

Magnetic Carbon Nanotube-Catalyzed Multicomponent Synthesis of 5-Substituted-1H-Tetrazoles

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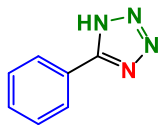
Abhayveer Singh: abhayveer_singh@outlook.com

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Subhashree Ray: sbhashreeray@soa.ac.in

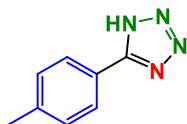
Naveen Chandra Talniya: ntalniya@gehu.ac.in

NMR data of synthesized compounds



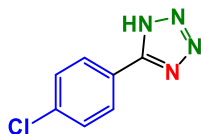
5-phenyl-1H-tetrazole

^1H NMR (400 MHz, CDCl_3): 8.26 (d, $J = 8.0$ Hz, 2H), 7.53-7.47 (m, 3H), 6.34 (s, 1H) ppm; ^{13}C (100 MHz, CDCl_3): 155.4, 131.9, 130.7, 128.3, 127.6, 125.2 ppm.



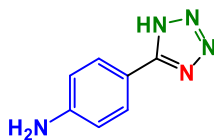
5-(p-tolyl)-1H-tetrazole

^1H NMR (400 MHz, CDCl_3): 8.16 (d, $J = 7.7$ Hz, 2H), 7.53 (d, $J = 8.6$ Hz, 2H), 6.33 (s, 1H), 2.34 (s, 3H) ppm; ^{13}C (100 MHz, CDCl_3): 155.4, 130.9, 129.1, 127.2, 125.8, 21.0 ppm.



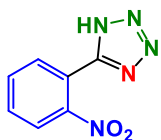
5-(4-chlorophenyl)-1H-tetrazole

M.P: 259-261 °C. ^1H NMR (400 MHz, CDCl_3): 8.13 (d, $J = 7.8$ Hz, 2H), 7.55 (d, $J = 8.0$ Hz, 2H), 6.33 (s, 1H) ppm; ^{13}C (100 MHz, CDCl_3): 155.6, 135.2, 129.4, 128.1, 126.7 ppm.



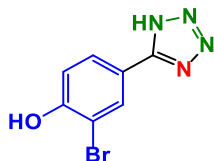
4-(1H-tetrazol-5-yl)aniline

M.P: 264-266 °C. ^1H NMR (400 MHz, CDCl_3): 7.90 (d, $J = 7.9$ Hz, 2H), 6.71 (d, $J = 7.4$ Hz, 2H), 6.33 (s, 1H), 5.24 (s, 2H) ppm; ^{13}C (100 MHz, CDCl_3): 163.0, 150.3, 133.2, 129.0, 128.5, 127.3, 125.1 ppm.



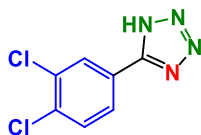
5-(2-nitrophenyl)-1*H*-tetrazole

M.P: 155-157 °C. ¹HNMR (400 MHz, CDCl₃): 7.84 (dd, J = 9.3, 4.1 Hz, 2H), 7.73-7.68 (m, 1H), 7.46-7.42 (m, 1H), 6.33 (s, 1H) ppm; ¹³C (100 MHz, CDCl₃): 155.6, 131.2, 129.0, 126.5, 126.1, 124.3 ppm.



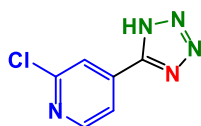
2-bromo-4-(1*H*-tetrazol-5-yl)phenol

M.P: 173-175 °C. ¹HNMR (400 MHz, CDCl₃): 9.01 (s, 1H), 7.76 (d, J = 8.6 Hz, 1H), 7.34 (s, 1H), 6.89 (d, J = 8.0 Hz, 1H), 6.33 (s, 1H) ppm; ¹³C (100 MHz, CDCl₃): 157.8, 155.4, 133.6, 129.4, 125.1, 119.0, 114.2 ppm.



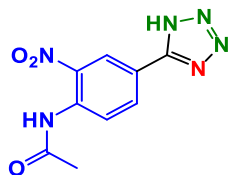
5-(3,4-dichlorophenyl)-1*H*-tetrazole

M.P: 148-150 °C. ¹HNMR (400 MHz, CDCl₃): 9.01 (s, 1H), 7.76 (d, J = 8.6 Hz, 1H), 7.34 (s, 1H), 6.89 (d, J = 8.0 Hz, 1H), 6.33 (s, 1H) ppm; ¹³C (100 MHz, CDCl₃): 157.8, 155.4, 133.6, 129.4, 125.1, 119.0, 114.2 ppm.



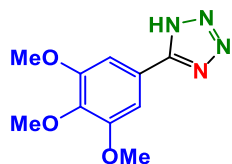
2-chloro-4-(1*H*-tetrazol-5-yl)pyridine

M.P: 198-200 °C. ¹HNMR (400 MHz, CDCl₃): 8.72 (d, J = 8.0 Hz, 1H), 8.37 (d, J = 8.4 Hz, 1H), 7.95 (s, 1H), 6.33 (s, 1H) ppm; ¹³C (100 MHz, CDCl₃): 155.6, 148.9, 144.9, 140.1, 114.3, 112.5 ppm.



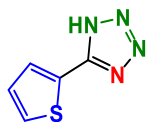
N-(2-nitro-4-(1*H*-tetrazol-5-yl)phenyl)acetamide

M.P: 210-212 °C. ¹HNMR (400 MHz, CDCl₃): 9.81 (s, 1H), 8.79 (s, 1H), 8.58 (d, J = 8.0 Hz, 1H), 8.11 (d, J = 7.6 Hz, 1H), 6.33 (s, 1H), 2.08 (s, 3H) ppm; ¹³C (100 MHz, CDCl₃): 168.9, 155.7, 143.2, 133.7, 131.0, 127.6, 123.1, 24.3 ppm.



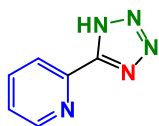
5-(3',4',5'-trimethoxyphenyl)tetrazole

M.P: 200-202 °C. ¹HNMR (400 MHz, CDCl₃): 7.01 (s, 2H), 6.33 (s, 1H), 3.90 (s, 6H), 3.76 (s, 3H) ppm; ¹³C (100 MHz, CDCl₃): 158.5, 155.1, 140.9, 124.6, 104.3, 63.9, 55.4 ppm.



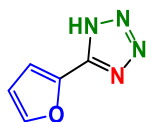
5-(thiophen-2-yl)-1H-tetrazole

M.P: 201-203 °C. ¹HNMR (400 MHz, CDCl₃): 7.82 (d, J = 7.8 Hz, 1H), 7.65 (d, J = 8.6 Hz, 1H), 7.06-7.02 (m, 1H), 6.33 (s, 1H) ppm; ¹³C (100 MHz, CDCl₃): 163.2, 143.5, 129.6, 128.6, 128.1 ppm.



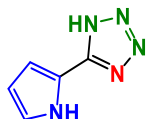
2-(1H-tetrazol-5-yl)pyridine

M.P: 210-212 °C. ¹HNMR (400 MHz, CDCl₃): 8.63 (d, J = 8.0 Hz, 1H), 8.35 (d, J = 8.0 Hz, 1H), 7.47-7.43 (m, 1H), 7.28-7.23 (m, 1H), 6.33 (s, 1H) ppm; ¹³C (100 MHz, CDCl₃): 163.2, 154.0, 148.7, 137.6, 125.6, 123.1 ppm.



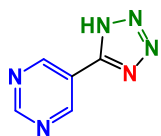
5-(furan-2-yl)-1H-tetrazole

M.P: 201-203 °C. ¹HNMR (400 MHz, CDCl₃): 8.22 (d, J = 7.6 Hz, 1H), 7.45 (d, J = 8.0 Hz, 1H), 6.73-6.70 (m, 1H), 6.33 (s, 1H) ppm; ¹³C (100 MHz, CDCl₃): 163.7, 155.1, 142.8, 111.4, 108.3 ppm.



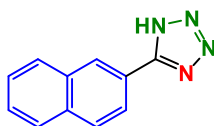
5-(1H-pyrrol-2-yl)-1H-tetrazole

M.P: 224-226 °C. ¹HNMR (400 MHz, CDCl₃): 9.26 (s, 1H), 7.04 (d, J = 7.7 Hz, 1H), 6.68 (d, J = 7.6 Hz, 1H), 6.33 (s, 1H), 6.23-6.20 (m, 1H) ppm; ¹³C (100 MHz, CDCl₃): 163.2, 128.3, 120.7, 112.6, 106.7 ppm.



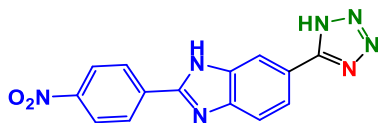
5-(1*H*-tetrazol-5-yl)pyrimidine

M.P: 253-255 °C. ¹HNMR (400 MHz, CDCl₃): 9.34 (s, 1H), 9.04 (s, 2H), 6.43 (s, 1H) ppm; ¹³C (100 MHz, CDCl₃): 164.0, 150.7, 147.4, 131.1 ppm.



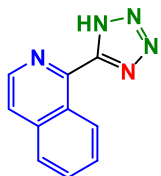
5-(naphthalen-2-yl)-1*H*-tetrazole

M.P: 202-204 °C. ¹HNMR (400 MHz, CDCl₃): 9.06 (s, 1H), 8.17 (d, J = 8.0 Hz, 1H), 8.04 (d, J = 7.7 Hz, 1H), 7.64 (d, J = 7.4 Hz, 1H), 7.47 (d, J = 8.6 Hz, 1H), 7.36-7.29 (m, 2H), 6.33 (s, 1H) ppm; ¹³C (100 MHz, CDCl₃): 157.4, 135.1, 133.2, 129.9, 128.3, 127.6, 125.3 ppm.



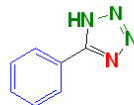
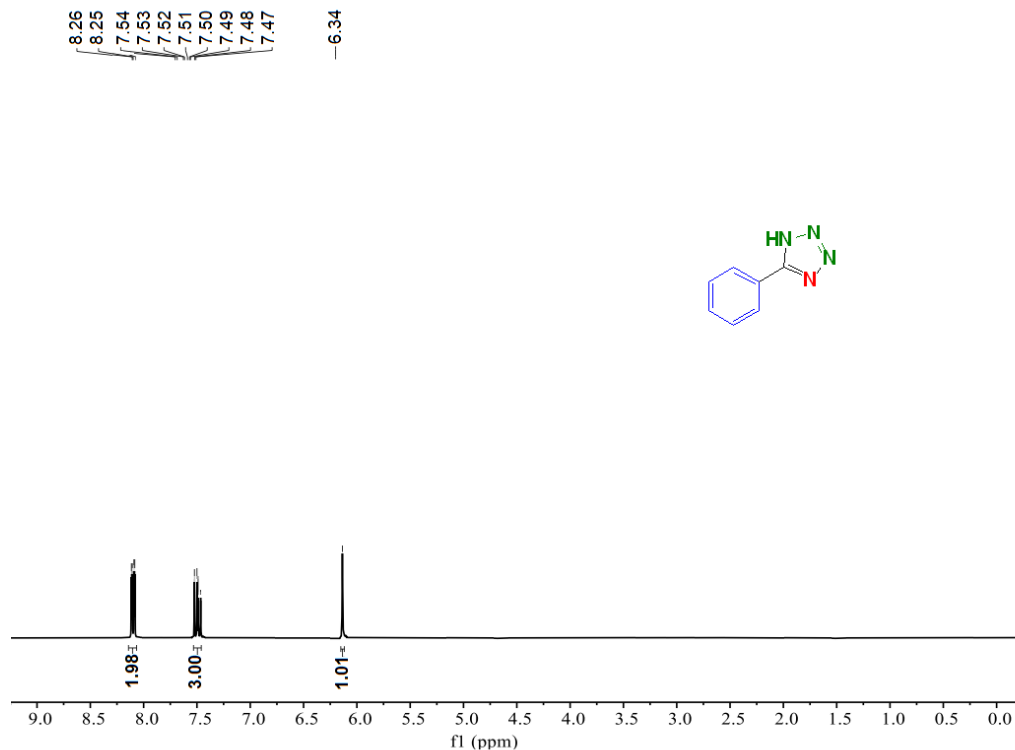
2-(4-nitrophenyl)-6-(1*H*-tetrazol-5-yl)-1*H*-benzo[*d*]imidazole

M.P: 276-278 °C. ¹HNMR (400 MHz, CDCl₃): 9.34 (s, 1H), 9.04 (s, 2H), 6.43 (s, 1H) ppm; ¹³C (100 MHz, CDCl₃): 164.0, 150.7, 147.4, 131.1 ppm.



1-(1*H*-tetrazol-5-yl)isoquinoline

M.P: 235-237 °C. ¹HNMR (400 MHz, CDCl₃): 8.73 (d, J = 7.8 Hz, 1H), 8.09 (d, J = 8.0 Hz, 1H), 7.71 (d, J = 8.6 Hz, 1H), 7.46-7.41 (m, 3H), 6.33 (s, 1H) ppm; ¹³C (100 MHz, CDCl₃): 163.0, 160.5, 143.1, 138.7, 133.2, 130.8, 129.7, 128.1, 127.0, 126.4, 118.6 ppm.



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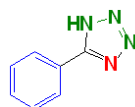
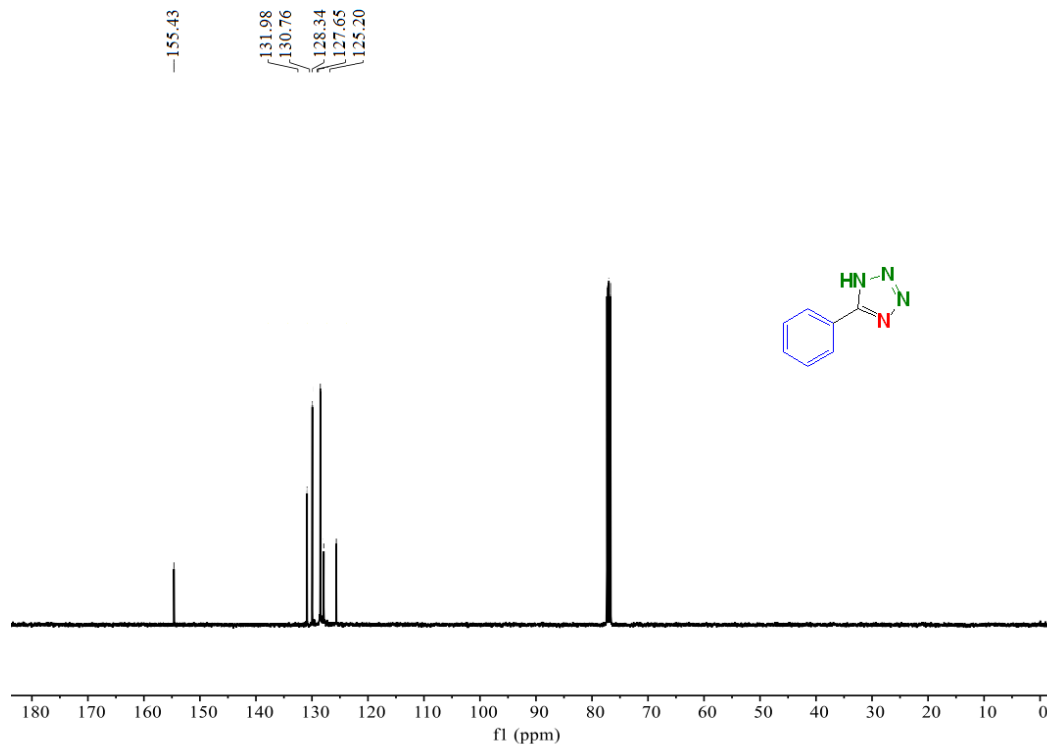
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PULPROG   zg30
TD        65536
SOLVENT   CDCl3
NS        24
DS        0
SWH       8012.820 Hz
FIDRES    0.122266 Hz
AQ        4.0894966 sec
RG        406
DW        62.400 usec
DE        6.50 usec
TE        293.2 K
D1        6.0000000 sec
TDO       1

```

```

===== CHANNEL f1 =====
NUC1      1H
P1        14.00 usec
PL1       -2.00 dB
PL1W      11.86359406 W
SFO1      400.2236020 MHz
SI        32768
SF        400.2200000 MHz
WDW       EM
SSB       0
LB        0.30 Hz
GB        0
PC        1.00

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NAME      UN
EXPNO     435
PROCNO    2
Date_     20241202
INSTRUM   spect
PROBHD    5 mm PABBO BB-
PULPROG   zgpg
TD        65536
SOLVENT   CDCl3
NS        31
DS        0
SWH       25252.525 Hz
FIDRES    0.385323 Hz
AQ        1.2976629 sec
RG        2050
DW        19.800 usec
DE        6.50 usec
TE        293.4 K
D1        3.0000000 sec
D11       0.03000000 sec
TDO       1

```

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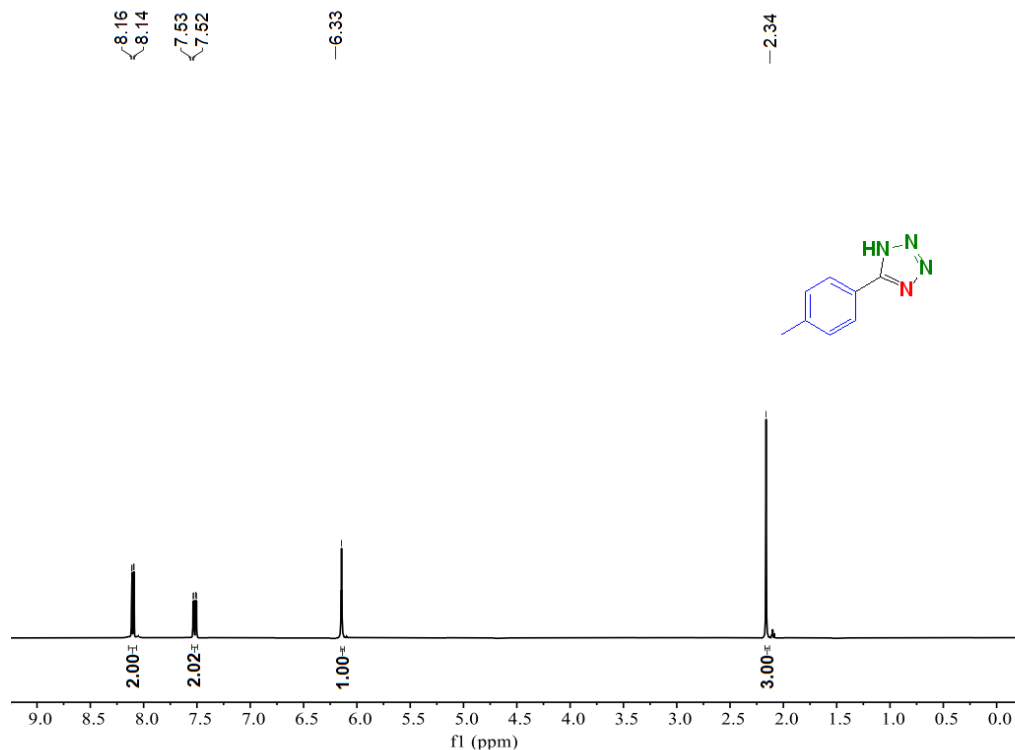
===== CHANNEL f1 =====
NUC1      13C
P1        9.00 usec
PL1       -0.90 dB
PL1W      42.02801895 W
SFO1      100.6479784 MHz

```

```

===== CHANNEL f2 =====
CPDPRG2   waltz16
NUC2      1H
PCPD2     90.00 usec
PL2       -2.00 dB
PL12      14.16 dB
PL13      17.90 dB
PL12W     11.86359406 W
PL13W     6.28722104 W
SFO2      400.2216009 MHz
SI        32768
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WDW       EM
SSB       0
LB        1.00 Hz
GB        0
PC        1.40

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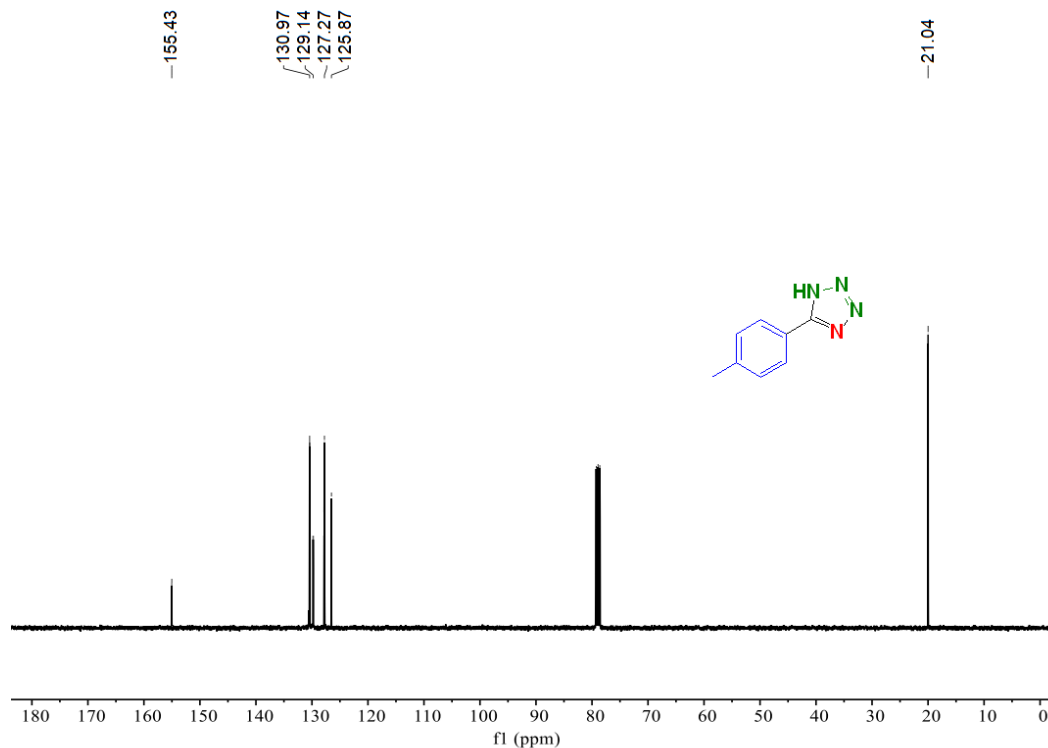


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NAME      UN
EXPNO     426
PROCNO    1
Date_     20241202
INSTRUM   spect
PROBHD    5 mm PABBO BB-
PULPROG   zg30
TD         65536
SOLVENT   CDCl3
NS         24
DS         0
SWH        8012.820 Hz
FIDRES     0.122266 Hz
AQ         4.0894966 sec
RG         406
DW         62.400 usec
DE         6.50 usec
TE         293.2 K
D1         6.00000000 sec
D10        1
  
```

```

===== CHANNEL f1 =====
NUC1      1H
P1        14.00 usec
PL1       -2.00 dB
PL1W      11.86359406 W
SFO1      400.2236020 MHz
SI        32768
SF        400.2200000 MHz
WDW        EM
SSB        0
LB         0.30 Hz
GB         0
PC         1.00
  
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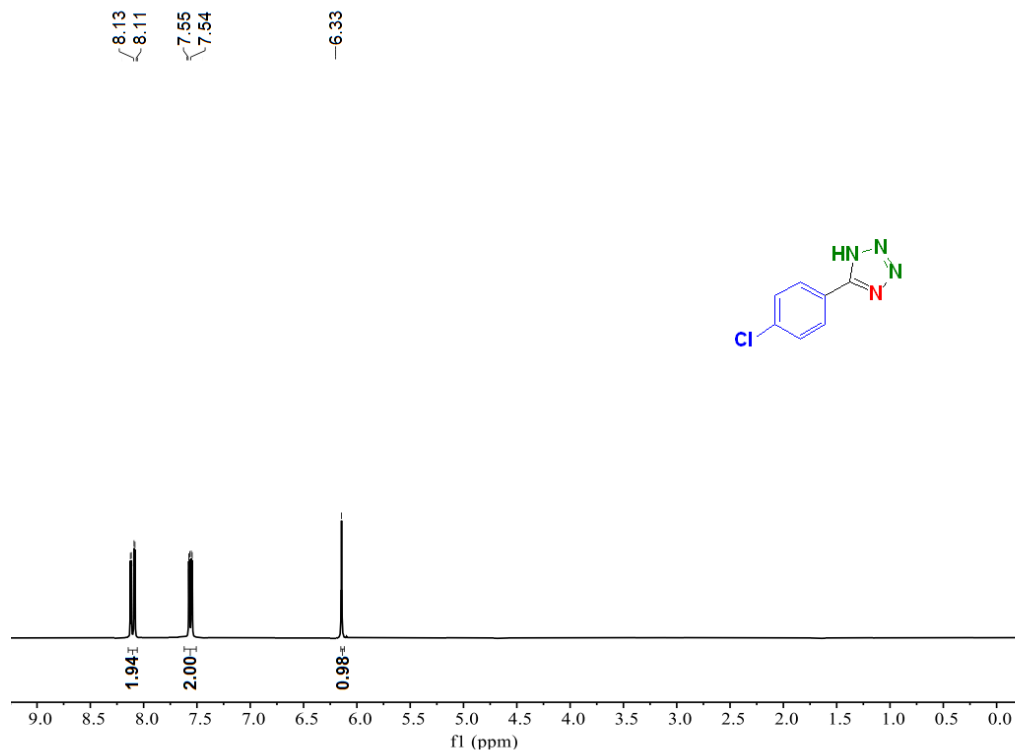
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NAME      UN
EXPNO     435
PROCNO    2
Date_     20241202
INSTRUM   spect
PROBHD    5 mm PABBO BB-
PULPROG   zgpg
TD         65536
SOLVENT   CDCl3
NS         31
DS         0
SWH        25252.525 Hz
FIDRES     0.385323 Hz
AQ         1.2976629 sec
RG         2050
DW         19.800 usec
DE         6.50 usec
TE         293.4 K
D1         3.00000000 sec
D11        0.03000000 sec
D10        1
  
```

```

===== CHANNEL f1 =====
NUC1      13C
P1        9.00 usec
PL1       -0.90 dB
PL1W      42.02801895 W
SFO1      100.6479784 MHz

===== CHANNEL f2 =====
CPDPRG2   waltz16
NUC2      1H
PCPD2     90.00 usec
PL2       -2.00 dB
PL12      14.16 dB
PL13      17.90 dB
PL2W      11.86359406 W
PL12W     6.28722104 W
PL13W     6.12139934 W
SFO2      400.2216009 MHz
SI        32768
SF        100.6353999 MHz
WDW        EM
SSB        0
LB         1.00 Hz
GB         0
PC         1.40
  
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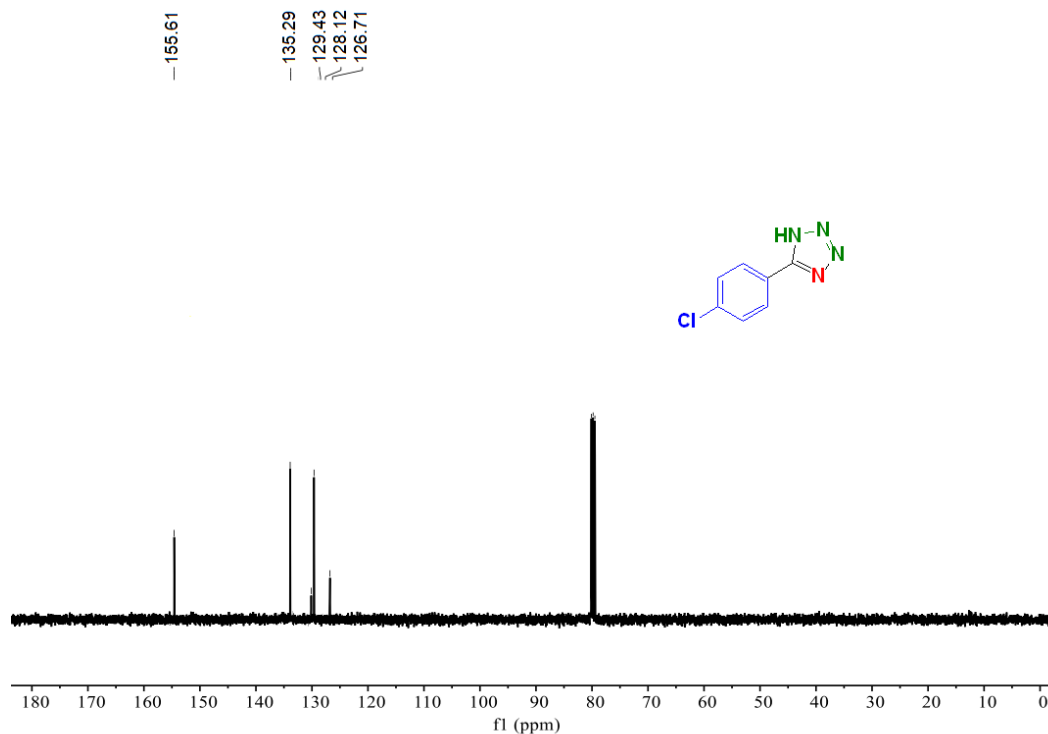


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NAME      UN
EXPNO     426
PROCNO    1
Date_     20241202
INSTRUM   spect
PROBHD    5 mm PABBO BB-
PULPROG   zg30
TD         65536
SOLVENT   CDCl3
NS         24
DS         0
SWH        8012.820 Hz
FIDRES     0.122266 Hz
AQ         4.0894966 sec
RG         406
DW         62.400 usec
DE         6.50 usec
TE         293.2 K
D1         6.0000000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
NUC1       1H
P1         14.00 usec
PL1        -2.00 dB
PL1W       11.86359406 W
SFO1       400.2236020 MHz
SI         32768
SF         400.2200000 MHz
WDW        EM
SSB        0
LB         0.30 Hz
GB         0
PC         1.00
  
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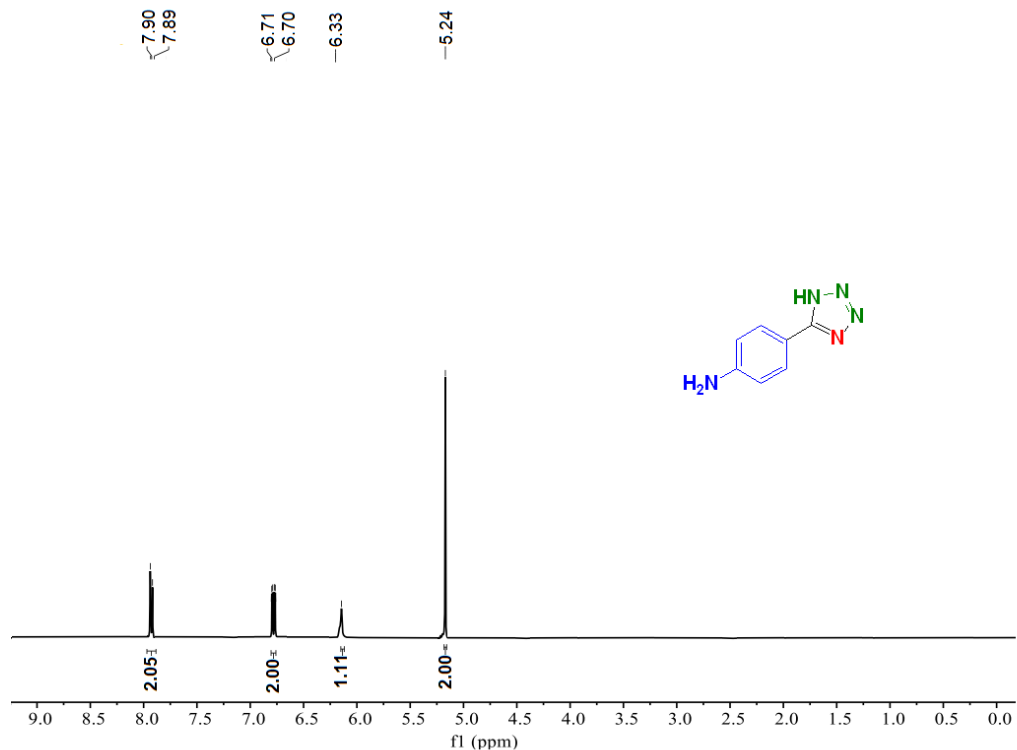
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EXPNO     435
PROCNO    2
Date_     20241202
INSTRUM   spect
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PULPROG   zgpg
TD         65536
SOLVENT   CDCl3
NS         31
DS         0
SWH        25252.525 Hz
FIDRES     0.385323 Hz
AQ         1.2976629 sec
RG         2050
DW         19.800 usec
DE         6.50 usec
TE         293.2 K
D1         3.0000000 sec
D11        6.0300000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
NUC1       13C
P1         9.00 usec
PL1        -0.90 dB
PL1W       42.02801895 W
SFO1       100.6479784 MHz
  
```

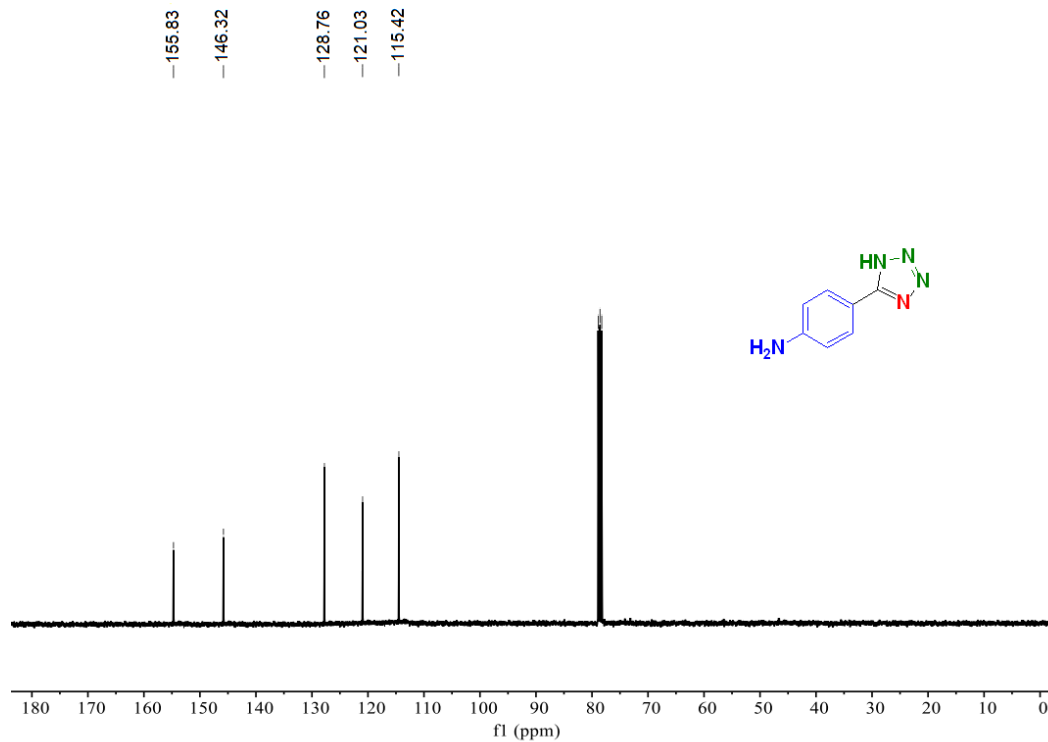
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===== CHANNEL f2 =====
CPDPRG2   waltz16
NUC2       1H
PCPD2     90.00 usec
PL2        -2.00 dB
PL12       14.16 dB
PL13       17.90 dB
PL12W      11.86359406 W
PL12W      6.28722104 W
PL13W      6.12139934 W
SFO2       400.2216009 MHz
SI         32768
SF         100.6353999 MHz
WDW        EM
SSB        0
LB         1.00 Hz
GB         0
PC         1.40
  
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NAME UN
EXPNO 426
PROCNO 1
Date_ 20241202
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl₃
NS 24
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 406
DW 62.400 usec
DE 6.50 usec
TE 293.2 K
D1 6.0000000 sec
TD0 1

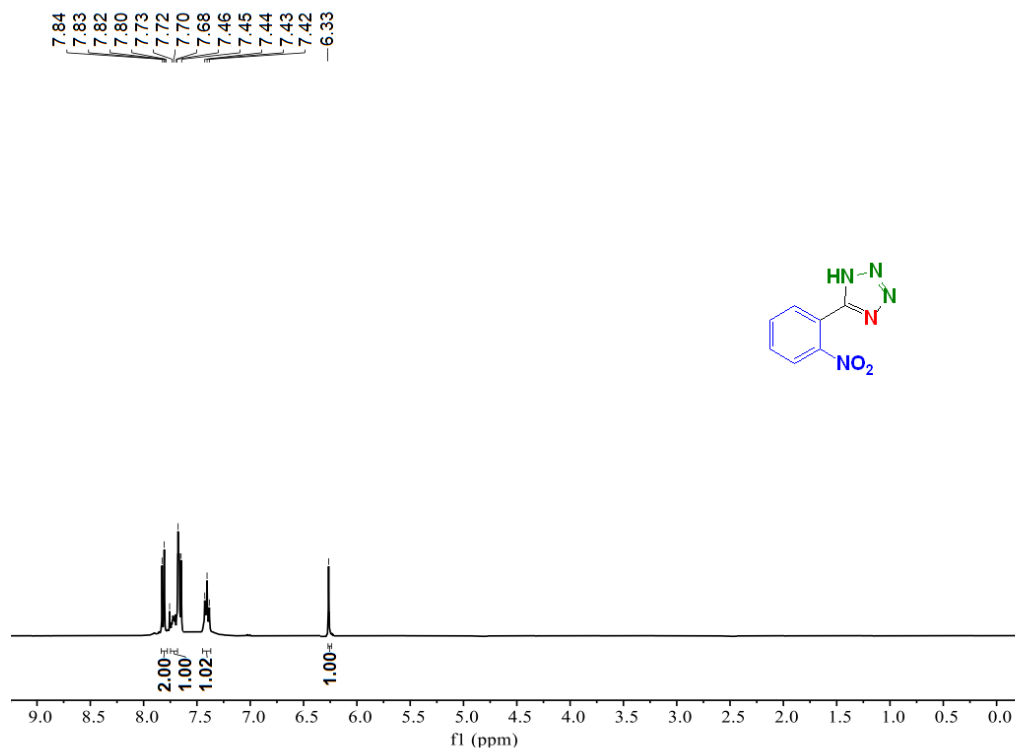
===== CHANNEL f1 =====
NUC1 1H
P1 14.00 usec
PL1 -2.00 dB
PL1W 11.86359406 W
SFO1 400.2236020 MHz
SI 32768
SF 400.2200000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



NAME UN
EXPNO 435
PROCNO 2
Date_ 20241202
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg
TD 65536
SOLVENT CDCl₃
NS 31
DS 0
SWH 25252.525 Hz
FIDRES 0.385323 Hz
AQ 1.2976629 sec
RG 2050
DW 19.800 usec
DE 6.50 usec
TE 293.2 K
D1 3.0000000 sec
D11 6.0300000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PL1 -0.90 dB
PL1W 42.02801895 W
SFO1 100.6479784 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 90.00 usec
PL2 -2.00 dB
PL12 14.16 dB
PL13 17.90 dB
PL12W 11.86359406 W
PL12W 6.28722104 W
PL13W 6.12139934 W
SFO2 400.2216009 MHz
SI 32768
SF 100.6353999 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

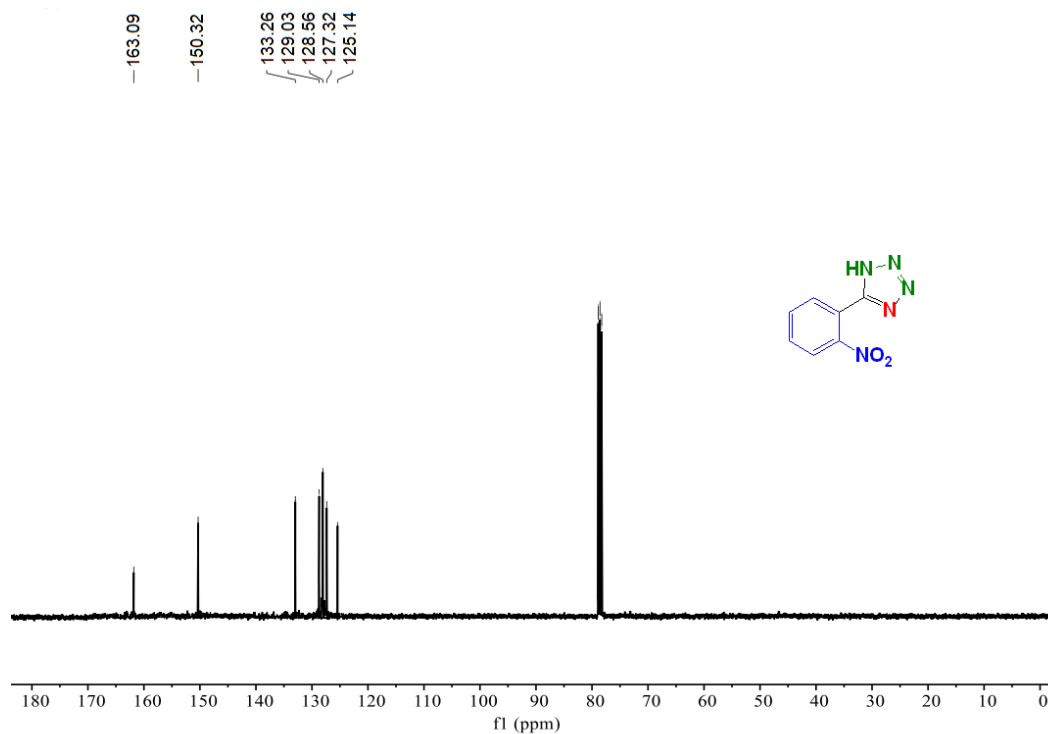


```

NAME      UN
EXPNO     426
PROCNO    1
Date_     20241202
INSTRUM   spect
PROBHD    5 mm PABBO BB-
PULPROG   zg30
TD         65536
SOLVENT   CDCl3
NS         24
DS         0
SWH        8012.820 Hz
FIDRES     0.122266 Hz
AQ         4.0894966 sec
RG         406
DW         62.400 usec
DE         6.50 usec
TE         293.2 K
D1         6.0000000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
NUC1      1H
P1        14.00 usec
PL1       -2.00 dB
PL1W      11.86359406 W
SFO1      400.2236020 MHz
SI        32768
SF        400.2200000 MHz
WDW        EM
SSB        0
LB         0.30 Hz
GB         0
PC         1.00
  
```



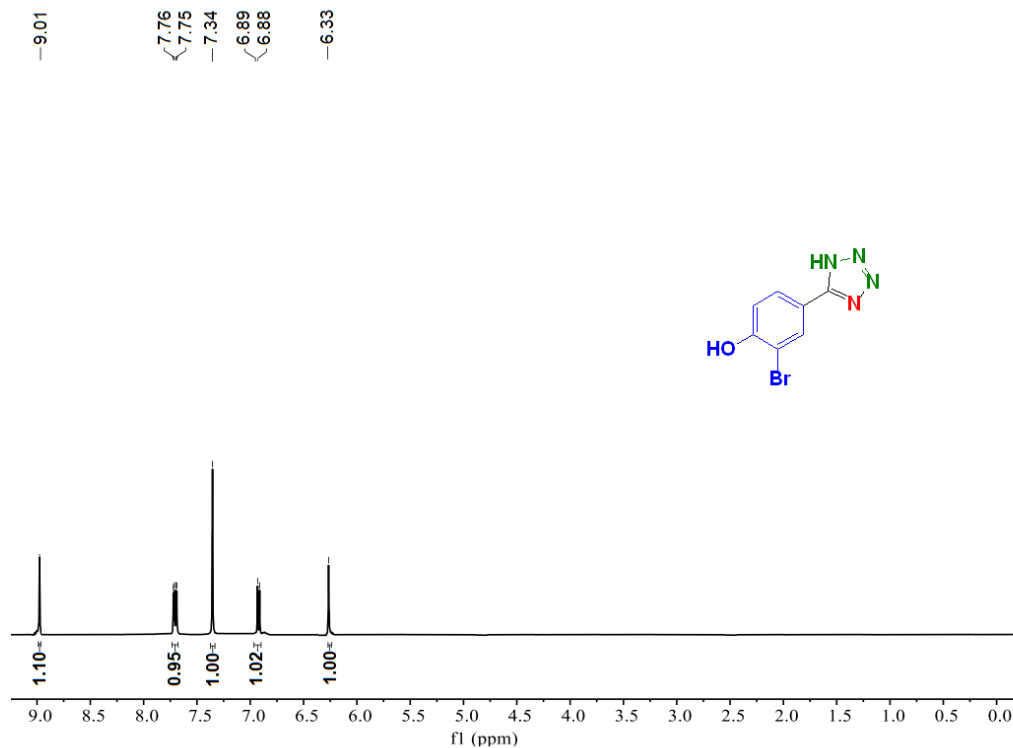
```

NAME      UN
EXPNO     435
PROCNO    2
Date_     20241202
INSTRUM   spect
PROBHD    5 mm PABBO BB-
PULPROG   zgpg
TD         65536
SOLVENT   CDCl3
NS         31
DS         0
SWH        25252.523 Hz
FIDRES     0.385323 Hz
AQ         1.2976629 sec
RG         2050
DW         19.800 usec
DE         6.50 usec
TE         293.4 K
D1         3.0000000 sec
D11        0.0300000 sec
TD0        1
  
```

```

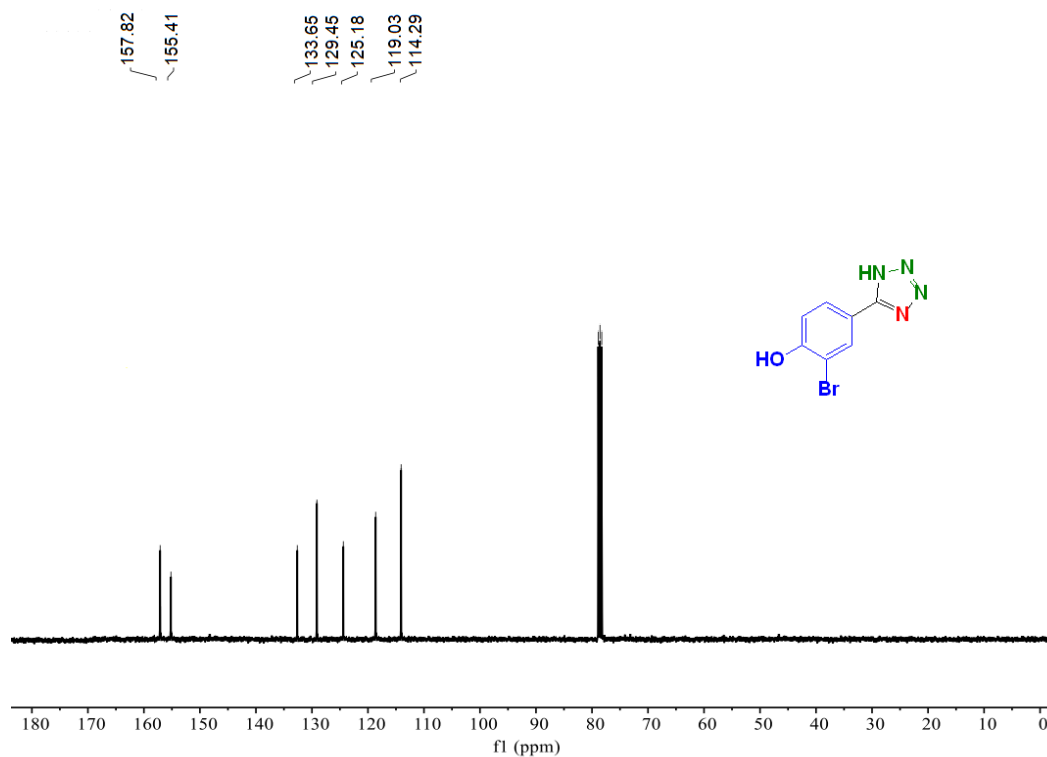
===== CHANNEL f1 =====
NUC1      13C
P1         9.00 usec
PL1       -0.90 dB
PL1W      42.02801895 W
SFO1      100.6479784 MHz

===== CHANNEL f2 =====
CPDPRG2   waltz16
NUC2       1H
PCPD2      90.00 usec
PL2        -2.00 dB
PL12       14.16 dB
PL13       17.50 dB
PL12W      11.86359406 W
PL12W      6.28722104 W
PL13W      6.12139934 W
SFO2      400.2216009 MHz
SI        32768
SF        100.6353990 MHz
WDW        EM
SSB        0
LB         1.00 Hz
GB         0
PC         1.40
  
```



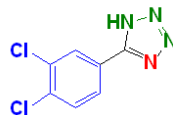
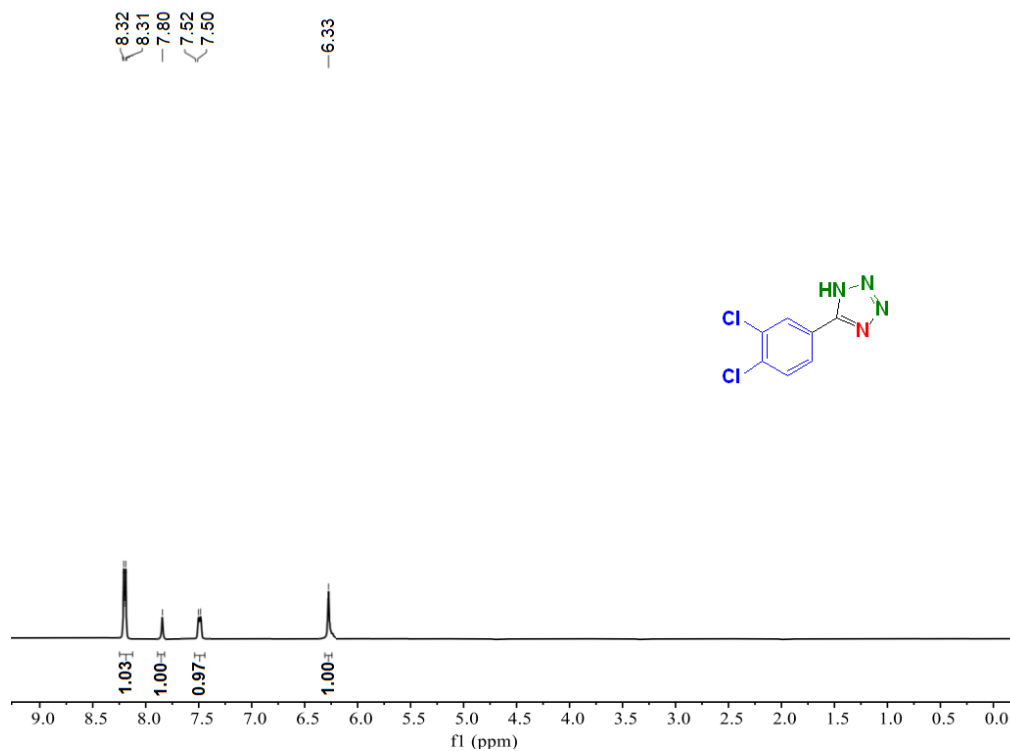
NAME UN
EXPNO 426
PROCNO 1
Date_ 20241202
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl₃
NS 24
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 406
DW 62.400 usec
DE 6.50 usec
TE 293.2 K
D1 6.0000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 14.00 usec
PL1 -2.00 dB
PL1W 11.86359406 W
SFO1 400.2236020 MHz
SI 32768
SF 400.2200000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



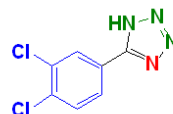
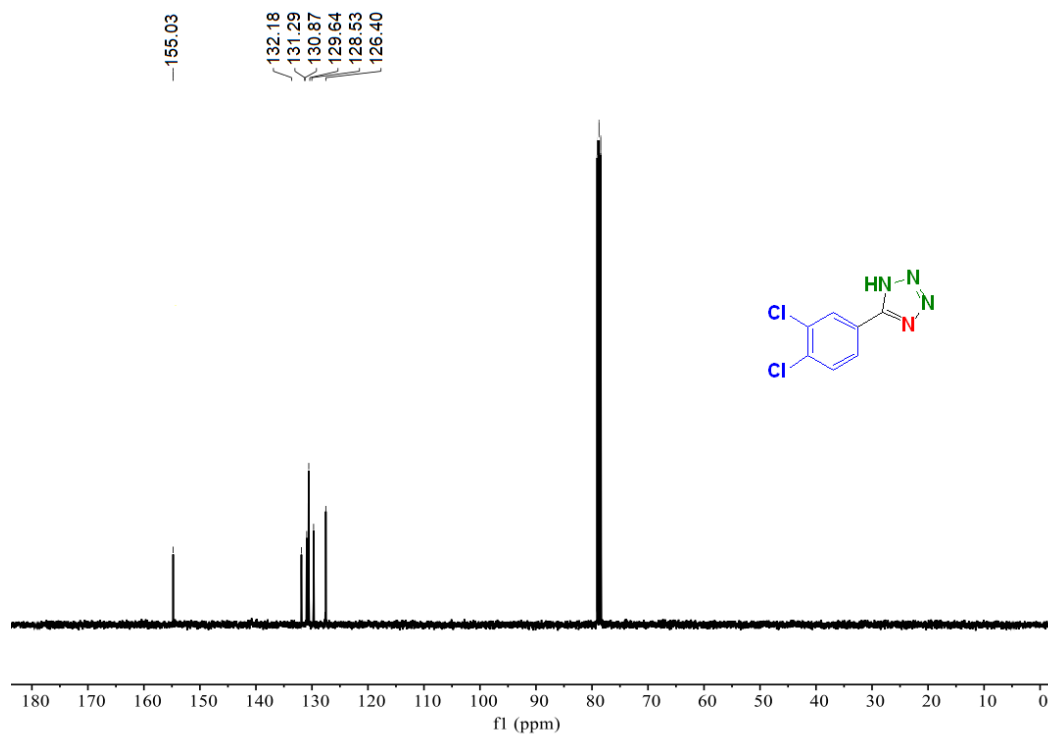
NAME UN
EXPNO 435
PROCNO 2
Date_ 20241202
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg30
TD 65536
SOLVENT CDCl₃
NS 31
DS 0
SWH 25252.523 Hz
FIDRES 0.385323 Hz
AQ 1.2976629 sec
RG 2050
DW 19.800 usec
DE 6.50 usec
TE 293.4 K
D1 3.0000000 sec
D11 0.0300000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PL1 -0.90 dB
PL1W 42.02801895 W
SFO1 100.6479784 MHz
===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 90.00 usec
PL2 -2.00 dB
PL12 14.16 dB
PL13 17.50 dB
PL2W 11.86359406 W
PL12W 6.28722104 W
PL13W 6.12139934 W
SFO2 400.2216009 MHz
SI 32768
SF 100.6353990 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



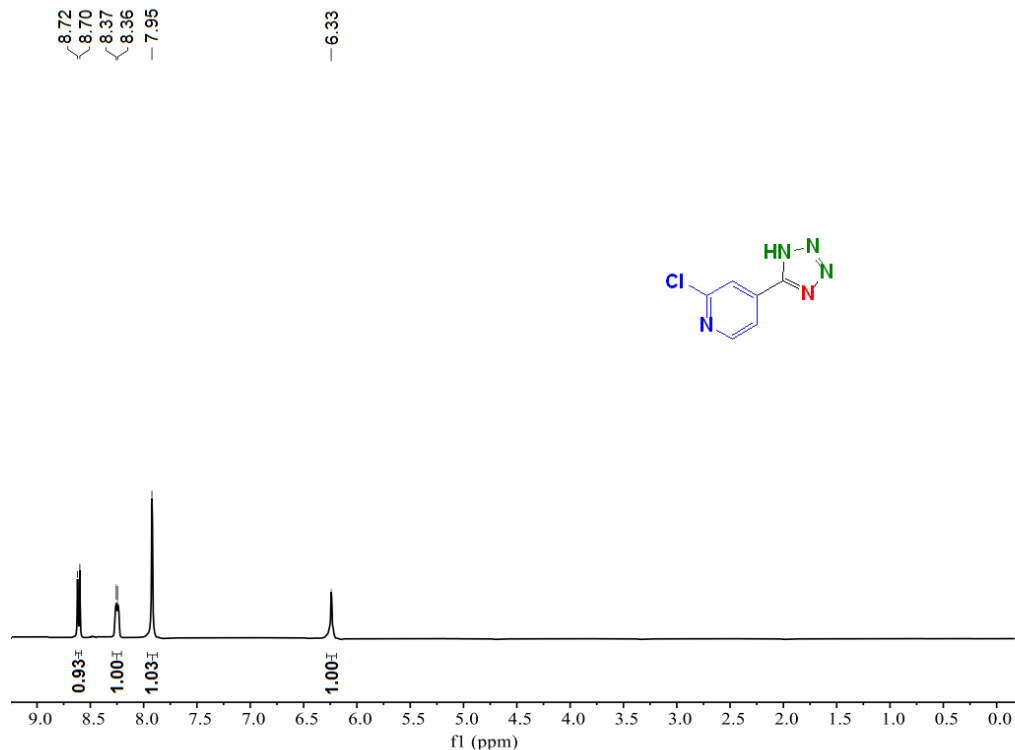
NAME UN
EXPNO 426
PROCNO 1
Date_ 20241211
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 24
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 406
DW 62.400 usec
DE 6.50 usec
TE 293.2 K
D1 6.00000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 14.00 usec
PL1 -2.00 dB
PL1W 11.86359406 W
SFO1 400.2236020 MHz
SI 32768
SF 400.2200000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



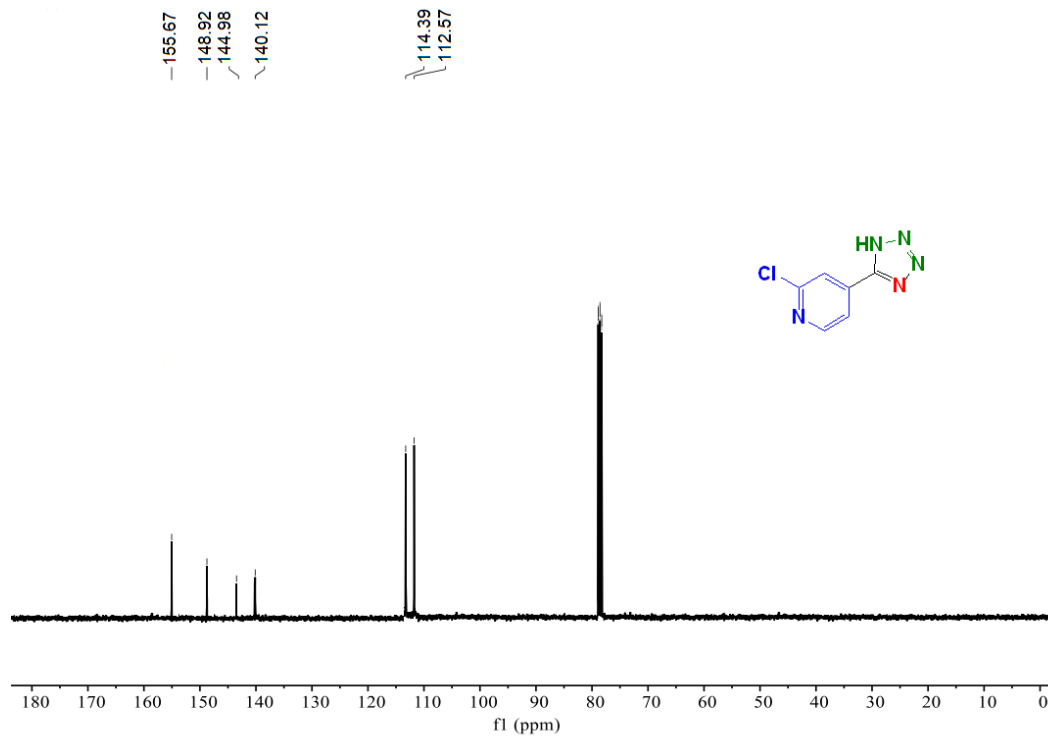
NAME UN
EXPNO 435
PROCNO 2
Date_ 20241211
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg
TD 65536
SOLVENT CDCl3
NS 31
DS 0
SWH 25252.523 Hz
FIDRES 0.385323 Hz
AQ 1.2976629 sec
RG 2050
DW 19.800 usec
DE 6.50 usec
TE 293.4 K
D1 3.00000000 sec
D11 0.03000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PL1 -0.90 dB
PL1W 42.02801895 W
SFO1 100.6479784 MHz
===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 90.00 usec
PL2 -2.00 dB
PL12 14.116 dB
PL13 17.90 dB
PL2W 11.86359406 W
PL12W 0.28722104 W
PL13W 0.12139934 W
SFO2 400.2216009 MHz
SI 32768
SF 100.6353990 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



NAME UN
EXPNO 426
PROCNO 1
Date_ 20241206
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl₃
NS 24
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 406
DW 62.400 usec
DE 6.50 usec
TE 293.2 K
D1 6.0000000 sec
TD0 1

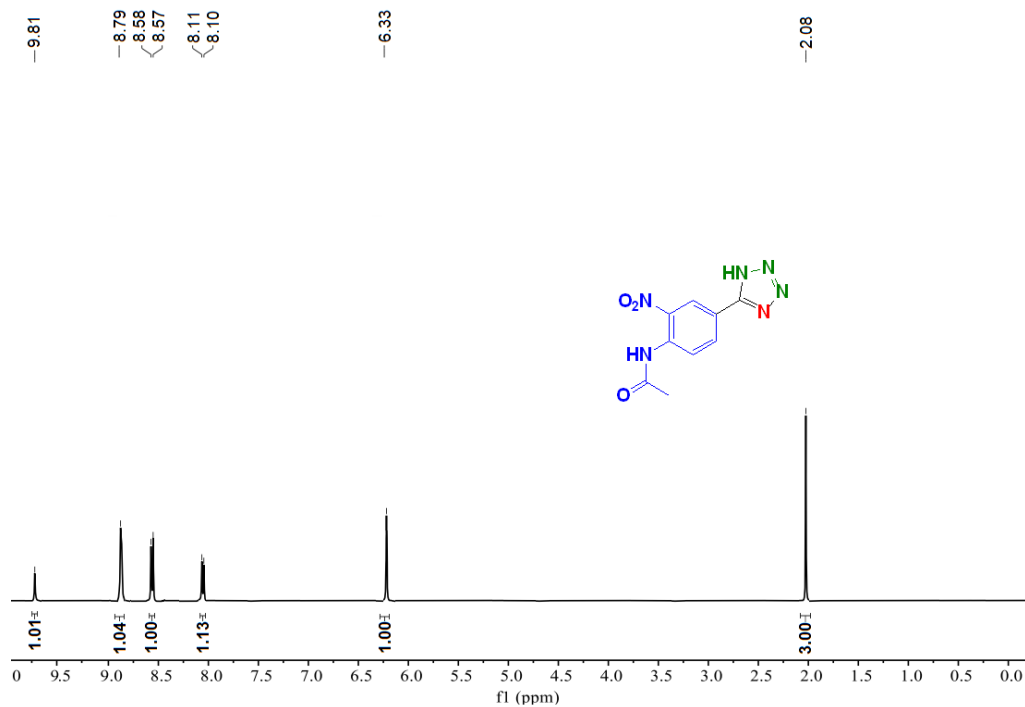
===== CHANNEL f1 =====
NUC1 1H
P1 14.00 usec
PL1 -2.00 dB
PL1W 11.86359406 W
SFO1 400.2236020 MHz
SI 32768
SF 400.2200000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



NAME UN
EXPNO 435
PROCNO 2
Date_ 20241206
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg
TD 65536
SOLVENT CDCl₃
NS 31
DS 0
SWH 25252.525 Hz
FIDRES 0.385323 Hz
AQ 1.2976629 sec
RG 2050
DW 19.800 usec
DE 6.50 usec
TE 293.2 K
D1 3.0000000 sec
D11 6.0300000 sec
TD0 1

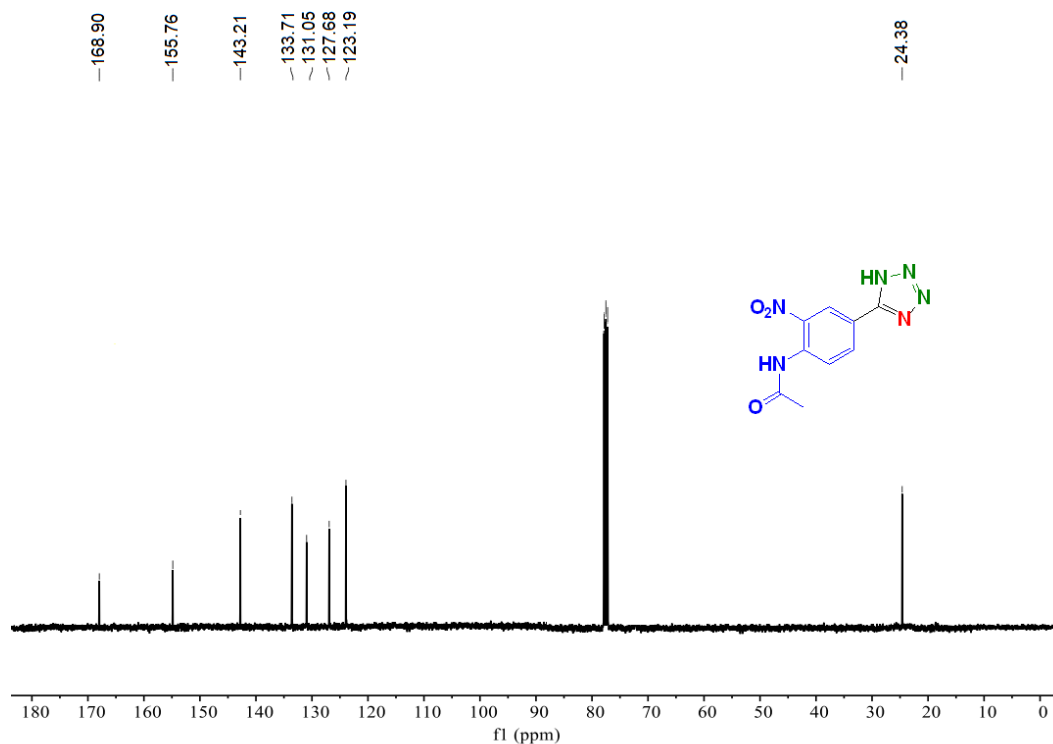
===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PL1 -0.90 dB
PL1W 42.02801895 W
SFO1 100.6479784 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 90.00 usec
PL2 -2.00 dB
PL12 14.16 dB
PL13 17.90 dB
PL12W 11.86359406 W
PL12W 6.28722104 W
PL13W 6.12139934 W
SFO2 400.2216009 MHz
SI 32768
SF 100.6353990 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



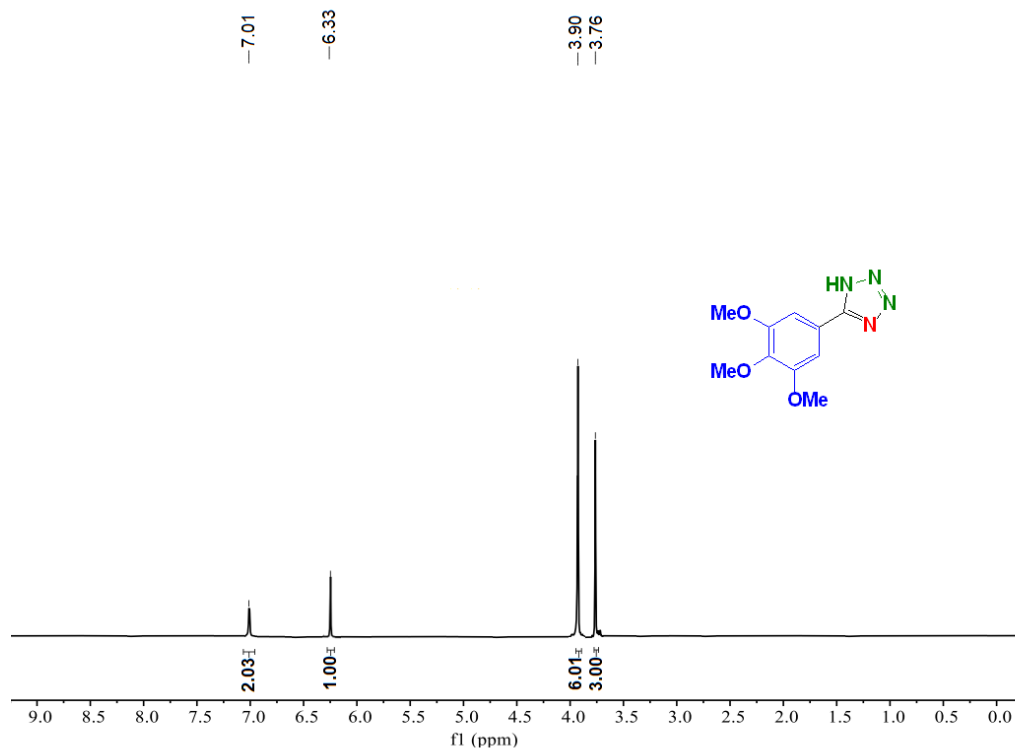
NAME UN
EXPNO 426
PROCNO 1
Date_ 20241206
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl₃
NS 24
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 406
DW 62.400 usec
DE 6.50 usec
TE 293.2 K
D1 6.00000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 14.00 usec
PL1 -2.00 dB
PL1W 11.86359406 W
SFO1 400.2236020 MHz
SI 32768
SF 400.2200000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



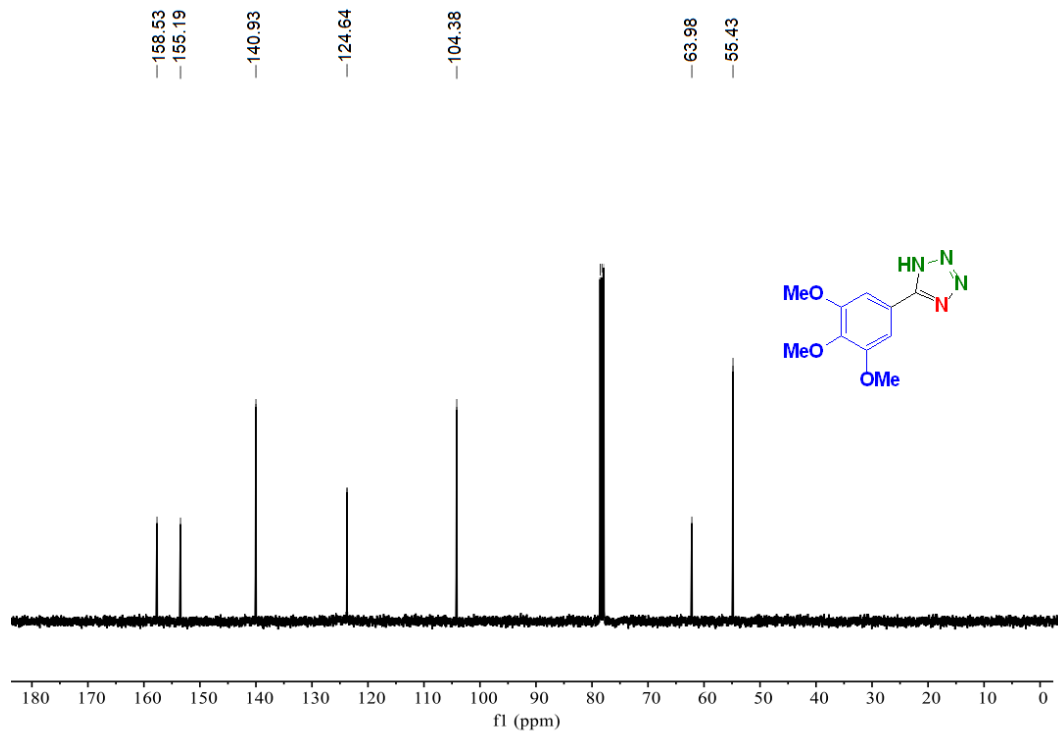
NAME UN
EXPNO 435
PROCNO 2
Date_ 20241206
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg
TD 65536
SOLVENT CDCl₃
NS 31
DS 0
SWH 25252.525 Hz
FIDRES 0.385323 Hz
AQ 1.2976629 sec
RG 2050
DW 19.800 usec
DE 6.50 usec
TE 293.2 K
D1 3.00000000 sec
D11 6.03000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PL1 -0.90 dB
PL1W 42.02801895 W
SFO1 100.6479784 MHz
===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 90.00 usec
PL2 -2.00 dB
PL12 14.16 dB
PL13 17.90 dB
PL1W 11.86359406 W
PL12W 6.28722104 W
PL13W 6.12139934 W
SFO2 400.2216009 MHz
SI 32768
SF 100.6353990 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



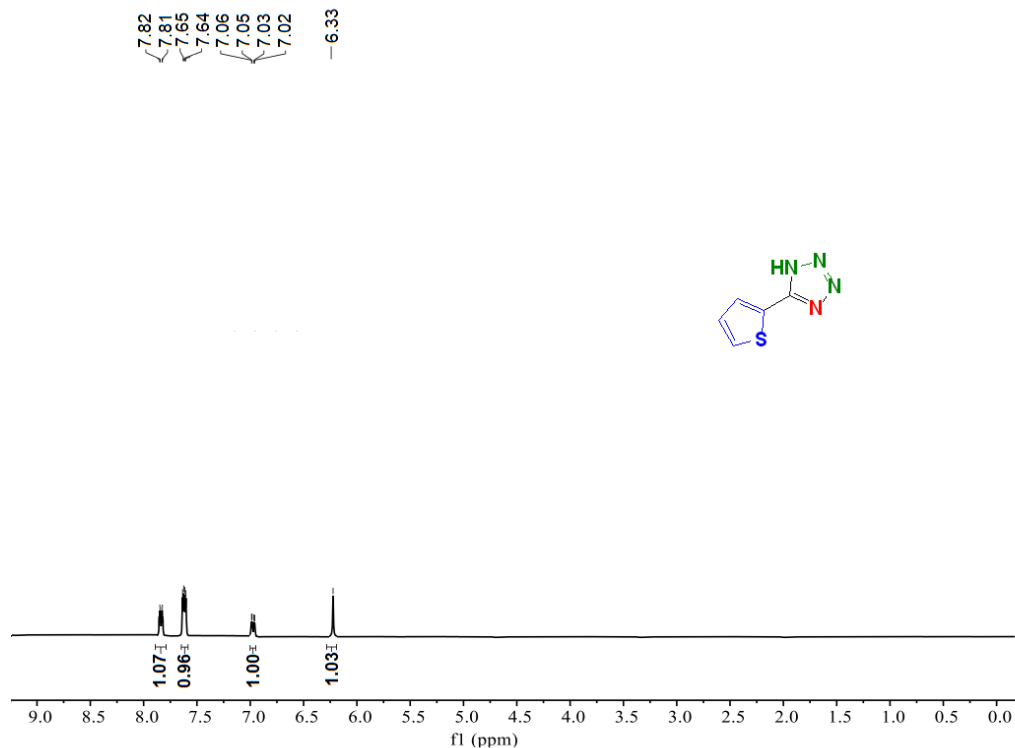
NAME UN
EXPNO 426
PROCNO 1
Date_ 20241211
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl₃
NS 24
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 406
DW 62.400 usec
DE 6.50 usec
TE 293.2 K
D1 6.0000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 14.00 usec
PL1 -2.00 dB
PL1W 11.86359406 W
SFO1 400.2236020 MHz
SI 32768
SF 400.2200000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



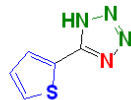
NAME UN
EXPNO 435
PROCNO 2
Date_ 20241211
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg
TD 65536
SOLVENT CDCl₃
NS 31
DS 0
SWH 25252.525 Hz
FIDRES 0.385353 Hz
AQ 1.2976629 sec
RG 2050
DW 19.800 usec
DE 6.50 usec
TE 293.4 K
D1 3.0000000 sec
D11 0.0300000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PL1 -0.90 dB
PL1W 42.02801895 W
SFO1 100.6479784 MHz
===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 90.00 usec
PL2 -2.00 dB
PL12 14.16 dB
PL13 17.90 dB
PL2W 11.86359406 W
PL12W 0.28722104 W
PL13W 0.12139934 W
SFO2 400.2216009 MHz
SI 32768
SF 100.6353990 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



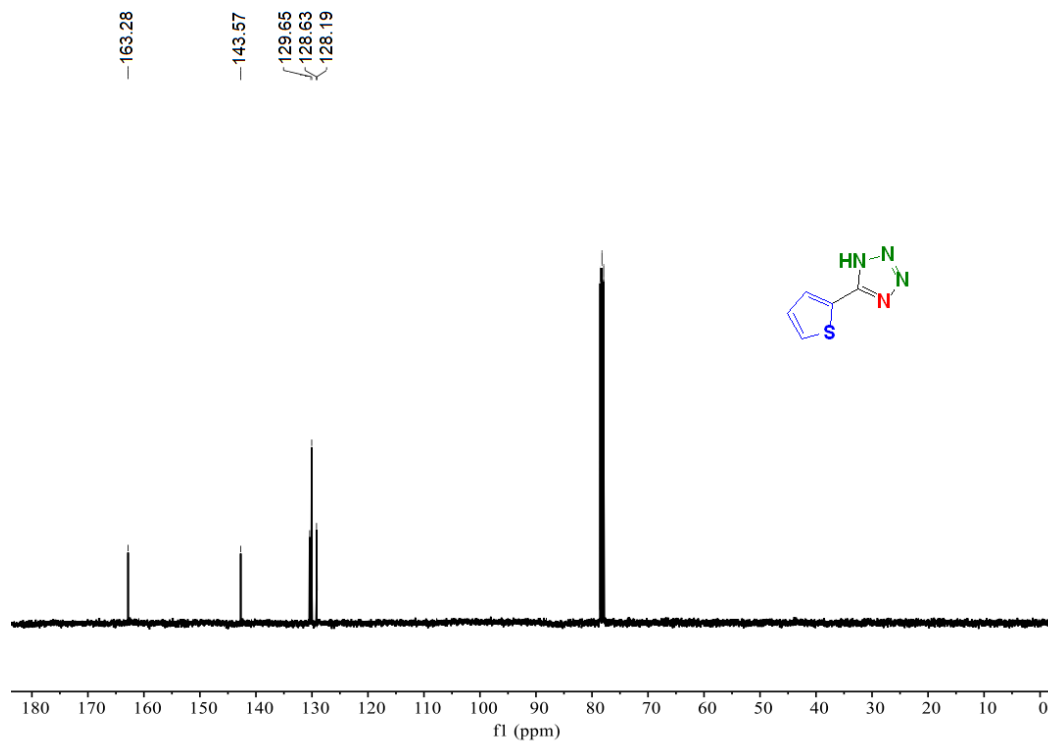
```

NAME      UN
EXPNO     426
PROCNO    1
Date_     20241206
INSTRUM   spect
PROBHD    5 mm PABBO BB-
PULPROG   zg30
TD         65536
SOLVENT   CDCl3
NS         24
DS         0
SWH        8012.820 Hz
FIDRES     0.122266 Hz
AQ         4.0894966 sec
RG         406
DW         62.400 usec
DE         6.50 usec
TE         293.2 K
D1         6.0000000 sec
TD0        1
  
```



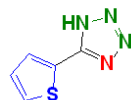
```

===== CHANNEL f1 =====
NUC1      1H
P1        14.00 usec
PL1       -2.00 dB
PL1W      11.86359406 W
SFO1      400.2236020 MHz
SI        32768
SF        400.2200000 MHz
WDW        EM
SSB        0
LB         0.30 Hz
GB         0
PC         1.00
  
```



```

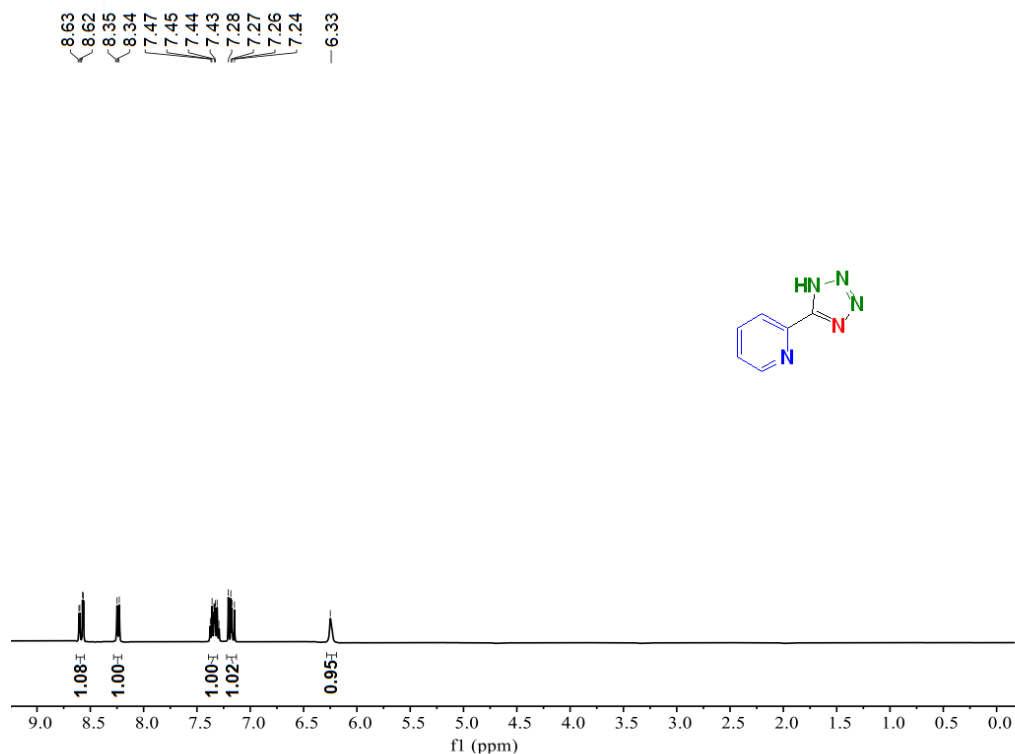
NAME      UN
EXPNO     435
PROCNO    2
Date_     20241206
INSTRUM   spect
PROBHD    5 mm PABBO BB-
PULPROG   zgpg
TD         65536
SOLVENT   CDCl3
NS         31
DS         0
SWH        25252.525 Hz
FIDRES     0.385323 Hz
AQ         1.2976629 sec
RG         2050
DW         19.800 usec
DE         6.50 usec
TE         293.4 K
D1         3.0000000 sec
D11        0.0300000 sec
TD0        1
  
```



```

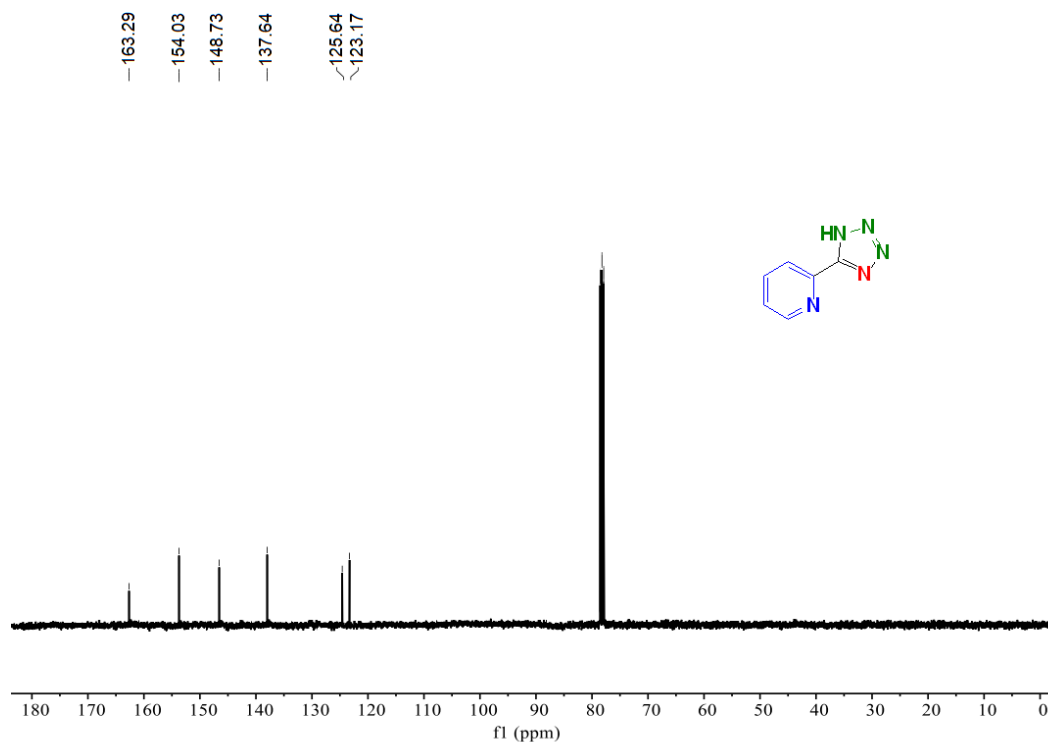
===== CHANNEL f1 =====
NUC1      13C
P1        9.00 usec
PL1       -0.90 dB
PL1W      42.02801895 W
SFO1      100.6479784 MHz

===== CHANNEL f2 =====
CPDPRG2   waltz16
NUC2      1H
PCPD2     90.00 usec
PL2       -2.00 dB
PL12      14.16 dB
PL13      17.90 dB
PL1W      11.86359406 W
PL12W     0.28722104 W
PL13W     0.12139934 W
SFO2      400.2216009 MHz
SI        32768
SF        100.6353999 MHz
WDW        EM
SSB        0
LB         1.00 Hz
GB         0
PC         1.40
  
```



NAME UN
EXPNO 426
PROCNO 1
Date_ 20241206
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl₃
NS 24
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 406
DW 62.400 usec
DE 6.50 usec
TE 293.2 K
D1 6.0000000 sec
TD0 1

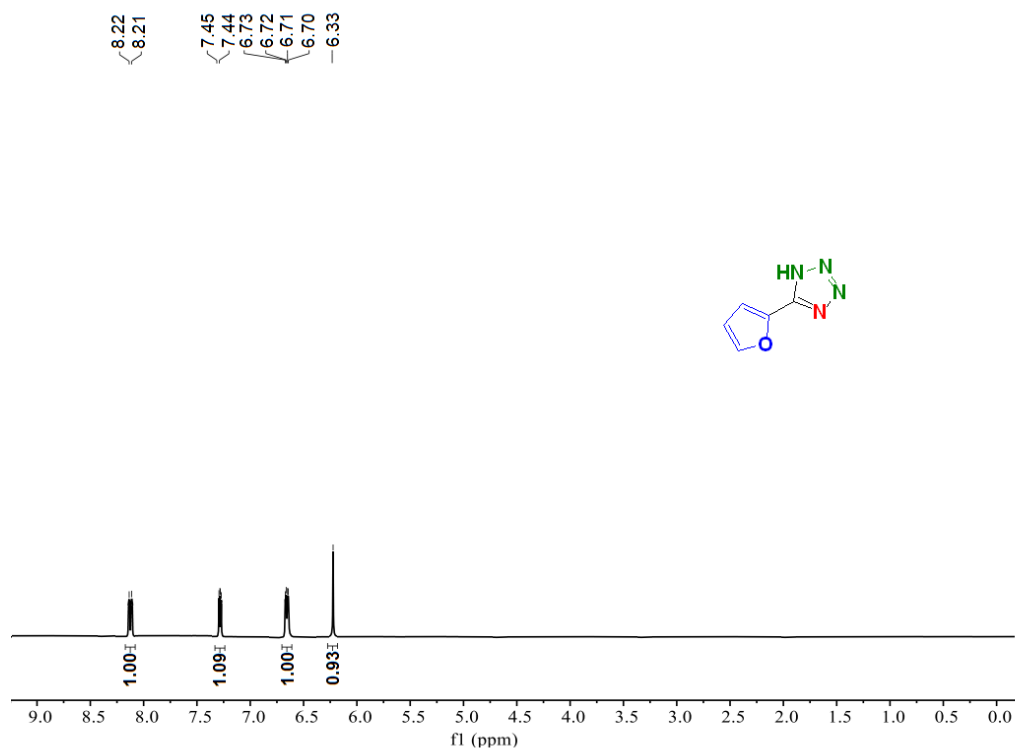
===== CHANNEL f1 =====
NUC1 1H
P1 14.00 usec
PL1 -2.00 dB
PL1W 11.86359406 W
SFO1 400.2236020 MHz
SI 32768
SF 400.2200000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



NAME UN
EXPNO 435
PROCNO 2
Date_ 20241206
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg
TD 65536
SOLVENT CDCl₃
NS 31
DS 0
SWH 25252.525 Hz
FIDRES 0.385323 Hz
AQ 1.2976629 sec
RG 2050
DW 19.800 usec
DE 6.50 usec
TE 293.4 K
D1 3.0000000 sec
D11 6.0300000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PL1 -0.90 dB
PL1W 42.02801895 W
SFO1 100.6479784 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 90.00 usec
PL2 -2.00 dB
PL12 14.16 dB
PL13 17.90 dB
PL2W 11.86359406 W
PL12W 6.28722104 W
PL13W 6.12139934 W
SFO2 400.2216009 MHz
SI 32768
SF 100.6353990 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

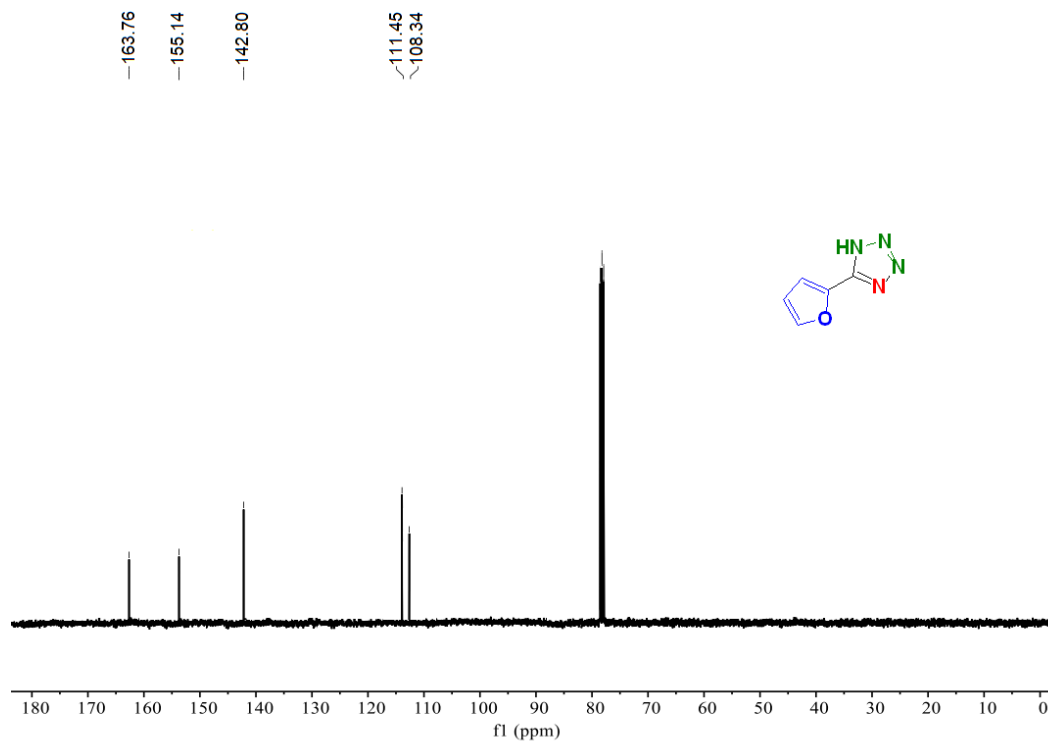


```

NAME      UN
EXPNO     426
PROCNO    1
Date_     20241206
INSTRUM   spect
PROBHD    5 mm PABBO BB-
PULPROG   zg30
TD        65536
SOLVENT   CDCl3
NS         24
DS         0
SWH       8012.820 Hz
FIDRES    0.122266 Hz
AQ        4.0894966 sec
RG         406
DW        62.400 usec
DE         6.50 usec
TE        293.2 K
D1        6.0000000 sec
TD0       1
  
```

```

===== CHANNEL f1 =====
NUC1      1H
P1        14.00 usec
PL1       -2.00 dB
PL1W      11.86359406 W
SFO1      400.2236020 MHz
SI        32768
SF        400.2200000 MHz
WDW        EM
SSB        0
LB        0.30 Hz
GB         0
PC         1.00
  
```



```

NAME      UN
EXPNO     435
PROCNO    2
Date_     20241206
INSTRUM   spect
PROBHD    5 mm PABBO BB-
PULPROG   zgpg
TD        65536
SOLVENT   CDCl3
NS         31
DS         0
SWH       25252.525 Hz
FIDRES    0.385323 Hz
AQ        1.2976629 sec
RG         2050
DW        19.800 usec
DE         6.50 usec
TE        293.4 K
D1        3.0000000 sec
D11       0.0300000 sec
TD0       1
  
```

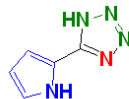
```

===== CHANNEL f1 =====
NUC1      13C
P1        9.00 usec
PL1       -0.90 dB
PL1W      42.02801895 W
SFO1      100.6479784 MHz

===== CHANNEL f2 =====
CPDPRG2   waltz16
NUC2      1H
PCPD2     90.00 usec
PL2       -2.00 dB
PL12      14.16 dB
PL13      17.90 dB
PL1W      11.86359406 W
PL12W     0.28722104 W
PL13W     0.12139934 W
SFO2      400.2216009 MHz
SI        32768
SF        100.6353990 MHz
WDW        EM
SSB        0
LB        1.00 Hz
GB         0
PC         1.40
  
```

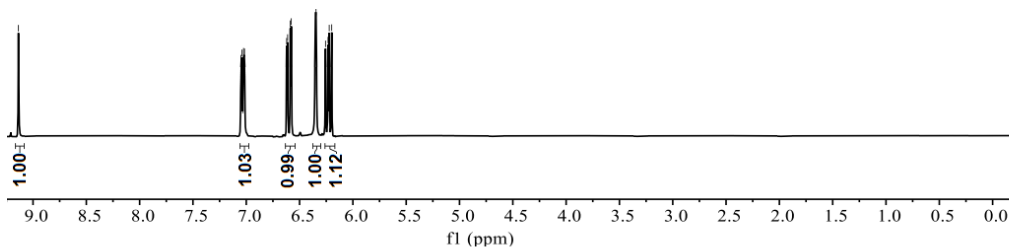
— 9.26

7.04
7.02
6.68
6.66
6.33
6.23
6.22
6.21
6.20



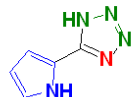
NAME UN
EXPNO 426
PROCNO 1
Date_ 20241211
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl₃
NS 24
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 406
DW 62.400 usec
DE 6.50 usec
TE 293.2 K
D1 6.0000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 14.00 usec
PL1 -2.00 dB
PL1W 11.86359406 W
SFO1 400.2236020 MHz
SI 32768
SF 400.2200000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



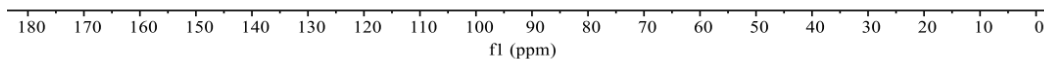
— 163.29

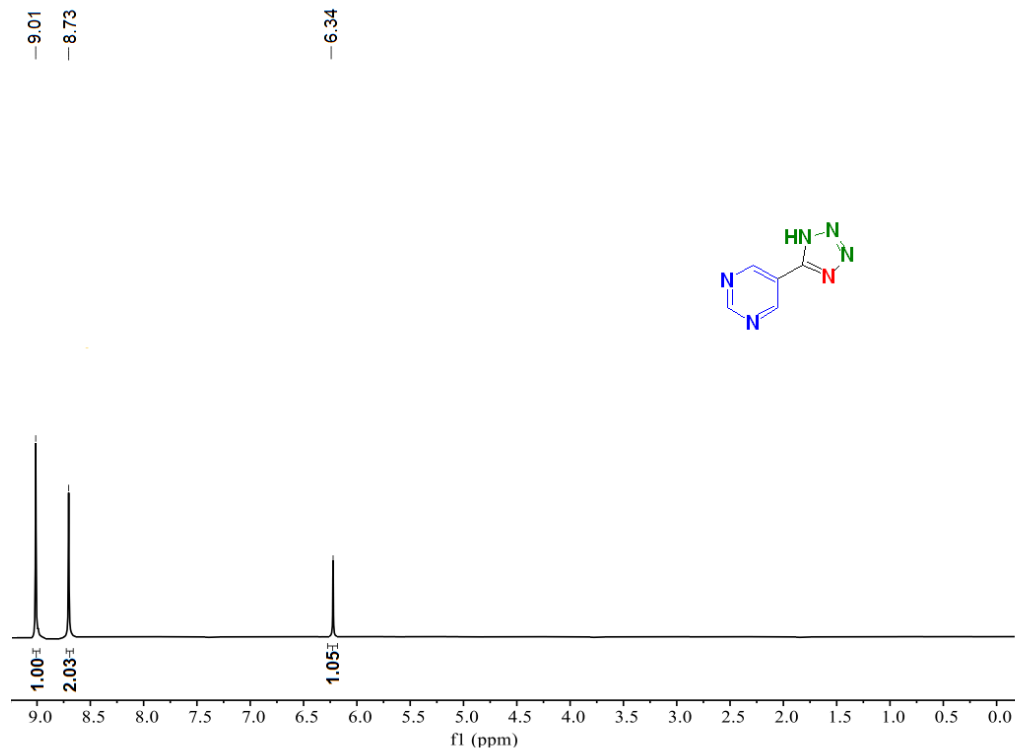
128.34
120.76
112.65
106.72



NAME UN
EXPNO 435
PROCNO 2
Date_ 20241211
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg
TD 65536
SOLVENT CDCl₃
NS 31
DS 0
SWH 25252.525 Hz
FIDRES 0.385323 Hz
AQ 1.2976629 sec
RG 2050
DW 19.800 usec
DE 6.50 usec
TE 293.4 K
D1 3.0000000 sec
D11 0.0300000 sec
TD0 1

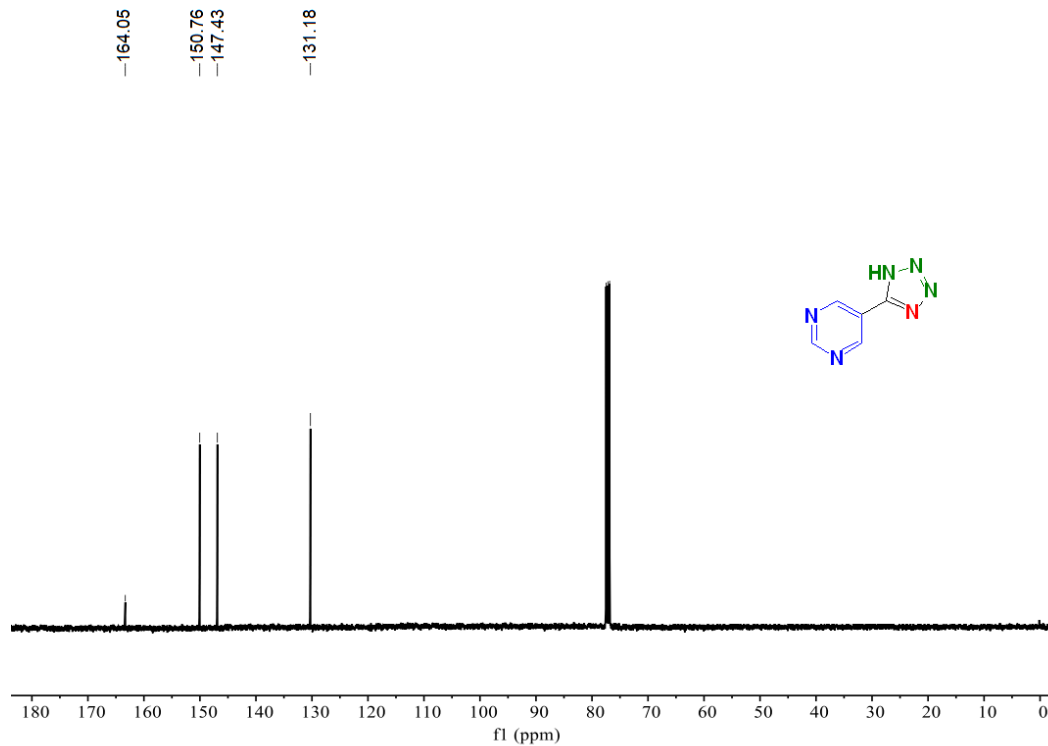
===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PL1 -0.90 dB
PL1W 42.02801855 W
SFO1 100.6479784 MHz
===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 90.00 usec
PL2 -2.00 dB
PL12 14.16 dB
PL13 17.50 dB
PL2W 11.86359406 W
PL12W 6.28722104 W
PL13W 6.12139934 W
SFO2 400.2216009 MHz
SI 32768
SF 100.6353990 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40





NAME UN
EXPNO 426
PROCNO 1
Date_ 20241206
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl₃
NS 24
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 406
DW 62.400 usec
DE 6.50 usec
TE 293.2 K
D1 6.0000000 sec
TD0 1

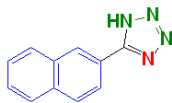
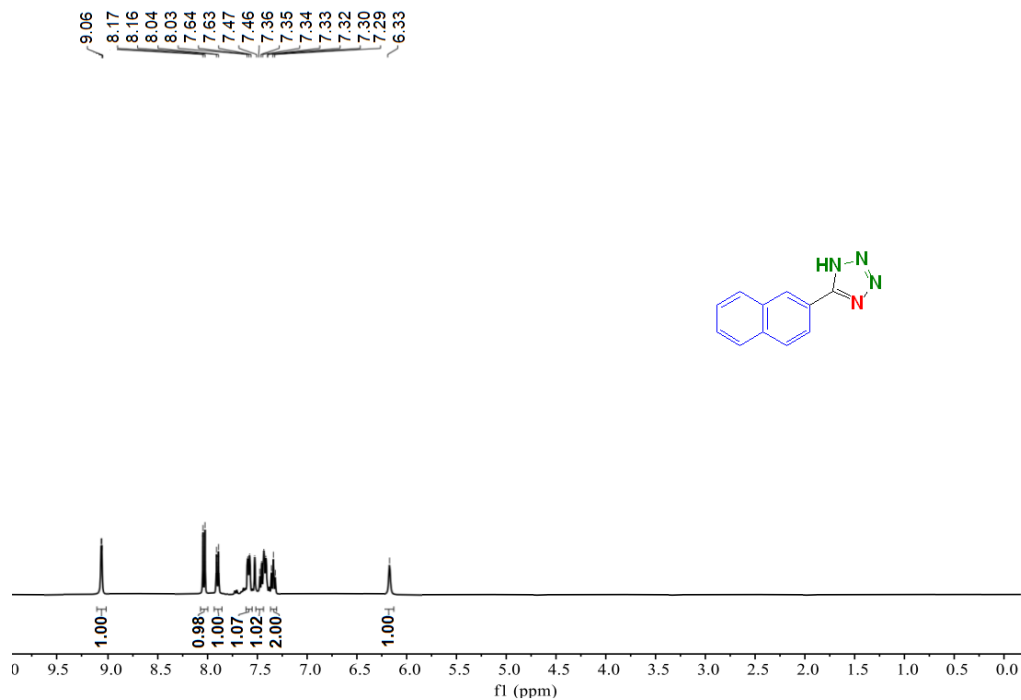
===== CHANNEL f1 =====
NUC1 1H
P1 14.00 usec
PL1 -2.00 dB
PL1W 11.86359406 W
SFO1 400.2236020 MHz
SI 32768
SF 400.2200000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



NAME UN
EXPNO 435
PROCNO 2
Date_ 20241206
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg
TD 65536
SOLVENT CDCl₃
NS 31
DS 0
SWH 25252.525 Hz
FIDRES 0.385323 Hz
AQ 1.2976629 sec
RG 2050
DW 19.800 usec
DE 6.50 usec
TE 293.2 K
D1 3.0000000 sec
D11 6.0300000 sec
TD0 1

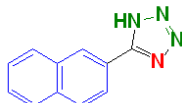
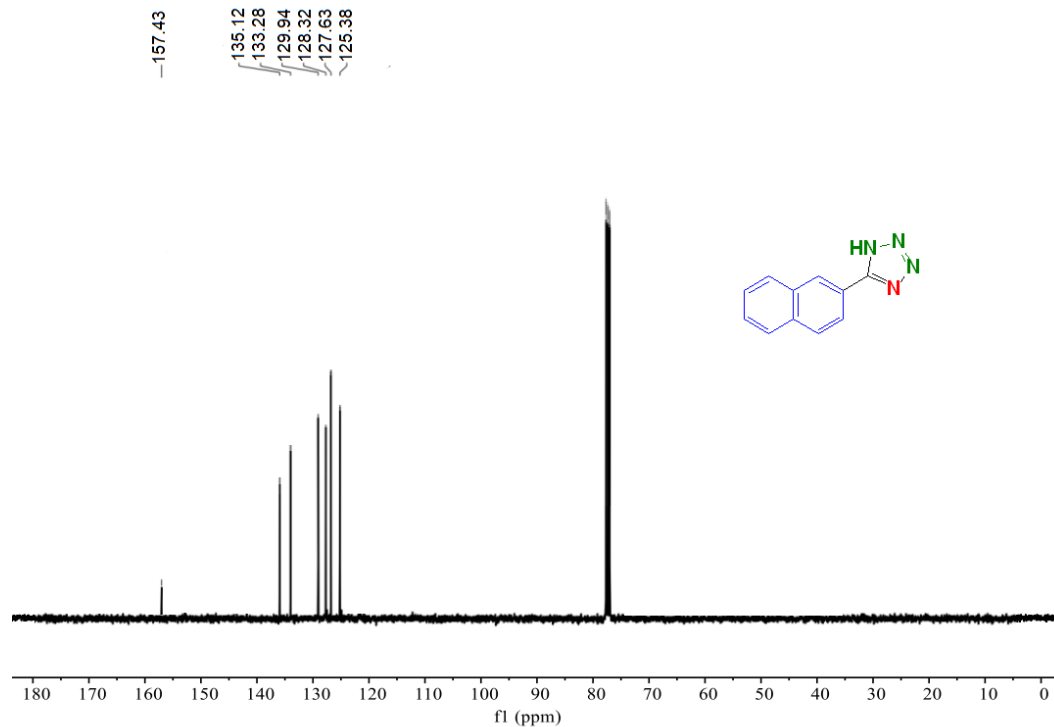
===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PL1 -0.90 dB
PL1W 42.02801895 W
SFO1 100.6479784 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 90.00 usec
PL2 -2.00 dB
PL12 14.16 dB
PL13 17.90 dB
PL2W 11.86359406 W
PL12W 6.28722104 W
PL13W 6.12139934 W
SFO2 400.2216009 MHz
SI 32768
SF 100.6353990 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



NAME UN
EXPNO 426
PROCNO 1
Date_ 20241211
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl₃
NS 24
DS 0
SWH 8012.920 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 406
DW 62.400 usec
DE 6.50 usec
TE 293.2 K
D1 6.0000000 sec
TD0 1

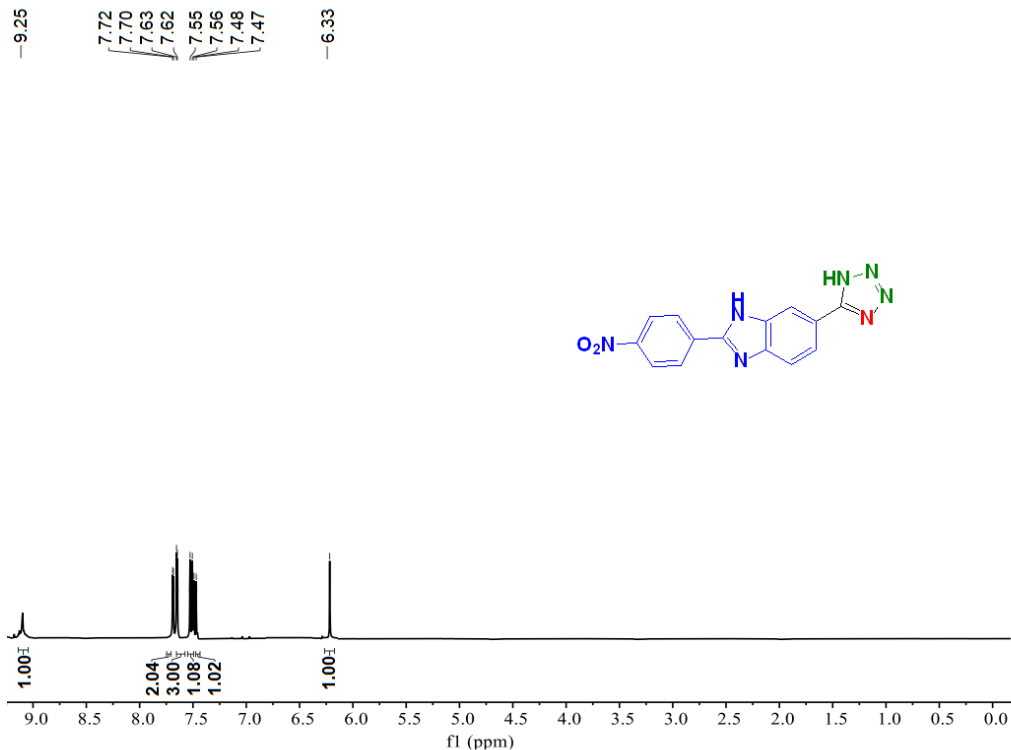
===== CHANNEL f1 =====
NUC1 1H
P1 14.00 usec
PL1 -2.00 dB
PL1W 11.86359406 W
SFO1 400.2236020 MHz
SI 32768
SF 400.2200000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



NAME UN
EXPNO 435
PROCNO 2
Date_ 20241211
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg
TD 65536
SOLVENT CDCl₃
NS 31
DS 0
SWH 25252.525 Hz
FIDRES 0.385353 Hz
AQ 1.2976629 sec
RG 2050
DW 19.800 usec
DE 6.50 usec
TE 293.4 K
D1 3.0000000 sec
D11 0.0300000 sec
TD0 1

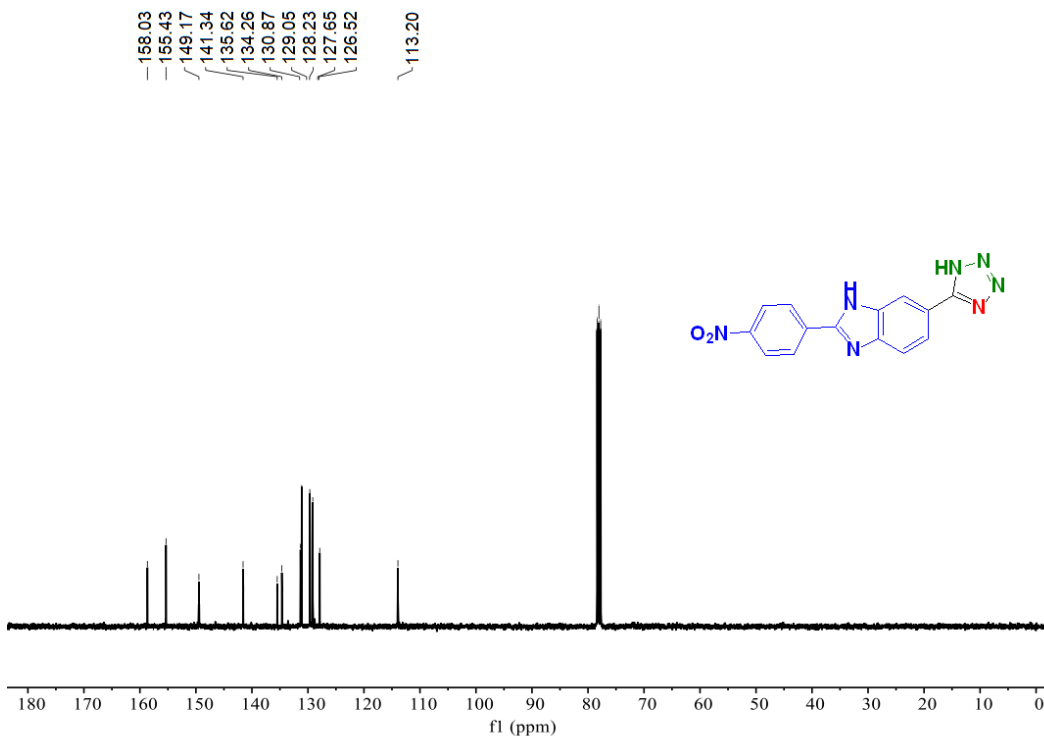
===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PL1 -0.90 dB
PL1W 42.02801895 W
SFO1 100.6479784 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 90.00 usec
PL2 -2.00 dB
PL12 14.16 dB
PL13 17.50 dB
PL2W 11.86359406 W
PL12W 0.28722104 W
PL13W 0.12139934 W
SFO2 400.2216009 MHz
SI 32768
SF 100.6353990 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



NAME UN
EXPNO 426
PROCNO 1
Date_ 20241211
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl₃
NS 24
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 406
DW 62.400 usec
DE 6.50 usec
TE 293.2 K
D1 6.0000000 sec
TD0 1

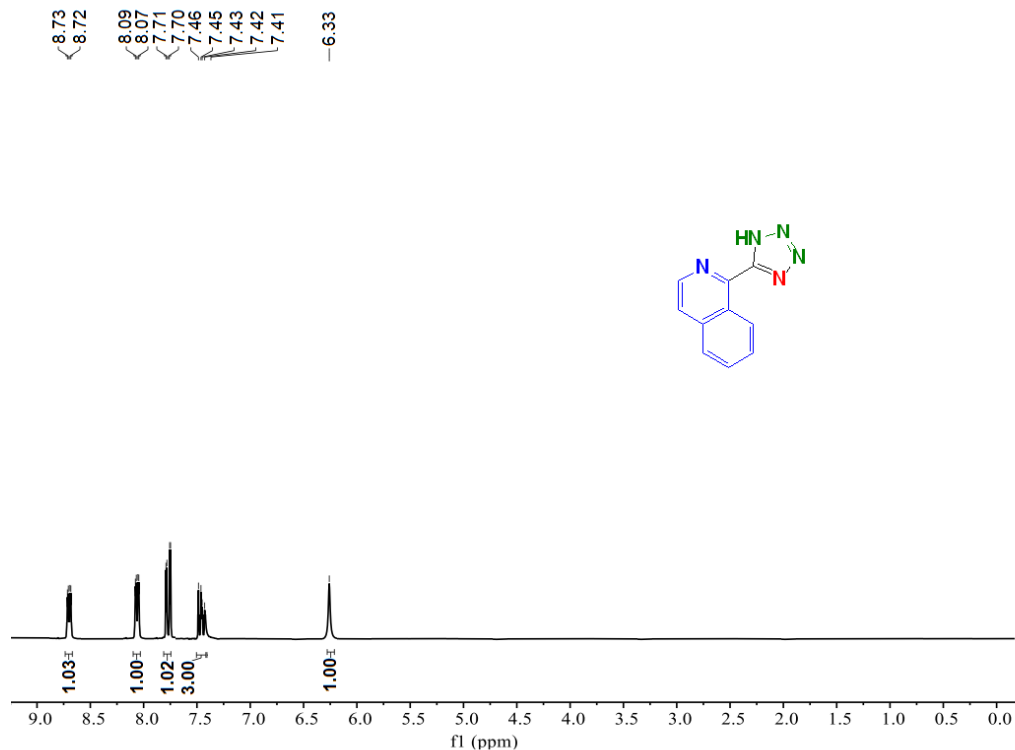
===== CHANNEL f1 =====
NUC1 1H
P1 14.00 usec
PL1 -2.00 dB
PL1W 11.86359406 W
SFO1 400.2236020 MHz
SI 32768
SF 400.2200000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



NAME UN
EXPNO 435
PROCNO 2
Date_ 20241211
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg
TD 65536
SOLVENT CDCl₃
NS 31
DS 0
SWH 25252.525 Hz
FIDRES 0.385323 Hz
AQ 1.2976629 sec
RG 2050
DW 19.800 usec
DE 6.50 usec
TE 293.2 K
D1 3.0000000 sec
D11 6.0300000 sec
TD0 1

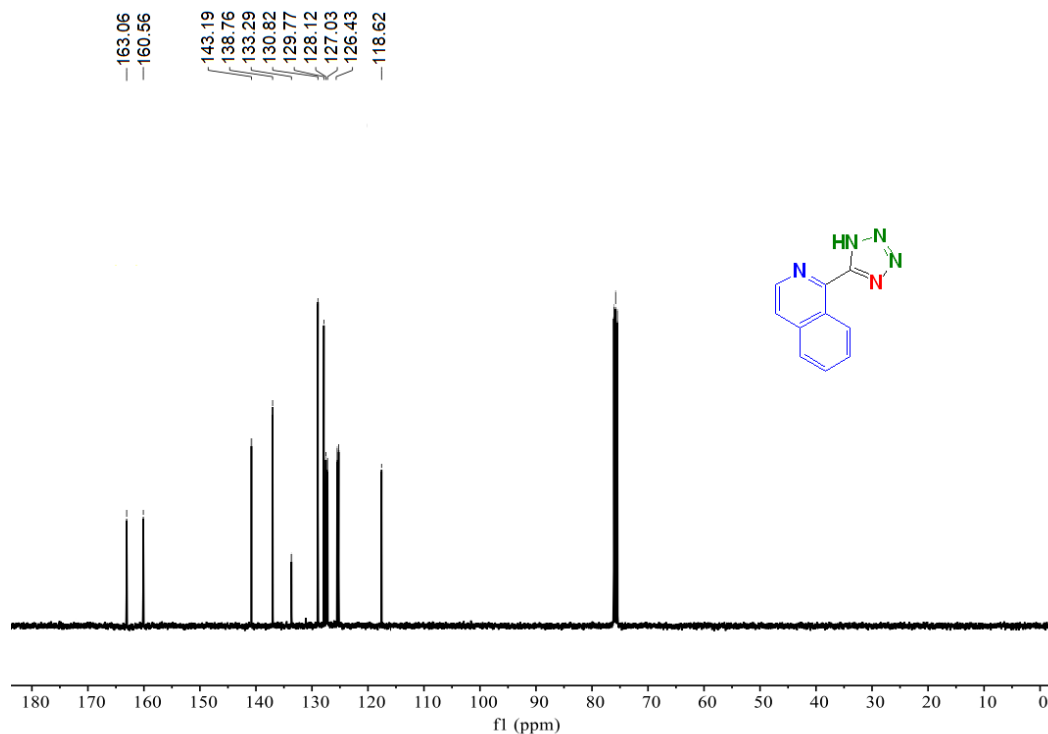
===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PL1 -0.90 dB
PL1W 42.02801895 W
SFO1 100.6479784 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 90.00 usec
PL2 -2.00 dB
PL12 14.16 dB
PL13 17.90 dB
PL2W 11.86359406 W
PL12W 6.28722104 W
PL13W 6.12139934 W
SFO2 400.2216009 MHz
SI 32768
SF 100.6353990 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



NAME UN
EXPNO 426
PROCNO 1
Date_ 20241211
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl₃
NS 24
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
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DW 62.400 usec
DE 6.50 usec
TE 293.2 K
D1 6.0000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 14.00 usec
PL1 -2.00 dB
PL1W 11.86359406 W
SFO1 400.2236020 MHz
SI 32768
SF 400.2200000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



NAME UN
EXPNO 435
PROCNO 2
Date_ 20241211
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg
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DS 0
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TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PL1 -0.90 dB
PL1W 42.02801895 W
SFO1 100.6475784 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 90.00 usec
PL2 -2.00 dB
PL12 14.16 dB
PL13 17.90 dB
PL1W 11.86359406 W
PL12W 0.28722104 W
PL13W 0.12139534 W
SFO2 400.2216000 MHz
SI 32768
SF 100.6353990 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40