Supporting Information

For

Synthesis of fully substituted pyrazoles from pyridinium 1,4-zwitterionic thiolates and hydrazonoyl chlorides via [[3+3]-1] pathway

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† *These authors contributed equally to this work*

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1. NMR spectra

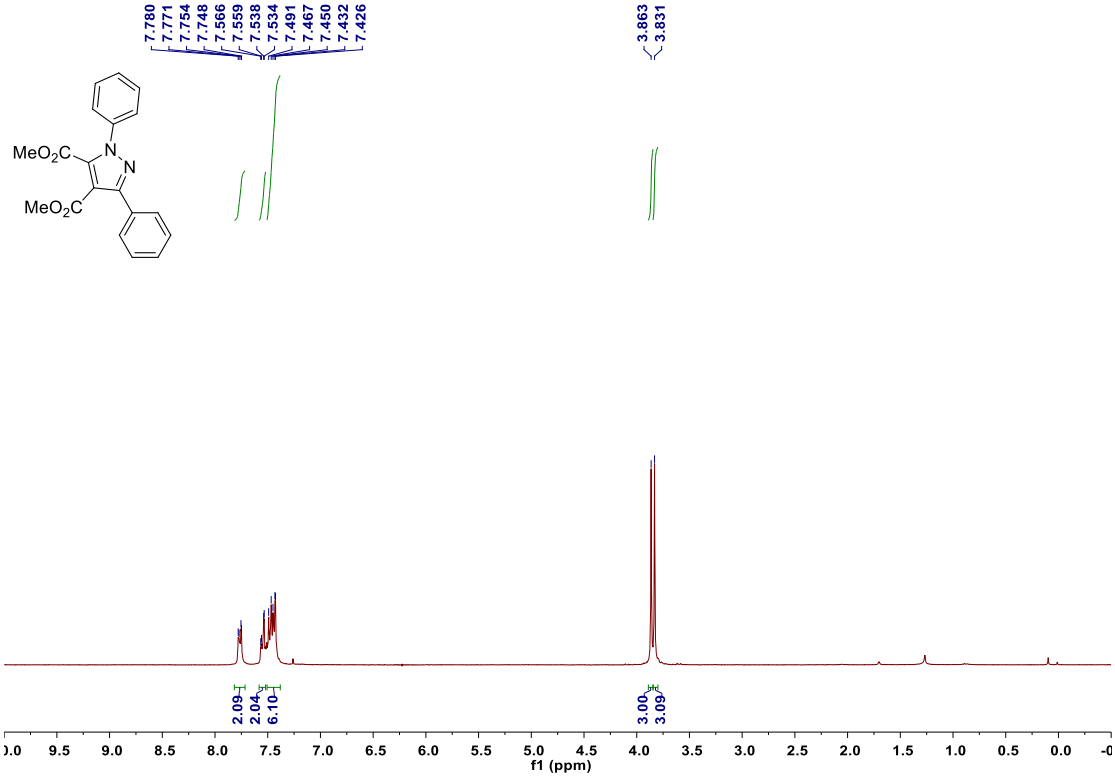

Fig. S1 ^{1}H NMR of compound **4a** (300 MHz, $CDCl_3$)

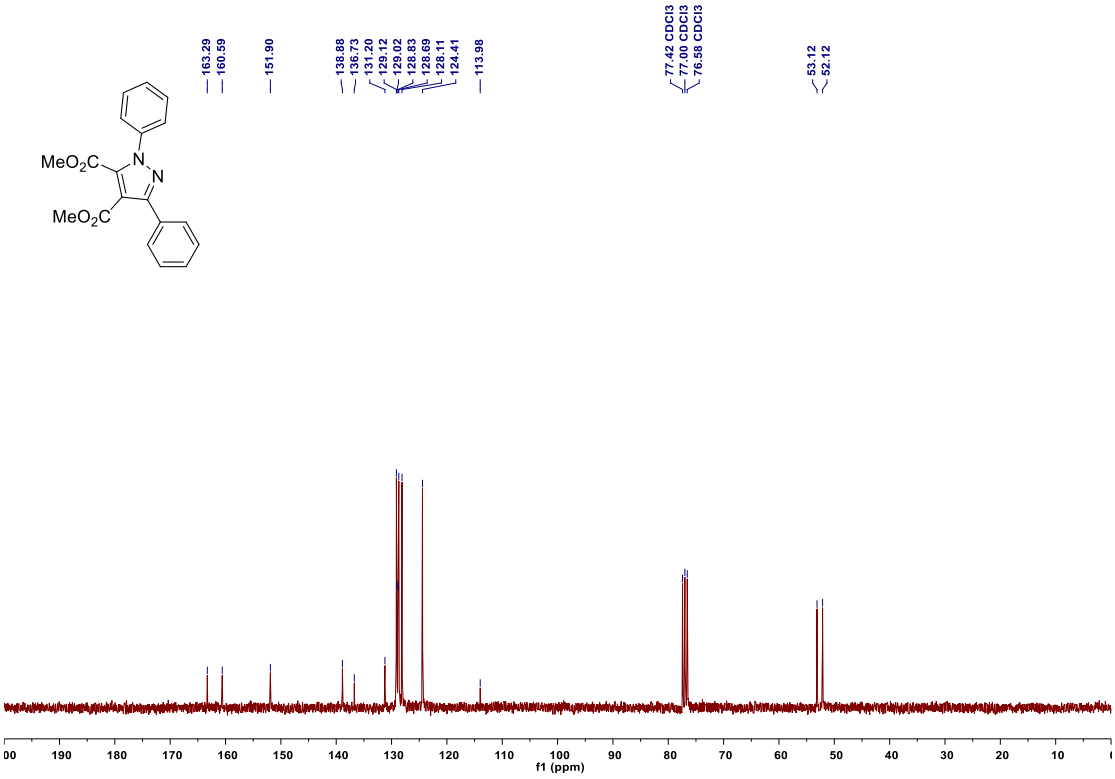

Fig. S2 ^{13}C NMR of compound **4a** (75 MHz, $CDCl_3$)

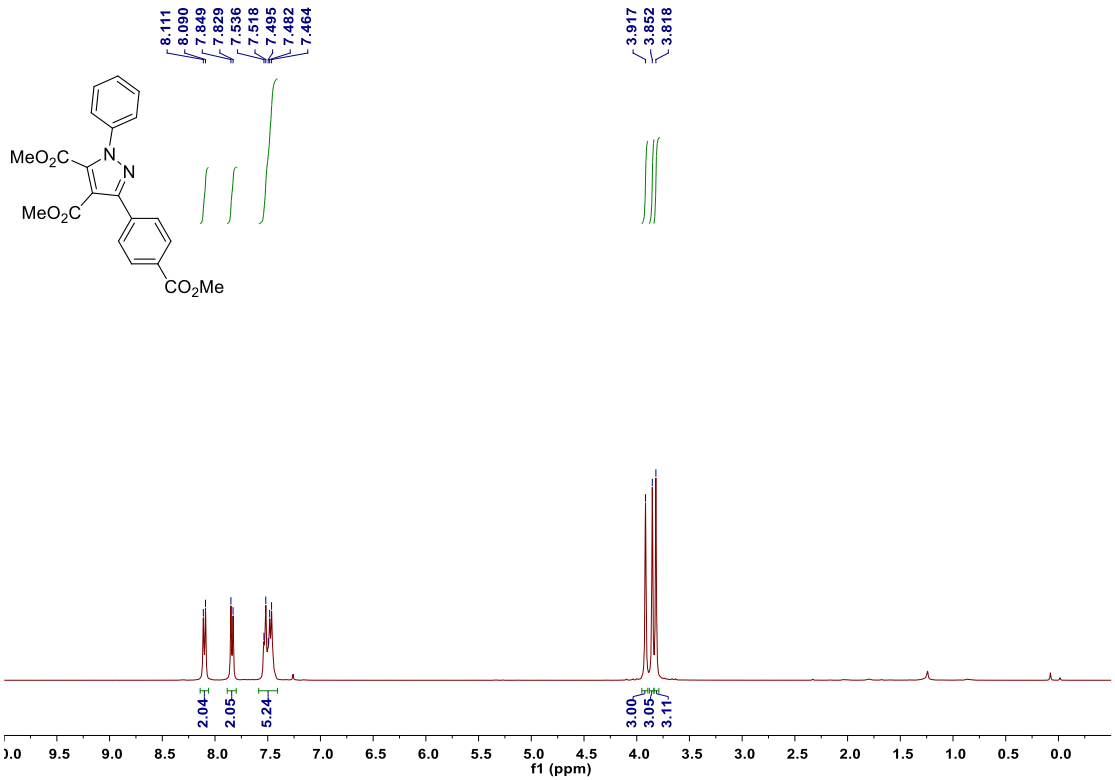

Fig. S3 ^{1}H NMR of compound **4b** (400 MHz, $CDCl_3$)

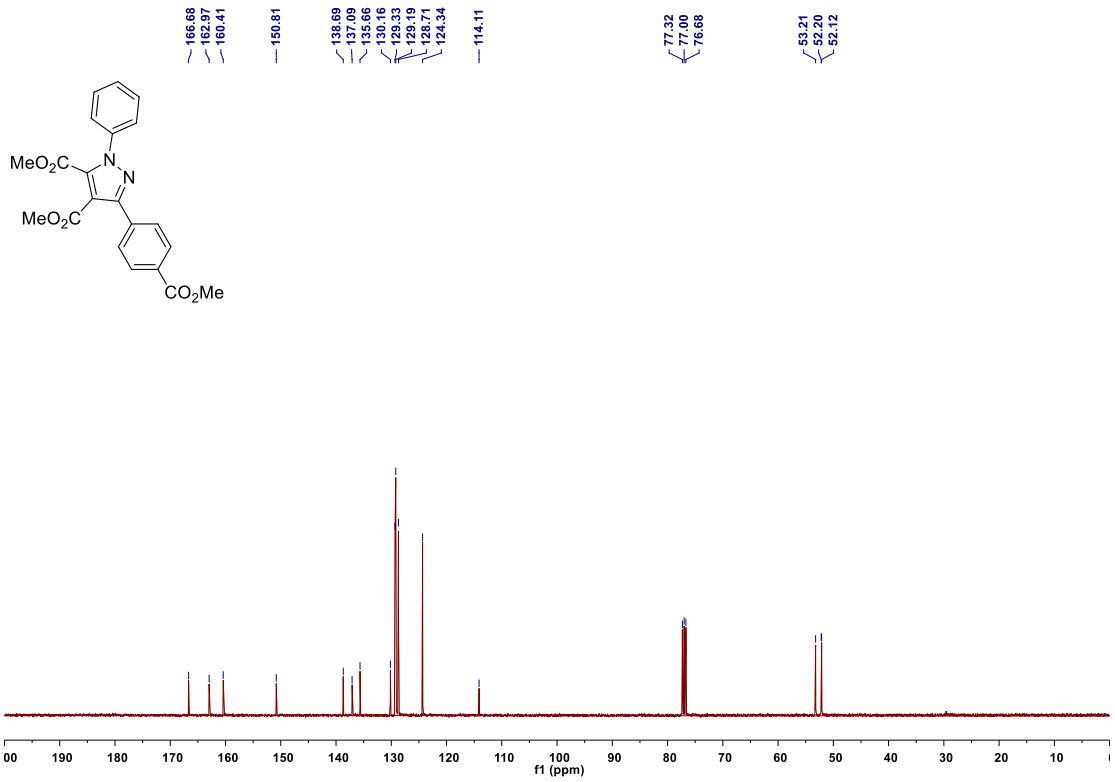

Fig. S4 ^{13}C NMR of compound **4b** (100 MHz, $CDCl_3$)

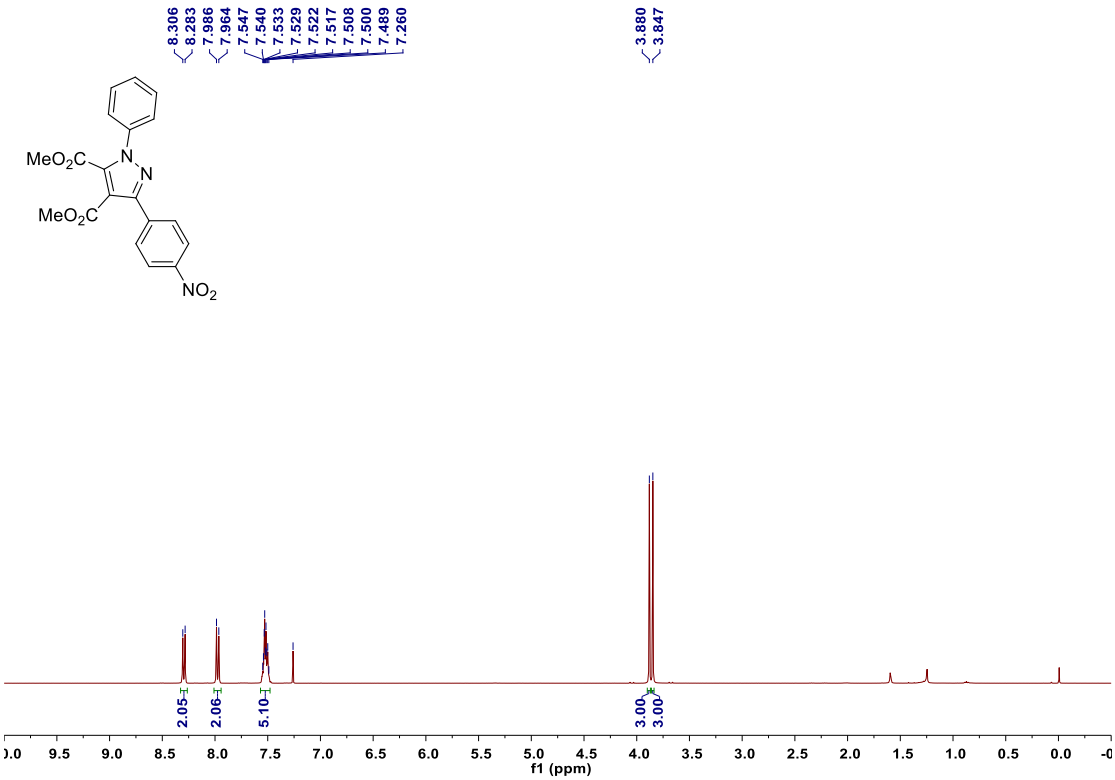

Fig. S5 ^{1}H NMR of compound **4c** (400 MHz, $CDCl_3$)

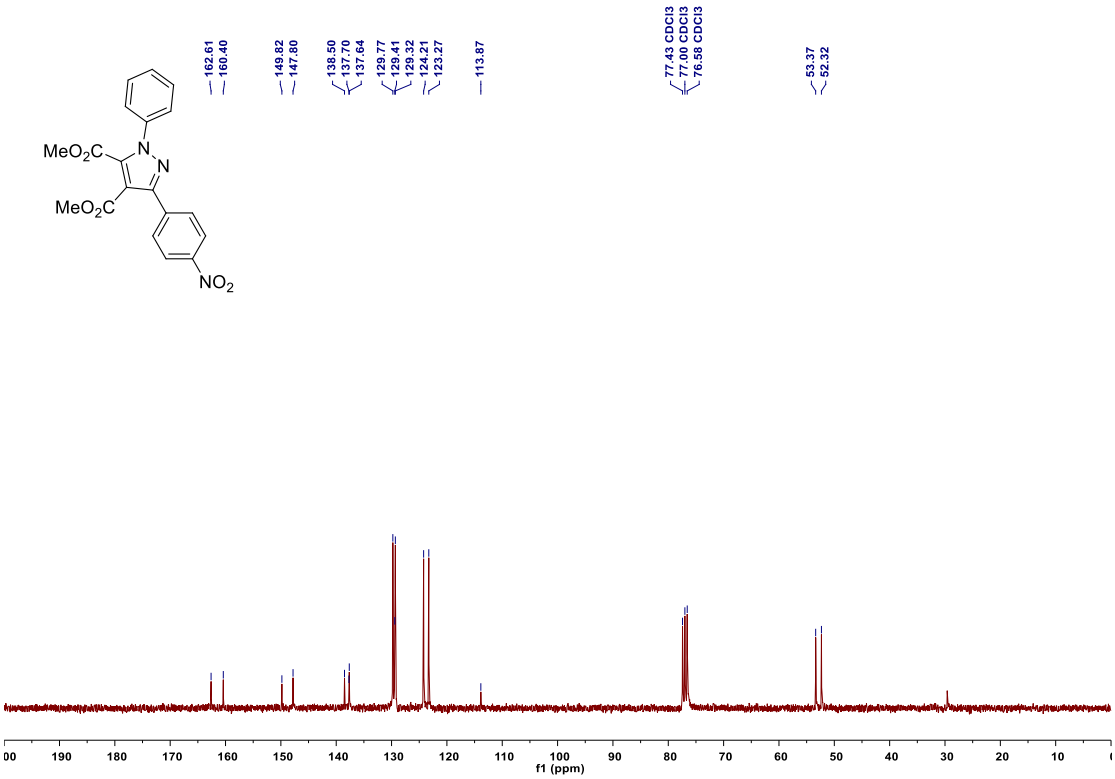

Fig. S6 ^{13}C NMR of compound **4c** (75 MHz, $CDCl_3$).

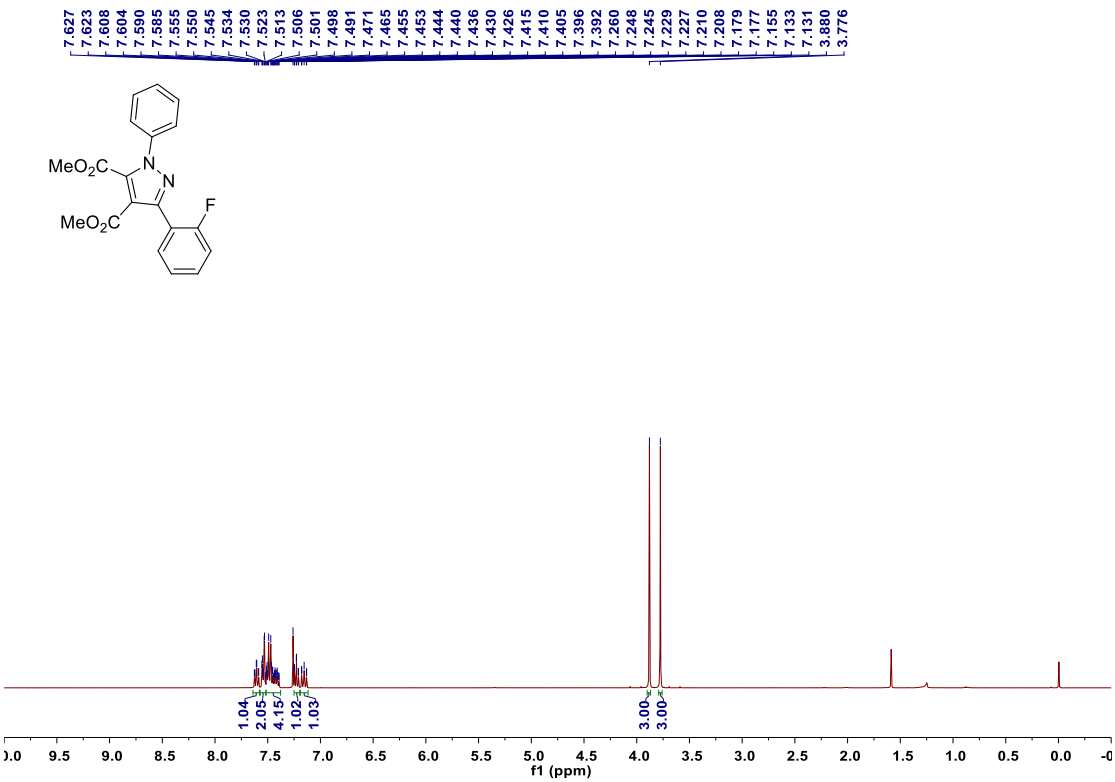

Fig. S7 ^{1}H NMR of compound **4d** (400 MHz, $CDCl_3$)

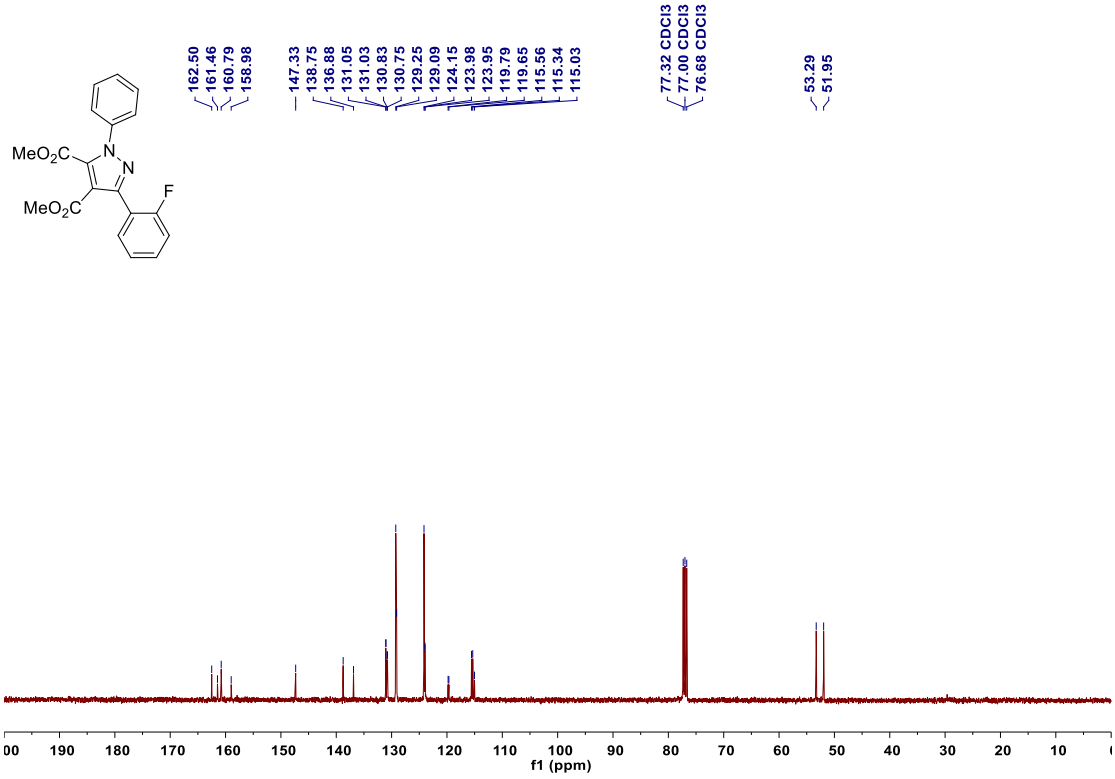

Fig. S8 ^{13}C NMR of compound **4d** (100 MHz, $CDCl_3$)

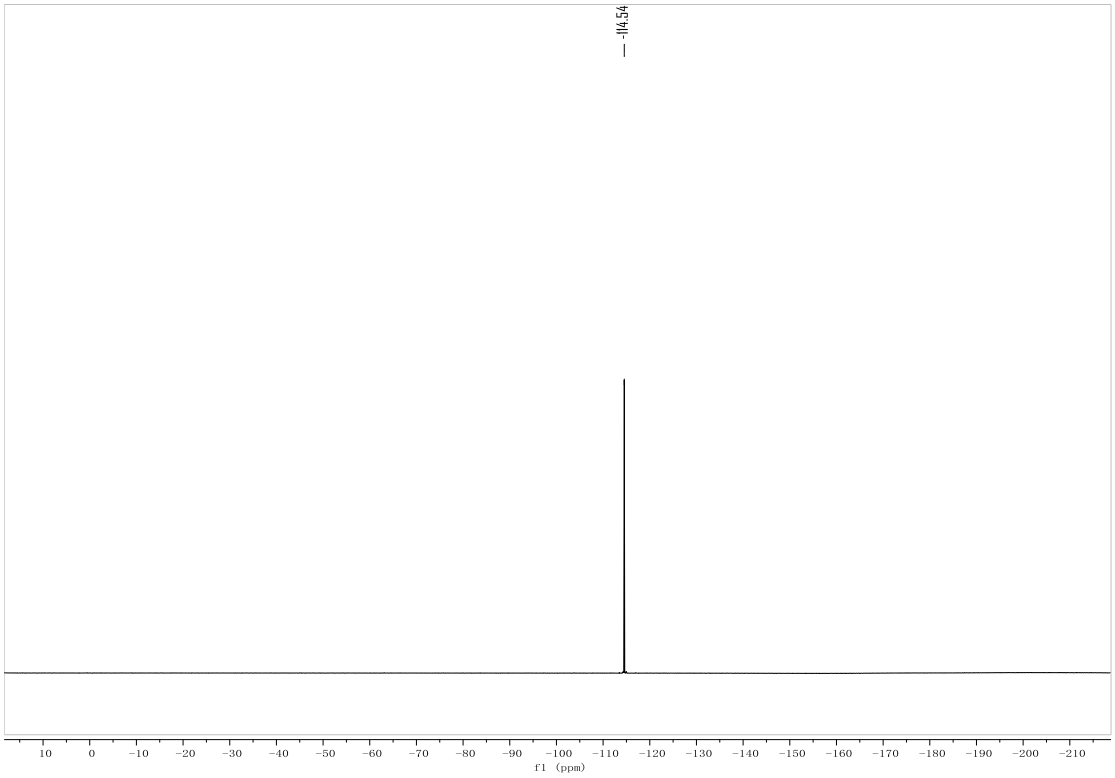

Fig. S9 ^{19}F NMR of compound **4d** (376 MHz, $CDCl_3$)

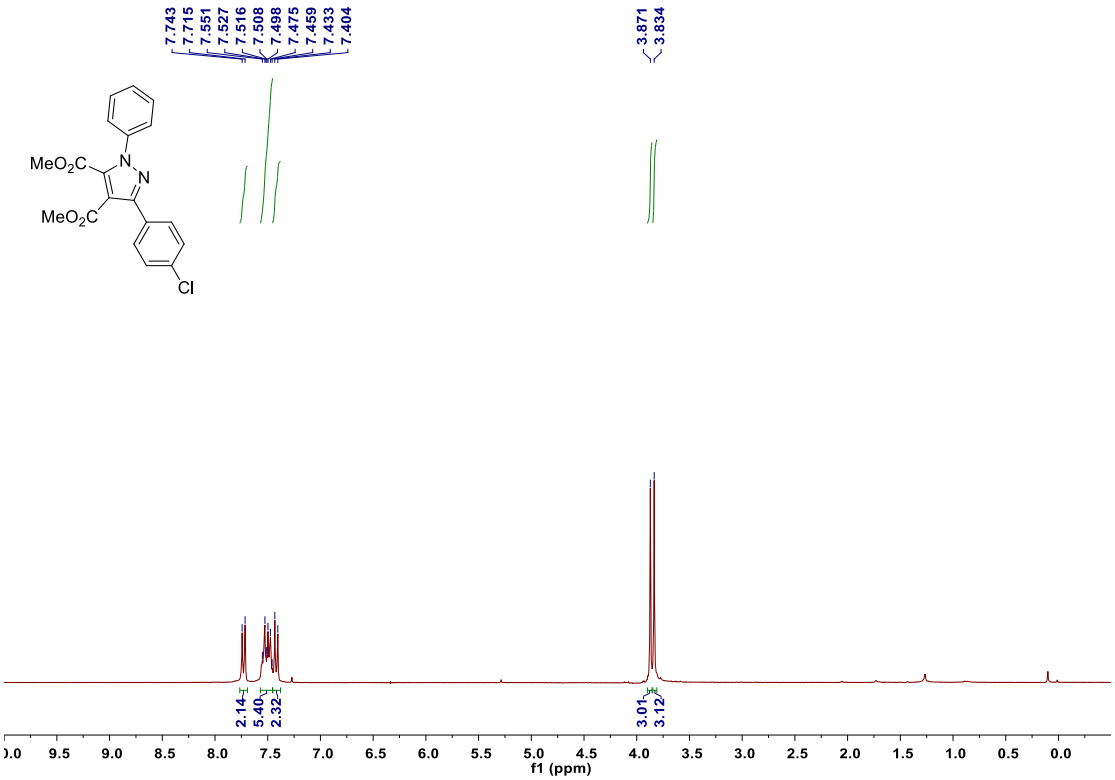

Fig. S10 ^{1}H NMR of compound **4e** (300 MHz, $CDCl_3$)

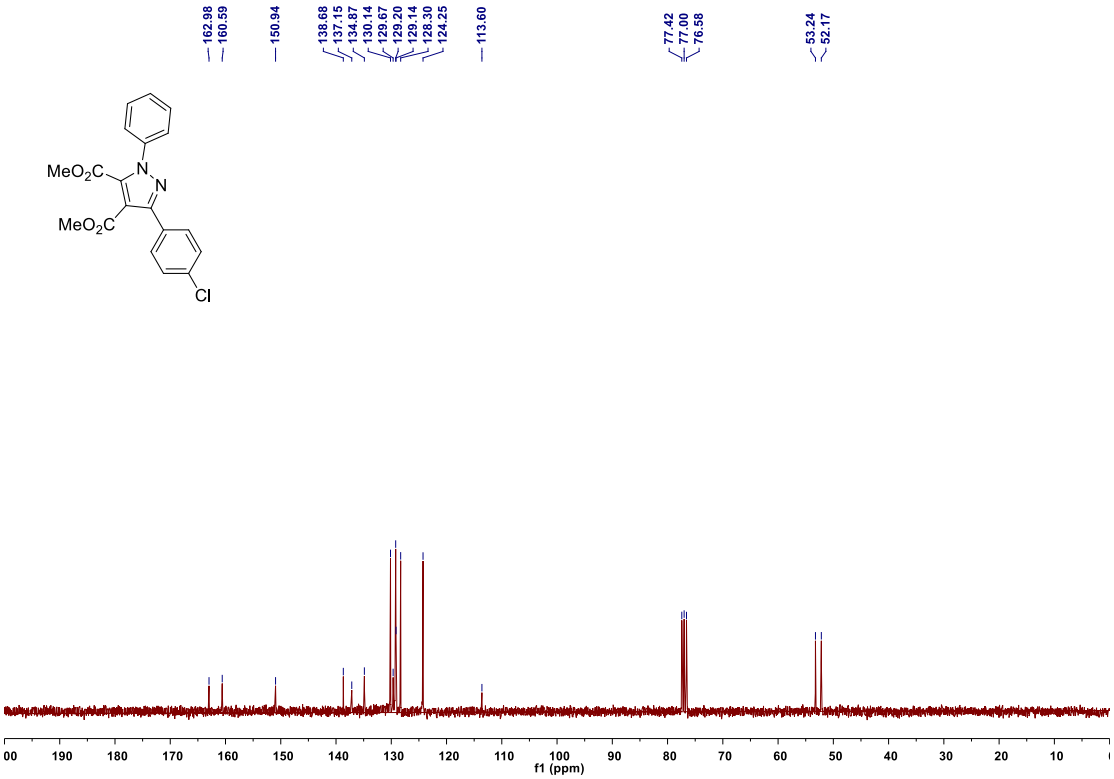

Fig. S11 ^{13}C NMR of compound **4e** (75 MHz, $CDCl_3$)

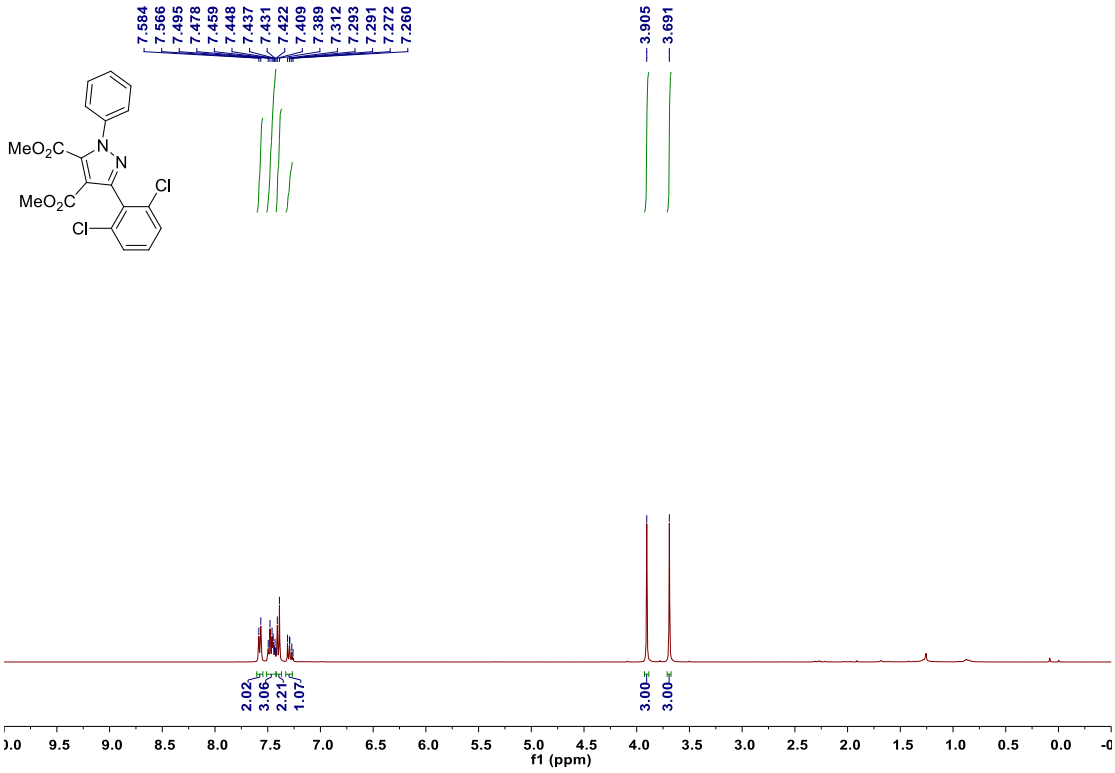

Fig. S12 ^{1}H NMR of compound **4f** (400 MHz, $CDCl_3$)

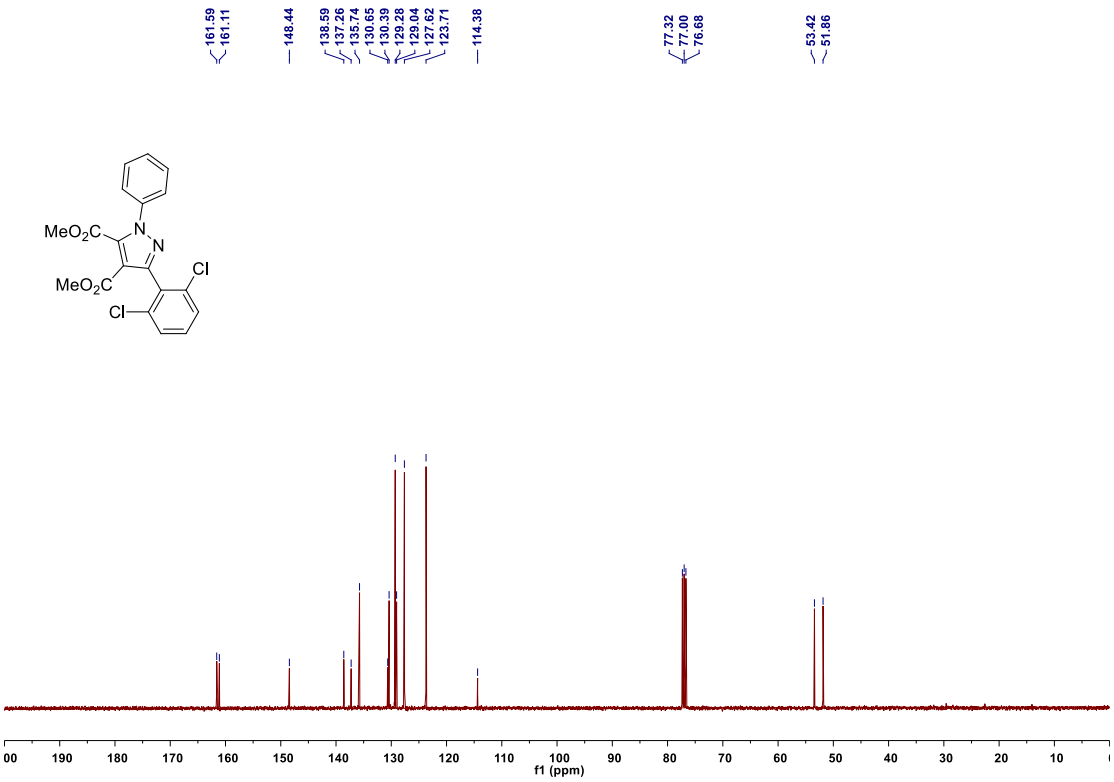

Fig. S13 ^{13}C NMR of compound **4f** (100 MHz, $CDCl_3$)

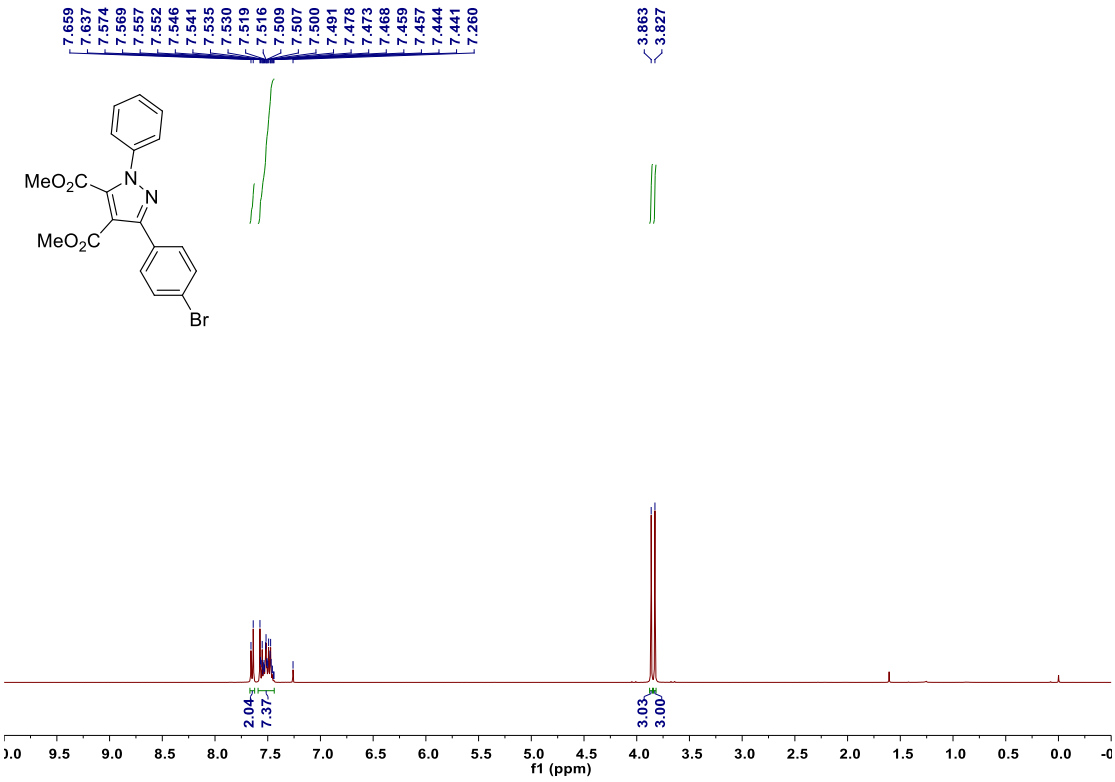

Fig. S14 ^{1}H NMR of compound **4g** (400 MHz, $CDCl_3$)

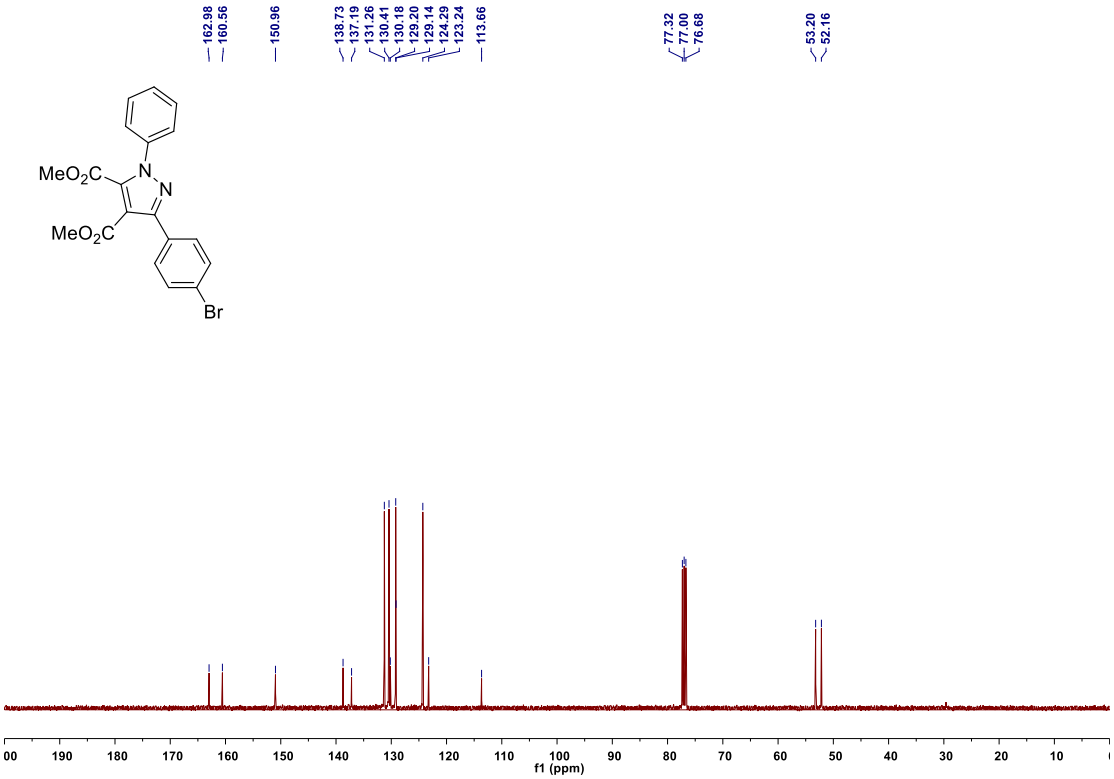

Fig. S15 ^{13}C NMR of compound **4g** (100 MHz, $CDCl_3$)

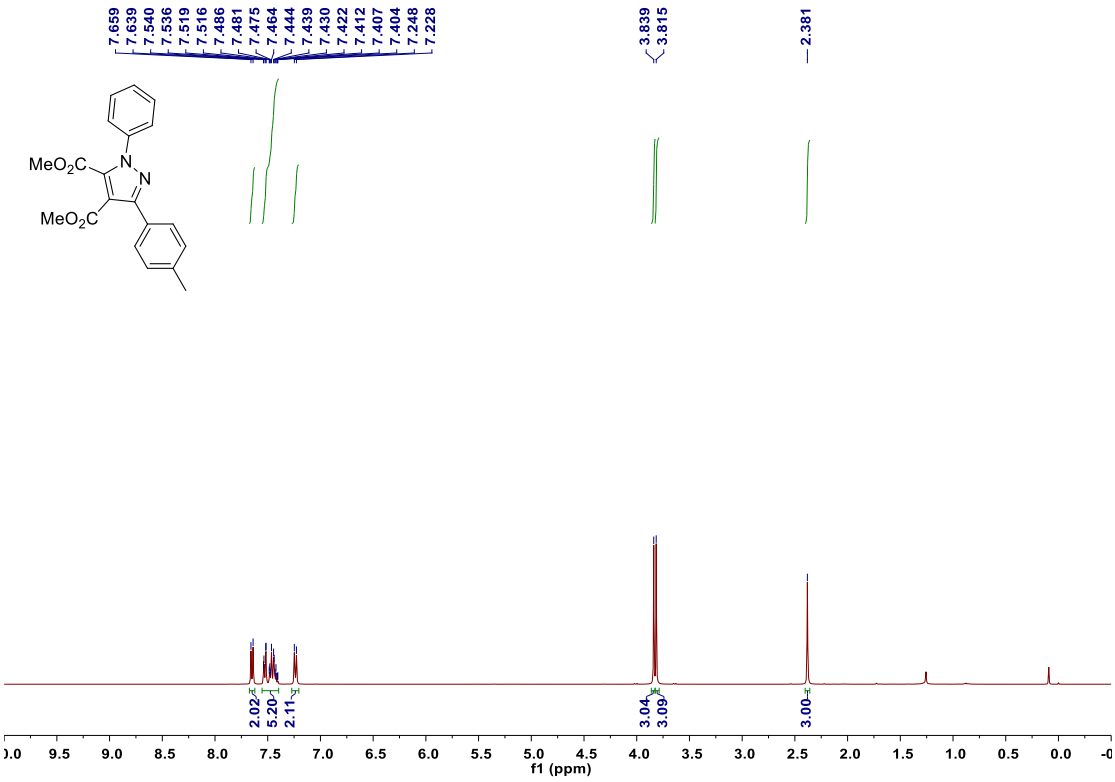

Fig. S16 ^{1}H NMR of compound **4h** (400 MHz, $CDCl_3$)

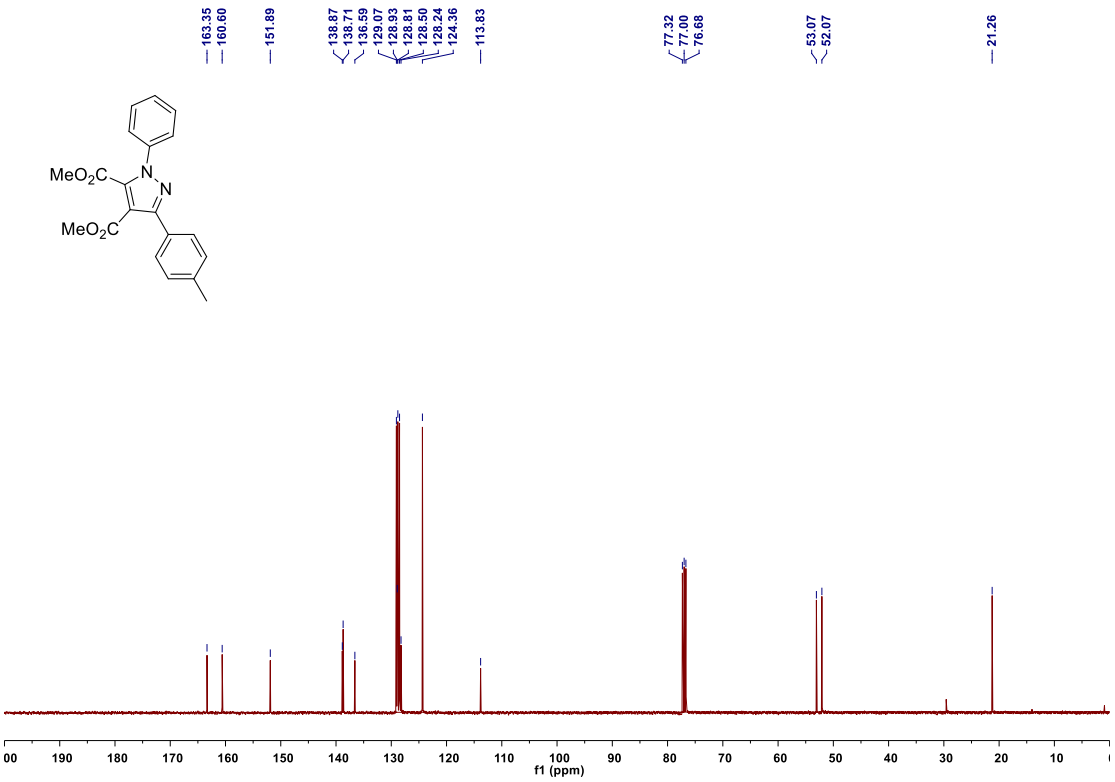

Fig. S17 ^{13}C NMR of compound **4h** (100 MHz, $CDCl_3$)

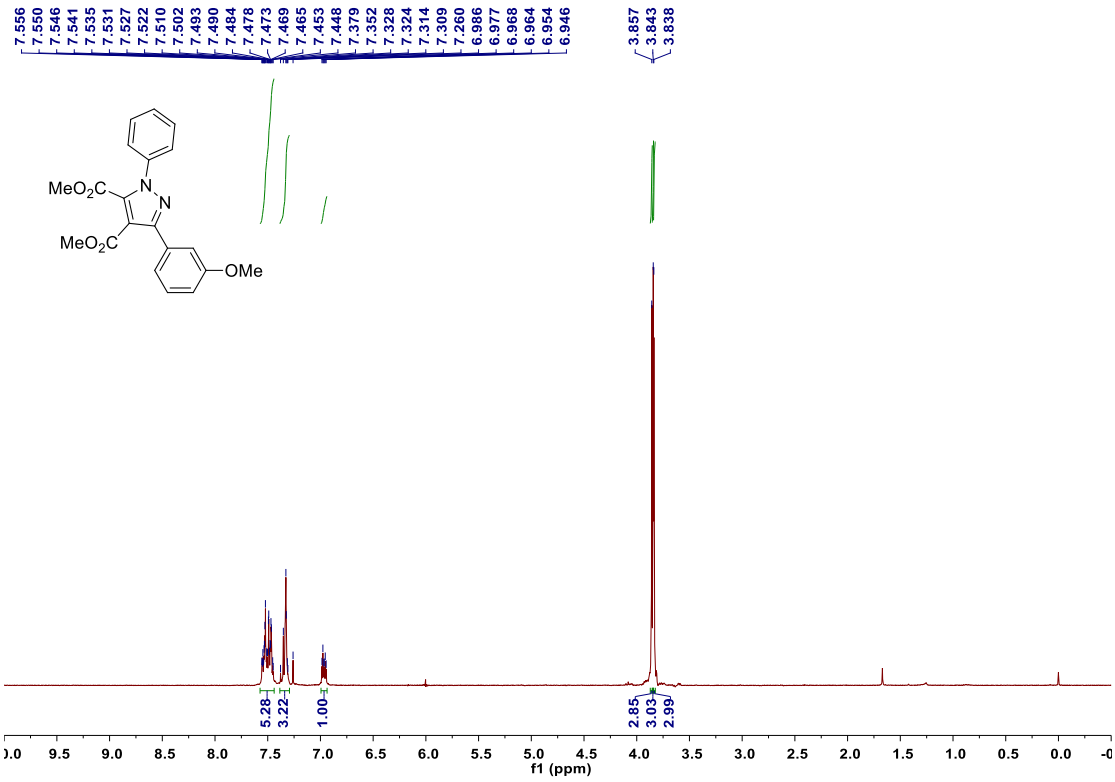

Fig. S18 ^{1}H NMR of compound **4i** (300 MHz, $CDCl_3$)

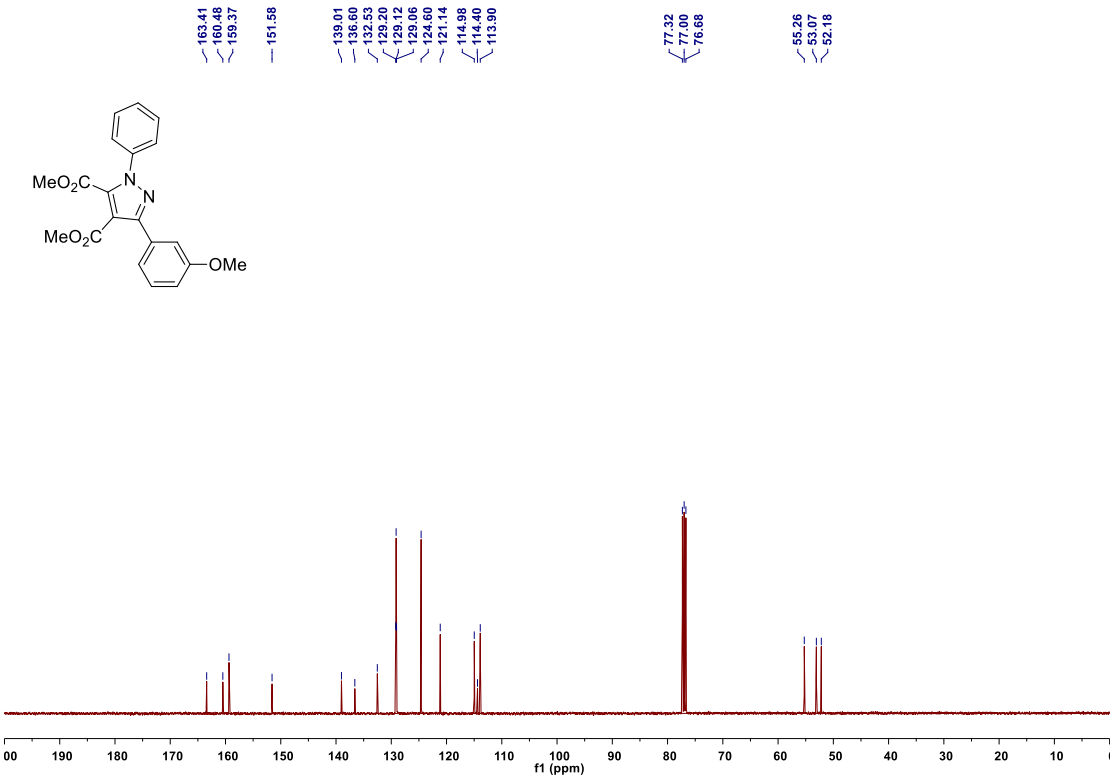

Fig. S19 ^{13}C NMR of compound **4i** (100 MHz, $CDCl_3$)

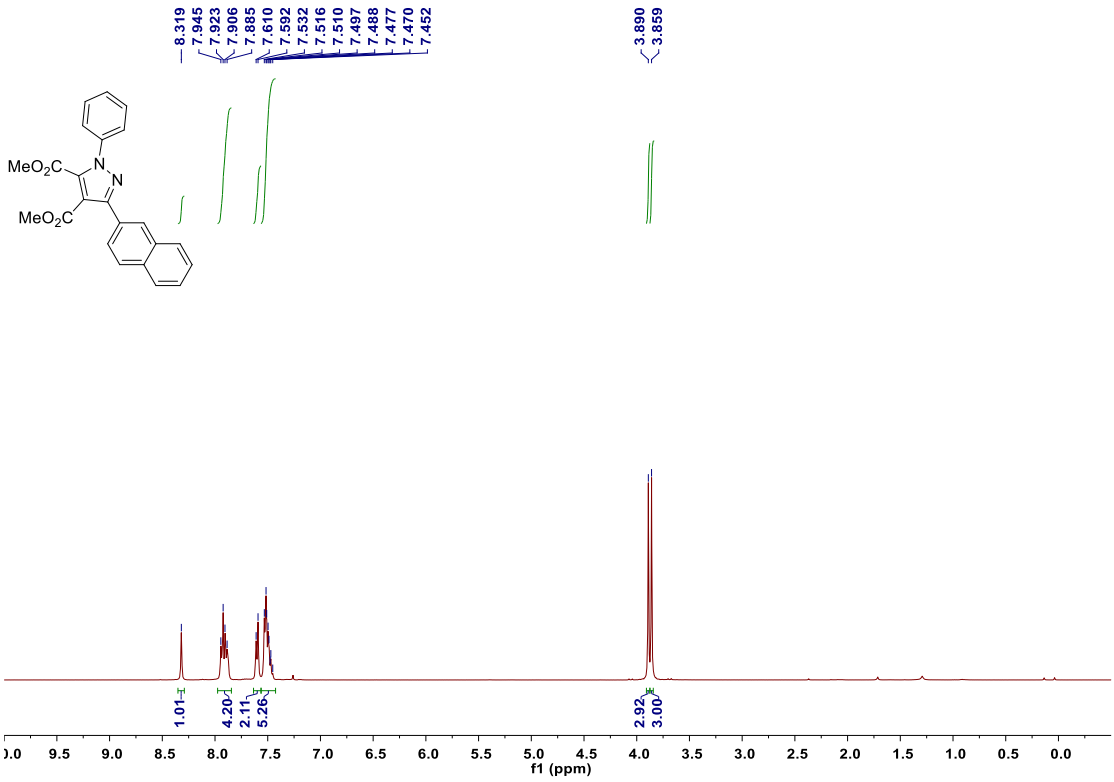

Fig. S20 ^{1}H NMR of compound **4j** (400 MHz, $CDCl_3$)

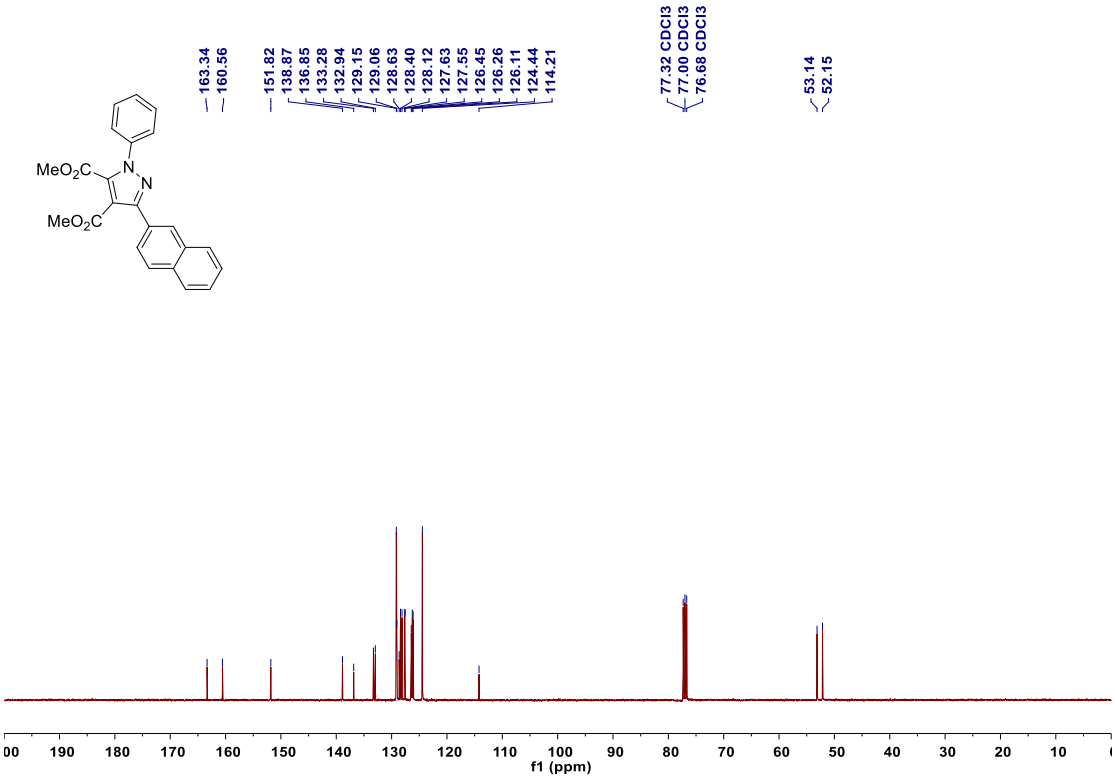

Fig. S21 ^{13}C NMR of compound **4j** (100 MHz, $CDCl_3$)

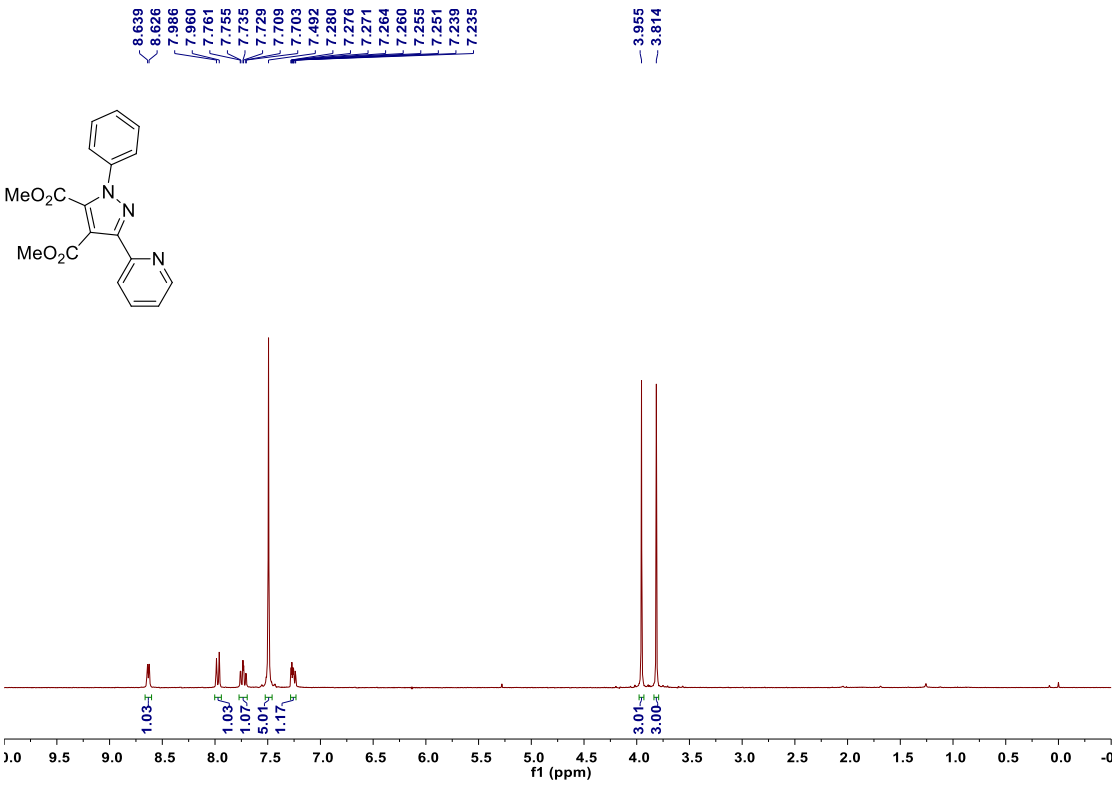

Fig. S22 ^{1}H NMR of compound **4k** (400 MHz, $CDCl_3$)

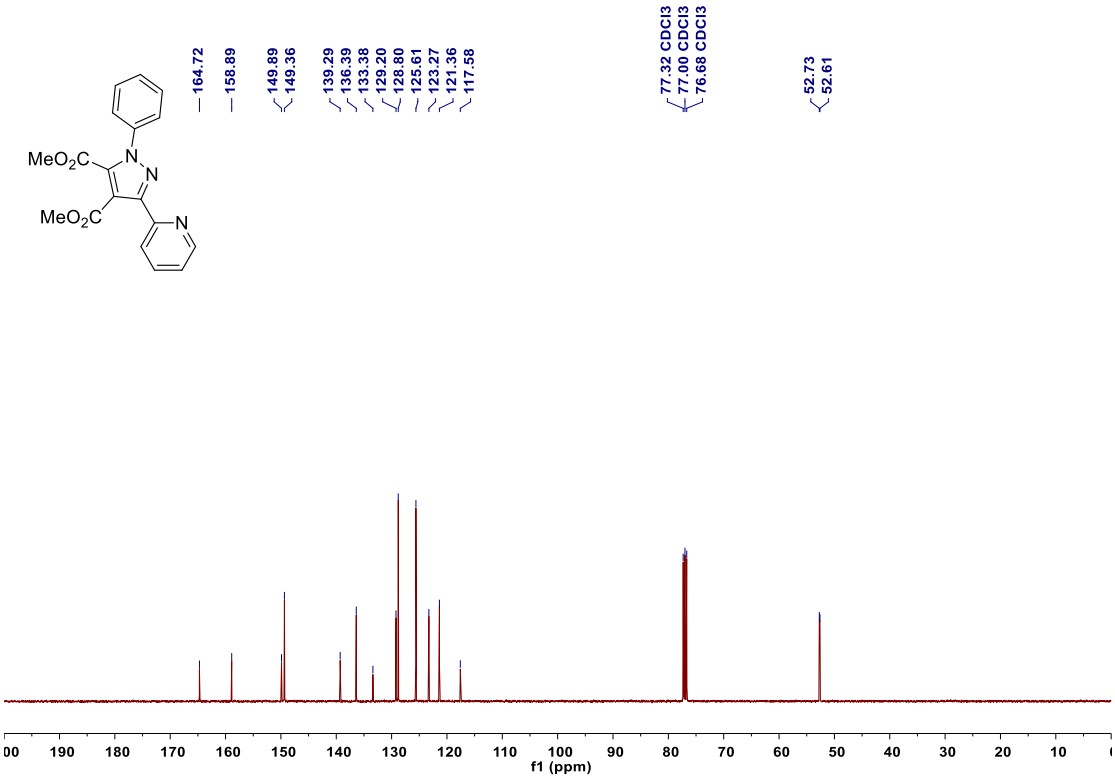

Fig. S23 ^{13}C NMR of compound **4k** (100 MHz, $CDCl_3$)

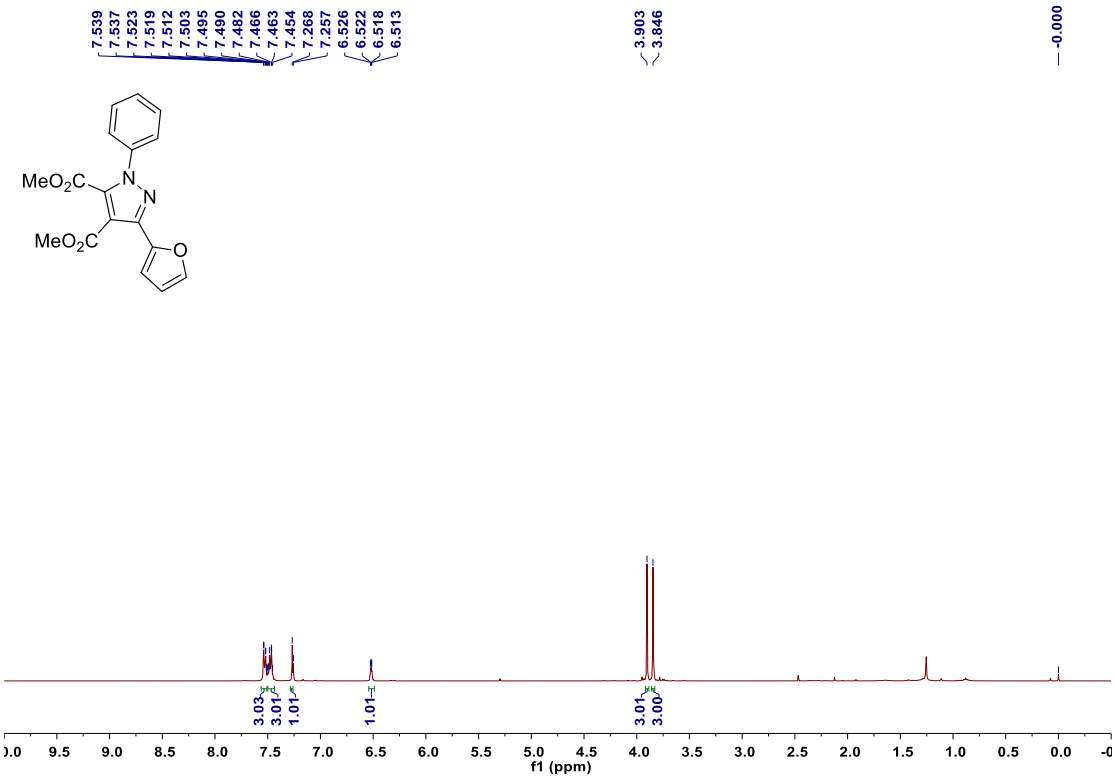

Fig. S24 ^{1}H NMR of compound **4l** (400 MHz, $CDCl_3$)

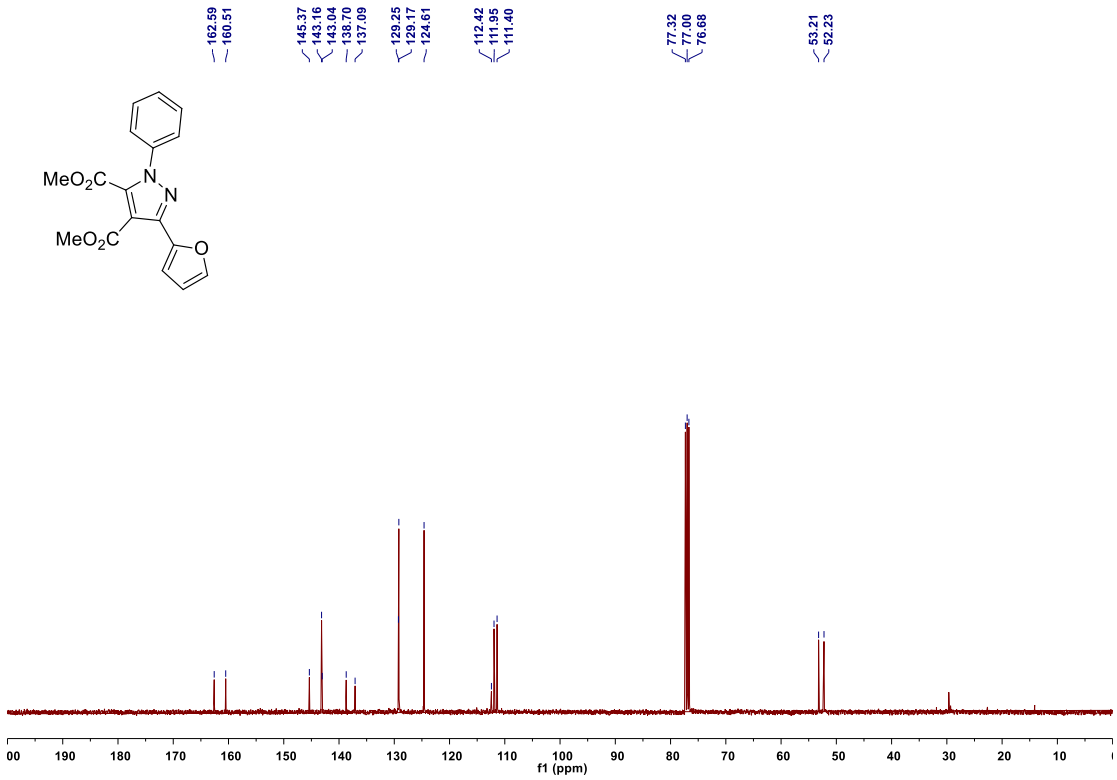

Fig. S25 ^{13}C NMR of compound **4l** (100 MHz, $CDCl_3$)

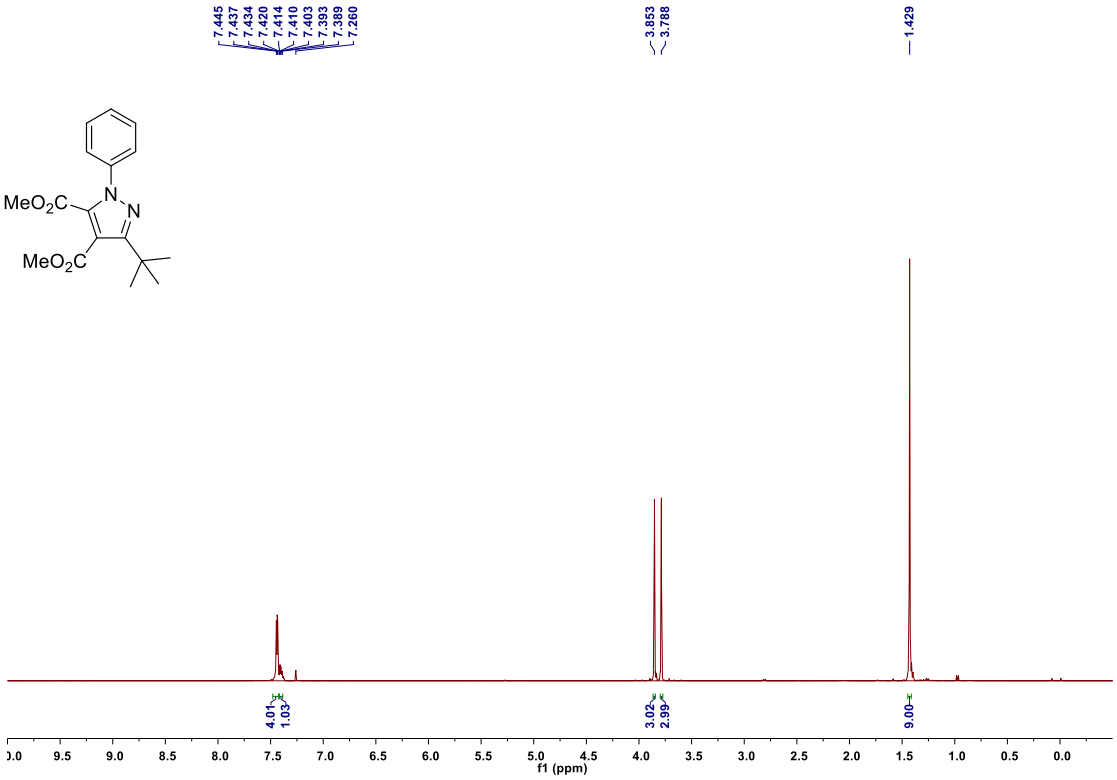

Fig. S26 ^{1}H NMR of compound **4m** (400 MHz, $CDCl_3$)

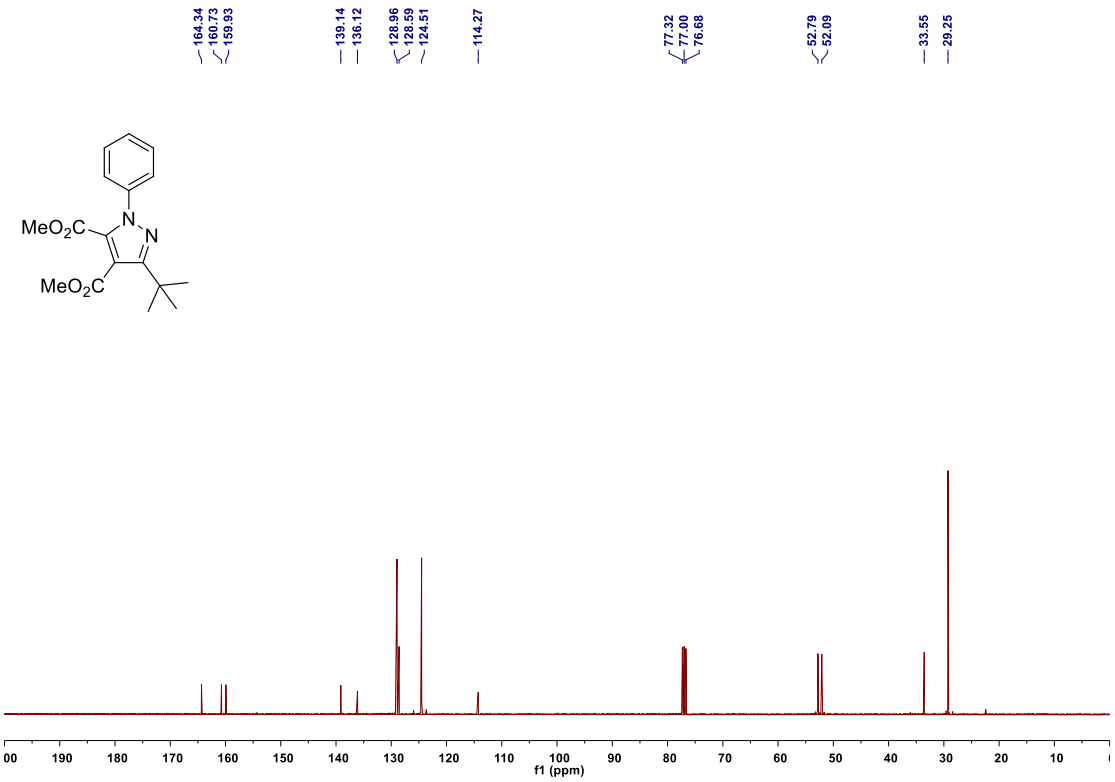

Fig. S27 ^{13}C NMR of compound **4m** (100 MHz, $CDCl_3$)

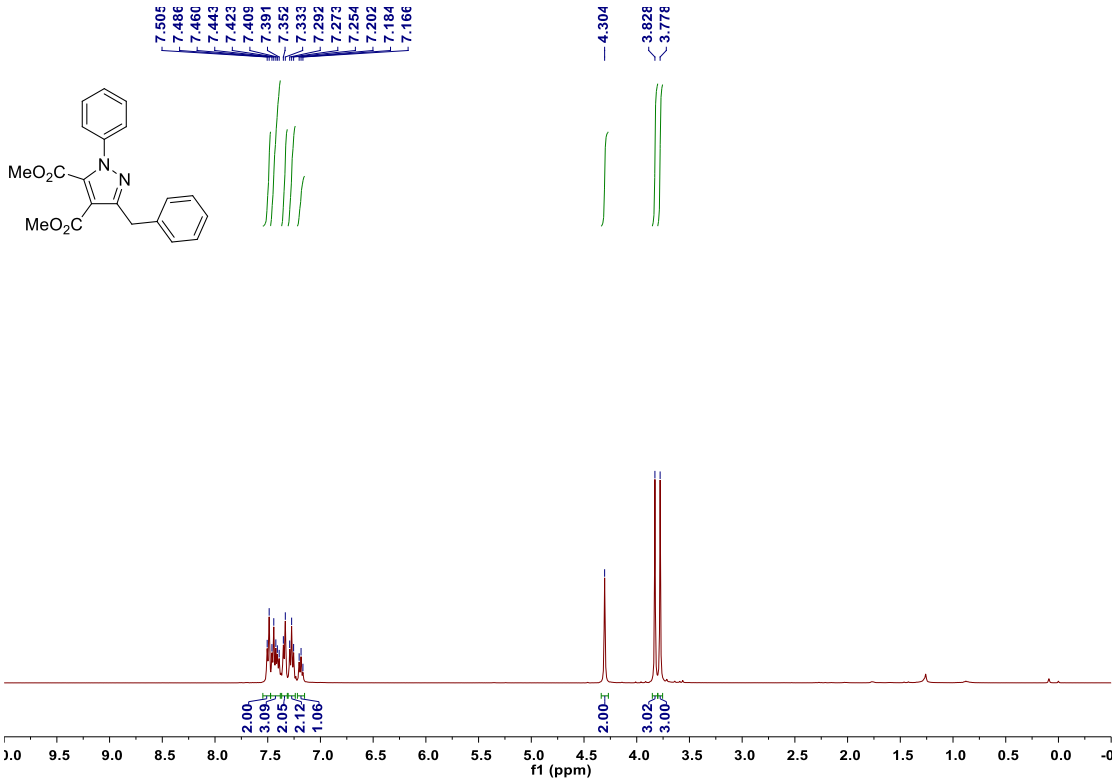

Fig. S28 ^{1}H NMR of compound **4n** (400 MHz, $CDCl_3$)

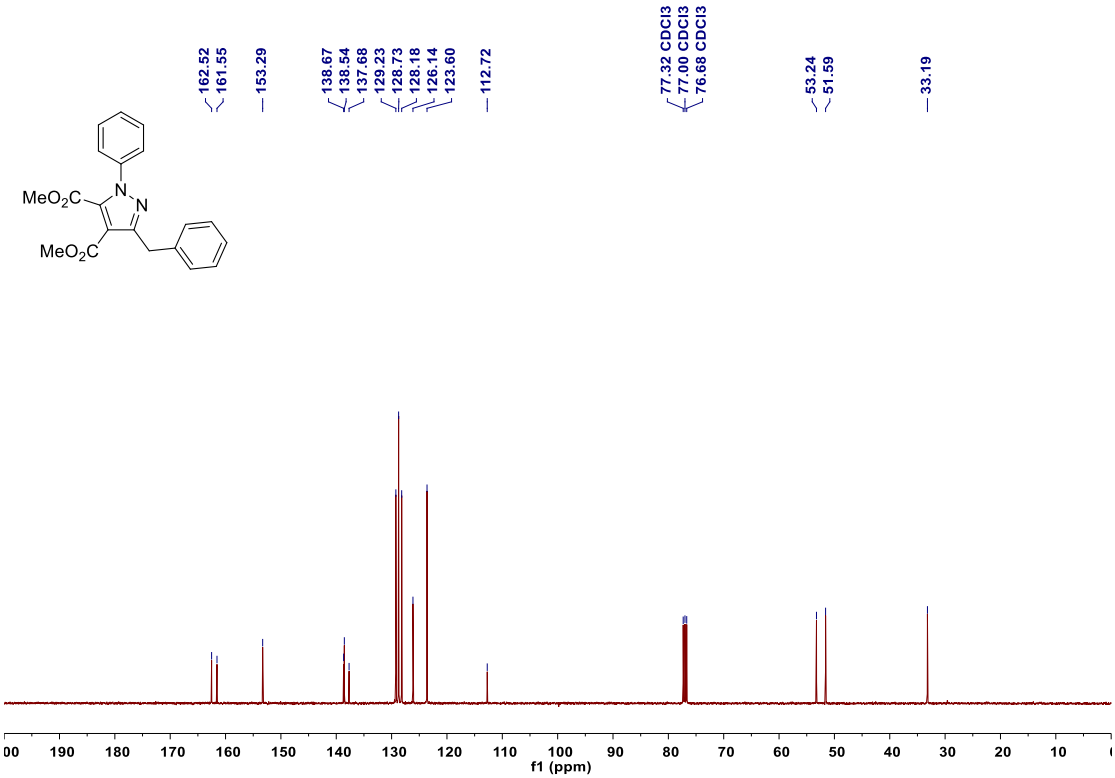

Fig. S29 ^{13}C NMR of compound **4n** (100 MHz, $CDCl_3$)

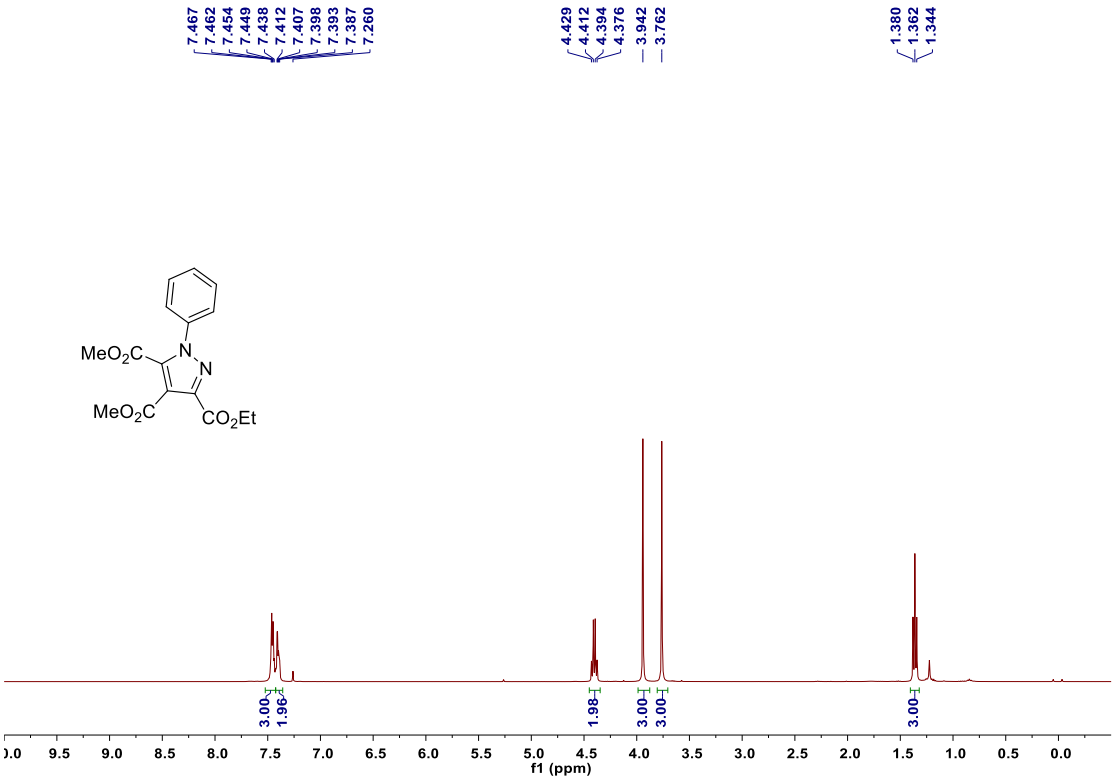

Fig. S30 ^{1}H NMR of compound **4o** (400 MHz, $CDCl_3$)

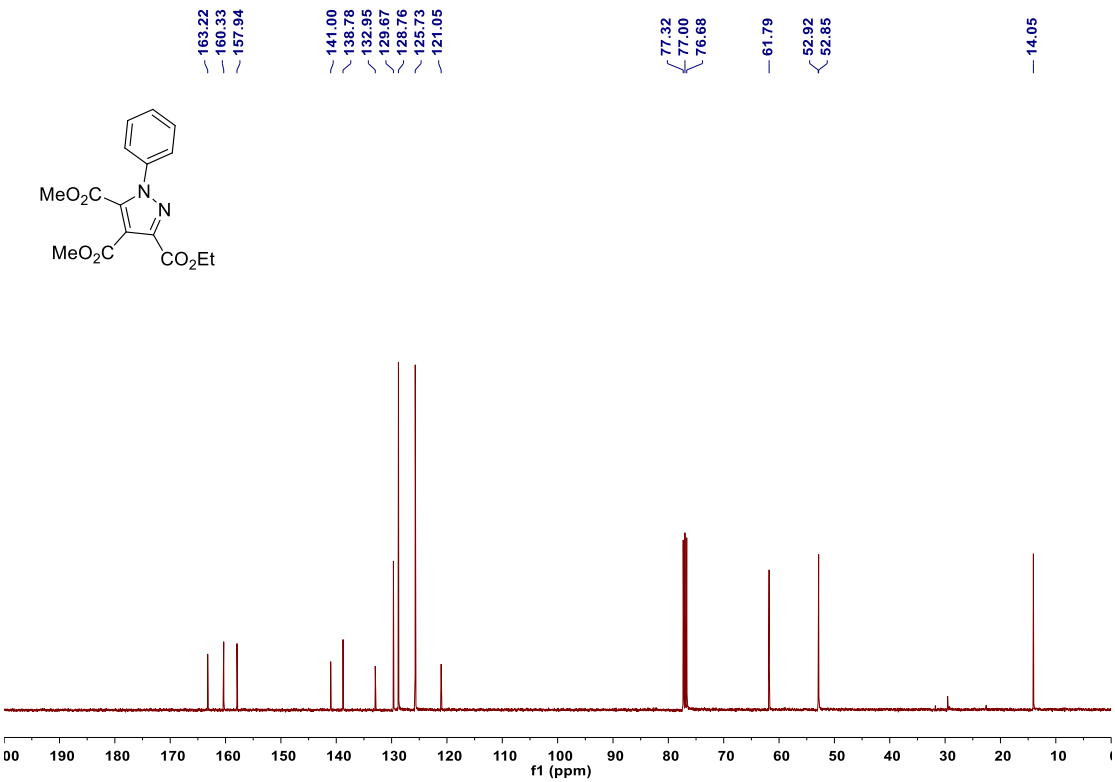

Fig. S31 ^{13}C NMR of compound **4o** (100 MHz, $CDCl_3$)

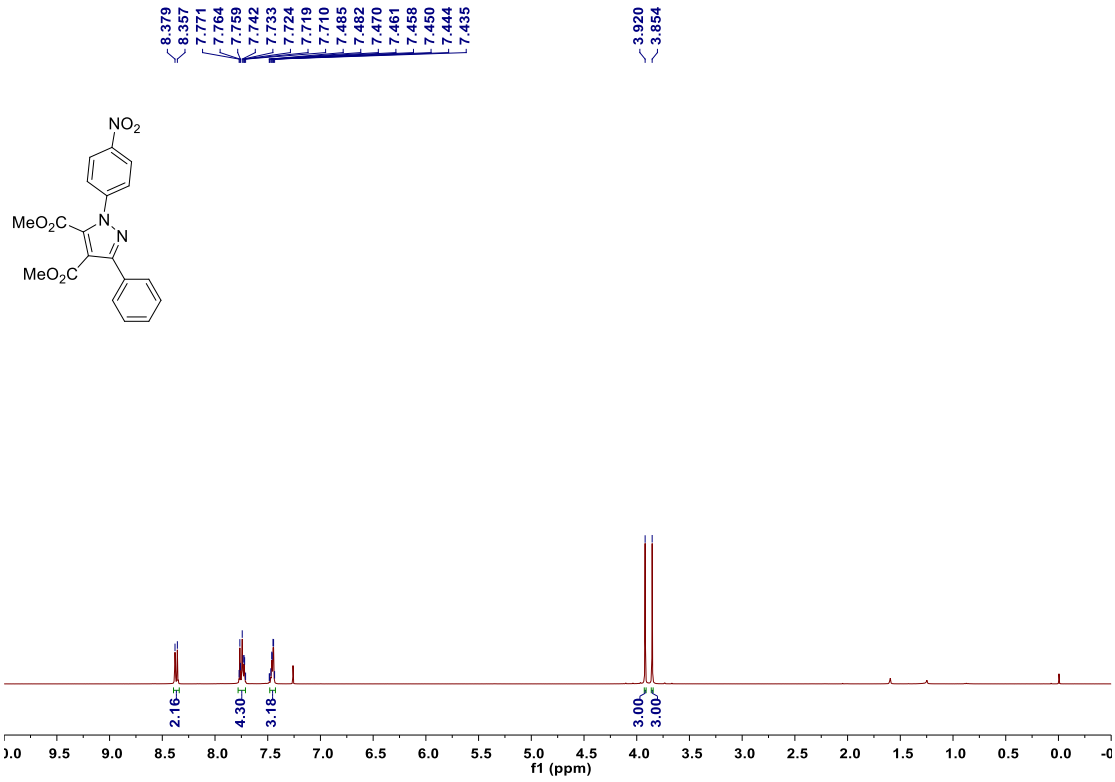

Fig. S32 ^{1}H NMR of compound **4p** (400 MHz, $CDCl_3$)

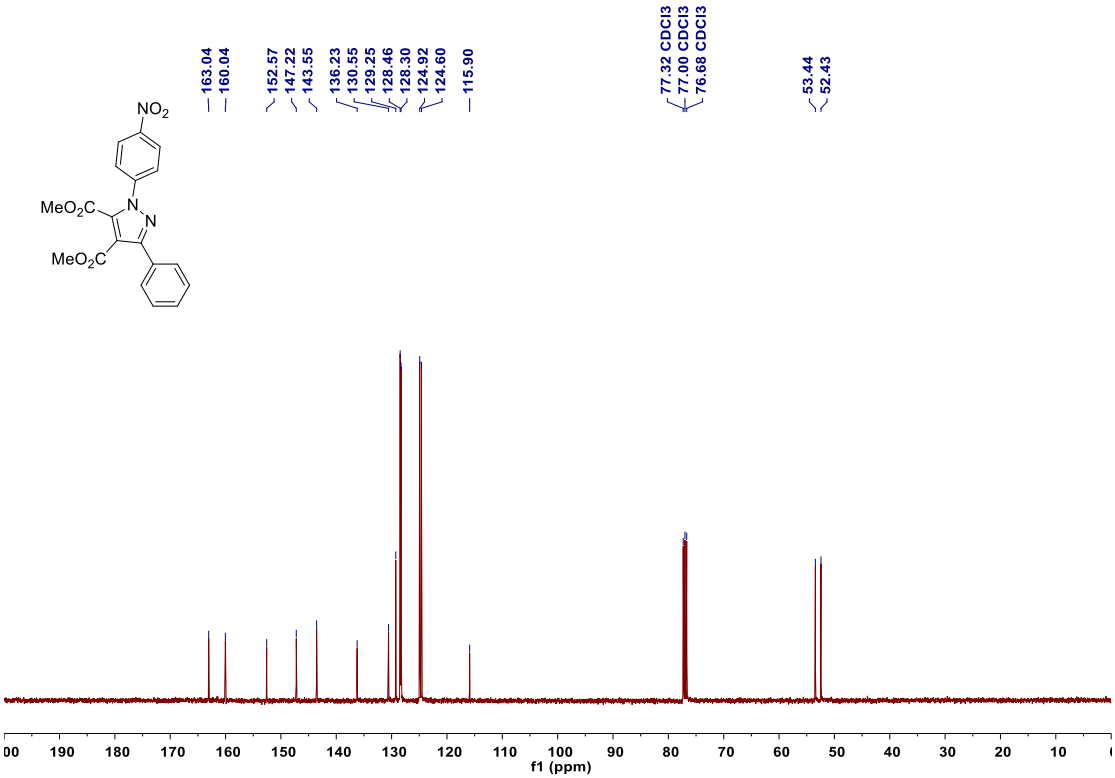

Fig. S33 ^{13}C NMR of compound **4p** (100 MHz, $CDCl_3$)

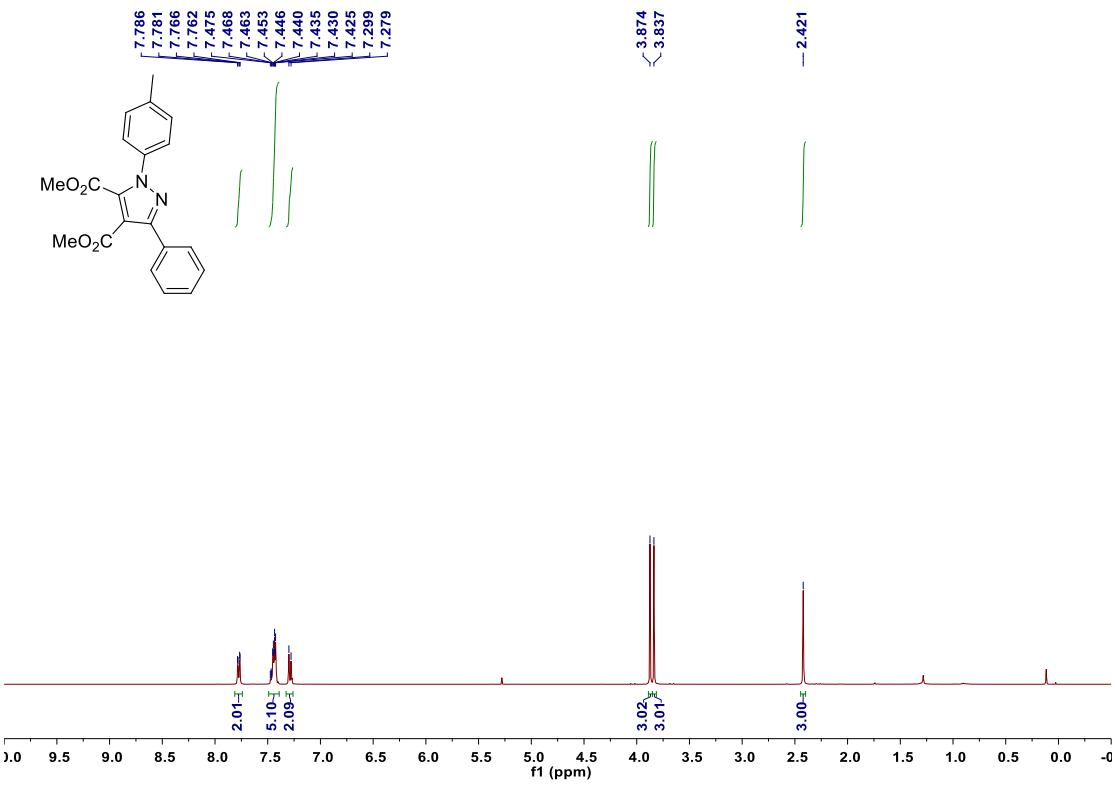

Fig. S34 ^{1}H NMR of compound **4q** (400 MHz, $CDCl_3$)

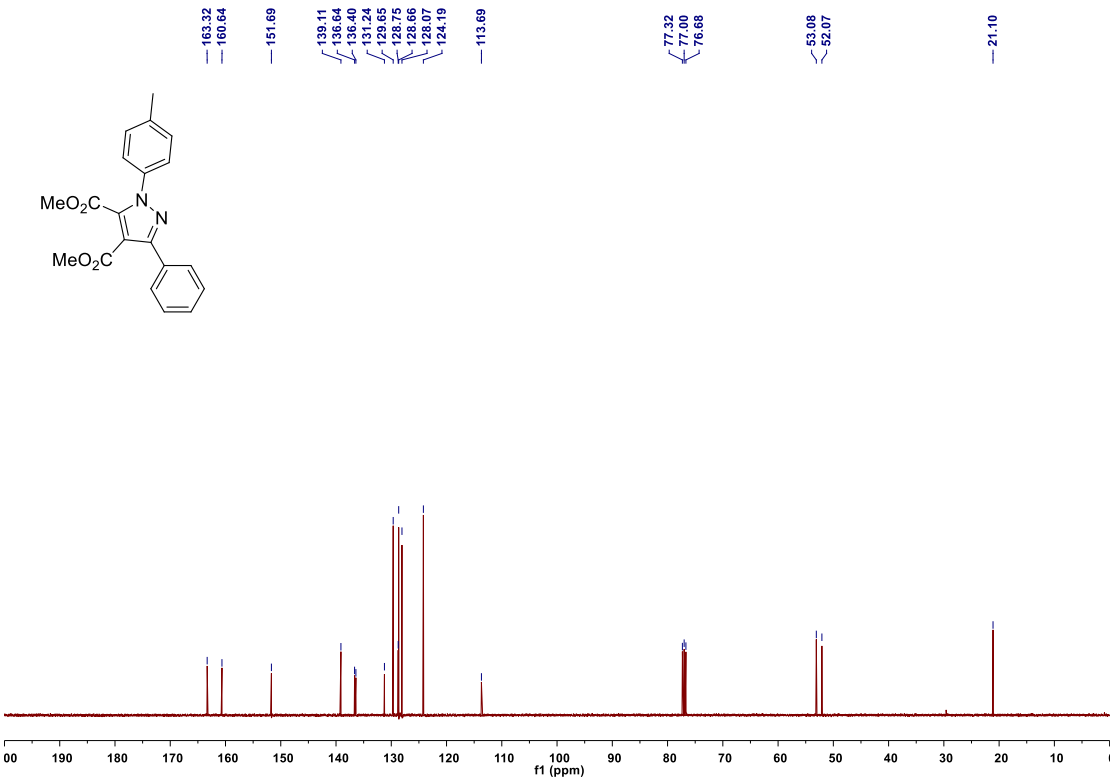

Fig. S35 ^{13}C NMR of compound **4q** (100 MHz, $CDCl_3$)

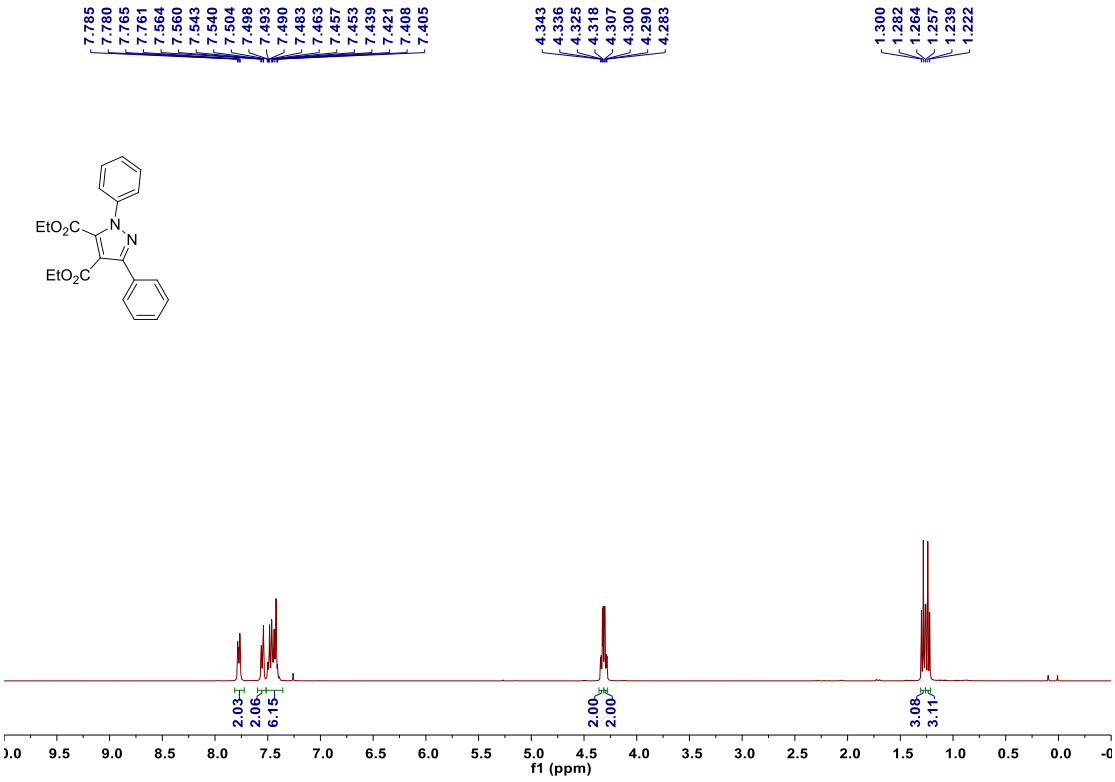

Fig. S36 ^{1}H NMR of compound **4r** (400 MHz, $CDCl_3$)

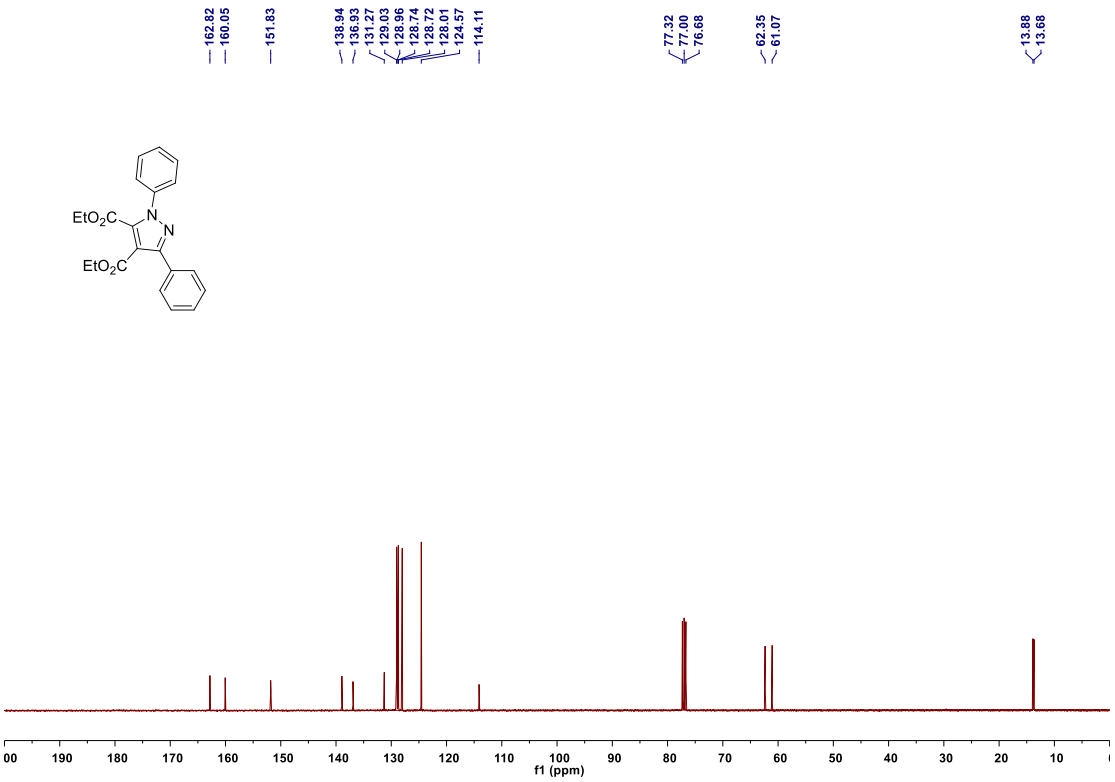

Fig. S37 ^{13}C NMR of compound **4r** (100 MHz, $CDCl_3$)

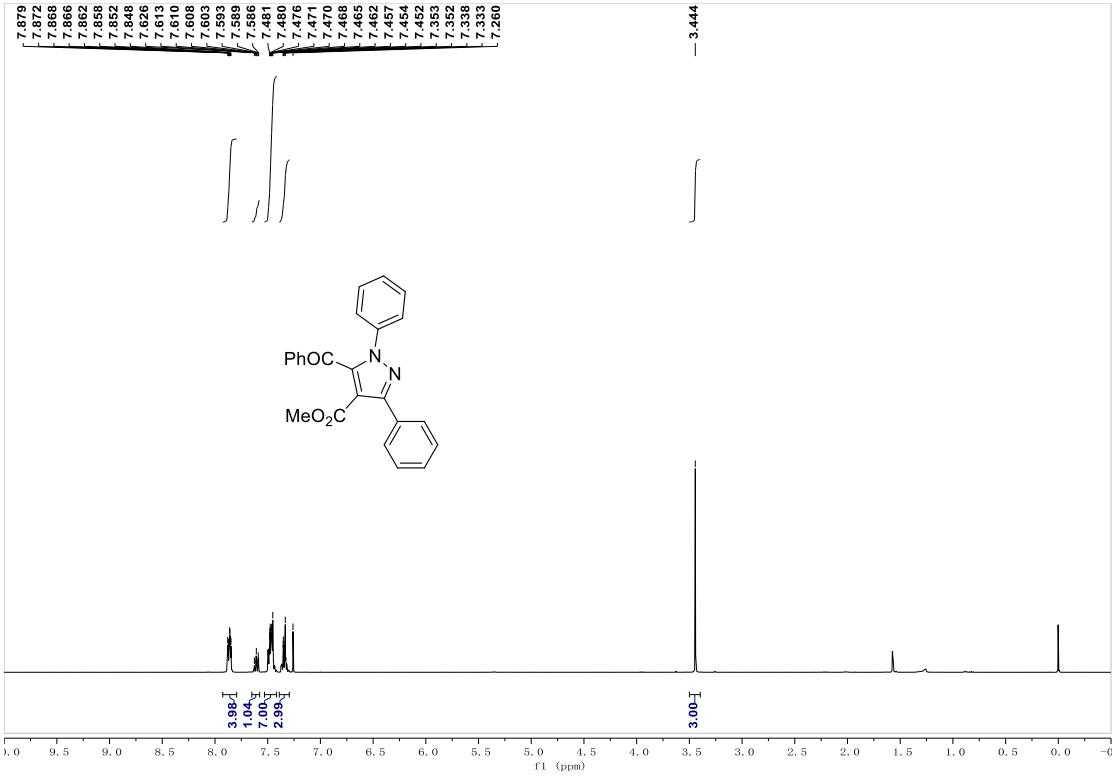

Fig. S38 ^{1}H NMR of compound **4s** (400 MHz, $CDCl_3$)

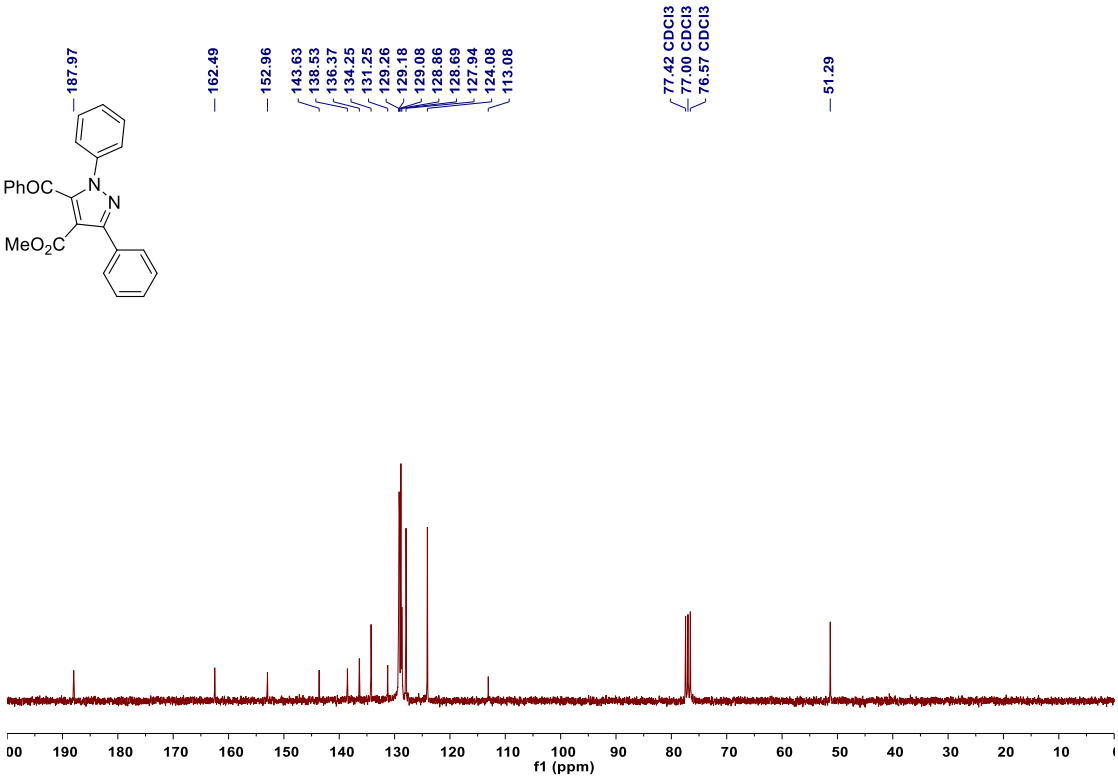

Fig. S39 ^{13}C NMR of compound **4s** (100 MHz, $CDCl_3$)

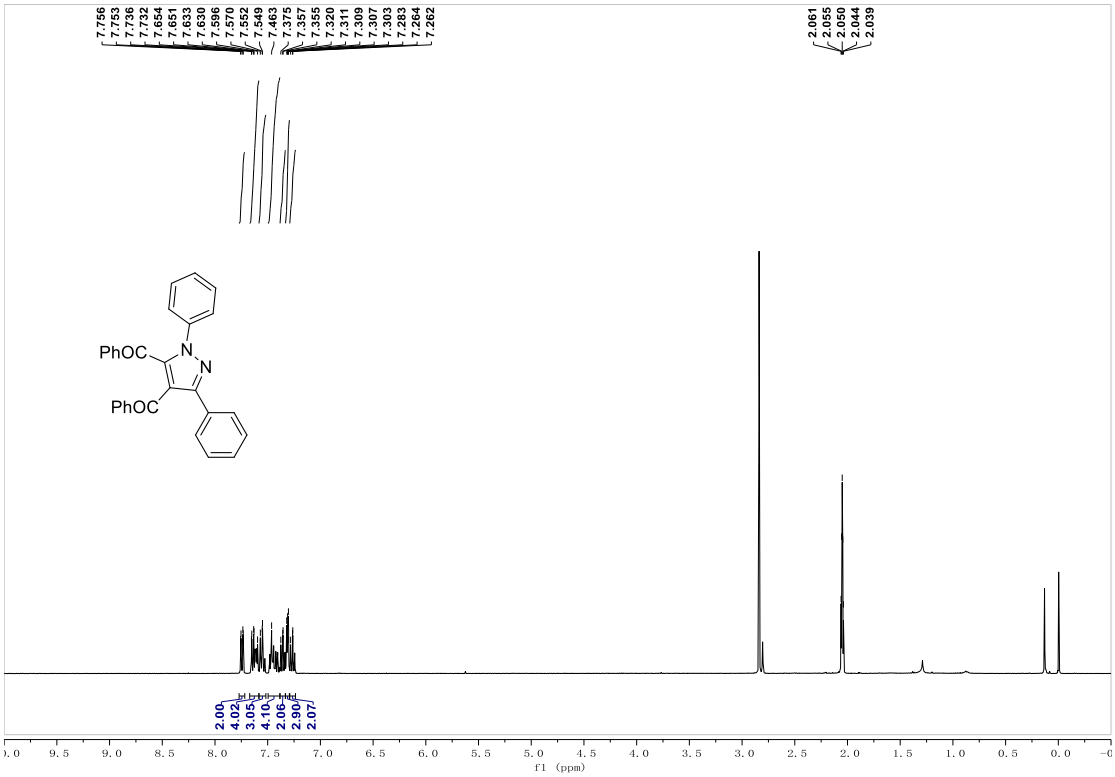

Fig. S40 ^{1}H NMR of compound **4t** (400 MHz, $(CD_3)_2CO$)

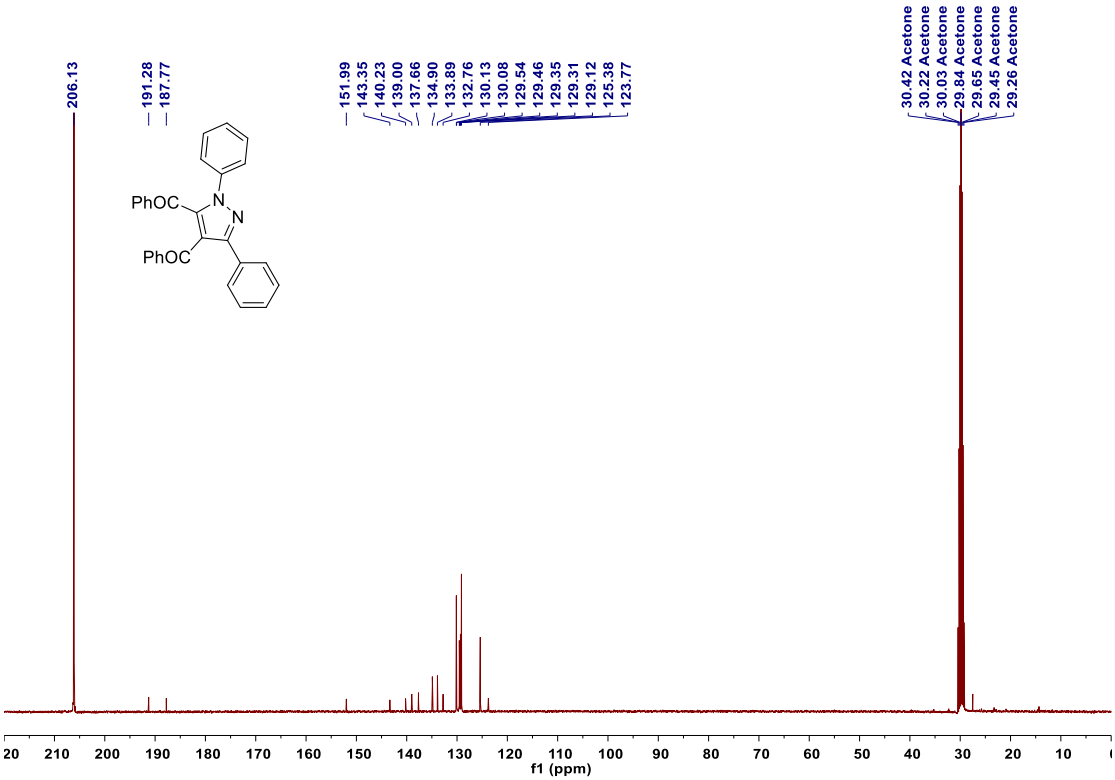

Fig. S41 ^{13}C NMR of compound **4t** (100 MHz, $(CD_3)_2CO$)

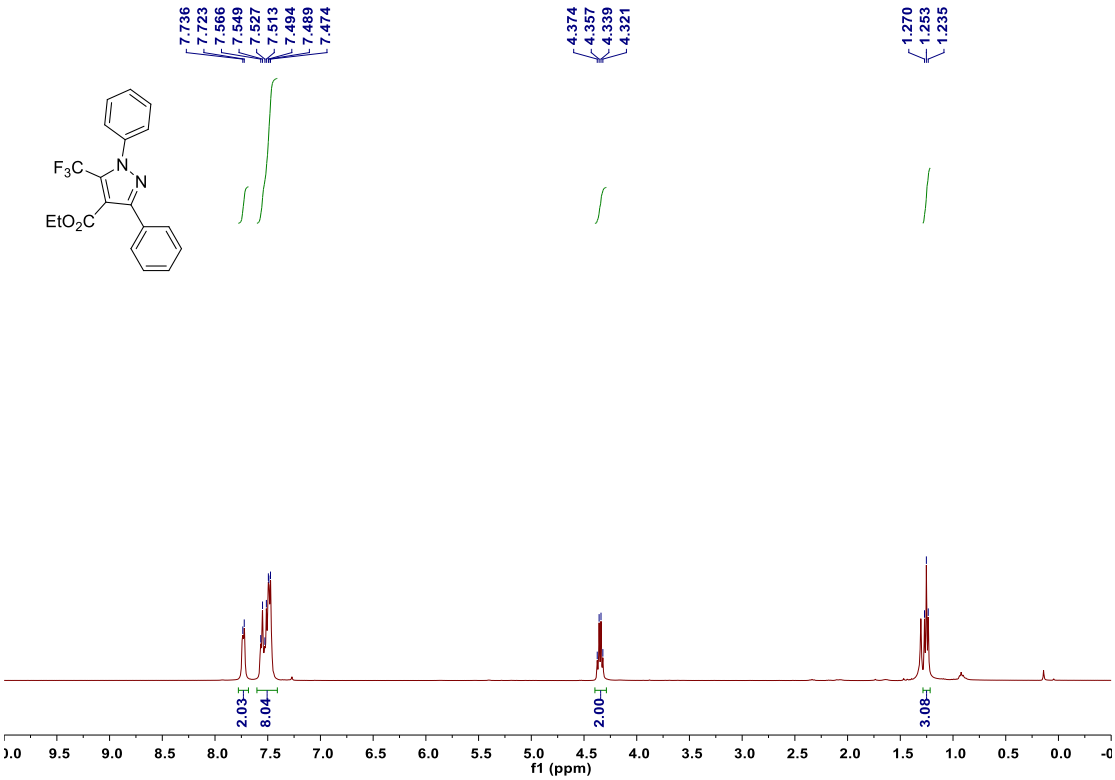

Fig. S42 ^{1}H NMR of compound **4u** (400 MHz, $CDCl_3$)

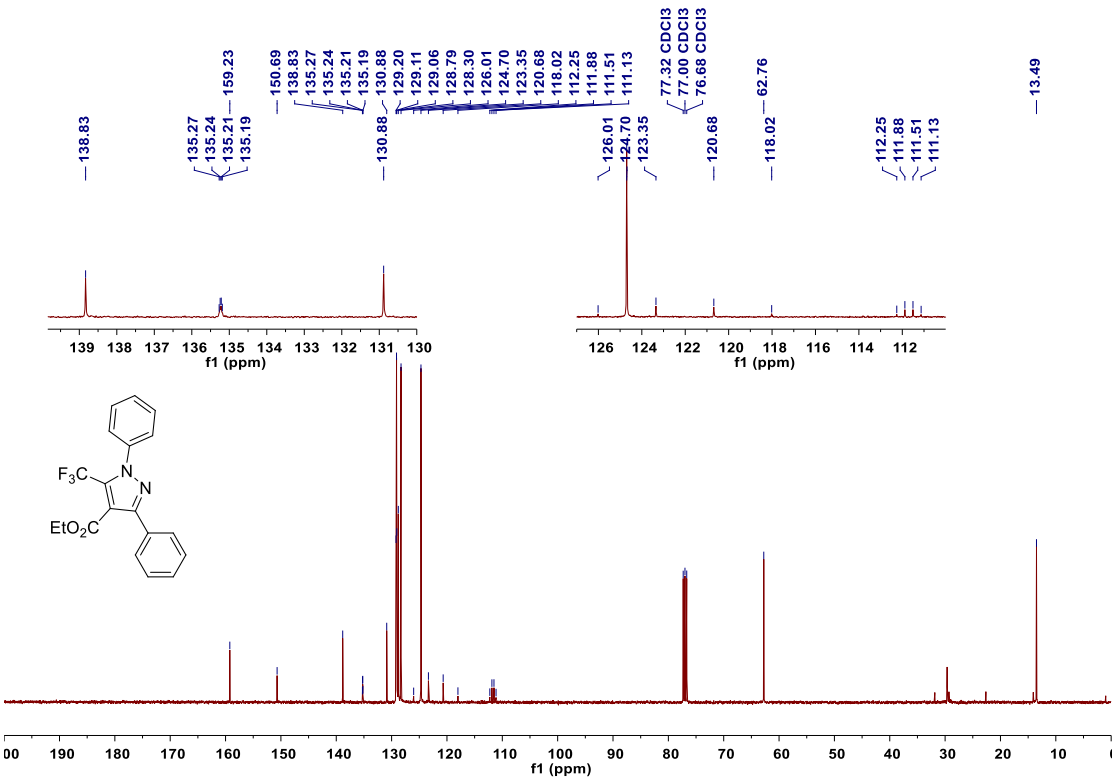

Fig. S43 ^{13}C NMR of compound **4u** (100 MHz, $CDCl_3$)

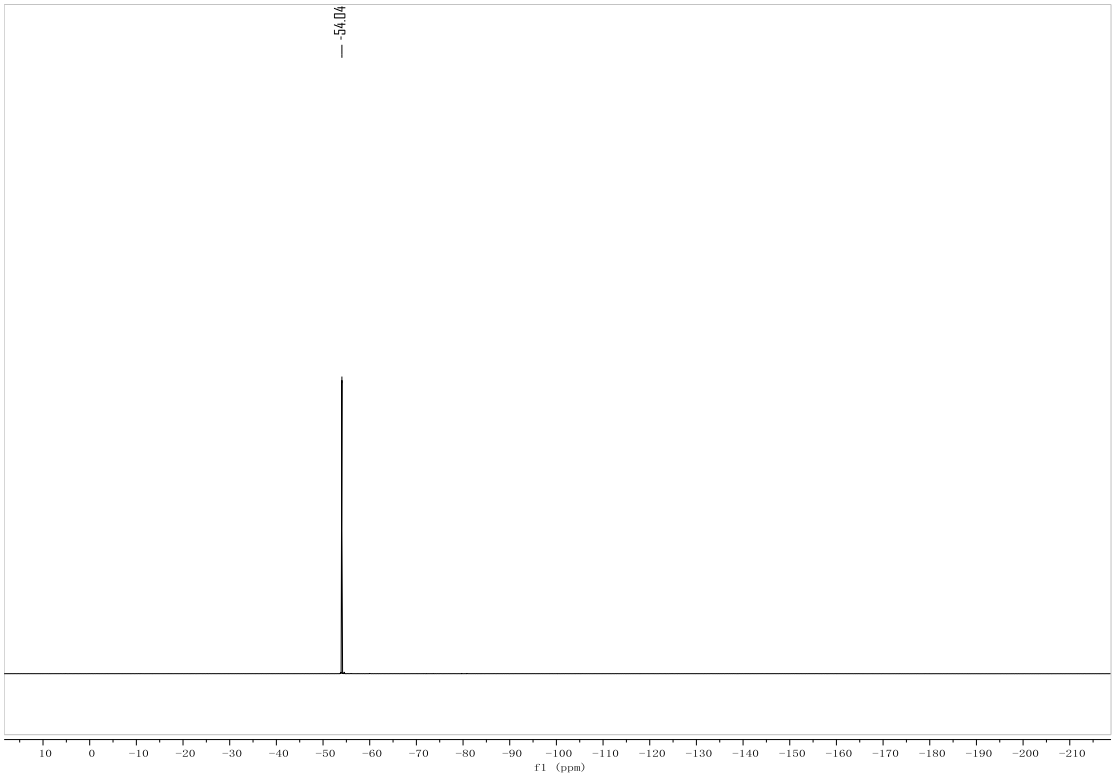

Fig. S44 ^{19}F NMR of compound **4u** (376 MHz, $CDCl_3$)

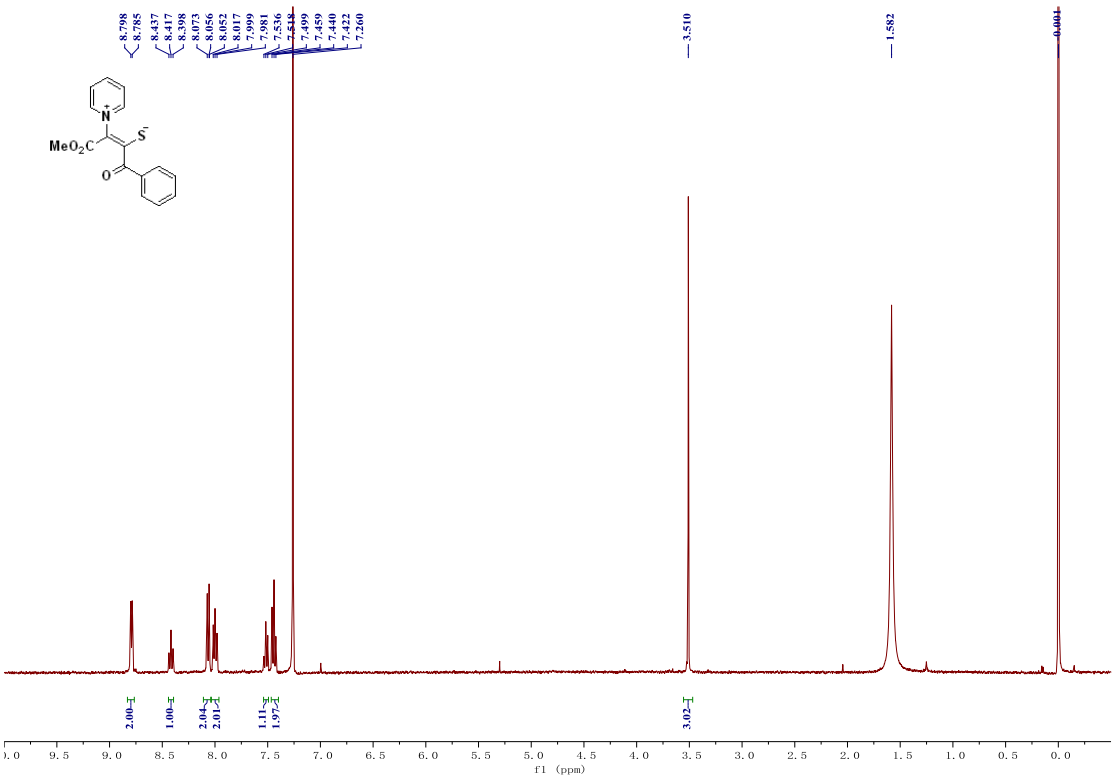

Fig. S45 ^{1}H NMR of compound **2c** (400 MHz, $CDCl_3$)

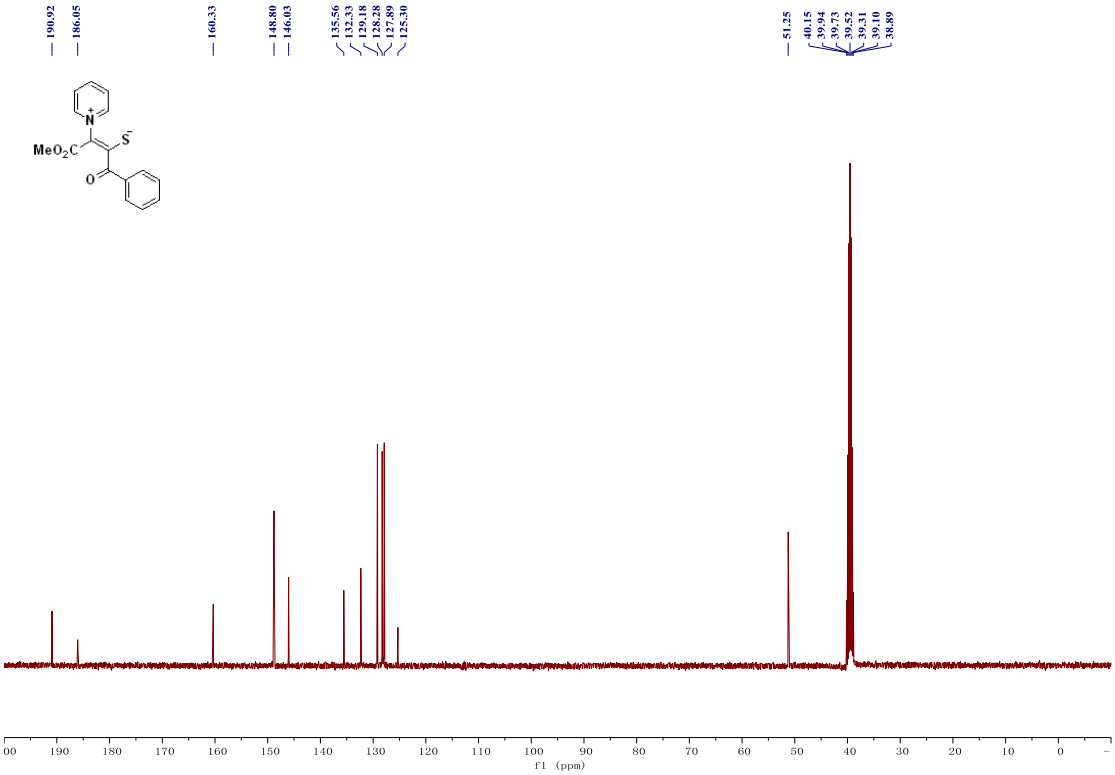

Fig. S46 ^{13}C NMR of compound **2c** (100 MHz, $(CD_3)_2SO$)

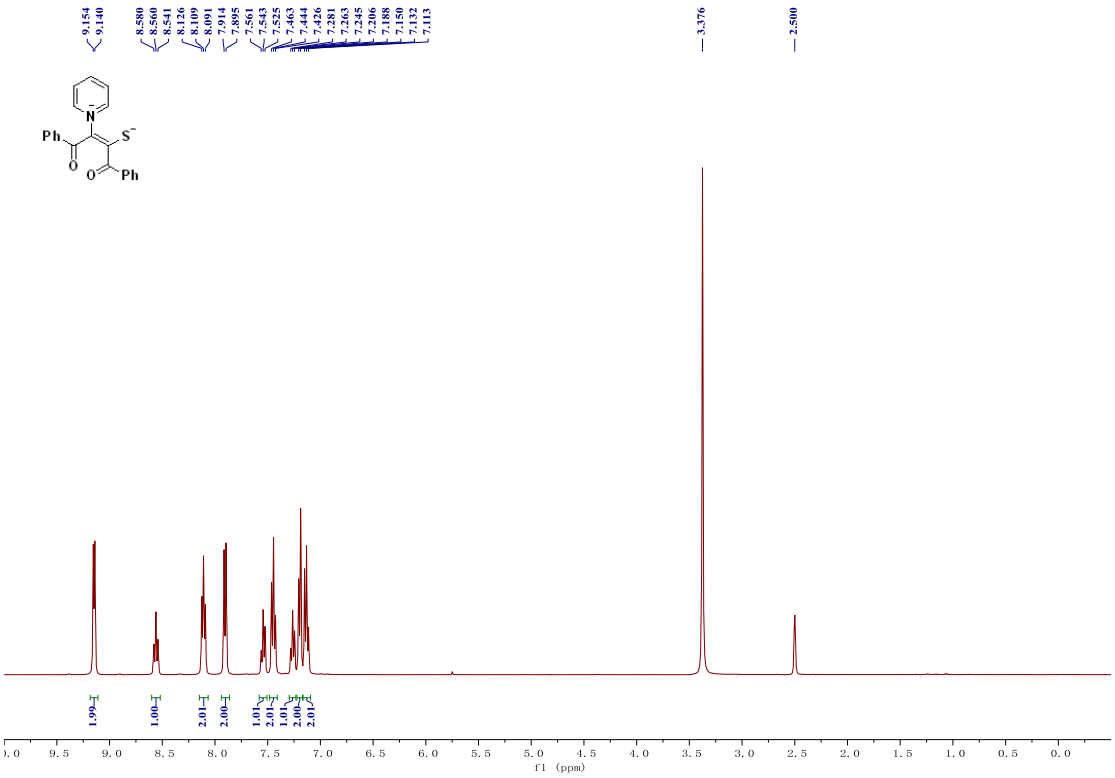

Fig. S47 ^{1}H NMR of compound **2d** (400 MHz, $(CD_3)_2SO$)

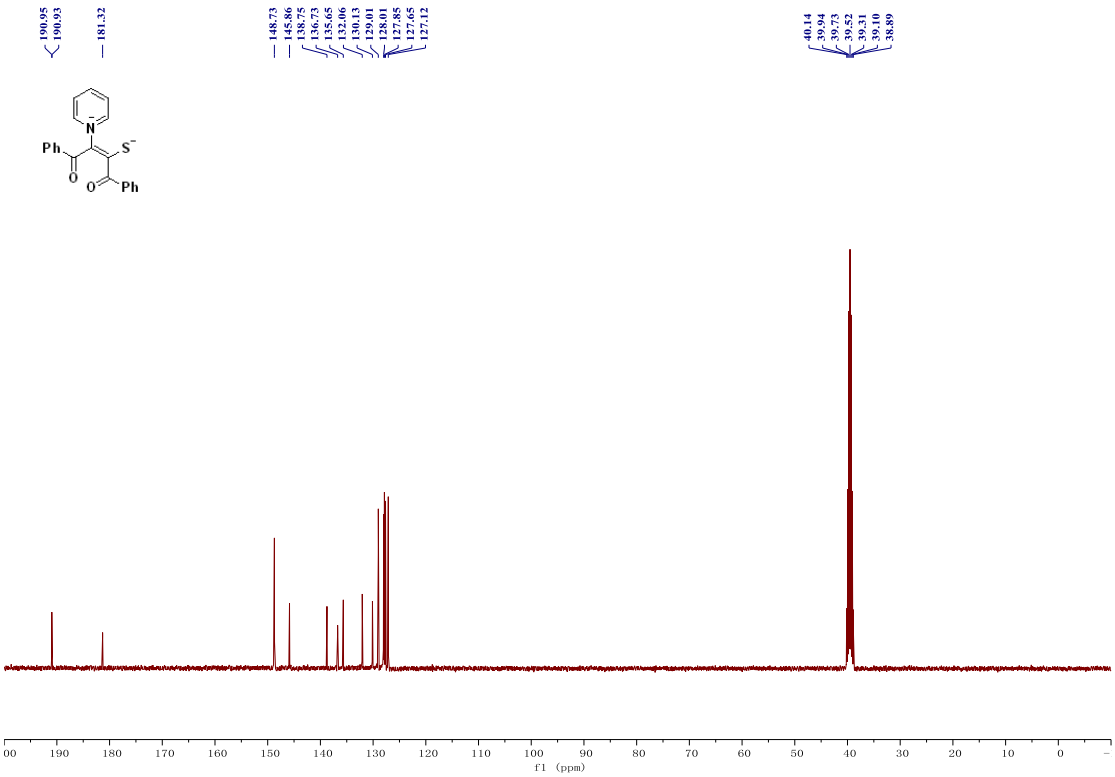

Fig. S48 ^{13}C NMR of compound **2d** (100 MHz, $(CD_3)_2SO$)

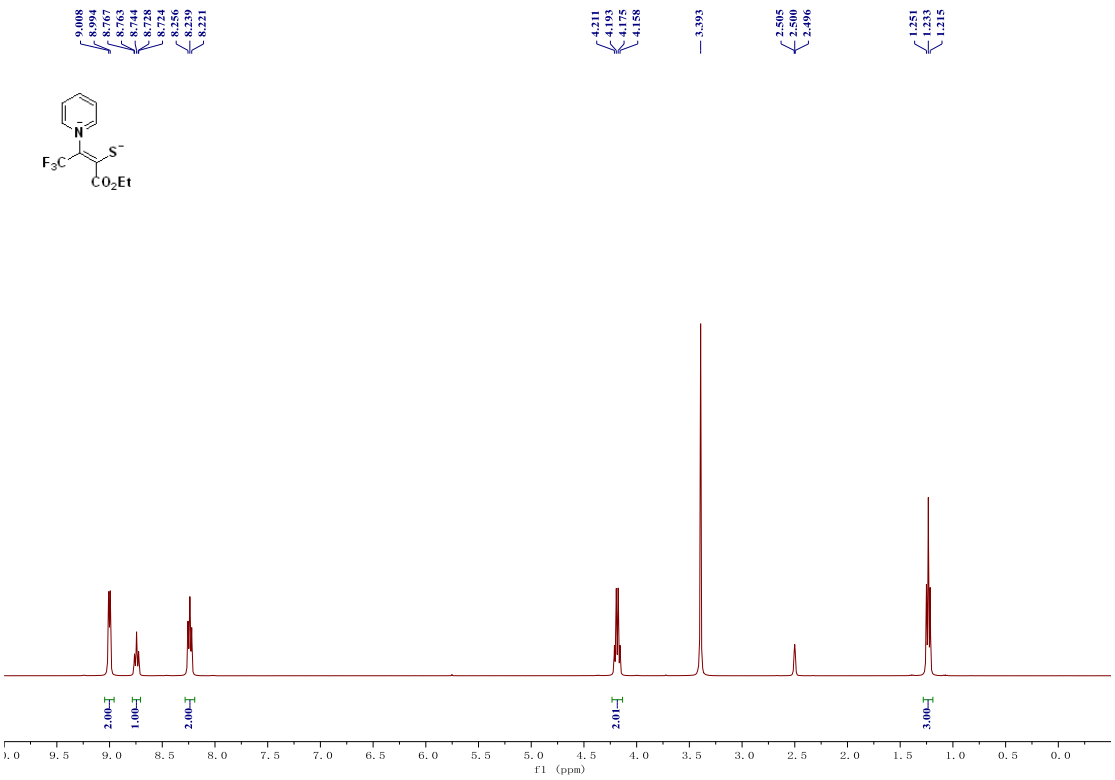

Fig. S49 ^{1}H NMR of compound **2e** (400 MHz, $(CD_3)_2SO$)

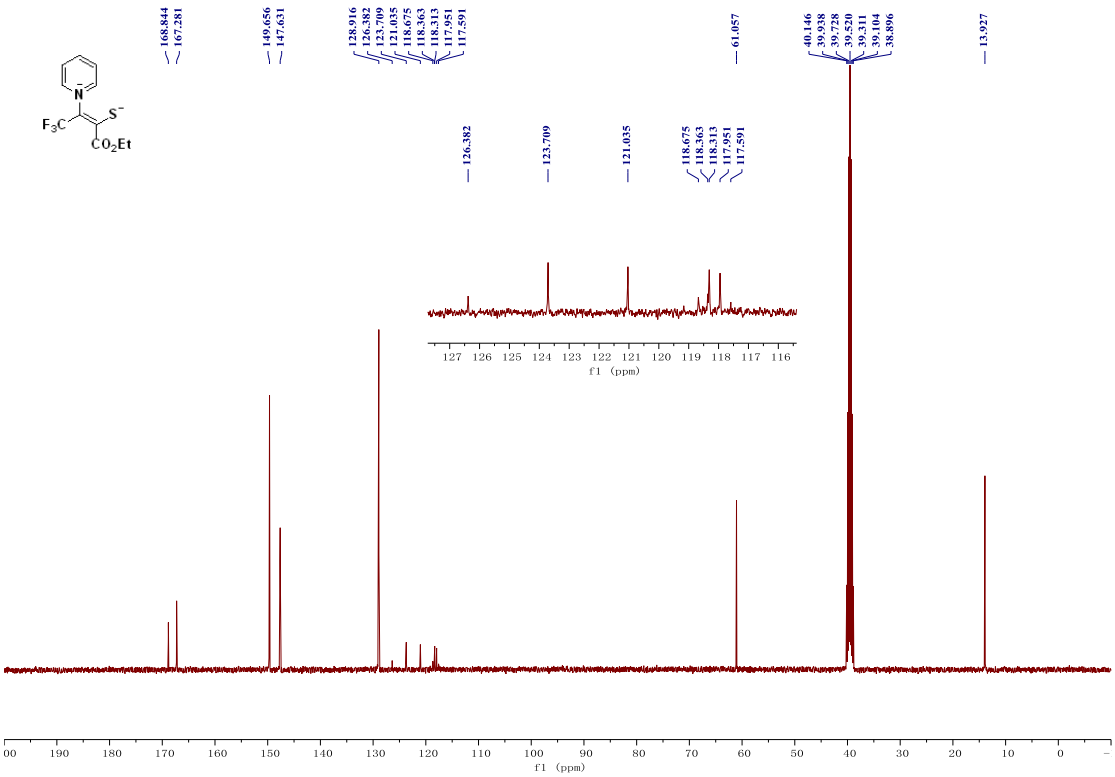

Fig. S50 ^{13}C NMR of compound **2e** (100 MHz, $(CD_3)_2SO$)