SUPPORTING INFORMATION

Experimental

NMR spectra were obtained on a Bruker AV 300 spectrometer (^{1}H NMR at 300 MHz, ^{13}C NMR at 75 MHz) in $CDCl_3$ using TMS as an internal standard. Chemical shifts (δ) were given in ppm and coupling constants (*J*) in Hz. HRMS data were obtained on a Micromass GCT Mass Spectrometer or Bruker Solarix XR FTMS. TLC was performed with precoated TLC plates, silica gel 60F-254, layer thickness 0.25 mm. Flash chromatography separations were performed on 100-200 mesh silica gel. Reagents and solvents are commercial grade and were used as supplied. Substrates are commercially available and were purchased from Innochem.

General procedures for dichlorination of olefin acids using Ph_2SO and $(COCl)_2$

To a solution of oxalyl chloride (0.51 mL, 6.0 mmol, 1.2 equiv) in CH_2Cl_2 (10 mL) cooled at -78 °C was added dropwise a solution of diphenyl sulfoxide (1.21 g, 6.0 mmol, 1.2 equiv) in CH_2Cl_2 (10 mL) under the atmosphere of nitrogen. After 10 min, a solution of alkenoic acid (5 mmol, 1.0 equiv) in CH_2Cl_2 (10 mL) was added. The mixture was then allowed to warm up to room temperature and stirred for 1 h. The mixture was carefully basified with saturated $NaHCO_3$ (aq.) at 0 °C. The aqueous layer was separated and extracted with CH_2Cl_2 (3 × 20 mL). The aqueous layer was acidified with 2 M HCl solution, and extracted with CH_2Cl_2 (3 × 20 mL). The combined extracts were washed with brine, dried (Na_2SO_4), filtered, and concentrated in vacuum to afford the corresponding dichloro acids (**2**, **5**, **8**, **11**).

anti-3,4-Dichloropentanoic acid (2)

Colorless oil, 598 mg, 70% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 4.32 (ddd, *J* = 9.3, 7.5, 3.3 Hz, 1 H), 4.19 (dq, *J* = 7.5, 6.6 Hz, 1 H), 3.23 (dd, *J* = 16.8, 3.3 Hz, 1 H), 2.87 (dd, *J* = 16.8, 9.3 Hz, 1 H), 1.68 (d, *J* = 6.6 Hz, 3 H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 176.21, 60.78, 59.33, 40.71, 22.51. All measured values were identical to those in the literature.[1]

4,5-Dichloropentanoic acid (5)

Colorless oil, 420 mg, 49% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 4.20-4.10 (m, 1 H), 3.80 (dd, *J* = 11.4, 4.2 Hz, 1 H), 3.66 (dd, *J* = 11.4, 7.5 Hz, 1 H), 2.74-2.53 (m, 2 H), 2.46-2.34 (m, 1 H), 2.05-1.91 (m, 1 H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 178.88, 59.66, 47.88, 30.36, 29.93. All measured values were identical to those in the literature.[2]

5,6-Dichlorohexanoic acid (8)

Colorless oil, 805 mg, 87% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 4.11-3.99 (m, 1 H), 3.78 (dd, *J* = 11.4, 5.1 Hz, 1 H), 3.65 (dd, *J* = 11.4, 7.8 Hz, 1 H), 2.43 (t, *J* = 6.9 Hz, 2 H), 2.15-1.87 (m, 2 H), 1.86-1.67 (m, 2 H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 179.64, 60.41, 47.90, 34.09, 33.18, 20.94. All measured values were identical to those in the literature.[3]

trans-3,4-Dichlorocyclopentanecarboxylic acid (11)

White solid, 778 mg, 85% yield. ^{1}H NMR ($CDCl_3$, 300 MHz) δ 4.43-4.40 (m, 1 H, H-C-3 or H-C-4), 4.37-4.32 (m, 1 H, H-C-4 or H-C-3), 3.39-3.24 (m, 1 H, H-C-1), 2.92-2.76 (m, 2 H, H-C-2 and H-C-5), 2.48-2.28 (m, 2 H, H′-C-2 and H′-C-5). ^{13}C NMR ($CDCl_3$, 75 MHz) δ 180.60 (COOH), 65.39, 64.17 (C-3 and C-4), 40.21 (C-1), 36.49, 36.39 (C-2 and C-5). HRMS (ESI), m/z $[M - H]^-$ calcd for $C_6H_7Cl_2O_2$: 180.9828; found: 180.9826.

(*E*)-2,3-Dichloropropyl but-2-enoate (16)

Colorless oil, 788 mg, 80% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.04 (dq, *J* = 15.6, 6.9 Hz, 1 H), 5.88 (dq, *J* = 15.6, 1.5 Hz, 1 H), 4.47 (dd, *J* = 12.0, 5.1 Hz, 1 H), 4.42 (dd, *J* = 12.0, 5.1 Hz, 1 H), 4.31-4.23 (m, 1 H), 3.79 (d, *J* = 6.0 Hz, 2 H), 1.91 (dd, *J* = 6.9, 1.8 Hz, 3 H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 165.79, 146.41, 121.86, 64.11, 57.04, 44.88, 18.24. All measured values were identical to those in the literature.[4]

General Procedure for dichlorination of olefins or olefins with hydroxy or carbonyl group using Ph_2SO and $(COCl)_2$.

To a solution of oxalyl chloride (0.51 mL, 6.0 mmol, 1.2 equiv) in CH_2Cl_2 (10 mL) cooled at -78 °C was added dropwise a solution of diphenyl sulfoxide (1.21 g, 6.0 mmol, 1.2 equiv) in CH_2Cl_2 (10 mL) under the atmosphere of nitrogen. After 10 min, a solution of substrate (5 mmol, 1.0 equiv) in CH_2Cl_2 (10 mL) was added. The mixture was then allowed to warm up to the temperature and stirred until TLC showed the reaction completed. Distilled water (30 mL) was added dropwise at 0 °C. After stirring for 10 min, the organic layer was separated and successively washed with brine. The combined organic extracts were dried (Na_2SO_4), filtered, and concentrated in vacuum. For **16**, **34**, **35**, and **37**, the residue was purified by flash chromatography (silica gel, petroleum ether/ethyl acetate = 30:1 for **16**, and 10:1 for **34**, **35** and **37**). For **17**, **19**, **21**, **24**, **26**, **28** and **32**, the corresponding dichloroalkanes and the byproduct diphenyl sulfide cannot be separated by chromatography due to the similar polarity. The problem can be solved by oxidizing diphenyl sulfide to diphenyl sulfoxide to differentiate the polarity. The residue was dissolved in CH_3CN (20 mL), then aqueous 30% H_2O_2 (1.5 mL, 15 mmol, 3.0 equiv) and TMSCl (0.96 mL, 7.5 mmol, 1.5 equiv) were added. The mixture was stirred at room temperature for 30 min. After disappearance of diphenyl sulfide, the reaction mixture was quenched by adding water (20 mL), extracted with CH_2Cl_2 (3 x 20 mL), and the extract washed with brine, dried (Na_2SO_4), filtered, and concentrated in vacuum. Purification by flash chromatography (silica gel, petroleum ether/ethyl acetate = 20:1) afforded the corresponding dichloroalkanes.

***trans*-1,2-Dichlorocyclohexane (18)**

Colorless oil, 631 mg, 83% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 4.08-3.94 (m, 2 H), 2.40-2.26 (m, 2 H), 1.84-1.65 (m, 4 H), 1.50-1.34 (m, 2 H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 63.30, 33.58, 23.20. All measured values were identical to those in the literature.[5]

1,2-Dichlorodecane (20)

Colorless oil, 966 mg, 92% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 4.03 (dddd, *J* = 9.0, 7.5, 5.1, 3.9 Hz, 1 H), 3.76 (dd, *J* = 11.1, 5.1 Hz, 1 H), 3.65 (dd, *J* = 11.1, 7.5 Hz, 1 H), 1.99 (dddd, *J* = 13.8, 9.9, 5.4, 3.9 Hz, 1 H), 1.78-1.64 (m, 1 H), 1.61-1.48 (m, 1 H), 1.48-1.38 (m, 1 H), 1.36-1.24 (m, 10 H), 0.88 (t, *J* = 6.9 Hz, 3 H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 61.41, 48.41, 35.21, 31.97, 29.51, 29.33, 29.13, 25.96, 22.80, 14.24. All measured values were identical to those in the literature.[6]

1-(2,3-Dichloropropyl)benzene (22) and 1-(1,3-dichloropropan-2-yl)benzene (23)

1-Allylbenzene (**21**) gave a mixture of two isomers (**22** and **23**) with a ratio of 1:0.25. Colorless oil, 895 mg, 93% yield.

1-(2,3-Dichloropropyl)benzene (**22**): ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.33-7.14 (m, 5 H), 4.23-4.14 (m, 1 H), 3.66 (dd, *J* = 11.4, 4.8 Hz, 1 H), 3.58 (dd, *J* = 11.4, 6.9 Hz, 1 H), 3.23 (dd, *J* = 14.1,

5.7 Hz, 1 H), 2.99 (dd, *J* = 14.1, 7.2 Hz, 1 H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 136.44, 129.69, 128.72, 127.34, 61.11, 47.60, 41.17. All measured values were identical to those in the literature.[7]

1-(1,3-Dichloropropan-2-yl)benzene (**23**): ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.33-7.14 (m, 5 H), 3.85 (dd, *J* = 11.1, 6.9 Hz, 2 H), 3.78 (dd, *J* = 11.1, 6.0 Hz, 2 H), 3.27 (quin., *J* = 6.3 Hz, 1 H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 138.94, 128.91, 128.03, 127.96, 49.51, 46.02. All measured values were identical to those in the literature.[8]

1-(1,2-Dichloroethyl)benzene (25)

Colorless oil, 621 mg, 71% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.44-7.36 (m, 5 H), 5.01 (dd, *J* = 7.8, 6.6 Hz, 1 H), 4.01 (dd, *J* = 11.4, 6.6 Hz, 1 H), 3.94 (dd, *J* = 11.4, 7.8 Hz, 1 H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 138.14, 129.29, 128.95, 127.53, 61.89, 48.48. All measured values were identical to those in the literature.[5]

2-(1,2-Dichloroethyl)naphthalene (27)

White solid, 821 mg, 73% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.92-7.83 (m, 4 H), 7.57-7.51 (m, 3 H), 5.18 (dd, *J* = 8.1, 6.6 Hz, 1 H), 4.10 (dd, *J* = 11.4, 6.6 Hz, 1 H), 4.04 (dd, *J* = 11.4, 8.1 Hz, 1 H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 135.29, 133.66, 133.09, 129.12, 128.31, 127.92, 127.41, 126.99, 126.82, 124.30, 62.18, 48.30. All measured values were identical to those in the literature.[5]

***anti*-1,2-Dichloro-1-phenylpropane (29) and *syn*-1,2-dichloro-1-phenylpropane (30)**

(*Z*)-1-(Prop-1-enyl)benzene (**28**) gave a mixture of two dichloro-isomers (**29** and **30**) with a ratio of 1:0.4 (705 mg, 75% yield) and one monochloro-isomer (**31**) (61 mg, 8% yield). (*E*)-1-(Prop-1-enyl)benzene (**32**) gave a mixture of two dichloro-isomers (**29** and **30**) with a ratio of 1:0.23 (colorless oil, 770 mg, 82% yield) and one monochloro-isomer (**31**) (colorless oil, 83 mg, 11% yield).

anti-1,2-Dichloro-1-phenylpropane (**29**): ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.34-7.22 (m, 5 H), 4.83 (d, *J* = 7.8 Hz, 1 H), 4.30 (dq, *J* = 7.8, 6.3 Hz, 1 H), 1.62 (d, *J* = 6.3 Hz, 3 H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 138.77, 128.90, 128.64, 127.87, 67.55, 60.32, 22.28. All measured values were identical to those in the literature.[5]

syn-1,2-Dichloro-1-phenylpropane (**30**): ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.35-7.26 (m, 5 H), 4.92 (d, *J* = 6.0 Hz, 1 H), 4.38-4.27 (m, 1 H), 1.38 (d, *J* = 6.6 Hz, 3 H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 137.50, 128.98, 128.55, 128.22, 67.57, 61.35, 21.82. All measured values were identical to those in the literature.[5]

(*E*)-1-Phenyl-2-chloro-1-propene (**31**): ^{1}H NMR ($CDCl_3$, 300 MHz) δ 7.29-7.24 (m, 2 H, H-phenyl), 7.20-7.12 (m, 3 H, H-phenyl), 6.63 (s, 1 H, H-CHPh), 2.20 (d, *J* = 1.2 Hz, 3 H, CH_3). ^{13}C NMR ($CDCl_3$, 75 MHz) δ 136.06 (C1-phenyl), 133.04 (C-Cl), 128.62, 128.55 (C-*o*-phenyl and C-*m*-phenyl), 128.22 (C-CHCCl), 127.24 (C-*p*-phenyl), 22.64 (CH_3). HRMS (EI), m/z $[M]^{+\cdot}$ calcd for C_9H_9Cl: 152.0393; found: 152.0395.

***anti*-1,2-Dichlorohexan-3-ol (34) and *syn*-1,2-dichlorohexan-3-ol (35)**

1,2-Dichlorohexan-3-ol was obtained as a mixture of two isomers (**34** + **35**) with a ratio of 1:2.2. Colorless oil, 727 mg, 85% yield.

anti-1,2-Dichlorohexan-3-ol (**34**): ^{1}H NMR ($CDCl_3$, 300 MHz) δ 4.10 (dt, *J* = 5.7, 5.7 Hz, 1 H, H-C-2), 3.98-3.92 (m, 1 H, H-C-3), 3.87 (dd, *J* = 13.8, 5.7 Hz, 1 H, H-C-1), 3.83 (dd, *J* = 13.8, 5.7

Hz, 1 H, H′-C-1), 1.95 (s, 1 H, -OH), 1.70-1.49 (m, 3 H, H-C-4 and H-C-5), 1.47-1.32 (m, 1 H, H′-C-5), 0.97 (t, J = 7.2 Hz, 3 H, C-6). ^{13}C NMR ($CDCl_3$, 75 MHz) δ 72.42 (C-3), 65.55 (C-2), 45.59 (C-1), 34.77 (C-4), 18.93 (C-5), 14.02 (C-6). HRMS (ESI), m/z $[M + Na]^+$ calcd for $C_6H_{12}Cl_2NaO$: 193.0157; found: 193.0157.

syn-1,2-Dichlorohexan-3-ol (**35**): ^{1}H NMR ($CDCl_3$, 300 MHz) δ 4.07-4.01 (m, 2 H, H-C-2 and H-C-3), 3.92 (dd, J = 10.8, 8.4 Hz, 1 H, H-C-1), 3.75 (dd, J = 10.8, 5.1 Hz, 1 H, H′-C-1), 1.73-1.60 (m, 2 H, -OH and H-C-4), 1.59-1.34 (m, 3 H, H′-C-4 and H-C-5), 0.96 (t, J = 7.2 Hz, 3 H, H-C-6). ^{13}C NMR ($CDCl_3$, 75 MHz) δ 69.51 (C-3), 65.67 (C-2), 44.72 (C-1), 37.15 (C-4), 18.94 (C-5), 14.01 (C-6). HRMS (EI), m/z $[M - H]^+$ calcd for $C_6H_{11}Cl_2O$: 169.0182; found: 169.0181.

anti-2,3-Dichloro-1-hexanol (37)

Colorless oil, 761 mg, 89% yield. ^{1}HNMR (300 MHz, $CDCl_3$) δ 0.96 (t, J = 7.5 Hz, 3 H), 1.40-1.54 (m, 1 H), 1.56-1.70 (m, 1H), 1.70-1.84 (m, 1H), 1.90-2.10 (m, 2H), 4.00-4.17 (m, 4H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 66.46, 64.52, 61.53, 36.98, 18.95, 13.40. All measured values were identical to those in the literature.[9]

anti-3,4-Dichloro-1-hexanol (39)

Light yellow oil, 795 mg, 93% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.01 (t, J = 7.1 Hz, 3 H), 1.70-2.04 (m, 3 H), 2.23 (dddd, J = 14.7, 8.1, 6.9, 2.7 Hz, 1 H), 2.49 (s, 1 H), 3.78 (m, 2 H), 3.93 (ddd, J = 9.3, 6.3, 3.3 Hz, 1 H), 4.16 (ddd, J = 10.5, 6.3, 2.7 Hz, 1 H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 67.92, 62.02, 59.20, 37.03, 28.11, 10.60. All measured values were identical to those in the literature.[10]

syn-3,4-Dichloro-1-hexanol (41)

Colorless oil, 778 mg, 91% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.00 (t, J = 7.5 Hz, 3 H), 1.60 (s, 1 H), 1.72-2.15 (m, 4 H), 3.78 (dd, J = 7.2, 4.5 Hz, 2 H), 3.92 (ddd, J = 9.3, 4.2, 2.7 Hz, 1 H), 4.29 (ddd, J = 9.9, 3.6, 2.7 Hz, 1 H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 67.46, 61.63, 59.36, 37.49, 28.19, 11.38. All measured values were identical to those in the literature.[10]

(1*R,3*S**,4*S**)-3,4-Dichlorocyclohexylmethanol (43)**

Colorless oil, 823 mg, 90% yield. ^{1}H NMR ($CDCl_3$, 300 MHz) δ 4.40 (m, 1 H, H-C-2), 4.34 (q, J = 3.0 Hz, 1 H, H-C-1), 3.53 (d, J = 5.7 Hz, 2 H, H-C$\underline{H}_2$OH), 2.35 (dddd, J = 15,3, 12.3, 4.2, 3.0 Hz, 1 H, H′-C-6), 2.00-2.14 (m, 2 H, H′-C-3 and H-C-4), 1.84-1.98 (m, 2 H, H-C-3 and H-C-6), 1.50-1.70 (m, 2 H, H-C-5), 1.45 (br, 1 H, OH). ^{13}C NMR ($CDCl_3$, 75 MHz) δ 66.93 (C-$\underline{C}$H$_2$OH), 59.81 (C-1), 59.74 (C-2), 33.33 (C-4), 30.63 (C-3), 27.16 (C-6), 22.33 (C-5). HRMS (EI), m/z $[M - H_2O]^+$ calcd for $C_7H_{10}Cl_2$: 164.0154; found: 164.0152.

1-Mesyloxy-3,4-dichlorobutane (45)

Colorless oil, 994 mg, 90% yield. ^{1}H NMR ($CDCl_3$, 300 MHz) δ 4.41 (m, 2 H, H-C-1), 4.23 (m, 1 H, H-C-3), 3.82 (dd, J = 11.7, 5.1 Hz, 1 H, H-C-4), 3.70 (dd, J = 11.7, 6.9 Hz, 1 H, H′-C-4), 3.03 (s, 3 H, C$\underline{H}_3$ (MsO)), 2.48 (m, 1 H, H-C-2), 2.05 (1 H, H′-C-2). ^{13}C NMR ($CDCl_3$, 75 MHz) δ 66.10 (C-1), 56.46 (C-3), 47.96 (C-4), 37.25 ($\underline{C}$H$_3$ (MsO)), 34,53 (C-2). HRMS (ESI), m/z $[M + Na]^+$ calcd for $C_5H_{10}Cl_2NaO_3S$: 242.9620; found: 242.9621.

5,6-Dichloro-2-hexanone (47)

Light yellow oil, 835 mg, 87% yield. ^{1}H NMR ($CDCl_3$, 300 MHz) δ 4.12 (dddd, J = 9.9, 7.2, 5.1, 3.0 Hz, 1 H, H-C-5), 3.78 (dd, J = 11.4, 5.1 Hz, 1 H, H′-C-6), 3.66 (dd, J = 11.4, 7.2 Hz, 1 H, H-C-

6), 2.61-2.80 (m, 2 H, H-C-3), 2.30-2.42 (m, 1 H, H′-C-4), 2.19 (s, 3 H, H-C-1), 1.83-1.97 (m, 1 H, H-C-4). ^{13}C NMR ($CDCl_3$, 75 MHz) δ 207.04 (C-2), 60.30 (C-5), 48.20 (C-6), 39.58 (C-3), 29.99 (C-1), 29.01 (C-4). HRMS (ESI), m/z $[M + Na]^+$ calcd for $C_6H_{10}Cl_2NaO$: 191.0001; found: 191.0005.

10,11-Dichloro-1-undecanal (49)

Light yellow oil, 1111 mg, 93% yield. ^{1}H NMR ($CDCl_3$, 300 MHz) δ 9.71 (t, J = 2.1 Hz, 1 H, H-C-1), 3.99 (dddd, J = 9.0, 7.2, 5.1, 3.9 Hz, 1 H, H-C-10), 3.71 (dd, J = 11.4, 5.1 Hz, 1 H, H-C-11), 3.61 (dd, J = 11.4, 7.2 Hz, 1 H, H-C-11), 2.38 (td, J = 7.2, 2.1 Hz, 2 H, H-C-2), 1.91 (m, 1 H, H′-C-9), 1.67 (m, 1 H, H-C9), 1.20~1.62 (m, 12 H, H-C3~8). ^{13}C NMR ($CDCl_3$, 75 MHz) δ 202.62 (C-1), 61.09 (C-10), 48.15 (C-11), 43.71 (C-2), 34.87 (C-9), 29.05, 29.00, 28.93, 28.72 (C-4~7), 25.62 (C-8), 21.87 (C-3). HRMS (ESI), m/z $[M + Na]^+$ calcd for $C_{11}H_{20}Cl_2NaO$: 261.0783; found: 261.0776.

***anti*-2,3-Dichloro-1,3-diphenylpropan-1-one (51)**

White solid, 767 mg, 55% yield. ^{1}H NMR ($CDCl_3$, 300 MHz) δ 8.10 (m, 2 H), 7.67 (m, 1 H), 7.60-7.50 (m, 4 H), 7.48-7.40 (m, 3 H), 5.52 (d, J = 10.5 Hz, 1 H), 5.48 (d, J = 10.5 Hz, 1 H). ^{13}C NMR ($CDCl_3$, 75 MHz) δ 191.31, 137.04, 134.65, 134.27, 129.34, 128.98, 128.77, 128.31, 60.03, 56.96. All measured values were identical to those in the literature.[11]

(*Z*)-2-Chloro-1,3-diphenylprop-2-en-1-one (52)

Light yellow oil, 327 mg, 27% yield. ^{1}H NMR ($CDCl_3$, 300 MHz) δ 7.88-7.76 (m, 4 H), 7.57 (m, 1 H), 7.53-7.40 (m, 6 H). ^{13}C NMR ($CDCl_3$, 75 MHz) δ 191.33, 139.83, 136.86, 132.90, 132.58, 130.72, 130.50, 130.44, 129.58, 128.66, 128.51. All measured values were identical to those in the literature.[12]

***anti*-2,3-Dichloro-1-phenyl-3-*p*-methoxyphenylpropan-1-one (54)**

White solid, 1250 mg, 81% yield. ^{1}H NMR ($CDCl_3$, 300 MHz) δ 8.09 (m, 2 H), 7.66 (m, 1 H), 7.55 (m, 2 H), 7.45 (d, J = 8.7 Hz, 2 H), 6.96 (d, J = 8.7 Hz, 2 H), 5.50 (d, J = 10.5 Hz, 1 H), 5.46 (d, J = 10.5 Hz, 1 H), 3.84 (s, 3 H). ^{13}C NMR ($CDCl_3$, 75 MHz) δ 191.43, 160.22, 134.70, 134.21, 129.54, 129.04, 128.95, 114.13, 60.07, 57.12, 55.31. All measured values were identical to those in the literature.[11]

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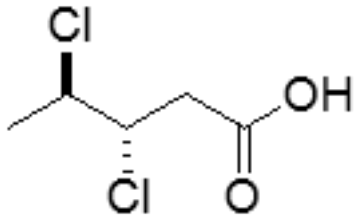

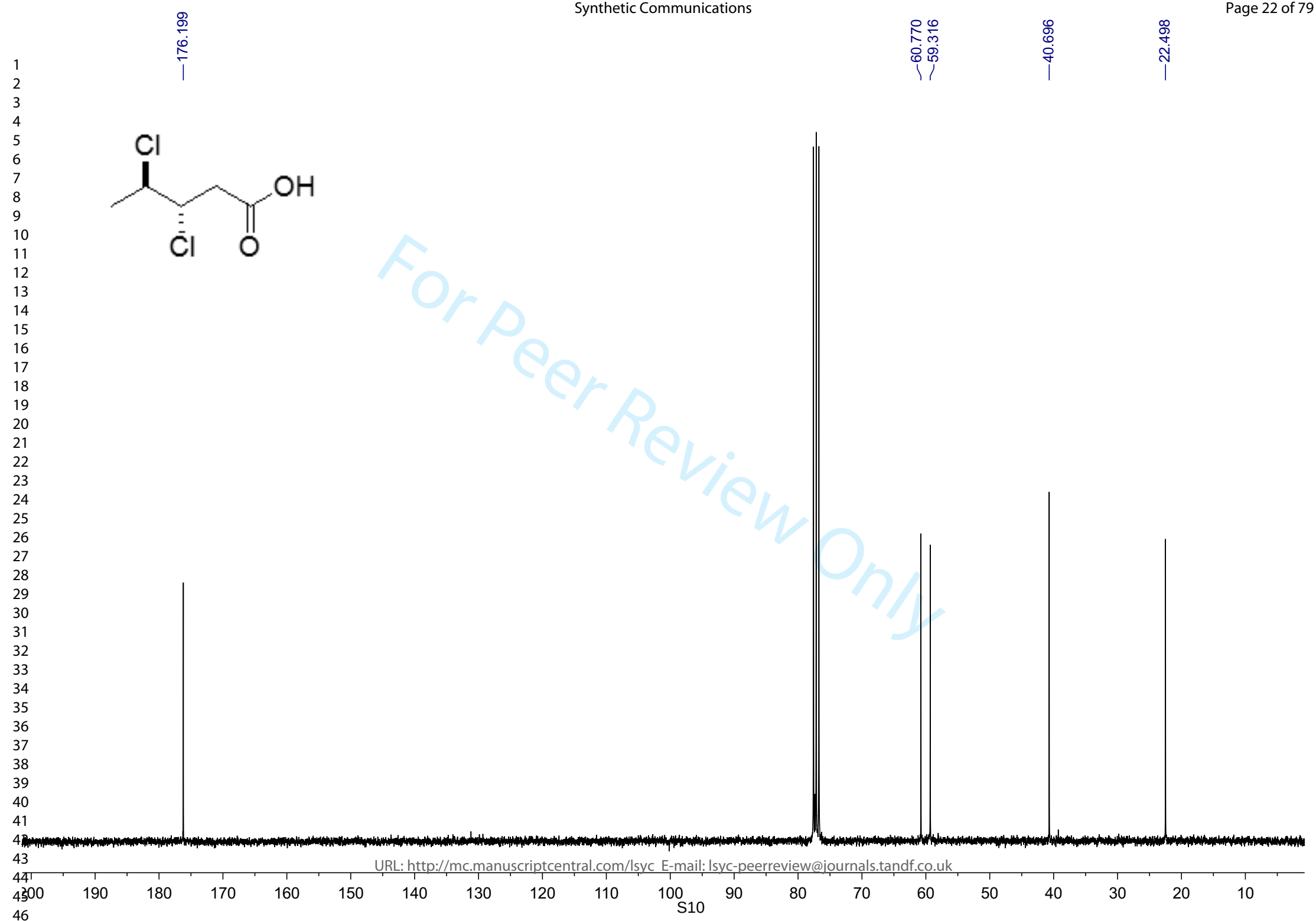

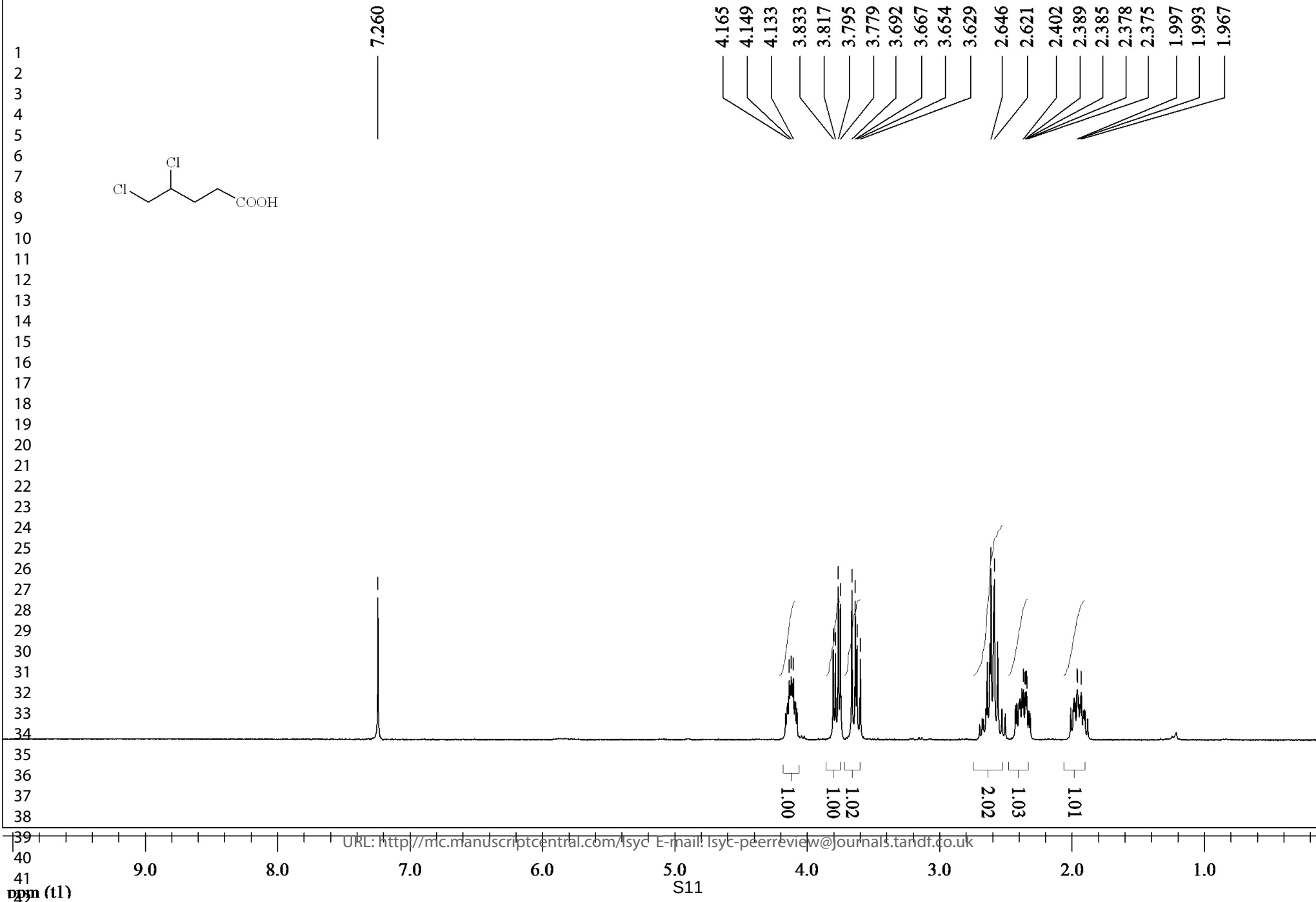
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2.385
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2.375
1.997
1.993
1.967
Cl
Cl
COOH
1.00
1.00
1.02
2.02
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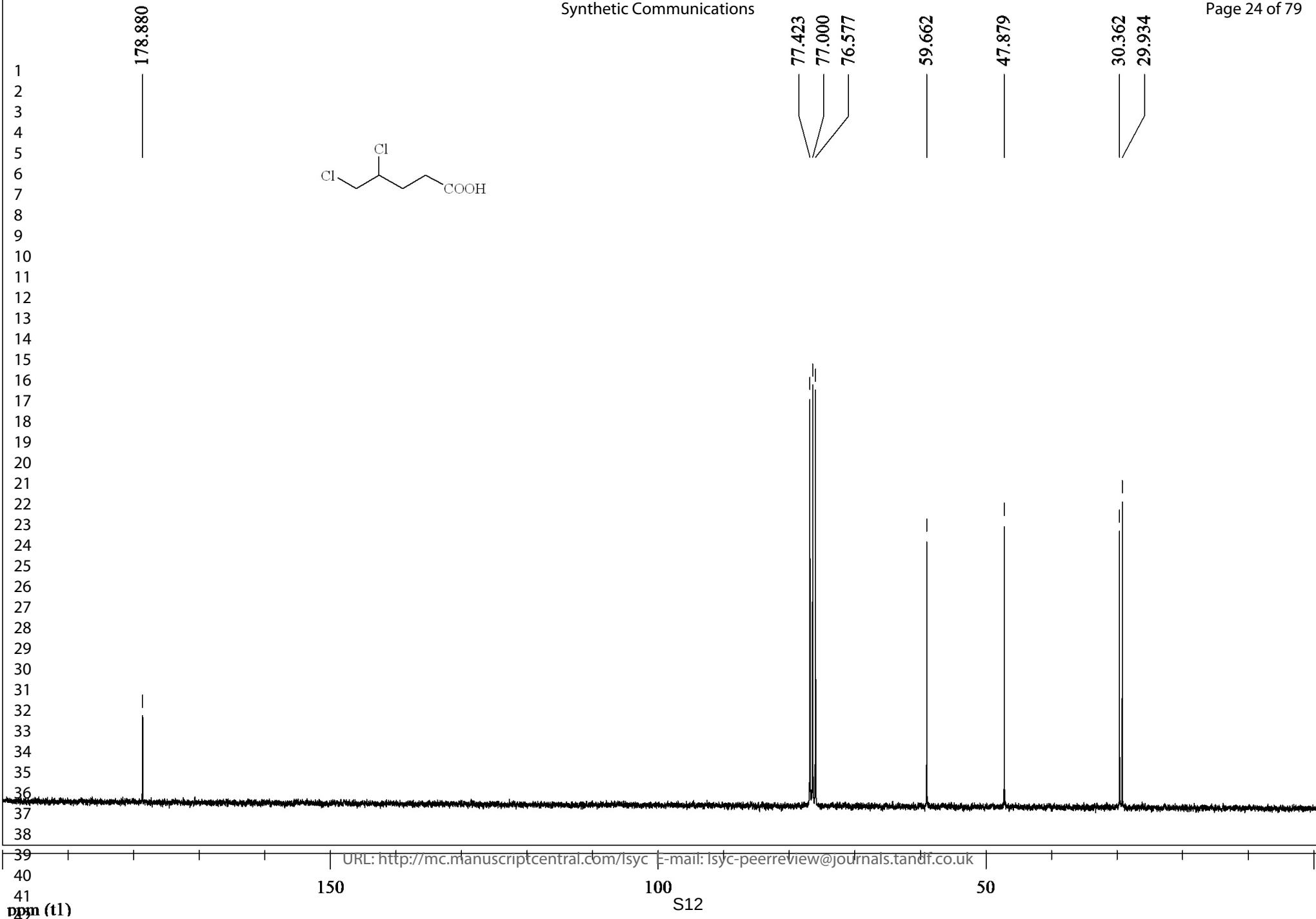
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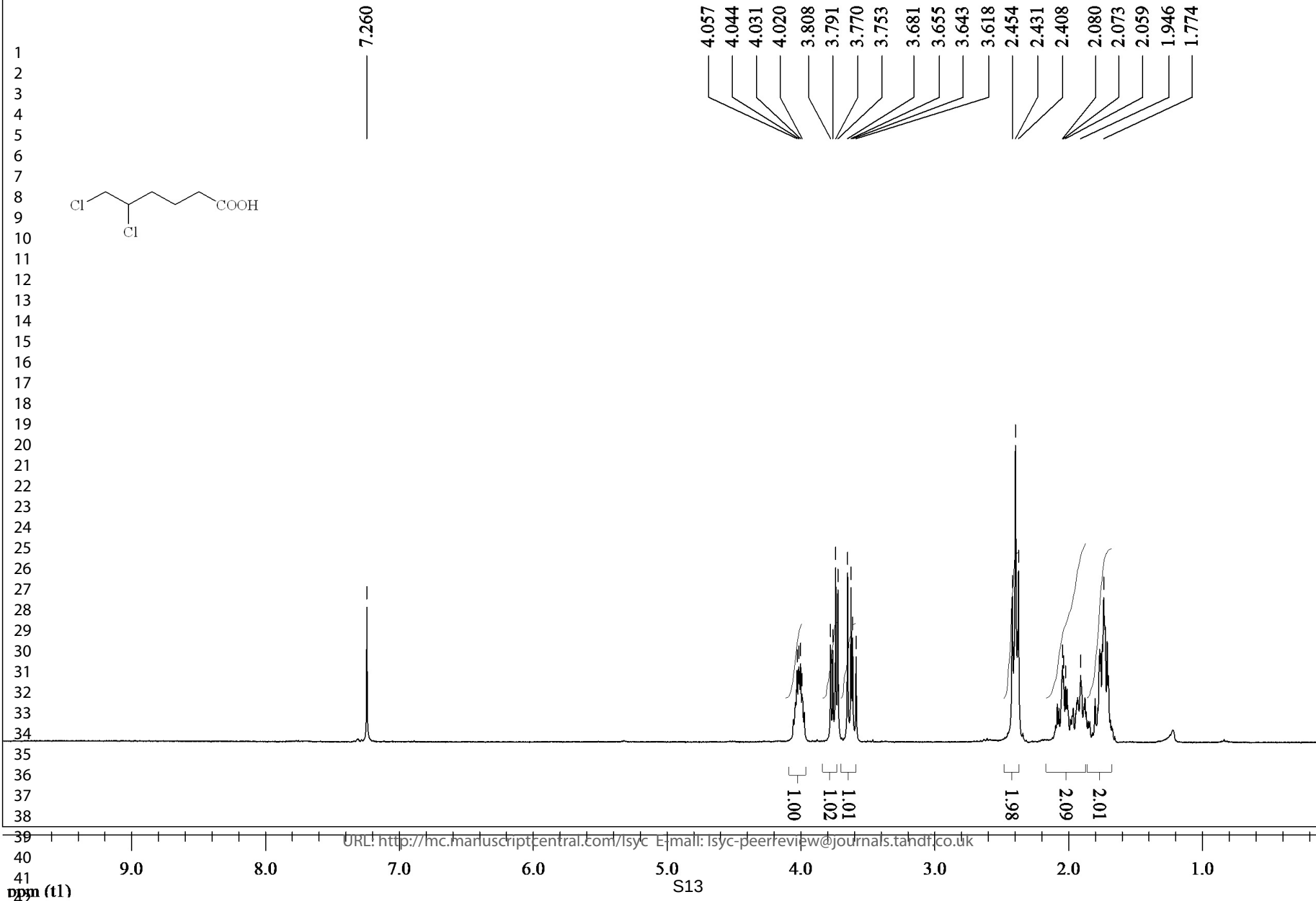
ppm (t1)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COOH
Cl
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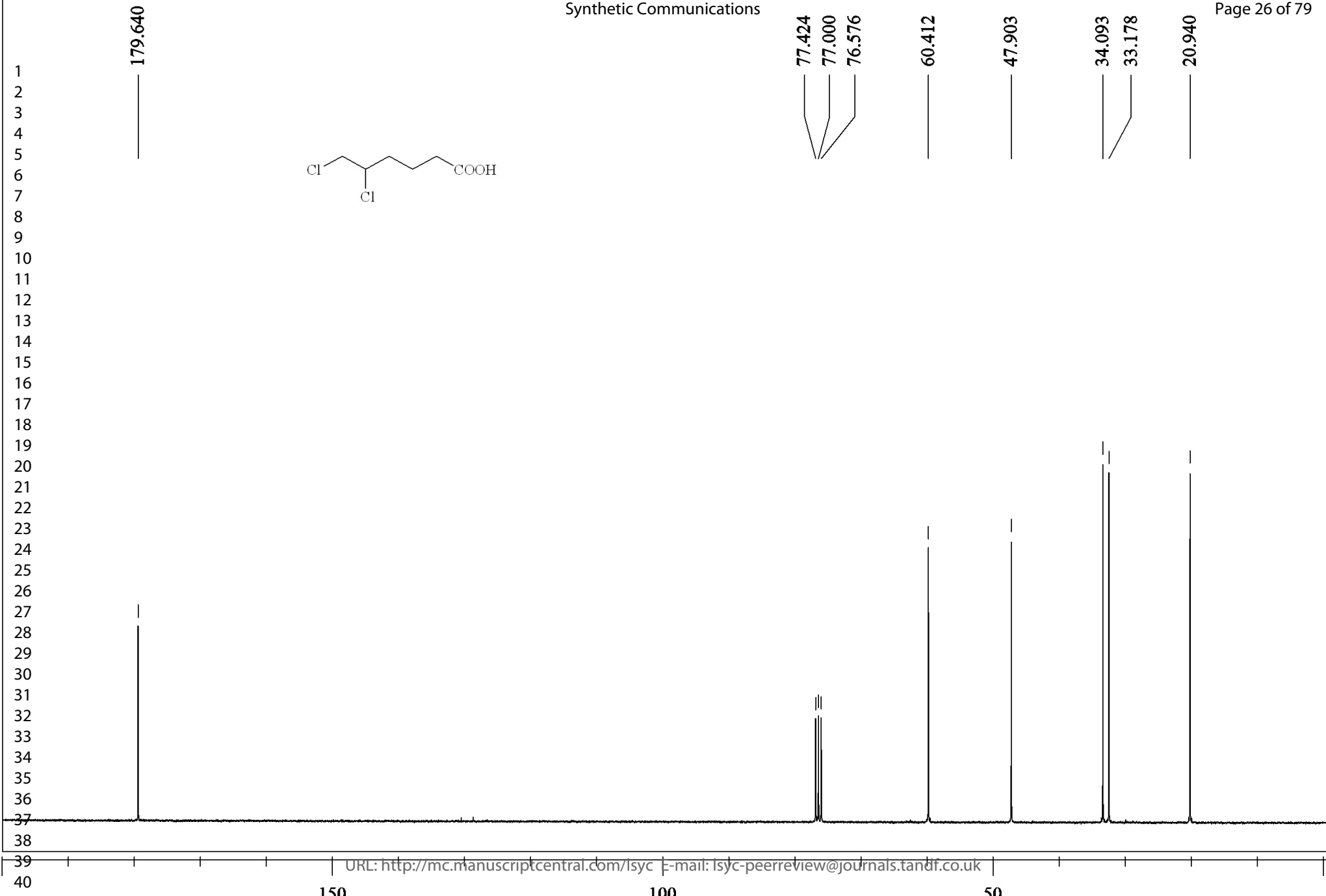
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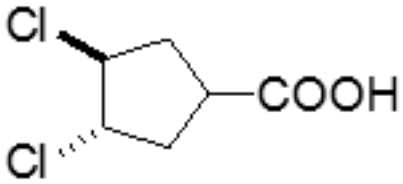
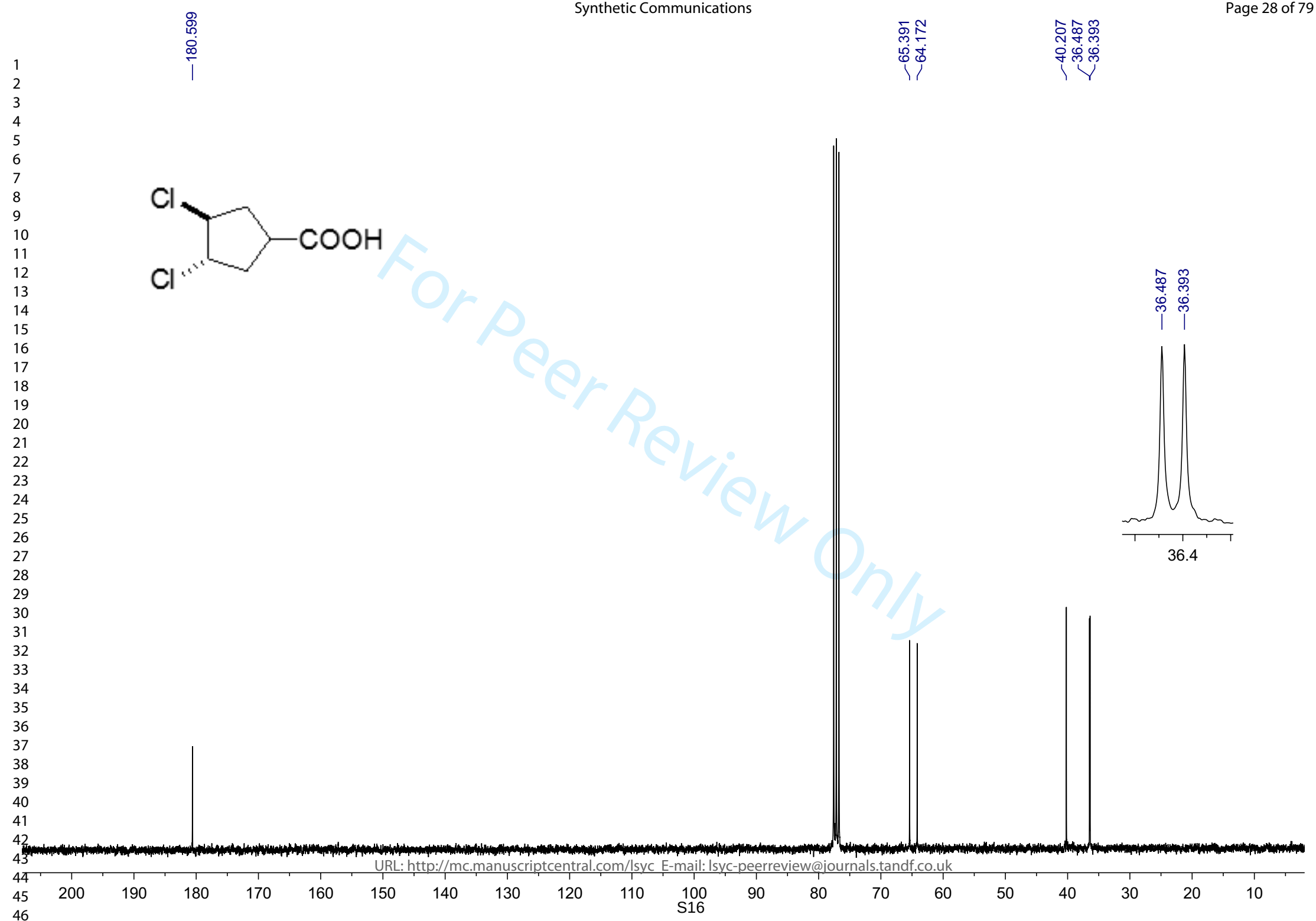
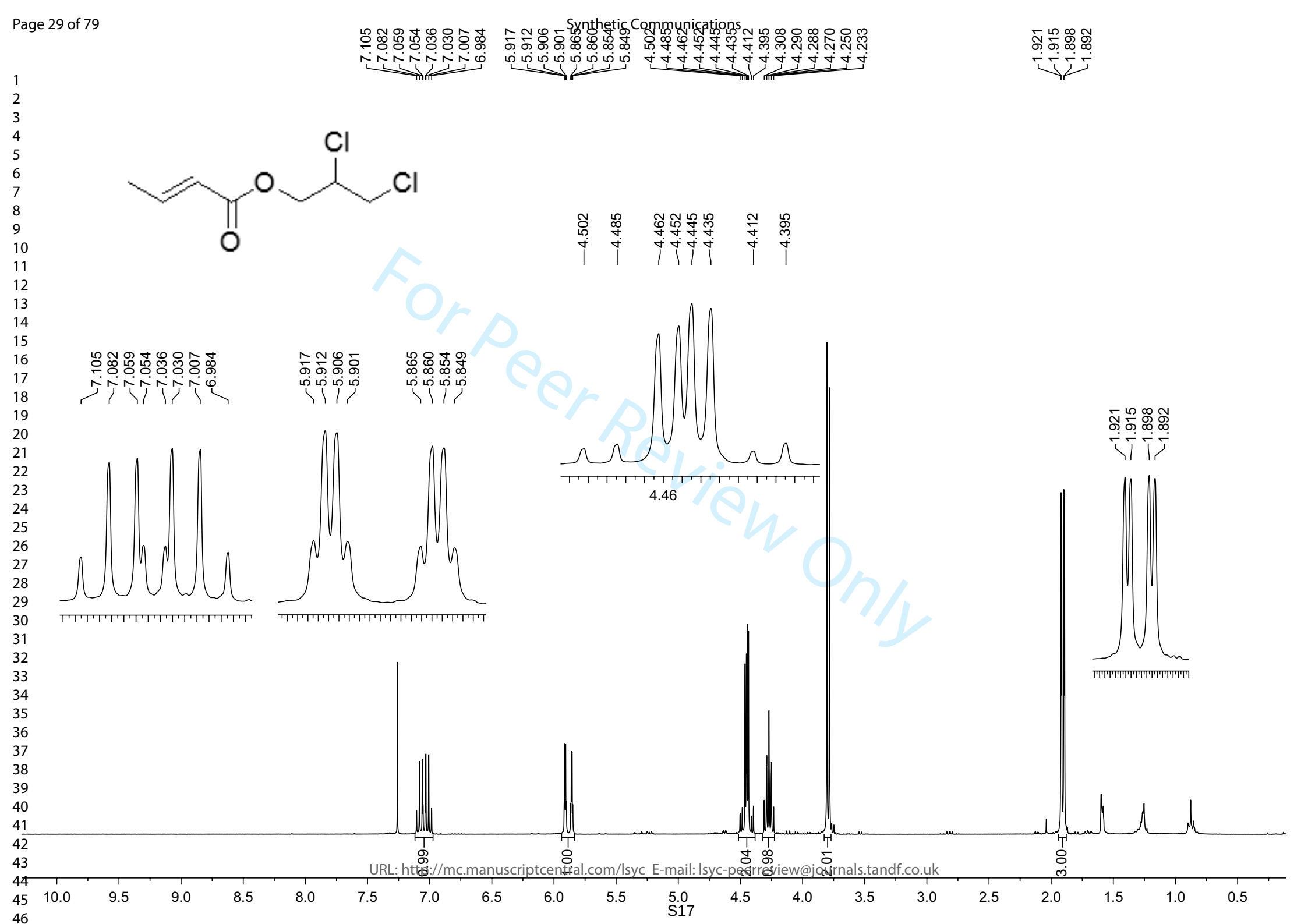
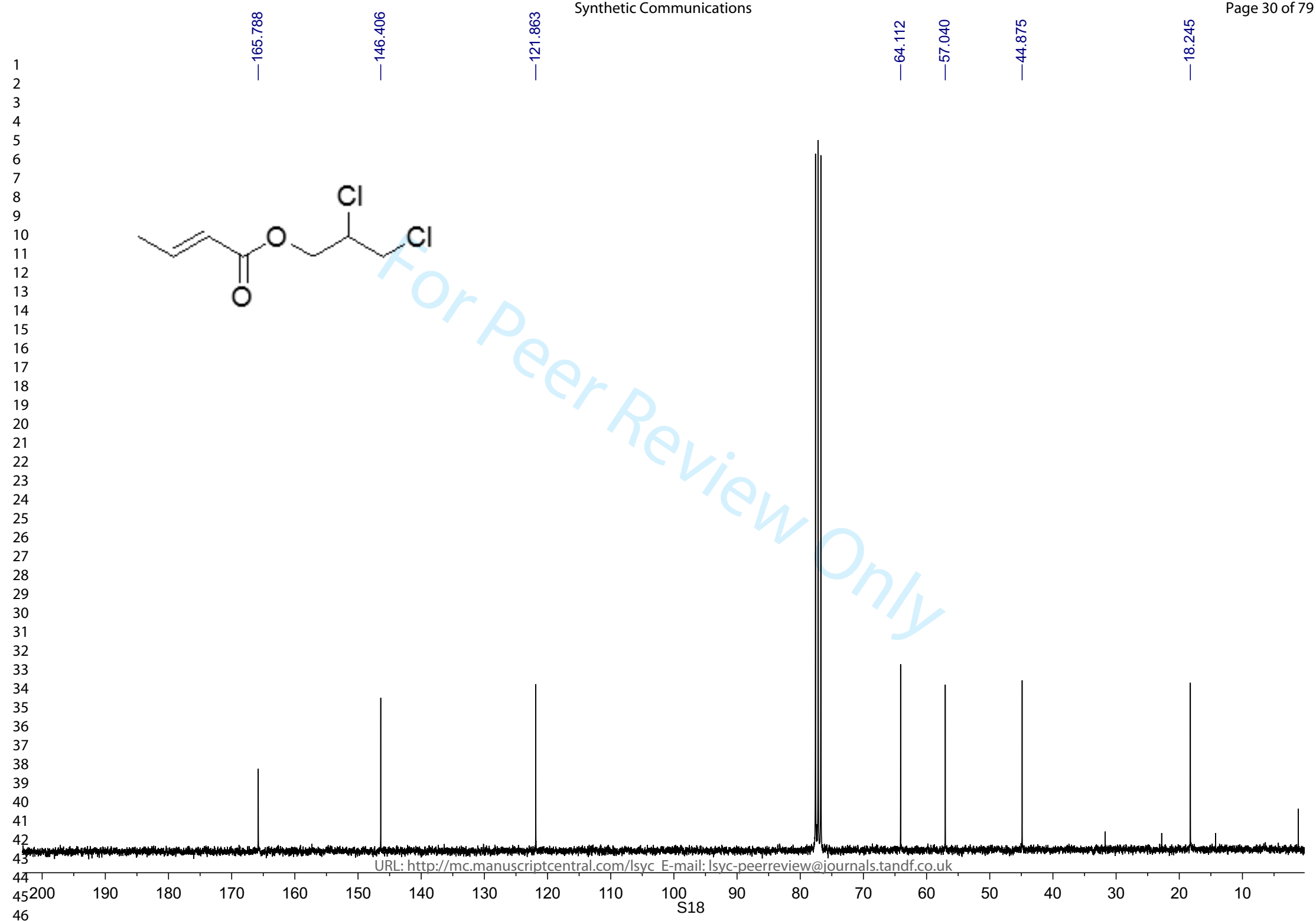
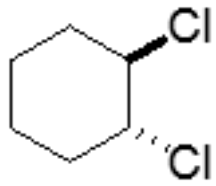
ppm (t1)

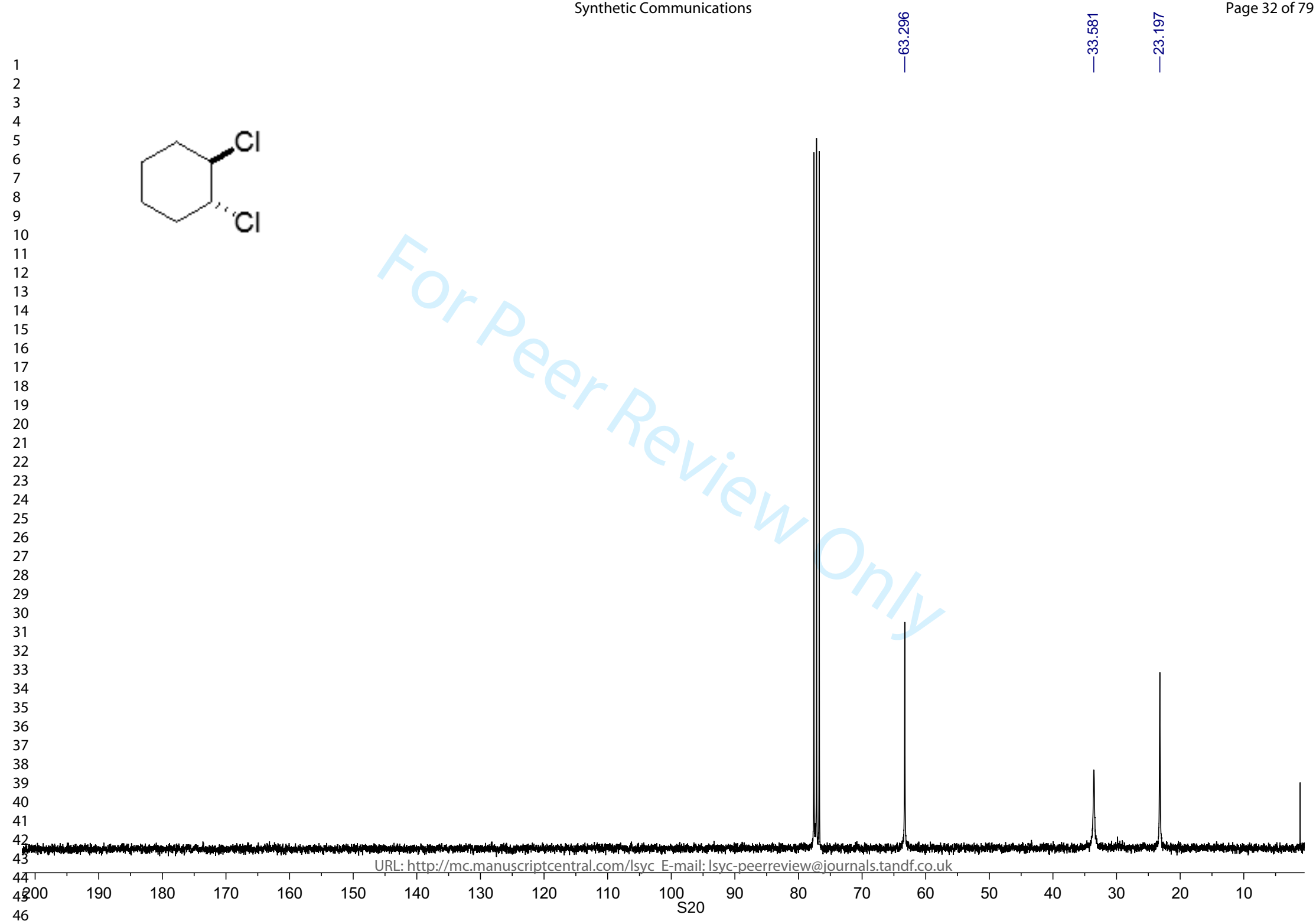


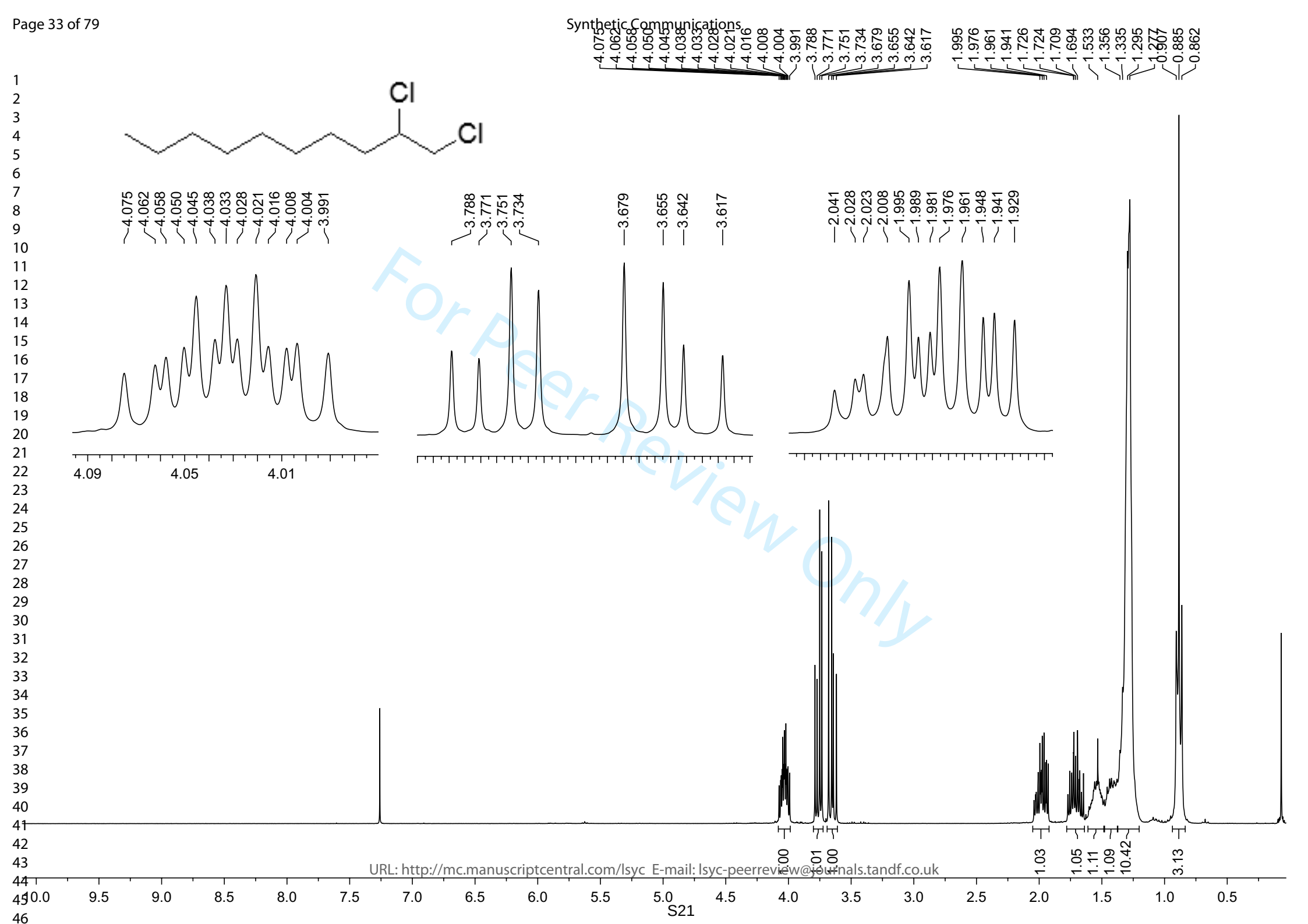


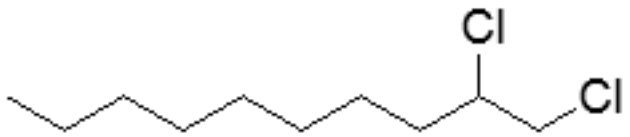


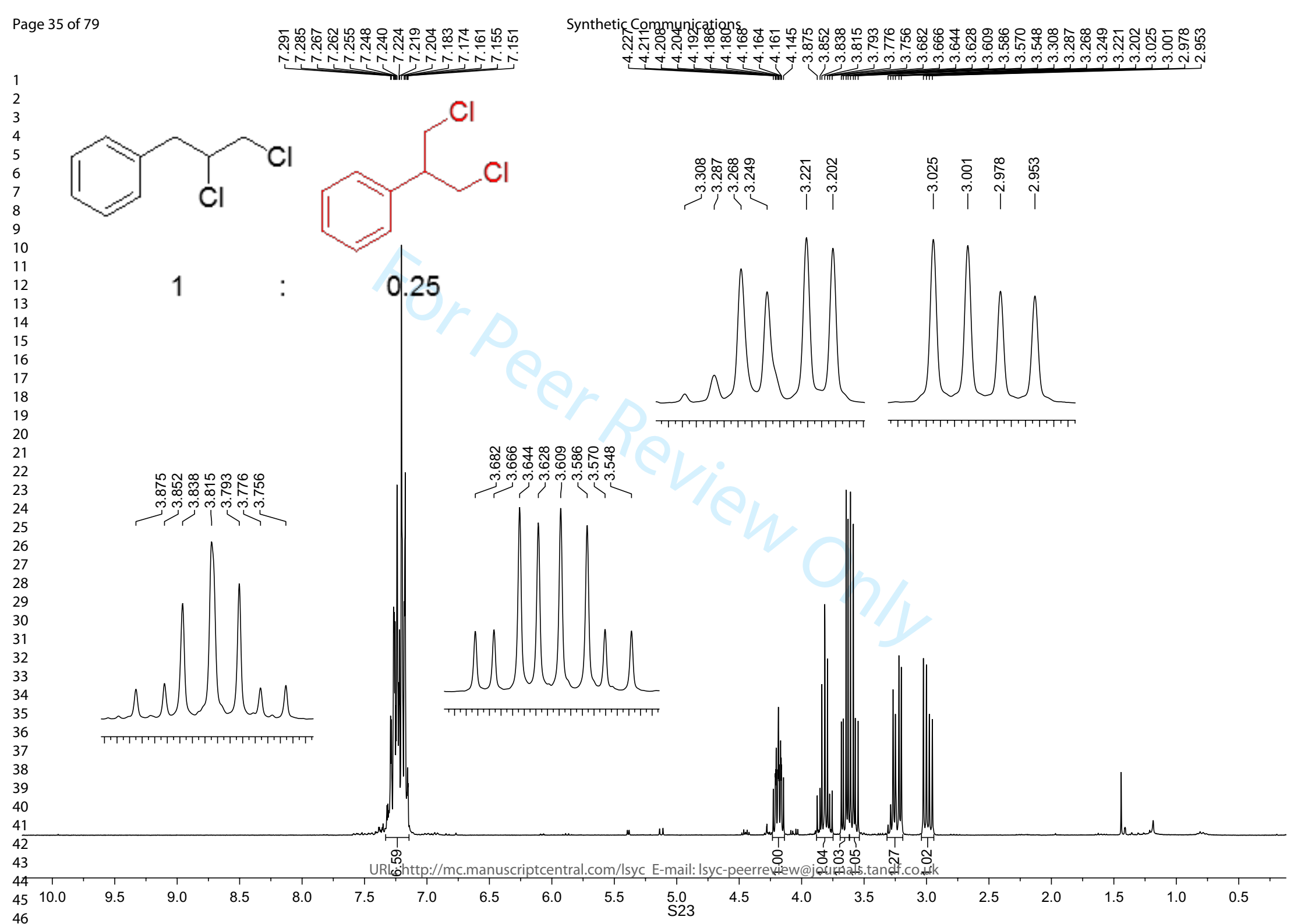


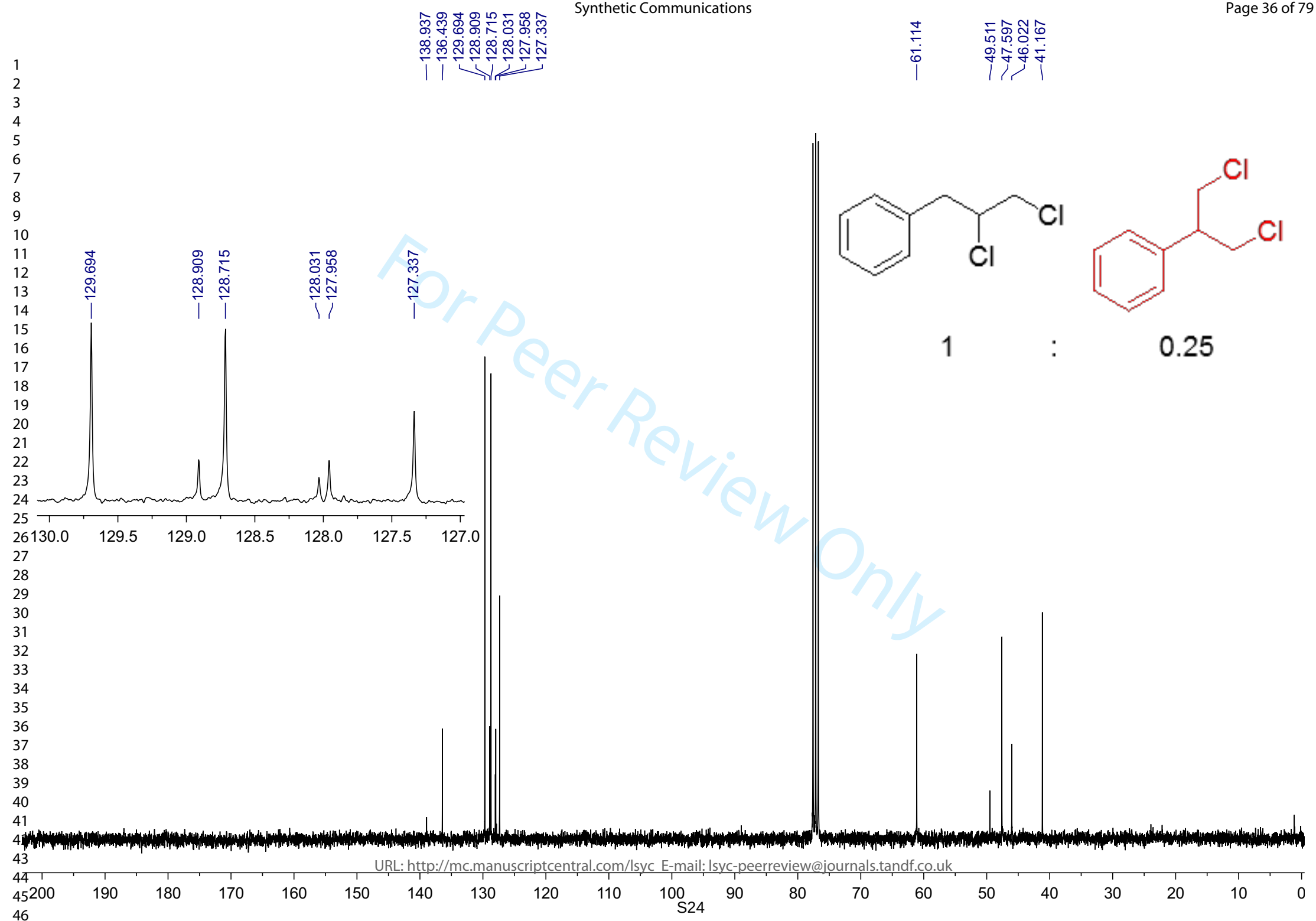


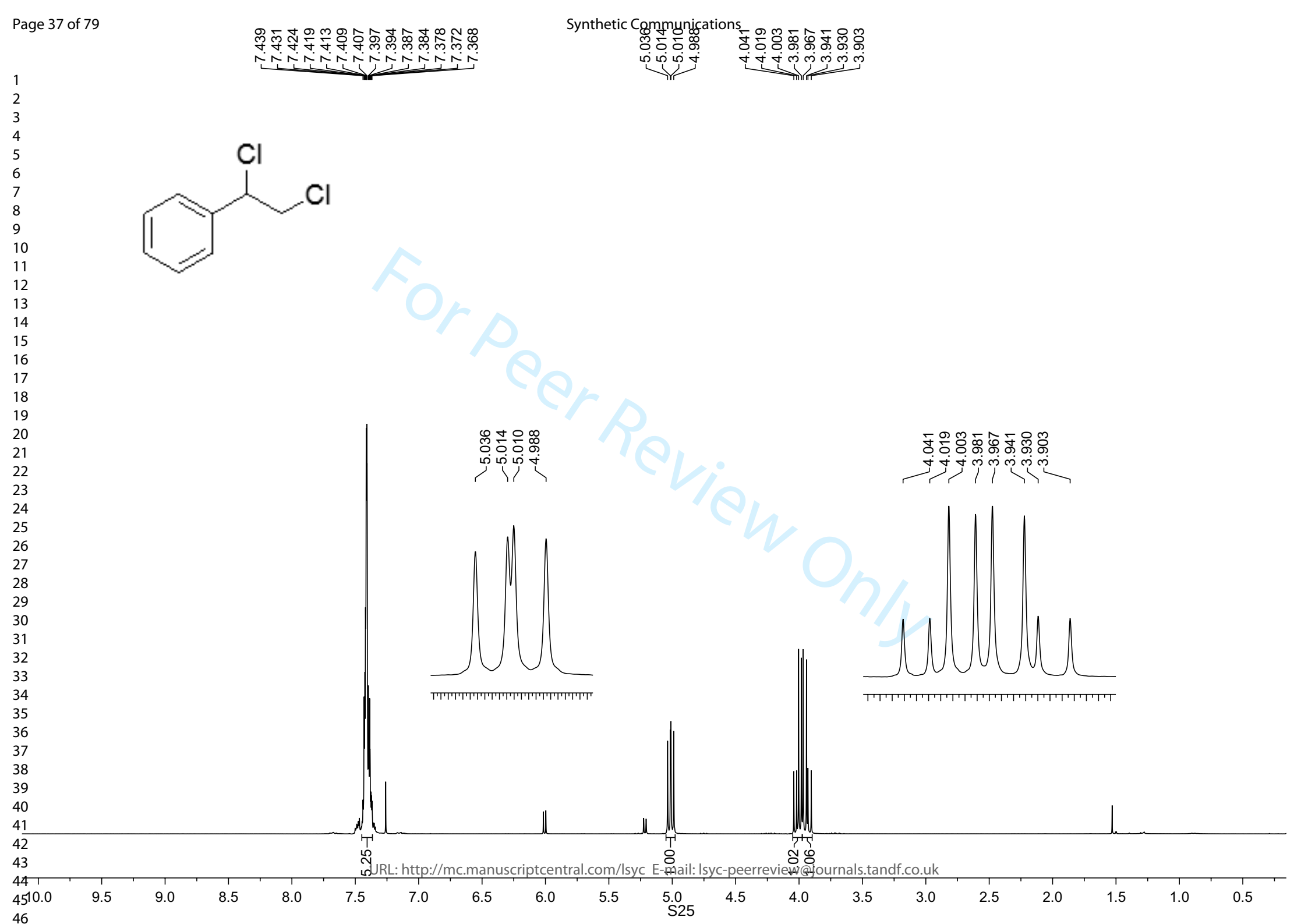


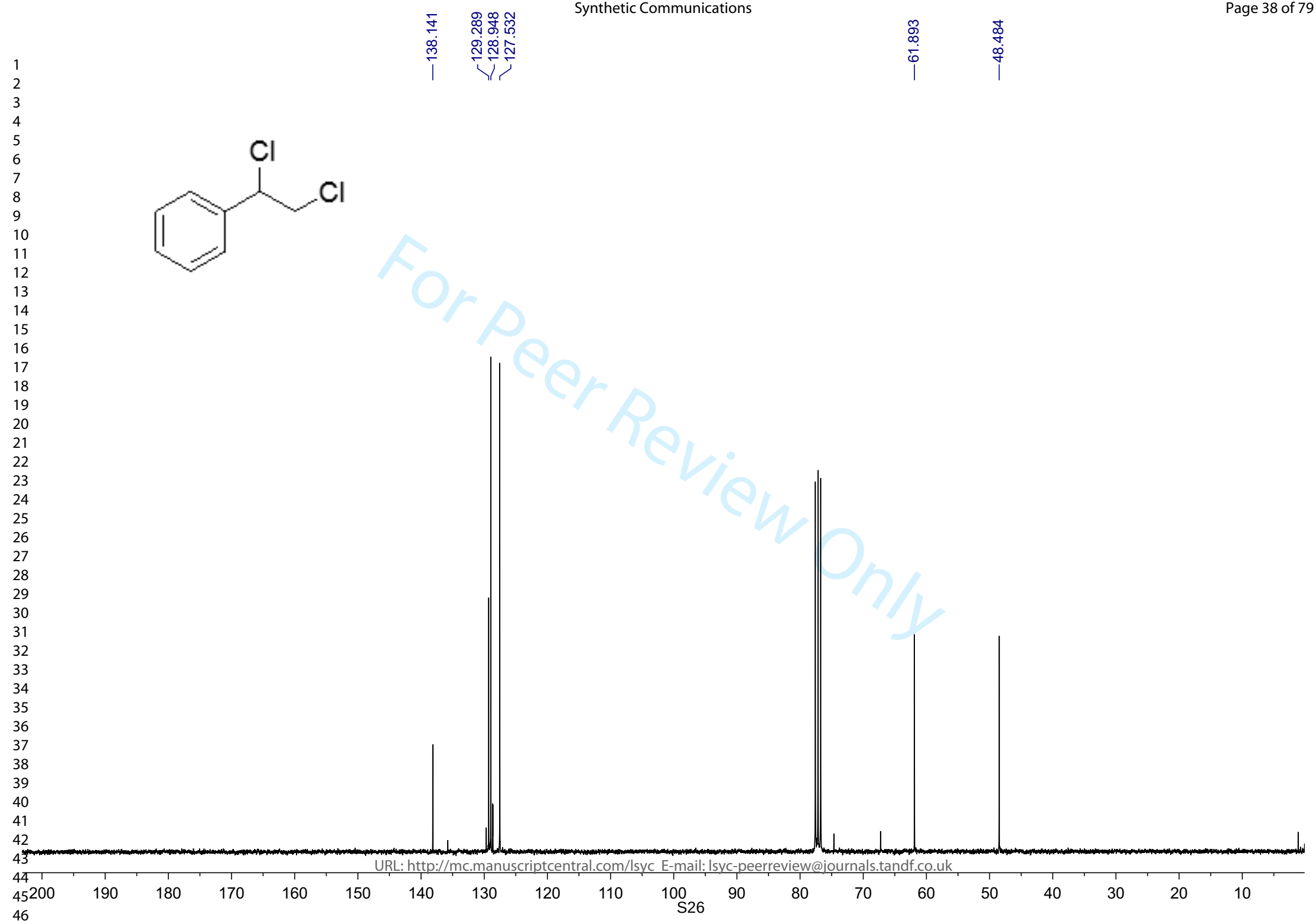


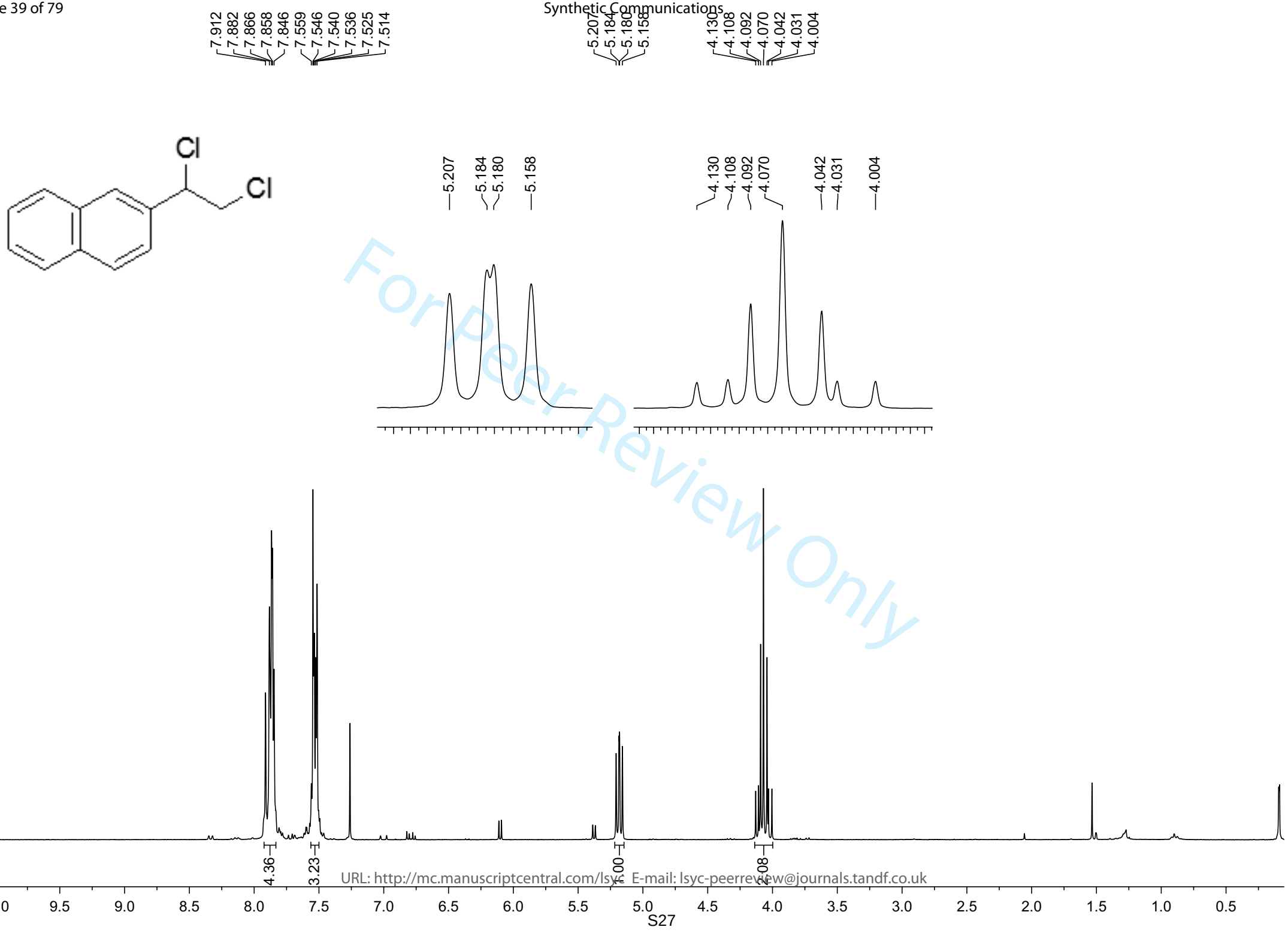


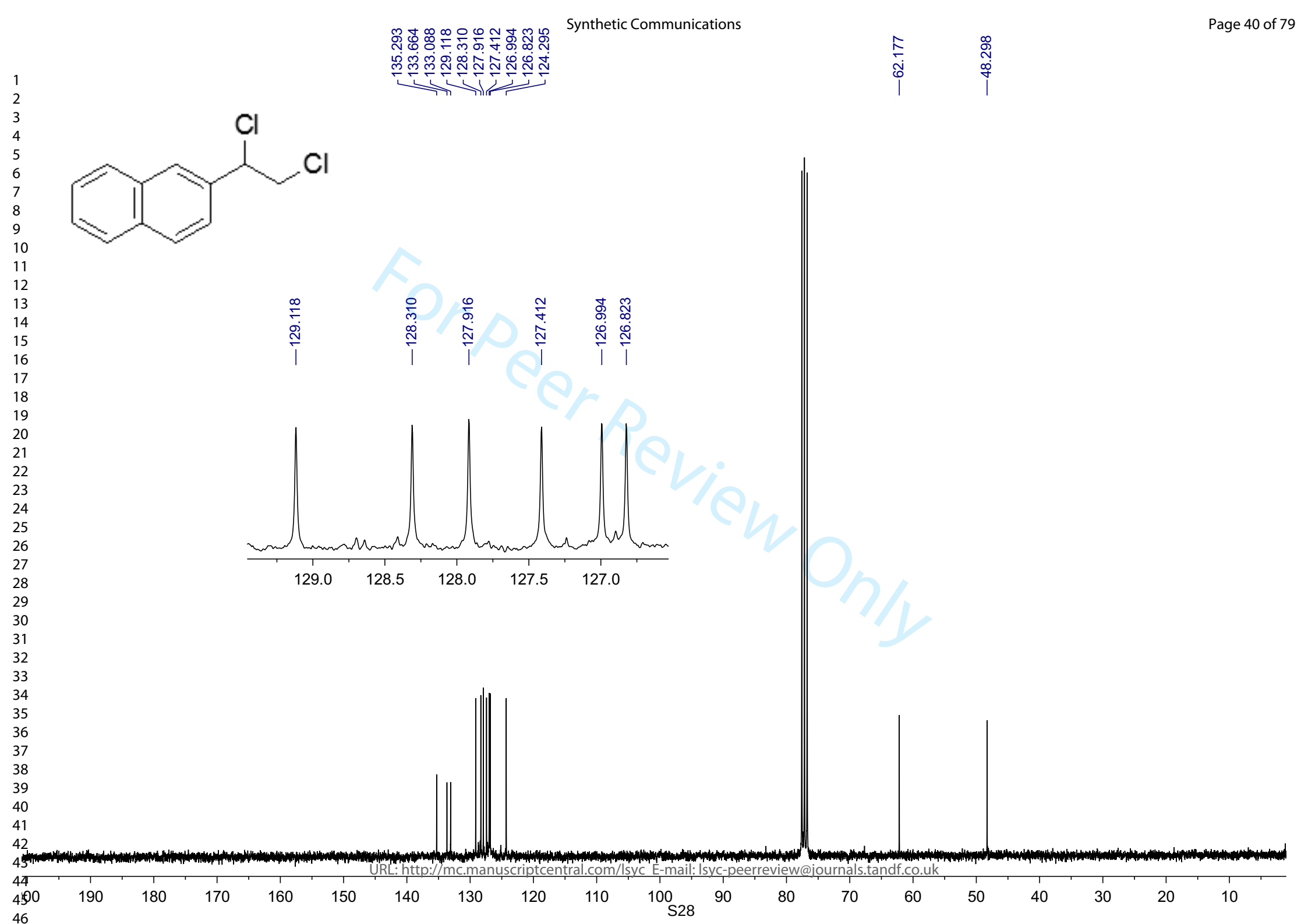


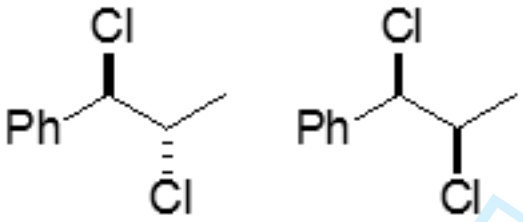












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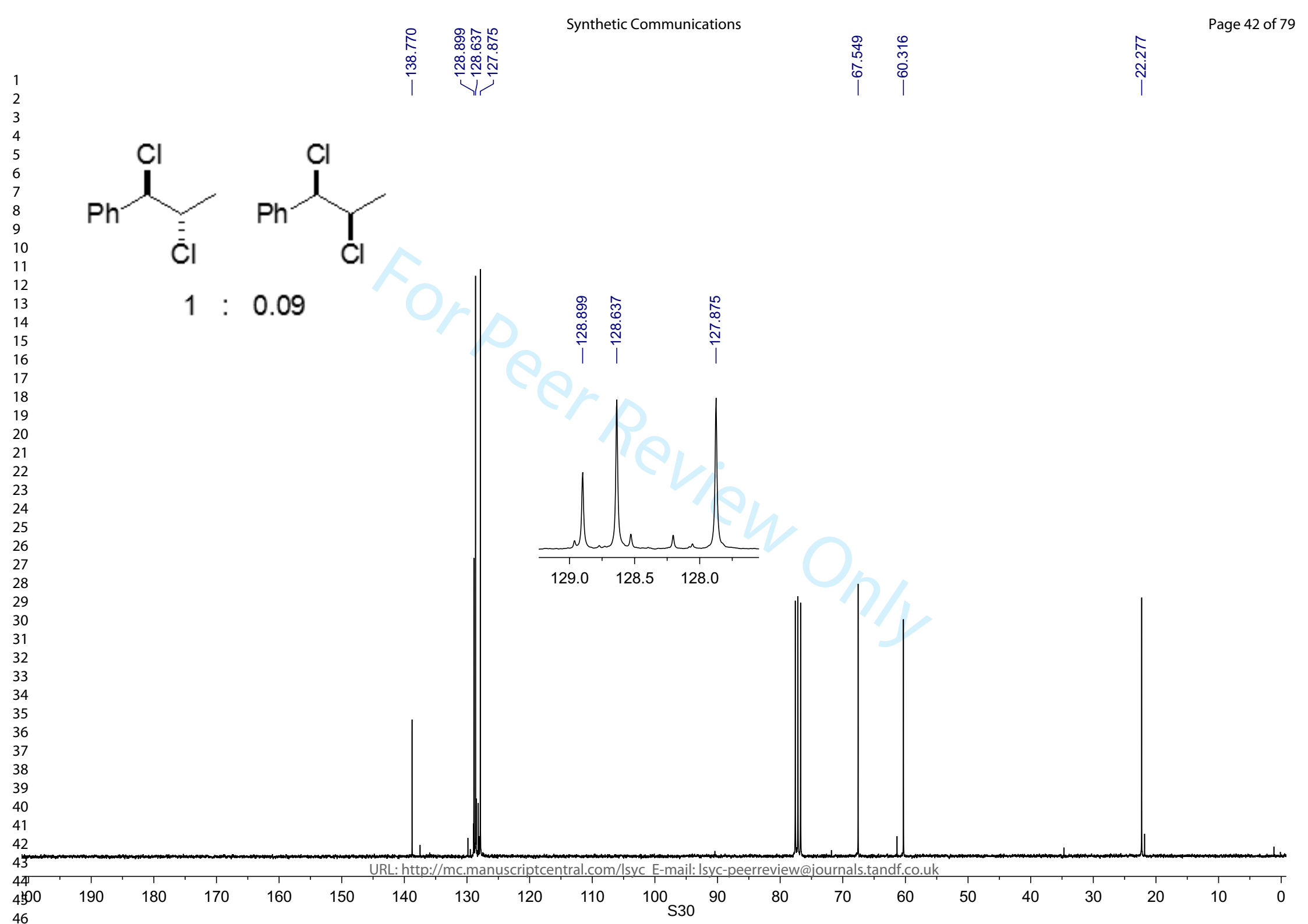

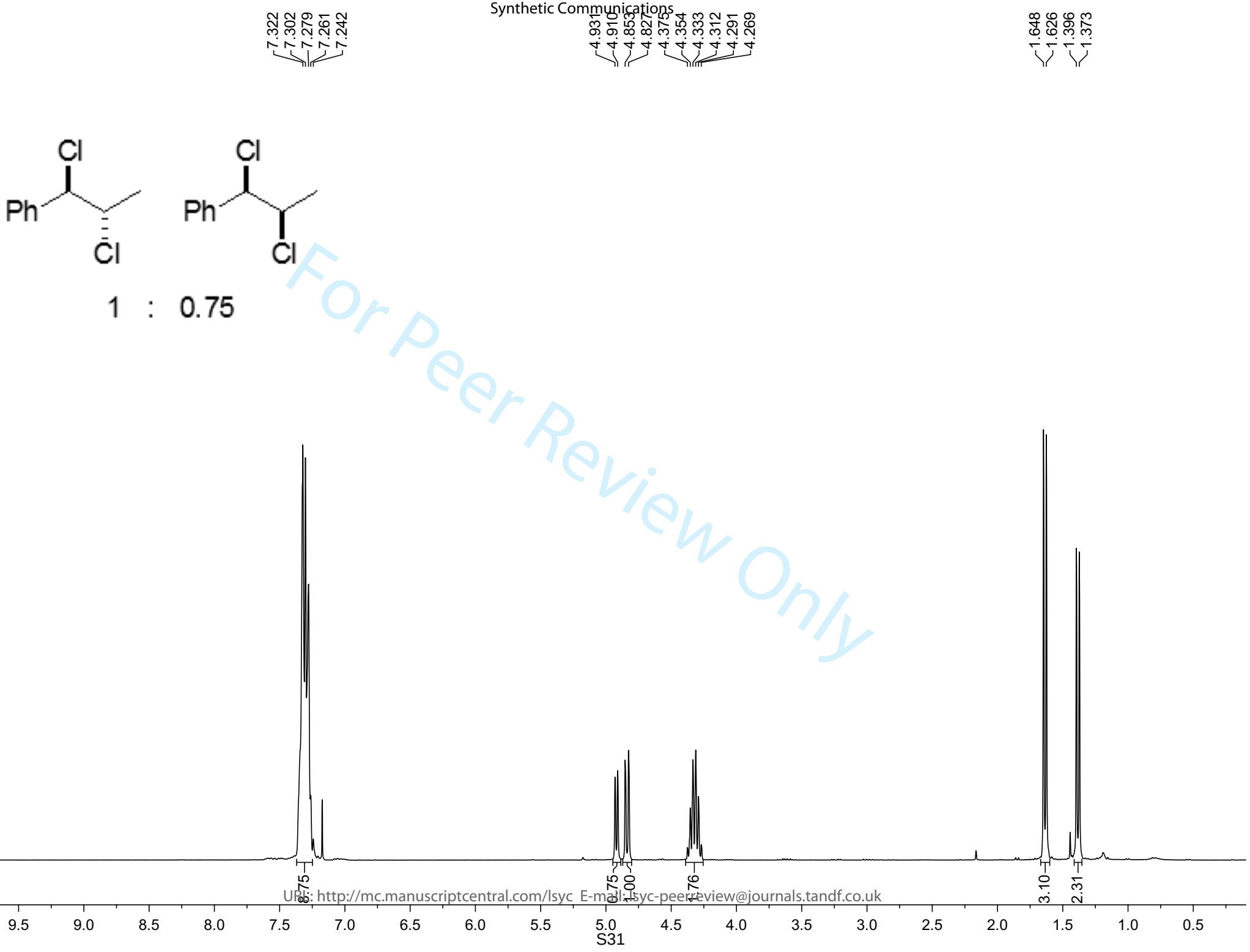

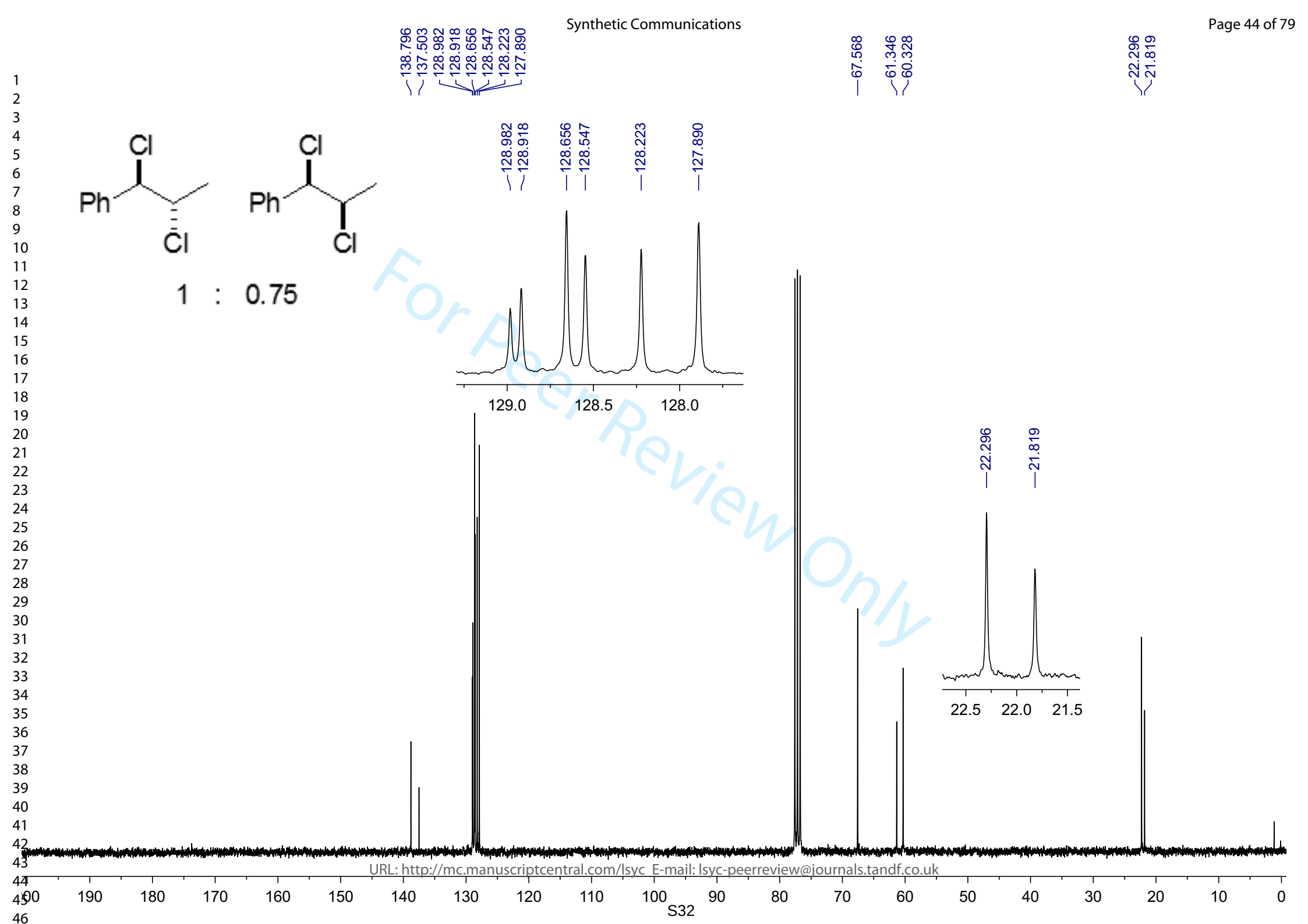

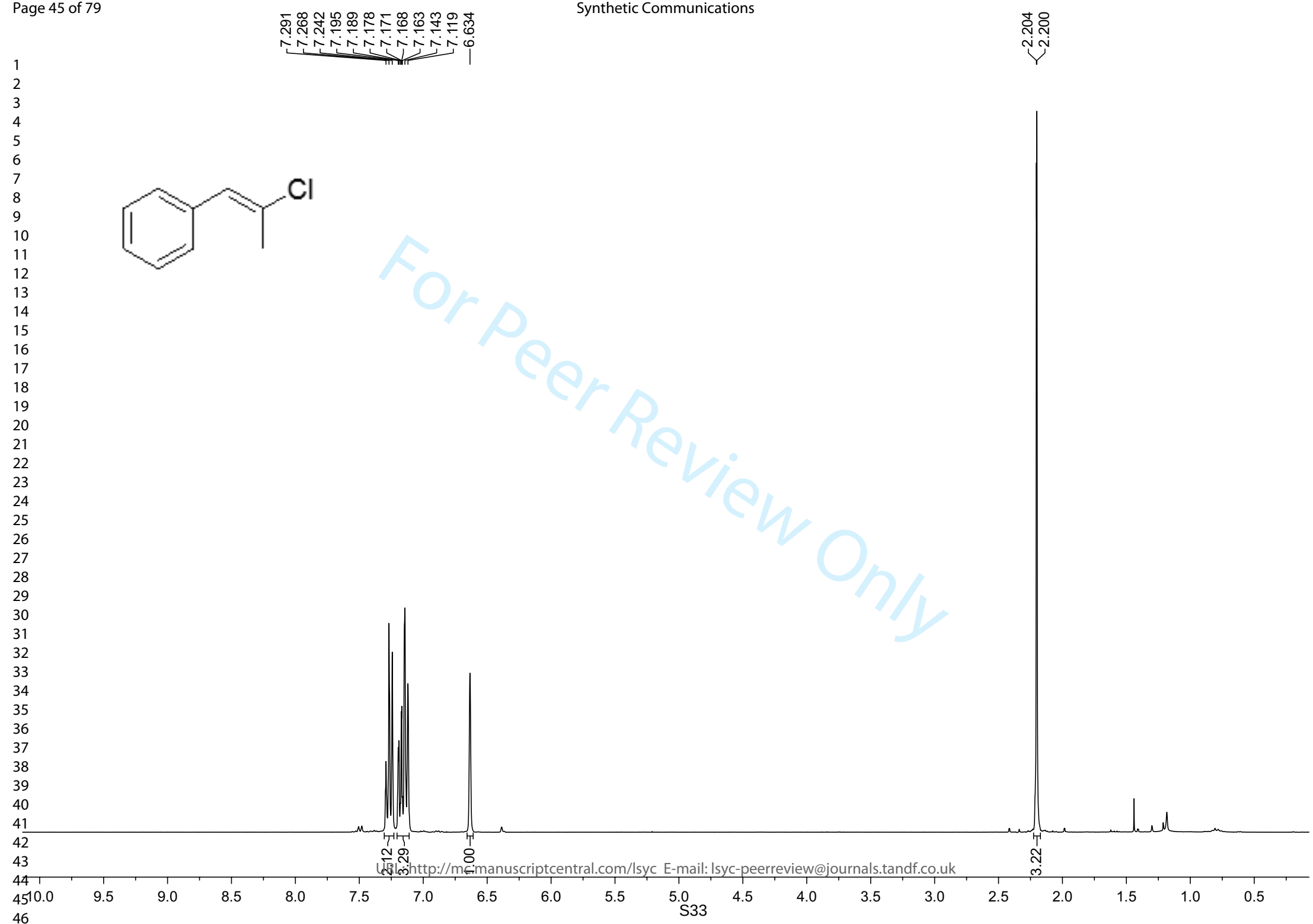

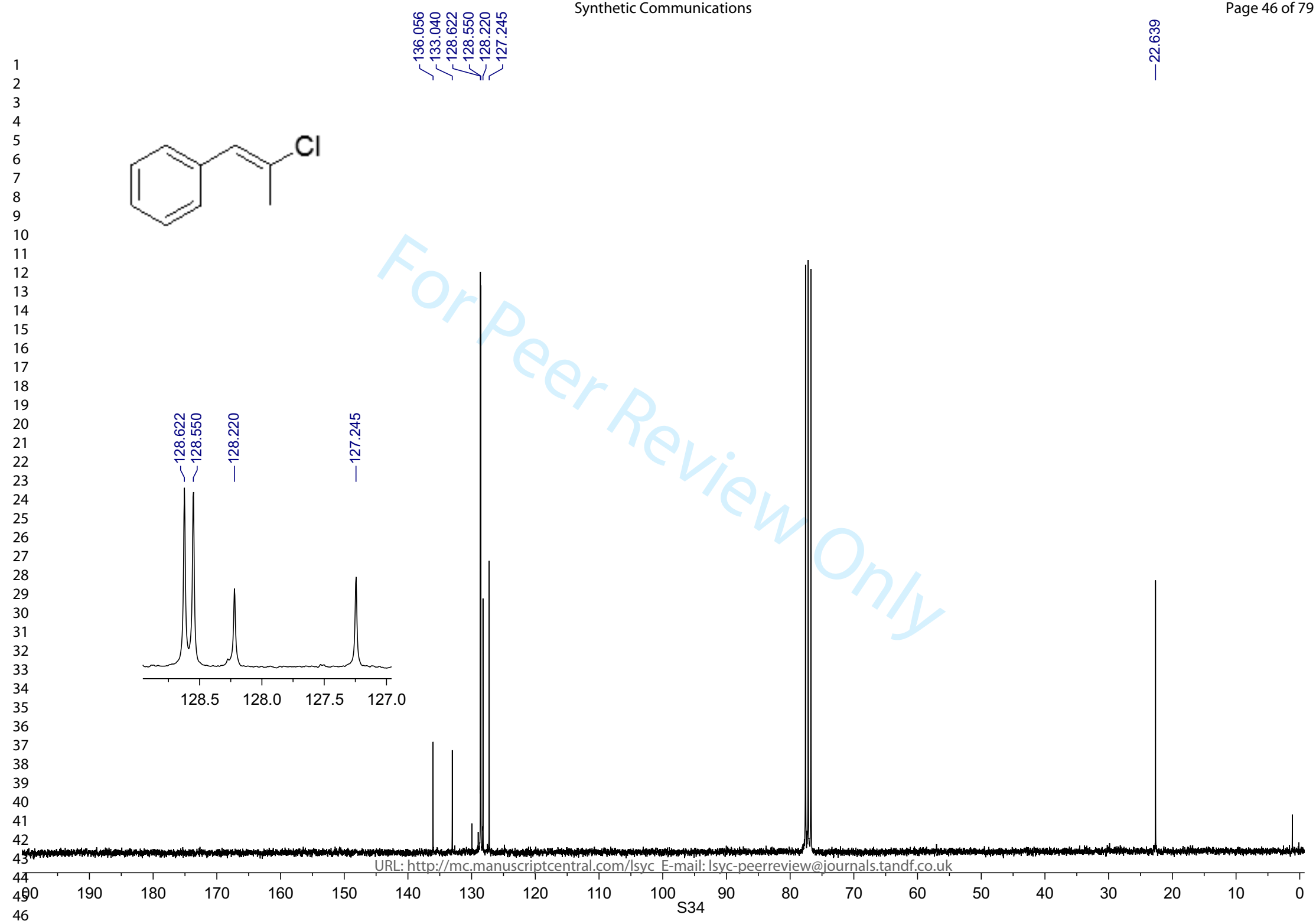

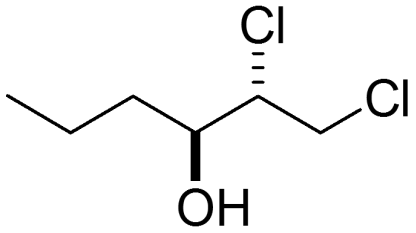

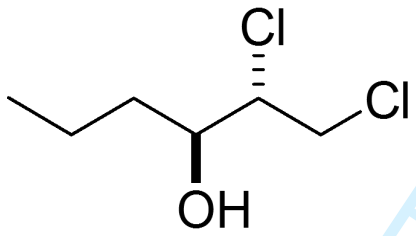

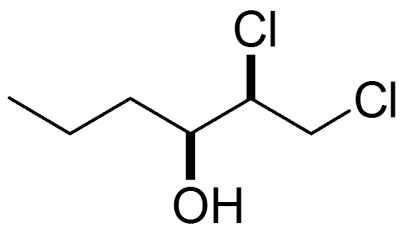

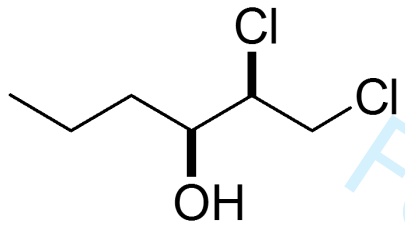

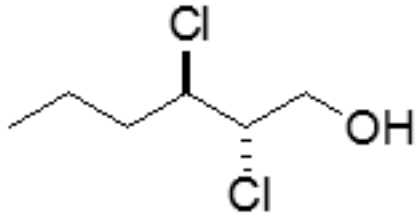

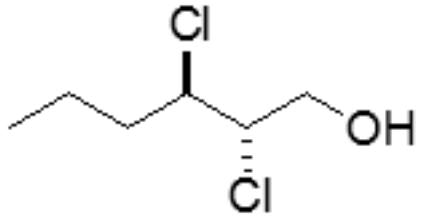

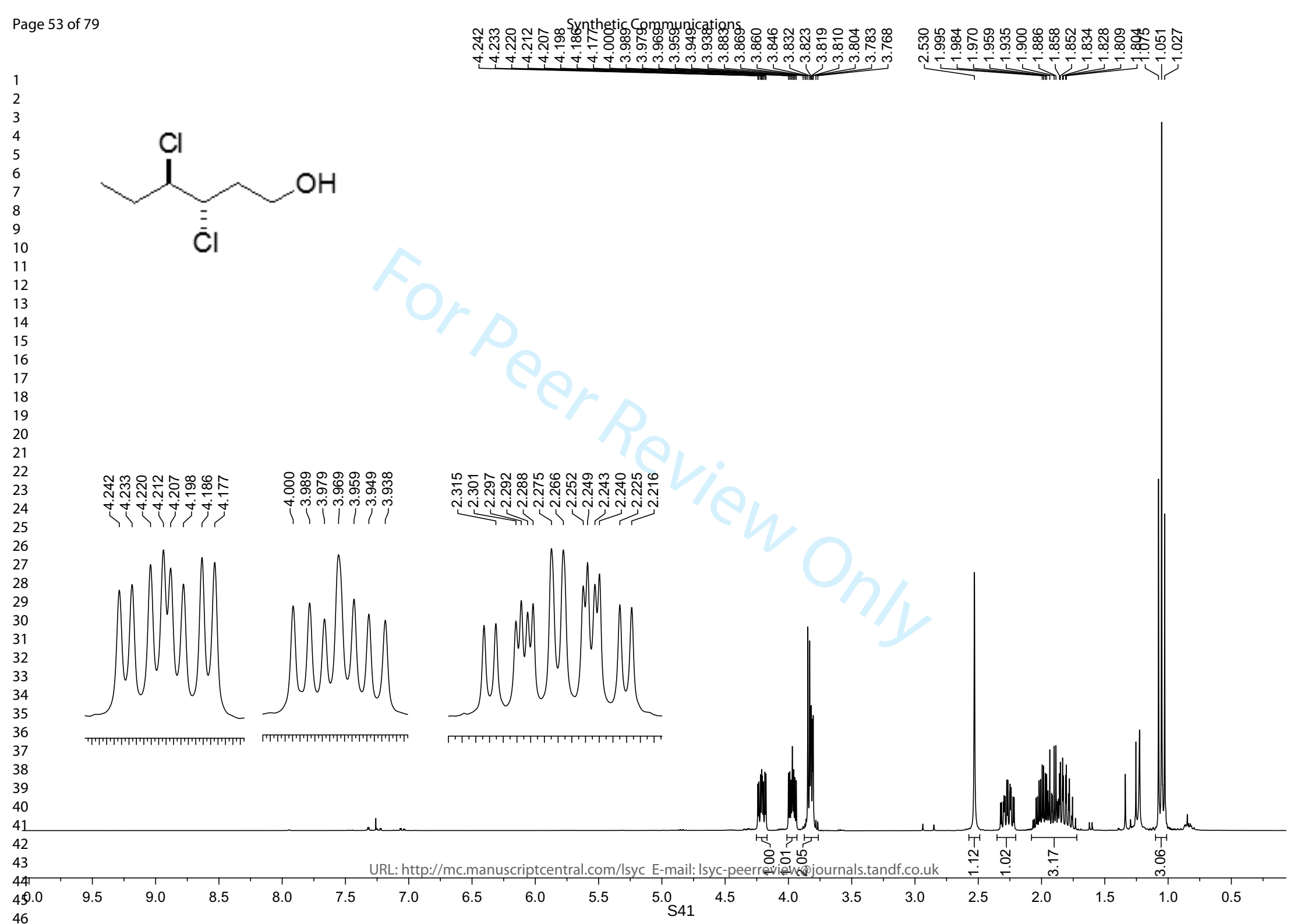

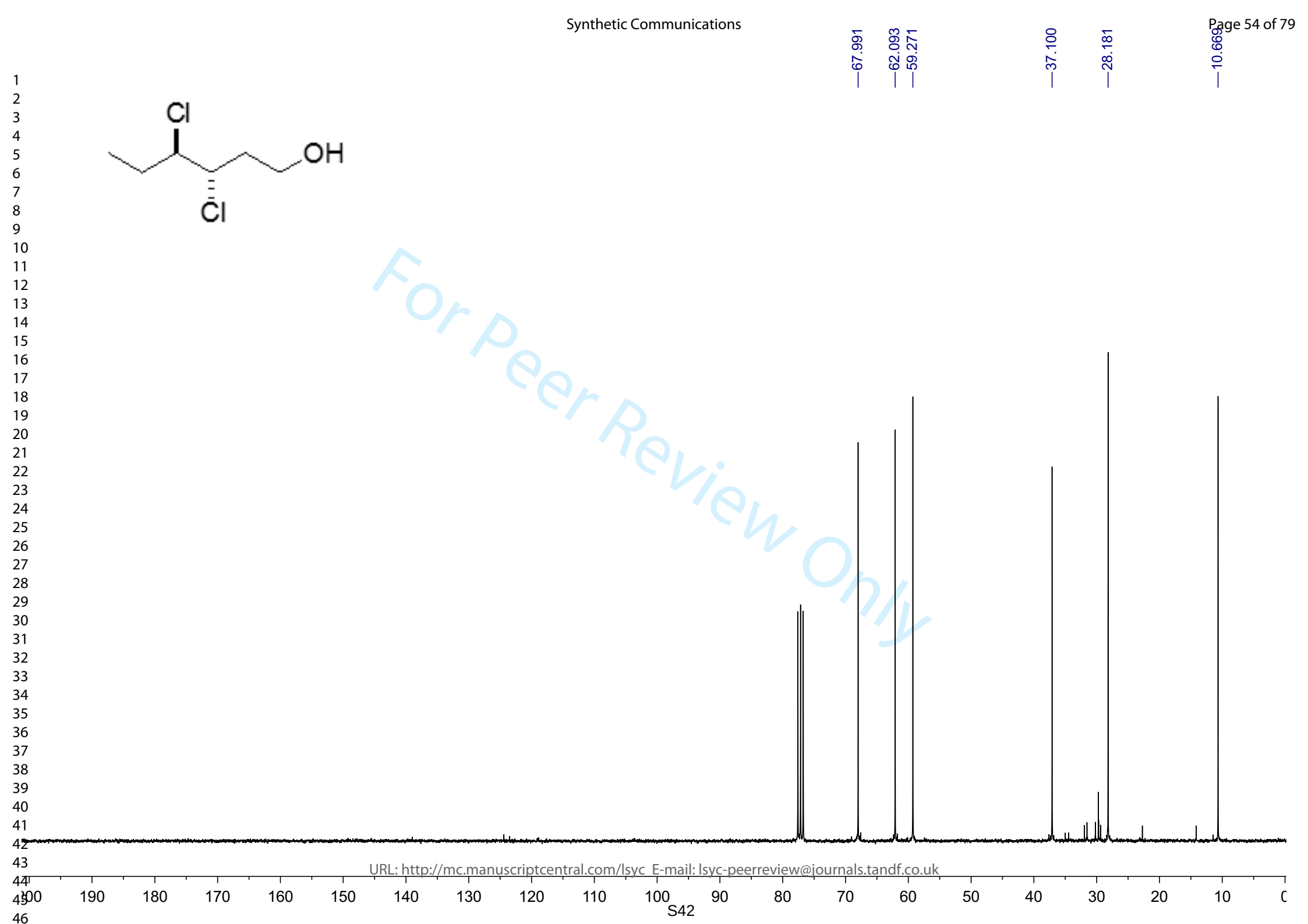

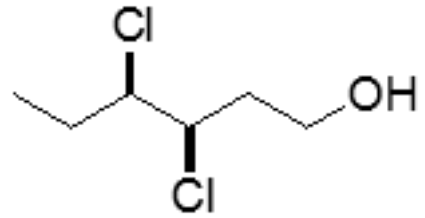

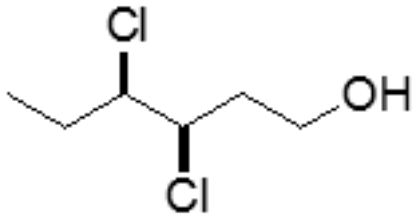

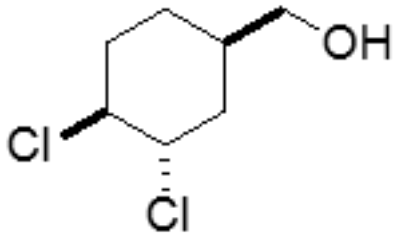

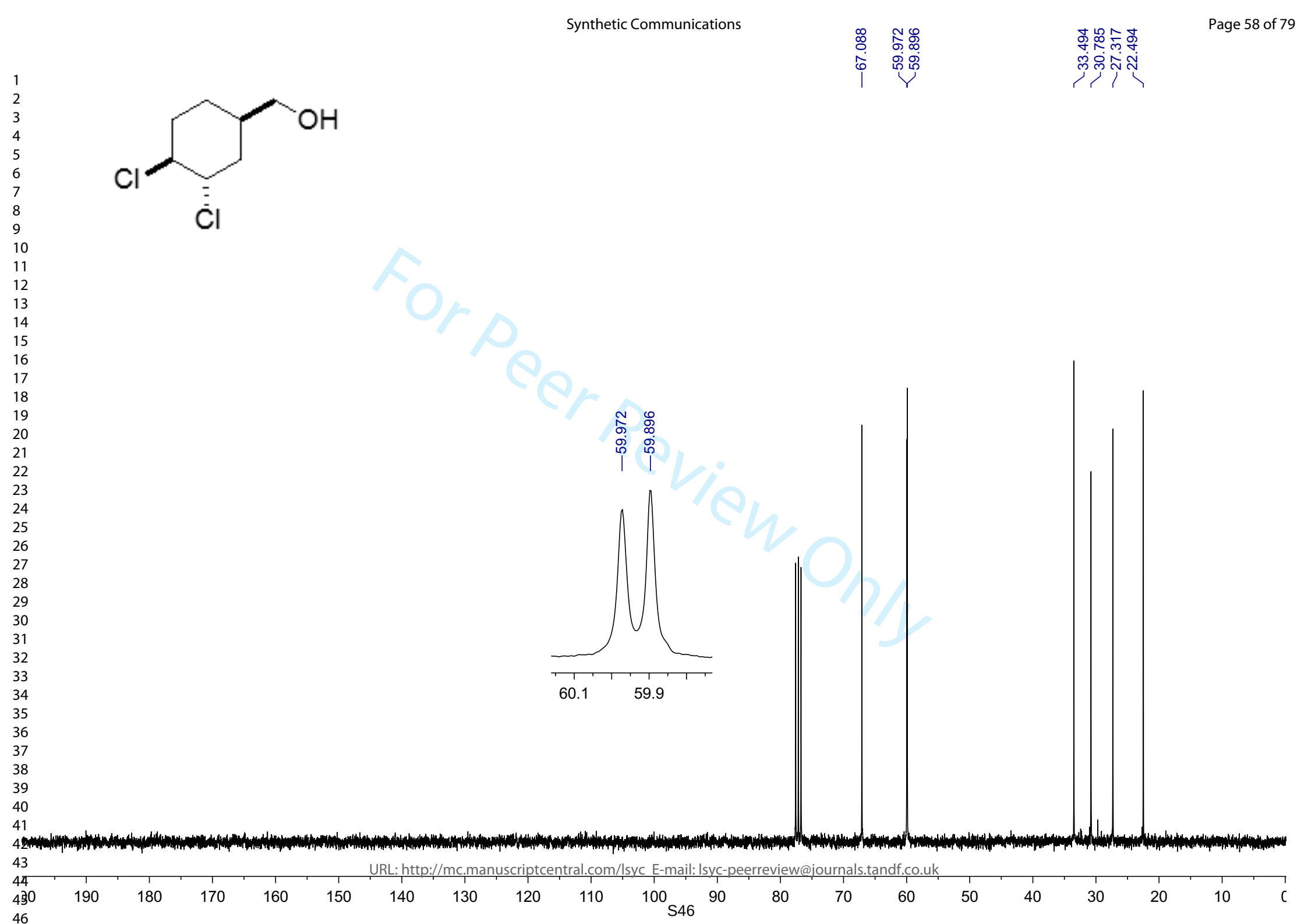

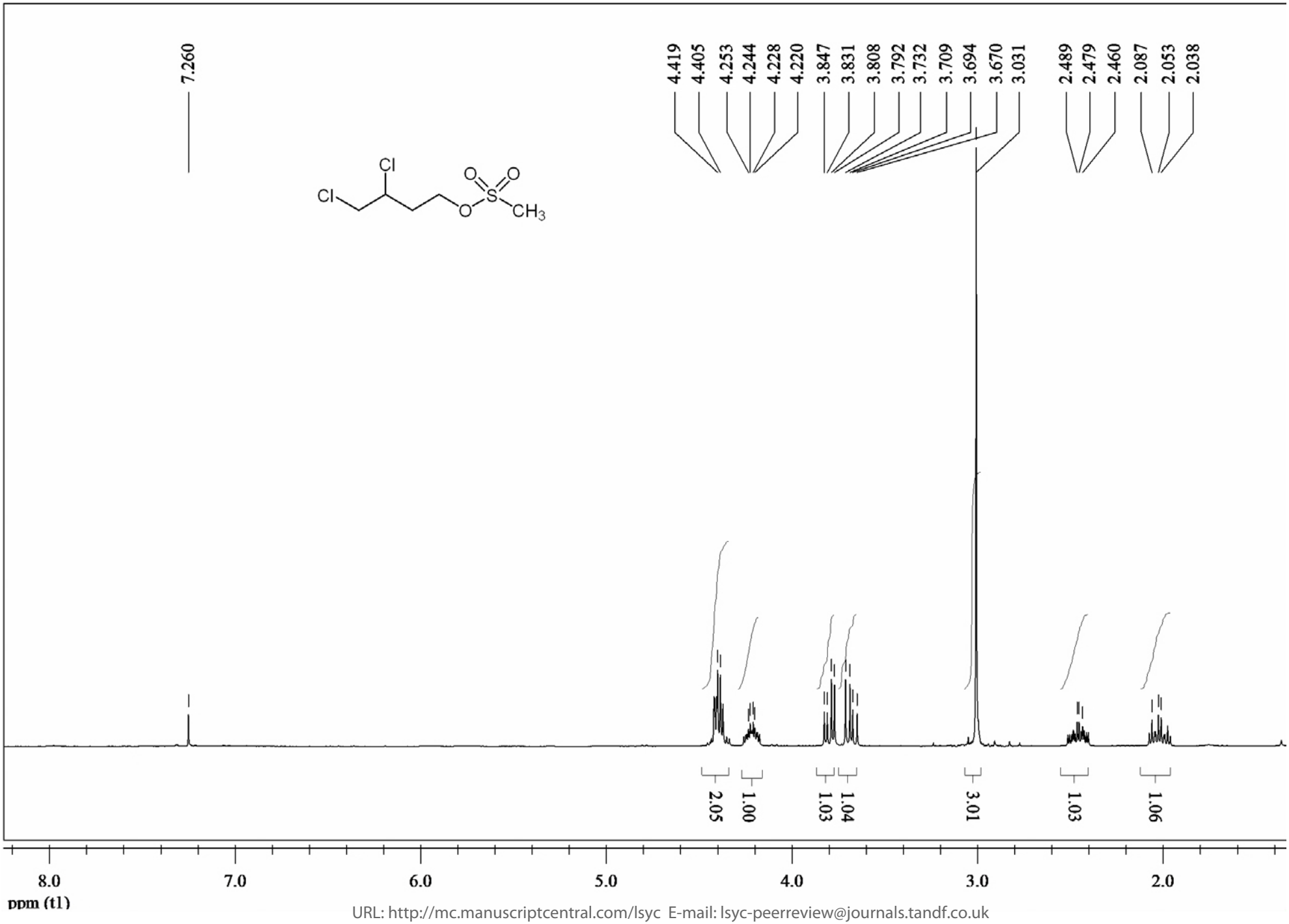
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2.087
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2.038
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O
S
O
CH3
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1.03
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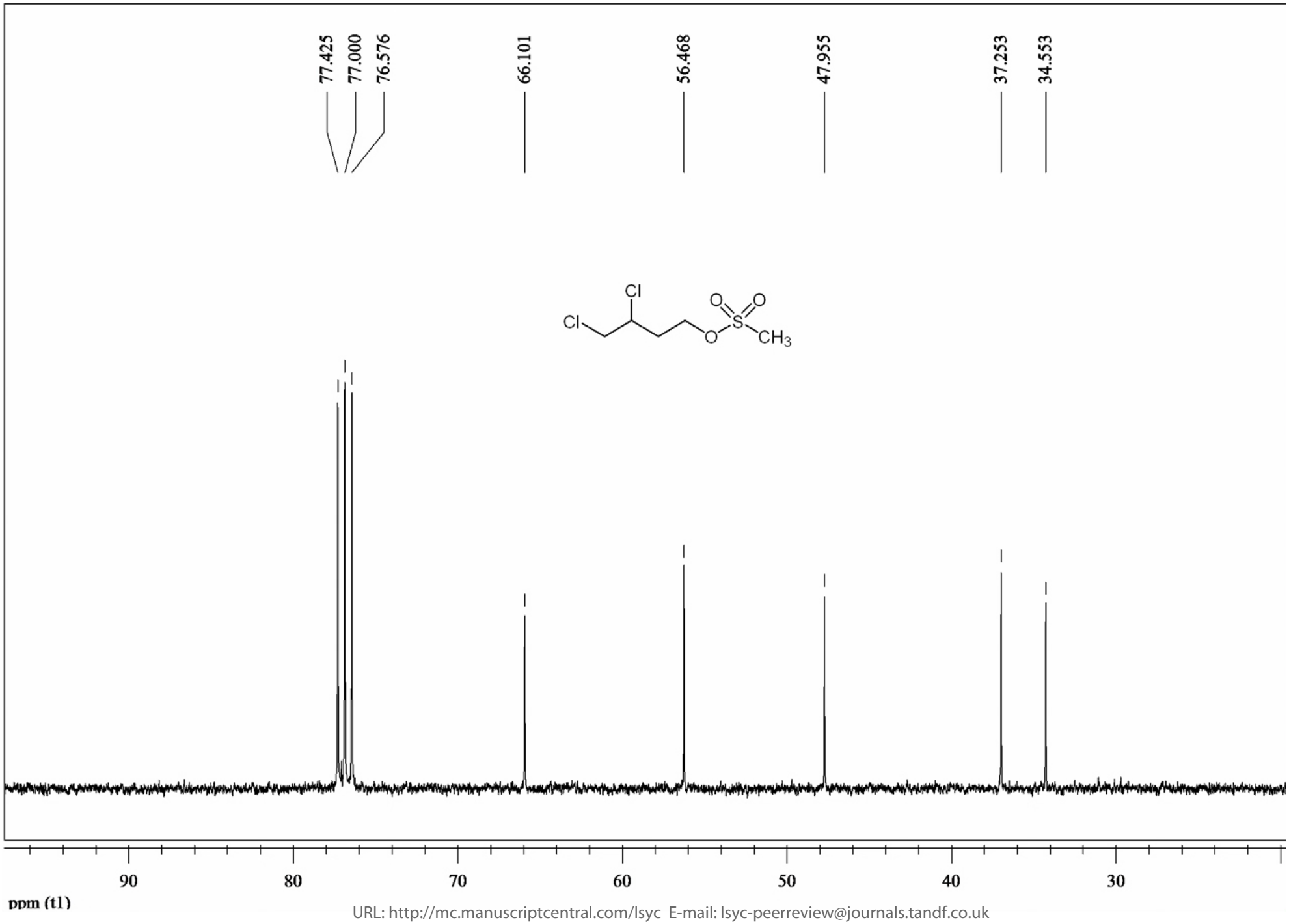
ppm (t1)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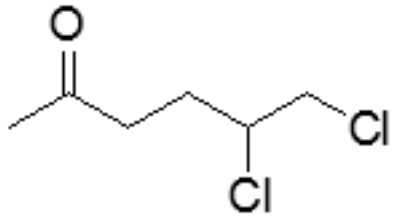
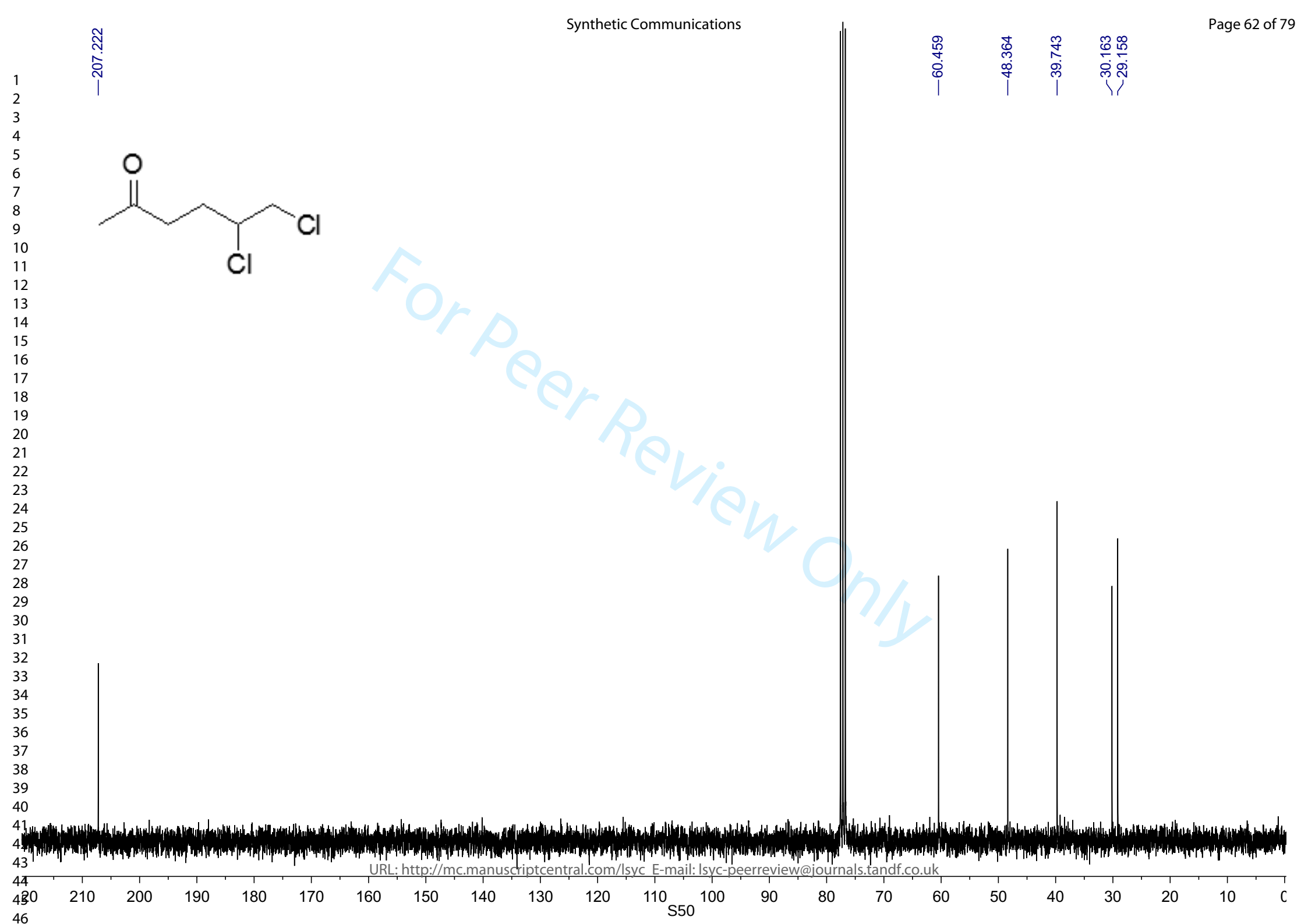
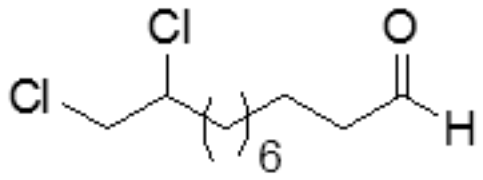
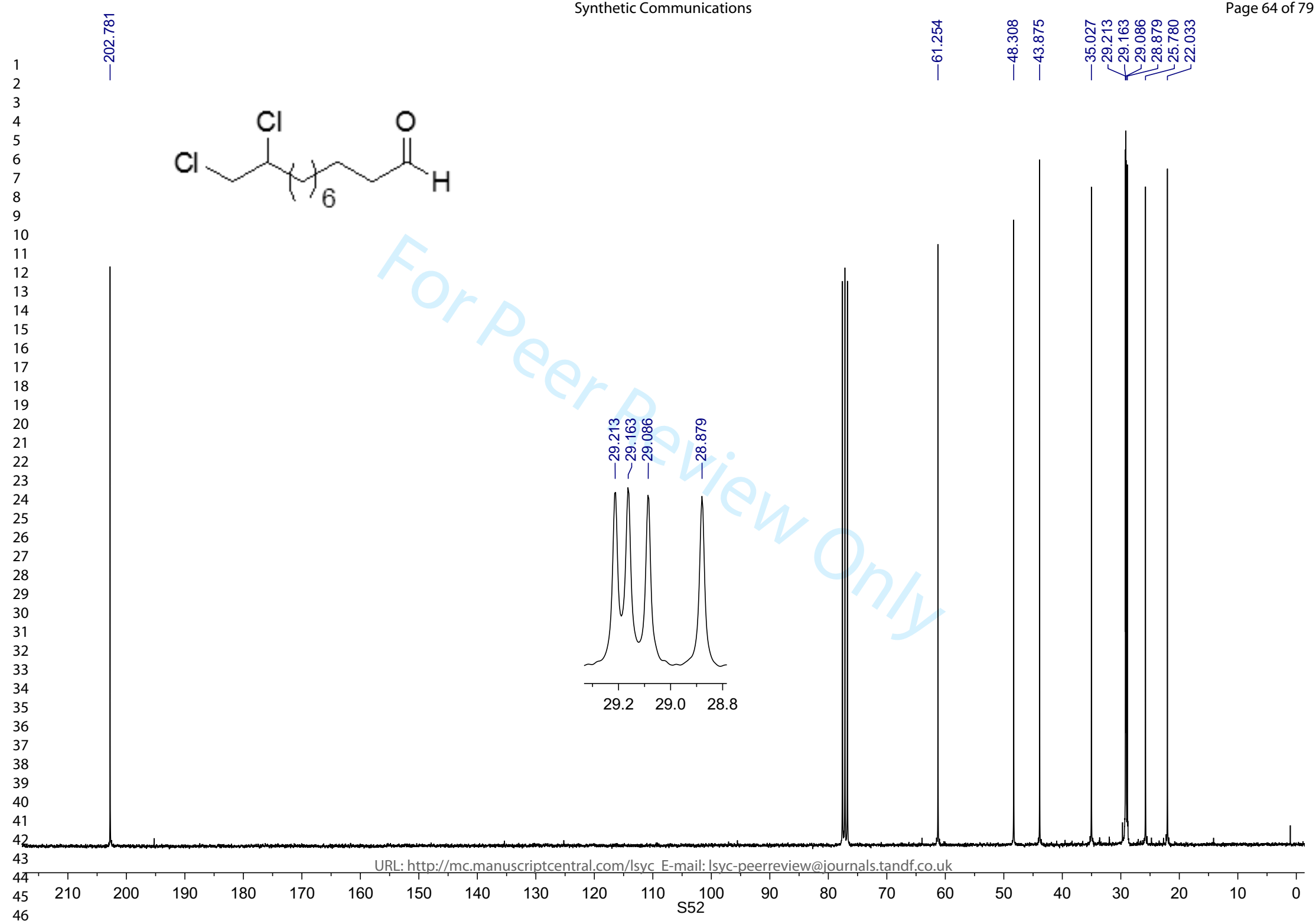
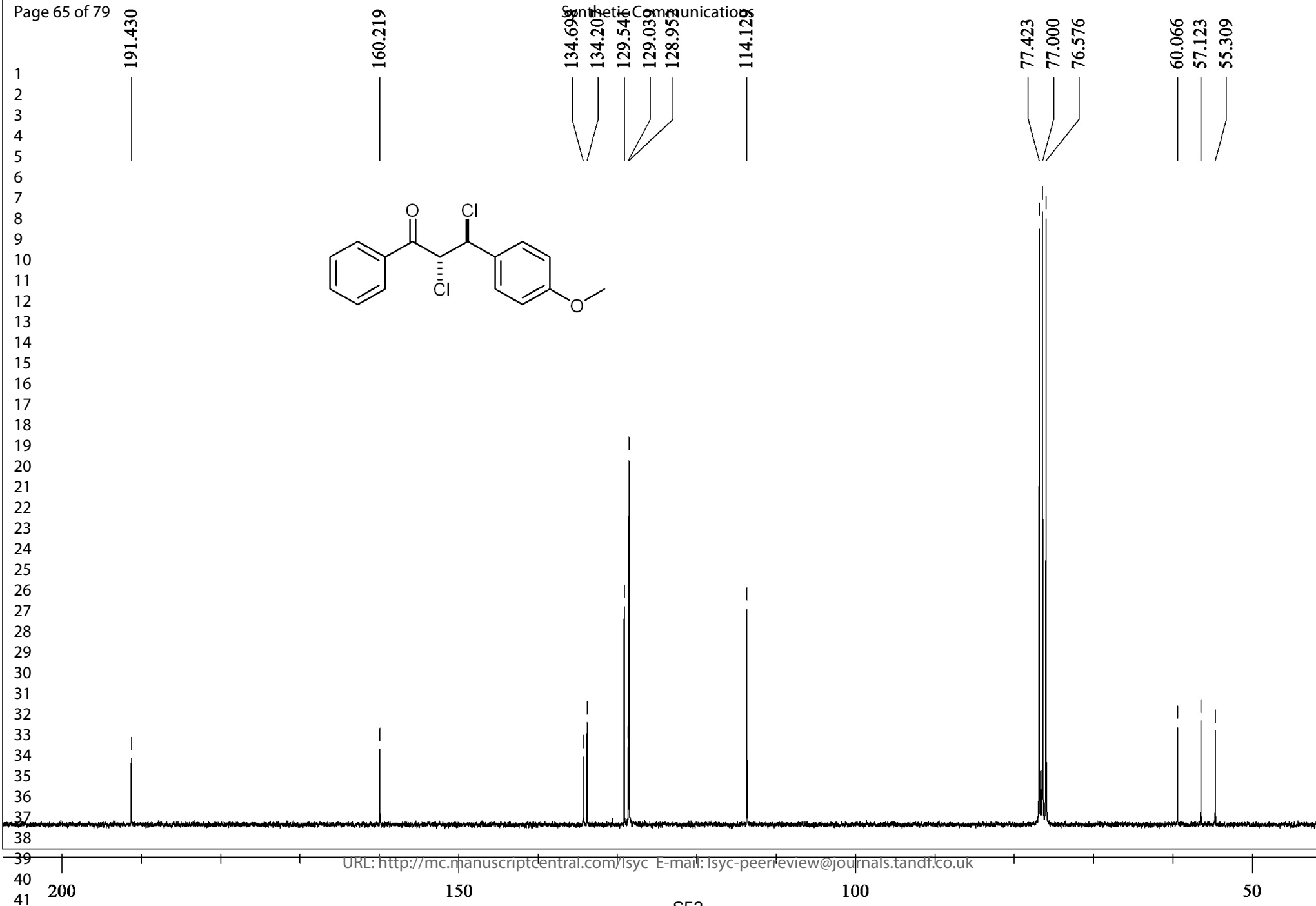
ppm (t1)







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Cl
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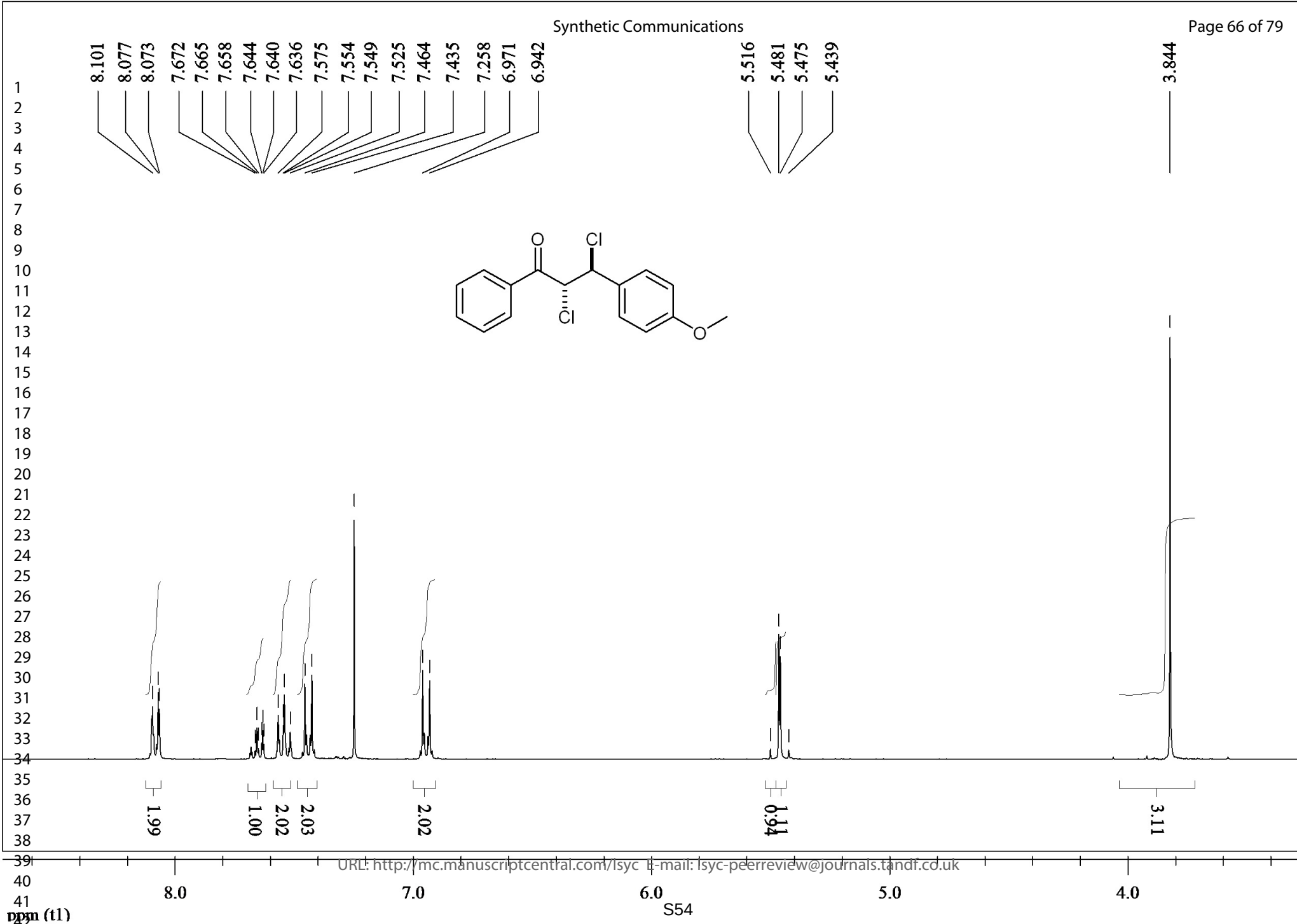
ppm (t1)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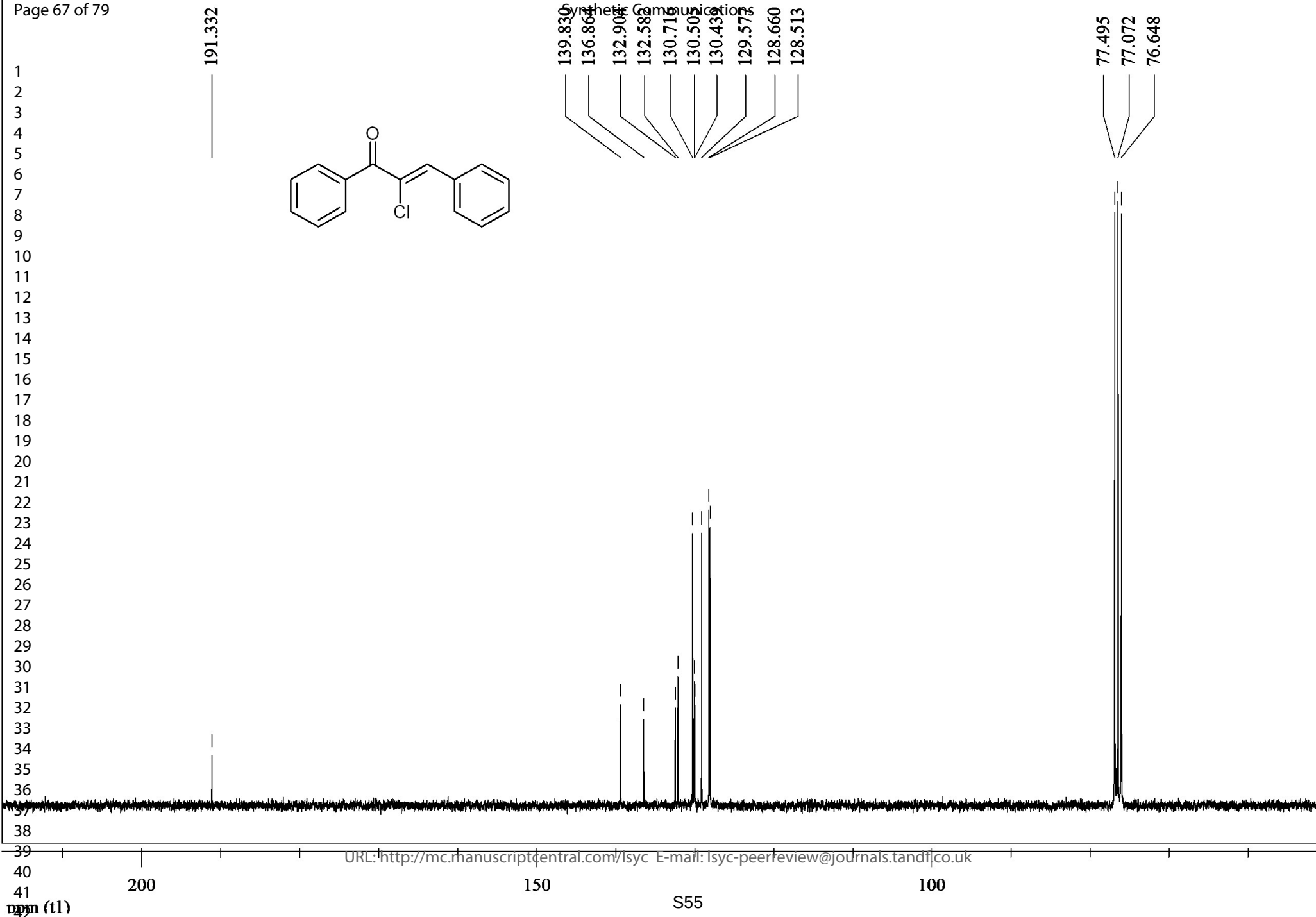
ppm (t1)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150
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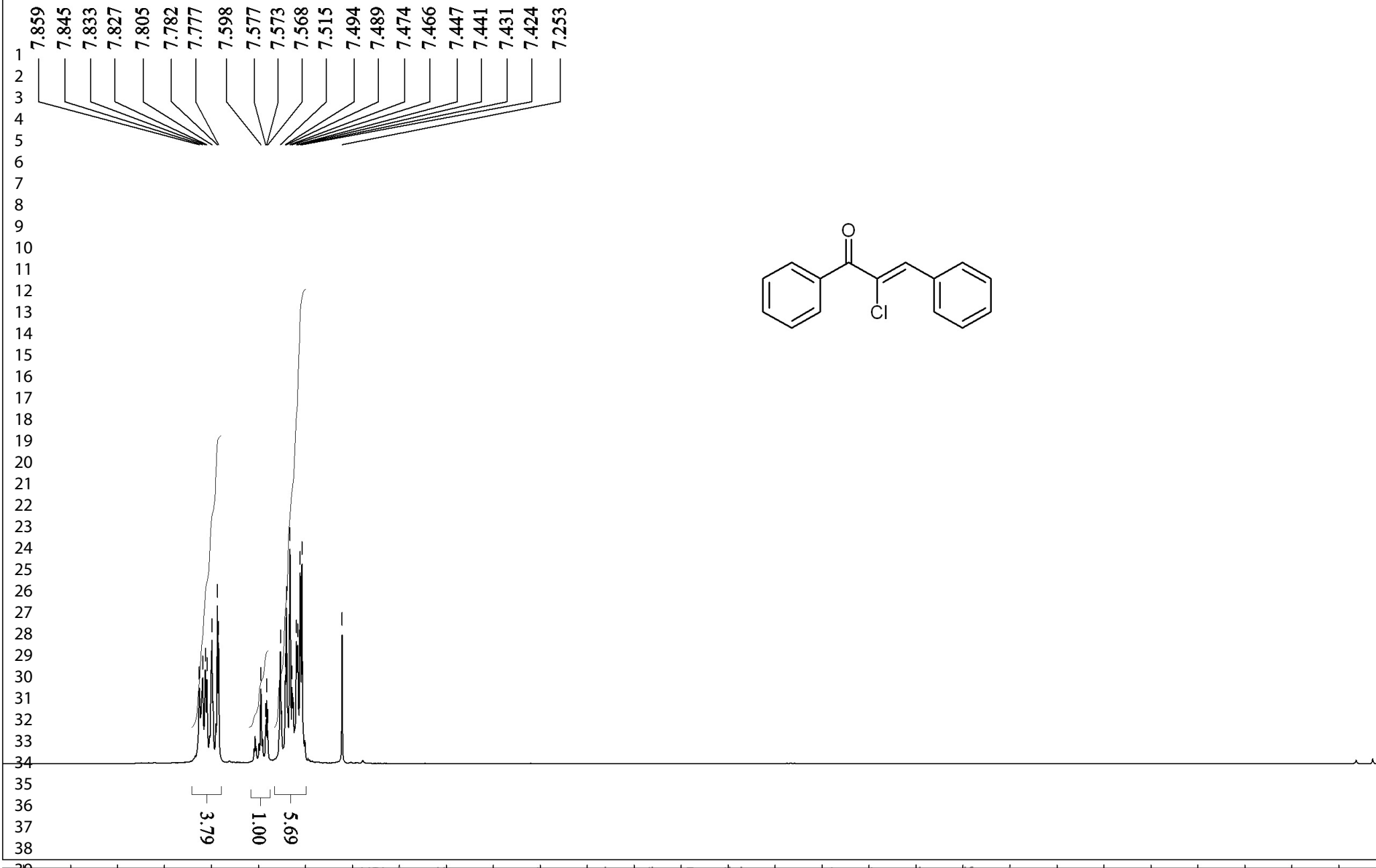
ppm (t1)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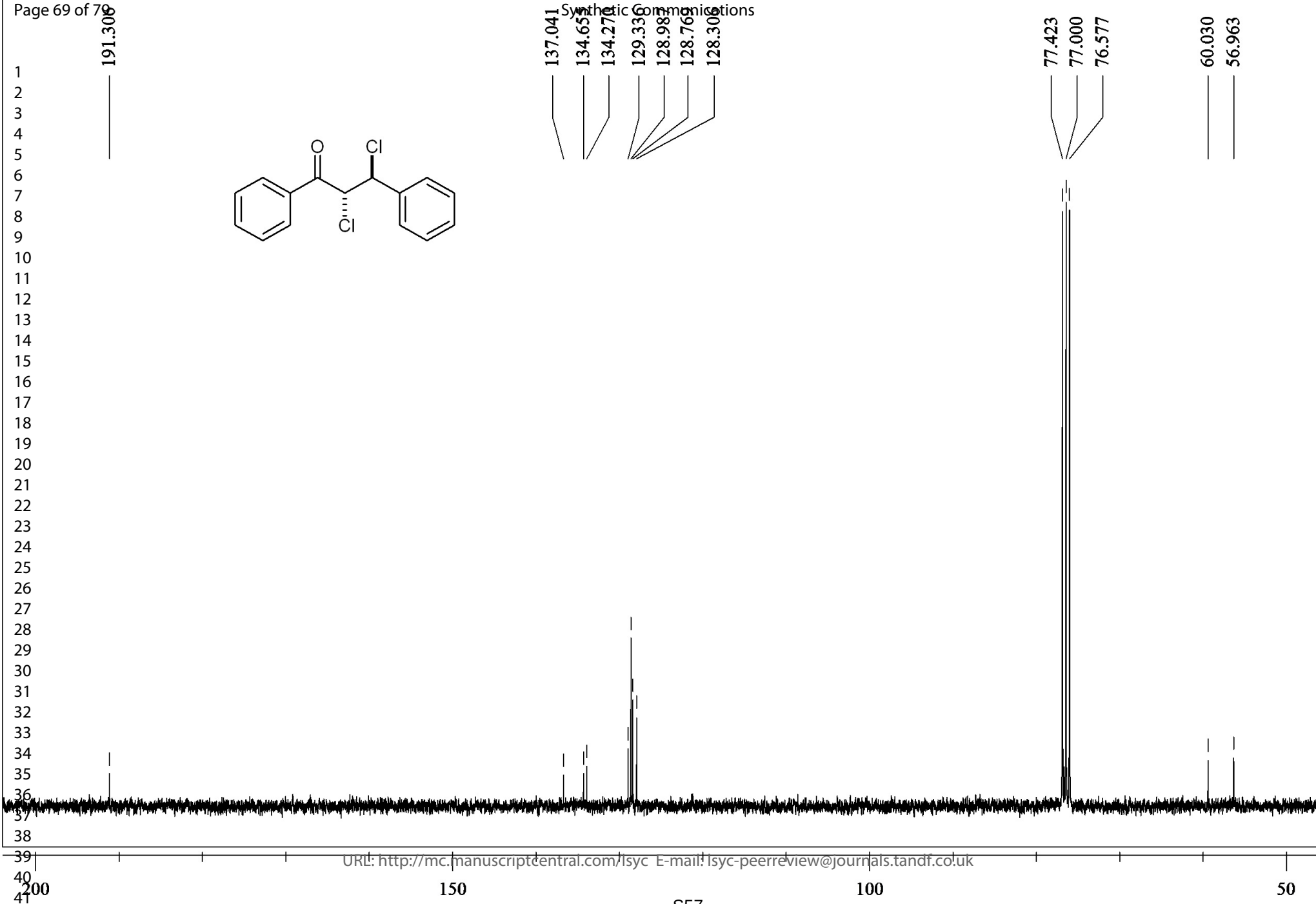
ppm (t1)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Cl
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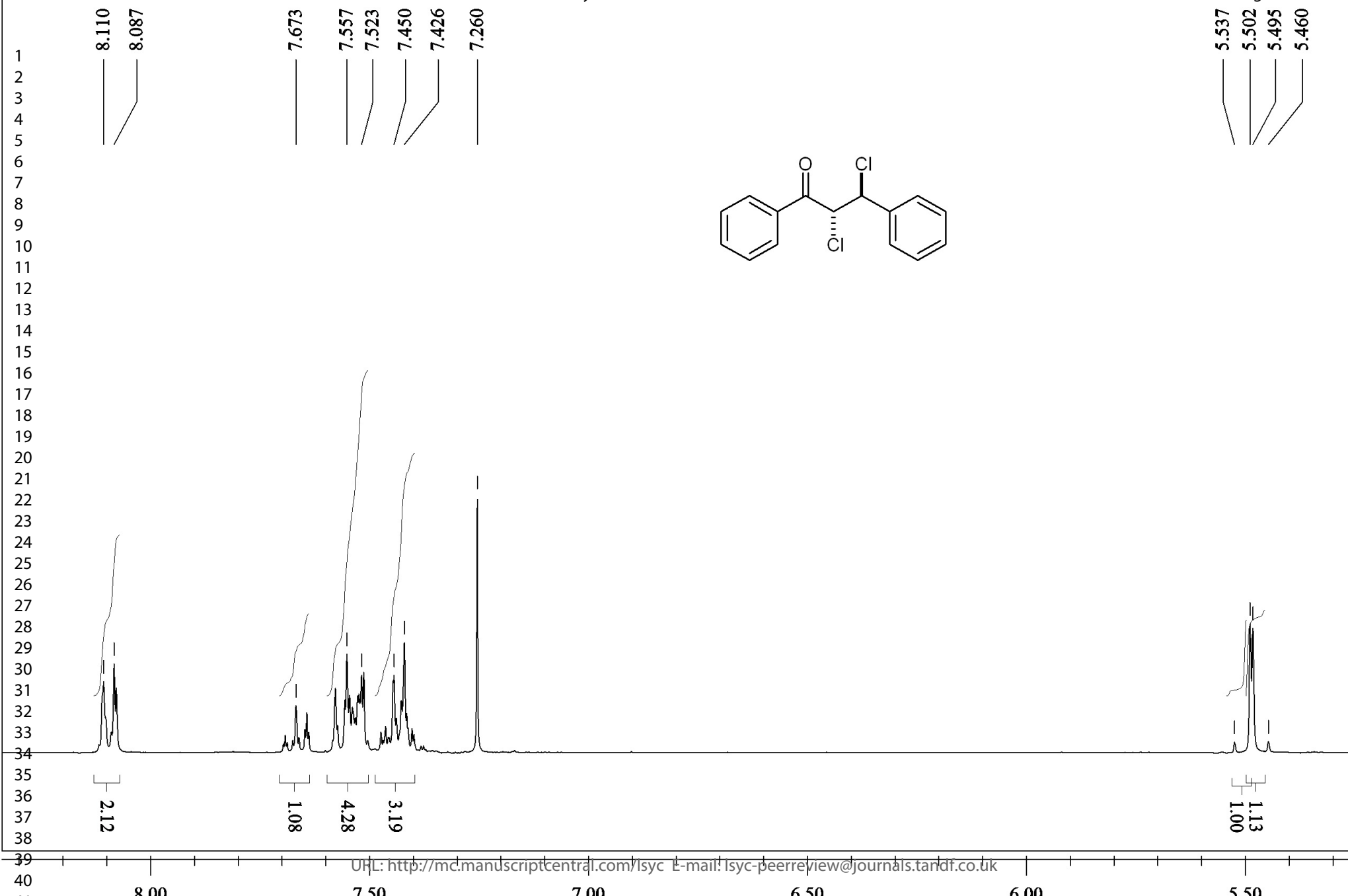
ppm (t1)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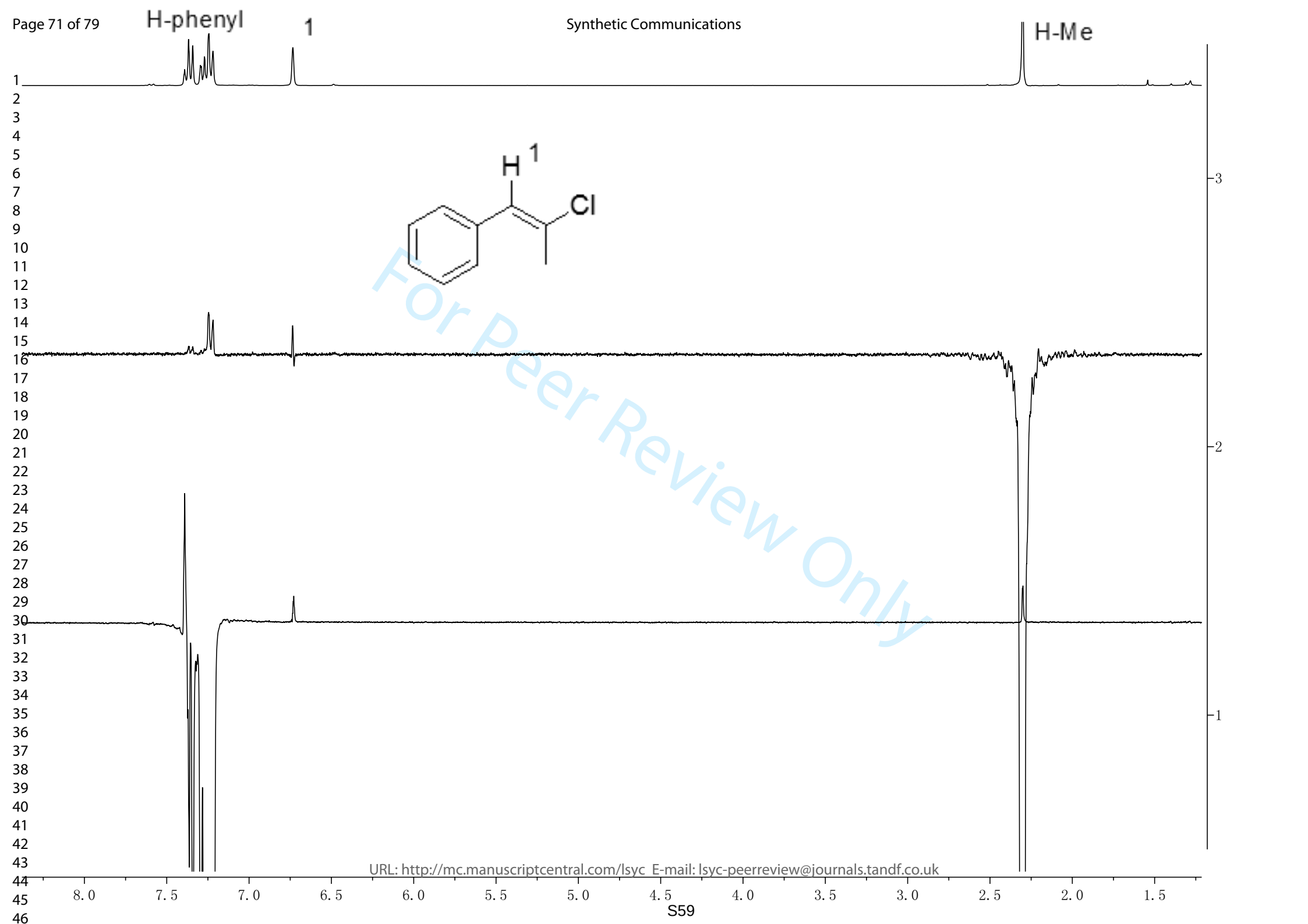
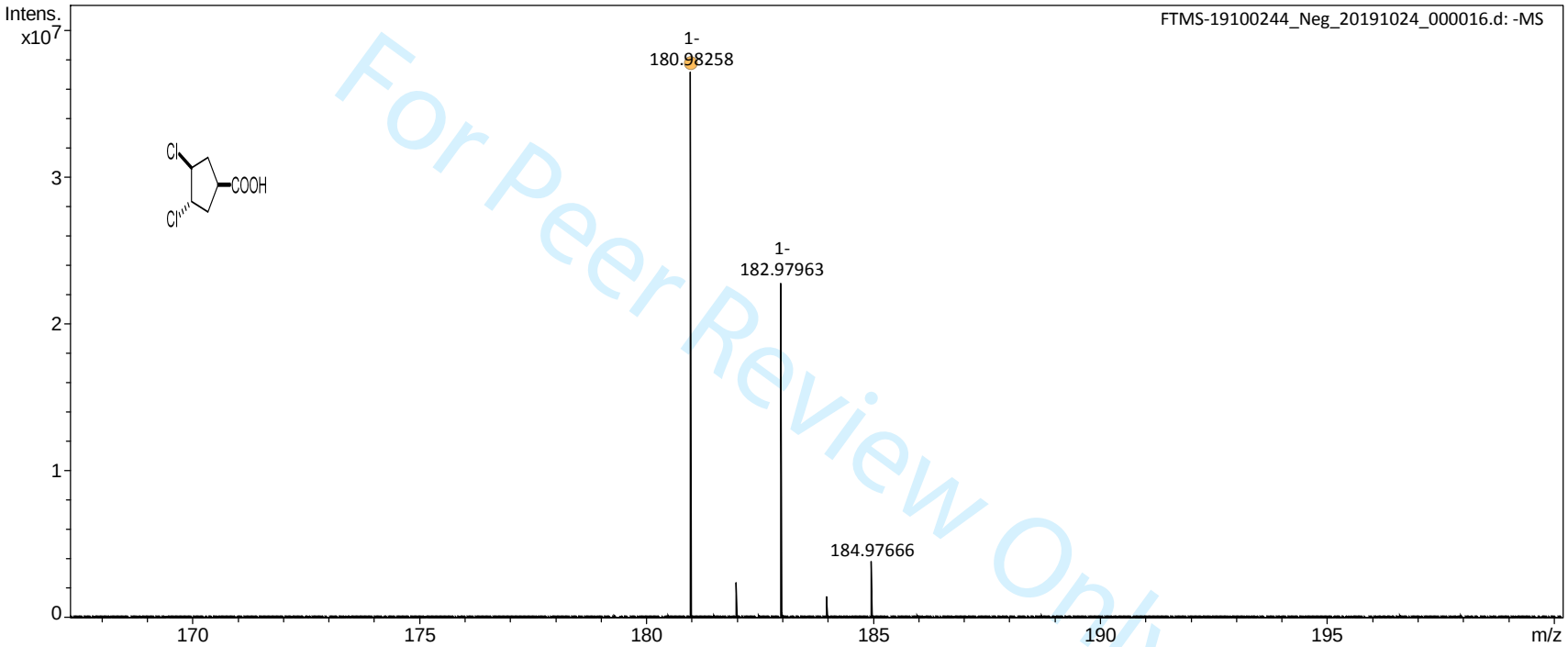
7.426
7.260
5.537
5.502
5.495
5.460
O
Cl
Cl
2.12
1.08
4.28
3.19
1.00
1.13
8.00
7.50
7.00
6.50
6.00
5.50
ppm (t1)



Peking University Mass Spectrometry Sample Analysis Report

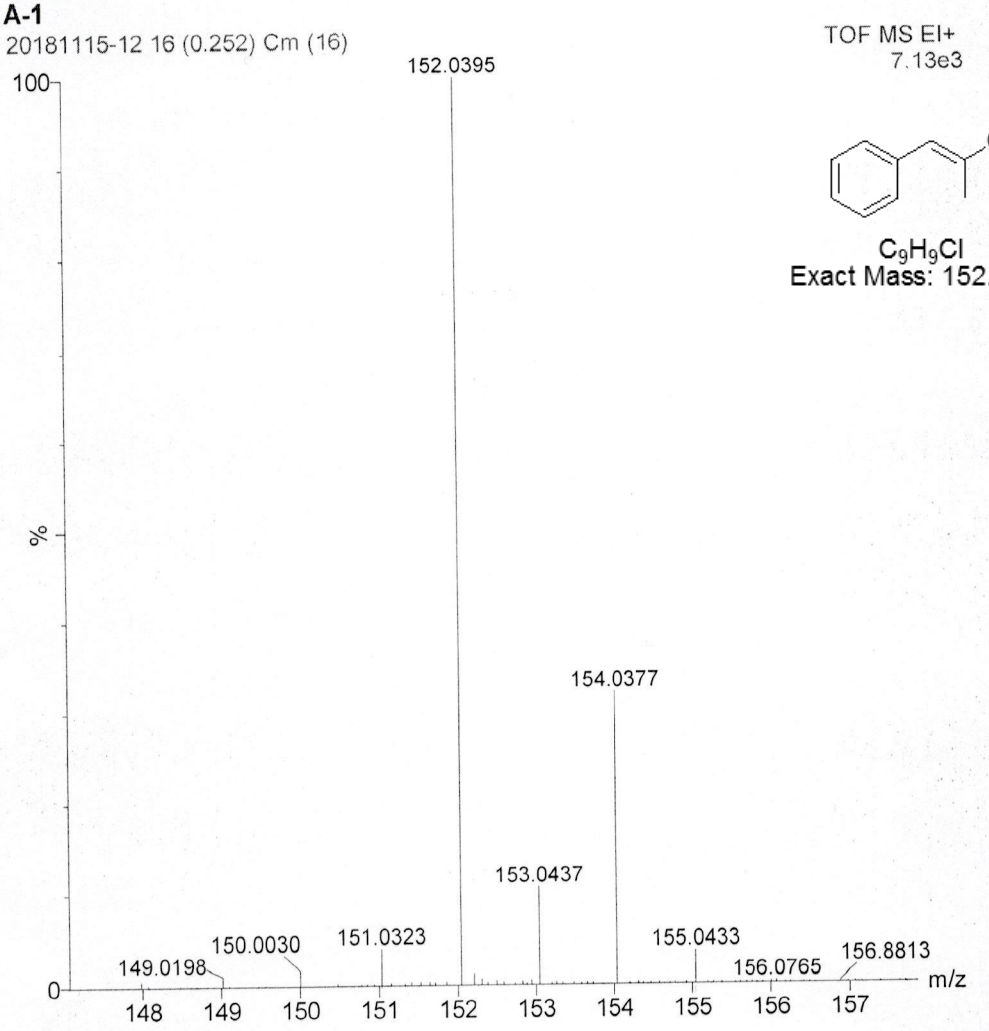
Analysis Info

Analysis Name	FTMS-19100244_Neg_20191024_000016.d	Acquisition Date	10/24/2019 4:33:12 PM
Sample	v-1	Instrument	Bruker Solarix XR FTMS
Comment		Operator	Peking University



Meas. m/z	#	Ion Formula	Score	m/z	err [ppm]	Mean err [ppm]	mSigma	rdb	e⁻ Conf	N-Rule
180.982583	1	C6H7Cl2O2	100.00	180.982858	1.5	1.7	10.0	8.0	even	ok

A-1
A-1
20181115-12 16 (0.252) Cm (16)



C_9H_9Cl
Exact Mass: 152.0393

Elemental Composition Report

Multiple Mass Analysis: 2 mass(es) processed
Tolerance = 100.0 PPM / DBE: min = -1.5, max = 50.0
Isotope cluster parameters: Separation = 1.0 Abundance = 1.0%

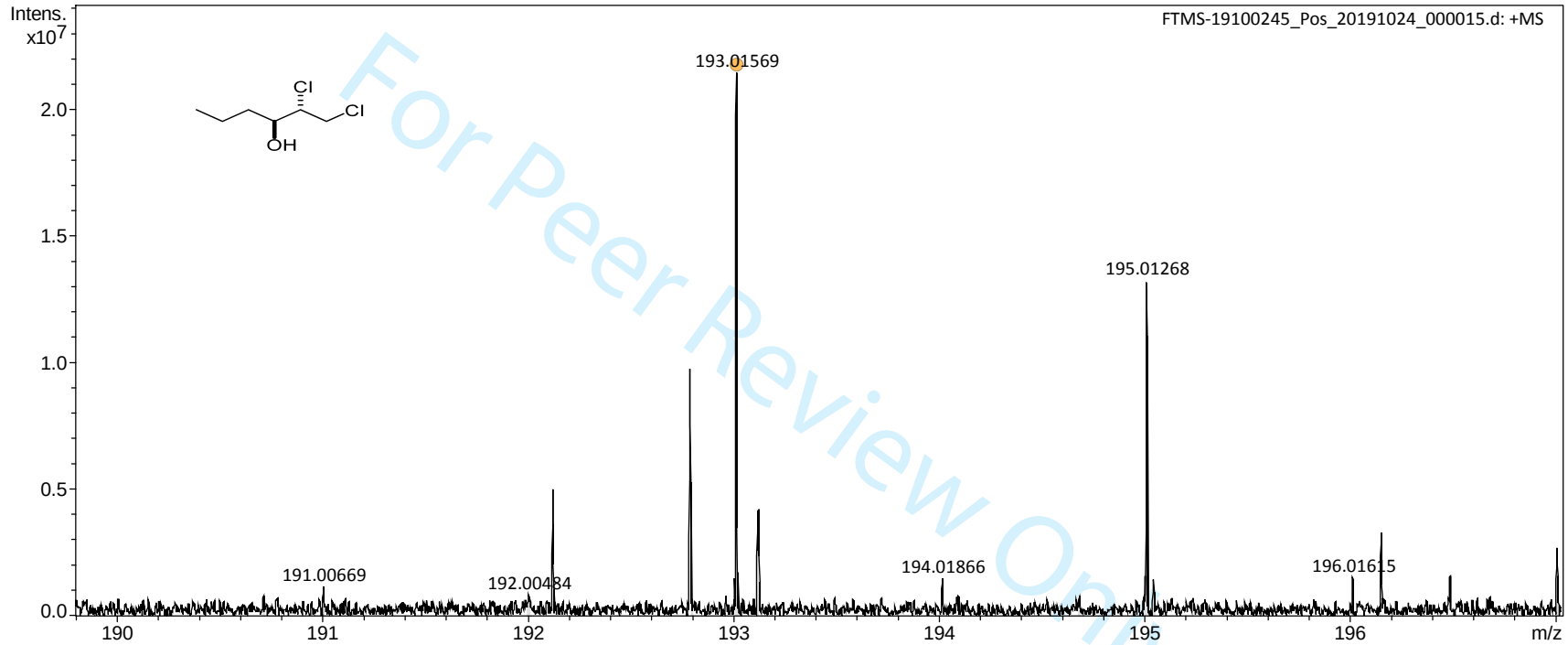
Monoisotopic Mass, Odd and Even Electron Ions
4 formula(e) evaluated with 1 results within limits (up to 50 closest results for each mass)

Minimum:	30.00				-1.5		
Maximum:	100.00		200.0	100.0	50.0		
Mass	RA	Calc. Mass	mDa	PPM	DBE	Score	Formula
152.0395	100.00	152.0393	0.2	1.5	5.0	1	C9 H9 Cl

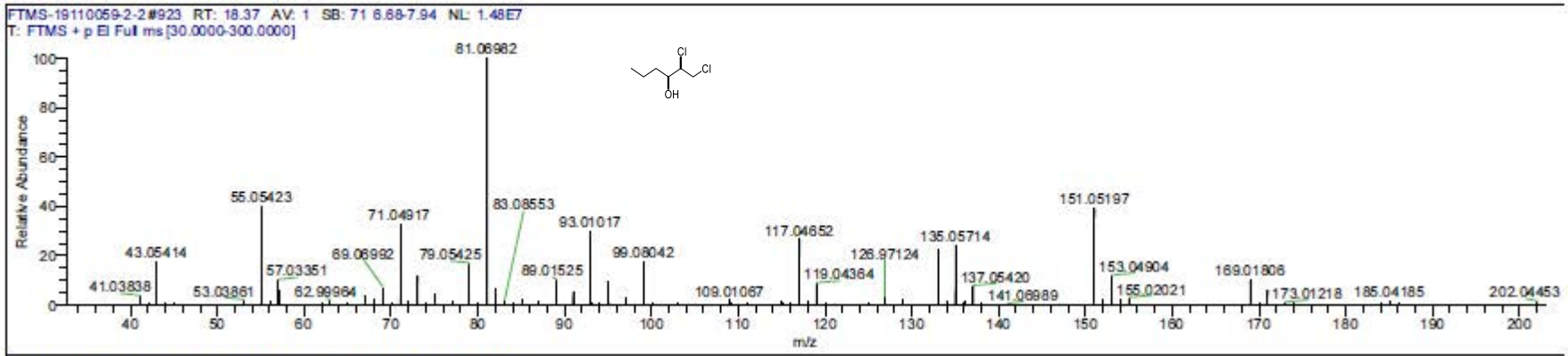
Peking University Mass Spectrometry Sample Analysis Report

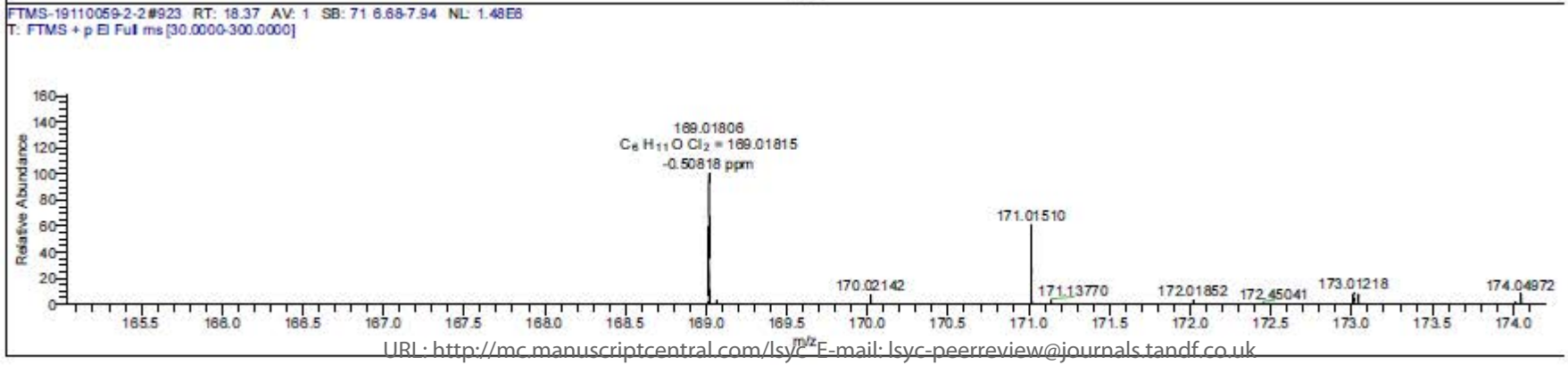
Analysis Info

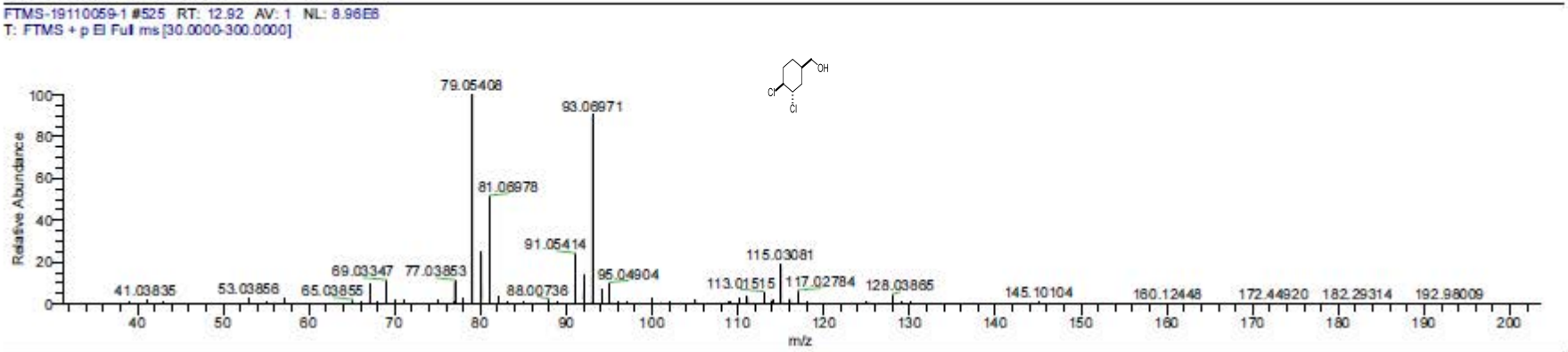
Analysis Name	FTMS-19100245_Pos_20191024_000015.d	Acquisition Date	10/24/2019 3:53:19 PM
Sample	W-P2	Instrument	Bruker Solarix XR FTMS
Comment		Operator	Peking University

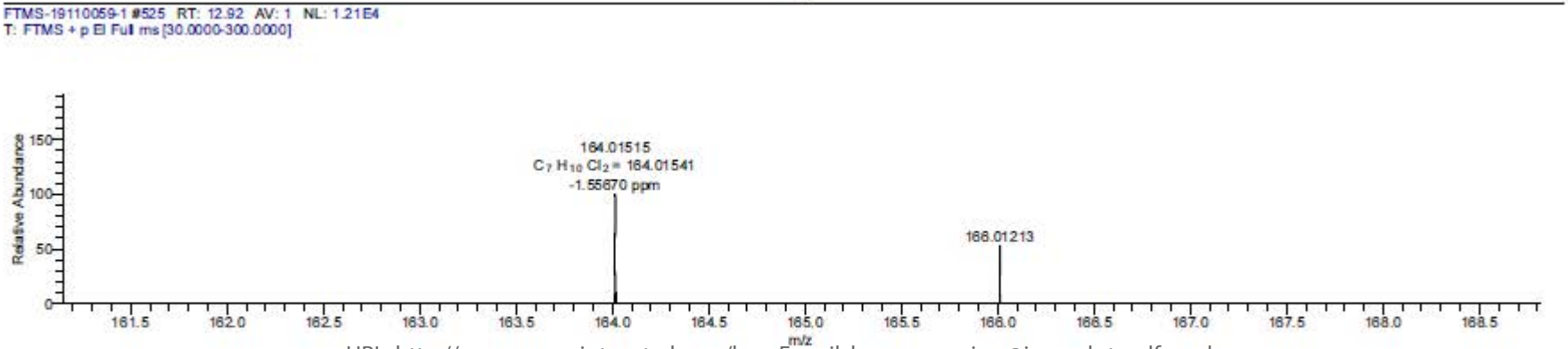


Meas. m/z	#	Ion Formula	Score	m/z	err [ppm]	Mean err [ppm]	mSigma	rdb	e⁻ Conf	N-Rule
193.015685	1	C6H12Cl2NaO	100.00	193.015741	0.3	0.6	19.4	6.0	even	ok


FTMS-19110059-2-2#923 RT: 18.37 AV: 1 SB: 71 6.68-7.94 NL: 1.48E7
T: FTMS + p EI Full ms [30.0000-300.0000]
Relative Abundance
m/z
81.06982
55.05423
71.04917
83.08553
93.01017
43.05414
69.06992
79.05425
99.08042
117.04652
135.05714
151.05197
57.03351
89.01525
119.04364
126.97124
137.05420
153.04904
169.01806
41.03838
53.03861
62.99964
109.01067
141.06989
155.02021
173.01218
185.04185
202.04453
Cl
Cl
OH


FTMS-19110059-2-2#923 RT: 18.37 AV: 1 SB: 71 6.68-7.94 NL: 1.48E8
T: FTMS + p EI Full ms [30.0000-300.0000]
Relative Abundance
m/z
169.01806
C6 H11 O Cl2 = 169.01815
-0.50818 ppm
171.01510
170.02142
171.13770
172.01852
172.45041
173.01218
174.04972

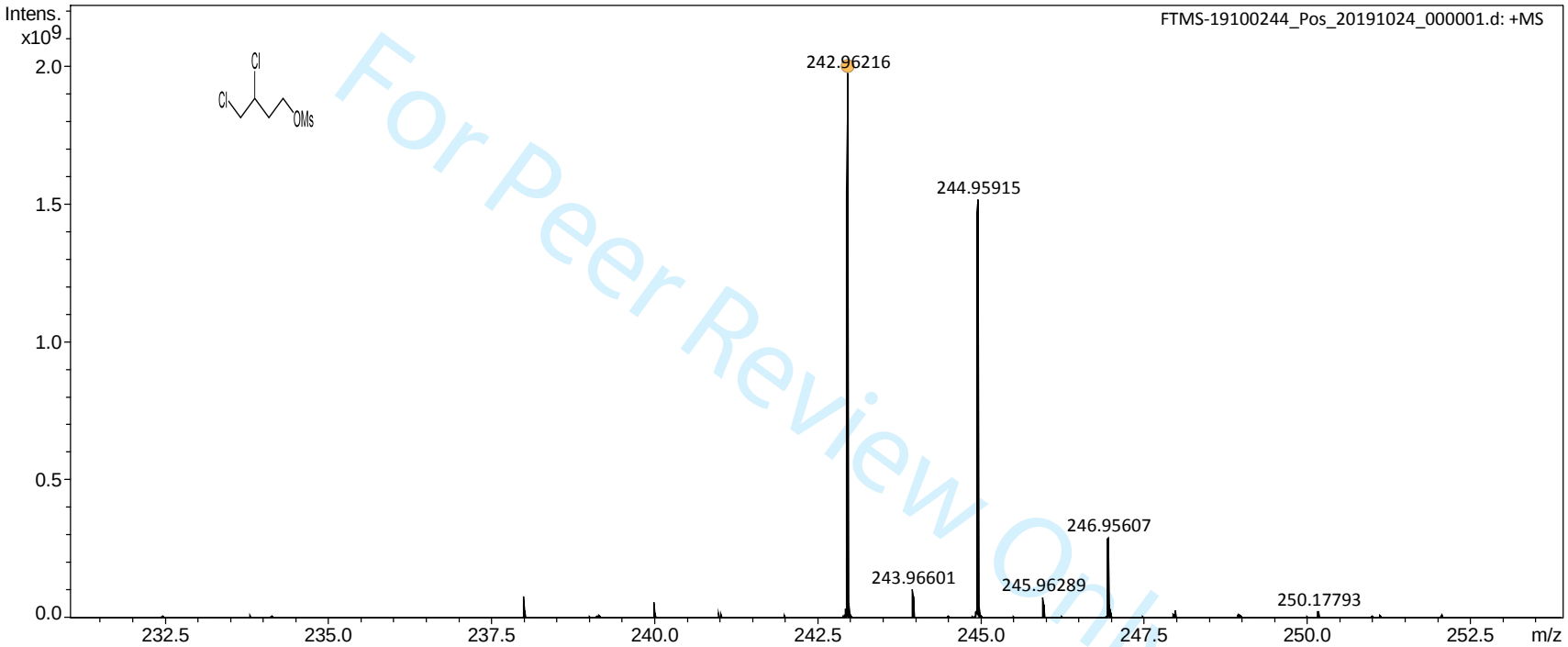

FTMS-19110059-1 #525 RT: 12.92 AV: 1 NL: 8.96E6
T: FTMS + p EI Full ms [30.0000-300.0000]
79.05408
93.06971
81.06978
91.05414
115.03081
69.03347
77.03853
95.04904
41.03835
53.03856
65.03855
88.00736
113.01515
117.02784
128.03865
145.10104
160.12448
172.44920
182.29314
192.98009
Relative Abundance
m/z


FTMS-19110059-1 #525 RT: 12.92 AV: 1 NL: 1.21E4
T: FTMS + p EI Full ms [30.0000-300.0000]
164.01515
C7 H10 Cl2 = 164.01541
-1.55670 ppm
166.01213
Relative Abundance
m/z

Peking University Mass Spectrometry Sample Analysis Report

Analysis Info

Analysis Name	FTMS-19100244_Pos_20191024_000001.d	Acquisition Date	10/24/2019 4:01:59 PM
Sample	Y-P	Instrument	Bruker Solarix XR FTMS
Comment		Operator	Peking University

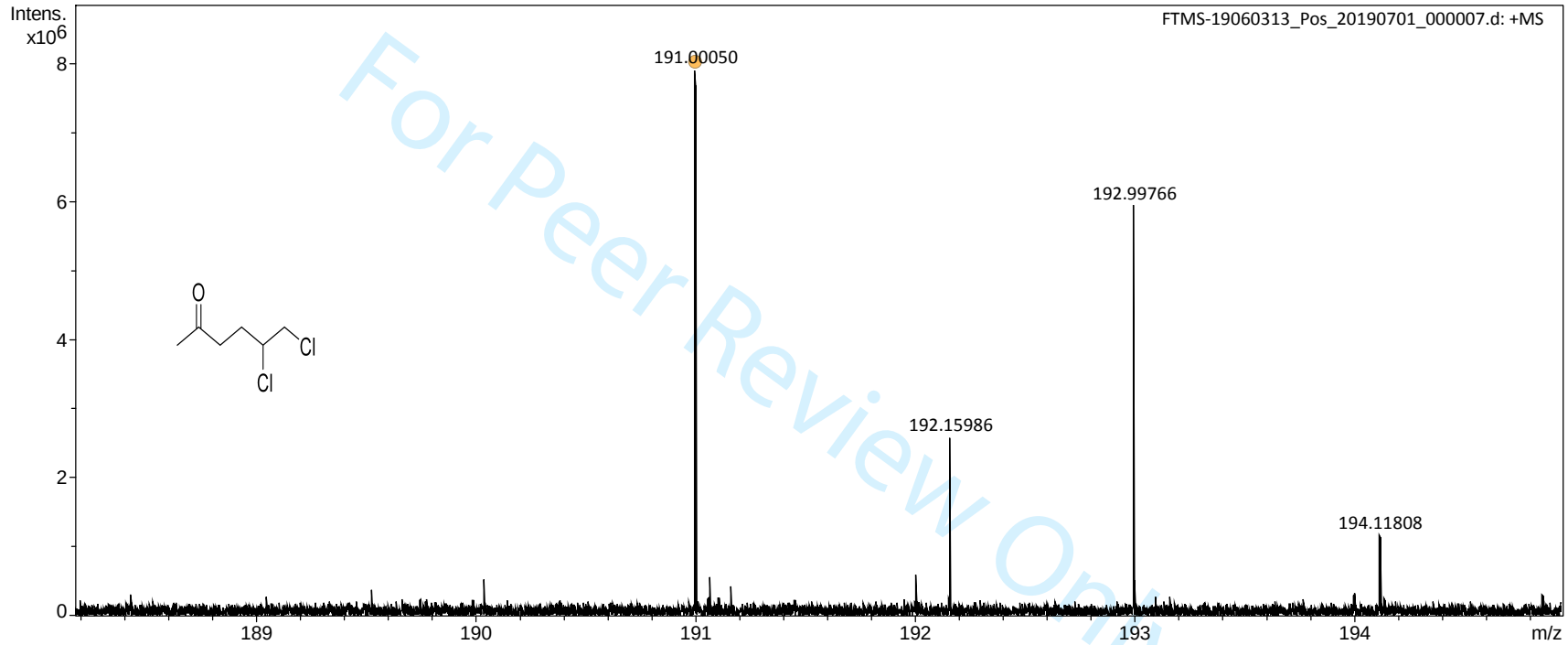


Meas. m/z	#	Ion Formula	Score	m/z	err [ppm]	Mean err [ppm]	mSigma	rdb	e⁻ Conf	N-Rule
242.962158	1	C5H10Cl2NaO3S	100.00	242.961991	-0.7	-1.8	35.4	8.0	even	ok

Peking University Mass Spectrometry Sample Analysis Report

Analysis Info

Analysis Name	FTMS-19060313_Pos_20190701_000007.d	Acquisition Date	7/1/2019 3:44:52 PM
Sample	O-1	Instrument	Bruker Solarix XR FTMS
Comment		Operator	Peking University

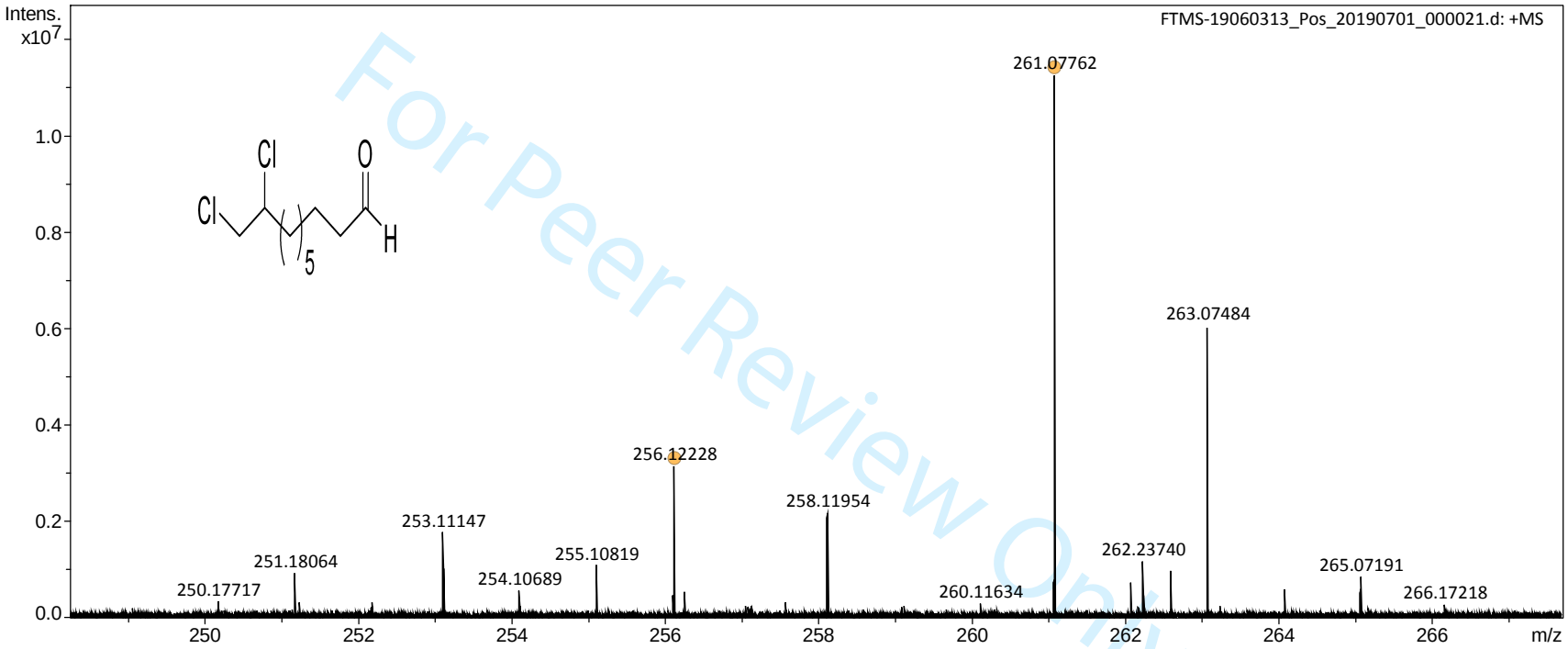


Meas. m/z	#	Ion Formula	Score	m/z	err [ppm]	Mean err [ppm]	mSigma	rdb	e⁻ Conf	N-Rule
191.000496	1	C6H10Cl2NaO	100.00	191.000091	-2.1	-2.4	53.5	7.0	even	ok

Peking University Mass Spectrometry Sample Analysis Report

Analysis Info

Analysis Name	FTMS-19060313_Pos_20190701_000021.d	Acquisition Date	7/1/2019 4:30:07 PM
Sample	K-1	Instrument	Bruker Solarix XR FTMS
Comment		Operator	Peking University



Meas. m/z	#	Ion Formula	Score	m/z	err [ppm]	Mean err [ppm]	mSigma	rdb	e⁻ Conf	N-Rule
256.122281	1	C11H24Cl2NO	100.00	256.122946	2.6	1.7	23.0	6.0	even	ok
261.077619	1	C11H20Cl2NaO	100.00	261.078341	2.8	1.6	45.3	7.0	even	ok