Supplementary Material

Synthesis and antimicrobial activity of some new of 2-(furan-2-yl)-1-(piperidin-4-yl)-1*H*-benzo[*d*]imidazole derivatives

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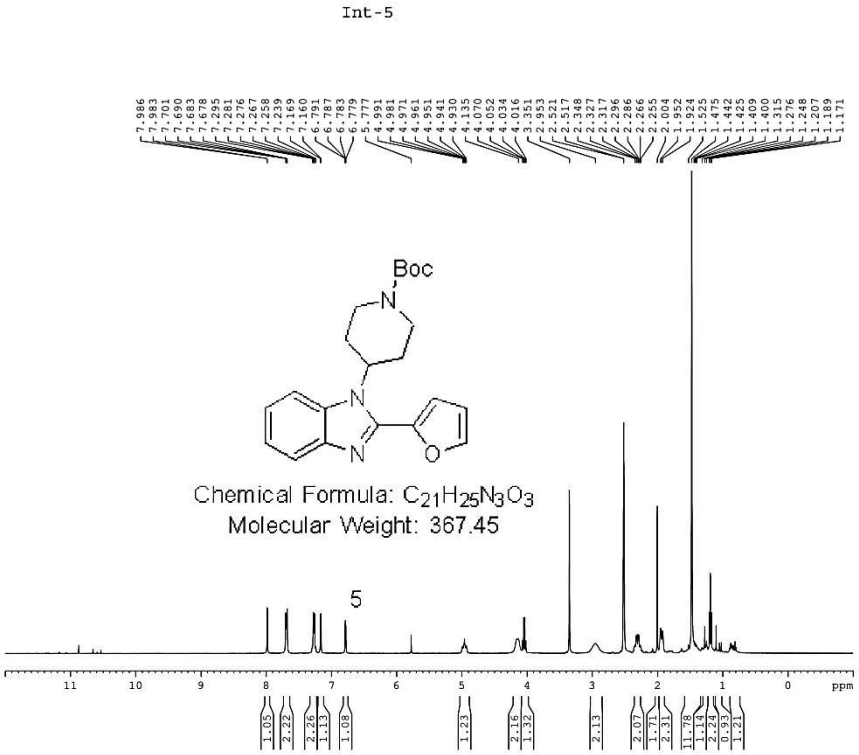
^{1}H NMR spectra of Tert-butyl 4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidine-1-carboxylate (5):

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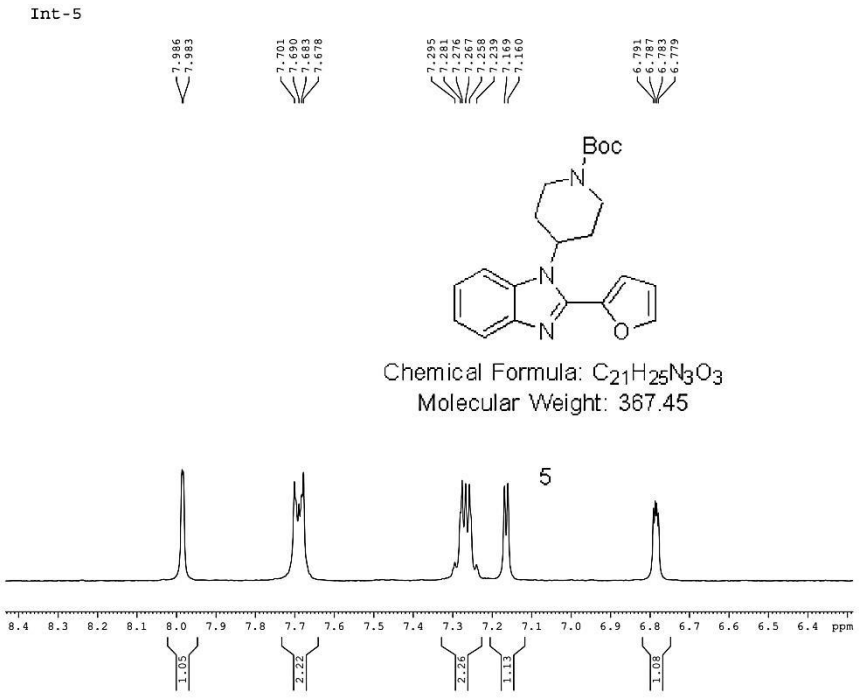


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AQ            1.6025500 sec
RG                159.5
DW               50.000 usec
DE                6.50 usec
TE                294.7 K
D1           1.00000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1         400.3024720 MHz
NUC1                 1H
P1                12.90 usec
PLW1        15.00000000 W

F2 - Processing parameters
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WDW                  EM
SSB       0
LB                1.00 Hz
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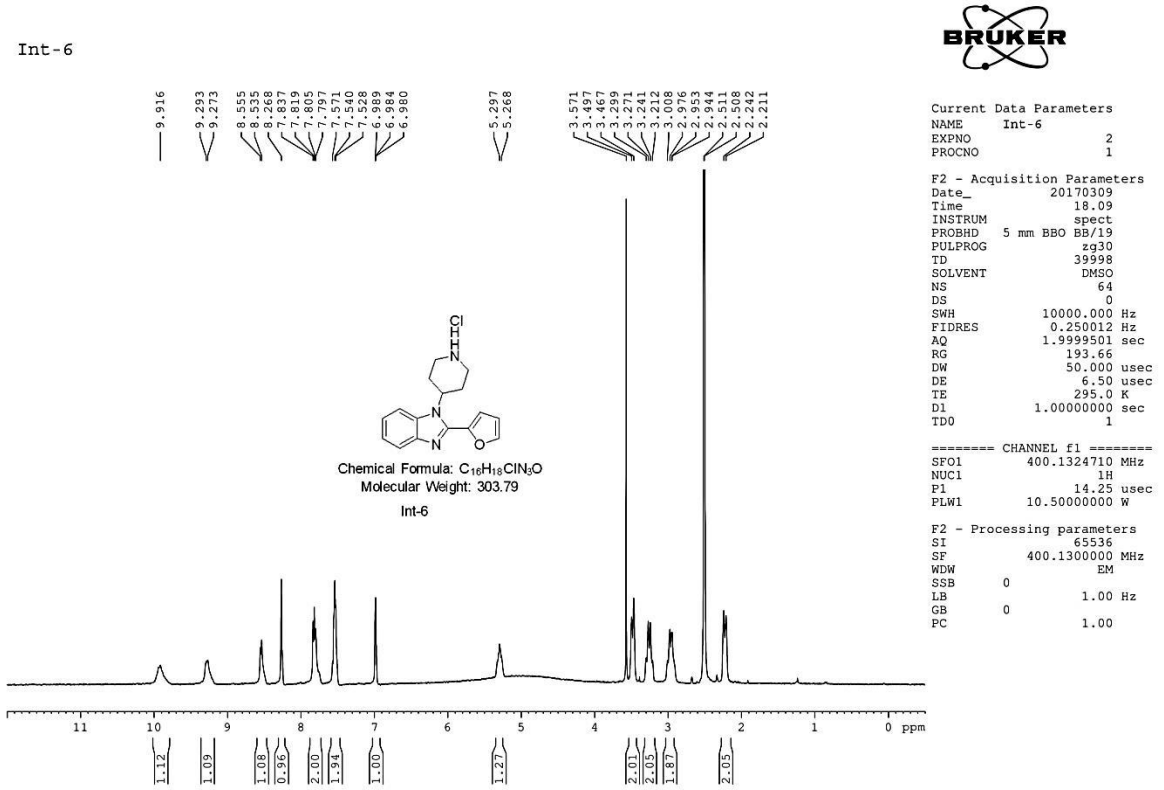

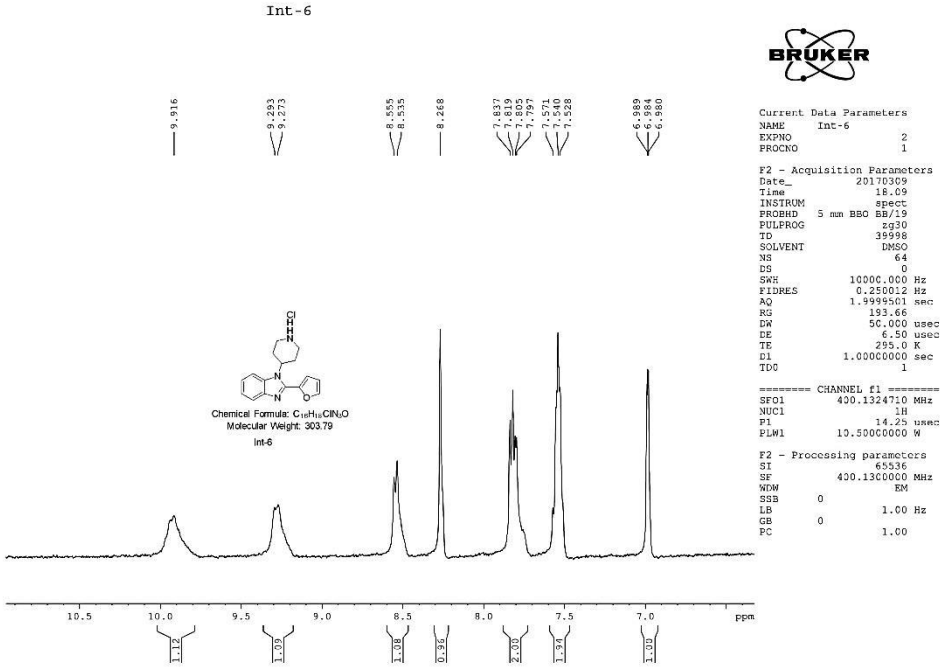

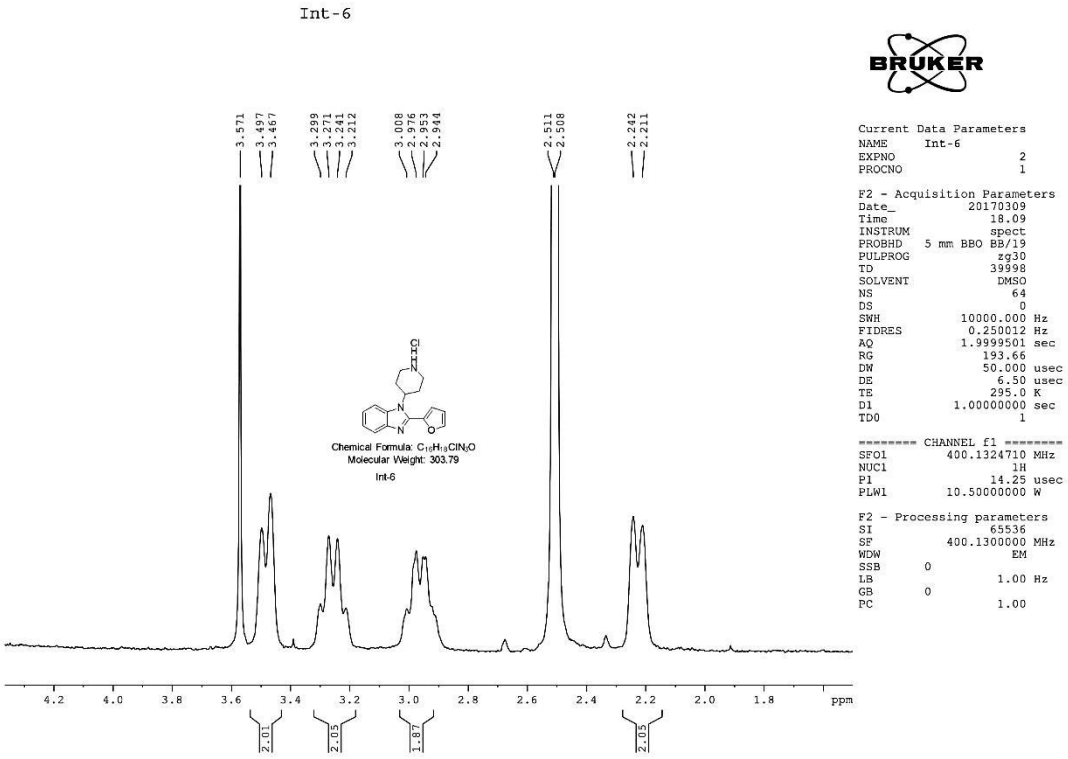

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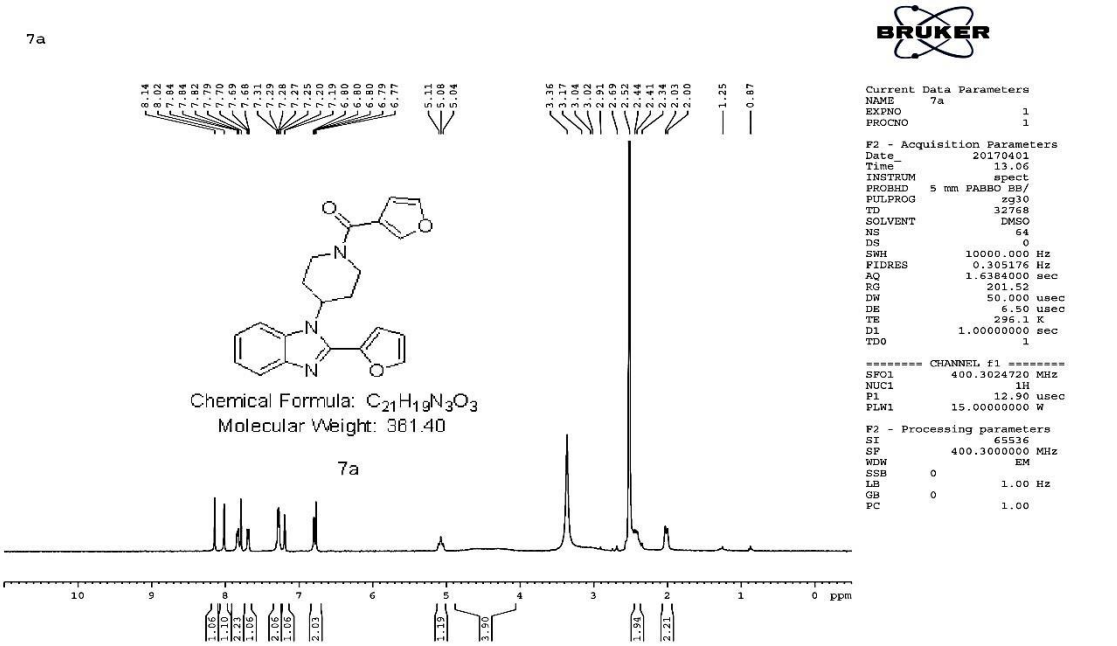

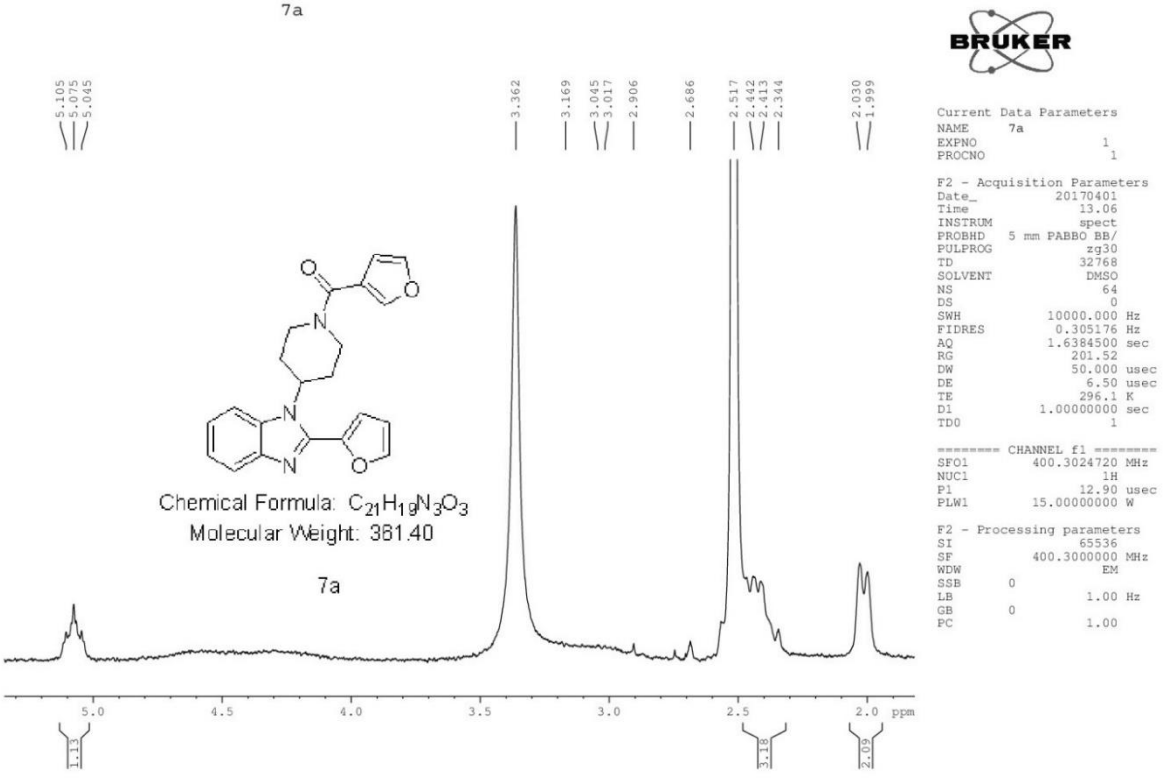

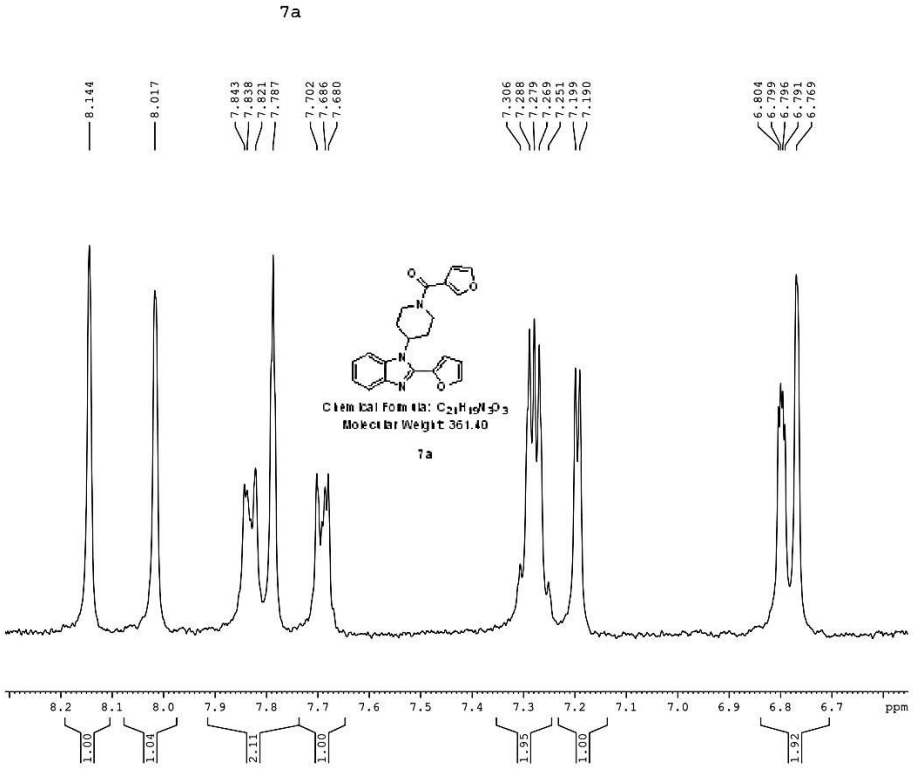

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RG               201.52
DW               50.000 usec
DE                6.50 usec
TE               296.1 K
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TD0                  1

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NUC1                 1H
P1                12.90 usec
PLW1        15.00000000 W

F2 - Processing parameters
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WDW                  EM
SSB       0
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GB        0
PC                1.00
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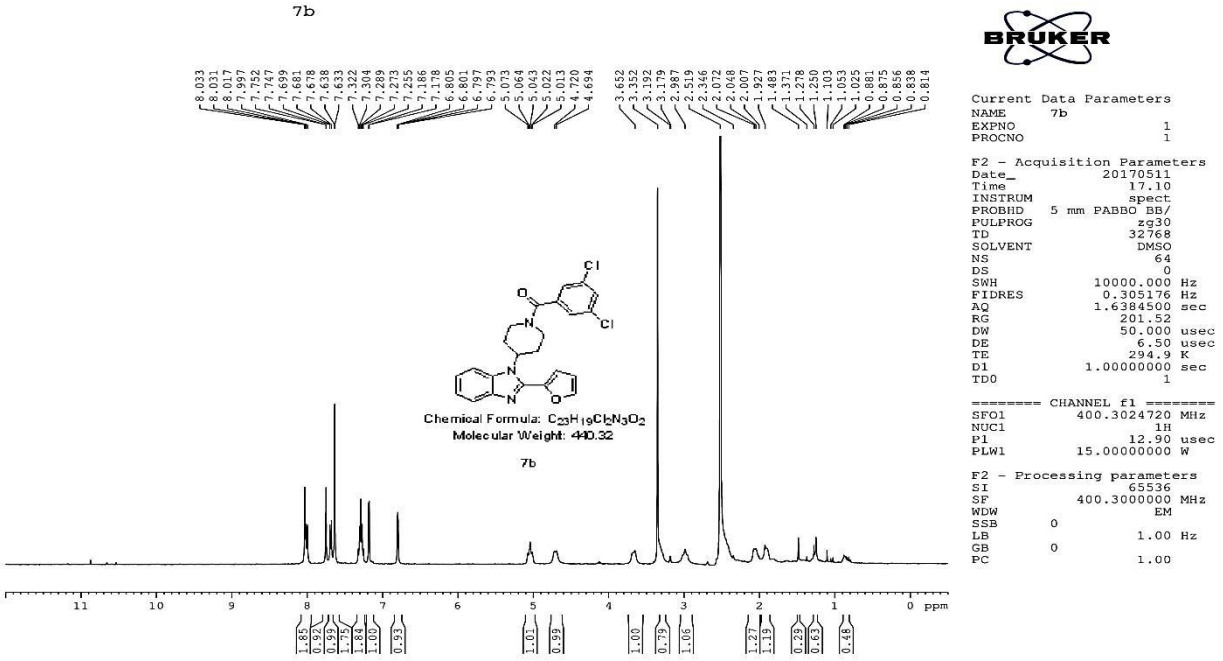


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SWH         10000.000 Hz
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DW               50.000 usec
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======== CHANNEL f1 ========
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NUC1              1H
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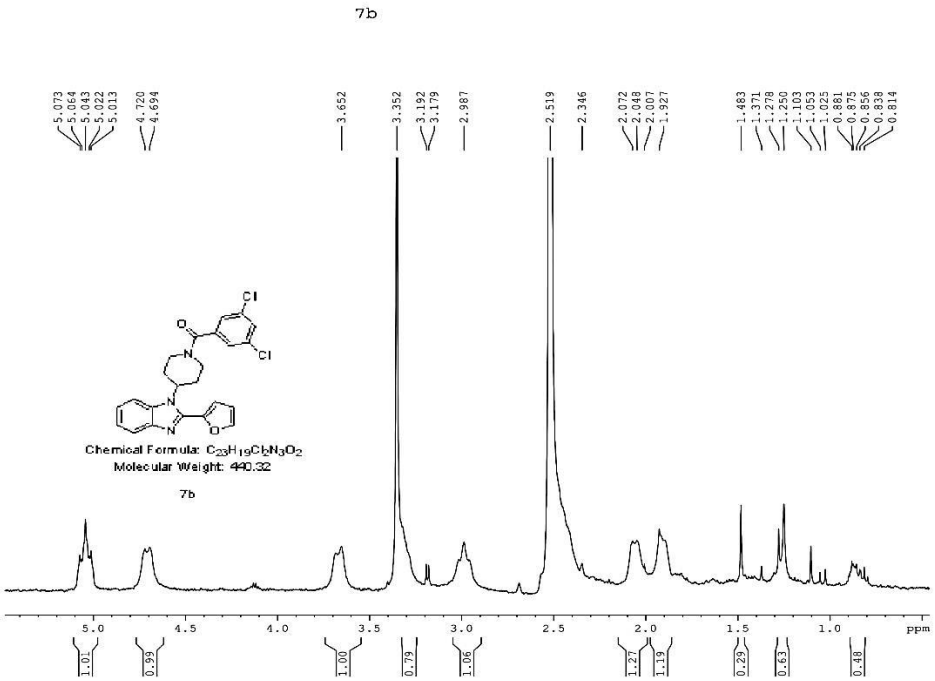


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PROCNO                 1

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NS                    64
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SWH            10000.000 Hz
FIDRES             0.305176 Hz
AQ             1.6384500 sec
RG                201.52
DW                50.000 usec
DE                 6.50 usec
TE                294.9 K
D1             1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1          400.3024720 MHz
NUC1                  1H
P1                 12.90 usec
PLW1          15.00000000 W

F2 - Processing parameters
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WDW                   EM
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LB                 1.00 Hz
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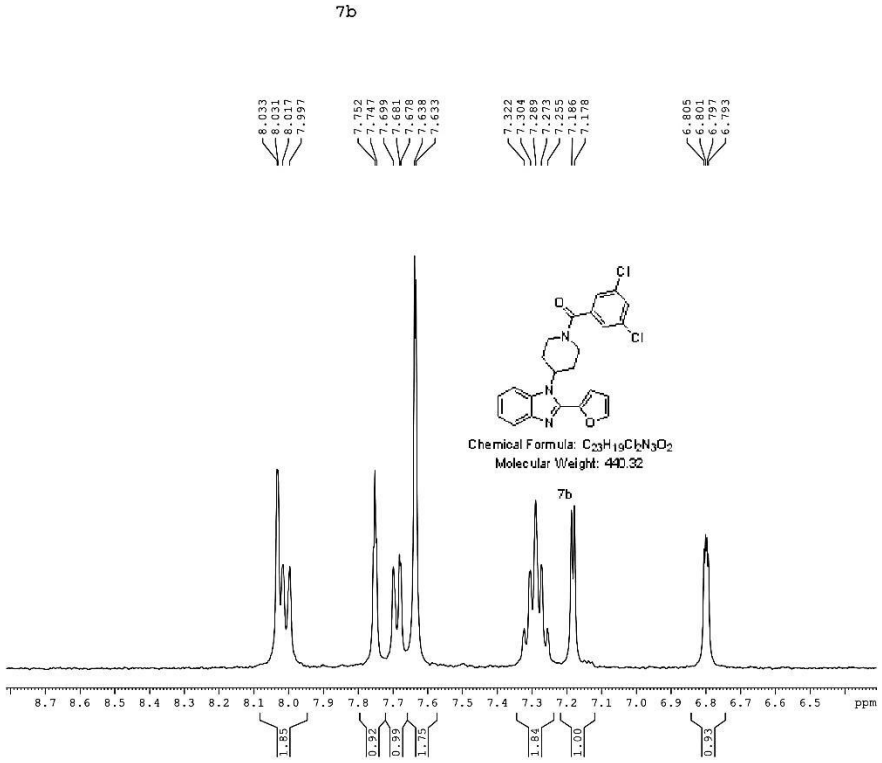


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PROCNO                 1

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NS                    64
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SWH            10000.000 Hz
FIDRES             0.305176 Hz
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RG                201.52
DW                50.000 usec
DE                 6.50 usec
TE                294.9 K
D1             1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
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NUC1                  1H
P1                 12.90 usec
PLW1          15.00000000 W

F2 - Processing parameters
SI                 65536
SF            400.3000000 MHz
WDW                   EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.00
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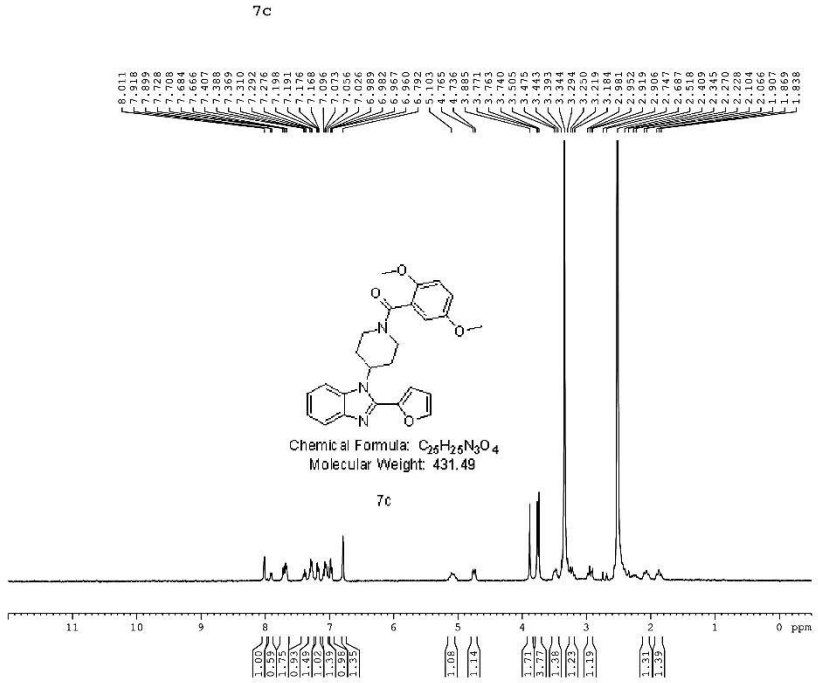
^{1}H NMR of (2,5-dimethoxyphenyl)(4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidin-1-yl)methanone (7c).

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RG                201.52
DW                50.000 usec
DE                 6.50 usec
TE                297.0 K
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TD0                    1

======== CHANNEL f1 ========
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NUC1                  1H
P1                 12.90 usec
PLW1          15.00000000 W

F2 - Processing parameters
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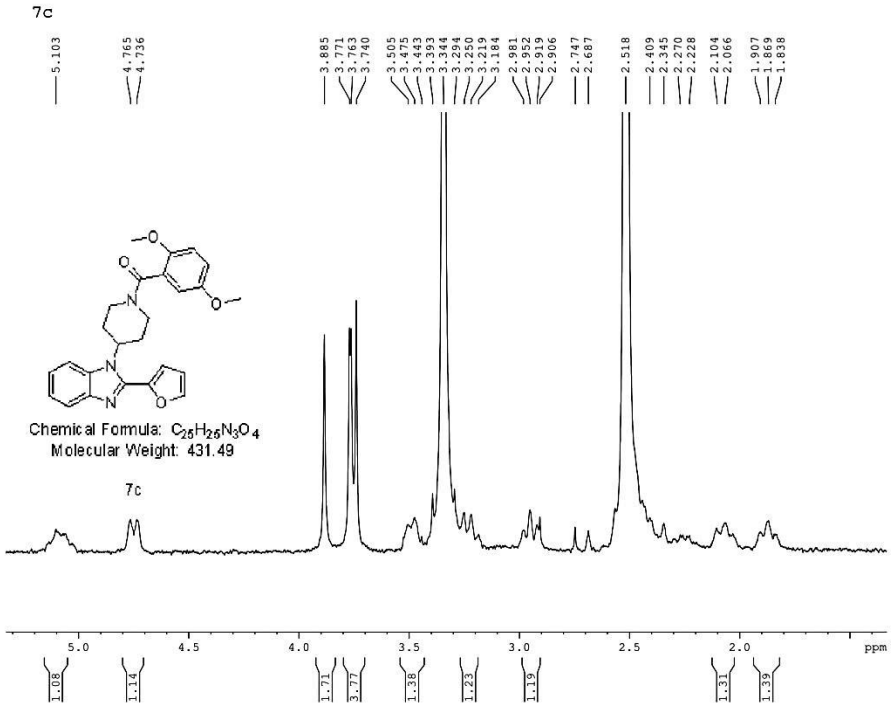


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PROCNO                 1

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SOLVENT             DMSO
NS                    64
DS                     0
SWH            10000.000 Hz
FIDRES         0.305176 Hz
AQ             1.6384500 sec
RG                201.52
DW                50.000 usec
DE                 6.50 usec
TE                297.0 K
D1             1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1          400.3024720 MHz
NUC1                  1H
P1                 12.90 usec
PLW1          15.00000000 W

F2 - Processing parameters
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SF            400.3000000 MHz
WDW                   EM
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LB                 1.00 Hz
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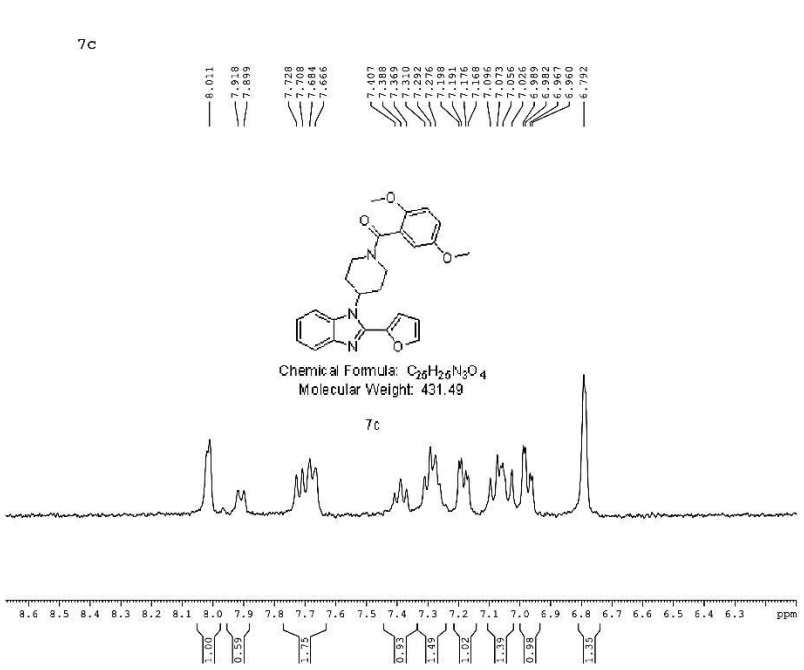

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Current Data Parameters
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PROCNO 1

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SWH 10000.000 Hz
FIDRES 0.305176 Hz
AQ 1.6384500 sec
RG 201.52
DW 50.000 usec
DE 6.50 usec
TE 297.0 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
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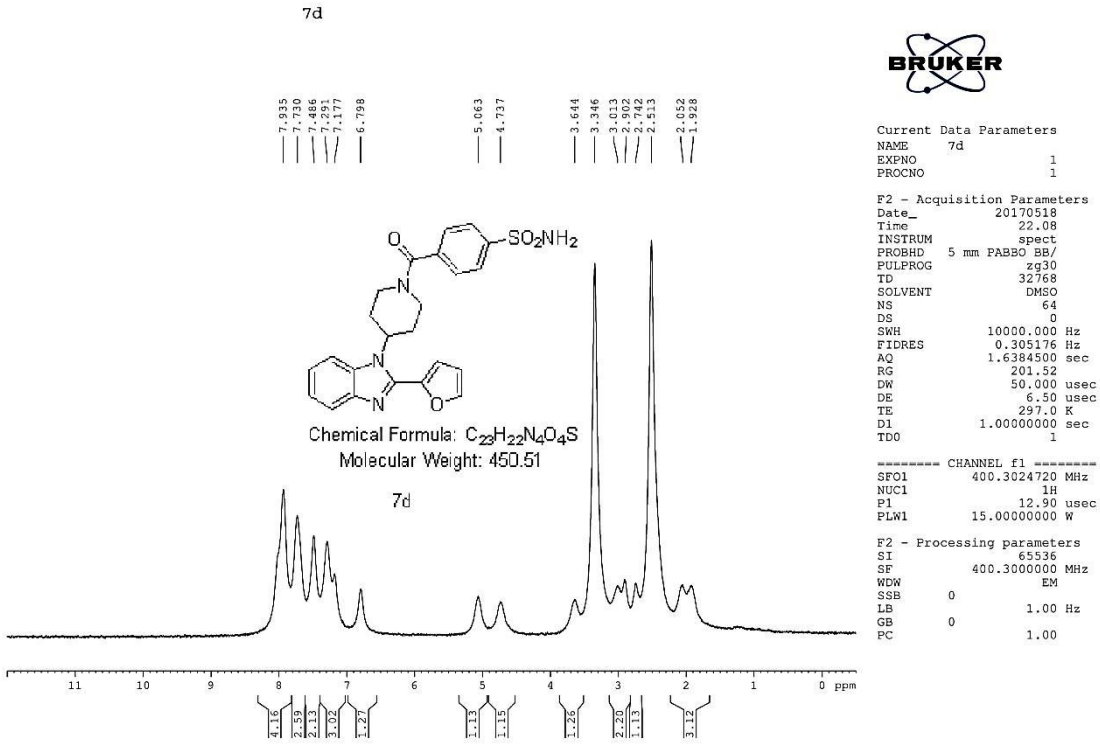
NUC1 1H
P1 12.90 usec
PLW1 15.00000000 W

F2 - Processing parameters
SI 65536
SF 400.3000000 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.00

^{1}H NMR spectra of 4-(4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidine-1-carbonyl) benzene sulfonamide



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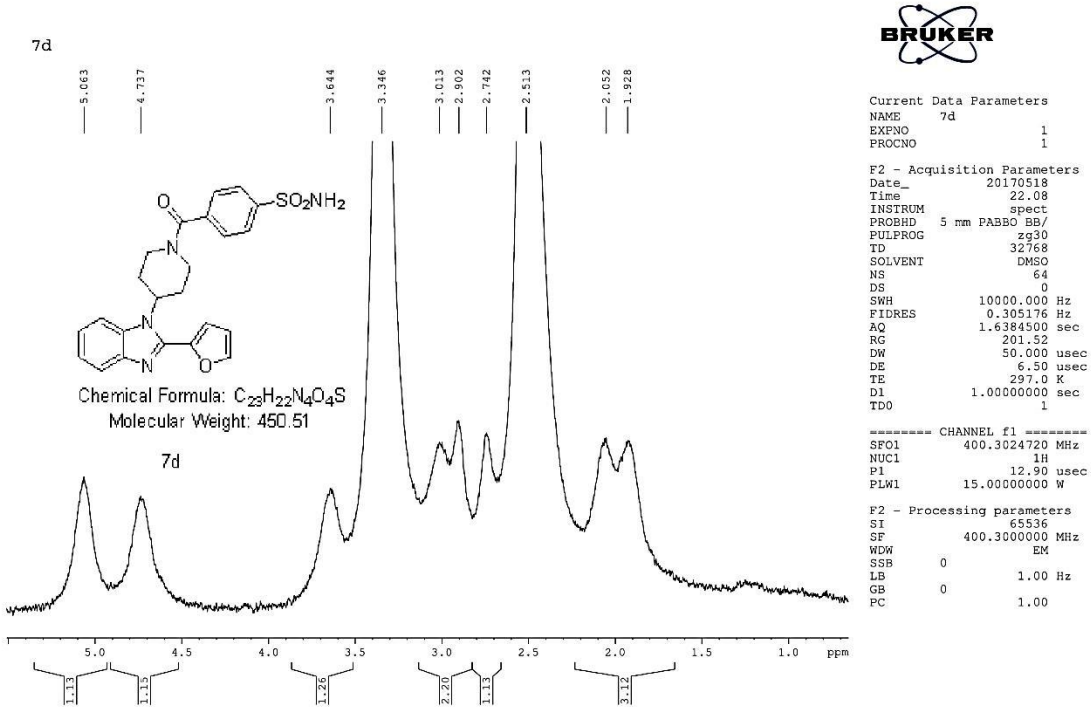

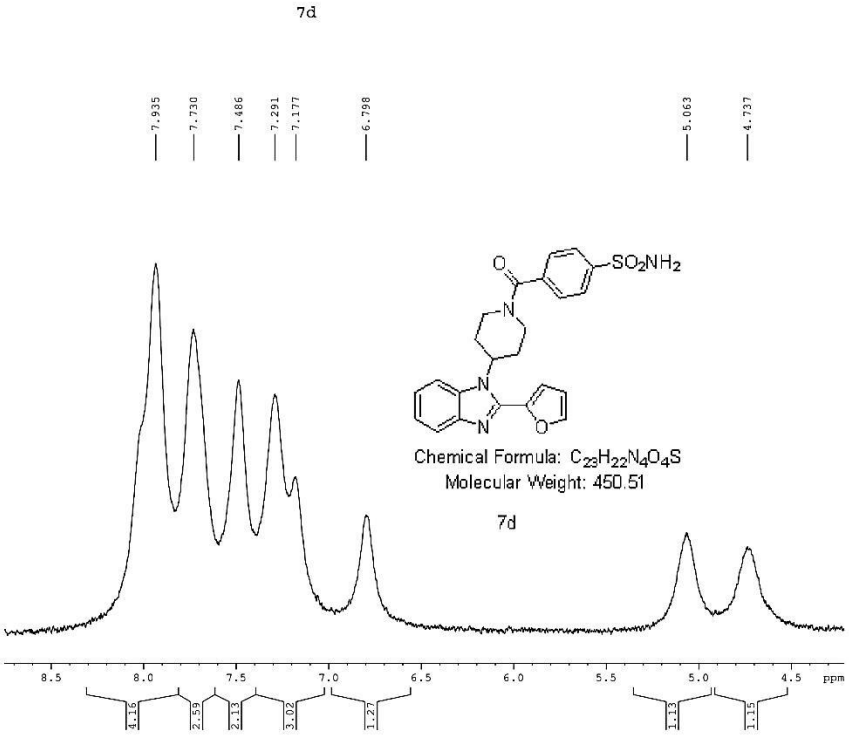


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AQ            1.6384500 sec
RG                201.52
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TE                297.0 K
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NUC1                1H
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F2 - Processing parameters
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SF          400.3000000 MHz
WDW                 EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.00
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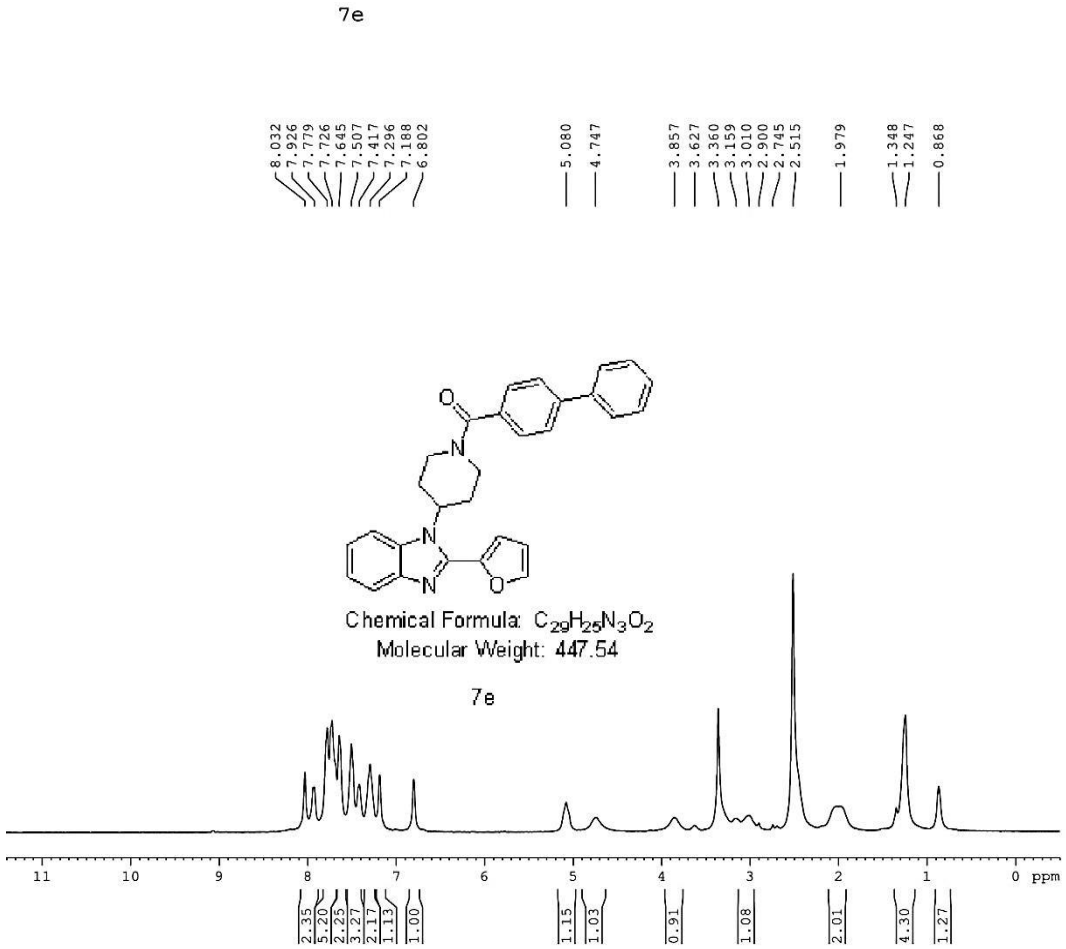
^{1}H NMR spectra of [1,1'-biphenyl]-4-yl(4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidin-1-yl)methanone (7e).

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RG                134.98
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DE                 6.50 usec
TE                294.6 K
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======== CHANNEL f1 ========
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NUC1                   1H
P1                 12.90 usec
PLW1         15.00000000 W

F2 - Processing parameters
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LB                 1.00 Hz
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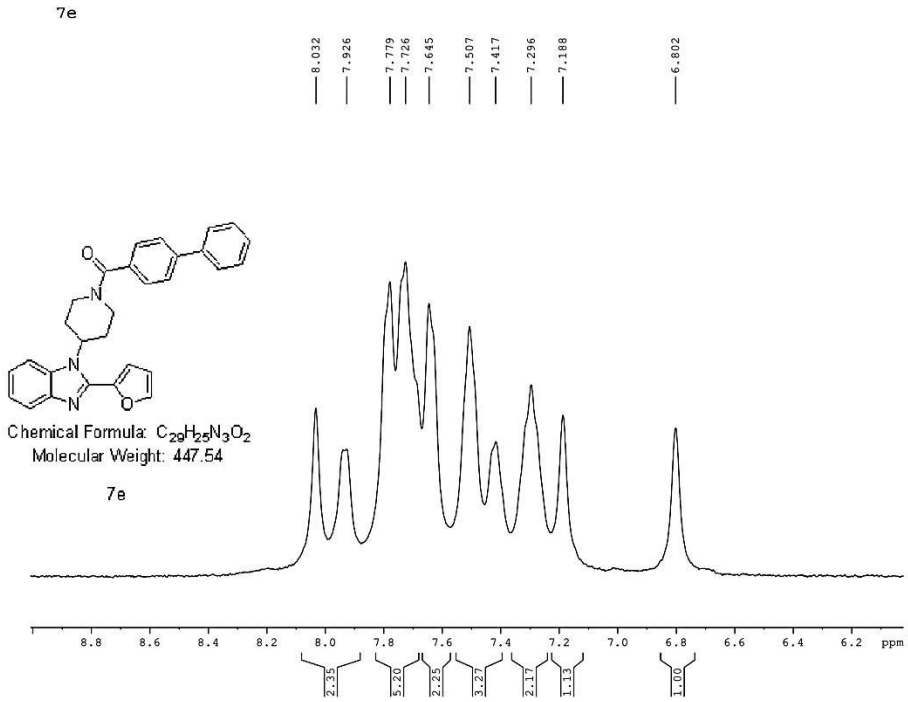

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PROCNO                 1

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SOLVENT             DMSO
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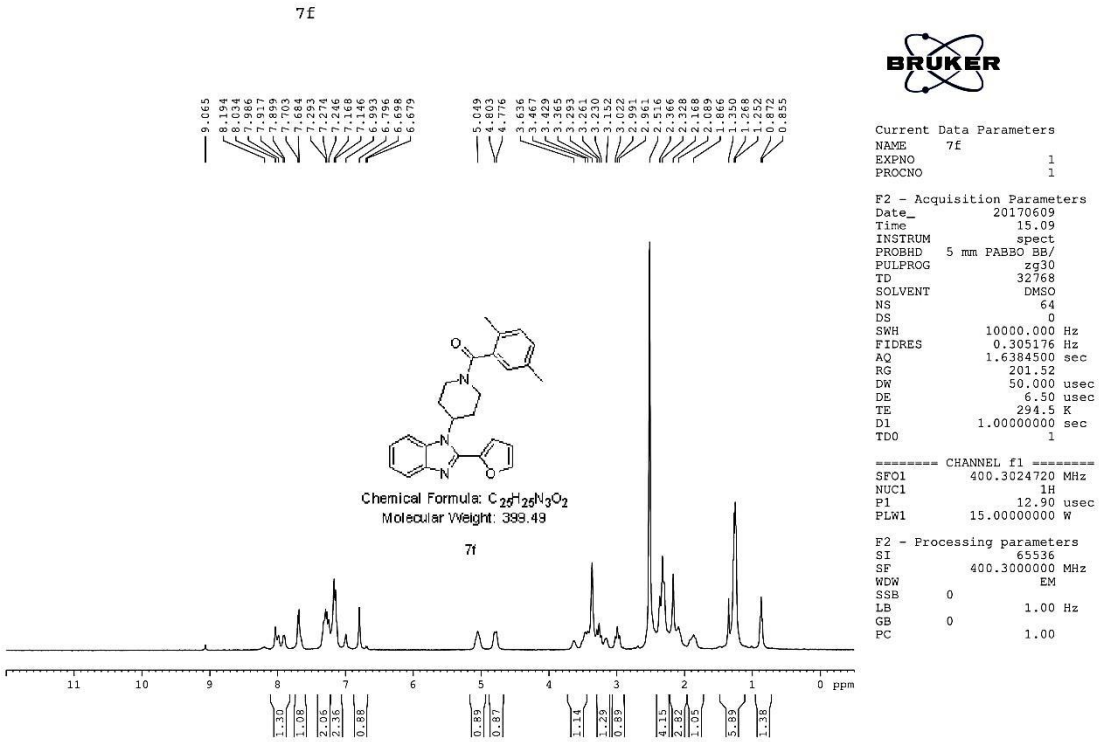
FIDRES          0.305176 Hz
AQ             1.6384500 sec
RG                134.98
DW                50.000 usec
DE                 6.50 usec
TE                294.6 K
D1             1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.3024720 MHz
NUC1                   1H
P1                  12.90 usec
PLW1        15.00000000 W

F2 - Processing parameters
SI                 65536
SF           400.3000000 MHz
WDW                   EM
SSB       0
LB                  1.00 Hz
GB        0
PC                  1.00
```

^{1}H NMR spectra of (2,5-dimethylphenyl) (4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidin-1-yl)methanone



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PROCNO                 1

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TD                32768
SOLVENT            DMSO
NS                   64
DS                    0
SWH           10000.000 Hz
FIDRES         0.305176 Hz
AQ            1.6384500 sec
RG               201.52
DW               50.000 usec
DE                6.50 usec
TE               294.5 K
D1           1.00000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1         400.3024720 MHz
NUC1                 1H
P1                12.90 usec
PLW1         15.00000000 W

F2 - Processing parameters
SI                 65536
SF           400.3000000 MHz
WDW                  EM
SSB       0
LB                1.00 Hz
GB        0
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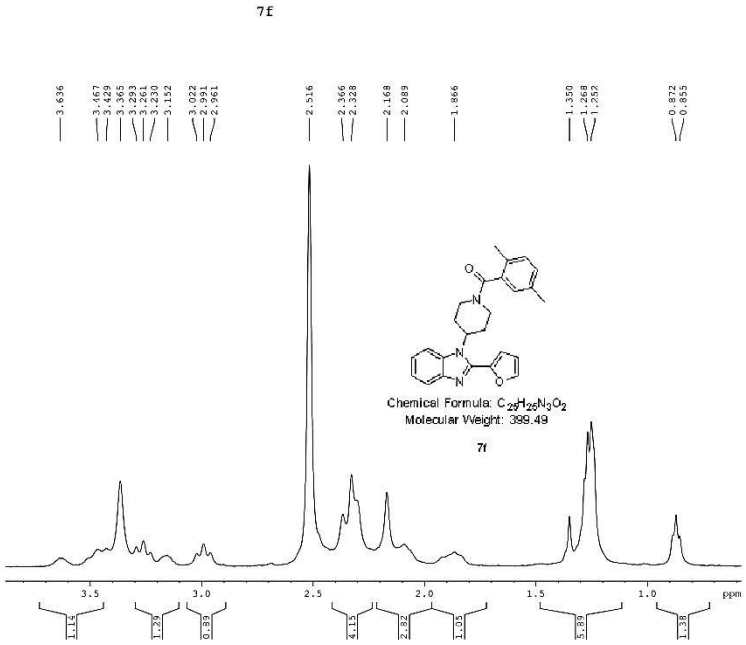
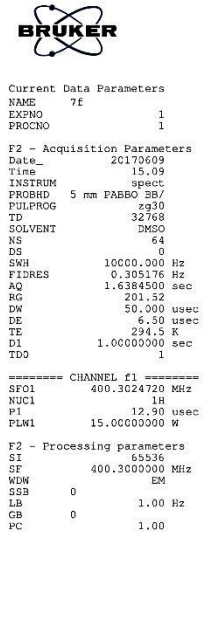
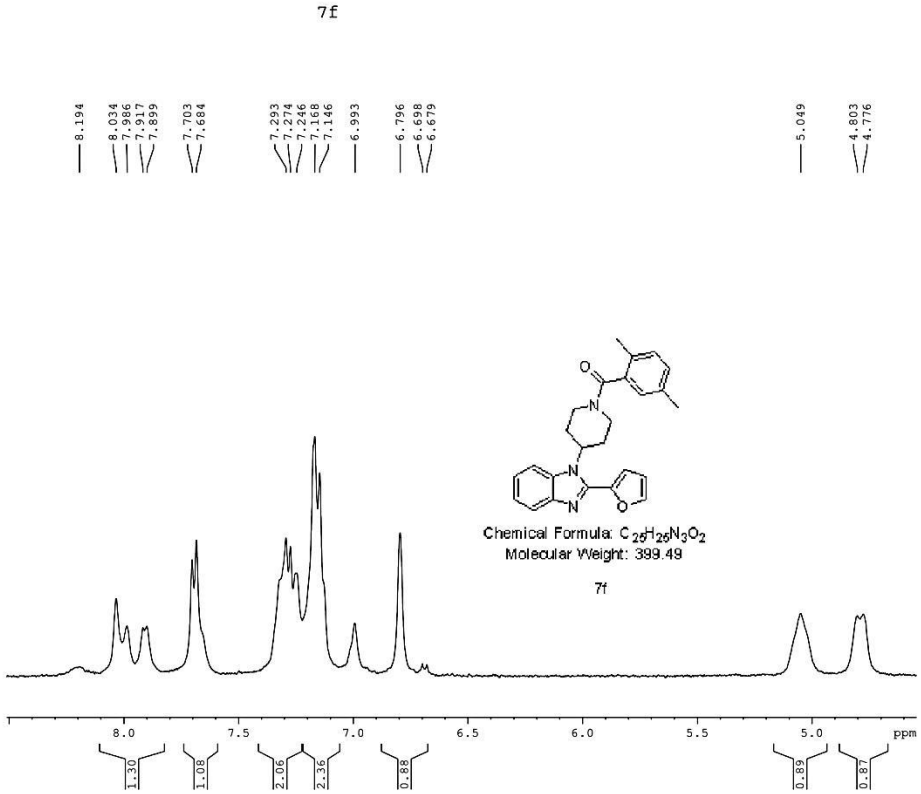
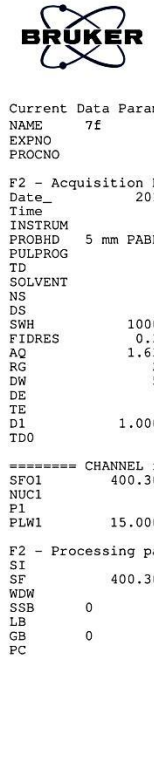
(7f):

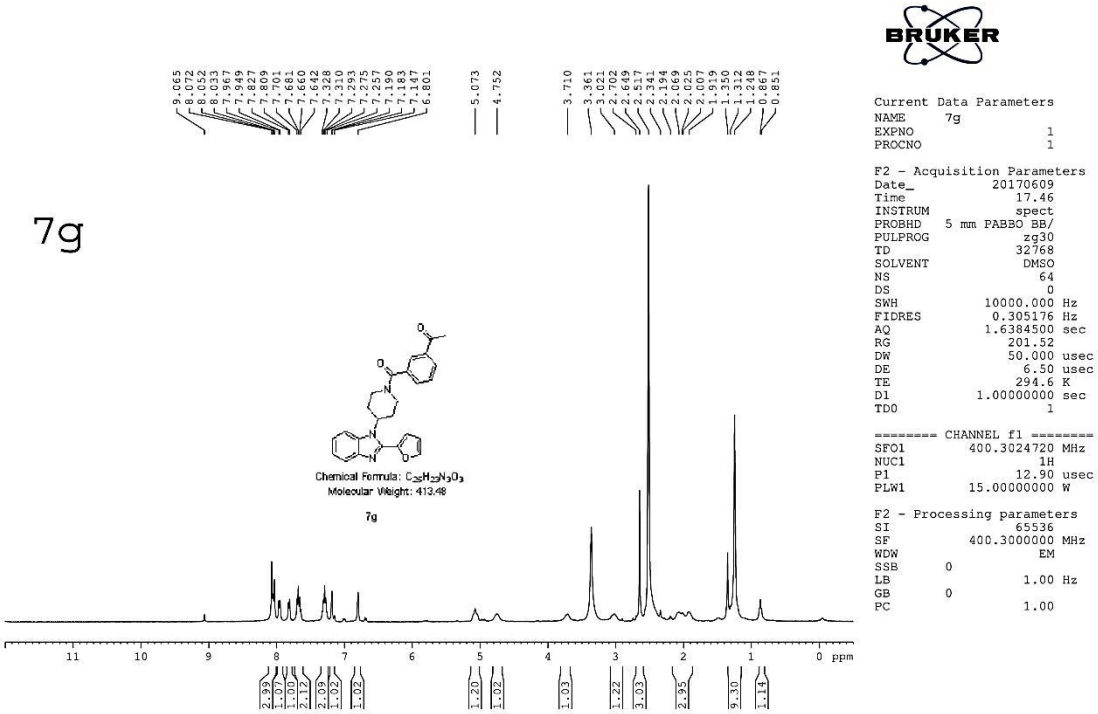








^{1}H NMR spectra of 1-(3-(4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidine-1-carbonyl) phenyl)ethan-1-one (7g):

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TD                32768
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DS                     0
SWH           10000.000 Hz
FIDRES         0.305176 Hz
AQ            1.6384500 sec
RG               201.52
DW               50.000 usec
DE                6.50 usec
TE               294.6 K
D1            1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.3024720 MHz
NUC1                   1H
P1                 12.90 usec
PLW1         15.00000000 W

F2 - Processing parameters
SI                 65536
SF           400.3000000 MHz
WDW                   EM
SSB       0
LB                 1.00 Hz
GB        0
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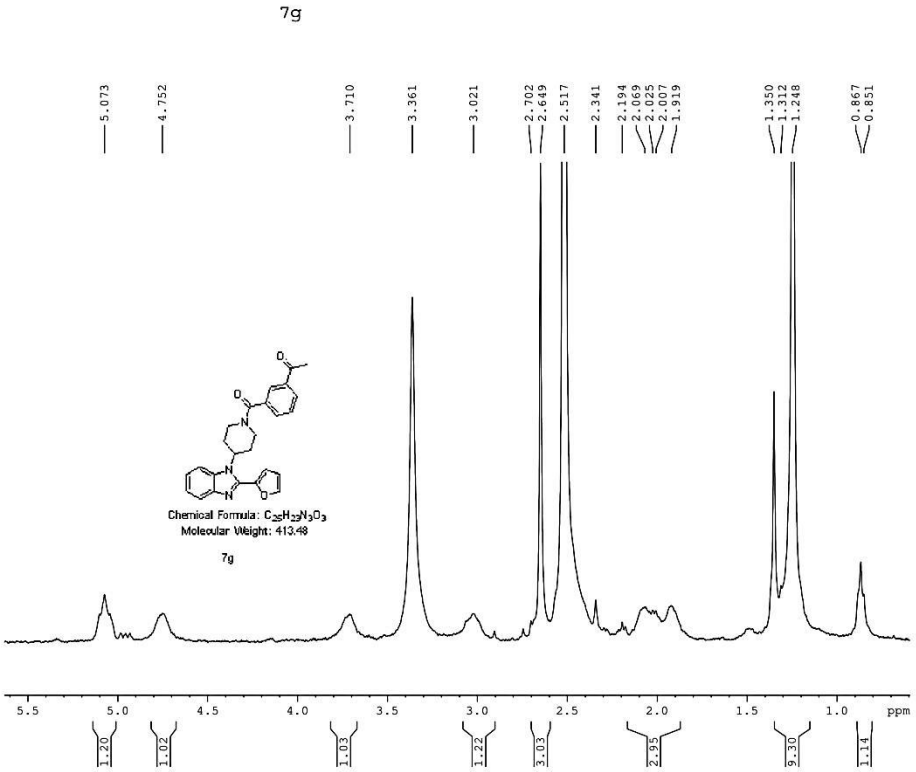


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Current Data Parameters
NAME      7g
EXPNO                  1
PROCNO                 1

F2 - Acquisition Parameters
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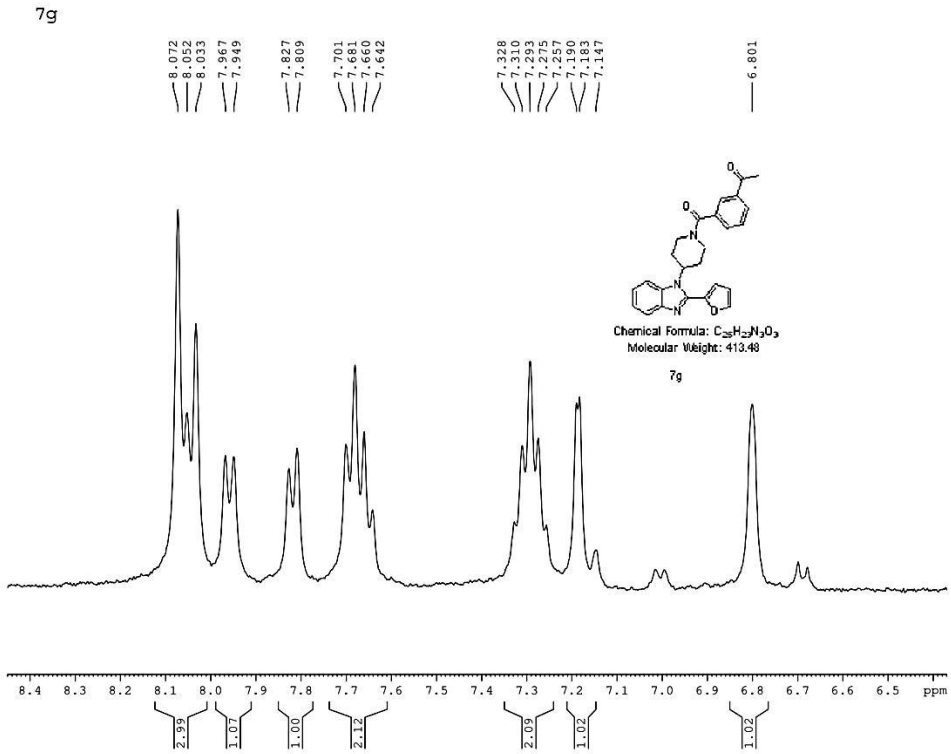
Time               17.46
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG            zg30
TD                32768
SOLVENT            DMSO
NS                   64
DS                    0
SWH           10000.000 Hz
FIDRES        0.305176 Hz
AQ            1.6384500 sec
RG               201.52
DW               50.000 usec
DE                6.50 usec
TE               294.6 K
D1            1.00000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1         400.3024720 MHz
NUC1                 1H
P1                12.90 usec
PLW1         15.00000000 W

F2 - Processing parameters
SI                 65536
SF           400.3000000 MHz
WDW                  EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.00
```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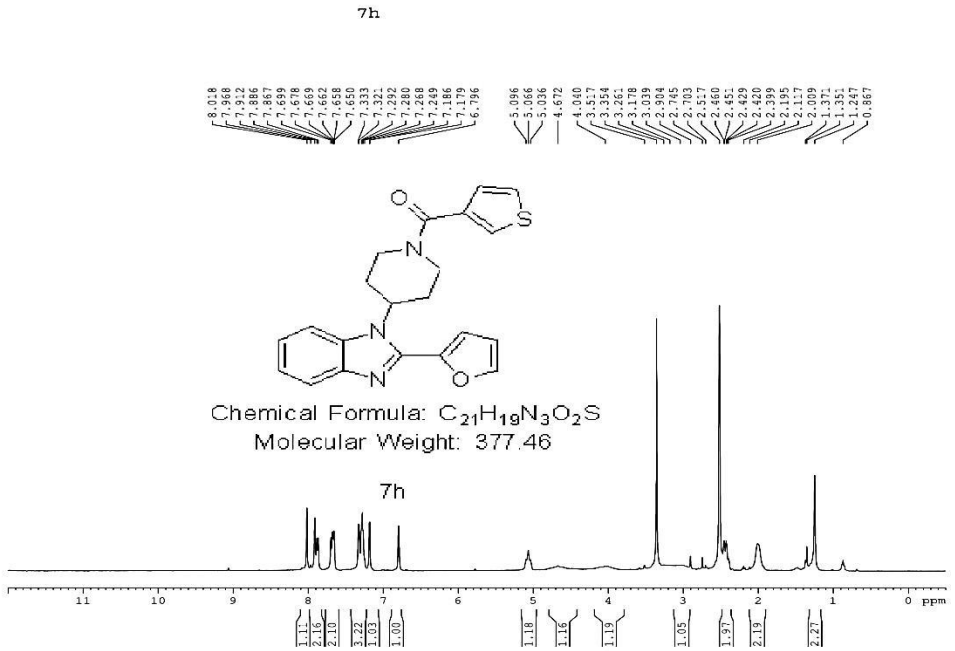
Current Data Parameters
NAME      7g
EXPNO                  1
PROCNO                 1

F2 - Acquisition Parameters
Date_           20170609
Time               17.46
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG            zg30
TD                32768
SOLVENT            DMSO
NS                    64
DS                     0
SWH            10000.000 Hz
FIDRES             0.305176 Hz
AQ             1.6384500 sec
RG                201.52
DW                50.000 usec
DE                 6.50 usec
TE                294.6 K
D1            1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.3024720 MHz
NUC1                   1H
P1                 12.90 usec
PLW1         15.00000000 W

F2 - Processing parameters
SI                 65536
SF           400.3000000 MHz
WDW                   EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.00
```

^{1}H NMR spectra of (4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidin-1-yl)(thiophen-3-yl)methanone (7h):




```
Current Data Parameters
NAME      7h
EXPNO                  1
PROCNO                 1

F2 - Acquisition Parameters
Date_           20170615
Time              18.33
INSTRUM           spect
PROBHD   5 mm PABBO BB/
PULPROG           zg30
TD               32768
SOLVENT           DMSO
NS                  64
DS                   0
SWH          10000.000 Hz
FIDRES           0.305176 Hz
AQ            1.6384500 sec
RG                201.52
DW               50.000 usec
DE                6.50 usec
TE               295.7 K
D1           1.00000000 sec
TD0                  1

======== CHANNEL f1 ========
SFO1        400.3024720 MHz
NUC1              1H
P1               12.90 usec
PLW1        15.00000000 W

F2 - Processing parameters
SI                65536
SF          400.3000000 MHz
WDW               EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.00
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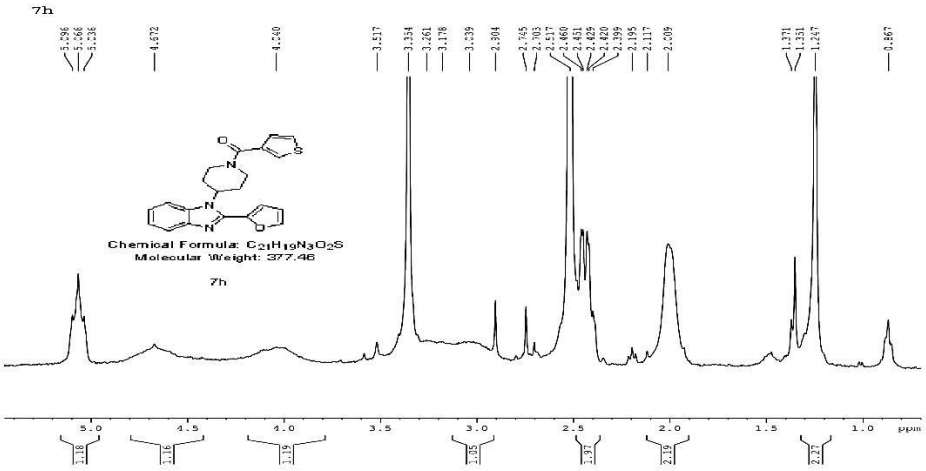
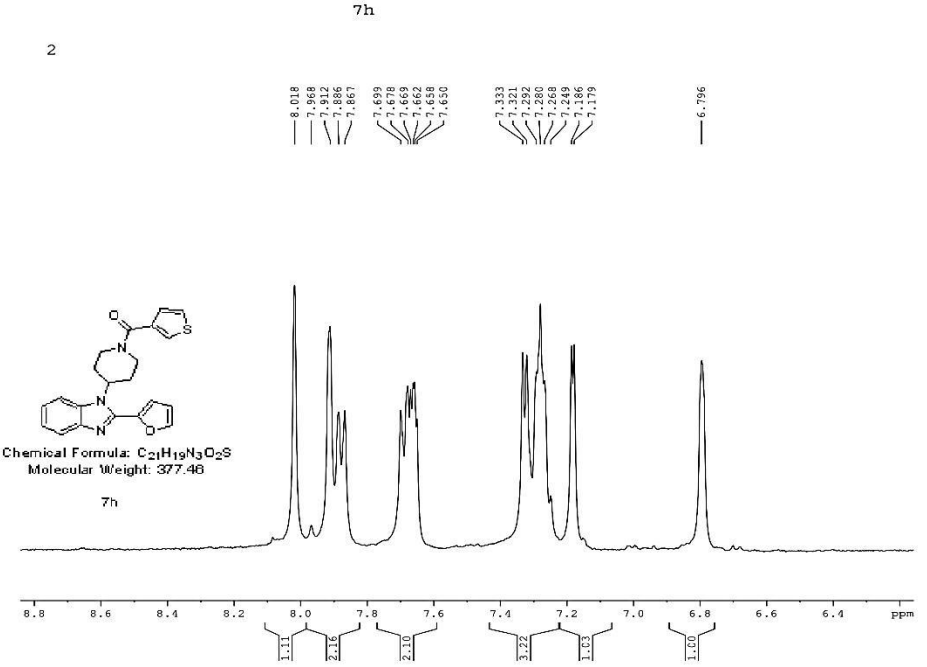



```
Current Data Parameters
NAME      7h
EXPNO                  1
PROCNO                 1

F2 - Acquisition Parameters
Date_           20170615
Time               18.33
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG            zg30
TD                32768
SOLVENT            DMSO
NS                    64
DS                     0
SWH           10000.000 Hz
FIDRES            0.305176 Hz
AQ             1.6384500 sec
RG                201.52
DW                50.000 usec
DE                 6.50 usec
TE                295.7 K
D1             1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1          400.3024720 MHz
NUC1                  1H
P1                 12.90 usec
PLW1          15.00000000 W

F2 - Processing parameters
SI                 65536
SF            400.3000000 MHz
WDW                   EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.00
```



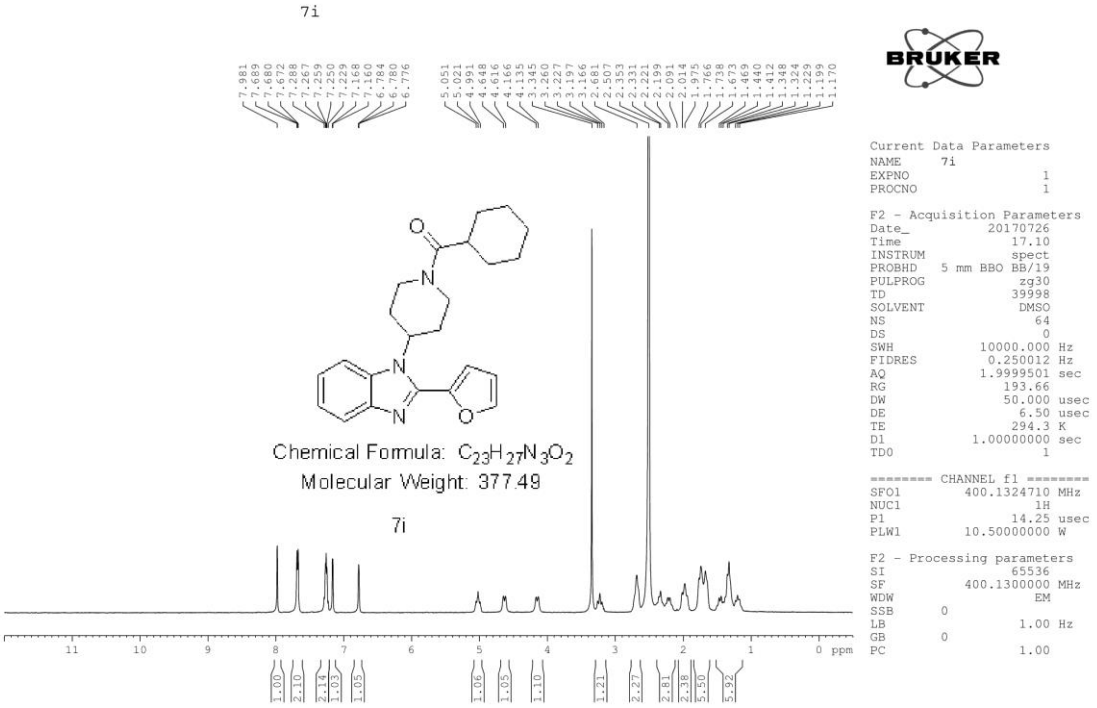

```
Current Data Parameters
NAME      7h
EXPNO                  1
PROCNO                 1

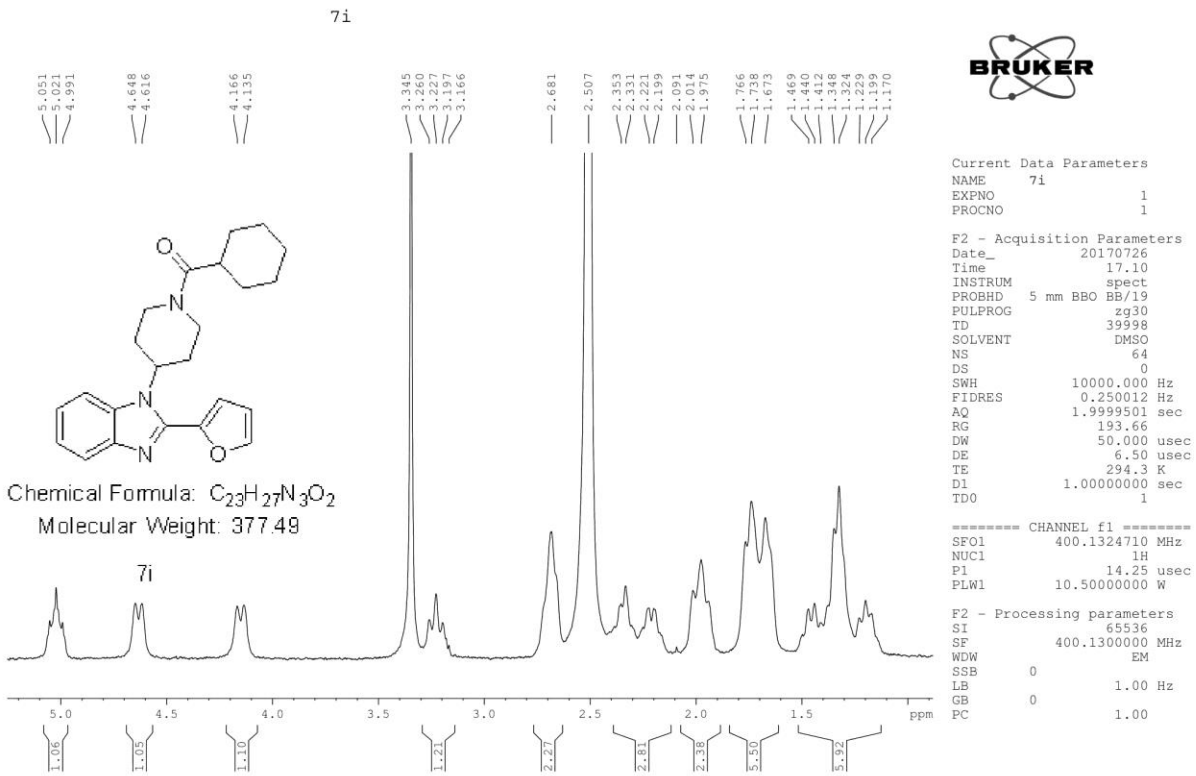
F2 - Acquisition Parameters
Date_           20170615
Time               18.33
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG            zg30
TD                32768
SOLVENT            DMSO
NS                    64
DS                     0
SWH           10000.000 Hz
FIDRES            0.305176 Hz
AQ             1.6384500 sec
RG                201.52
DW                50.000 usec
DE                 6.50 usec
TE                295.7 K
D1             1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1          400.3024720 MHz
NUC1                  1H
P1                 12.90 usec
PLW1          15.00000000 W

F2 - Processing parameters
SI                 65536
SF            400.3000000 MHz
WDW                   EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.00
```


^{1}H NMR spectra of Cyclohexyl (4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidin-1-yl)methanone (7i):





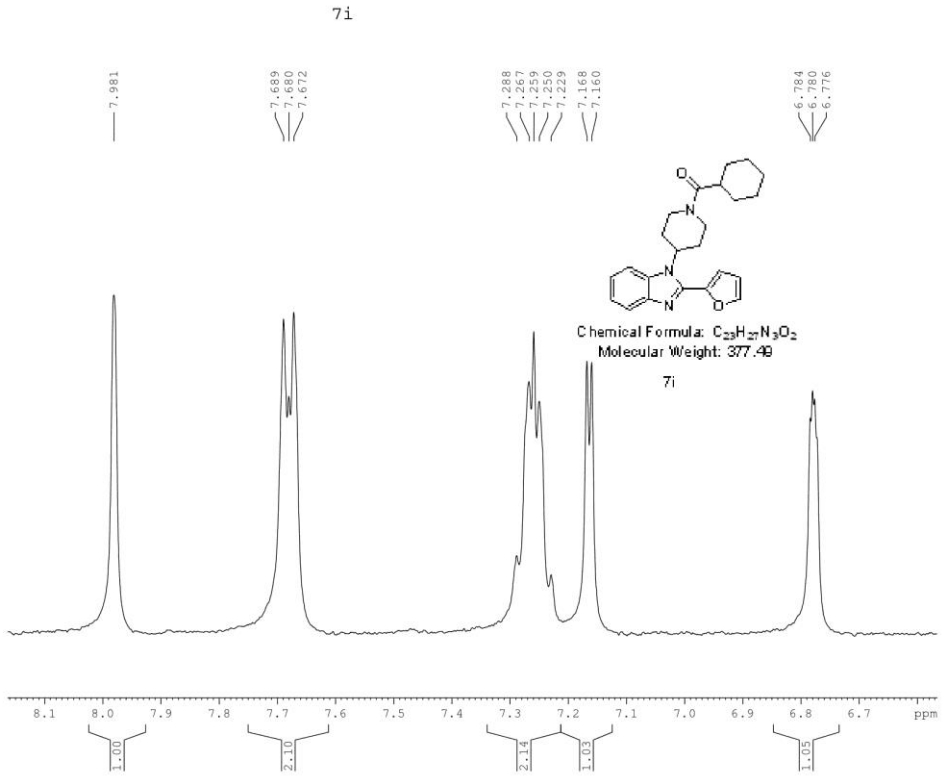
BRUKER

```
Current Data Parameters
NAME      7i
EXPNO                  1
PROCNO                 1

F2 - Acquisition Parameters
Date_           20170726
Time               17.10
INSTRUM            spect
PROBHD   5 mm BBO BB/19
PULPROG             zg30
TD                 39998
SOLVENT             DMSO
NS                    64
DS                     0
SWH            10000.000 Hz
FIDRES             0.250012 Hz
AQ              1.9999501 sec
RG                 193.66
DW                 50.000 usec
DE                  6.50 usec
TE                 294.3 K
D1            1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1          400.1324710 MHz
NUC1                  1H
P1                 14.25 usec
PLW1          10.50000000 W

F2 - Processing parameters
SI                 65536
SF            400.1300000 MHz
WDW                   EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.00
```

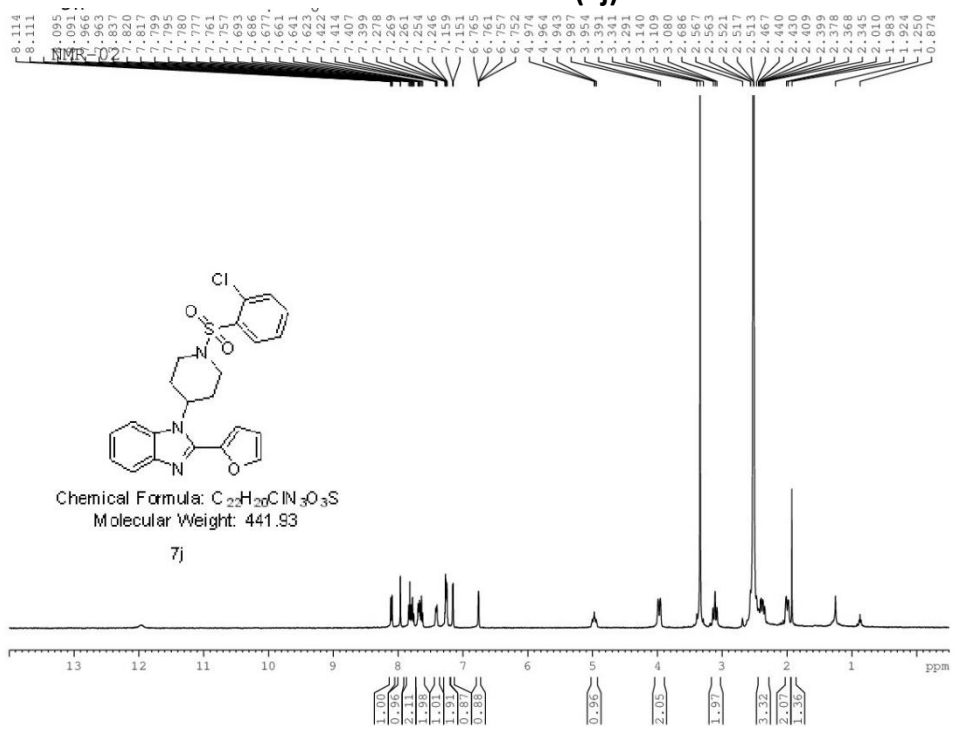

```
Current Data Parameters
NAME      7i
EXPNO                  1
PROCNO                 1

F2 - Acquisition Parameters
Date_           20170726
Time               17.10
INSTRUM            spect
PROBHD   5 mm BBO BB/19
PULPROG             zg30
TD                 39998
SOLVENT             DMSO
NS                    64
DS                     0
SWH            10000.000 Hz
FIDRES         0.250012 Hz
AQ             1.9999501 sec
RG                193.66
DW                50.000 usec
DE                 6.50 usec
TE                294.3 K
D1           1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.1324710 MHz
NUC1                   1H
P1                 14.25 usec
PLW1        10.50000000 W

F2 - Processing parameters
SI                 65536
SF           400.1300000 MHz
WDW                   EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.00
```


^{1}H NMR spectra of 1-(1-((2-chlorophenyl)sulfonyl)piperidin-4-yl)-2-(furan-2-yl)-1*H*-benzo[*d*]imidazole (7j):

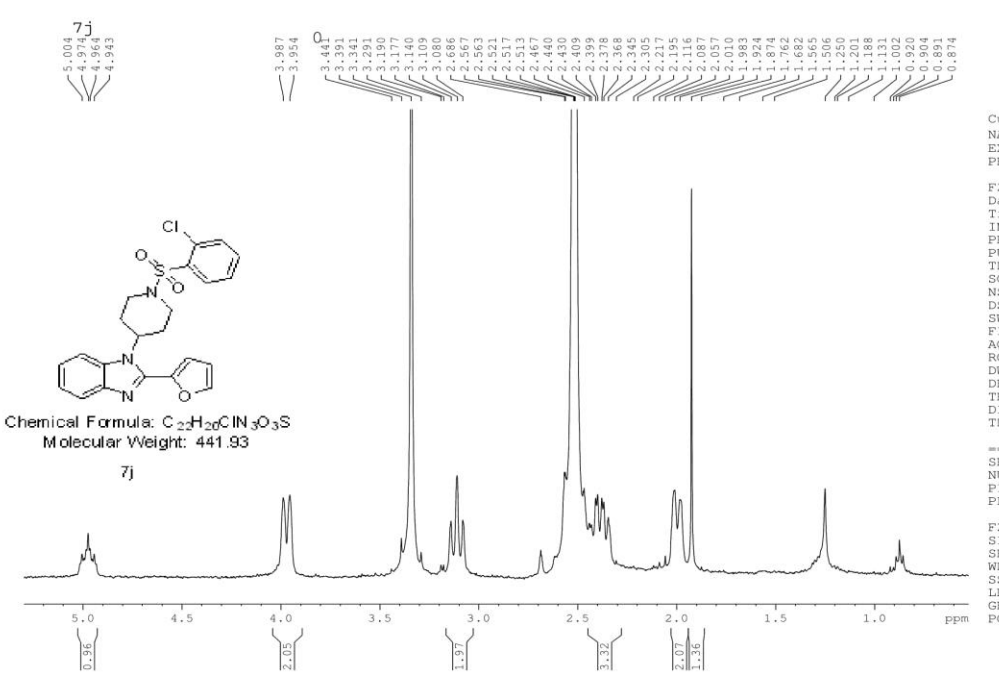



```
Current Data Parameters
NAME      7j
EXPNO                1
PROCNO               1

F2 - Acquisition Parameters
Date_          20170731
Time               19.02
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG            zg30
TD                32768
SOLVENT            DMSO
NS                   64
DS                    0
SWH           10000.000 Hz
FIDRES        0.305176 Hz
AQ            1.6384500 sec
RG               201.52
DW               50.000 usec
DE                6.50 usec
TE               297.2 K
D1           1.00000000 sec
TD0                  1

======== CHANNEL f1 ========
SFO1         400.3024720 MHz
NUC1                1H
P1                12.90 usec
PLW1         15.00000000 W

F2 - Processing parameters
SI                65536
SF           400.3000000 MHz
WDW                  EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.00
```

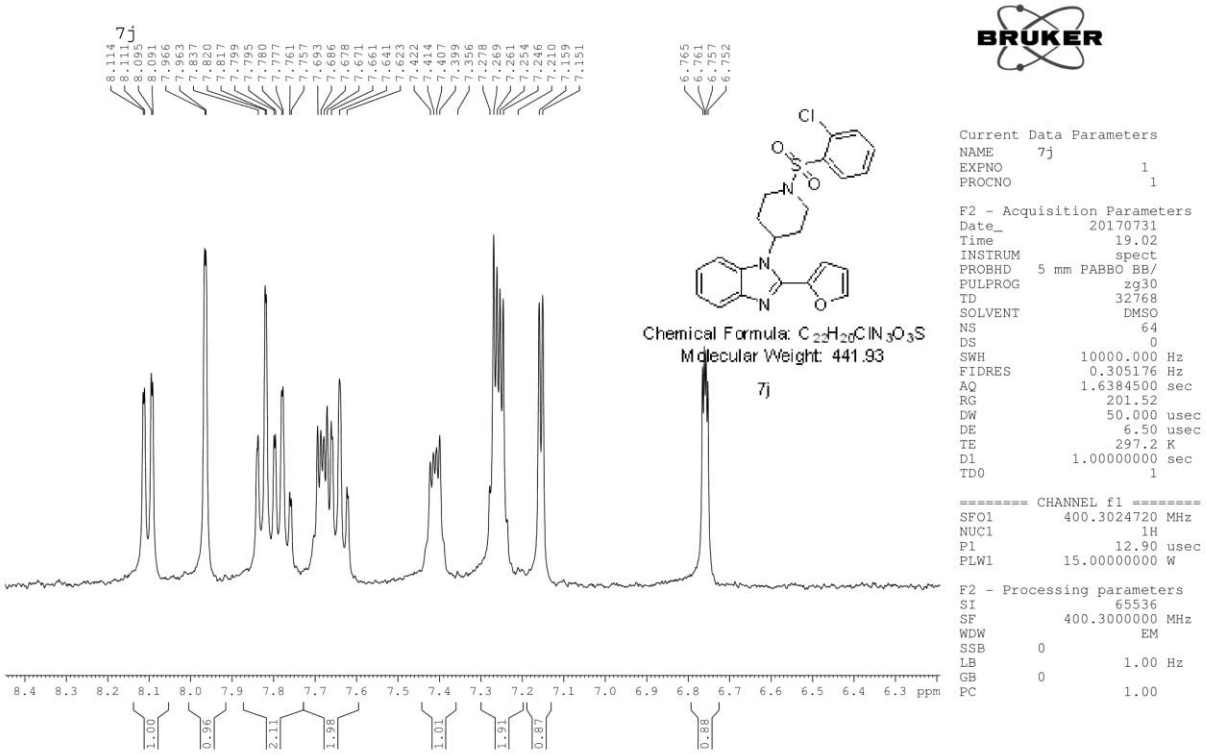



```
Current Data Parameters
NAME      7j
EXPNO                1
PROCNO               1

F2 - Acquisition Parameters
Date_          20170731
Time               19.02
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG            zg30
TD                32768
SOLVENT            DMSO
NS                   64
DS                    0
SWH           10000.000 Hz
FIDRES        0.305176 Hz
AQ            1.6384500 sec
RG               201.52
DW               50.000 usec
DE                6.50 usec
TE               297.2 K
D1           1.00000000 sec
TD0                  1

======== CHANNEL f1 ========
SFO1         400.3024720 MHz
NUC1                1H
P1                12.90 usec
PLW1         15.00000000 W

F2 - Processing parameters
SI                65536
SF           400.3000000 MHz
WDW                  EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.00
```

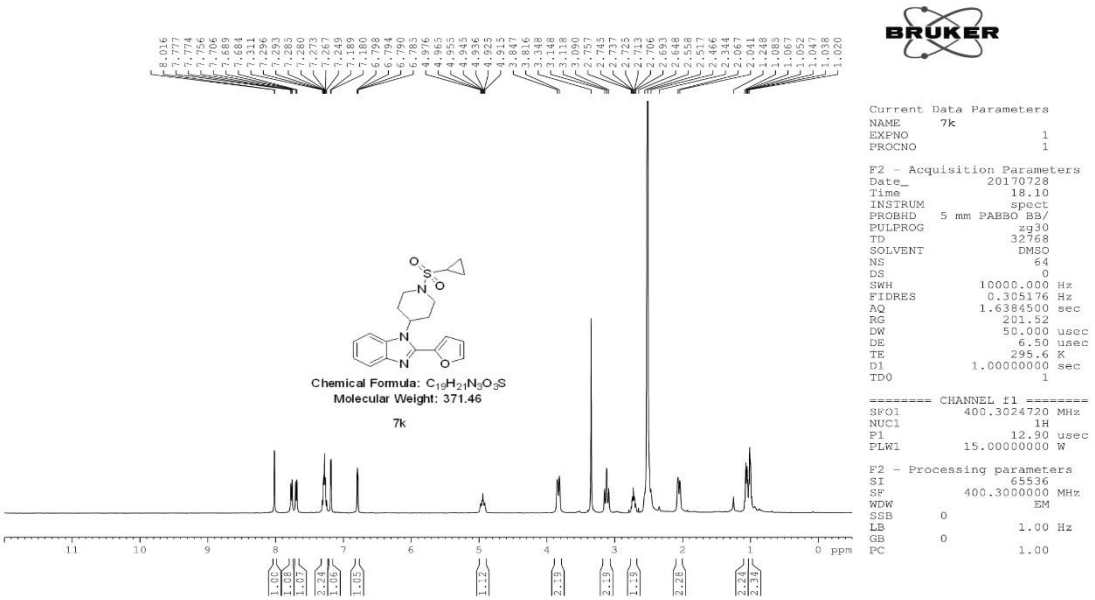

```
Current Data Parameters
NAME      7j
EXPNO                  1
PROCNO                 1

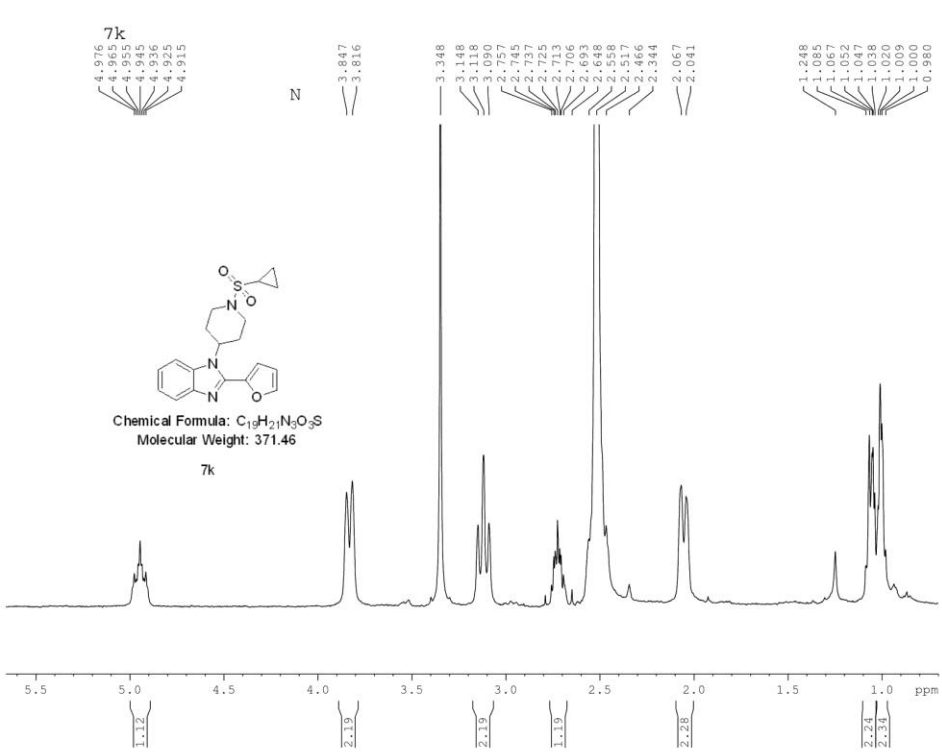
F2 - Acquisition Parameters
Date_           20170731
Time              19.02
INSTRUM           spect
PROBHD   5 mm PABBO BB/
PULPROG            zg30
TD                32768
SOLVENT            DMSO
NS                    64
DS                     0
SWH           10000.000 Hz
FIDRES        0.305176 Hz
AQ            1.6384500 sec
RG               201.52
DW               50.000 usec
DE                6.50 usec
TE               297.2 K
D1          1.00000000 sec
TD0                    1

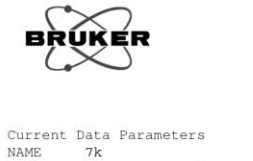
======== CHANNEL f1 ========
SFO1        400.3024720 MHz
NUC1                   1H
P1                12.90 usec
PLW1       15.00000000 W

F2 - Processing parameters
SI                 65536
SF          400.3000000 MHz
WDW                   EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.00
```


^{1}H NMR of 1-(1-(cyclopropylsulfonyl)piperidin-4-yl)-2-(furan-2-yl)-1*H*-benzo[*d*]imidazole (7k):





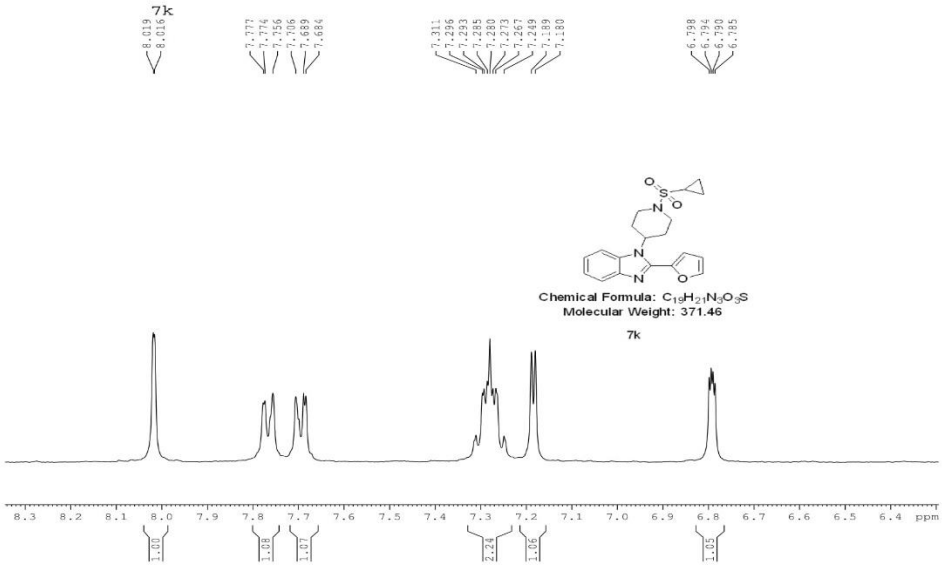


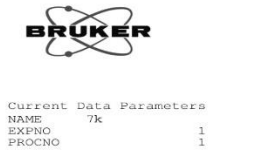
```
Current Data Parameters
NAME      7k
EXPNO                  1
PROCNO                 1

F2 - Acquisition Parameters
Date_           20170728
Time               18.10
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG            zg30
TD                32768
SOLVENT            DMSO
NS                    64
DS                     0
SWH            10000.000 Hz
FIDRES         0.305176 Hz
AQ             1.6384500 sec
RG                201.52
DW                50.000 usec
DE                 6.50 usec
TE                295.6 K
D1           1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.3024720 MHz
NUC1                1H
P1                 12.90 usec
PLW1        15.00000000 W

F2 - Processing parameters
SI                 65536
SF           400.3000000 MHz
WDW                EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.00
```





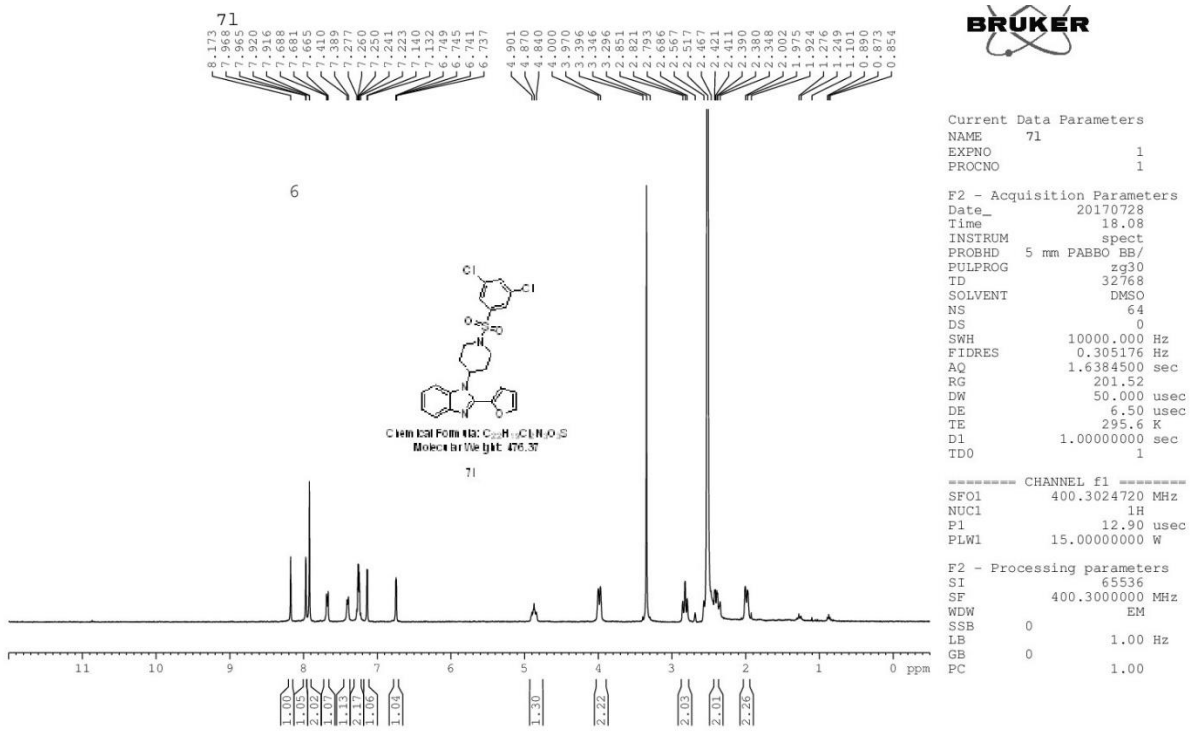
```
Current Data Parameters
NAME      7k
EXPNO                  1
PROCNO                 1

F2 - Acquisition Parameters
Date_           20170728
Time               18.10
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG            zg30
TD                32768
SOLVENT            DMSO
NS                    64
DS                     0
SWH            10000.000 Hz
FIDRES         0.305176 Hz
AQ             1.6384500 sec
RG                201.52
DW                50.000 usec
DE                 6.50 usec
TE                295.6 K
D1           1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.3024720 MHz
NUC1                1H
P1                 12.90 usec
PLW1        15.00000000 W

F2 - Processing parameters
SI                 65536
SF           400.3000000 MHz
WDW                EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.00
```


^{1}H NMR of 1-(1-((3,5-dichlorophenyl)sulfonyl)piperidin-4-yl)-2-(furan-2-yl)-1*H*-benzo[*d*]imidazole (7l).

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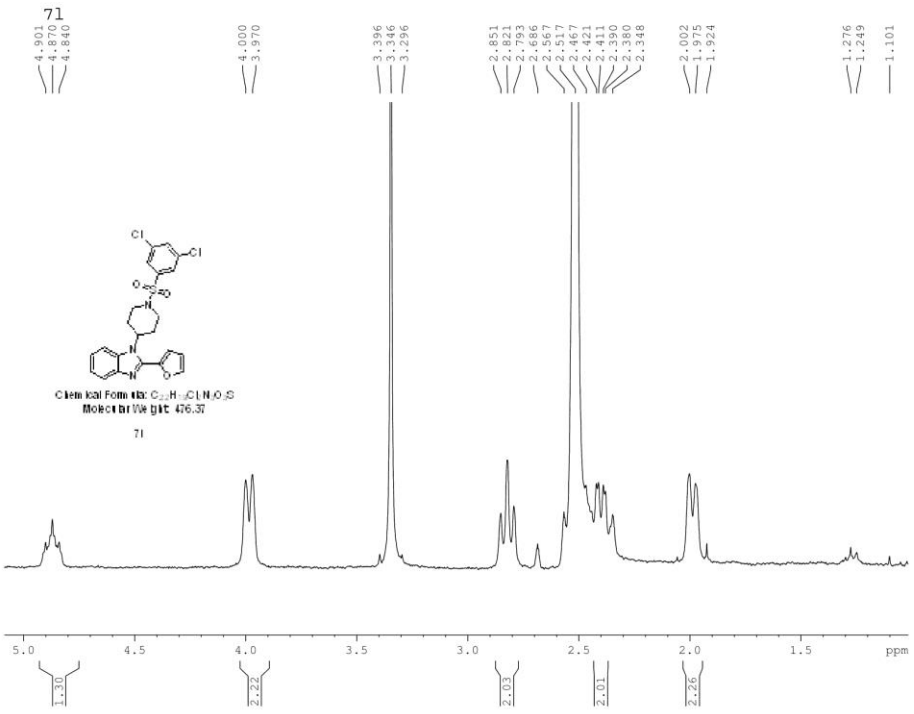
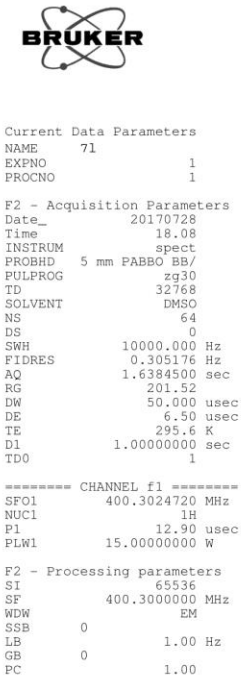
Current Data Parameters
NAME      7l
EXPNO                  1
PROCNO                 1

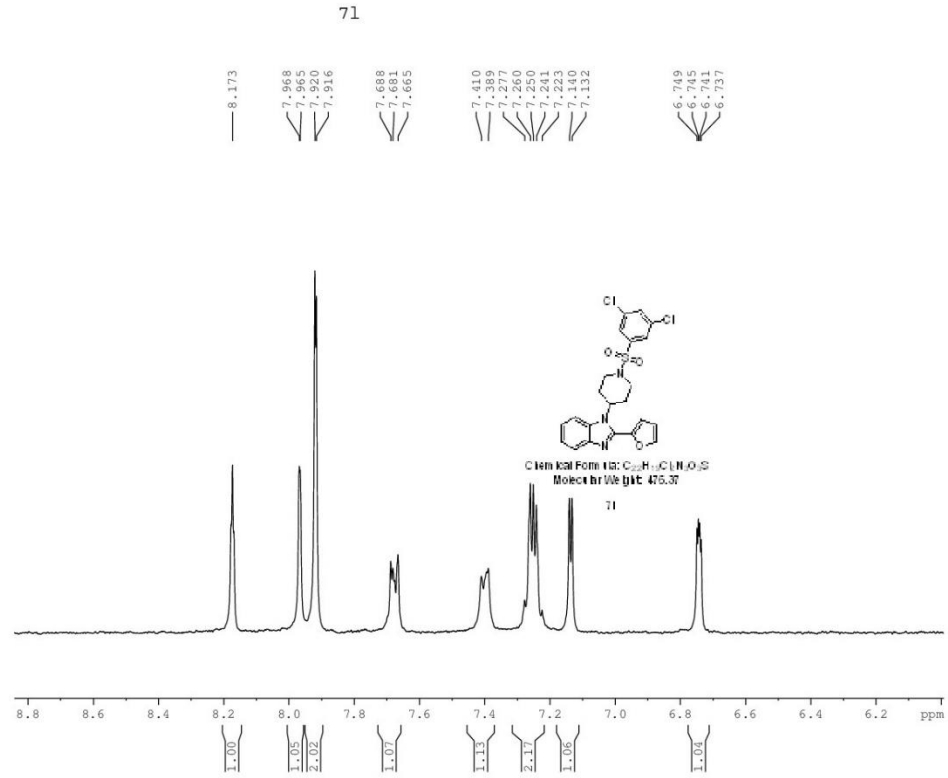
F2 - Acquisition Parameters
Date_           20170728
Time              18.08
INSTRUM           spect
PROBHD   5 mm PABBO BB/
PULPROG            zg30
TD                32768
SOLVENT            DMSO
NS                    64
DS                     0
SWH           10000.000 Hz
FIDRES            0.305176 Hz
AQ             1.6384500 sec
RG                201.52
DW                50.000 usec
DE                 6.50 usec
TE                295.6 K
D1             1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1          400.3024720 MHz
NUC1                  1H
P1                 12.90 usec
PLW1          15.00000000 W

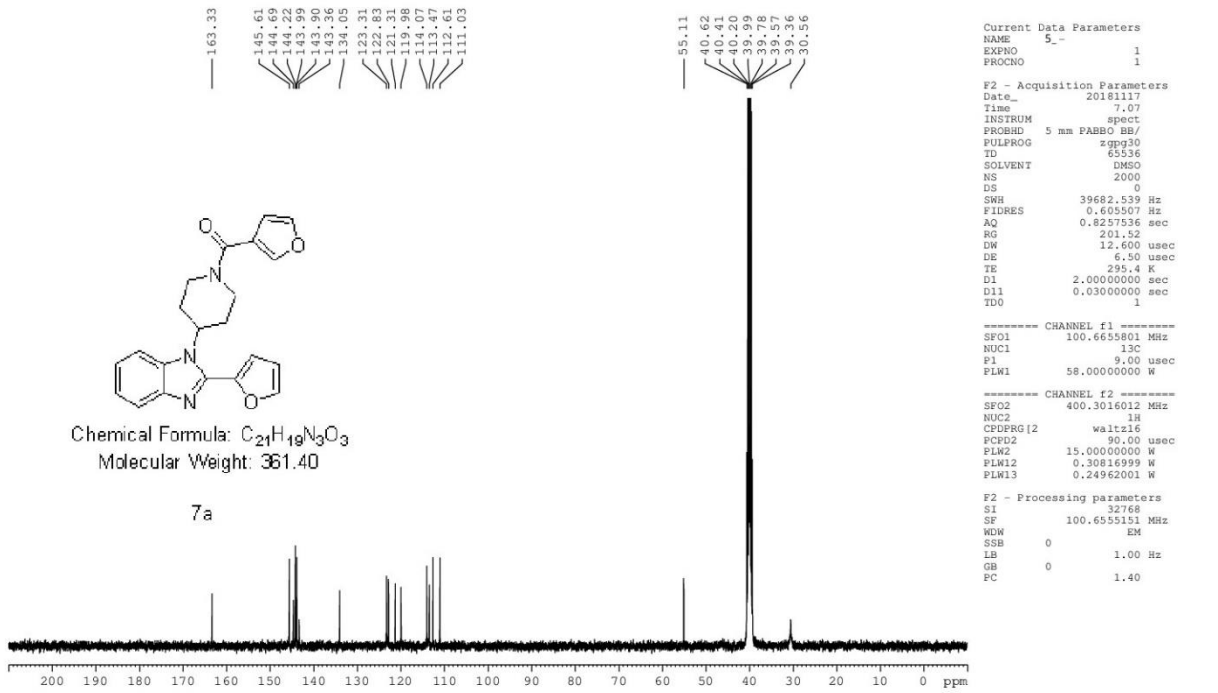
F2 - Processing parameters
SI                 65536
SF            400.3000000 MHz
WDW                   EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.00
```







^{13}C NMR spectra of (4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidin-1-yl)(furan-3-yl)methanone(7a):



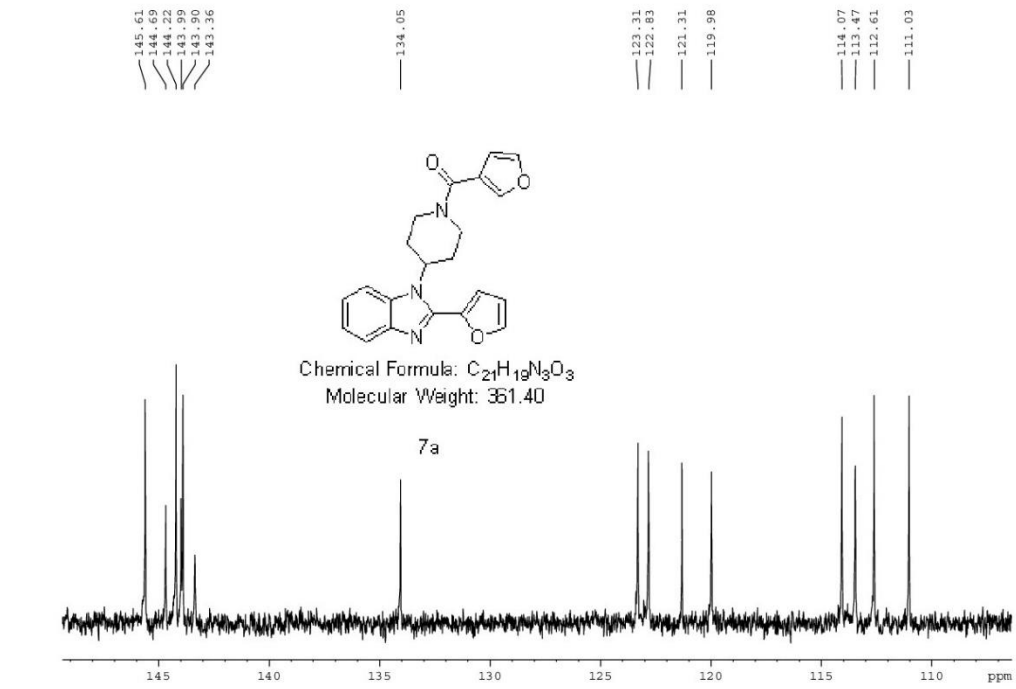

```
Current Data Parameters
NAME      5_-
EXPNO                1
PROCNO               1

F2 - Acquisition Parameters
Date_             20181117
Time                 7.07
INSTRUM             spect
PROBHD    5 mm PABBO BB/
PULPROG          zgpg30
TD                65536
SOLVENT             DMSO
NS                   2000
DS                      0
SWH           39682.539 Hz
FIDRES         0.605507 Hz
AQ             0.8257536 sec
RG                201.52
DW                12.600 usec
DE                 6.50 usec
TE                295.4 K
D1             2.00000000 sec
D11            0.03000000 sec
TD0                  1

======== CHANNEL f1 ========
SFO1         100.6655801 MHz
NUC1                13C
P1                 9.00 usec
PLW1         58.00000000 W

======== CHANNEL f2 ========
SFO2         400.3016012 MHz
NUC2                1H
CPDPRG[2         waltz16
PCPD2             90.00 usec
PLW2         15.00000000 W
PLW12         0.30816999 W
PLW13         0.24962001 W

F2 - Processing parameters
SI                 32768
SF           100.6555151 MHz
WDW                   EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.40
```




```
Current Data Parameters
NAME      7a
EXPNO                1
PROCNO               1

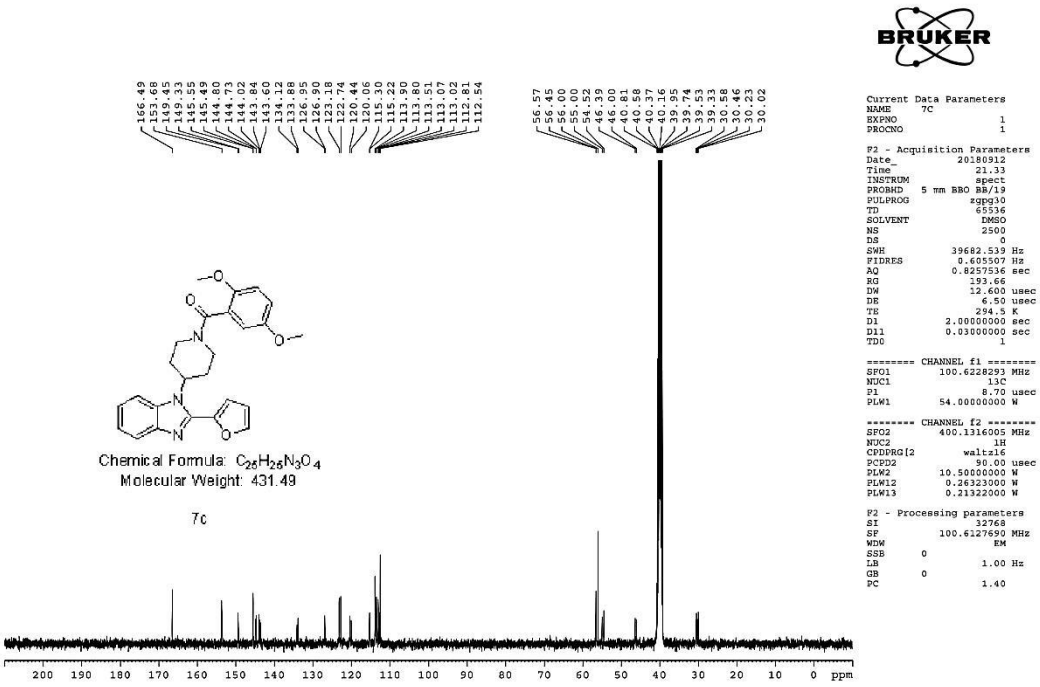
F2 - Acquisition Parameters
Date_             20181117
Time                 7.07
INSTRUM             spect
PROBHD    5 mm PABBO BB/
PULPROG          zgpg30
TD                65536
SOLVENT             DMSO
NS                   2000
DS                      0
SWH           39682.539 Hz
FIDRES         0.605507 Hz
AQ             0.8257536 sec
RG                201.52
DW                12.600 usec
DE                 6.50 usec
TE                295.4 K
D1             2.00000000 sec
D11            0.03000000 sec
TD0                  1

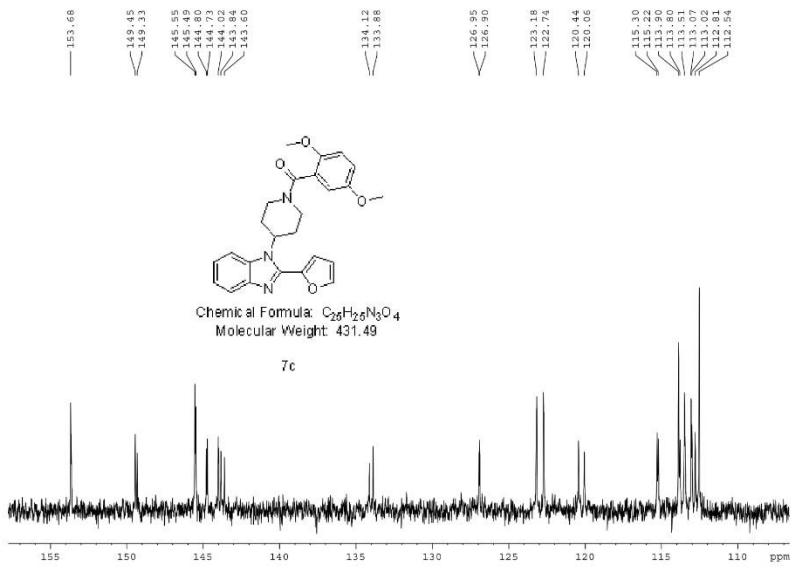
======== CHANNEL f1 ========
SFO1         100.6655801 MHz
NUC1                13C
P1                 9.00 usec
PLW1         58.00000000 W

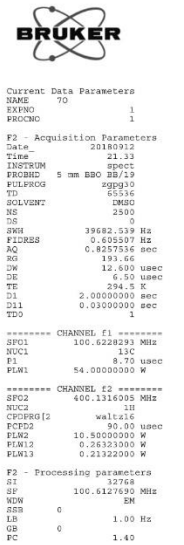
======== CHANNEL f2 ========
SFO2         400.3016012 MHz
NUC2                1H
CPDPRG[2         waltz16
PCPD2             90.00 usec
PLW2         15.00000000 W
PLW12         0.30816999 W
PLW13         0.24962001 W

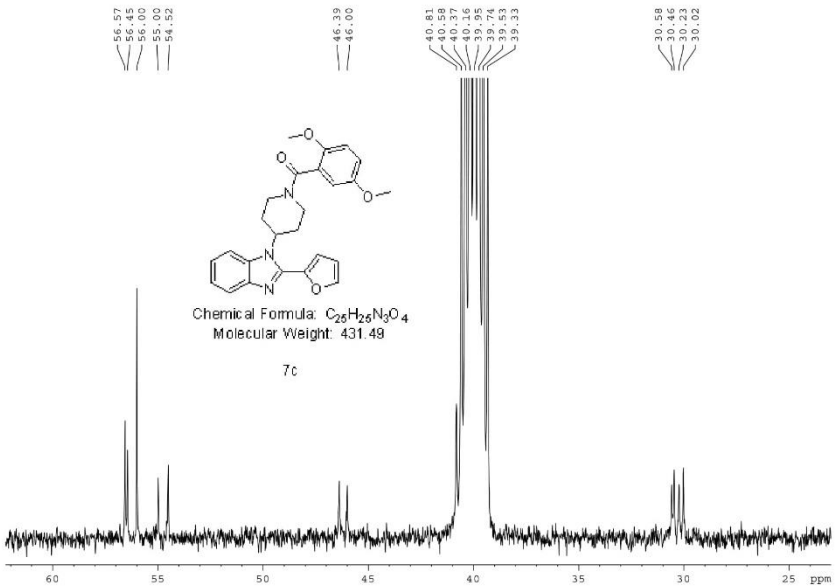
F2 - Processing parameters
SI                 32768
SF           100.6555151 MHz
WDW                   EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.40
```

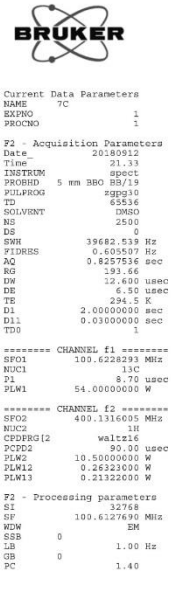

^{13}C NMR spectra of (2,5-dimethoxyphenyl)(4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidin-1-yl)methanone (7c):



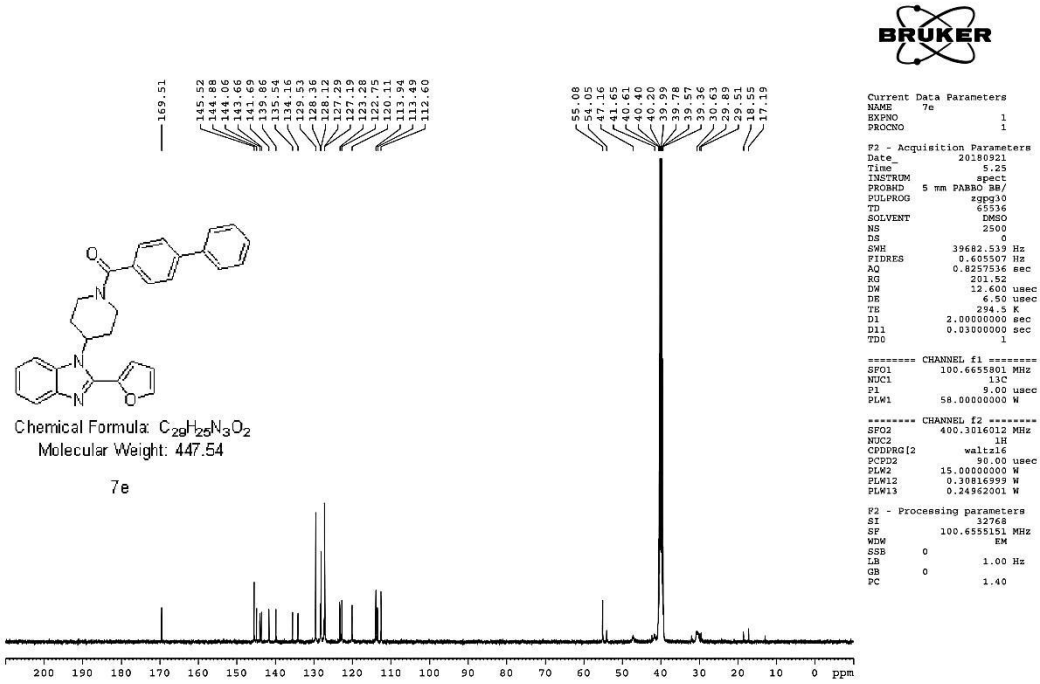


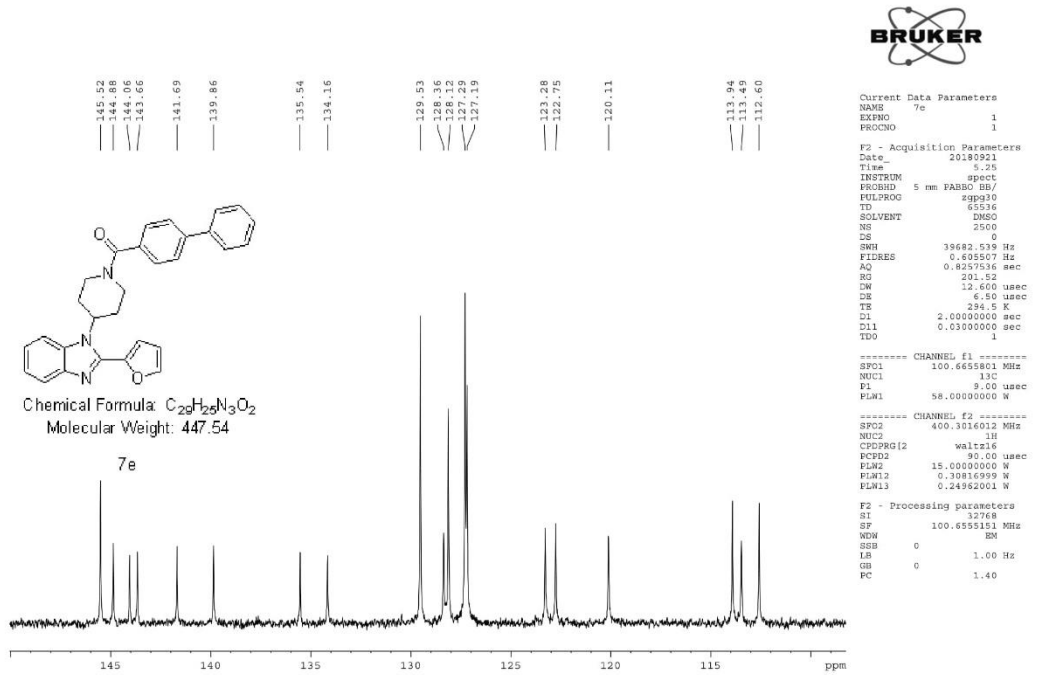


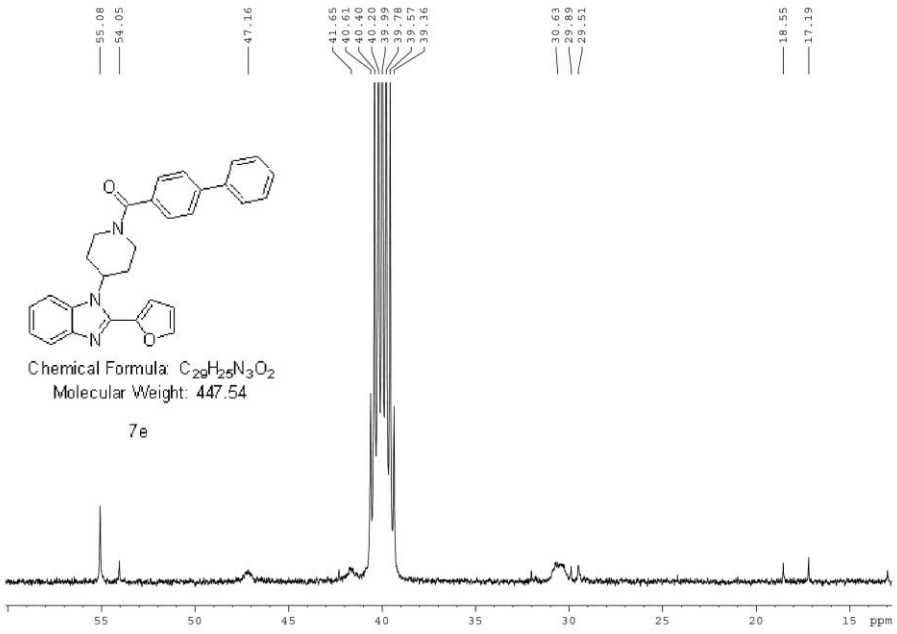




^{13}C NMR spectra of [1,1'-biphenyl]-4-yl(4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidin-1-yl)methanone (7e):








```
Current Data Parameters
NAME      7e
EXPNO                  1
PROCNO                 1

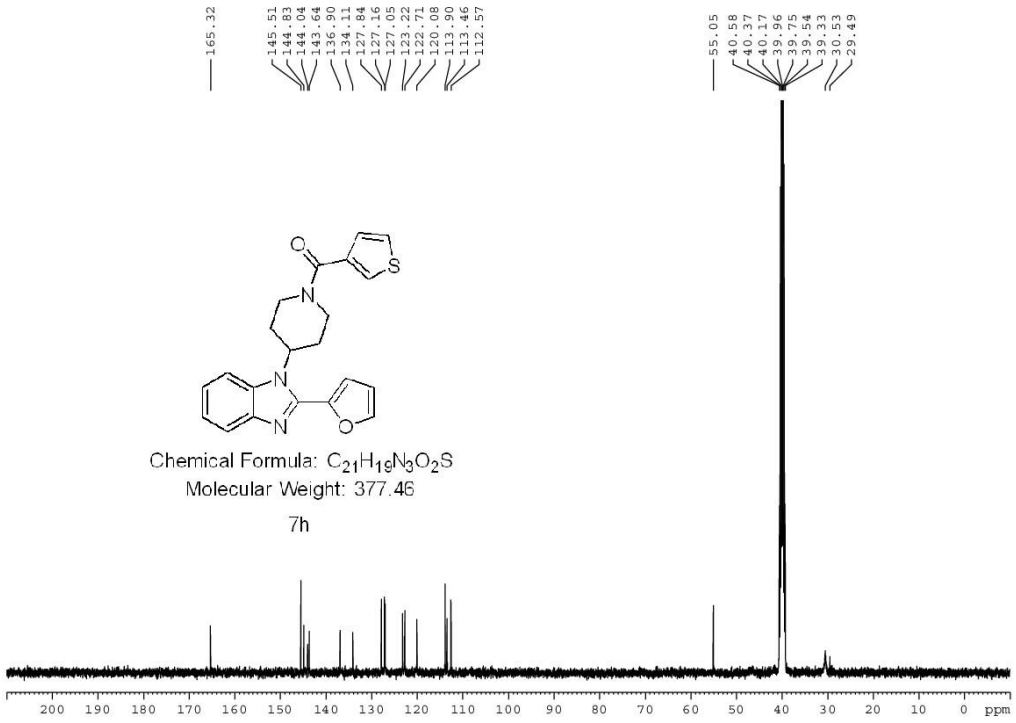
F2 - Acquisition Parameters
Date_           20180921
Time               5.25
INSTRUM           spect
PROBHD   5 mm PABBO BB/
PULPROG         zgpg30
TD               65536
SOLVENT            DMSO
NS                 2500
DS                    0
SWH           39682.539 Hz
FIDRES         0.605507 Hz
AQ            0.8257536 sec
RG               201.52
DW               12.600 usec
DE                6.50 usec
TE              294.5 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        100.6655801 MHz
NUC1               13C
P1                9.00 usec
PLW1       58.00000000 W

======== CHANNEL f2 ========
SFO2        400.3016012 MHz
NUC2               1H
CPDPRG[2        waltz16
PCPD2             90.00 usec
PLW2       15.00000000 W
PLW12       0.30816999 W
PLW13       0.24962001 W

F2 - Processing parameters
SI                32768
SF          100.6555151 MHz
WDW                EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.40
```

^{13}C NMR spectra of (4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidin-1-yl)(thiophen-3-yl)methanone (7h):



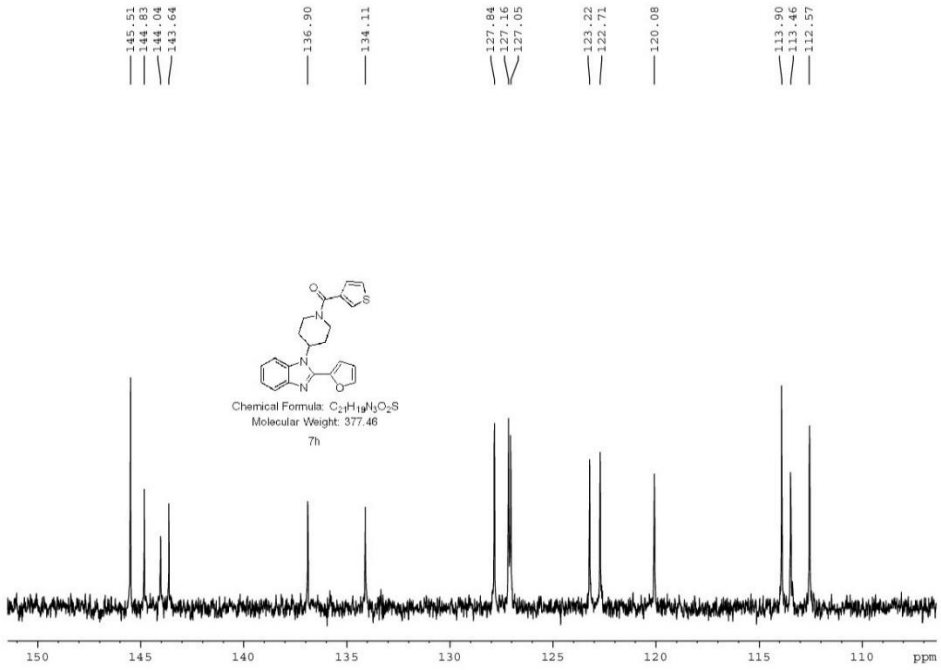

```
Current Data Parameters
NAME      7h
EXPNO                  1
PROCNO                 1

F2 - Acquisition Parameters
Date_           20181116
Time               22.17
INSTRUM            spect
PROBHD   5 mm BBO BB/19
PULPROG          zgpg30
TD                65536
SOLVENT             DMSO
NS                  2000
DS                     0
SWH           39682.539 Hz
FIDRES         0.605507 Hz
AQ             0.8257536 sec
RG                193.66
DW                12.600 usec
DE                 6.50 usec
TE                294.2 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         100.6228293 MHz
NUC1                 13C
P1                  8.70 usec
PLW1         54.00000000 W

======== CHANNEL f2 ========
SFO2         400.1316005 MHz
NUC2                 1H
CPDPRG[2          waltz16
PCPD2               90.00 usec
PLW2         10.50000000 W
PLW12         0.26323000 W
PLW13         0.21322000 W

F2 - Processing parameters
SI                 32768
SF           100.6127690 MHz
WDW                   EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.40
```




```
Current Data Parameters
NAME      7h
EXPNO                  1
PROCNO                 1

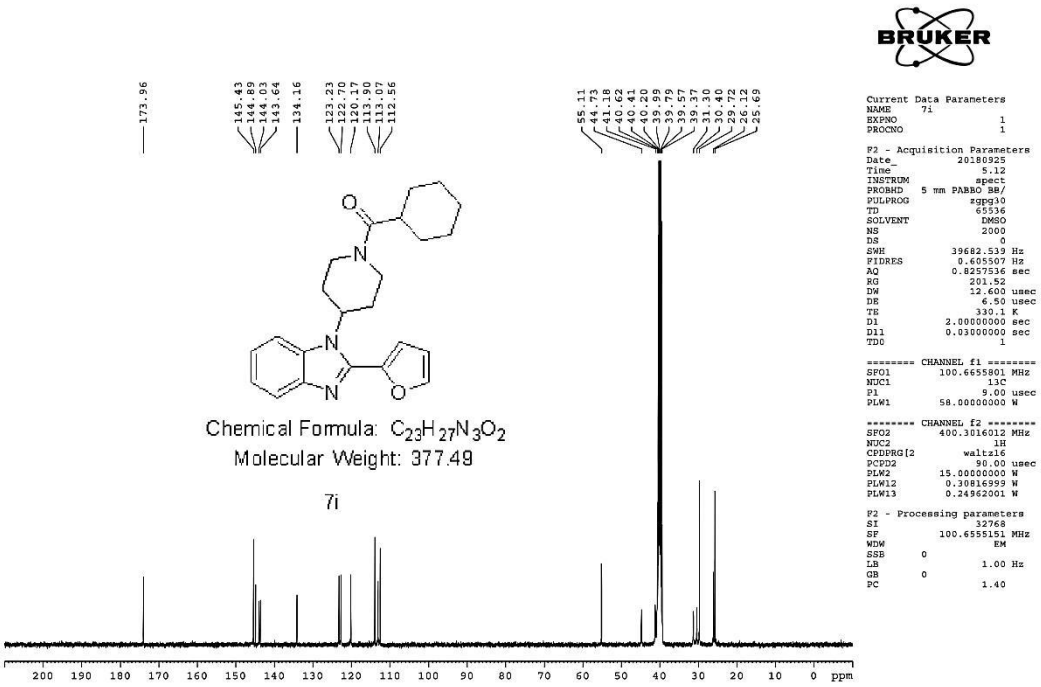
F2 - Acquisition Parameters
Date_           20181116
Time               22.17
INSTRUM            spect
PROBHD   5 mm BBO BB/19
PULPROG          zgpg30
TD                65536
SOLVENT             DMSO
NS                  2000
DS                     0
SWH           39682.539 Hz
FIDRES         0.605507 Hz
AQ             0.8257536 sec
RG                193.66
DW                12.600 usec
DE                 6.50 usec
TE                294.2 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                    1

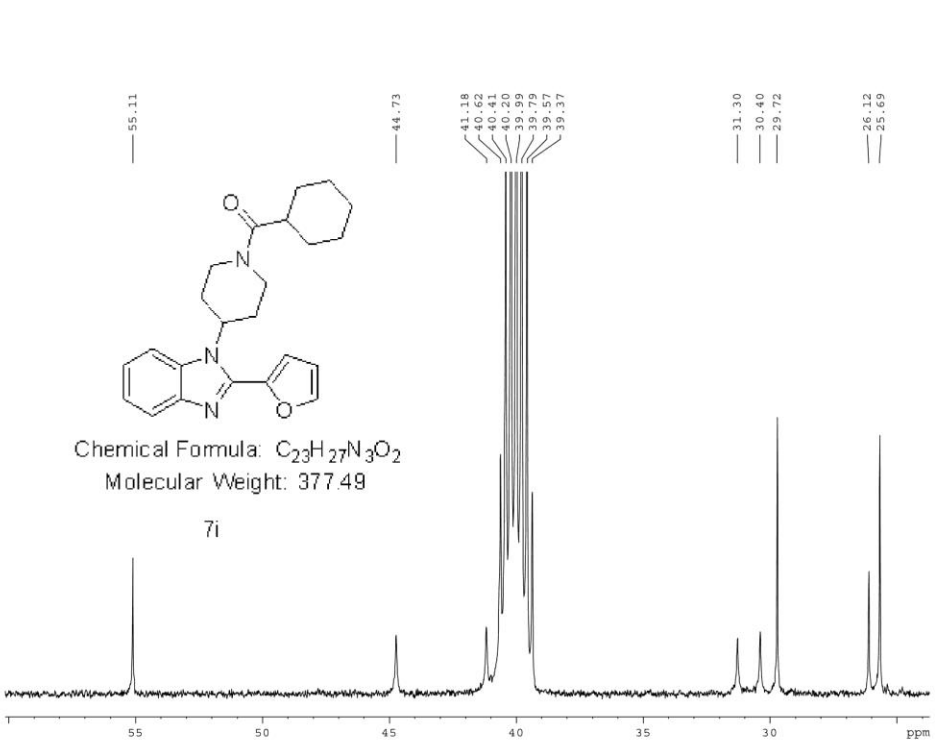
======== CHANNEL f1 ========
SFO1         100.6228293 MHz
NUC1                 13C
P1                  8.70 usec
PLW1         54.00000000 W

======== CHANNEL f2 ========
SFO2         400.1316005 MHz
NUC2                 1H
CPDPRG[2          waltz16
PCPD2               90.00 usec
PLW2         10.50000000 W
PLW12         0.26323000 W
PLW13         0.21322000 W

F2 - Processing parameters
SI                 32768
SF           100.6127690 MHz
WDW                   EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.40
```

^{13}C NMR spectra of Cyclohexyl (4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidin-1-yl)methanone (7i):





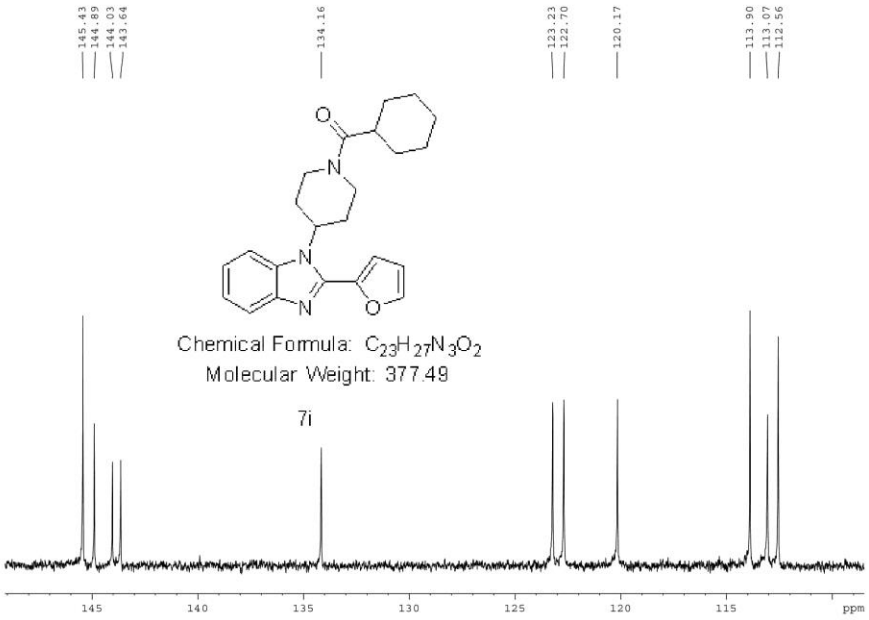

```
Current Data Parameters
NAME      7i
EXPNO                  1
PROCNO                 1

F2 - Acquisition Parameters
Date_           20180925
Time                5.12
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG          zgpg30
TD                65536
SOLVENT            DMSO
NS                  2000
DS                     0
SWH           39682.539 Hz
FIDRES         0.605507 Hz
AQ             0.8257536 sec
RG                201.52
DW               12.600 usec
DE                6.50 usec
TE                330.1 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         100.6655801 MHz
NUC1                  13C
P1                   9.00 usec
PLW1         58.00000000 W

======== CHANNEL f2 ========
SFO2         400.3016012 MHz
NUC2                  1H
CPDPRG[2          waltz16
PCPD2               90.00 usec
PLW2         15.00000000 W
PLW12         0.30816999 W
PLW13         0.24962001 W

F2 - Processing parameters
SI                 32768
SF           100.6555151 MHz
WDW                   EM
SSB       0
LB                  1.00 Hz
GB        0
PC                  1.40
```




```
Current Data Parameters
NAME      7i
EXPNO                  1
PROCNO                 1

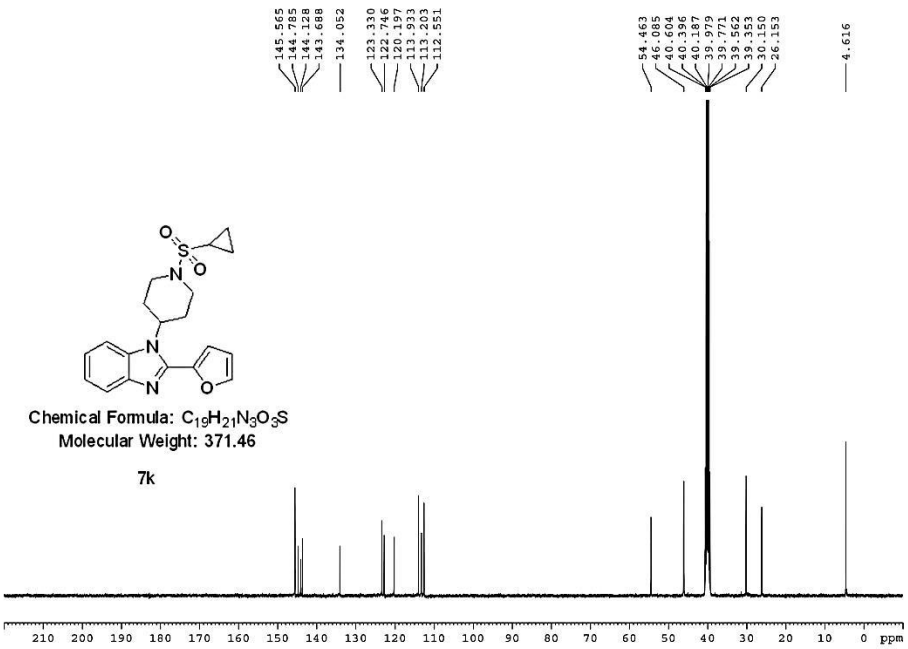
F2 - Acquisition Parameters
Date_           20180925
Time                5.12
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG          zgpg30
TD                65536
SOLVENT            DMSO
NS                  2000
DS                     0
SWH           39682.539 Hz
FIDRES         0.605507 Hz
AQ             0.8257536 sec
RG                201.52
DW               12.600 usec
DE                6.50 usec
TE                330.1 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                    1

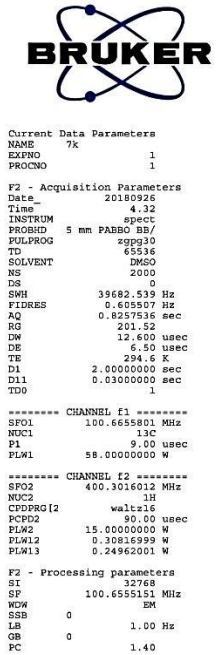
======== CHANNEL f1 ========
SFO1         100.6655801 MHz
NUC1                  13C
P1                   9.00 usec
PLW1         58.00000000 W

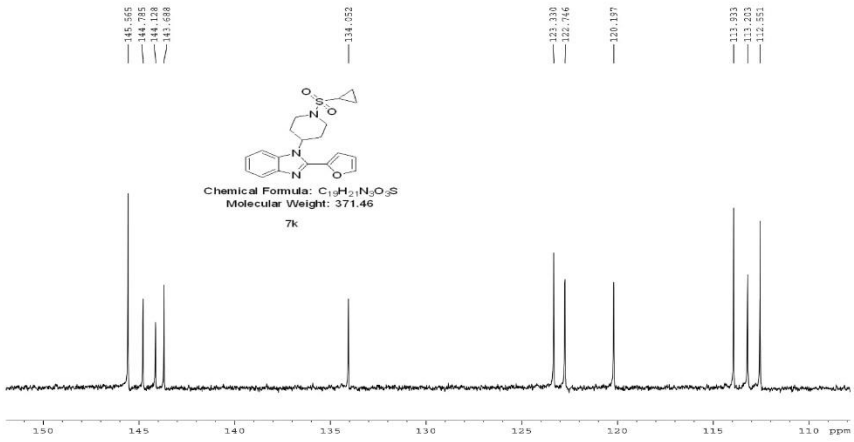
======== CHANNEL f2 ========
SFO2         400.3016012 MHz
NUC2                  1H
CPDPRG[2          waltz16
PCPD2               90.00 usec
PLW2         15.00000000 W
PLW12         0.30816999 W
PLW13         0.24962001 W

F2 - Processing parameters
SI                 32768
SF           100.6555151 MHz
WDW                   EM
SSB       0
LB                  1.00 Hz
GB        0
PC                  1.40
```

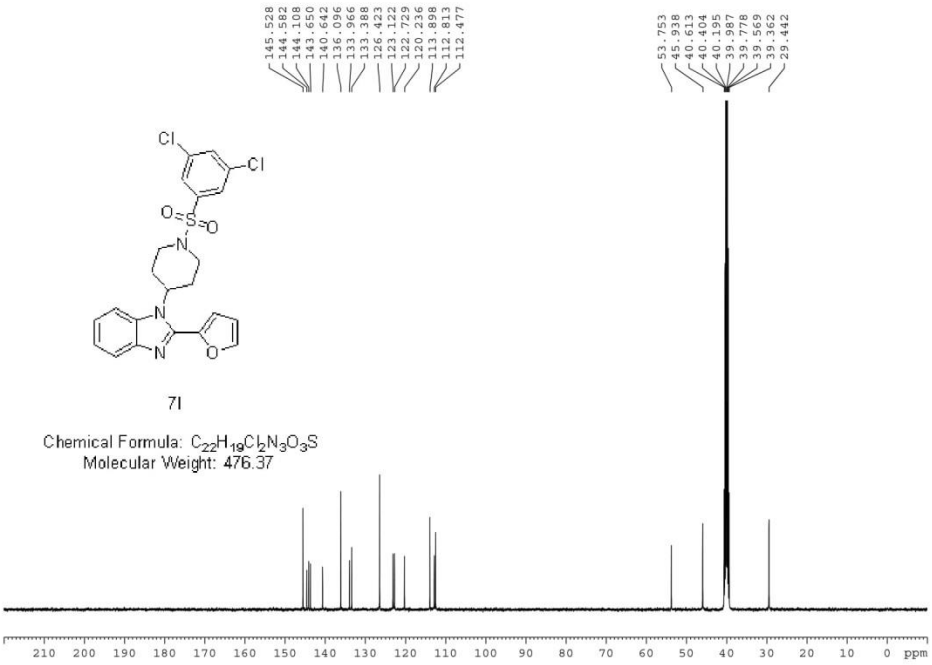

^{13}C NMR spectra of 1-(1-(cyclopropylsulfonyl)piperidin-4-yl)-2-(furan-2-yl)-1*H*-benzo[*d*]imidazole (7k):







^{13}C NMR spectra of 1-(1-((3,5-dichlorophenyl)sulfonyl)piperidin-4-yl)-2-(furan-2-yl)-1*H*-benzo[*d*]imidazole (7l):



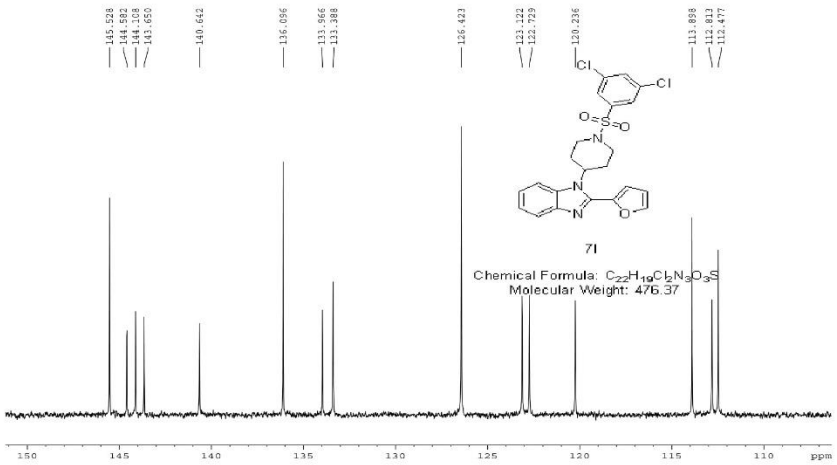
Current Data Parameters
NAME 7l
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
Date_ 20180926
Time 2.53
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT DMSO
NS 2000
DS 0
SWH 39682.539 Hz
FIDRES 0.605507 Hz
AQ 0.8257536 sec
RG 201.52
DW 12.600 usec
DE 6.50 usec
TE 294.7 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6655801 MHz
NUC1 13C
P1 9.00 usec
PLW1 58.00000000 W

======== CHANNEL f2 ========
SFO2 400.3016012 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 15.00000000 W
PLW12 0.30816999 W
PLW13 0.24962001 W

F2 - Processing parameters
SI 32768
SF 100.6555151 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



Current Data Parameters
NAME 7l
EXPNO 1
PROCNO 1

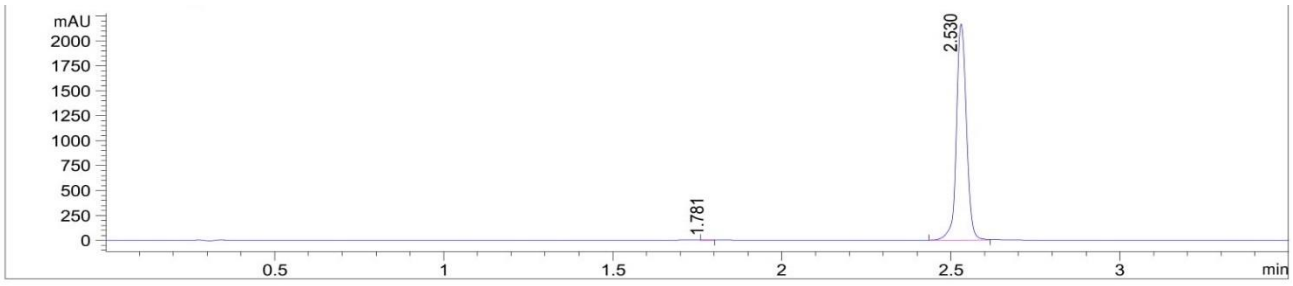
F2 - Acquisition Parameters
Date_ 20180926
Time 2.53
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT DMSO
NS 2000
DS 0
SWH 39682.539 Hz
FIDRES 0.605507 Hz
AQ 0.8257536 sec
RG 201.52
DW 12.600 usec
DE 6.50 usec
TE 294.7 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6655801 MHz
NUC1 13C
P1 9.00 usec
PLW1 58.00000000 W

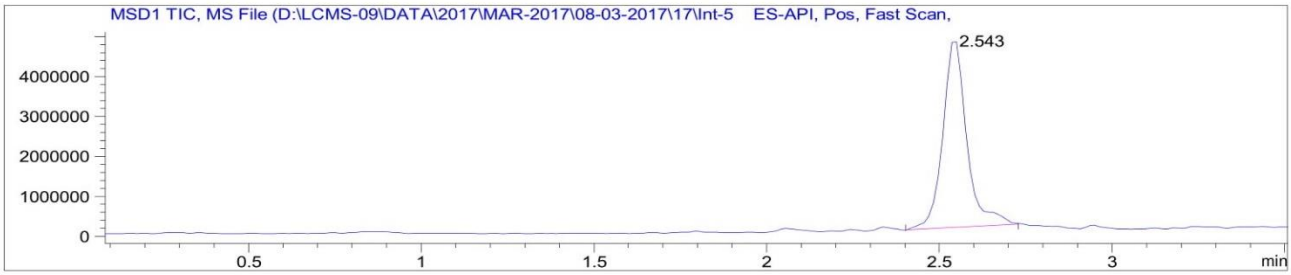
======== CHANNEL f2 ========
SFO2 400.3016012 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 15.00000000 W
PLW12 0.30816999 W
PLW13 0.24962001 W

F2 - Processing parameters
SI 32768
SF 100.6555151 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

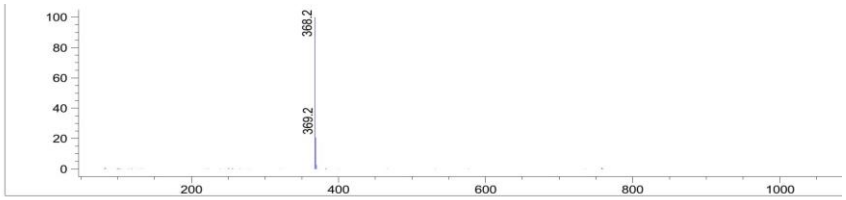
LC-MS spectra of Tert-butyl 4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidine-1-carboxylate (5):

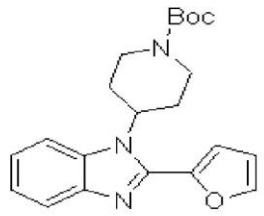


Peak No	RT (min)	Area	Area %
1	1.781	7	0.15
2	2.530	4523	99.85



Peak No	RT (min)	Area	Area %
1	2.543	22602898	100.00

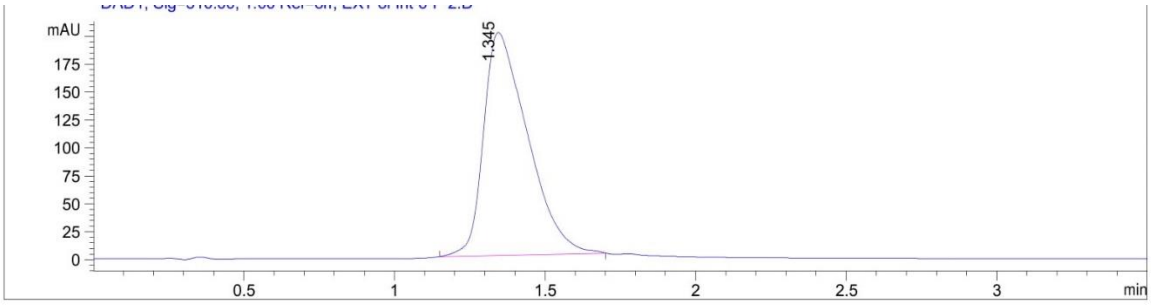




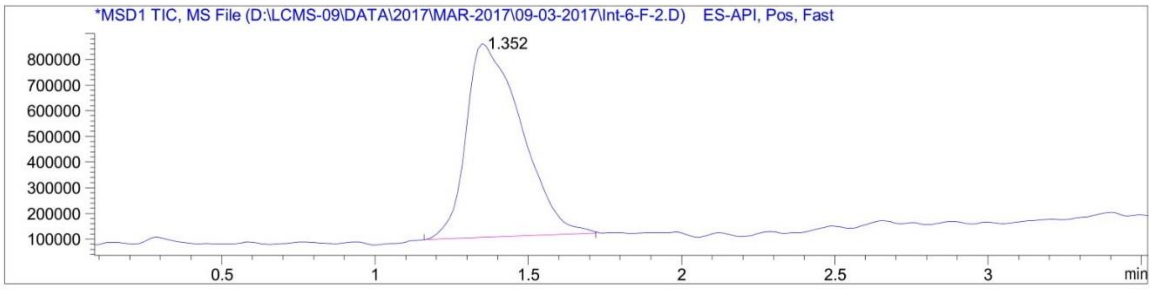
Chemical Formula: $C_{21}H_{25}N_3O_3$
Molecular Weight: 367.45

5

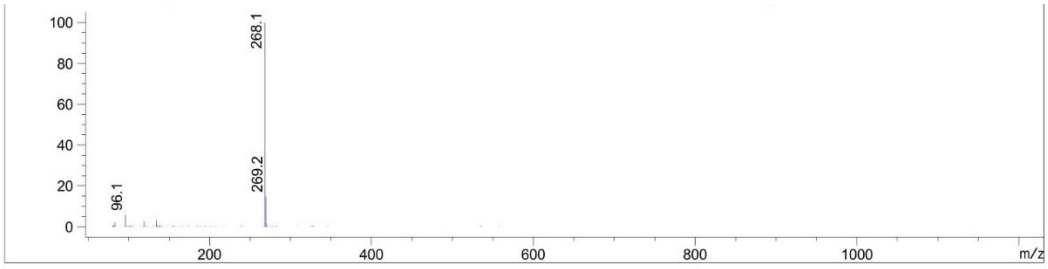
LC-MS spectra of 2-(furan-2-yl)-1-(piperidin-4-yl)-1*H*-benzo[*d*]imidazole hydrochloride (6) :

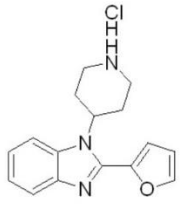


Peak No	RT (min)	Area	Area %
1	1.345	2034	100.00



Peak No	RT (min)	Area	Area %
1	1.352	9457601	100.00

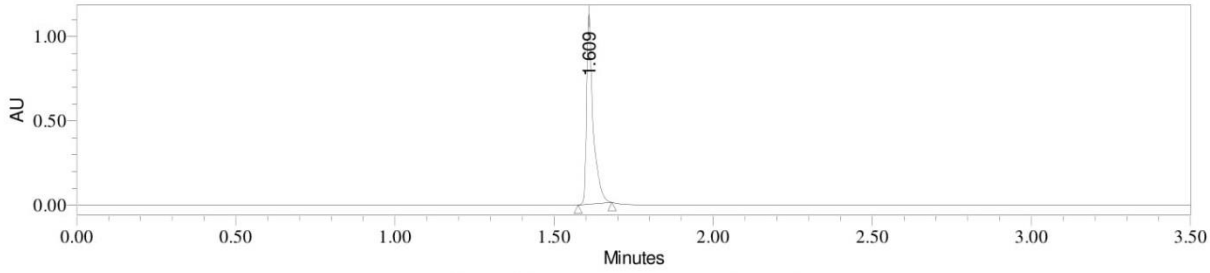


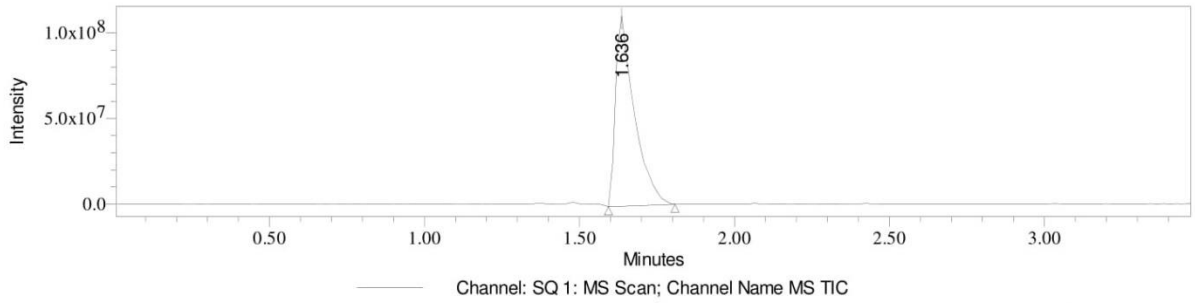


Chemical Formula: $C_{16}H_{18}ClN_3O$
Molecular Weight: 303.79

Int-6

LC-MS spectra of (4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidin-1-yl)(furan-3-yl)methanone (7a):



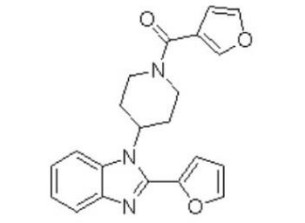


Peak Results
Channel: PDA Spectrum

	Retention Time (min)	Base Peak (m/z)	Height (µV)	Area (µV*sec)	% Area	Channel	Channel Name
1	1.609		1125574	1592083	100.00	PDA Spectrum	308.0nm

Peak Results
Channel: SQ 1: MS Scan

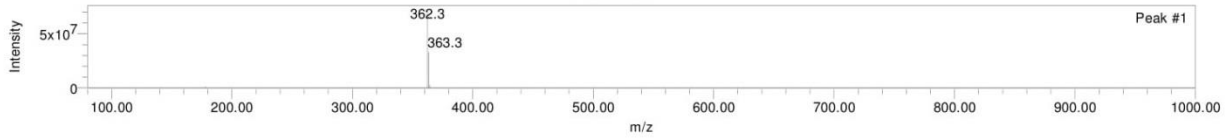
	Retention Time (min)	Base Peak (m/z)	Height (µV)	Area (µV*sec)	% Area	Channel	Channel Name
1	1.636	362.30	111117479	469232498	100.00	SQ 1: MS Scan	MS TIC



Chemical Formula: $C_{21}H_{19}N_3O_3$
Molecular Weight: 361.40

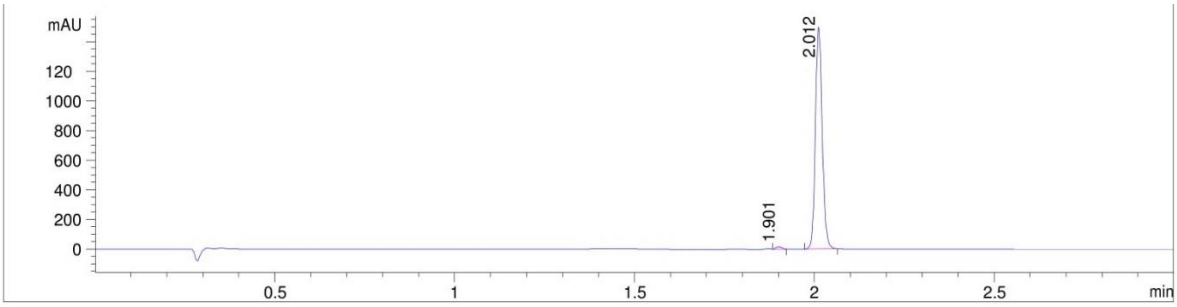
7a

Match Plot

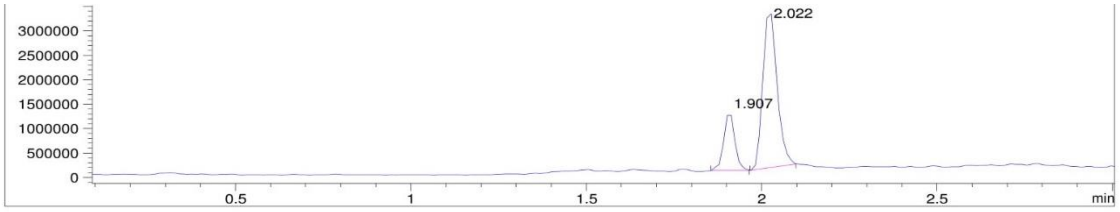


Base Peak 362.30 Channel Description 1: 80.00-1000.00 ES+, Centroid, CV=30 - AVG (0.0:1.0;2.2:3.5) x 40.000 - AVG (0.0:1.0;2.2:3.5) x 40.000 Retention Time 1.636

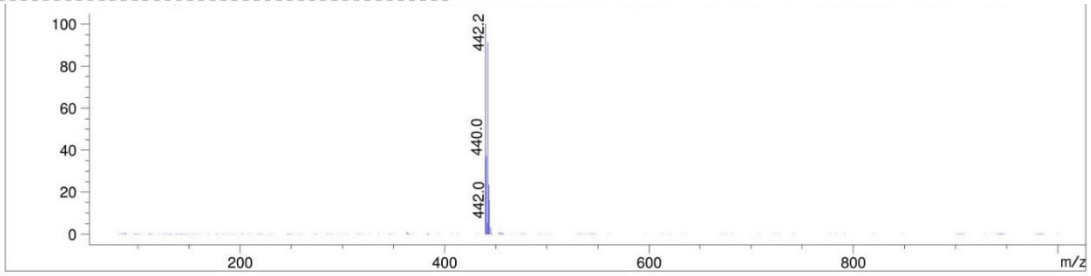
LC-MS spectra of (3,5-dichlorophenyl)(4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidin-1-yl)methanone (7b):

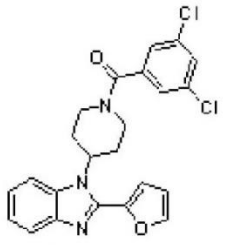


Peak No	RT (min)	Area	Area %
1	1.901	21	1.04
2	2.012	1976	98.96



Peak No	RT (min)	Area	Area %
1	1.907	2595021	22.33
2	2.022	9025639	77.67

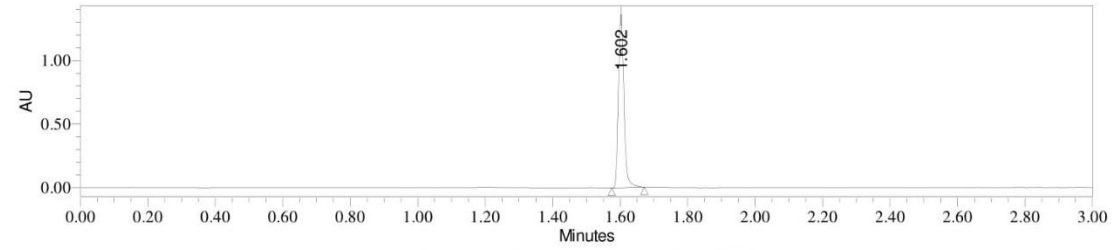


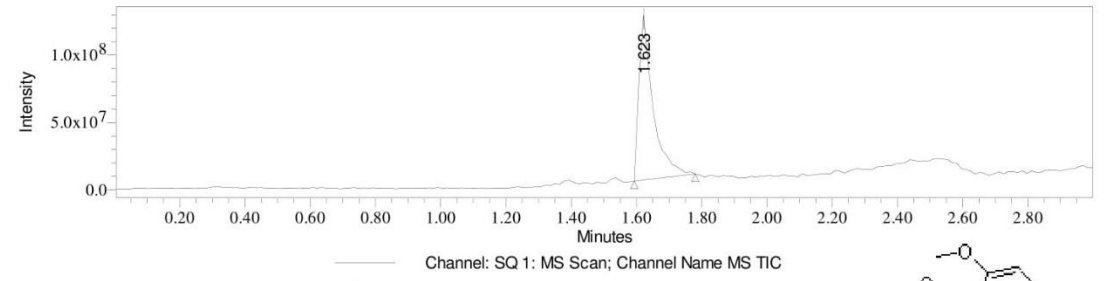


Chemical Formula: $C_{23}H_{19}Cl_2N_3O_2$
Molecular Weight: 440.32

7b

LC-MS of (2,5-dimethoxyphenyl)(4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidin-1-yl)methanone (7c).



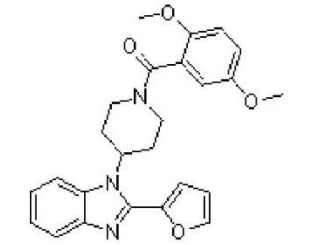


Peak Results
Channel: PDA Spectrum

	Retention Time (min)	Base Peak (m/z)	Height (µV)	Area (µV*sec)	% Area	Channel	Channel Name
1	1.602		1370719	1562759	100.00	PDA Spectrum	302.0nm

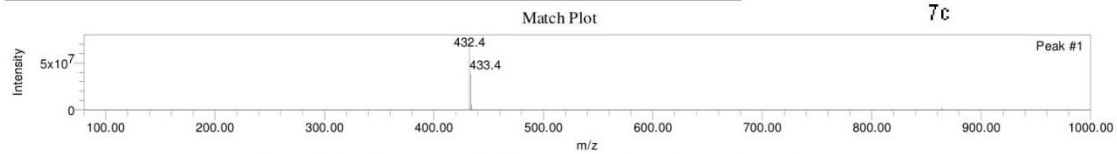
Peak Results
Channel: SQ 1: MS Scan

	Retention Time (min)	Base Peak (m/z)	Height (µV)	Area (µV*sec)	% Area	Channel	Channel Name
1	1.623	432.40	122257173	364072628	100.00	SQ 1: MS Scan	MS TIC



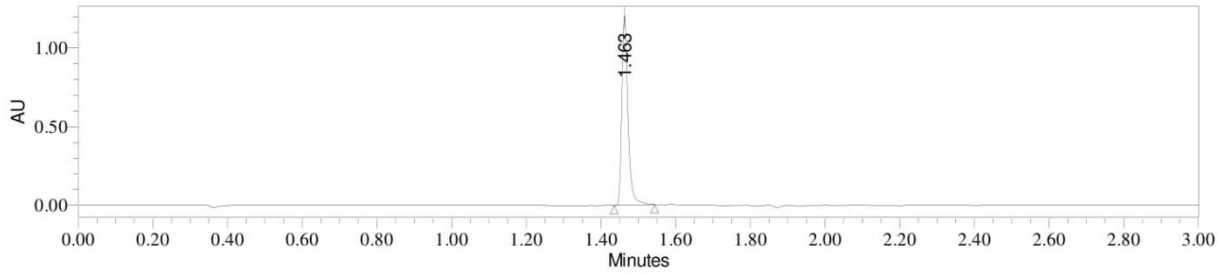
Chemical Formula: $C_{25}H_{25}N_3O_4$
Molecular Weight: 431.49

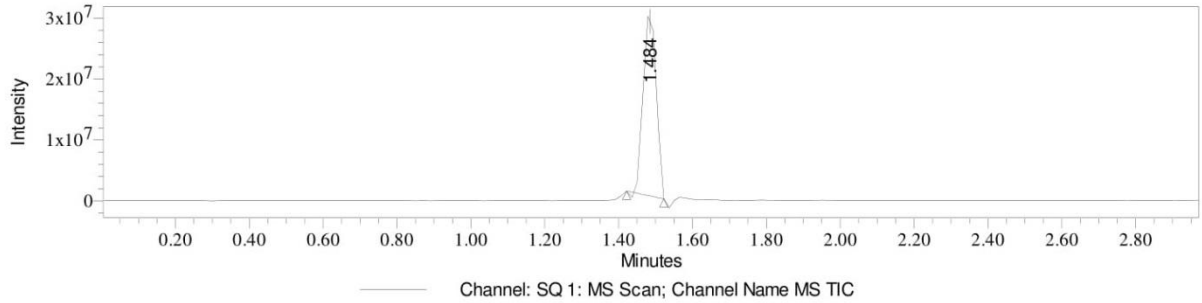
7c



Base Peak 432.40 Channel Description 1: 80.00-1000.00 ES+, Centroid, CV=30 Retention Time 1.623

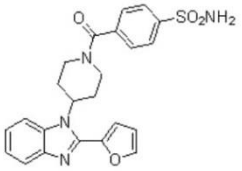
LC-MS spectra of 4-(4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidine-1-carbonyl) benzene sulfonamide (7d):





Peak Results
Channel: PDA Spectrum

	Retention Time (min)	Base Peak (m/z)	Height (µV)	Area (µV*sec)	% Area	Channel	Channel Name
1	1.463		1204558	1388236	100.00	PDA Spectrum	254.0nm

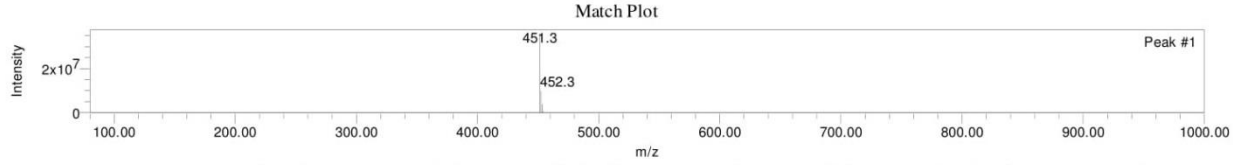


Chemical Formula: $C_{23}H_{22}N_4O_4S$
Molecular Weight: 450.51

7d

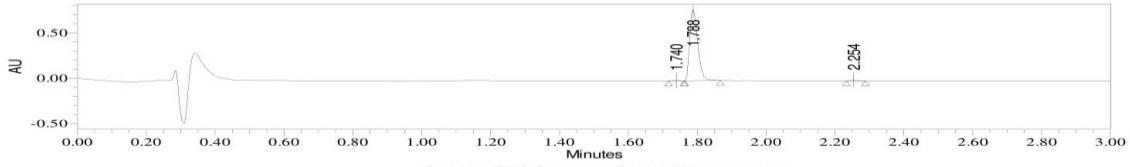
Peak Results
Channel: SQ 1: MS Scan

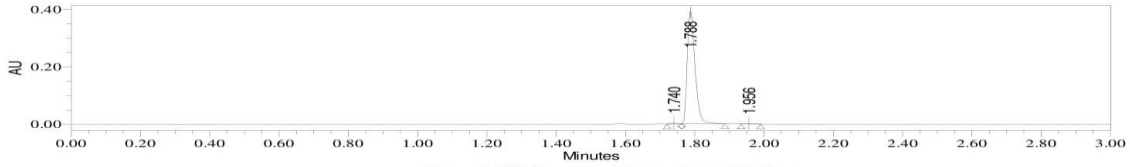
	Retention Time (min)	Base Peak (m/z)	Height (µV)	Area (µV*sec)	% Area	Channel	Channel Name
1	1.484	451.35	30540885	73939498	100.00	SQ 1: MS Scan	MS TIC

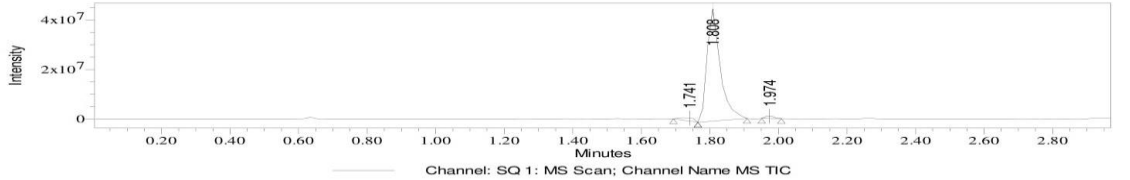


Base Peak 451.35 Channel Description 1: 80.00-1000.00 ES+, Centroid, CV=30 - AVG (1.6:3.0;0.0:1.4) x 60.000 - AVG (1.6:3.0;0.0:1.4) x 60.000 Retention Time 1.484

LC-MS spectra of [1,1'-biphenyl]-4-yl(4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidin-1-yl)methanone (7e).



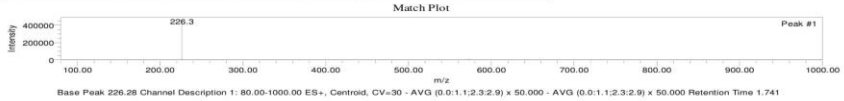




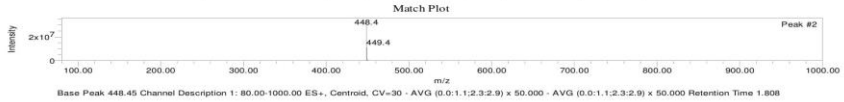
Peak Results
Channel: PDA Spectrum

	Retention Time (min)	Base Peak (m/z)	Height (µV)	Area (µV*sec)	% Area	Channel	Channel Name
1	1.740		7296	9733	0.75	PDA Spectrum	202.0nm
2	1.740		3276	4409	0.71	PDA Spectrum	254.0nm
3	1.788		393354	615470	99.02	PDA Spectrum	254.0nm
4	1.788		783142	1268829	97.95	PDA Spectrum	202.0nm
5	1.956		972	1694	0.27	PDA Spectrum	254.0nm
6	2.254		11556	16878	1.30	PDA Spectrum	202.0nm

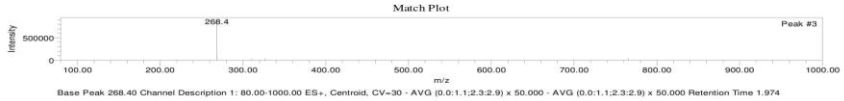
	Retention Time (min)	Base Peak (m/z)	Height (µV)	Area (µV*sec)	% Area	Channel	Channel Name
1	1.741	226.28	1268927	3462317	2.72	SQ 1: MS Scan	MS TIC
2	1.808	448.45	45406837	121735179	95.79	SQ 1: MS Scan	MS TIC
3	1.974	268.40	1040417	1885655	1.48	SQ 1: MS Scan	MS TIC



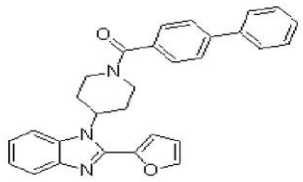
Base Peak 226.28 Channel Description 1: 80.00-1000.00 ES+, Centroid, CV=30 - AVG (0.0:1.1;2.3:2.9) x 50.000 - AVG (0.0:1.1;2.3:2.9) x 50.000 Retention Time 1.741



Base Peak 448.45 Channel Description 1: 80.00-1000.00 ES+, Centroid, CV=30 - AVG (0.0:1.1;2.3:2.9) x 50.000 - AVG (0.0:1.1;2.3:2.9) x 50.000 Retention Time 1.808



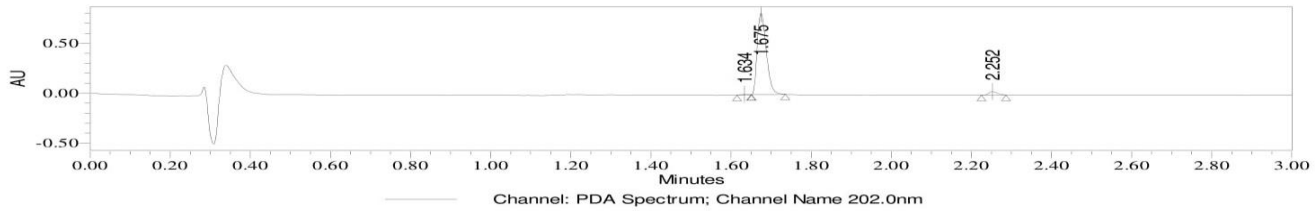
Base Peak 268.40 Channel Description 1: 80.00-1000.00 ES+, Centroid, CV=30 - AVG (0.0:1.1;2.3:2.9) x 50.000 - AVG (0.0:1.1;2.3:2.9) x 50.000 Retention Time 1.974

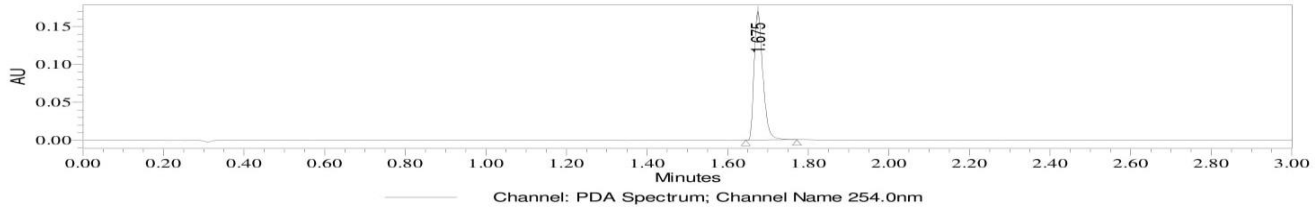


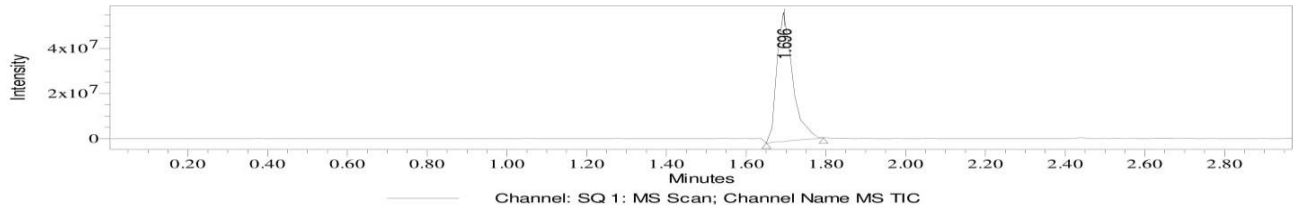
Chemical Formula: $C_{29}H_{25}N_3O_2$
Molecular Weight: 447.54

7e

LC-MS spectra of (2,5-dimethylphenyl) (4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidin-1-yl)methanone (7f):

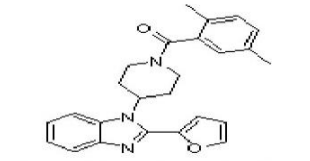






Peak Results
Channel: PDA Spectrum

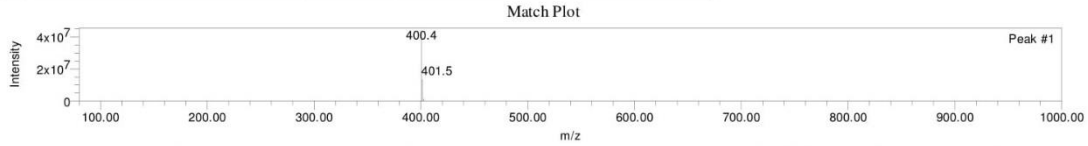
	Retention Time (min)	Base Peak (m/z)	Height (µV)	Area (µV*sec)	% Area	Channel	Channel Name
1	1.634		8624	9545	0.71	PDA Spectrum	202.0nm
2	1.675		169719	258440	100.00	PDA Spectrum	254.0nm
3	1.675		813053	1285063	95.43	PDA Spectrum	202.0nm
4	2.252		35694	52018	3.86	PDA Spectrum	202.0nm



Chemical Formula: $C_{28}H_{25}N_3O_2$
Molecular Weight: 399.49

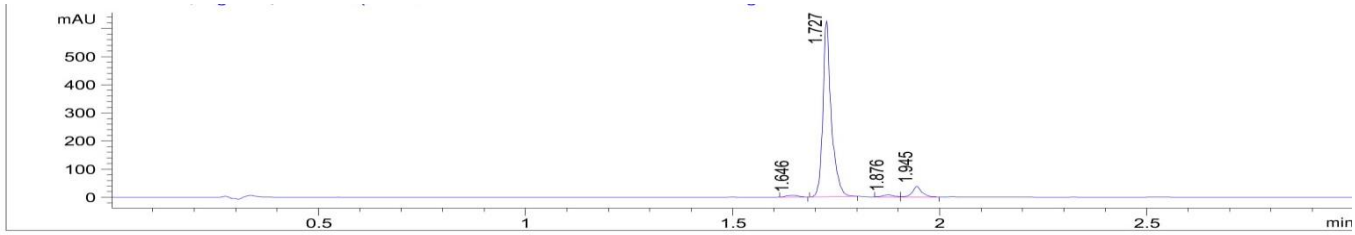
7f

	Retention Time (min)	Base Peak (m/z)	Height (µV)	Area (µV*sec)	% Area	Channel	Channel Name
1	1.696	400.45	53479544	156430027	100.00	SQ 1: MS Scan	MS TIC

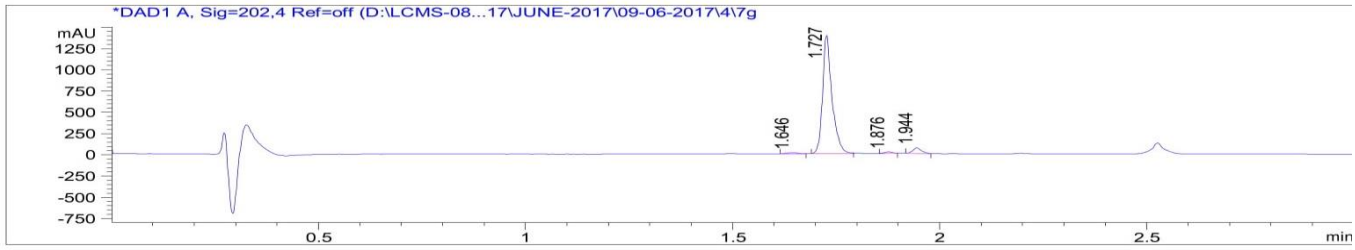


Base Peak 400.45 Channel Description 1: 80.00-1000.00 ES+, Centroid, CV=30 - AVG (0.0:1.4;2.2:3.0) x 50.000 - AVG (0.0:1.4;2.2:3.0) x 50.000 Retention Time 1.696

LC-MS spectra of 1-(3-(4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidine-1-carbonyl)phenyl)ethan-1-one (7g):

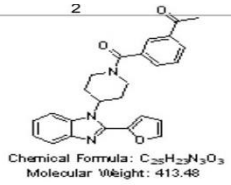


Peak No	RT (min)	Area	Area %
1	1.646	14	1.43
2	1.727	881	90.81
3	1.876	15	1.51
4	1.945	61	6.24

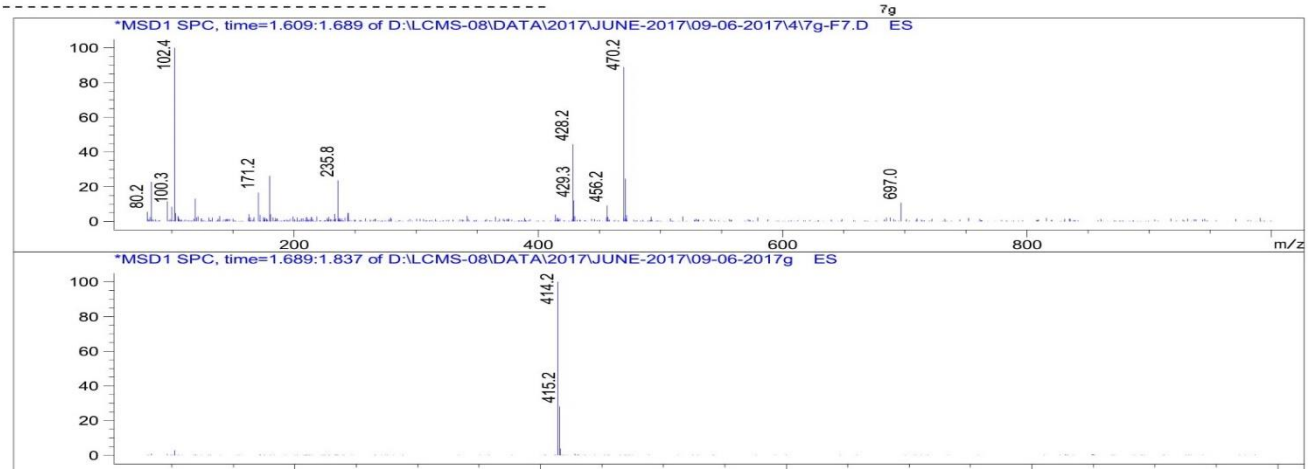


Peak No	RT (min)	Area	Area %
1	1.646	25	1.08
2	1.727	2199	93.94
3	1.876	22	0.92
4	1.944	95	4.06

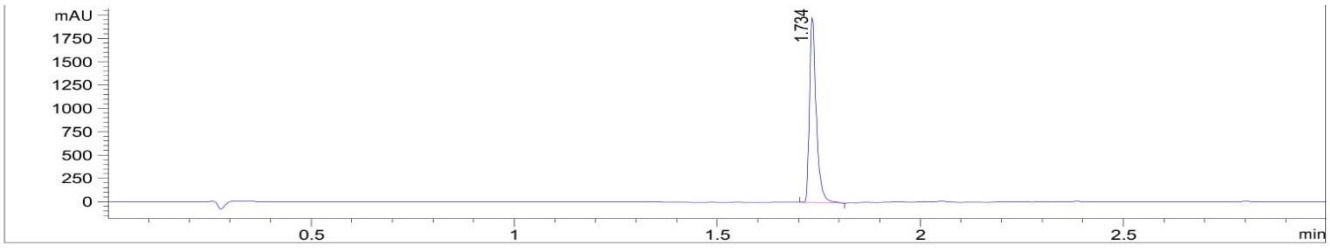
Peak No	RT (min)	Area	Area %
1	1.647	179329	3.61
2	1.741	3811686	76.69
3	1.884	196557	3.95
4	1.955	782805	15.75



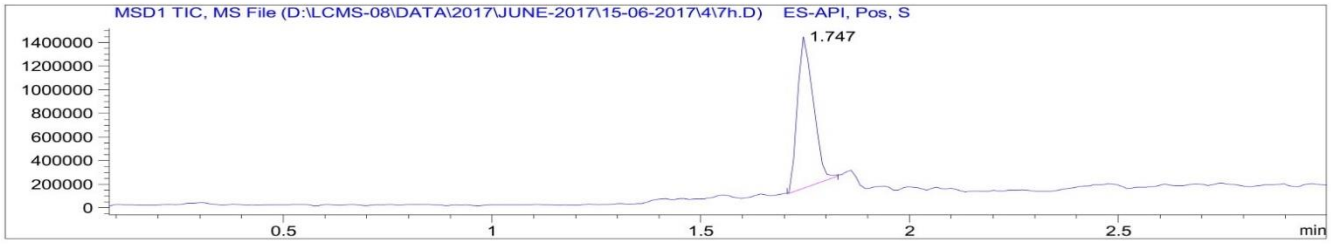
7g



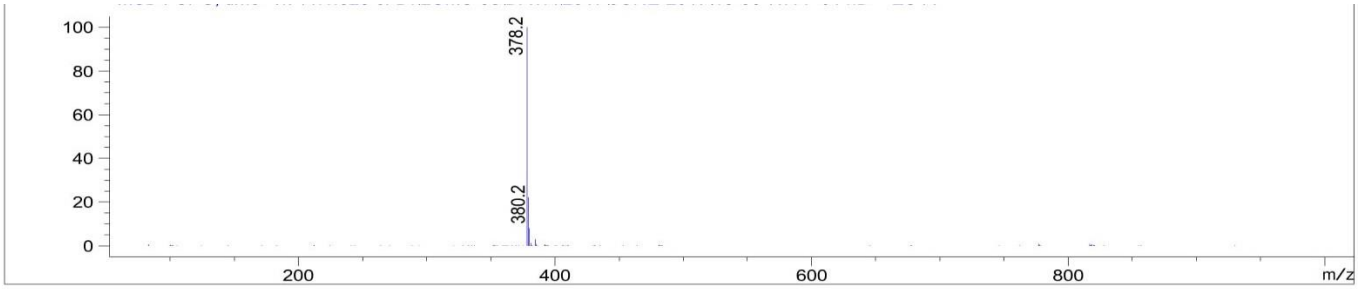
LC-MS spectra of (4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidin-1-yl)(thiophen-3-yl)methanone (7h):

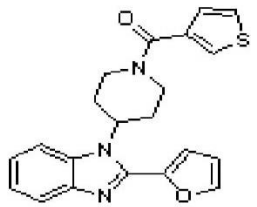


Peak No	RT (min)	Area	Area %
1	1.734	2298	100.00



Peak No	RT (min)	Area	Area %
1	1.747	3365750	100.00

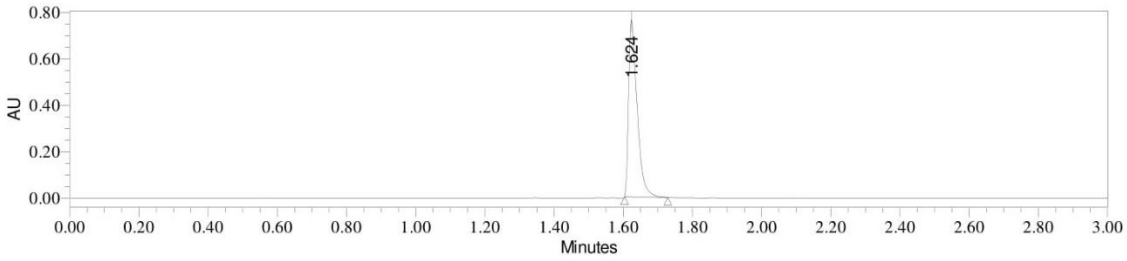


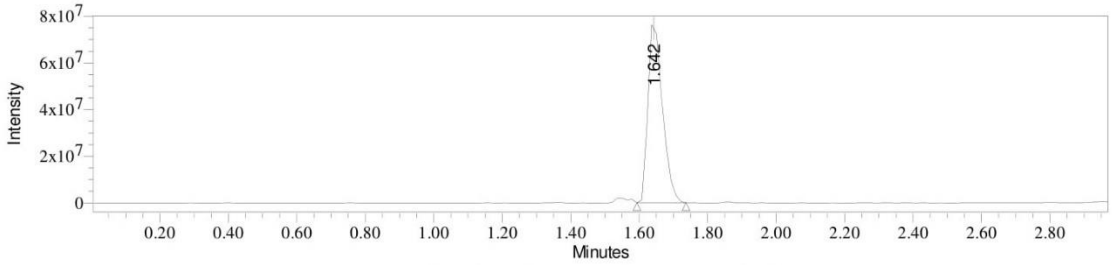


Chemical Formula: $C_{21}H_{19}N_3O_2S$
Molecular Weight: 377.46

7h

LC-MS spectra of Cyclohexyl (4-(2-(furan-2-yl)-1*H*-benzo[*d*]imidazol-1-yl)piperidin-1-yl)methanone (7i):

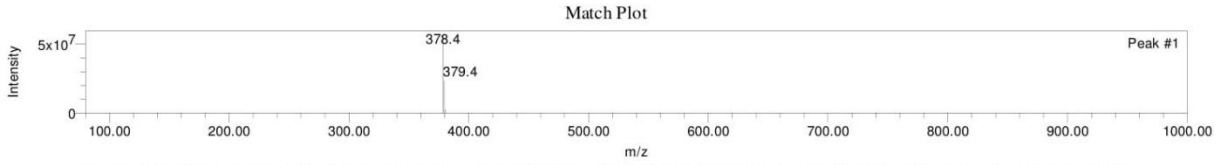




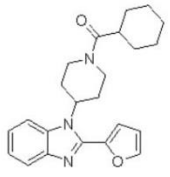
	Retention Time (min)	Base Peak (m/z)	Height (µV)	Area (µV*sec)	% Area	Channel	Channel Name
1	1.624		763218	1307902	100.00	PDA Spectrum	305.0nm
2	1.624		411220	707530	100.00	PDA Spectrum	247.0nm
3	1.624		971961	1817292	100.00	PDA Spectrum	202.0nm

Peak Results
Channel: SQ 1: MS Scan

	Retention Time (min)	Base Peak (m/z)	Height (µV)	Area (µV*sec)	% Area	Channel	Channel Name
1	1.642	378.45	80695366	225293658	100.00	SQ 1: MS Scan	MS TIC



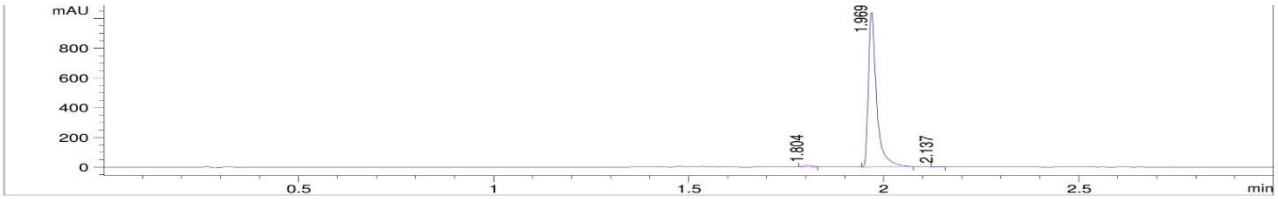
Base Peak 378.45 Channel Description 1: 80.00-1000.00 ES+, Centroid, CV=30 - AVG (1.9:2.9;0.0:1.5) x 50.000 - AVG (1.9:2.9;0.0:1.5) x 50.000 Retention Time 1.642



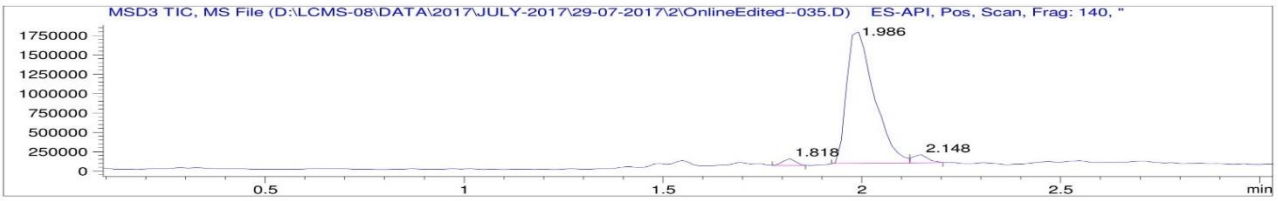
Chemical Formula: $C_{23}H_{27}N_3O_2$
Molecular Weight: 377.49

7i

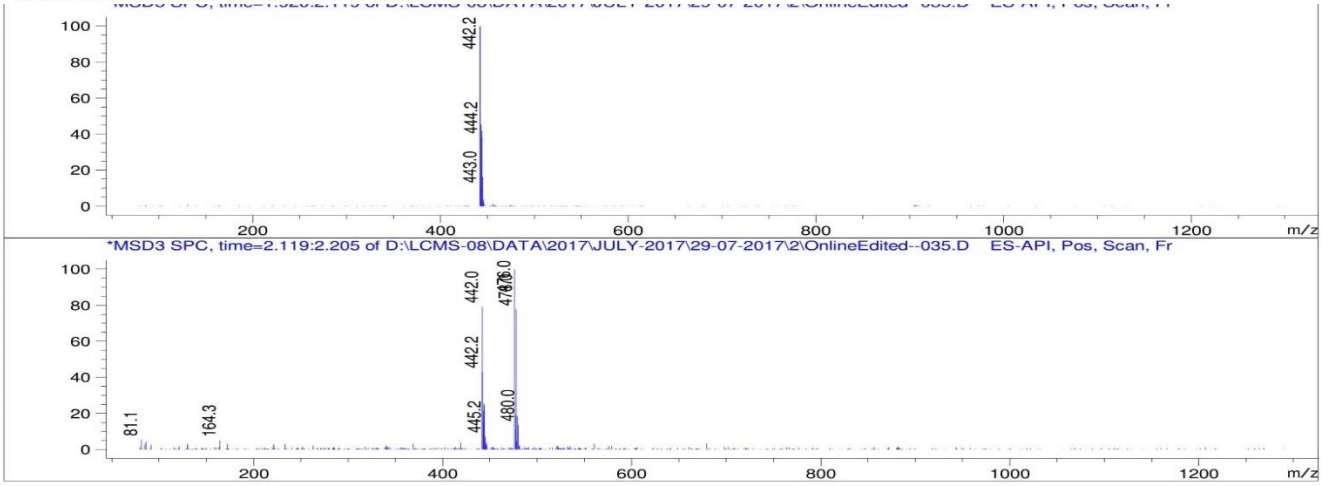
LC-MS spectra of 1-(1-((2-chlorophenyl)sulfonyl)piperidin-4-yl)-2-(furan-2-yl)-1*H*-benzo[*d*]imidazole (7j):

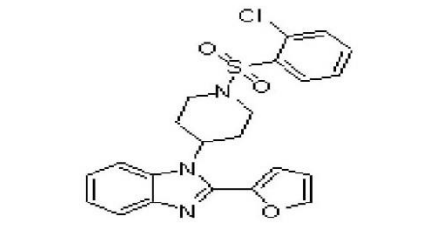


Peak No	RT (min)	Area	Area %
1	1.804	20	1.30
2	1.969	1530	98.27
3	2.137	7	0.44



Peak No	RT (min)	Area	Area %
1	1.818	197802	2.29
2	1.986	8213046	94.91
3	2.148	243023	2.81

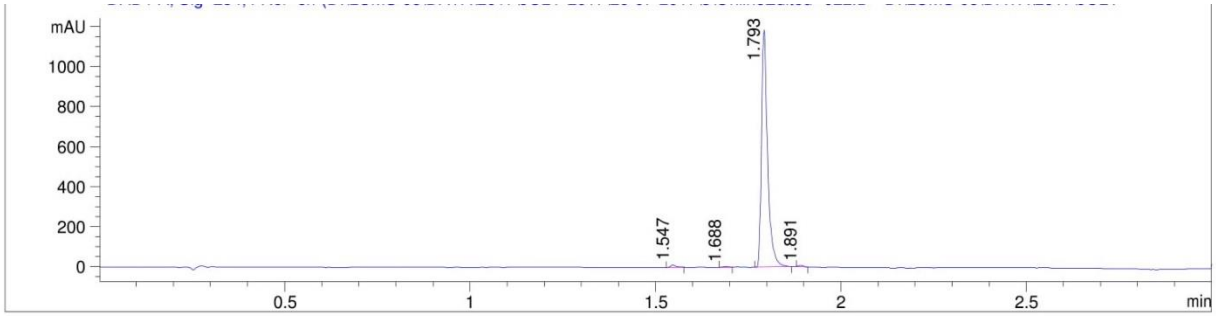




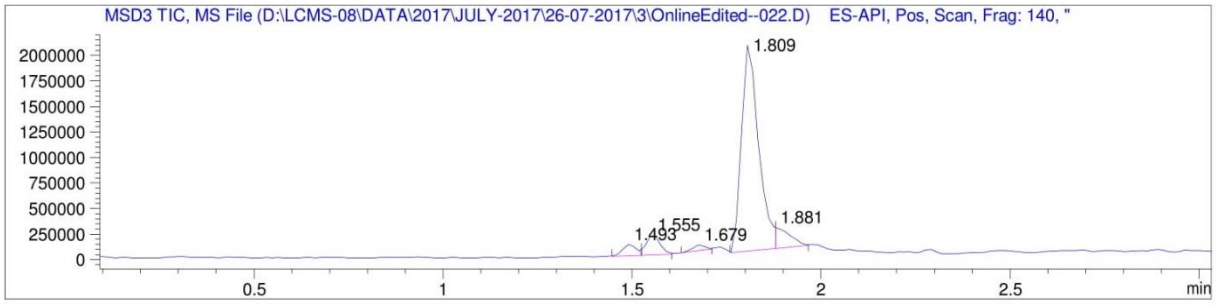
Chemical Formula: $C_{25}H_{20}ClN_3O_3S$
Molecular Weight: 441.93

7j

LC-MS spectra of 1-(1-(cyclopropylsulfonyl)piperidin-4-yl)-2-(furan-2-yl)-1*H*-benzo[*d*]imidazole

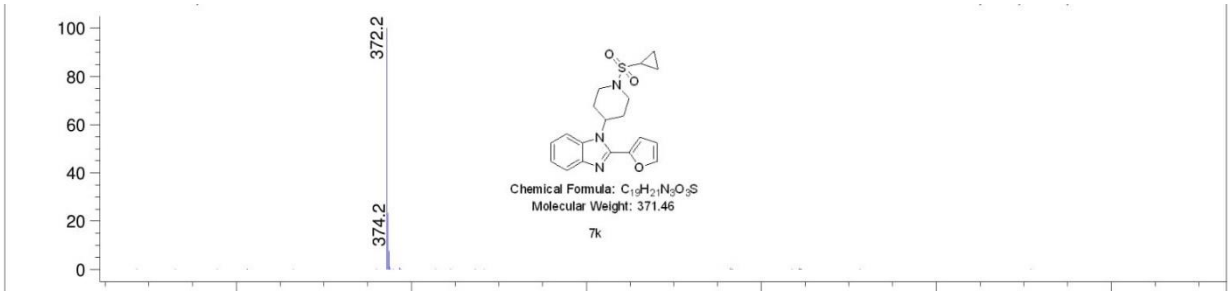


Peak No	RT (min)	Area	Area %
1	1.547	12	0.85
2	1.688	4	0.31
3	1.793	1359	98.37
4	1.891	6	0.47

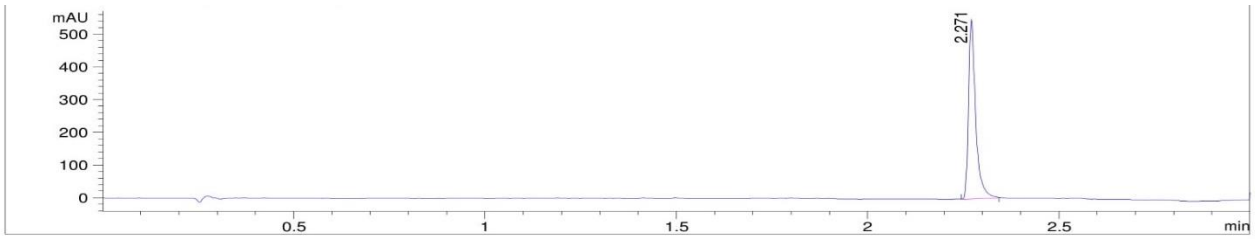


Peak No	RT (min)	Area	Area %
1	1.493	319490	4.09
2	1.555	460692	5.89
3	1.679	122861	1.57
4	1.809	6480148	82.86
5	1.881	437027	5.59

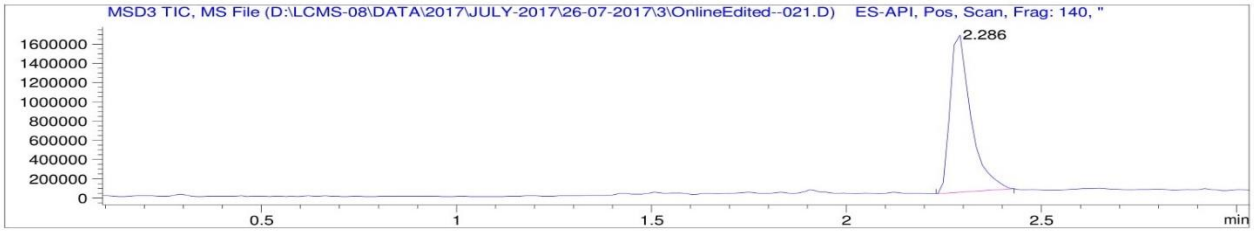
(7k):



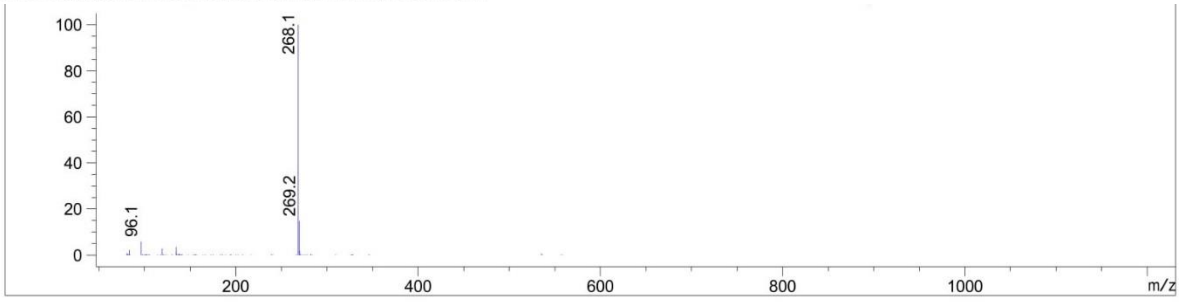
LC-MS spectra of 1-(1-((3,5-dichlorophenyl)sulfonyl)piperidin-4-yl)-2-(furan-2-yl)-1*H*-benzo[*d*] imidazole (7l).

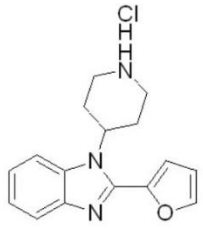


Peak No	RT (min)	Area	Area %
1	2.271	716	100.00



Peak No	RT (min)	Area	Area %
1	2.286	6101514	100.00





Chemical Formula: $C_{16}H_{18}ClN_3O$
Molecular Weight: 303.79

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