Supplementary Material

One-pot synthesis of 2,4,5-trisubstituted 1, 2, 3-triazoles through cascade reaction of acid chlorides, terminal acetylenes, sodium azide and aryl halides

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Table of Contents

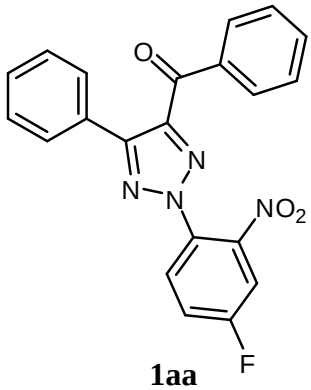
1. General remarks:

Column chromatography was carried out on silica gel. ^{1}H NMR spectra were recorded on 300 or 400 MHz in $CDCl_3$ and ^{13}C NMR spectra were recorded on 75 or 100 MHz in $CDCl_3$ or Dimethyl Sulfoxide-D_6 using TMS as internal standard. IR spectra were recorded on a FT-IR spectrometer and only major peaks are reported in cm^{-1}. Melting points were determined on a microscopic apparatus and were uncorrected. All desired products were further characterized by ESI HRMS, EI MS or element analysis; copies of their ^{1}H NMR and ^{13}C NMR spectra are provided. Commercially available reagents and solvents were used without further purification.

The general procedure of the reaction between acid chlorides, terminal acetylenes, sodium azide and alkyl halides: regioselective synthesis of (2-(4-fluoro-2-nitrophenyl)-5-phenyl-2H-1,2,3-triazol-4-yl)(phenyl)methanone) 1aa:

All reactions were performed on a 0.25 mmol scale relative to acid chlorides. A round-bottom sidearm flask (10 mL) containing $PdCl_2(PPh_3)_2$ (0.0025 mmol), CuI (0.005 mmol) was subjected to the Schlenk-line procedures of evacuation and purging of N_2 for three cycles. Phenyl acetylene (0.25 mmol), benzoyl chloride (0.25 mmol) and 3.0 equiv Et_3N (0.75 mmol) was successively added, and the flask was put into ultrasonic (32KHz, 160 W) to react at room temperature for 1h, the flask was took out, then NaN_3 (0.25 mmol), K_2CO_3 (0.125 mmol), 2,5-diF-$C_6H_3NO_2$ (0.375 mmol) and 3 mL DMSO were added to the mixture and the reaction continued at 100 ^{o}C for three hours. Following, to the reaction mixture was added water (2 mL), 20% HCl solution (1 mL) and extracted with ester (3×10 mL). The combined organic phases were washed with brine (2×5 mL), dried over anhydrous $MgSO_4$ and concentrated in vacuo. The residue was subjected to flash column chromatography with hexanes/EtOAc (15/1) as eluent to obtain the desired **1aa** (84 mg, 87% yield).

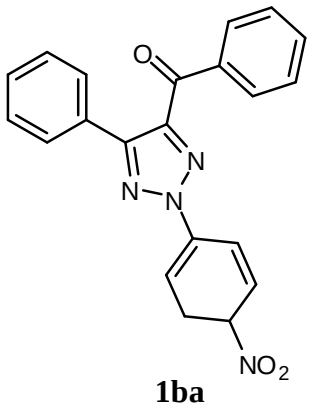
2. Spectral data of the compounds:



1aa

(2-(4-fluoro-2-nitrophenyl)-5-phenyl-2H-1,2,3-triazol-4-yl)(phenyl)methanone

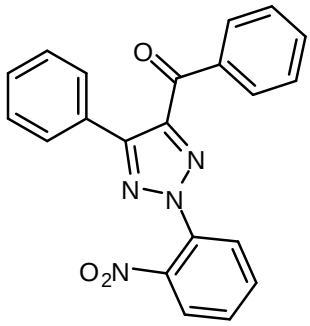
1aa[b]**: 1aa** was purified by flash chromatography (Hexane-EtOAc, v/v=15/1) as light yellow solid (yield: 87%), mp: 128-130 ^{o}C. IR (cm^{-1}): 3071, 1656, 1549. ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.14-8.27 (m, 5H), 7.87-7.89 (m, 2H), 7.64 (t, *J*=7.4 Hz, 1H), 7.51 (t, *J*=7.6 Hz, 2H), 7.43-7.45 (m, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 187.4, 162.8, 160.3, 151.3, 144.2, 136.7, 133.8, 130.4, 129.7, 128.8, 128.6, 128.5, 128.48, 127.8, 127.7, 120.4, 120.1, 113.0, 112.8. ESI HRMS: calcd. for $C_{21}H_{14}FN_4O_3$ $[M+H]^+$: 389.1044, found: 389.1050.



1ba

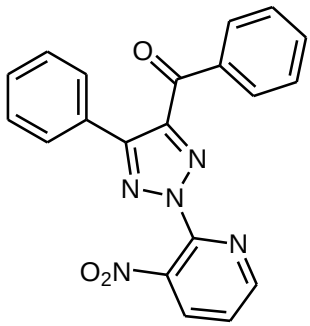
(2-(4-nitrophenyl)-5-phenyl-2H-1,2,3-triazol-4-yl)(phenyl)methanone (1ba)[b]**: 1ba** was purified by flash chromatography (Hexane-EtOAc, v/v=20/1) as green-yellow solid, mp: 145-147 ^{o}C. IR (cm^{-1}): 3075, 2918, 1653, 1594 ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.33-8.35 (m, 4H), 8.11-8.13 (m, 2H), 7.87-7.90 (m, 2H), 7.64-7.67 (m, 1H),

7.44-7.54 (m, 5H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 187.5, 151.3, 146.9, 144.4, 143.1, 136.6, 133.9, 130.4, 129.8, 128.7, 128.6, 128.56, 128.52, 125.2, 119.5. EI–MS: m/z = 370 $[M]^+$. Anal. Calcd. For $C_{21}H_{14}N_4O_3$: C, 68.10; H, 3.81; N, 15.13. Found: C, 68.14; H, 3.79; N, 15.15.



1ca

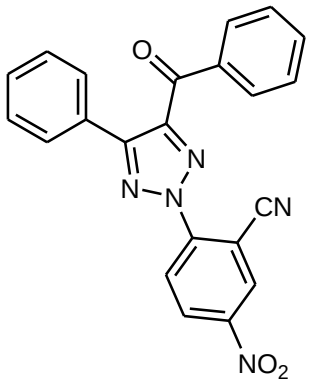
(2-(2-nitrophenyl)-5-phenyl-2H-1,2,3-triazol-4-yl)(phenyl)methanone 1ca[b]: 1ca was purified by flash chromatography (Hexane-EtOAc, v/v=10/1) as green-yellow solid, mp: 102-104 °C. IR (cm^{-1}): 3067, 1664, 1602. ^{1}H NMR (300 MHz, $CDCl_3$): δ 8.07-8.10 (m, 2H), 8.0 (dd, *J*=8.1, 0.9 Hz, 1H), 7.87-7.91 (m, 3H), 7.69-7.74 (m, 1H), 7.42-7.64 (m, 7H). ^{13}C NMR (75 MHz, $CDCl_3$): δ 187.5, 151.3, 144.1, 143.8, 136.8, 133.9, 133.1, 131.9, 130.5, 129.8, 129.7, 128.9, 128.7, 128.5, 125.8, 125.1. ESI HRMS: calcd. for $C_{21}H_{18}N_5O_3$ $[M+NH_4]^+$: 388.1404, found: 388.1411.



1ha

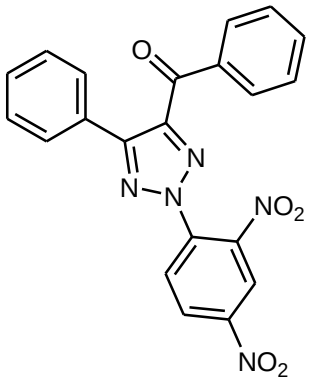
(2-(3-nitropyridin-2-yl)-5-phenyl-2H-1,2,3-triazol-4-yl)(phenyl)methanone 1ha[b]: 1ha was purified by flash chromatography (Hexane-EtOAc, v/v=10/1) as green-yellow solid (yield: 80%), mp: 144-146 °C. IR (cm^{-1}): 3068, 1663, 1592. ^{1}H NMR (300 MHz, $CDCl_3$): δ 8.81-8.83 (m, 1H), 8.27 (dd, *J*=8.1, 0.9 Hz, 1H), 8.09 (d, *J*=7.5 Hz, 2H), 7.89-7.92 (m, 2H),

7.59-7.66 (m, 2H), 7.43-7.5 (m, 5H). ^{13}C NMR (75 MHz, $CDCl_3$): δ 187.3, 151.7, 151.6, 144.7, 142.0, 139.9, 136.4, 134.2, 133.9, 130.4, 129.9, 128.9, 128.5, 128.47, 128.3, 124.7. ESI HRMS: calcd. for $C_{20}H_{14}N_5O_3$ $[M+H]^+$: 372.1091, found: 372.1097.



1ia

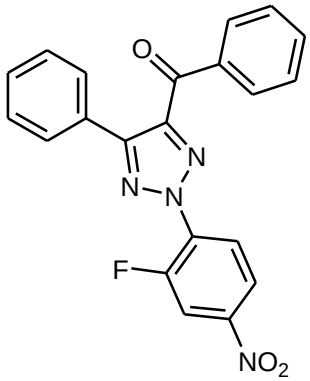
2-(4-benzoyl-5-phenyl-2H-1,2,3-triazol-2-yl)-5-nitrobenzonitrile 1ia[b]: 1ia was purified by flash chromatography (Hexane-EtOAc, v/v=10/1) as green-yellow solid (yield: 90%), mp: 134-136 °C. IR (cm^{-1}): 3086, 1664, 1583. ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.72 (t, *J*=2.6 Hz, 1H), 8.52-8.55 (m, 1H), 8.43 (dd, *J*=9.0, 2.2 Hz, 1H), 8.20 (d, *J*=7.6 Hz, 2H), 7.90-7.91 (m, 2H), 7.66 (t, *J*=7.4 Hz, 1H), 7.53 (t, *J*=7.6 Hz, 2H), 7.44-7.46 (m, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 186.8, 152.2, 146.2, 145.2, 142.9, 136.1, 134.3, 131.0, 130.6, 130.3, 128.8, 128.7, 128.6, 127.9, 123.1, 114.8, 105.2. ESI HRMS: calcd. for. ESI HRMS: calcd. for $C_{22}H_{14}N_5O_3$ $[M+H]^+$: 396.1091, found: 396.1100.



1ja

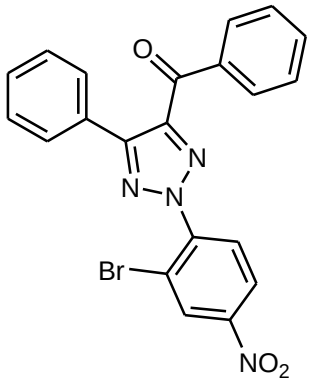
(2-(2,4-dinitrophenyl)-5-phenyl-2H-1,2,3-triazol-4-yl)(phenyl)methanone 1ja[b]: 1ja was purified by flash chromatography (Hexane-EtOAc, v/v=15/1) as yellow solid (yield: 95%),

mp: 156-158 ^{o}C . IR (cm^{-1}): 3089，1665，1602. ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.67 (d, *J*=2.4 Hz, 1H), 8.55 (dd, *J*=9.0, 2.2 Hz, 1H), 8.35 (d, *J*=8.8 Hz, 1H), 8.06 (d, *J*=7.6 Hz, 1H), 7.84 (t, *J*=3.8 Hz, 2H), 7.66 (t, *J*=7.4 Hz, 2H), 7.53 (t, *J*=7.6 Hz, 2H), 7.44-7.46 (m, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 186.9, 152.3, 146.5, 145.3, 142.5, 136.2, 135.0, 134.2, 130.5, 130.2, 128.8, 128.6, 127.9, 127.2, 125.3, 120.8. HRMS: calcd. for $C_{21}H_{14}N_5O_5$ [M+H]$^{+}$: 416.09916, Found: 416.09895.[a]



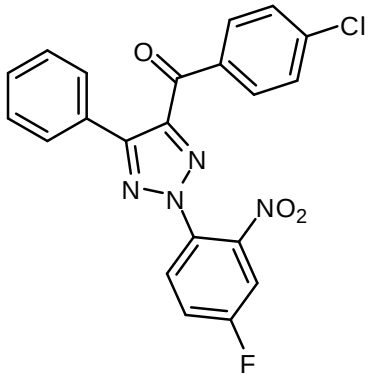
1la

(2-(2-fluoro-4-nitrophenyl)-5-phenyl-2H-1,2,3-triazol-4-yl)(phenyl)methanone 1la[b]: 1la was purified by flash chromatography (Hexane-EtOAc, v/v=15/1) as light yellow solid (yield: 87%), mp: 135-137 ^{o}C. IR (cm^{-1}): 3092, 1664, 1536. ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.14-8.27 (m, 5H), 7.87-7.89 (m, 2H), 7.64 (t, *J*=7.4 Hz, 1H), 7.51 (t, *J*=7.8 Hz, 2H), 7.44 (dd, *J*=6.4, 3.6 Hz, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 187.2, 154.7, 152.0, 151.4, 147.4, 147.3, 144.6, 136.6, 134.0, 132.3, 132.2, 130.5, 129.9, 128.8, 128.6, 128.5, 128.4, 124.8, 120.0, 119.96, 114.2, 114.0. ESI HRMS: calcd. for $C_{21}H_{14}FN_4O_3$ [M+H]$^{+}$: 389.1044, found: 389.1048.



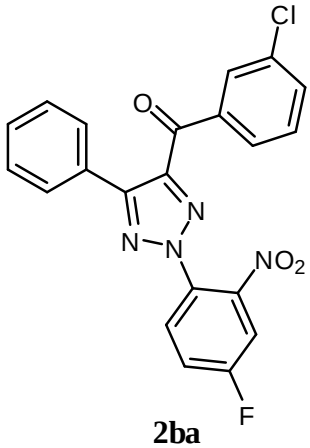
1ma

(2-(2-bromo-4-nitrophenyl)-5-phenyl-2H-1,2,3-triazol-4-yl)(phenyl)methanone 1ma[b]: **1ma** was purified by flash chromatography (Hexane-EtOAc, v/v=10/1) as light yellow solid (yield: 55%), mp: 140-142 ^{o}C. IR (cm^{-1}): 3069, 1661, 1541. ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.01-8.07 (m, 3H), 7.92 (d, *J*=8.2 Hz, 1H), 7.83-7.88 (m, 3H), 7.61-7.64 (m, 1H), 7.49-7.53 (m, 2H), 7.42-7.44 (m, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 187.2, 151.5, 144.3, 143.7, 136.6, 135.9, 133.9, 130.7, 130.5, 129.8, 128.8, 128.52, 128.5, 128.4, 127.9, 126.5, 122.7. ESI HRMS: calcd. for $C_{21}H_{14}BrN_4O_3$ [M+H]$^{+}$: 449.0244, found: 449.0240.



2aa

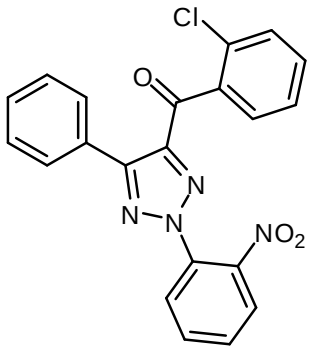
(4-chlorophenyl)(2-(4-fluoro-2-nitrophenyl)-5-phenyl-2H-1,2,3-triazol-4-yl)methanone 2aa[b]: 2aa was purified by flash chromatography (Hexane-EtOAc, v/v=10/1) as white solid (yield: 89%), mp: 162-164 ^{o}C. IR (cm^{-1}): 3086, 1660, 1581. ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.00-8.04 (m, 3H), 7.87-7.89 (m, 2H), 7.67 (dd, *J*= 7.4, 2.6 Hz, 1H), 7.45-7.50 (m, 6H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 185.9, 162.9, 160.3, 151.6, 144.2, 143.7, 140.4, 135.0, 131.8, 129.9, 128.9, 128.8, 128.5, 128.4, 128.3, 128.29, 127.7, 127.6, 120.4, 120.2, 113.2, 112.8. ESI HRMS: calcd. for $C_{21}H_{13}ClFN_4O_3$ [M+H]$^{+}$: 423.0655, found: 423.0652.



2ba

(3-chlorophenyl)(2-(4-fluoro-2-nitrophenyl)-5-phenyl-2H-1,2,3-triazol-4-yl)methanone

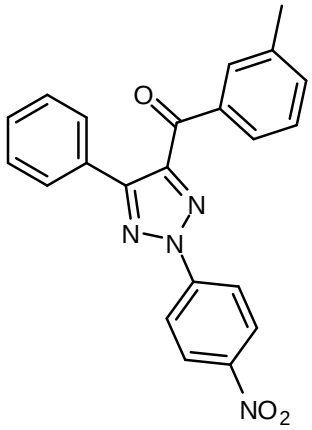
2ba[b]: 2ba was purified by flash chromatography (Hexane-EtOAc, v/v=10/1) as white solid (yield: 87%), mp: 122-124 ^{o}C. IR (cm^{-1}): 3081, 1668, 1548. ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.08 (d, *J*=1.6 Hz, 1H), 8.03 (dd, *J*=9.2, 4.8 Hz, 1H), 7.95-7.97 (m, 1H), 7.88-7.90 (m, 2H), 7.68 (dd, *J*=7.2, 2.8 Hz, 1H), 7.59-7.62 (m, 1H), 7.44-7.51 (m, 5H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 185.8, 162.9, 160.4, 151.7, 144.2, 143.6, 138.2, 134.8, 133.6, 130.2, 129.9, 129.8, 128.9, 128.7, 128.5, 128.4, 128.3, 128.28, 127.7, 127.6, 120.4, 120.2, 113.1, 112.8. ESI HRMS: calcd. for $C_{21}H_{13}ClFN_4O_3$ $[M+H]^+$: 423.0655, found: 423.0650.



2ca

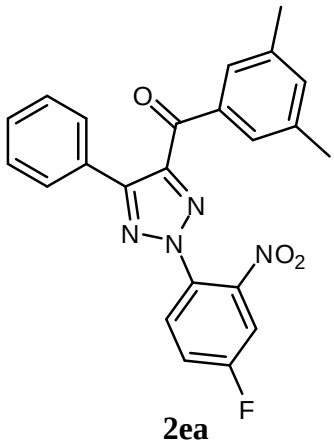
(2-chlorophenyl)(2-(2-nitrophenyl)-5-phenyl-2H-1,2,3-triazol-4-yl)methanone 2ca[c]: 2ca was purified by flash chromatography (Hexane-EtOAc, v/v=10/1) as light yellow solid (yield: 82%), mp: 126-128 ^{o}C. IR (cm^{-1}): 3085, 1655, 1526. ^{1}H NMR (300 MHz, $CDCl_3$): δ 7.98-8.01 (m, 2H), 7.85-7.93 (m, 2H), 7.66-7.72 (m, 1H), 7.54-7.59 (m, 2H), 7.34-7.47 (m, 6H). ^{13}C NMR (75 MHz, $CDCl_3$): δ 187.6, 151.4, 144.4, 143.8, 138.0, 133.0, 132.2, 131.8,

130.4, 130.3, 130.0, 129.98, 129.2, 128.5, 128.4, 126.6, 126.0, 125.1. ESI HRMS: calcd. for $C_{21}H_{14}ClN_4O_3$ $[M+H]^+$: 405.0749, found: 405.0742.



2da

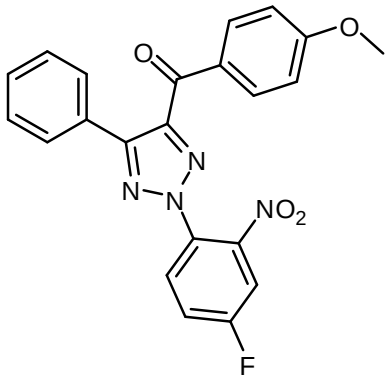
(2-(4-nitrophenyl)-5-phenyl-2H-1,2,3-triazol-4-yl)(m-tolyl)methanone 2da[d]: 2da was purified by flash chromatography (Hexane-EtOAc, v/v=10/1) as slight yellow solid (yield: 82%), mp: 136-138 ^oC. IR (cm^{-1}): 3064, 1663, 1597. ^1H NMR (300 MHz, $CDCl_3$): δ 8.34-8.38 (m, 4H), 7.86-7.91 (m, 4H), 7.37-7.48 (m, 5H), 2.43 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$): δ 187.8, 151.2, 146.9, 144.7, 143.2, 138.5, 136.6, 134.8, 130.7, 129.8, 128.6, 128.58, 128.4, 127.9, 125.2, 119.5, 21.3. EI–MS: m/z = 384 $[M]^+$. Anal. Calcd. For $C_{22}H_{16}N_4O_3$: C, 68.74; H, 4.20; N, 14.58. Found: C, 68.66; H, 4.25; N, 14.50.



2ea

(3,5-dimethylphenyl)(2-(4-fluoro-2-nitrophenyl)-5-phenyl-2H-1,2,3-triazol-4-yl)methanone 2ea[b]: 2ea was purified by flash chromatography (Hexane-EtOAc, v/v=10/1) as white solid (yield: 89%), mp: 127-129 ^oC. IR (cm^{-1}): 3080, 1663, 1601. ^1H NMR (400 MHz, $CDCl_3$): δ 8.02 (dd, *J*=9.2, 4.8 Hz, 1H), 7.86-7.88 (m, 2H), 7.63-7.66 (m, 3H), 7.42-7.48 (m, 4H), 7.25

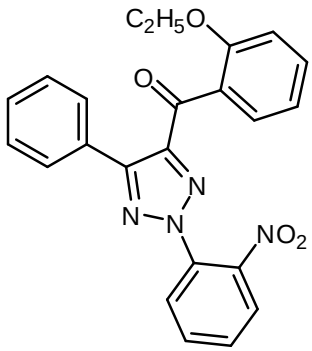
(s, 1H), 2.40 (s, 6H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 187.8, 162.7, 160.2, 151.1, 144.4, 144.3, 138.2, 136.6, 135.7, 129.7, 128.7, 128.6, 128.5, 128.2, 127.7, 127.6, 120.3, 120.1, 113.0, 112.7, 21.1. ESI HRMS: calcd. for $C_{23}H_{18}FN_4O_3$ $[M+H]^+$: 417.1357, found: 417.1347.



2fa

(2-(4-fluoro-2-nitrophenyl)-5-phenyl-2H-1,2,3-triazol-4-yl)(4-methoxyphenyl)methanone

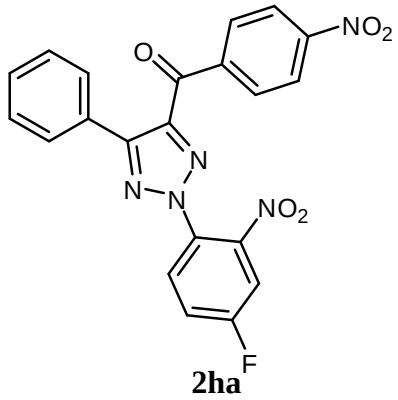
2fa[b]: 2fa was purified by flash chromatography (Hexane-EtOAc, v/v=10/1) as light yellow solid (yield: 88%), mp: 150-152 °C. IR (cm^{-1}): 3080, 1653, 1598. ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.07 (d, *J*=8.8 Hz, 2H), 8.02 (dd, *J*=9.2, 4.8 Hz, 1H), 7.85-7.87 (m, 2H), 7.66 (dd, *J*=7.2, 2.8 Hz, 1H), 7.42-7.49 (m, 4H), 6.99 (d, *J*=8.8 Hz, 2H), 3.89 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 185.9, 164.4, 162.7, 160.2, 150.9, 144.5, 144.2, 144.1, 133.0, 129.6, 129.5, 128.7, 128.5, 127.7, 127.6, 120.4, 120.1, 113.9, 113.0, 112.8, 55.5. ESI HRMS: calcd. for $C_{22}H_{16}FN_4O_4$ $[M+H]^+$: 419.1150, found: 419.1148.



2ga

(2-ethoxyphenyl)(2-(2-nitrophenyl)-5-phenyl-2H-1,2,3-triazol-4-yl)methanone 2ga[c]: 2ga was purified by flash chromatography (Hexane-EtOAc, v/v =10/1) as light yellow solid (yield: 92%), mp: 100-102 °C IR (cm^{-1}): 2982, 1667, 1600. ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.93 (d, J=8.0 Hz, 1H), 7.81-7.86 (m, 3H), 7.67-7.72 (m, 2H), 7.54 (t, J=7.6 Hz, 1H), 7.38-7.47 (m, 3H), 7.04 (t, J=7.4 Hz, 1H), 6.83 (d, J=8.4 Hz, 1H), 3.89 (q, J=6.8 Hz, 2H), 1.13(t, J=7.0 Hz,

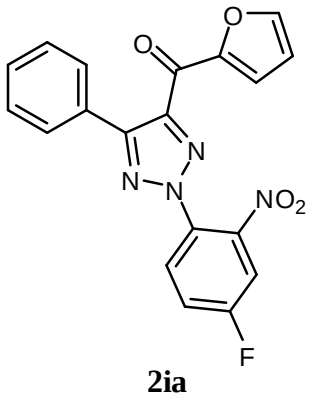
3H). ^{13}C NMR (100 MHz, $CDCl_3$): 189.0, 158.3, 149.6, 146.9, 143.5, 134.1, 132.8, 131.9, 130.4, 129.3, 128.8, 128.5, 128.3, 128.1, 125.5, 124.8, 120.2, 112.1, 63.8, 14.1. ESI HRMS: calcd. for $C_{23}H_{22}N_5O_4$ $[M+NH_4]^+$: 432.1666, found: 432.1656.



2ha

(2-(4-fluoro-2-nitrophenyl)-5-phenyl-2H-1,2,3-triazol-4-yl)(4-nitrophenyl)methanone

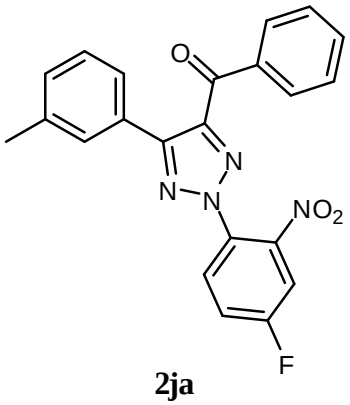
2ha[b]: 2ha was purified by flash chromatography (Hexane-EtOAc, v/v=10/1) as yellow solid (yield: 50%)**,** mp: 170-172 ^{o}C. IR (cm^{-1}): 3056, 1662, 1548. ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.36 (d, *J*=8.8 Hz, 2H), 8.24-8.30 (m, 4H), 7.85-7.92 (m, 3H), 7.52 (t, *J*=3.2 Hz, 3H). ^{13}C NMR (100 MHz, D_6-DMSO): δ 185.4, 162.7, 160.2, 151.0 150.1, 143.9, 143.8, 142.9, 141.4, 131.5, 130.0, 128.8, 128.6, 128.4, 128.3, 128.1, 127.3, 127.2, 123.5, 121.4, 121.2, 113.7, 113.4. The molecular signal did not find in ESI HRMS. EI-MS: m/z = 433 $[M]^+$. Anal. Calcd. for $C_{21}H_{12}FN_5O_5$: C, 58.20; H, 2.79; N, 16.16. Found: C, 58.10; H, 2.84; N, 16.23.



2ia

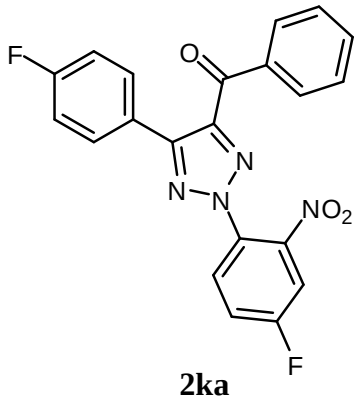
(2-(4-fluoro-2-nitrophenyl)-5-phenyl-2H-1,2,3-triazol-4-yl)(furan-2-yl)methanone 2ia[b]: 2ia was purified by flash chromatography (Hexane-EtOAc, v/v=10/1) as yellow solid (yield: 88%), mp: 130-132 ^{o}C. IR (cm^{-1}): 3076, 1649, 1548. ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.06 (dd, *J*=4.8, 9.2 Hz, 1H), 7.92-7.94 (m, 2H), 7.74 (d, *J*=1.2 Hz, 1H), 7.66 (dd, *J*=7.2, 2.8 Hz, 1H), 7.56 (d, *J*=3.6 Hz, 1H), 7.44-7.51 (m, 4H), 6.62 (dd, *J*=3.6, 1.6 Hz, 1H). ^{13}C NMR (100 MHz,

$CDCl_3$): δ 173.0, 162.8, 160.2, 151.4, 151.3, 148.4, 143.9, 143.3, 129.8, 129.1, 128.5, 128.4, 128.3, 128.2, 128.16, 127.5, 127.4, 123.0, 120.4, 120.1, 113.0, 112.8, 112.7. ESI HRMS: calcd. for $C_{19}H_{12}FN_4O_4$ $[M+H]^+$: 379.0837, found: 379.0829.



2ja

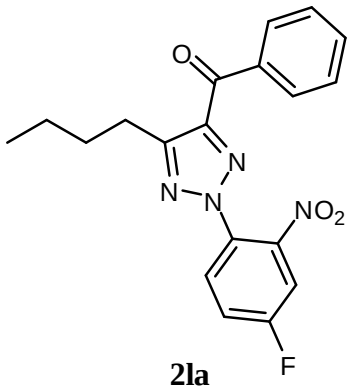
(2-(4-fluoro-2-nitrophenyl)-5-m-tolyl-2H-1,2,3-triazol-4-yl)(phenyl)methanone 2ja[b]: 2ja was purified by flash chromatography (Hexane-EtOAc, v/v=10/1) as white solid (yield: 88%), mp: 123-125 ^oC. IR (cm^{-1}): 3081, 1665, 1546. ^1H NMR (400 MHz, $CDCl_3$): δ 8.04-8.06 (m, 2H), 8.00 (dd, J=8.8, 4.8 Hz, 1H), 7.60-7.67(m, 4H), 7.42-7.52 (m, 3H), 7.32 (t, J=7.6 Hz, 1H), 7.23-7.25 (m, 1H), 2.39 (s, 3H). ^3C NMR (100 MHz, $CDCl_3$): δ 187.4, 162.8, 160.2, 151.5, 144.2, 144.1, 138.2, 136.7, 133.8, 130.5, 130.4, 129.3, 128.5, 128.4, 128.36, 127.8, 127.7, 125.9, 120.4, 120.1, 113.0, 112.7, 21.4. $C_{22}H_{19}FN_5O_3$ $[M+NH_4]^+$: 420.1466, found: 420.1477.



2ka

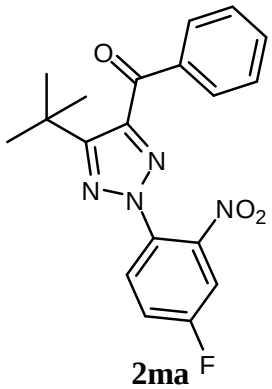
(2-(4-fluoro-2-nitrophenyl)-5-(4-fluorophenyl)-2H-1,2,3-triazol-4-yl)(phenyl)methanone 2ka[b]: 2ka was purified by flash chromatography (Hexane-EtOAc, v/v=10/1) as white solid

(yield: 95%), mp: 121-123 °C. IR (cm^{-1}): 3084, 1663, 1544. ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.06 (d, *J*=7.2 Hz, 2H), 7.98-8.05 (m, 1H), 7.90 (dd, *J*=8.8, 5.6 Hz, 2H), 7.61-7.67 (m, 2H), 7.44-7.52 (m, 3H), 7.12 (t, *J*=8.6 Hz, 2H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 187.2, 164.9, 162.9, 162.4, 160.3, 150.6, 144.3, 144.2, 143.9, 136.6, 133.9, 131.0, 130.9, 130.5, 128.5, 128.4, 128.3, 127.7, 127.6, 124.7, 124.7, 120.4, 120.2, 115.7, 115.5, 113.1, 112.8. ESI HRMS: calcd. for $C_{21}H_{13}F_2N_4O_3$ $[M+H]^+$: 407.0950, found: 407.0954.



2la

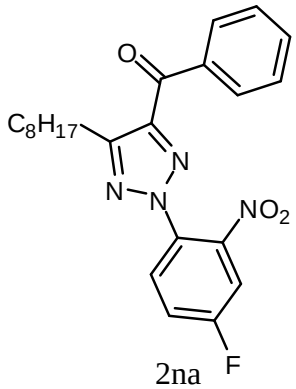
(5-butyl-2-(4-fluoro-2-nitrophenyl)-2H-1,2,3-triazol-4-yl)(phenyl)methanone 2la[b]: 2la was purified by flash chromatography (Hexane-EtOAc, v/v=10/1) as light yellow oil (yield: 60%). IR (cm^{-1}): 3080, 1657, 1549. ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.13-8.15 (m, 2H), 7.97 (dd, *J*=9.2, 4.8 Hz, 1H), 7.59-7.64 (m, 2H), 7.42-7.53 (m, 3H), 3.09 (t, *J*=7.8 Hz, 2H), 1.73-1.81 (m, 2H), 1.41-1.50 (m, 2H), 0.97 (t, *J*=7.4 Hz, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 186.9, 162.6, 160.1, 155.0, 144.5, 136.9, 133.4, 130.3, 128.5, 128.49, 128.4, 127.5, 127.4, 120.2, 120.0, 112.9, 112.6, 30.4, 25.7, 22.4, 13.8. ESI HRMS: calcd. for $C_{19}H_{18}FN_4O_3$ $[M+H]^+$: 369.1357, found: 369.1359.



2ma

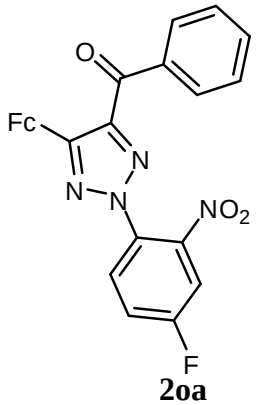
(5-tert-butyl-2-(4-fluoro-2-nitrophenyl)-2H-1,2,3-triazol-4-yl)(phenyl)methanone 2ma[b]: 2ma

was purified by flash chromatography (Hexane-EtOAc, v/v =80/1) as colorless oil (yield: 72%). IR (cm^{-1}): 2968, 1666, 1548. ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.94-8.00 (m, 3H), 7.61-7.65 (m, 2H), 7.50-7.53 (m, 2H), 7.42-7.47 (m, 1H), 1.48 (s, 9H). ^{13}C NMR (100 MHz, $CDCl_3$): 188.8, 162.5, 160.7, 160.0, 144.5, 137.4, 133.6, 130.34 128.6, 128.5, 128.4, 127.4, 127.3, 120.1, 119.9, 112.9, 112.6, 32.6, 29.3. ESI HRMS: calcd. for $C_{19}H_{18}FN_4O_3$ $[M+H]^+$: 369.1357, found:369.1350.



2na

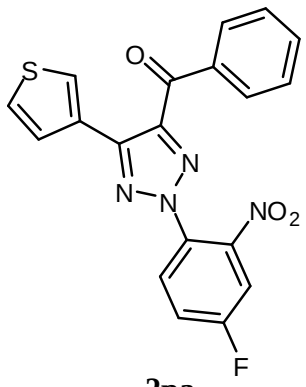
(2-(4-fluoro-2-nitrophenyl)-5-octyl-2H-1,2,3-triazol-4-yl)(phenyl)methanone 2na[b]: 2na was purified by flash chromatography (Hexane-EtOAc, v/v =80/1) as light yellow oil (yield: 68%). IR (cm^{-1}): 2927, 1656, 1548. ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.14 (d, J=7.2 Hz, 2H), 7.97 (dd, J=9.2, 4.8 Hz, 1H), 7.59-7.63 (m, 2H), 7.42-7.53 (m, 3H), 3.08 (t, J=7.6 Hz, 2H), 1.74-1.80 (m, 2H), 1.27-1.44 (m, 10H), 0.87 (t, J=6.6 Hz, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): 186.8, 162.6, 160.0, 155.0, 144.5, 144.1, 136.8, 133.3, 130.3, 128.5, 128.45, 128.4, 127.4, 127.3, 120.2, 120.0, 112.9, 112.6, 31.8, 29.3, 29.26, 29.2, 28.3, 26.0, 22.6, 14.1. ESI HRMS: calcd. for $C_{23}H_{29}FN_5O_3$ $[M+NH_4]^+$: 442.2294, found: 442.2298.



2oa

(2-(4-fluoro-2-nitrophenyl)-5-ferrocenyl -2H-1,2,3-triazol-4-yl)(phenyl)methanone 2oa[b]: 2oa

was purified by flash chromatography (Hexane-EtOAc, v/v =10/1) as brown-red solid (yield: 88%), mp: 113-115 ^{o}C. IR (cm^{-1}): 3085, 1663, 1549. ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.08 (d, J=7.2 Hz, 2H), 7.93 (dd, J=8.4, 4.8, 1H), 7.61-7.65 (m, 2H), 7.53 (t, J=7.6 Hz, 2H), 7.43 (t, J=6.8 Hz, 1H), 5.07 (s, 2H), 4.40 (s, 2H), 4.10 (s, 5H). ^{13}C NMR (100 MHz, $CDCl_3$): 187.2, 162.6, 160.0, 152.0, 144.2, 144.1, 143.6, 137.1, 133.6, 130.3, 128.5, 128.4, 127.6, 127.5, 120.3, 120.1, 112.9, 112.6, 72.3, 70.1, 69.6. EI–MS: m/z = 496 $[M]^+$.



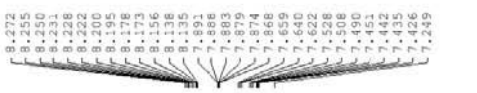
2pa

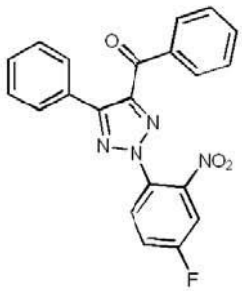
(2-(4-fluoro-2-nitrophenyl)-5-(thiophen-3-yl)-2H-1,2,3-triazol-4-yl)(phenyl)methanone

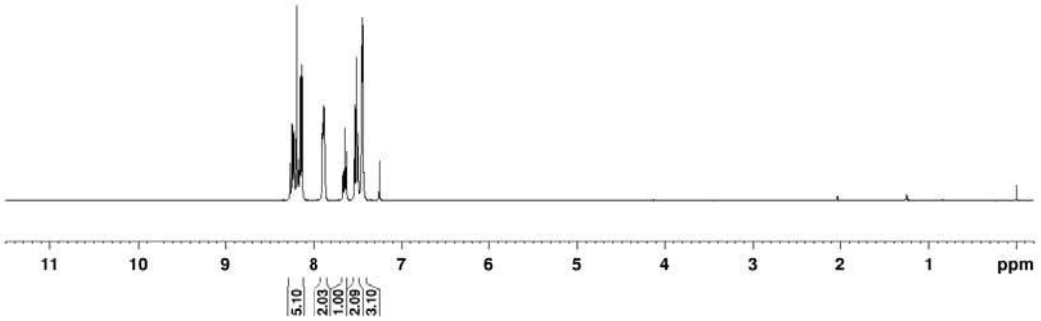
2pa[b]: 2pa was purified by flash chromatography (Hexane-EtOAc, v/v =10/1) as white solid, mp: 120-122 ^{o}C. IR (cm^{-1}): 3083, 1662, 1547. ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.35-8.36 (m, 1H), 8.05-8.07 (m, 2H), 7.99 (dd, *J*=8.8, 4.8 Hz, 1H), 7.60-7.70 (m, 3H), 7.43-7.53 (m, 3H), 7.38 (dd, *J*=5.0, 3.0 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 187.3, 162.8, 160.3, 147.2, 143.7, 136.9, 133.7, 130.4, 129.2, 128.4, 128.3, 127.9, 127.7, 127.6, 127.6, 125.7, 120.3, 120.1, 113.0, 112.8. ESI HRMS: calcd. for $C_{19}H_{12}FN_4O_3S$ $[M+H]^+$: 395.0609, found: 395.0619.

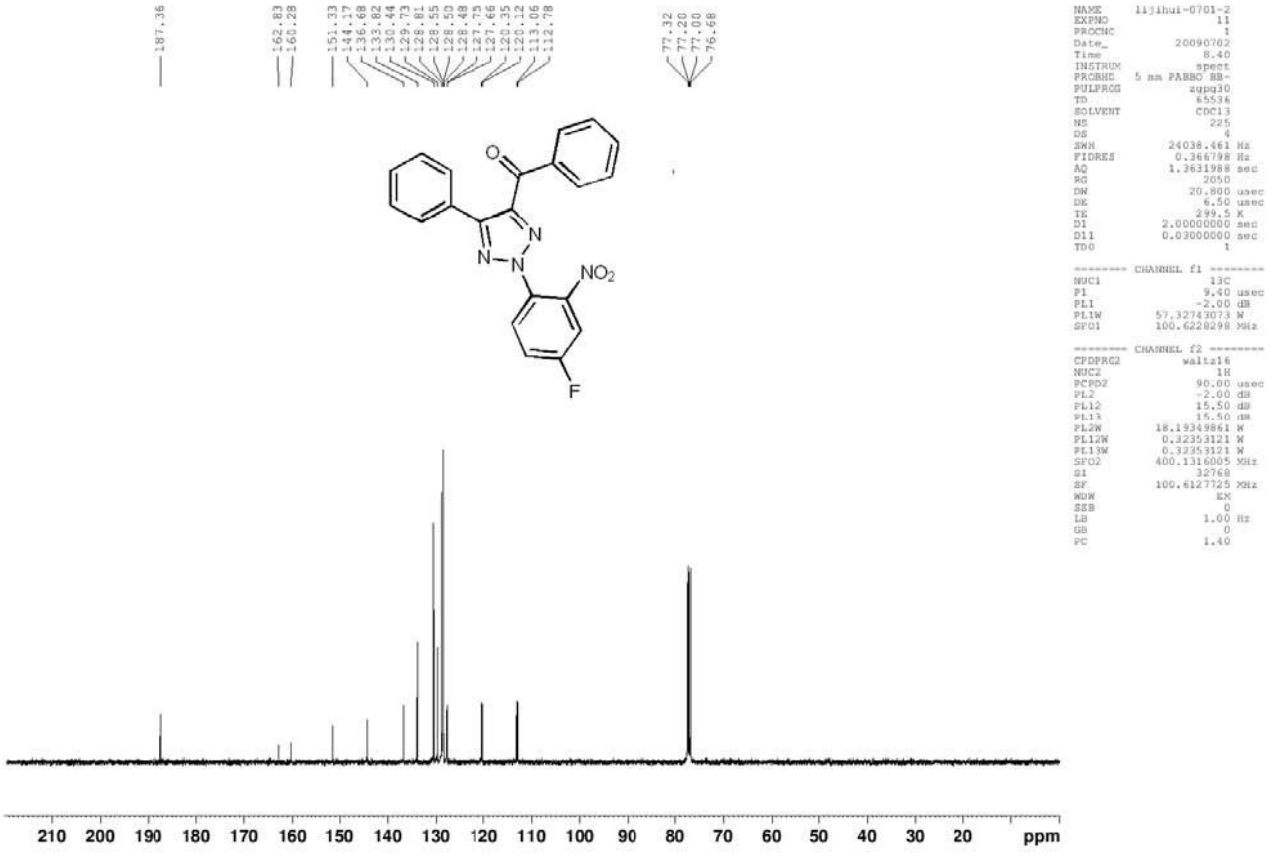
2. ^{1}H and ^{13}C NMR spectra of the compounds:

1aa:







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PROCNO                     1
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DE                      6.50 usec
TE                     299.5 K
D1                 2.00000000 sec
D11                0.03000000 sec
TD0                         1

======== CHANNEL f1 ========
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P1                      9.40 usec
PL1                    -2.00 dB
PL1W            57.32743073 W
SFO1            100.6228298 MHz

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NUC2                       1H
PCPD2                  90.00 usec
PL2                    -2.00 dB
PL12                   15.50 dB
PL13                   15.50 dB
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PL12W            0.32353121 W
PL13W            0.32353121 W
SFO2            400.1316005 MHz
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GB                          0
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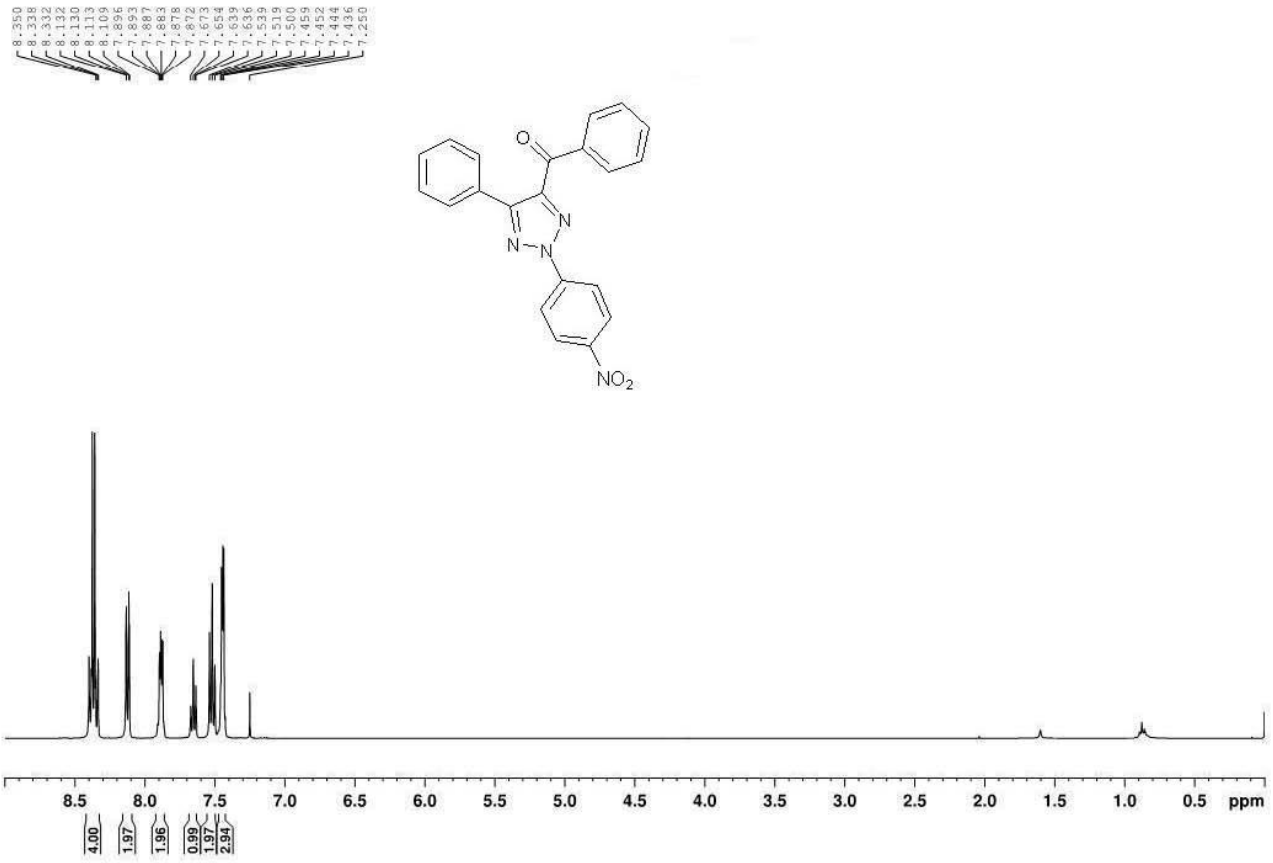
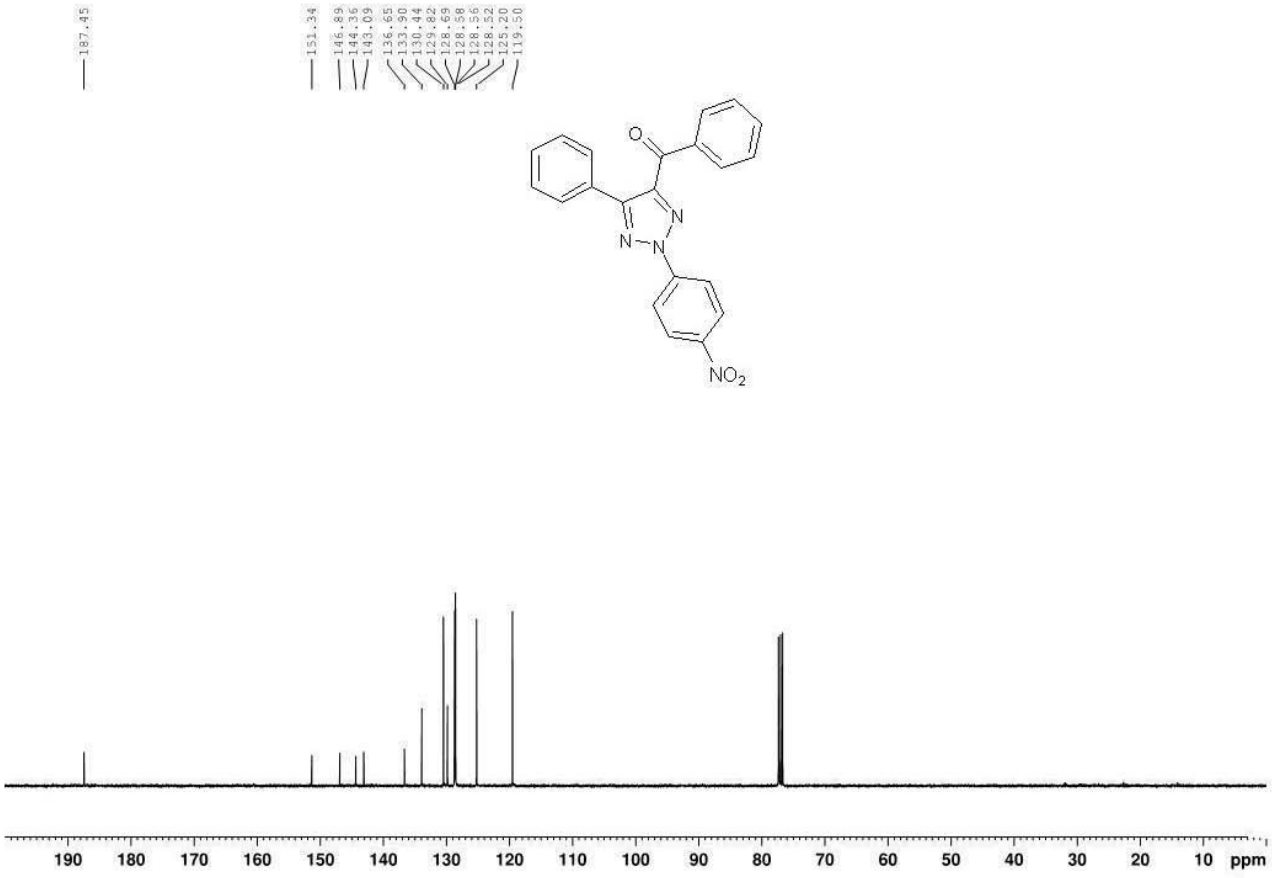
1ba:





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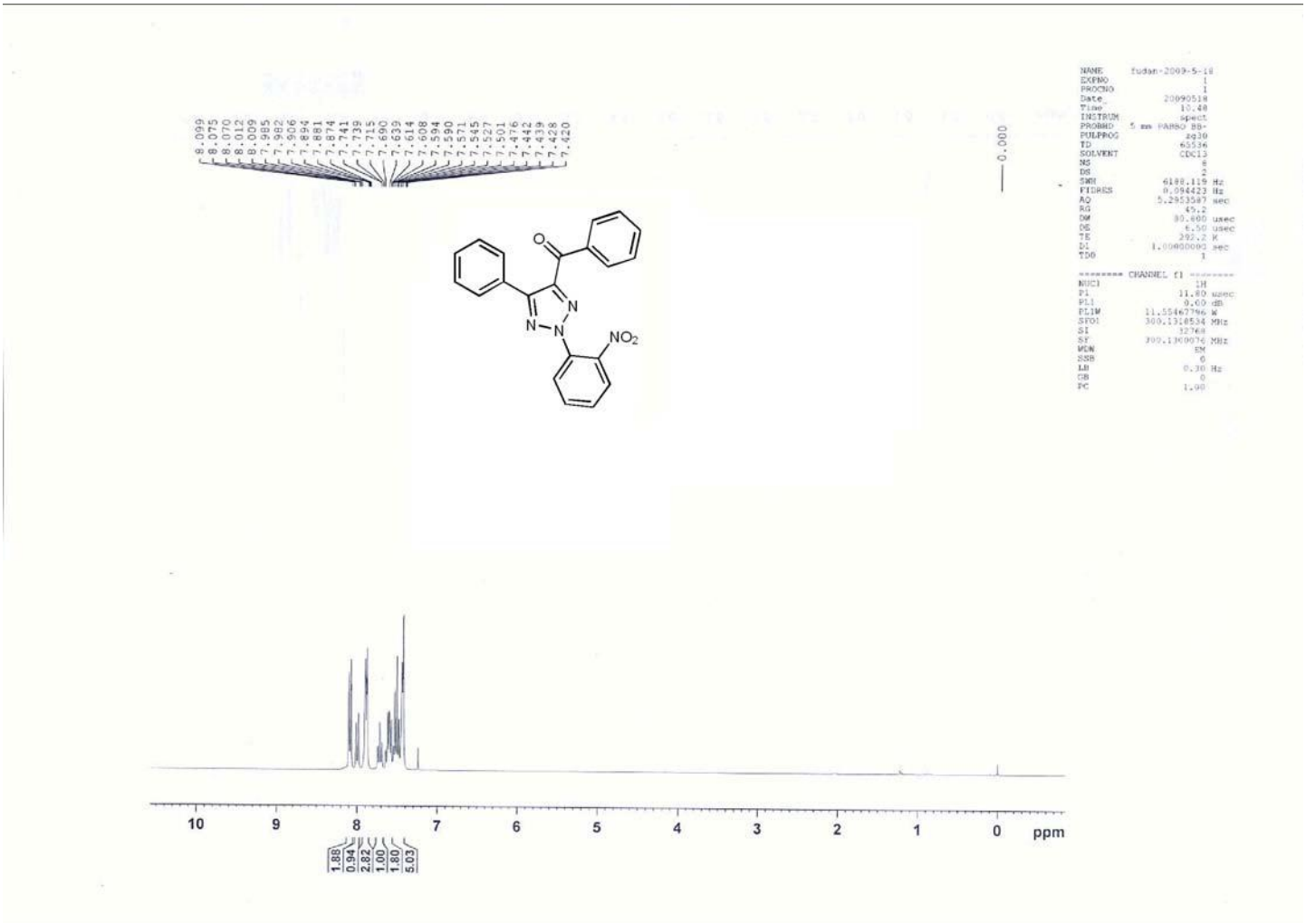

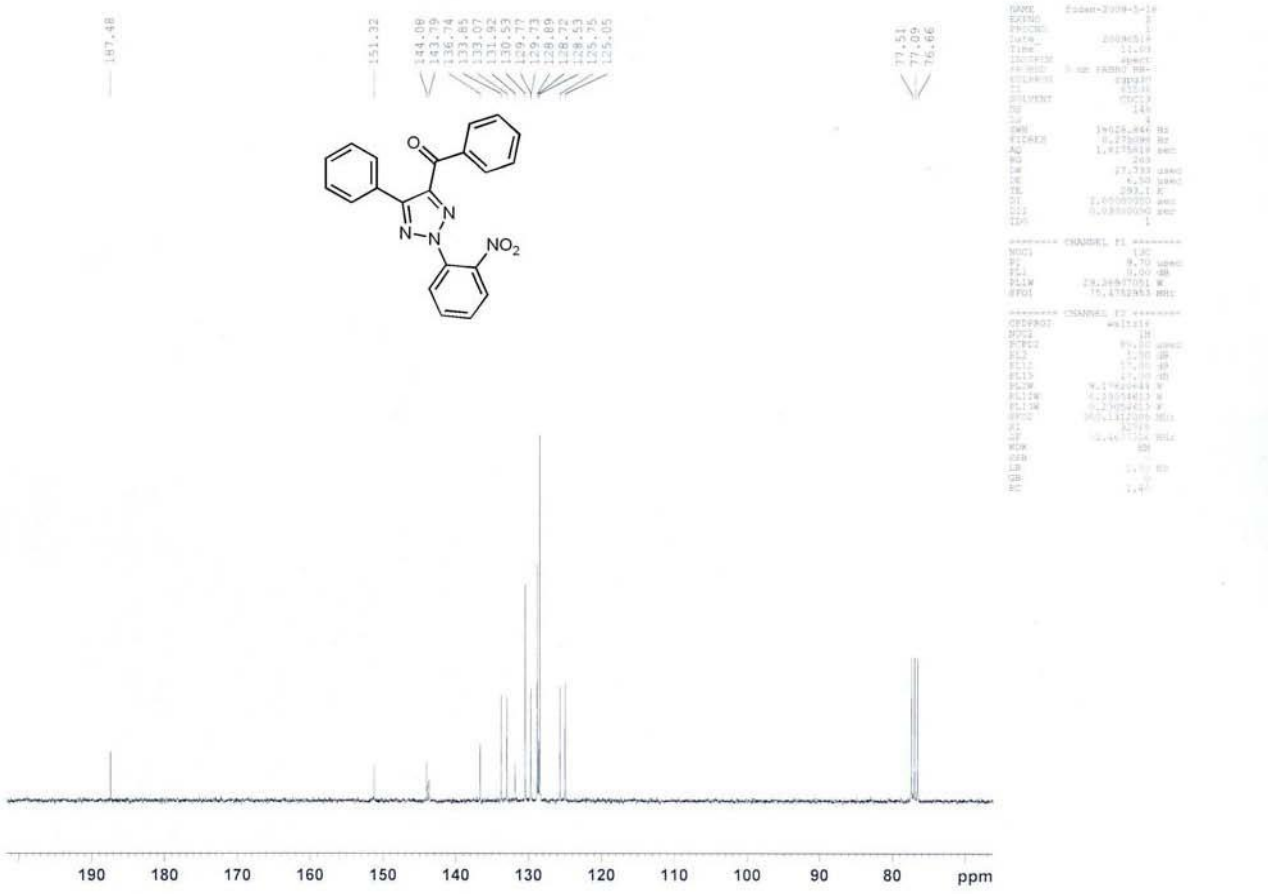

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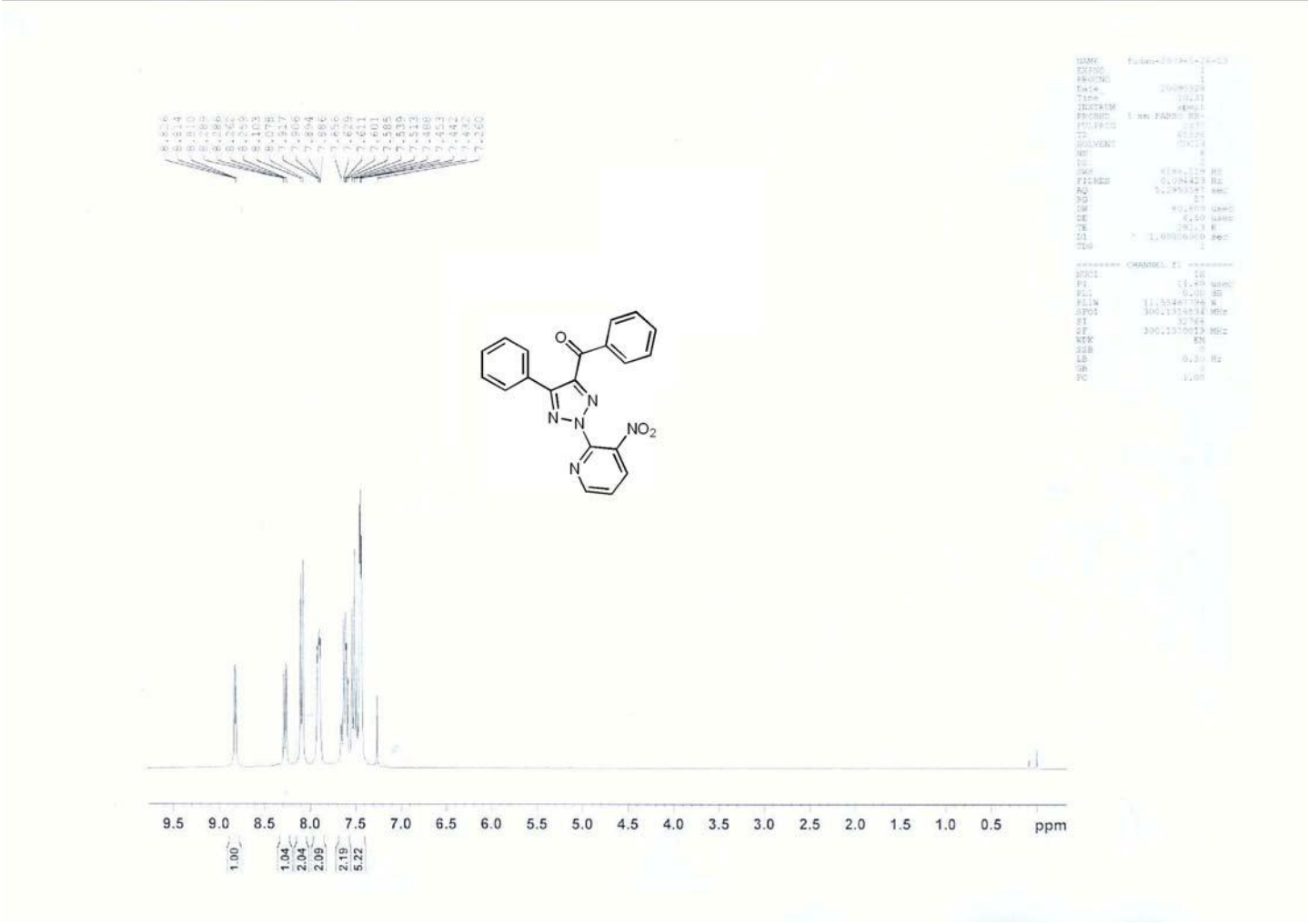

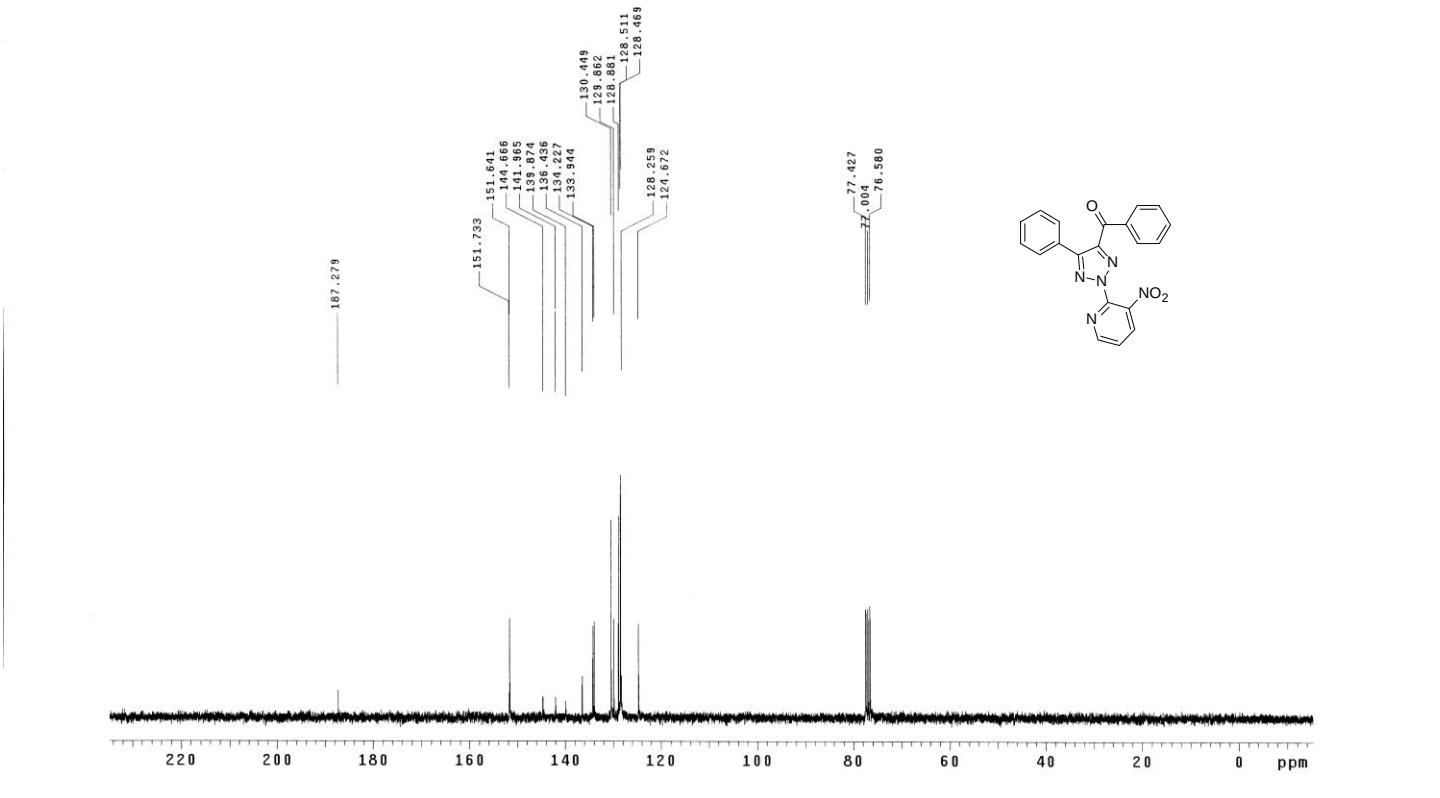

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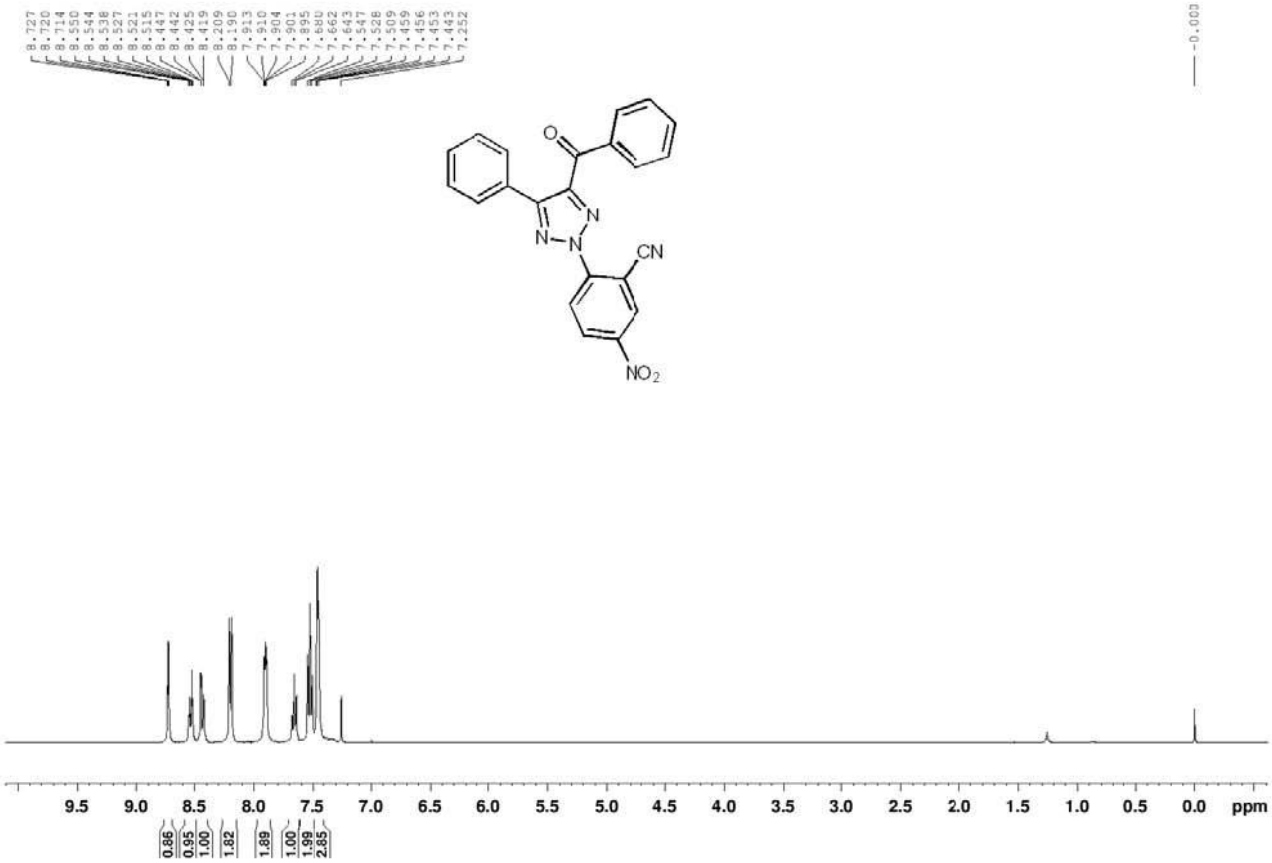

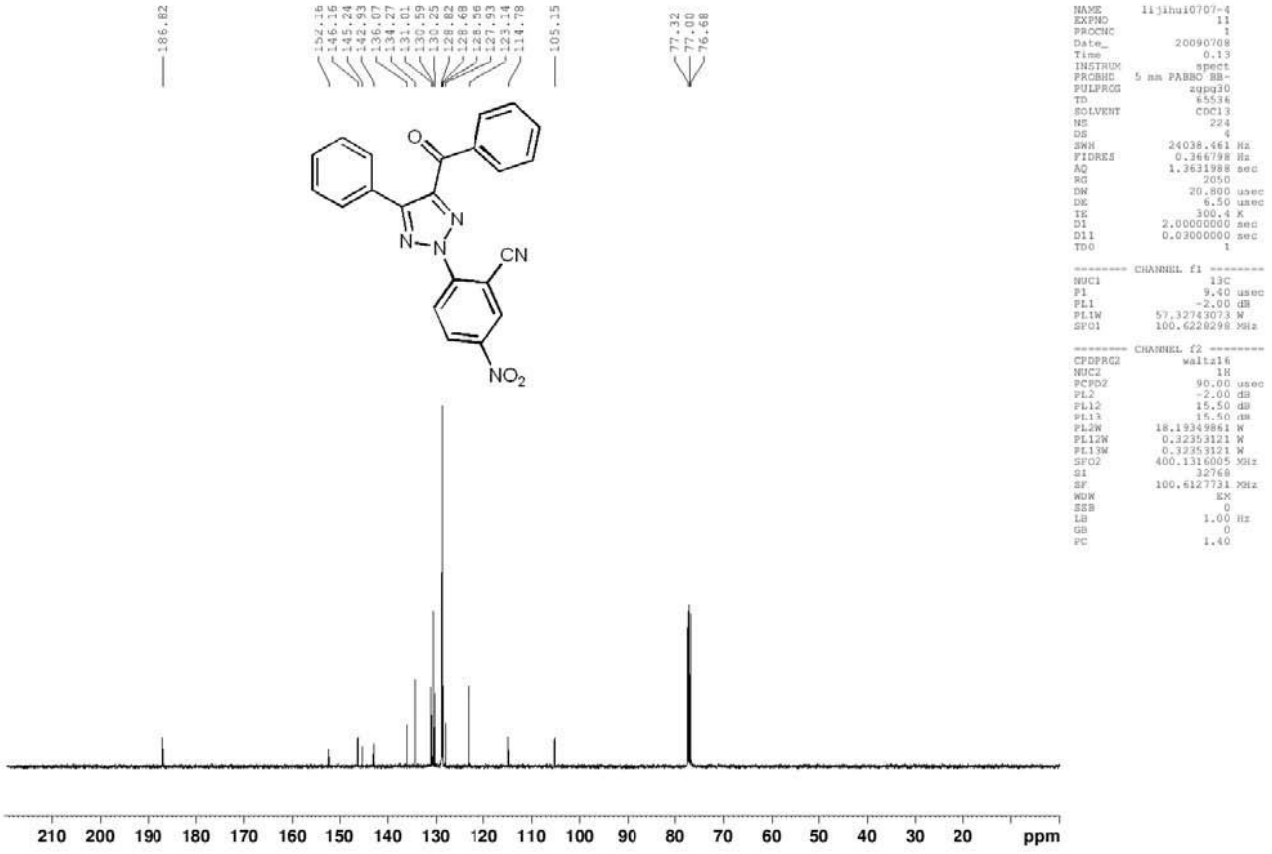


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PROCNO                      1
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DE                    6.50 usec
TE                     300.4 K
D1                 2.00000000 sec
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TD0                         1

======== CHANNEL f1 ========
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P1                   9.40 usec
PL1                  -2.00 dB
PL1W            57.32743073 W
SFO1           100.6228298 MHz

======== CHANNEL f2 ========
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NUC2                        1H
PCPD2                90.00 usec
PL2                  -2.00 dB
PL12                 15.50 dB
PL13                 15.50 dB
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PL12W            0.32353121 W
PL13W            0.32353121 W
SFO2           400.1316005 MHz
SI                      32768
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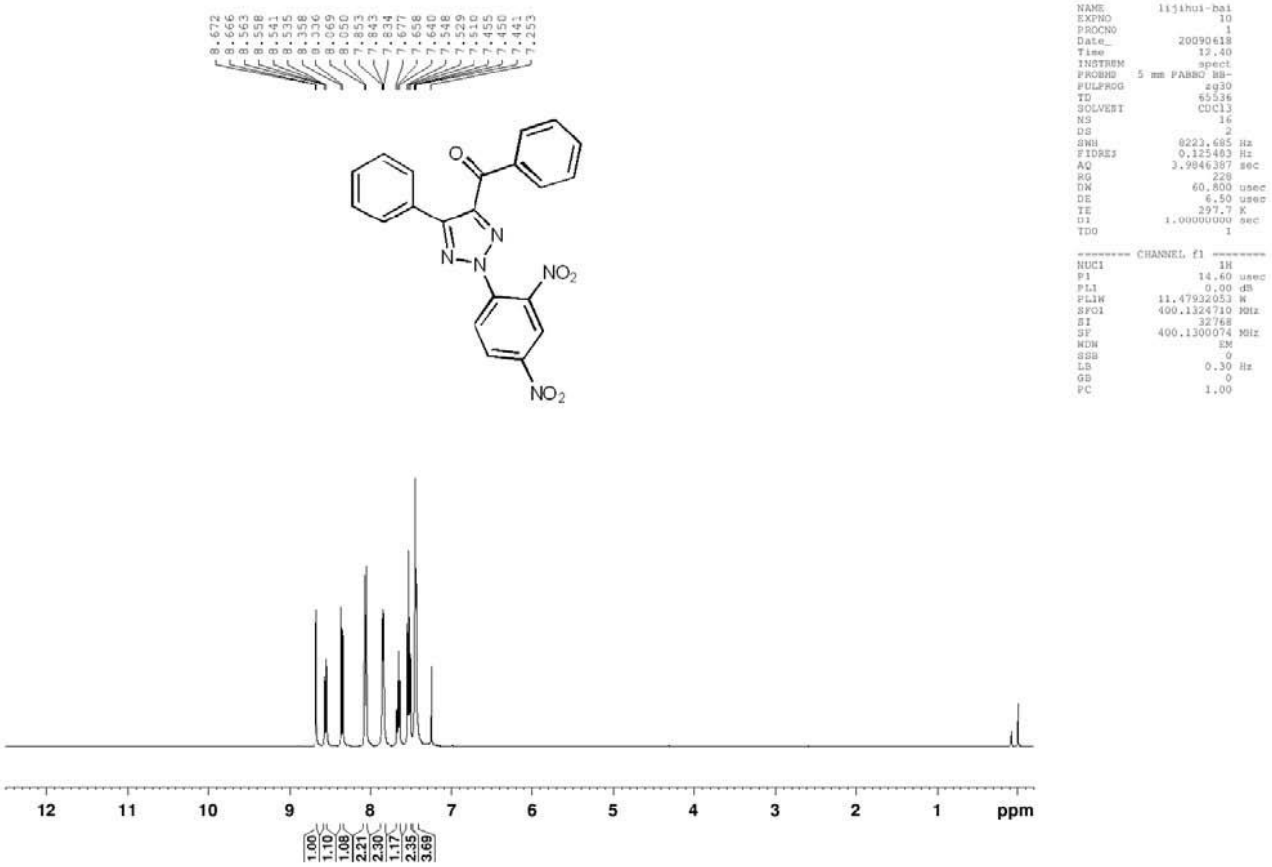
1ja:

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PROCNO                    1
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TE                   297.7 K
D1                 1.0000000 sec
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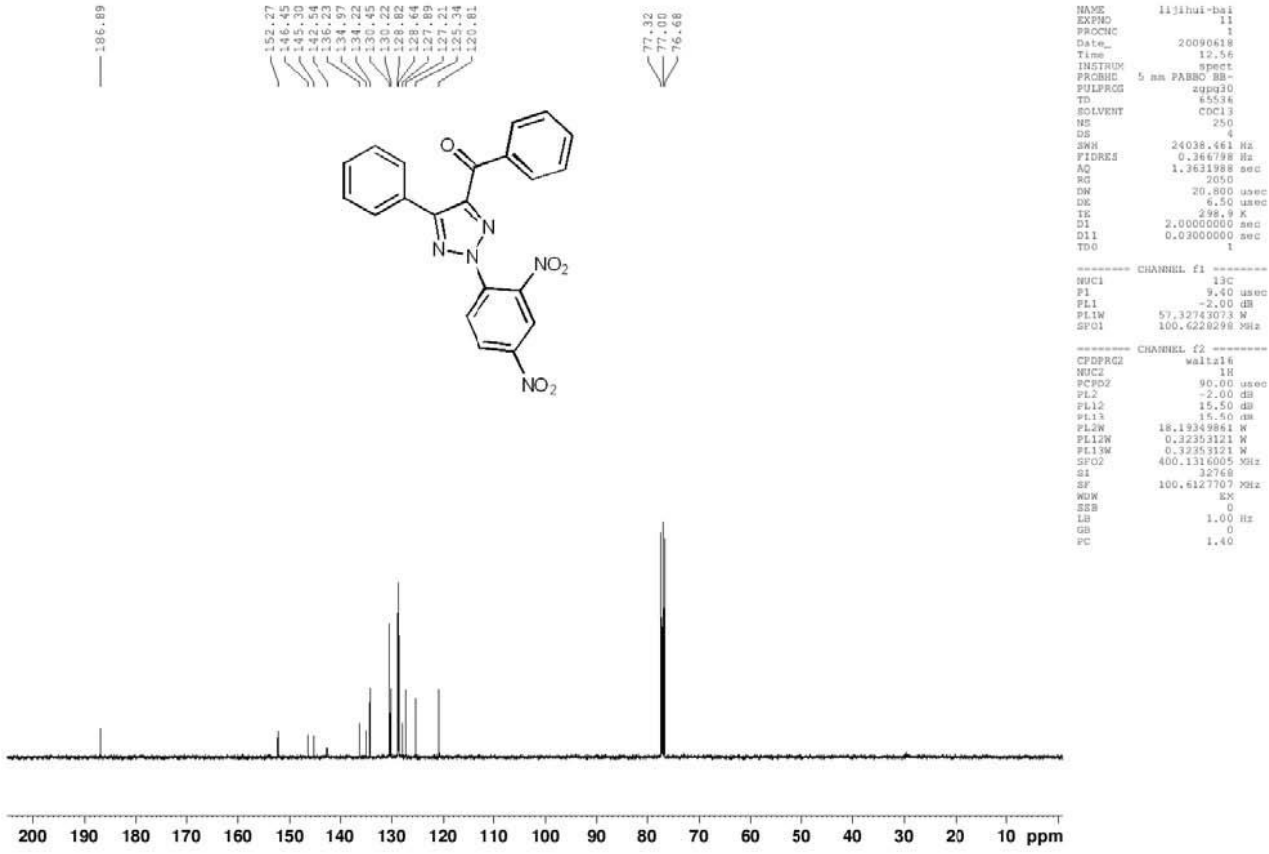


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FIDRES           0.366798 Hz
AQ               1.3631988 sec
RG                    2050
DW                  20.800 usec
DE                   6.50 usec
TE                  298.9 K
D1             2.00000000 sec
D11            0.03000000 sec
TD0                      1

======== CHANNEL f1 ========
NUC1                   13C
P1                    9.40 usec
PL1                  -2.00 dB
PL1W          57.32743073 W
SFO1          100.6228298 MHz

======== CHANNEL f2 ========
CPDPRG2            waltz16
NUC2                   1H
PCPD2                90.00 usec
PL2                  -2.00 dB
PL12                 15.50 dB
PL13                 15.50 dB
PL2W          18.19349861 W
PL12W          0.32353121 W
PL13W          0.32353121 W
SFO2          400.1316005 MHz
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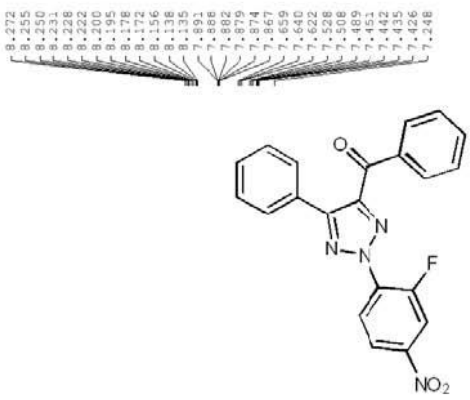
1la:

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DW                     60.800 usec
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TE                     297.8 K
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TD0                         1

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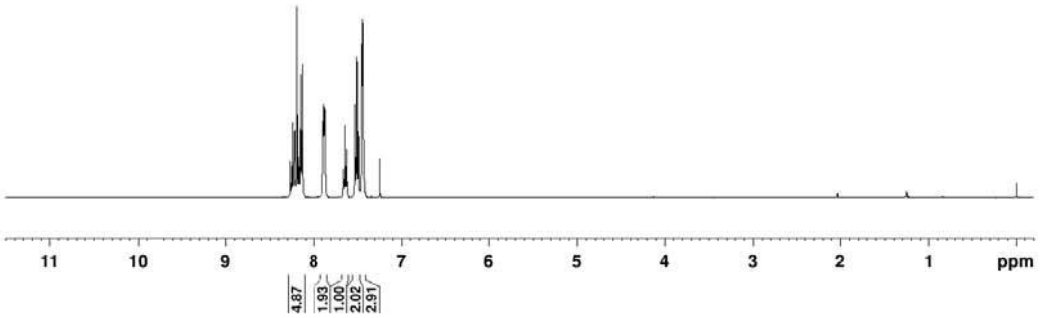
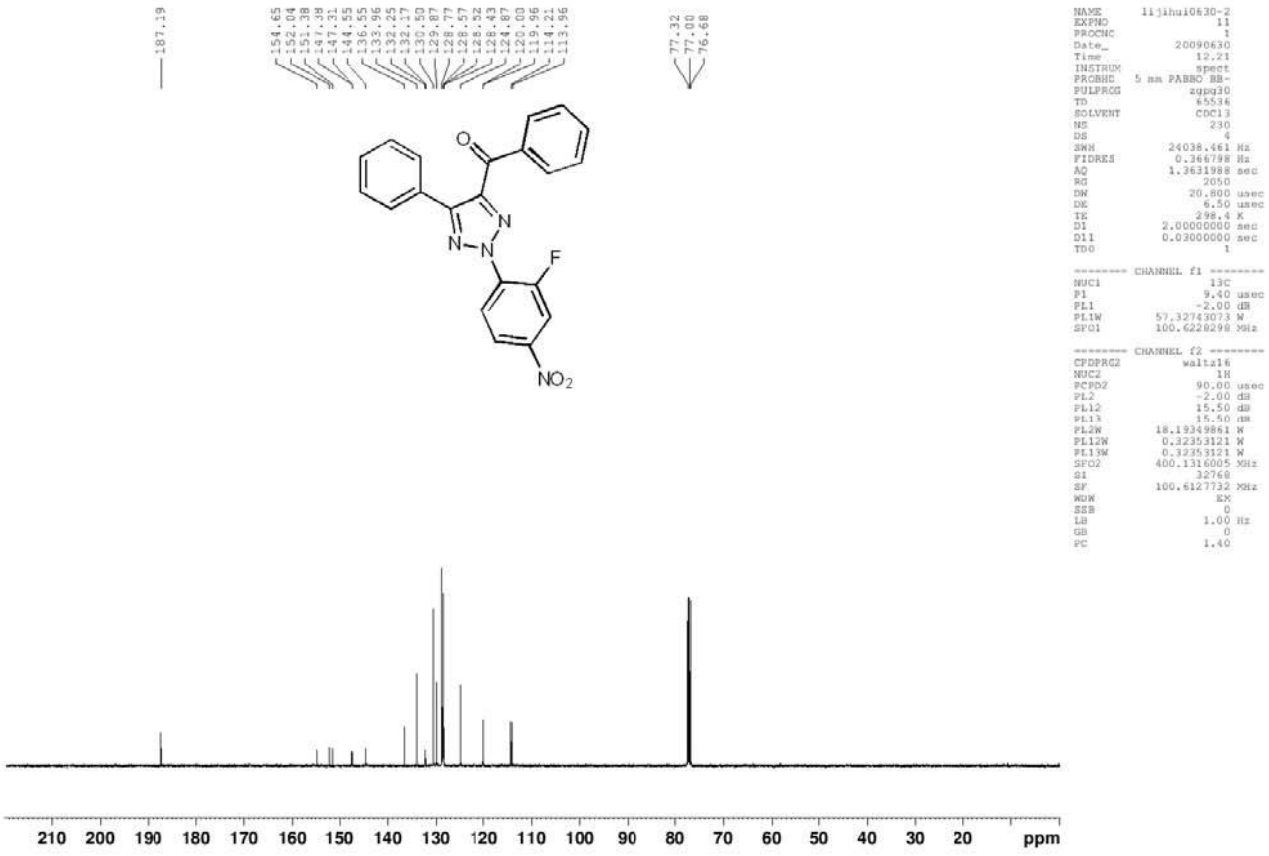
PC                       1.00
```



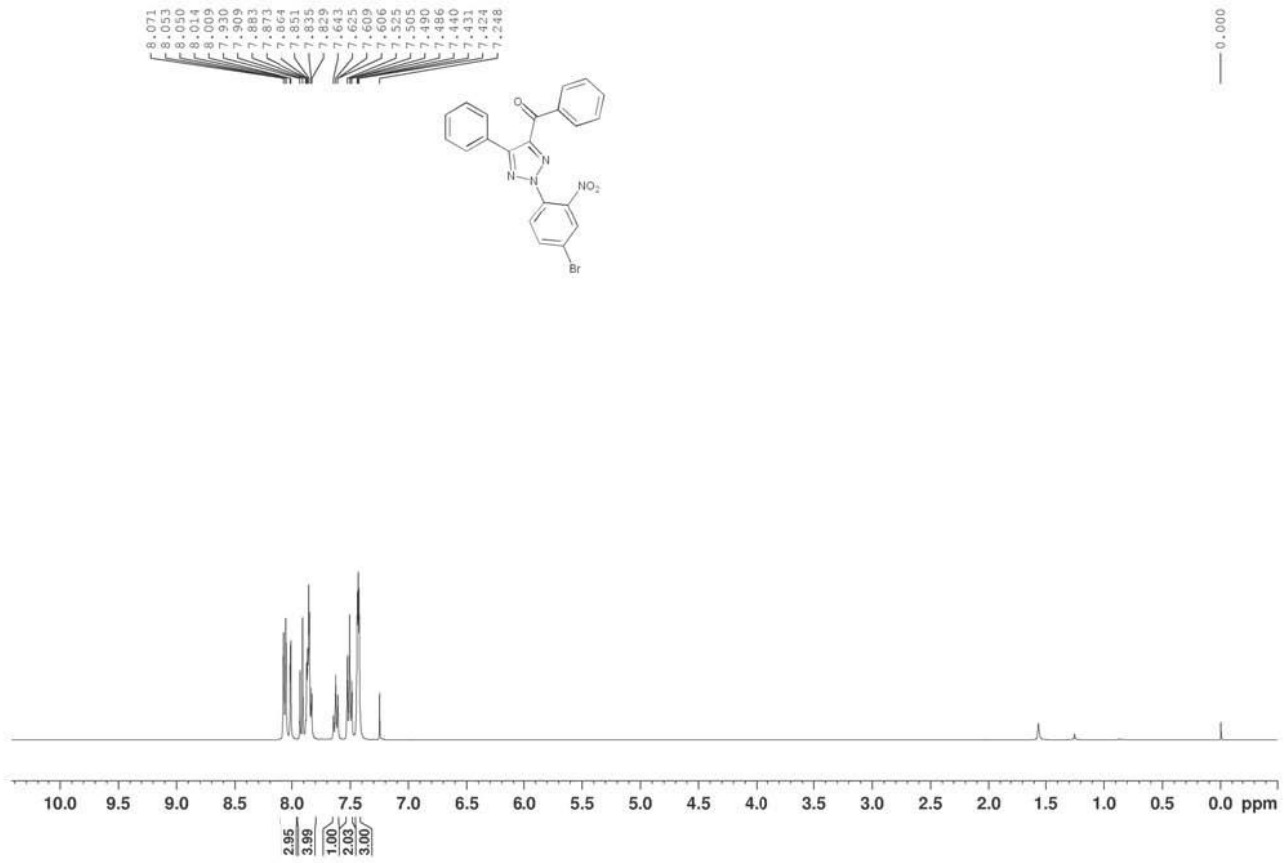


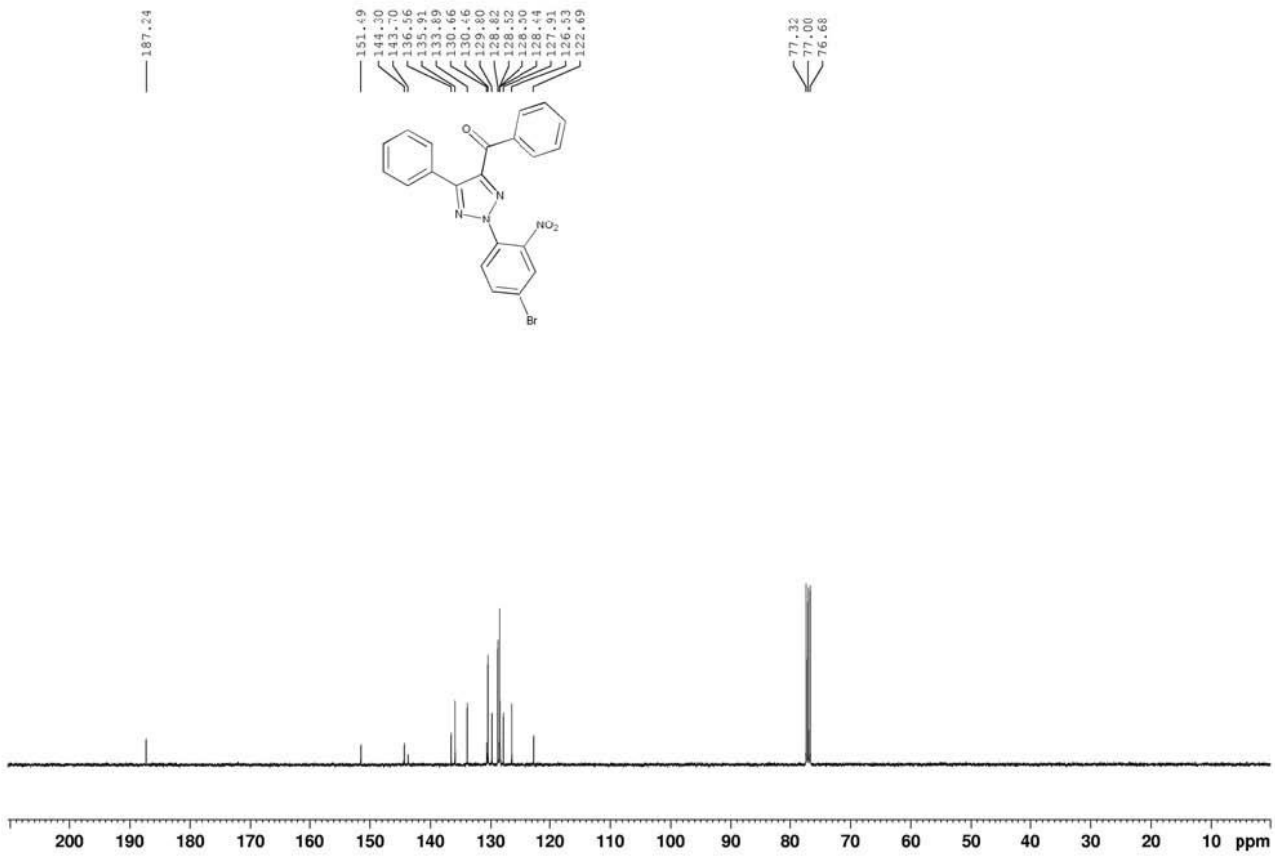

```
NAME                lijihui0630-2
EXPNO                          11
PROCNO                          1
Date_                    20090630
Time                        12.21
INSTRUM                      spect
PROBHD     5 mm PABBO BB-
PULPROG                   zgpg30
TD                             65536
SOLVENT                      CDCl3
NS                               230
DS                                 4
SWH                      24038.461 Hz
FIDRES                       0.366798 Hz
AQ                       1.3631988 sec
RG                              2050
DW                         20.800 usec
DE                          6.50 usec
TE                          298.4 K
D1                     2.00000000 sec
D11                    0.03000000 sec
TD0                              1

======== CHANNEL f1 ========
NUC1                           13C
P1                            9.40 usec
PL1                          -2.00 dB
PL1W                57.32743073 W
SFO1                100.6228298 MHz

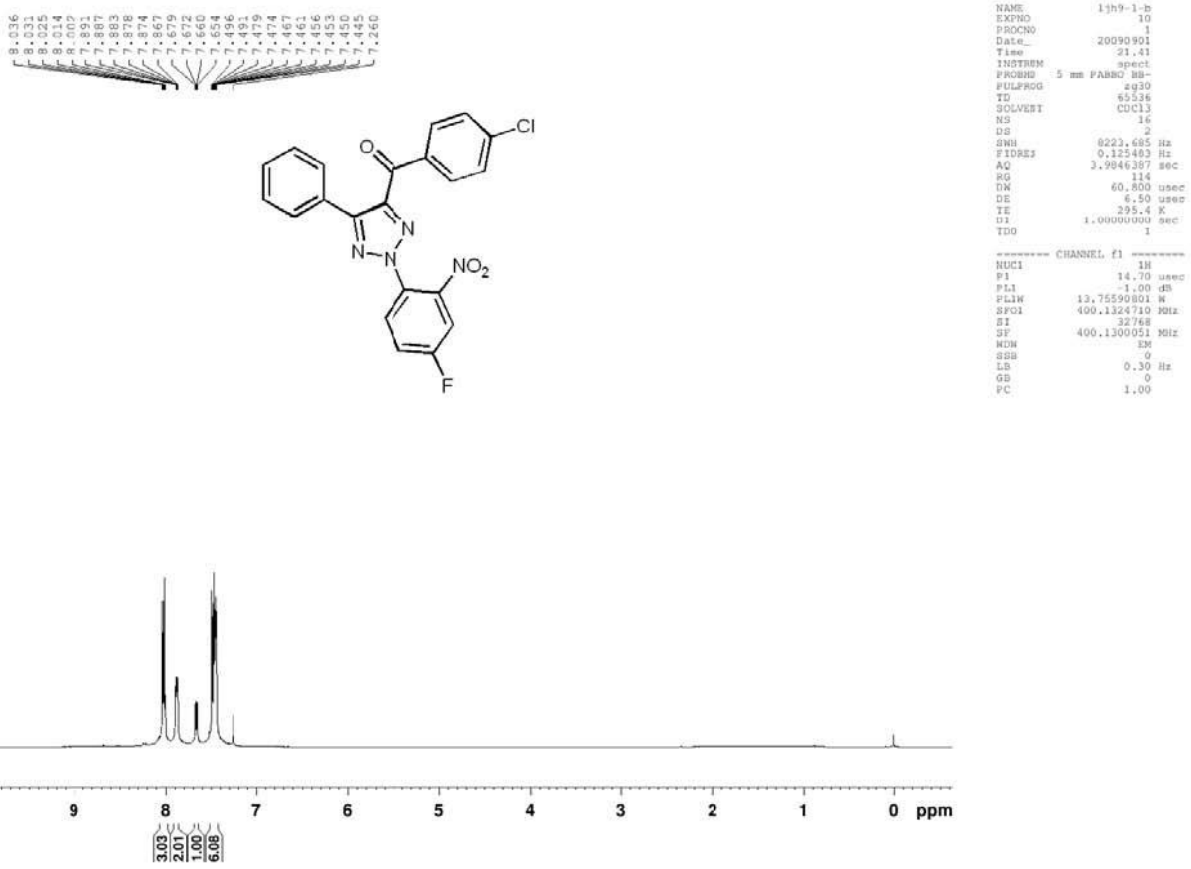
======== CHANNEL f2 ========
CPDPRG2                    waltz16
NUC2                           1H
PCPD2                        90.00 usec
PL2                          -2.00 dB
PL12                         15.50 dB
PL13                         15.50 dB
PL2W                18.19349861 W
PL12W                0.32353121 W
PL13W                0.32353121 W
SFO2                400.1316005 MHz
SI                           32768
SF                  100.6127732 MHz
WDW                             EM
SSB                              0
LB                            1.00 Hz
GB                               0
PC                            1.40
```

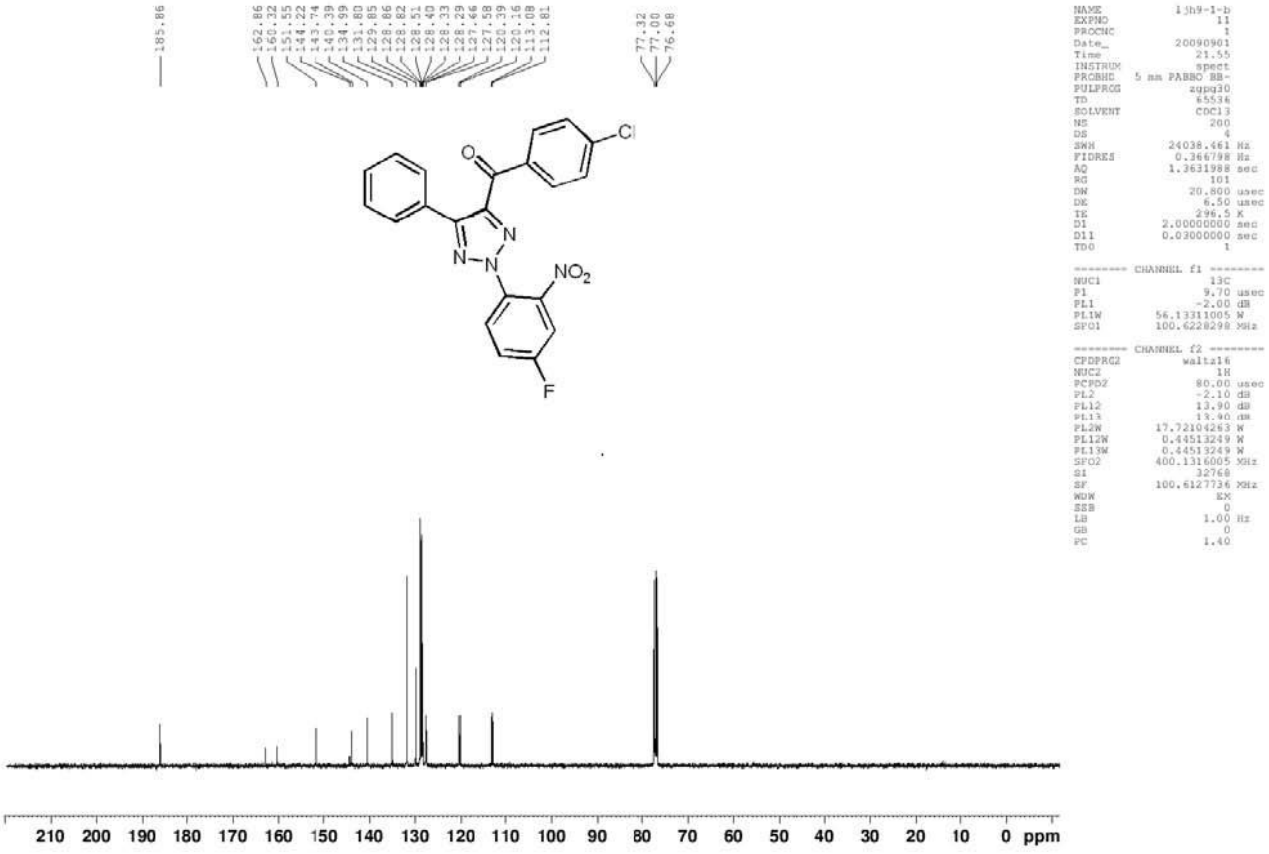
1ma:





2aa:



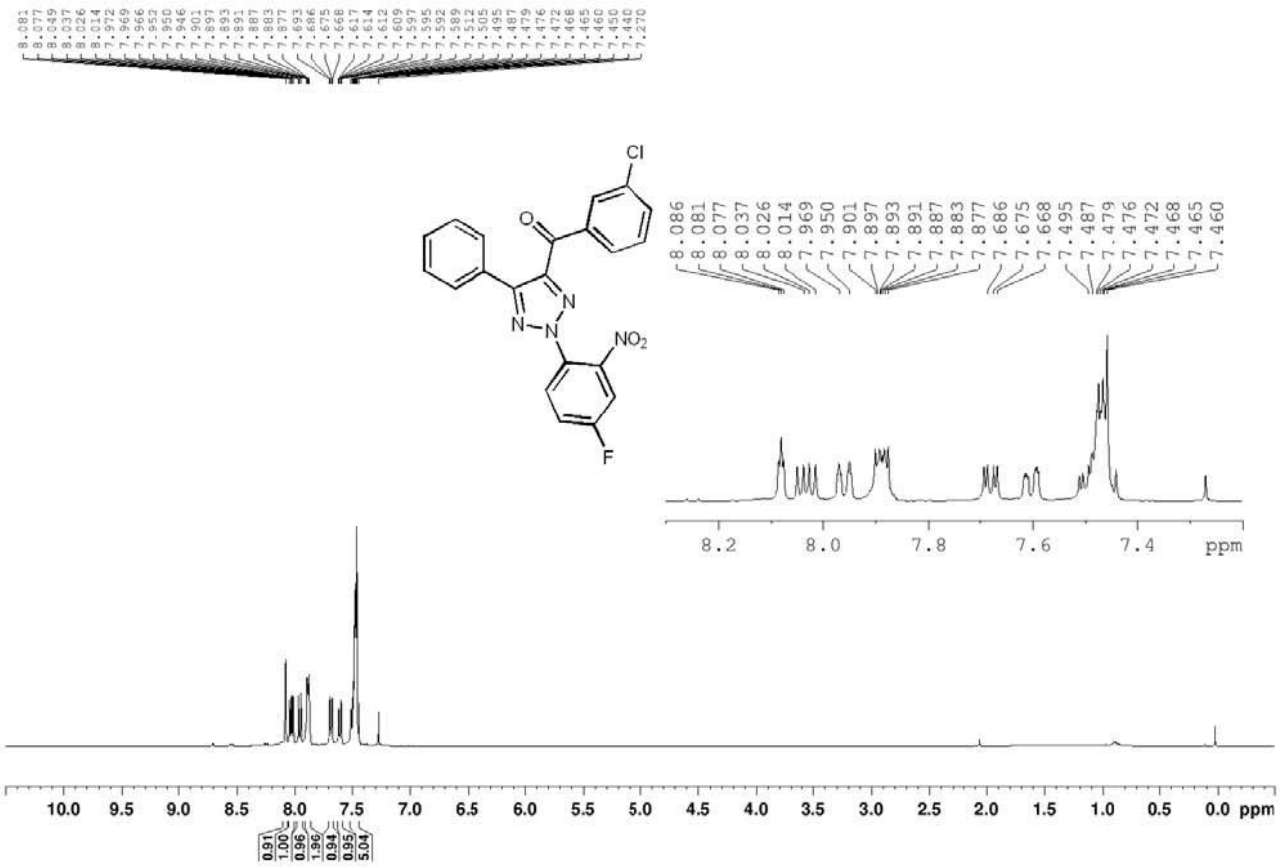


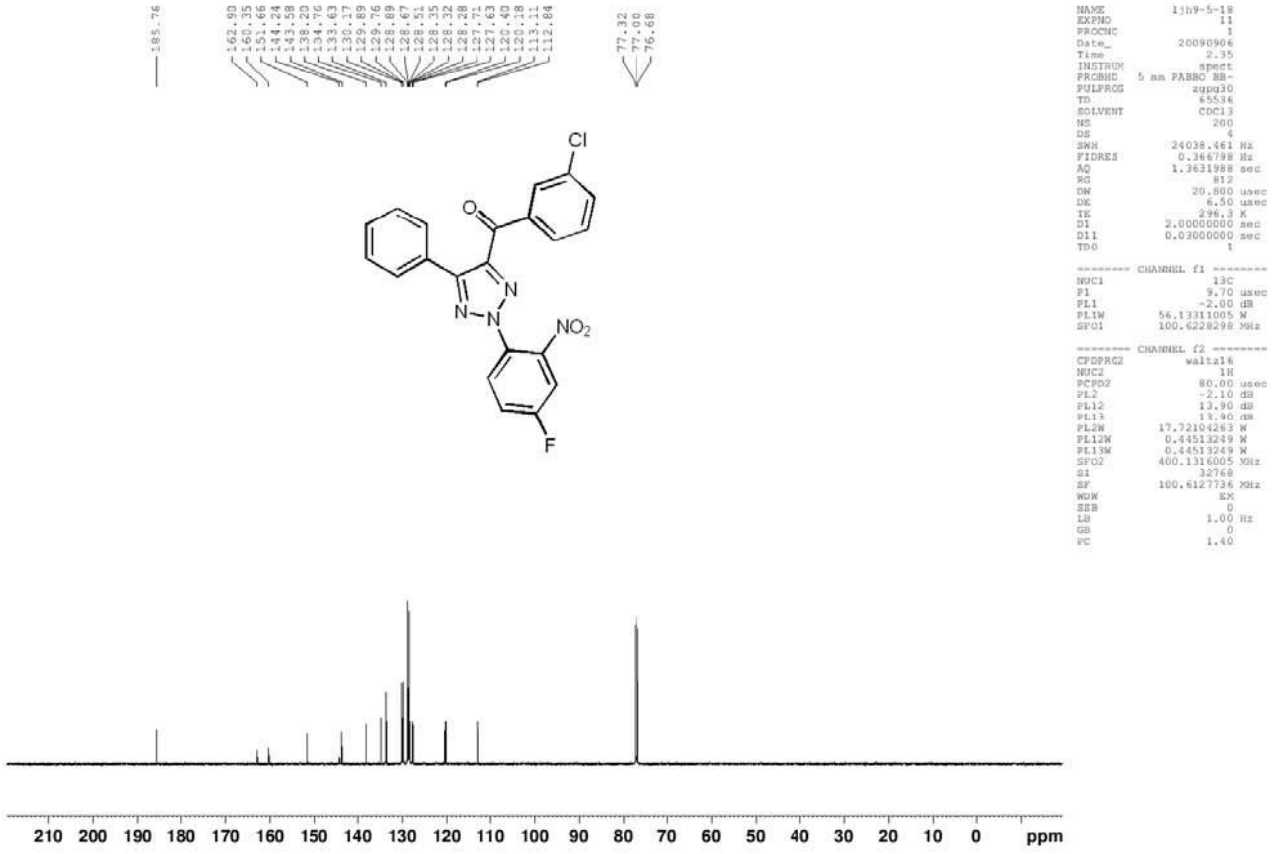

```
NAME                 1jh9-1-b
EXPNO                      11
PROCNO                      1
Date_              20090901
Time                    21.55
INSTRUM                  spect
PROBHD     5 mm PABBO BB-
PULPROG                 zgpg30
TD                       65536
SOLVENT                  CDCl3
NS                         200
DS                           4
SWH                24038.461 Hz
FIDRES             0.366798 Hz
AQ                 1.3631988 sec
RG                         101
DW                    20.800 usec
DE                     6.50 usec
TE                     296.5 K
D1                 2.00000000 sec
D11                0.03000000 sec
TD0                          1

======== CHANNEL f1 ========
NUC1                      13C
P1                       9.70 usec
PL1                     -2.00 dB
PL1W               56.13311005 W
SFO1               100.6228298 MHz

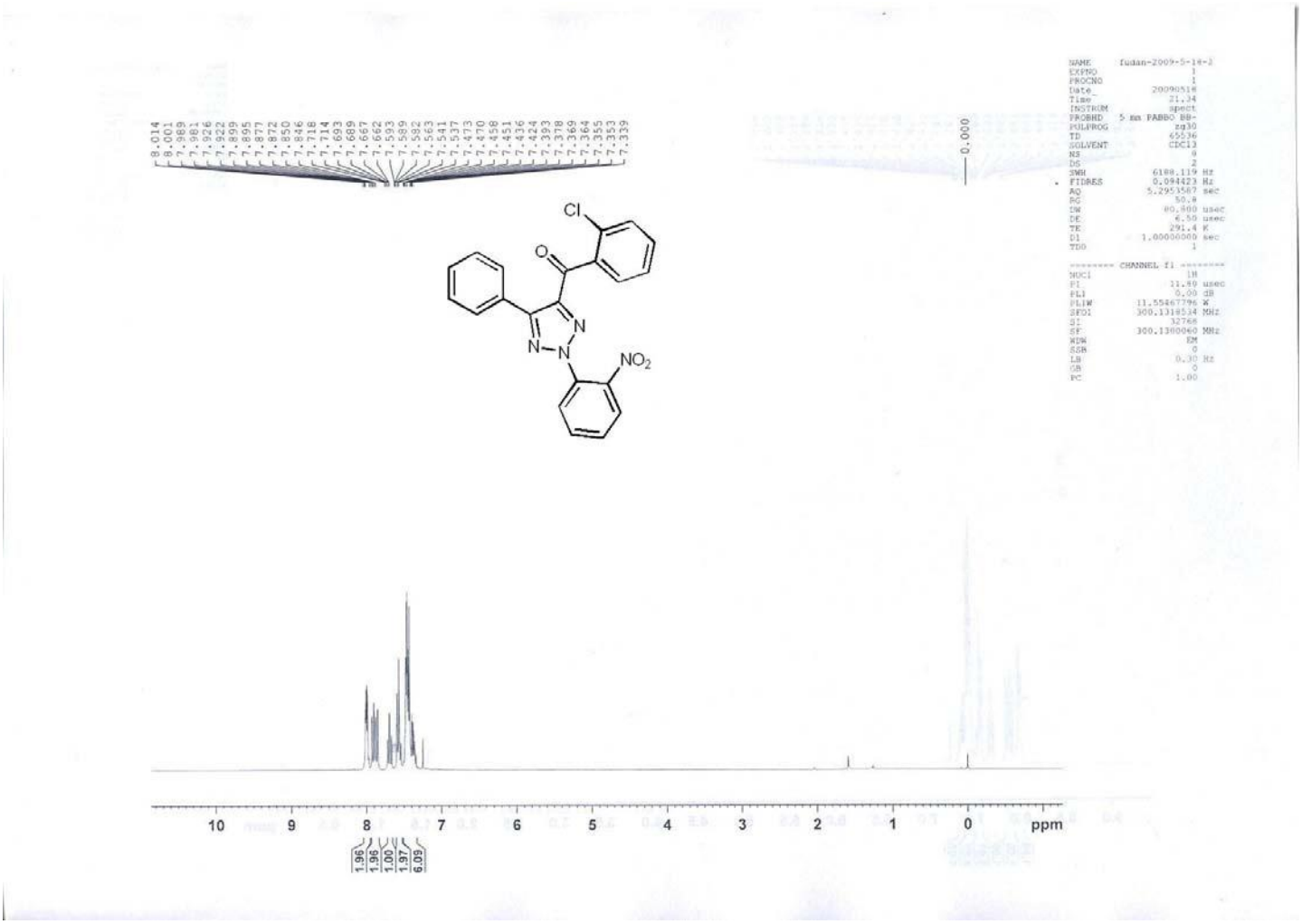
======== CHANNEL f2 ========
CPDPRG2                waltz16
NUC2                       1H
PCPD2                   80.00 usec
PL2                     -2.10 dB
PL12                    13.90 dB
PL13                    13.90 dB
PL2W               17.72104263 W
PL12W               0.44513249 W
PL13W               0.44513249 W
SFO2               400.1316005 MHz
SI                        32768
SF                 100.6127736 MHz
WDW                         EM
SSB                          0
LB                        1.00 Hz
GB                           0
PC                        1.40
```

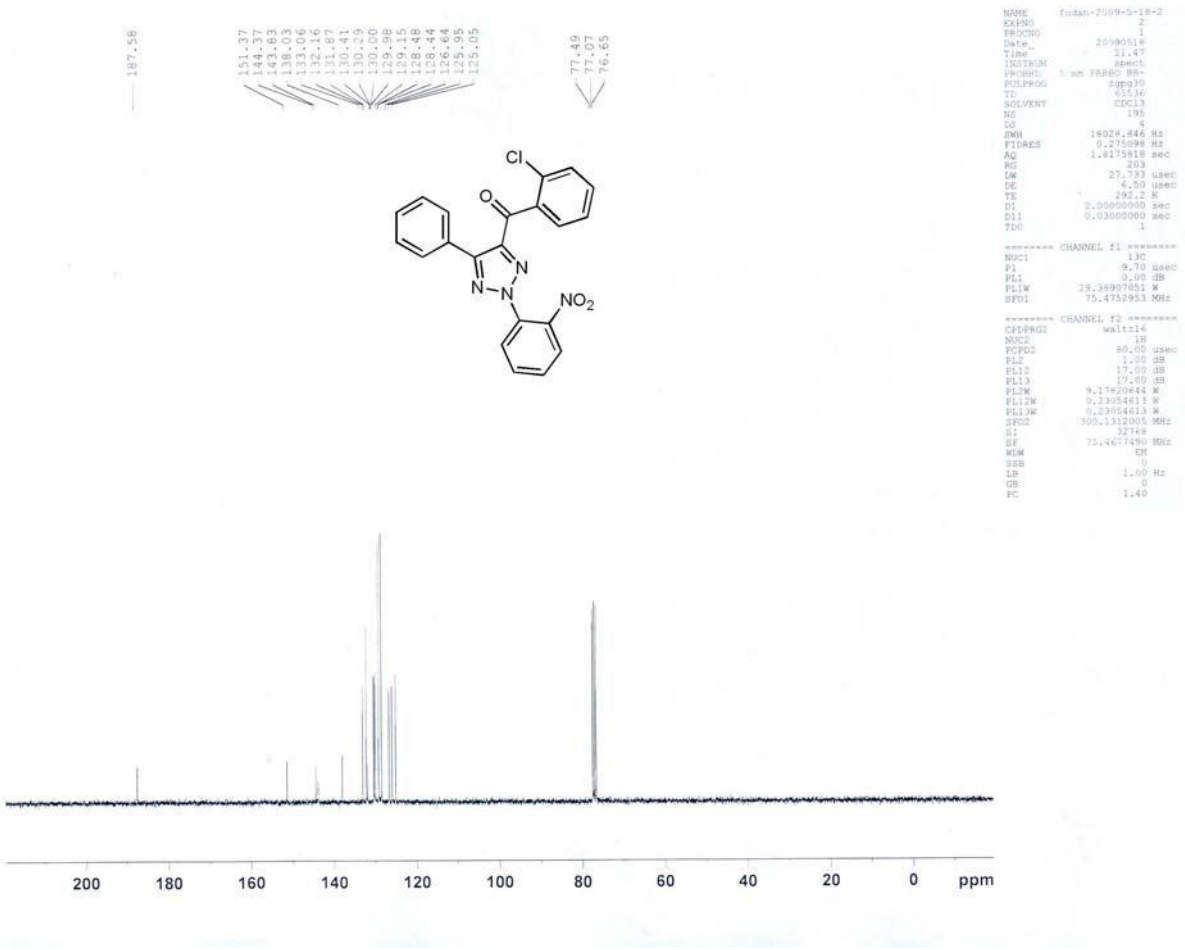
2ba:



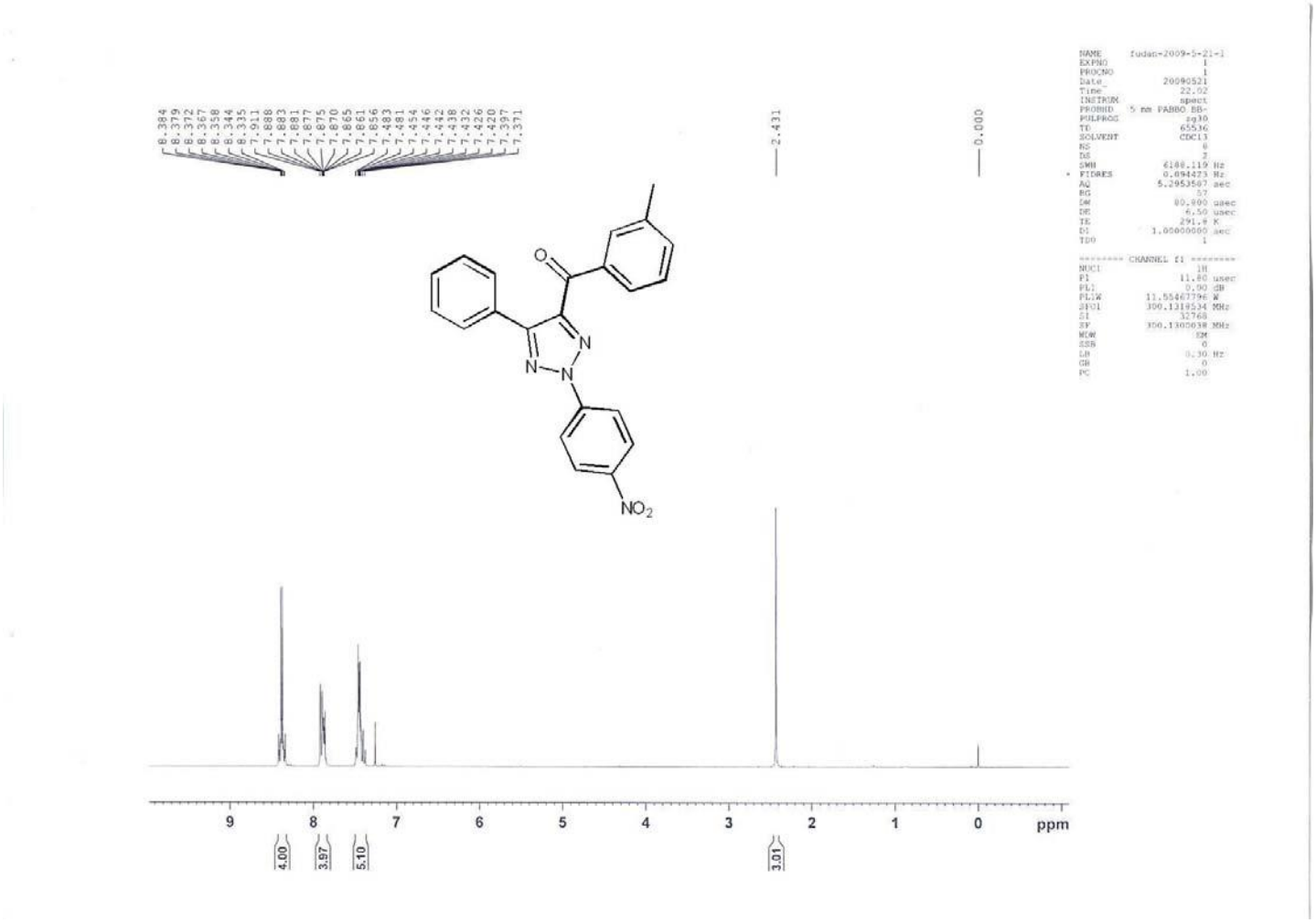


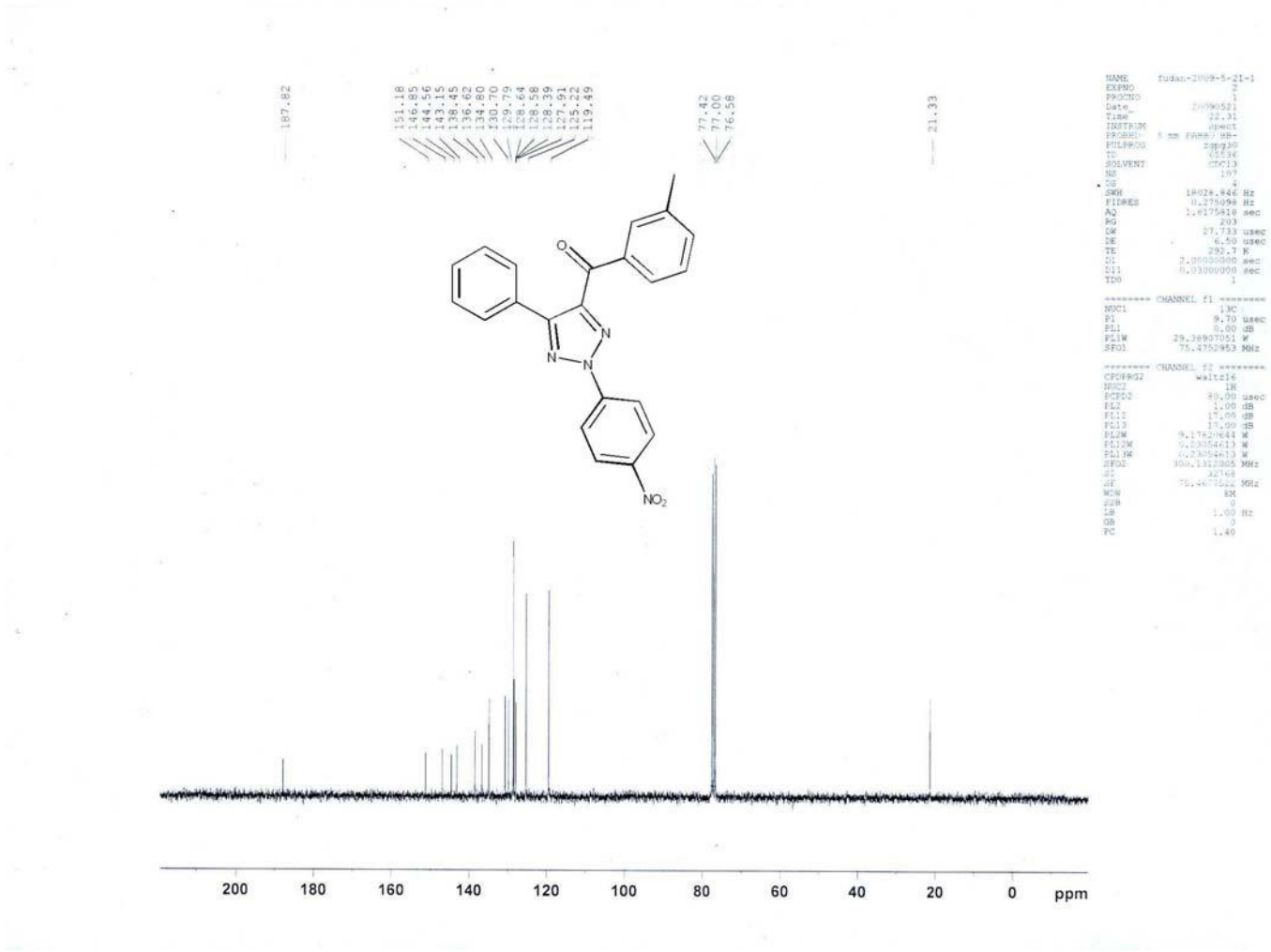
2ca:



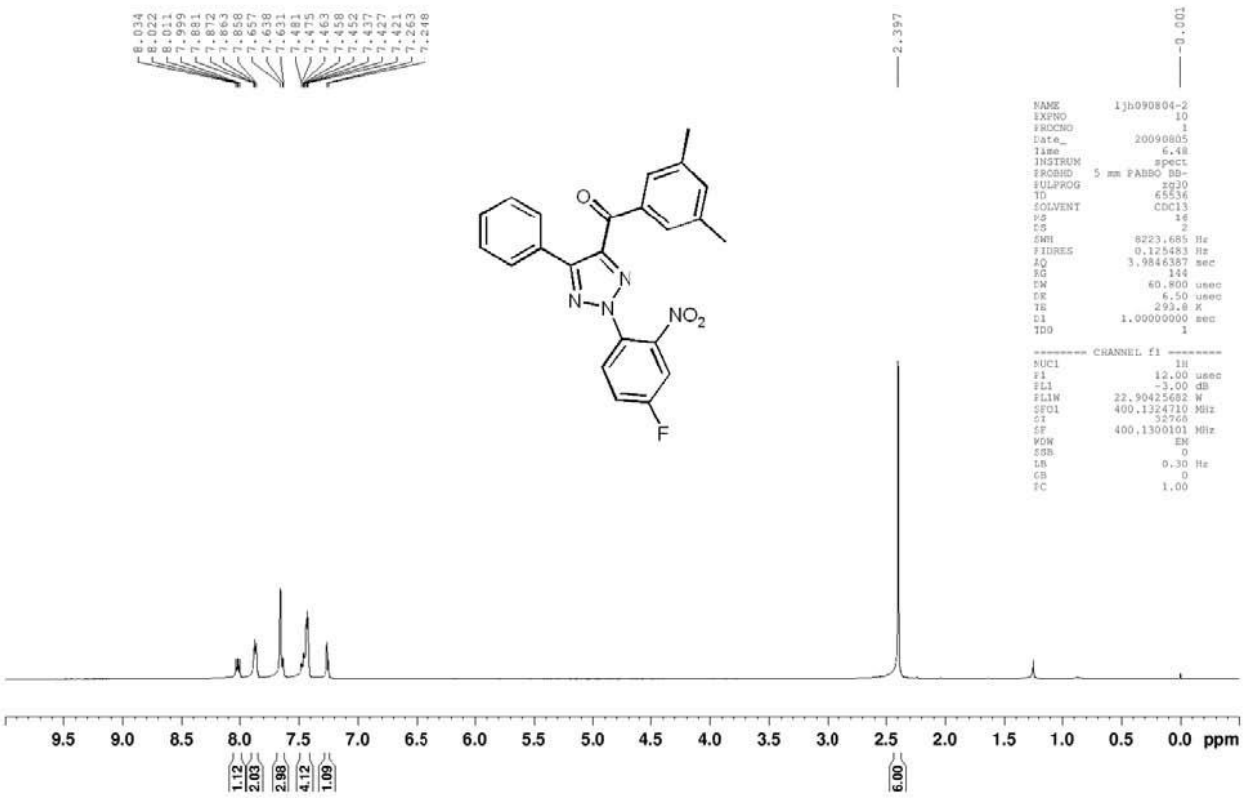


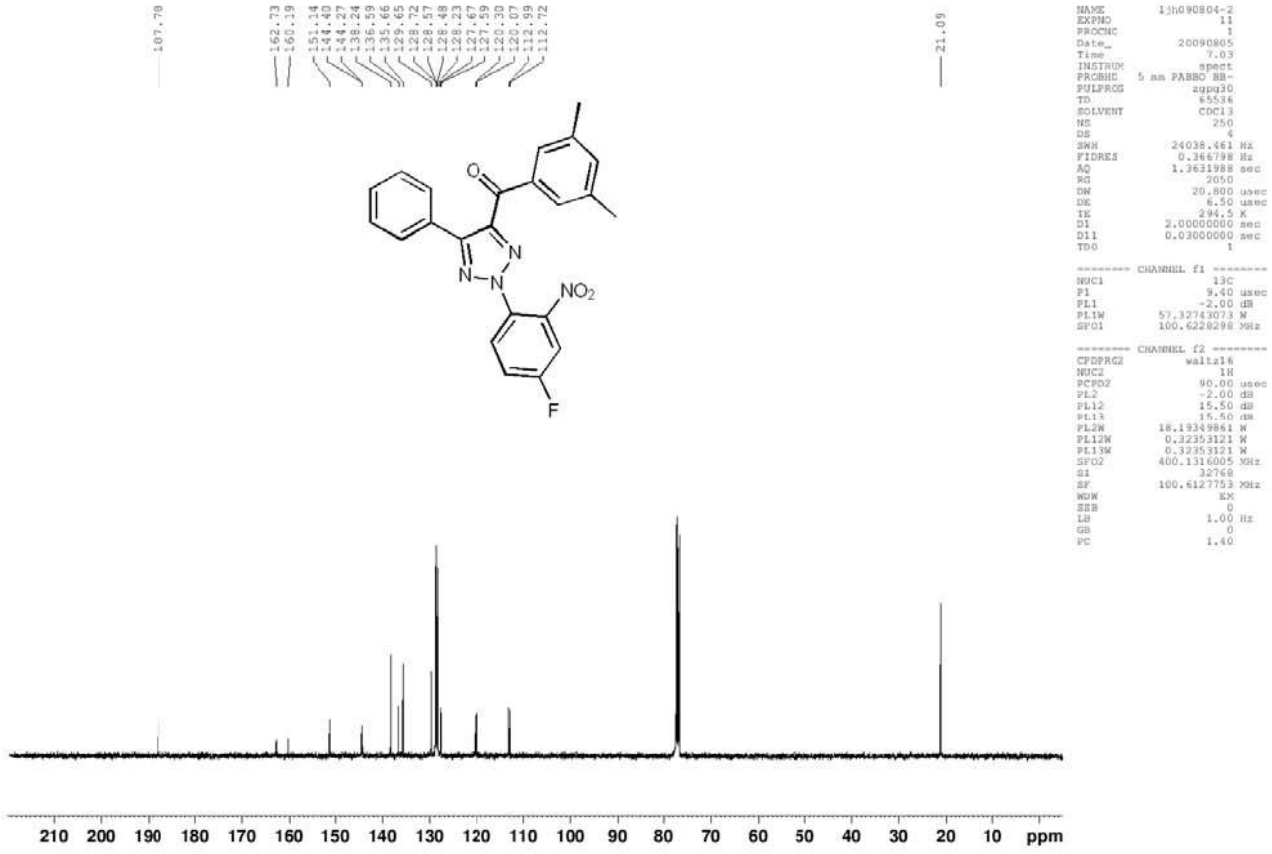
2da:





2ea:



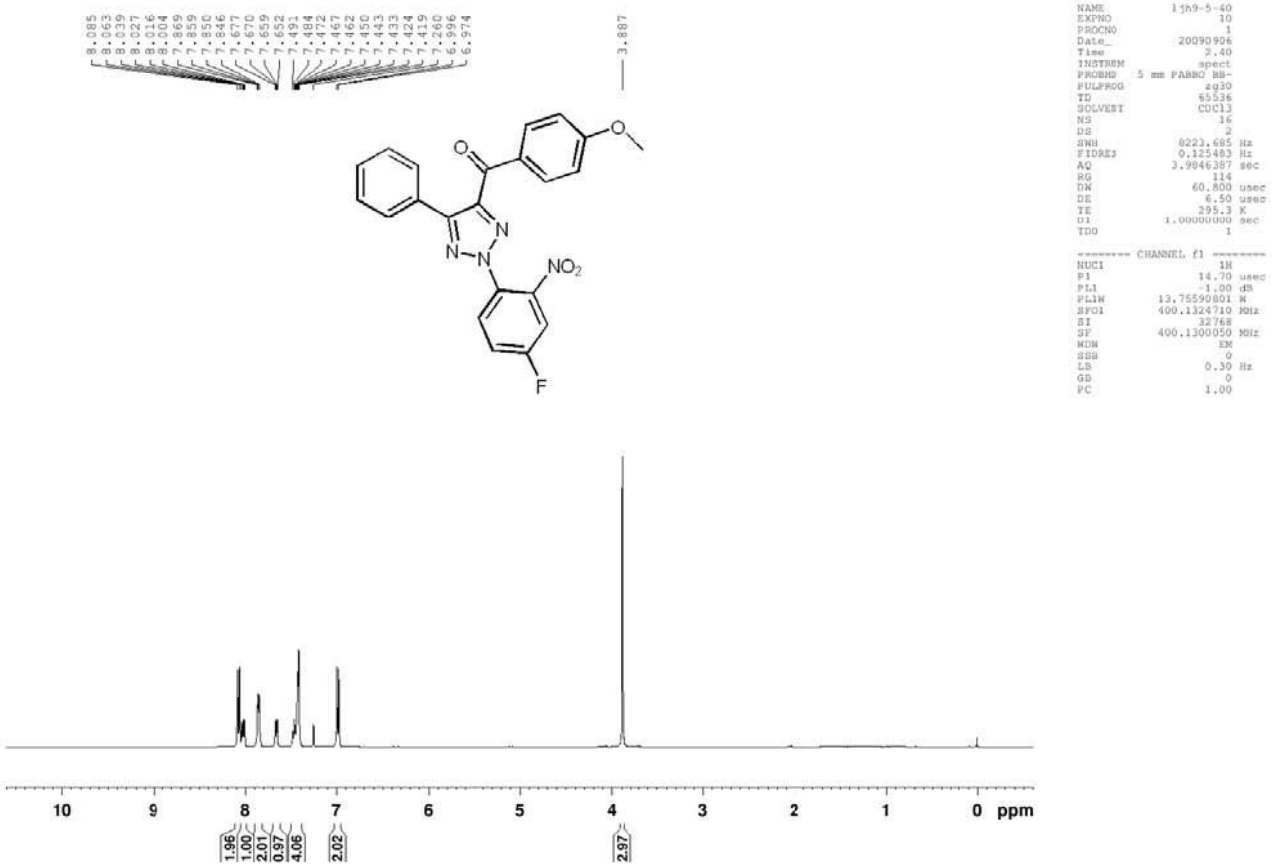



```
NAME                1jh090804-2
EXPNO                        11
PROCNO                        1
Date_                  20090805
Time                       7.03
INSTRUM                   spect
PROBHD     5 mm PABBO BB-
PULPROG                 zgpg30
TD                       65536
SOLVENT                  CDCl3
NS                         250
DS                           4
SWH                  24038.461 Hz
FIDRES               0.366798 Hz
AQ                   1.3631988 sec
RG                        2050
DW                      20.800 usec
DE                       6.50 usec
TE                      294.5 K
D1                   2.00000000 sec
D11                  0.03000000 sec
TD0                          1

======== CHANNEL f1 ========
NUC1                       13C
P1                        9.40 usec
PL1                      -2.00 dB
PL1W                57.32743073 W
SFO1               100.6228298 MHz

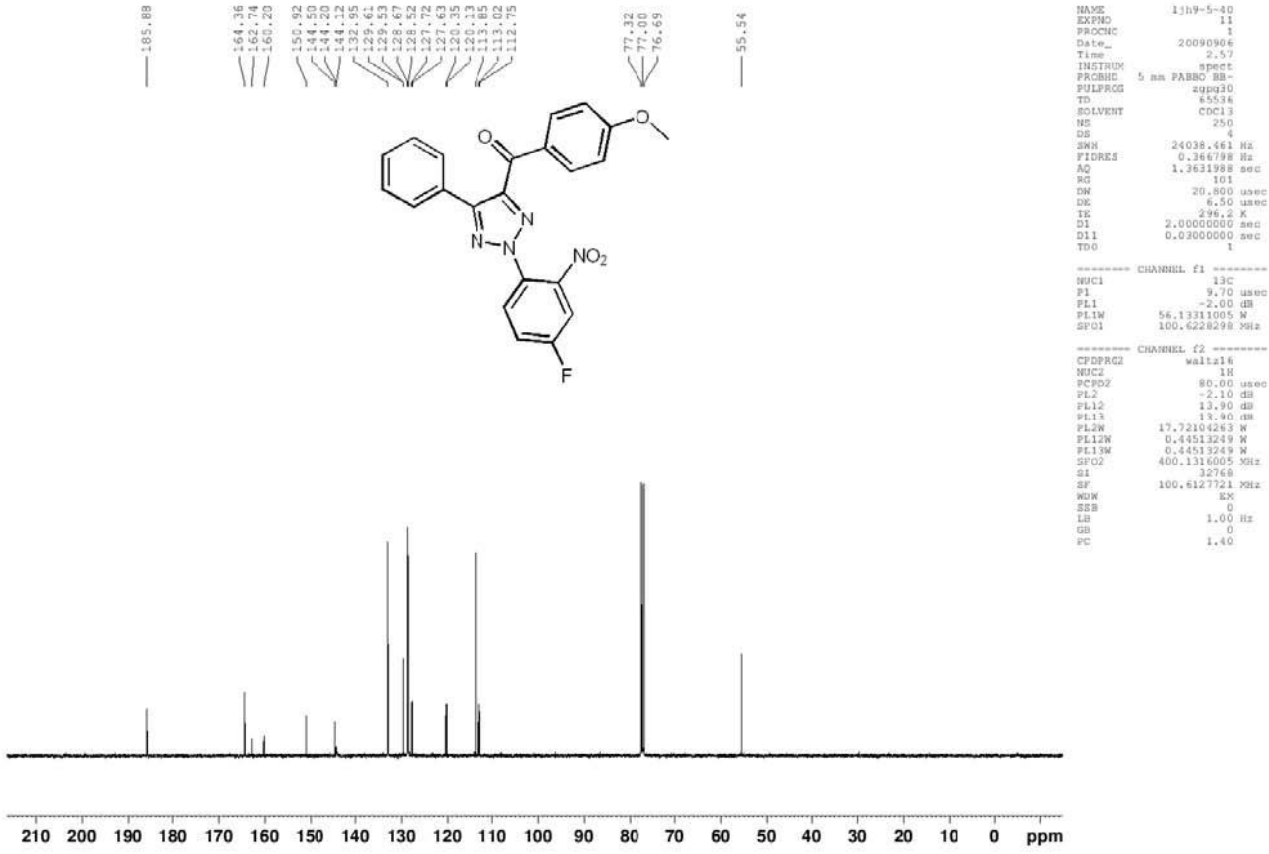
======== CHANNEL f2 ========
CPDPRG2                waltz16
NUC2                       1H
PCPD2                    90.00 usec
PL2                      -2.00 dB
PL12                     15.50 dB
PL13                     15.50 dB
PL2W                18.19349861 W
PL12W                0.32353121 W
PL13W                0.32353121 W
SFO2               400.1316005 MHz
SI                       32768
SF                 100.6127753 MHz
WDW                         EM
SSB                          0
LB                        1.00 Hz
GB                           0
PC                        1.40
```

2fa:



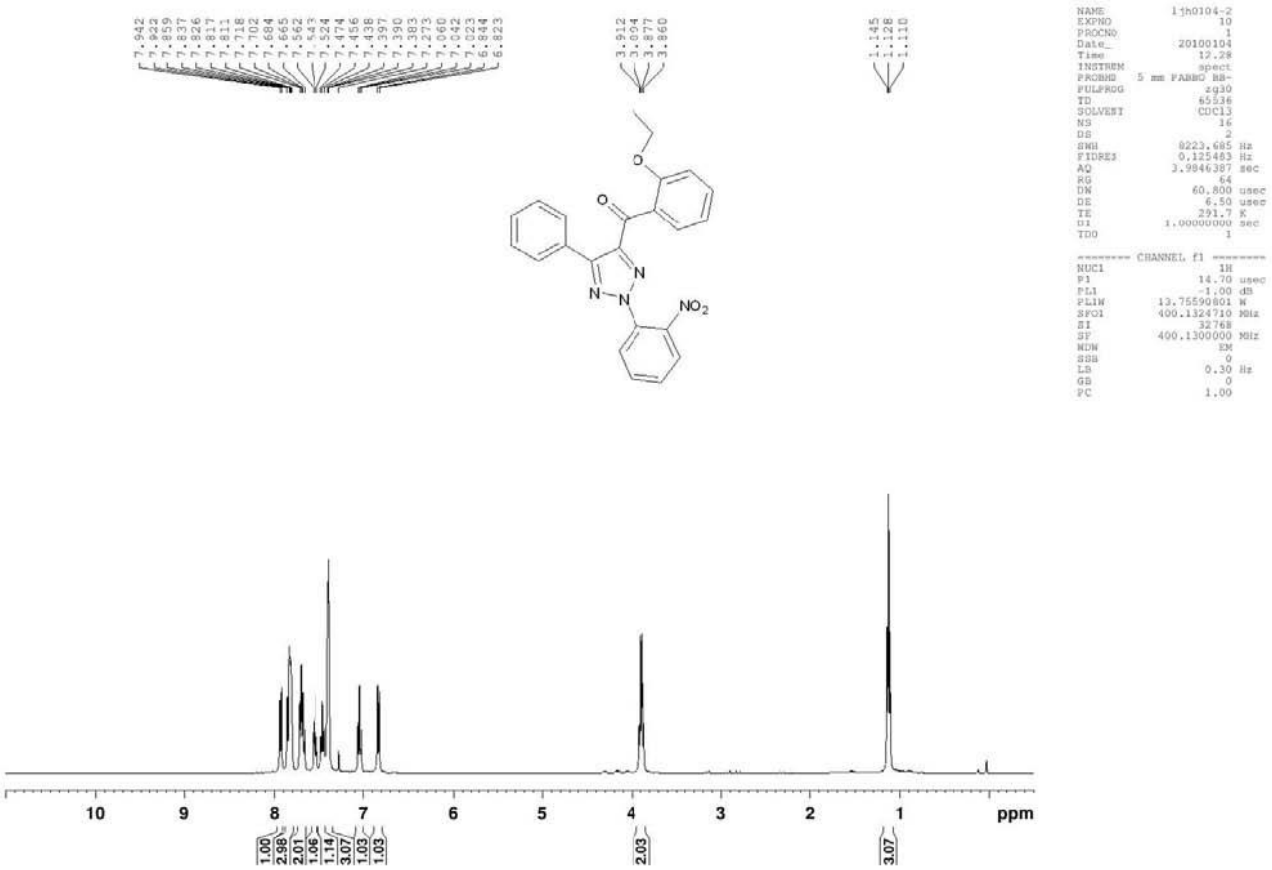

```
NAME                1jh9-5-40
EXPNO                      10
PROCNO                      1
Date_                20090906
Time                     2.40
INSTRM                   spect
PROBHD     5 mm PABBO BB-
PULPROG                 zg30
TD                     65536
SOLVENT                CDCl3
NS                        16
DS                         2
SWH                 8223.685 Hz
FIDRES              0.125483 Hz
AQ                  3.9846387 sec
RG                       114
DW                    60.800 usec
DE                     6.50 usec
TE                    295.3 K
D1                 1.0000000 sec
TD0                        1

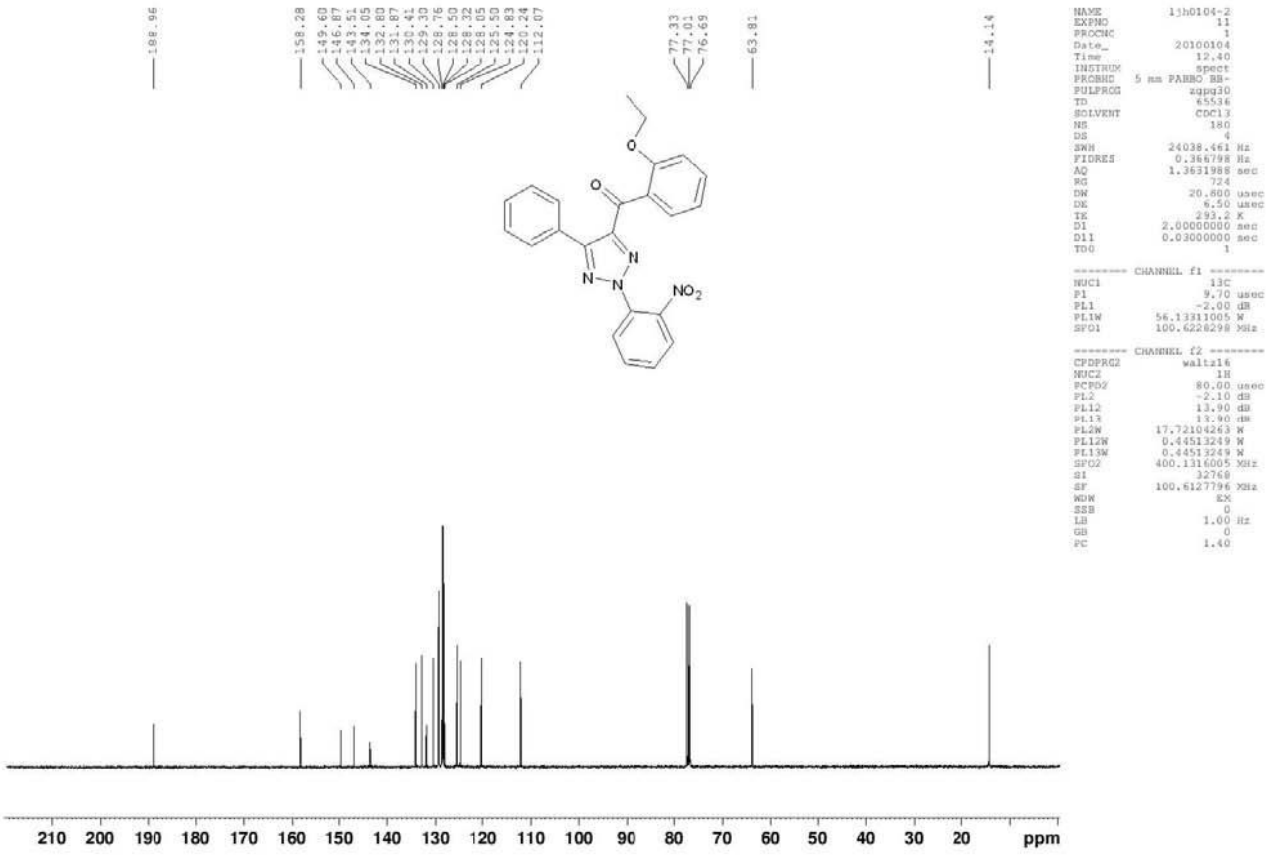
======== CHANNEL f1 ========
NUC1                      1H
P1                     14.70 usec
PL1                    -1.00 dB
PL1W            13.75590801 W
SFO1            400.1324710 MHz
SI                     32768
SF              400.1300050 MHz
WDW                       EM
SSB                        0
LB                     0.30 Hz
GB                         0
PC                     1.00
```



NAME	1jh9-5-40
EXPNO	11
PROCNO	1
Date_	20090906
Time	2.57
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	250
DS	4
SWH	24038.461 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	101
DW	20.800 usec
DE	6.50 usec
TE	296.2 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.70 usec
PL1	-2.00 dB
PL1W	56.13311005 W
SFO1	100.6228298 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	-2.10 dB
PL12	13.90 dB
PL13	13.90 dB
PL2W	17.72104263 W
PL12W	0.44513249 W
PL13W	0.44513249 W
SFO2	400.1316005 MHz
SI	32768
SF	100.6127721 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

2ga:



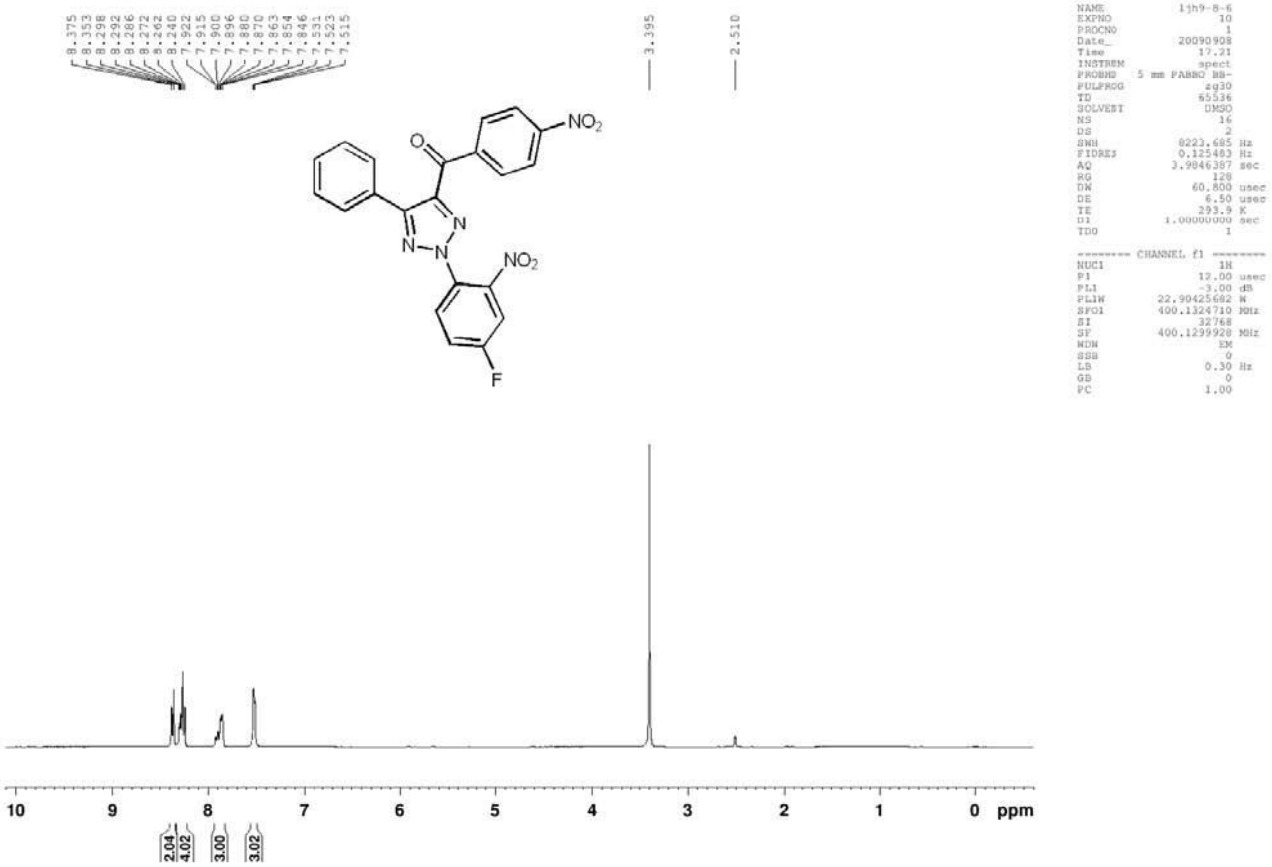



```
NAME                11h0104-2
EXPNO                      11
PROCNO                      1
Date_              20100104
Time                    12.40
INSTRUM                 spect
PROBHD     5 mm PABBO BB-
PULPROG                 zgpg30
TD                       65536
SOLVENT                 CDCl3
NS                        180
DS                          4
SWH                24038.461 Hz
FIDRES             0.366798 Hz
AQ                 1.3631988 sec
RG                        724
DW                    20.800 usec
DE                     6.50 usec
TE                    293.2 K
D1                 2.00000000 sec
D11                0.03000000 sec
TD0                         1

======== CHANNEL f1 ========
NUC1                      13C
P1                       9.70 usec
PL1                     -2.00 dB
PL1W              56.13311005 W
SFO1              100.6228298 MHz

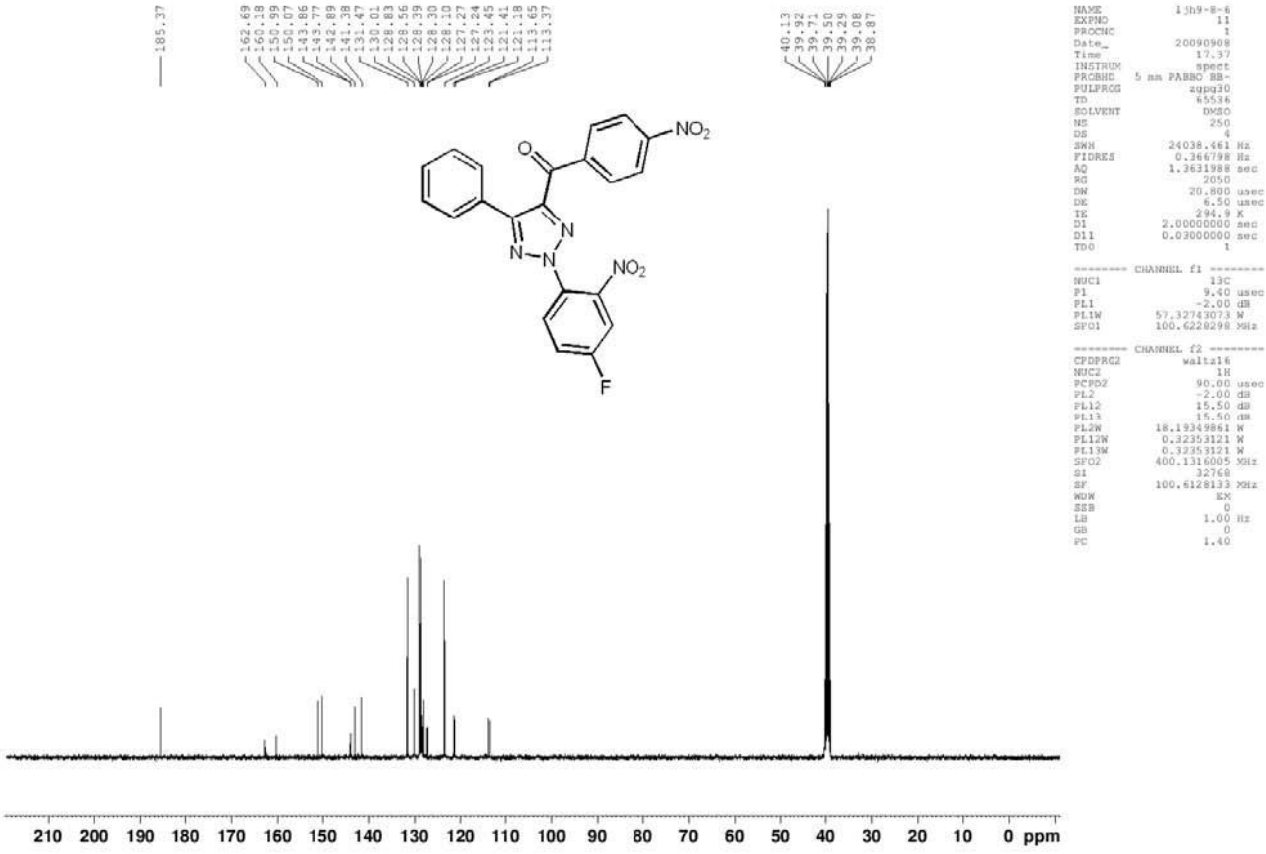
======== CHANNEL f2 ========
CPDPRG2                 waltz16
NUC2                        1H
PCPD2                   80.00 usec
PL2                     -2.10 dB
PL12                    13.90 dB
PL13                    13.90 dB
PL2W              17.72104263 W
PL12W              0.44513249 W
PL13W              0.44513249 W
SFO2              400.1316005 MHz
SI                       32768
SF                100.6127796 MHz
WDW                        EM
SSB                         0
LB                       1.00 Hz
GB                          0
PC                       1.40
```

2ha:

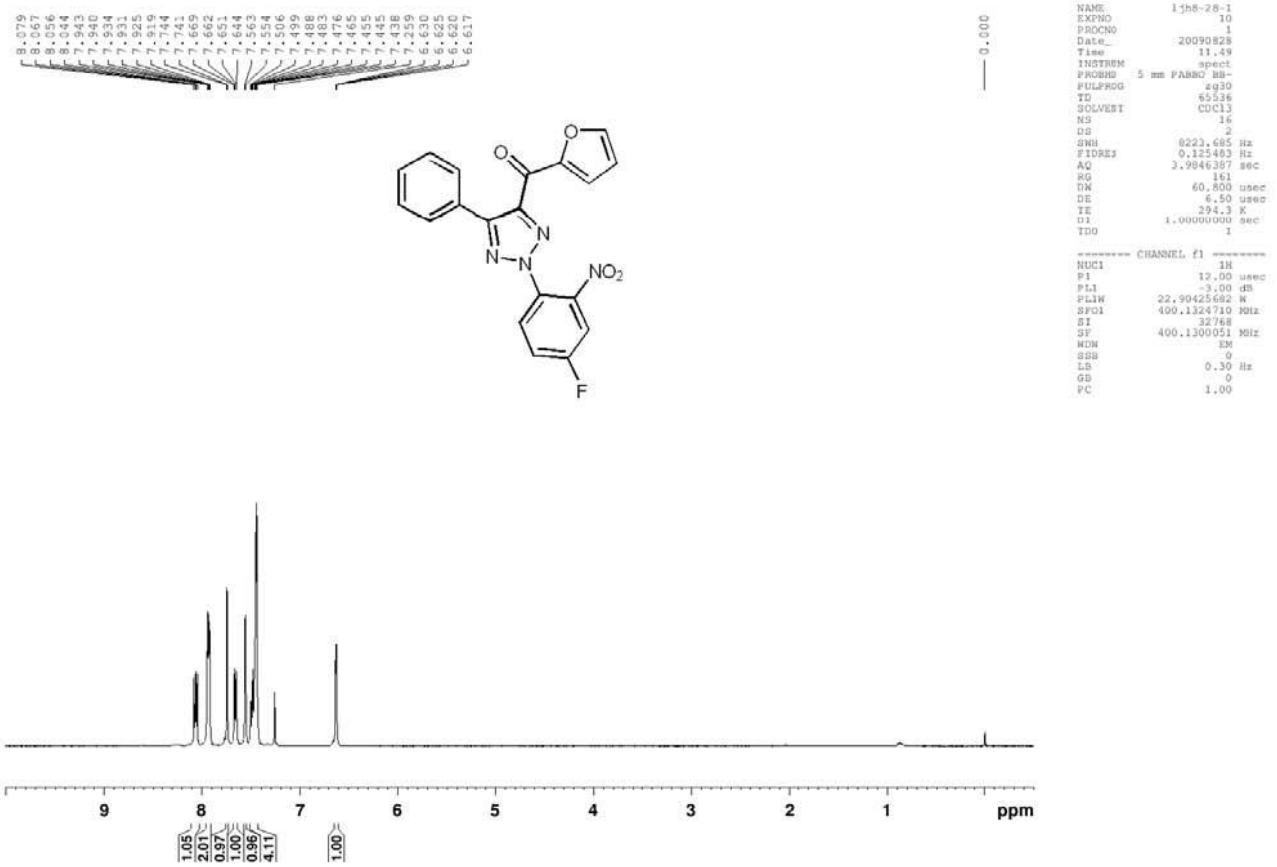


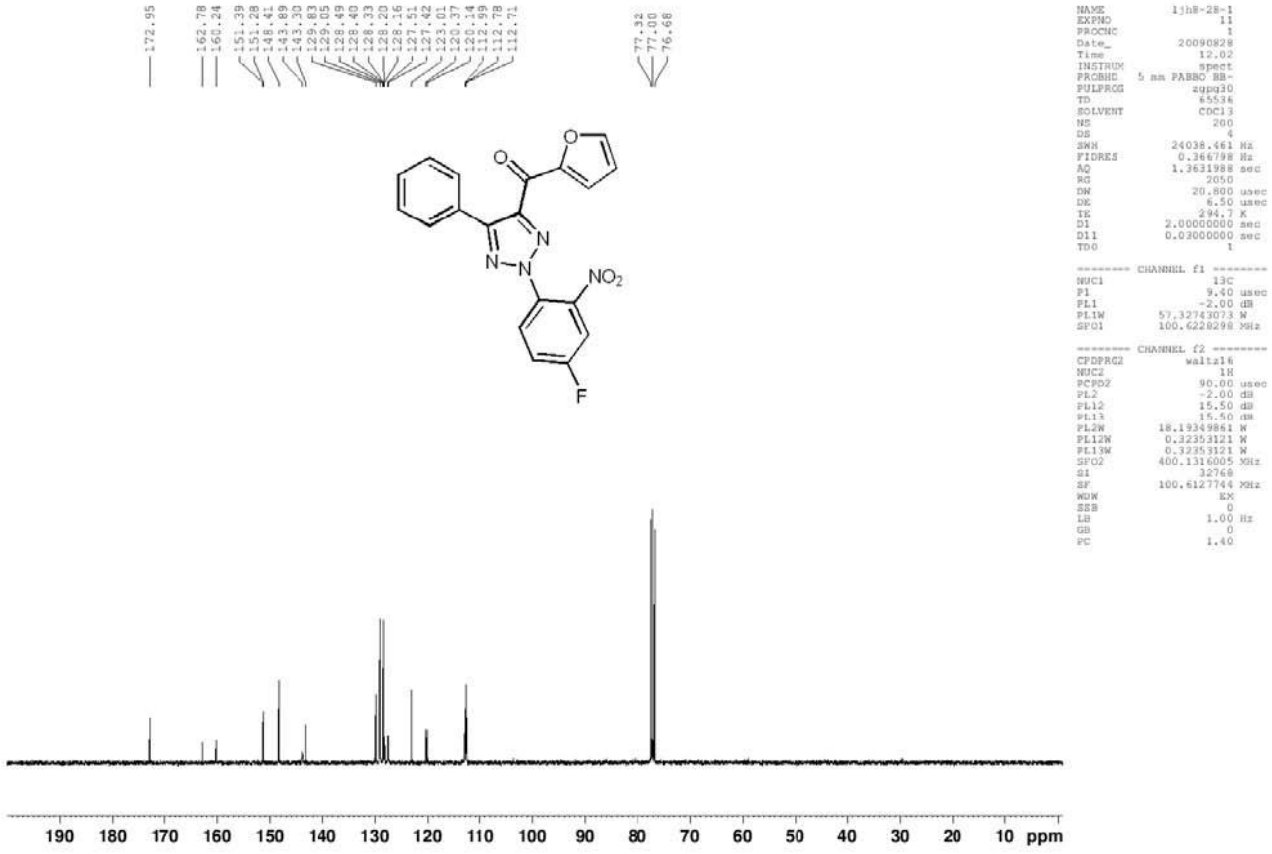

```
NAME                1jh9-8-6
EXPNO                     10
PROCNO                     1
Date_               20090908
Time                   17.21
INSTRUM                spect
PROBHD     5 mm PABBO BB-
PULPROG                zg30
TD                    65536
SOLVENT                DMSO
NS                        16
DS                         2
SWH                8223.685 Hz
FIDRES             0.125483 Hz
AQ                 3.9846387 sec
RG                       128
DW                    60.800 usec
DE                     6.50 usec
TE                    293.9 K
D1                 1.0000000 sec
TD0                        1

======== CHANNEL f1 ========
NUC1                      1H
P1                     12.00 usec
PL1                    -3.00 dB
PL1W            22.90425682 W
SFO1            400.1324710 MHz
SI                     32768
SF              400.1299920 MHz
WDW                       EM
SSB                        0
LB                     0.30 Hz
GB                         0
PC                     1.00
```



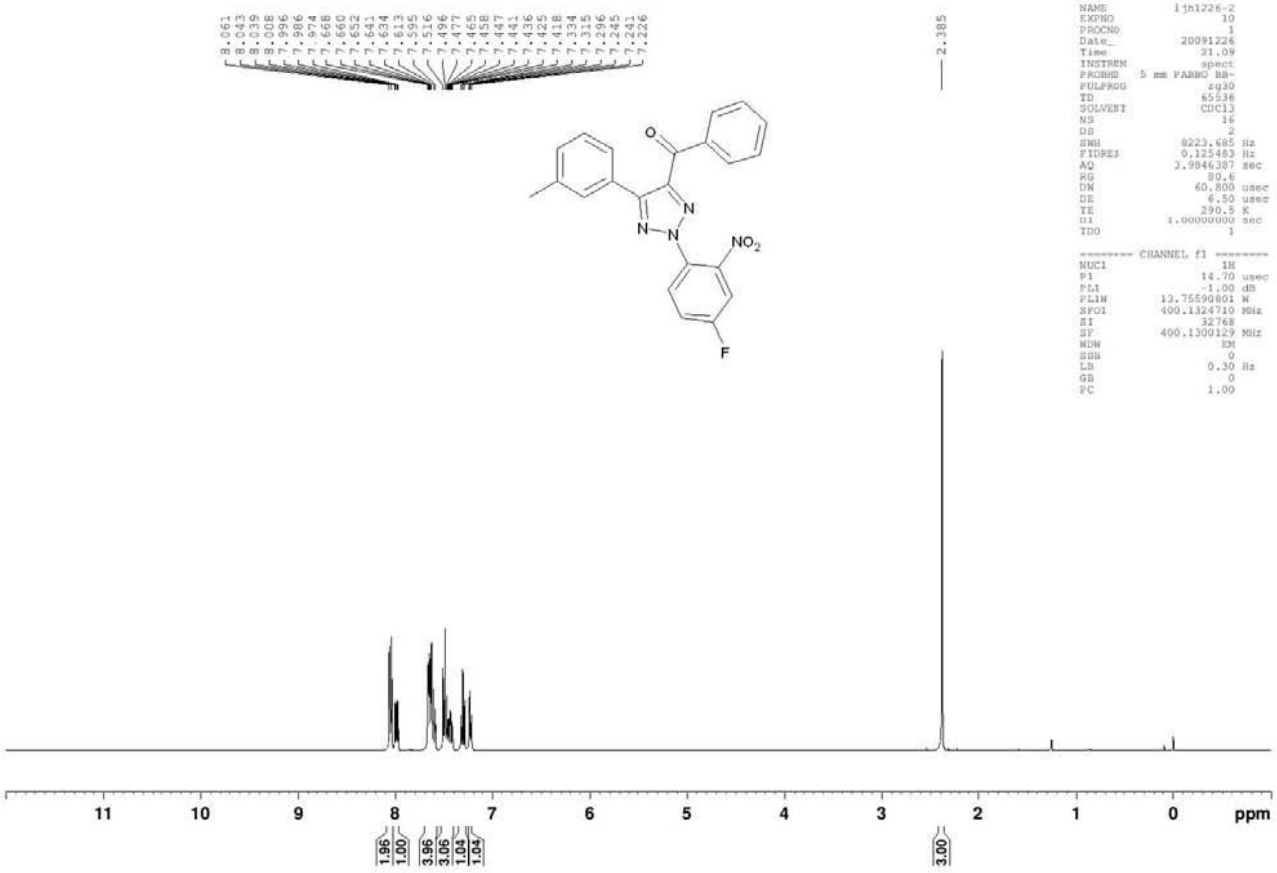
2ia:

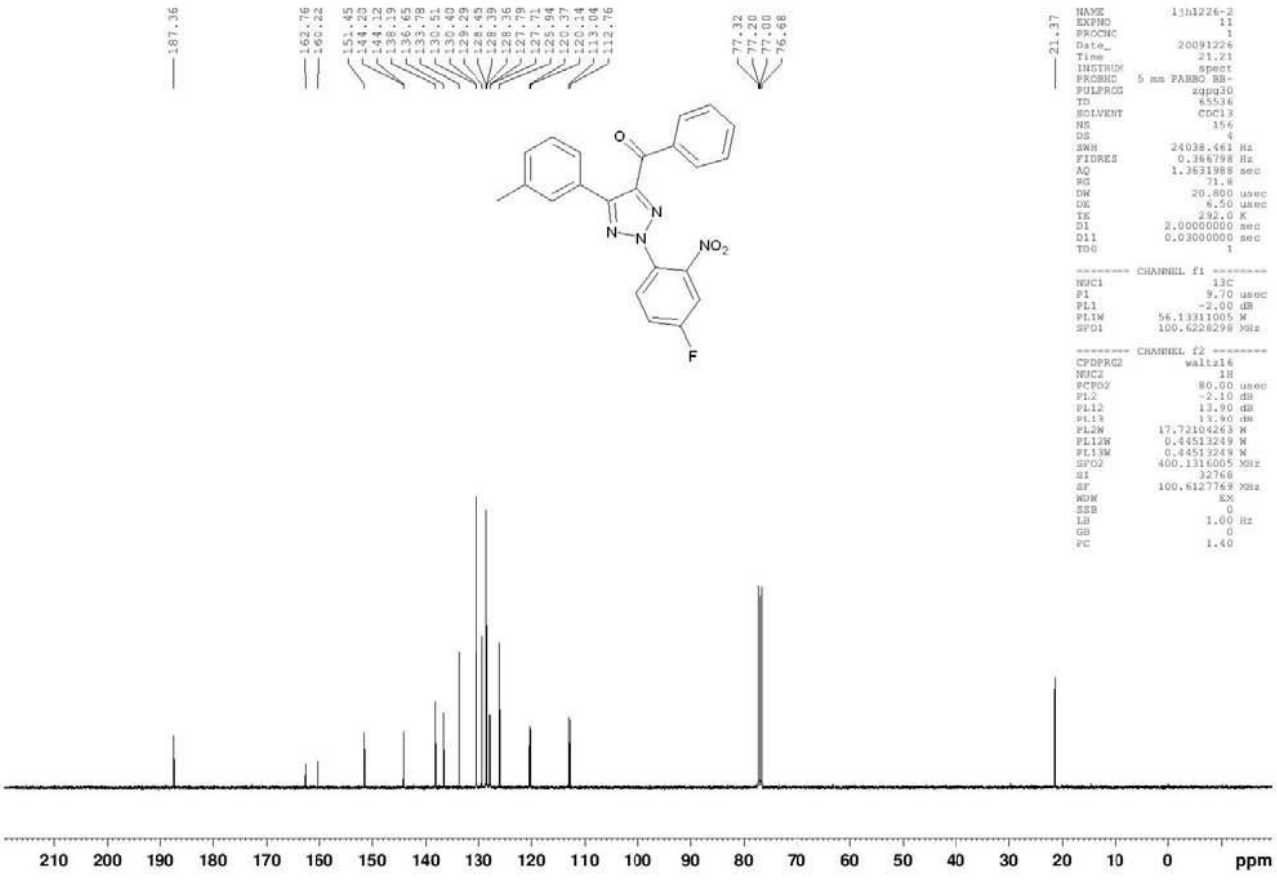




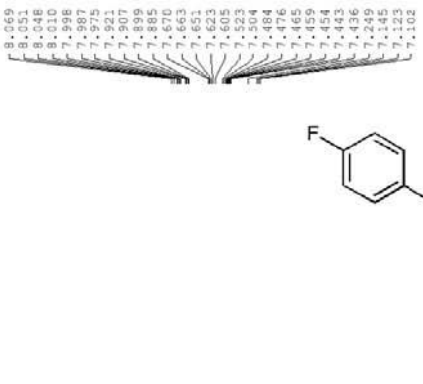
NAME	ljh8-28-1
EXPNO	11
PROCNO	1
Date_	20090828
Time	12.02
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	200
DS	4
SWH	24038.461 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	2050
DW	20.800 usec
DE	6.50 usec
TE	294.7 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
PL1	-2.00 dB
PL1W	57.32743073 W
SFO1	100.6228298 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	90.00 usec
PL2	-2.00 dB
PL12	15.50 dB
PL13	15.50 dB
PL2W	18.19349861 W
PL12W	0.32353121 W
PL13W	0.32353121 W
SFO2	400.1316005 MHz
SI	32768
SF	100.6127744 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

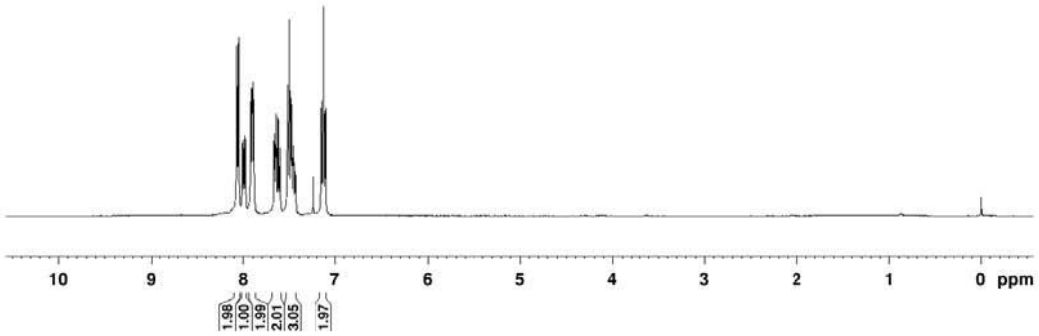
2ja:

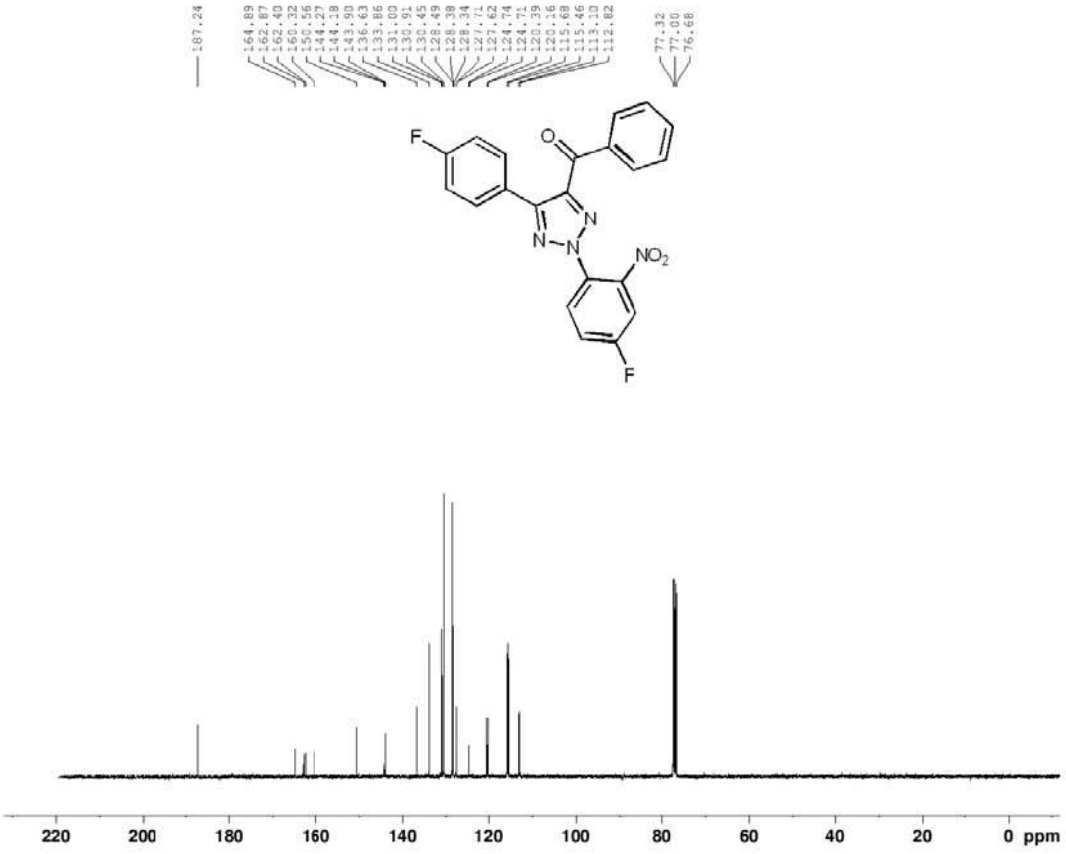




2ka:





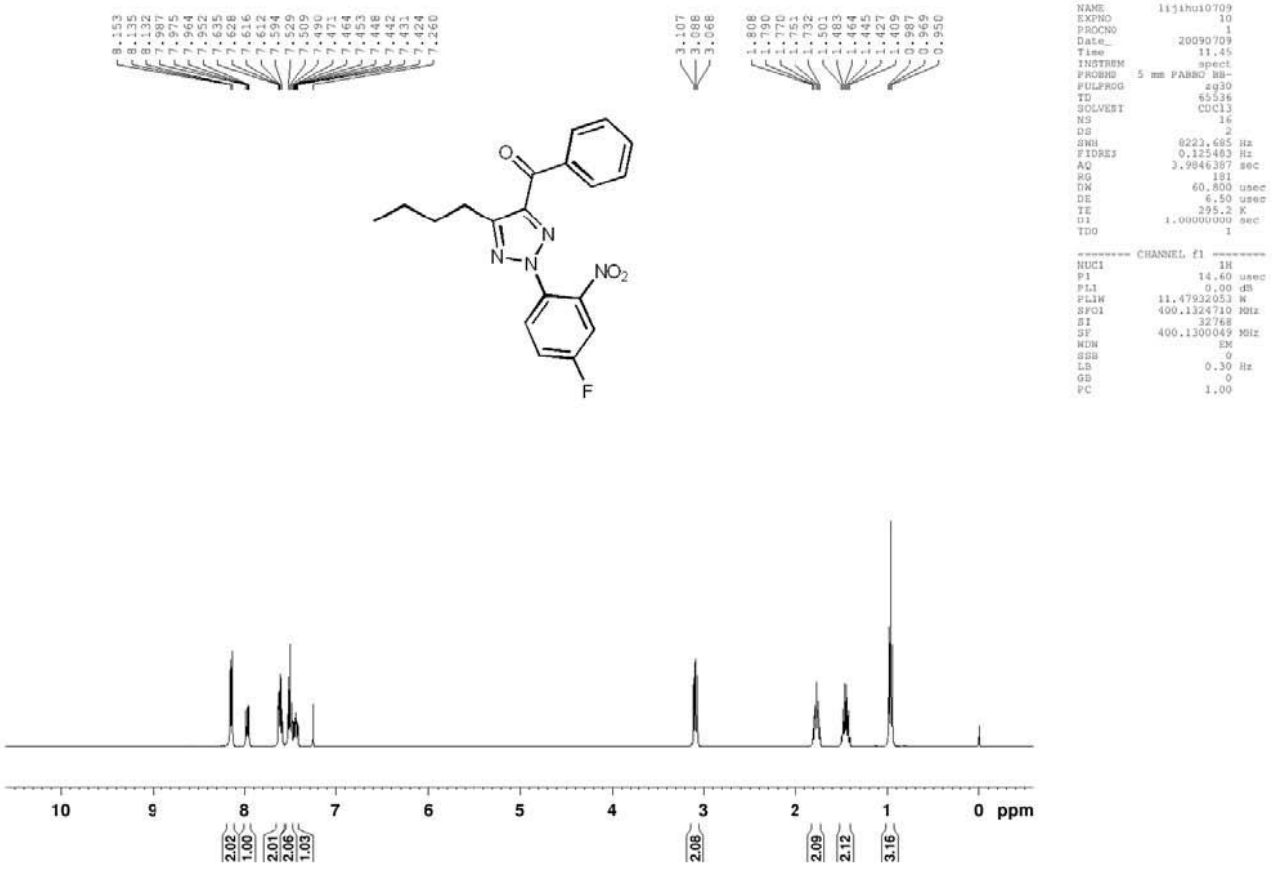


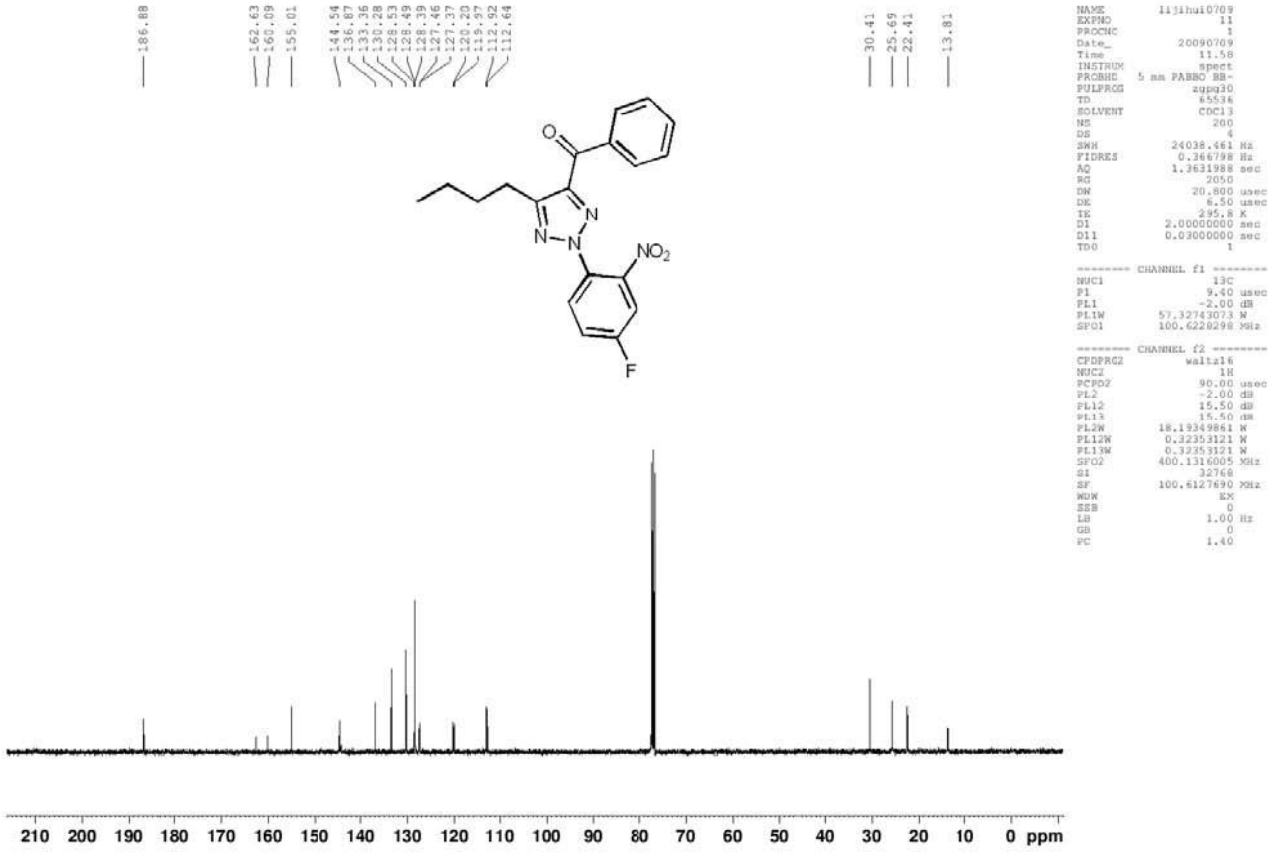

```
NAME                 1jh9-4-18
EXPNO                       11
PROCNO                       1
Date_             20090903
Time                     21.40
INSTRUM                  spect
PROBHD     5 mm PABBO BB-
PULPROG                 zgpg30
TD                       65536
SOLVENT                  CDCl3
NS                         200
DS                           4
SWH                  24038.461 Hz
FIDRES                0.366798 Hz
AQ                    1.3631988 sec
RG                         144
DW                      20.800 usec
DE                       6.50 usec
TE                      296.7 K
D1                    2.00000000 sec
D11                   0.03000000 sec
TD0                          1

======== CHANNEL f1 ========
NUC1                        13C
P1                         9.70 usec
PL1                       -2.00 dB
PL1W                56.13311005 W
SFO1               100.6228298 MHz

======== CHANNEL f2 ========
CPDPRG2                 waltz16
NUC2                        1H
PCPD2                     80.00 usec
PL2                       -2.10 dB
PL12                      13.90 dB
PL13                      13.90 dB
PL2W                17.72104263 W
PL12W                0.44513249 W
PL13W                0.44513249 W
SFO2               400.1316005 MHz
SI                       32768
SF                 100.6127730 MHz
WDW                         EM
SSB                          0
LB                        1.00 Hz
GB                           0
PC                        1.40
```

2la:



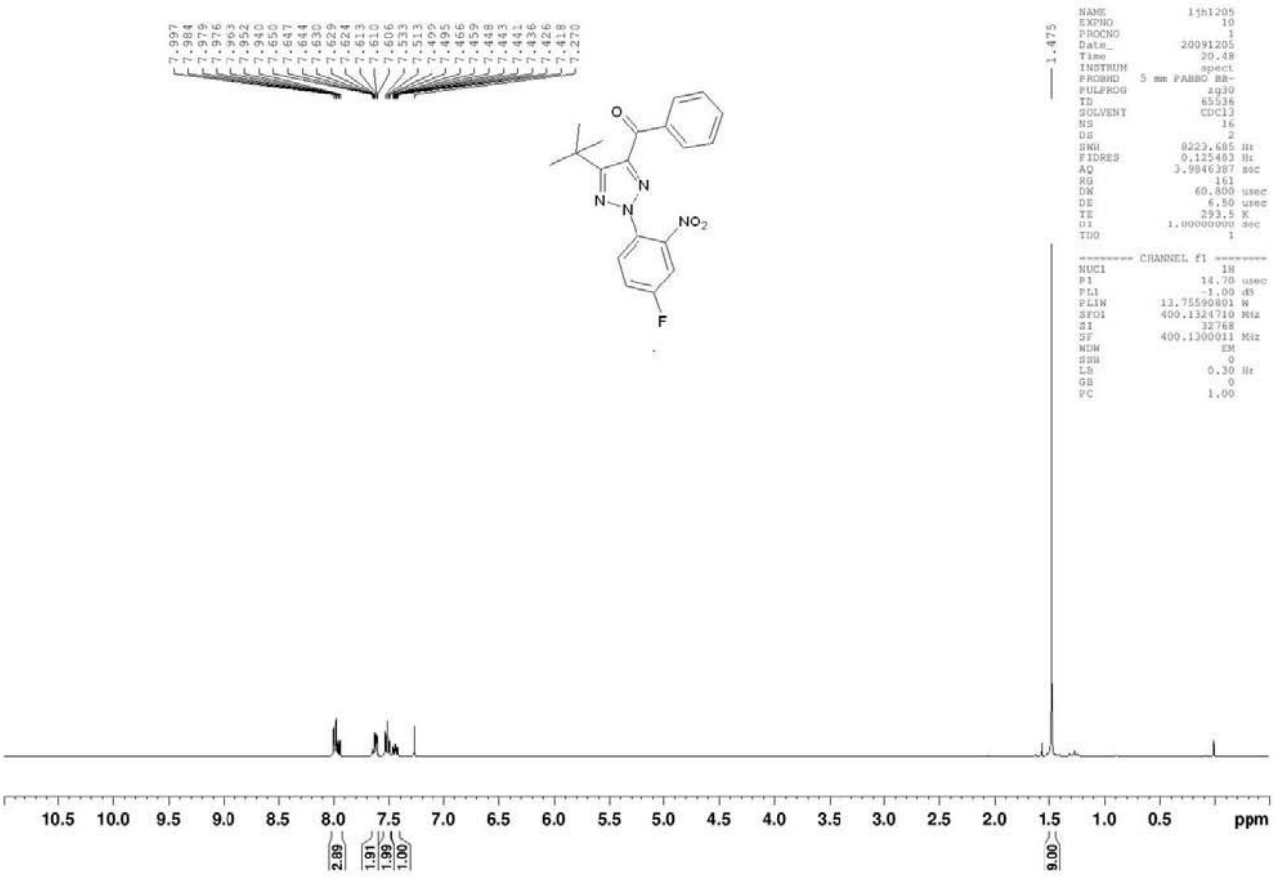


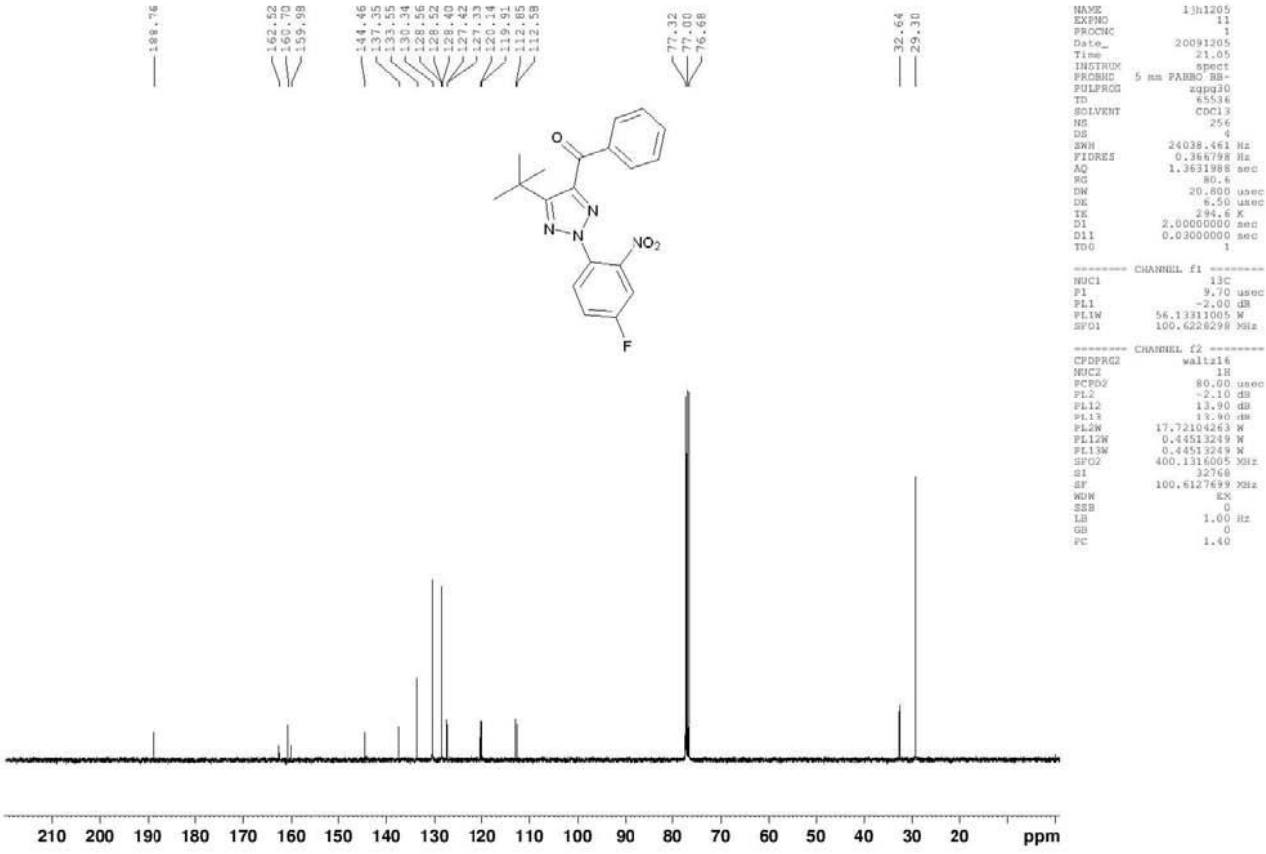

```
NAME                 lijihui0709
EXPNO                        11
PROCNO                        1
Date_              20090709
Time                      11.58
INSTRUM                    spect
PROBHD     5 mm PABBO BB-
PULPROG                 zgpg30
TD                       65536
SOLVENT                  CDCl3
NS                         200
DS                           4
SWH                  24038.461 Hz
FIDRES               0.366798 Hz
AQ                   1.3631988 sec
RG                        2050
DW                      20.800 usec
DE                       6.50 usec
TE                      295.8 K
D1                   2.00000000 sec
D11                  0.03000000 sec
TD0                          1

======== CHANNEL f1 ========
NUC1                       13C
P1                        9.40 usec
PL1                      -2.00 dB
PL1W                57.32743073 W
SFO1               100.6228298 MHz

======== CHANNEL f2 ========
CPDPRG2                 waltz16
NUC2                        1H
PCPD2                     90.00 usec
PL2                      -2.00 dB
PL12                     15.50 dB
PL13                     15.50 dB
PL2W                18.19349861 W
PL12W                0.32353121 W
PL13W                0.32353121 W
SFO2               400.1316005 MHz
SI                        32768
SF                 100.6127690 MHz
WDW                         EM
SSB                          0
LB                        1.00 Hz
GB                           0
PC                        1.40
```

2ma:






```
NAME                 13h1205
EXPNO                     11
PROCNO                     1
Date_             20091205
Time                  21.05
INSTRUM                spect
PROBHD     5 mm PABBO BB-
PULPROG             zgpg30
TD                     65536
SOLVENT                CDCl3
NS                       256
DS                         4
SWH               24038.461 Hz
FIDRES            0.366798 Hz
AQ                1.3631988 sec
RG                      80.6
DW                   20.800 usec
DE                    6.50 usec
TE                   294.6 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                        1

======== CHANNEL f1 ========
NUC1                     13C
P1                    9.70 usec
PL1                  -2.00 dB
PL1W             56.13311005 W
SFO1             100.6228298 MHz

======== CHANNEL f2 ========
CPDPRG2              waltz16
NUC2                     1H
PCPD2                80.00 usec
PL2                  -2.10 dB
PL12                 13.90 dB
PL13                 13.90 dB
PL2W             17.72104263 W
PL12W             0.44513249 W
PL13W             0.44513249 W
SFO2             400.1316005 MHz
SI                     32768
SF               100.6127699 MHz
WDW                       EM
SSB                        0
LB                    1.00 Hz
GB                         0
PC                    1.40
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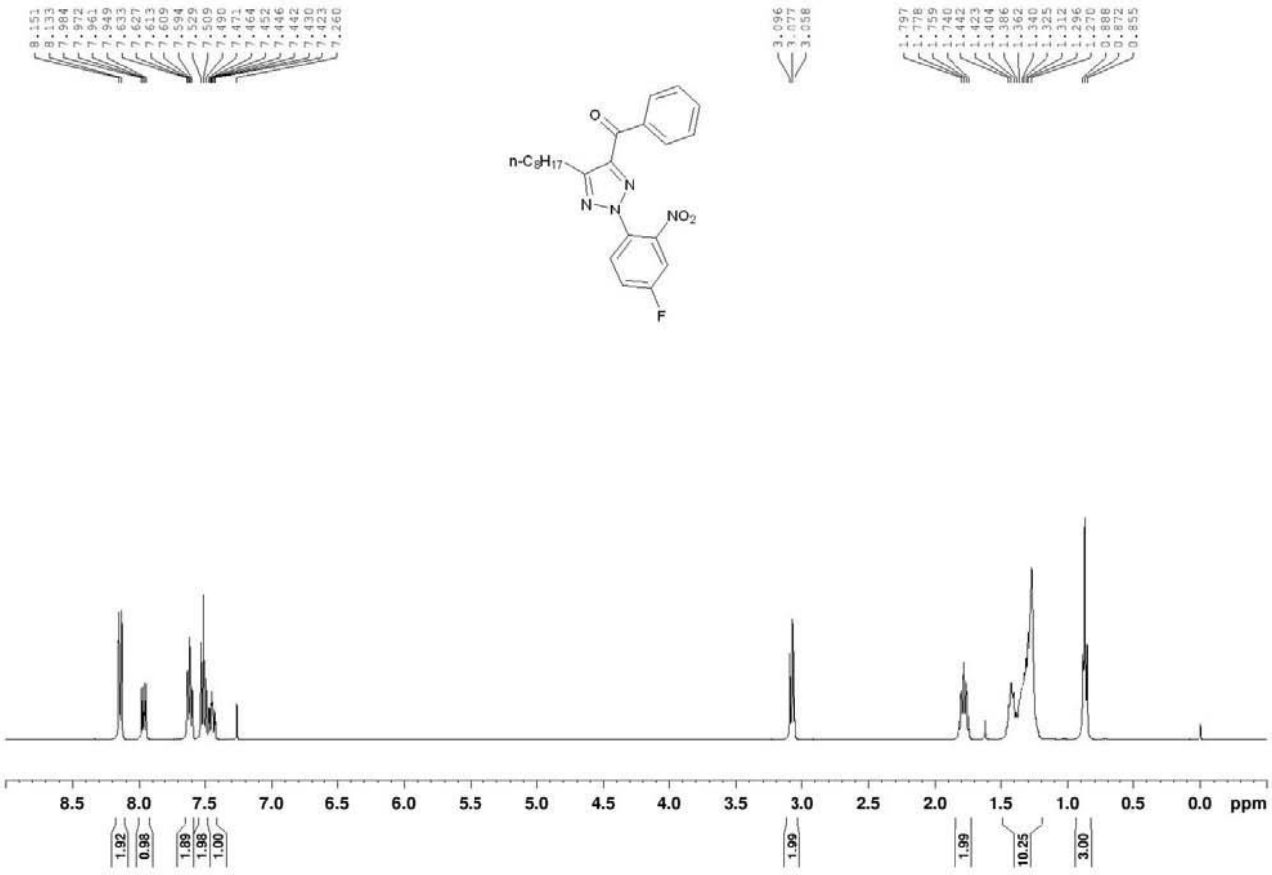
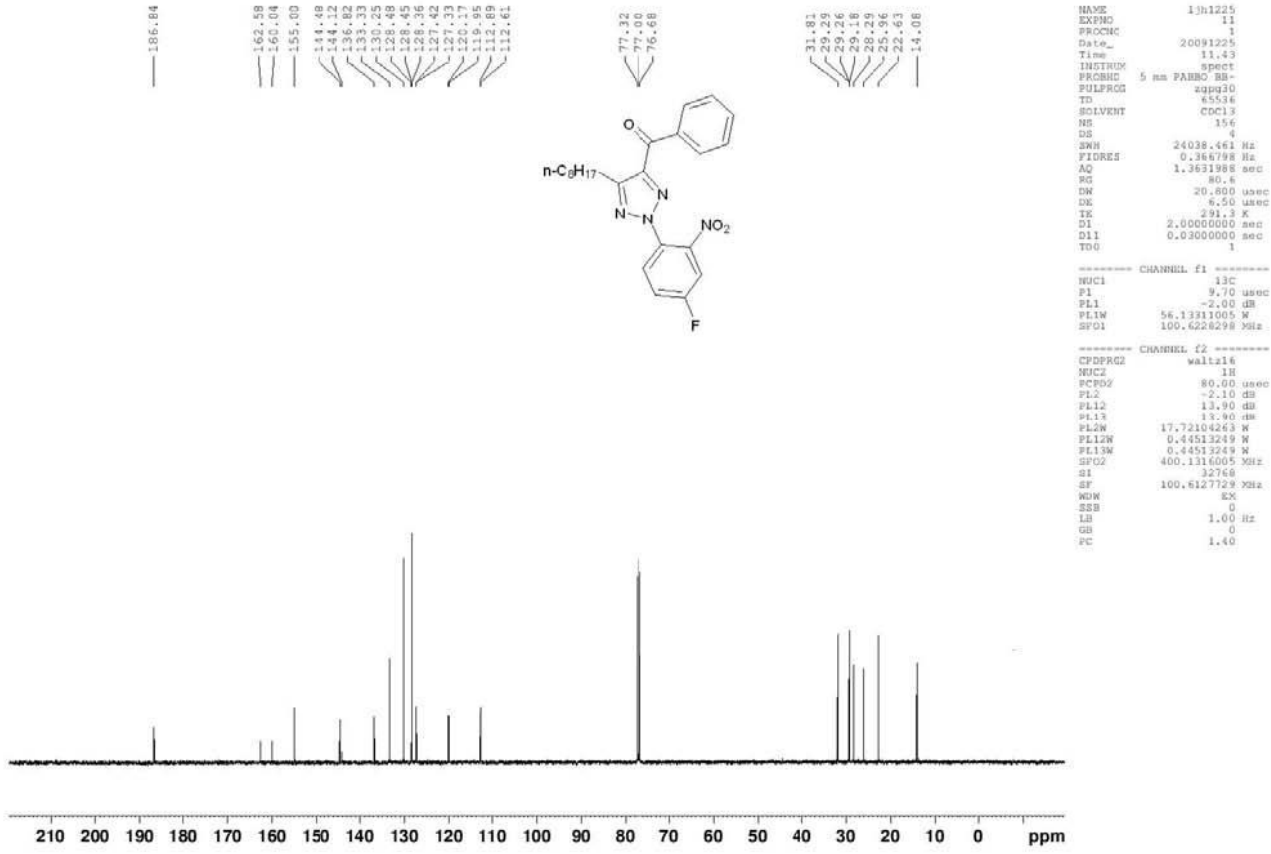
2na:





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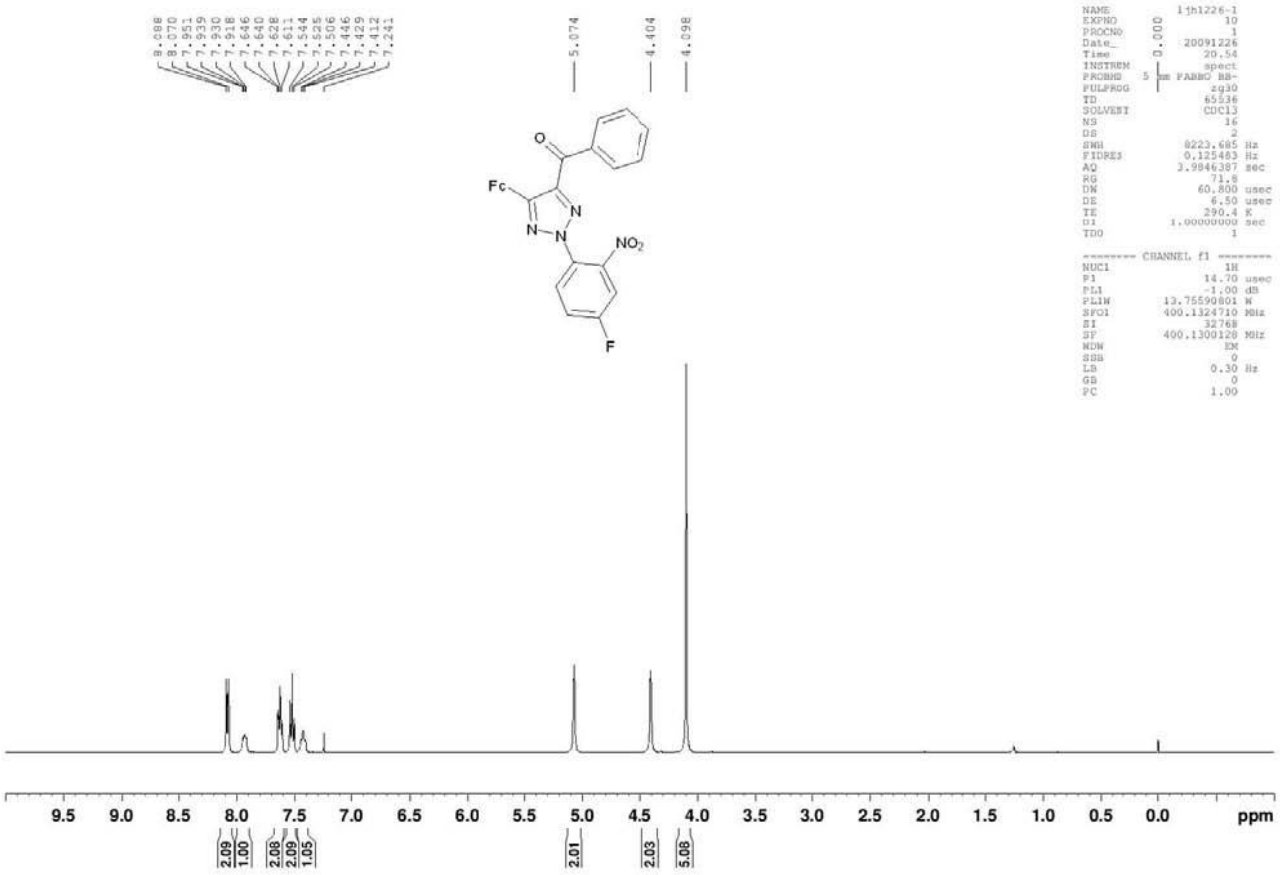

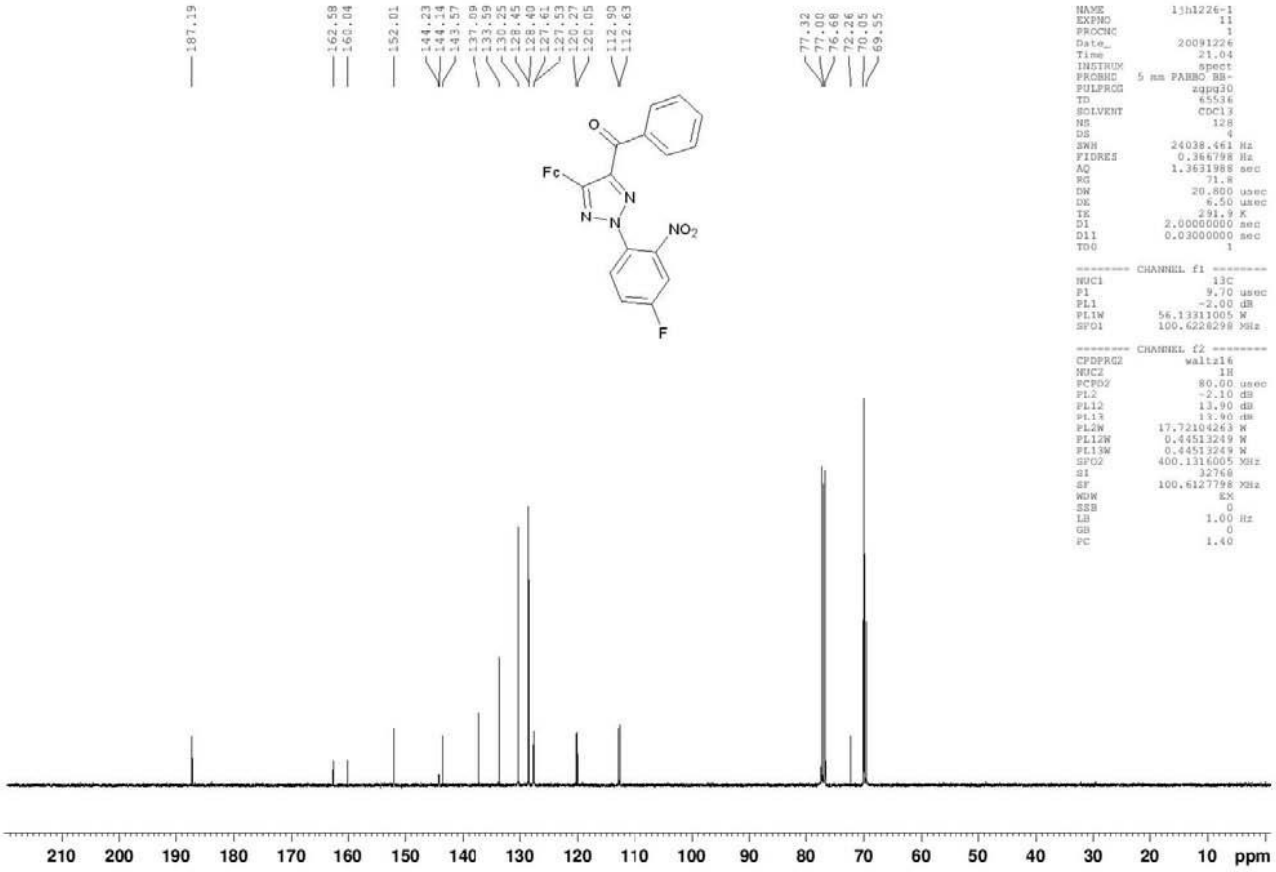

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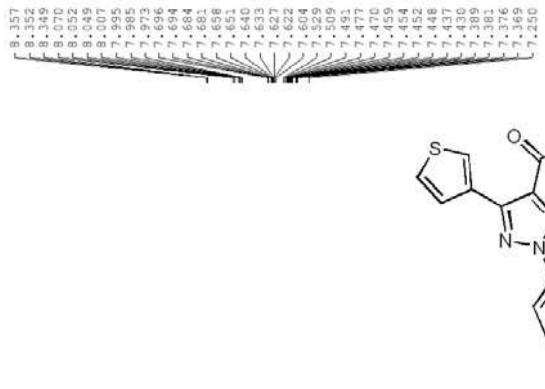

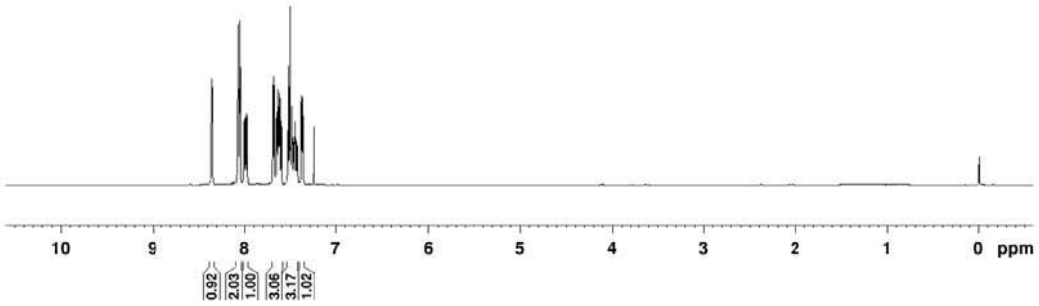

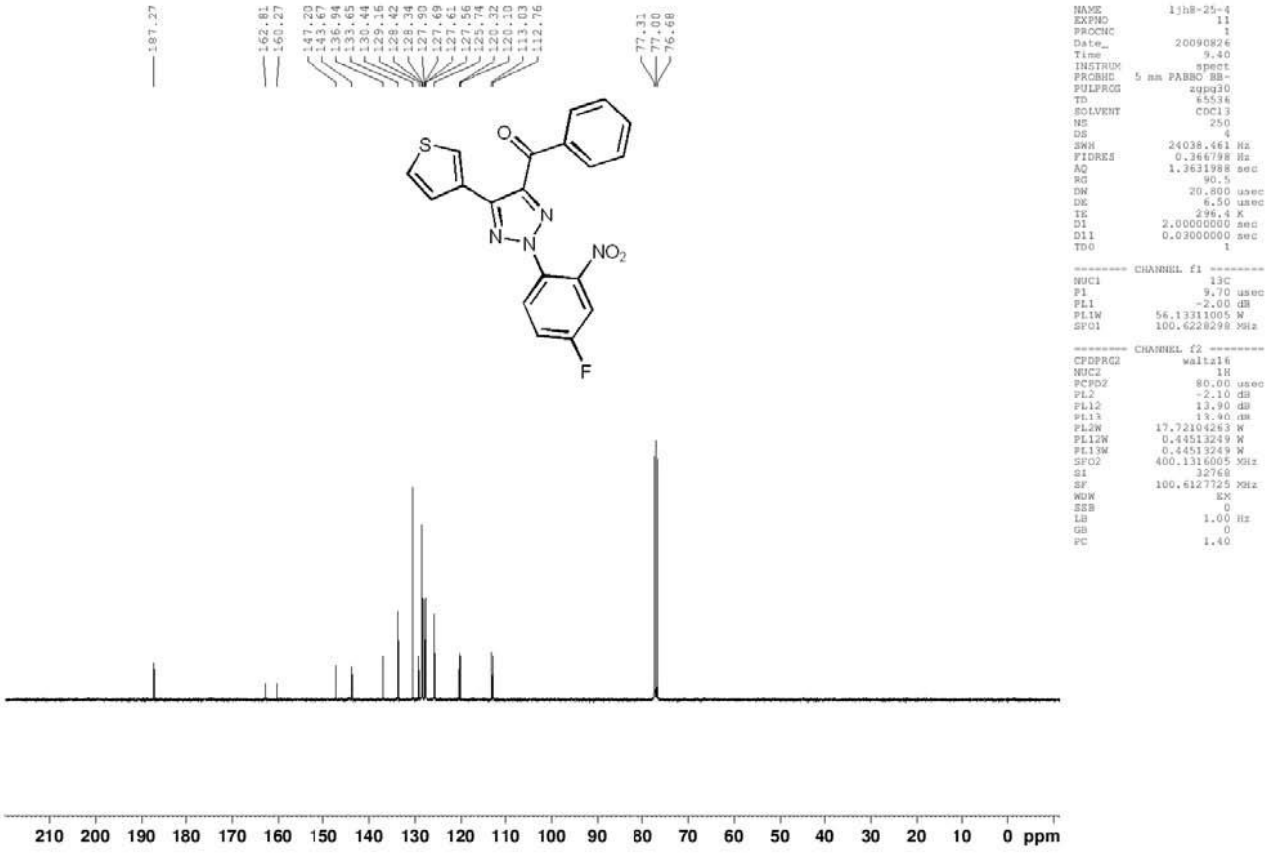

NAME	ljh8-25-4
EXPNO	11
PROCNO	1
Date_	20090826
Time	9.40
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	250
DS	4
SWH	24038.461 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	90.5
DW	20.800 usec
DE	6.50 usec
TE	296.4 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.70 usec
PL1	-2.00 dB
PL1W	56.13311005 W
SFO1	100.6228298 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	-2.10 dB
PL12	13.90 dB
PL13	13.90 dB
PL2W	17.72104263 W
PL12W	0.44513249 W
PL13W	0.44513249 W
SFO2	400.1316005 MHz
SI	32768
SF	100.6127725 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40