Supporting Information

Design of Multivalent Galactosyl Carborane as a Targeting Specific Agent for Potential Application to Boron Neutron Capture Therapy

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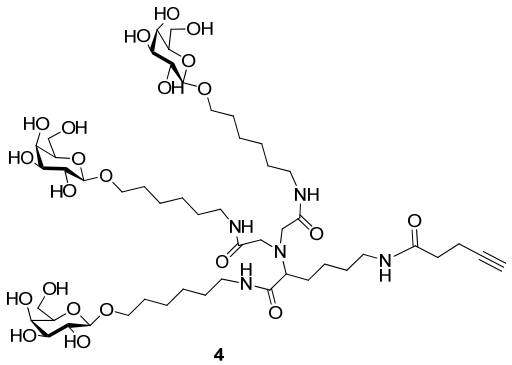
(1) Materials. *N*-(5-Hexynyl) phthalimide (Aldrich), acetonitrile (CH_3CN, Merck), toluene (Merck), sodium borohydride ($NaBH_4$, Acros), iso-propanol (i-PrOH, Merck), hydrochloric acid (HCl, Acros), acetic acid (HOAc, Acros), dimethyl formaldehyde (DMF, Merck), triethyl amine (NEt_3, Merck), 4-dimethylaminopyridine (DMAP, Acros), 4-nitrophenyl chloroformate (NPCC, Acros), *O*-(7-azabenzotriazol-1-yl)-1,1,3,3-tetramethyluronium hexafluorophosphate (HATU, Biochem), 2-(1H-Benzotriazole-1-yl)-1,1,3,3-tetramethyluronium hexafluorophosphate (HBTU, Anaspec), copper(I) iodide (CuI, Acros), copper(II) sulfate ($CuSO_4$, Merck), sodium ascorbate (Acros), ethanol (EtOH, Merck), tert-butanol (t-BuOH, Acros), 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT, Sigma), decaborane ($B_{10}H_{14}$, CMS), and sodium borocaptate ($Na_2B_{12}H_{11}SH$ or BSH, Katchem Ltd., Prague, Czech Republic) were used as received. The P2 gel was purchased from Bio-Rad. Analytical thin-layer chromatography (TLC) and reverse-phase TLC were performed using pre-coated plates (Silica Gel 60 F_{254} and 60 RP-18F_{254S}, respectively, Merck). Silica gel 60 and C-18 reverse-phase gel (Merck) were used for flash chromatography. All reactions were carried out in oven-dried glassware (120 °C) under a nitrogen atmosphere unless indicated otherwise. All solvents were dried and distilled using standard techniques.

(2) General Measurements. ^{1}H-, ^{13}C- and ^{11}B-NMR spectra were recorded using a Bruker AV-400 or a DMX-600 MHz spectrometer. Chemical shifts are expressed in ppm and were referenced to the residual $CDCl_3$ (7.24 ppm) or CD_3OD (3.31 ppm) resonances, which served as internal standards. The coupling constants, *J*, are reported in Hz.

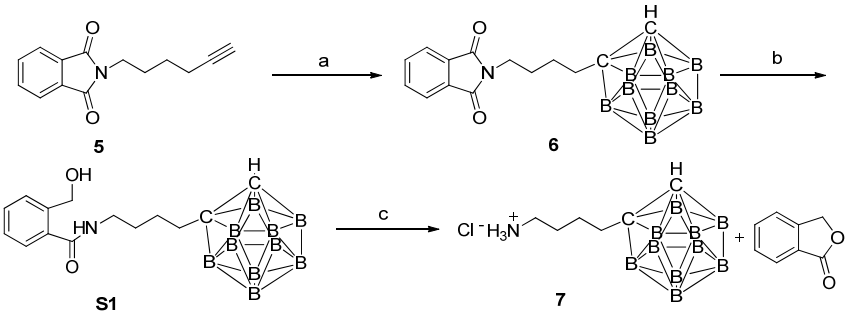
(3) Synthesis of chemical compounds.



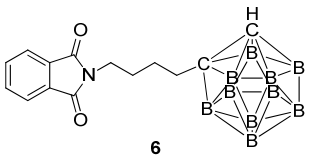
4

Pent-4-ynoic acid {5-(bis-{[6-(beta-D-galactopyranosyl)-hexylcarbamoyl]-methyl}-amino)-5- [6-(beta-D-galactopyranosyl)-hexylcarbamoyl]-pentyl}-amide (4) A solution of compound **1** (*N*,*N*-Bis[carboxymethyl]-L-lysine,[1] 145 mg, 0.55 mmol) and compound **2**[2] (130 mg, 0.66 mmol) in anhydrous DMF and H_2O (3/1, 8 mL) was added NEt_3 (76.5 μL, 0.55 mmol) at 4°C. The resulting solution was stirred for 16 h under N_2. After completion of the reaction monitored by TLC, the solvent was evaporated. The crude mixture was purified by column chromatography (CH_3CN/H_2O, 1/100–1/15 gradient) on reverse-phase silica gel (98 mg, 52%). The above pure product (100 mg, 0.29 mmol) was dissolved in anhydrous DMF (5 mL) followed by addition of compound **3** (6-aminohexyl-beta-D-galactopyranoside,[3] 327 mg, 1.17 mmole), HATU (445 mg, 1.17 mmol) and NEt_3 (168 μL, 1.17 mmol) under nitrogen. The reaction was kept stirring at 45 °C for 16 h. After removal of solvent, the resulting residue was subjected to P2 gel filtration (eluent: H_2O) and then reverse-phase silica gel chromatography (CH_3CN/H_2O, 1/8–1/4 gradient) to give **4** (168 mg, 51% yield). ^{1}H NMR (400 MHz, MeOD, δ): 1.46 (14H, m), 1.53 (8H, m), 1.63 (8H, m), 2.29 (1H, m), 2.39 (2H, m), 2.45 (2H, m), 3.04-3.29 (8H, m), 3.29-3.64 (17H, m), 3.74 (6H, m), 3.85 (3H, m), 3.90 (3H, m), 4.22 (3H, d, J = 6.24 Hz); ^{13}C NMR (150 MHz, MeOD, δ): 14.49, 23.58, 25.39 × 3, 26.45 × 3, 28.84, 28.98 × 3, 29.33 × 3, 34.74, 38.80, 38.84, 38.98, 55.80, 61.10 × 3, 65.87, 68.93 × 3, 69.25, 69.37

× 3, 71.22 × 3, 73.65 × 3, 75.14 × 3, 82.39, 103.55 × 3, 171.38, 172.45, 172.58, 173.23; IR (KBr): 2042 cm^{-1} (alkyne, C≡C), 1643 cm^{-1} (C=O); HRMS (ESI) calcd for $C_{51}H_{91}N_5O_{22}Na$ $[M + Na]^+$ 1148.6053, found 1148.6063.

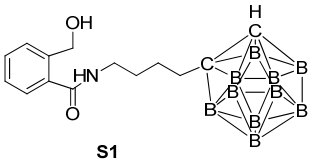


Scheme S1. Synthesis of the carborane derivative compound **7**. Reaction condition: a) $B_{10}H_{14}$, CH_3CN, toluene, reflux, 4 h, 43%. b) $NaBH_4$, *i*-PrOH, rt, 22 h, 76%. c)HCl/ HOAc, 95°C, 3 h, 95%



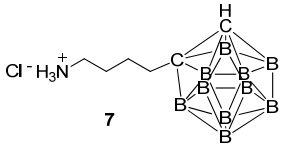
1-(4-Phthalimidobutyl)-1,2-dicarba-*closo*-dodecaborane (6) A modified procedure from the literature[4] was employed. A solution of decarborane (1.00 g, 8.18 mmole) in 40 mL of dry toluene and 6.8 mL of dry acetonitrile under nitrogen was heated at reflux for 1h. A solution of compound **5** (*N*-(5-Hexynyl) phthalimide, 1.86 g, 8.18 mmole) in 10 mL of dry toluene was then added and solution was heated at reflux for 3 h. The solution was filtered from insoluble material, cooled, and filtered again. Solvent was evaporated at reduced pressure. Flash chromatography of the residue (ethyl acetic acid/hexane 1/20-1/8) gave 1.2 g (43% yield) of the carborane derivative **6** as a white solid. ^1H NMR (400 MHz, $CDCl_3$, δ): 1.47 (2H, m), 1.63 (2H, quint, J = 7.2 Hz), 2.25 (2H, m), 3.59 (1H, s), 3.63 (2H, t, J = 7.0 Hz), 7.70 (2H, m), 7.81 (2H,

m); ^{13}C NMR (100 MHz, $CDCl_3$, δ): 26.13, 27.67, 36.72, 37.13, 61.10, 74.84, 123.25 × 2, 131.84 × 2, 134.06 × 2, 168.29 × 2; ^{11}B NMR (192 MHz, $CDCl_3$, δ): -3.98 (1B), -7.43 (1B), -10.98 (2B), -13.14 (2B), -13.87 (2B), -14.76 (2B); IR (KBr): 2571(B-H), 1762 (C=O), 1706 (C=O) cm^{-1}; MS (MALDI-TOF) calcd for $C_{14}H_{23}B_{10}NO_2$ $[M]^+$ 347.2659, found 347.2659.



S1

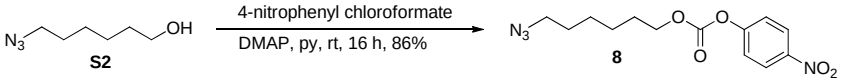
(((2-(Hydromethyl)benzoyl)amino)butyl)-*o*-carborane (S1) To a suspension of compound **6** (556 mg, 1.61 mmole) in *i*-PrOH (17 mL) and H_2O (2.8 mL) was added $NaBH_4$ (349 mg, 8.05 mmole) and the resultant mixture was stirred under nitrogen at room temperature for 22 h. The result solution was evaporated at reduced pressure. The mixture was vigorously extracted with hot water twice (5 mL) and the dried product was recrystallized from ethanol (2.4 mL) and water (1.3 mL) to give product **S1** (424 mg,76% yeild). ^{1}H NMR (400 MHz, $CDCl_3$, δ): 1.57 (4H, m), 2.26 (2H, m), 3.42 (2H, dt, J = 6.4, 12.6 Hz), 3.60 (1H, s), 4.57 (2H, s), 6.57 (1H, s), 7.35 (2H, m), 7.44 (1H, m), 7.51 (1H, m); ^{13}C NMR (100 MHz, $CDCl_3$, δ): 26.38, 28.95, 37.48, 39.22, 61.22, 64.65, 74.86, 127.63, 128.27, 130.82, 131.31, 135.54, 139.71, 170.07; ^{11}B NMR (192 MHz, $CDCl_3$, δ): -3.93 (1B), -7.36 (1B), -10.92 (2B), -13.17 (2B), -13.78 (2B), -14.68 (2B); IR (KBr): 2599(B-H), 2571(B-H), 1619 (C=O) cm^{-1}; HRMS (ESI) calcd for $C_{14}H_{27}B_{10}NO_2Na$ $[M + Na]^+$ 374.2870, found 374.2870.



7

(Aminobutyl)-*o*-carborane Hydrochloride (7) A solution of the compound **S1** (1.00

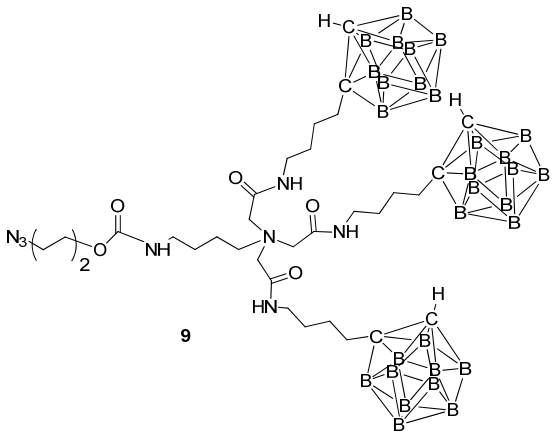
g, 2.87mmole) in acetic acid (12 mL), water (3 mL), and hydrochloric acid (3 mL) was heated on a water bath for 3 h. After removal of the solvent by high vacuum, the residue was stirred with dichloromethane (15 mL) for 2 h. The finely crystalline hydrochloride was collected (583 mg, 95% yield). ^{1}H NMR (400 MHz, MeOD, δ): 1.60 (4H, m), 2.33 (2H, dd, J = 6.8, 8.9 Hz), 2.90 (2H, dd, J = 6.7, 7.2 Hz), 4.59 (1H, s); ^{13}C NMR (100 MHz, MeOD, δ): 26.01, 26.50, 36.75, 38.84, 62.42, 75.43; ^{11}B NMR (192 MHz, MeOD, δ): -4.43 (1B), -7.61 (1B), -11.23 (2B), -13.28 (2B), -13.59 (2B), -14.70 (2B); IR (KBr): 2588(B-H) cm^{-1}; HRMS (ESI) calcd for $C_6H_{22}B_{10}N$ $[M]^+$ 218.2683, found 218.2686.



Scheme S2. Synthesis of linker compound **8**.

Carbonic acid 6-azido-hexyl ester 4-nitro-phenyl ester (8) 6-Azido-hexan-1-ol , **S2** (1.00 g, 6.98 mmol) was added to a solution of DMAP (2.13 g, 17.46 mmol) in pyridine, and followed by the addition of 4-nitrophenyl chloroformate (3.52 g, 17.46 mmol) in ice bath. The yellow mixture reaction was stirred for 16 h at room temperature. After completion of the reaction as monitored by TLC, the reaction was evaporated. Then, the residue was added EA and the organic layer was washed with water and brine solution. The organic layer was dried ($MgSO_4$) and concentrated. The product was purified by column chromatography (EA/Hexane, 1:20-1:3) on silica gel to give compound **8** (1.85 g, 86%). ^{1}H NMR (400 MHz, MeOD, δ): 1.42 (4H, m), 1.61 (2H, m), 1.76 (2H, m), 3.26 (2H, t, J = 6.8 Hz), 4.27 (2H, t, J = 6.6 Hz), 7.35 (2H, d, J = 9.2 Hz), 8.26 (2H, d, J = 9.2 Hz) ; ^{13}C NMR (100 MHz, MeOD, δ): 25.27, 26.30, 28.37, 28.69, 51.28, 69.35, 115.61, 121.61, 125.30, 126.21, 152.55; HRMS

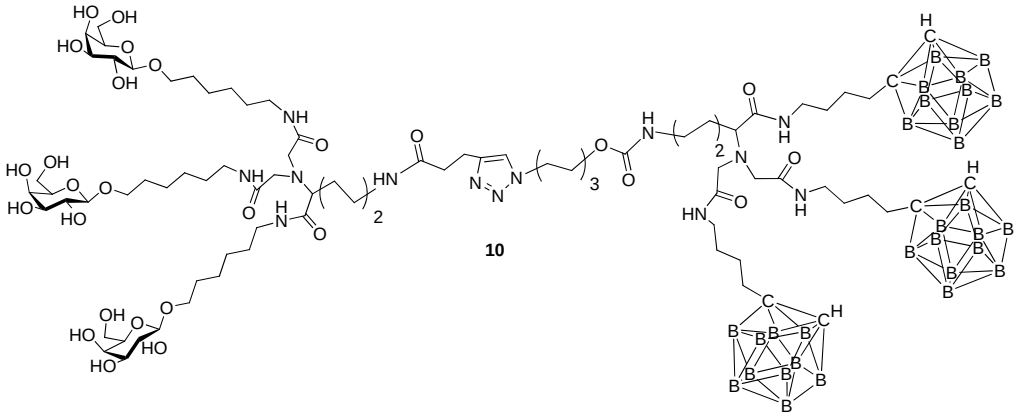
(FAB) calcd for $C_{13}H_{17}N_4O_5$ $[M + H]^+$ 309.1199, found 309.1194.



9

[5-{Bis-[(4-*o*-carborane-butylcarbamoyl)-methyl]-amino}-5-(4-*o*-carborane-butyl carbamoyl)-pentyl]- carbamic acid 6-azido-hexyl ester (9) A solution of compound **1** (*N*,*N*-Bis[carboxymethyl]-L-lysine,[1] 300 mg, 1.15 mmol) and compound **8** (424 mg, 1.37 mmol) in anhydrous DMF and H_2O (3/1) 6 mL was added NEt_3 (399 μL, 2.88 mmol) and stirred at room temperature for 16 h under N_2. After completion of the reaction monitored by TLC, the solvent was evaporated. The crude mixture was purified by column chromatography (MeOH/DCM, 3/100–1/1 gradient) on silica gel (437 mg, 88.5%). The product (135 mg, 0.31 mmol) was further dissolved in anhydrous DMF (3 mL) and followed by addition of compound **7** (268 mg, 1.25 mmole), HBTU (474 mg, 1.25 mmol) and NEt_3 (173 μL, 1.25 mmol) under nitrogen. The reaction was kept stirring at 45 °C for 16 h. After solvent removal, the residue was added EA and the organic layer was washed with water and brine solution. The organic layer was dried ($MgSO_4$) and concentrated. The product was subjected silica gel chromatography (MeOH/DCM, 1/100–1/10 gradient) to give **9** (170 mg, 53% yield). ^{1}H NMR (400 MHz, $CDCl_3$, δ): 1.38 (4H, m), 1.47 (12H, m), 1.59 (6H, m), 1.82 (4H, m), 2.20 (6H, m), 3.10-3.40 (13H, m), 3.63 (4H, m), 3.70 (1H, m), 4.00 (2H, m), 4.87 (1H, b), 7.22 (1H, b), 7.51 (2H, b) ;^{13}C NMR (100 MHz, $CDCl_3$, δ): 23.58, 25.46, 26.47, 27.16, 28.70, 28.81, 29.11, 37.43, 38.38, 38.57, 38.68, 40.26, 51.28, 56.15, 61.33, 64.87, 74.97, 157.17, 171.48, 172.28; ^{11}B NMR (192 MHz, $CDCl_3$, δ):

-4.01 (3B), -10.96 (3B), -13.20 (6B), -12.00 ~ -18.00 (18B); IR (KBr): 2588 (B-H), 2096 (N_3), 1645 (C=O) cm^{-1}; HRMS (ESI) calcd for $C_{35}H_{86}B_{30}N_8O_5Na$ $[M + Na]^+$ 1051.9410, found 1051.9420.



10

Tri-galactosyl-linker-tri-carborane (10) Compound **9** (50mg, 48.85 μmol) and compound **4** (55 mg, 48.83 μmol) were dissolved in EtOH/H_2O/t-BuOH (3/2/5) 6mL. Sodium ascrobate (1 mg, 5.05 μmol), CuI (1mg, 5.25 μmol), NEt_3 (50 μl, 0.36 mmol) and $CuSO_4$ were added. The reaction mixture was stirred at room temperature for 65 h and progress was monitored by TLC. Upon completion of reaction, the solvent was removed under reduced pressure and the crude product was purified by using P2 gel filtration (eluent, H_2O) to give compound **10** (102 mg, 98% yeild). ^{1}H NMR (600 MHz, MeOD, δ): 1.25-1.45 (30H, m), 1.45-1.53 (14H, m), 1.53-1.76 (8H, m), 1.86-2.00 (4H, m), 2.26-2.38 (8H, m), 2.50-2.60 (2H), 3.00-3.25 (21H,, m), 3.37-3.60 (18H, m), 3.62 (1H, s), 3.74 (6H, m), 3.84 (3H, m), 3.89 (3H, m), 4.01 (2H, m), 4.21 (3H, d, J = 7.44 Hz), 4.37 (1H, m), 4.53 (3H, s); ^{13}C NMR (150 MHz, MeOD, δ):24.85, 24.97,26.40, 26.56, 26.72, 26.78, 27.16, 27.48, 27.83, 29.74, 29.84, 30.37, 30.52, 30.72, 31.15, 38.36, 39.50, 39.63, 40.17, 40.33, 41.47, 51.29, 52.36, 52.41, 57.07, 62.49, 63.68, 65.63, 67.07, 67.14, 70.31, 70.67, 72.59, 75.05, 76.57, 77.16, 104.99, 159.17, 173.79, 173.92, 174.45, 174.59, 174.70; ^{11}B NMR (192 MHz, $CDCl_3$, δ): -4.49 (3B), -7.63 (3B), -11.28 (6B), -13.20 (12B), -14.71 (6B); IR (KBr): 2584

(B-H), 1647 (C=O) cm^{-1}; HRMS (MALDI) calcd for $C_{86}H_{177}B_{30}N_{13}O_{27}Na$ $[M + Na]^+$ 2172.7162, found 2172.3516.

(4) The ^{11}B-NMR, mass data, HPLC and IR of boron compounds

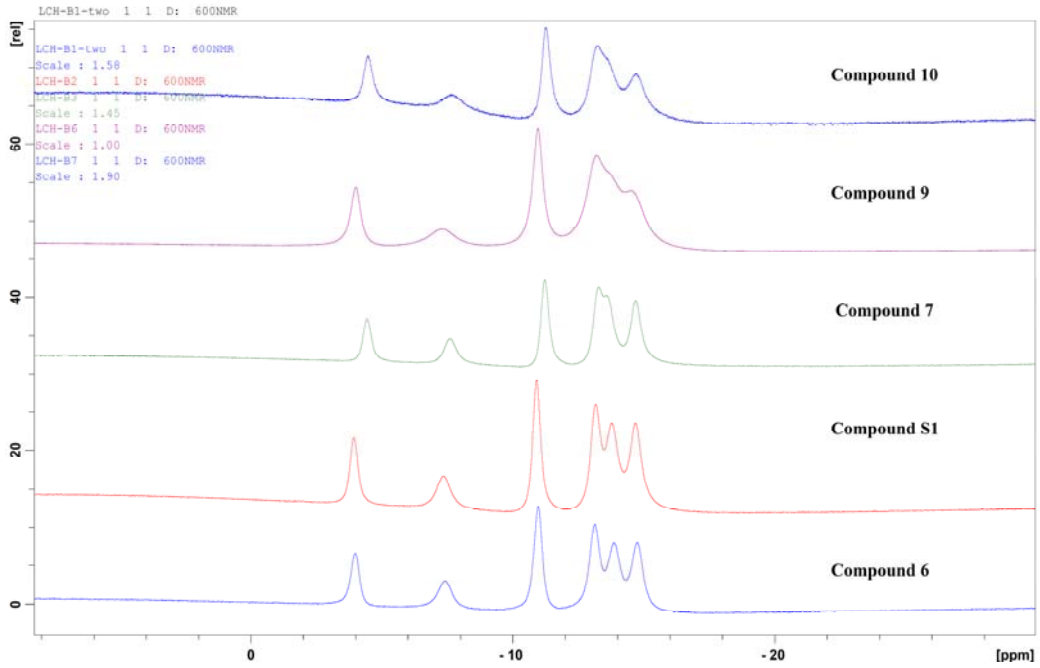


Figure S1. The ^{11}B NMR spectra of all carborane derivatives give the similar B atom peaks.

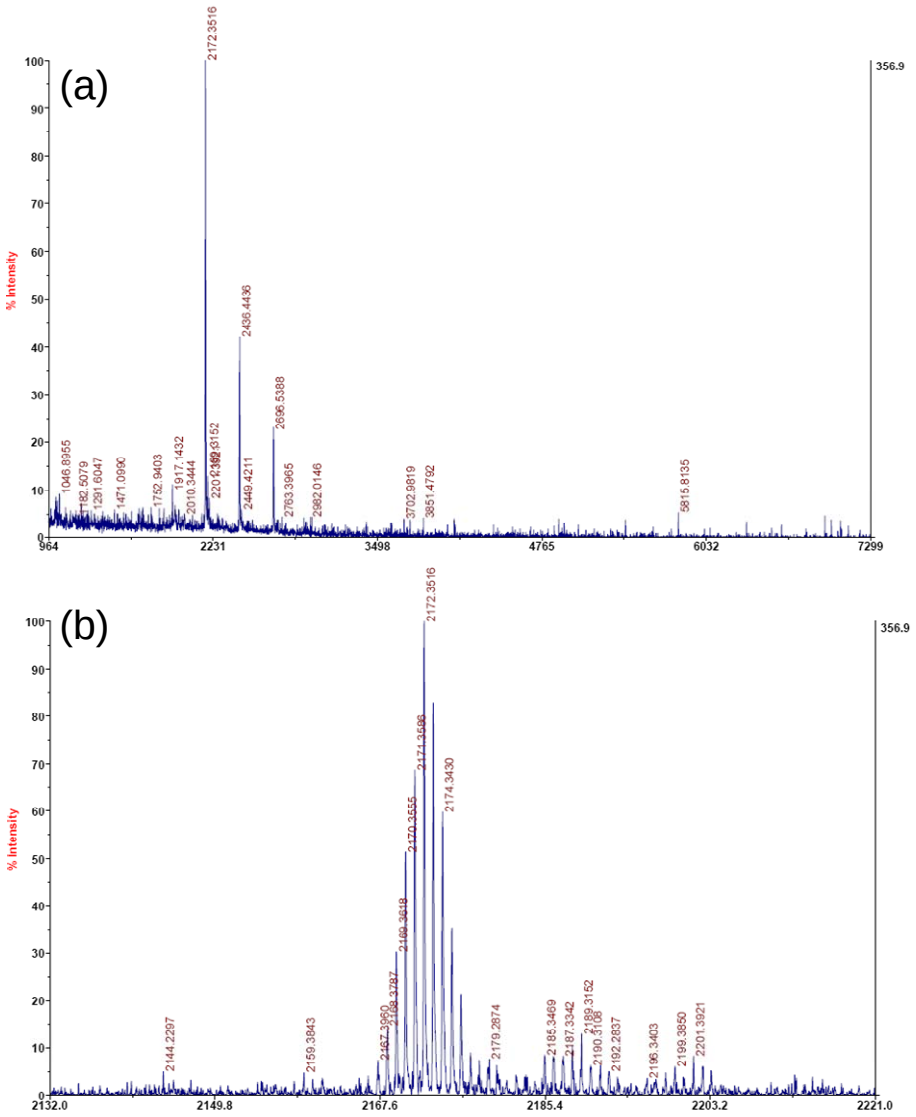
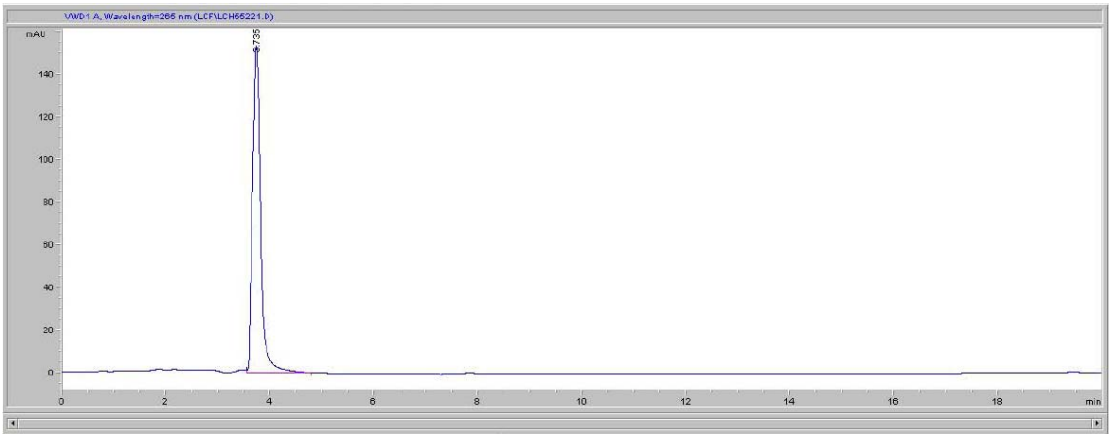


Figure S2. The mass spectrometry identified carborane derivatives compound **10**. Due to the presence of two natural isotopes of boron (^{10}B, 19.6% and ^{11}B, 80.4%), the spectrum shows characteristic isotope patterns.



#	Time	Area	Height	Width	Area%	Symmetry
1	3.735	1670.5	153.7	0.1603	100.000	0.868

Column: Vydac C18-column (Cat#218TP54, 4.6mm I.D. ∗250 mm)

Eluent: H_2O (with 0.1%TFA) / Acetonitrile

	H_2O (with .1%TFA)	Acetonitrile(%)	Flow Rate (mL/min)
0 min	100%	0	1
20 min	50%	50%	1

Figure S3. The HPLC spectrum of compound **10**. Column: Vydac C18-column (Cat#218TP54, 4.6mm I.D. ∗250 mm); Eluent: H_2O (0.1%TFA)/ Acetonitrile.

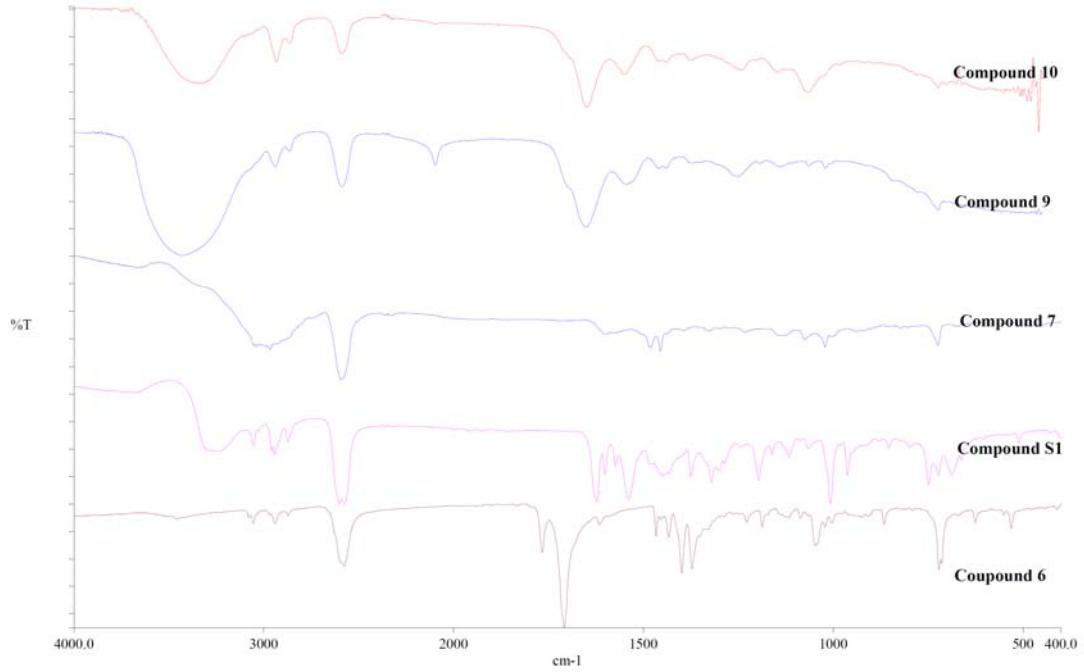


Figure S4. The IR spectra of all boron compounds displayed a strong B-H stretch signal at approximately 2580 cm^{-1}.

(5) Cell culture conditions

HepG2 and Hela cells were cultured in 10 cm^2-dish with Dulbecco's Modified Eagle's Medium (DMEM, Gibco), 10% heat-inactivated fetal bovine serum (FBS, Gibco), 100 U/mL penicillin (Gibco), 100 μg/mL streptomycin (Gibco), and 0.25 μg/mL Fungizone (BioSOURCE). Cells were incubated at 37 °C in an ambient air/5% CO_2 atmosphere and subcultured every 3 days.

(6) MTT assay of compound 10 or BSH treated HepG2 and Hela Cells

HepG2 cells (1.0×10^4) and Hela cells (5.0×10^4) were respectively seeded in 100 μL DMEM containing 10% FBS in the wells of a 96-well plate and allowed to attach overnight. Because HepG2 and Hela are different in cell size, this two different cell lines were grown to fill up the dish with different cell number. Compound **10** or BSH with series different boron concentration was added to each well, and then the cells were incubated at 37 °C for 6 or 72 h. Cells were washed with PBS, and then 10

μL of 12 mM MTT in PBS and 90 μL DMEM were added to each well. After incubation for another 4 h, 75 μL of medium was removed and 100 μL of DMSO was added to each well. Each mixture was pipetted to ensure complete dispersion of DMSO and then incubated at 37 °C for 10 min. The cell cytotoxicity was determined by measuring the absorption of the cell lysates at 570 nm using a SpectraMax M2^e microplate reader. Each optical absorption at 570 nm was related to cell viability by comparison with a control experiment which was carried out under the same conditions except that compound **10** or BSH was not added.

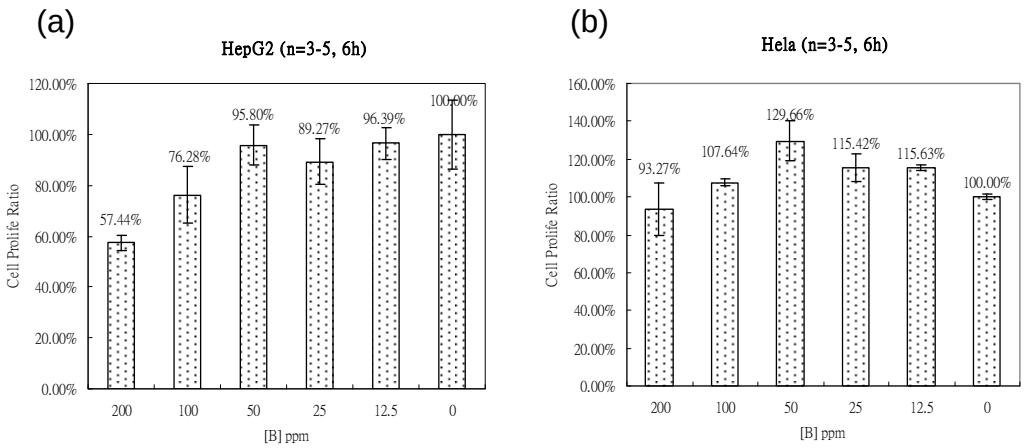


Figure S5. The MTT assay results of compound **10** treated HepG2 and Hela cells. The cells were culture with series concentrations of compound **10** for 6 h at 37 °C, and then MTT assay was applied to measure cell viability.

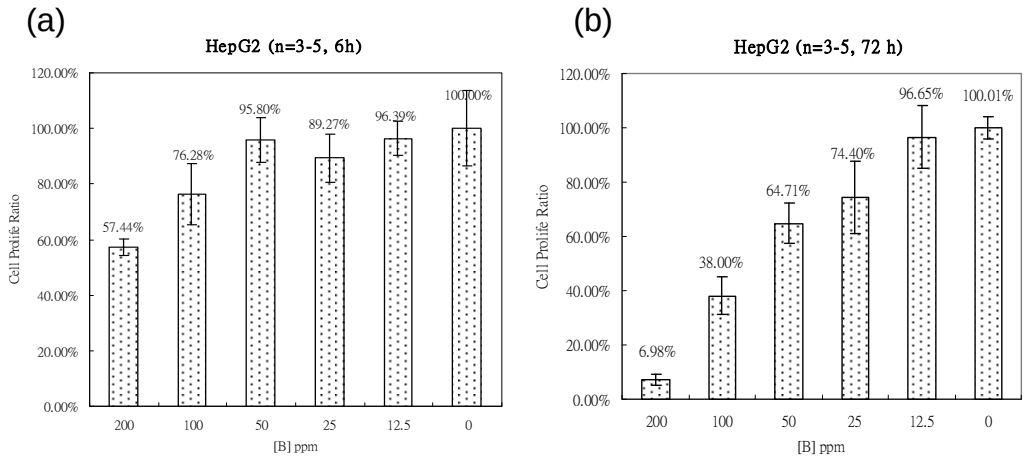


Figure S6. The cells were culture with series concentrations of compound **10** for 6 h or 72 h, and then MTT assay was applied to measure cell viability.

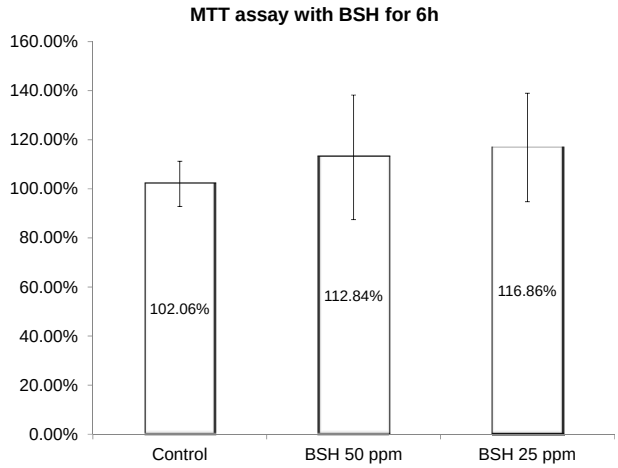


Figure S7. The MTT assay was used to determine cell viability of HepG2 cells treated with 25 ppm and 50 ppm, respectively, of BSH for 6 h.

(7) Soft-agar colony formation assay of compound 10 treated HepG2 cells

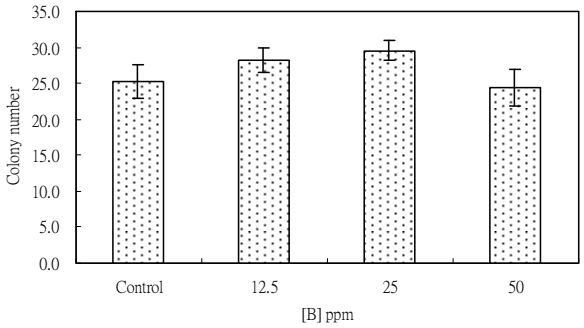


Figure S8. The colony formation was applied to prove that the compound **10** does not influence cell proliferation. The tumor mass colonies were formed in the melting-temperature agarose (Sigma).[5] The images were captured randomly by TE-2000 inverted microscope equipped with Nikon D50 digital camera (Nikon). The size of tumor was all measured in diameter, and the statistic was normalized with the control group.

(8) Intracellular boron uptake measured by ICP-MS

For boron uptake measurements, HepG2 cells were seeded in the wells of a 6-well plate. When the cells were grown to fill up the dish, the cell number was counted (about 1-2 × 10^6 cells/well). HepG2 cells were cultured in medium supplemented with boron containing compound **10** (in boron concentration: 12.5, 25, 50 ppm) or BSH (in boron concentration: 50 ppm), respectively. After a 6 h treatment, the medium was removed and the cells were washed with PBS, and then trypsinized to collect cell residues in eppendorf. The cell residues were further digested with 300 μL of 60% $HClO_4$/30%H_2O_2 (1:2) solution, and then decomposed for 3 h at 80 ^oC. After cool to room temperature, 700 μL of dd-H_2O was added to the each eppendorf. The boron concentration was determined by ICP-MS (inductively coupled plasma-mass spectrometer, Perkin Elmer, SCIEX ELAN 5000). Finally, the cellular uptakes of boron were calculated based on the ICP-MS data and the number of the

HepG2 cells present in the sample. Three repetitions of each experiment were carried out, and the data are indicated in Figure 1.

(9) Thermal neutron irradiation of HepG2 cells

An adequate number of HepG2 cells in 1 mL of complete Dulbecco's modified Eagle medium (DMEM) were seeded in the wells of a 12-well plate and incubated at 37 ℃ in a CO_2 incubator for 20 h. HepG2 cells were then incubated in 50 μg B/mL (boron concentration at 50 ppm) of compound **10** or BSH containing media for 6 h. Cells untreated with boron drug were used as the controls. The cell culture plates were removed from the incubator and transported to Tsing Hua Open Pool Reactor (THOR), inserted into a phantom (20x20x10 cm^3) and irradiated with an thermal neutron flux of 1.1×10^9 n /cm^2 s in an ambient temperature (25 ± 3 ^oC) at various time intervals to obtain different thermal neutron fluencies. The control cells were also moved to THOR, but not irradiated. Following irradiation, cells were cultured in a boron-free medium for seven to ten days to allow for colony formation. Colonies were fixed with methanol and acetic acid solution, followed by staining with crystal violet. Next, the reduction in survival in compound **10** or BSH treated culture after neutron irradiation was investigated. Cell morphology was observed by microscopy. Plating efficiency is defined as the number of colonies observed, as divided by the number of cells plated. Meanwhile, surviving fraction refers to the number of colonies counted, as divided by the number of colonies plated with a correction for plating efficiency.

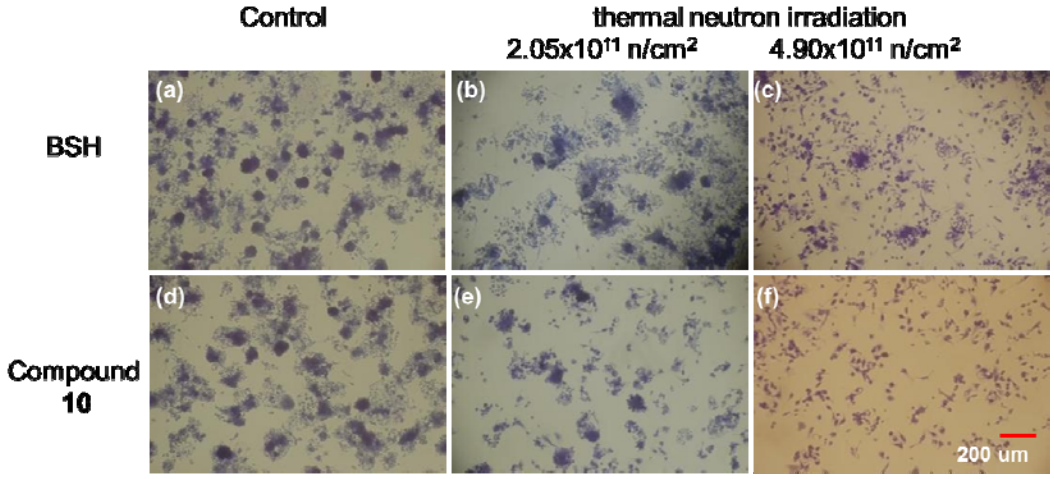


Figure S9. Distribution and morphological changes of compound **10** or BSH treated HepG2 cells after neutron irradiation. HepG2 cells were treated with 50 μg B/mL of compound **10** or BSH containing media for 6 h. (a, d) The non-irradiated cells, (b, e) cells were irradiated with thermal neutron fluency of 2.05×10^{11} n/cm^2, and (c, f) thermal neutron fluency of 4.9×10^{11} n/cm^2. (bar, 200 μm)

References

(1) Schmitt, L.; Dietrich, C.; Tampe, R. *J Am Chem Soc* **1994**, *116*, 8485.

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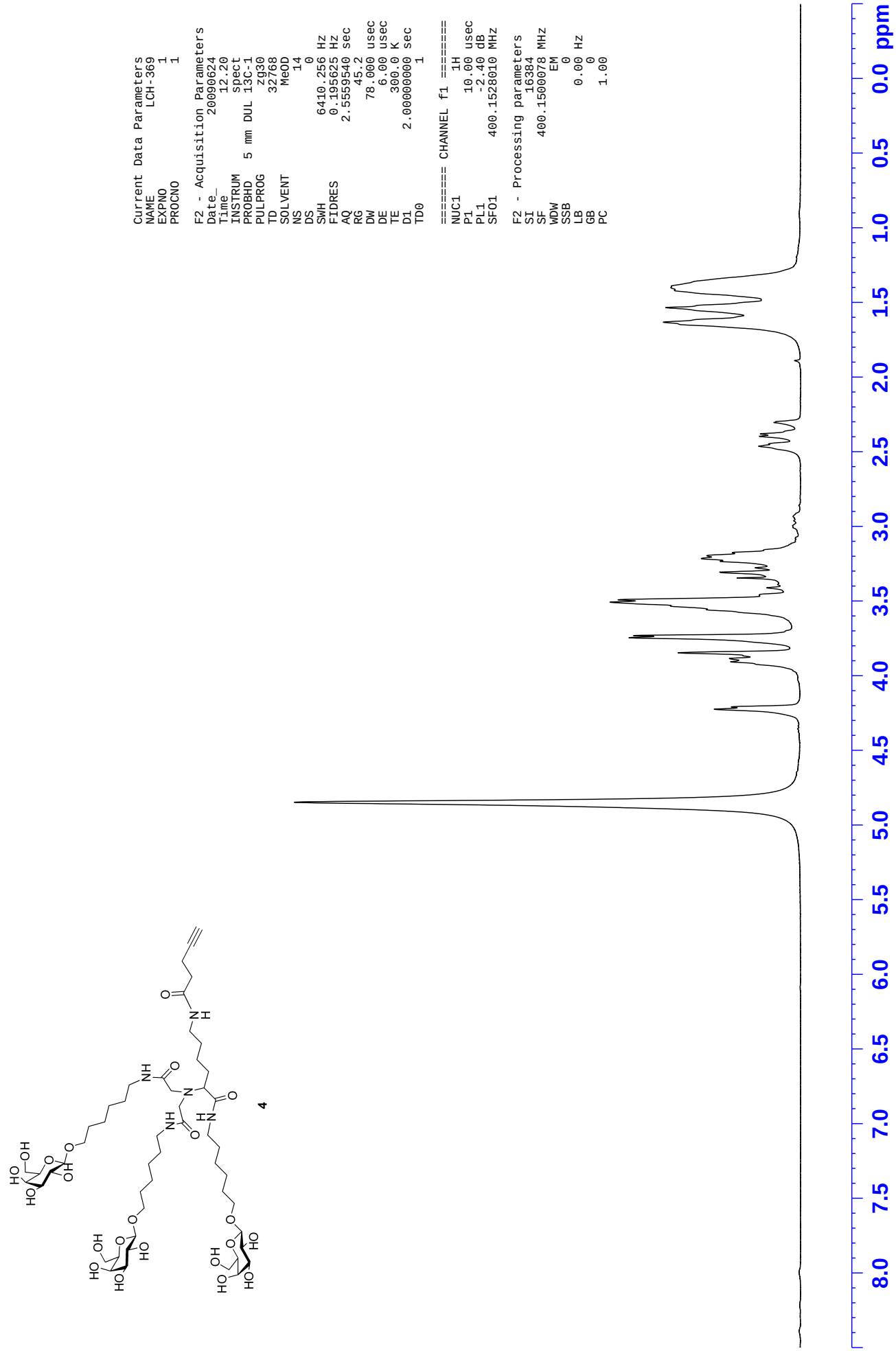
(5) Tsunoda, N.; Kokuryo, T.; Oda, K.; Senga, T.; Yokoyama, Y.; Nagino, M.; Nimura, Y.; Hamaguchi, M. *Cancer Science* **2009**, *100*, 111.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D1 2.00000000 sec
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6.0
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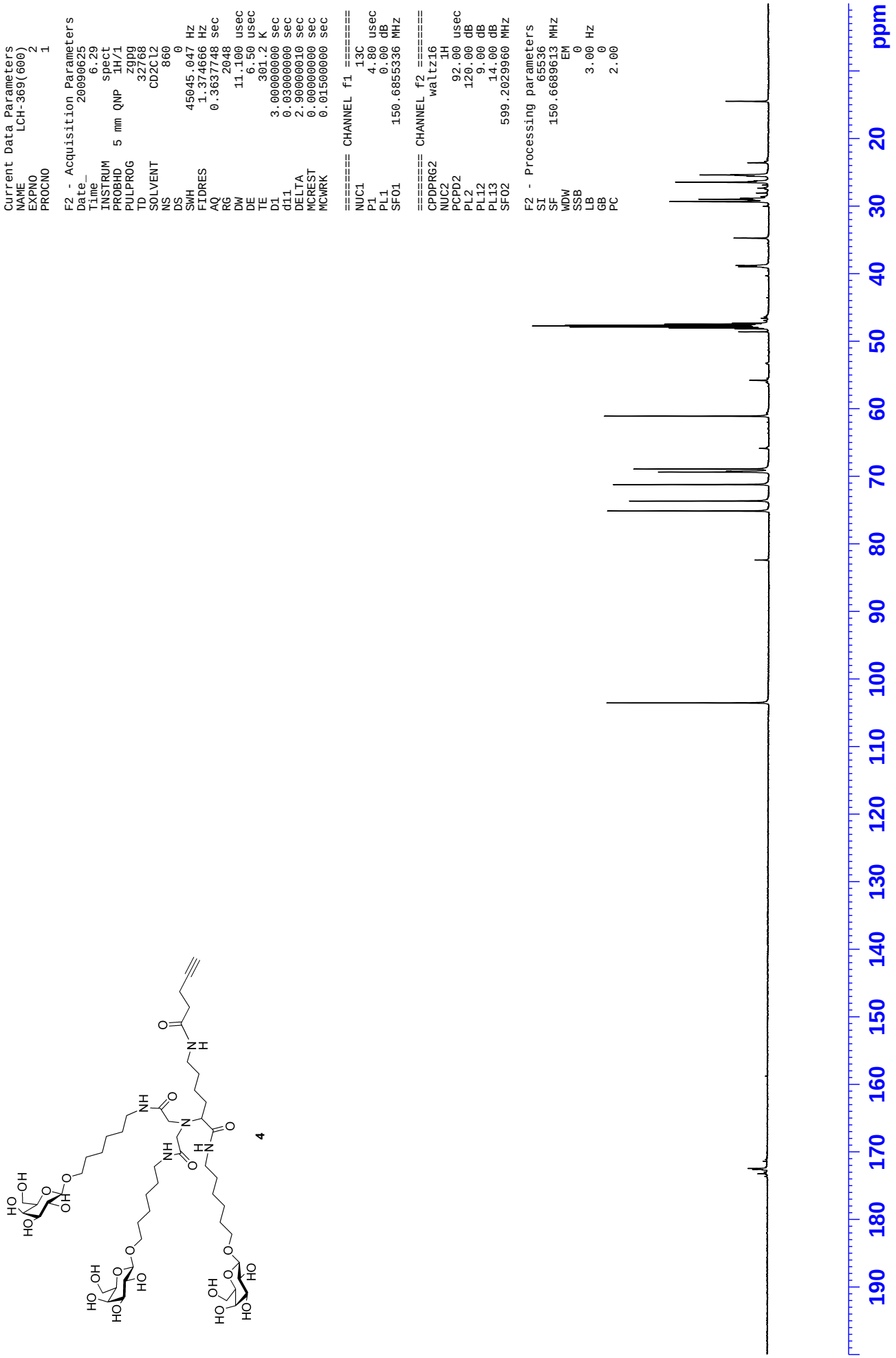
4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TE 301.2 K
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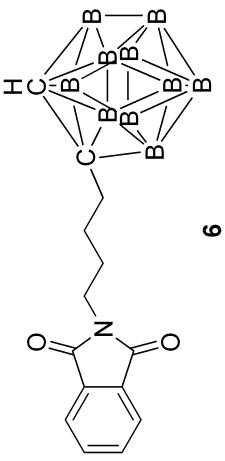

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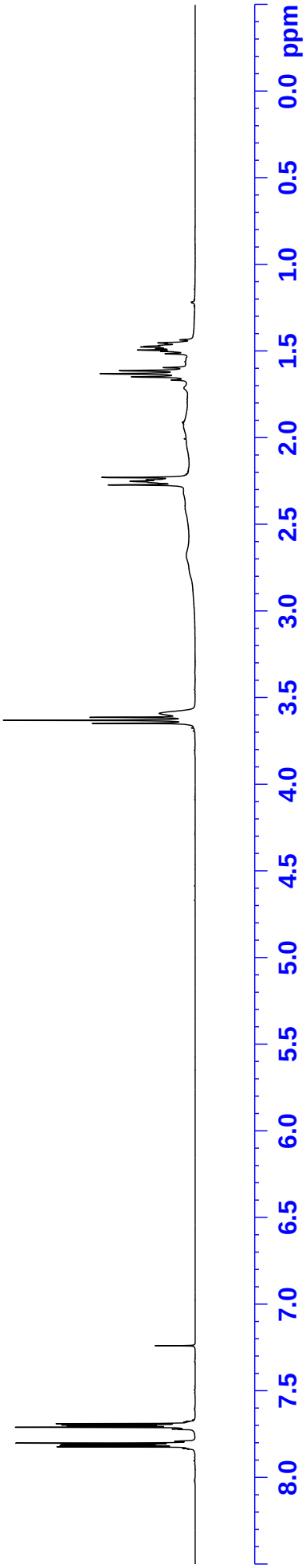

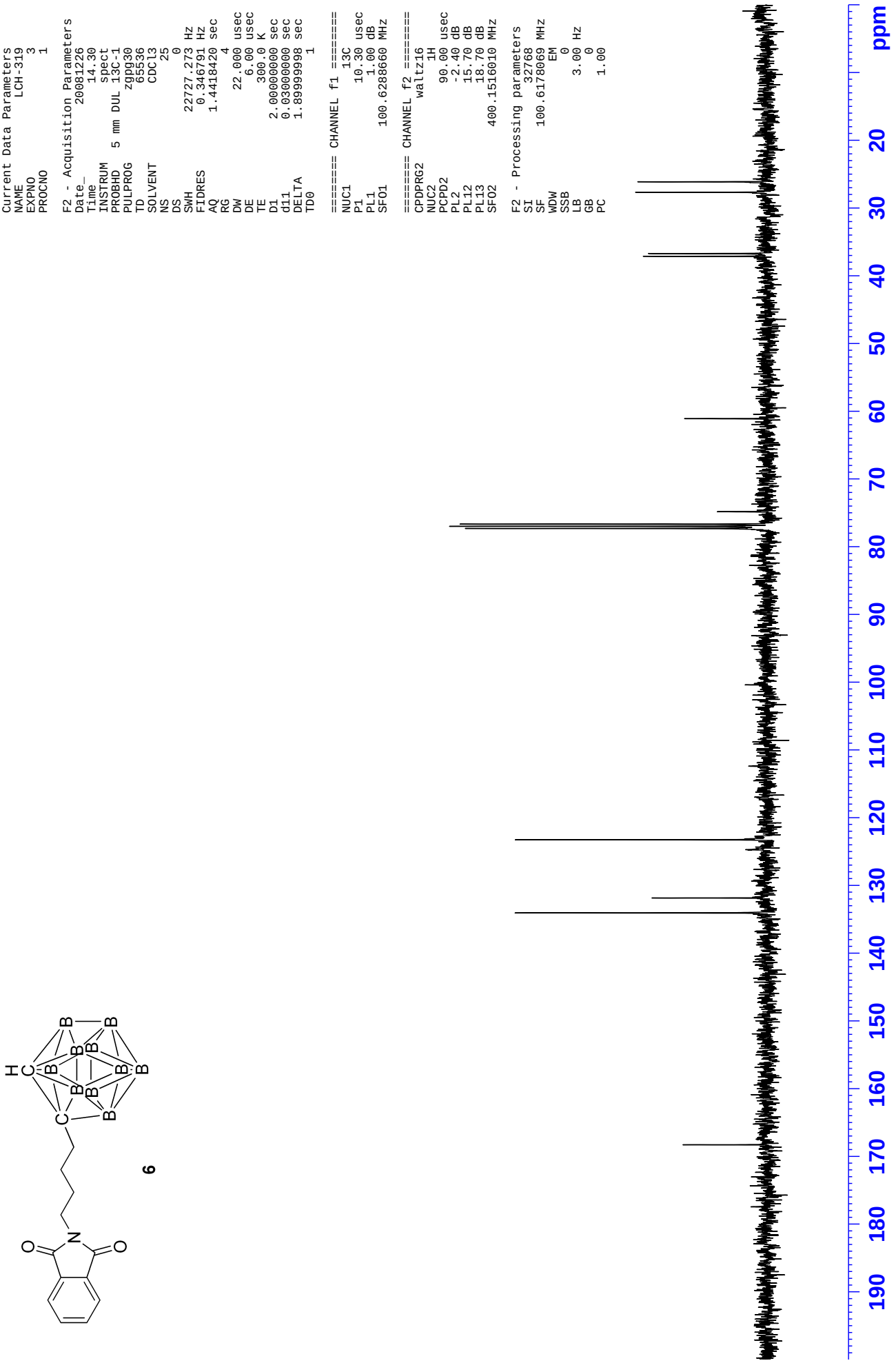
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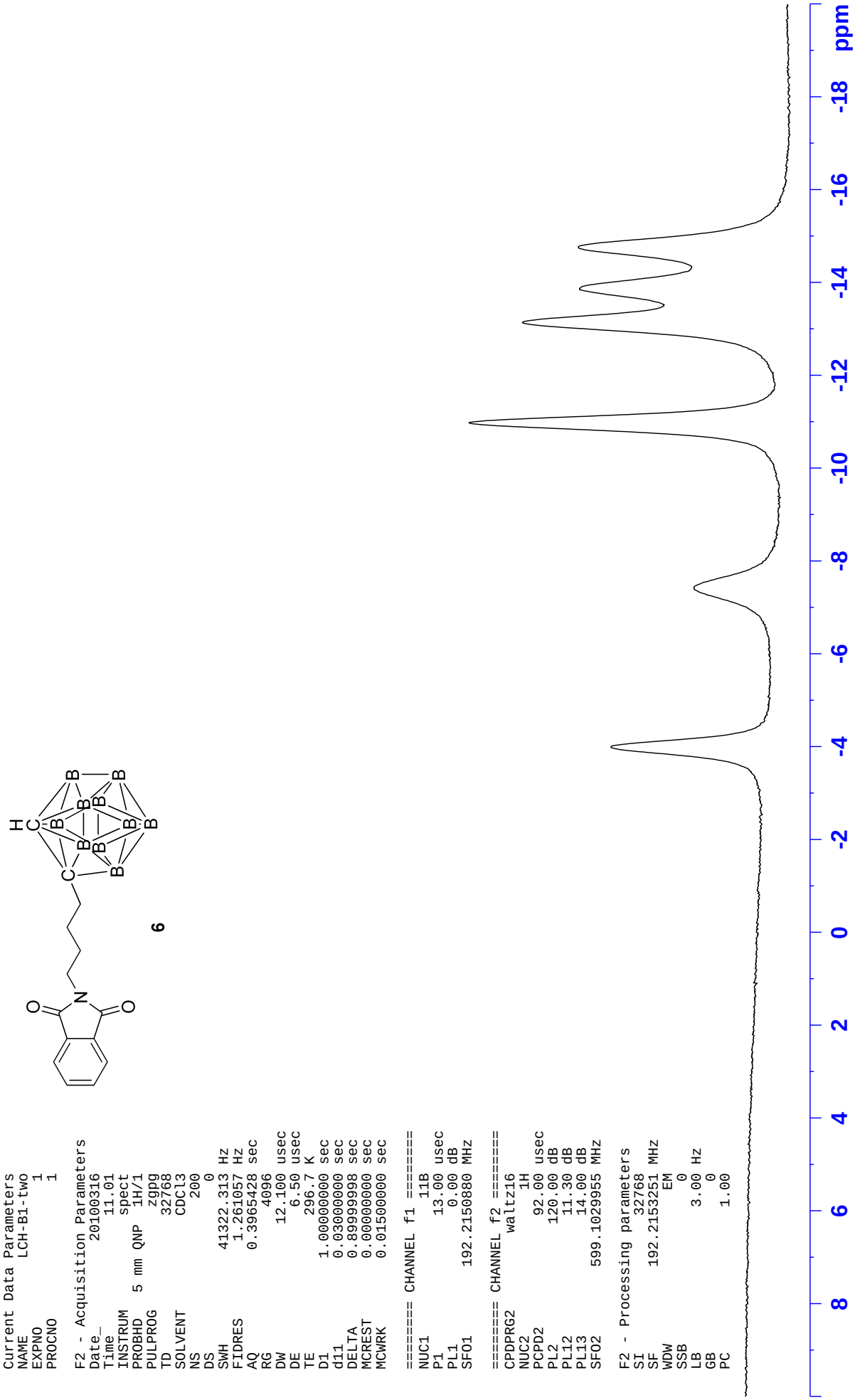
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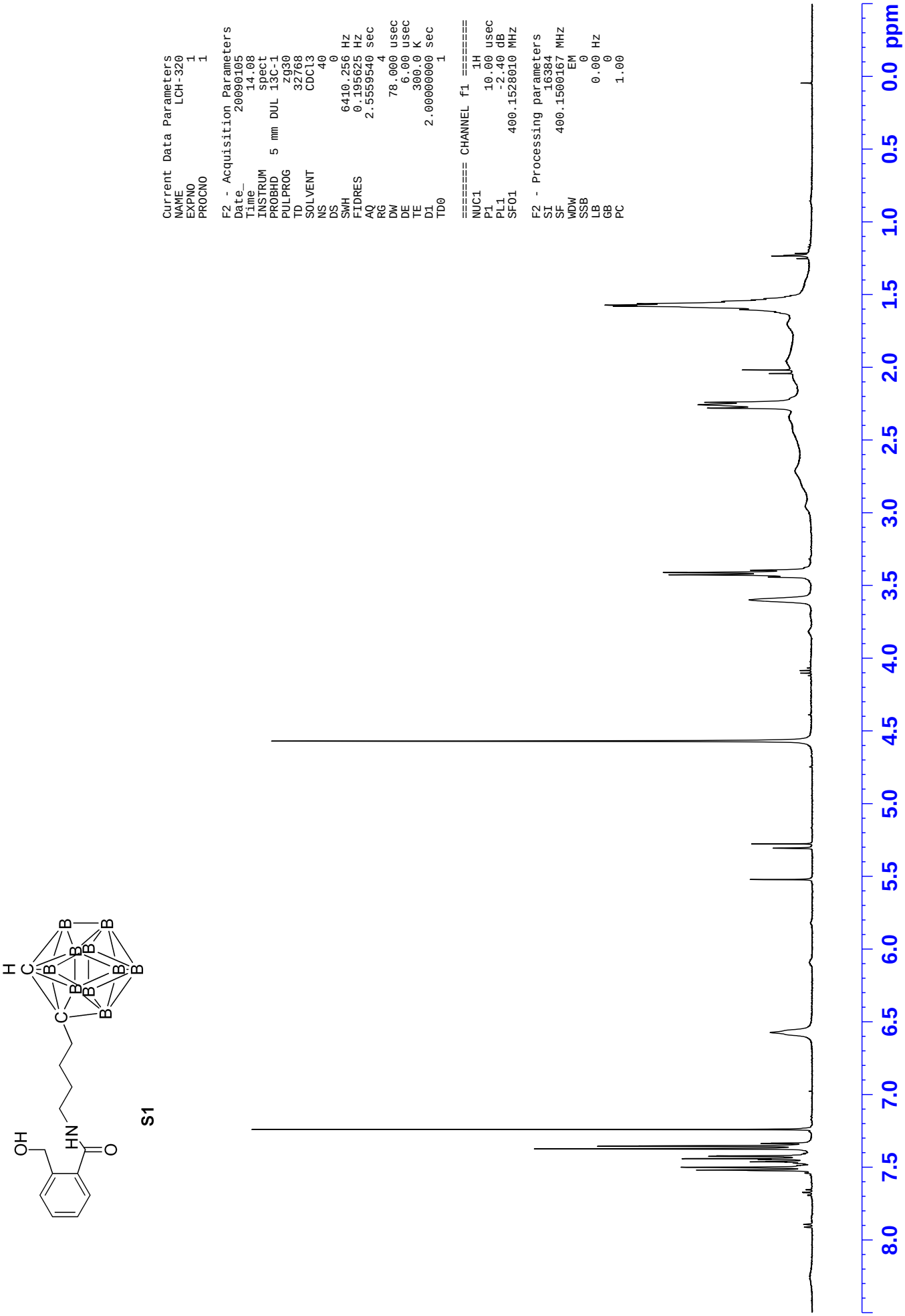
ppm

6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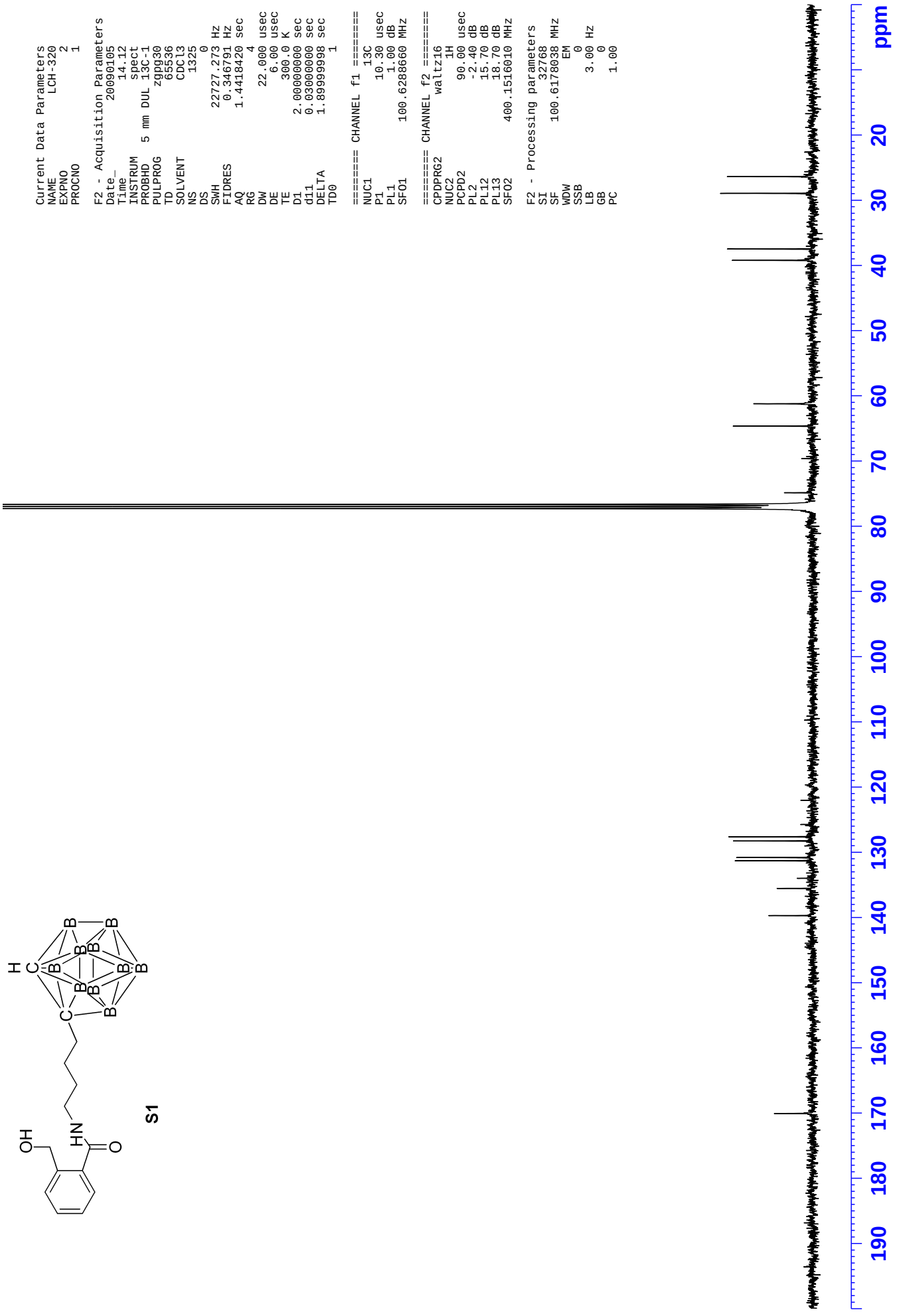
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d11 0.03000000 sec
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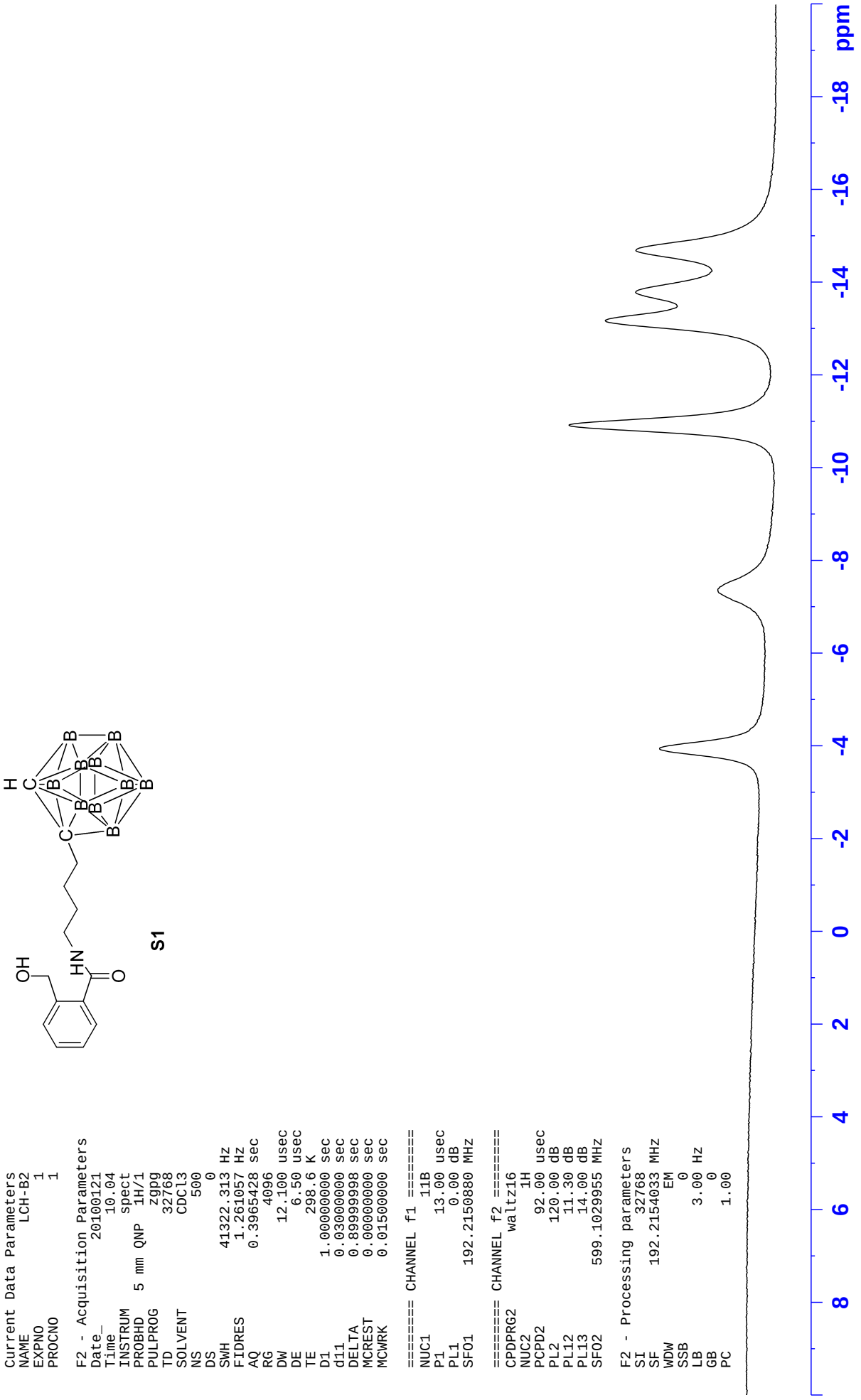
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SFO1 192.2150880 MHz
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NUC2 1H
PCPD2 92.00 usec
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S1
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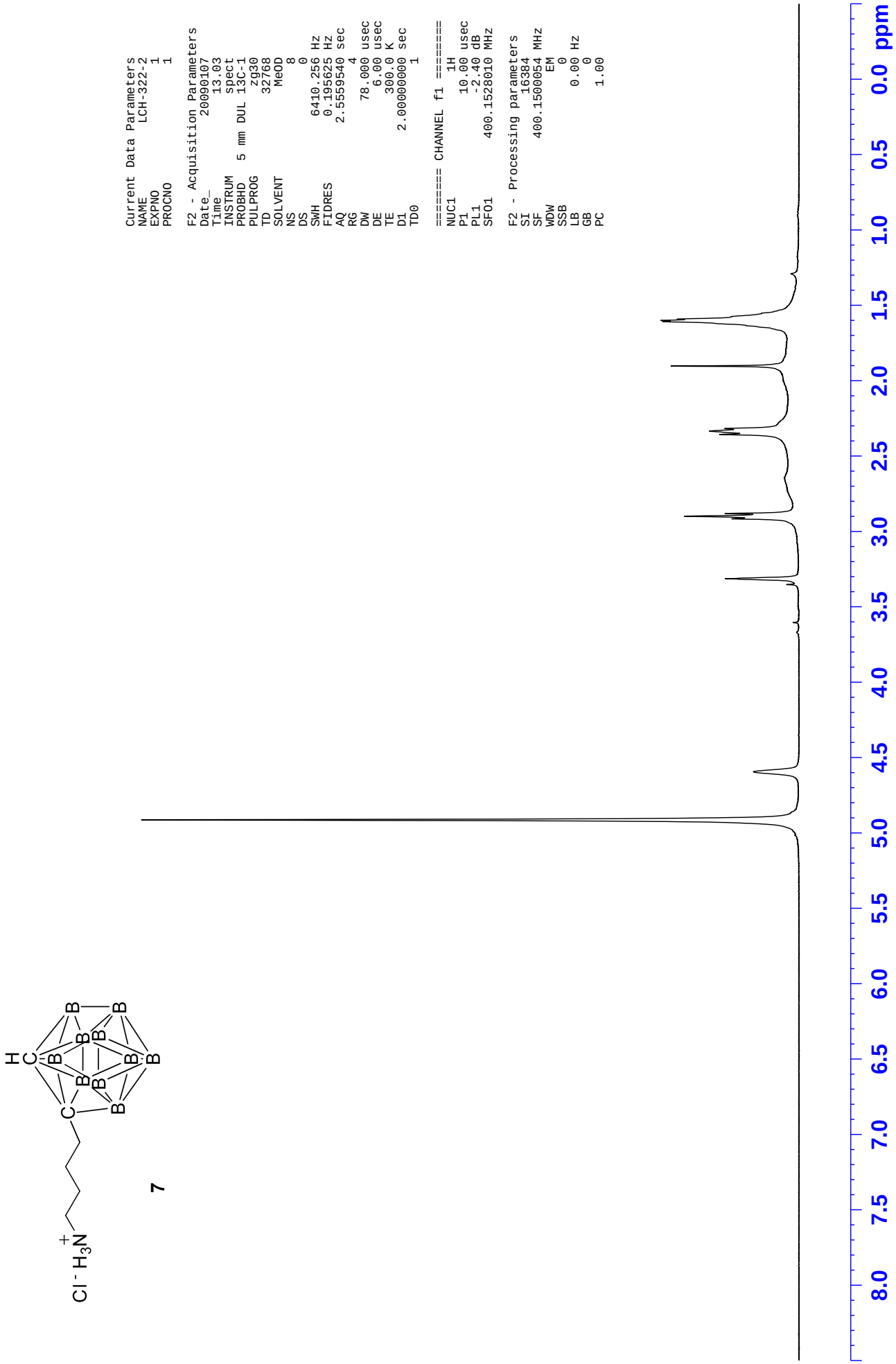
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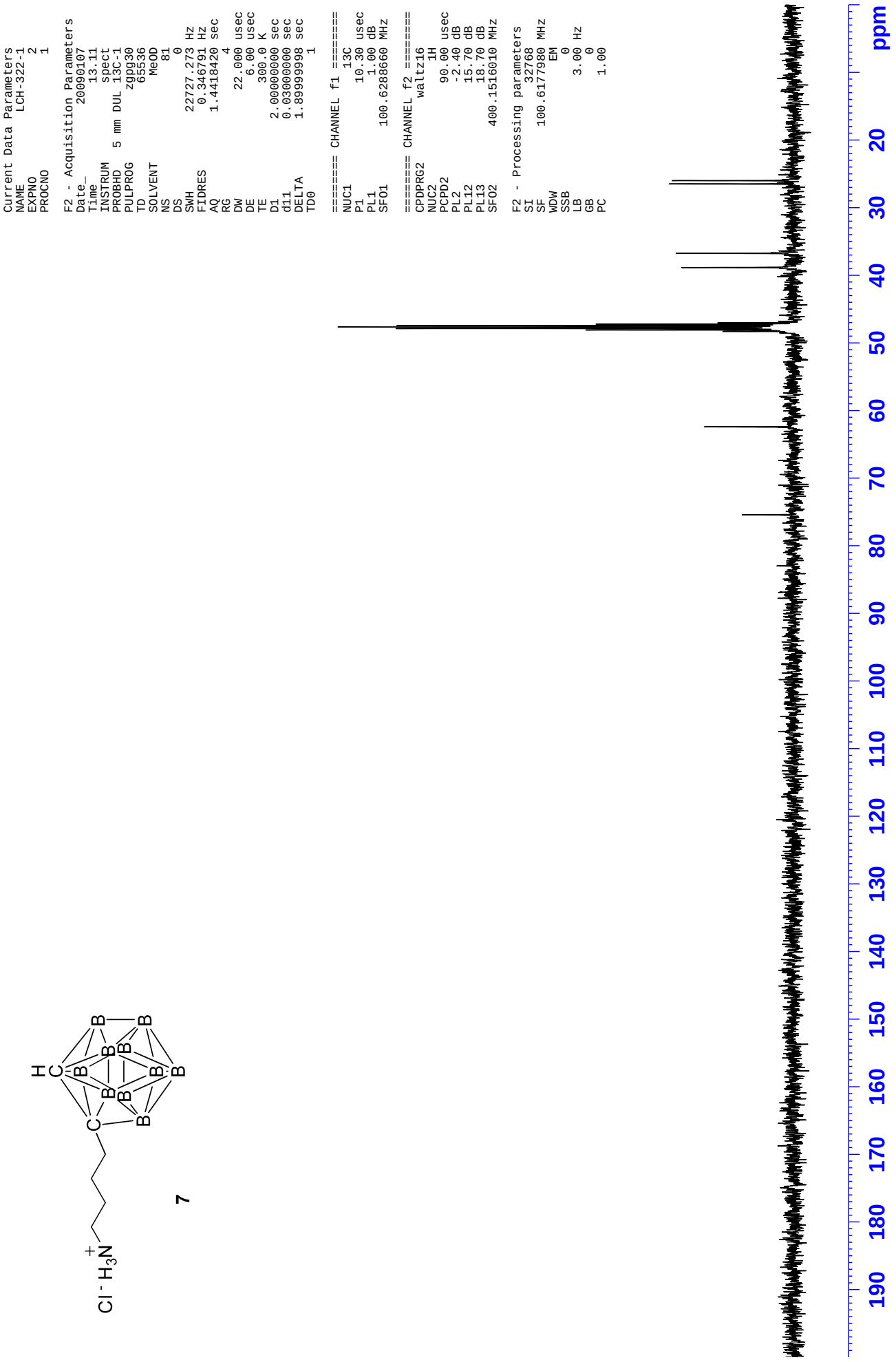
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PC 1.00
ppm
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H
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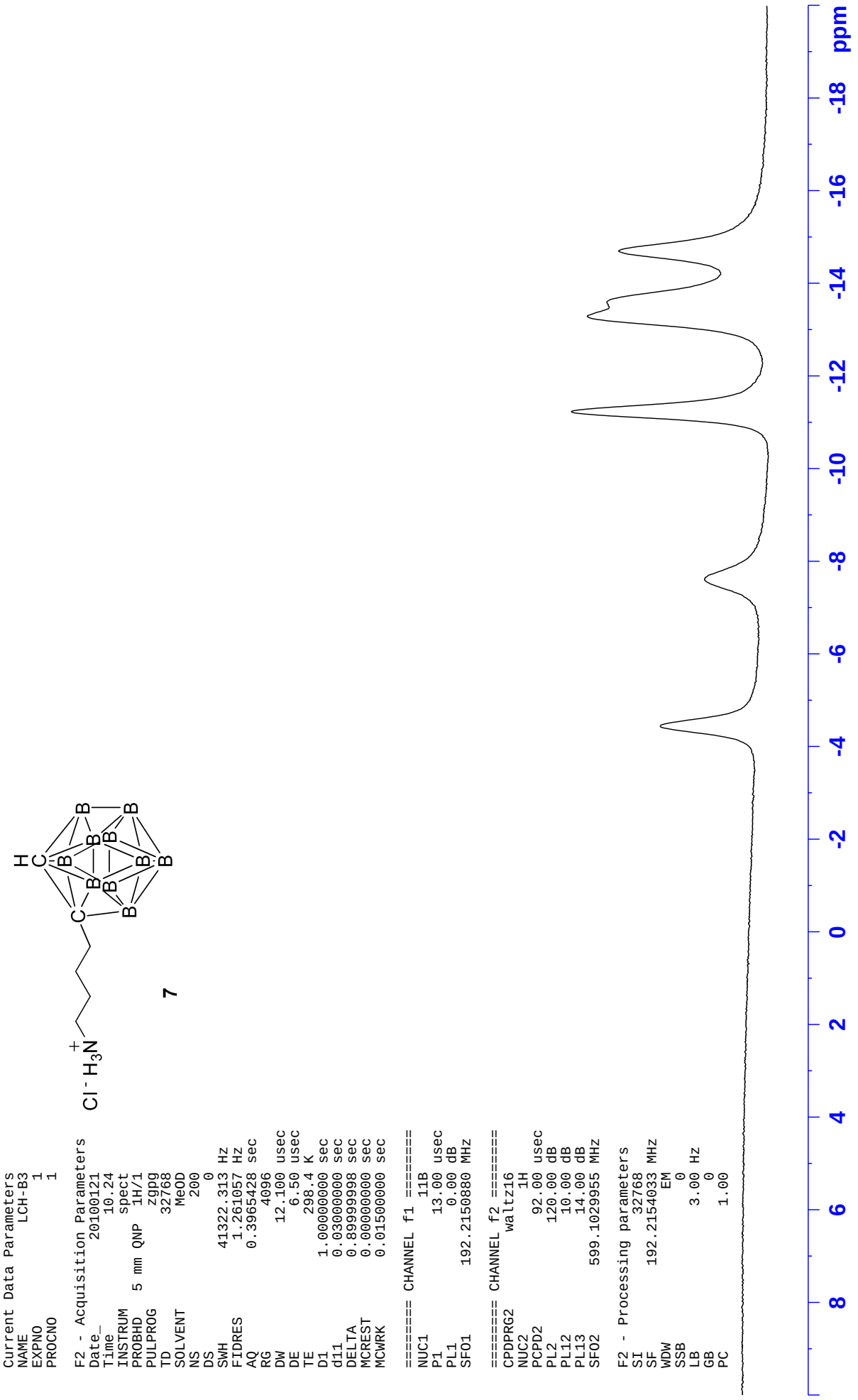
7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PCPD2 92.00 usec
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PL13 14.00 dB
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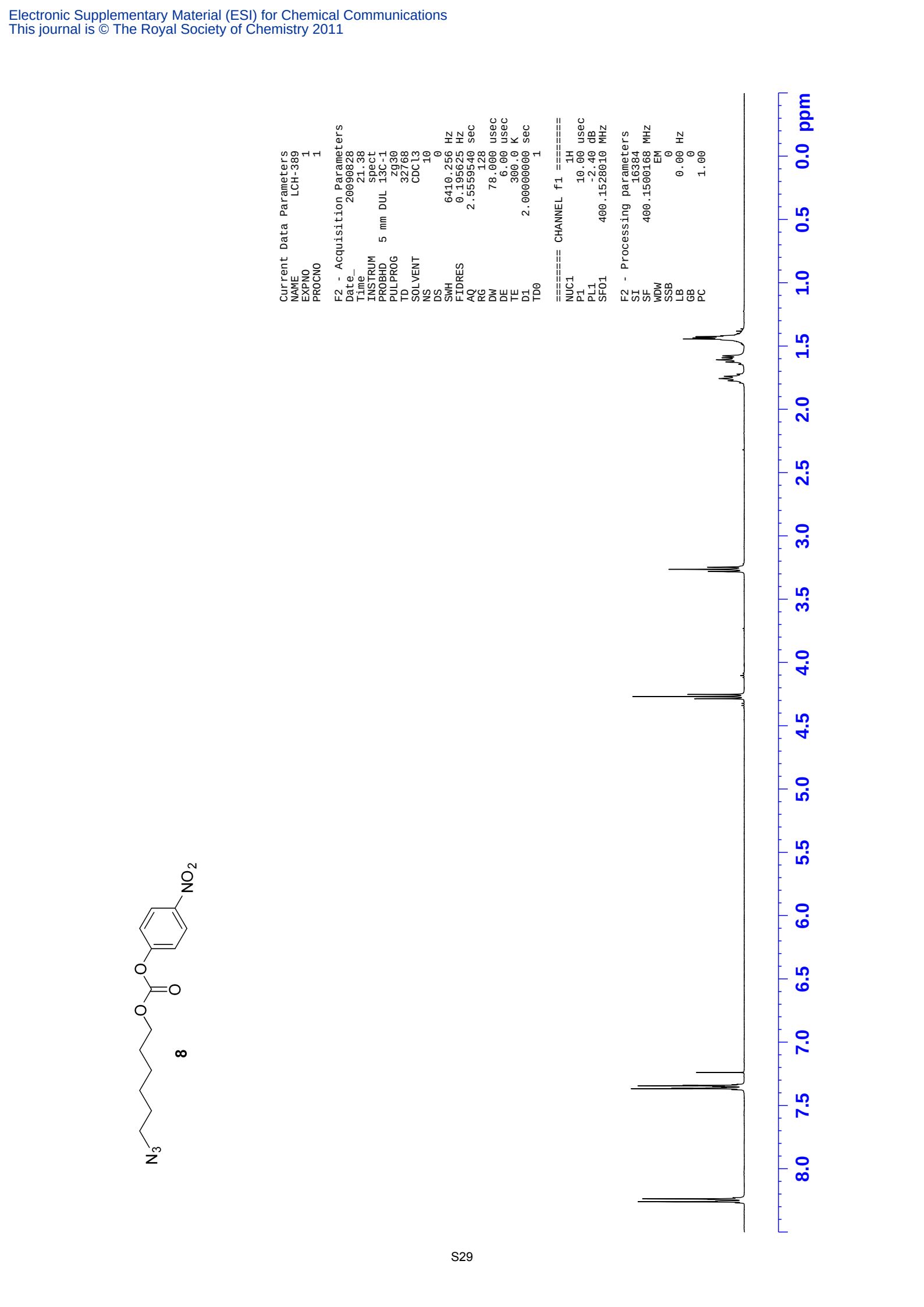
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SI 16384
SF 400.1500168 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
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7.5
7.0
6.5
6.0
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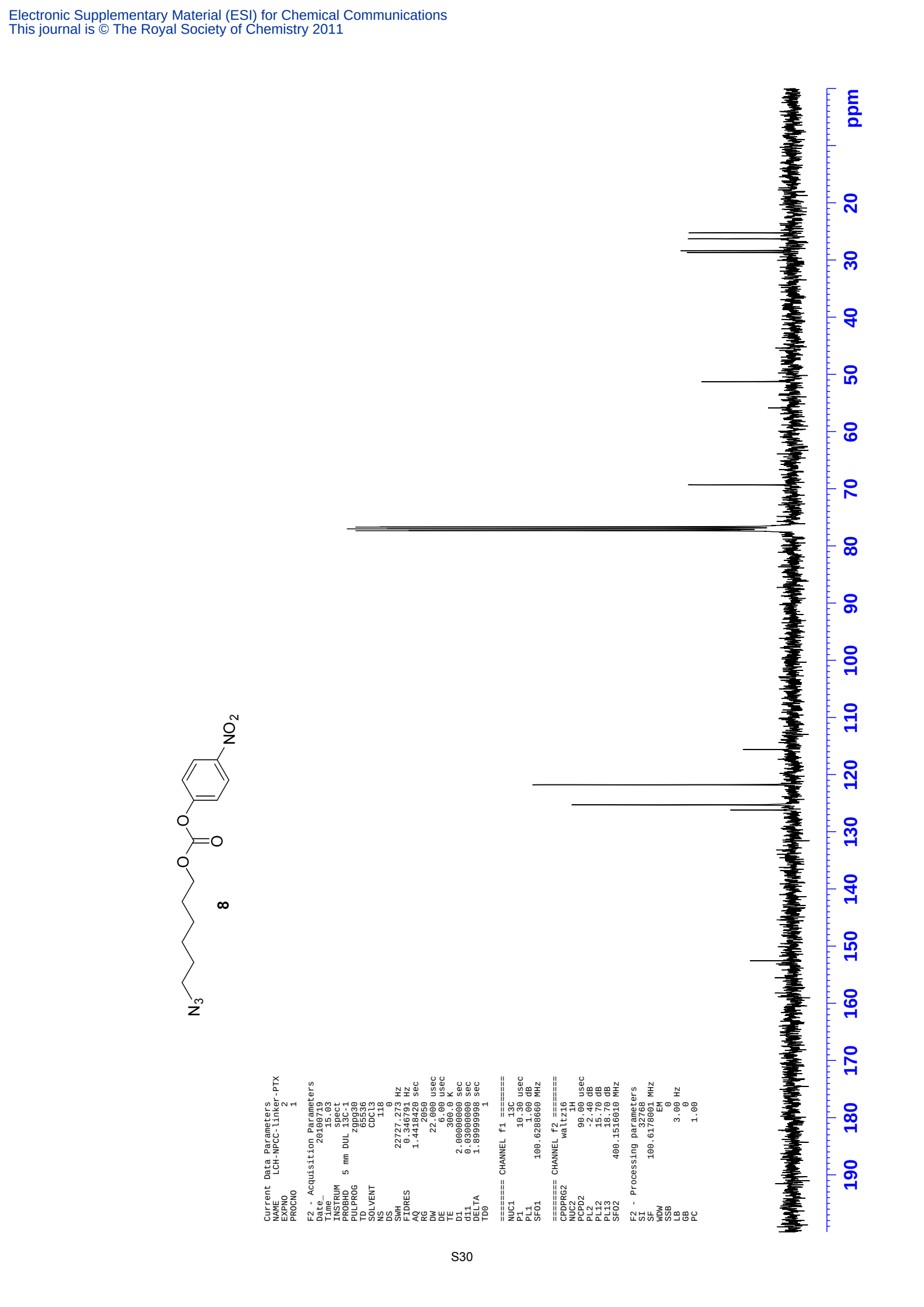
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d11 0.03000000 sec
DELTA 1.89999998 sec
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P1 10.30 usec
PL1 1.00 dB
SFO1 100.6288660 MHz
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NUC2 1H
PCPD2 90.00 usec
PL2 -2.40 dB
PL12 15.70 dB
PL13 18.70 dB
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O
O
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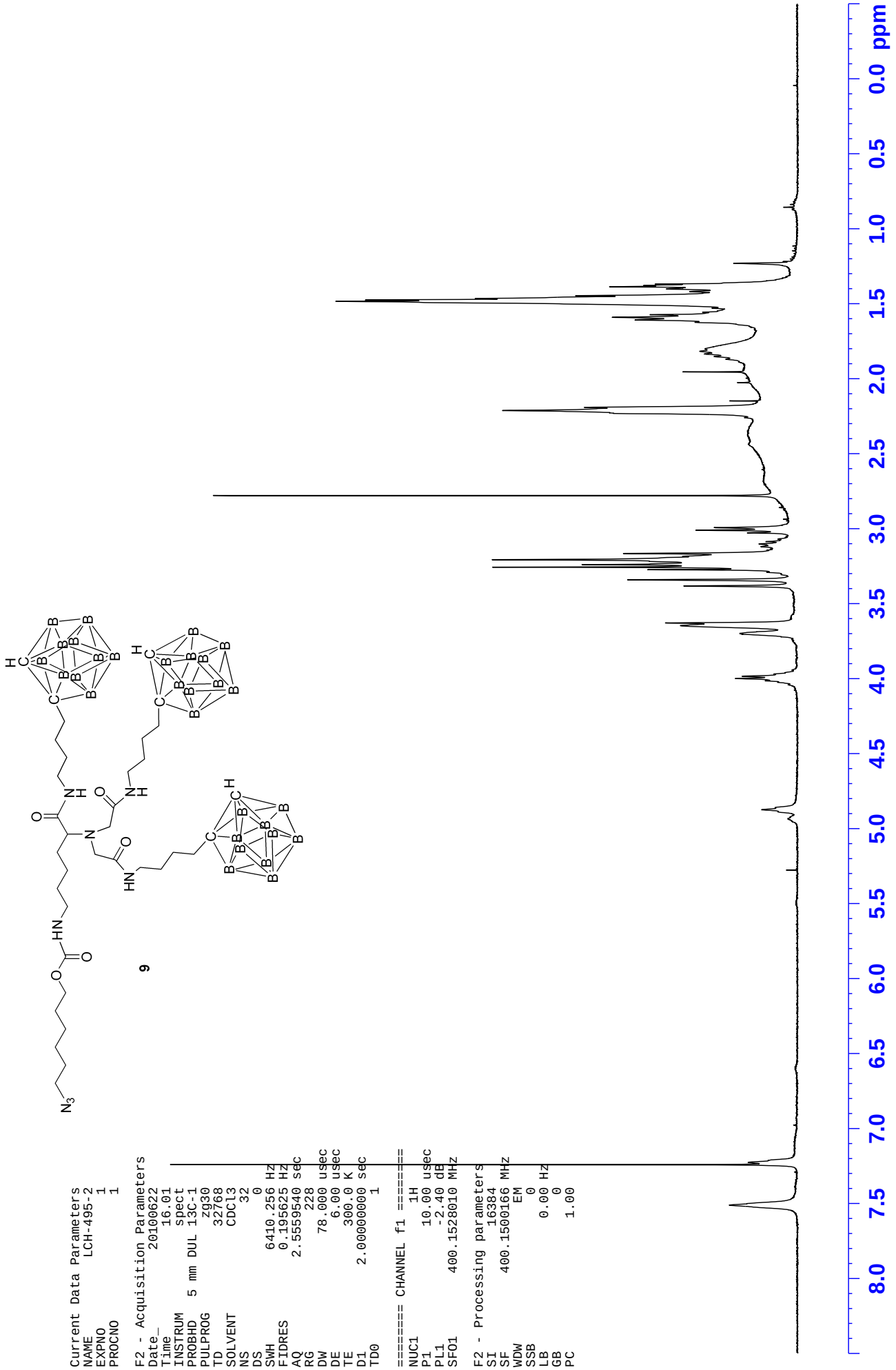
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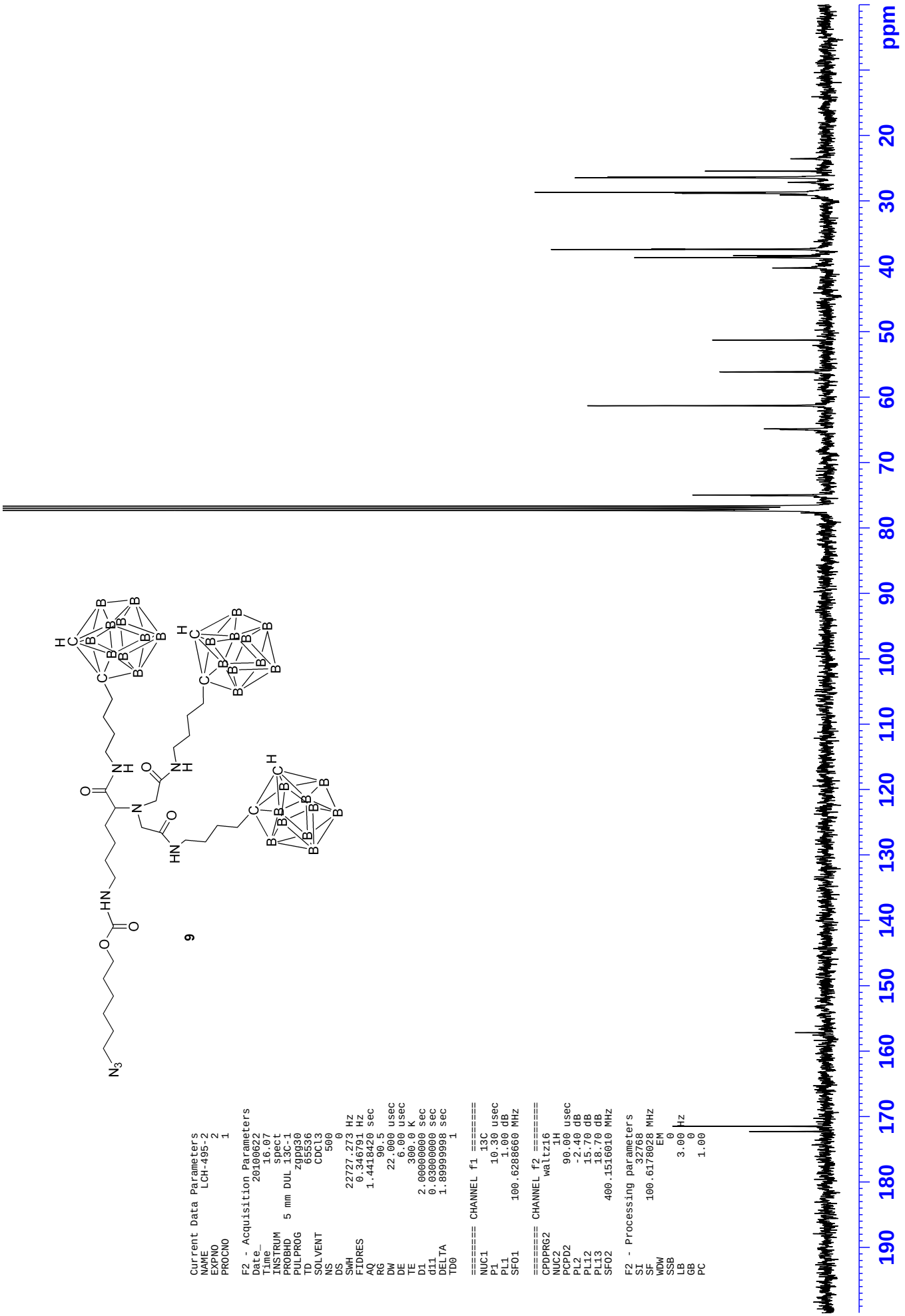
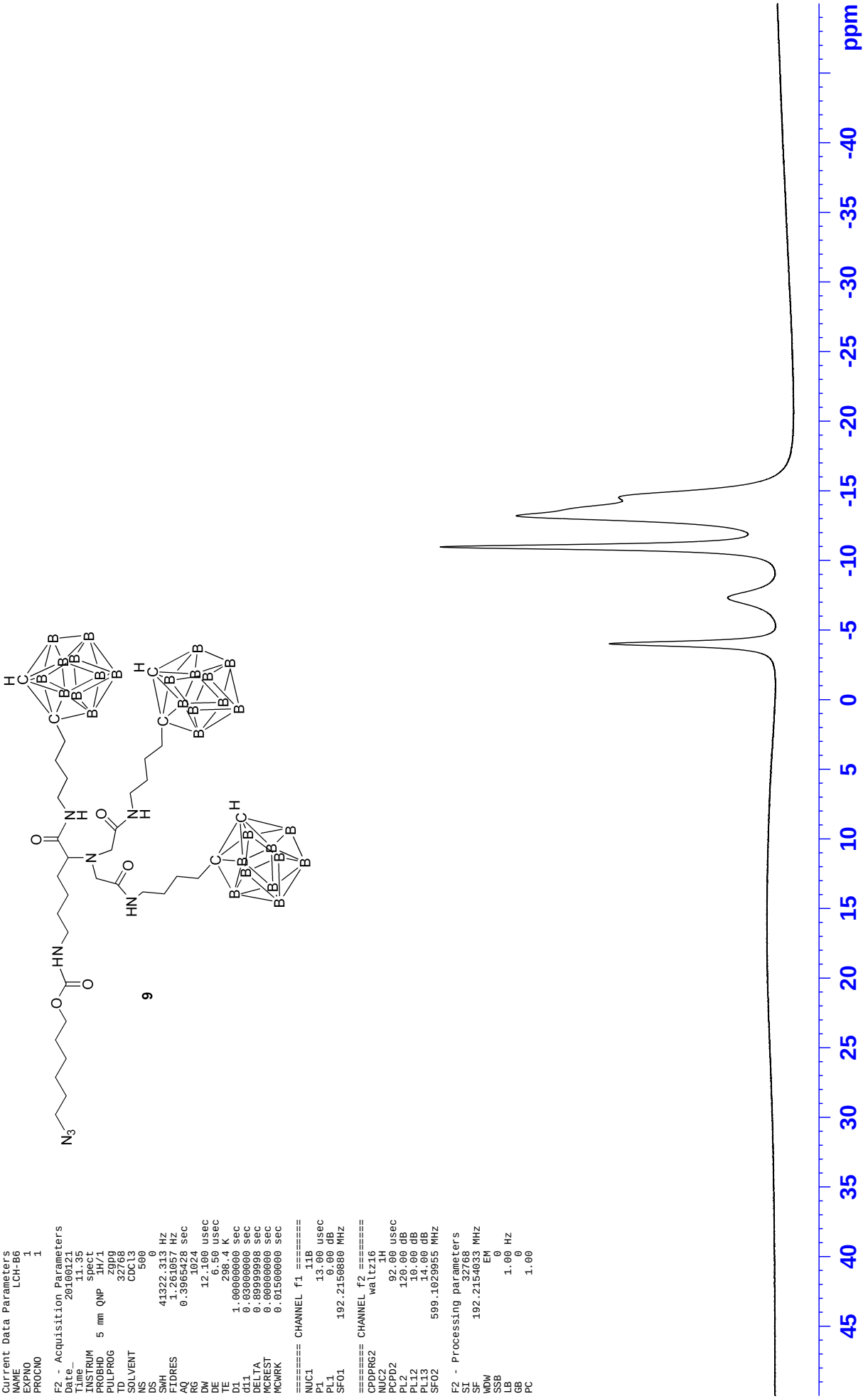
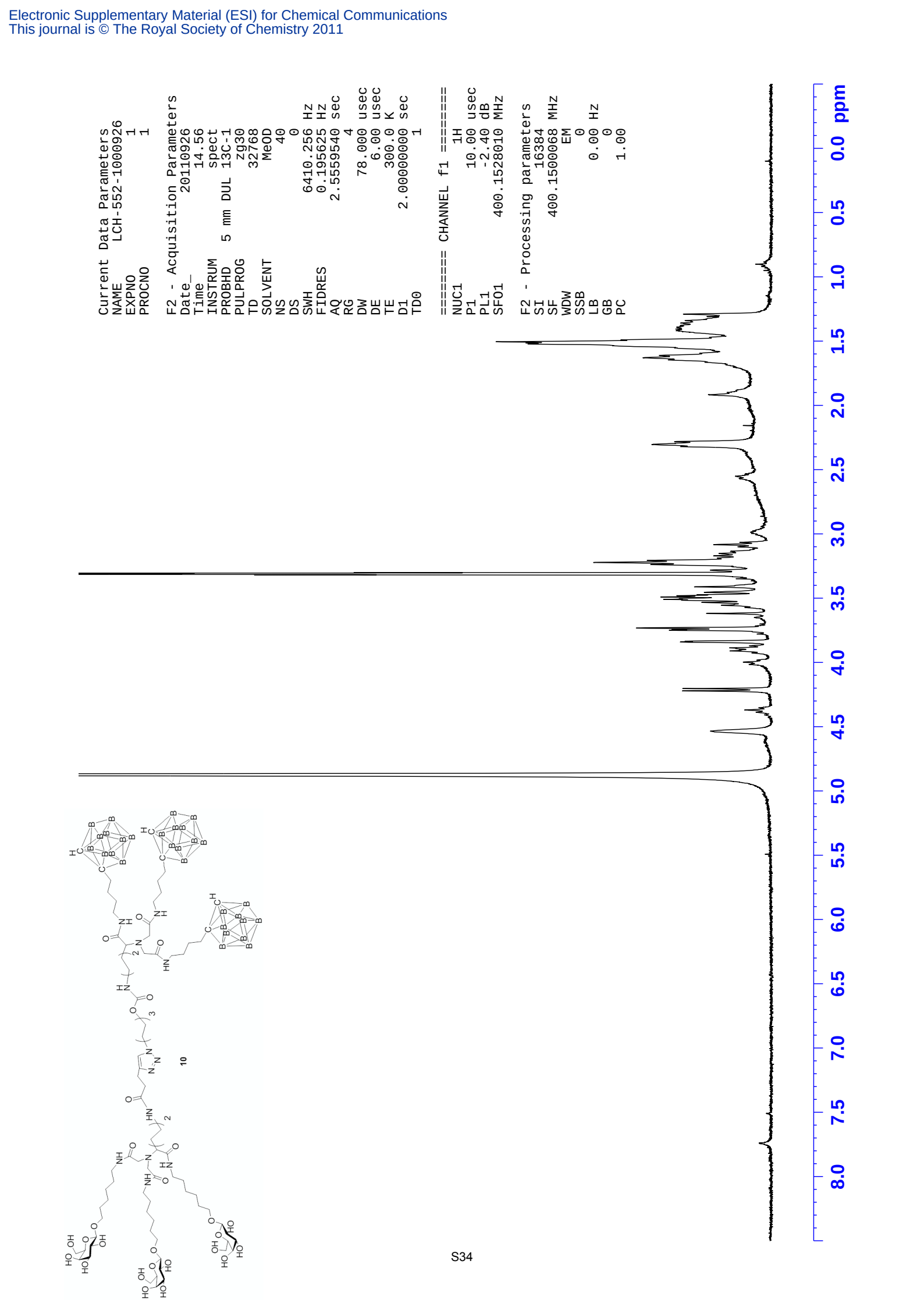
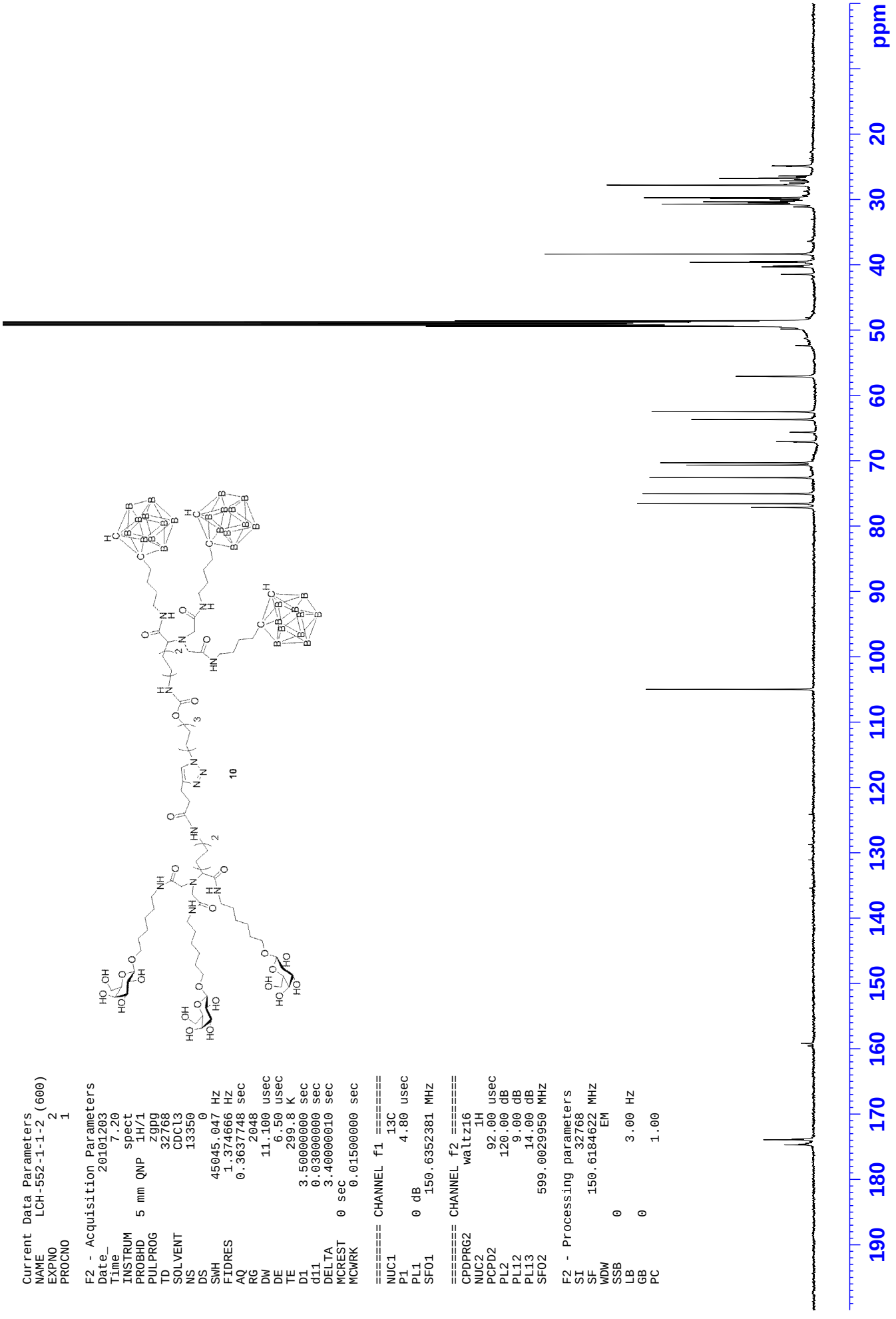
NS 32
DS 0
SWH 6410.256 Hz
FIDRES 0.195625 Hz
AQ 2.5559540 sec
RG 228
DW 78.000 usec
DE 6.00 usec
TE 300.0 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
NUC1 1H
P1 10.00 usec
PL1 -2.40 dB
SFO1 400.1528010 MHz
F2 - Processing parameters
SI 16384
SF 400.1500166 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
9
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
ppm

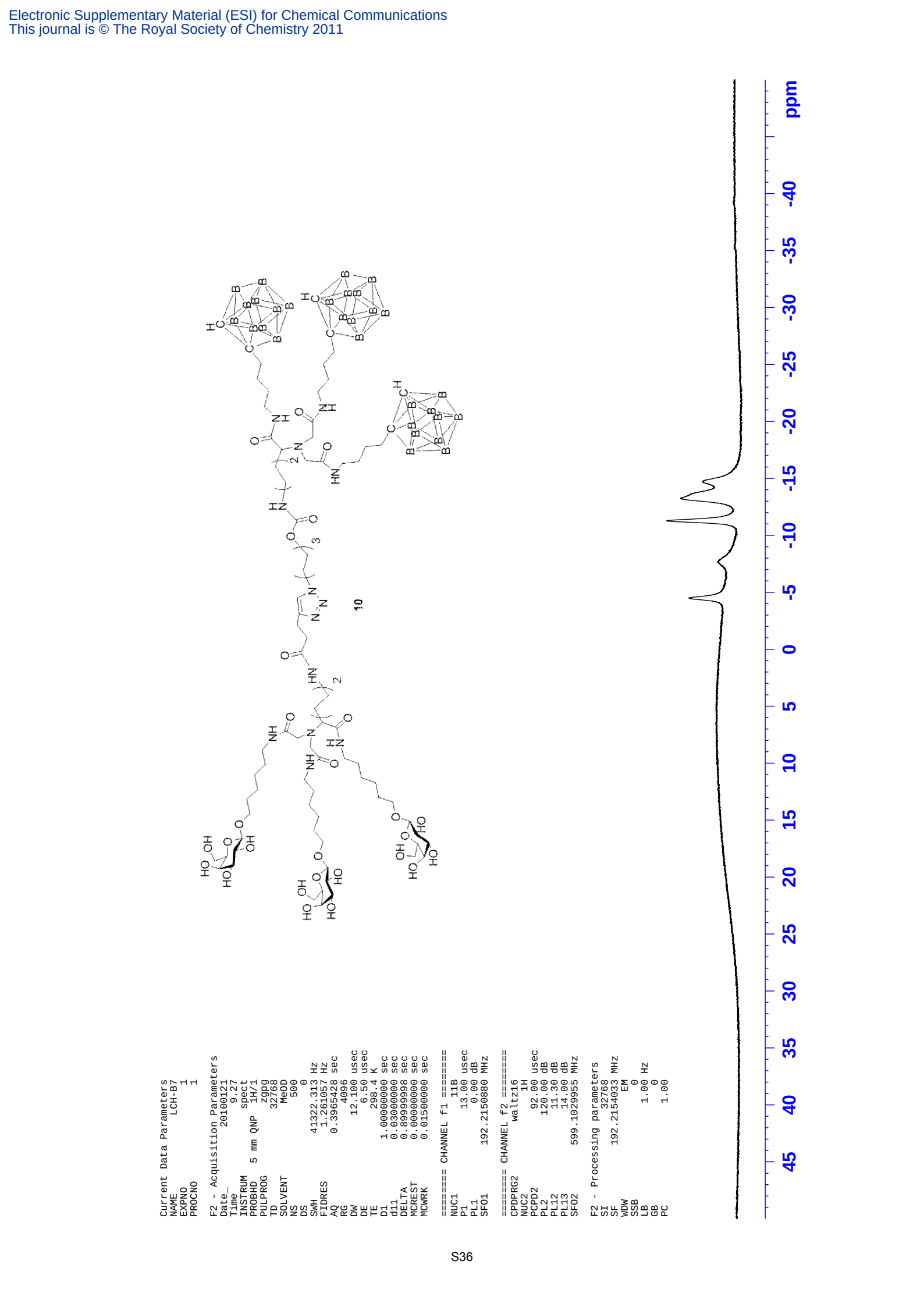

9
ppm
Current Data Parameters
NAME LCH-495-2
EXPNO 2
PROCNO 1
F2 - Acquisition Parameters
Date_ 20100622
Time 16.07
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 500
DS 0
SWH 22727.273 Hz
FIDRES 0.346791 Hz
AQ 1.4418420 sec
RG 90.5
DW 22.000 usec
DE 6.00 usec
TE 300.0 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
TD0 1
======== CHANNEL f1 ========
NUC1 13C
P1 10.30 usec
PL1 1.00 dB
SFO1 100.6288660 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 90.00 usec
PL2 -2.40 dB
PL12 15.70 dB
PL13 18.70 dB
SFO2 400.1516010 MHz
F2 - Processing parameters
SI 32768
SF 100.6178028 MHz
WDW EM
SSB 0
LB 3.00 Hz
GB 0
PC 1.00




```
Current Data Parameters
NAME          LCH-B6
EXPNO              1
PROCNO             1

F2 - Acquisition Parameters
Date_        20100121
Time_           11.35
INSTRUM          spect
PROBHD   5 mm QNP 1H/1
PULPROG          zgpg
TD              32768
SOLVENT         CDCl3
NS                500
DS                  0
SWH         41322.313 Hz
FIDRES       1.261057 Hz
AQ           0.3965428 sec
RG                1024
DW               12.100 usec
DE                6.50 usec
TE              298.4 K
D1           1.00000000 sec
d11          0.03000000 sec
DELTA        0.89999998 sec
MCREST       0.00000000 sec
MCWRK        0.01500000 sec

======== CHANNEL f1 ========
NUC1               11B
P1               13.00 usec
PL1               0.00 dB
SFO1       192.2150880 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                1H
PCPD2            92.00 usec
PL2             120.00 dB
PL12             10.00 dB
PL13             14.00 dB
SFO2       599.1029955 MHz

F2 - Processing parameters
SI              32768
SF         192.2154033 MHz
WDW                EM
SSB                 0
LB               1.00 Hz
GB                  0
PC               1.00
```


Current Data Parameters
NAME LCH-552-1000926
EXPNO 1
PROCNO 1
F2 - Acquisition Parameters
Date_ 20110926
Time 14.56
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 32768
SOLVENT MeOD
NS 40
DS 0
SWH 6410.256 Hz
FIDRES 0.195625 Hz
AQ 2.5559540 sec
RG 4
DW 78.000 usec
DE 6.00 usec
TE 300.0 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
NUC1 1H
P1 10.00 usec
PL1 -2.40 dB
SFO1 400.1528010 MHz
F2 - Processing parameters
SI 16384
SF 400.1500068 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0 ppm


Current Data Parameters
NAME LCH-552-1-1-2 (600)
EXPNO 2
PROCNO 1
F2 - Acquisition Parameters
Date_ 20101203
Time 7.20
INSTRUM spect
PROBHD 5 mm QNP 1H/1
PULPROG zgpg
TD 32768
SOLVENT CDCl3
NS 13350
DS 0
SWH 45045.047 Hz
FIDRES 1.374666 Hz
AQ 0.3637748 sec
RG 2048
DW 11.100 usec
DE 6.50 usec
TE 299.8 K
D1 3.50000000 sec
d11 0.03000000 sec
DELTA 3.40000010 sec
MCREST 0 sec 0.01500000 sec
MCWRK 0.01500000 sec
======== CHANNEL f1 ========
NUC1 13C
P1 4.80 usec
PL1 0 dB
SFO1 150.6352381 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 92.00 usec
PL2 120.00 dB
PL12 9.00 dB
PL13 14.00 dB
SFO2 599.0029950 MHz
F2 - Processing parameters
SI 32768
SF 150.6184622 MHz
WDW EM
SSB 0
LB 3.00 Hz
GB 0
PC 1.00
10
ppm
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20




```
Current Data Parameters
NAME          LCH-B7
EXPNO              1
PROCNO             1

F2 - Acquisition Parameters
Date_        20100121
Time_            9.27
INSTRUM         spect
PROBHD  5 mm QNP 1H/1
PULPROG          zgpg
TD              32768
SOLVENT          MeOD
NS                500
DS                  0
SWH           41322.313 Hz
FIDRES         1.261057 Hz
AQ             0.3965428 sec
RG                4096
DW               12.100 usec
DE                6.50 usec
TE              298.4 K
D1             1.00000000 sec
d11            0.03000000 sec
DELTA          0.89999998 sec
MCREST         0.00000000 sec
MCWRK          0.01500000 sec

======== CHANNEL f1 ========
NUC1              11B
P1              13.00 usec
PL1              0.00 dB
SFO1        192.2150880 MHz

======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                1H
PCPD2           92.00 usec
PL2             120.00 dB
PL12             11.30 dB
PL13             14.00 dB
SFO2        599.1029955 MHz

F2 - Processing parameters
SI                32768
SF          192.2154033 MHz
WDW                  EM
SSB                   0
LB                 1.00 Hz
GB                    0
PC                 1.00
```