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SUPPORTING INFORMATION

Modified graphene supported Ag-Cu NPs with enhanced bimetallic synergistic effect in oxidation and Chan-Lam coupling reactions

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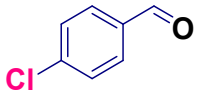
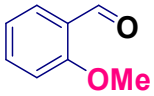
S1. Characterization Data of Compounds 2a-2l



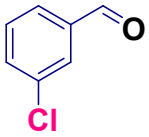
4-Chlorobenzaldehyde (2a)

^{1}H NMR (400 MHz, $CDCl_3$): δ 10.00 (s, 1H, CHO), 7.84 (d, J = 8.3 Hz, 2H, Ar-H), 7.53 (d, J = 8.3 Hz, 2H, Ar-H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 191.05, 140.96, 134.58, 130.60, 129.31.



2-Methoxybenzaldehyde (2b)

^{1}H NMR (400 MHz, $CDCl_3$): δ 10.50 (s, 1H, CHO), 7.86 (d, J = 7.7 Hz, 1H, Ar-H), 7.58 (t, J = 7.9 Hz, 1H, Ar-H), 7.01-7.08 (m, 2H, Ar-H), 3.96 (s, 3H, OCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 189.90, 161.81, 135.91, 128.55, 124.49, 120.69, 111.68, 55.74.

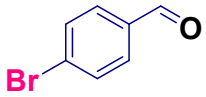


3-Chlorobenzaldehyde (2c)

^{1}H NMR (400 MHz, $CDCl_3$): δ 9.94 (s, 1H, CHO), 7.77 (s, 1H, Ar-H), 7.71 (d, J = 7.5 Hz, 1H, Ar-H), 7.53 (d, J = 8.0 Hz, 1H, Ar-H), 7.42 (t, J = 7.8 Hz, 1H, Ar-H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 190.81, 137.96, 135.33, 134.30, 130.36, 129.12, 127.98.

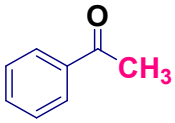
2-Nitrobenzaldehyde (2d)

^{1}H NMR (400 MHz, $CDCl_3$): δ 10.42 (s, 1H, CHO), 8.13 (d, J = 8 Hz, 1H, Ar-H), 7.96 (d, J = 8 Hz, 1H, Ar-H), 7.76-7.84 (m, 2H, Ar-H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 188.24, 149.48, 133.92, 133.56, 131.22, 129.27, 124.32.



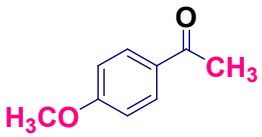
4-Bromobenzaldehyde (2e)

^{1}H NMR (400 MHz, $CDCl_3$): δ 10.00 (s, 1H, CHO), 7.78 (d, J = 8 Hz, 2H, Ar-H), 7.71 (d, J = 8 Hz, 2H, Ar-H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 197.49, 140.16, 137.54, 136.51, 133.91.



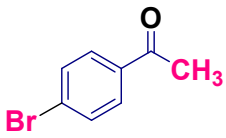
Acetophenone (2f)

^{1}H NMR (400 MHz, $CDCl_3$): δ 7.93 (d, J = 7.1 Hz, 2H, Ar-H), 7.53 (t, J = 7.4 Hz, 1H, Ar-H), 7.42 (t, J = 7.6 Hz, 2H, Ar-H), 2.57 (s, 3H, $COCH_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 198.14, 137.05, 133.06, 128.58, 128.24, 26.59.



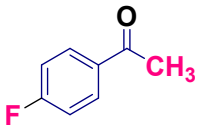
4-Methoxyacetophenone (2g)

^{1}H NMR (400 MHz, $CDCl_3$): δ 7.95 (d, J = 8.8 Hz, 2H, Ar-H), 6.94 (d, J = 8.8 Hz, 2H, Ar-H), 3.88 (s, 3H, CH_3), 2.57 (s, 3H, $COCH_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 196.71, 163.48, 130.61, 130.30, 113.83, 55.48, 26.38.



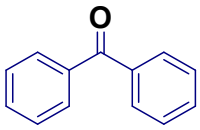
4-Bromoacetophenone (2h)

^{1}H NMR (400 MHz, $CDCl_3$): δ 7.84 (d, *J* = 8.2 Hz, 2H, Ar-H), 7.63 (d, *J* = 8.3 Hz, 2H, Ar-H), 2.61 (s, 3H, $COCH_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 197.08, 135.73, 131.75, 129.87, 128.48, 26.46.



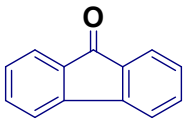
4-Fluoroacetophenone (2i)

^{1}H NMR (400 MHz, $CDCl_3$): δ 7.69 (t, *J* = 5.9 Hz, 2H, Ar-H), 6.83 (t, *J* = 8.6 Hz, 2H, Ar-H), 2.29 (s, 3H, $COCH_3$); ^{13}C NMR (100 MHz, $CDCl_3$): δ 195.91, 165.38 (d, *J* = 253.9 Hz), 133.35 (d, *J* = 3.0 Hz), 130.68 (d, *J* = 9.3 Hz), 115.23 (d, *J* = 21.9 Hz), 25.97.



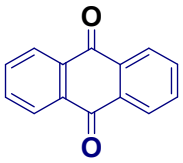
Benzophenone (2j)

^{1}H NMR (400 MHz, $CDCl_3$): δ 7.84 (d, *J* = 8.1 Hz, 4H, Ar-H), 7.62 (t, *J* = 7.4 Hz, 2H, Ar-H), 7.51 (t, *J* = 7.6 Hz, 4H, Ar-H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 197.01, 137.61, 132.44, 129.99, 128.41.



Fluorenone (2k)

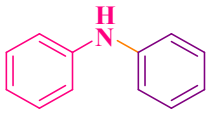
^{1}H NMR (400 MHz, $CDCl_3$): δ 7.68 (d, *J* = 7.3 Hz, 2H, Ar-H), 7.55-7.49 (m, 4H, Ar-H), 7.32 (t, *J* = 7.2 Hz, 2H, Ar-H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 198.45, 144.52, 134.54, 133.94, 129.26, 124.36, 120.33.



Anthraquinone (2l)

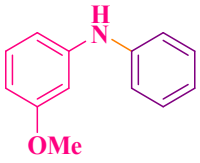
^{1}H NMR (400 MHz, $CDCl_3$): δ 8.35 (dd, *J* = 5.8, 3.3 Hz, 4H, Ar-H), 7.84 (dd, *J* = 5.8, 3.3 Hz, 4H, Ar-H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 184.26, 137.19, 136.97, 130.85.

S2. Characterization Data of Compounds 5a-5i



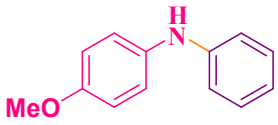
Diphenylamine (5a)

^{1}H NMR (400 MHz, $CDCl_3$): δ 7.64 (d, *J* = 8 Hz, 4H, Ar-H), 7.49 (t, *J* = 8 Hz, 4H, Ar-H), 7.39 (t, *J* = 8 Hz, 2H, Ar-H) and 5.75 (bs, 1H, NH, exchangeable with D_2O); ^{13}C NMR (100 MHz, $CDCl_3$): δ 145.21, 130.92, 129.35, 117.61.



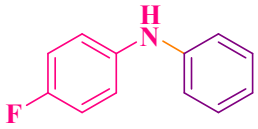
***N*-(3-Methoxyphenyl)benzenamine (5b)**

^{1}H NMR (400 MHz, $CDCl_3$): δ 7.16 (d, *J* = 7.6 Hz, 2H, Ar-H), 7.11 (t, *J* = 7.8 Hz, 1H, Ar-H), 6.91-6.95 (m, 3H, Ar-H), 6.79 (d, *J* = 8.4 Hz, 2H, Ar-H), 6.63 (s, 1H, Ar-H), 5.74 (bs, 1H, NH, exchangeable with D_2O), 3.76 (s, 3H, OCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 160.16, 145.52, 143.56, 130.49, 129.41, 121.19, 118.76, 110.32, 107.04, 103.46, 55.26.



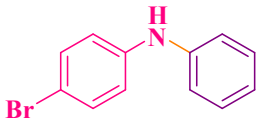
***N*-(4-Methoxyphenyl)benzenamine (5c)**

H NMR (400 MHz, $CDCl_3$): δ 7.27 (t, *J* = 7.8 Hz, 2H, Ar-H), 7.12 (d, *J* = 8.8 Hz, 2H, Ar-H), 6.97 – 6.87 (m, 5H, Ar-H), 5.56 (bs, 1H, NH, exchangeable with D_2O), 3.85 (s, 3H, OCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): δ 155.29, 145.21, 135.93, 129.42, 122.23, 119.59, 115.48, 114.71, 55.48.



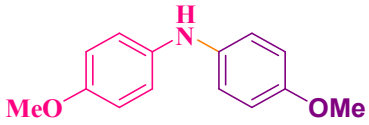
***N*-(4-Fluorophenyl)benzenamine (5d)**

1H NMR (400 MHz, $CDCl_3$): δ 7.28 (t, *J* = 7.9 Hz, 2H, Ar-H), 7.08 (dd, *J* = 8.9, 4.8 Hz, 2H, Ar-H), 7.03-6.98 (m, 4H, Ar-H), 6.93 (t, *J* = 7.3 Hz, 1H, Ar-H), 5.61 (bs, 1H, NH, exchangeable with D_2O); ^{13}C NMR (100 MHz, $CDCl_3$): δ 158.03 (d, *J* = 240.2 Hz), 143.91, 138.90 (d, *J* = 2.5 Hz), 129.41, 120.59, 120.52, 116.76, 115.94 (d, *J* = 22.5 Hz).



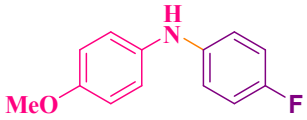
***N*-(4-Bromophenyl)benzenamine (5e)**

^1H NMR (400 MHz, $CDCl_3$): δ 7.62 (t, *J* = 8 Hz, 1H, Ar-H), 7.54 (d, *J* = 8 Hz, 1H, Ar-H), 7.45-7.49 (m, 2H, Ar-H), 7.36-7.39 (m, 1H, Ar-H), 7.16 (t, *J* = 8 Hz, 1H, Ar-H), 7.08 (d, *J* = 8 Hz, 1H, Ar-H), 7.01-6.95 (m, 2H, Ar-H), 5.74 (bs, 1H, NH, exchangeable with D_2O); ^{13}C NMR (100 MHz, $CDCl_3$): δ 140.79, 138.17, 130.26, 128.70, 127.13, 122.05, 116.62, 113.11.



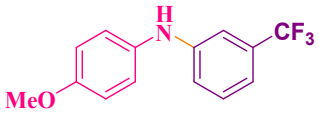
bis(4-Methoxyphenyl)amine (5f)

^{1}H NMR (400 MHz, $CDCl_3$): δ 6.96 (d, *J* = 8.8 Hz, 4H, Ar-H), 6.84 (d, *J* = 8.8 Hz, 4H, Ar-H), 5.80 (bs, 1H, NH, exchangeable with D_2O), 3.80 (s, 6H, OCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): 154.23, 138.14, 119.57, 114.68, 55.75.



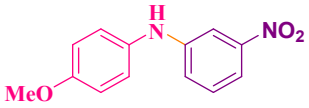
4-Fluoro-N-(4-methoxyphenyl)benzenamine (5g)

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.03 (d, *J* = 8.8 Hz, 2H, Ar-H), 6.96 (d, *J* = 8.9 Hz, 2H, Ar-H), 6.93 – 6.86 (m, 4H, Ar-H), 5.45 (bs, 1H, NH, exchangeable with D_2O), 3.84 (s, 3H, OCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): 159.94 (d, *J* = 333.1 Hz), 155.02, 141.06, 136.51, 121.22, 117.78 (d, *J* = 7.6 Hz), 115.82 (d, *J* = 22.4 Hz), 114.75, 55.51.



3-(Trifluoromethyl)-N-(4-methoxyphenyl)benzenamine (5h)

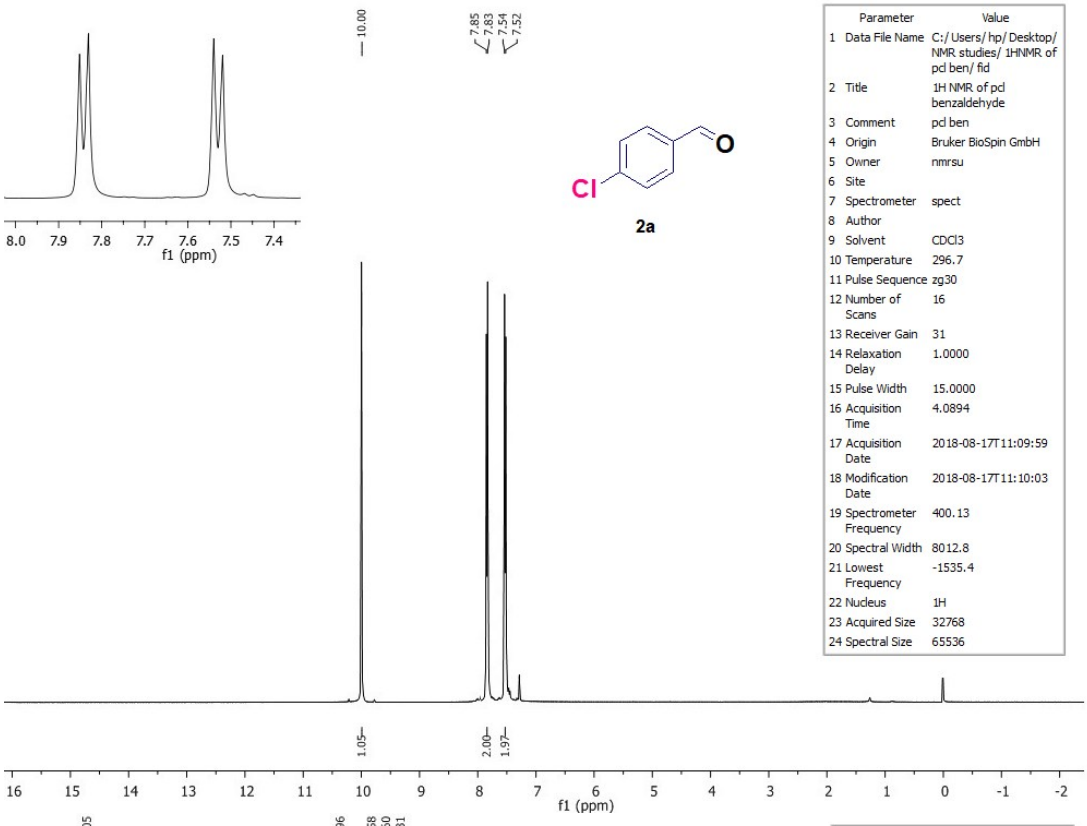
^{1}H NMR (400 MHz, $CDCl_3$): δ 7.92 (d, *J* = 8.9 Hz, 2H, Ar-H), 7.31 (d, *J* = 7.9 Hz, 1H, Ar-H), 7.12 (d, *J* = 8.9 Hz, 1H, Ar-H), 7.03 (d, *J* =9.0 Hz, 3H, Ar-H), 6.92 (d, *J* = 8.7 Hz, 1H, Ar-H), 5.68 (bs, 1H, NH, exchangeable with D_2O), 3.91(s, 3H, OCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): 156.05, 146.02, 134.25, 132.07 – 131.19 (m), 129.76, 124.37, 123.50, 115.53 (q, *J* = 4.0 Hz), 114.84, 114.17, 111.20 (q, *J* = 3.9 Hz), 55.55.



***N*-(4-Methoxyphenyl)-3-nitrobenzenamine (5i)**

^{1}H NMR (400 MHz, $CDCl_3$): δ 7.67 (s, 1H, Ar-H), 7.62 (d, *J* = 8.0 Hz, 1H, Ar-H), 7.32 (t, *J* = 8.1 Hz, 1H, Ar-H), 7.13 (t, *J* = 8.5 Hz, 3H, Ar-H), 6.94 (d, *J* = 8.8 Hz, 2H, Ar-H), 5.81 (bs, 1H, NH, exchangeable with D_2O), 3.85 (s, 3H, OCH_3); ^{13}C NMR (100 MHz, $CDCl_3$): 156.66, 149.27, 146.86, 133.37, 129.91, 124.23, 120.44, 115.06, 113.57, 108.44, 55.48.

S3. ^{1}H NMR and ^{13}C NMR spectra of compounds listed in Table 3



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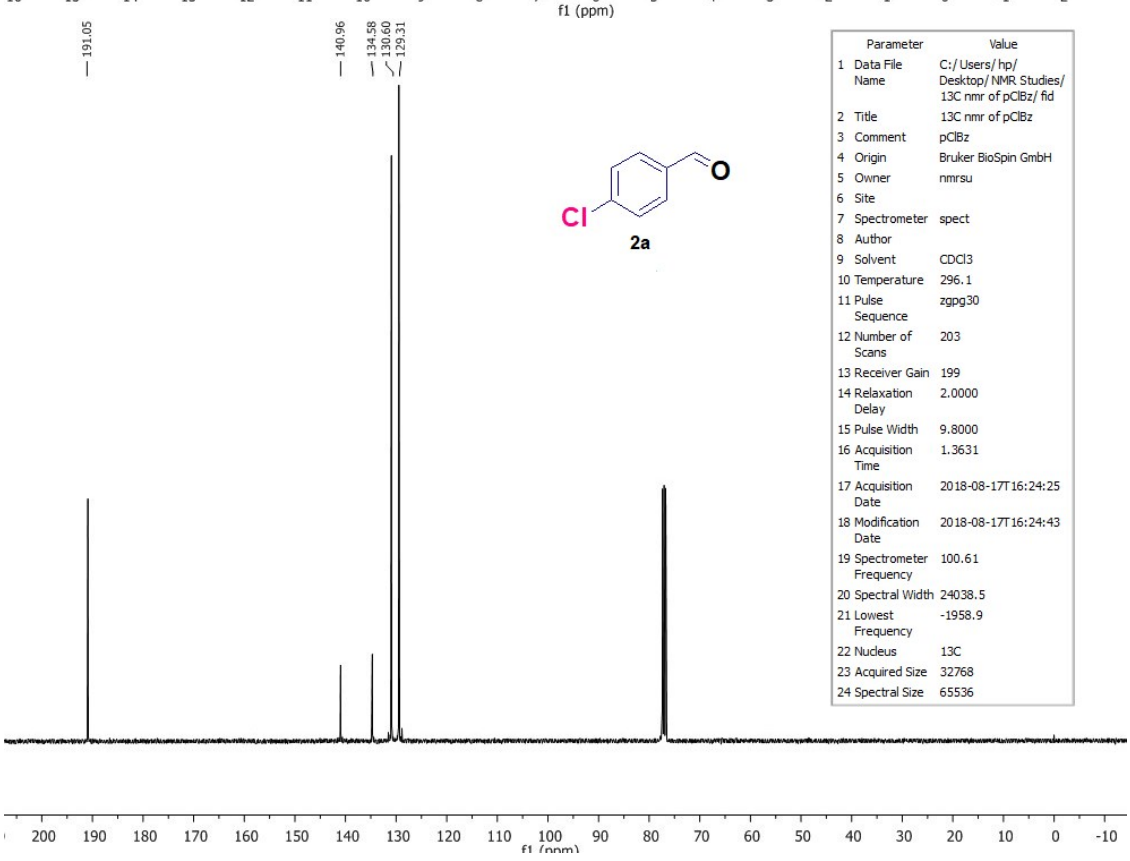

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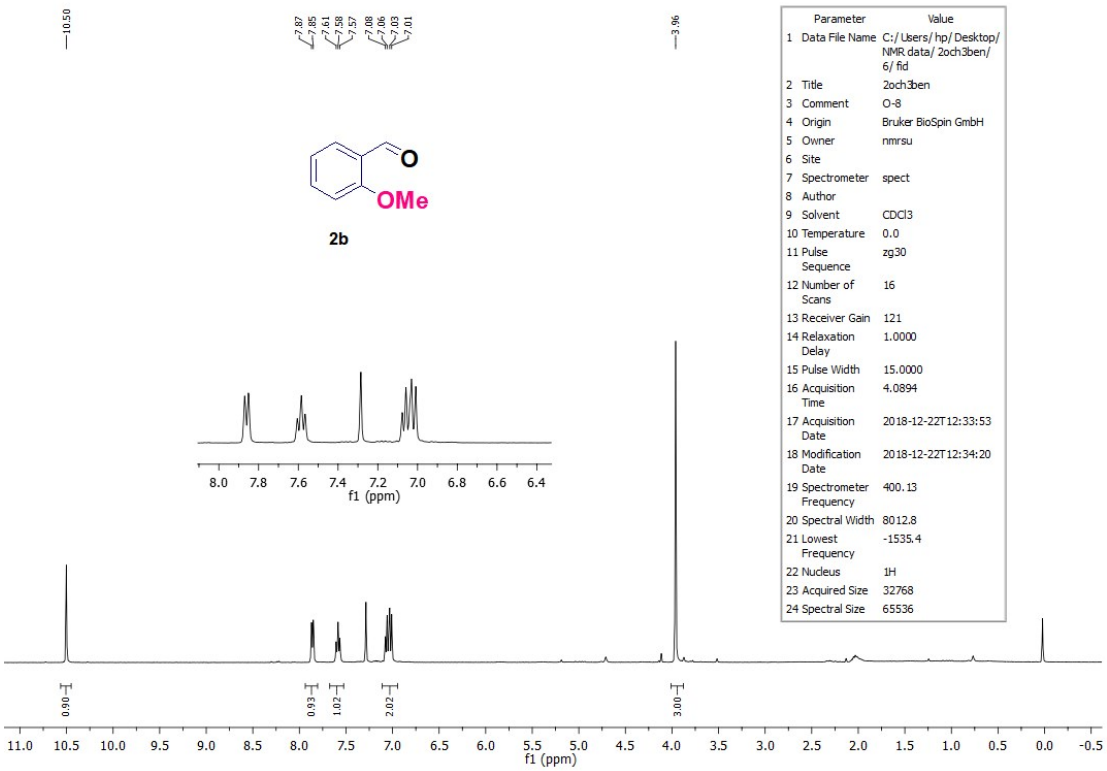

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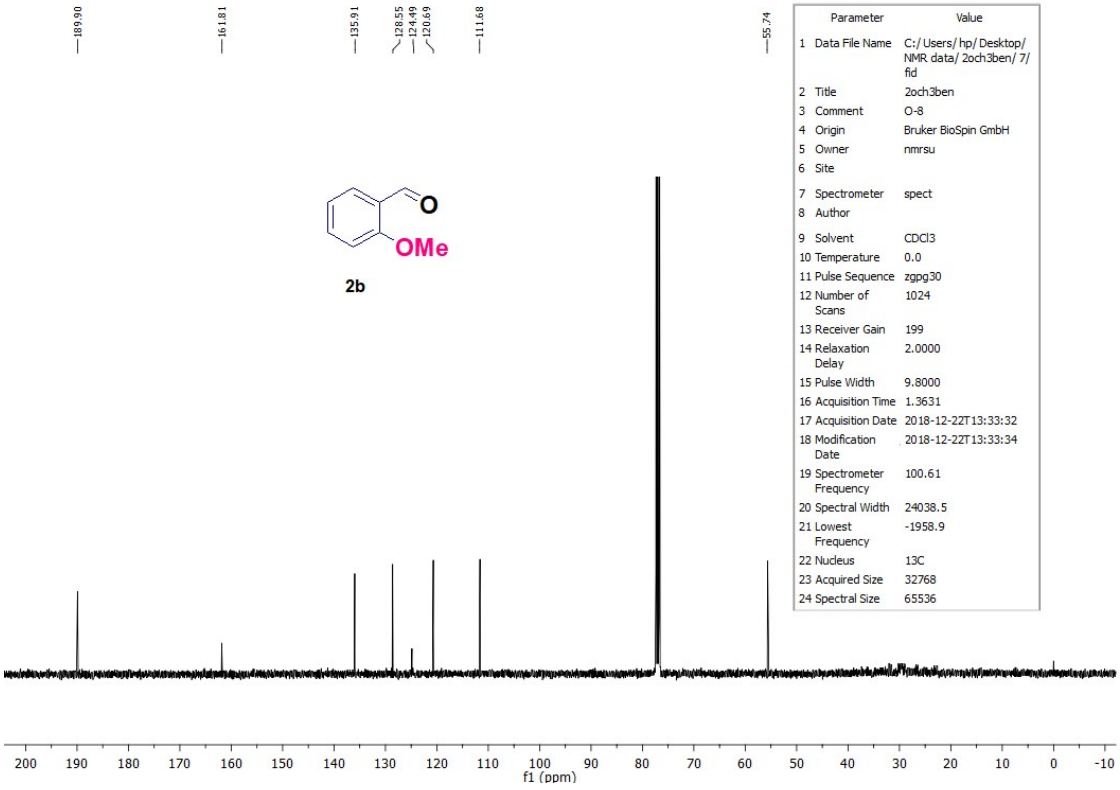

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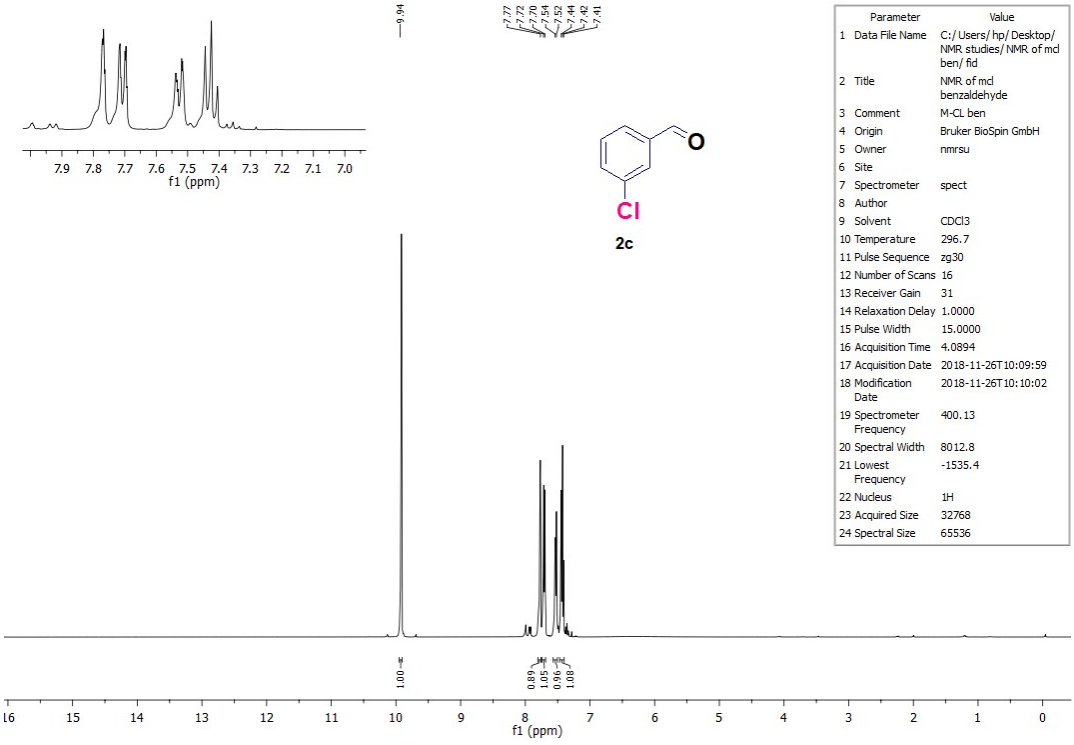
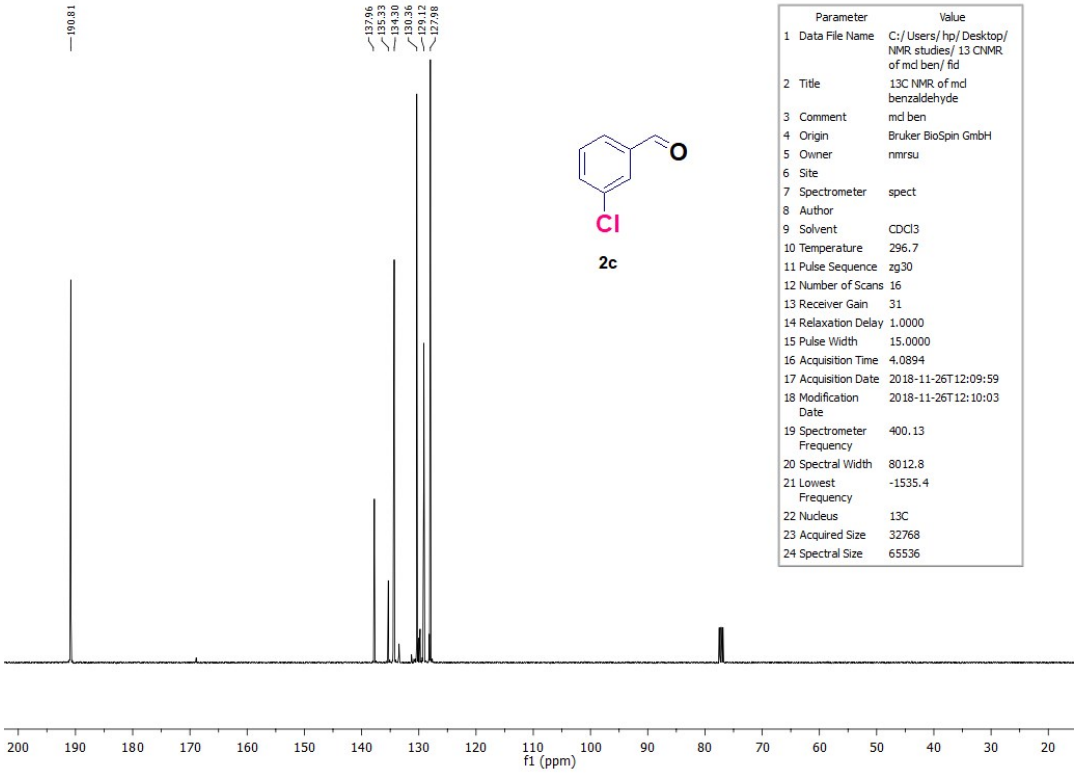


	Parameter	Value
1	Data File Name	C:/Users/hp/Desktop/NMR studies/NMR of mcl ben/fid
2	Title	NMR of mcl benzaldehyde
3	Comment	M-CL ben
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	296.7
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	31
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2018-11-26T10:09:59
18	Modification Date	2018-11-26T10:10:02
19	Spectrometer Frequency	400.13
20	Spectral Width	8012.8
21	Lowest Frequency	-1535.4
22	Nucleus	1H
23	Acquired Size	32768
24	Spectral Size	65536



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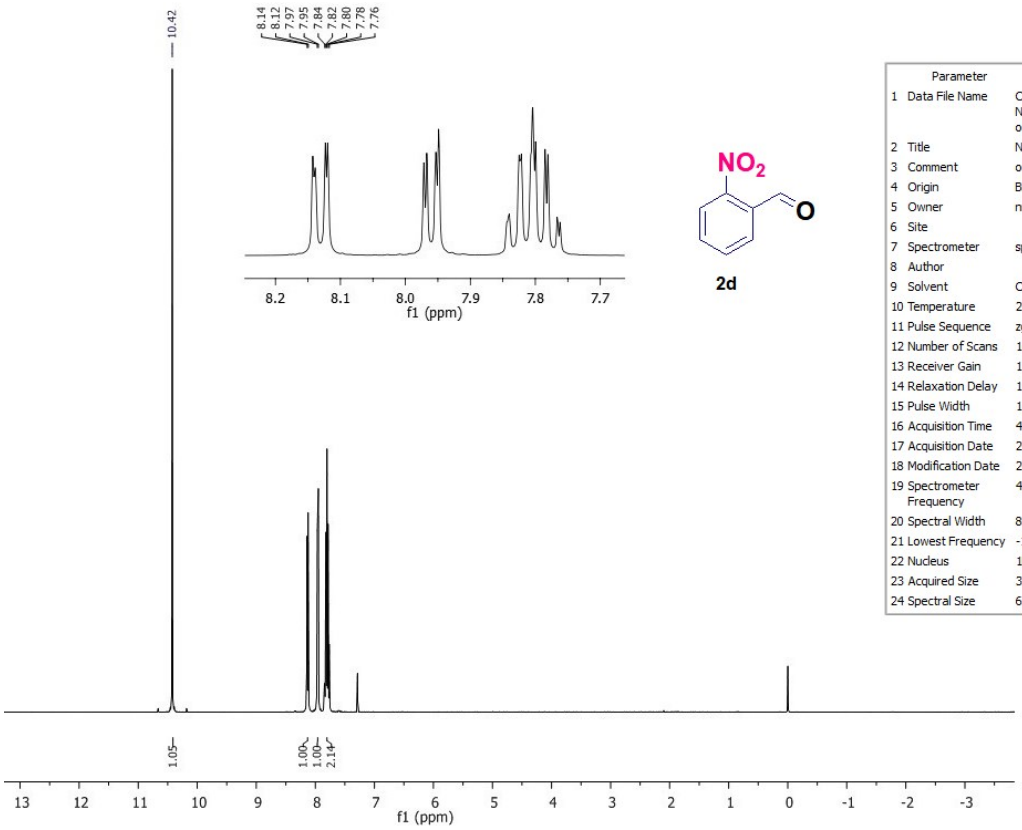
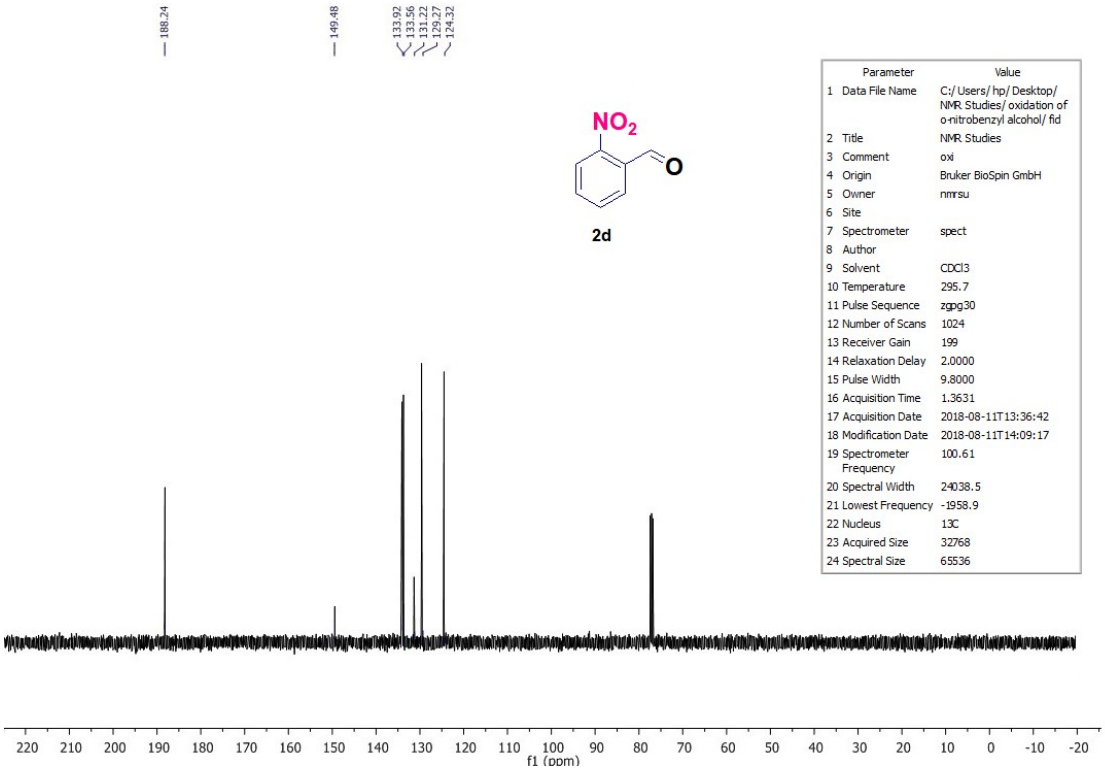
1	Data File Name	C:/Users/hp/Desktop/NMR studies/13 CNMR of mcl ben/fid
2	Title	13C NMR of mcl benzaldehyde
3	Comment	mcl ben
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	296.7
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	31
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2018-11-26T12:09:59
18	Modification Date	2018-11-26T12:10:03
19	Spectrometer Frequency	400.13
20	Spectral Width	8012.8
21	Lowest Frequency	-1535.4
22	Nucleus	13C
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
1	Data File Name	C:/ Users/ hp/ Desktop/ NMR Studies/ oxidation of o-nitrobenzyl alcohol/ fid
2	Title	NMR Studies
3	Comment	oxi
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	294.7
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	114
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2018-08-11T13:09:33
18	Modification Date	2018-08-11T13:09:34
19	Spectrometer Frequency	400.13
20	Spectral Width	8012.8
21	Lowest Frequency	-1535.4
22	Nucleus	1H
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
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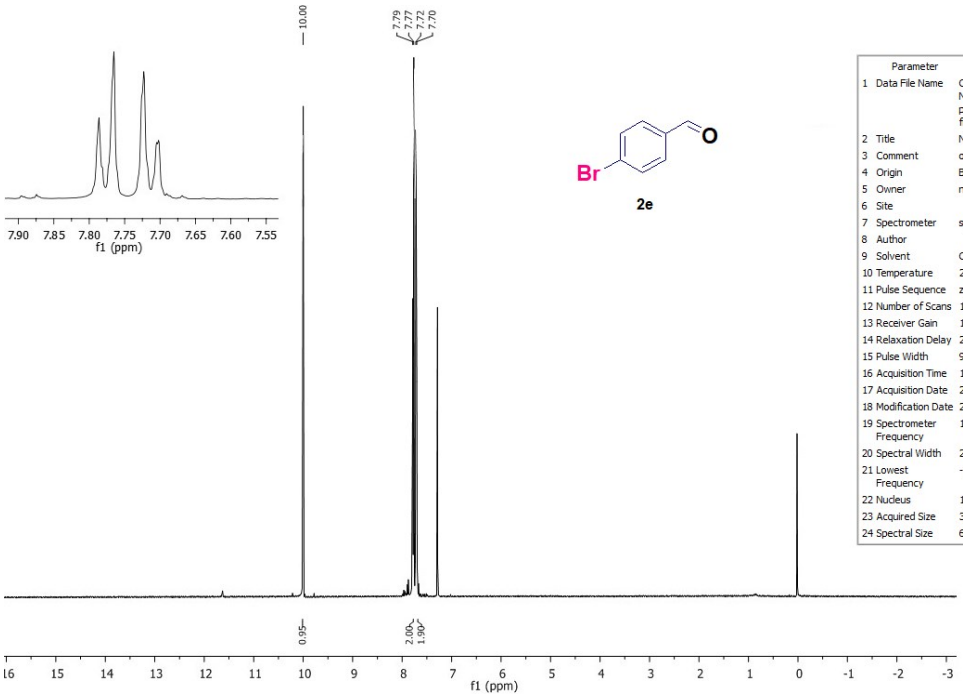
2	Title	NMR Studies
3	Comment	oxi
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	295.7
11	Pulse Sequence	zgpg30
12	Number of Scans	1024
13	Receiver Gain	199
14	Relaxation Delay	2.0000
15	Pulse Width	9.8000
16	Acquisition Time	1.3631
17	Acquisition Date	2018-08-11T13:36:42
18	Modification Date	2018-08-11T14:09:17
19	Spectrometer Frequency	100.61
20	Spectral Width	24038.5
21	Lowest Frequency	-1958.9
22	Nucleus	13C
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
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2	Title	NMR Studies
3	Comment	oxi
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	295.7
11	Pulse Sequence	zgpg30
12	Number of Scans	1024
13	Receiver Gain	199
14	Relaxation Delay	2.0000
15	Pulse Width	9.8000
16	Acquisition Time	1.3631
17	Acquisition Date	2018-08-07T14:31:34
18	Modification Date	2018-08-07T14:32:40
19	Spectrometer Frequency	100.61
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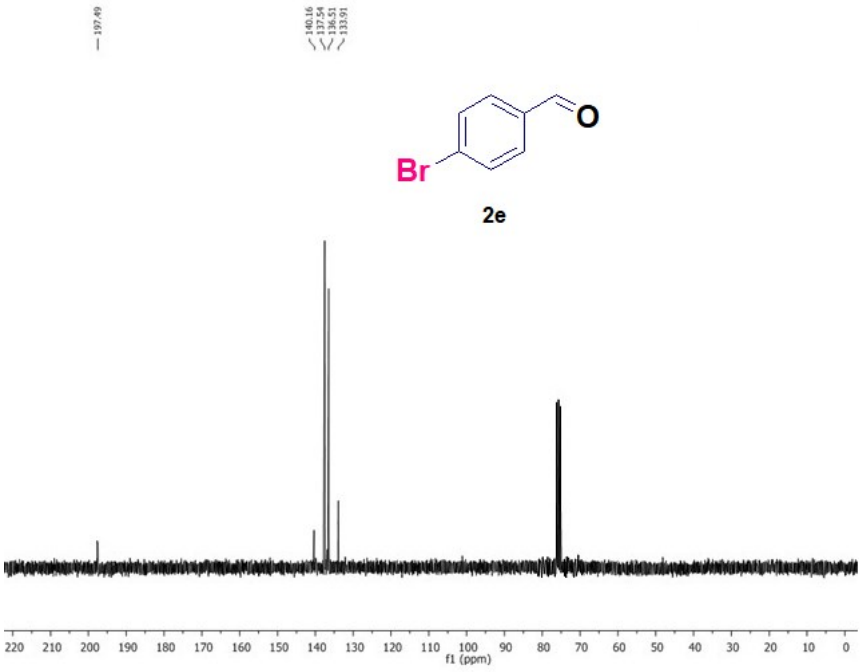
21	Lowest Frequency	-1958.9
22	Nucleus	1H
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
1	Data File Name	C:/ Users/ hp/ Desktop/ NMR Studies/ p-br/ fid
2	Title	NMR Studies
3	Comment	oxi
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	295.7
11	Pulse Sequence	zgpg30
12	Number of Scans	1024
13	Receiver Gain	199
14	Relaxation Delay	2.0000
15	Pulse Width	9.8000
16	Acquisition Time	1.3631
17	Acquisition Date	2018-08-07T10:36:42
18	Modification Date	2018-08-07T10:09:17
19	Spectrometer Frequency	100.61
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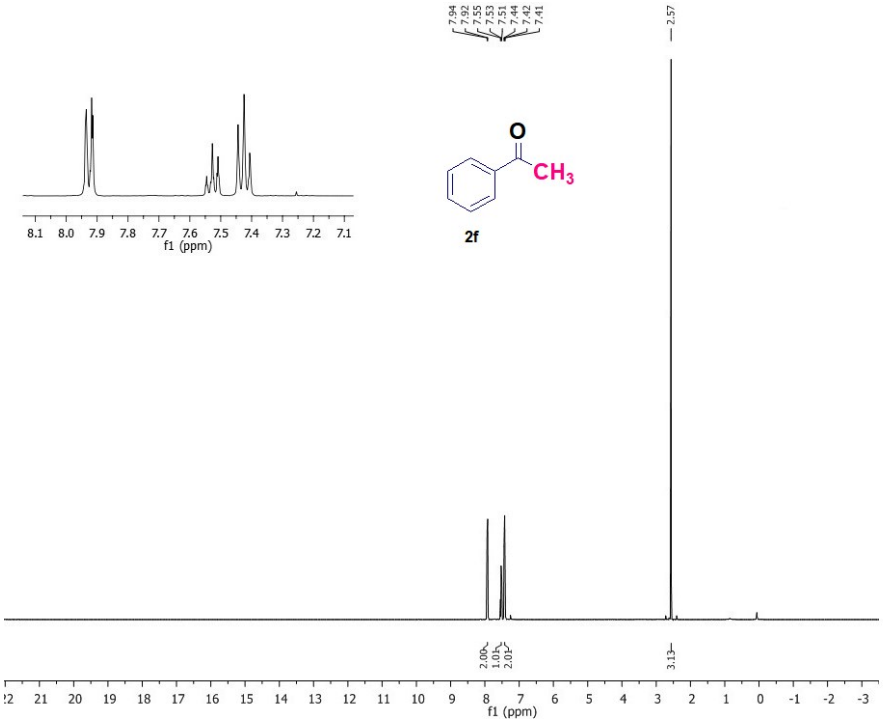
21	Lowest Frequency	-1958.9
22	Nucleus	13C
23	Acquired Size	32768
24	Spectral Size	65536



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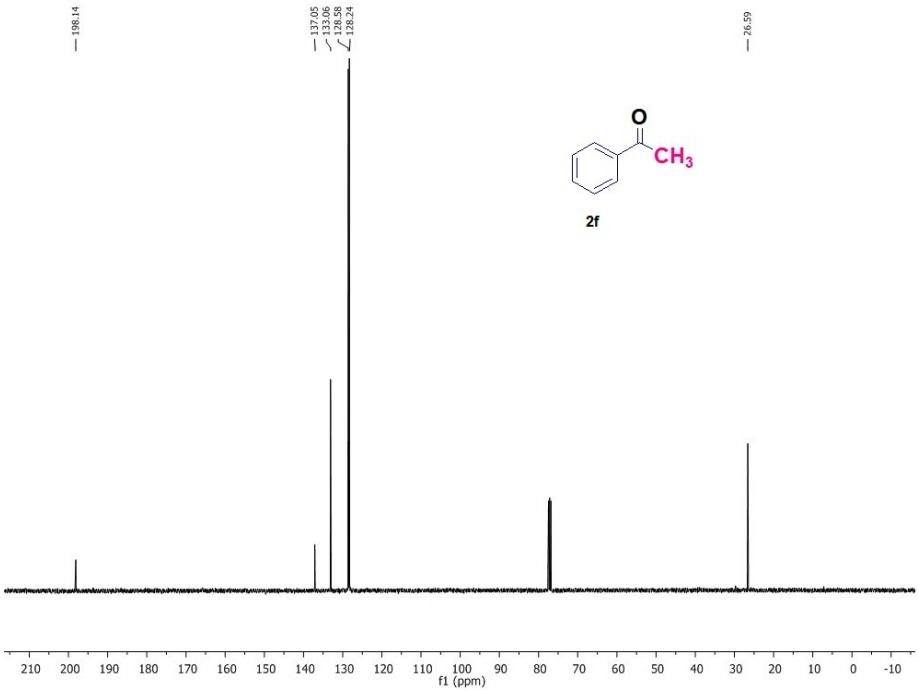
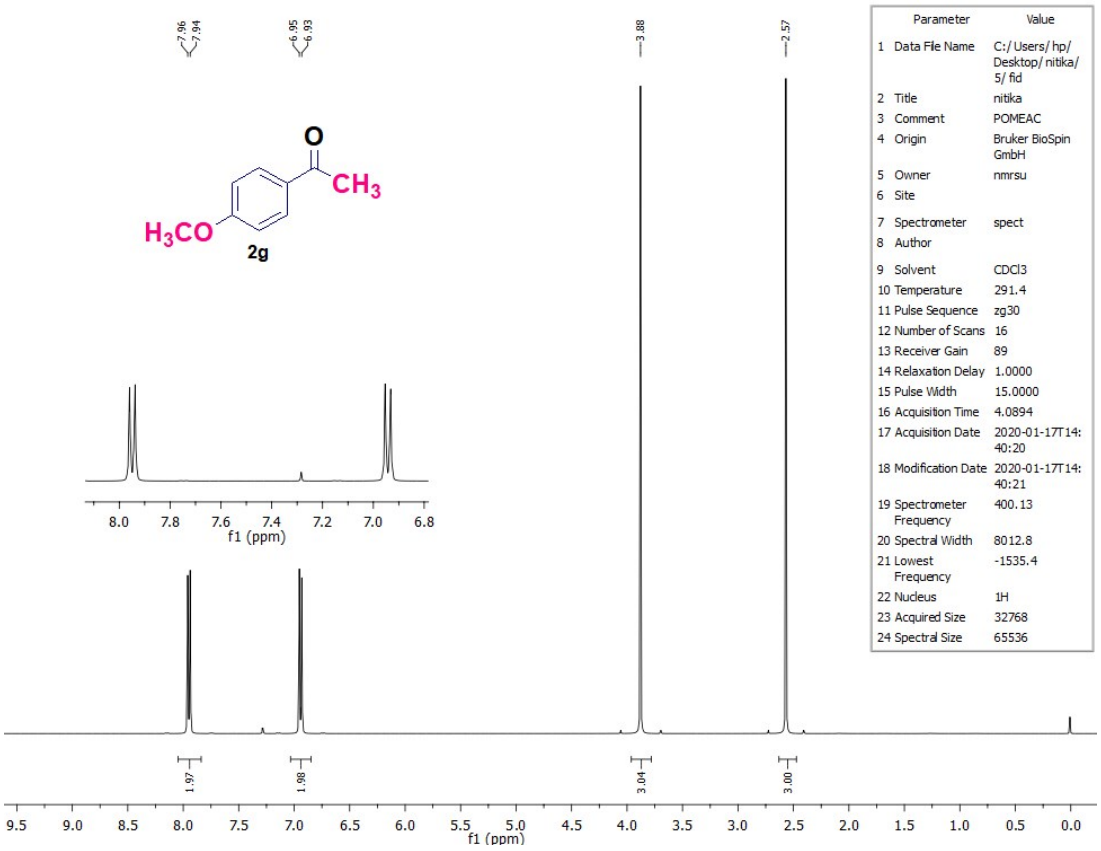
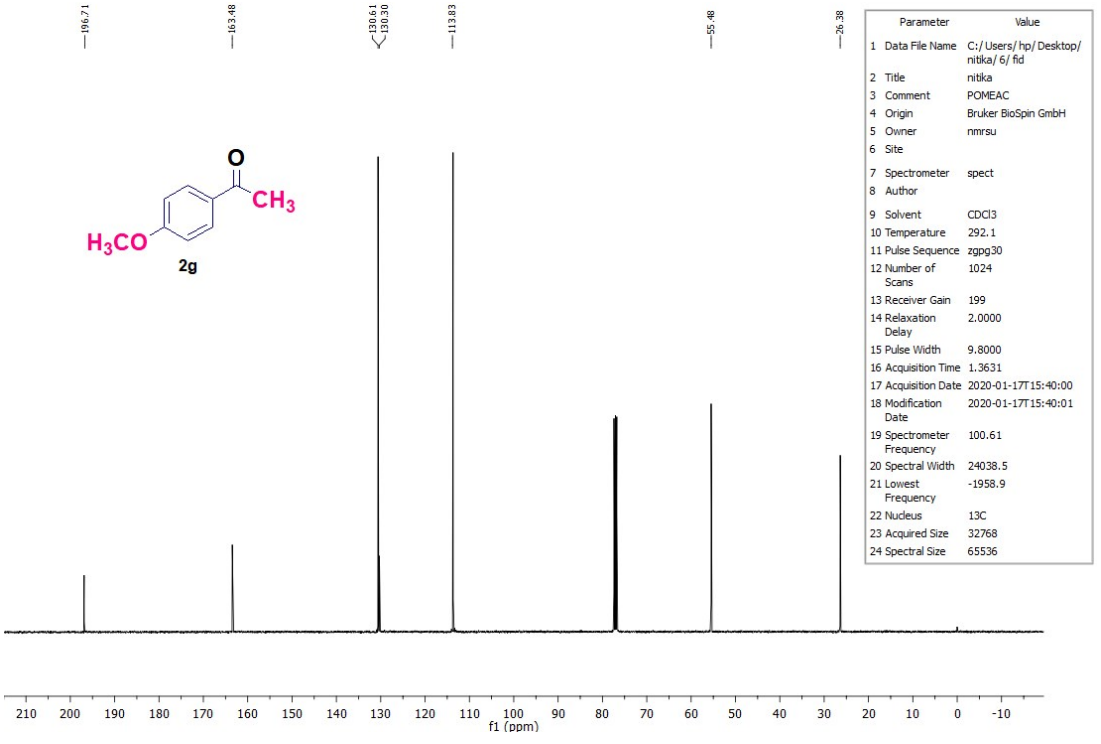
1	Data File Name	C:/Users/hp/Desktop/NMR Studies/act/fid
2	Title	NMR Studies
3	Comment	oxi
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	294.7
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	114
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2018-09-19T12:09:33
18	Modification Date	2018-09-19T12:09:34
19	Spectrometer Frequency	400.13
20	Spectral Width	8012.8
21	Lowest Frequency	-1535.4
22	Nucleus	1H
23	Acquired Size	32768
24	Spectral Size	65536



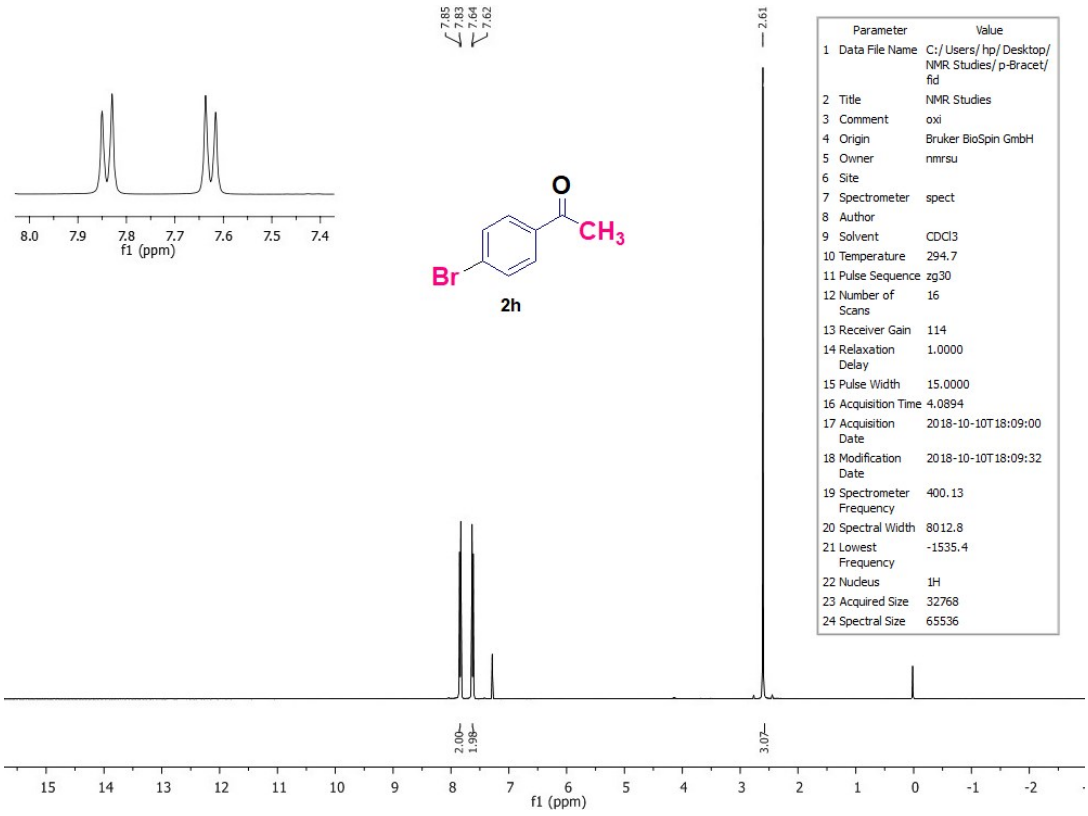
	Parameter	Value
1	Data File Name	C:/Users/hp/Desktop/NMR Studies/act/fid
2	Title	NMR Studies
3	Comment	oxi
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	294.7
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	114
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2018-09-19T16:08:32
18	Modification Date	2018-09-19T16:08:31
19	Spectrometer Frequency	400.13
20	Spectral Width	8012.8
21	Lowest Frequency	-1535.4
22	Nucleus	13C
23	Acquired Size	32768
24	Spectral Size	65536



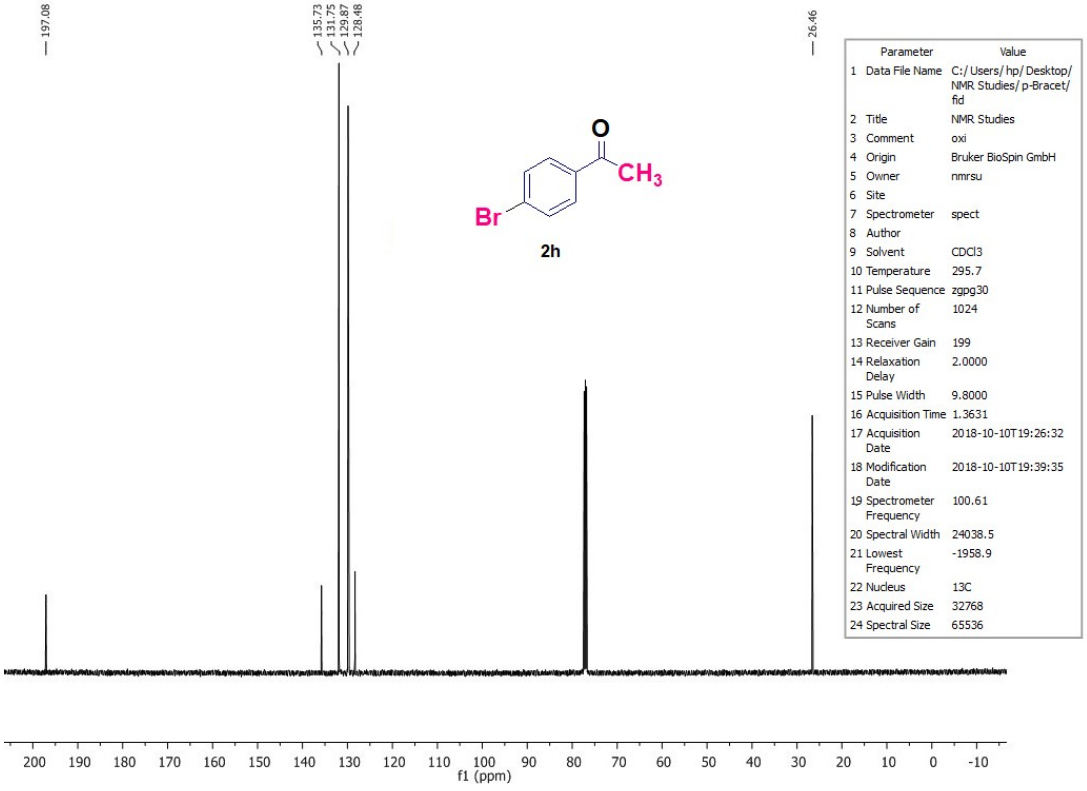
Parameter	Value
1 Data File Name	C:/ Users/ hp/ Desktop/ nitika/ 5/ fid
2 Title	nitika
3 Comment	POMEAC
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	291.4
11 Pulse Sequence	zg30
12 Number of Scans	16
13 Receiver Gain	89
14 Relaxation Delay	1.0000
15 Pulse Width	15.0000
16 Acquisition Time	4.0894
17 Acquisition Date	2020-01-17T14:40:20
18 Modification Date	2020-01-17T14:40:21
19 Spectrometer Frequency	400.13
20 Spectral Width	8012.8
21 Lowest Frequency	-1535.4
22 Nucleus	1H
23 Acquired Size	32768
24 Spectral Size	65536



Parameter	Value
1 Data File Name	C:/ Users/ hp/ Desktop/ nitika/ 6/ fid
2 Title	nitika
3 Comment	POMEAC
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	292.1
11 Pulse Sequence	zgpg30
12 Number of Scans	1024
13 Receiver Gain	199
14 Relaxation Delay	2.0000
15 Pulse Width	9.8000
16 Acquisition Time	1.3631
17 Acquisition Date	2020-01-17T15:40:00
18 Modification Date	2020-01-17T15:40:01
19 Spectrometer Frequency	100.61
20 Spectral Width	24038.5
21 Lowest Frequency	-1958.9
22 Nucleus	13C
23 Acquired Size	32768
24 Spectral Size	65536



	Parameter	Value
1	Data File Name	C:/Users/hp/Desktop/NMR Studies/p-Bracet/fid
2	Title	NMR Studies
3	Comment	oxi
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	294.7
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	114
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2018-10-10T18:09:00
18	Modification Date	2018-10-10T18:09:32
19	Spectrometer Frequency	400.13
20	Spectral Width	8012.8
21	Lowest Frequency	-1535.4
22	Nucleus	1H
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
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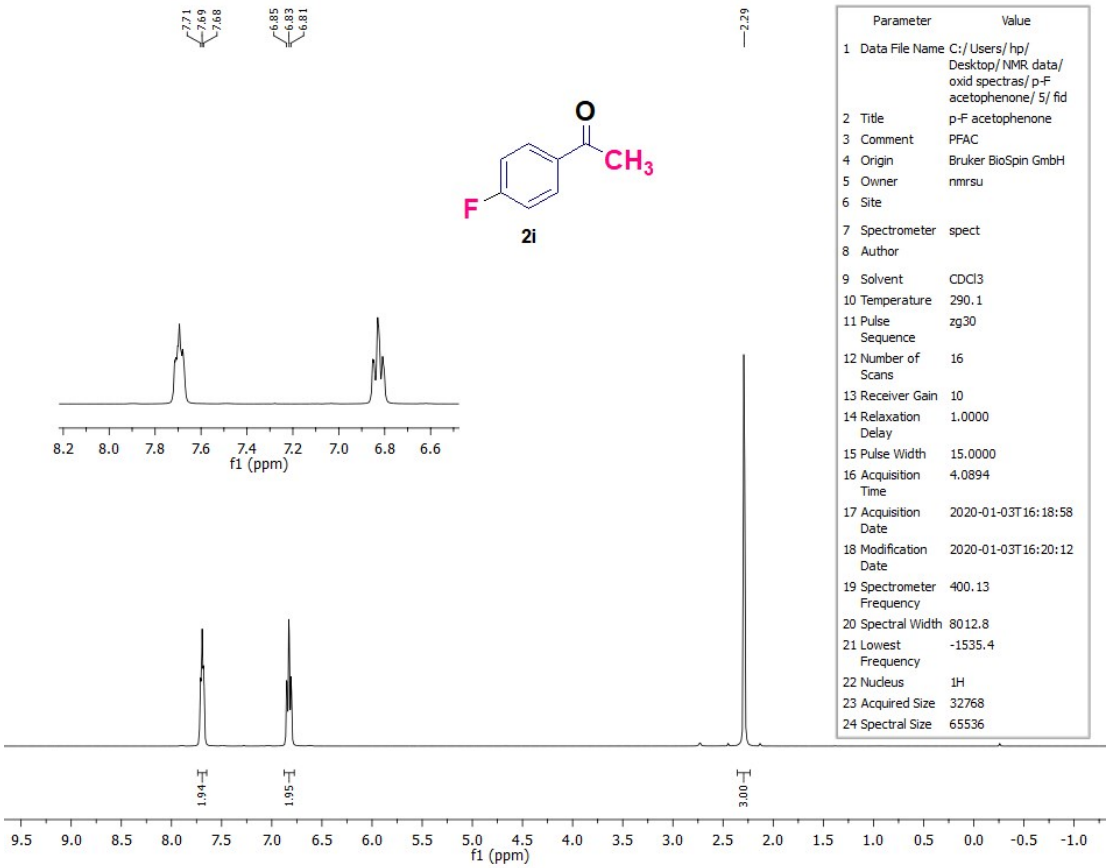
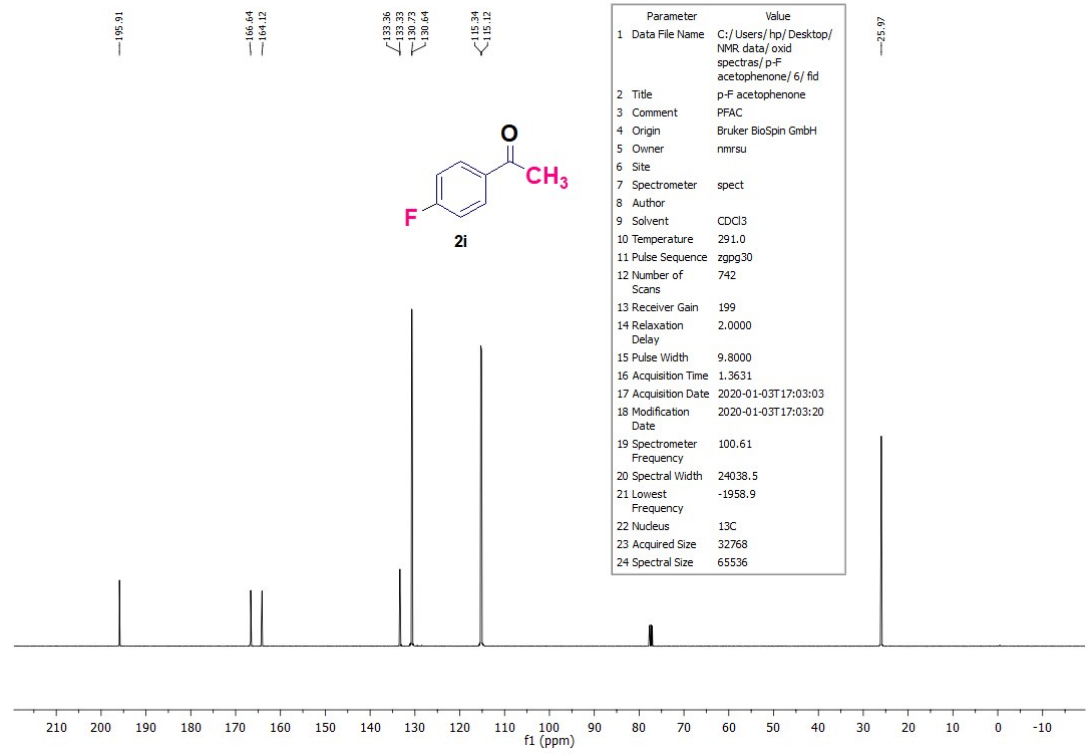
2	Title	NMR Studies
3	Comment	oxi
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	295.7
11	Pulse Sequence	zgpg30
12	Number of Scans	1024
13	Receiver Gain	199
14	Relaxation Delay	2.0000
15	Pulse Width	9.8000
16	Acquisition Time	1.3631
17	Acquisition Date	2018-10-10T19:26:32
18	Modification Date	2018-10-10T19:39:35
19	Spectrometer Frequency	100.61
20	Spectral Width	24038.5
21	Lowest Frequency	-1958.9
22	Nucleus	13C
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
1	Data File Name	C:/ Users/ hp/ Desktop/ NMR data/ oxid spectras/ p-F acetophenone/ 5/ fid
2	Title	p-F acetophenone
3	Comment	PFAC
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	290.1
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	10
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2020-01-03T16:18:58
18	Modification Date	2020-01-03T16:20:12
19	Spectrometer Frequency	400.13
20	Spectral Width	8012.8
21	Lowest Frequency	-1535.4
22	Nucleus	1H
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
1	Data File Name	C:/ Users/ hp/ Desktop/ NMR data/ oxid spectras/ p-F acetophenone/ 6/ fid
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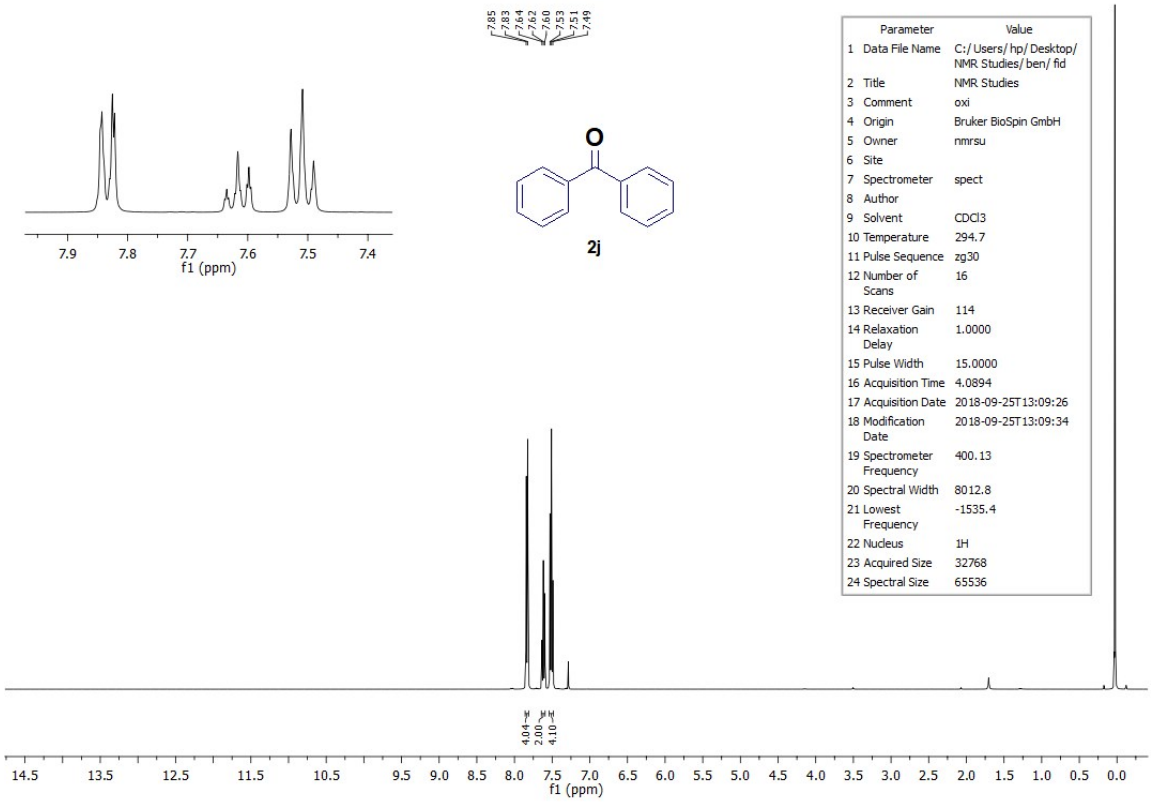
3	Comment	PFAC
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	291.0
11	Pulse Sequence	zgpg30
12	Number of Scans	742
13	Receiver Gain	199
14	Relaxation Delay	2.0000
15	Pulse Width	9.8000
16	Acquisition Time	1.3631
17	Acquisition Date	2020-01-03T17:03:03
18	Modification Date	2020-01-03T17:03:20
19	Spectrometer Frequency	100.61
20	Spectral Width	24038.5
21	Lowest Frequency	-1958.9
22	Nucleus	13C
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
1	Data File Name	C:/Users/hp/Desktop/NMR Studies/ben/fid
2	Title	NMR Studies
3	Comment	oxi
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	294.7
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	114
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2018-09-25T13:09:26
18	Modification Date	2018-09-25T13:09:34
19	Spectrometer Frequency	400.13
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21	Lowest Frequency	-1535.4
22	Nucleus	1H
23	Acquired Size	32768
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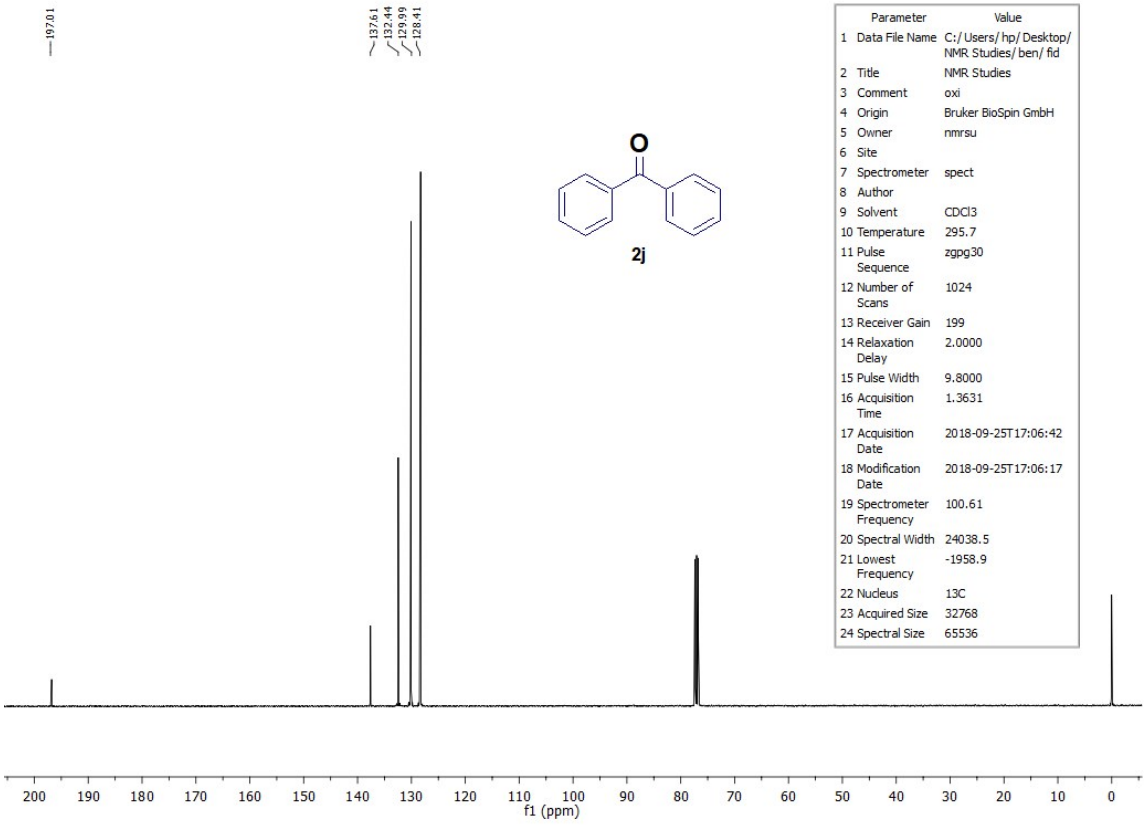
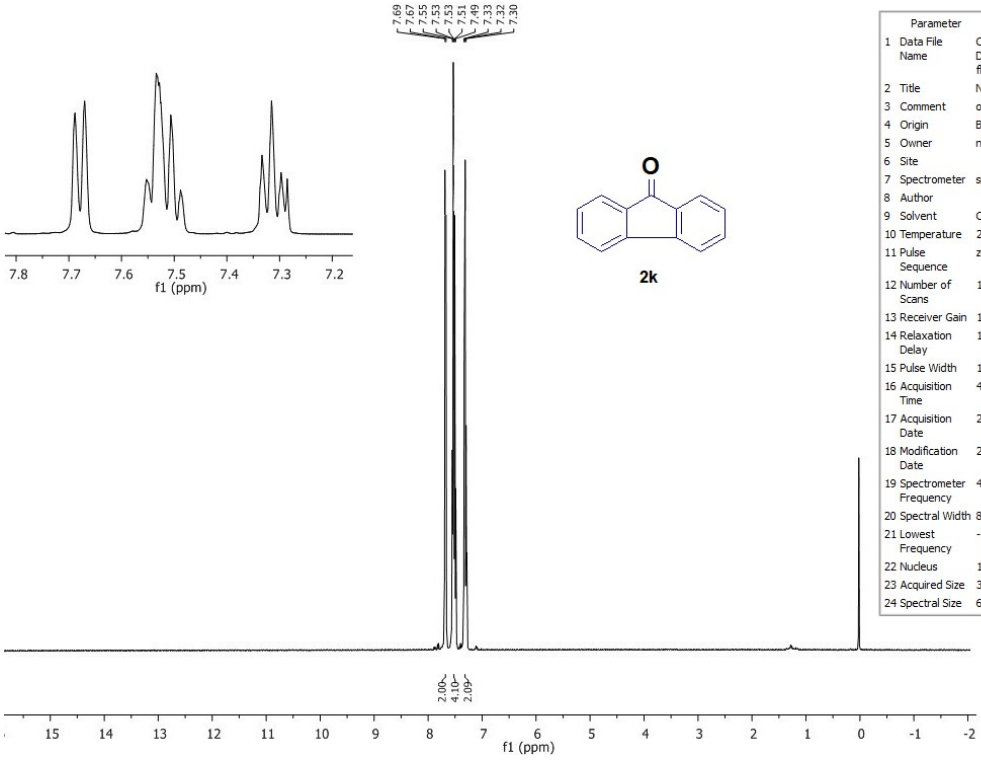
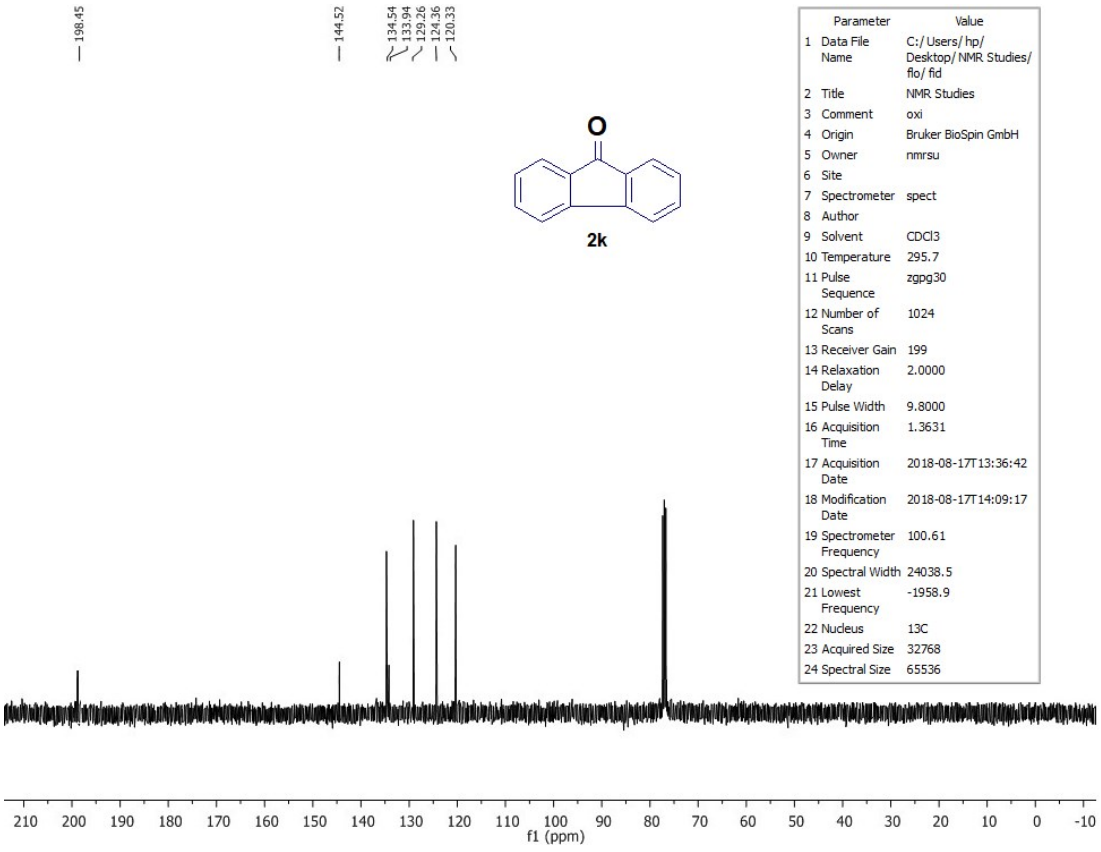


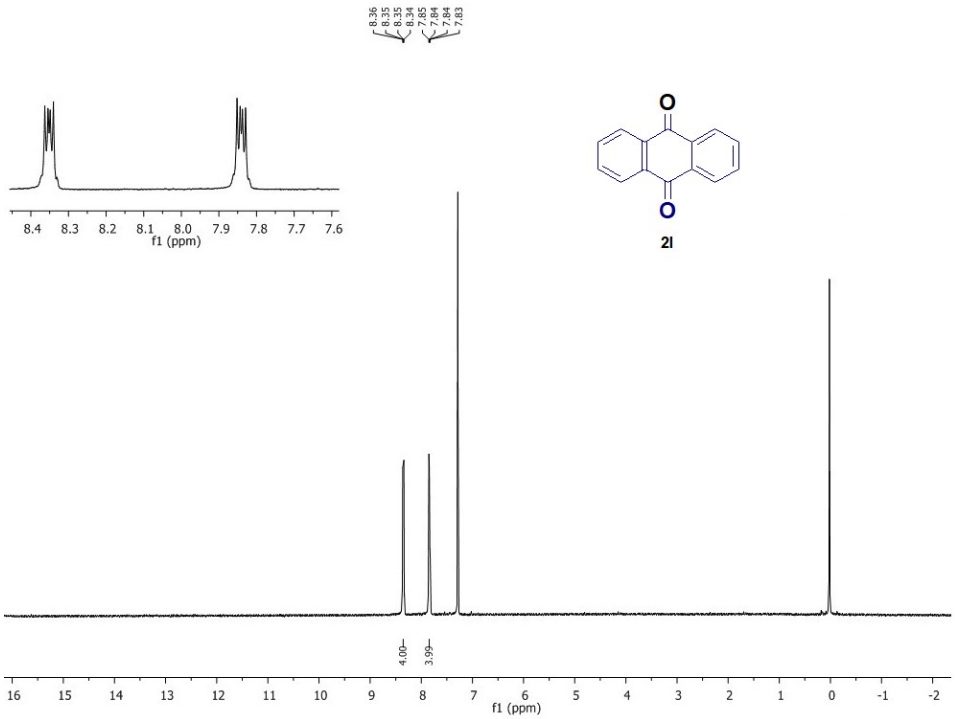
	Parameter	Value
1	Data File Name	C:/Users/hp/Desktop/NMR Studies/ben/fid
2	Title	NMR Studies
3	Comment	oxi
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	295.7
11	Pulse Sequence	zgpg30
12	Number of Scans	1024
13	Receiver Gain	199
14	Relaxation Delay	2.0000
15	Pulse Width	9.8000
16	Acquisition Time	1.3631
17	Acquisition Date	2018-09-25T17:06:42
18	Modification Date	2018-09-25T17:06:17
19	Spectrometer Frequency	100.61
20	Spectral Width	24038.5
21	Lowest Frequency	-1958.9
22	Nucleus	13C
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
1	Data File Name	C:/Users/hp/Desktop/NMR Studies/flo/fid
2	Title	NMR Studies
3	Comment	oxi
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	294.7
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	114
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2018-08-17T11:39:10
18	Modification Date	2018-08-17T11:39:12
19	Spectrometer Frequency	400.13
20	Spectral Width	8012.8
21	Lowest Frequency	-1535.4
22	Nucleus	1H
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
1	Data File Name	C:/Users/hp/Desktop/NMR Studies/flo/fid
2	Title	NMR Studies
3	Comment	oxi
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	295.7
11	Pulse Sequence	zgpg30
12	Number of Scans	1024
13	Receiver Gain	199
14	Relaxation Delay	2.0000
15	Pulse Width	9.8000
16	Acquisition Time	1.3631
17	Acquisition Date	2018-08-17T13:36:42
18	Modification Date	2018-08-17T14:09:17
19	Spectrometer Frequency	100.61
20	Spectral Width	24038.5
21	Lowest Frequency	-1958.9
22	Nucleus	13C
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
1	Data File Name	C:/Users/hp/Desktop/NMR Studies/anth/fid
2	Title	NMR Studies
3	Comment	oxi
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	294.7
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	114
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2018-09-26T15:39:12
18	Modification Date	2018-09-26T15:39:14
19	Spectrometer Frequency	400.13
20	Spectral Width	8012.8
21	Lowest Frequency	-1535.4
22	Nucleus	1H
23	Acquired Size	32768
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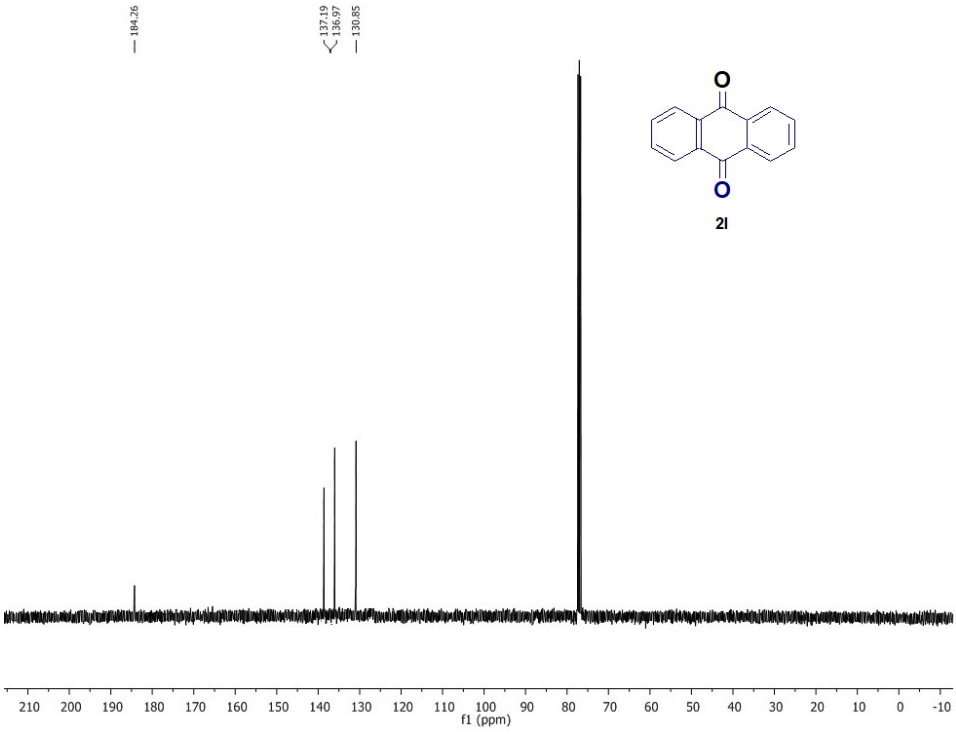
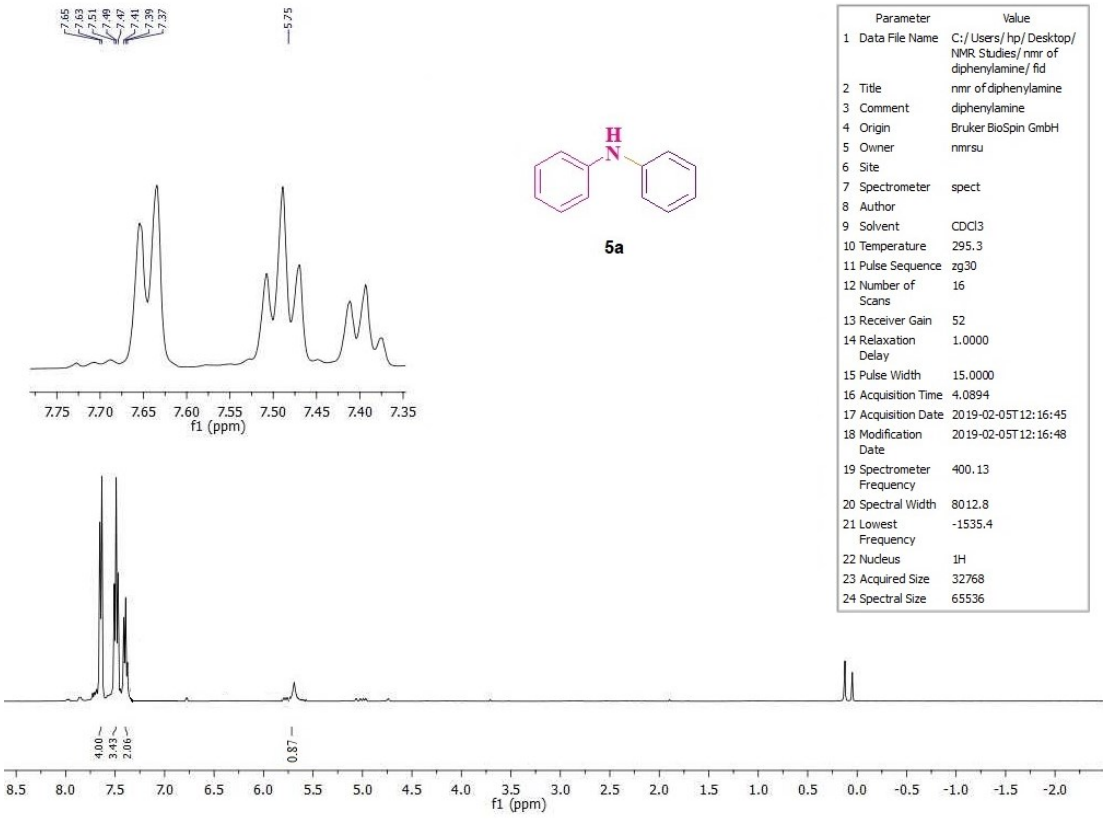


	Parameter	Value
1	Data File Name	C:/Users/hp/Desktop/NMR Studies/anth/fid
2	Title	NMR Studies
3	Comment	oxi
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	295.7
11	Pulse Sequence	zgpg30
12	Number of Scans	1024
13	Receiver Gain	199
14	Relaxation Delay	2.0000
15	Pulse Width	9.8000
16	Acquisition Time	1.3631
17	Acquisition Date	2018-09-26T15:03:42
18	Modification Date	2018-09-26T15:09:00
19	Spectrometer Frequency	100.61
20	Spectral Width	24038.5
21	Lowest Frequency	-1958.9
22	Nucleus	13C
23	Acquired Size	32768
24	Spectral Size	65536

S4. ^{1}H NMR and ^{13}C NMR spectra of compounds listed in Table 5



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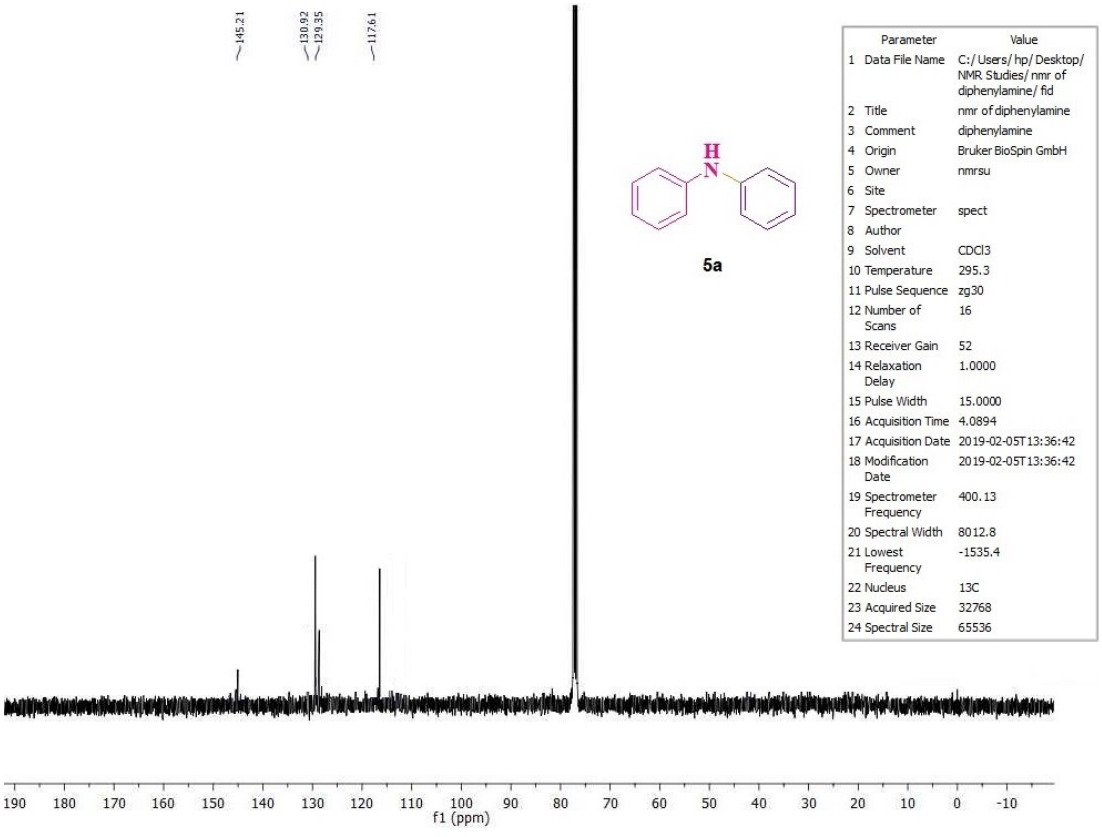
2	Title	nmr of diphenylamine
3	Comment	diphenylamine
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	295.3
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	52
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2019-02-05T12:16:45
18	Modification Date	2019-02-05T12:16:48
19	Spectrometer Frequency	400.13
20	Spectral Width	8012.8
21	Lowest Frequency	-1535.4
22	Nucleus	1H
23	Acquired Size	32768
24	Spectral Size	65536



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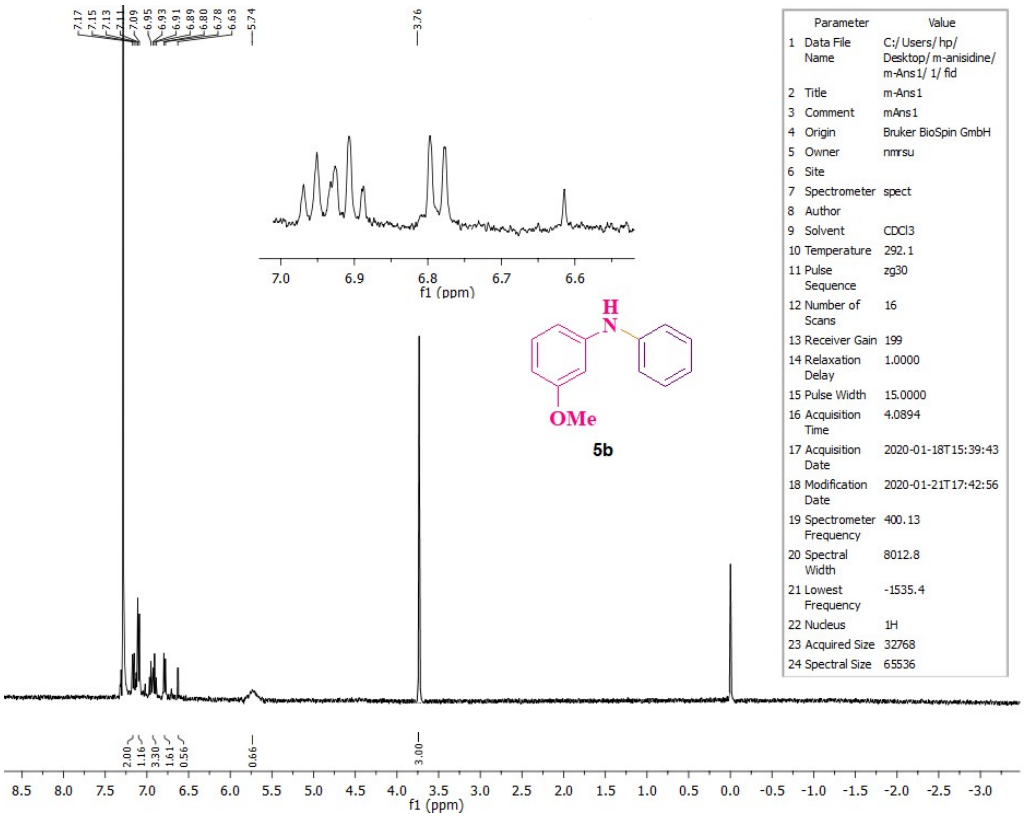
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	295.3
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	52
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2019-02-05T13:36:42
18	Modification Date	2019-02-05T13:36:42
19	Spectrometer Frequency	400.13
20	Spectral Width	8012.8
21	Lowest Frequency	-1535.4
22	Nucleus	13C
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
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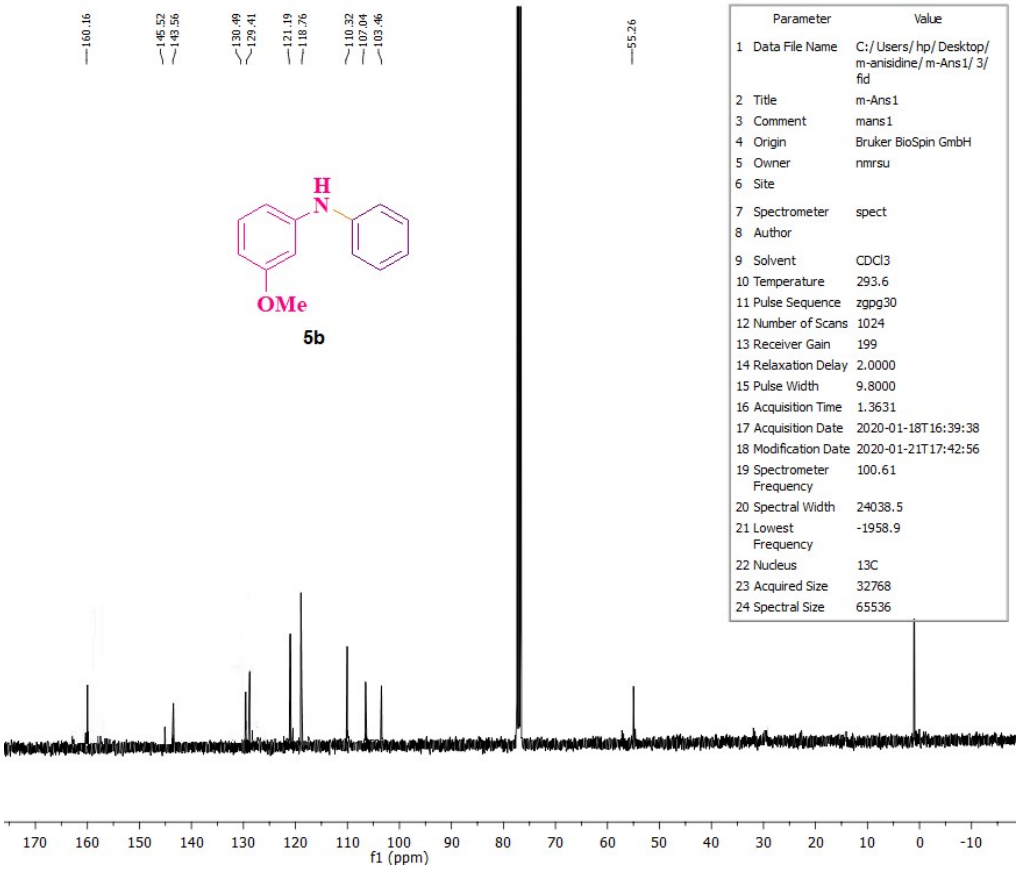
3	Comment	mAns1
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	292.1
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	199
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2020-01-18T15:39:43
18	Modification Date	2020-01-21T17:42:56
19	Spectrometer Frequency	400.13
20	Spectral Width	8012.8
21	Lowest Frequency	-1535.4
22	Nucleus	1H
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
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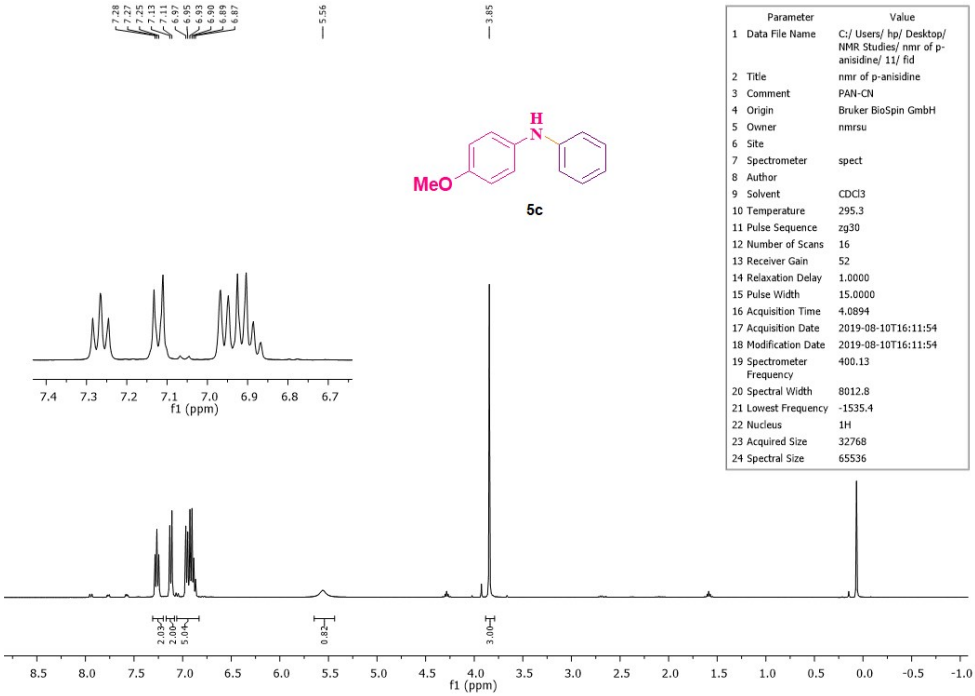
3	Comment	mans1
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	293.6
11	Pulse Sequence	zgpg30
12	Number of Scans	1024
13	Receiver Gain	199
14	Relaxation Delay	2.0000
15	Pulse Width	9.8000
16	Acquisition Time	1.3631
17	Acquisition Date	2020-01-18T16:39:38
18	Modification Date	2020-01-21T17:42:56
19	Spectrometer Frequency	100.61
20	Spectral Width	24038.5
21	Lowest Frequency	-1958.9
22	Nucleus	13C
23	Acquired Size	32768
24	Spectral Size	65536



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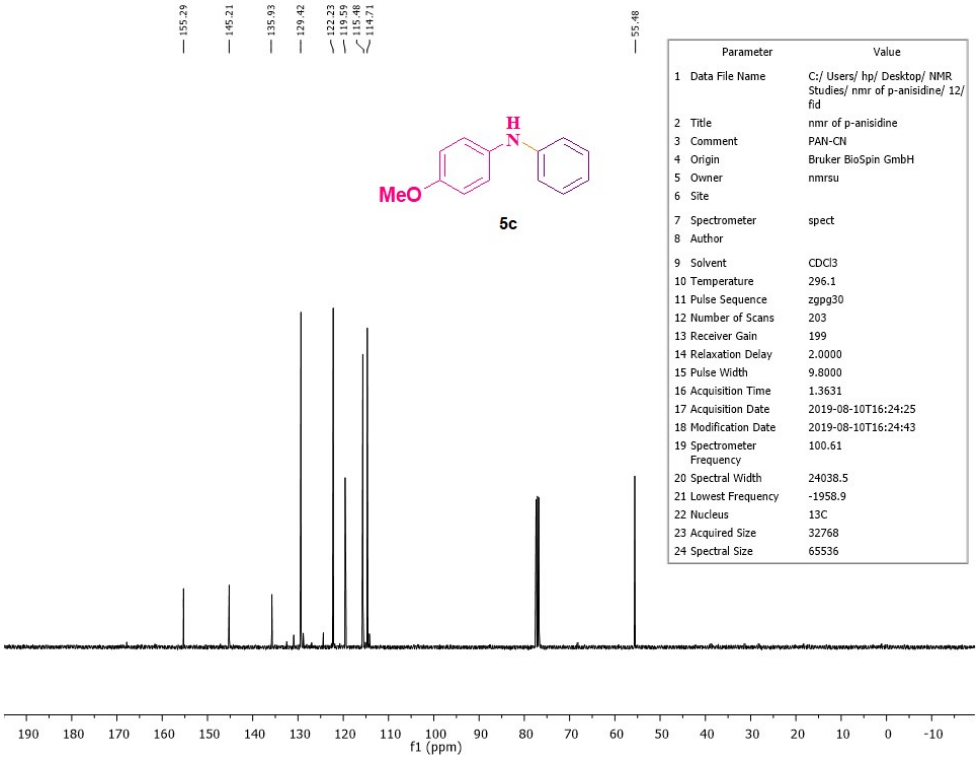
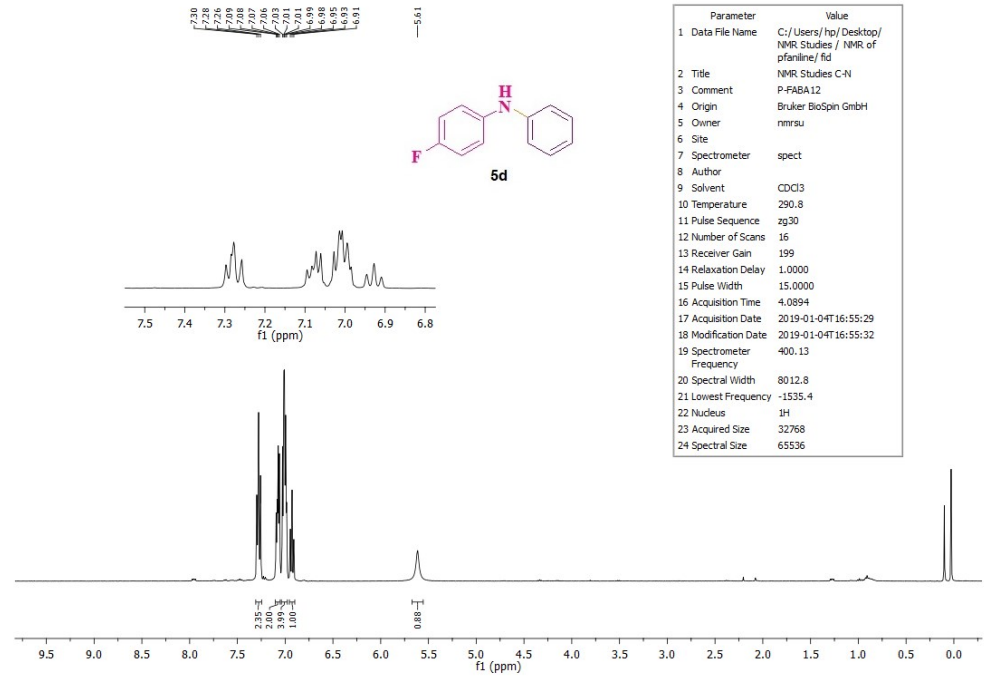
3	Comment	PAN-CN
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	295.3
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	52
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2019-08-10T16:11:54
18	Modification Date	2019-08-10T16:11:54
19	Spectrometer Frequency	400.13
20	Spectral Width	8012.8
21	Lowest Frequency	-1535.4
22	Nucleus	1H
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
1	Data File Name	C:/ Users/ hp/ Desktop/ NMR Studies/ nmr of p-anisidine/ 12/ fid
2	Title	nmr of p-anisidine
3	Comment	PAN-CN
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	296.1
11	Pulse Sequence	zgpg30
12	Number of Scans	203
13	Receiver Gain	199
14	Relaxation Delay	2.0000
15	Pulse Width	9.8000
16	Acquisition Time	1.3631
17	Acquisition Date	2019-08-10T16:24:25
18	Modification Date	2019-08-10T16:24:43
19	Spectrometer Frequency	100.61
20	Spectral Width	24038.5
21	Lowest Frequency	-1958.9
22	Nucleus	13C
23	Acquired Size	32768
24	Spectral Size	65536



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1	Data File Name	C:/Users/hp/Desktop/NMR Studies / NMR of pfaniline/fid
2	Title	NMR Studies C-N
3	Comment	P-FABA12
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	290.8
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	199
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2019-01-04T16:55:29
18	Modification Date	2019-01-04T16:55:32
19	Spectrometer Frequency	400.13
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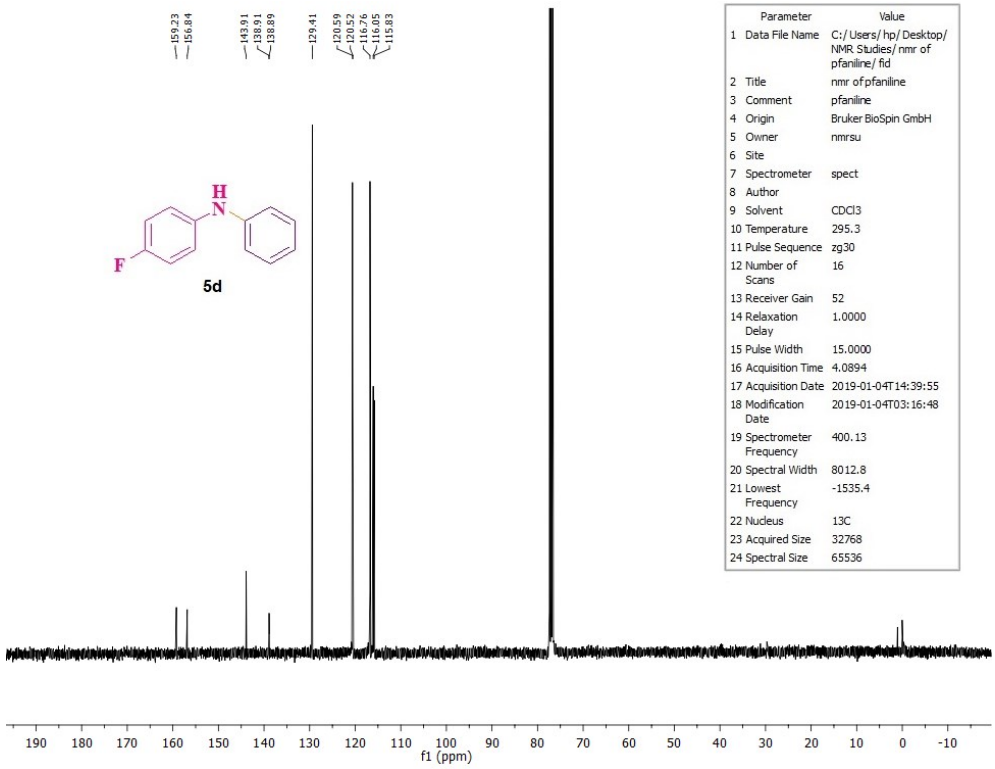
21	Lowest Frequency	-1535.4
22	Nucleus	1H
23	Acquired Size	32768
24	Spectral Size	65536



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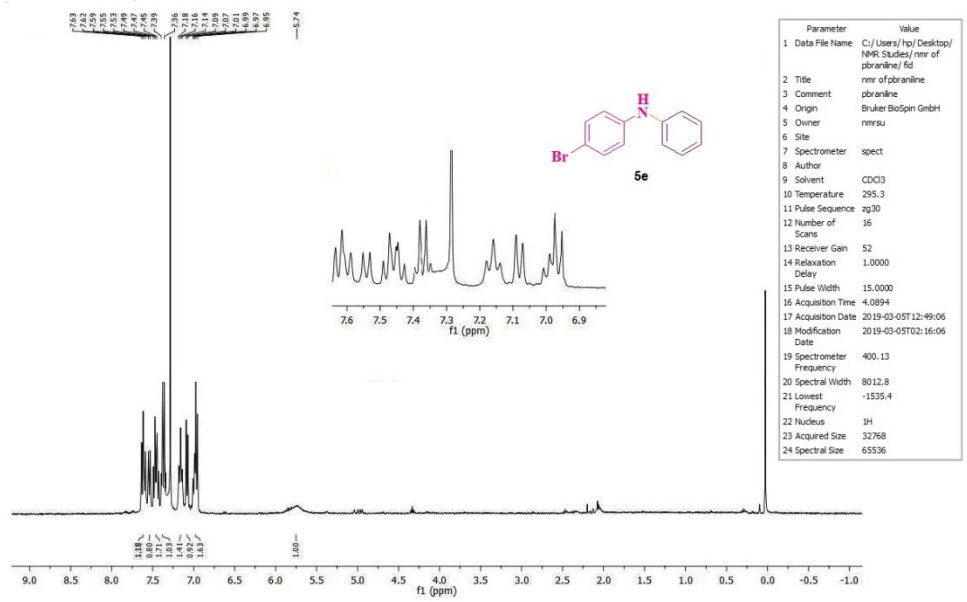
1	Data File Name	C:/Users/hp/Desktop/NMR Studies/nmr of pfaniline/fid
2	Title	nmr of pfaniline
3	Comment	pfaniline
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	295.3
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	52
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2019-01-04T14:39:55
18	Modification Date	2019-01-04T03:16:48
19	Spectrometer Frequency	400.13
20	Spectral Width	8012.8
21	Lowest Frequency	-1535.4
22	Nucleus	13C
23	Acquired Size	32768
24	Spectral Size	65536



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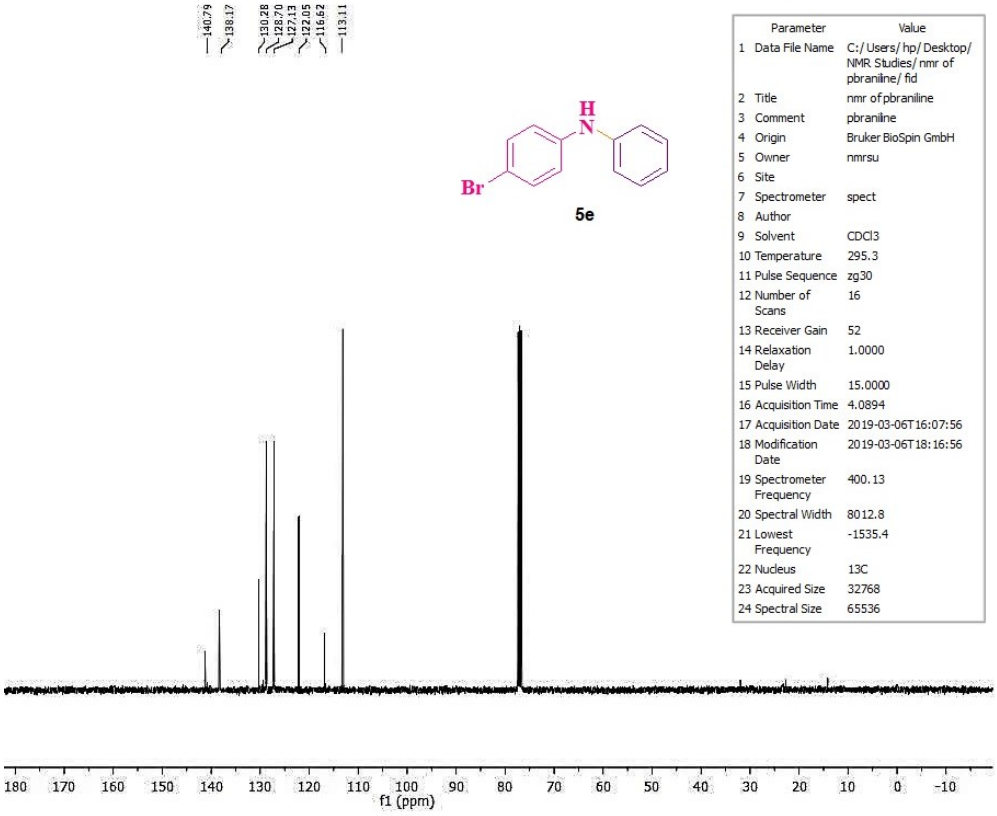
1 Data File Name	C:/Users/hp/Desktop/NMR Studies/nmr of pbraniline/fid
2 Title	nmr of pbraniline
3 Comment	pbraniline
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	295.3
11 Pulse Sequence	zg30
12 Number of Scans	16
13 Receiver Gain	52
14 Relaxation Delay	1.0000
15 Pulse Width	15.0000
16 Acquisition Time	4.0894
17 Acquisition Date	2019-03-05T12:49:06
18 Modification Date	2019-03-05T02:16:06
19 Spectrometer Frequency	400.13
20 Spectral Width	8012.8
21 Lowest Frequency	-1535.4
22 Nucleus	1H
23 Acquired Size	32768
24 Spectral Size	65536



Parameter	Value
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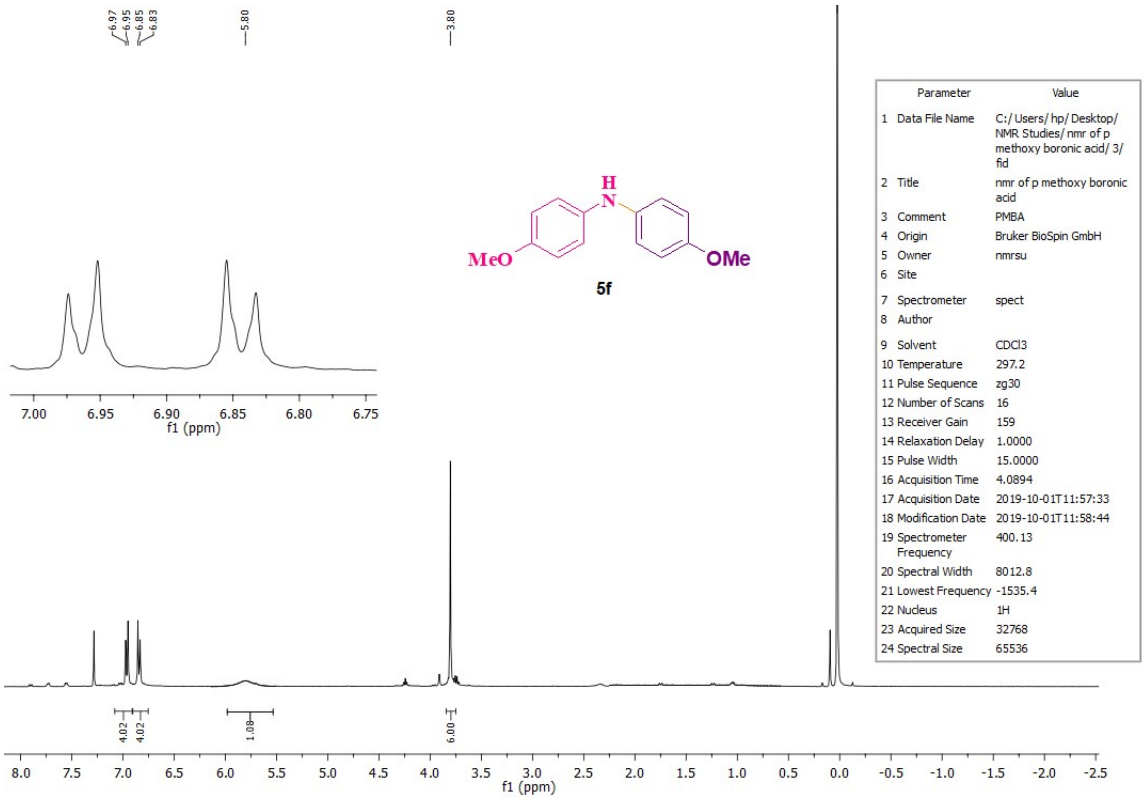
3 Comment	pbraniline
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	295.3
11 Pulse Sequence	zg30
12 Number of Scans	16
13 Receiver Gain	52
14 Relaxation Delay	1.0000
15 Pulse Width	15.0000
16 Acquisition Time	4.0894
17 Acquisition Date	2019-03-06T16:07:56
18 Modification Date	2019-03-06T18:16:56
19 Spectrometer Frequency	400.13
20 Spectral Width	8012.8
21 Lowest Frequency	-1535.4
22 Nucleus	13C
23 Acquired Size	32768
24 Spectral Size	65536



Parameter	Value
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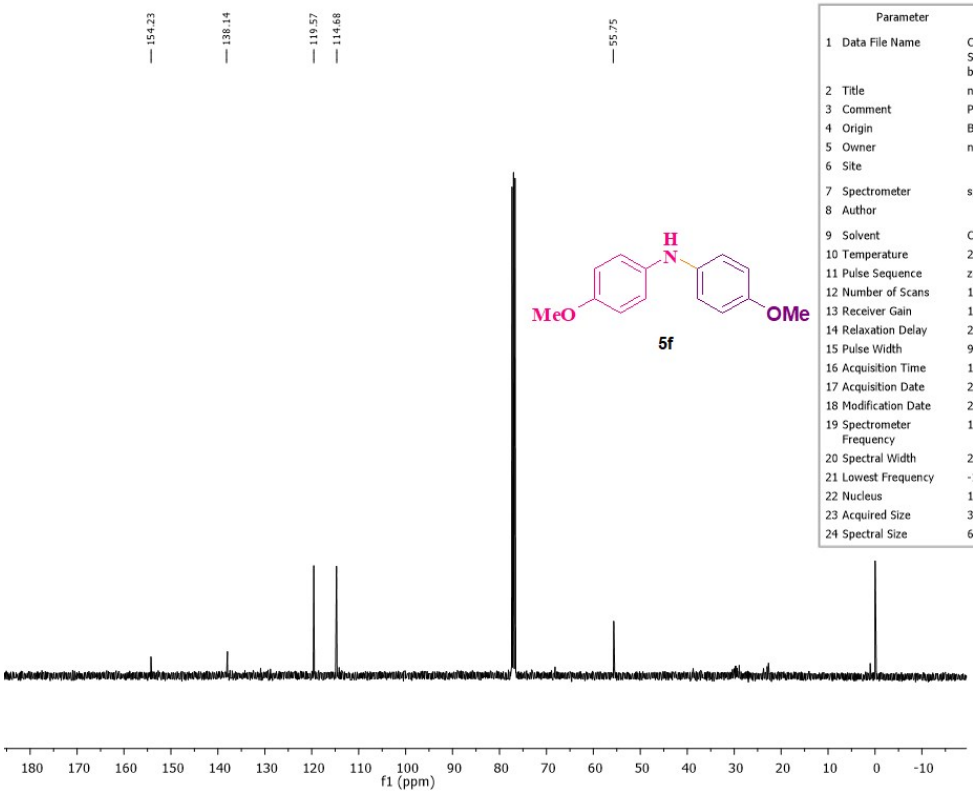
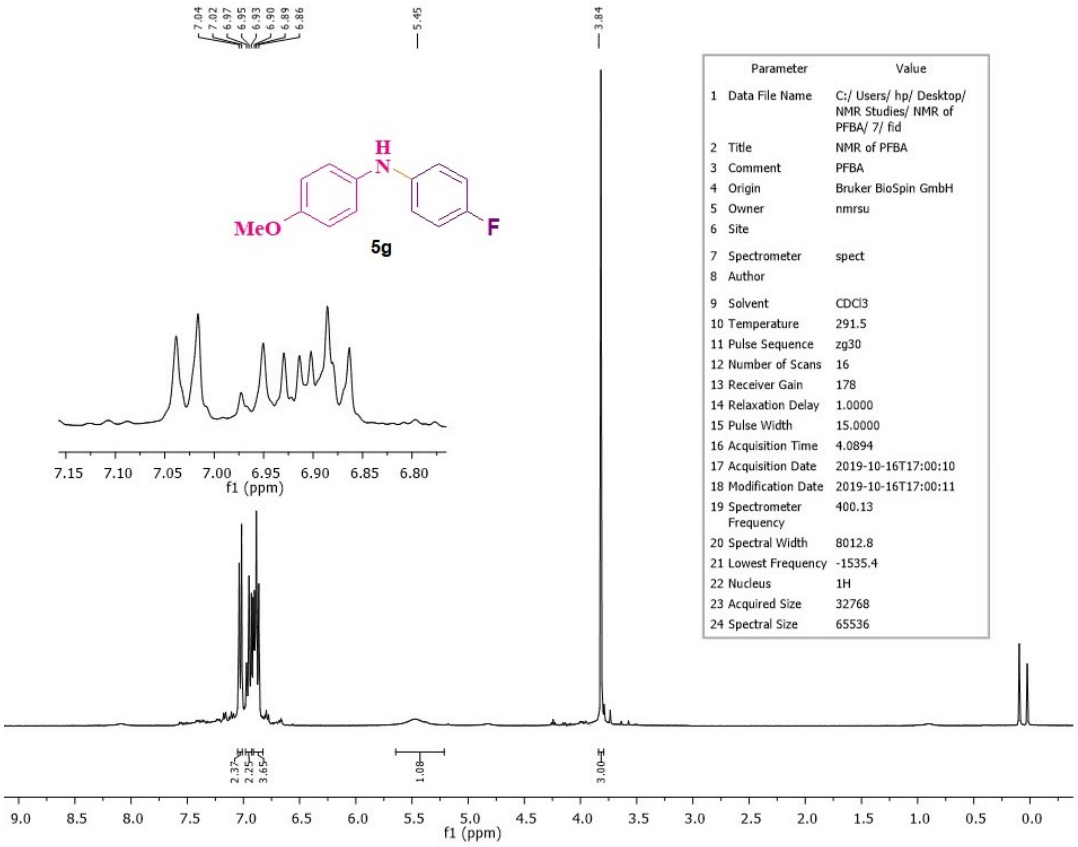
3 Comment	PMBA
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	297.2
11 Pulse Sequence	zg30
12 Number of Scans	16
13 Receiver Gain	159
14 Relaxation Delay	1.0000
15 Pulse Width	15.0000
16 Acquisition Time	4.0894
17 Acquisition Date	2019-10-01T11:57:33
18 Modification Date	2019-10-01T11:58:44
19 Spectrometer Frequency	400.13
20 Spectral Width	8012.8
21 Lowest Frequency	-1535.4
22 Nucleus	1H
23 Acquired Size	32768
24 Spectral Size	65536



Parameter	Value
1 Data File Name	C:/ Users/ hp/ Desktop/ NMR Studies/ nmr of p methoxy boronic acid/ 4/ fid
2 Title	nmr of p methoxy boronic acid
3 Comment	PMBA
4 Origin	Bruker BioSpin GmbH
5 Owner	nmrsu
6 Site	
7 Spectrometer	spect
8 Author	
9 Solvent	CDCl3
10 Temperature	297.2
11 Pulse Sequence	zgpg30
12 Number of Scans	1024
13 Receiver Gain	199
14 Relaxation Delay	2.0000
15 Pulse Width	9.8000
16 Acquisition Time	1.3631
17 Acquisition Date	2019-10-01T12:58:35
18 Modification Date	2019-10-01T12:58:36
19 Spectrometer Frequency	100.61
20 Spectral Width	24038.5
21 Lowest Frequency	-1958.9
22 Nucleus	13C
23 Acquired Size	32768
24 Spectral Size	65536



	Parameter	Value
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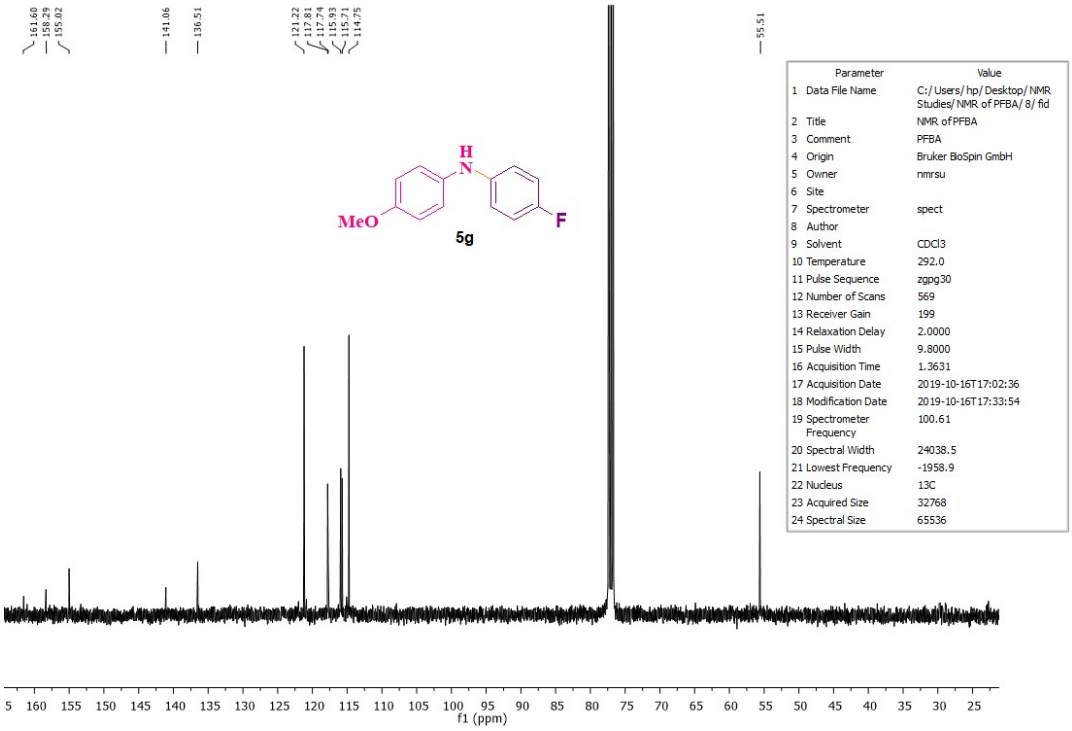
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	291.5
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	178
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2019-10-16T17:00:10
18	Modification Date	2019-10-16T17:00:11
19	Spectrometer Frequency	400.13
20	Spectral Width	8012.8
21	Lowest Frequency	-1535.4
22	Nucleus	1H
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
1	Data File Name	C:/ Users/ hp/ Desktop/ NMR Studies/ NMR of PFBA/ 8/ fid
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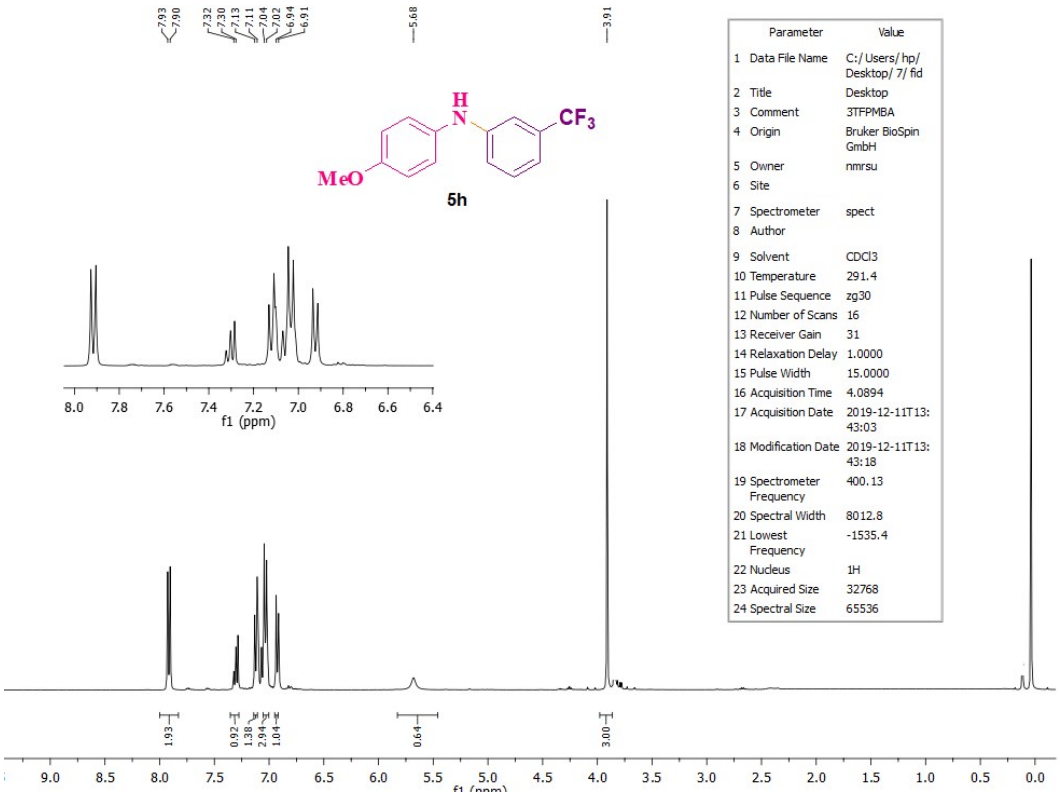
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	292.0
11	Pulse Sequence	zgpg30
12	Number of Scans	569
13	Receiver Gain	199
14	Relaxation Delay	2.0000
15	Pulse Width	9.8000
16	Acquisition Time	1.3631
17	Acquisition Date	2019-10-16T17:02:36
18	Modification Date	2019-10-16T17:33:54
19	Spectrometer Frequency	100.61
20	Spectral Width	24038.5
21	Lowest Frequency	-1958.9
22	Nucleus	13C
23	Acquired Size	32768
24	Spectral Size	65536



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5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	291.4
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	31
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2019-12-11T13:43:03
18	Modification Date	2019-12-11T13:43:18
19	Spectrometer Frequency	400.13
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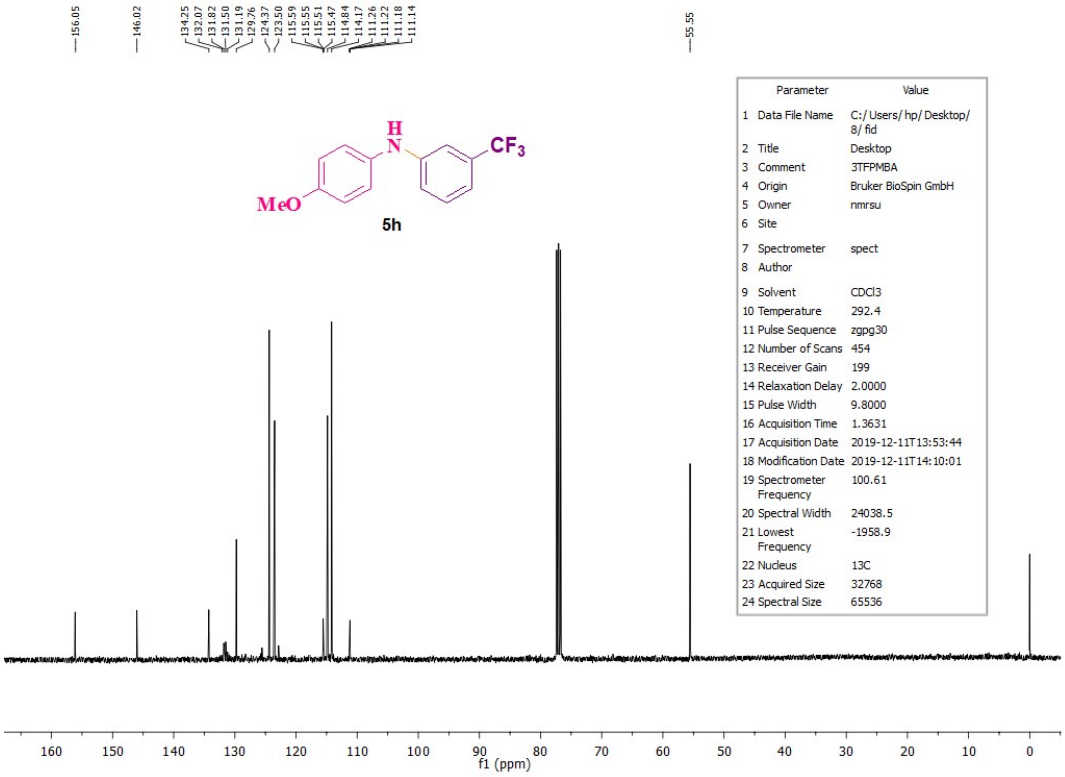
21	Lowest Frequency	-1535.4
22	Nucleus	1H
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
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2	Title	Desktop
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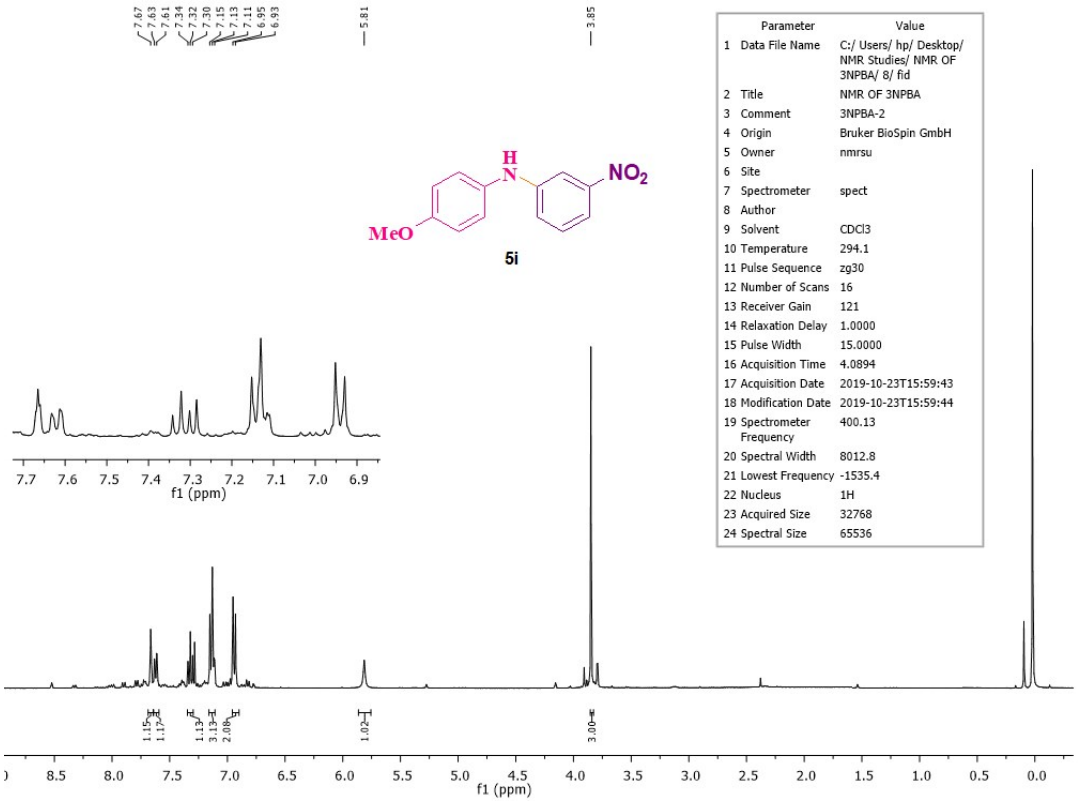
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	292.4
11	Pulse Sequence	zgpg30
12	Number of Scans	454
13	Receiver Gain	199
14	Relaxation Delay	2.0000
15	Pulse Width	9.8000
16	Acquisition Time	1.3631
17	Acquisition Date	2019-12-11T13:53:44
18	Modification Date	2019-12-11T14:10:01
19	Spectrometer Frequency	100.61
20	Spectral Width	24038.5
21	Lowest Frequency	-1958.9
22	Nucleus	13C
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
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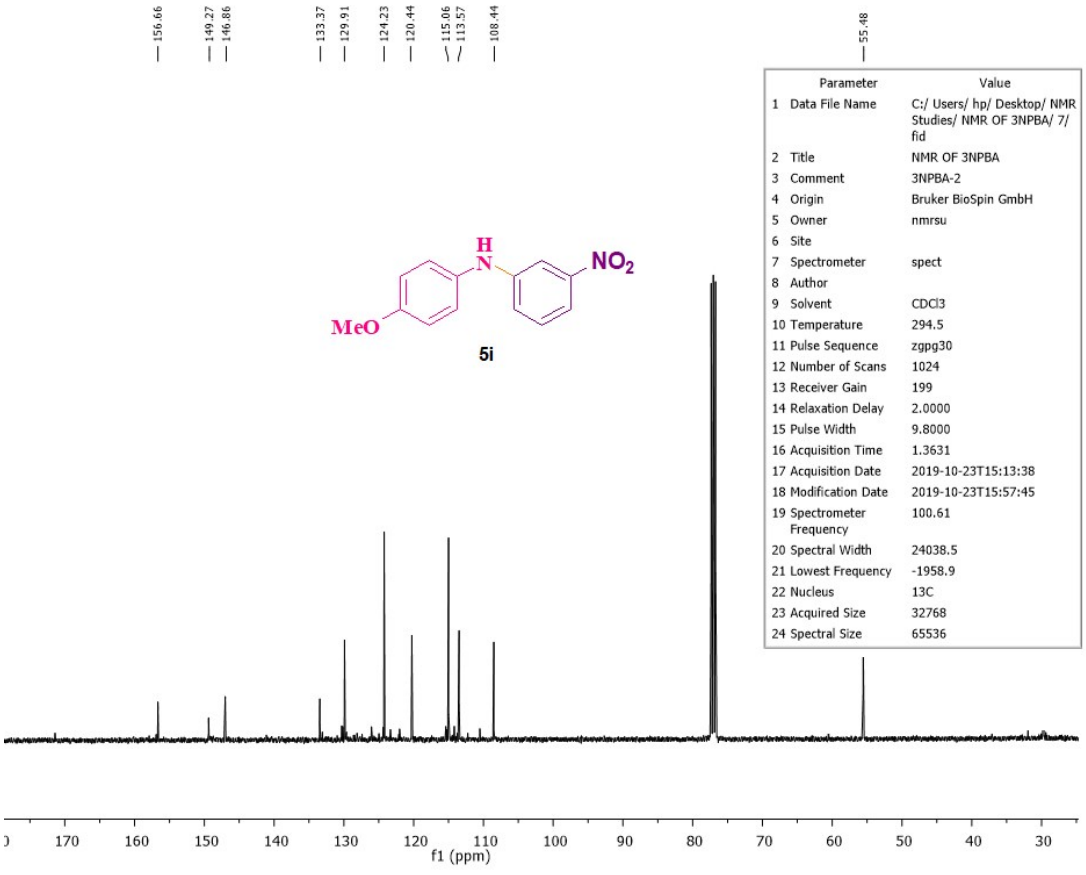
2	Title	NMR OF 3NPBA
3	Comment	3NPBA-2
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	294.1
11	Pulse Sequence	zg30
12	Number of Scans	16
13	Receiver Gain	121
14	Relaxation Delay	1.0000
15	Pulse Width	15.0000
16	Acquisition Time	4.0894
17	Acquisition Date	2019-10-23T15:59:43
18	Modification Date	2019-10-23T15:59:44
19	Spectrometer Frequency	400.13
20	Spectral Width	8012.8
21	Lowest Frequency	-1535.4
22	Nucleus	1H
23	Acquired Size	32768
24	Spectral Size	65536



	Parameter	Value
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3	Comment	3NPBA-2
4	Origin	Bruker BioSpin GmbH
5	Owner	nmrsu
6	Site	
7	Spectrometer	spect
8	Author	
9	Solvent	CDCl3
10	Temperature	294.5
11	Pulse Sequence	zgpg30
12	Number of Scans	1024
13	Receiver Gain	199
14	Relaxation Delay	2.0000
15	Pulse Width	9.8000
16	Acquisition Time	1.3631
17	Acquisition Date	2019-10-23T15:13:38
18	Modification Date	2019-10-23T15:57:45
19	Spectrometer Frequency	100.61
20	Spectral Width	24038.5
21	Lowest Frequency	-1958.9
22	Nucleus	13C
23	Acquired Size	32768
24	Spectral Size	65536