Supporting Information

Automated Synthesis of a Library of Triazolated 1,2,5-Thiadiazepane 1,1-Dioxides via a Double aza-Michael Strategy

Qin Zang,[a,b] *Salim Javed*,[a,b] *David Hill*,[b] *Farman Ullah*,[b,c] *Danse Bi*,[a] *Patrick Porubsky*,[b]

Benjamin Neuenswander,[b] *Gerald H. Lushington*,[b]

Conrad Santini,[b] *Michael G. Organ*,[b,c] *Paul R. Hanson*[a,b,*]

[a] Department of Chemistry, University of Kansas, 1251 Wescoe Hall Drive, Lawrence, KS 66045-7582

[b] The University of Kansas Center for Chemical Methodologies and Library Development (KU-CMLD), 2034 Becker Drive, Del Shankel Structural Biology Center, Lawrence, KS 66047

[c] Department of Chemistry, York University, 4700 Keele Street, Toronto, ON, M3J 1P3 Canada

Table of Contents

General Experimental Methods

Stirring was achieved with oven-dried magnetic stir bars. Toluene, THF and CH_2Cl_2 were either purchased through Sigma-Aldrich or purified by passage through a Solv-Tek purification system employing activated Al_2O_3 (Grubbs, R. H.; Rosen, R. K.; Timmers, F. J. *Organometallics* **1996**, *15*, 1518–1520). Et_3N was purified by passage over basic alumina or distilled over CaH and stored over KOH. Flash column chromatography was performed with Sorbent Technologies (30930M-25, Silica Gel 60A, 40-63 um). Thin layer chromatography was performed on silica gel 60F254 plates (EM-5717, Merck). Deuterated solvents were purchased from Cambridge Isotope laboratories. ^{1}H, ^{13}C NMR spectra were recorded on a Bruker DRX-400 spectrometer operating at 400 MHz, 100 MHz respectively as well as a Bruker DRX-500 spectrometer operating at 500 MHz, 126 MHz respectively. High-resolution mass spectrometry (HRMS) and FAB spectra were obtained either on a VG Instrument ZAB double-focusing mass spectrometer boron a LCT Premier Spectrometer (Micromass UK Ltd) operating in the ESI mode (MeOH). Library production was carried out on a Chemspeed Accelerator SLT-100. Products were purified by an automated preparative reverse-phase HPLC (Waters 2767 Mass Directed Fractionation) detected by UV (270 nm, Waters Xbridge MS C-18 column, 19x150 mm, 5 μm elution with the appropriate gradient of acetonitrile in pH 9.8 buffered aqueous ammonium formate at 18 mL/min flow rate). Purity was determined by reverse-phase HPLC (Waters Acquity system) with peak area (UV) at 214 nm. (Waters Acquity BEH C-18 column, 2.1x50mm, 1.7 μm elution with a linear gradient of 5% acetonitrile in pH 9.8 buffered aqueous ammonium formate to 100% acetonitrile at 0.6 mL/min flow rate).

Experimental Procedures

General Procedure of Scaffolds Synthesis.

To a RB flask containing racemic TBS-protected serine methyl ester (**1**, 1.1 equiv) was added CH_2Cl_2 (0.25 M) and Et_3N (3 equiv). This mixture was allowed to stir for several minutes until soluble, cooled to 0 ºC, and 2-2-chloroethanesulfonyl chloride (1 equiv) was added drop-wise over several minutes. The solution was slowly warmed to rt, and stirred overnight. The reaction mixture was quenched with 10% HCl and extracted with CH_2Cl_2. The combined organic layers were washed with saturated aqueous $NaHCO_3$, brine, and dried (Na_2SO_4). The solution was filtered, and concentrated under reduced pressure to afford crude vinyl sulfonamide **2** as a clear, viscous oil (93%). The crude product was submitted to the following reaction without further purification.

To the crude sulfonamide **2** (1 equiv) was added DMF (0.1M), K_2CO_3 (2 equiv) and NaI (2 equiv) followed by the addition of propargyl bromide (1.5 equiv). This was allowed to stir at 60 ºC for 14 hrs. The reaction was cooled to rt and filtered through a pad of celite/silica and concentrated to afford crude tertiary sulfonamide **3** as a dark orange oil. The crude product was purified by flash column chromatography on silica gel (eluent: hexane-EtOAc, 5:1) to provide the product as pale yellow oil (60%).

To the crude sulfonamide **2** (1 equiv) was added CH_3CN (0.1M) and K_2CO_3 (1.2 equiv) followed by the dropwise addition of benzyl bromides (1.2 equiv). This mixture was allowed to stir at 60 ºC for 12−14 hrs. The reaction was cooled to rt, filtered through a pad of celite/silica and concentrated under reduced pressure to afford crude tertiary sulfonamide **7**{*1-6*} as a dark orange oil. The crude product was purified by flash column chromatography on silica gel (eluent: hexane-EtOAc, 5:1) to provide products (60-92%)

Experimental Procedure A for the automated sequential one-pot elimination, double aza-Michael and Huisgen cycloaddition process to synthesize 6{*1-8*, *1-6*} (Scheme 2).

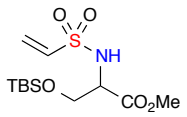
Using a Chemspeed Accelerator SLT-100 automated synthesizer with 48 individual 13 mL reactor vessels, 1 mL of a 0.3 M (0.3 mmol, 1 equiv.) solution of the sulfonamide **3** in MeOH was added in each of the appropriate reactor vessels followed by 1 mL of a 0.33 M (0.33 mmol, 1.1 equiv.) solution of amines **4**{*1-8*} in MeOH and 1 mL of a 0.06 M (0.06 mmol. 0.2 equiv.) solution of DBU in MeOH. The reaction mixtures were vortex shaken at 40 ºC for 4 hours, after which the reaction mixtures were concentrated within the reactor vessels (6 mm Hg). To the crude products of **9** in the same reactor vessels, 2 mL of CH_2Cl_2 was added, followed by 1 mL of a 0.6 M (0.6 mmol, 2 equiv.) solution of azides **5**{*1-6*} in CH_2Cl_2. Solid CuI (0.06 mmol, 0.2 equiv.) was dispensed into each reactor vessels, and the reaction mixtures were vortex shaken at rt for 14 hrs. The mixtures were gravity filtered through a silica 500 mg SPE-Si cartridge followed by washing the SPE with ethyl acetate (2 mL). The solutions were concentrated using a Genevac EZ-series evaporator and the resulting residues were further purified using preparative HPLC.

Experimental Procedure B for the automated sequential one-pot elimination, double aza-Michael and Huisgen cycloaddition process to synthesize 8{*1-6*, *1-8*} (Scheme 2).

Using a Chemspeed Accelerator SLT-100 automated synthesizer with 48 individual 13 mL reactor vessels, 1 mL of a 0.3 M (0.3 mmol, 1 equiv.) solution of each of 6 sulfonamides **7**{*1-6*} in MeOH was added in 8 appropriate reactor vessels followed by 1 mL of a 0.33 M (0.33 mmol, 1.1 equiv.) solution of propargyl amine in MeOH and 1 mL of a 0.06 M (0.06 mmol. 0.2 equiv.) solution of DBU in MeOH. The reaction mixtures were vortex shaken at 40 ºC for 4 hours, after which the reaction mixtures were concentrated within the reactor vessels (6 mm Hg). To the crude products of **9** in the same reactor vessels, 2 mL of CH_2Cl_2 was added, followed by 1 mL of a 0.6 M (0.6 mmol, 2 equiv.) solution of azides **5**{*1-8*} in CH_2Cl_2. Solid CuI (0.06 mmol, 0.2 equiv.) was dispensed into each reactor vessels, and the reaction mixtures were vortex shaken at rt for 14 hrs. The mixtures were gravity filtered through a silica 500 mg SPE-Si cartridge followed by washing the SPE with ethyl acetate (2 mL). The solutions were concentrated using a Genevac EZ-series evaporator and the resulting residues were further purified using preparative HPLC.

Characterization Data for Compounds 2, 3, 7

Methyl 3-((*tert*-butyldimethylsilyl)oxy)-2-(vinylsulfonamido)propanoate (2)



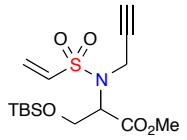
FTIR (neat): 3290, 2955, 2930, 2858, 1749, 1342, 1256, 1138, 1113, 837 cm^{-1};

^{1}H NMR (500 MHz, $CDCl_3$): δ 6.57 (dd, *J* = 16.5, 9.9 Hz, 1H), 6.25 (d, *J* = 16.5 Hz, 1H), 5.91 (d, *J* = 9.9 Hz, 1H), 5.21 (d, *J* = 8.7 Hz, 1H), 4.09–4.04 (m, 2H), 3.88 (dd, *J* = 10.9, 4.0 Hz, 1H), 3.77 (s, 3H), 0.86 (s, 9H), 0.06 (s, 3H), 0.06 (s, 3H);

^{13}C NMR (126 MHz, $CDCl_3$): δ 170.5, 136.5, 126.3, 64.8, 57.6, 52.6, 25.6, -5.5, -5.7;

HRMS: calculated for $C_{12}H_{26}NO_5SSi$ $(M+H)^+$ = 324.1301; found 324.1288 (TOF MS ES+).

Methyl 3-((*tert*-butyldimethylsilyl)oxy)-2-(*N*-(prop-2-yn-1-yl)vinylsulfonamido)propanoate (3)



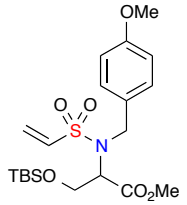
FTIR (neat): 3275, 2959, 1745, 1339, 1146, 972, 737, 565 cm^{-1};

^{1}H NMR (500 MHz, $CDCl_3$): δ 6.61 (dd, *J* = 16.5, 9.9 Hz, 1H), 6.28 (d, *J* = 16.5 Hz, 1H), 5.95 (d, *J* = 9.9 Hz, 1H), 4.59 (m, 1H), 4.27 (dd, *J* = 18.5, 2.4 Hz, 1H), 4.22 (dd, *J* = 18.5, 2.4 Hz, 1H), 4.18 (dd, *J* = 9.1, 3.6 Hz, 1H), 4.15 (dd, J = 9.1, 2.4 Hz, 1H), 3.75 (s, 3H), 2.26 (t, *J* = 2.4 Hz, 1H), 0.89 (s, 9H), 0.09 (s, 3H), 0.07 (s, 3H);

^{13}C NMR (126 MHz, $CDCl_3$): δ 169.7, 135.6, 126.8, 80.0, 71.8, 62.8, 60.9, 52.3, 35.4, 25.7, 18.1, -5.7, -5.9;

HRMS: calculated for $C_{15}H_{27}NO_5SSiNa$ $(M+Na)^+$ = 384.1277; found 384.1256 (TOF MS ES+).

Methyl 3-((*tert*-butyldimethylsilyl)oxy)-2-(*N*-(4-methoxybenzyl)vinylsulfonamido)propanoate (7{*I*})



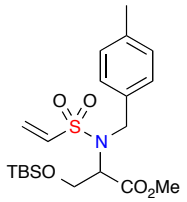
FTIR (neat): 2953, 2932, 2856, 1747, 1512, 1342, 1250, 1151, 837, 777 cm^{-1};

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.33 (d, *J* = 8.7 Hz, 2H), 6.89 – 6.82 (m, 2H), 6.51 (dd, *J* = 16.6, 9.9 Hz, 1H), 6.20 (d, *J* = 16.6 Hz, 1H), 5.88 (d, *J* = 9.9 Hz, 1H), 4.54 (dd, *J* = 7.0, 4.8 Hz, 1H), 4.46 (d, *J* = 15.9 Hz, 1H), 4.42 (d, *J* = 15.9 Hz, 1H), 4.00 (dd, *J* = 10.9, 7.1 Hz, 1H), 3.97 (dd, *J* = 10.9, 4.8 Hz, 1H), 3.80 (s, 3H), 3.66 (s, 3H), 0.85 (s, 9H), 0.01 (s, 3H), -0.03 (s, 3H);

^{13}C NMR (126 MHz, $CDCl_3$): δ 170.0, 159.1, 135.7, 129.5, 129.0, 126.3, 113.6, 62.2, 61.3, 55.3, 52.1, 49.6, 25.7, 18.1, -5.7, -5.8;

HRMS: calculated for $C_{20}H_{33}NO_6SSiK$ $(M+K)^+$ = 482.1435; found 482.1429 (TOF MS ES+).

Methyl 3-((*tert*-butyldimethylsilyl)oxy)-2-(*N*-(4-methylbenzyl)vinylsulfonamido)propanoate (7{*2*})



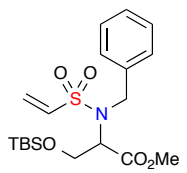
FTIR (neat): 2953, 2930, 2856, 1747, 1342, 1258, 1150, 1119, 837, 777 cm^{-1};

^{1}H NMR (500 MHz, $CDCl_3$): δ 7.29 (d, *J* = 8.0 Hz, 2H), 7.12 (d, *J* = 7.8 Hz, 2H), 6.53 (dd, *J* = 16.6, 9.9 Hz, 1H), 6.21 (d, *J* = 16.6 Hz, 1H), 5.89 (d, *J* = 9.9 Hz, 1H), 4.54 (dd, *J* = 7.0, 4.6 Hz, 1H), 4.49 (d, *J* = 16.1 Hz, 1H), 4.45 (d, *J* = 16.1 Hz, 1H), 4.01 (dd, *J* = 10.8, 7.0 Hz, 1H), 3.96 (dd, *J* = 10.8, 4.6 Hz, 1H), 3.66 (s, 3H), 2.33 (s, 3H), 0.84 (s, 9H), -0.01 (s, 3H), -0.06 (s, 3H);

^{13}C NMR (126 MHz, $CDCl_3$): δ 170.0, 137.1, 135.6, 134.0, 128.9, 128.0, 126.4, 62.3, 61.4, 52.1, 49.9, 25.7, 21.1, 18.1, -5.7, -5.8;

HRMS: calculated for $C_{20}H_{37}N_2O_5SSi$ $(M+NH_4)^+$ = 445.2192; found 445.2184 (TOF MS ES+).

Methyl 2-(*N*-benzylvinylsulfonamido)-3-((*tert*-butyldimethylsilyl)oxy)propanoate (7{*3*})



FTIR (neat): 2953, 2930, 2856, 1745, 1342, 1254, 1150, 1119, 837, 777 cm^{-1};

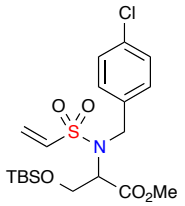
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.41 (d, *J* = 7.4 Hz, 2H), 7.32 (t, *J* = 7.4 Hz, 2H), 7.25 (m, 1H), 6.54 (dd, *J* = 16.6, 9.9 Hz, 1H), 6.22 (d, *J* = 16.6 Hz, 1H), 5.91 (d, *J* = 9.9 Hz, 1H), 4.59 (dd, *J* = 6.9, 4.2 Hz, 1H), 4.54 (d, *J* =

16.5 Hz, 1H), 4.51 (d, *J* = 16.4 Hz, 1H), 4.03 (dd, *J* = 10.8, 6.9 Hz, 1H), 3.96 (dd, *J* = 10.8, 4.2 Hz, 1H), 3.67 (s, 3H), 0.83 (s, 9H), -0.03 (s, 3H), -0.09 (s, 3H);

^{13}C NMR (126 MHz, $CDCl_3$): δ 170.0, 137.3, 135.4, 128.2, 127.8, 127.4, 126.6, 62.4, 61.5, 52.1, 50.1, 25.7, 18.1, -5.8, -5.9;

HRMS: calculated for $C_{19}H_{35}N_2O_5SSi$ $(M+NH_4)^+$ = 431.2036; found 431.2051 (TOF MS ES+).

Methyl 3-((*tert*-butyldimethylsilyl)oxy)-2-(*N*-(4-chlorobenzyl)vinylsulfonamido)propanoate (7{*4*})



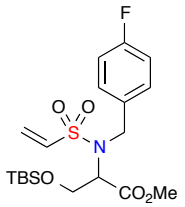
FTIR (nrat): 2953, 2930, 2856, 1745, 1493, 1342, 1254, 1151, 837, 770 cm^{-1};

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.36 (d, *J* = 8.5 Hz, 2H), 7.31–7.27 (m, 2H), 6.51 (dd, *J* = 16.5, 9.9 Hz, 1H), 6.21 (d, *J* = 16.5 Hz, 1H), 5.93 (d, *J* = 9.9 Hz, 1H), 4.61 (dd, *J* = 6.6, 3.7 Hz, 1H), 4.52 (d, *J* = 16.9 Hz, 1H), 4.49 (d, *J* = 16.9 Hz, 1H), 4.05 (dd, *J* = 10.9, 6.7 Hz, 1H), 3.95 (dd, *J* = 10.9, 3.8 Hz, 1H), 3.69 (s, 3H), 0.82 (s, 9H), -0.02 (s, 3H), -0.09 (s, 3H);

^{13}C NMR (126 MHz, $CDCl_3$): δ 169.9, 136.2, 135.1, 133.1, 129.1, 128.3, 126.9, 62.6, 61.6, 52.2, 49.5, 25.7, 18.1, -5.8, -5.9;

HRMS: calculated for $C_{19}H_{34}ClN_2O_5SSi$ $(M+NH_4)^+$ = 465.1646; found 465.1630 (TOF MS ES+).

Methyl 3-((*tert*-butyldimethylsilyl)oxy)-2-(*N*-(4-fluorobenzyl)vinylsulfonamido)propanoate (7{*5*})



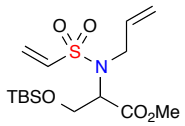
FTIR (neat): 2953, 2930, 2856, 1747, 1510, 1342, 1256, 1151, 837, 775 cm^{-1};

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.39 (dd, *J* = 8.6, 5.4 Hz, 2H), 7.01 (t, *J* = 8.7 Hz, 2H), 6.51 (dd, *J* = 16.5, 9.9 Hz, 1H), 6.21 (d, *J* = 16.5 Hz, 1H), 5.91 (d, *J* = 9.9 Hz, 1H), 4.60 (dd, *J* = 6.8, 4.0 Hz, 1H), 4.51 (d, *J* = 16.5 Hz, 1H), 4.48 (d, *J* = 16.4 Hz, 1H), 4.03 (dd, *J* = 10.9, 6.8 Hz, 1H), 3.95 (dd, *J* = 10.9, 4.0 Hz, 1H), 3.68 (s, 3H), 0.83 (s, 9H), -0.01 (s, 3H), -0.08 (s, 3H);

^{13}C NMR (126 MHz, $CDCl_3$): δ 170.0, 162.2 (d, $^1J_{CF}$ = 245.5 Hz), 135.3, 133.2 (d, $^4J_{CF}$ = 3.1 Hz), 129.5 (d, $^3J_{CF}$ = 8.1 Hz), 126.7, 115.0 (d, $^2J_{CF}$ = 21.5 Hz), 62.4, 61.5, 52.2, 49.4, 25.7, 18.1, -5.8, -5.9;

HRMS: calculated for $C_{19}H_{31}FNO_5SSi$ $(M+H)^+$ = 432.1676; found 432.1667 (TOF MS ES+).

Methyl 2-(*N*-allylvinylsulfonamido)-3-((*tert*-butyldimethylsilyl)oxy)propanoate (7{*6*})



FTIR (neat): 3028, 2952, 2856, 1747, 1346, 1255, 1157, 837, 777 cm^{-1};

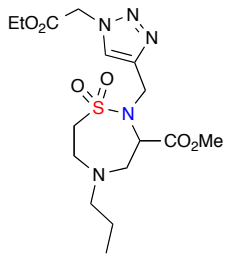
^{1}H NMR (500 MHz, $CDCl_3$) δ 6.46 (dd, *J* = 16.6, 9.9 Hz, 1H), 6.24–6.11 (m, 1H), 5.95–5.77 (m, 2H), 5.27–5.15 (m, 1H), 5.15–5.03 (m, 1H), 4.50 (dd, *J* = 6.6, 4.2 Hz, 1H), 4.10–3.96 (m, 2H), 3.96–3.82 (m, 2H), 3.67 (s, 3H), 1.48 (s, 1H), 0.88–0.76 (m, 9H), 0.00 (d, *J* = 2.8 Hz, 6H);

^{13}C NMR (126 MHz, $CDCl_3$): δ 170.1, 135.6, 135.1, 126.3, 117.2, 62.5, 61.4, 52.2, 49.0, 25.7, 18.2, -5.6, -5.8;

HRMS: calculated for $C_{15}H_{29}NNaO_5SSi$ $(M+Na)^+$ = 386.1433; found 386.1441 (TOF MS ES+).

Characterization Data for Representative Library Compounds 6

Methyl 2-((1-(2-ethoxy-2-oxoethyl)-1*H*-1,2,3-triazol-4-yl)methyl)-5-propyl-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*1,6*})



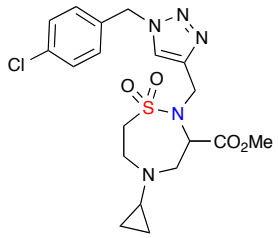
FTIR (neat): 2959, 2935, 2874, 1745, 1732, 1327, 1217, 1144, 1084, 1049, 1020, 754 cm^{-1};

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.85 (s, 1H), 5.16 (q, *J* = 17.5 Hz, 2H), 4.85 (d, *J* = 16.0 Hz, 1H), 4.51 (d, *J* = 16.0 Hz, 1H), 4.28 (q, *J* = 7.1 Hz, 2H), 4.17 (t, *J* = 8.5 Hz, 1H), 3.68 (s, 3H), 3.47 (d, *J* = 8.5 Hz, 2H), 3.31–3.16 (m, 2H), 3.09–3.01 (m, 2H), 2.52–2.36 (m, 2H), 1.44 (dt, *J* = 14.7, 7.3 Hz, 2H), 1.32 (t, *J* = 7.1 Hz, 3H), 0.84 (t, *J* = 7.4 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.3, 170.3, 166.1, 124.9, 62.5, 58.3, 55.6, 54.5, 52.5, 50.9, 49.6, 45.5, 20.7, 14.1, 11.5, 11.4;

HRMS calculated for $C_{16}H_{28}N_5O_6S$ $(M+H)^+$ = 418.1760; found 418.1708 (TOF MS ES+).

Methyl 2-((1-(4-chlorobenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-5-cyclopropyl-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*2,4*})



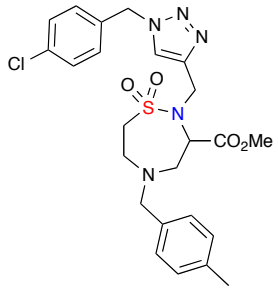
FTIR (neat) cm^{-1} 2951, 2930, 1745, 1327, 1138, 1097, 1049, 733, 492;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.64 (s, 1H), 7.38–7.33 (m, 2H), 7.23–7.20 (m, 2H), 5.54–5.43 (dd, J = 17.7, 15 Hz, 2H), 4.72 (d, J = 16.0 Hz, 1H), 4.49 (d, J = 16.0 Hz, 1H), 4.13 (dd, J = 10.3, 6.8 Hz, 1H), 3.59 (s, 3H), 3.58–3.46 (m, 2H), 3.30–3.23 (m, 1H), 3.19 (dt, J = 13.9, 3.4 Hz, 1H), 3.16–3.06 (m, 2H), 2.02–1.95 (m, 1H), 0.50–0.42 (m, 2H), 0.37–0.33 (m, 2H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.3, 144.4, 134.9, 133.0, 129.3, 129.3, 123.3, 58.6, 55.8, 54.6, 53.5, 52.3, 49.7, 45.7, 34.5, 30.9, 7.7, 7.5;

HRMS calculated for $C_{19}H_{25}ClN_5O_4S$ $(M+H)^+$ = 454.1316; found 454.1295 (TOF MS ES+).

Methyl 2-((1-(4-chlorobenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-5-(4-methylbenzyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*5,4*})



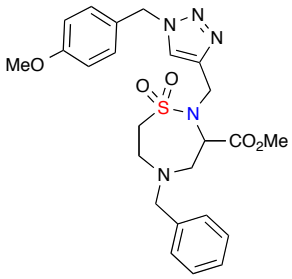
FTIR (neat) cm^{-1} 2949, 2922, 2841, 1745, 1327, 1142, 1084, 1047, 1014, 781, 746, 488;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.68 (s, 1H), 7.34–7.30 (m, 2H), 7.23–7.20 (m, 2H), 7.15–7.10 (m, 4H), 5.57–5.46 (dd, J = 17.8, 15 Hz, 2H), 4.84 (d, J = 16.0 Hz, 1H), 4.53 (d, J = 16.0 Hz, 1H), 4.09 (dd, J = 10.1, 6.9 Hz, 1H), 3.62 (dd, J = 39.5, 13.2 Hz, 2H), 3.54 (s, 3H), 3.45 (qd, J = 14.6, 8.5 Hz, 2H), 3.22–3.11 (m, 2H), 3.02–2.94 (m, 2H), 2.35 (s, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.1, 144.6, 137.3, 134.9, 133.1, 129.3, 129.3, 129.3, 128.5, 128.4, 123.4, 59.4, 58.5, 56.0, 54.4, 53.5, 52.3, 49.0, 45.6, 21.1;

HRMS calculated for $C_{24}H_{29}ClN_5O_4S$ $(M+H)^+$ = 518.1629; found 518.1611 (TOF MS ES+).

Methyl 5-benzyl-2-((1-(4-methoxybenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*6,1*})



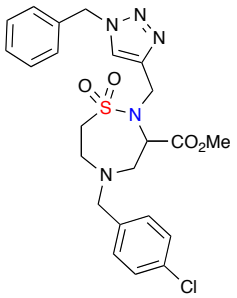
FTIR (neat) cm^{-1} 2951, 2934, 2837, 1745, 1514, 1327, 1250, 1142, 1049, 1047, 1028, 783, 737, 700;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.61 (s, 1H), 7.35–7.31 (m, 2H), 7.30–7.27 (m, 1H), 7.24–7.21 (m, 4H), 6.88–6.84 (m, 2H), 5.47 (s, 2H), 4.89 (d, J = 15.9 Hz, 1H), 4.49 (d, *J* = 15.9 Hz, 1H), 4.08 (dd, *J* = 10.2, 6.8 Hz, 1H), 3.79 (s, 3H), 3.62 (dd, *J* = 38.8, 13.4 Hz, 2H), 3.54 (s, 3H), 3.48 (ddd, *J* = 21.5, 14.8, 8.6 Hz, 2H), 3.21–3.09 (m, 2H), 2.97 (qd, *J* = 14.7, 10.6 Hz, 2H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.2, 159.9, 144.1, 138.0, 129.6, 128.6, 128.5, 127.6, 126.5, 123.1, 114.5, 59.2, 58.2, 55.9, 55.3, 54.5, 53.8, 52.3, 49.1, 45.5;

HRMS calculated for $C_{24}H_{30}N_5O_5S$ $(M+H)^+$ = 500.1968; found 500.1927 (TOF MS ES+).

Methyl 2-((1-benzyl-1*H*-1,2,3-triazol-4-yl)methyl)-5-(4-chlorobenzyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*7,3*})



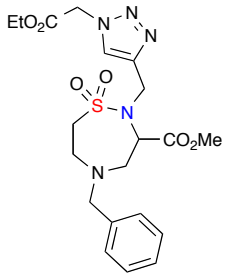
FTIR (neat) cm^{-1} 2951, 2928, 2841, 1745, 1732, 1327, 1142, 1084, 1049, 1013, 754, 725, 511, 492;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.64 (s, 1H), 7.36–7.34 (m, 3H), 7.31–7.28 (m, 4H), 7.19–7.16 (m, 2H), 5.55 (s, 2H), 4.91 (d, *J* = 15.9 Hz, 1H), 4.47 (d, *J* = 15.9 Hz, 1H), 4.05 (dd, *J* = 10.4, 6.7 Hz, 1H), 3.62 (d, *J* = 13.6 Hz, 1H), 3.55 (d, *J* = 13.4 Hz, 1H), 3.55 (s, 3H), 3.50 (dd, *J* = 14.8, 10.4 Hz, 1H), 3.41 (dd, *J* = 14.8, 6.7 Hz, 1H), 3.17–3.10 (m, 2H), 3.00 (ddd, *J* = 13.4, 9.4, 3.9 Hz, 1H), 2.93 (dt, *J* = 14.5, 4.1 Hz, 1H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.1, 144.1, 136.5, 134.5, 133.3, 129.7, 129.2, 128.9, 128.8, 128.1, 123.3, 58.2, 58.1, 55.7, 54.6, 54.3, 52.4, 49.3, 45.4;

HRMS calculated for $C_{23}H_{27}ClN_5O_4S$ $(M+H)^+$ = 504.1472; found 504.1463 (TOF MS ES+).

Methyl 5-benzyl-2-((1-(2-ethoxy-2-oxoethyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*6,6*})



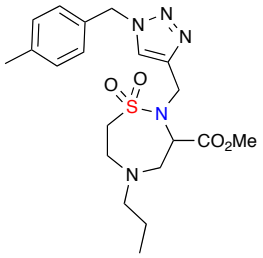
FTIR (neat) cm^{-1} 2986, 2951, 1745, 1327, 1217, 1142, 1086, 1049, 1020, 739, 700;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.87 (s, 1H), 7.34–7.30 (m, 2H), 7.28–7.24 (m, 3H), 5.19 (q, *J* = 17.5 Hz, 2H), 4.99 (d, *J* = 16.0 Hz, 1H), 4.51 (d, *J* = 16.0 Hz, 1H), 4.26 (q, *J* = 7.1 Hz, 2H), 4.17 (dd, *J* = 10.2, 6.8 Hz, 1H), 3.71–3.61 (m, 5H), 3.60–3.45 (m, 2H), 3.27–3.13 (m, 2H), 3.07–2.94 (m, 2H), 1.30 (t, *J* = 7.2 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.3, 166.1, 144.3, 138.0, 128.5, 128.5, 127.5, 125.0, 62.5, 58.8, 58.4, 55.8, 54.7, 52.5, 50.9, 49.0, 45.3, 14.1;

HRMS calculated for $C_{20}H_{28}N_5O_6S$ $(M+H)^+$ = 466.1760; found 466.1718 (TOF MS ES+).

Methyl 2-((1-(4-methylbenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-5-propyl-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*1,2*})



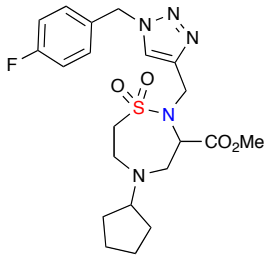
FTIR (neat) cm^{-1} 2957, 2932, 2872, 1745, 1329, 1144, 1084, 1047, 1007, 779, 758, 523, 505, 476;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.61 (s, 1H), 7.18 (s, 4H), 5.47 (s, 2H), 4.78–4.70 (m, 1H), 4.49 (dd, *J* = 16.5, 8.1 Hz, 1H), 4.11–4.04 (m, 1H), 3.57–3.51 (m, 3H), 3.42 (t, *J* = 7.7 Hz, 2H), 3.23–3.13 (m, 2H), 3.05–2.93 (m, 2H), 2.42 (dd, *J* = 13.9, 7.1 Hz, 2H), 2.35 (s, 3H), 1.47–1.36 (m, 2H), 0.90–0.81 (m, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.3, 144.2, 138.8, 131.5, 129.8, 128.1, 123.2, 58.2, 56.9, 55.8, 54.4, 54.1, 52.3, 49.8, 45.6, 21.1, 20.8, 11.5;

HRMS calculated for $C_{20}H_{30}N_5O_4S$ $(M+H)^+$ = 436.2019; found 436.2020 (TOF MS ES+).

Methyl 5-cyclopentyl-2-((1-(4-fluorobenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*3,5*})



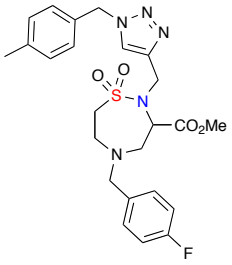
FTIR (neat) cm^{-1} 2951, 2868, 1744, 1512, 1327, 1223, 1140, 1086, 1047, 1014, 783, 530, 500;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.68 (s, 1H), 7.30–7.26 (m, 2H), 7.09–7.04 (m, 2H), 5.49 (s, 2H), 4.70 (d, *J* = 15.9 Hz, 1H), 4.55 (d, *J* = 15.9 Hz, 1H), 4.08 (dd, *J* = 10.6, 6.7 Hz, 1H), 3.54 (s, 3H), 3.48 (dd, *J* = 14.8, 6.6 Hz, 1H), 3.36 (dd, *J* = 14.8, 10.7 Hz, 1H), 3.20–3.13 (m, 2H), 3.09–3.04(m, 1H), 2.99–2.92 (m, 2H), 1.90–1.60 (m, 4H), 1.57–1.47 (m, 2H), 1.37–1.25 (m, 2H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.2, 162.8 ($^{1}J_{CF}$ = 248.3 Hz), 144.6, 130.5 ($^{4}J_{CF}$ = 3.4 Hz), 129.9 ($^{3}J_{CF}$ = 8.3 Hz), 123.3, 116.1 ($^{2}J_{CF}$ = 21.8 Hz), 64.3, 58.8, 54.7, 54.4, 53.5, 52.3, 48.5, 45.9, 30.7, 30.0, 23.8, 23.7;

HRMS calculated for $C_{21}H_{29}FN_5O_4S$ $(M+H)^+$ = 466.1924; found 466.1888 (TOF MS ES+).

Methyl 5-(4-fluorobenzyl)-2-((1-(4-methylbenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*8,2*})



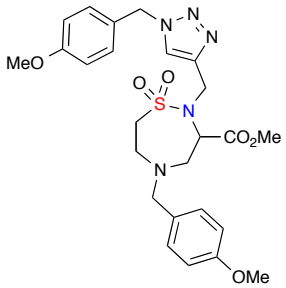
FTIR (neat) cm^{-1} 2951, 2926, 1745, 1728, 1508, 1327, 1219, 1142, 1082, 1049, 1013, 777, 758;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.61 (s, 1H), 7.21–7.14 (m, 6H), 7.03–6.98 (m, 2H), 5.50 (d, *J* = 1.1 Hz, 2H), 4.91 (d, *J* = 15.9 Hz, 1H), 4.46 (d, *J* = 15.9 Hz, 1H), 4.05 (dd, *J* = 10.3, 6.7 Hz, 1H), 3.61 (d, *J* = 13.4 Hz, 1H), 3.56 (s, 3H), 3.54 (d, *J* = 13.7 Hz, 1H), 3.46 (ddd, *J* = 21.5, 14.9, 8.6 Hz, 2H), 3.19–3.09 (m, 2H), 3.04–2.97 (m, 1H), 2.93 (dt, *J* = 14.5, 4.1 Hz, 1H), 2.34 (s, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.2, 162.2 ($^{1}J_{CF}$ = 245.7 Hz), 144.0, 138.9, 133.7 ($^{4}J_{CF}$ = 3.1 Hz), 131.4, 130.0 ($^{3}J_{CF}$ = 8.0 Hz), 129.8, 128.1, 123.2, 115.4 ($^{2}J_{CF}$ = 21.3 Hz), 58.0, 58.0, 55.6, 54.6, 54.1, 52.4, 49.2, 45.4, 21.1;

HRMS calculated for $C_{24}H_{29}FN_5O_4S$ $(M+H)^+$ = 502.1924; found 502.1902 (TOF MS ES+).

Methyl 5-(4-methoxybenzyl)-2-((1-(4-methoxybenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*4,1*})



FTIR (neat) cm^{-1} 2951, 2837, 1744, 1612, 1514, 1327, 1248, 1142, 1030, 824, 783, 758, 515;

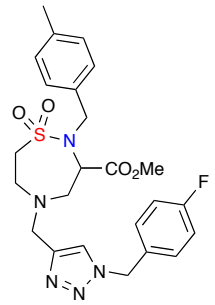
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.61 (s, 1H), 7.25–7.21 (m, 2H), 7.14 (d, *J* = 8.5 Hz, 2H), 6.87–6.85 (m, 4H), 5.47 (s, 2H), 4.87 (d, *J* = 15.9 Hz, 1H), 4.48 (d, *J* = 15.9 Hz, 1H), 4.06 (dd, *J* = 10.1, 6.9 Hz, 1H), 3.81 (s, 3H), 3.79 (s, 3H), 3.59 (d, *J* = 13.1 Hz, 1H), 3.54 (s, 3H), 3.51 (d, *J* = 11.8 Hz, 1H), 3.44 (ddd, *J* = 28.4, 13.8, 7.7 Hz, 2H), 3.20–3.14 (m, 1H), 3.12 (dd, *J* = 10.9, 7.2 Hz, 1H), 3.01–2.90 (m, 2H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.2, 159.9, 159.0, 144.1, 129.9, 129.7, 129.6, 126.5, 123.1, 114.5, 113.9, 58.2, 55.7, 55.3, 55.3, 54.5, 53.8, 52.3, 48.9, 45.5, 30.9;

HRMS calculated for $C_{25}H_{32}N_5O_6S$ $(M+H)^+$ = 530.2073; found 530.2090 (TOF MS ES+).

Characterization Data for Representative Library Compounds 8

Methyl 5-((1-(4-fluorobenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-2-(4-methylbenzyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*2,5*})



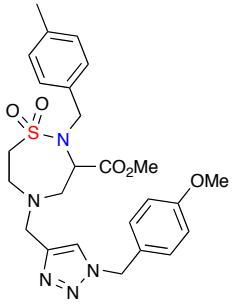
FTIR (neat): 2935, 2845, 1734, 1512, 1330, 1223, 1142 cm^{-1};

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.28 (s, 1H), 7.26 (d, *J* = 2.9 Hz, 2H), 7.26–7.22 (m, 2H), 7.12 (d, *J* = 7.7 Hz, 2H), 7.10–7.05 (m, 2H), 5.49 (s, 2H), 4.73 (d, *J* = 15.0 Hz, 1H), 4.36 (d, *J* = 15.0 Hz, 1H), 3.88 (dd, *J* = 10.8, 6.4 Hz, 1H), 3.83–3.75 (m, 2H), 3.51 (s, 3H), 3.47 (dd, *J* = 14.6, 10.5 Hz, 1H), 3.34 (dd, *J* = 14.5, 6.4 Hz, 1H), 3.28 (dd, *J* = 14.1, 7.2 Hz, 1H), 3.23 (dt, *J* = 14.0, 3.9 Hz, 1H), 3.07 (dd, *J* = 7.0, 3.9 Hz, 2H), 2.62 (s, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.2, 162.9 ($^1J_{CF}$ = 248.4 Hz), 145.1, 137.7, 132.7, 129.8 ($^3J_{CF}$ = 8.2 Hz), 129.2, 129.1 ($^3J_{CF}$ = 4.9 Hz), 128.7, 122.0, 116.2 ($^4J_{CF}$ = 21.8 Hz), 57.3, 55.5, 54.5, 53.5, 53.4, 52.2, 50.9, 49.8, 21.1;

HRMS calculated for $C_{24}H_{29}FN_5O_4S$ $(M+H)^+$ = 502.1924; found 502.1909 (TOF MS ES+).

Methyl 5-((1-(4-methoxybenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-2-(4-methylbenzyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*2,1*})



FTIR (neat): 2949, 2838, 1744, 1515, 1330, 1250, 1142 cm^{-1};

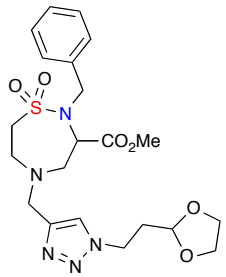
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.28 (d, *J* = 2.5 Hz, 1H), 7.26 (s, 1H), 7.23–7.19 (m, 3H), 7.12 (d, *J* = 7.8 Hz, 2H), 6.92–6.88 (m, 2H), 5.45 (s, 2H), 4.71 (d, *J* = 15.0 Hz, 1H), 4.36 (d, *J* = 15.0 Hz, 1H), 3.88 (dt, *J* = 6.4, 4.6

Hz, 1H), 3.81 (s, 3H), 3.77 (d, J = 3.5 Hz, 2H), 3.51 (s, 3H), 3.46 (dd, J = 14.6, 10.5 Hz, 1H), 3.34 (dd, J = 14.4, 6.4 Hz, 1H), 3.28 (dd, J = 14.1, 6.8 Hz, 1H), 3.24 (dd, J = 7.4, 3.3 Hz, 1H), 3.06 (dd, J = 6.9, 3.9 Hz, 2H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.2, 160.0, 144.8, 137.7, 132.8, 129.6, 129.2, 129.1, 126.5, 121.8, 114.5, 57.3, 55.5, 55.3, 54.5, 53.7, 53.5, 52.2, 50.9, 49.7, 21.1;

HRMS calculated for $C_{25}H_{32}N_5O_5S$ $(M+H)^+$ = 514.2124; found 514.2106 (TOF MS ES+).

Methyl 5-((1-(2-(1,3-dioxolan-2-yl)ethyl)-1*H*-1,2,3-triazol-4-yl)methyl)-2-benzyl-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*3,8*})



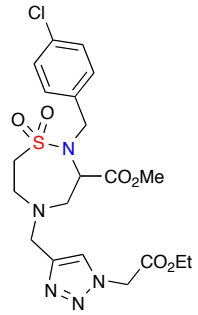
FTIR (neat): 2953, 2885, 2843, 1744, 1328, 1142 cm^{-1};

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.46–7.42 (m, 2H), 7.39–7.29 (m, 4H), 4.92 (t, J = 4.2 Hz, 1H), 4.79 (d, J = 15.1 Hz, 1H), 4.50 (t, J = 7.2 Hz, 2H), 4.43 (d, J = 15.1 Hz, 1H), 4.01–3.97 (m, 2H), 3.95 (dd, J = 10.1, 6.9 Hz, 1H), 3.89–3.86 (m, 2H), 3.83 (d, J = 2.3 Hz, 2H), 3.51 (s, 3H), 3.50–3.46 (m, 1H), 3.37 (dd, J = 14.6, 6.6 Hz, 1H), 3.34–3.28 (m, 1H), 3.26 (dd, J = 11.2, 7.2 Hz, 1H), 3.08 (dd, J = 6.6, 4.2 Hz, 2H), 2.29 (td, J = 7.2, 4.3 Hz, 2H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.1, 144.4, 135.9, 129.2, 128.5, 128.0, 122.4, 101.5, 65.1, 57.5, 55.7, 54.6, 53.7, 52.2, 51.3, 49.7, 45.3, 34.0;

HRMS calculated for $C_{21}H_{30}N_5O_6S$ $(M+H)^+$ = 480.1917; found 480.1909 (TOF MS ES+).

Methyl 2-(4-chlorobenzyl)-5-((1-(2-ethoxy-2-oxoethyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*4,6*})



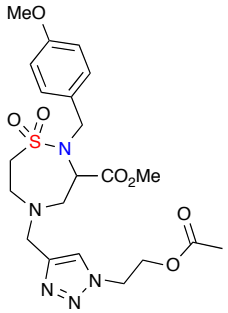
FTIR (neat): 2984, 2953, 2940, 1750, 1730, 1330, 1215, 1142 cm^{-1};

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.53 (s, 1H), 7.41–7.38 (m, 2H), 7.33–7.30 (m, 2H), 5.17 (s, 2H), 4.69 (d, *J* = 15.3 Hz, 1H), 4.43 (d, *J* = 15.3 Hz, 1H), 4.29 (q, *J* = 7.2 Hz, 2H), 3.96 (dd, *J* = 10.2, 7.0 Hz, 1H), 3.93 (d, *J* = 4.3 Hz, 2H), 3.51 (s, 3H), 3.49 (dd, *J* = 14.6, 10.4 Hz, 1H), 3.38 (dd, *J* = 14.6, 6.7 Hz, 1H), 3.26 (dd, *J* = 8.1, 3.2 Hz, 2H), 3.09 (dd, *J* = 10.0, 5.0 Hz, 2H), 1.32 (t, *J* = 7.2 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 169.9, 166.2, 145.0, 134.6, 133.7, 130.4, 128.6, 123.7, 62.5, 57.9, 55.9, 54.4, 53.1, 52.3, 51.9, 50.8, 49.9, 14.1;

HRMS calculated for $C_{20}H_{27}ClN_5O_6S$ $(M+H)^+$ = 500.1371; found 500.1376 (TOF MS ES+).

Methyl 5-((1-(2-acetoxyethyl)-1*H*-1,2,3-triazol-4-yl)methyl)-2-(4-methoxybenzyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*1,7*})



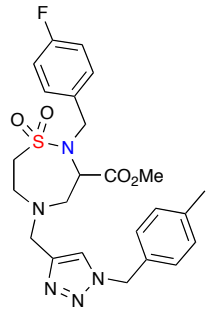
FTIR (neat): 2953, 2838, 1743, 1513, 1327, 1242, 1141, 1045, 1030 cm^{-1};

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.38 (s, 1H), 7.37–7.33 (m, 2H), 6.91–6.86 (m, 2H), 4.72 (d, *J* = 15.0 Hz, 1H), 4.63–4.59 (m, 2H), 4.50–4.45 (m, 2H), 4.38 (d, *J* = 14.8 Hz, 1H), 3.94 (dd, *J* = 10.5, 6.5 Hz, 1H), 3.83 (dd, *J* = 18.8, 14.2 Hz, 2H), 3.81 (s, 3H), 3.53 (s, 3H), 3.49 (dd, *J* = 14.6, 10.5 Hz, 1H), 3.41–3.33 (m, 1H), 3.32–3.20 (m, 2H), 3.08 (dd, *J* = 6.9, 4.0 Hz, 2H), 2.05 (s, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.3, 170.3, 159.4, 144.8, 130.6, 127.9, 122.7, 113.9, 62.2, 57.2, 55.7, 55.3, 54.5, 53.3, 52.3, 50.9, 49.8, 49.1, 20.6;

HRMS calculated for $C_{21}H_{30}N_5O_7S$ $(M+H)^+$ = 496.1866; found 496.1844 (TOF MS ES+).

Methyl 2-(4-fluorobenzyl)-5-((1-(4-methylbenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*5,2*})



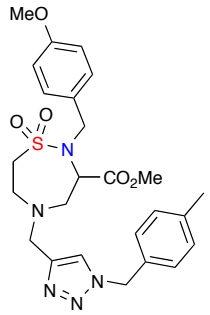
FTIR (neat): 2949, 2922, 2843, 1744, 1510, 1330, 1220, 1142, 1048, 756 cm^{-1};

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.41–7.36 (m, 2H), 7.27 (s, 1H), 7.18 (q, *J* = 8.2 Hz, 4H), 7.02–6.97 (m, 2H), 5.48 (s, 2H), 4.66 (d, *J* = 15.3 Hz, 1H), 4.42 (d, *J* = 15.1 Hz, 1H), 3.93 (dd, *J* = 10.4, 6.6 Hz, 1H), 3.84 (q, *J* = 14.1 Hz, 2H), 3.49 (s, 3H), 3.46 (dd, *J* = 9.2, 5.3 Hz, 1H), 3.33 (dd, *J* = 14.6, 6.6 Hz, 1H), 3.24 (dd, *J* = 8.7, 4.4 Hz, 2H), 3.06 (dd, *J* = 6.3, 4.5 Hz, 2H), 2.36 (s, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.0, 162.4 ($^1J_{CF}$ = 246.6 Hz), 144.8, 138.9, 131.8 ($^4J_{CF}$ = 3.2 Hz), 131.4, 130.8 ($^3J_{CF}$ = 8.2 Hz), 129.8, 128.1, 122.0, 115.3 ($^2J_{CF}$ = 21.8 Hz), 57.7, 55.6, 54.3, 54.0, 53.1, 52.2, 51.4, 49.8, 21.2;

HRMS calculated for $C_{24}H_{29}FN_5O_4S$ $(M+H)^+$ = 502.1924; found 502.1895 (TOF MS ES+).

Methyl 2-(4-methoxybenzyl)-5-((1-(4-methylbenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*1,2*})



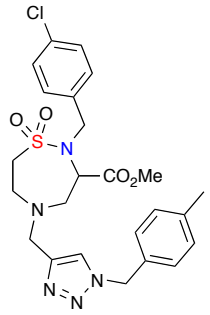
FTIR (neat): 2949, 2837, 1751, 1740, 1520, 1328, 1246, 1142, 1048, 1032 cm^{-1};

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.33–7.29 (m, 2H), 7.22 (s, 1H), 7.16 (t, *J* = 8.3 Hz, 4H), 6.87–6.82 (m, 2H), 5.47 (s, 2H), 4.68 (d, *J* = 14.8 Hz, 1H), 4.35 (d, *J* = 15.0 Hz, 1H), 3.90 (dd, *J* = 10.5, 6.6 Hz, 1H), 3.79 (s, 3H), 3.78 (dd, *J* = 18.8, 11.7 Hz, 2H), 3.52 (s, 3H), 3.46 (dd, *J* = 14.6, 10.5 Hz, 1H), 3.34 (dd, *J* = 14.6, 6.5 Hz, 1H), 3.29–3.18 (m, 2H), 3.05 (dd, *J* = 7.1, 3.9 Hz, 2H), 2.36 (s, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.2, 159.3, 144.9, 138.8, 131.5, 130.5, 129.8, 128.0, 127.8, 122.0, 113.8, 57.2, 55.6, 55.3, 54.5, 54.0, 53.3, 52.2, 50.9, 49.7, 21.2;

HRMS calculated for $C_{25}H_{32}N_5O_5S$ $(M+H)^+$ = 514.2124; found 514.2114 (TOF MS ES+).

Methyl 2-(4-chlorobenzyl)-5-((1-(4-methylbenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*4,2*})



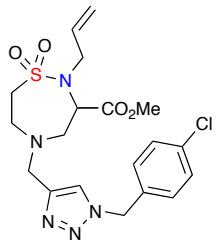
FTIR (neat): 2923, 2849, 1747, 1734, 1330, 1142, 1080, 1048, 1014, 759 cm^{-1};

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.37–7.34 (m, 2H), 7.30–7.27 (m, 3H), 7.17 (dt, *J* = 6.1, 5.0 Hz, 4H), 5.49 (s, 2H), 4.66 (d, *J* = 15.3 Hz, 1H), 4.41 (d, *J* = 15.3 Hz, 1H), 3.92 (dd, *J* = 10.4, 6.6 Hz, 1H), 3.85 (dd, *J* = 20.2, 14.1 Hz, 2H), 3.49 (s, 3H), 3.45 (dd, *J* = 14.5, 10.4 Hz, 1H), 3.33 (dd, *J* = 14.5, 6.6 Hz, 1H), 3.26–3.22 (m, 2H), 3.06 (dd, *J* = 7.8, 4.5 Hz, 2H), 2.36 (s, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 169.9, 144.7, 138.9, 134.6, 133.7, 131.4, 130.4, 129.9, 128.6, 128.1, 122.0, 57.8, 55.7, 54.3, 54.0, 53.1, 52.3, 51.6, 49.8, 21.2;

HRMS calculated for $C_{24}H_{29}ClN_5O_4S$ $(M+H)^+$ = 518.1629; found 518.1636 (TOF MS ES+).

Methyl 2-allyl-5-((1-(4-chlorobenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*6,4*})



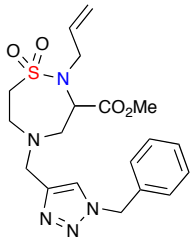
FTIR (neat): 2950, 2847, 1746, 1327, 1142 cm^{-1};

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.39 (s, 1H), 7.38–7.35 (m, 2H), 7.23–7.19 (m, 2H), 5.91 (ddt, *J* = 16.8, 10.1, 6.6 Hz, 1H), 5.51 (s, 2H), 5.23 (ddd, *J* = 13.6, 11.3, 1.3 Hz, 2H), 4.18–4.11 (m, 1H), 3.98–3.87 (m, 4H), 3.70 (s, 3H), 3.43 (dd, *J* = 8.6, 2.1 Hz, 2H), 3.28–3.15 (m, 2H), 3.11–2.99 (m, 2H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 170.4, 145.1, 134.9, 133.3, 133.0, 129.4, 129.4, 122.1, 119.2, 57.4, 55.7, 54.3, 53.5, 53.2, 52.4, 51.2, 49.9;

HRMS calculated for $C_{19}H_{25}ClN_5O_4S$ $(M+H)^+$ = 454.1316; found 454.1297 (TOF MS ES+).

Methyl 2-allyl-5-((1-benzyl-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*6,3*})



FTIR (neat): 2951, 2925, 2848, 1747, 1733, 1328, 1243, 1049, 759, 720 cm^{-1};

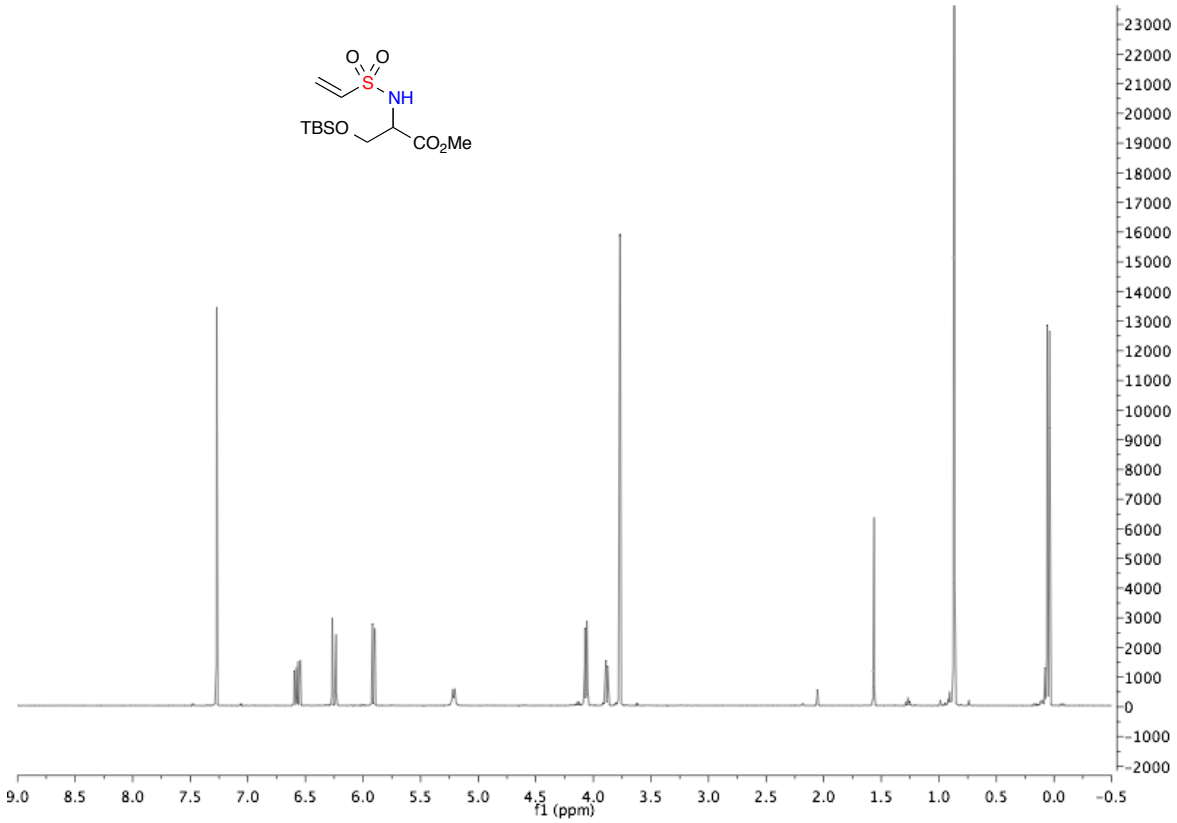
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.44–7.35 (m, 4H), 7.28 (d, *J* = 2.5 Hz, 1H), 7.26 (s, 1H), 5.90 (ddt, *J* = 16.8, 10.1, 6.6 Hz, 1H), 5.54 (s, 2H), 5.21 (ddd, *J* = 13.6, 11.3, 1.3 Hz, 2H), 4.14 (ddd, *J* = 14.3, 6.1, 3.3 Hz, 1H), 3.99–3.86 (m, 4H), 3.70 (s, 3H), 3.46–3.41 (m, 2H), 3.27–3.14 (m, 2H), 3.11–2.98 (m, 2H);

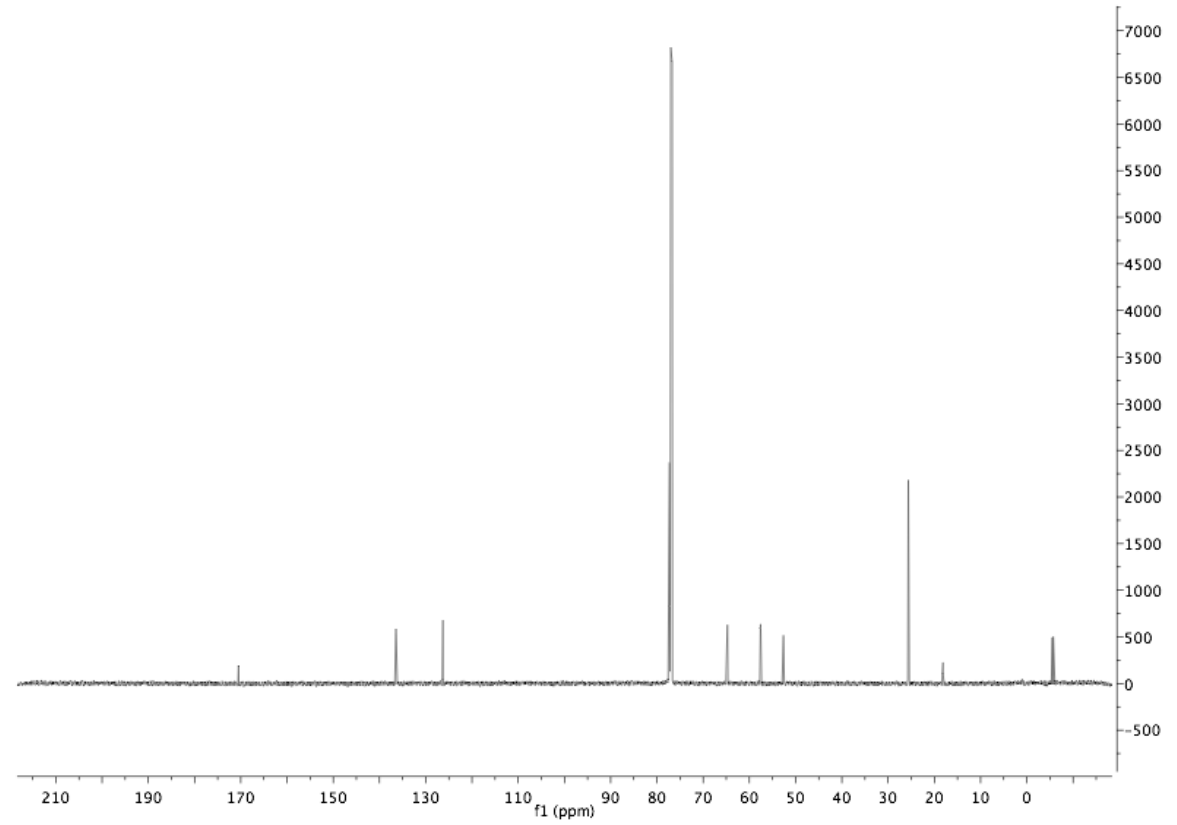
^{13}C NMR (126 MHz, $CDCl_3$) δ 170.4, 145.0, 134.5, 133.3, 129.2, 128.9, 128.0, 122.1, 119.2, 57.4, 55.8, 54.3, 54.2, 53.2, 52.4, 51.3, 49.8;

HRMS calculated for $C_{19}H_{26}N_5O_4S$ $(M+H)^+$ = 420.1706; found 420.1684 (TOF MS ES+).

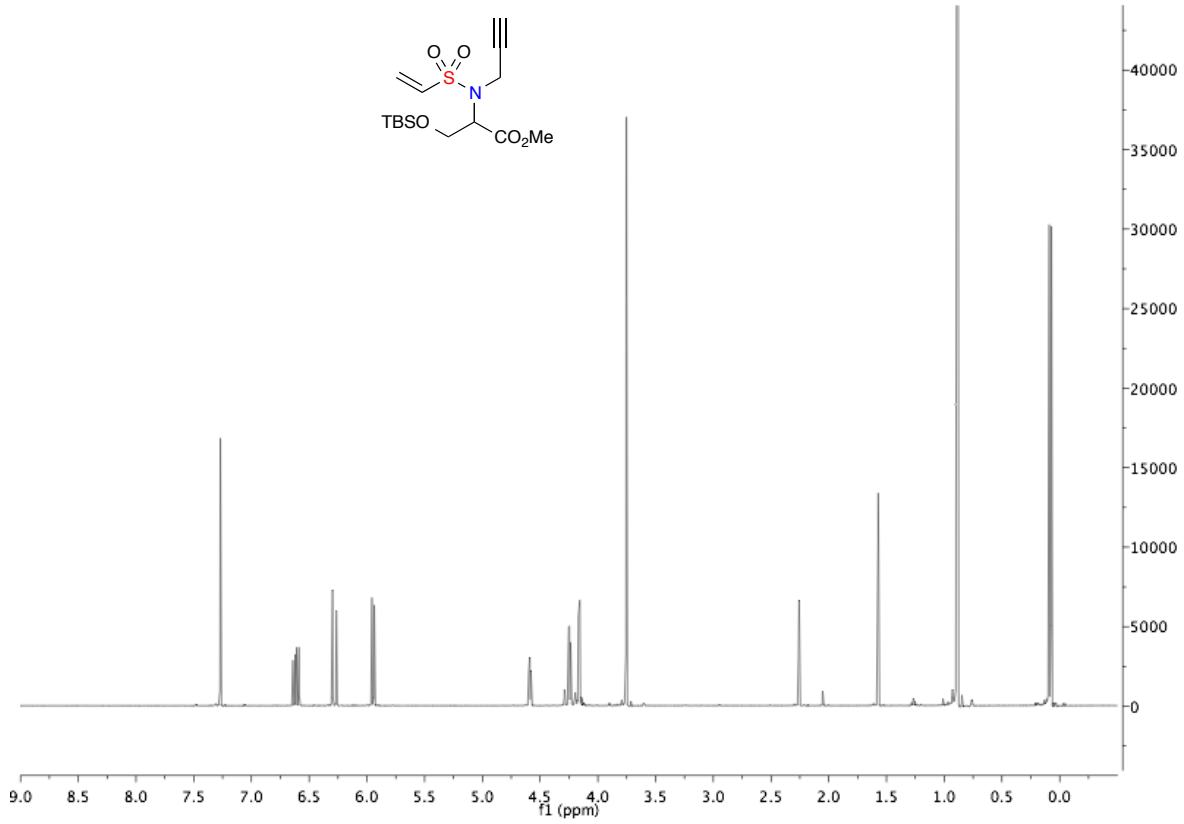
Spectral Data for Compounds 2, 3, 7

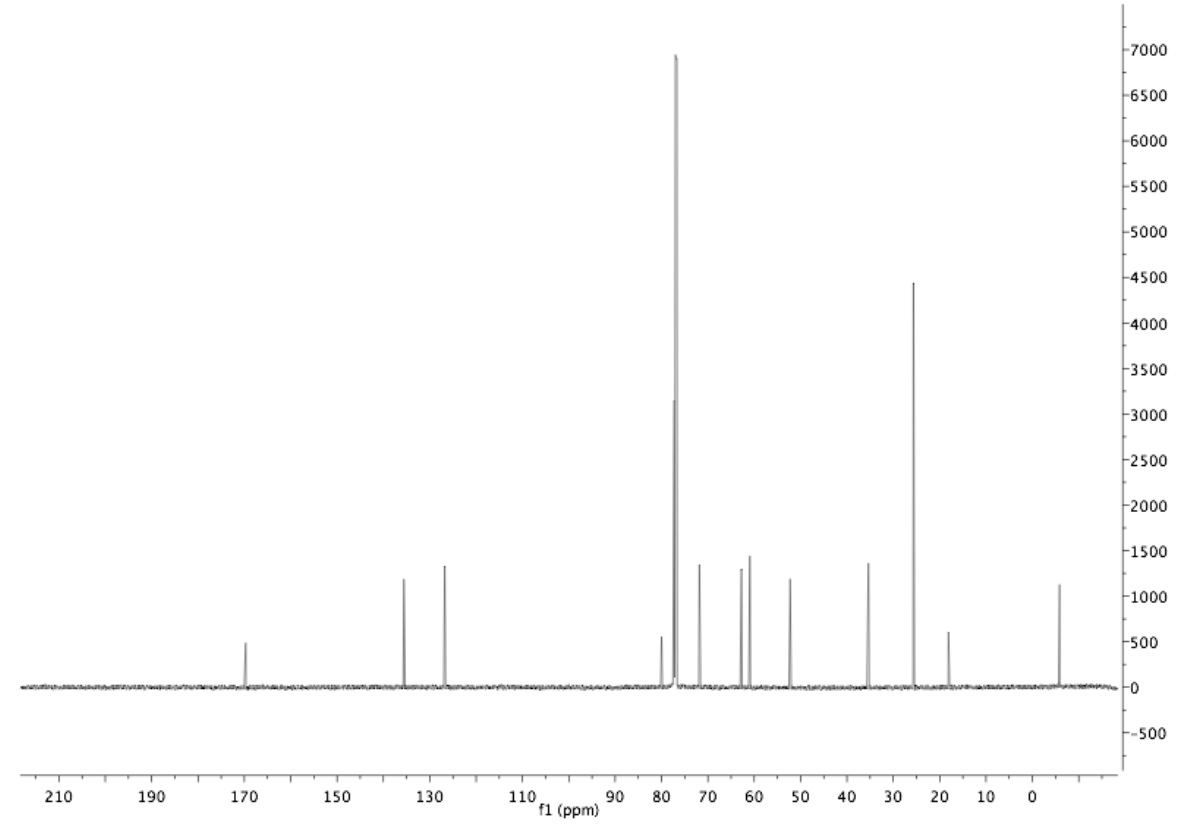
Methyl 3-((*tert*-butyldimethylsilyl)oxy)-2-(vinylsulfonamido)propanoate (2)



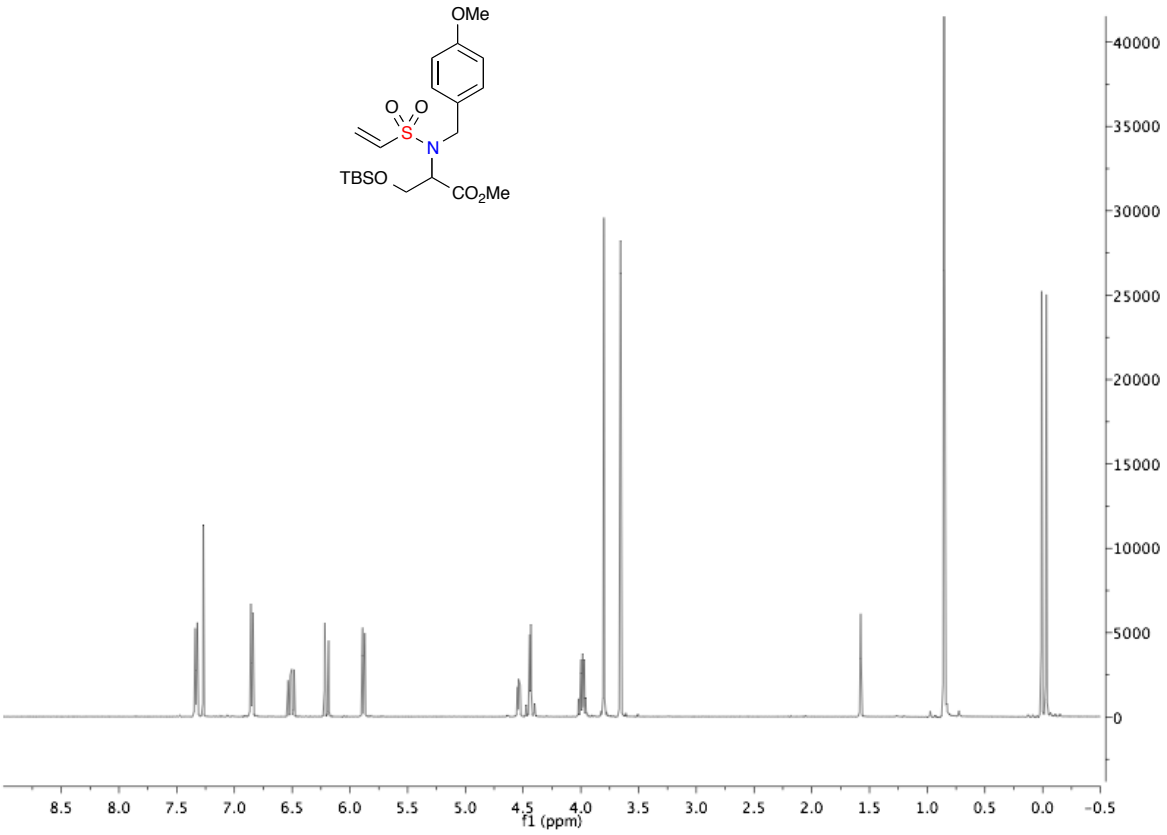


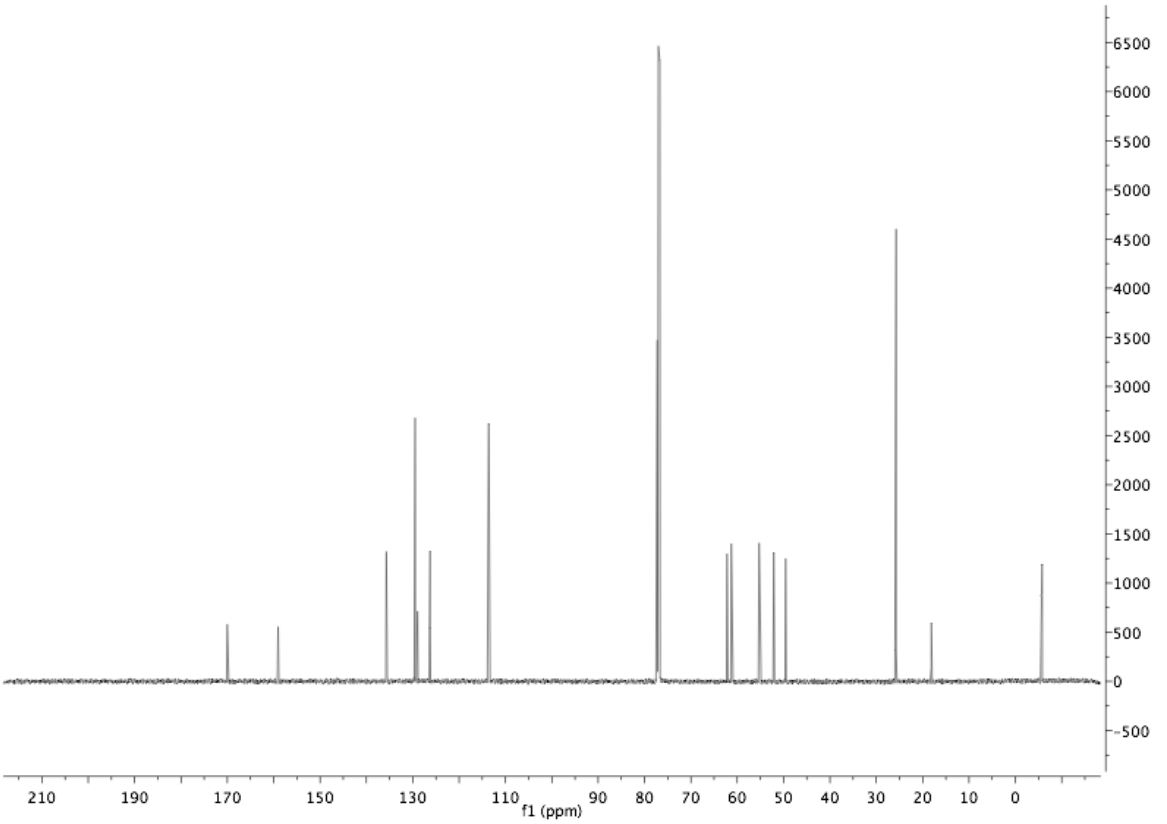
Methyl 3-((*tert*-butyldimethylsilyl)oxy)-2-(*N*-(prop-2-yn-1-yl)vinylsulfonamido)propanoate (3)



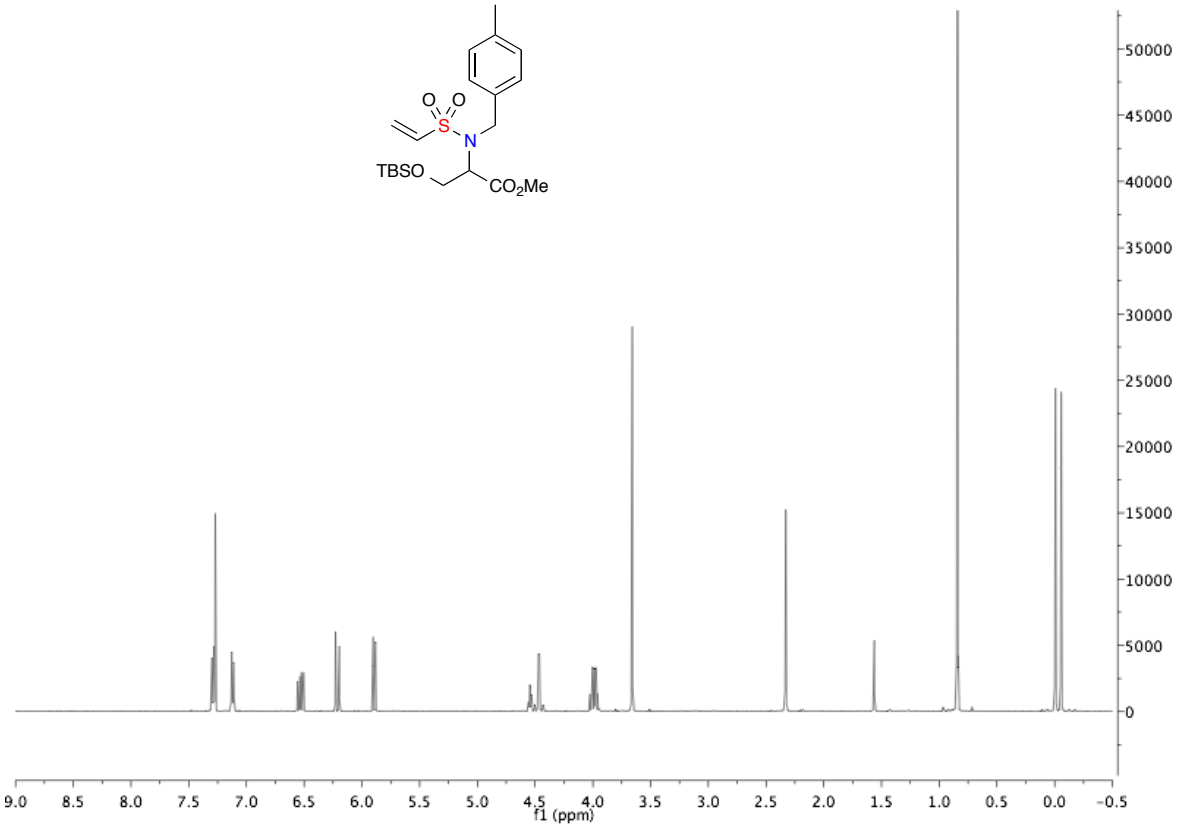


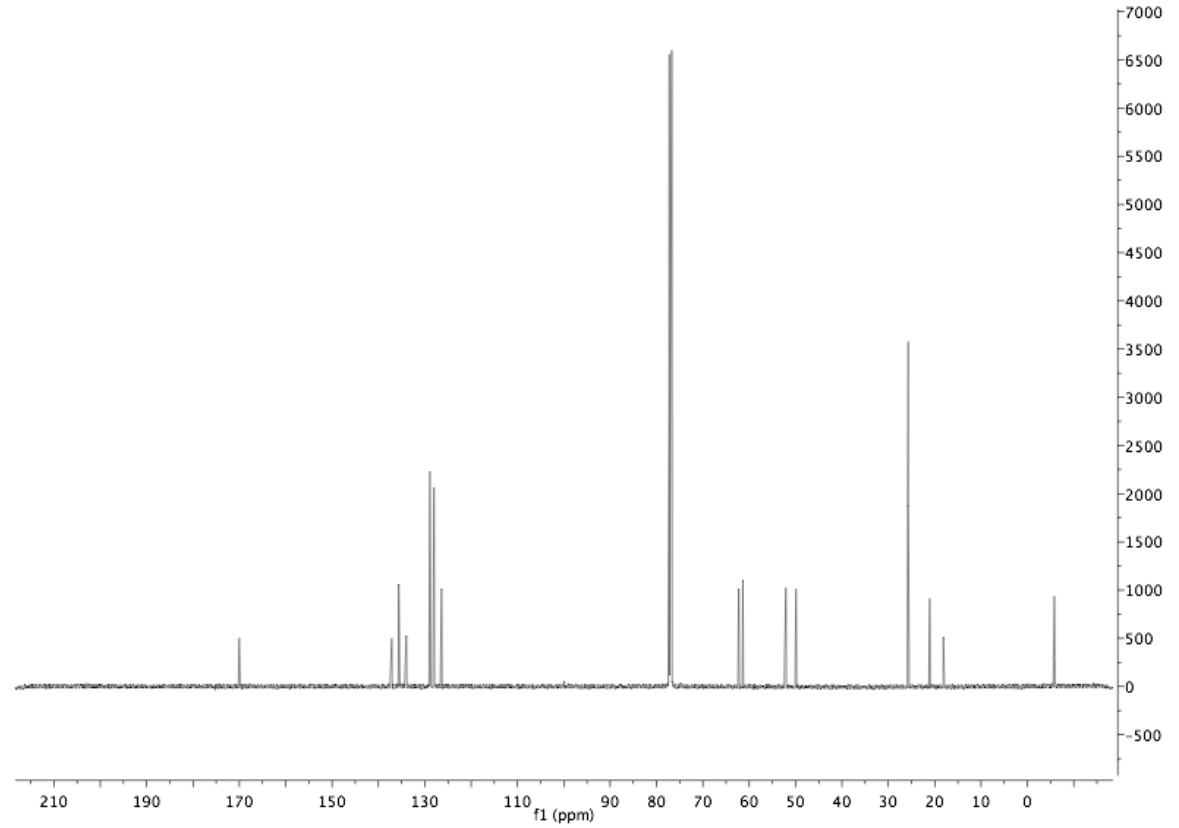
Methyl 3-((*tert*-butyldimethylsilyl)oxy)-2-(*N*-(4-methoxybenzyl)vinylsulfonamido)propanoate (7{*1*})



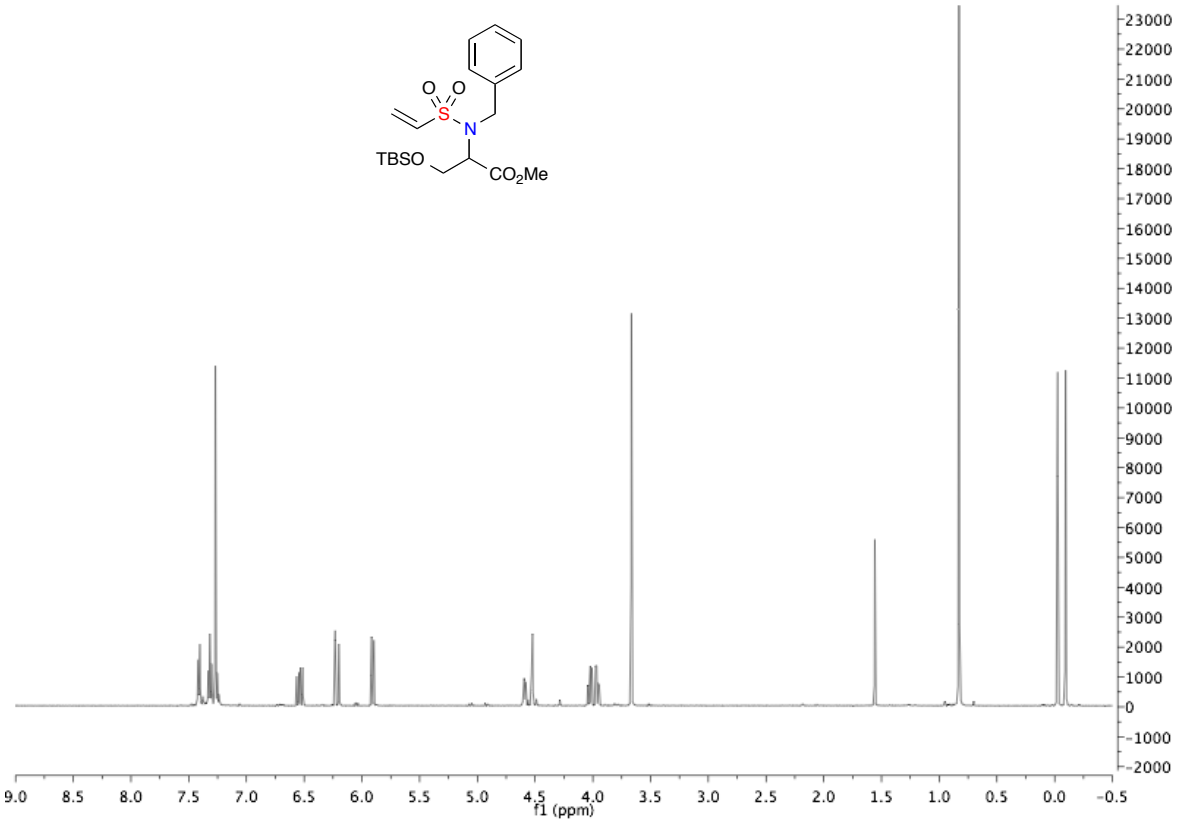


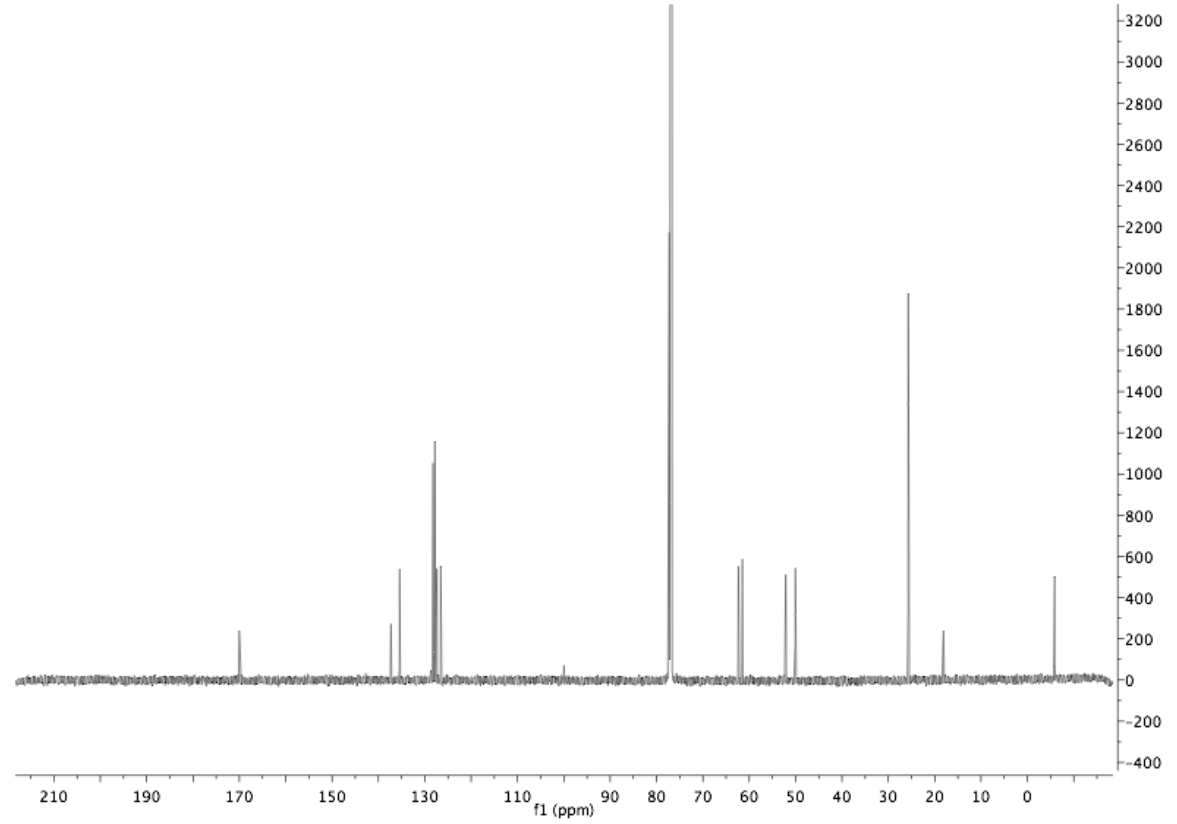
Methyl 3-((*tert*-butyldimethylsilyl)oxy)-2-(*N*-(4-methylbenzyl)vinylsulfonamido)propanoate (7{*2*})



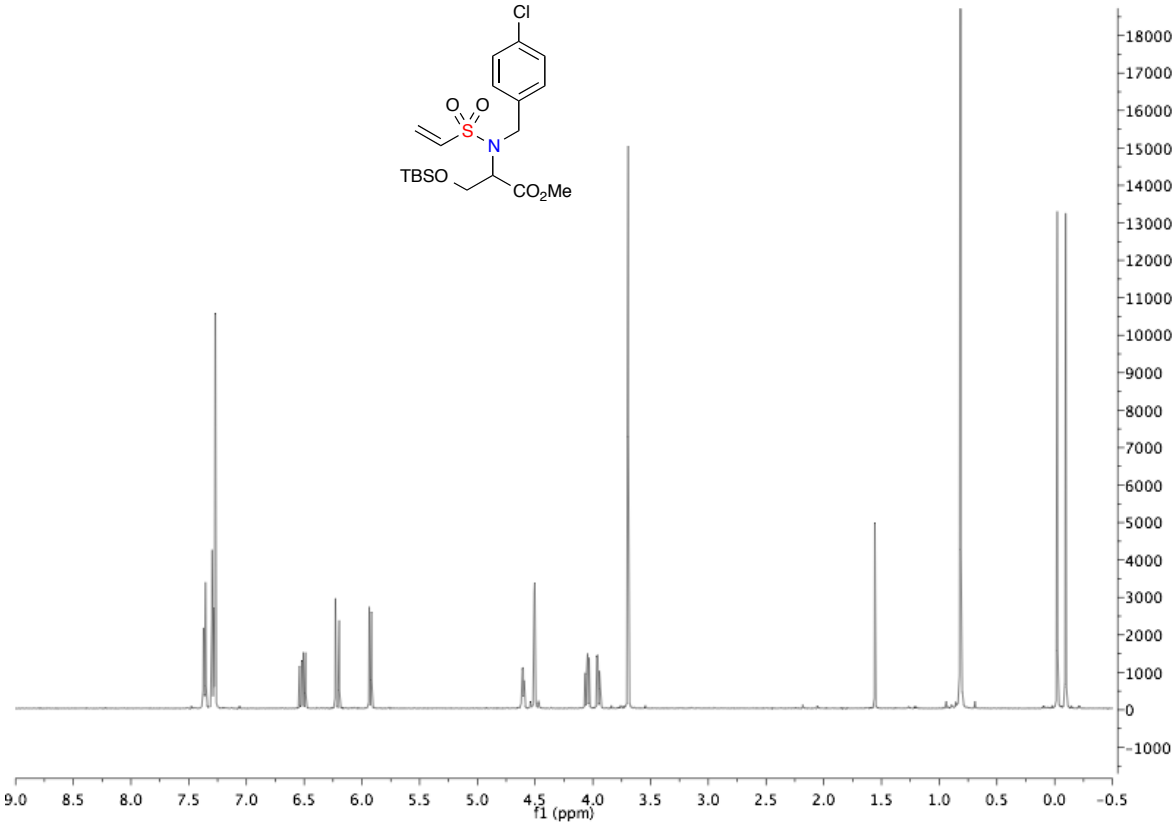


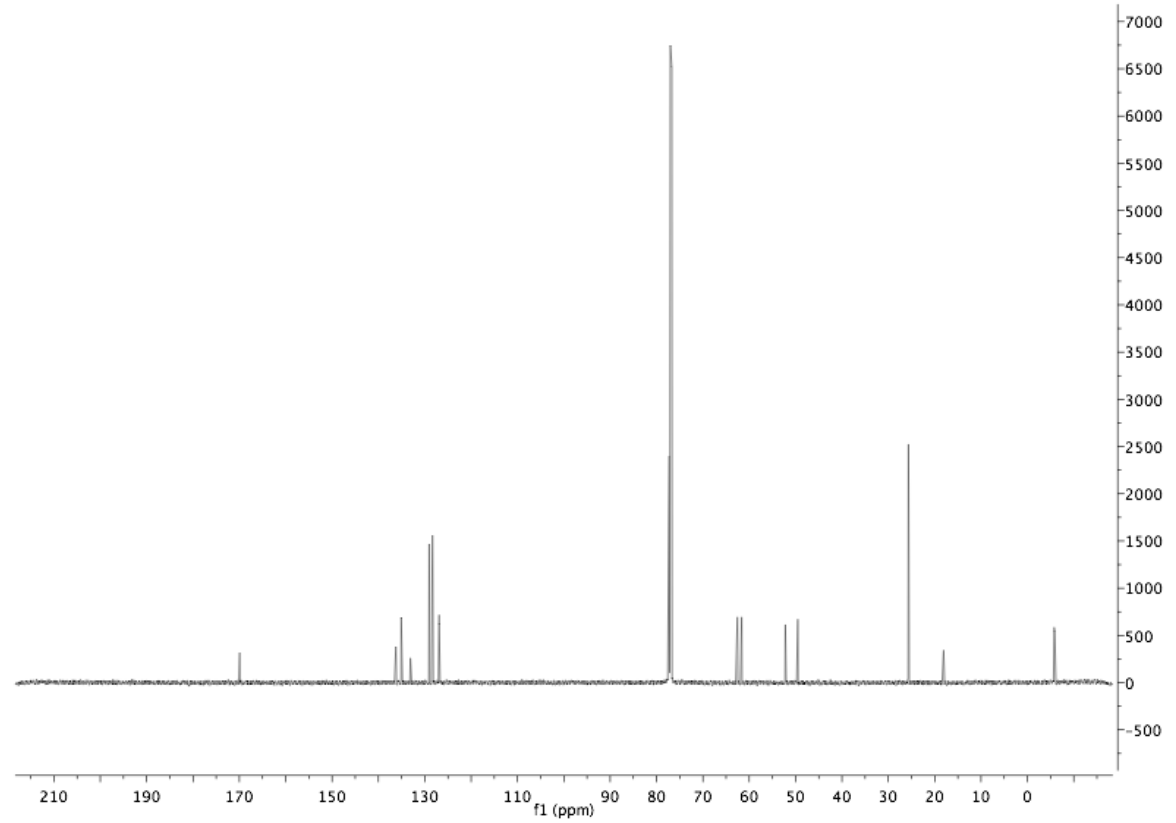
Methyl 2-(*N*-benzylvinylsulfonamido)-3-((*tert*-butyldimethylsilyl)oxy)propanoate (7{*3*})



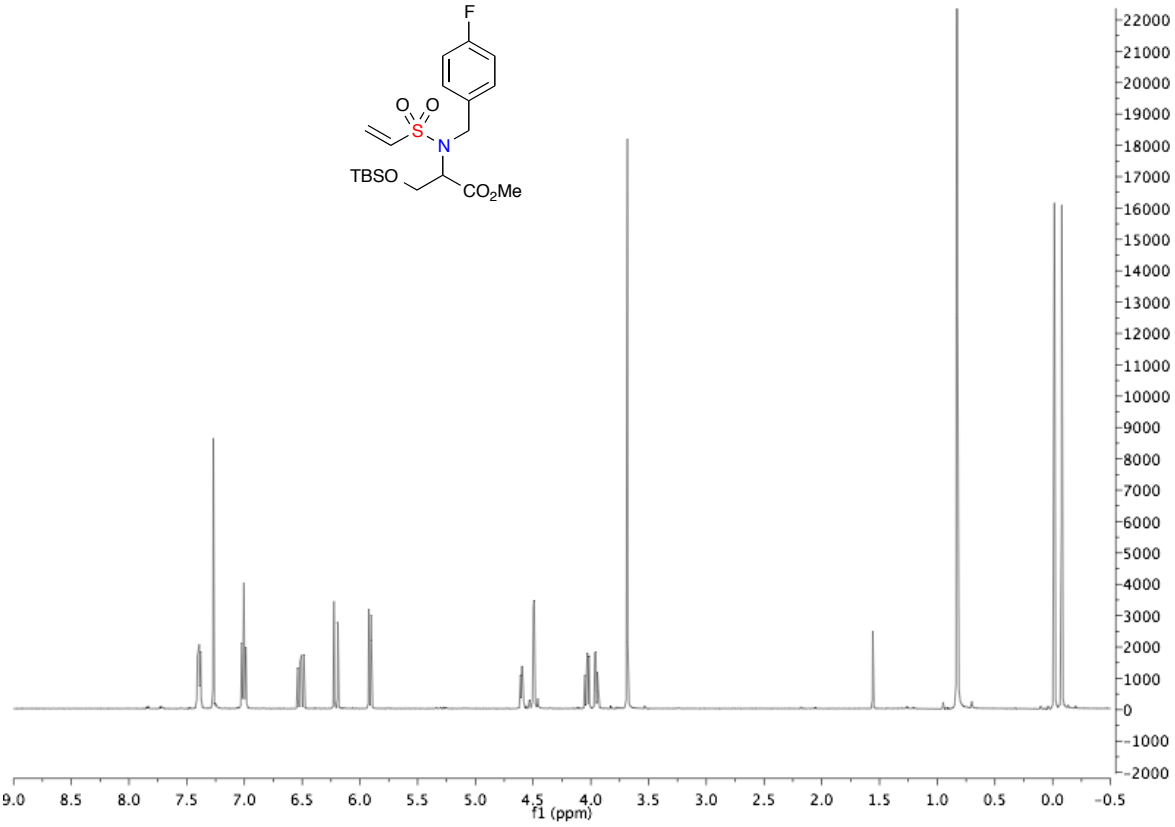


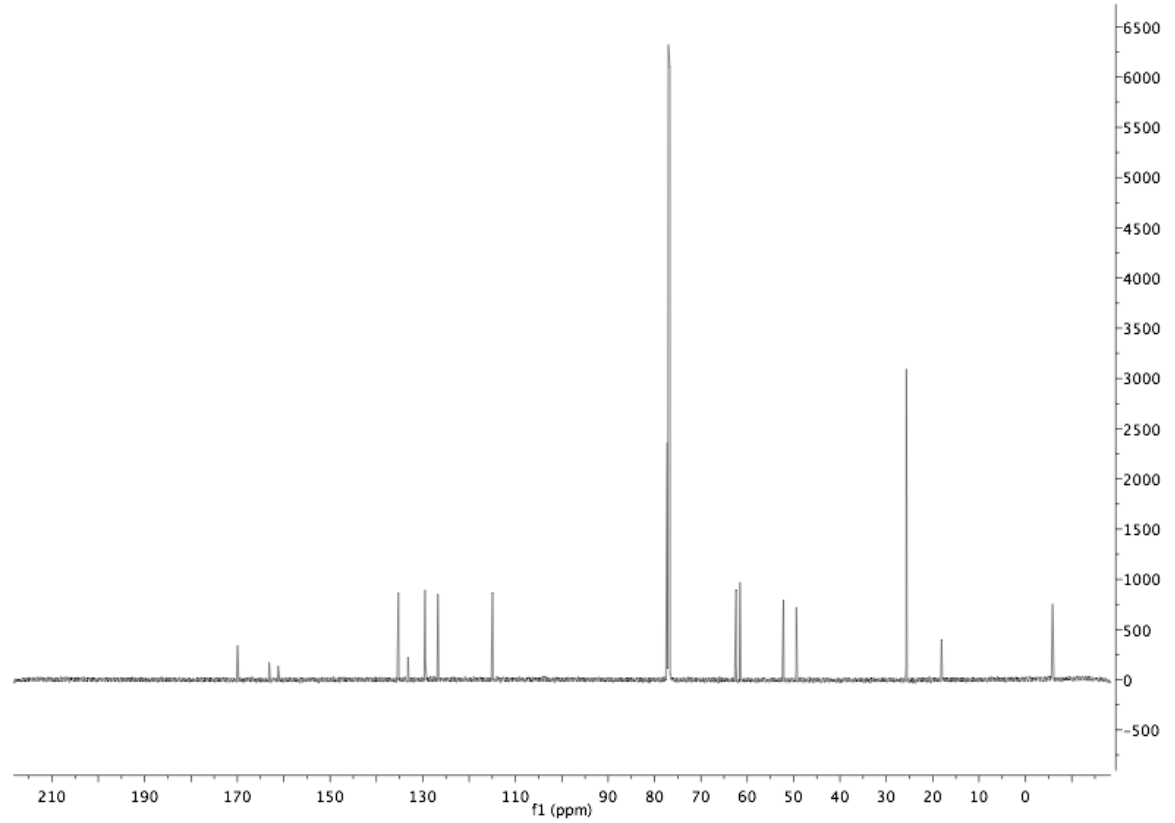
Methyl 3-((*tert*-butyldimethylsilyl)oxy)-2-(*N*-(4-chlorobenzyl)vinylsulfonamido)propanoate (7{*4*})



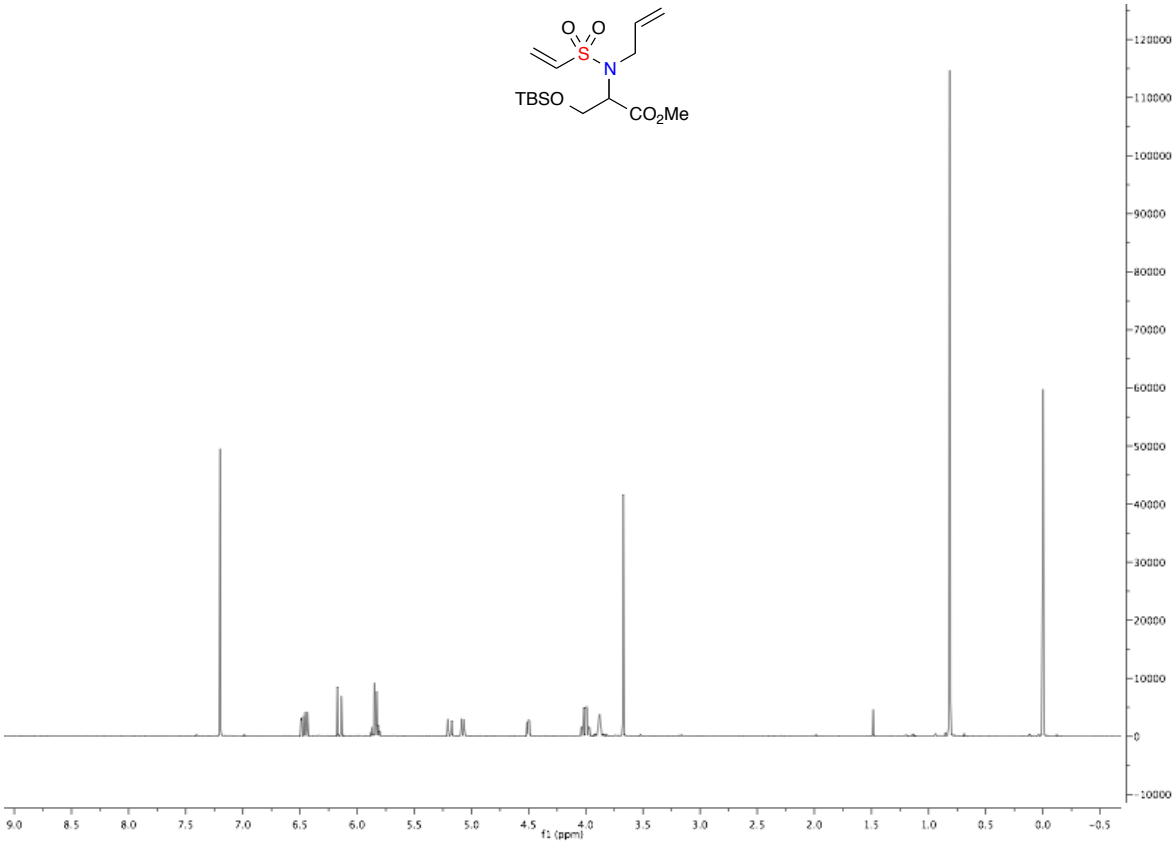


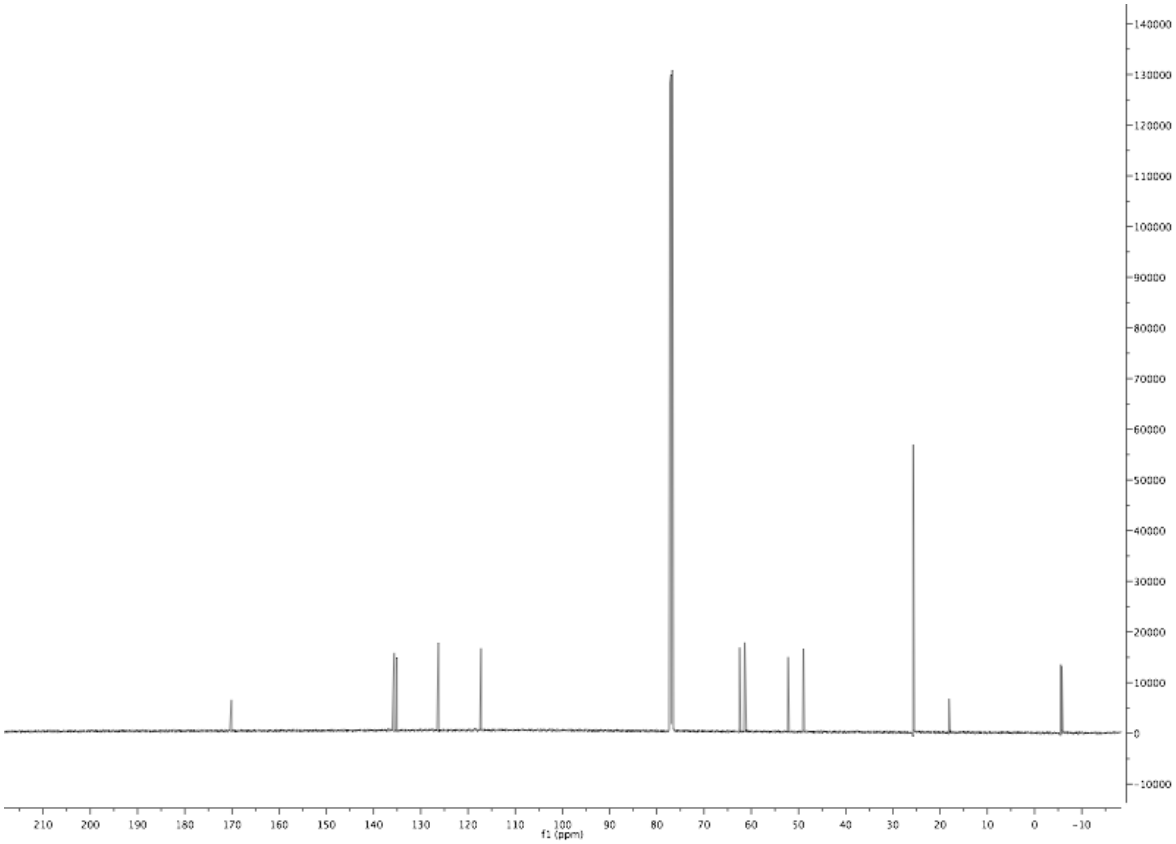
Methyl 3-((*tert*-butyldimethylsilyl)oxy)-2-(*N*-(4-fluorobenzyl)vinylsulfonamido)propanoate (7{*5*})





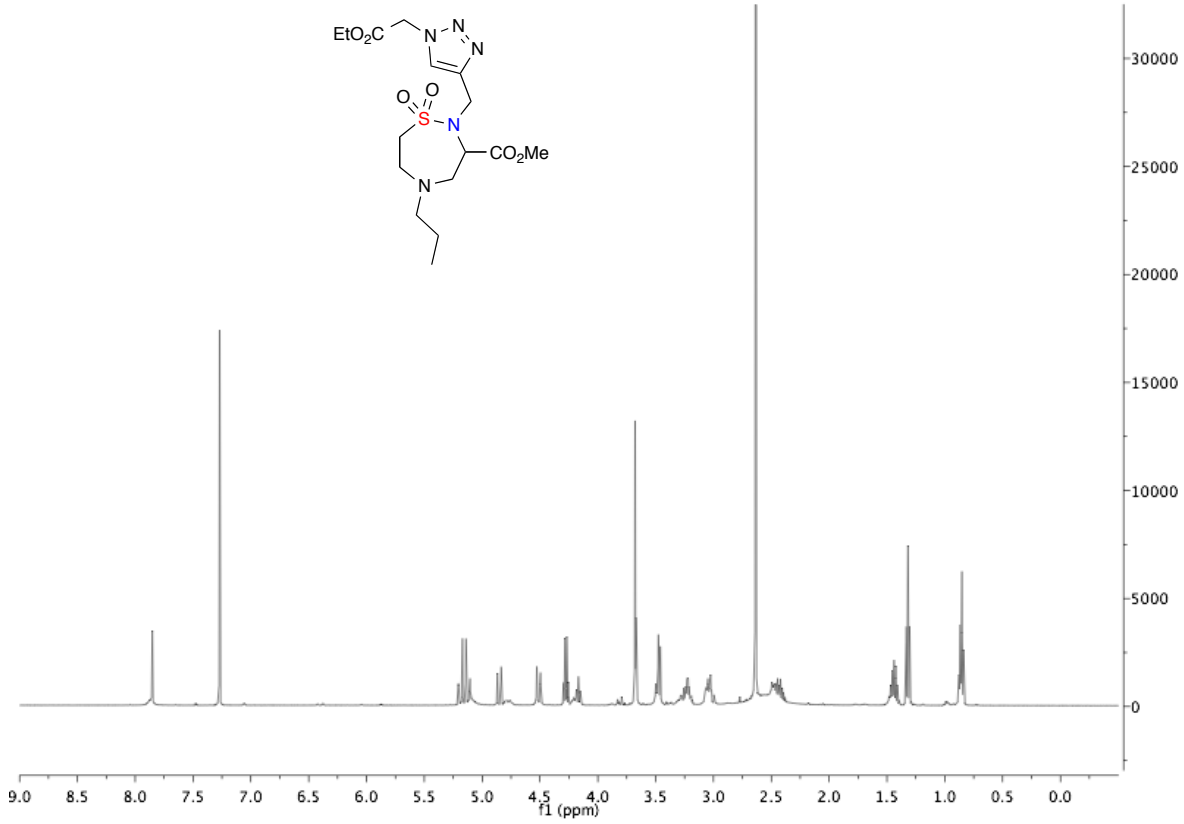
Methyl 2-(*N*-allylvinylsulfonamido)-3-((*tert*-butyldimethylsilyl)oxy)propanoate (7{*6*})

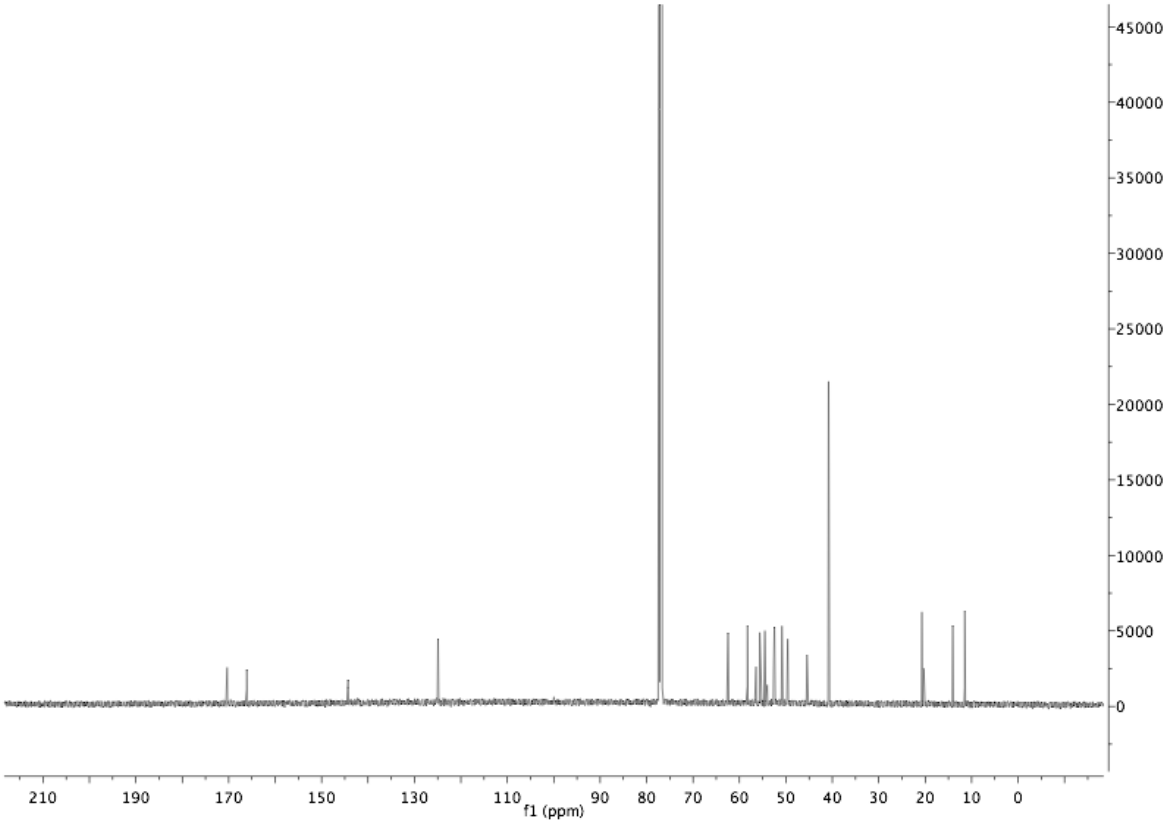




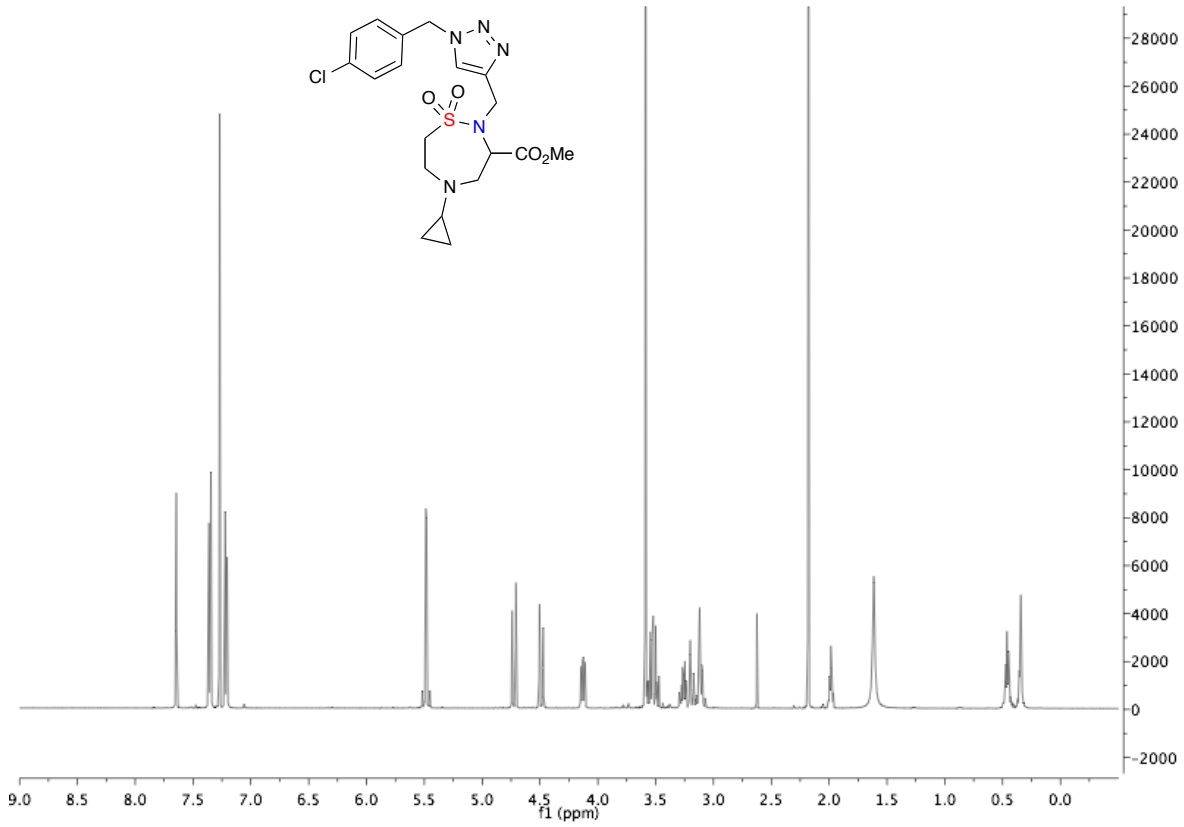
Spectral Data for Representative Library Compounds 6 and 8

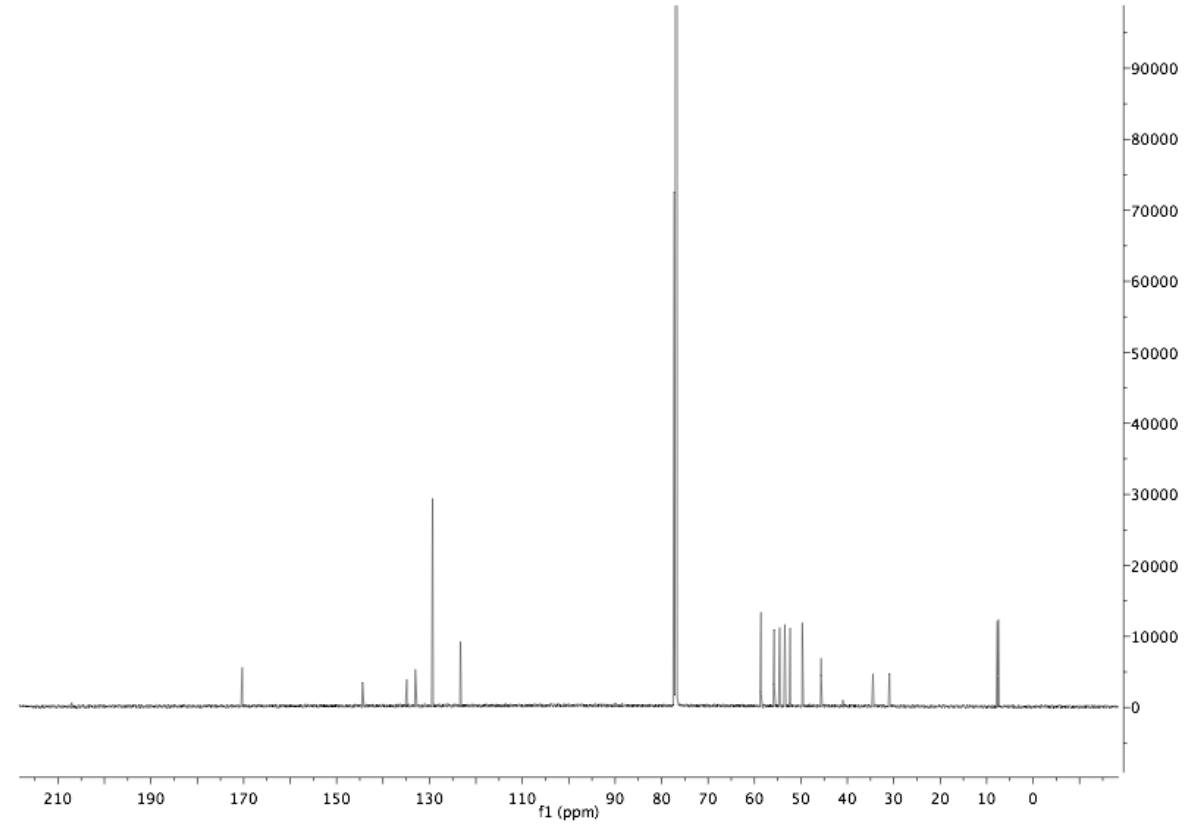
Methyl 2-((1-(2-ethoxy-2-oxoethyl)-1*H*-1,2,3-triazol-4-yl)methyl)-5-propyl-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*1,6*})



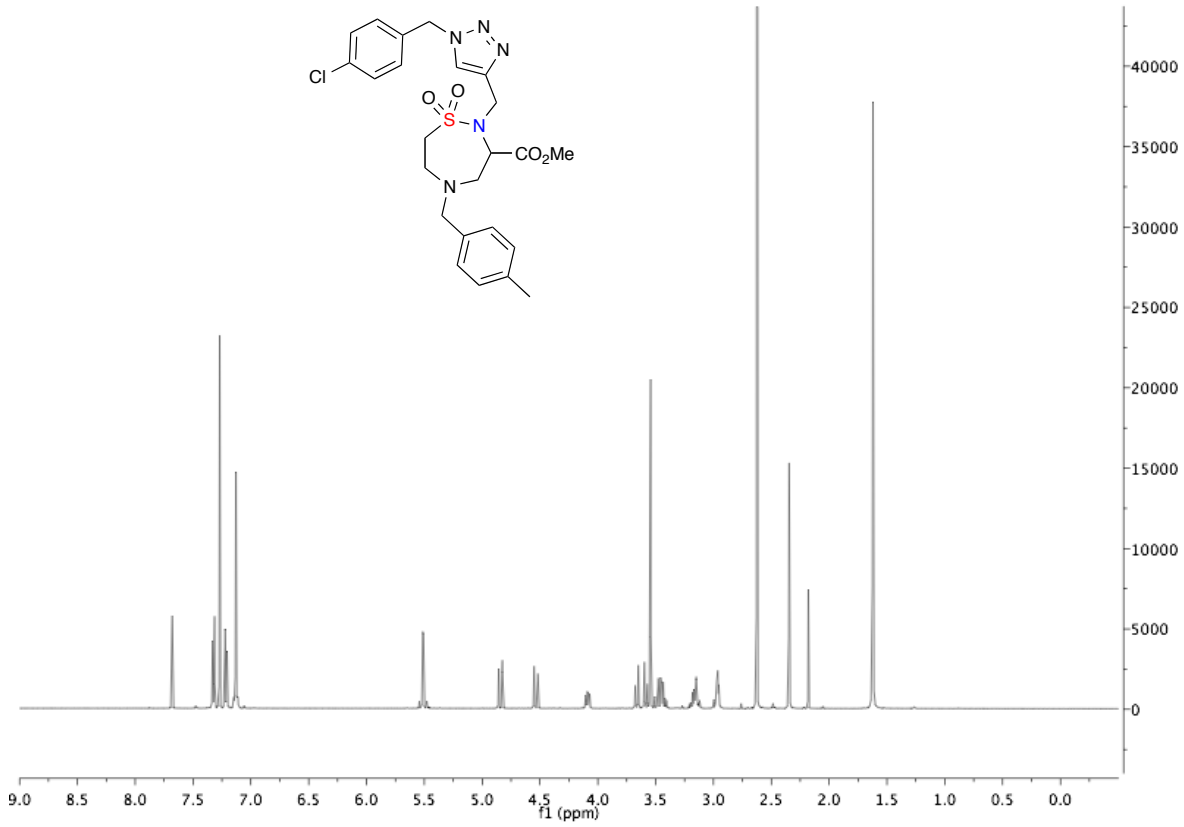

45000
40000
35000
30000
25000
20000
15000
10000
5000
0
210
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

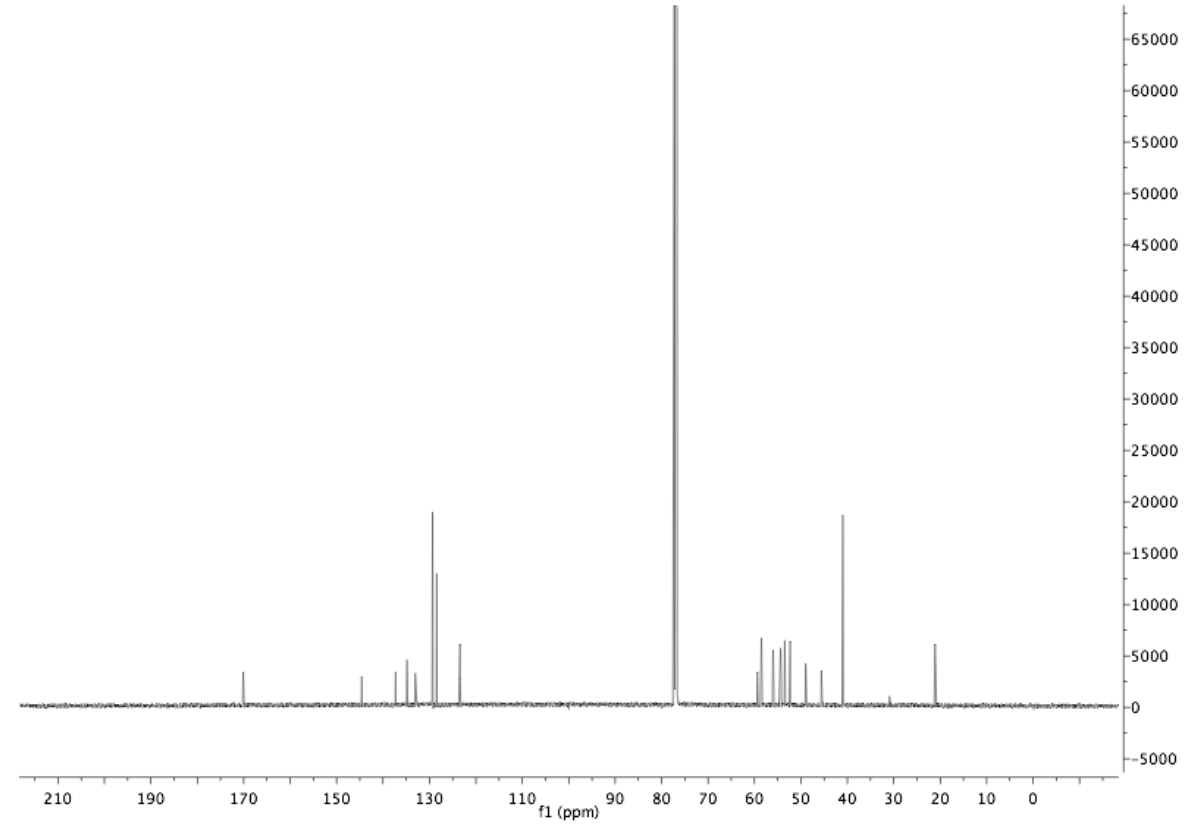
Methyl 2-((1-(4-chlorobenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-5-cyclopropyl-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*2,4*})



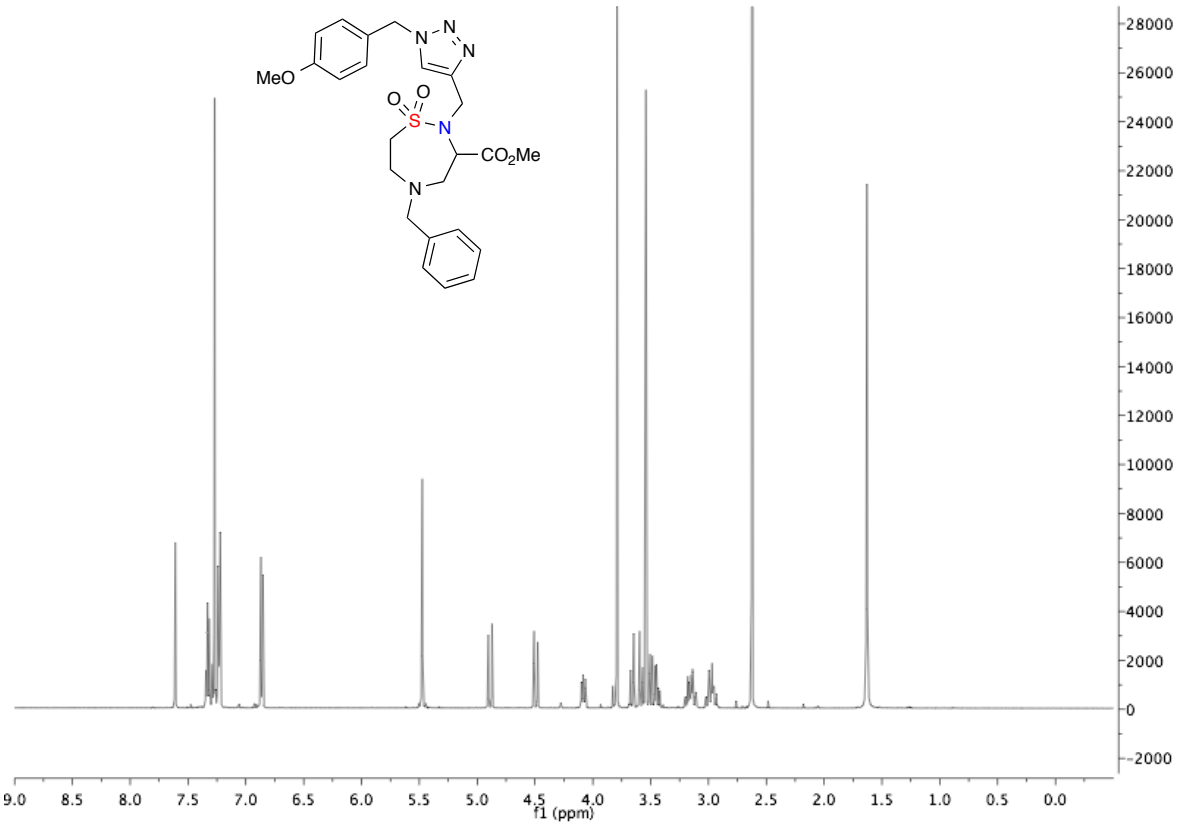


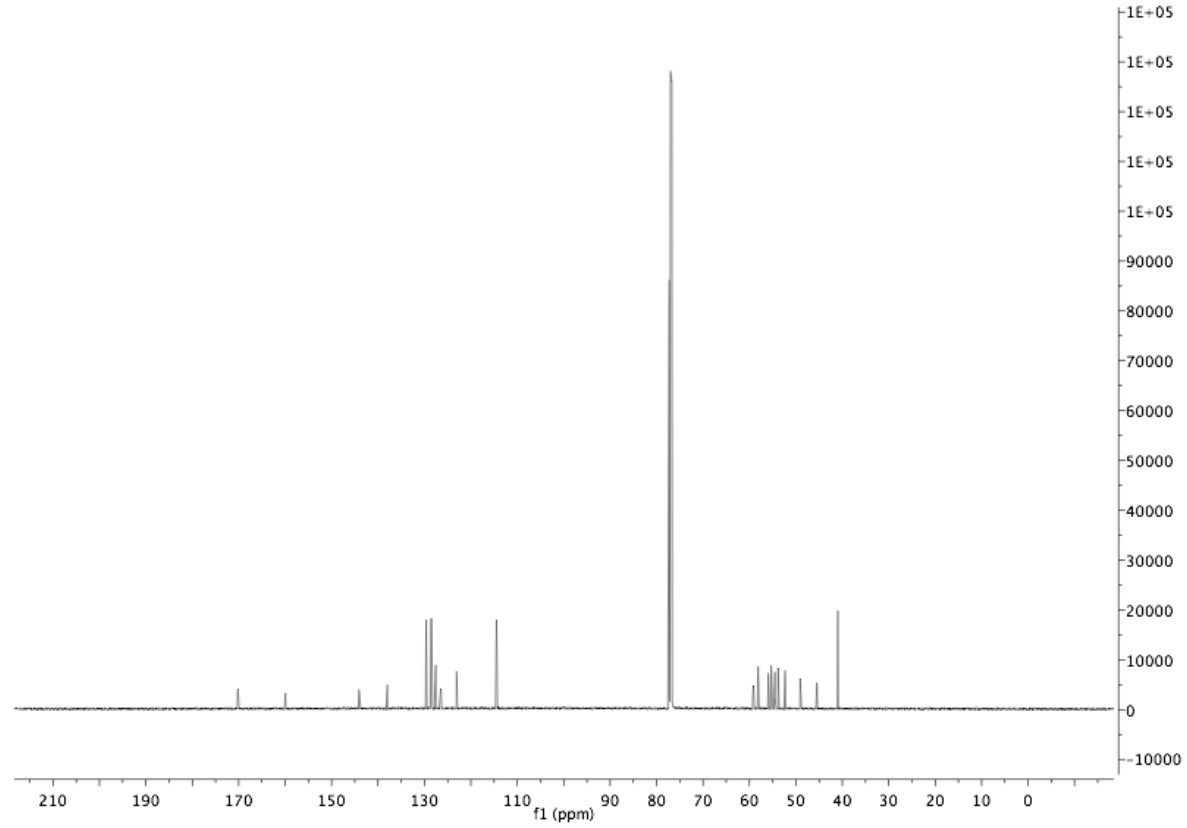
Methyl 2-((1-(4-chlorobenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-5-(4-methylbenzyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*5,4*})



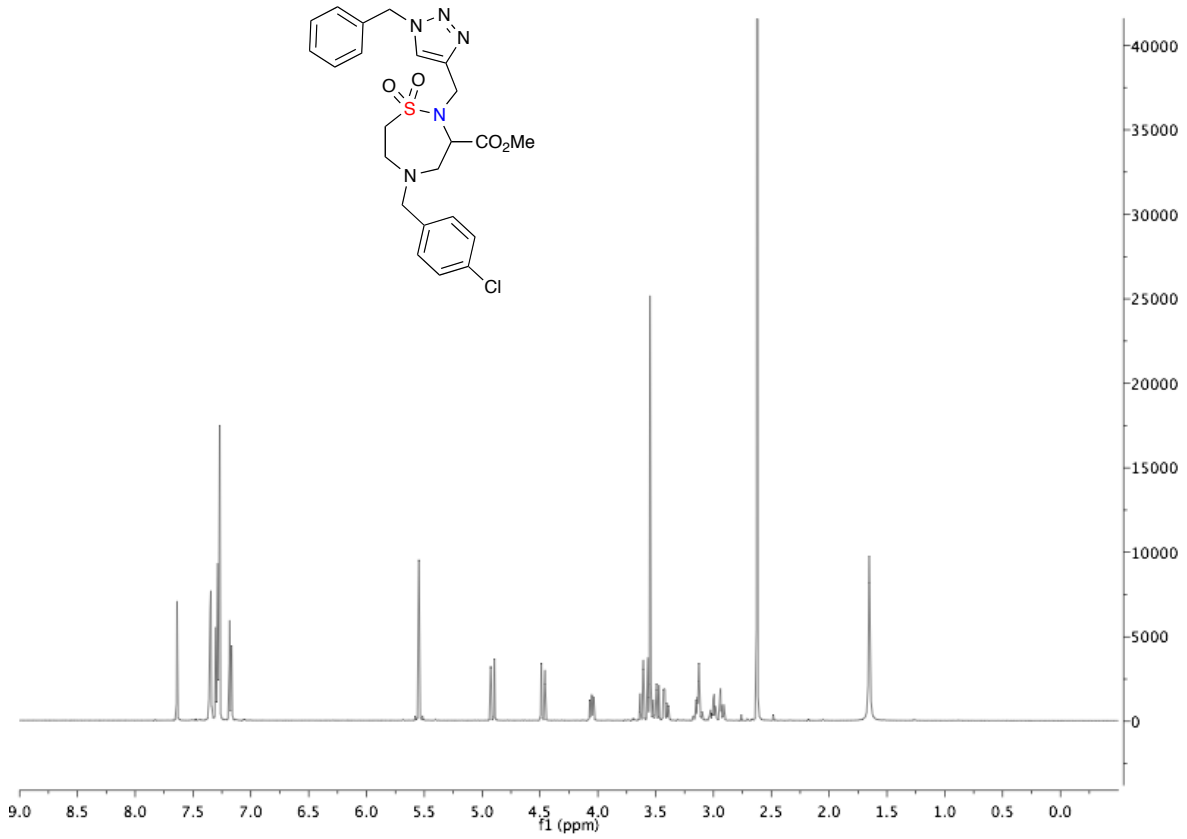


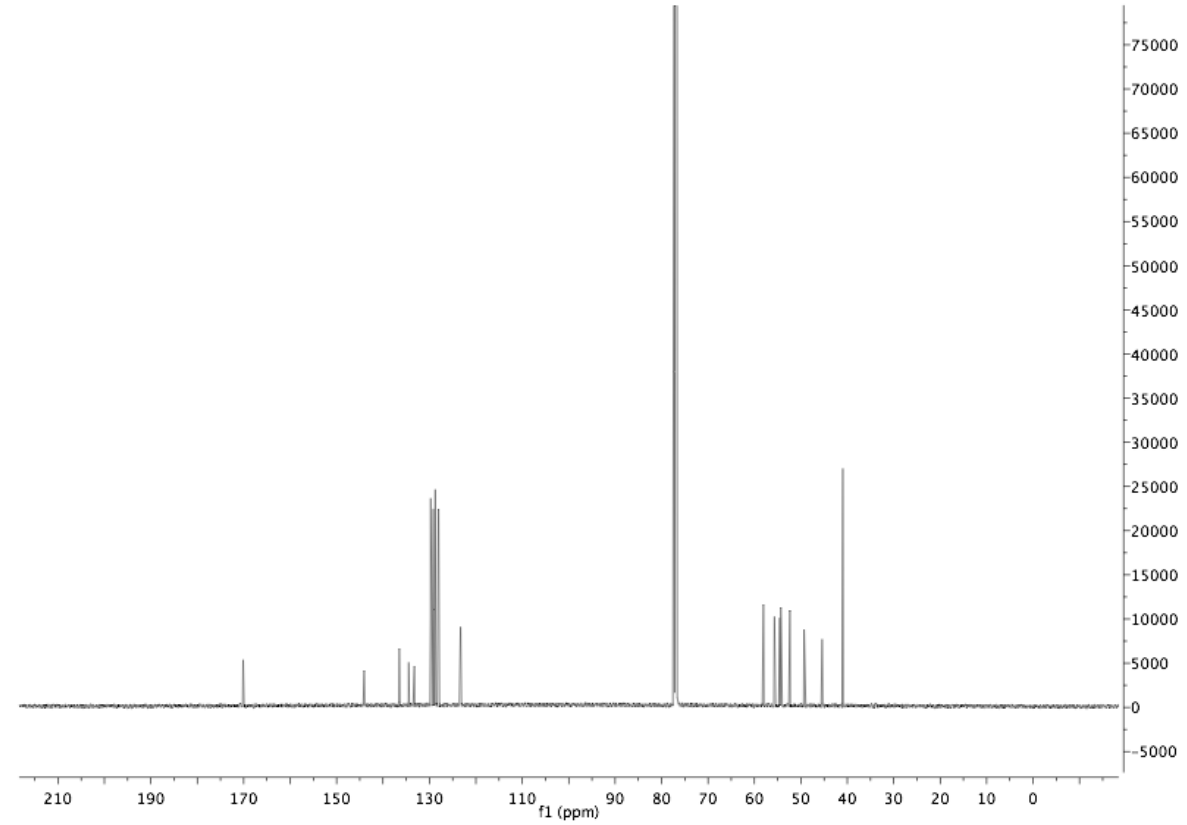
Methyl 5-benzyl-2-((1-(4-methoxybenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*6,1*})



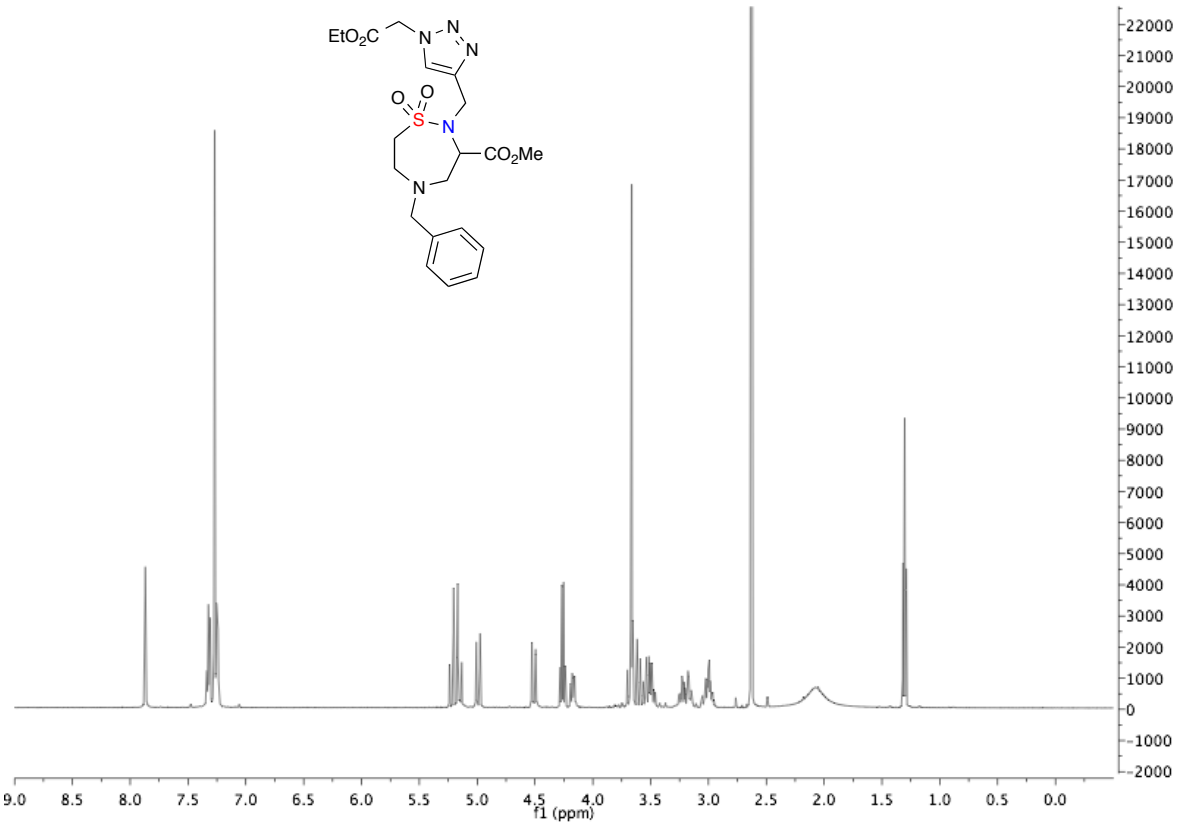


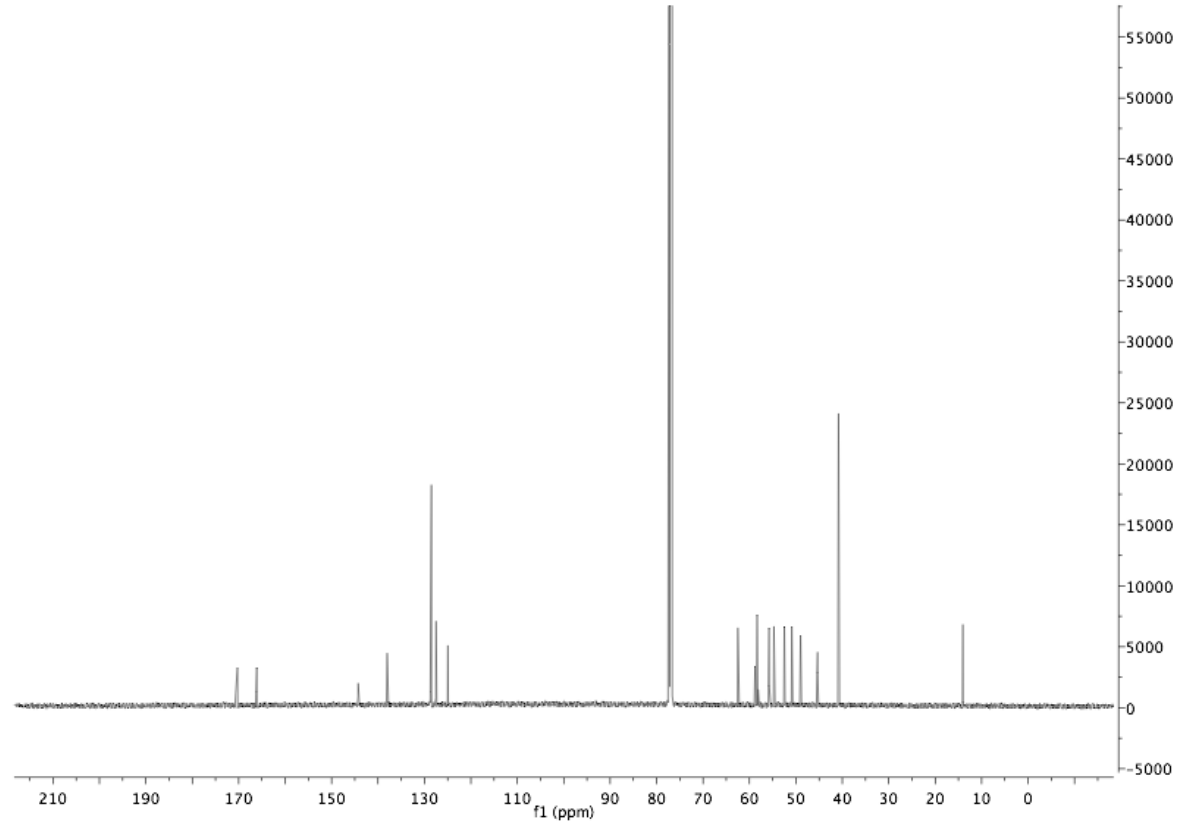
Methyl 2-((1-benzyl-1*H*-1,2,3-triazol-4-yl)methyl)-5-(4-chlorobenzyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*7,3*})



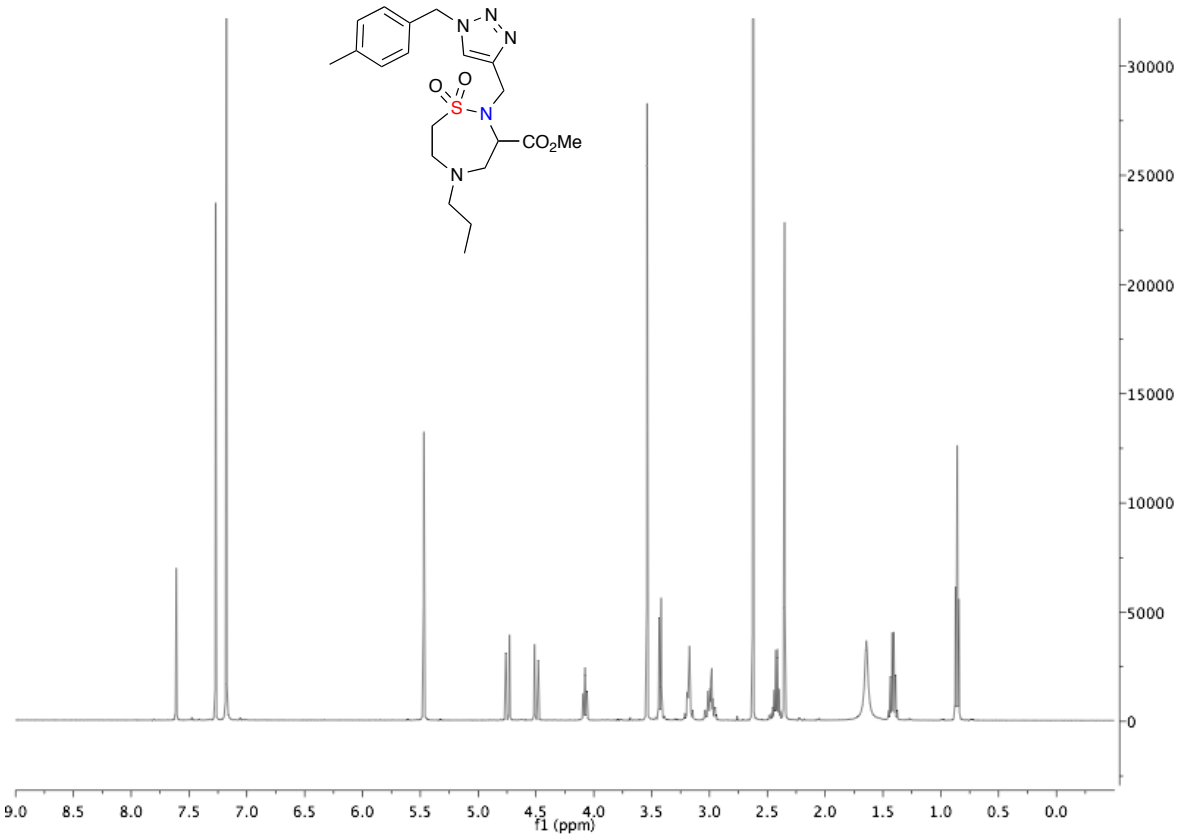


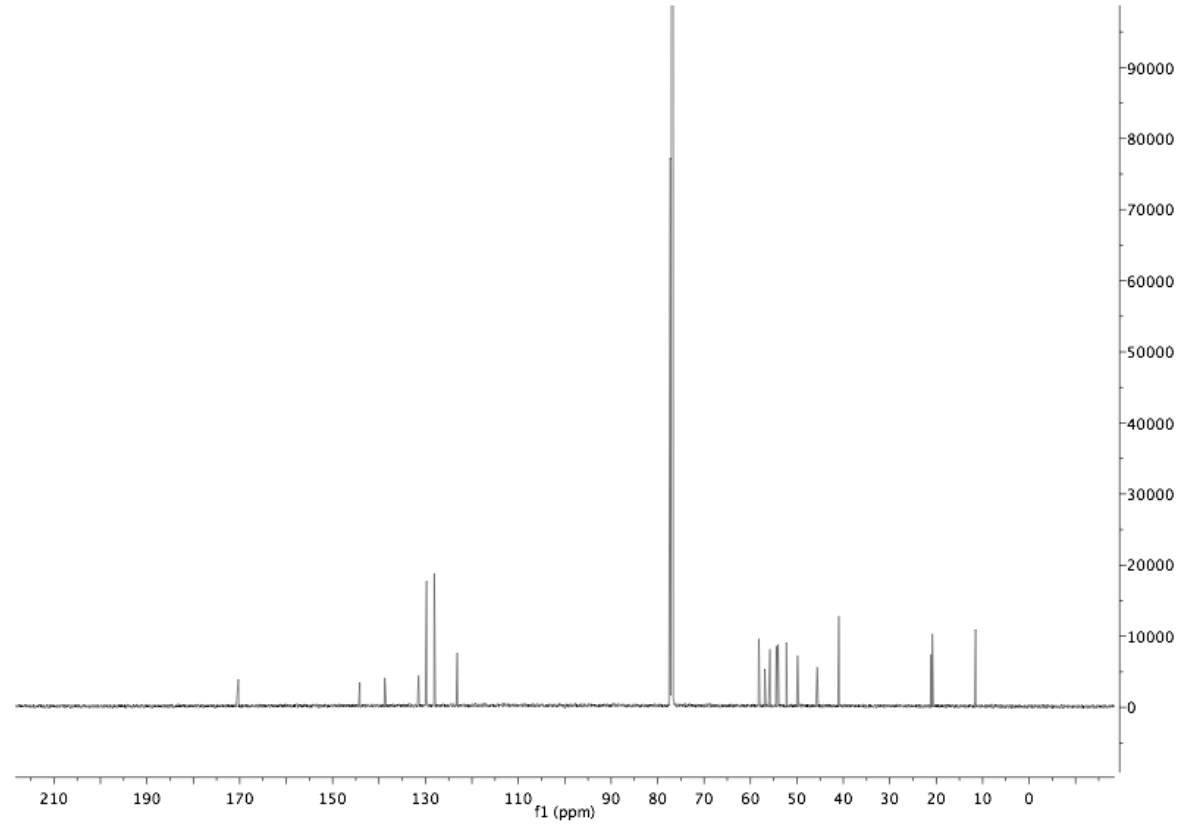
Methyl 5-benzyl-2-((1-(2-ethoxy-2-oxoethyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*6,6*})



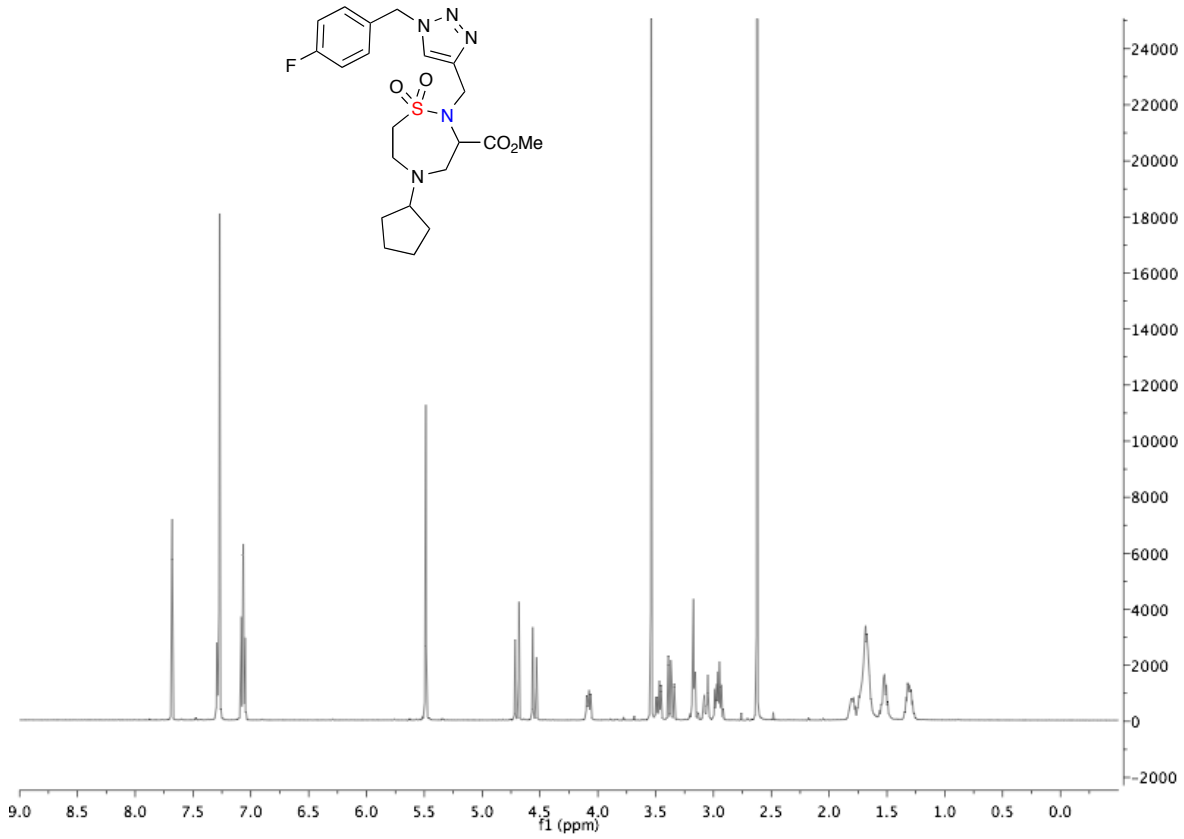


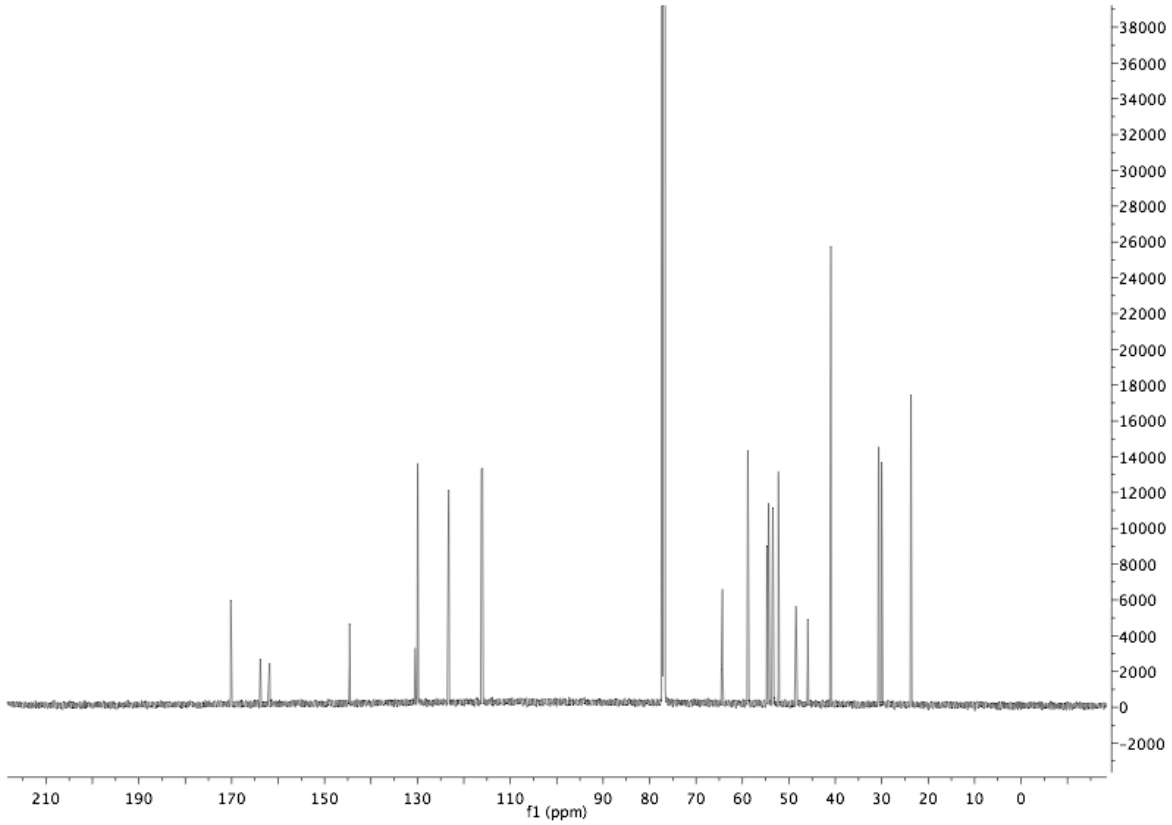
Methyl 2-((1-(4-methylbenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-5-propyl-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*1,2*})



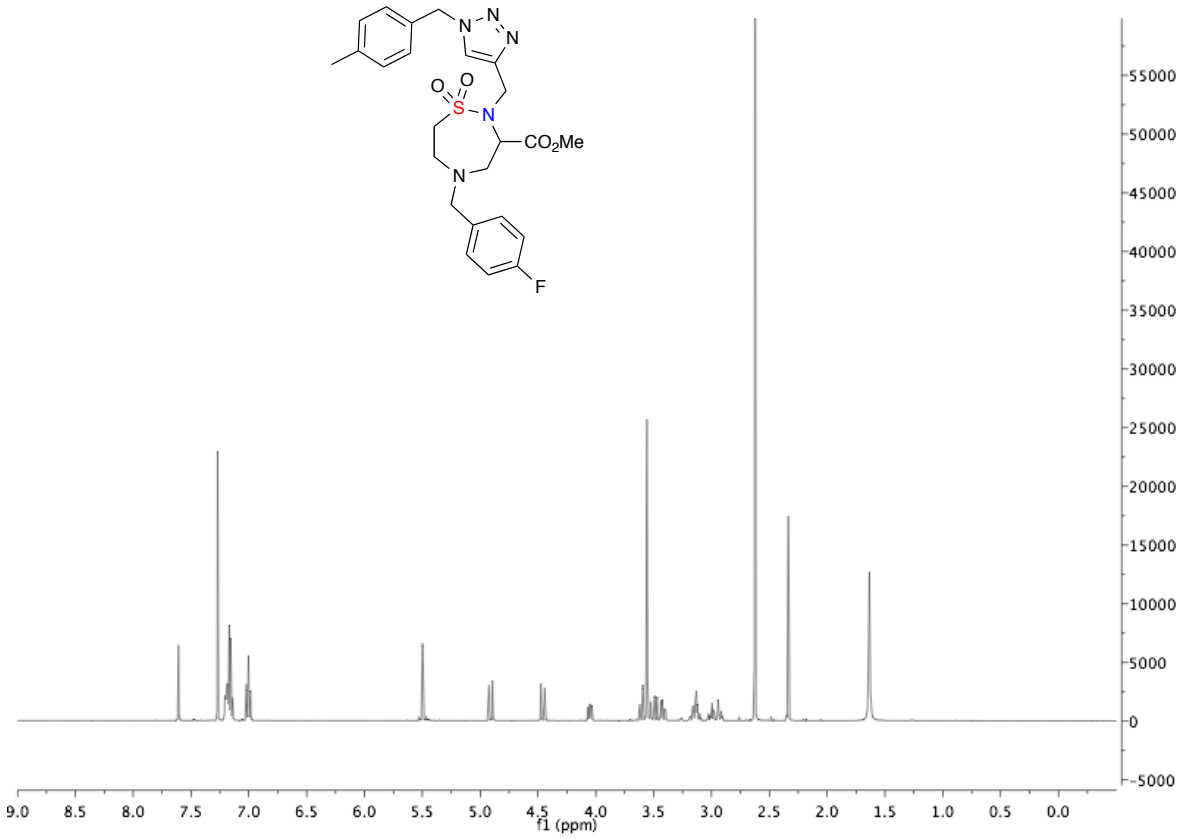


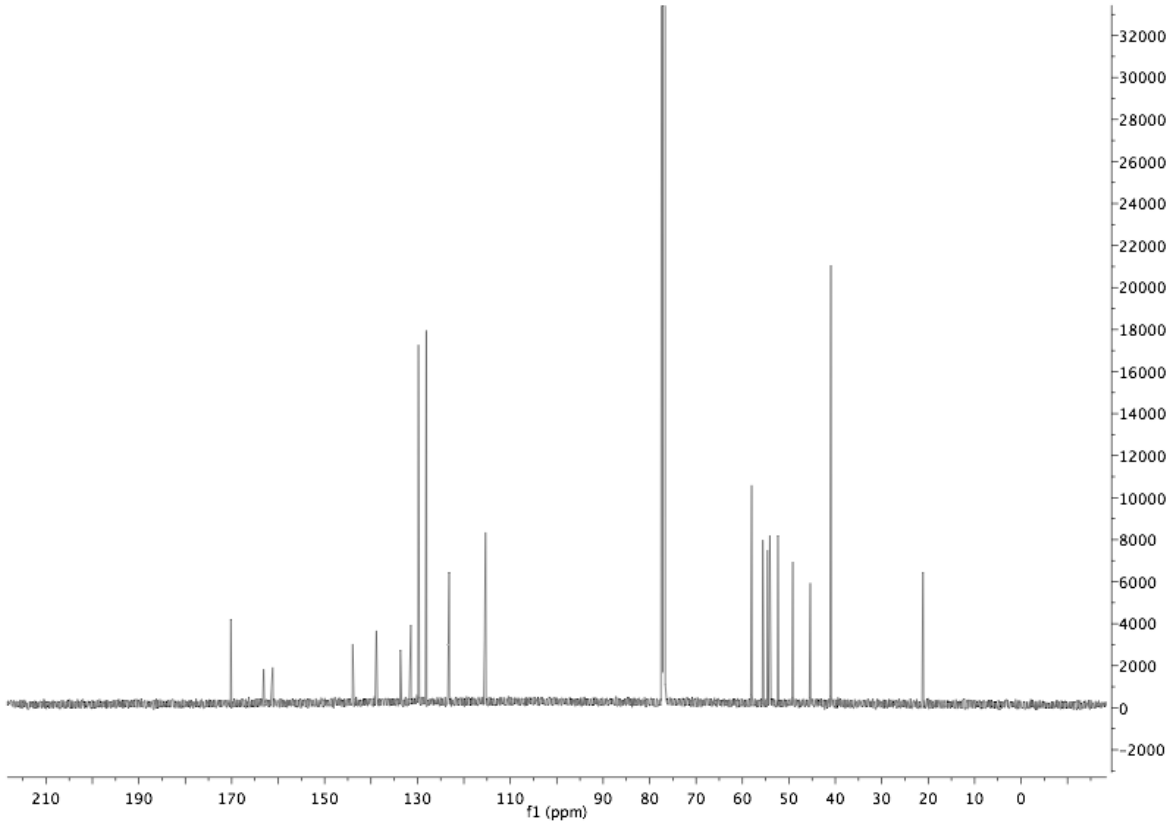
Methyl 5-cyclopentyl-2-((1-(4-fluorobenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*3,5*})



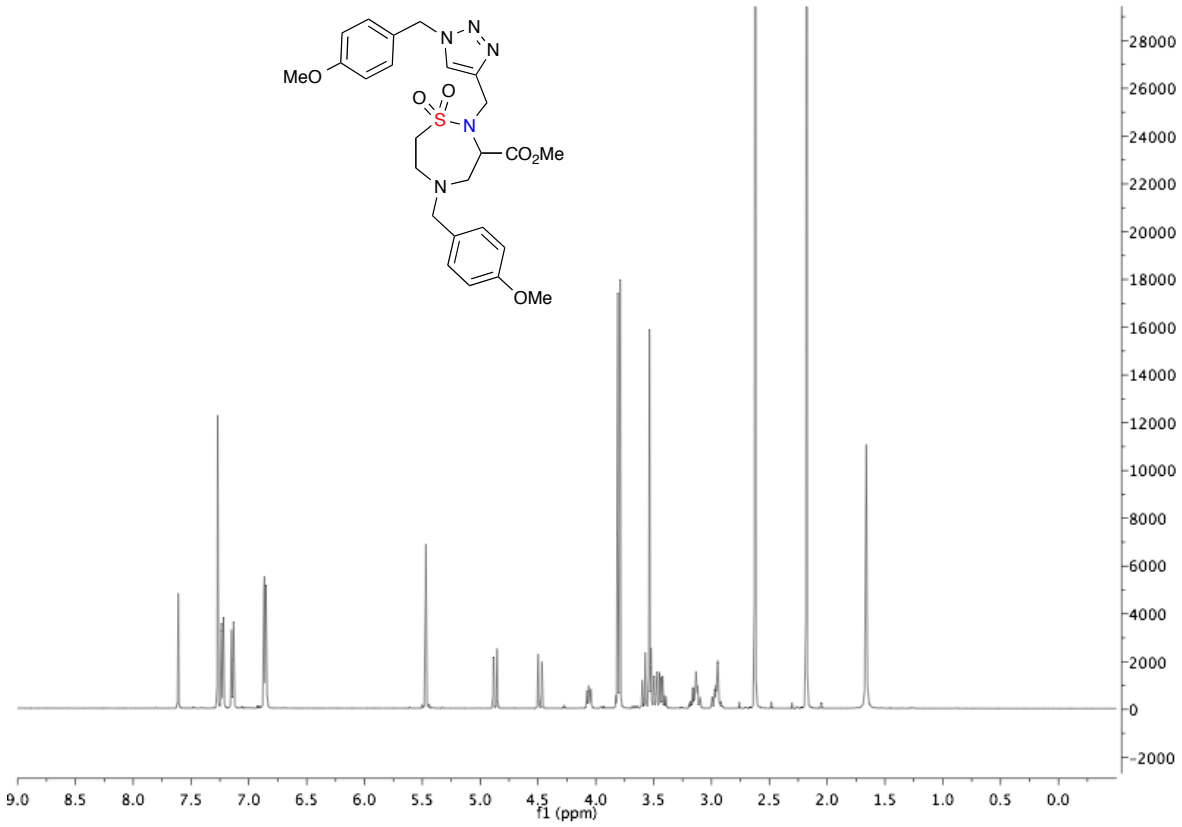


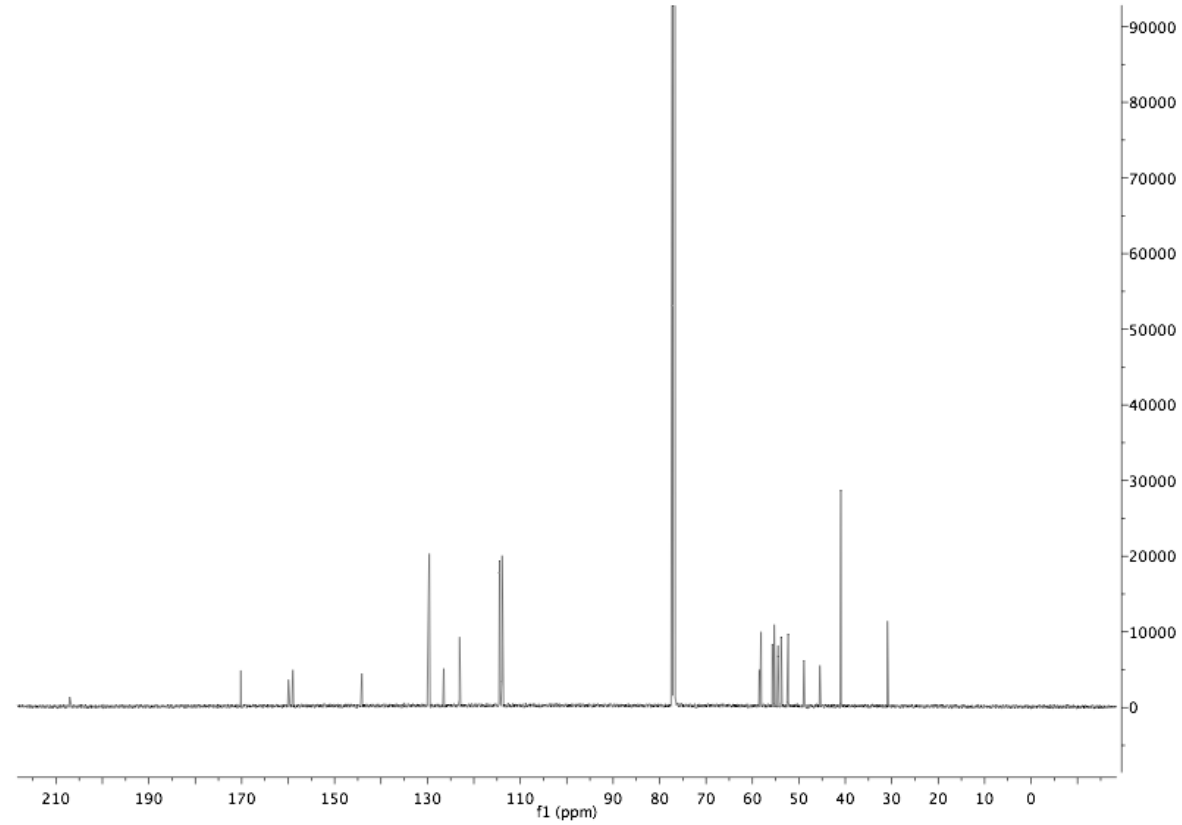
Methyl 5-(4-fluorobenzyl)-2-((1-(4-methylbenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*8,2*})



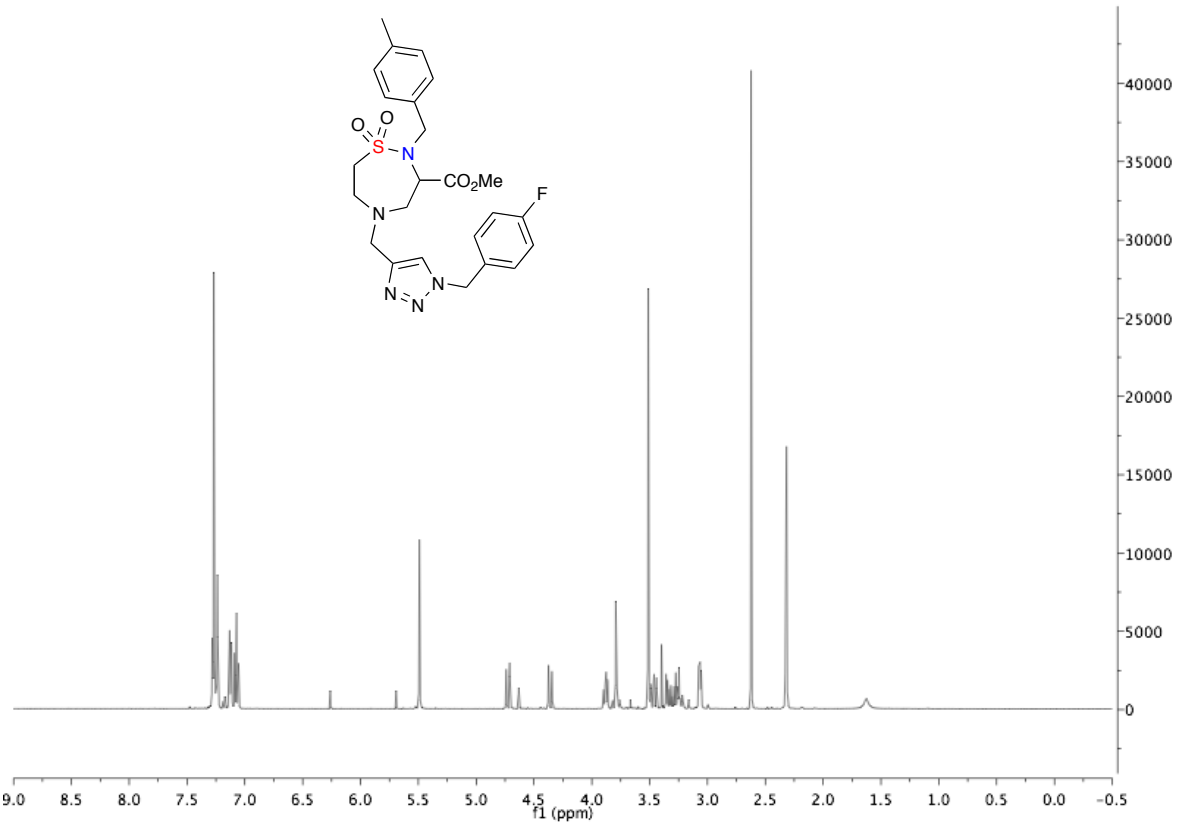


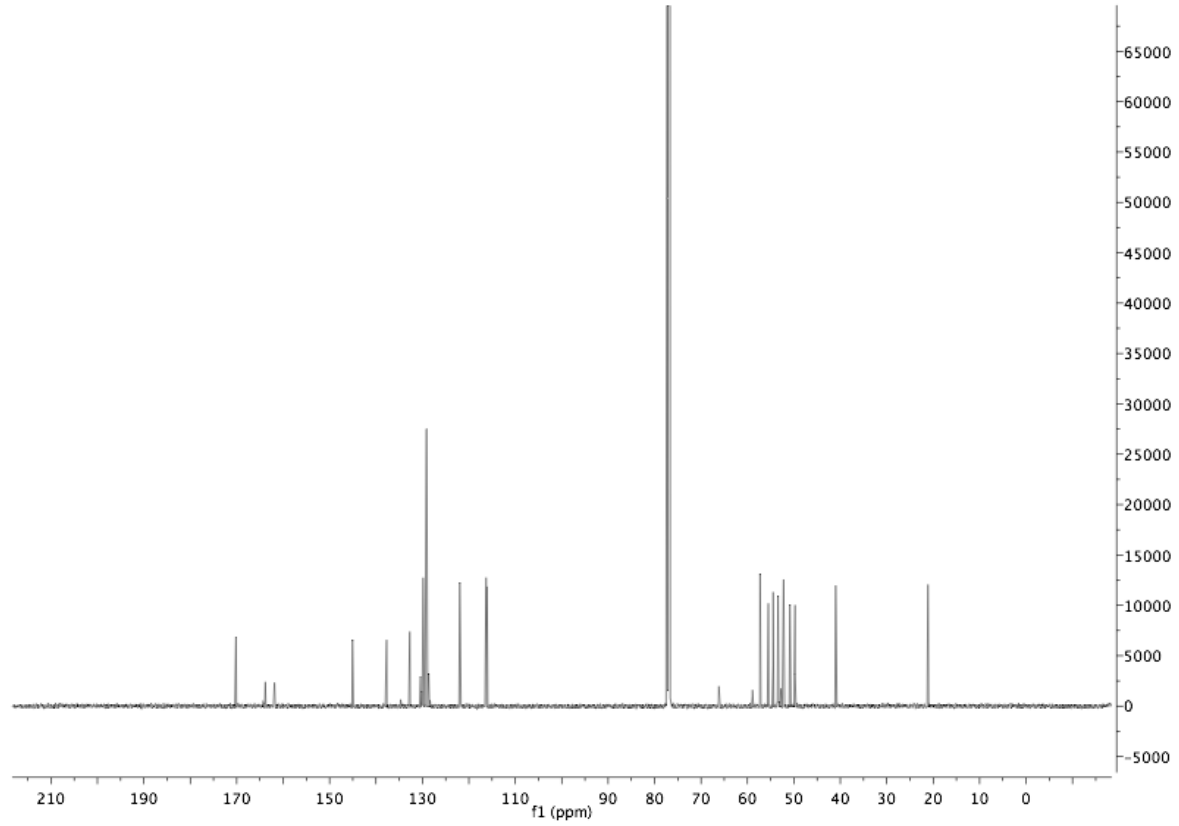
Methyl 5-(4-methoxybenzyl)-2-((1-(4-methoxybenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (6{*4,1*})



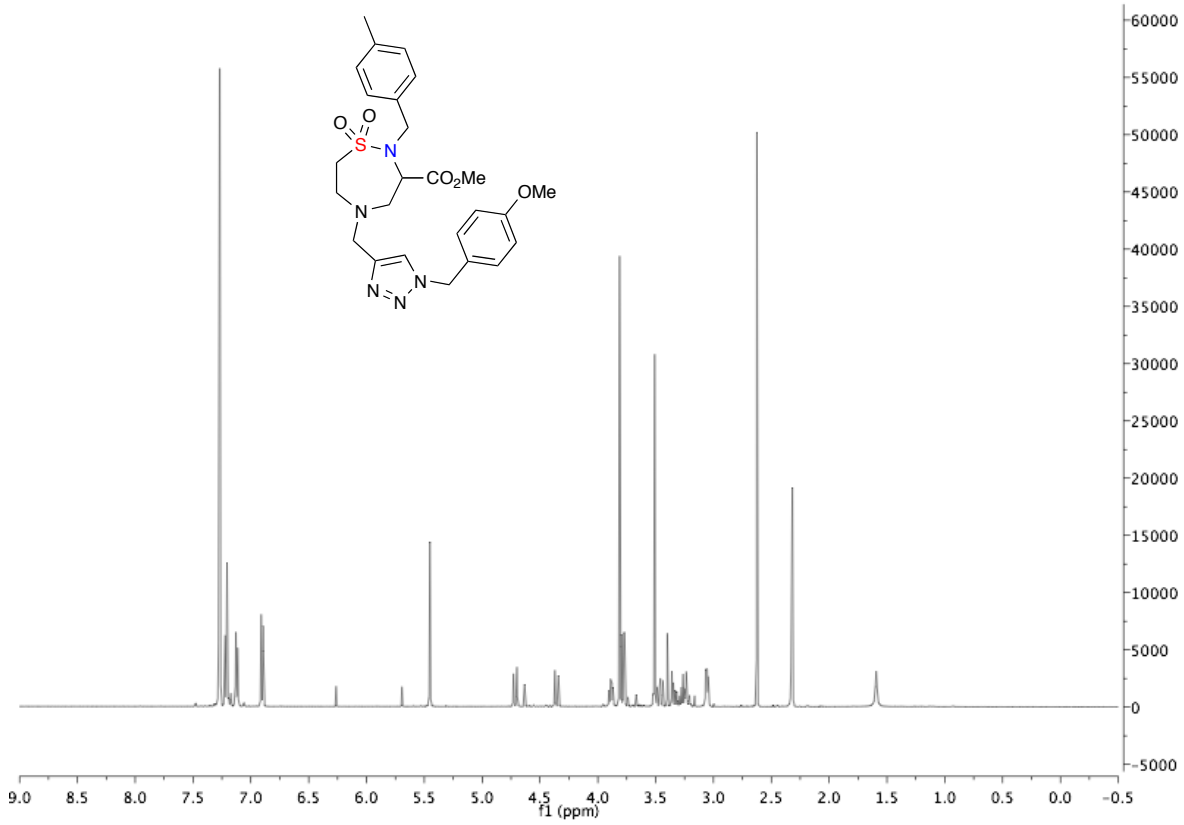


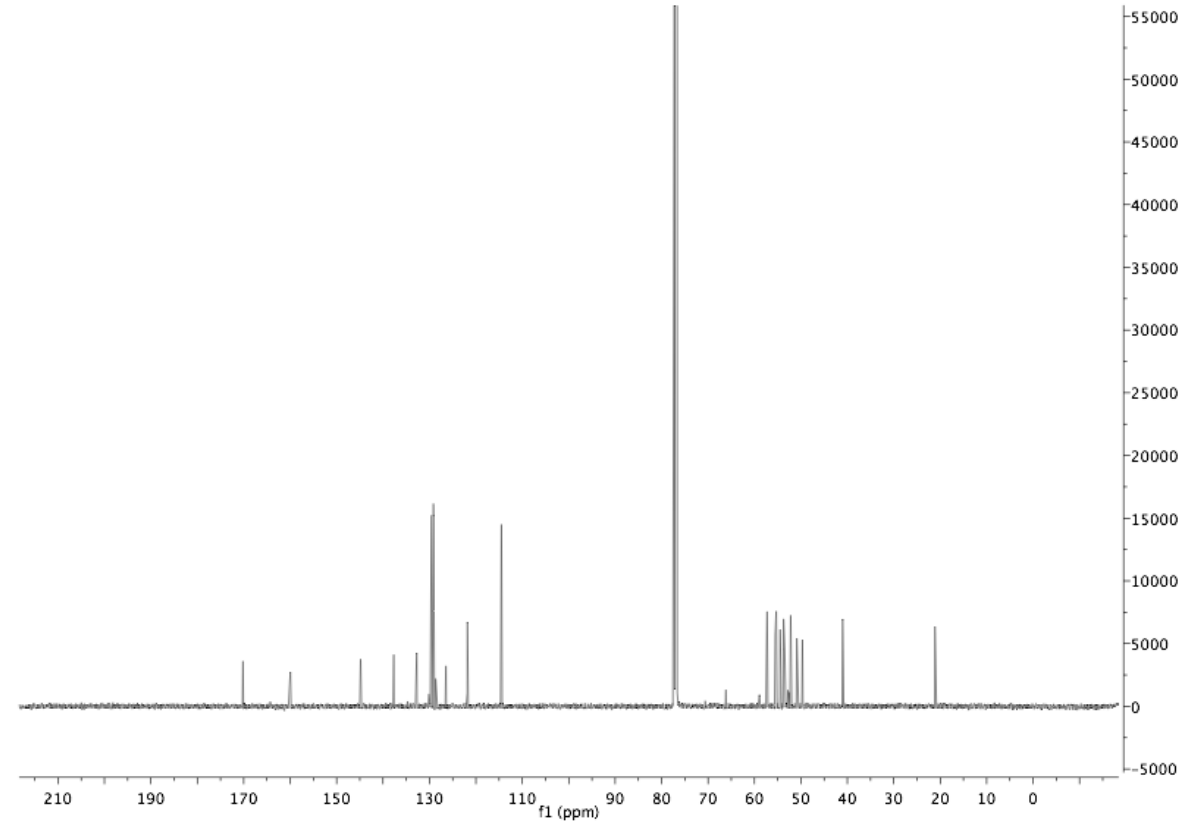
Methyl 5-((1-(4-fluorobenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-2-(4-methylbenzyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*2,5*})



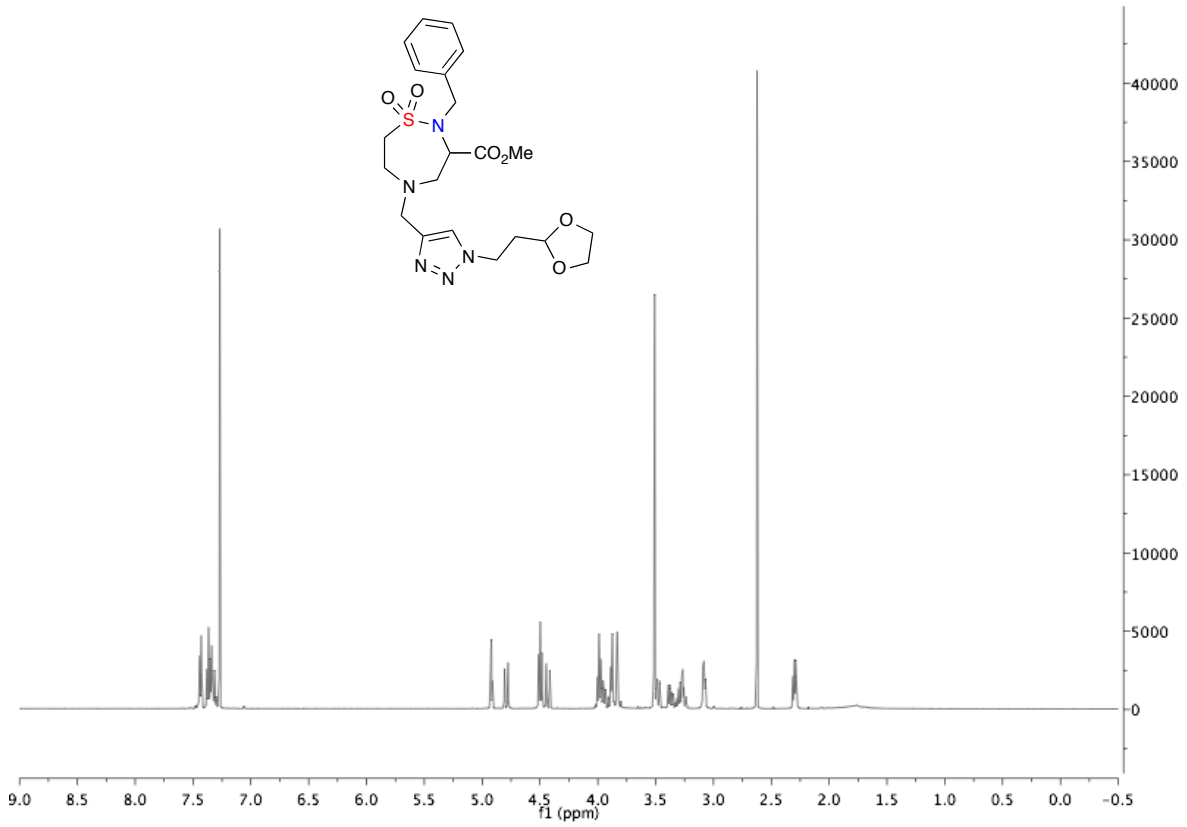


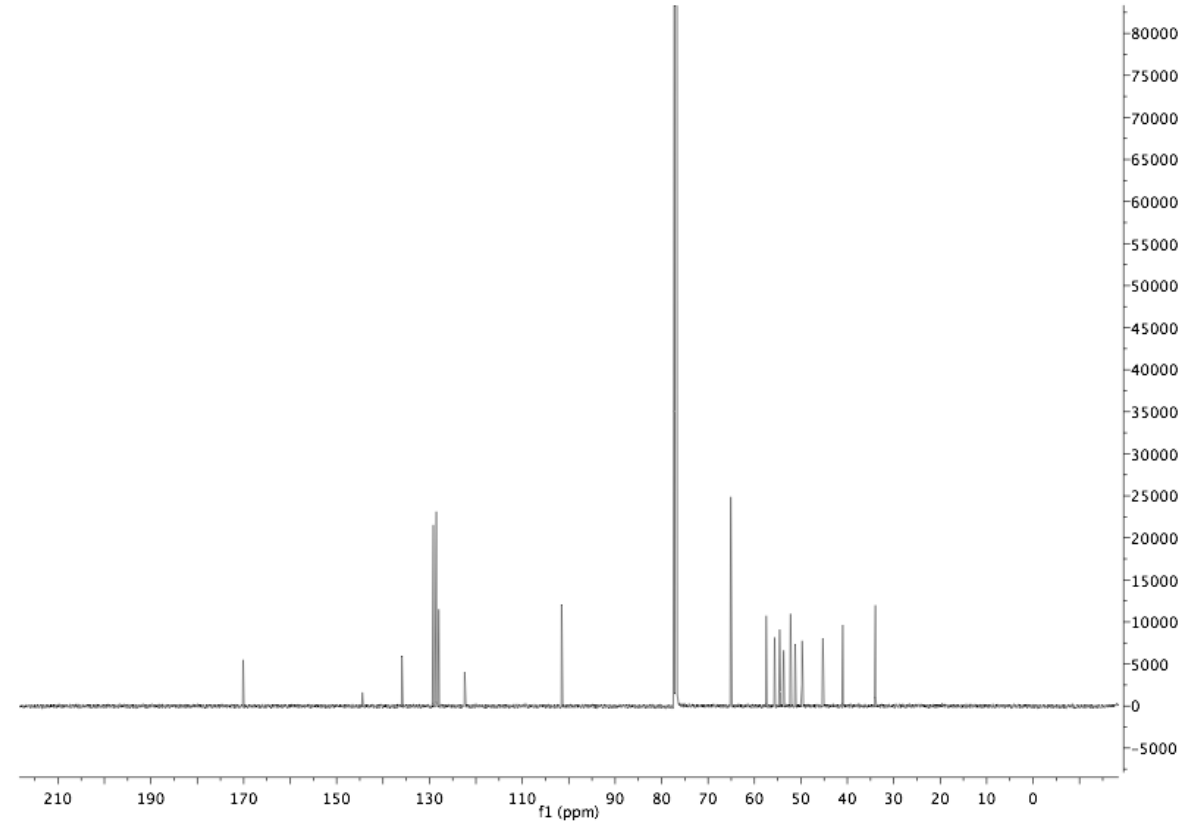
Methyl 5-((1-(4-methoxybenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-2-(4-methylbenzyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*2,1*})



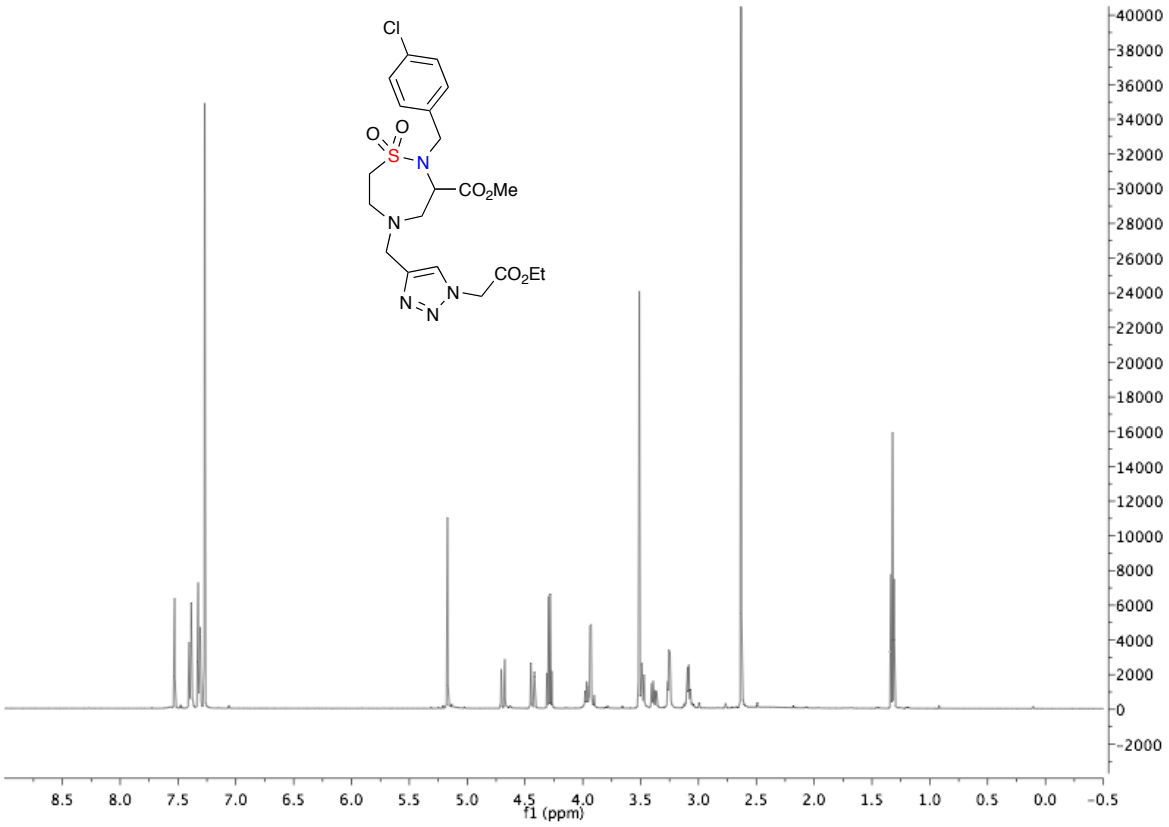


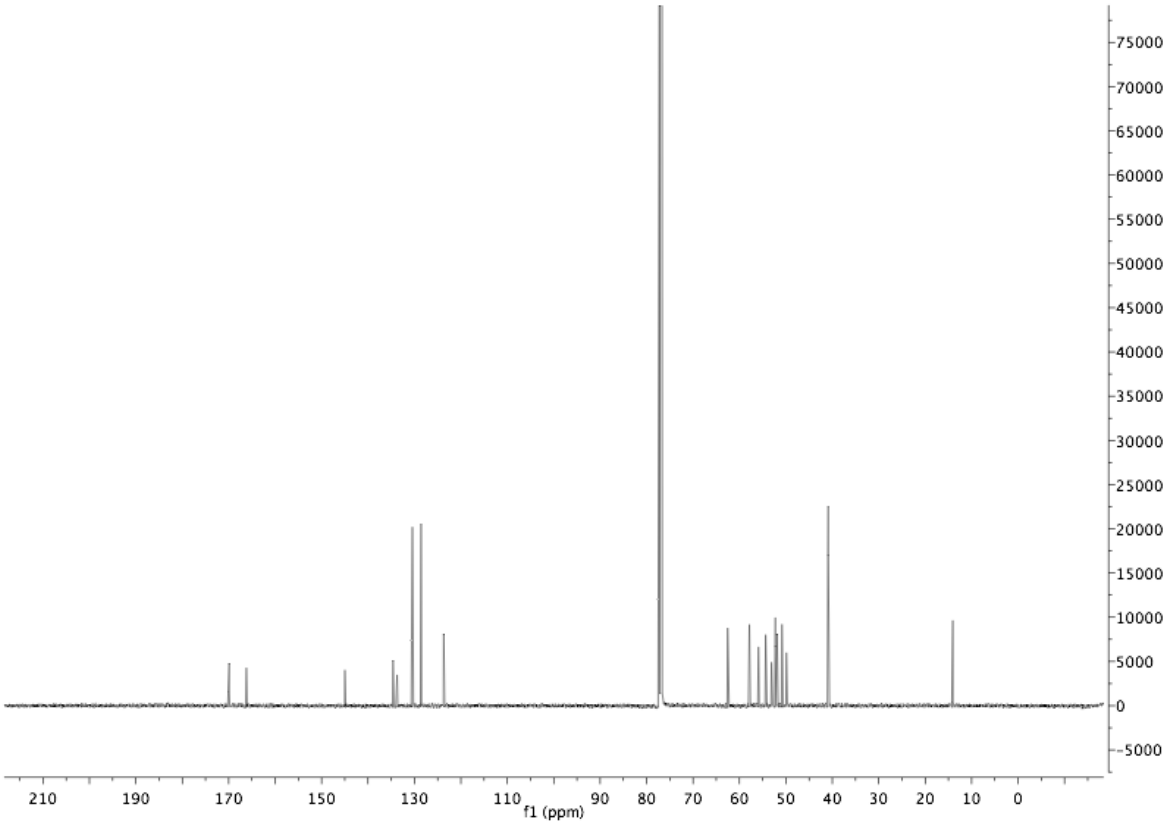
Methyl 5-((1-(2-(1,3-dioxolan-2-yl)ethyl)-1*H*-1,2,3-triazol-4-yl)methyl)-2-benzyl-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*3,8*})



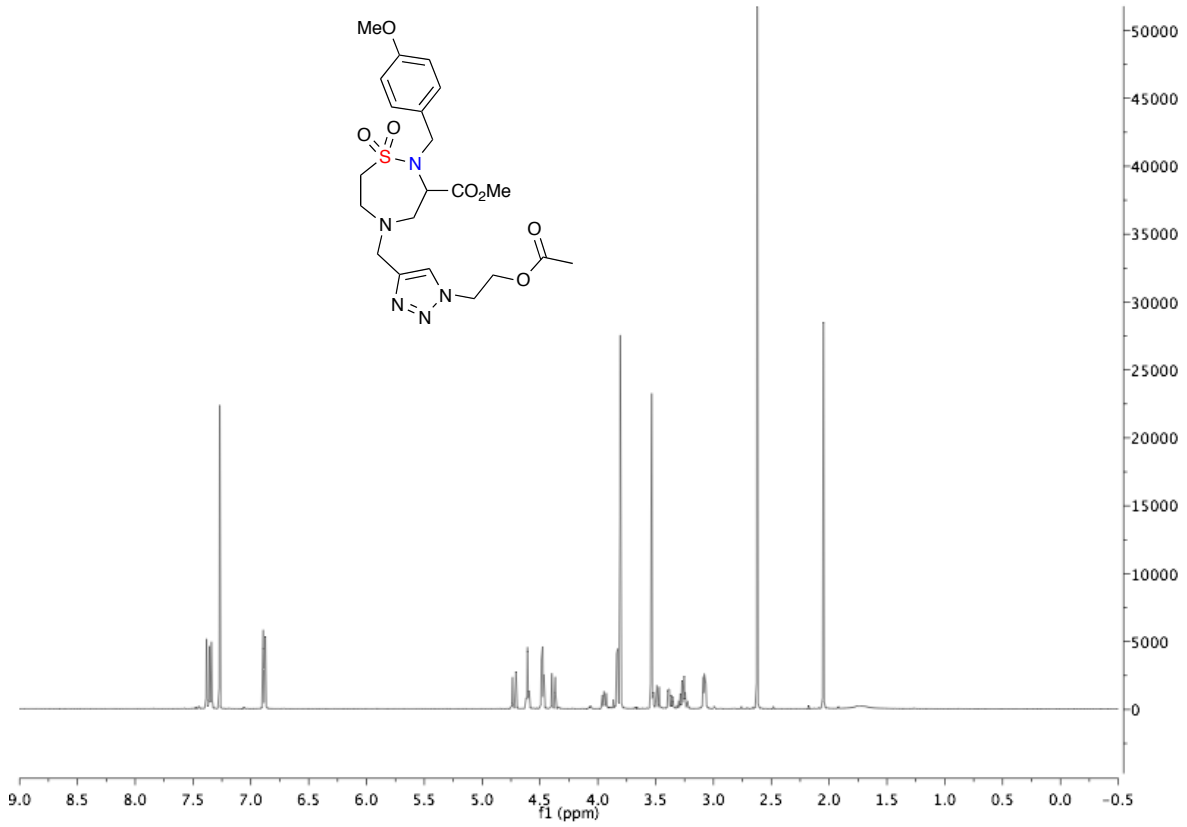


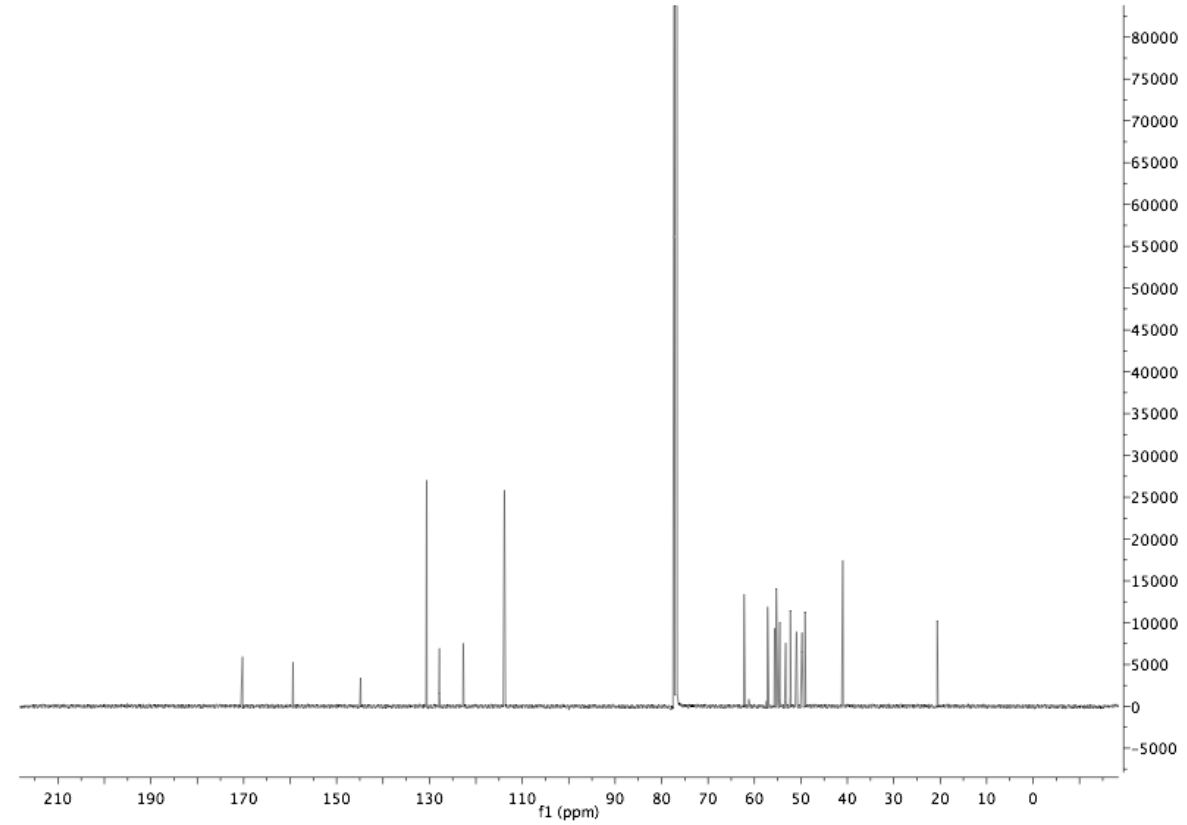
Methyl 2-(4-chlorobenzyl)-5-((1-(2-ethoxy-2-oxoethyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*4,6*})



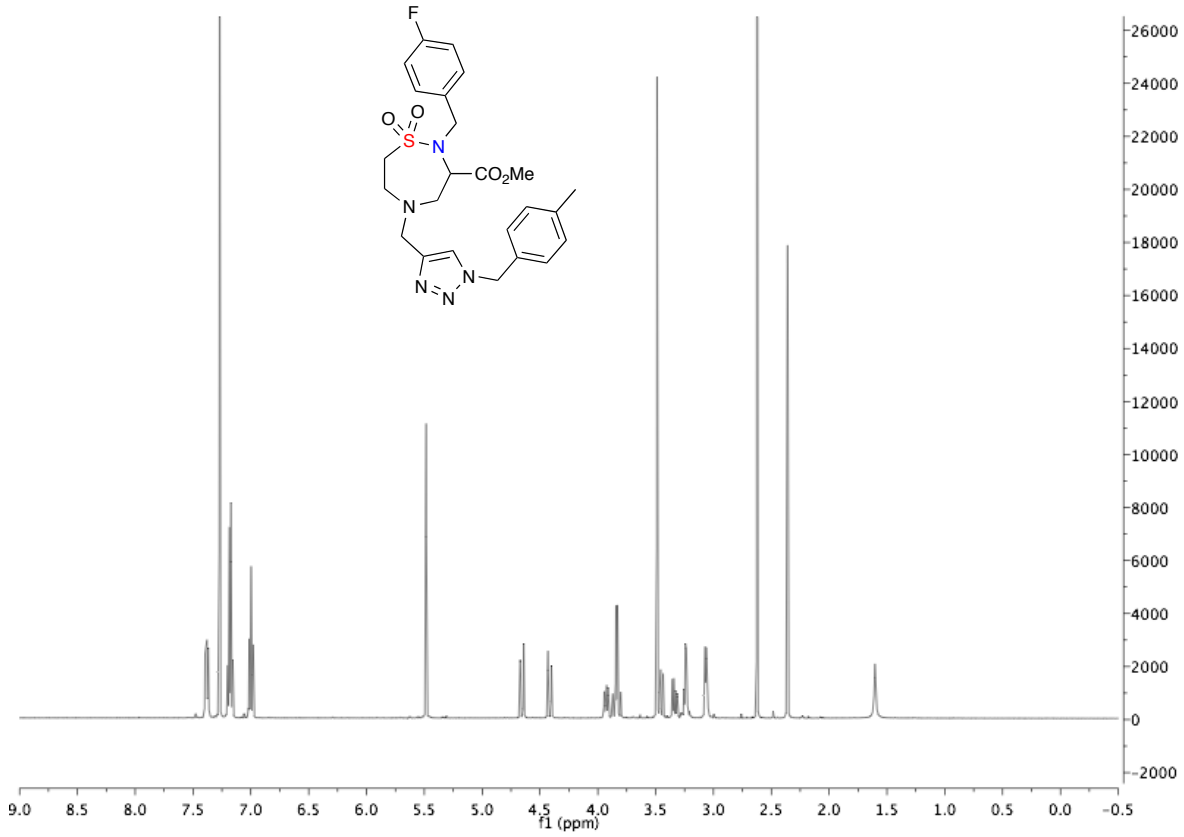


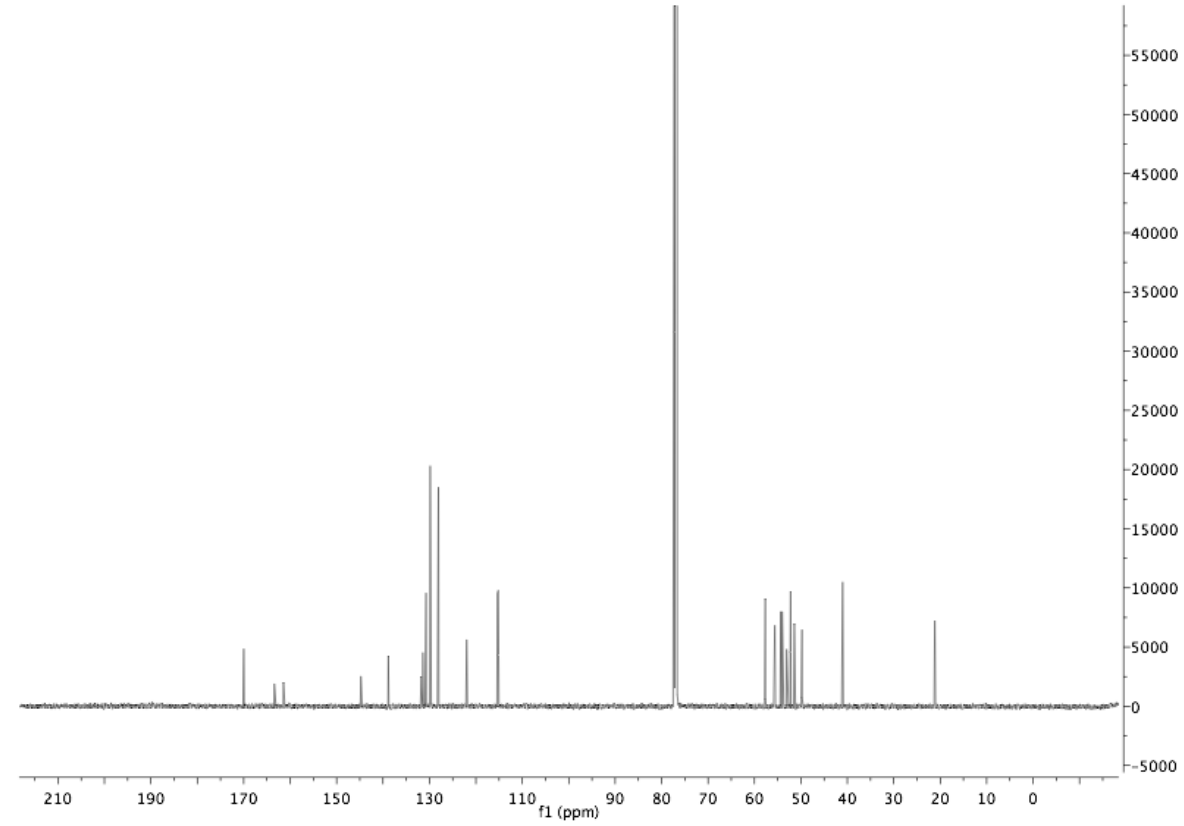
Methyl 5-((1-(2-acetoxyethyl)-1*H*-1,2,3-triazol-4-yl)methyl)-2-(4-methoxybenzyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*1,7*})



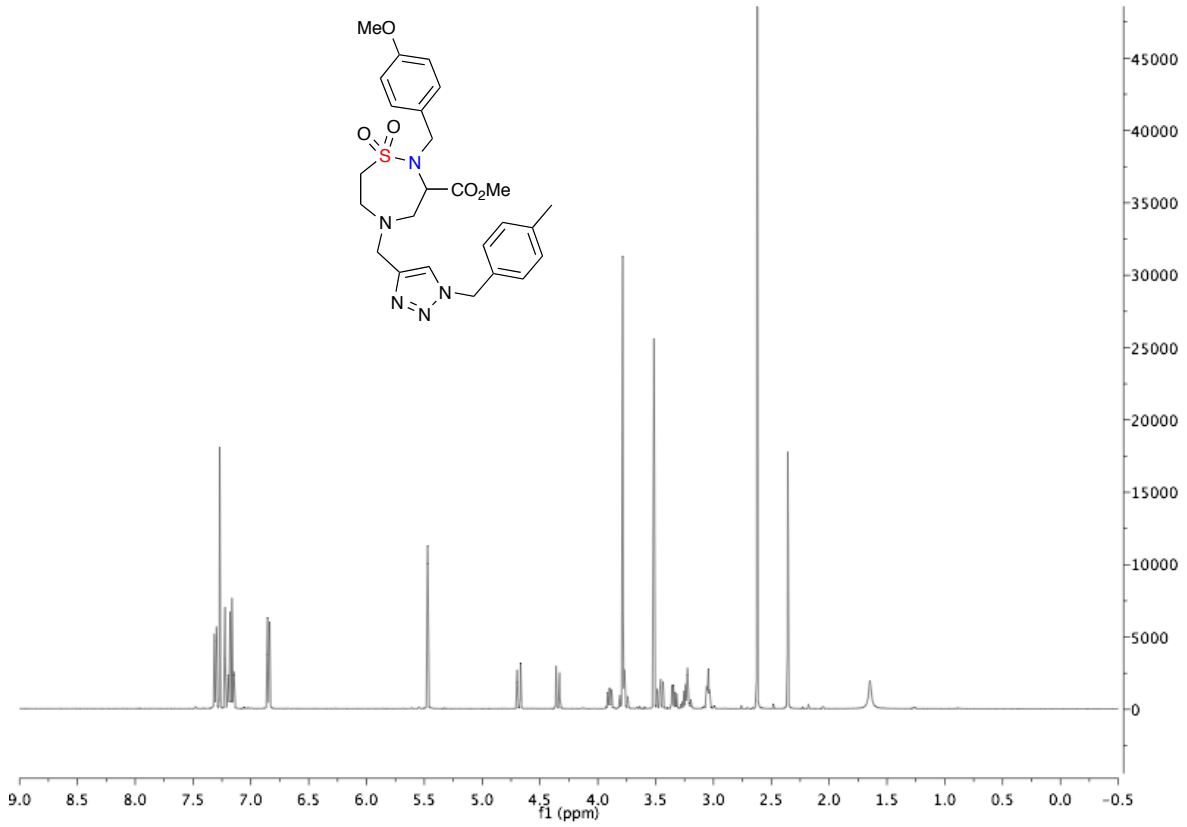


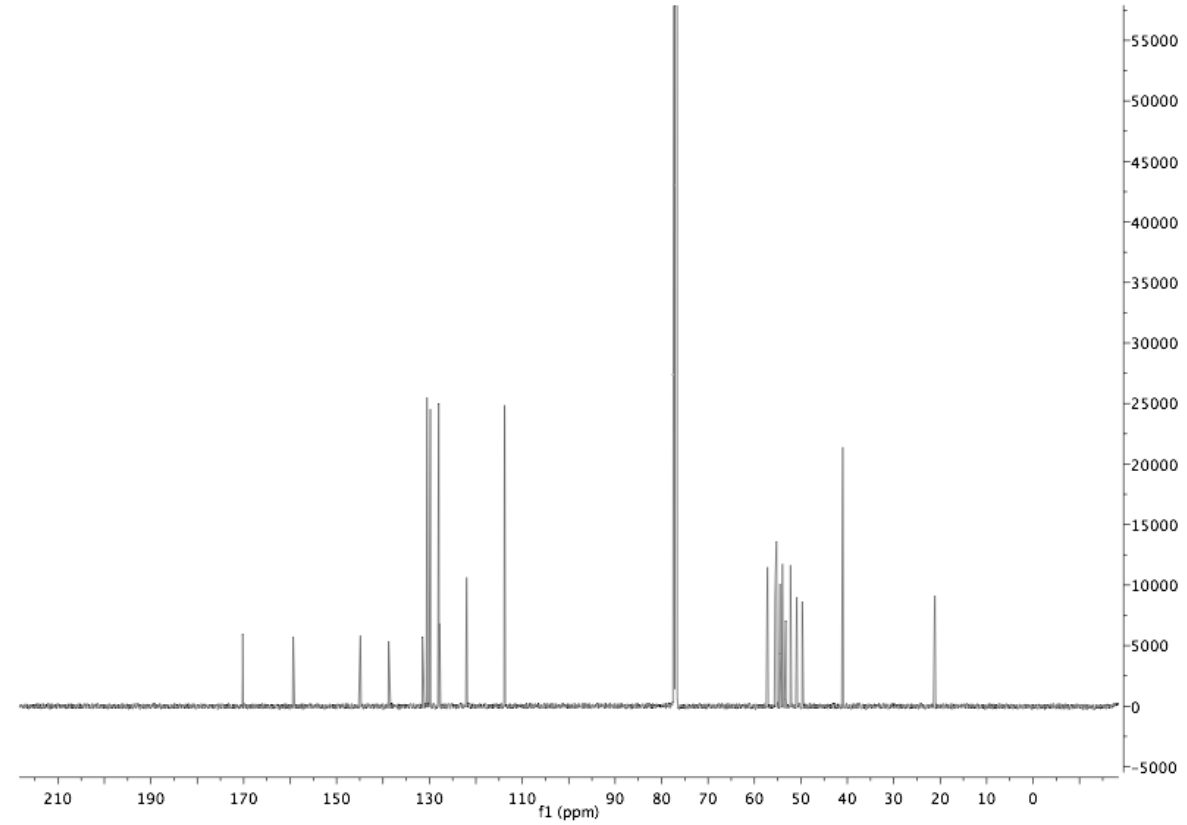
Methyl 2-(4-fluorobenzyl)-5-((1-(4-methylbenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*5,2*})



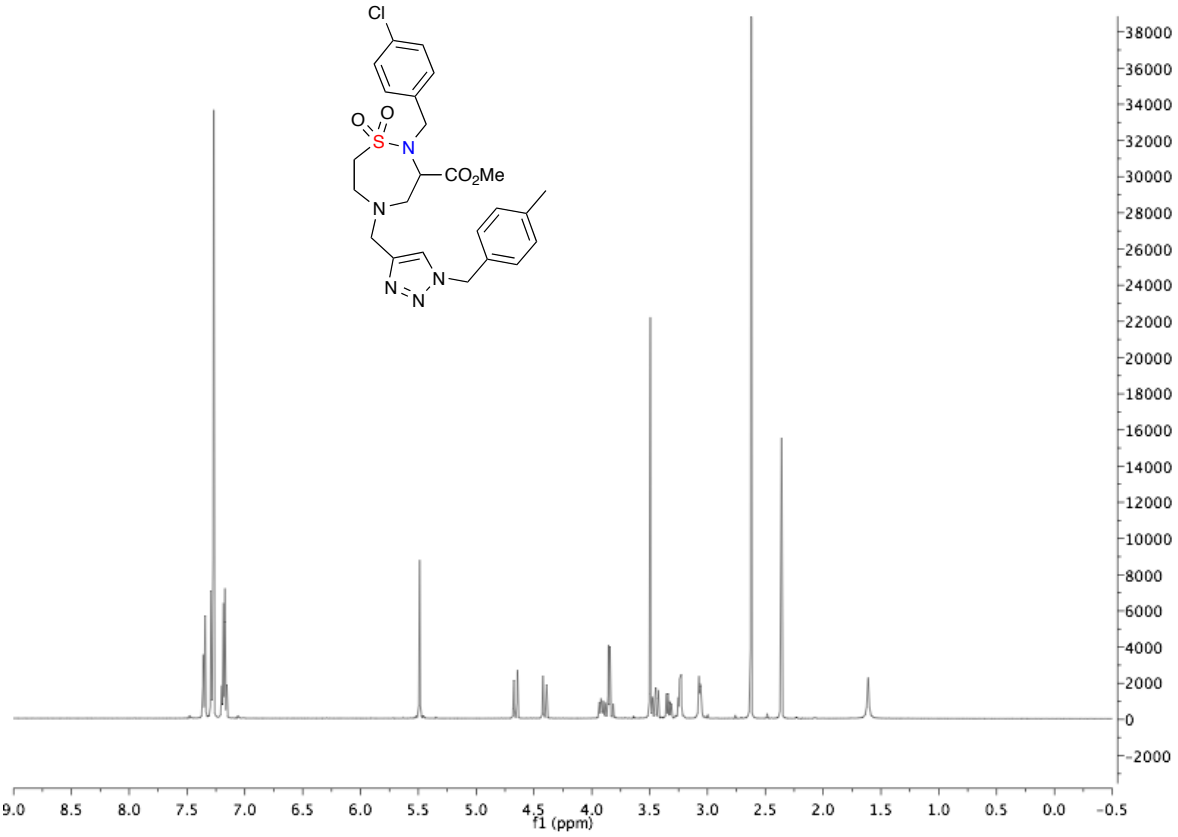


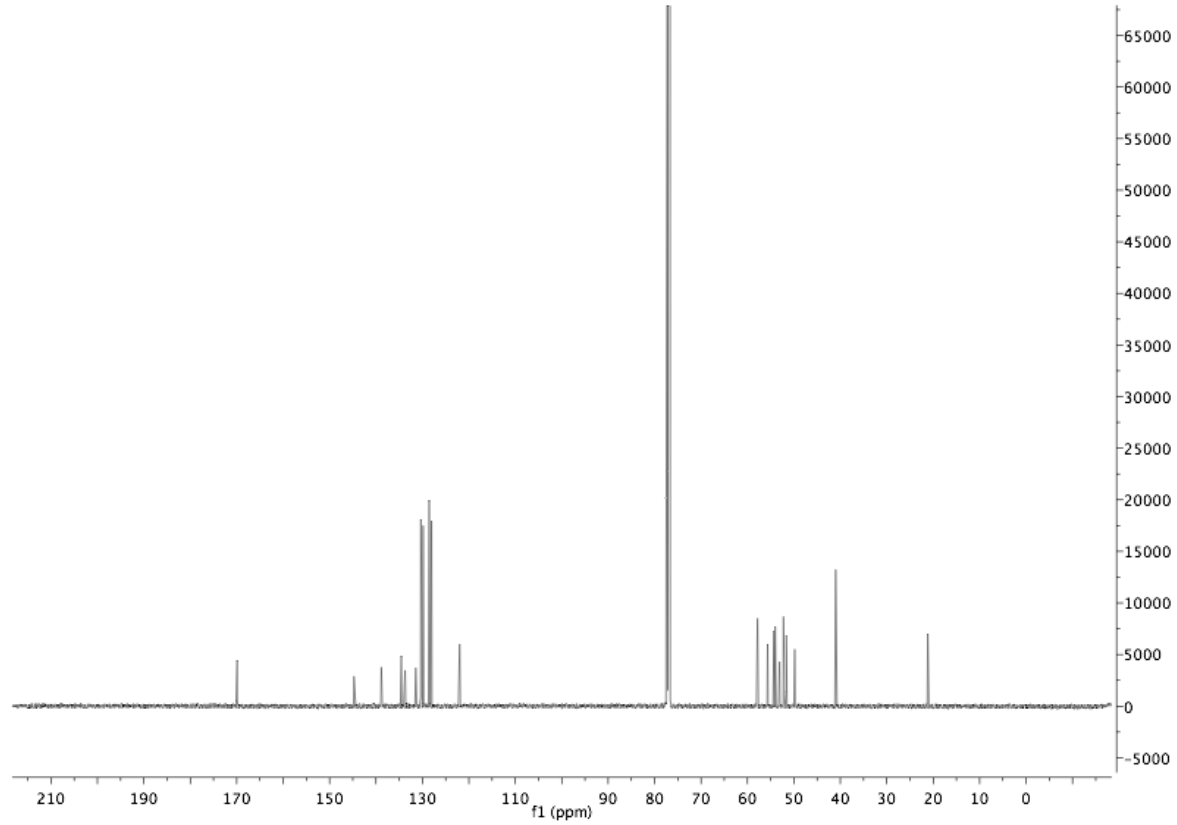
Methyl 2-(4-methoxybenzyl)-5-((1-(4-methylbenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*1,2*})



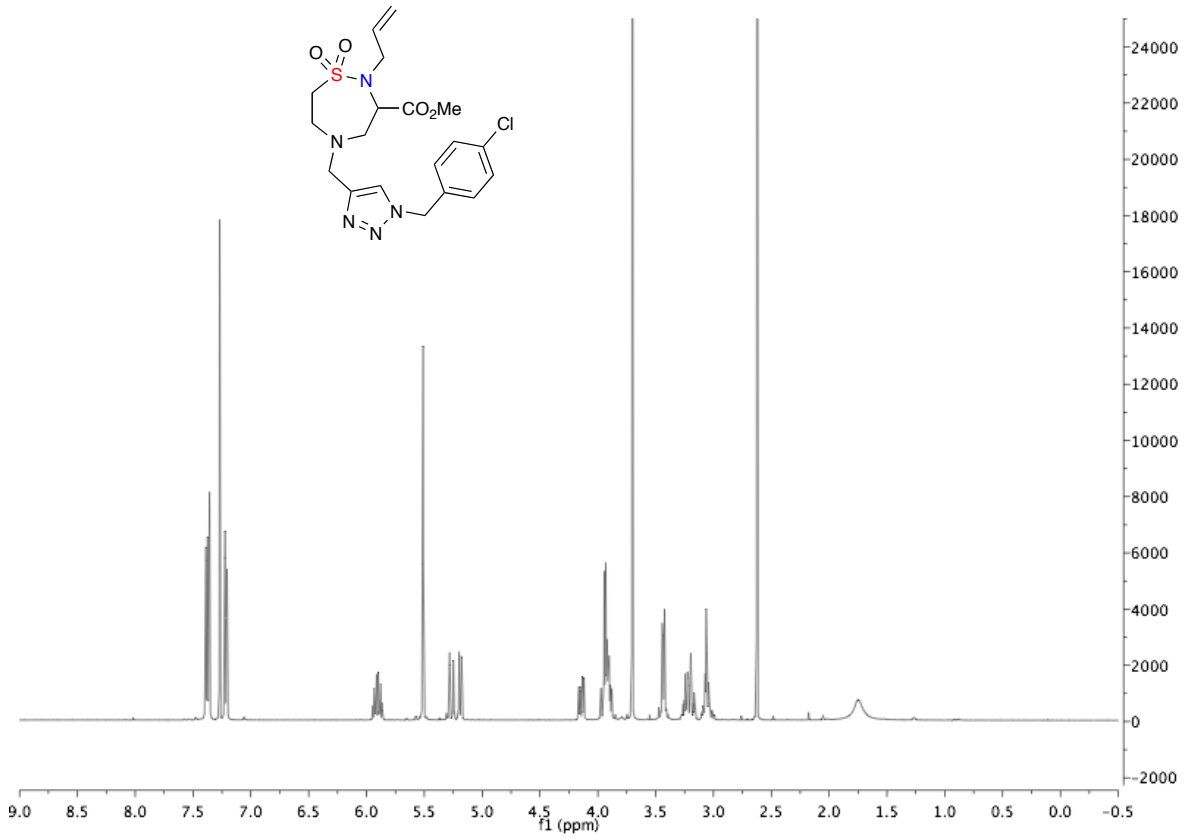


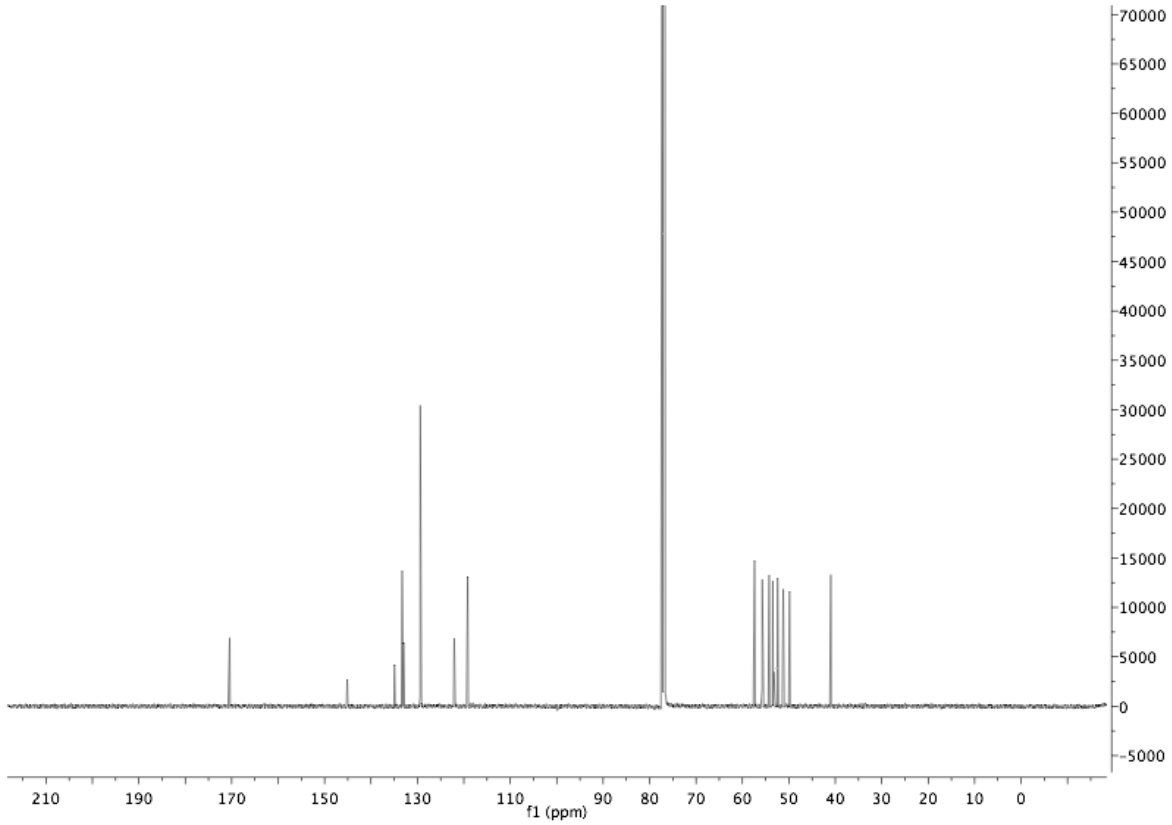
Methyl 2-(4-chlorobenzyl)-5-((1-(4-methylbenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*4,2*})



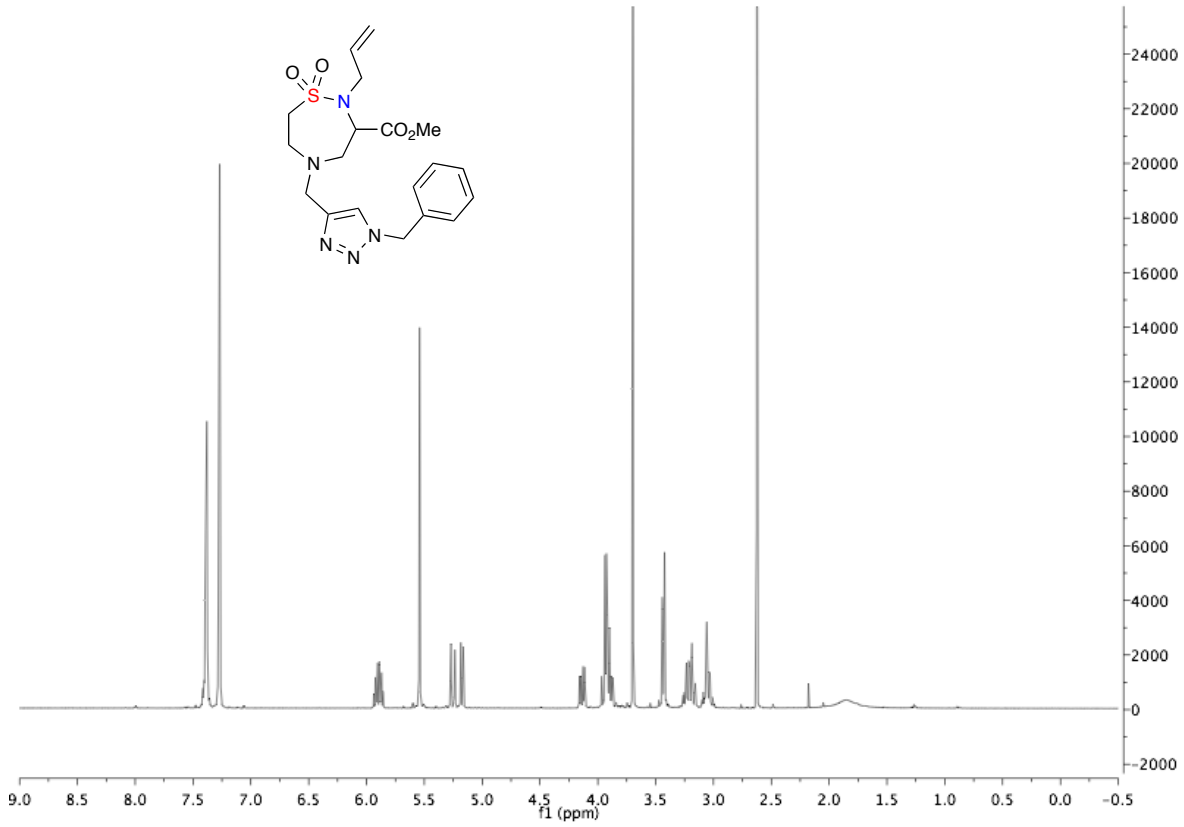


Methyl 2-allyl-5-((1-(4-chlorobenzyl)-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*6,4*})





Methyl 2-allyl-5-((1-benzyl-1*H*-1,2,3-triazol-4-yl)methyl)-1,2,5-thiadiazepane-3-carboxylate 1,1-dioxide (8{*6,3*})



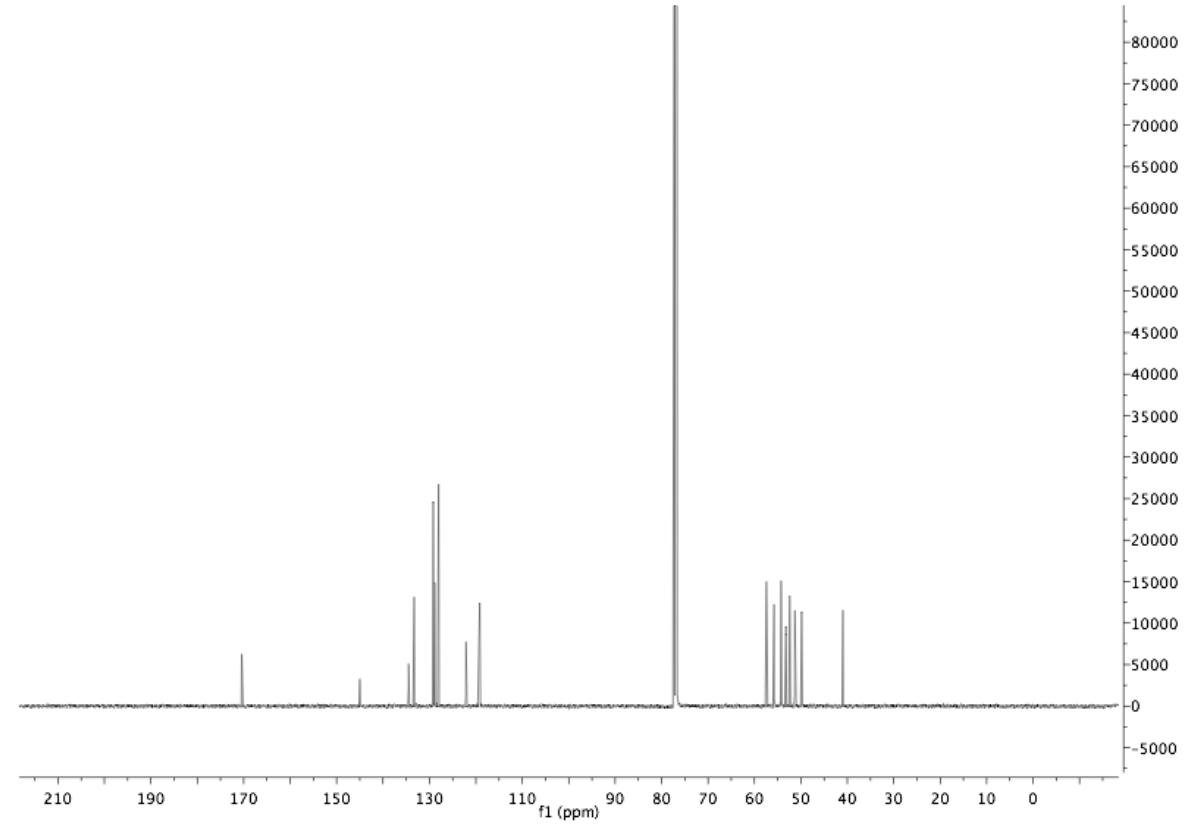


Table of Mass Spectroscopy Data, Final Mass and Purity for all Library Compounds

Compounds	Cal. Mass	Found Mass	Recovered Weight (mg)	Purity %	Yield %
6{*1,1*}	451.1889	452.1911	64.8	99.9	47.9
6{*1,2*}	449.1733	450.1771	56.4	97.2	41.9
6{*1,3*}	477.2046	478.2109	53.7	96.7	37.5
6{*1,4*}	529.1995	530.2084	91.6	83.0	57.7
6{*1,5*}	513.2046	514.2112	88.6	98.0	57.5
6{*1,6*}	499.1889	500.1972	83.3	82.7	55.6
6{*1,7*}	533.1500	534.1520	84.0	97.9	52.5
6{*1,8*}	517.1795	518.1853	95.1	81.3	61.3
6{*2,1*}	435.1940	436.2020	35.0	99.3	26.8
6{*2,2*}	433.1784	434.1842	51.4	99.5	39.6
6{*2,3*}	461.2097	462.2193	71.7	98.0	51.8
6{*2,4*}	513.2046	514.2121	88.2	96.2	57.3
6{*2,5*}	497.2097	498.2094	87.9	86.0	58.9
6{*2,6*}	483.1940	484.2019	62.0	99.9	42.8
6{*2,7*}	517.1550	518.1631	77.3	92.0	49.8
6{*2,8*}	501.1846	502.1934	47.3	87.1	31.5
6{*3,1*}	421.1784	422.1827	66.0	99.3	52.2
6{*3,2*}	419.1627	420.1678	53.2	98.2	42.3
6{*3,3*}	447.1940	448.2002	72.4	97.5	54.0
6{*3,4*}	499.1889	500.1092	89.5	87.9	59.8
6{*3,5*}	483.1940	484.2006	82.0	99.6	56.6
6{*3,6*}	469.1784	470.1859	74.9	87.4	53.2
6{*3,7*}	503.1394	504.1463	68.9	99.4	45.6
6{*3,8*}	487.1690	488.1750	74.6	87.5	51.0
6{*4,1*}	455.1394	456.1481	66.8	99.9	48.9
6{*4,2*}	453.1238	454.1295	55.5	99.6	40.8
6{*4,3*}	481.1551	482.1615	76.6	98.8	53.1
6{*4,4*}	533.1500	534.1574	91.9	94.4	57.5
6{*4,5*}	517.1550	518.1614	84.2	80.3	54.3
6{*4,6*}	503.1394	504.1420	61.4	94.3	40.7
6{*4,7*}	537.1004	538.1042	68.8	92.7	42.7
6{*4,8*}	521.1300	522.1349	77.5	81.9	49.6
6{*5,1*}	439.1690	440.1778	46.9	99.7	35.6
6{*5,2*}	437.1533	438.1608	42.3	99.7	32.3
6{*5,3*}	465.1846	466.1888	42.0	99.6	30.1
6{*5,4*}	517.1795	518.1862	64.8	90.1	41.8
6{*5,5*}	501.1846	502.1889	81.6	99.7	54.3
6{*5,6*}	487.1690	488.1776	77.0	93.8	52.7
6{*5,7*}	521.1300	522.1369	75.0	98.3	48.0
6{*5,8*}	505.1595	506.1688	80.2	88.3	52.9
6{*6,1*}	417.1682	418.1708	56.4	95.3	45.1
6{*6,2*}	415.1526	416.1601	39.5	70.4	31.7
6{*6,3*}	443.1839	444.1917	51.4	96.1	38.7
6{*6,4*}	495.1788	496.1880	65.2	97.9	43.9

6{*6,5*}	479.1839	480.1914	51.2	98.4	35.6
6{*6,6*}	465.1682	466.1718	44.1	98.3	31.6
6{*6,7*}	499.1292	500.1376	47.7	98.1	31.9
6{*6,8*}	483.1588	484.1606	50.3	98.6	34.7
8{*1,1*}	529.1995	530.2064	67.1	90.4	42.3
8{*1,2*}	513.2046	514.2114	59.4	99.8	38.6
8{*1,3*}	499.1889	500.1964	65.2	98.5	43.5
8{*1,4*}	533.1500	534.1567	62.6	98.3	39.1
8{*1,5*}	517.1795	518.1859	41.7	98.4	26.9
8{*1,6*}	495.1788	496.1827	36.5	97.6	24.6
8{*1,7*}	495.1788	496.1844	37.8	93.1	25.4
8{*1,8*}	509.1944	510.2009	40.2	99.8	26.3
8{*2,1*}	513.2046	514.2106	76.8	76.6	49.9
8{*2,2*}	497.2098	498.2142	53.8	99.5	36.1
8{*2,3*}	483.1940	484.2000	67.0	78.2	46.2
8{*2,4*}	517.1551	518.1636	60.6	99.7	39.1
8{*2,5*}	501.1846	502.1909	60.9	79.2	40.5
8{*2,6*}	479.1839	480.1899	39.2	99.1	27.3
8{*2,7*}	479.1839	480.1890	45.1	86.2	31.4
8{*2,8*}	493.1995	494.2083	55.4	98.6	37.4
8{*3,1*}	499.1889	500.1963	51.9	97.3	34.7
8{*3,2*}	483.1940	484.2020	56.2	99.9	38.8
8{*3,3*}	469.1784	470.1843	43.8	99.6	31.1
8{*3,4*}	503.1394	504.1467	56.6	98.8	37.5
8{*3,5*}	487.1690	488.1747	47.0	96.3	32.2
8{*3,6*}	465.1682	466.1761	43.3	98.8	31.0
8{*3,7*}	465.1682	466.1745	41.5	95.0	29.7
8{*3,8*}	479.1839	480.1909	42.0	99.9	29.2
8{*4,1*}	533.1500	534.1566	32.4	75.4	20.3
8{*4,2*}	517.1551	518.1636	56.0	98.7	36.1
8{*4,3*}	503.1394	504.1476	62.9	80.3	41.7
8{*4,4*}	537.1004	538.1065	60.3	96.9	37.4
8{*4,5*}	521.1300	522.1370	49.2	78.4	31.5
8{*4,6*}	499.1292	500.1376	46.9	99.2	31.3
8{*4,7*}	499.1292	500.1361	37.9	94.9	25.3
8{*4,8*}	513.1449	514.1505	40.9	98.8	26.6
8{*5,1*}	517.1795	518.1868	56.9	73.3	36.7
8{*5,2*}	501.1846	502.1895	49.8	99.2	33.1
8{*5,3*}	487.1690	488.1750	35.4	98.5	24.2
8{*5,4*}	521.1300	522.1368	51.5	100.0	32.9
8{*5,5*}	505.1595	506.1637	40.4	99.1	26.7
8{*5,6*}	483.1588	484.1647	41.8	97.1	28.8
8{*5,7*}	483.1588	484.1626	41.3	95.9	28.5
8{*5,8*}	497.1744	498.1830	38.2	99.7	25.6
8{*6,1*}	449.1733	450.1781	48.7	99.1	36.1
8{*6,2*}	433.1784	434.1850	48.2	99.7	37.1
8{*6,3*}	419.1627	420.1684	47.9	98.0	38.1

8{*6,4*}	453.1238	454.1297	52.5	99.8	38.6
8{*6,5*}	437.1533	438.1584	42.4	99.6	32.3
8{*6,6*}	415.1526	416.1583	38.0	44.3	30.5
8{*6,7*}	415.1526	416.1563	38.7	75.4	31.1
8{*6,8*}	429.1682	430.1740	35.7	100.0	27.7

Lipinski and ADME Data

Sketched electronic versions of the library compounds were imported into the Tripos Molecular Spreadsheet[1] wherein standard Lipinski Rule of 5 parameters[2] (molecular weight, ClogP, number of H-acceptors, and number of H-donors) plus the number of rotatable bonds and polar surface area were computed. Lipinski violations were specified according to molecular weight > 500, ClogP > 5.0, number of acceptors > 10, number of donors > 5, and number of rotatable bonds > 5. The structures were then exported into SDF format and coverted into three-dimensional protonated structures via Concord[3]. Absorption, distribution, metabolism and excretion (ADME) profiles of these compounds was then generated via Volsurf[4]. Descriptors were generated using three probes (water, hydrophobic and carbonyl oxygen) with a grid space distribution of 1.0 Å. Predictions were then projected onto internal ADME models at the 5-component level. Finally diversity analysis was carried out using DiverseSolutions[5] using standard H-aware 3D BCUT descriptors. The library was then projected onto a chemical space defined by the following descriptors: gastchrg_invdist2_000.550_K_L, gastchrg_invdist6_000.500_K_H, haccept_invdist2_001.000_K_H, tabpolar_invdist_000.250_K_H, tabpolar_invdist_000.500_K_L and populated (for comparison) by a recent version of the MLSMR screening set (ca. 7/2010; ~330,000 unique chemical structures). Diversity scores (*div(A)*) for our library were then generated for each of our compounds (*A*) according to the expression:

$$div(A) = \frac{pop[Cell(A)]}{\sum_{i \in Occ} pop(i) / N_{occ}}$$

[1] SYBYL 8.0, The Tripos Associates, St. Louis MO, 2008.
[2] Lipinski, C.A., Lombardo, F., Dominy, B.W., Feeney, P.J. Experimental and computational approaches to estimate solubility and permeability in drug discovery and development settings. *Adv. Drug Delivery Rev*. **1997**, *23*, 3-25.
[3] Concord 8.0, The Tripos Associates, St. Louis MO, 2008.
[4] Cruciani, G., Meniconi, M., Carosati, E., Zamora, I., Mannhold, R. VOLSURF: A Tool for Drug ADME-Properties Prediction. In: *Methods and Principles in Medicinal Chemistry*. Eds. van de Waterbeemd, H., Lennernäs, H., Artursson, P. (Wiley-VCH Verlag GmbH & Co., Weinheim, 2003).
[5] Pearlman, R.S.; Smith, K.M. Metric Validation and the Receptor-Relevant Subspace Concept. *J. Chem. Inf. Comput. Sci*. **1999**, *39*, 28-35.

where N_{occ} is the number of cells occupied by PubChem compounds in an evenly distributed 10×10×10×10×10 grid decomposition of the chemistry space, and *pop(i)* is the population of cell *i*.

Molecule	CLOGP	Mol.Wt	Acceptor	Donor	Rot. Bond	LIP VIOLS	PSA	DIVS	BBB	SOLY	CACO2	SP_S	SP_P	PB	VOLD	HERG	Sol. DMSO	METSTAB
6{*1,1*}	2.09	451.54	8	1	9	1	9.00	0.29	-0.33	-5.81	0.36	-0.43	0.36	91.32	-0.45	0.79	0.65	-0.39
6{*1,2*}	2.67	435.54	7	1	8	1	8.00	0.29	-0.40	-5.23	0.48	-0.37	0.48	89.45	-0.48	0.96	1.04	-0.24
6{*1,3*}	2.17	421.51	7	1	8	1	8.00	0.29	-0.11	-5.34	0.55	-0.30	0.42	88.02	-0.51	0.92	0.78	-0.29
6{*1,4*}	2.88	455.96	7	1	8	1	8.00	0.08	-0.26	-5.55	0.65	-0.62	0.52	93.36	-0.77	0.00	0.77	-0.39
6{*1,5*}	2.31	439.50	7	1	8	1	8.00	0.29	-0.29	-5.43	0.22	-0.21	0.24	88.45	-0.47	1.16	0.66	-0.39
6{*1,6*}	1.16	429.49	9	1	11	1	11.00	0.29	-0.30	-5.06	0.03	-0.04	0.05	71.57	-0.28	1.13	1.03	-0.38
6{*1,7*}	1.41	449.52	8	1	8	1	8.00	0.29	-0.21	-5.01	0.24	-0.26	0.46	86.94	-0.56	0.92	0.94	-0.44
6{*1,8*}	1.99	433.52	7	1	7	1	7.00	0.29	-0.06	-5.32	0.42	-0.24	0.52	90.71	-0.54	0.74	0.87	-0.55
6{*2,1*}	1.49	419.50	7	1	7	1	7.00	0.29	-0.02	-5.05	0.44	-0.16	0.48	86.42	-0.53	0.81	1.02	-0.42
6{*2,2*}	2.20	453.94	7	1	7	1	7.00	0.08	-0.09	-5.40	0.50	-0.40	0.56	95.00	-0.76	0.21	0.90	-0.57
6{*2,3*}	1.63	437.49	7	1	7	1	7.00	0.29	-0.19	-5.09	0.09	-0.11	0.29	84.97	-0.51	1.02	0.86	-0.55
6{*2,4*}	0.48	427.48	9	1	10	1	10.00	0.29	-0.74	-4.42	-0.11	0.09	0.03	62.98	-0.41	1.27	1.57	-0.33
6{*2,5*}	2.30	477.58	8	1	8	1	8.00	0.43	-0.15	-5.82	0.34	-0.45	0.45	97.43	-0.62	0.70	0.70	-0.73
6{*2,6*}	2.88	461.58	7	1	7	1	7.00	0.43	-0.09	-5.76	0.53	-0.42	0.53	96.92	-0.64	0.57	0.79	-0.76
6{*2,7*}	2.38	447.55	7	1	7	1	7.00	0.43	-0.05	-5.49	0.50	-0.33	0.49	93.46	-0.62	0.63	0.90	-0.68
6{*2,8*}	3.09	482.00	7	1	7	1	7.00	0.49	-0.15	-5.76	0.51	-0.54	0.56	102.01	-0.76	0.25	0.83	-0.77
6{*3,1*}	2.52	465.54	7	1	7	1	7.00	0.43	-0.27	-5.54	0.12	-0.26	0.31	92.39	-0.56	0.91	0.76	-0.80
6{*3,2*}	1.37	455.53	9	1	10	1	10.00	0.43	-0.95	-5.33	-0.02	-0.10	0.08	82.70	-0.50	0.91	1.77	-0.50
6{*3,3*}	2.66	529.61	9	1	10	2	10.00	0.06	-0.90	-6.28	0.16	-0.85	0.42	103.33	-0.61	0.05	0.90	-1.13
6{*3,4*}	3.24	513.61	8	1	9	2	9.00	0.06	-0.58	-6.23	0.36	-0.82	0.49	101.55	-0.61	-0.15	0.59	-1.23
6{*3,5*}	2.74	499.58	8	1	9	1	9.00	0.06	-0.45	-6.36	0.37	-0.75	0.45	100.75	-0.60	-0.16	0.57	-1.24
6{*3,6*}	3.45	534.03	8	1	9	2	9.00	0.08	-0.37	-7.03	0.47	-1.06	0.52	110.51	-0.89	-0.97	0.32	-1.38
6{*3,7*}	2.88	517.57	8	1	9	2	9.00	0.06	-0.96	-6.16	-0.08	-0.67	0.31	103.09	-0.48	0.22	1.14	-1.11
6{*3,8*}	1.73	507.56	10	1	12	2	12.00	0.06	-0.61	-6.37	0.06	-0.46	0.22	101.59	-0.54	0.55	0.85	-0.72
6{*4,1*}	3.24	513.61	8	1	9	2	9.00	0.06	-0.80	-6.21	0.24	-0.79	0.51	105.64	-0.58	-0.03	1.13	-1.12
6{*4,2*}	3.82	497.61	7	1	8	1	8.00	0.06	-0.64	-6.15	0.44	-0.79	0.58	103.68	-0.63	0.00	0.97	-1.04
6{*4,3*}	3.32	483.58	7	1	8	1	8.00	0.06	-0.53	-5.90	0.40	-0.69	0.57	101.54	-0.62	0.09	1.10	-1.00
6{*4,4*}	4.03	518.03	7	1	8	2	8.00	0.08	-0.48	-6.53	0.49	-1.03	0.63	109.34	-0.84	-0.83	1.00	-1.14
6{*4,5*}	3.46	501.57	7	1	8	2	8.00	0.06	-0.84	-6.16	0.07	-0.62	0.43	104.47	-0.52	0.37	1.16	-1.04
6{*4,6*}	2.31	491.56	9	1	11	1	11.00	0.06	-0.96	-6.22	0.10	-0.40	0.28	100.84	-0.49	0.54	1.56	-0.75
6{*4,7*}	2.74	499.58	8	1	9	1	9.00	0.06	-0.74	-5.97	0.23	-0.68	0.49	102.70	-0.55	0.15	1.21	-0.96
6{*4,8*}	3.32	483.58	7	1	8	1	8.00	0.06	-0.63	-5.80	0.42	-0.67	0.58	101.22	-0.56	0.09	1.23	-0.87
6{*5,1*}	2.82	469.56	7	1	8	1	8.00	0.06	-0.47	-5.64	0.39	-0.57	0.53	98.16	-0.58	0.26	1.20	-0.80
6{*5,2*}	3.53	504.00	7	1	8	2	8.00	0.08	-0.42	-6.25	0.49	-0.92	0.62	106.91	-0.84	-0.69	1.09	-0.95
6{*5,3*}	2.96	487.55	7	1	8	1	8.00	0.06	-0.82	-5.74	0.01	-0.51	0.37	99.84	-0.45	0.37	1.40	-0.88
6{*5,4*}	1.82	477.53	9	1	11	1	11.00	0.29	-0.89	-5.96	0.04	-0.30	0.22	96.78	-0.45	0.60	1.67	-0.69
6{*5,5*}	3.45	534.03	8	1	9	2	9.00	0.08	-0.65	-6.82	0.27	-0.94	0.53	111.93	-0.68	-0.50	1.04	-1.18
6{*5,6*}	4.03	518.03	7	1	8	2	8.00	0.08	-0.23	-7.15	0.58	-0.97	0.62	108.85	-0.80	-0.58	0.34	-1.33
6{*5,7*}	3.53	504.00	7	1	8	2	8.00	0.08	-0.14	-6.90	0.55	-0.87	0.58	106.47	-0.75	-0.50	0.45	-1.24
6{*5,8*}	4.25	538.45	7	1	8	2	8.00	0.08	-0.30	-6.87	0.54	-1.02	0.62	109.78	-0.85	-0.85	0.54	-1.32
6{*6,1*}	3.68	521.99	7	1	8	2	8.00	0.08	-0.46	-7.03	0.22	-0.80	0.46	111.02	-0.71	-0.29	0.52	-1.24
6{*6,2*}	2.53	511.98	9	1	11	2	11.00	0.08	-0.39	-6.59	0.22	-0.59	0.32	105.81	-0.67	-0.09	0.97	-0.76
6{*6,3*}	2.88	517.57	8	1	9	2	9.00	0.06	-0.85	-5.91	-0.01	-0.59	0.35	97.85	-0.55	0.39	0.72	-0.92
6{*6,4*}	3.46	501.57	7	1	8	2	8.00	0.06	-0.75	-6.01	0.22	-0.60	0.46	99.65	-0.58	0.27	0.63	-0.91
6{*6,5*}	2.96	487.55	7	1	8	1	8.00	0.06	-0.66	-5.90	0.17	-0.53	0.43	101.66	-0.55	0.37	1.14	-0.76
6{*6,6*}	3.68	521.99	7	1	8	2	8.00	0.08	-0.68	-6.45	0.22	-0.85	0.51	111.07	-0.80	-0.44	1.06	-0.85
6{*6,7*}	3.11	505.54	7	1	8	2	8.00	0.06	-0.93	-5.84	-0.26	-0.48	0.18	96.35	-0.52	0.49	1.09	-0.87
6{*6,8*}	1.96	495.52	9	1	11	1	11.00	0.29	-0.95	-5.73	-0.33	-0.23	0.01	84.52	-0.52	0.74	1.11	-0.84
8{*1,1*}	2.66	529.61	9	1	10	2	10.00	0.06	-0.32	-6.83	0.13	-0.64	0.22	108.89	-0.33	0.03	0.43	-0.80
8{*1,2*}	3.24	513.61	8	1	9	2	9.00	0.06	-1.06	-6.82	0.08	-0.58	0.31	110.70	-0.26	-0.09	1.64	-1.02
8{*1,3*}	2.74	499.58	8	1	9	1	9.00	0.06	-0.81	-6.56	0.05	-0.50	0.26	108.06	-0.20	-0.05	1.81	-0.92
8{*1,4*}	3.45	534.03	8	1	9	2	9.00	0.08	-0.75	-7.33	0.15	-0.82	0.37	116.52	-0.52	-0.80	1.23	-1.09
8{*1,5*}	2.88	517.57	8	1	9	2	9.00	0.06	-1.31	-6.45	-0.30	-0.42	0.05	101.98	-0.31	0.18	1.48	-1.02
8{*1,6*}	1.73	507.56	10	1	12	2	12.00	0.06	-0.68	-5.78	-0.23	-0.27	-0.07	81.57	-0.22	0.43	1.22	-0.50
8{*1,7*}	1.48	493.53	10	1	11	1	11.00	0.06	-0.54	-5.36	-0.21	-0.14	0.06	79.29	-0.23	0.78	1.45	-0.25
8{*1,8*}	0.70	509.58	10	1	10	2	10.00	0.06	-0.53	-5.84	-0.31	-0.23	-0.02	79.99	-0.13	0.38	1.33	-0.58
8{*2,1*}	3.24	513.61	8	1	9	2	9.00	0.06	-0.18	-6.57	0.27	-0.59	0.28	100.88	-0.36	-0.06	0.57	-1.03
8{*2,2*}	3.82	497.61	7	1	8	1	8.00	0.06	-0.28	-6.65	0.37	-0.62	0.41	108.32	-0.34	-0.05	0.94	-1.03
8{*2,3*}	3.32	483.58	7	1	8	1	8.00	0.06	-0.19	-6.33	0.32	-0.51	0.36	102.72	-0.33	0.01	1.04	-0.99
8{*2,4*}	4.03	518.03	7	1	8	2	8.00	0.08	-0.06	-7.13	0.46	-0.87	0.47	115.42	-0.64	-0.85	0.74	-1.11
8{*2,5*}	3.46	501.57	7	1	8	2	8.00	0.06	-0.54	-6.35	0.02	-0.48	0.18	103.90	-0.36	0.24	0.90	-1.05
8{*2,6*}	2.31	491.56	9	1	11	1	11.00	0.06	-0.68	-5.62	-0.09	-0.29	0.02	83.36	-0.29	0.57	1.39	-0.48
8{*2,7*}	2.06	477.53	9	1	10	1	10.00	0.29	-1.05	-4.93	-0.18	-0.14	0.16	76.96	-0.34	0.94	2.19	-0.22
8{*2,8*}	1.28	493.58	9	1	9	1	9.00	0.06	-1.15	-5.03	-0.26	-0.22	0.10	79.46	-0.34	0.52	2.20	-0.25
8{*3,1*}	2.74	499.58	8	1	9	1	9.00	0.06	-0.94	-6.25	0.07	-0.51	0.28	99.87	-0.37	0.15	1.54	-0.84
8{*3,2*}	3.32	483.58	7	1	8	1	8.00	0.06	-0.20	-6.51	0.38	-0.55	0.41	107.45	-0.28	0.09	0.97	-0.87
8{*3,3*}	2.82	469.56	7	1	8	1	8.00	0.06	-0.12	-6.19	0.32	-0.43	0.35	102.23	-0.27	0.14	1.04	-0.85
8{*3,4*}	3.53	504.00	7	1	8	2	8.00	0.08	-0.02	-6.87	0.43	-0.77	0.47	114.36	-0.54	-0.63	0.83	-0.94
8{*3,5*}	2.96	487.55	7	1	8	1	8.00	0.06	-0.48	-6.20	0.02	-0.39	0.15	103.57	-0.33	0.32	0.92	-0.93
8{*3,6*}	1.82	477.53	9	1	11	1	11.00	0.29	-0.64	-5.51	-0.14	-0.20	-0.04	82.27	-0.25	0.58	1.46	-0.48
8{*3,7*}	1.56	463.51	9	1	10	1	10.00	0.29	-0.49	-5.03	-0.10	-0.06	0.09	75.83	-0.28	0.86	1.54	-0.29
8{*3,8*}	0.78	479.55	9	1	9	1	9.00	0.06	-0.62	-5.14	-0.18	-0.14	0.03	78.06	-0.28	0.44	1.54	-0.33
8{*4,1*}	3.45	534.03	8	1	9	2	9.00	0.08	0.00	-7.13	0.25	-0.73	0.29	107.04	-0.42	-0.46	0.54	-1.15
8{*4,2*}	4.03	518.03	7	1	8	2	8.00	0.08	-0.12	-7.13	0.38	-0.77	0.42	112.96	-0.42	-0.45	0.85	-1.21
8{*4,3*}	3.53	504.00	7	1	8	2	8.00	0.08	-0.02	-6.82	0.32	-0.66	0.37	107.60	-0.41	-0.39	0.94	-1.15
8{*4,4*}	4.25	538.45	7	1	8	2	8.00	0.08	-0.11	-7.29	0.41	-0.87	0.44	118.63	-0.61	-0.80	0.73	-1.22
8{*4,5*}	3.68	521.99	7	1	8	2	8.00	0.08	-0.40	-6.84	0.01	-0.60	0.19	110.16	-0.42	-0.17	0.81	-1.10
8{*4,6*}	2.53	511.98	9	1	11	2	11.00	0.08	-0.68	-5.99	-0.13	-0.43	0.07	87.65	-0.46	0.16	1.32	-0.55
8{*4,7*}	2.27	497.95	9	1	10	1	10.00	0.08	-0.54	-5.41	-0.11	-0.29	0.19	81.50	-0.47	0.45	1.49	-0.34
8{*4,8*}	1.49	513.99	9	1	9	2	9.00	0.08	-0.66	-5.60	-0.18	-0.37	0.14	83.52	-0.47	0.03	1.44	-0.38
8{*5,1*}	2.88	517.57	8	1	9	2	9.00	0.06	-0.58	-6.60	-0.07	-0.49	0.21	106.31	-0.31	0.32	0.97	-0.82
8{*5,2*}	3.46	501.57	7	1	8	2	8.00	0.06	-0.53	-6.72	0.14	-0.51	0.33	114.11	-0.28	0.23	1.07	-0.85
8{*5,3*}	2.96	487.55	7	1	8	1	8.00	0.29	-0.45	-6.40	0.08	-0.39	0.26	108.84	-0.28	0.27	1.13	-0.83
8{*5,4*}	3.68	521.99	7	1	8	2	8.00	0.08	-0.37	-6.95	0.12	-0.70	0.36	119.55	-0.48	-0.34	0.91	-0.85
8{*5,5*}	3.11	505.54	7	1	8	2	8.00	0.29	-0.71	-6.39	-0.30	-0.36	0.01	104.79	-0.35	0.39	0.87	-0.85
8{*5,6*}	1.96	495.52	9	1	11	1	11.00	0.29	-0.85	-5.78	-0.50	-0.14	-0.21	82.50	-0.17	0.69	1.39	-0.55
8{*5,7*}	1.70	481.50	9	1	10	1	10.00	0.29	-0.65	-5.20	-0.44	-0.03	-0.12	73.28	-0.25	0.87	1.41	-0.42

8{*5,8*}	0.92	497.54	9	1	9	1	9.00	0.06	-0.76	-5.35	-0.51	-0.10	-0.17	76.52	-0.24	0.54	1.37	-0.42
8{*6,1*}	1.31	435.50	8	1	8	1	8.00	0.51	-0.79	-5.28	0.09	-0.27	0.30	91.59	-0.20	1.09	1.66	0.24
8{*6,2*}	1.89	419.50	7	1	7	1	7.00	0.51	-0.59	-5.06	0.28	-0.22	0.39	89.28	-0.19	1.09	1.62	0.21
8{*6,3*}	1.39	405.47	7	1	7	1	7.00	0.51	-0.55	-4.84	0.25	-0.15	0.36	87.54	-0.20	1.06	1.75	0.32
8{*6,4*}	2.10	439.92	7	1	7	1	7.00	0.18	-0.60	-4.92	0.32	-0.41	0.42	94.16	-0.41	0.55	1.59	0.16
8{*6,5*}	1.53	423.46	7	1	7	1	7.00	0.51	-0.70	-4.98	-0.10	-0.09	0.10	86.62	-0.22	1.14	1.62	0.29
8{*6,6*}	0.38	413.45	9	1	10	1	10.00	0.51	-1.08	-4.15	-0.36	0.19	-0.13	59.16	-0.15	1.52	2.15	0.32
8{*6,7*}	0.13	399.42	9	1	9	1	9.00	0.51	-0.68	-4.05	-0.40	0.44	-0.18	48.33	0.07	1.62	2.14	0.01
8{*6,8*}	-0.65	415.46	9	1	8	1	8.00	0.51	-0.87	-3.86	-0.33	0.20	-0.16	55.59	-0.14	1.39	1.85	0.42
averages	2.57	486.26	8	1	9	1	8.71	0.16	-0.53	-5.94	0.14	-0.46	0.30	96.04	-0.46	0.29	1.12	-0.71