Supporting Information

Massive Parallel Catalyst Screening: Towards Asymmetric MCRs

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General. Melting points were determined in open capillaries on an electrothermal IA 9100 melting point apparatus and are reported uncorrected. Proton and Carbon nmr spectra were obtained in $CDCl_3$ and determined with a Mercury 400 spectrometer. Chemical shifts are expressed in ppm (δ) with respect to TMS as an internal standard. NMR peak assignments were made on the basis of 2-D experiments. Electrospray ionisation mass spectra (ESI) were obtained using a MSD (Hewlett-Packards HPLC 1100 driven electrospray MS instrument). Products were purified either by crystallization with the named solvent or by preparative chromatography with silica gel and a mixture of ethylacetate (EA) and petrolether (PE) as eluent. Thin layer chromatography (TLC) and preparative thin layer chromatography (PTLC) was performed on 60 F_{254} aluminum sheets and glass plates from Merck using UV detection. The identity was determined utilizing a Hewlett-Packard LC 1100 system using a YMC ODS-A column (2.1 mm x 50 mm, 3 µm), detection wavelength at 220 nm and 254 nm; flow: 0.6 ml/min, with a 2.5 min gradient from 90 % H_2O to 10 % H_2O (0.5 % CH_3COOH) vs. CH_3CN (0.5 % CH_3COOH). Preparative HPLC was performed on a Labomatic System, using a Grom Sil 120 ODS-4 HE column (10 µm, 30 x 100 mm) with a 30 min methanol/water gradient (40-100 % MeOH + 0.5 % CH_3COOH) with single wavelength detection at 254 nm, flow: 50 ml/min. IR spectra were recorded on a Nexus FT-IR apparatus from Thermo-Nicolet. The intensity of the absorption bands are characterized as s = strong, m = medium, w = weak and br = broad.

Experimental Procedures

General procedure for the preparation of benzoic acid 1-benzylcarbamoyl-2-methyl-propyl ester (16) and analogous Passerini products:

5 Mmol (610 mg) benzoic acid (**15**) are diluted in 10 ml diethylether. To the solution 5 mmol (360 mg) *iso*-butyric aldehyde (**14**) and 5 mmol (586 mg) benzyl isocyanide (**13**) are added. The reaction mixture is allowed to stir over night at room temperature. The crystallized product is filtered off, washed with cold diethylether and dried under high vacuum to give 1.30 g (84 %) as a solid. All described Passerini reactions were performed in scheduled quantities and were crystallized or purified by preparative HPLC.

General screening procedure for Passerini reaction with chiral catalyst:

0.25 mmol chiral ligand are diluted in 125 µL THF (dry) in a 2 ml reaction flask with septum and magnetic stirrer under nitrogen atmosphere. Via a Hamilton syringe 100 µL of the lewis acid (**A**) are added and stirred for 30 minutes at the respective temperature (25°C, 0°C, -18°C or -78°C). A 2.5 M stock solution of every starting material is prepared in THF, in case of catalyst to reactant ratio of 1/1 and Lewis acid to ligand ratio of 1/1, and 100 µL are added in the ranking aldehyde, acid and isocyanide with a time delay of 30 min after each compound. The reaction mixture is stirred over night at room temperature.

For the work up 50 µL of the reaction mixture are added to a mixture of 200 µL THF, 200 µL *iso*-propanol and 200 µL saturated $NaHCO_3$ solution and shook vigorously. After complete separation of the two layers the upper organic layer is separated and subject to a silica based solid phase extraction column (equilibrated with 200 µL THF) and eluted with THF.

Purification of screening reaction mixtures with chiral catalyst using HPLC:

The purification was performed on a Hewlett-Packard LC 1100 system with a HP Zorbax Eclipse XDB-C8 column (4.6 x 150 mm, 5 µm) using a linear 14 min gradient from 10 % to 50 % MeCN (0.1 % HCOOH) vs. H_2O (0.1 % HCOOH). The corresponding UV active fraction is collected and completely evaporated under high vacuum. The residue is dissolved in *n*-hexane/*iso*-propanol (1/1) and measured on chiral stationary HPLC phase.

General procedure for Passerini reaction with chiral catalyst combination A7:

1 Mmol (466 mg) (4*S*,5*S*)-4,5-bis-(diphenylhydroxymethyl)-2,2-dimethyldioxolane (**7**) are diluted in 400 µL THF (dry) in a 5 ml reaction flask with septum and magnetic stirrer under nitrogen atmosphere. Via a syringe 400 µL titanisopropoxide (**A**) are added and stirred for 1h at -78°C. A 2.5 M stock solution of every starting material is prepared in 400 µL THF are added in the ranking aldehyde, acid and isocyanide with a time delay of 60 min after each compound. The reaction mixture is stirred over night.

For the work up the reaction mixture is completely transferred with a capillary to a preparative thin layer chromatography plate and developed with a solvent mixture of petrol ether/ethyl acetate. The corresponding band is scratched out and the product is unhinged with ethyl acetate. The silica gel is filtered off and the resulting filtrate is evaporated and dried on high vacuum.

Determination of enantiomeric excess by means of chiral stationary phases:

The enantiomeric excess is determined using an Agilent HPLC 1100 and an UV-detector at 254 nm or 220 nm. The products were separated on a Chiralcel-ODH (4.6 x 250 mm, 5µm) stationary phase with hexane and *iso*-propanol as eluents in LiChrosolve® quality with a flow of 0.5 ml/min. The separations have been performed in an isocratic mode using *n*-hexane/*iso*-propanol in a ratio of 85/15, in case of product (**17**) of 90/10. Stationary phases weren't equipped with a thermostate, so that a variation in temperatures may cause differences in retention times of the enantiomers. For that reason all supposed enantiomers have been proved by mass-spectrometry. Other chiral phases used (4.6 x 50 mm): Chirex 3020, 3010, 3002 from Phenomenex.

Experimental data for the described substances:

Benzoic acid 1-benzylcarbamoyl-2-methyl-propyl ester (**16**): scheduled quantity 5 mmol gave 1.300 g (84 %) $C_{19}H_{21}NO_3$ MW: 311.38 g/mol; **M.p.** 112.5°C - 113.3°C; $\mathbf{R_f}$: 0.70 (PE/EA, 1/1, v/v); **HPLC-MS (ESI):** t_R = 3.65 min; m/z = 312 $[M+H]^+$; 334 $[M+Na]^+$; **^{1}H-NMR ($CDCl_3$, 400 MHz):** δ = 1.06 (dd, 6H, ^{3}J=11.6Hz, ^{4}J=6.9Hz, 2×C**H**$_3$); 2.47-2.54 (m, 1H, CHC**H**$(CH_3)_2$); 4.40-4.57 (m, 2H, $^2J_{ab}$=14.95Hz, NHC**H**$_2$), 5.37 (d, 1H, ^{3}J=4.1Hz, C**H**CH$(CH_3)_2$); 6.44 (br, 1H, N**H**); 7.24-7.33 (m, 5H, 5×C**H**-Ar); 7.45-7.49 (m, 2H, 2×C**H**-Ar), 7.59-7.62 (m, 1H, 1×C**H**-Ar), 8.06-8.08 (m, 2H, 2×C**H**-Ar); **^{13}C-NMR ($CDCl_3$, 100 MHz):** δ = 17.32 (**C**H$_3$); 19.26 (**C**H$_3$); 31.09 (**C**H$(CH_3)_2$); 43.36 (NH**C**H$_2$); 78.87 (**C**HCH$(CH_3)_2$); 127.80 (**C**H-Ar); 128.93 (**C**H-Ar); 129.51 (**C**H-Ar); 129.99 (**C**H-Ar); 133.86 (**C**H-Ar); 138.15 (**C**H-Ar); 165.76 (**C**O); 169.62 (**C**O); **IR**: ? (cm^{-1}) = 3264 (m); 3088 (w); 2971 (m); 2359 (w); 1723 (s); 1656 (s); 1561 (m); 1292 (s), 1258 (s); 708 (s). Separation of enantiomers: t_R(A): 18.72 min (50 %), t_R(B): 21.89 min (50 %); with

chiral induction of catalyst A7: scheduled quantity 1 mmol gave 677 mg (46 %): t_R(A): 18.73 min (32 %), t_R(B): 21.90 min (68 %); ee = 36 %.

2-Hydroxy-benzoic acid 1-benzylcarbamoyl-2-methyl-propyl ester (**17**): scheduled quantity 5 mmol gave 1.516 g (93 %) $C_{19}H_{21}NO_4$ MW: 327.38 g/mol; **R_f**: 0.36 (PE/EA, 5/1, v/v); **HPLC-MS (ESI):** t_R = 3.68 min; m/z = 350 $[M+Na]^+$; **^{1}H-NMR ($CDCl_3$, 400 MHz):** δ = 1.06 (dd, 6H, ^{3}J=9.3Hz, ^{4}J=6.9Hz, 2×C**H**$_3$); 2.48 (m, 1H, C**H**$(CH_3)_2$); 4.40-4.57 (m, 2H, $^2J_{a,b}$=14.9Hz, ^{3}J=5.6Hz, NHC**H**$_2$); 5.31 (d, 1H, ^{3}J=4.4Hz, C**H**CH$(CH_3)_2$); 6.43 (t, 1H, ^{3}J=5.6Hz, N**H**); 6.89-6.93 (m, 1H, 1×C**H**-Ar); 7.00-7.02 (m, 1H, 1×C**H**-Ar); 7.24-7.34 (m, 5H, 5×C**H**-Ar); 7.47-7.52 (m, 1H, 1×C**H**-Ar); 7.86-7.88 (m, 1H, 1×C**H**-Ar); 10.53 (s, 1H, O**H**); **^{13}C-NMR ($CDCl_3$, 100 MHz):** δ = 17.05 (**C**H_3); 18.88 (**C**H_3); 30.73 (**C**H$(CH_3)_2$); 43.13 (NH**C**H_2); 78.98 (**C**HCH$(CH_3)_2$); 111.60 (**C**-Ar); 117.88 (**C**H-Ar); 119.40 (**C**H-Ar); 127.49 (**C**H-Ar); 128.67 (**C**H-Ar); 129.50 (**C**H-Ar); 136.34 (**C**H-Ar); 137.69 (**C**-Ar); 161.90 (Ar**C**-OH); 168.76 (**C**O); 169.06 (**C**O). Separation of enantiomers: t_R(A): 19.88 min (50 %), t_R(B): 21.79 min (50 %); with chiral induction of catalyst A7: scheduled quantity 1 mmol gave 39 mg (12 %): t_R(A): 21.02 min (33 %), t_R(B): 23.17 min (67 %); ee = 32 %. The identity has been proved by coelution with the enantiomeric 1:1 mixture of compound **17.**

Benzoic acid 1-(3,5-dimethyl-benzylcarbamoyl)-2-methyl-propyl ester (**18**): scheduled quantity 1 mmol gave 160 mg (47 %) $C_{21}H_{25}NO_3$ MW: 339.44 g/mol; **R_f**: 0.60 (PE/EA, 2/1, v/v); **HPLC-MS (ESI):** t_R = 3.84 min; m/z = 340 $[M+H]^+$; 362 $[M+Na]^+$; **^{1}H-NMR ($CDCl_3$, 400 MHz):** δ = 1.05-1.10 (dd, 6H, ^{3}J=13.9Hz, ^{4}J=6.8Hz, 2×C**H**$_3$); 2.56 (s, 6H, 2×C**H**$_3$-Ar); 2.46-2.54 (m, 1H, CHC**H**$(CH_3)_2$); 4.35-4.47 (m, 2H; NHC**H**$_2$); 5.35-5.37 (d, 1H, ^{3}J=4.3Hz, C**H**CH$(CH_3)_2$); 6.47 (m, 1H, N**H**CH_2); 6.85-6.88 (m, 3H, 3×C**H**-Ar); 7.45-7.49 (m, 2H, 2×C**H**-Ar); 7.58-7.62 (m, 1H, 1×C**H**-Ar); 8.07-8.09 (m, 2H, 2×C**H**-Ar); **^{13}C-NMR ($CDCl_3$, 100 MHz):** δ = 16.96 (**C**H_3); 18.86 (**C**H_3); 21.05 (**C**H_3); 30.66 (CH**C**H$(CH_3)_2$); 42.85 (NH**C**H_2); 78.55 (**C**HCH$(CH_3)_2$); 125.17 (**C**H-Ar); 128.49 (**C**H-Ar); 128.92 (**C**H-Ar); 129.16 (**C**H-Ar);129.59 (**C**H-Ar); 133.43 (**C**H-Ar); 137.67(**C**-Ar); 138.09 (**C**-Ar); 165.37 (**C**O); 169.161 (**C**O). Separation of enantiomers: t_R(A): 12.05 min (50 %), t_R(B): 20.17 min (50 %). In contrast to the other perfomed separations, here the retention times of the two enantiomers differs in a range of 8 min. To prove these data every peak was collected and reinjected into HPLC-MS which approved the separation of the enantiomers; with chiral induction of catalyst A7: scheduled quantity 1 mmol gave 105 mg (31 %): t_R(A): 12.21 min (34 %), t_R(B): 20.15 min (66 %); ee = 32 % (for this example only few amounts were purified which leads to low concentration and low intensity in the UV spectra).

Benzoic acid 2-methyl-1-[(pyridin-3-ylmethyl)-carbamoyl]-propyl ester (**19**): scheduled quantity 1 mmol gave 237 mg (76 %) $C_{18}H_{20}N_2O_3$ MW: 312,37 g/mol; $\mathbf{R_f}$: 0.22 (PE/EA, 2/1, v/v); **HPLC-MS (ESI):** t_R = 2.88 min; m/z = 313 $[M+H]^+$; **^{1}H-NMR ($CDCl_3$, 400 MHz):** δ = 0.99-1.09 (m, 6H, 2xCH_3); 2.40-2.48 (m, 1H, $CHCH(CH_3)_2$); 4.36-4.52 (m, 2H, $NHCH_2$); 5.28-5.30 (m, 1H, $CHCH(CH_3)_2$); 6.69 (m, 1H, $NHCH_2$); 7.18-7.24 (m, 1H, 1xCH-Ar); 7.41-7.44 (m, 2H, 2xCH-Ar); 7.55-7.59 (m, 2H, 2xCH-Ar); 8.01-8.03 (m, 2H, 2xCH-Ar); 8.42 (m, 2H, 2xCH-Ar); **^{13}C-NMR ($CDCl_3$, 100 MHz):** δ = 17.03 (CH_3); 18.90 (CH_3); 30.74 ($CH(CH_3)_2$); 40.50 ($NHCH_2$); 78.55 ($CHCH(CH_3)_2$); 123.59 (CH-Ar); 128.62 (CH-Ar); 129.70 (CH-Ar); 133.64 (CH-Ar); 135.47 (CH-Ar); 148.86 (CH-Ar); 165.54 (CO); 169.65 (CO). Separation of enantiomers: t_R(A): 25.20 min (33 %), t_R(B): 29.89 min (33 %), t_R(C): 34.25 min (33 %) side product, to confirm that the peaks of enantiomers A and B are correctly assigned the fractions were collected and product peaks were reinjected into HPLC-MS which approved the separation of the enantiomers; with chiral induction of catalyst A7: scheduled quantity 1 mmol gave 87 mg (28 %): t_R(A): 25.36 min (29 %), t_R(B): 29.67 min (71 %); ee = 42 %.

Benzoic acid 1-benzylcarbamoyl-2,2-dimethyl-propyl ester (**20**): scheduled quantity 1 mmol gave 263 mg (81 %) $C_{20}H_{23}NO_3$ MW: 325,41 g/mol; $\mathbf{R_f}$: 0.50 (PE/EA, 3/1, v/v); **HPLC-MS (ESI):** t_R = 3.72 min; m/z = 326 $[M+H]^+$; 348 $[M+Na]^+$; **^{1}H-NMR ($CDCl_3$, 400 MHz):** δ = 1.07 (s, 9H, 3×CH_3); 4.32-4.47 (m, 2H, $^2J_{ab}$=14.92Hz, $NHCH_2$); 5.04 (s, 1H, $CHC(CH_3)_3$); 6.20 (m, 1H, $NHCH_2$); 7.16-7.24 (m, 5H, 5×CH-Ar); 7.38-7.42 (m, 2H, 2×CH-Ar); 7.51-7.55 (m, 1H, 1×CH-Ar); 7.99-8.01 (m, 2H, 2×CH-Ar); **^{13}C-NMR ($CDCl_3$, 100 MHz):** δ = 26.39 (CH_3); 34.50 ($C(CH_3)_3$); 43.03 ($NHCH_2$); 81.41 ($CHC(CH_3)_3$); 127.38 (CH-Ar); 127.55 (CH-Ar); 126.57 (CH-Ar); 129.29 (C-Ar); 129.64 (CH-Ar); 133.48 (CH-Ar); 137.93 (C-Ar); 165.33 (CO); 168.31 (CO). Separation of enantiomers: t_R(A): 11.72 min (50 %), t_R(B): 14.19 min (50 %); with chiral induction of catalyst A7: scheduled quantity 1 mmol gave 156 mg (48 %): t_R(A): 11.81 min (33 %), t_R(B): 14.13 min (67 %); ee = 34 %.

Biphenyl-4-carboxylic acid 1-benzylcarbamoyl-2,2-dimethyl-propyl ester (**21**): scheduled quantity 1 mmol gave 383 mg (95 %) $C_{26}H_{27}NO_3$ MW: 401,51 g/mol; $\mathbf{R_f}$: 0.40 (PE/EA, 4/1, v/v); **HPLC-MS (ESI):** t_R = 4.08 min; m/z = 402 $[M+H]^+$; 424 $[M+Na]^+$; **^{1}H-NMR ($CDCl_3$, 400 MHz):** δ = 1.09 (s, 9H, 3×CH_3); 4.33-4.48 (m, 2H, $^2J_{ab}$=14.92Hz, $NHCH_2$); 5.06 (s, 1H, $CHC(CH_3)_3$); 6.22 (t, 1H, ^{3}J=5.5Hz, $NHCH_2$); 7.16-7.24 (m, 5H, 5×CH-Ar); 7.31-7.42 (m, 3H,

3×C**H**-Ar); 7.53-7.55 (m, 2H, 2×C**H**-Ar); 7.59-7.62 (m, 2H, 2×C**H**-Ar); 8.05-8.07 (m, 2H, 2×C**H**-Ar); **^{13}C-NMR (CDCl$_3$, 100 MHz):** δ = 26.44 (**C**H$_3$); 34.56 (**C**(CH$_3$)$_3$); 43.08 (NH**C**H$_2$); 81.44 (**C**HC(CH$_3$)$_3$); 127.23 (**C**H-Ar); 127.58 (**C**H-Ar); 127.97 (**C**H-Ar); 128.29 (**C**H-Ar); 128.62 (**C**H-Ar); 128.94 (**C**H-Ar); 130.20 (**C**H-Ar); 137.97 (**C**-Ar); 139.68 (**C**-Ar); 146.27 (**C**-Ar); 165.25 (**C**O); 168.36 (**C**O). Separation of enantiomers: t_R(A): 16.18 min (50 %), t_R(B): 26.23 min (50 %); with chiral induction of catalyst A7: scheduled quantity 1 mmol gave 185 mg (46 %): t_R(A): 16.15 min (32 %), t_R(B): 26.30 min (68 %); ee = 36 %.

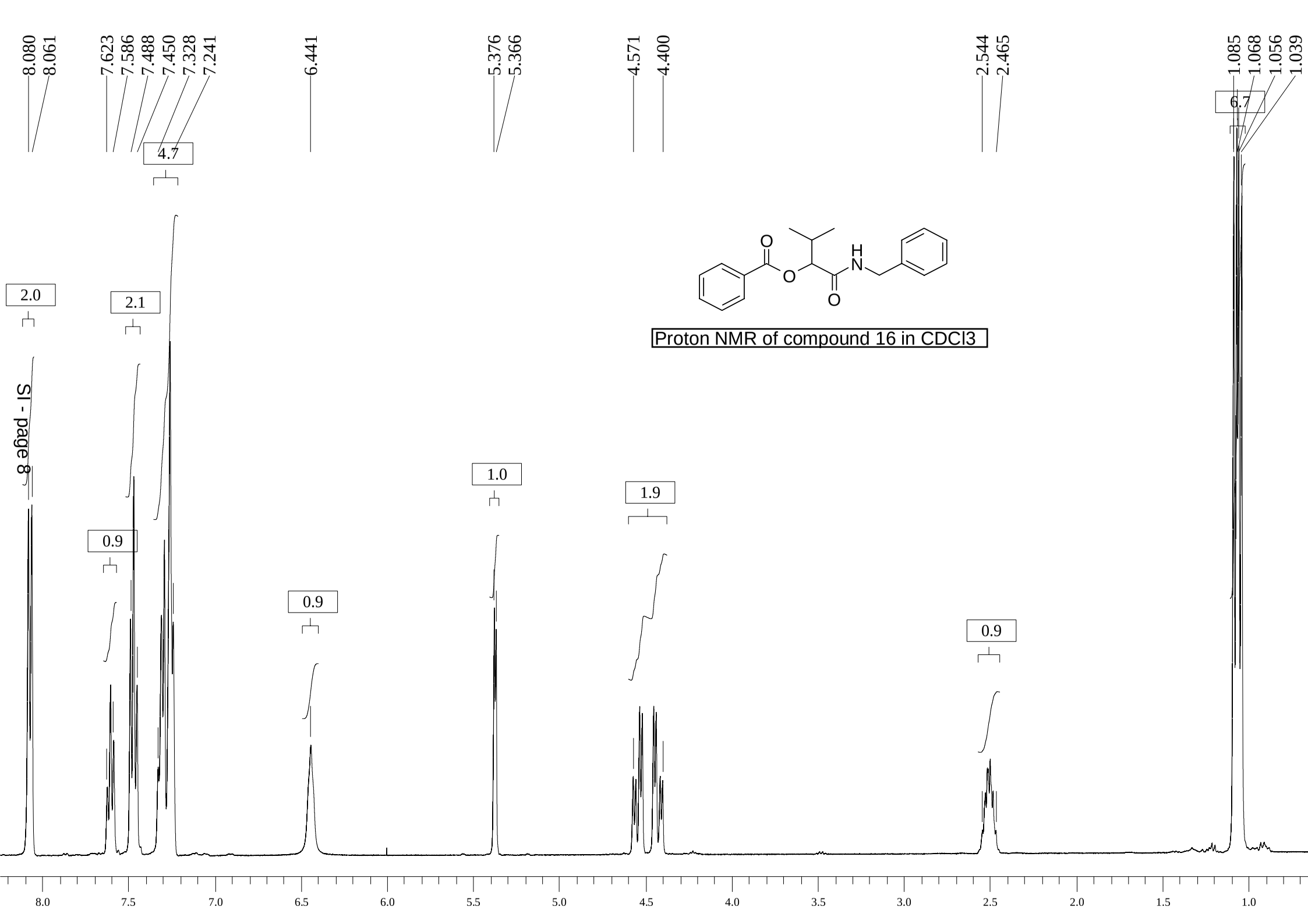
2-*tert*-Butoxycarbonylamino-3-phenyl-propionic acid 1-benzylcarbamoyl-2-methyl-propyl ester (**22**): scheduled quantity 5 mmol gave 1.264 g (56 %) $C_{26}H_{34}N_2O_5$ MW: 454.57g/mol; **HPLC-MS (ESI):** t_R = 3.93 min; m/z = 477 $[M+Na]^+$; **^{1}H-NMR (CDCl$_3$, 400 MHz):** δ = 0.59-0.86 (m, 6H, 2×C**H**$_3$); 1.26-1.30 (m, 9H, 3×C**H**$_3$); 2.30-2.41 (m, 1H, C**H**(CH$_3$)$_2$); 3.01-3.20 (m, 2H, CC**H**$_2$CH); 4.22-4.67 (m, 2H, NHC**H**$_2$); 4.92-4.94 (br, 1H, **N**H); 5.06-5.07 (m, 1H, NHC**H**CO); 5.14 (m, 1H, C**H**CH(CH$_3$)$_2$); 7.16-7.31 (m, 10H, 10×C**H**-Ar); 7.60 (br, 1H, **N**H); **^{13}C-NMR (CDCl$_3$, 100 MHz)** The product is obtained as a diastereomeric mixture, all signals occur doubled**:** δ = 16.08 & 16.28 (1×**C**H$_3$); 18.53 & 18.95 (1×**C**H$_3$); 28.07 (3×**C**H$_3$); 29.88 & 30.23 (**C**H(CH$_3$)$_2$); 36.93 & 37.24 (1×C**C**H$_2$CH); 42.89 & 43.00 (1×NH**C**H$_2$); 54.82 & 55.79 (NH**C**H); 78.73 & 78.96 (**C**HCH(CH$_3$)$_2$); 80.59 & 80.64 (**C**CH$_3$); 126.94-129.06 (**C**H-Ar; **C**); 135.35 & 135.46 (**C**-Ar); 138.18 & 138.43 (**C**-Ar); 155.79& 156.26 (**C**O); 169.05 (**C**O); 170.95 (**C**O); 172.11 (**C**O). Separation of diastereomers: injection of the mother liquor t_R(A): 11.73 min (44 %), t_R(B): 17.64 min (56 %), de = 12 %; injection of the second part of the crystal used for single crystal X-ray determination: t_R(A): 11.66 min (100 %); coelution of diastereomeric mixture and crystal t_R(A): 11.79 min (57 %), t_R(B): 17.89 min (43 %).

X-ray single crystal structure determination of **22**: *Crystal data:* $C_{26}H_{34}N_2O_5$, M_r = 454.55, colourless crystal, 0.76 × 0.64 × 0.38 mm^3, orthorhombic, space group $P2_12_12_1$ (No. 19), a = 11.2376(1), b = 12.3949(1), c = 18.3839(1) Å, V = 2560.67(3) Å^3, Z = 4, r_{calcd} = 1.179 g cm^{-3}, F(000) = 976, m (Mo K_α) = 0.082 mm^{-1}, T = 173 K. *Data collection*: Nonius MACH3 κ-axis CCD-diffractometer, l = 0.71073 Å, unit cell parameters by least-squares for 2669 reflections. A total number of 57025 reflections were integrated. After merging, 4666 reflections [all data; R_{int} = 0.037] remained and these were used for all further calculations. *Structure solution and refinement*: Direct methods (*SIR92*), full-matrix least-squares refinements on F^2 (*SHELXL-97*) converged with $R1$ = 0.0277 [4314 data; $I_o>2\sigma(I_o)$], $wR2$ =

0.0680 [all data], *GOF* = 1.045 and stopped at a maximum shift/error < 0.001. Crystallographic data (excluding structure factors) for the structure reported in this paper have been deposited with the Cambridge Crystallographic Data Centre as supplementary publication no. CCDC-xxxxxx (**22**). Copies of the data can be obtained free of charge on application to CCDC, 12 Union Road, Cambridge CB2 1EZ, UK [Fax: (internat.) +44-1223/336-033; E-mail: deposit@ccdc.cam.ac.uk]. b) Altomare, A.; Cascarano, G.; Giacovazzo, C.; Guagliardi, A.; Burla, M. C.; Polidori, G.; Camalli, M. *SIR92; J. Appl. Cryst.* **1994**, *27*, 435. c) Sheldrick G. M. *SHELXL-97*; University of Göttingen: Germany, **1998**.

Preparation of *N*-Benzyl-2-hydroxy-3-methyl-butyramide (**23**): 10 mg of the corresponding ester {saponification of 2-*tert*-Butoxycarbonylamino-3-phenyl-propionic acid 1-benzylcarbamoyl-2-methyl-propyl ester (**22**) in the following refers to experiment A or saponification of Benzoic acid 1-benzylcarbamoyl-2-methyl-propyl ester (**16**) in the following refers to experiment B} is dissolved in a mixture of *n*-hexane/*iso*-propanol (1/1) 40 µL. To this solution 40 µL of a 2N aq. NaOH solution are added and stirred for 30 min at room temperature. The formed alcohol **23** is isolated on a HPLC (HP Zorbax Eclipse XDB-C8 column) The solvent is completely evaporated under high vacuum and the residue is dissolved in *n*-hexane/*iso*-propanol (1/1) and meassured on chiral HPLC phase.

N-Benzyl-2-hydroxy-3-methyl-butyramide (**23**): $C_{12}H_{17}NO_2$ MW: 207.27g/mol; **HPLC-MS (ESI):** t_R = 2.95 min; m/z = 208 $[M+H]^+$; 230 $[M+Na]^+$; Experiment A: saponification of the crystal **22** leads to alcohol **23**; HPLC on Chiralcel-ODH (4.6 x 250): t_R(A): 14.57 min as a single peak; Experiment B: saponification of the ester **16** with chiral induction of catalyst A7: t_R(A): 14.70 min, t_R(B): 15.55 min these peaks show no baseline separation; peak A which corresponds to the alcohol **23** in *R*-configuration from experiment A shows less intensity than peak B. The co-injection approved the induction of the *S*-enantiomer: t_R(A): 14.60 min, t_R(B): 15.46 min.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Proton NMR of compound 16 in CDCl3
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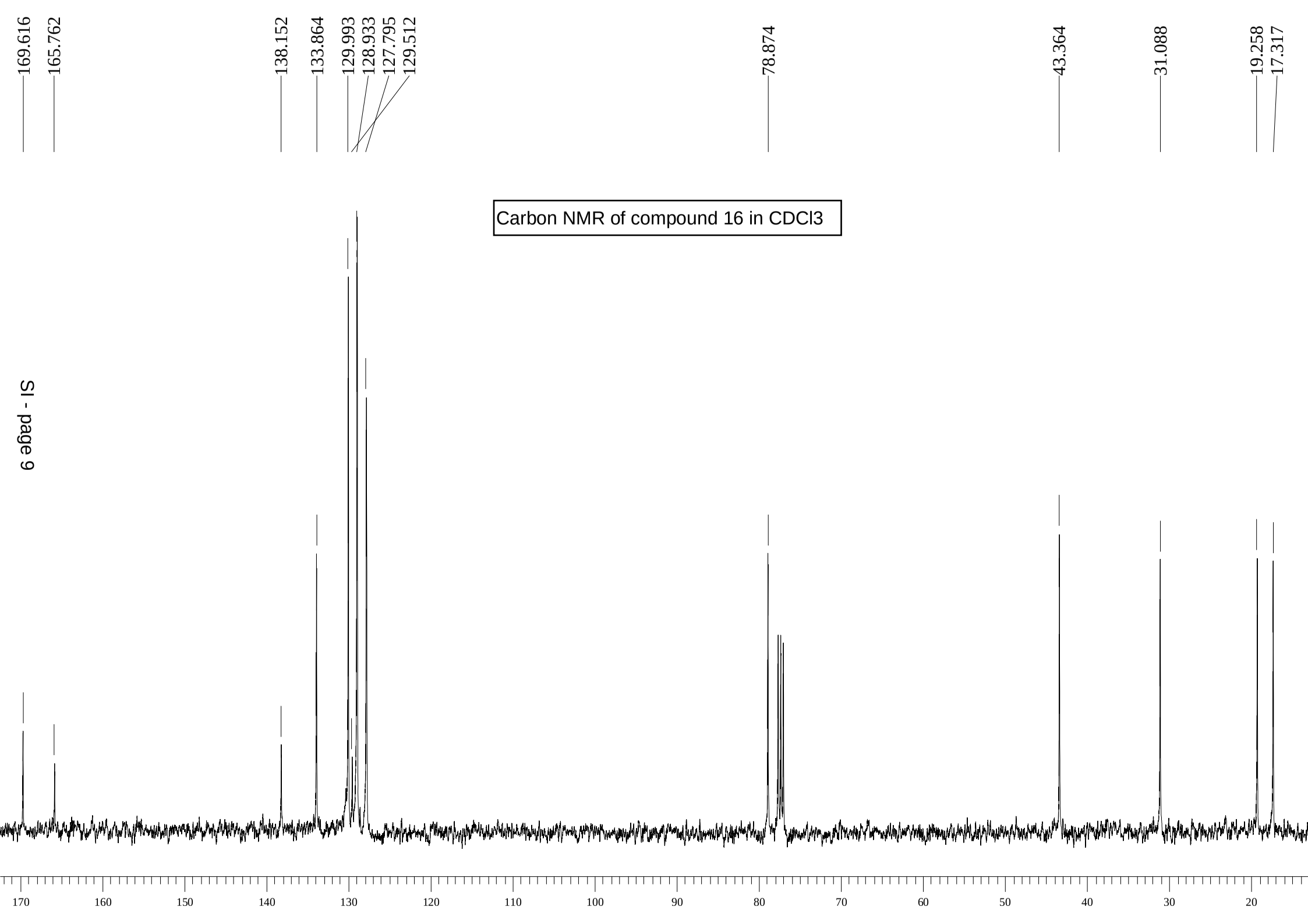
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SI - page 9
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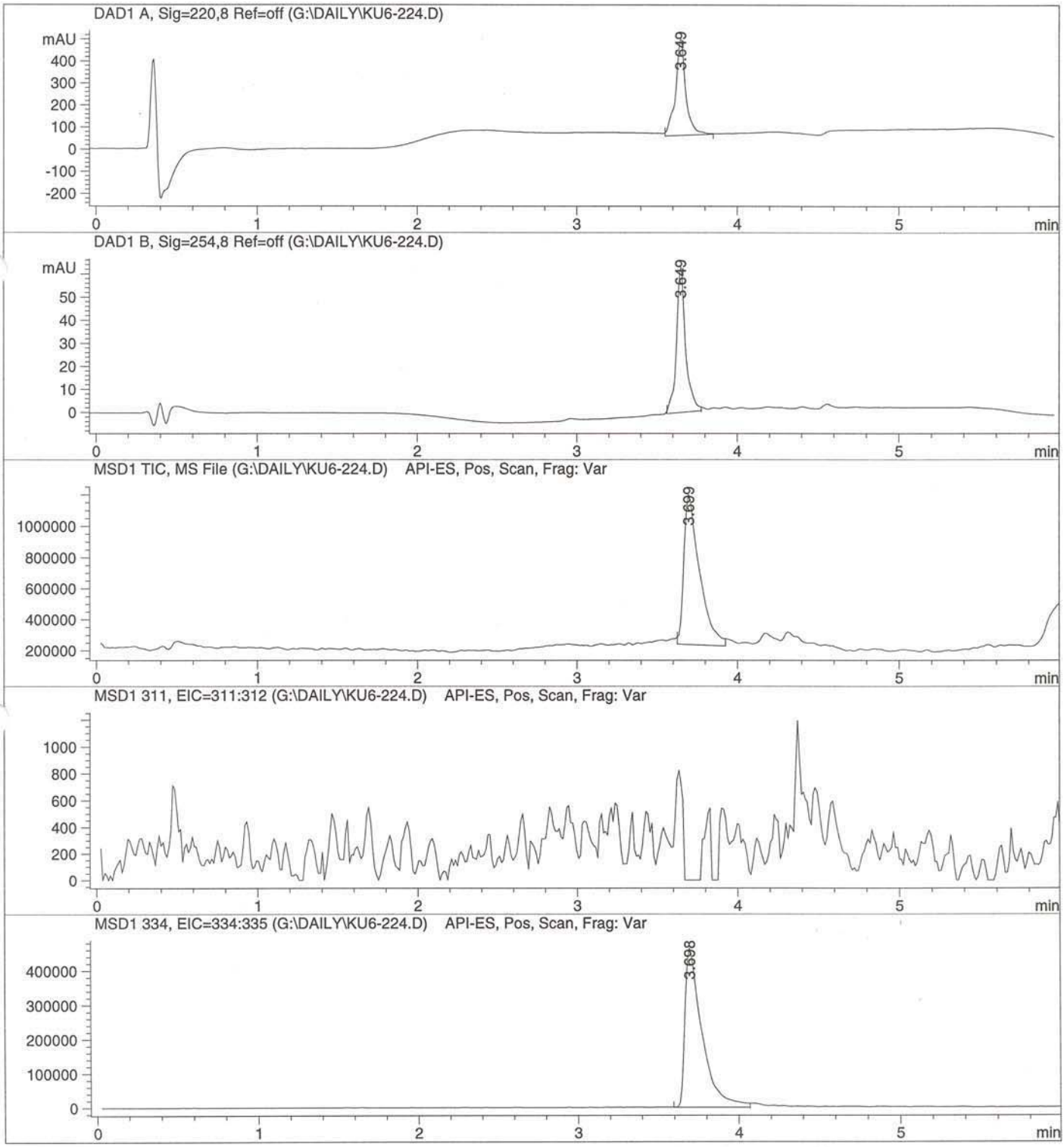
```

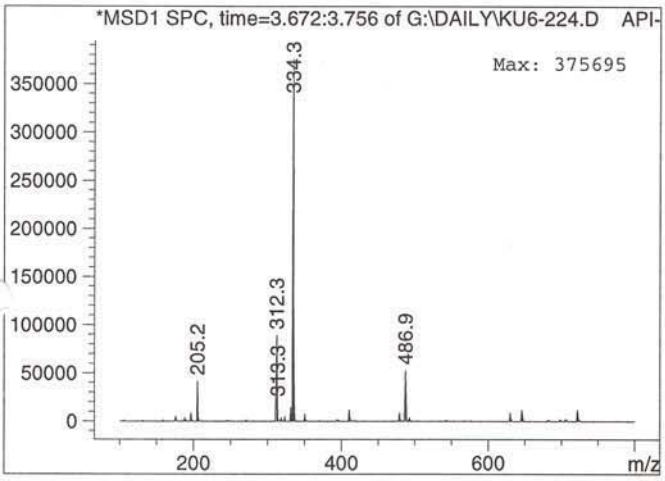
HPLC-MS Spectra of compund 16



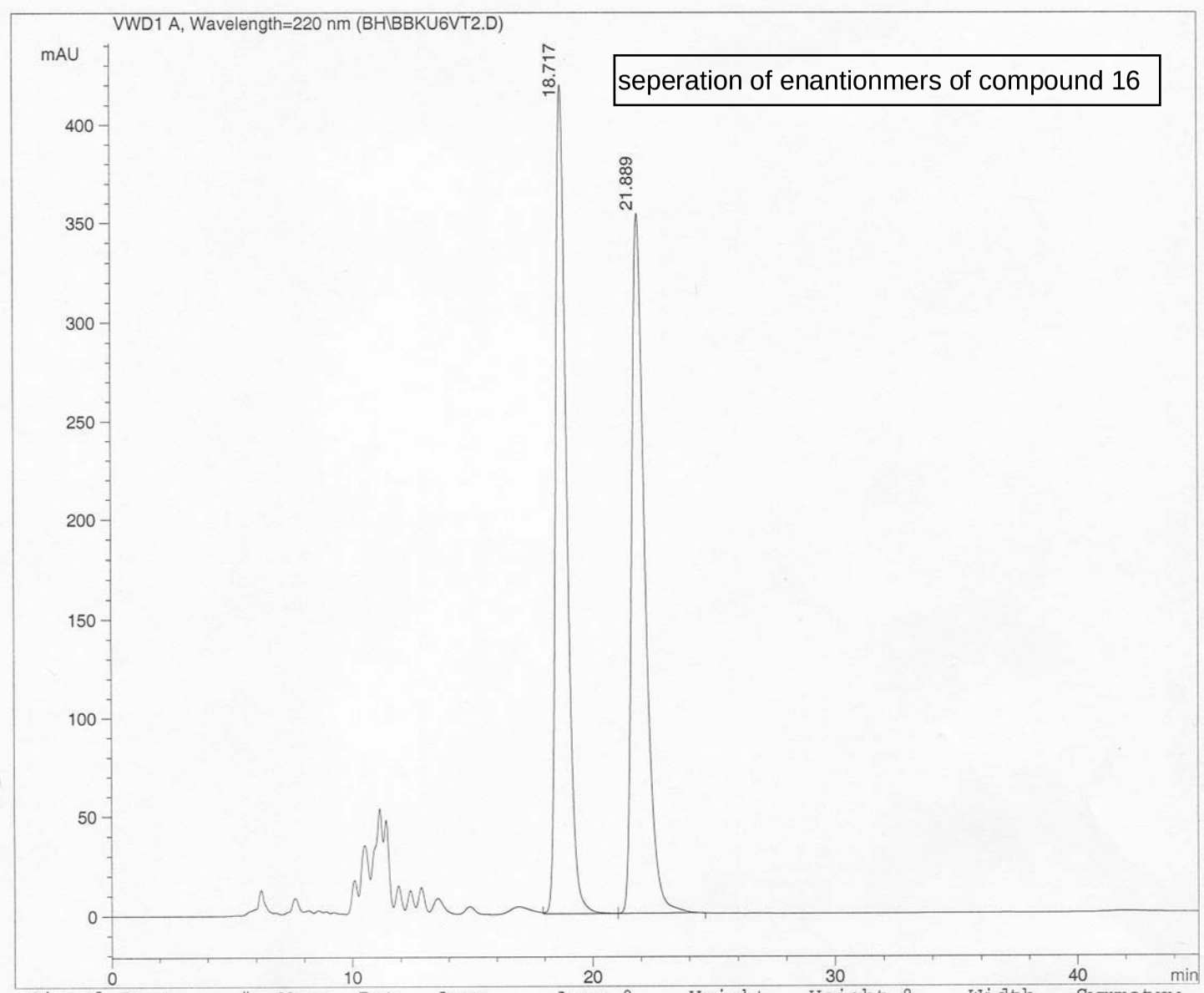
product KU6B100 after purification with HPLC

MS Signal: MSD1 TIC, MS File, API-ES, Pos, Scan, Frag: Var
Spectra averaged over upper half of peaks.
Noise Cutoff: 1000 counts.
Reportable Ion Abundance: > 10%.

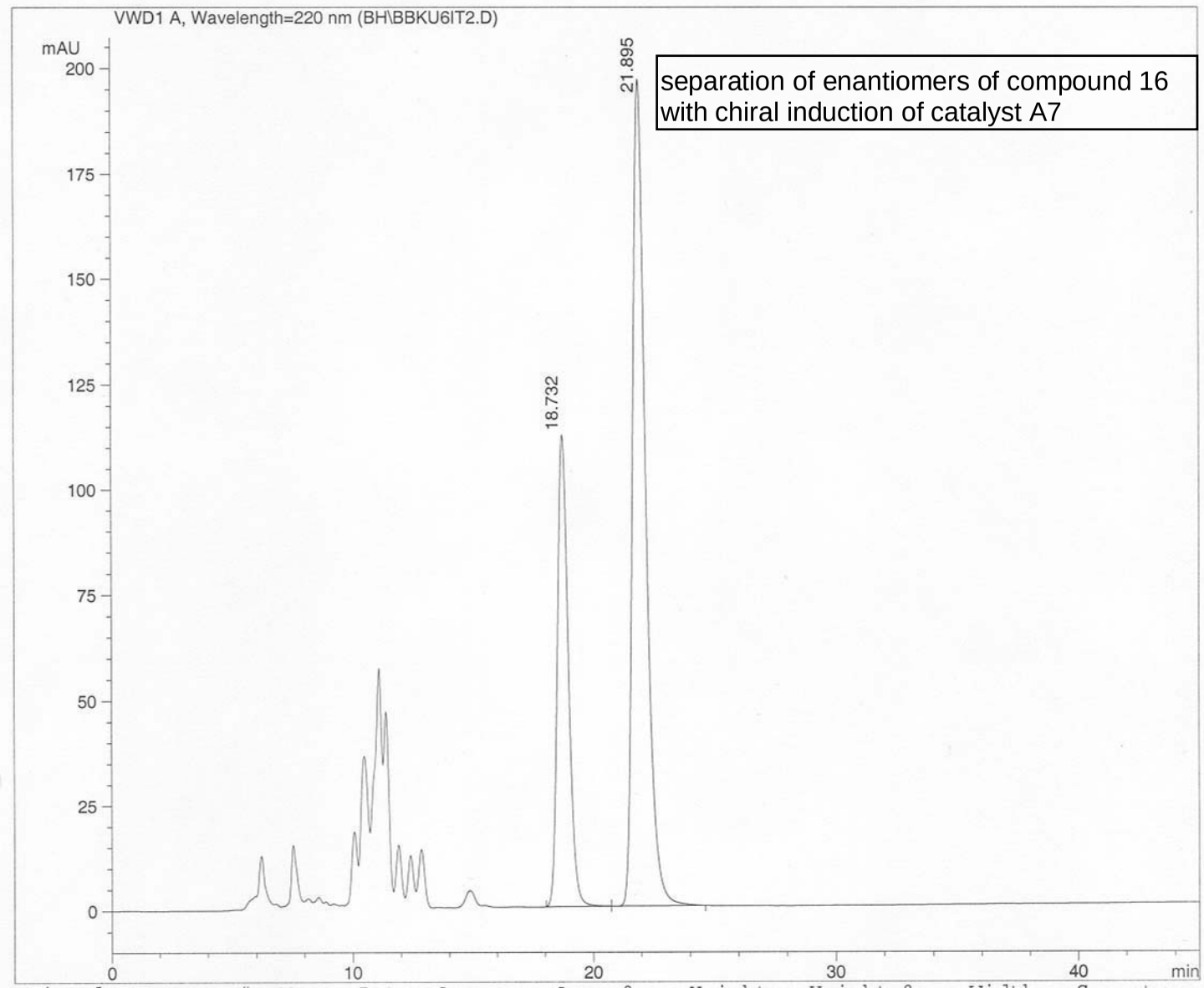
Retention Time (MS)	MS Area	Mol. Weight or Ion
3.699	6540607	486.90 I
		335.30 I
		334.30 I
		312.30 I
		205.20 I



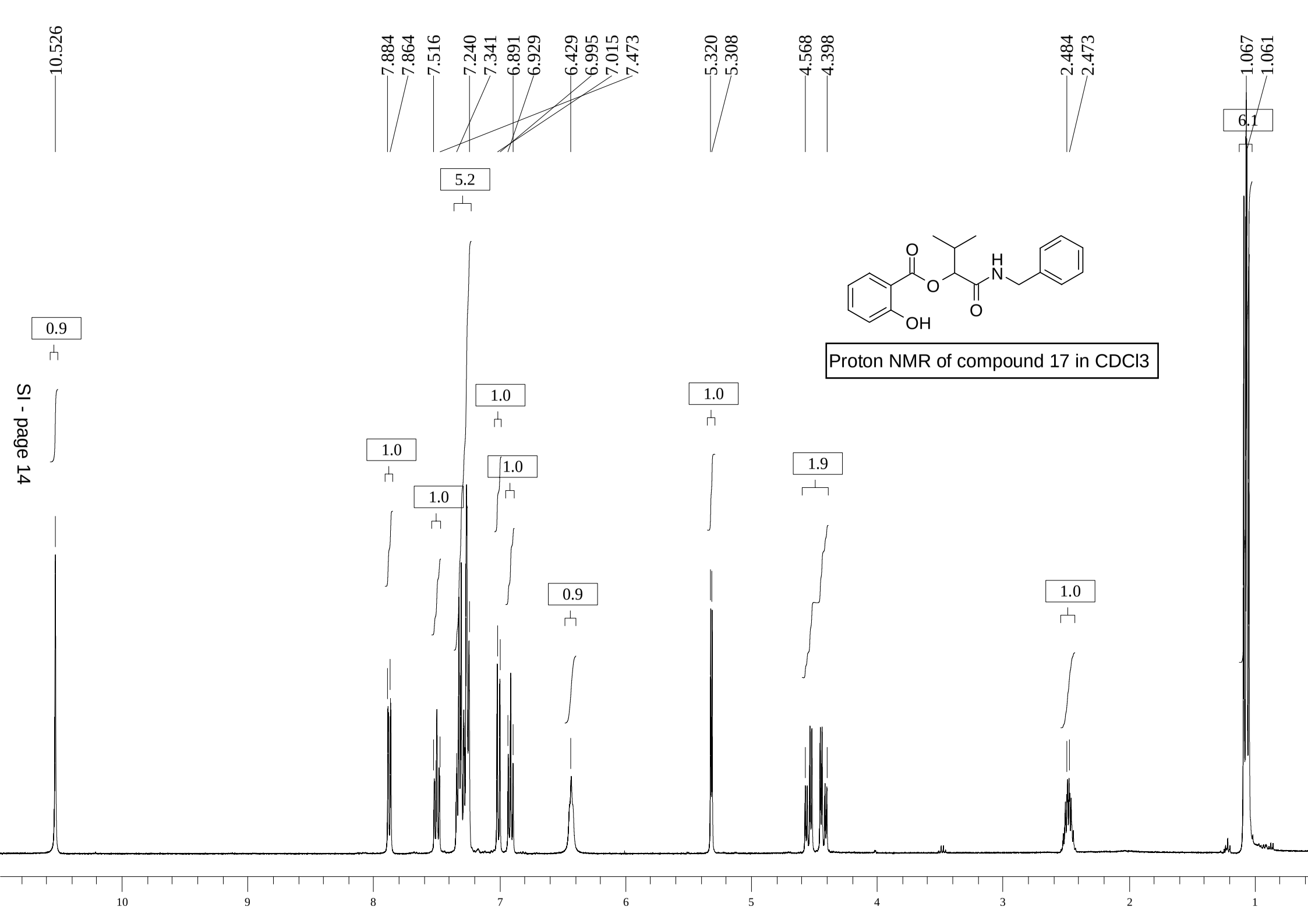
*** End of Report ***

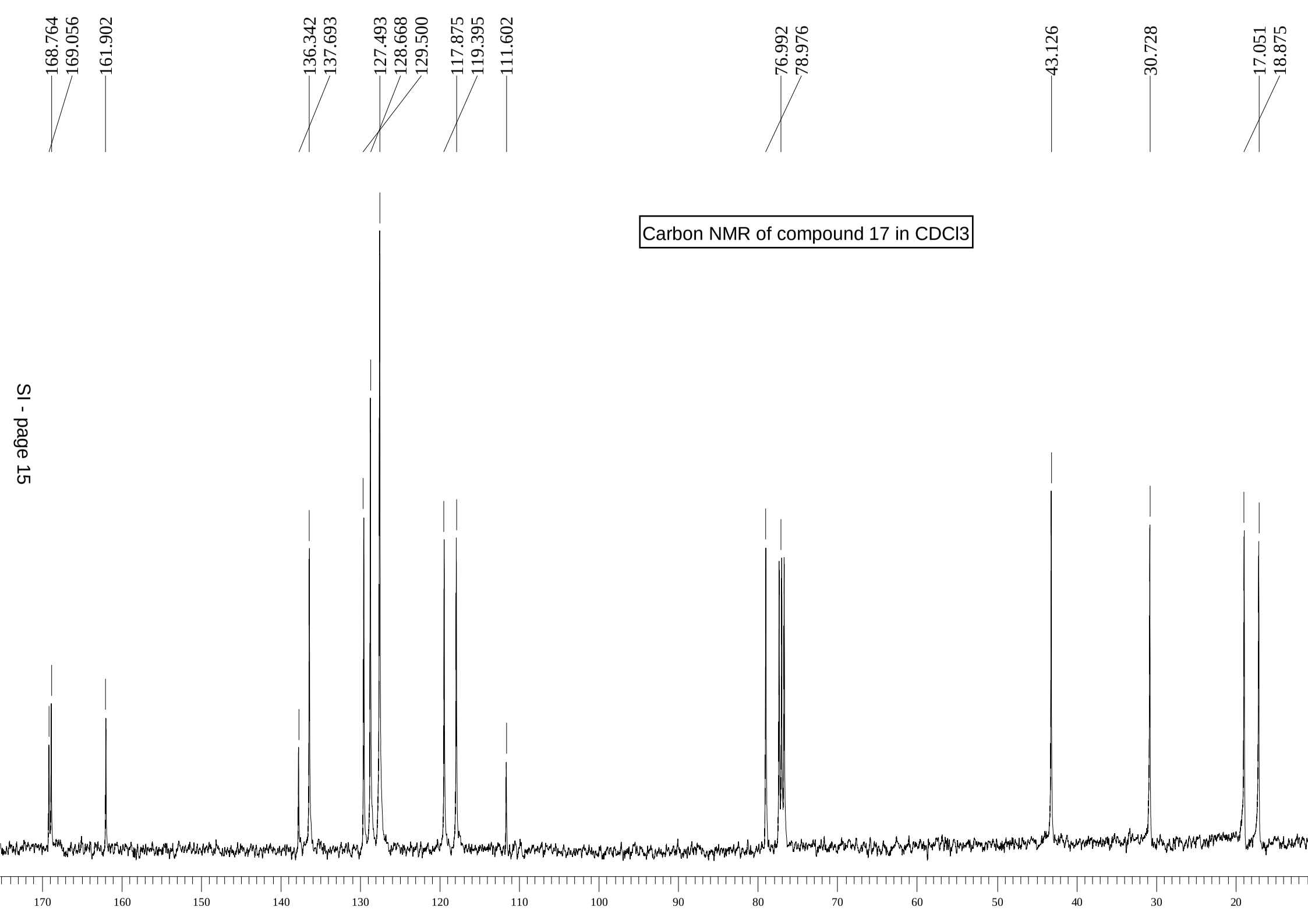


Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	18.72	13412.39	49.92	418.75	54.27	0.502	0.764
	2	21.89	13456.89	50.08	352.79	45.73	0.585	0.675



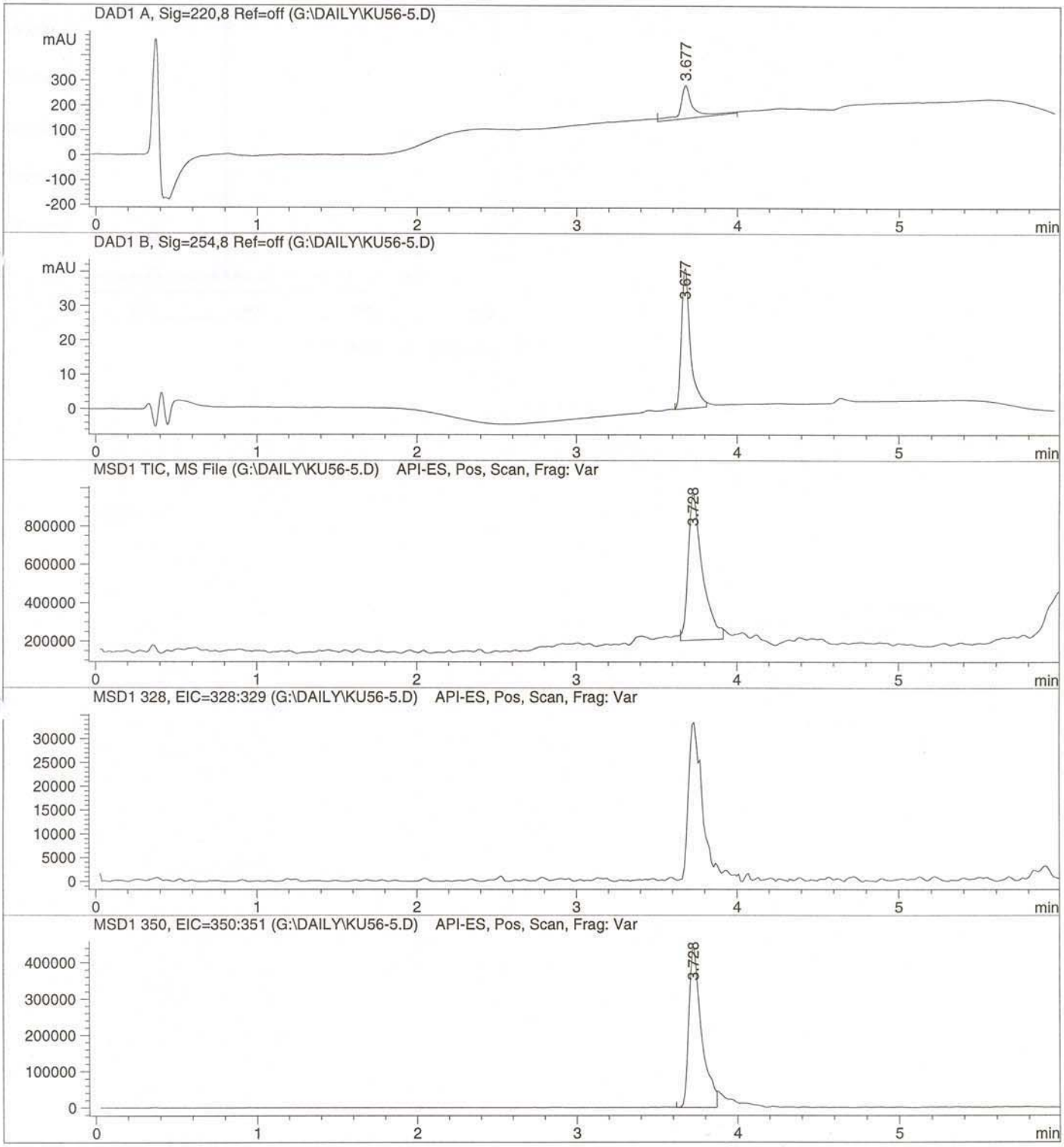
Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	18.73	3549.64	32.35	111.97	36.35	0.486	0.778
	2	21.89	7421.72	67.65	196.05	63.65	0.581	0.700


10.526
7.884
7.864
7.516
7.240
7.341
6.891
6.929
6.429
6.995
7.015
7.473
5.320
5.308
4.568
4.398
2.484
2.473
1.067
1.061
6.1
5.2
0.9
1.0
1.0
1.0
1.0
0.9
1.0
1.9
1.0
O
O
H
N
O
OH
Proton NMR of compound 17 in CDCl3
SI - page 14
10
9
8
7
6
5
4
3
2
1


168.764
169.056
161.902
136.342
137.693
127.493
128.668
129.500
117.875
119.395
111.602
76.992
78.976
43.126
30.728
17.051
18.875
Carbon NMR of compound 17 in CDCl3
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20

```
==========================================================================
Injection Date  : 10/31/02 4:55:09 AM          Seq. Line : 150
Sample Name     : KU56-5                        Location : Vial 94
Acq. Operator   : user                             Inj :   1
                                               Inj Volume : 5 µl
Acq. Method     : D:\HPCHEM\1\METHODS\ESI_LC6.M
Last changed    : 10/31/02 4:53:12 AM by user
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\ESI_LC6.M
Last changed    : 10/24/02 2:01:04 PM
                  (modified after loading)
YMC ODS-A 5cm 2µ
ESI positiv
```

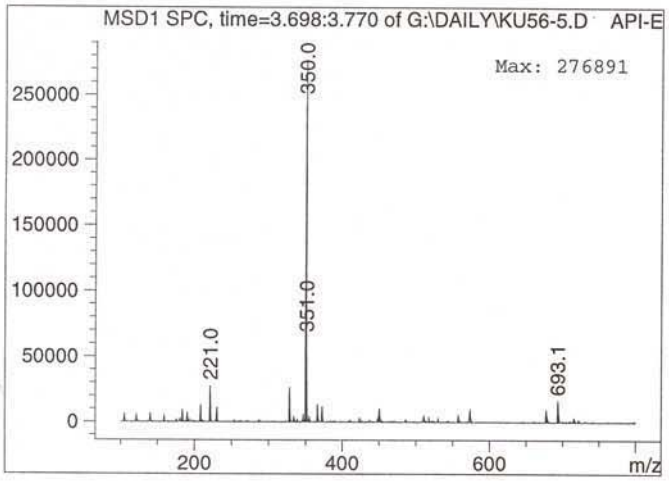
HPLC-MS Spectrum of compound 17



KU56 – hplc-ms of product after purification with hplc

MS Signal: MSD1 TIC, MS File, API-ES, Pos, Scan, Frag: Var
Spectra averaged over upper half of peaks.
Noise Cutoff: 1000 counts.
Reportable Ion Abundance: > 10%.

Retention Time (MS)	MS Area	Mol. Weight or Ion
3.728	4747170	351.00 I
		350.00 I



*** End of Report ***

Standard Report

Data File name: I:\ULRIKE\HPLC4\300702\KU19R5-3.D
Sample name: KU19r5
Act. Inj. Vol.: Actual Injection Volume same as Method

Acquis. Meth.: POS1_E7.M

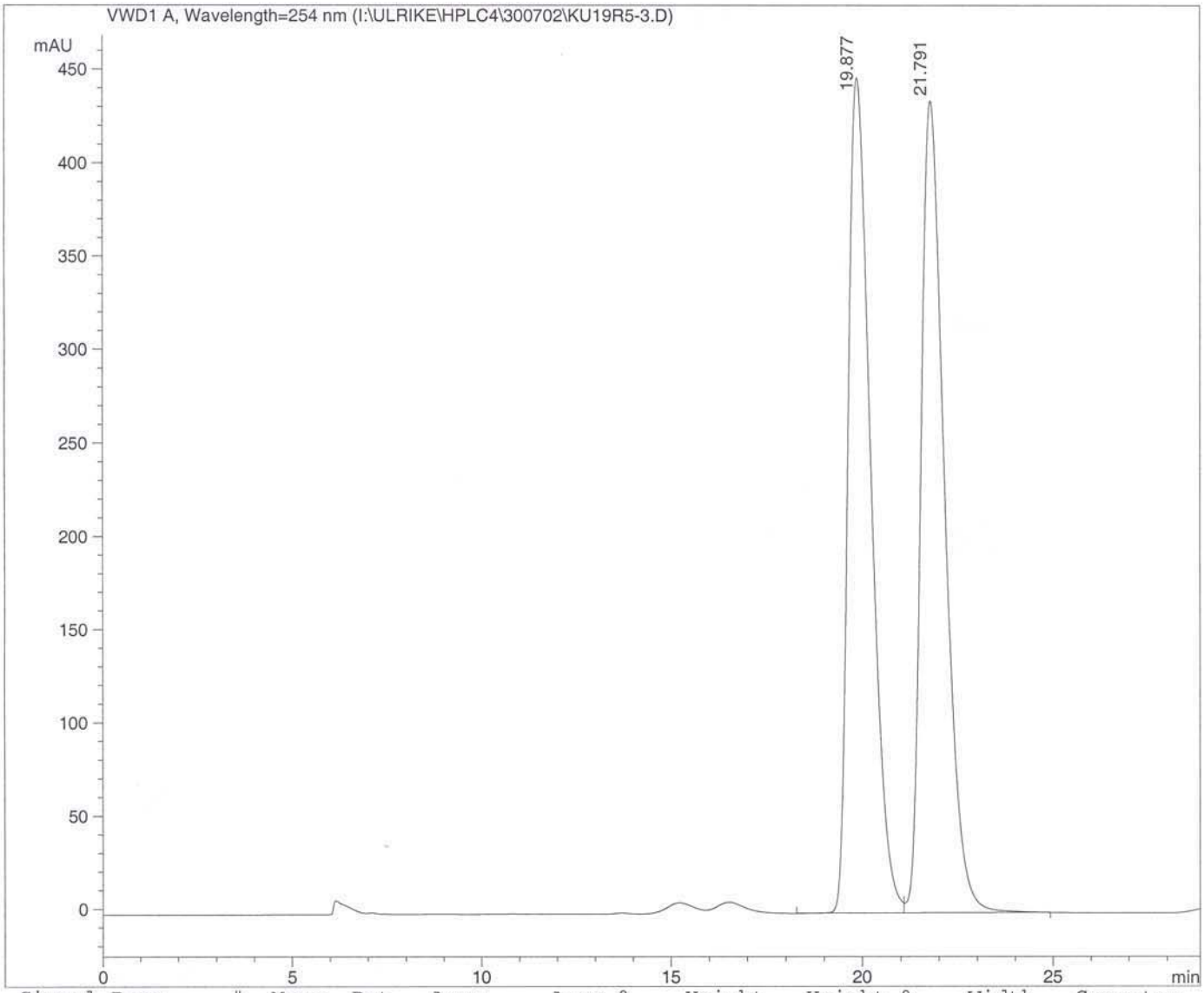
Integr. Method: D:\HPCHEM\1\METHODS\POS2_E13.M
Meth. Inj. Vol.: 5.00 uL

Injection date: 7/30/02 3:47:48 PM
Report date: 12/2/02 1:50:48 PM

Process Meth. Info:
Position 2:
Phenomenex Chirex R-NGLY & DNB
4.6 x 50

data acquired by:
vial: 75

separation of enantiomers of compound 17



Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	19.88	18392.25	49.66	447.04	50.67	0.643	0.615
	2	21.79	18643.01	50.34	435.20	49.33	0.663	0.609

KU 19 - separation of enantiomeres

Standard Report

Data File name: D:\HPCHEM\1\DATA\311002\KU56-5.D
Sample name: KU56-5
Act. Inj. Vol.: 15.00 uL

Acquis. Meth.: POS1_7.M

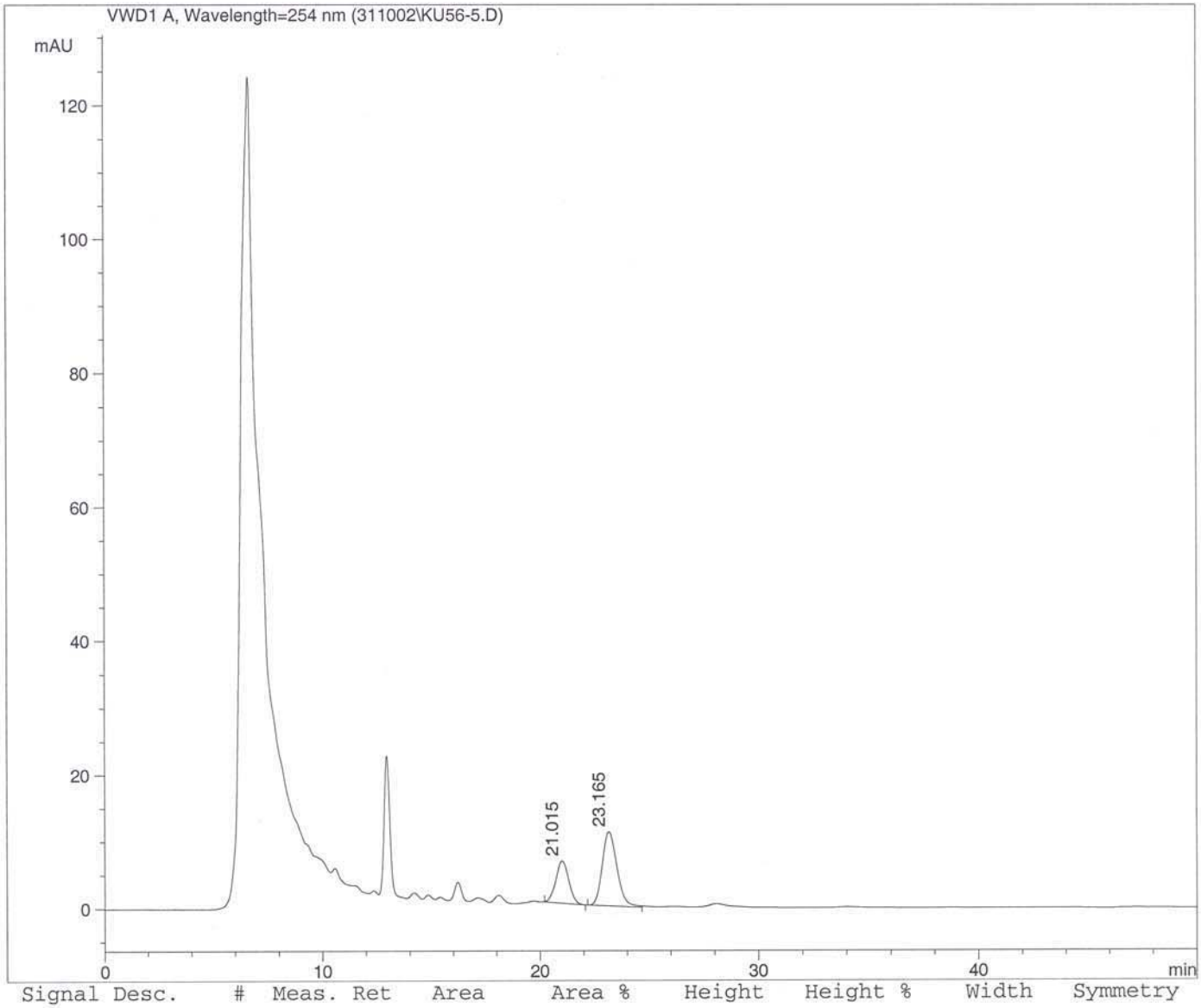
Integr. Method: D:\HPCHEM\1\METHODS\POS1_7.M
Meth. Inj. Vol.: 5.00 uL

Injection date: 10/31/02 12:52:29 PM
Report date: 10/31/02 1:46:05 PM

Process Meth. Info:
Position 1:
Daicel Chiralcel OD-H
4.6 x 250

data acquired by:
vial: 71

separation of enantiomers of compound 17 with chiral induction of catalyst A7

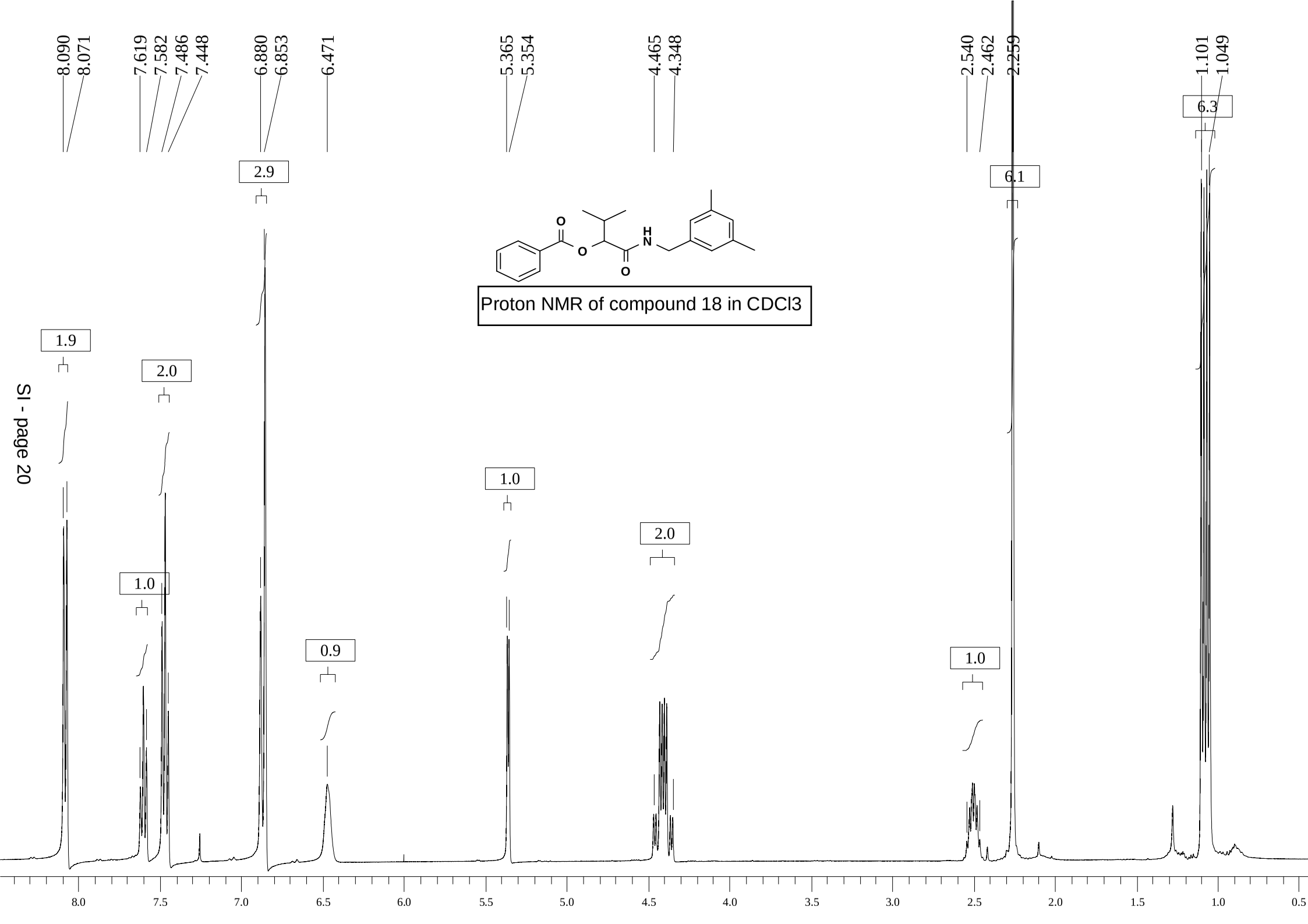


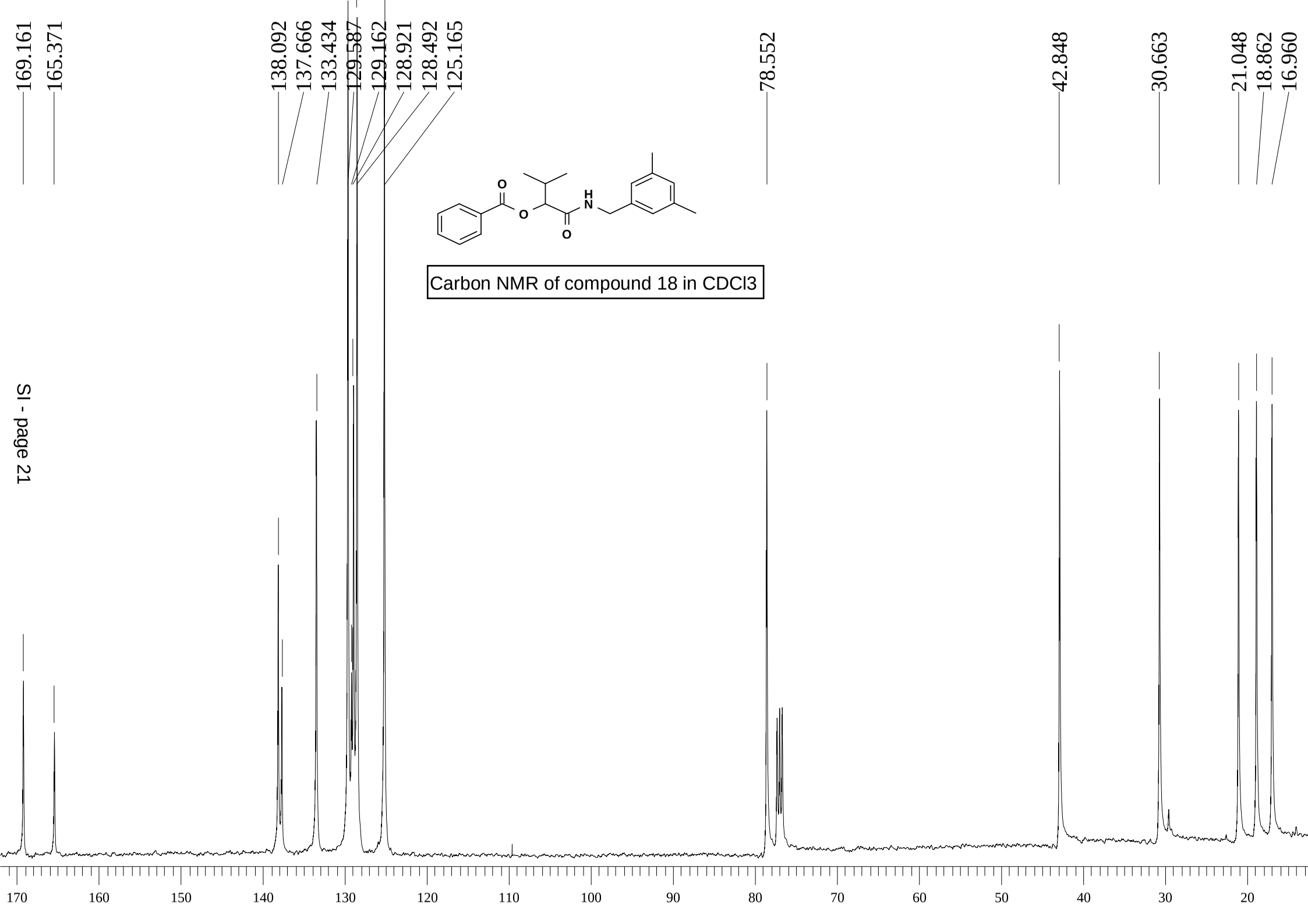
Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	21.01	265.20	33.59	6.37	36.33	0.694	0.931
	2	23.16	524.39	66.41	11.15	63.67	0.784	0.813

chiral HPLC of KU 56 → 32% ee

(enantiomeres have been prooved by co-injection with KU 19)

Page 1 of 1

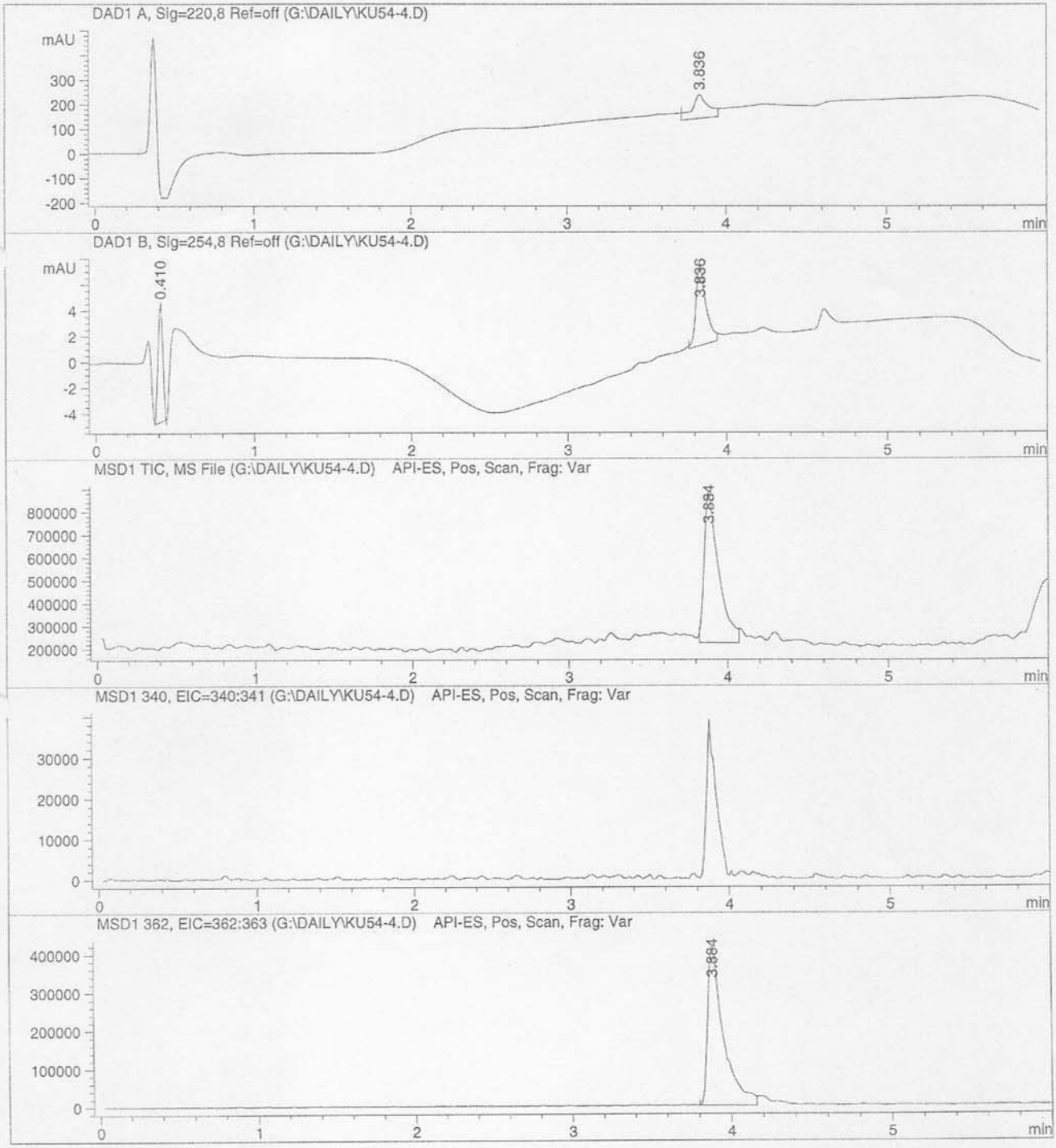

8.090
8.071
7.619
7.582
7.486
7.448
6.880
6.853
6.471
5.365
5.354
4.465
4.348
2.540
2.462
2.259
1.101
1.049
1.9
2.0
1.0
0.9
1.0
2.0
1.0
6.1
6.3
2.9
O
O
O
H
N
Proton NMR of compound 18 in CDCl3
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5


169.161
165.371
138.092
137.666
133.434
129.587
129.162
128.921
128.492
125.165
78.552
42.848
30.663
21.048
18.862
16.960
O
O
O
H
N
Carbon NMR of compound 18 in CDCl3
SI - page 21
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20

Data File G:\DAILY\KU54-4.D Sample Name: KU54-4_RK

```
==========================================================================
Injection Date  : 10/29/02 4:40:52 PM          Seq. Line :  33
Sample Name     : KU54-4_RK                     Location : Vial 2
Acq. Operator   : user                             Inj :   1
                                               Inj Volume : 5 µl
Acq. Method     : D:\HPCHEM\1\METHODS\ESI_LC6.M
Last changed    : 10/29/02 4:39:01 PM by user
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\ESI_LC6.M
Last changed    : 10/24/02 2:01:04 PM
                  (modified after loading)
YMC ODS-A 5cm 2µ
ESI positiv
```

HPLC-MS Spectrum of compound 18

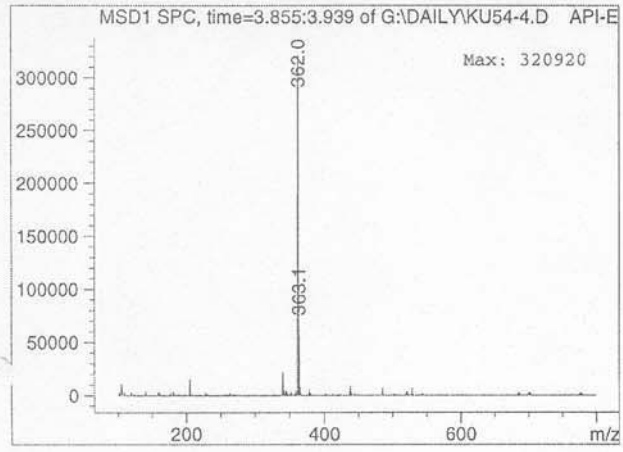


KU54 hplc-ms of product after purification with hplc

Instrument 1 10/29/02 4:51:34 PM Page 1 of 2

MS Signal: MSD1 TIC, MS File, API-ES, Pos, Scan, Frag: Var
Spectra averaged over upper half of peaks.
Noise Cutoff: 1000 counts.
Reportable Ion Abundance: > 10%.

Retention Time (MS)	MS Area	Mol. Weight or Ion
3.884	4135192	363.10 I
		362.05 I



*** End of Report ***

Standard Report

Data File name: D:\HPCHEM\1\DATA\201102\KU47-13.D
Sample name: KU47-13
Act. Inj. Vol.: 20.00 uL

Acquis. Meth.: POS1_3.M

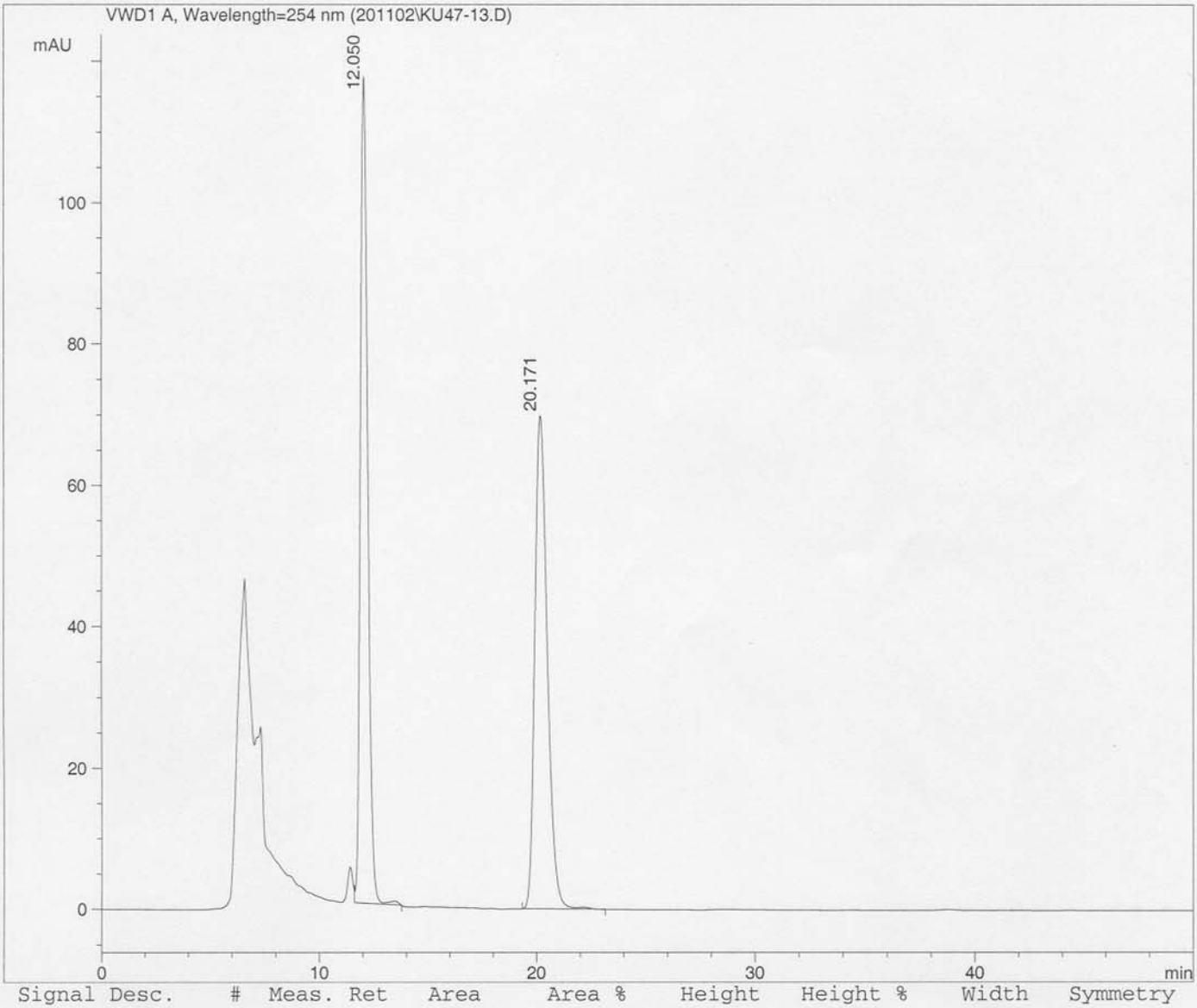
Integr. Method: D:\HPCHEM\1\METHODS\POS1_3.M
Meth. Inj. Vol.: 5.00 uL

Injection date: 11/20/02 11:17:40 AM
Report date: 11/20/02 12:18:18 PM

Process Meth. Info:
Position 1:
Daicel Chiralcel OD-H
4.6 x 250

data acquired by:
vial: 81

separation of enantiomers of compound 18



Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	12.05	2785.56	49.90	116.87	62.61	0.377	0.764
	2	20.17	2796.68	50.10	69.78	37.39	0.619	0.726

KU47- fraction 13 after purification with chromatotron
chiral hplc

Standard Report

Data File name: D:\HPCHEM\1\DATA\291002\KU54-4W.D
Sample name: KU54-4
Act. Inj. Vol.: 40.00 uL

Acquis. Meth.: POS1_3.M

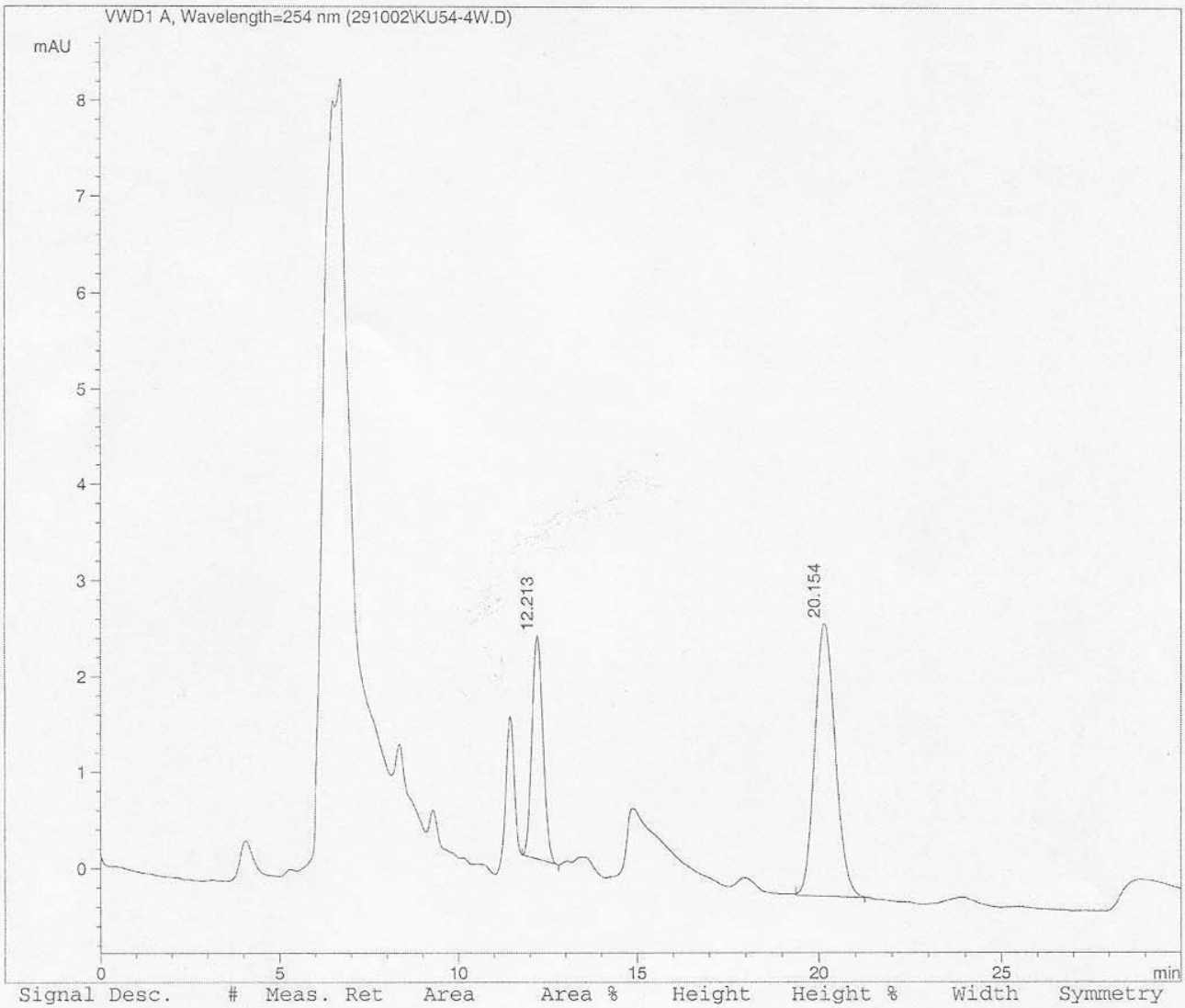
Integr. Method: D:\HPCHEM\1\METHODS\POS1_3.M
Meth. Inj. Vol.: 5.00 uL

Injection date: 10/29/02 5:55:47 PM
Report date: 10/30/02 10:10:39 AM

Process Meth. Info:
Position 1:
Daicel Chiralcel OD-H
4.6 x 250

data acquired by:
vial: 81

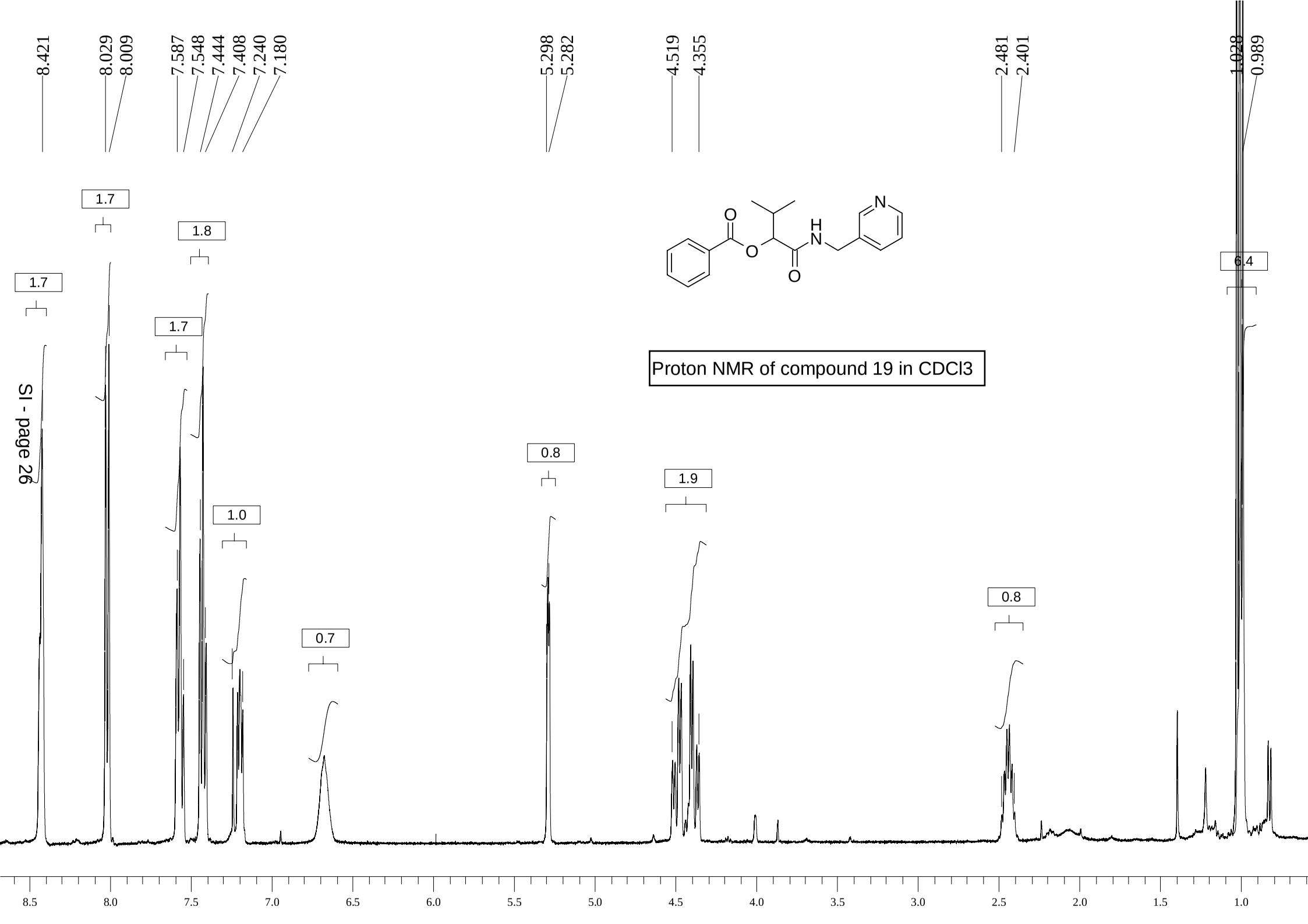
separation of enantiomers of compound 18 with chiral induction of catalyst A7

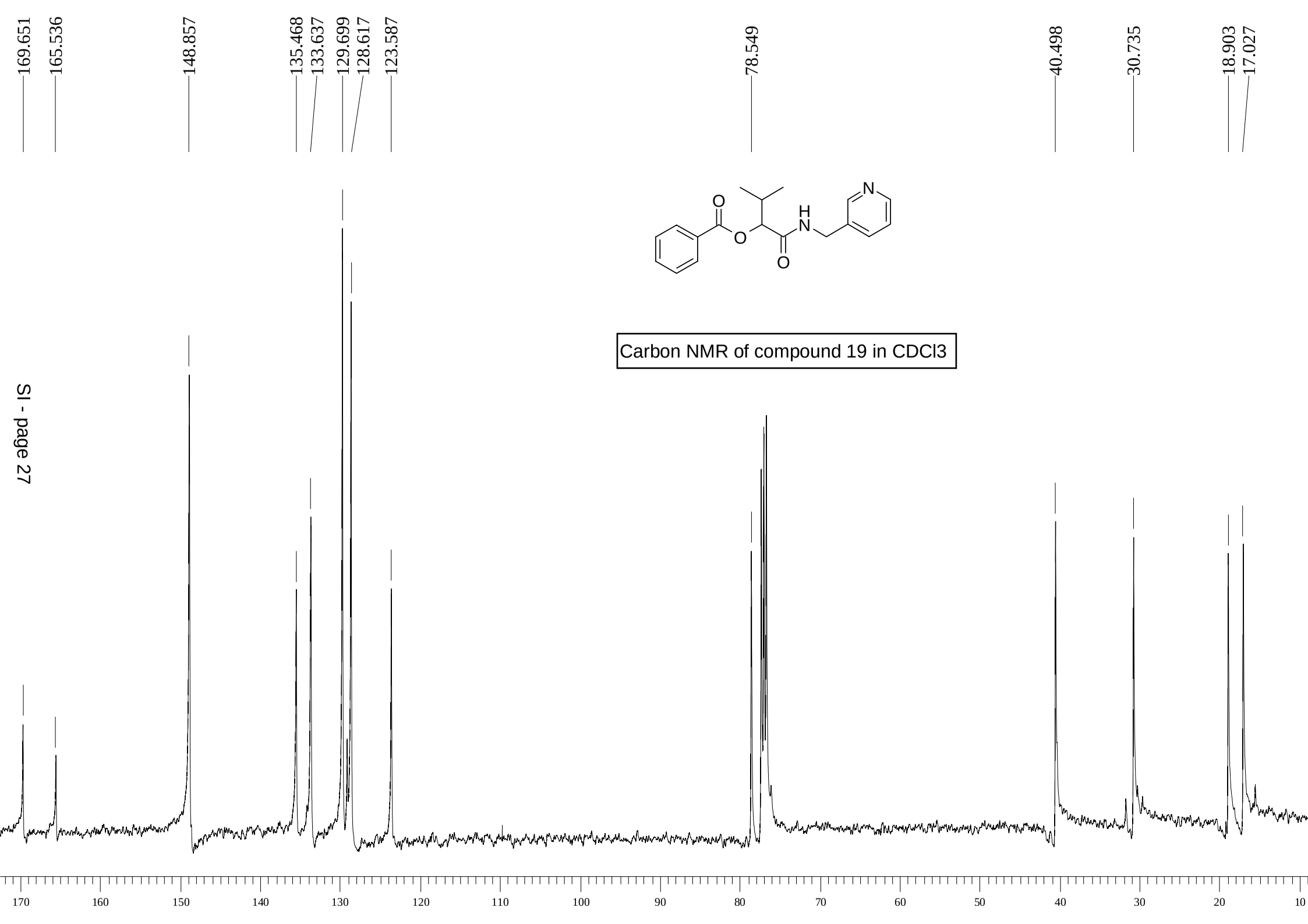


Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	12.21	57.25	34.07	2.33	44.90	0.374	0.737
	2	20.15	110.78	65.93	2.85	55.10	0.647	0.844

KU54 - chiral hplc → 32% ee
peaks of enantiomeres have been proved by co-injection with KU47

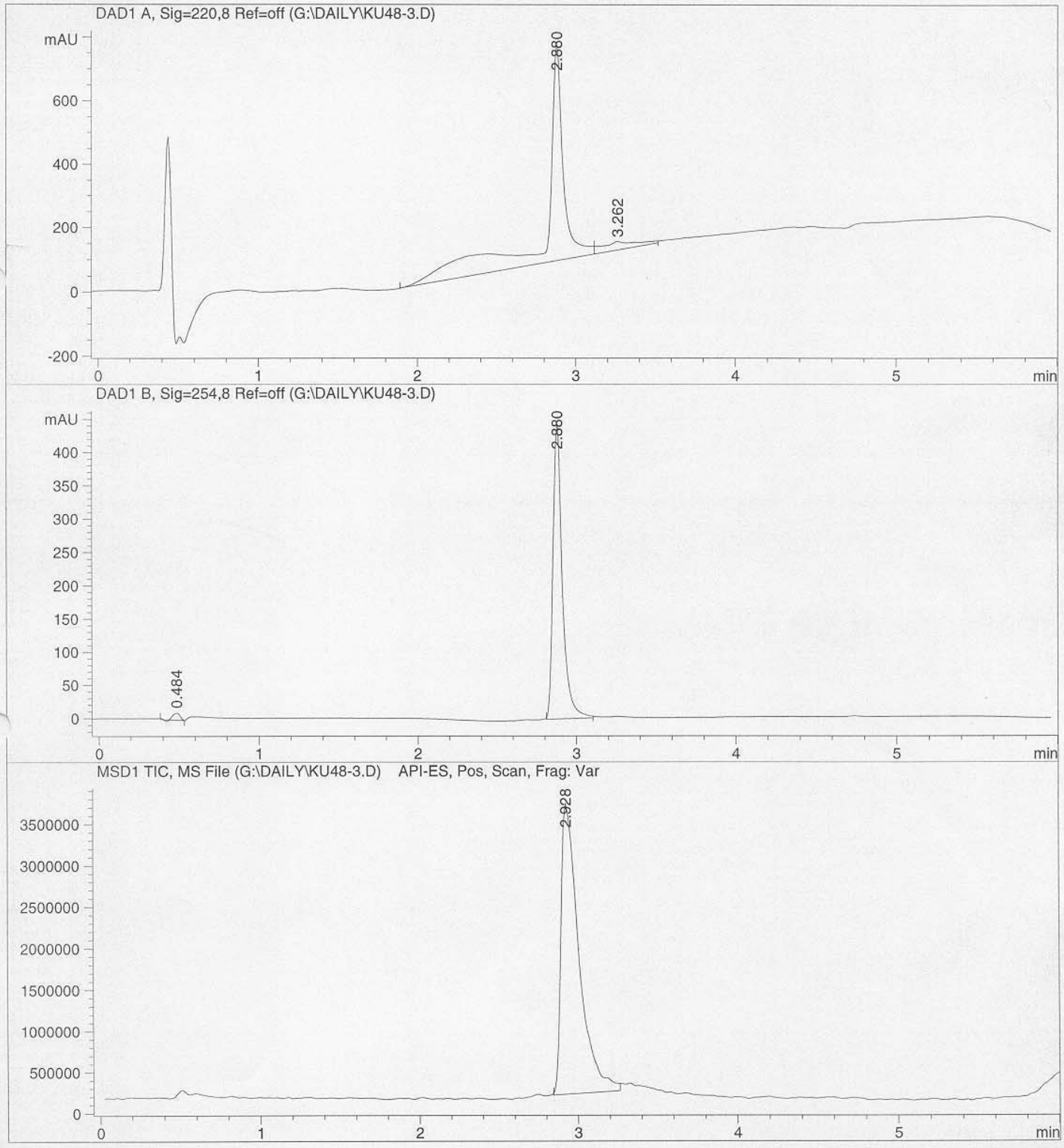
Page 1 of 1


8.421
8.029
8.009
7.587
7.548
7.444
7.408
7.240
7.180
5.298
5.282
4.519
4.355
2.481
2.401
1.028
0.989
1.7
1.7
1.8
1.7
1.0
0.7
0.8
1.9
0.8
6.4
O
O
H
N
O
N
Proton NMR of compound 19 in CDCl3
S1 - page 26
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


169.651
165.536
148.857
135.468
133.637
129.699
128.617
123.587
78.549
40.498
30.735
18.903
17.027
O
O
H
N
N
O
Carbon NMR of compound 19 in CDCl3
SI - page 27
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10

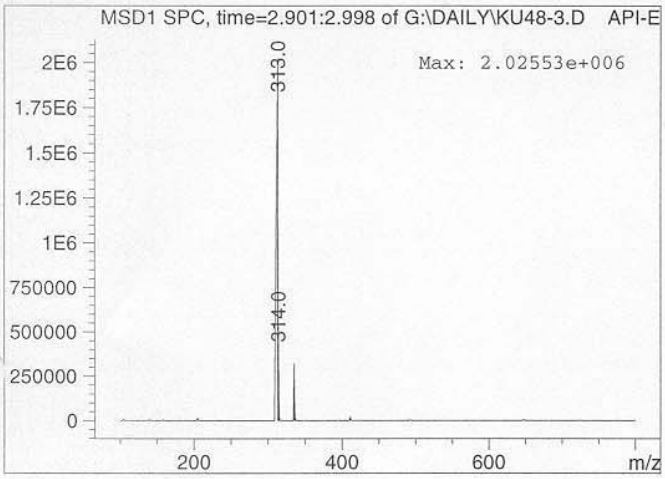
```
==========================================================================
Injection Date  : 11/21/02 3:54:24 PM          Seq. Line :  53
Sample Name     : KU48-3-RK                     Location : Vial 2
Acq. Operator   : user                             Inj :   1
                                               Inj Volume : 5 µl
Acq. Method     : D:\HPCHEM\1\METHODS\ESI_LC6.M
Last changed    : 11/21/02 3:51:31 PM by user
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\ESI_LC6.M
Last changed    : 6/18/02 3:31:34 PM
YMC ODS-A 5cm 2µ
ESI positiv
```

HPLC-MS Spectrum of compound 19



MS Signal: MSD1 TIC, MS File, API-ES, Pos, Scan, Frag: Var
Spectra averaged over upper half of peaks.
Noise Cutoff: 1000 counts.
Reportable Ion Abundance: > 10%.

Retention Time (MS)	MS Area	Mol. Weight or Ion
2.928	27623556	335.00 I
		314.00 I
		313.00 I



*** End of Report ***

Standard Report

Data File name: D:\HPCHEM\1\DATA\241002\KU48-2.D
Sample name: KU48
Act. Inj. Vol.: 5.00 uL

Acquis. Meth.: POS1_3.M

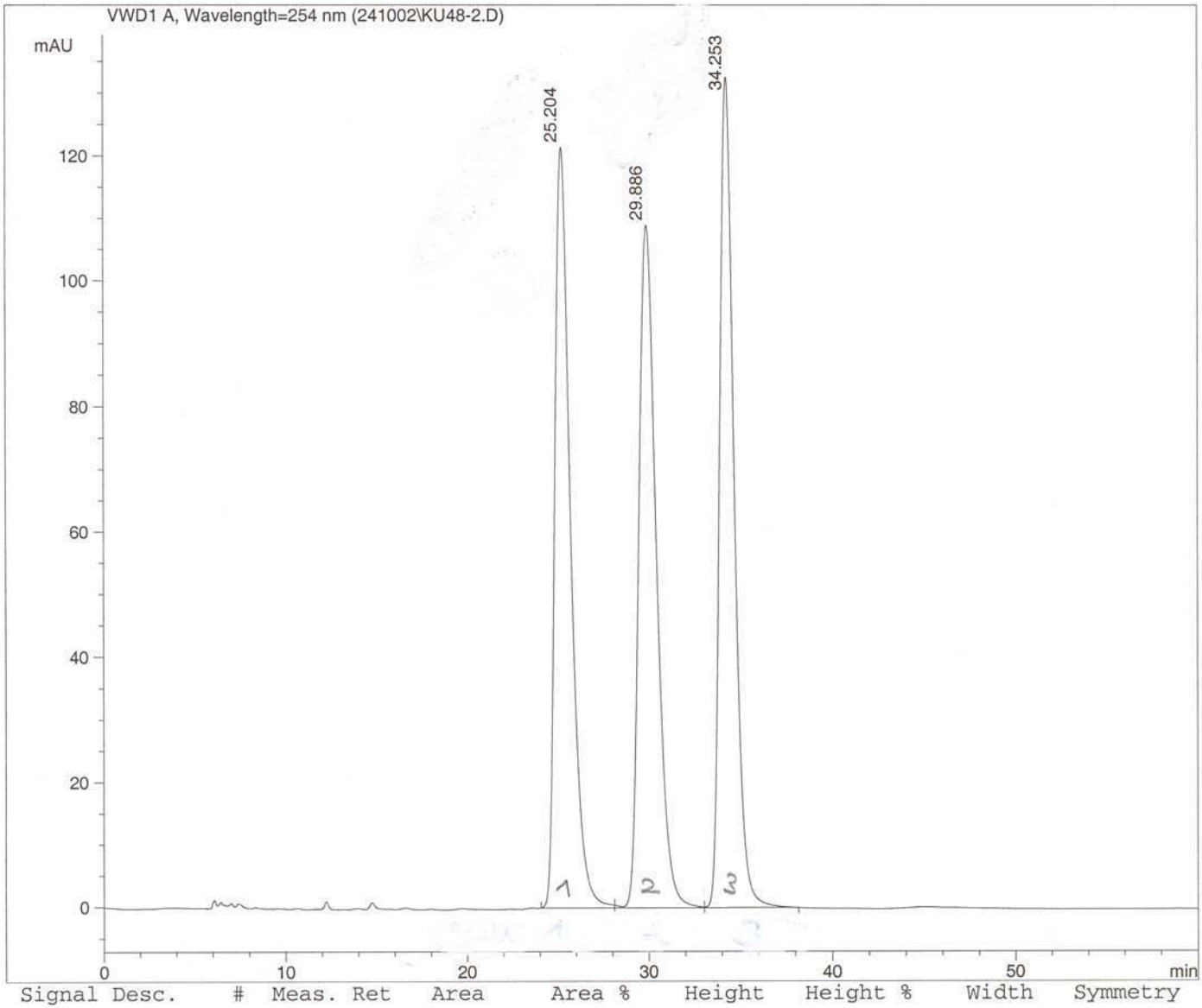
Integr. Method: D:\HPCHEM\1\METHODS\POS1_3.M
Meth. Inj. Vol.: 5.00 uL

Process Meth. Info:
Position 1:
Daicel Chiralcel OD-H
4.6 x 250

Injection date: 10/24/02 10:44:25 AM
Report date: 10/24/02 11:45:37 AM

data acquired by:
vial: 21

separation of the enantiomers of compound 19



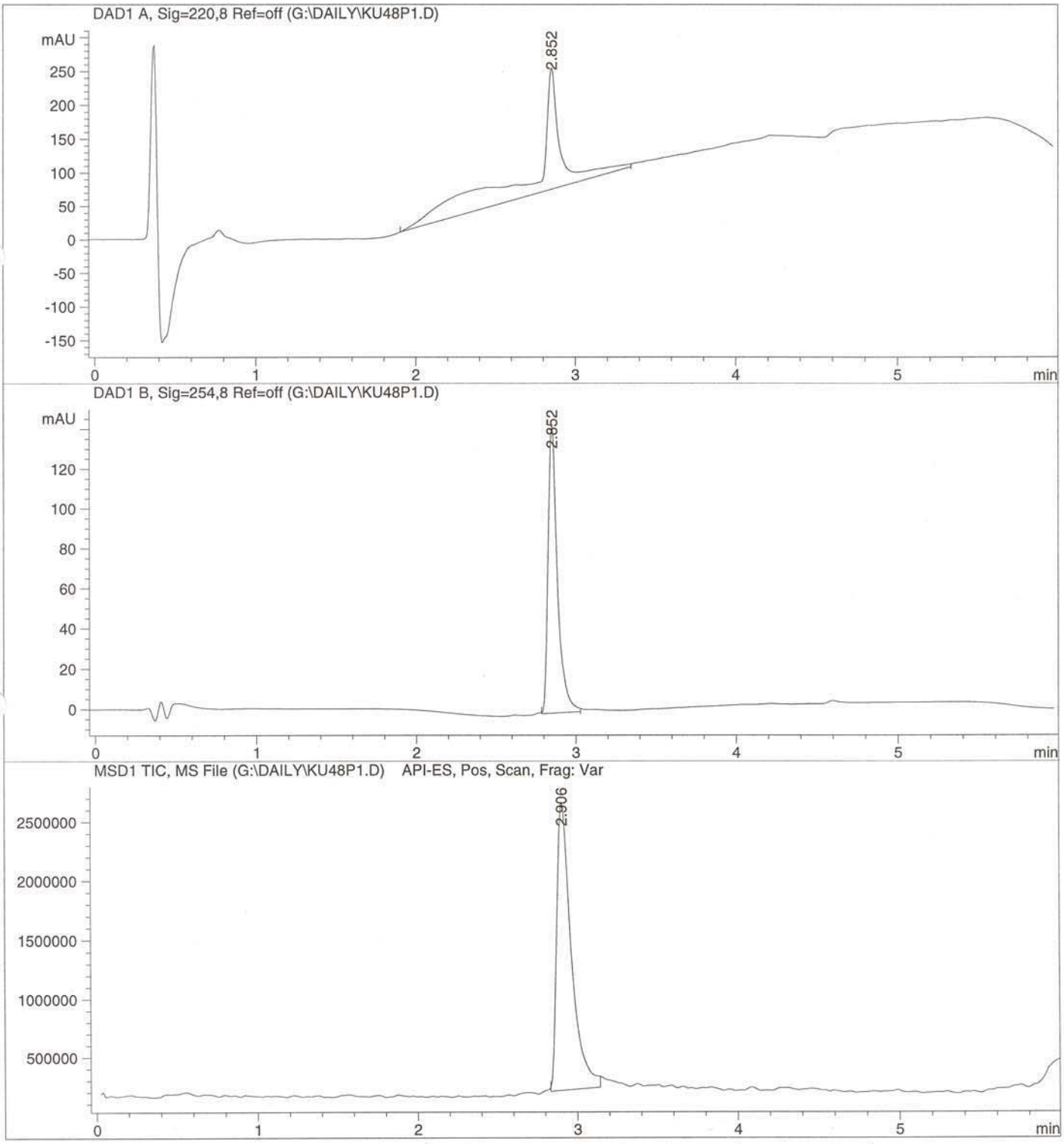
Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	25.20	7265.04	33.32	121.53	33.46	0.913	0.614
	2	29.89	7270.34	33.35	109.03	30.02	1.028	0.708
	3	34.25	7267.83	33.33	132.65	36.52	0.843	0.730

KU48 separation of enantiomeres
before purification
peak 1 and 2 are the product
→ see hplc-ms - chromatogramm

Page 1 of 1

```
==========================================================================
Injection Date  : 10/24/02 4:28:39 PM          Seq. Line :  12
Sample Name     : KU48P1_RK                     Location : Vial 1
Acq. Operator   : user                             Inj :   1
                                               Inj Volume : 5 µl
Acq. Method     : D:\HPCHEM\1\METHODS\ESI_LC6.M
Last changed    : 10/24/02 4:25:27 PM by user
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\ESI_LC6.M
Last changed    : 10/24/02 2:01:04 PM
                  (modified after loading)
YMC ODS-A 5cm 2µ
ESI positiv
```

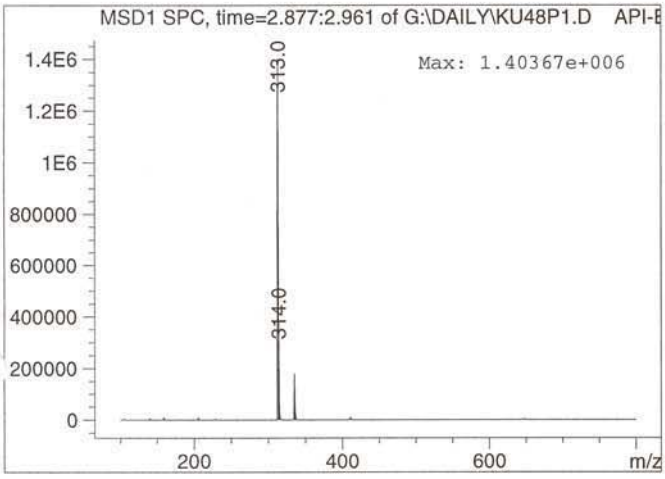
HPLC-MS of peak 1 from separation of compound 19 on Chiracel OD-H



hplc- ms of enantiomere 1

MS Signal: MSD1 TIC, MS File, API-ES, Pos, Scan, Frag: Var
Spectra averaged over upper half of peaks.
Noise Cutoff: 1000 counts.
Reportable Ion Abundance: > 10%.

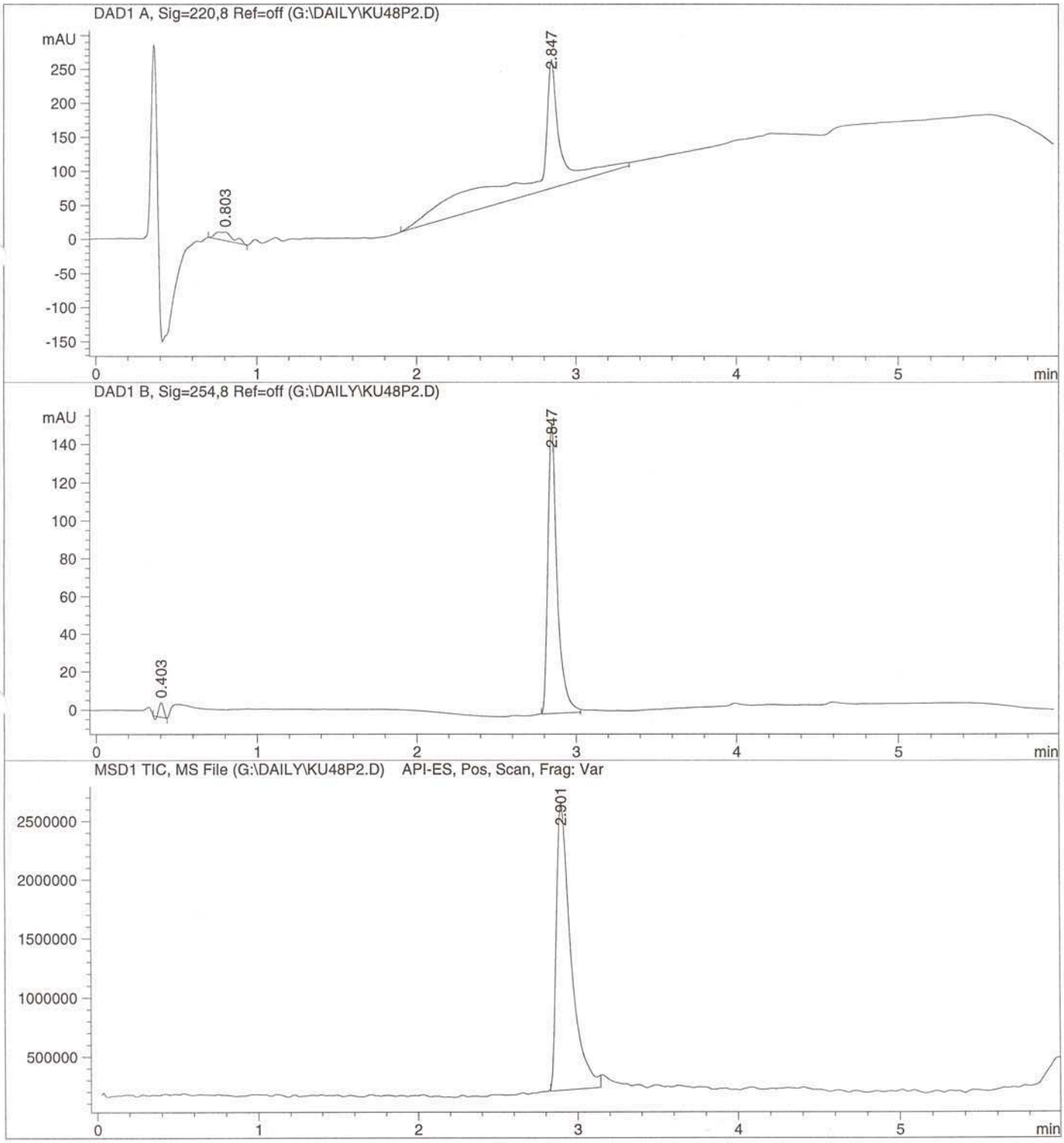
Retention Time (MS)	MS Area	Mol. Weight or Ion
2.906	15603306	335.00 I
		314.00 I
		313.00 I



*** End of Report ***

```
==========================================================================
Injection Date  : 10/24/02 4:37:04 PM          Seq. Line :  13
Sample Name     : KU48P2_RK                     Location : Vial 2
Acq. Operator   : user                             Inj :   1
                                               Inj Volume : 5 µl
Acq. Method     : D:\HPCHEM\1\METHODS\ESI_LC6.M
Last changed    : 10/24/02 4:33:54 PM by user
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\ESI_LC6.M
Last changed    : 10/24/02 2:01:04 PM
                  (modified after loading)
YMC ODS-A 5cm 2µ
ESI positiv
```

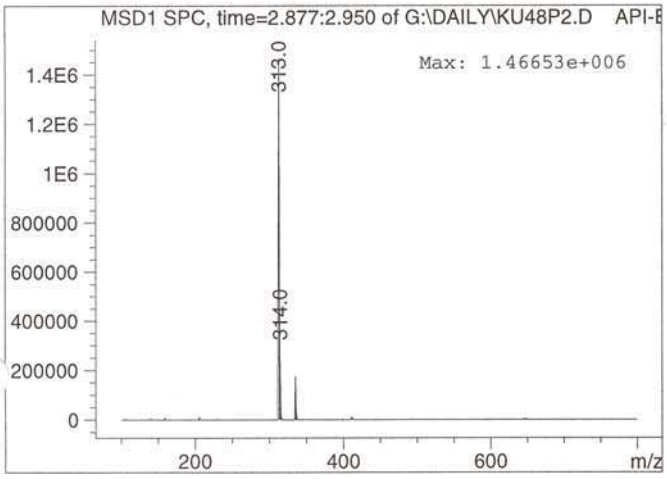
HPLC-MS of peak 2 from separation of compound 19 on Chiracel OD-H



hplc -ms of enantiomere 2

MS Signal: MSD1 TIC, MS File, API-ES, Pos, Scan, Frag: Var
Spectra averaged over upper half of peaks.
Noise Cutoff: 1000 counts.
Reportable Ion Abundance: > 10%.

Retention Time (MS)	MS Area	Mol. Weight or Ion
2.901	15557765	335.00 I
		314.05 I
		313.05 I



*** End of Report ***

Standard Report

Data File name: D:\HPCHEM\1\DATA\061102\KU50F5.D
Sample name: KU50f5
Act. Inj. Vol.: 10.00 uL

Acquis. Meth.: POS1_3.M

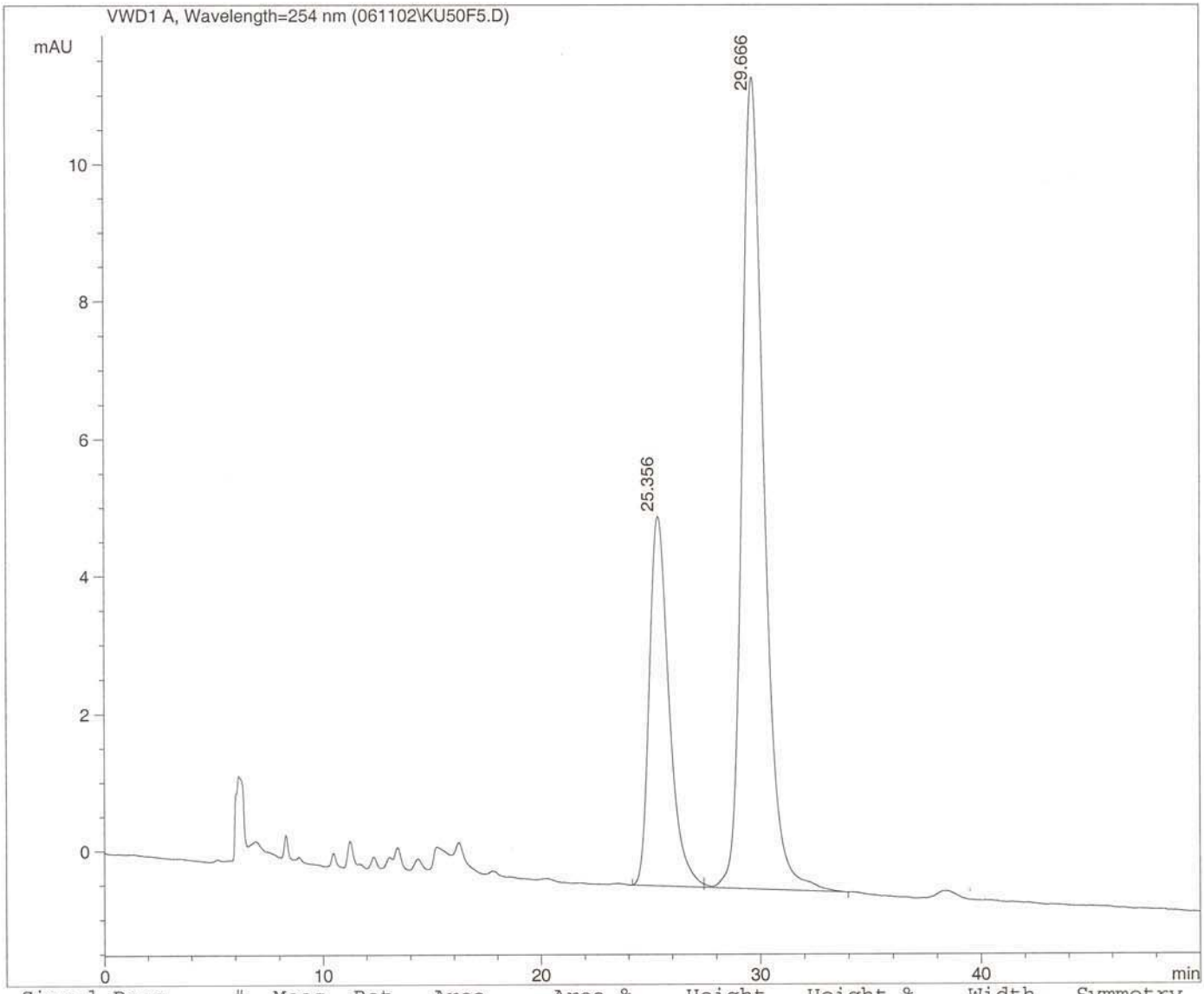
Integr. Method: D:\HPCHEM\1\METHODS\POS1_3.M
Meth. Inj. Vol.: 5.00 uL

Process Meth. Info:
Position 1:
Daicel Chiralcel OD-H
4.6 x 250

Injection date: 11/6/02 2:18:36 PM
Report date: 11/6/02 3:10:47 PM

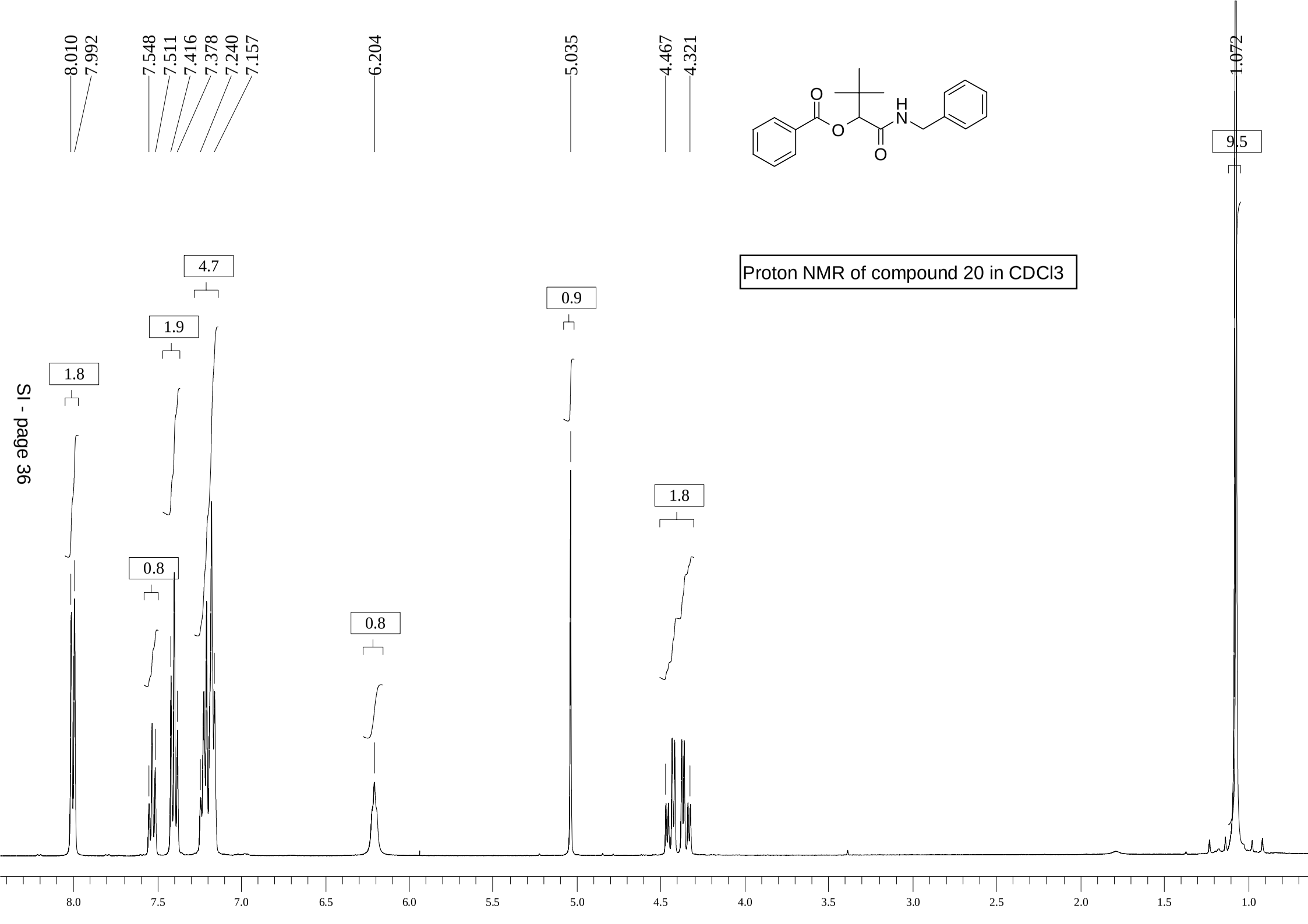
data acquired by:
vial: 81

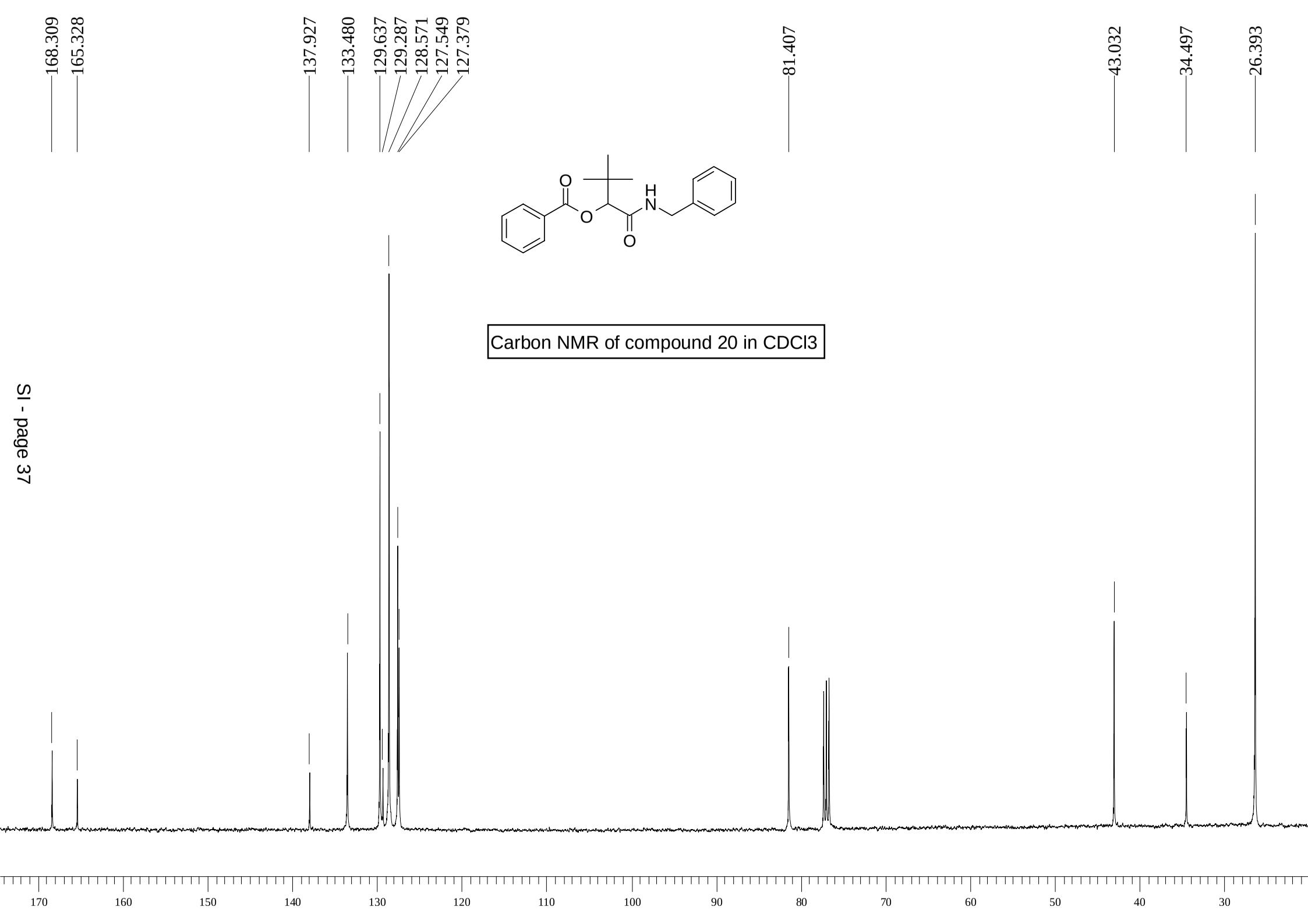
separation of the enantiomers of compound 19 with chiral induction of catalyst A7



Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	25.36	337.07	29.05	5.38	31.29	0.859	0.694
	2	29.67	823.11	70.95	11.82	68.71	1.066	0.761

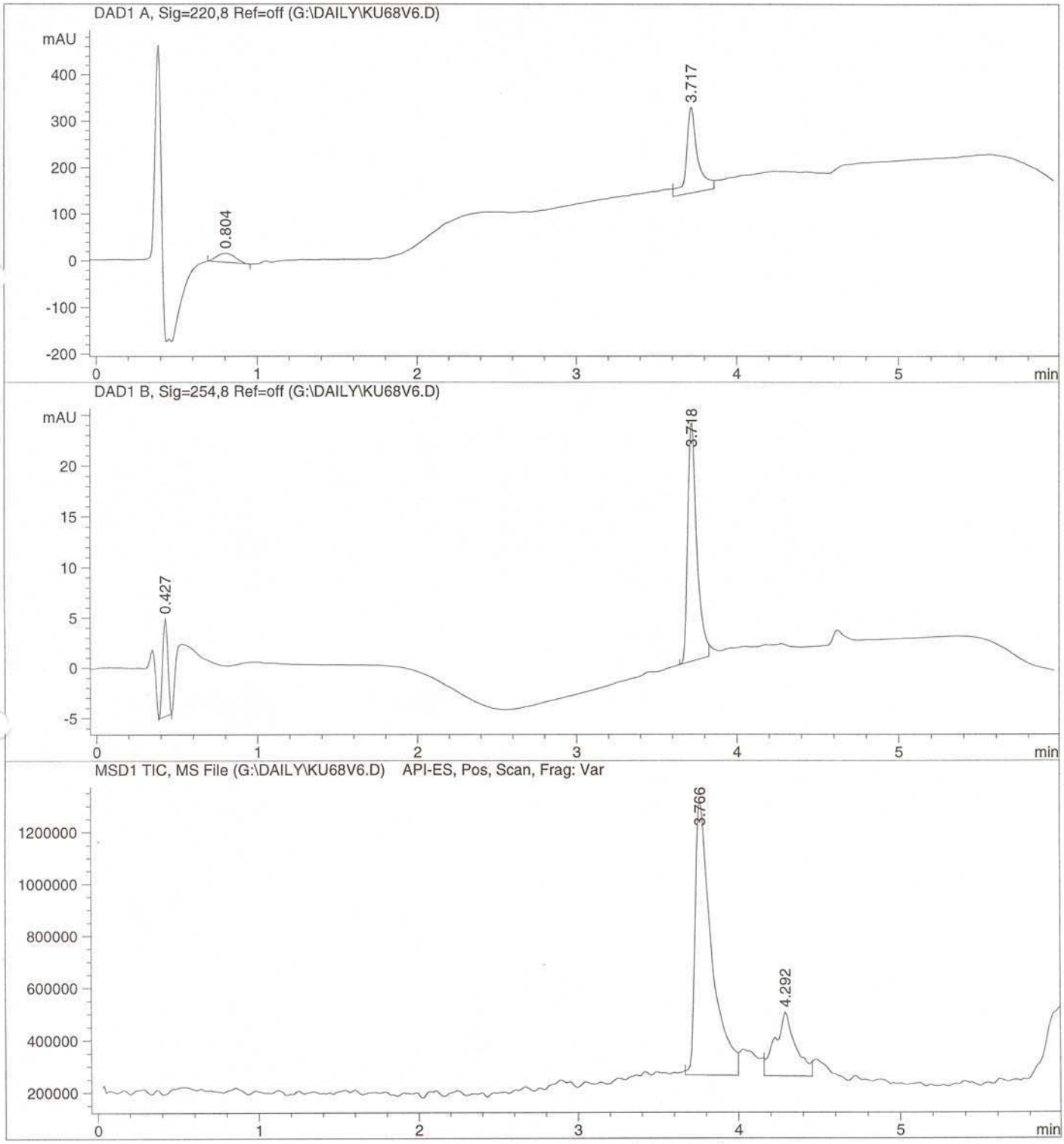
KU50 chiral hplc → 42% ee


8.010
7.992
7.548
7.511
7.416
7.378
7.240
7.157
6.204
5.035
4.467
4.321
1.072
O
O
H
N
O
Proton NMR of compound 20 in CDCl3
4.7
1.9
1.8
0.8
0.8
0.9
1.8
9.5
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


168.309
165.328
137.927
133.480
129.637
129.287
128.571
127.549
127.379
81.407
43.032
34.497
26.393
O
O
H
N
O
Carbon NMR of compound 20 in CDCl3
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30

```
==========================================================================
Injection Date  : 11/8/02 11:56:12 AM          Seq. Line :  27
Sample Name     : KU68v6_RK                     Location : Vial 23
Acq. Operator   : user                             Inj :   1
                                               Inj Volume : 5 µl
Acq. Method     : D:\HPCHEM\1\METHODS\ESI_LC6.M
Last changed    : 11/8/02 11:54:37 AM by user
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\ESI_LC6.M
Last changed    : 6/18/02 3:31:34 PM
YMC ODS-A 5cm 2µ
ESI positiv
```

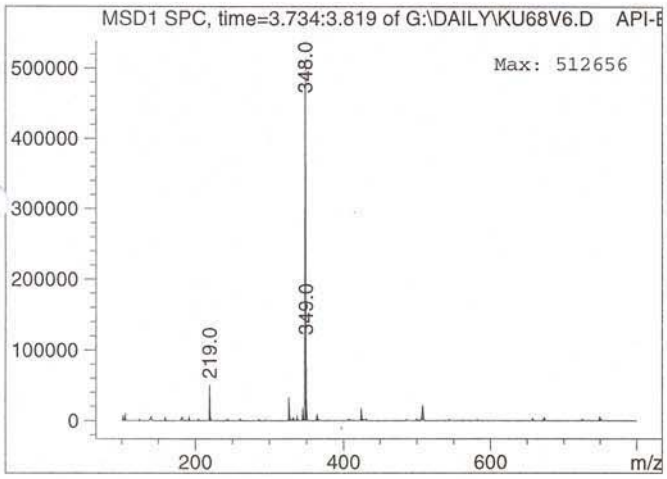
HPLC-MS Spectrum of compound 20

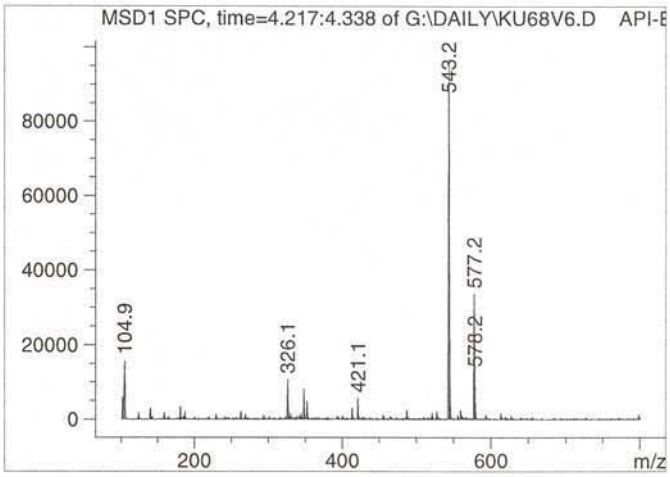


hplc-ms of product after purification with hplc

MS Signal: MSD1 TIC, MS File, API-ES, Pos, Scan, Frag: Var
Spectra averaged over upper half of peaks.
Noise Cutoff: 1000 counts.
Reportable Ion Abundance: > 10%.

Retention Time (MS)	MS Area	Mol. Weight or Ion
3.766	7503952	349.00 I
		348.00 I
4.292	2185946	578.20 I
		577.15 I
		544.20 I
		543.20 I
		326.10 I
		104.95 I





*** End of Report ***

Standard Report

Data File name: D:\HPCHEM\1\DATA\051102\KU58.D
Sample name: KU58
Act. Inj. Vol.: 5.00 uL

Acquis. Meth.: POS1_3.M

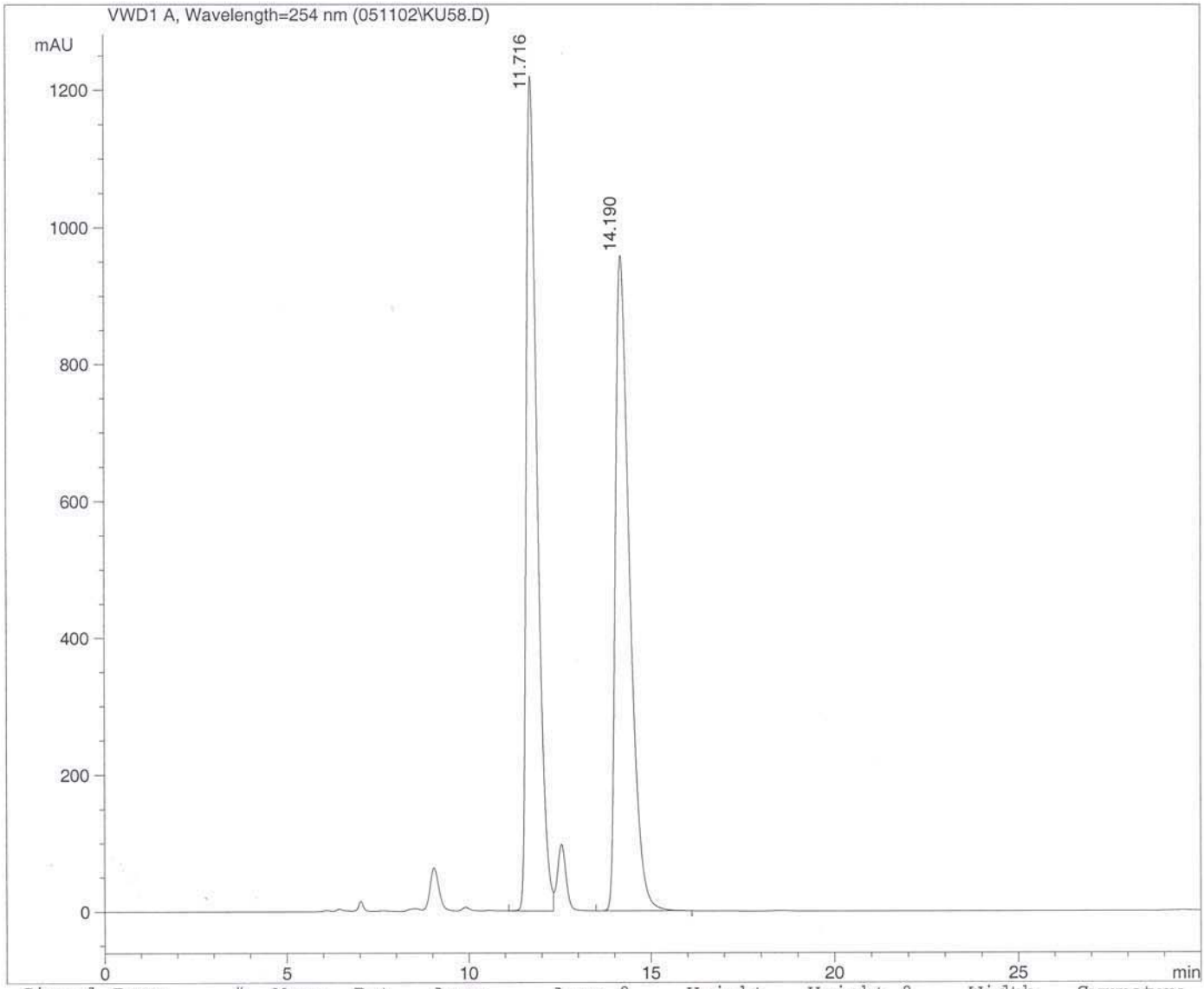
Integr. Method: D:\HPCHEM\1\METHODS\POS1_3.M
Meth. Inj. Vol.: 5.00 uL

Injection date: 11/5/02 11:52:04 AM
Report date: 11/5/02 12:36:53 PM

Process Meth. Info:
Position 1:
Daicel Chiralcel OD-H
4.6 x 250

data acquired by:
vial: 71

separation of enantiomers of compound 20



Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	11.72	25478.61	49.68	1220.80	56.06	0.319	0.538
	2	14.19	25802.29	50.32	957.02	43.94	0.408	0.528

KU58-separation of enantiomeres

Standard Report

Data File name: D:\HPCHEM\1\DATA\081102\KU68V6.D
Sample name: KU68v6
Act. Inj. Vol.: 25.00 uL

Acquis. Meth.: POS1_3.M

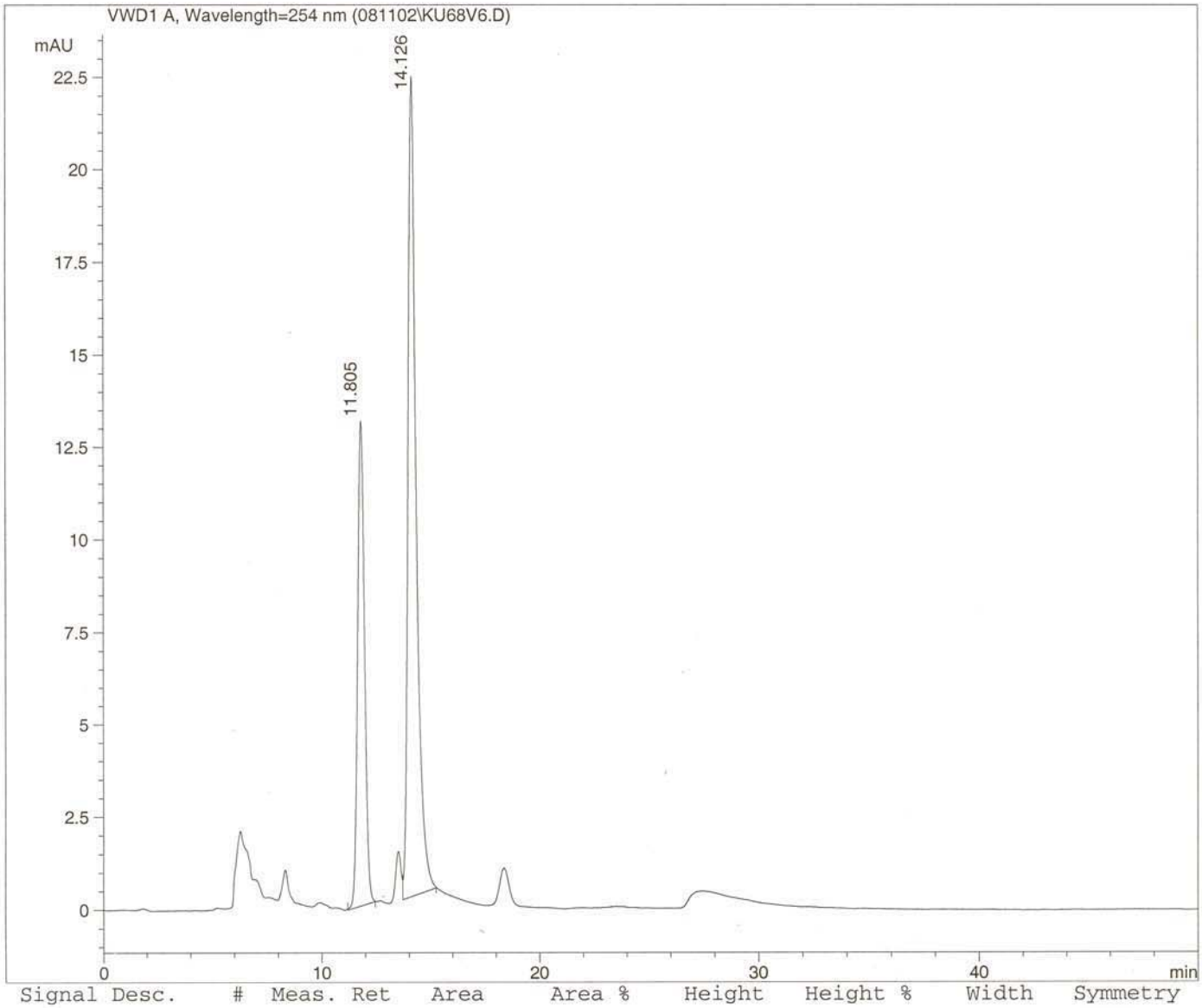
Integr. Method: D:\HPCHEM\1\METHODS\POS1_3.M
Meth. Inj. Vol.: 5.00 uL

Injection date: 11/8/02 1:37:09 PM
Report date: 11/8/02 2:52:37 PM

Process Meth. Info:
Position 1:
Daicel Chiralcel OD-H
4.6 x 250

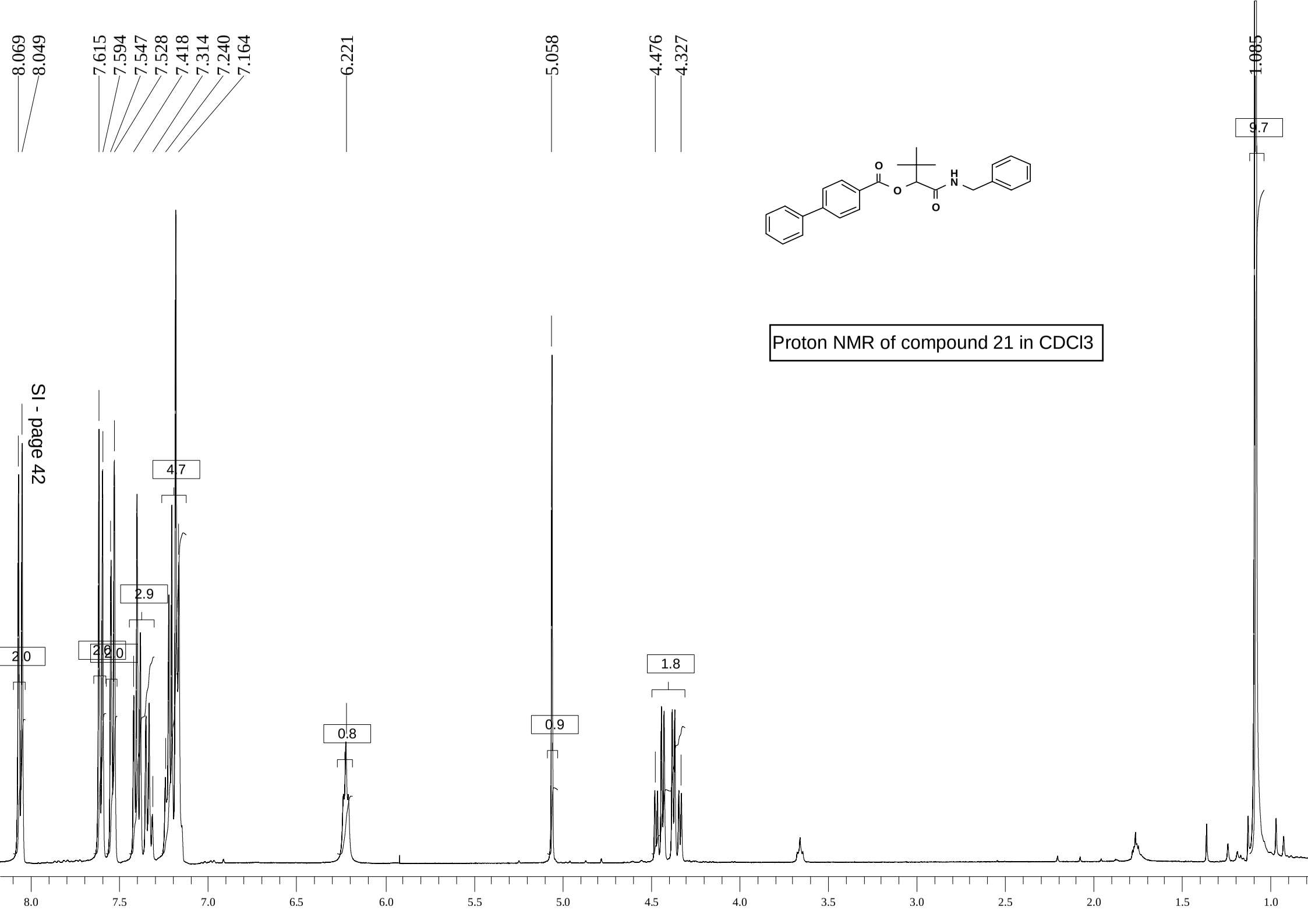
data acquired by:
vial: 82

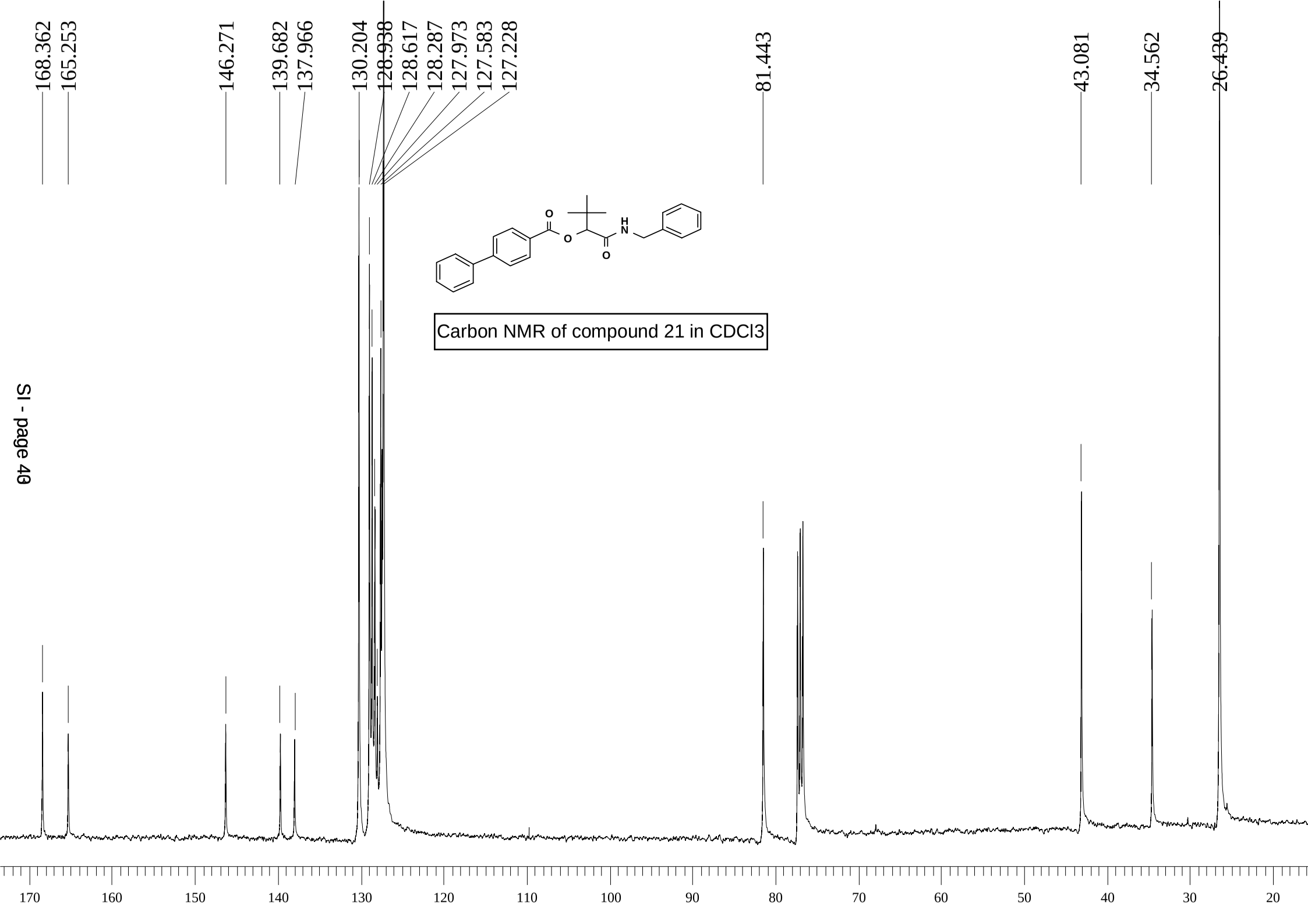
separation of enantiomers of compound 20 with chiral induction of catalyst A7



Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	11.80	288.27	33.26	13.11	37.16	0.367	0.907
	2	14.13	578.34	66.74	22.17	62.84	0.435	0.671

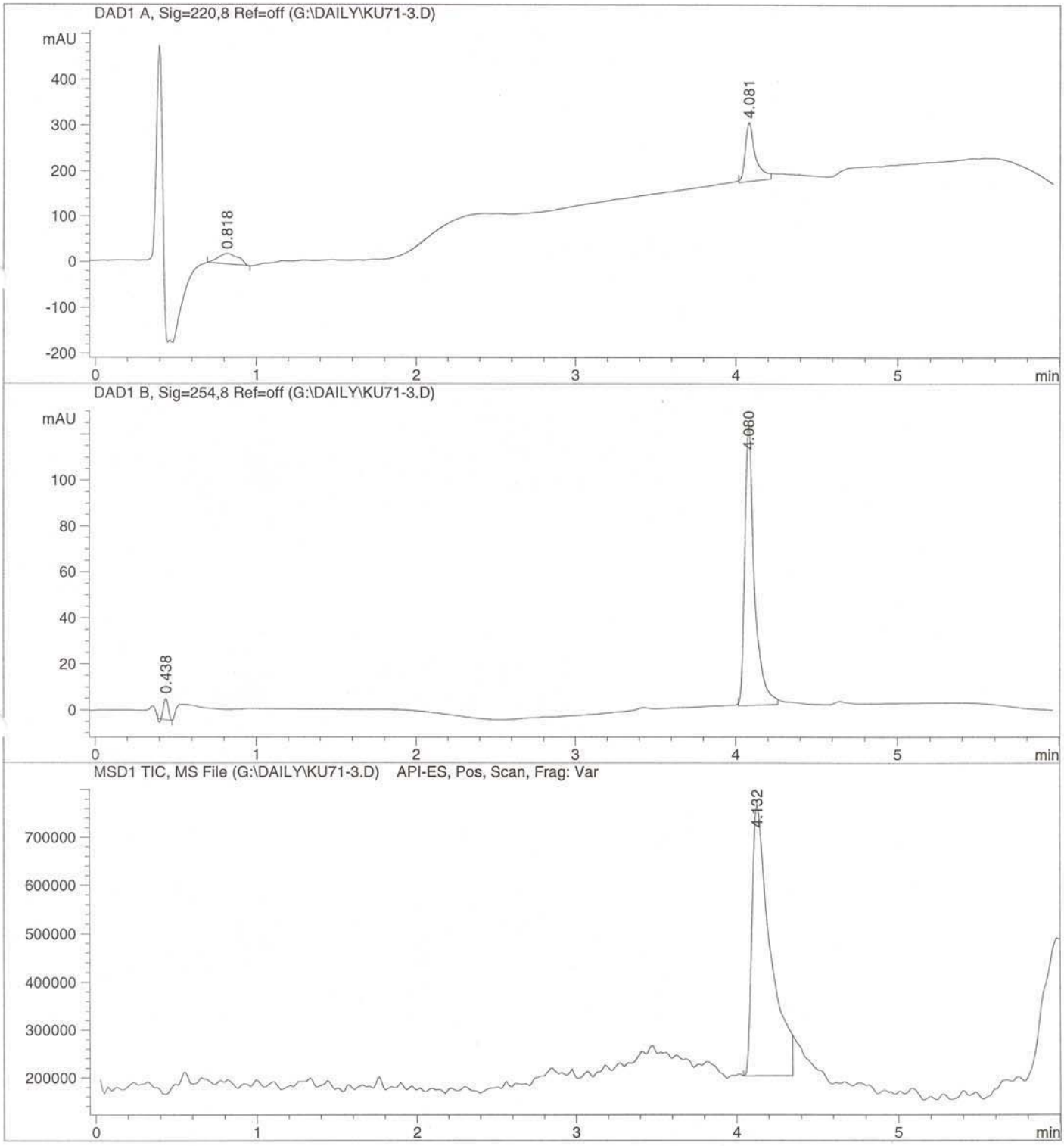
chiral hplc → 34% ee


8.069
8.049
7.615
7.594
7.547
7.528
7.418
7.314
7.240
7.164
6.221
5.058
4.476
4.327
1.085
9.7
Proton NMR of compound 21 in CDCl3
SI - page 42
4.7
2.9
2.0
2.0
0.8
0.9
1.8
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


168.362
165.253
146.271
139.682
137.966
130.204
128.938
128.617
128.287
127.973
127.583
127.228
81.443
43.081
34.562
26.439
O
O
H
N
O
Carbon NMR of compound 21 in CDCl3
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20

```
==========================================================================
Injection Date  : 11/8/02 2:20:17 PM          Seq. Line :  44
Sample Name     : KU71-3_RK                    Location : Vial 31
Acq. Operator   : user                            Inj :   1
                                              Inj Volume : 5 µl
Acq. Method     : D:\HPCHEM\1\METHODS\ESI_LC6.M
Last changed    : 11/8/02 2:18:40 PM by user
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\ESI_LC6.M
Last changed    : 6/18/02 3:31:34 PM
YMC ODS-A 5cm 2µ
ESI positiv
```

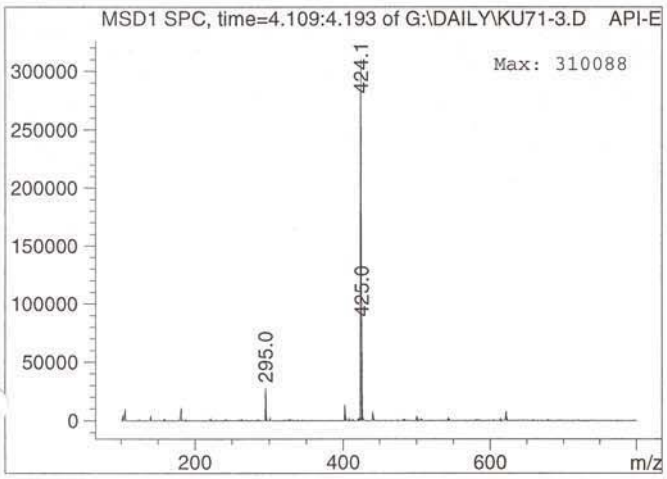
HPLC-MS Spectrum of compound 21



KU71 - after purification with hplc

MS Signal: MSD1 TIC, MS File, API-ES, Pos, Scan, Frag: Var
Spectra averaged over upper half of peaks.
Noise Cutoff: 1000 counts.
Reportable Ion Abundance: > 10%.

Retention Time (MS)	MS Area	Mol. Weight or Ion
4.132	4424279	425.00 I
		424.10 I



*** End of Report ***

Standard Report

Data File name: D:\HPCHEM\1\DATA\061102\KU65VERD.D
Sample name: KU65verd
Act. Inj. Vol.: 5.00 uL

Acquis. Meth.: POS1_3.M

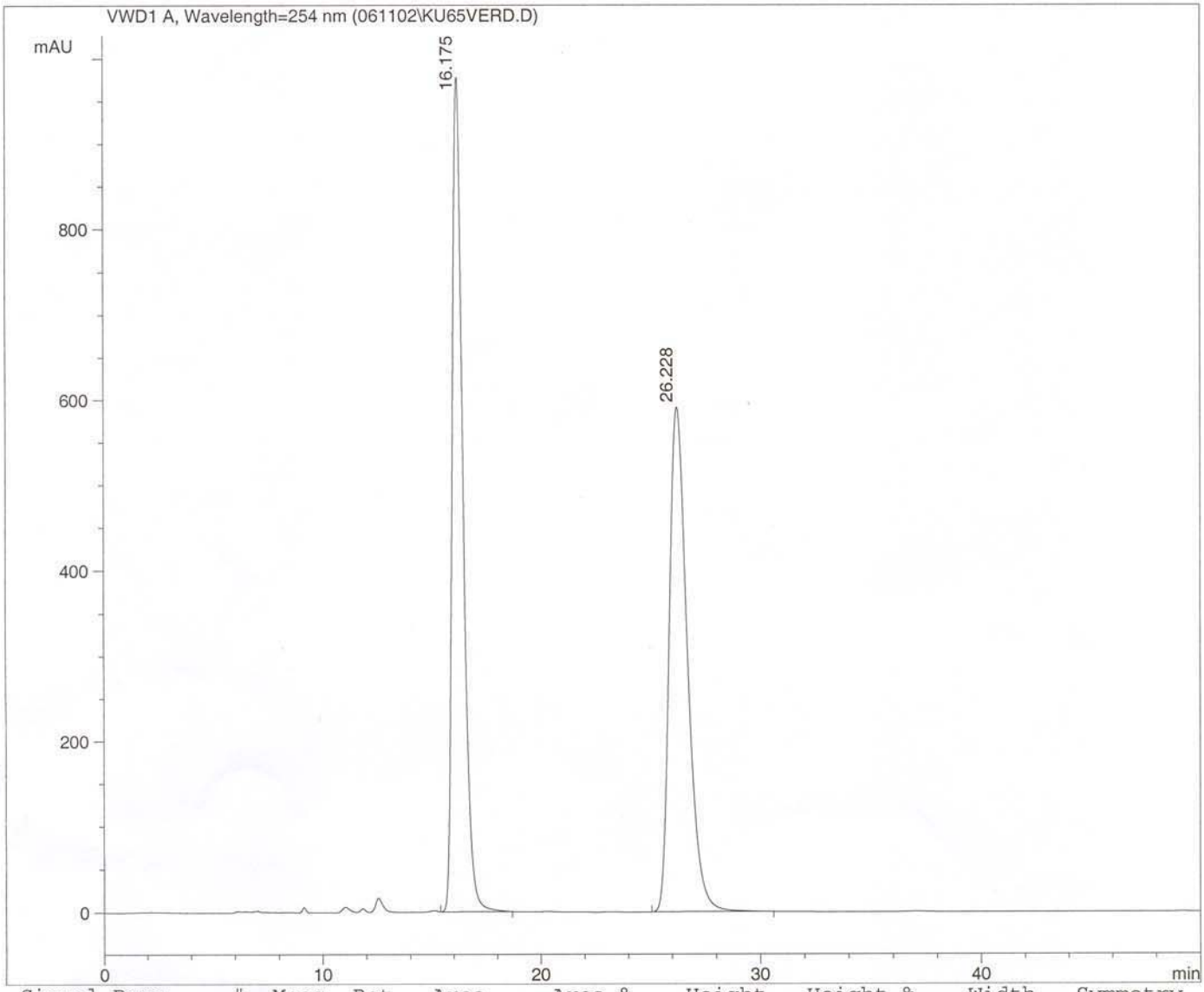
Integr. Method: D:\HPCHEM\1\METHODS\POS1_3.M
Meth. Inj. Vol.: 5.00 uL

Injection date: 11/6/02 12:40:23 PM
Report date: 11/6/02 2:14:11 PM

Process Meth. Info:
Position 1:
Daicel Chiralcel OD-H
4.6 x 250

data acquired by:
vial: 53

separation of enantiomers of compound 21



Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	16.17	33419.76	49.70	976.97	62.30	0.539	0.658
	2	26.23	33823.89	50.30	591.29	37.70	0.877	0.656

KU65-separation of enantiomeres

Standard Report

Data File name: D:\HPCHEM\1\DATA\081102\KU71-3.D
Sample name: KU71-3
Act. Inj. Vol.: 20.00 uL

Acquis. Meth.: POS1_3.M

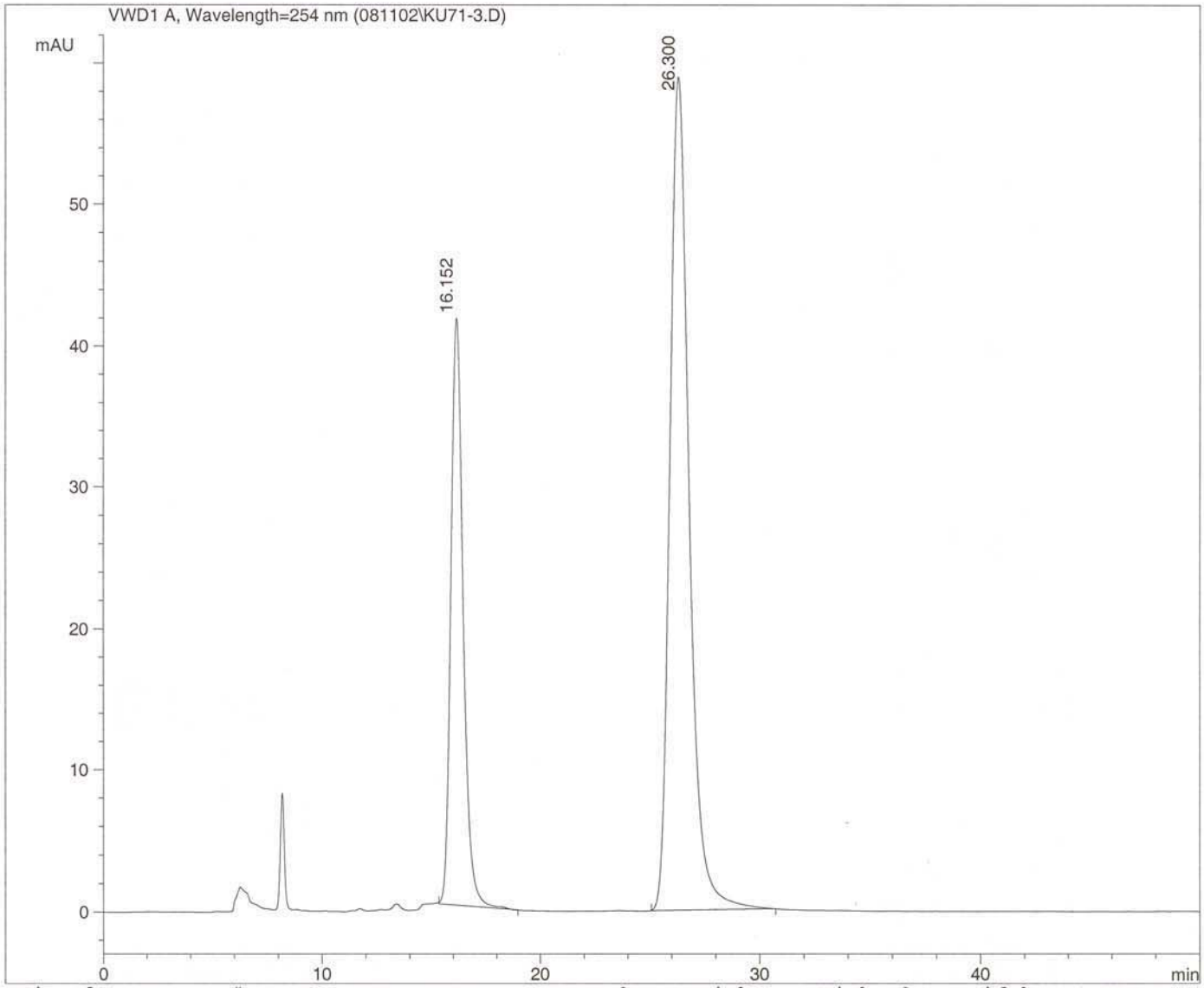
Integr. Method: D:\HPCHEM\1\METHODS\POS1_3.M
Meth. Inj. Vol.: 5.00 uL

Injection date: 11/8/02 3:28:56 PM
Report date: 11/8/02 4:22:10 PM

data acquired by:
vial: 85

Process Meth. Info:
Position 1:
Daicel Chiralcel OD-H
4.6 x 250

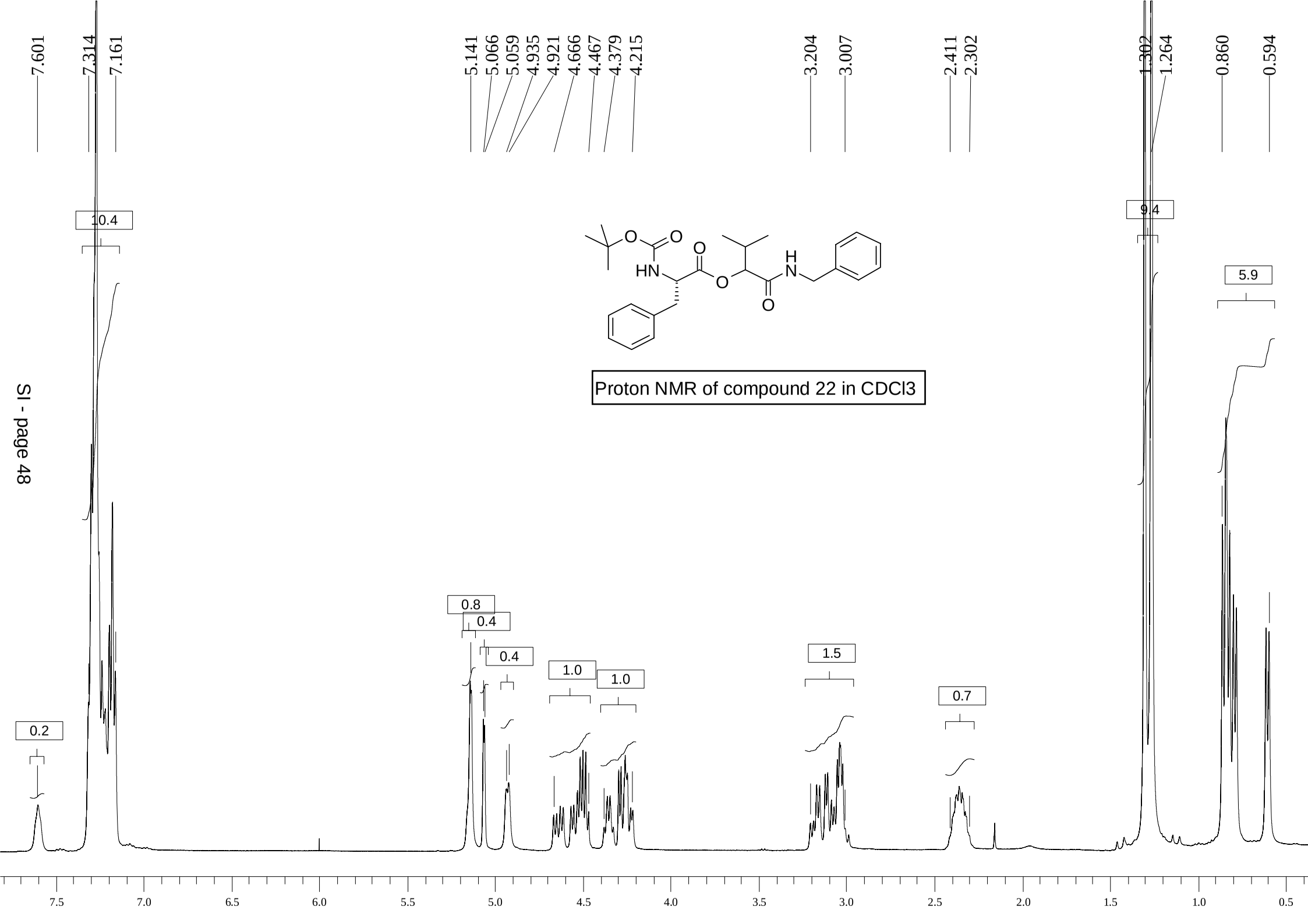
separation of enantiomers of compound 21 with chiral induction of catalyst A7

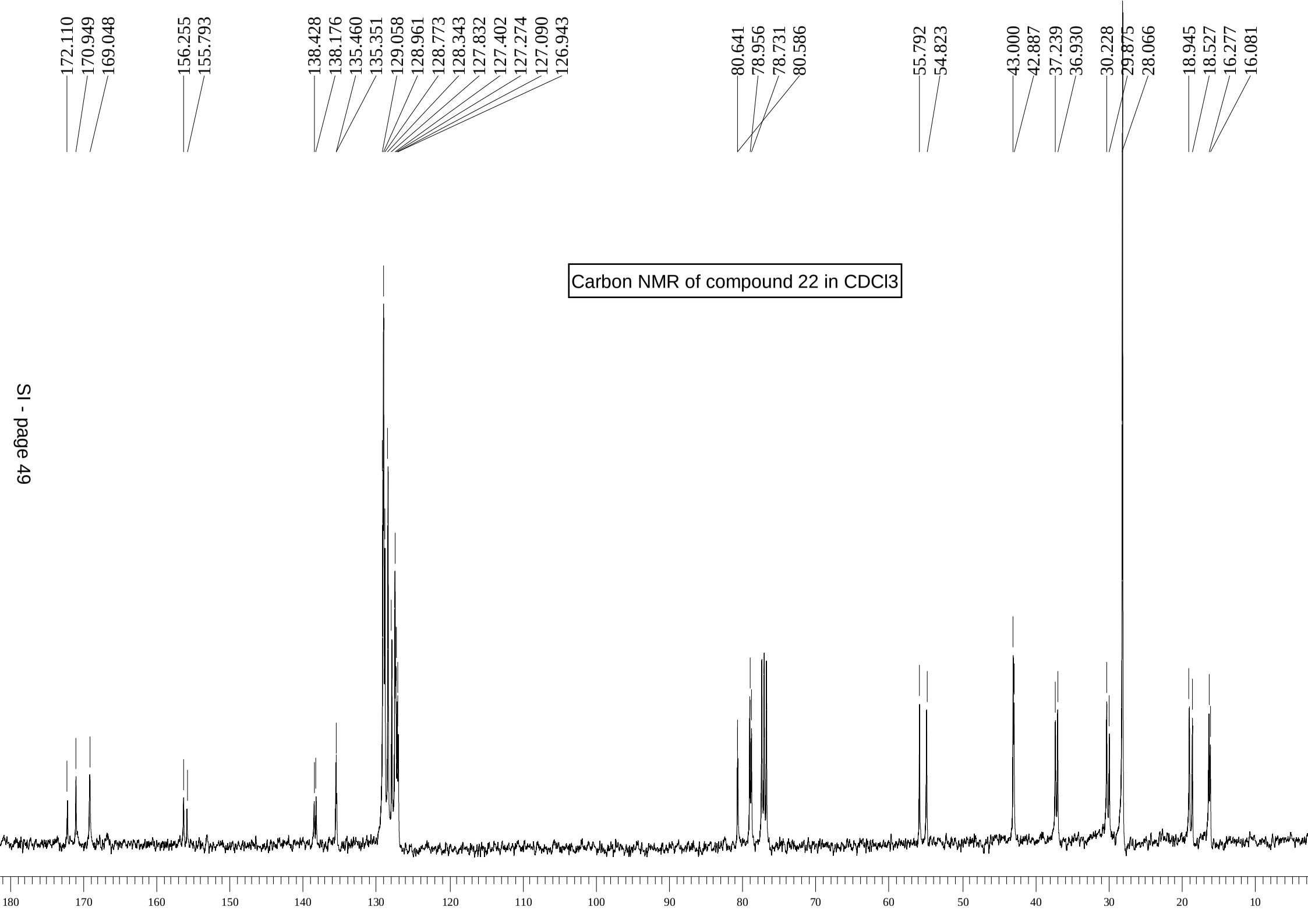


Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	16.15	1673.20	31.78	41.53	41.35	0.613	0.730
	2	26.30	3592.41	68.22	58.92	58.65	0.933	0.717

KU71 - chiral hplc → 36% ee

Page 1 of 1


7.601
7.314
7.161
5.141
5.066
5.059
4.935
4.921
4.666
4.467
4.379
4.215
3.204
3.007
2.411
2.302
1.302
1.264
0.860
0.594
10.4
9.4
5.9
0.8
0.4
0.4
1.0
1.0
1.5
0.7
0.2
O
O
HN
O
O
H
N
O
Proton NMR of compound 22 in CDCl3
SI - page 48
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


172.110
170.949
169.048
156.255
155.793
138.428
138.176
135.460
135.351
129.058
128.961
128.773
128.343
127.832
127.402
127.274
127.090
126.943
80.641
78.956
78.731
80.586
55.792
54.823
43.000
42.887
37.239
36.930
30.228
29.875
28.066
18.945
18.527
16.277
16.081
Carbon NMR of compound 22 in CDCl3
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10

Standard Report

Data File name: I:\ULRIKE\HPLC4\110602\KU7_10µL.D
Sample name: KU7
Act. Inj. Vol.: 10.00 uL

Acquis. Meth.: POS1_3.M

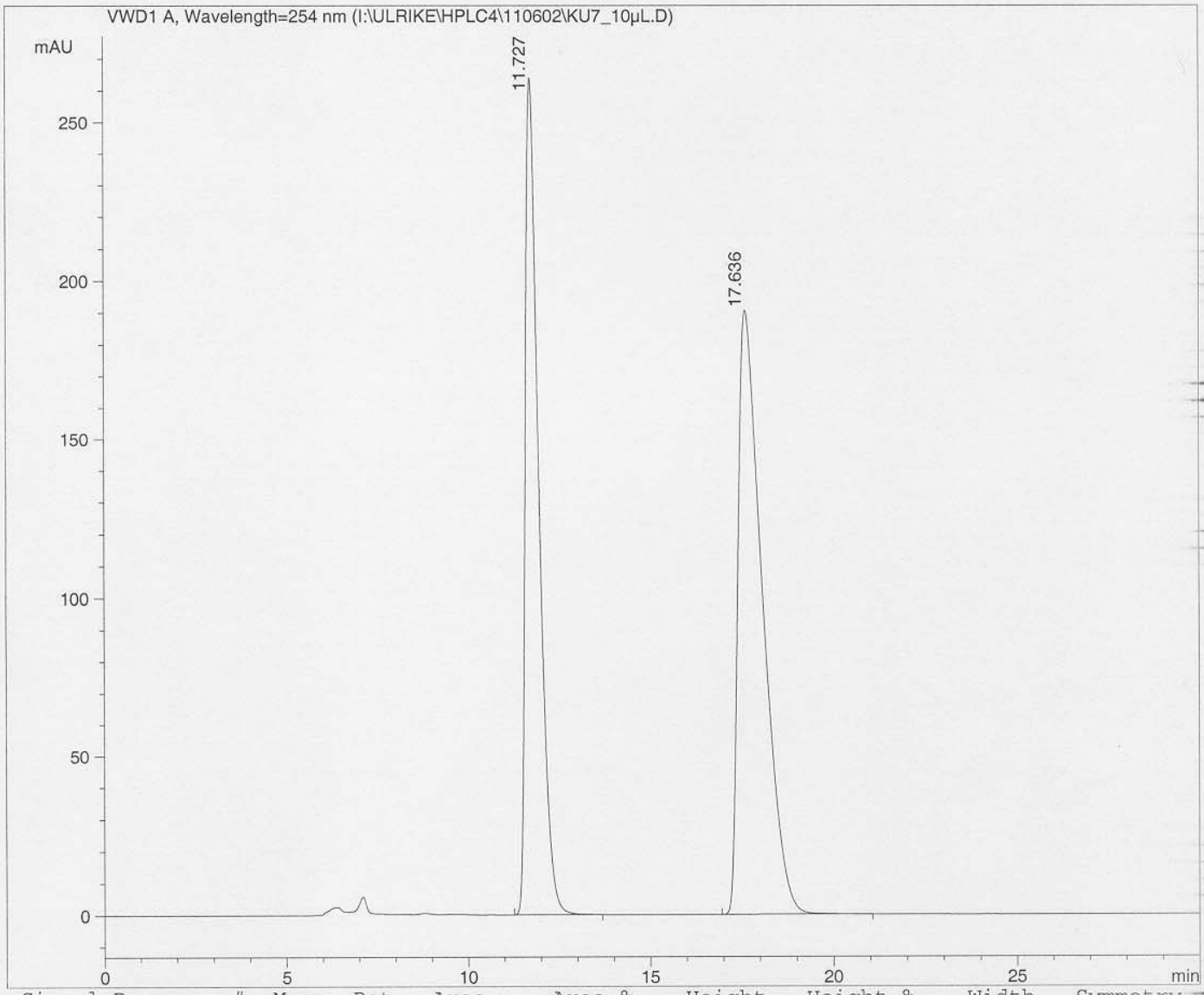
Integr. Method: D:\HPCHEM\1\METHODS\PO51_2.M
Meth. Inj. Vol.: 10.00 uL

Injection date: 6/11/02 2:19:20 PM
Report date: 5/22/03 1:24:15 PM

Process Meth. Info:
Position 5:
Phenomenex Chirex S-VAL & R-NEA
4.6 x 50

data acquired by:
vial: 52

separation of diastereomers of compound 22
(taken from the supernatant of solution with crystals)



Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	11.73	6760.79	43.53	263.57	58.11	0.392	0.519
	2	17.64	8770.16	56.47	189.97	41.89	0.690	0.440

Standard Report

Data File name: I:\ULRIKE\HPLC4\110602\KU7_1482.D
Sample name: KU7-1482xray
Act. Inj. Vol.: 5.00 uL

Acquis. Meth.: POS1_3.M

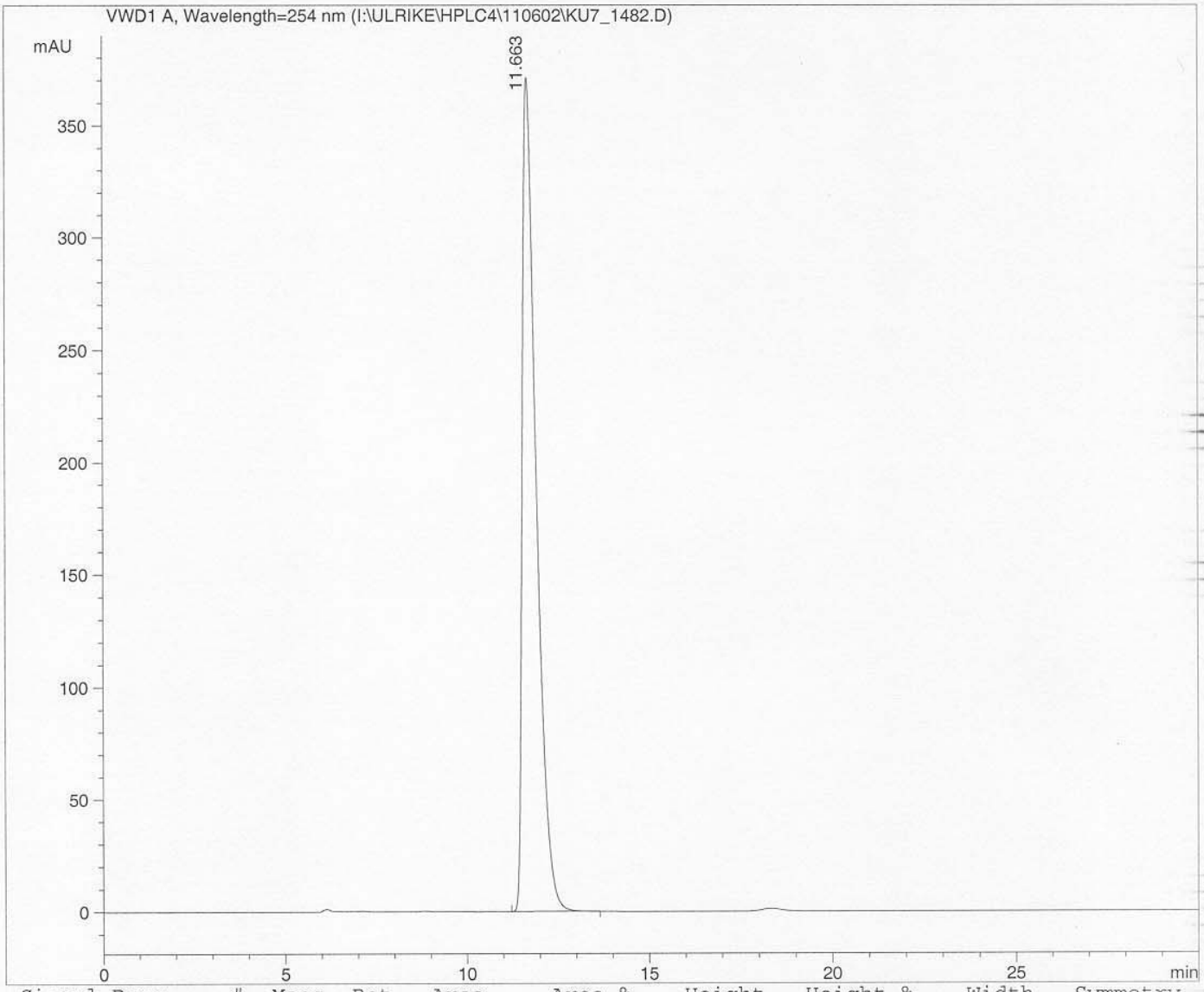
Integr. Method: D:\HPCHEM\1\METHODS\PO51_2.M
Meth. Inj. Vol.: 5.00 uL

Process Meth. Info:
Position 5:
Phenomenex Chirex S-VAL & R-NEA
4.6 x 50

Injection date: 6/11/02 1:44:57 PM
Report date: 5/22/03 1:24:47 PM

data acquired by:
vial: 51

part of the crystal used for single crystal X-ray determination of compound 22



Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	11.66	9897.53	100.00	371.28	100.00	0.397	0.433

Standard Report

```
  Data File name:   I:\ULRIKE\HPLC4\110602\7_4182.D
     Sample name:   KU7+KU7-4182
  Act. Inj. Vol.:   5.00                                        uL

   Acquis. Meth.:  POS1_3.M

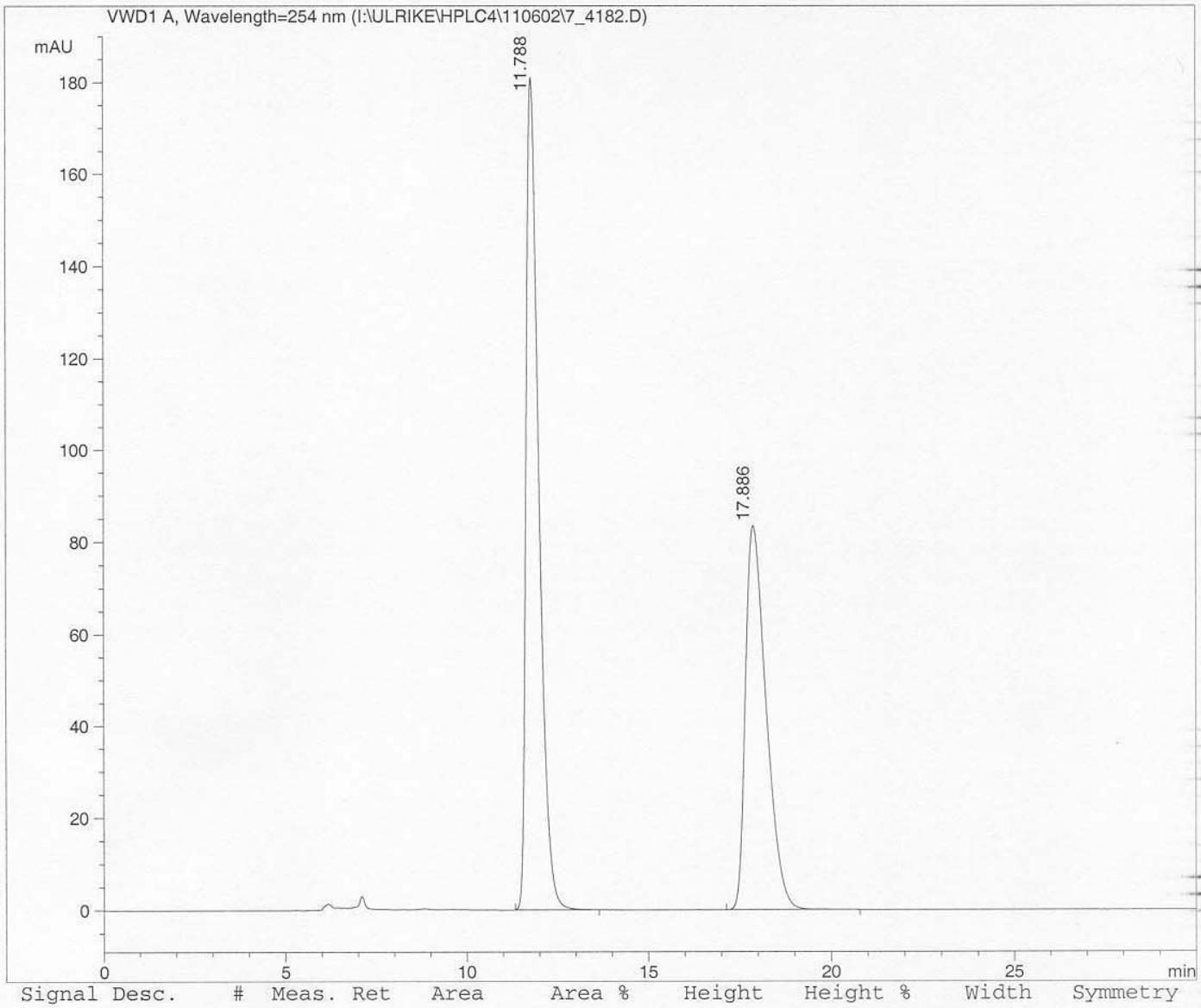
  Integr. Method:  D:\HPCHEM\1\METHODS\PO51_2.M
 Meth. Inj. Vol.:  5.00  uL

  Injection date:  6/11/02         3:13:44 PM
     Report date:  5/22/03         1:25:40 PM

data acquired by:
            vial:  53
```

```
Process Meth. Info:
Position 5:
Phenomenex Chirex S-VAL & R-NEA
4.6 x 50
```

coinjection of single crystal used for X-ray determination and solution diasteromeric mixture of compound 22

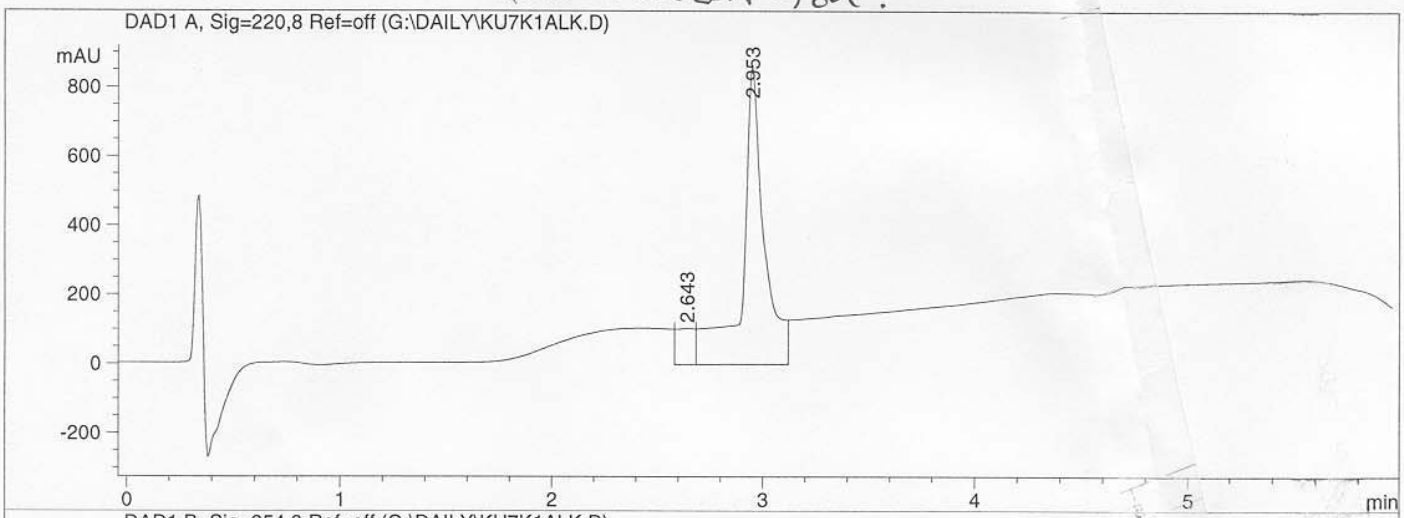


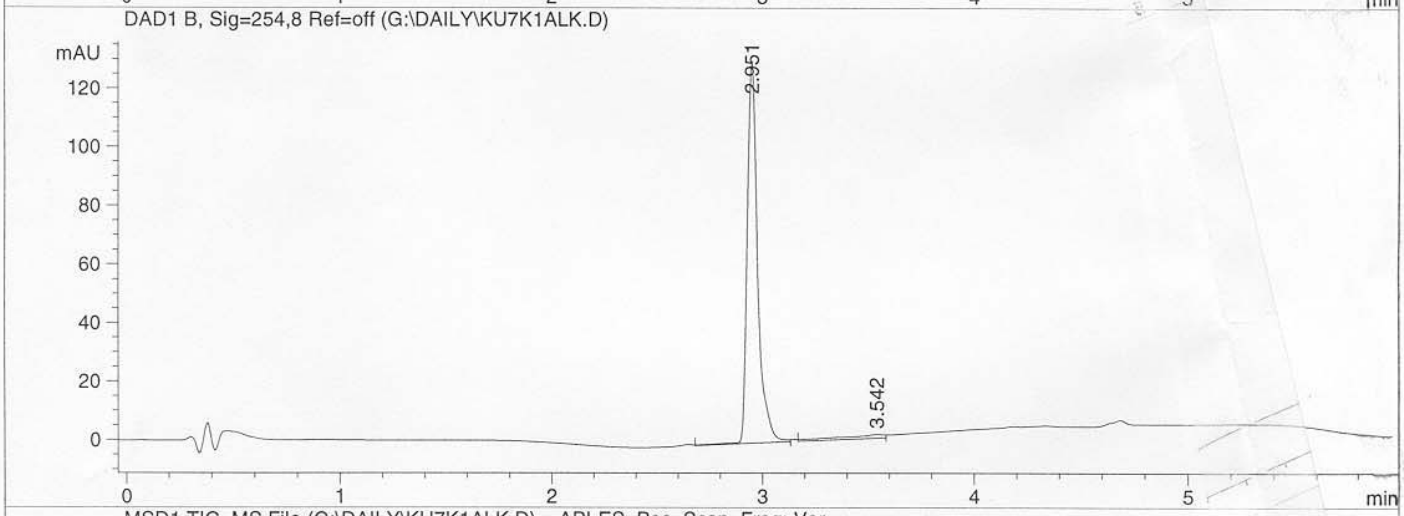
Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	11.79	4410.49	57.37	180.91	68.43	0.372	0.561
	2	17.89	3277.15	42.63	83.44	31.57	0.598	0.571

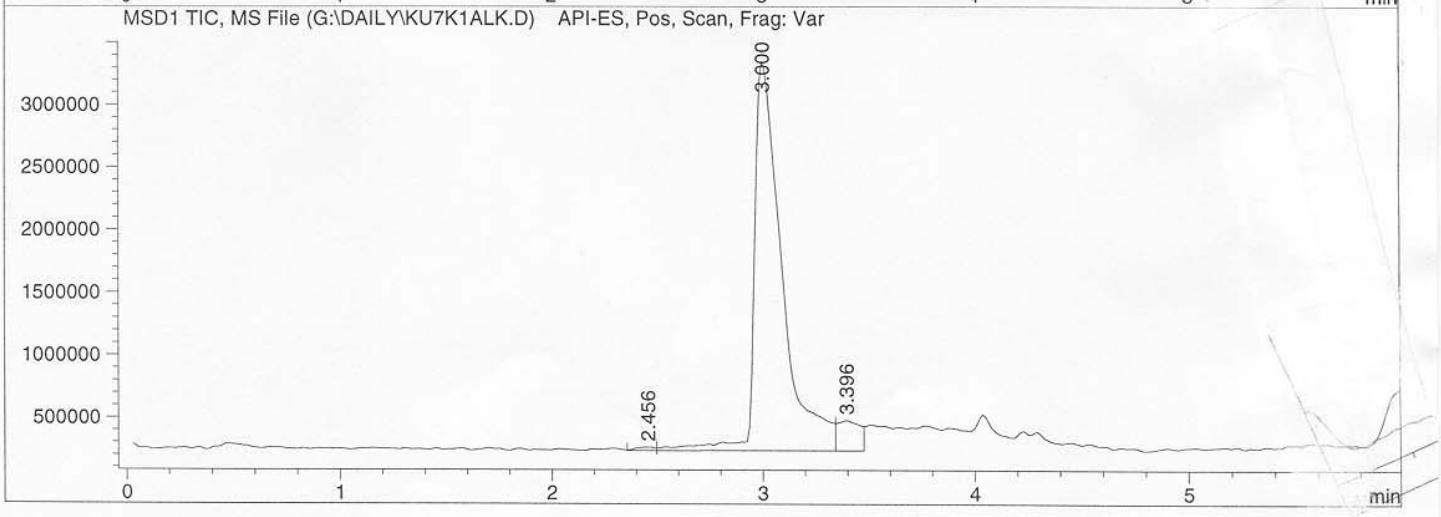
```
==========================================================================
Injection Date  : 3/7/03 7:20:30 PM          Seq. Line :  79
Sample Name     : KU7K1alk                    Location : Vial 1
Acq. Operator   : Brixner                        Inj :   1
                                           Inj Volume : 5 µl
Acq. Method     : D:\HPCHEM\1\METHODS\ESI_LC6.M
Last changed    : 3/7/03 7:18:59 PM by Brixner
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\ESI_LC6.M
Last changed    : 3/7/03 10:48:48 AM
                  (modified after loading)
YMC ODS-A 5cm 2µ
ESI positiv
```

HPLC-MS spectrum of compound 23

kristall - verseift - abgehende Alkohol an LC1 -> ok!

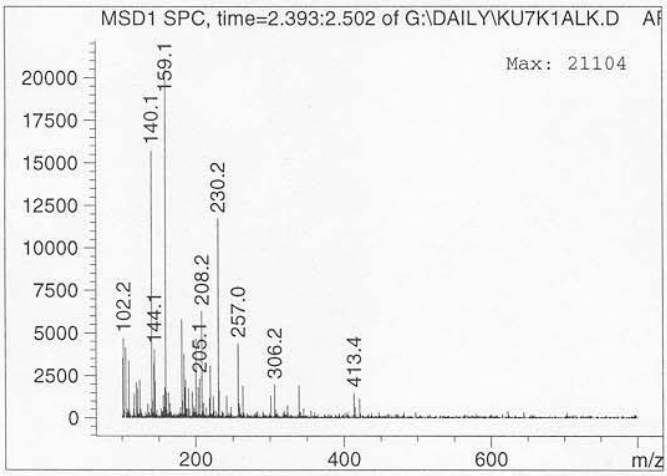


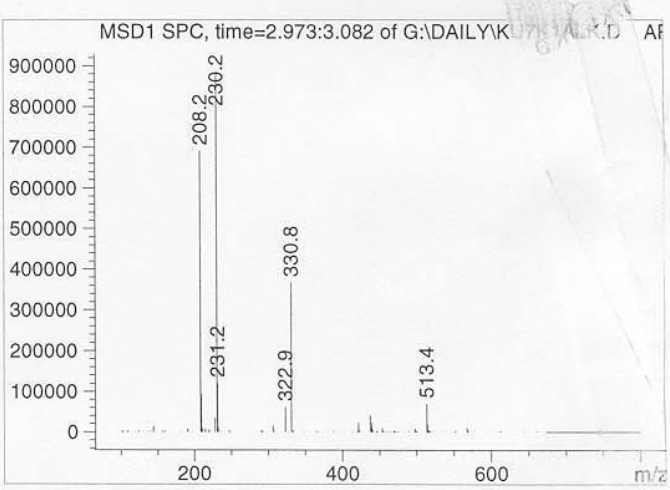


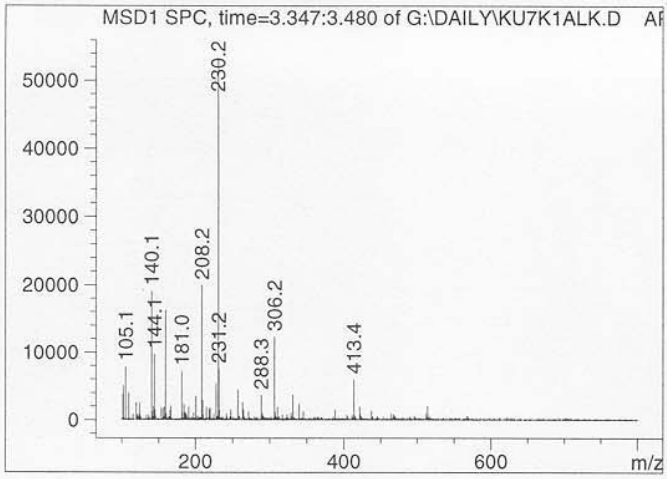


MS Signal: MSD1 TIC, MS File, API-ES, Pos, Scan, Frag: Var
Spectra averaged over upper half of peaks.
Noise Cutoff: 1000 counts.
Reportable Ion Abundance: > 10%.

Retention Time (MS)	MS Area	Mol. Weight or Ion
2.456	184763	256.95 I
		230.20 I
		219.20 I
		208.20 I
		205.10 I
		200.10 I
		186.05 I
		184.10 I
		181.00 I
		159.10 I
		145.05 I
		144.10 I
		143.05 I
		140.10 I
		124.10 I
		109.15 I
		105.10 I
		102.20 I
		101.20 I
3.000	28285604	330.80 I
		231.20 I
		230.20 I
		209.20 I
		208.20 I
3.396	1812192	413.40 I
		306.20 I
		231.20 I
		230.20 I
		227.30 I
		208.20 I
		181.00 I
		159.05 I
		144.15 I
		140.10 I
		105.10 I







*** End of Report ***

Standard Report

Data File name: D:\HPCHEM\1\DATA\DAILY\BBKRI.D
Sample name: bbkri
Act. Inj. Vol.: 5.00 uL

Acquis. Meth.: PO11_5_D.M

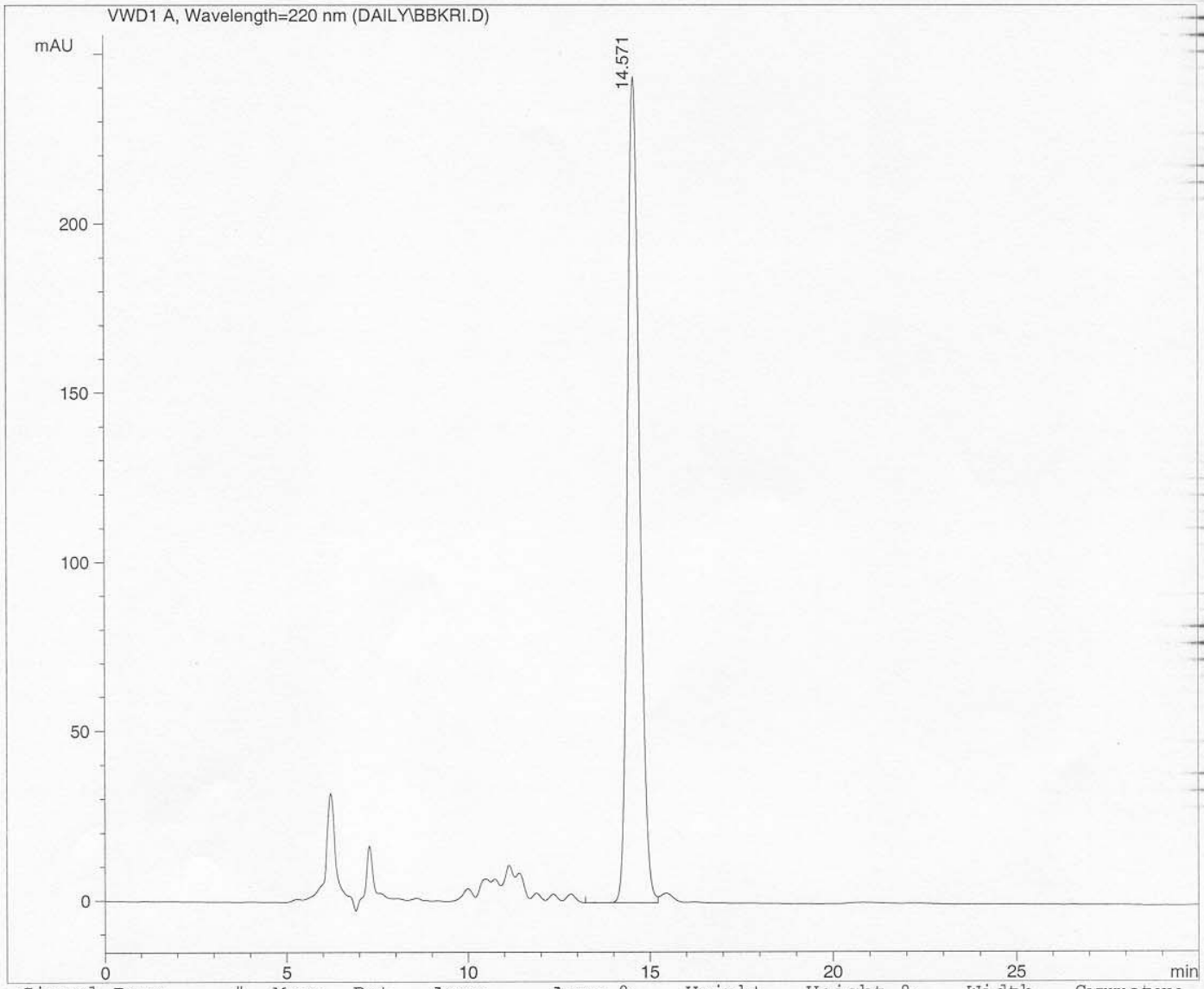
Integr. Method: D:\HPCHEM\1\METHODS\PO11_10.M
Meth. Inj. Vol.: 5.00 uL

Process Meth. Info:
Position 1:
Daicel Chiralcel OD-H
4.6 x 250

Injection date: 3/26/03 1:58:36 PM
Report date: 5/23/03 7:22:32 PM

data acquired by:
vial: 2

alcohol 23 resulting from saponification of crystal 22 used for single crystal X-ray determination; Experiment A



Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	14.57	5641.87	100.00	244.04	100.00	0.363	0.869

Standard Report

Data File name: D:\HPCHEM\1\DATA\BH\KU6IN.D
Sample name: ku6in
Act. Inj. Vol.: 10.00 uL

Acquis. Meth.: PO11_5_D.M

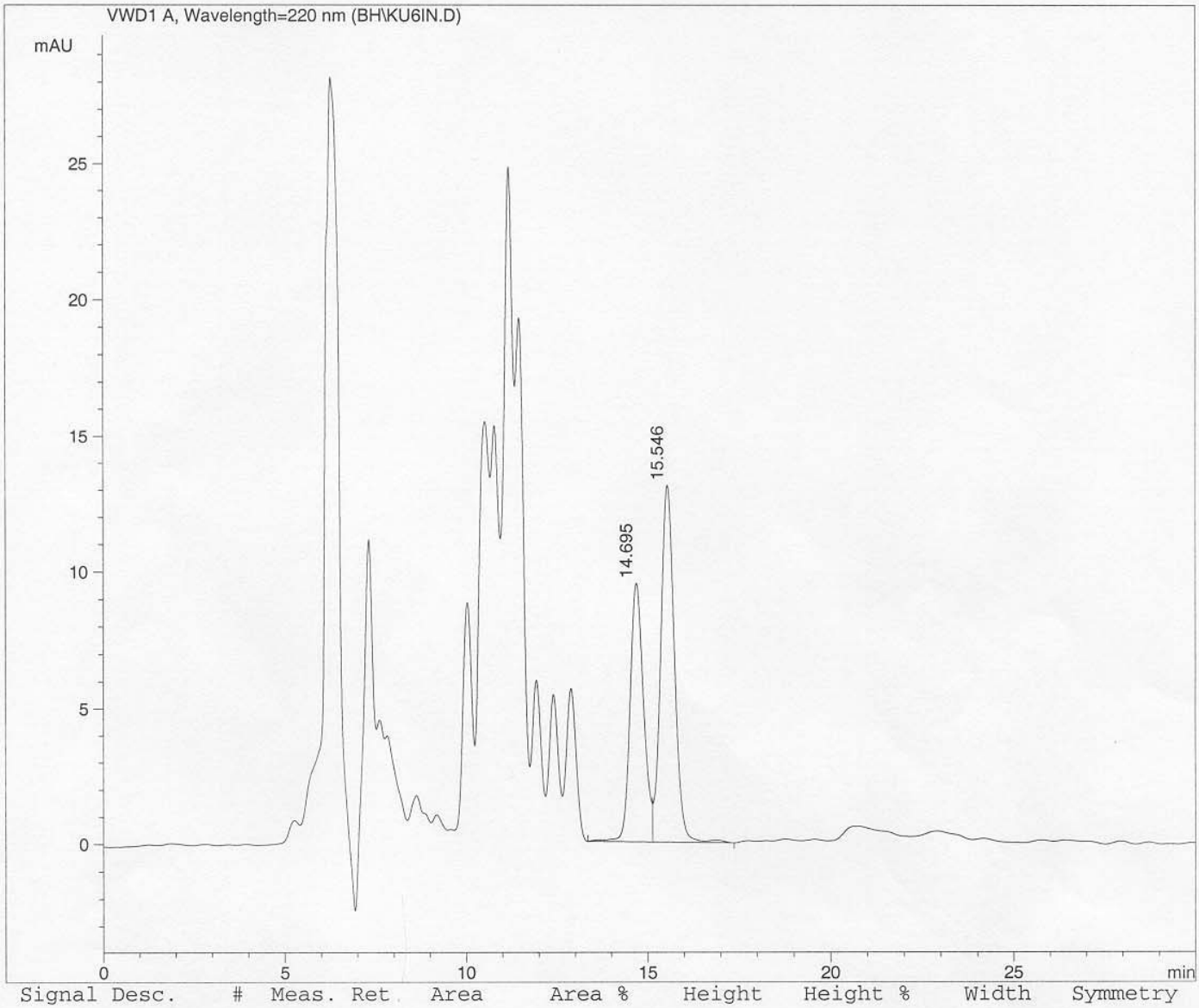
Integr. Method: D:\HPCHEM\1\METHODS\PO11_7.M
Meth. Inj. Vol.: 5.00 uL

Injection date: 3/25/03 1:33:38 PM
Report date: 3/25/03 3:32:30 PM

Process Meth. Info:
Position 1:
Daicel Chiralcel OD-H
4.6 x 250

data acquired by:
vial: 12

alcohol 23 resulting from saponification of ester 16 with chiral induction of catalyst A7; Experiment B



Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	14.69	246.67	41.72	9.50	42.03	0.396	0.891
	2	15.55	344.55	58.28	13.11	57.97	0.406	0.894

Standard Report

Data File name: D:\HPCHEM\1\DATA\DAILY\BBCOIN.D
Sample name: bbcoin
Act. Inj. Vol.: 5.00 uL

Acquis. Meth.: PO11_5_D.M

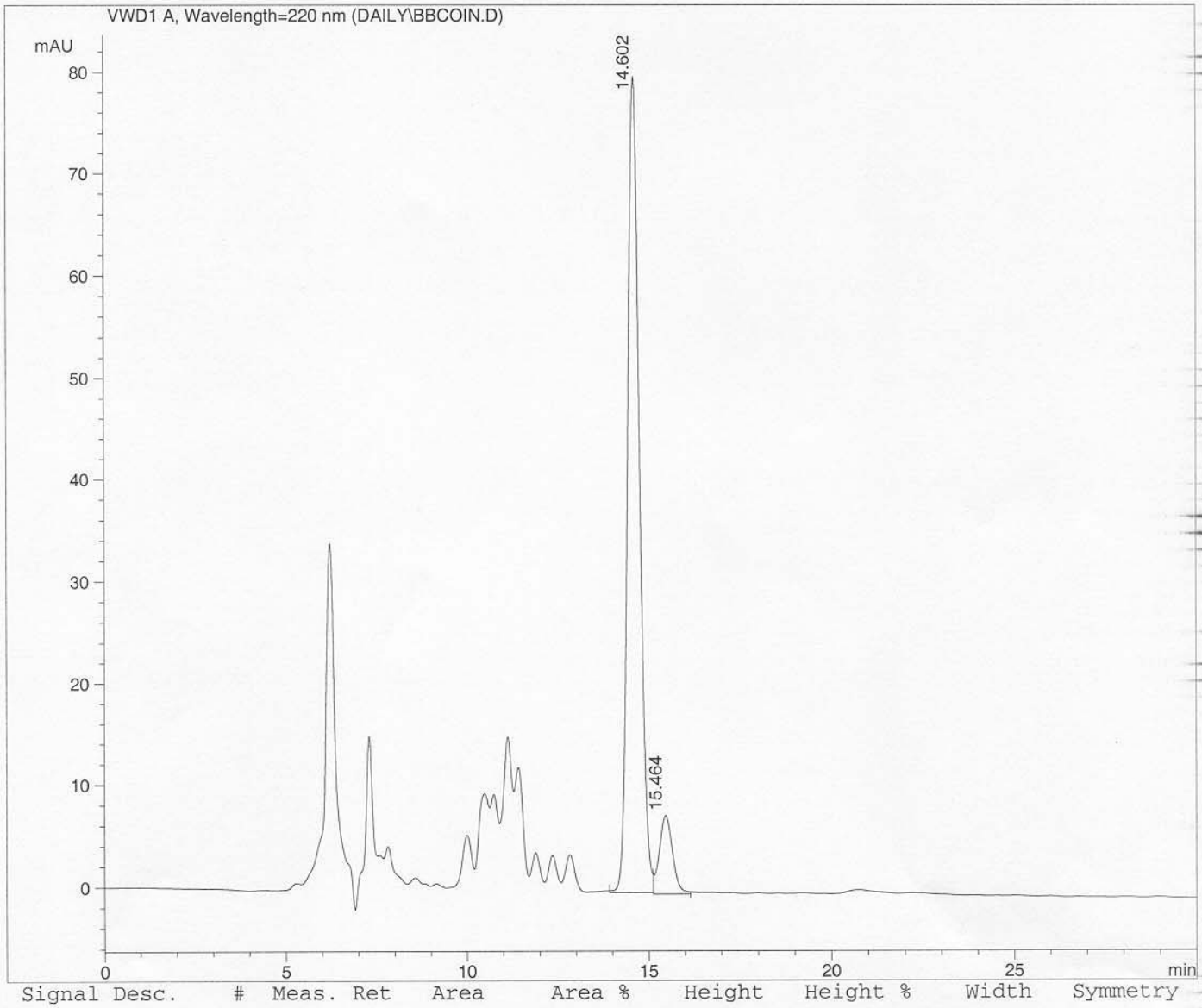
Integr. Method: D:\HPCHEM\1\METHODS\PO11_10.M
Meth. Inj. Vol.: 5.00 uL

Injection date: 3/26/03 2:29:44 PM
Report date: 5/23/03 7:21:56 PM

Process Meth. Info:
Position 1:
Daicel Chiralcel OD-H
4.6 x 250

data acquired by:
vial: 3

alcohol 23 coinjection of hplc solutions from experiment A and B



Signal Desc.	#	Meas. Ret	Area	Area %	Height	Height %	Width	Symmetry
VWD1 A, Wavelen	1	14.60	1806.25	90.25	80.12	91.24	0.376	0.906
	2	15.46	195.20	9.75	7.69	8.76	0.423	0.899

==========

S U P P O R T I N G I N F O R M A T I O N

==========

DOEA 4182-173

Compound 22 ($C_{26}H_{34}N_2O_5$)

B E L O N G I N G T O T H E P A P E R

Massive Parallel Catalyst Screening: Towards Asymmetric MCRs

b y

Ulrike Kusebauch, Barbara Beck, Kim Messer, Eberhardt Herdtweck, Alexander Dömling

C o n t e n t s

==========

Table S1 - Crystal Data and Details of the Structure Determination for **DOEA 4182-173**

Operator:	*** Herdtweck ***
Molecular Formula:	$C_{26}\ H_{34}\ N_2\ O_5$
Crystal Colour / Shape	Colorless fragment. Approximate size of crystal used for data collection:
Crystal Size	0.76 × 0.64 × 0.38 mm
Molecular Weight:	454.55 a.m.u.
F_{000}:	976
Systematic Absences:	h00: h≠2n; 0k0: k≠2n; 00l: l≠2n
Space Group:	Orthorhombic $P\ 2_12_12_1$ (I.T.-No.: 19)
Cell Constants:	Least-squares refinement of 2669 reflections with the programs "DENZO / HKL" [1, 2]; Theta range 1.98° < Θ < 25.33°; Mo(Kα); λ = 0.71073 Å a = 11.2376(1) Å b = 12.3949(1) Å c = 18.3839(1) Å V = 2560.67(3) $Å^3$; Z = 4; D_{calc} = 1.179 g cm^{-3}; Mos. = 0.406(1)
Diffractometer:	Kappa CCD (Area Diffraction System; NONIUS); rotating anode; graphite monochromator; 50 kV; 60 mA; λ = 0.71073 Å; Mo(Kα)
Temperature:	(-100±1) °C; (173±1) K
Measurement Range:	1.98°<Θ <25.33°; h: -13/13, k: -14/14, l: -22/22
Measurement Time:	2 × 2.5 s per film
Measurement Mode:	9 sets; 1034 films φ– and Ω–movement; Increment: Δφ/ΔΩ = 1.0°; dx = 40.0 mm
LP - Correction:	Yes [2]
Intensity Correction	No
Absorption Correction:	No; μ = 0.082 mm^{-1}
Reflection Data:	97013 reflections were used 57025 reflections were integrated 57025 reflections to be merged 4666 independent reflections

0.037	R_{int} :(basis Fo^2)
4666	independent reflections (all) were used in refinements
4314	independent reflections with Io > 2σ(Io)
100.0%	completeness of the data set
435	Parameter full-matrix refinement
10.7	reflections per parameter

Solution: Direct Methods [3]; Difference Fourier syntheses

Refinement Parameters: In the asymmetric unit:
33 Non-hydrogen atoms with anisotropic displacement parameters
34 Hydrogen atoms with isotropic displacement parameters

Hydrogen Atoms: All hydrogen atom positions were found in the difference map calculated from the model containing all non-hydrogen atoms. The hydrogen positions were refined with individual isotropic displacement parameters.

Atomic Form Factors: For neutral atoms and anomalous dispersion [4]

Extinction Correction: $Fc(korr) = kFc[1+ 0.001 \cdot \varepsilon \cdot Fc^2 \cdot \lambda^3/\sin(2\Theta)]^{-1/4}$ SHELXL-97 [5]

ε refined: $\varepsilon = 0.0121(15)$

Weighting Scheme: $w^{-1} = \sigma^2(Fo^2)+(a*P)^2+b*P.$

with a: 0.0379; b: 0.2620; P: [Maximum(0 or Fo^2)+2∗Fc^2]/3

Shift/Err : Less than 0.001 in the last cycle of refinement:

Resid. Electron Dens.: +0.11 $e_0;^-$ /Å^3; -0.11 $e_0;^-$ /Å^3

R1 : $\Sigma(||Fo|-|Fc||)/\Sigma|Fo|$

[Fo > 4σ(Fo);	N=4314]:	= 0.0277
[all reflctns;	N=4666 :	= 0.0319

wR2 : $[\Sigma w (Fo^2-Fc^2)^2/\Sigma w (Fo^2)^2]^{1/2}$

[Fo > 4σ(Fo);	N=4314]:	= 0.0661
[all reflctns;	N=4666]:	= 0.0680

Goodness of fit : $[\Sigma w (Fo^2-Fc^2)^2/(NO-NV)]^{1/2}$ = 1.045

Flack's Parameter : x= 0.1(6)

Remarks: Refinement expression $\Sigma w(Fo^2-Fc^2)^2$

The correct enantiomere could **not** be proved by Flack's Parameter.

Hydrogen bond exists between:

D - H A	D A	D-H	H · A	D-H A	Σ
N1-H1 ··· O5	287.7(1)	84(2)	204(2)	171(1)°	
N2-H2 ··· O1	264.8(1)	85(2)	227(2)	107(1)°	
N2-H2 ··· O3	281.3(1)	85(2)	201(2)	156(1)°	357(2)°

All tables are calculated with the program PLATON [6] ---> DOEA_FINE.CIF (options *round 2* ; *table IC*)

----------> No match in a CSD-Data-Research [8]; 224400 entries; version 2/00

References:

Measurements and Data Reduction

[1] Data Collection Software for Nonius KappaCCD, Delft, The Netherlands, (1997).

[2] Otwinowski, Z.; Minor, W., *Methods in Enzymology* **1997**, *276*, 307.

Solution

[3] Altomare, A.; Cascarano, G.; Giacovazzo, C.; Guagliardi, A.; Burla, M. C.; Polidori, G.; Camalli M. "**SIR92**", *J. Appl. Cryst.* **1994**, *27*, 435-436.

Refinement

[4] International Tables for Crystallography, Vol. C, Tables 6.1.1.4 (pp. 500-502), 4.2.6.8 (pp. 219-222), and 4.2.4.2 (pp. 193-199), Wilson, A. J. C., Ed., Kluwer Academic Publishers, Dordrecht, The Netherlands, 1992.

[5] Sheldrick, G. M. "**SHELXL-97**", University of Göttingen, Göttingen, Germany, (1998).

Graphics

[6] Spek, A. L. "**PLATON**", A Multipurpose Crystallographic Tool, Utrecht University, Utrecht, The Netherlands, (2001).

Miscellaneous

[7] Artus, G.; Scherer, W.; Priermeier, T.; Herdtweck, E. "**S T R U X - *V* **", A Program System to Handle X-Ray Data, TU München, Germany, (1997).

[8] 3d Search and research Using the Cambridge Structural Database; Allen, F. H.; Kennard, O. *Chemical Design Automation News* **1993**, *8*, 1 & 31-37.

Table S2 - Final Coordinates and Equivalent Isotropic Thermal Parameters of the non-Hydrogen atoms for **DOEA 4182-173**

Atom	x	y	z	U(eq) [Å^2]
O1	0.22428(7)	0.60882(7)	0.18632(4)	0.0248(2)
O2	0.08237(10)	0.49383(9)	0.14754(5)	0.0480(3)
O3	0.36705(8)	0.41904(7)	0.11375(5)	0.0346(3)
O4	0.34362(9)	0.31908(7)	0.01111(5)	0.0356(3)
O5	0.29290(9)	0.53289(8)	0.36883(5)	0.0376(3)
N1	0.24360(10)	0.47190(8)	0.02371(6)	0.0289(3)
N2	0.36813(11)	0.48083(10)	0.26099(6)	0.0351(3)
C1	0.16498(11)	0.55179(10)	0.13533(7)	0.0272(4)
C2	0.21729(11)	0.57365(10)	0.05981(6)	0.0254(4)
C3	0.12780(14)	0.63681(12)	0.01377(7)	0.0343(4)
C4	0.09721(13)	0.74673(11)	0.04402(7)	0.0345(4)
C5	0.18254(18)	0.82578(13)	0.05122(10)	0.0508(6)
C6	0.1520(2)	0.92793(15)	0.07620(12)	0.0739(8)
C7	0.0357(2)	0.95148(16)	0.09396(11)	0.0734(8)
C8	-0.0493(2)	0.87392(17)	0.08787(9)	0.0619(7)
C9	-0.01882(15)	0.77170(14)	0.06342(8)	0.0464(5)
C10	0.32251(12)	0.40409(10)	0.05393(6)	0.0269(3)
C11	0.43015(14)	0.23506(11)	0.03365(8)	0.0404(5)
C12	0.4156(3)	0.15131(17)	-0.02630(11)	0.0693(8)
C13	0.3946(2)	0.18574(14)	0.10561(10)	0.0564(7)
C14	0.55318(17)	0.28322(19)	0.03602(14)	0.0646(7)
C15	0.19182(11)	0.59469(10)	0.26231(6)	0.0266(3)
C16	0.16467(13)	0.70453(11)	0.29602(7)	0.0332(4)
C17	0.26557(18)	0.78366(13)	0.28292(9)	0.0487(6)
C18	0.04610(17)	0.74767(16)	0.26948(10)	0.0528(6)
C19	0.29055(11)	0.53420(10)	0.30167(6)	0.0279(4)
C20	0.45540(13)	0.40772(13)	0.29220(8)	0.0398(4)
C21	0.40711(13)	0.29781(12)	0.31238(7)	0.0357(4)
C22	0.47938(15)	0.22805(13)	0.35195(9)	0.0462(5)
C23	0.43993(17)	0.12742(14)	0.37213(10)	0.0536(6)
C24	0.32814(18)	0.09354(14)	0.35373(10)	0.0569(6)
C25	0.2550(2)	0.16154(15)	0.31446(12)	0.0656(7)
C26	0.29460(16)	0.26320(14)	0.29373(10)	0.0532(6)

==========

U(eq) = 1/3 of the trace of the orthogonalized U

Table S3 - Hydrogen Atom Positions and Isotropic Thermal Parameters for **DOEA 4182-173**

Atom	x	y	z	U(iso) [Å^2]
H1	0.2264(13)	0.4664(12)	-0.0208(9)	0.036(4)
H2	0.3625(14)	0.4816(13)	0.2147(9)	0.041(4)
H21	0.2918(12)	0.6152(10)	0.0675(7)	0.023(3)
H31	0.1625(14)	0.6449(12)	-0.0324(9)	0.041(4)
H32	0.0562(14)	0.5905(13)	0.0096(8)	0.038(4)
H51	0.2634(18)	0.8172(15)	0.0404(10)	0.060(5)
H61	0.212(2)	0.980(2)	0.0812(12)	0.084(7)
H71	0.013(2)	1.0246(19)	0.1120(12)	0.089(7)
H81	-0.138(2)	0.8907(18)	0.1042(11)	0.086(6)
H91	-0.0818(18)	0.7134(17)	0.0602(11)	0.073(6)
H121	0.328(3)	0.130(2)	-0.0313(14)	0.102(9)
H122	0.4680(19)	0.0926(18)	-0.0175(11)	0.073(6)
H123	0.4466(18)	0.1877(18)	-0.0715(12)	0.080(7)
H131	0.308(2)	0.1656(17)	0.1053(11)	0.070(6)
H132	0.4102(17)	0.2350(16)	0.1485(10)	0.066(6)
H133	0.435(2)	0.1189(19)	0.1097(11)	0.081(6)
H141	0.570(2)	0.310(2)	-0.0163(16)	0.116(9)
H142	0.6085(18)	0.2259(16)	0.0482(10)	0.070(6)
H143	0.5602(19)	0.3369(19)	0.0753(13)	0.083(7)
H151	0.1202(13)	0.5494(11)	0.2622(7)	0.030(3)
H161	0.1595(12)	0.6896(12)	0.3495(8)	0.035(4)
H171	0.2470(18)	0.8492(18)	0.3127(11)	0.074(6)
H172	0.2710(14)	0.8002(14)	0.2309(10)	0.049(4)
H173	0.3424(19)	0.7550(16)	0.2998(11)	0.071(6)
H181	0.0256(18)	0.8219(19)	0.2913(11)	0.076(6)
H182	-0.0241(19)	0.6986(18)	0.2856(10)	0.072(6)
H183	0.0476(16)	0.7584(15)	0.2164(11)	0.062(5)
H201	0.4869(14)	0.4406(13)	0.3374(9)	0.044(4)
H202	0.5206(14)	0.3994(13)	0.2565(9)	0.045(4)
H221	0.5568(18)	0.2527(15)	0.3647(10)	0.060(5)
H231	0.4909(16)	0.0811(15)	0.3996(10)	0.060(5)
H241	0.2981(16)	0.0246(17)	0.3667(10)	0.064(5)
H251	0.1775(19)	0.1398(16)	0.3015(11)	0.069(6)
H261	0.2433(15)	0.3084(15)	0.2671(10)	0.054(5)

==========

The Temperature Factor has the Form of Exp(-T) Where
T = 8*(Pi**2)*U*(Sin(Theta)/Lambda)**2 for Isotropic Atoms

Table S4 - (An)isotropic Thermal Parameters for **DOEA 4182-173**

Atom	U(1,1)	U(2,2)	U(3,3)	U(2,3)	U(1,3)	U(1,2)
O1	0.0308(4)	0.0268(4)	0.0168(4)	-0.0021(3)	-0.0004(3)	-0.0016(4)
O2	0.0535(6)	0.0579(7)	0.0325(5)	-0.0095(5)	0.0042(5)	-0.0287(5)
O3	0.0461(5)	0.0316(5)	0.0262(5)	-0.0056(4)	-0.0108(4)	0.0086(4)
O4	0.0479(6)	0.0310(5)	0.0279(5)	-0.0082(4)	-0.0082(4)	0.0150(4)
O5	0.0511(6)	0.0429(5)	0.0187(4)	0.0028(4)	0.0017(4)	0.0048(4)
N1	0.0412(6)	0.0259(5)	0.0196(5)	-0.0046(4)	-0.0051(5)	0.0080(5)
N2	0.0434(6)	0.0411(6)	0.0209(5)	0.0020(5)	-0.0019(5)	0.0114(5)
C1	0.0329(7)	0.0241(6)	0.0245(6)	-0.0033(5)	-0.0038(5)	0.0003(5)
C2	0.0323(7)	0.0231(6)	0.0208(6)	-0.0027(5)	-0.0018(5)	0.0029(5)
C3	0.0436(8)	0.0343(7)	0.0249(7)	-0.0026(6)	-0.0059(6)	0.0102(6)
C4	0.0475(8)	0.0311(7)	0.0249(6)	0.0042(5)	-0.0005(6)	0.0117(6)
C5	0.0615(11)	0.0345(8)	0.0563(10)	0.0003(7)	0.0174(8)	0.0021(8)
C6	0.1137(19)	0.0313(9)	0.0768(13)	-0.0005(9)	0.0252(13)	-0.0059(11)
C7	0.127(2)	0.0378(10)	0.0554(11)	0.0044(8)	0.0236(12)	0.0379(12)
C8	0.0780(13)	0.0668(13)	0.0409(9)	0.0044(8)	0.0063(9)	0.0449(11)
C9	0.0460(9)	0.0576(10)	0.0355(8)	0.0007(7)	-0.0058(7)	0.0211(8)
C10	0.0330(6)	0.0250(6)	0.0227(6)	-0.0027(5)	0.0001(5)	0.0018(5)
C11	0.0543(9)	0.0344(8)	0.0326(7)	-0.0023(6)	-0.0062(7)	0.0206(7)
C12	0.1084(19)	0.0515(11)	0.0479(11)	-0.0166(9)	-0.0163(11)	0.0474(12)
C13	0.0873(15)	0.0323(8)	0.0495(10)	0.0039(8)	-0.0011(9)	0.0095(9)
C14	0.0489(11)	0.0681(13)	0.0767(14)	0.0080(11)	0.0020(10)	0.0220(10)
C15	0.0314(6)	0.0306(6)	0.0177(5)	-0.0009(5)	0.0028(5)	-0.0034(6)
C16	0.0433(8)	0.0340(7)	0.0224(6)	-0.0049(5)	-0.0005(6)	0.0064(6)
C17	0.0711(12)	0.0338(8)	0.0412(9)	-0.0106(7)	-0.0011(8)	-0.0066(8)
C18	0.0590(10)	0.0612(11)	0.0383(9)	-0.0092(8)	-0.0078(8)	0.0260(10)
C19	0.0364(7)	0.0257(6)	0.0217(6)	0.0004(5)	0.0010(5)	-0.0025(5)
C20	0.0398(8)	0.0460(8)	0.0335(7)	0.0007(7)	-0.0049(6)	0.0123(7)
C21	0.0404(8)	0.0412(8)	0.0254(6)	-0.0057(6)	-0.0010(6)	0.0133(6)
C22	0.0444(9)	0.0498(9)	0.0443(8)	0.0049(7)	-0.0006(7)	0.0151(7)
C23	0.0589(11)	0.0465(10)	0.0554(10)	0.0066(8)	-0.0020(8)	0.0196(8)
C24	0.0734(12)	0.0362(8)	0.0611(11)	-0.0039(8)	-0.0027(9)	0.0058(9)
C25	0.0644(12)	0.0502(10)	0.0821(13)	-0.0049(9)	-0.0259(11)	-0.0022(9)
C26	0.0556(10)	0.0454(9)	0.0585(10)	0.0004(8)	-0.0200(8)	0.0086(8)

==========

The Temperature Factor has the Form of Exp(-T) Where
T = 8*(Pi**2)*U*(Sin(Theta)/Lambda)**2 for Isotropic Atoms
T = 2*(Pi**2)*Sumij(h(i)*h(j)*U(i,j)*Astar(i)*Astar(j)), for
Anisotropic Atoms. Astar(i) are Reciprocal Axial Lengths and
h(i) are the Reflection Indices.

Table S5 - Bond Distances (Å) for **DOEA 4182-173**

O1	-C1	1.3500(15)	N1	-H1	0.844(16)
O1	-C15	1.4544(13)	N2	-H2	0.853(17)
O2	-C1	1.1951(17)	C2	-H21	0.993(13)
O3	-C10	1.2224(15)	C3	-H31	0.939(16)
O4	-C10	1.3365(15)	C3	-H32	0.991(16)
O4	-C11	1.4838(17)	C5	-H51	0.94(2)
O5	-C19	1.2351(14)	C6	-H61	0.94(2)
N1	-C2	1.4555(16)	C7	-H71	1.00(2)
N1	-C10	1.3422(17)	C8	-H81	1.06(2)
N2	-C19	1.3255(17)	C9	-H91	1.01(2)
N2	-C20	1.453(2)	C12	-H121	1.02(3)
C1	-C2	1.5318(17)	C12	-H122	0.95(2)
C2	-C3	1.5299(19)	C12	-H123	1.01(2)
C3	-C4	1.511(2)	C13	-H131	1.00(2)
C4	-C9	1.387(2)	C13	-H132	1.013(19)
C4	-C5	1.377(2)	C13	-H133	0.95(2)
C5	-C6	1.390(3)	C14	-H141	1.03(3)
C6	-C7	1.378(3)	C14	-H142	0.97(2)
C7	-C8	1.360(3)	C14	-H143	0.99(2)
C8	-C9	1.387(3)	C15	-H151	0.981(14)
C11	-C14	1.507(3)	C16	-H161	1.002(15)
C11	-C13	1.511(2)	C17	-H171	1.00(2)
C11	-C12	1.523(3)	C17	-H172	0.980(18)
C15	-C16	1.5267(18)	C17	-H173	0.98(2)
C15	-C19	1.5221(17)	C18	-H181	1.03(2)
C16	-C18	1.516(2)	C18	-H182	1.04(2)
C16	-C17	1.518(2)	C18	-H183	0.98(2)
C20	-C21	1.513(2)	C20	-H201	0.991(17)
C21	-C26	1.378(2)	C20	-H202	0.989(16)
C21	-C22	1.392(2)	C22	-H221	0.95(2)
C22	-C23	1.375(2)	C23	-H231	0.955(18)
C23	-C24	1.367(3)	C24	-H241	0.95(2)
C24	-C25	1.381(3)	C25	-H251	0.94(2)
C25	-C26	1.390(3)	C26	-H261	0.941(18)

Table S6 - Bond Angles (Degrees) for **DOEA 4182-173**

C1	-O1	-C15	118.69(9)
C10	-O4	-C11	120.34(10)
C2	-N1	-C10	119.22(10)
C19	-N2	-C20	122.16(11)
O1	-C1	-C2	110.32(10)
O2	-C1	-C2	125.07(12)
O1	-C1	-O2	124.60(12)
N1	-C2	-C1	109.75(10)
N1	-C2	-C3	108.95(10)
C1	-C2	-C3	109.86(10)
C2	-C3	-C4	114.03(11)
C3	-C4	-C9	120.65(13)
C5	-C4	-C9	118.11(14)
C3	-C4	-C5	121.22(14)
C4	-C5	-C6	120.52(18)
C5	-C6	-C7	120.35(19)
C6	-C7	-C8	119.79(19)
C7	-C8	-C9	119.9(2)
C4	-C9	-C8	121.28(16)
O3	-C10	-N1	123.23(11)
O4	-C10	-N1	111.54(10)
O3	-C10	-O4	125.22(12)
O4	-C11	-C12	101.89(14)
O4	-C11	-C13	110.80(13)
O4	-C11	-C14	109.35(13)
C12	-C11	-C13	109.23(14)
C12	-C11	-C14	112.93(18)
C13	-C11	-C14	112.18(16)
O1	-C15	-C19	109.46(9)
C16	-C15	-C19	113.08(10)
O1	-C15	-C16	109.43(10)
C17	-C16	-C18	112.17(13)
C15	-C16	-C17	111.25(12)
C15	-C16	-C18	111.07(12)
O5	-C19	-C15	119.82(11)
N2	-C19	-C15	117.20(10)
O5	-C19	-N2	122.92(12)
N2	-C20	-C21	114.60(12)
C20	-C21	-C22	118.59(13)
C20	-C21	-C26	123.25(14)
C22	-C21	-C26	118.16(14)
C21	-C22	-C23	121.11(16)
C22	-C23	-C24	120.55(17)
C23	-C24	-C25	119.26(17)
C24	-C25	-C26	120.41(19)
C21	-C26	-C25	120.51(17)

Table S6 (cont.) - Bond Angles (Degrees) for **DOEA 4182-173**

C2	-N1	-H1	117.8(10)	O1	-C15	-H151	105.8(8)
C10	-N1	-H1	120.2(10)	C16	-C15	-H151	110.3(8)
C20	-N2	-H2	116.8(11)	C19	-C15	-H151	108.5(8)
C19	-N2	-H2	120.5(11)	C15	-C16	-H161	104.2(9)
N1	-C2	-H21	110.1(7)	C17	-C16	-H161	108.6(8)
C1	-C2	-H21	106.6(7)	C18	-C16	-H161	109.3(8)
C3	-C2	-H21	111.6(7)	C16	-C17	-H171	106.4(12)
C2	-C3	-H31	106.4(10)	C16	-C17	-H172	109.7(10)
C2	-C3	-H32	106.3(9)	C16	-C17	-H173	111.8(12)
C4	-C3	-H31	109.3(9)	H171	-C17	-H172	112.1(16)
C4	-C3	-H32	111.5(9)	H171	-C17	-H173	107.7(17)
H31	-C3	-H32	109.2(13)	H172	-C17	-H173	109.2(15)
C4	-C5	-H51	125.1(12)	C16	-C18	-H181	112.7(11)
C6	-C5	-H51	114.4(12)	C16	-C18	-H182	111.6(12)
C5	-C6	-H61	118.8(14)	C16	-C18	-H183	110.6(11)
C7	-C6	-H61	120.8(14)	H181	-C18	-H182	104.0(17)
C6	-C7	-H71	120.9(13)	H181	-C18	-H183	105.6(16)
C8	-C7	-H71	119.3(13)	H182	-C18	-H183	112.0(15)
C7	-C8	-H81	119.9(12)	N2	-C20	-H201	108.4(9)
C9	-C8	-H81	120.2(12)	N2	-C20	-H202	107.6(10)
C4	-C9	-H91	118.9(12)	C21	-C20	-H201	107.0(9)
C8	-C9	-H91	119.9(12)	C21	-C20	-H202	109.5(9)
C11	-C12	-H121	110.1(15)	H201	-C20	-H202	109.6(13)
C11	-C12	-H122	109.4(13)	C21	-C22	-H221	117.6(11)
C11	-C12	-H123	104.7(13)	C23	-C22	-H221	121.3(11)
H121	-C12	-H122	114(2)	C22	-C23	-H231	119.6(11)
H121	-C12	-H123	112.0(19)	C24	-C23	-H231	119.8(11)
H122	-C12	-H123	105.6(17)	C23	-C24	-H241	122.8(11)
C11	-C13	-H131	110.6(12)	C25	-C24	-H241	118.0(11)
C11	-C13	-H132	113.1(11)	C24	-C25	-H251	120.5(12)
C11	-C13	-H133	107.2(13)	C26	-C25	-H251	119.1(12)
H131	-C13	-H132	108.8(16)	C21	-C26	-H261	120.4(11)
H131	-C13	-H133	104.3(18)	C25	-C26	-H261	119.1(11)
H132	-C13	-H133	112.5(17)				
C11	-C14	-H141	105.5(13)				
C11	-C14	-H142	107.7(12)				
C11	-C14	-H143	111.2(13)				
H141	-C14	-H142	109.4(17)				
H141	-C14	-H143	117(2)				
H142	-C14	-H143	105.9(17)				