Electronic Supplementary Material (ESI) for Dalton Transactions.

Supplementary Information

In situ synthesis of CuO nanoparticles over functionalized mesoporous silica and their application in catalytic syntheses of symmetrical diselenides

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1,2-diphenyldiselane (3a)[1]**:** (243 mg, Yield: 78%); ^{1}H NMR ($CDCl_3$, 400 MHz): δ (ppm) 7.65-7.63 (m, 4H), 7.32-7.27 (m, 6H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ (ppm) 131.6, 131.0, 129.3, 127.8; ^{77}Se NMR (CDCl3, 76.28 MHz): δ (ppm) 463.09.

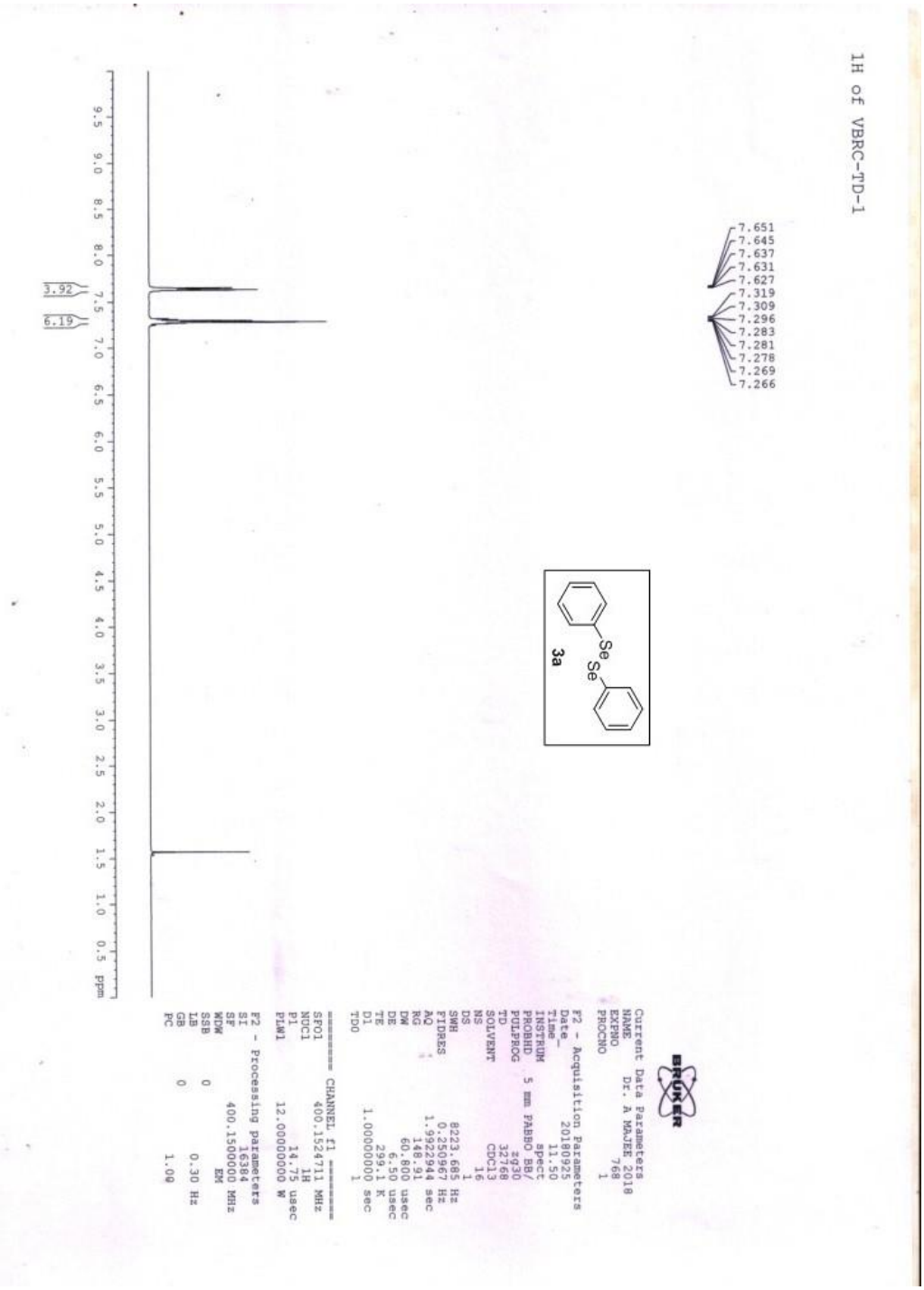

Fig. s1 ^{1}H NMR of **3a** in $CDCl_3$

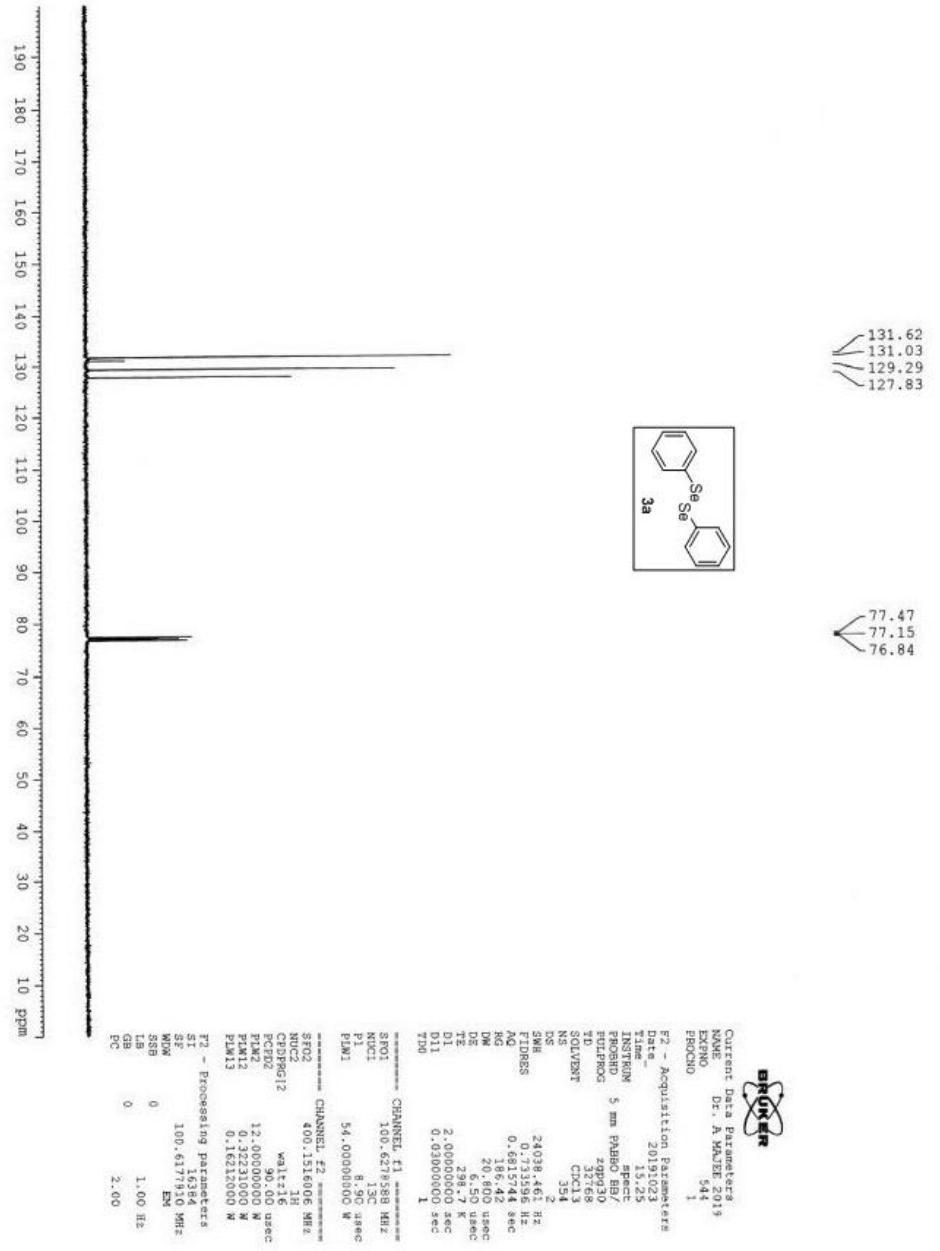

Fig. s2 ^{13}C NMR of **3a** in $CDCl_3$

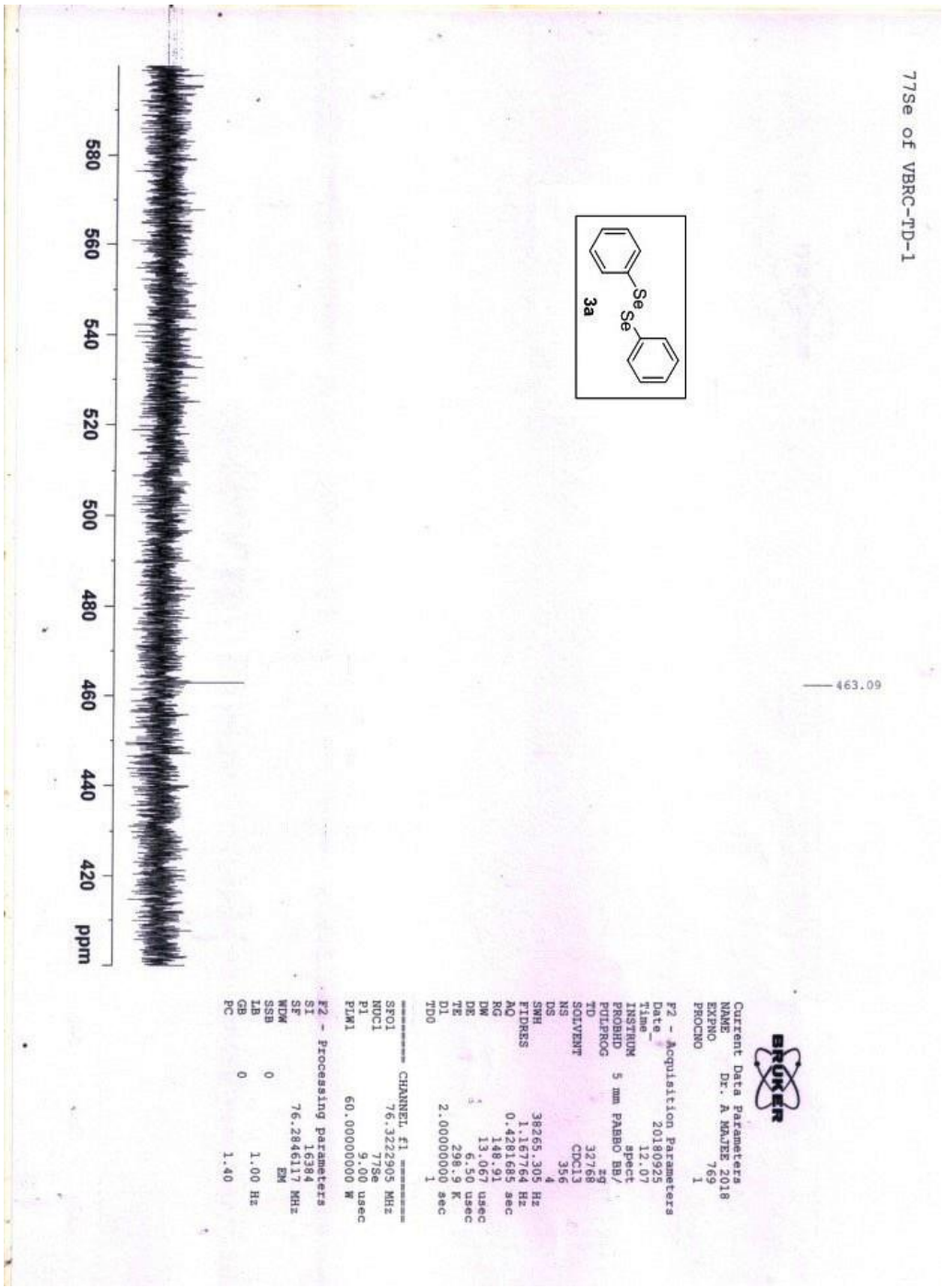

Fig. s3 ^{77}Se NMR of **3a** in $CDCl_3$

1,2-di-p-tolyldiselane (3b)[1]: (261 mg, Yield: 77%); ^{1}H NMR ($CDCl_3$, 400 MHz): δ (ppm) 7.52-7.50 (m, 4H), 7.10-7.04 (m, 4H), 2.37 (s, 6H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ (ppm) 138.1, 134.2, 132.4, 127.4, 21.2.

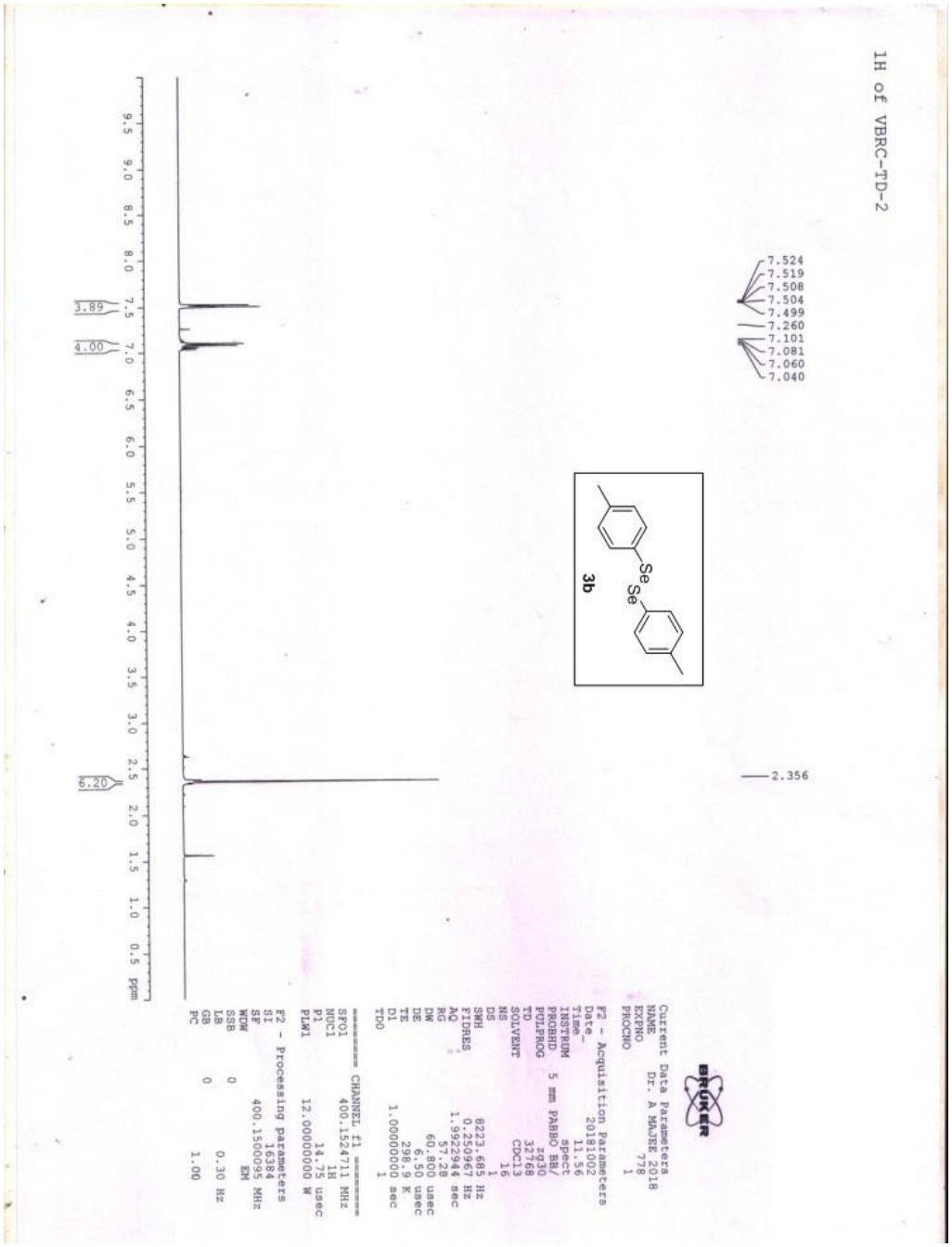

Fig. s4 ^{1}H NMR of **3b** in $CDCl_3$

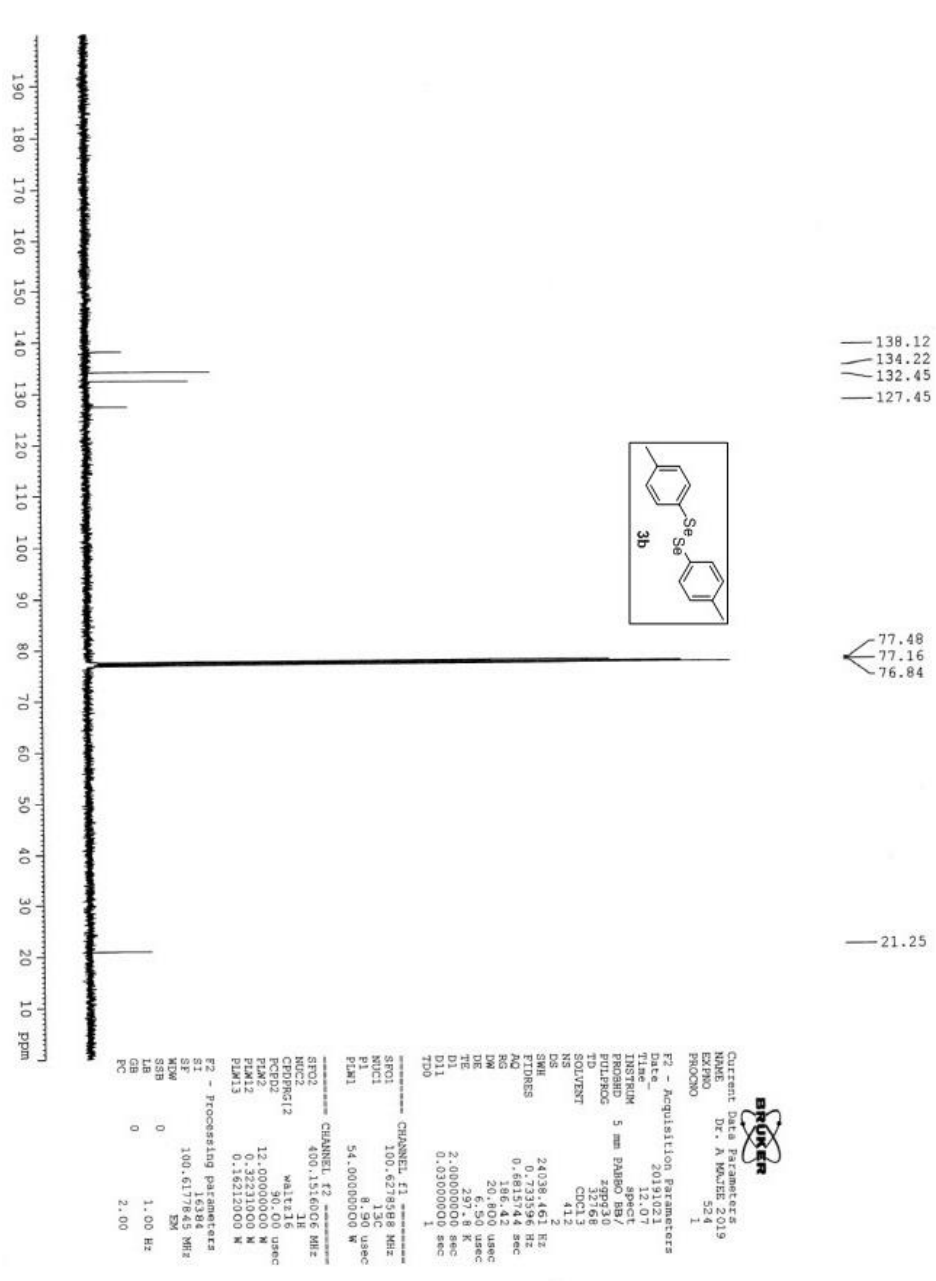

Fig. s5 ^{13}C NMR of **3b** in $CDCl_3$

1,2-di-m-tolyldiselane (3c)[1]: (255 mg, Yield: 75%); ^{1}H NMR ($CDCl_3$, 400 MHz): δ (ppm) 7.43-7.41 (m, 4H), 7.18-7.14 (m, 2H), 7.07-7.05 (m, 2H), 2.32 (s, 6H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ (ppm) 139.1, 133.6, 132.3, 129.1, 128.8, 128.7, 21.4.

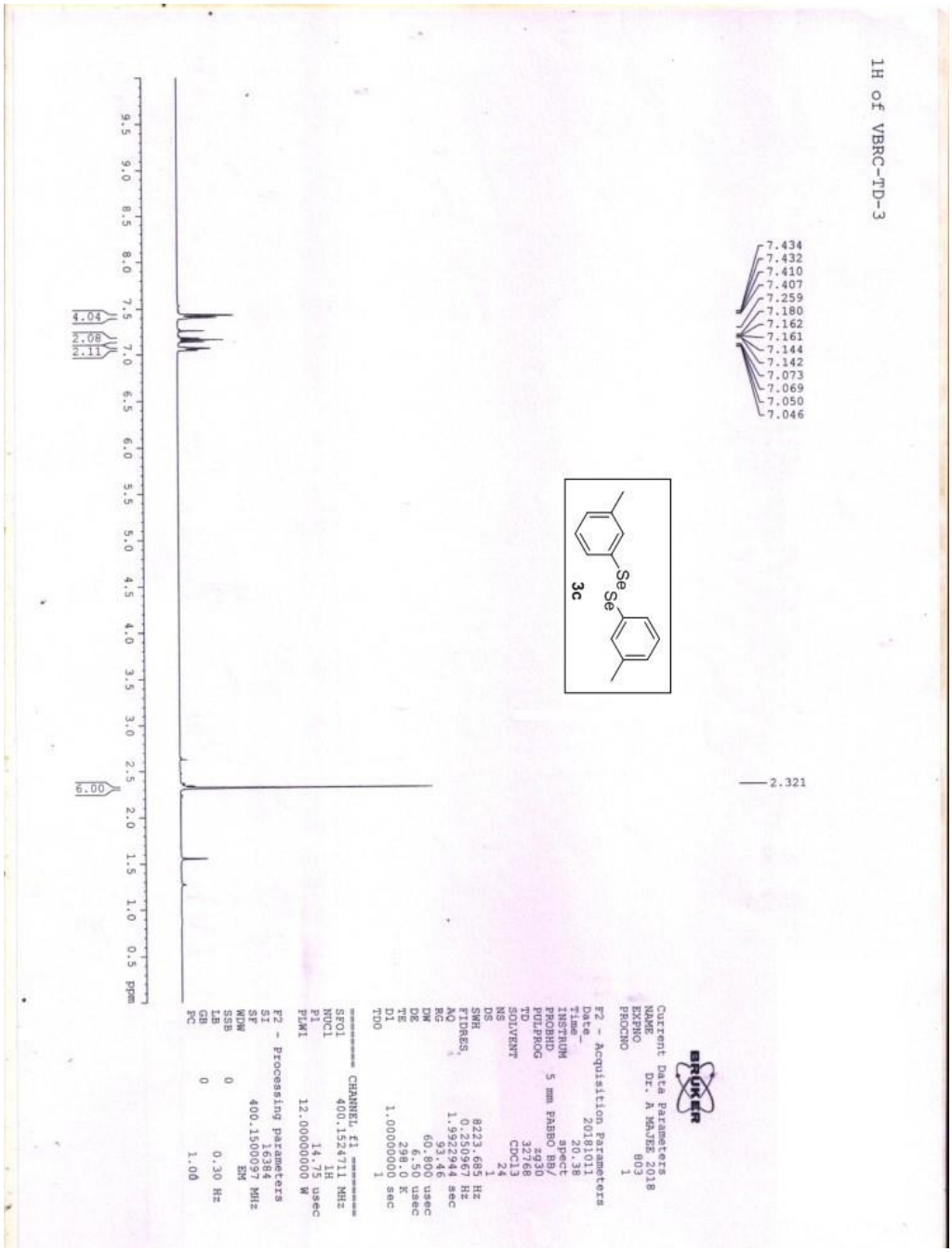

Fig. s6 ^{1}H NMR of **3c** in $CDCl_3$

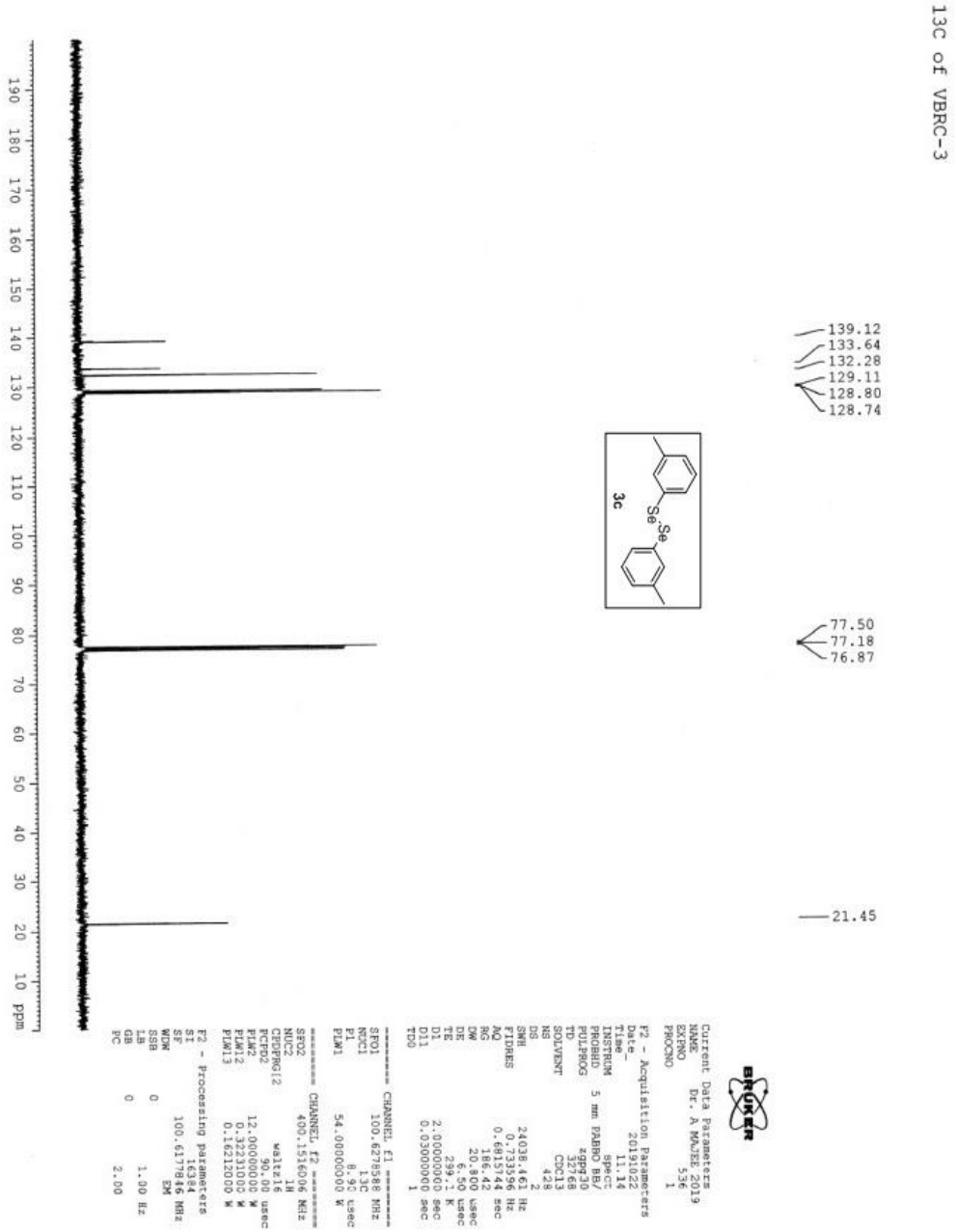

Fig. s7 ^{13}C NMR of **3c** in $CDCl_3$

1,2-bis(4-fluorophenyl)diselane (3d)[2]**:** (248 mg, Yield: 74%); ^{1}H NMR ($CDCl_3$, 400 MHz): δ (ppm) 7.58-7.52 (m, 4H), 7.02-6.95 (m, 4H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ (ppm) 163.2 (d, $J_{C\text{-}F}$ = 244 Hz), 135.0 (d, $J_{C\text{-}F}$ = 7 Hz), 116.6 (d, $J_{C\text{-}F}$ = 4 Hz), 116.4 (d, $J_{C\text{-}F}$ = 3 Hz).

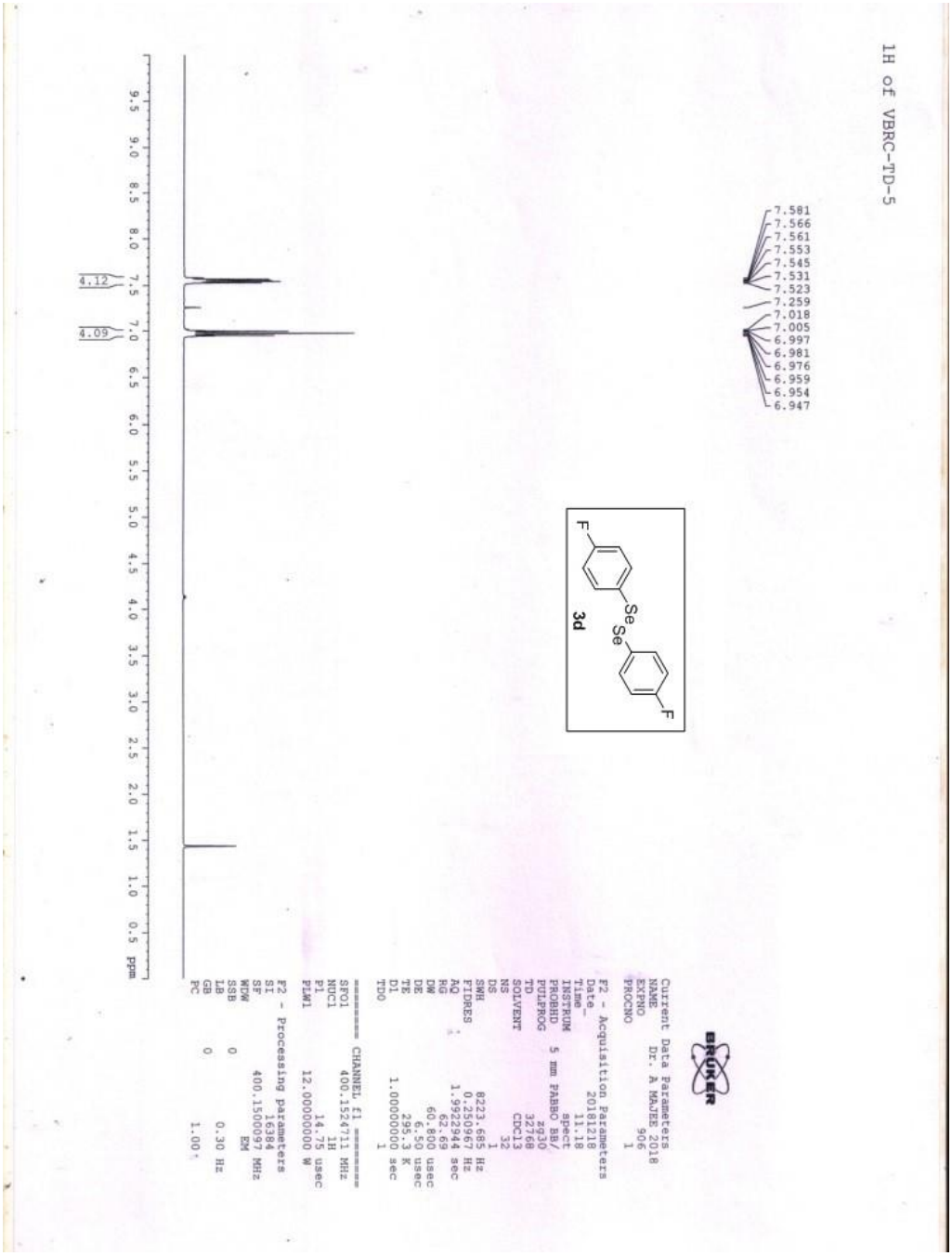

Fig. s8 ^{1}H NMR of **3d** in $CDCl_3$

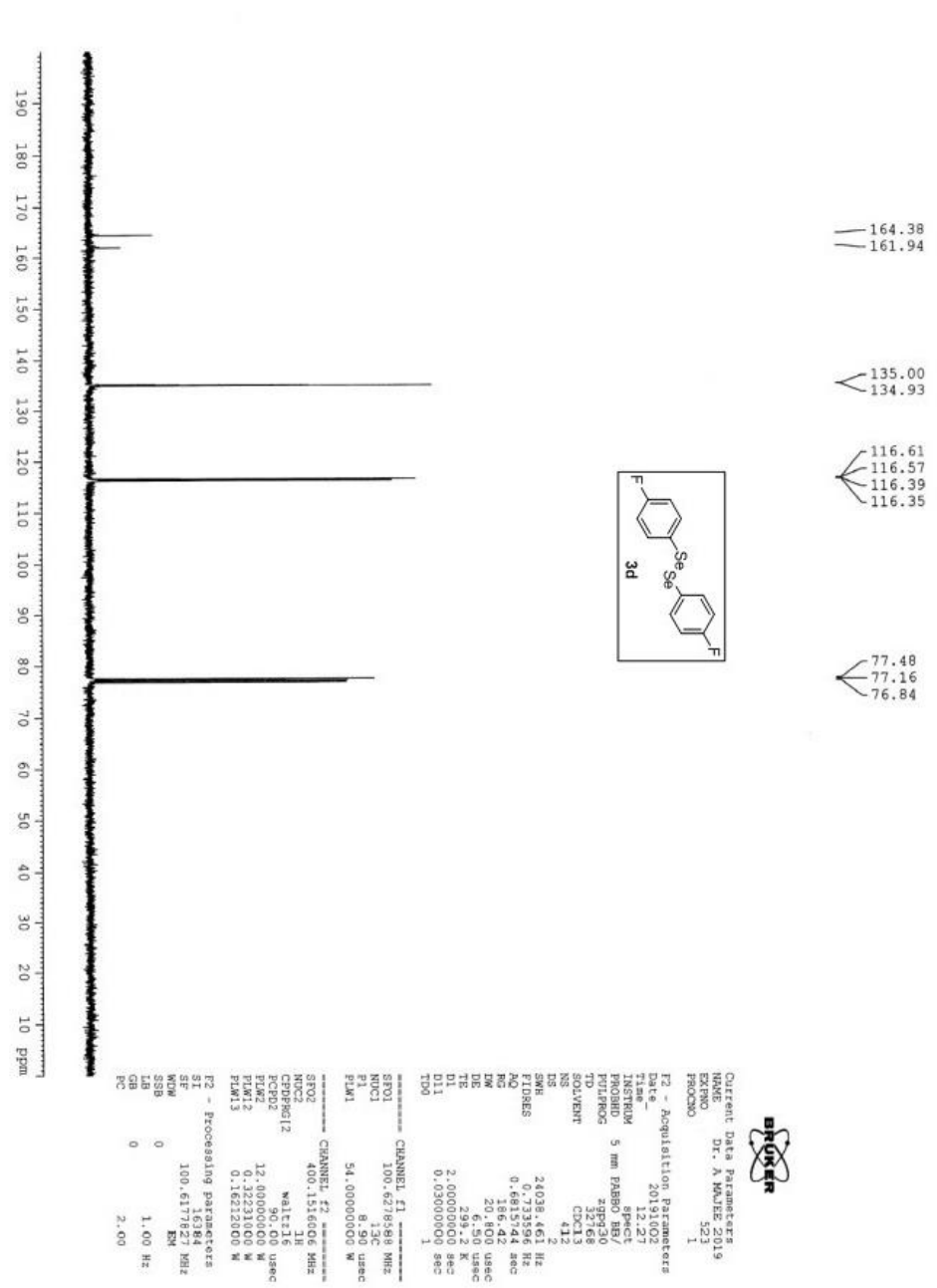

Fig. s9 ^{13}C NMR of **3d** in $CDCl_3$

1,2-bis(4-chlorophenyl)diselane (3e)[1]**:** (289 mg, Yield: 76%); ^{1}H NMR ($CDCl_3$, 400 MHz): δ (ppm) 7.52-7.49 (m, 4H), 7.25-7.22 (m, 4H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ (ppm) 134.4, 133.4, 129.7, 129.5.

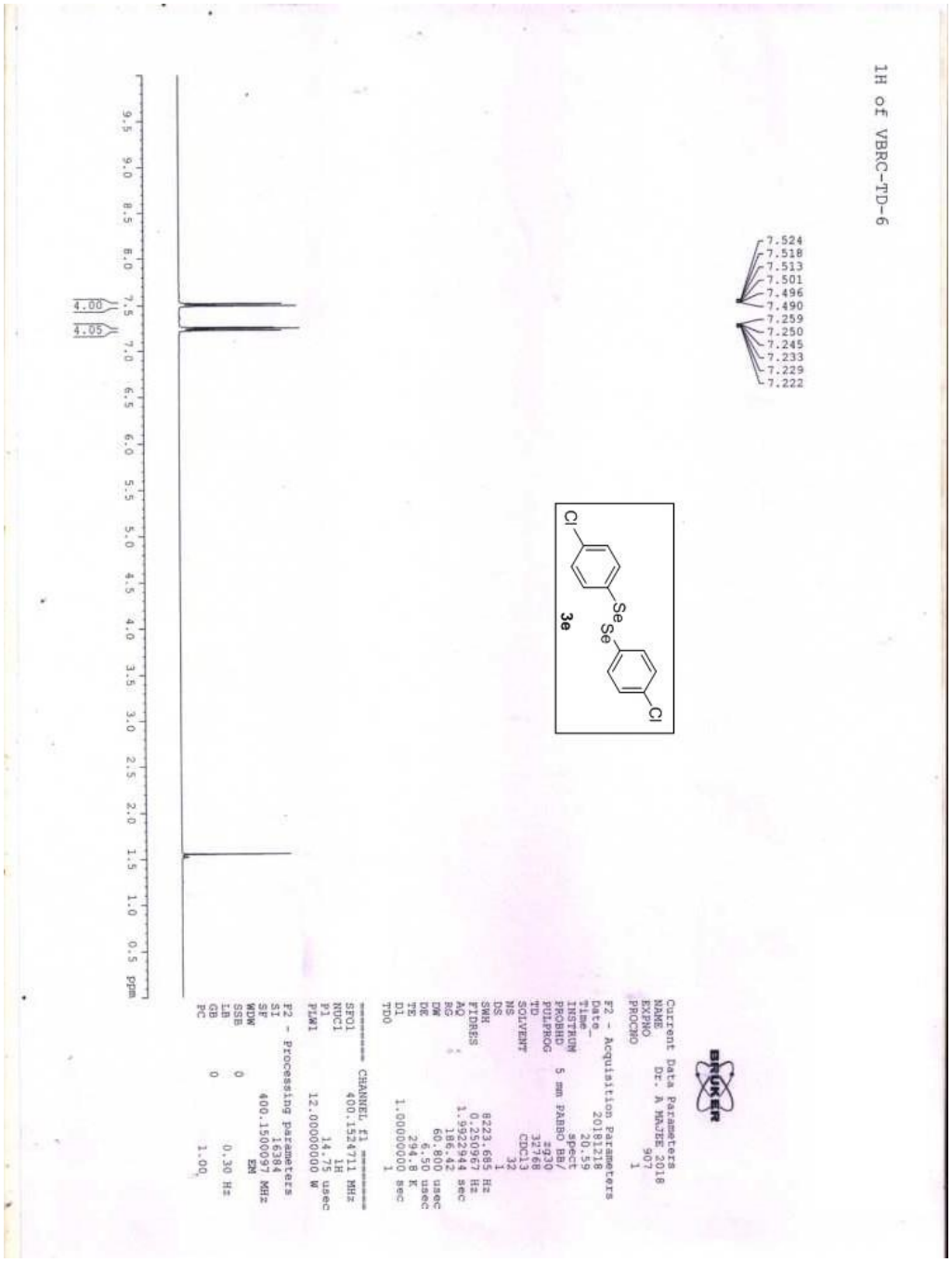

Fig. s10 ^{1}H NMR of **3e** in $CDCl_3$

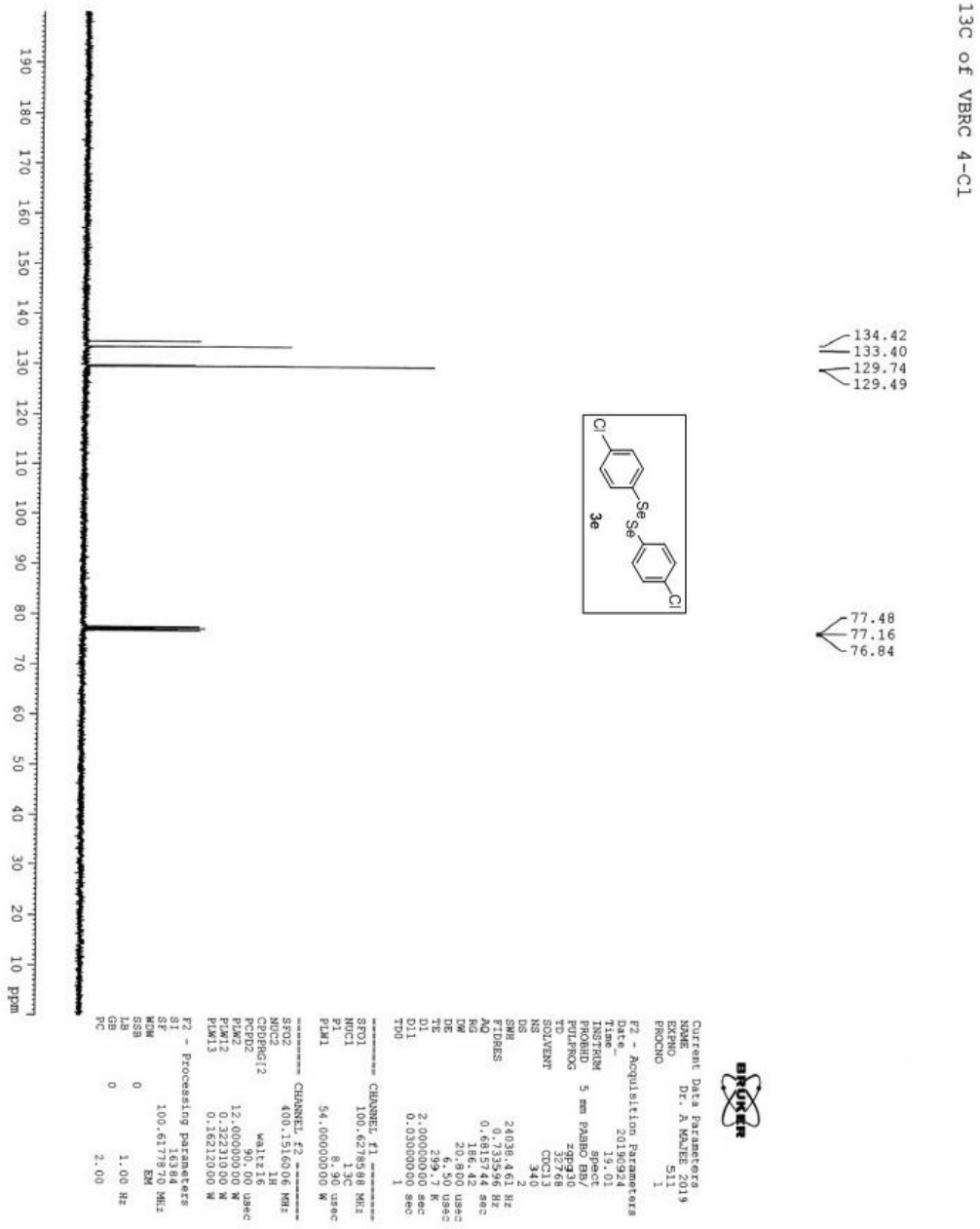

Fig. s11 ^{13}C NMR of **3e** in $CDCl_3$

1,2-bis(4-bromophenyl)diselane (3f)[1]**:** (353 mg, Yield: 75%); ^{1}H NMR ($CDCl_3$, 400 MHz): δ (ppm) 7.45-7.37 (m, 8H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ (ppm) 134.7, 133.5, 132.4, 122.4.

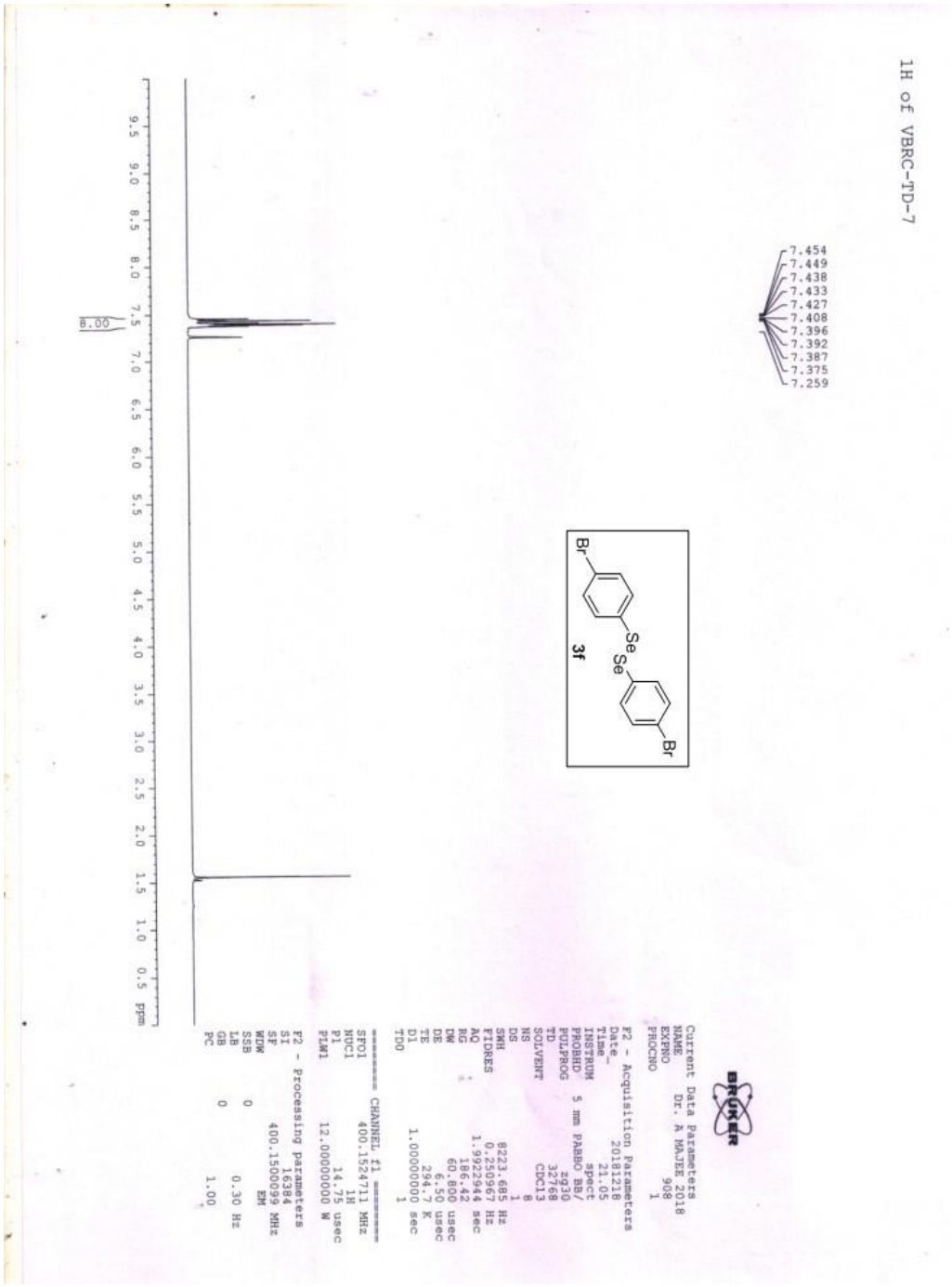

Fig. s12 ^{1}H NMR of **3f** in $CDCl_3$

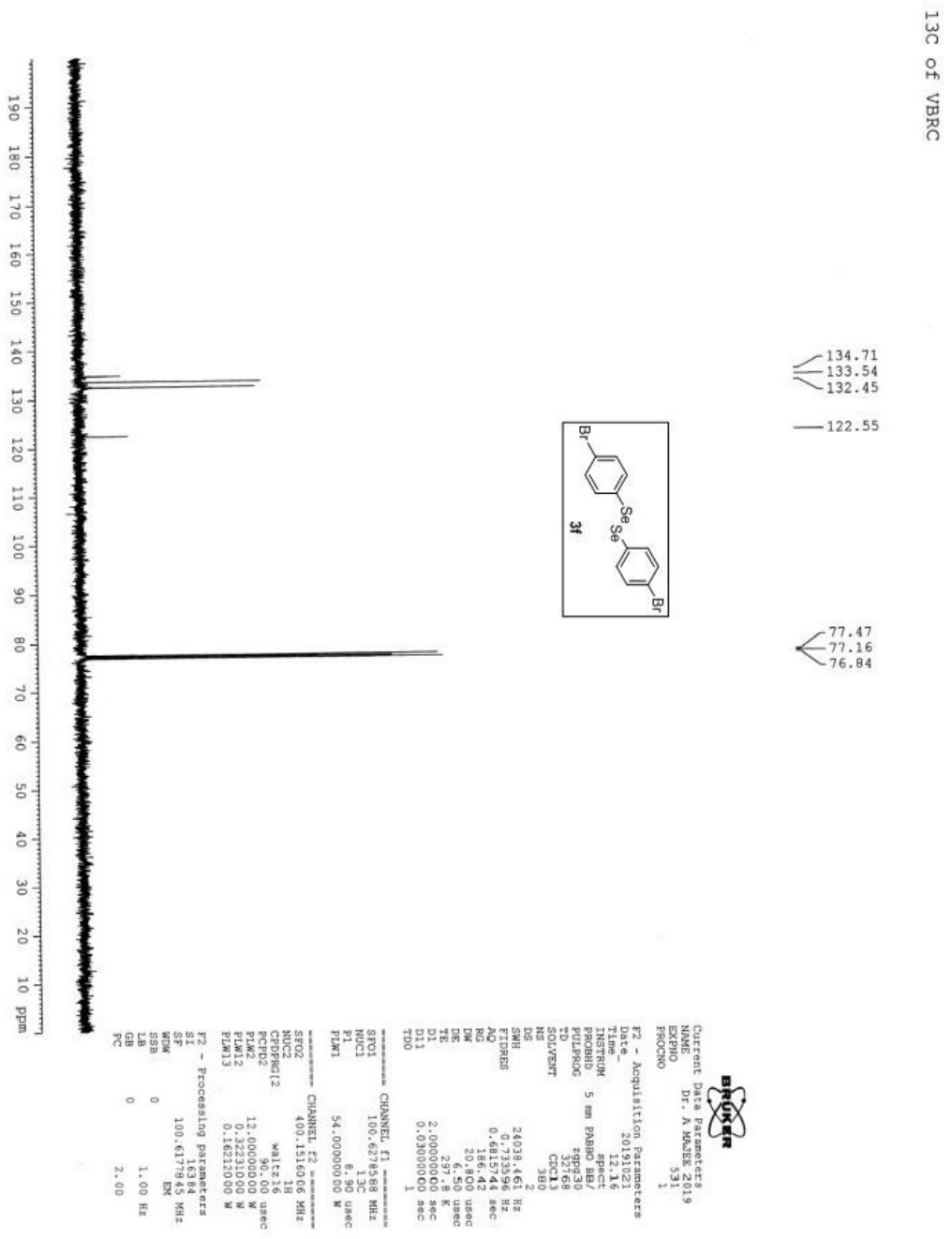

Fig. s13 ^{13}C NMR of **3f** in $CDCl_3$

1,2-bis(3-(trifluoromethyl)phenyl)diselane (3g)[3]**:** (323mg, Yield: 72%); ^{1}H NMR ($CDCl_3$, 400 MHz): δ (ppm) 7.92-7.88 (m, 1H), 7.82-7.77 (m, 2H), 7.62-7.55 (m, 3H), 7.47-7.41 (m, 2H), ^{13}C NMR ($CDCl_3$, 100 MHz): δ (ppm) 136.4, 135.0, 131.5 (2C), 130.0, 129.8, 129.6, 128.5 (q, $J_{C\text{-}F}$ = 11 Hz), 125.0 (2C), 124.8 (2C), 122.3, 119.6.

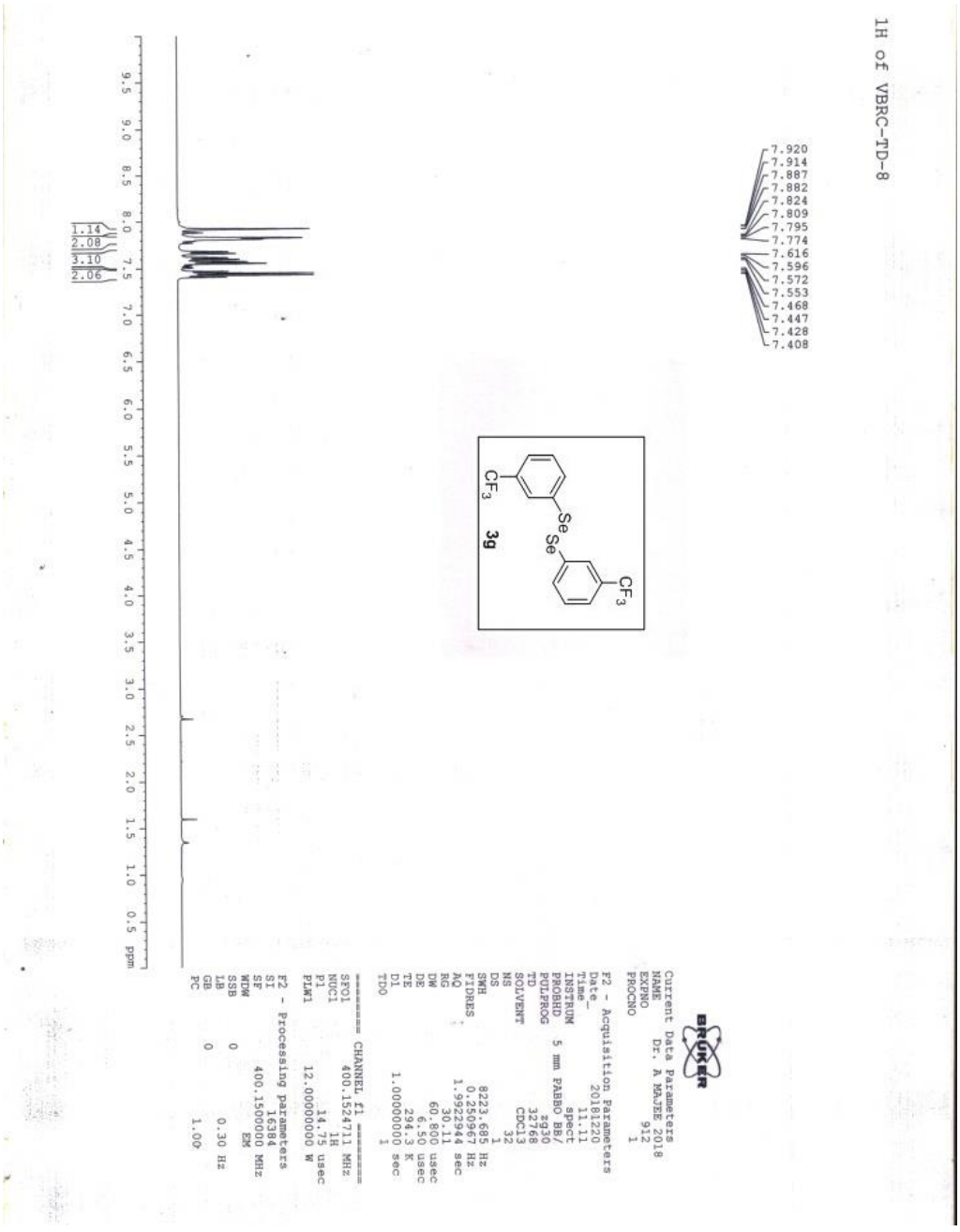

Fig. s14 ^{1}H NMR of **3g** in $CDCl_3$

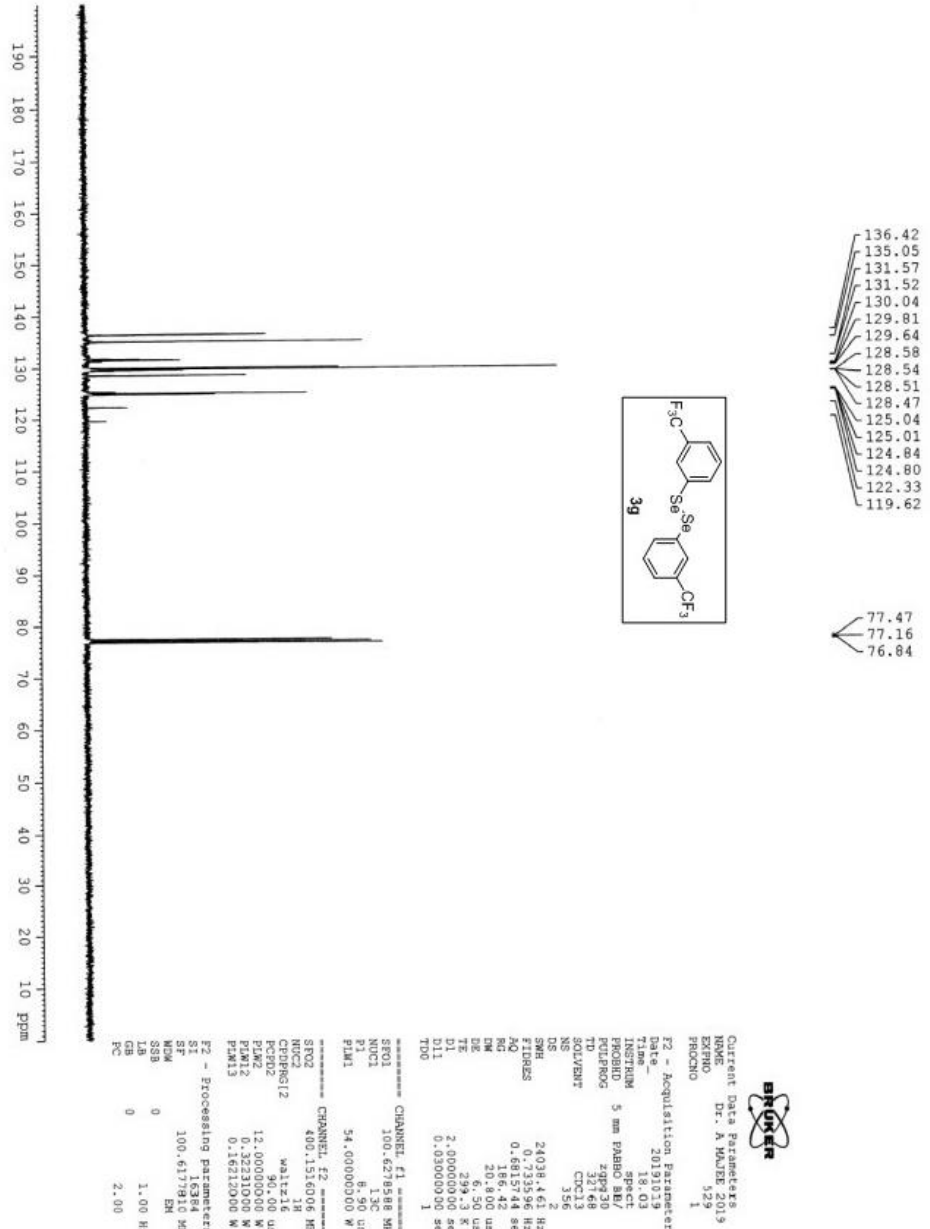

Fig. s15 ^{13}C NMR of **3g** in $CDCl_3$

1,2-di(thiophen-2-yl)diselane (3h)[4]**:** (237 mg, Yield: 73%); ^{1}H NMR ($CDCl_3$, 400 MHz): δ (ppm) 7.50-7.48 (m, 2H), 7.24-7.23 (m, 2H), 7.02-7.00 (m, 2H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ (ppm) 137.1, 134.8, 131.1, 128.0.

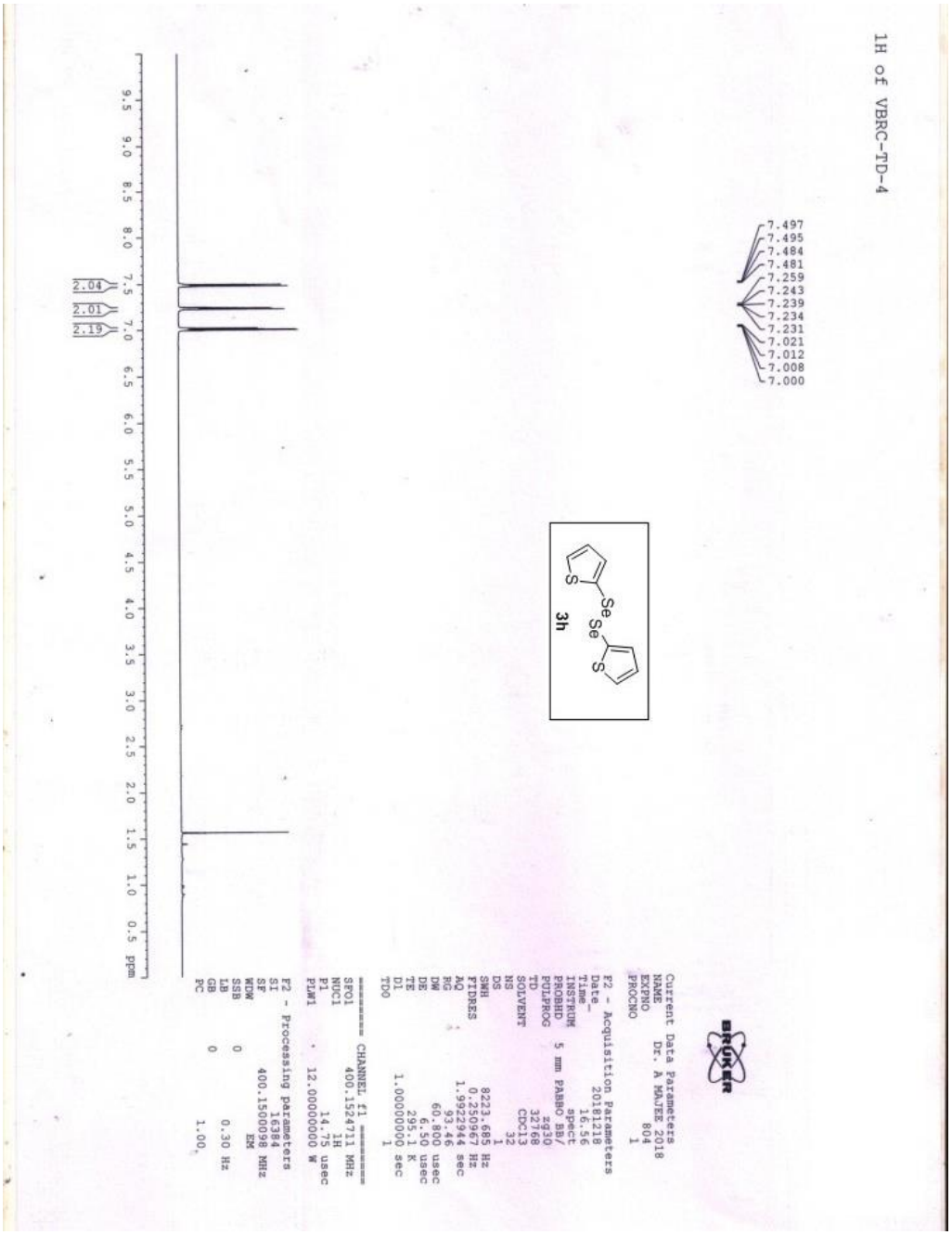

Fig. s16 ^{1}H NMR of **3h** in $CDCl_3$

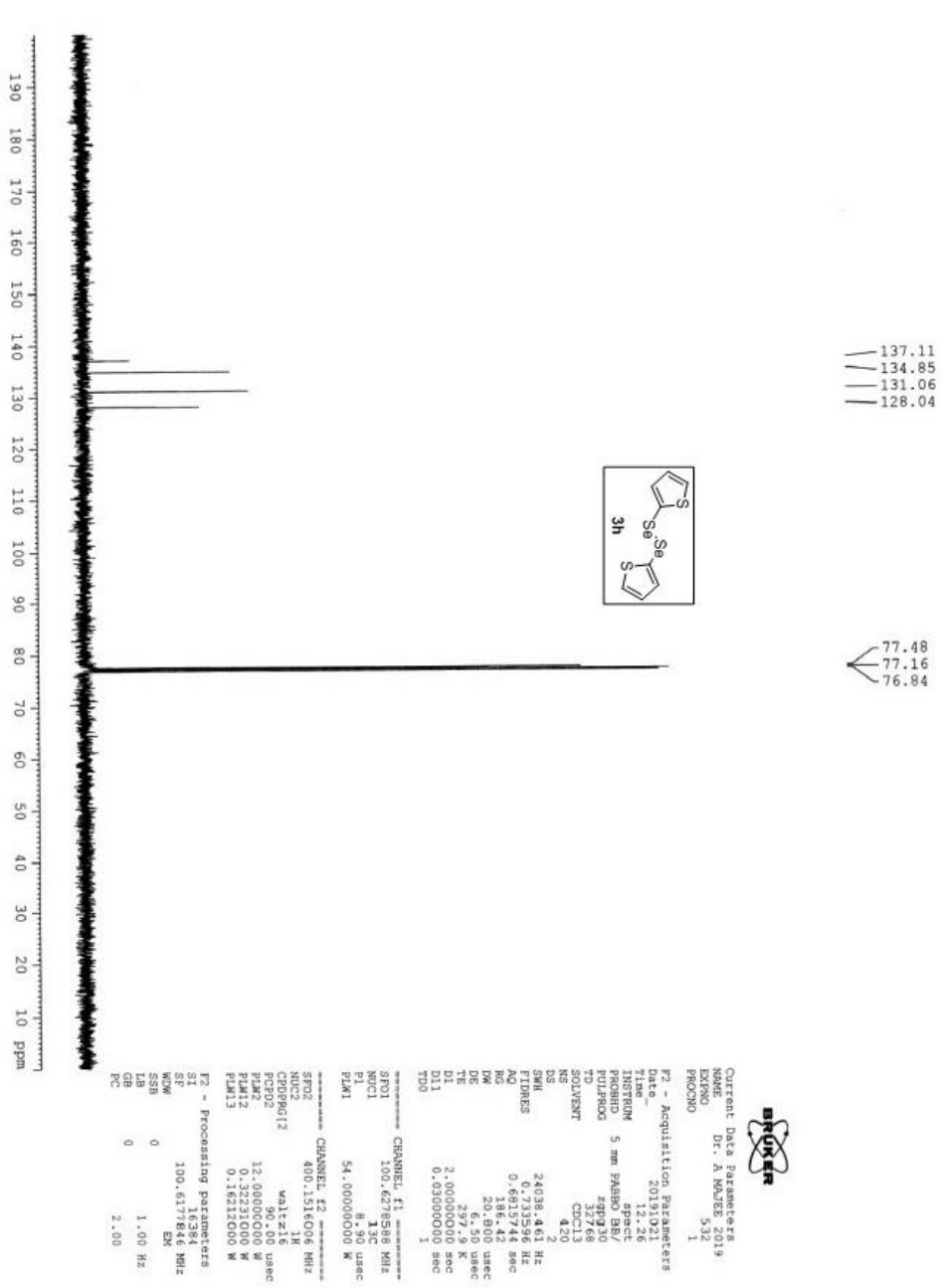

Fig. s17 ^{13}C NMR of **3h** in $CDCl_3$

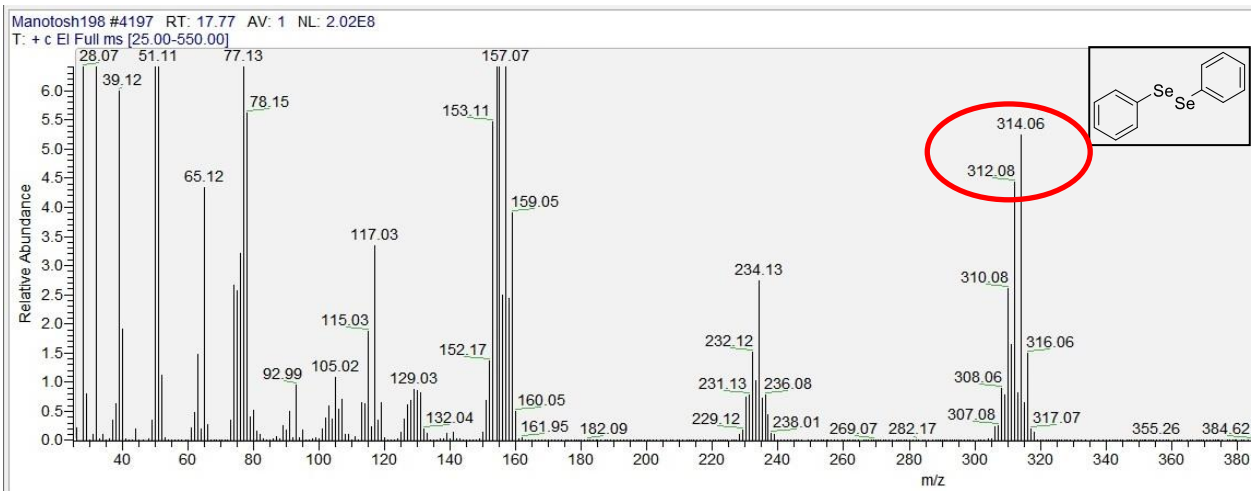

Fig. s18 Mass spectra of **3a**

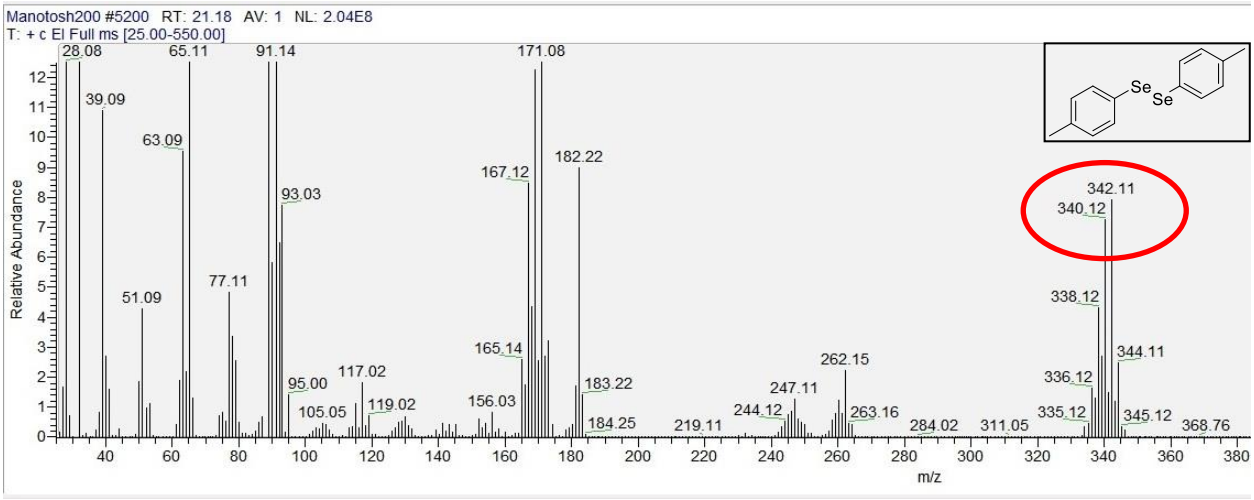

Fig. s19 Mass spectra of **3b**

References

1.	Singh, D.; Deobald, A. M.; Camargo, L. R. S.; Tabarelli, G.; Rodrigues, O. E. D.; Braga, A. L. An Efficient One-Pot Synthesis of Symmetrical Diselenides or Ditellurides from Halides with CuO Nanopowder/Se^0 or Te^0/Base. *Org. Lett.* **2010**, *12*, 3288-3291.
2.	Li, Z.; Ke, F.; Deng, H.; Xu, H.; Xiang, H.; Zhou, X. Synthesis of disulfides and diselenides by copper-catalyzed coupling reactions in water. *Org. Biomol. Chem.* **2013**, *11*, 2943-2946.
3.	Curran, S.P.; Connon, S.J. Selenide Ions as Catalysts for Homo- and Crossed-Tishchenko Reactions of Expanded Scope. *Org. Lett.* **2012**, *14*, 1074-1077.
4.	Balkrishna, S.J.; Bhakuni, B.S.; Kumar, S. Copper catalyzed/mediated synthetic methodology for ebselen and related isoselenazolones. *Tetrahedron* **2011**, *67*, 9565-9575.