

# **Photoredox functionalization of 3-halogenchromones, 3-formylchromones and chromone-3-carboxylic acids: Routes to 3-acylchromones.**

Satenik Mkrtchyan\*, Viktor O. Iaroshenko\*.

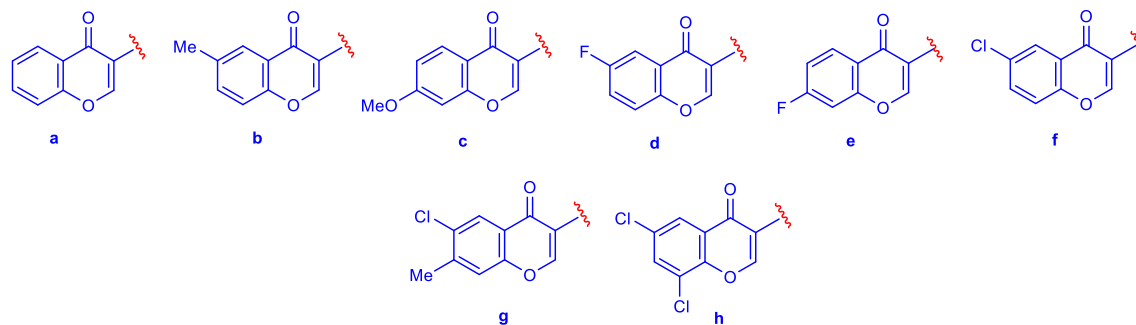
Laboratory of Homogeneous Catalysis and Molecular Design at the Centre of Molecular and Macromolecular Studies, Polish Academy of Sciences, Sienkiewicza 112, PL-90-363 Łódź, Poland. E-mail: [iva108@gmail.com](mailto:iva108@gmail.com) , [viktori@cbmm.lodz.pl](mailto:viktori@cbmm.lodz.pl) , [sm19860214@gmail.com](mailto:sm19860214@gmail.com)

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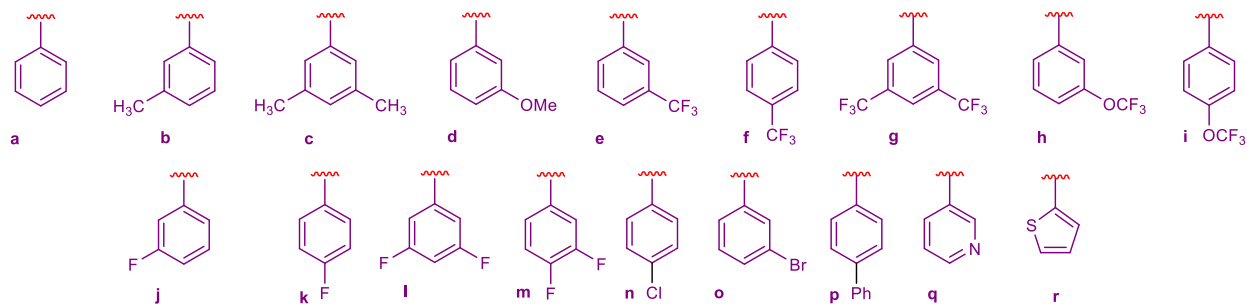
(A) List of used starting materials.....	S3
(B) Copies $^1\text{H}$ and $^{13}\text{C}$ NMR spectra.....	S7

## (A) List of used starting materials

### Chromone part:

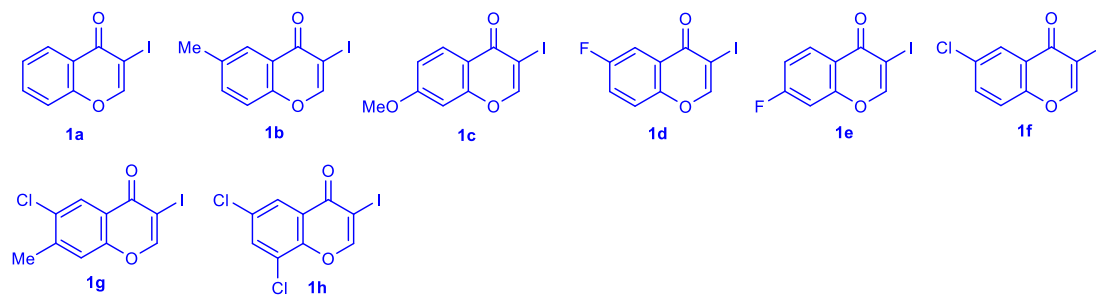


### Ar(Het) part:

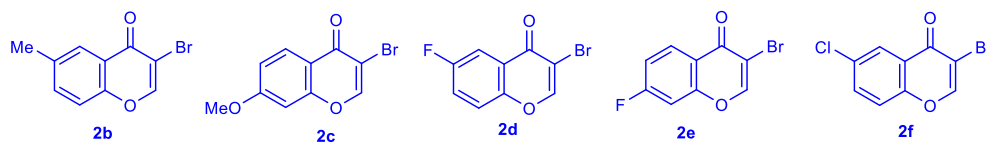


**Scheme S1.** List of chromone frameworks and aryl substituents.

**Scope of 3-iodochromones 1:**

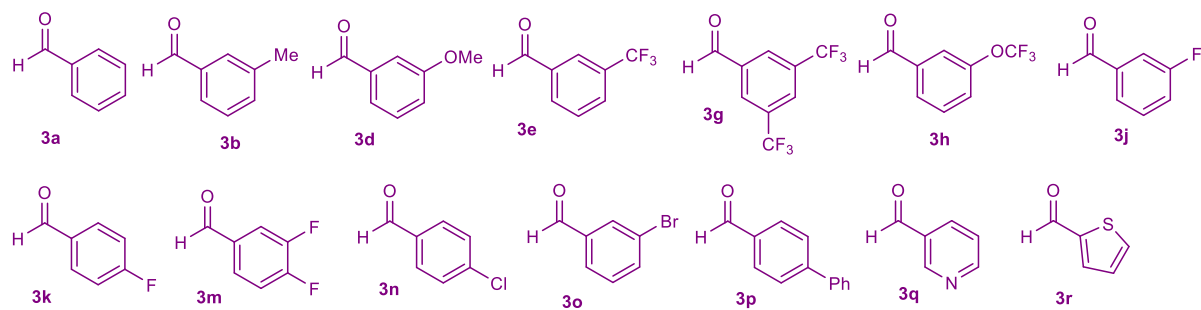


**Scope of 3-bromochromones 2:**



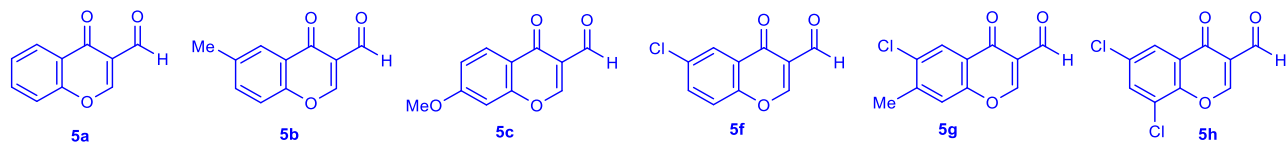
**Scheme S2.** List of the used 3-iodochromones **1** and 3-bromochromones **2**.

**Scope of aldehydes 3:**



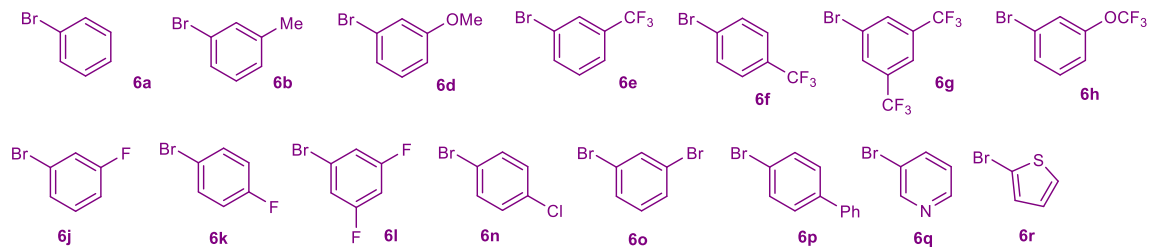
**Scheme S3.** List of the used aldehydes **3**.

**Scope of 3-formylchromones 5:**

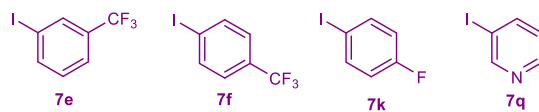


**Scheme S4.** List of the used 3-formylchromones **5**.

**Scope of aryl bromides 6:**

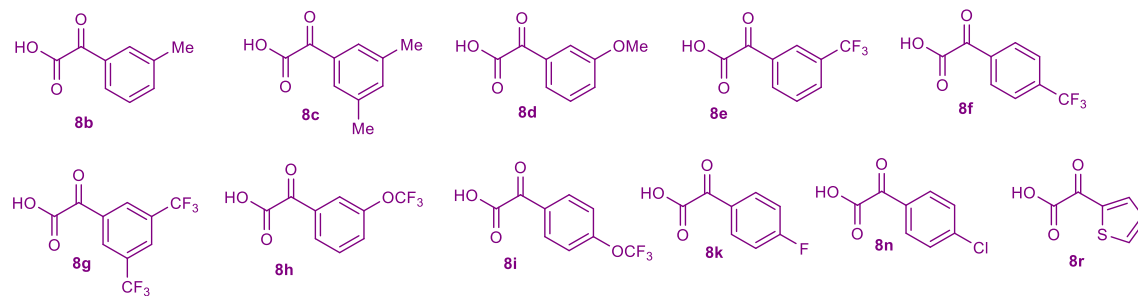


**Scope of aryl iodides 7:**



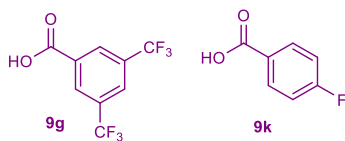
**Scheme S5.** List of the used aryl bromides **6** and aryl iodides **7**.

**Scope of  $\alpha$ -keto acids 8:**

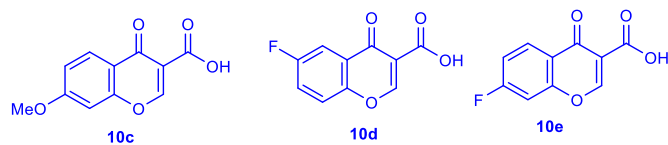


**Scheme S6.** List of the used  $\alpha$ -keto acids **8**.

**Scope of carboxylic acids 9:**



**Scope of chromone-3-carboxylic acids 10:**

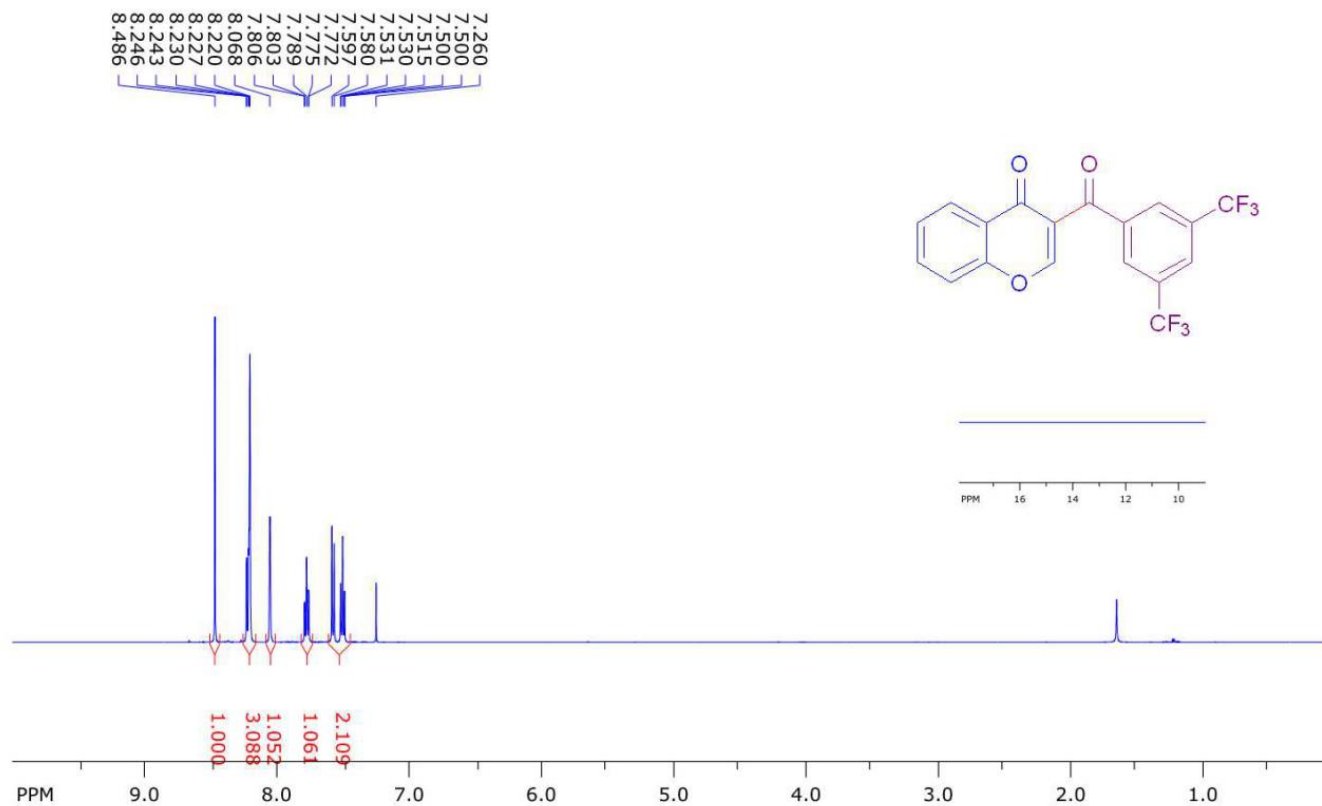


**Scheme S7.** List of the used reagents carboxylic acids **9** and chromone-3-carboxylic acids **10**.

**(B) Copies  $^1\text{H}$  and  $^{13}\text{C}$  NMR spectra**

# Compound 4ag (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 913 1H



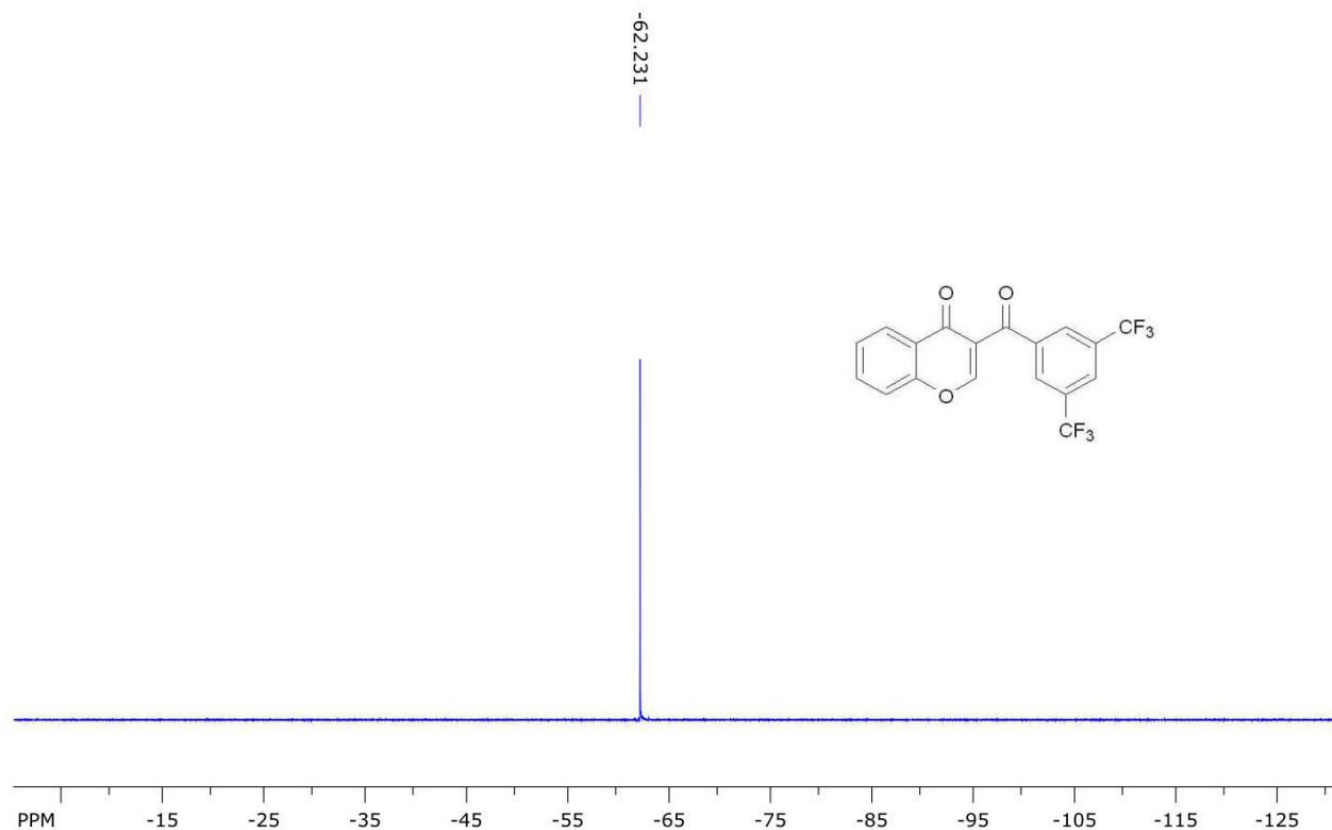
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 number of scans: 24

freq. of 0 ppm: 500.130023 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 200.452 ppm/cm: 0.40080



# Compound 4ag (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 913 F CDCl<sub>3</sub>

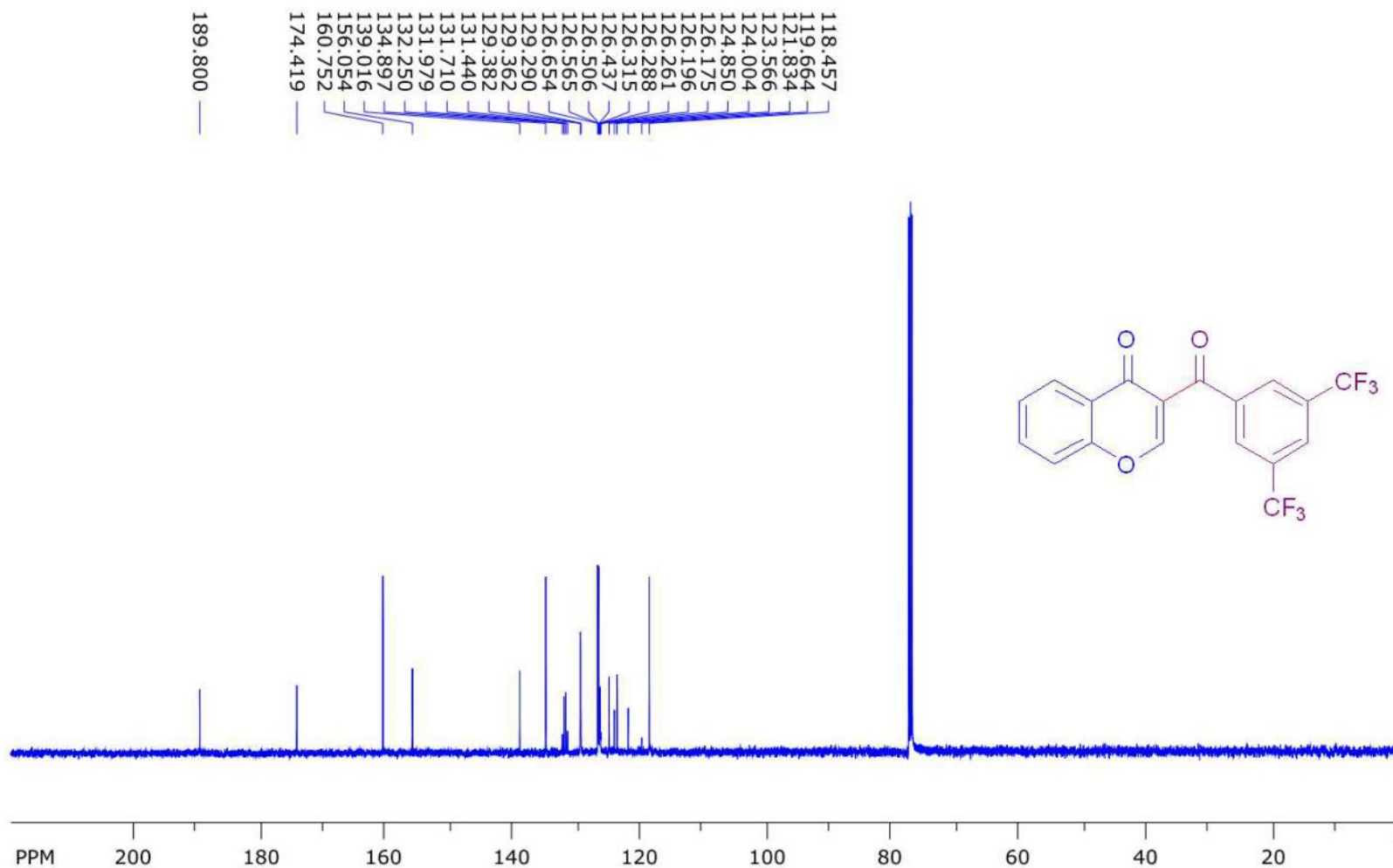


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time domain size: 65536 points  
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number of scans: 16

freq. of 0 ppm: 188.338450 MHz  
processed size: 32768 complex points  
LB: 0.300 GF: 0.0000  
Hz/cm: 990.156 ppm/cm: 5.25771

# Compound 4ag (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 913 13C

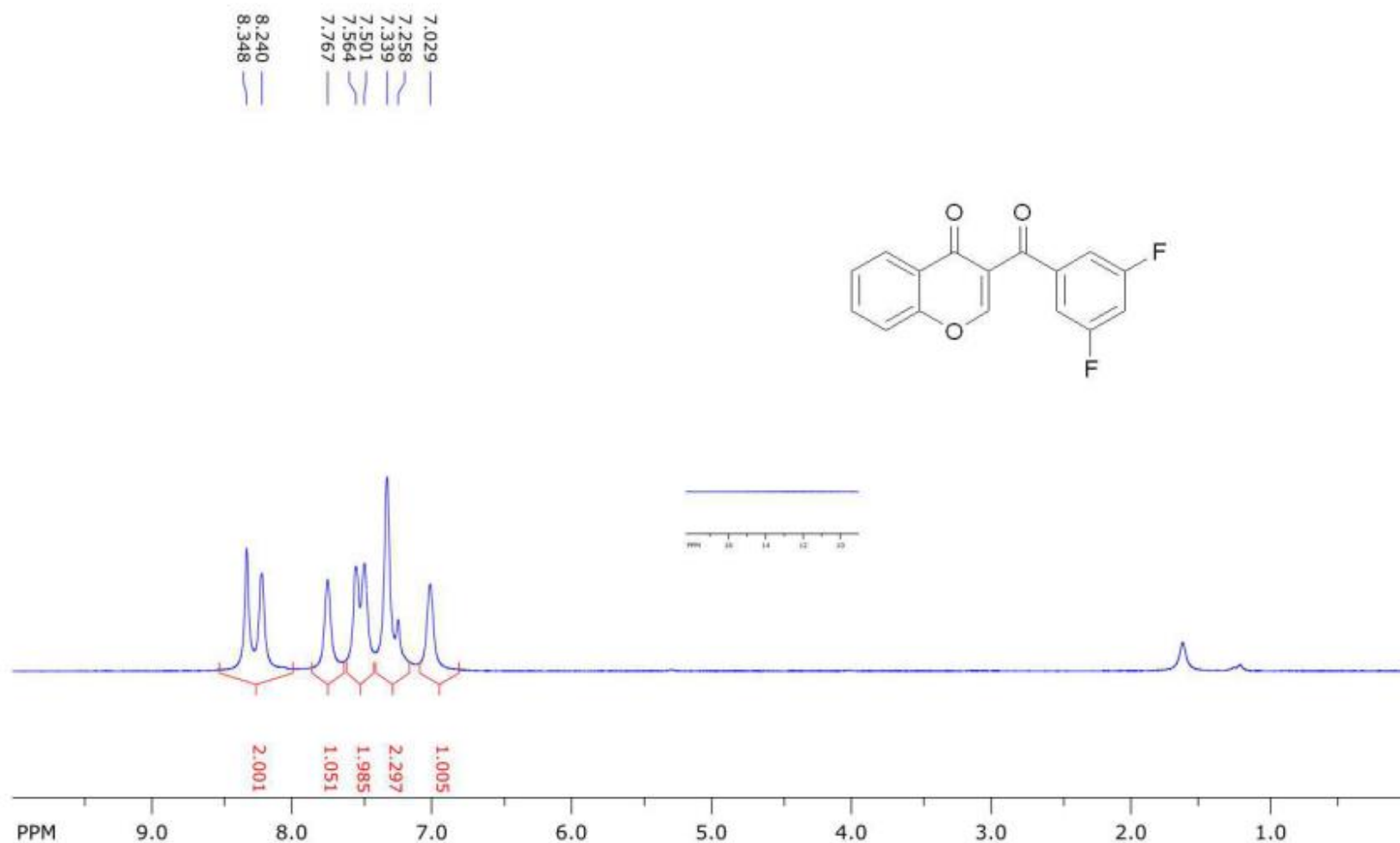


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 number of scans: 512

freq. of 0 ppm: 125.757792 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1105.877 ppm/cm: 8.79265

# Compound 4al (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 985 1H

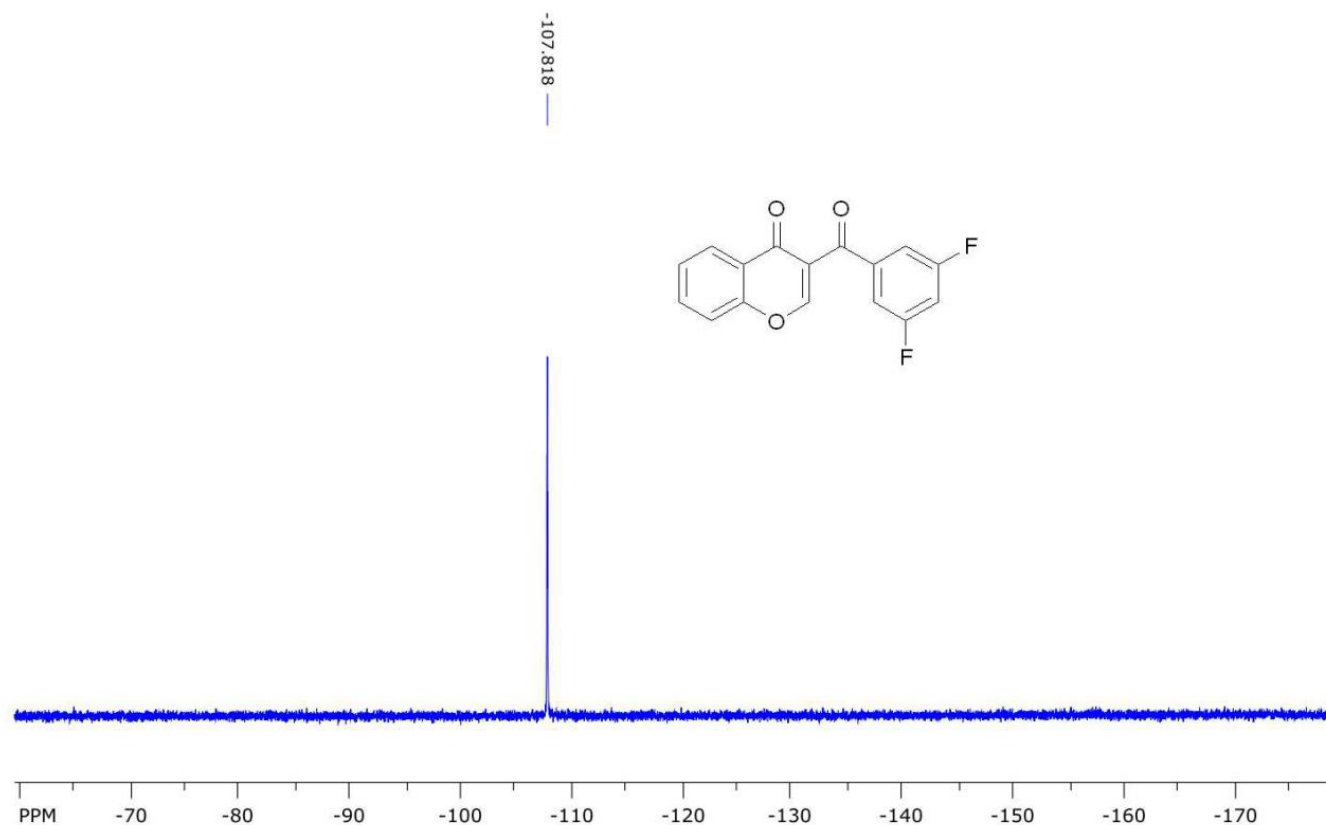


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 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 32

freq. of 0 ppm: 500.130024 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 200.452 ppm/cm: 0.40080

# Compound 4al (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 985 19F CDCI3

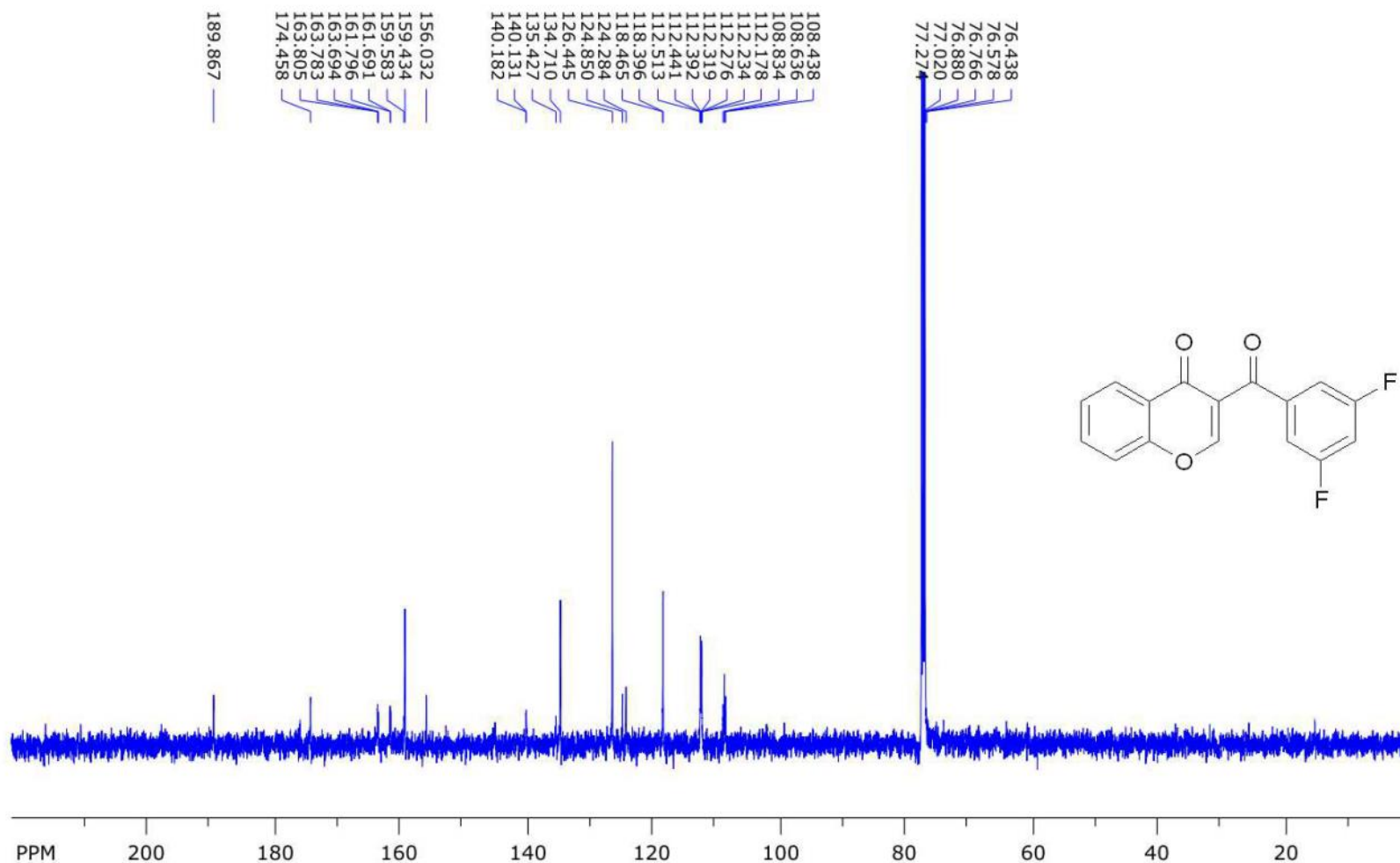


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time domain size: 65536 points  
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number of scans: 16

freq. of 0 ppm: 188.338450 MHz  
processed size: 32768 complex points  
LB: 0.300 GF: 0.0000  
Hz/cm: 904.304 ppm/cm: 4.80184

# Compound 4al (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 985 13C

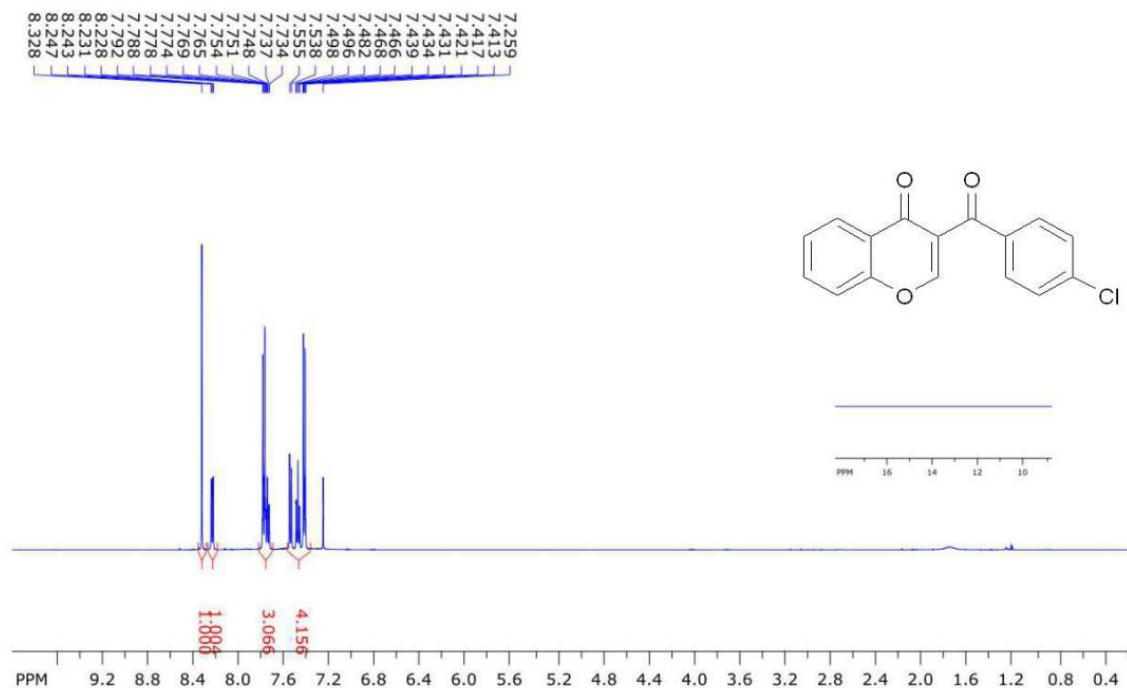


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number of scans: 512

freq. of 0 ppm: 125.757793 MHz  
processed size: 32768 complex points  
LB: 2.000 GF: 0.0000  
Hz/cm: 1118.754 ppm/cm: 8.89504

# Compound 4an (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 896 1H

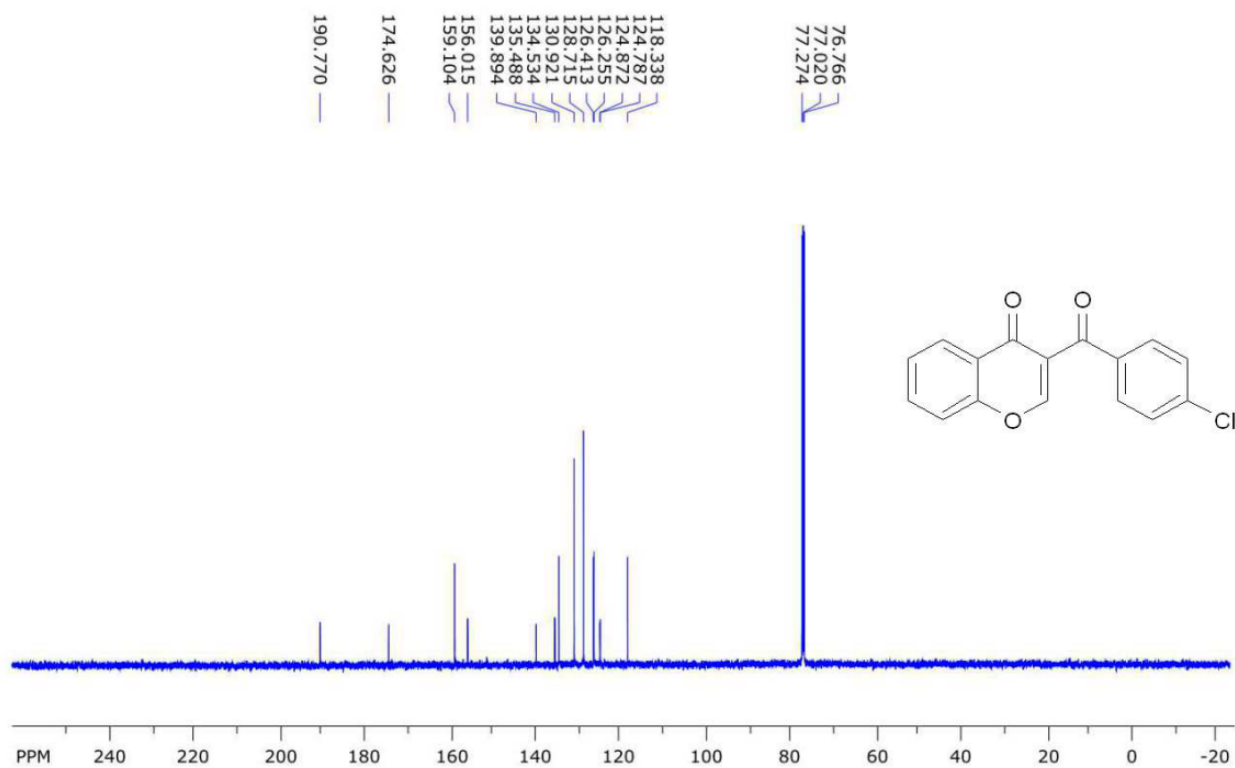


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 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 24

freq. of 0 ppm: 500.130024 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 198.250 ppm/cm: 0.39639

# Compound 4an (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 896 13C

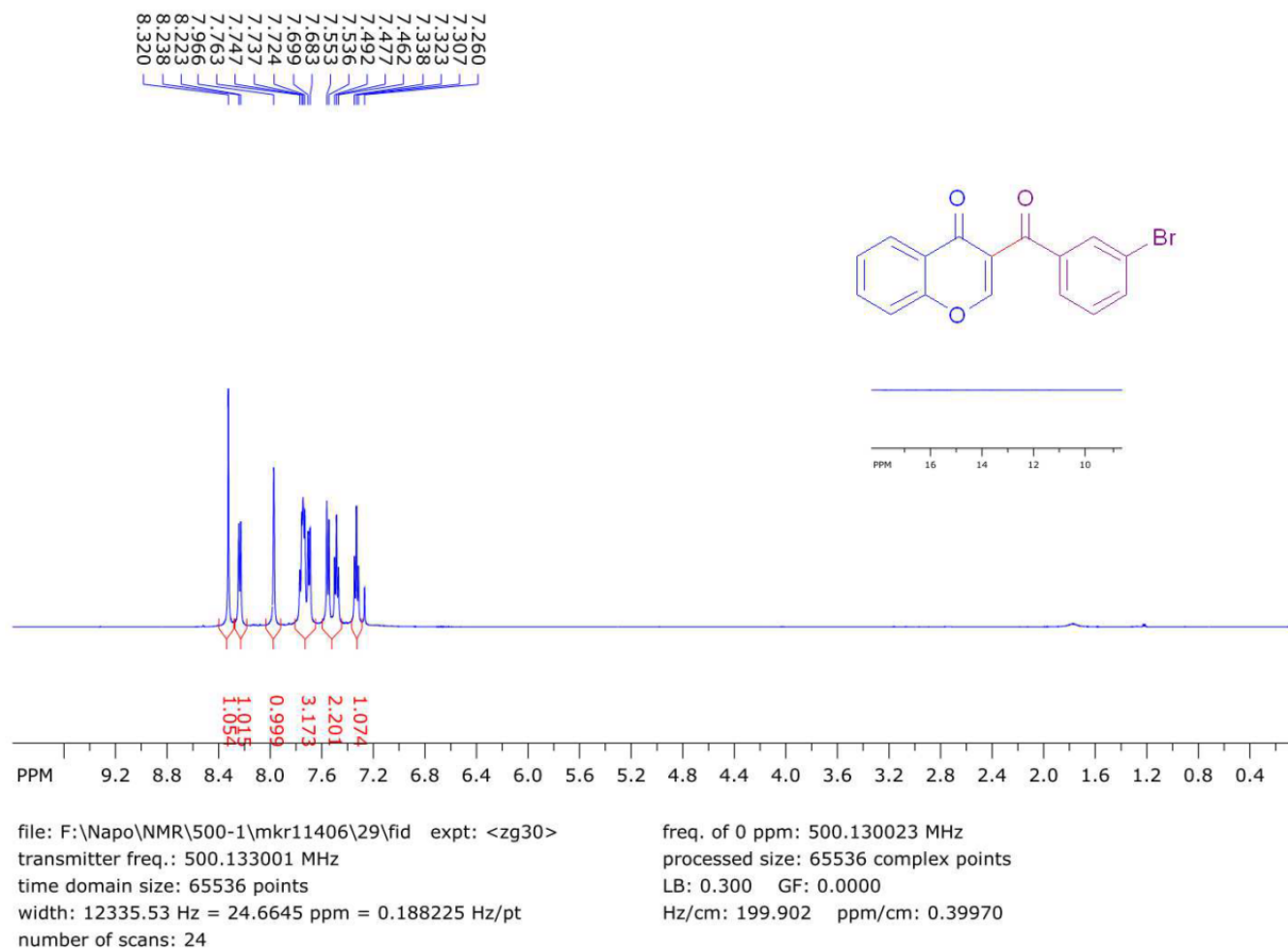


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 number of scans: 256

freq. of 0 ppm: 125.757796 MHz  
 processed size: 32768 complex points  
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 Hz/cm: 1442.308 ppm/cm: 11.46756

# Compound 4ao (NMR in CDCl<sub>3</sub>)

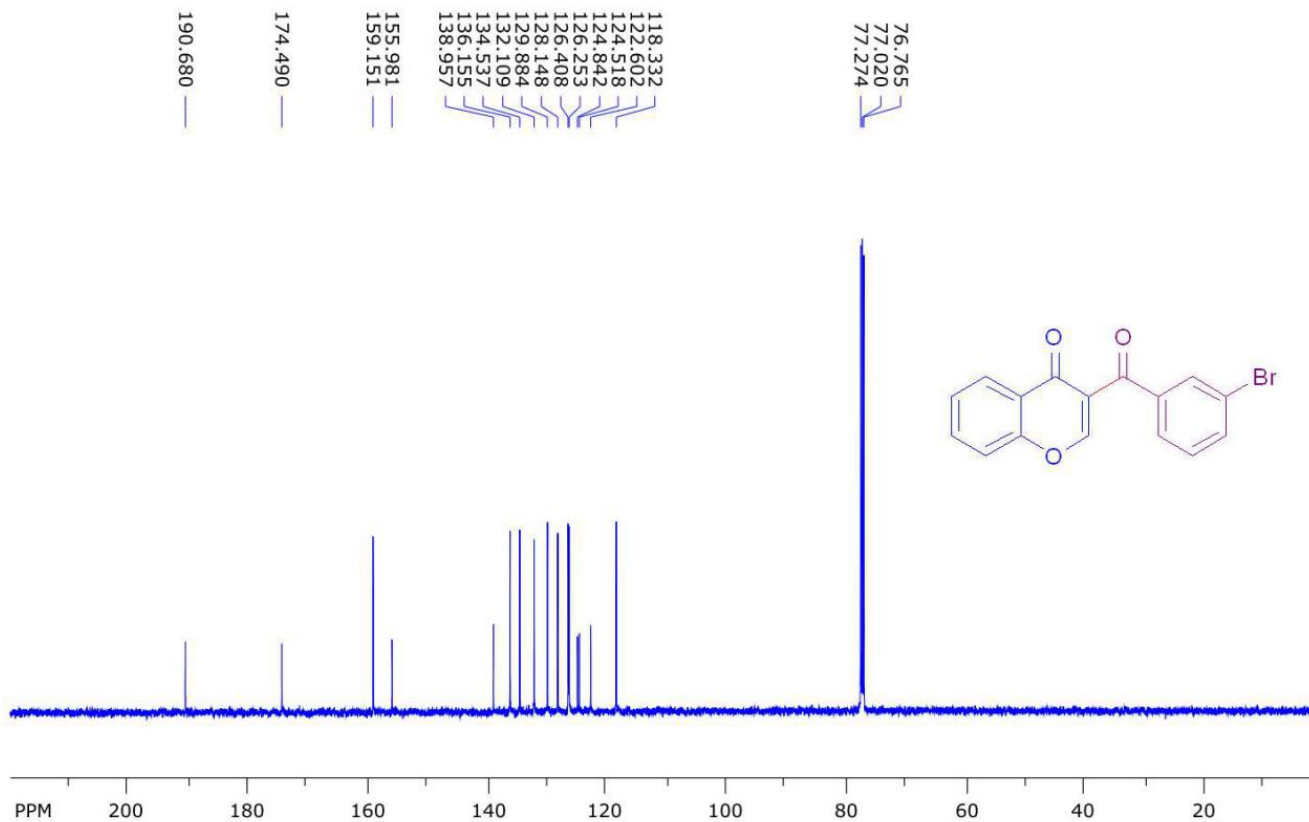
SpinWorks 4: IVA 1038 1H





# Compound 4ao (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1038 13C

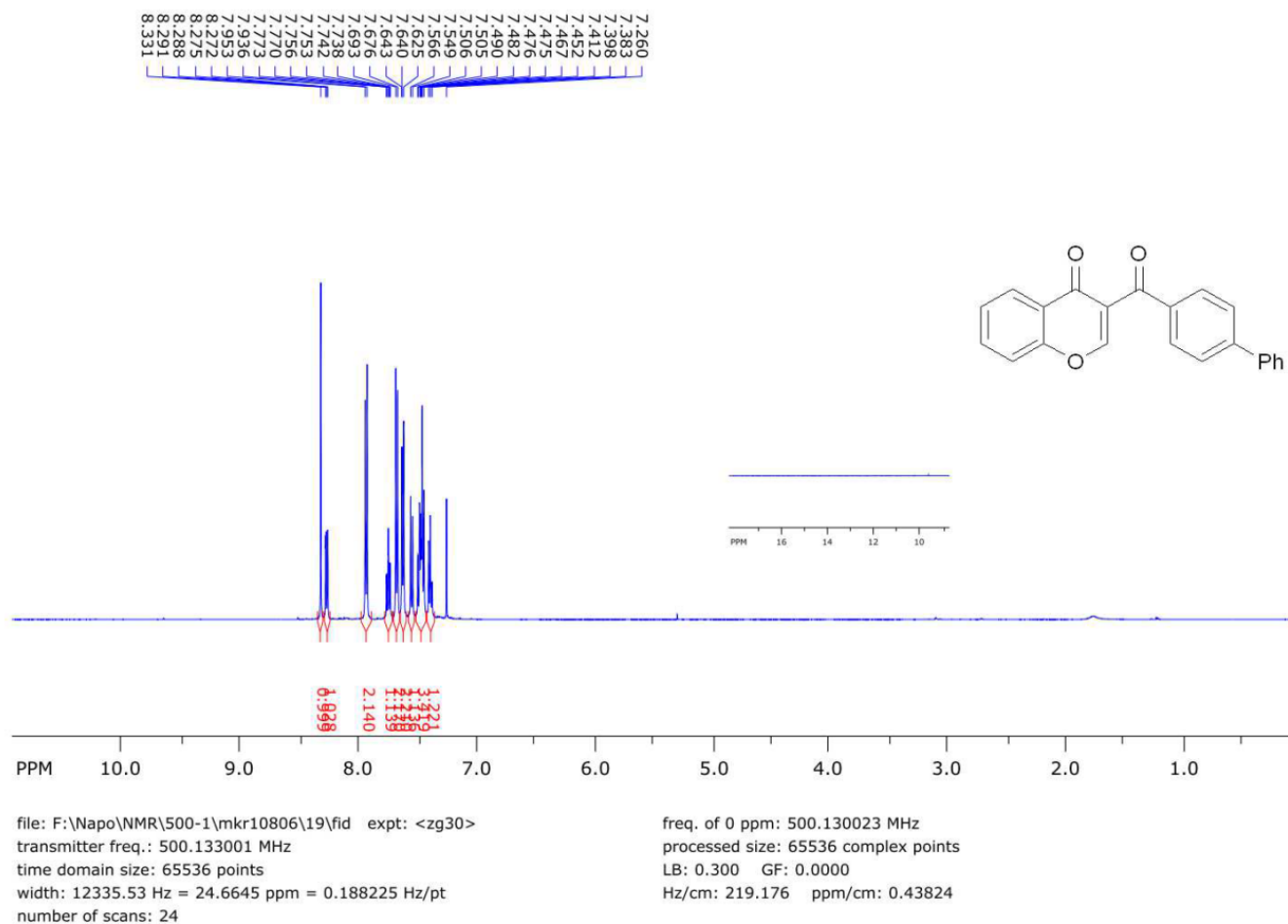


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number of scans: 512

freq. of 0 ppm: 125.757798 MHz  
processed size: 32768 complex points  
LB: 2.000 GF: 0.0000  
Hz/cm: 1105.877 ppm/cm: 8.79265

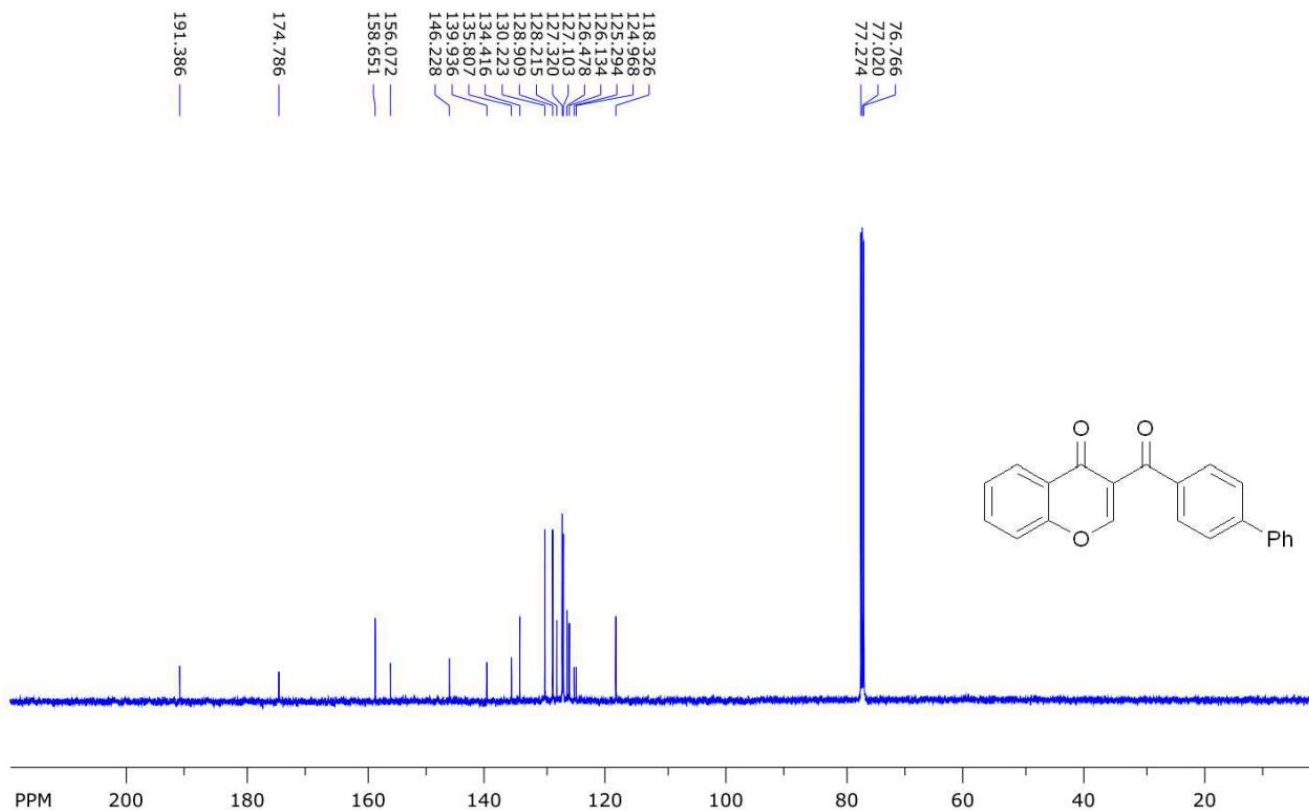
# Compound 4ap (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 993-3 1H



# Compound 4ap (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 9333 13C

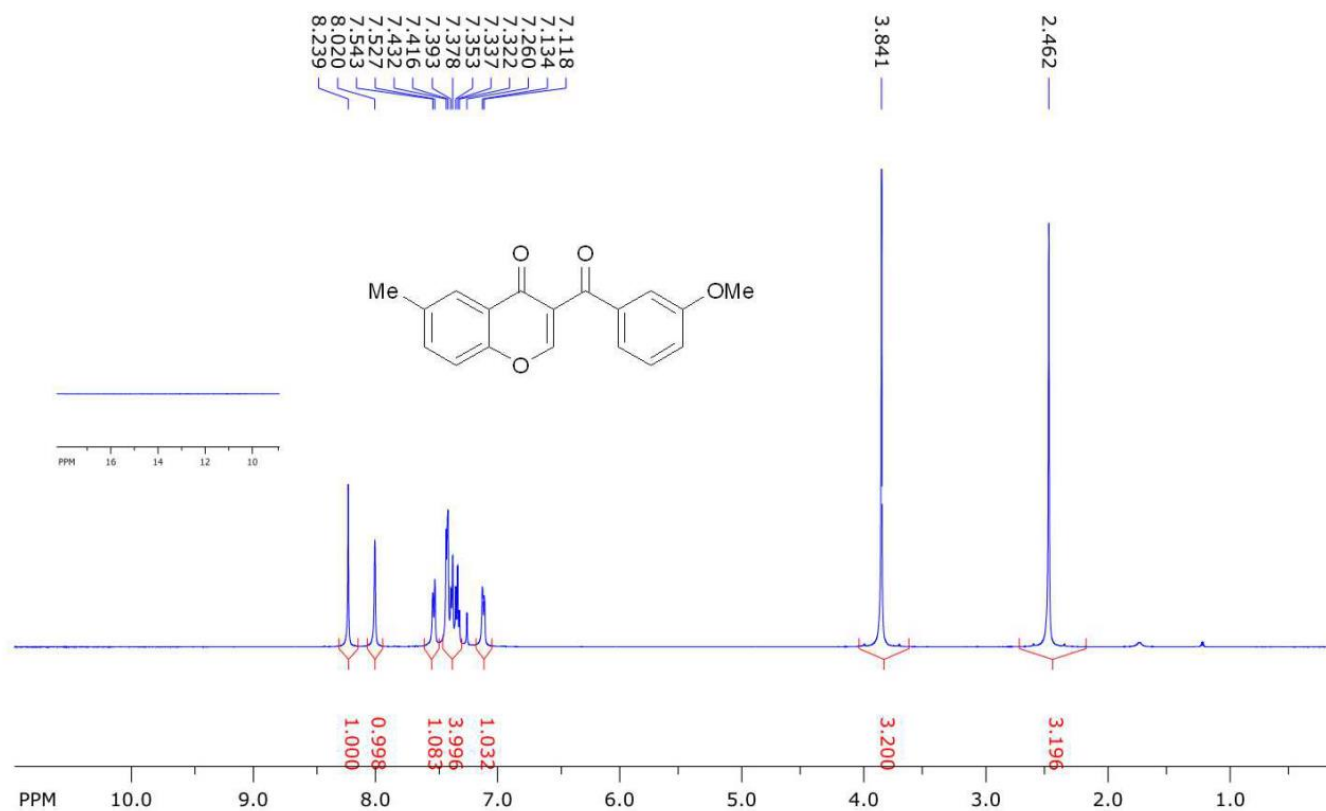


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 number of scans: 512

freq. of 0 ppm: 125.757795 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1104.267 ppm/cm: 8.77985

# Compound 4bd (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 983 1H

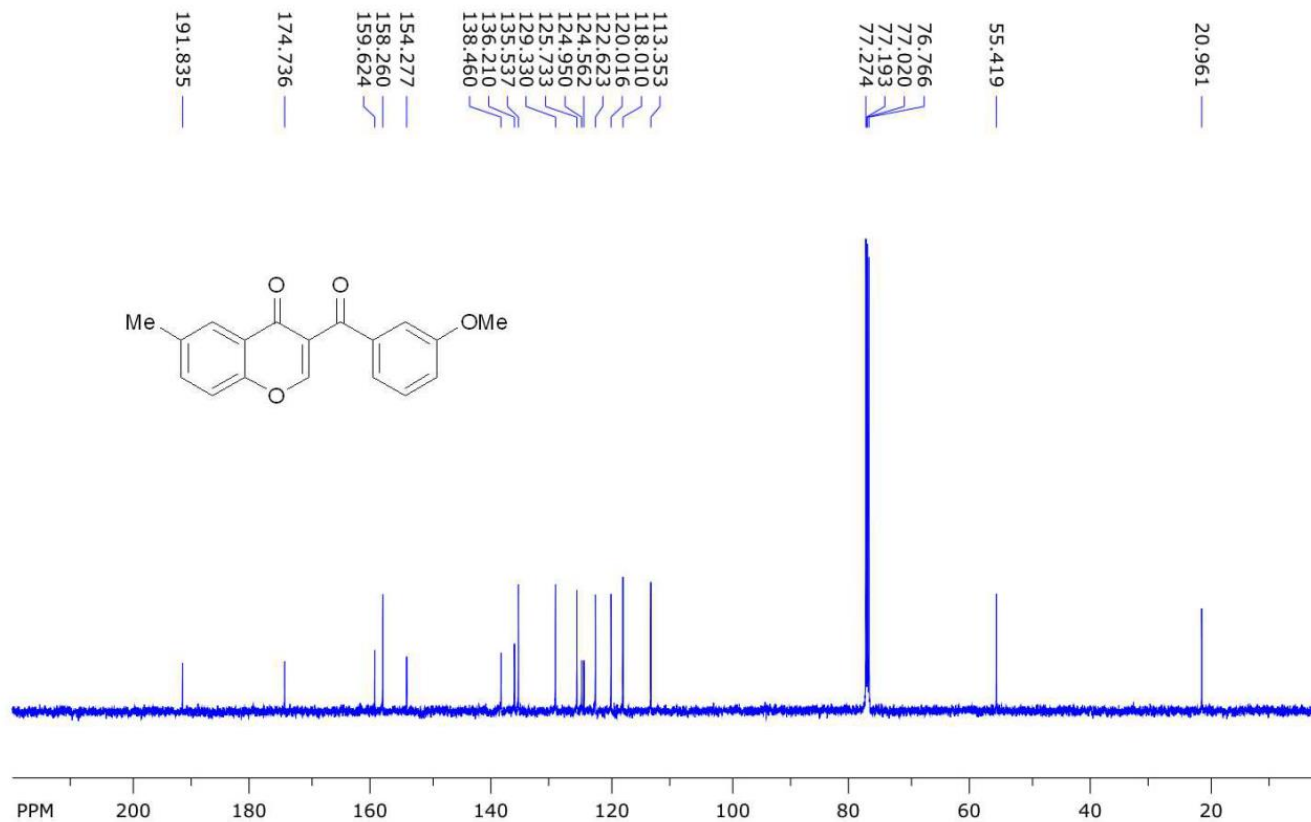


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 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 24

freq. of 0 ppm: 500.130023 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 218.074 ppm/cm: 0.43603

# Compound 4bd (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 983 13C

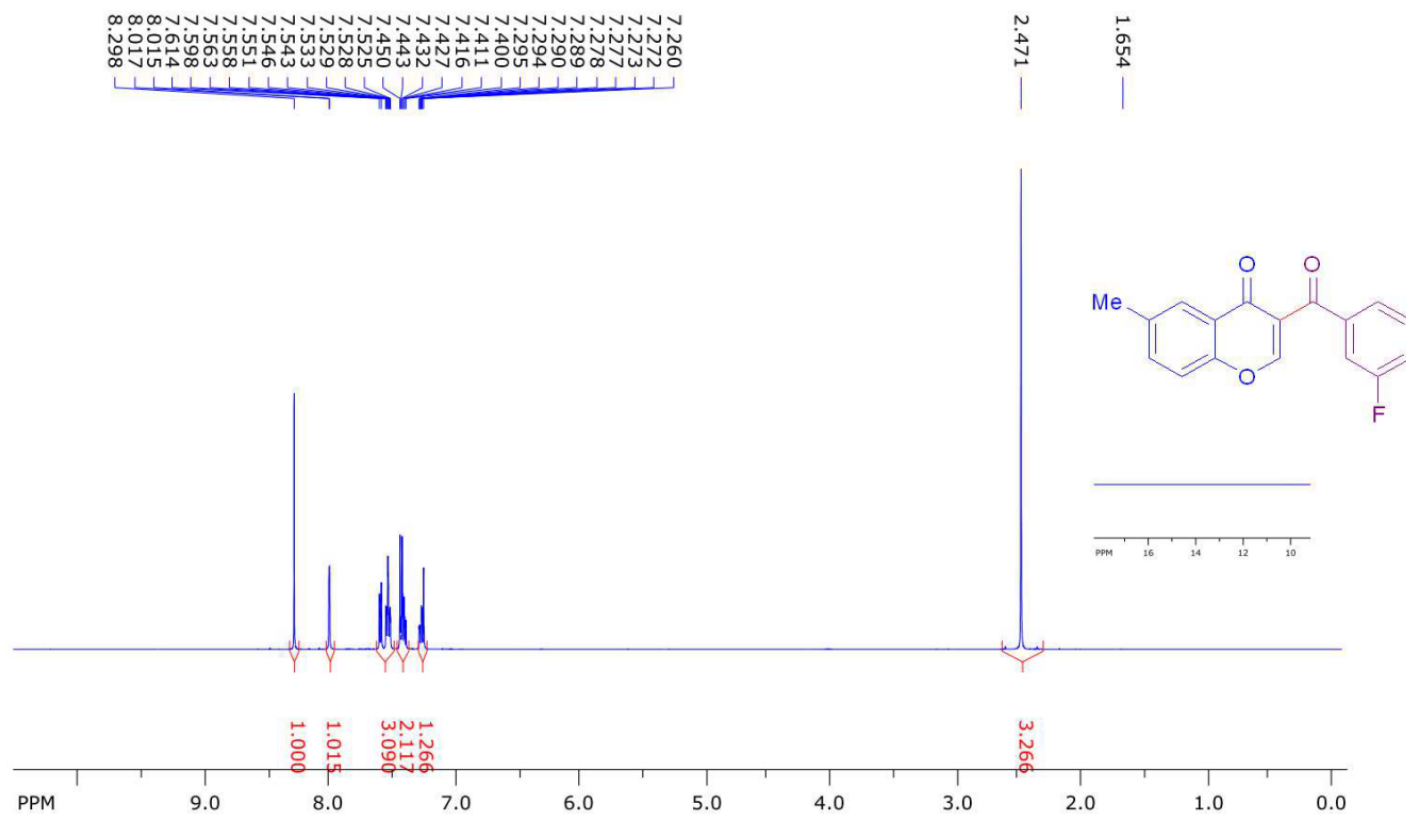


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 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 256

freq. of 0 ppm: 125.757797 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1104.267 ppm/cm: 8.77985

# Compound 4bj (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 915 1H

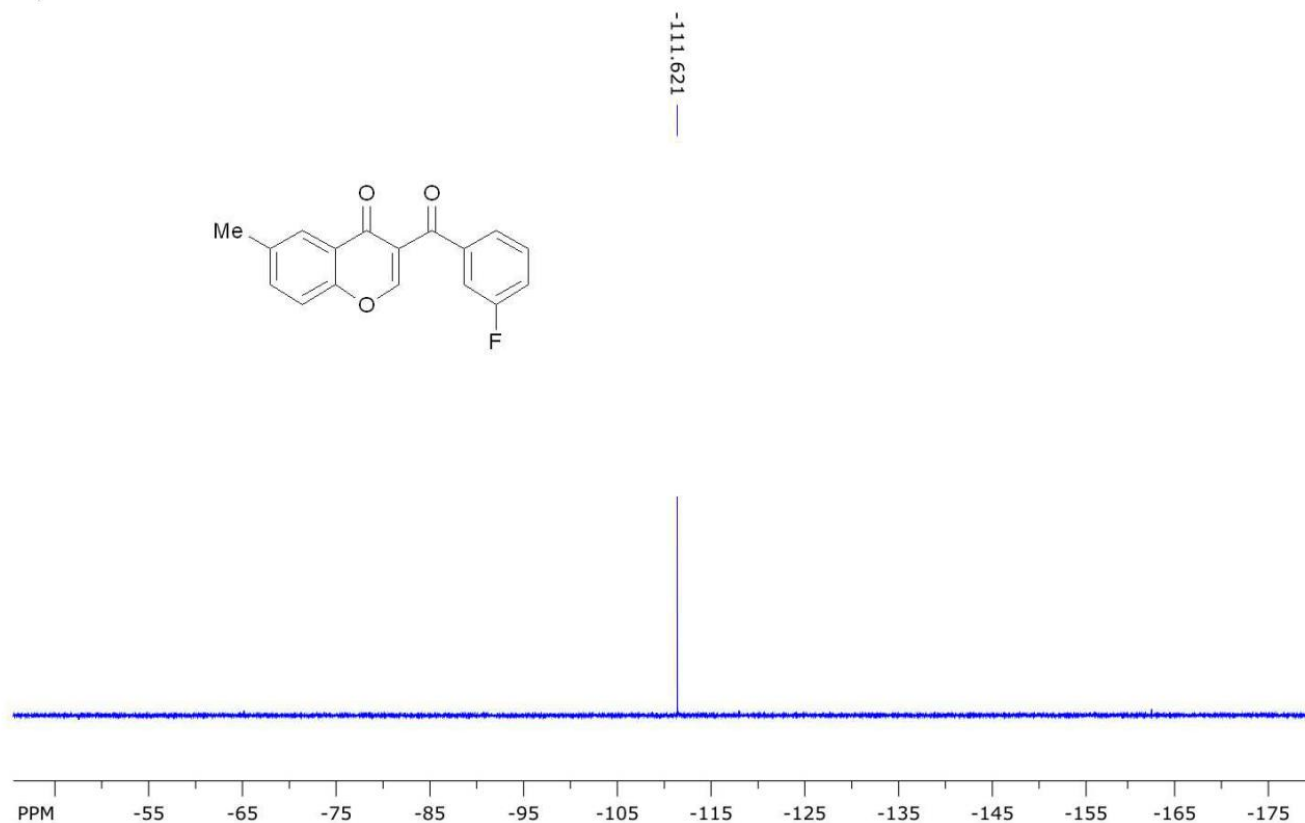


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 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 24

freq. of 0 ppm: 500.130023 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 213.118 ppm/cm: 0.42612

# Compound 4bj (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 915 CDCl<sub>3</sub> 19F

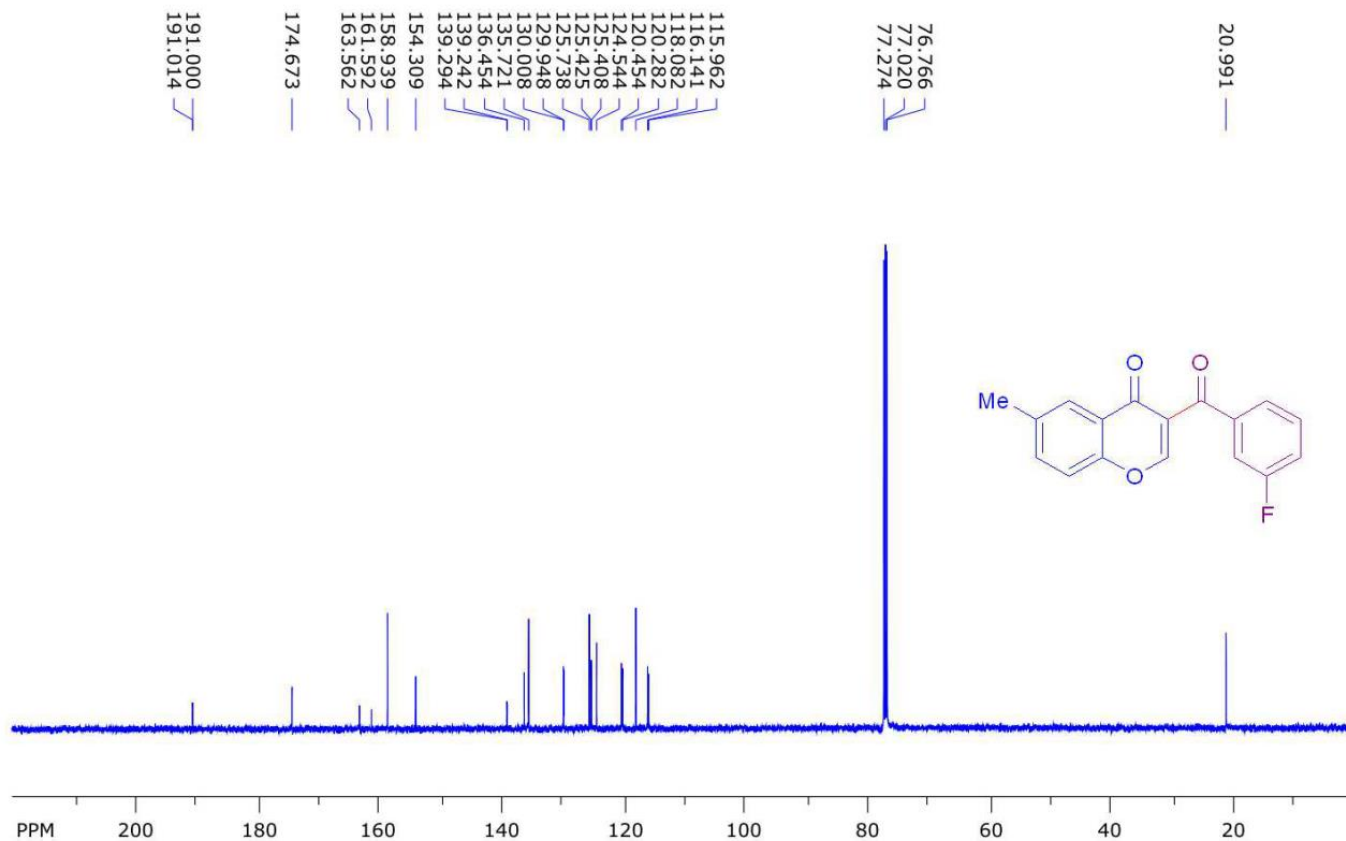


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time domain size: 65536 points  
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number of scans: 16

freq. of 0 ppm: 188.338450 MHz  
processed size: 32768 complex points  
LB: 0.300 GF: 0.0000  
Hz/cm: 1047.390 ppm/cm: 5.56162

# Compound 4bj (NMR in CDCl<sub>3</sub>)

SpinWorks 4: iva 915 13C



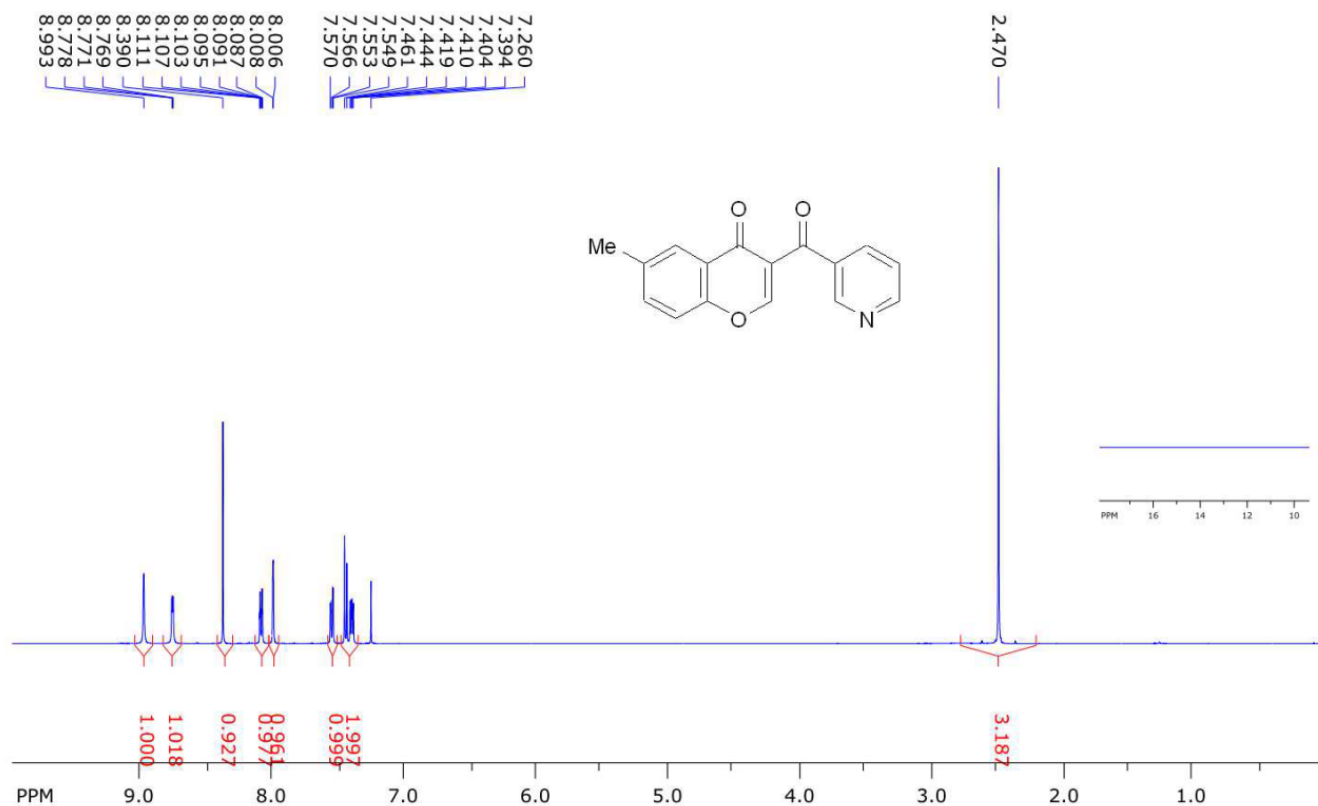
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time domain size: 65536 points  
width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
number of scans: 512

freq. of 0 ppm: 125.757795 MHz  
processed size: 32768 complex points  
LB: 2.000 GF: 0.0000  
Hz/cm: 1109.096 ppm/cm: 8.81824



# Compound 4bq (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 876 1H

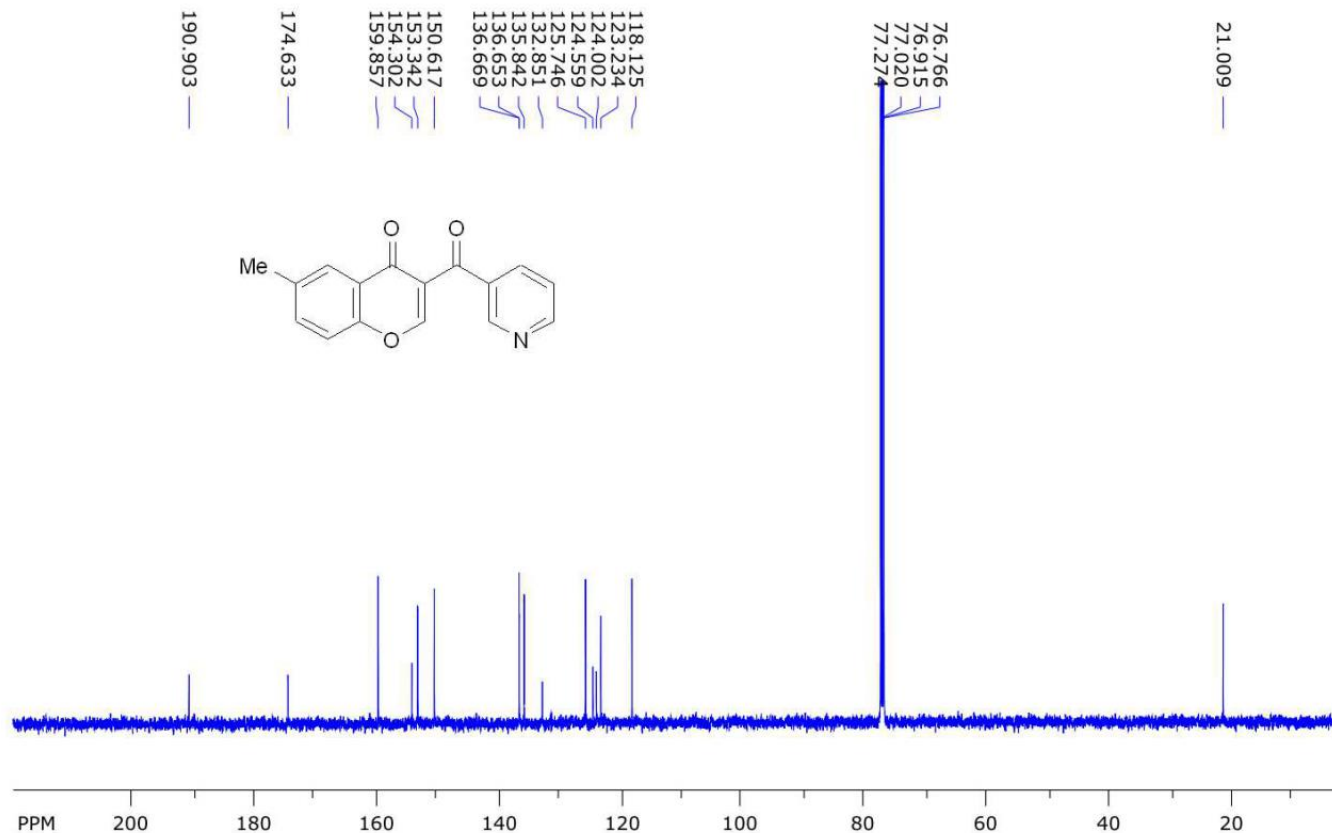


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 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 24

freq. of 0 ppm: 500.130023 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 201.003 ppm/cm: 0.40190

# Compound 4bq (NMR in CDCl<sub>3</sub>)

SpinWorks 4: iva 876 13C

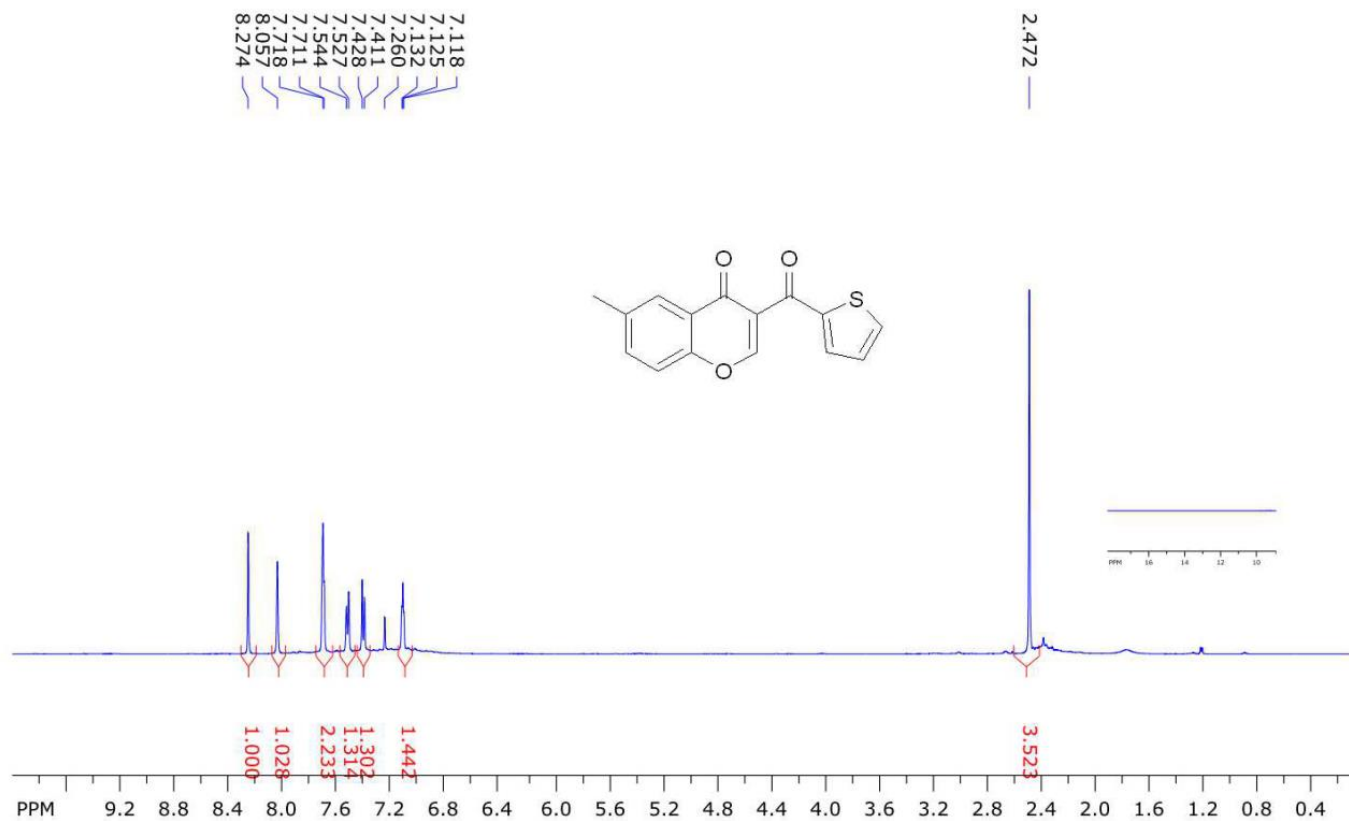


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 number of scans: 256

freq. of 0 ppm: 125.757795 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1099.438 ppm/cm: 8.74145

# Compound 4br (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1002 1H

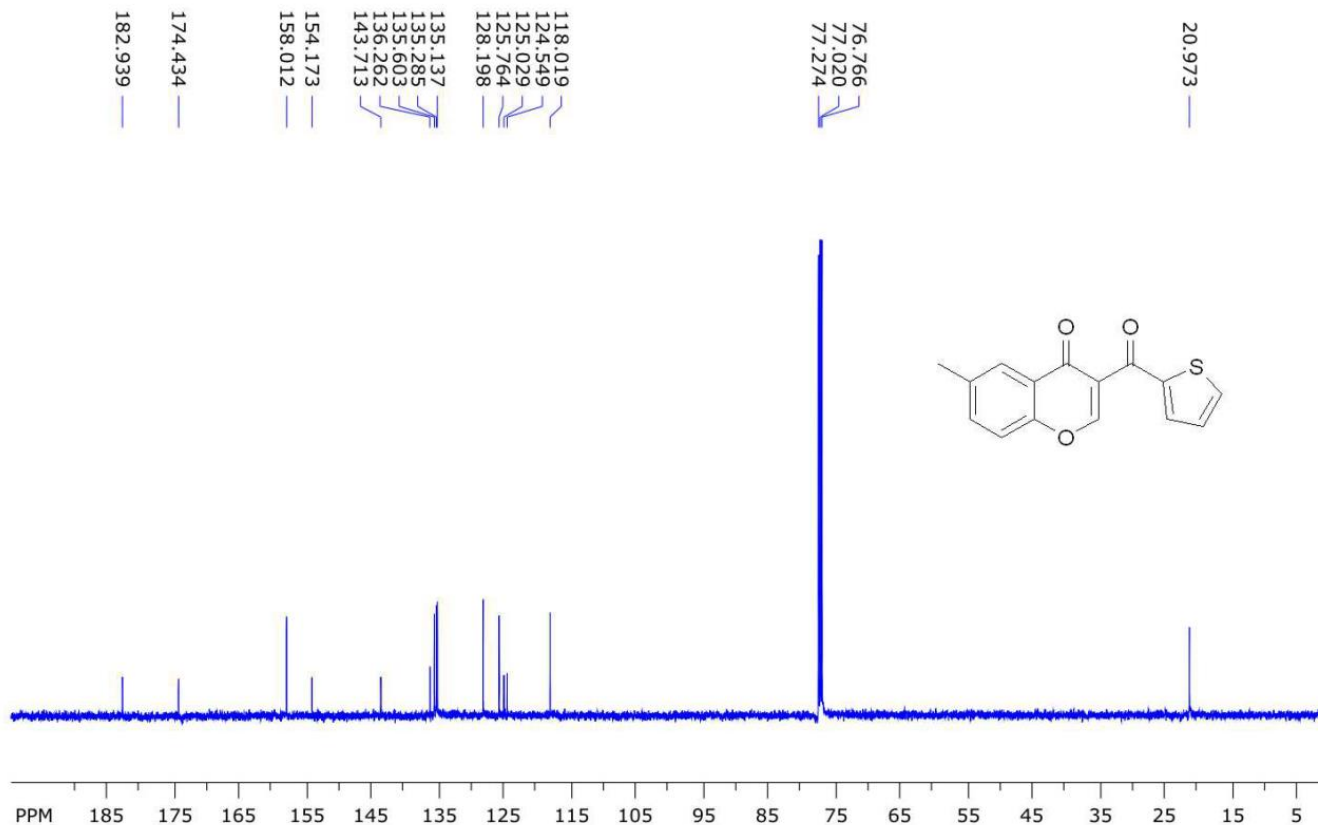


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 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 32

freq. of 0 ppm: 500.130023 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 199.351 ppm/cm: 0.39860

# Compound 4br (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1002 13C

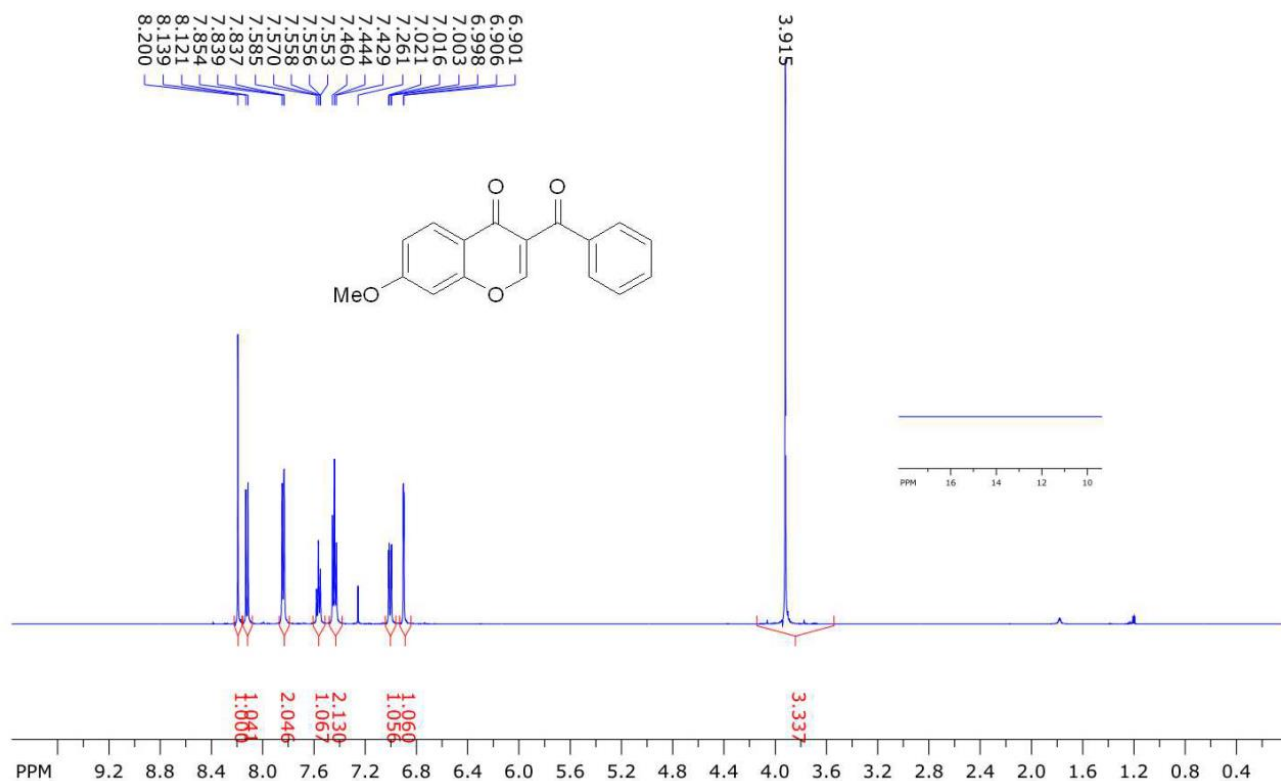


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 number of scans: 264

freq. of 0 ppm: 125.757797 MHz  
 processed size: 32768 complex points  
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 Hz/cm: 1005.851 ppm/cm: 7.99736

# Compound 4ca (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 995 1H

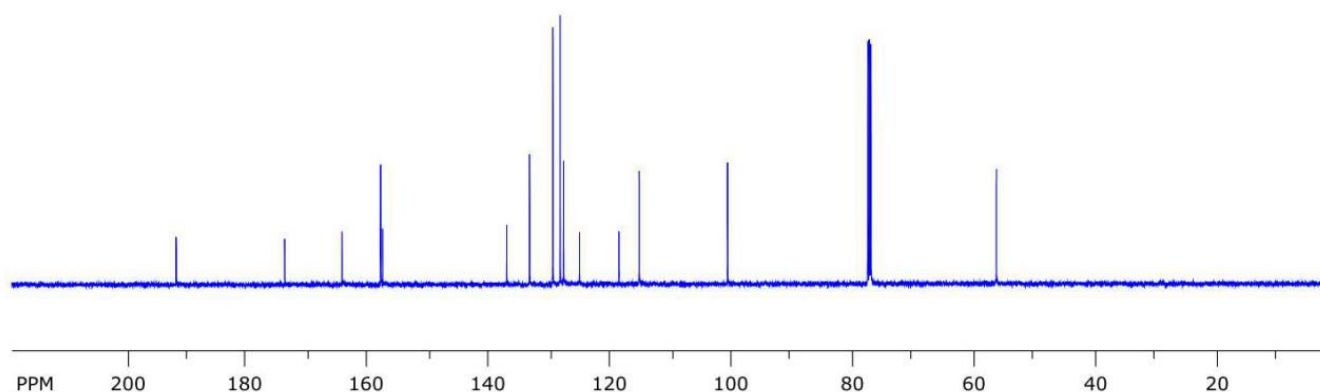
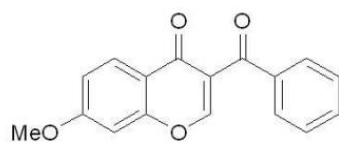
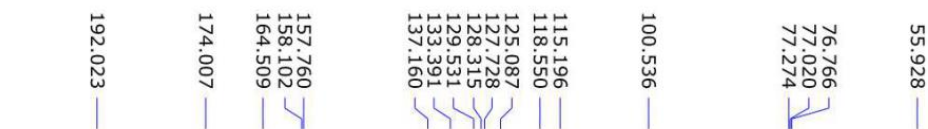


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 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 24

freq. of 0 ppm: 500.130023 MHz  
 processed size: 65536 complex points  
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 Hz/cm: 199.902 ppm/cm: 0.39970

# Compound 4ca (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 995 13C

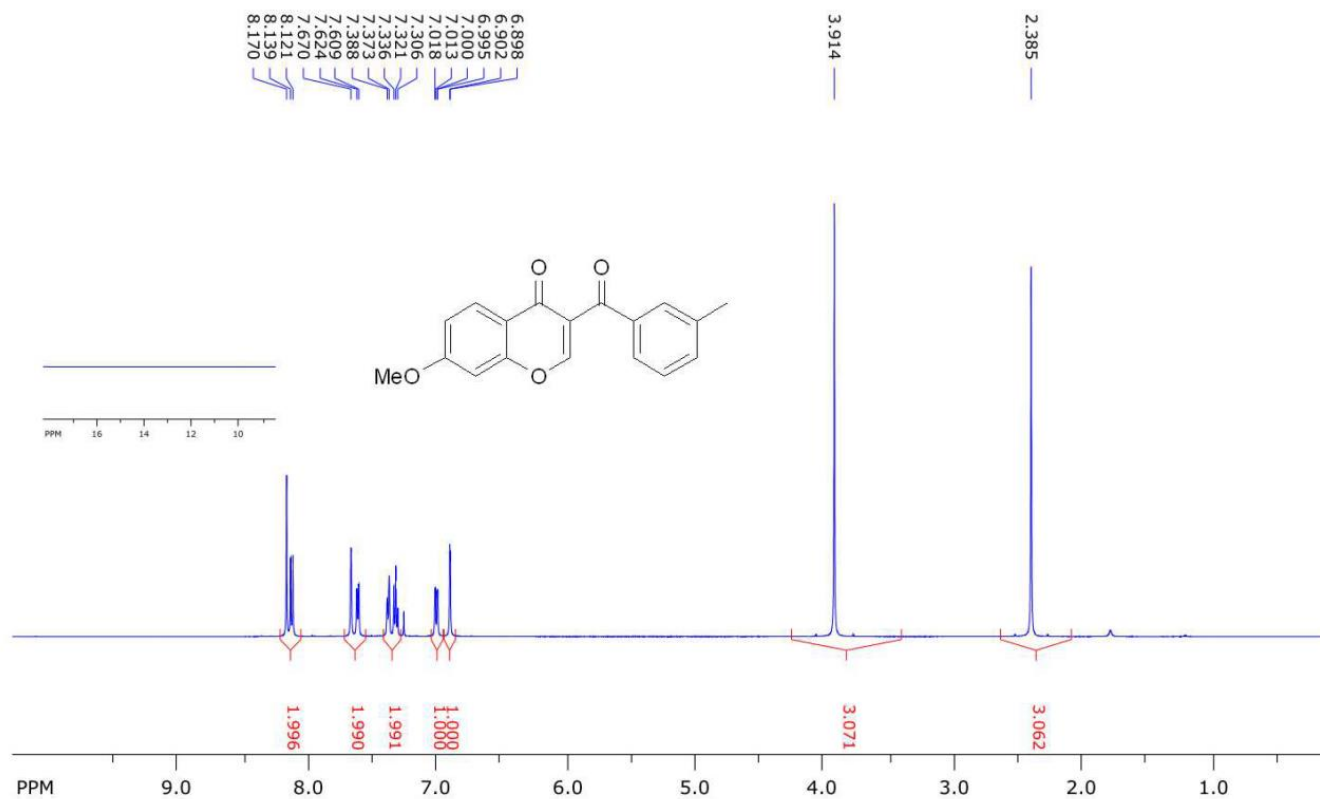


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 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 512

freq. of 0 ppm: 125.757800 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1098.650 ppm/cm: 8.73519

# Compound 4cb (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 975 1H

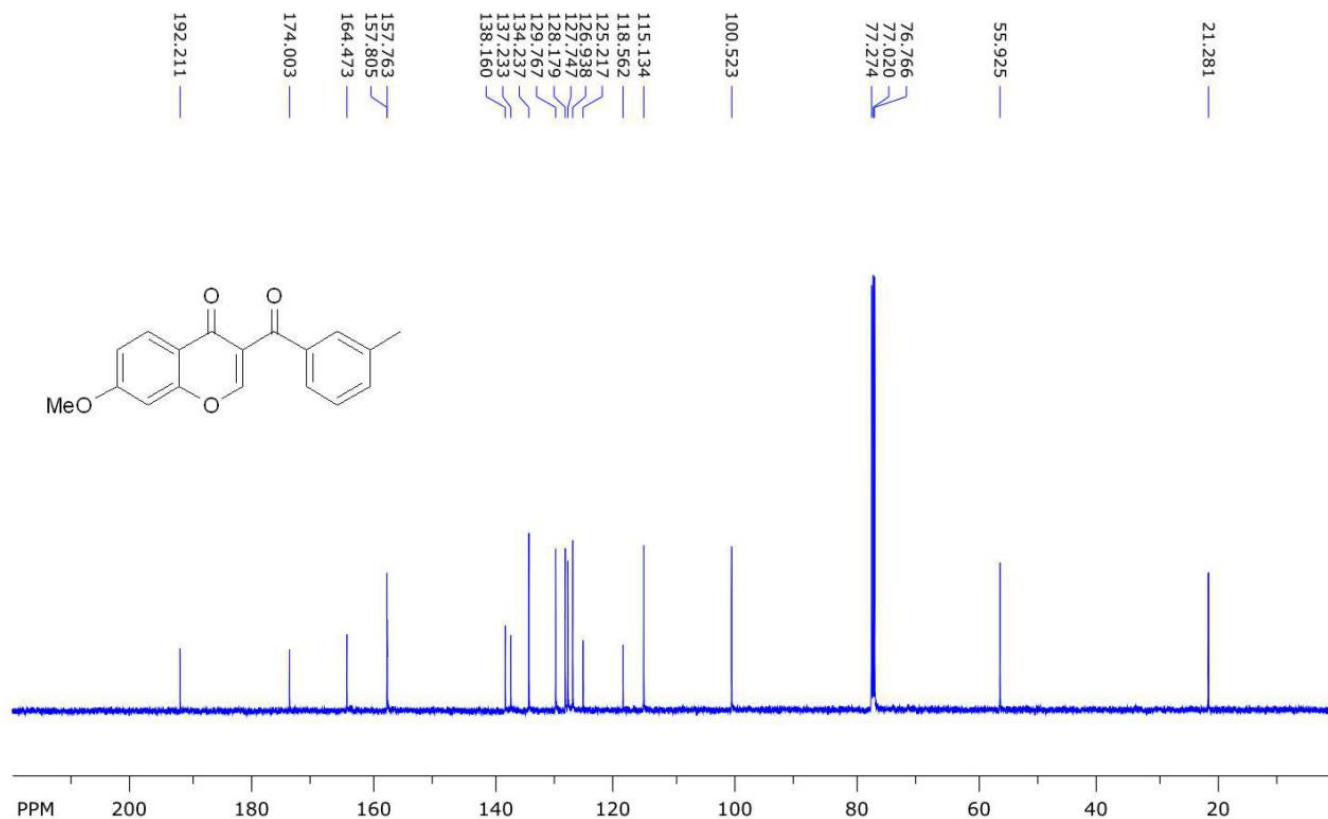


file: F:\Napo\NMR\500-1\mkr12105\19\fid exp: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 32

freq. of 0 ppm: 500.130023 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 204.858 ppm/cm: 0.40961

# Compound 4cb (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 975 13C



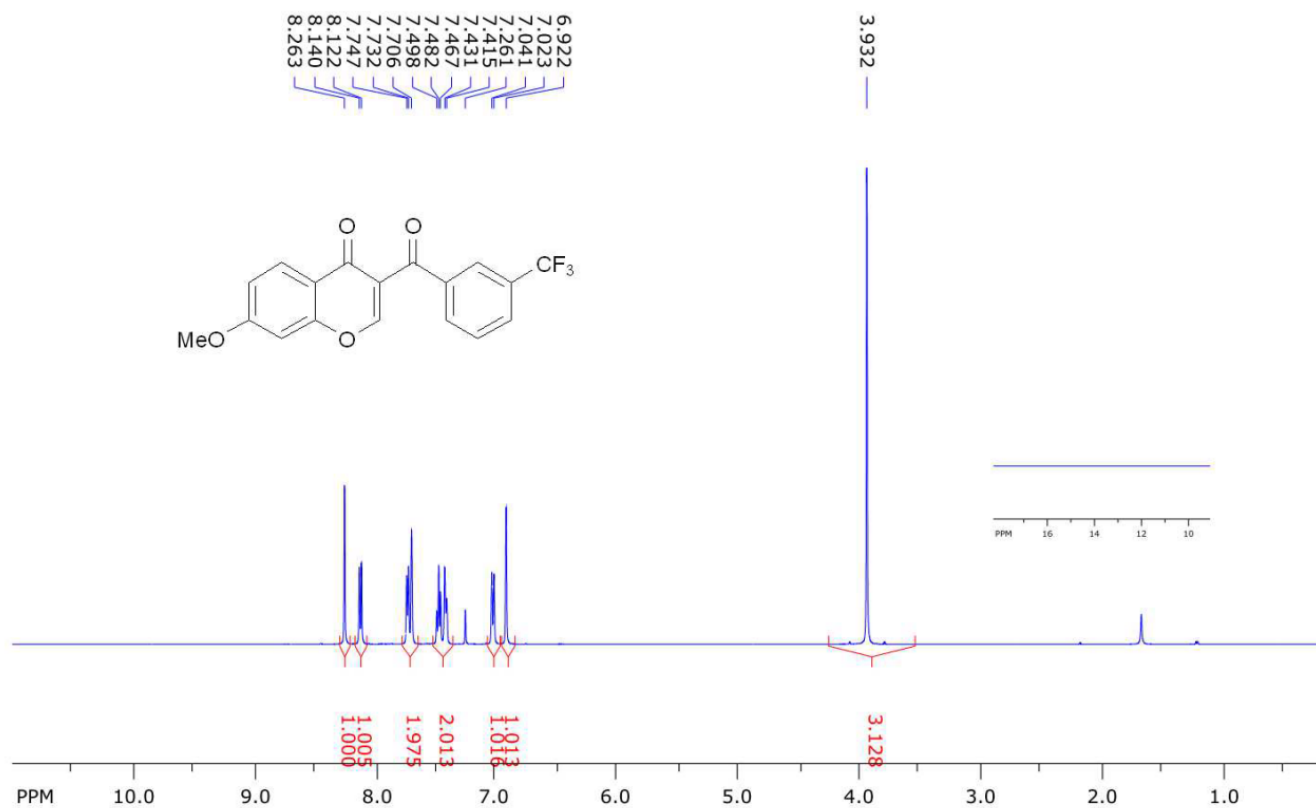
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 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 512

freq. of 0 ppm: 125.757800 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1105.877 ppm/cm: 8.79265



# Compound 4ce (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1012 1H

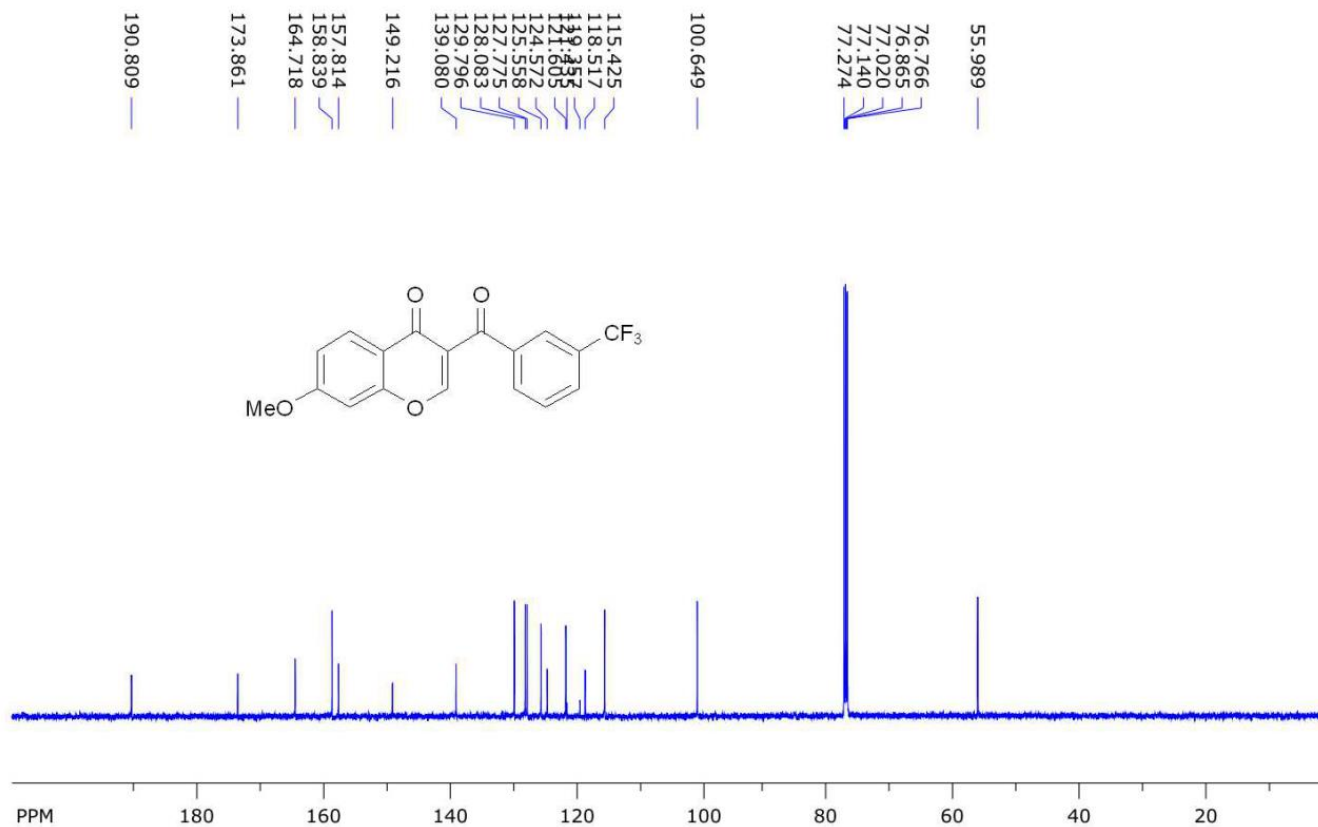


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 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 32

freq. of 0 ppm: 500.130023 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 218.625 ppm/cm: 0.43713

# Compound 4ce (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1012 13C

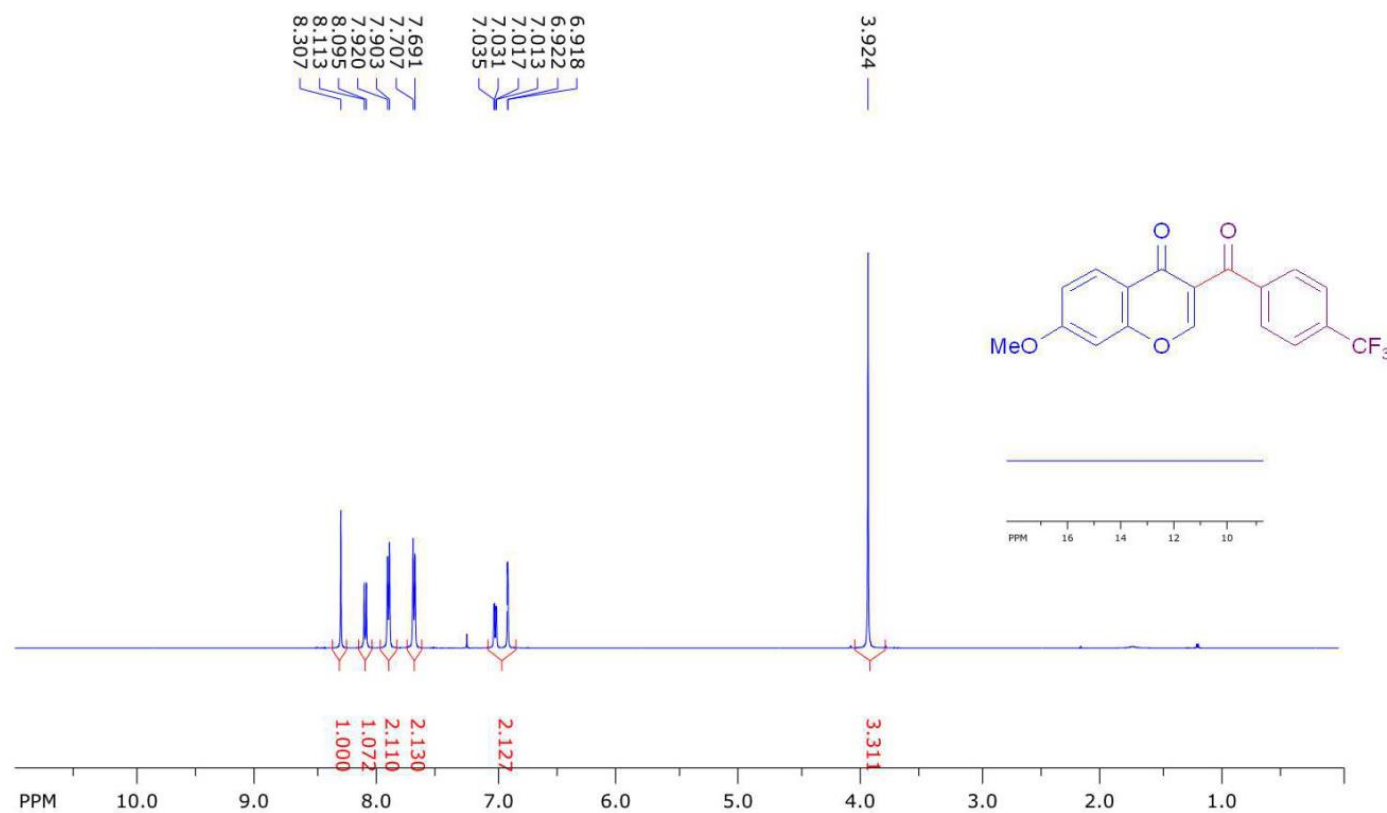


file: F:\Napo\NMR\500-1\mkr20307\22\fid expt: <zpgp30>  
 transmitter freq.: 125.772879 MHz  
 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 512

freq. of 0 ppm: 125.757794 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1054.366 ppm/cm: 8.38309

# Compound 4cf (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1130 1H

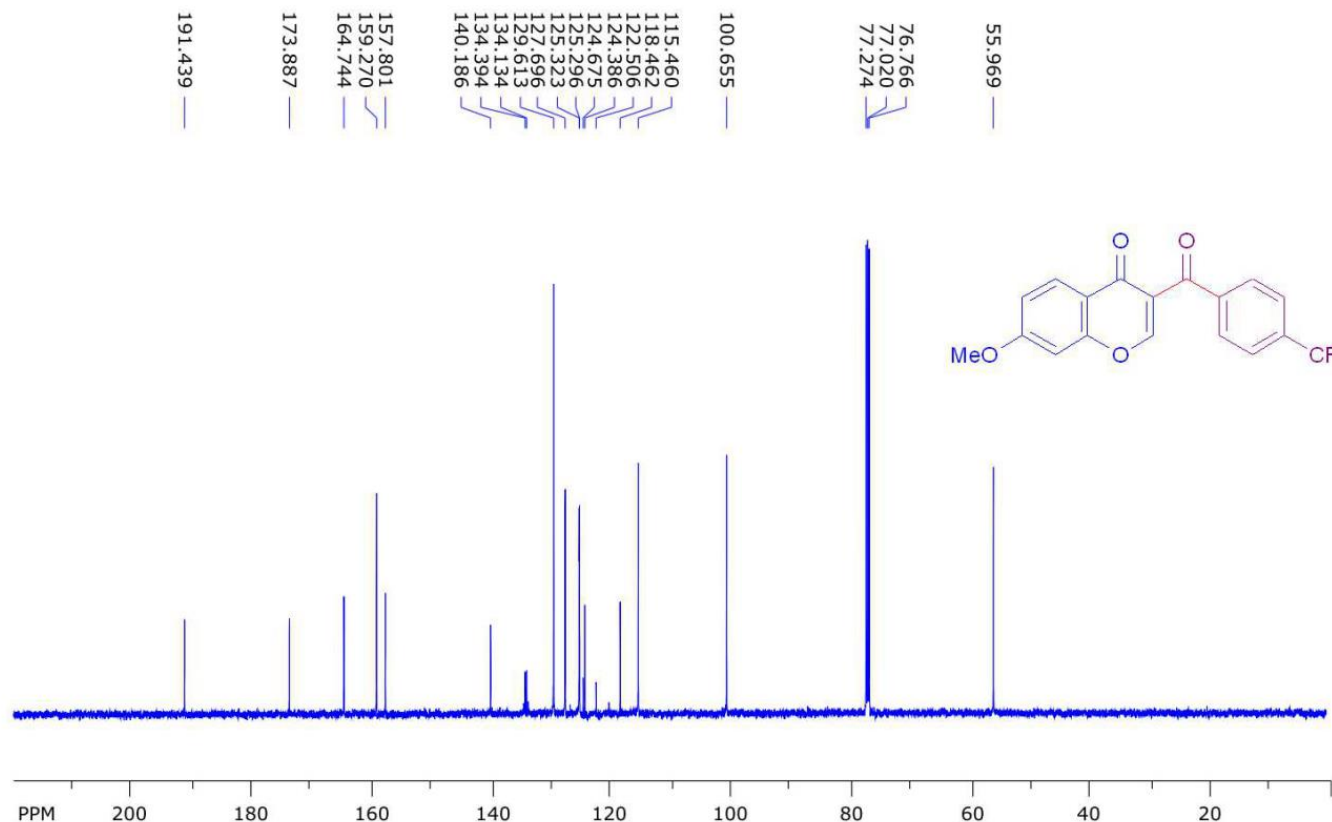


file: F:\Napo\NMR\500-2\mkr11202\29\fid expt: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 24

freq. of 0 ppm: 500.130023 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 220.277 ppm/cm: 0.44044

# Compound 4cf (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1130 13C

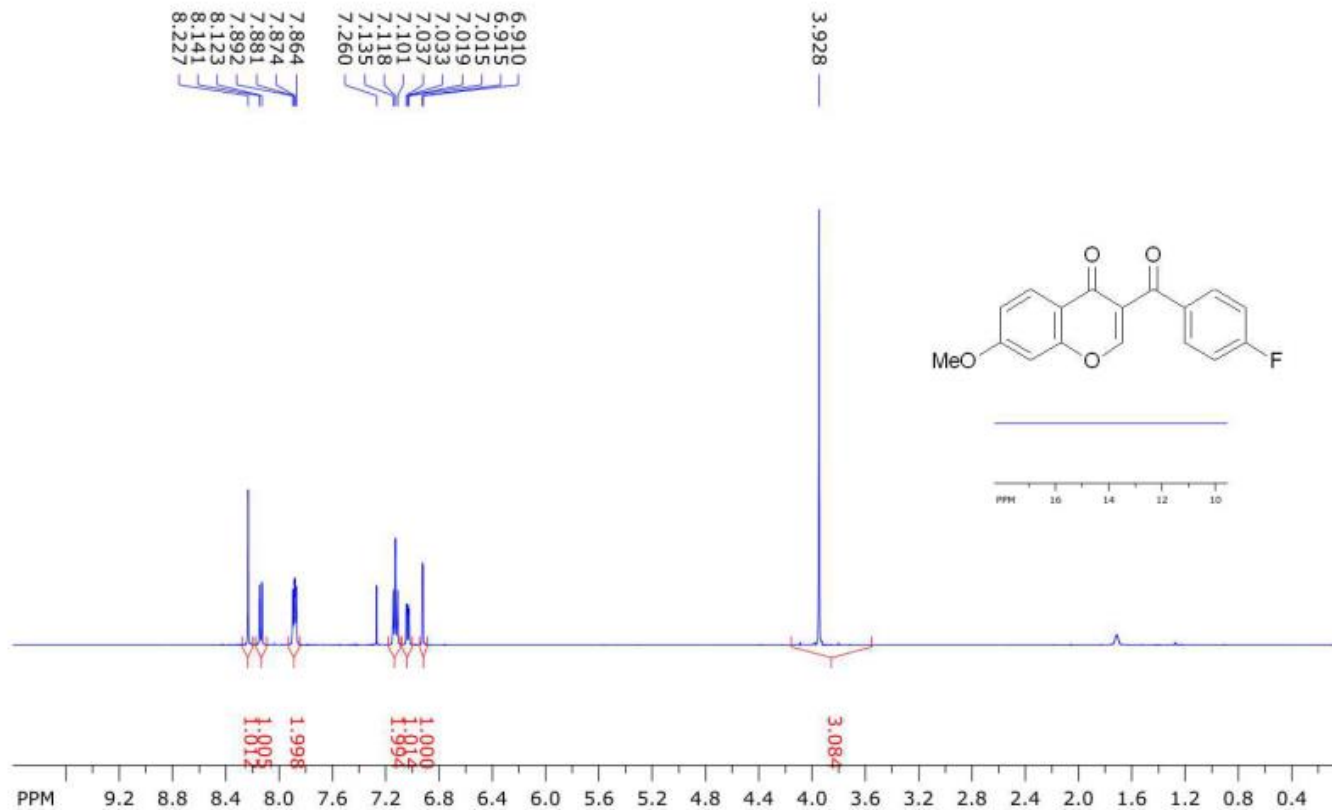


file: F:\Napo\NMR\500-2\mkr11202\30\fid expt: <zpgp30>  
 transmitter freq.: 125.772879 MHz  
 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 512

freq. of 0 ppm: 125.757797 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1105.877 ppm/cm: 8.79265

# Compound 4ck (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 907 1H

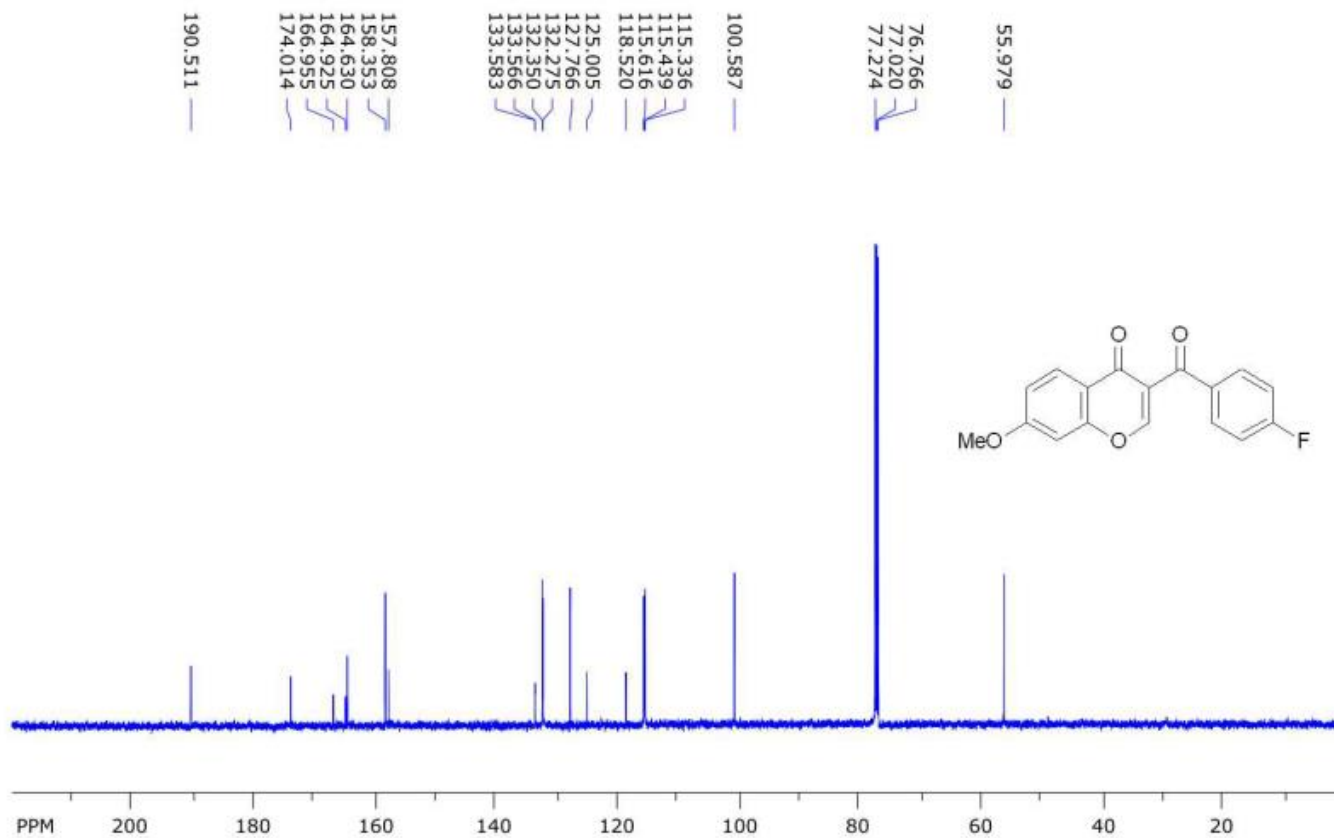


file: F:\Napo\NMR\500-1\mkr13005\7\fid expt: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 24

freq. of 0 ppm: 500.130023 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 199.902 ppm/cm: 0.39970

# Compound 4ck (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 907 13C

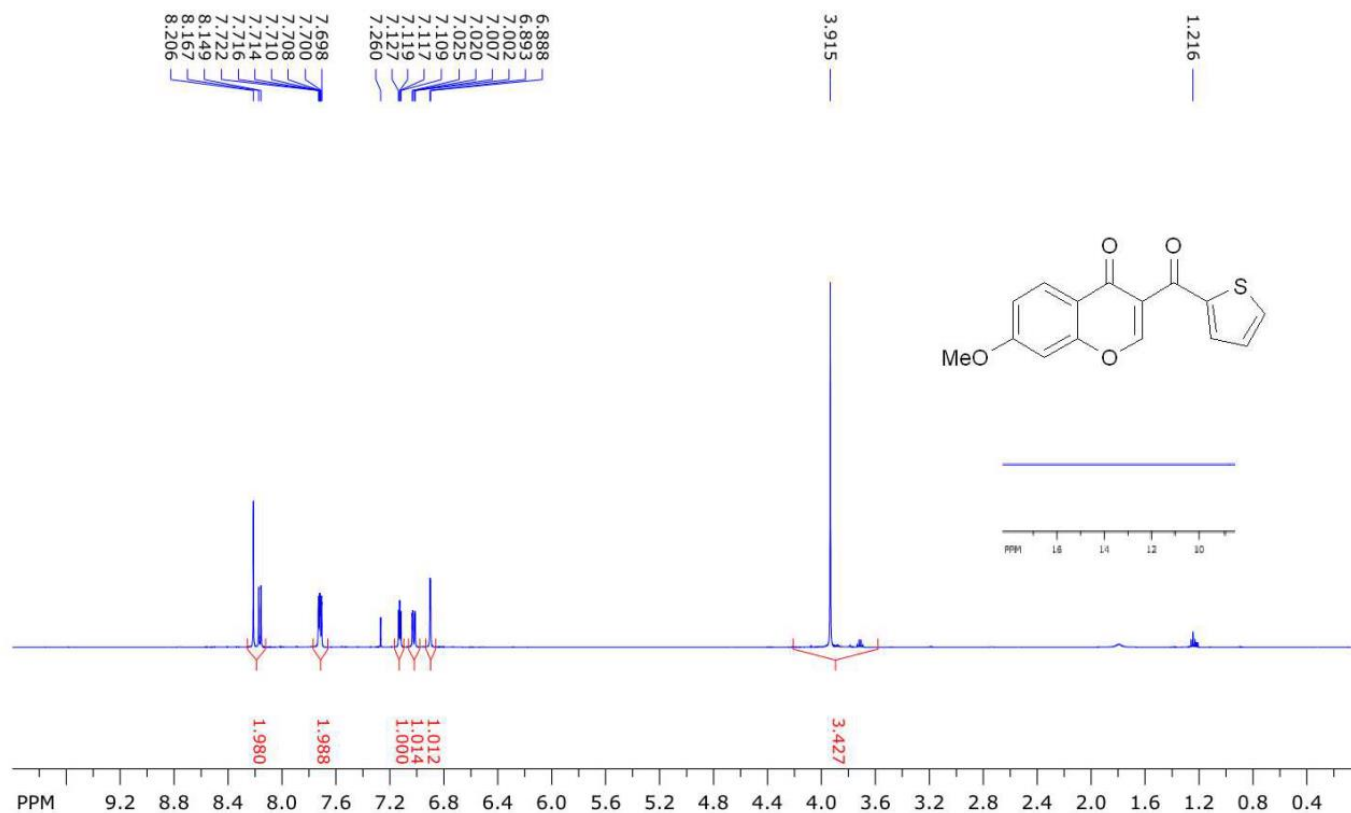


file: F:\Napo\NMR\500-1\mkr13005\8\fid expt: <zpgg30>  
 transmitter freq.: 125.772879 MHz  
 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 512

freq. of 0 ppm: 125.757795 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1109.096 ppm/cm: 8.81824

# Compound 4cr (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 947 1H

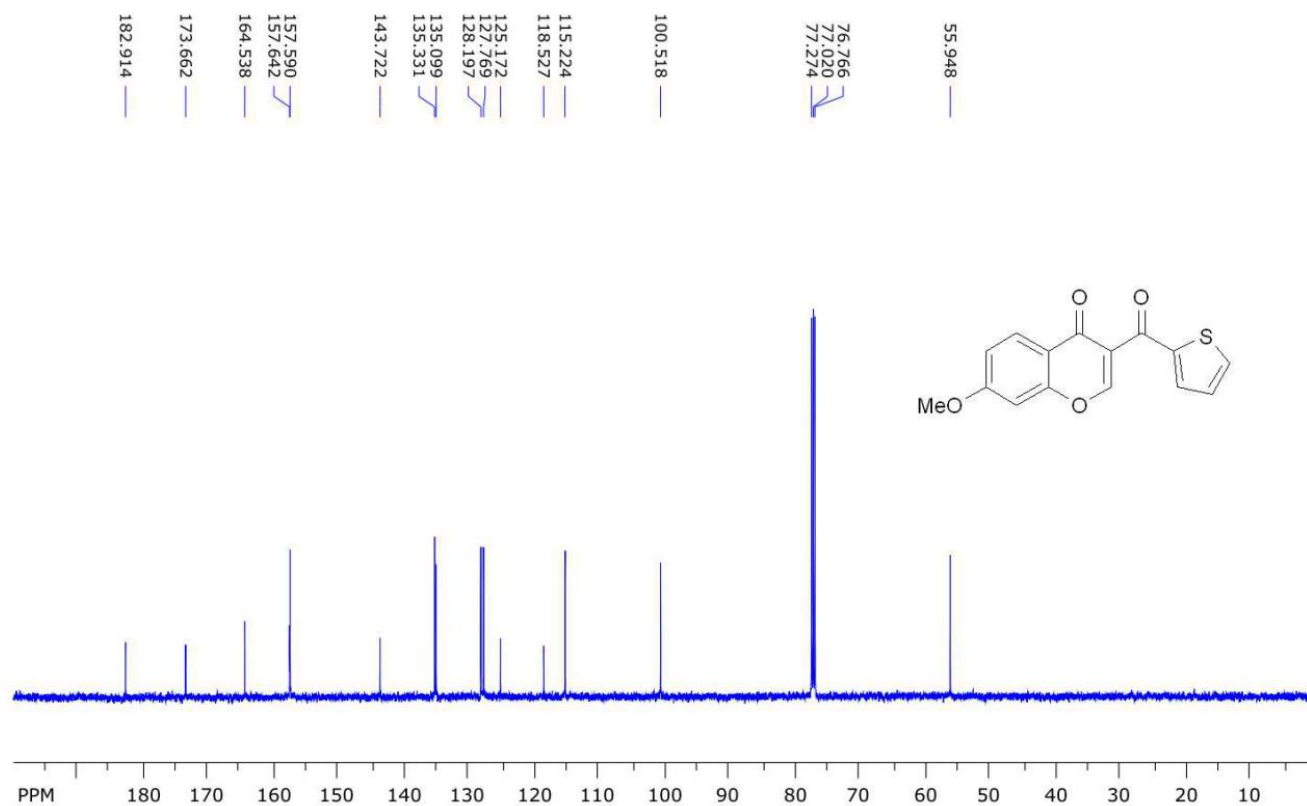


file: F:\Napo\NMR\500-1\mkr11405\1\fid expt: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 24

freq. of 0 ppm: 500.130023 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 199.902 ppm/cm: 0.39970

# Compound 4cr (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 947 13C



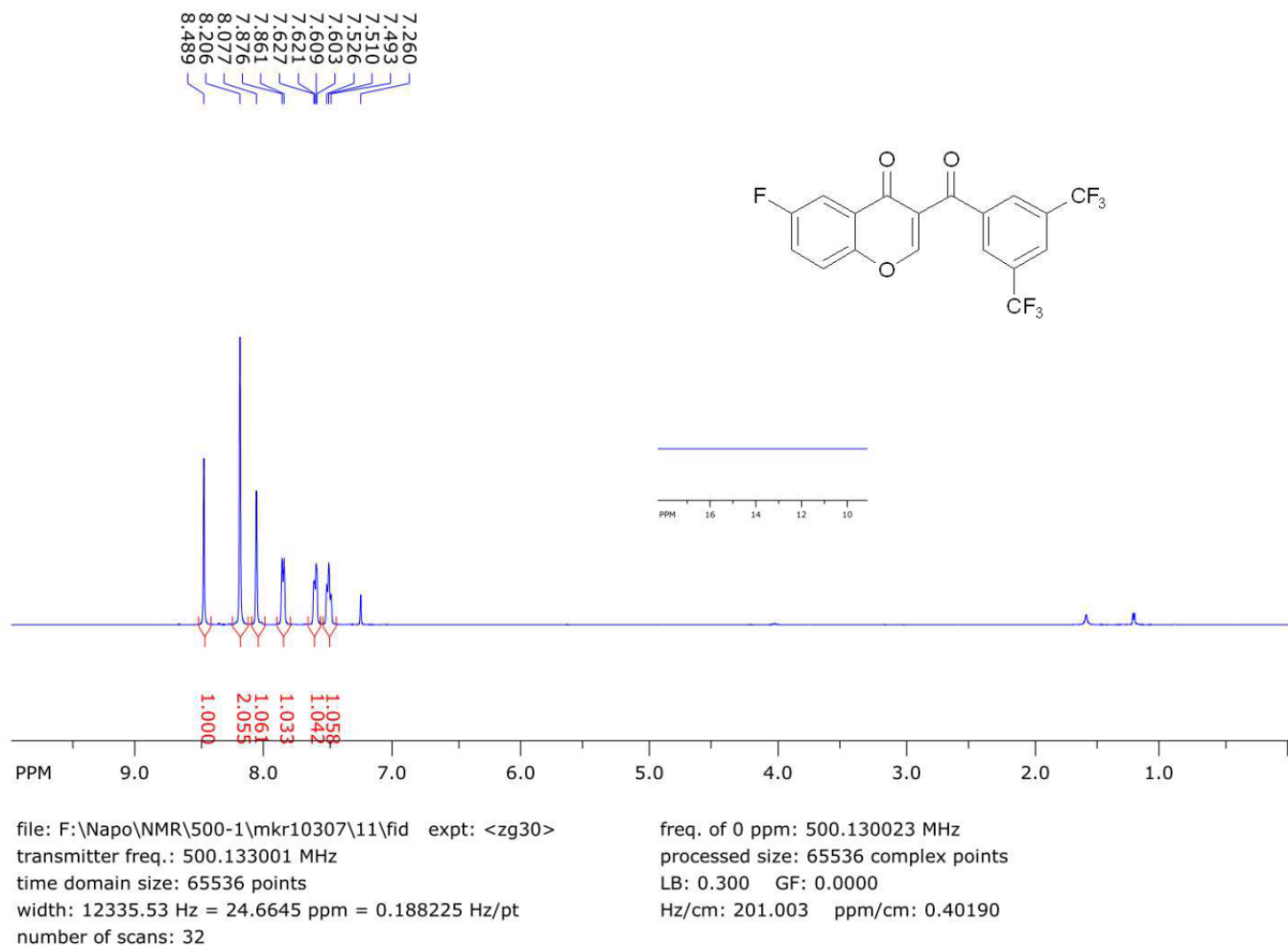
file: F:\Napo\NMR\500-1\mkr11405\2\fid exp: <zpgg30>  
 transmitter freq.: 125.772879 MHz  
 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 256

freq. of 0 ppm: 125.757799 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1005.446 ppm/cm: 7.99414



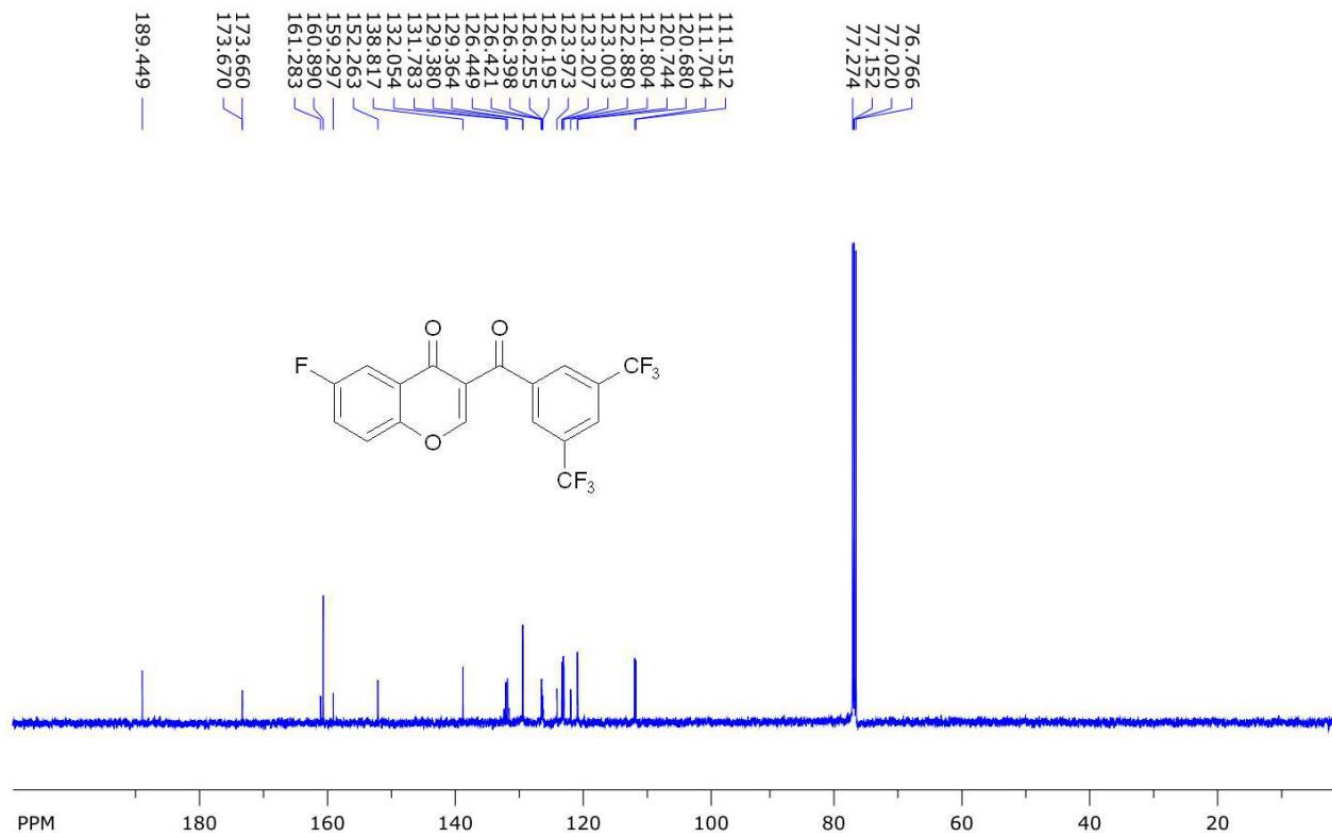
# Compound 4dg (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1024 1H



# Compound 4dg (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1024 13C

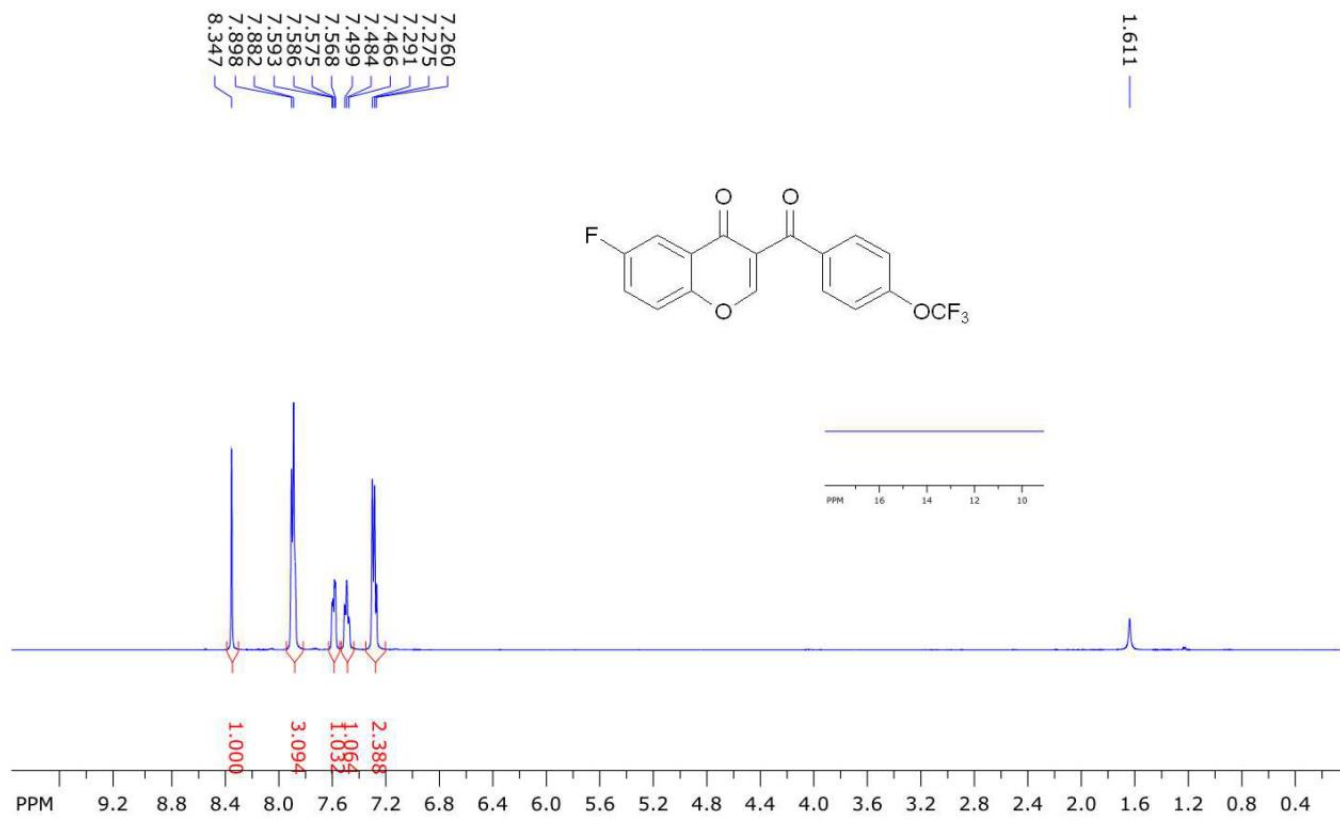


file: F:\Napo\NMR\500-1\mkr10307\12\fid expt: <zgpg30>  
 transmitter freq.: 125.772879 MHz  
 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 256

freq. of 0 ppm: 125.757791 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1054.366 ppm/cm: 8.38309

# Compound 4di (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1024 1H

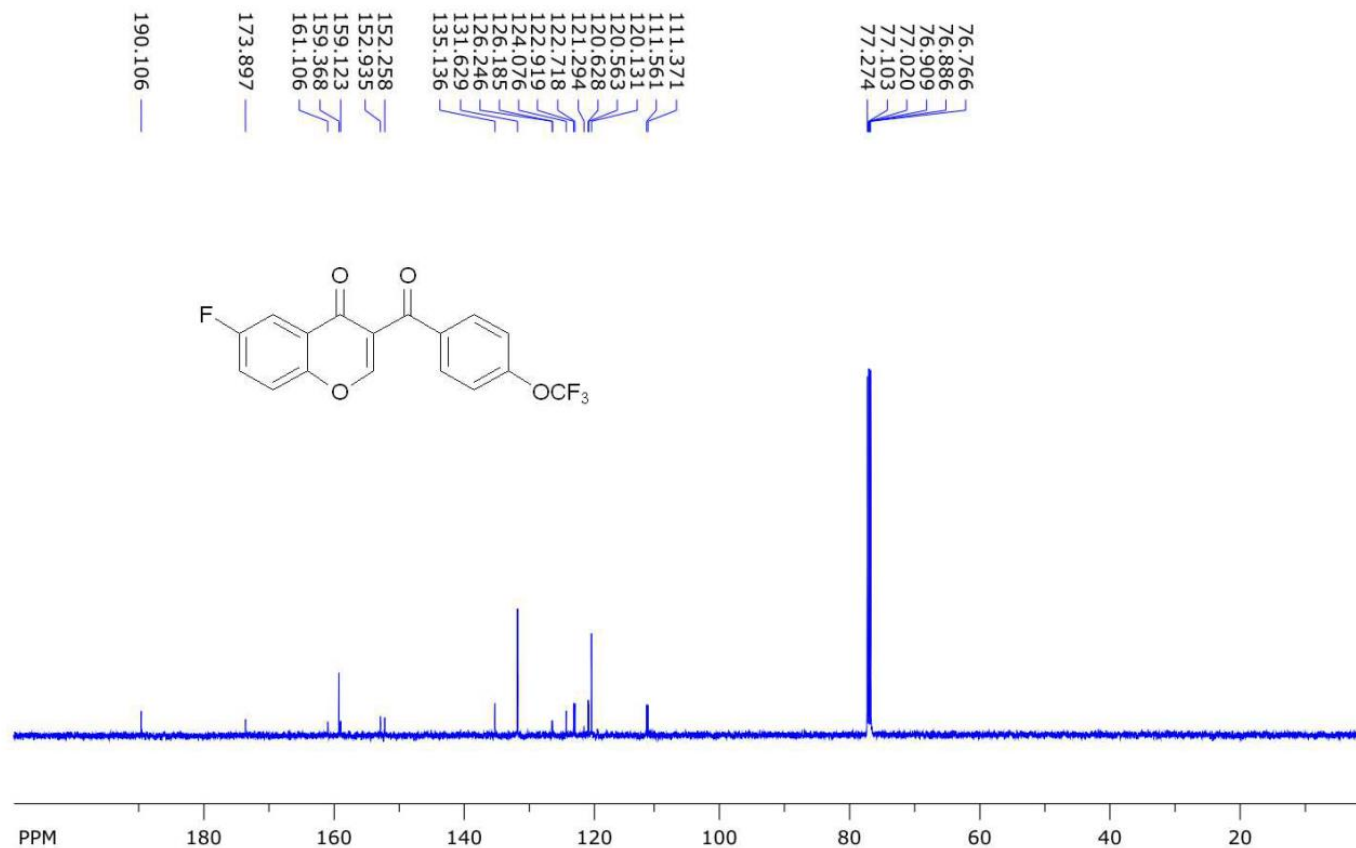


file: F:\Napo\NMR\500-1\mkr10307\21\fid expt: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 32

freq. of 0 ppm: 500.130024 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 199.902 ppm/cm: 0.39970

# Compound 4di (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1026 13C

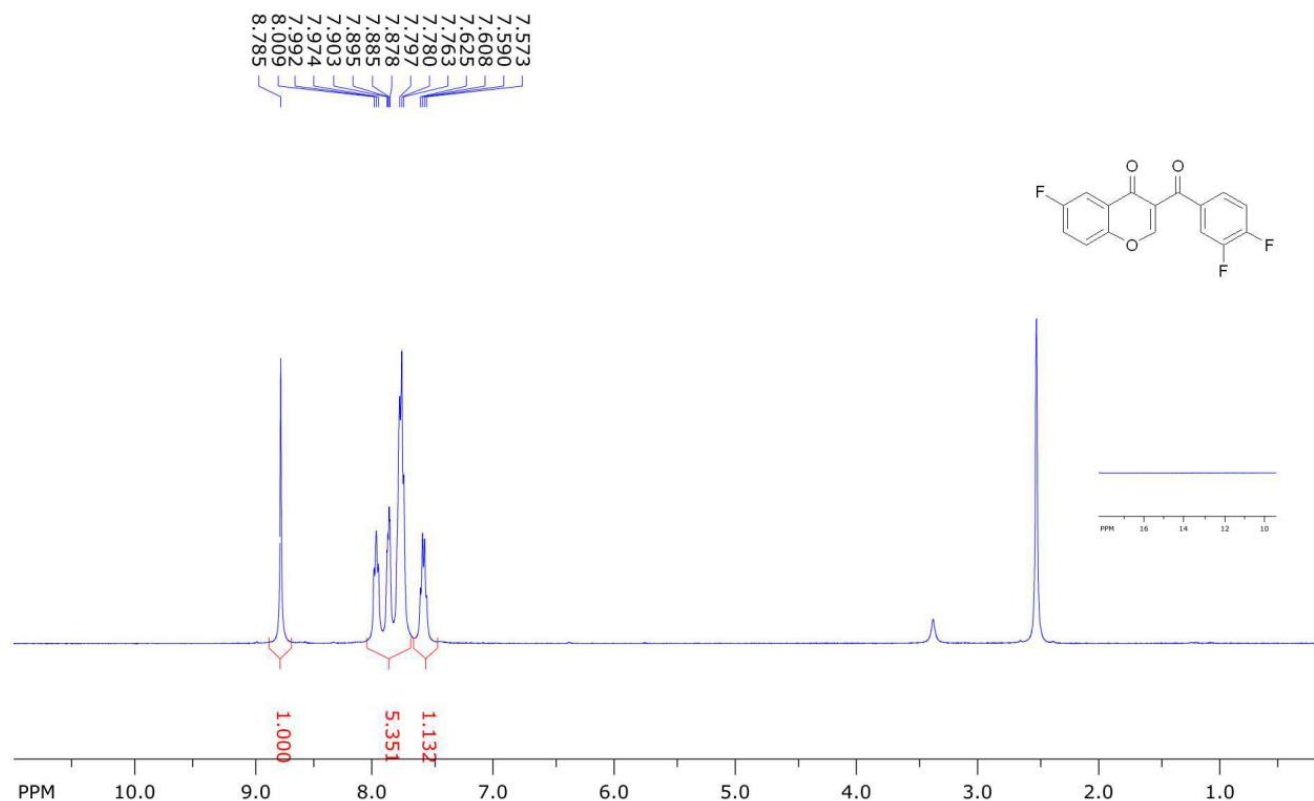


file: F:\Napo\NMR\500-1\mkr10307\22\fid expt: <zpgp30>  
 transmitter freq.: 125.772879 MHz  
 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 256

freq. of 0 ppm: 125.757792 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1055.975 ppm/cm: 8.39589

# Compound 4dm (NMR in DMSO-*d*<sub>6</sub>)

SpinWorks 4: IVA 1176 1H

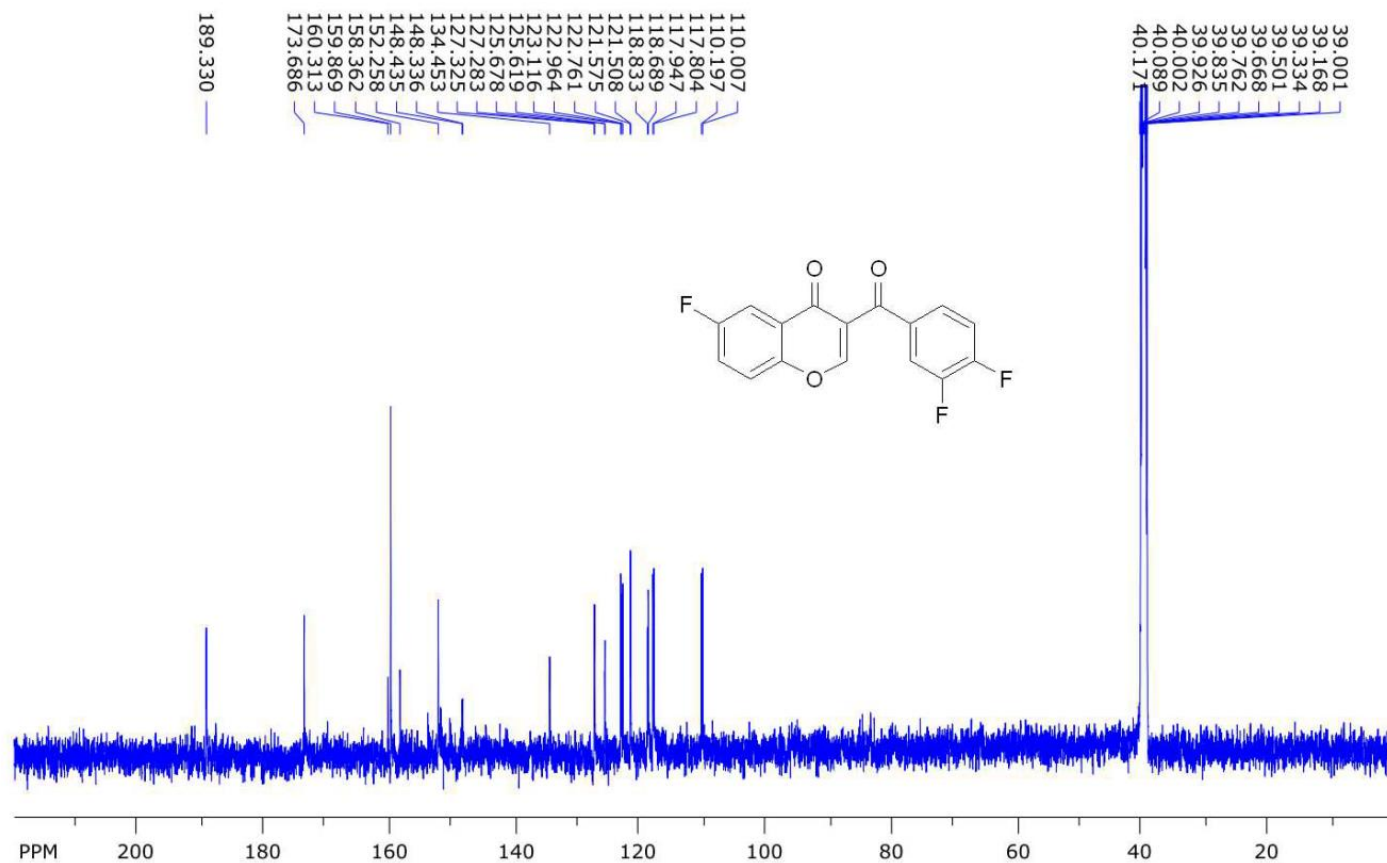


file: F:\Napo\NMR\500-1\mkr10110\13\fid expt: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 24

freq. of 0 ppm: 500.130002 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 218.074 ppm/cm: 0.43603

# Compound 4dm (NMR in DMSO-*d*<sub>6</sub>)

SpinWorks 4: IVA 1176 1H

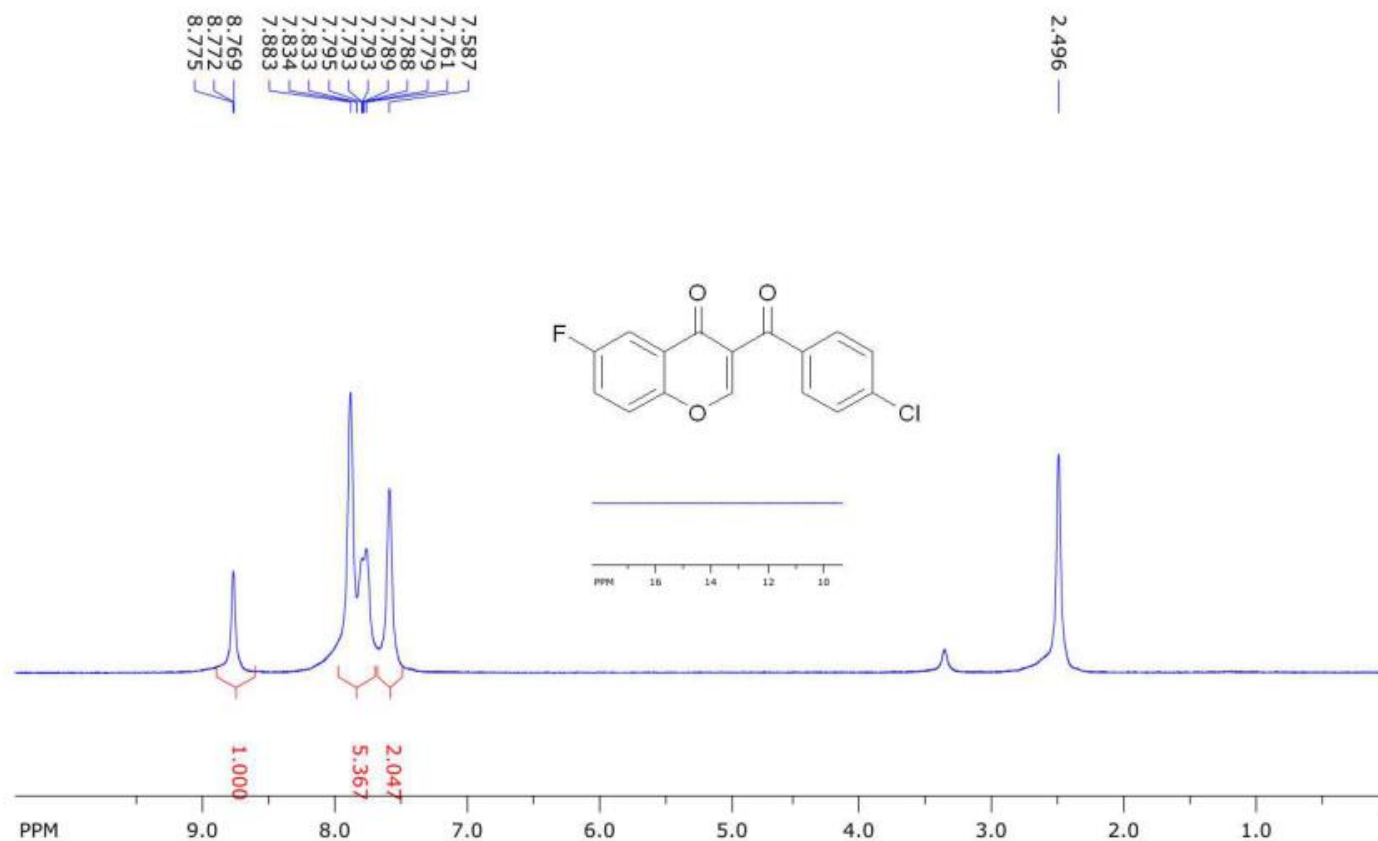


file: F:\Napo\NMR\500-1\mkr10110\14\fid expt: <zpgg30>  
 transmitter freq.: 125.772879 MHz  
 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 512

freq. of 0 ppm: 125.757846 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1104.267 ppm/cm: 8.77985

# Compound 4dn (NMR in DMSO-*d*<sub>6</sub>)

SpinWorks 4: IVA 1031 1H

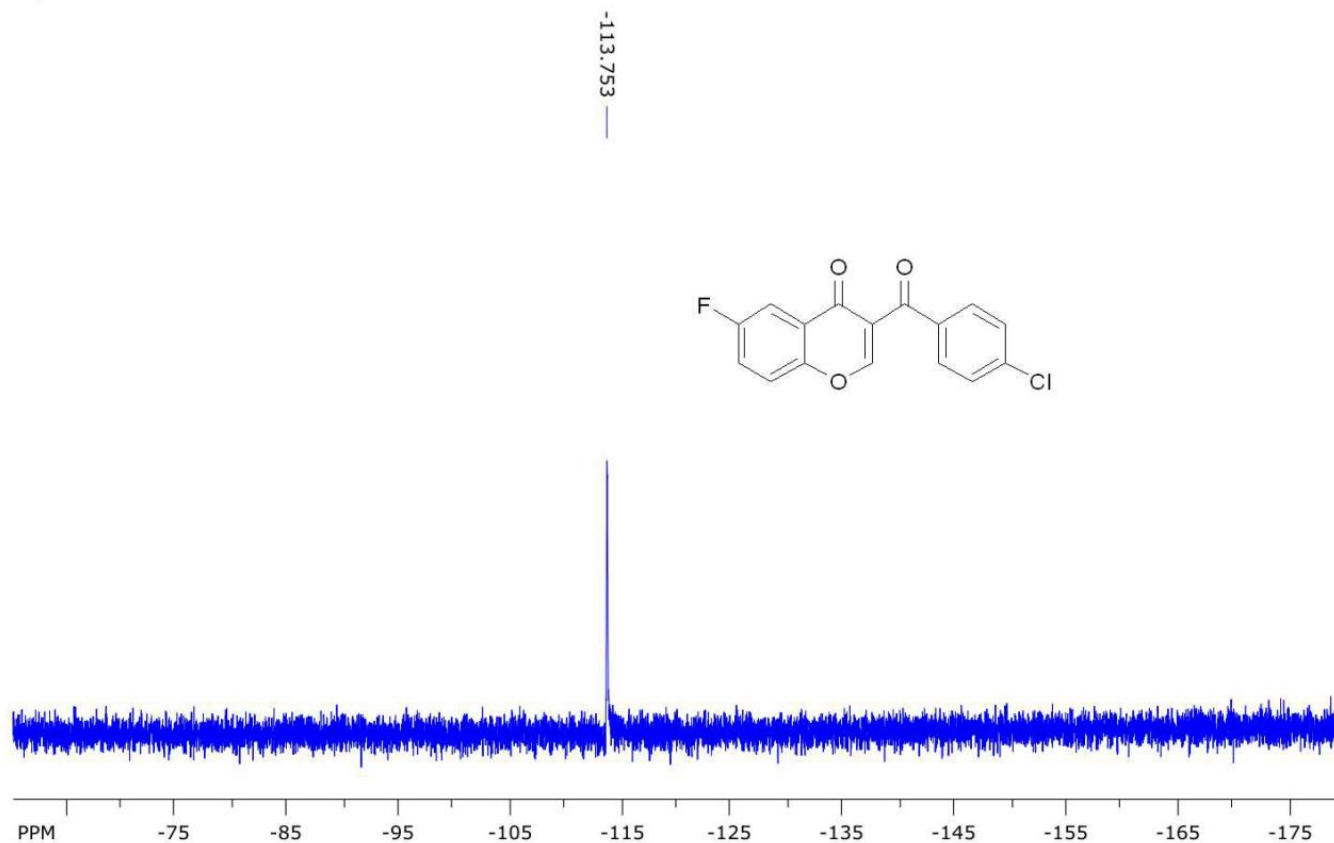


file: D:\NAPO\NMR\500-1\mkr10110\15\fid expt: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 24

freq. of 0 ppm: 500.130006 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 209.049 ppm/cm: 0.41799

# Compound 4dn (NMR in DMSO-*d*<sub>6</sub>)

SpinWorks 4: IVA 1031 F DMSO



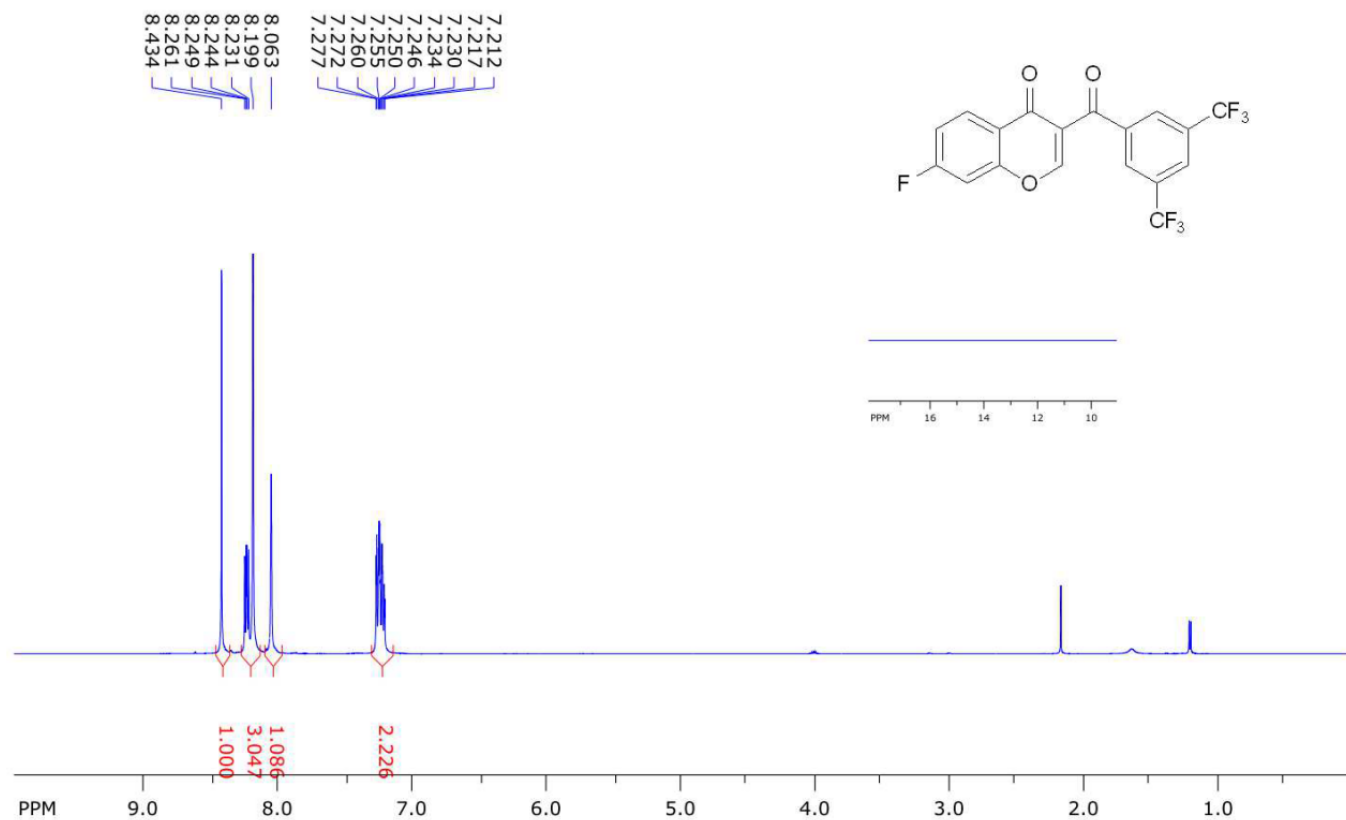
file: F:\Napo\NMR\IVA\IVA 1031 F\1\fid expt: <zg30>  
transmitter freq.: 188.324539 MHz  
time domain size: 65536 points  
width: 64102.56 Hz = 340.3835 ppm = 0.978128 Hz/pt  
number of scans: 16

freq. of 0 ppm: 188.338450 MHz  
processed size: 32768 complex points  
LB: 0.300 GF: 0.0000  
Hz/cm: 904.304 ppm/cm: 4.80184



# Compound 4eg (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1227 1H

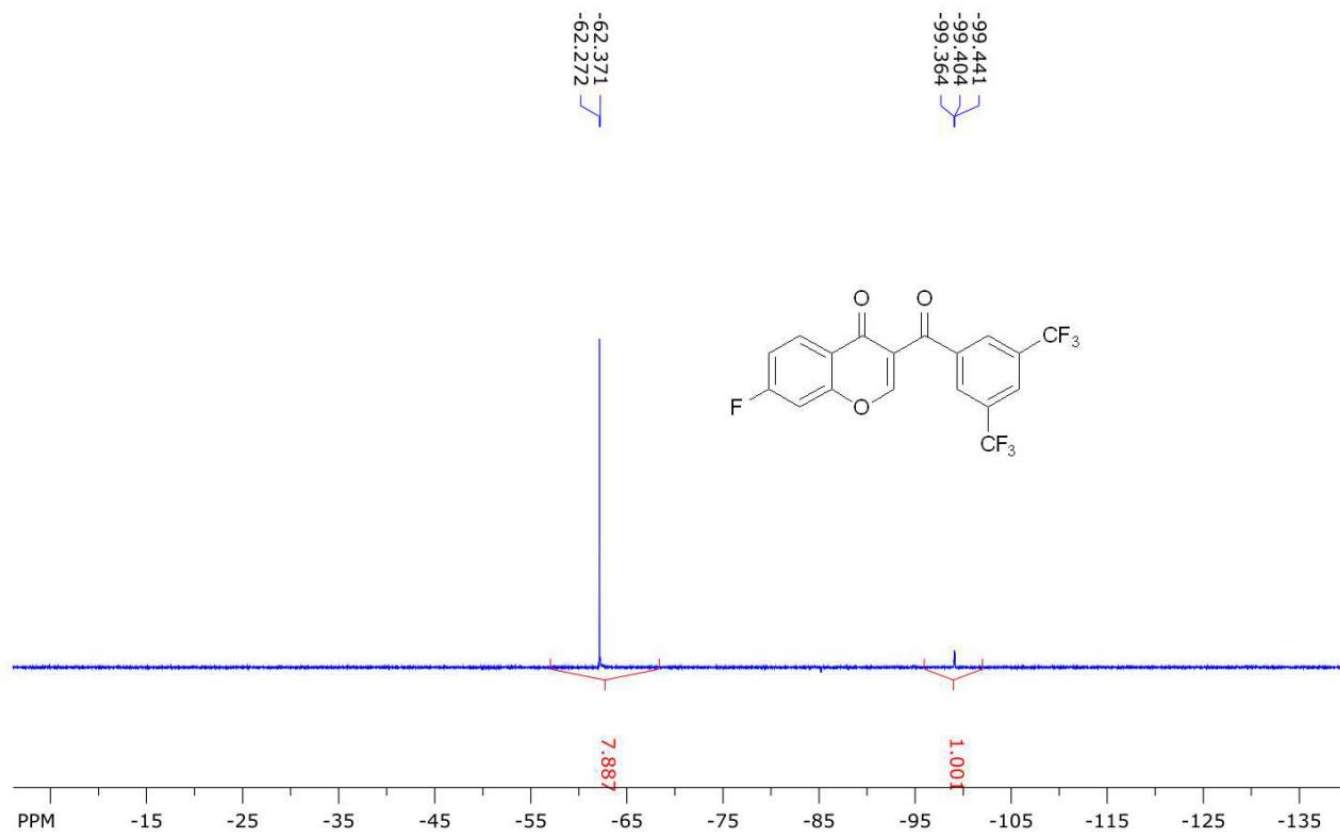


file: F:\Napo\NMR\500-1\mkr12009\19\fid expt: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 32

freq. of 0 ppm: 500.130029 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 200.452 ppm/cm: 0.40080

# Compound 4eg (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1227 CDCL<sub>3</sub>

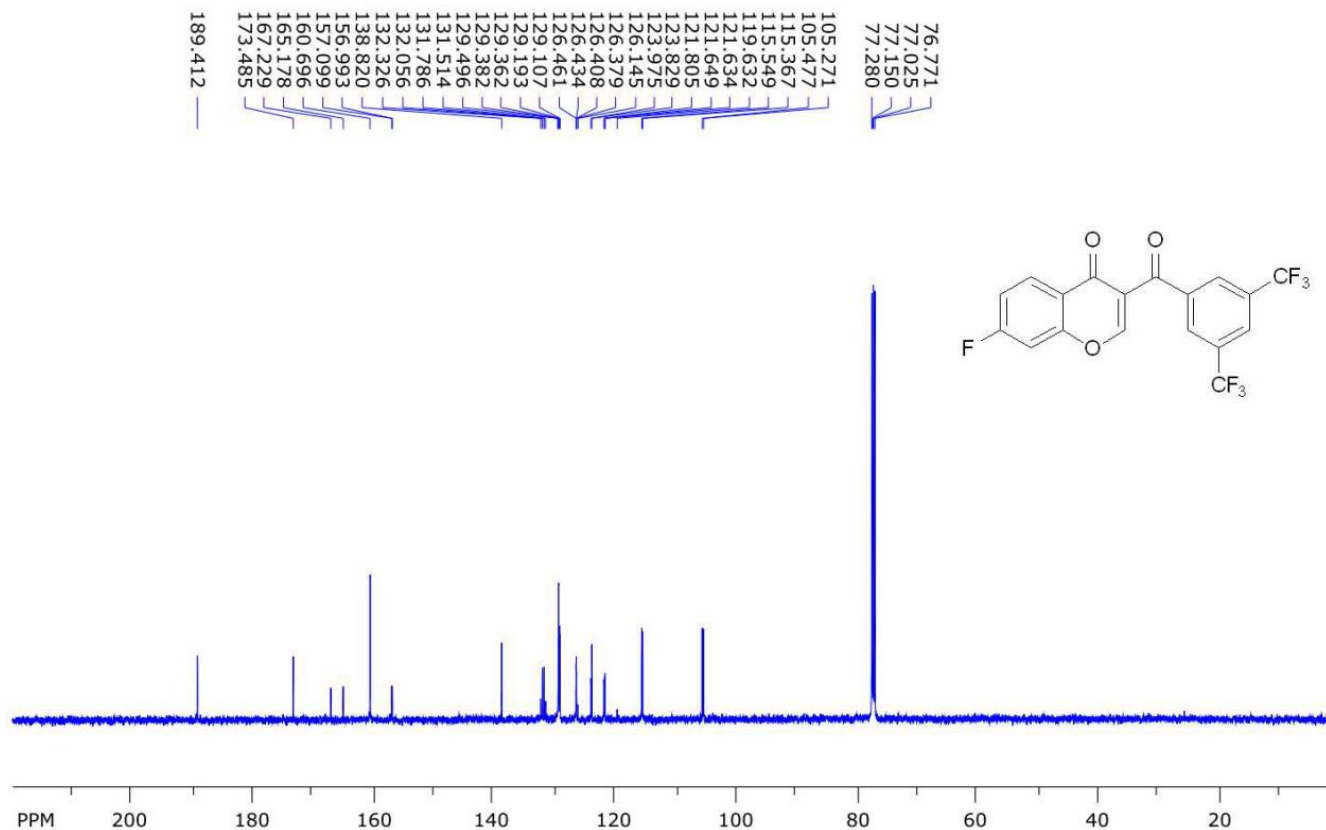


file: F:\Napo\NMR\IVA\IVA 1227\1\fid expt: <zg30>  
transmitter freq.: 188.324539 MHz  
time domain size: 65536 points  
width: 64102.56 Hz = 340.3835 ppm = 0.978128 Hz/pt  
number of scans: 4

freq. of 0 ppm: 188.338450 MHz  
processed size: 32768 complex points  
LB: 0.300 GF: 0.0000  
Hz/cm: 1047.390 ppm/cm: 5.56162

# Compound 4eg (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1227 13C

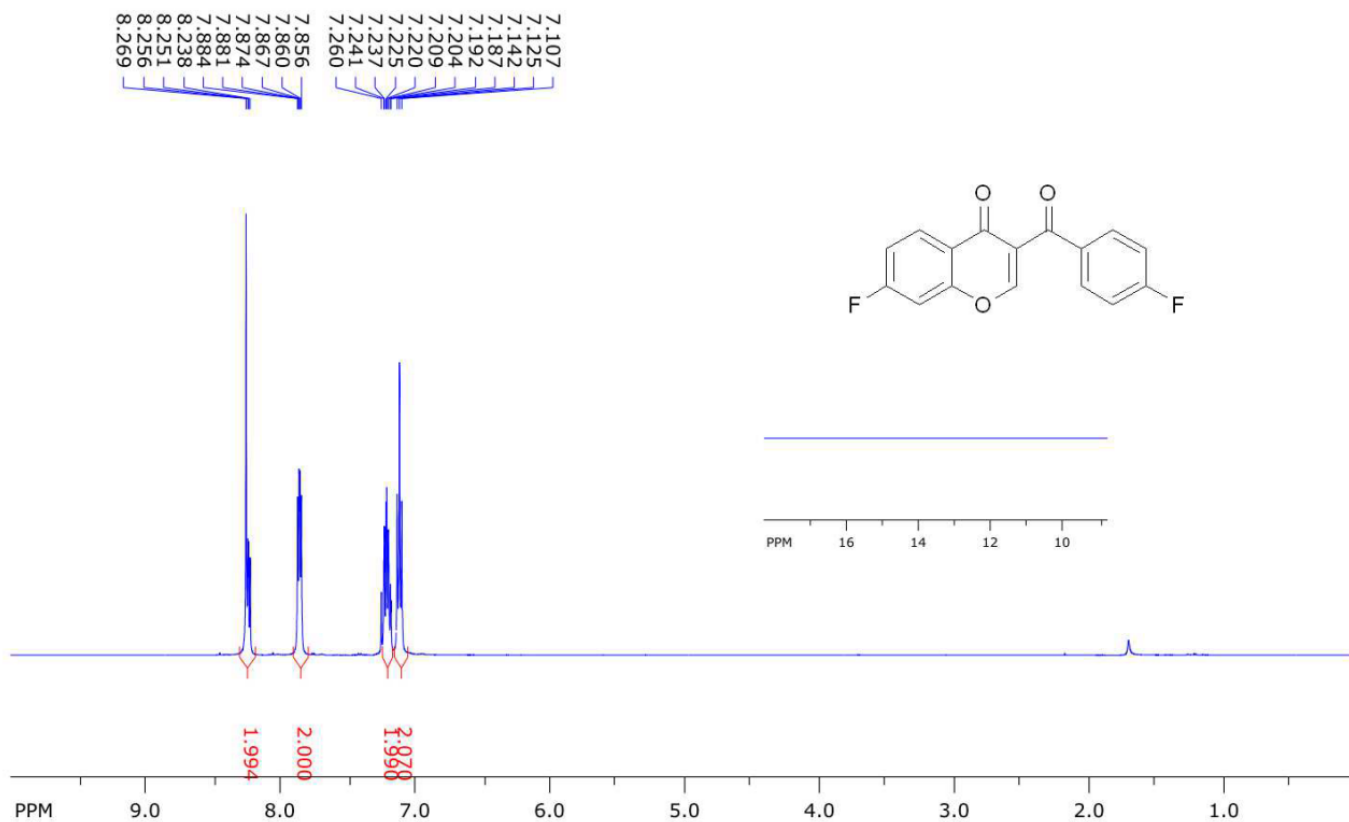


file: F:\Napo\NMR\500-1\mkr12009\20\fid expt: <zpgp30>  
 transmitter freq.: 125.772879 MHz  
 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 512

freq. of 0 ppm: 125.757792 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1107.486 ppm/cm: 8.80545

# Compound 4ek (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1221 1H

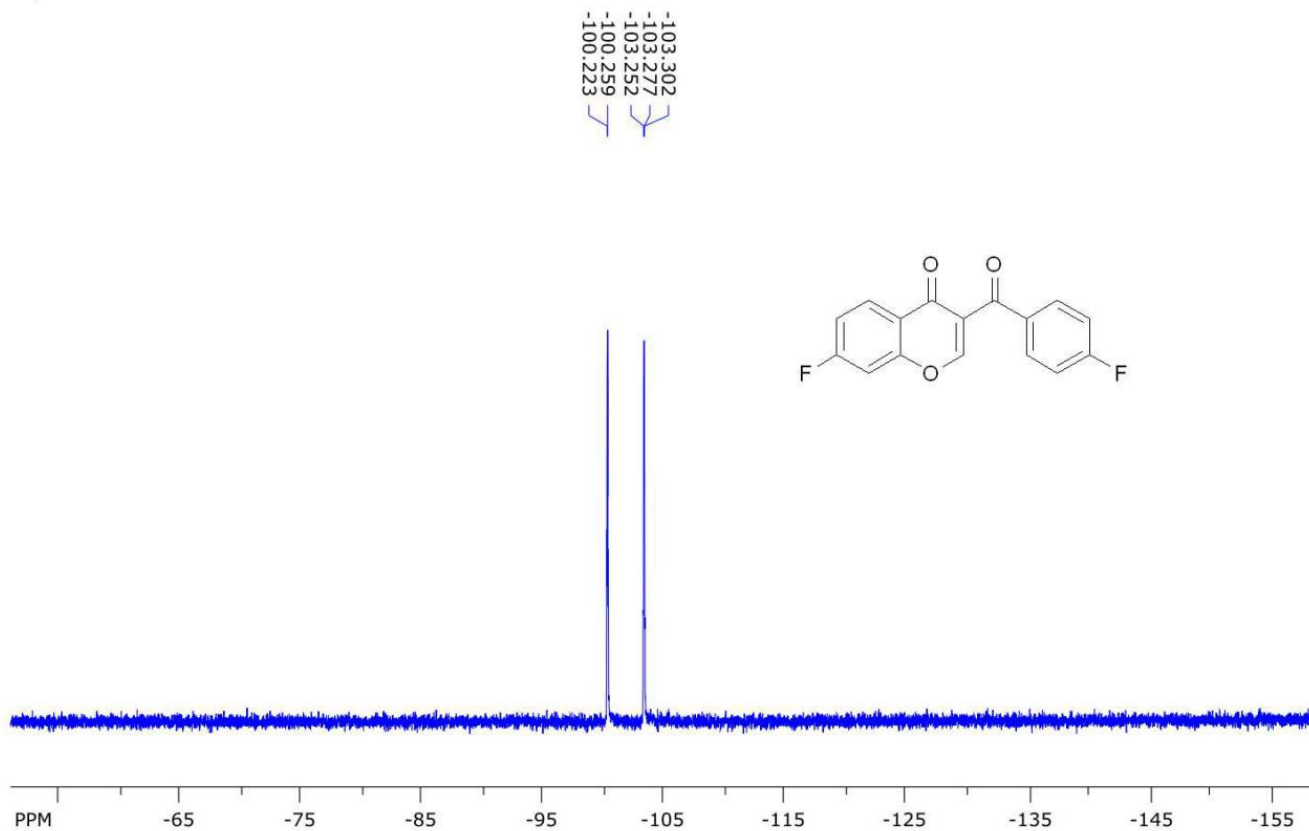


file: F:\Napo\NMR\500-1\mkr12709\13\fid expt: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 32

freq. of 0 ppm: 500.130023 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 200.452 ppm/cm: 0.40080

# Compound 4ek (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1221 F

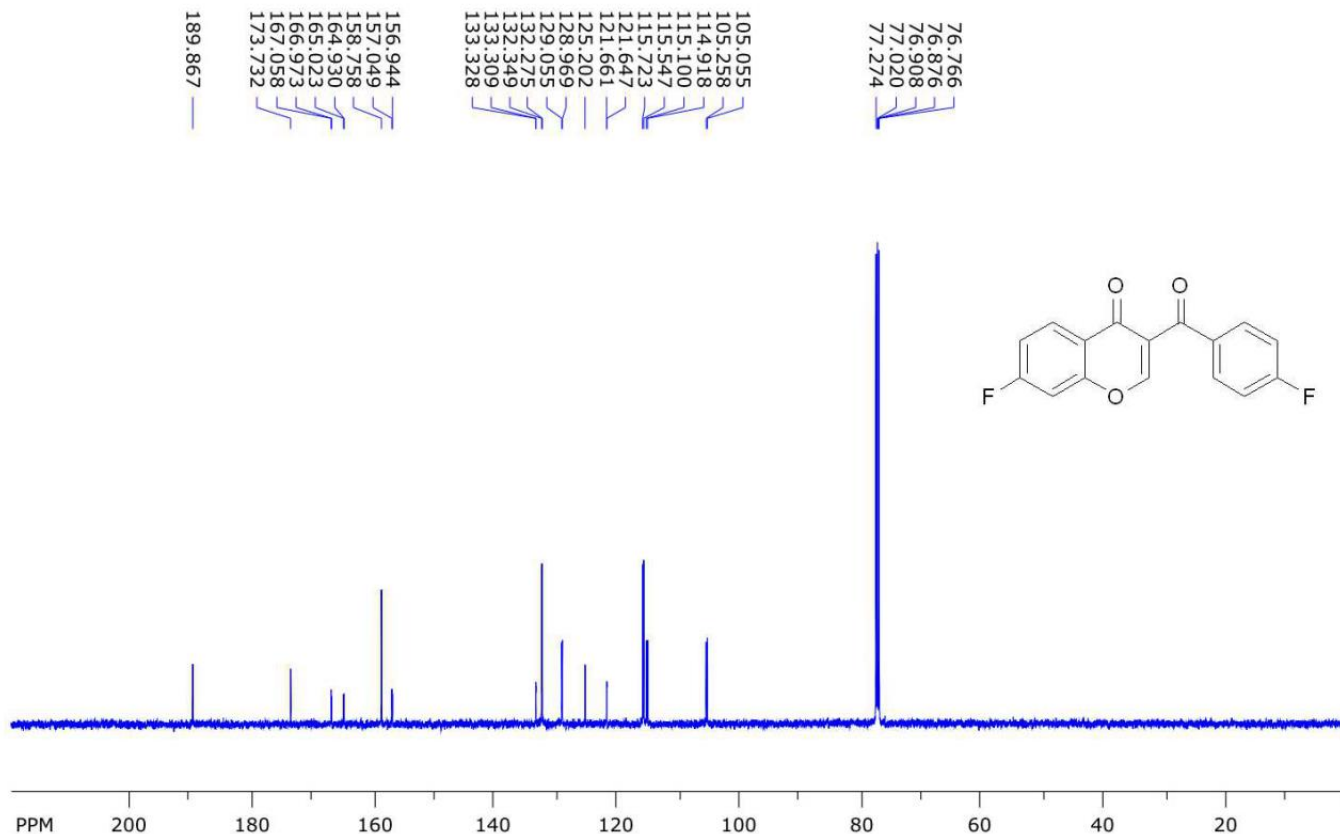


file: F:\Napo\NMR\IVA\IVA 1221 F\1\fid expt: <zg30>  
transmitter freq.: 188.324539 MHz  
time domain size: 65536 points  
width: 64102.56 Hz = 340.3835 ppm = 0.978128 Hz/pt  
number of scans: 16

freq. of 0 ppm: 188.338450 MHz  
processed size: 32768 complex points  
LB: 0.300 GF: 0.0000  
Hz/cm: 818.452 ppm/cm: 4.34597

# Compound 4ek (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1221 13C

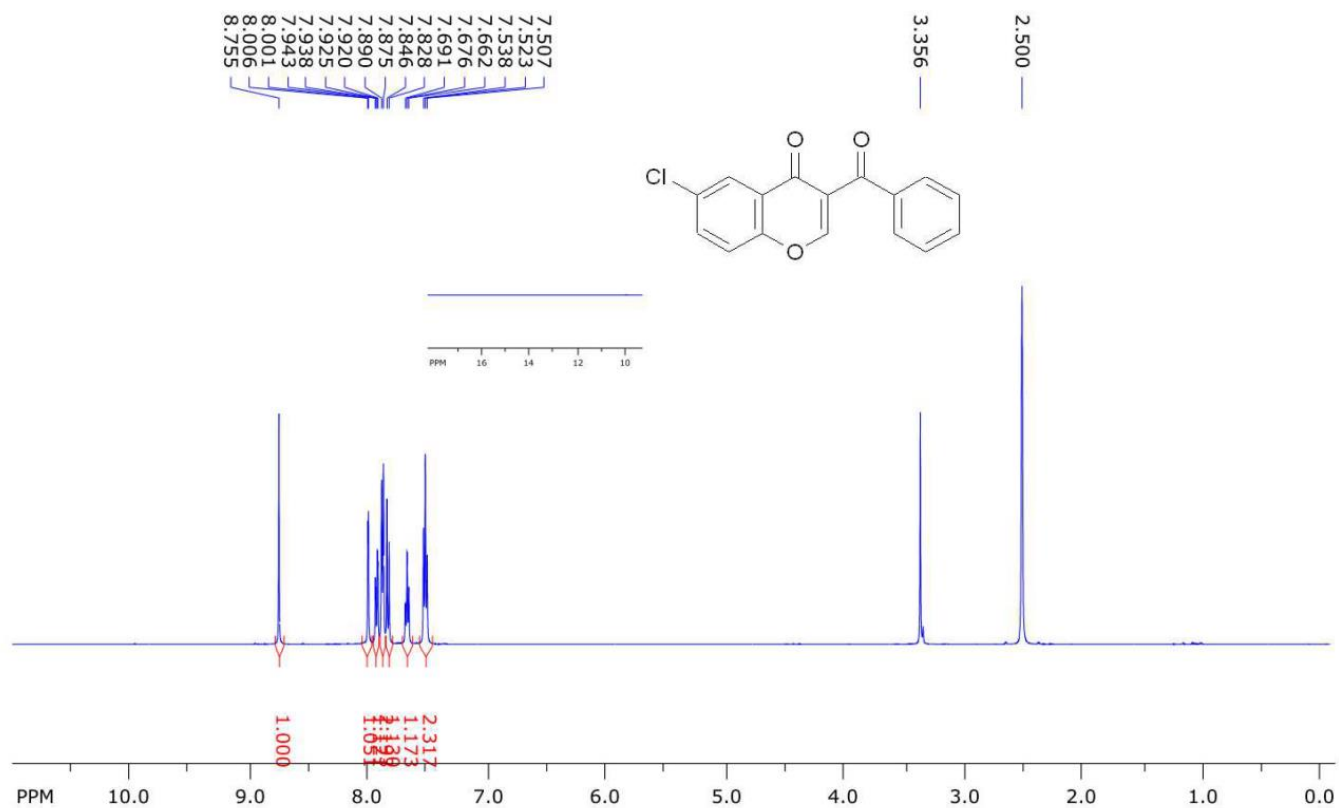


file: F:\Napo\NMR\500-1\mkr12709\14\fid expt: <zpgg30>  
transmitter freq.: 125.772879 MHz  
time domain size: 65536 points  
width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
number of scans: 332

freq. of 0 ppm: 125.757796 MHz  
processed size: 32768 complex points  
LB: 2.000 GF: 0.0000  
Hz/cm: 1104.267 ppm/cm: 8.77985

# Compound 4fa (NMR in DMSO-*d*<sub>6</sub>)

SpinWorks 4: IVA 875 1H

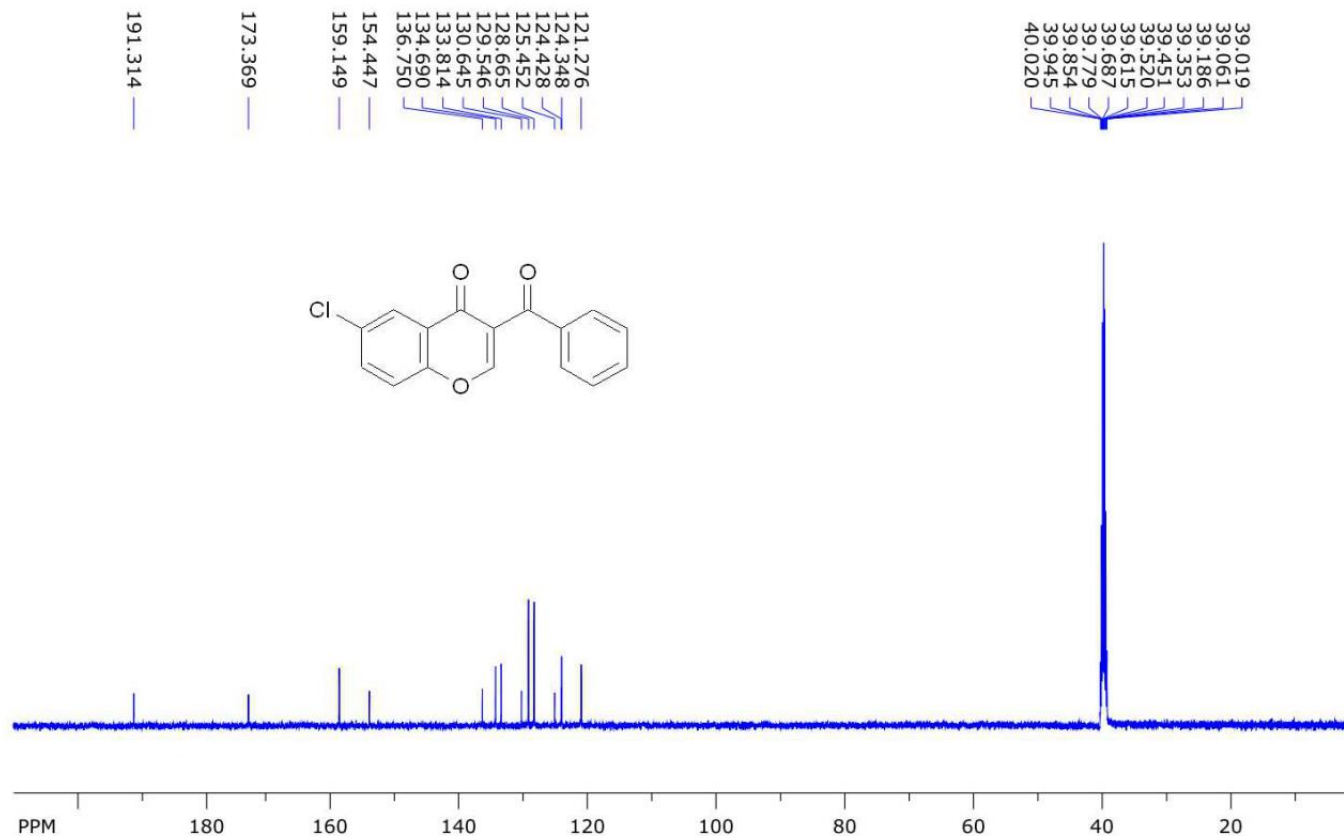


file: F:\Napo\NMR\500-1\mkr12403\11\fid expt: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 24

freq. of 0 ppm: 500.130005 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 221.929 ppm/cm: 0.44374

# Compound 4fa (NMR in DMSO-*d*<sub>6</sub>)

SpinWorks 4: IVA 875 13C



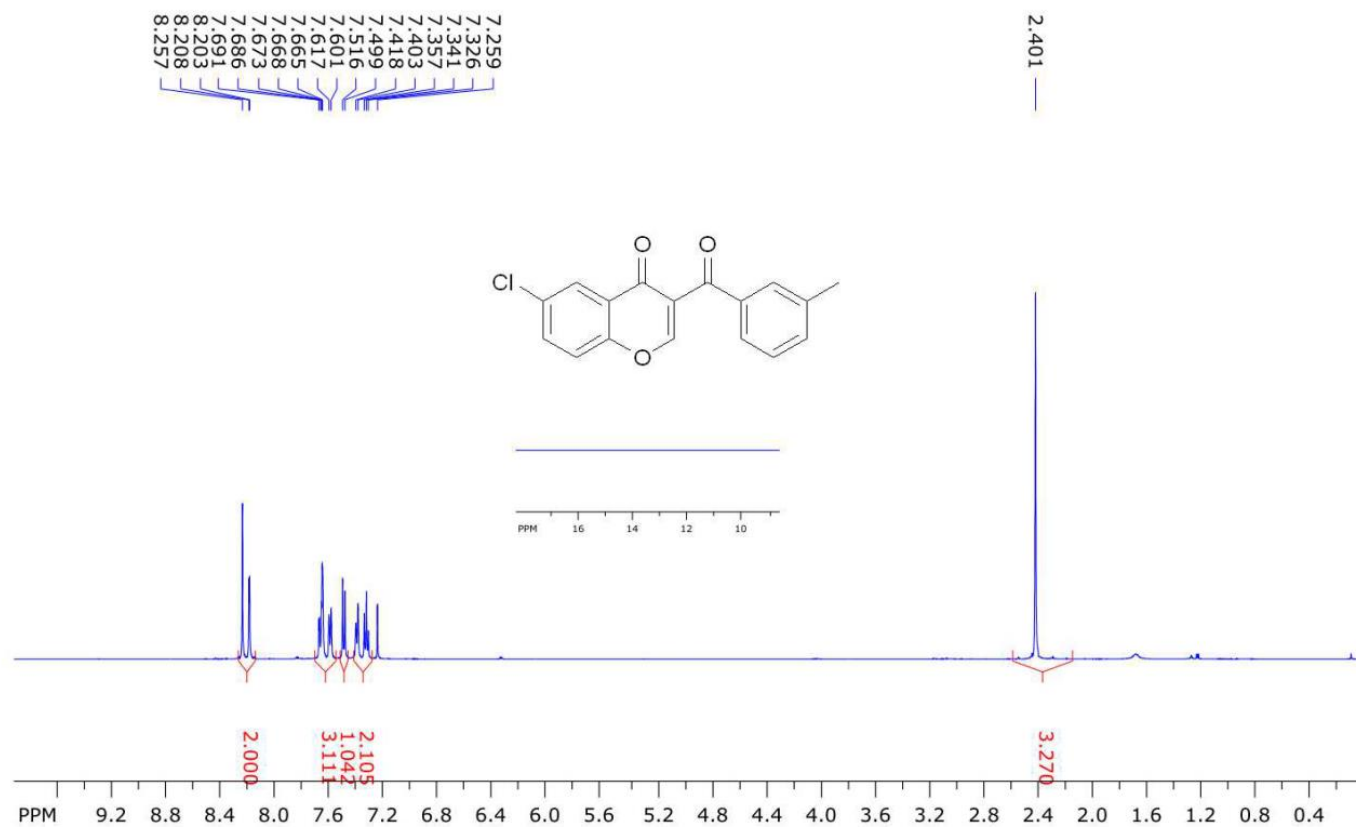
file: F:\Napo\NMR\500-1\mkr12403\12\fid expt: <zpgp30>  
 transmitter freq.: 125.772879 MHz  
 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 225

freq. of 0 ppm: 125.757842 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1051.146 ppm/cm: 8.35749



# Compound 4fb (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 982-2 CDCl<sub>3</sub>

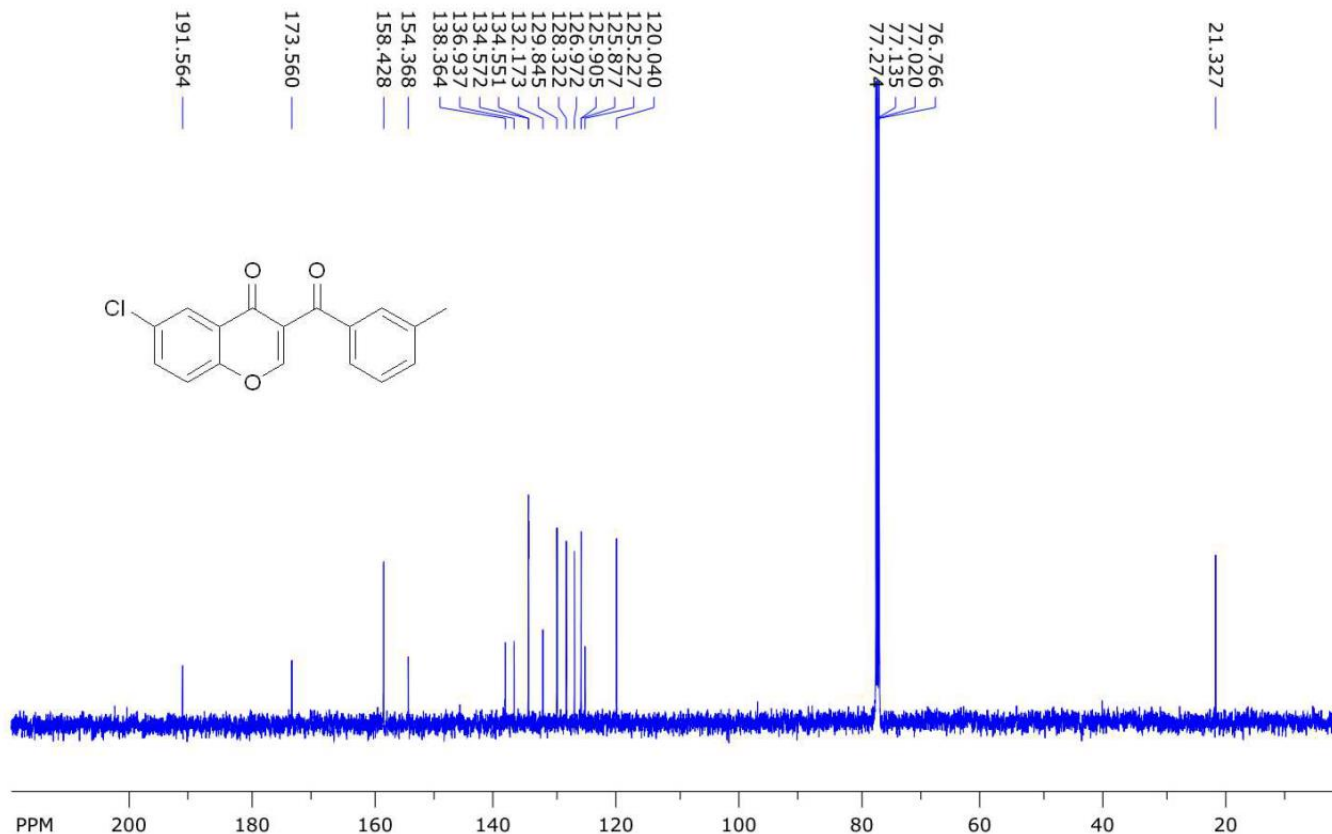


file: F:\Napo\NMR\500-1\mkr13004\5\fid expt: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 24

freq. of 0 ppm: 500.130024 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 199.351 ppm/cm: 0.39860

# Compound 4fb (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 982-2 13C CDCl<sub>3</sub>

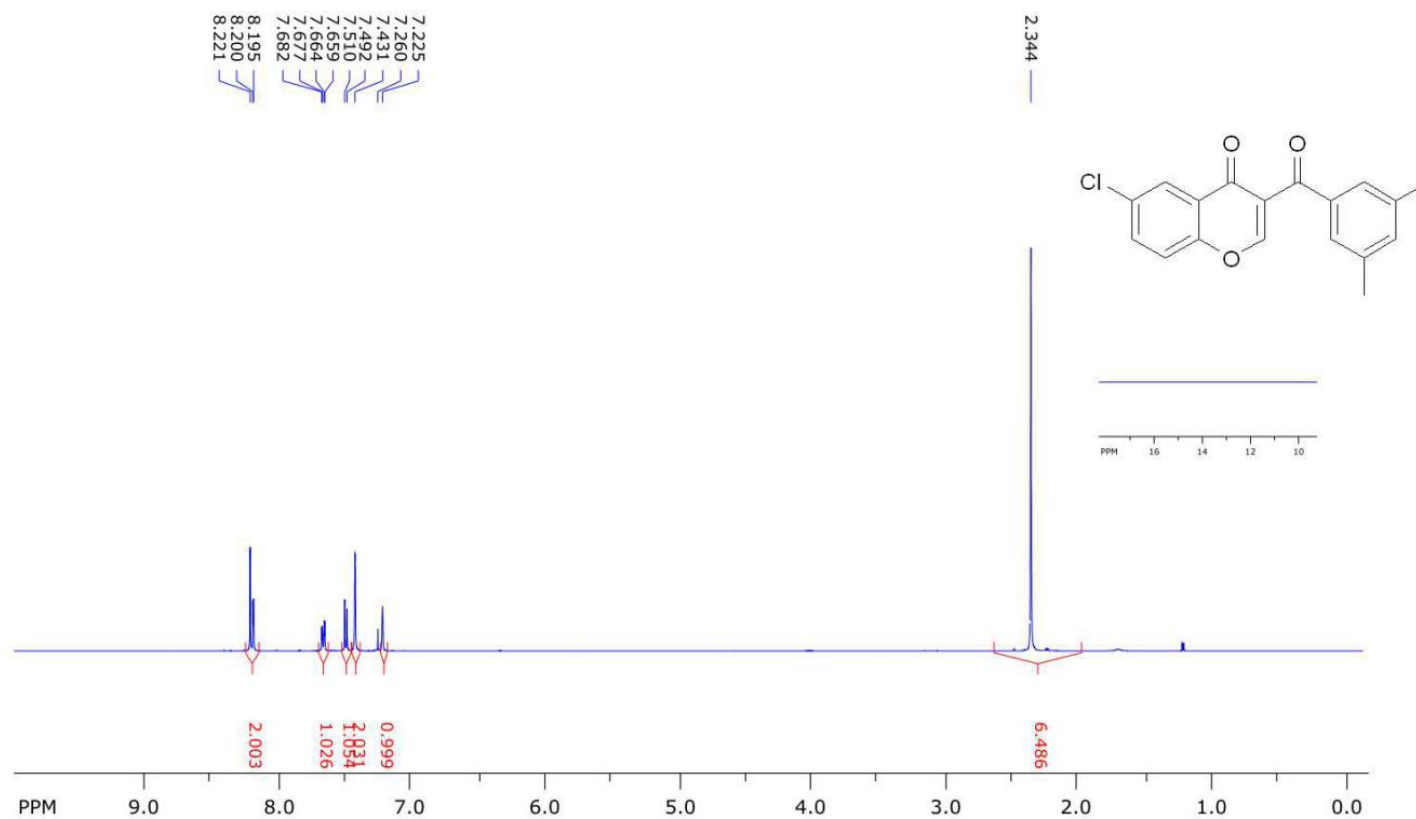


file: F:\Napo\NMR\500-1\mkr13004\6\fid expt: <zpgg30>  
 transmitter freq.: 125.772879 MHz  
 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 256

freq. of 0 ppm: 125.757794 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1104.267 ppm/cm: 8.77985

# Compound 4fc (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 990 1H

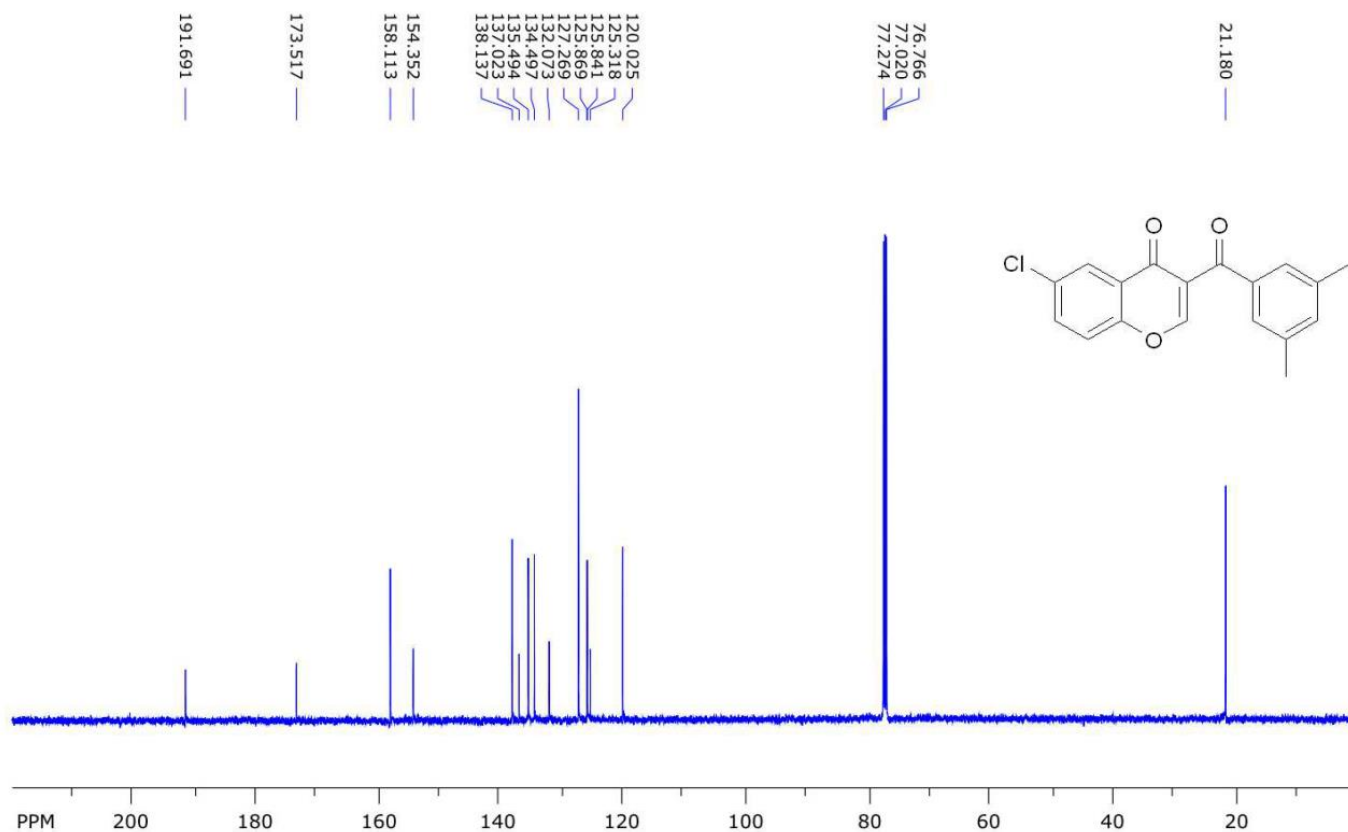


file: F:\Napo\NMR\500-1\mkr13005\15\fid expt: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 24

freq. of 0 ppm: 500.130023 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 203.206 ppm/cm: 0.40630

# Compound 4fc (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 990 13C

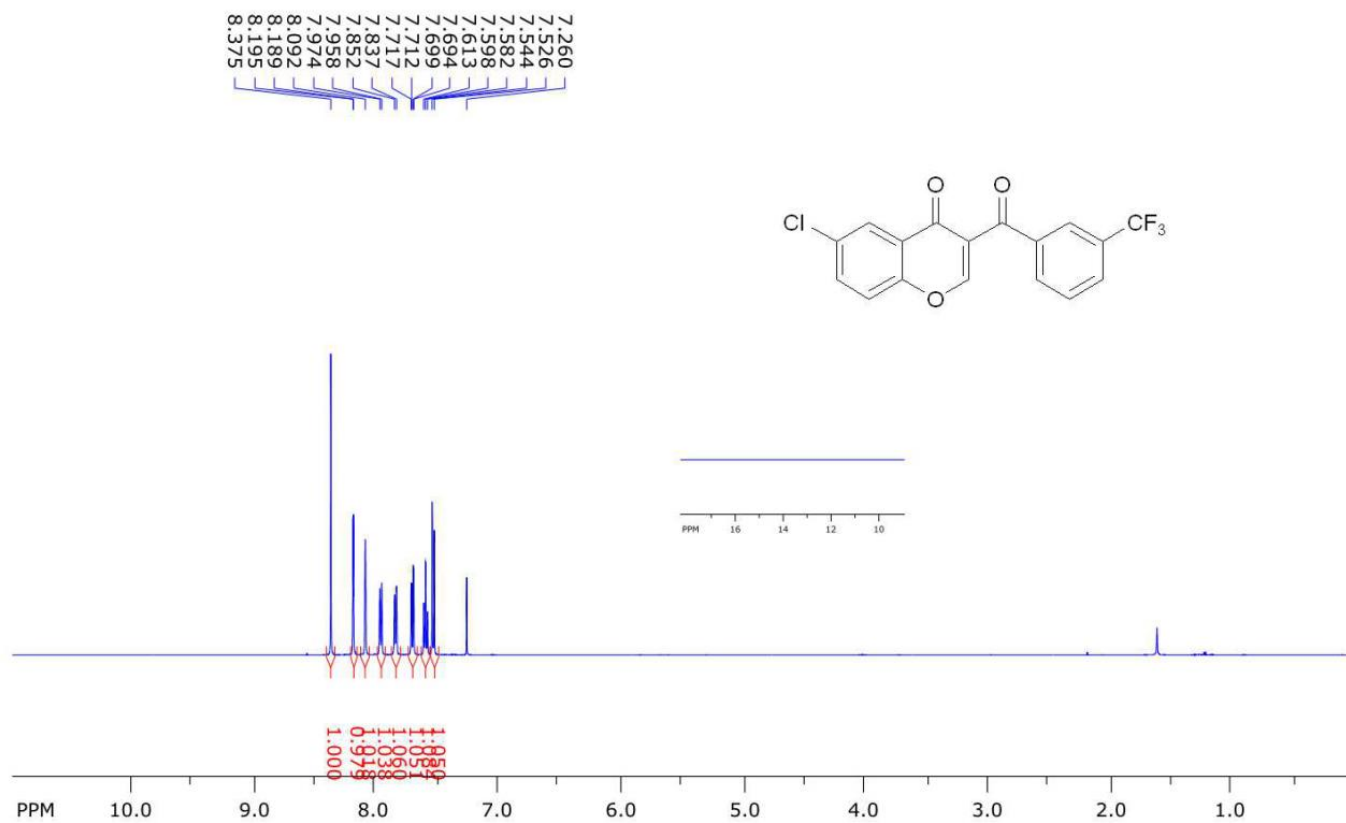


file: F:\Napo\NMR\500-1\mkr13005\16\fid expt: <zpg30>  
 transmitter freq.: 125.772879 MHz  
 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 512

freq. of 0 ppm: 125.757797 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1107.486 ppm/cm: 8.80545

# Compound 4fe (NMR in CDCl<sub>3</sub>)

iva 1008

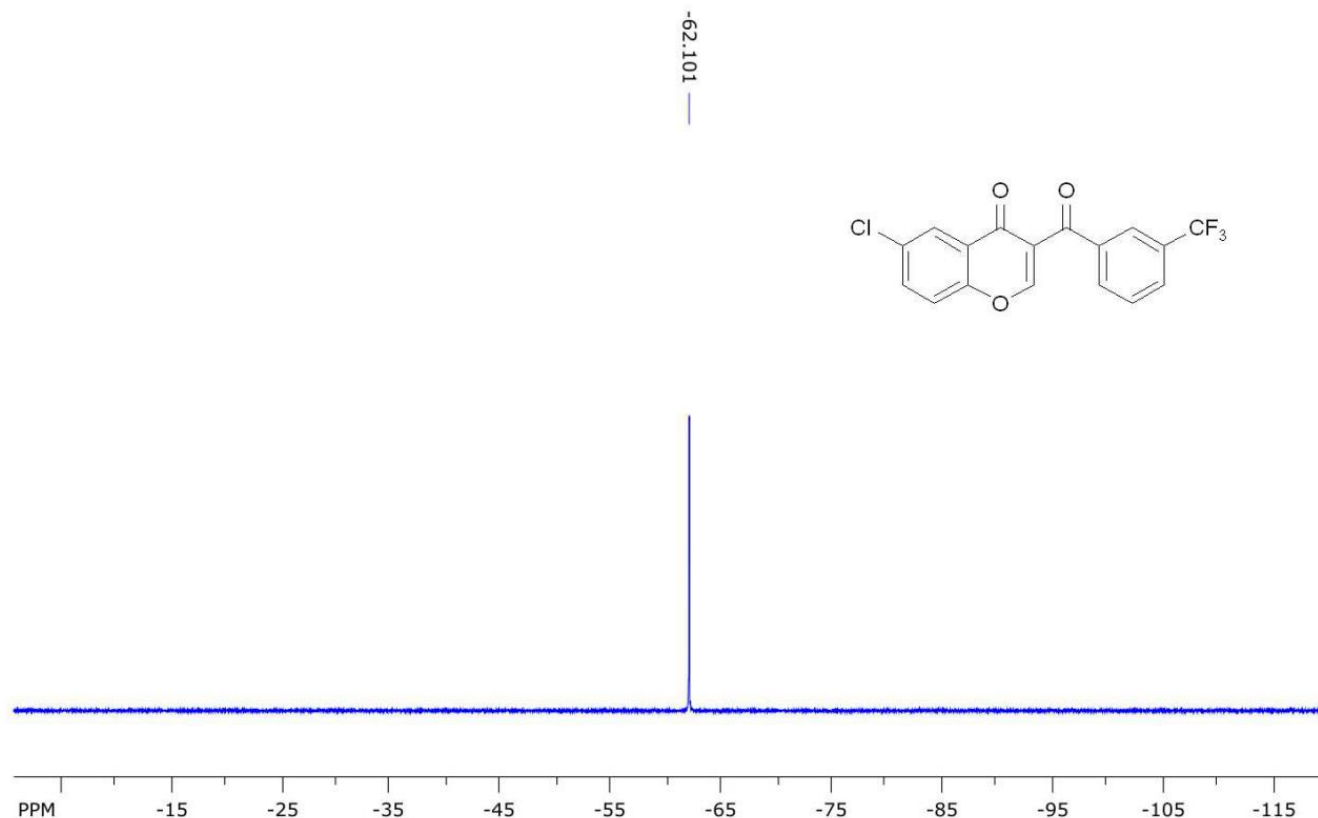


file: F:\Napo\NMR\500-1\mkr11406\17\fid expt: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 24

freq. of 0 ppm: 500.130023 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 220.277 ppm/cm: 0.44044

# Compound 4fe (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1008 F CDCl<sub>3</sub>

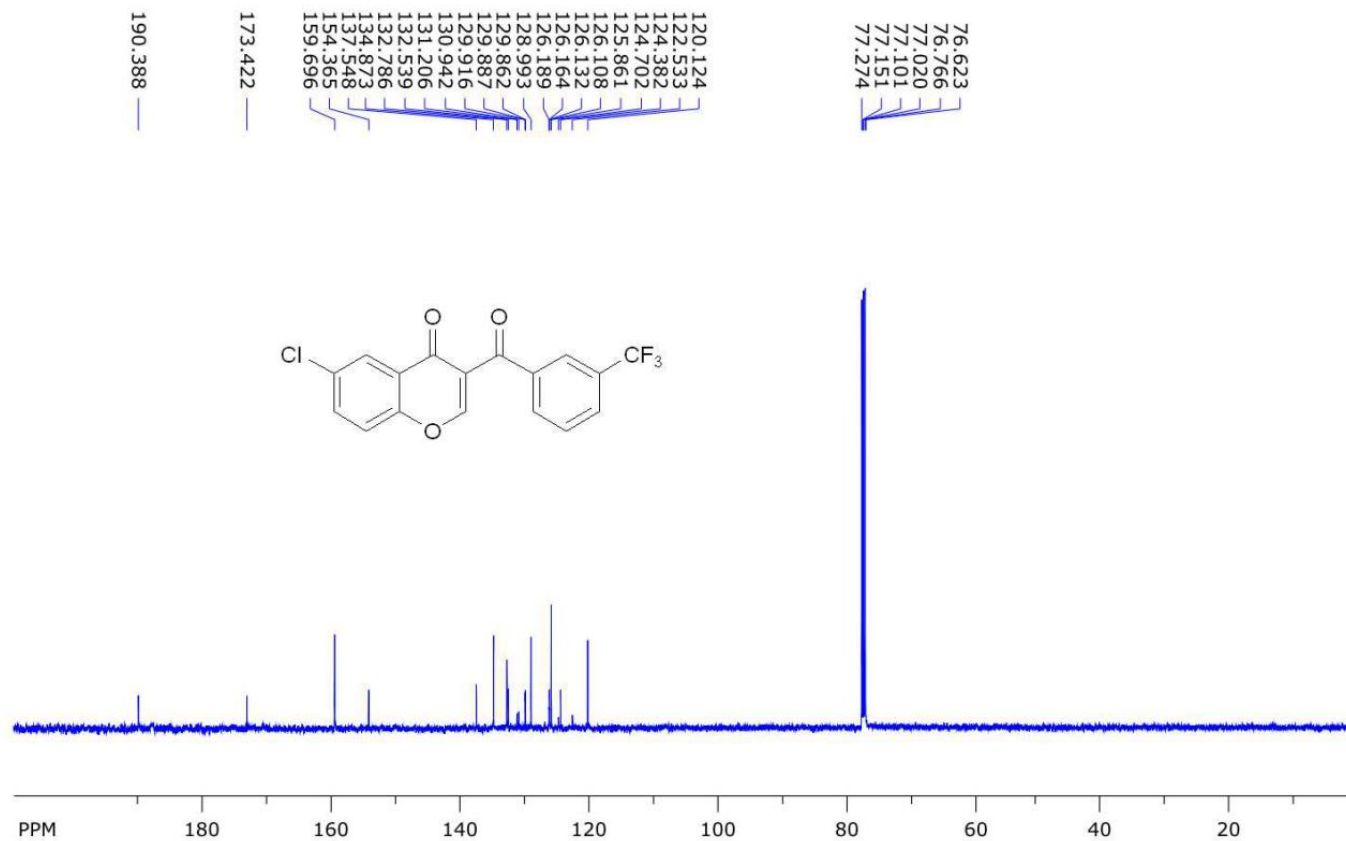


file: F:\Napo\NMR\IVA\IVA 1008 F\1\fid expt: <zg30>  
transmitter freq.: 188.324539 MHz  
time domain size: 65536 points  
width: 64102.56 Hz = 340.3835 ppm = 0.978128 Hz/pt  
number of scans: 16

freq. of 0 ppm: 188.338450 MHz  
processed size: 32768 complex points  
LB: 0.300 GF: 0.0000  
Hz/cm: 901.442 ppm/cm: 4.78664

# Compound 4fe (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1008 13C

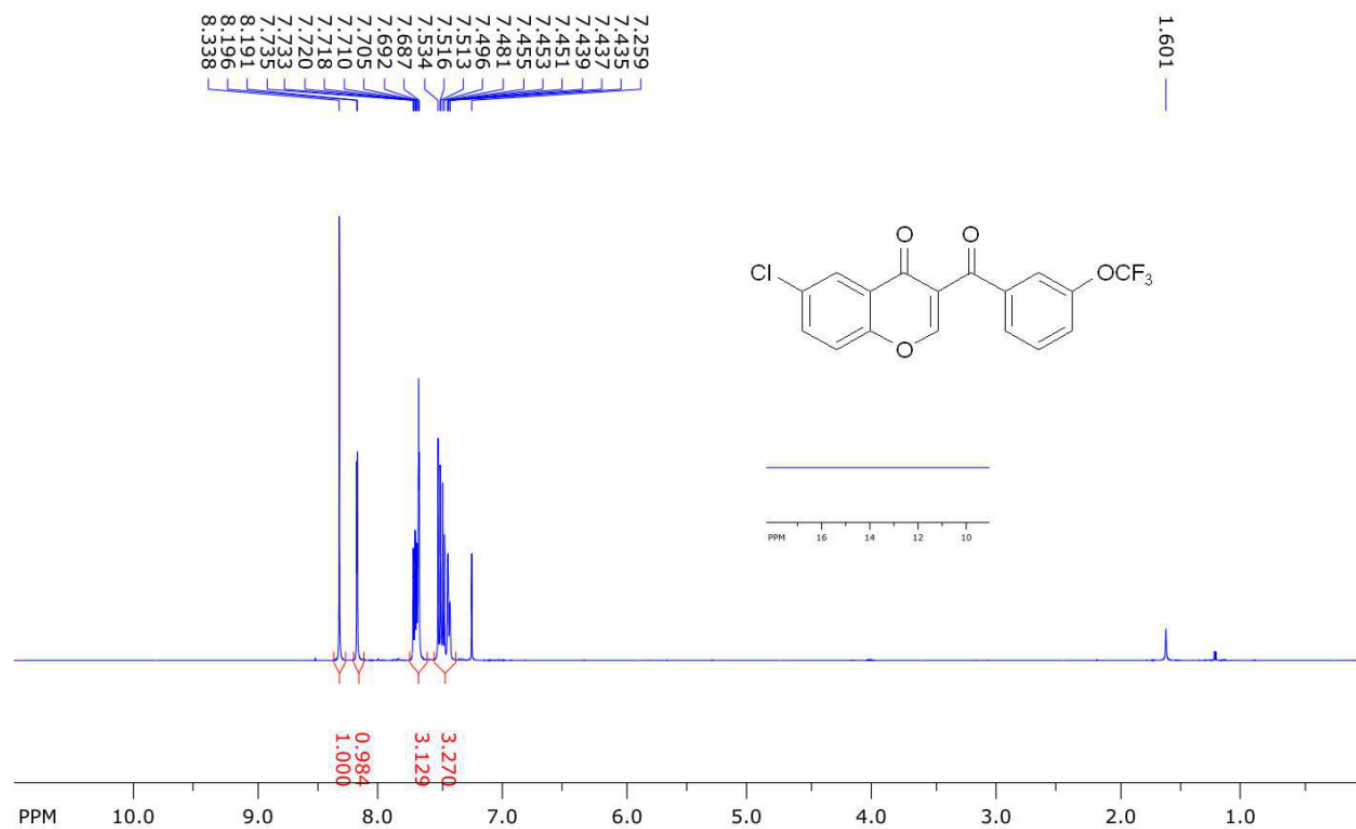


file: F:\Napo\NMR\500-1\mkr11406\18\fid expt: <zpgp30>  
 transmitter freq.: 125.772879 MHz  
 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 512

freq. of 0 ppm: 125.757793 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1052.756 ppm/cm: 8.37029

# Compound 4fh (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1007 1H



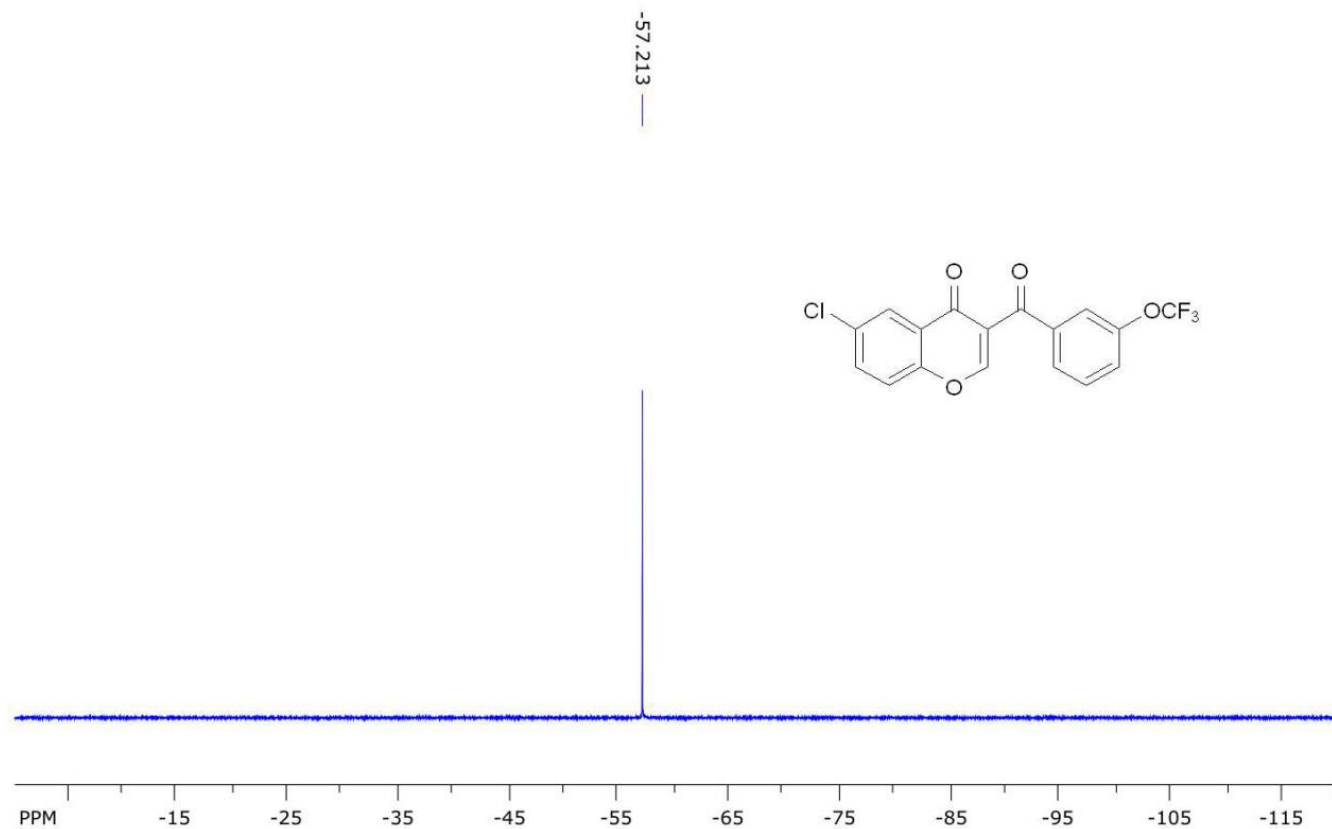
file: F:\Napo\NMR\500-1\mkr11406\7\fid expt: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 24

freq. of 0 ppm: 500.130024 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 220.277 ppm/cm: 0.44044



# Compound 4fh (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1007 F CDCl<sub>3</sub>

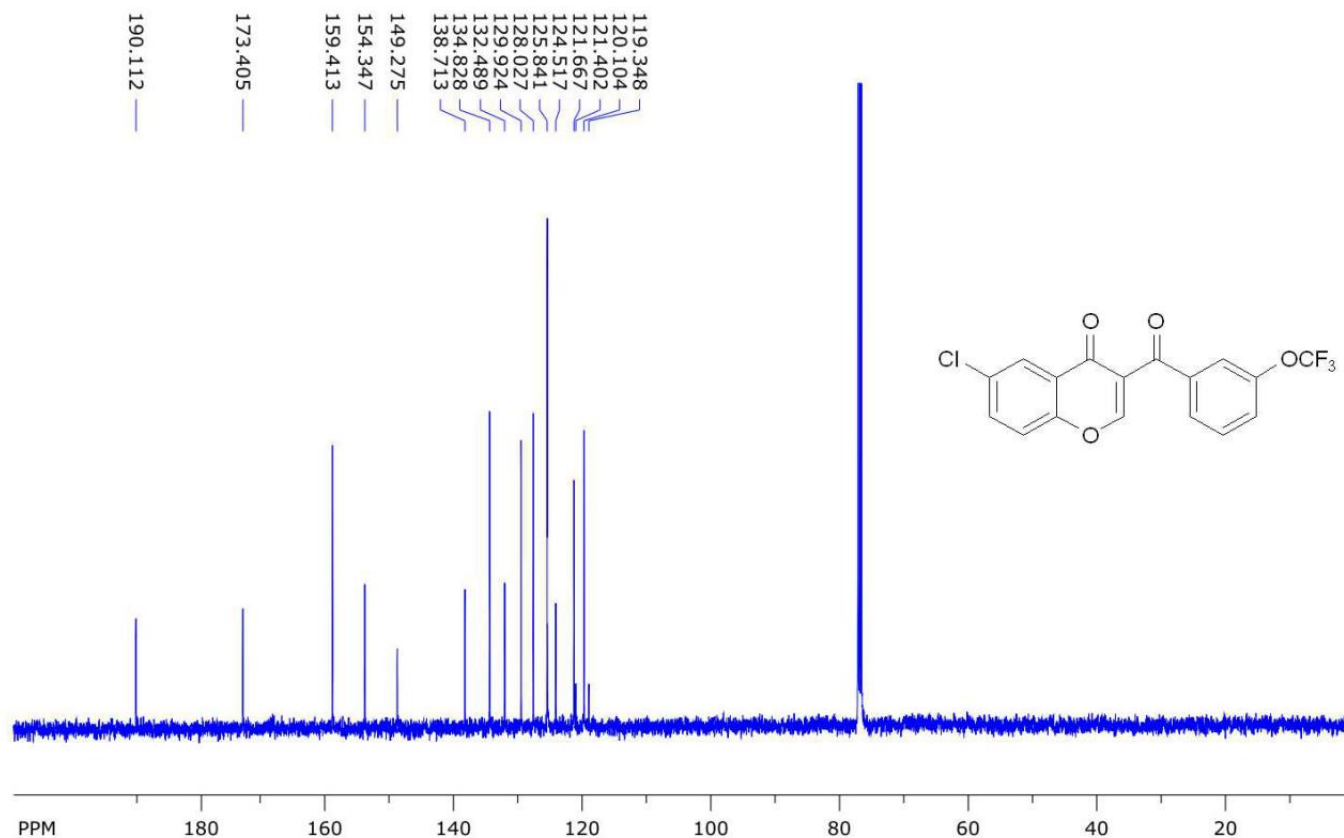


file: F:\Napo\NMR\IVA\IVA 1007 F\1\fid expt: <zg30>  
transmitter freq.: 188.324539 MHz  
time domain size: 65536 points  
width: 64102.56 Hz = 340.3835 ppm = 0.978128 Hz/pt  
number of scans: 16

freq. of 0 ppm: 188.338450 MHz  
processed size: 32768 complex points  
LB: 0.300 GF: 0.0000  
Hz/cm: 907.166 ppm/cm: 4.81703

# Compound 4fh (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1007 13C

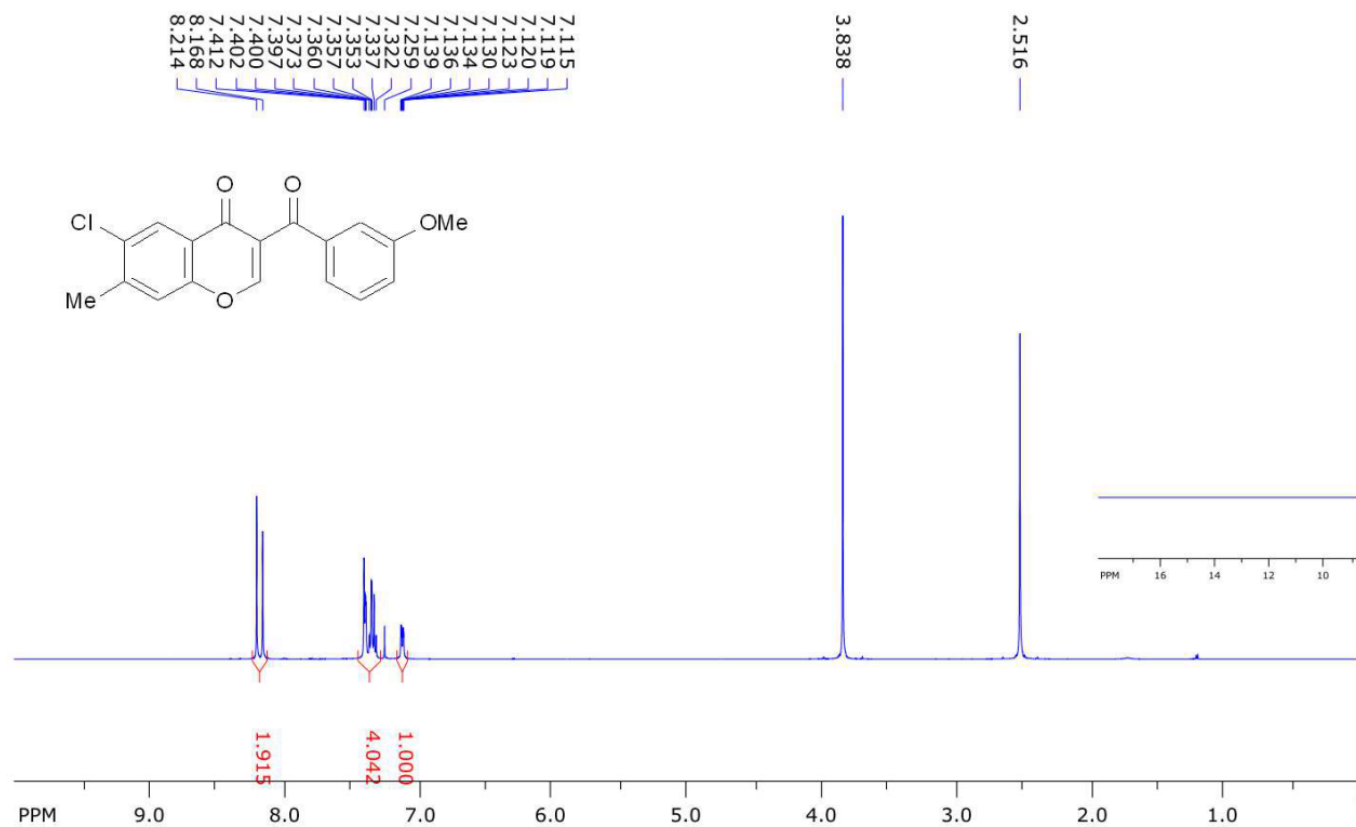


file: F:\Napo\NMR\500-1\mkr11406\8\fid expt: <zpgg30>  
 transmitter freq.: 125.772879 MHz  
 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 512

freq. of 0 ppm: 125.757793 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1049.536 ppm/cm: 8.34470

# Compound 4gd (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 888 1H

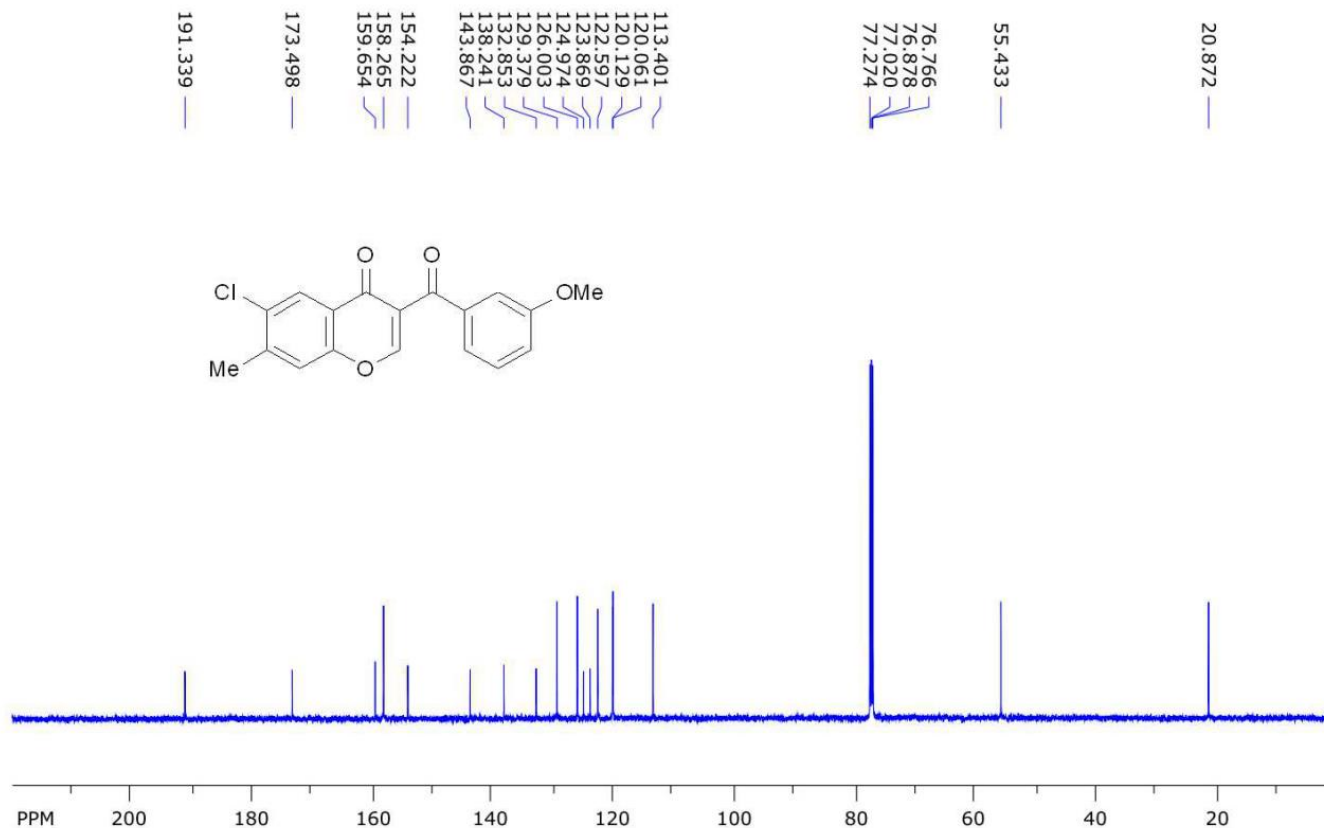


file: F:\Napo\NMR\500-1\mkr11010\17\fid expt: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 24

freq. of 0 ppm: 500.130024 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 201.554 ppm/cm: 0.40300

# Compound 4gd (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 888 13C

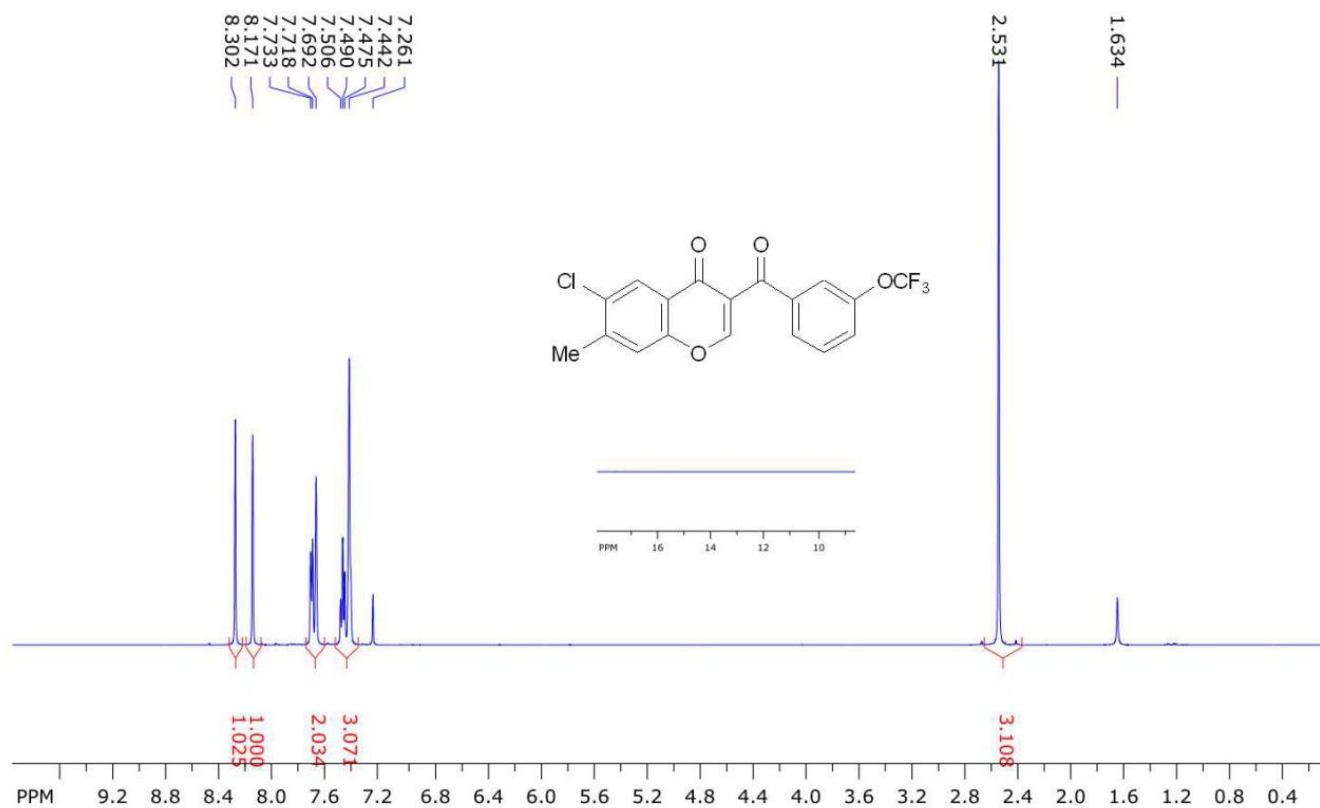


file: F:\Napo\NMR\500-1\mkr11010\18\fid expt: <zgpg30>  
 transmitter freq.: 125.772879 MHz  
 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 512

freq. of 0 ppm: 125.757797 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1107.486 ppm/cm: 8.80545

# Compound 4gh (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1063 1H

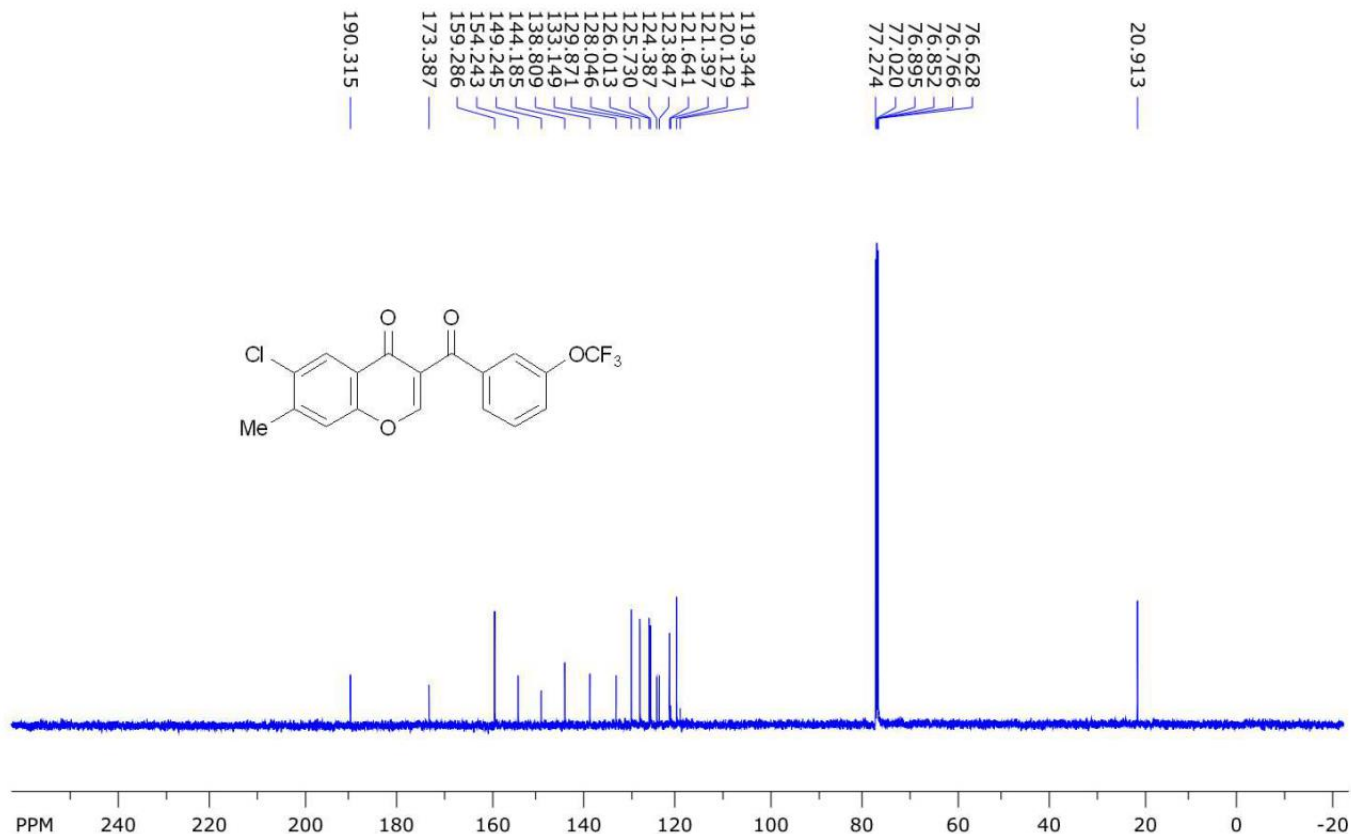


file: F:\Napo\NMR\500-1\mkr10307\3\fid exp: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 32

freq. of 0 ppm: 500.130022 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 199.315 ppm/cm: 0.39852

# Compound 4gh (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1063 1H

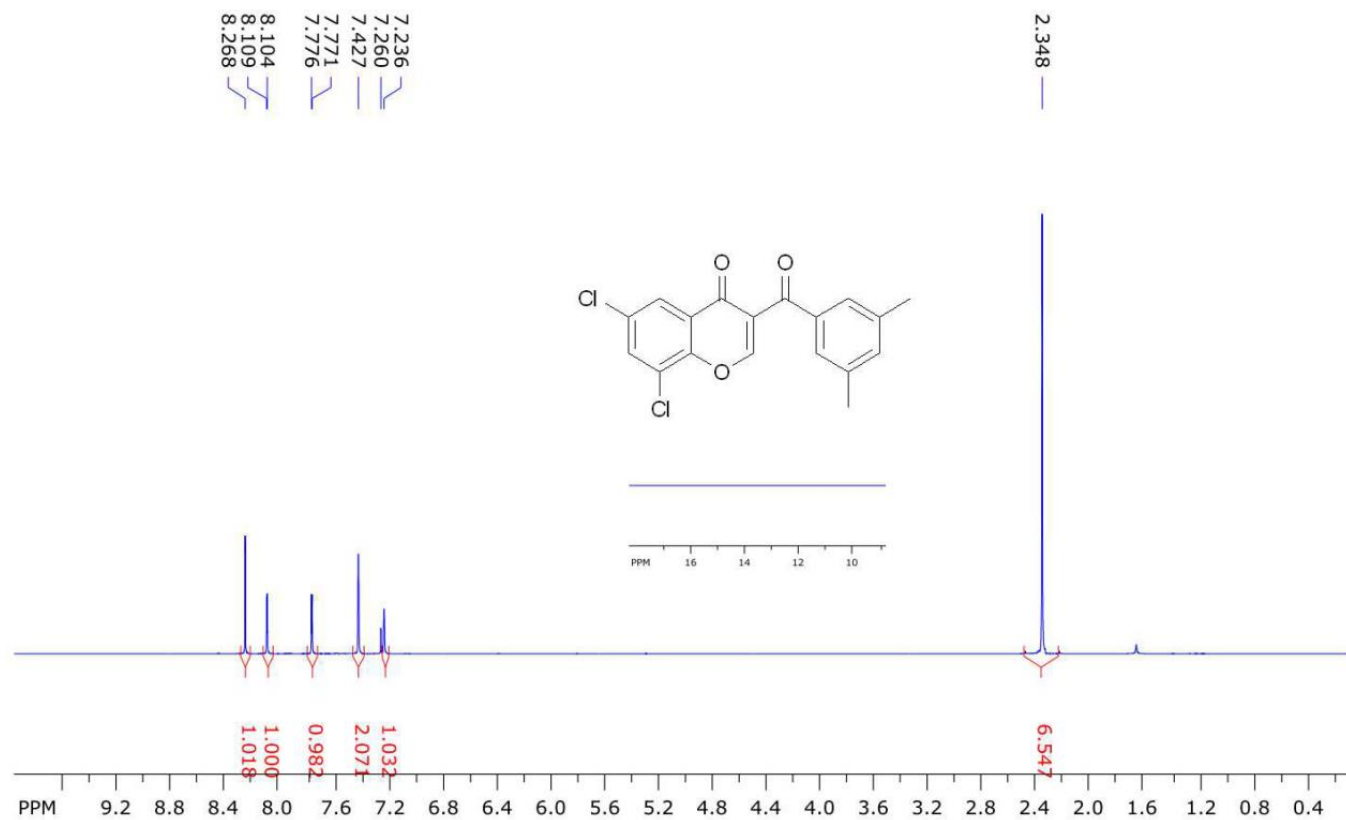


file: F:\Napo\NMR\500-1\mkr10307\4\fid expt: <zpgg30>  
 transmitter freq.: 125.772879 MHz  
 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 256

freq. of 0 ppm: 125.757794 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1442.308 ppm/cm: 11.46756

# Compound 4hc (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1214 1H

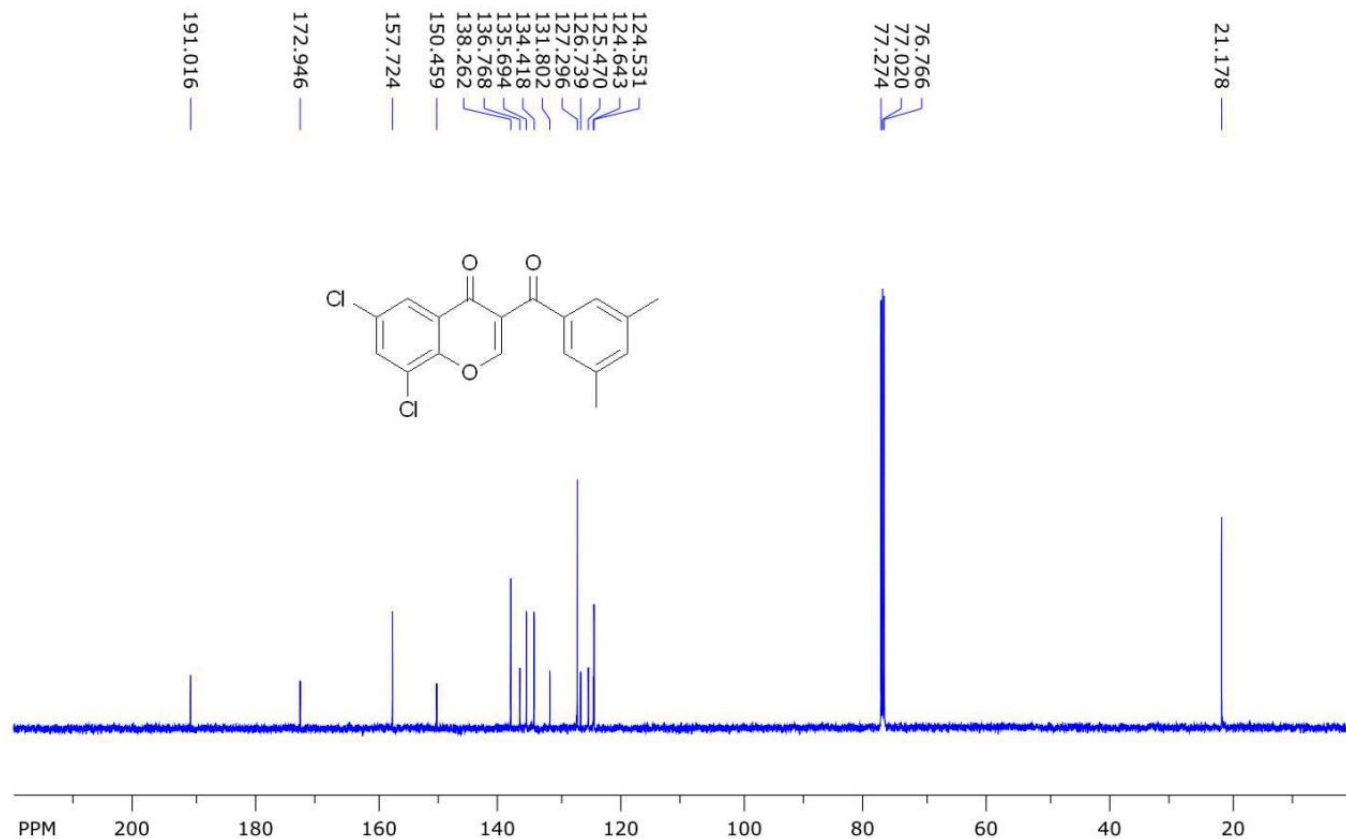


file: F:\Napo\NMR\500-1\mkr11709\15\fid expt: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 32

freq. of 0 ppm: 500.130023 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 198.803 ppm/cm: 0.39750

# Compound 4hc (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1214 13C



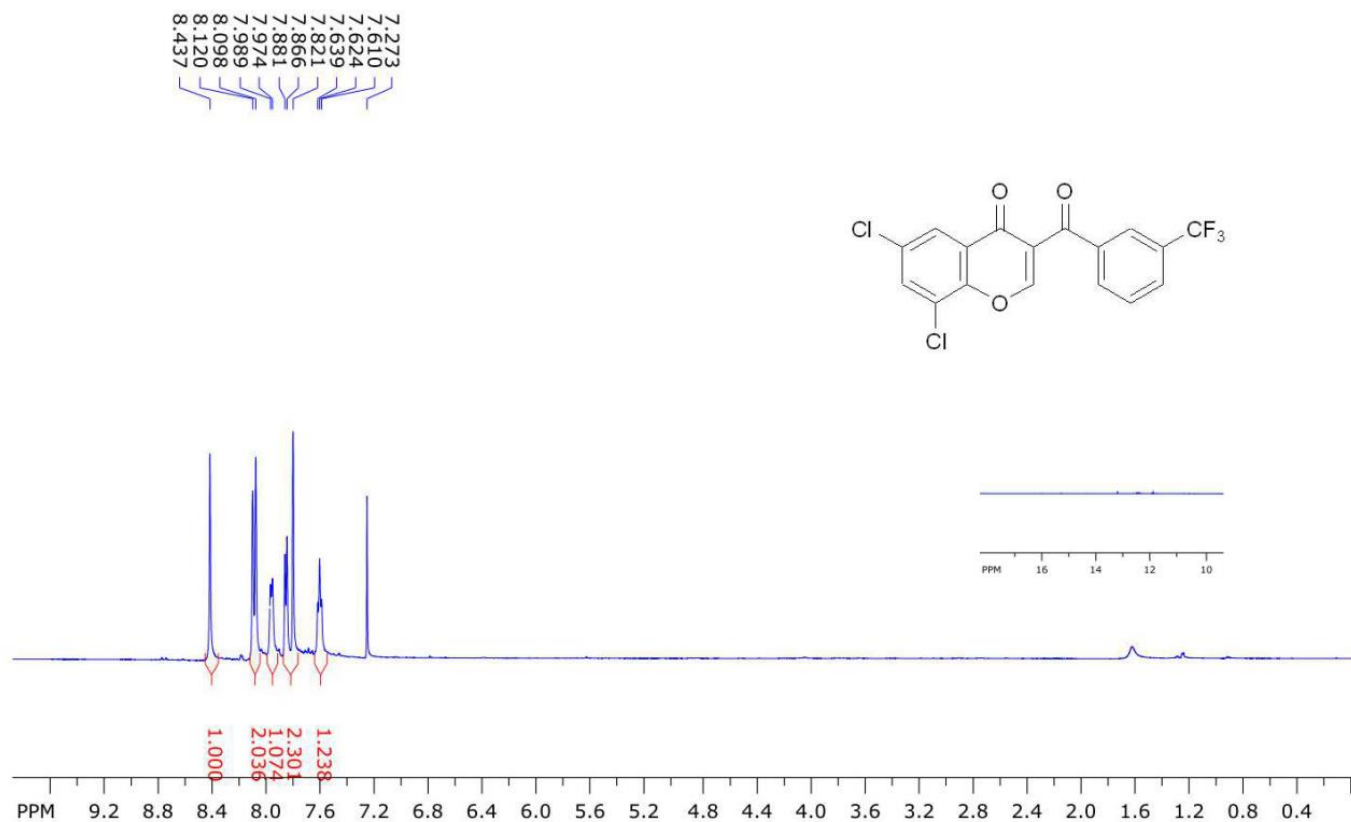
file: F:\Napo\NMR\500-1\mkr11709\16\fid expt: <zgpg30>  
 transmitter freq.: 125.772879 MHz  
 time domain size: 65536 points  
 width: 36057.69 Hz = 286.6889 ppm = 0.550197 Hz/pt  
 number of scans: 310

freq. of 0 ppm: 125.757796 MHz  
 processed size: 32768 complex points  
 LB: 2.000 GF: 0.0000  
 Hz/cm: 1108.315 ppm/cm: 8.81204



# Compound 4he (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 1052 1H

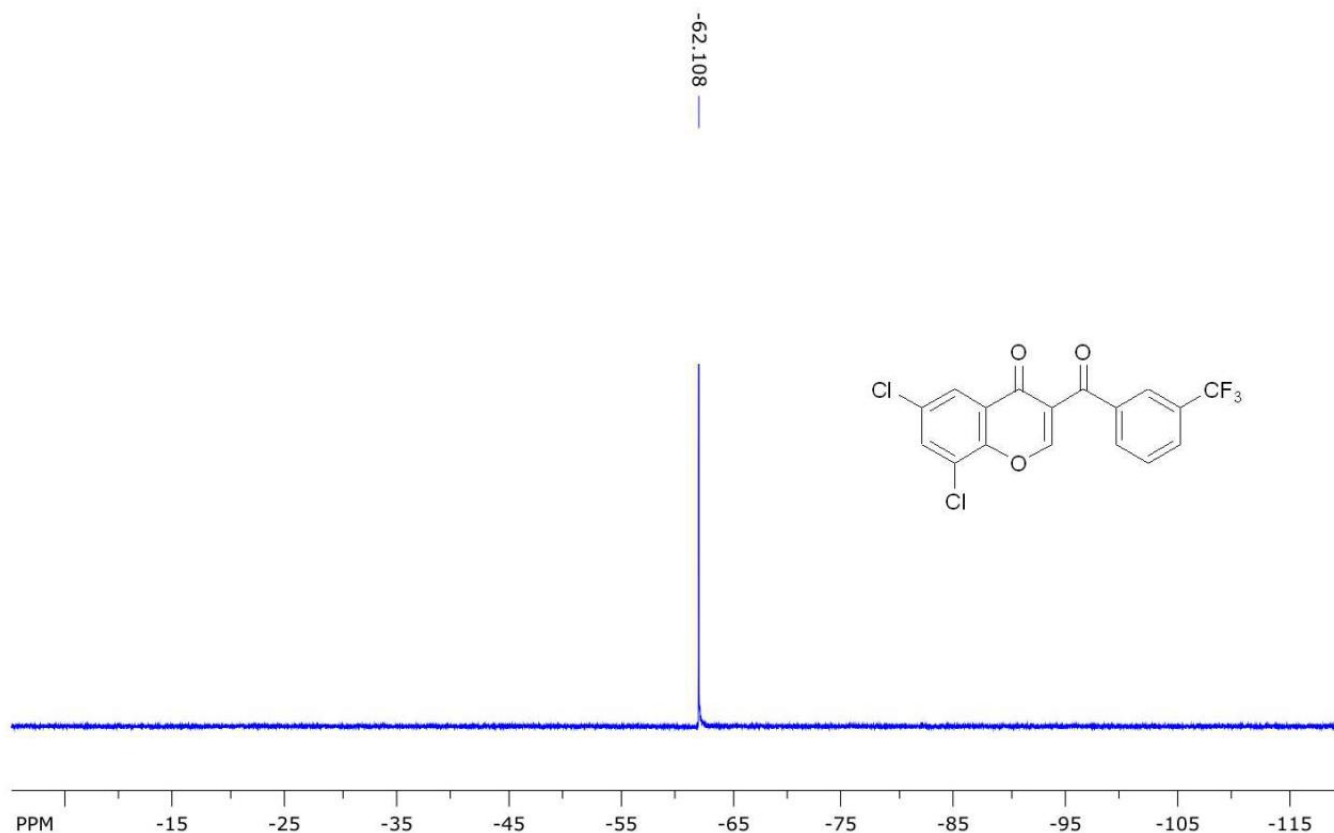


file: F:\Napo\NMR\500-1\mkr11809\13\fid expt: <zg30>  
 transmitter freq.: 500.133001 MHz  
 time domain size: 65536 points  
 width: 12335.53 Hz = 24.6645 ppm = 0.188225 Hz/pt  
 number of scans: 32

freq. of 0 ppm: 500.130017 MHz  
 processed size: 65536 complex points  
 LB: 0.300 GF: 0.0000  
 Hz/cm: 199.351 ppm/cm: 0.39860

# Compound 4he (NMR in CDCl<sub>3</sub>)

SpinWorks 4: IVA 11052 CDCl<sub>3</sub>



file: F:\Napo\NMR\IVA\IVA 1052\1\fid expt: <zg30>  
transmitter freq.: 188.324539 MHz  
time domain size: 65536 points  
width: 64102.56 Hz = 340.3835 ppm = 0.978128 Hz/pt  
number of scans: 16

freq. of 0 ppm: 188.338450 MHz  
processed size: 32768 complex points  
LB: 0.300 GF: 0.0000  
Hz/cm: 904.304 ppm/cm: 4.80184