

EXPERIMENTAL SUPPORTING INFORMATION

The Indium Trichloride-Promoted Aza-Prins Reaction

Adrian P. Dobbs,[a,b*] Sebastien J.J. Guesné,[b] Robert J. Parker,[b] John Skidmore,[c] Richard A. Stephenson[d] and Mike B. Hursthouse[d]

[a]School of Biological and Chemical Sciences, Joseph Priestley Building, Queen Mary University of London, Mile End Road, London E1 4NS, United Kingdom.

[b]School of Chemistry, University of Exeter, Stocker Road, Exeter, EX4 4QD, United Kingdom.

[c]GlaxoSmithKline, New Frontiers Science Park (North), Harlow, Essex CM19 5AD, United Kingdom.

EPSRC National Crystallographic Service, Chemistry, University of Southampton, Southampton SO17 1BJ, United Kindon.

A.Dobbs@qmul.ac.uk

Contents:

General:

All chemicals were purified by distillation where appropriate. Diethyl ether and tetrahydrofuran were predried over sodium wire and distilled from sodium under nitrogen, with benzophenone ketyl as indicator directly in the reaction vessel. Dichloromethane was distilled over calcium hydride and kept under nitrogen. All reactions were carried out under anhydrous conditions and in an atmosphere of nitrogen unless otherwise stated, using flame-dried glassware with all transfers performed using plastic syringes and needles.

All column chromatography was carried out using Fluka Silica Gel 60 (220-440 mesh) (Brockmann 2-3). TLC analysis was carried out using aluminium-backed plates coated with Merck Kieselgel 60 GF254. Plates were visualised by ultraviolet light and aqueous potassium permanganate spray ($KMnO_4$:K_2CO_3:water 6:1:100, w/w/v). Another purification technique involved the use of Mass-Directed-Auto-Prep (MDAP), a form of preparative HPLC, performed in the laboratories at GlaxoSmithKline®, Harlow (confidential).

Melting points were determined using a Gallenkamp melting point apparatus.

Optical rotations were measured on an Optical Activity Ltd. AA-1000 polarimeter, values are quoted in 10^{-1} cm^2g^{-1}.

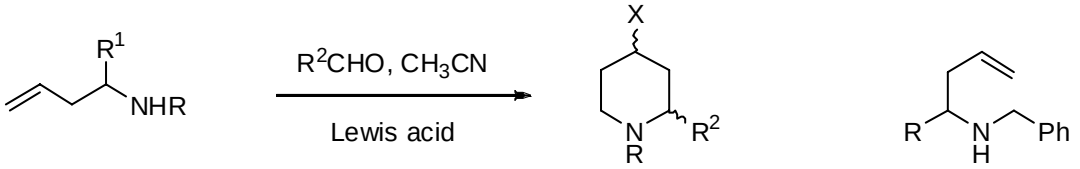
Infrared spectra were recorded in the range 4000-600 cm^{-1} on a Nicolet MAGNA 550 FT-IR spectrometer with internal calibration. Spectra were recorded as thin films between NaCl plates, as KBr disks or as Nujol® pastes.

Proton (^1H) and carbon (^{13}C) NMR spectra were recorded at 300 MHz or at 400 MHz and at 75.5 MHz or 100.6 MHz respectively on JNM-LA300 (300 MHz and 75.5 MHz) and on a Bruker ACF-300 or a Advance DRX 400 spectrometers. Chemical shift values (δ_H and δ_C) are reported as values in parts per million (ppm) from the residual protic solvent as the internal standard reference for ^1H NMR spectra and from the solvent peaks for ^{13}C NMR. ^1H NMR spectra are recorded in the form (integration; multiplicity; coupling constants; assignment). Multiplicities are given as s-singlet, d-doublet, t-triplet, q-quartet, m-multiplet and bs-broad signal. Coupling constants (*J* values) are quoted to one decimal place with values in Hz. ^{13}C NMR spectra are recorded in the form δ_C (assignment).

High and low resolution mass spectra were recorded on a Kratos profile instrument or on a VG Analytical ZAB-E instrument (EPSRC Mass Spectrometry Service, Swansea) or on a ThermoQuest Trace GC 2000 series and Agilent 6890 Series GC system, Micromas GCT. Mass spectra data were also acquired using LCMS analysis, performed in the laboratories at GlaxoSmithKline®, Harlow (confidential).

Full characterisation of a compound within this experimental includes, but is not limited to, data on IR, ^{1}H NMR, ^{13}C NMR, low-resolution mass spectra and high-resolution mass spectra. Compounds that have been characterised fully in the literature contain two or more from the previous list. On some occasions, it was not possible to obtain all required data; the reasons for this have been alluded to in the main body of this thesis. Crystal structures have been deposited at the Cambridge Crystallographic Data Centre (CCDC).

Table 1: Unsuccessful Lewis acid Screening Reactions



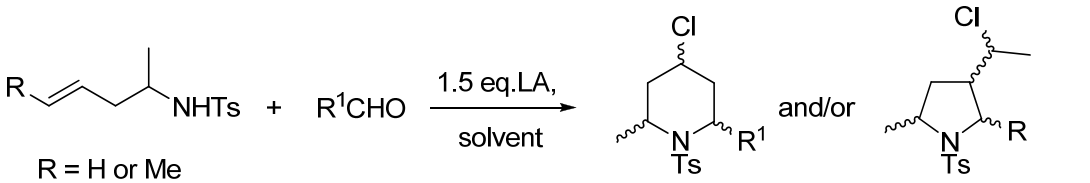
Entry	Lewis Acid	R	R^1	R^2	X	Temp	Time (h)	Yield(%)
1	$InCl_3$	*n*-Bu	H	CO_2Et	Cl	reflux	48	0
2			H	Bn			48	0
3		Bn	H	CO_2Et			48	0
4	$In(OTf)_3$		H	Bn	OTf		72	0
5			H	*n*-C_5H_{11}			72	0
6	$AlCl_3$		H	Bn	Cl		24	0
7			H	*n*-C_5H_{11}			24	0
8	$TiCl_4$[a]		H	Bn	Cl		24	0
9			H	*n*-C_5H_{11}			24	0
10	TMSOTf		H	Bn	OTf	-30°C to rt[b]	72	0
11	$BF_3.OEt_2$		H	*n*-C_5H_{11}	F		72	0
12	$InCl_3$	CBz	*n*-C_7H_{15}	*n*-C_5H_{11}	Cl	reflux	48	0
13			Bn	Bn			72	0
14							72	0
15	$In(OTf)_3$			*n*-C_5H_{11}	OTf		72	0
16				Bn			72	0
17	$BF_3.OEt_2$			*n*-C_5H_{11}	F	-30°C to rt[b]	72	0
18				Bn			72	0
19	TMSOTf			*n*-C_5H_{11}	OTf		72	0
20				Bn			72	0
21	$SnBr_4$[c]			*n*-C_5H_{11}	Br	-78°C to 0 °C to reflux in DCM	48	0
22				CO_2Et			48	0

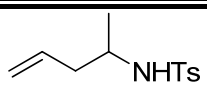
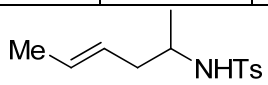
[a]Based on aube

[b]Decomposition if initial addition performed at 0 or above

[c]Based on Hanessian

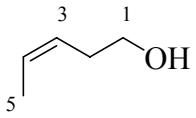
Table 2. Unsuccessful aza-Prins reactions involving C1 substituted tosylamine.



Entry	R^1	Lewis Acid	Solvent	Temp / °C	Time	Comment
						
1	*n*-C_7H_{15}	$InCl_3$	DCM	Rt and reflux	48 h, then 24 h reflux	No reaction, SM remained
2	$(CH_2)_2Ph$	$InCl_3$	DCM	Rt	48 h	No reaction, SM remained
3	*c*-Hex	$InCl_3$	DCM	Rt	48 h	No reaction, SM remained
4	*n*-C_7H_{15}	TMSOTf	DCM	Rt	48 h	No reaction, SM remained
5	$(CH_2)_2Ph$	$InCl_3$	CH_3CN	Rt and reflux	48 h, then 72 h reflux	No reaction, SM remained
6	$(CH_2)_2Ph$	$FeCl_3$ anhydrous	DCM	Rt	70 h	90% SM consumed, product trace
						
7	$(CH_2)_2Ph$	$InCl_3$	DCM	Rt and reflux	72 h, then 72 h reflux	No reaction, SM remained
8	$(CH_2)_2Ph$	$InCl_3$	DCM	Rt and reflux	24 h, then 24 h reflux	No reaction, SM remained
9	$(CH_2)_2Ph$	$InCl_3$	CH_3CN	Reflux	72 h	No reaction, SM remained

1. Preparation of alcohol-containing precursors

(*Z*)-Pent-3-en-1-ol

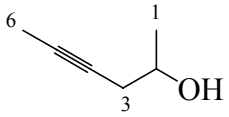


$C_5H_{10}O$
Mol. Wt.: 86.13

A solution of pent-3-yn-1-ol (5.00 g, 59.44 mmol) in methanol (85 mL) was injected into a hydrogenation flask containing a prehydrogenated suspension of Lindlar's catalyst (425 mg) in methanol (10 mL). The hydrogenation was complete in 17 hours. The mixture was filtered through celite, washed with diethyl ether (10 mL) and concentrated *in vacuo*. This gave a pale yellow oil, which was purified by distillation at atmospheric pressure (50 °C, 760mmHg) to give the *title compound* (4.02 g, 46.69 mmol, 79%) as a colourless oil.

δ_H (300 MHz; $CDCl_3$) 5.66-5.53 (1H, m, H-C3), 5.43-5.31 (1H, m, H-C4), 3.61 (2H, t, *J* 6.6, H-C1), 2.34-2.26 (2H, m, H-C2), 2.11 (1H, bs, H-OH), 1.64-1.59 (3H, m, H-C5); δ_C (75.5 MHz; $CDCl_3$) 126.9 (C3), 126.0 (C4), 62.0 (C1), 30.3 (C2), 12.8 (C5).

(±)-Hex-4-yn-2-ol

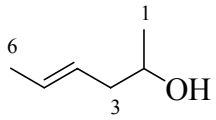


$C_6H_{10}O$
Mol. Wt.: 98.14

A round-bottomed flask was wrapped in aluminium foil and equipped with a dropping funnel and a thermometer. The flask was charged with (±)-pent-4-yn-2-ol (5.00 g, 59.43 mmol, 1.00 eq.) and tetrahydrofuran (96 mL). The resulting solution was cooled to –78 °C and a 2.5 M solution of *n*-butyllithium in hexane (47 mL, 118.86 mmol, 2.00 eq.) was added dropwise over 30 minutes. The mixture was stirred at -78 °C for a further 90 minutes and iodomethane (18.6 mL, 297.15 mmol, 5.00 eq.) was added dropwise. The mixture was allowed to warm to room temperature for 1 hour and 1.0 M hydrochloric acid (100 mL) was added dropwise over 30 minutes. The mixture was stirred for a further 30 minutes at room temperature, the organic layer separated and the aqueous layer extracted with diethyl ether (3 x 100 mL). The combined organic layers were dried over magnesium sulfate, filtered and concentrated *in vacuo*. This afforded a yellow oil, which was purified by distillation under reduced pressure (125 °C, 226 mmHg) to give the *title compound* (3.10 g, 31.59 mmol, 53%) as a colourless oil.

δ_H (300 MHz; $CDCl_3$) 3.88-3.77 (1H, m, H-C2), 2.37 (1H, bs, H-OH), 2.28-2.18 (2H, m, H-C3), 1.75 (3H, t, *J* 2.2, H-C6), 1.17 (3H, d, *J* 6.2, H-C1); δ_C (75.5 MHz; $CDCl_3$) 78.2 (C4), 75.3 (C3), 66.4 (C2), 29.2 (C3), 22.1 (C1), 3.4 (C6). All other data in agreement with literature values.

(±)-(*E*)-Hex-4-en-2-ol



$C_6H_{12}O$
Mol. Wt.: 100.16

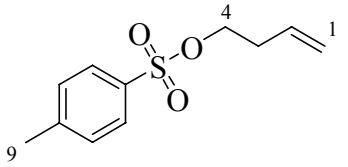
Following the general procedure X, **(±)**-hex-4-yn-2-ol (966 mg, 9.84 mmol) gave a pale yellow oil, which was purified by distillation under reduced pressure (120 °C, 213mmHg) to give the *title compound* (590 mg, 5.89 mmol, 60%) as a colourless oil.

δ_H (300 MHz; $CDCl_3$) 5.62-5.48 (1H, m, H-C4), 5.47-5.35 (1H, m, H-C5), 3.82-3.70 (1H, m, H-C2), 2.24-2.12 (1H, m, H-C3), 2.12-1.99 (1H, m, H-C3), 1.74 (1H, bs, H-OH), 1.70-1.65 (3H, m, H-C6), 1.17 (3H, d, *J* 6.2, H-C1). All other data in agreement with literature values.

General procedure for alcohol tosylation

A round-bottomed flask was charged with homoallylic alcohol (69.73 mmol, 1.00 eq.) and dichloromethane (140 mL). The resulting solution was stirred and cooled to 0 °C before adding sequentially 4-dimethylaminopyridine (5.08 g, 41.84 mmol, 0.60 eq.) and *p*-toluenesulfonyl chloride (15.96 g, 83.68 mmol, 1.20 eq.) portionwise and dropwise triethylamine (9.82 mL, 69.73 mmol, 1.00 eq.). The resulting solution was stirred at 0 °C until TLC showed complete consumption of starting material. The resulting suspension was diluted with diethyl ether (150 mL), stirred for a further 30 minutes and the precipitate removed by filtration. The solution was then washed sequentially with 10% aqueous copper sulphate (2 x 75 mL), 10% aqueous sodium hydrogen carbonate (2 x 75 mL) and a saturated aqueous sodium chloride solution (60 mL). The combined organic layers were dried over magnesium sulfate, filtered, and concentrated *in vacuo*.

4-(Toluene-4-sulfonyloxy)-but-1-ene 2

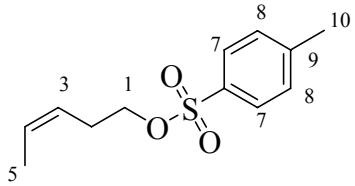


$C_{11}H_{14}O_3S$
Mol. Wt.: 226.29

Following the general procedure A, 3-buten-1-ol (3.35 g, 46.40 mmol) gave after 22 hours of stirring, a yellow oil which was purified by flash column chromatography (50% petroleum ether 50% diethyl ether) to give the *title compound* (8.22 g, 36.30 mmol, 78%) as a colourless oil.

δ_H (300 MHz; $CDCl_3$) 7.80 (2H, d, *J* 8.3, H-C6), 7.36 (2H, d, *J* 8.3, H-C7), 5.75-5.61 (1H, m, H-C2), 5.13-5.07 (2H, m, H-C1), 4.07 (2H, t, *J* 6.7, H-C4), 2.45 (3H, s, H-C9), 2.44-2.39 (2H, m, H-C3); δ_C (75.5 MHz; $CDCl_3$) 145.2 (C8), 133.5 (C5), 132.8 (C2), 130.3 (C7), 128.3 (C6), 118.7 (C1), 69.8 (C4), 33.6 (C3), 22.1 (C9); *m/z* (CI) 227 (MH^+, 100), 173 (95), 155 (55).

(*Z*)-Pent-3-enyl 4-methylbenzenesulfonate 19

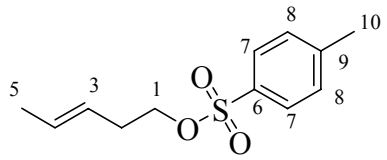


$C_{12}H_{16}O_3S$
Mol. Wt.: 240.32

Following the general procedure X, (Z)-pent-3-en-1-ol (3.99 g, 46.32 mmol) was consumed based on analysis by TLC after 20 hours of stirring at 0 °C. The work up afforded a yellow oil, which was purified by flash column chromatography (90% petroleum ether, 10% ethyl acetate) to give the *title compound* (9.78 g, 40.71 mmol, 88%) as a colourless oil.

δ_H (300 MHz; $CDCl_3$) 7.79 (2H, d, *J* 8.3, H-C7), 7.34 (2H, d, *J* 8.3, H-C8), 5.62-5.49 (1H, m, H-C3), 5.31-5.19 (1H, m, H-C4), 4.01 (2H, t, *J* 7.0, H-C1), 2.45 (3H, s, H-C10), 2.44-2.35 (2H, m, H-C2), 1.59-1.54 (3H, m, H-C5); *m/z* (CI) 241 (MH^+, 17), 213 (20), 173 (100).

(*E*)-Pent-3-enyl 4-methylbenzenesulfonate 20

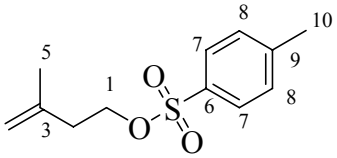


$C_{12}H_{16}O_3S$
Mol. Wt.: 240.32

Following the general procedure X, (*E*)-pent-3-en-1-ol (2.10 g, 24.38 mmol) was consumed based on analysis by TLC after 20 hours of stirring at 0 °C. The work up afforded a yellow oil, which was purified by flash column chromatography (90% petroleum ether, 10% ethyl acetate) to give the *title compound* (3.32 g, 13.82 mmol, 57%) as a colourless oil.

δ_H (300 MHz; $CDCl_3$) 7.77 (2H, d, *J* 8.3, H-C7), 7.33 (2H, d, *J* 8.3, H-C8), 5.55-5.40 (1H, m, H-C3), 5.30-5.17 (1H, m, H-C4), 3.99 (2H, t, *J* 6.8, H-C1), 2.44 (3H, s, H-C10), 2.34-2.26 (2H, m, H-C2), 1.63-1.57 (3H, m, H-C5); *m/z* (CI) 241 (MH^+, 15), 213 (20), 173 (100).

3-Methylbut-3-enyl 4-methylbenzenesulfonate 24

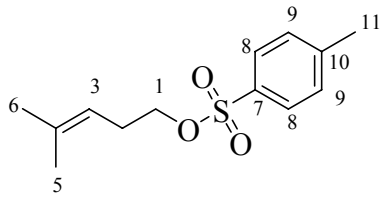


$C_{12}H_{16}O_3S$
Mol. Wt.: 240.32

Following the general procedure X, 3-methylbut-3-en-1-ol (6.01 g, 69.73 mmol) was consumed based on analysis by TLC after 48 hours of stirring at 0 °C. The work up gave the *title compound* (12.63 g, 52.55 mmol, 75%) as a yellow oil which was used in the next step without any further purification.

δ_H (300 MHz; $CDCl_3$) 7.77 (2H, d, *J* 8.3, H-C7), 7.33 (2H, d, *J* 8.3, H-C8), 4.77 (1H, s, H-C4), 4.66 (1H, s, H-C4), 4.10 (2H, t, *J* 6.8, H-C1), 2.43 (3H, s, H-C10), 2.33 (2H, t, *J* 6.8, H-C2), 1.64 (3H, s, H-C5); *m/z* (CI) 241 (MH^+, 90), 173 (72), 137 (100).

4-Methylpent-3-enyl 4-methylbenzenesulfonate 25

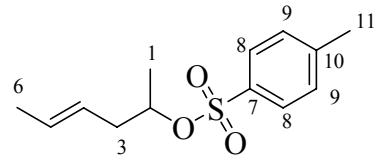


$C_{13}H_{18}O_3S$
Mol. Wt.: 254.35

Following the general procedure X, 4-methylpent-3-en-1-ol (250 mg, 2.50 mmol) was consumed based on analysis by TLC after 20 hours of stirring at 0 °C. The work up gave the *title compound* (630 mg, 2.48 mmol, 99%) as a yellow oil which was used in the next step without any further purification.

δ_H (300 MHz; $CDCl_3$) 7.78 (2H, d, *J* 8.3, H-C8), 7.34 (2H, d, *J* 8.3, H-C9), 4.99-4.91 (1H, m, H-C3), 3.97 (2H, t, *J* 7.1, H-C1), 2.45 (3H, s, H-C11), 2.37-2.28 (2H, m, H-C2), 1.65 (3H, s, H-C6), 1.55 (3H, s, H-C5); *m/z* (CI) 255 (MH^+, 30), 173 (100), 155 (20).

(±)-(*E*)-Hex-4-en-2-yl 4-methylbenzenesulfonate 42



$C_{13}H_{18}O_3S$
Mol. Wt.: 254.35

Following the general procedure, (±)-(*E*)-hex-4-en-2-ol (590 mg, 5.90 mmol) was consumed based on analysis by TLC after 40 hours of stirring at 0 °C. The work up afforded a yellow oil, which was purified by flash column chromatography (90% hexane, 10% ethyl acetate) to give the *title compound* (374 mg, 1.47 mmol, 25%) as a colourless oil.

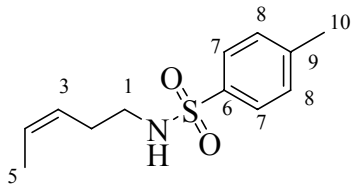
δ_H (300 MHz; $CDCl_3$) 7.78 (2H, d, *J* 8.2, H-C8), 7.33 (2H, d, *J* 8.2, H-C9), 5.49-5.35 (1H, m, H-C4), 5.20-5.07 (1H, m, H-C5), 4.61-4.50 (1H, m, H-C2), 2.44 (3H, s, H-C11), 2.32-2.12 (2H, m, H-C3), 1.58-1.53 (3H, m, H-C6), 1.25 (3H, d, *J* 6.3, H-C1);

δ_C (75.5 MHz; $CDCl_3$) 144.3 (C10), 134.4 (C7), 129.6 (C9), 128.3 (C4), 127.7 (C8), 124.7 (C5), 80.1 (C2), 39.6 (C3), 21.6 (C11), 20.4 (C1), 17.9 (C6);

General Procedure for the amination of a tosyl-protected/activated alcohol with 4-methylbenzenesulfonamide, catalysed by sodium iodide.

A round-bottomed flask fitted with a reflux condenser was charged with 4-methylbenzenesulfonamide (27.98 g, 160.38 mmol, 2.30 eq.), finely powdered potassium hydroxide (5.06 g, 90.65 mmol, 1.30 eq.) and dimethylsulfoxide (87 mL). The resulting suspension was heated to 50 °C and stirred for 2 hours. The resulting solution was cooled to room temperature and a tosylated alcohol derivative (69.73 mmol, 1.00 eq.) in dimethylsulfoxide (10 mL) added dropwise followed by sodium iodide (3.15 g, 20.92 mmol, 0.30 eq.) in one portion. The mixture was heated to 50 °C and stirred until TLC showed full consumption of starting material. The mixture was cooled to room temperature, ice cold water (100 mL) added, the organic layer separated, and the aqueous layer extracted with dichloromethane (3 x 50 mL). The combined organic layers were washed with a 15 % aqueous solution of potassium hydroxide (100 mL), water (100 mL) and a saturated aqueous solution of sodium chloride (100 mL). The organic layer was dried over magnesium sulfate, filtered and concentrated *in vacuo*.

(*Z*)-4-Methyl-*N*-(pent-3-enyl)benzenesulfonamide 21

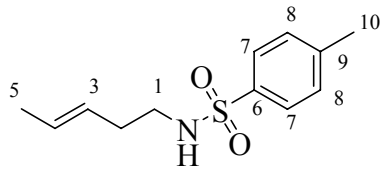


$C_{12}H_{17}NO_2S$
Mol. Wt.: 239.33

Following the general procedure X, (*Z*)-pent-3-enyl 4-methylbenzenesulfonate (1.00 g, 4.16 mmol) was consumed based on analysis by TLC after 20 hours of stirring at 50 °C. The work-up afforded a yellow oil, which was purified by flash column chromatography (80% hexane, 20% ethyl acetate) to give the *title compound* (0.93g, 3.89 mmol, 94%) as a colourless oil.

ν_{max}(neat)/cm^{-1} 3282, 2924, 1598; δ_H (300 MHz; $CDCl_3$) 7.74 (2H, d, *J* 8.3, H-C7), 7.31 (2H, d, *J* 8.3, H-C8), 5.64-5.50 (1H, m, H-C3), 5.25-5.13 (1H, m, H-C4), 4.49-4.39 (1H, m, H-NH), 3.01-2.93 (2H, m, H-C1), 2.43 (3H, s, H-C10), 2.25-2.16 (2H, m, H-C2), 1.59-1.54 (3H, m, H-C5); δ_C (75.5 MHz; $CDCl_3$) 143.3 (C9), 136.8 (C6), 129.7 (C8), 127.7 (C3), 127.1 (C7), 125.5 (C4), 42.6 (C1), 27.0 (C2), 21.5 (C10), 12.9 (C5); *m/z* (CI) 240 (MH^+, 100), 184 (65), 172 (26); HRMS (ES) Found $[M+NH_4]^+$ 257.1315, $C_{12}H_{17}NO_2S$ requires 257.1318.

(*E*)-4-Methyl-*N*-(pent-3-enyl)benzenesulfonamide 22

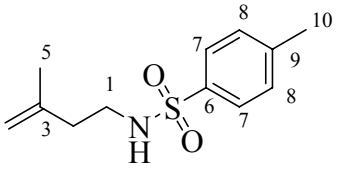


$C_{12}H_{17}NO_2S$
Mol. Wt.: 239.33

Following the general procedure X, (*E*)-pent-3-enyl 4-methylbenzenesulfonate (1.00 g, 4.16 mmol) was consumed based on analysis by TLC after 20 hours of stirring at 50 °C. The work-up afforded a yellow oil, which was purified by flash column chromatography (80% hexane, 20% ethyl acetate) to give the *title compound* (0.97g, 4.04 mmol, 97%) as a colourless oil.

ν_{max}(neat)/cm^{-1} 3284, 3035, 2918, 1816, 1598; δ_H (300 MHz; $CDCl_3$) 7.74 (2H, d, *J* 8.4, H-C7), 7.31 (2H, d, *J* 8.4, H-C8), 5.52-5.38 (1H, m, H-C3), 5.25-5.13 (1H, m, H-C4), 4.47-4.37 (1H, m, N-NH), 2.96 (2H, dd, *J* 12.7, 6.4, H-C1), 2.43 (3H, s, H-C10), 2.15-2.07 (2H, m, H-C2), 1.64-1.60 (3H, m, H-C5); δ_C (75.5 MHz; $CDCl_3$) 143.3 (C9), 136.9 (C6), 129.6 (C8), 128.9 (C3), 127.1 (C7), 126.6 (C4), 42.5 (C1), 32.4 (C2), 21.4 (C10), 17.9 (C5); *m/z* (CI) 240 (MH^+, 100), 184 (35), 111 (18); HRMS (ES) Found $[M+H]^+$ 240.1050, $C_{12}H_{17}NO_2S$ requires 240.1053.

4-Methyl-*N*-(3-methylbut-3-enyl)benzenesulfonamide 24

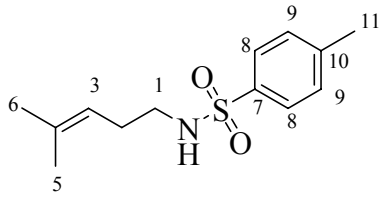


$C_{12}H_{17}NO_2S$
Mol. Wt.: 239.33

Following the general procedure X, 3-methylbut-3-enyl 4-methylbenzenesulfonate (12.63 g, 52.55 mmol) was consumed based on analysis by TLC after 20 hours of stirring at 50 °C. The work up afforded a yellow oil, which was purified by flash column chromatography (80% hexane, 20% ethyl acetate) to give the *title compound* (8.59 g, 35.89 mmol, 68%) as a white solid.

M.p. 38-39 °C; δ_H (300 MHz; $CDCl_3$) 7.70 (2H, d, *J* 8.4, H-C7), 7.25 (2H, d, *J* 8.4, H-C8), 4.89-4.78 (1H, m, N-NH), 4.73-4.69 (1H, m, H-C4), 4.59-4.56 (1H, m, H-C4), 2.98 (2H, dd, *J* 12.9, 6.8, H-C1), 2.36 (3H, s, H-C10), 2.09 (2H, t, *J* 6.8, H-C2), 1.53 (3H, s, H-C5); *m/z* (CI) 240 (MH^+, 62), 184 (100), 157 (18).

4-Methyl-*N*-(4-methylpent-3-enyl)benzenesulfonamide 25

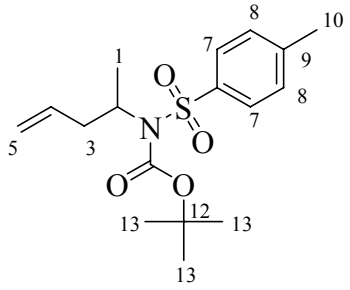


$C_{13}H_{19}NO_2S$
Mol. Wt.: 253.36

Following the general procedure X, 4-methylpent-3-enyl 4-methylbenzenesulfonate (630 mg, 2.48 mmol) was consumed based on analysis by TLC after 20 hours of stirring at 50 °C. The work up afforded a yellow oil, which was purified by flash column chromatography (80% hexane, 20% ethyl acetate) to give the *title compound* (317 mg, 1.25 mmol, 50%) as a colourless oil.

ν_{max}(neat)/cm^{-1} 3521, 3281, 2926, 1598; δ_H (300 MHz; $CDCl_3$) 7.74 (2H, d, *J* 8.3, H-C8), 7.30 (2H, d, *J* 8.3, H-C9), 4.95-4.87 (1H, m, H-C3), 4.48 (1H, t, *J* 5.8, H-NH), 2.93 (2H, dd, *J* 13.1, 6.6, H-C1), 2.42 (3H, s, H-C11), 2.19-2.09 (2H, m, H-C2), 1.66 (3H, s, H-C6), 1.55 (3H, s, H-C5); δ_C (75.5 MHz; $CDCl_3$) 143.3 (C10), 136.8 (C7), 135.6 (C3), 129.6 (C9), 127.1 (C8), 119.6 (C4), 42.9 (C1), 28.1 (C2), 25.7 (C6), 21.5 (C10), 17.8 (C5); *m/z* (CI) 254 (MH^+, 100), 184 (38), 155 (12); HRMS (ES) Found $[M+H]^+$ 254.1207, $C_{13}H_{20}NO_2S$ requires 254.1209.

(±)-*tert*-Butyl pent-4-en-2-yl(tosyl)carbamate 40



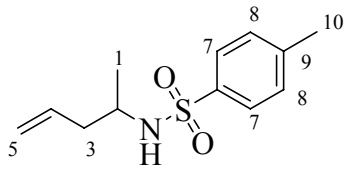
$C_{17}H_{25}NO_4S$
Mol. Wt.: 339.45

A round-bottomed flask was charged with (±)-pent-4-en-2-ol (1.00 g, 11.61 mmol, 1.00 eq.) and tetrahydrofuran (160 mL). The resulting solution was stirred at room temperature and triphenylphosphine (9.07 g, 34.83 mmol, 3.00 eq.) added portionwise followed by *tert*-butyl tosylcarbamate (4.72 g, 17.38 mmol, 1.50 eq.) portionwise and di*iso*propyl azodicarboxylate (5.67 mL, 28.62 mmol, 2.47 eq.) dropwise. The resulting solution was stirred overnight, filtered over a pad of celite and concentrated *in vacuo*. This afforded a pale yellow oil which was purified by flash column chromatography (90% hexane 10% ethyl acetate) to afford the *title compound* (2.72 g, 8.01 mmol, 69%) as a sticky colourless oil.

δ_H (300 MHz; $CDCl_3$) 7.78 (2H, d, *J* 8.4, H-C7), 7.28 (2H, d, *J* 8.4, H-C8), 5.74 (1H, tdd, *J* 17.2, 10.0, 7.2, H-C4), 5.13-5.00 (2H, m, H-C5), 4.69-4.56 (1H, m, H-C2), 2.78-2.66 (1H, m, H-C3), 2.52-2.42 (1H, m, H-C3), 2.43 (3H, s, H-C10), 1.46 (3H, d, *J* 6.8, H-C1), 1.35 (9H, s, H-C13); δ_C (75.5 MHz; $CDCl_3$) 150.6

(C11), 143.7 (C9), 137.9 (C4), 135.2 (C6), 129.1 (C8), 127.8 (C7), 117.6 (C5), 83.9 (C12), 54.9 (C2), 39.4 (C3), 27.9 (C13), 21.6 (C10), 19.4 (C1);

(±)-4-Methyl-*N*-(pent-4-en-2-yl)benzenesulfonamide 41



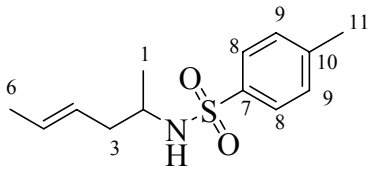
$C_{12}H_{17}NO_2S$
Mol. Wt.: 239.33

A round-bottomed flask was charged with (±)-*tert*-butyl pent-4-en-2-yl(tosyl)carbamate (2.13 g, 6.27 mmol, 1.00 eq.) and dichloromethane (43 mL). The resulting solution was stirred at room temperature and trifluoroacetic acid (3.61 g, 31.66 mmol, 5.00 eq.) added dropwise. The mixture was stirred at room temperature overnight and water (50 mL) was added. The organic layer was separated and the aqueous layer was extracted with dichloromethane (3 x 30 mL). The combined organic layers were dried over magnesium sulfate, filtered, and concentrated *in vacuo*.

This afforded a pale yellow oil which was purified by flash column chromatography (80% hexane 20% ethyl acetate) to afford the *title compound* (1.50 g, 6.27 mmol, *quantitative*) as a colourless oil.

δ_H (300 MHz; $CDCl_3$) 7.75 (2H, d, *J* 8.3, H-C7), 7.29 (2H, d, *J* 8.3, H-C8), 5.56 (1H, tdd, *J* 17.4, 10.3, 7.2, H-C4), 5.06-4.95 (2H, m, H-C5), 4.53 (1H, d, *J* 7.1, H-NH), 3.43-3.29 (1H, m, H-C2), 2.42 (3H, s, H-C10), 2.14-2.08 (2H, m, H-C3), 1.06 (3H, d, *J* 6.6, H-C1); *m/z* (CI) 240 (MH^+, 45), 198 (100), 155 (10).

(±)-(*E*)-*N*-(Hex-4-en-2-yl)-4-methylbenzenesulfonamide 43



$C_{13}H_{19}NO_2S$
Mol. Wt.: 253.36

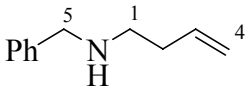
Following the general procedure X, (±)-(*E*)-hex-4-en-2-yl 4-methylbenzenesulfonate (350 mg, 1.38 mmol) was consumed based on analysis by TLC after 20 hours of stirring at 50 °C. The work up afforded a yellow oil, which was purified by flash column chromatography (80% hexane, 20% ethyl acetate) to give the *title compound* (107 mg, 0.42 mmol, 31%) as a colourless oil.

δ_H (300 MHz; $CDCl_3$) 7.66 (2H, d, *J* 8.3, H-C8), 7.22 (2H, d, *J* 8.3, H-C9), 5.36-5.23 (1H, m, H-C4), 5.08-4.95 (1H, m, H-C5), 4.66 (1H, d, *J* 7.2, H-NH), 3.24-3.11 (1H, m, H-C2), 2.33 (3H, s, H-C11), 1.96-1.89 (2H, m, H-C3), 1.50-1.46 (3H, m, H-C6), 0.97 (3H, d, *J* 6.6, H-C1); *m/z* (CI) 254 (MH^+, 100), 198 (70), 172 (22).

General procedure for amination (tosyl displacement by primary amine)

A round-bottomed flask equipped with a condenser was charged with primary amine (90 mmol, 5.00 eq.), tosylated alcohol (18 mmol, 1.00 eq.), and ethanol (18ml). The resulting solution was stirred at reflux temperature until TLC showed complete consumption of starting material. The solution was cooled to room temperature, the ethanol removed *in vacuo* and the excess of primary amine carefully distilled under reduced pressure unless otherwise stated. The resulting residue was partitioned between dichloromethane (60 mL) and 1.0 M aqueous sodium hydroxide solution (40mL). The organic layer was separated, the aqueous layer extracted with dichloromethane (3 x 10 mL), the combined organic layers dried over magnesium sulphate, filtered and concentrated *in vacuo*.

***N*-Benzyl-*N*-(3-butenyl)amine 3**



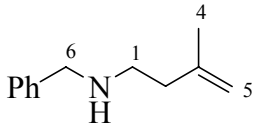
$C_{11}H_{15}N$
Mol. Wt.: 161.24

Following the general procedure X, 4-(toluene-4-sulfonyloxy)-but-1-ene (4.07 g, 18.00 mmol), in the presence of benzylamine (9.65 g, 90.00 mmol), was consumed based on analysis by TLC after 20 hours of stirring and heating. The excess of benzylamine was distilled (104 °C, 245 mmHg) and the work up gave a yellow oil, which was purified by flash column chromatography (75% petroleum ether 24% ethyl acetate 1% triethylamine) to give the *title compound* (2.29 g, 14.00 mmol, 50%) as a colourless oil.

δ_H (300 MHz; $CDCl_3$) 7.38-7.24 (5H, m, ArH) 5.88-5.74 (1H, m, H-C3), 5.15-5.03 (2H, m, H-C4), 3.82 (2H, s, H-C5), 2.73 (2H, t, *J* 6.0, H-C1), 2.31 (2H, dt, *J* 6.0, 6.0

H-C2), 1.66 (1H, bs, H-NH); δ_C (75.5 MHz; $CDCl_3$) 140.5 (ArC), 136.8 (C3), 128.9 (ArC), 128.5 (ArC), 127.2 (ArC), 116.9 (C4), 54.2 (C5), 48.6 (C1), 34.6 (C2).

Benzyl-(3-methyl-but-3-enyl)-amine 13



$C_{12}H_{17}N$
Mol. Wt.: 175.27

Following the general procedure, 2-methyl-4-(toluene-4-sulfonyloxy)-but-1-ene (2.88 g, 12.00 mmol), in the presence of benzylamine (6.43 g, 60 mmol), was consumed based on analysis by TLC after 18 hours of stirring and heating. The work up gave a yellow oil, which was purified by flash column chromatography (75% petroleum ether 24% ethyl acetate 1% triethylamine) to give the *title compound* (2.55 g, 14.55 mmol, 97%) as a colourless oil.

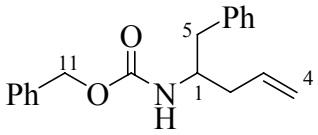
δ_H (300 MHz; $CDCl_3$) 7.37-7.23 (5H, m, ArH), 4.79 (1H, s, H-C5), 4.75 (1H, s, H-C5), 3.81 (2H, s, H-C6), 2.76 (2H, t, *J* 6.3, H-C1), 2.26 (2H, t, *J* 6.3, H-C2), 1.72 (3H, s, H-C4); δ_C (75.5 MHz; $CDCl_3$) 143.9 (C3),

140.5 (ArC), 128.8 (ArC), 128.6 (ArC), 127.4 (ArC), 112.0 (C5), 54.2 (C6), 47.1 (C1), 38.3 (C2), 22.6 (C4); *m/z* (CI) 176 (MH^+, 100), 120 (93).

General procedure for the iodine catalysed synthesis of homoallylic amines

A round-bottom flask was charged with aldehyde (15.00 mmol, 1 eq.) and acetonitrile (15 ml). To the resulting solution at room temperature was added sequentially iodine (0.38 g, 1.5 mmol, 0.10 eq.), benzyl carbamate (2.38 g, 15.75 mmol, 1.05 eq.) portionwise, and dropwise allyl trimethyl silane (2.38 mL, 15 mmol, 1.00 eq.). The resulting suspension was stirred at room temperature until TLC showed complete consumption of starting material. To the solution was added sodium thiosulfate (0.90 g), distilled water (10 mL) and the reaction mixture stirred for a further 20 minutes. The biphasic solution was diluted with diethyl ether (30 mL), the organic layer washed with saturated aqueous sodium chloride (2 x 25 mL) and combined aqueous layers extracted with diethyl ether (2 x 25 mL). The combined organic layers were dried over sodium thiosulfate, filtered, and concentrated *in vacuo*.

***N*-Benzyloxycarbonyl-(±)-1-benzylbut-3-enylamine 6**

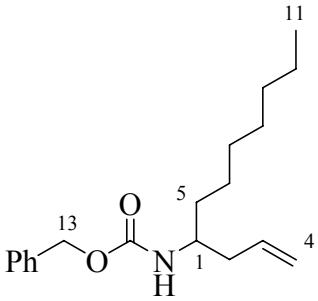


$C_{19}H_{21}NO_2$
Mol. Wt.: 295.38

Following the general procedure, phenylacetaldehyde (1.80 g, 15.00 mmol), gave after overnight stirring a yellow oil which was purified by flash column chromatography (90% petroleum ether 10% ethyl acetate) to give the *title compound* (2.00 g, 6.76 mmol, 45%) as a colourless oil.

δ_H (300 MHz; $CDCl_3$) 7.42-7.18 (10H, m, ArH), 5.88-5.74 (1H, m, H-C3), 5.14-5.07 (2H, m, H-C4), 5.08 (2H, s, H-C11), 4.67-4.64 (1H, m, H-NH), 4.04-3.97 (1H, m, H-C1), 2.89-2.76 (2H, m, H-C2), 2.35-2.28 (1H, m, H-C5), 2.20-2.07 (1H, m, H-C5); δ_C (75.5 MHz; $CDCl_3$) 156.2 (C10), 138.3 (ArC), 137.0 (C3), 134.6 (ArC), 129.8 (ArC), 129.0 (ArC), 128.7 (ArC), 128.5 (ArC), 128.4 (ArC), 126.9 (ArC), 118.7 (C4), 67.4 (C11), 52.1 (C5), 40.8 (C1), 38.6 (C2).

***N*-Benzyloxycarbonyl-(±)-1-heptylbut-3-enylamine 7**



$C_{19}H_{29}NO_2$
Mol. Wt.: 303.44

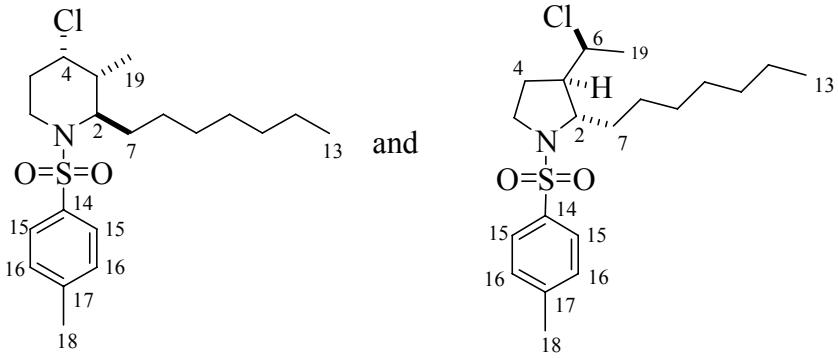
Following the general procedure, octanal (1.80 g, 15.00 mmol), gave after overnight stirring a yellow oil which was purified by flash column chromatography (90% petroleum ether 10% ethyl acetate) to give the *title compound* (1.53 g, 5.03 mmol, 34%) as a white solid.

M.p. 52-53°C (Lit.: 51-52°C); δ_H (300 MHz; $CDCl_3$) 7.38-7.34 (5H, m, ArH), 5.82-5.71 (1H, m, H-C3), 5.10-5.05 (2H, m, H-C4), 5.10 (2H, s, H-C13), 4.57-4.54 (1H, m, H-NH), 3.73-3.71 (1H, m, H-C1), 2.31-2.15 (2H, m, H-C2), 1.32-1.25 (12H, m, H-C5 to C10), 0.89 (3H, t, *J* 6.0, H-C11); δ_C (75.5 MHz; $CDCl_3$) 156.5 (C12), 137.2 (ArC), 134.8 (C3), 128.9 (ArC), 128.4 (ArC), 118.16 (C4), 66.9 (C13), 51.1 (C5), 39.9 (C1), 35.0 (C2), 32.2 (C6), 29.8 (C7 and C8), 26.3 (C9), 23.1 (C10), 14.5 (C11); *m/z* (CI) 304 (MH^+, 100), 196 (28), 172 (18).

4.5. General procedure for the aza-Prins reaction

A round-bottomed flask was charged with indium trichloride (642 mg, 2.96 mmol, 1.50 eq.) and dichloromethane (5 mL). To the resulting suspension was added an aldehyde (2.96 mmol, 1.50 eq.) in dichloromethane (1.5 mL). After stirring the mixture for 15 minutes at room temperature, a *N*-tosyl homoallylicamine derivative (1.97 mmol, 1.00 eq.) in dichloromethane (1.5 mL) was added and the resulting mixture stirred until TLC showed complete consumption of starting material. The mixture was diluted with dichloromethane (10 mL) and water (10 mL) and stirred for 30 minutes. The organic layer was separated and the aqueous layer was extracted with dichloromethane (3 x 10 mL). The combined organic layers were dried over magnesium sulfate, filtered and concentrated *in vacuo* and purified by chromatography.

4.5.1 (2*R*,3*R*,4*S*)-4-Chloro-2-heptyl-3-methyl-1-tosylpiperidine/(2*S*,3*S*,4*R*)-4-Chloro-2-heptyl-3-methyl-1-tosylpiperidine (26a) and (2*S*,3*R*)-3-((*S*)-1-Chloroethyl)-2-heptyl-1-tosylpyrrolidine/(2*R*,3*S*)-3-((*R*)-1-Chloroethyl)-2-heptyl-1-tosylpyrrolidine (27a)



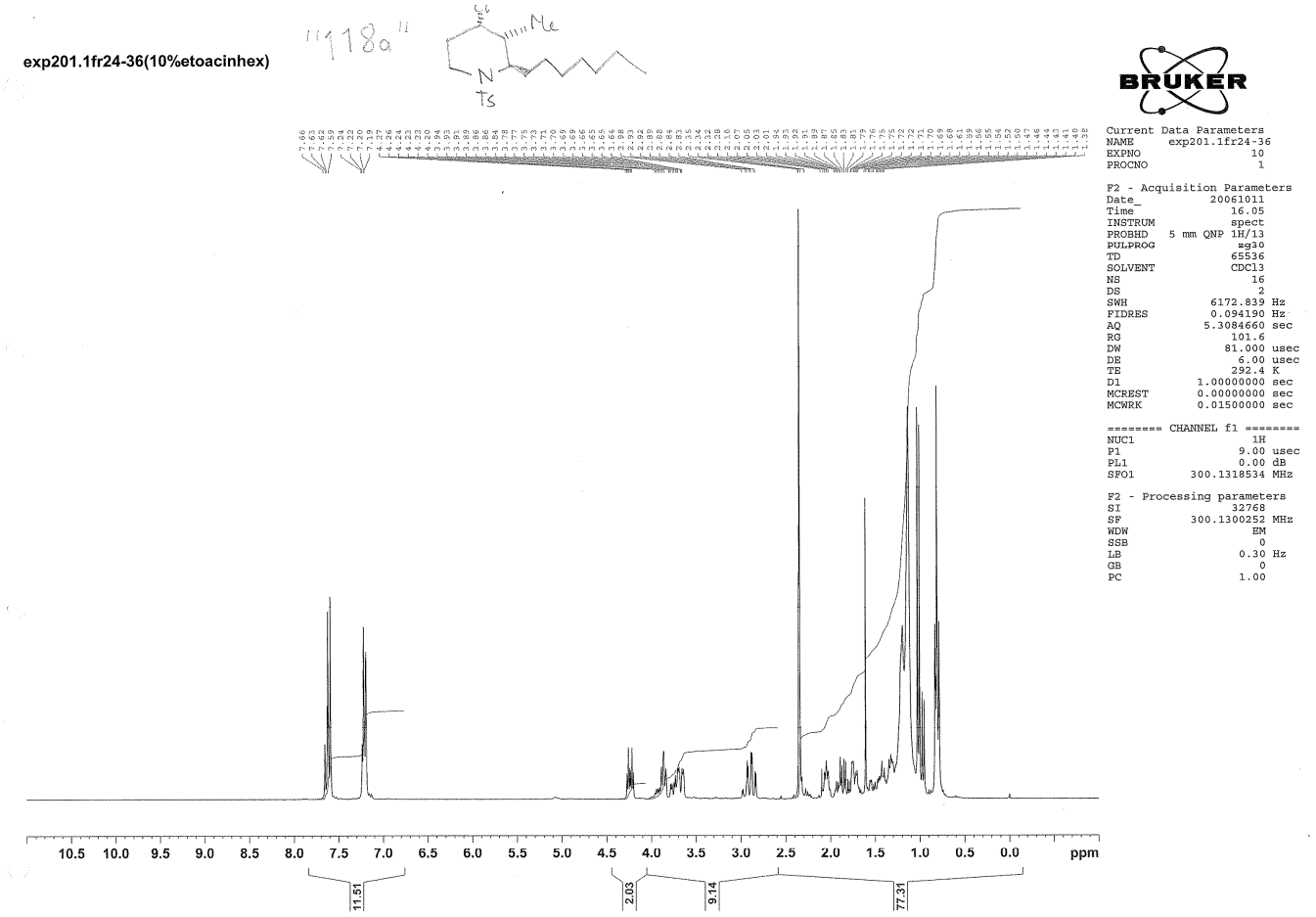
$C_{20}H_{32}ClNO_2S$
Mol. Wt.: 385.99

Following the general procedure for the aza-Prins reaction, (*Z*)-4-methyl-*N*-(pent-3-enyl)benzenesulfonamide (150 mg, 0.62 mmol), and octanal (120 mg, 0.94 mmol), were consumed based on analysis by TLC after 17 hours of stirring at room temperature. The work up afforded a yellow oil, which was purified by flash column chromatography (90% hexane, 10% ethyl acetate) to give the two *title compounds.*

(2*R*,3*R*,4*S*)-4-Chloro-2-heptyl-3-methyl-1-tosylpiperidine/(2*S*,3*S*,4*R*)-4-Chloro-2-heptyl-3-methyl-1-tosylpiperidine (26a)

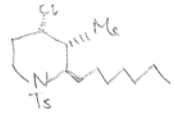
84 mg (0.22 mmol, 35%) as a colourless oil. ν_{max}(neat)/cm^{-1} 2928, 1729, 1598; δ_H (300 MHz, $CDCl_3$) 7.67 (2H, d, *J* 8.2, H-C15), 7.27 (2H, d, *J* 8.2, H-C16), 4.31 (1H, td, *J* 12.6, 4.6, H-C4), 3.96-3.88 (1H, m, H-C2), 3.78-3.69 (1H, m, H-C6), 2.94 (1H, td, *J* 13.6, 3.2, H-C6), 2.41 (3H, s, H-C18) 2.16-2.05 (1H, m, H-C3), 2.01-1.84 (1H, m , H-C5), 1.84-1.74 (1H, m, H-C5), 1.66-1.33 (2H, m, H-C7), 1.32-1.11 (10H, m, H-C8 to H-C12), 1.08 (3H, d, *J* 6.9, H-C19), 0.87 (3H, t, *J* 6.8, H-C13); δ_C (75.5 MHz; $CDCl_3$) 143.1 (C17), 138.1 (C14), 129.5 (C16), 126.9 (C15), 60.1 (C2), 57.4 (C4), 40.6 (C6), 37.3 (C3), 31.7 (C11), 30.0 (C5),

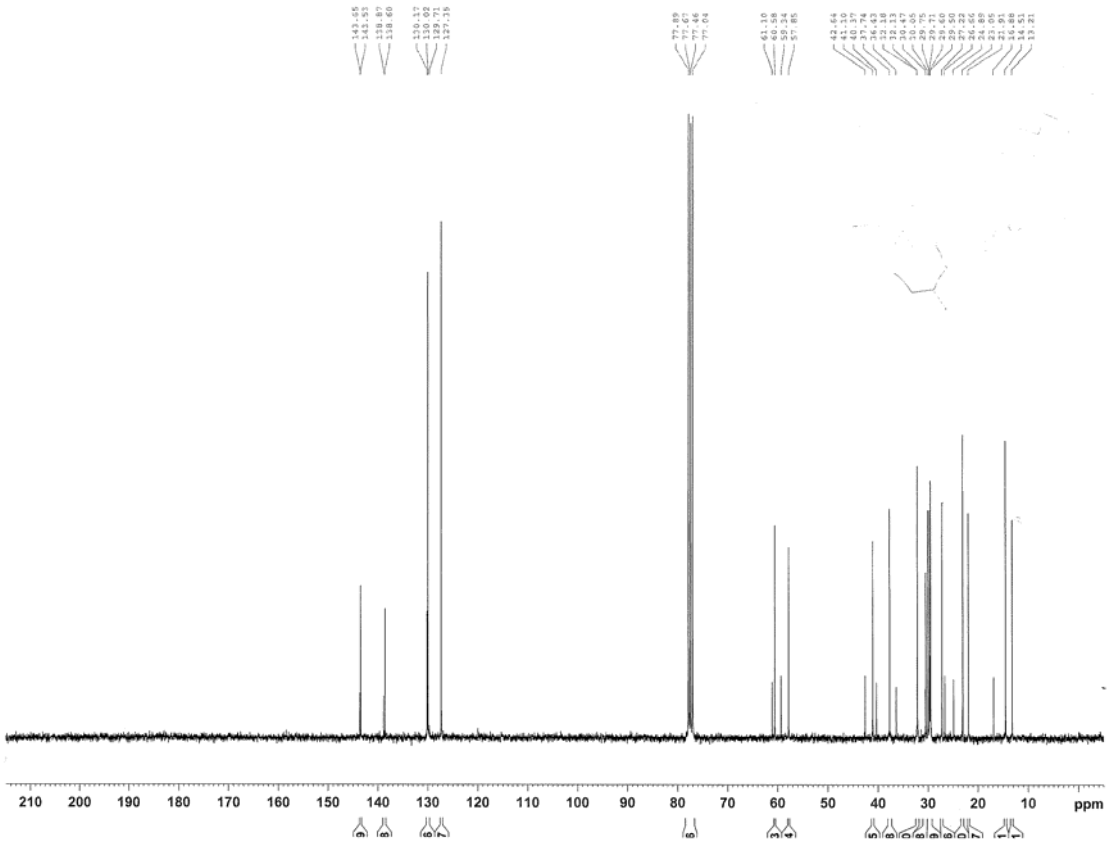
29.4 (C9 and C10), 26.8 (C12), 22.6 (C8), 21.5 (C18), 14.1 (C13), 12.7 (C19); *m/z* (CI) 386 (MH^+, 100), 350 (60), 286 (42); HRMS (ES) Found $[M+H]^+$ 386.1910, $C_{20}H_{33}ClNO_2S$ requires 386.1915.



exp201.1fr24-36(10%etoacinhex)

"178a"



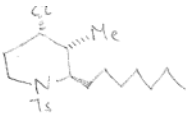


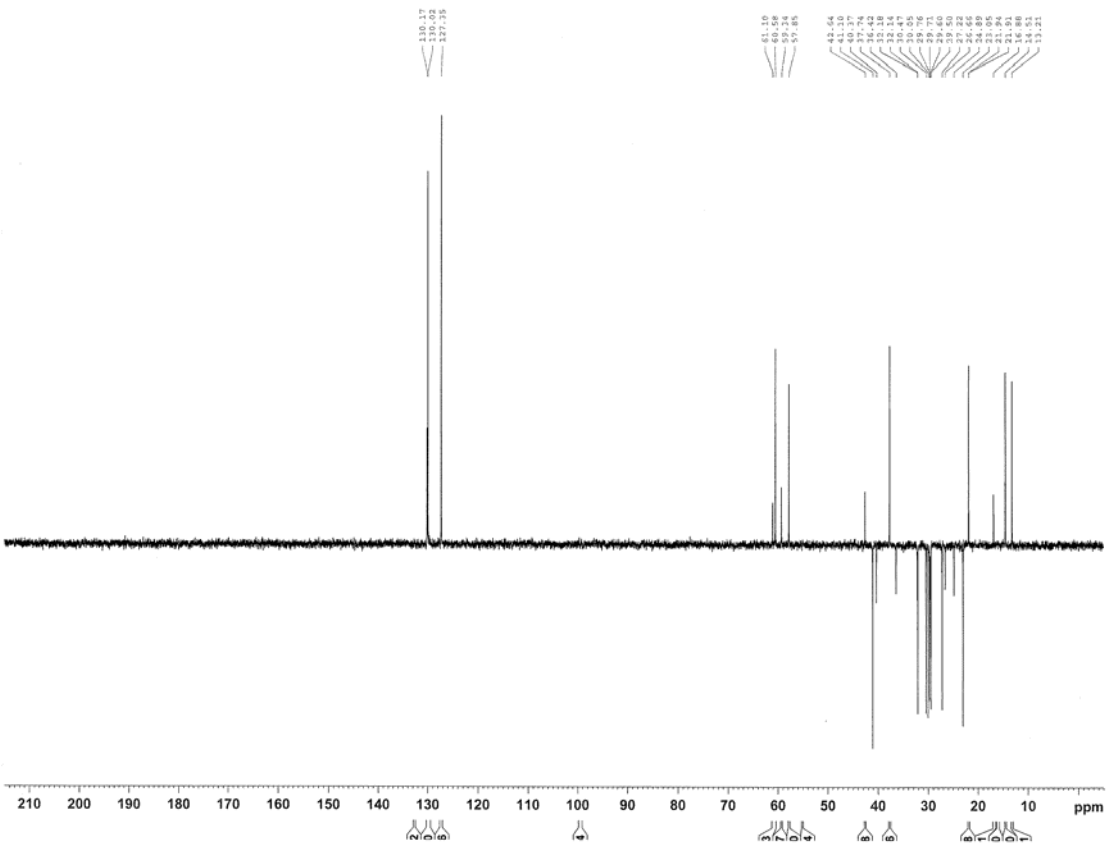
BRUKER

```
Current Data Parameters
NAME      exp201.1fr24-36
EXPNO                 11
PROCNO                 1

F2 - Acquisition Parameters
Date_           20061011
Time              21.40
INSTRUM           spect
PROBHD   5 mm QNP 1H/13
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                 1024
DS                    4
SWH           17985.611 Hz
FIDRES         0.274439 Hz
AQ            1.8219508 sec
RG               1290.2
DW               27.800 usec
DE                6.00 usec
TE               292.7 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.89999998 sec
MCREST        0.00000000 sec
MCWRK         0.01500000 sec

======== CHANNEL f1 ========
NUC1                 13C
P1                8.00 usec
PL1               0.00 dB
SFO1        75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                 1H
PCPD2           100.00 usec
PL2               0.00 dB
PL12             23.00 dB
PL13             24.00 dB
SFO2        300.1312005 MHz

F2 - Processing parameters
SI                32768
SF          75.4677190 MHz
WDW                  EM
SSB                   0
LB                1.00 Hz
GB                    0
PC                1.40
```

exp201.1fr24-36(10%etoacinhex)

"178a"



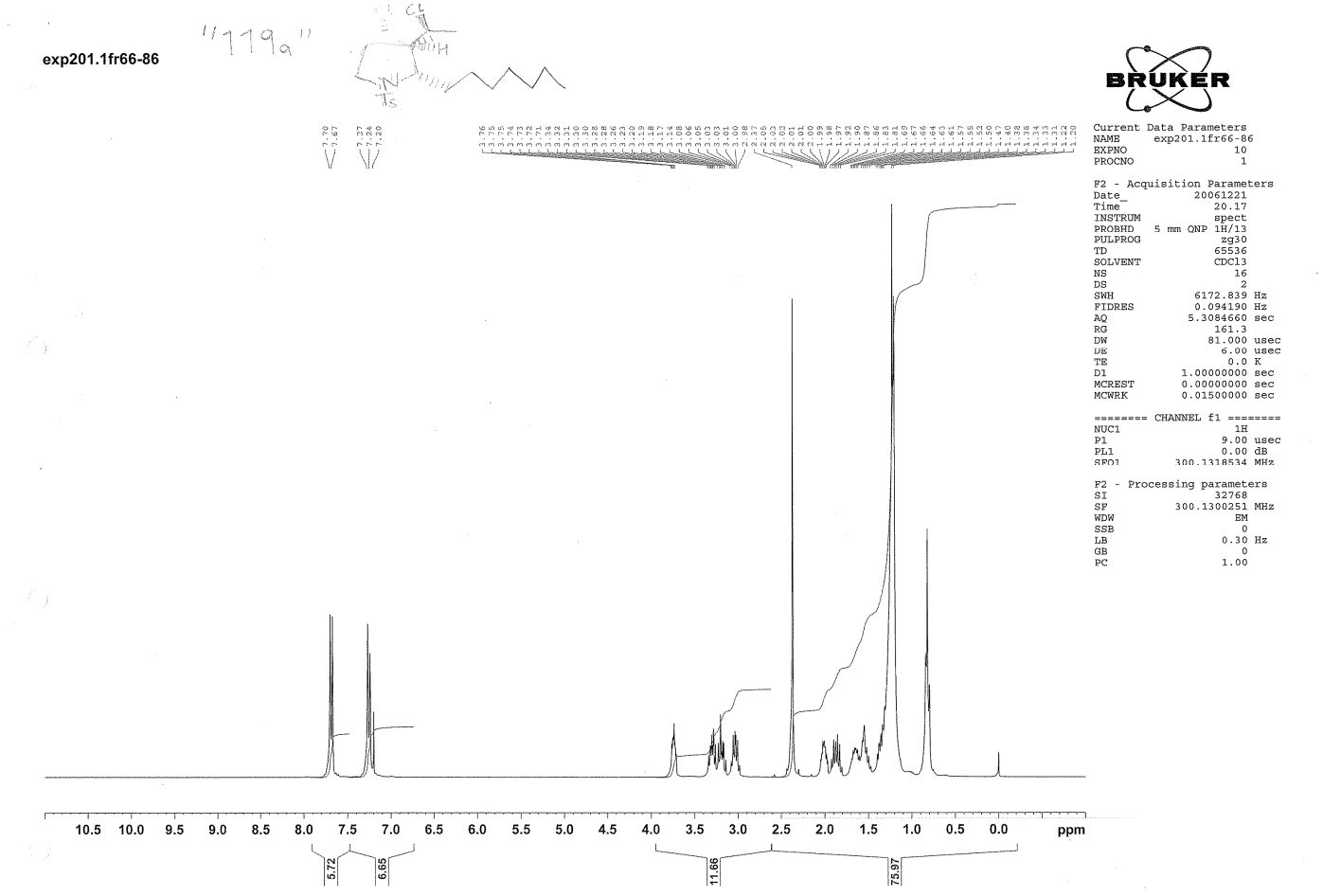


BRUKER

```
Current Data Parameters
NAME      exp201.1fr24-36
EXPNO                 12
PROCNO                 1

F2 - Acquisition Parameters
Date_           20061011
Time              21.58
INSTRUM           spect
PROBHD   5 mm QNP 1H/13
PULPROG          dept135
TD                65536
SOLVENT           CDCl3
NS                  256
DS                    4
SWH           17985.611 Hz
FIDRES         0.274439 Hz
AQ            1.8219508 sec
RG                16384
DW               27.800 usec
DE                6.00 usec
TE               292.6 K
CNST2        145.0000000
D1            2.00000000 sec
d2            0.00344828 sec
d12           0.00002000 sec
DELTA         0.00001019 sec
MCREST        0.00000000 sec
MCWRK         0.01500000 sec

======== CHANNEL f1 ========
NUC1                 13C
P1                8.00 usec
p2               16.00 usec
PL1               0.00 dB
SFO1        75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                 1H
P3                8.00 usec
p4               16.00 usec
PCPD2           100.00 usec
PL2               0.00 dB
PL12             23.00 dB
SFO2        300.1312005 MHz

F2 - Processing parameters
SI                32768
SF          75.4677190 MHz
WDW                  EM
SSB                   0
LB                1.00 Hz
GB                    0
PC                1.40
```

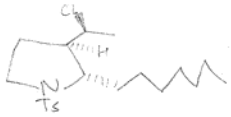
(2*S*,3*R*)-3-((*S*)-1-Chloroethyl)-2-heptyl-1-tosylpyrrolidine/(2*R*,3*S*)-3-((*R*)-1-Chloroethyl)-2-heptyl-1-tosylpyrrolidine (27a)

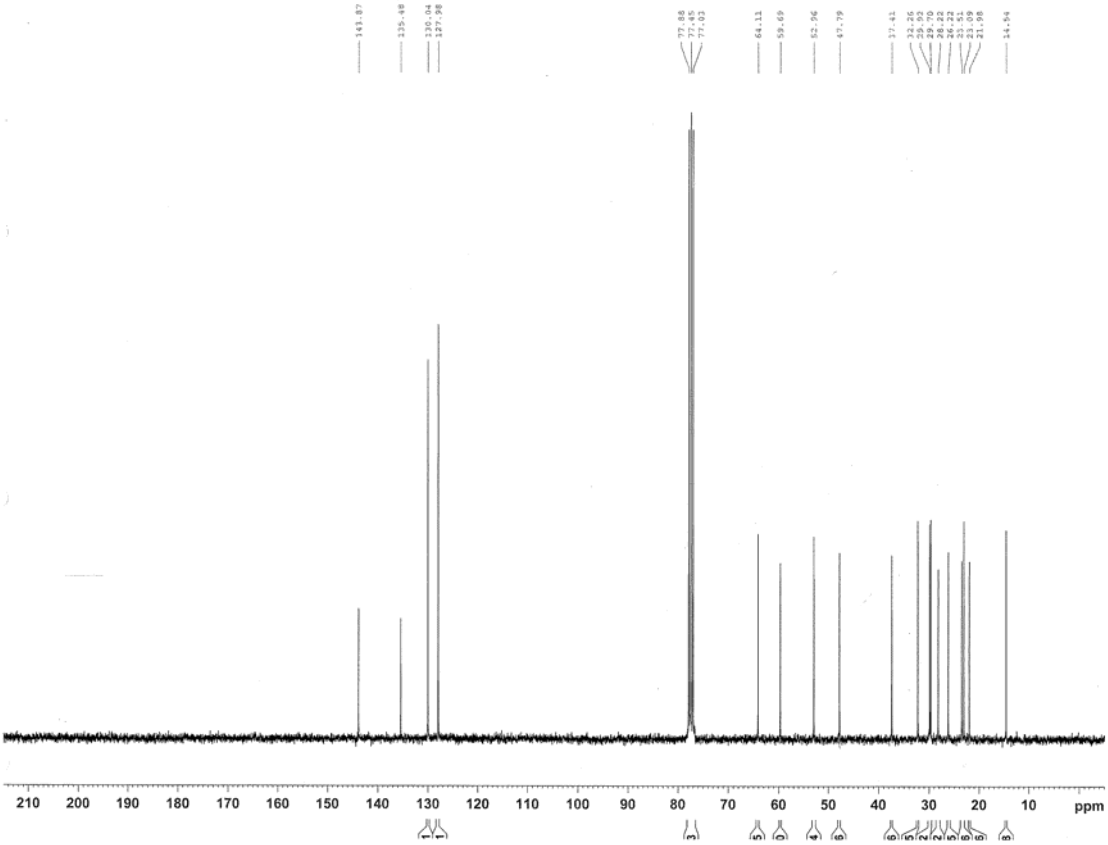
Further elution (90% hexane 10% ethyl acetate) provided the other *title compound* (84 mg, 0.22 mmol, 35%) as a colourless oil. ν_{max}(neat)/cm^{-1} 2927, 1598; δ_H (300 MHz; $CDCl_3$) 7.75 (2H, d, *J* 8.3, H-C15), 7.32 (2H, d, *J* 8.3, H-C16), 3.80 (1H, ddd, *J* 7.6, 4.9, 2.9, H-C2), 3.36 (1H, ddd, *J* 10.7, 7.3, 5.7, H-C5), 3.25 (1H, td, *J* 10.7, 7.3, H-C5), 3.09 (1H, qd, *J* 8.8, 6.5, H-C6), 2.43 (3H, s, H-C18), 2.13-2.01 (1H, m, H-C3), 1.93 (1H, dt, *J* 14.6, 7.3, H-C4), 1.79-1.66 (1H, m, H-C7), 1.66-1.51 (1H, m, H-C7), 1.48-1.31 (1H, m, H-C4), 1.27 (3H, d, *J* 6.5, H-C19), 1.33-1.19 (10H, m, H-C8 to H-C12), 0.88 (3H, t, *J* 6.6, H-C13); δ_C (75.5 MHz; $CDCl_3$) 143.4 (C17), 135.0 (C14), 129.6 (C16), 127.5 (C15), 63.7 (C1), 59.2 (C6), 52.5 (C3), 47.3 (C5), 37.0 (C7), 31.8 (C11), 29.4 (C9 and C10), 27.8 (C4), 25.8 (C8), 23.1 (C19), 22.6 (C12), 21.5 (C18), 14.1 (C13); *m/z* (CI) 386 (MH^+, 100), 350 (25), 286 (27); HRMS (ES) Found $[M+NH_4]+$ 403.2185, $C_{20}H_{36}ClN_2O_2S$ requires 403.2181.



exp201.1fr66-86

"179a"



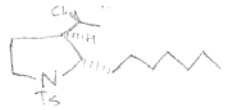


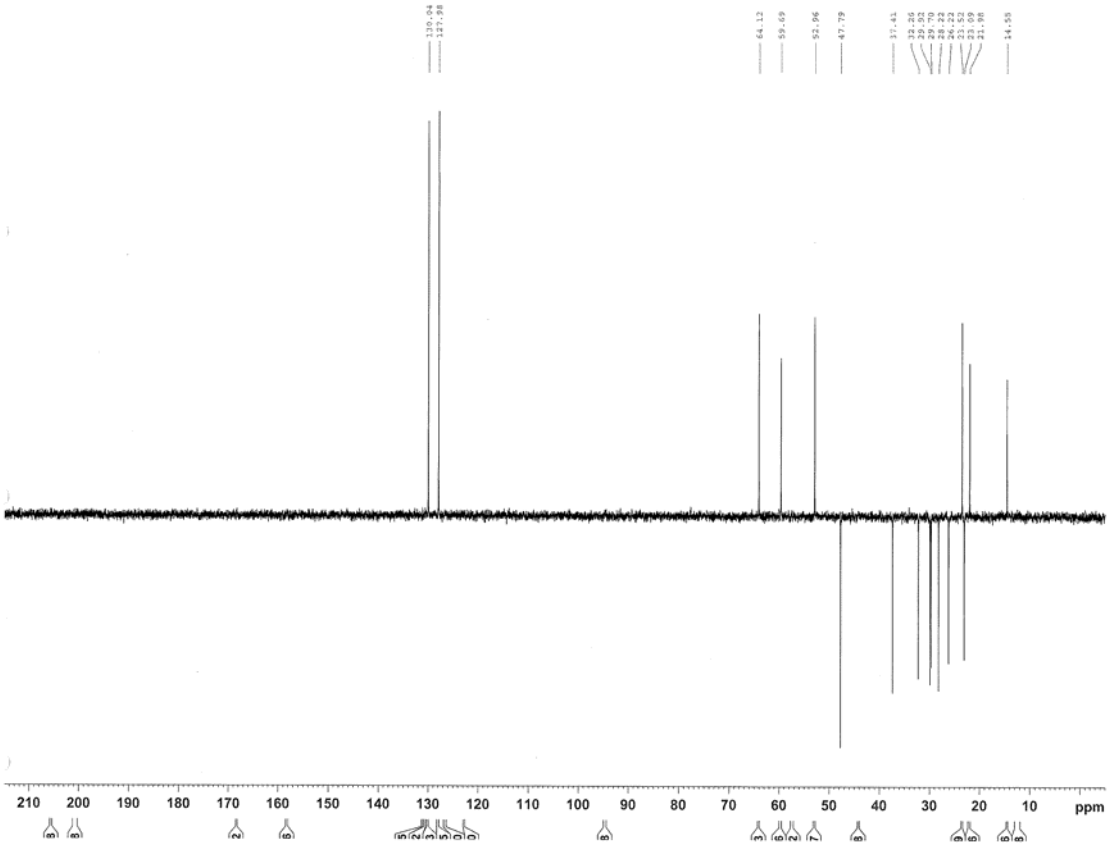
BRUKER

```
Current Data Parameters
NAME      exp201.1fr66-86
EXPNO                 11
PROCNO                 1

F2 - Acquisition Parameters
Date_           20061221
Time              21.25
INSTRUM           spect
PROBHD   5 mm QNP 1H/13
PULPROG         zgpg30
TD               65536
SOLVENT           CDCl3
NS                 1024
DS                    4
SWH          17985.611 Hz
FIDRES        0.274439 Hz
AQ            1.8219508 sec
RG                724.1
DW             27.800 usec
DE              6.00 usec
TE                0.0 K
D1          2.00000000 sec
d11         0.03000000 sec
DELTA       1.89999998 sec
MCREST      0.00000000 sec
MCWRK       0.01500000 sec

======== CHANNEL f1 ========
NUC1               13C
P1              8.00 usec
PL1             0.00 dB
SFO1       75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2               1H
PCPD2         100.00 usec
PL2             0.00 dB
PL12           23.00 dB
PL13           24.00 dB
SFO2      300.1312005 MHz

F2 - Processing parameters
SI                32768
SF         75.4677190 MHz
WDW                EM
SSB                 0
LB              1.00 Hz
GB                  0
PC              1.40
```

exp201.1fr66-86

"179a"

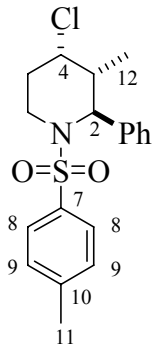




BRUKER

```
Current Data Parameters
NAME      exp201.1fr66-86
EXPNO                 12
PROCNO                 1

F2 - Acquisition Parameters
Date_           20061221
Time              21.42
INSTRUM           spect
PROBHD   5 mm QNP 1H/13
PULPROG         dept135
TD               65536
SOLVENT           CDCl3
NS                  256
DS                    4
SWH          17985.611 Hz
FIDRES        0.274439 Hz
AQ            1.8219508 sec
RG                16384
DW             27.800 usec
DE              6.00 usec
TE                0.0 K
CNST2       145.0000000
D1          2.00000000 sec
d2          0.00344828 sec
d12         0.00002000 sec
DELTA       0.00001019 sec
MCREST      0.00000000 sec
MCWRK       0.01500000 sec

======== CHANNEL f1 ========
NUC1               13C
P1              8.00 usec
p2             16.00 usec
PL1             0.00 dB
SFO1       75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2               1H
P3              8.00 usec
p4             16.00 usec
PCPD2         100.00 usec
PL2             0.00 dB
PL12           23.00 dB
SFO2      300.1312005 MHz

F2 - Processing parameters
SI                32768
SF         75.4677190 MHz
WDW                EM
SSB                 0
LB              1.00 Hz
GB                  0
PC              1.40
```


(2*S*,3*R*,4*S*)-4-Chloro-3-methyl-2-phenyl-1-tosylpiperidine/(2*R*,3*S*,4*R*)-4-Chloro-3-methyl-2-phenyl-1-tosylpiperidine (26b)

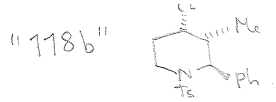


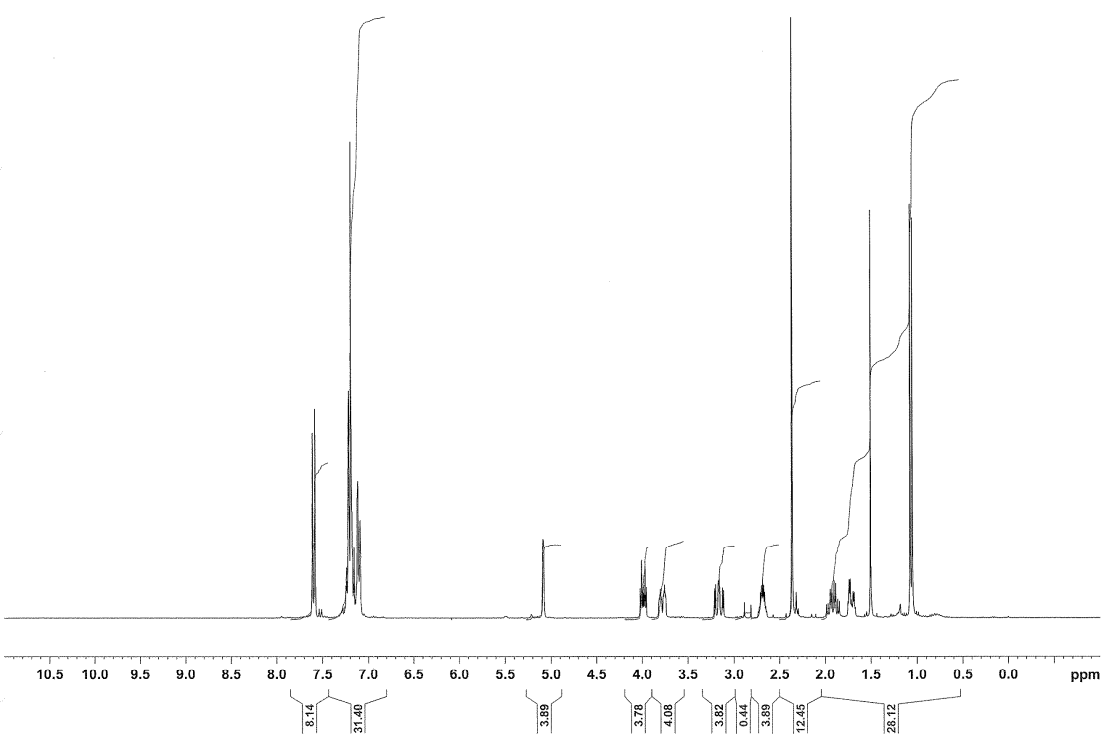
$C_{19}H_{22}ClNO_2S$
Mol. Wt.: 363.9

Following the general procedure, (*Z*)-4-methyl-*N*-(pent-3-enyl)benzenesulfonamide (150 mg, 0.62 mmol) in the presence of benzaldehyde (99 mg, 0.94 mmol), was consumed based on analysis by TLC after 144 hours of stirring at room temperature. The work up afforded a yellow oil, which was purified by flash column chromatography (90% hexane, 10% ethyl acetate) to give the *title compound* (34 mg, 0.09 mmol, 15%) as a white solid. M.p. 112-114 °C**;** ν_{max}(neat)/cm^{-1} 3029, 2940, 2344, 1596; δ_H (300 MHz; $CDCl_3$) 7.70 (2H, d, *J* 7.8, H-C8), 7.45-7.27 (5H, m, Ar-H), 7.21 (2H, d, *J* 7.8, H-C9), 5.19 (1H, s, H-C2), 4.09 (1H, td, *J* 11.8, 4.1, H-C4), 3.97-3.80 (1H, m, H-C6), 3.27 (1H, ddd, *J* 13.9, 11.8, 3.5, H-C6), 2.88-2.72 (1H, m, H-C3), 2.47 (3H, s, H-C11), 2.07-1.91 (1H, m, H-C5) 1.85-1.78 (1H, m, H-C5), 1.16 (3H, d, *J* 6.9, H-C12); δ_C (75.5 MHz; $CDCl_3$) 143.8 (C10), 137.8 (C7), 137.7 (ArC), 129.6 (ArC), 128.7 (ArC), 127.2 (ArC), 127.1 (C8), 126.8 (C9), 62.5 (C2), 57.5 (C4), 41.8 (C6), 39.3 (C3), 29.8 (C5), 21.5 (C11), 13.0 (C12); *m/z* (CI) 364 (MH^+, 64), 328 (30), 210 (55); HRMS (ES) Found $[M+H]^+$ 364.1135, $C_{19}H_{23}ClNO_2S$ requires 364.1133.

exp201.2fr46-58(high vac)

"7786"

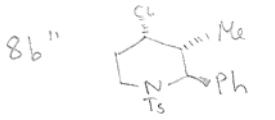


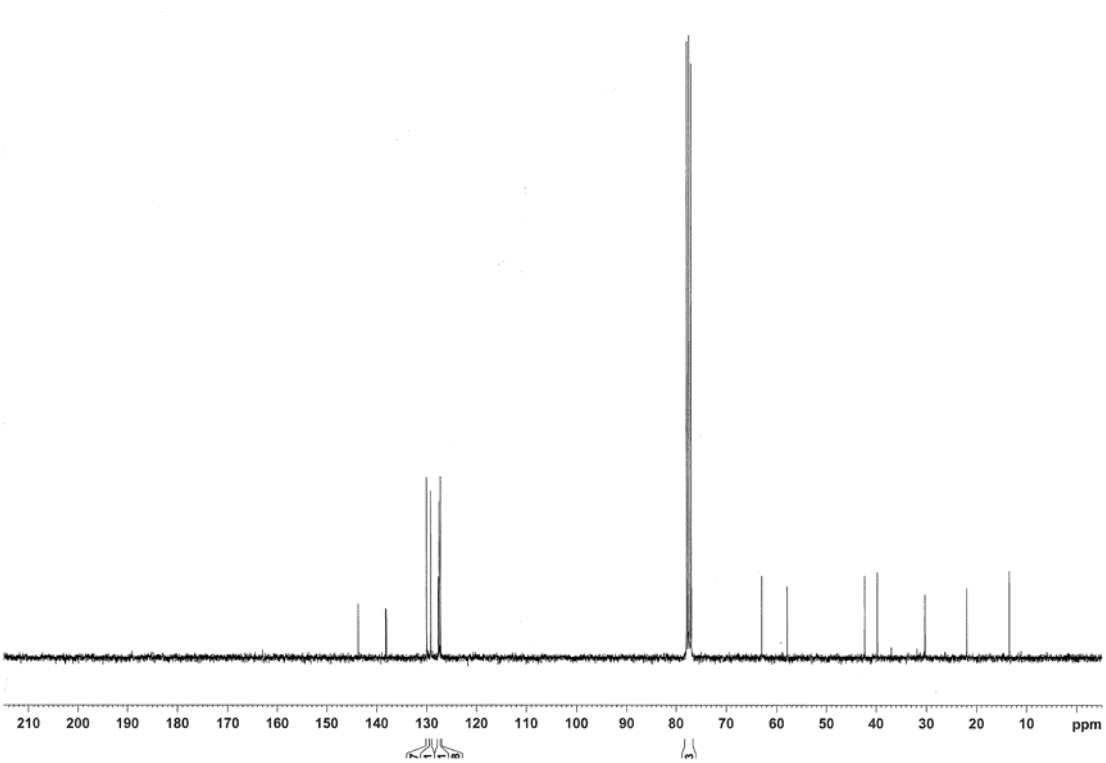



```
Current Data Parameters
NAME      exp201.2fr46-58
EXPNO                 20
PROCNO                 1

F2 - Acquisition Parameters
Date_           20061013
Time              15.19
INSTRUM           spect
PROBHD   5 mm QNP 1H/13
PULPROG           zg30
TD               65536
SOLVENT          CDCl3
NS                  16
DS                   2
SWH            6172.839 Hz
FIDRES            0.094190 Hz
AQ                5.3084660 sec
RG                  456.1
DW                 81.000 usec
DE                  6.00 usec
TE                292.2 K
D1              1.00000000 sec
MCREST          0.00000000 sec
MCWRK           0.01500000 sec

======== CHANNEL f1 ========
NUC1                  1H
P1                 9.00 usec
PL1                0.00 dB
SFO1          300.1318534 MHz

F2 - Processing parameters
SI                 32768
SF            300.1300278 MHz
WDW                  EM
SSB                   0
LB                 0.30 Hz
GB                    0
PC                 1.00
```

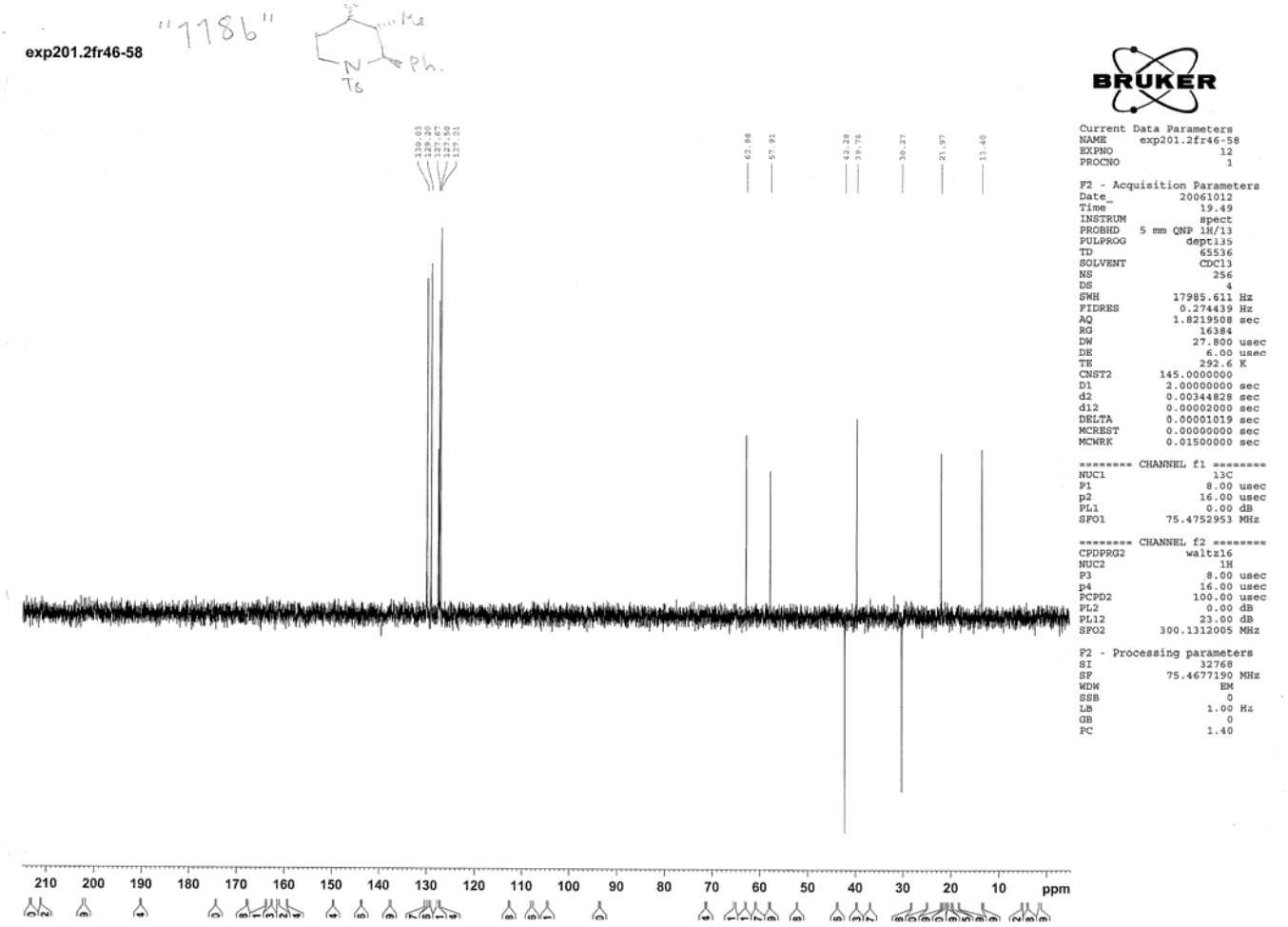
exp201.2fr46-58

"7786"

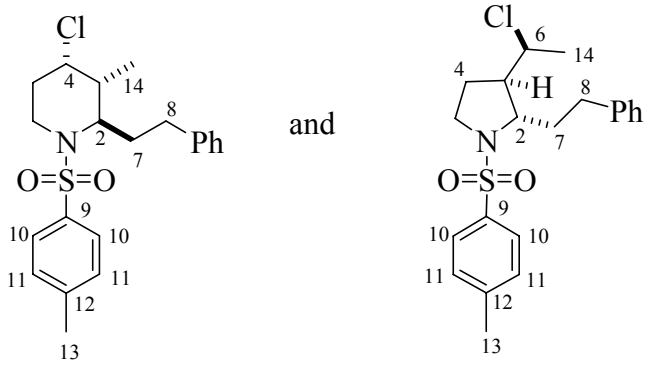





```
Current Data Parameters
NAME      exp201.2fr46-58
EXPNO                 11
PROCNO                 1

F2 - Acquisition Parameters
Date_           20061012
Time              19.31
INSTRUM           spect
PROBHD   5 mm QNP 1H/13
PULPROG           zgpg30
TD               65536
SOLVENT          CDCl3
NS                1024
DS                   4
SWH           17985.611 Hz
FIDRES            0.274439 Hz
AQ                1.8219508 sec
RG                2048
DW                27.800 usec
DE                 6.00 usec
TE                292.9 K
D1              2.00000000 sec
d11             0.03000000 sec
DELTA           1.89999998 sec
MCREST          0.00000000 sec
MCWRK           0.01500000 sec

======== CHANNEL f1 ========
NUC1                 13C
P1                 8.00 usec
PL1                0.00 dB
SFO1          75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                 1H
PCPD2            100.00 usec
PL2                0.00 dB
PL12              23.00 dB
PL13              24.00 dB
SFO2          300.1312005 MHz

F2 - Processing parameters
SI                 32768
SF            75.4677190 MHz
WDW                  EM
SSB                   0
LB                 1.00 Hz
GB                    0
PC                 1.40
```



(2*R*,3*R*,4*S*)-4-Chloro-3-methyl-2-phenethyl-1-tosylpiperidine, (2*S*,3*S*,4*R*)-4-Chloro-3-methyl-2-phenethyl-1-tosylpiperidine (26c), (2*S*,3*R*)-3-((*S*)-1-Chloroethyl)-2-phenethyl-1-tosylpyrrolidine and (2*R*,3*S*)-3-((*R*)-1-Chloroethyl)-2-phenethyl-1-tosylpyrrolidine (27c)



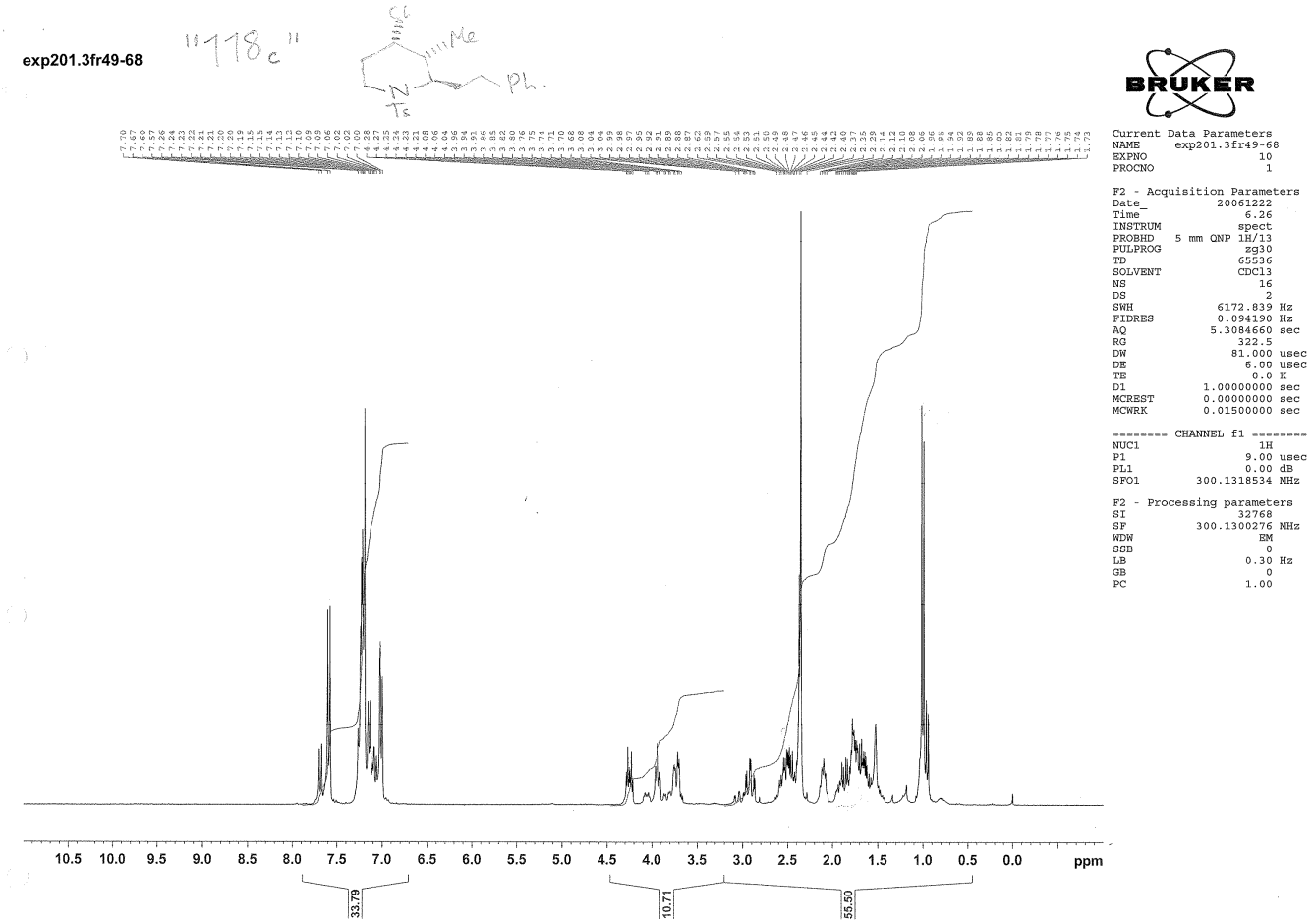
$C_{21}H_{26}ClNO_2S$
Mol. Wt.: 391.95

Following the general procedure, (*Z*)-4-methyl-*N*-(pent-3-enyl)benzenesulfonamide (150 mg, 0.62 mmol) in the presence of 3-phenylpropanal (126 mg, 0.94 mmol), was consumed based on analysis by TLC after 17 hours of stirring at room temperature. The work up afforded a yellow oil, which was purified by flash column chromatography (90% hexane, 10% ethyl acetate) to give the two *title compounds*

(2*R*,3*R*,4*S*)-4-Chloro-3-methyl-2-phenethyl-1-tosylpiperidine/(2*S*,3*S*,4*R*)-4-Chloro-3-methyl-2-phenethyl-1-tosylpiperidine (26c)

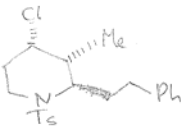
(98 mg, 0.25 mmol, 40%) as a colourless oil.

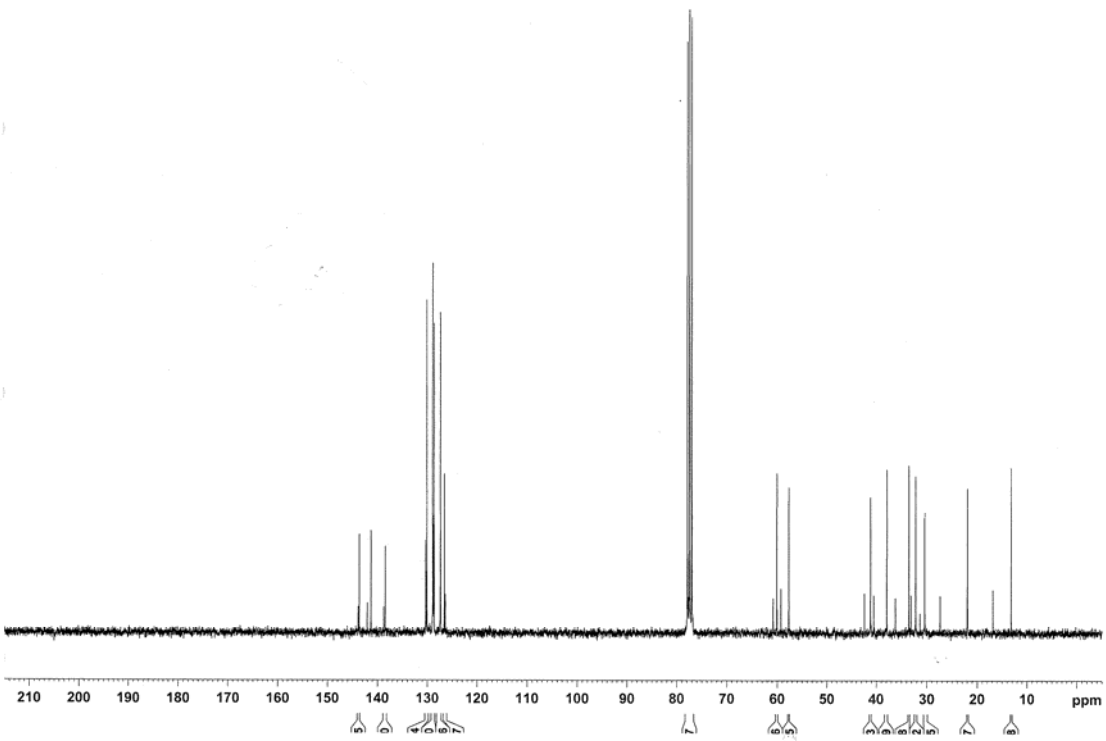
ν_{max}(neat)/cm^{-1} 3063, 2938, 1598; δ_H (300 MHz; $CDCl_3$) 7.66 (2H, d, *J* 8.3, H-C10), 7.34-7.13 (5H, m, Ar-H), 7.08 (2H, d, *J* 8.3, H-C11), 4.32 (1H, td, *J* 12.3, 4.6, H-C4), 4.01 (1H, m, H-C2), 3.80 (1H, dd, *J* 13.3, 4.5, H-C6), 2.99 (1H, dt, *J* 13.3, 3.3, H-C6), 2.66-2.47 (2H, m, H-C8), 2.42 (3H, s, H-C13), 2.22-2.13 (1H, m, H-C3)**,** 2.02-1.88 (1H, m, H-C5), 1.89-1.77 (1H, m, H-C5), 1.78-1.52 (2H, m, H-C7), 1.07 (3H, d, *J* 6.9, H-C14); δ_C (75.5 MHz; $CDCl_3$) 143.2 (C12), 140.9 (ArC), 138.0 (C9), 129.7 (C11), 128.5 (ArC), 128.2 (ArC), 126.9 (C10), 126.1 (ArC), 59.6 (C2), 57.2 (C4), 40.7 (C6), 37.4 (C3), 33.1 (C8), 31.8 (C5 or C7), 30.0 (C5 or C7), 21.5 (C13), 12.7 (C14); *m/z* (CI) 392 (MH^+, 100), 356 (18), 238 (48); HRMS (ES) Found $[M+NH_4]^+$ 409.1716, $C_{21}H_{30}ClN_2O_2S$ requires 409.1711.



exp201.3fr49-68(high vac)

"118c"



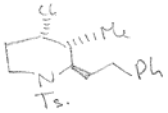


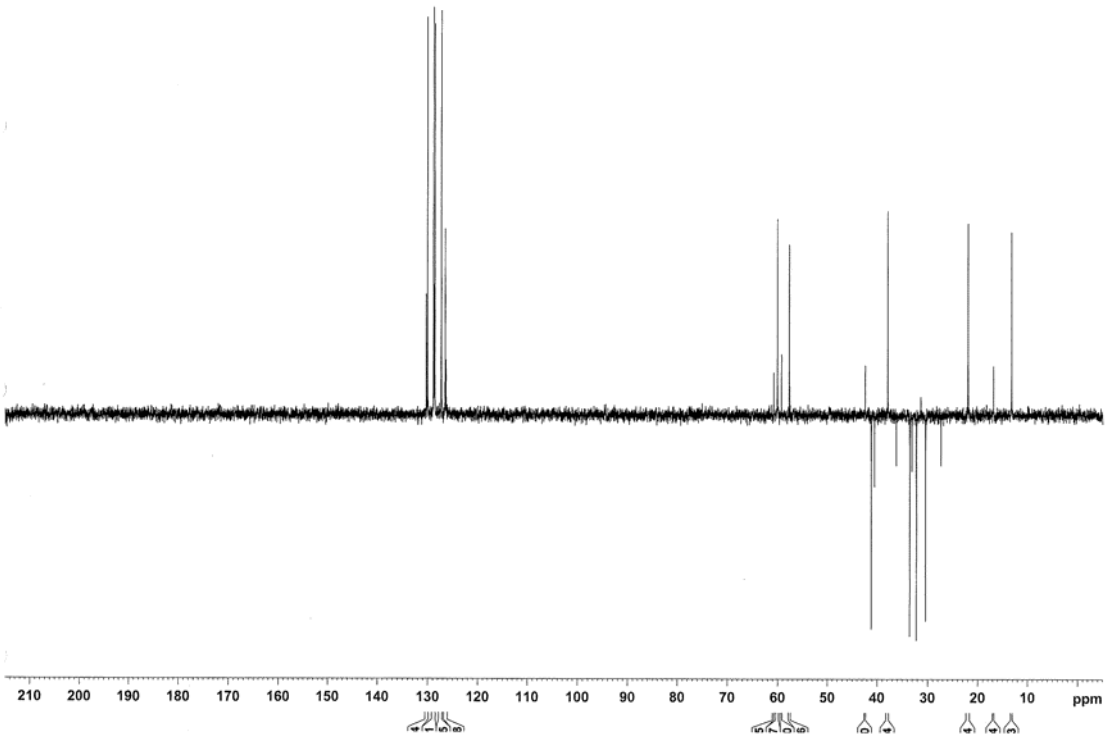
BRUKER

```
Current Data Parameters
NAME      exp201.3fr49-68
EXPNO                  21
PROCNO                  1

F2 - Acquisition Parameters
Date_            20061006
Time                20.18
INSTRUM             spect
PROBHD   5 mm QNP 1H/13
PULPROG            zgpg30
TD                  65536
SOLVENT             CDCl3
NS                   1024
DS                      4
SWH           17985.611 Hz
FIDRES         0.274439 Hz
AQ             1.8219508 sec
RG                1625.5
DW                27.800 usec
DE                 6.00 usec
TE                292.9 K
D1           2.00000000 sec
d11          0.03000000 sec
DELTA        1.89999998 sec
MCREST       0.00000000 sec
MCWRK        0.01500000 sec

======== CHANNEL f1 ========
NUC1                  13C
P1                   8.00 usec
PL1                  0.00 dB
SFO1          75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2           waltz16
NUC2                  1H
PCPD2              100.00 usec
PL2                  0.00 dB
PL12                23.00 dB
PL13                24.00 dB
SFO2         300.1312005 MHz

F2 - Processing parameters
SI                   32768
SF            75.4677190 MHz
WDW                     EM
SSB                      0
LB                    1.00 Hz
GB                       0
PC                    1.40
```

exp201.3fr49-68(high vac)

"118c"



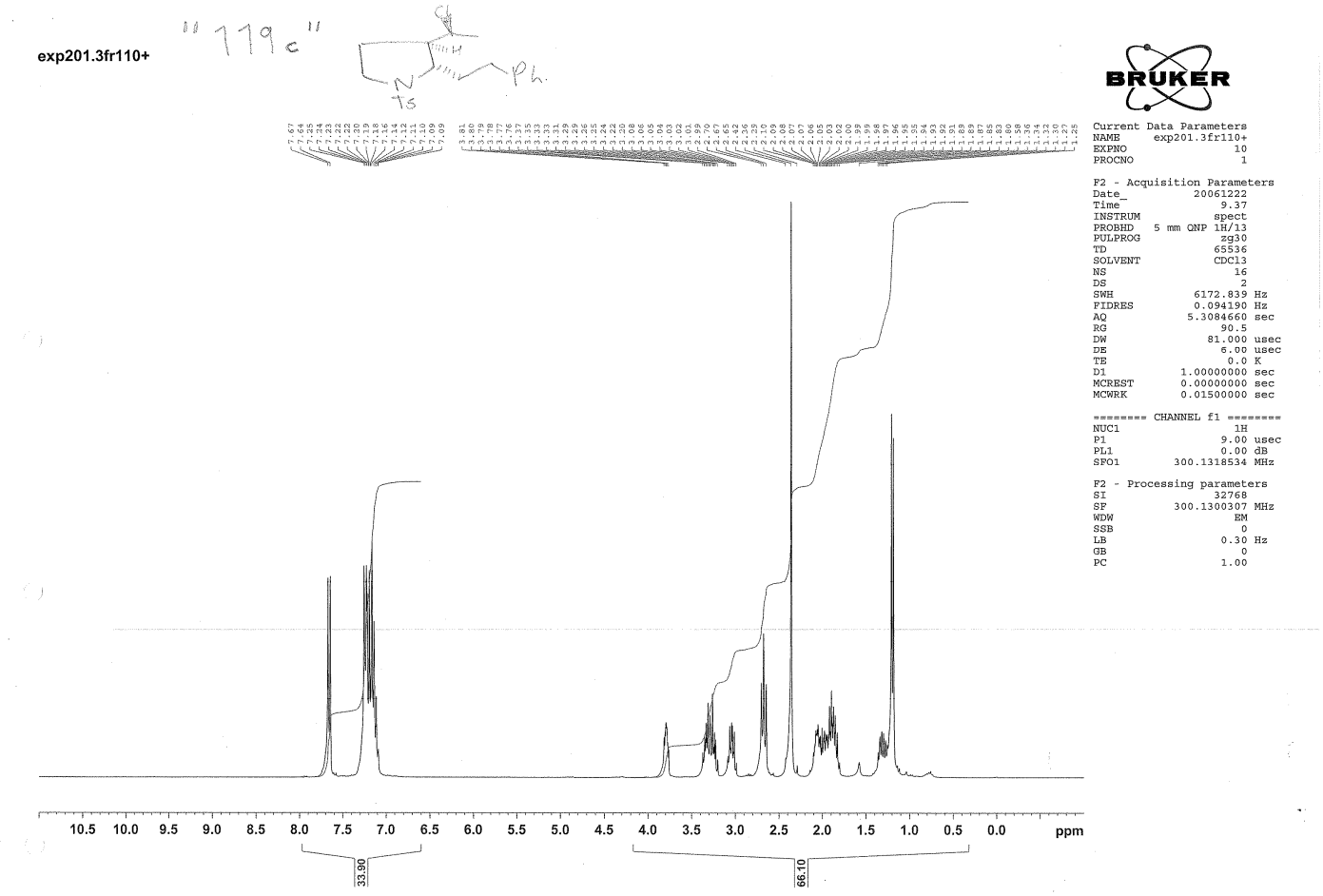


BRUKER

```
Current Data Parameters
NAME      exp201.3fr49-68
EXPNO                  23
PROCNO                  1

F2 - Acquisition Parameters
Date_            20061006
Time                21.58
INSTRUM             spect
PROBHD   5 mm QNP 1H/13
PULPROG            dept135
TD                  65536
SOLVENT             CDCl3
NS                    256
DS                      4
SWH           17985.611 Hz
FIDRES         0.274439 Hz
AQ             1.8219508 sec
RG                16384
DW                27.800 usec
DE                 6.00 usec
TE                292.6 K
CNST2        145.0000000
D1           2.00000000 sec
d2           0.00344828 sec
d12          0.00002000 sec
DELTA        0.00001019 sec
MCREST       0.00000000 sec
MCWRK        0.01500000 sec

======== CHANNEL f1 ========
NUC1                  13C
P1                   8.00 usec
p2                  16.00 usec
PL1                  0.00 dB
SFO1          75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2           waltz16
NUC2                  1H
P3                   8.00 usec
p4                  16.00 usec
PCPD2              100.00 usec
PL2                  0.00 dB
PL12                23.00 dB
SFO2         300.1312005 MHz

F2 - Processing parameters
SI                   32768
SF            75.4677190 MHz
WDW                     EM
SSB                      0
LB                    1.00 Hz
GB                       0
PC                    1.40
```

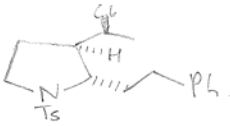
(2*S*,3*R*)-3-((*S*)-1-Chloroethyl)-2-phenethyl-1-tosylpyrrolidine/(2*R*,3*S*)-3-((*R*)-1-Chloroethyl)-2-phenethyl-1-tosylpyrrolidine (27c)

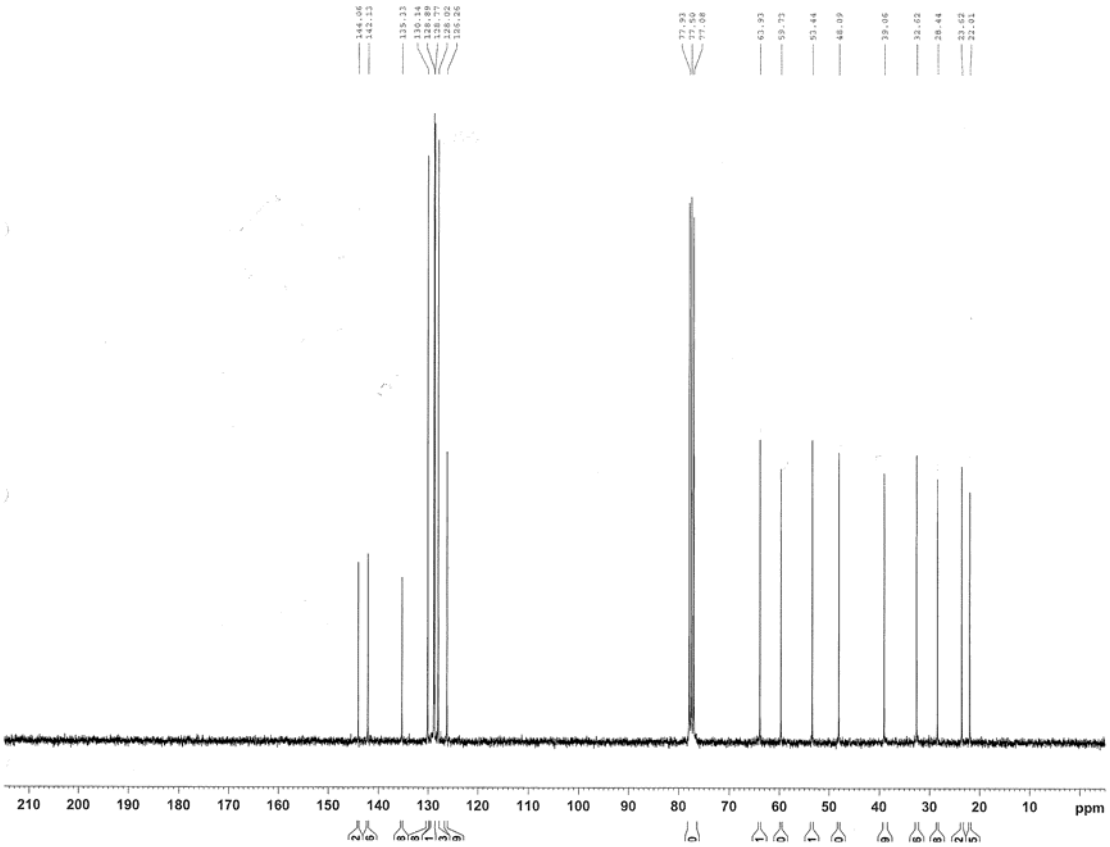
Further elution (90% hexane 10% ethyl acetate) provided the other *title compound* (88 mg, 0.22 mmol, 36%) as a white solid. M.p. 122-123 °C; ν_{max}(KBr)/cm^{-1} 3062, 2955, 1664, 1594; δ_H (300 MHz; $CDCl_3$) 7.81 (2H, d, *J* 8.3, H-C10), 7.39 (2H, d, *J* 8.3, H-C11), 7.36-7.24 (5H, m, Ar-H), 3.94 (1H, dt, *J* 6.7, 3.2, H-C2), 3.55-3.31 (2H, m, H-C5), 3.18 (1H, qd, *J* 9.1, 6.6, H-C6), 2.82 (2H, t, *J* 8.3, H-C8), 2.50 (3H, s, H-C13), 2.25-2.17 (1H, m, H-C3), 2.18-2.08 (2H, m, H-C7), 2.19-1.95 (1H, m, H-C4), 1.45 (1H, dt, *J* 13.0, 6.2, H-C4), 1.34 (3H, d, *J* 6.6, H-C14); δ_C (75.5 MHz; $CDCl_3$) 143.6 (C12), 141.6 (ArC), 134.8 (C9), 129.6 (C11), 128.4 (ArC), 128.3 (ArC), 127.5 (C10), 125.7 (ArC), 63.4 (C2), 59.2 (C6), 52.9 (C3), 47.6 (C5), 38.6 (C7), 32.1 (C8), 27.9 (C4), 23.1 (C14), 21.5 (C13); *m/z* (CI) 392 (MH^+, 100), 356 (12), 238 (58); Anal. Calcd. for $C_{21}H_{26}ClNO_2S$ requires C, 64.35; H, 6.69; N, 3.57%. Found: C, 64.47; H, 6.58; N, 3.54%.



exp201.3fr110+

"119c"



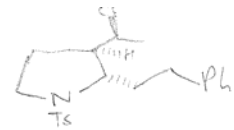


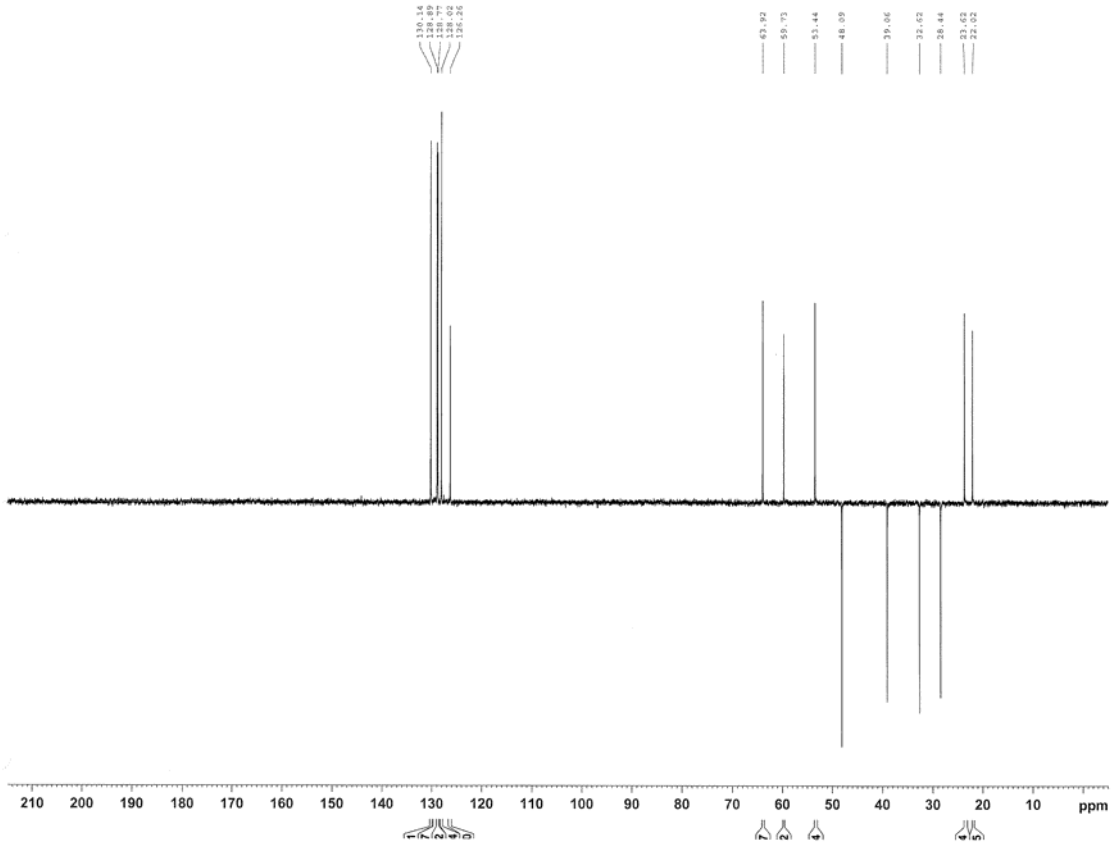
BRUKER

```
Current Data Parameters
NAME      exp201.3fr110+
EXPNO                 11
PROCNO                 1

F2 - Acquisition Parameters
Date_           20061222
Time              10.45
INSTRUM           spect
PROBHD   5 mm QNP 1H/13
PULPROG         zgpg30
TD               65536
SOLVENT          CDCl3
NS                1024
DS                   4
SWH         17985.611 Hz
FIDRES        0.274439 Hz
AQ            1.8219508 sec
RG               1290.2
DW              27.800 usec
DE               6.00 usec
TE                0.0 K
D1          2.00000000 sec
d11         0.03000000 sec
DELTA       1.89999998 sec
MCREST      0.00000000 sec
MCWRK       0.01500000 sec

======== CHANNEL f1 ========
NUC1                 13C
P1                8.00 usec
PL1               0.00 dB
SFO1        75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                 1H
PCPD2           100.00 usec
PL2               0.00 dB
PL12             23.00 dB
PL13             24.00 dB
SFO2       300.1312005 MHz

F2 - Processing parameters
SI                32768
SF          75.4677190 MHz
WDW                  EM
SSB                   0
LB                1.00 Hz
GB                    0
PC                1.40
```

exp201.3fr110+

"119c"

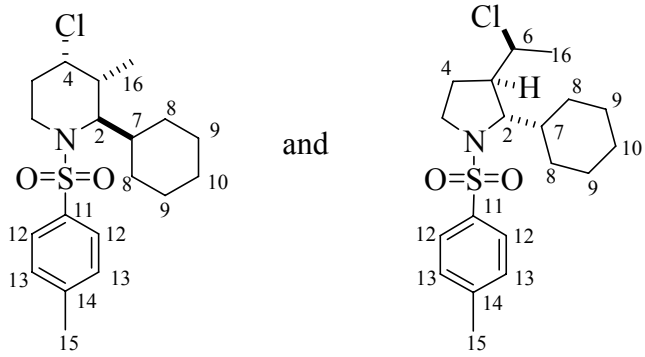




BRUKER

```
Current Data Parameters
NAME      exp201.3fr110+
EXPNO                 12
PROCNO                 1

F2 - Acquisition Parameters
Date_           20061222
Time              11.03
INSTRUM           spect
PROBHD   5 mm QNP 1H/13
PULPROG          dept135
TD               65536
SOLVENT          CDCl3
NS                 256
DS                   4
SWH         17985.611 Hz
FIDRES        0.274439 Hz
AQ            1.8219508 sec
RG                16384
DW              27.800 usec
DE               6.00 usec
TE                0.0 K
CNST2       145.0000000
D1          2.00000000 sec
d2          0.00344828 sec
d12         0.00002000 sec
DELTA       0.00001019 sec
MCREST      0.00000000 sec
MCWRK       0.01500000 sec

======== CHANNEL f1 ========
NUC1                 13C
P1                8.00 usec
p2               16.00 usec
PL1               0.00 dB
SFO1        75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                 1H
P3                8.00 usec
p4               16.00 usec
PCPD2           100.00 usec
PL2               0.00 dB
PL12             23.00 dB
SFO2       300.1312005 MHz

F2 - Processing parameters
SI                32768
SF          75.4677190 MHz
WDW                  EM
SSB                   0
LB                1.00 Hz
GB                    0
PC                1.40
```

(2*R*,3*R*,4*S*)-4-Chloro-2-cyclohexyl-3-methyl-1-tosylpiperidine/(2*S*,3*S*,4*R*)-4-Chloro-2-cyclohexyl-3-methyl-1-tosylpiperidine (26d) and (2*S*,3*R*)-3-((*S*)-1-Chloroethyl)-2-cyclohexyl-1-tosylpyrrolidine/(2*R*,3*S*)-3-((*R*)-1-Chloroethyl)-2-cyclohexyl-1-tosylpyrrolidine (27d)



$C_{19}H_{28}ClNO_2S$
Mol. Wt.: 369.95

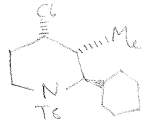
Following the general procedure, (*Z*)-4-methyl-*N*-(pent-3-enyl)benzenesulfonamide (150 mg, 0.62 mmol) in the presence of cyclohexanecarbaldehyde (105 mg, 0.94 mmol), was consumed based on analysis by TLC after 144 hours of stirring at room temperature. The work up afforded a yellow oil, which was purified by flash column chromatography (90% hexane, 10% ethyl acetate) to give the two *title compounds*.

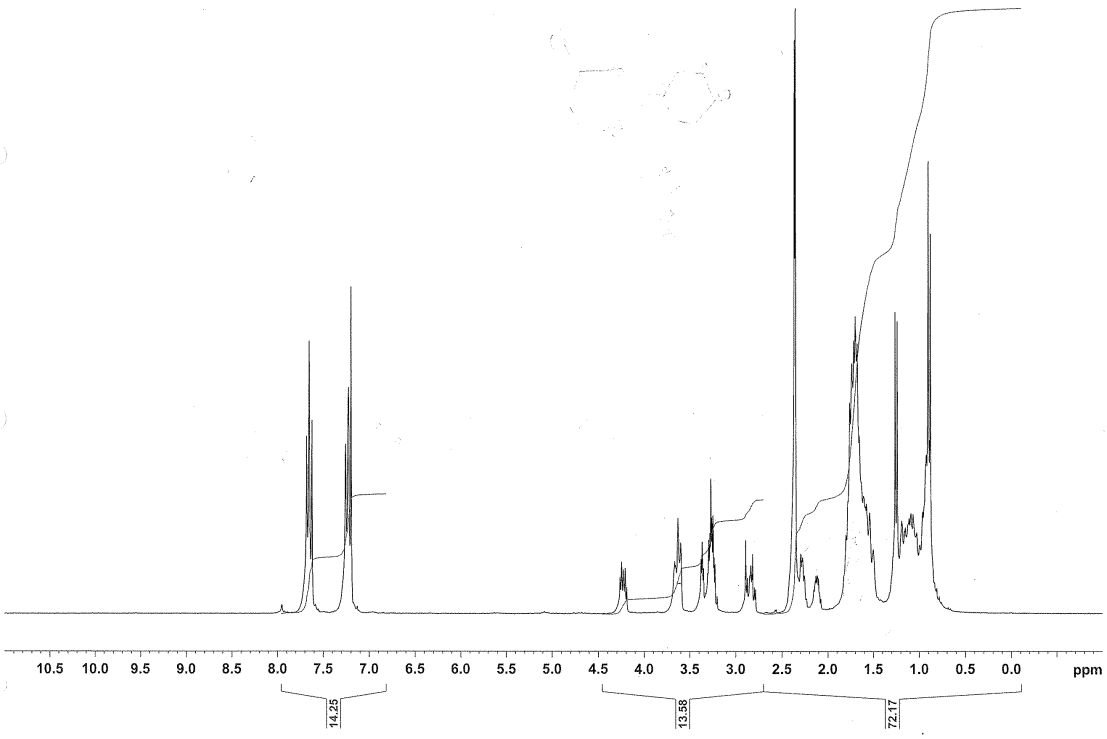
(2*R*,3*R*,4*S*)-4-Chloro-2-cyclohexyl-3-methyl-1-tosylpiperidine/(2*S*,3*S*,4*R*)-4-Chloro-2-cyclohexyl-3-methyl-1-tosylpiperidine (26d)

(60 mg, 0.16 mmol, 26%) as a white solid. M.p. 89-91 °C; ν_{max}(KBr)/cm^{-1} 3044, 2923, 1597; δ_H (300 MHz; $CDCl_3$) 7.70 (2H, d, *J* 8.4, H-C12), 7.27 (2H, d, *J* 8.4, H-C13), 4.34-4.24 (1H, m, H-C4), 3.76-3.64 (2H, m, H-C2 and H-C6), 2.98-2.83 (1H, m, H-C6), 2.42 (3H, s, H-C15), 2.39-2.28 (1H, m, H-C3), 1.85-1.71 (2H, m, H-C5), 1.77-1.53 (5H, m, H-C7 and H-C8), 1.27-0.99 (6H, m, H-C9 and H-C10), 0.95 (3H, d, *J* 6.9, H-C16); δ_C (75.5 MHz; $CDCl_3$) 142.9 (C14), 138.3 (C11), 129.4 (C13), 127.1 (C12), 65.8 (C2), 57.6 (C4), 41.0 (C6), 36.1 (C3), 34.7 (C7), 31.0 (C8), 30.2 (C8), 29.5 (C5), 26.3 (C10), 26.2 (C9), 26.1 (C9), 21.5 (C15), 13.2 (C16); *m/z* (CI) 370 (MH^+, 100), 334 (12), 286 (10); Anal. Calcd. for $C_{19}H_{28}ClNO_2S$ requires C, 61.68; H, 7.63; N, 3.79%. Found: C, 61.44; H, 7.72; N, 3.76%.

exp201.4fr24-48

"178d"



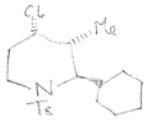


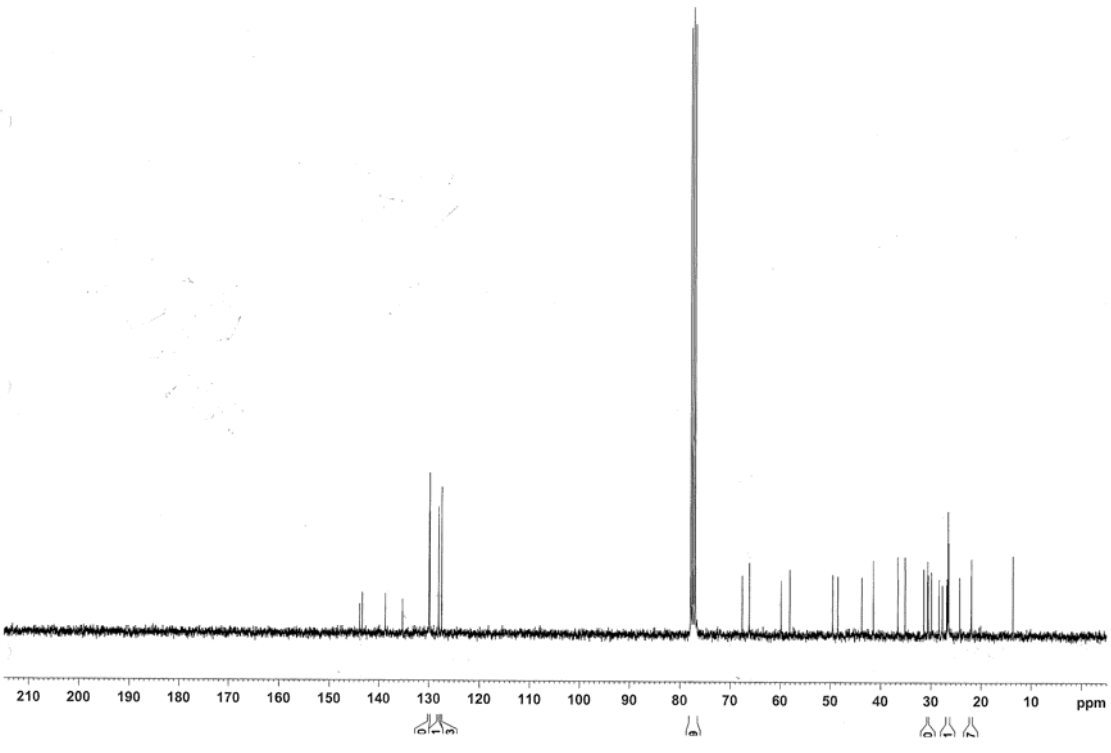
BRUKER

```
Current Data Parameters
NAME      exp201.4fr24-48
EXPNO                 10
PROCNO                 1

F2 - Acquisition Parameters
Date_           20061222
Time               16.34
INSTRUM            spect
PROBHD   5 mm QNP 1H/13
PULPROG            zg30
TD                65536
SOLVENT           CDCl3
NS                   16
DS                    2
SWH           6172.839 Hz
FIDRES           0.094190 Hz
AQ               5.3084660 sec
RG                228.1
DW                81.000 usec
DE                 6.00 usec
TE                  0.0 K
D1           1.00000000 sec
MCREST       0.00000000 sec
MCWRK        0.01500000 sec

======== CHANNEL f1 ========
NUC1                  1H
P1                 9.00 usec
PL1                0.00 dB
SFO1        300.1318534 MHz

F2 - Processing parameters
SI                32768
SP           300.1300255 MHz
WDW                  EM
SSB                   0
LB                 0.30 Hz
GB                    0
PC                 1.00
```

exp201.4fr24-48

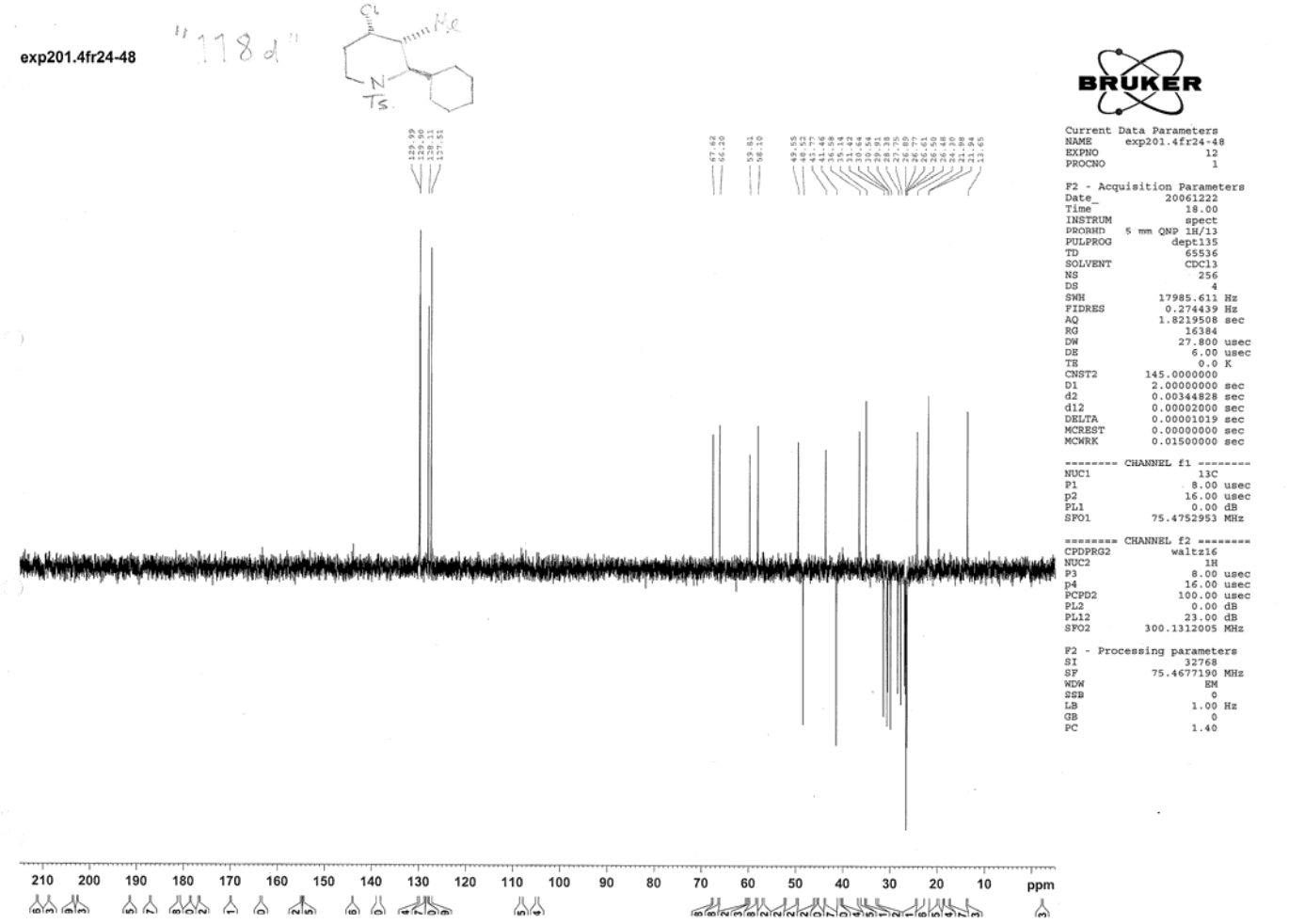
"178d"





BRUKER

```
Current Data Parameters
NAME      exp201.4fr24-48
EXPNO                 11
PROCNO                 1

F2 - Acquisition Parameters
Date_           20061222
Time               17.42
INSTRUM            spect
PROBHD   5 mm QNP 1H/13
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                 1024
DS                    4
SWH          17985.611 Hz
FIDRES           0.274439 Hz
AQ               1.8219508 sec
RG                1290.2
DW                27.800 usec
DE                 6.00 usec
TE                  0.0 K
D1           2.00000000 sec
D11          0.03000000 sec
DELTA        1.89999998 sec
MCREST       0.00000000 sec
MCWRK        0.01500000 sec

======== CHANNEL f1 ========
NUC1                 13C
P1                 8.00 usec
PL1                0.00 dB
SFO1        75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2            100.00 usec
PL2                0.00 dB
PL12              23.00 dB
PL13              24.00 dB
SFO2        300.1312005 MHz

F2 - Processing parameters
SI                32768
SP           75.4677190 MHz
WDW                  EM
SSB                   0
LB                 1.00 Hz
GB                    0
PC                 1.40
```

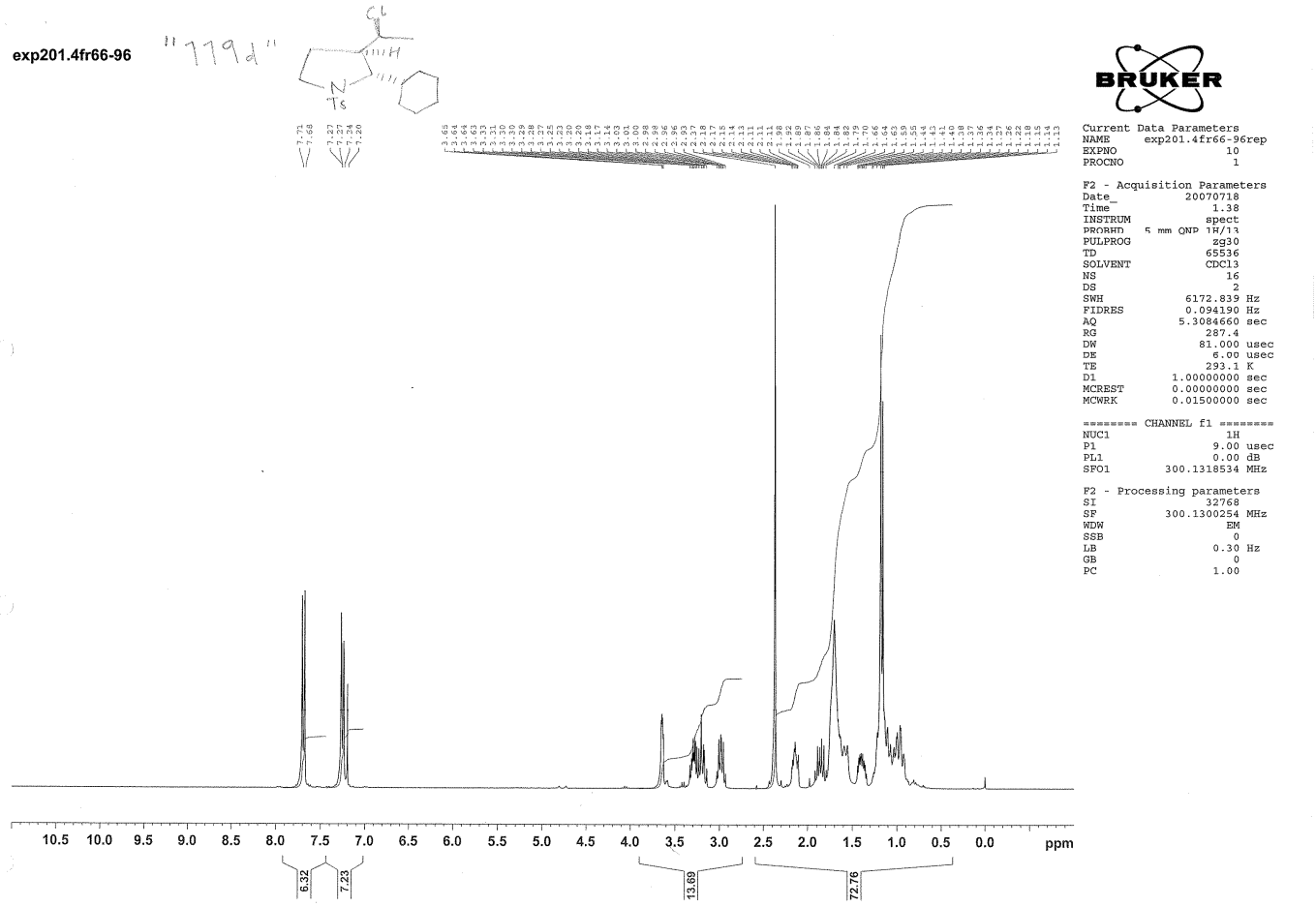


(2*S*,3*R*)-3-((*S*)-1-Chloroethyl)-2-cyclohexyl-1-tosylpyrrolidine/(2*R*,3*S*)-3-((*R*)-1-Chloroethyl)-2-cyclohexyl-1-tosylpyrrolidine (27d)

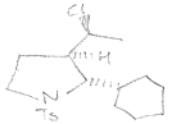
Further elution (90% hexane 10% ethyl acetate) provided the other *title compound* (115 mg, 0.31 mmol, 50%) as a white solid. M.p. 109-112 °C; ν_{max}(KBr)/cm^{-1} 2918, 1670, 1597; δ_H (300 MHz; $CDCl_3$) 7.74 (2H, d, *J* 8.1, H-C12), 7.30 (2H, d, *J* 8.1, H-C13), 3.69 (1H, dd, *J* 4.3, 2.5, H-C2), 3.38-3.30 (1H, m, H-C5), 3.28-3.19 (1H, m, H-C5), 3.02 (1H, qd, *J* 8.8, 6.5, H-C6), 2.41 (3H, s, H-C15), 2.17-2.09 (1H, m, H-C3), 1.98-1.83 (1H, m, H-C4), 1.78-1.58 (5H, m, H-C7 and H-C8), 1.38 (1H, ddd, *J* 16.8, 8.1, 4.8, H-C4), 1.16 (3H, d, *J* 6.5, H-C16), 1.22-0.76 (6H, m, H-C9 and H-C10); δ_C (75.5 MHz; $CDCl_3$) 143.4 (C14), 134.8 (C11), 129.5 (C13), 127.6 (C12), 68.1 (C2), 59.5 (C6), 49.6 (C3), 48.0 (C5), 43.3 (C7), 29.8 (C8), 28.5 (C8), 27.9 (C4), 26.4 (C10), 26.3 (C9), 26.2 (C9), 22.7 (C16), 21.5 (C15); *m/z* (CI) 370 (MH^+, 100), 334 (28), 286 (20); Anal. Calcd. for $C_{19}H_{28}ClNO_2S$ requires C, 61.69; H, 7.63; N, 3.79%. Found: C, 61.65; H, 7.84; N, 3.66%; HRMS (ES) Found $[M+H]^+$ 370.1602, $C_{19}H_{29}ClNO_2S$ requires 370.1599.

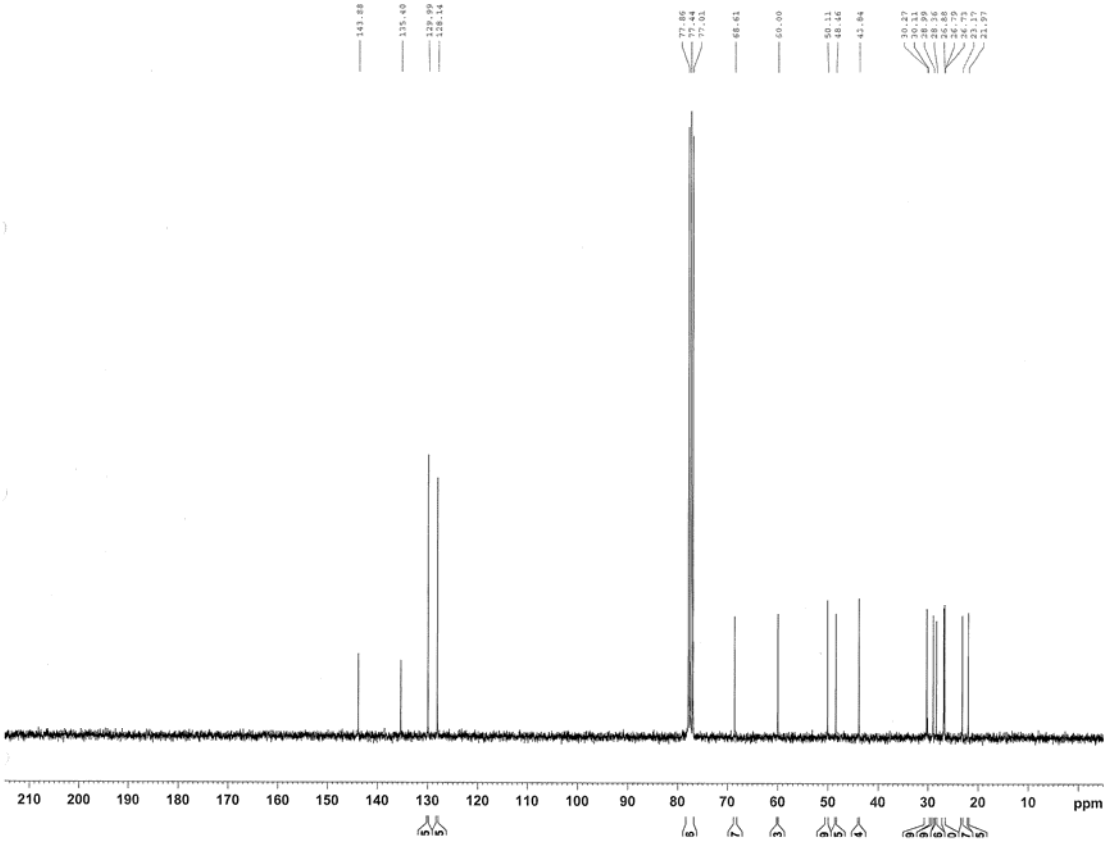
Crystal data. $C_{19}H_{28}ClNO_2S$; *M* = 369.93; Orthorhombic; Space group *P*212121; *a* = 9.5924(3) Å, *b* = 12.9905(3) Å, *c* = 15.0218(4) Å; Volume 1871.87(9) Å^3; T = 120 K; *Z* 4; 16779 reflections measured, 4283 unique [R_{int} = 0.0484]. The final R values *R1* = 0.0376, *wR2* = 0.0826 (observed) and *R1* = 0.0516, *wR2* =

0.0886 (all).


exp201.4fr66-96
"779d"
Cl
H
N
Ts
BRUKER
Current Data Parameters
NAME exp201.4fr66-96rep
EXPNO 10
PROCNO 1
F2 - Acquisition Parameters
Date_ 20070718
Time 1.38
INSTRUM spect
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 6172.839 Hz
FIDRES 0.094190 Hz
AQ 5.3084660 sec
RG 287.4
DW 81.000 usec
DE 6.00 usec
TE 293.1 K
D1 1.00000000 sec
MCREST 0.00000000 sec
MCWRK 0.01500000 sec
======== CHANNEL f1 ========
NUC1 1H
P1 9.00 usec
PL1 0.00 dB
SFO1 300.1318534 MHz
F2 - Processing parameters
SI 32768
SP 300.1300254 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 ppm
6.32
7.23
13.69
72.76

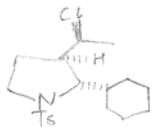
exp201.4fr66-96 "119d"

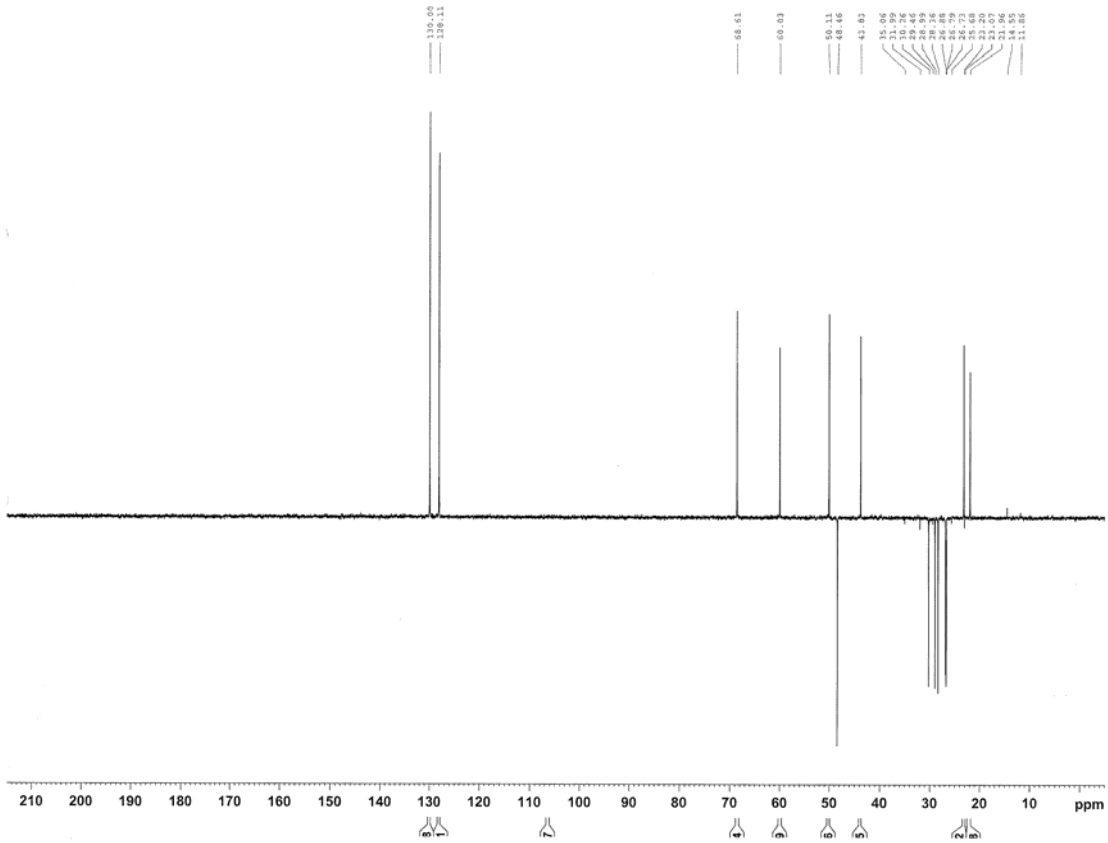





```
Current Data Parameters
NAME      exp201.4fr66-96rep
EXPNO                    11
PROCNO                    1

F2 - Acquisition Parameters
Date_              20070718
Time                   2.46
INSTRUM               spect
PROBHD   5 mm QNP 1H/13
PULPROG              zgpg30
TD                    65536
SOLVENT               CDCl3
NS                     1024
DS                        4
SWH             17985.611 Hz
FIDRES           0.274439 Hz
AQ               1.8219508 sec
RG                     1024
DW                27.800 usec
DE                 6.00 usec
TE                 293.3 K
D1             2.00000000 sec
d11            0.03000000 sec
DELTA          1.89999998 sec
MCREST         0.00000000 sec
MCWRK          0.01500000 sec

======== CHANNEL f1 ========
NUC1                   13C
P1                  8.00 usec
PL1                 0.00 dB
SFO1          75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2            waltz16
NUC2                   1H
PCPD2             100.00 usec
PL2                 0.00 dB
PL12               23.00 dB
PL13               24.00 dB
SFO2         300.1312005 MHz

F2 - Processing parameters
SI                    32768
SF            75.4677190 MHz
WDW                      EM
SSB                       0
LB                 1.00 Hz
GB                        0
PC                 1.40
```

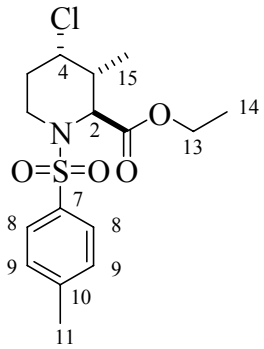
exp201.4fr66-96 "119d"






```
Current Data Parameters
NAME      exp201.4fr66-96
EXPNO                    12
PROCNO                    1

F2 - Acquisition Parameters
Date_              20061014
Time                   0.37
INSTRUM               spect
PROBHD   5 mm QNP 1H/13
PULPROG              dept135
TD                    65536
SOLVENT               CDCl3
NS                      256
DS                        4
SWH             17985.611 Hz
FIDRES           0.274439 Hz
AQ               1.8219508 sec
RG                     16384
DW                27.800 usec
DE                 6.00 usec
TE                 292.5 K
CNST2         145.0000000
D1             2.00000000 sec
d2             0.00344828 sec
d12            0.00002000 sec
DELTA          0.00001019 sec
MCREST         0.00000000 sec
MCWRK          0.01500000 sec

======== CHANNEL f1 ========
NUC1                   13C
P1                  8.00 usec
p2                 16.00 usec
PL1                 0.00 dB
SFO1          75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2            waltz16
NUC2                   1H
P3                  8.00 usec
p4                 16.00 usec
PCPD2             100.00 usec
PL2                 0.00 dB
PL12               23.00 dB
SFO2         300.1312005 MHz

F2 - Processing parameters
SI                    32768
SF            75.4677190 MHz
WDW                      EM
SSB                       0
LB                 1.00 Hz
GB                        0
PC                 1.40
```

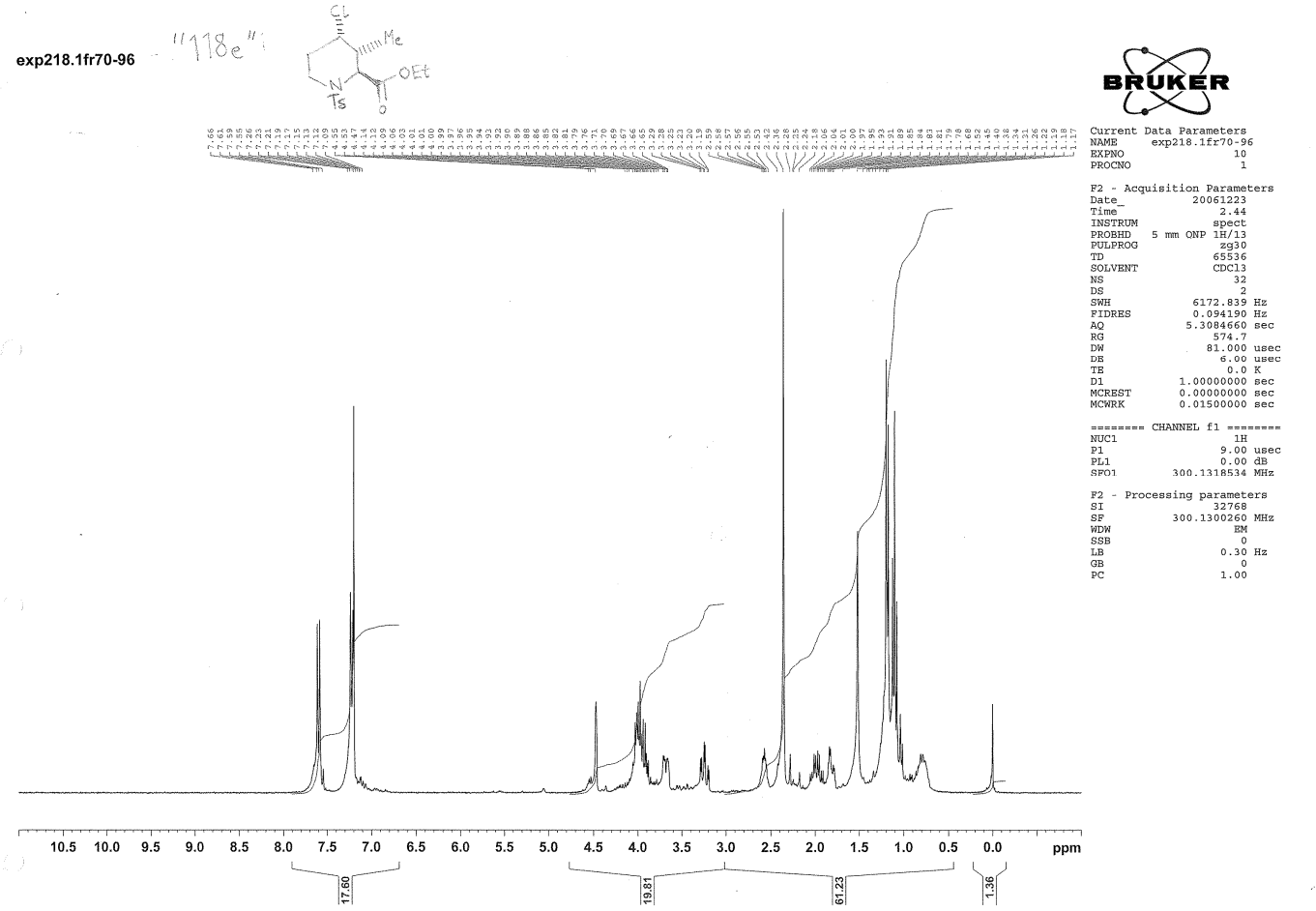

(2*S*,3*R*,4*S*)-Ethyl-4-chloro-3-methyl-1-tosylpiperidine-2-carboxylate/(2*R*,3*S*,4*R*)-Ethyl-4-chloro-3-methyl-1-tosylpiperidine-2-carboxylate (26e)



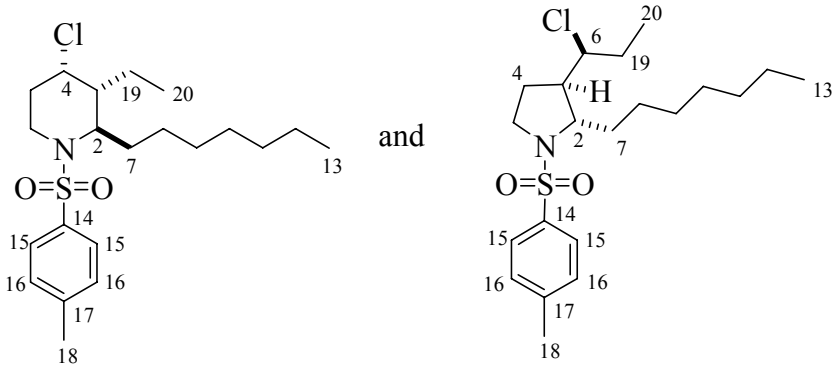
$C_{16}H_{22}ClNO_4S$
Mol. Wt.: 359.87

Following the general procedure, (*Z*)-4-methyl-*N*-(pent-3-enyl)benzenesulfonamide (40 mg, 0.17 mmol), in the presence of a pre-heated 33% solution of ethyl 2-oxoacetate in toluene (76 mg, 0.25 mmol, 1.50 eq.), was consumed based on analysis by TLC after 1 hour of stirring at room temperature. The work up afforded a yellow oil, which was purified by flash column chromatography (90% hexane, 10% ethyl acetate) to give the *title compound* (12 mg, 0.03 mmol, 20%) as a pale yellow oil.

ν_{max}(neat)/cm^{-1} 2927, 1736, 1598; δ_H (300 MHz; $CDCl_3$) 7.66 (2H, d, *J* 8.3, H-C8), 7.29 (2H, d, *J* 8.3, H-C9), 4.54 (1H, d, *J* 1.2, H-C2), 4.13-4.02 (1H, m, H-C4), 4.04-3.94 (2H, m, H-C13), 3.79-3.70 (1H, m, H-C6), 3.31 (1H, td, *J* 12.4, 3.4, H-C6), 2.69-2.58 (1H, m, H-C3), 2.42 (3H, s, H-C11), 2.13-1.97 (1H, m, H-C5), 1.94-1.82 (1H, m, H-C5), 1.25 (3H, d, *J* 6.9, H-C15), 1.16 (3H, t, *J* 7.1, H-C14); δ_C (75.5 MHz; $CDCl_3$) 169.9 (C12), 143.4 (C10), 136.3 (C7), 129.4 (C9), 127.2 (C8), 61.6 (C13), 61.0 (C2), 57.2 (C4), 42.3 (C6), 37.2 (C3), 29.3 (C5), 21.5 (C11), 13.9 (C14), 11.9 (C15); *m/z* (CI) 360 (MH^+, 90), 286 (45), 206 (100); HRMS (ES) Found $[M+H]^+$ 360.1027, $C_{16}H_{23}ClNO_4S$ requires 360.1031.



(2*R*,3*R*,4*S*)-4-Chloro-3-ethyl-2-heptyl-1-tosylpiperidine/(2*S*,3*S*,4*R*)-4-Chloro-3-ethyl-2-heptyl-1-tosylpiperidine (28a) and (2*S*,3*R*)-3-((*S*)-1-Chloropropyl)-2-heptyl-1-tosylpyrrolidine/(2*R*,3*S*)-3-((*R*)-1-Chloropropyl)-2-heptyl-1-tosylpyrrolidine (29a)



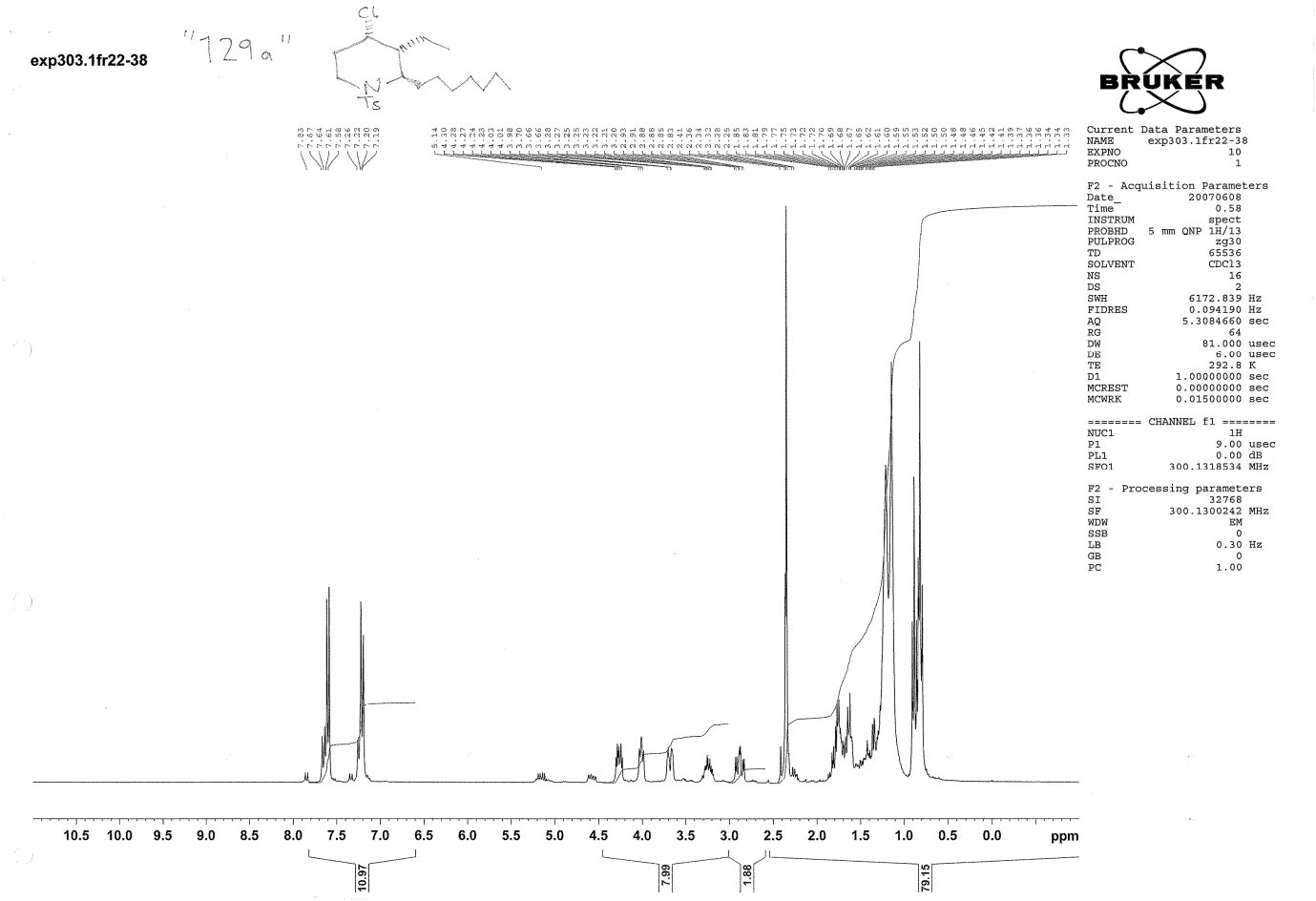
$C_{21}H_{34}ClNO_2S$
Mol. Wt.: 400.02

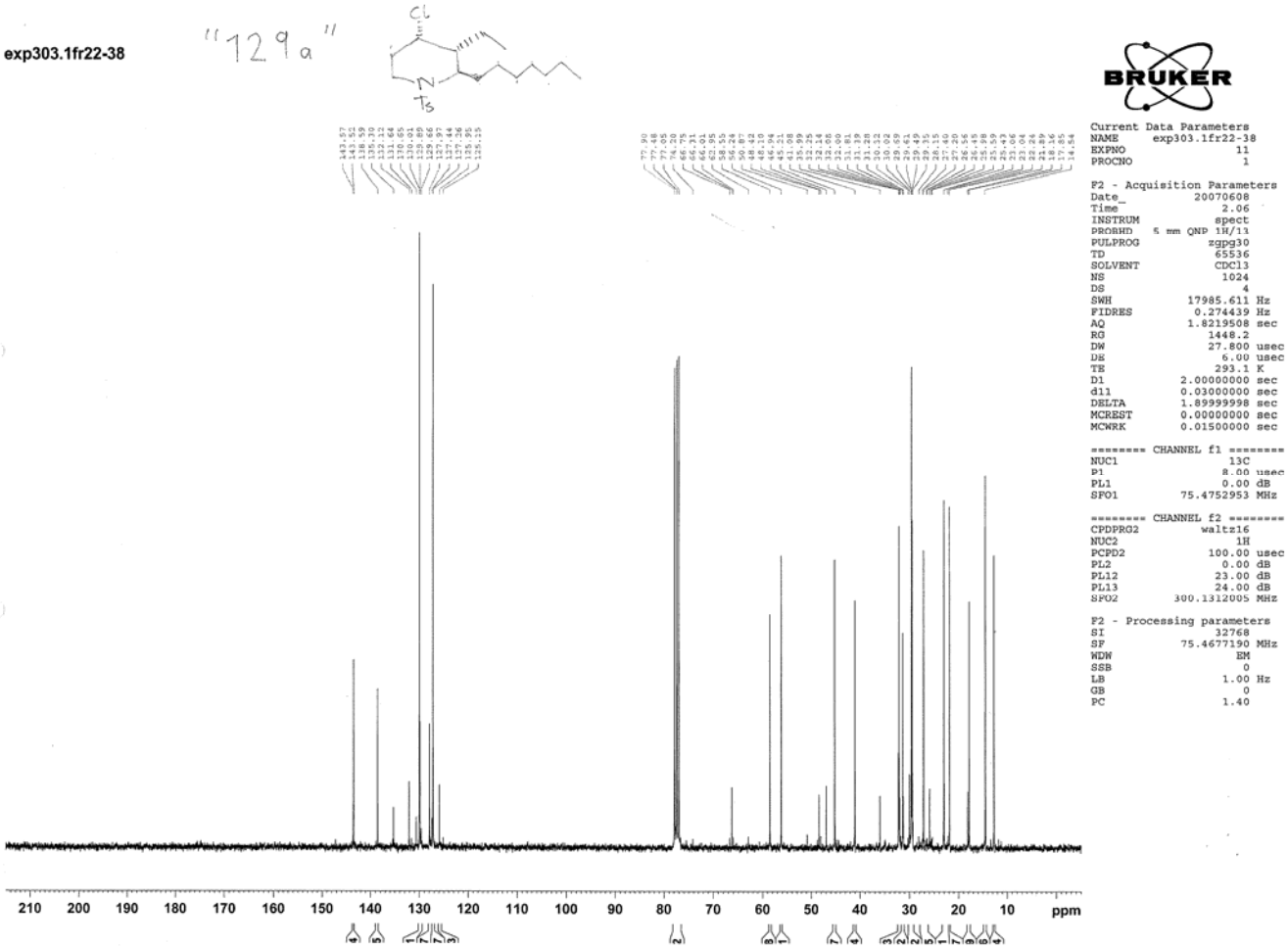
Following the general procedure, (*Z*)-*N*-(hex-3-enyl)-4-methylbenzenesulfonamide (500 mg, 1.97 mmol), in the presence of octanal (379 mg, 2.96 mmol), was consumed based on analysis by TLC after 17 hours of stirring at room temperature. The work up afforded a yellow oil, which was purified by flash column chromatography (90% hexane, 10% ethyl acetate) to give two title compounds.

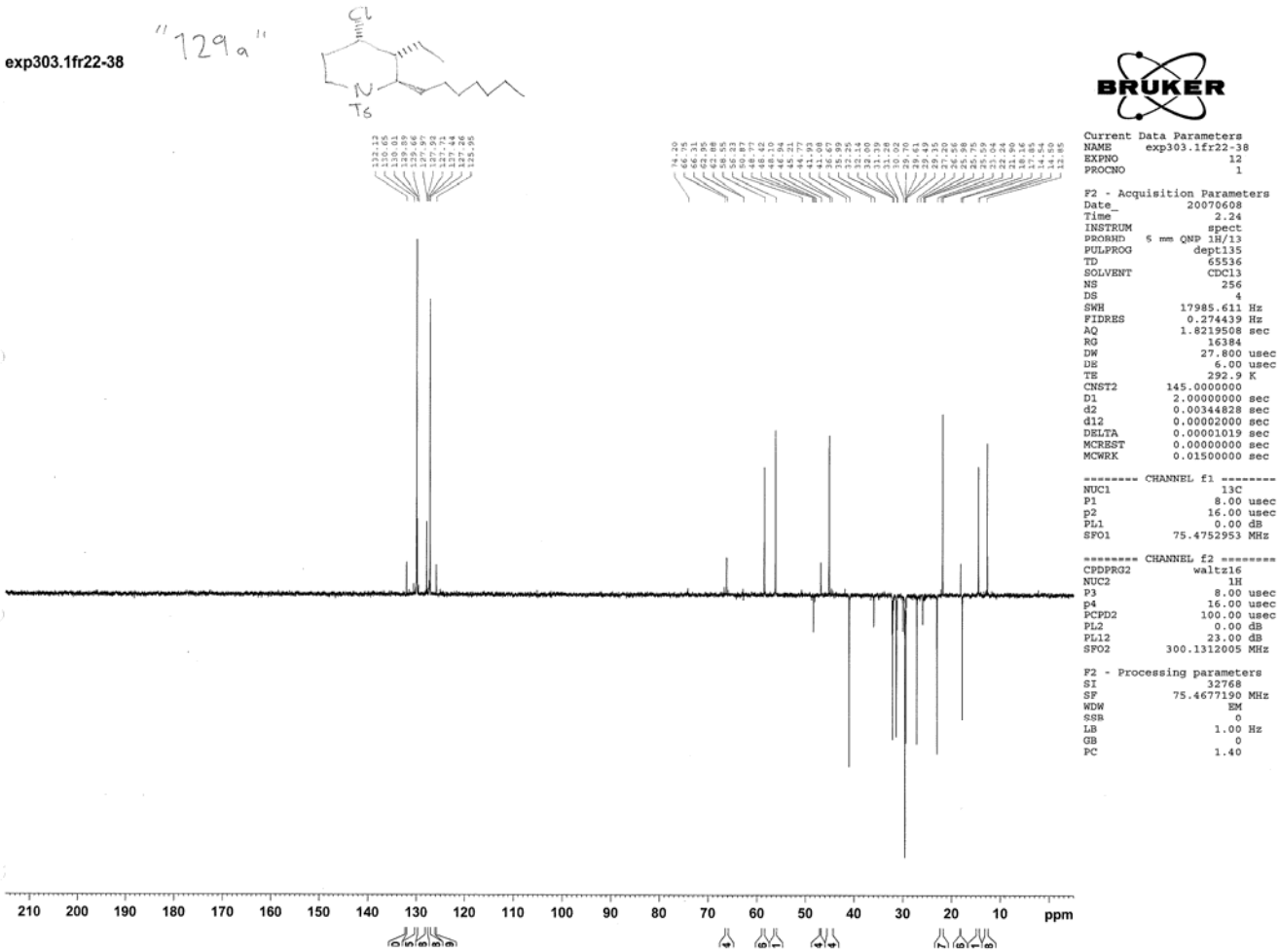
(2*R*,3*R*,4*S*)-4-Chloro-3-ethyl-2-heptyl-1-tosylpiperidine/(2*S*,3*S*,4*R*)-4-Chloro-3-ethyl-2-heptyl-1-tosylpiperidine (28a)

323 mg, (0.81 mmol, 41%) as a colourless oil.

ν_{max}(neat)/cm^{-1} 2957, 1729, 1598; δ_H (300 MHz; $CDCl_3$) 7.66 (2H, d, *J* 8.4, H-C15), 7.26 (2H, d, *J* 8.4, H-C16), 4.37-4.28 (1H, m, H-C4), 4.11-4.03 (1H, m, H-C2), 3.79-3.69 (1H, m, H-C6), 3.01-2.87 (1H, m, H-C6), 2.40 (3H, s, H-C18), 1.91-1.74 (2H, m, H-C5), 1.75-1.63 (1H, m, H-C3), 1.59-1.29 (2H, m, H-C7), 1.32-1.23 (8H, m, H-C8 to H-C11), 1.23-1.16 (4H, m, H-C19 and H-C12), 0.94 (3H, t, *J* 7.3, H-C20), 0.87 (3H, t, *J* 6.8, H-C13); δ_C (75.5 MHz; $CDCl_3$) 143.0 (C17), 138.1 (C14), 129.5 (C16), 126.8 (C15), 58.1 (C4), 55.8 (C2), 44.7 (C3), 40.6 (C6), 31.7 (C11), 30.9 (C5), 29.1 (C9 and C10), 26.7 (C8), 22.6 (C12), 22.6 (C7), 21.4 (C18), 17.4 (C19), 14.0 (C13), 12.3 (C20); *m/z* (CI) 400 (MH^+, 100), 364 (78), 300 (42); HRMS (ES) Found $[M+H]^+$ 400.2073, $C_{21}H_{35}ClNO_2S$ requires 400.2072.

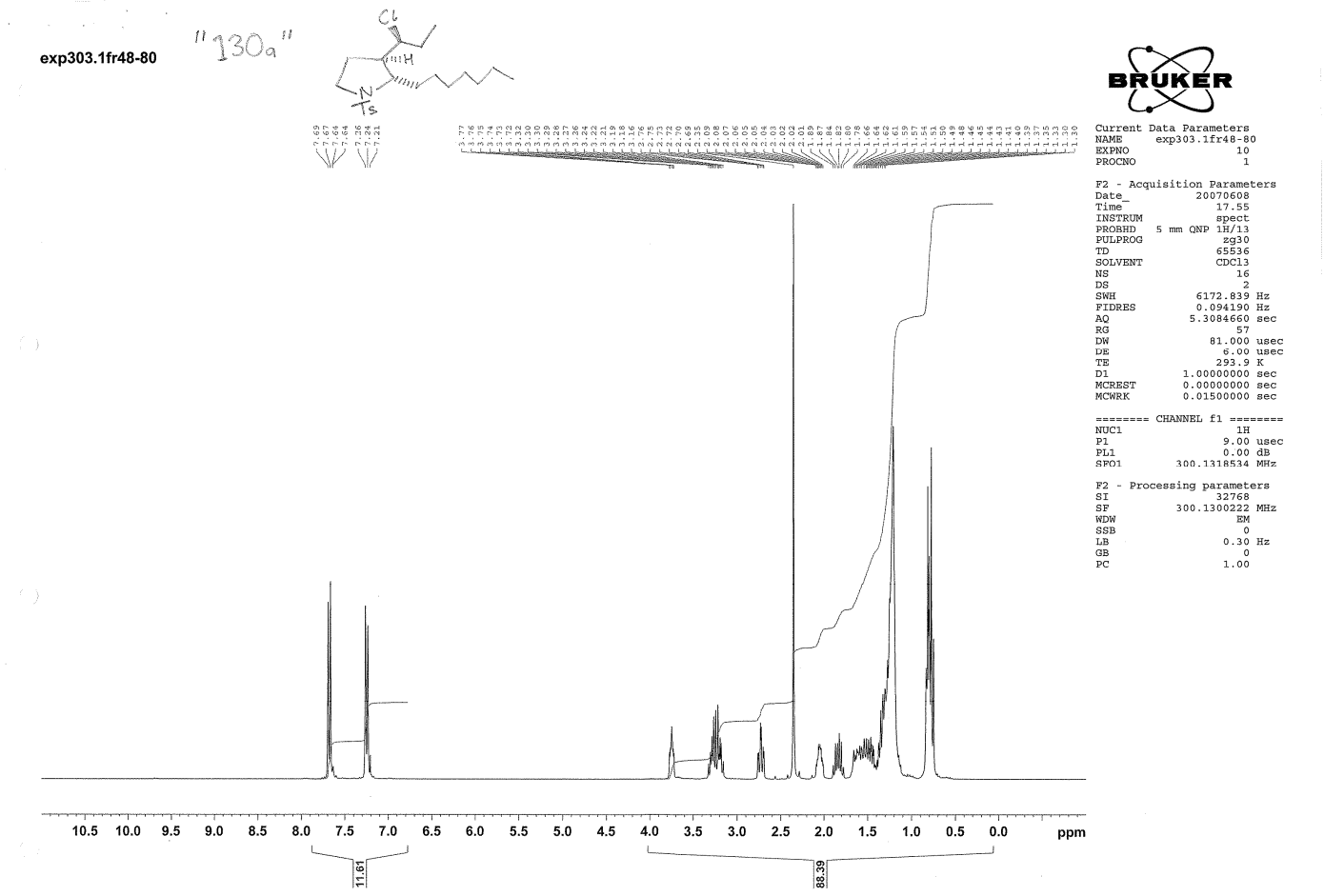



exp303.1fr22-38
"129a"
Cl
N
Ts
BRUKER
Current Data Parameters
NAME exp303.1fr22-38
EXPNO 11
PROCNO 1
F2 - Acquisition Parameters
Date_ 20070608
Time 2.06
INSTRUM spect
PROBHD 5 mm QNP 1H/11
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 1024
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 1448.2
DW 27.800 usec
DE 6.00 usec
TE 293.1 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
MCREST 0.00000000 sec
MCWRK 0.01500000 sec
======== CHANNEL f1 ========
NUC1 13C
P1 8.00 usec
PL1 0.00 dB
SFO1 75.4752953 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 100.00 usec
PL2 0.00 dB
PL12 23.00 dB
PL13 24.00 dB
SFO2 300.1312005 MHz
F2 - Processing parameters
SI 32768
SF 75.4677190 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm

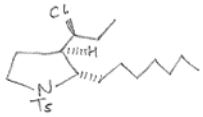

exp303.1fr22-38
"129a"
Cl
N
Ts
BRUKER
Current Data Parameters
NAME exp303.1fr22-38
EXPNO 12
PROCNO 1
F2 - Acquisition Parameters
Date_ 20070608
Time 2.24
INSTRUM spect
PROBHD 5 mm QNP 1H/13
PULPROG dept135
TD 65536
SOLVENT CDCl3
NS 256
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 16384
DW 27.800 usec
DE 6.00 usec
TE 292.9 K
CNST2 145.0000000
D1 2.00000000 sec
d2 0.00344828 sec
d12 0.00002000 sec
DELTA 0.00001019 sec
MCREST 0.00000000 sec
MCWRK 0.01500000 sec
======== CHANNEL f1 ========
NUC1 13C
P1 8.00 usec
p2 16.00 usec
PL1 0.00 dB
SFO1 75.4752953 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
P3 8.00 usec
p4 16.00 usec
PCPD2 100.00 usec
PL2 0.00 dB
PL12 23.00 dB
SFO2 300.1312005 MHz
F2 - Processing parameters
SI 32768
SF 75.4677190 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm

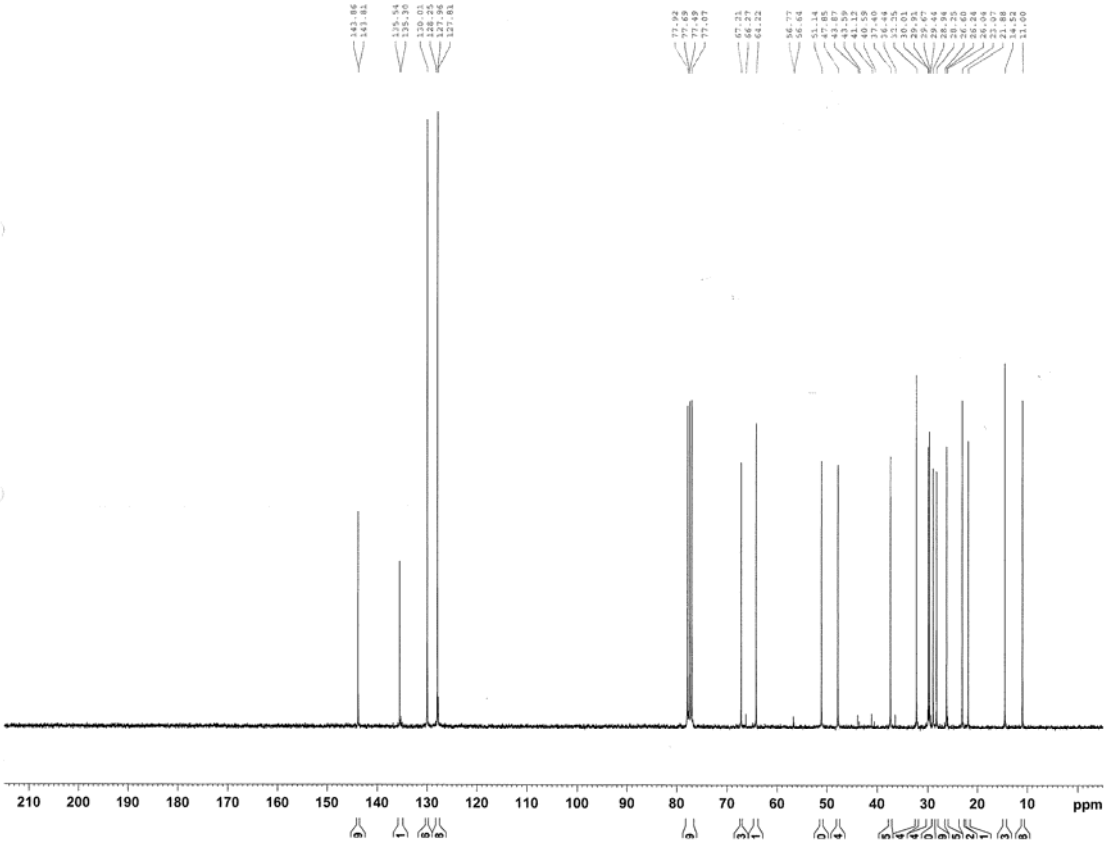
(2*S*,3*R*)-3-((*S*)-1-Chloropropyl)-2-heptyl-1-tosylpyrrolidine/(2*R*,3*S*)-3-((*R*)-1-Chloropropyl)-2-heptyl-1-tosylpyrrolidine (29a)

Further elution (90% hexane 10% ethyl acetate) provided the other *title compound* (339 mg, 0.85 mmol, 43%) as a colourless oil. ν_{max}(neat)/cm^{-1} 2954, 1597, δ_H (300 MHz; $CDCl_3$) 7.73 (2H, d, *J* 8.3, H-C15), 7.30 (2H, d, *J* 8.3, H-C16), 3.83-3.77 (1H, m, H-C2), 3.39-3.20 (2H, m, H-C5), 2.78 (1H, dt, *J* 9.1, 2.8, H-C6), 2.41 (3H, s, H-C18), 2.16-2.05 (1H, m, H-C3), 1.96-1.82 (1H, m, H-C4), 1.73-1.54 (2H, m, H-C7), 1.60-1.39 (2H, m, H-C19), 1.43-1.29 (1H, m, H-C4), 1.31-1.19 (10H, m, H-C8 to H-C12), 0.86 (3H, t, *J* 6.5, H-C13), 0.83 (3H, t, *J* 7.2, H-C20); δ_C (75.5 MHz; $CDCl_3$) 143.4 (C17), 135.0 (C14), 129.5 (C16), 127.5 (C15), 66.7 (C6), 63.7 (C2), 50.7 (C3), 47.4 (C5), 36.9 (C7), 31.8 (C11), 29.3 (C9 and C10), 28.5 (C19), 27.8 (C4), 25.8 (C8), 22.6 (C12), 21.4 (C18), 14.0 (C20), 10.5 (C13); *m/z* (CI) 400 (MH^+, 100), 364 (40), 300 (25); Anal. Calcd. for $C_{21}H_{34}ClNO_2S$ requires C, 63.05; H, 8.57; N, 3.50%. Found: C, 62.99; H, 8.83; N, 3.50%.



exp303.1fr48-80 "130a"

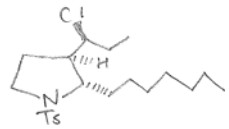


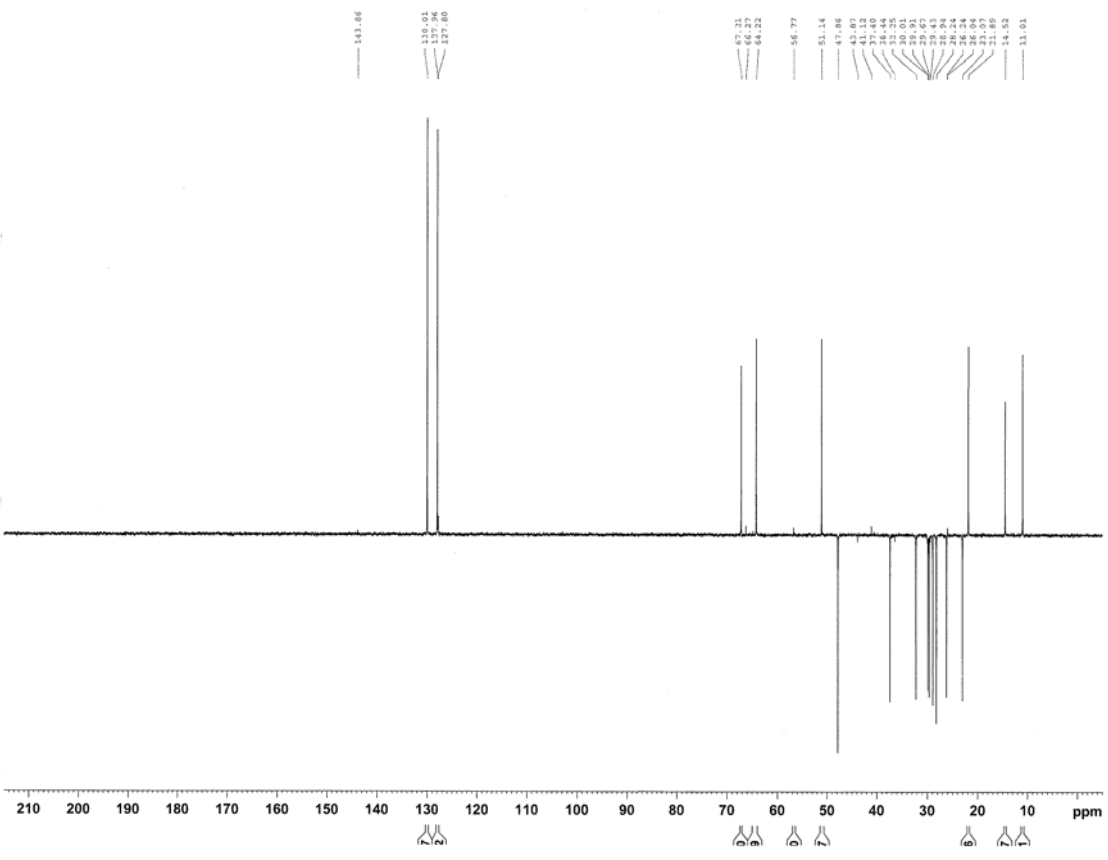


BRUKER

```
Current Data Parameters
NAME      exp303.1fr48-80
EXPNO                 11
PROCNO                 1

F2 - Acquisition Parameters
Date_           20070608
Time              19.03
INSTRUM           spect
PROBHD   5 mm QNP 1H/11
PULPROG         zgpg30
TD               65536
SOLVENT           CDCl3
NS                 1024
DS                    4
SWH          17985.611 Hz
FIDRES        0.274439 Hz
AQ            1.8219508 sec
RG                645.1
DW               27.800 usec
DE                6.00 usec
TE                294.4 K
D1          2.00000000 sec
d11         0.03000000 sec
DELTA       1.89999998 sec
MCREST      0.00000000 sec
MCWRK       0.01500000 sec

======== CHANNEL f1 ========
NUC1                13C
P1                 8.00 usec
PL1                0.00 dB
SFO1         75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                1H
PCPD2            100.00 usec
PL2                0.00 dB
PL12              23.00 dB
PL13              24.00 dB
SFO2        300.1312005 MHz

F2 - Processing parameters
SI                 32768
SF          75.4677190 MHz
WDW                EM
SSB                 0
LB                1.00 Hz
GB                  0
PC                1.40
```

exp303.1fr48-80 "130a"

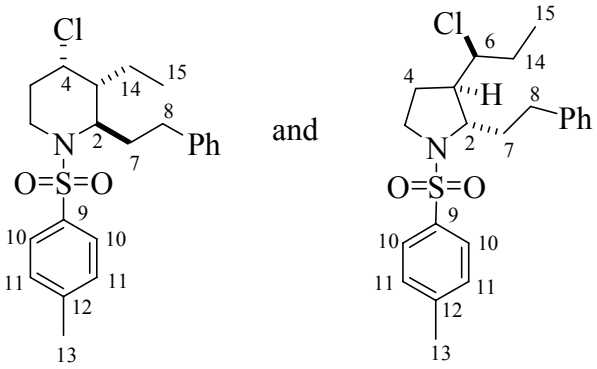




BRUKER

```
Current Data Parameters
NAME      exp303.1fr48-80
EXPNO                 12
PROCNO                 1

F2 - Acquisition Parameters
Date_           20070608
Time              19.21
INSTRUM           spect
PROBHD   5 mm QNP 1H/13
PULPROG         dept135
TD               65536
SOLVENT           CDCl3
NS                  256
DS                    4
SWH          17985.611 Hz
FIDRES        0.274439 Hz
AQ            1.8219508 sec
RG                16384
DW               27.800 usec
DE                6.00 usec
TE                294.2 K
CNST2       145.0000000
D1          2.00000000 sec
d2          0.00344828 sec
d12         0.00002000 sec
DELTA       0.00001019 sec
MCREST      0.00000000 sec
MCWRK       0.01500000 sec

======== CHANNEL f1 ========
NUC1                13C
P1                 8.00 usec
p2                16.00 usec
PL1                0.00 dB
SFO1         75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                1H
P3                 8.00 usec
p4                16.00 usec
PCPD2            100.00 usec
PL2                0.00 dB
PL12              23.00 dB
SFO2        300.1312005 MHz

F2 - Processing parameters
SI                 32768
SF          75.4677190 MHz
WDW                EM
SSB                 0
LB                1.00 Hz
GB                  0
PC                1.40
```

(2*R*,3*R*,4*S*)-4-Chloro-3-ethyl-2-phenethyl-1-tosylpiperidine/(2*S*,3*S*,4*R*)-4-Chloro-3-ethyl-2-phenethyl-1-tosylpiperidine (28b) , (2*S*,3*R*)-3-((*S*)-1-Chloropropyl)-2-phenethyl-1-tosylpyrrolidine and (2*R*,3*S*)-3-((*R*)-1-Chloropropyl)-2-phenethyl-1-tosylpyrrolidine (29b)



$C_{22}H_{28}ClNO_2S$
Mol. Wt.: 405.98

Following the general procedure, (*Z*)-*N*-(hex-3-enyl)-4-methylbenzenesulfonamide (500 mg, 1.97 mmol), in the presence of 3-phenylpropanal (398 mg, 2.96 mmol), was consumed based on analysis by TLC after 17 hours of stirring at room temperature. The work up afforded a pale yellow oil, which was purified by flash column chromatography (90% hexane, 10% ethyl acetate) to give the two *title compounds.*

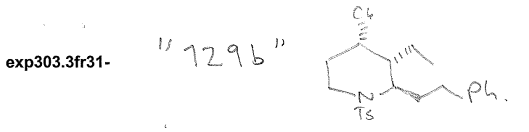
(2*R*,3*R*,4*S*)-4-Chloro-3-ethyl-2-phenethyl-1-tosylpiperidine/(2*S*,3*S*,4*R*)-4-Chloro-3-ethyl-2-phenethyl-1-tosylpiperidine (28b)

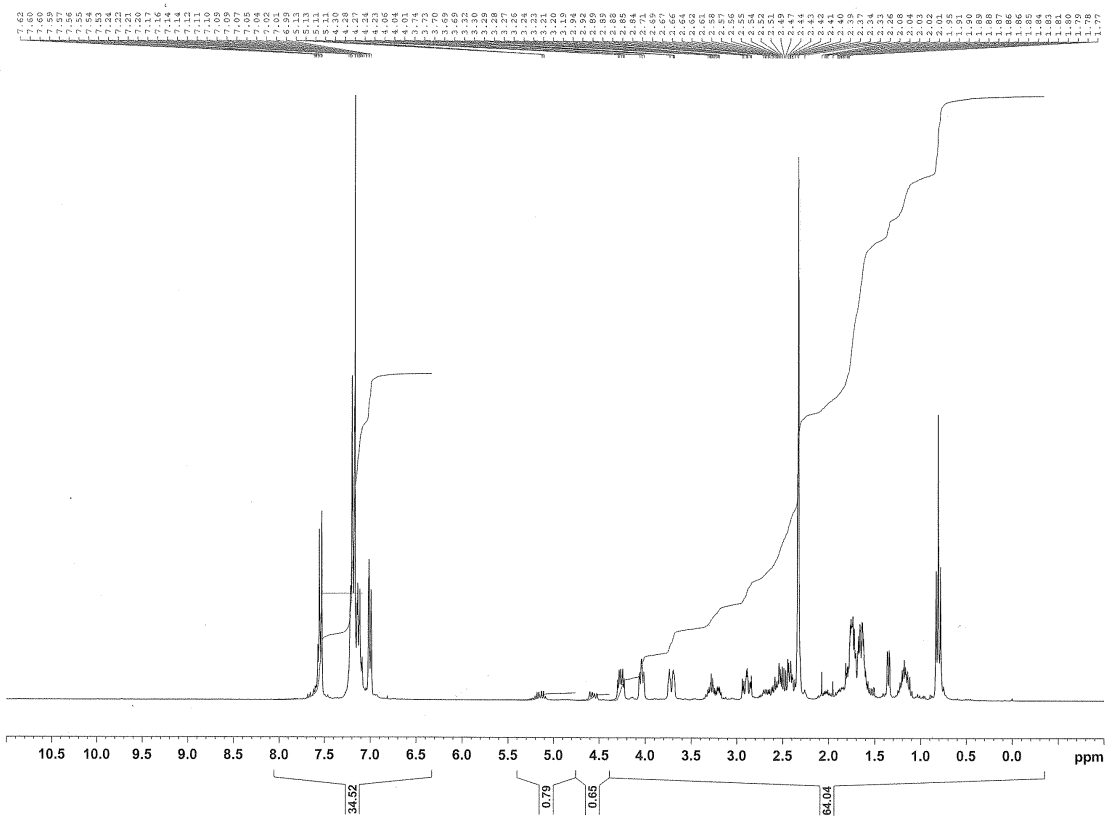
328 mg (0.81 mmol, 41%) as a white solid. M.p. 95-97 °C; ν_{max}(neat)/cm^{-1} 3032, 1941, 1598; δ_H (300 MHz; $CDCl_3$) 7.58 (2H, d, *J* 8.3, H-C10), 7.29-7.11 (5H, m, Ar-H), 7.04 (2H, d, *J* 8.3, H-C11), 4.35-4.25 (1H, m, H-C4), 4.11-4.04 (1H, m, H-C2), 3.81-3.70 (1H, m, H-C6), 2.99-2.85 (1H, m, H-C6), 2.64-2.39 (2H, m, H-C8), 2.37 (3H, s, H-C13), 1.88-1.73 (2H, m, H-C5), 1.73-1.62 (1H, m, H-C3), 1.73-1.50 (2H, m, H-C7), 1.30-1.11 (1H, m, H-C14), 0.84 (3H, t, *J* 7.3, H-C15); δ_C (75.5 MHz; $CDCl_3$) 143.2 (C12), 140.6 (ArC), 137.9 (C9), 129.6 (C11), 128.4 (ArC), 128.3 (ArC), 126.8 (C10), 126.1 (ArC), 57.9 (C4), 55.2 (C2), 44.8 (C3), 40.7 (C6), 33.0 (C8), 31.2 (C5 or C7), 30.9 (C7 or C5), 21.4 (C13), 17.4 (C14), 12.2 (C15); *m/z* (CI) 406 (MH^+, 20), 216 (90), 111 (100); HRMS (ES) Found $[M+H]^+$ 406.1606, $C_{22}H_{29}ClNO_2S$ requires 406.1602.

Crystal data. $C_{22}H_{28}ClNO_2S$; M = 405.96; Monoclinic; *a* = 8.9411(3) Å, *b* = 11.0719(3) Å, *c* = 10.9373(4) Å; Volume 1066.91(6) Å^3; T = 120 K; *Z* 2, 13213 reflections measured, 4663 unique [R_{int} = 0.0367]. The final R values *R1* = 0.0404, *wR2* = 0.1043 (observed) and *R1* = 0.0470, *wR2* = 0.1078 (all data). Flack parameter 0.44(6).

exp303.3fr31-

"1296"

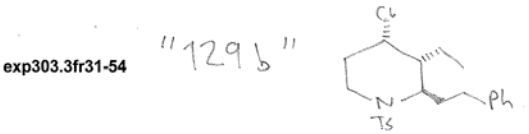


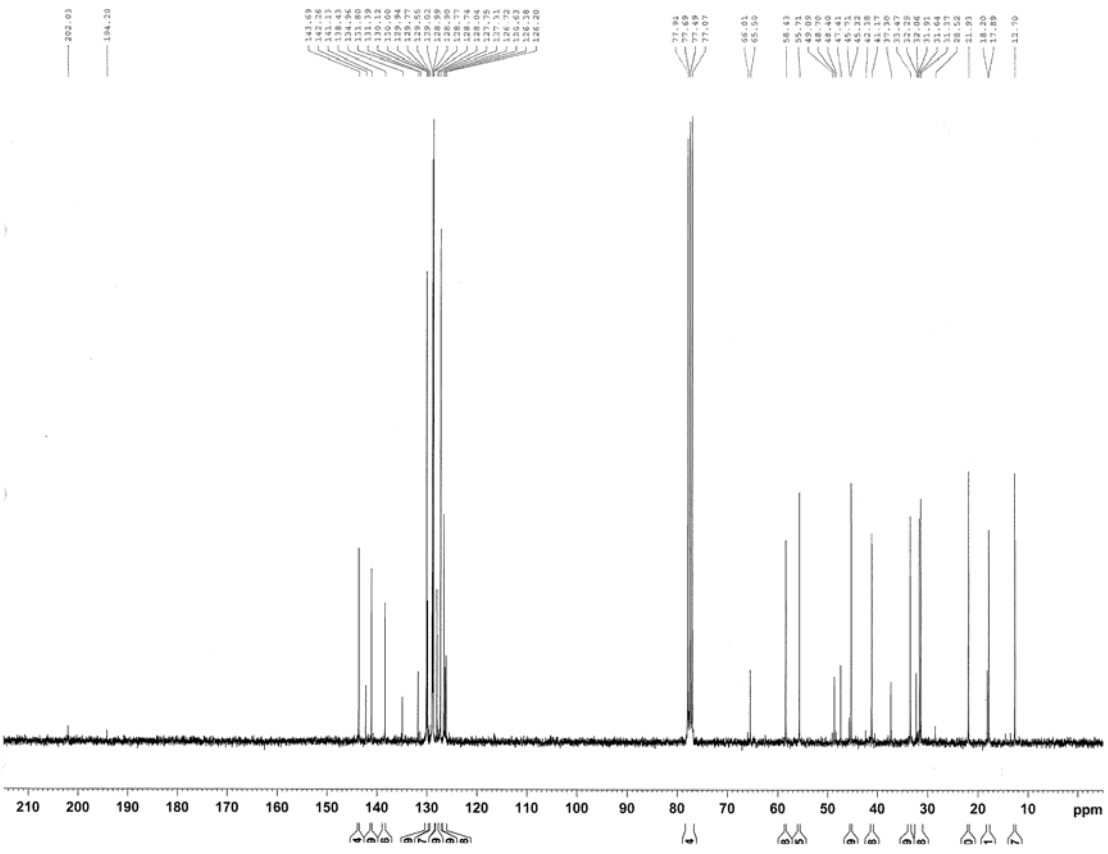



```
Current Data Parameters
NAME        exp303.3fr31-
EXPNO                  10
PROCNO                  1

F2 - Acquisition Parameters
Date_            20071010
Time                10.50
INSTRUM             spect
PROBHD    5 mm QNP 1H/13
PULPROG             zg30
TD                 65536
SOLVENT            CDCl3
NS                    16
DS                     2
SWH             6172.839 Hz
FIDRES             0.094190 Hz
AQ                5.3084660 sec
RG                     80.6
DW                 81.000 usec
DE                  6.00 usec
TE                 294.1 K
D1              1.00000000 sec
MCREST          0.00000000 sec
MCWRK           0.01500000 sec

======== CHANNEL f1 ========
NUC1                   1H
P1                  9.00 usec
PL1                 0.00 dB
SFO1          300.1318534 MHz

F2 - Processing parameters
SI                 32768
SF           300.1300353 MHz
WDW                   EM
SSB                    0
LB                  0.30 Hz
GB                     0
PC                  1.00
```

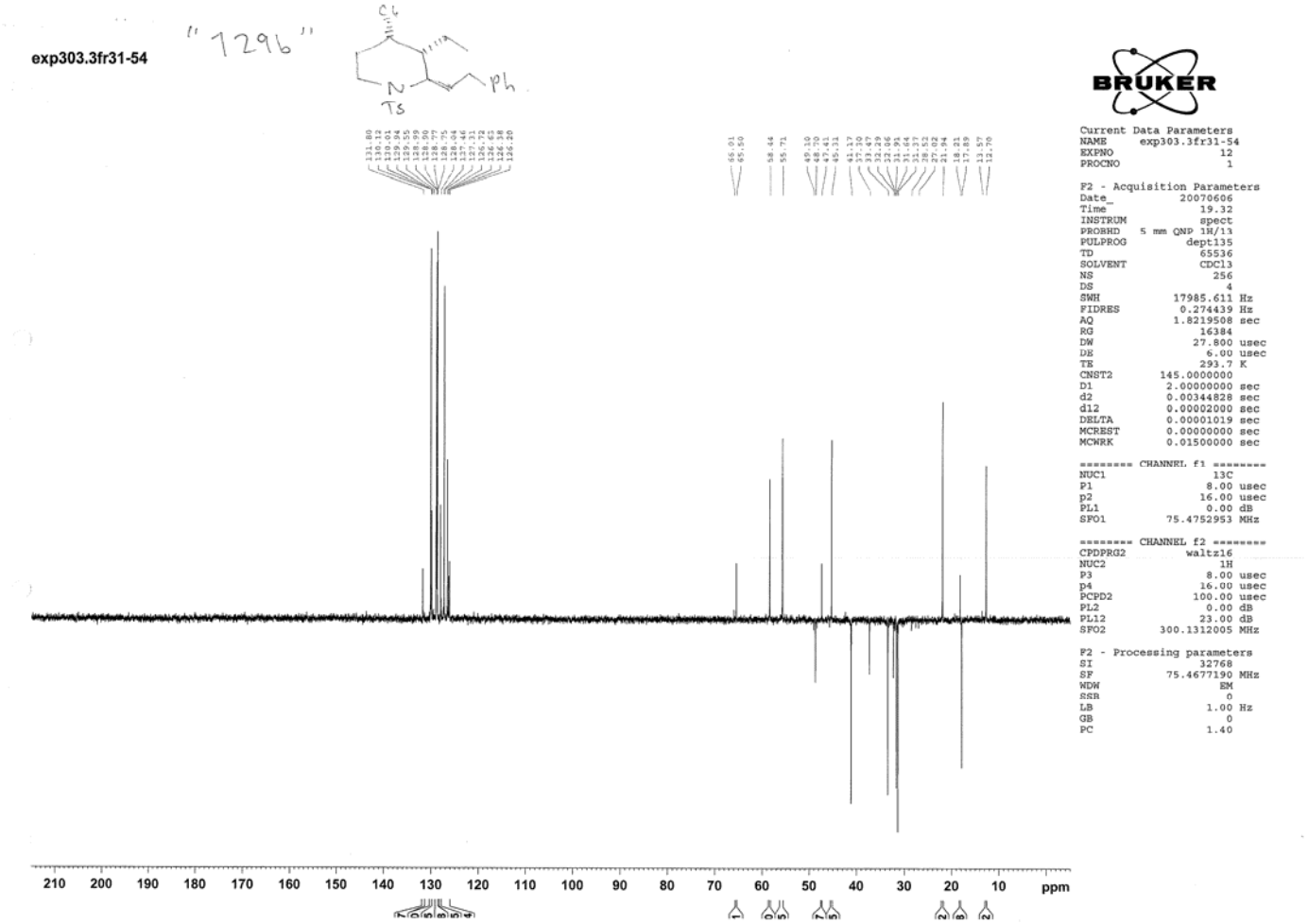
exp303.3fr31-54

"1296"






```
Current Data Parameters
NAME       exp303.3fr31-54
EXPNO                  11
PROCNO                  1

F2 - Acquisition Parameters
Date_            20070606
Time                19.14
INSTRUM             spect
PROBHD    5 mm QNP 1H/13
PULPROG          zgpg30
TD                 65536
SOLVENT            CDCl3
NS                  1024
DS                     4
SWH            17985.611 Hz
FIDRES             0.274439 Hz
AQ                1.8219508 sec
RG                  1448.2
DW                 27.800 usec
DE                  6.00 usec
TE                 293.9 K
D1              2.00000000 sec
d11             0.03000000 sec
DELTA           1.89999998 sec
MCREST          0.00000000 sec
MCWRK           0.01500000 sec

======== CHANNEL f1 ========
NUC1                  13C
P1                  8.00 usec
PL1                 0.00 dB
SFO1          75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                   1H
PCPD2             100.00 usec
PL2                 0.00 dB
PL12               23.00 dB
PL13               24.00 dB
SFO2          300.1312005 MHz

F2 - Processing parameters
SI                 32768
SF           75.4677190 MHz
WDW                   EM
SSB                    0
LB                  1.00 Hz
GB                     0
PC                  1.40
```

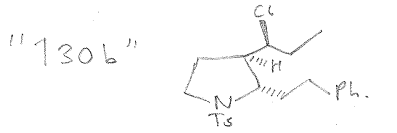


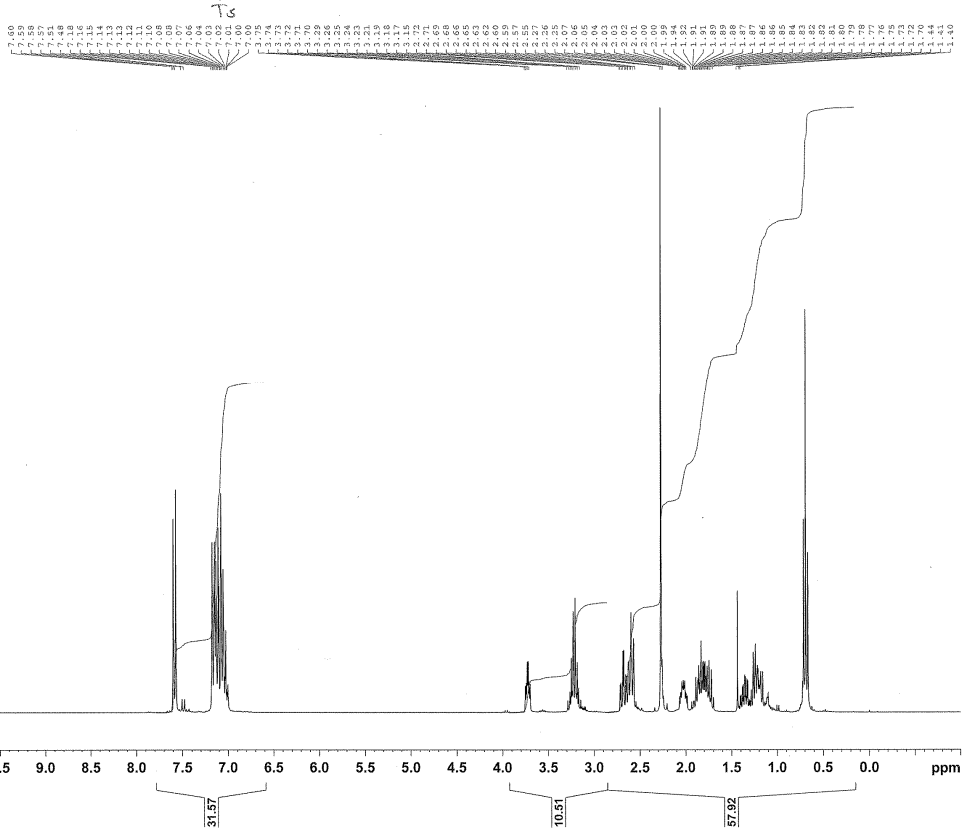
(2*S*,3*R*)-3-((*S*)-1-Chloropropyl)-2-phenethyl-1-tosylpyrrolidine and (2*R*,3*S*)-3-((*R*)-1-Chloropropyl)-2-phenethyl-1-tosylpyrrolidine (29b)

Further elution (90% hexane 10% ethyl acetate) provided the other *title compound* (392 mg, 0.97 mmol, 49%) as a white solid. M.p. 69-71 °C; ν_{max}(neat)/cm^{-1} 3088, 2936, 1598; δ_H (300 MHz; $CDCl_3$) 7.75 (2H, d, *J* 8.3, H-C10), 7.35-7.16 (5H, m, Ar-H), 7.23 (2H, d, *J* 8.3, H-C11), 3.89 (1H, dt, *J* 6.2, 3.1, H-C2), 3.45-3.30 (2H, m, H-C5), 2.84 (1H, dt, *J* 9.1, 2.9, H-C6), 2.80-2.71 (2H, m, H-C8), 2.43 (3H, s, H-C13), 2.24-2.14 (1H, m, H-C3), 2.09-1.84 (2H, m, H-C7), 1.97-1.85 (1H, m, H-C4), 1.59-1.44 (1H, m, H-C14), 1.44-1.29 (2H, m, H-C14 and H-C4), 0.85 (3H, t, *J* 7.2, H-C15); δ_C (75.5 MHz; $CDCl_3$) 143.6 (C12), 141.7 (ArC), 135.0 (C9), 129.6 (C11), 128.4 (ArC), 128.3 (ArC), 127.6 (C10), 125.8 (ArC), 66.7 (C6), 63.6 (C2), 51.2 (C3), 47.7 (C5), 38.6 (C7), 32.2 (C8), 28.6 (C14), 28.0 (C4), 21.5 (C13), 10.6 (C15); *m/z* (CI) 406 (MH^+, 92), 252 (52), 216 (100); HRMS (ES) Found $[M+H]^+$ 406.1602, $C_{22}H_{29}ClNO_2S$ requires 406.1606.

Crystal Data. $C_{22}H_{28}ClNO_2S$; M = 405.96; Orthorhombic; *a* = 14.7643(7) Å, *b* = 13.3490(6) Å, *c* = 10.3953(3) Å; Volume 2048.80(15) Å3; Space group *Pna*2$_1$; T = 120 K; *Z* 4, 16800 reflections measured, 4515 unique [R_{int} = 0.0836]. The final R values *R1* = 0.0504, *wR2* = 0.1017 (observed) and *R1* = 0.0832, *wR2* = 0.1143 (all data). Flack parameter 0.10(8).

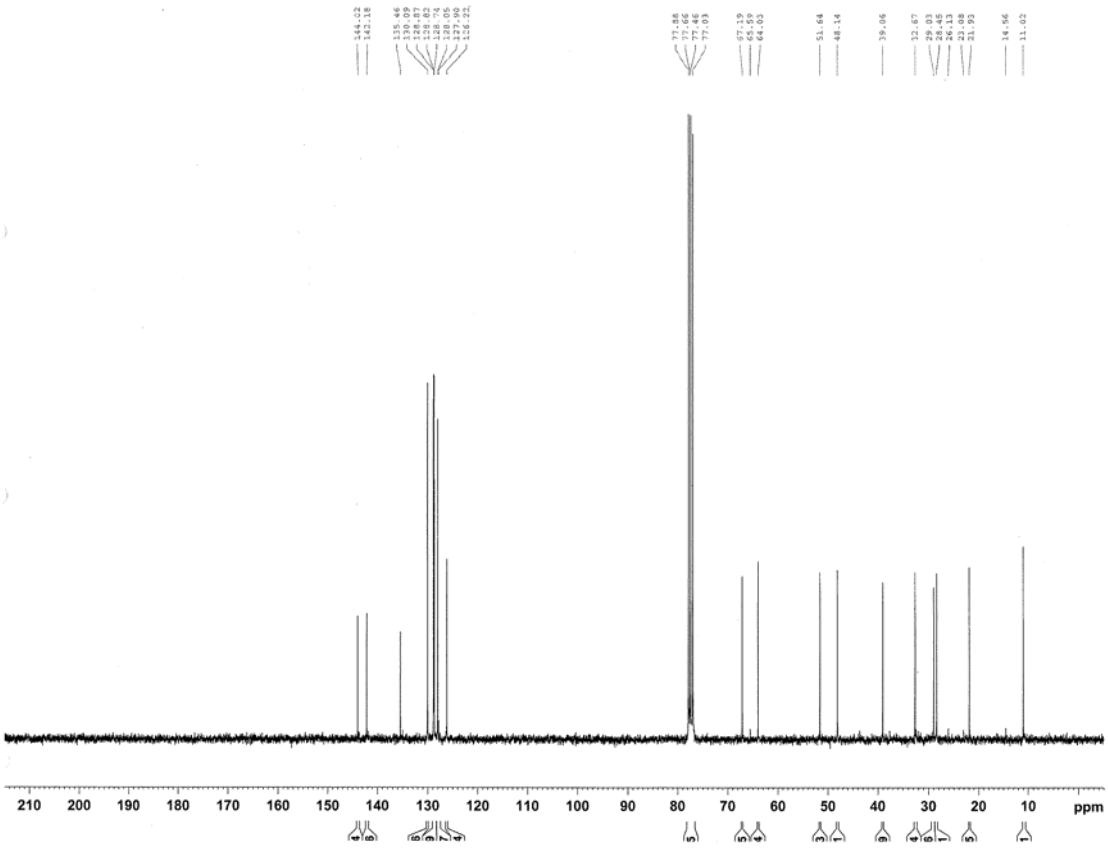
exp303.3fr80+



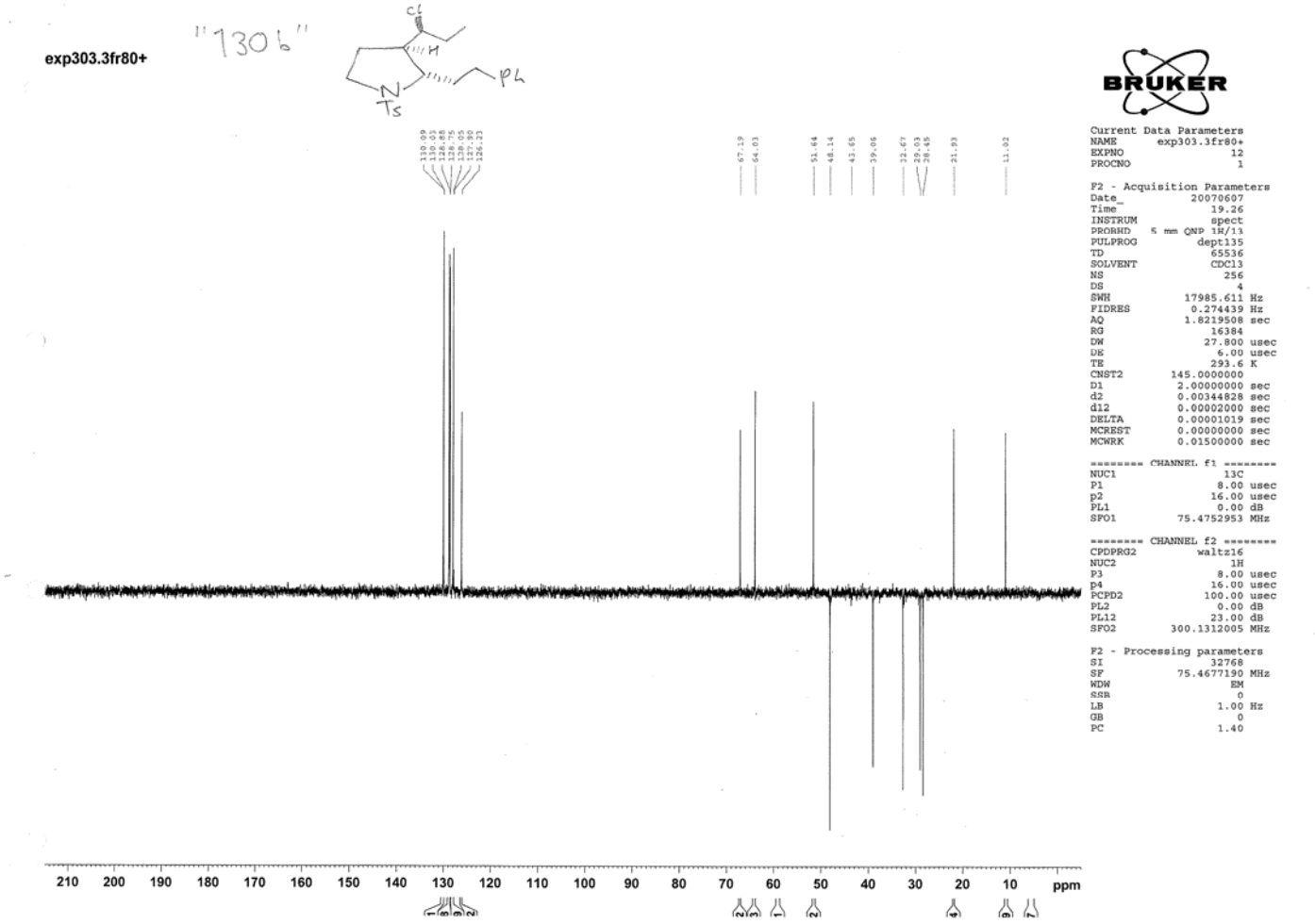



```
Current Data Parameters
NAME        exp303.3fr80+
EXPNO                  10
PROCNO                  1

F2 - Acquisition Parameters
Date_            20070606
Time                17.49
INSTRUM             spect
PROBHD    5 mm QNP 1H/13
PULPROG             zg30
TD                 65536
SOLVENT            CDCl3
NS                    16
DS                     2
SWH           6172.839 Hz
FIDRES           0.094190 Hz
AQ               5.308660 sec
RG                 203.2
DW                81.000 usec
DE                 6.00 usec
TE                293.7 K
D1            1.00000000 sec
MCREST        0.00000000 sec
MCWRK         0.01500000 sec

======== CHANNEL f1 ========
NUC1                   1H
P1                  9.00 usec
PL1                 0.00 dB
SFO1         300.1318534 MHz

F2 - Processing parameters
SI                 32768
SF          300.1300548 MHz
WDW                   EM
SSB                    0
LB                  0.30 Hz
GB                     0
PC                  1.00
```

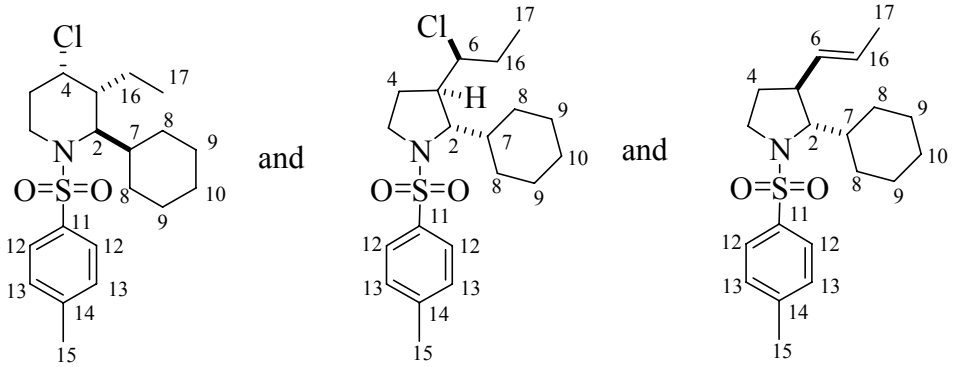
exp303.3fr80+




```
Current Data Parameters
NAME        exp303.3fr80+
EXPNO                  11
PROCNO                  1

F2 - Acquisition Parameters
Date_            20070607
Time                19.08
INSTRUM             spect
PROBHD    5 mm QNP 1H/13
PULPROG          zgpg30
TD                 65536
SOLVENT            CDCl3
NS                  1024
DS                     4
SWH          17985.611 Hz
FIDRES           0.274439 Hz
AQ               1.8219508 sec
RG                 1448.2
DW                27.800 usec
DE                 6.00 usec
TE                293.8 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.89999998 sec
MCREST        0.00000000 sec
MCWRK         0.01500000 sec

======== CHANNEL f1 ========
NUC1                  13C
P1                  8.00 usec
PL1                 0.00 dB
SFO1         75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                   1H
PCPD2             100.00 usec
PL2                 0.00 dB
PL12               23.00 dB
PL13               24.00 dB
SFO2         300.1312005 MHz

F2 - Processing parameters
SI                 32768
SF          75.4677190 MHz
WDW                   EM
SSB                    0
LB                  1.00 Hz
GB                     0
PC                  1.40
```



(2*R*,3*R*,4*S*)-4-chloro-2-cyclohexyl-3-ethyl-1-tosylpiperidine/(2*S*,3*S*,4*R*)-4-chloro-2-cyclohexyl-3-ethyl-1-tosylpiperidine (28c), (2*S*,3*R*)-3-((*S*)-1-chloropropyl)-2-cyclohexyl-1-tosylpyrrolidine/(2*R*,3*S*)-3-((*R*)-1-chloropropyl)-2-cyclohexyl-1-tosylpyrrolidine (29c) and (2*S*,3*S*,*E*)-2-cyclohexyl-3-(prop-1-enyl)-1-tosylpyrrolidine/(2*S*,3*S*,*E*)-2-cyclohexyl-3-(prop-1-enyl)-1-tosylpyrrolidine (30c).



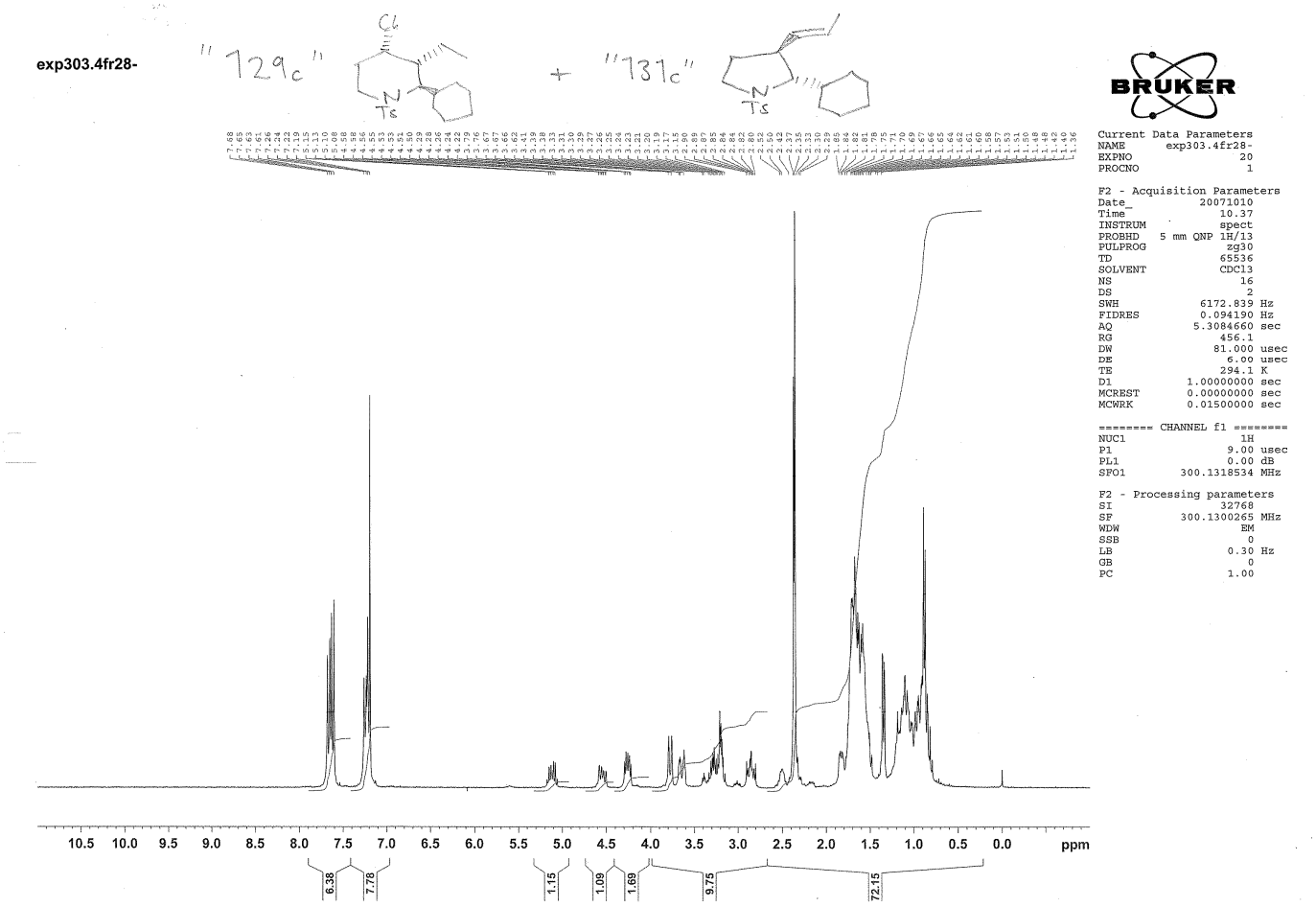
$C_{20}H_{30}ClNO_2S$
Mol. Wt.: 383.98

$C_{20}H_{29}NO_2S$
Mol. Wt.: 347.51

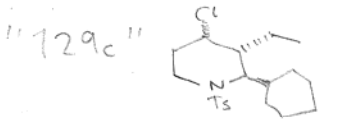
Following the general procedure, (*Z*)-*N*-(hex-3-enyl)-4-methylbenzenesulfonamide (500 mg, 1.97 mmol), in the presence of cyclohexanecarbaldehyde (332 mg, 2.96 mmol), was consumed based on analysis by TLC after 72 hours of stirring at room temperature. The work up afforded a yellow oil, which was purified by flash column chromatography (90% hexane, 10% ethyl acetate) to give the three *title compounds.*

(2*R*,3*R*,4*S*)-4-chloro-2-cyclohexyl-3-ethyl-1-tosylpiperidine/(2*S*,3*S*,4*R*)-4-chloro-2-cyclohexyl-3-ethyl-1-tosylpiperidine (28c)

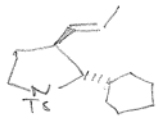
182 mg (0.47 mmol, 24%) as a white solid. M.p. 151-153°C (mixture); ν_{max}(neat)/cm^{-1} 3035, 2928, 1815 (mixture); δ_H (300 MHz; $CDCl_3$) 7.68 (2H, d, *J* 8.3, H-C12), 7.27 (2H, d, *J* 8.3, H-C13), 4.37-4.28 (1H, m, H-C4), 3.84 (1H, d, *J* 10.5, H-C2), 3.76-3.65 (1H, m, H-C6), 2.99-2.85 (1H, m, H-C6), 2.42 (3H, s, H-C15), 1.94-1.84 (1H, m, H-C3), 1.85-1.51 (5H, m, H-C7 and H-C8), 1.75-1.54 (2H, m, H-C5), 1.29-0.88 (6H, m, H-C9 and H-C10), 1.09-0.82 (2H, m, H-C16), 0.97-0.92 (3H, m, H-C17); δ_C (75.5 MHz; $CDCl_3$) 142.9 (C14), 138.4 (C11), 129.4 (C13), 126.9 (C12), 61.4 (C2), 58.5 (C4), 43.8 (C3), 41.1 (C6), 35.9 (C7), 31.0 (C8), 30.4 (C8), 28.3 (C5), 26.5 (C10), 26.4 (C9), 26.2 (C9), 21.5 (C15), 17.2 (C16), 12.2 (C17); *m/z* (CI) 384 (MH^+, 100), 348 (78), 300 (22); Anal. Calcd. for $C_{20}H_{30}ClNO_2S$ requires C, 62.56; H, 7.88; N, 3.65%. Found: C, 62.66; H, 8.01; N, 3.69%.

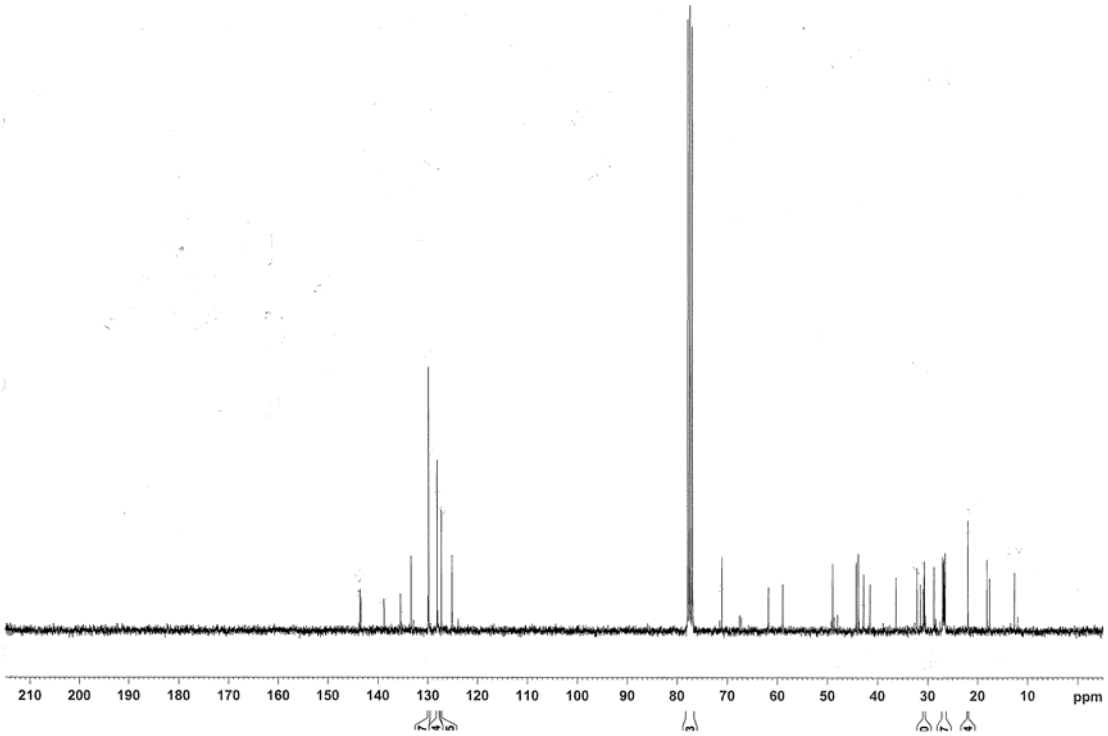


exp303.4fr28-40



+

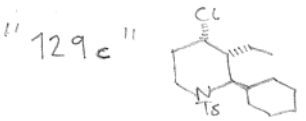




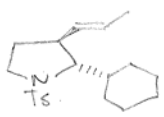
BRUKER

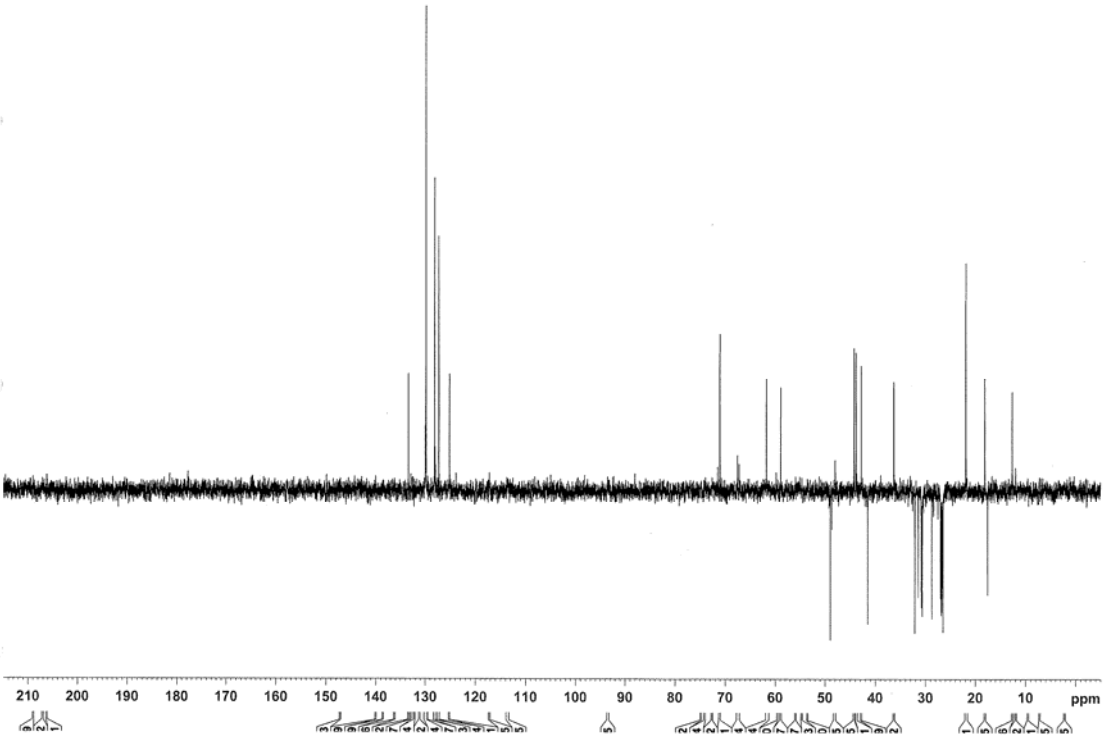
```
Current Data Parameters
NAME      exp303.4fr28-40rep
EXPNO                    11
PROCNO                    1

F2 - Acquisition Parameters
Date_              20070717
Time                 19.48
INSTRUM              spect
PROBHD    5 mm QNP 1H/13
PULPROG           zgpg30
TD                 65536
SOLVENT            CDCl3
NS                  1024
DS                     4
SWH           17985.611 Hz
FIDRES         0.274439 Hz
AQ             1.8219508 sec
RG                912.3
DW               27.800 usec
DE                6.00 usec
TE                294.4 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.89999998 sec
MCREST        0.00000000 sec
MCWRK         0.01500000 sec

======== CHANNEL f1 ========
NUC1                 13C
P1                  8.00 usec
PL1                 0.00 dB
SFO1          75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2           waltz16
NUC2                 1H
PCPD2              100.00 usec
PL2                 0.00 dB
PL12               23.00 dB
PL13               24.00 dB
SFO2         300.1312005 MHz

F2 - Processing parameters
SI                  32768
SF           75.4677190 MHz
WDW                  EM
SSB                   0
LB                 1.00 Hz
GB                    0
PC                 1.40
```

exp303.4fr28-40



+





BRUKER

```
Current Data Parameters
NAME      exp303.4fr28-40rep
EXPNO                    12
PROCNO                    1

F2 - Acquisition Parameters
Date_              20070717
Time                 20.06
INSTRUM              spect
PROBHD    5 mm QNP 1H/13
PULPROG           dept135
TD                 65536
SOLVENT            CDCl3
NS                   256
DS                     4
SWH           17985.611 Hz
FIDRES         0.274439 Hz
AQ             1.8219508 sec
RG                16384
DW               27.800 usec
DE                6.00 usec
TE                294.1 K
CNST2        145.0000000
D1            2.00000000 sec
d2            0.00344828 sec
d12           0.00002000 sec
DELTA         0.00001019 sec
MCREST        0.00000000 sec
MCWRK         0.01500000 sec

======== CHANNEL f1 ========
NUC1                 13C
P1                  8.00 usec
p2                 16.00 usec
PL1                 0.00 dB
SFO1          75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2           waltz16
NUC2                 1H
P3                  8.00 usec
p4                 16.00 usec
PCPD2              100.00 usec
PL2                 0.00 dB
PL12               23.00 dB
SFO2         300.1312005 MHz

F2 - Processing parameters
SI                  32768
SF           75.4677190 MHz
WDW                  EM
SSB                   0
LB                 1.00 Hz
GB                    0
PC                 1.40
```

(2*S*,3*S*,*E*)-2-cyclohexyl-3-(prop-1-enyl)-1-tosylpyrrolidine/(2*S*,3*S*,*E*)-2-cyclohexyl-3-(prop-1-enyl)-1-tosylpyrrolidine (**30c**; only partially seperable from piperidine product)

δ_H (300 MHz; $CDCl_3$) 7.73 (2H, d, *J* 8.2, H-C12), 7.31 (2H, d, *J* 8.2, H-C13), 5.25-5.11 (1H, m, H-C16), 4.66-4.55 (1H, m, H-C6), 3.40-3.30 (1H, m, H-C5), 3.31-3.25 (1H, m, H-C5), 3.27-3.21 (1H, m, H-C2), 2.62-2.51 (1H, m, H-C3), 2.43 (3H, s, H-C15), 1.84-1.68 (5H, m, H-C7 and H-C8), 1.69-1.56 (2H, m, H-C4), 1.41 (3H, dd, *J* 6.4, 1.3, H-C17), 1.29-1.03 (6H, m, H-C9 and H-C10); δ_C (75.5 MHz; $CDCl_3$) 143.2 (C14), 135.1 (C6), 133.0 (C11), 129.5 (C13), 127.7 (C12), 124.7 (C16), 70.7 (C2), 48.5 (C5), 43.4 (C3), 42.0 (C7), 31.7 (C8), 30.2 (C8), 26.6 (C4), 26.4 (C10), 26.3 (C10), 26.1 (C9), 21.5 (C15), 17.7 (C17); *m/z* (CI) 348 (MH^+, 100), 264 (10), 194 (35).

Crystal data. $C_{20}H_{29}NO_2S$; M = 347.50; Monoclinic; *a* = 7.7257(2) Å, *b* = 21.1223(7) Å, *c* = 11.5315(2) Å; Volume 1869.09(9) $Å^3$; Space group *P*21/*c* ; T = 120 K; *Z* 4; 20906 reflections measured, 4239 unique [R_{int} = 0.0585]. The final R values *R1* = 0.0678, *wR2* = 0.1531 (observed) and *R1* = 0.0950, *wR2* = 0.1737 (all data).

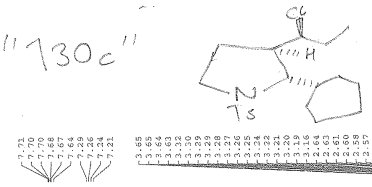
(2*S*,3*R*)-3-((*S*)-1-chloropropyl)-2-cyclohexyl-1-tosylpyrrolidine/(2*R*,3*S*)-3-((*R*)-1-chloropropyl)-2-cyclohexyl-1-tosylpyrrolidine (29c)

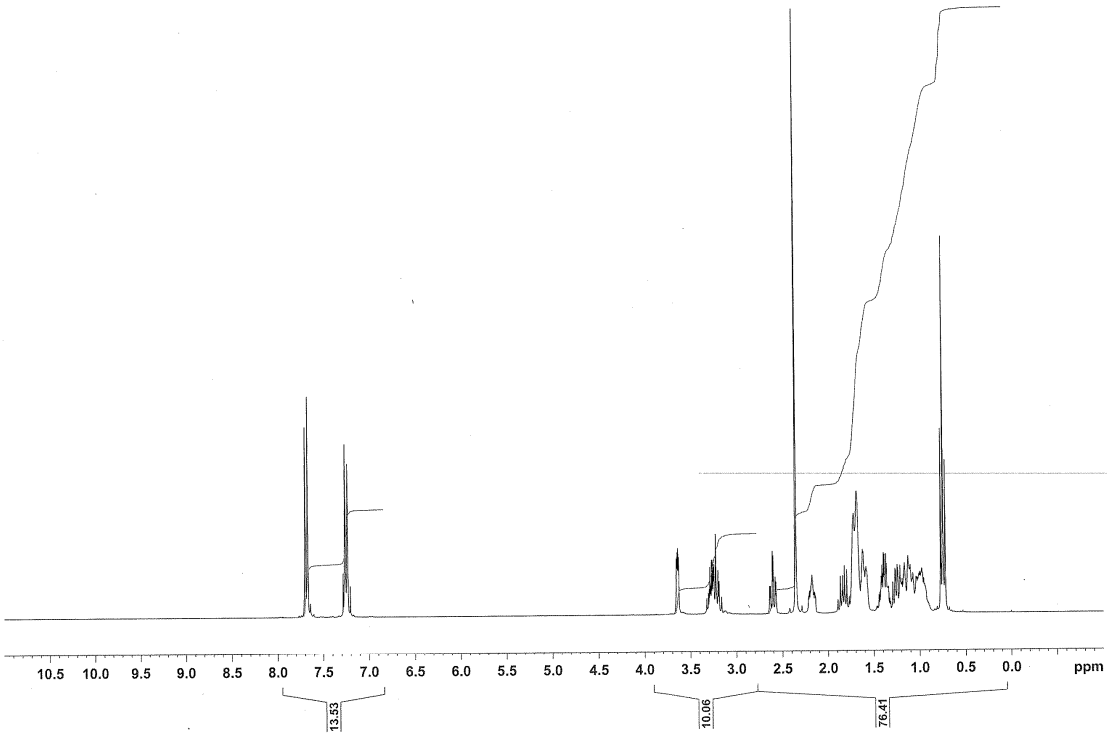
Further elution (90% hexane 10% ethyl acetate) provided the *title compound* (470 mg, 1.22 mmol, 62%) as a white solid. M.p. 102-103 °C; ν_{max}(neat)/cm^{-1} 3034, 2927, 1597; δ_H (300 MHz; $CDCl_3$) 7.75 (2H, d, *J* 8.3, H-C12), 7.31 (2H, d, *J* 8.3, H-C13), 3.70 (1H, dd, *J* 4.8, 2.3, H-C2), 3.40-3.20 (2H, m, H-C5), 2.67 (1H, dt, *J* 9.2, 2.6, H-C6), 2.42 (3H, s, H-C15), 2.29-2.19 (1H, m, H-C3), 1.96-1.82 (1H, m, H-C4), 1.83-1.71 (4H, m, H-C8), 1.71-1.60 (1H, m, H-C7), 1.54-1.37 (2H, m, H-C4 and H-C16), 1.37-1.24 (1H, m, H-C16), 1.28-0.96 (6H, m, H-C9 and H-C10), 0.81 (3H, t, *J* 7.2, H-C17); δ_C (75.5 MHz; $CDCl_3$) 143.4 (C14), 135.0 (C11), 129.5 (C13), 127.6 (C12), 68.4 (C2), 67.1 (C6), 48.1 (C3), 48.0 (C5), 43.4 (C7), 29.7 (C8), 28.9 (C8), 28.2 (C16), 27.9 (C4), 26.4 (C10), 26.3 (C9), 26.3 (C9), 21.4 (C15), 10.7 (C17); *m/z* (CI) 384 (MH^+, 100), 348 (45), 300 (25); HRMS (ES) Found $[M+NH_4]^+$ 401.2021, $C_{20}H_{34}ClN_2O_2S$ requires 401.2024.

Crystal data. $C_{20}H_{30}ClNO_2S$; M = 383.96; Orthorhombic; *a* = 13.0538(3) Å, *b* = 15.5288(3) Å, *c* = 19.1088(4) Å; Volume 3873.54(14) $Å^3$; Space group *Pbca*; T = 120 K; *Z* 8, 31418 reflections measured, 4422 unique [R_{int} = 0.0516]. The final R values *R1* = 0.0406, *wR2* = 0.1017 (observed) and *R1* = 0.0550, *wR2* = 0.1096 (all data).

exp303.4fr46+((elimination?

"130c"



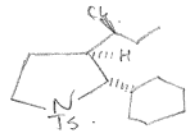


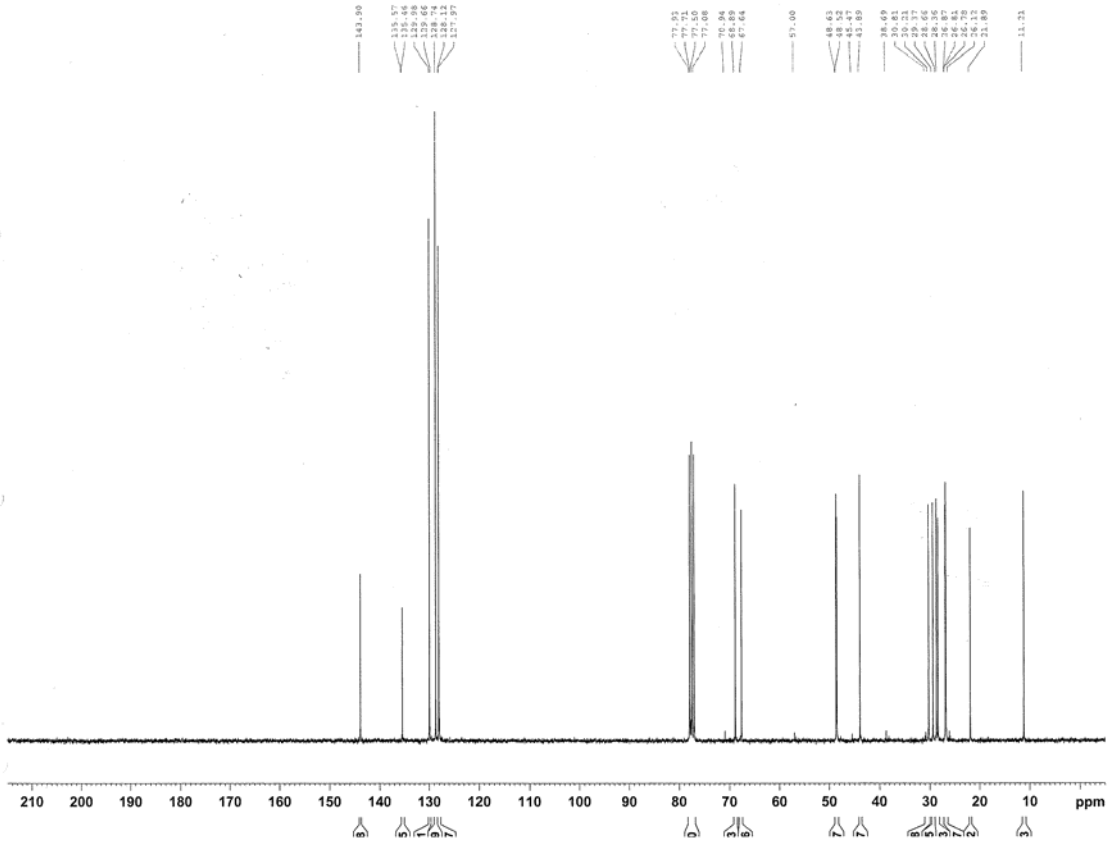
BRUKER

```
Current Data Parameters
NAME        exp303.4fr46-
EXPNO                  20
PROCNO                  1

F2 - Acquisition Parameters
Date_            20071010
Time                12.15
INSTRUM             spect
PROBHD   5 mm QNP 1H/13
PULPROG             zg30
TD                 65536
SOLVENT            CDCl3
NS                    16
DS                     2
SWH             6172.839 Hz
FIDRES             0.094190 Hz
AQ              5.3084660 sec
RG                  90.5
DW                 81.000 usec
DE                  6.00 usec
TE                294.4 K
D1             1.00000000 sec
MCREST         0.00000000 sec
MCWRK          0.01500000 sec

======== CHANNEL f1 ========
NUC1                   1H
P1                  9.00 usec
PL1                 0.00 dB
SFO1          300.1318534 MHz

F2 - Processing parameters
SI                 32768
SF            300.1300228 MHz
WDW                   EM
SSB                    0
LB                  0.30 Hz
GB                     0
PC                  1.00
```

exp303.4fr46-

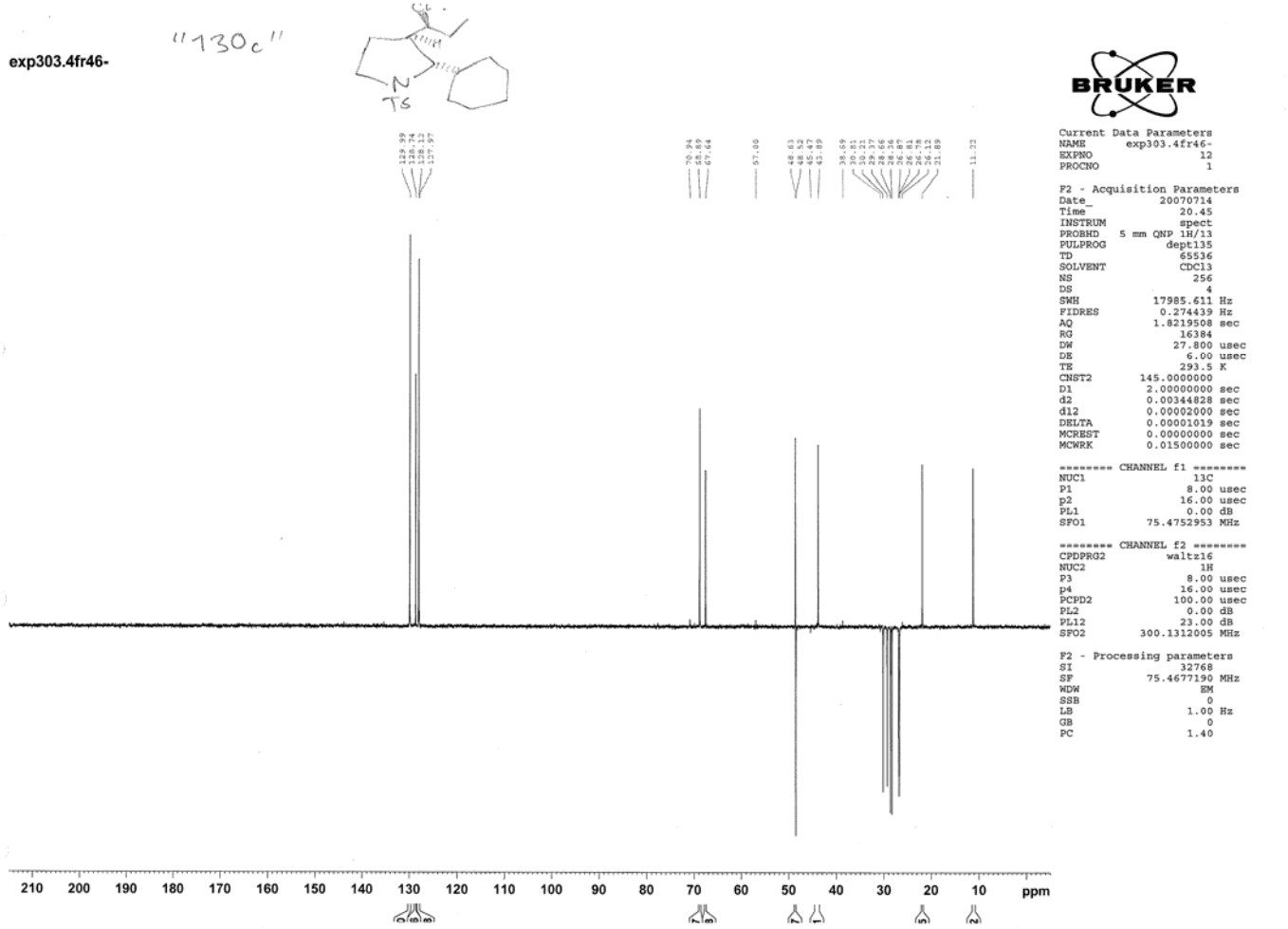
"130c"



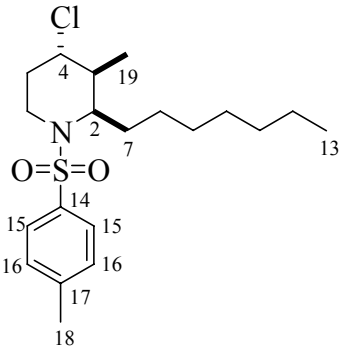


BRUKER

```
Current Data Parameters
NAME        exp303.4fr46-
EXPNO                  11
PROCNO                  1

F2 - Acquisition Parameters
Date_            20070714
Time                20.27
INSTRUM             spect
PROBHD   5 mm QNP 1H/13
PULPROG           zgpg30
TD                 65536
SOLVENT            CDCl3
NS                  1024
DS                     4
SWH            17985.611 Hz
FIDRES             0.274439 Hz
AQ              1.8219508 sec
RG                  1024
DW                 27.800 usec
DE                  6.00 usec
TE                293.7 K
D1             2.00000000 sec
d11            0.03000000 sec
DELTA          1.89999998 sec
MCREST         0.00000000 sec
MCWRK          0.01500000 sec

======== CHANNEL f1 ========
NUC1                  13C
P1                  8.00 usec
PL1                 0.00 dB
SFO1          75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                   1H
PCPD2              100.00 usec
PL2                 0.00 dB
PL12               23.00 dB
PL13               24.00 dB
SFO2          300.1312005 MHz

F2 - Processing parameters
SI                 32768
SF            75.4677190 MHz
WDW                   EM
SSB                    0
LB                  1.00 Hz
GB                     0
PC                  1.40
```



(2*R*,3*S*,4*S*)-4-Chloro-2-heptyl-3-methyl-1-tosylpiperidine/(2*S*,3*R*,4*R*)-4-Chloro-2-heptyl-3-methyl-1-tosylpiperidine (31a)

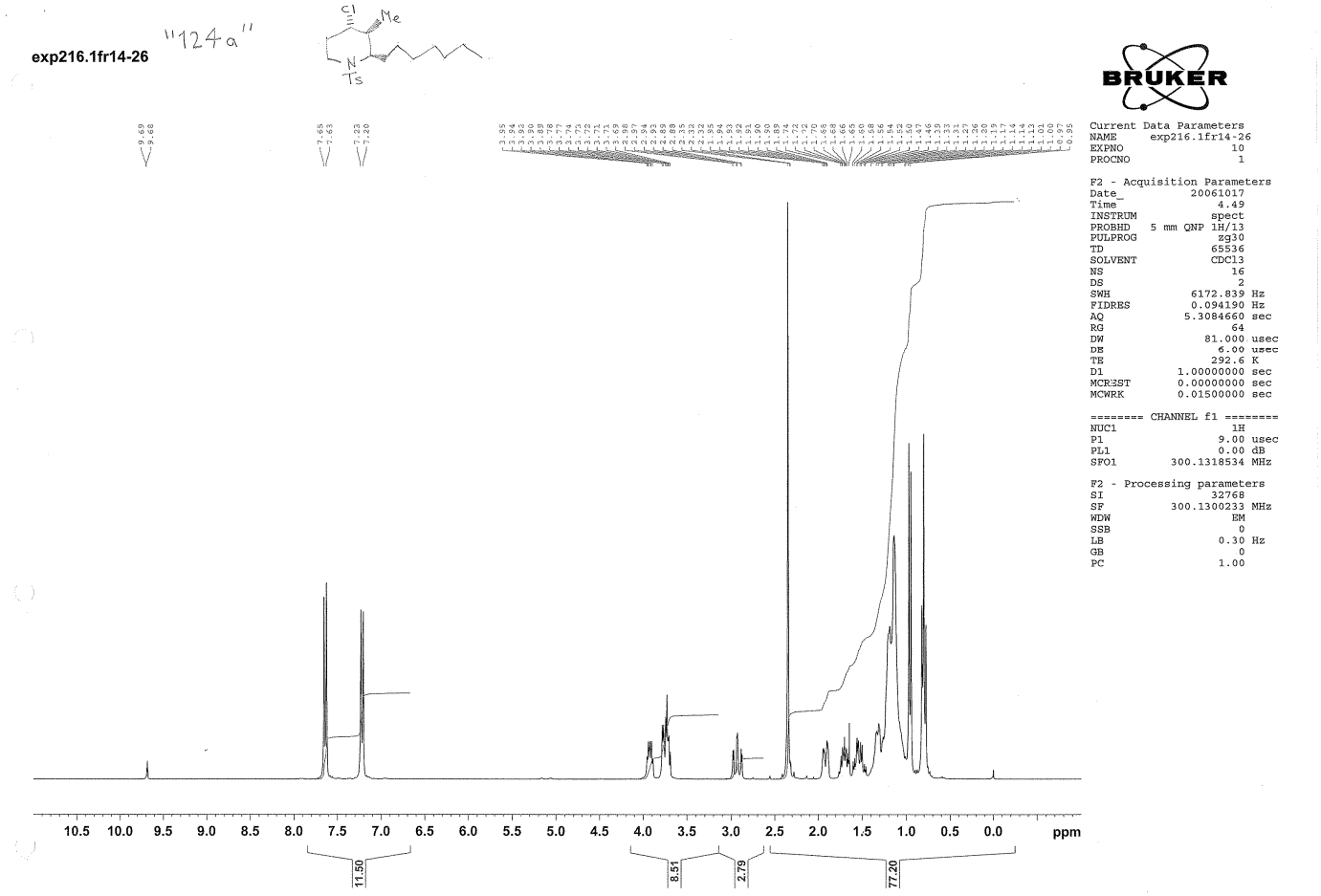


$C_{20}H_{32}ClNO_2S$
Mol. Wt.: 385.99

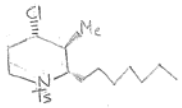
Following the general procedure, (*E*)-4-methyl-*N*-(pent-3-enyl)benzenesulfonamide (150 mg, 0.62 mmol)), in the presence of octanal (120 mg, 0.94 mmol), was consumed based on analysis by TLC after 17 hours of stirring at room temperature. The work up afforded a yellow oil, which was purified by flash column chromatography (90% hexane, 10% ethyl acetate) to give the *title compound* (159 mg, 0.41 mmol, 66%) as a white solid.

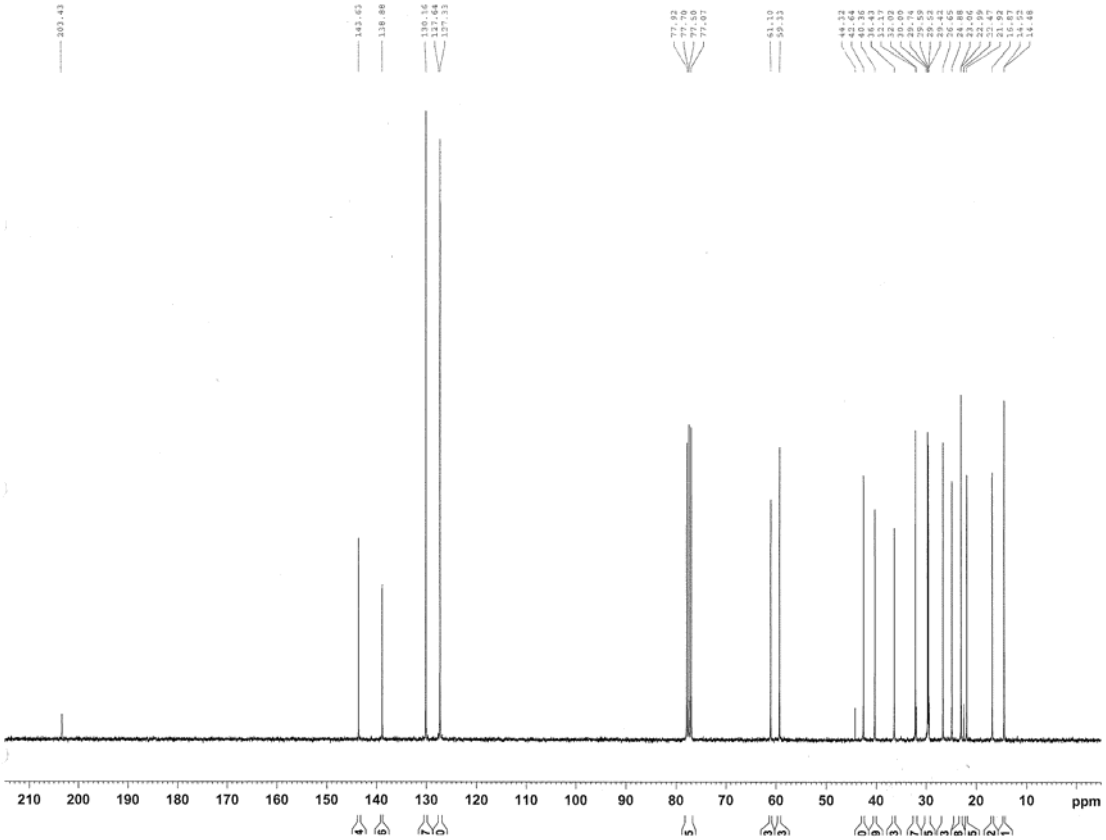
M.p. 56-57 °C; ν_{max}(neat)/cm^{-1} 2925, 1712, 1461; δ_H (300 MHz; $CDCl_3$) 7.69 (2H, d, *J* 8.4, H-C15), 7.27 (2H, d, *J* 8.4, H-C16), 3.98 (1H, td, *J* 9.7, 4.4, H-C2), 3.84-3.82 (1H, m, H-C4), 3.81-3.75 (1H, m, H-C6),

2.99 (1H, td, *J* 15.1, 2.7, H-C6), 2.40 (3H, s, H-C18), 2.03-1.93 (1H, m, H-C5), 1.83-1.69 (1H, m, H-C3), 1.67-1.50 (1H, m, H-C5), 1.47-1.34 (2H, m, H-C7), 1.33-1.10 (10H, m, H-C8 to H-C12), 1.01 (3H, d, *J* 6.9, H-C19), 0.86 (3H, t, *J* 6.8, H-C13); δ_C (75.5 MHz; $CDCl_3$) 143.1 (C17), 138.4 (C14), 129.7 (C16), 126.8 (C15), 60.6 (C4), 58.8 (C2), 42.1 (C3), 39.9 (C6), 35.9 (C5), 31.7 (C11), 29.2 (C9 and C10), 26.2 (C8), 24.4 (C7), 22.6 (C12), 21.4 (C18), 16.4 (C19), 14.0 (C13); *m/z* (CI) 386 (MH^+, 100), 350 (42), 286 (40); HRMS (ES) Found $[M+NH_4]^+$ 403.2176, $C_{20}H_{36}ClN_2O_2S$ requires 403.2181.



exp216.1fr14-26 "124a"





Current Data Parameters
NAME exp216.1fr14-26
EXPNO 11
PROCNO 1

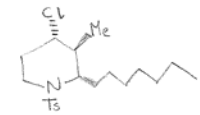
F2 - Acquisition Parameters
Date_ 20061017
Time 5.57
INSTRUM spect
PROBHD 5 mm QNP 1H/13
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 1024
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 724.1
DW 27.800 usec
DE 6.00 usec
TE 292.9 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
MCREST 0.00000000 sec
MCWRK 0.01500000 sec

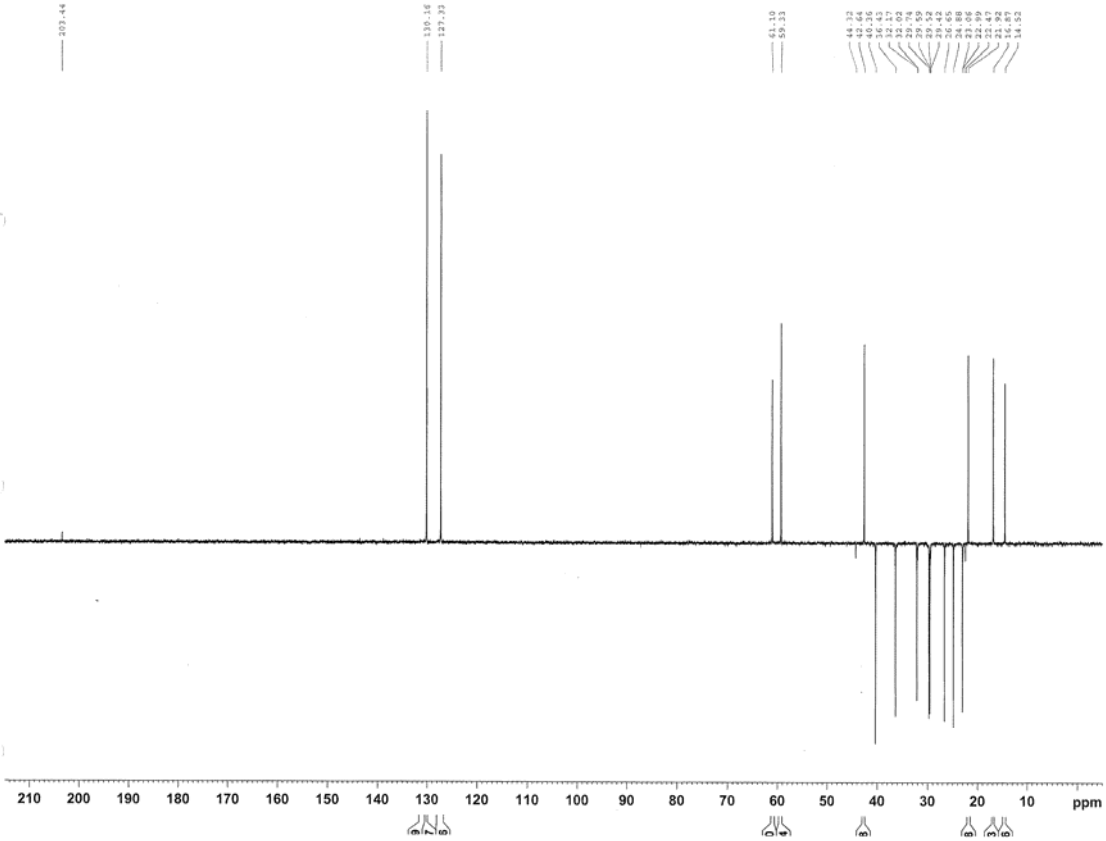
======== CHANNEL f1 ========
NUC1 13C
P1 8.00 usec
PL1 0.00 dB
SFO1 75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 100.00 usec
PL2 0.00 dB
PL12 23.00 dB
PL13 24.00 dB
SFO2 300.1312005 MHz

F2 - Processing parameters
SI 32768
SF 75.4677190 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

exp216.1fr14-26 "124a"





Current Data Parameters
NAME exp216.1fr14-26
EXPNO 13
PROCNO 1

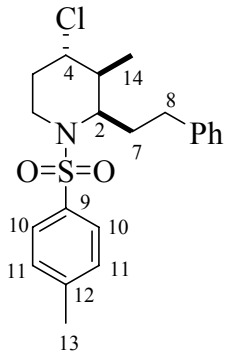
F2 - Acquisition Parameters
Date_ 20061017
Time 7.37
INSTRUM spect
PROBHD 5 mm QNP 1H/13
PULPROG dept135
TD 65536
SOLVENT CDCl3
NS 256
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 16384
DW 27.800 usec
DE 6.00 usec
TE 292.7 K
CNST2 145.0000000
D1 2.00000000 sec
d2 0.00344828 sec
d12 0.00002000 sec
DELTA 0.00001019 sec
MCREST 0.00000000 sec
MCWRK 0.01500000 sec

======== CHANNEL f1 ========
NUC1 13C
P1 8.00 usec
p2 16.00 usec
PL1 0.00 dB
SFO1 75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
P3 8.00 usec
P4 16.00 usec
PCPD2 100.00 usec
PL2 0.00 dB
PL12 23.00 dB
SFO2 300.1312005 MHz

F2 - Processing parameters
SI 32768
SF 75.4677190 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

(2*R*,3*S*,4*S*)-4-Chloro-3-methyl-2-phenethyl-1-tosylpiperidine/(2*S*,3*R*,4*R*)-4-Chloro-3-methyl-2-phenethyl-1-tosylpiperidine (31b)



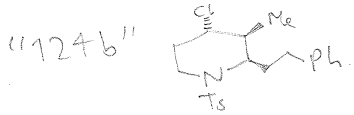
$C_{21}H_{26}ClNO_2S$
Mol. Wt.: 391.95

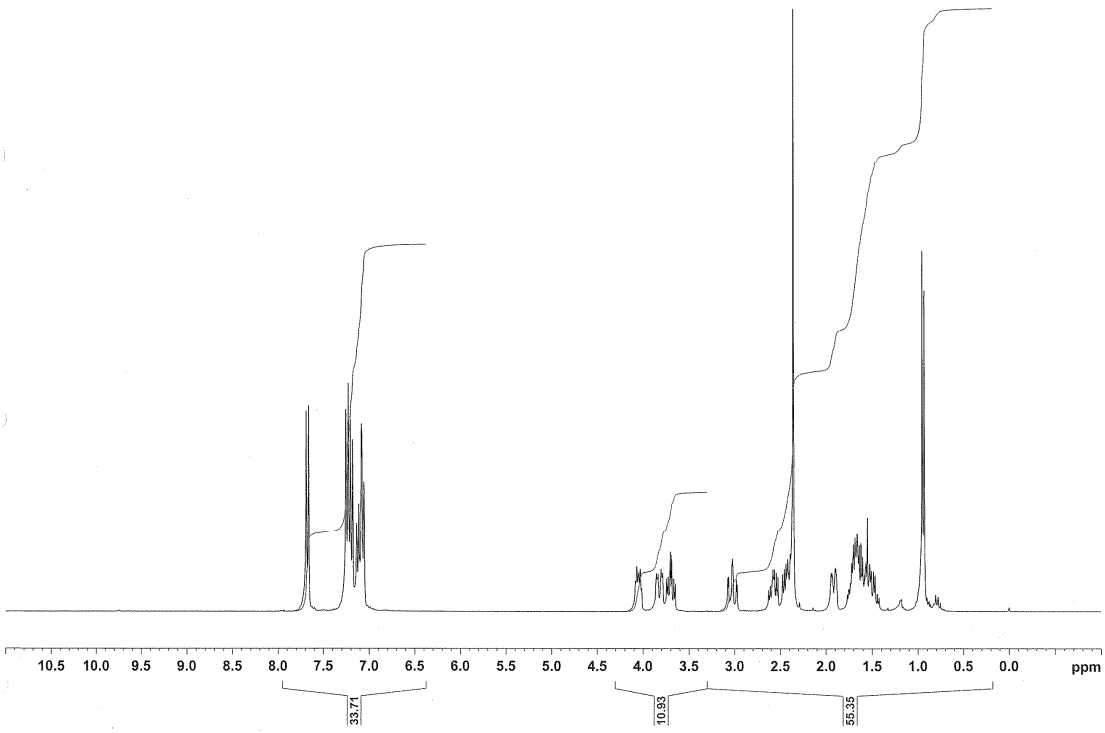
Following the general procedure, (*E*)-4-methyl-*N*-(pent-3-enyl)benzenesulfonamide (150 mg, 0.62 mmol) in the presence of 3-phenylpropanal (126 mg, 0.94 mmol), was consumed based on analysis by TLC after 17 hours of stirring at room temperature. The work up afforded a yellow oil, which was purified by flash column chromatography (90% hexane, 10% ethyl acetate) to give the *title compound* (157 mg, 0.40 mmol, 64%) as a white solid.

M.p. 105-106 °C; ν_{max}(KBr)/cm^{-1} 3030, 2955, 1596; δ_H (300 MHz; $CDCl_3$) 7.83 (2H, d, *J* 8.1, H-C10), 7.39 (2H, d, *J* 8.1, H-C11), 7.36-7.18 (5H, m, Ar-H), 4.26-4.15 (1H, m, H-C2), 3.97 (1H, dd, *J* 15.0, 4.9, H-C6), 3.85 (1H, dt, *J* 11.6, 4.5, H-C4), 3.25-3.11 (1H, m, H-C6), 2.79-2.66 (1H, m, H-C8), 2.65-2.52 (1H, m, H-C8), 2.51 (3H, s, H-C13), 2.13-2.00 (1H, m, H-C5), 1.95-1.71 (1H, m, H-C3), 1.87-1.63 (2H, m, H-C7), 1.74-1.56 (1H, m, H-C5), 1.09 (3H, d, *J* 6.8, H-C14); δ_C (75.5 MHz; $CDCl_3$) 143.4 (C12), 141.6 (ArC), 138.3 (C9), 129.9 (C11), 128.4 (ArC), 128.3 (ArC), 126.9 (C10), 125.9 (ArC), 60.4 (C4), 58.8 (C2), 41.9 (C3), 40.1 (C6), 35.7 (C5), 32.7 (C8), 26.9 (C7), 21.5 (C13), 16.4 (C14); *m/z* (CI) 392 (MH^+, 40), 238 (20), 202 (74); Anal. Calcd. for $C_{21}H_{26}ClNO_2S$ requires C, 64.35; H, 7.08; N, 3.57%. Found: C, 64.15; H, 6.70; N, 3.50%; HRMS (ES) Found $[M+H]^+$ 392.1446, $C_{21}H_{27}ClNO_2S$ requires 392.1444.

Crystal data. $C_{21}H_{26}ClNO_2S$; M = 391.94; Monoclinic; *a* = 24.2931(8) Å, *b* = 11.7455(3) Å, *c* = 14.3281(4) Å; Volume 3937.7(2) Å^3; Space group *C*12/*c*1; T = 120 K; *Z* 8; 22425 reflections measured, 4514 unique [R_{int} = 0.0566]. The final R values *R1* = 0.0494, *wR2* = 0.1195 (observed) and *R1* = 0.0830, *wR2* = 0.1356 (all data).

exp216.2fr37-56





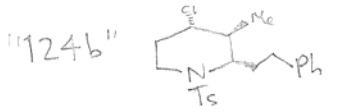
Current Data Parameters
NAME exp216.2fr37-56
EXPNO 21
PROCNO 1

F2 - Acquisition Parameters
Date_ 20061010
Time 13.26
INSTRUM spect
PROBHD 5 mm QNP 1H/13
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 6172.839 Hz
FIDRES 0.094190 Hz
AQ 5.3084660 sec
RG 128
DW 81.000 usec
DE 6.00 usec
TE 292.7 K
D1 1.00000000 sec
MCREST 0.00000000 sec
MCWRK 0.01500000 sec

======== CHANNEL f1 ========
NUC1 1H
P1 9.00 usec
PL1 0.00 dB
SFO1 300.1318534 MHz

F2 - Processing parameters
SI 32768
SF 300.1300321 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

exp216.2fr37-56



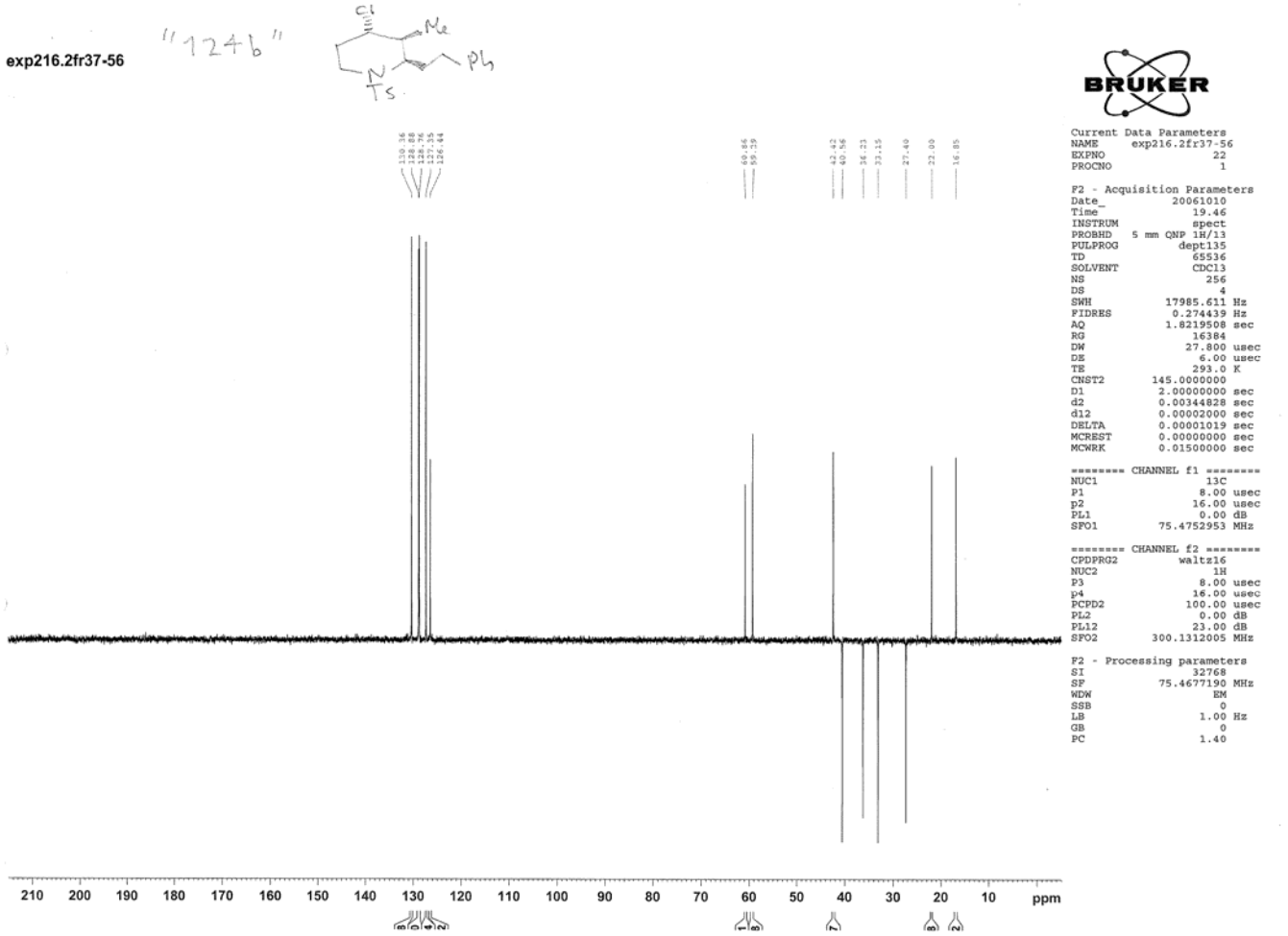
Current Data Parameters
NAME exp216.2fr37-56
EXPNO 21
PROCNO 1

F2 - Acquisition Parameters
Date_ 20061010
Time 19.28
INSTRUM spect
PROBHD 5 mm QNP 1H/13
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 1024
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 645.1
DW 27.800 usec
DE 6.00 usec
TE 293.1 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
MCREST 0.00000000 sec
MCWRK 0.01500000 sec

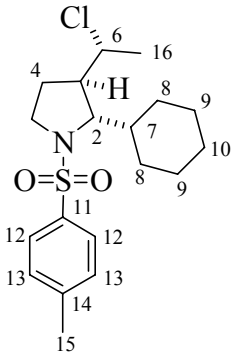
======== CHANNEL f1 ========
NUC1 13C
P1 8.00 usec
PL1 0.00 dB
SFO1 75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 100.00 usec
PL2 0.00 dB
PL12 23.00 dB
PL13 24.00 dB
SFO2 300.1312005 MHz

F2 - Processing parameters
SI 32768
SF 75.4677190 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



(2*S*,3*R*)-3-((S)-1-Chloroethyl)-2-cyclohexyl-1-tosylpyrrolidine/(2*R*,3*S*)-3-((*R*)-1-Chloroethyl)-2-cyclohexyl-1-tosylpyrrolidine (32c)



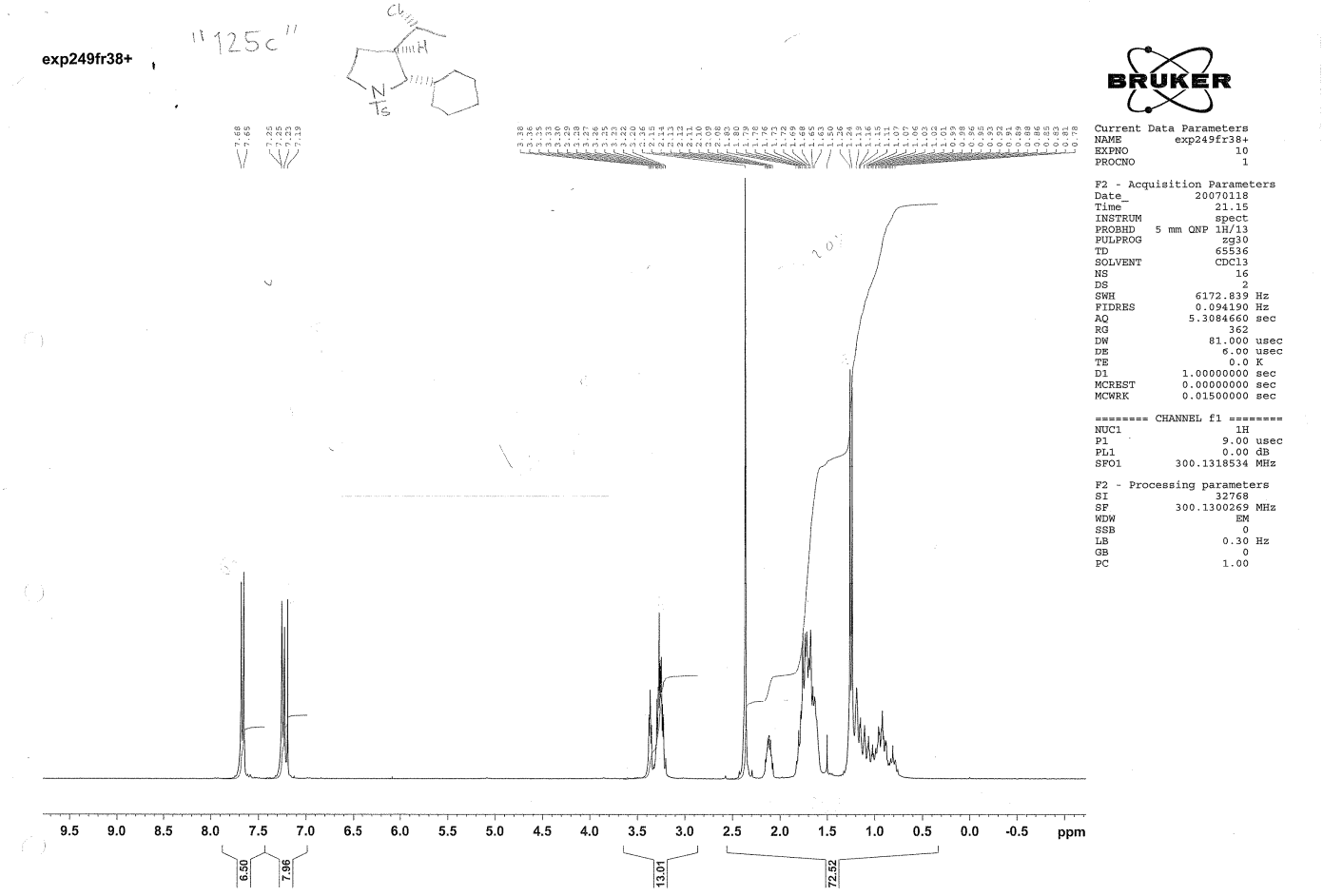
$C_{19}H_{28}ClNO_2S$
Mol. Wt.: 369.95

Following the general procedure, (*E*)-4-methyl-*N*-(pent-3-enyl)benzenesulfonamide (150 mg, 0.62 mmol) in the presence of cyclohexanecarbaldehyde (105 mg, 0.94 mmol), was consumed based on analysis by TLC after 240 hours of stirring at room temperature. The work up afforded a yellow oil, which was purified by flash column chromatography (90% hexane, 10% ethyl acetate) to give the *title compound* (162 mg, 0.44 mmol, 70%) as a white solid.

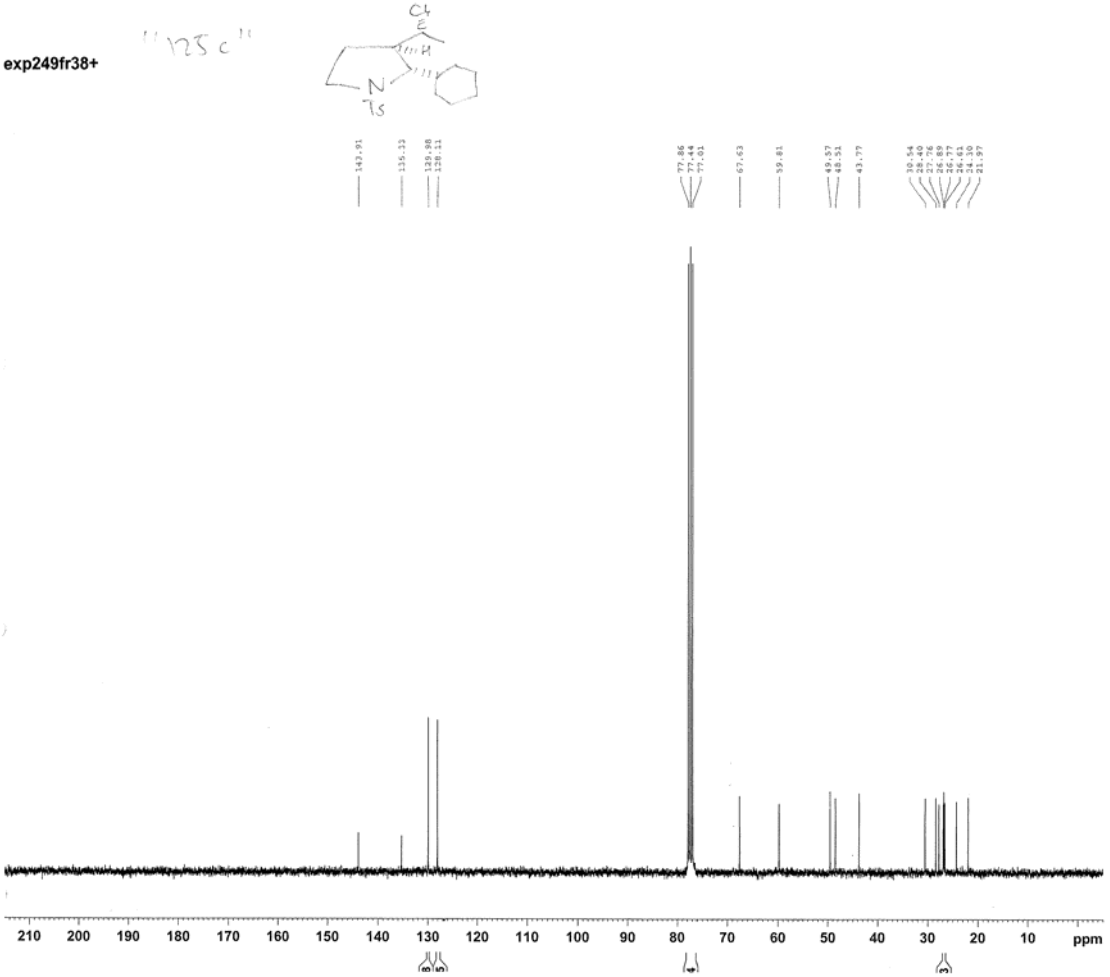
M.p. 116-118 °C; ν_{max}(neat)/cm^{-1} 2927, 1669, 1599; δ_H (300 MHz; $CDCl_3$) 7.73 (2H, d, *J* 8.4, H-C12), 7.31 (2H, d, *J* 8.4, H-C13), 3.45-3.41 (1H, m, H-C2), 3.38-3.28 (3H, m, H-C6 and H-C5), 2.43 (3H, s, H-C15),

2.23-2.14 (1H, m, H-C3), 1.91-1.63 (7H, m, H-C4, H-C7 and H-C8), 1.32 (3H, d, *J* 6.6, H-C16), 1.28-0.81 (6H, m, H-C9 and H-C10); δ_C (75.5 MHz; $CDCl_3$) 143.5 (C14), 134.9 (C11), 129.5 (C13), 127.7 (C12), 67.2 (C2), 59.4 (C6), 49.1 (C3), 48.1 (C5), 43.3 (C7), 30.1 (C8), 28.0 (C8), 27.3 (C4), 26.5 (C10), 26.3 (C9), 26.2 (C9), 23.9 (C16), 21.5 (C15); *m/z* (CI) 370 (MH^+, 100), 334 (55), 286 (62); HRMS (ES) Found $[M+NH_4]^+$ 387.1871, $C_{19}H_{32}ClN_2O_2S$ requires 387.1868.

Crystal data. $C_{19}H_{28}ClNO_2S$; M = 369.93; Orthorhombic; *a* = 15.4076 (3) Å, *b* = 12.9924(4) Å, *c* = 9.3800(3) Å; Volume 1877.70(9) $Å^3$; Space group $Pna2_1$; T = 120 K; *Z* 4; 10624 reflections measured, 4506 unique [R_{int} = 0.0506]. The final R values *R1* = 0.0699, *wR2* = 0.1726 (observed) and *R1* = 0.0743, *wR2* = 0.1761 (all data). Flack parameter 0.40(12).

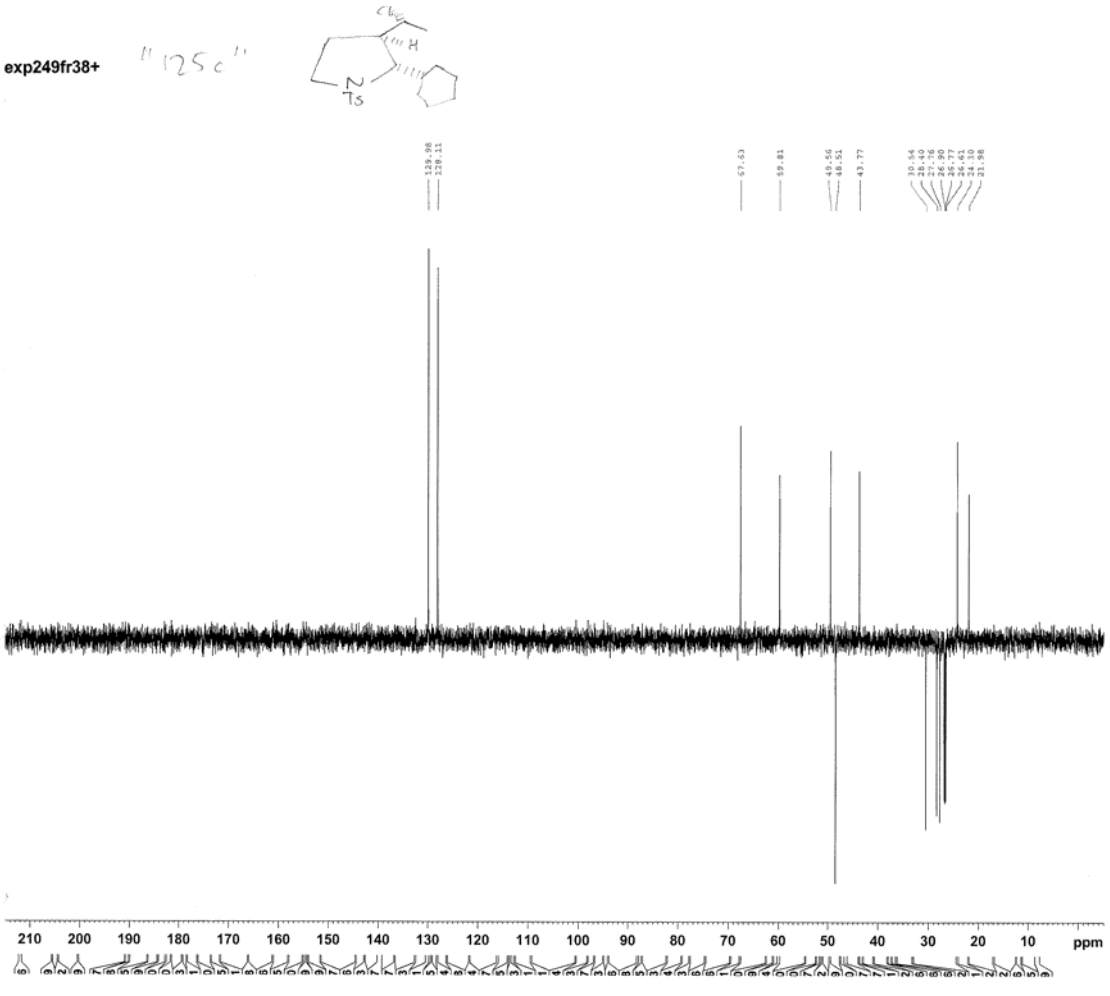


exp249fr38+



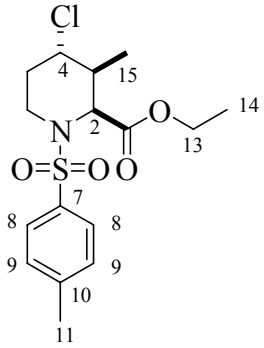

```
Current Data Parameters
NAME          exp249fr38+
EXPNO                  11
PROCNO                  1

F2 - Acquisition Parameters
Date_              20070118
Time                 22.23
INSTRUM              spect
PROBHD   5 mm QNP 1H/13
PULPROG            zgpg30
TD                  65536
SOLVENT             CDCl3
NS                   1024
DS                      4
SWH           17985.611 Hz
FIDRES         0.274439 Hz
AQ             1.8219508 sec
RG                  724.1
DW                27.800 usec
DE                 6.00 usec
TE                  0.0 K
D1           2.00000000 sec
d11          0.03000000 sec
DELTA        1.89999998 sec
MCREST       0.00000000 sec
MCWRK        0.01500000 sec

======== CHANNEL f1 ========
NUC1                  13C
P1                   8.00 usec
PL1                  0.00 dB
SFO1          75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2           waltz16
NUC2                   1H
PCPD2              100.00 usec
PL2                  0.00 dB
PL12                23.00 dB
PL13                24.00 dB
SFO2         300.1312005 MHz

F2 - Processing parameters
SI                    32768
SF            75.4677190 MHz
WDW                      EM
SSB                       0
LB                     1.00 Hz
GB                        0
PC                     1.40
```

exp249fr38+




```
Current Data Parameters
NAME          exp249fr38+
EXPNO                  12
PROCNO                  1

F2 - Acquisition Parameters
Date_              20070118
Time                 22.41
INSTRUM              spect
PROBHD   5 mm QNP 1H/13
PULPROG            dept135
TD                  65536
SOLVENT             CDCl3
NS                    256
DS                      4
SWH           17985.611 Hz
FIDRES         0.274439 Hz
AQ             1.8219508 sec
RG                  16384
DW                27.800 usec
DE                 6.00 usec
TE                  0.0 K
CNST2        145.0000000
D1           2.00000000 sec
d2           0.00344828 sec
d12          0.00002000 sec
DELTA        0.00001019 sec
MCREST       0.00000000 sec
MCWRK        0.01500000 sec

======== CHANNEL f1 ========
NUC1                  13C
P1                   8.00 usec
p2                  16.00 usec
PL1                  0.00 dB
SFO1          75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2           waltz16
NUC2                   1H
P3                   8.00 usec
p4                  16.00 usec
PCPD2              100.00 usec
PL2                  0.00 dB
PL12                23.00 dB
SFO2         300.1312005 MHz

F2 - Processing parameters
SI                    32768
SF            75.4677190 MHz
WDW                      EM
SSB                       0
LB                     1.00 Hz
GB                        0
PC                     1.40
```


(2*S*,3*S*,4*S*)-Ethyl-4-chloro-3-methyl-1-tosylpiperidine-2-carboxylate/(2*R*,3*R*,4*R*)-Ethyl-4-chloro-3-methyl-1-tosylpiperidine-2-carboxylate (31d)



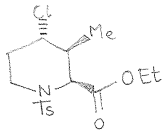
$C_{16}H_{22}ClNO_4S$
Mol. Wt.: 359.87

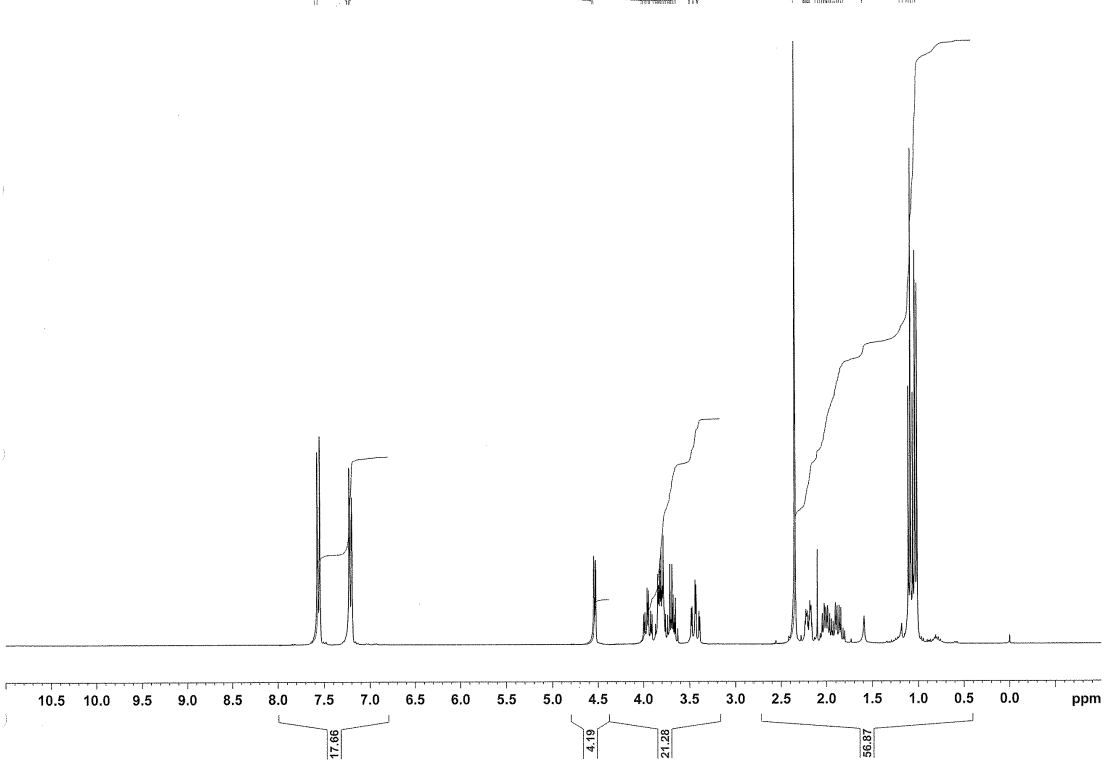
Following the general procedure, (*E*)-4-methyl-*N*-(pent-3-enyl)benzenesulfonamide (150 mg, 0.62 mmol), in the presence of a pre-heated 33% solution of ethyl 2-oxoacetate in toluene (287 mg, 0.94 mmol, 1.50 eq.), was consumed based on analysis by TLC after 1 hour of stirring at room temperature. The work up afforded a yellow oil, which was purified by flash column chromatography (90% hexane, 10% ethyl acetate) to give the *title compound* (47 mg, 0.13 mmol, 21%) as a pale yellow oil.

ν_{max}(neat)/cm^{-1} 2980, 1733, 1598; δ_H (300 MHz; $CDCl_3$) 7.62 (2H, d, *J* 8.4, H-C8), 7.27 (2H, d, *J* 8.4, H-C9), 4.59 (1H, d, *J* 5.8, H-C2), 4.01 (1H, td, *J* 11.6, 4.4, H-C4), 3.93-3.81 (1H, m, H-C6), 3.81-3.66 (2H, m, H-C13), 3.49 (1H, td, *J* 12.8, 2.8, H-C6), 2.41 (3H, s, H-C10), 2.26 (1H, tdd, *J* 9.5, 5.1, 2.8, H-C5), 2.14-2.01 (1H, m, H-C3), 2.01-1.85 (1H, m, H-C5), 1.14 (3H, t, *J* 7.2, H-C14), 1.08 (3H, d, *J* 6.9, H-C15); δ_C (75.5 MHz; $CDCl_3$) 168.9 (C12), 143.7 (C10), 135.6 (C7), 129.5 (C9), 127.1 (C8), 60.8 (C13), 59.6 (C2), 59.2 (C4), 42.1 (C6), 41.0 (C3), 36.0 (C5), 21.5 (C11), 15.2 (C15), 13.9 (C14); *m/z* (CI) 360 (MH^+, 100), 286 (65), 206 (87); HRMS (ES) Found $[M+H]^+$ 360.1029, $C_{16}H_{23}ClNO_4S$ requires 360.1031.

exp219.1fr70-96

"124d"

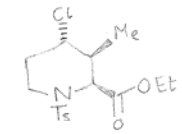


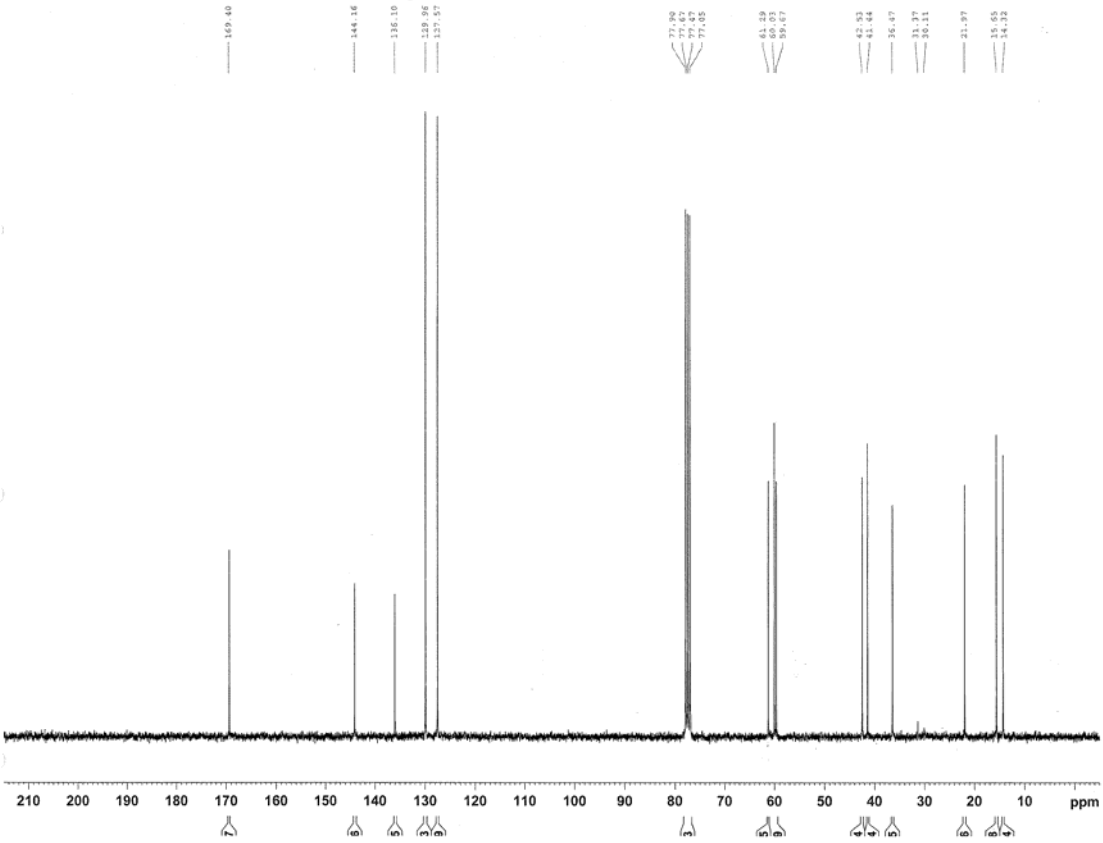



```
Current Data Parameters
NAME      exp219.1fr70-96
EXPNO                 10
PROCNO                 1

F2 - Acquisition Parameters
Date_           20061017
Time              16.37
INSTRUM           spect
PROBHD   5 mm QNP 1H/13
PULPROG           zg30
TD               65536
SOLVENT          CDCl3
NS                  16
DS                   2
SWH           6172.839 Hz
FIDRES        0.094190 Hz
AQ            5.3084660 sec
RG                161.3
DW             81.000 usec
DE              6.00 usec
TE             292.1 K
D1          1.00000000 sec
MCREST      0.00000000 sec
MCWRK       0.01500000 sec

======== CHANNEL f1 ========
NUC1                  1H
P1              9.00 usec
PL1             0.00 dB
SFO1       300.1318534 MHz

F2 - Processing parameters
SI               32768
SF          300.1300239 MHz
WDW                 EM
SSB                  0
LB              0.30 Hz
GB                   0
PC              1.00
```

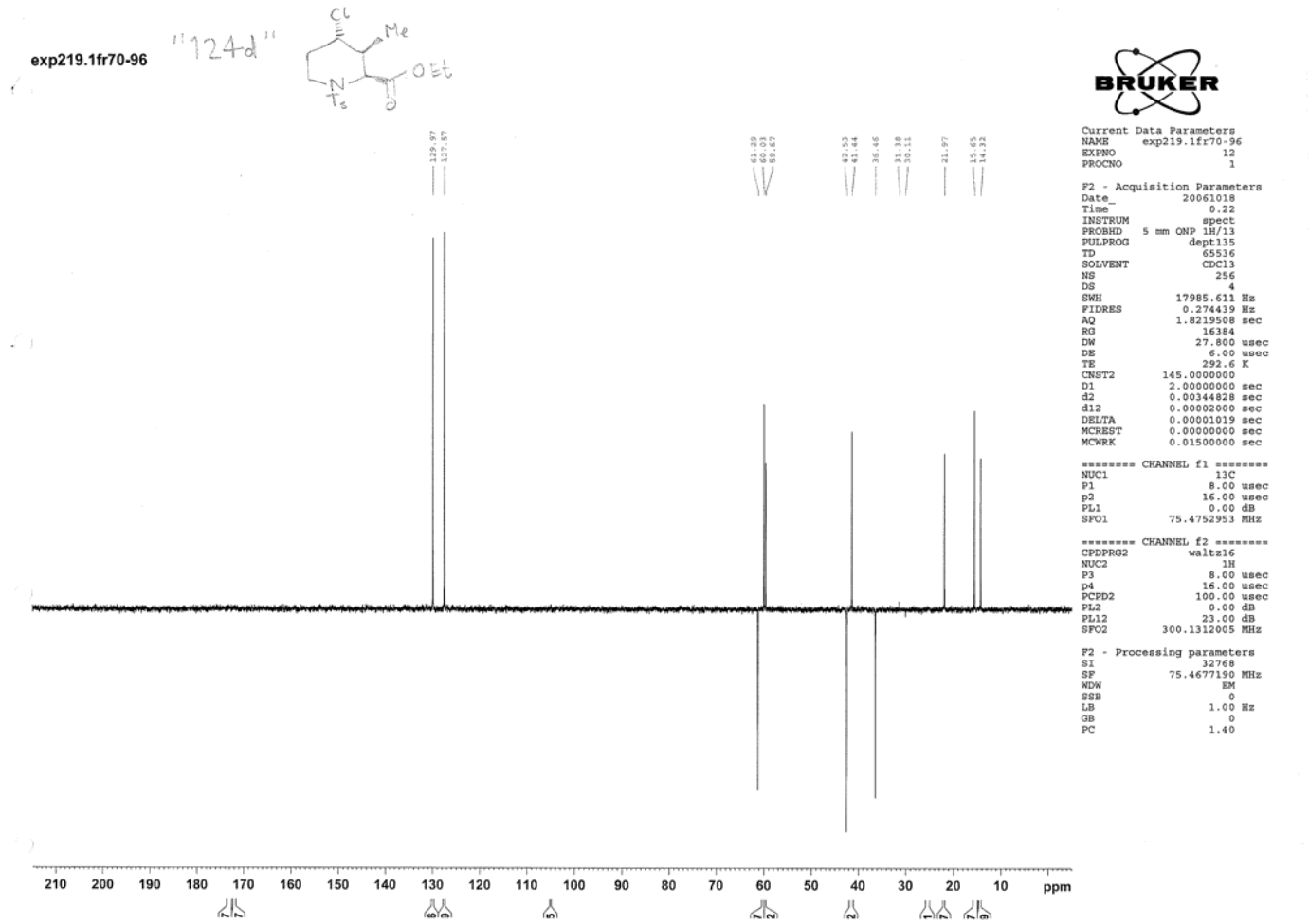
exp219.1fr70-96

"124d"

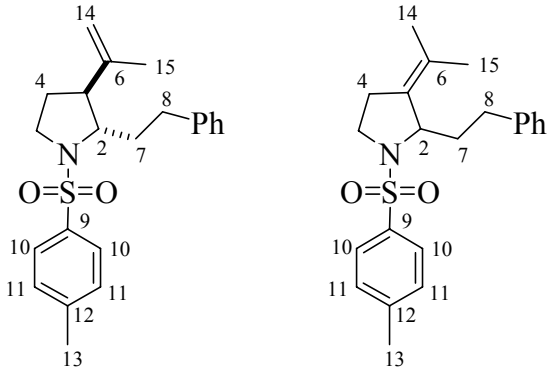





```
Current Data Parameters
NAME      exp219.1fr70-96
EXPNO                 11
PROCNO                 1

F2 - Acquisition Parameters
Date_           20061018
Time              0.05
INSTRUM           spect
PROBHD   5 mm QNP 1H/13
PULPROG         zgpg30
TD               65536
SOLVENT          CDCl3
NS                1024
DS                   4
SWH          17985.611 Hz
FIDRES        0.274439 Hz
AQ            1.8219508 sec
RG                724.1
DW             27.800 usec
DE              6.00 usec
TE             292.8 K
D1          2.00000000 sec
d11         0.03000000 sec
DELTA       1.89999998 sec
MCREST      0.00000000 sec
MCWRK       0.01500000 sec

======== CHANNEL f1 ========
NUC1                 13C
P1              8.00 usec
PL1             0.00 dB
SFO1       75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                 1H
PCPD2          100.00 usec
PL2             0.00 dB
PL12           23.00 dB
PL13           24.00 dB
SFO2       300.1312005 MHz

F2 - Processing parameters
SI               32768
SF          75.4677190 MHz
WDW                 EM
SSB                  0
LB              1.00 Hz
GB                   0
PC              1.40
```



(2*S*,3*S*)-2-Phenethyl-3-(prop-1-en-2-yl)-1-tosylpyrrolidine/(2*R*,3*R*)-2-Phenethyl-3-(prop-1-en-2-yl)-1-tosylpyrrolidine and (±)-2-Phenethyl-3-(propan-2-ylidene)-1-tosylpyrrolidine



$C_{22}H_{27}NO_2S$
Mol. Wt.: 369.52

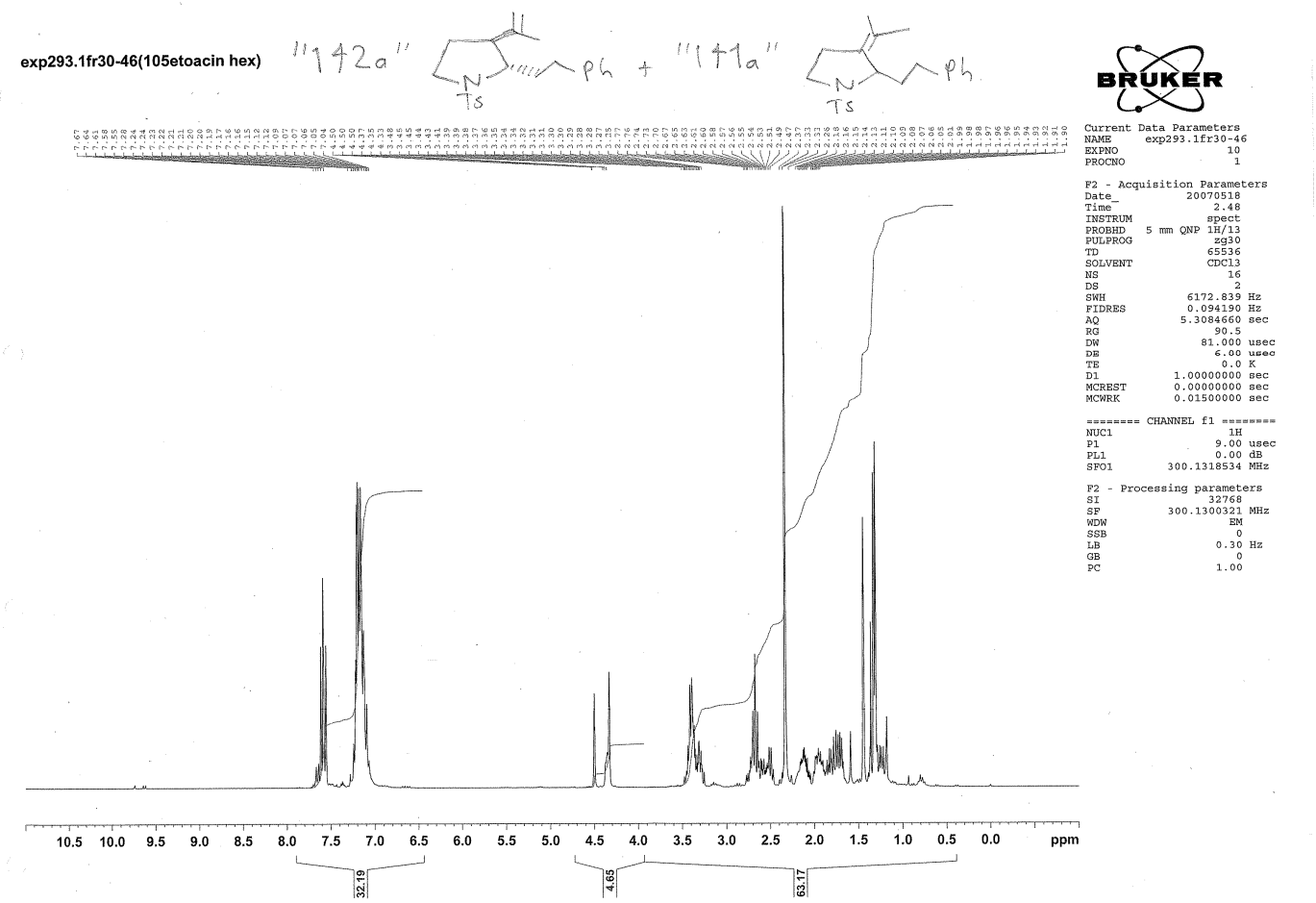
Following the general procedure, 4-methyl-*N*-(4-methylpent-3-enyl)benzenesulfonamide (100 mg, 0.39 mmol), in the presence of 3-phenylpropanal (80 mg, 0.59 mmol), was consumed based on analysis by TLC after 6 hours of stirring at room temperature. The work up afforded a yellow oil, which was purified by flash column chromatography (90% hexane, 10% ethyl acetate) to give the two regioisomer *title compounds* as only a partially separable mixture (108 mg, 0.29 mmol, 75%) as a colourless oil.

(2*S*,3*S*)-2-Phenethyl-3-(prop-1-en-2-yl)-1-tosylpyrrolidine/(2*R*,3*R*)-2-Phenethyl-3-(prop-1-en-2-yl)-1-tosylpyrrolidine (major regioisomer)

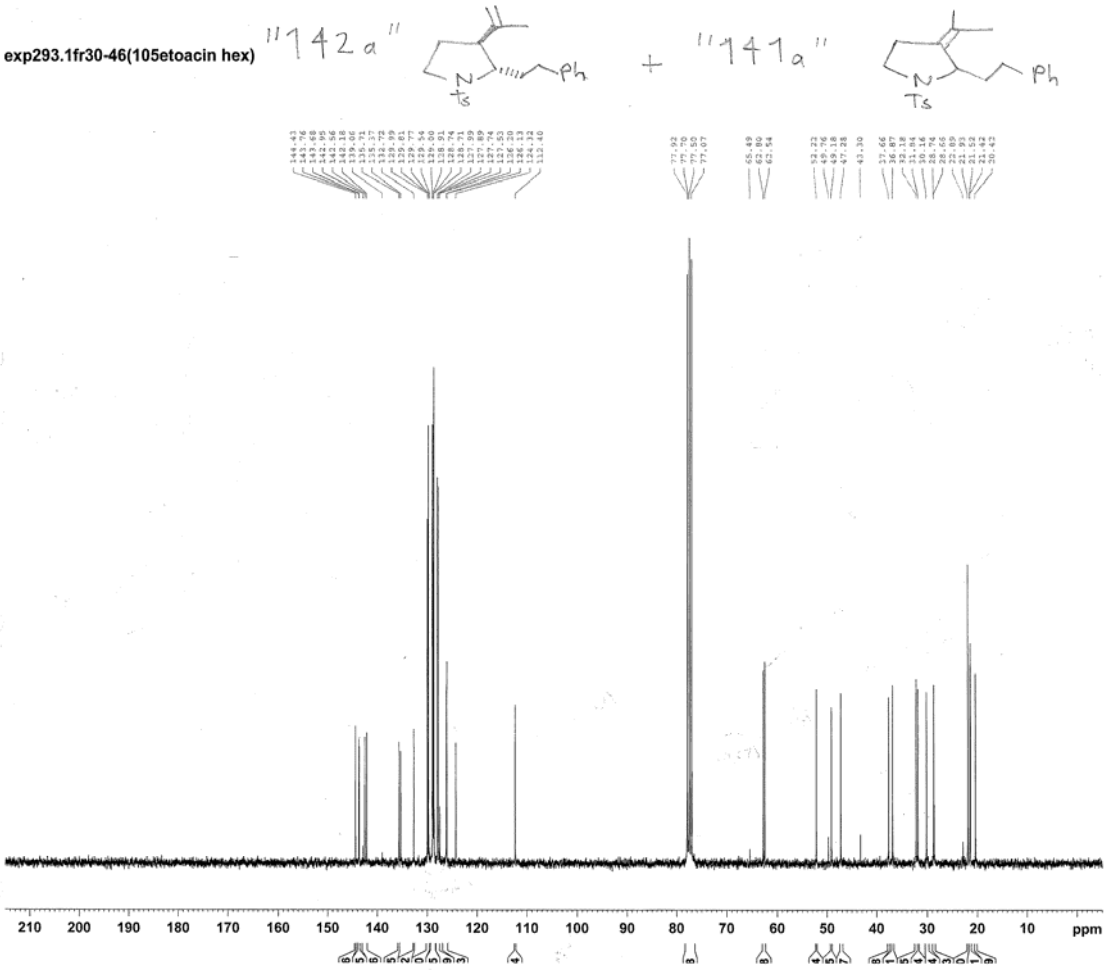
ν_{max}(neat)/cm^{-1} 3026, 2925, 1644, 1599 (mixture); δ_H (300 MHz; $CDCl_3$) 7.69-7.61 (2H, m, H-C10), 7.30-7.24 (2H, m, H-C11), 7.27-7.13 (5H, m, Ar-H), 4.46-4.40 (1H, m, H-C2), 3.47-3.32 (2H, m, H-C5), 2.71-2.58 (2H, m, H-C8), 2.40 (3H, s, H-C13), 2.28-2.10 (1H, m, H-C4), 2.09-1.94 (1H, m, H-C4), 1.95-1.81 (2H, m, H-C7), 1.39 (3H, s, H-C15), 1.37 (3H, s, H-C14); δ_C (75.5 MHz; $CDCl_3$) 143.2 (C12), 142.1 (ArC), 135.2 (C9), 132.2 (C3), 129.3 (C11), 128.4 (ArC), 128.2 (ArC), 127.4 (C10), 125.6 (ArC), 123.8 (C6), 62.0 (C2), 48.7 (C5), 37.2 (C4), 36.4 (C7), 31.7 (C8), 21.4 (C13), 21.0 (C15), 19.9 (C15); *m/z* (CI) 370 (MH^+, 100), 264 (18), 216 (35); HRMS (ES) Found $[M+H]^+$ (mixture) 370.1837, $C_{22}H_{28}NO_2S$ requires 370.1835.

(±)-2-Phenethyl-3-(propan-2-ylidene)-1-tosylpyrrolidine (minor regioisomer)

δ_H (300 MHz; $CDCl_3$) 7.69-7.61 (2H, m, H-C10), 7.30-7.24 (2H, m, H-C11), 7.30-7.24 (5H, m, Ar-H), 4.59-4.56 (1H, m, H-C14), 4.41-4.39 (1H, m, H-C14), 3.51-3.41 (1H, m, H-C2), 3.54-3.38 (2H, m, H-C5), 2.83-2.65 (2H, m, H-C8), 2.66-2.50 (1H, m, H-C3), 2.40 (3H, s, H-C13), 2.28-2.10 (1H, m, H-C4), 2.09-1.94 (1H, m, H-C4), 1.87-1.70 (2H, m, H-C7), 1.51 (3H, s, H-C15); δ_C (75.5 MHz; $CDCl_3$) 143.9 (C6), 143.3 (C12), 141.7 (ArC), 134.9 (C9), 129.5 (C11), 128.5 (ArC), 128.2 (ArC), 127.5 (C10), 125.7 (ArC), 111.9 (C14), 62.3 (C2), 51.7 (C3), 46.8 (C5), 31.4 (C8), 29.7 (C7), 28.2 (C4), 21.4 (C13), 20.9 (C15); *m/z* (CI) 370 (MH^+, 100), 264 (15), 216 (40).

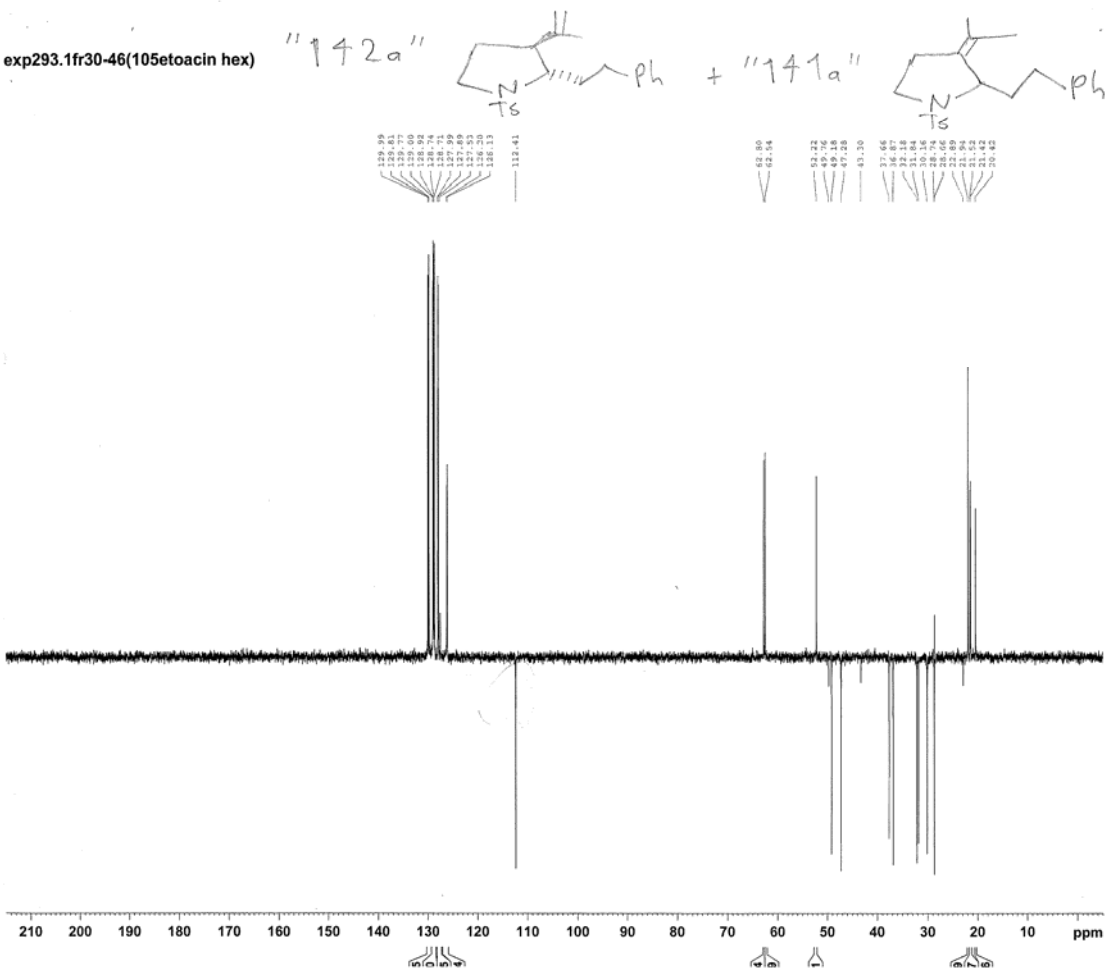


exp293.1fr30-46(105etoacin hex)



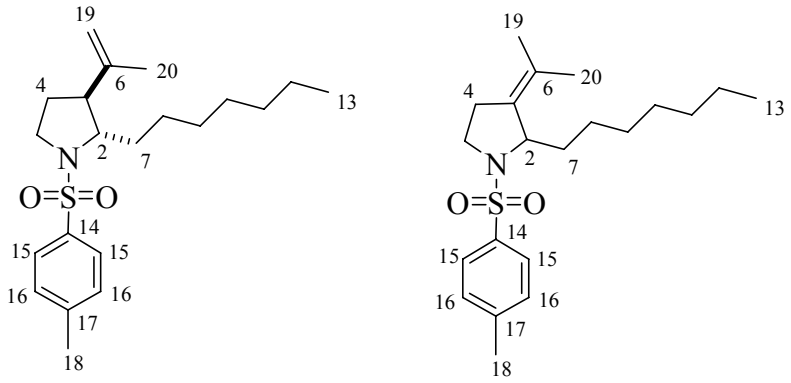

```
Current Data Parameters
NAME      exp293.1fr30-46
EXPNO                 11
PROCNO                 1

F2 - Acquisition Parameters
Date_           20070518
Time               3.56
INSTRUM           spect
PROBHD   5 mm QNP 1H/13
PULPROG         zgpg30
TD              65536
SOLVENT           CDCl3
NS                 1024
DS                    4
SWH           17985.611 Hz
FIDRES         0.274439 Hz
AQ             1.8219508 sec
RG                912.3
DW                27.800 usec
DE                 6.00 usec
TE                  0.0 K
D1           2.00000000 sec
d11          0.03000000 sec
DELTA        1.89999998 sec
MCREST       0.00000000 sec
MCWRK        0.01500000 sec

======== CHANNEL f1 ========
NUC1                13C
P1                 8.00 usec
PL1                0.00 dB
SFO1         75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                1H
PCPD2            100.00 usec
PL2                0.00 dB
PL12              23.00 dB
PL13              24.00 dB
SFO2        300.1312005 MHz

F2 - Processing parameters
SI                 32768
SF          75.4677190 MHz
WDW                   EM
SSB                    0
LB                  1.00 Hz
GB                     0
PC                  1.40
```

exp293.1fr30-46(105etoacin hex)




```
Current Data Parameters
NAME      exp293.1fr30-46
EXPNO                 12
PROCNO                 1

F2 - Acquisition Parameters
Date_           20070518
Time               4.14
INSTRUM           spect
PROBHD   5 mm QNP 1H/13
PULPROG          dept135
TD              65536
SOLVENT           CDCl3
NS                  256
DS                    4
SWH           17985.611 Hz
FIDRES         0.274439 Hz
AQ             1.8219508 sec
RG                16384
DW                27.800 usec
DE                 6.00 usec
TE                  0.0 K
CNST2        145.0000000
D1           2.00000000 sec
d2           0.00344828 sec
d12          0.00002000 sec
DELTA        0.00001019 sec
MCREST       0.00000000 sec
MCWRK        0.01500000 sec

======== CHANNEL f1 ========
NUC1                13C
P1                 8.00 usec
p2                16.00 usec
PL1                0.00 dB
SFO1         75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                1H
P3                 8.00 usec
p4                16.00 usec
PCPD2            100.00 usec
PL2                0.00 dB
PL12              23.00 dB
SFO2        300.1312005 MHz

F2 - Processing parameters
SI                 32768
SF          75.4677190 MHz
WDW                   EM
SSB                    0
LB                  1.00 Hz
GB                     0
PC                  1.40
```

(2*S*,3*S*)-2-Heptyl-3-(prop-1-en-2-yl)-1-tosylpyrrolidine/(2*R*,3*R*)-2-Heptyl-3-(prop-1-en-2-yl)-1-tosylpyrrolidine and (±)-2-Heptyl-3-(propan-2-ylidene)-1-tosylpyrrolidine



$C_{21}H_{33}NO_2S$
Mol. Wt.: 363.56

Following the general procedure, 4-methyl-*N*-(4-methylpent-3-enyl)benzenesulfonamide (100 mg, 0.39 mmol), in the presence of octanal (76 mg, 0.59 mmol), was consumed based on analysis by TLC after 6 hours of stirring at room temperature. The work up afforded a yellow oil, which was purified by flash column chromatography (90% hexane, 10% ethyl acetate) to give the two *title compounds* as a partially separable mixture (85 mg, 0.23 mmol, 60%) as a colourless oil.

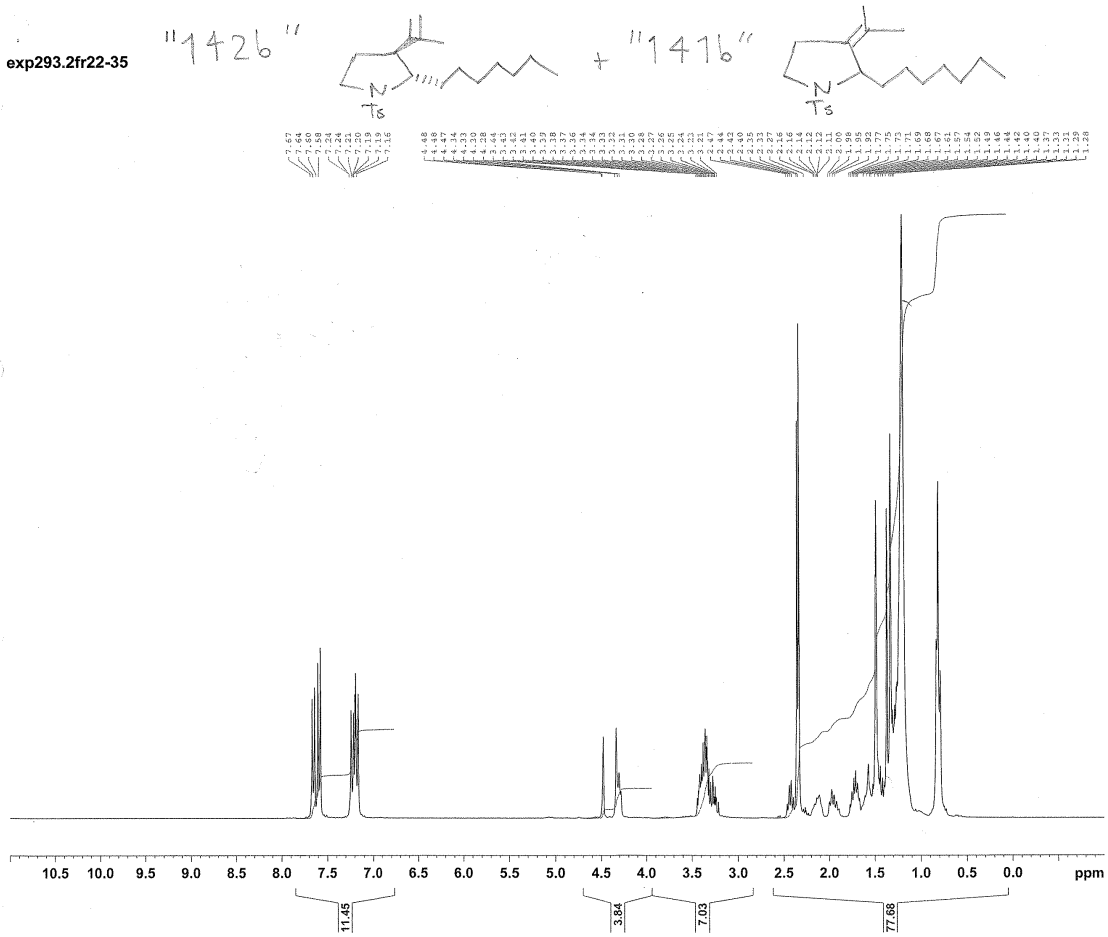
(2*S*,3*S*)-2-Heptyl-3-(prop-1-en-2-yl)-1-tosylpyrrolidine/(2*R*,3*R*)-2-Heptyl-3-(prop-1-en-2-yl)-1-tosylpyrrolidine (major regioisomer)

ν_{max}(neat)/cm^{-1} 2926, 1735, 1645, 1598 (mixture); δ_H (300 MHz; $CDCl_3$) 7.72 (2H, d, *J* 8.3, H-C15), 7.29 (2H, d, *J* 8.3, H-C16), 4.39-4.33 (1H, m, H-C2), 3.52-3.37 (2H, m, H-C5), 2.42 (3H, s, H-C18), 1.86-1.70 (2H, m, H-C4), 1.70-1.57 (2H, m, H-C7), 1.43 (3H, s, H-C20), 1.39 (3H, s, H-C19), 1.37-1.17 (10H, m, H-C8 to H-C12), 0.91-0.84 (3H, m, H-C13); δ_C (75.5 MHz; $CDCl_3$) 143.0 (C17), 135.5 (C14), 132.5 (C3), 129.2 (C16), 127.4 (C15), 123.3 (C6), 62.3 (C2), 46.6 (C5), 34.7 (C4), 31.8 (C11), 29.6 (C7), 29.4 (C9 and C10), 25.4 (C8), 22.6 (C12), 21.5 (C18), 21.0 (C20), 20.2 (C19), 14.1 (C13); *m/z* (CI) 364 (MH^+, 100), 264 (40), 210 (38); HRMS (ES) Found $[M+NH_4]^+$ (mixture) 381.2569, $C_{21}H_{37}N_2O_2S$ requires 381.2570.

(±)-2-Heptyl-3-(propan-2-ylidene)-1-tosylpyrrolidine (minor regioisomer)

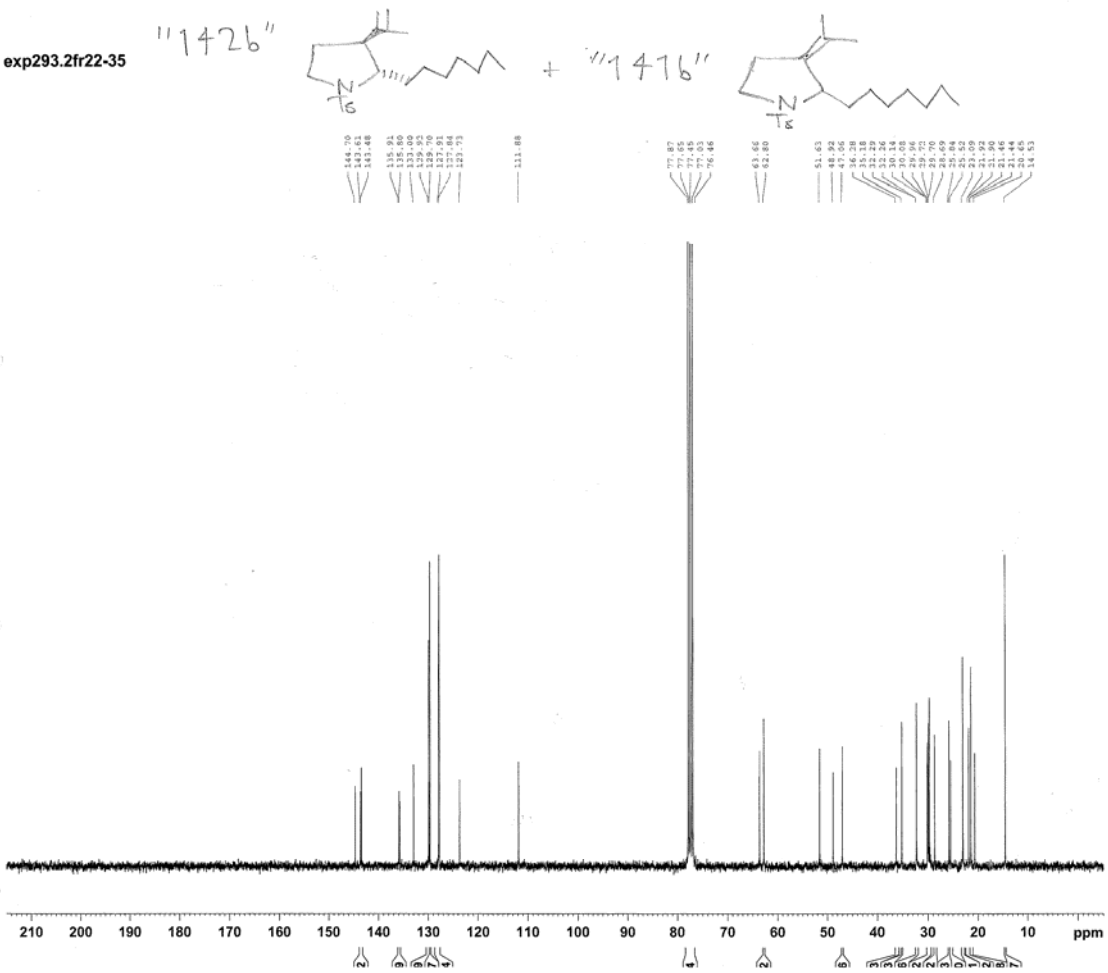
δ_H (300 MHz; $CDCl_3$) 7.65 (2H, d, *J* 8.4, H-C15), 7.24 (2H, d, *J* 8.4, H-C16), 4.56-4.52 (1H, m, H-C19), 4.43-4.37 (1H, m, H-C19), 3.52-3.39 (1H, m, H-C2), 3.40-3.25 (2H, m, H-C5), 2.49 (1H, dd, *J* 13.2, 6.8, H-C3), 2.40 (3H, s, H-C18), 2.27-2.12 (1H, m, H-C4), 2.08-1.94 (1H, m, H-C4), 1.55 (3H, s, H-C20), 1.54-1.43 (2H, m, H-C7), 1.37-1.17 (10H, m, H-C8 to H-C12), 0.91-0.84 (3H, m, H-C13); δ_C (75.5 MHz; $CDCl_3$) 144.2 (C6), 143.2 (C17), 135.4 (C14), 129.5 (C16), 127.5 (C15), 111.4 (C19), 63.2 (C2), 51.2 (C3), 48.5 (C5), 35.8 (C4), 31.8 (C11), 29.7 (C7), 29.3 (C9), 28.2 (C10), 25.1 (C8), 22.6 (C12), 21.5 (C18), 21.0 (C20), 14.1 (C13); *m/z* (CI) 364 (MH^+, 100), 264 (30), 210 (44).

exp293.2fr22-35

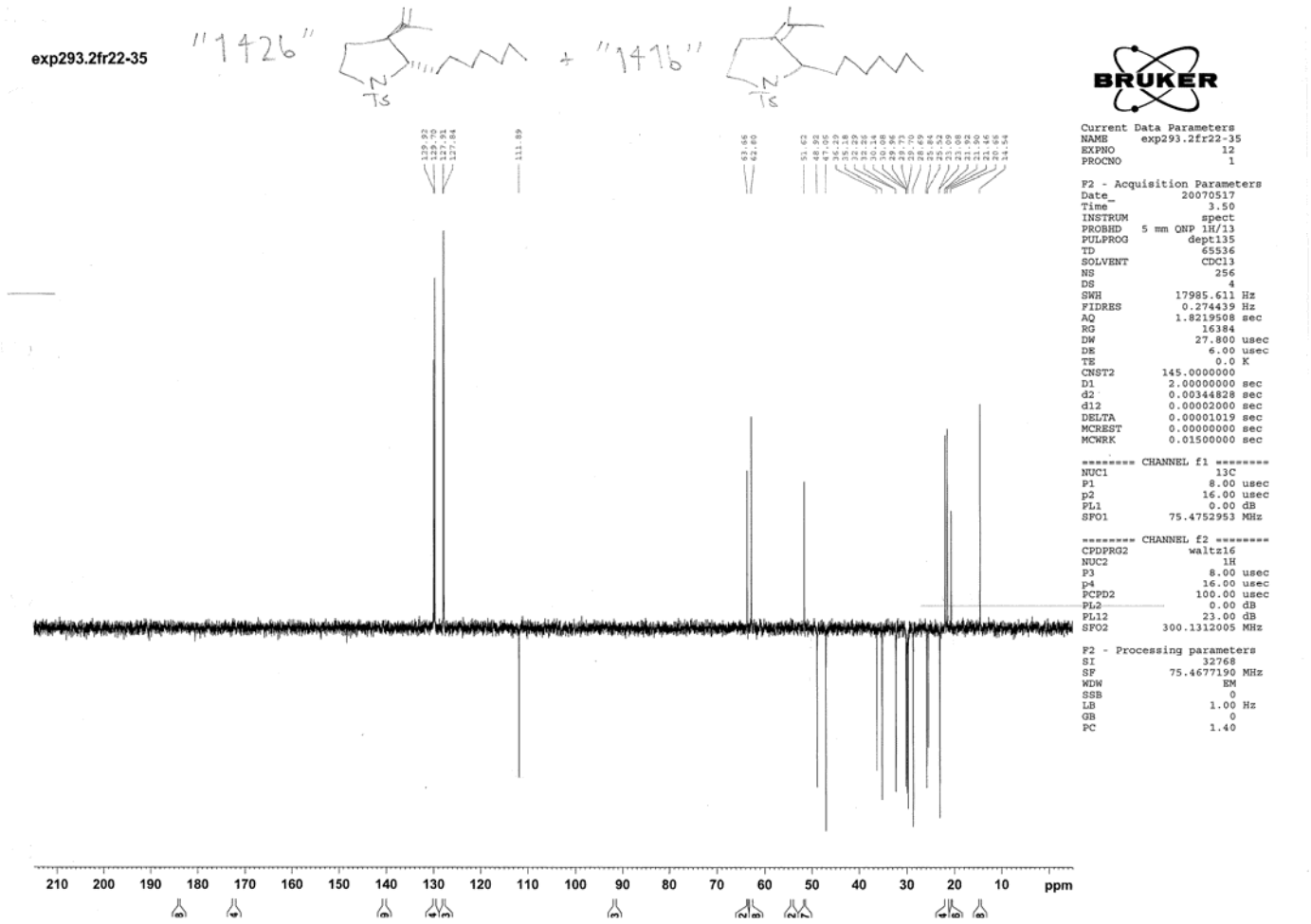



```
Current Data Parameters
NAME      exp293.2fr22-35
EXPNO                 10
PROCNO                 1

F2 - Acquisition Parameters
Date_           20070517
Time                2.25
INSTRUM            spect
PROBHD   5 mm QNP 1H/13
PULPROG            zg30
TD                65536
SOLVENT           CDCl3
NS                   16
DS                    2
SWH            6172.839 Hz
FIDRES         0.094190 Hz
AQ             5.3084660 sec
RG                101.6
DW               81.000 usec
DE                6.00 usec
TE                 0.0 K
D1             1.00000000 sec
MCREST         0.00000000 sec
MCWRK          0.01500000 sec

======== CHANNEL f1 ========
NUC1                  1H
P1                 9.00 usec
PL1                0.00 dB
SFO1         300.1318534 MHz

F2 - Processing parameters
SI                32768
SF           300.1300250 MHz
WDW                  EM
SSB                   0
LB                 0.30 Hz
GB                    0
PC                 1.00
```

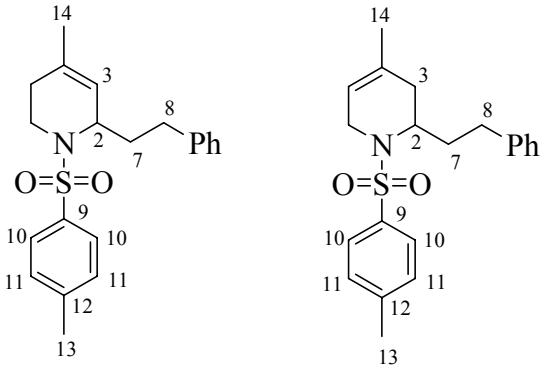
exp293.2fr22-35




```
Current Data Parameters
NAME      exp293.2fr22-35
EXPNO                 11
PROCNO                 1

F2 - Acquisition Parameters
Date_           20070517
Time                3.33
INSTRUM            spect
PROBHD   5 mm QNP 1H/13
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                 1024
DS                    4
SWH           17985.611 Hz
FIDRES         0.274439 Hz
AQ             1.8219508 sec
RG                1290.2
DW               27.800 usec
DE                6.00 usec
TE                 0.0 K
D1             2.00000000 sec
d11            0.03000000 sec
DELTA          1.89999998 sec
MCREST         0.00000000 sec
MCWRK          0.01500000 sec

======== CHANNEL f1 ========
NUC1                 13C
P1                 8.00 usec
PL1                0.00 dB
SFO1         75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2            100.00 usec
PL2                0.00 dB
PL12              23.00 dB
PL13              24.00 dB
SFO2         300.1312005 MHz

F2 - Processing parameters
SI                32768
SF           75.4677190 MHz
WDW                  EM
SSB                   0
LB                 1.00 Hz
GB                    0
PC                 1.40
```



(±)-4-Methyl-2-phenethyl-1-tosyl-1,2,3,6-tetrahydropyridine (33a) and (±)-4-Methyl-2-phenethyl-1-tosyl-1,2,5,6-tetrahydropyridine (34a)



$C_{21}H_{25}NO_2S$
Mol. Wt.: 355.49

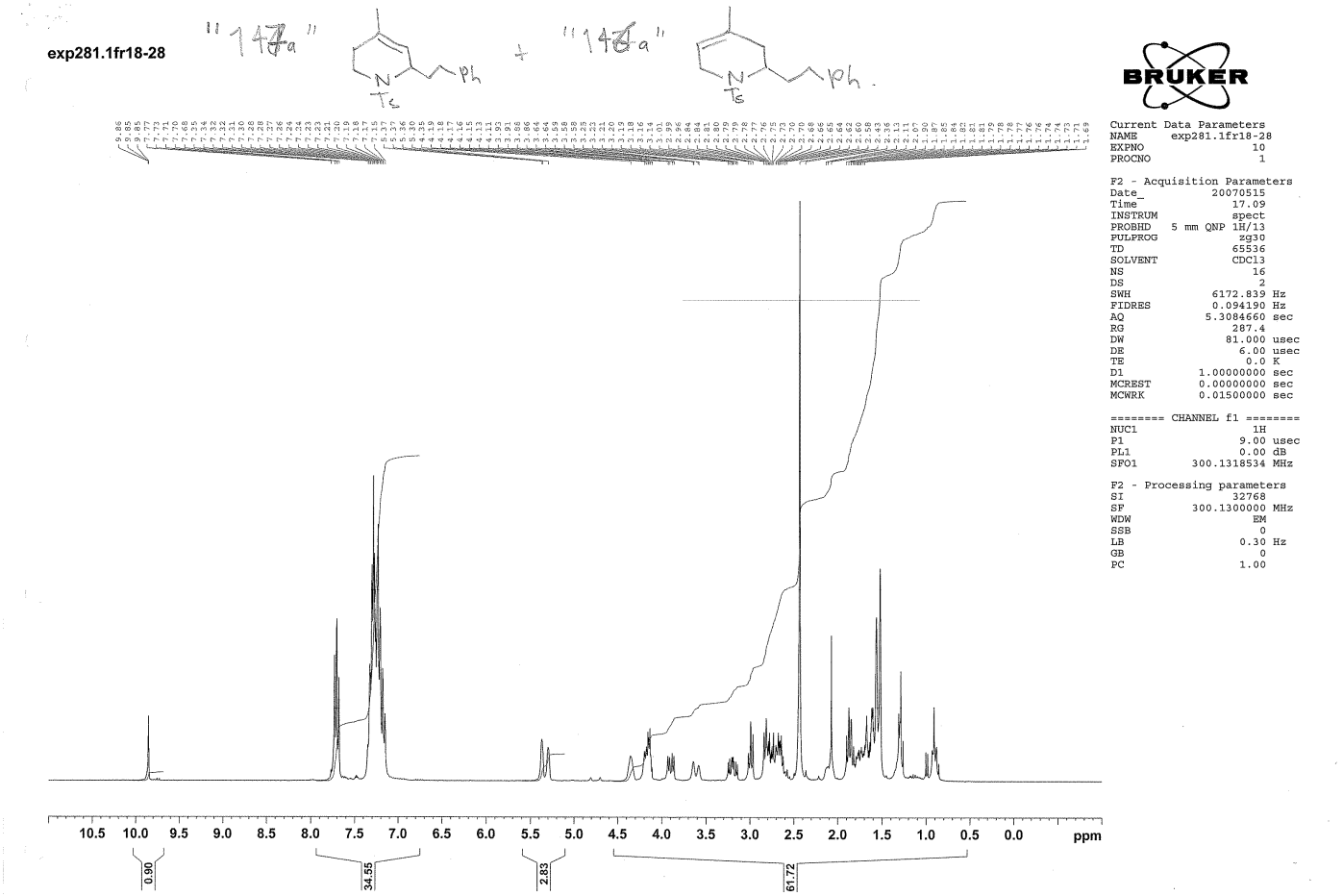
Following the general procedure, 4-methyl-*N*-(3-methylbut-3-enyl)benzenesulfonamide (250 mg, 1.04 mmol), in the presence of 3-phenylpropanal (210 mg, 1.56 mmol), was consumed based on analysis by TLC after 2 hours of stirring at room temperature. The work up afforded a yellow oil, which was purified by flash column chromatography (90% hexane, 10% ethyl acetate) to give the *title compounds* as an inseparable mixture (331 mg, 0.93 mmol, 90%) as a pale yellow oil.

(±)-4-Methyl-2-phenethyl-1-tosyl-1,2,3,6-tetrahydropyridine (33a)

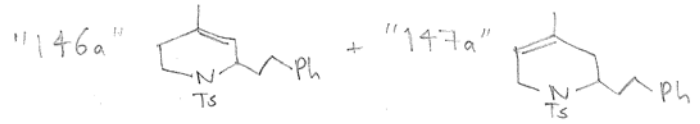
ν_{max}(neat)/cm^{-1} 3026, 2929, 1736, 1598 (mixture); δ_H (300 MHz; $CDCl_3$) 7.82-7.79 (2H, m, H-C10), 7.44-7.39 (2H, m, H-C11), 7.39-7.23 (5H, m, Ar-H), 5.48-5.42 (1H, m, H-C3), 4.50-4.37 (1H, m, H-C2), 3.98 (1H, dd, *J* 14.6, 6.1, H-C6), 3.28 (1H, ddd, *J* 14.6, 11.8, 4.8, H-C6), 3.07 (1H, t, *J* 7.5, H-C8), 2.95-2.86 (1H, m, H-C8), 2.51 (3H, s, H-C13), 2.00-1.89 (2H, m, H-C7), 1.87-1.72 (2H, m, H-C5), 1.64 (3H, s, H-C14); δ_C (75.5 MHz; $CDCl_3$) 142.9 (C12), 141.9 (ArC), 138.4 (C9), 132.7 (C4), 129.4 (C11), 128.3 (ArC), 128.3 (ArC), 127.0 (C10), 125.7 (ArC), 121.5 (C3), 53.6 (C2), 40.4 (C6), 36.8 (C5), 32.8 (C8), 28.1 (C7), 23.2 (C14), 21.5 (C13); *m/z* (CI) (mixture) 356 (MH^+, 100), 250 (25), 202 (37); HRMS (ES) Found $[M+H]^+$ (mixture) 356.1682, $C_{21}H_{26}NO_2S$ requires 356.1679.

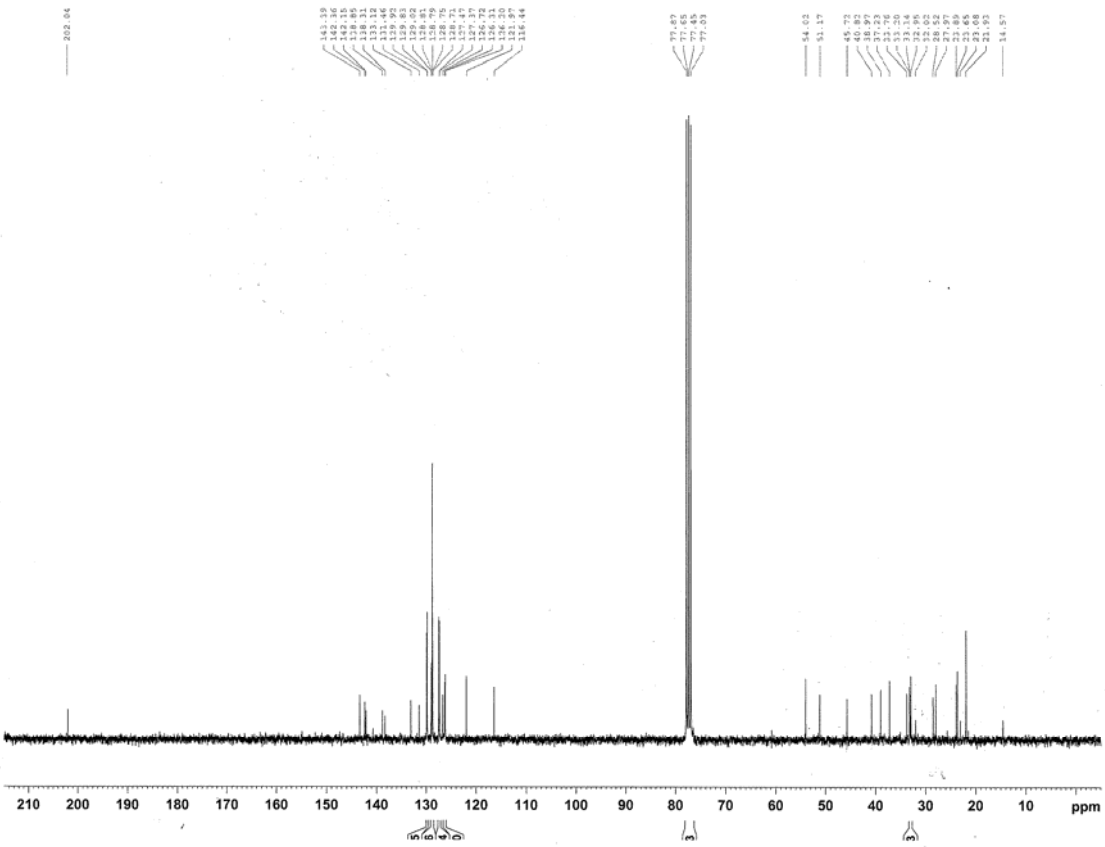
(±)-4-Methyl-2-phenethyl-1-tosyl-1,2,5,6-tetrahydropyridine (34a)

δ_H (300 MHz; $CDCl_3$) 7.79-7.75 (2H, m, H-C10), 7.38-7.34 (2H, m, H-C11), 7.39-7.23 (5H, m, Ar-H), 5.40-5.35 (1H, m, H-C5), 4.31-4.23 (1H, m, H-C2), 4.26-4.18 (1H, m, H-C6), 3.77-3.62 (1H, m, H-C6), 2.88-2.70 (2H, m, H-C8), 2.51 (3H, s, H-C13), 2.24-2.12 (1H, m, H-C3), 1.87-1.71 (2H, m, H-C7), 1.77-1.65 (1H, m, H-C3), 1.60 (3H, s, H-C14); δ_C (75.5 MHz; $CDCl_3$) 142.9 (C12), 141.7 (ArC), 137.9 (C9), 131.0 (C4), 129.5 (C11), 128.4 (ArC), 128.3 (ArC), 126.9 (C10), 125.9 (ArC), 116.0 (C5), 50.7 (C2), 45.3 (C6), 38.5 (C3), 32.7 (C8), 27.5 (C7), 23.4 (C14), 21.5 (C13).



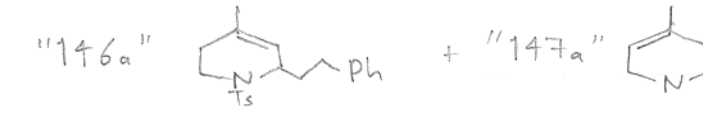
exp281.1fr18-28

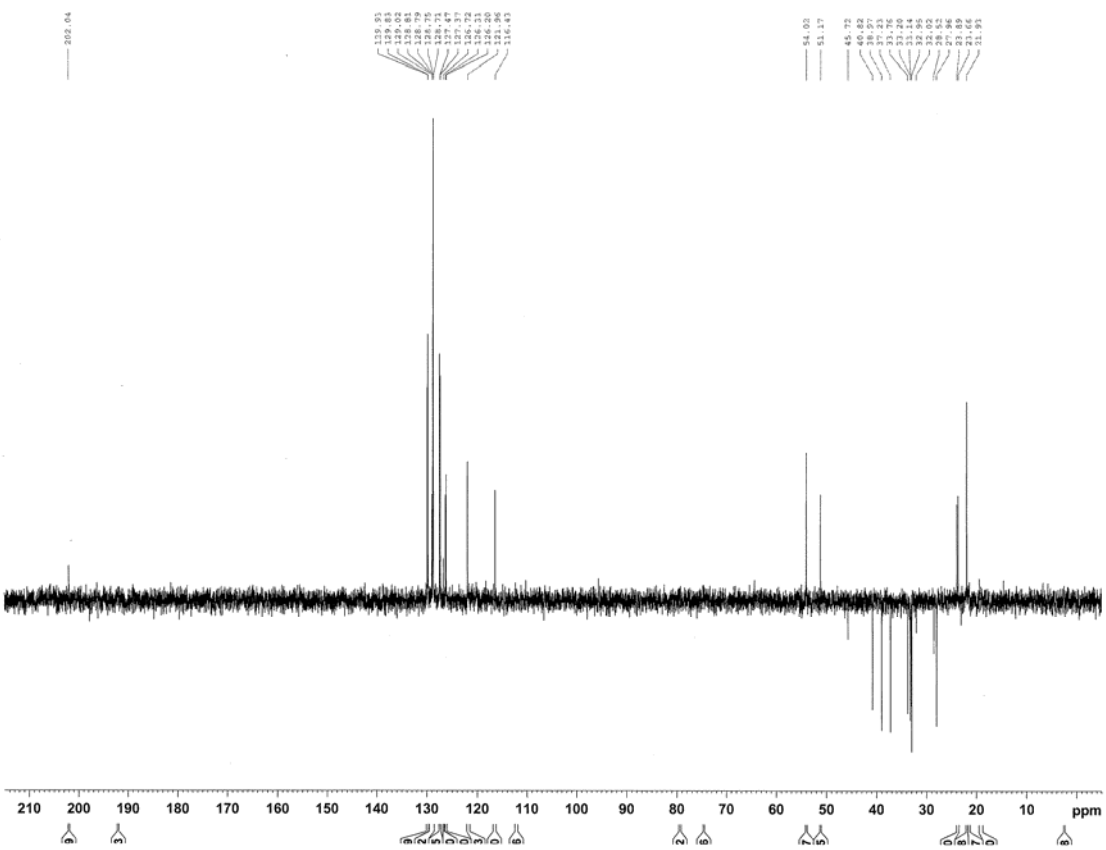





```
Current Data Parameters
NAME      exp281.1fr18-28
EXPNO                  11
PROCNO                  1

F2 - Acquisition Parameters
Date_            20070516
Time                4.40
INSTRUM             spect
PROBHD   5 mm QNP 1H/13
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                 1024
DS                    4
SWH           17985.611 Hz
FIDRES         0.274439 Hz
AQ            1.8219508 sec
RG                812.7
DW               27.800 usec
DE                6.00 usec
TE                 0.0 K
D1           2.00000000 sec
d11          0.03000000 sec
DELTA        1.89999998 sec
MCREST       0.00000000 sec
MCWRK        0.01500000 sec

======== CHANNEL f1 ========
NUC1                 13C
P1                8.00 usec
PL1               0.00 dB
SFO1        75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                 1H
PCPD2           100.00 usec
PL2               0.00 dB
PL12             23.00 dB
PL13             24.00 dB
SFO2        300.1312005 MHz

F2 - Processing parameters
SI                  32768
SF           75.4677190 MHz
WDW                    EM
SSB                     0
LB                 1.00 Hz
GB                      0
PC                   1.40
```

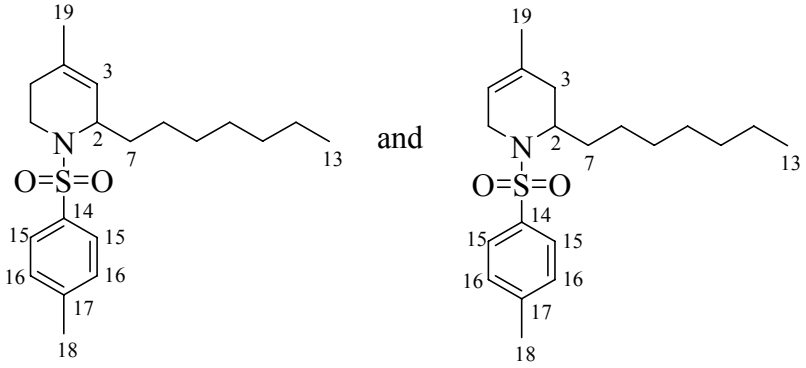
exp281.1fr18-28






```
Current Data Parameters
NAME      exp281.1fr18-28
EXPNO                  12
PROCNO                  1

F2 - Acquisition Parameters
Date_            20070516
Time                4.57
INSTRUM             spect
PROBHD   5 mm QNP 1H/13
PULPROG          dept135
TD                65536
SOLVENT           CDCl3
NS                  256
DS                    4
SWH           17985.611 Hz
FIDRES         0.274439 Hz
AQ            1.8219508 sec
RG                16384
DW               27.800 usec
DE                6.00 usec
TE                 0.0 K
CNST2       145.0000000
D1           2.00000000 sec
d2           0.00344828 sec
d12          0.00002000 sec
DELTA        0.00001019 sec
MCREST       0.00000000 sec
MCWRK        0.01500000 sec

======== CHANNEL f1 ========
NUC1                 13C
P1                8.00 usec
p2               16.00 usec
PL1               0.00 dB
SFO1        75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                 1H
P3                8.00 usec
p4               16.00 usec
PCPD2           100.00 usec
PL2               0.00 dB
PL12             23.00 dB
SFO2        300.1312005 MHz

F2 - Processing parameters
SI                  32768
SF           75.4677190 MHz
WDW                    EM
SSB                     0
LB                 1.00 Hz
GB                      0
PC                   1.40
```

(±)-2-Heptyl-4-methyl-1-tosyl-1,2,3,6-tetrahydropyridine (33b) and (±)-2-Heptyl-4-methyl-1-tosyl-1,2,5,6-tetrahydropyridine (34b)



$C_{20}H_{31}NO_2S$
Mol. Wt.: 349.53

Following the general procedure, 4-methyl-*N*-(3-methylbut-3-enyl)benzenesulfonamide (250 mg, 1.04 mmol), in the presence of octanal (200 mg, 1.56 mmol), was consumed based on analysis by TLC after 2 hours of stirring at room temperature. The work up afforded a yellow oil, which was purified by flash column chromatography (90% hexane, 10% ethyl acetate) to give the *title compounds* (265 mg, 0.76 mmol, 73%) as a pale yellow oil.

(±)-2-Heptyl-4-methyl-1-tosyl-1,2,3,6-tetrahydropyridine (33b, major regioisomer)

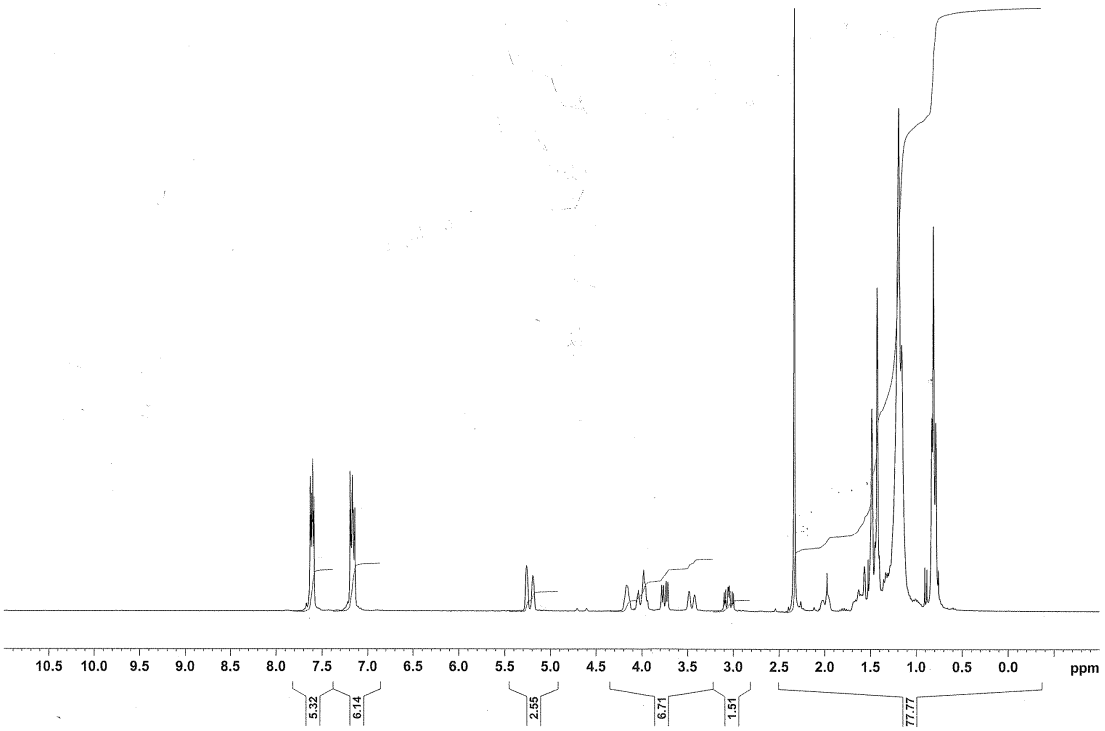
ν_{max}(neat)/cm^{-1} 2927, 1598 (mixture); δ_H (300 MHz; $CDCl_3$) 7.73-7.68 (2H, m, H-C15), 7.27-7.23 (2H, m, H-C16), 5.36-5.30 (1H, m, H-C3), 4.31-4.16 (1H, m, H-C2), 3.82 (1H, dd, *J* 14.6, 6.2, H-C6), 3.11 (1H, ddd, *J* 14.6, 11.9, 4.7, H-C6), 2.40 (3H, s, H-C18), 1.77-1.58 (1H, m, H-C5), 1.58-1.44 (1H, m, H-C5), 1.55 (3H, s, H-C19), 1.46-1.34 (2H, m, H-C7), 1.38-1.11 (10H, m, H-C8 to H-C12), 0.91-0.84 (3H, m, H-C13); δ_C (75.5 MHz; $CDCl_3$) 142.8 (C17), 138.6 (C14), 132.1 (C4), 129.3 (C16), 127.0 (C15), 121.9 (C3), 53.8 (C2), 38.4 (C6), 32.7 (C5), 31.8 (C11), 31.6 (C7), 29.5 (C9), 29.2 (C10), 26.2 (C8), 23.2 (C19), 22.6 (C12), 21.5 (C18), 14.1 (C13); *m/z* (CI) (mixture) 350 (MH^+, 100), 250 (12), 196 (40); HRMS (ES) Found $[M+H]^+$ (mixture) 350.2148, $C_{20}H_{32}NO_2S$ requires 350.2149.

(±)-2-Heptyl-4-methyl-1-tosyl-1,2,5,6-tetrahydropyridine (34b, minor regioisomer)

δ_H (300 MHz; $CDCl_3$) 7.68-7.64 (2H, m, H-C15), 7.23-7.19 (2H, m, H-C16), 5.29-5.22 (1H, m, H-C5), 4.14-4.03 (1H, m, H-C6), 4.09-4.01 (1H, m, H-C2), 3.58-3.46 (1H, m, H-C6), 2.40 (3H, s, H-C18), 2.16-1.98 (1H, m, H-C3), 1.58-1.47 (1H, m, H-C3), 1.49 (3H, s, H-C19), 1.55-1.41 (2H, m, H-C7), 1.38-1.11 (10H, m, H-C8 to H-C12), 0.91-0.84 (3H, m, H-C13); δ_C (75.5 MHz; $CDCl_3$) 142.8 (C17), 138.0 (C14), 131.1 (C4), 129.4 (C16), 126.9 (C15), 116.0 (C5), 50.9 (C2), 40.3 (C6), 35.2 (C3), 31.8 (C11), 31.2 (C7), 29.3 (C9), 29.2 (C10), 26.4 (C8), 23.5 (C19), 22.7 (C12), 21.5 (C18), 14.1 (C13).

exp281.2fr17-32

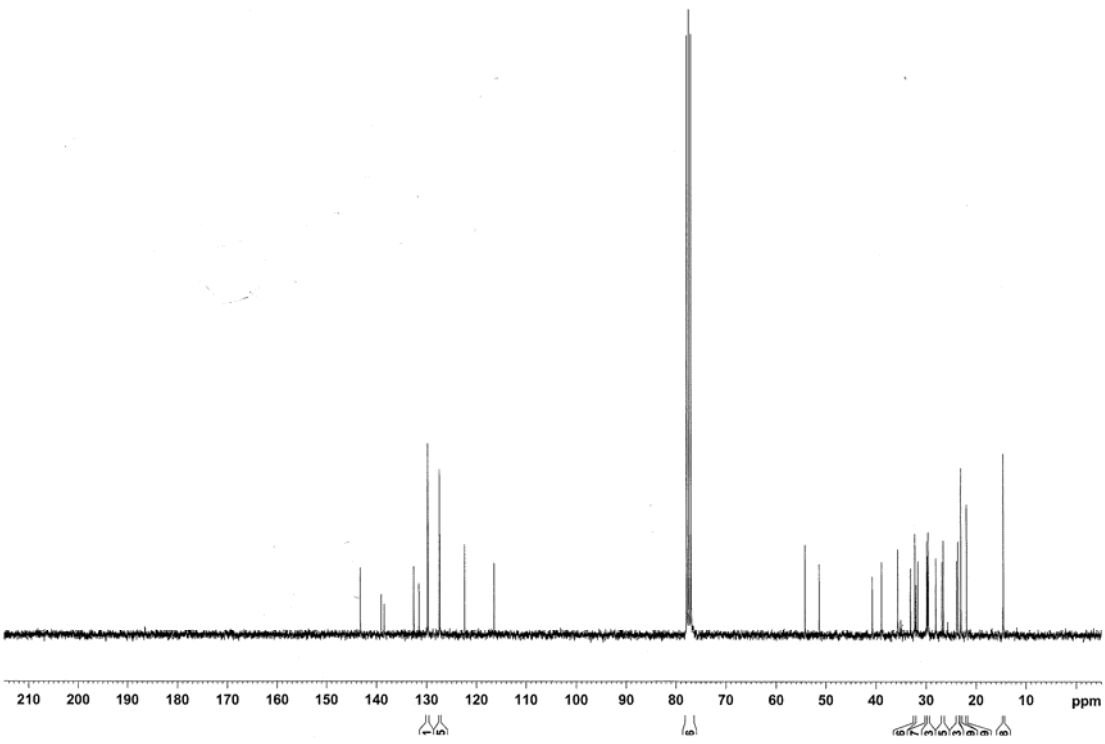
"147b" + "146b"



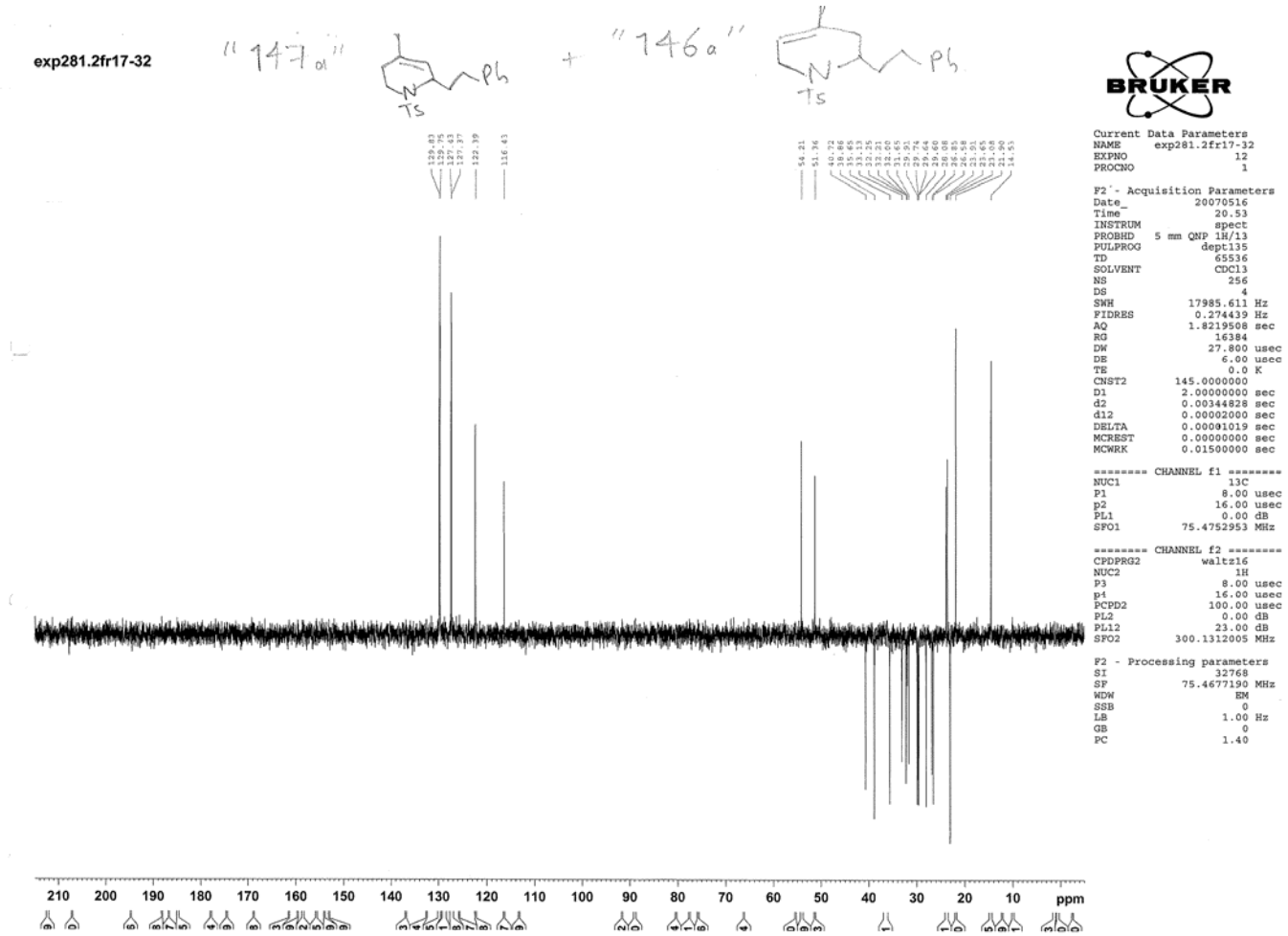

```
Current Data Parameters
NAME                exp281.2fr17-32
EXPNO                            10
PROCNO                            1

F2 - Acquisition Parameters
Date_                      20070515
Time                          18.04
INSTRUM                       spect
PROBHD     5 mm QNP 1H/13
PULPROG                       zg30
TD                           65536
SOLVENT                      CDCl3
NS                              16
DS                               2
SWH                       6172.839 Hz
FIDRES                    0.094190 Hz
AQ                        5.3084660 sec
RG                            143.7
DW                           81.000 usec
DE                            6.00 usec
TE                             0.0 K
D1                        1.00000000 sec
MCREST                    0.00000000 sec
MCWRK                     0.01500000 sec

======== CHANNEL f1 ========
NUC1                             1H
P1                            9.00 usec
PL1                           0.00 dB
SFO1                  300.1318534 MHz

F2 - Processing parameters
SI                            32768
SF                    300.1300269 MHz
WDW                              EM
SSB                               0
LB                             0.30 Hz
GB                                0
PC                             1.00
```

exp281.2fr17-32

"147a" + "146a"




```
Current Data Parameters
NAME                exp281.2fr17-32
EXPNO                            11
PROCNO                            1

F2 - Acquisition Parameters
Date_                      20070516
Time                          20.35
INSTRUM                       spect
PROBHD     5 mm QNP 1H/13
PULPROG                    zgpg30
TD                           65536
SOLVENT                      CDCl3
NS                            1024
DS                               4
SWH                      17985.611 Hz
FIDRES                    0.274439 Hz
AQ                        1.8219508 sec
RG                           1824.6
DW                           27.800 usec
DE                            6.00 usec
TE                             0.0 K
D1                        2.00000000 sec
d11                       0.03000000 sec
DELTA                     1.89999998 sec
MCREST                    0.00000000 sec
MCWRK                     0.01500000 sec

======== CHANNEL f1 ========
NUC1                            13C
P1                            8.00 usec
PL1                           0.00 dB
SFO1                  75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2                     waltz16
NUC2                             1H
PCPD2                       100.00 usec
PL2                           0.00 dB
PL12                         23.00 dB
PL13                         24.00 dB
SFO2                  300.1312005 MHz

F2 - Processing parameters
SI                            32768
SF                    75.4677190 MHz
WDW                              EM
SSB                               0
LB                             1.00 Hz
GB                                0
PC                             1.40
```


```
Current Data Parameters
NAME      exp281.2fr17-32
EXPNO                  12
PROCNO                  1

F2 - Acquisition Parameters
Date_            20070516
Time                20.53
INSTRUM             spect
PROBHD   5 mm QNP 1H/13
PULPROG          dept135
TD                 65536
SOLVENT            CDCl3
NS                   256
DS                     4
SWH            17985.611 Hz
FIDRES             0.274439 Hz
AQ              1.8219508 sec
RG                 16384
DW                27.800 usec
DE                 6.00 usec
TE                  0.0 K
CNST2         145.0000000
D1             2.00000000 sec
d2             0.00344828 sec
d12            0.00002000 sec
DELTA          0.00001019 sec
MCREST         0.00000000 sec
MCWRK          0.01500000 sec

======== CHANNEL f1 ========
NUC1                  13C
P1                  8.00 usec
p2                 16.00 usec
PL1                 0.00 dB
SFO1          75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2           waltz16
NUC2                   1H
P3                  8.00 usec
p4                 16.00 usec
PCPD2             100.00 usec
PL2                 0.00 dB
PL12               23.00 dB
SFO2          300.1312005 MHz

F2 - Processing parameters
SI                 32768
SF            75.4677190 MHz
WDW                   EM
SSB                    0
LB                  1.00 Hz
GB                     0
PC                  1.40
```

