

**A Microwave Assisted Tandem Synthesis of Quinazolinones using Ionic Liquid Supported Copper (II) Catalyst with Mechanistic Insights**

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[barnalimaiti.m@gmail.com](mailto:barnalimaiti.m@gmail.com)

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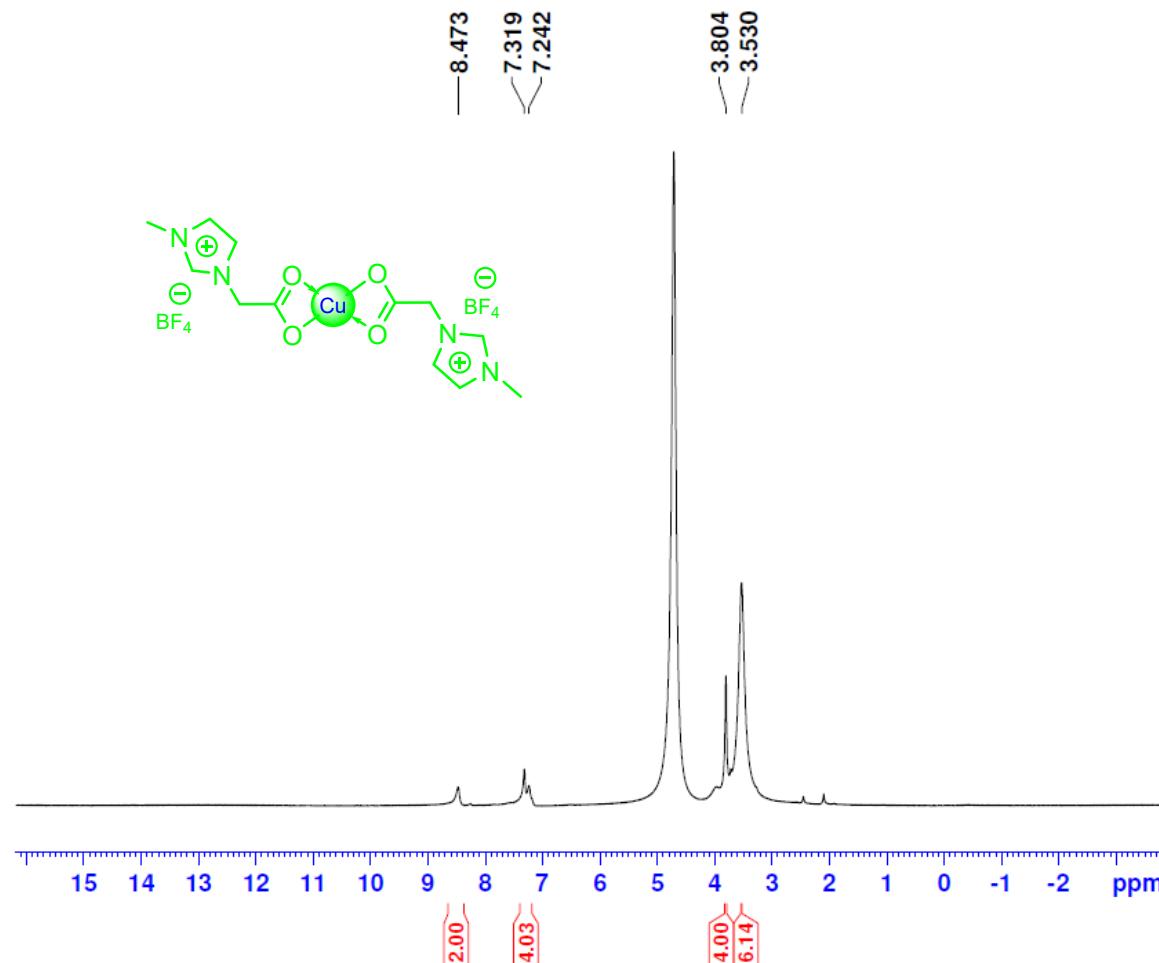
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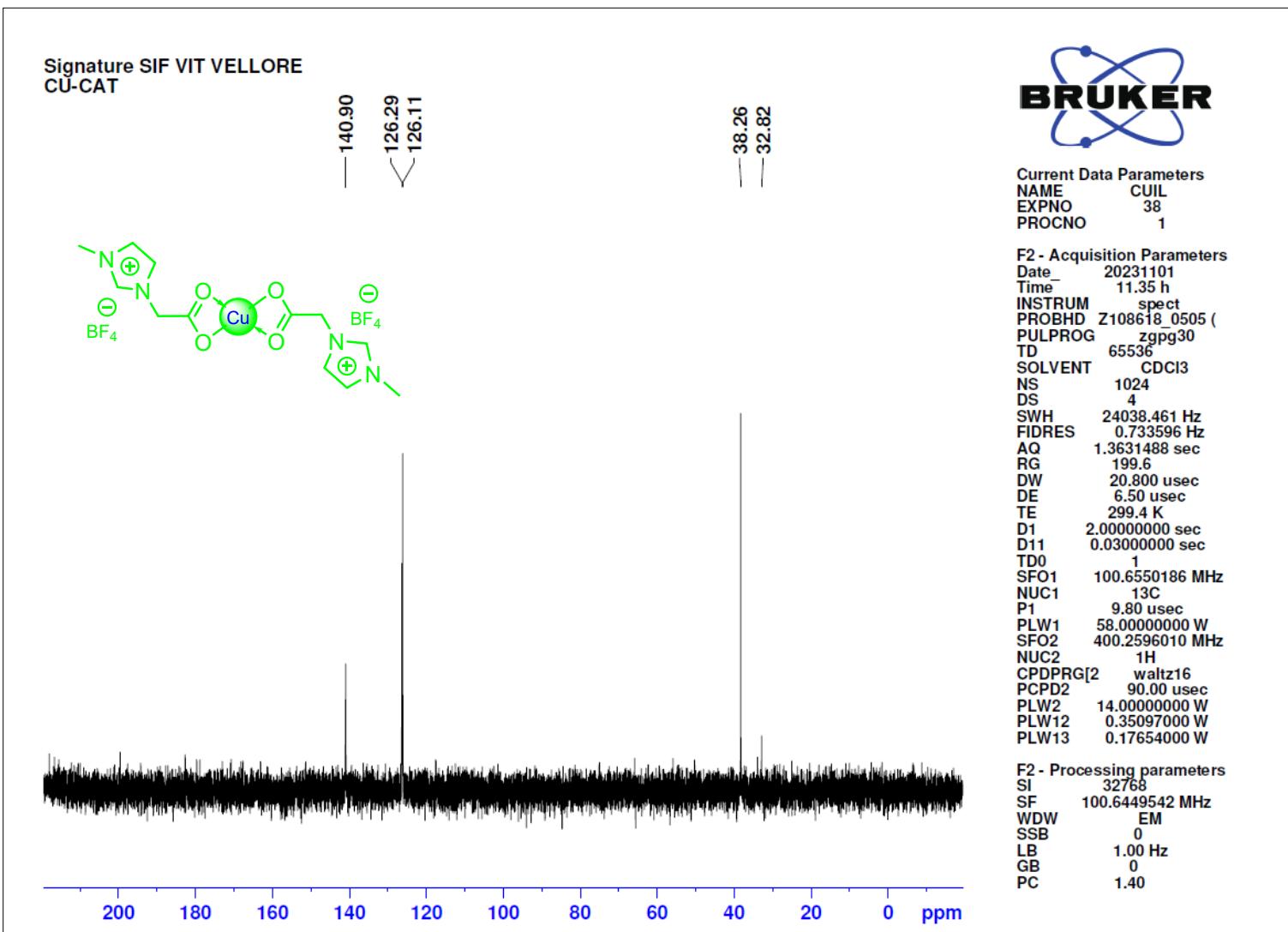


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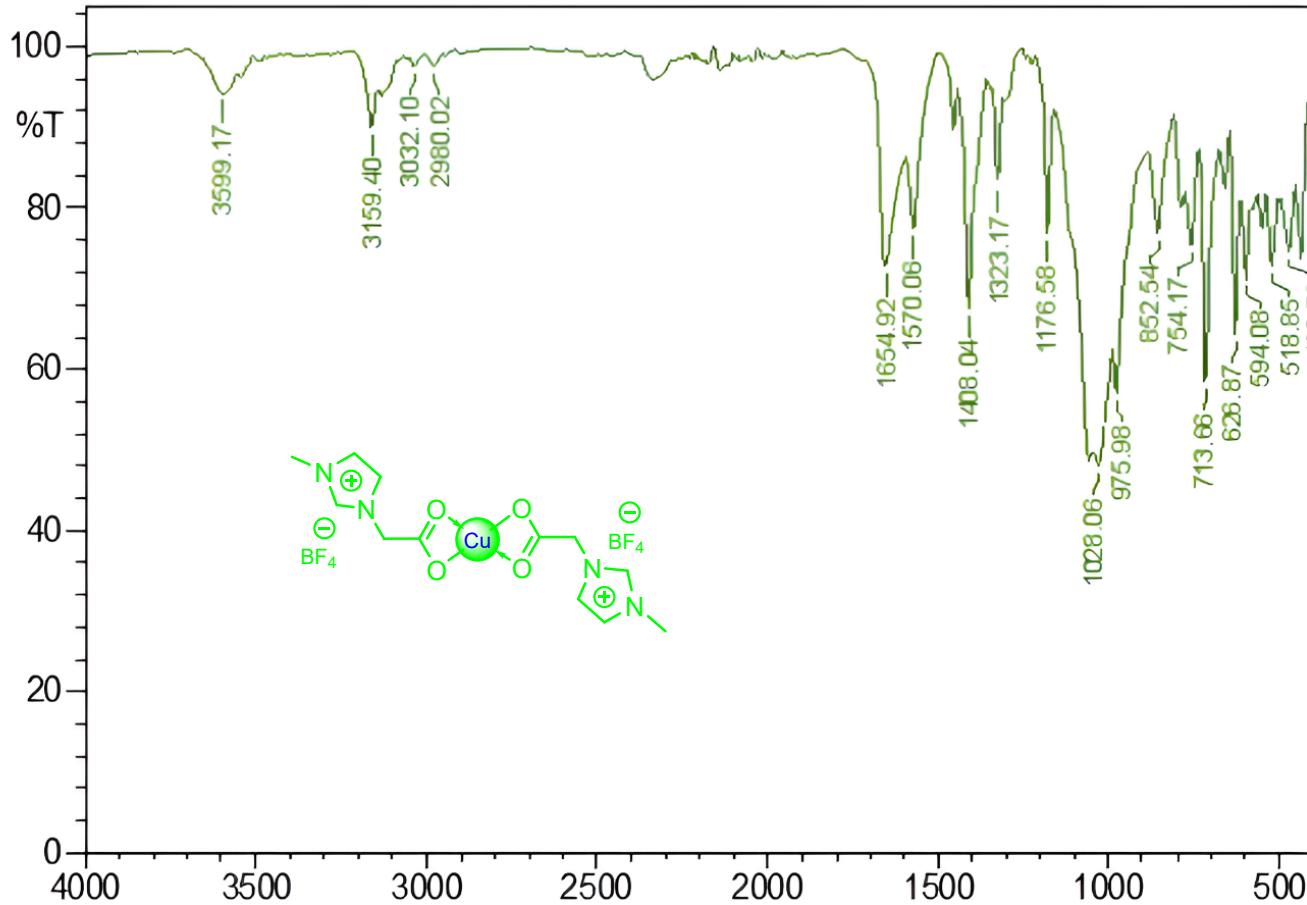
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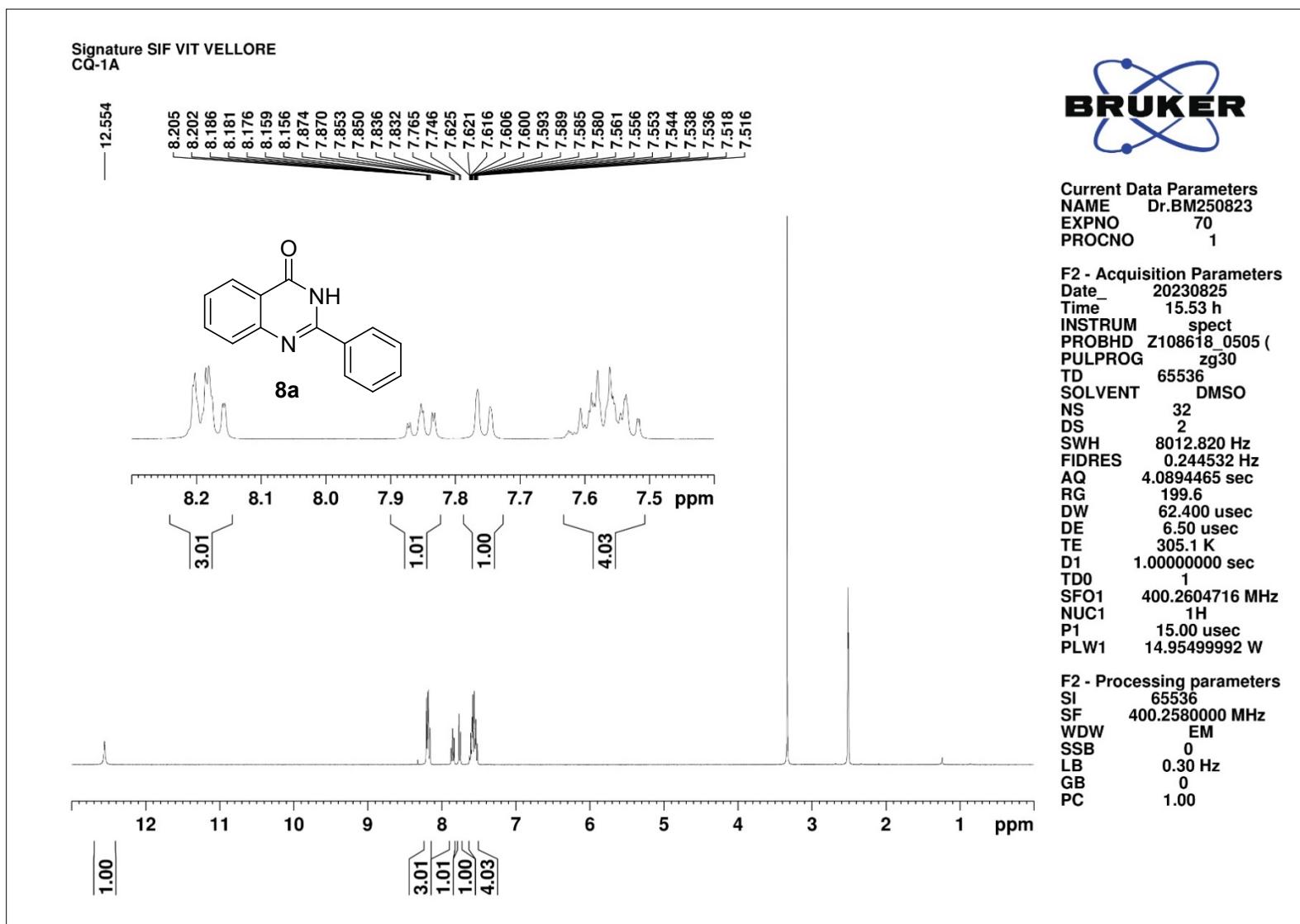




**Figure 2:** <sup>13</sup>C NMR spectrum of the ionic liquid supported copper catalyst 4.



**Figure 3:** FT-IR spectrum of the ionic liquid supported copper catalyst 4.



**Figure 4:**  $^1\text{H}$  NMR spectrum of the compound 8a.

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CQ-IA

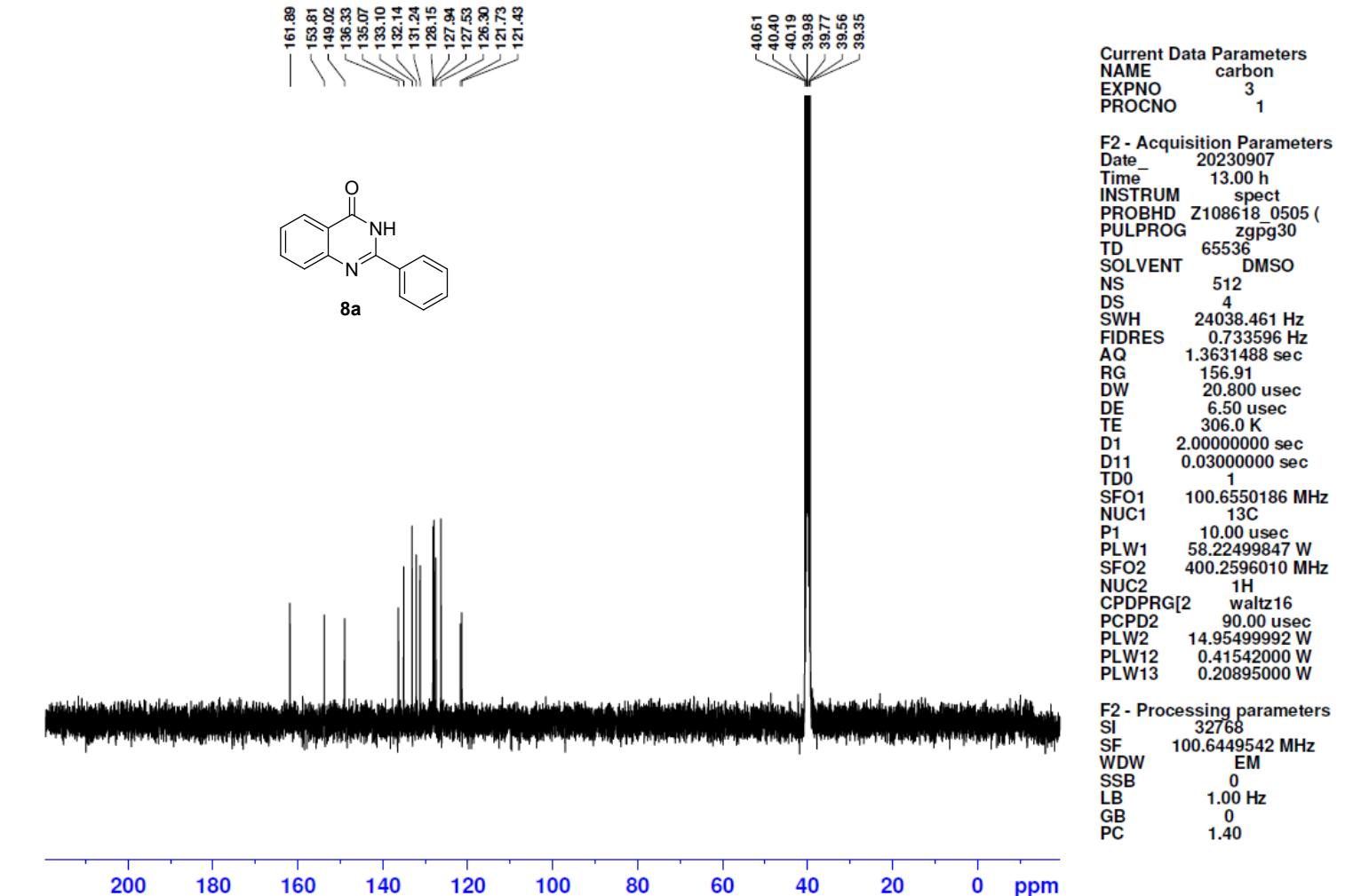
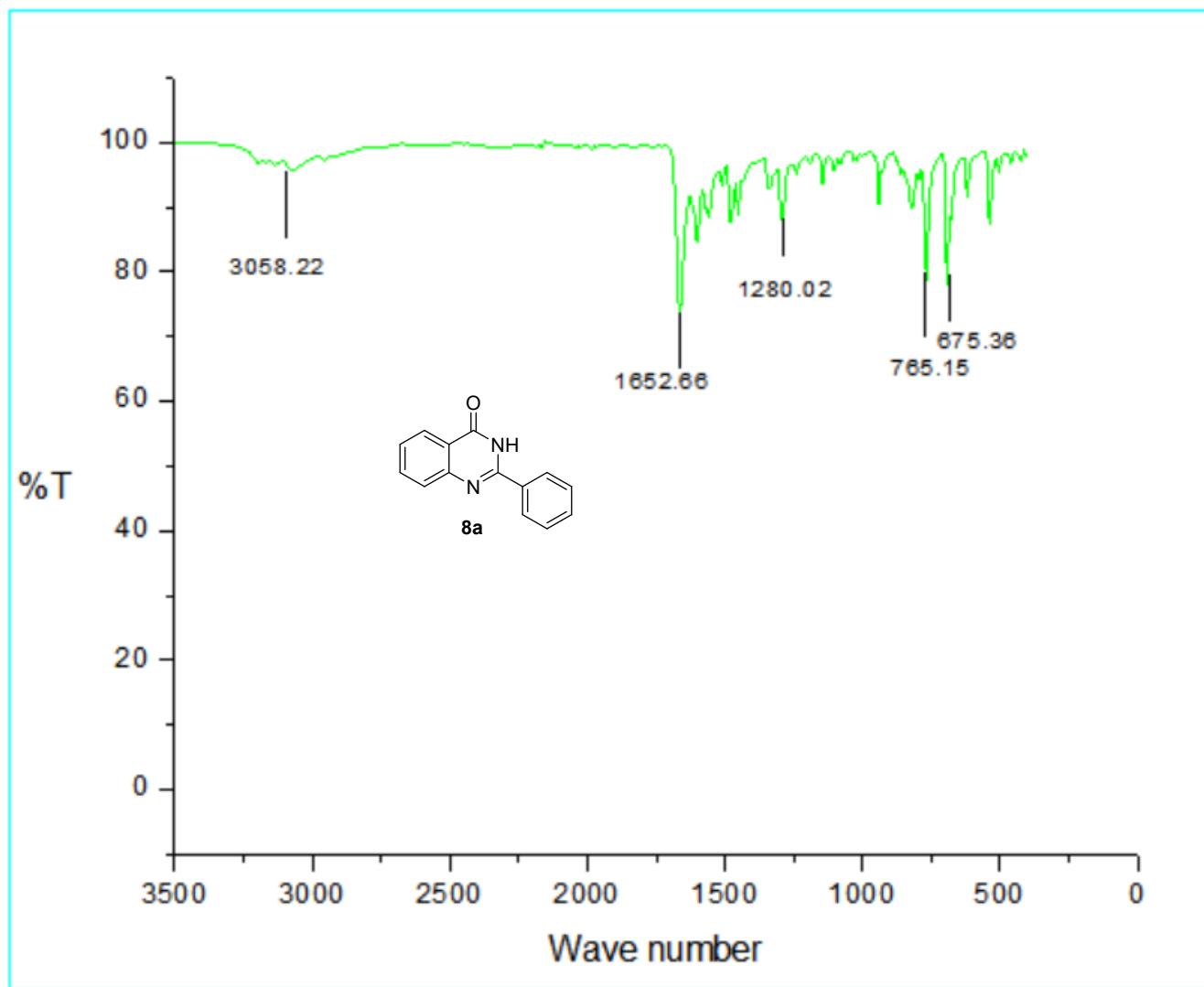
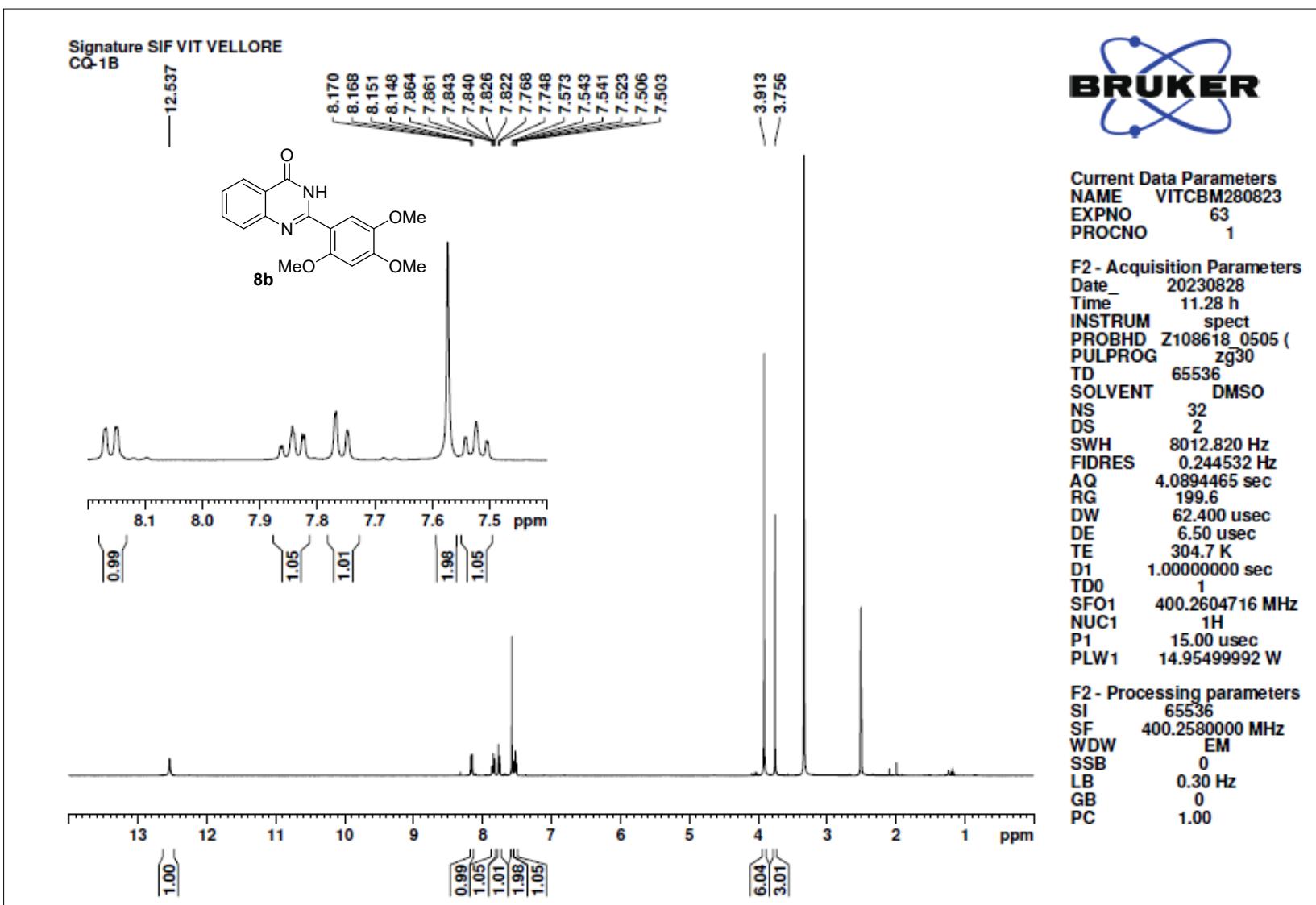


Figure 5: <sup>13</sup>C NMR spectrum of the compound **8a**.

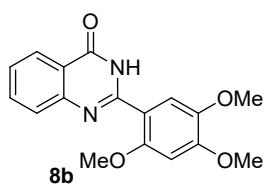


**Figure 6:** FT-IR spectrum of the compound **8a**.



**Figure 7:**  $^1\text{H}$  NMR spectrum of the compound **8b**.

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CQ-1B



162.79  
153.35  
149.15  
135.11  
127.96  
126.96  
126.33  
105.65

60.63  
56.60

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NUC2 <sup>1</sup>H  
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PLW12 0.41542000 W  
PLW13 0.20895000 W

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PC 1.40

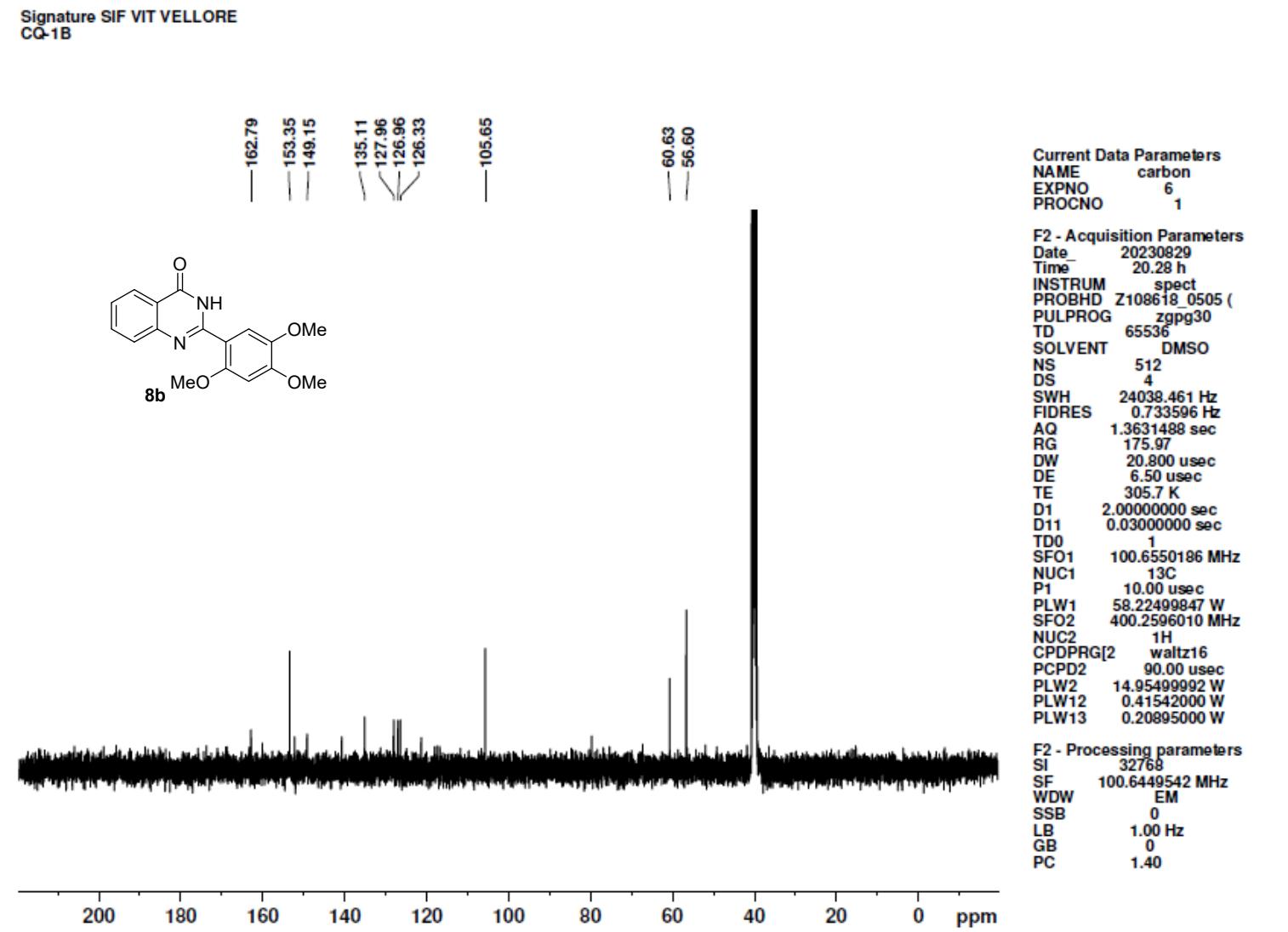


Figure 8: <sup>13</sup>C NMR spectrum of the compound **8b**.

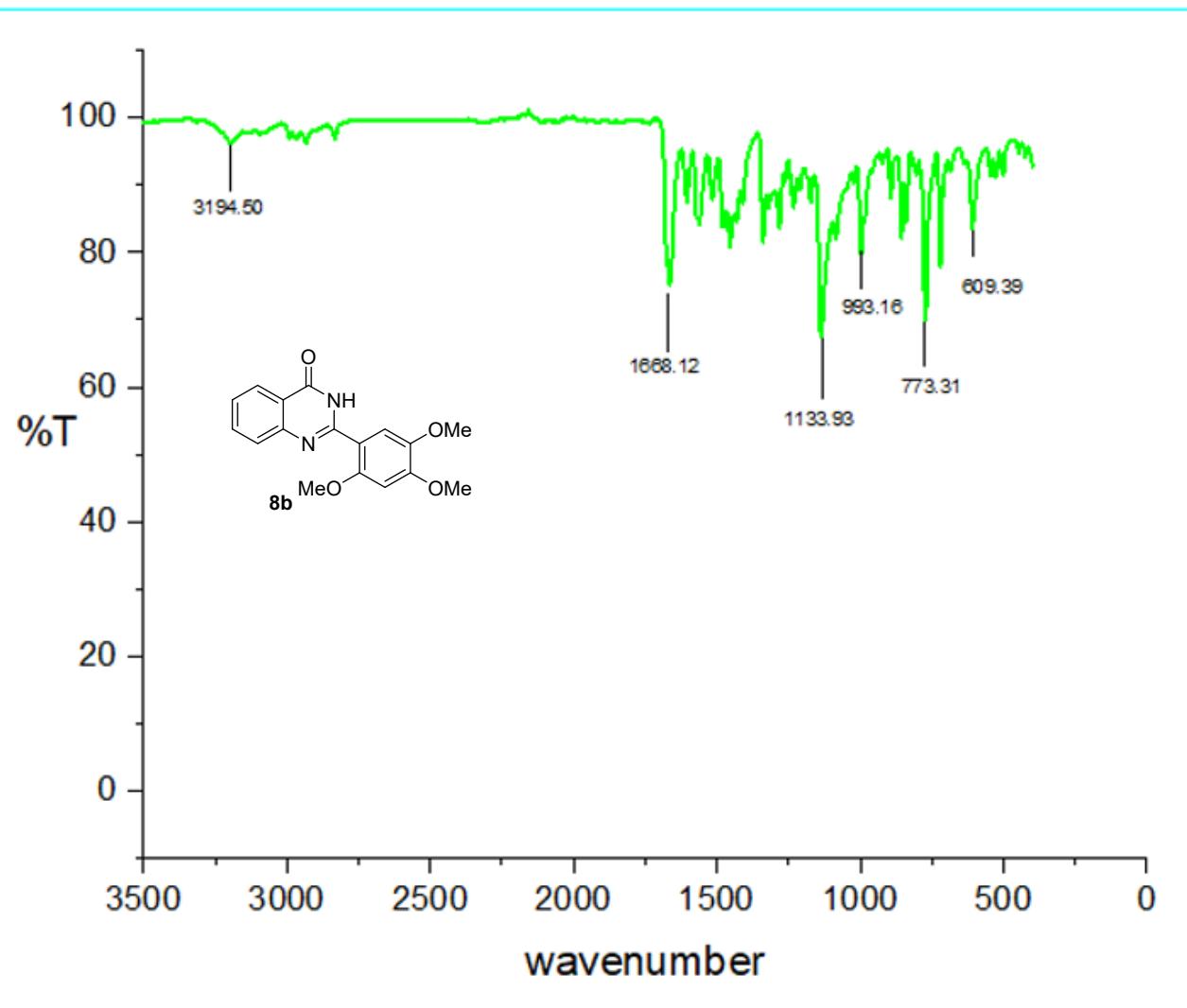
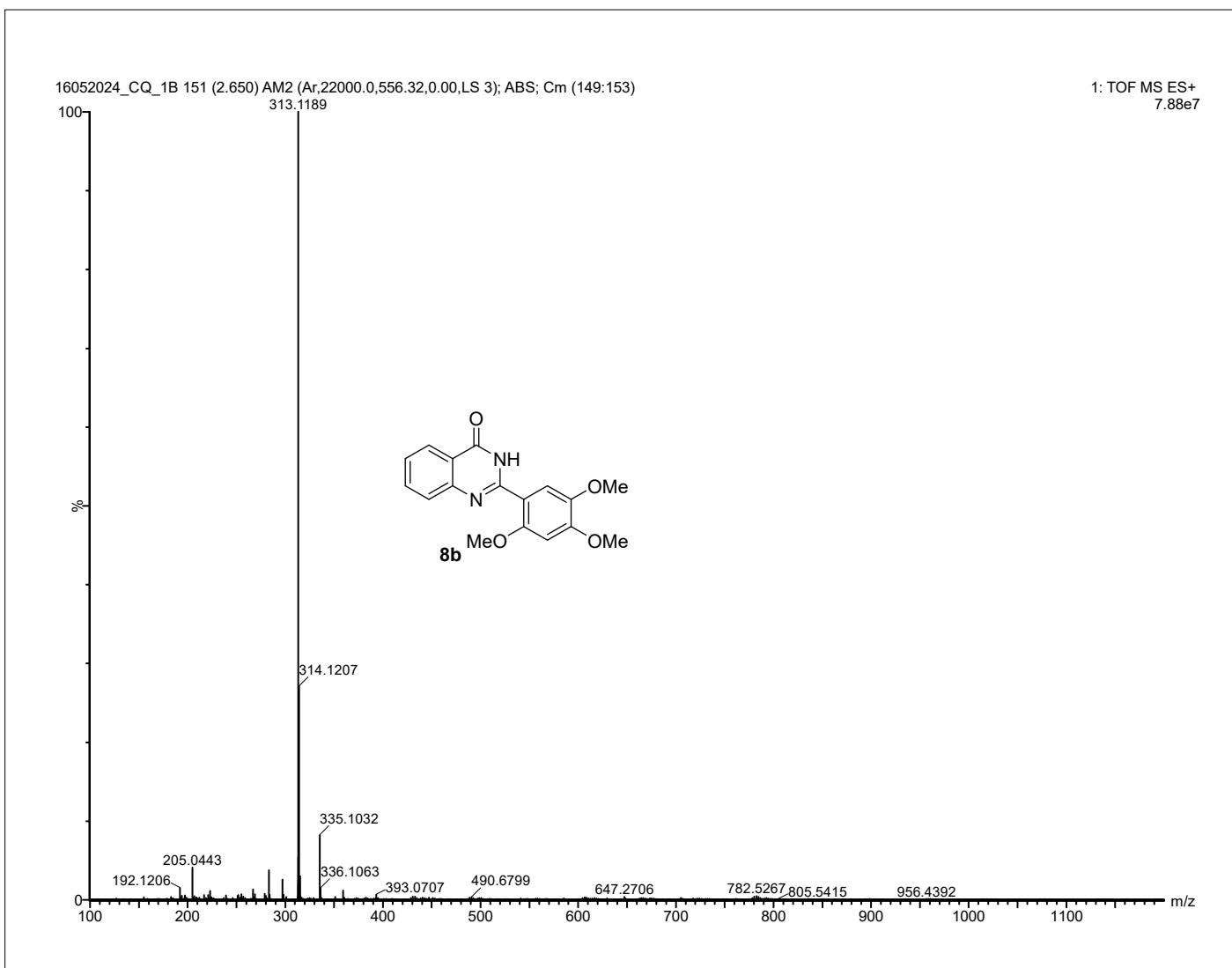


Figure 9: FT-IR spectrum of the compound **8b**.



**Figure 10:** HRMS spectrum of the compound **8b**.

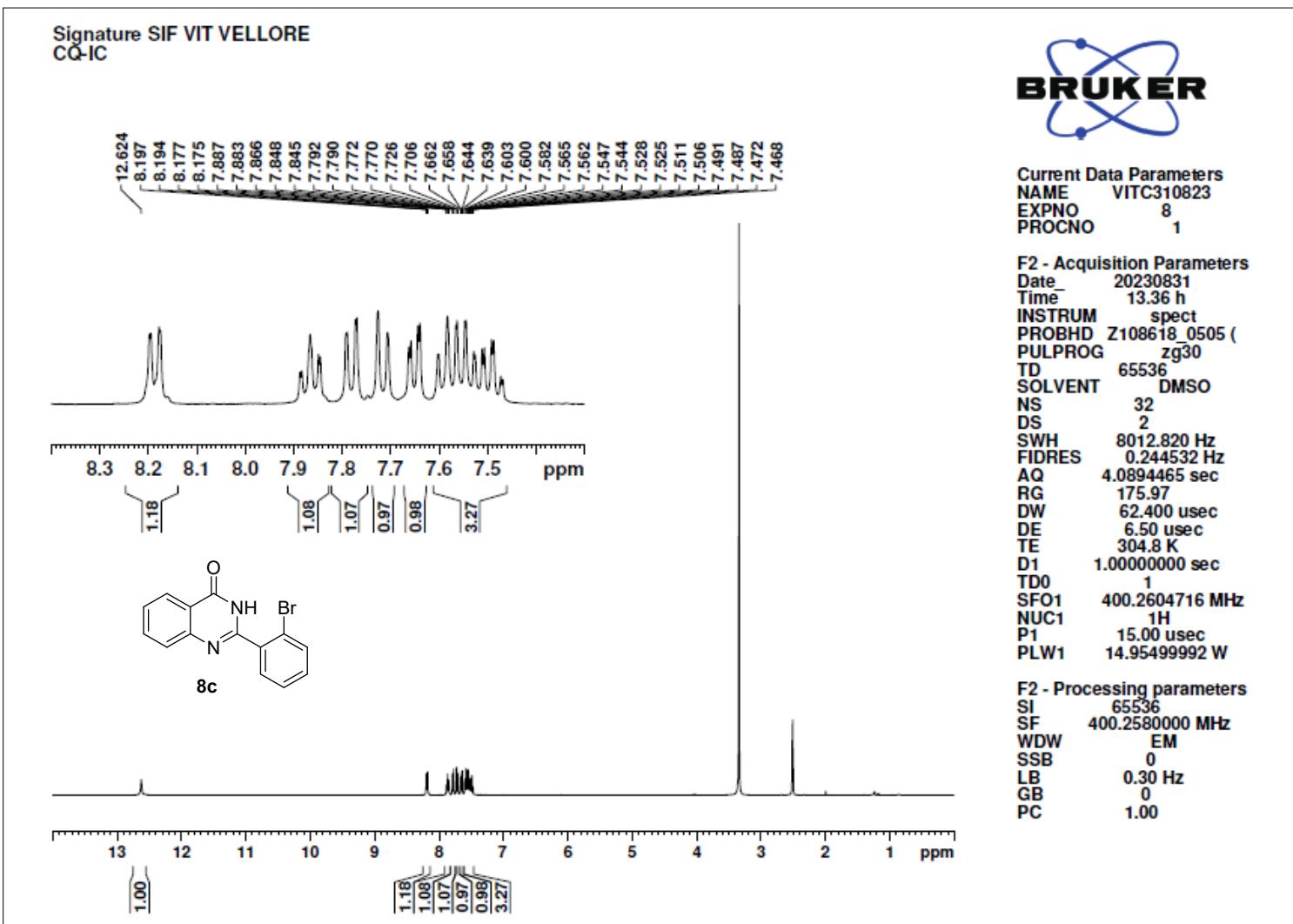


Figure 11:  $^1\text{H}$  NMR spectrum of the compound **8c**.

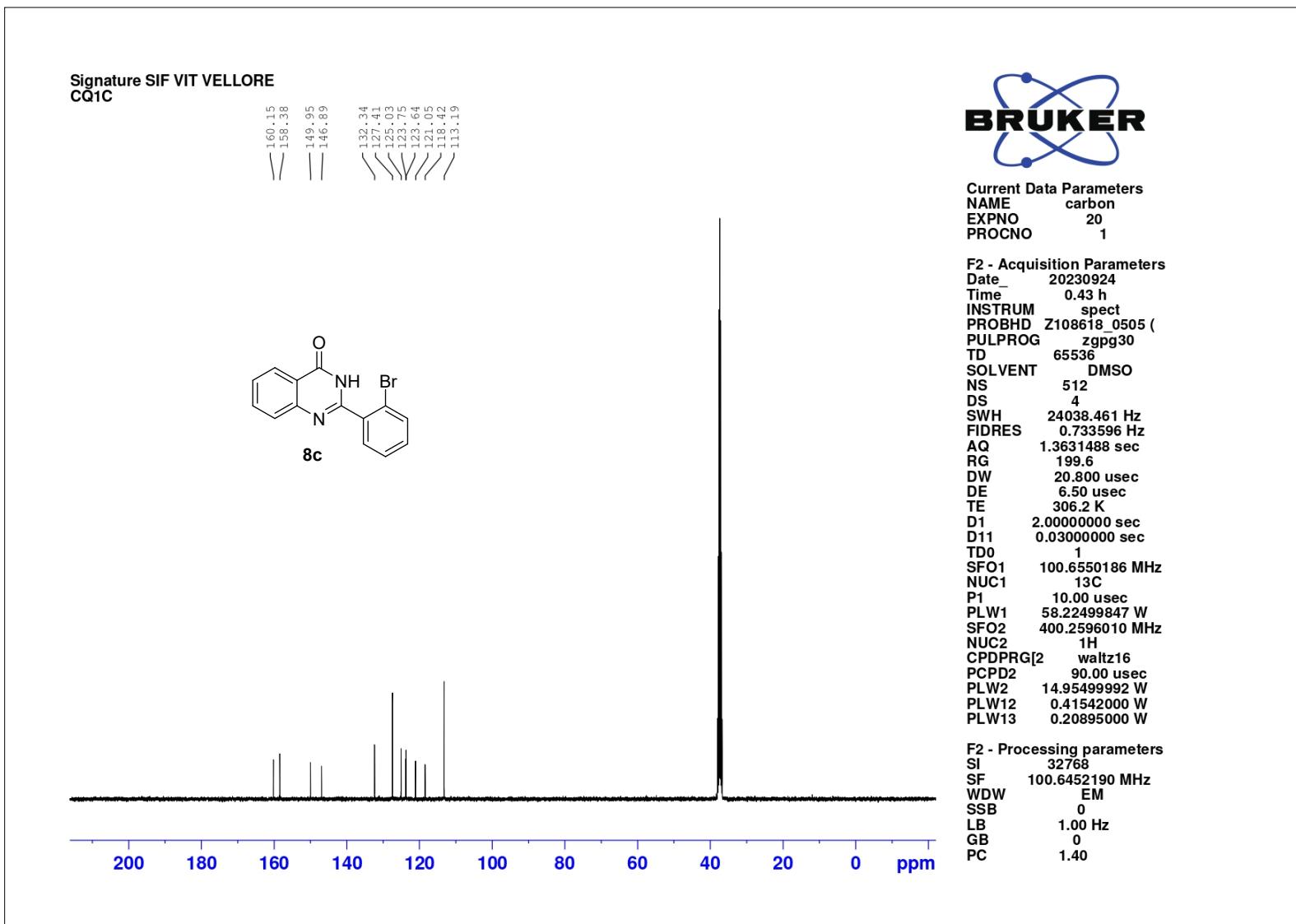
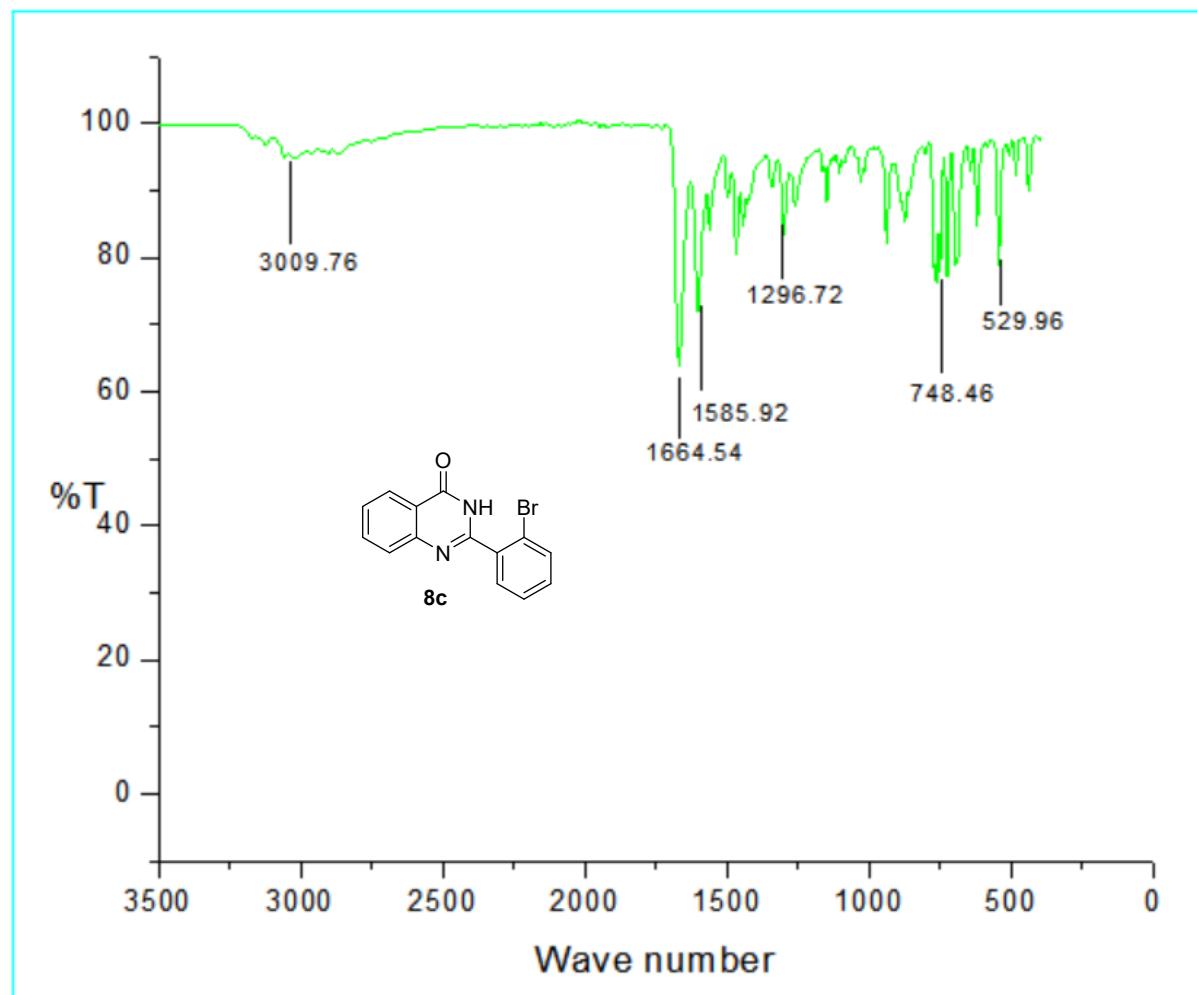
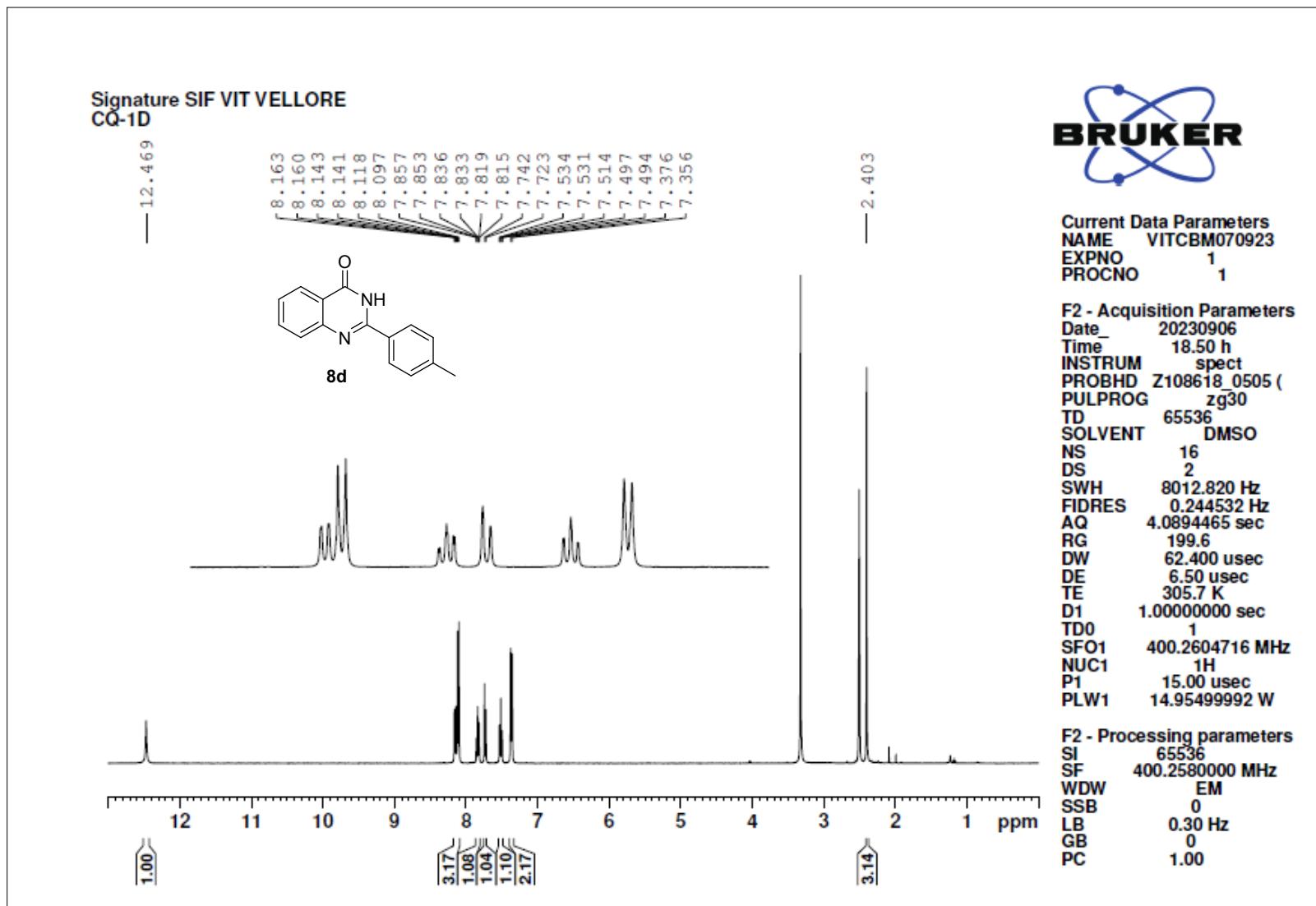


Figure 12:  $^{13}\text{C}$  NMR spectrum of the compound 8c.



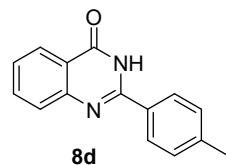
**Figure 13:** FT-IR spectrum of the compound **8c**.



**Figure 14:**  $^1\text{H}$  NMR spectrum of the compound **8d**.

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CO-1D

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135.05  
130.37  
129.67  
128.16  
127.89  
126.87  
126.31



21.47

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RG 199.6  
DW 20.800 usec  
DE 6.50 usec  
TE 306.0 K  
D1 2.0000000 sec  
D11 0.03000000 sec  
TD0 1  
SFO1 100.6550186 MHz  
NUC1 13C  
P1 10.00 usec  
PLW1 58.22499847 W  
SFO2 400.2596010 MHz  
NUC2 1H  
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PLW2 14.95499992 W  
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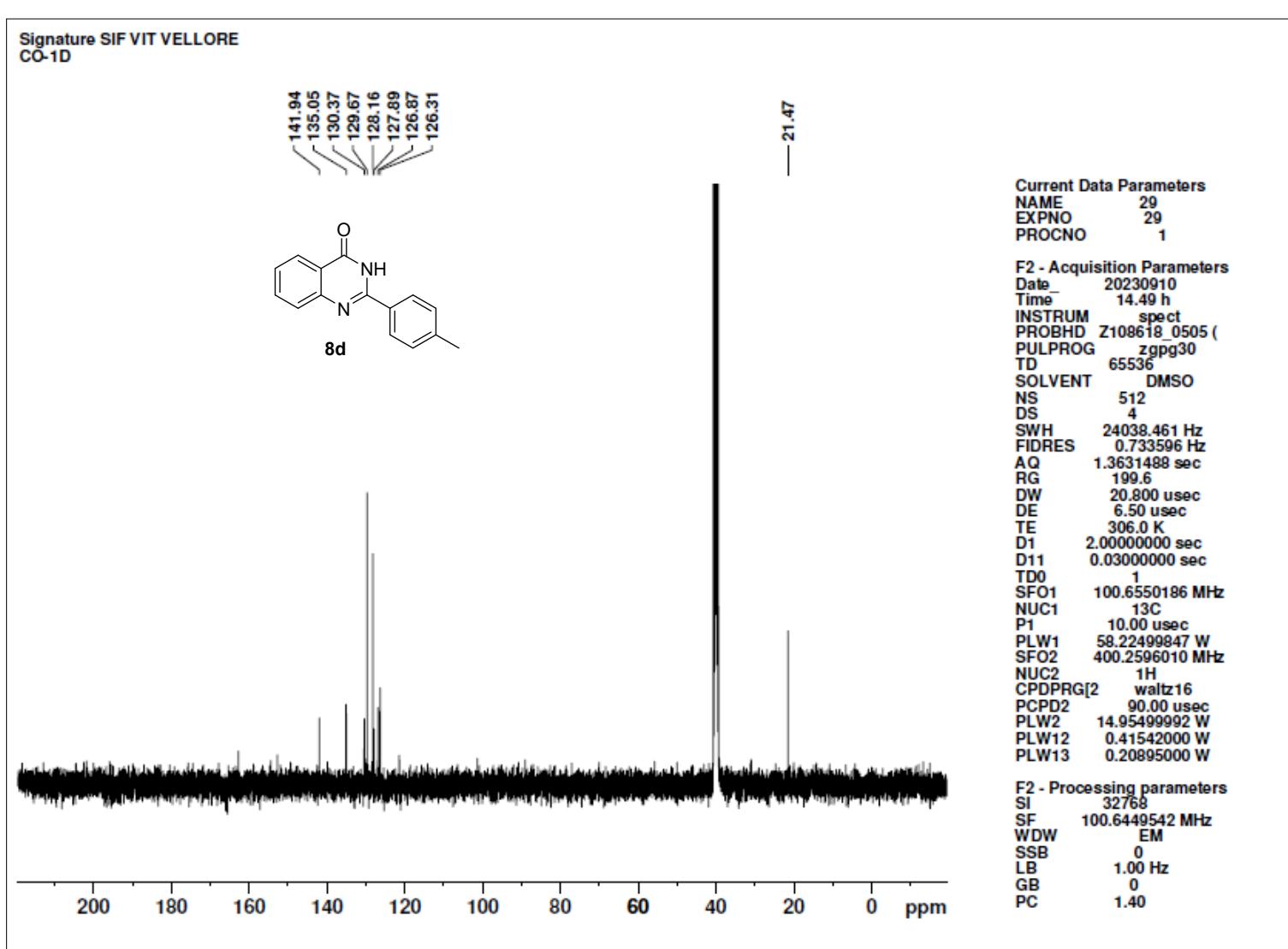
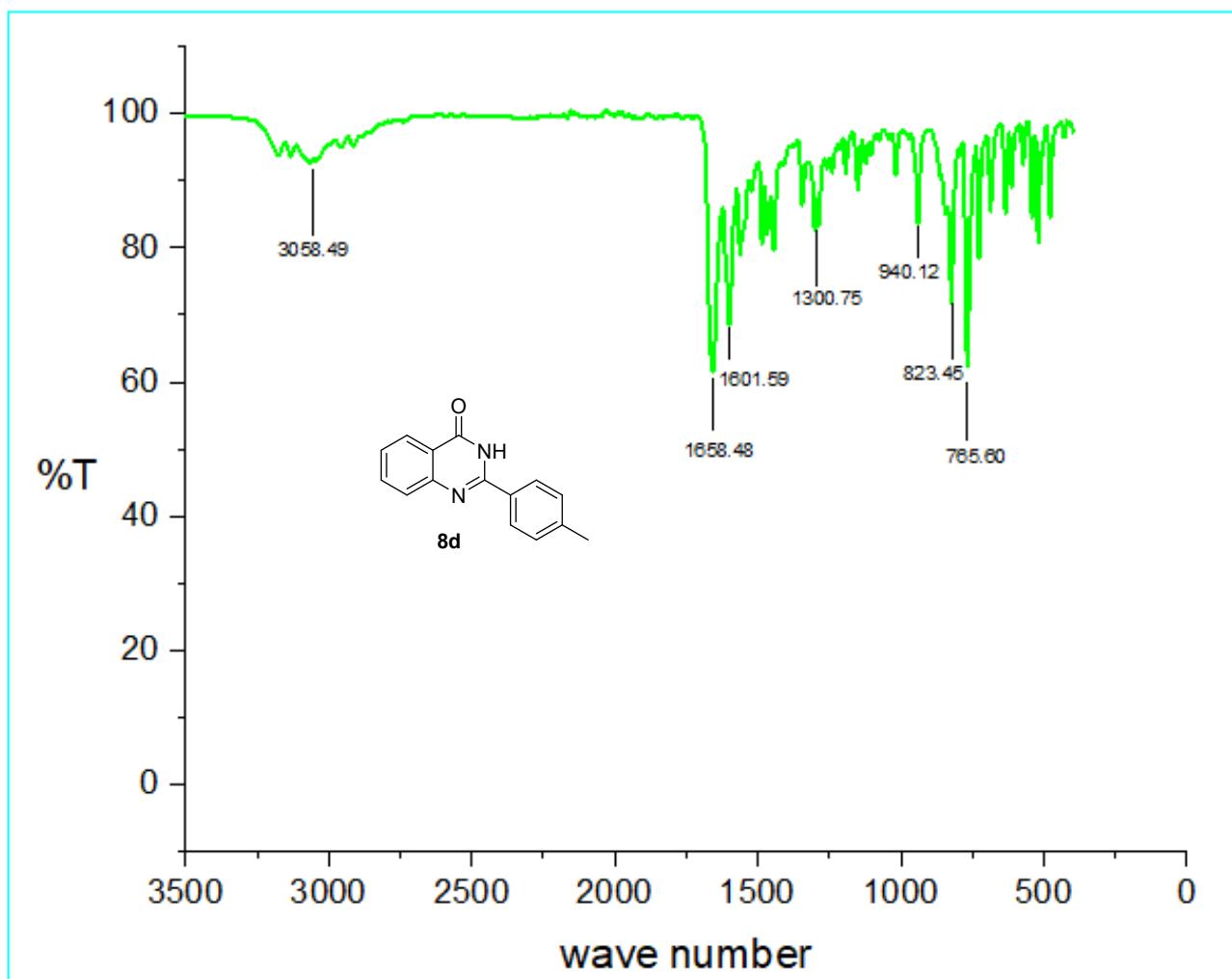


Figure 15:  $^{13}\text{C}$  NMR spectrum of the compound 8d.



**Figure 16:** FT-IR spectrum of the compound **8d**.

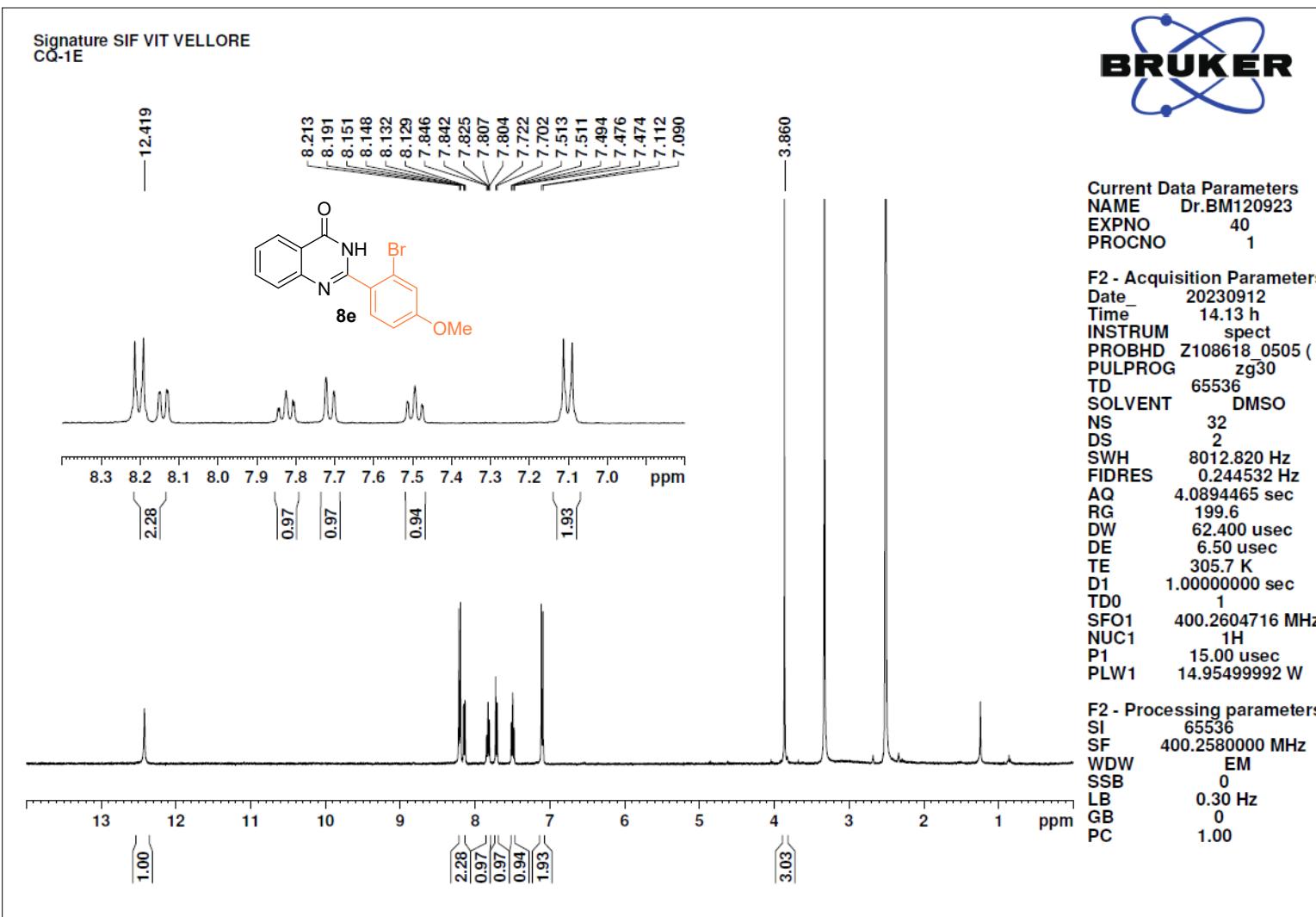
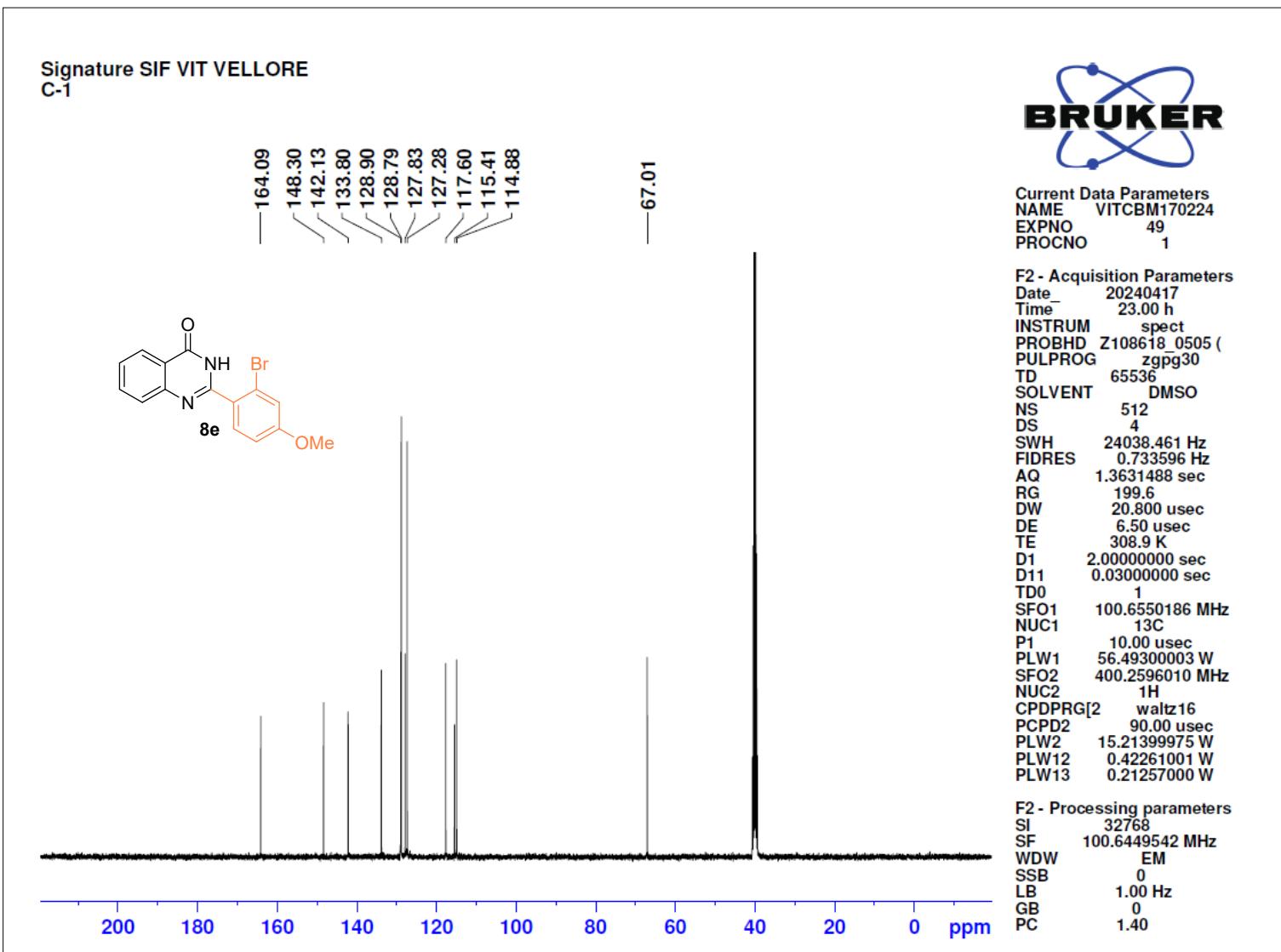
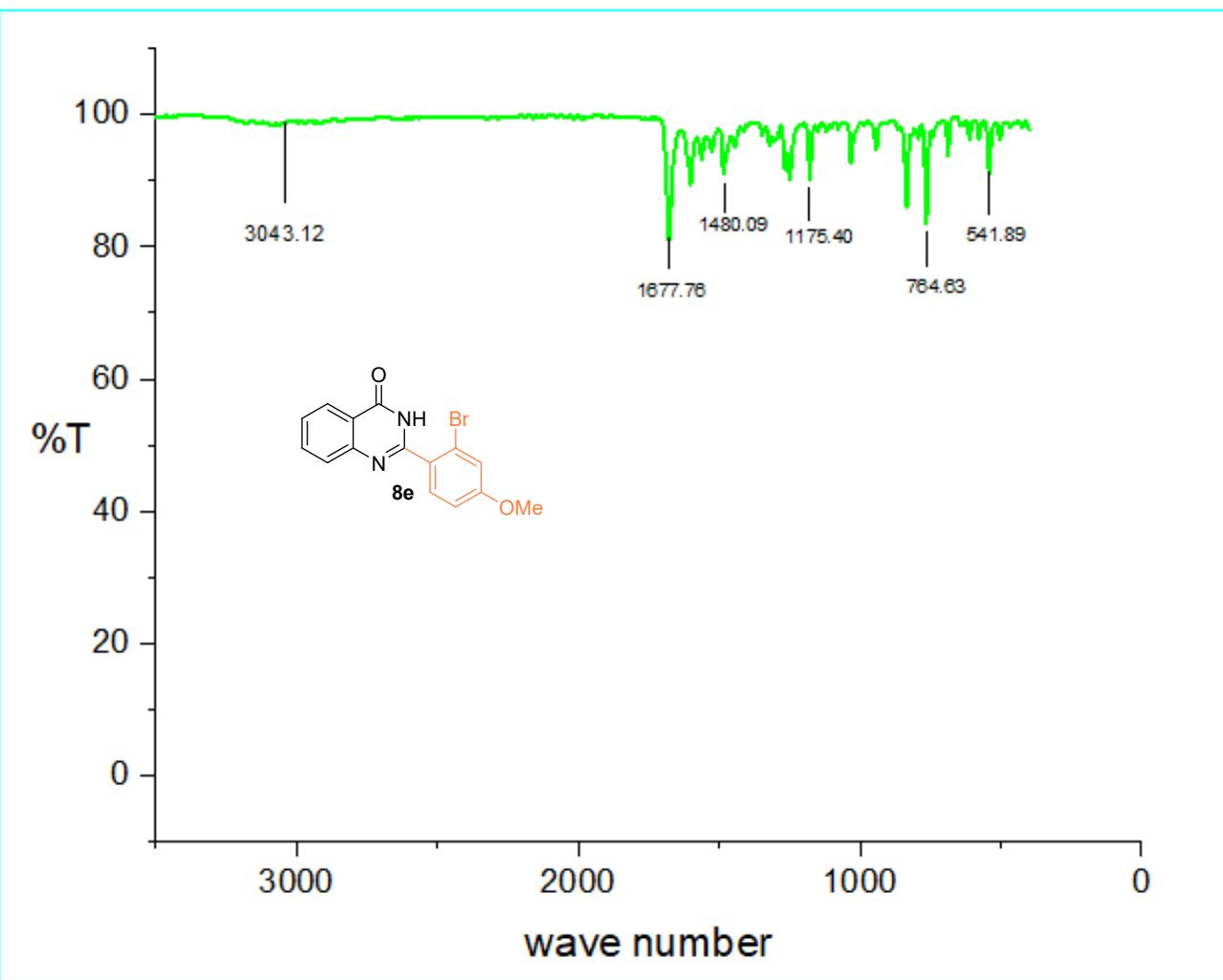


Figure 17:  $^1\text{H}$  NMR spectrum of the compound 8e.



**Figure 18:** <sup>13</sup>C NMR spectrum of the compound 8e.



**Figure 19:** FT-IR spectrum of the compound **8e**.

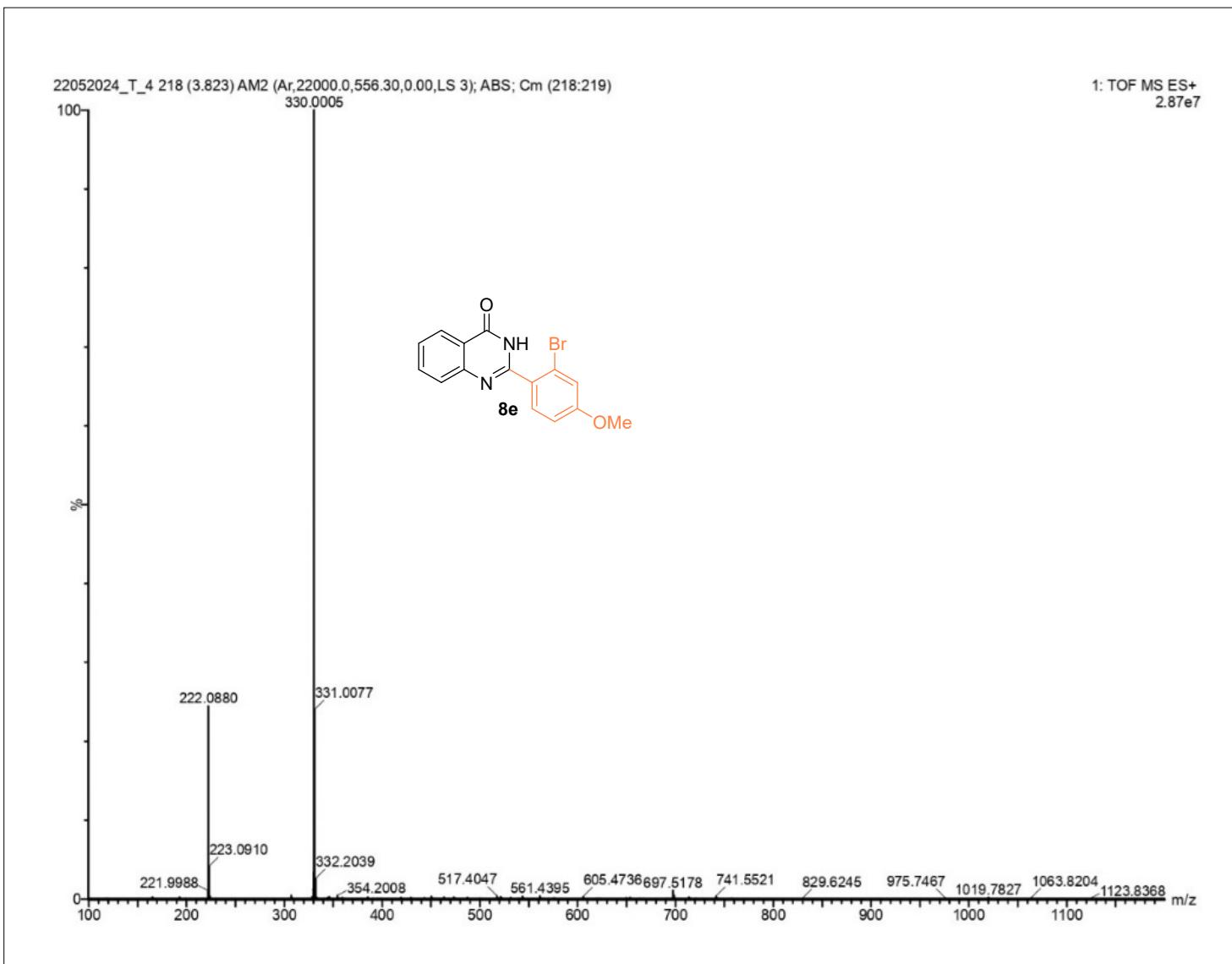
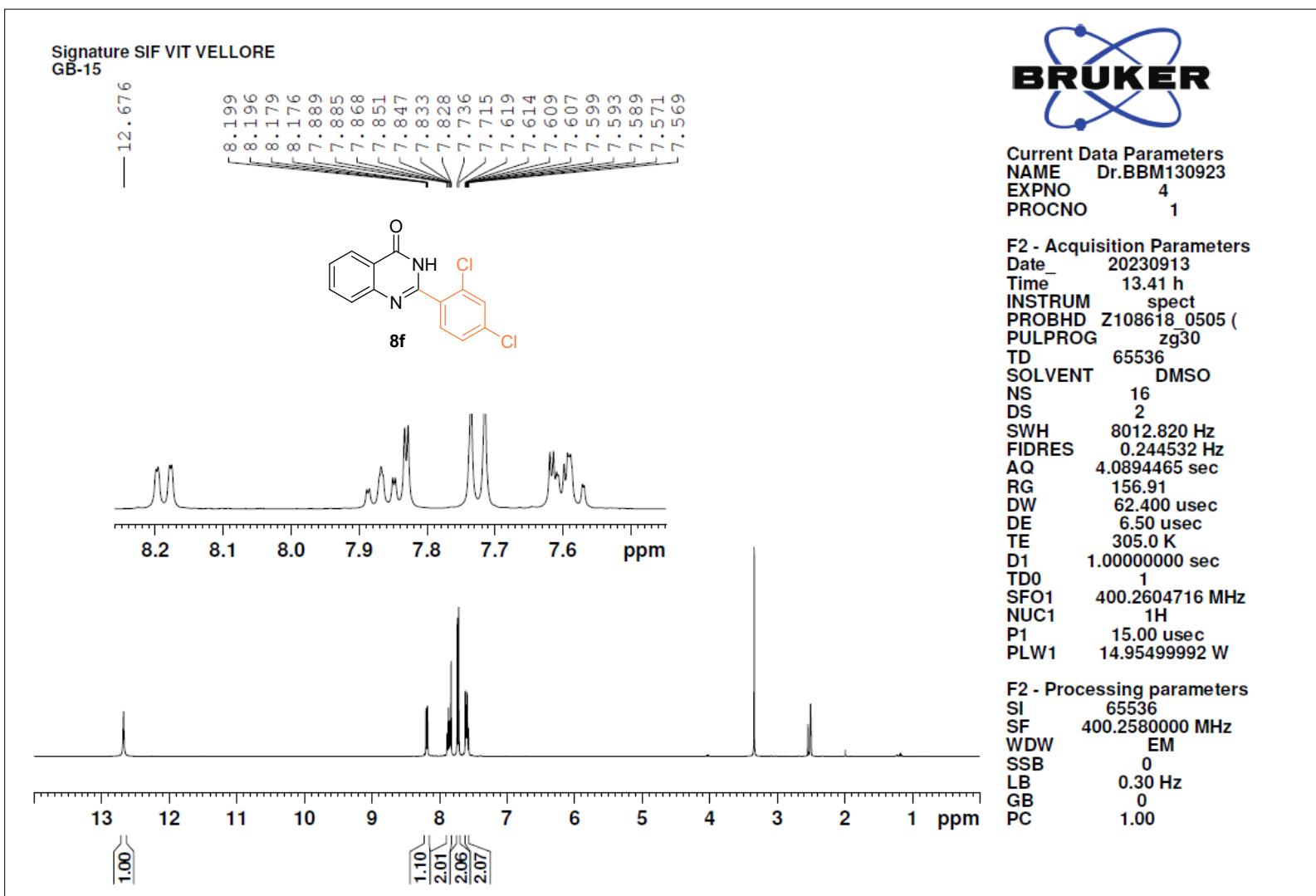


Figure 20: HRMS spectrum of the compound **8e**.



**Figure 21:**  $^1\text{H}$  NMR spectrum of the compound **8f**.

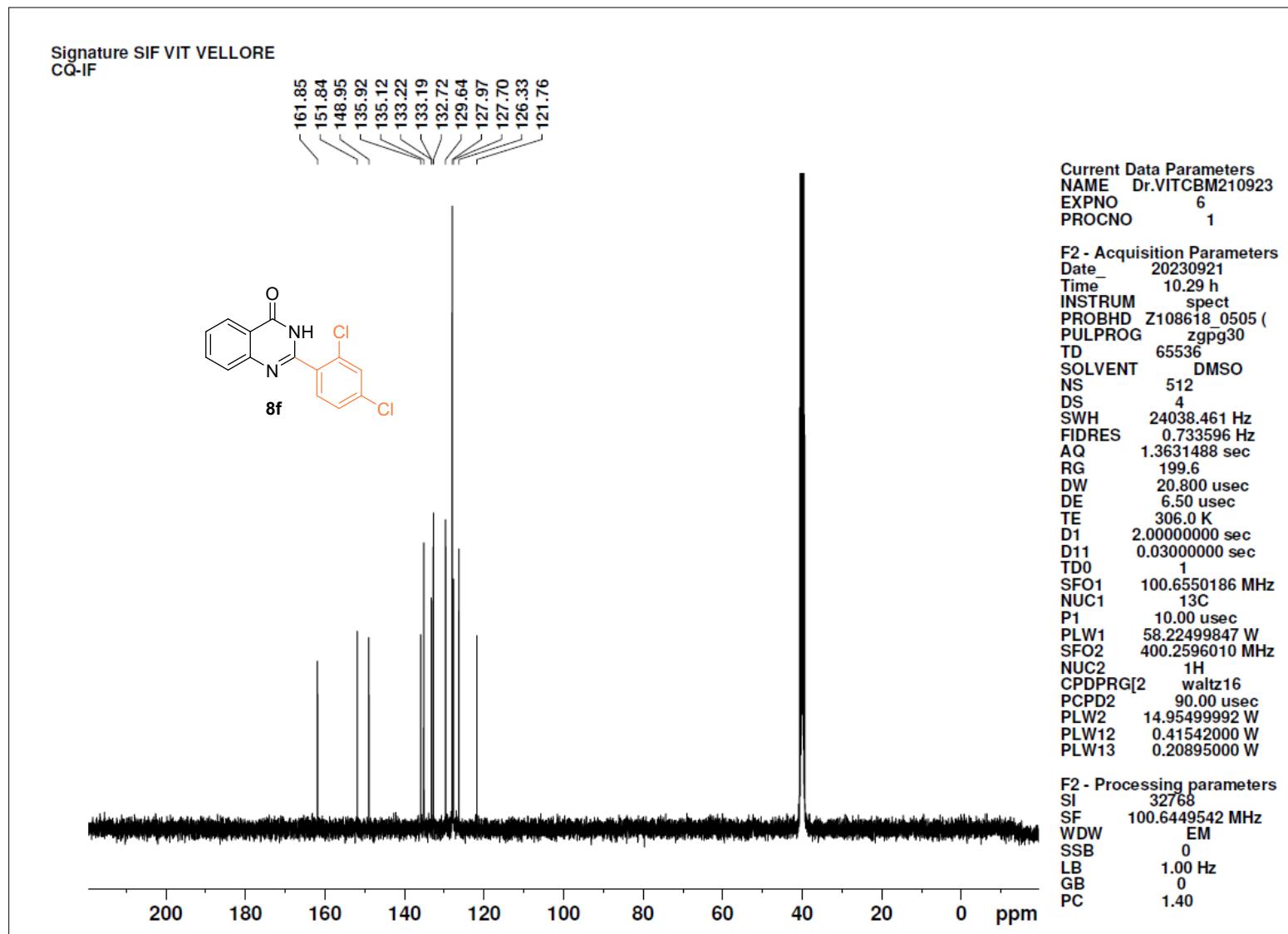
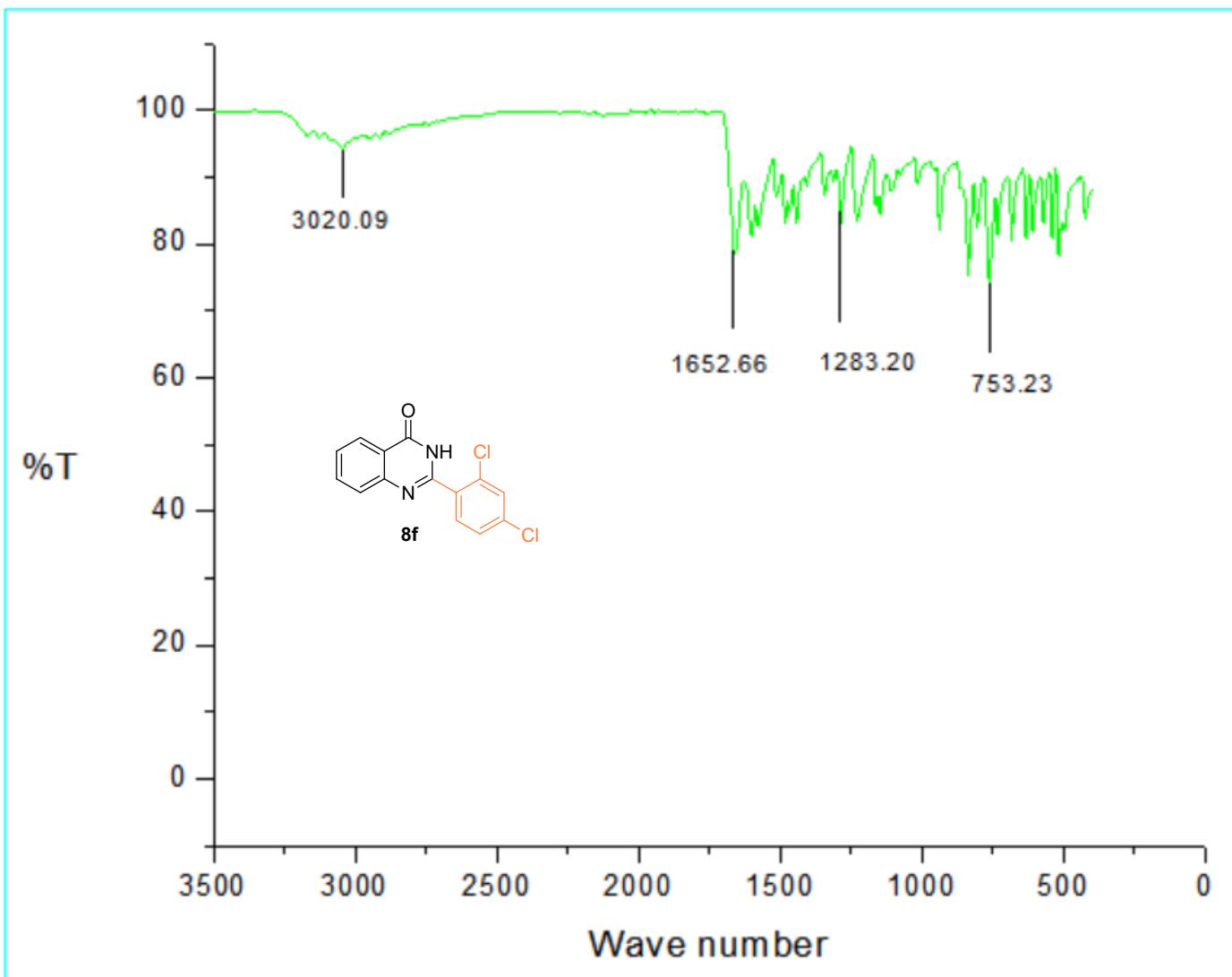
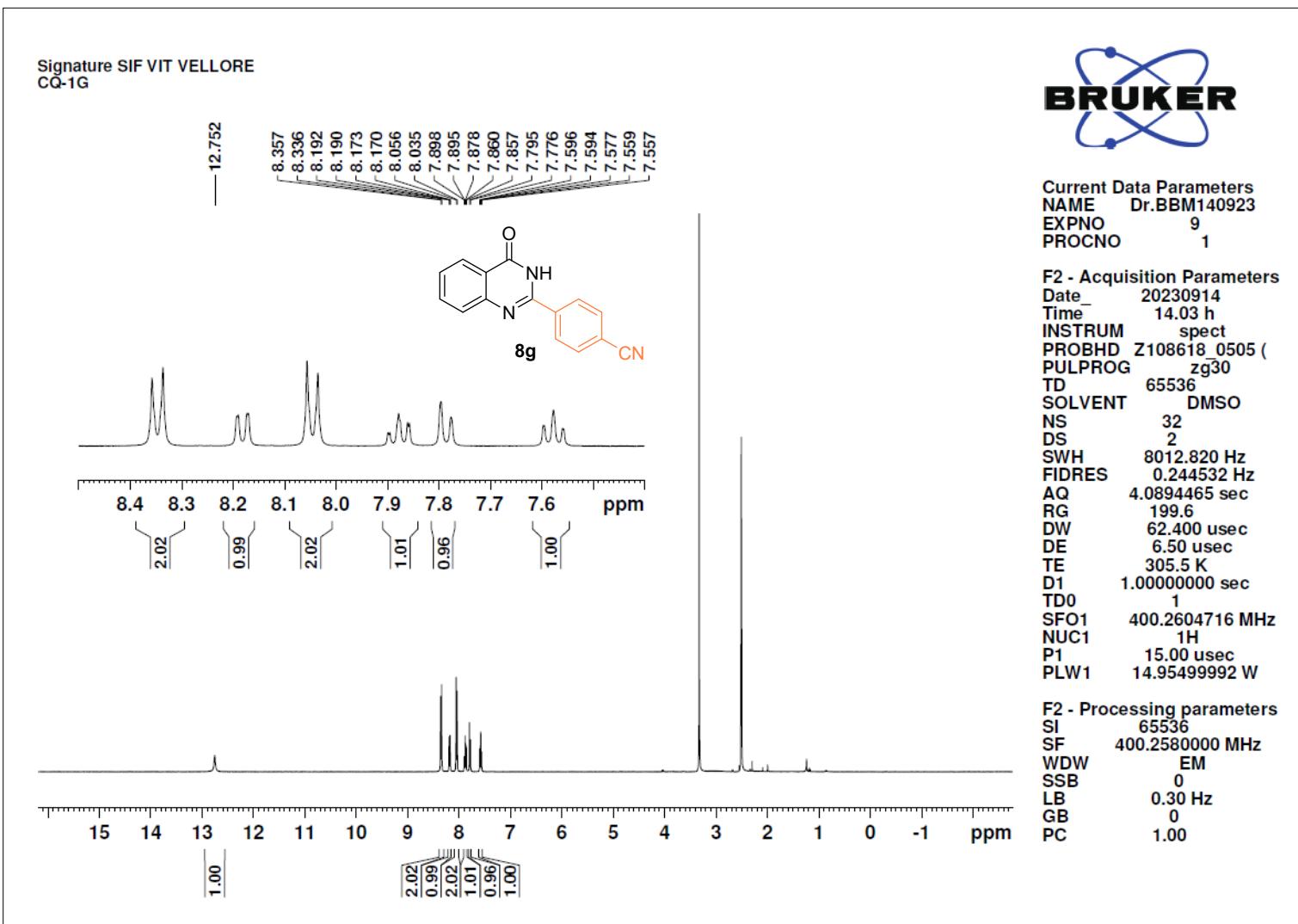


Figure 22: <sup>13</sup>C NMR spectrum of the compound 8f.



**Figure 23:** FT-IR spectrum of the compound **8f**.



**Figure 24:**  $^1\text{H}$  NMR spectrum of the compound **8g**.

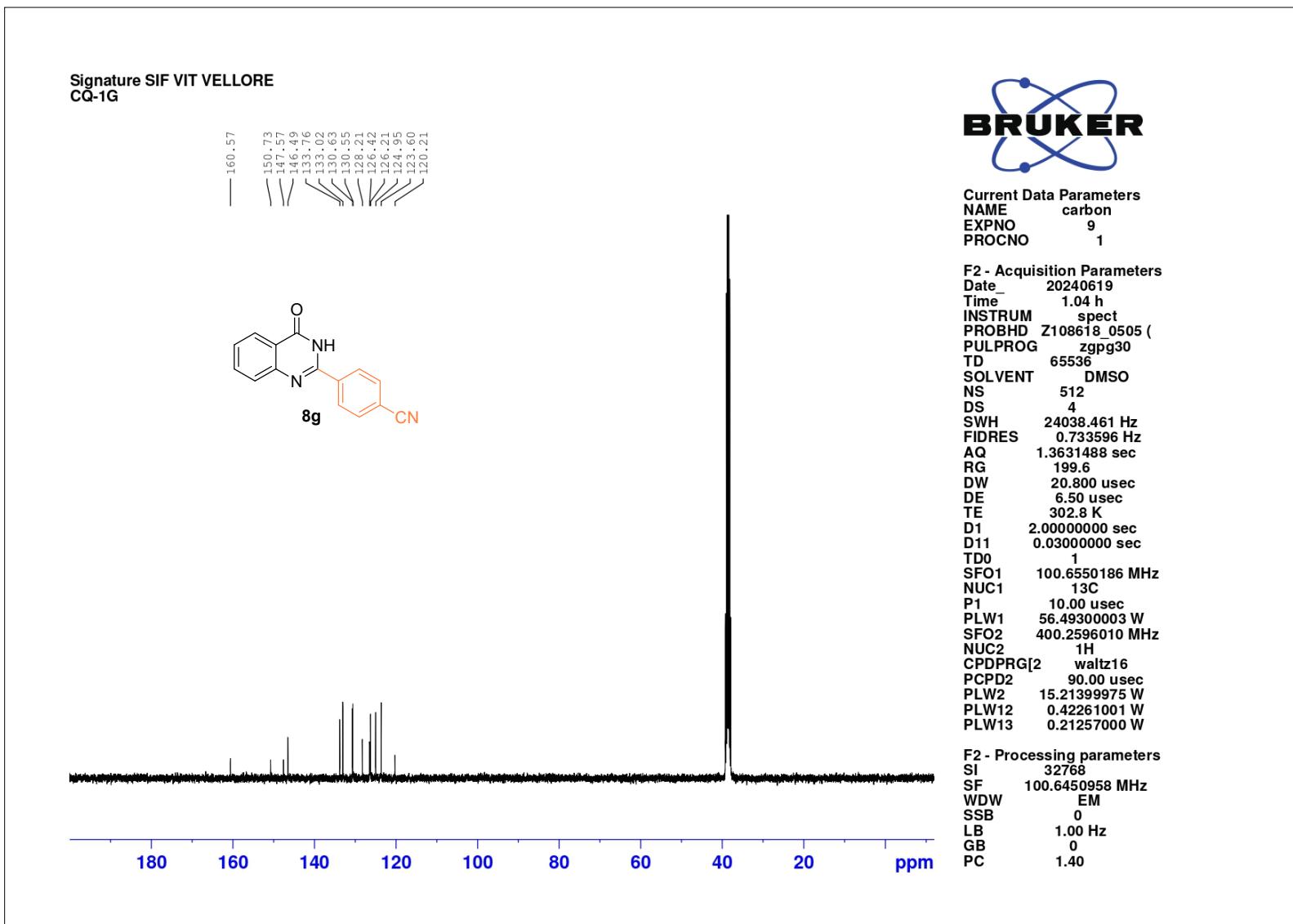
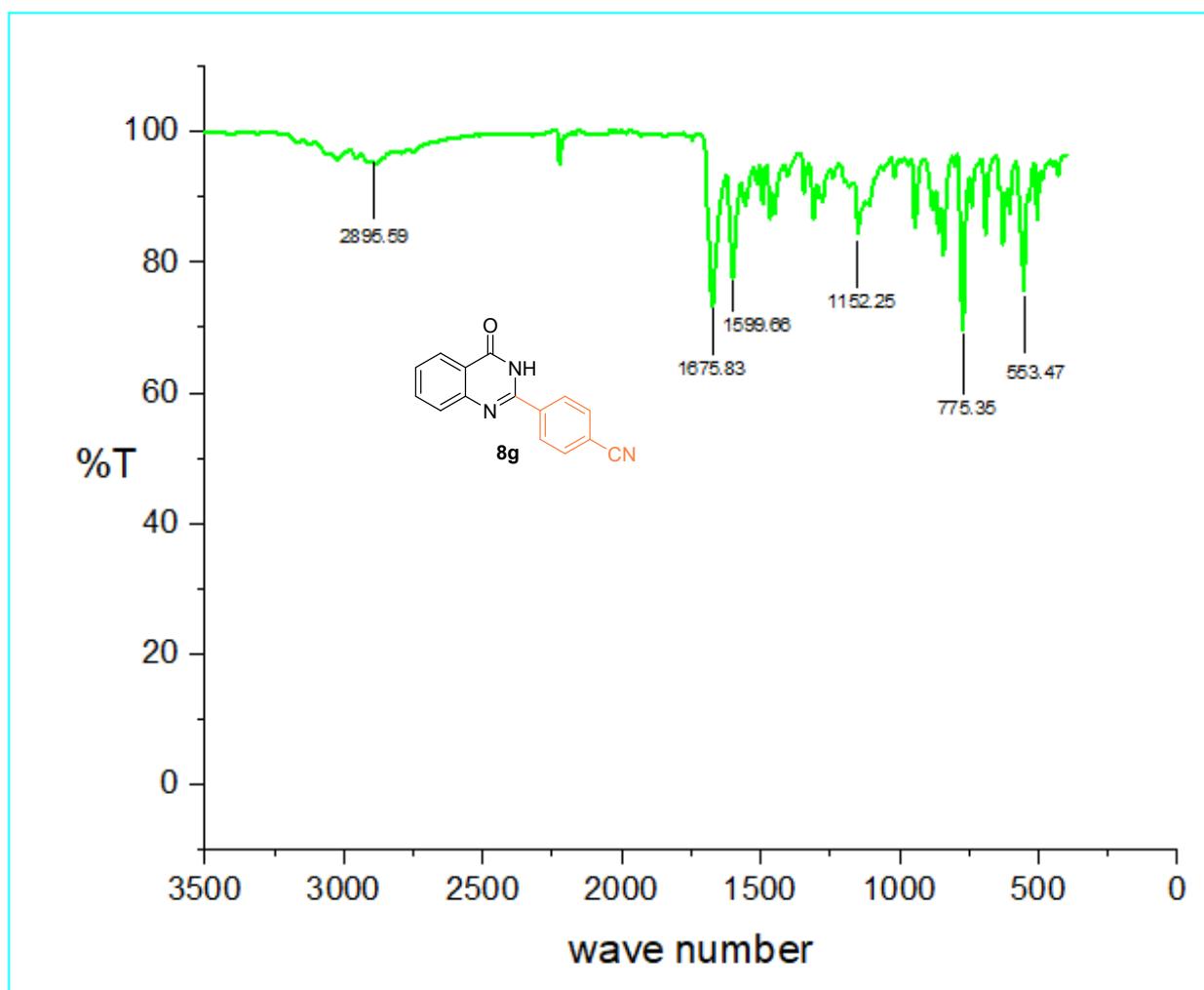
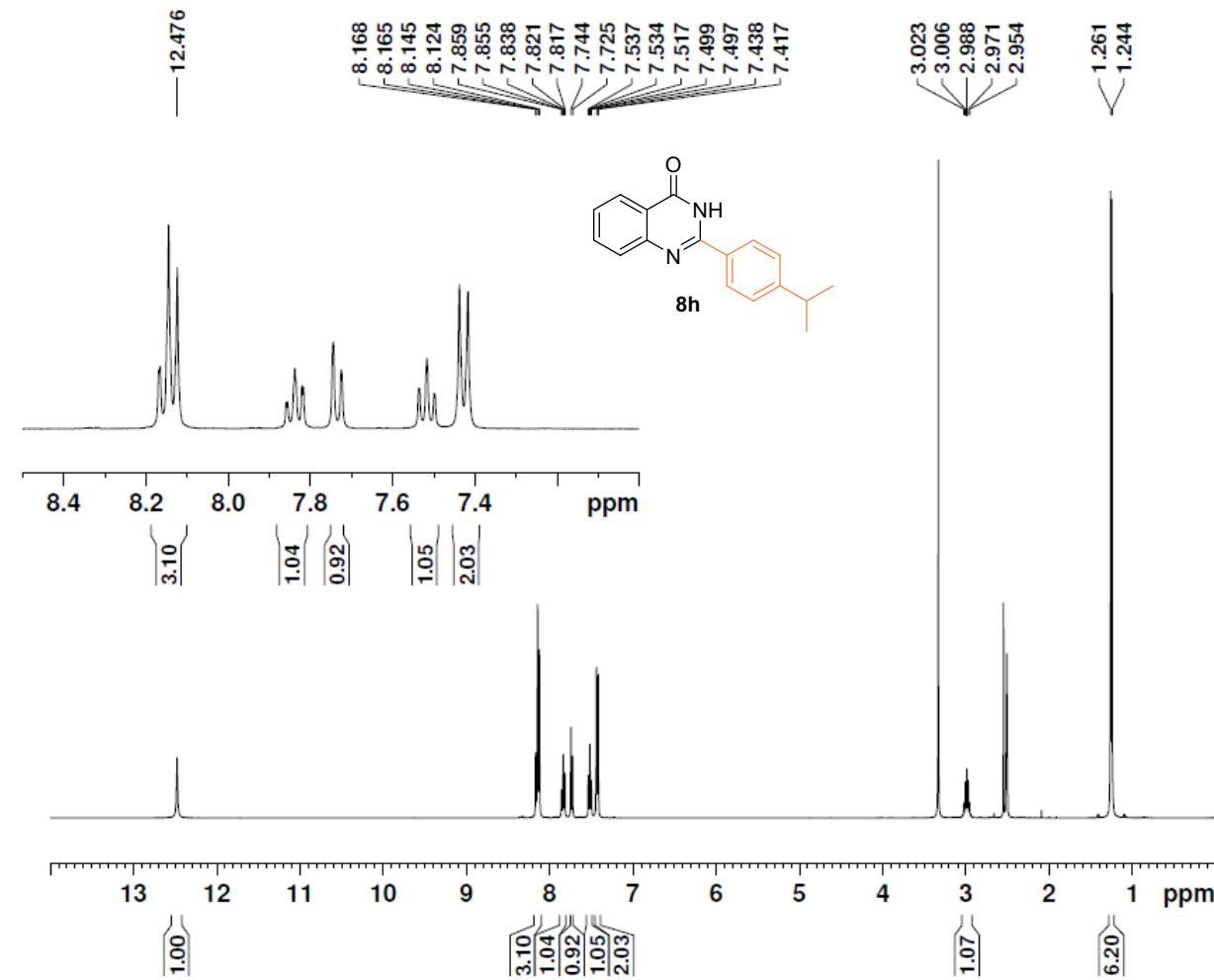


Figure 25:  $^{13}\text{C}$  NMR spectrum of the compound 8g.



**Figure 26:** FT-IR spectrum of the compound **8g**.

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CQ-1H



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FIDRES 0.244532 Hz  
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RG 175.97  
DW 62.400 usec  
DE 6.50 usec  
TE 305.8 K  
D1 1.0000000 sec  
TD0 1  
SFO1 400.2604716 MHz  
NUC1 1H  
P1 15.00 usec  
PLW1 14.95499992 W

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Figure 27: <sup>1</sup>H NMR spectrum of the compound **8h**.

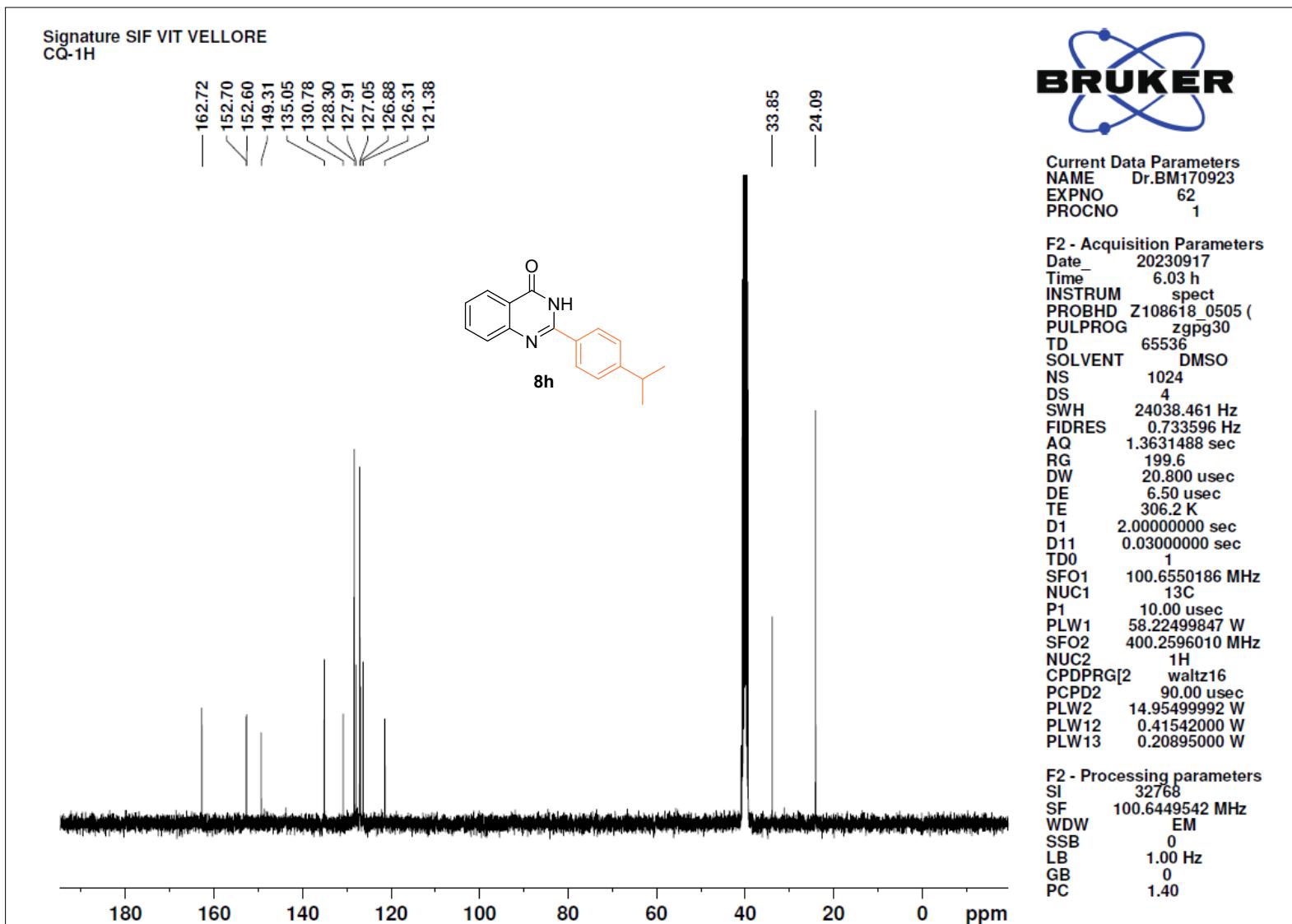
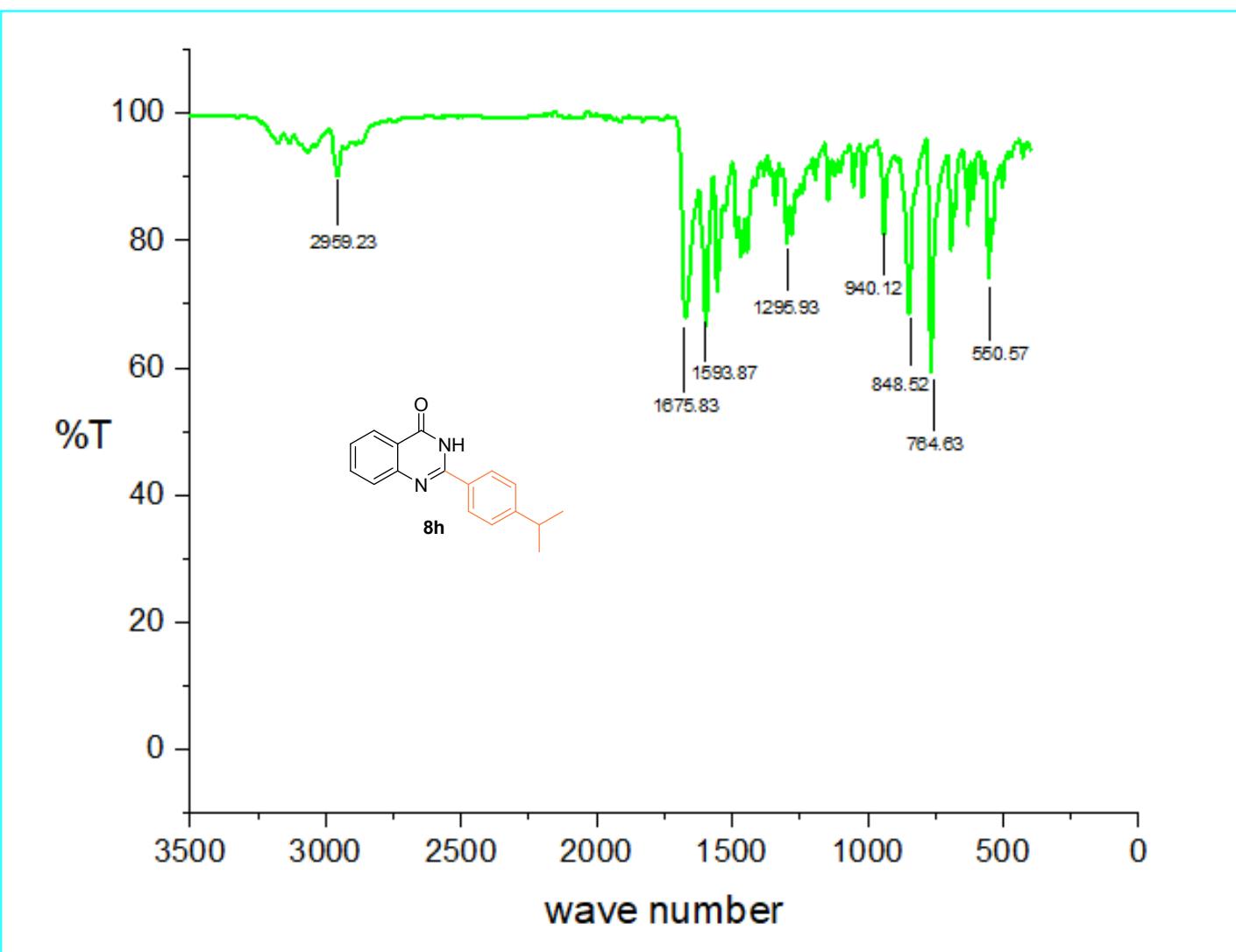
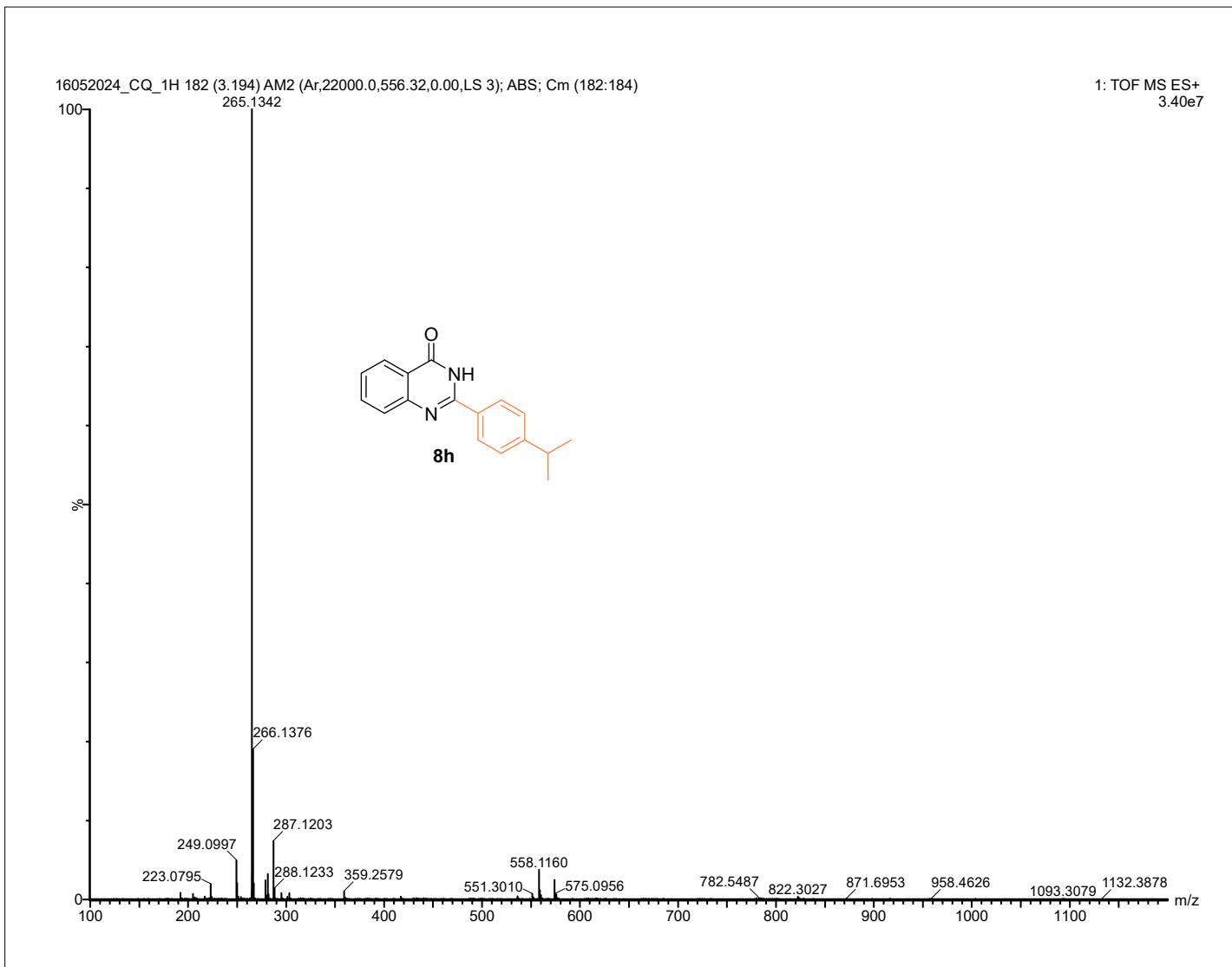


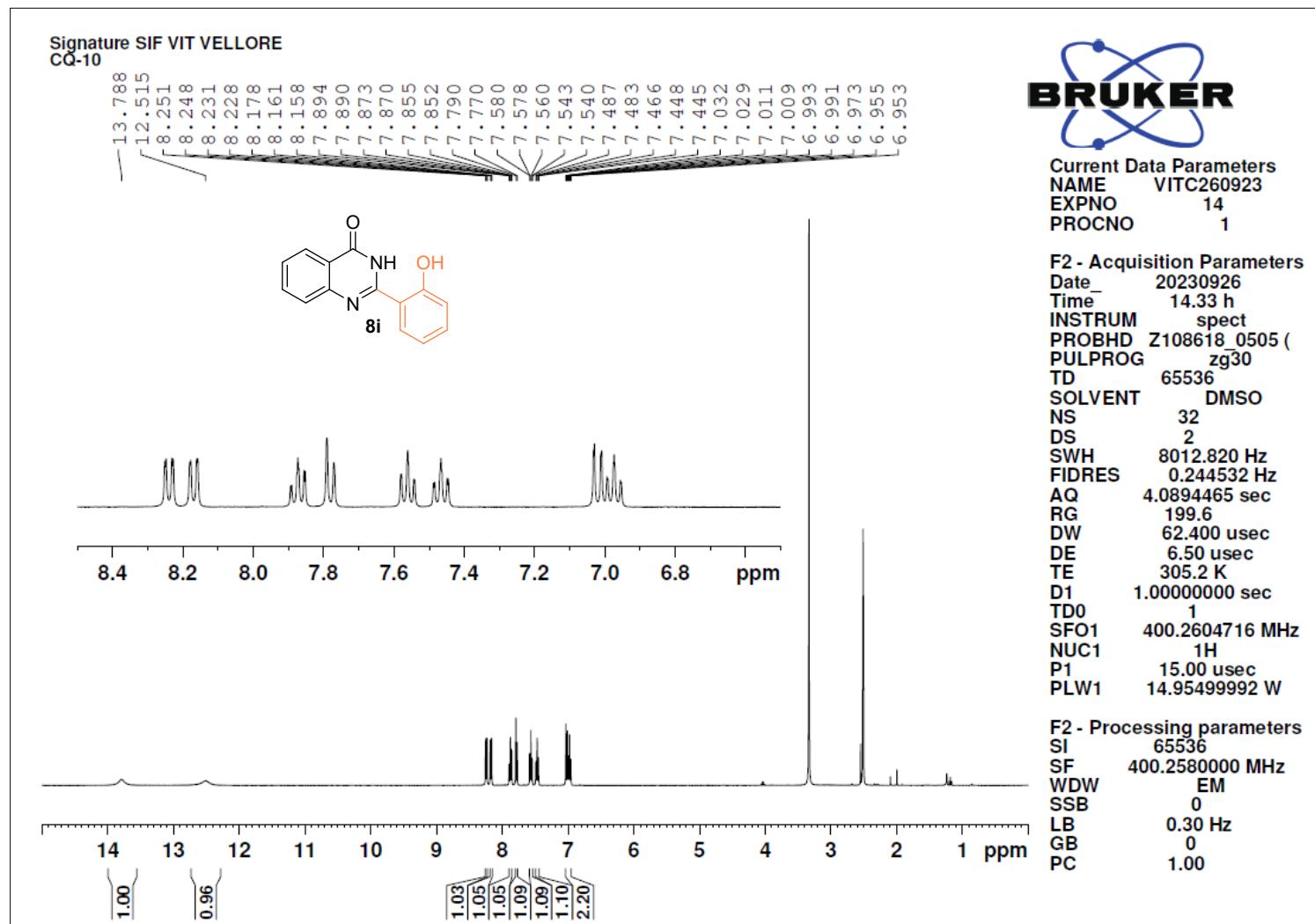
Figure 28:  $^{13}\text{C}$  NMR spectrum of the compound **8h**.



**Figure 29:** FT-IR spectrum of the compound **8h**.



**Figure 30:** HRMS spectrum of the compound **8h**.



**Figure 31:**  $^1\text{H}$  NMR spectrum of the compound **8i**.

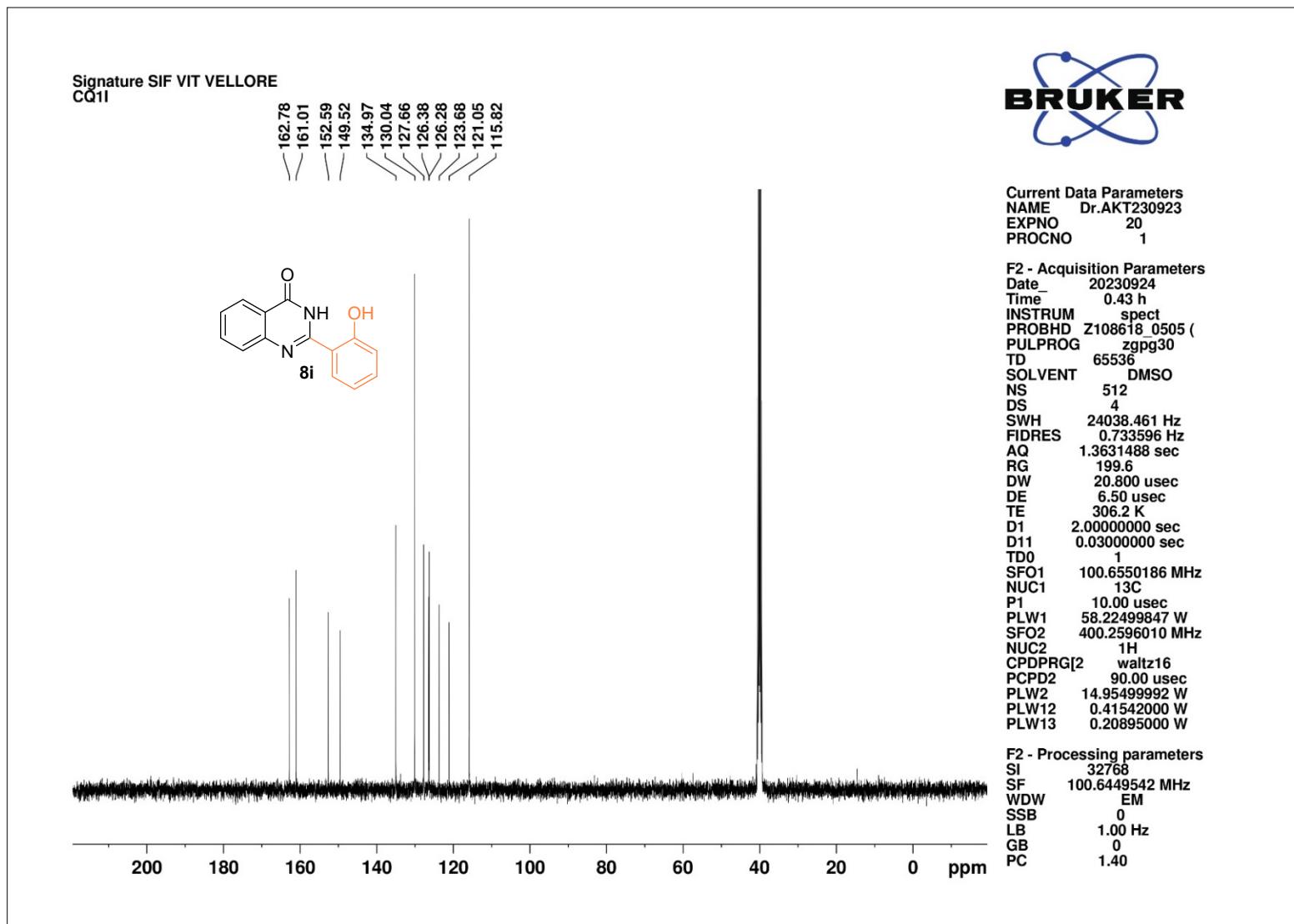


Figure 32:  $^{13}\text{C}$  NMR spectrum of the compound **8i**.

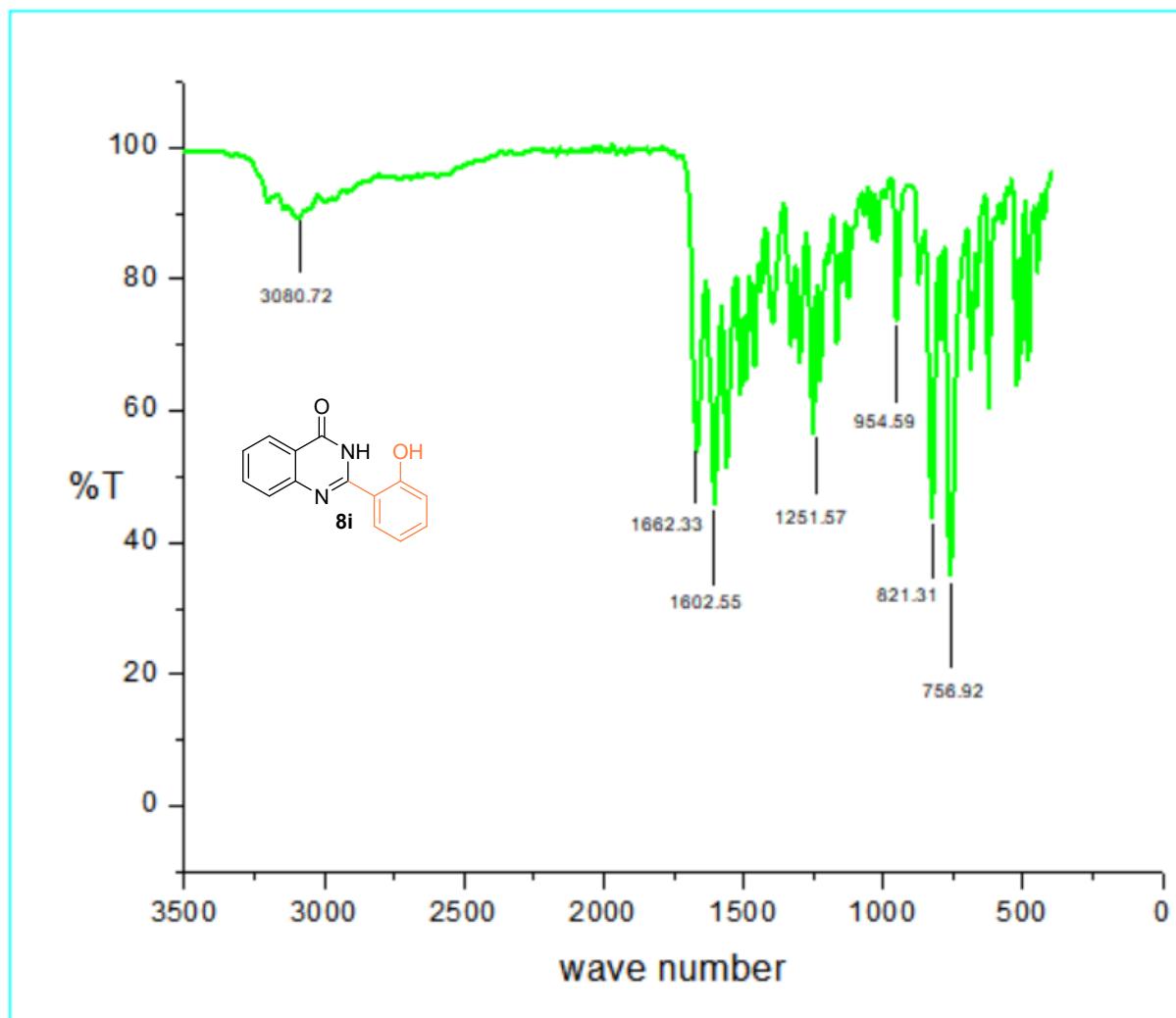
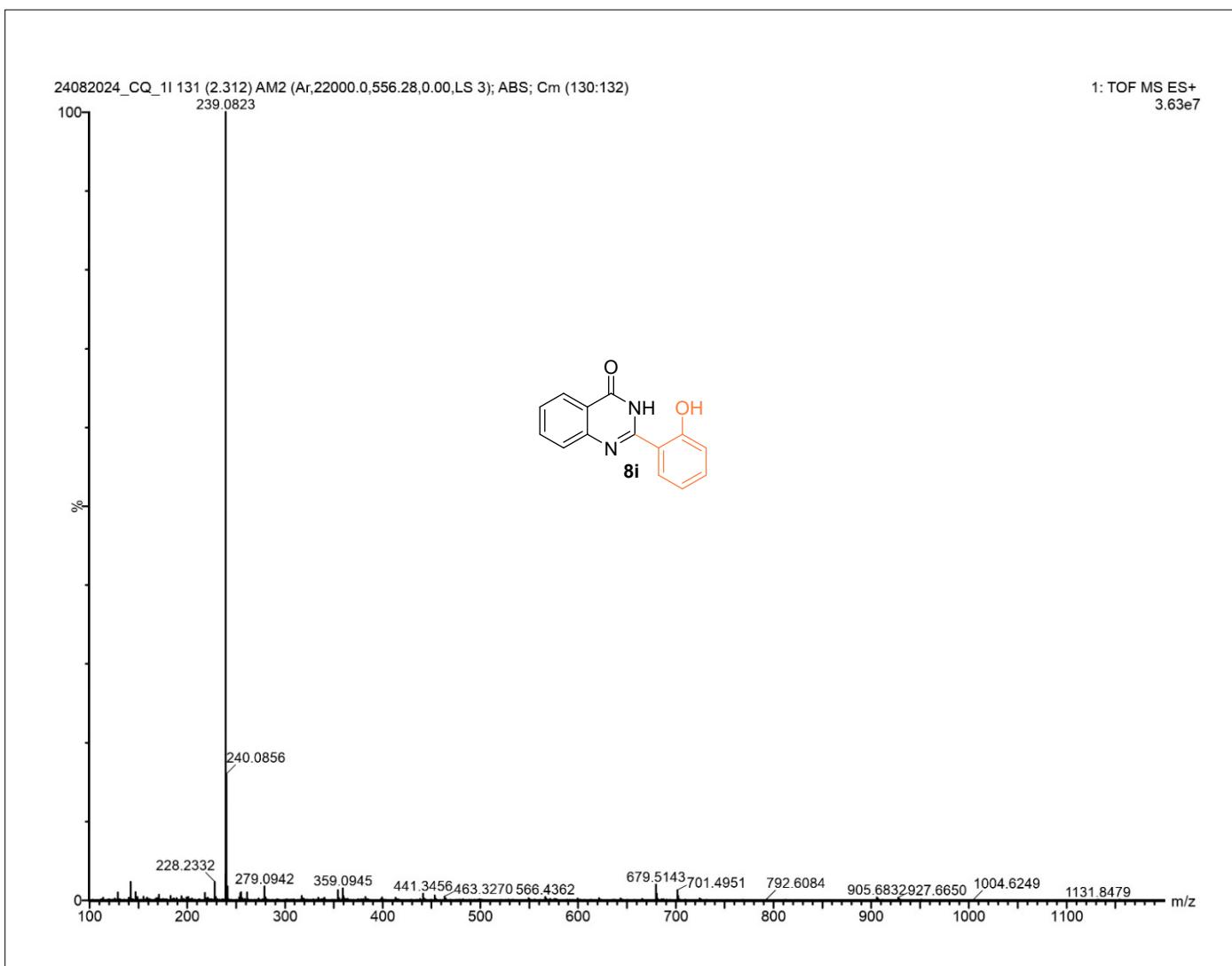
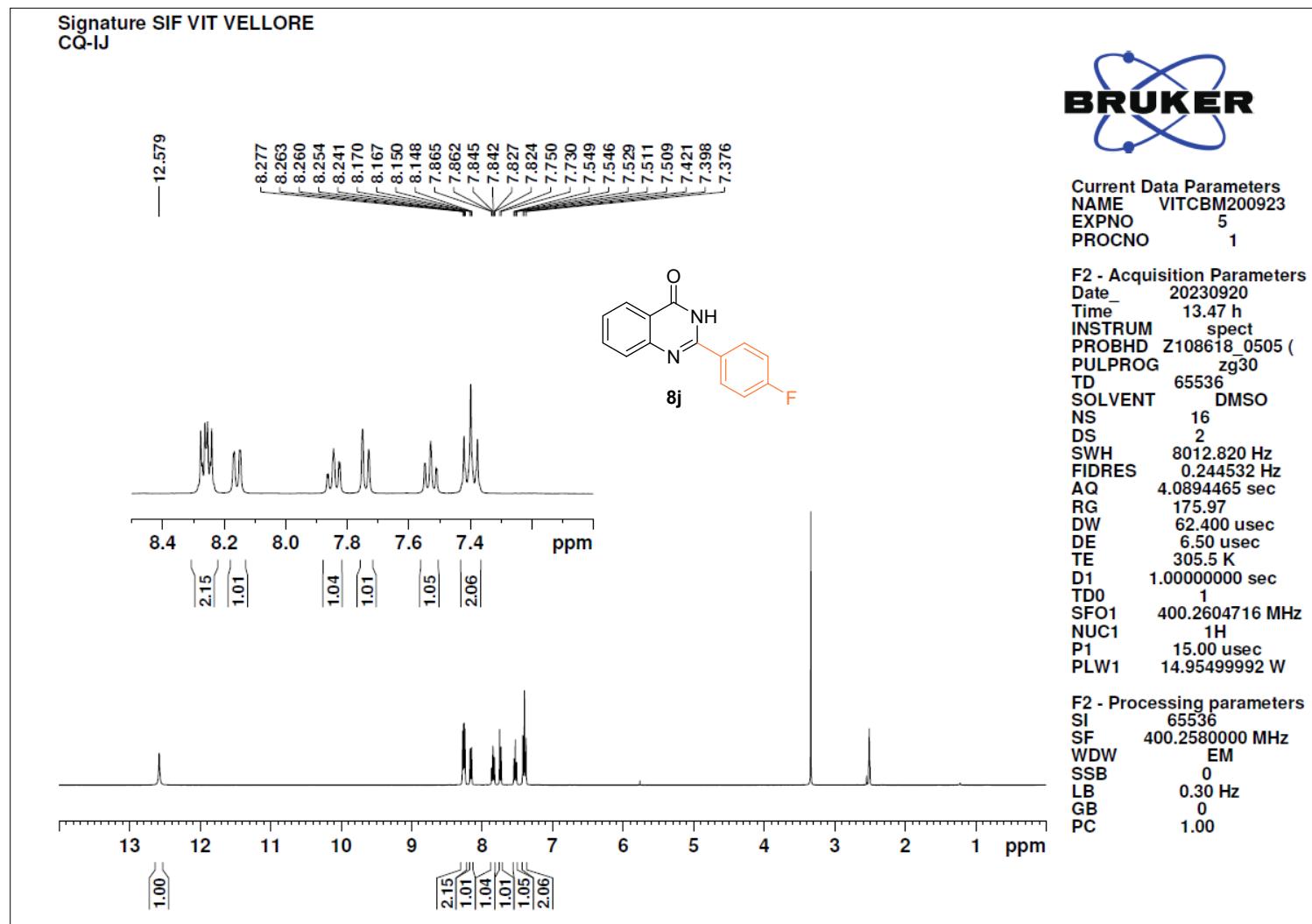


Figure 33: FT-IR spectrum of the compound **8i**.



**Figure 34:** FT-IR spectrum of the compound **8i**.

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CQ-IJ**

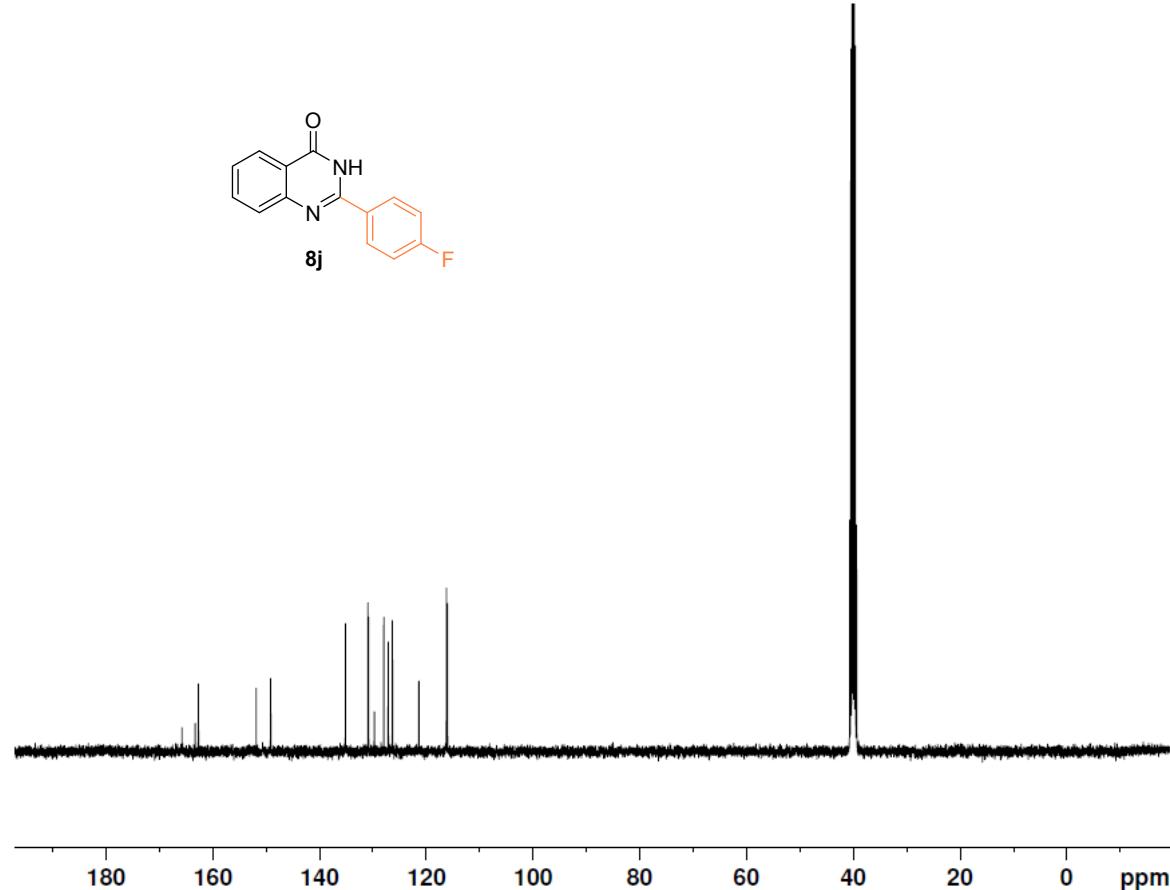
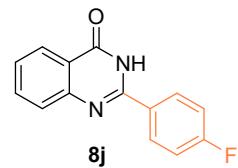


**Figure 35:**  $^1\text{H}$  NMR spectrum of the compound **8j**.

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CQ-IJ



162.67  
151.84  
149.12  
135.11  
130.89  
130.80  
129.71  
129.69  
127.93  
127.09  
126.32  
121.36  
116.21  
115.99

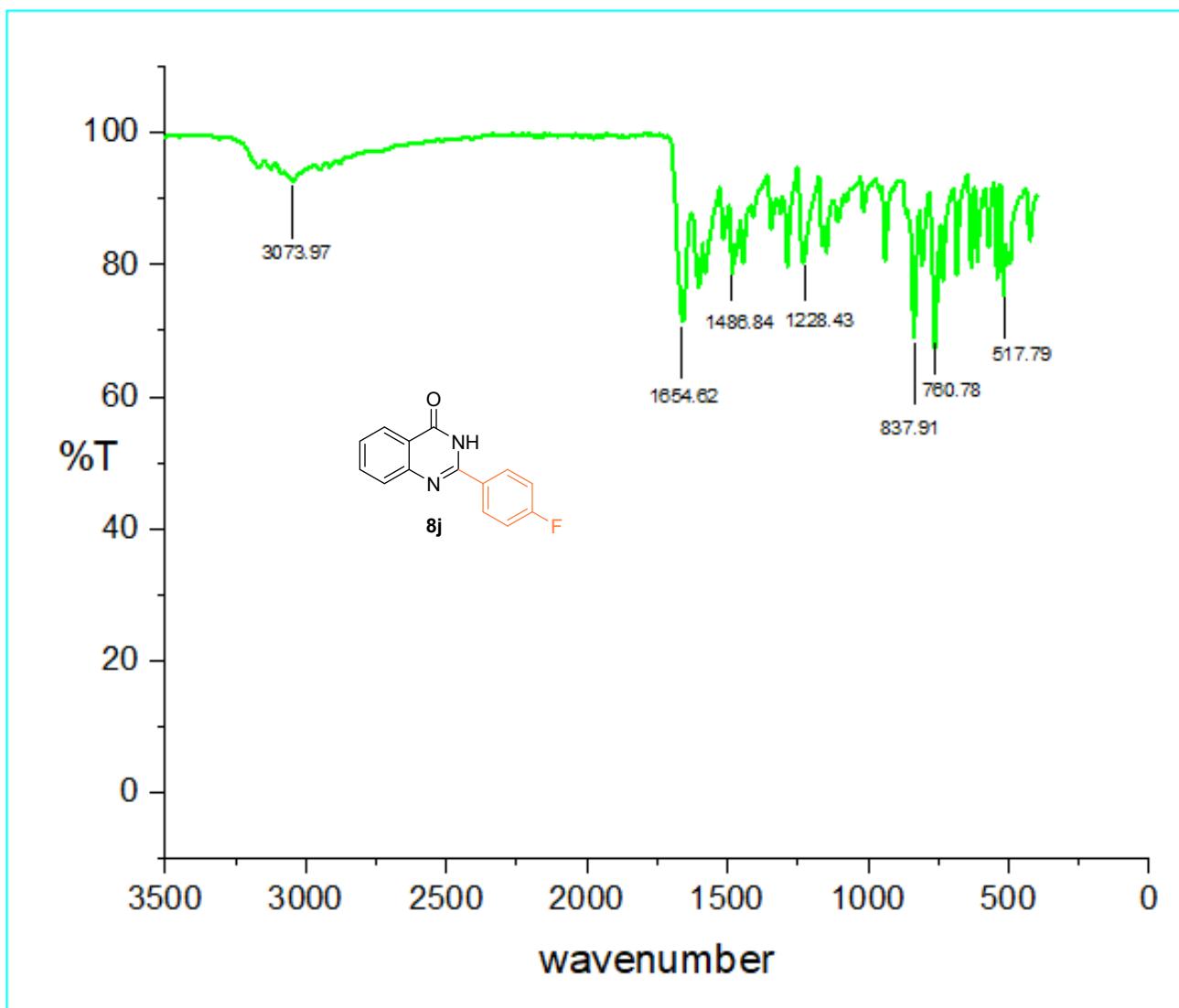


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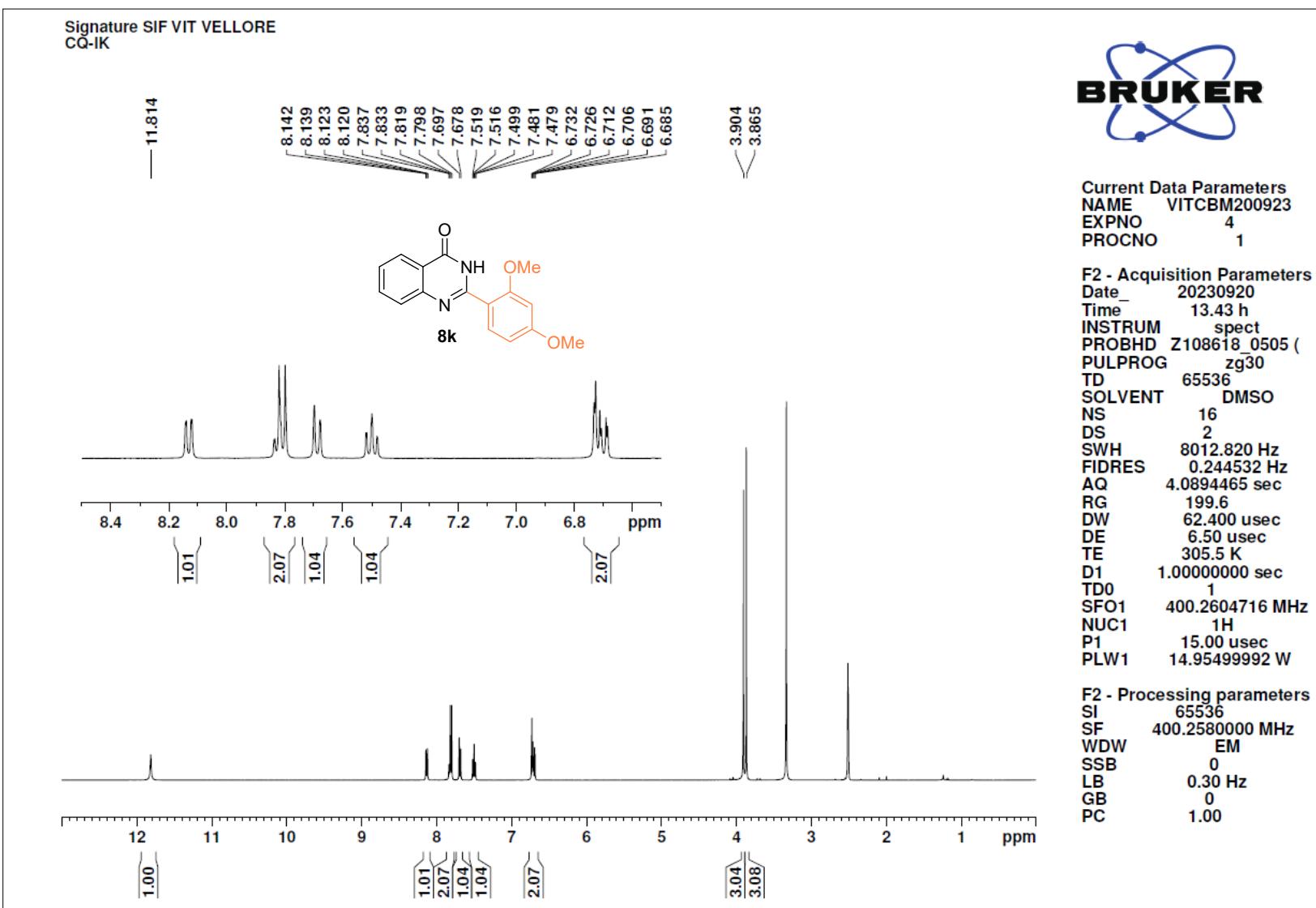
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DW 20.800 usec  
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D1 2.0000000 sec  
D11 0.0300000 sec  
TD0 1  
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NUC1 13C  
P1 10.00 usec  
PLW1 58.22499847 W  
SFO2 400.2596010 MHz  
NUC2 1H  
CPDPRG[2] waltz16  
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PLW2 14.95499992 W  
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Figure 36:  $^{13}\text{C}$  NMR spectrum of the compound 8j.



**Figure 37:** FT-IR spectrum of the compound **8j**.

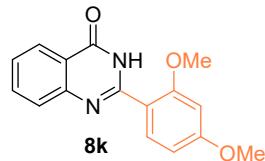


**Figure 38:**  $^1\text{H}$  NMR spectrum of the compound **8k**.

Signature SIF VIT VELLORE  
CQ-1K

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161.66  
159.24  
152.40  
149.65  
134.87  
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56.49  
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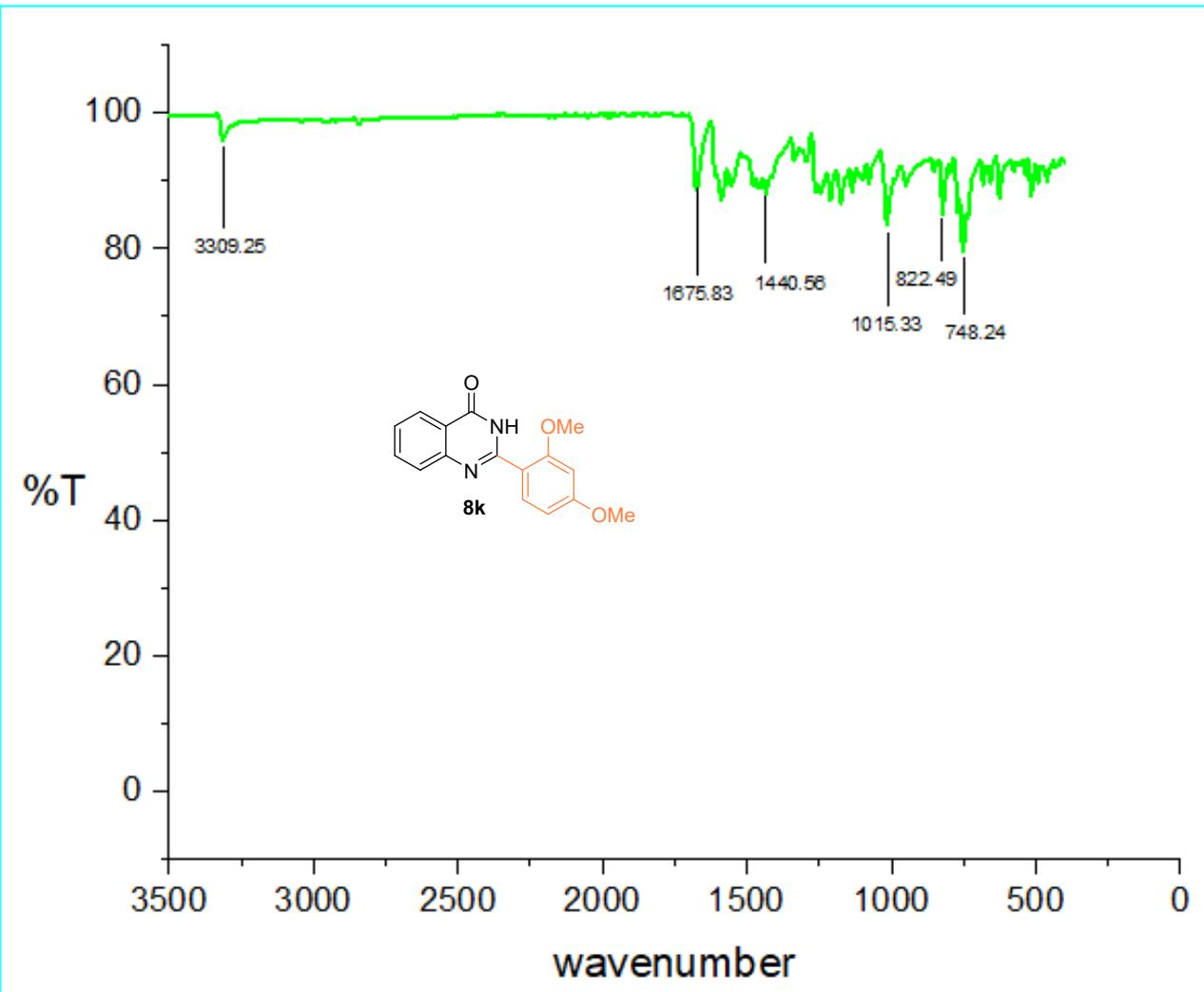
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DS 4  
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FIDRES 0.733596 Hz  
AQ 1.3631488 sec  
RG 143.73  
DW 20.800 usec  
DE 6.50 usec  
TE 306.2 K  
D1 2.00000000 sec  
D11 0.03000000 sec  
TD0 1  
SFO1 100.6550186 MHz  
NUC1 <sup>13</sup>C  
P1 10.00 usec  
PLW1 58.22499847 W  
SFO2 400.2596010 MHz  
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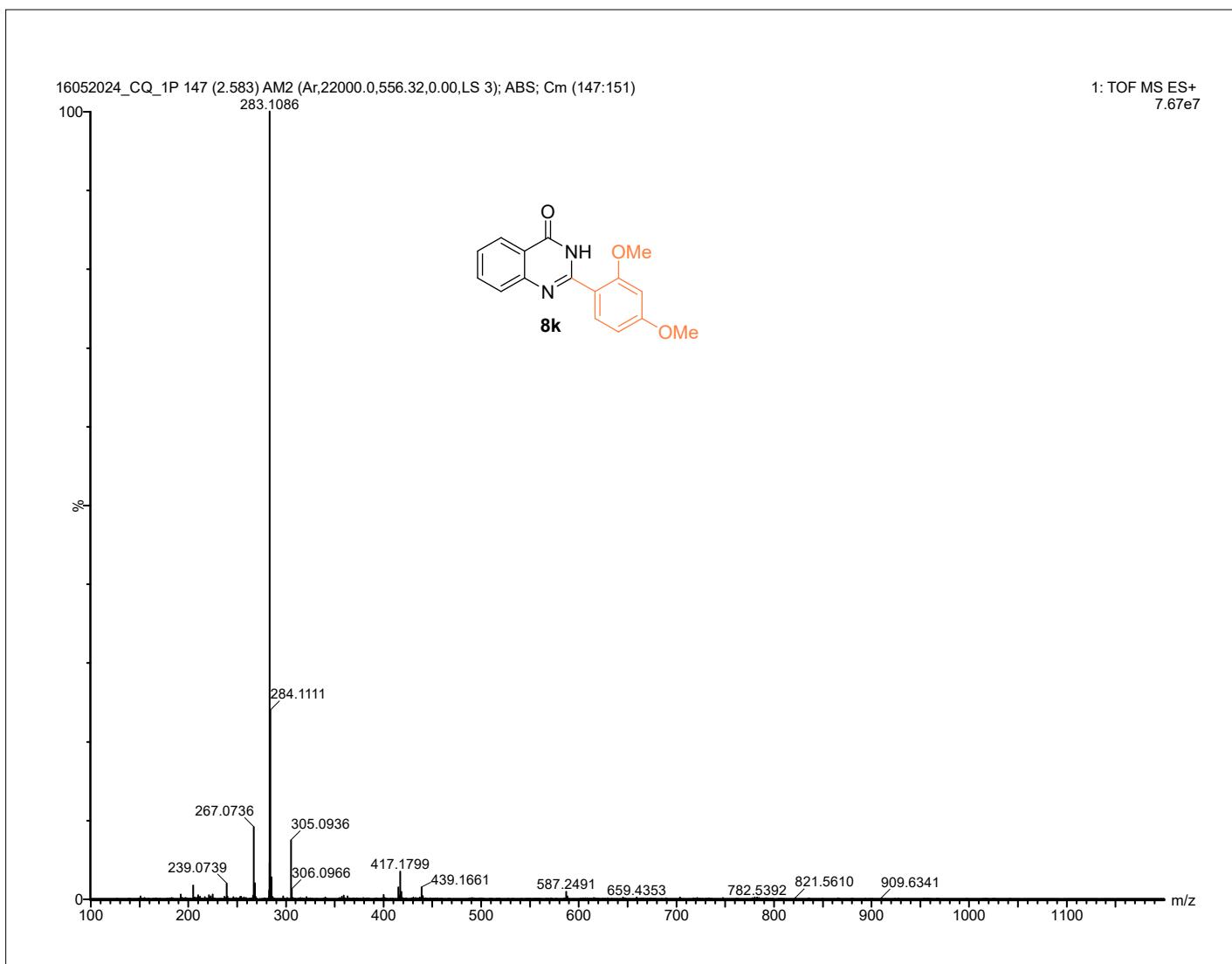
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Figure 39: <sup>13</sup>C NMR spectrum of the compound **8k**.

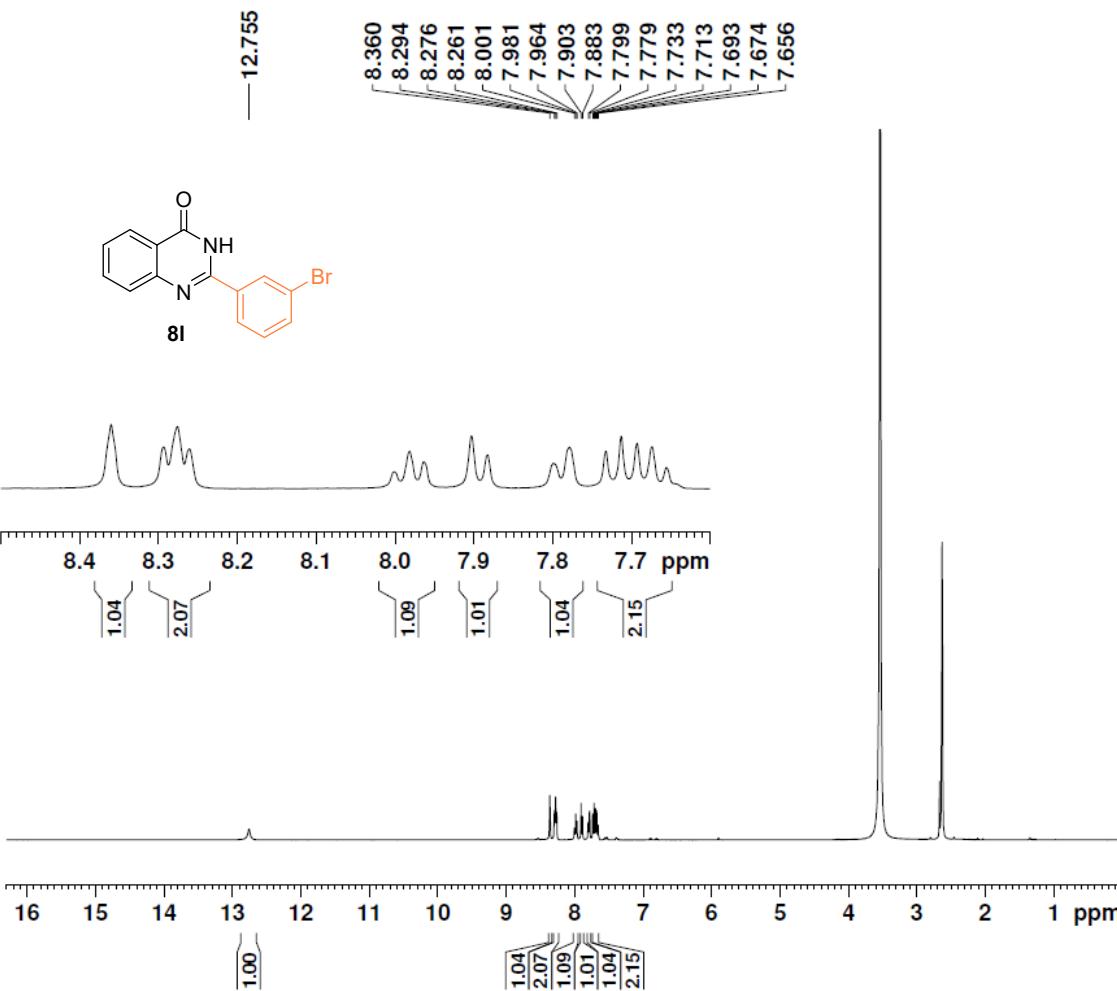


**Figure 40:** FT-IR spectrum of the compound **8k**.



**Figure 41:** HRMS of the compound **8k**.

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CQ-new

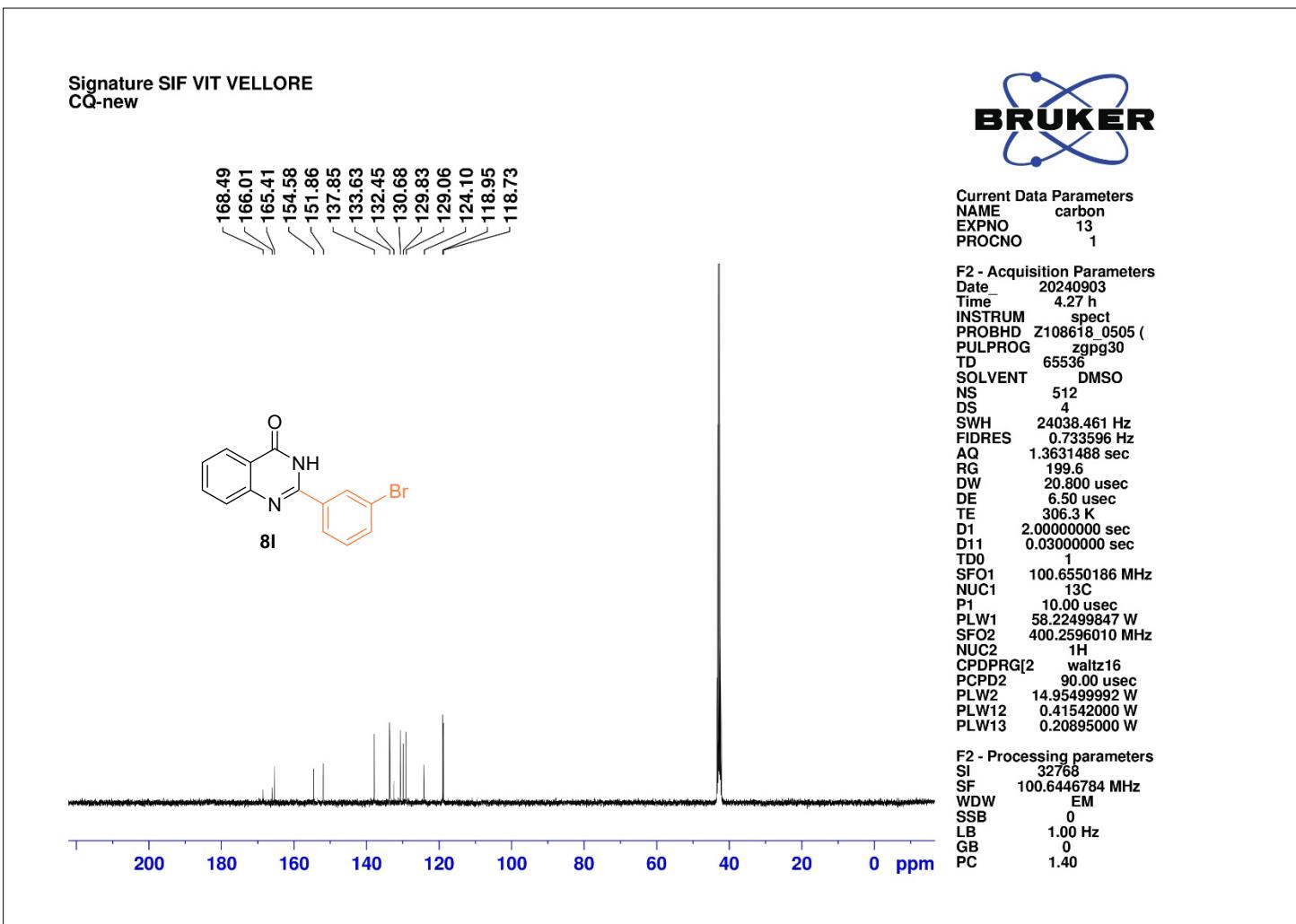


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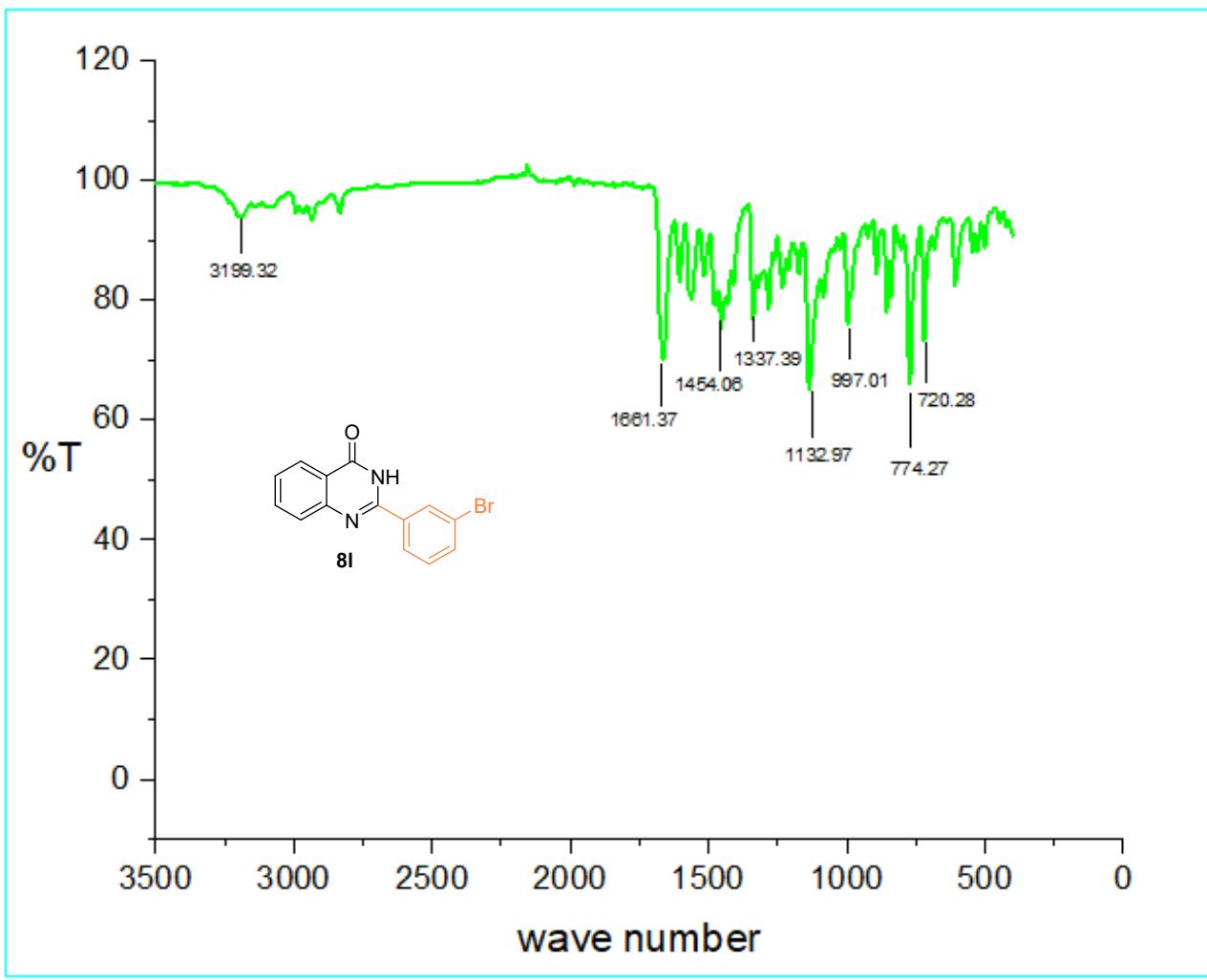
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GB 0  
PC 1.00

Figure 42:  $^1\text{H}$  NMR spectrum of the compound **8l**.



**Figure 43:** <sup>13</sup>C NMR spectrum of the compound **8l**.



**Figure 44:** FT-IR spectrum of the compound **8l**.

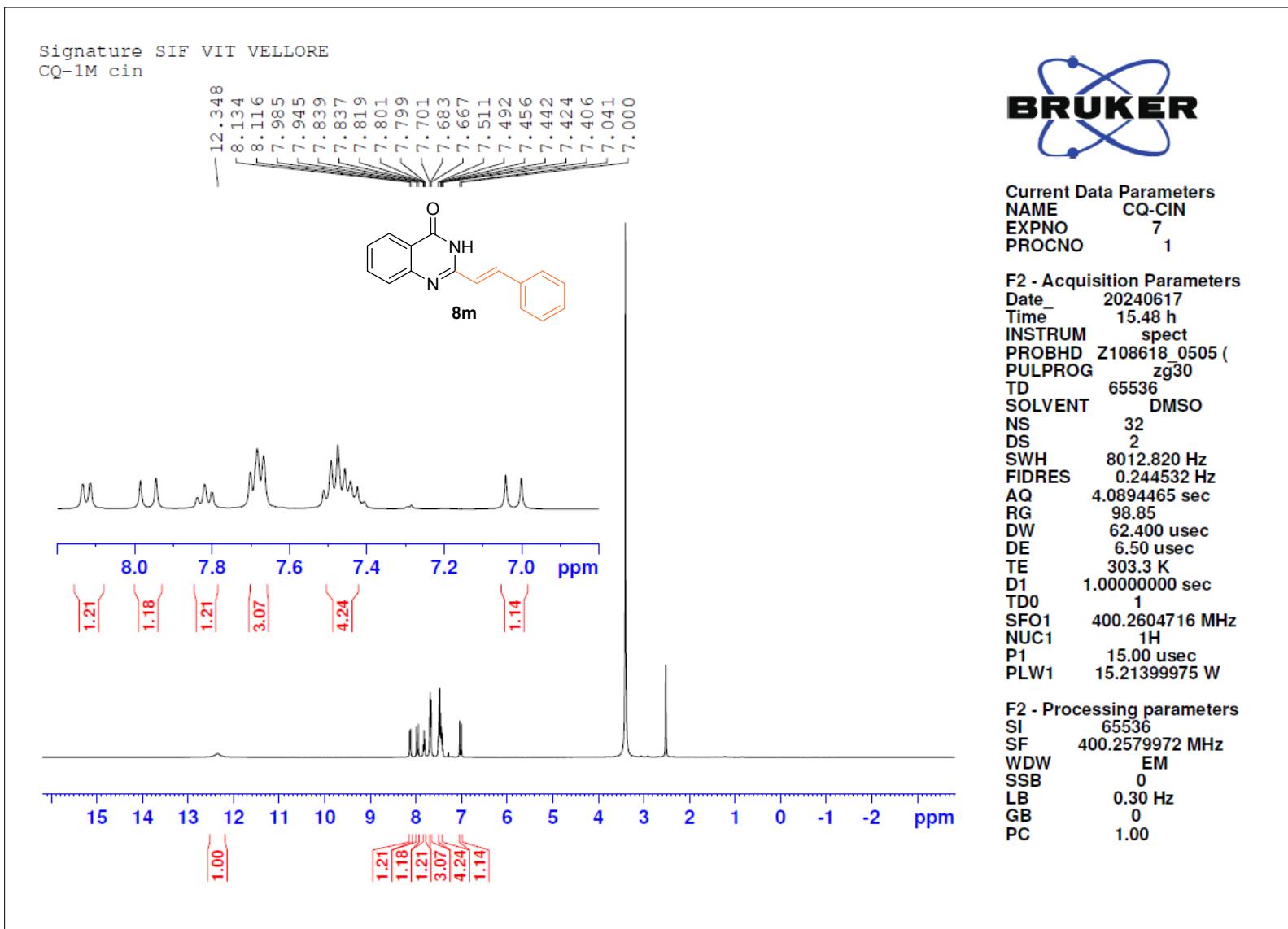


Figure 45:  $^1\text{H}$  NMR spectrum of the compound 8m.

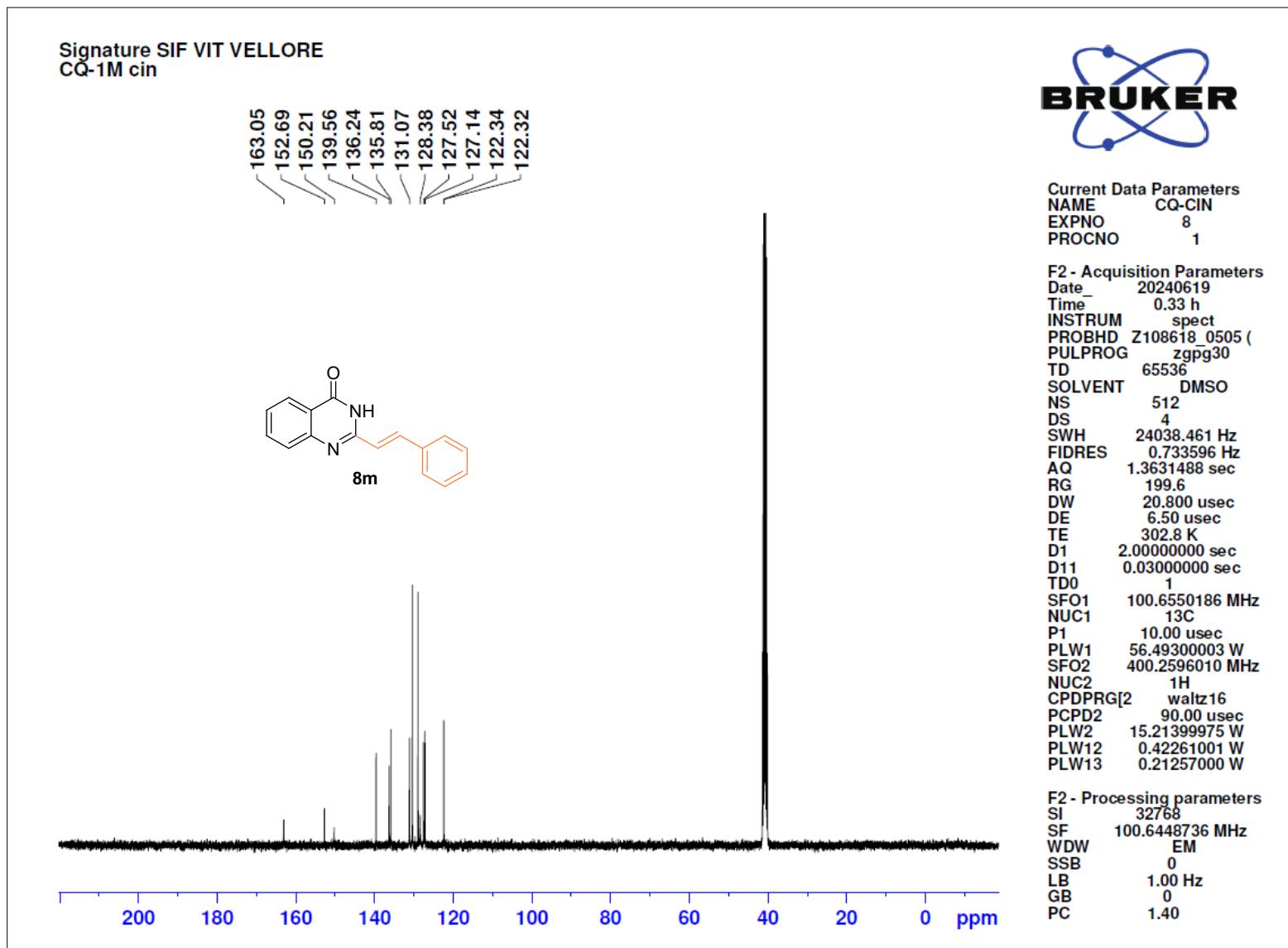
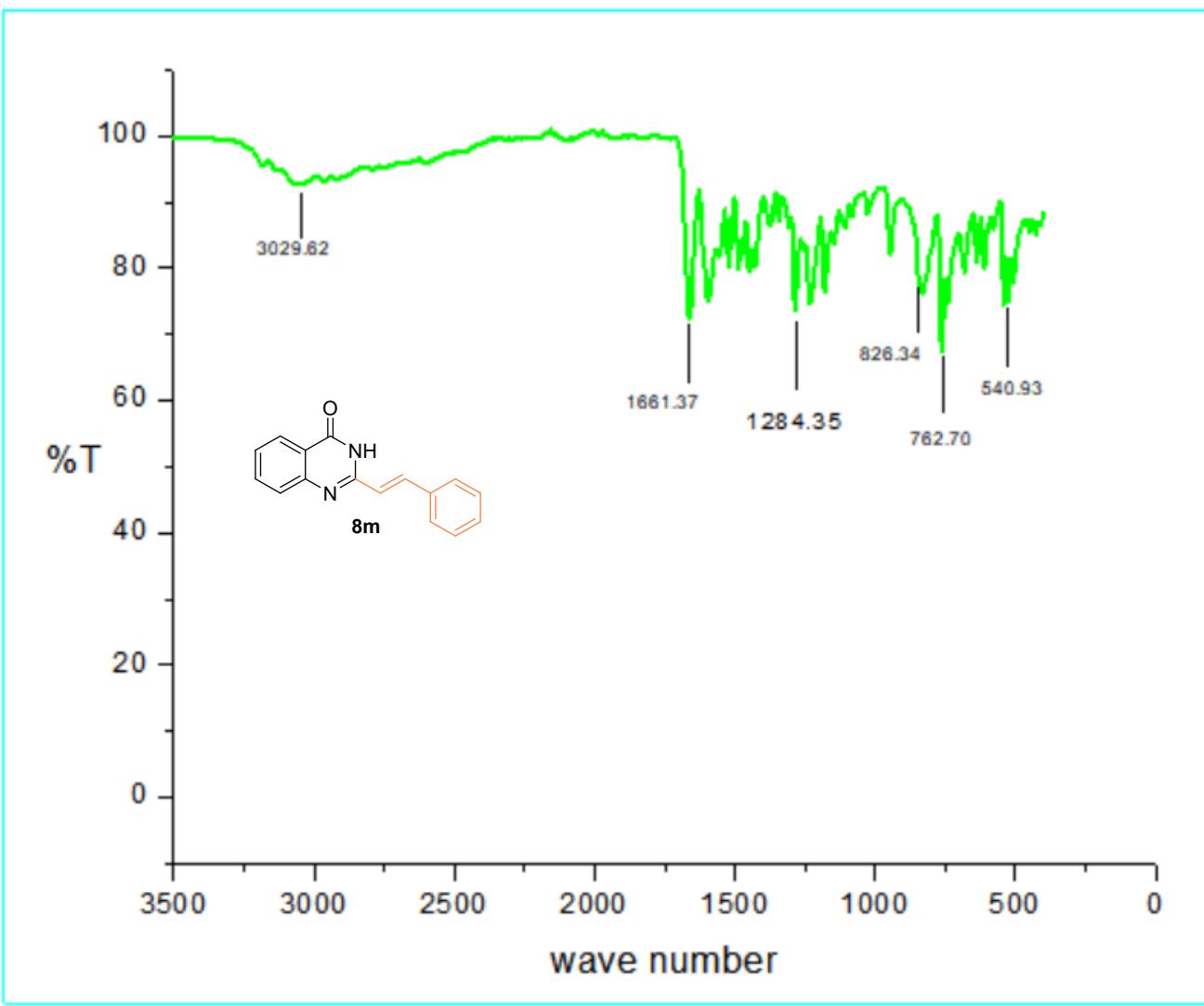
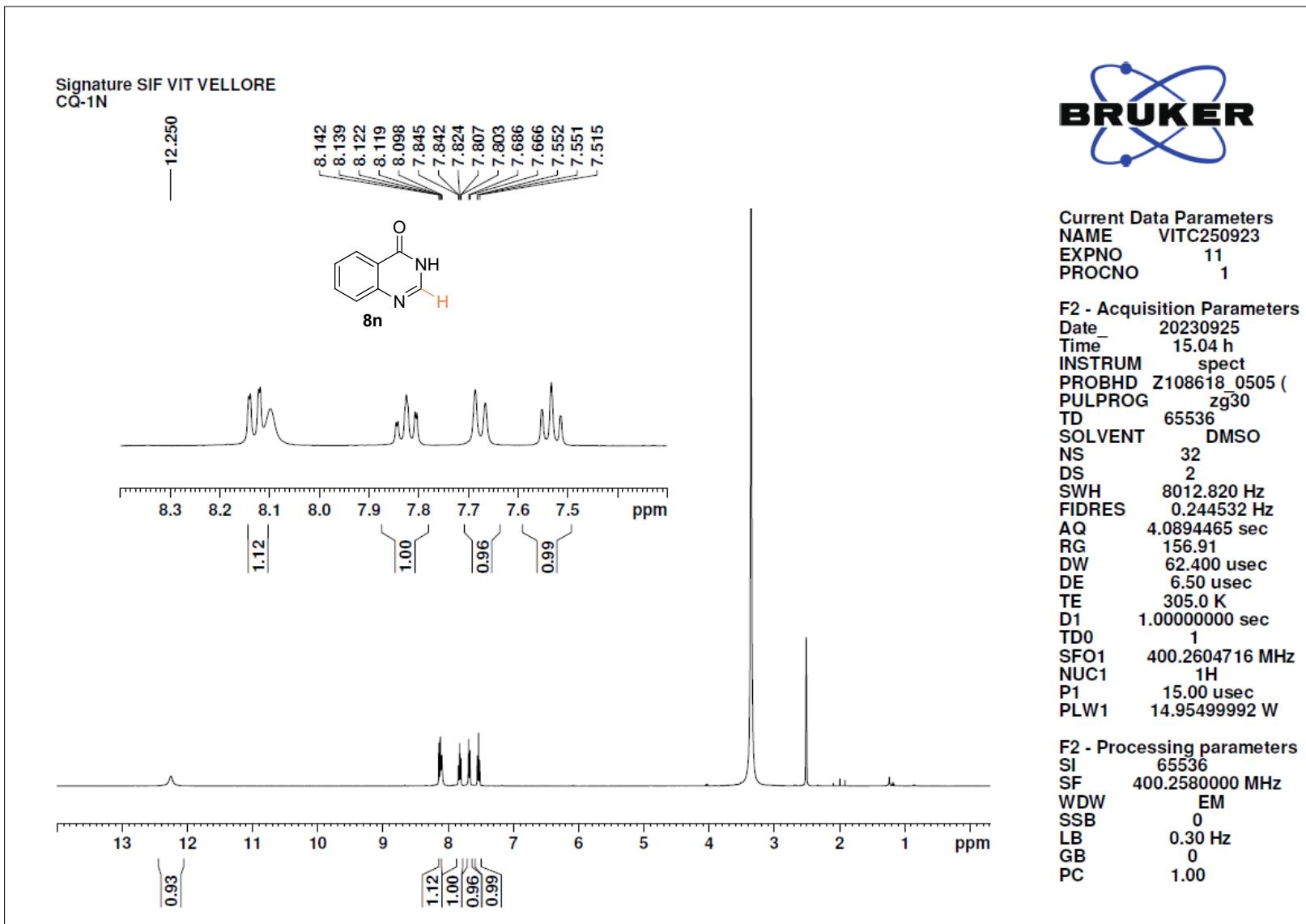


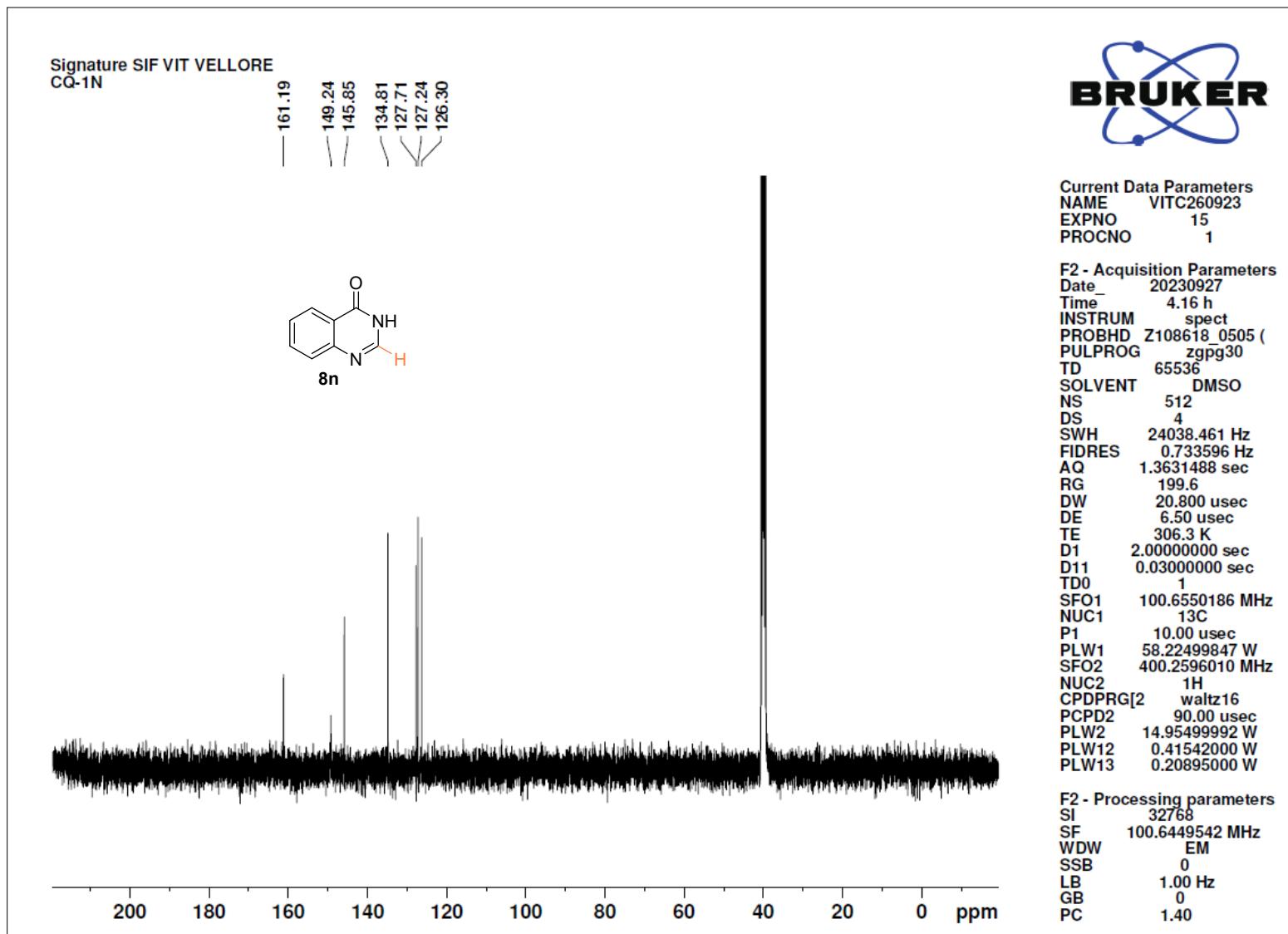
Figure 46:  $^{13}\text{C}$  NMR spectrum of the compound **8m**.



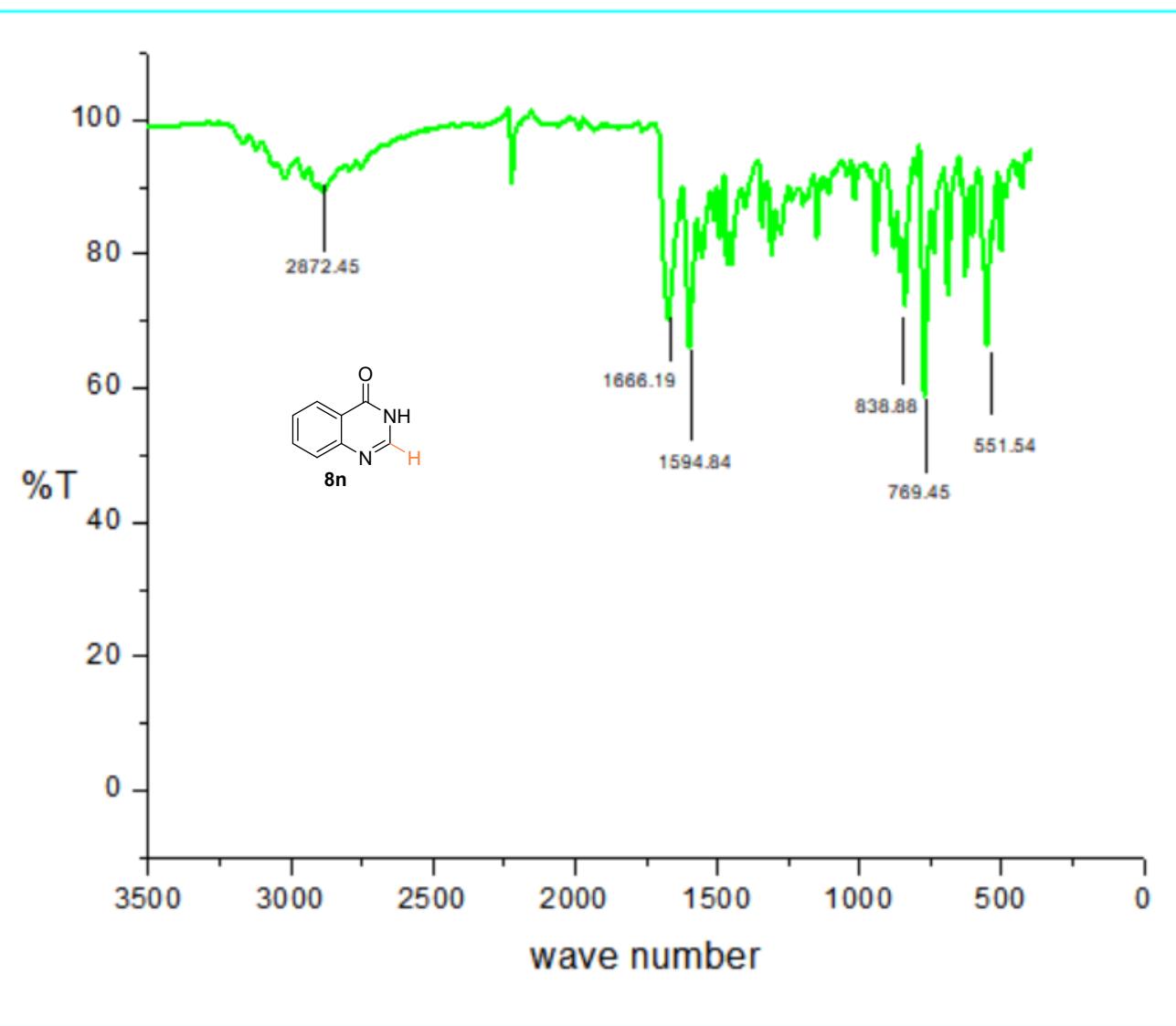
**Figure 47:** FT-IR spectrum of the compound **8m**.



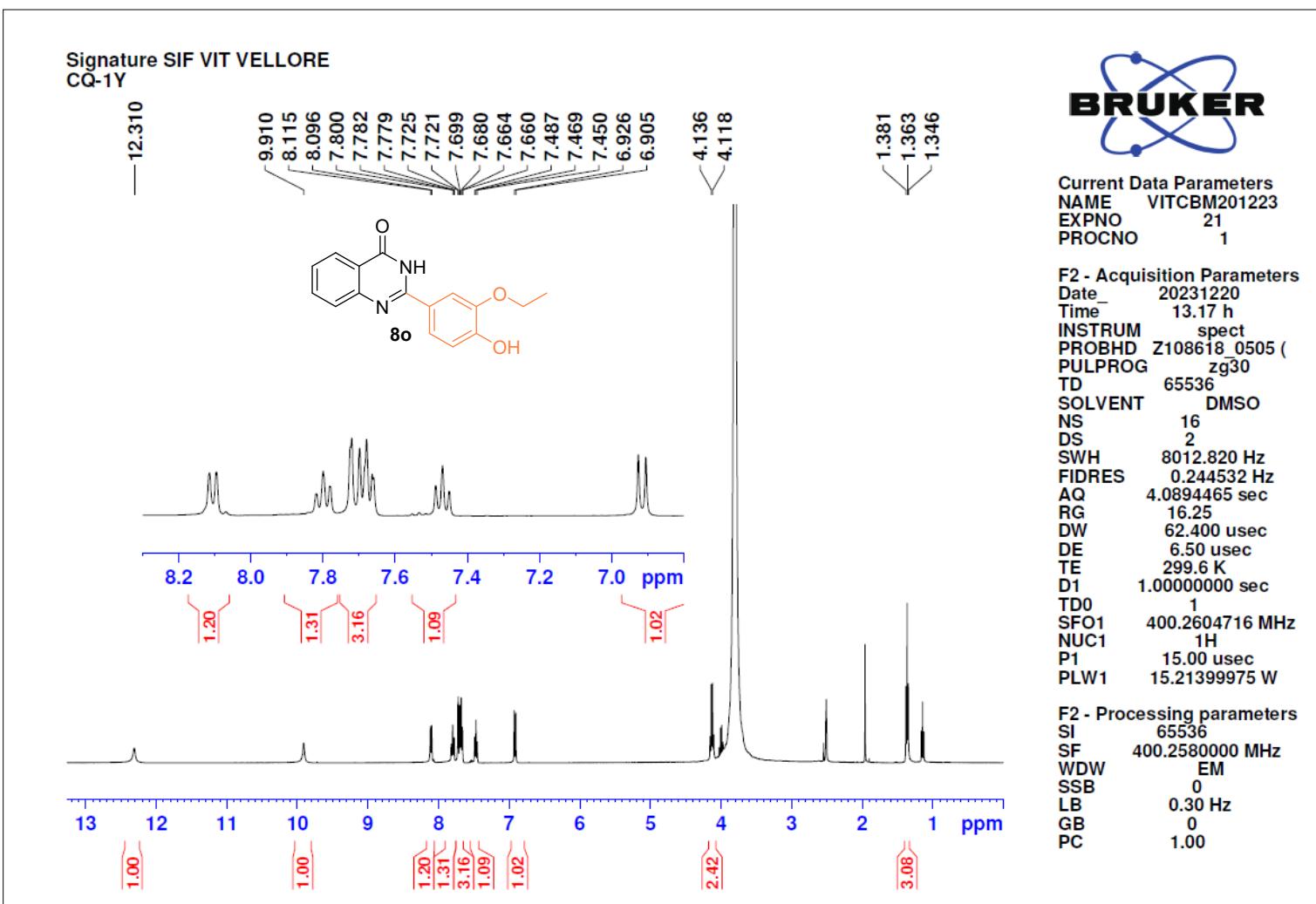
**Figure 48:**  $^1\text{H}$  NMR spectrum of the compound **8n**.



**Figure 49:** <sup>13</sup>C NMR spectrum of the compound **8n**.



**Figure 50:** FT-IR spectrum of the compound **8n**.



**Figure 51:**  $^1\text{H}$  NMR spectrum of the compound **8o**.

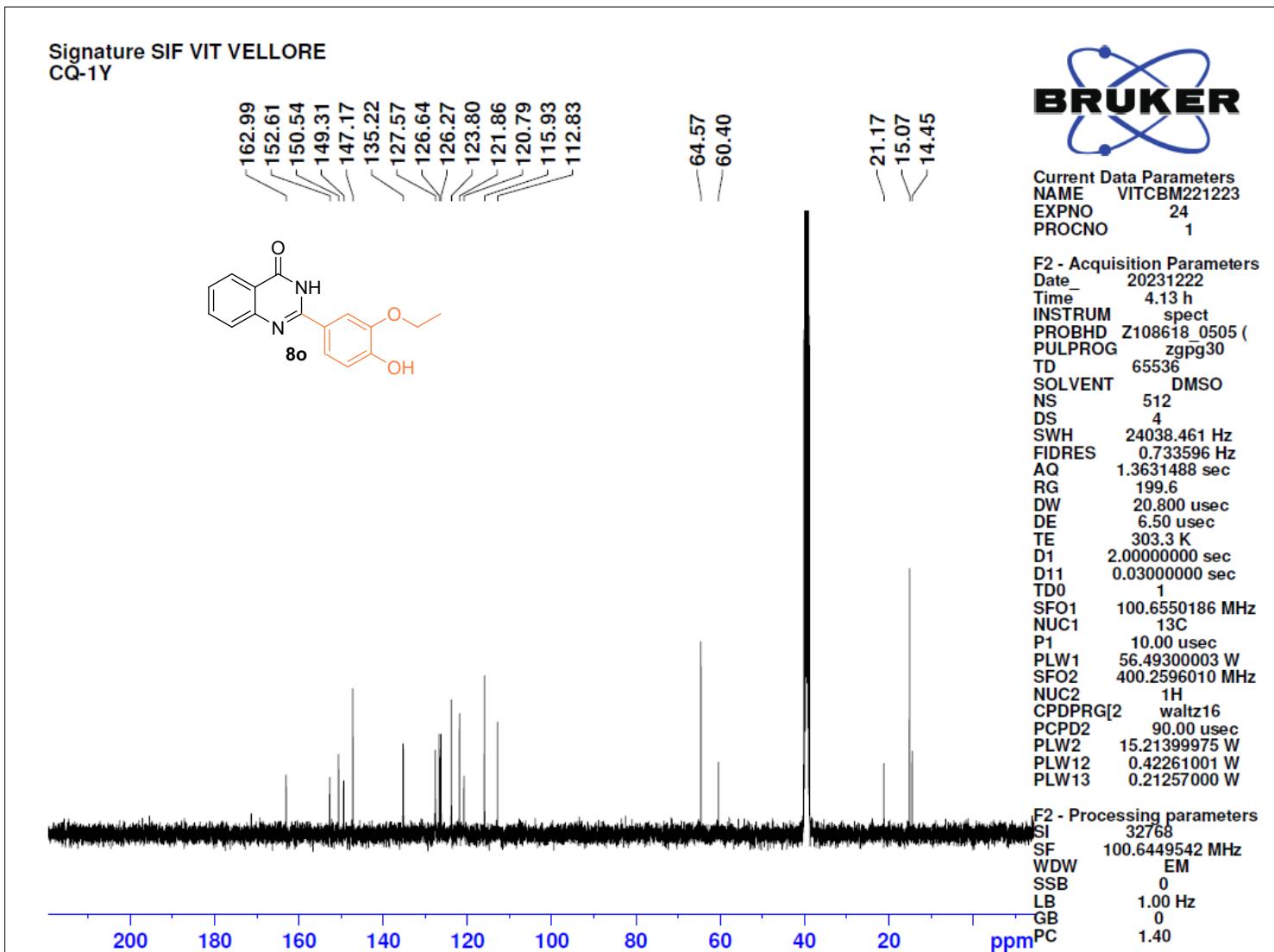
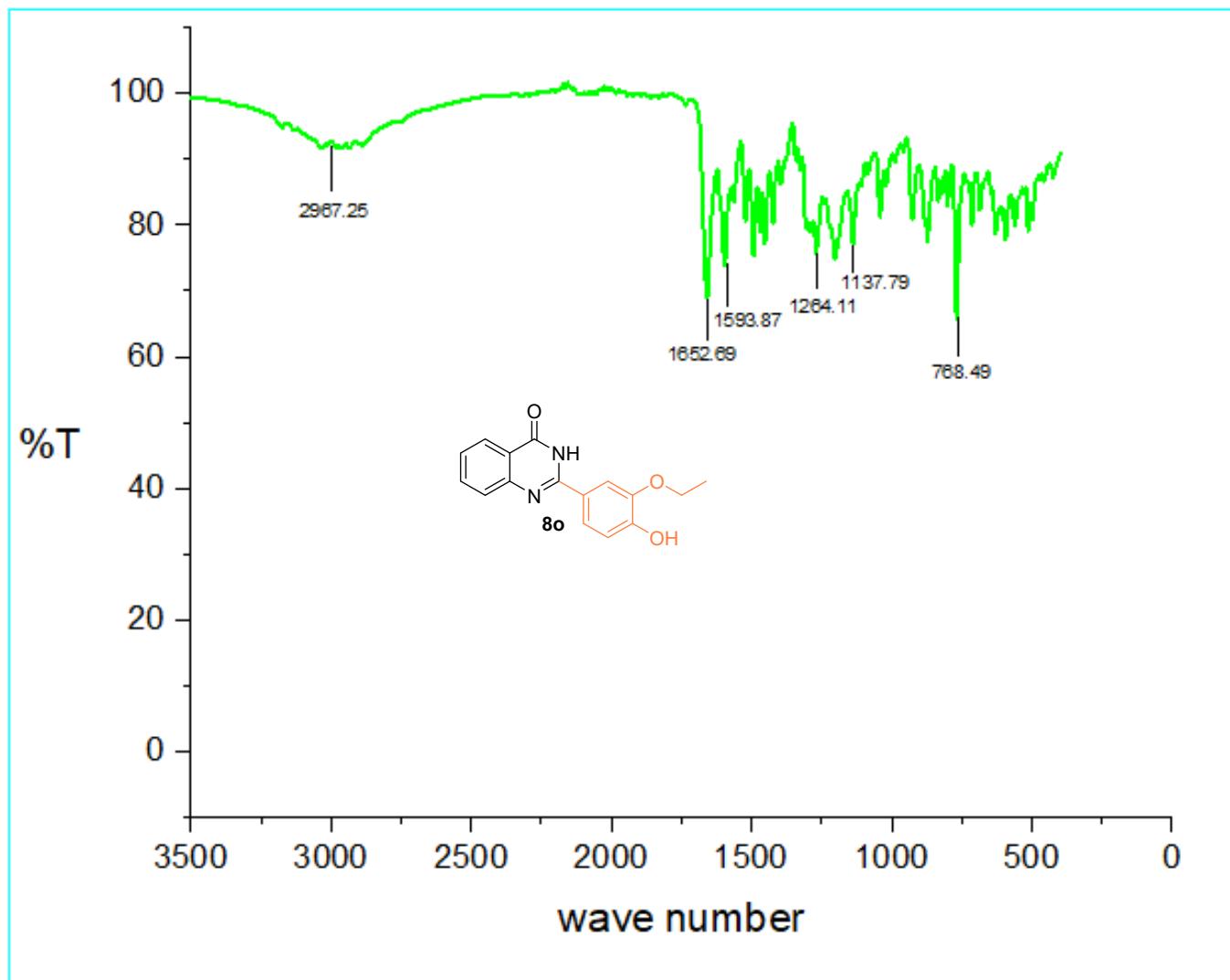
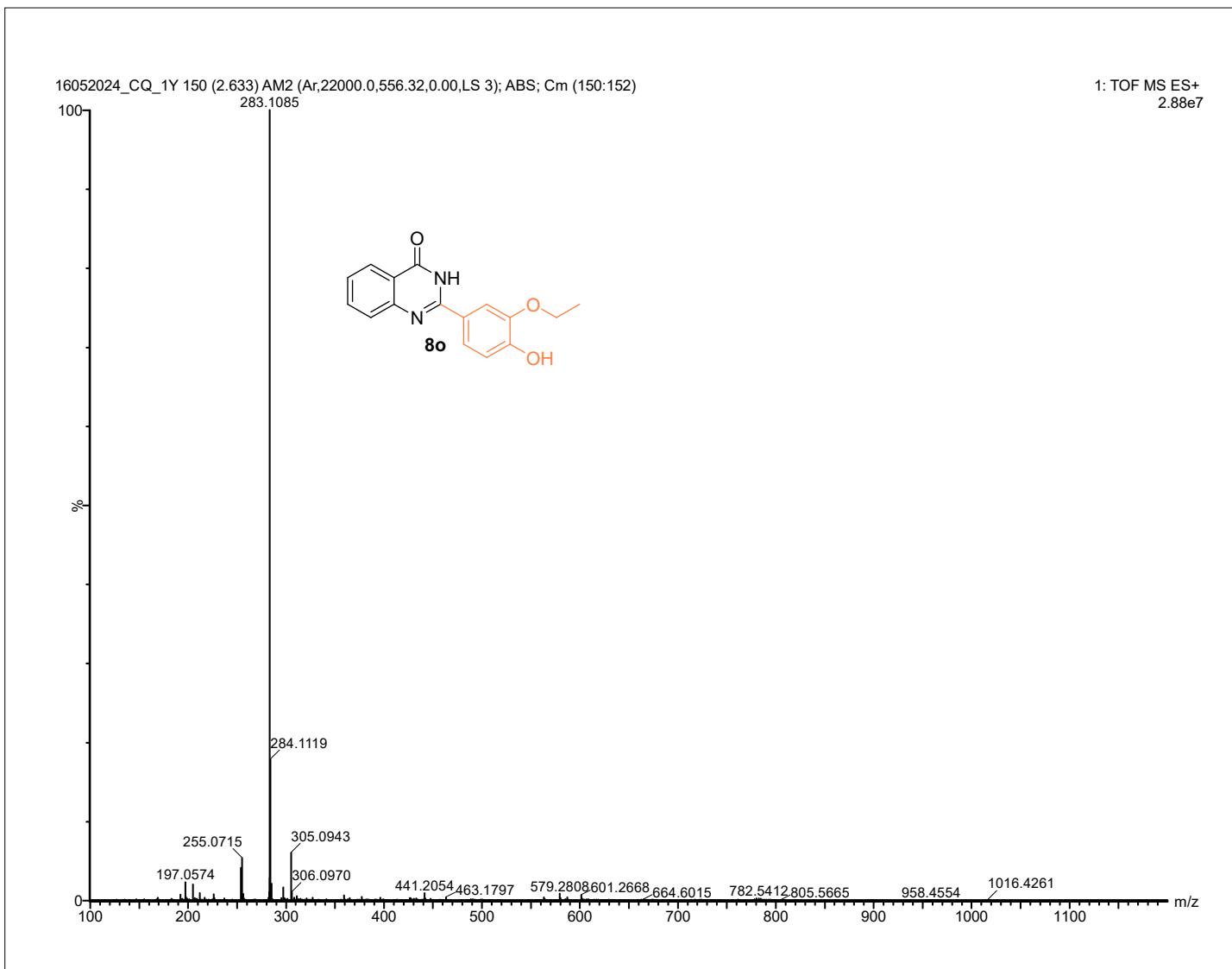


Figure 52: <sup>13</sup>C NMR spectrum of the compound 8o.



**Figure 53:** FT-IR spectrum of the compound **8o**.



**Figure 54:** HRMS of the compound **8o**.

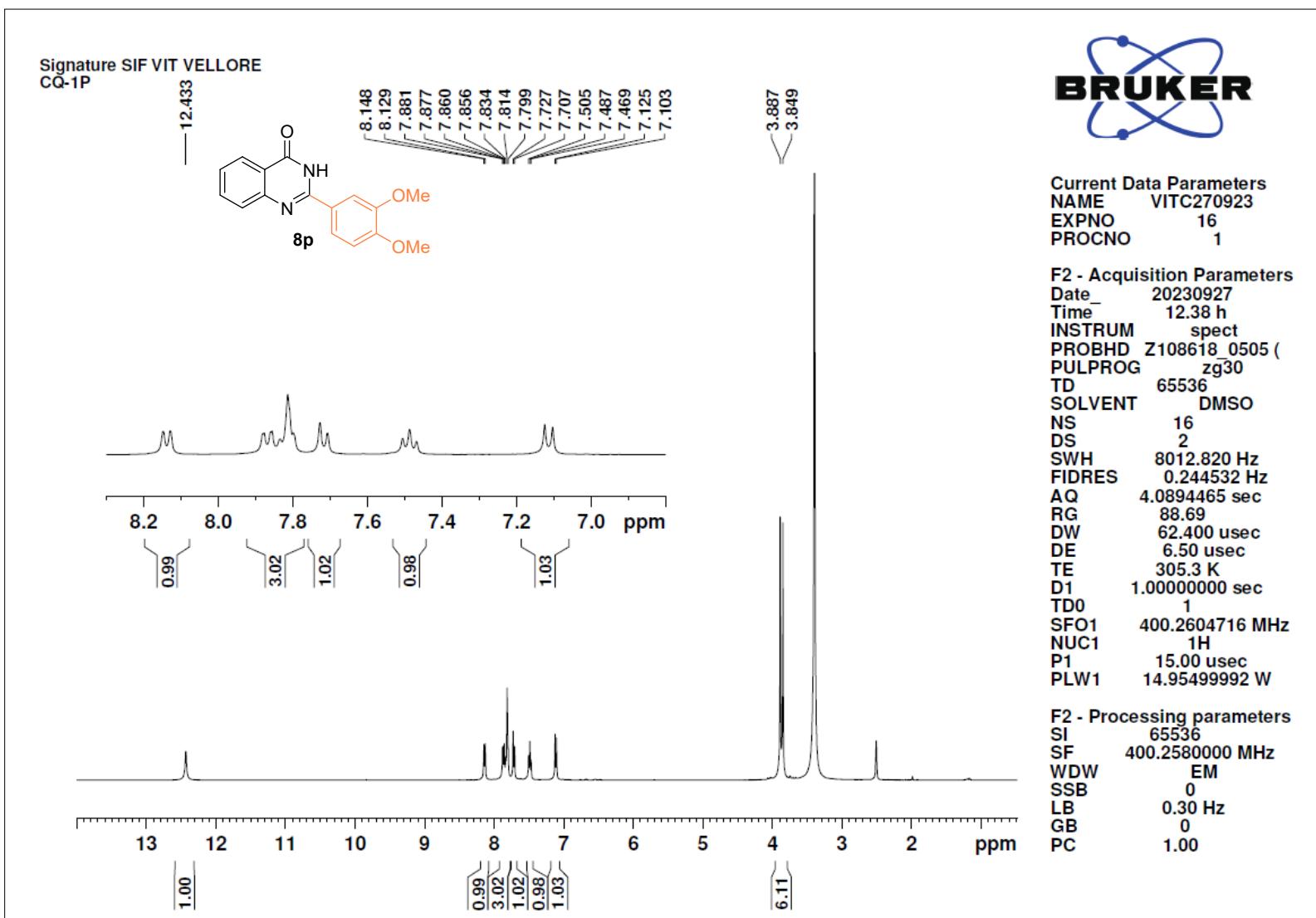
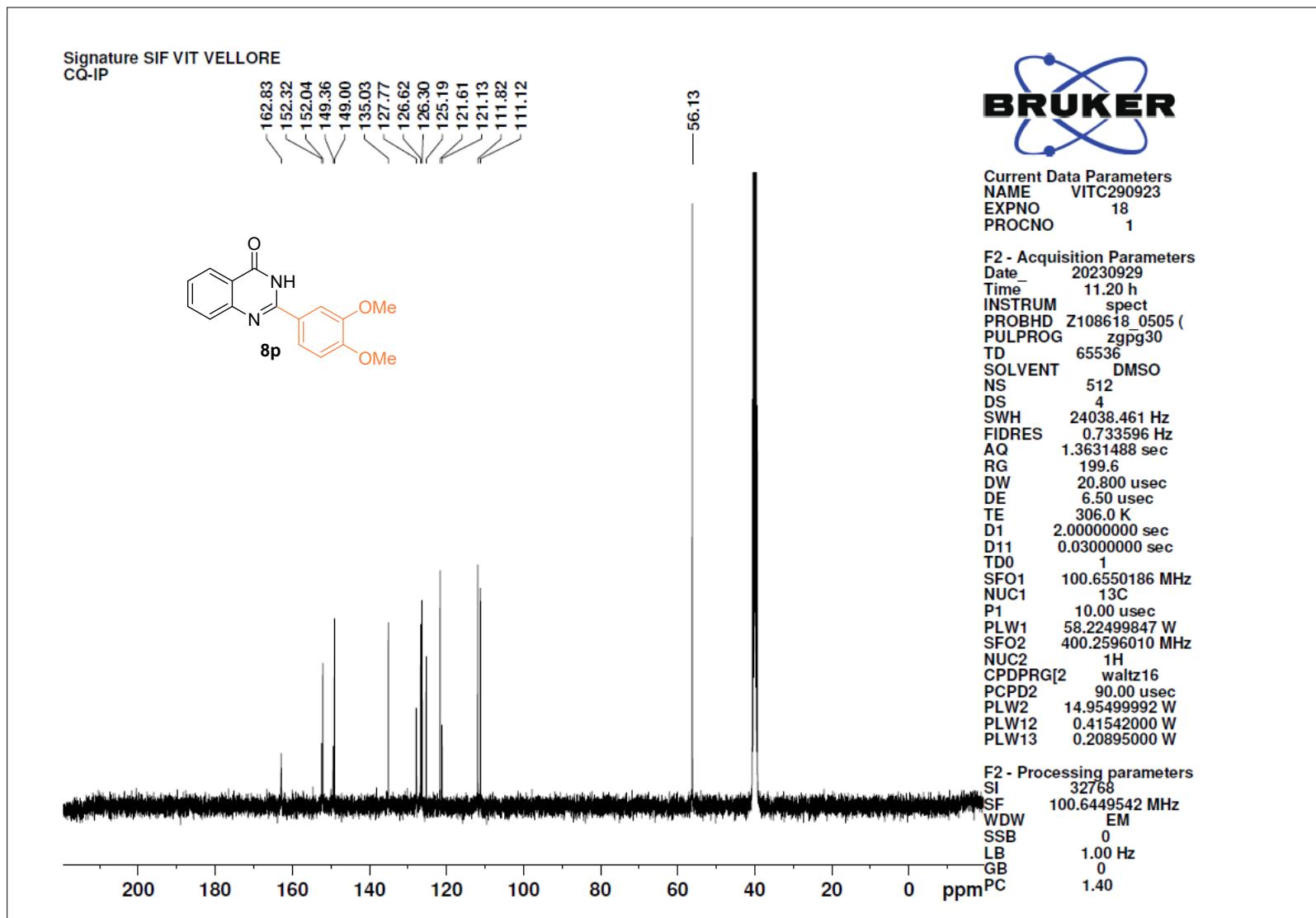
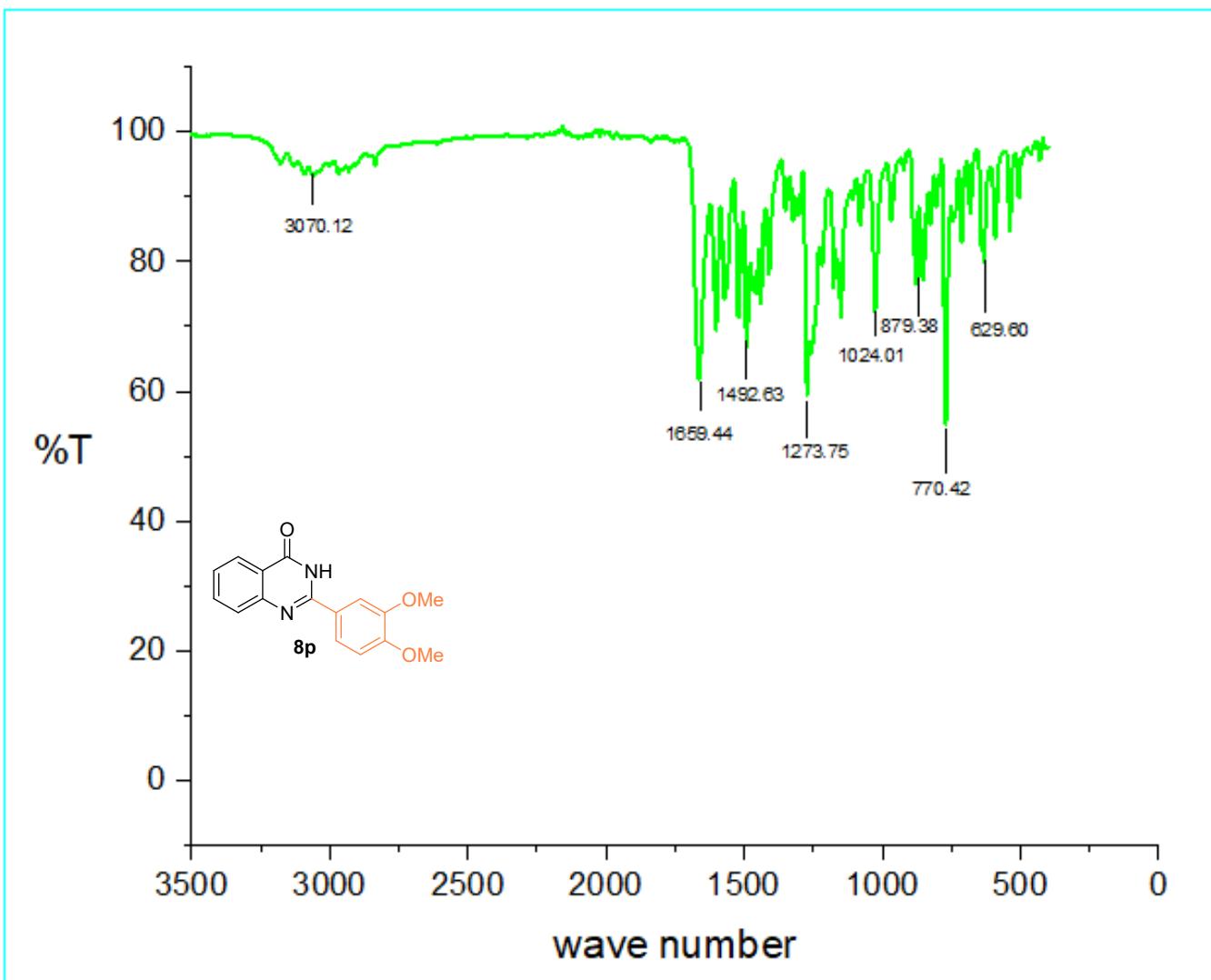


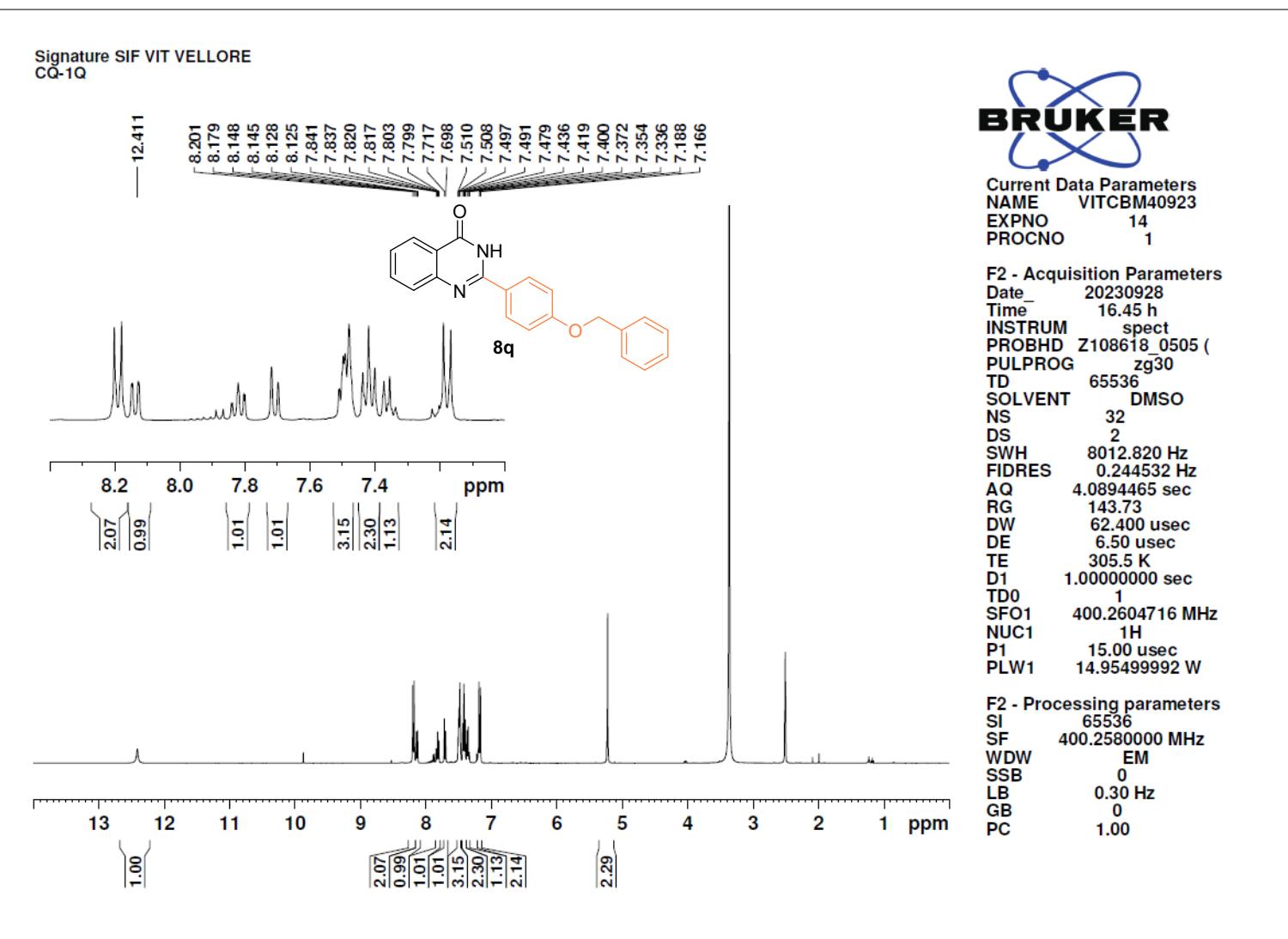
Figure 55:  $^1\text{H}$  NMR spectrum of the compound 8p.



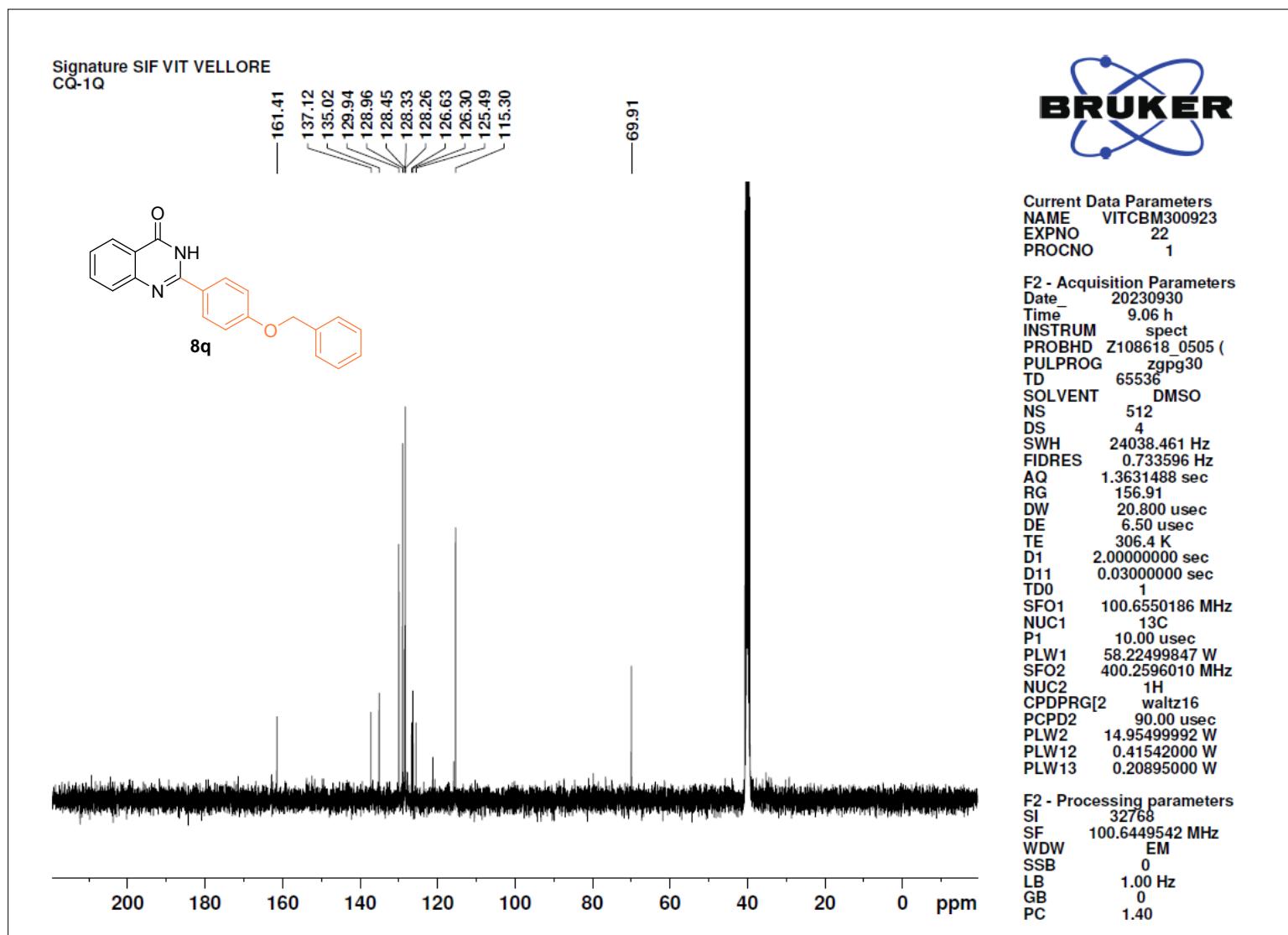
**Figure 56:**  $^{13}\text{C}$  NMR spectrum of the compound **8p**.



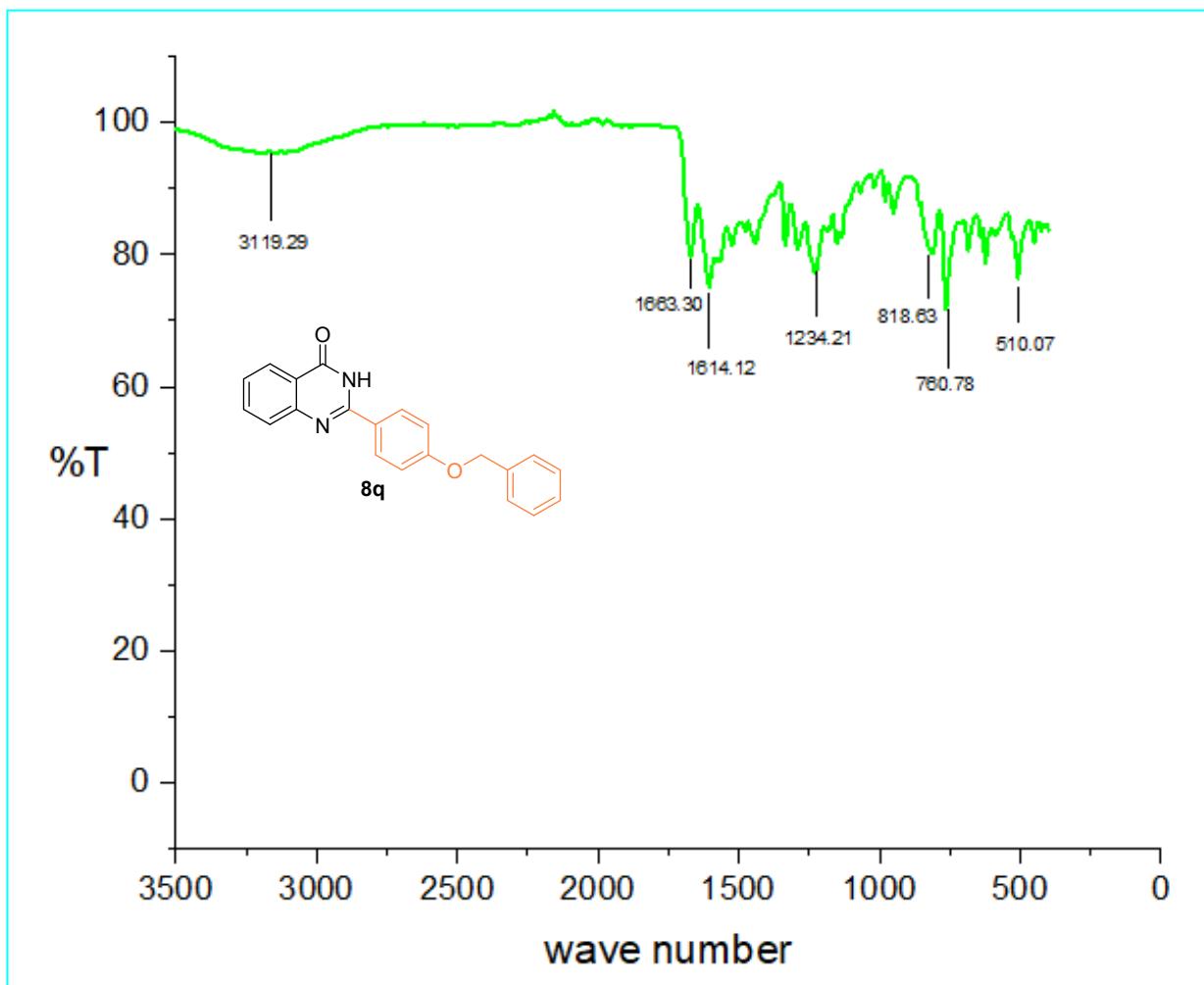
**Figure 57:** FT-IR spectrum of the compound **8p**.



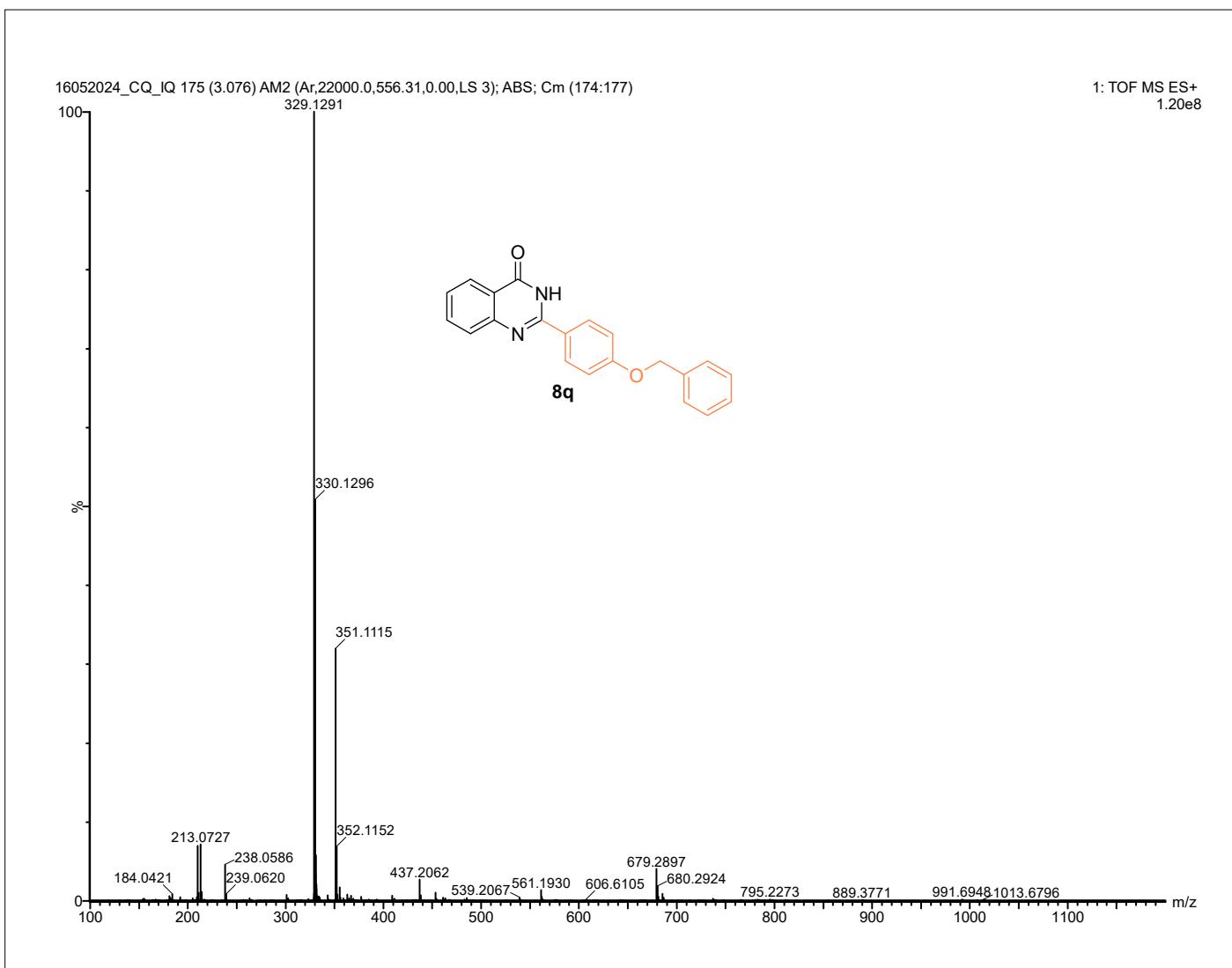
**Figure 58:** <sup>1</sup>H NMR spectrum of the compound 8q.



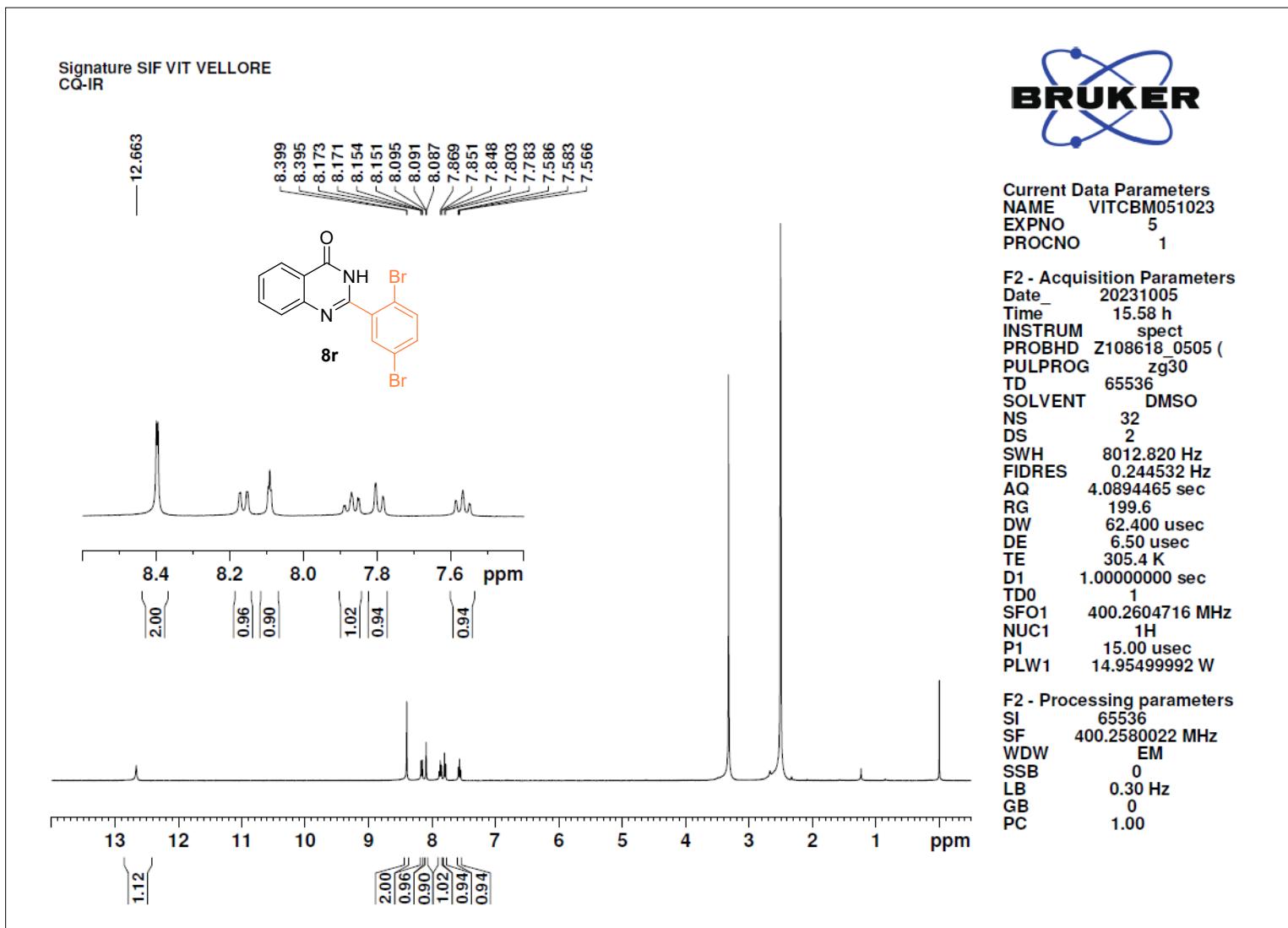
**Figure 59:** <sup>13</sup>C NMR spectrum of the compound 8q.



**Figure 60:** FT-IR spectrum of the compound **8q**.



**Figure 61:** HRMS spectrum of the compound **8q**.



**Figure 62:**  $^1\text{H}$  NMR spectrum of the compound **8r**.

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CQ-1R



Current Data Parameters  
NAME CQ-CIN  
EXPNO 8  
PROCNO 1

F2 - Acquisition Parameters  
Date 20240619  
Time 0.33 h  
INSTRUM spect  
PROBHD Z108618\_0505 (   
PULPROG zgpg30  
TD 65536  
SOLVENT DMSO  
NS 512  
DS 4  
SWH 24038.461 Hz  
FIDRES 0.733596 Hz  
AQ 1.3631488 sec  
RG 199.6  
DW 20.800 usec  
DE 6.50 usec  
TE 302.8 K  
D1 2.0000000 sec  
D11 0.03000000 sec  
TD0 1  
SFO1 100.6550186 MHz  
NUC1 <sup>13</sup>C  
P1 10.00 usec  
PLW1 56.49300003 W  
SFO2 400.2596010 MHz  
NUC2 <sup>1</sup>H  
CPDPRG[2] waltz16  
PCPD2 90.00 usec  
PLW2 15.21399975 W  
PLW12 0.42261001 W  
PLW13 0.21257000 W

F2 - Processing parameters  
SI 32768  
SF 100.6446724 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40

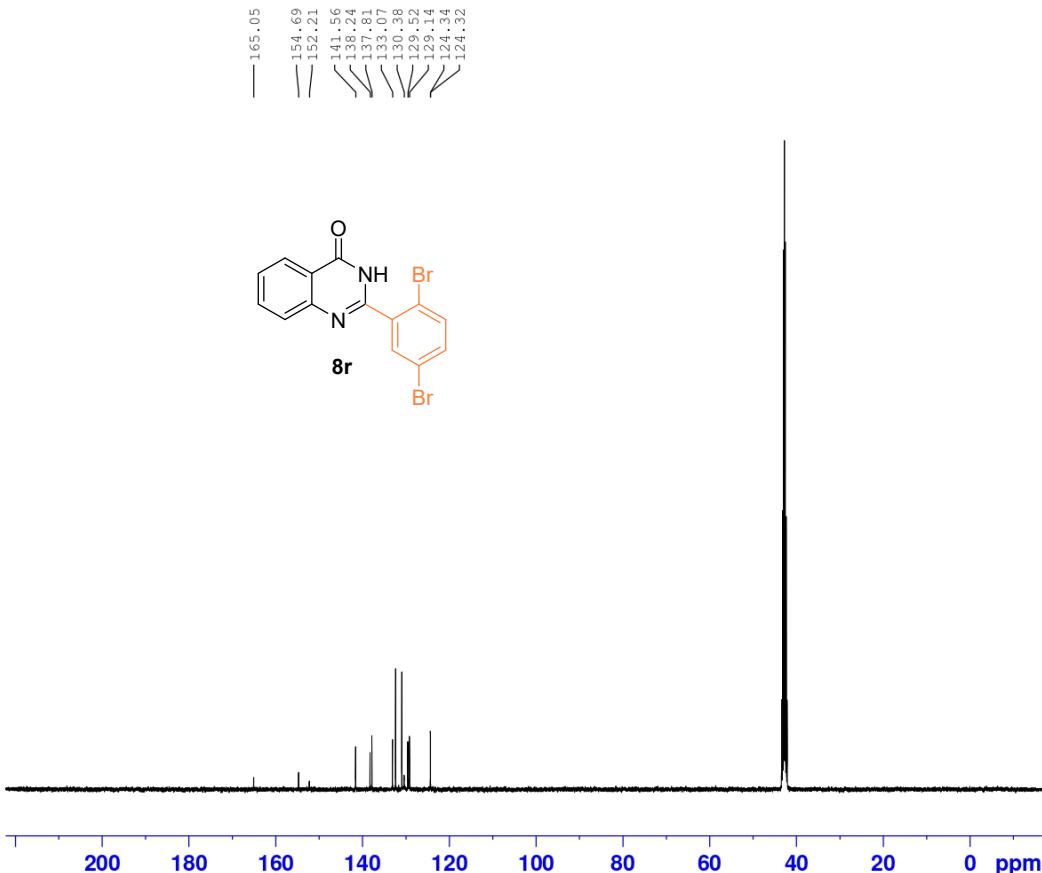


Figure 63: <sup>13</sup>C NMR spectrum of the compound 8r.

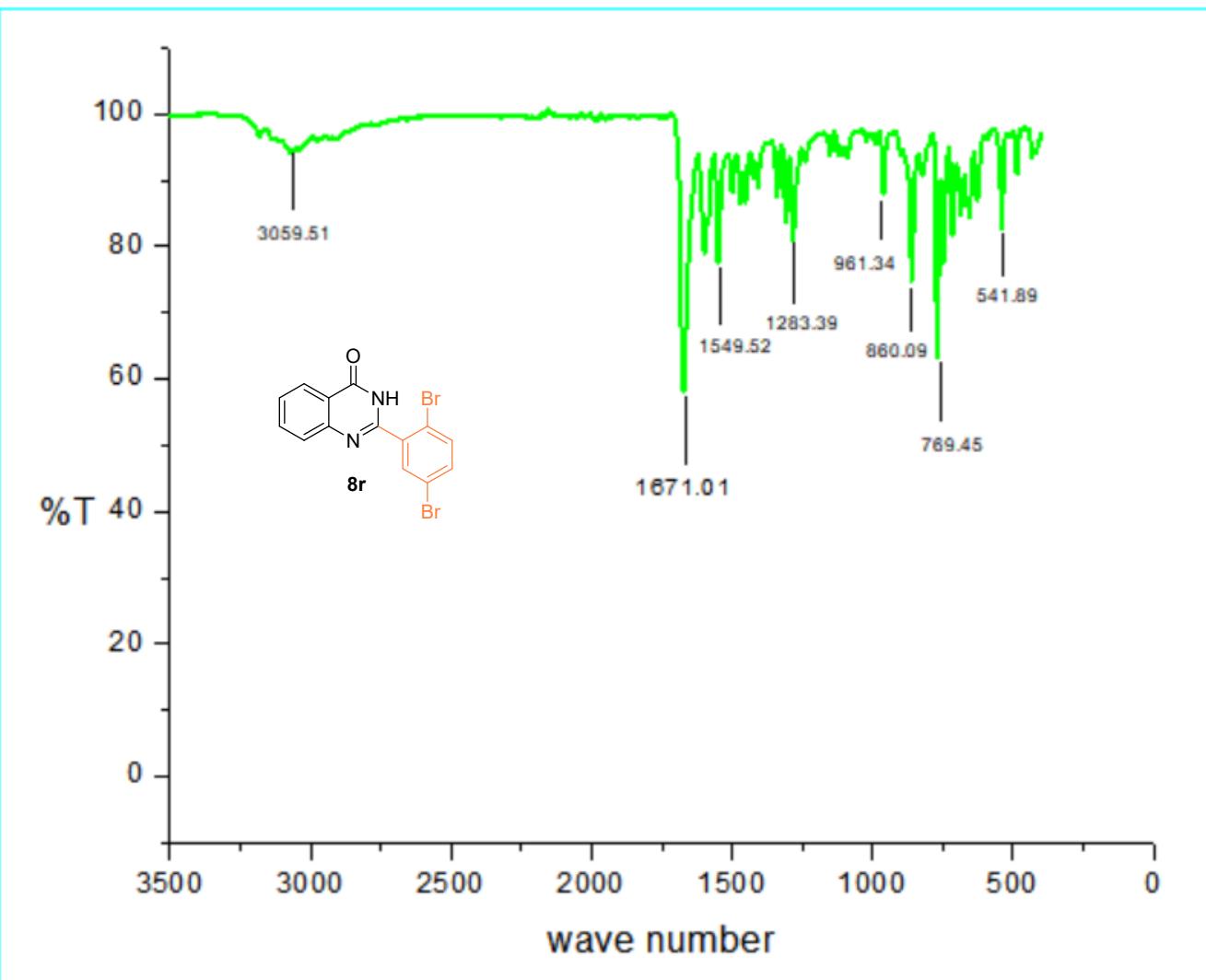
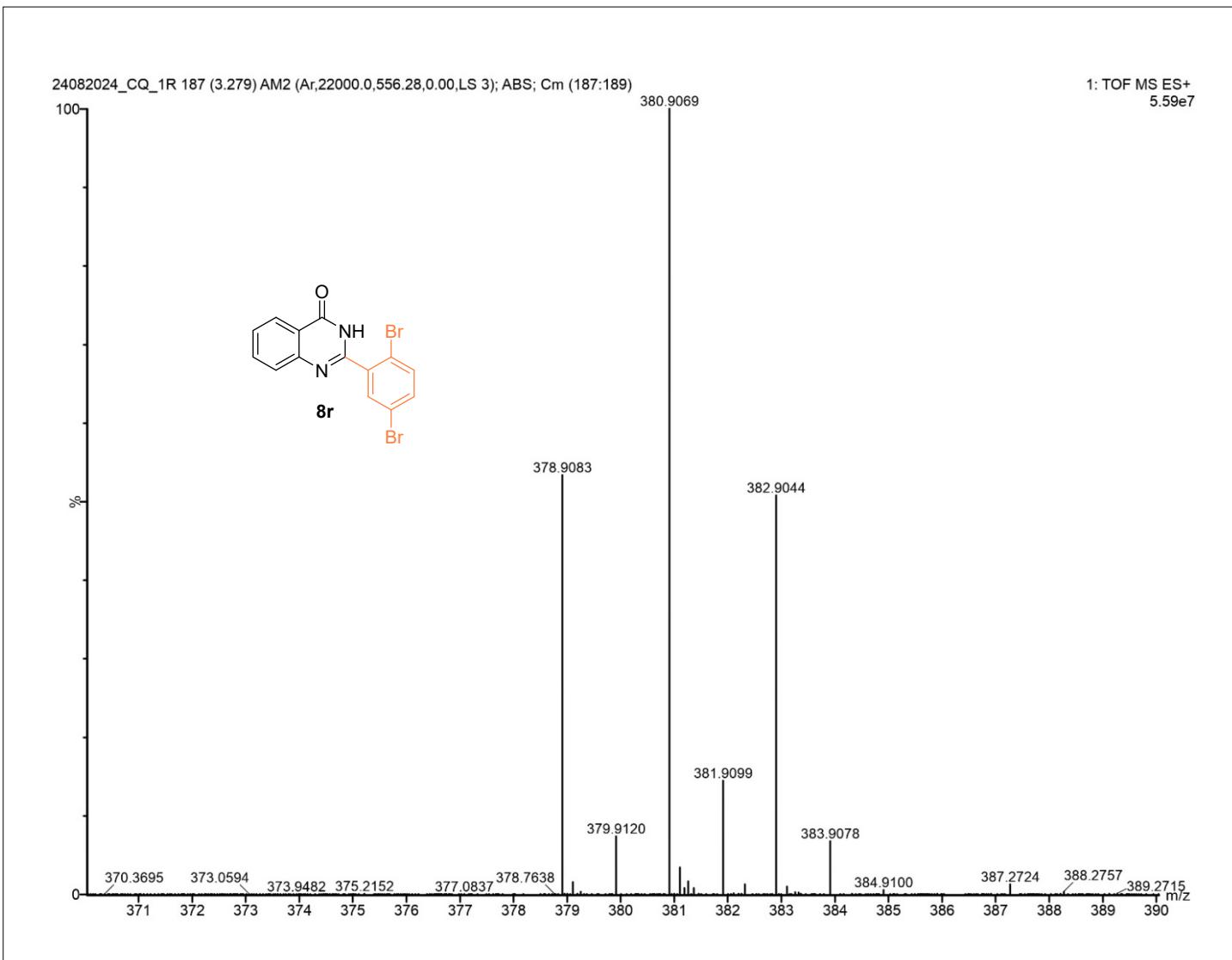
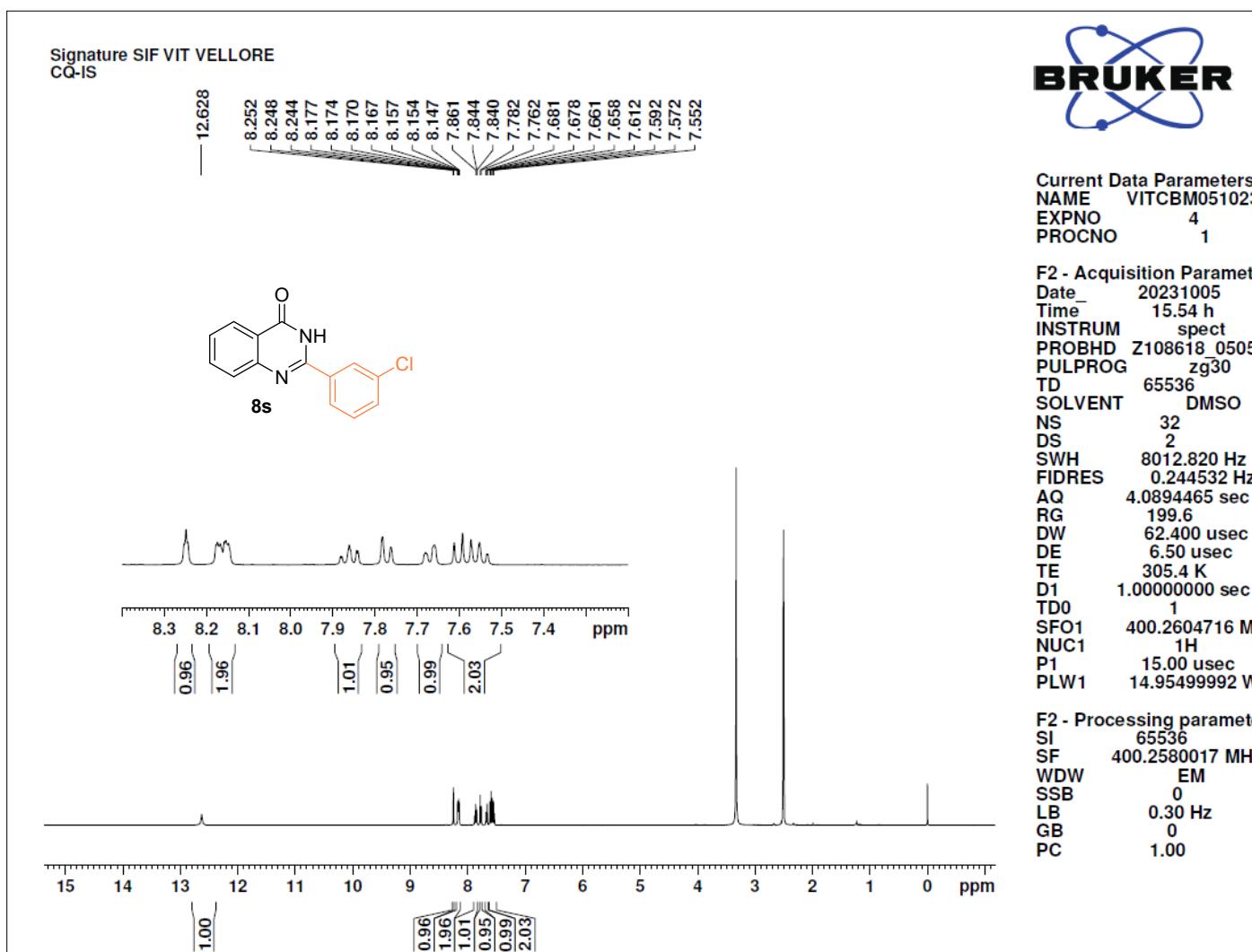


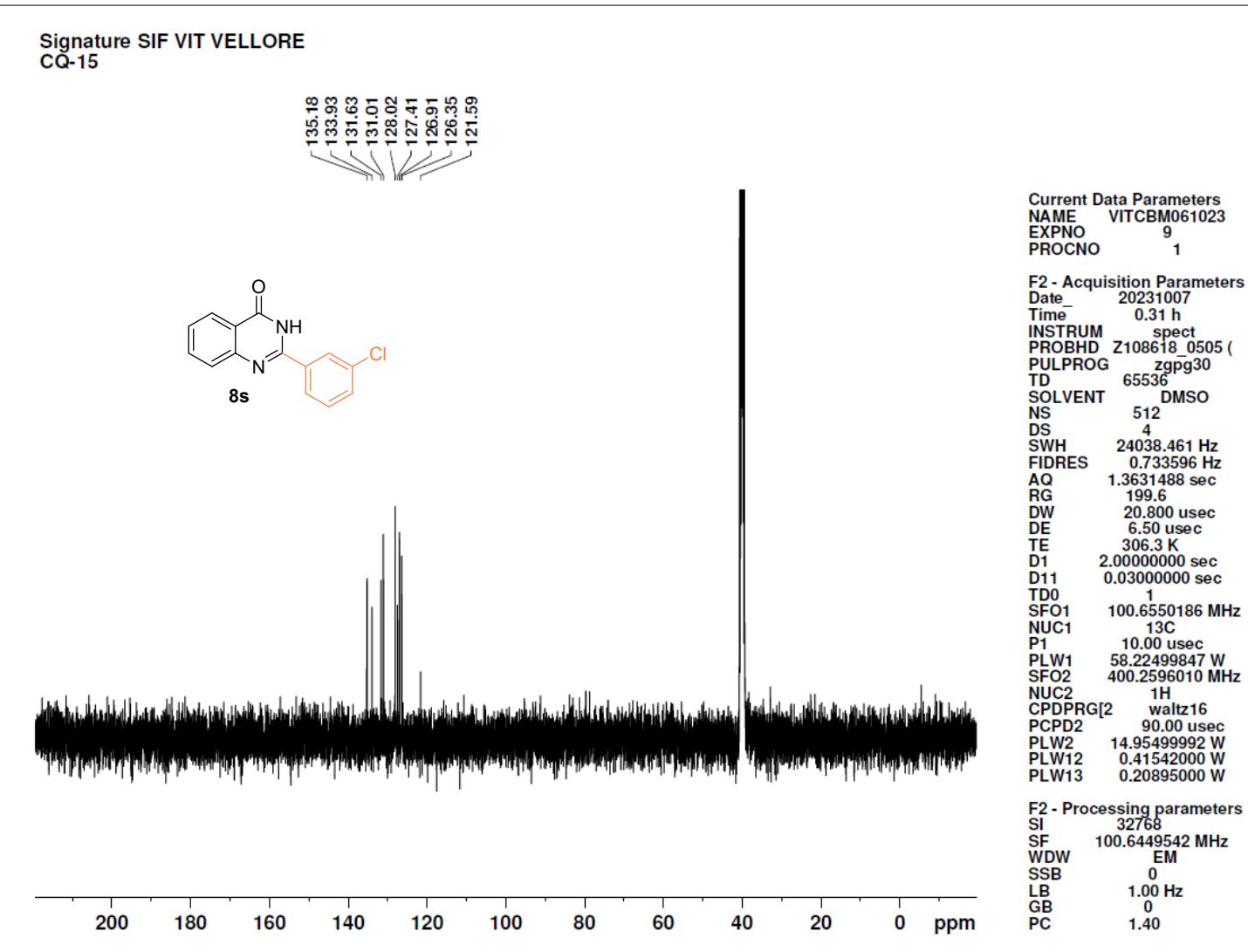
Figure 64: FT-IR spectrum of the compound **8r**.



**Figure 65:** HRMS of the compound **8r**.



**Figure 66:**  $^1\text{H}$  NMR spectrum of the compound **8s**.



**Figure 67:**  $^{13}\text{C}$  NMR spectrum of the compound **8s**.

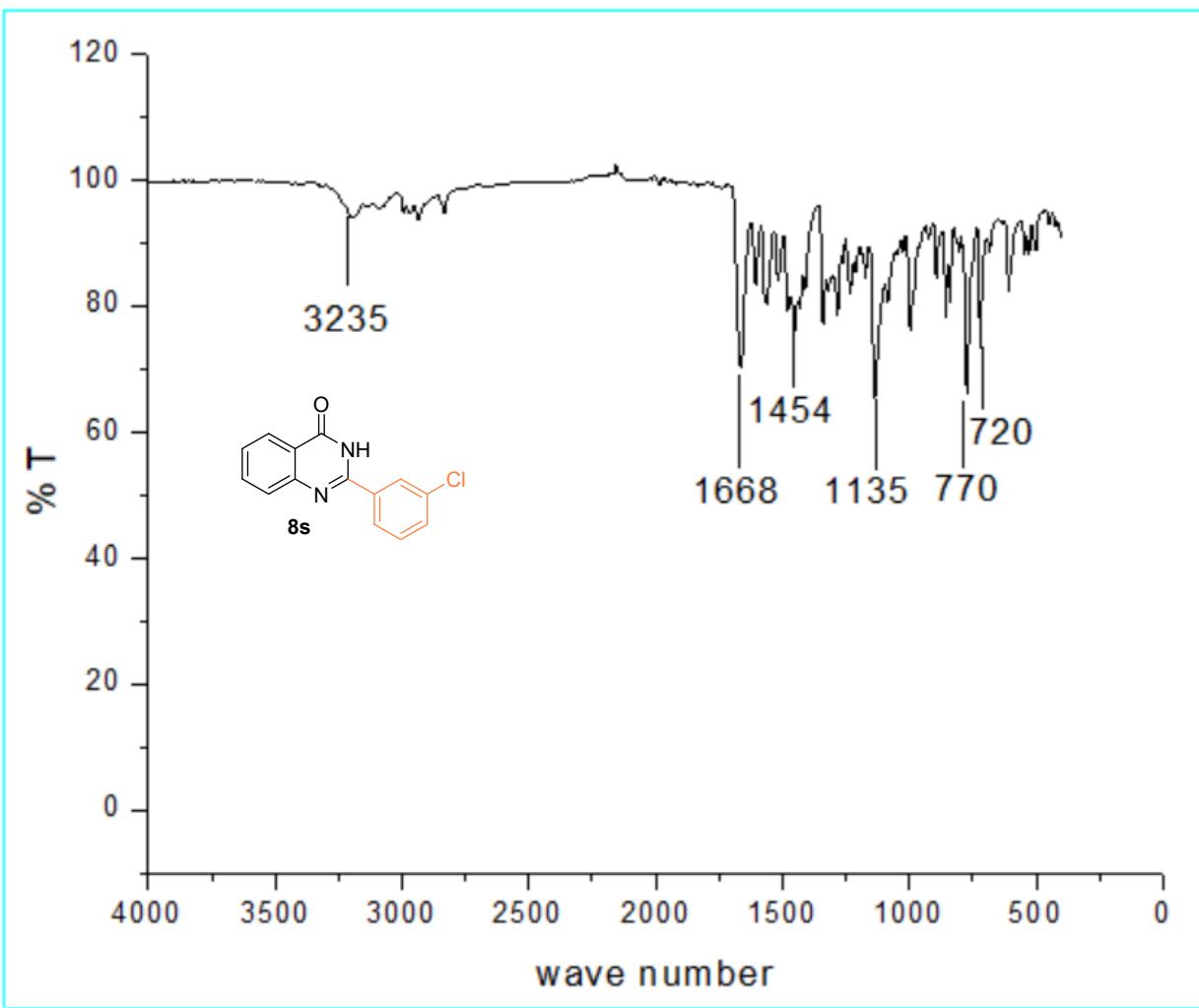
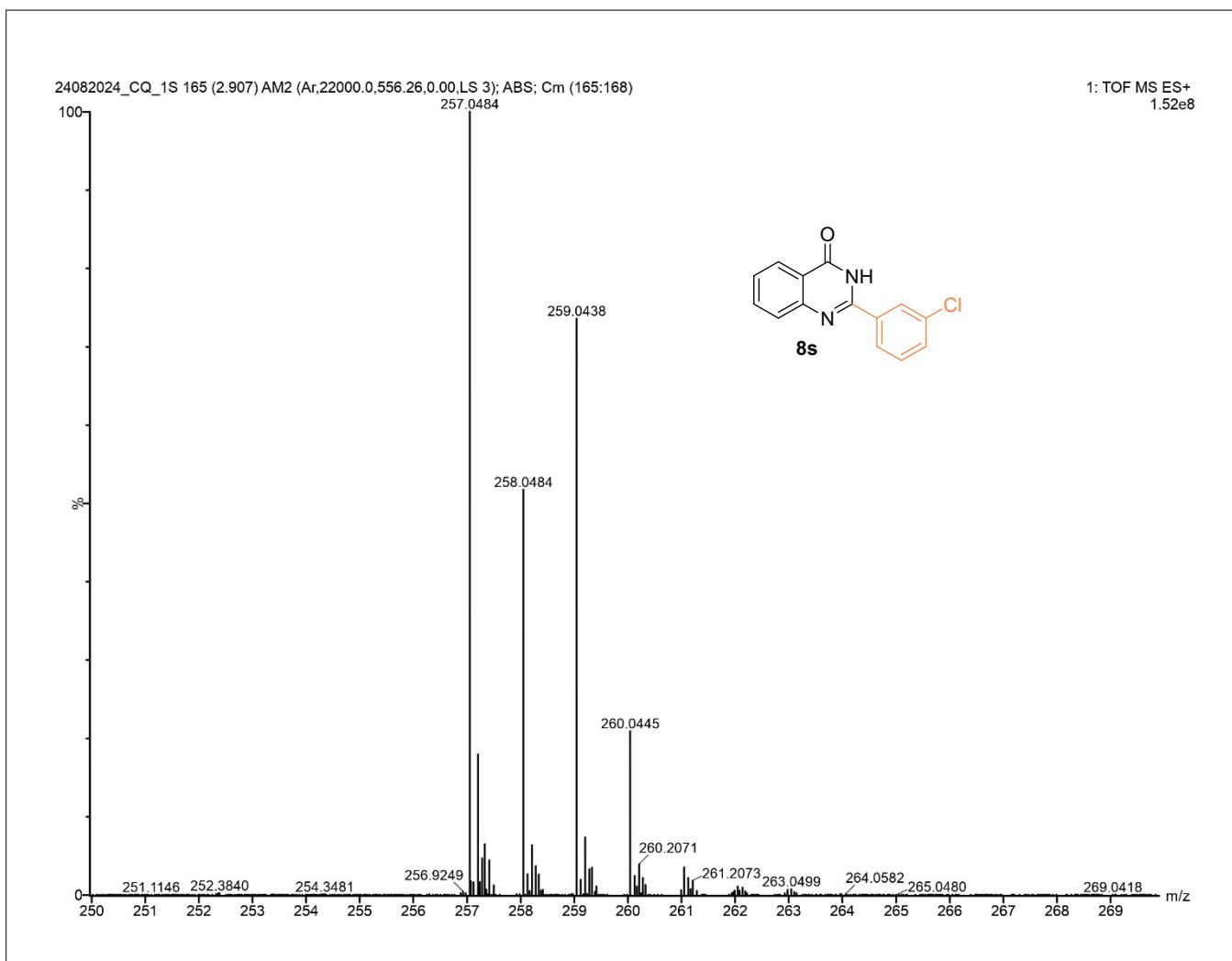
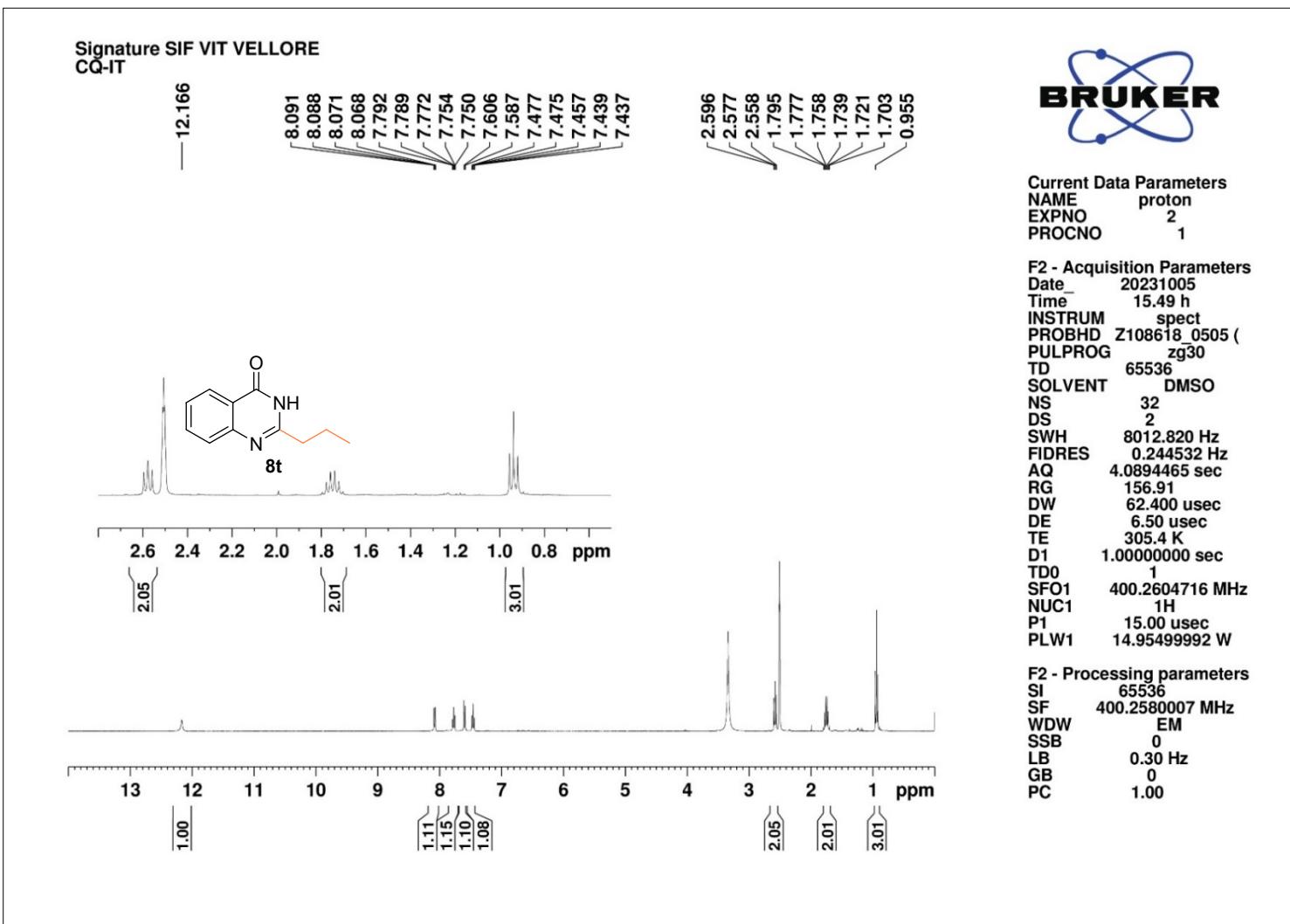


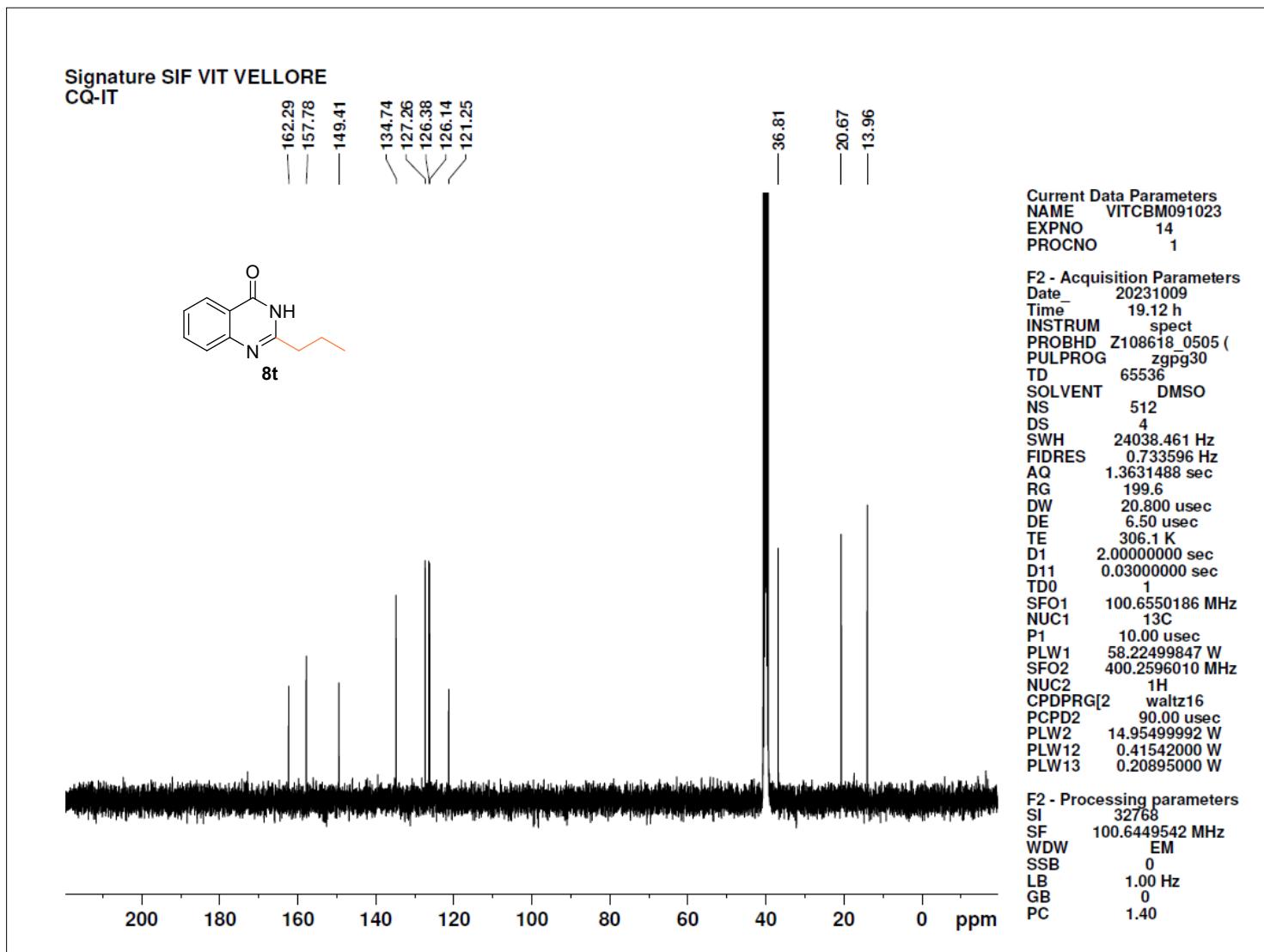
Figure 68: FT-IR spectrum of the compound **8s**.

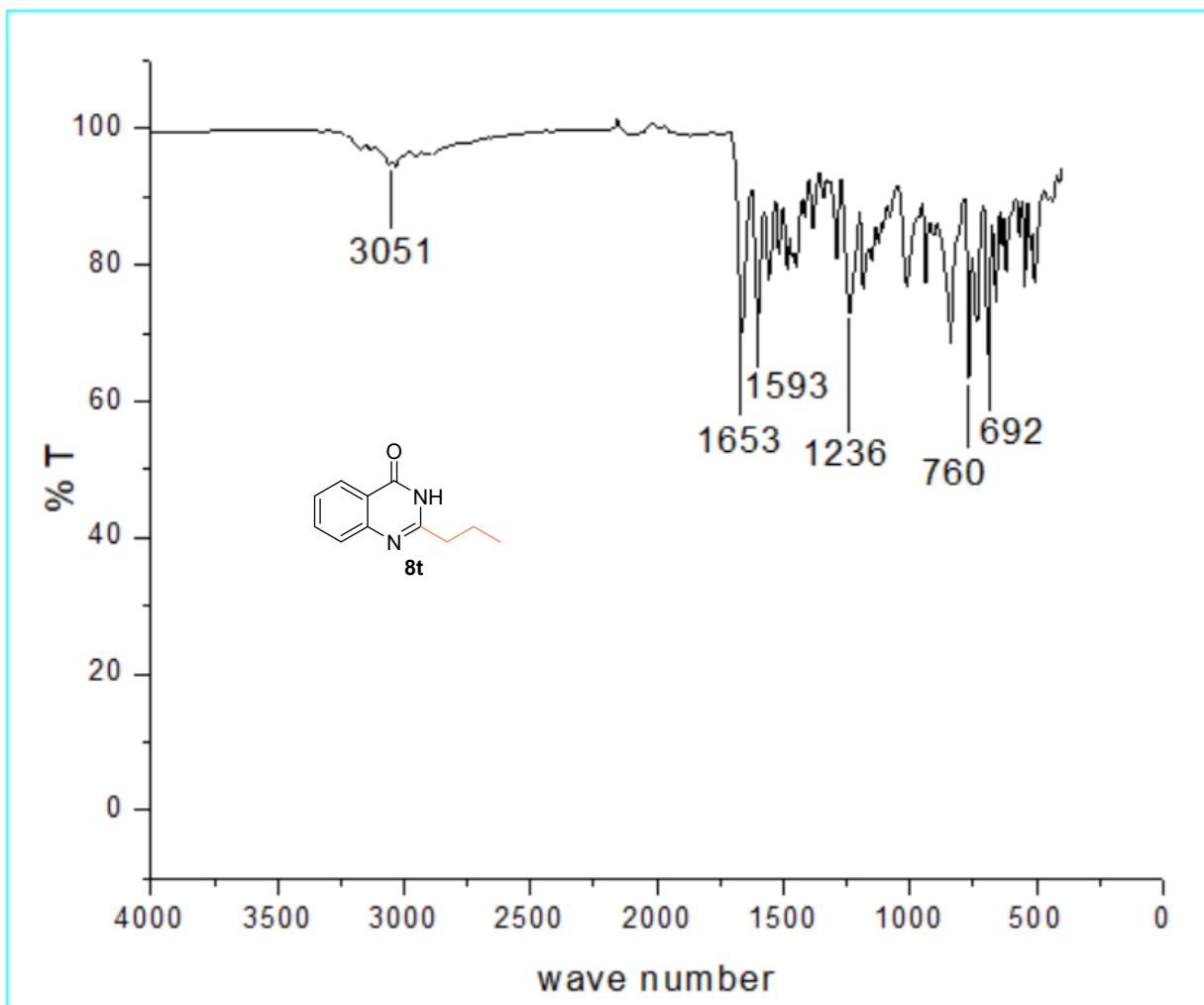


**Figure 69:** HRMS of the compound **8s**.



**Figure 70:**  $^1\text{H}$  NMR spectrum of the compound **8t**.





**Figure 72:** FT-IR spectrum of the compound **8t**.

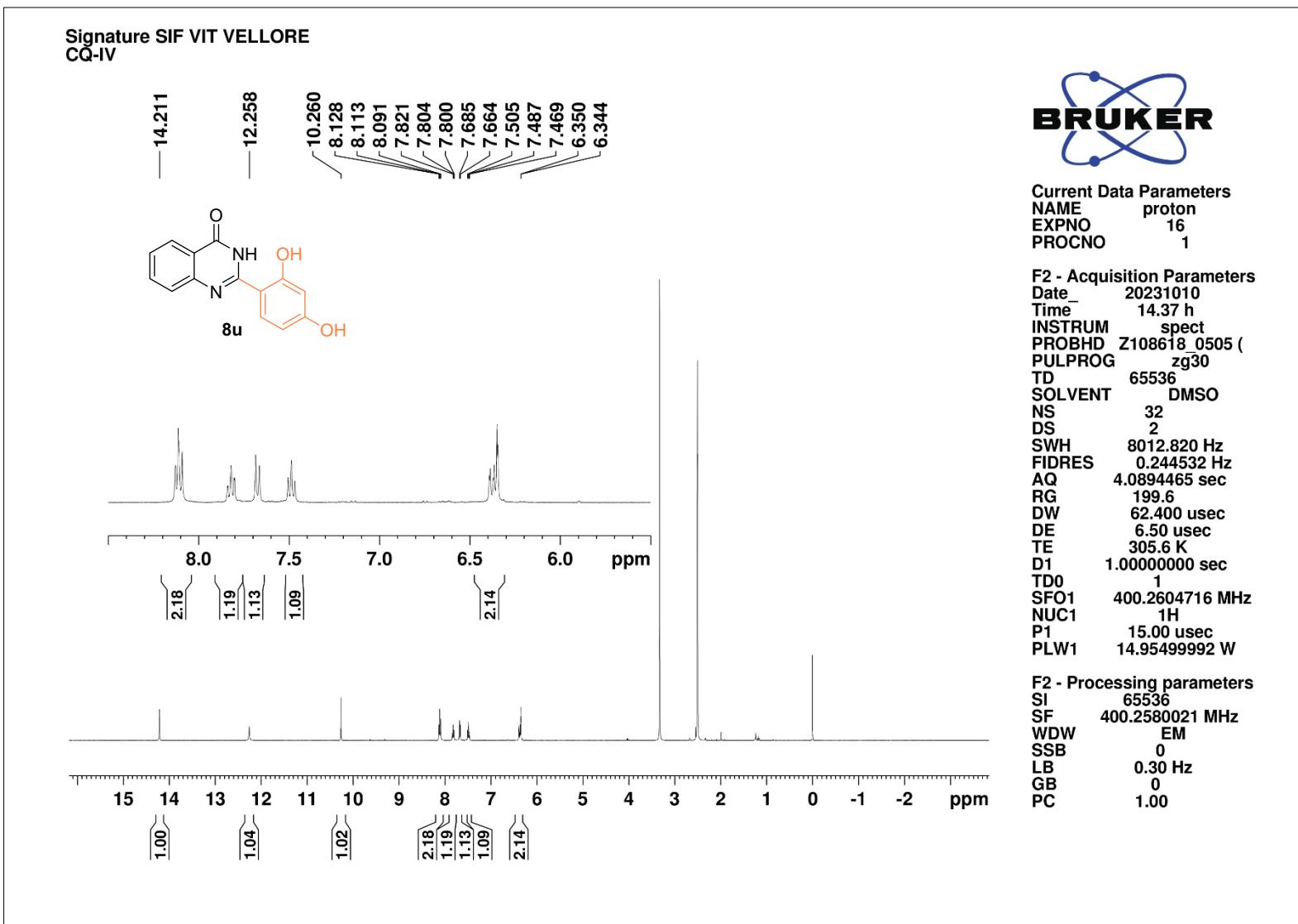


Figure 73:  $^1\text{H}$  NMR spectrum of the compound **8u**.

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CQ-IV



Current Data Parameters

NAME VITC221123  
EXPNO 23  
PROCNO 1

F2 - Acquisition Parameters

Date 20231122  
Time 20.53 h  
INSTRUM spect  
PROBHD Z108618\_0505 (   
PULPROG zgpg30  
TD 65536  
SOLVENT DMSO  
NS 512  
DS 4  
SWH 24038.461 Hz  
FIDRES 0.733596 Hz  
AQ 1.3631488 sec  
RG 199.6  
DW 20.800 usec  
DE 6.50 usec  
TE 302.5 K  
D1 2.0000000 sec  
D11 0.0300000 sec  
TD0 1  
SFO1 100.6550186 MHz  
NUC1 13C  
P1 10.00 usec  
PLW1 56.49300003 W  
SFO2 400.2596010 MHz  
NUC2 1H  
CPDPRG[2 waltz16  
PCPD2 90.00 usec  
PLW2 15.21399975 W  
PLW12 0.42261001 W  
PLW13 0.21257000 W

F2 - Processing parameters

SI 32768  
SF 100.6449542 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40

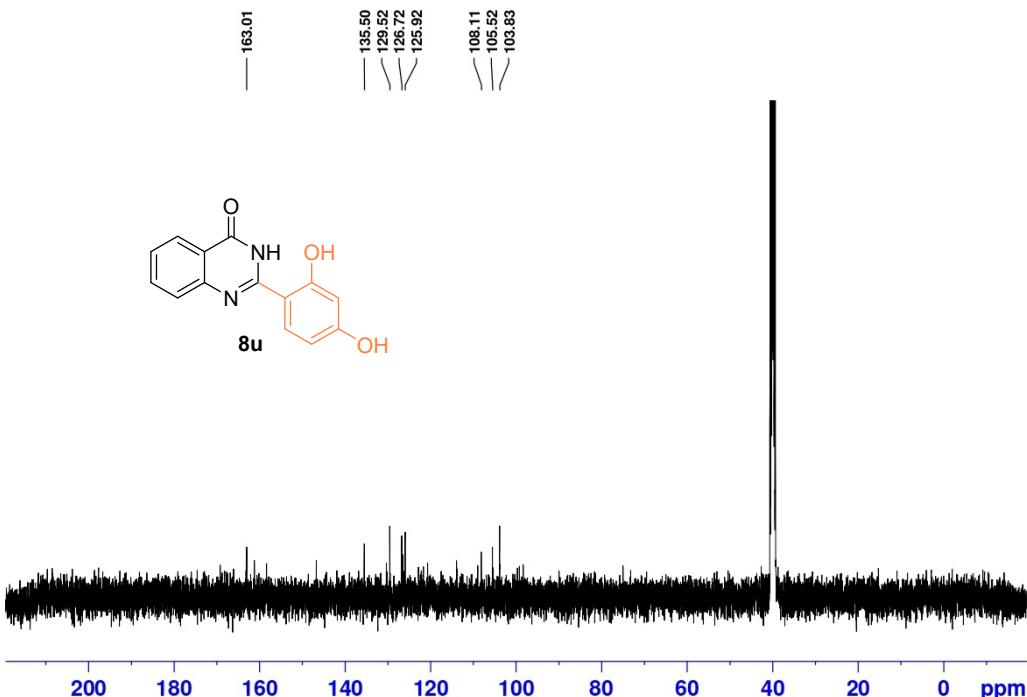
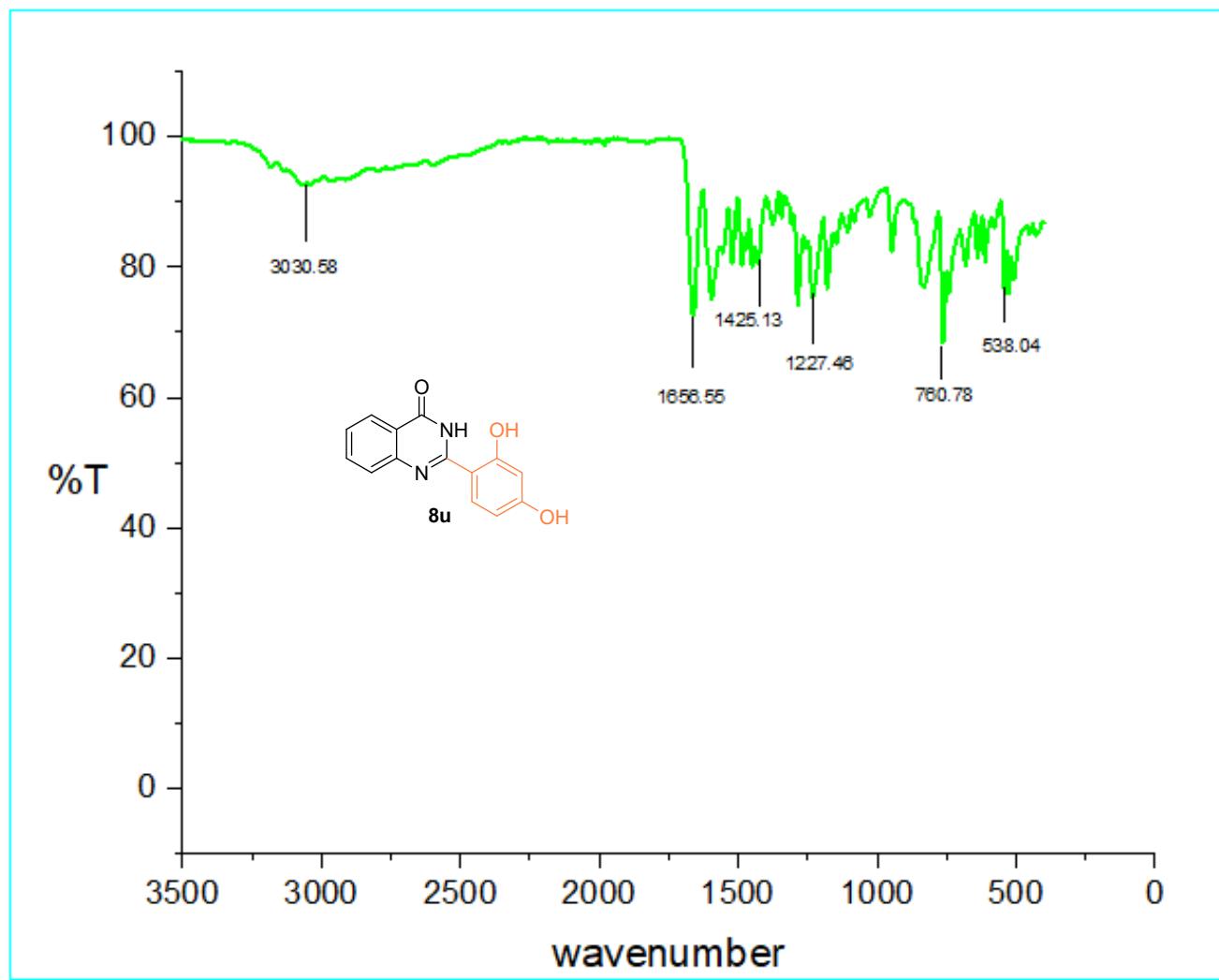


Figure 74: <sup>13</sup>C NMR spectrum of the compound 8u.



**Figure 75:** FT-IR spectrum of the compound **8u**.

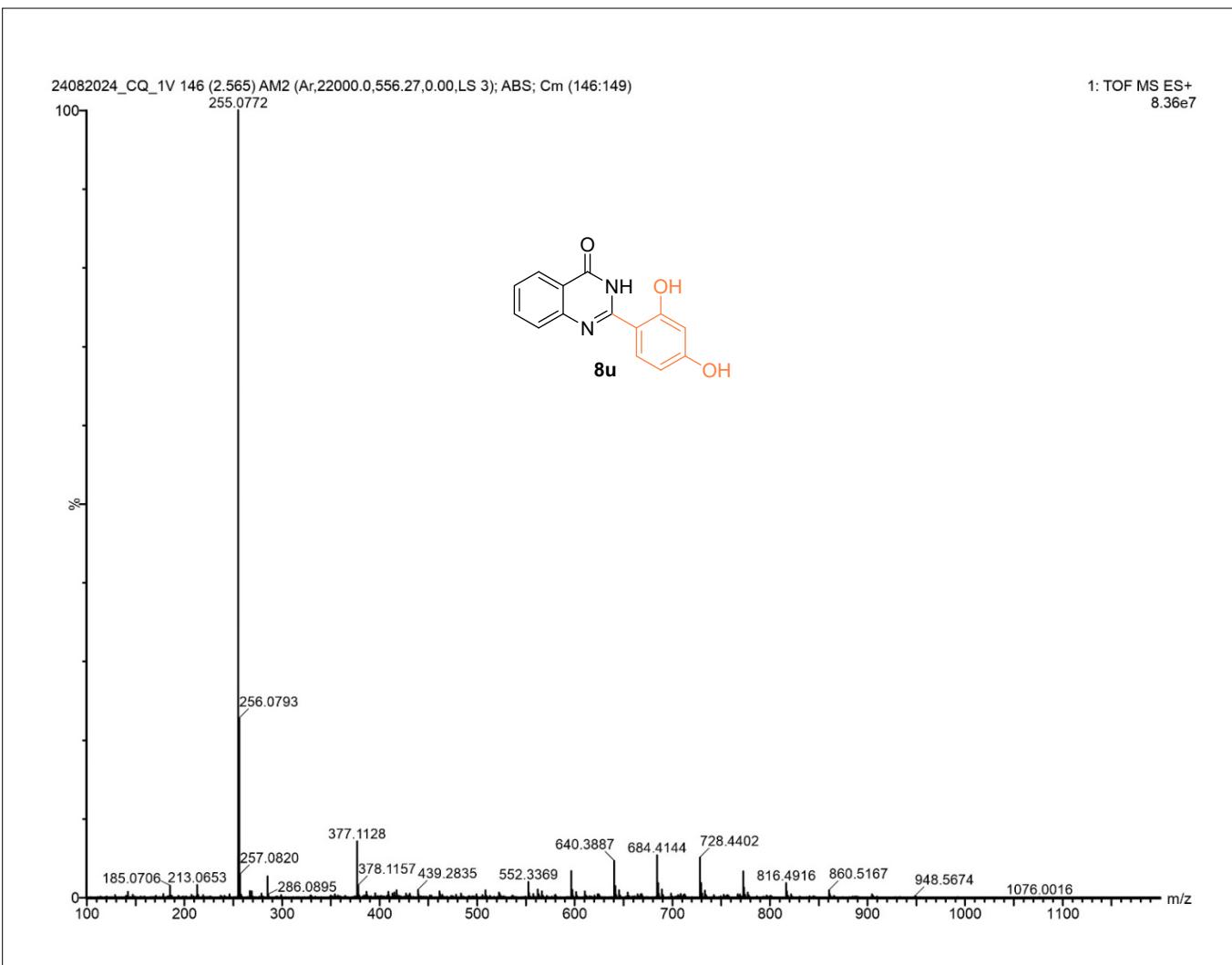
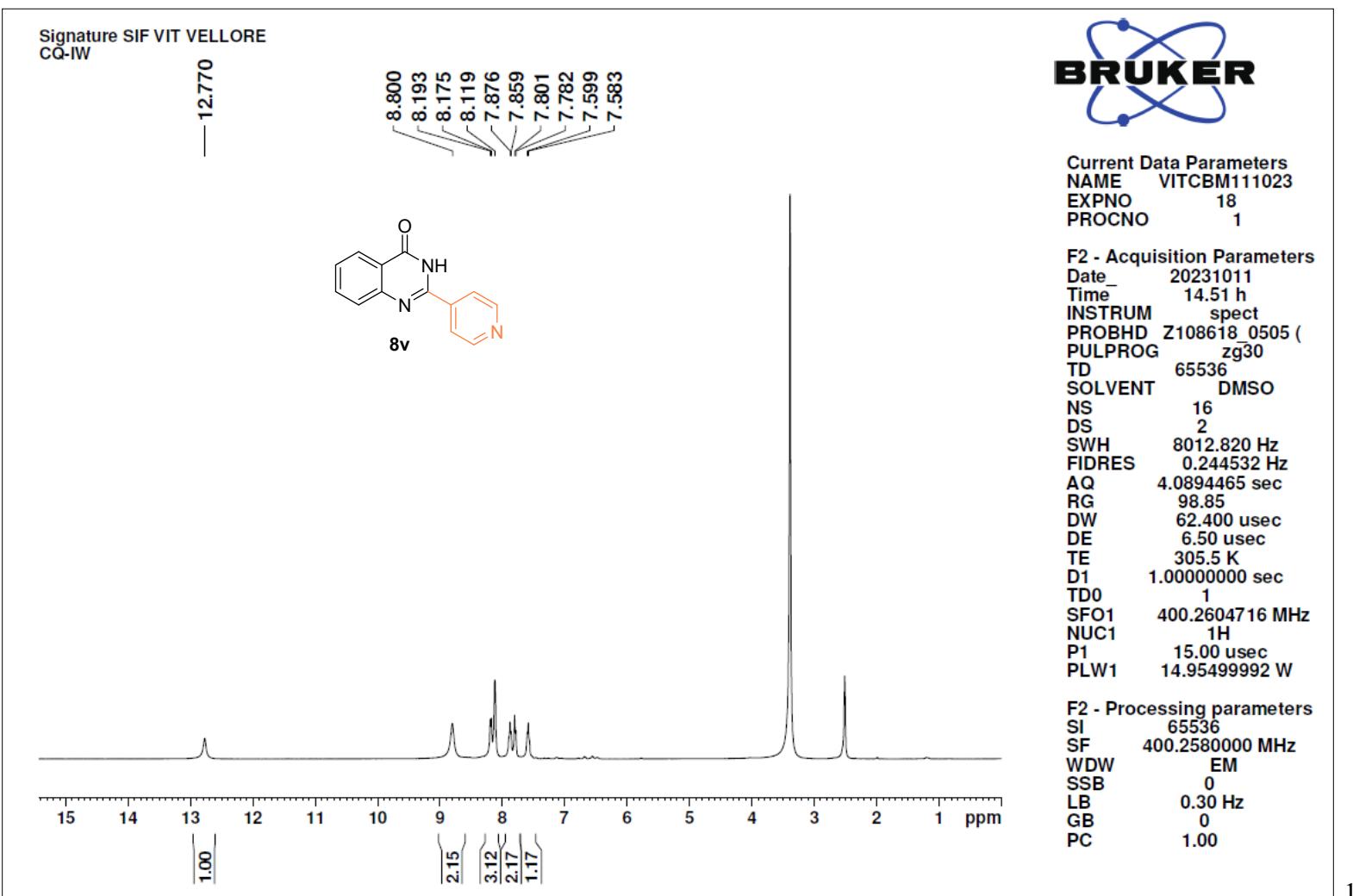
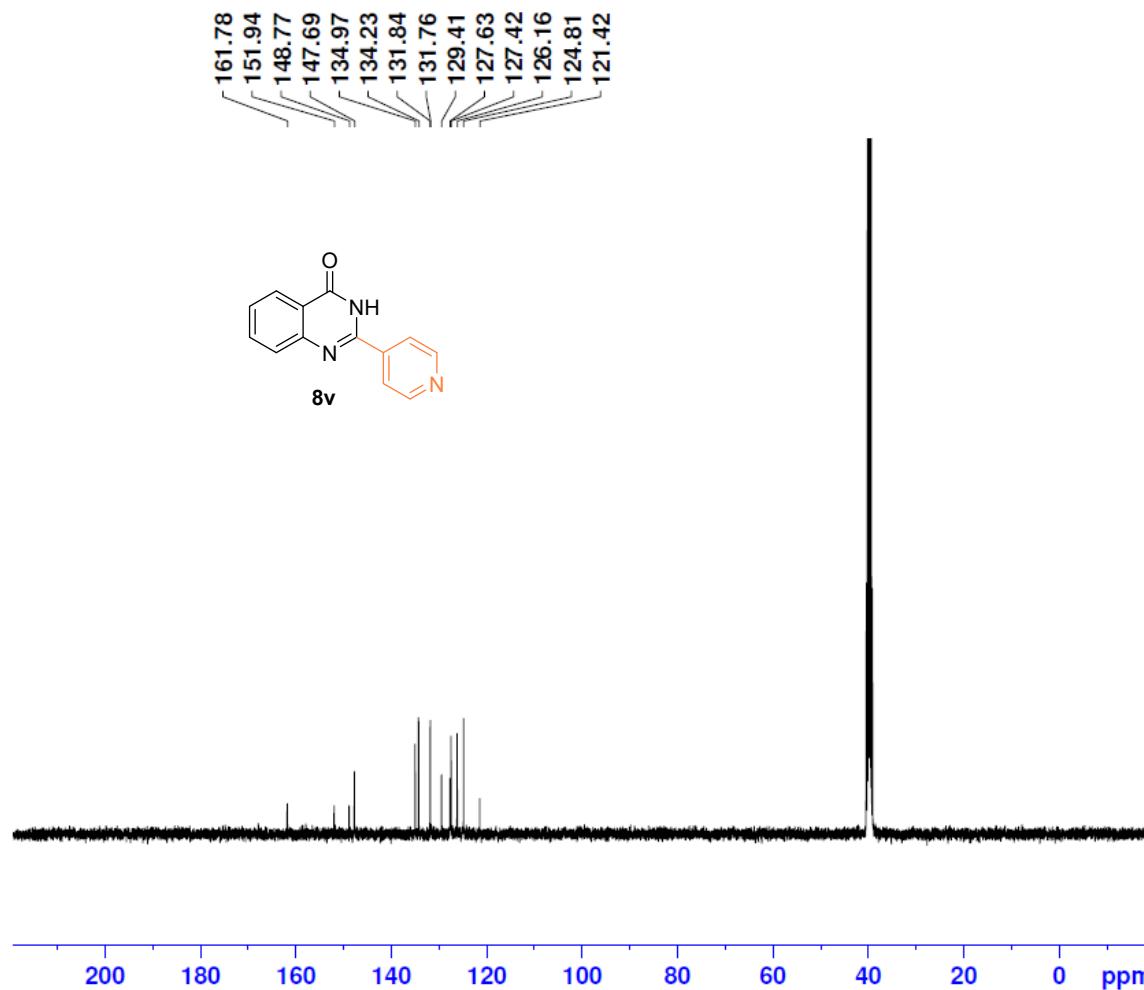


Figure 76: HRMS of the compound **8u**.



**Figure 77:**  $^1\text{H}$  NMR spectrum of the compound **8v**.

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CQ-1W

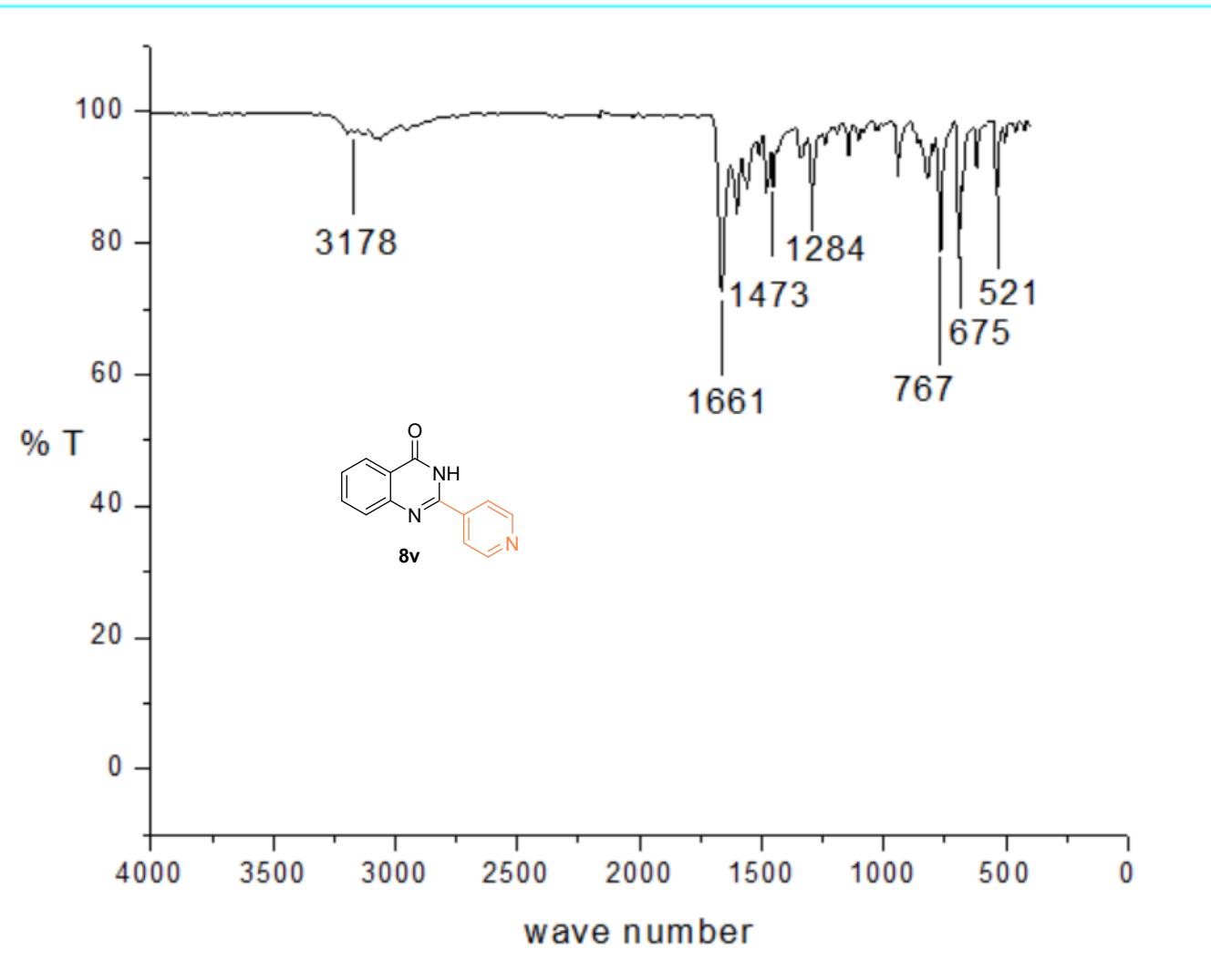


Current Data Parameters  
NAME CQ-1W  
EXPNO 9  
PROCNO 1

F2 - Acquisition Parameters  
Date 20240619  
Time 1.04 h  
INSTRUM spect  
PROBHD Z108618\_0505 (PULPROG zgpg30  
TD 65536  
SOLVENT DMSO  
NS 512  
DS 4  
SWH 24038.461 Hz  
FIDRES 0.733596 Hz  
AQ 1.3631488 sec  
RG 199.6  
DW 20.800 usec  
DE 6.50 usec  
TE 302.8 K  
D1 2.0000000 sec  
D11 0.03000000 sec  
TD0 1  
SFO1 100.6550186 MHz  
NUC1 <sup>13</sup>C  
P1 10.00 usec  
PLW1 56.49300003 W  
SFO2 400.2596010 MHz  
NUC2 1H  
CPDPRG[2 waltz16  
PCPD2 90.00 usec  
PLW2 15.21399975 W  
PLW12 0.42261001 W  
PLW13 0.21257000 W

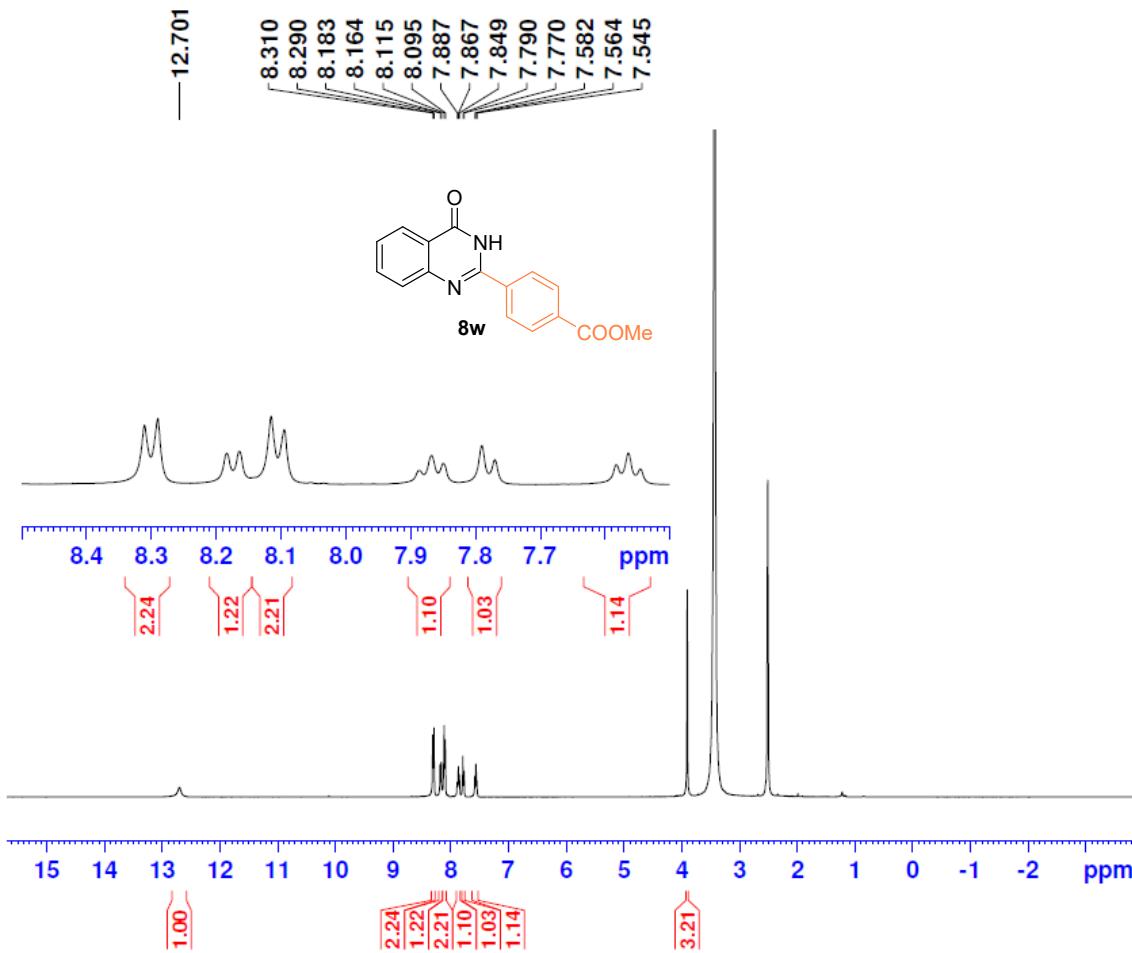
F2 - Processing parameters  
SI 32768  
SF 100.6449743 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40

Figure 78: <sup>13</sup>C NMR spectrum of the compound **8v**.



**Figure 79:** FT-IR spectrum of the compound **8v**.

Signature SIF VIT VELLORE  
CQ-1Z



**BRUKER**

Current Data Parameters  
NAME CQ-1Z  
EXPNO 12  
PROCNO 1

**F2 - Acquisition Parameters**  
 Date\_ 20240621  
 Time 13.01 h  
**INSTRUM** spect  
**PROBHD** Z108618\_0505 (   
**PULPROG** zg30  
**TD** 65536  
**SOLVENT** DMSO  
**NS** 32  
**DS** 2  
**SWH** 8012.820 Hz  
**FIDRES** 0.244532 Hz  
**AQ** 4.0894465 sec  
**RG** 77.73  
**DW** 62.400 usec  
**DE** 6.50 usec  
**TE** 303.3 K  
**D1** 1.0000000 sec  
**TD0** 1  
**SFO1** 400.2604716 MHz  
**NUC1** 1H  
**P1** 15.00 usec  
**PLW1** 15.21399975 W

F2 - Processing parameters  
SI 65536  
SF 400.2580000 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

**Figure 80:**  $^1\text{H}$  NMR spectrum of the compound **8w**.

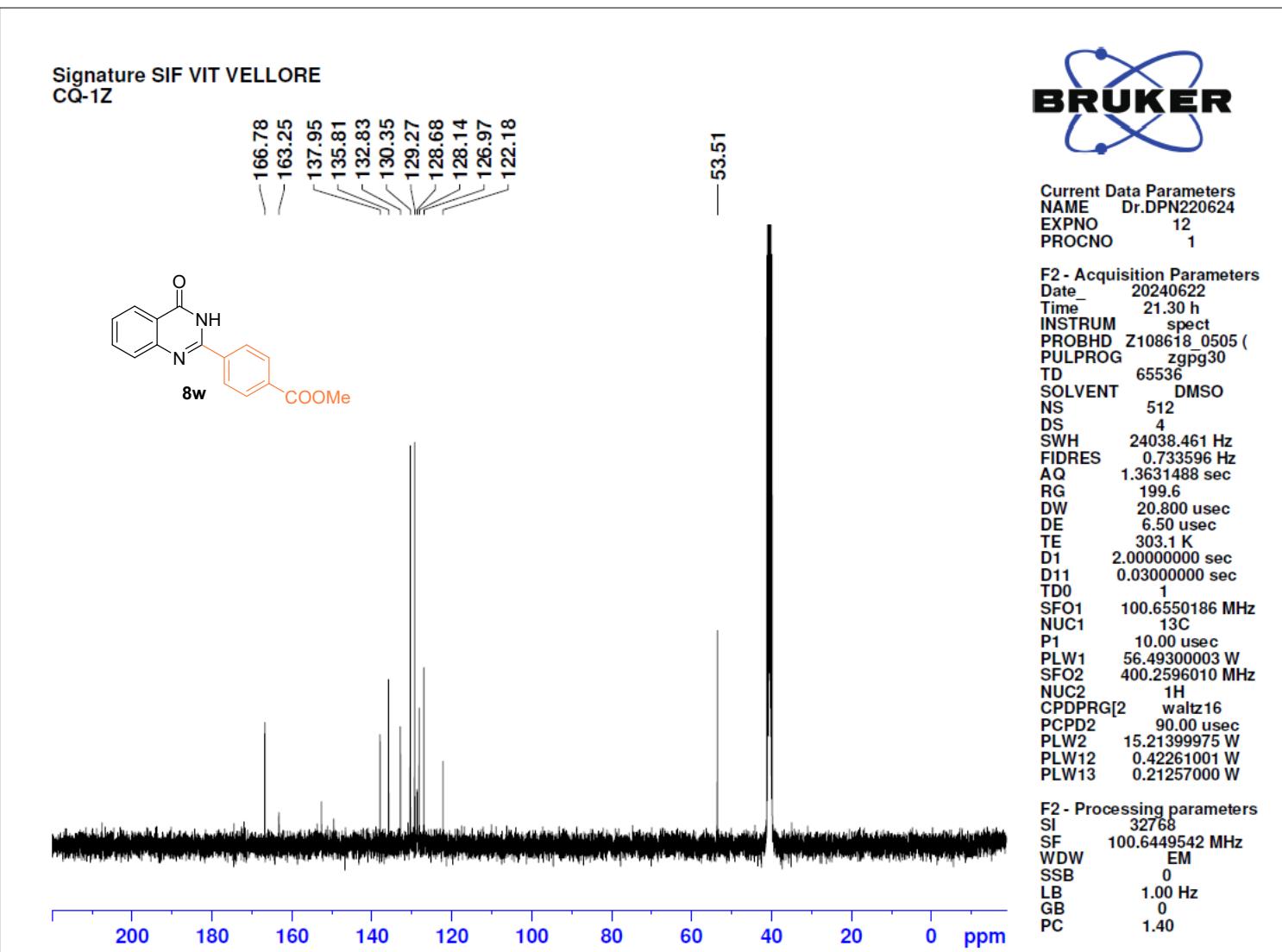
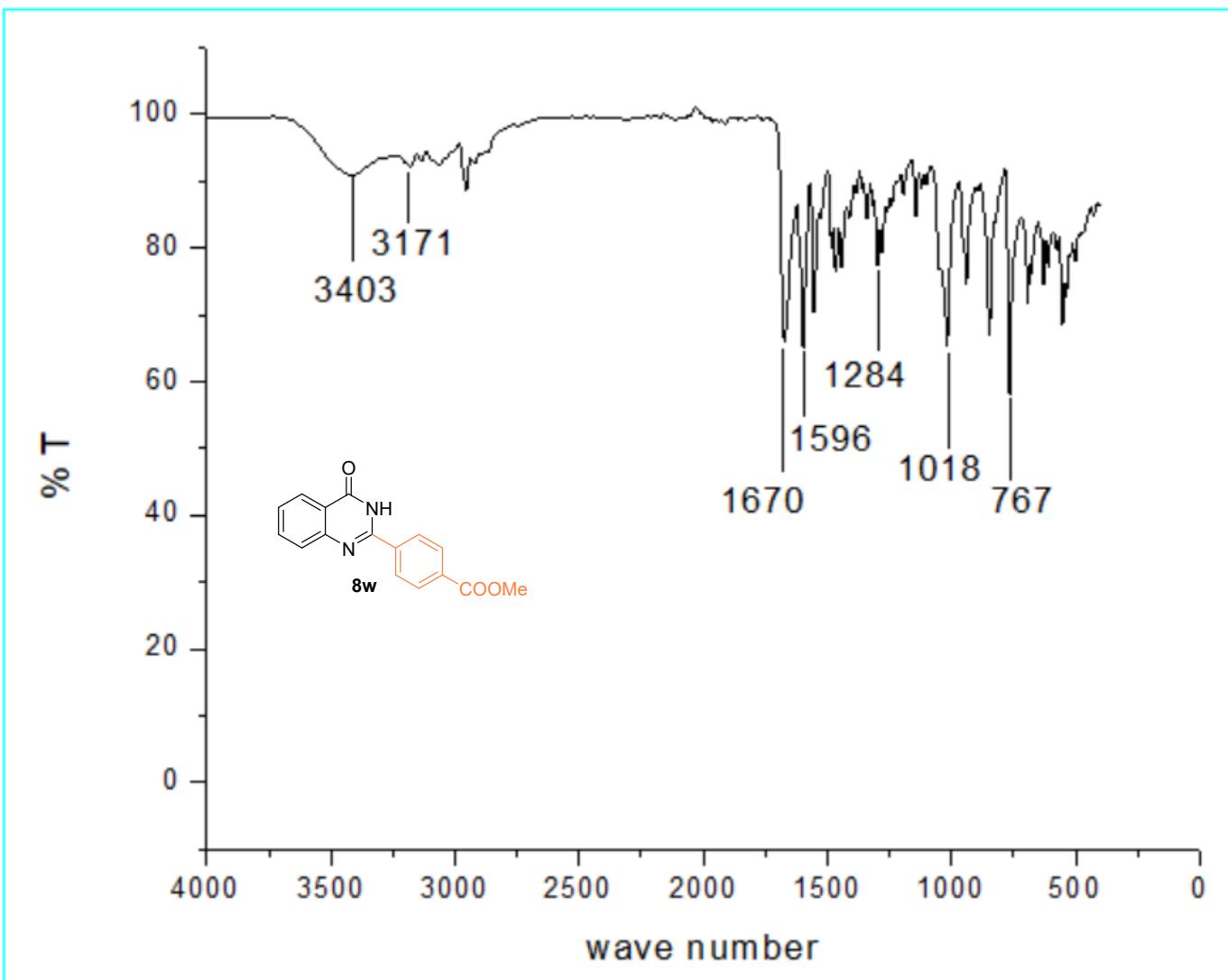
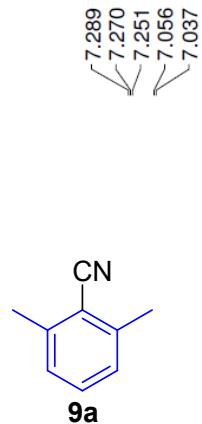


Figure 81: <sup>13</sup>C NMR spectrum of the compound 8w.

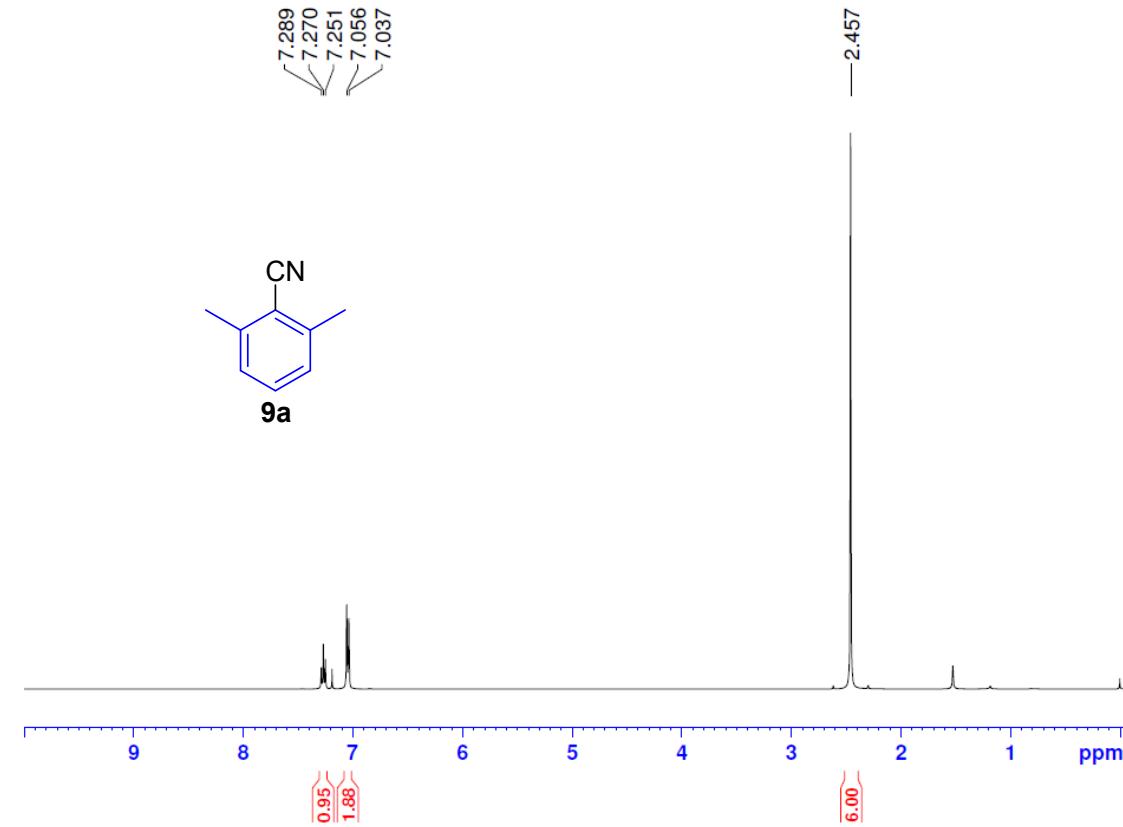


**Figure 82:** FT-IR spectrum of the compound **8w**.

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SET-1B



9a



Current Data Parameters  
NAME Dr.BM250823  
EXPNO 68  
PROCNO 1

F2 - Acquisition Parameters  
Date 20230825  
Time 13.47 h  
INSTRUM spect  
PROBHD Z108618\_0505 (   
PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 32  
DS 2  
SWH 8012.820 Hz  
FIDRES 0.244532 Hz  
AQ 4.0894465 sec  
RG 127.79  
DW 62.400 usec  
DE 6.50 usec  
TE 305.1 K  
D1 1.0000000 sec  
TD0 1  
SFO1 400.2604716 MHz  
NUC1 <sup>1</sup>H  
P1 15.00 usec  
PLW1 14.95499992 W

F2 - Processing parameters  
SI 65536  
SF 400.2580379 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

Figure 83: <sup>1</sup>H NMR spectrum of the compound 9a.

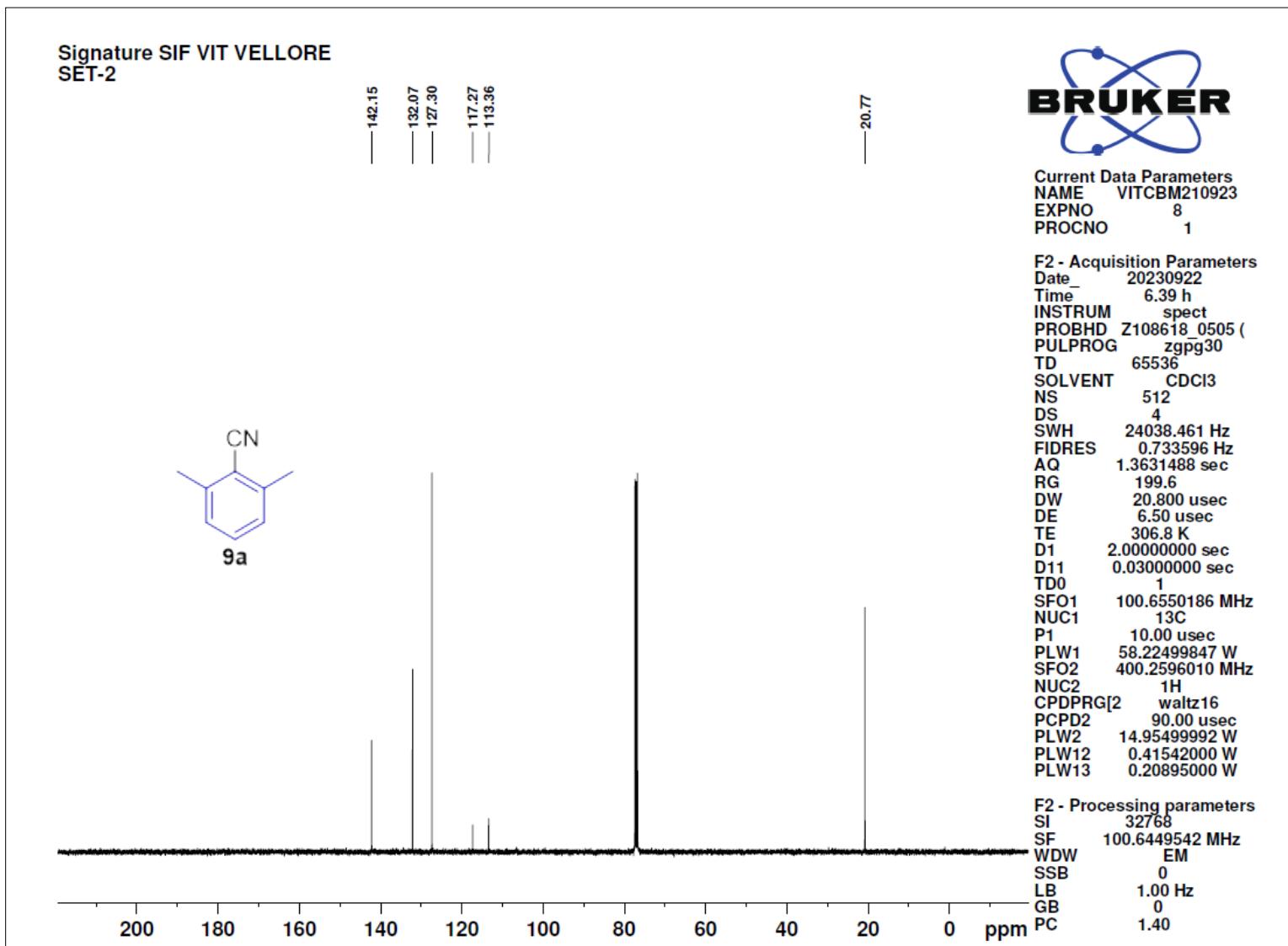
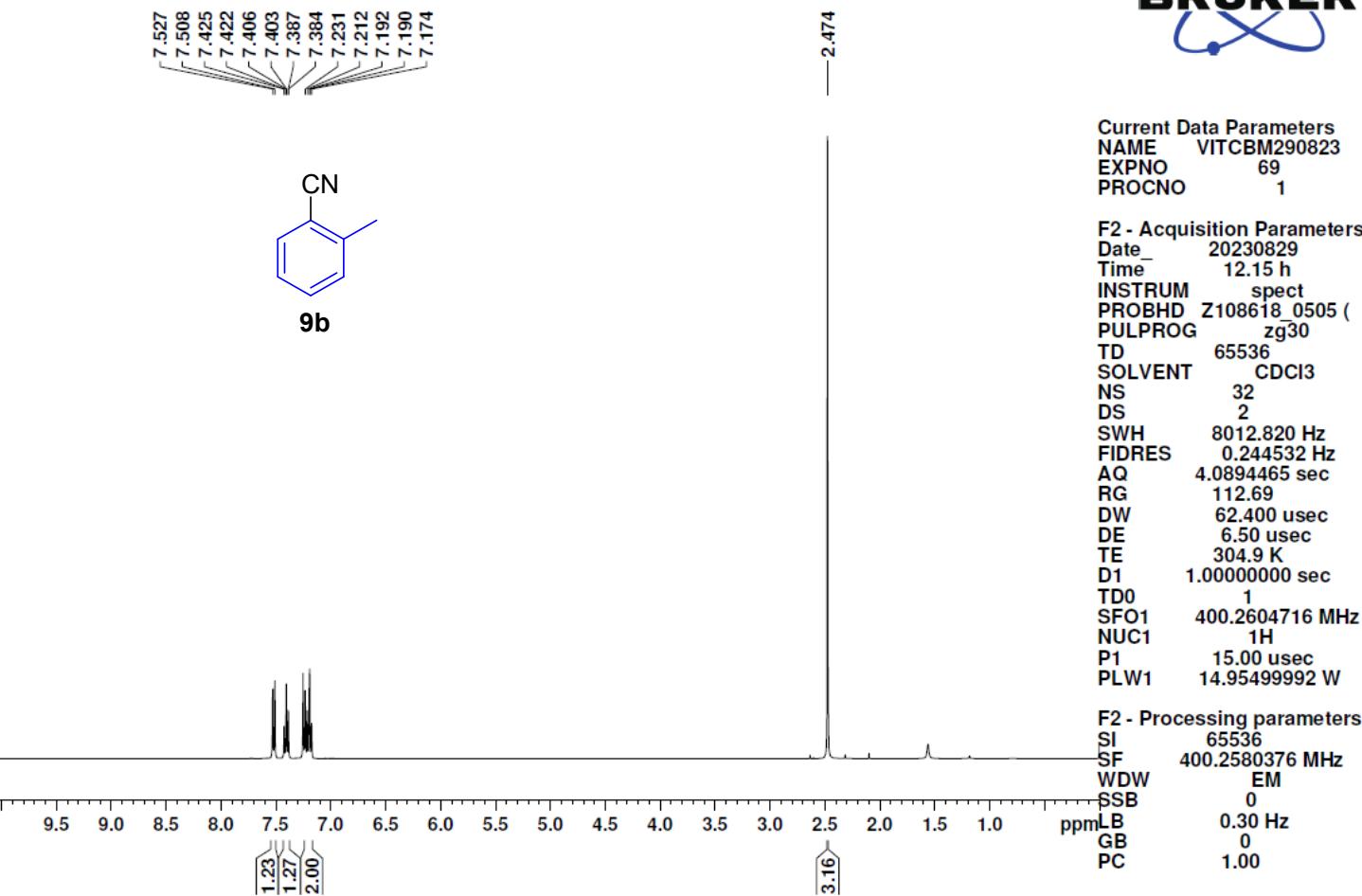
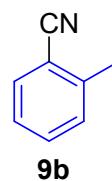


Figure 84:  $^{13}\text{C}$  NMR spectrum of the compound 9a.

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SET-3

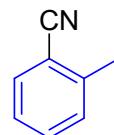


**Figure 85:** <sup>1</sup>H NMR spectrum of the compound **9b**.

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SET-3



141.94  
132.61  
132.51  
130.22  
126.21  
118.12  
112.81



9b

—20.45

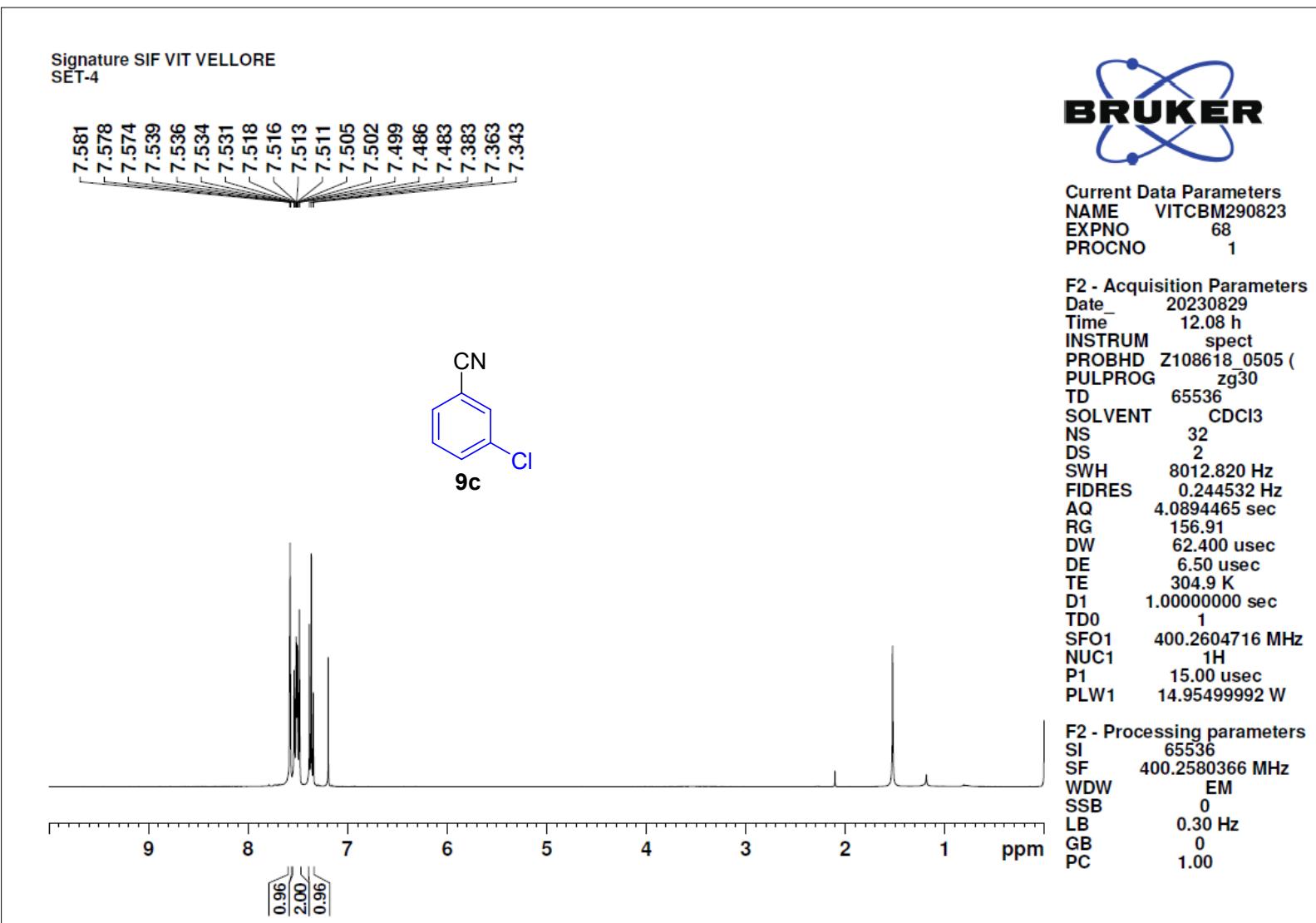
Current Data Parameters  
NAME Dr.DPN120424  
EXPNO 4  
PROCNO 1

F2 - Acquisition Parameters  
Date\_ 20240413  
Time 9.32 h  
INSTRUM spect  
PROBHD Z108618\_0505 (   
PULPROG zgpg30  
TD 65536  
SOLVENT CDCl3  
NS 512  
DS 4  
SWH 24038.461 Hz  
FIDRES 0.733596 Hz  
AQ 1.3631488 sec  
RG 199.6  
DW 20.800 usec  
DE 6.50 usec  
TE 307.3 K  
D1 2.0000000 sec  
D11 0.03000000 sec  
TD0 1  
SFO1 100.6550186 MHz  
NUC1 13C  
P1 10.00 usec  
PLW1 56.49300003 W  
SFO2 400.2596010 MHz  
NUC2 1H  
CPDPRG[2] waltz16  
PCPD2 90.00 usec  
PLW2 15.21399975 W  
PLW12 0.42261001 W  
PLW13 0.21257000 W

F2 - Processing parameters  
SI 32768  
SF 100.6449542 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40



Figure 86:  $^{13}\text{C}$  NMR spectrum of the compound 9b.



**Figure 87:** <sup>1</sup>H NMR spectrum of the compound **9c**.

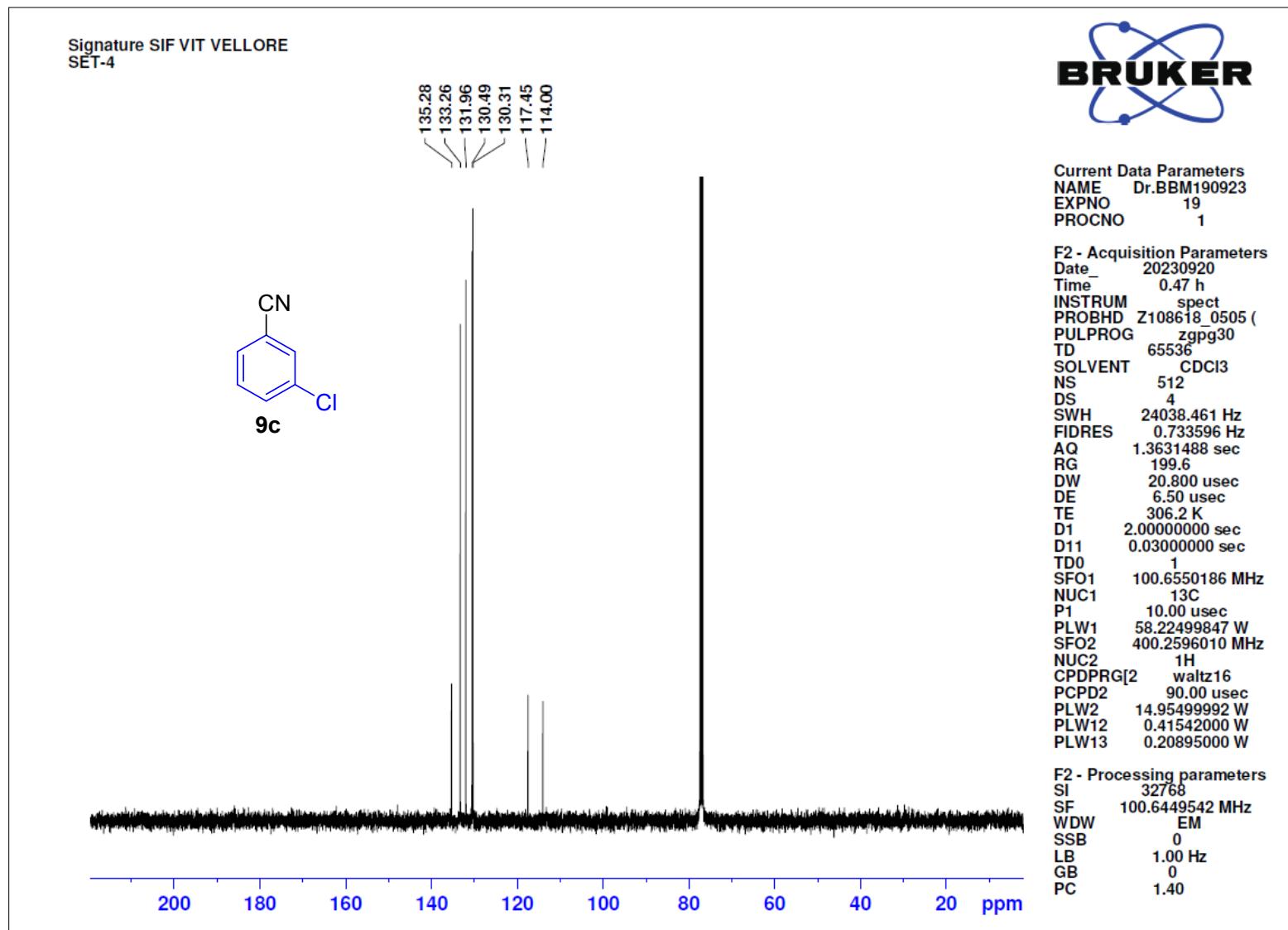
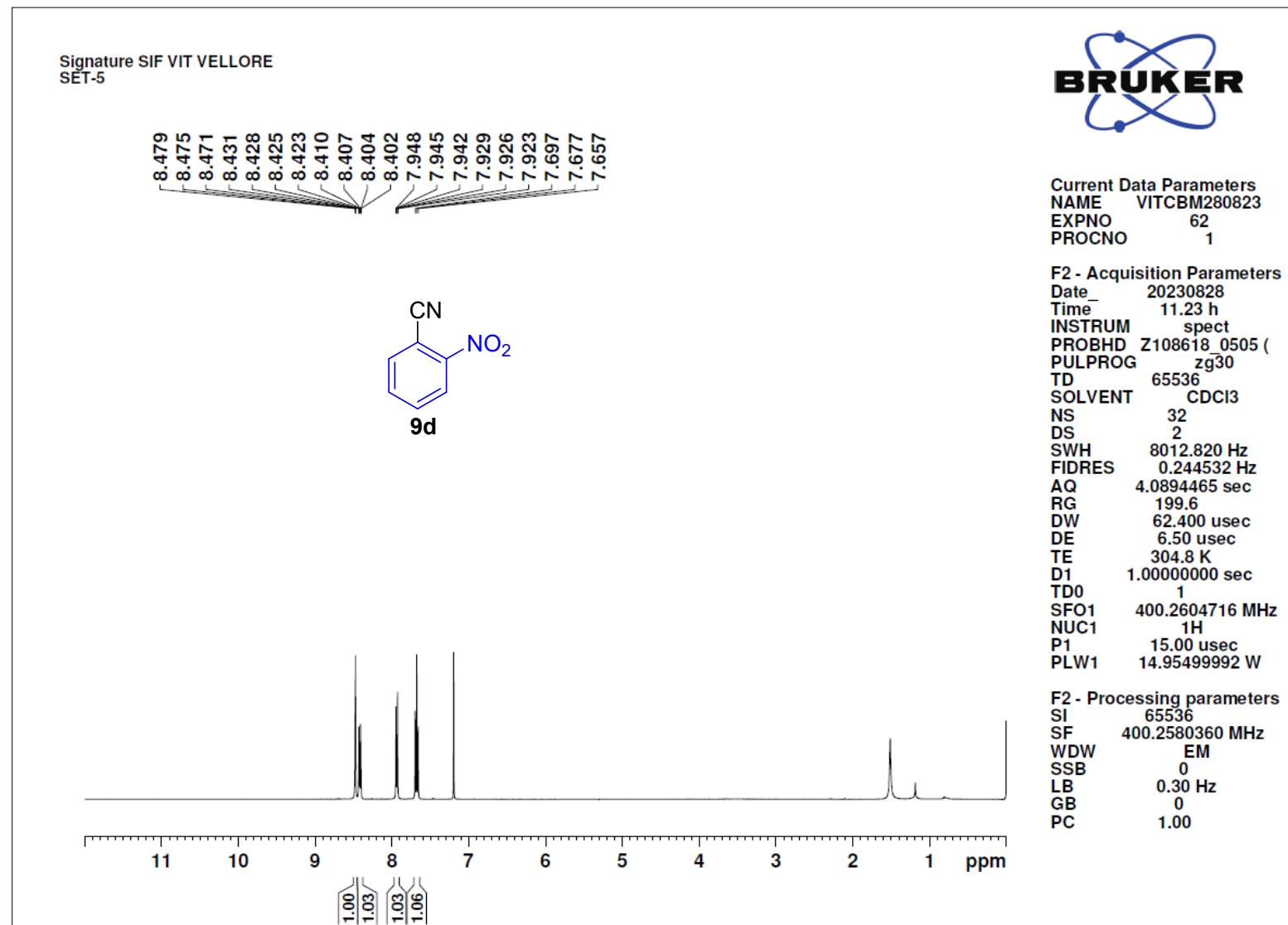


Figure 88: <sup>13</sup>C NMR spectrum of the compound 9c.



**Figure 89:** <sup>1</sup>H NMR spectrum of the compound 9d.

Signature SIF VIT VELLORE  
SET-5

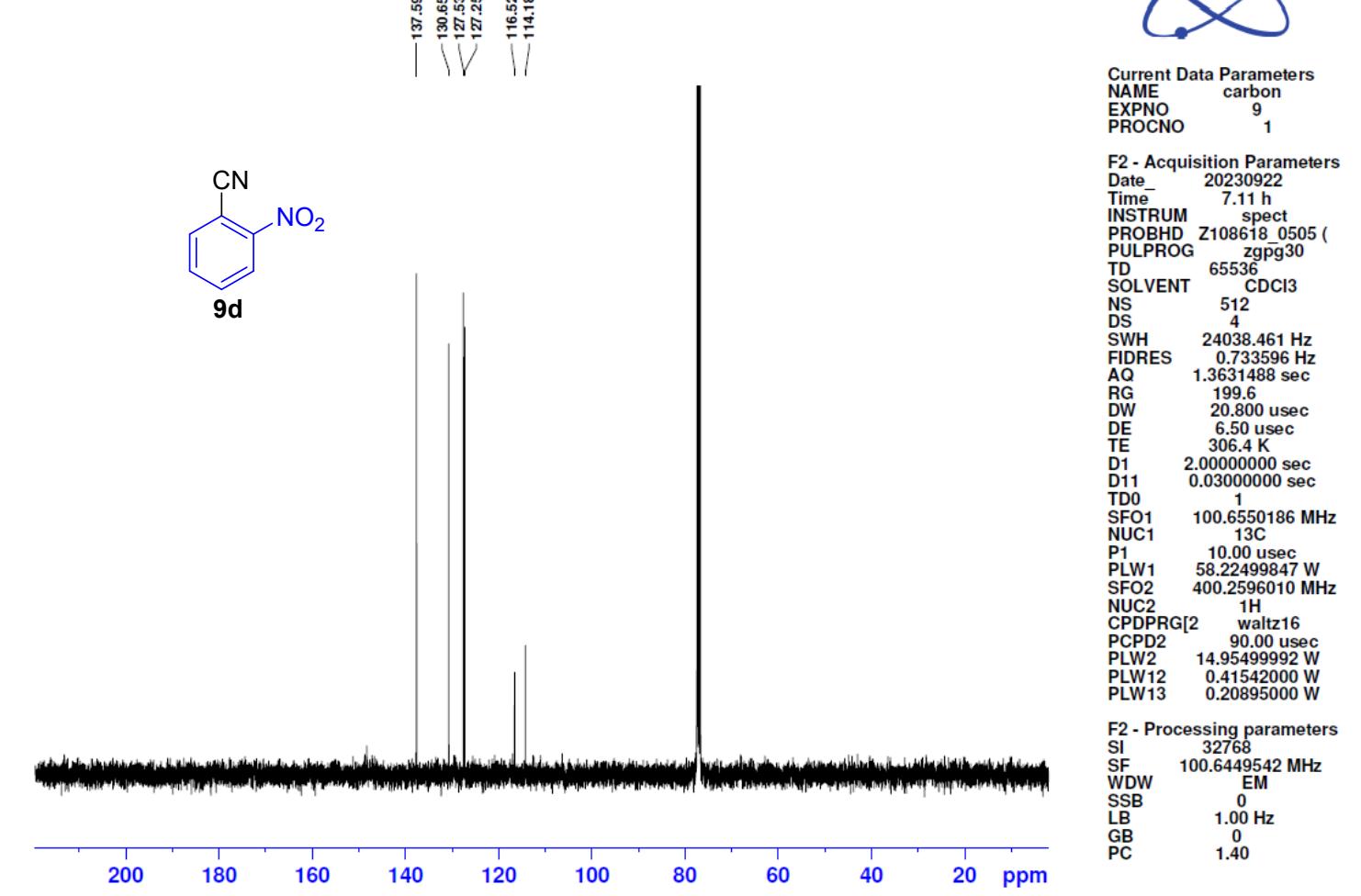


Figure 90:  $^{13}\text{C}$  NMR spectrum of the compound **9d**.

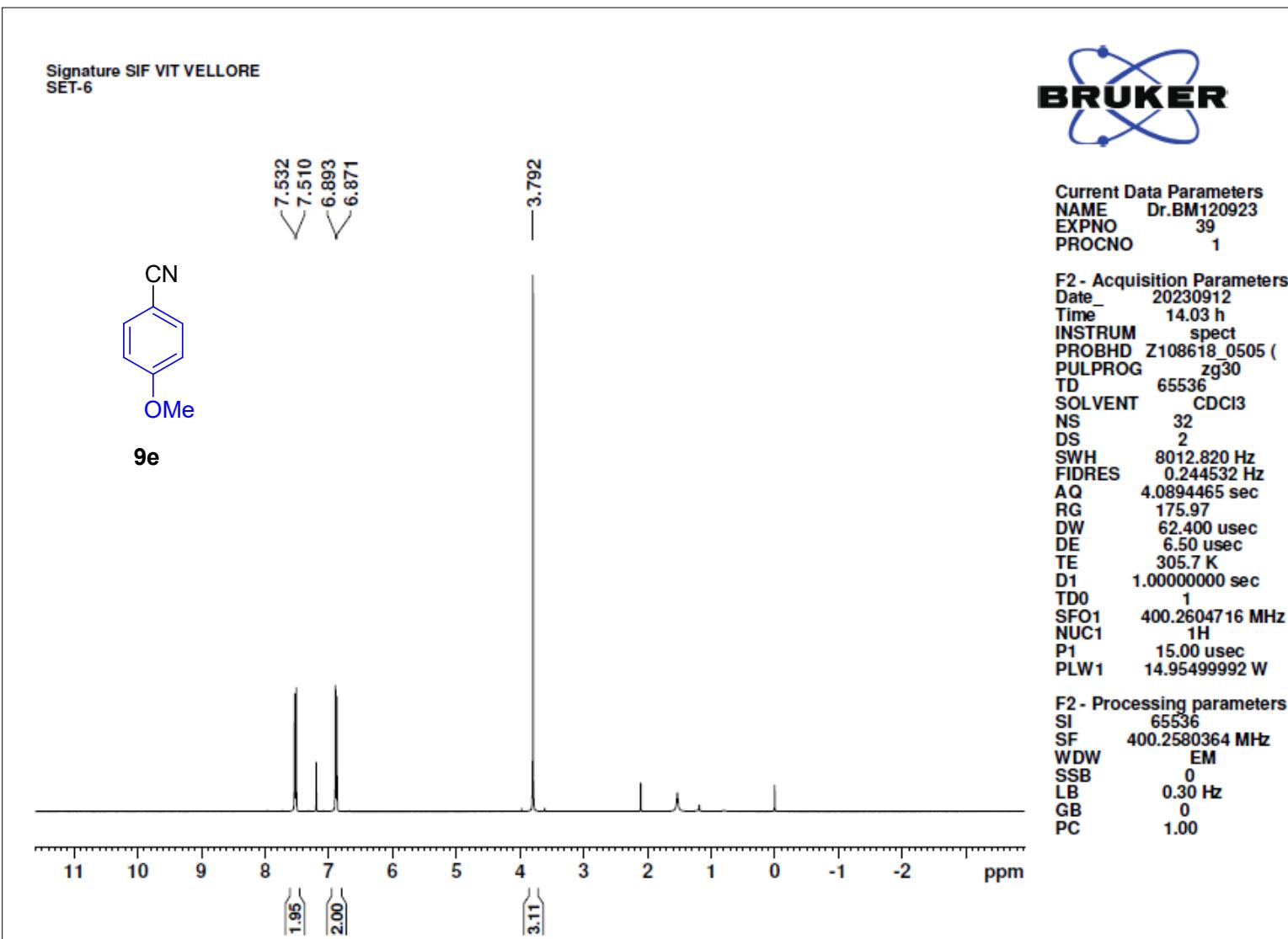
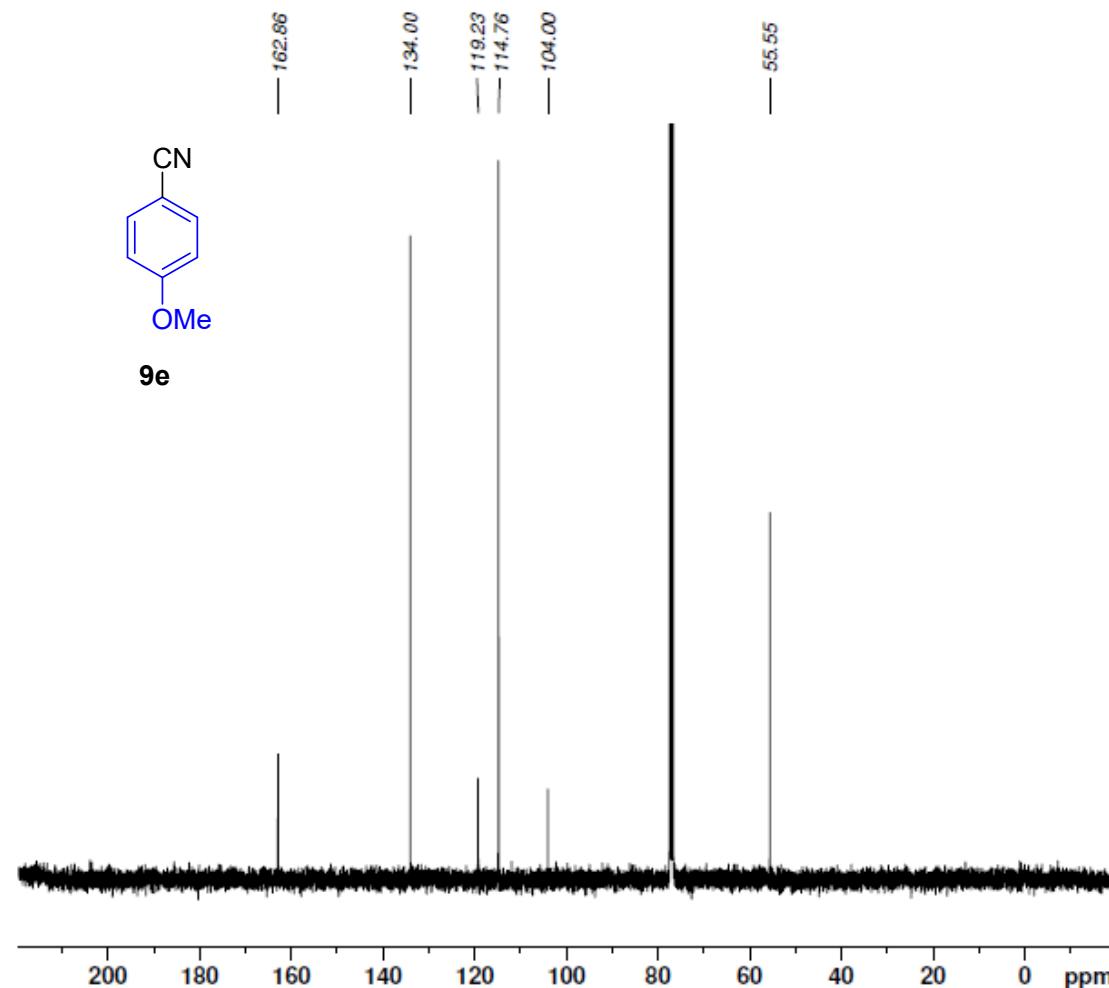


Figure 91: <sup>1</sup>H NMR spectrum of the compound 9e.

Signature SIF VIT VELLORE  
BE T-6



Current Data Parameters  
NAME Dr.BBM190923  
EXPNO 18  
PROCNO 1

F2 - Acquisition Parameters  
Date 20230920  
Time 0.15 h  
INSTRUM spect  
PROBHD Z108618\_0505 (   
PULPROG zgpg30  
TD 65536  
SOLVENT CDCl3  
NS 512  
DS 4  
SWH 24038.461 Hz  
FIDRES 0.733596 Hz  
AQ 1.3631488 sec  
RG 112.69  
DW 20.800 usec  
DE 6.50 usec  
TE 306.4 K  
D1 2.0000000 sec  
D11 0.0300000 sec  
TD0 1  
SF01 100.6550186 MHz  
NUC1 13C  
P1 10.00 usec  
PLW1 58.22499847 W  
SFO2 400.2596010 MHz  
NUC2 1H  
CPDPRG[2] waltz16  
PCPD2 90.00 usec  
PLW2 14.95499992 W  
PLW12 0.41542000 W  
PLW13 0.20895000 W

F2 - Processing parameters  
SI 32768  
SF 100.6449542 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40

Figure 92:  $^{13}\text{C}$  NMR spectrum of the compound 9e.

Signature SIF VIT VELLORE  
SET-7

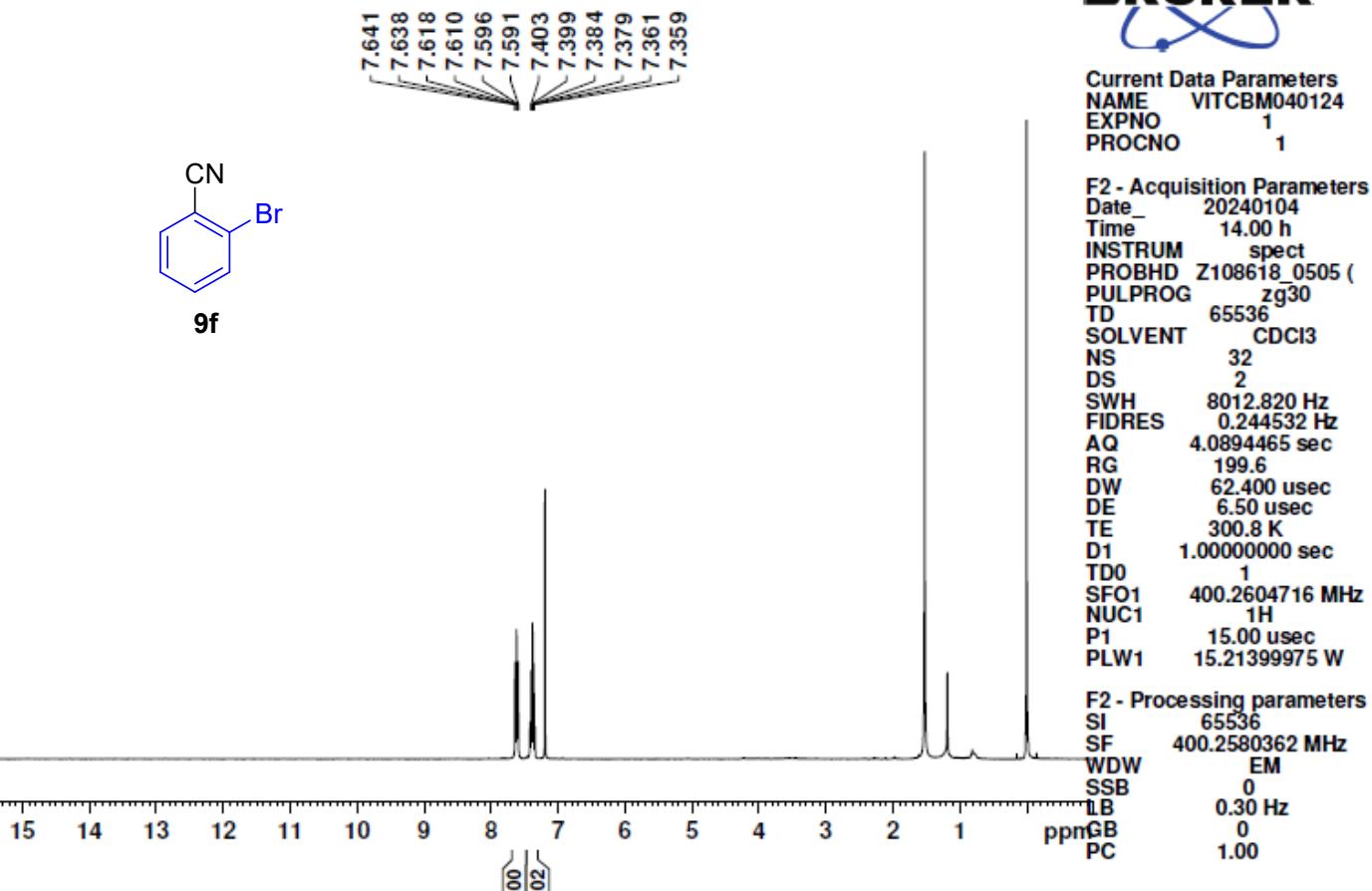


Figure 93: <sup>1</sup>H NMR spectrum of the compound 9f.

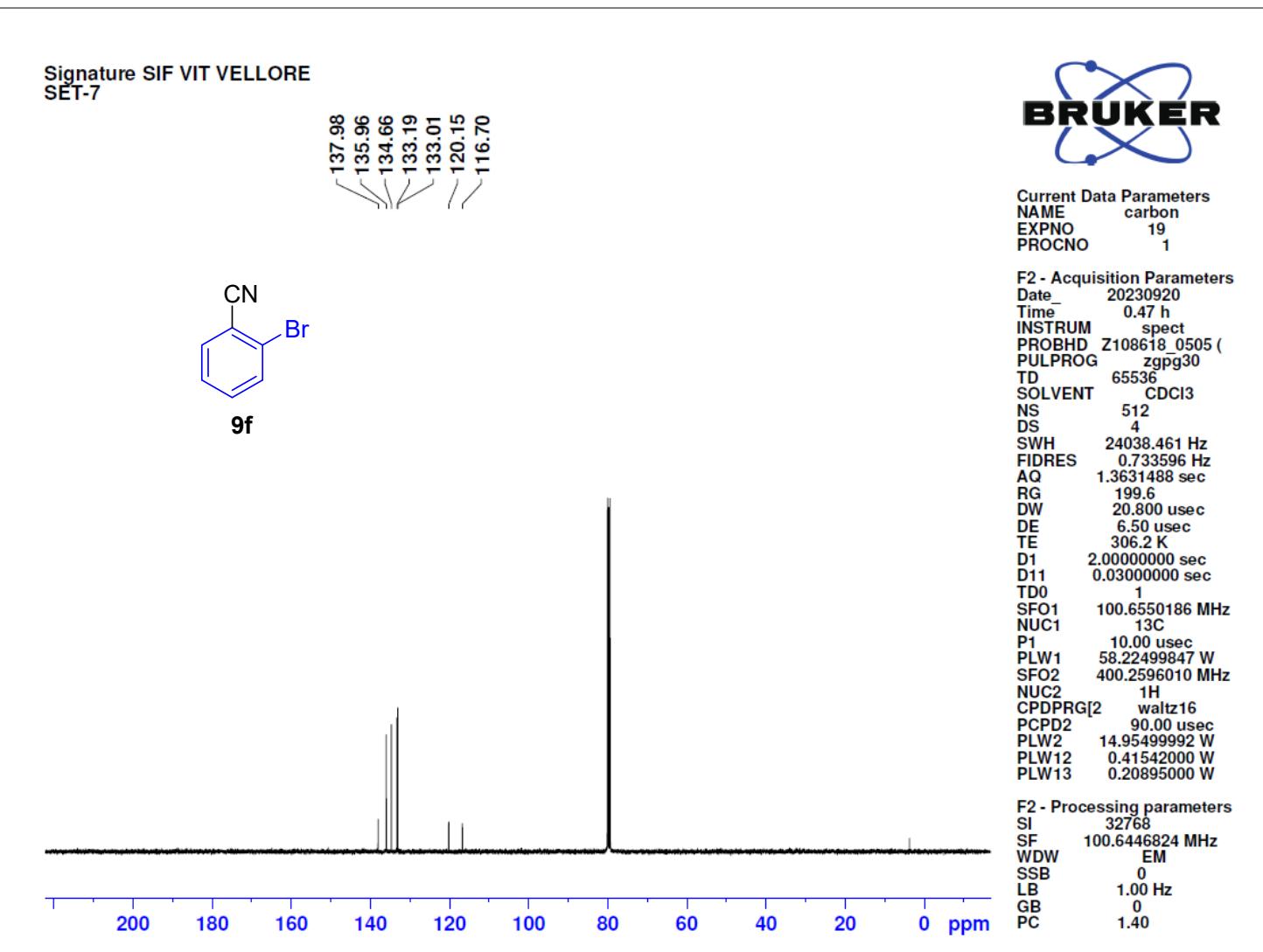
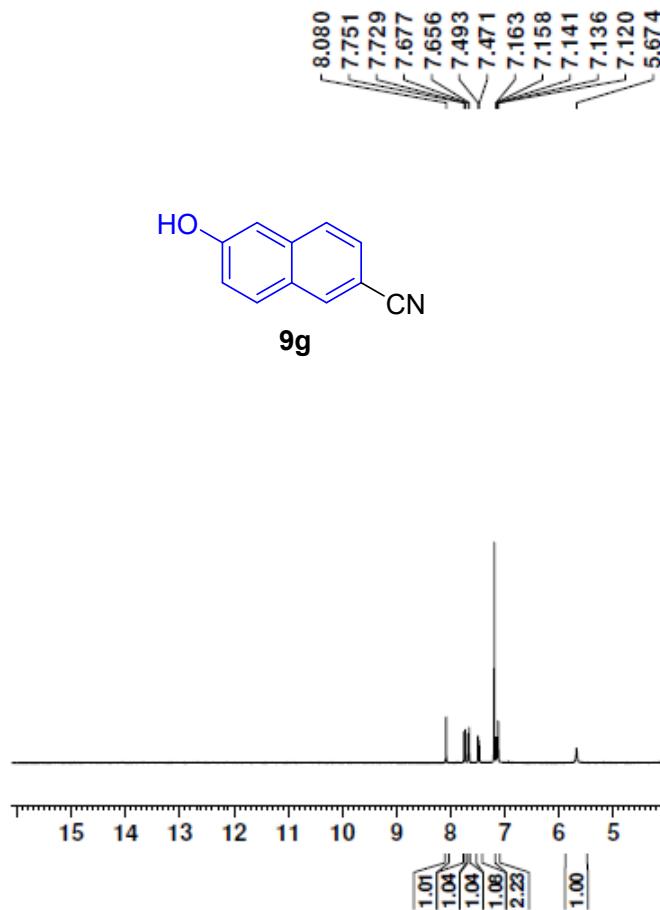


Figure 94: <sup>13</sup>C NMR spectrum of the compound 9f.

Signature SIF VIT VELLORE  
SET-8



Current Data Parameters  
NAME VITCBM060124  
EXPNO 8  
PROCNO 1

F2 - Acquisition Parameters  
Date 20240107  
Time 12.18 h  
INSTRUM spect  
PROBHD Z108618\_0505 (   
PULPROG zg30  
TD 65536  
SOLVENT CDCl<sub>3</sub>  
NS 16  
DS 2  
SWH 8012.820 Hz  
FIDRES 0.244532 Hz  
AQ 4.0894465 sec  
RG 199.6  
DW 62.400 usec  
DE 6.50 usec  
TE 300.7 K  
D1 1.0000000 sec  
TD0 1  
SFO1 400.2604716 MHz  
NUC1 <sup>1</sup>H  
P1 15.00 usec  
PLW1 15.21399975 W

F2 - Processing parameters  
SI 65536  
SF 400.2580365 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

Figure 95: <sup>1</sup>H NMR spectrum of the compound 9g.

Signature SIF VIT VELLORE  
SET8



Current Data Parameters  
NAME VITCBM090124  
EXPNO 12  
PROCNO 1

F2 - Acquisition Parameters  
Date 20240110  
Time 7.54 h  
INSTRUM spect  
PROBHD Z108618\_0505 (   
PULPROG zgpg30  
TD 65536  
SOLVENT CDCl3  
NS 512  
DS 4  
SWH 24038.461 Hz  
FIDRES 0.733596 Hz  
AQ 1.3631488 sec  
RG 199.6  
DW 20.800 usec  
DE 6.50 usec  
TE 304.6 K  
D1 2.0000000 sec  
D11 0.03000000 sec  
TD0 1  
SFO1 100.6550186 MHz  
NUC1 <sup>13</sup>C  
P1 10.00 usec  
PLW1 56.49300003 W  
SFO2 400.2596010 MHz  
NUC2 <sup>1</sup>H  
CPDPRG[2] waltz16  
PCPD2 90.00 usec  
PLW2 15.21399975 W  
PLW12 0.42261001 W  
PLW13 0.21257000 W

F2 - Processing parameters  
SI 32768  
SF 100.6450572 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40

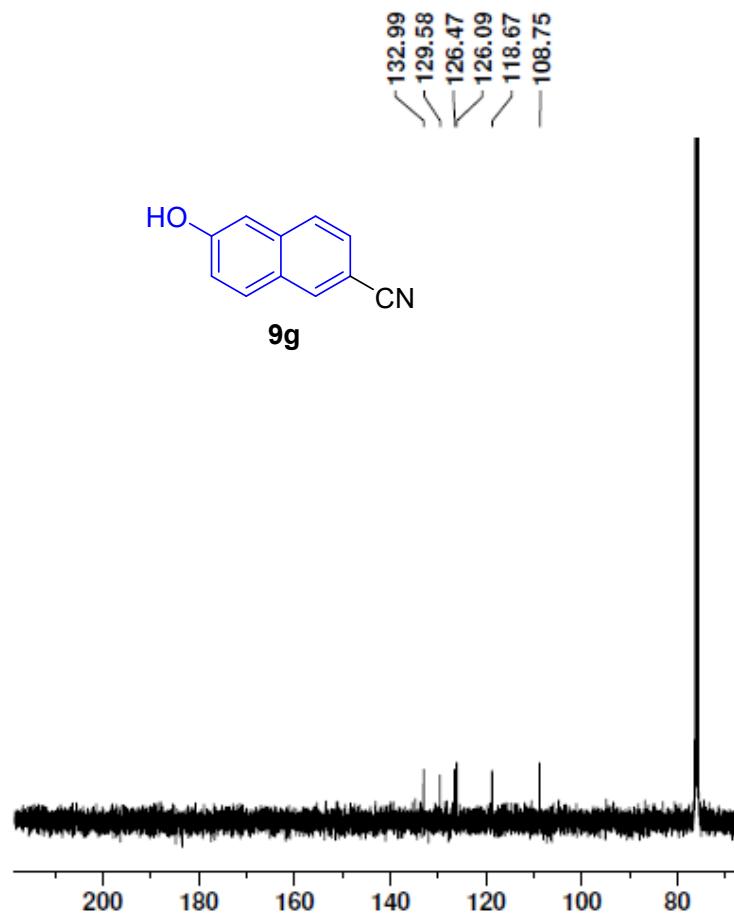


Figure 96: <sup>13</sup>C NMR spectrum of the compound 9g.

Signature SIF VIT VELLORE  
SET-9



Current Data Parameters  
NAME VITCBM060124  
EXPNO 5  
PROCNO 1

F2 - Acquisition Parameters  
Date 20240107  
Time 12.06 h  
INSTRUM spect  
PROBHD Z108618\_0505 (   
PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 16  
DS 2  
SWH 8012.820 Hz  
FIDRES 0.244532 Hz  
AQ 4.0894465 sec  
RG 127.79  
DW 62.400 usec  
DE 6.50 usec  
TE 300.7 K  
D1 1.0000000 sec  
TD0 1  
SFO1 400.2604716 MHz  
NUC1 1H  
P1 15.00 usec  
PLW1 15.21399975 W

F2 - Processing parameters  
SI 65536  
SF 400.2580344 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
PC 0  
ppmGB 1.00

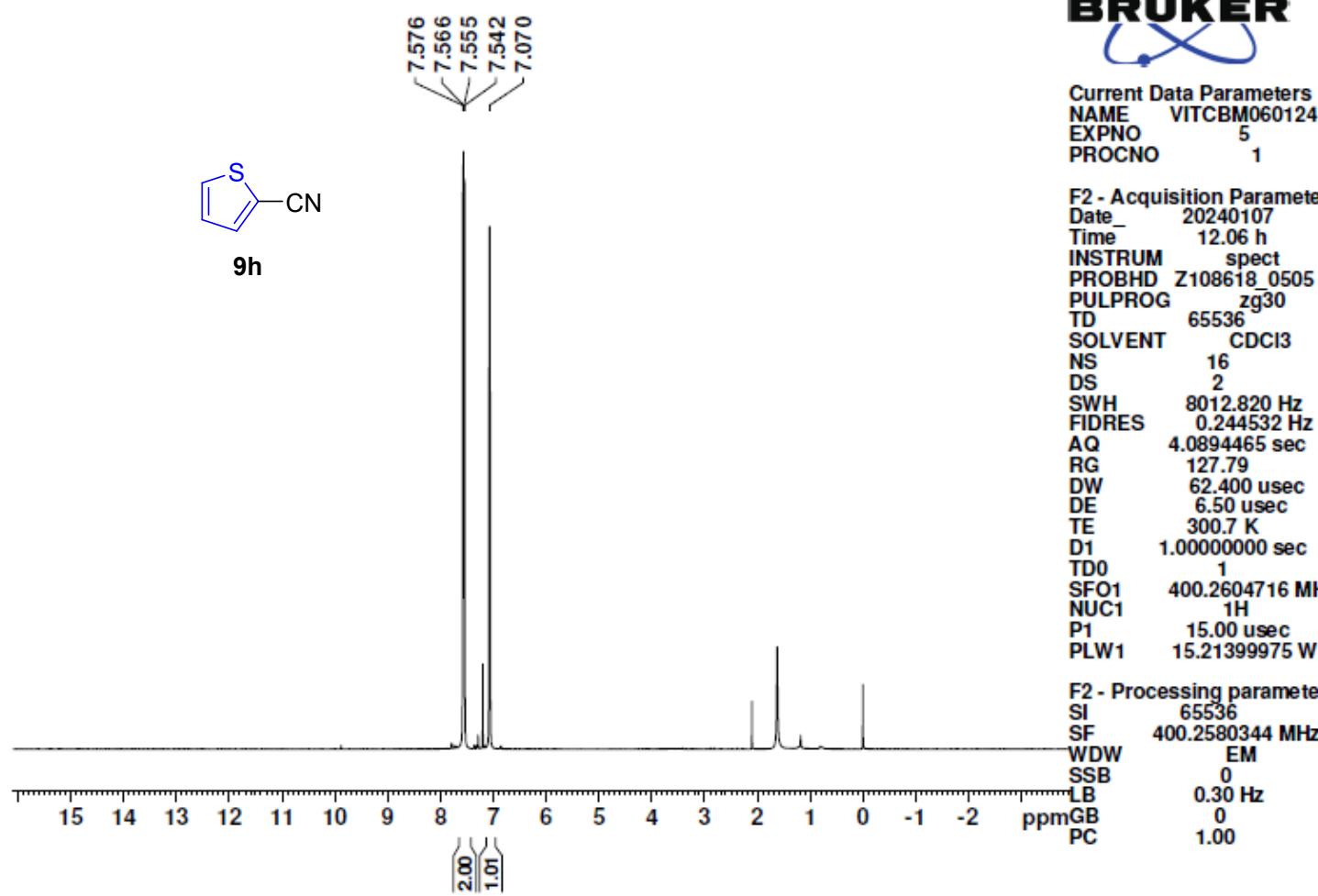


Figure 97: <sup>1</sup>H NMR spectrum of the compound 9h.

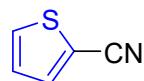
Signature SIF VIT VELLORE  
SET9



Current Data Parameters  
NAME VITCBM090124  
EXPNO 11  
PROCNO 1

F2 - Acquisition Parameters  
Date 20240110  
Time 7.22 h  
INSTRUM spect  
PROBHD Z108618\_0505 (   
PULPROG zgpg30  
TD 65536  
SOLVENT CDCl3  
NS 512  
DS 4  
SWH 24038.461 Hz  
FIDRES 0.733596 Hz  
AQ 1.3631488 sec  
RG 199.6  
DW 20.800 usec  
DE 6.50 usec  
TE 304.4 K  
D1 2.0000000 sec  
D11 0.03000000 sec  
TD0 1  
SFO1 100.6550186 MHz  
NUC1 13C  
P1 10.00 usec  
PLW1 56.49300003 W  
SFO2 400.2596010 MHz  
NUC2 1H  
CPDPRG[2] waltz16  
PCPD2 90.00 usec  
PLW2 15.21399975 W  
PLW12 0.42261001 W  
PLW13 0.21257000 W

F2 - Processing parameters  
SI 32768  
SF 100.6449542 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40



9h

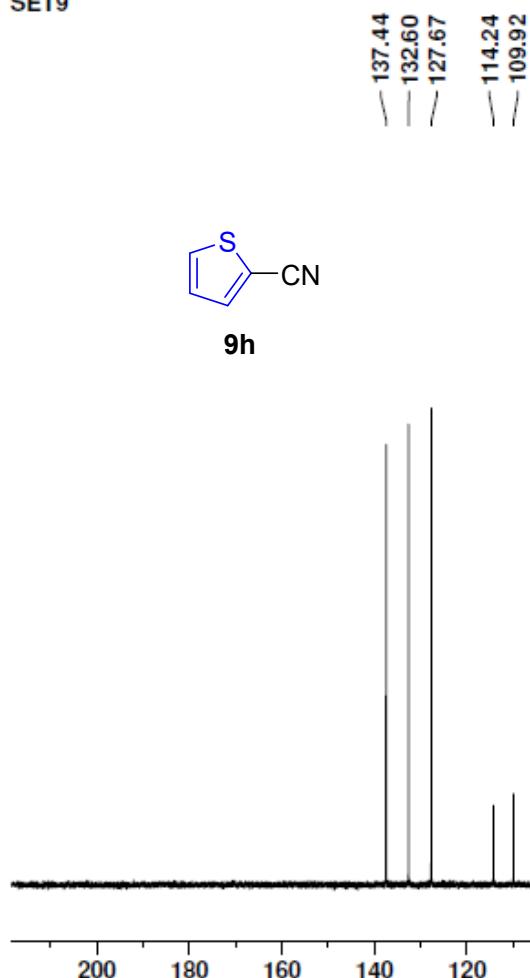
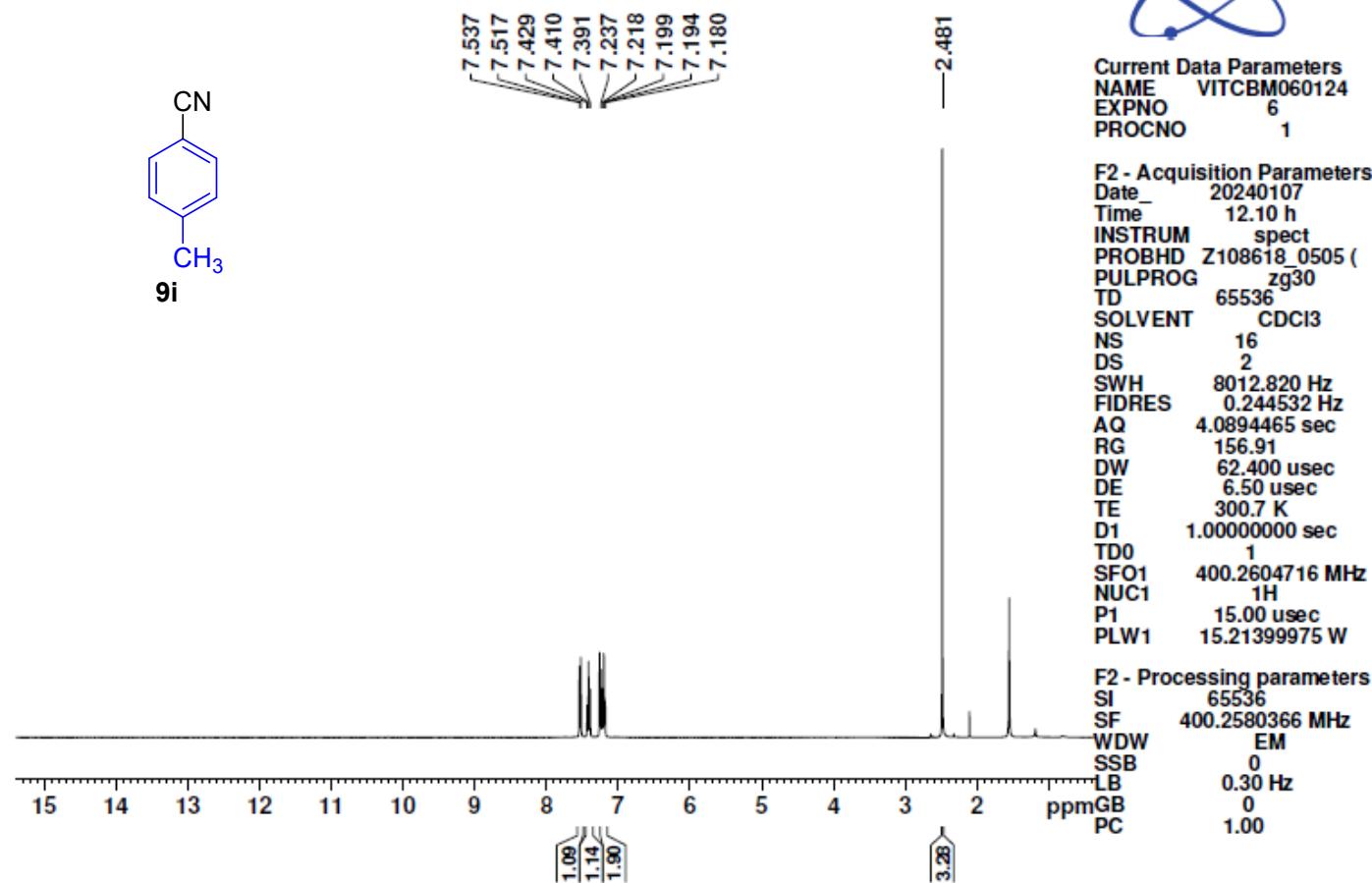


Figure 98: <sup>13</sup>C NMR spectrum of the compound 9h.

Signature SIF VIT VELLORE  
SET-10



**Figure 99:** <sup>1</sup>H NMR spectrum of the compound **9i**.

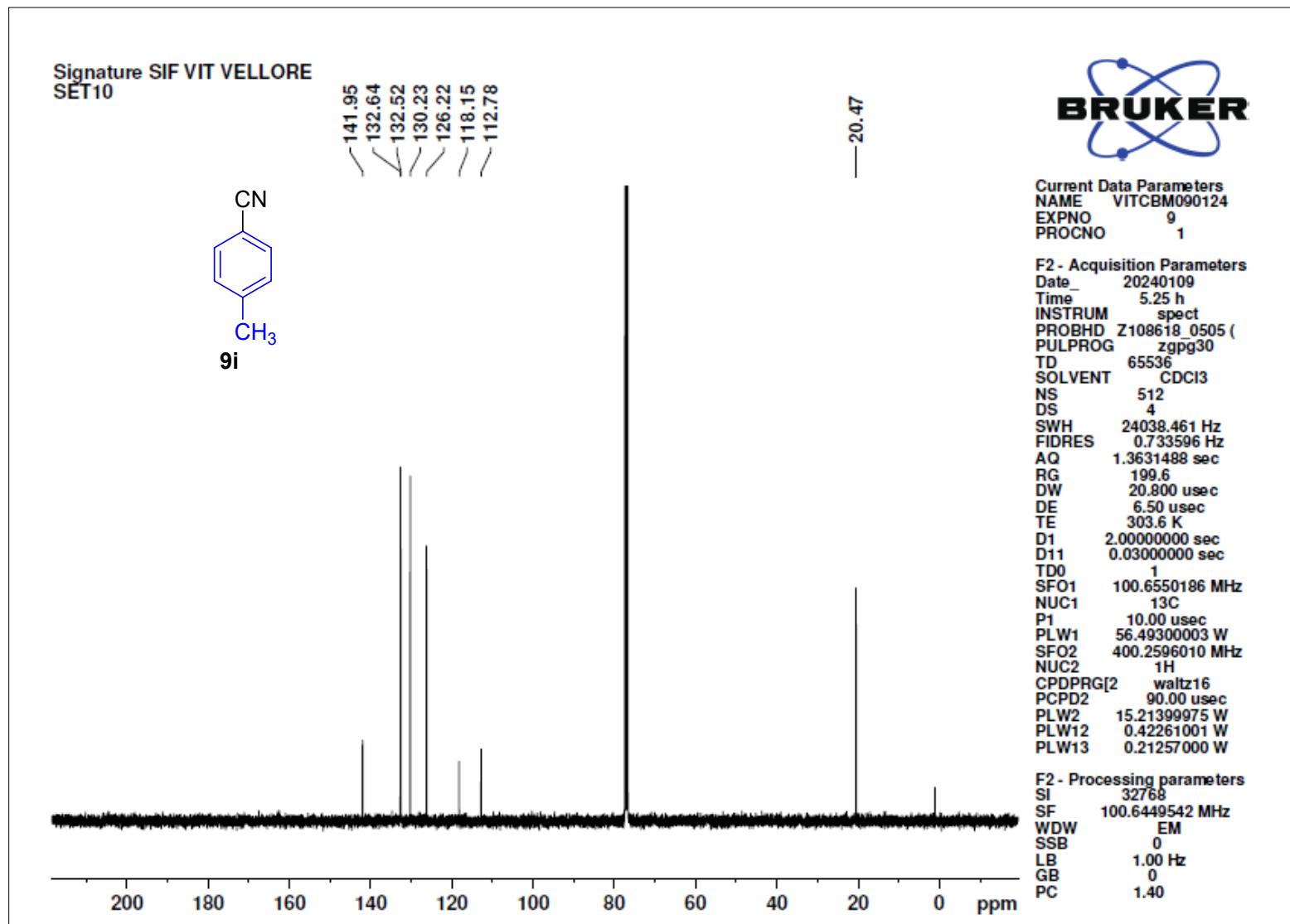
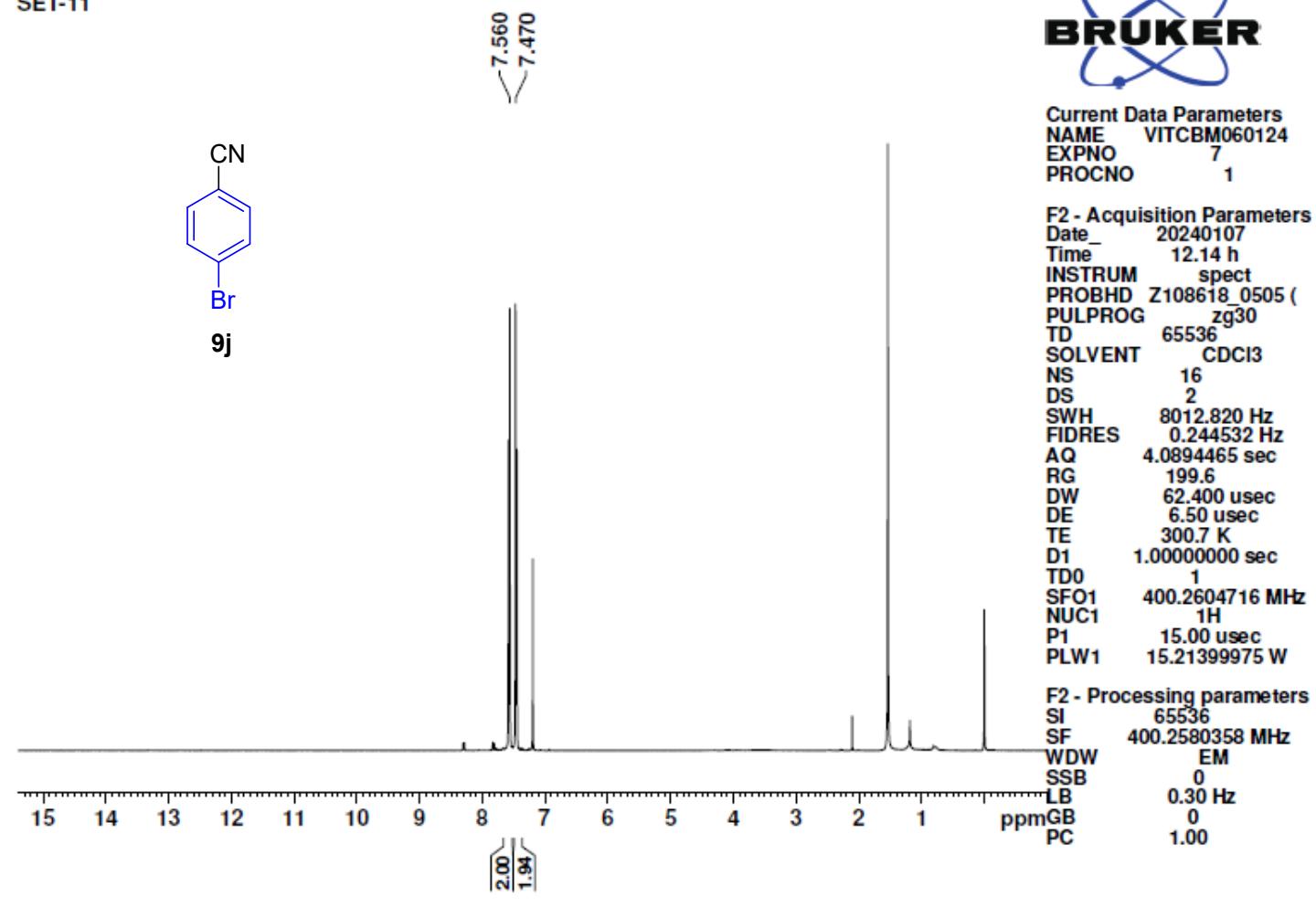
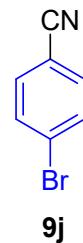


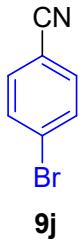
Figure 100: <sup>13</sup>C NMR spectrum of the compound 9i.

Signature SIF VIT VELLORE  
SET-11

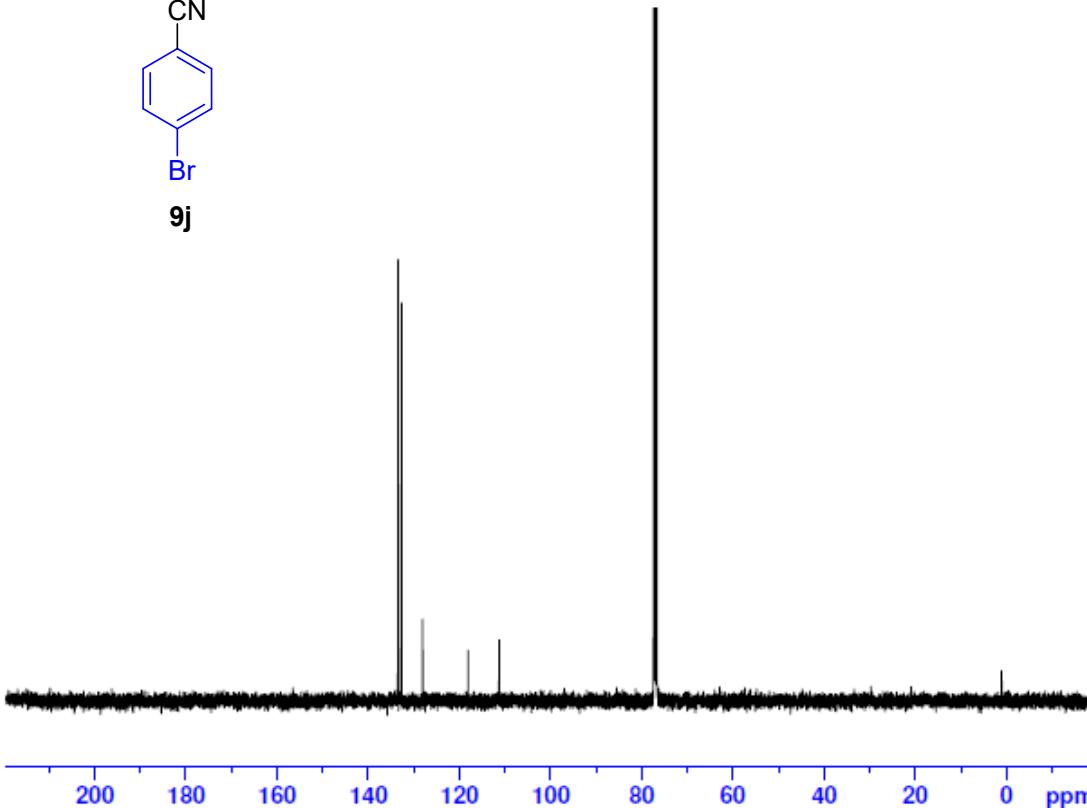


**Figure 101:** <sup>1</sup>H NMR spectrum of the compound 9j.

Signature SIF VIT VELLORE  
SET11



133.42  
132.66  
128.04  
118.06  
111.26



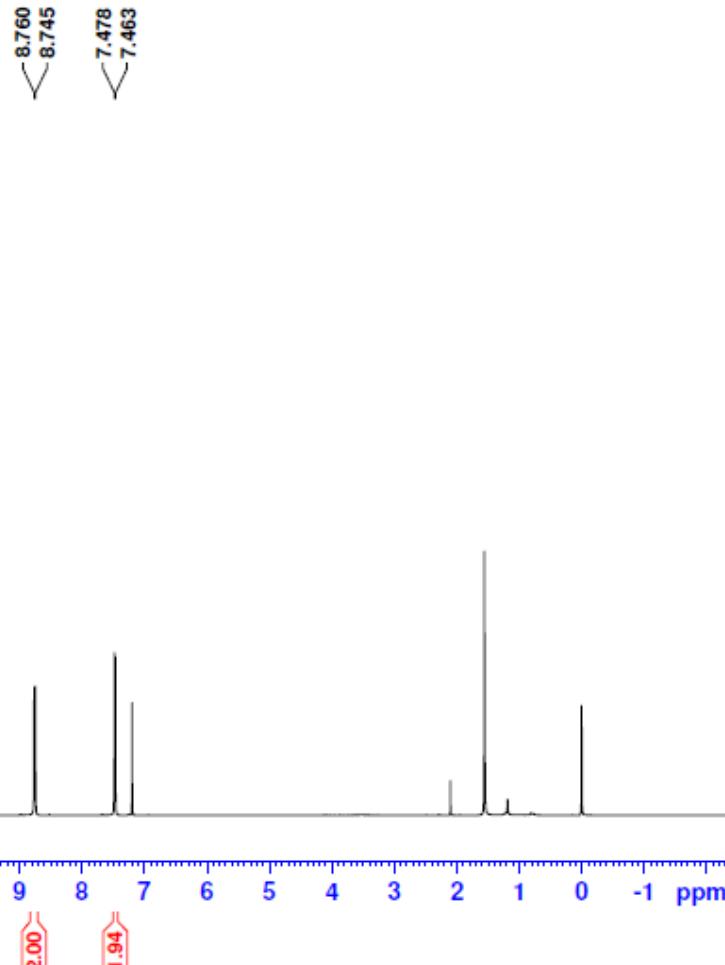
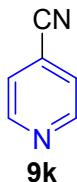
Current Data Parameters  
NAME carbon  
EXPNO 10  
PROCNO 1

F2 - Acquisition Parameters  
Date 20240109  
Time 5.57 h  
INSTRUM spect  
PROBHD Z108618\_0505 (   
PULPROG zgpg30  
TD 65536  
SOLVENT CDCl3  
NS 512  
DS 4  
SWH 24038.461 Hz  
FIDRES 0.733596 Hz  
AQ 1.3631488 sec  
RG 199.6  
DW 20.800 usec  
DE 6.50 usec  
TE 303.4 K  
D1 2.0000000 sec  
D11 0.0300000 sec  
TDO 1  
SFO1 100.6550196 MHz  
NUC1 13C  
P1 10.00 usec  
PLW1 56.49300003 W  
SFO2 400.2596010 MHz  
NUC2 1H  
CPDPRG[2] waltz16  
PCPD2 90.00 usec  
PLW2 15.21399975 W  
PLW12 0.42261001 W  
PLW13 0.21257000 W

F2 - Processing parameters  
SI 32768  
SF 100.6449542 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40

Figure 102:  $^{13}\text{C}$  NMR spectrum of the compound **9j**.

Signature SIF VIT VELLORE  
SET12

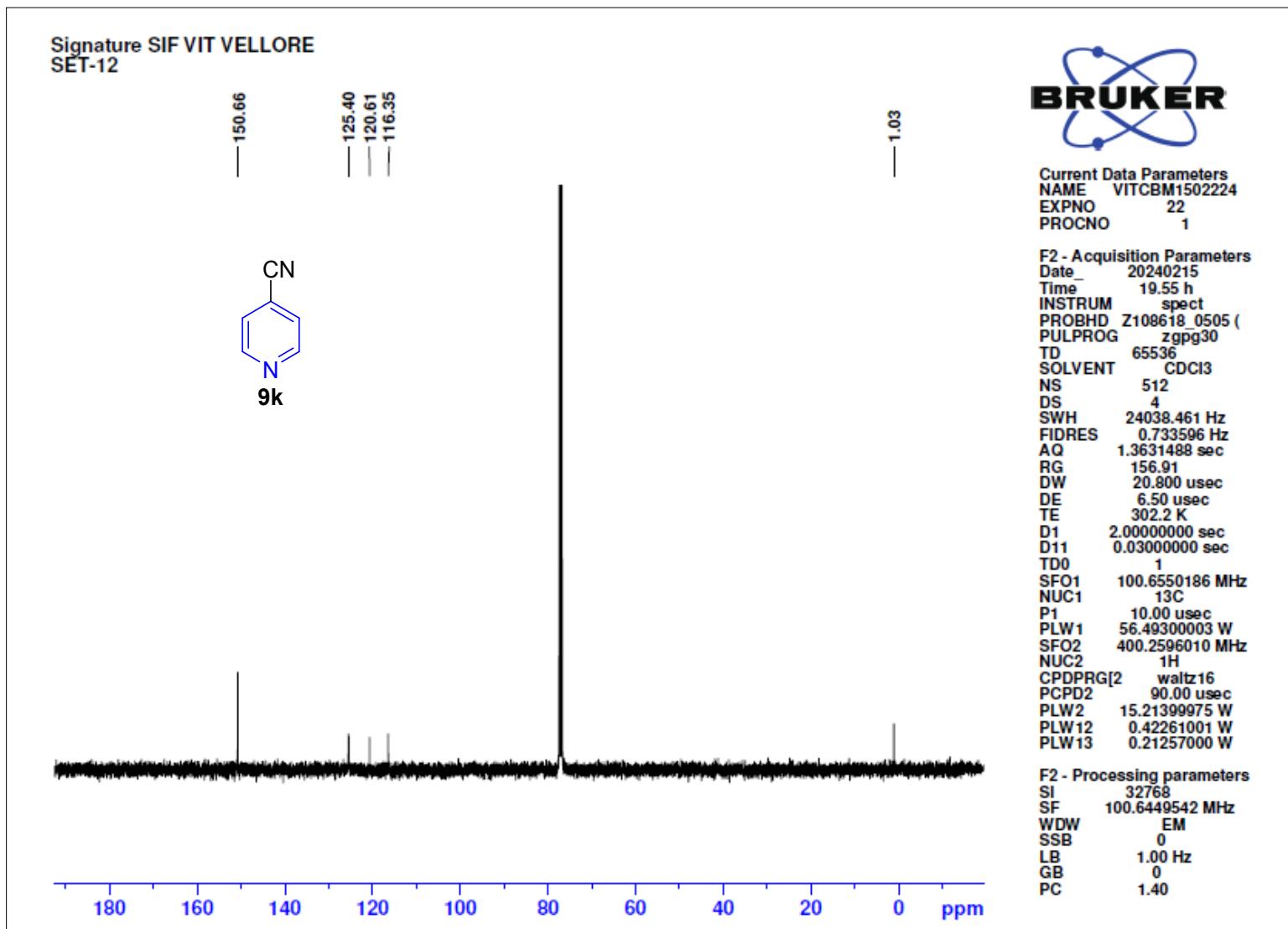


Current Data Parameters  
NAME VITCBM120124  
EXPNO 18  
PROCNO 1

F2 - Acquisition Parameters  
Date 20240117  
Time 9.44 h  
INSTRUM spect  
PROBHD Z108618\_0505 (   
PULPROG zg30  
TD 65536  
SOLVENT CDCl<sub>3</sub>  
NS 32  
DS 2  
SWH 8012.820 Hz  
FIDRES 0.244532 Hz  
AQ 4.0894465 sec  
RG 199.6  
DW 62.400 usec  
DE 6.50 usec  
TE 305.0 K  
D1 1.0000000 sec  
TD0 1  
SFO1 400.2604716 MHz  
NUC1 1H  
P1 15.00 usec  
PLW1 15.21399975 W

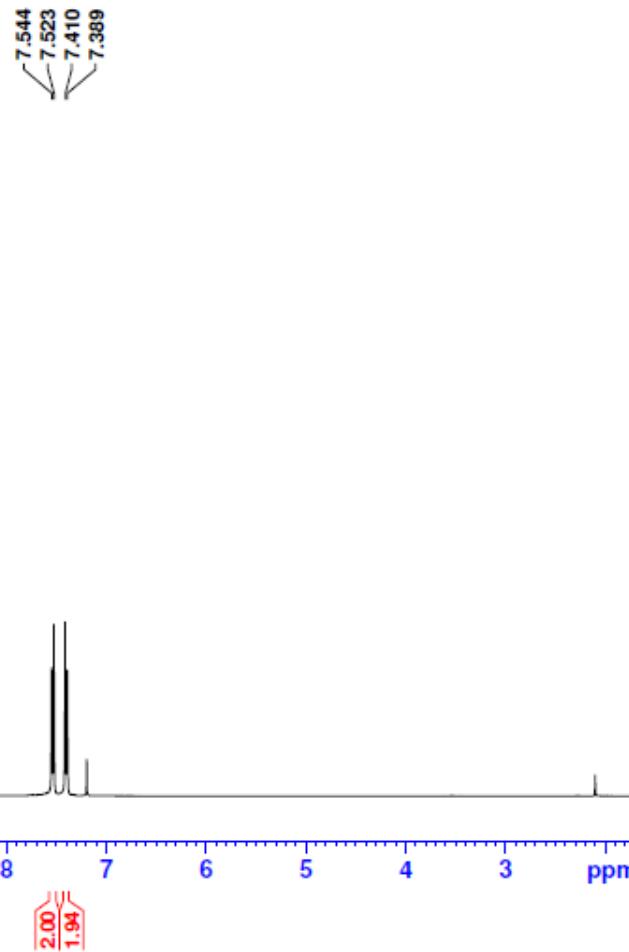
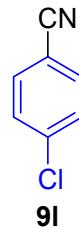
F2 - Processing parameters  
SI 65536  
SF 400.2580358 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

Figure 103: <sup>1</sup>H NMR spectrum of the compound 9k.



**Figure 104:** <sup>13</sup>C NMR spectrum of the compound 9k.

Signature SIF VIT VELLORE  
SET13



Current Data Parameters  
NAME VITCBM120124  
EXPNO 19  
PROCNO 1

F2 - Acquisition Parameters  
Date 20240117  
Time 9.50 h  
INSTRUM spect  
PROBHD Z108618\_0505 (   
PULPROG zg30  
TD 65536  
SOLVENT CDCl<sub>3</sub>  
NS 32  
DS 2  
SWH 8012.820 Hz  
FIDRES 0.244532 Hz  
AQ 4.0894465 sec  
RG 175.97  
DW 62.400 usec  
DE 6.50 usec  
TE 304.7 K  
D1 1.0000000 sec  
TD0 1  
SFO1 400.2604716 MHz  
NUC1 1H  
P1 15.00 usec  
PLW1 15.21399975 W

F2 - Processing parameters  
SI 65536  
SF 400.2580368 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

**Figure 105:** <sup>1</sup>H NMR spectrum of the compound 9l.

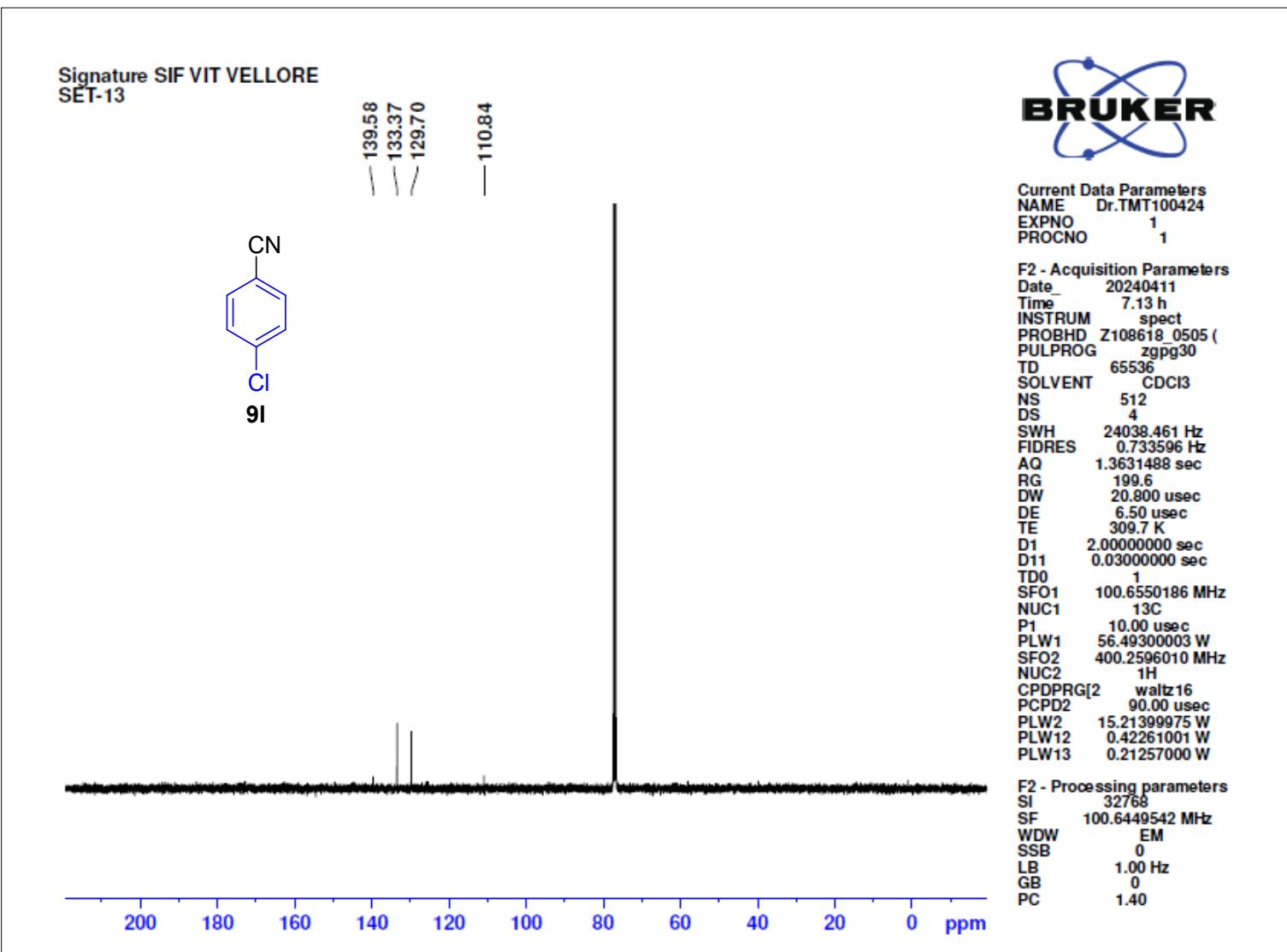


Figure 106: <sup>13</sup>C NMR spectrum of the compound 9l.

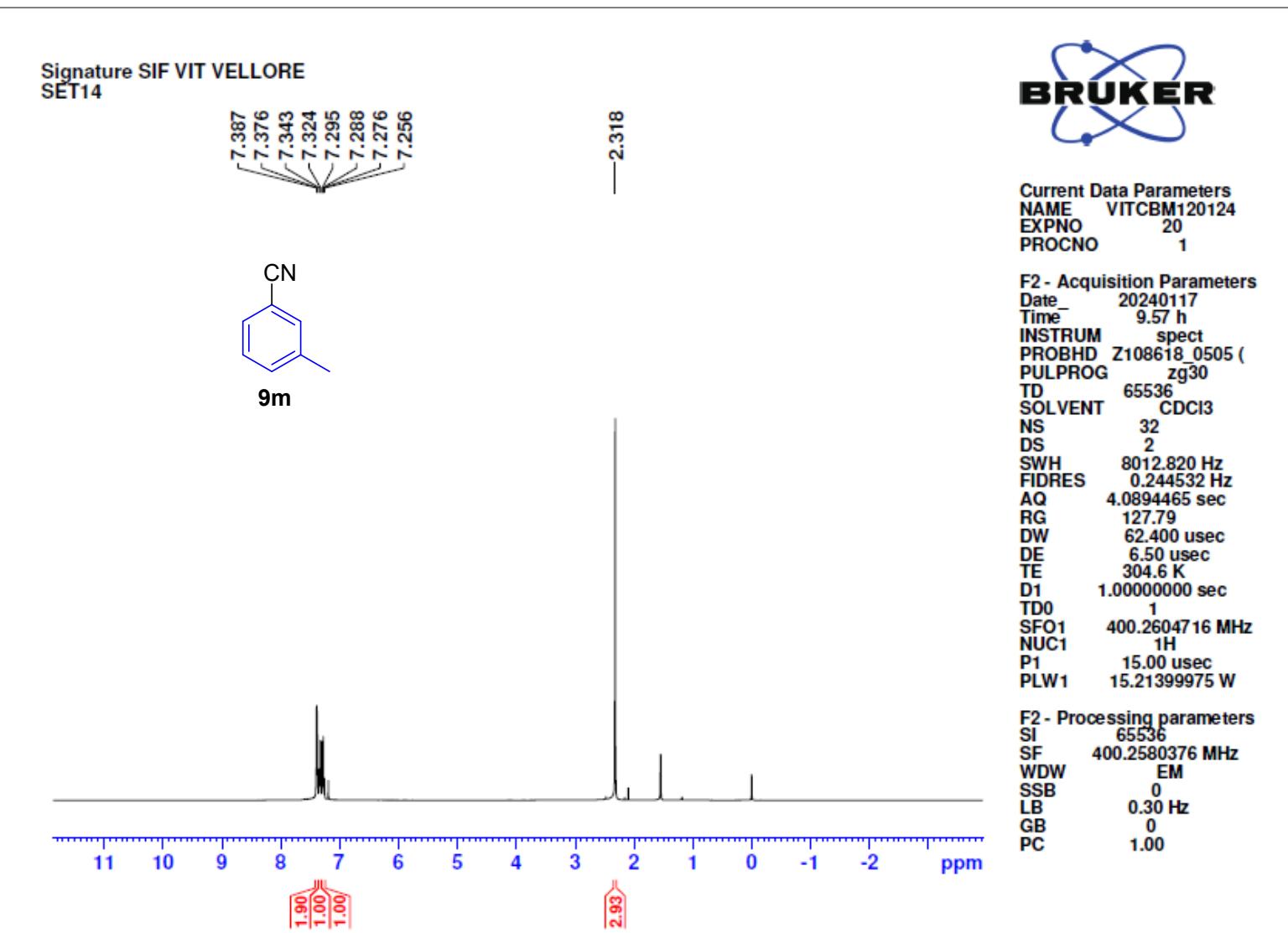


Figure 107: <sup>1</sup>H NMR spectrum of the compound 9m.

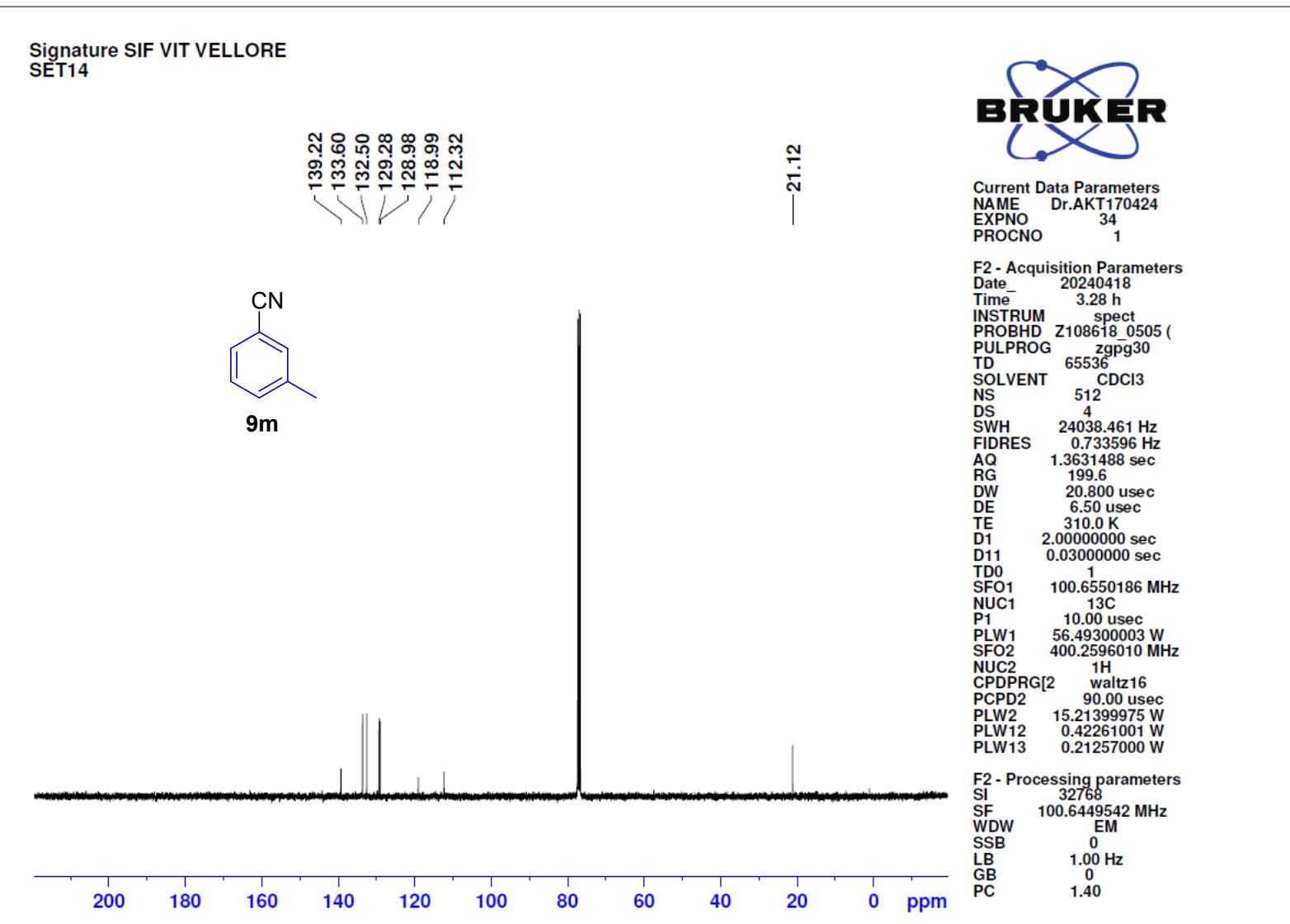
Signature SIF VIT VELLORE  
SET14



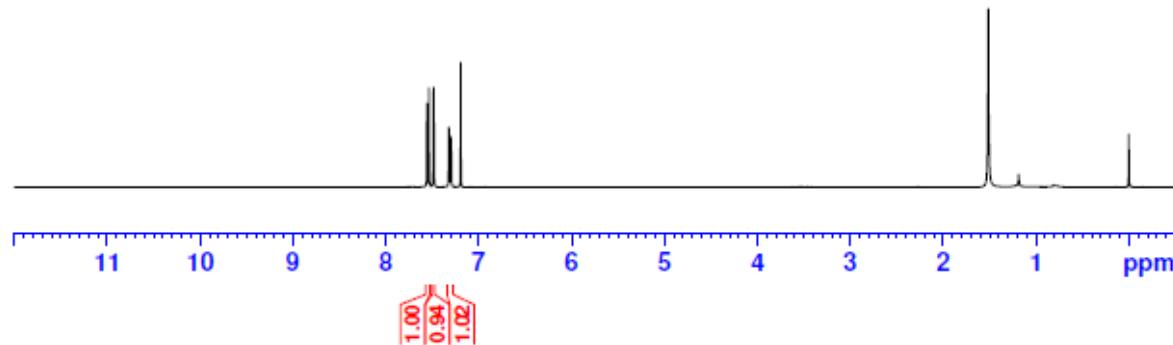
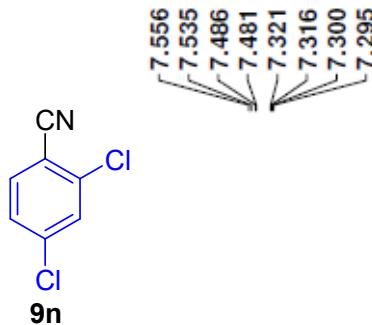
Current Data Parameters  
NAME Dr.AKT170424  
EXPNO 34  
PROCNO 1

F2 - Acquisition Parameters  
Date 20240418  
Time 3.28 h  
INSTRUM spect  
PROBHD Z108618\_0505 (   
PULPROG zgpg30  
TD 65536  
SOLVENT CDCl3  
NS 512  
DS 4  
SWH 24038.461 Hz  
FIDRES 0.733596 Hz  
AQ 1.3631488 sec  
RG 199.6  
DW 20.800 usec  
DE 6.50 usec  
TE 310.0 K  
D1 2.0000000 sec  
D11 0.03000000 sec  
TD0 1  
SFO1 100.6550186 MHz  
NUC1 13C  
P1 10.00 usec  
PLW1 56.49300003 W  
SFO2 400.2596010 MHz  
NUC2 1H  
CPDPRG[2] waltz16  
PCPD2 90.00 usec  
PLW2 15.21399975 W  
PLW12 0.42261001 W  
PLW13 0.21257000 W

F2 - Processing parameters  
SI 32768  
SF 100.6449542 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40



Signature SIF VIT VELLORE  
SET-15



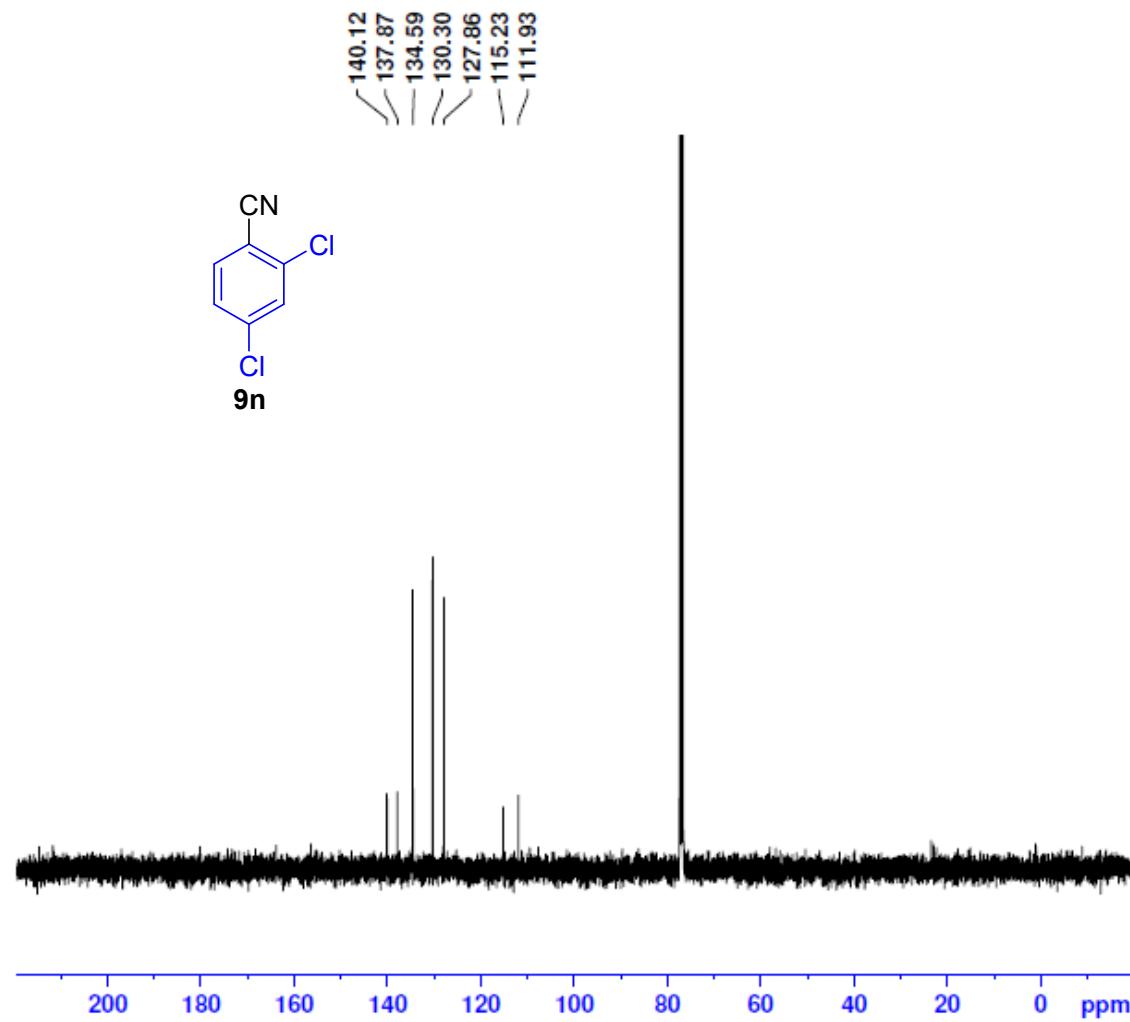
Current Data Parameters  
NAME VITCBM040424  
EXPNO 16  
PROCNO 1

F2 - Acquisition Parameters  
Date 20240404  
Time 16.07 h  
INSTRUM spect  
PROBHD Z108618\_0505 (   
PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 32  
DS 2  
SWH 8012.820 Hz  
FIDRES 0.244532 Hz  
AQ 4.0894465 sec  
RG 199.6  
DW 62.400 usec  
DE 6.50 usec  
TE 304.4 K  
D1 1.0000000 sec  
TD0 1  
SFO1 400.2604716 MHz  
NUC1 1H  
P1 15.00 usec  
PLW1 15.21399975 W

F2 - Processing parameters  
SI 65536  
SF 400.2580366 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

Figure 109:  $^1\text{H}$  NMR spectrum of the compound 9n.

Signature SIF VIT VELLORE  
SET-15



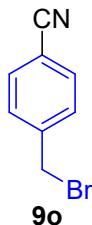
Current Data Parameters  
NAME Dr.VITCBM060424  
EXPNO 24  
PROCNO 1

F2 - Acquisition Parameters  
Date 20240407  
Time 8.33 h  
INSTRUM spect  
PROBHD Z108618\_0505 (PULPROG zgpg30  
TD 65536  
SOLVENT CDCl3  
NS 512  
DS 4  
SWH 24038.461 Hz  
FIDRES 0.733596 Hz  
AQ 1.3631488 sec  
RG 199.6  
DW 20.800 usec  
DE 6.50 usec  
TE 305.5 K  
D1 2.0000000 sec  
D11 0.03000000 sec  
TDO 1  
SFO1 100.6550186 MHz  
NUC1 13C  
P1 10.00 usec  
PLW1 56.49300003 W  
SFO2 400.2596010 MHz  
NUC2 1H  
CPDPRG[2] waltz16  
PCPD2 90.00 usec  
PLW2 15.21399975 W  
PLW12 0.42261001 W  
PLW13 0.21257000 W

F2 - Processing parameters  
SI 32768  
SF 100.6449542 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40

Figure 110:  $^{13}\text{C}$  NMR spectrum of the compound **9n**.

Signature SIF VIT VELLORE  
SET-16



7.583  
7.562  
7.440  
7.420

—4.406



Current Data Parameters  
NAME VITCBM290424  
EXPNO 80  
PROCNO 1

F2 - Acquisition Parameters  
Date 20240429  
Time 17.56 h  
INSTRUM spect  
PROBHD Z108618\_0505 (   
PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 32  
DS 2  
SWH 8012.820 Hz  
FIDRES 0.244532 Hz  
AQ 4.0894465 sec  
RG 199.6  
DW 62.400 usec  
DE 6.50 usec  
TE 306.5 K  
D1 1.0000000 sec  
TD0 1  
SFO1 400.2604716 MHz  
NUC1 1H  
P1 15.00 usec  
PLW1 15.21399975 W

F2 - Processing parameters  
SI 65536  
SF 400.2580371 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

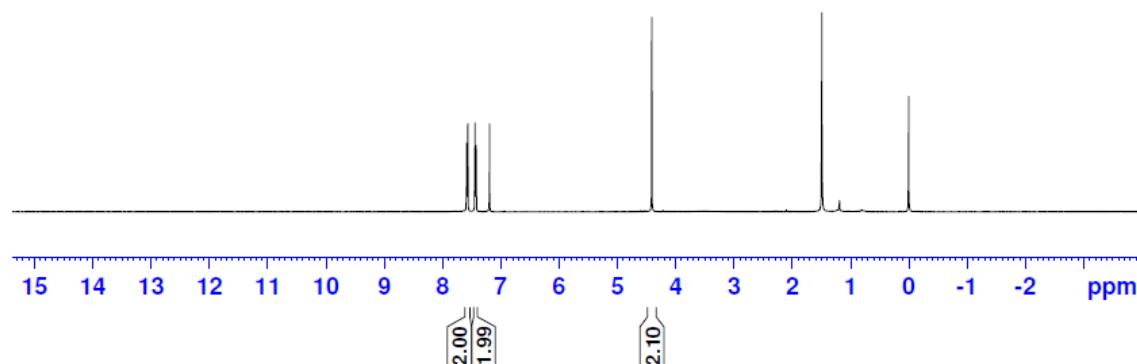


Figure 111:  $^1\text{H}$  NMR spectrum of the compound **9o**.

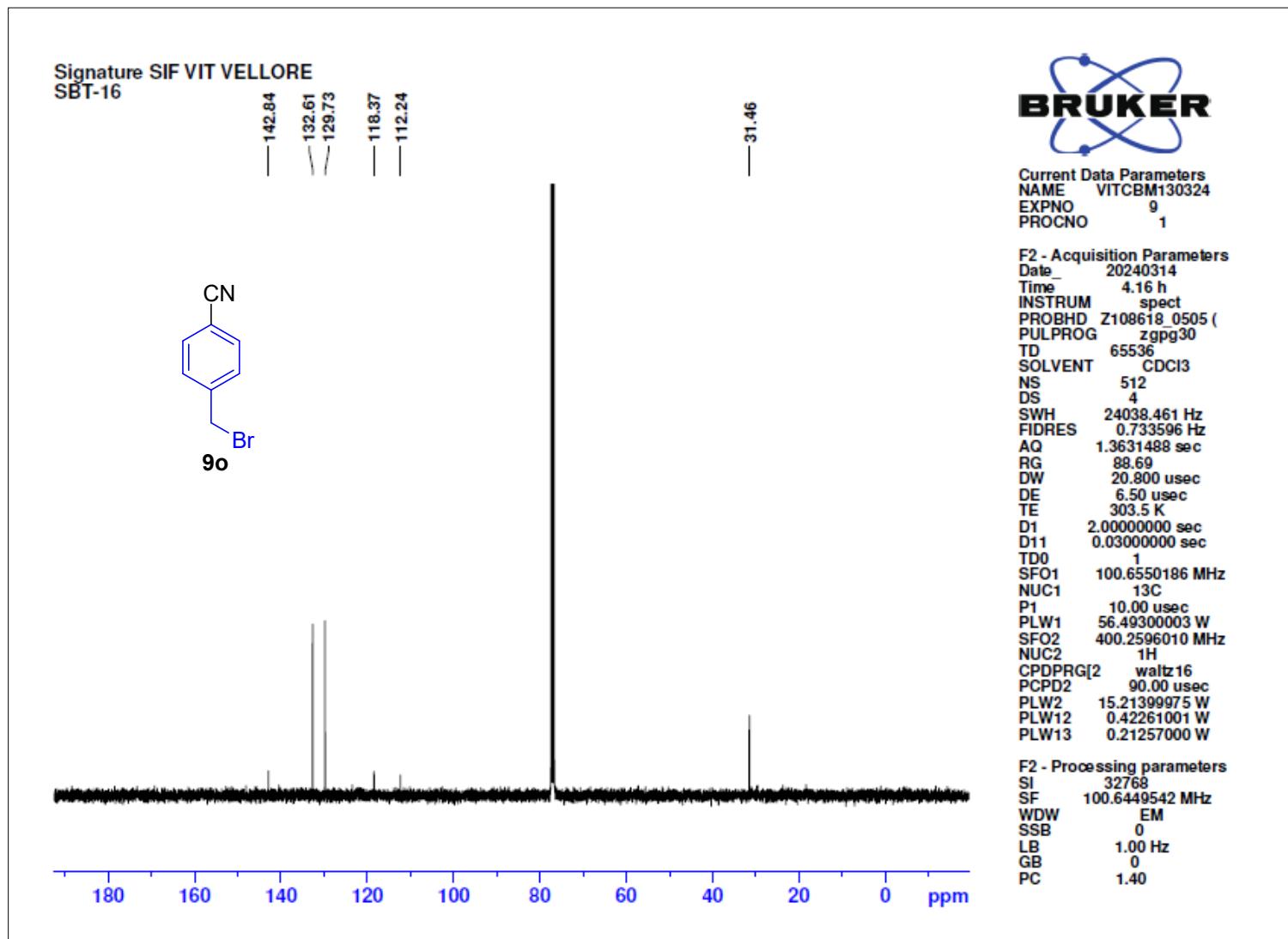
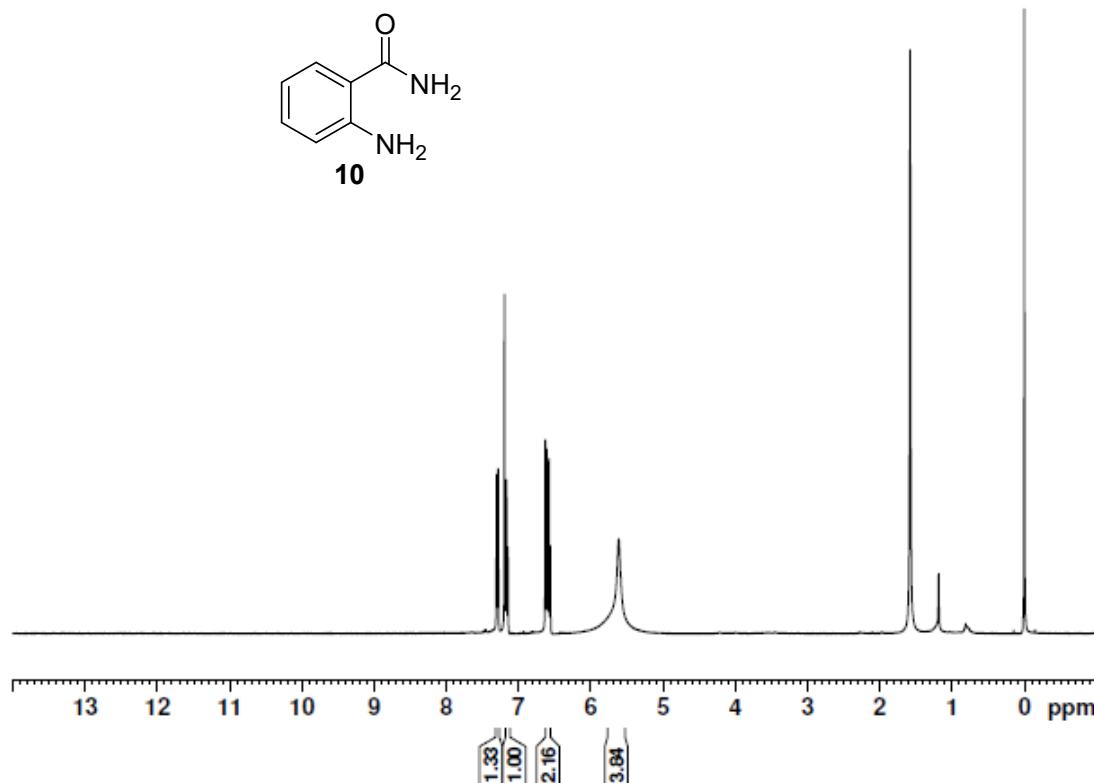
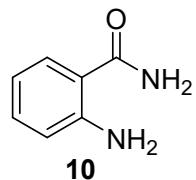


Figure 112:  $^{13}\text{C}$  NMR spectrum of the compound **9o**.

Signature SIF VIT VELLORE  
BM

7.303  
7.283  
7.168  
7.149  
6.629  
6.608  
6.599  
6.579  
6.561  
5.612



Current Data Parameters  
NAME VITCBM040124  
EXPNO 2  
PROCNO 1

F2 - Acquisition Parameters  
Date\_ 20240104  
Time 18.47 h  
INSTRUM spect  
PROBHD Z108618\_0505 (   
PULPROG zg30  
TD 65536  
SOLVENT CDCl3  
NS 32  
DS 2  
SWH 8012.820 Hz  
FIDRES 0.244532 Hz  
AQ 4.0894465 sec  
RG 175.97  
DW 62.400 usec  
DE 6.50 usec  
TE 300.8 K  
D1 1.0000000 sec  
TDO 1  
SFO1 400.2604716 MHz  
NUC1 1H  
P1 15.00 usec  
PLW1 15.21399975 W

F2 - Processing parameters  
SI 65536  
SF 400.2580364 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

Figure 113:  $^1\text{H}$  NMR spectrum of the compound **10**.

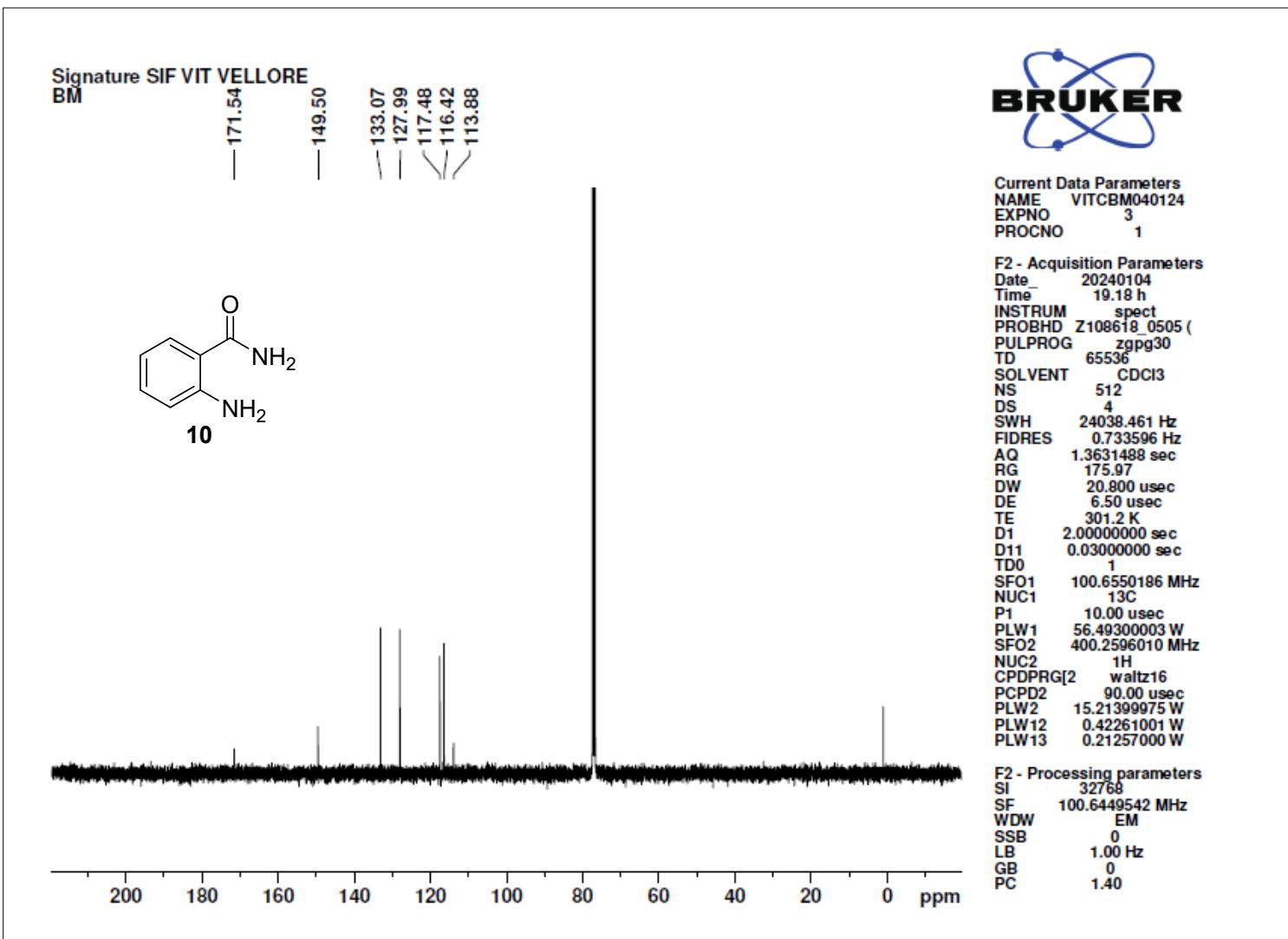


Figure 114: <sup>13</sup>C NMR spectrum of the compound 10.

Signature SIF VIT VELLORE  
C1



Current Data Parameters  
NAME C-1 proton  
EXPNO 14  
PROCNO 1

F2 - Acquisition Parameters  
Date 20230819  
Time 12.50 h  
INSTRUM spect  
PROBHD Z108618\_0505 (   
PULPROG zg30  
TD 65536  
SOLVENT DMSO  
NS 32  
DS 2  
SWH 8012.820 Hz  
FIDRES 0.244532 Hz  
AQ 4.0894465 sec  
RG 156.91  
DW 62.400 usec  
DE 6.50 usec  
TE 305.0 K  
D1 1.0000000 sec  
TD0 1  
SFO1 400.2604716 MHz  
NUC1 1H  
P1 15.00 usec  
PLW1 14.954999992 W

F2 - Processing parameters  
SI 65536  
SF 400.2580000 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

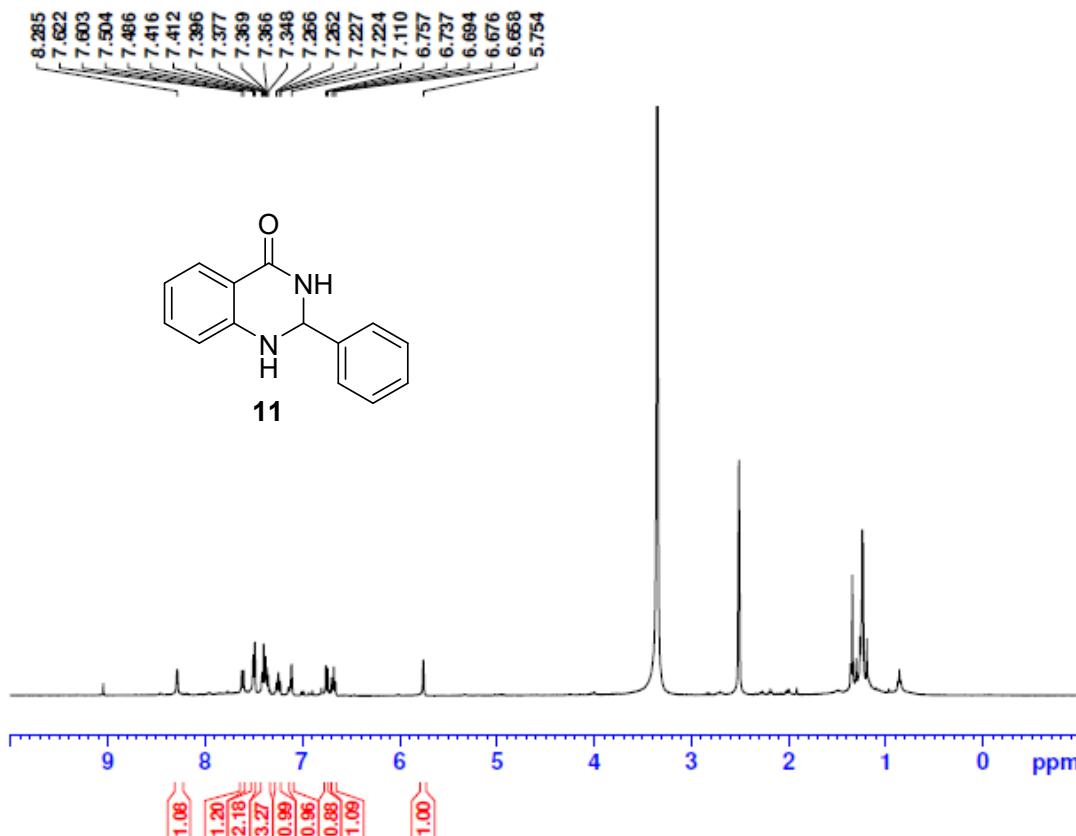
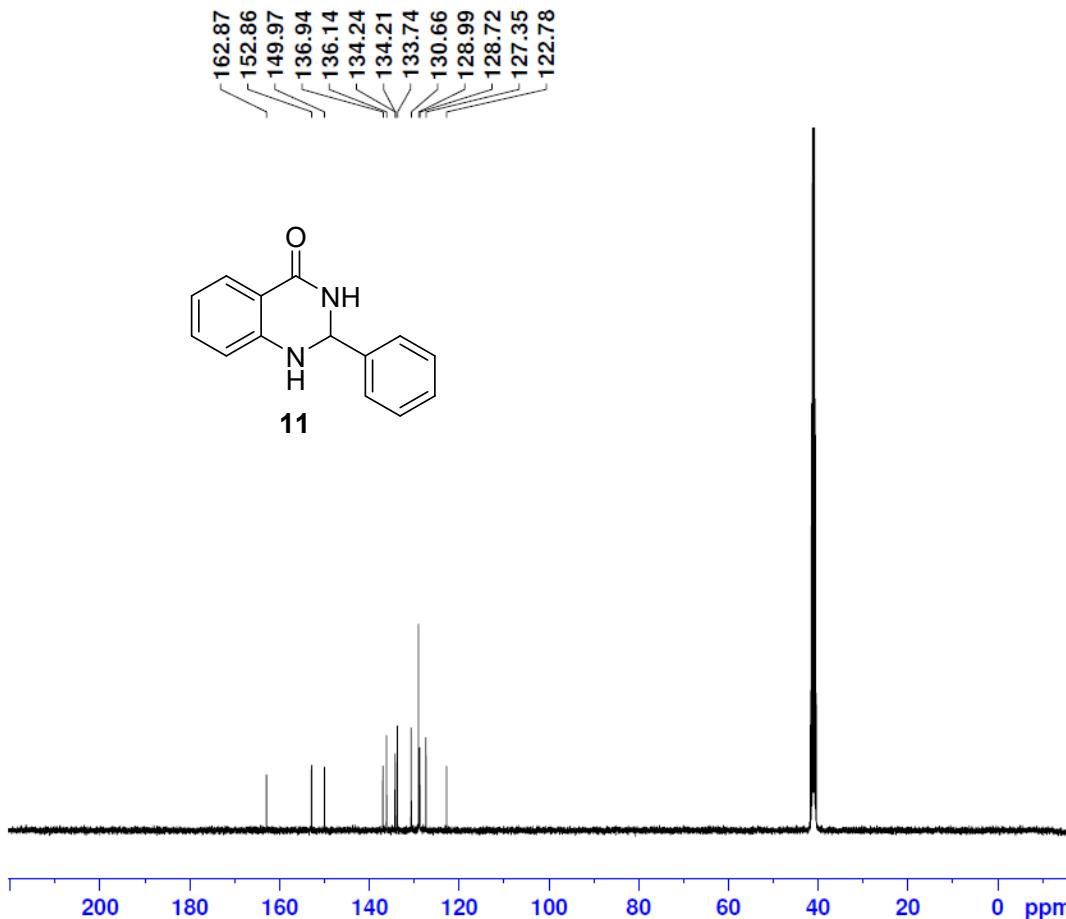


Figure 115: <sup>1</sup>H NMR spectrum of the compound 11.

Signature SIF VIT VELLORE  
CQ-IM



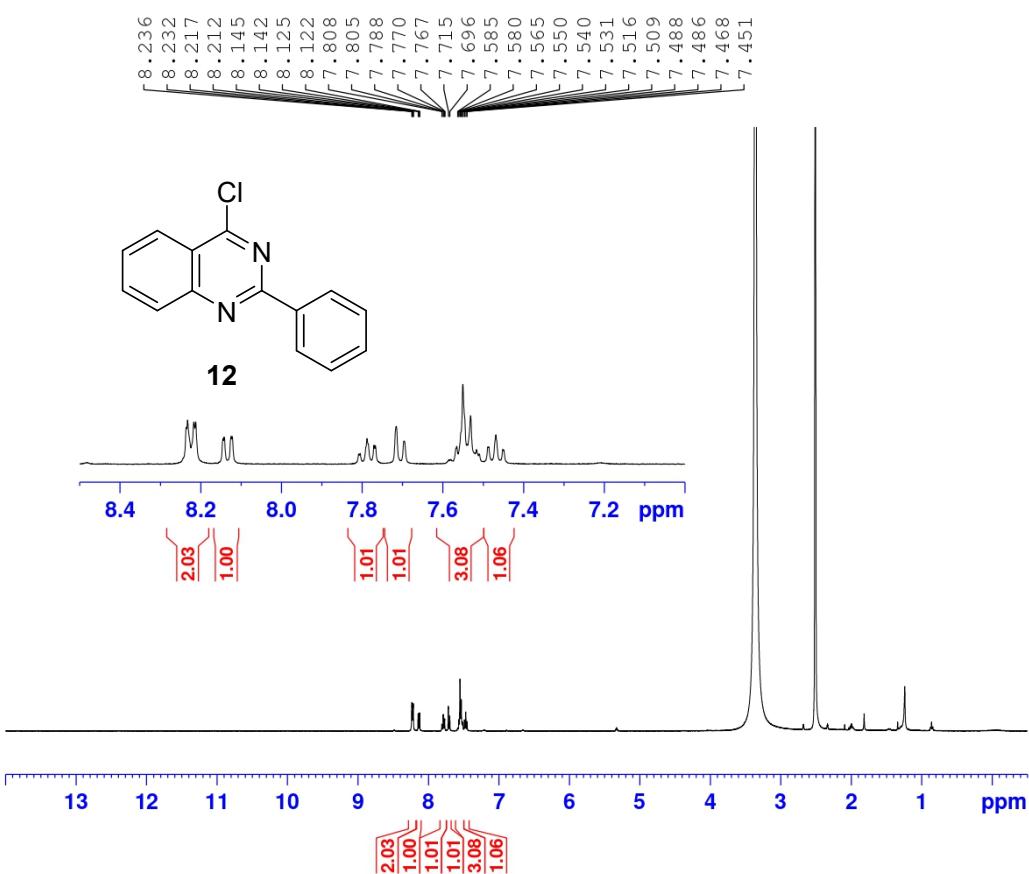
Current Data Parameters  
NAME carbon  
EXPNO 6  
PROCNO 1

F2 - Acquisition Parameters  
Date 20230921  
Time 10.29 h  
INSTRUM spect  
PROBHD Z108618\_0505 ( PULPROG zgpg30  
TD 65536  
SOLVENT DMSO  
NS 512  
DS 4  
SWH 24038.461 Hz  
FIDRES 0.733596 Hz  
AQ 1.3631488 sec  
RG 199.6  
DW 20.800 usec  
DE 6.50 usec  
TE 306.0 K  
D1 2.0000000 sec  
D11 0.03000000 sec  
TD0 1  
SFO1 100.6550186 MHz  
NUC1 13C  
P1 10.00 usec  
PLW1 58.22499847 W  
SFO2 400.2596010 MHz  
NUC2 1H  
CPDPRG[2] waltz16  
PCPD2 90.00 usec  
PLW2 14.95499992 W  
PLW12 0.41542000 W  
PLW13 0.20895000 W

F2 - Processing parameters  
SI 32768  
SF 100.6448515 MHz  
WDW EM  
SSB 0  
LB 1.00 Hz  
GB 0  
PC 1.40

Figure 116:  $^{13}\text{C}$  NMR spectrum of the compound 11.

Signature SIF VIT Vellore  
Cl intermediate



Current Data Parameters  
NAME Dr.AKT210324  
EXPNO 24  
PROCNO 1

F2 - Acquisition Parameters  
Date 20240321  
Time 16.46 h  
INSTRUM spect  
PROBHD Z108618\_0505 (zg30  
TD 65536  
SOLVENT DMSO  
NS 32  
DS 2  
SWH 8012.820 Hz  
FIDRES 0.244532 Hz  
AQ 4.0894465 sec  
RG 143.73  
DW 62.400 usec  
DE 6.50 usec  
TE 304.4 K  
D1 1.0000000 sec  
TD0 1  
SFO1 400.2604716 MHz  
NUC1 <sup>1</sup>H  
P1 15.00 usec  
PLW1 15.21399975 W

F2 - Processing parameters  
SI 65536  
SF 400.2580000 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

Figure 117: <sup>1</sup>H NMR spectrum of the compound 12.

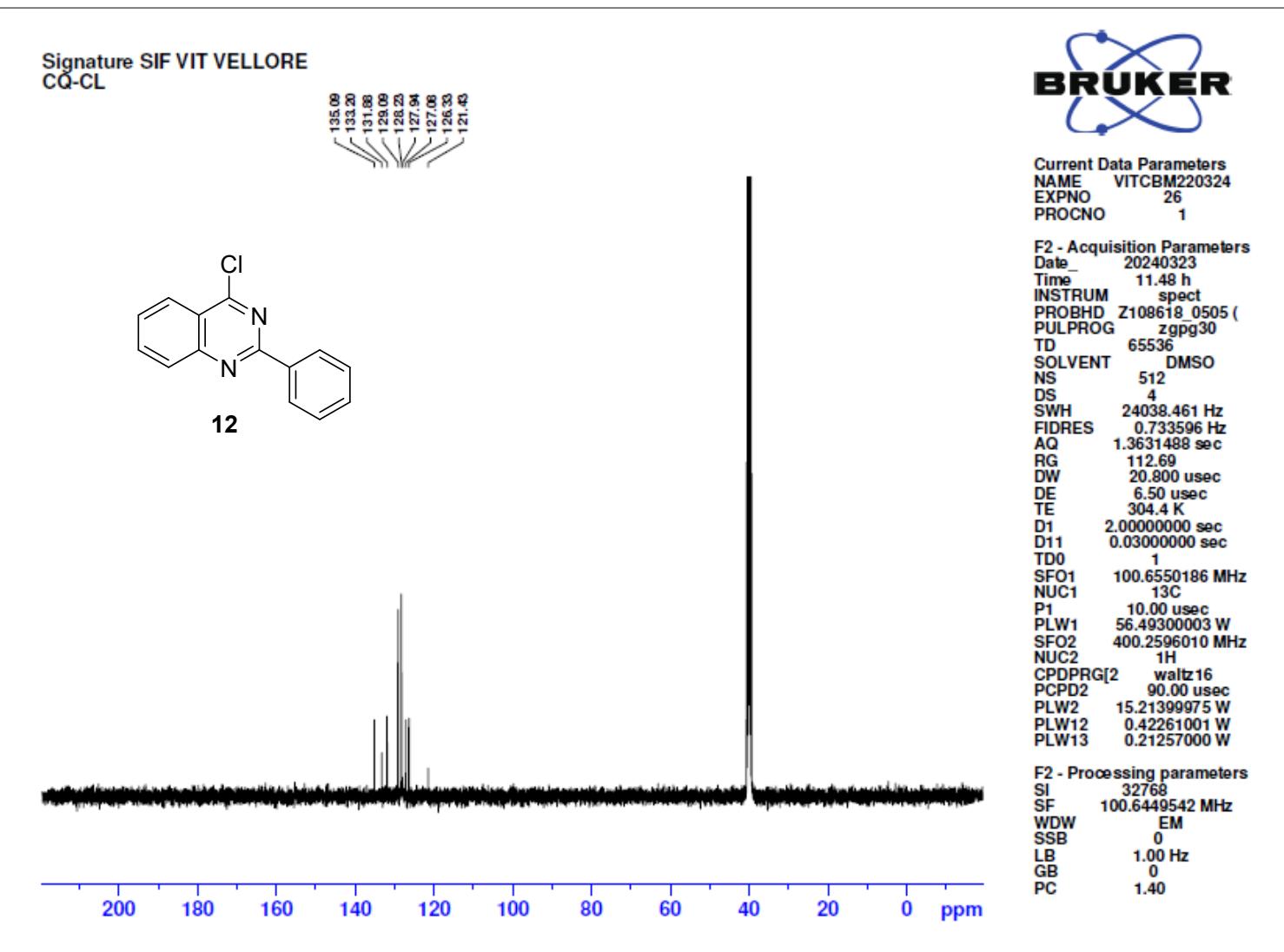
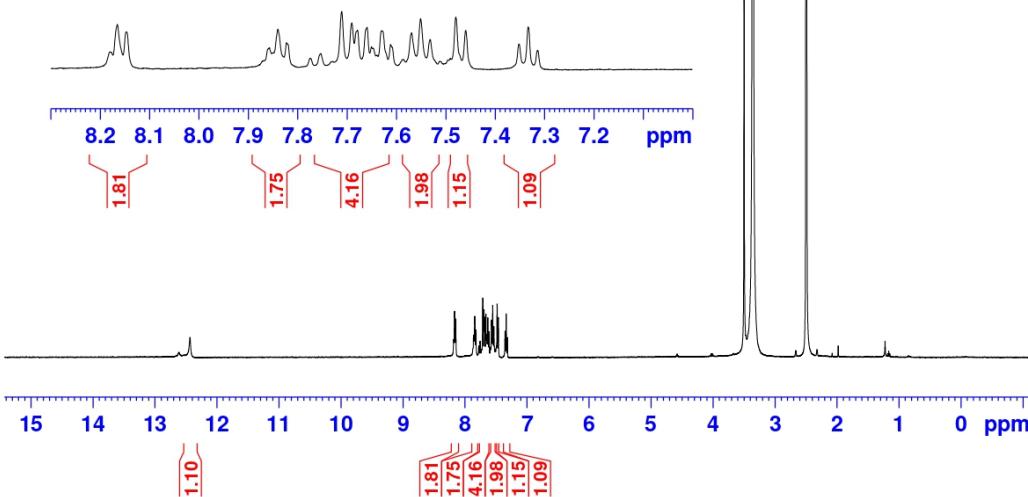
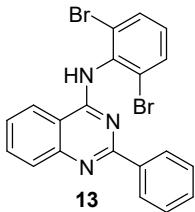


Figure 118:  $^{13}\text{C}$  NMR spectrum of the compound 12.

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12.433  
8.180  
8.165  
8.147  
7.857  
7.840  
7.822  
7.774  
7.753  
7.711  
7.690  
7.679  
7.659  
7.650  
7.647  
7.640  
7.630  
7.612  
7.569  
7.551  
7.531  
7.491  
7.479  
7.460  
7.352  
7.333  
7.314



Current Data Parameters  
NAME VITCBM260324  
EXPNO 31  
PROCNO 1

F2 - Acquisition Parameters  
Date 20240326  
Time 11.56 h  
INSTRUM spect  
PROBHD Z108618\_0505 (zg30  
PULPROG zg30  
TD 65536  
SOLVENT DMSO  
NS 32  
DS 2  
SWH 8012.820 Hz  
FIDRES 0.244532 Hz  
AQ 4.0894465 sec  
RG 127.79  
DW 62.400 usec  
DE 6.50 usec  
TE 302.7 K  
D1 1.0000000 sec  
TD0 1  
SFO1 400.2604716 MHz  
NUC1 1H  
P1 15.00 usec  
PLW1 15.21399975 W

F2 - Processing parameters  
SI 65536  
SF 400.2580064 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

Figure 119:  $^1\text{H}$  NMR spectrum of the compound 13.

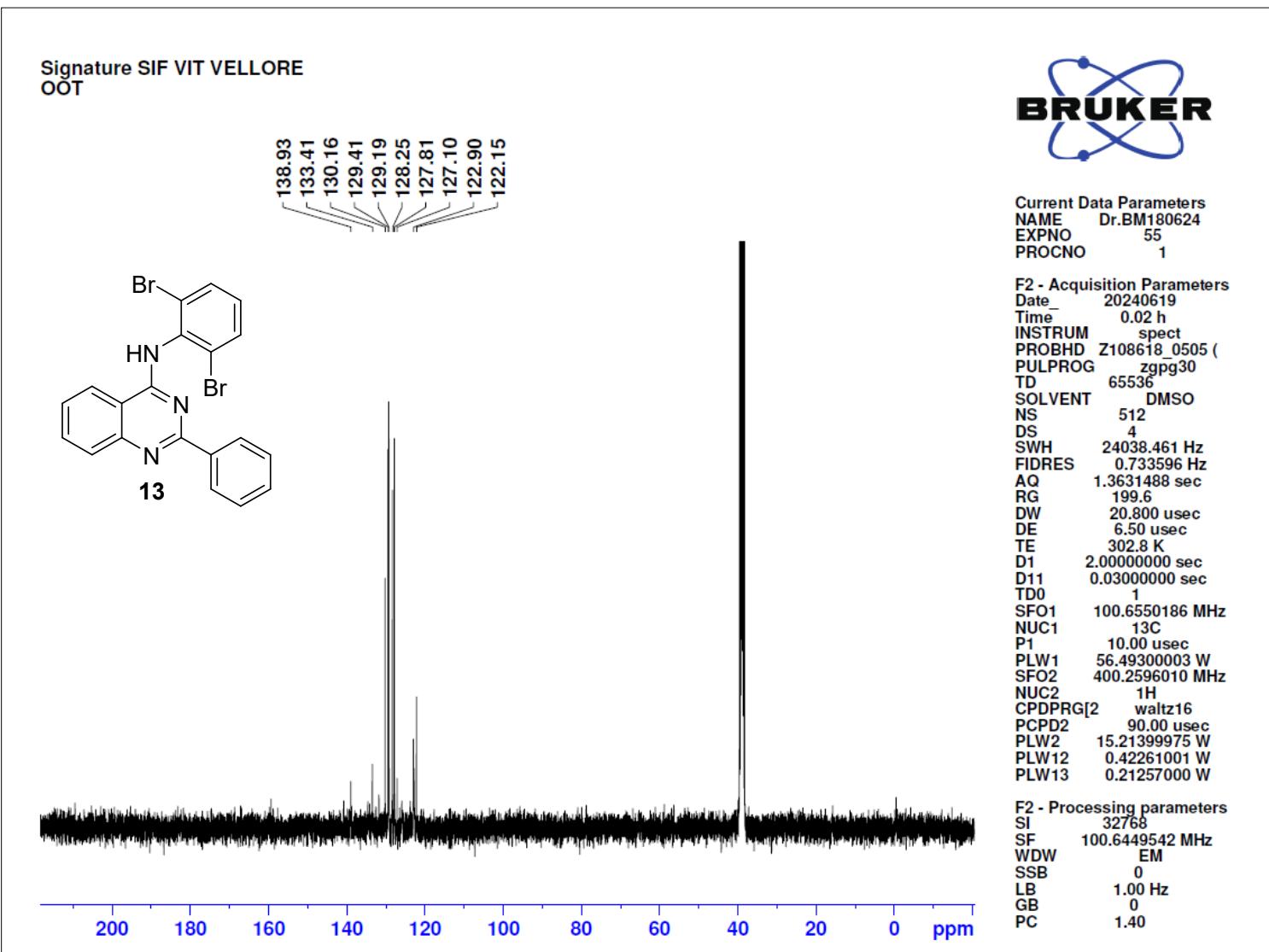
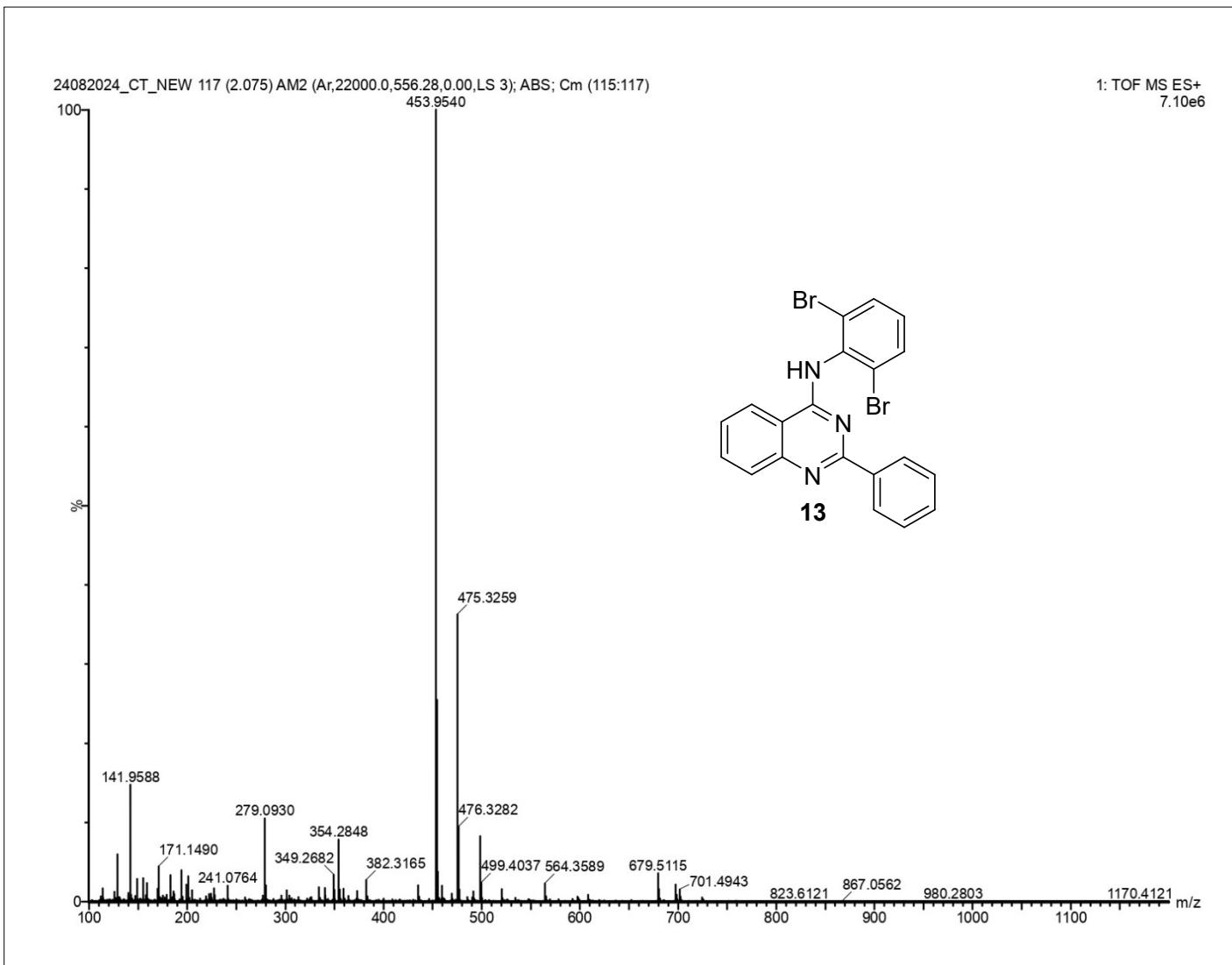


Figure 120: <sup>13</sup>C NMR spectrum of the compound 13.



**Fig 121:** HRMS of the compound **13**.

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Current Data Parameters  
NAME VITCBM050424  
EXPNO 21  
PROCNO 1

F2 - Acquisition Parameters  
Date 20240405  
Time 16.41 h  
INSTRUM spect  
PROBHD Z108618\_0505 (zg30  
PULPROG zg30  
TD 65536  
SOLVENT DMSO  
NS 32  
DS 2  
SWH 8012.820 Hz  
FIDRES 0.244532 Hz  
AQ 4.0894465 sec  
RG 127.79  
DW 62.400 usec  
DE 6.50 usec  
TE 304.4 K  
D1 1.0000000 sec  
TDO 1  
SFO1 400.2604716 MHz  
NUC1 1H  
P1 15.00 usec  
PLW1 15.21399975 W

F2 - Processing parameters  
SI 65536  
SF 400.2580007 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

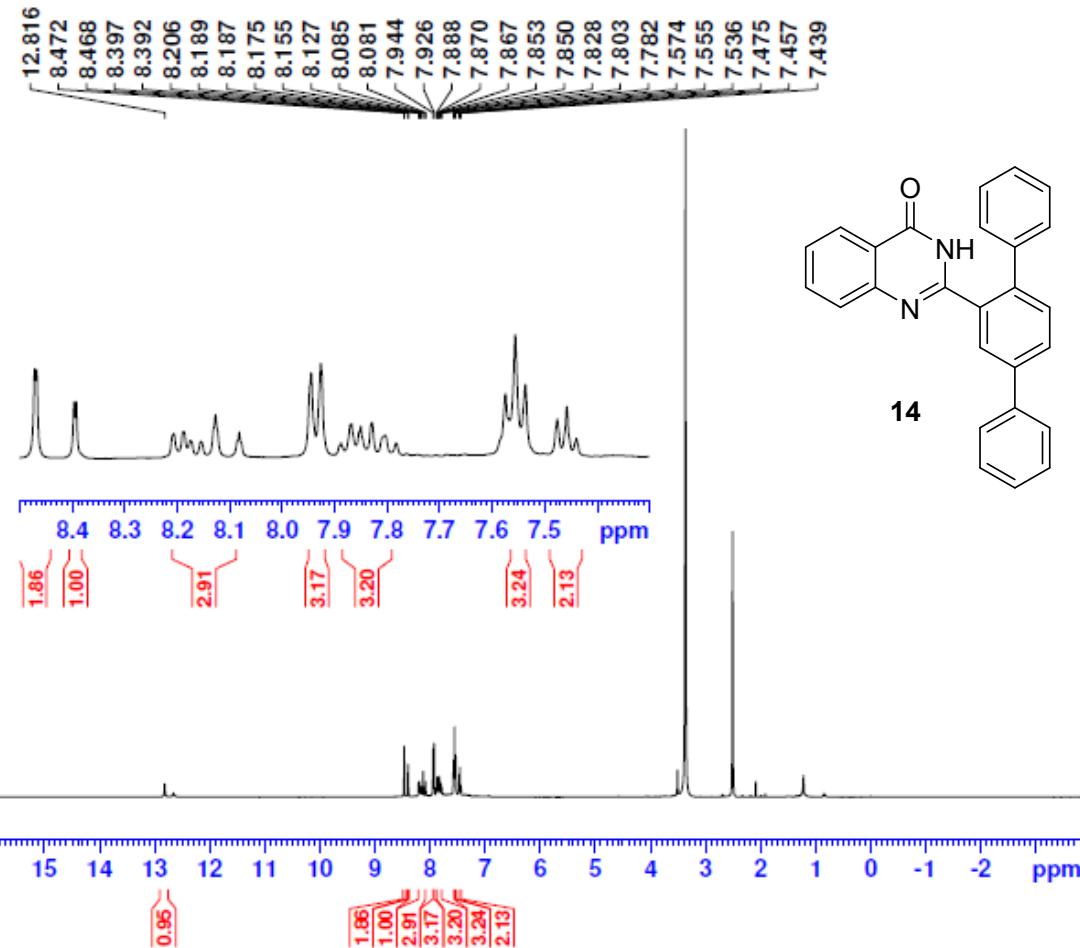


Figure 122: <sup>1</sup>H NMR spectrum of the compound 14.

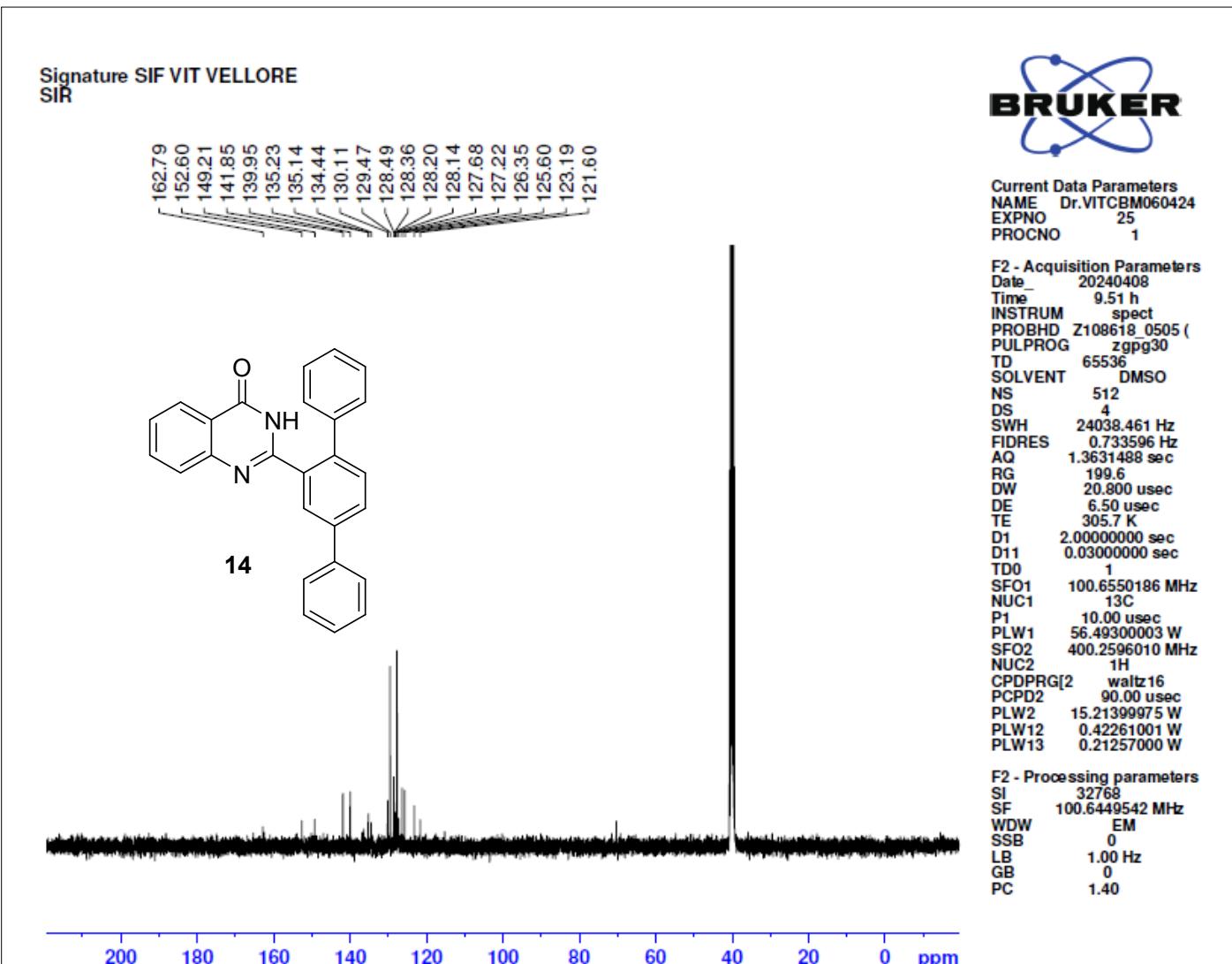


Figure 123:  $^{13}\text{C}$  NMR spectrum of the compound 14.

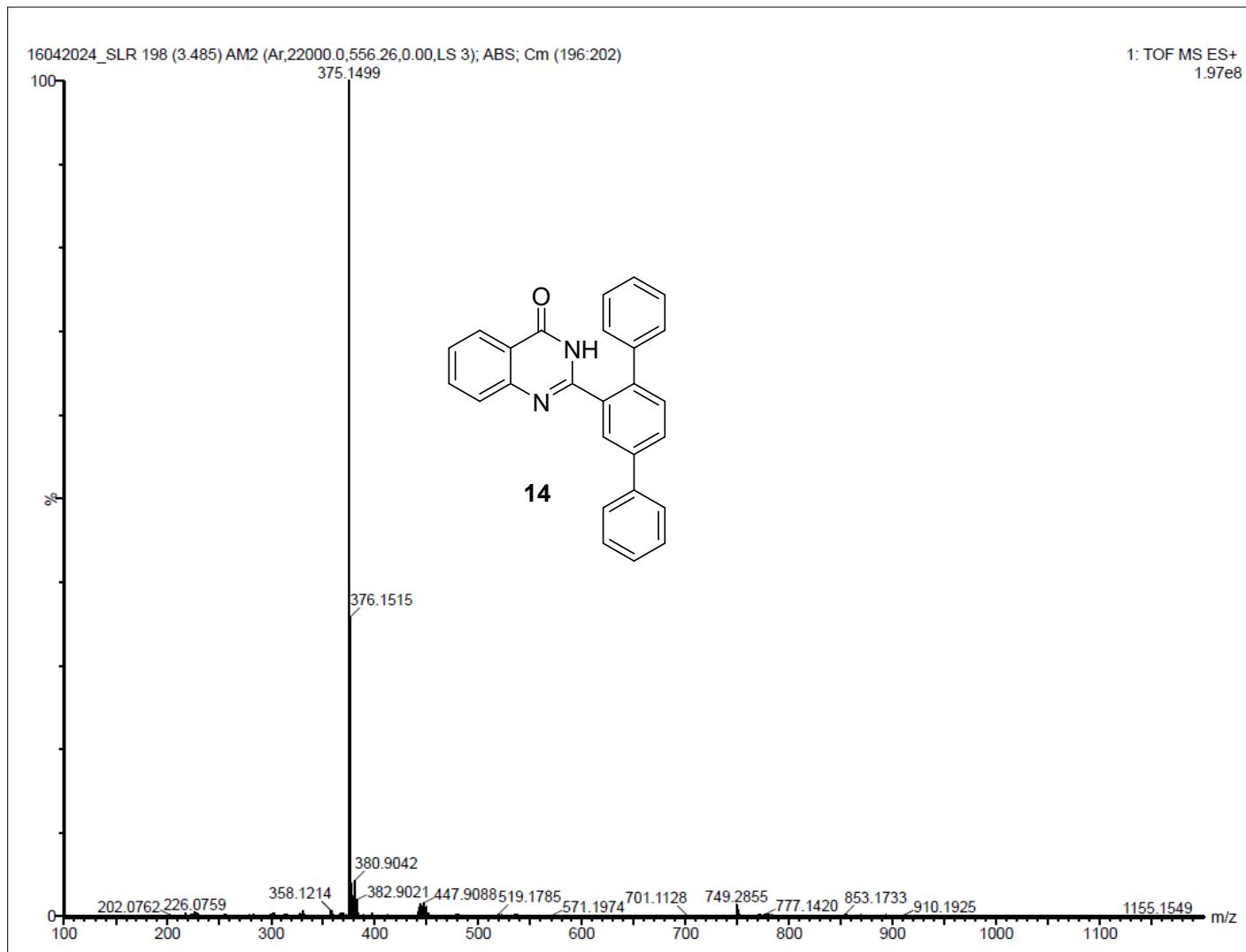


Figure 124: HRMS of the compound 14.