



## Supporting Information

for

### **Effective microwave-assisted approach to 1,2,3-triazolobenzodiazepinones via tandem Ugi reaction/catalyst-free intramolecular azide–alkyne cycloaddition**

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### **General synthetic procedures, characteristics of compounds 6 and 7, X-ray experimental data and copies of $^1\text{H}$ and $^{13}\text{C}$ NMR spectra**

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## 1. General synthetic aspects and procedures

$^1\text{H}$  and  $^{13}\text{C}$  NMR spectra were acquired on a Varian Mercury VX-400 instrument at 400 and 100 MHz, respectively, in  $\text{DMSO-}d_6$ . Experiments under microwave irradiation were carried out by using an Anton Paar Monowave 300 reactor (monomode cavity, 2.45 GHz).

**Synthesis of 2-azidobenzaldehyde 2.** 2-nitrobenzaldehyde (**1**, 33.1 mmol, 5 g) and sodium azide (99.3 mmol, 6.5 g) are placed in the round bottom flask equipped with a condenser and 40 ml of dry DMF are added. The reaction mixture is stirred on the oil bath (55 °C) for 7–10 days. After that the reaction mixture is poured on ice and extracted by hexane (4 × 20 ml). The organic layers were combined, washed with brine, dried over  $\text{Na}_2\text{SO}_4$  and the solvent was removed. The obtained yellow oil was purified by column chromatography. The product was stored at 4 °C in a freezer. Yield 3.37 g (69%), yellow crystals, mp 33-35°C.  $^1\text{H}$  NMR (400 MHz,  $\text{DMSO-}d_6$ )  $\delta$  (ppm): 10.16 (s, 1H), 7.78 – 7.61 (m, 2H), 7.41 (d,  $J$  = 8.1 Hz, 1H), 7.26 (t,  $J$  = 7.5 Hz, 1H).

**General procedure for the syntheses of compounds 6 in MeOH (Ugi reaction).** Amine **5** (2 mmol) and 2-azidobenzaldehyde (**2**, 2 mmol, 294 mg) were placed in a capped 10 ml vial and 2 ml of MeOH are added. The precipitate of intermediate imine can form. The reaction mixture was stirred at rt for 2 hours, then carboxylic acid **3** (2 mmol) was added and the reaction was stirred for an additional 20 minutes. After that isocyanide **4** (2 mmol) was added dropwise, the vial was hermetically closed with a cap and stirred overnight. The formed precipitate of Ugi product **6** was filtered out, washed with a minimum quantity of MeOH to remove red color (if necessary), and air-dried.

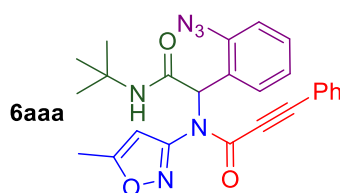
**General procedure for the syntheses of compounds 6ada and 6aea in DCM (Ugi reaction).** Amine **5** (2 mmol), 2-azidobenzaldehyde (**2**, 2 mmol, 294 mg), carboxylic acid **3** (2 mmol) and isocyanide **4** (2 mmol) were placed in the round bottom flask and 16 ml of DCM were added. The reaction mixture was stirred on the oil bath (40 °C) for 2–3 days. After that the solvent was removed from the reaction mixture using a rotary evaporator. To the crude product the minimum amount of MeOH is added. After stirring for 15–20 minutes the precipitate of Ugi product **6** is filtered out and air-dried.

**General procedure for the syntheses of compounds 7.**

**Method A.** The Ugi product **6** (100 mg) was placed in a G10 microwave vial. 3 ml of NMP was added. The vial was inserted in the microwave reactor and irradiated while stirring. The reaction progress was monitored by TLC (EtOAc/hexane = 1:2). After the reaction was completed and the reaction mixture was poured on ice a precipitate was formed. The precipitate was removed by filtration and dried in the air.

**Method B.** The Ugi product **6** (100 mg) was placed in a G10 microwave vial. 3 ml of toluene was added. The vial was inserted in the microwave reactor and irradiated while stirring. The reaction progress was monitored by TLC (EtOAc/hexane = 1:2). After the reaction was completed the reaction mixture was cooled. Compounds **7aab**, **7abb**, **7aeb** were isolated by removing the toluene in vacuo. All compounds were dried in the air.

## 2. Characteristics of compounds 6 and 7



### ***N*-(1-(2-Azidophenyl)-2-(*tert*-butylamino)-2-oxoethyl)-*N*-(5-methylisoxazol-3-yl)-3-phenylpropiolamide (6aaa).**

White solid.

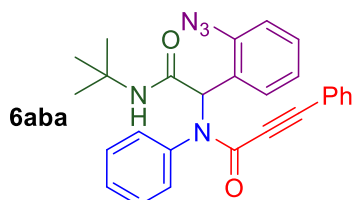
Yield 57%, mp. 165-167 °C;

Elemental analysis calcd for C<sub>25</sub>H<sub>24</sub>N<sub>6</sub>O<sub>3</sub>: C 65.78, H 5.30, N 18.41, found: C 65.81, H 5.67, N 18.31.

MS (EI, 70 eV): *m/z* = 457.20 [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 8.03 (s, 1H, NH), 7.03-7.60 (m, 9H, ArH), 6.40 (s, 1H, CH), 6.19 (s, 1H, CH), 2.29 (s, 3H, CH<sub>3</sub>), 1.26 (s, 9H, *t*-Bu).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 171.07, 167.46, 160.18, 152.91, 139.64, 132.63, 131.31, 130.63, 130.34, 129.40, 126.10, 125.05, 119.48, 119.21, 103.58, 90.60, 82.12, 58.50, 51.13, 28.72, 12.49.



### ***N*-(1-(2-Azidophenyl)-2-(*tert*-butylamino)-2-oxoethyl)-*N*,3-diphenylpropiolamide (6aba).**

Rotamer ratio: 90:10.

White solid.

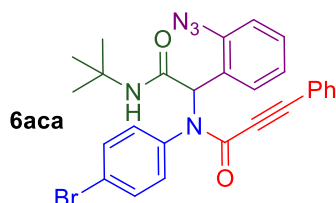
Yield 67%, mp. 184-186 °C;

Elemental analysis calcd for C<sub>27</sub>H<sub>25</sub>N<sub>5</sub>O<sub>2</sub>: C 71.82, H 5.58, N 15.51, found: C 72.25, H 5.86, N 15.34.

MS (EI, 70 eV): *m/z* = 452.20 [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 8.11 (s, 0.1H, NH), 7.90 (s, 0.9H, NH), 6.85 – 7.81 (m, 14H, ArH), 6.42 (s, 0.1H, CH), 6.19 (s, 0.9H, CH), 1.27 (s, 8.1H, *t*-Bu), 1.19 (s, 0.9H, *t*-Bu).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 168.41, 153.64, 139.39, 139.29, 132.31, 130.86, 130.83, 130.25, 129.25, 128.44, 126.58, 124.97, 119.86, 118.90, 90.60, 83.31, 59.42, 50.97, 28.81.



***N*-(1-(2-Azidophenyl)-2-(*tert*-butylamino)-2-oxoethyl)-*N*-(4-bromophenyl)-3-phenylpropiolamide (6aca).**

Rotamer ratio: 80:20.

White solid.

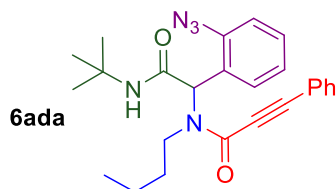
Yield 56%, mp. 178-180 °C;

Elemental analysis calcd for C<sub>27</sub>H<sub>24</sub>BrN<sub>5</sub>O<sub>2</sub>: C 61.14, H 4.56, N, 13.20, found: C 61.33, H 4.36, N 13.06.

MS (EI, 70 eV): *m/z* = 429.95 [C<sub>19</sub>H<sub>19</sub>BrN<sub>5</sub>O<sub>2</sub>]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 8.19 (s, 0.2H, NH), 7.98 (s, 0.8H, NH), 6.87 – 7.83 (m, 13H, ArH), 6.42 (s, 0.2H, CH), 6.19 (s, 0.8H, CH), 1.27 (s, 7.4H, *t*-Bu), 1.19 (s, 1.6H, *t*-Bu).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 168.35, 153.39, 139.30, 138.77, 133.02, 132.26, 131.49, 131.06, 130.71, 130.49, 129.34, 126.17, 125.10, 121.61, 119.64, 119.01, 91.05, 83.04, 59.33, 51.04, 28.77.



***N*-(1-(2-Azidophenyl)-2-(*tert*-butylamino)-2-oxoethyl)-*N*-butyl-3-phenylpropiolamide (6ada).**

Rotamer ratio: 50:50.

White solid.

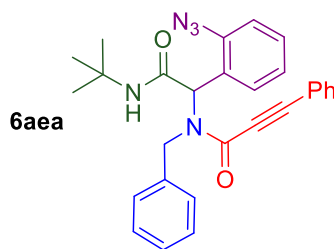
Yield 40%, mp. 156-158 °C;

Elemental analysis calcd for C<sub>25</sub>H<sub>29</sub>N<sub>5</sub>O<sub>2</sub>: C 69.58, H 6.77, N 16.23, found: C 70.03, H 7.14, N 15.97.

MS (EI, 70 eV): *m/z* = 432.15 [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 8.05 (s, 0.5H, NH), 7.86 (s, 0.5H, NH), 7.2 – 7.72 (m, 9H, ArH), 6.17 (s, 0.5H, CH), 6.04 (s, 0.5H, CH), 3.37 – 3.54 (m, 1H, *n*-Bu NCH<sub>2</sub>), 2.98 – 3.08 (m, 0.5H, *n*-Bu NCH<sub>2</sub>), 1.33 – 1.43 (m, 0.5H, *n*-Bu NCH<sub>2</sub>), 1.22 and 1.25 (both singlets, 9H, *t*-Bu), 0.52 – 1.13 (m, 7H, *n*-Bu CH<sub>2</sub> + *n*-Bu CH<sub>3</sub>).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 168.60, 168.43, 154.80, 154.25, 139.79, 139.74, 132.98, 132.47, 130.96, 130.94, 130.68, 130.53, 130.26, 130.11, 129.47, 129.21, 127.58, 127.51, 125.66, 125.56, 120.31, 120.12, 119.37, 89.69, 88.95, 82.77, 82.50, 60.87, 56.50, 50.94, 50.92, 47.04, 44.46, 32.06, 30.01, 28.75, 28.66, 28.16, 19.93, 19.84, 13.79.



***N*-(1-(2-Azidophenyl)-2-(*tert*-butylamino)-2-oxoethyl)-*N*-benzyl-3-phenylpropiolamide (6aea).**

Rotamer ratio: 55:45.

Pale yellow solid.

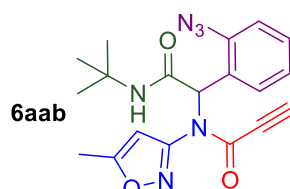
Yield 55%, mp. 169-171 °C;

Elemental analysis calcd for C<sub>28</sub>H<sub>27</sub>N<sub>5</sub>O<sub>2</sub>: C 72.24, H 5.85, N 15.04, found: C 72.08, H 6.19, N 14.90.

MS (EI, 70 eV): *m/z* = 466.15 [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 8.10 (s, 0.55H, NH), 7.90 (s, 0.45H, NH), 6.67 – 7.77 (m, 14H, ArH), 6.19 (s, 0.55H, CH), 6.06 (s, 0.45H, CH), 5.18 (d, *J* = 17.1 Hz, 0.5H, benzyl CH<sub>2</sub>), 5.07 (d, *J* = 15.6 Hz, 0.5H, benzyl CH<sub>2</sub>), 4.46 (d, *J* = 17.1 Hz, 0.5H, benzyl CH<sub>2</sub>), 3.98 (d, *J* = 15.7 Hz, 0.5H, benzyl CH<sub>2</sub>), 1.21 and 1.23 (both singlets, 9H, *t*-Bu).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 168.82, 168.58, 155.77, 155.12, 139.80, 139.61, 138.16, 137.84, 133.18, 132.52, 131.21, 131.00, 130.63, 130.42, 130.24, 130.07, 129.35, 129.26, 127.84, 127.68, 127.23, 126.70, 126.62, 126.47, 125.40, 125.24, 120.11, 119.85, 118.68, 118.57, 90.86, 89.63, 82.88, 82.15, 60.54, 56.39, 50.94, 47.79, 28.73, 28.60.



***N*-(1-(2-Azidophenyl)-2-(*tert*-butylamino)-2-oxoethyl)-*N*-(5-methylisoxazol-3-yl)propiolamide (6aab).**

White solid.

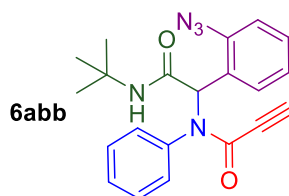
Yield 44%, mp. 164-166 °C;

Elemental analysis calcd for C<sub>19</sub>H<sub>20</sub>N<sub>6</sub>O<sub>3</sub>: C 59.99, H 5.30, N 22.09, found: C 60.05, H 5.56, N 21.88.

MS (EI, 70 eV): *m/z* = 381.05 [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 7.99 (s, 1H, NH), 7.00 – 7.39 (m, 4H, ArH), 6.33 (s, 1H, CH), 6.12 (s, 1H, CH), 4.40 (s, 1H, alkyne CH), 2.26 (s, 3H, CH<sub>3</sub>), 1.26 (s, 9H, *t*-Bu).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 171.26, 167.30, 159.84, 152.12, 139.60, 130.73, 130.24, 125.72, 125.04, 119.25, 103.54, 83.48, 76.01, 58.30, 51.12, 28.65, 12.52.



***N*-(1-(2-Azidophenyl)-2-(*tert*-butylamino)-2-oxoethyl)-*N*-phenylpropiolamide (6abb).**

Rotamer ratio: 90:10.

White solid.

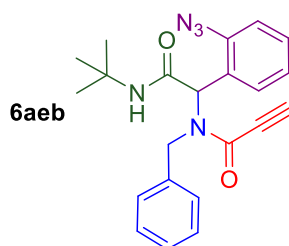
Yield 53%, mp. 174-176 °C;

Elemental analysis calcd for C<sub>21</sub>H<sub>21</sub>N<sub>5</sub>O<sub>2</sub>: C 67.18, H 5.64, N 18.65, found: C 67.35, H 6.07, N 18.46.

MS (EI, 70 eV): *m/z* = 376.05 [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 7.96 (s, 0.1H, NH), 7.87 (s, 0.9H, NH), 6.86 – 7.42 (m, 9H, ArH), 6.27 (s, 0.1H, CH), 6.10 (s, 0.9H, CH), 4.74 (s, 0.1H, triazole CH), 4.14 (s, 0.9H, triazole CH), 1.28 and 1.25 (both singlets, 9H, *t*-Bu).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 167.90, 152.54, 138.89, 138.58, 130.43, 130.29, 129.89, 128.17, 128.12, 125.99, 124.54, 118.47, 83.01, 76.81, 59.02, 50.58, 28.46.



***N*-(1-(2-Azidophenyl)-2-(*tert*-butylamino)-2-oxoethyl)-*N*-benzylpropiolamide (6aeb).**

Rotamer ratio: 55:45.

Pale orange solid.

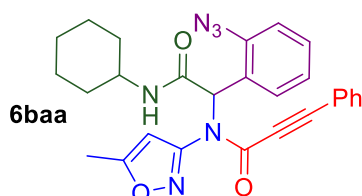
Yield 67%, mp. 178-180 °C;

Elemental analysis calcd for C<sub>22</sub>H<sub>23</sub>N<sub>5</sub>O<sub>2</sub>: C 67.85, H 5.95, N 17.98, found: C 68.05, H 6.23, N 17.65.

MS (EI, 70 eV): *m/z* = 390.10 [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 7.98 (s, 0.45H, NH), 7.85 (s, 0.55H, NH), 6.63 – 7.31 (m, 9H, ArH), 6.07 (s, 0.45H, CH), 5.96 (s, 0.55H, CH), 5.10 (d, *J* = 16.9 Hz, 0.55H, benzyl CH<sub>2</sub>), 4.98 (d, *J* = 15.7 Hz, 0.45H, benzyl CH<sub>2</sub>), 4.67 (s, 0.45H, triazole CH), 4.51 (s, 0.55H, triazole CH), 4.38 (d, *J* = 17.0 Hz, 0.45H, benzyl CH<sub>2</sub>), 3.97 (d, *J* = 15.7 Hz, 0.55H, benzyl CH<sub>2</sub>), 1.21 and 1.25 (both singlets, 9H, *t*-Bu).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 168.43, 168.40, 155.05, 154.45, 139.72, 139.58, 137.94, 137.34, 130.57, 130.42, 130.20, 130.02, 127.74, 127.69, 127.12, 126.74, 126.66, 126.56, 126.46, 125.34, 125.17, 118.77, 118.44, 83.70, 82.48, 76.99, 76.23, 60.50, 56.23, 51.08, 50.92, 47.60, 28.71.



***N*-(1-(2-Azidophenyl)-2-(cyclohexylamino)-2-oxoethyl)-*N*-(5-methylisoxazol-3-yl)-3-phenylpropiolamide (6baa).**

White solid.

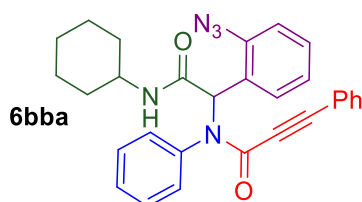
Yield 25%, mp. 149-151 °C;

Elemental analysis calcd for C<sub>27</sub>H<sub>26</sub>N<sub>6</sub>O<sub>3</sub>: C 67.21, H 5.4, N 17.42, found: C 67.06, H 5.92, N 17.09.

MS (EI, 70 eV): *m/z* = 483.15 [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 7.00 – 8.28 (m, 10H, ArH + NH), 6.40 (s, 1H, CH), 6.22 (s, 1H, CH), 3.57 – 3.69 (m, 1H, cyclohexyl NCH), 2.30 (s, 3H, CH<sub>3</sub>), 0.99 – 1.80 (m, 10H, cyclohexyl CH<sub>2</sub>).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 171.33, 167.06, 160.14, 152.84, 139.56, 132.64, 131.43, 130.79, 130.44, 125.60, 125.12, 119.32, 119.27, 103.65, 90.58, 81.97, 57.97, 53.90, 48.54, 32.52, 25.54, 24.77, 12.56.



***N*-(1-(2-Azidophenyl)-2-(cyclohexylamino)-2-oxoethyl)-*N*,3-diphenylpropiolamide (6bba).**

Rotamer ratio: 85:15.

White solid.

Yield 75%, mp. 160-162 °C;

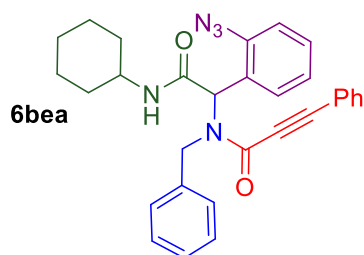
Elemental analysis calcd for C<sub>29</sub>H<sub>27</sub>N<sub>5</sub>O<sub>2</sub>: C 72.94, H 5.70, N 14.66, found: C 72.45, H 6.01, N 14.49.

MS (EI, 70 eV): *m/z* = 478.20 [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 8.12, 6.81 – 8.17 (m, 15H, ArH + NH), 6.46 (s, 0.15H, CH), 6.23 (s, 0.85H, CH), 3.55 – 3.72 (m, 1H, cyclohexyl NCH), 0.95 – 1.83 (m, 10H, cyclohexyl CH<sub>2</sub>).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 168.03, 153.70, 139.32, 139.28, 132.33, 131.03, 130.88, 130.35, 129.24, 128.48, 126.27, 124.97, 119.82, 118.88, 90.67, 83.25, 58.99, 48.54, 32.54, 25.59, 24.99, 24.85.





***N*-(1-(2-Azidophenyl)-2-(cyclohexylamino)-2-oxoethyl)-*N*-benzyl-3-phenylpropiolamide (6bea).**

Rotamer ratio: 50:50.

Pale yellow solid.

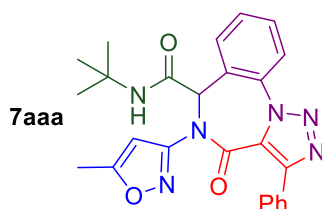
Yield 51%, mp. 163-165 °C;

Elemental analysis calcd for C<sub>30</sub>H<sub>29</sub>N<sub>5</sub>O<sub>2</sub>: C 73.30, H 5.95, N 14.25, found: C 73.52, H 6.40, N 13.96.

MS (EI, 70 eV): *m/z* = 492.15 [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 6.68 – 8.33 (m, 15H, ArH + NH), 6.24 (s, 0.5H, CH), 6.08 (s, 0.5H, CH), 5.19 (d, *J* = 17.0 Hz, 0.5H, benzyl CH<sub>2</sub>), 5.07 (d, *J* = 15.6 Hz, 0.5H, benzyl CH<sub>2</sub>), 4.47 (d, *J* = 17.1 Hz, 0.5H, benzyl CH<sub>2</sub>), 4.04 (d, *J* = 15.7 Hz, 0.5H, benzyl CH<sub>2</sub>), 3.52 – 3.69 (m, 1H, cyclohexyl NCH), 0.96 – 1.8 (m, 10H, cyclohexyl CH<sub>2</sub>).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 168.25, 168.10, 155.61, 155.17, 139.73, 139.59, 138.10, 137.78, 133.09, 132.53, 131.20, 131.03, 130.69, 130.53, 130.40, 130.14, 129.35, 129.28, 127.87, 127.71, 127.25, 126.75, 126.61, 126.51, 126.48, 126.39, 125.42, 125.27, 90.92, 89.73, 82.82, 82.04, 60.44, 56.20, 50.97, 48.34, 48.22, 47.66, 32.53, 32.50, 32.43, 32.37, 25.56, 25.52, 24.93, 24.81, 24.75, 24.71.



***N*-(*tert*-Butyl)-5-(5-methylisoxazol-3-yl)-4-oxo-3-phenyl-5,6-dihydro-4*H*-benzo[*f*][1,2,3]triazolo[1,5-*a*][1,4]diazepine-6-carboxamide (7aaa).**

White solid.

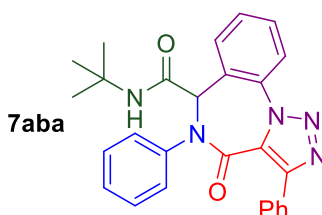
Yield 79%, mp. 247-249 °C;

Elemental analysis calcd for C<sub>25</sub>H<sub>24</sub>N<sub>6</sub>O<sub>3</sub>: C 65.78, H 5.30, N 18.41, found: C 65.55, H 5.73, N 18.11.

MS (EI, 70 eV): *m/z* = 457.15 [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 7.43 – 8.06 (m, 6H, ArH), 7.11 (s, 1H, NH), 6.79 (s, 1H, CH), 6.46 (s, 1H, CH), 2.41 (s, 3H, CH<sub>3</sub>), 0.91 (s, 9H, *t*-Bu).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 171.61, 164.99, 160.23, 157.72, 150.04, 134.48, 132.59, 131.33, 130.30, 129.93, 129.85, 129.46, 128.82, 128.58, 128.43, 123.54, 98.54, 62.30, 51.80, 28.12, 12.61.



***N*-(*tert*-Butyl)-4-oxo-3,5-diphenyl-5,6-dihydro-4*H*-benzo[*f*][1,2,3]triazolo[1,5-*a*][1,4]diazepine-6-carboxamide (7aba).**

Gray solid.

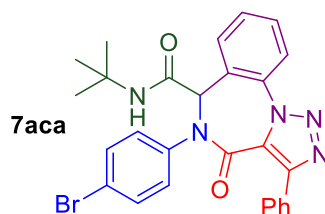
Yield 66%, mp. >250°C;

Elemental analysis calcd for C<sub>27</sub>H<sub>25</sub>N<sub>5</sub>O<sub>2</sub>: C 71.82, H 5.58, N 15.51, found: C 70.60, H 5.64, N 14.78.

MS (EI, 70 eV): *m/z* = 423.05 [C<sub>27</sub>H<sub>25</sub>N<sub>5</sub>O<sub>2</sub>]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 7.26 – 8.15 (m, 14H, ArH), 6.35 (s, 1H, NH), 5.82 (s, 1H, CH), 0.92 (s, 9H, *t*-Bu).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 166.12, 158.64, 149.36, 142.89, 134.24, 132.00, 131.25, 131.03, 130.48, 130.27, 129.67, 129.28, 129.15, 128.73, 128.63, 127.90, 127.07, 123.70, 67.33, 51.75, 28.20.



**5-(4-Bromophenyl)-*N*-(*tert*-butyl)-4-oxo-3-phenyl-5,6-dihydro-4*H*-benzo[*f*][1,2,3]triazolo[1,5-*a*][1,4]diazepine-6-carboxamide (7aca).**

Grey solid.

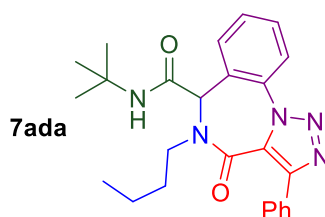
Yield 50%, mp. >250 °C;

Elemental analysis calcd for C<sub>27</sub>H<sub>24</sub>BrN<sub>5</sub>O<sub>2</sub>: C 61.14, H 4.56, N 13.20, found: C 60.86, H 4.68, N 13.56.

MS (EI, 70 eV): *m/z* = 502.95 [C<sub>27</sub>H<sub>24</sub>BrN<sub>3</sub>O<sub>2</sub>]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 7.24 – 8.12 (m, 13H, ArH), 6.41 (s, 1H, NH), 5.86 (s, 1H, CH), 0.92 (s, 9H, *t*-Bu).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 166.07, 158.63, 149.50, 141.95, 134.25, 132.55, 132.02, 131.30, 130.77, 130.49, 130.17, 129.39, 129.20, 129.01, 128.74, 128.63, 123.71, 120.62, 67.02, 51.82, 28.20.



***N*-(*tert*-Butyl)-5-butyl-4-oxo-3-phenyl-5,6-dihydro-4*H*-benzo[*f*][1,2,3]triazolo[1,5-*a*][1,4]diazepine-6-carboxamide (7ada).**

White solid.

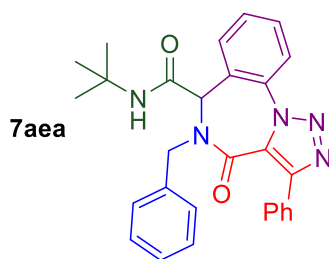
Yield 86%, mp. 203-205 °C;

Elemental analysis calcd for C<sub>25</sub>H<sub>29</sub>N<sub>5</sub>O<sub>2</sub>: C 69.58, H 6.77, N 16.23, found: C 67.92, H 6.95, N 16.49.

MS (EI, 70 eV): *m/z* = 432.10 [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) 7.38 – 8.05 (m, 9H, ArH), 6.84 (s, 1H, NH), 5.64 (s, 1H, CH), 3.95 – 4.07 (m, 1H, *n*-Bu NCH<sub>2</sub>), 3.39 – 3.50 (m, 1H, *n*-Bu NCH<sub>2</sub>), 0.69 – 1.69 (m, 16H, *t*-Bu + *n*-Bu CH<sub>3</sub> + *n*-Bu CH<sub>2</sub>).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 166.37, 158.53, 148.29, 134.39, 132.80, 131.51, 130.55, 130.21, 129.99, 129.09, 129.04, 128.67, 128.41, 123.27, 63.72, 51.51, 49.04, 30.00, 28.16, 19.61, 13.94.



**5-Benzyl-N-(tert-butyl)-4-oxo-3-phenyl-5,6-dihydro-4H-benzo[f][1,2,3]triazolo[1,5-a][1,4]diazepine-6-carboxamide (7aea).**

White solid.

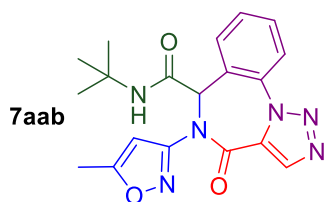
Yield 82%, mp. 191-193 °C;

Elemental analysis calcd for C<sub>28</sub>H<sub>27</sub>N<sub>5</sub>O<sub>2</sub>: C 72.24, H 5.85, N 15.04, found: C 72.35, H 6.33, N 15.08.

MS (EI, 70 eV): *m/z* = 437.05 [C<sub>28</sub>H<sub>27</sub>N<sub>5</sub>O<sub>2</sub>]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 7.2 – 7.99 (m, 14H, ArH), 6.65 (s, 1H, NH), 5.60 (s, 1H, CH), 5.17 (d, *J* = 14.6 Hz, 1H, CH<sub>2</sub>), 4.66 (d, *J* = 14.7 Hz, 1H, CH<sub>2</sub>), 0.84 (s, 9H, *t*-Bu).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 166.11, 158.87, 148.42, 137.28, 134.21, 132.13, 131.46, 130.36, 130.02, 129.62, 129.28, 128.92, 128.90, 128.79, 128.58, 128.37, 128.13, 123.16, 64.22, 52.61, 51.41, 28.02.



**N-(tert-Butyl)-5-(5-methylisoxazol-3-yl)-4-oxo-5,6-dihydro-4H-benzo[f][1,2,3]triazolo[1,5-a][1,4]diazepine-6-carboxamide (7aab).**

White solid.

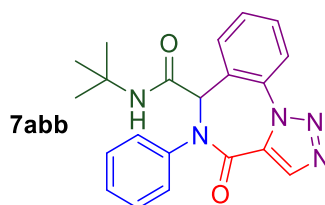
Yield >99%, mp. 170-172 °C;

Elemental analysis calcd for C<sub>19</sub>H<sub>20</sub>N<sub>6</sub>O<sub>3</sub>: C 59.99, H 5.30, N 22.09, found: C 59.68, H 5.07, N 21.68.

MS (EI, 70 eV): *m/z* = 381.10 [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 8.48 (s, 1H, triazole CH), 7.58 – 7.98 (m, 4H, ArH) 6.92 (s, 1H, NH), 6.76 (s, 1H, CH), 6.41 (s, 1H, CH), 2.43 (s, 3H, CH<sub>3</sub>), 0.95 (s, 9H, *t*-Bu).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 171.51, 165.00, 160.67, 157.32, 134.61, 133.84, 132.84, 131.34, 130.26, 128.90, 123.41, 98.67, 62.70, 55.33, 51.53, 28.18, 12.66.



***N*-(*tert*-Butyl)-4-oxo-5-phenyl-5,6-dihydro-4*H*-benzo[*f*][1,2,3]triazolo[1,5-*a*][1,4]diazepine-6-carboxamide (7abb).**

White solid.

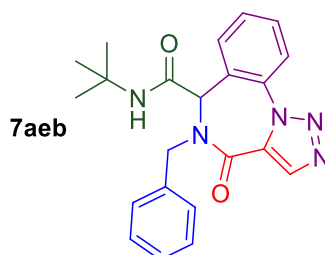
Yield >99%, mp. 110-112 °C;

Elemental analysis calcd for C<sub>21</sub>H<sub>21</sub>N<sub>5</sub>O<sub>2</sub>: C 67.18, H 5.64, N 18.65, found: C 65.99, H 5.92, N 18.43.

MS (EI, 70 eV): *m/z* = 376.10 [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 8.36 (s, 1H, triazole CH), 7.23 – 8.04 (m, 9H, ArH), 6.52 (s, 1H, NH), 5.69 (s, 1H, CH), 0.97 (s, 9H, *t*-Bu).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 166.19, 158.22, 143.46, 138.50, 134.42, 134.35, 132.15, 131.24, 130.45, 129.82, 129.76, 128.05, 127.09, 123.51, 67.60, 51.51, 28.20.



**5-Benzyl-*N*-(*tert*-butyl)-4-oxo-5,6-dihydro-4*H*-benzo[*f*][1,2,3]triazolo[1,5-*a*][1,4]diazepine-6-carboxamide (7aeb).**

Light brown solid.

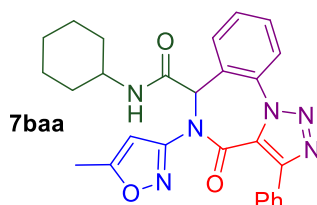
Yield >99%, mp. 137-139 °C;

Elemental analysis calcd for C<sub>22</sub>H<sub>23</sub>N<sub>5</sub>O<sub>2</sub>: C 67.85, H 5.95, N 17.98, found: C 67.50, H 6.14, N 18.03.

MS (EI, 70 eV): *m/z* = 390.10 [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 8.35 (s, 1H, triazole CH), 7.21 – 8.01 (m, 9H, ArH), 6.41 (s, 1H, NH), 5.47 (s, 1H, CH), 4.96 (d, *J* = 14.7 Hz, 1H, CH<sub>2</sub>), 4.75 (d, *J* = 14.7 Hz, 1H, CH<sub>2</sub>), 0.86 (s, 9H, *t*-Bu).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 165.96, 158.35, 138.10, 137.06, 134.49, 134.03, 131.86, 130.62, 130.47, 129.81, 128.95, 128.93, 128.12, 123.12, 64.42, 52.51, 51.16, 28.12.



**N-Cyclohexyl-5-(5-methylisoxazol-3-yl)-4-oxo-3-phenyl-5,6-dihydro-4H-benzo[f][1,2,3]triazolo[1,5-a][1,4]diazepine-6-carboxamide (7baa).**

Gray solid.

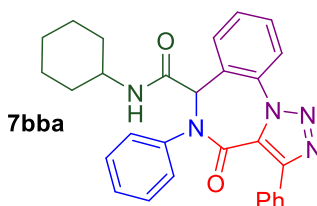
Yield 58%, mp. 229-231 °C;

Elemental analysis calcd for C<sub>27</sub>H<sub>26</sub>N<sub>6</sub>O<sub>3</sub>: C 67.21, H 5.43, N 17.42, found: C 67.03, H 5.64, N 17.29.

MS (EI, 70 eV): *m/z* = 483.20 [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) 7.39 – 8.06 (m, 10H, ArH + NH), 6.78 (s, 1H, CH), 6.49 (s, 1H, CH), 3.18 – 3.31 (m, 1H, cyclohexyl CH), 2.41 (s, 3H, CH<sub>3</sub>), 0.76 – 1.5 (m, 10H, cyclohexyl CH<sub>2</sub>).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 171.60, 164.71, 160.22, 157.67, 150.03, 134.60, 132.58, 131.38, 130.37, 129.85, 129.61, 129.44, 128.78, 128.27, 123.61, 98.57, 62.09, 49.32, 32.03, 31.69, 25.39, 24.99, 12.63.



**N-Cyclohexyl-4-oxo-3,5-diphenyl-5,6-dihydro-4H-benzo[f][1,2,3]triazolo[1,5-a][1,4]diazepine-6-carboxamide (7bba).**

Grey solid.

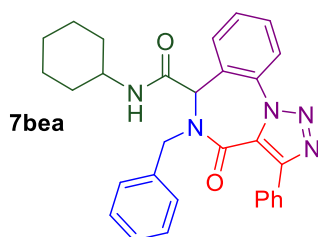
Yield 46%, mp. 229-231 °C;

Elemental analysis calcd for C<sub>29</sub>H<sub>27</sub>N<sub>5</sub>O<sub>2</sub>: C 72.94, H 5.70, N 14.66, found: C 72.77, H 5.99, N 14.20.

MS (EI, 70 eV): *m/z* = 478.20 [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 7.12 – 8.15 (m, 15H, ArH + NH), 5.86 (s, 1H, CH), 0.74 – 1.57 (m, 10H, cyclohexyl CH<sub>2</sub>), cyclohexyl NCH under water.

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 165.90, 158.64, 149.23, 142.91, 134.37, 132.03, 131.15, 130.87, 130.43, 130.30, 129.60, 129.16, 129.12, 128.71, 128.68, 127.85, 127.12, 66.99, 49.28, 31.98, 31.68, 25.38, 25.03.



**5-Benzyl-N-cyclohexyl-4-oxo-3-phenyl-5,6-dihydro-4H-benzo[f][1,2,3]triazolo[1,5-a][1,4]diazepine-6-carboxamide (7bea).**

This compound has been already described in the literature [1].

White solid.

Yield 68%, mp. 195-197 °C (mp. from the literature 194-196 °C);

Elemental analysis calcd for C<sub>30</sub>H<sub>29</sub>N<sub>5</sub>O<sub>2</sub>: C 73.30, H 5.95, N 14.25, found: C 73.14, H 6.25, N 14.18.

MS (EI, 70 eV):  $m/z = 492.20$  [M]<sup>+</sup>.

<sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 7.15 – 8.03 (m, 15H, ArH + NH), 5.64 (s, 1H, CH), 5.25 (d,  $J = 14.3$  Hz, 1H, CH<sub>2</sub>), 4.57 (d,  $J = 15.0$  Hz, 1H, CH<sub>2</sub>), 3.14 – 3.26 (m, 1H, cyclohexyl CH), 0.78 – 1.54 (m, 10H, cyclohexyl CH<sub>2</sub>).

<sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>) δ 165.82, 158.91, 148.53, 137.24, 134.30, 131.78, 131.53, 130.44, 130.21, 129.67, 129.14, 128.78, 128.74, 128.72, 128.64, 127.90, 123.24, 63.90, 52.70, 49.04, 32.05, 31.91, 25.40, 25.04.

### 3. X-ray experimental data

The experimental data were measured on an Xcalibur 3 diffractometer (graphite monochromated MoK $\alpha$  radiation, CCD-detector,  $\omega$  scanning,  $2\theta_{\max} = 50^\circ$  for structures **6aea** and **7aaa** and  $2\theta_{\max} = 60^\circ$  for structure **6aaa**). The structures were solved by the direct method using SHELXTL package [2]. Positions of hydrogen atoms were located from electron density difference maps and refined using the riding model with  $U_{\text{iso}} = nU_{\text{eq}}$  ( $n = 1.5$  for methyl groups and 1.2 for other hydrogen atoms). The hydrogen atoms of the amino group were refined isotropically in structure **7aaa**.

The crystals of **6aaa** (C<sub>25</sub>H<sub>24</sub>N<sub>6</sub>O<sub>3</sub>) are triclinic. At 293 K,  $a = 9.6032(11)$  Å,  $b = 11.7996(16)$  Å,  $c = 11.9647(16)$  Å,  $\alpha = 86.08(1)^\circ$ ,  $\beta = 80.22(1)^\circ$ ,  $\gamma = 70.22(1)^\circ$ ,  $V = 1257.1(3)$  Å<sup>3</sup>,  $M_r = 456.50$ ,  $Z = 2$ , space group P $\bar{1}$ ,  $d_{\text{calc}} = 1.206$  g/cm<sup>3</sup>,  $\mu(\text{MoK}\alpha) = 0.082$  mm<sup>-1</sup>,  $F(000) = 480$ . Intensities of 12528 reflections (7204 independent,  $R_{\text{int}} = 0.082$ ) were measured. Full-matrix least-squares refinement against  $F^2$  in anisotropic approximation for non-hydrogen atoms was converged to  $wR_2 = 0.189$  for 7204 reflections ( $R_1 = 0.069$  for 1731 reflections with  $F > 4\sigma(F)$ ,  $S = 0.750$ ).

The crystals of **6aea** C<sub>28</sub>H<sub>27</sub>N<sub>5</sub>O<sub>2</sub>, are orthorhombic. At 293 K,  $a = 31.807(2)$  Å,  $b = 11.8007(6)$  Å,  $c = 6.7991(6)$  Å,  $V = 2552.0(3)$  Å<sup>3</sup>,  $M_r = 465.54$ ,  $Z = 4$ , space group Pna2<sub>1</sub>,  $d_{\text{calc}} = 1.212$  g/cm<sup>3</sup>,  $\mu(\text{MoK}\alpha) = 0.079$  mm<sup>-1</sup>,  $F(000) = 984$ . Intensities of 17590 reflections (4461 independent,  $R_{\text{int}} = 0.114$ ) were measured. Full-matrix least-squares refinement against  $F^2$  in anisotropic approximation for non-hydrogen atoms was converged to  $wR_2 = 0.236$  for 4461 reflections ( $R_1 = 0.080$  for 2952 reflections with  $F > 4\sigma(F)$ ,  $S = 0.991$ ).

The crystals of **7aaa** C<sub>25</sub>H<sub>24</sub>N<sub>6</sub>O<sub>3</sub> are monoclinic. At 293 K,  $a = 10.9652(13)$  Å,  $b = 14.0758(15)$  Å,  $c = 14.8615(10)$  Å,  $\beta = 93.086(6)^\circ$ ,  $V = 2290.5(4)$  Å<sup>3</sup>,  $M_r = 456.50$ ,  $Z = 4$ , space group P2<sub>1</sub>/C,  $d_{\text{calc}} = 1.324$  g/cm<sup>3</sup>,  $\mu(\text{MoK}\alpha) = 0.090$  mm<sup>-1</sup>,  $F(000) = 960$ . Intensities of 16271 reflections (3975 independent,  $R_{\text{int}} = 0.115$ ) were measured. Full-matrix least-squares refinement against  $F^2$  in anisotropic approximation for non-hydrogen atoms was converged to  $wR_2 = 0.183$  for 3975 reflections ( $R_1 = 0.065$  for 2014 reflections with  $F > 4\sigma(F)$ ,  $S = 0.911$ ).

Final atomic coordinates, geometrical parameters, and crystallographic data have been deposited with the Cambridge Crystallographic Data Centre, 11 Union Road, Cambridge, CB2 1EZ, UK (E-mail: [deposit@ccdc.cam.ac.uk](mailto:deposit@ccdc.cam.ac.uk); fax: +44 1223 336033) and are available on request quoting the deposition numbers 2042893 (**6aaa**), 2042895 (**6aea**) and 2042894 (**7aaa**).

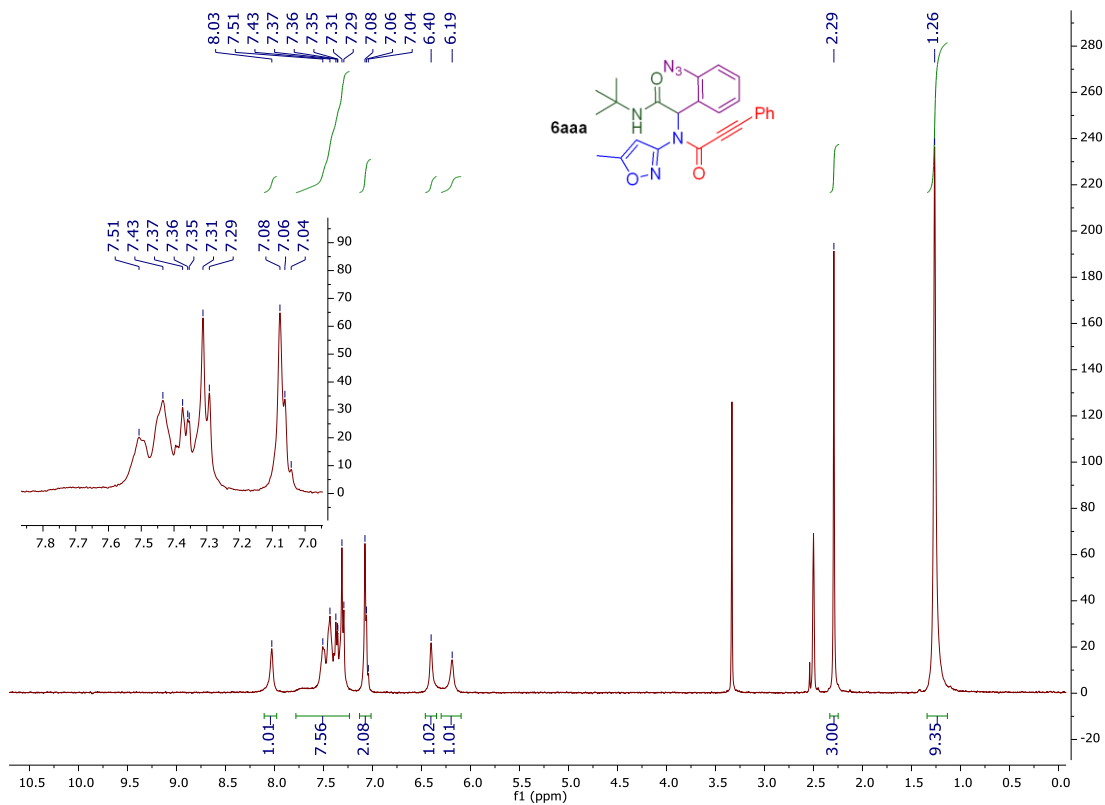
#### Literature

- (1) Vachhani, D. D.; Kumar, A.; Modha, S. G.; Sharma, S. K.; Parmar, V. S.; Van der Eycken, E. V. *Eur. J. Org. Chem* **2013**, 1223–1227
- (2) Sheldrick, G. M. A Short History of SHELX. *Acta Crystallogr. Sect. A Found. Crystallogr.* **2008**, *64*, 112–122

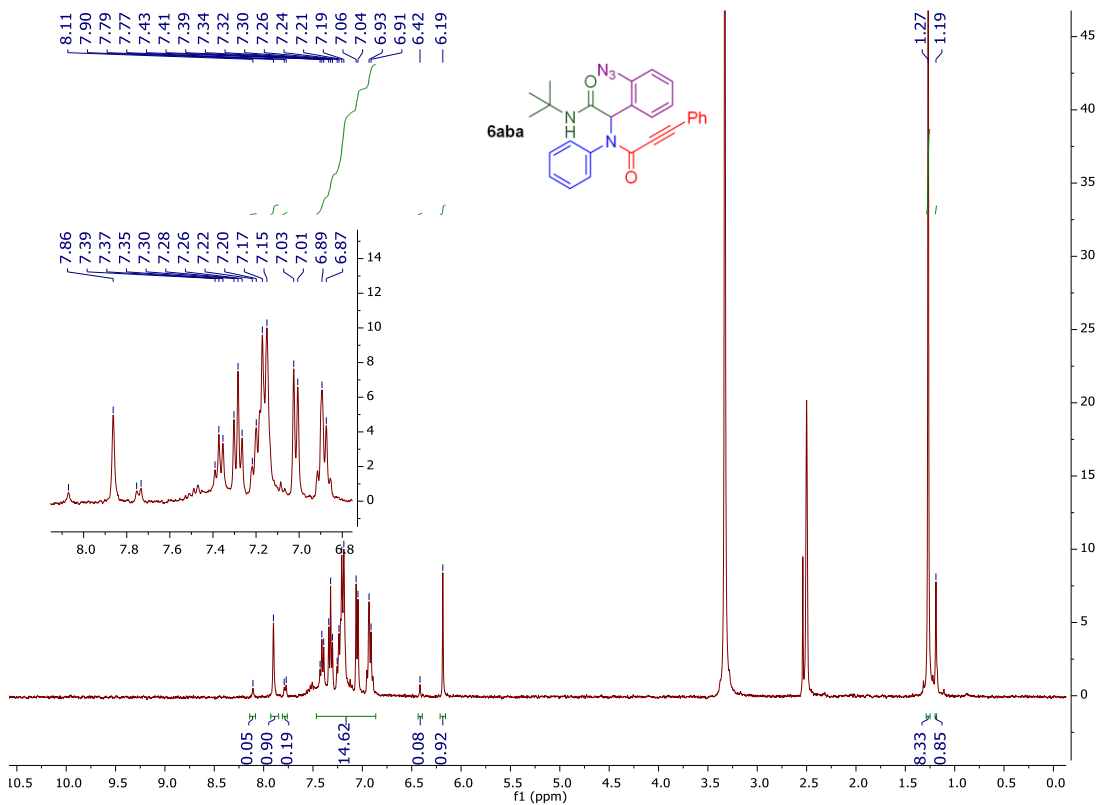


## 4. $^1\text{H}$ and $^{13}\text{C}$ NMR spectra

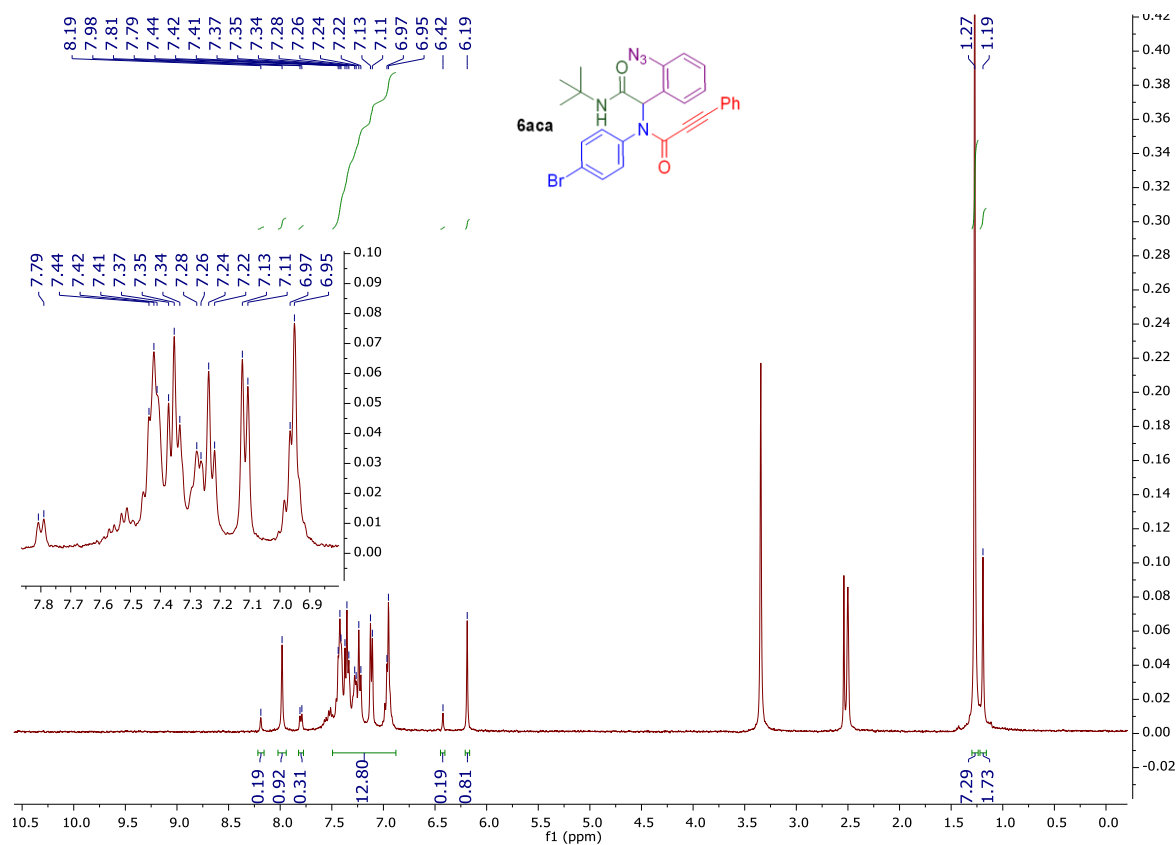
### $^1\text{H}$ NMR spectra of **6aaa**



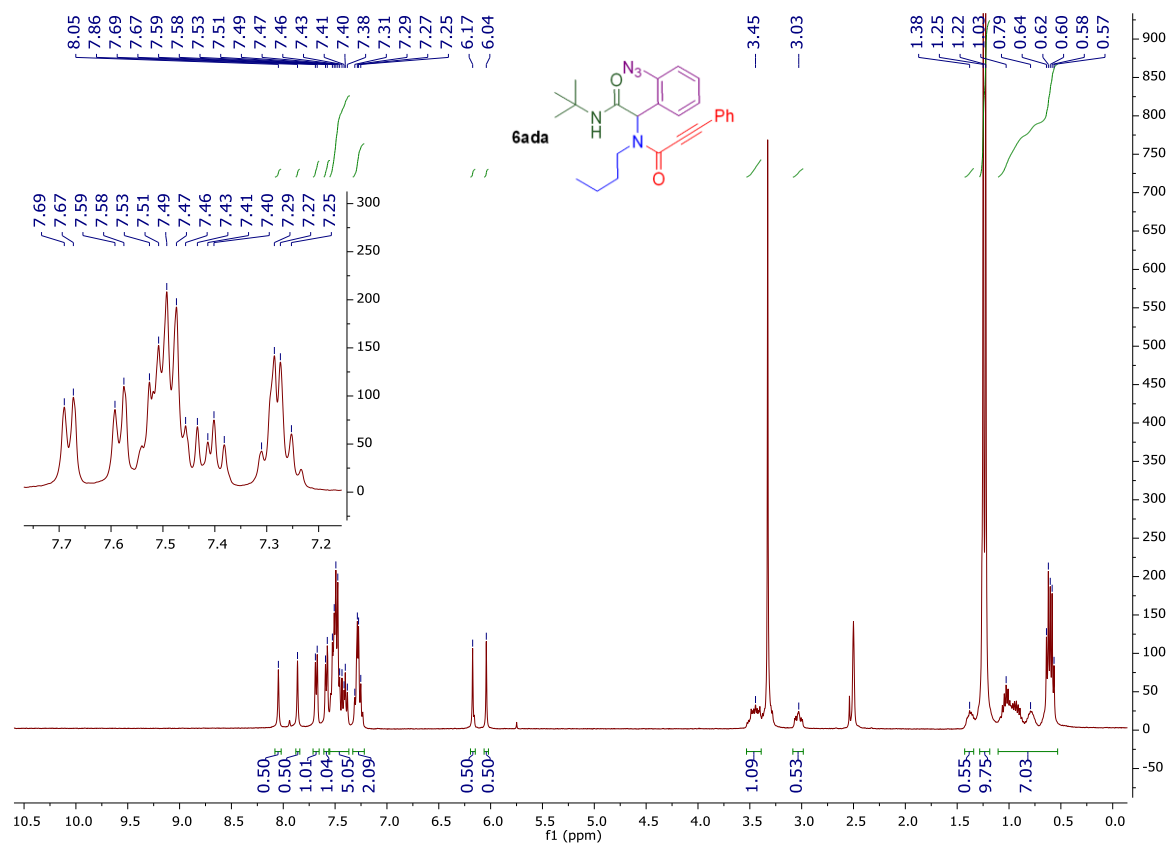
### $^1\text{H}$ NMR spectra of **6aba**



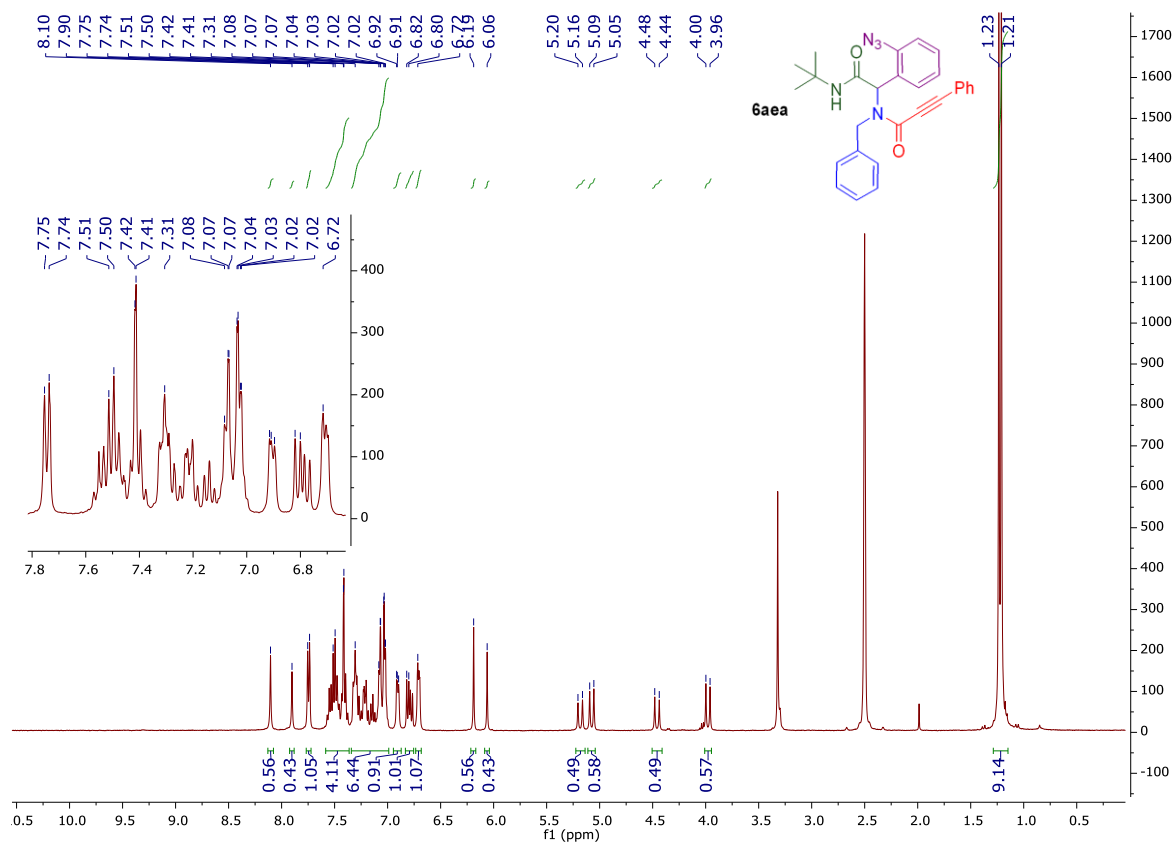
### <sup>1</sup>H NMR spectra of **6aca**



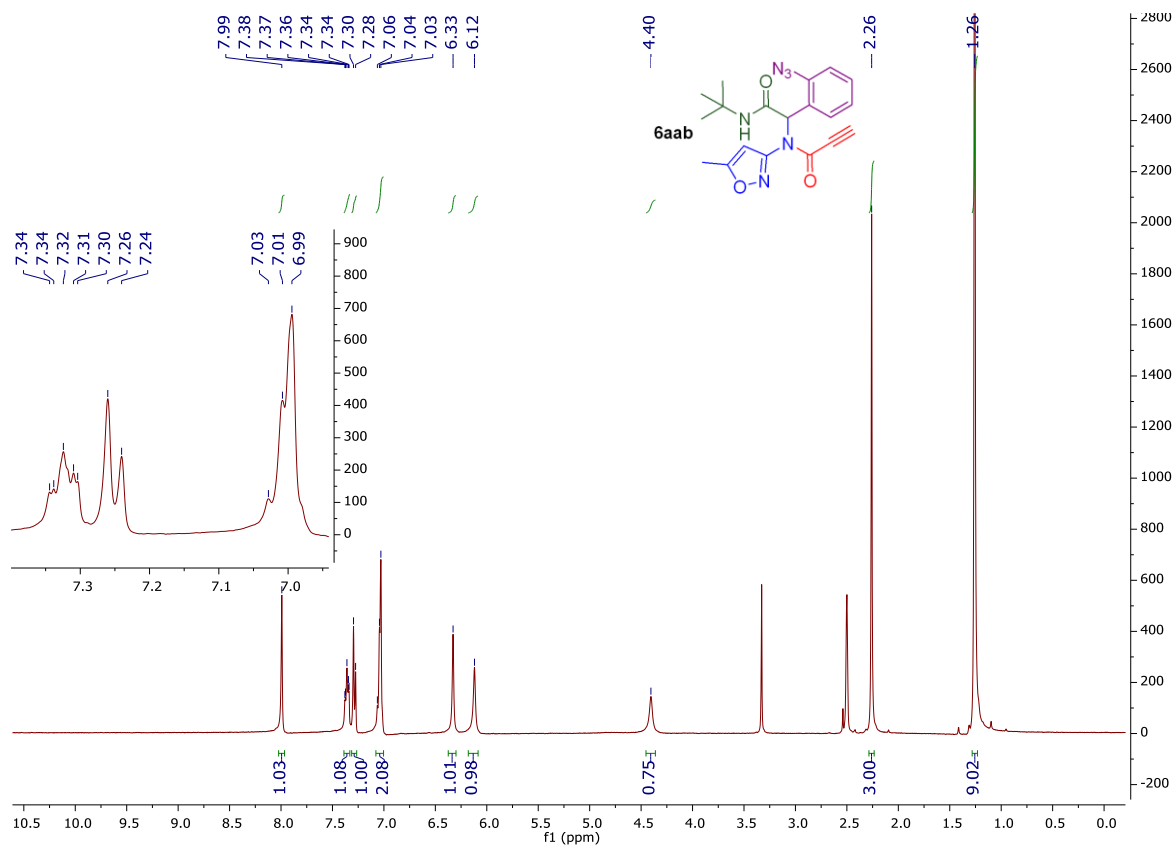
### <sup>1</sup>H NMR spectra of **6ada**



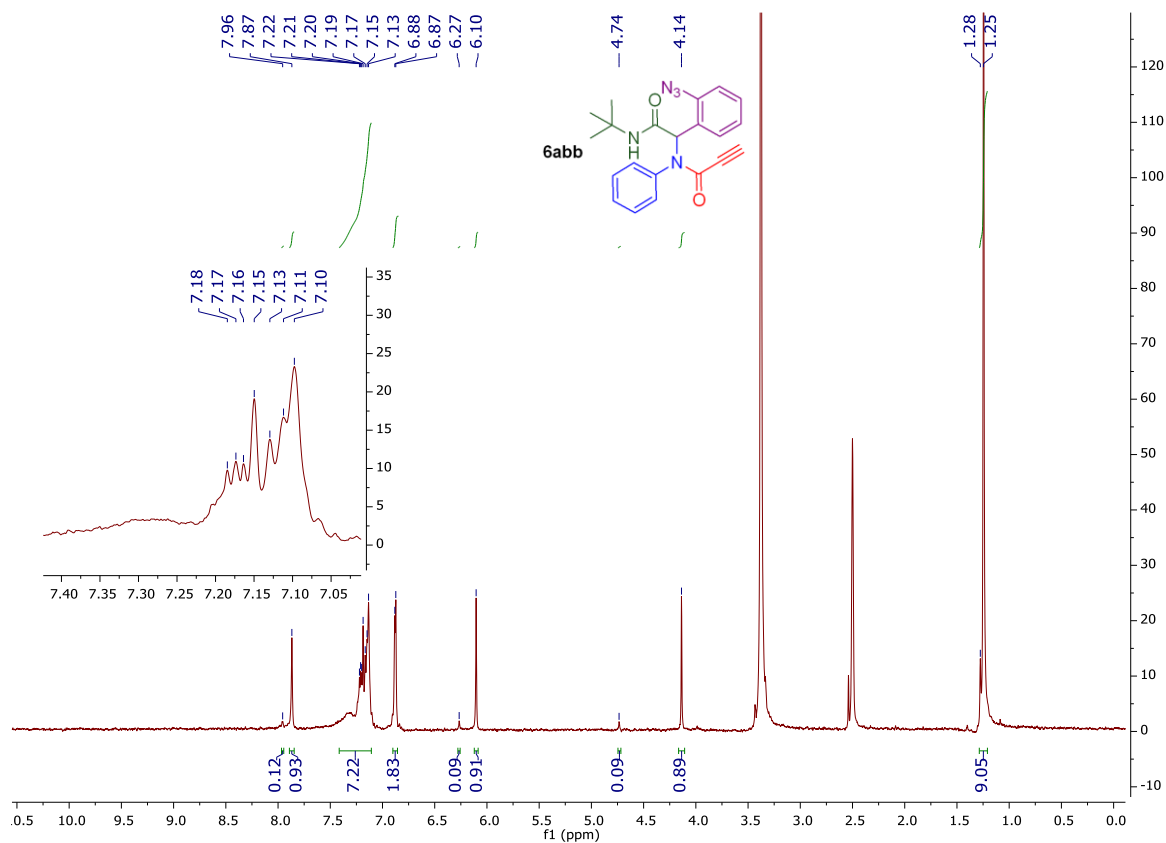
### <sup>1</sup>H NMR spectra of **6aea**



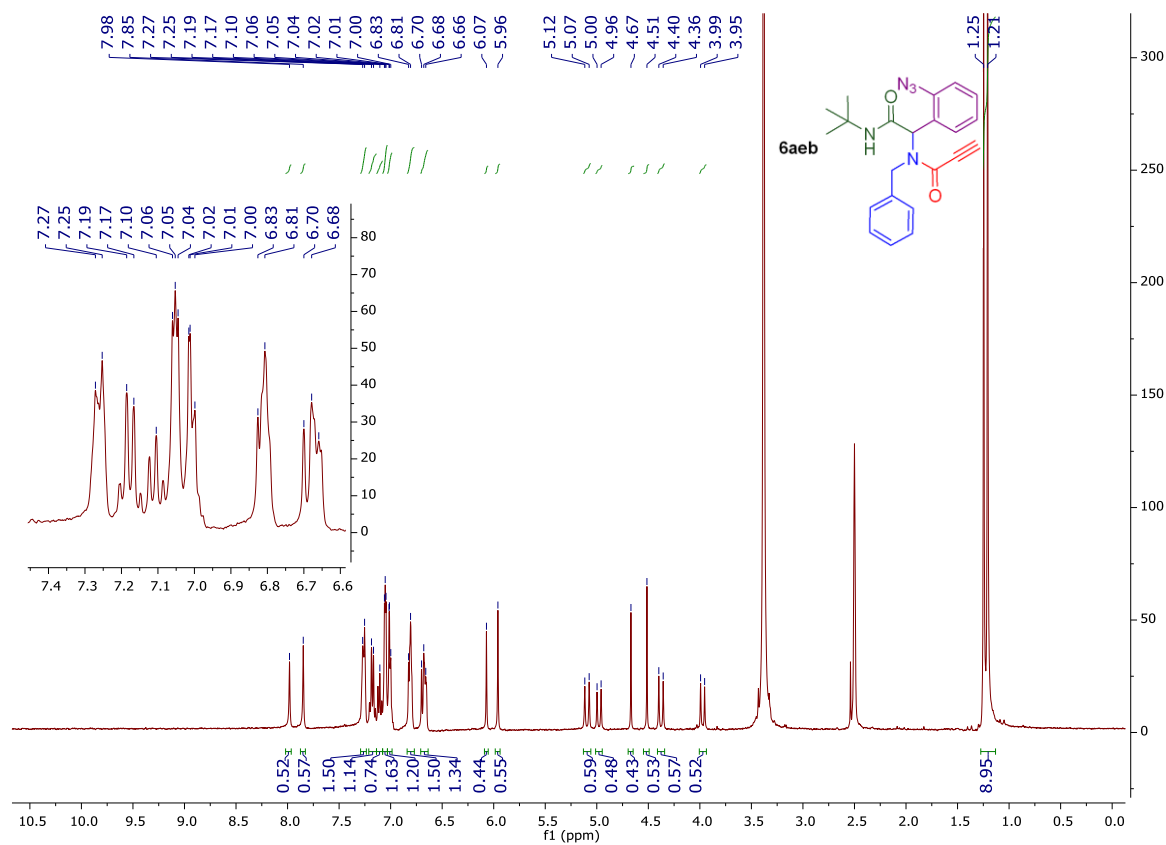
### <sup>1</sup>H NMR spectra of **6aab**



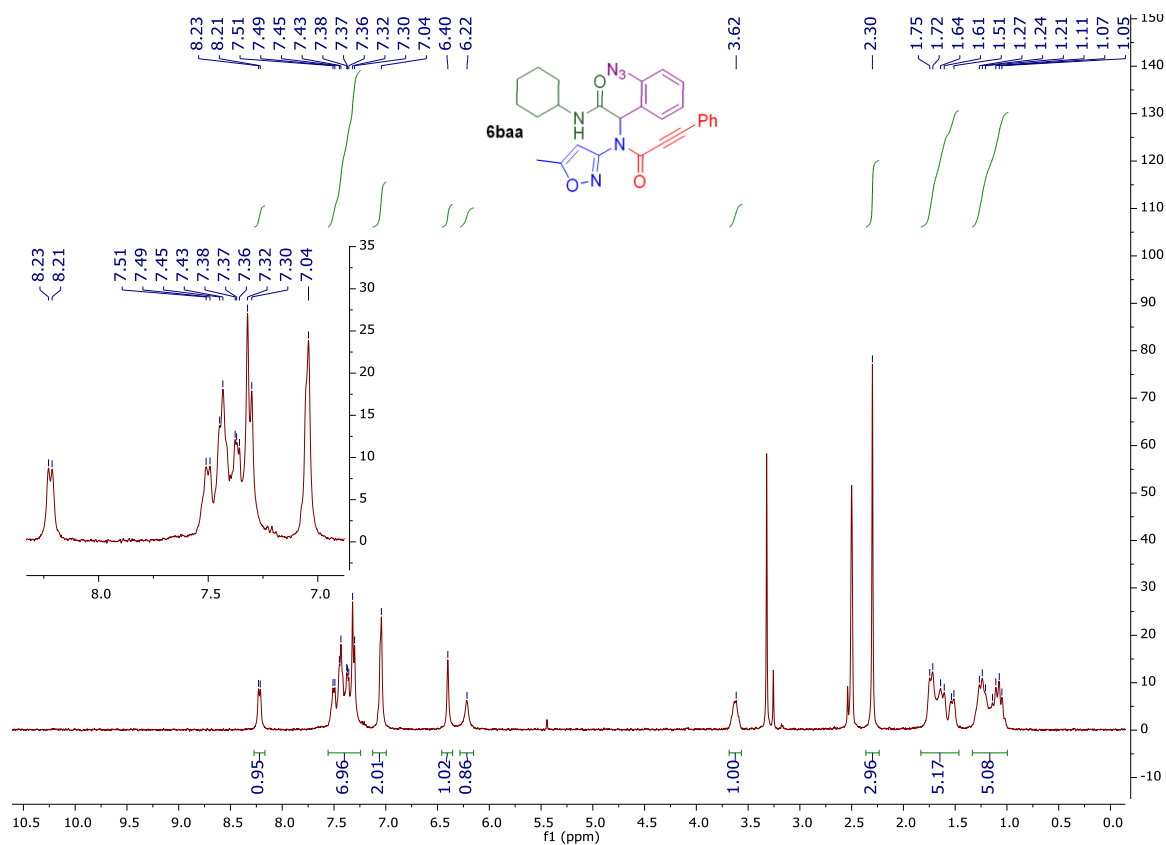
### <sup>1</sup>H NMR spectra of **6abb**



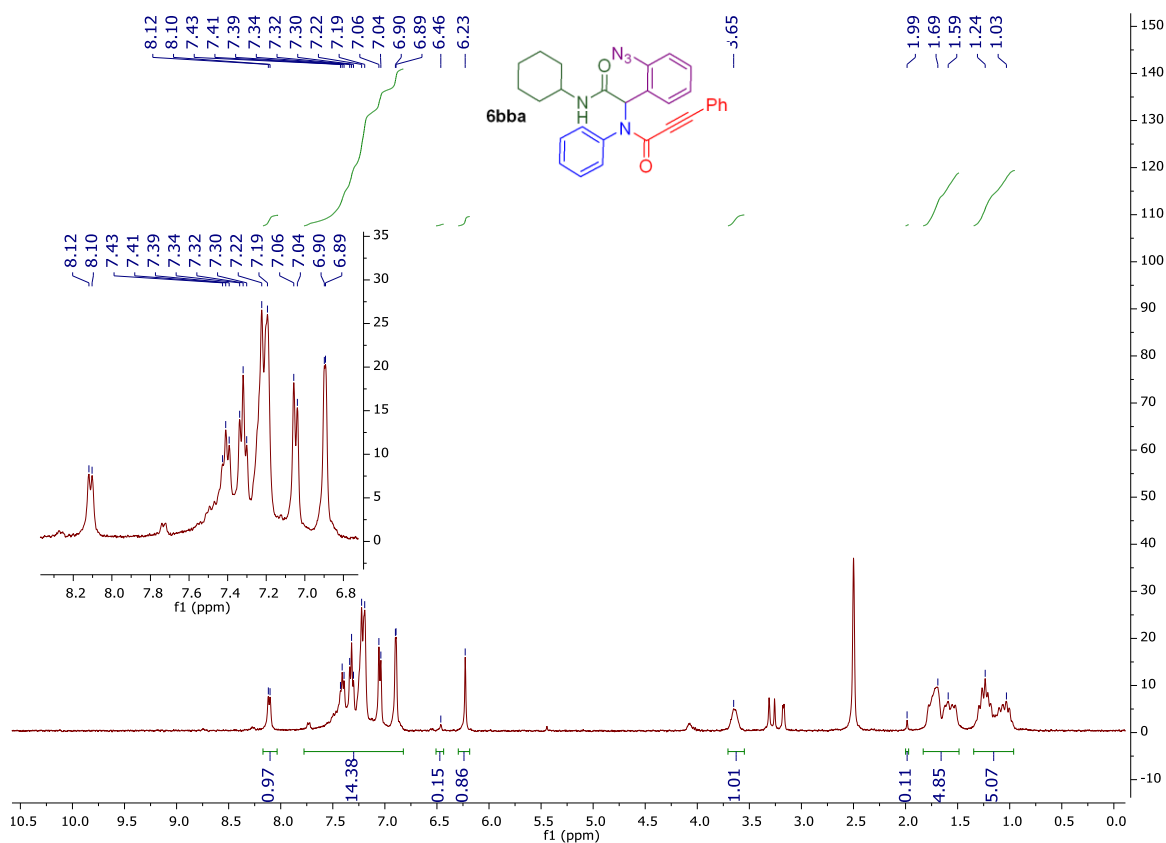
### <sup>1</sup>H NMR spectra of **6aeb**



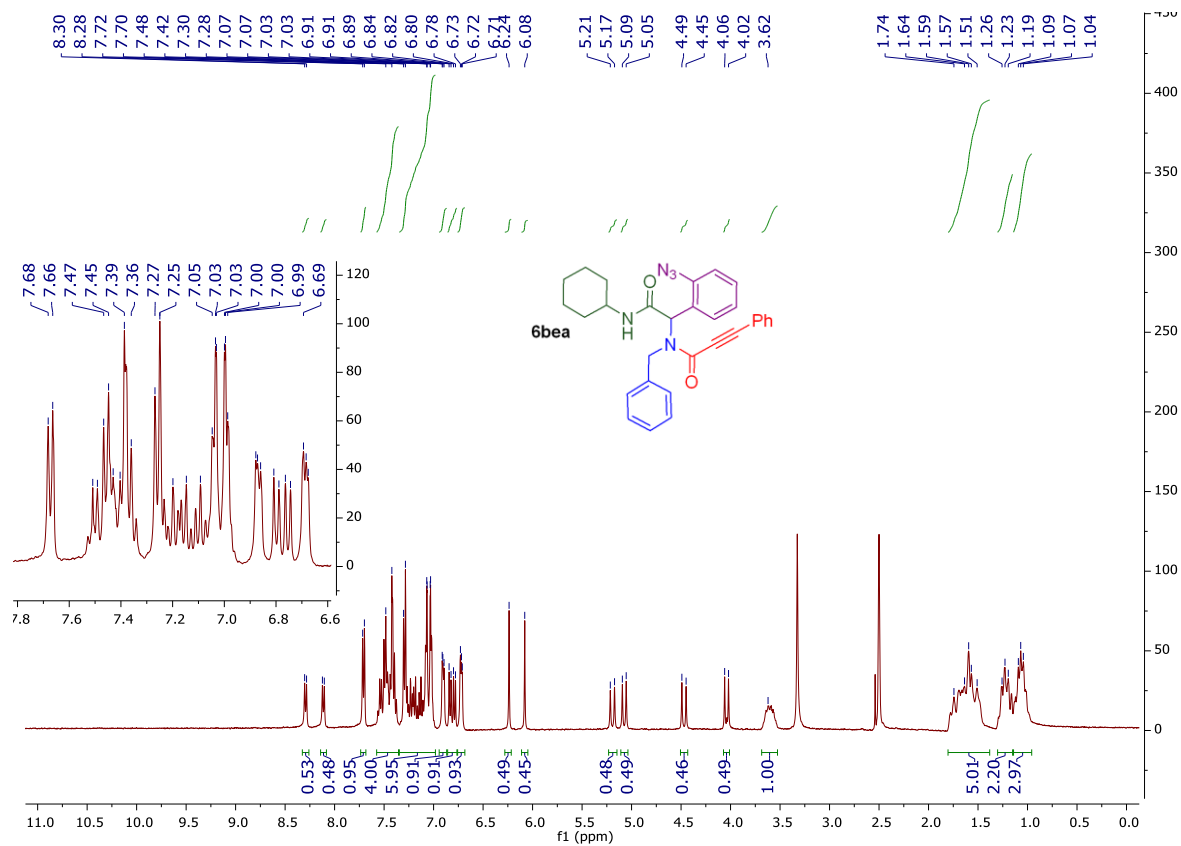
### <sup>1</sup>H NMR spectra of **6baa**



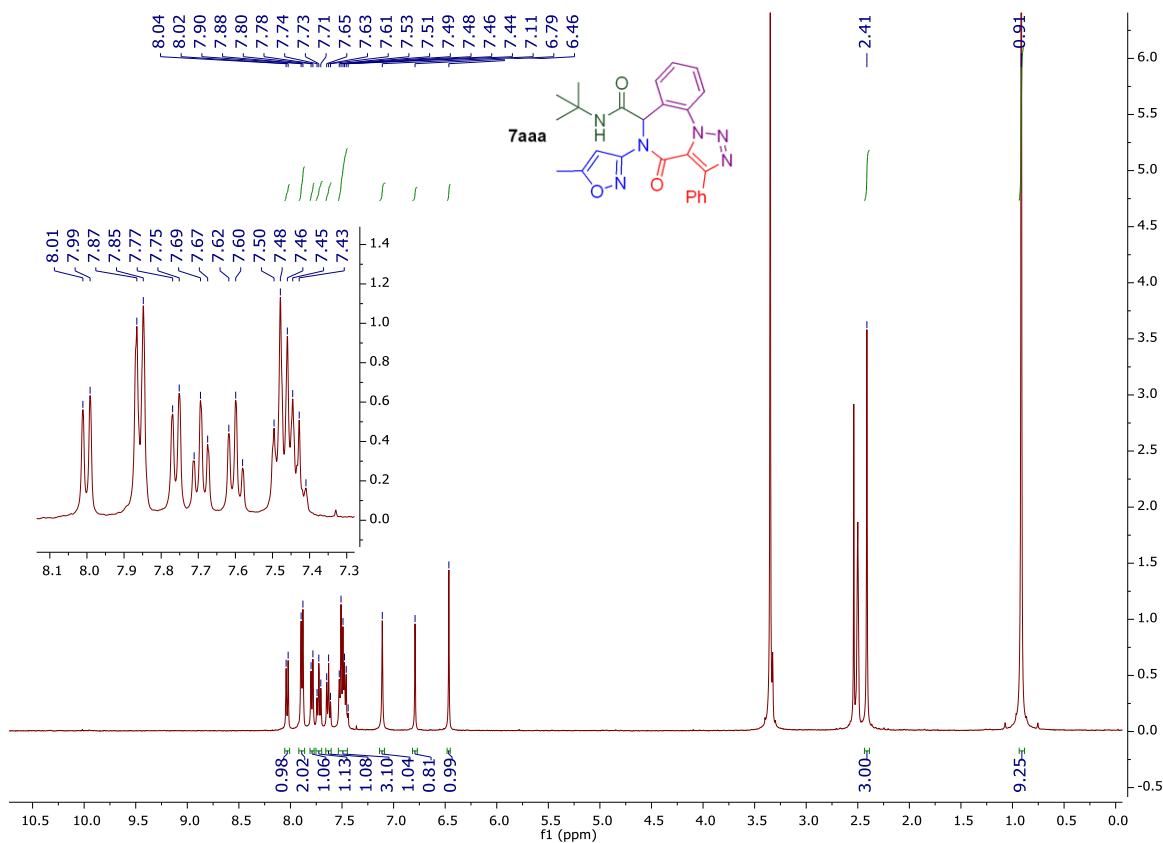
### <sup>1</sup>H NMR spectra of **6bba**



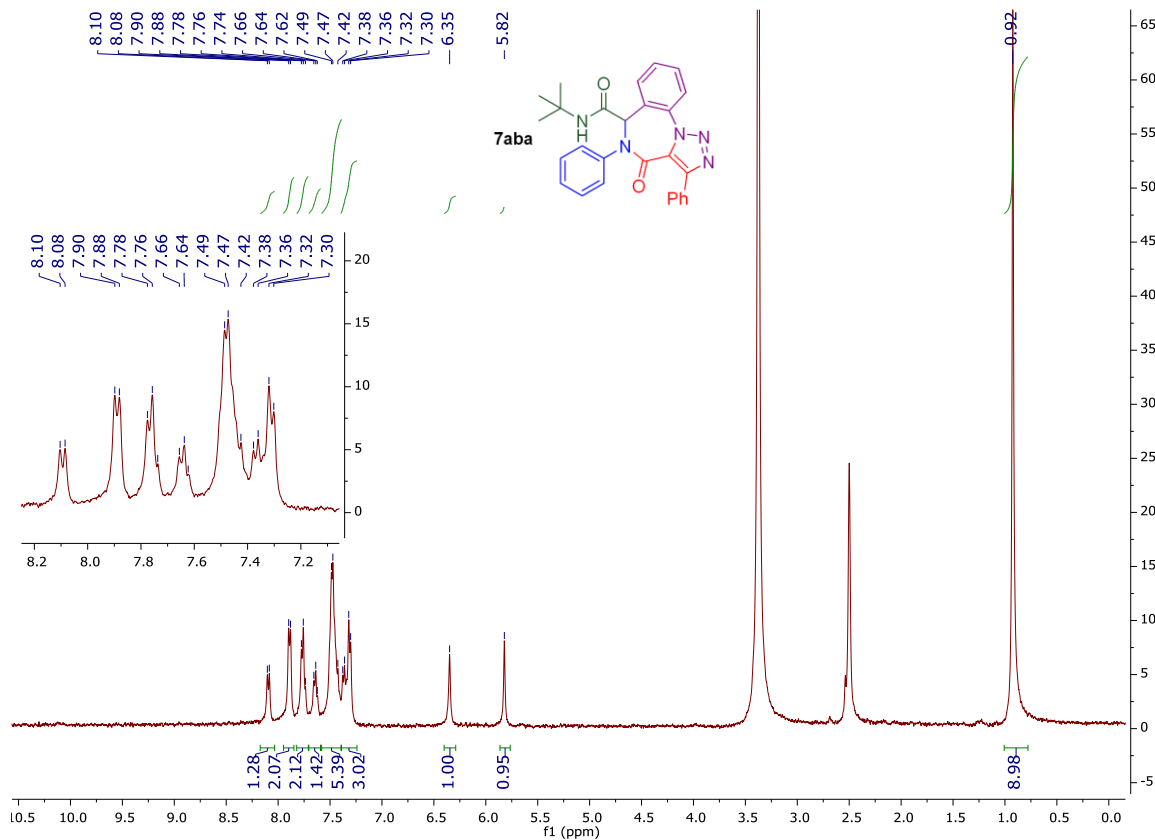
# <sup>1</sup>H NMR spectra of **6bea**



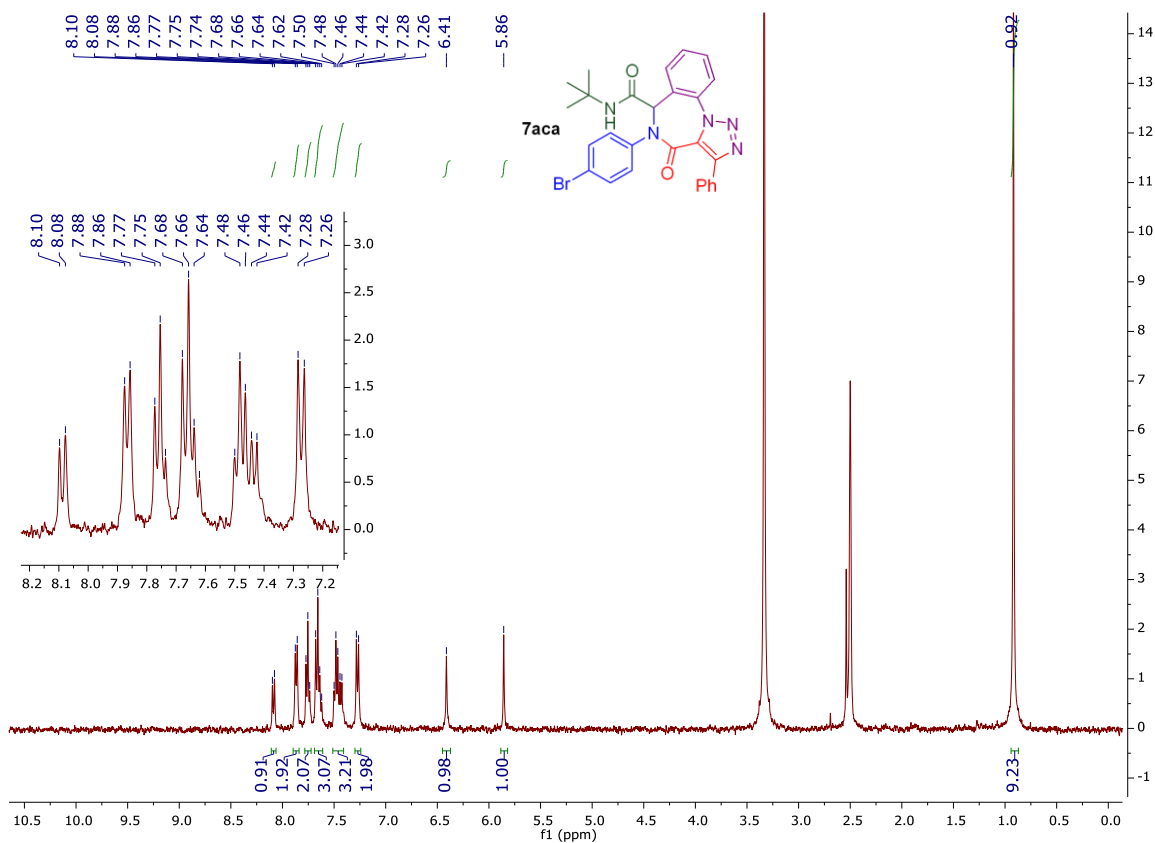
### <sup>1</sup>H NMR spectra of **7aaa**



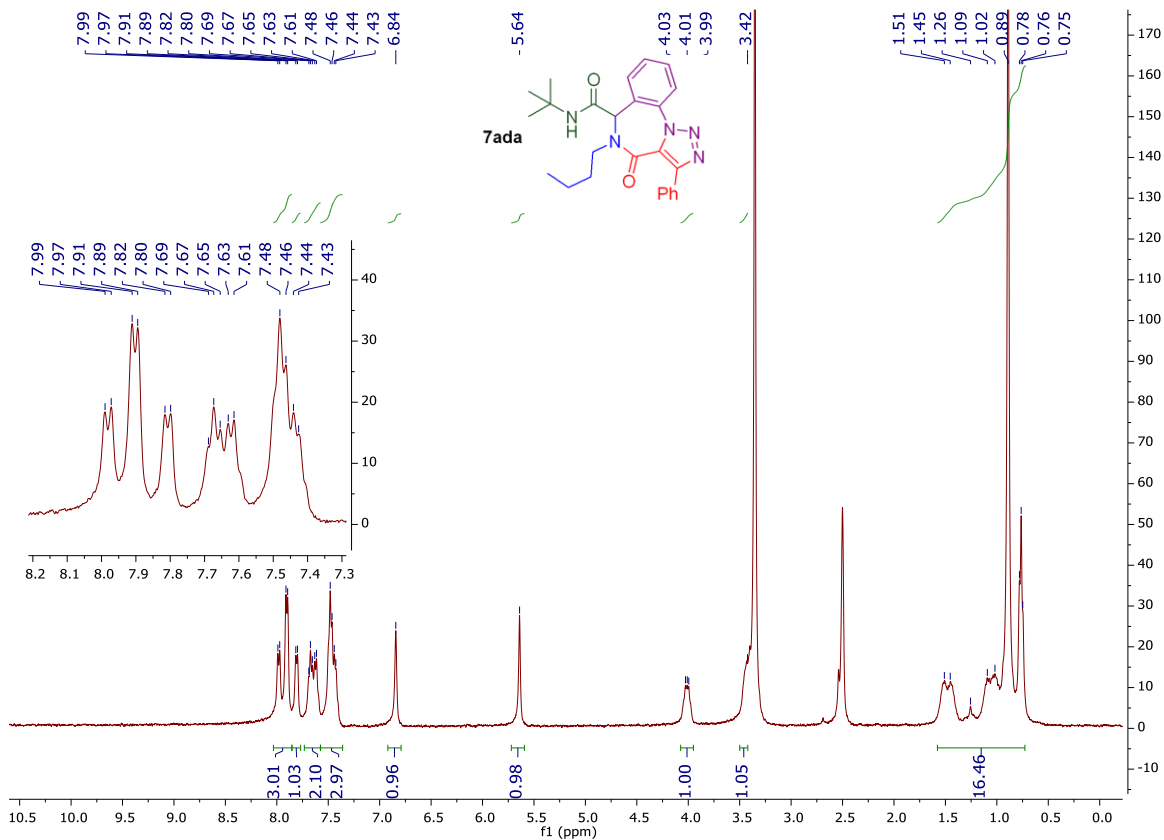
### <sup>1</sup>H NMR spectra of **7aba**



### <sup>1</sup>H NMR spectra of **7aca**

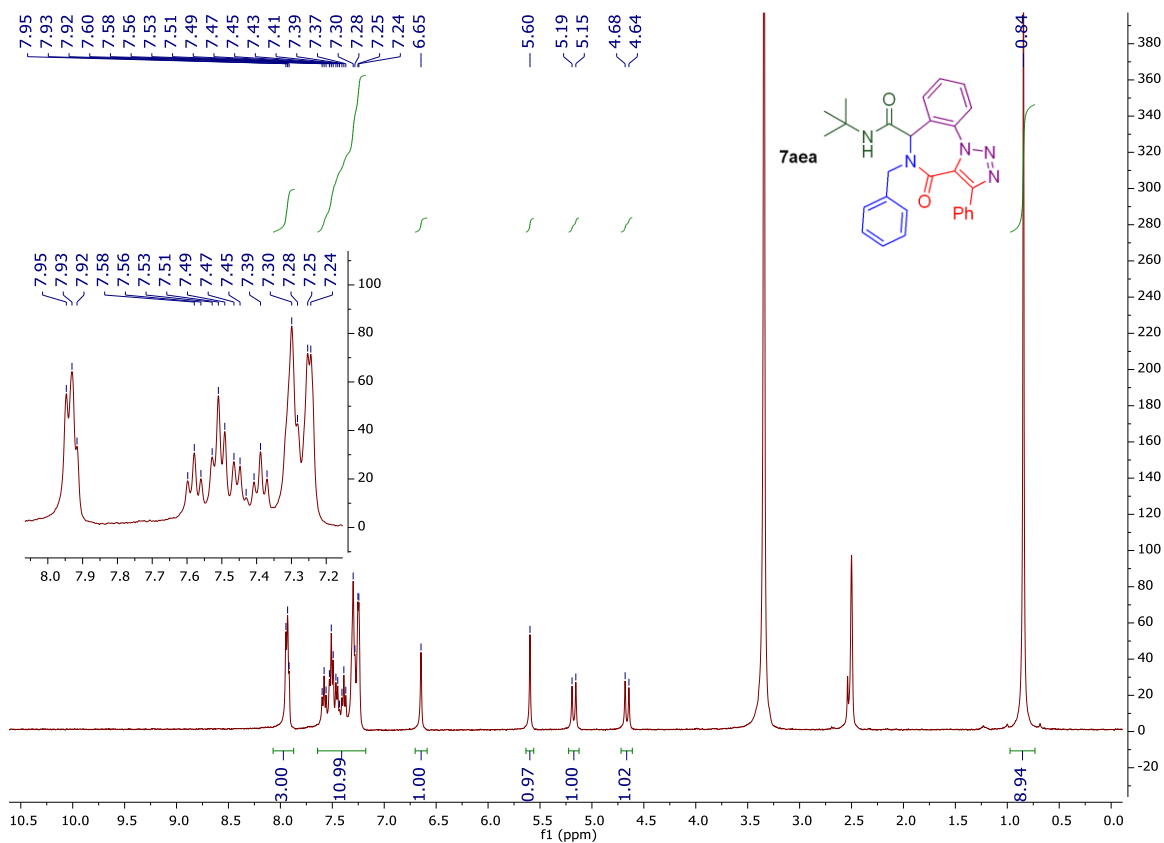


### <sup>1</sup>H NMR spectra of **7ada**

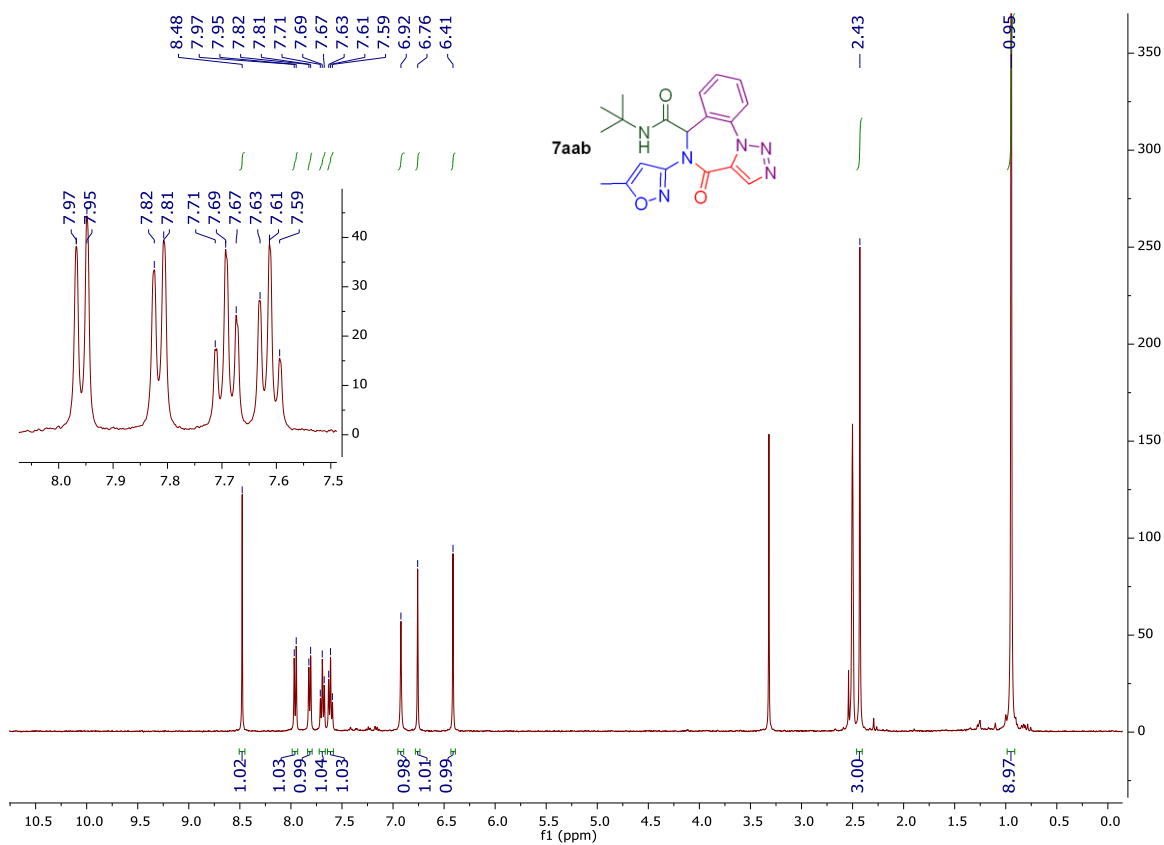




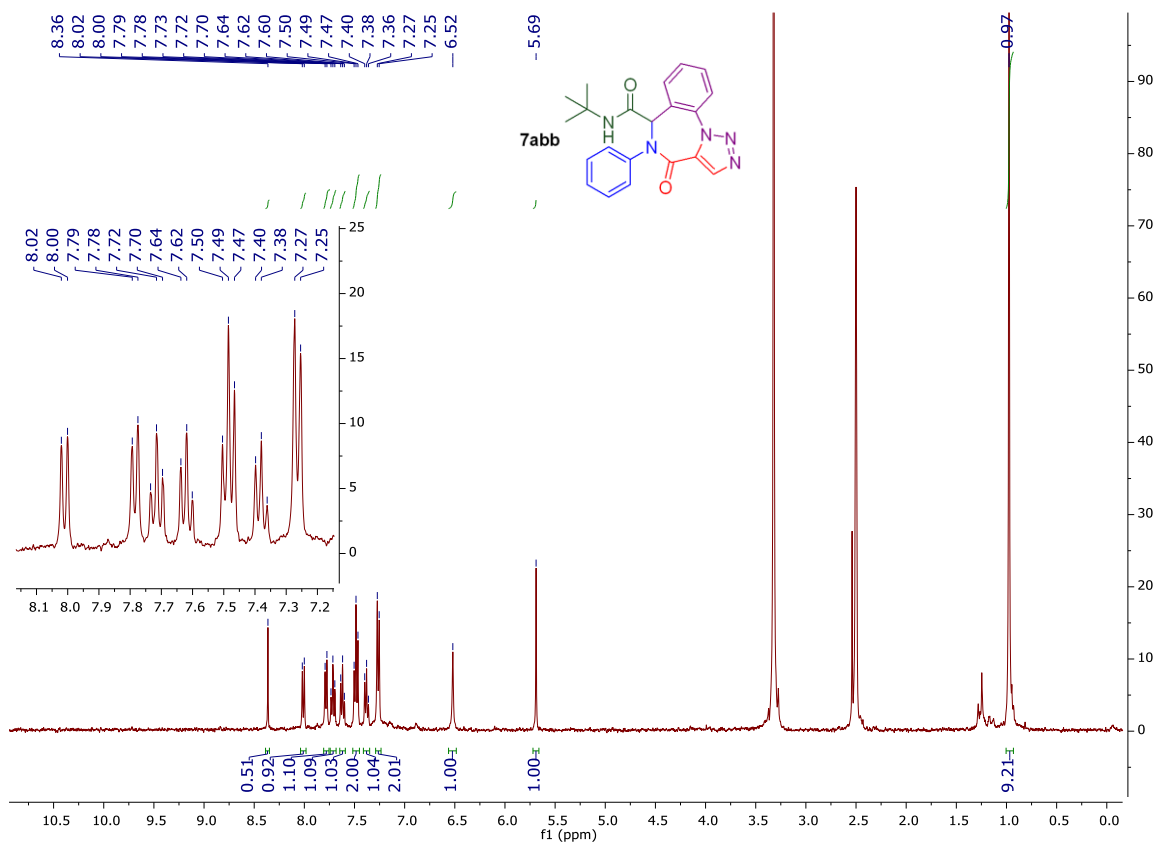
### <sup>1</sup>H NMR spectra of 7aea



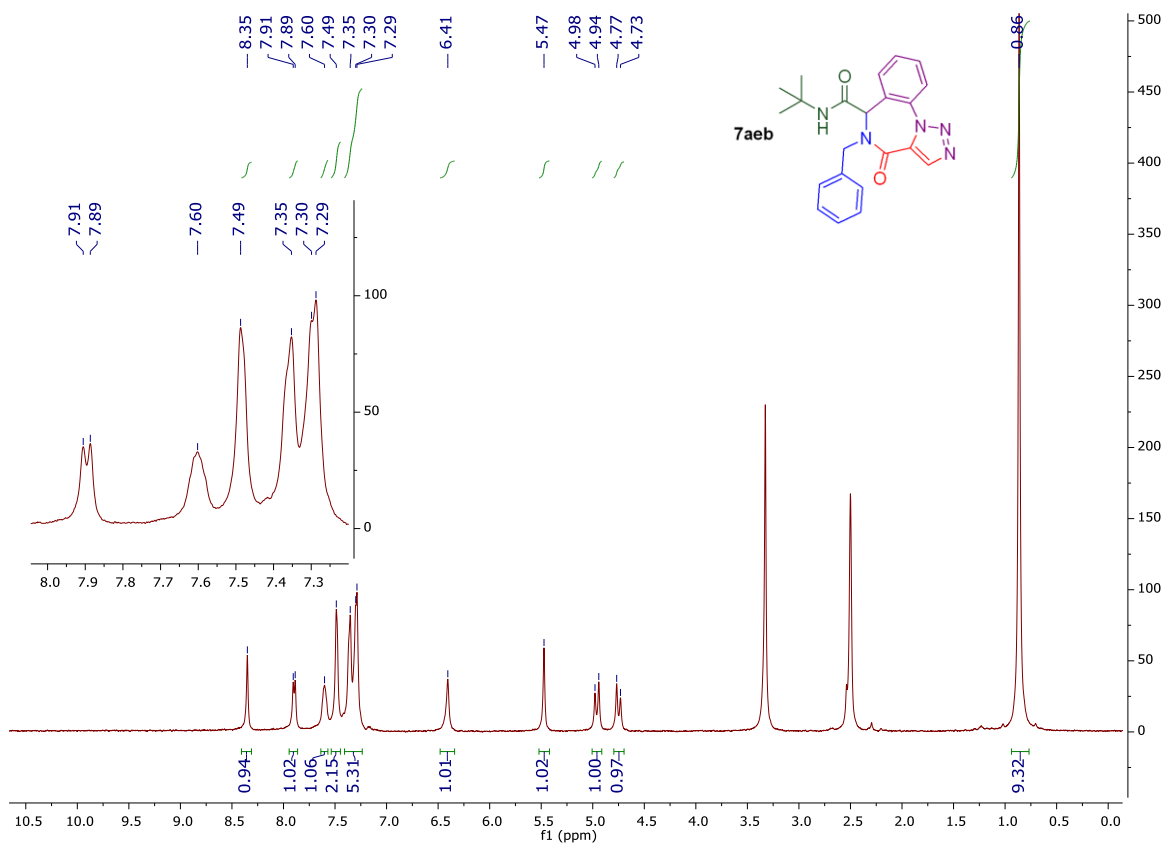
### <sup>1</sup>H NMR spectra of 7aab



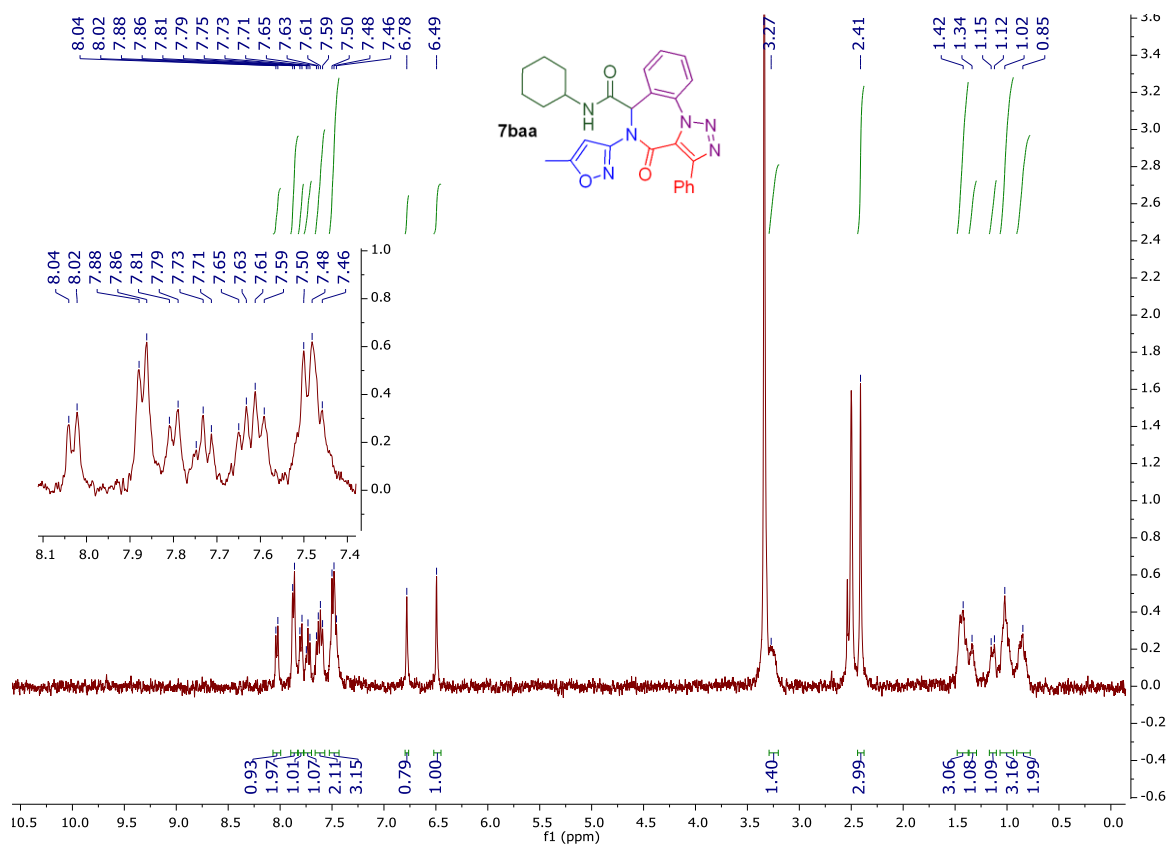
### <sup>1</sup>H NMR spectra of **7abb**



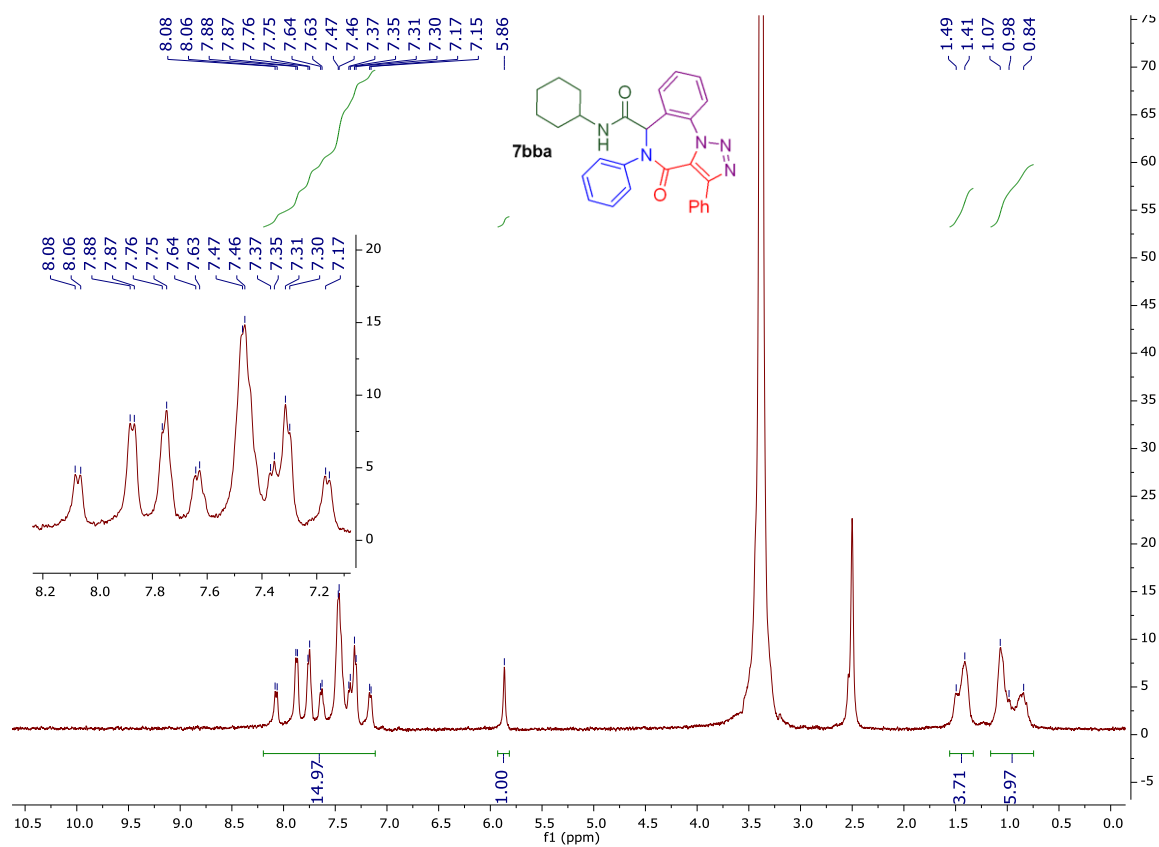
### <sup>1</sup>H NMR spectra of **7aeb**



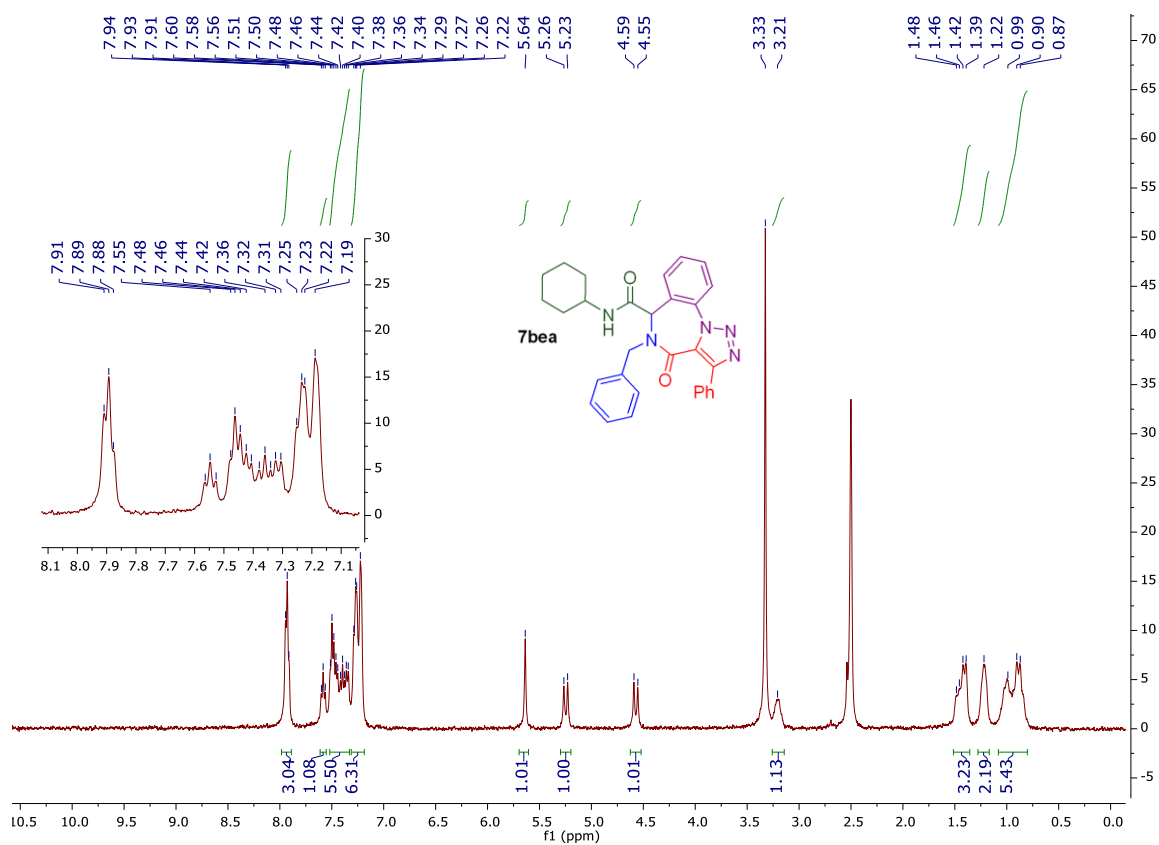
### <sup>1</sup>H NMR spectra of 7baa



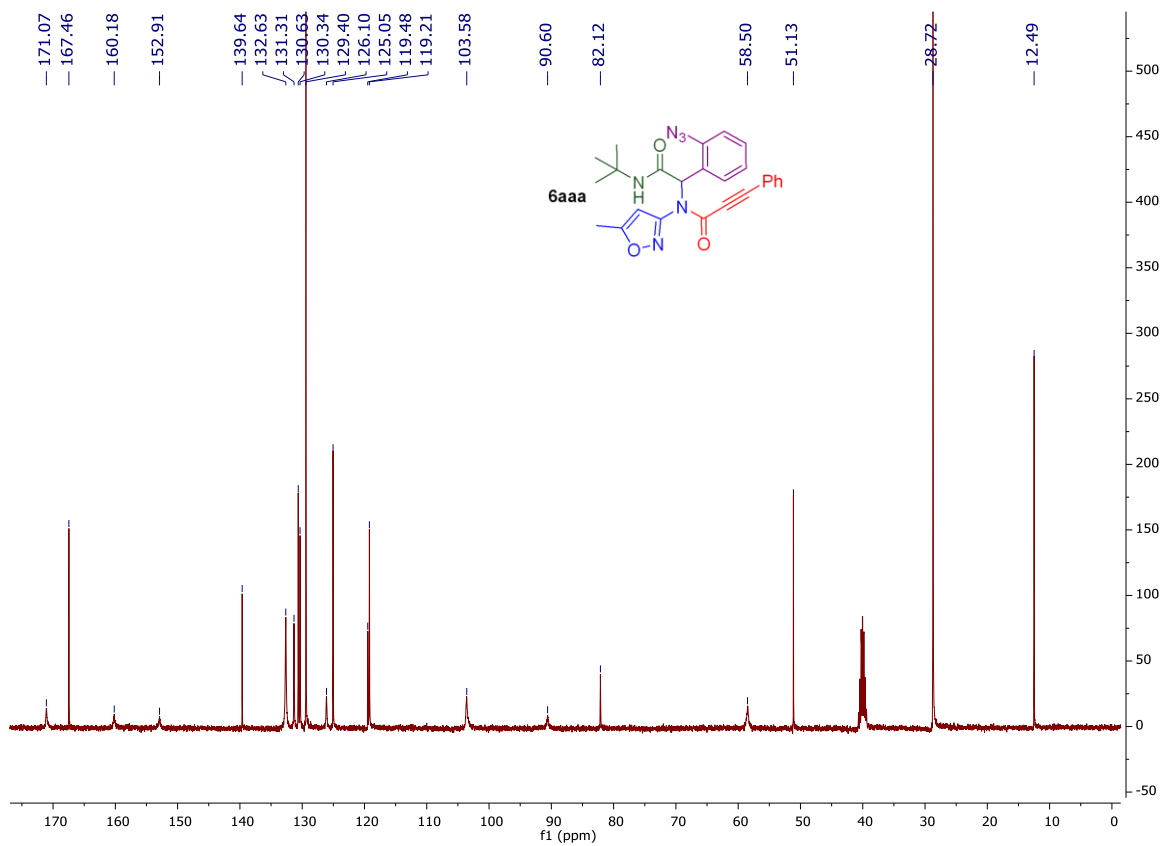
### <sup>1</sup>H NMR spectra of 7bba



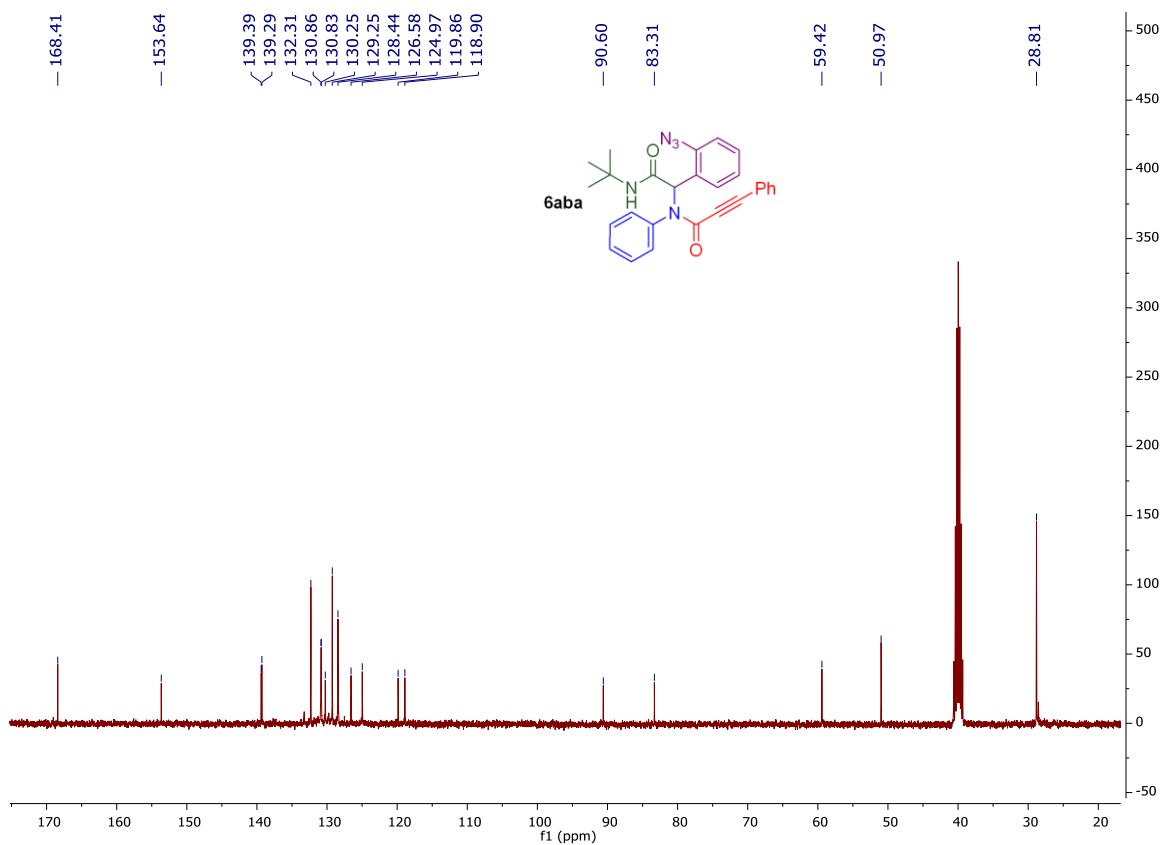
# <sup>1</sup>H NMR spectra of 7bea



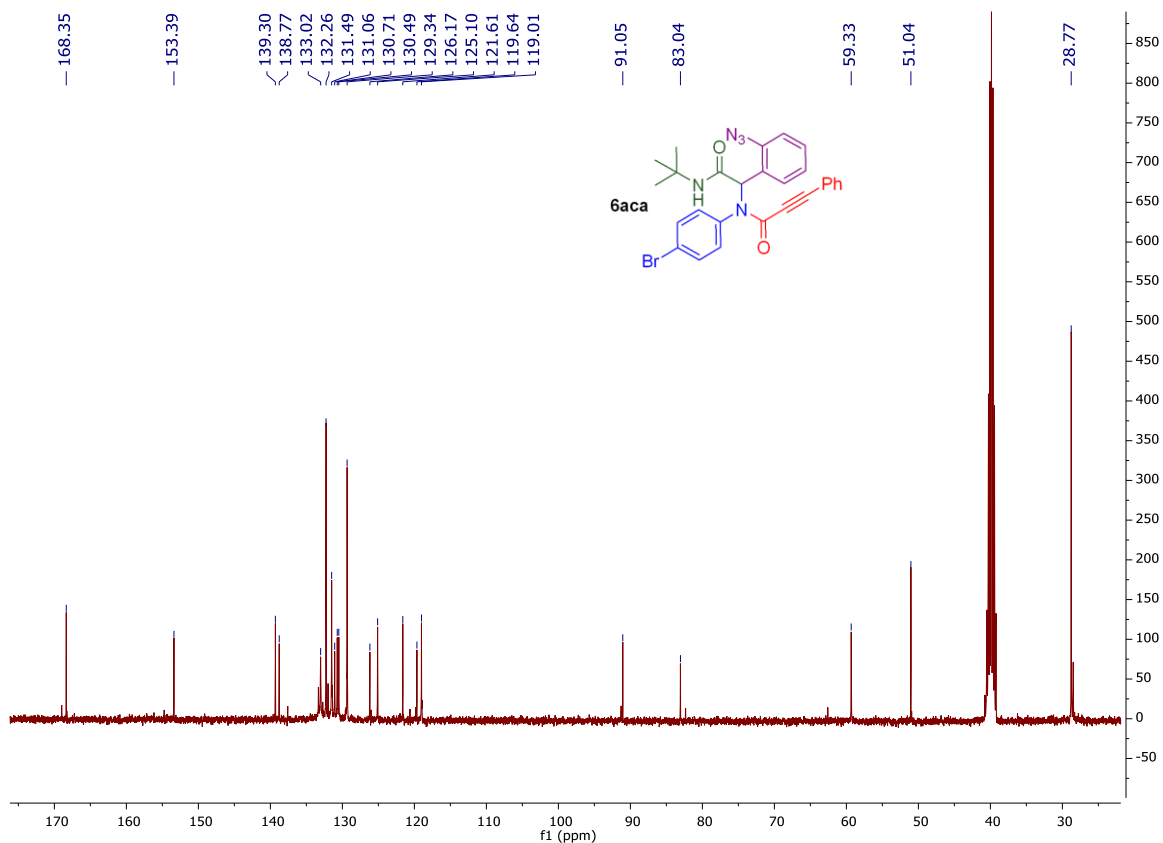
### <sup>13</sup>C NMR spectra of **6aaa**



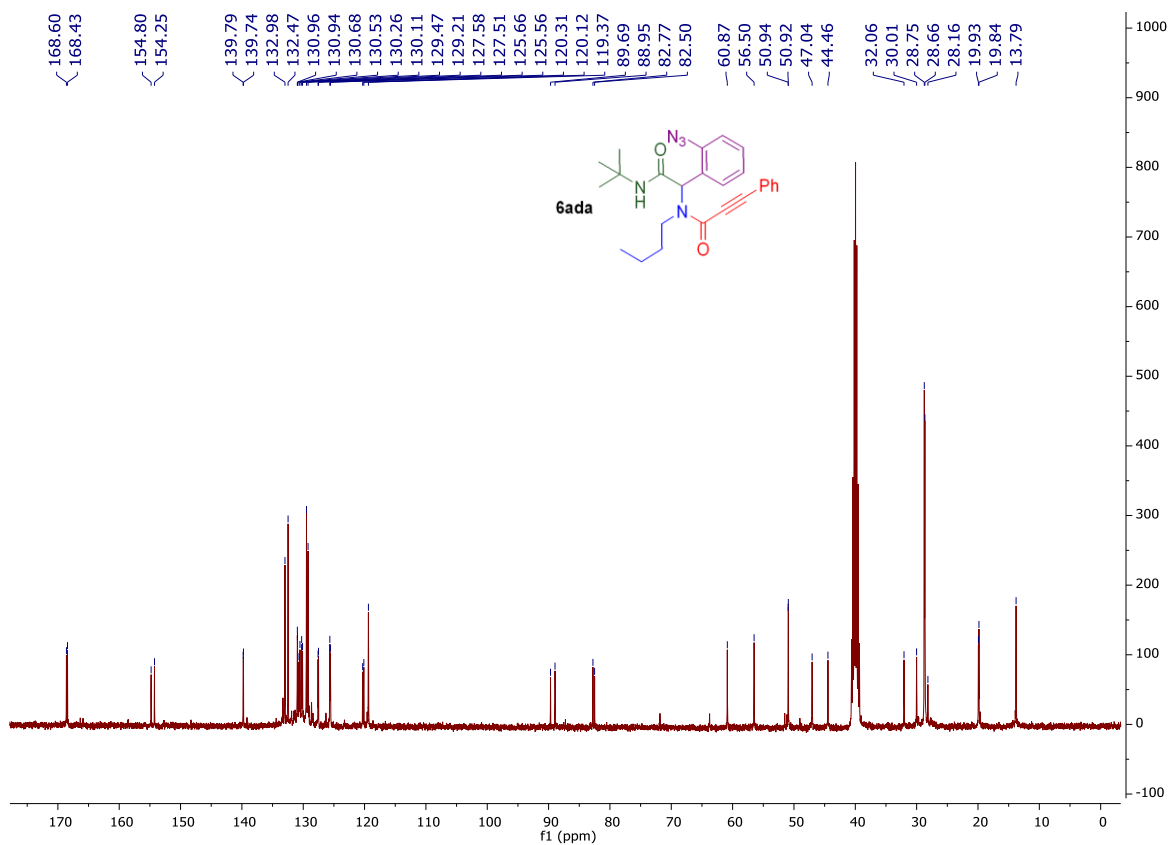
### <sup>13</sup>C NMR spectra of **6aba**



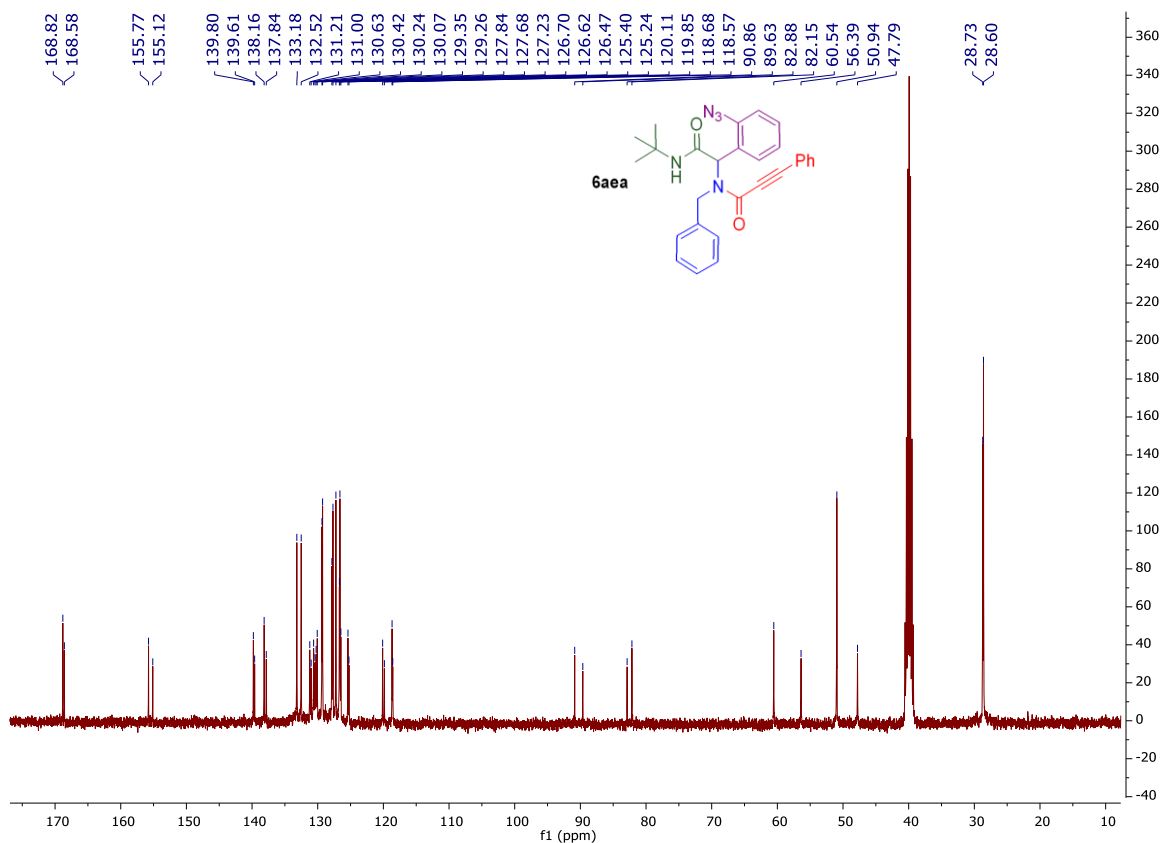
### <sup>13</sup>C NMR spectra of **6aca**



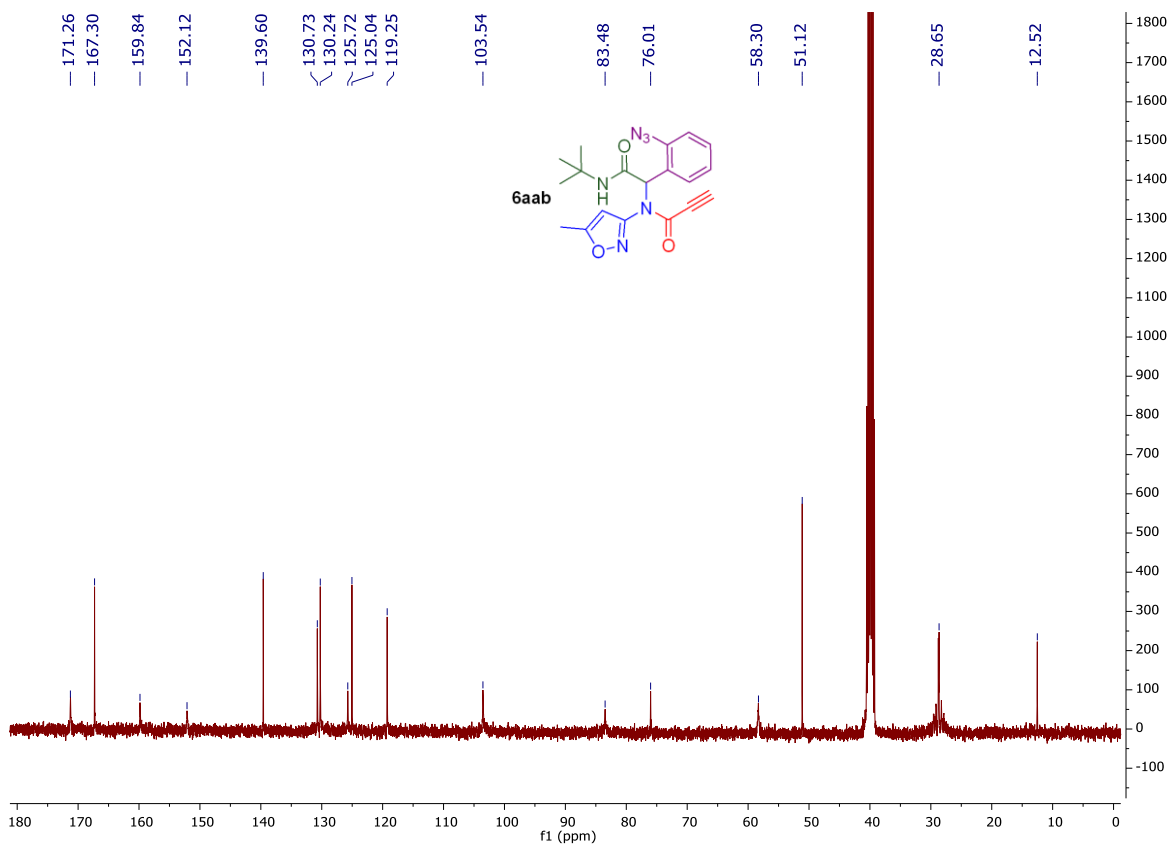
### <sup>13</sup>C NMR spectra of **6ada**



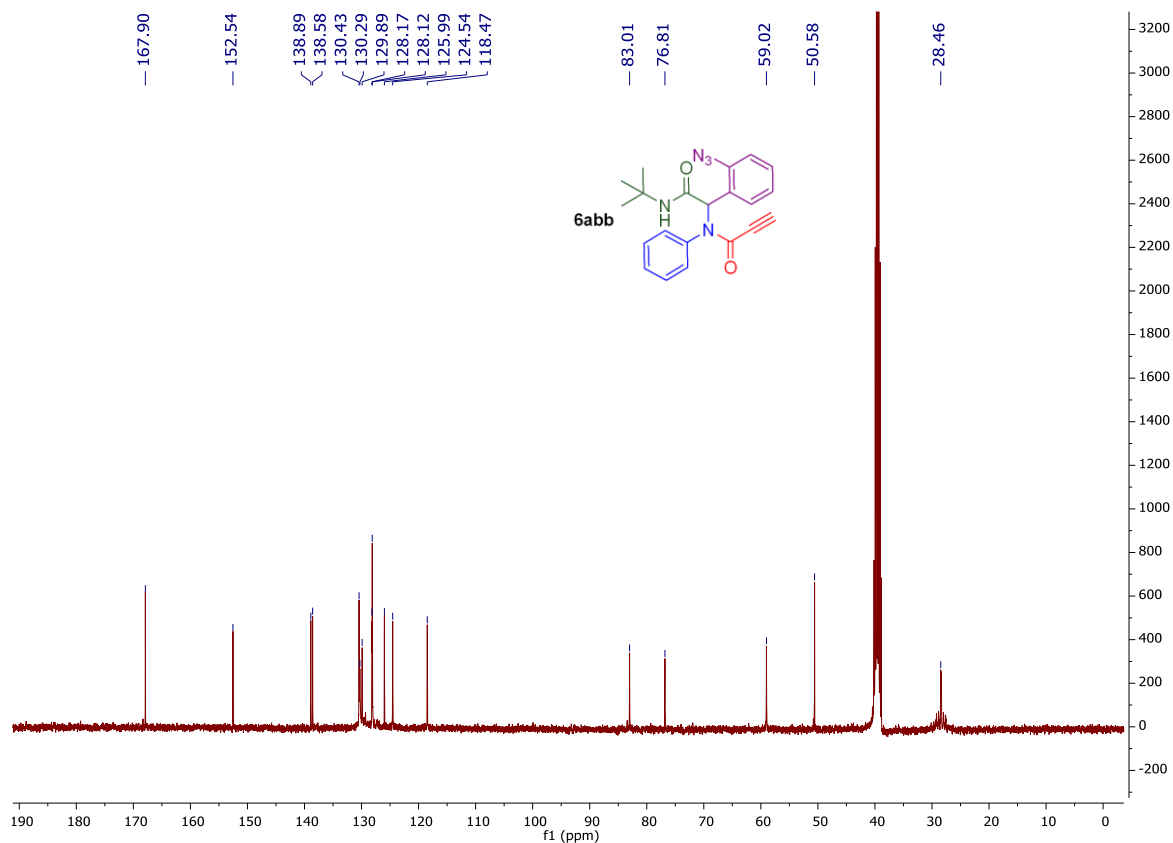
### <sup>13</sup>C NMR spectra of **6aea**



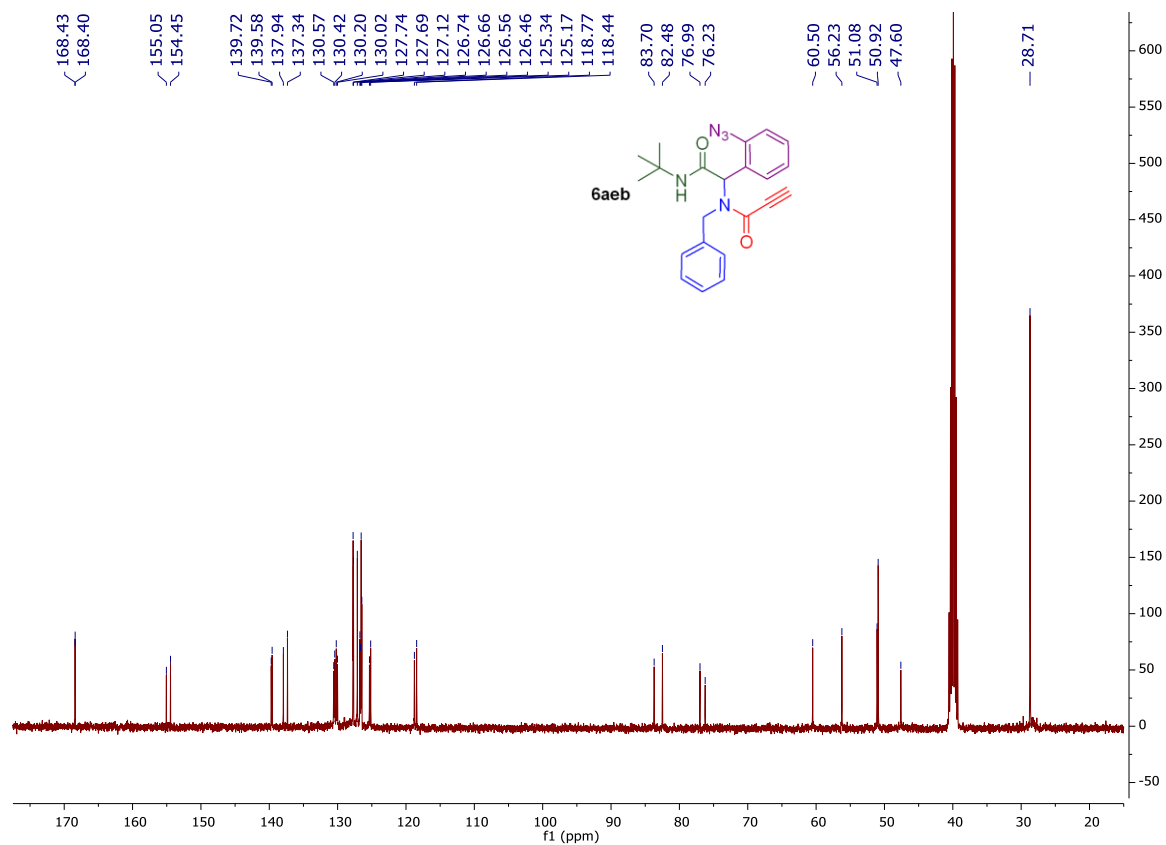
### <sup>13</sup>C NMR spectra of **6aab**



### <sup>13</sup>C NMR spectra of **6abb**

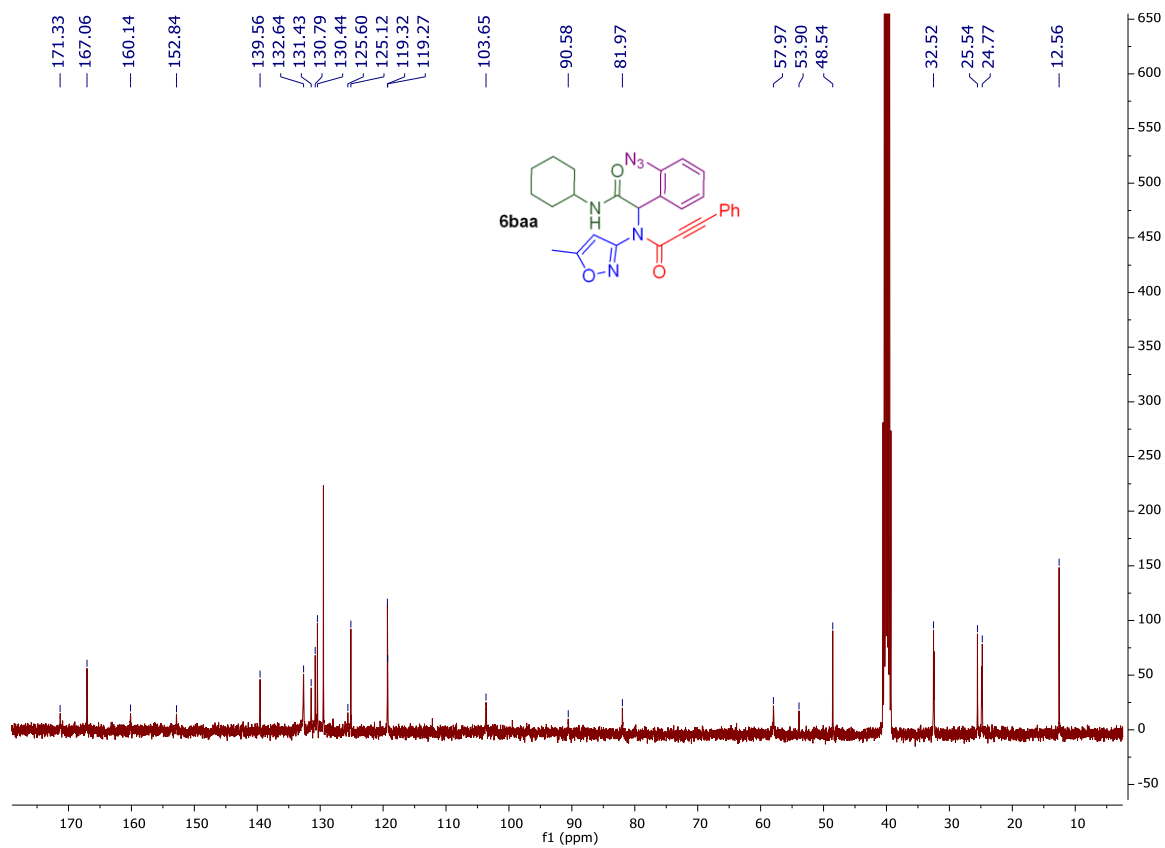


### <sup>13</sup>C NMR spectra of **6aeb**

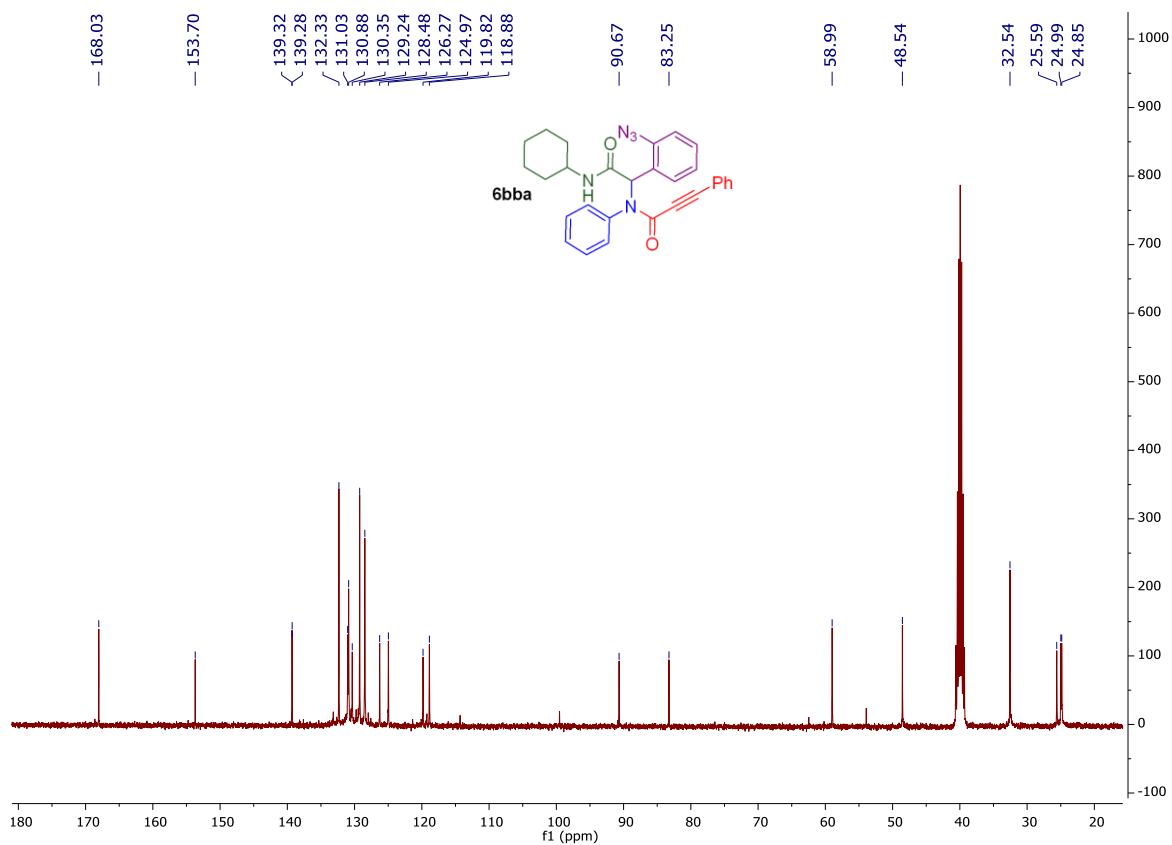




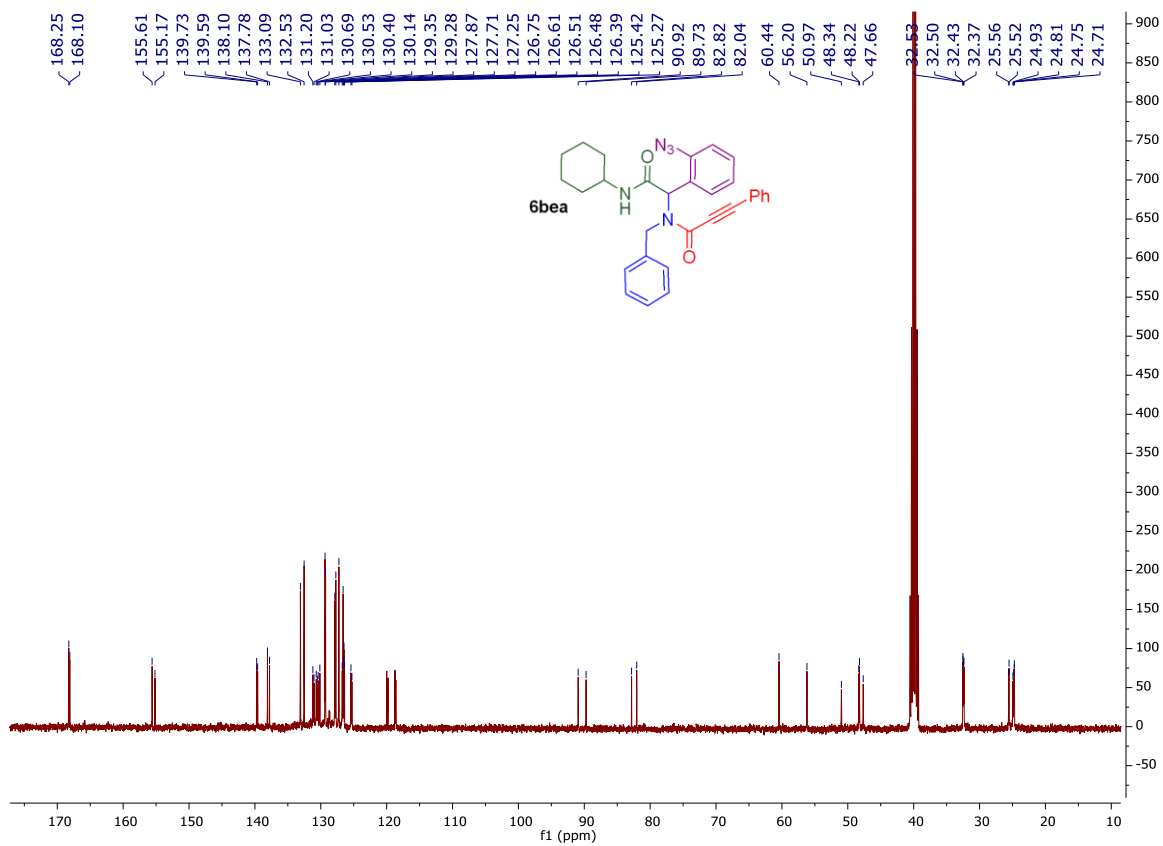
### <sup>13</sup>C NMR spectra of **6baa**



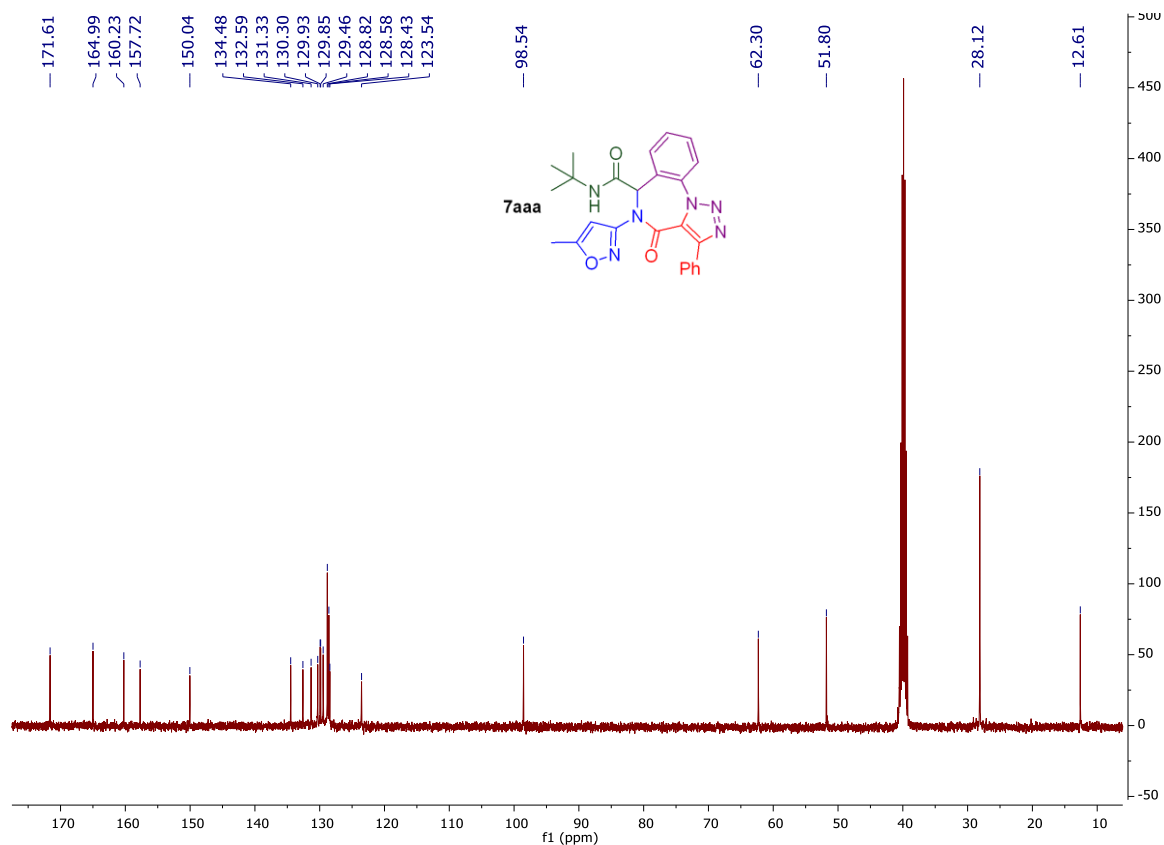
### <sup>13</sup>C NMR spectra of **6bba**



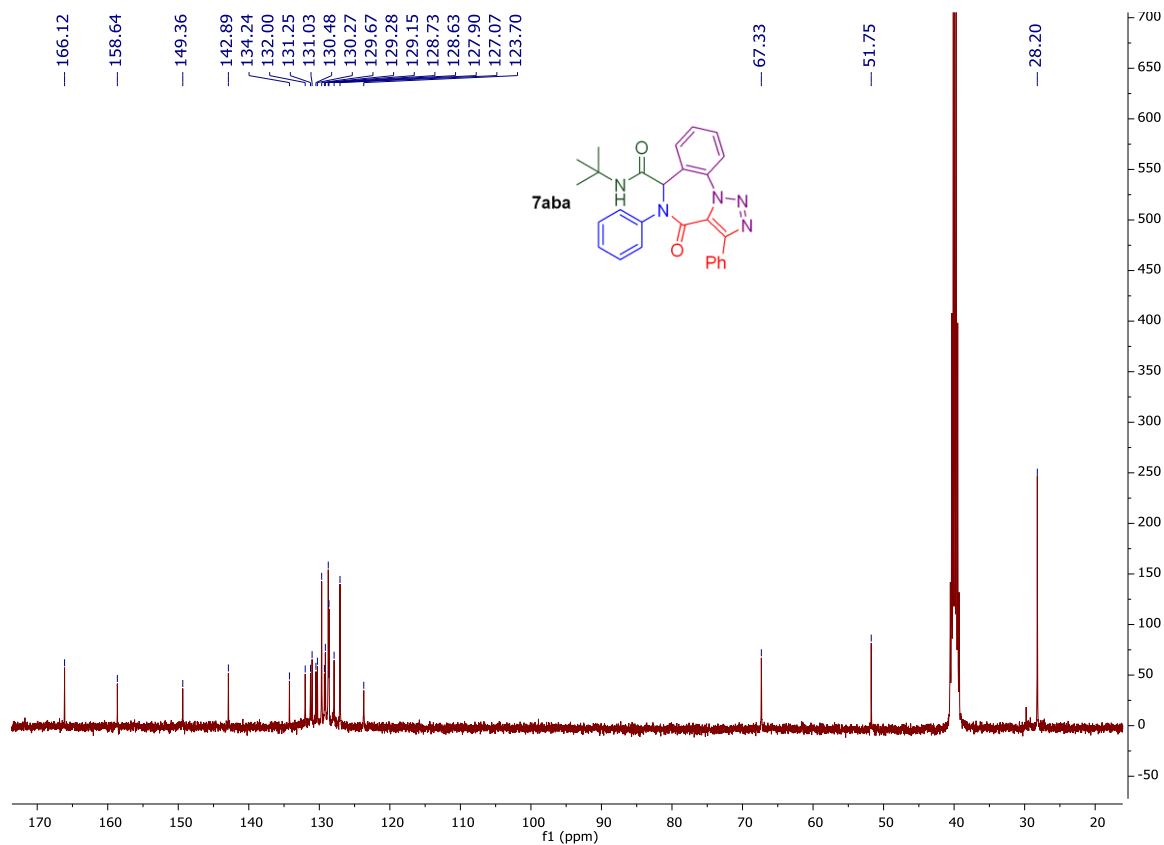
# <sup>13</sup>C NMR spectra of **6bea**



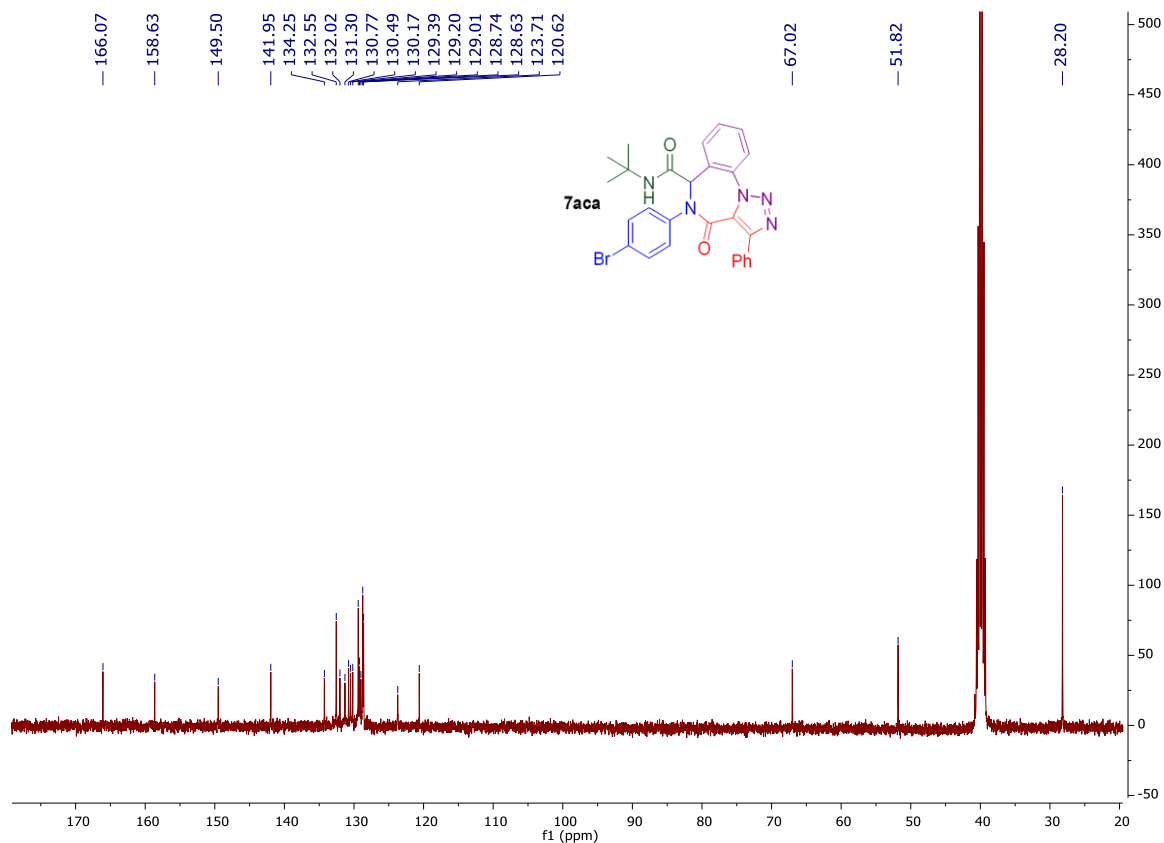
### <sup>13</sup>C NMR spectra of **7aaa**



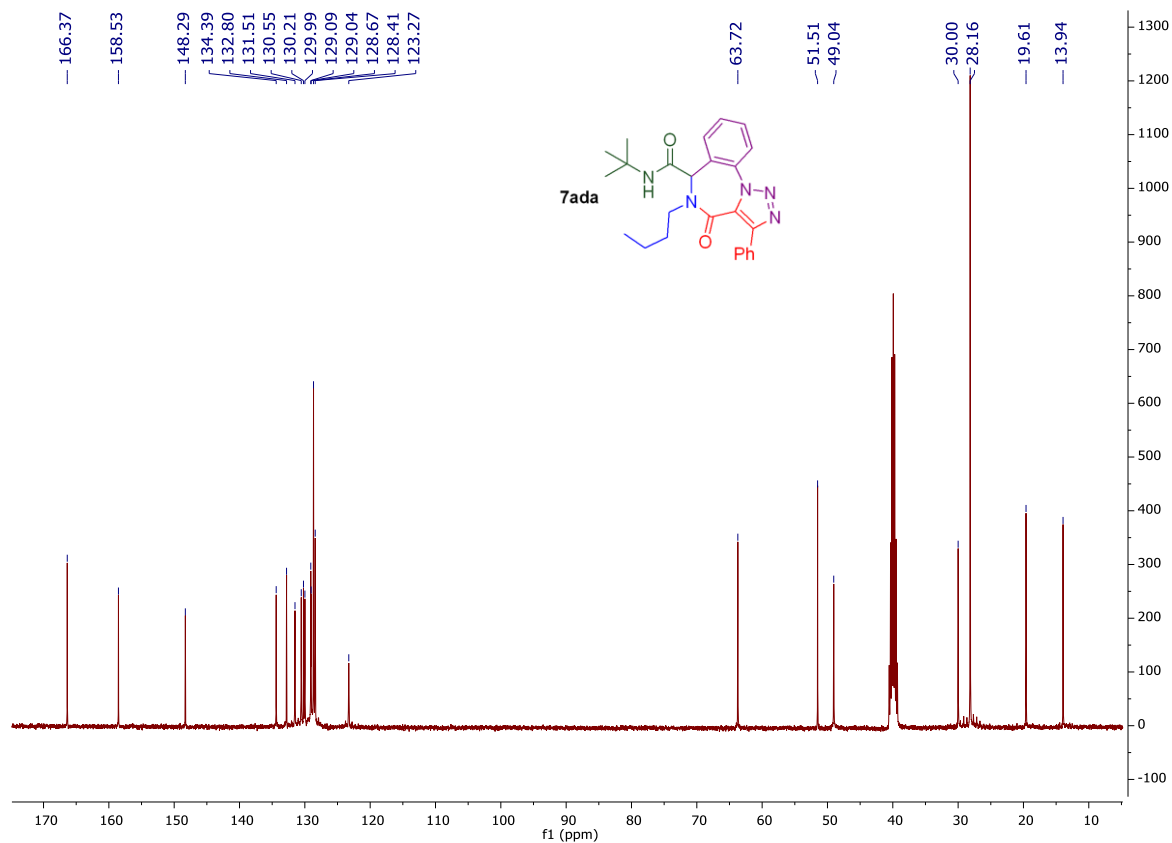
### <sup>13</sup>C NMR spectra of **7aba**



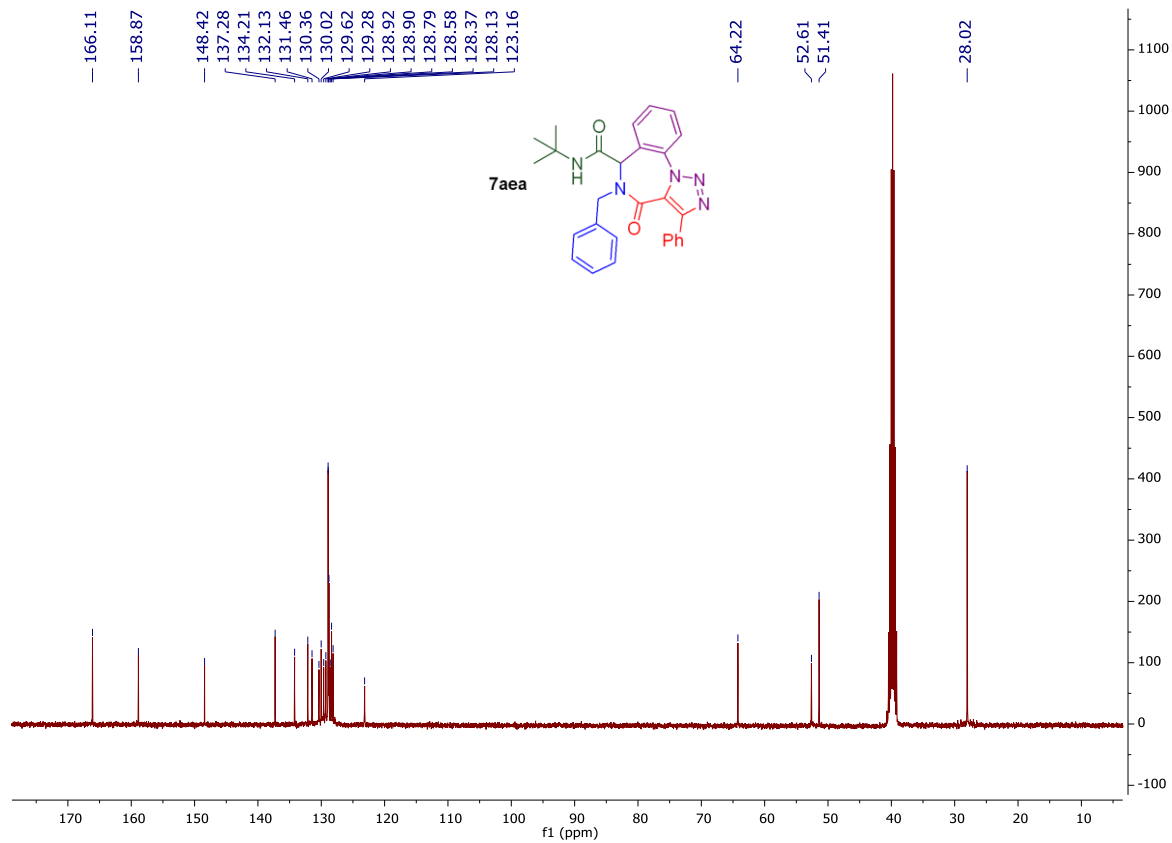
### <sup>13</sup>C NMR spectra of **7aca**



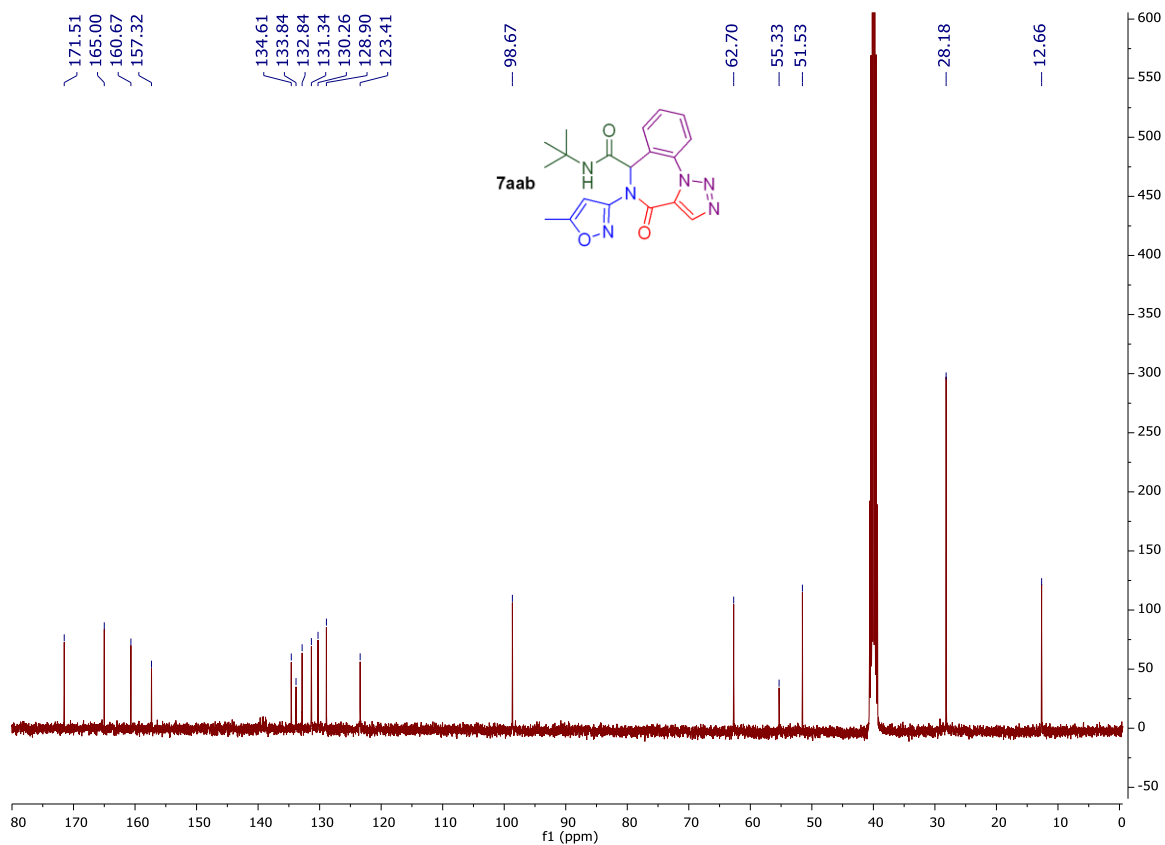
### <sup>13</sup>C NMR spectra of **7ada**



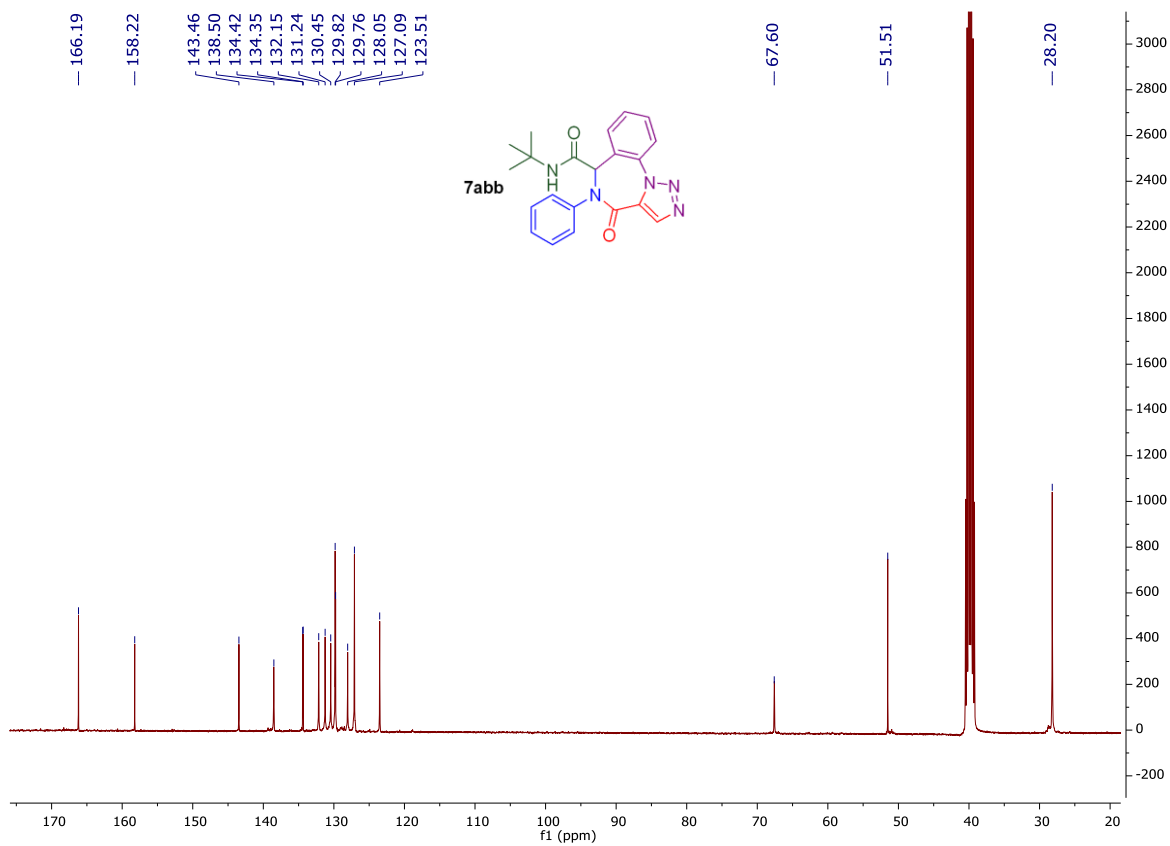
### <sup>13</sup>C NMR spectra of **7aea**



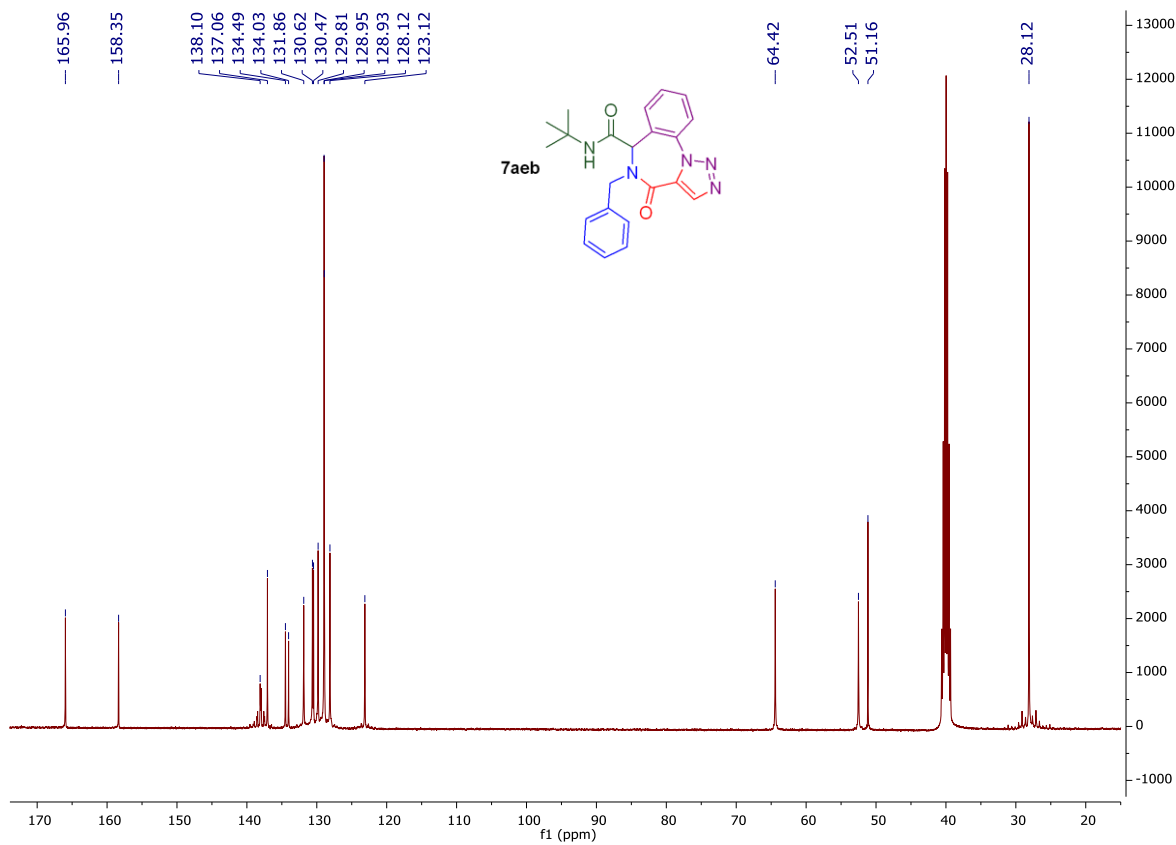
### <sup>13</sup>C NMR spectra of **7aab**



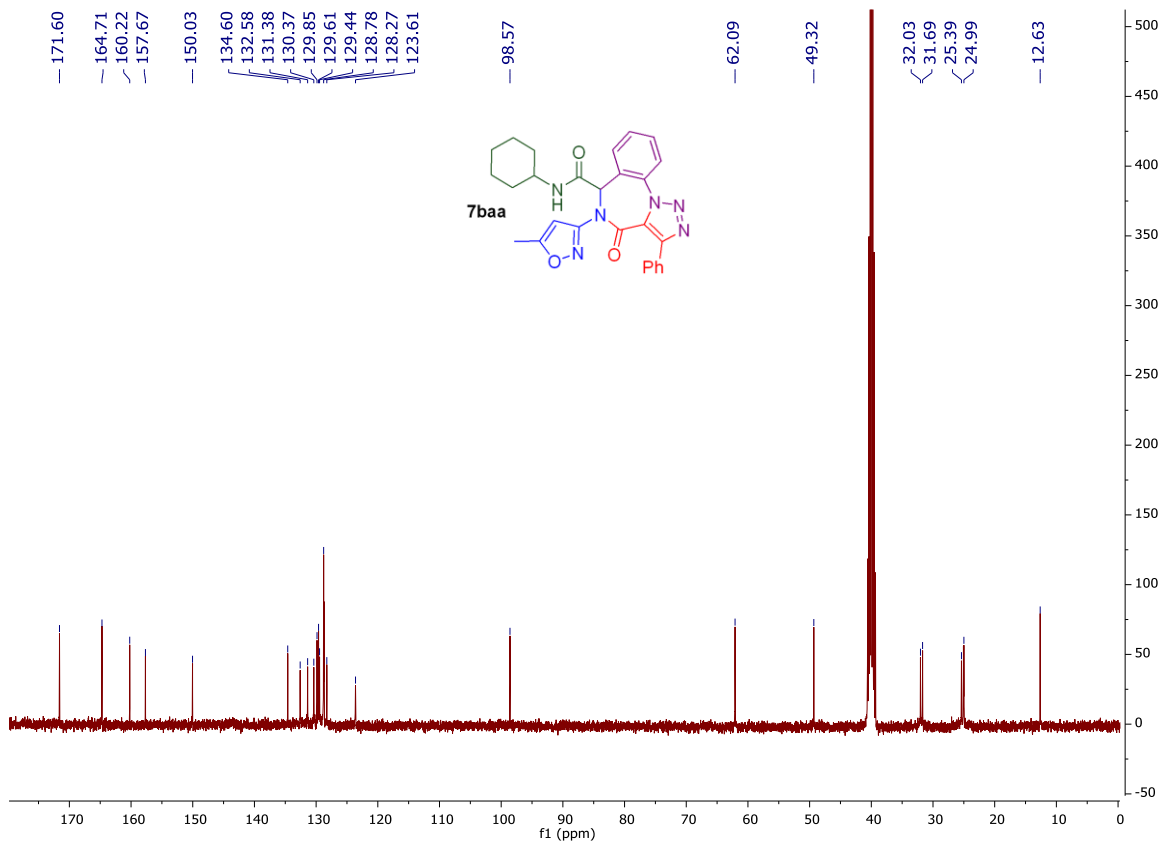
### <sup>13</sup>C NMR spectra of **7abb**



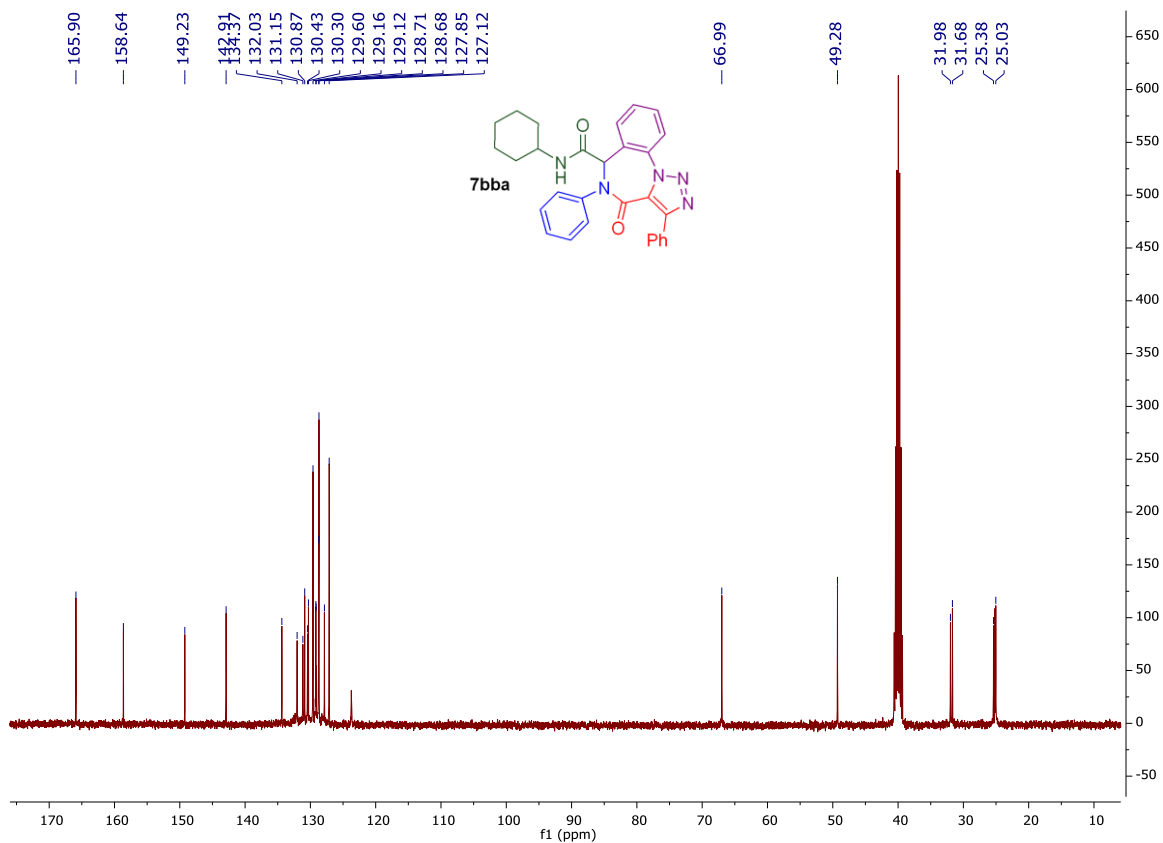
### <sup>13</sup>C NMR spectra of **7aeb**



### <sup>13</sup>C NMR spectra of 7baa



### <sup>13</sup>C NMR spectra of 7bba



# <sup>13</sup>C NMR spectra of 7bea

