PL12 15.48 dB  
 PL13 16.00 dB  
 PL2W 13.28156662 W  
 PL12W 0.29870972 W  
 PL13W 0.26500207 W  
 SFO2 300.1312005 MHz  
 SI 32768  
 SF 75.4677490 MHz  
 WDW EM  
 SSB 0  
 LB 1.00 Hz  
 GB 0  
 PC 1.40

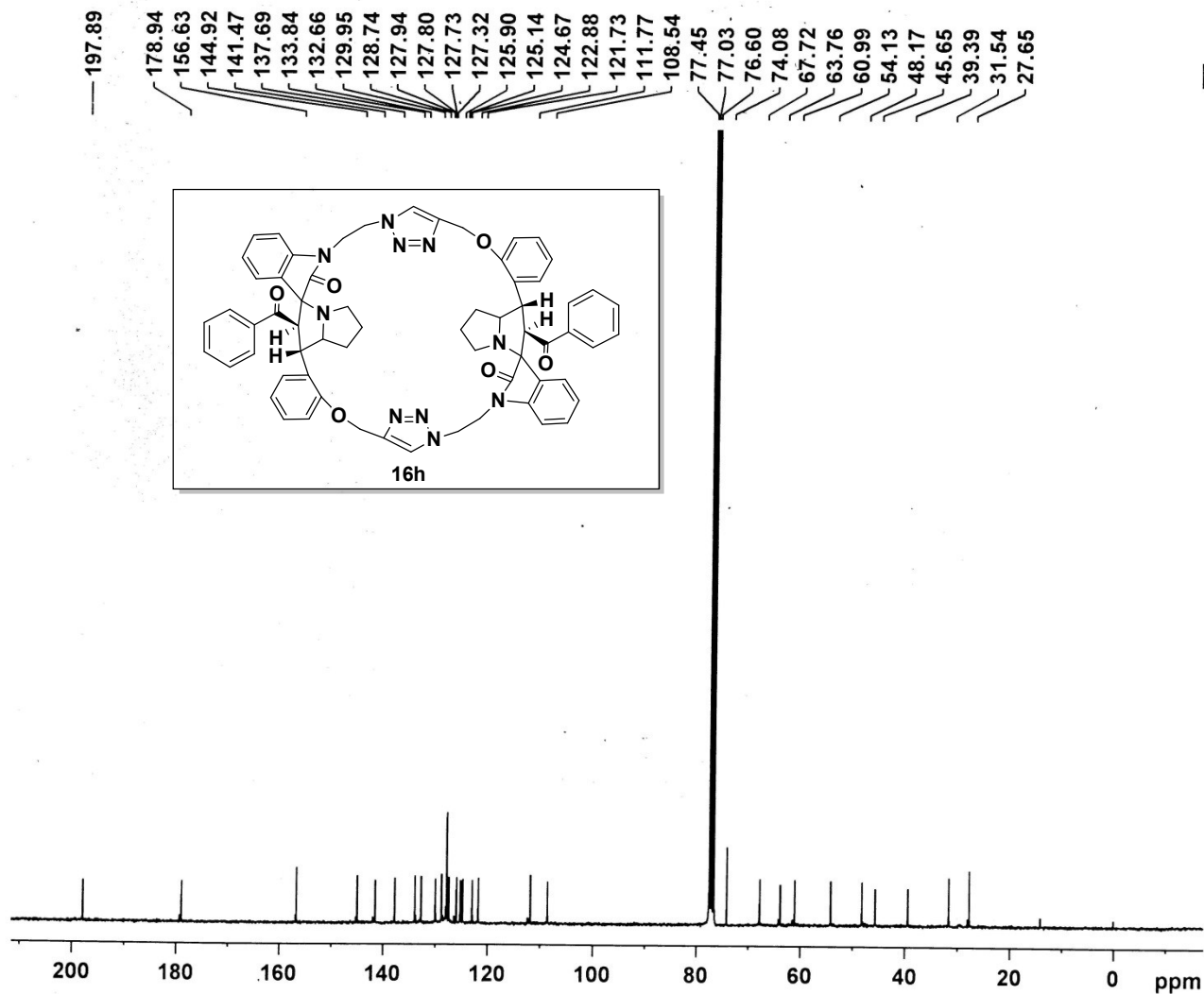
<sup>13</sup>C NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 16g



**<sup>13</sup>C (DEPT135) NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 16g**



<sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 16h



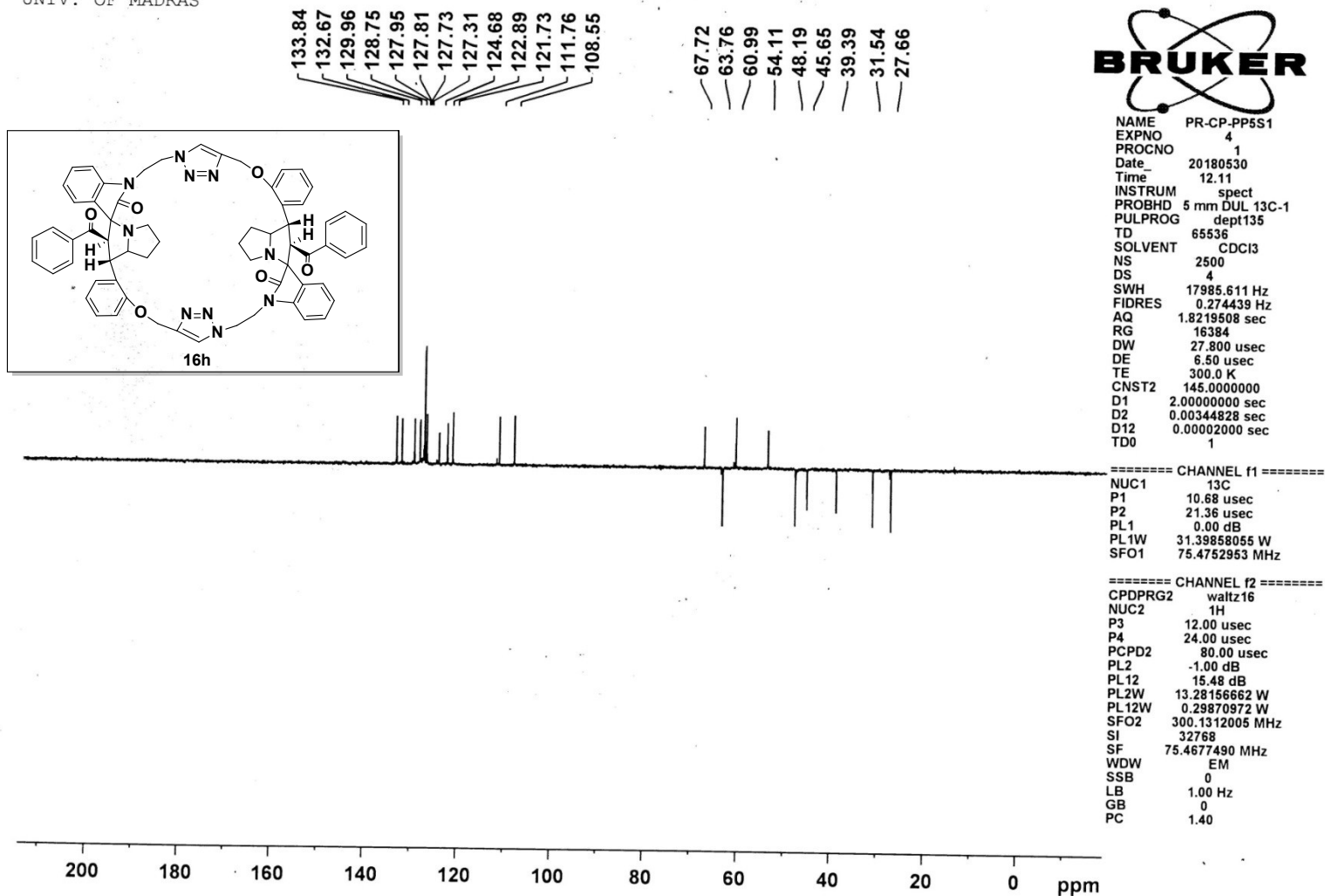
NAME PR-CP-PP5S1  
 EXPNO 2  
 PROCNO 1  
 Date\_ 20180529  
 Time 9.39  
 INSTRUM spect  
 PROBHD 5 mm DUL 13C-1  
 PULPROG zgpg30  
 TD 65536  
 SOLVENT CDCl3  
 NS 10000  
 DS 4  
 SWH 17985.611 Hz  
 FIDRES 0.274439 Hz  
 AQ 1.8219508 sec  
 RG 1625.5  
 DW 27.800 usec  
 DE 6.50 usec  
 TE 300.0 K  
 D1 2.00000000 sec  
 D11 0.03000000 sec  
 TD0 1

===== CHANNEL f1 =====  
 NUC1 13C  
 P1 10.68 usec  
 PL1 0.00 dB  
 PL1W 31.39858055 W  
 SFO1 75.4752953 MHz

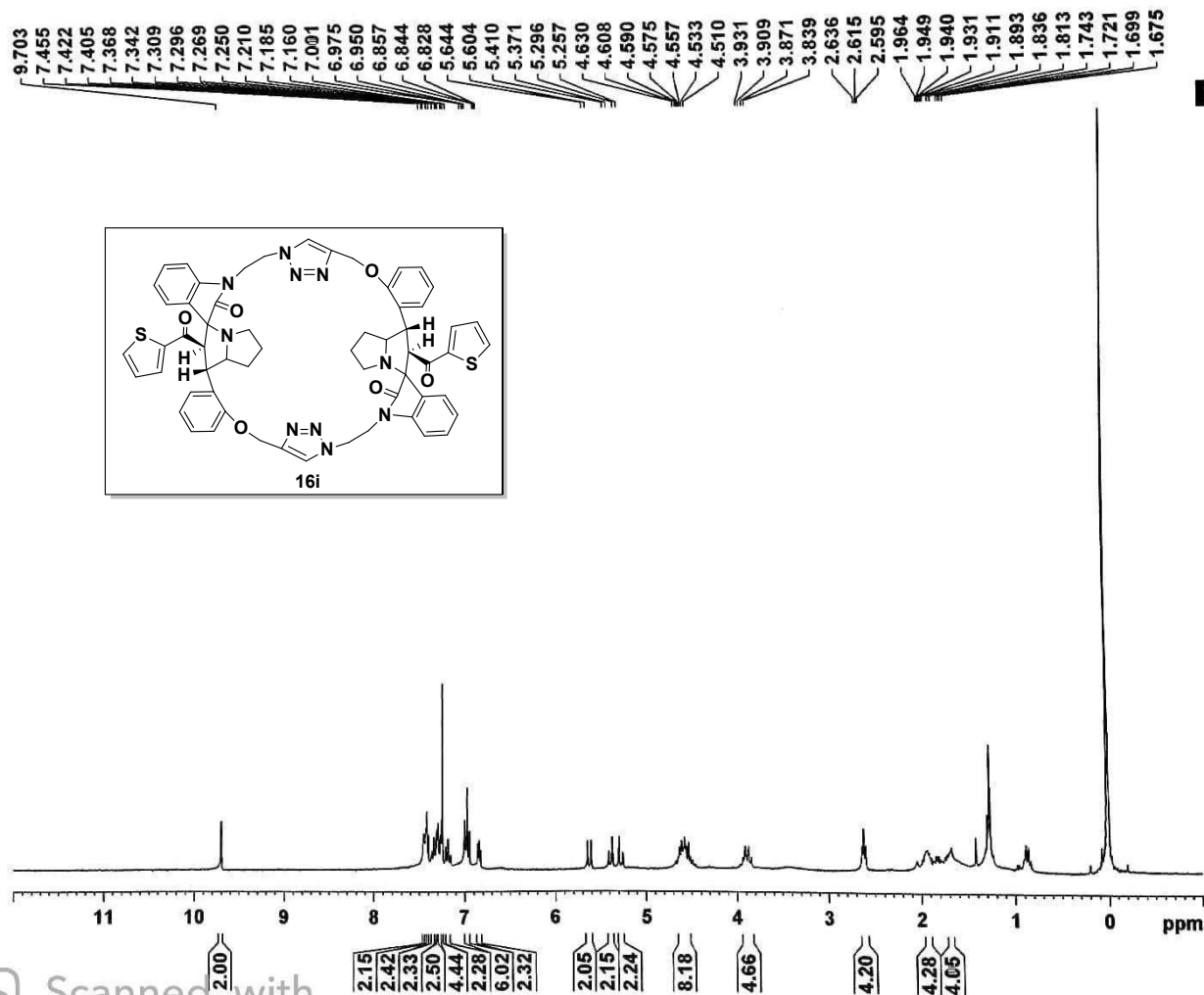
===== CHANNEL f2 =====  
 CPDPRG2 waltz16  
 NUC2 1H  
 PCPD2 80.00 usec  
 PL2 -1.00 dB  
 PL12 15.48 dB  
 PL13 16.00 dB  
 PL2W 13.28156662 W  
 PL12W 0.29870972 W  
 PL13W 0.26500207 W  
 SFO2 300.1312005 MHz  
 SI 32768  
 SF 75.4677490 MHz  
 WDW EM  
 SSB 0  
 LB 1.00 Hz  
 GB 0  
 PC 1.40

$^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 75MHz) Spectrum of Bis-spiropyrrolizidine -oxindole grafted macrocycle 16h

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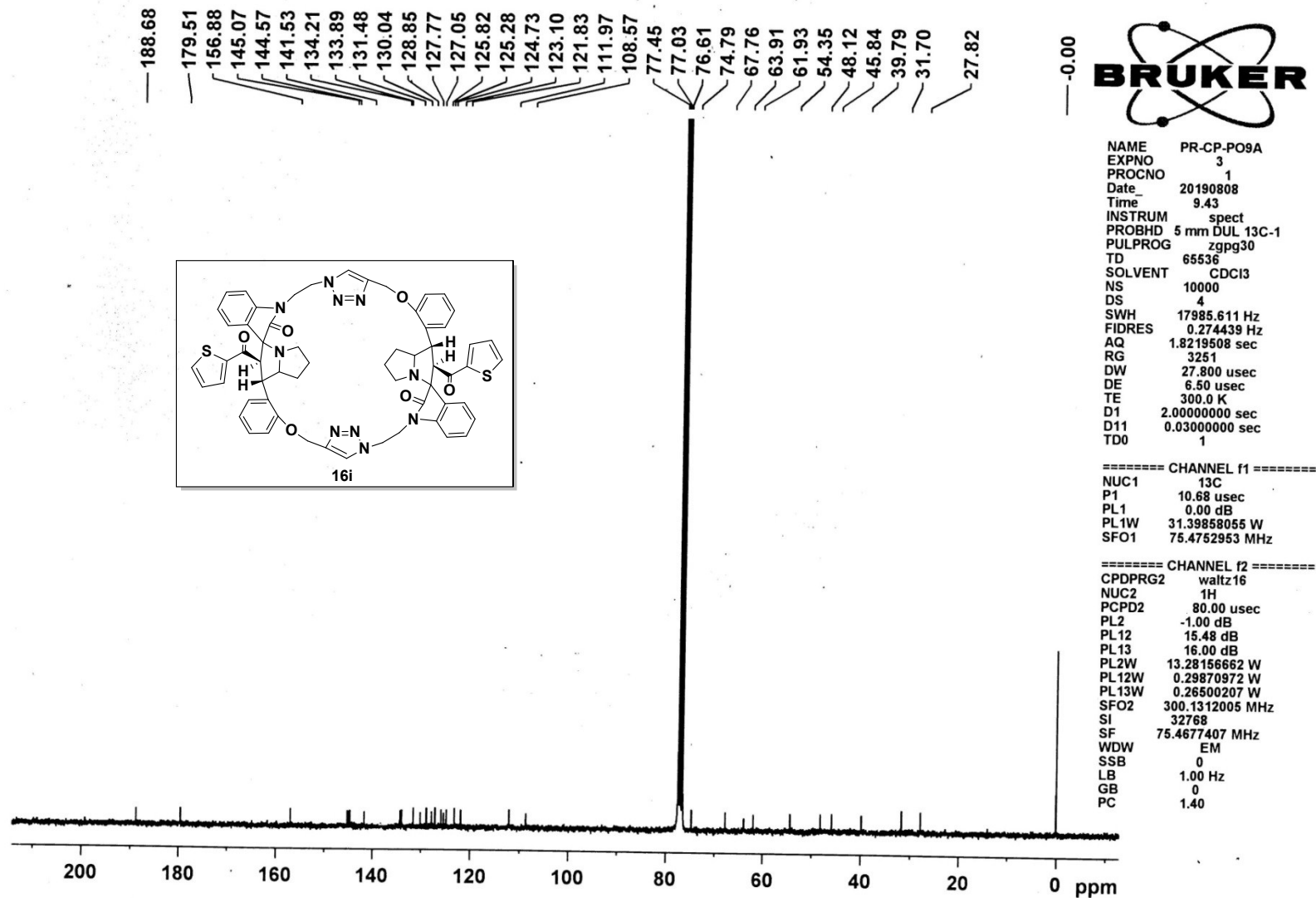


$^{13}\text{C}$  (DEPT135) NMR ( $\text{CDCl}_3$ , 75MHz) Spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 16h



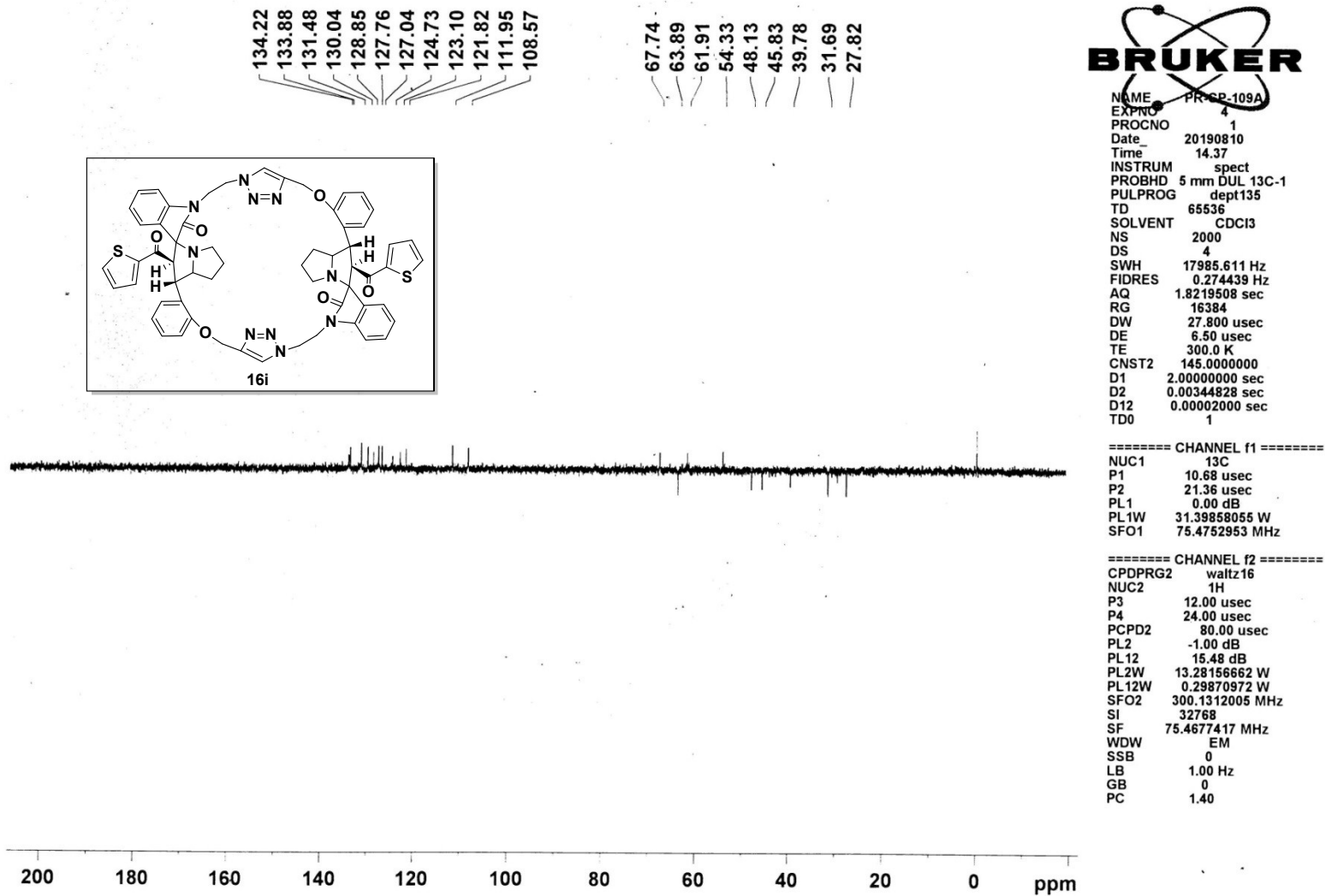
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<sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 16i

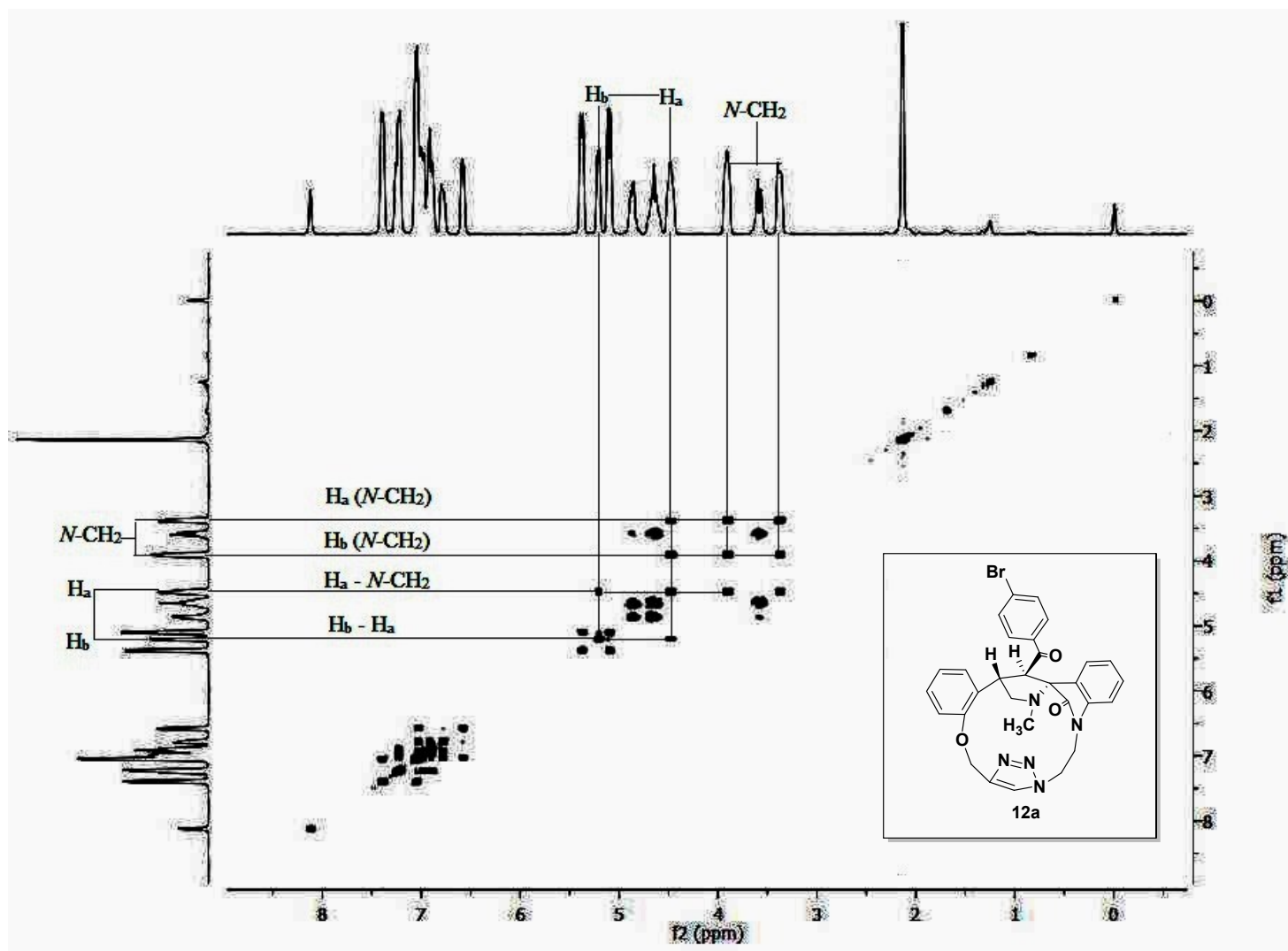


**<sup>13</sup>C NMR (CDCl<sub>3</sub>, 75MHz) Spectrum of Bis-spiropyrrolizidine -oxindole grafted macrocycle 16g**

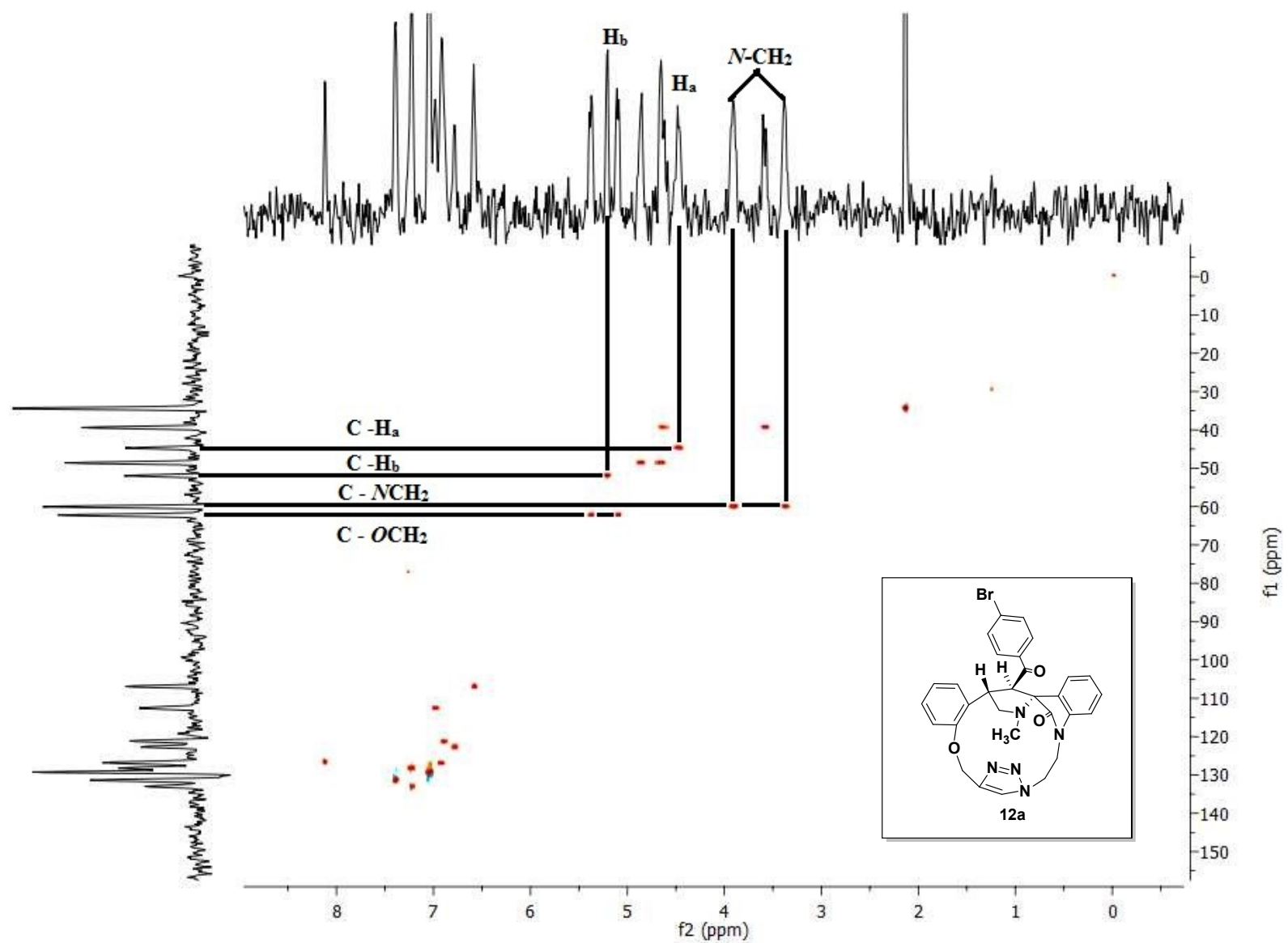




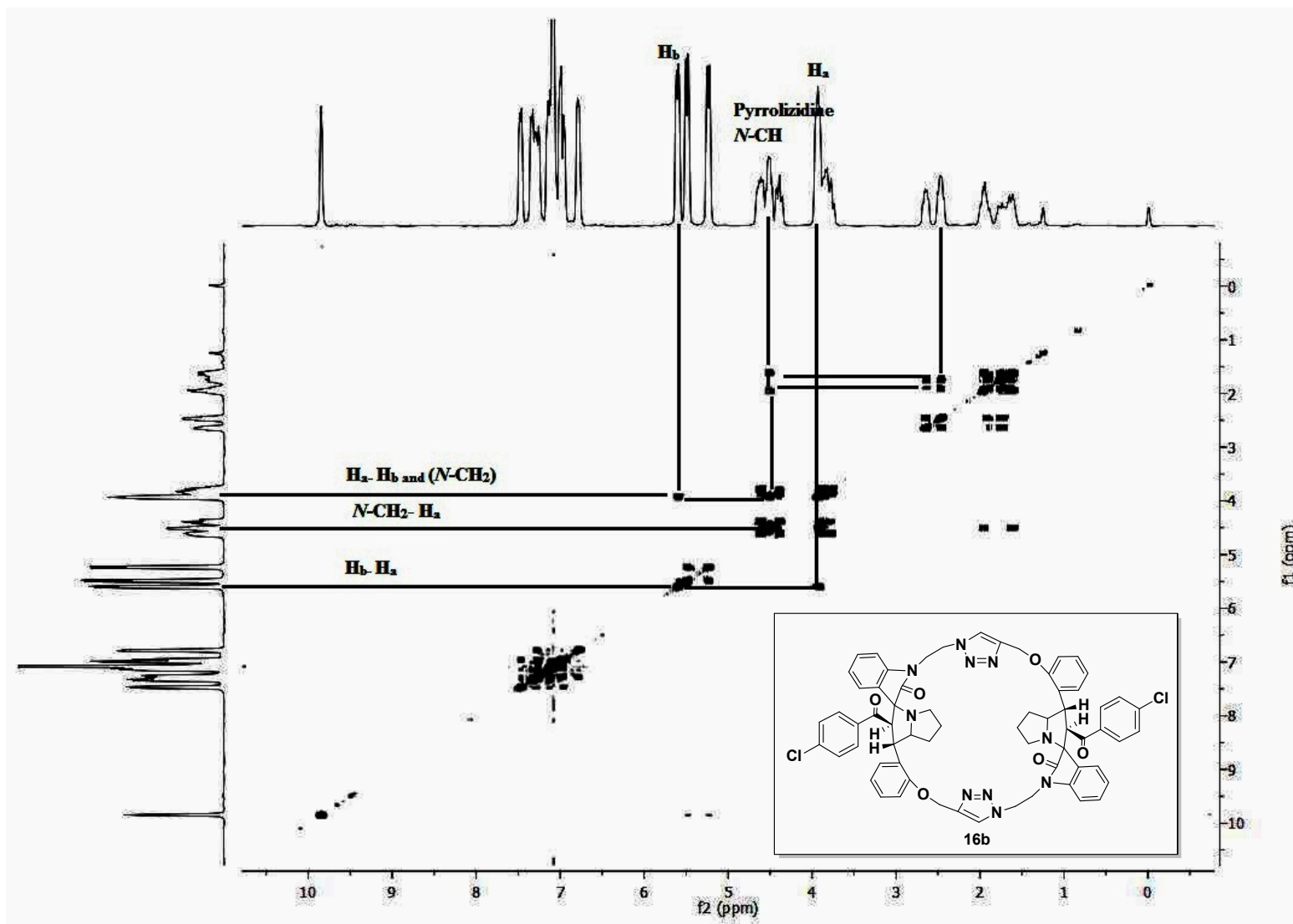
$^{13}\text{C}$  (DEPT135) NMR ( $\text{CDCl}_3$ , 75MHz) Spectrum of Bis-spiropyrrrolizidine -oxindole grafted macrocycle 16i



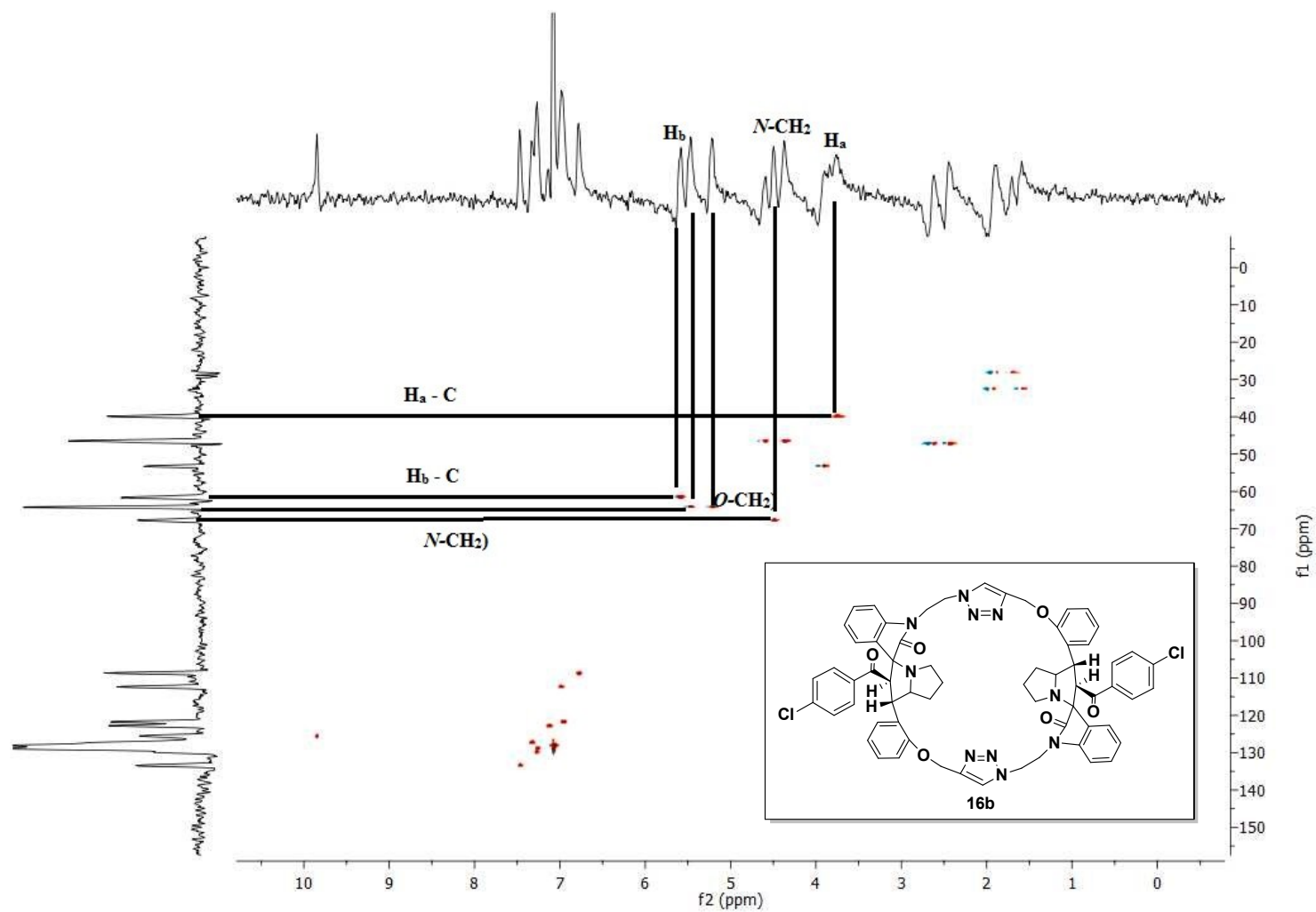
$^1\text{H}$ - $^1\text{H}$  COSY spectrum of Spiropyrrolidine oxindole grafted macrocycle 12a



$^1\text{H}$ - $^{13}\text{C}$  COSY spectrum of Spiropyrrolidine oxindole grafted macrocycle 12a



**$^1\text{H}$ - $^1\text{H}$  COSY spectrum of Bis-spiropyrrolizidine oxindole grafted macrocycle 16b**



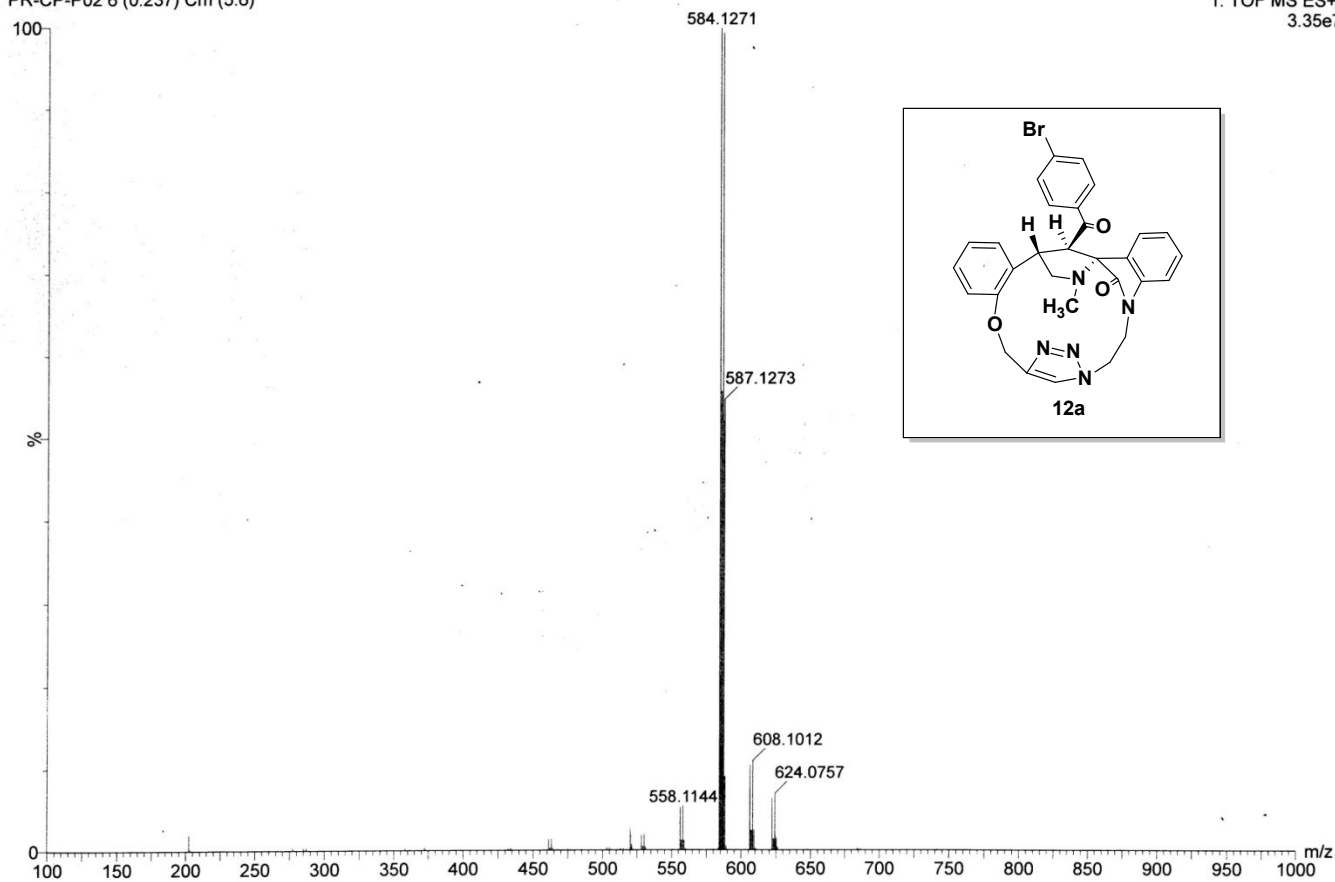
$^1\text{H}$ - $^{13}\text{C}$  COSY spectrum of Bis-spiropyrrolizidine oxindole grafted macrocycle 16b

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DRPR  
PR-CP-P02 6 (0.237) Cm (5:6)

XEVO-G2SQTOF#NotSet

25-Jun-2018  
12:03:30

1: TOF MS ES+  
3.35e7



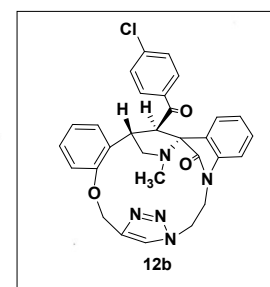
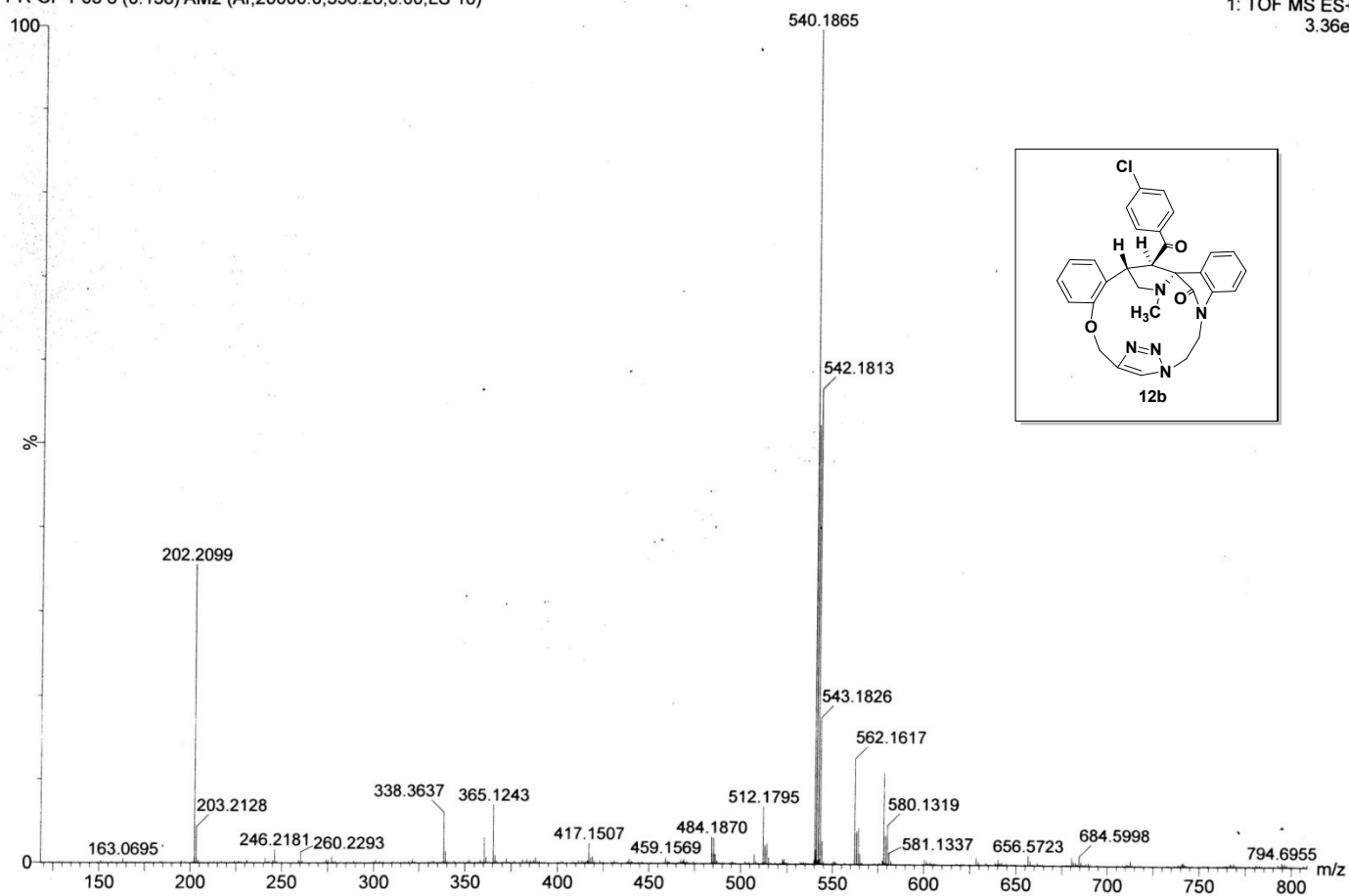
HRMS( TOF MS ES<sup>+</sup>) spectrum of spiropyrrolidine – oxindole grafted macrocycle 12a

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DRPR  
PR-CP-P03 6 (0.138) AM2 (Ar,20000.0,556.28,0.00,LS 10)

XEVO-G2SQTOF#NotSet

12-Jan-2018  
13:09:05

1: TOF MS ES+  
3.36e7

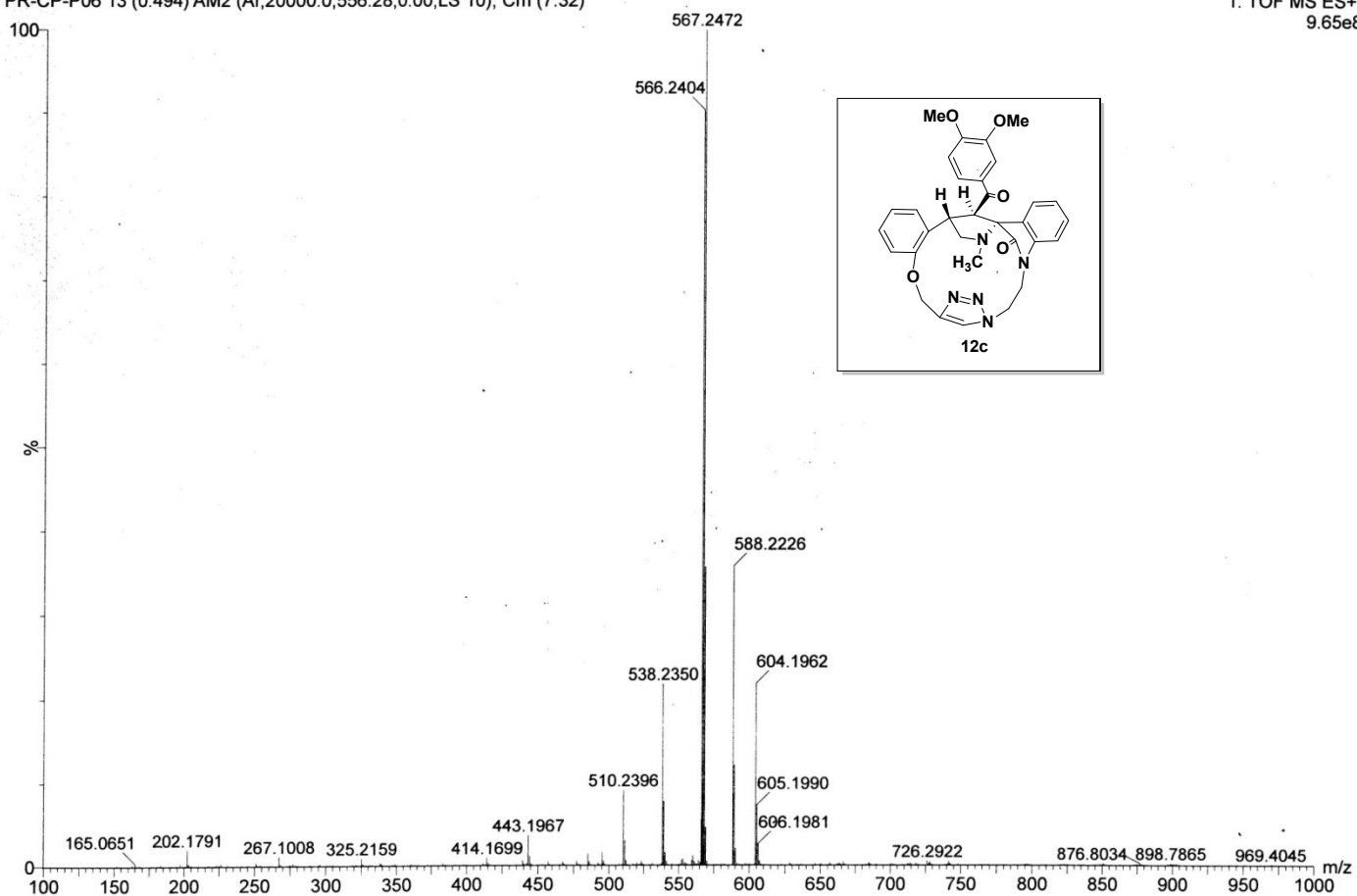


HRMS( TOF MS ES<sup>+</sup>) Spectrum of Spiropyrrolidine – Oxindole grafted macrocycle 12b

XEVO-G2SQTOF#NotSet

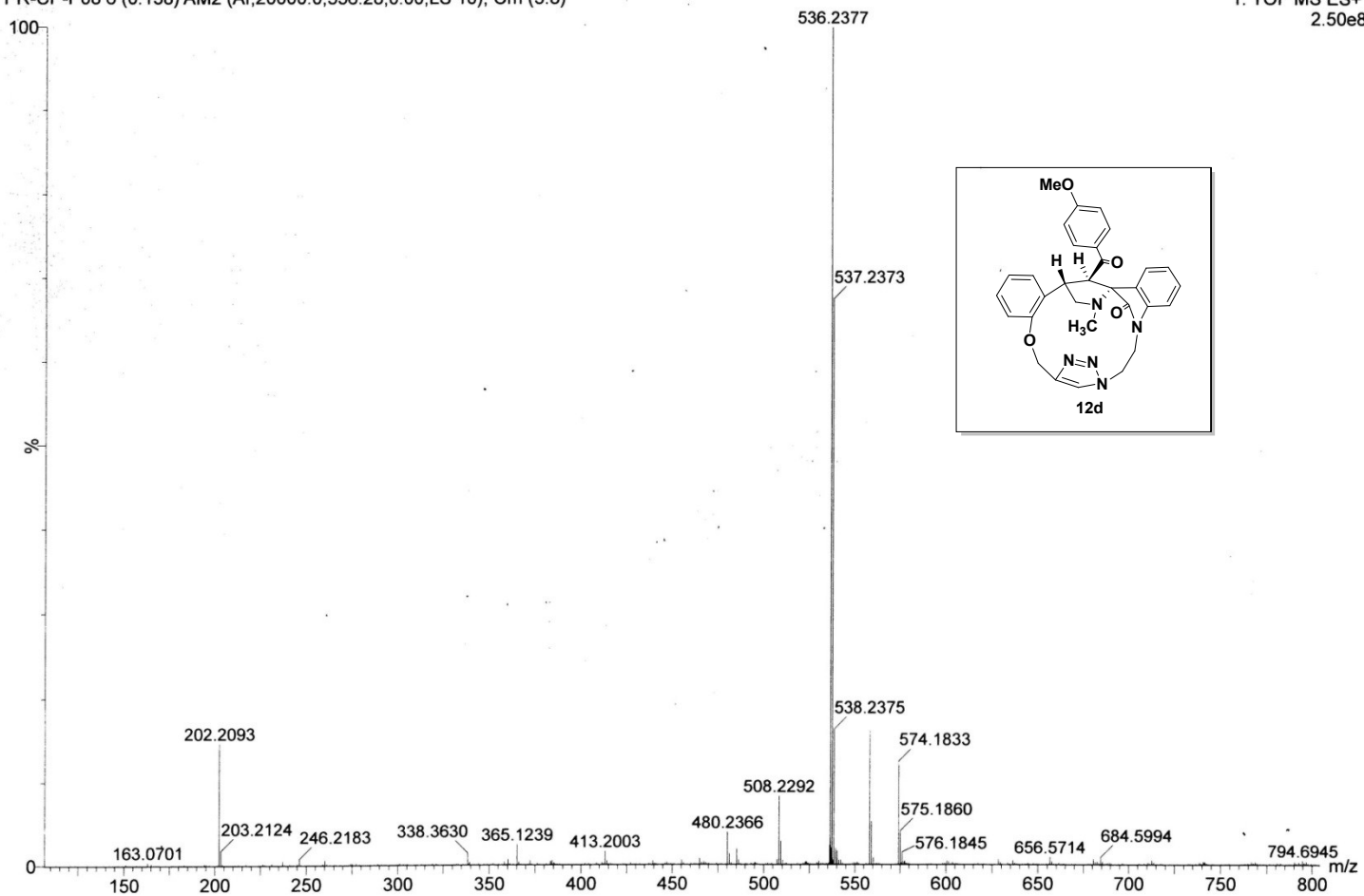
22-Jun-2018  
15:07:07DEPARTMENT OF ORGANIC CHEMISTRY  
UNIVERSITY OF MADRAS  
DRPR

PR-CP-P06 13 (0.494) AM2 (Ar,20000.0,556.28,0.00,LS 10); Cm (7:32)

1: TOF MS ES+  
9.65e8HRMS( TOF MS ES<sup>+</sup>) Spectrum of Spiropyrrolidine – Oxindole grafted macrocycle 12c



XEVO-G2SQTOF#NotSet

12-Jan-2018  
13:29:55DEPARTMENT OF ORGANIC CHEMISTRY  
UNIVERSITY OF MADRAS  
DRPR  
PR-CP-P08 6 (0.138) AM2 (Ar,20000.0,556.28,0.00,LS 10); Cm (3:8)1: TOF MS ES+  
2.50e8HRMS( TOF MS ES<sup>+</sup>) Spectrum of Spiropyrrolidine – Oxindole grafted macrocycle 12d

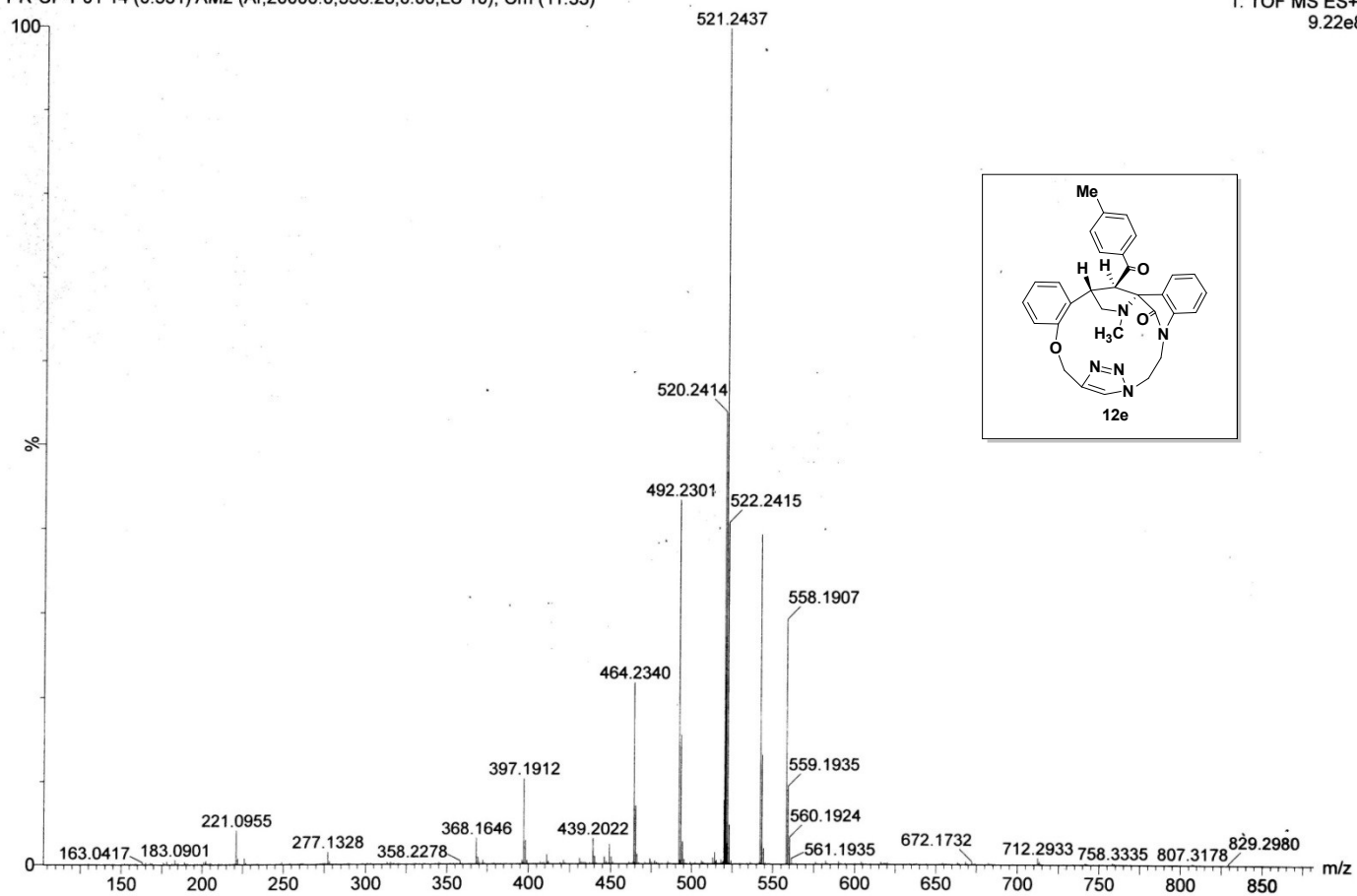
DEPARTMENT OF ORGANIC CHEMISTRY  
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XEVO-G2SQTOF#NotSet

25-Jun-2018  
11:47:27

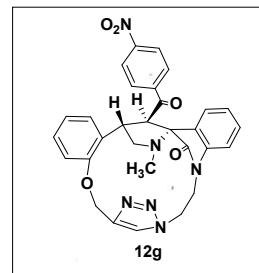
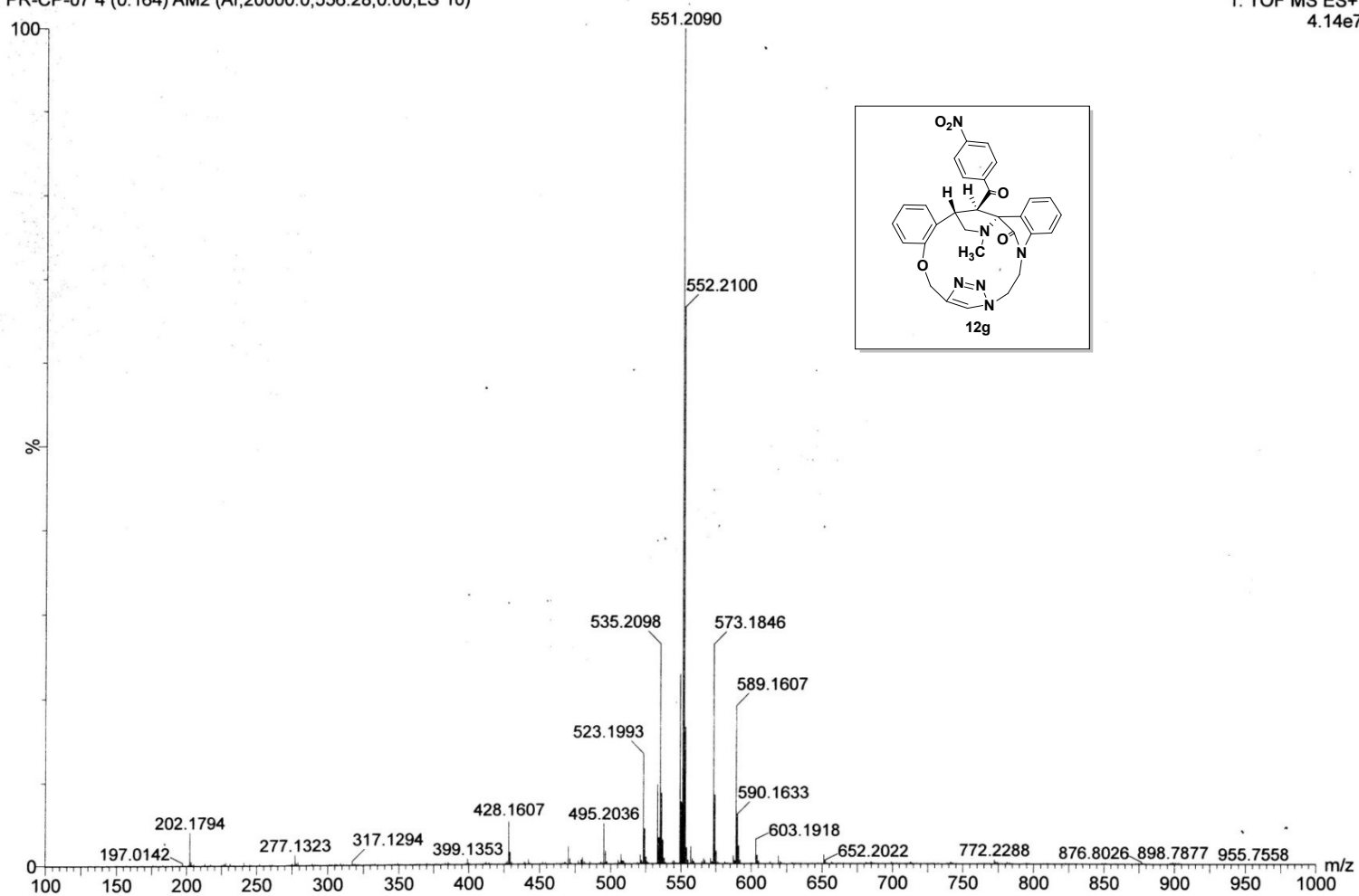
PR-CP-P01 14 (0.531) AM2 (Ar,20000.0,556.28,0.00,LS 10); Cm (11:33)

1: TOF MS ES+  
9.22e8



HRMS( TOF MS ES<sup>+</sup>) Spectrum of Spiropyrrolidine – Oxindole grafted macrocycle 12e

XEVO-G2SQTOF#NotSet

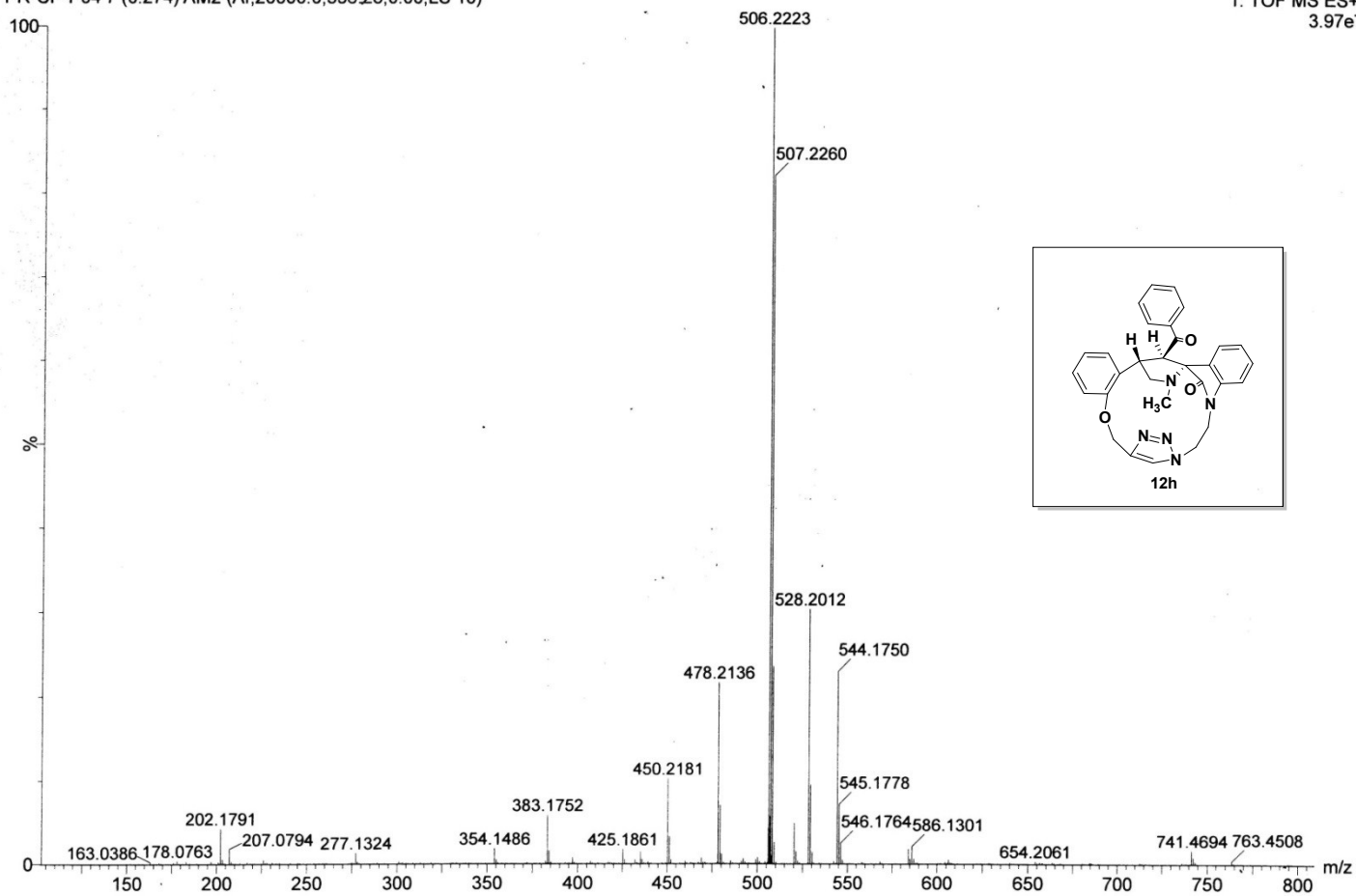
22-Jun-2018  
15:25:11DEPARTMENT OF ORGANIC CHEMISTRY  
UNIVERSITY OF MADRAS  
DRPR  
PR-CP-07 4 (0.164) AM2 (Ar,20000.0,556.28,0.00,LS 10)1: TOF MS ES+  
4.14e7HRMS( TOF MS ES<sup>+</sup>) Spectrum of Spiropyrrolidine – Oxindole grafted macrocycle 12g

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UNIVERSITY OF MADRAS  
DRPR  
PR-CP-P04 7 (0.274) AM2 (Ar,20000.0,556.28,0.00,LS 10)

XEVO-G2SQTOF#NotSet

25-Jun-2018  
12:22:52

1: TOF MS ES+  
3.97e7



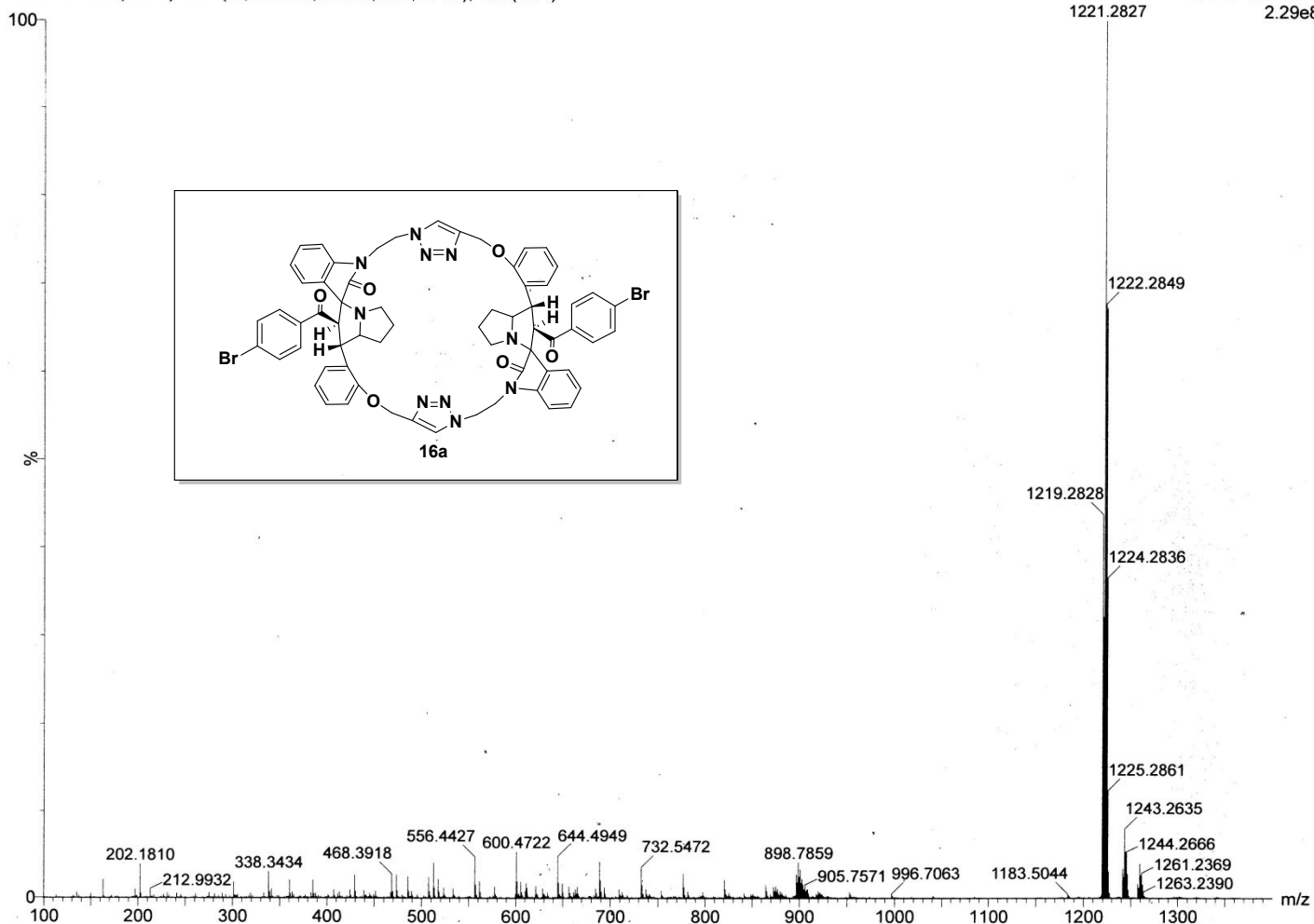
HRMS( TOF MS ES<sup>+</sup>) Spectrum of Spiropyrrolidine – Oxindole grafted macrocycle 12h

DRPR

PR-CP-PP4 5 (0.347) AM2 (Ar,20000,0,556.28,0,00,LS 10); Cm (3:14)

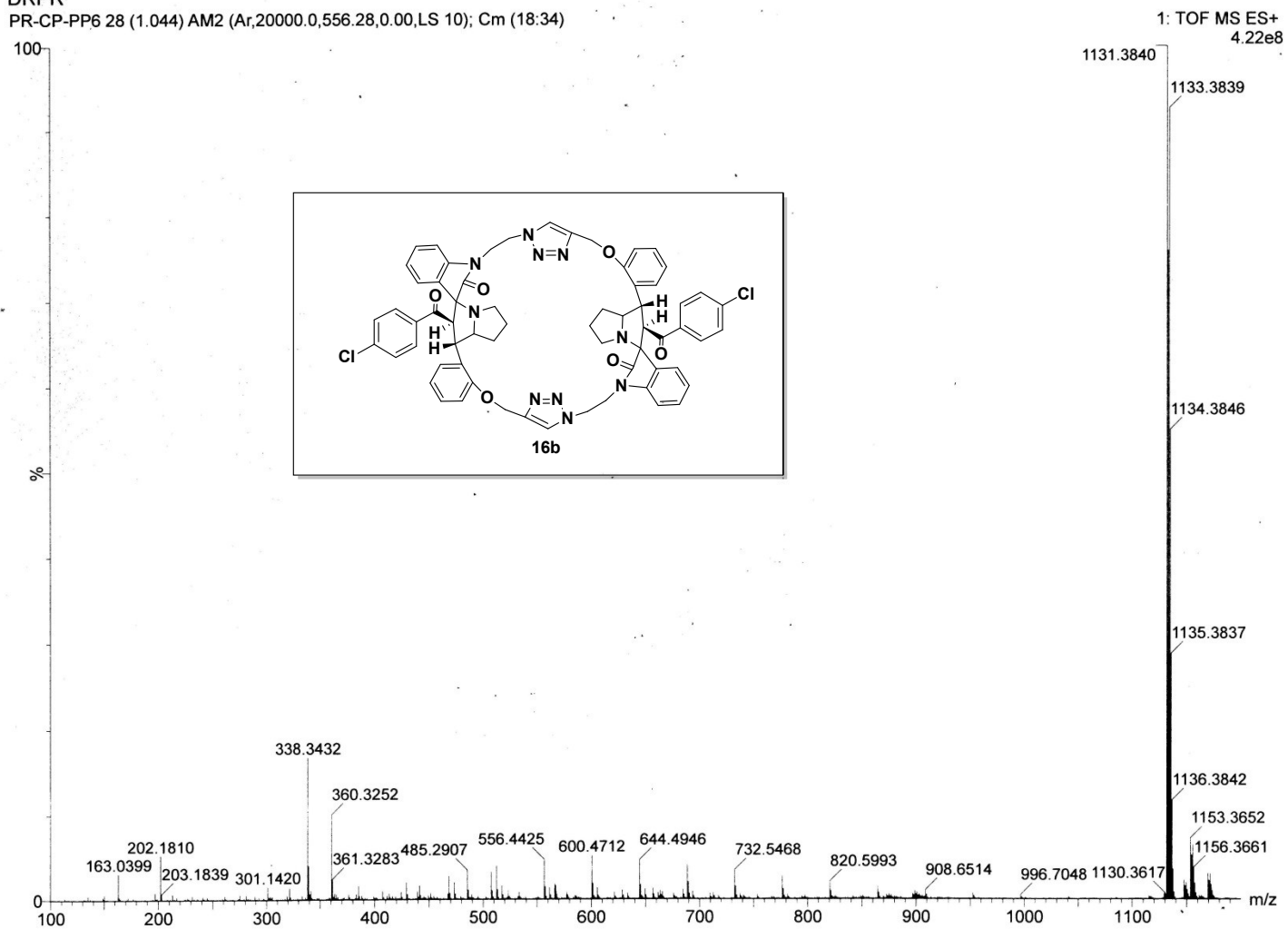
1: TOF MS ES+

2.29e8

**HRMS( TOF MS ES<sup>+</sup>) Spectrum of Bis-spiropyrrrolizidine – Oxindole grafted Macrocycle 16a**

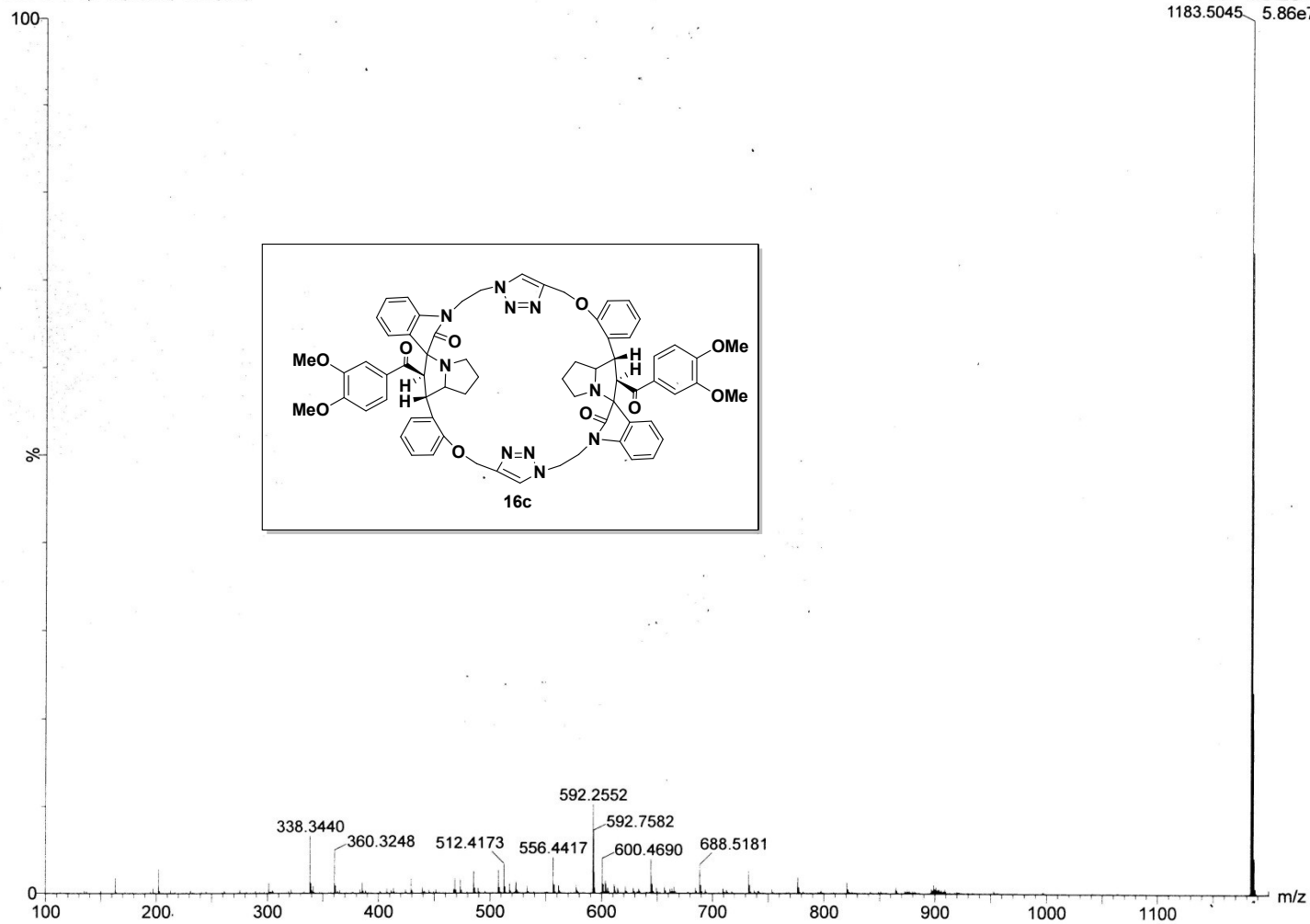
DRPR

PR-CP-PP6 28 (1.044) AM2 (Ar,20000.0,556.28,0.00,LS 10); Cm (18:34)

**HRMS( TOF MS ES<sup>+</sup>) Spectrum of Bis-spiropyrrrolizidine – Oxindole grafted Macrocycle 16b**

DRPR  
PR-CP-PP3 3 (0.127) Cm (3:9)

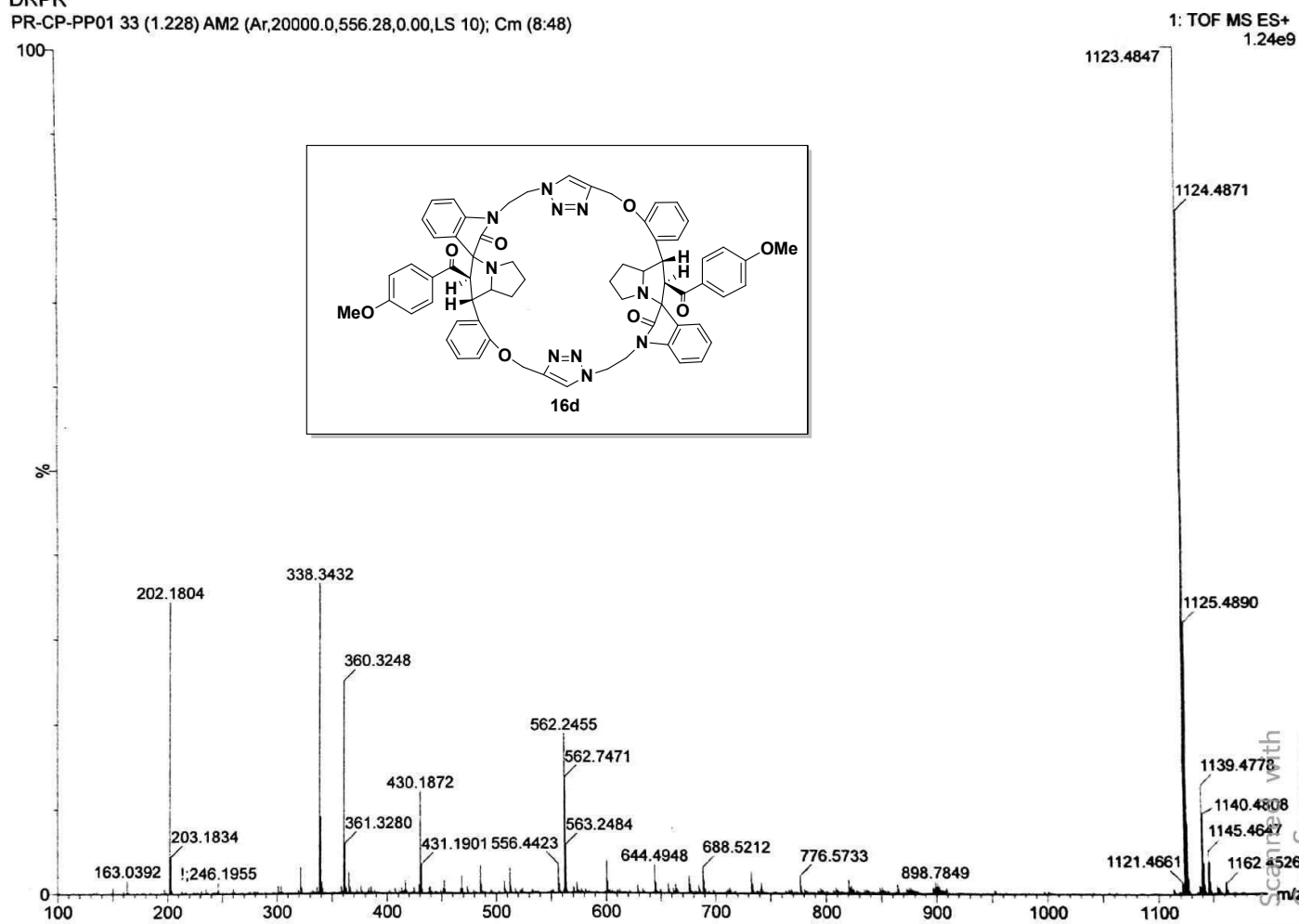
1: TOF MS ES+  
1183.5045 5.86e7



HRMS( TOF MS ES+) Spectrum of Bis-spiropyrrrolizidine – Oxindole grafted Macrocycle 16c

DRPR

PR-CP-PP01 33 (1.228) AM2 (Ar,20000.0,556.28,0.00,LS 10); Cm (8:48)

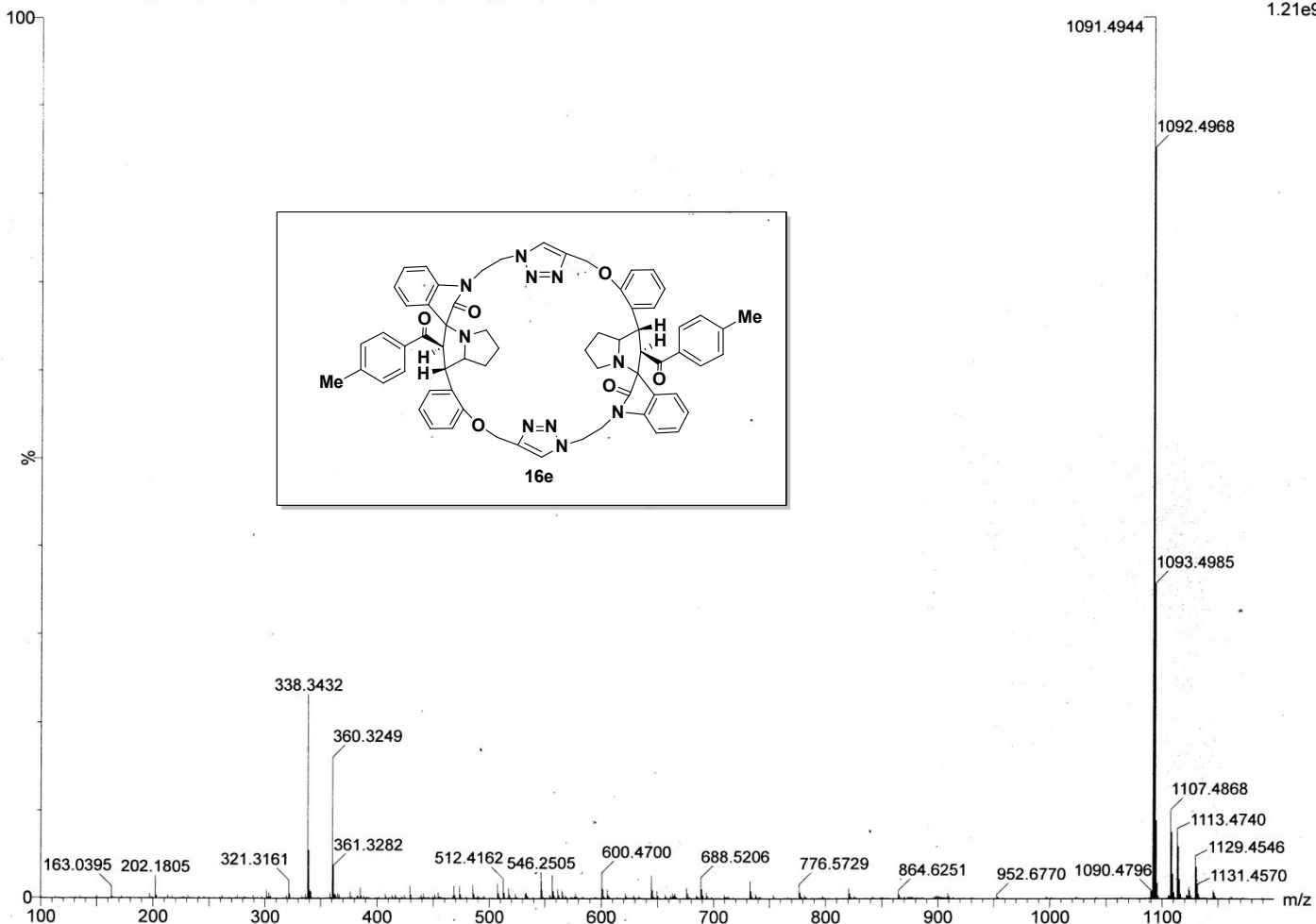


HRMS( TOF MS ES<sup>+</sup>) Spectrum of Bis-spiropyrrrolizidine – Oxindole grafted Macrocycle 16d



DRPR

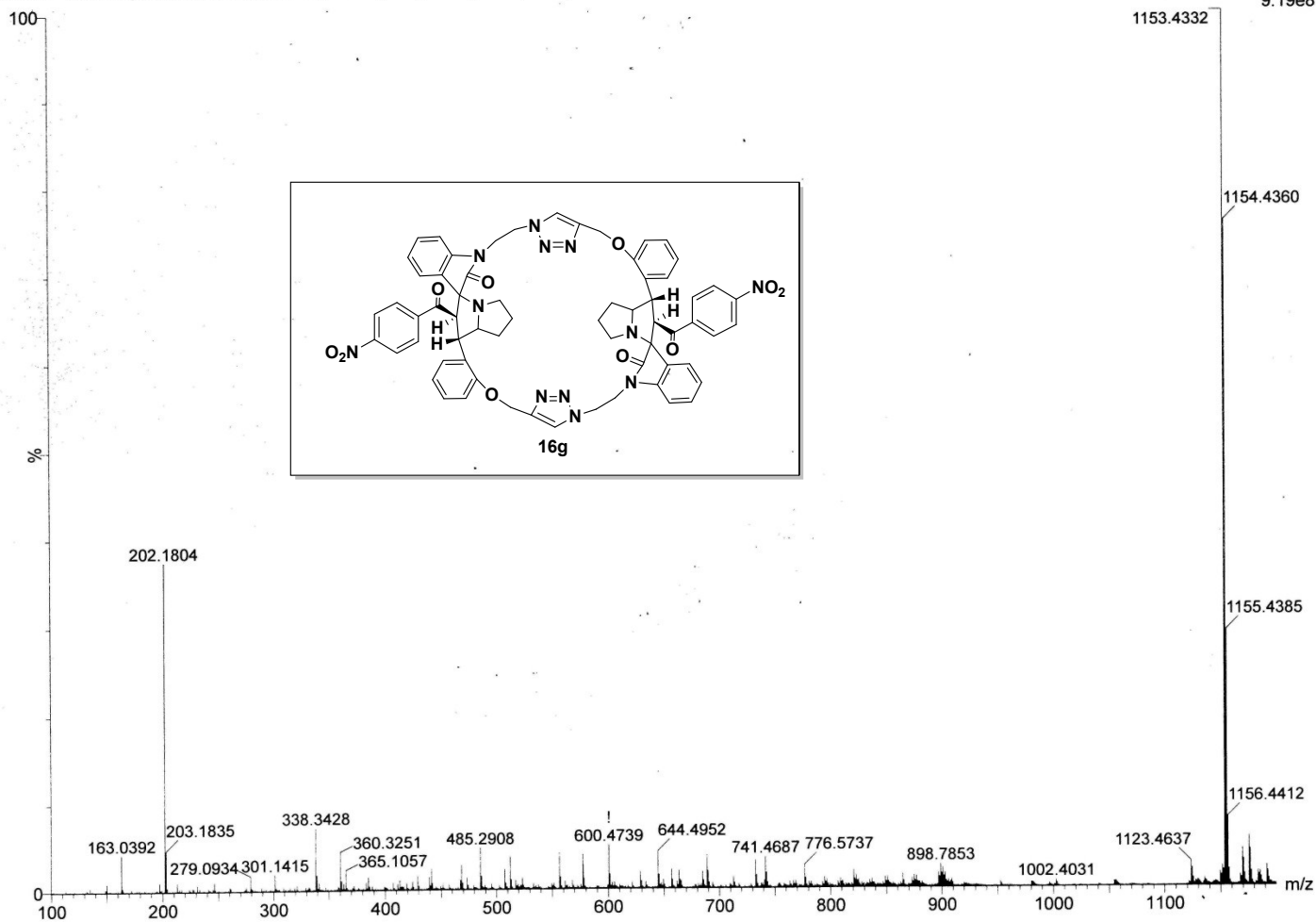
PR-CP-PP2-R 14 (0.531) AM2 (Ar,20000.0,556.28,0.00,LS 10); Cm (14:45)

1: TOF MS ES+  
1.21e9**HRMS( TOF MS ES<sup>+</sup>) Spectrum of Bis-spiropyrrrolizidine – Oxindole grafted Macrocycle 16e**

S73

DRPR  
PR-CP-PP9 38 (1.411) AM2 (Ar,20000.0,556.28,0.00,LS 10); Cm (11:48)

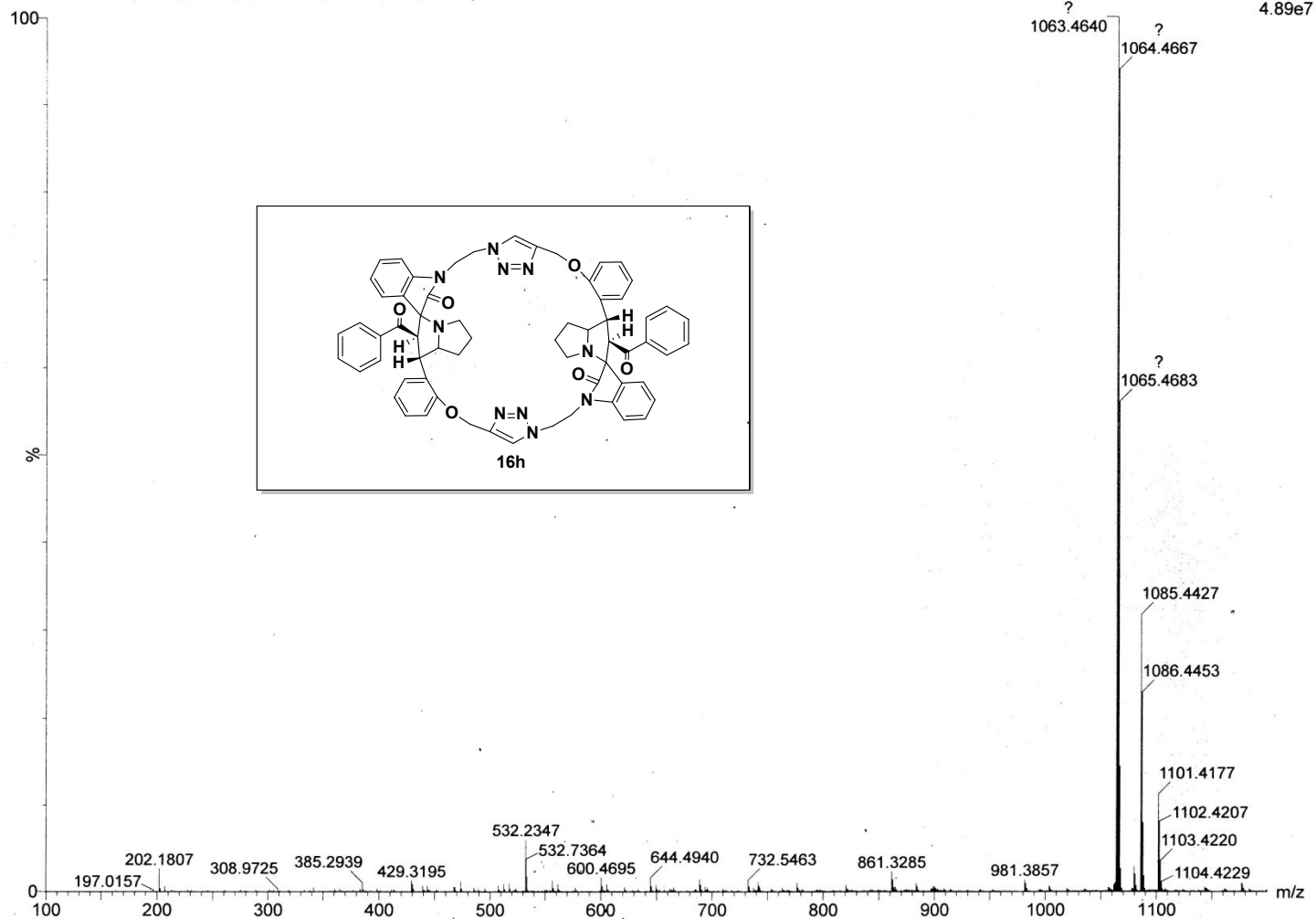
1: TOF MS ES+  
9.19e8



HRMS( TOF MS ES<sup>+</sup>) Spectrum of Bis-spiropyrrrolizidine – Oxindole grafted Macrocycle 16g

DRPR

PR-CP-PP51 3 (0.127) AM2 (Ar,20000.0,556.28,0.00,LS 10)



HRMS( TOF MS ES<sup>+</sup>) Spectrum of Bis-spiropyrrolizidine – Oxindole grafted Macrocycle 16h.