Electronic Supplementary Material (ESI) for Organic Chemistry Frontiers.

Electronic Supplementary Information

Highly Selective Synthesis of Bis-sulfanyl Substituted Conjugated Dienes by Copper-Palladium Cooperative Catalysis

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1. Crystal data of compound 4b

Empirical formula	$C_{32}H_{30}S_2$ (**CCDC**: 2023253)
Formula weight	478.70
Temperature	293(2) K
Wavelength	0.71073 Å
Crystal system	Monoclinic
Space group	P2(1)/c
Unit cell dimensions	a = 8.7800(10) Å $\alpha = 90^o$
	b = 12.5320(8) Å β = 92.22(2) ^{o}
	c = 11.4990(6) Å $\gamma = 90^o$
Volume	1264.30(18) $Å^3$
Z	2
Density (calculated)	1.257 mg/m^3
Absorption coefficient	0.229 mm^{-1}
F(000）	508
Crystal size	0.29×0.25×0.22 mm^3
Theta range for data collection	2.32 to 25.00 ^{o}
Index ranges	-10<=h<=10, -7<=k<=14, -13<=l<=13
Reflections collected	6150
Independent reflections	2225 [R(int) = 0.0719]
Completeness to theta = 25.00^o	99.8 %
Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	0.9512 and 0.9364
Refinement method	Full-matrix least-squares on F^2
Data / restraints / parameters	2223 / 0 / 154
Goodness-of-fit on F^2	1.089
Final R indices [I>2sigma(I)]	R_1 = 0.0550, wR_2 = 0.1021
R indices (all data)	R_1 = 0.0969, wR_2 = 0.1109
Largest diff. peak and hole	0.334 and -0.231 e.$Å^{-3}$

2. ^{1}H and ^{13}C NMR Spectra of 4

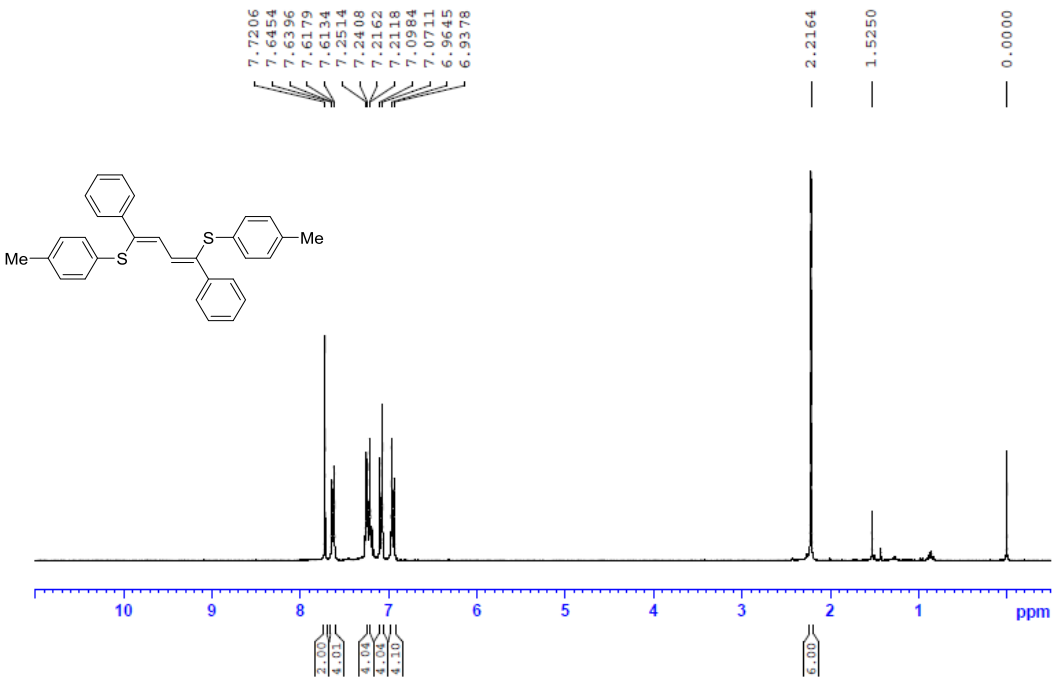

Figure S-1 ^{1}H NMR spectrum of compound **4a** (300 MHz, $CDCl_3$)

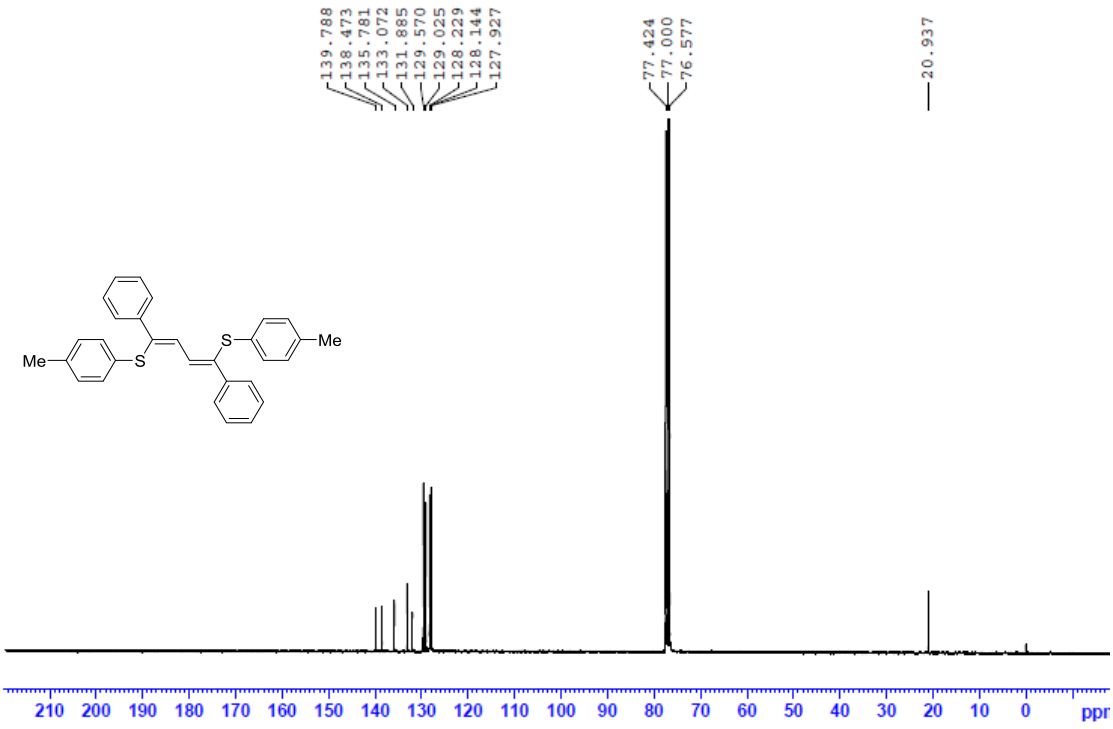

Figure S-2 ^{13}C NMR spectrum of compound **4a** (75 MHz, $CDCl_3$)

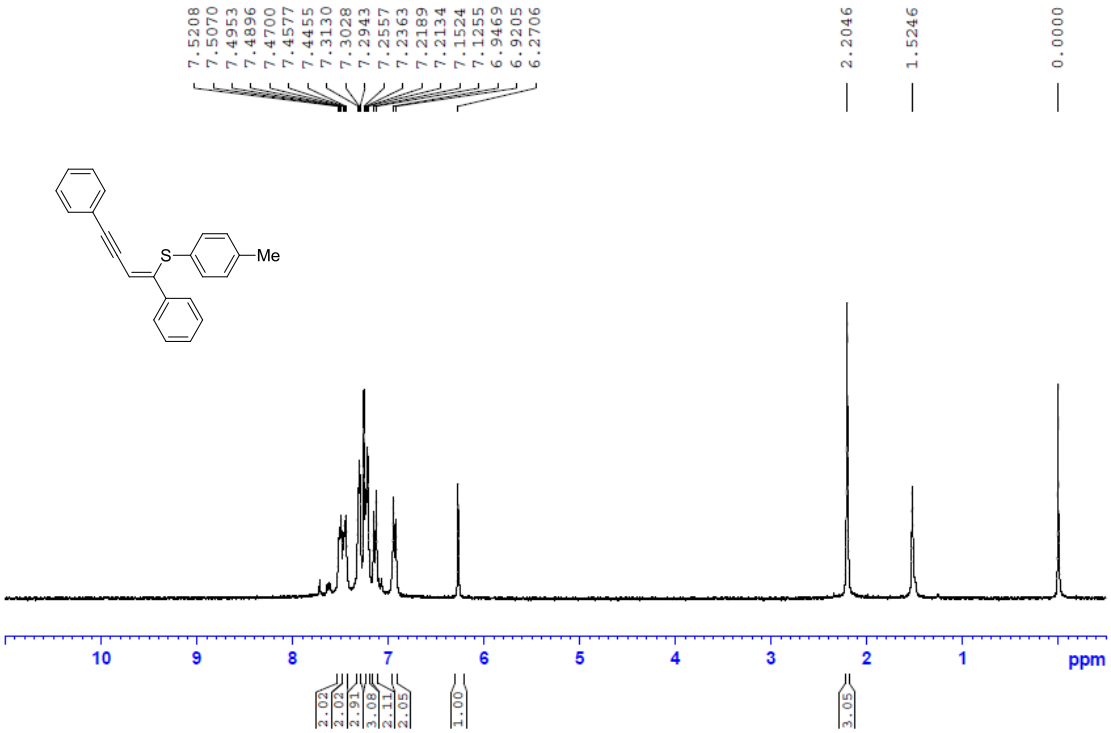

Figure S-3 ^{1}H NMR spectrum of compound **4a'** (300 MHz, $CDCl_3$)

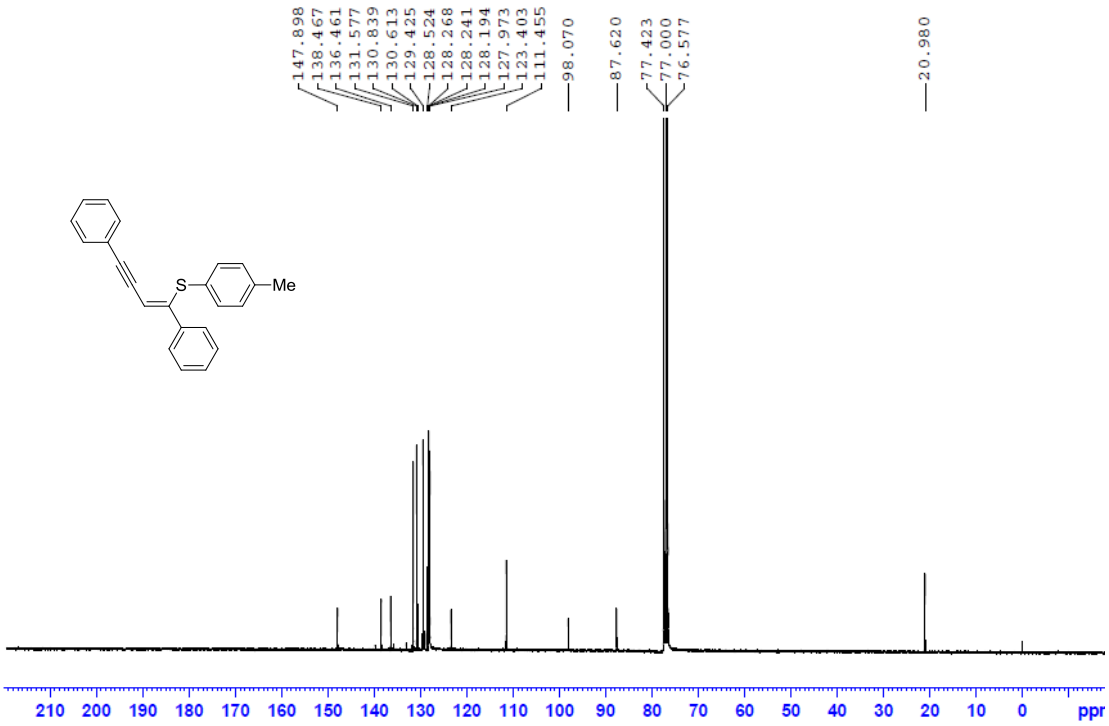

Figure S-4 ^{13}C NMR spectrum of compound **4a'** (75 MHz, $CDCl_3$)

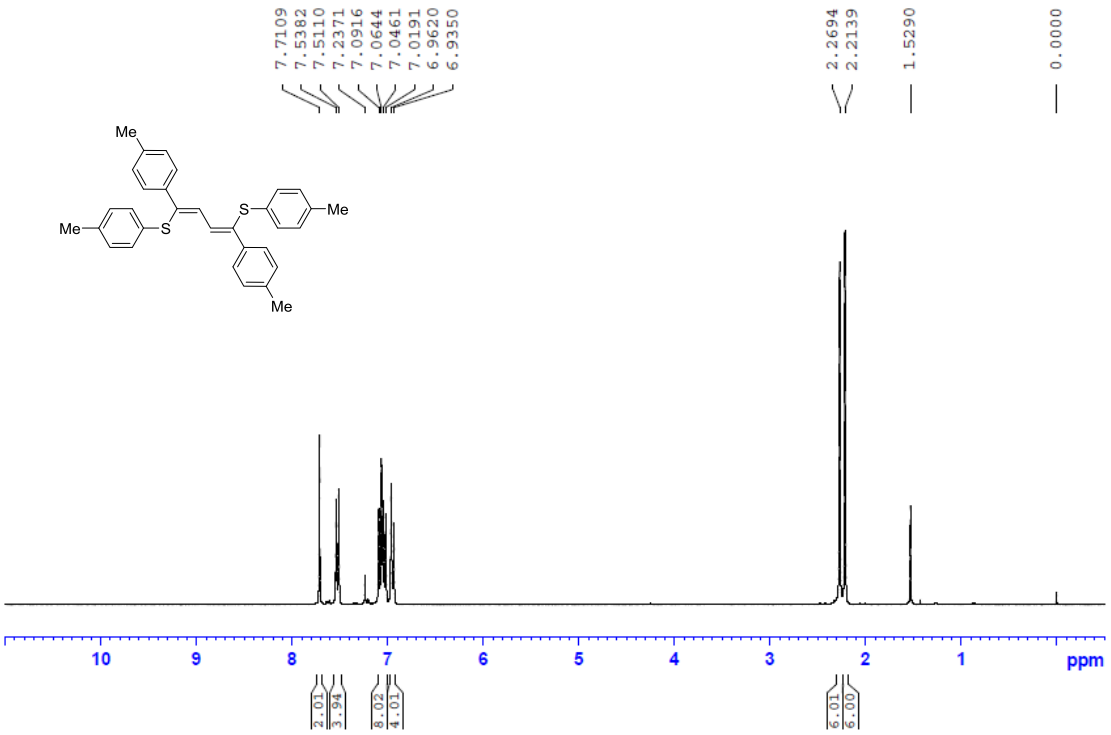

Figure S-5 ^{1}H NMR spectrum of compound **4b** (300 MHz, $CDCl_3$)

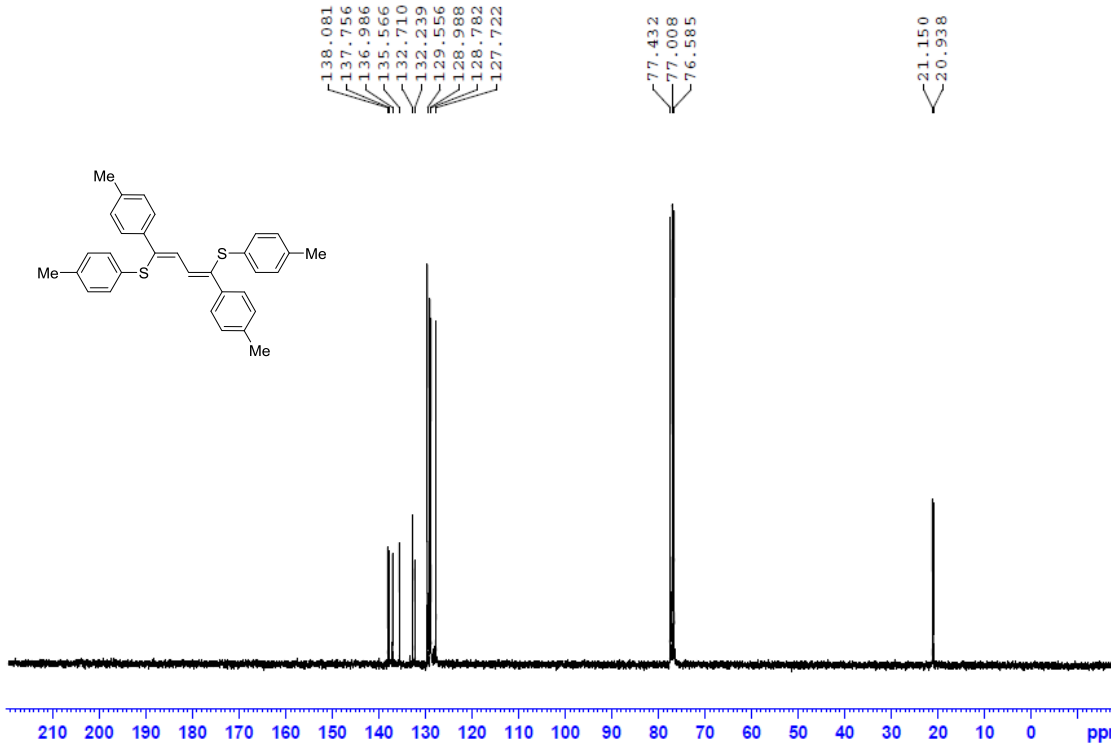

Figure S-6 ^{13}C NMR spectrum of compound **4b** (75 MHz, $CDCl_3$)

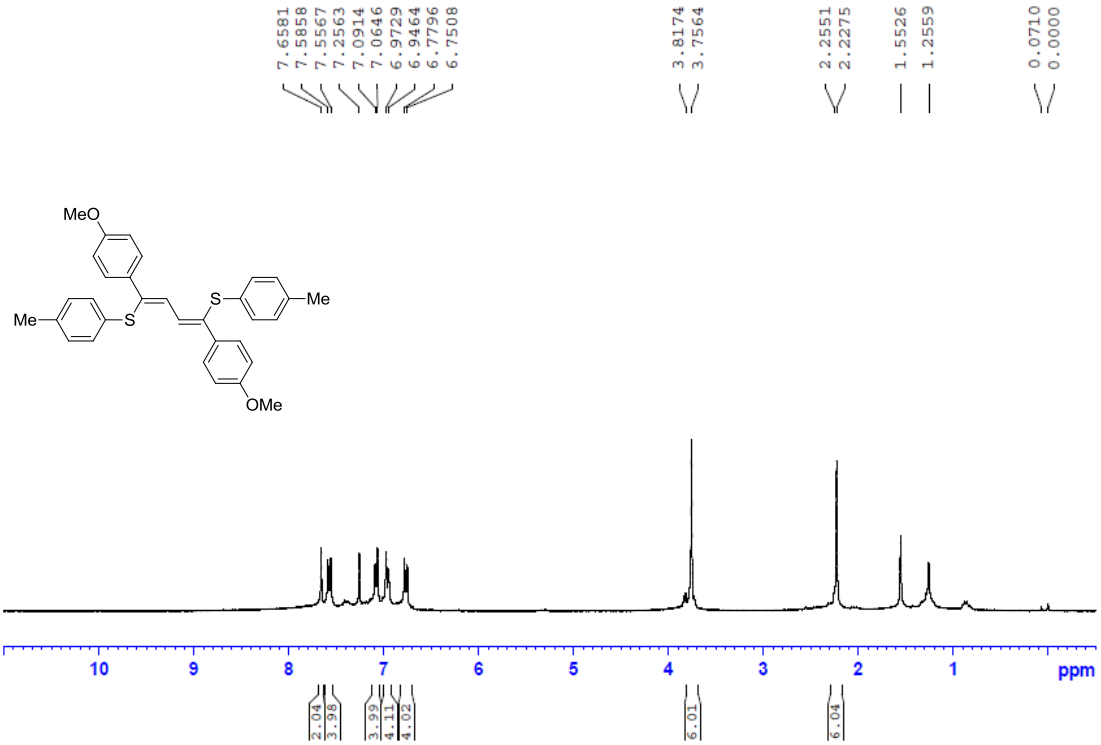

Figure S-7 ^{1}H NMR spectrum of compound **4c** (300 MHz, $CDCl_3$)

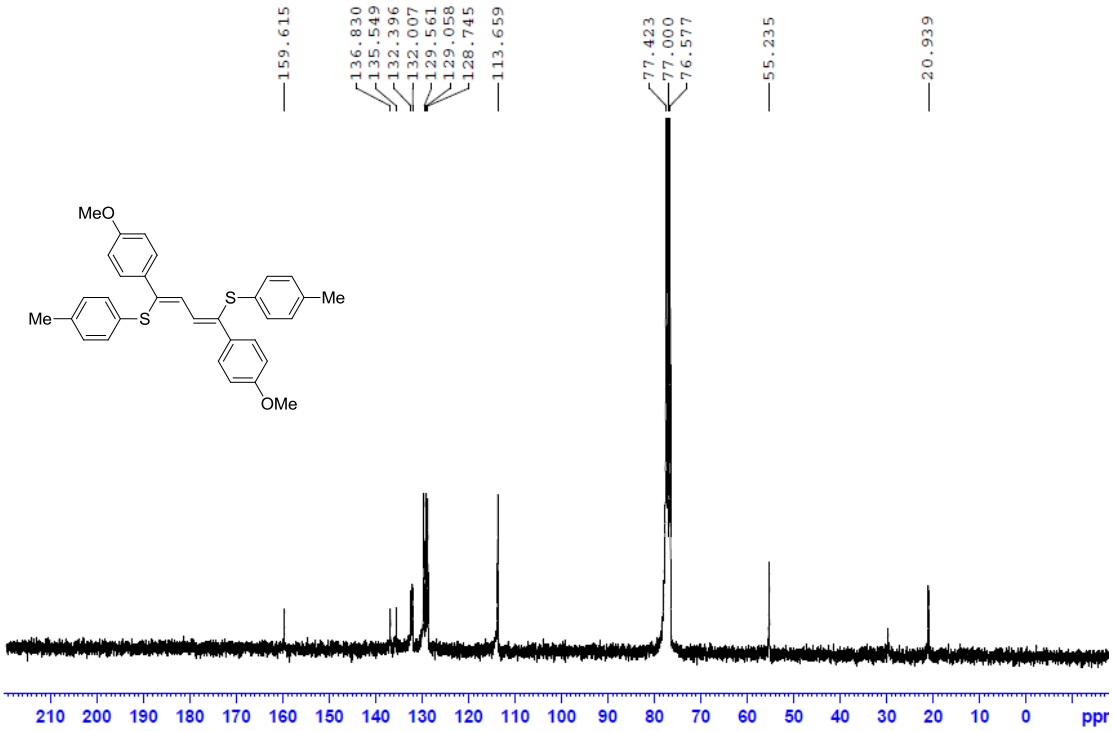

Figure S-8 ^{13}C NMR spectrum of compound **4c** (75 MHz, $CDCl_3$)

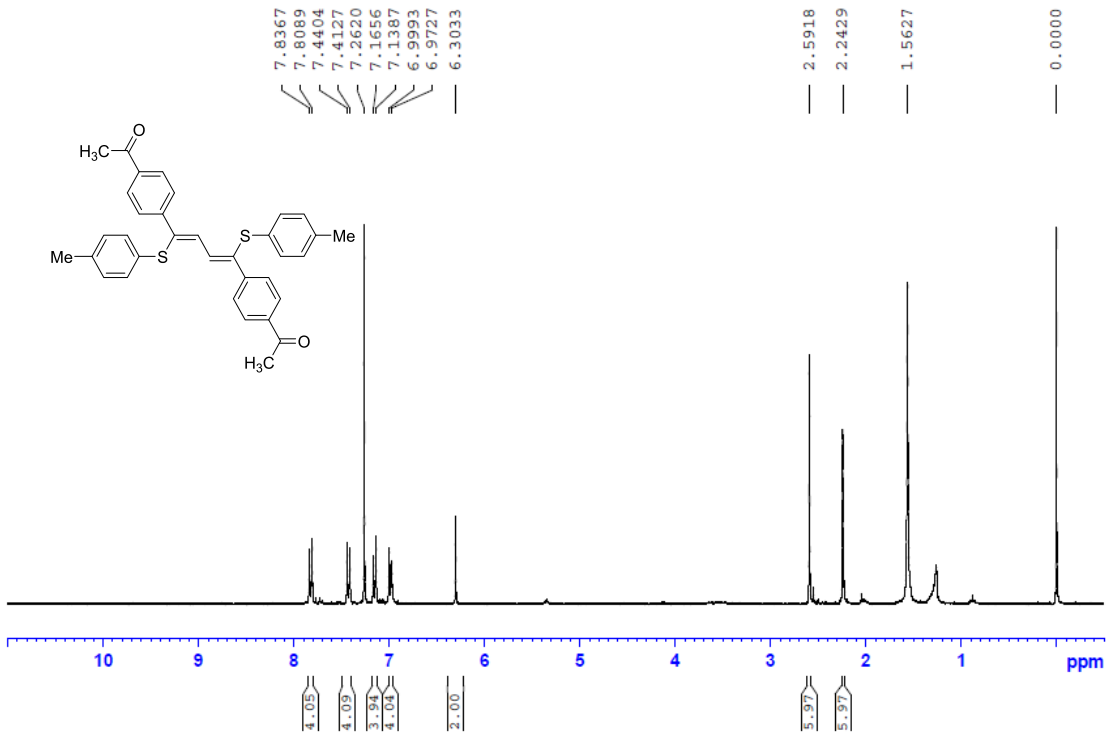

Figure S-9 ^{1}H NMR spectrum of compound **4d** (300 MHz, $CDCl_3$)

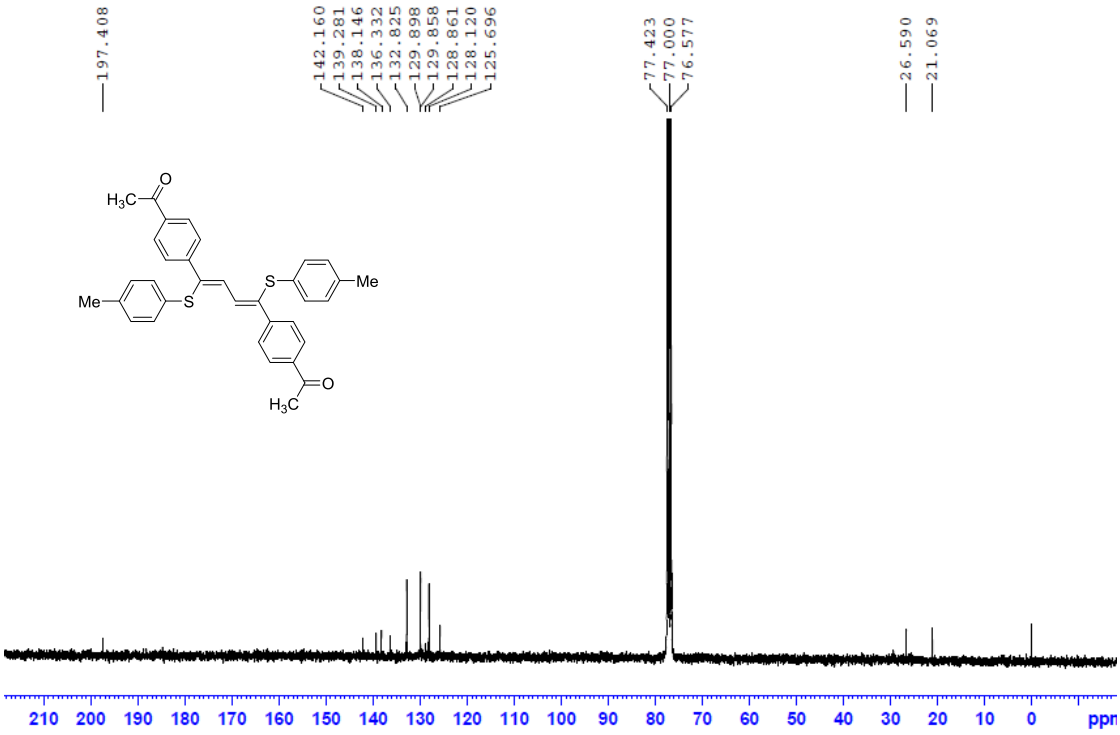

Figure S-10 ^{13}C NMR spectrum of compound **4d** (75 MHz, $CDCl_3$)

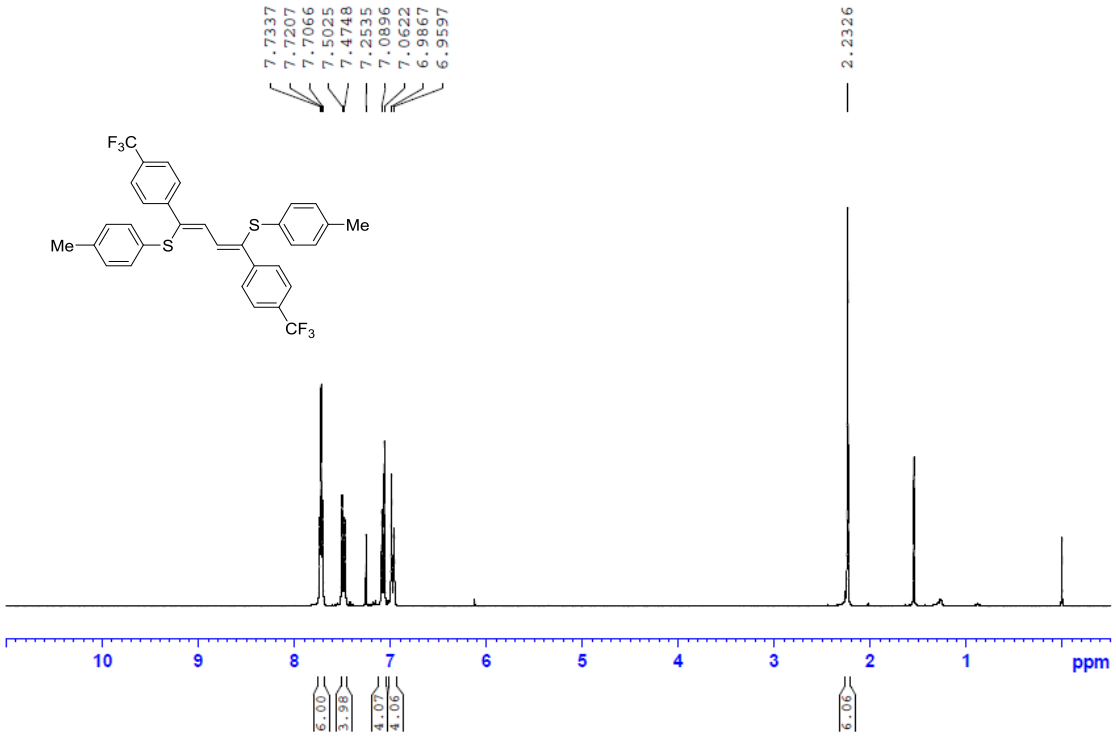

Figure S-11 ^{1}H NMR spectrum of compound **4e** (300 MHz, $CDCl_3$)

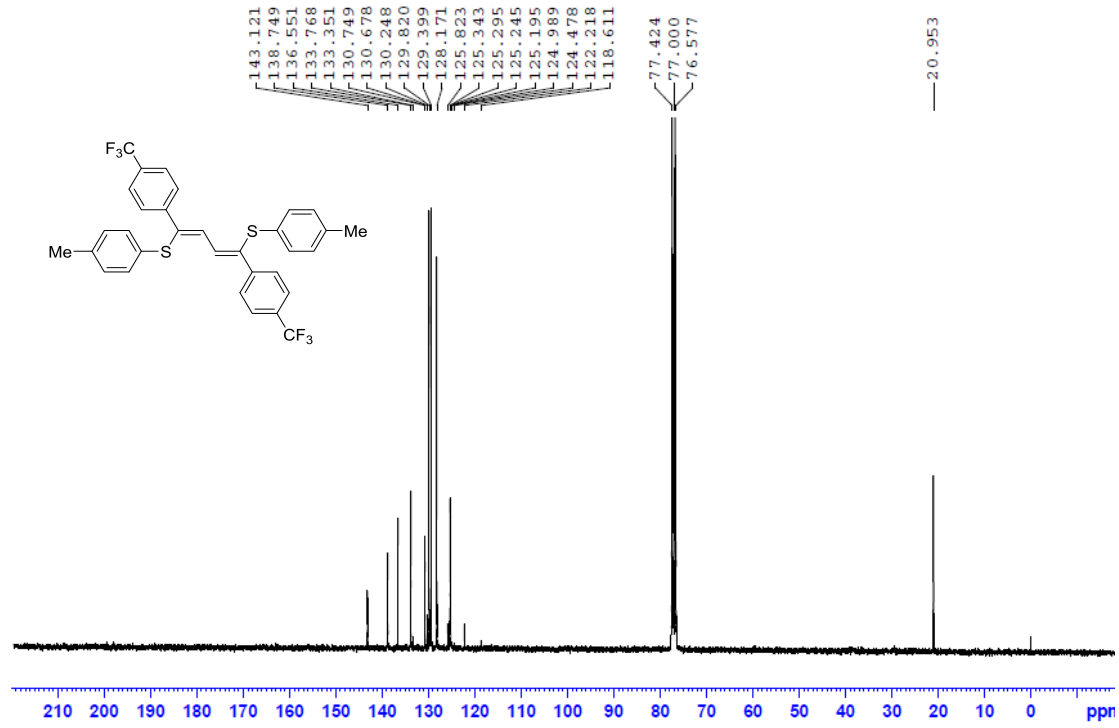

Figure S-12 ^{13}C NMR spectrum of compound **4e** (75 MHz, $CDCl_3$)

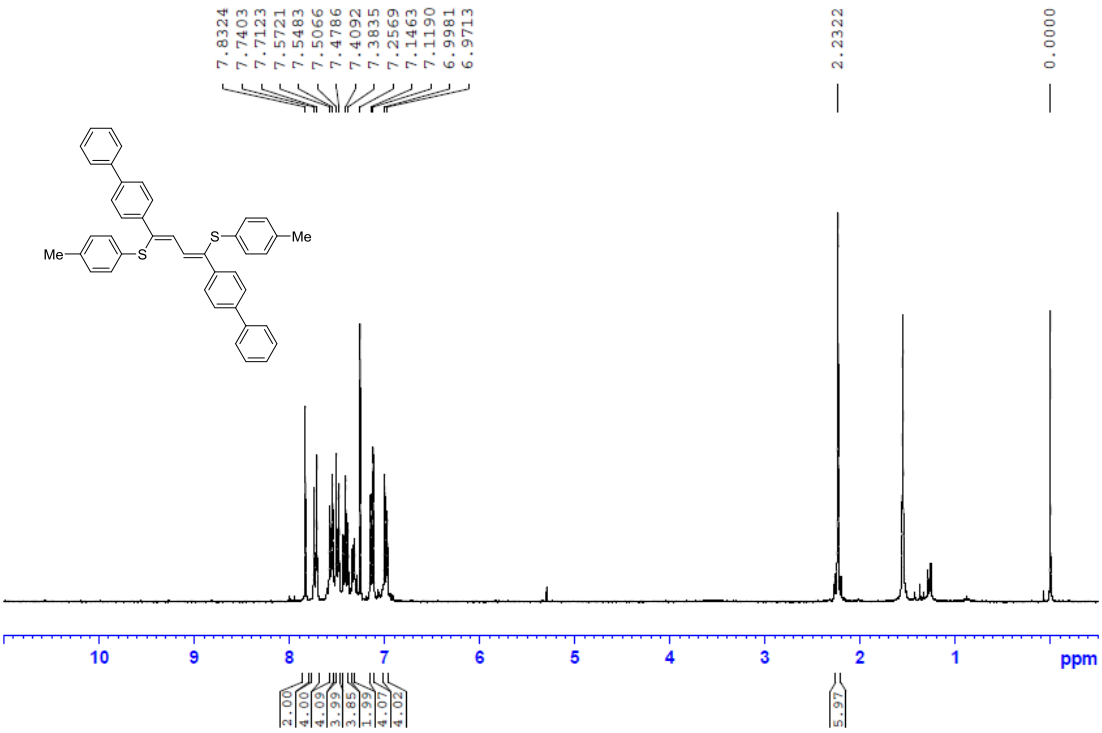

Figure S-13 ^{1}H NMR spectrum of compound **4f** (300 MHz, $CDCl_3$)

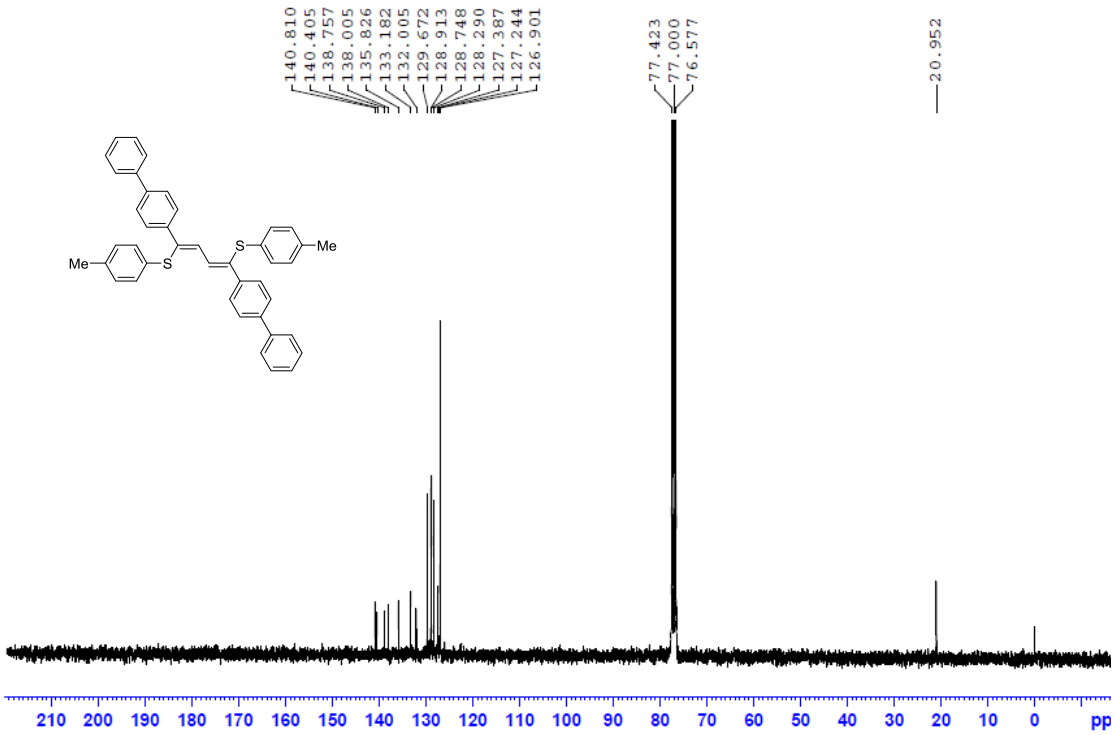

Figure S-14 ^{13}C NMR spectrum of compound **4f** (75 MHz, $CDCl_3$)

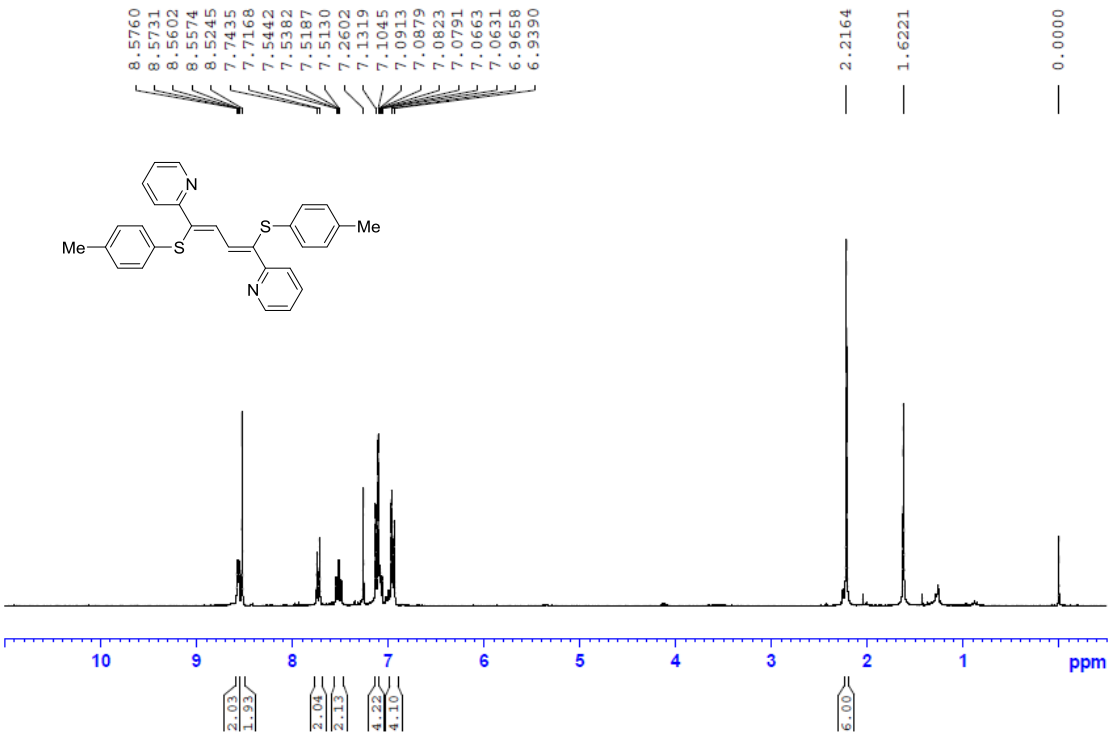

Figure S-15 ^{1}H NMR spectrum of compound **4g** (300 MHz, $CDCl_3$)

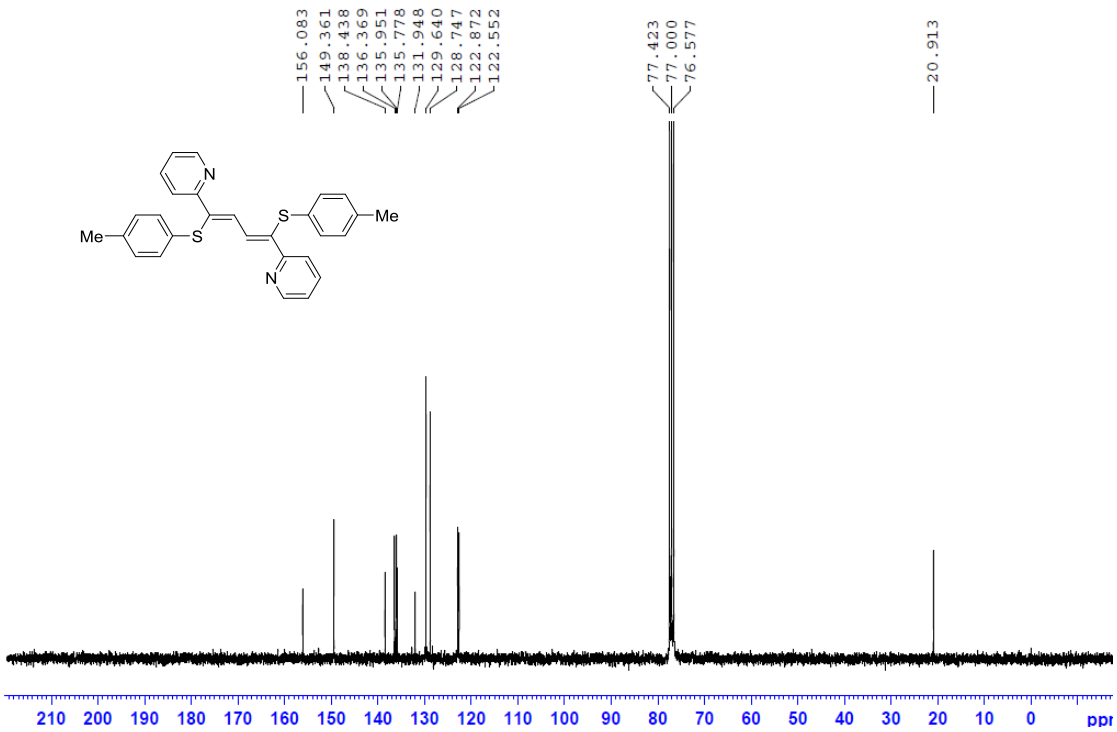

Figure S-16 ^{13}C NMR spectrum of compound **4g** (75 MHz, $CDCl_3$)

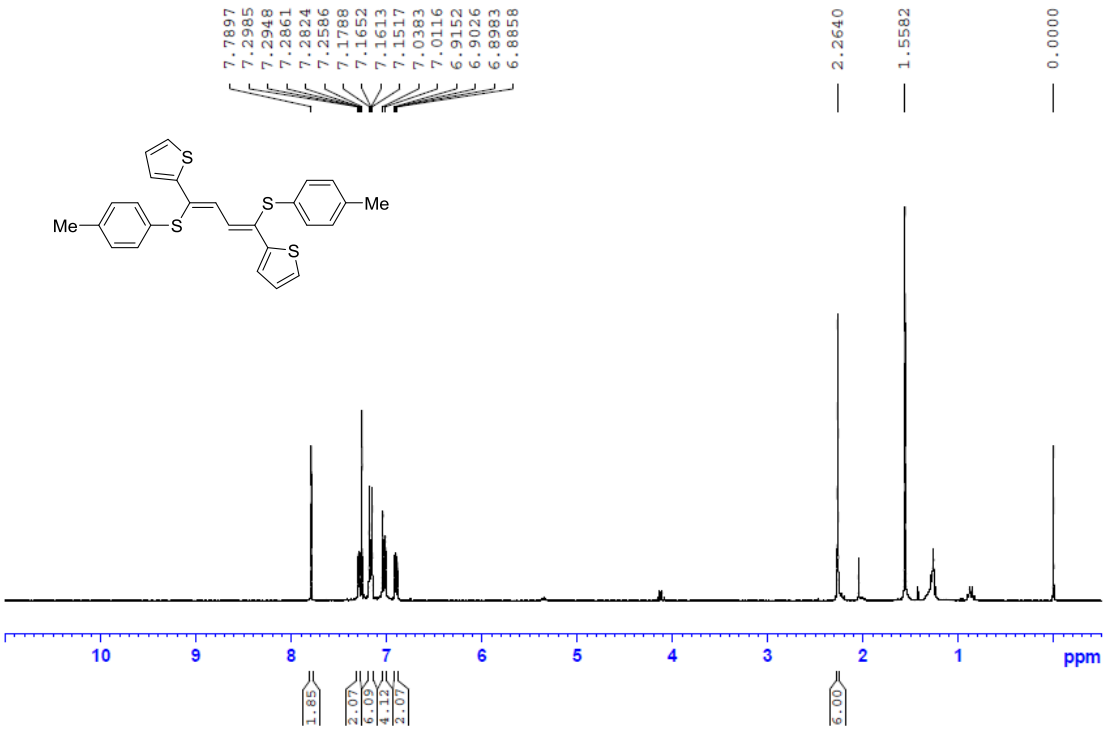

Figure S-17 ^{1}H NMR spectrum of compound **4h** (300 MHz, $CDCl_3$)

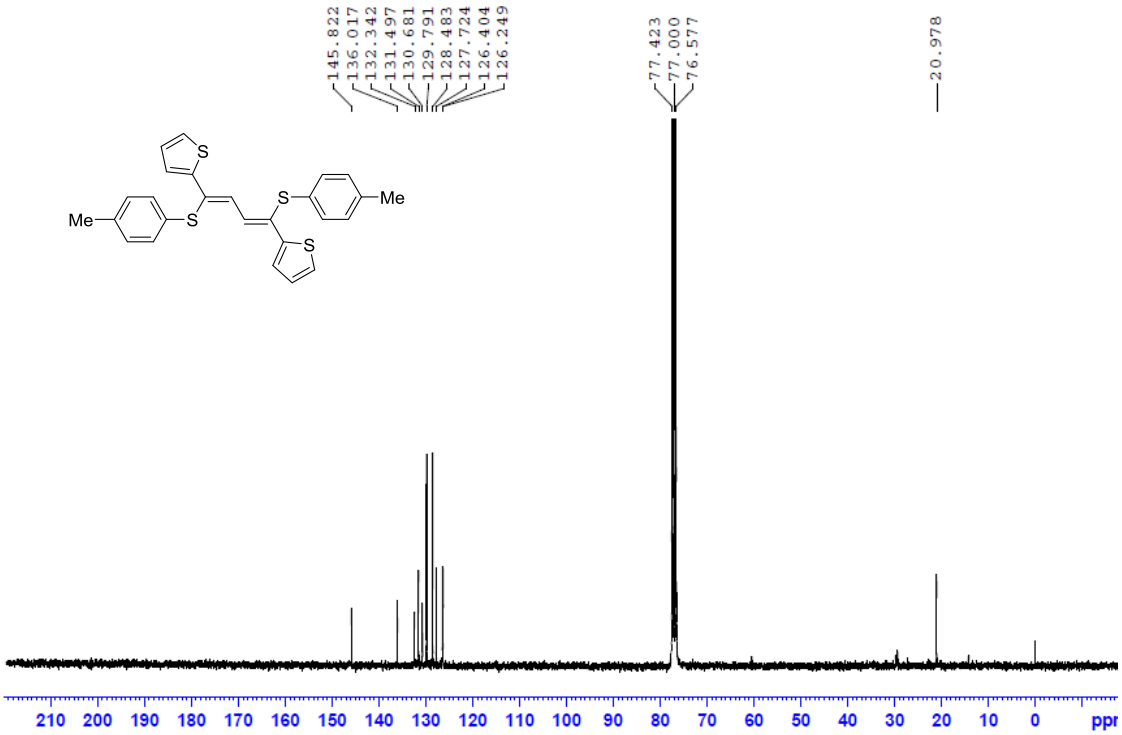

Figure S-18 ^{13}C NMR spectrum of compound **4h** (75 MHz, $CDCl_3$)

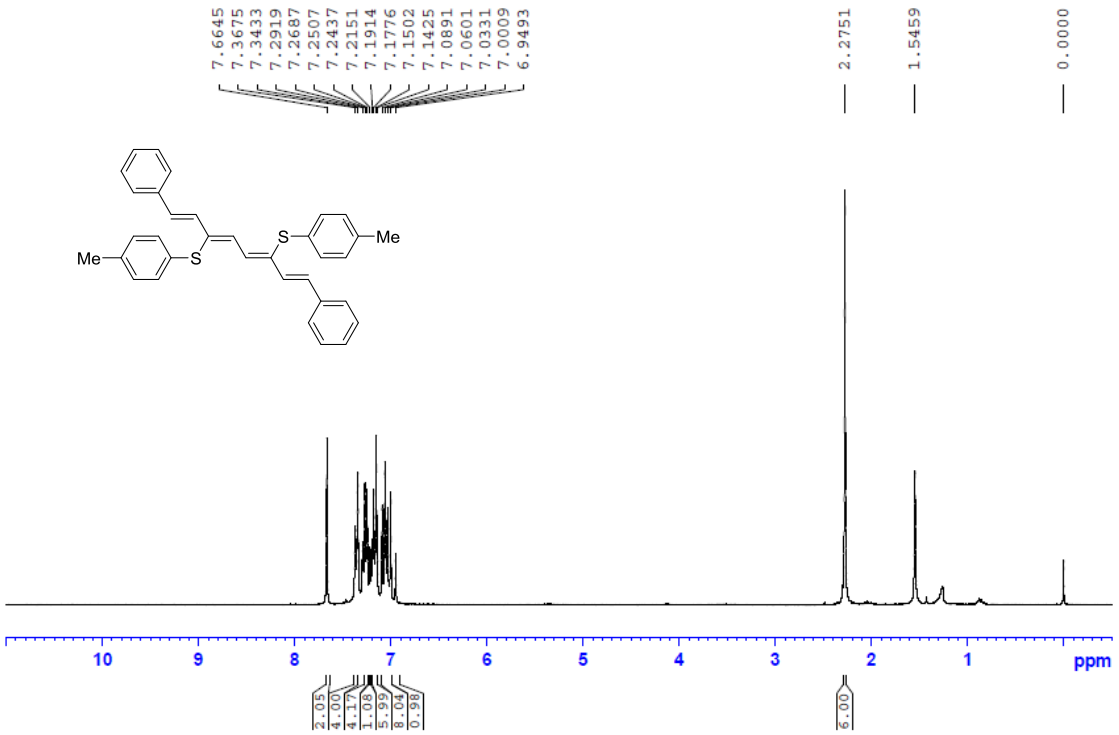

Figure S-19 ^{1}H NMR spectrum of compound **4i** (300 MHz, $CDCl_3$)

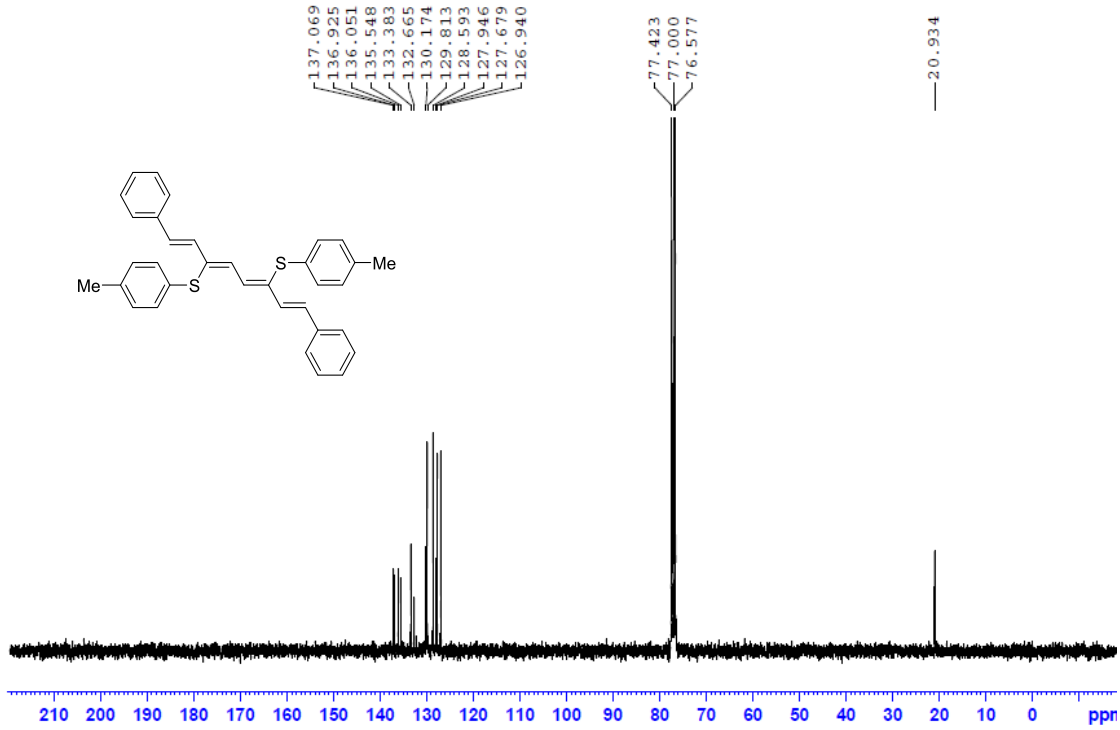

Figure S-20 ^{13}C NMR spectrum of compound **4i** (75 MHz, $CDCl_3$)

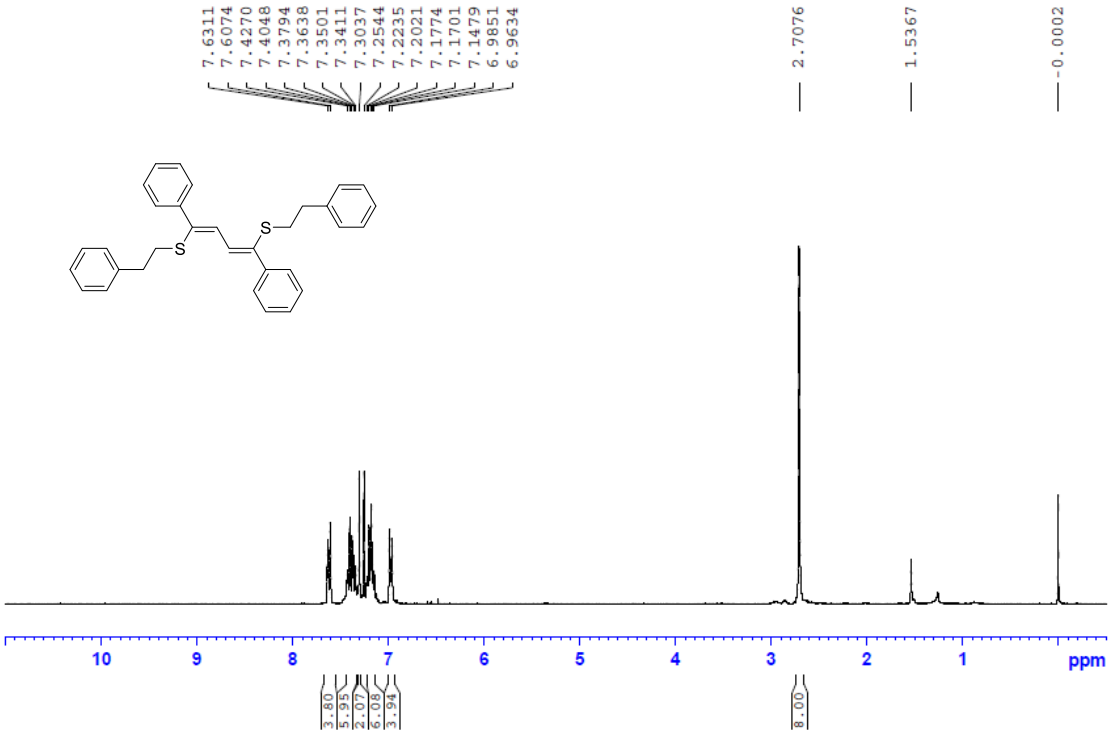

Figure S-21 ^{1}H NMR spectrum of compound **4j** (300 MHz, $CDCl_3$)

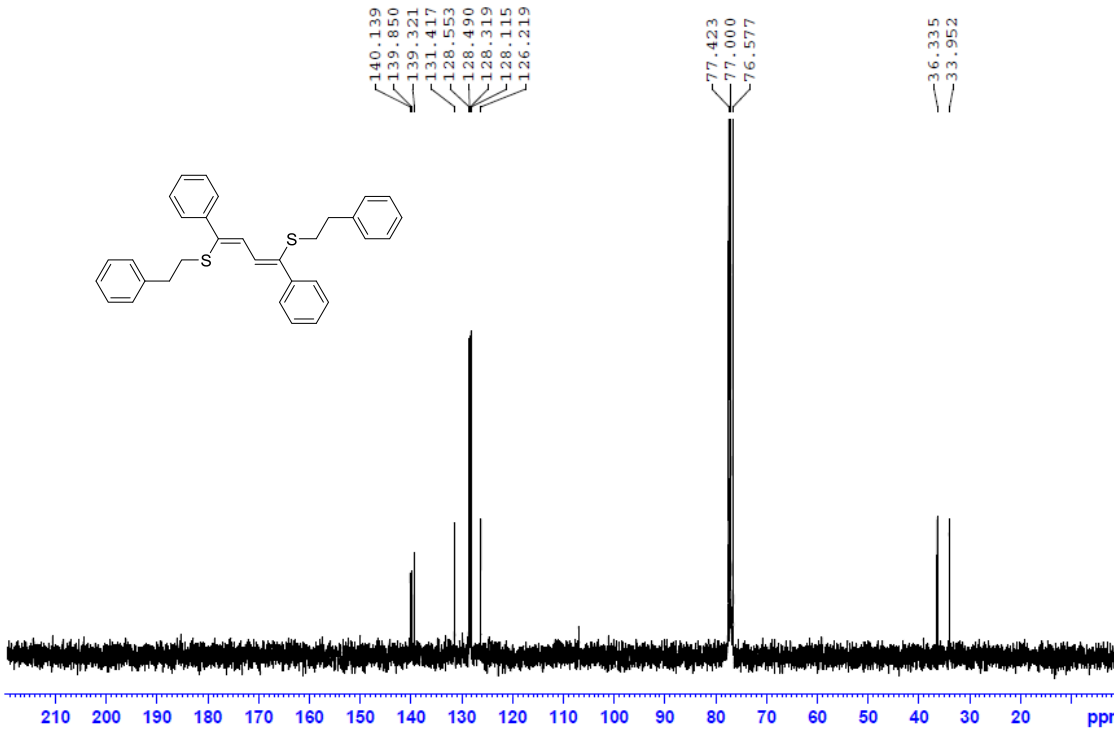

Figure S-22 ^{13}C NMR spectrum of compound **4j** (75 MHz, $CDCl_3$)

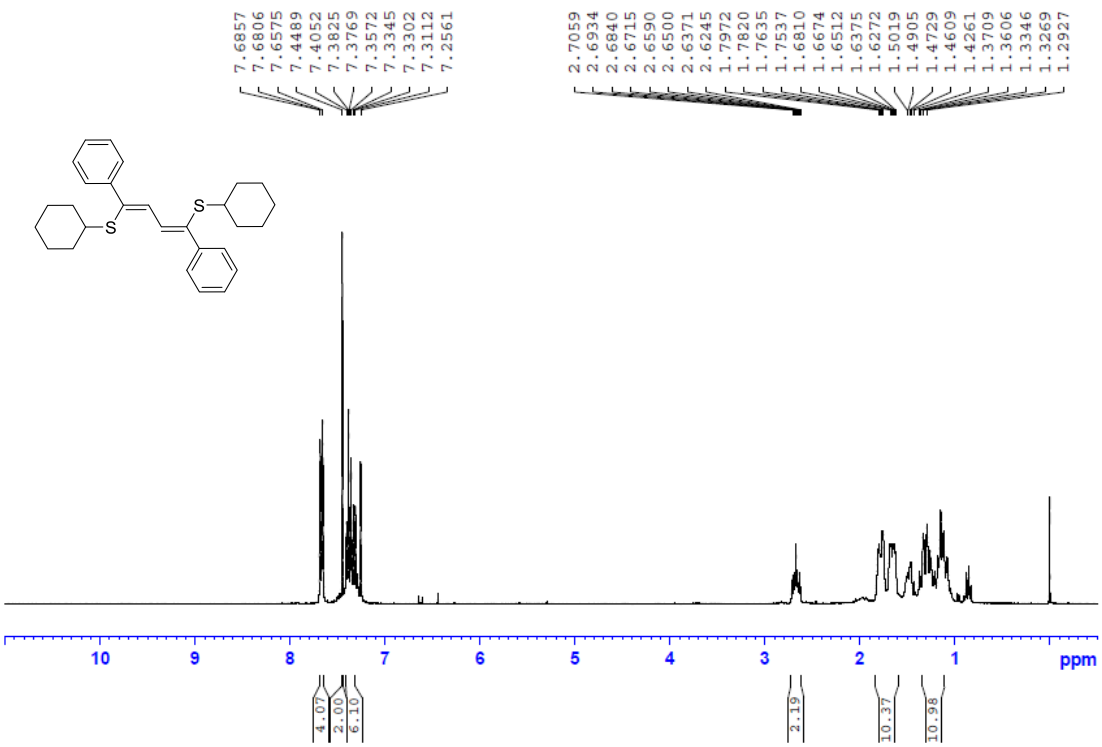

Figure S-23 ^{1}H NMR spectrum of compound **4k** (300 MHz, $CDCl_3$)

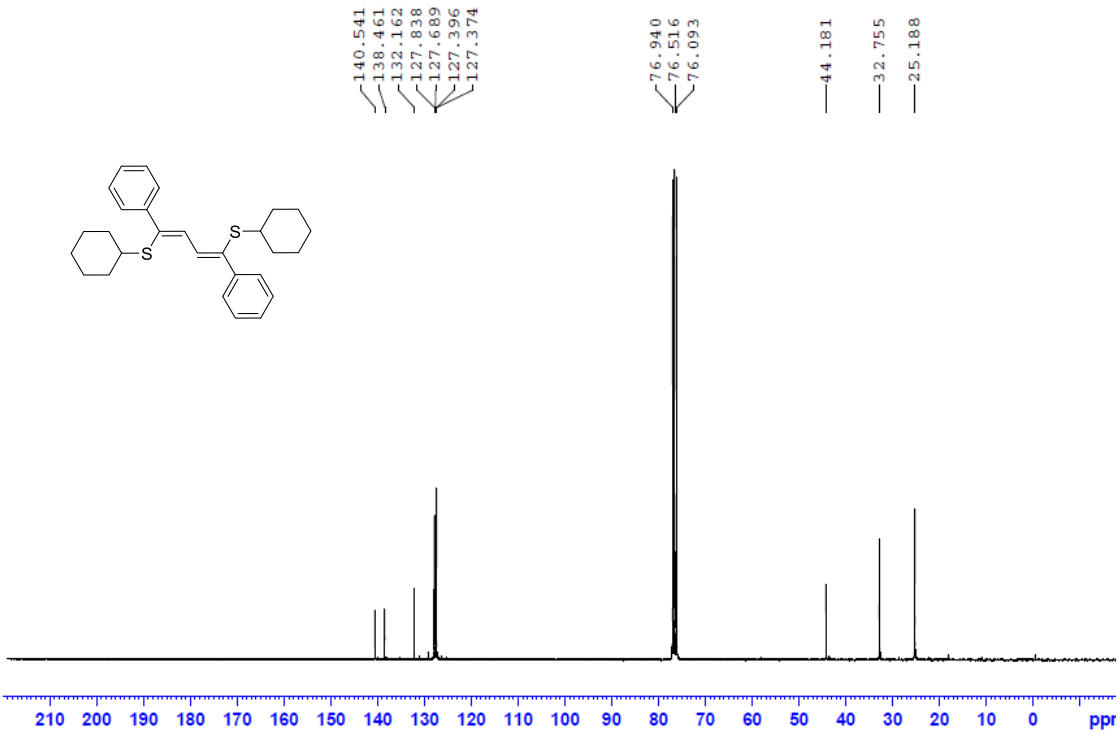

Figure S-24 ^{13}C NMR spectrum of compound **4k** (75 MHz, $CDCl_3$)

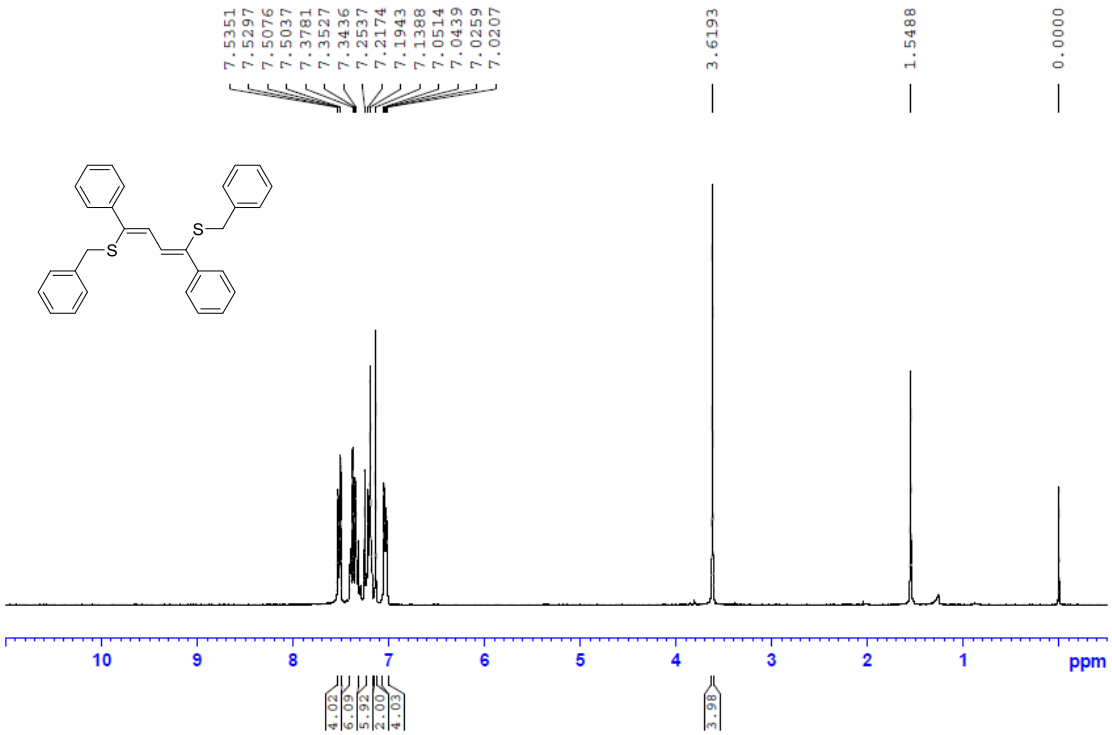

Figure S-25 ^{1}H NMR spectrum of compound **4l** (300 MHz, $CDCl_3$)

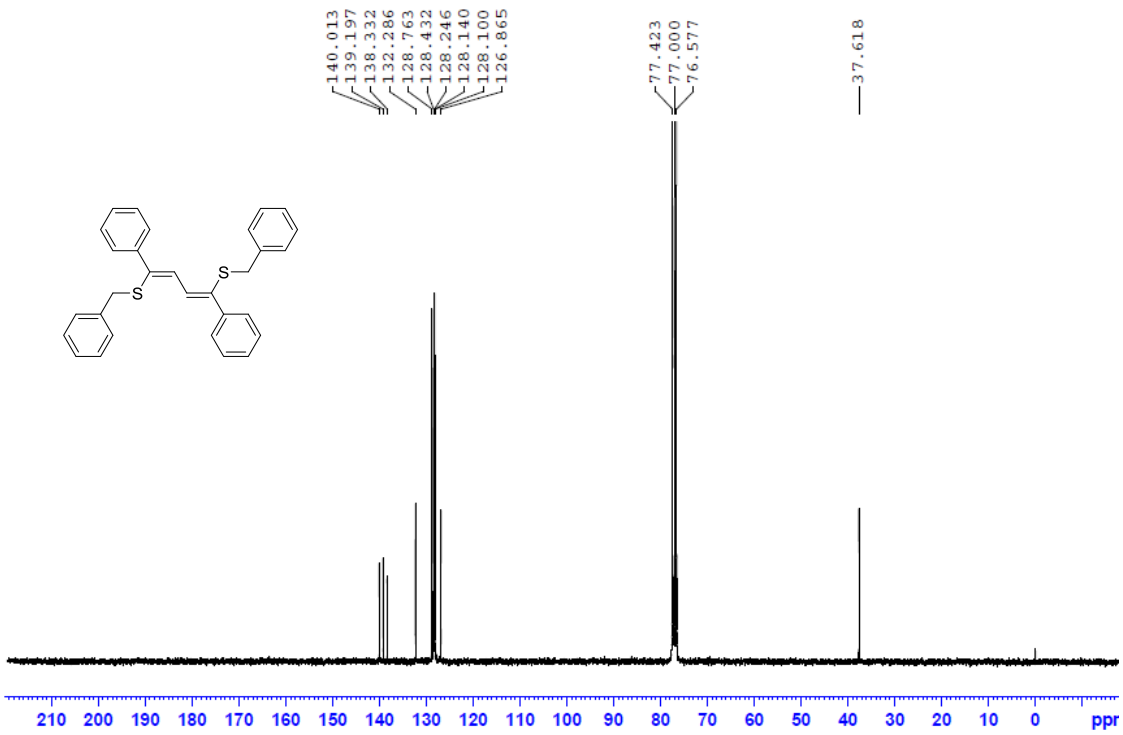

Figure S-26 ^{13}C NMR spectrum of compound **4l** (75 MHz, $CDCl_3$)

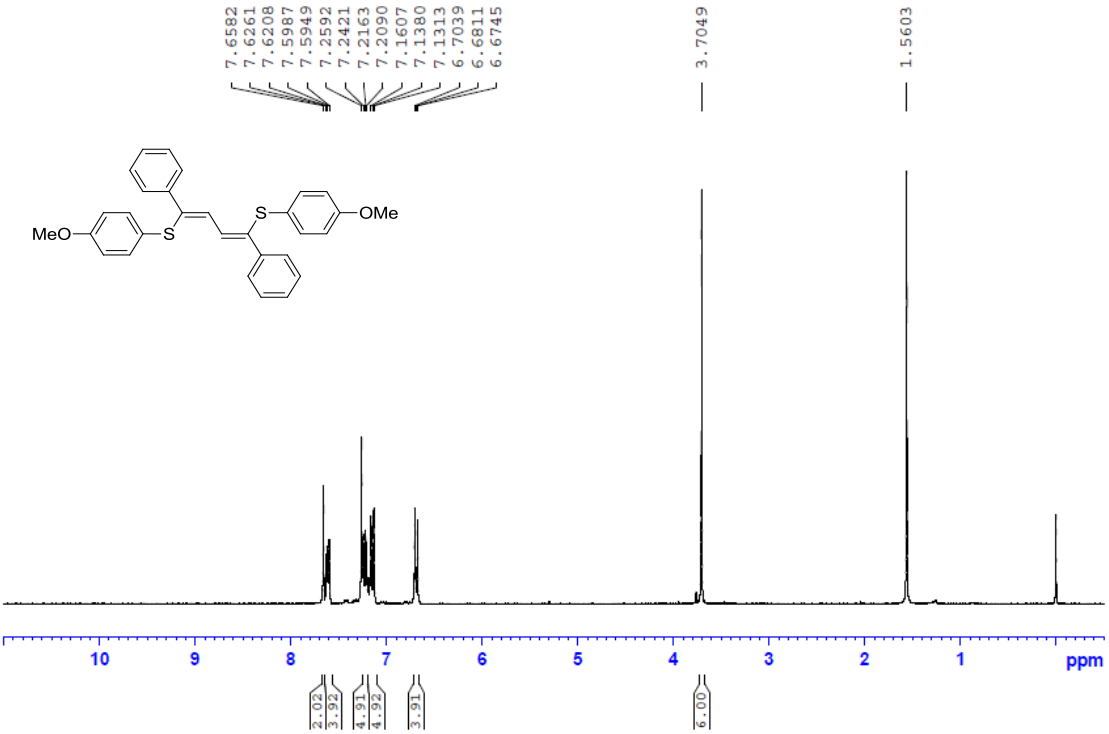

Figure S-27 ^{1}H NMR spectrum of compound **4m** (300 MHz, $CDCl_3$)

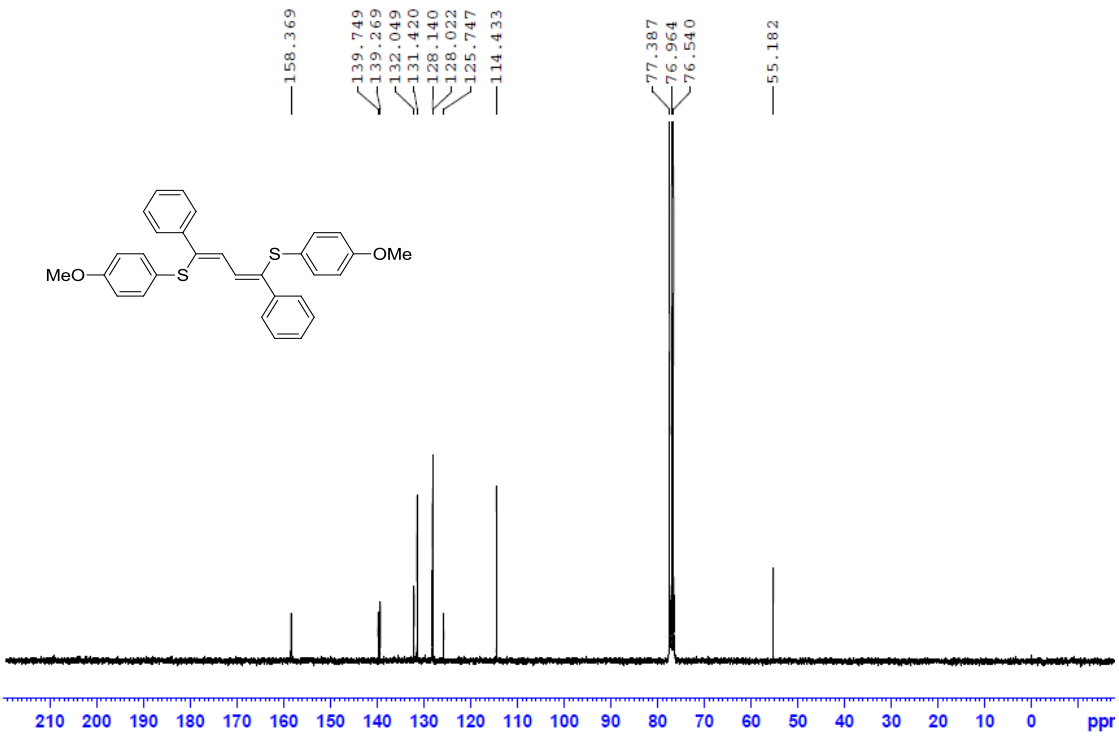

Figure S-28 ^{13}C NMR spectrum of compound **4m** (75 MHz, $CDCl_3$)

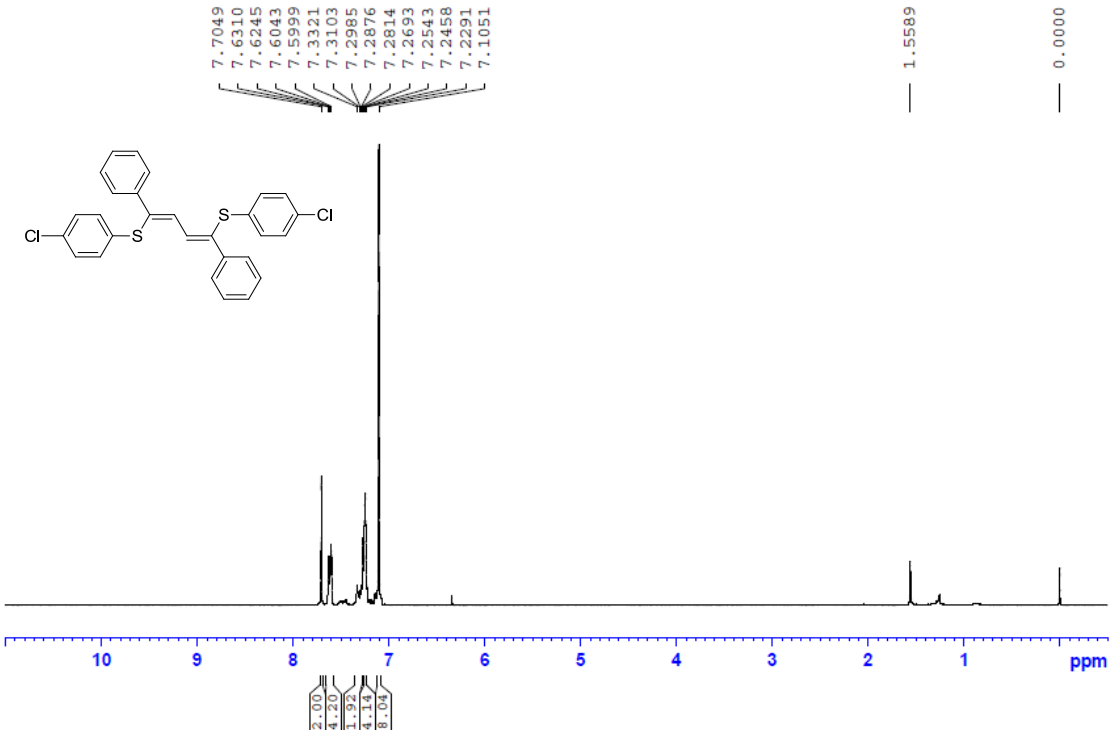

Figure S-29 ^{1}H NMR spectrum of compound **4n** (300 MHz, $CDCl_3$)

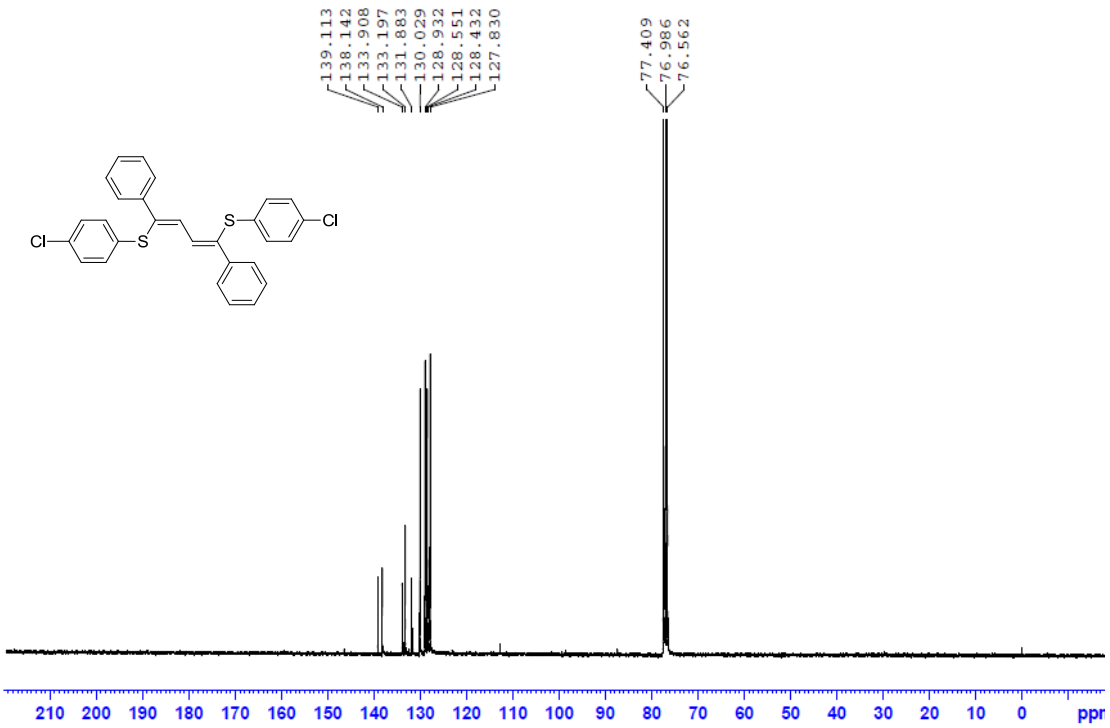

Figure S-30 ^{13}C NMR spectrum of compound **4n** (75 MHz, $CDCl_3$)

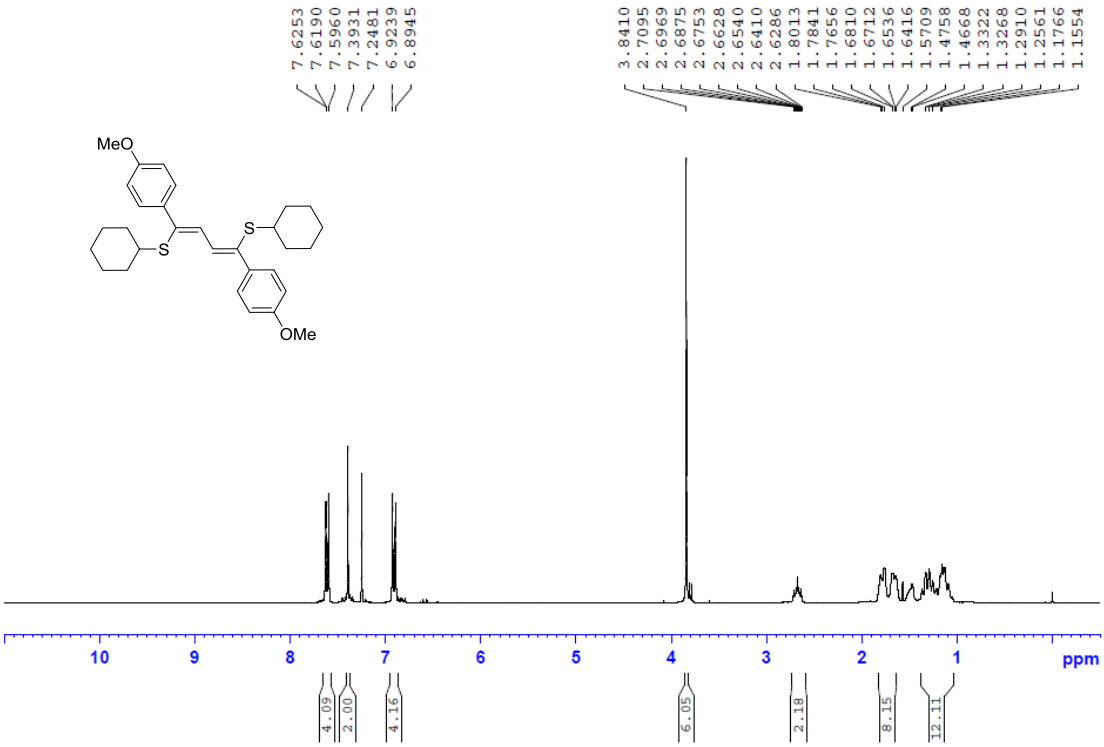

Figure S-31 ^{1}H NMR spectrum of compound **4o** (300 MHz, $CDCl_3$)

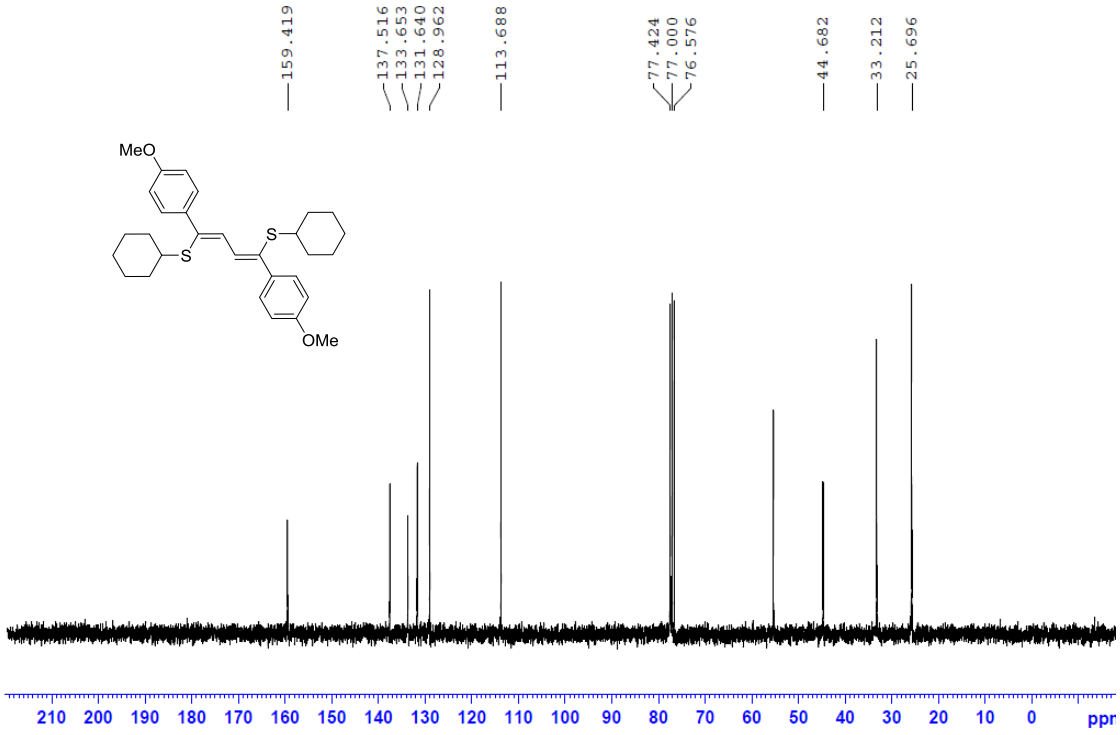

Figure S-32 ^{13}C NMR spectrum of compound **4o** (75 MHz, $CDCl_3$)

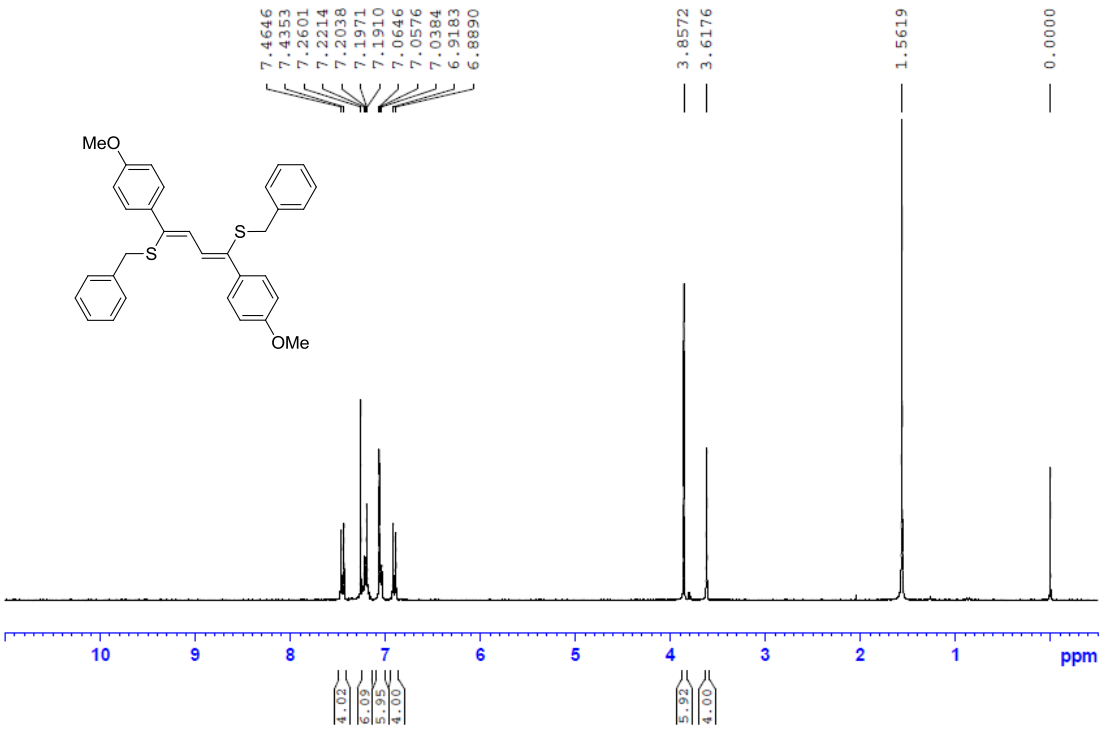

Figure S-33 ^{1}H NMR spectrum of compound **4p** (300 MHz, $CDCl_3$)

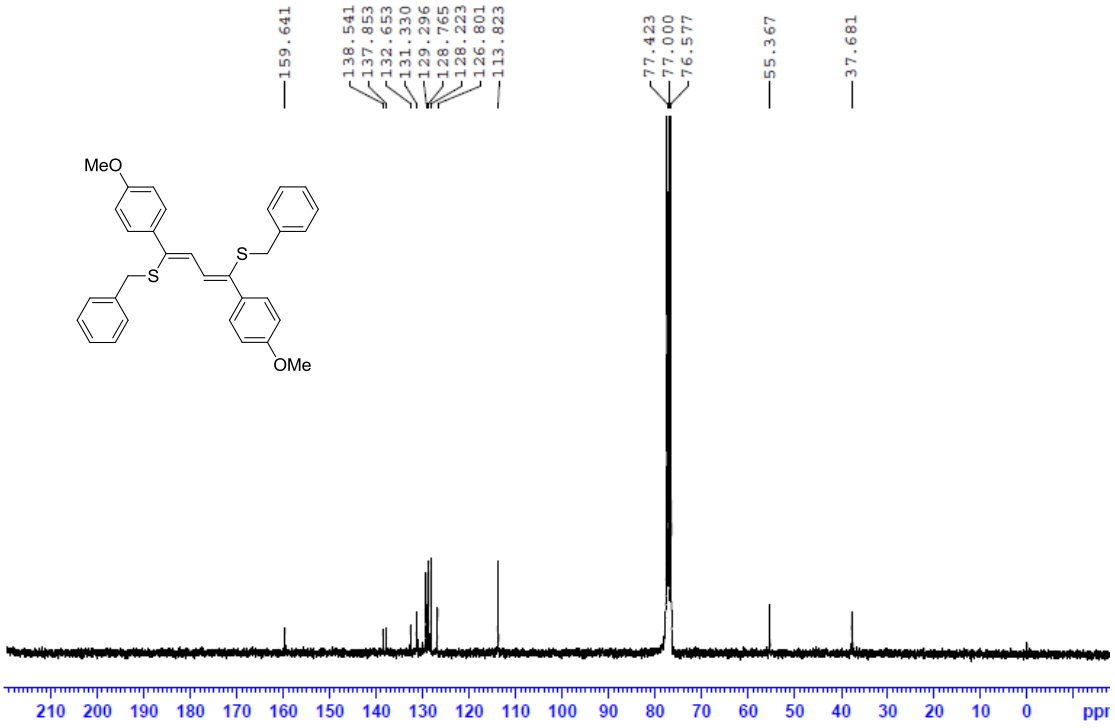

Figure S-34 ^{13}C NMR spectrum of compound **4p** (75 MHz, $CDCl_3$)

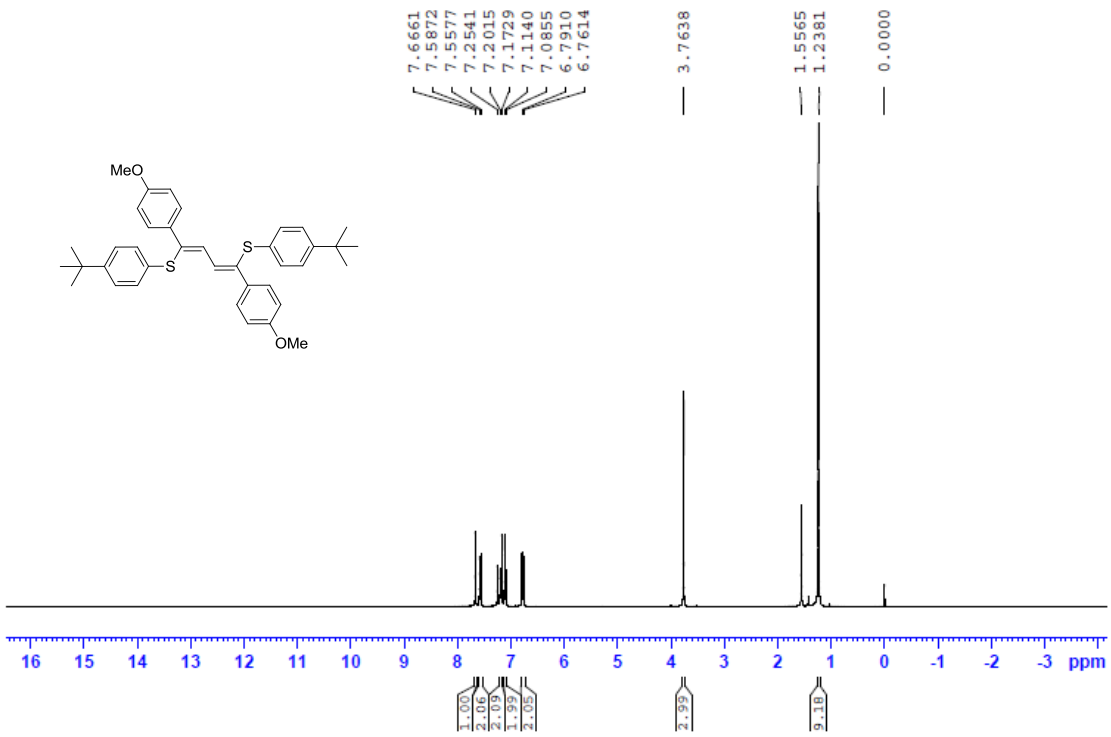

Figure S-35 ^{1}H NMR spectrum of compound **4q** (300 MHz, $CDCl_3$)

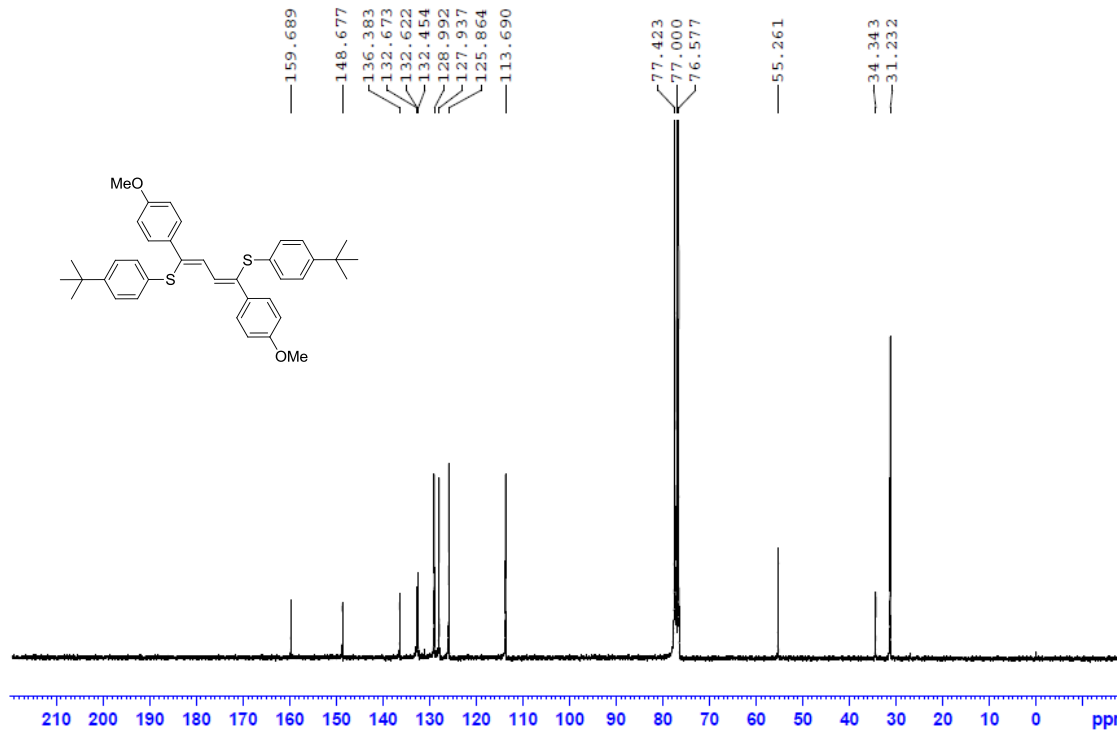

Figure S-36 ^{13}C NMR spectrum of compound **4q** (75 MHz, $CDCl_3$)

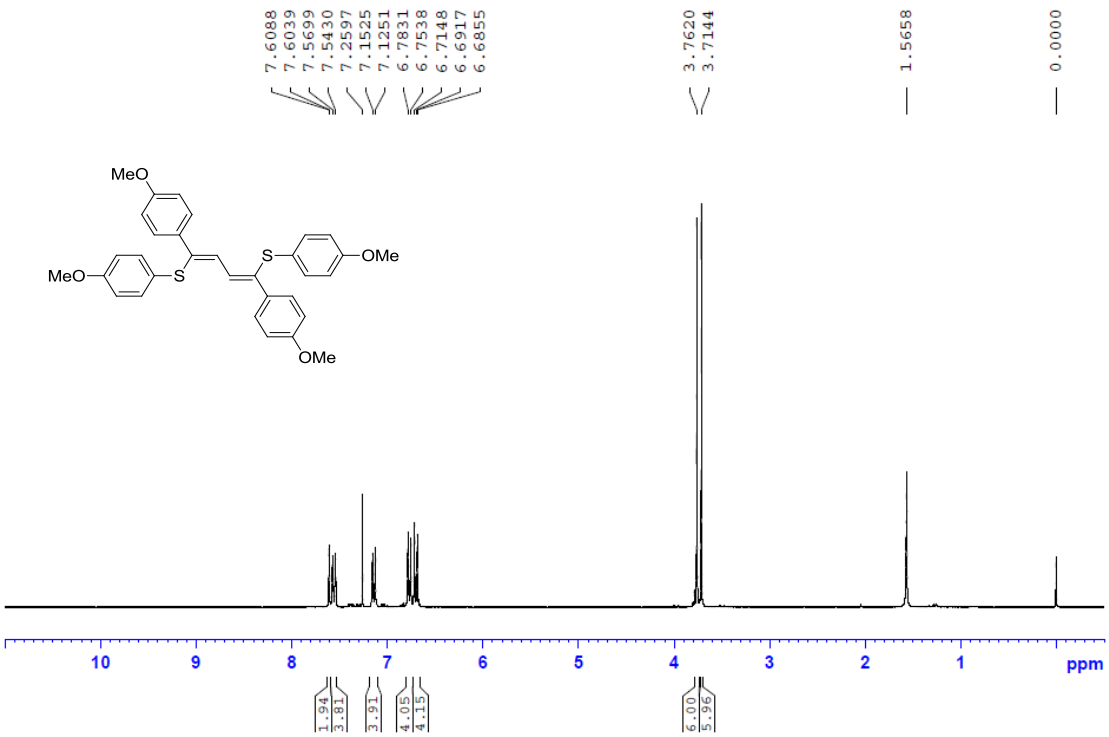

Figure S-37 ^{1}H NMR spectrum of compound **4r** (300 MHz, $CDCl_3$)

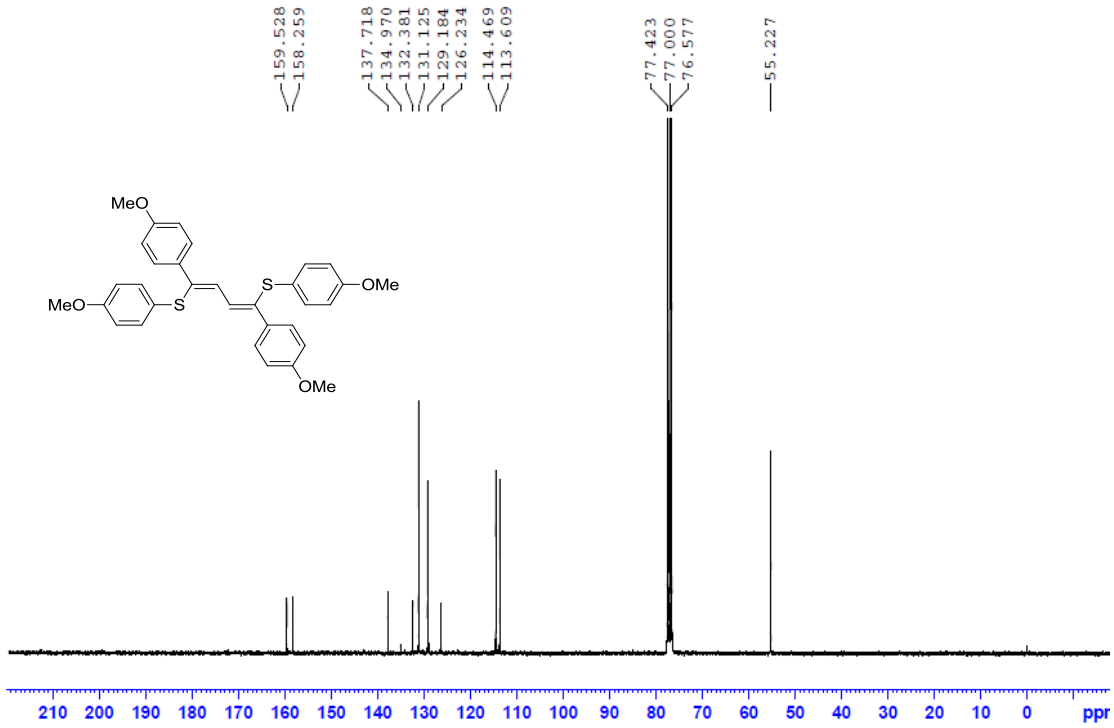

Figure S-38 ^{13}C NMR spectrum of compound **4r** (75 MHz, $CDCl_3$)

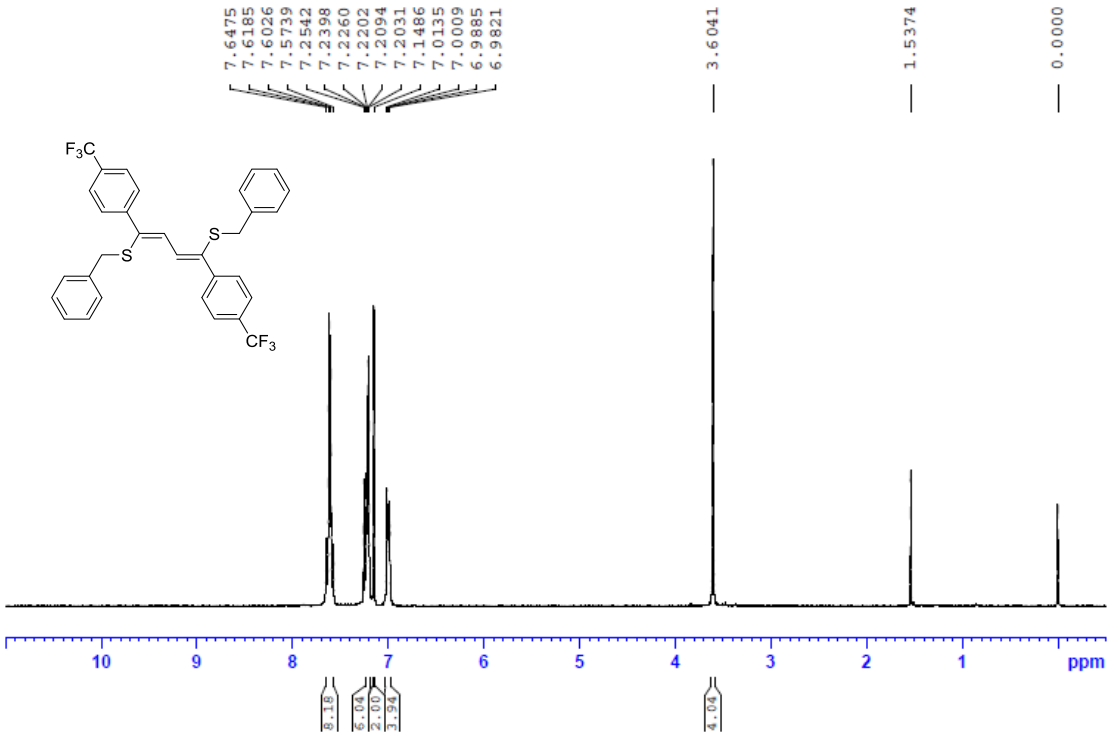

Figure S-39 ^{1}H NMR spectrum of compound **4s** (300 MHz, $CDCl_3$)

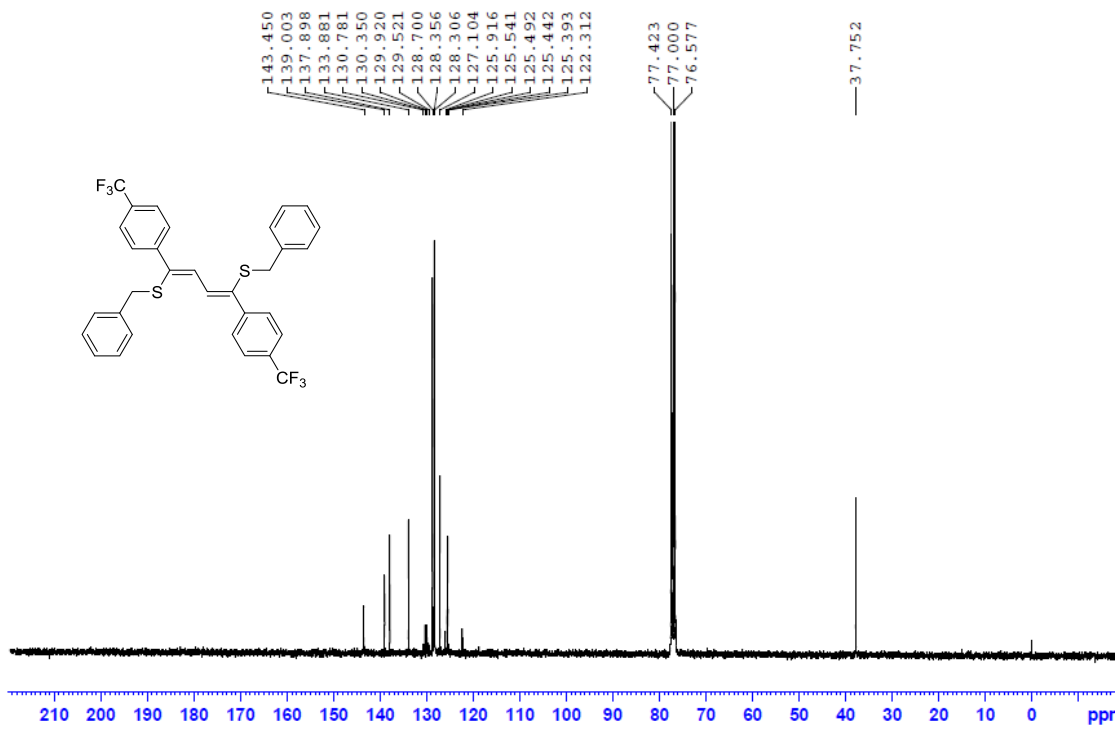

Figure S-40 ^{13}C NMR spectrum of compound **4s** (75 MHz, $CDCl_3$)

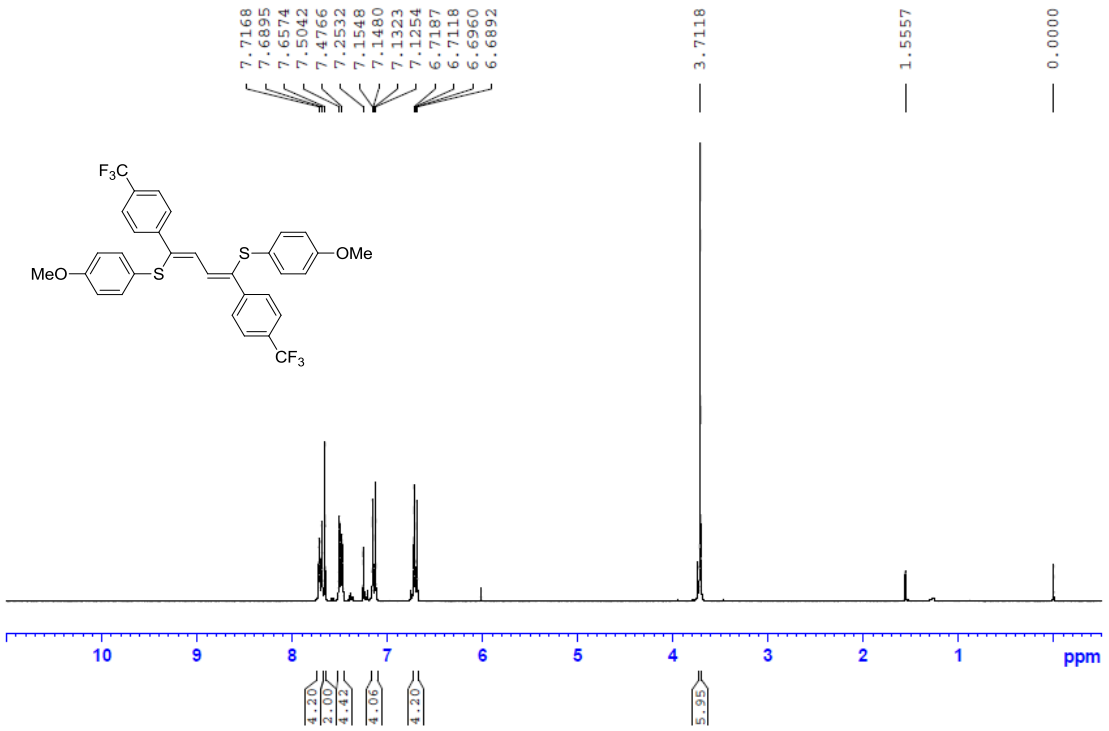

Figure S-41 ^{1}H NMR spectrum of compound **4t** (300 MHz, $CDCl_3$)

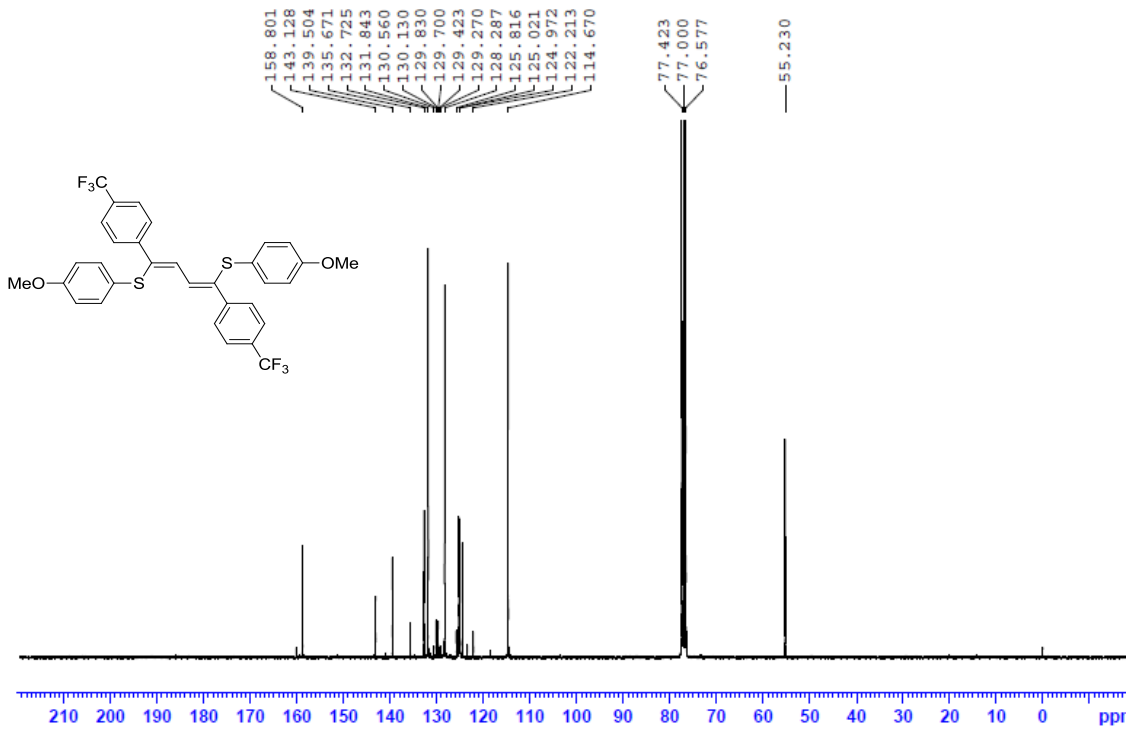

Figure S-42 ^{13}C NMR spectrum of compound **4t** (75 MHz, $CDCl_3$)

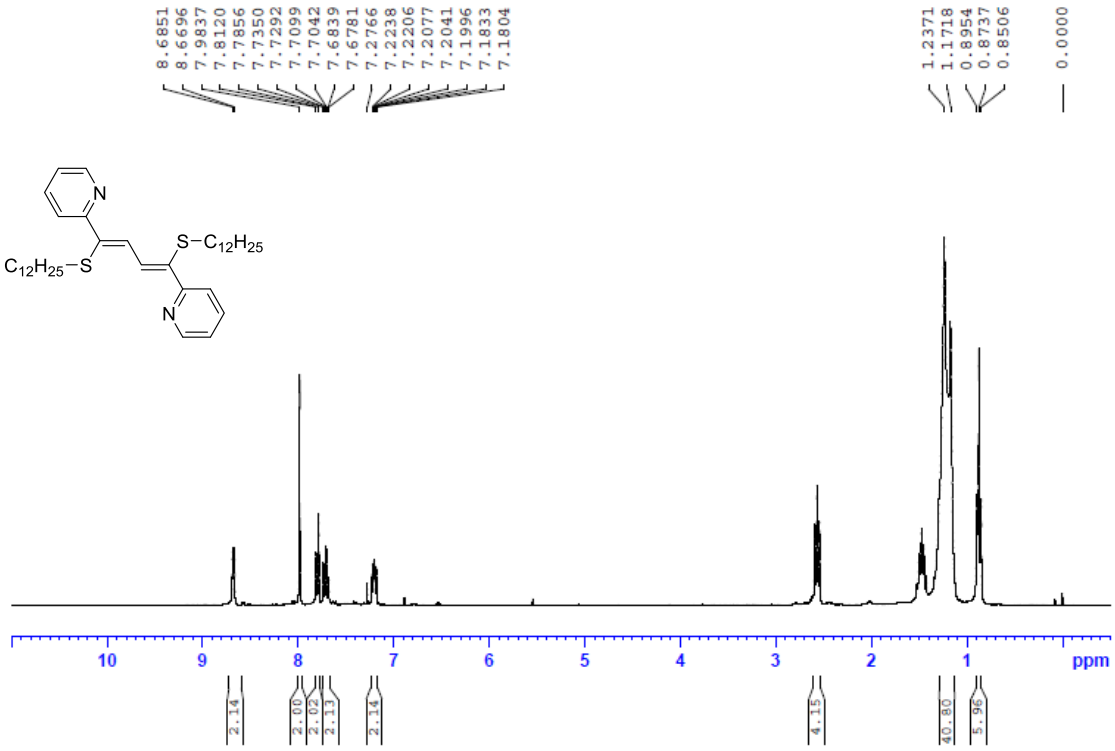

Figure S-43 ^{1}H NMR spectrum of compound **4u** (300 MHz, $CDCl_3$)

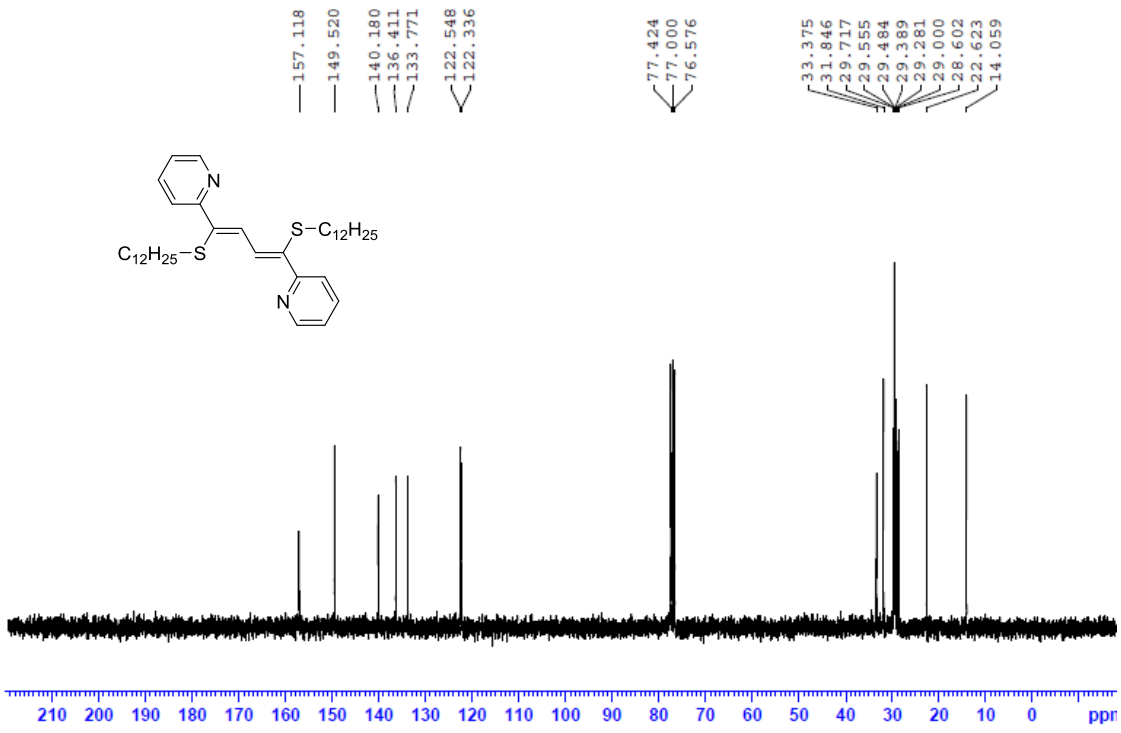

Figure S-44 ^{13}C NMR spectrum of compound **4u** (75 MHz, $CDCl_3$)

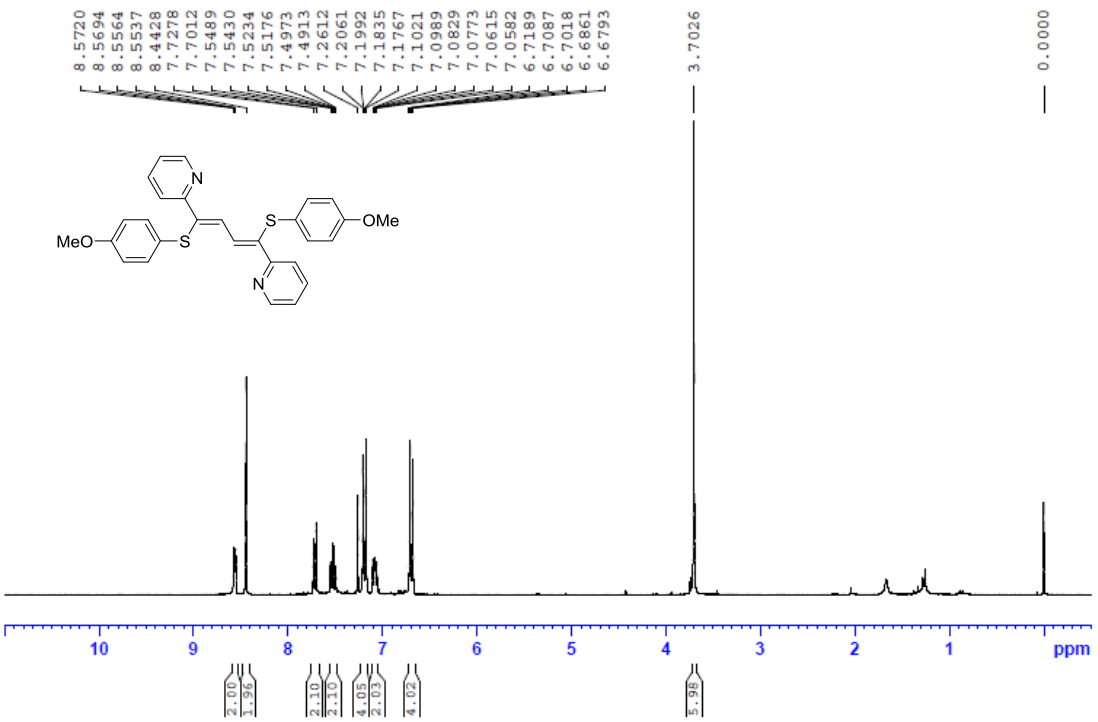

Figure S-45 ^{1}H NMR spectrum of compound **4v** (300 MHz, $CDCl_3$)

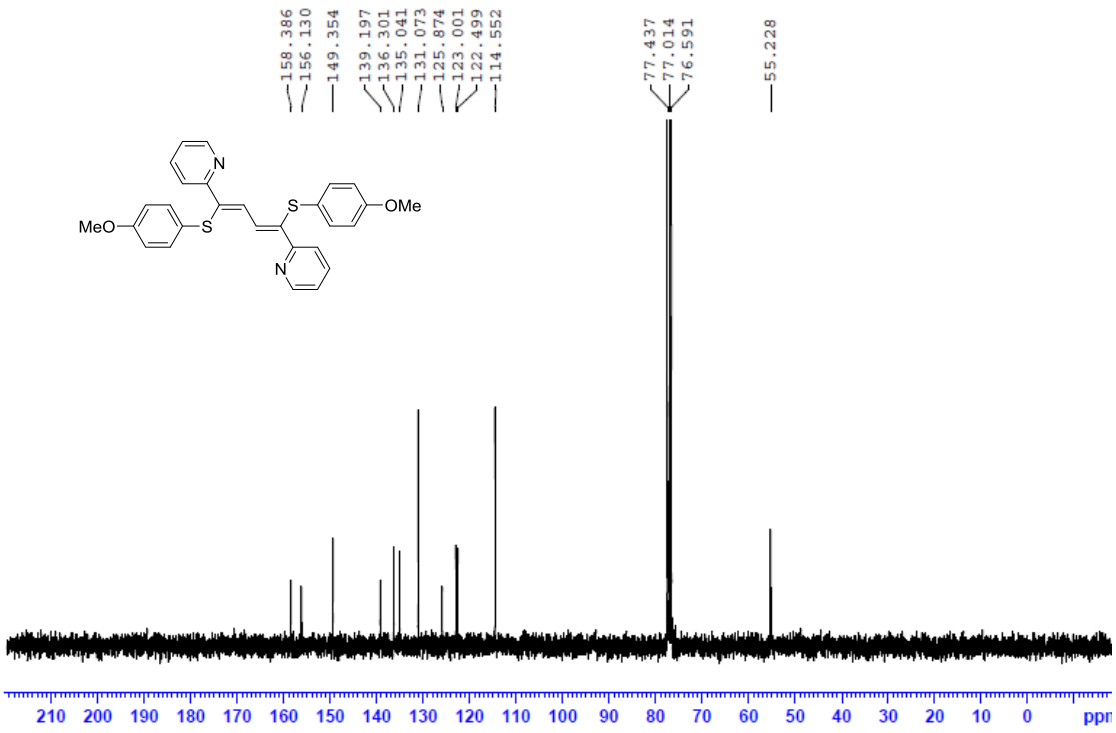

Figure S-46 ^{13}C NMR spectrum of compound **4v** (75 MHz, $CDCl_3$)