

# **Synthesis and Biological Evaluation of Novel Furopyidone Derivatives as Potent Cytotoxic Agents Against Esophageal Cancer**

**Xingyu Ren, Jiaojiao Zhang, Anying Dai, Pengzhi Sun, Yibo Zhang, Lu Jin and Le Pan \***

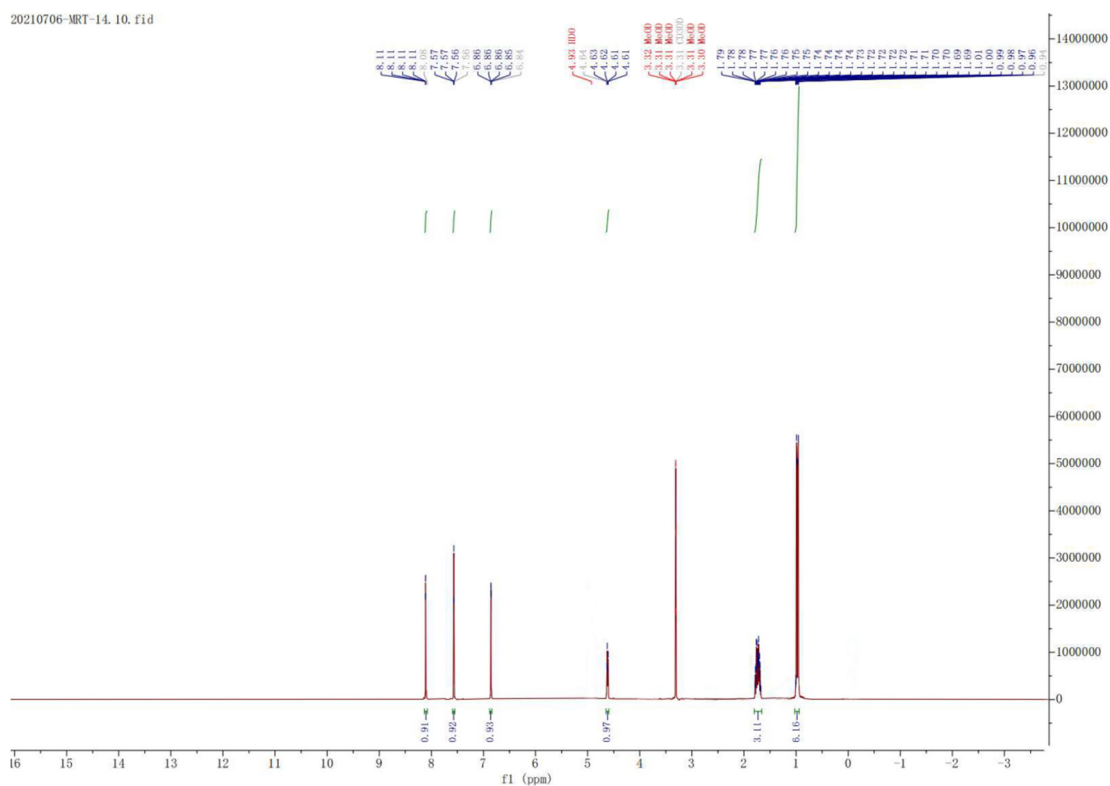
College of Chemistry and Chemical Engineering, Xinjiang Agricultural University, Urumqi 830052, China; 18299520272@163.com (X.R.); koh9391421@163.com (J.Z.); 13609979146@163.com (A.D.); sun8302587@163.com (P.S.); 18290824750@163.com (Y.Z.); lu\_lu\_jin@163.com (L.J.)

\* Correspondence: chempan03@163.com

**Data of  $^1\text{H}$  NMR,  $^{13}\text{C}$  NMR**

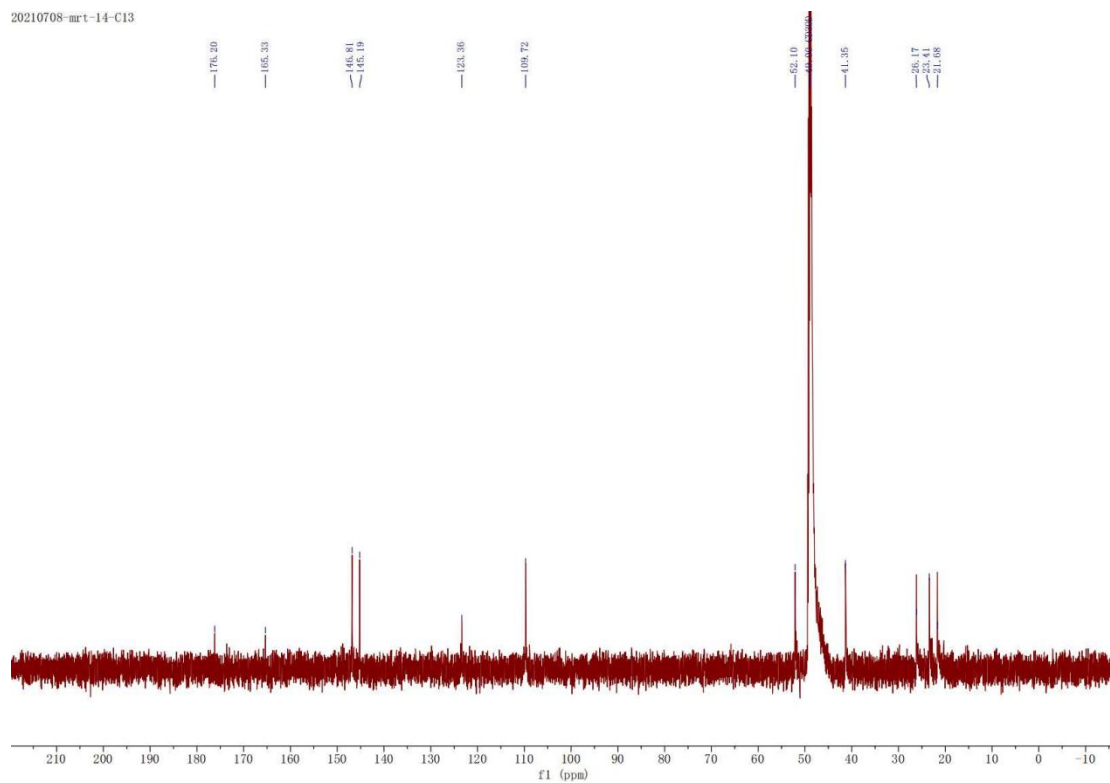
### <sup>1</sup>H NMR of compound 2a

20210706-MRT-14.10.fid



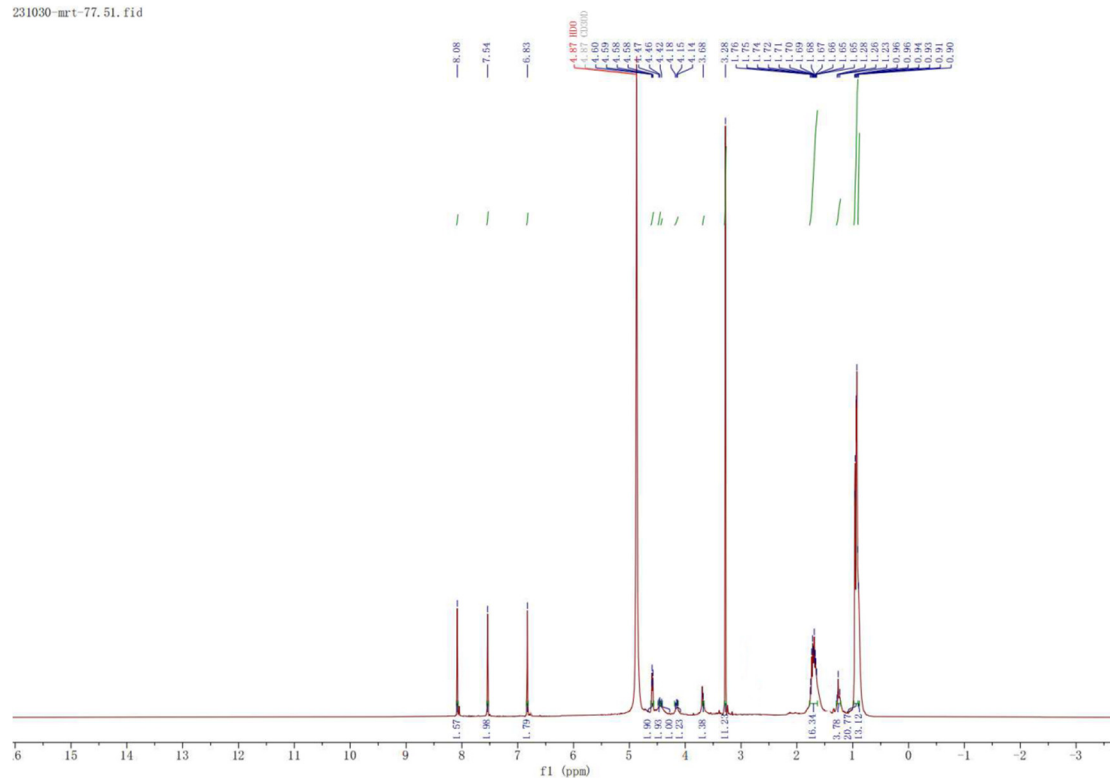
### <sup>13</sup>C NMR of compound 2a

20210708-mrt-14-C13



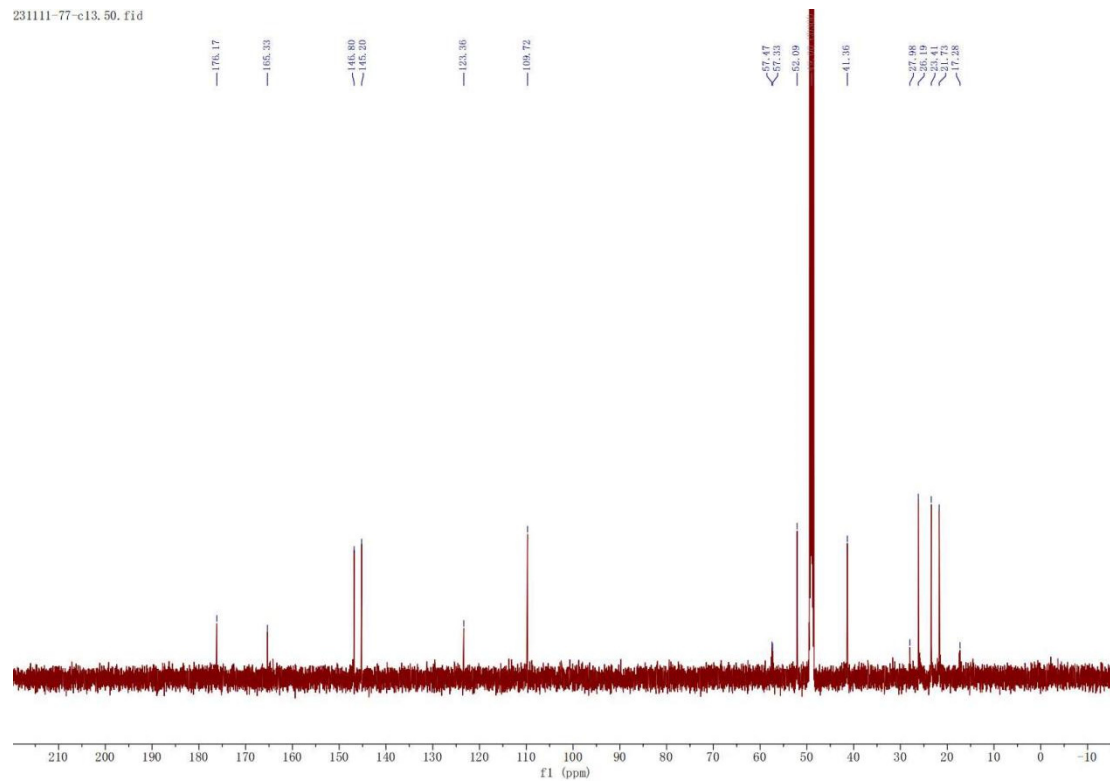
## <sup>1</sup>H NMR of compound 2b

231030-mrt-77.51.fid

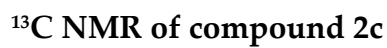


## <sup>13</sup>C NMR of compound 2b

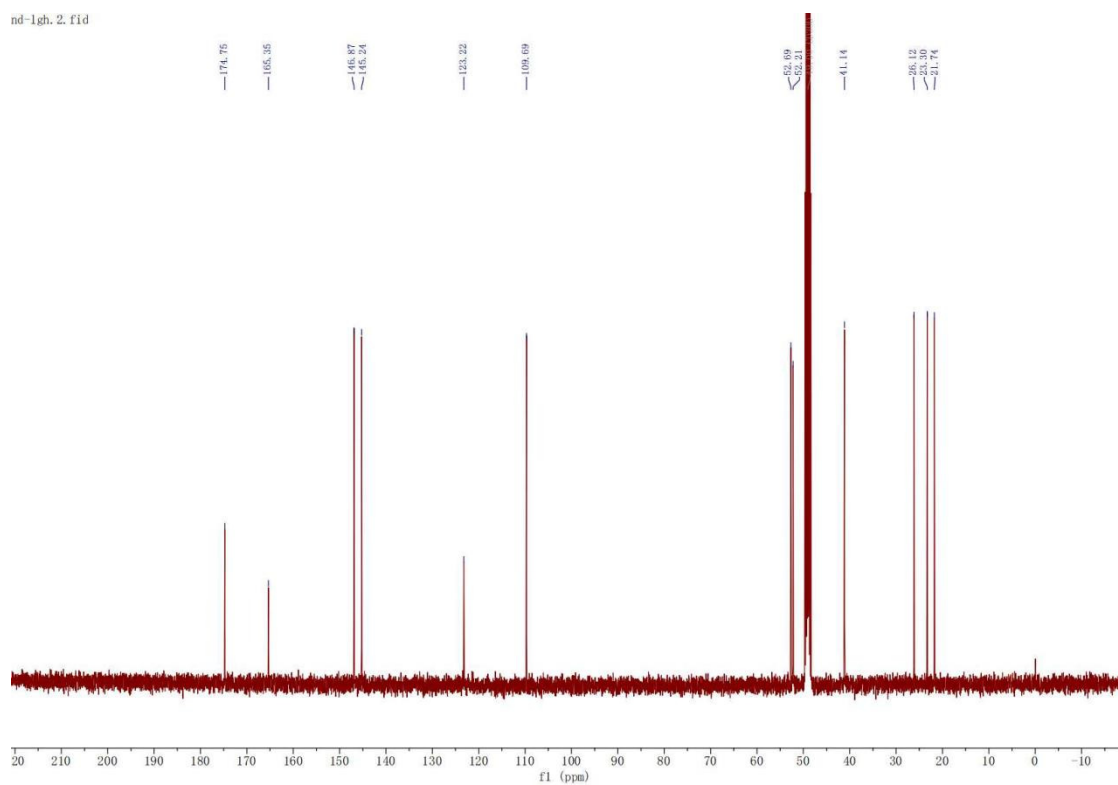
231111-77-c13.50.fid



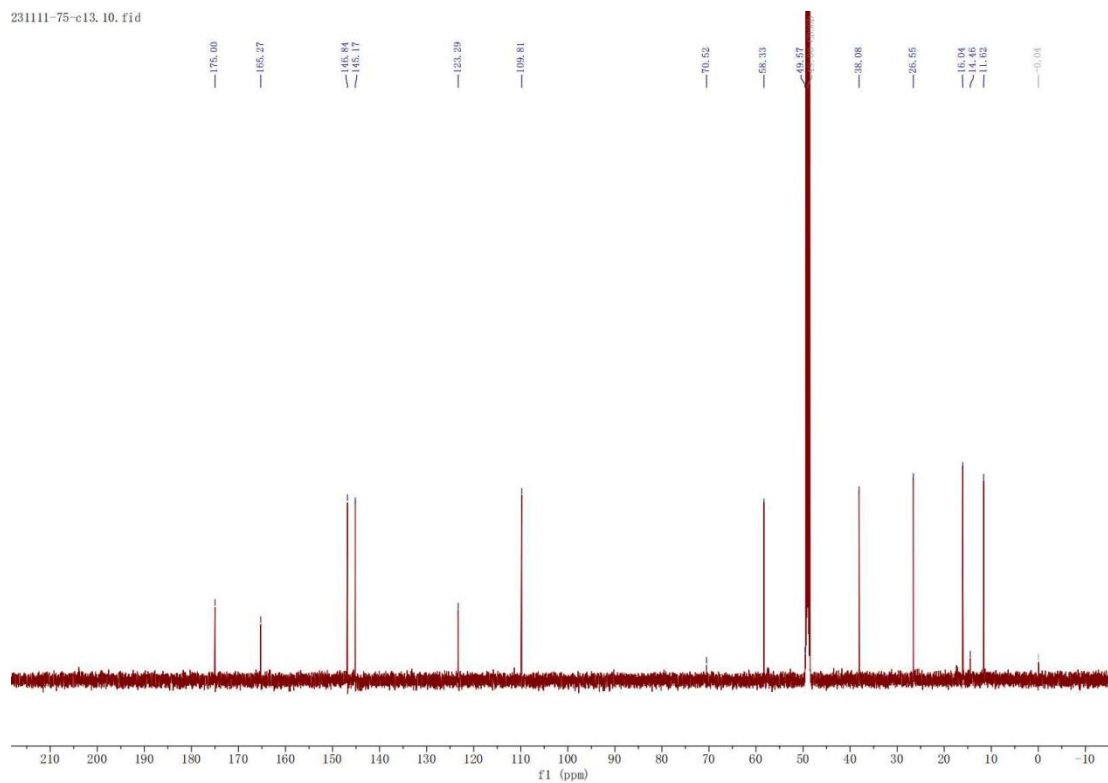
## nd-lgh. 1. fid



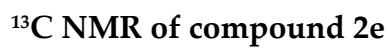
nd-lgh, 2, fid



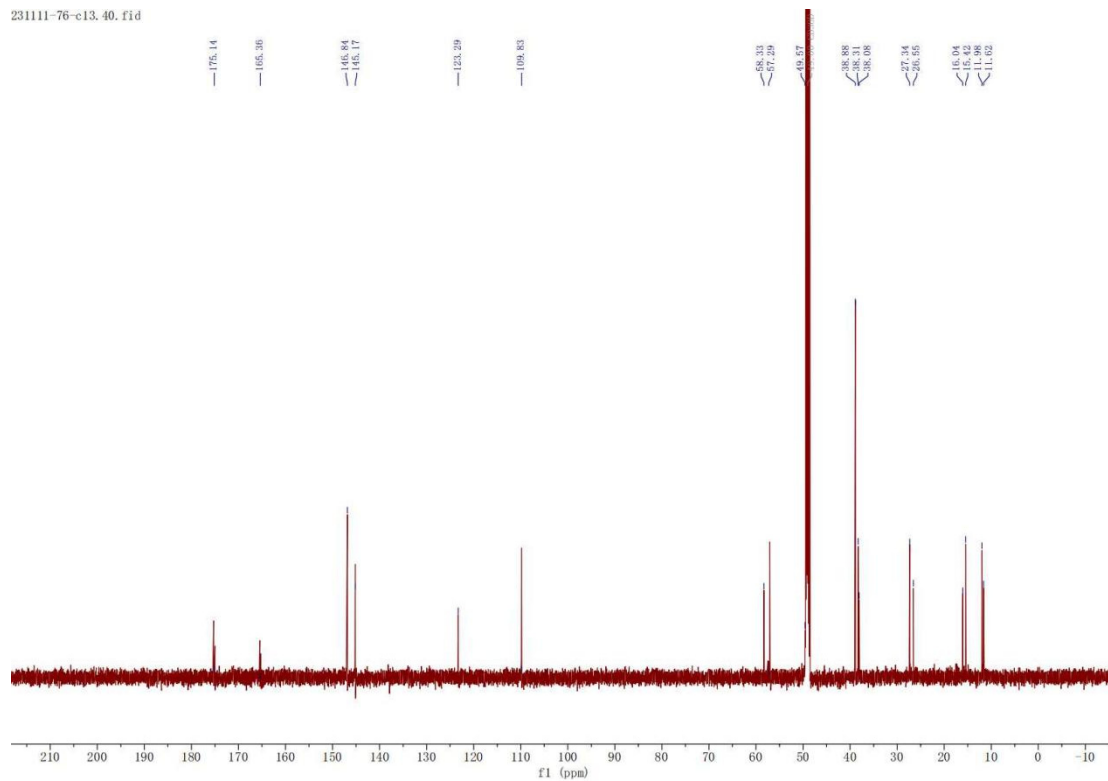
## 20210706-MRT-13



## 231030-mrt-76, 41, fid

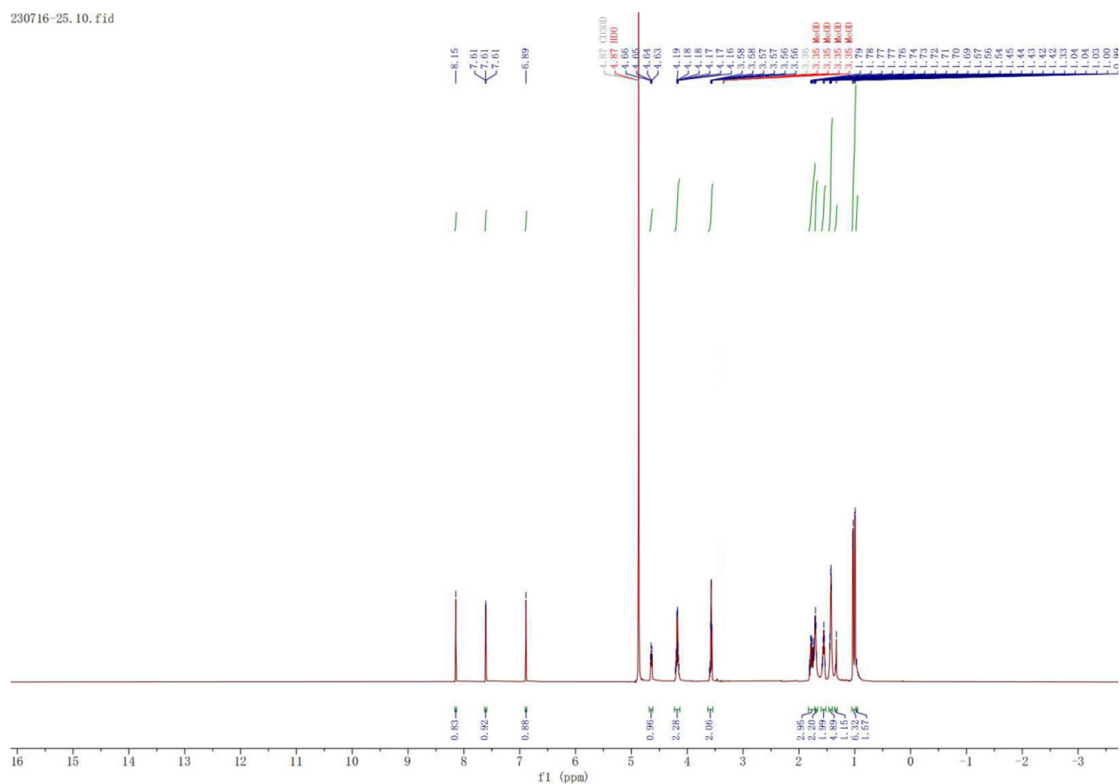


231111-76-c13, 40, fid



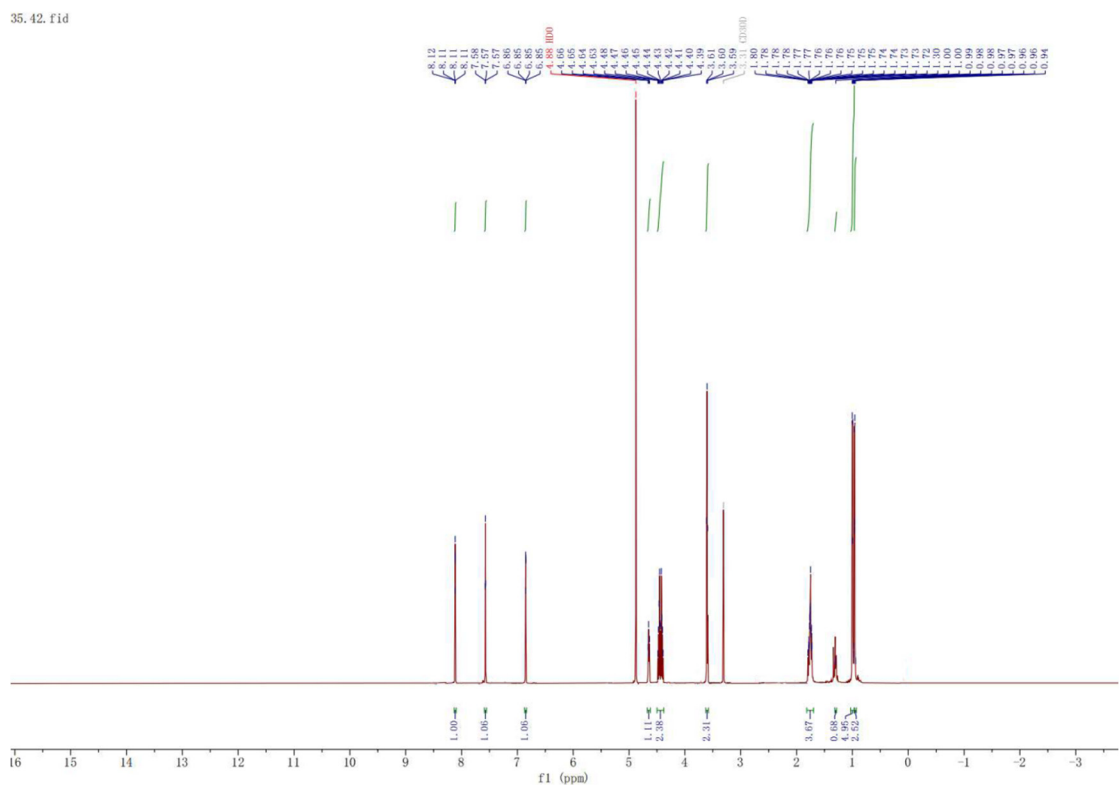
### <sup>1</sup>H NMR of compound 2f

230716-25, 10, fid



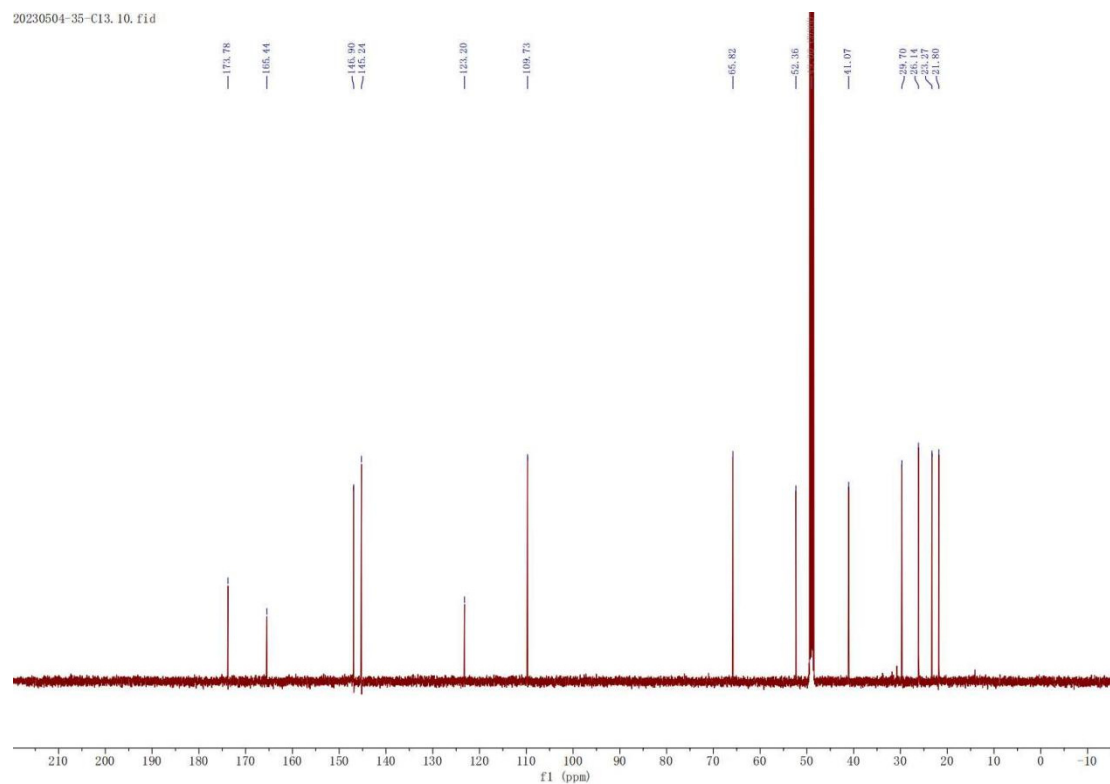
### <sup>1</sup>H NMR of compound 3a

35.42. fid



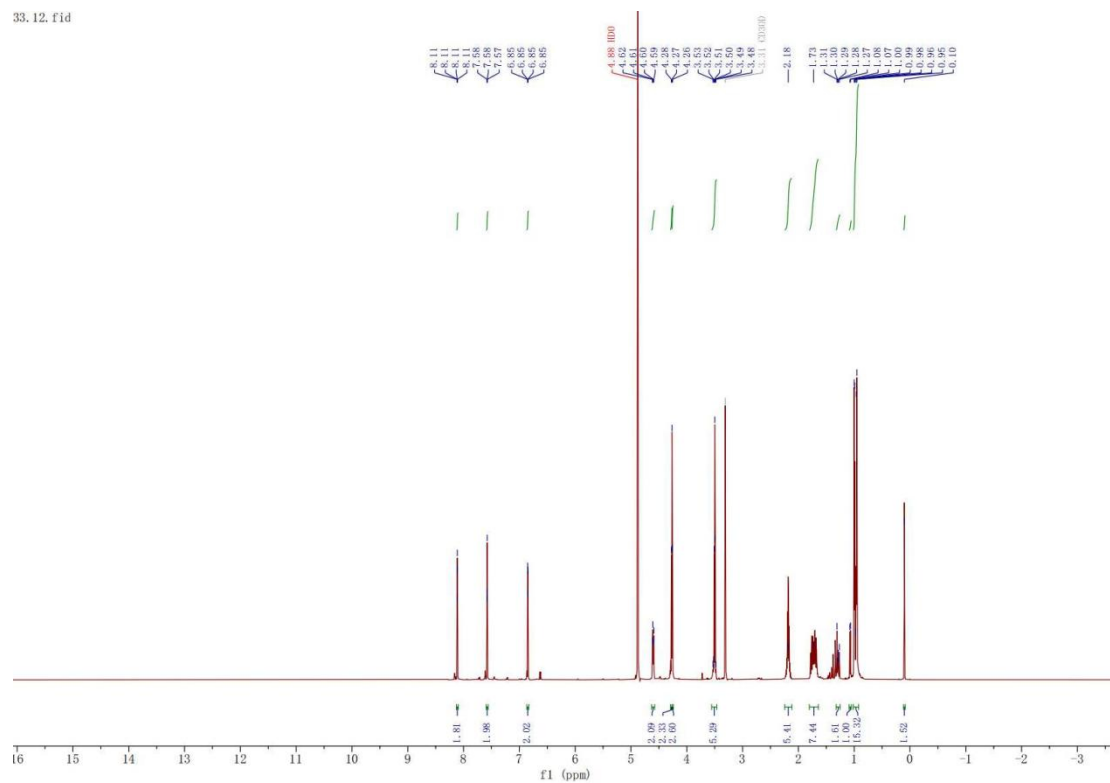
## $^{13}\text{C}$ NMR of compound 3a

20230504-35- $\text{C}13$ .10.fid



## $^1\text{H}$ NMR of compound 3b

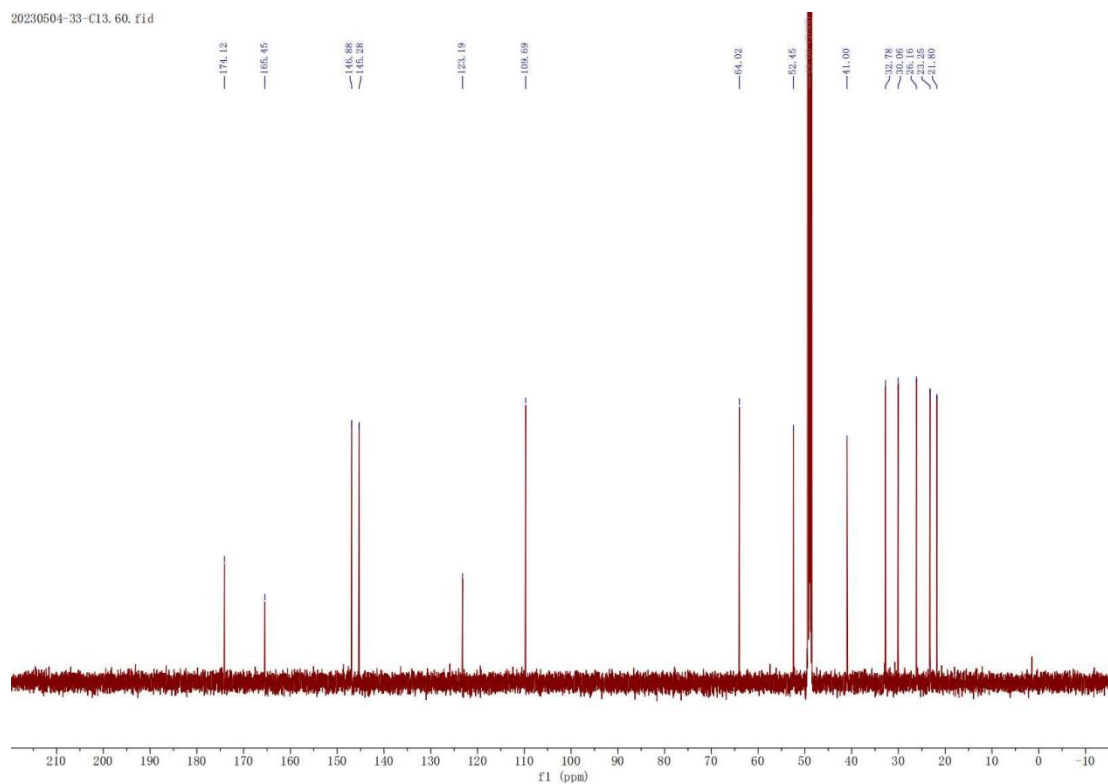
33.12.fid





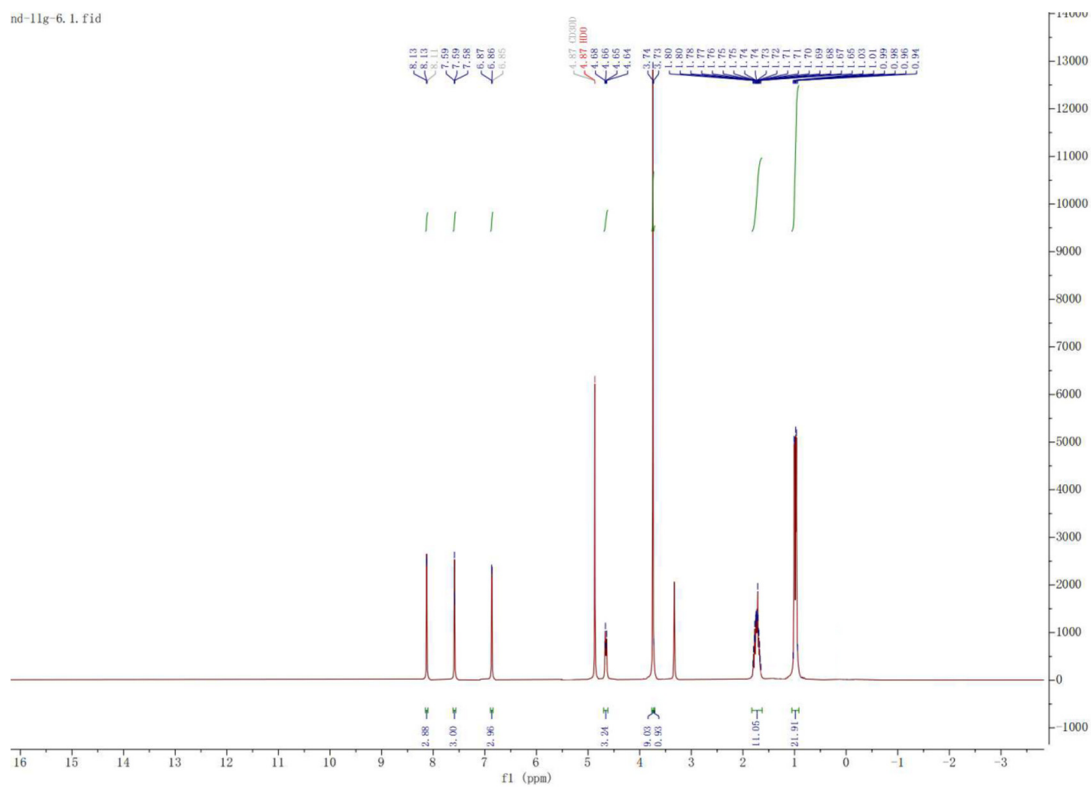
### <sup>13</sup>C NMR of compound 3b

20230504-33-C13. 60. fid

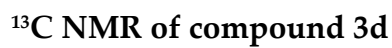


### <sup>1</sup>H NMR of compound 3c

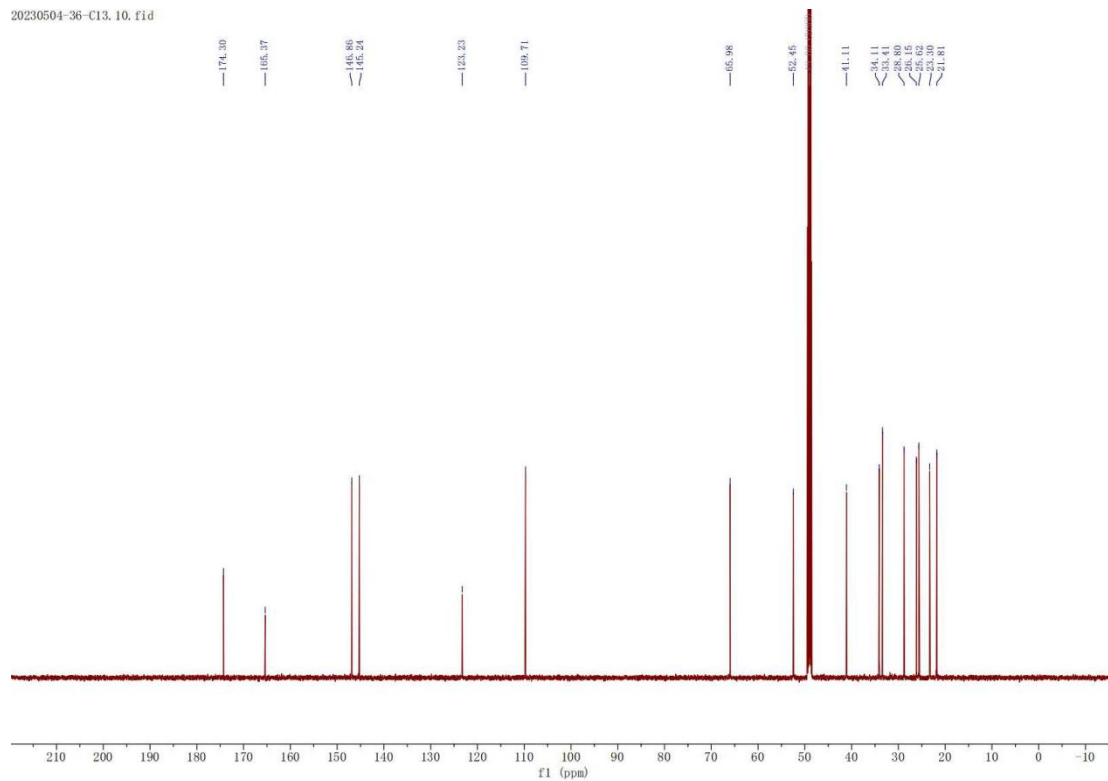
nd-llg-6. 1. fid



## 36, 52, fid

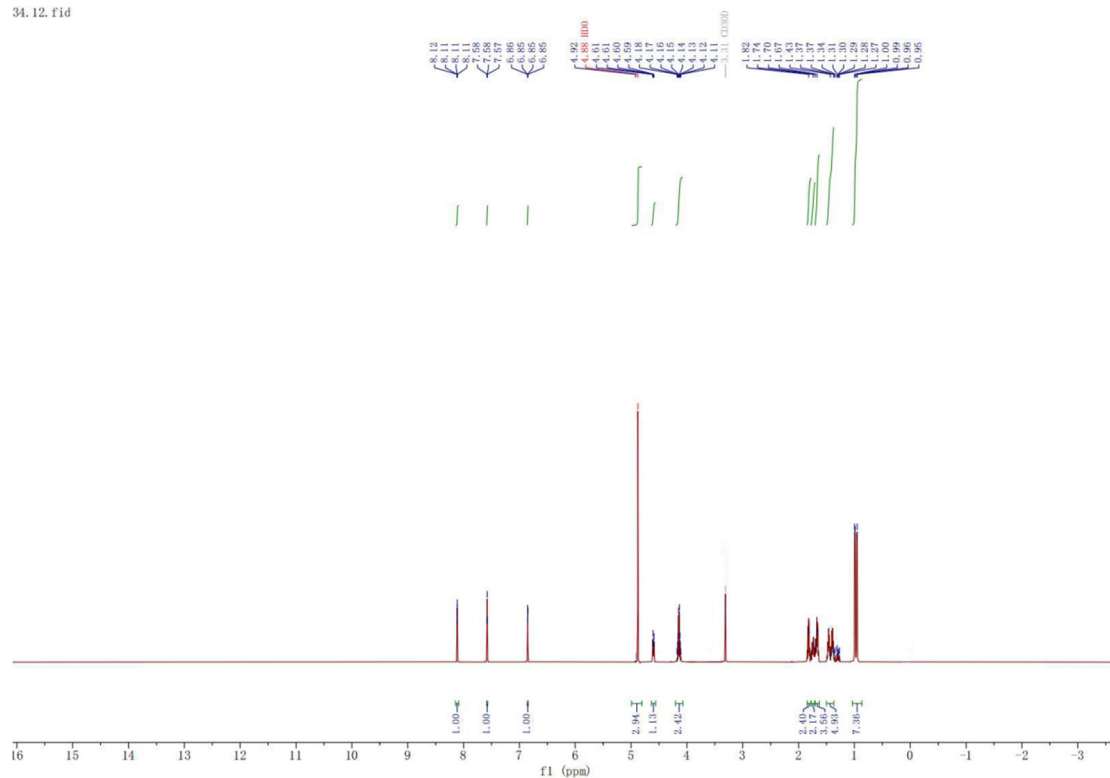


20230504-36-C13, 10, fid



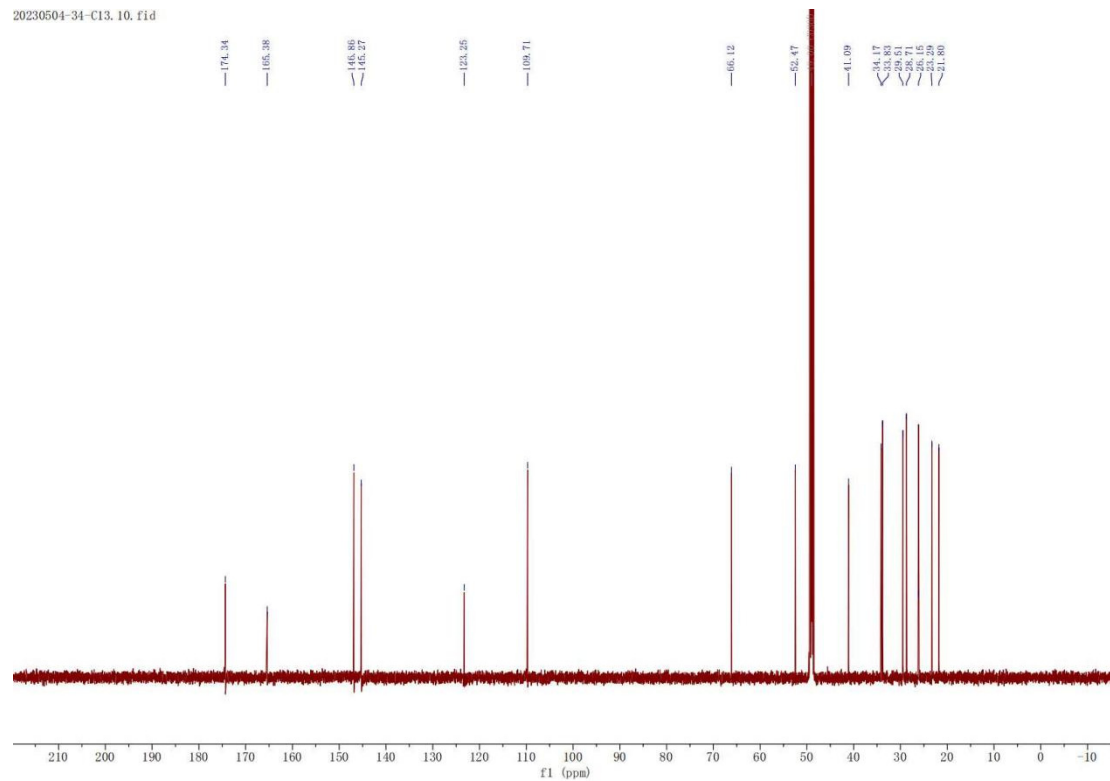
# <sup>1</sup>H NMR of compound 3e

34.12.fid



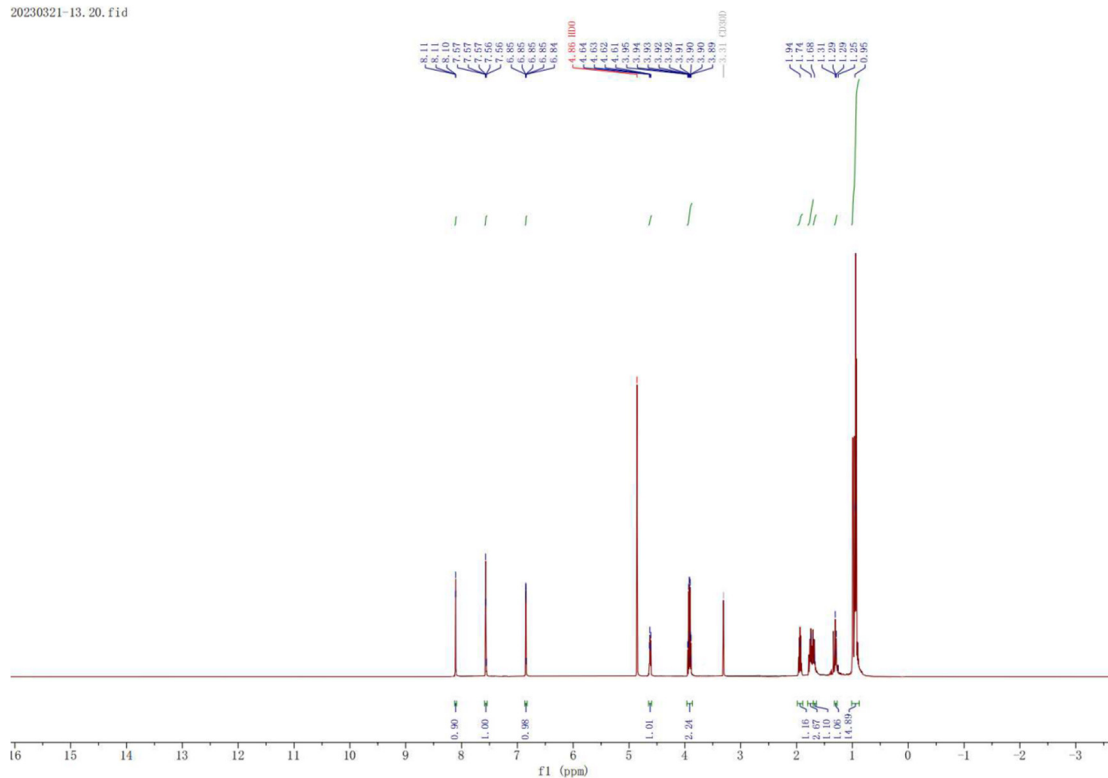
# <sup>13</sup>C NMR of compound 3e

20230504-34-C13.10.fid



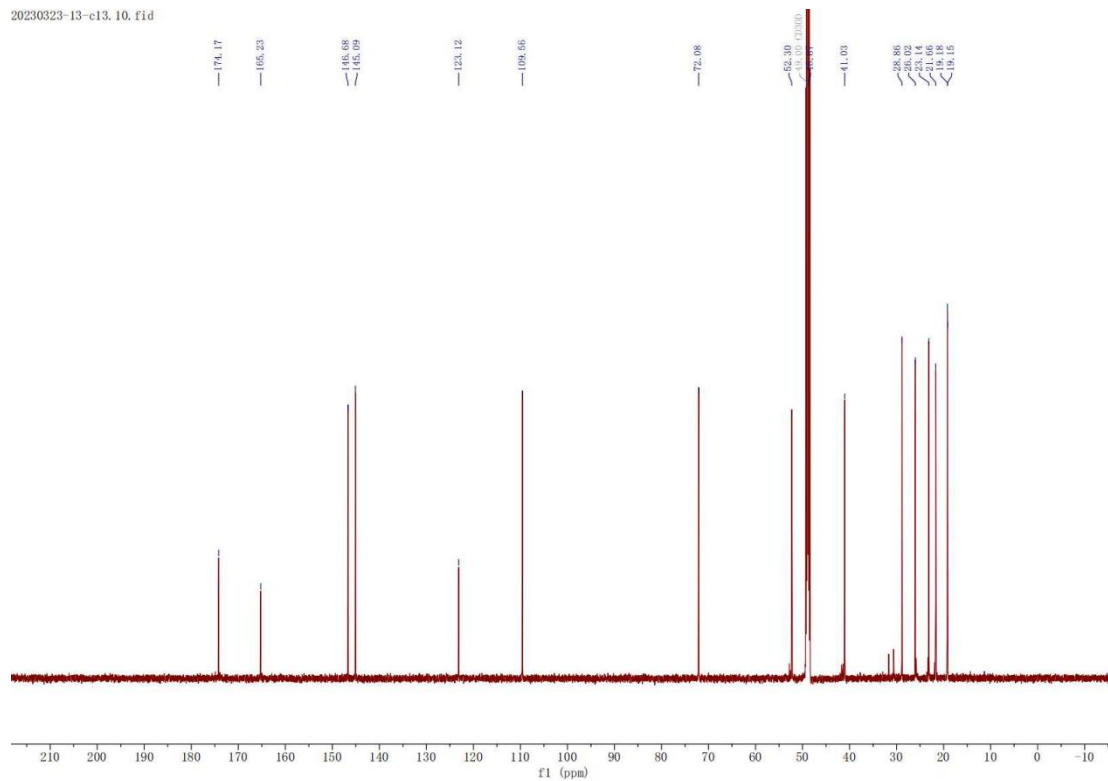
### <sup>1</sup>H NMR of compound 3f

20230321-13.20.fid



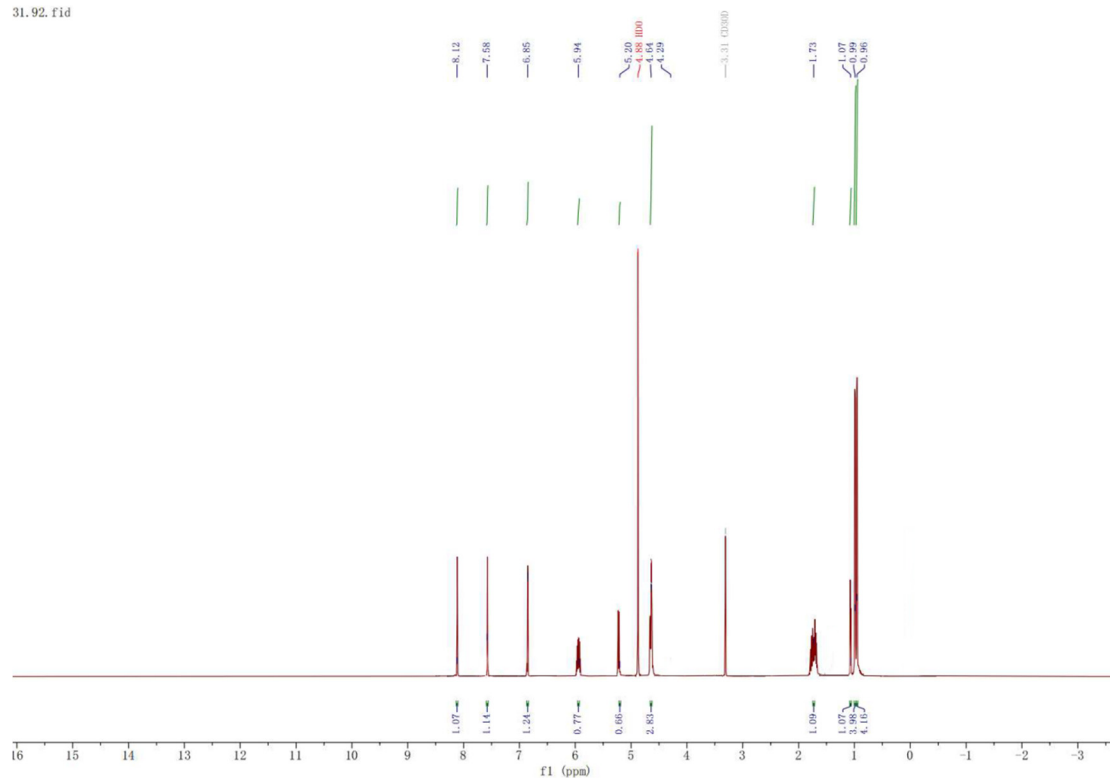
### <sup>13</sup>C NMR of compound 3f

20230323-13-c13, 10, fid



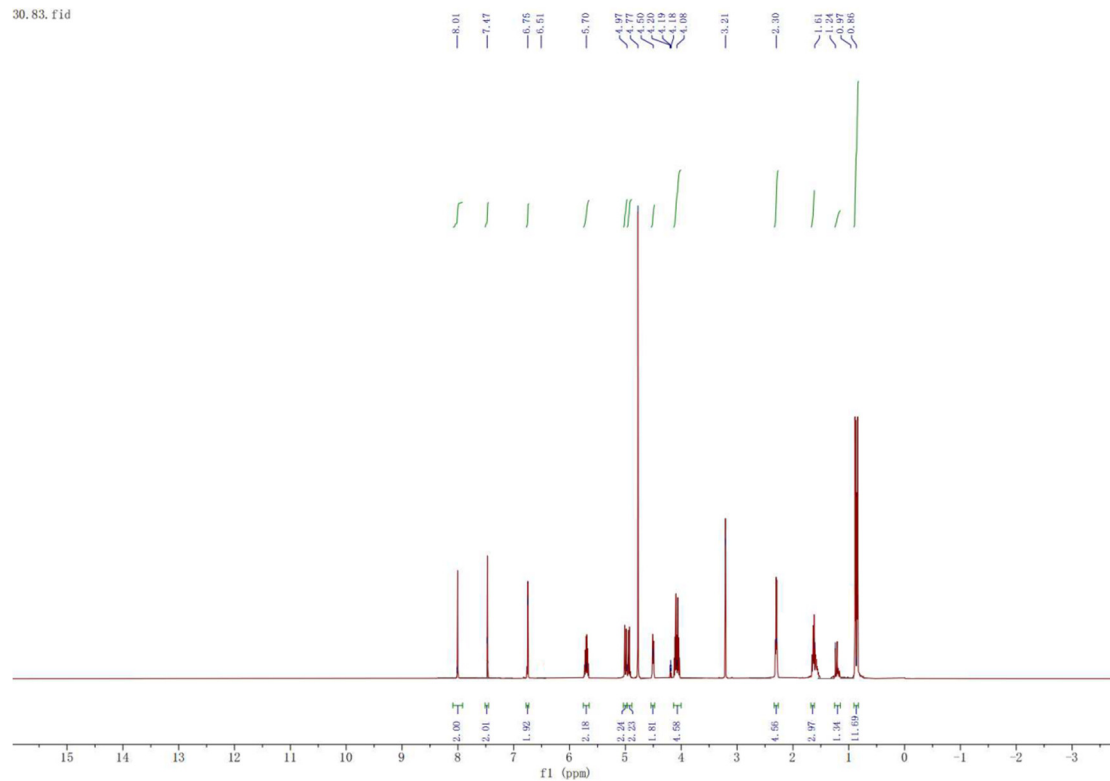
# <sup>1</sup>H NMR of compound 3g

31.92.fid



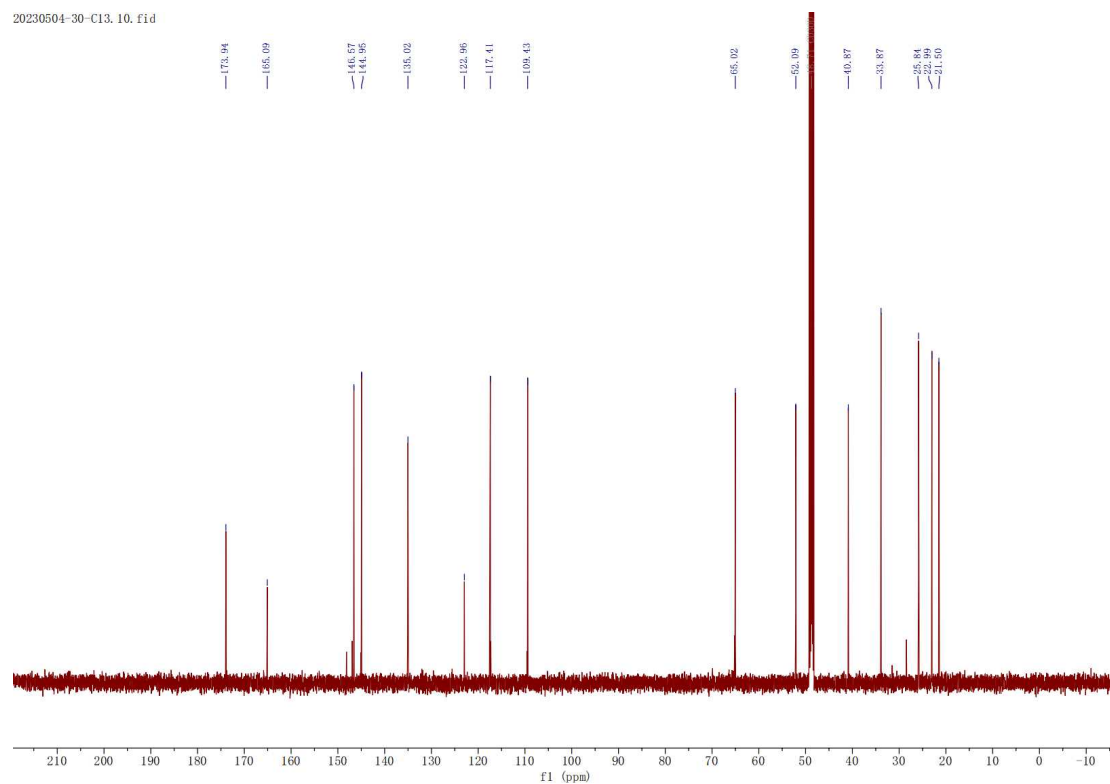
# <sup>1</sup>H NMR of compound 3h

30.83.fid



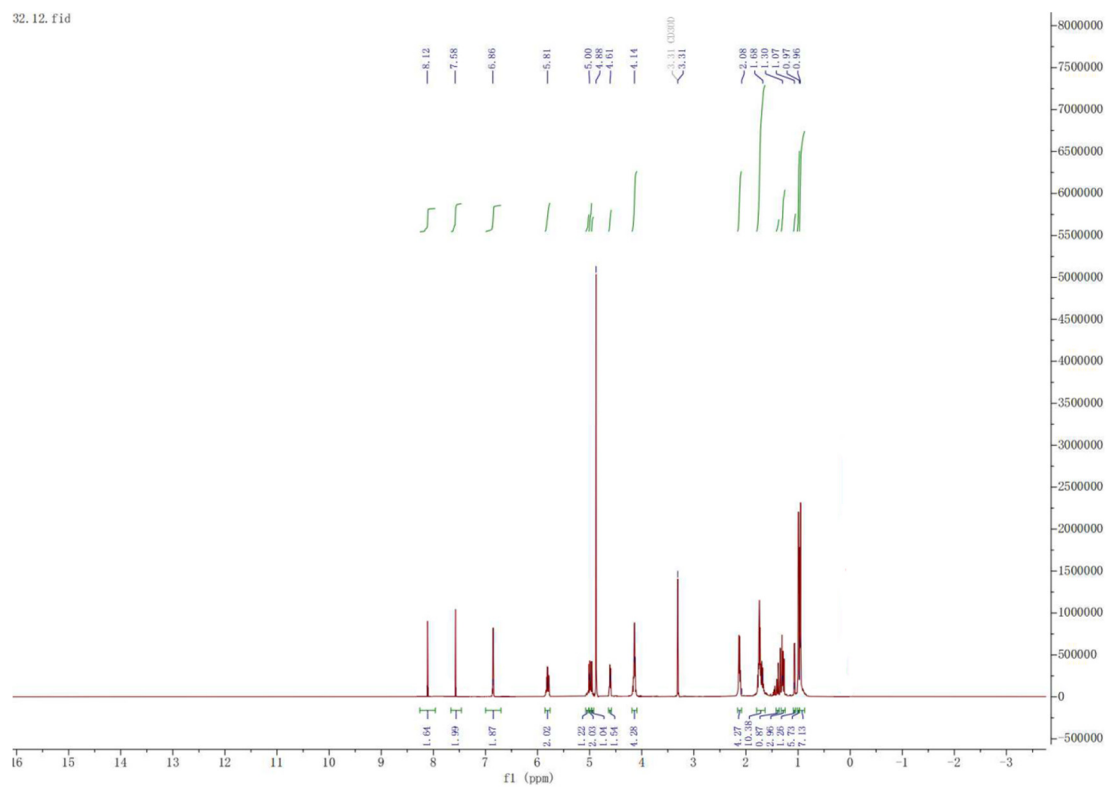
## $^{13}\text{C}$ NMR of compound 3h

20230504-30- $^{13}\text{C}$ 13.10.fid



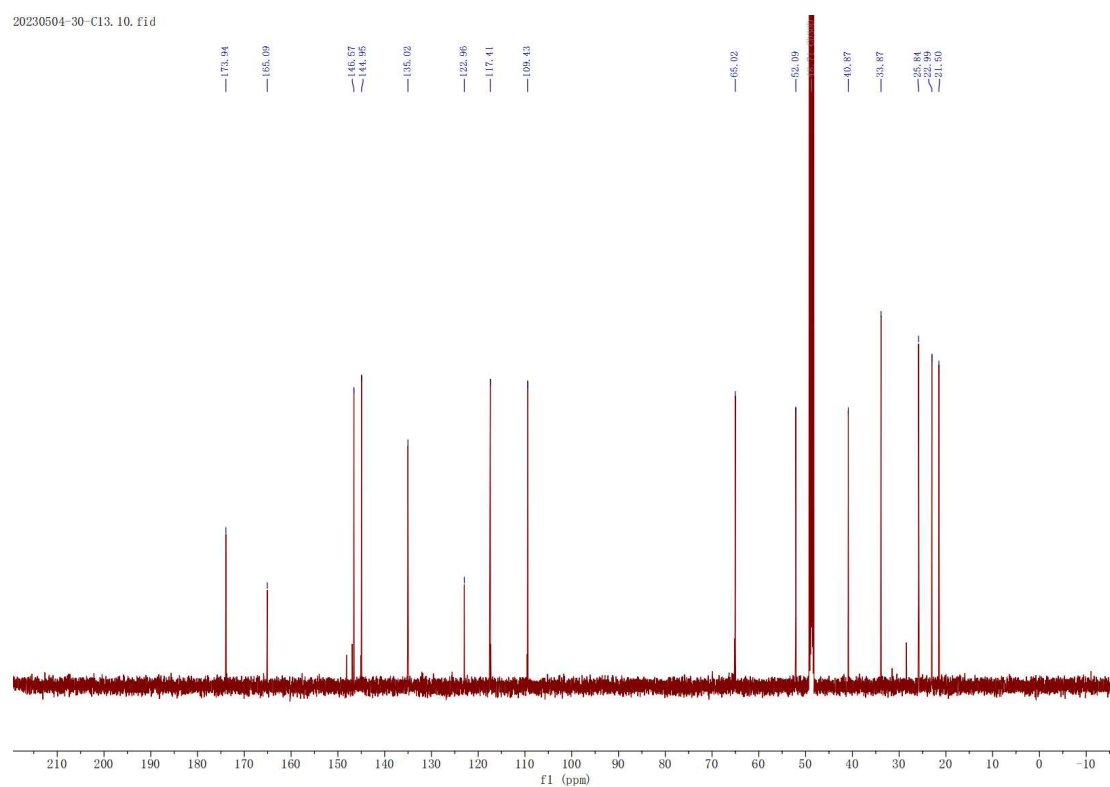
## $^1\text{H}$ NMR of compound 3i

32.12.fid



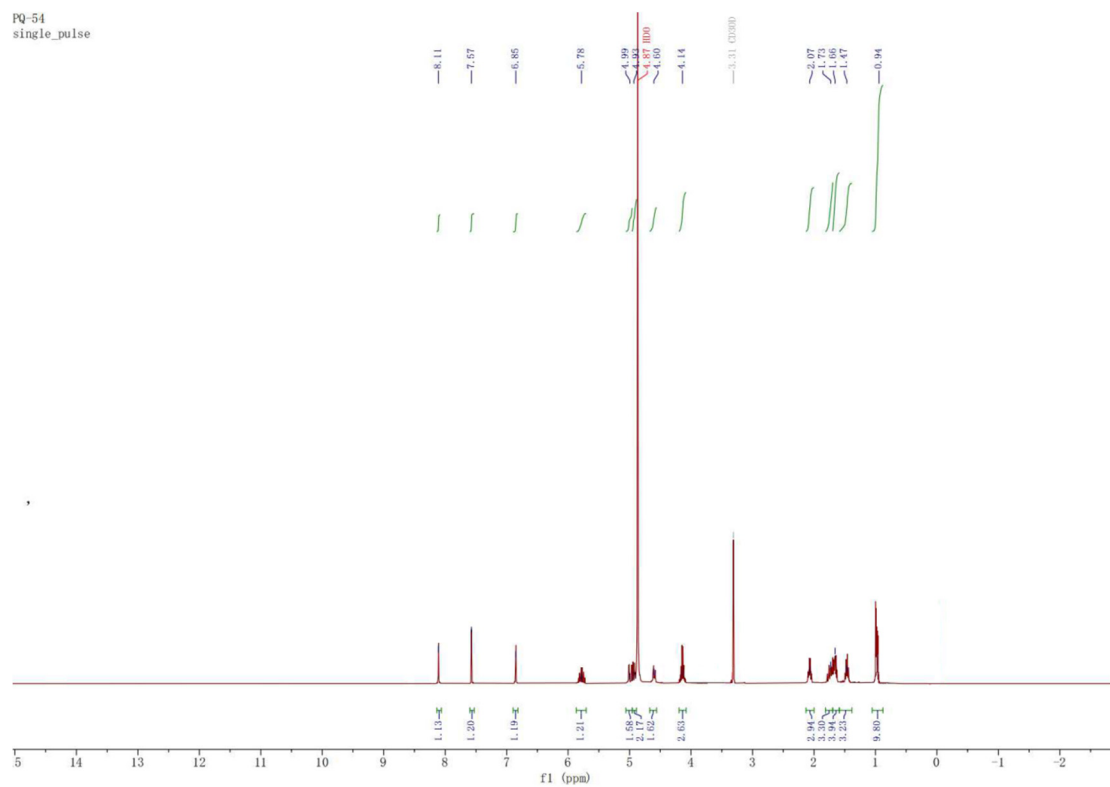
## $^{13}\text{C}$ NMR of compound 3i

20230504-30- $^{13}\text{C}$ 13.10.fid

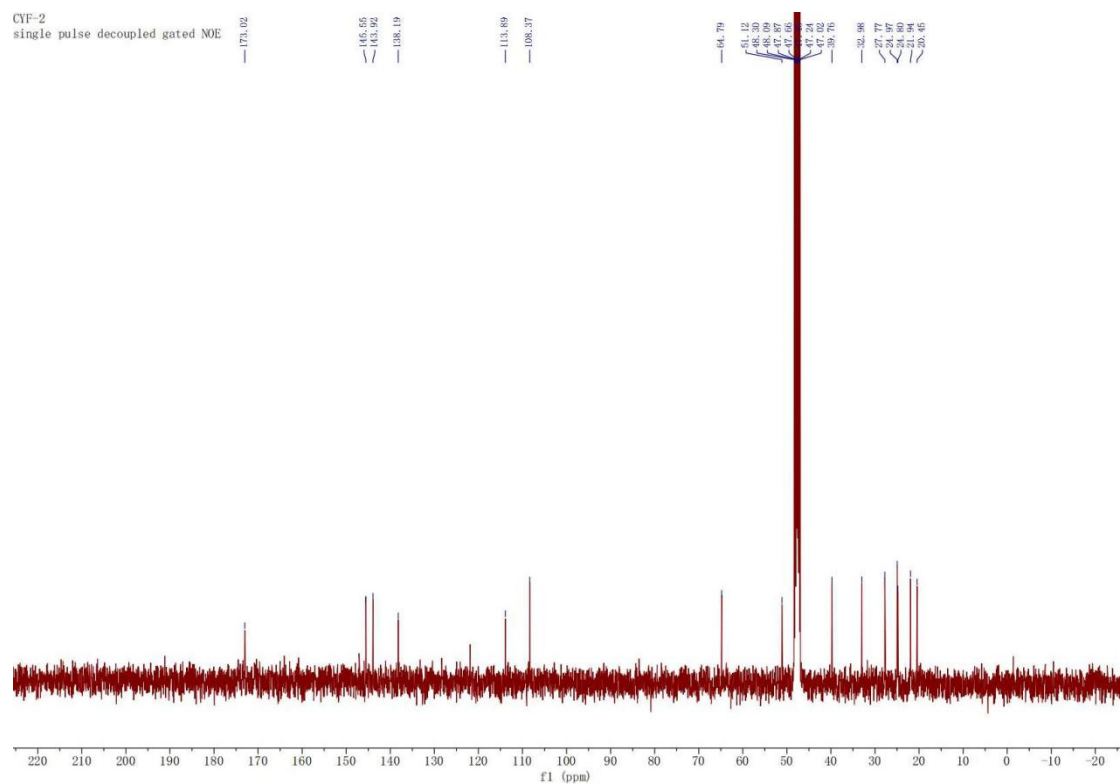


## $^1\text{H}$ NMR of compound 3j

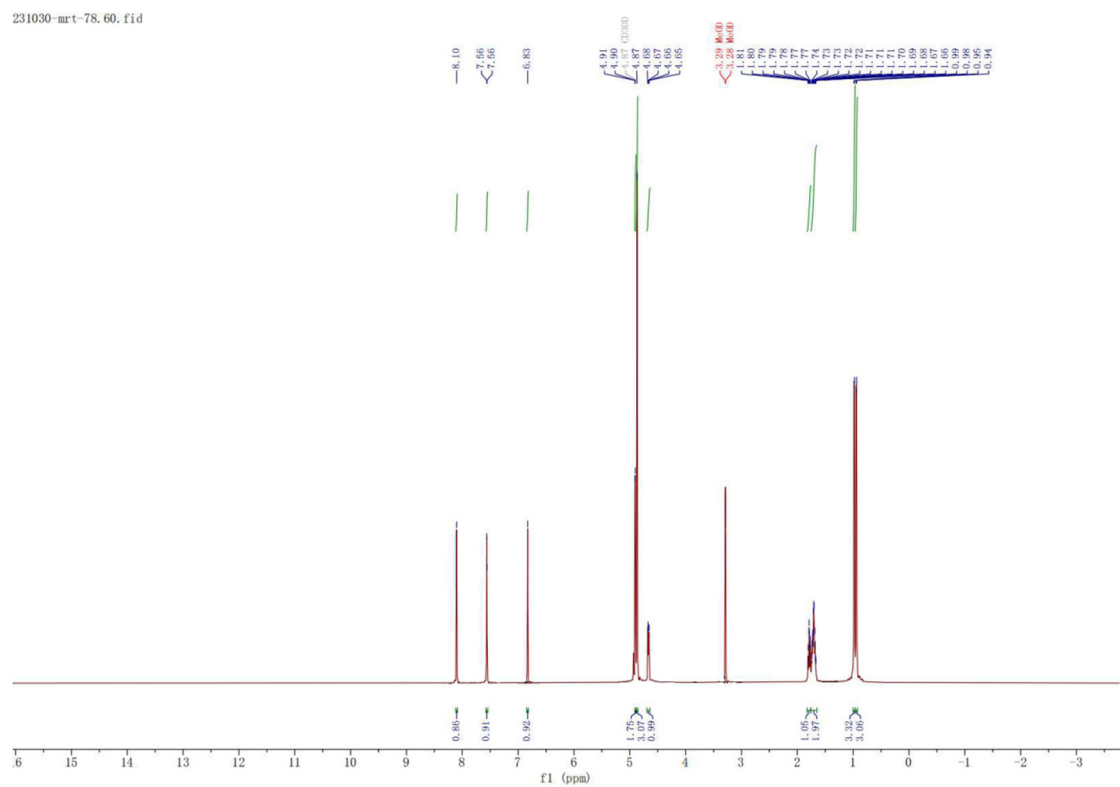
PQ-54  
single\_pulse



## $^{13}\text{C}$ NMR of compound 3j



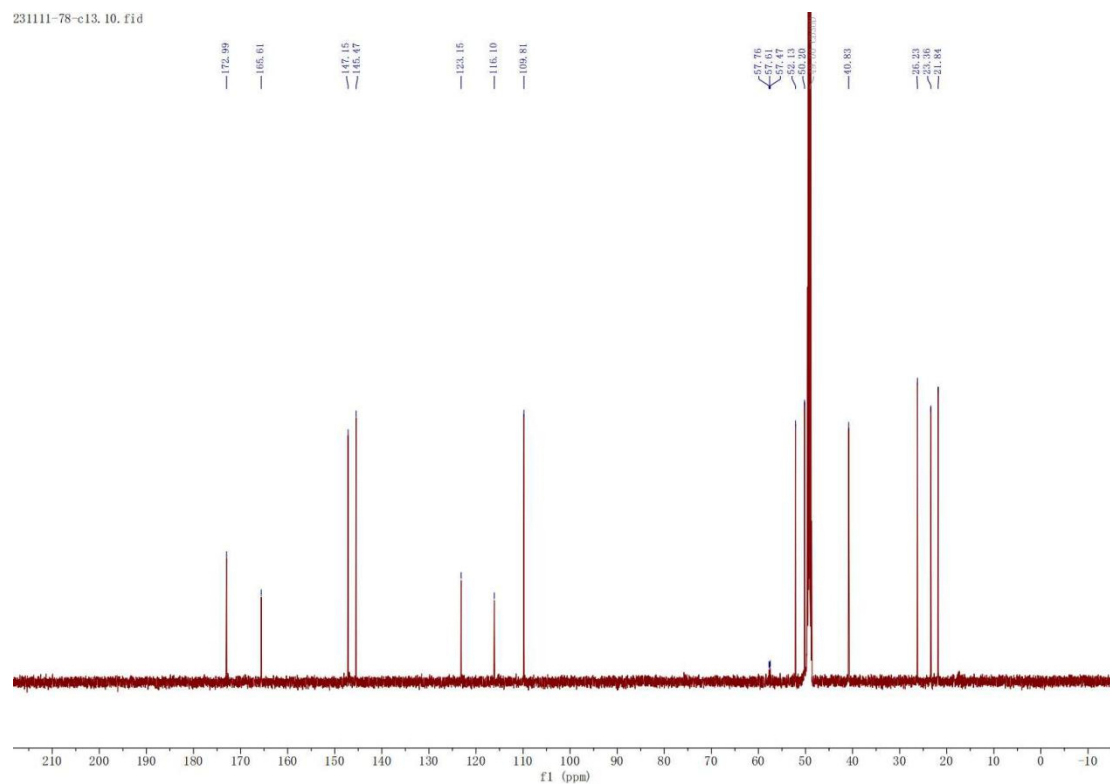
## $^1\text{H}$ NMR of compound 3k





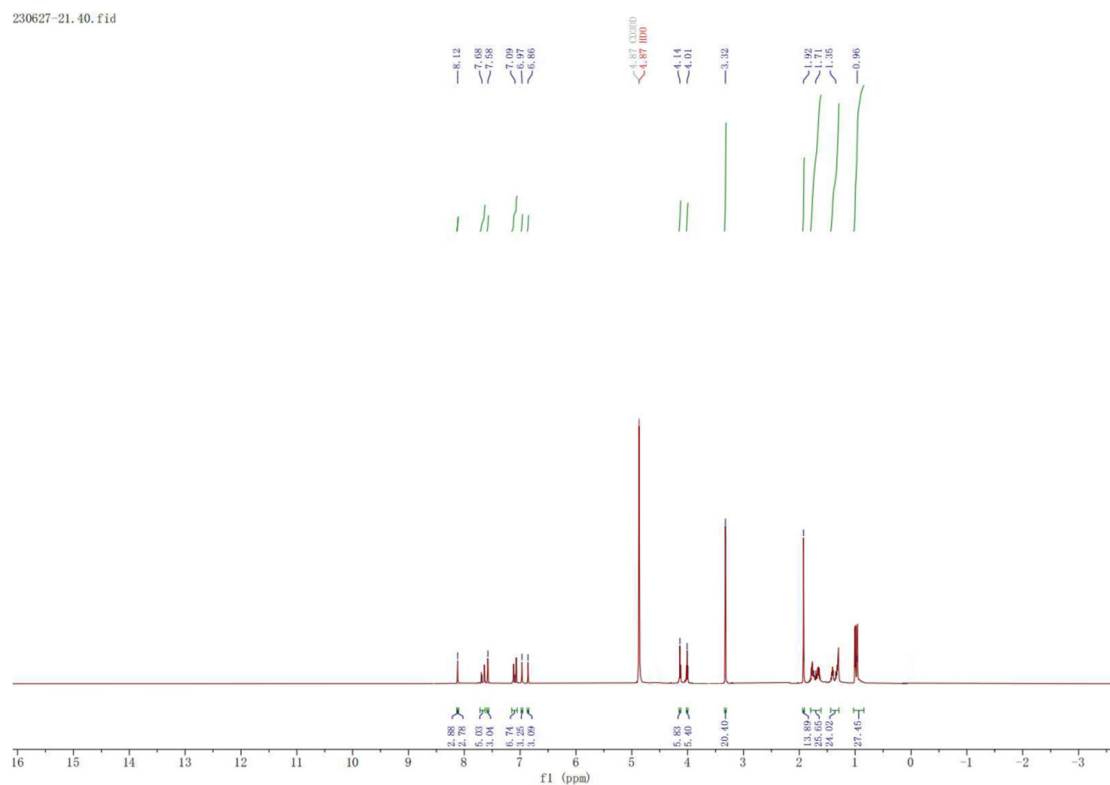
## $^{13}\text{C}$ NMR of compound 3k

231111-78-c13.10.fid



## $^1\text{H}$ NMR of compound 4a

230627-21.40.fid





CYF-1  
single pulse decoupled gated NOE

181.82  
180.39  
174.57  
147.11  
145.50  
123.45  
109.92  
66.31  
52.68  
50.85  
48.57  
41.28  
39.60  
38.79  
36.79  
35.27  
33.72  
32.86  
31.68  
30.36  
29.22  
27.00

f1 (ppm)

1H NMR spectrum of compound 10a in CDCl<sub>3</sub>. The x-axis represents the chemical shift in ppm (f1) from 0 to 15. The y-axis represents the intensity. The spectrum shows several peaks with corresponding integrations:

- ~7.8 ppm (triplet, integral 0.94)
- ~7.5 ppm (doublet, integral 0.97)
- ~7.2 ppm (doublet, integral 0.97)
- ~4.8 ppm (singlet, integral 2.29)
- ~3.8 ppm (doublet, integral 3.12)
- ~3.5 ppm (doublet, integral 9.16)
- ~2.1 ppm (singlet, integral 1.62)
- 1.5-2.0 ppm (multiplet, integrals 5.10, 5.57, 8.27)
- 0.8-1.0 ppm (multiplet, integrals 1.93, 1.65, 1.04, 1.30, 0.97)

Solvent peaks for CDCl<sub>3</sub> are visible at ~7.26, 4.76, and 3.30 ppm.

# <sup>13</sup>C NMR of compound 4d

CYF-1  
single pulse decoupled gated NOE

