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Supporting Information

for

Revisiting the bromination of 3β-hydroxycholest-5-ene with CBr_4/PPh_3 and the subsequent azidolysis of the resulting bromide, disparity in stereochemical behavior

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X-ray crystallography and NMR spectra

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I. X-ray crystallography

Due to the known stereochemistry of the cholesterol skeleton there is no need for ab initio absolute structure determination (viz. based on the Flack parameter). Single-crystal X-ray data for diene **9** was measured using a Bruker-Nonius Kappa CCD diffractometer with an APEX-II detector with graphite-monochromatized Mo-*K*α (λ = 0.71073 Å) radiation at 170 K. Data collection and reduction were performed using the program *COLLECT* [1] and *HKL DENZO AND SCALEPACK* [2], respectively, and the intensities were corrected for absorption using *SADABS* [3]. Single-crystal X-ray data for bromide **4** was measured using a Rigaku SuperNova dual-source Oxford diffractometer equipped with an Eos detector using mirror-monochromated Mo-*K*α (λ = 0.71073 Å) radiation at 120 K. The data collection and reduction were performed using the program *CrysAlisPro* and Gaussian face index absorption correction method was applied [4]. The structures were solved with intrinsic phasing (SHELXT) [5] and refined by full-matrix least squares on F^2 using the *OLEX2* software [6], which utilizes the *SHELXL* module [7]. For the azide **5** only a partial data collection was performed (see below) verifying the structure to be the known azide, 3α-azidocholest-5-ene [8].

Crystal data for the diene 9

$C_{27}H_{44}$, M = 368.62, colourless block, 0.24 × 0.30 × 0.40 mm, orthorhombic, space group $P2_12_12_1$, a = 7.5850(2) Å, b = 15.9238(4) Å, c = 19.4795(4) Å, V = 2352.77(10) Å^3, Z = 4, D_{calc} = 1.041 gcm^{-3}, F000 = 824, μ = 0.06 mm^{-1}, T = 170(1) K, θ_{max} = 28.7°, 5169 total reflections, 3861 with $I_o > 2\sigma(I_o)$, R_{int} = 0.052, 5169 data, 249 parameters, no restraints, GooF = 1.03, 0.28 < dΔρ < -0.17 eÅ^{-3}, $R[F^2 > 2\sigma(F^2)]$ = 0.053, $wR(F^2)$ = 0.131. CCDC-2204245.

Crystal data for the bromide 4

$C_{27}H_{45}Br$, M = 449.54, colourless plate, 0.06 × 0.17 × 0.25 mm^3, monoclinic, space group $P2_1$, a = 11.4127(12) Å, b = 7.5896(9) Å, c = 28.603(5) Å, β = 90.077(13)°, V = 2477.5(6) Å^3, Z = 4, D_{calc} = 1.205 gcm^{-3}, F000 = 968, μ = 1.67 mm^{-1}, T = 120.0(1) K, θ_{max} = 25.8°, 11562 total reflections, 5812 with $I_o > 2\sigma(I_o)$, R_{int} = 0.109, 11562 data, 467 parameters, 130 restraints, GooF = 1.06, 1.51 < dΔρ < -1.68 eÅ^{-3}, $R[F^2 > 2\sigma(F^2)]$ = 0.098, $wR(F^2)$ = 0.309. CCDC-2204246.

Verification of the structure of the azide 5

The physical habit (colorless plates), the unit cell (a = 13.2746(14) Å, b = 6.1854(6) Å, c = 14.9159(15) Å, β = 93.285(9)°, V = 1222.7(2) Å^3) and the space group ($P2_1$) matched that previously reported for 3α-azidocholest-5-ene [8]. A partial (30%) data set was collected and a figure base on it is shown in (Figure S1) confirming the studied sample to be the 3α-azidocholest-5-ene.

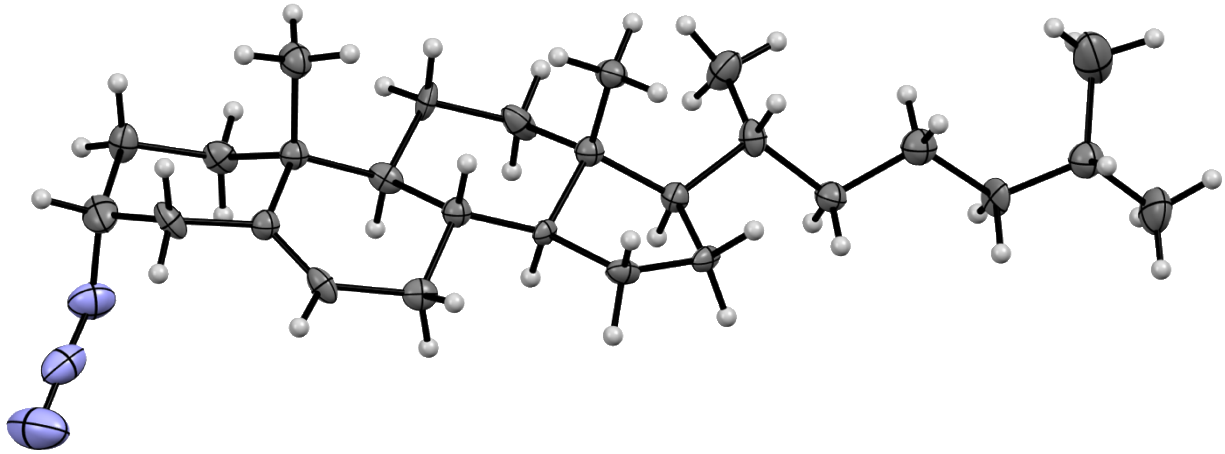

Fig. S1. The ORTEP plot of the 3α-azidocholest-5-ene from a partial data set with thermal displacement parameter at 50% probability level.

II. NMR spectra

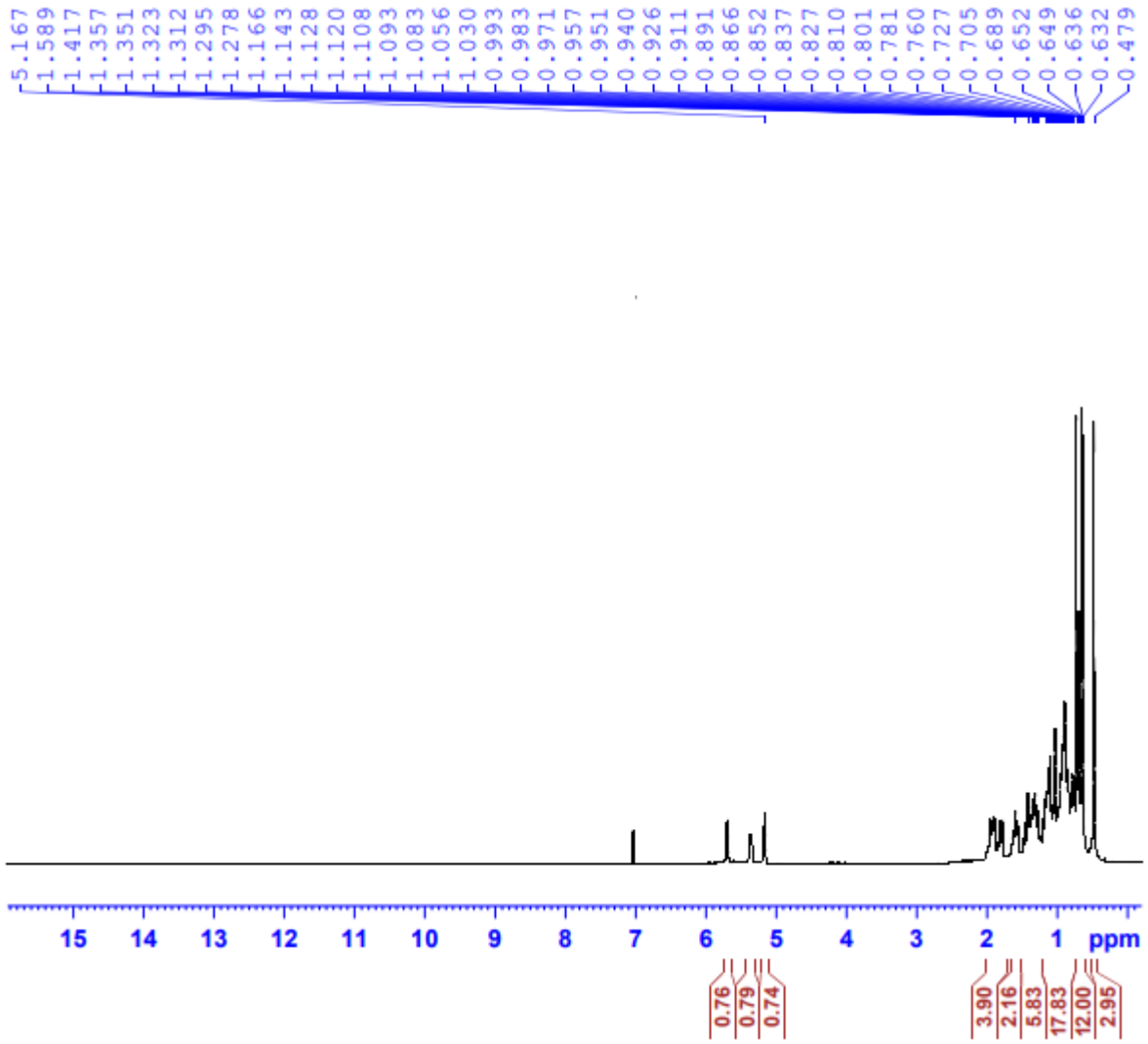

Fig. S2. ^{1}H NMR spectrum (400 MHz, $CDCl_3$) of compound **9**. A spectrum for this compound was previously published in [9], but incorrectly assigned to 3*α*-bromocholest-5-ene.

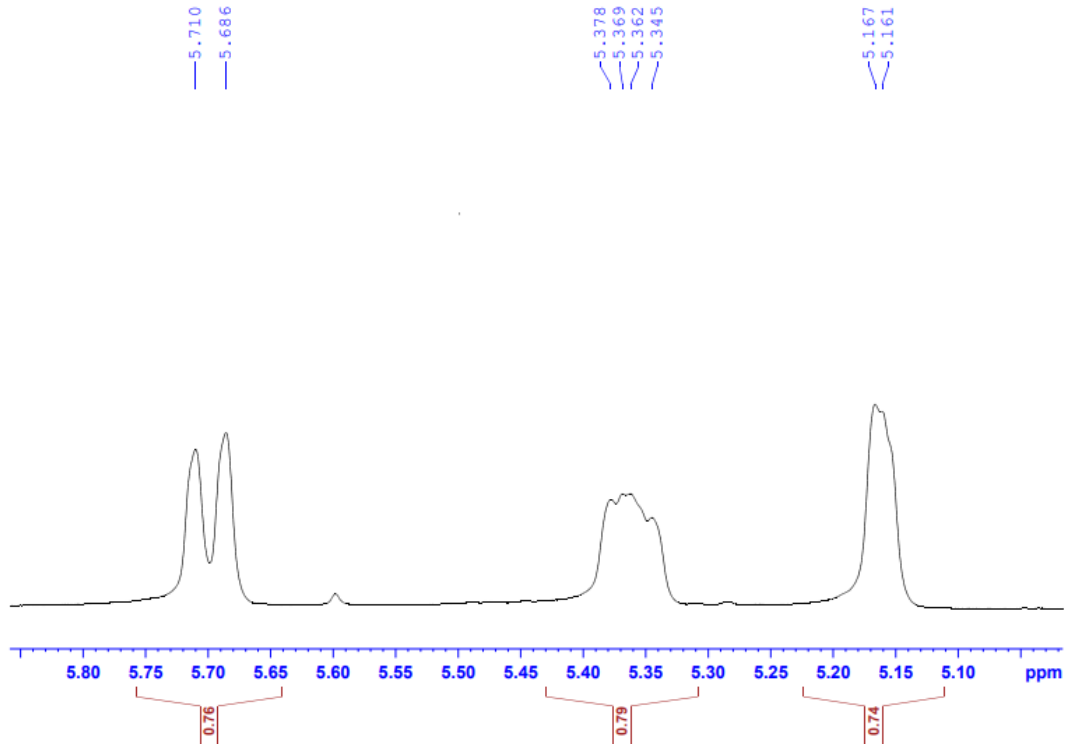

Fig. S3. Cross-section in the ^{1}H NMR spectrum (400 MHz, $CDCl_3$) of compound **9**.

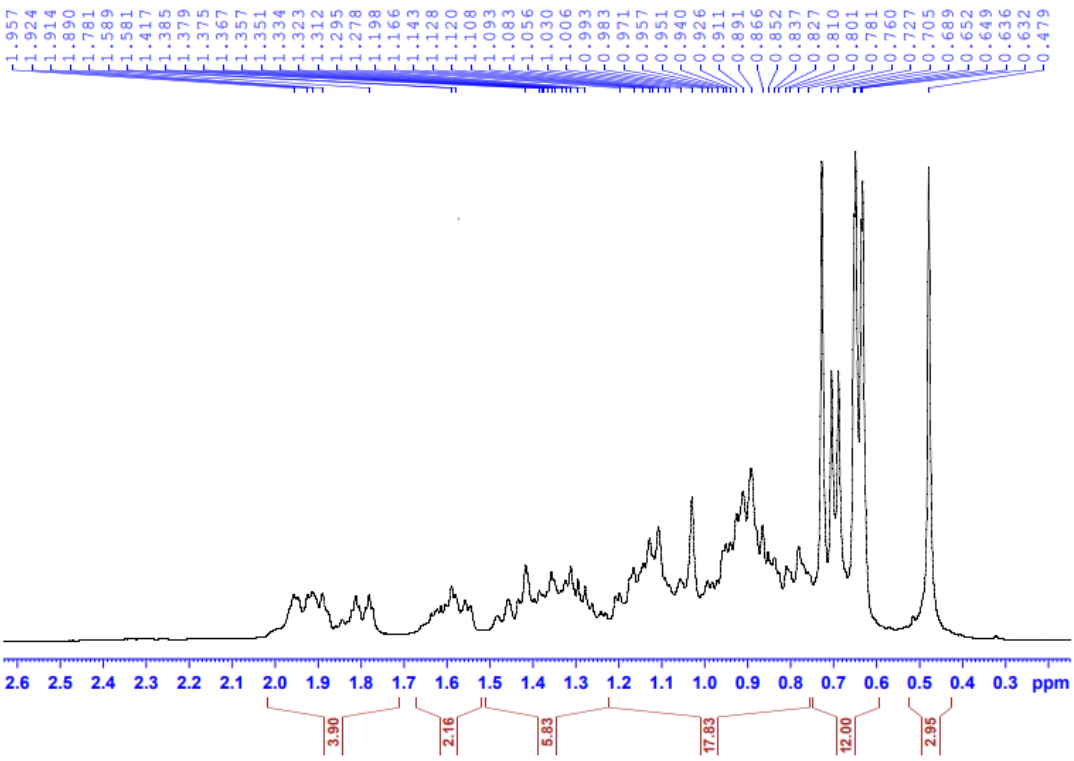

Fig. S4. Cross-section in the ^{1}H NMR spectrum (400 MHz, $CDCl_3$) of compound **9**.

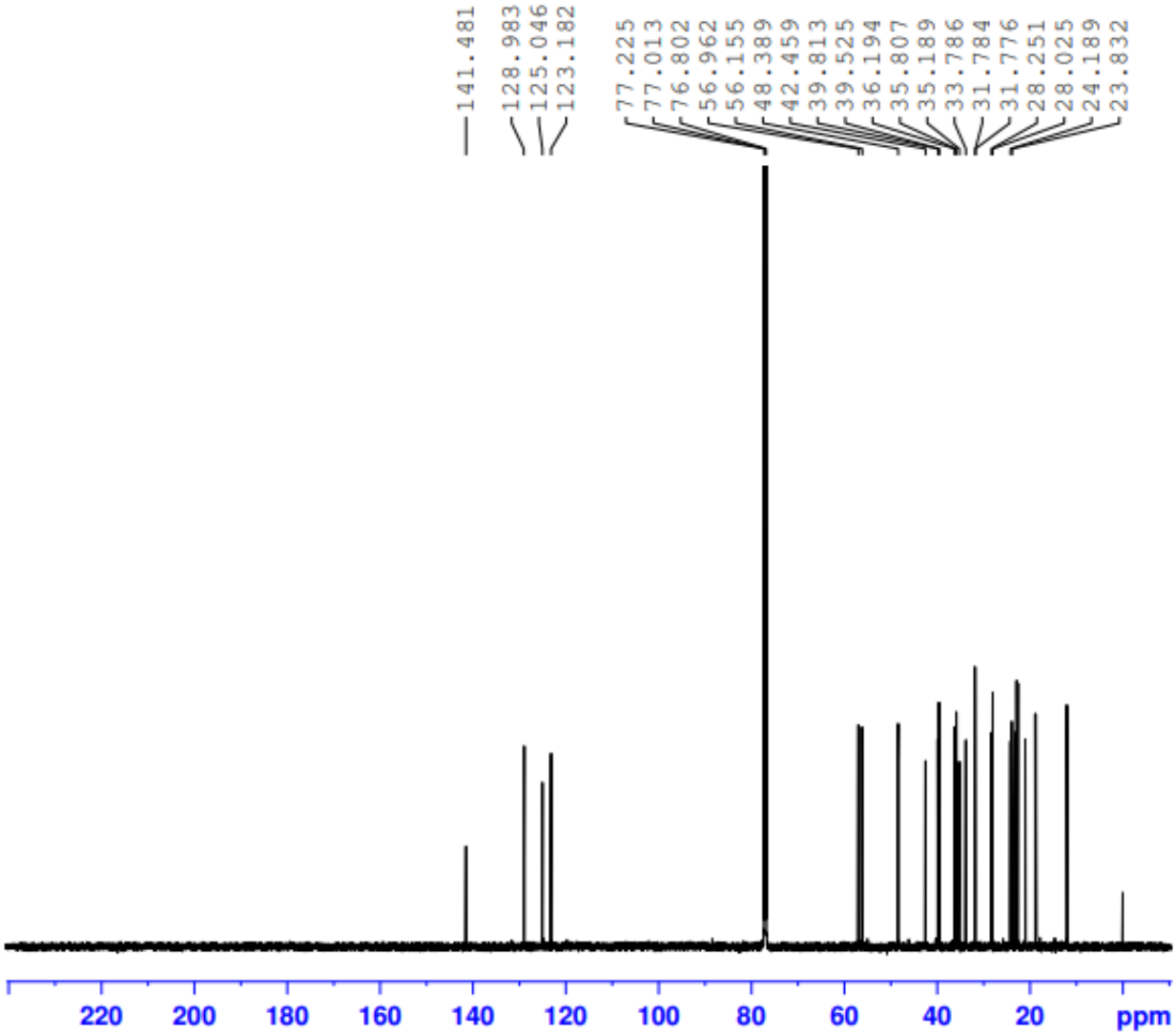

Fig. S5. ^{13}C {^{1}H} NMR spectrum (150 MHz, $CDCl_3$) of compound **9**. This spectrum was slightly adapted from [9] ("Synthesis, antimicrobial and cytotoxicity evaluation of new cholesterol congeners", © 2015 M. R. E. S. Aly et al., published by the Beilstein-Institut, distributed under the terms of the Creative Commons Attribution 2.0 Generic License, https://creativecommons.org/licenses/by/2.0). This spectrum was incorrectly assigned to 3α-bromocholest-5-ene in [9].

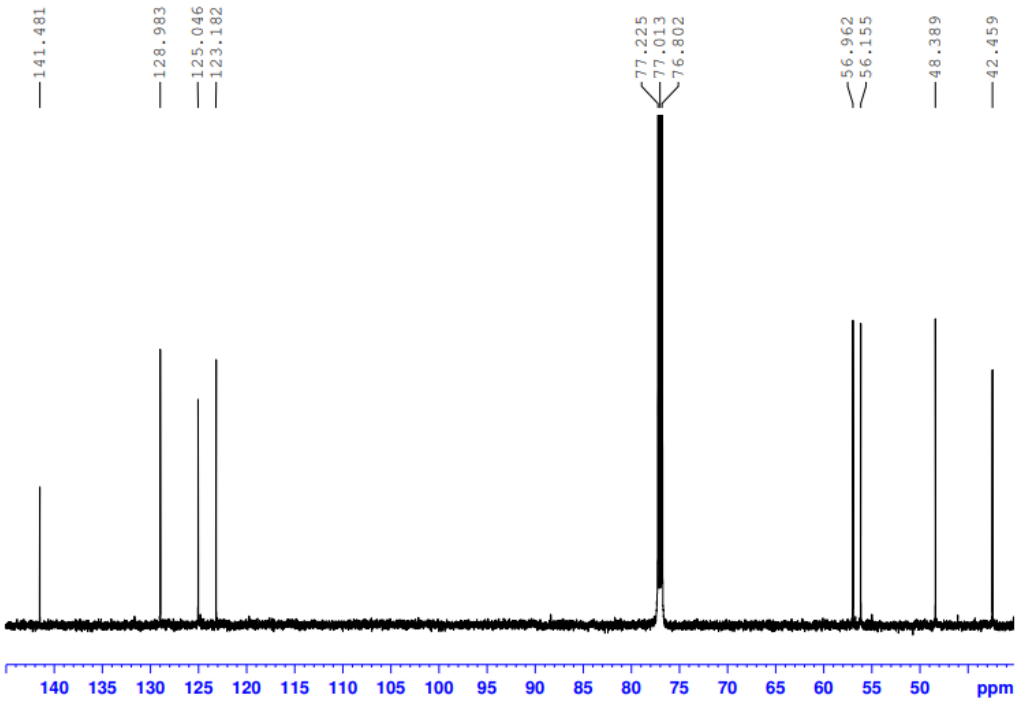

Fig. S6. Cross-section in the ^{13}C {^{1}H} NMR spectrum of compound **9**.

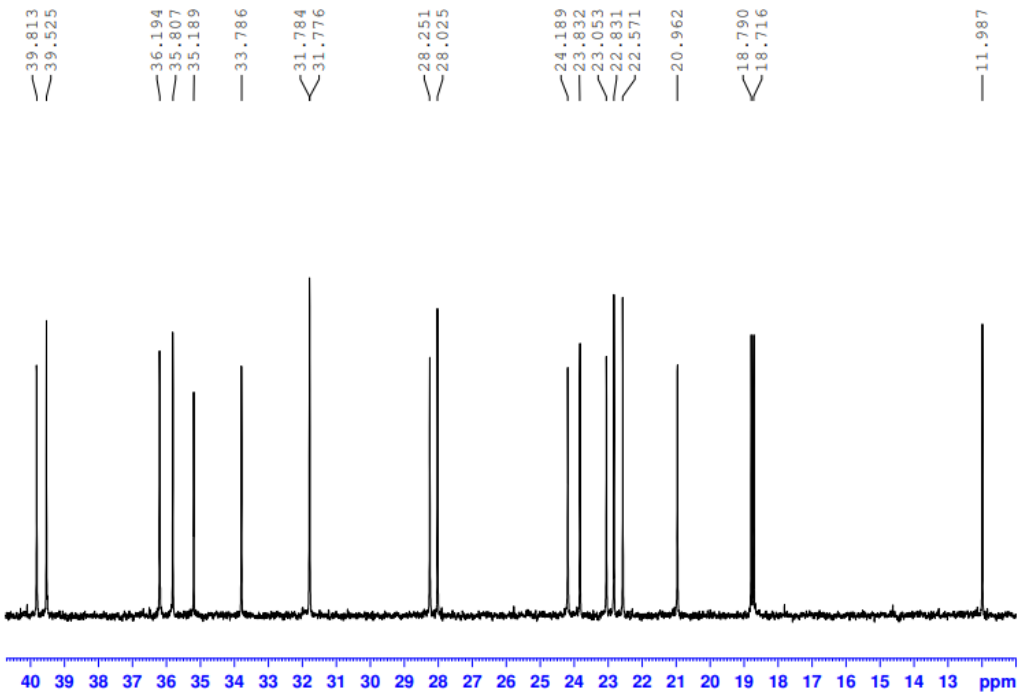

Fig. S7. Cross-section in the ^{13}C {^{1}H} NMR spectrum of compound **9**.

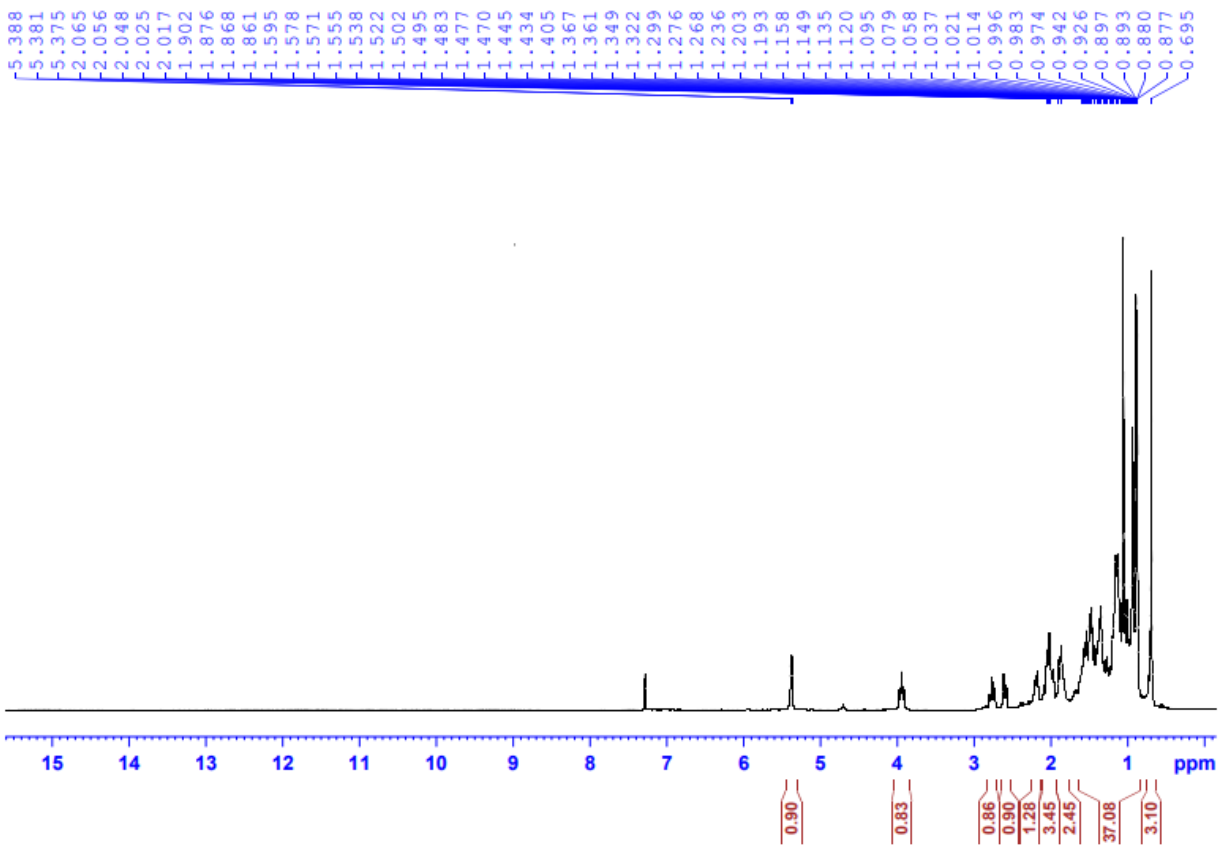

Fig. S8. ^{1}H NMR spectrum (400 MHz, $CDCl_3$) of compound **4**.

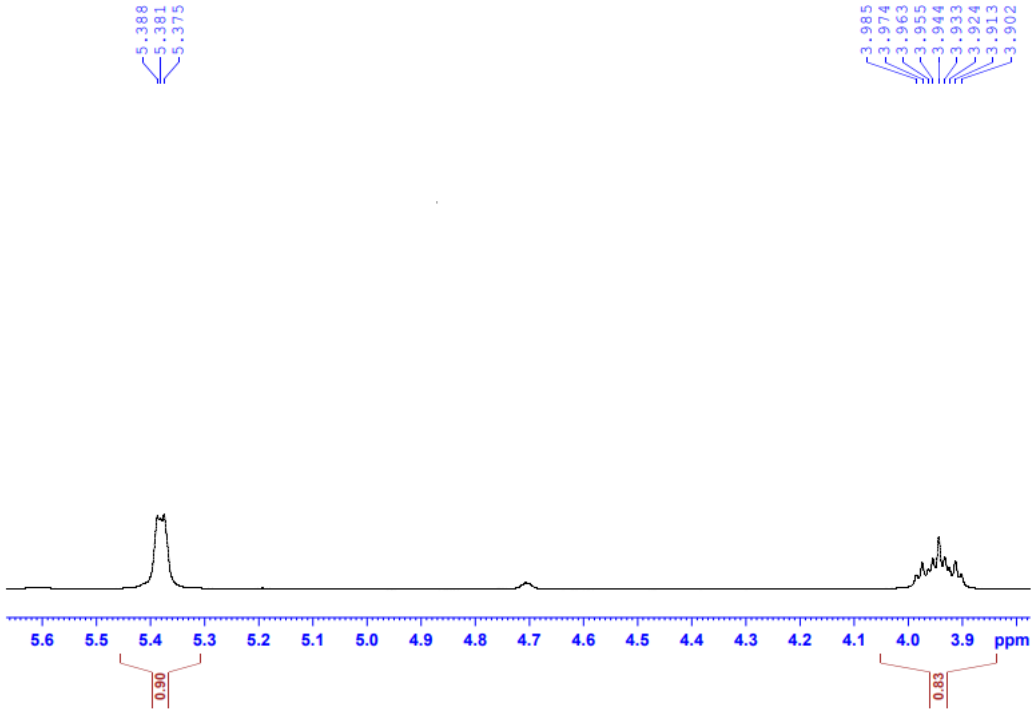

Fig. S9. Cross-section in the ^{1}H NMR spectrum of compound **4**.

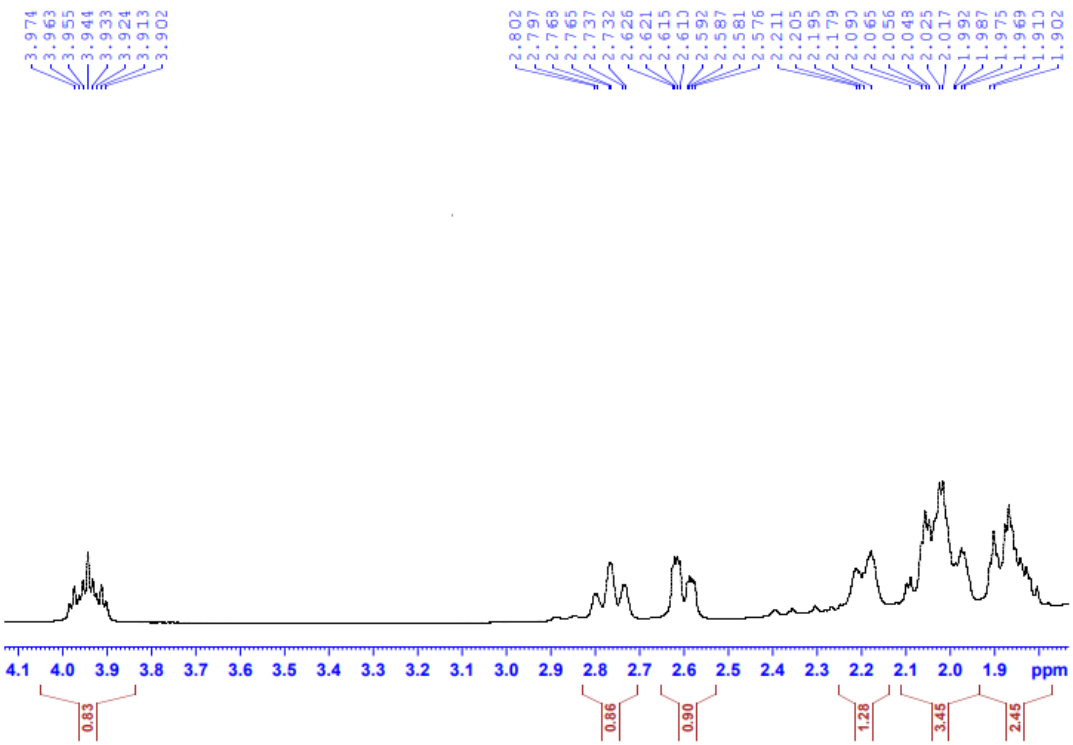

Fig. S10. Cross-sections in the ^{1}H NMR spectrum of compound **4**.

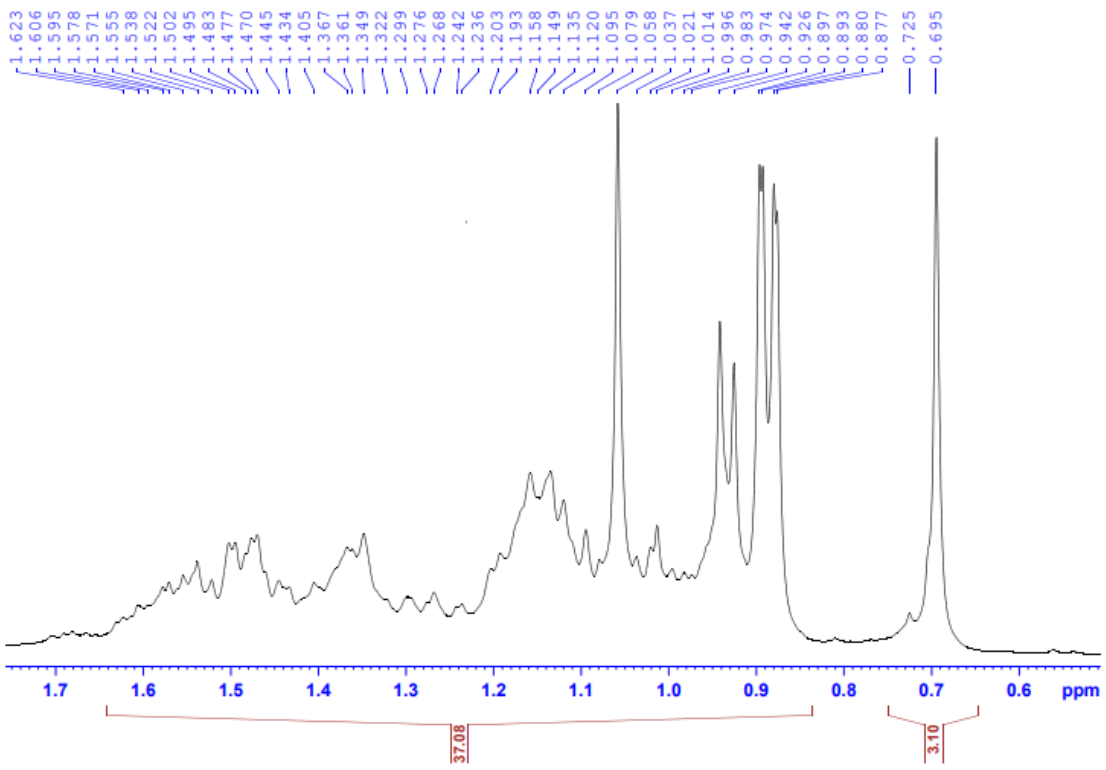

Fig. S11. Cross-sections in the ^{1}H NMR spectrum of compound **4**.

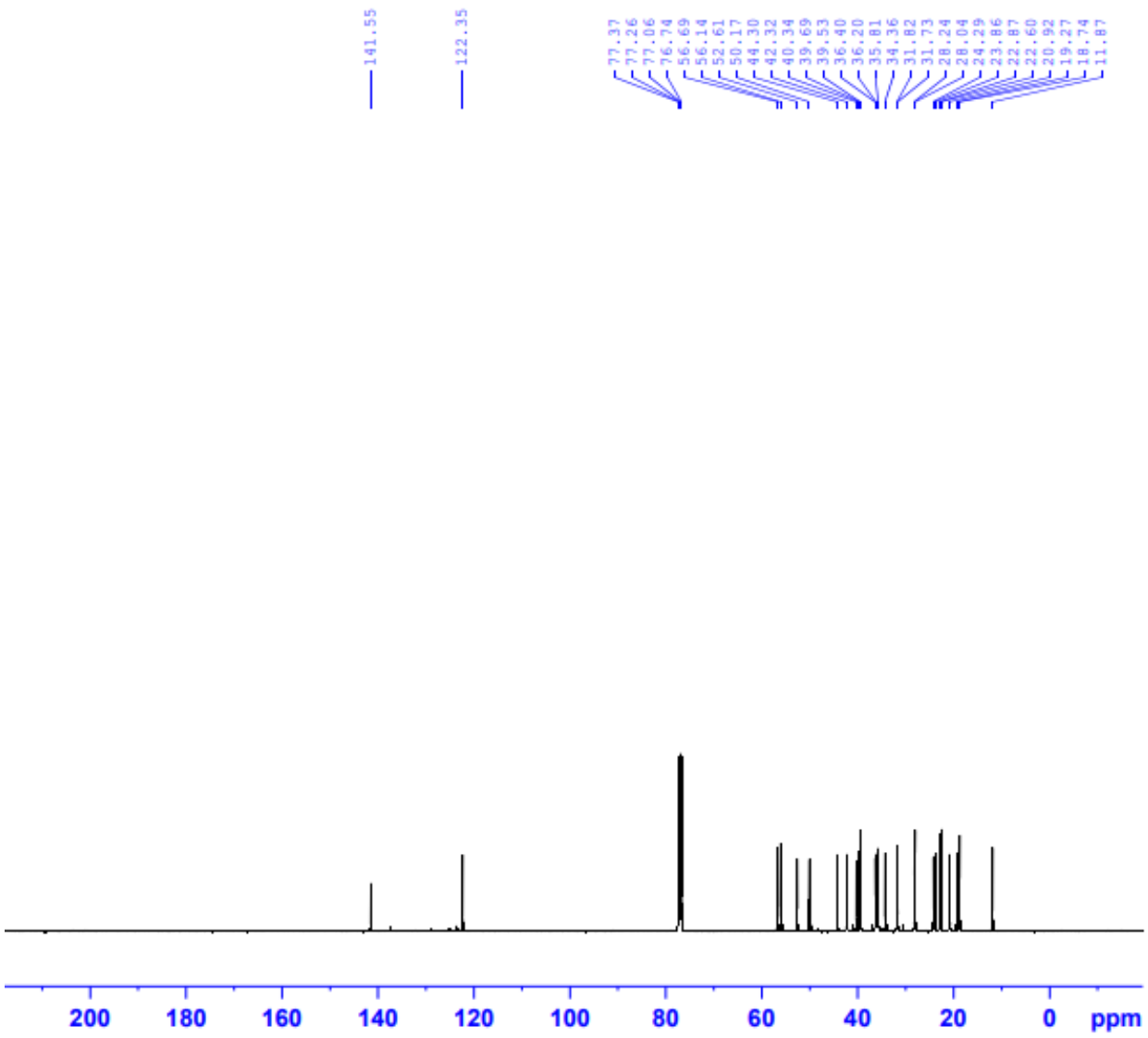

Fig. S12. ^{13}C {^{1}H} NMR spectrum (100 MHz, $CDCl_3$) of compound **4**.

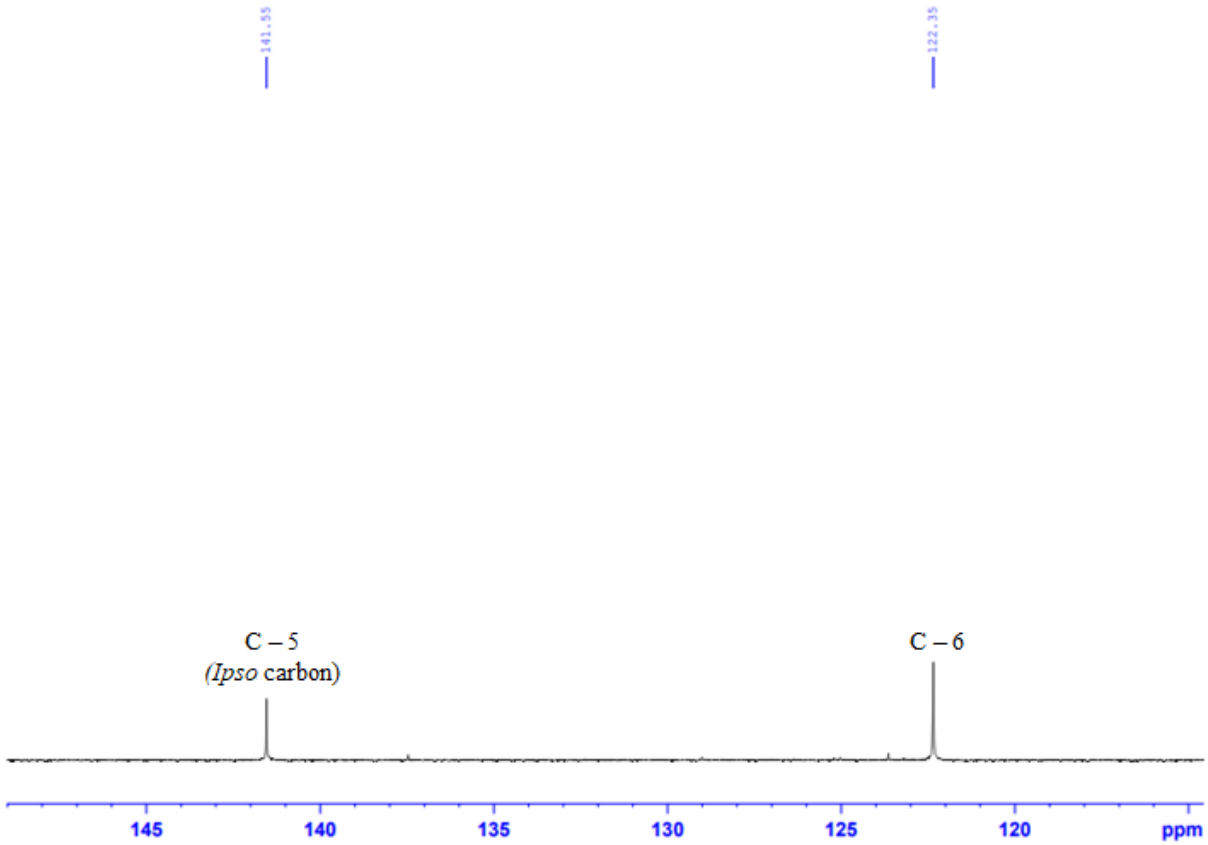

Fig. S13. Cross-section in the ^{13}C {^{1}H} NMR spectrum (100 MHz, $CDCl_3$) of compound **4**.

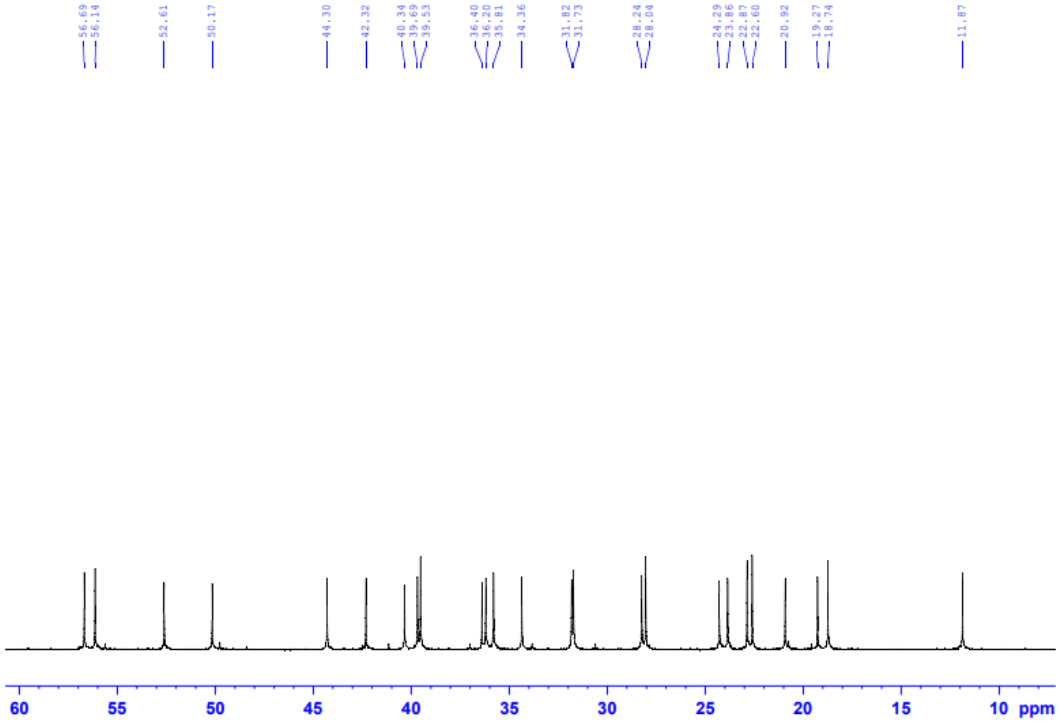

Fig. S14. Cross-section in the ^{13}C {^{1}H} NMR spectrum (100 MHz, $CDCl_3$) of compound **4**.

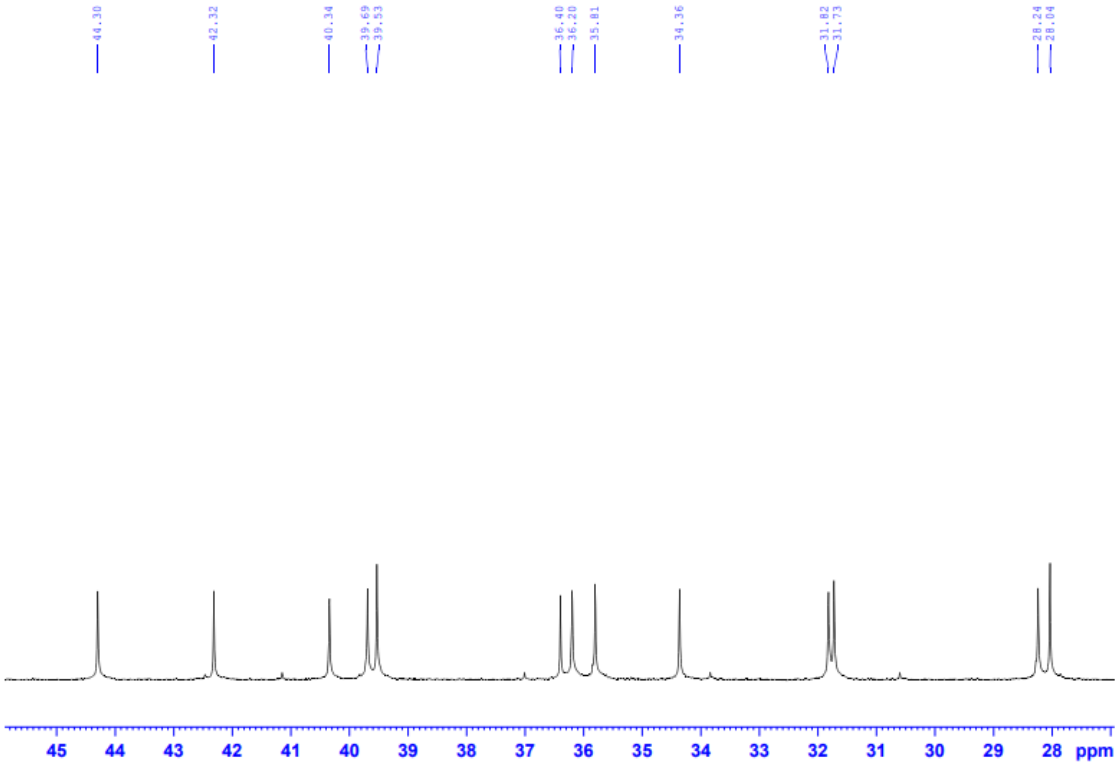

Fig. S15. Cross-section in the ^{13}C {^{1}H} NMR spectrum (100 MHz, $CDCl_3$) of compound **4**.

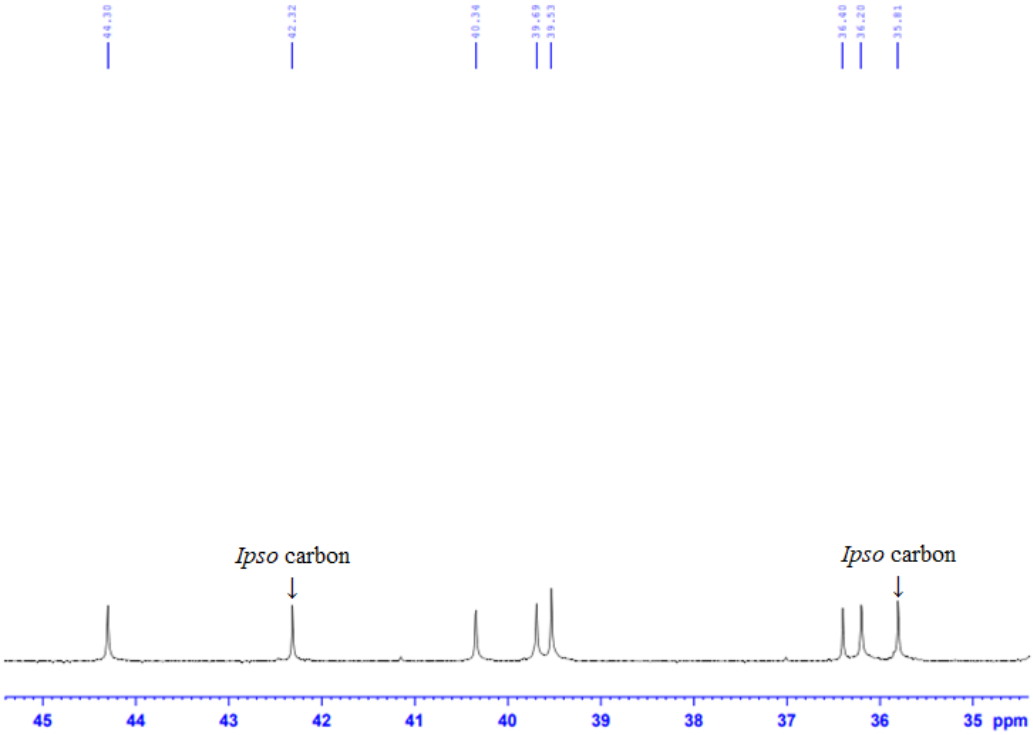

Fig. S16. Cross-section in the ^{13}C {^{1}H} NMR spectrum (100 MHz, $CDCl_3$) of compound **4**.

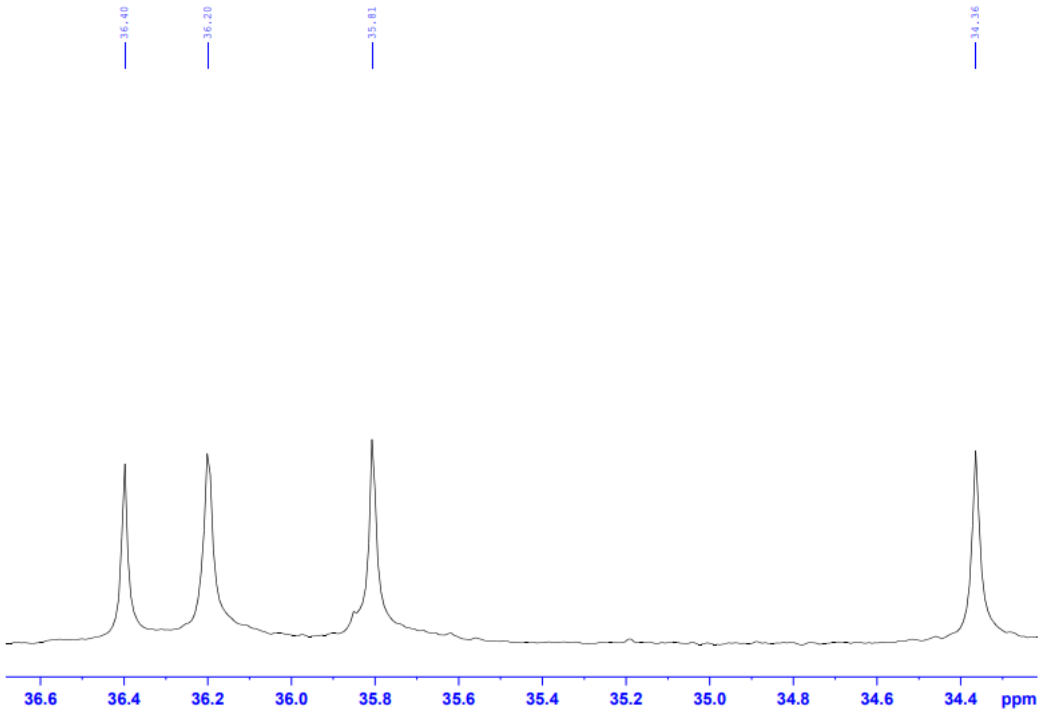

Fig. S17. Cross-section in the ^{13}C {^{1}H} NMR spectrum (100 MHz, $CDCl_3$) of compound **4**.

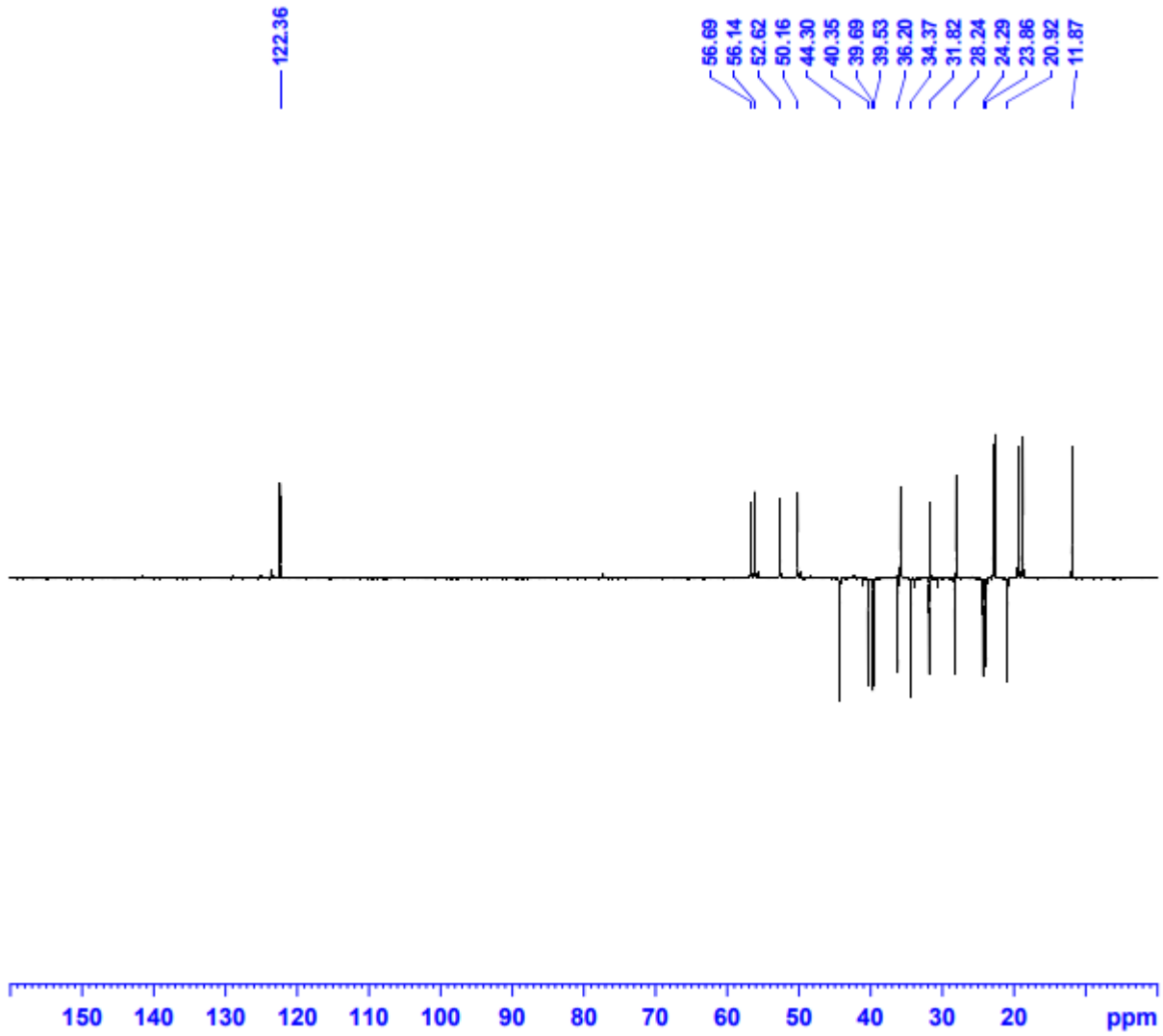

Fig. S18. DEPT-135º spectrum (100 MHz, $CDCl_3$) of compound **4**.

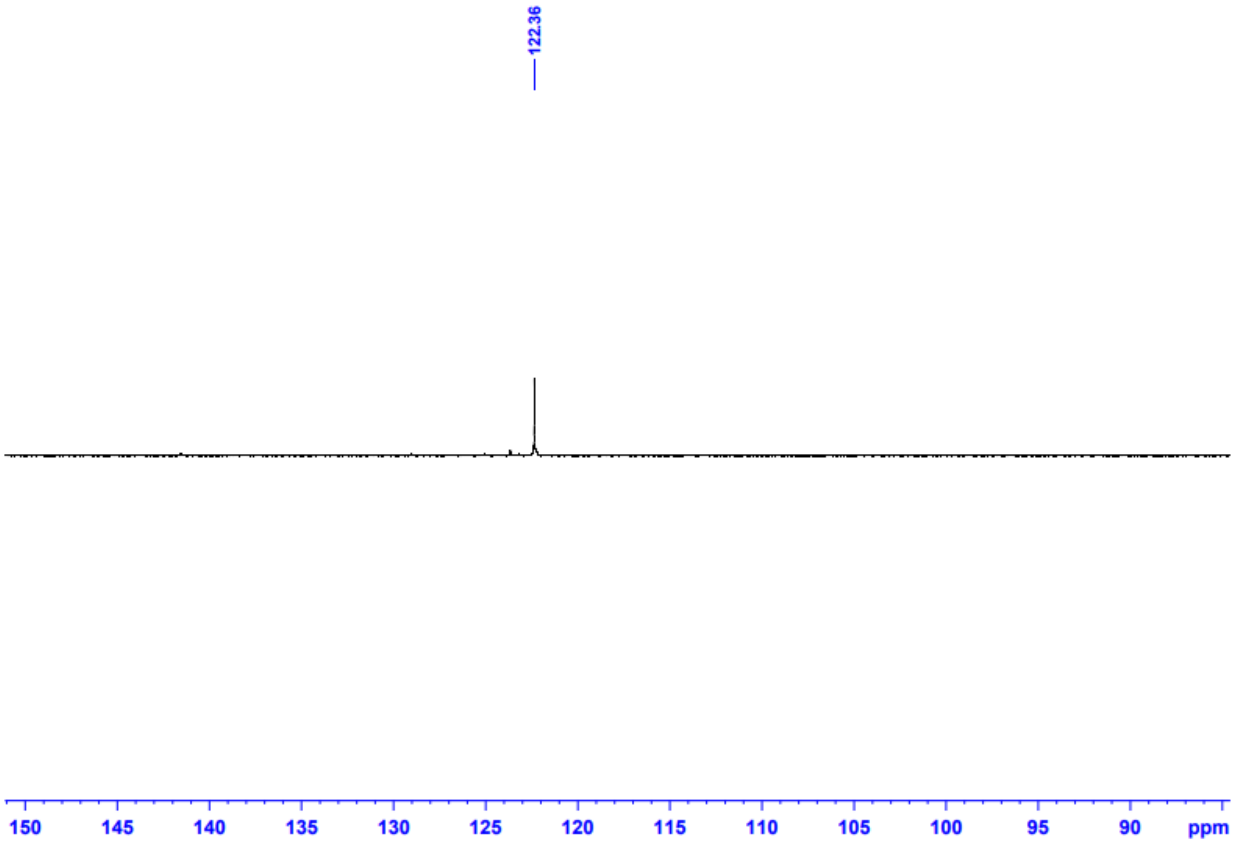

Fig. S19. Cross-section in the DEPT-135º spectrum (100 MHz, $CDCl_3$) of compound **4**.

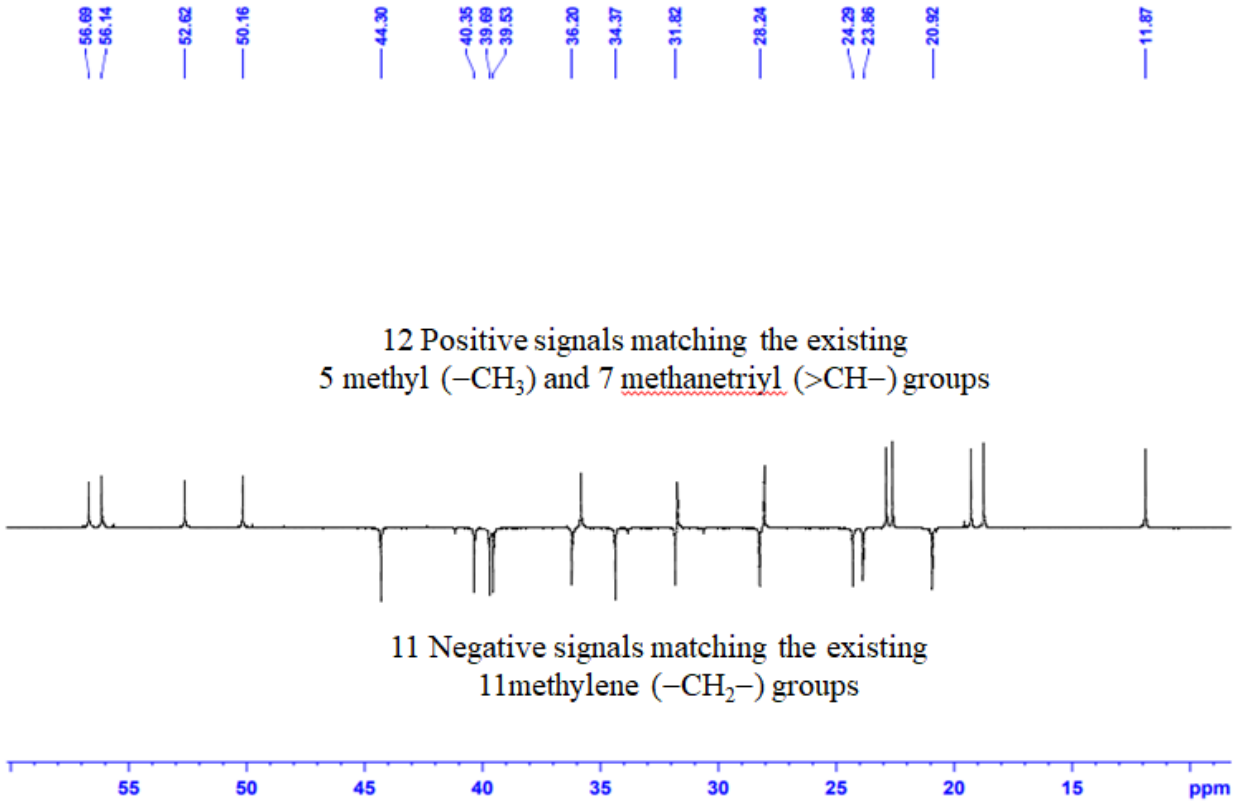

Fig. S20. Cross-section in the DEPT-135° spectrum (100 MHz, $CDCl_3$) of compound **4**.

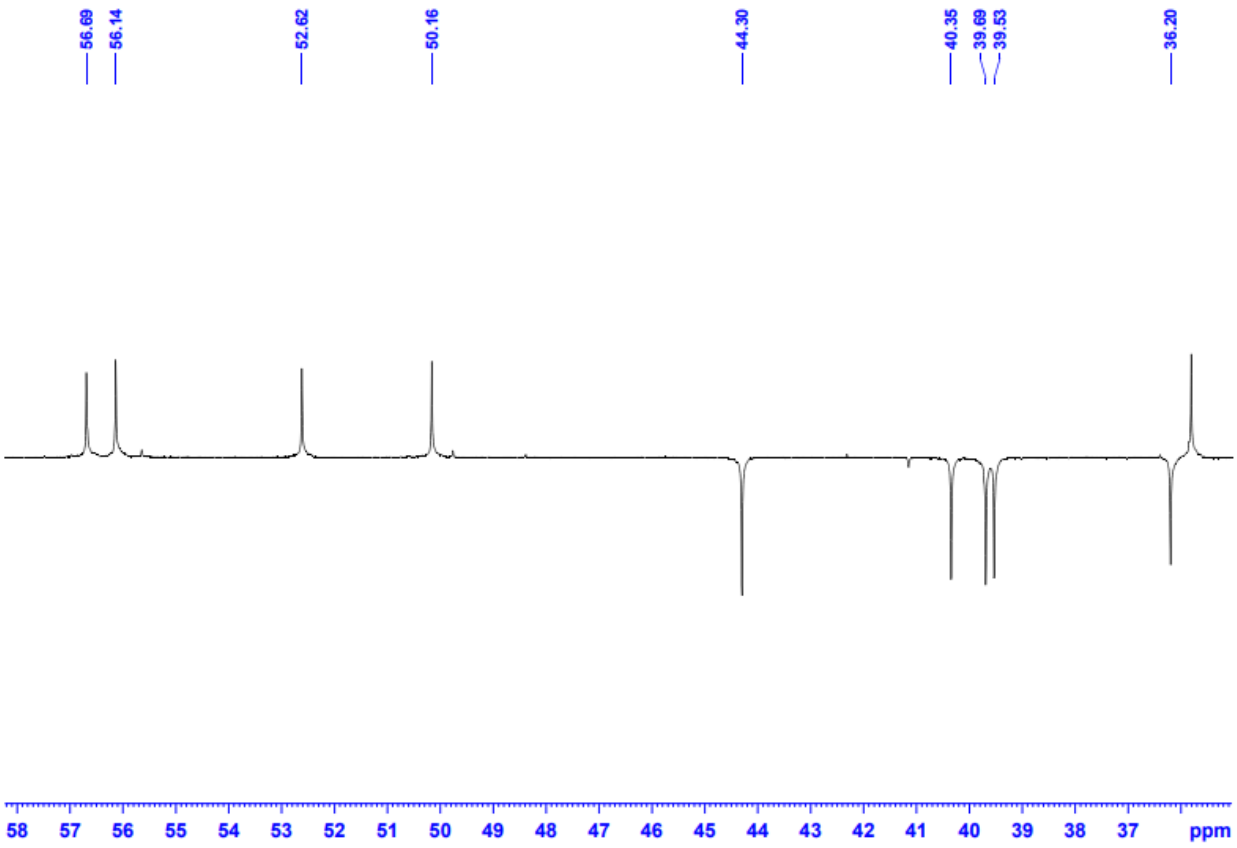

Fig. S21. Cross-section in the DEPT-135º spectrum (100 MHz, $CDCl_3$) of compound **4**.

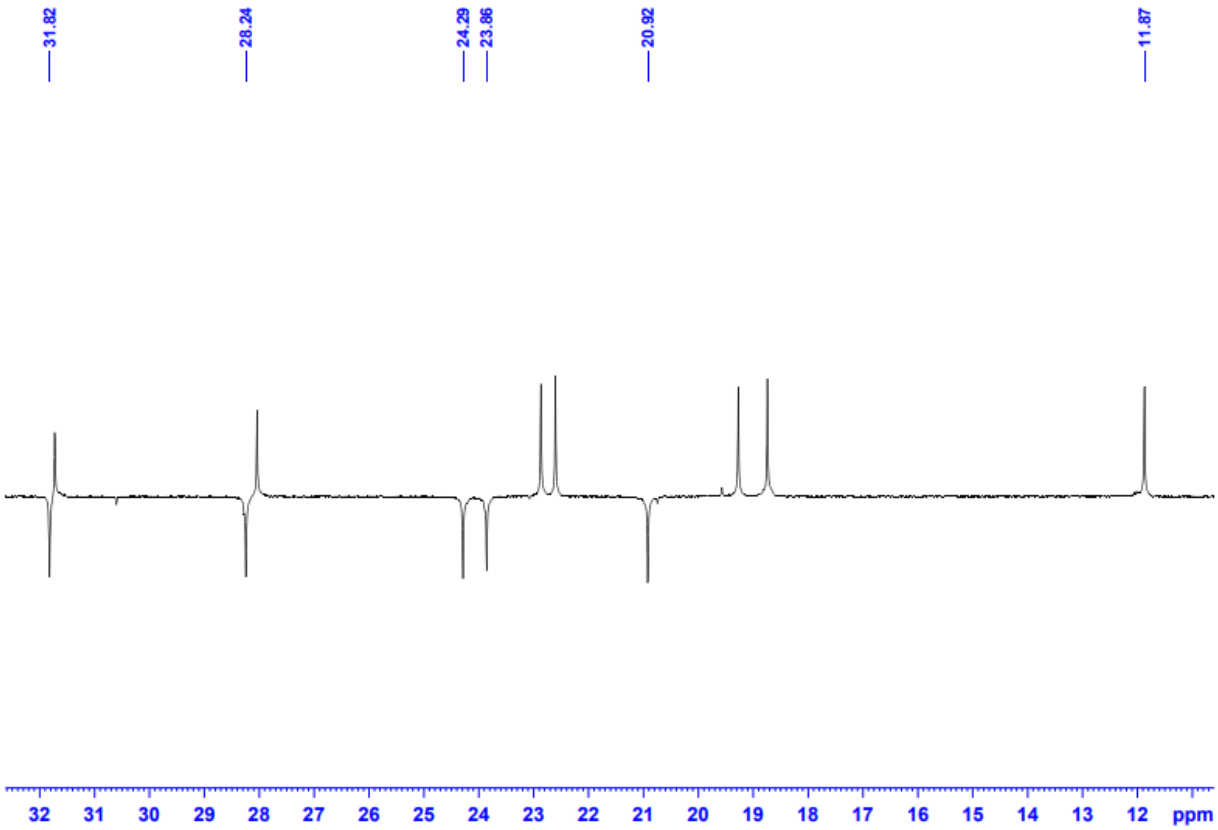

Fig. S22. Cross-section in the DEPT-135º spectrum (100 MHz, $CDCl_3$) of compound **4**.

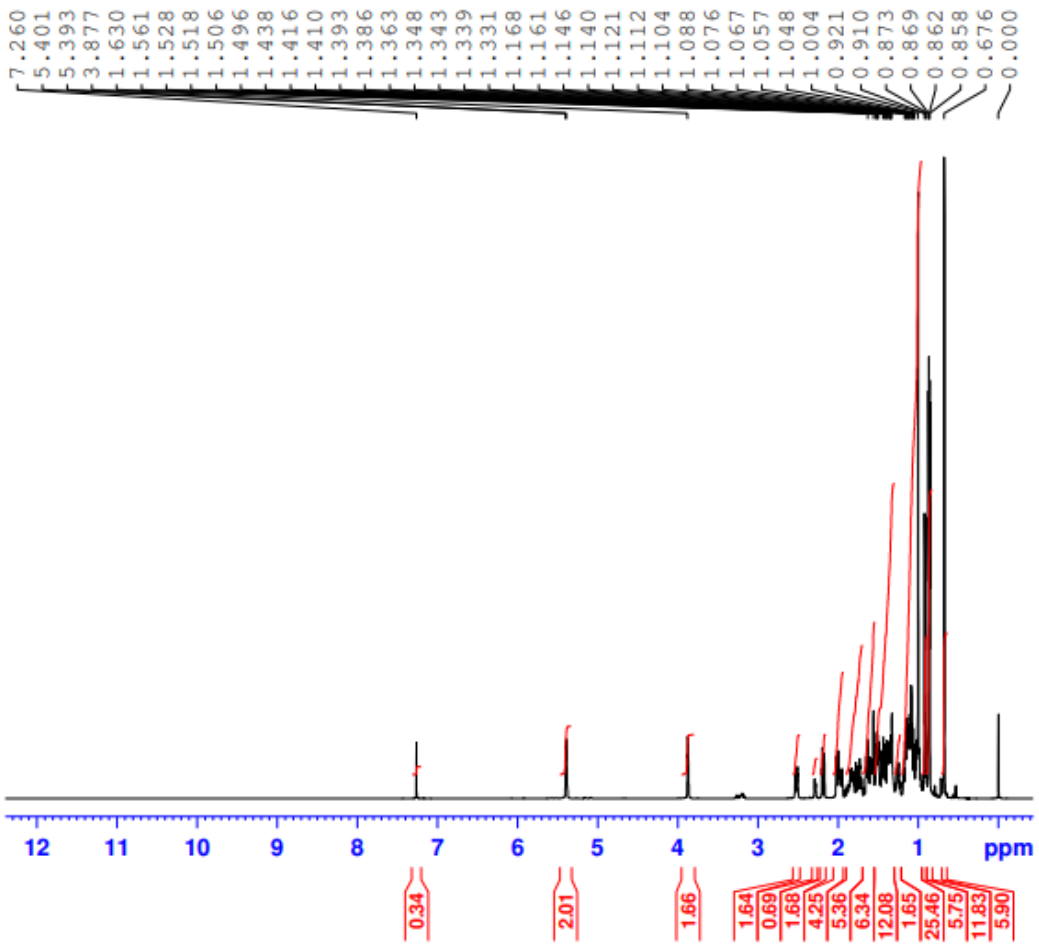

Fig. S23. ^{1}H NMR spectrum (600 MHz, $CDCl_3$) of compound **5**. This spectrum was slightly adapted from [9] ("Synthesis, antimicrobial and cytotoxicity evaluation of new cholesterol congeners", © 2015 M. R. E. S. Aly et al., published by the Beilstein-Institut, distributed under the terms of the Creative Commons Attribution 2.0 Generic License, https://creativecommons.org/licenses/by/2.0). This spectrum was incorrectly assigned to 3β-azidocholest-5-ene in [9]. The weak signal at δ = 3.20 (H-3$_\beta$) belongs to the β-epimer (ca. 15%) [10].

.

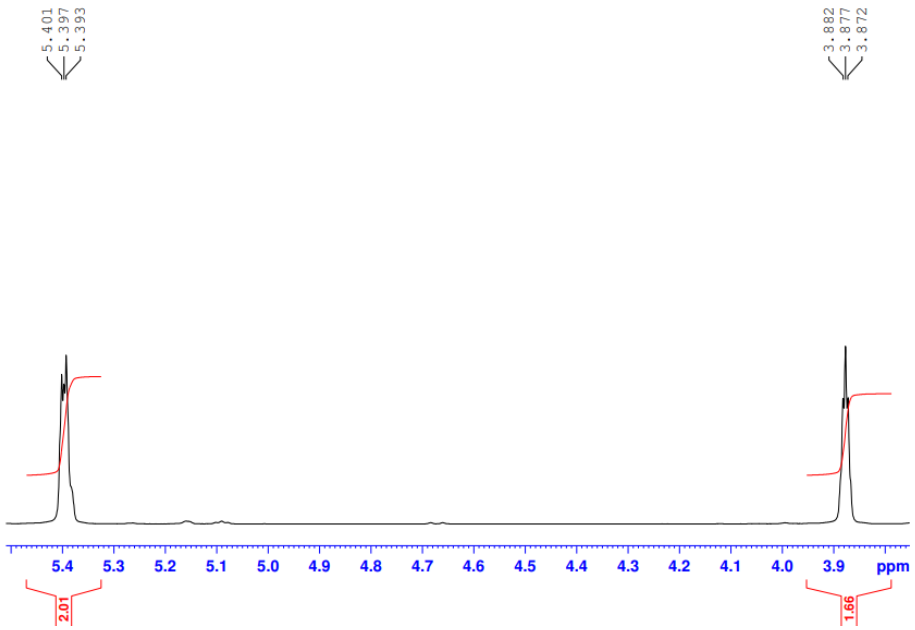

Fig. S24. Cross-section in the ^{1}H NMR spectrum of compound **5**.

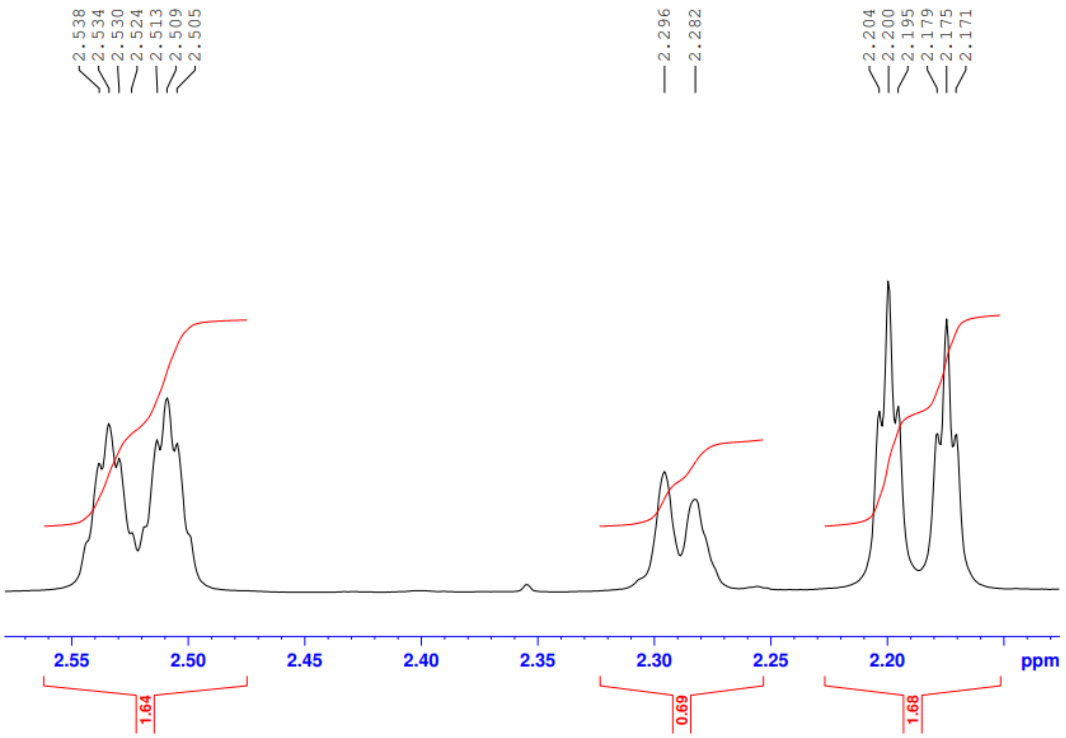

Fig. S25. Cross-section in the ^{1}H NMR spectrum of compound **5**. The signal at δ = 2.28 ppm arise from two protons of the β-epimer (ca. 15%) [10].

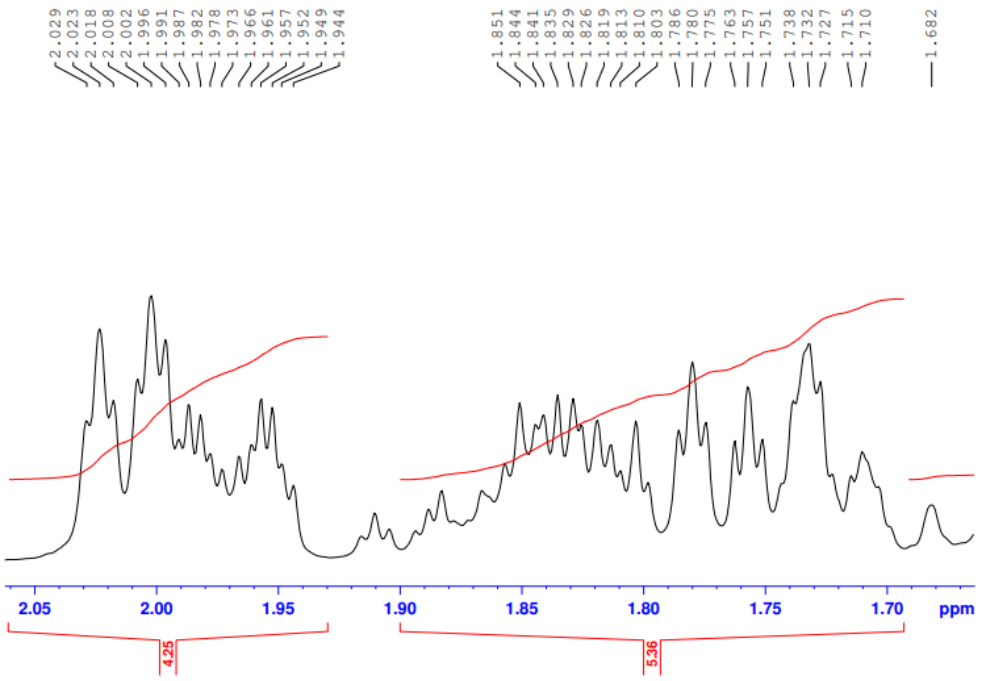

Fig. S26. Cross-section in the ^{1}H NMR spectrum of compound **5**.

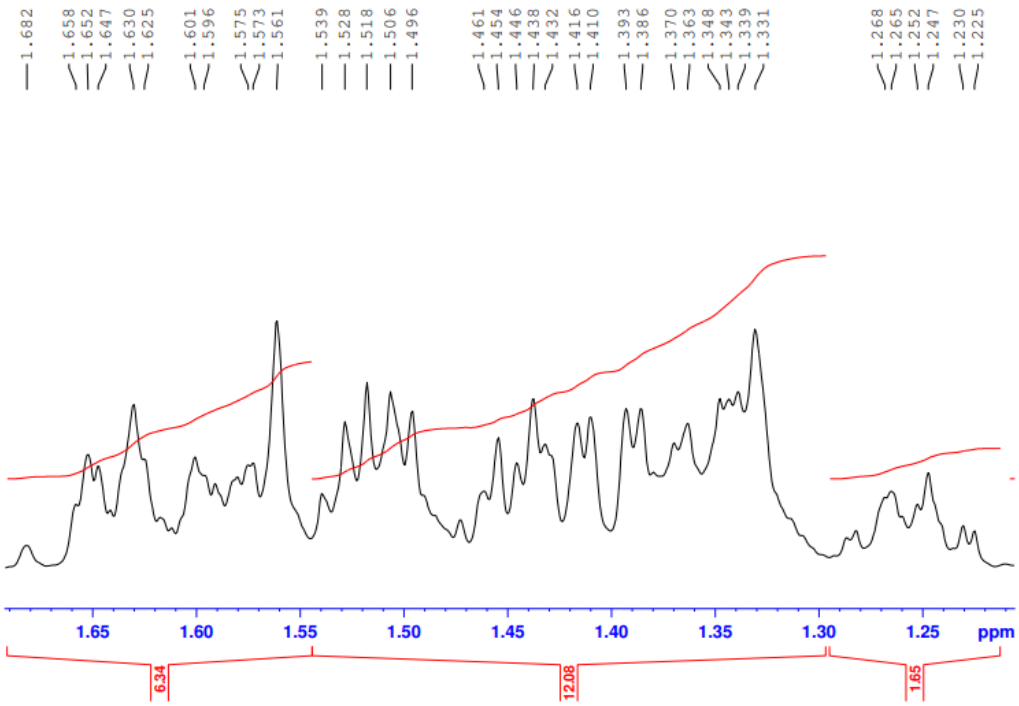

Fig. S27. Cross-section in the ^{1}H NMR spectrum of compound **5**.

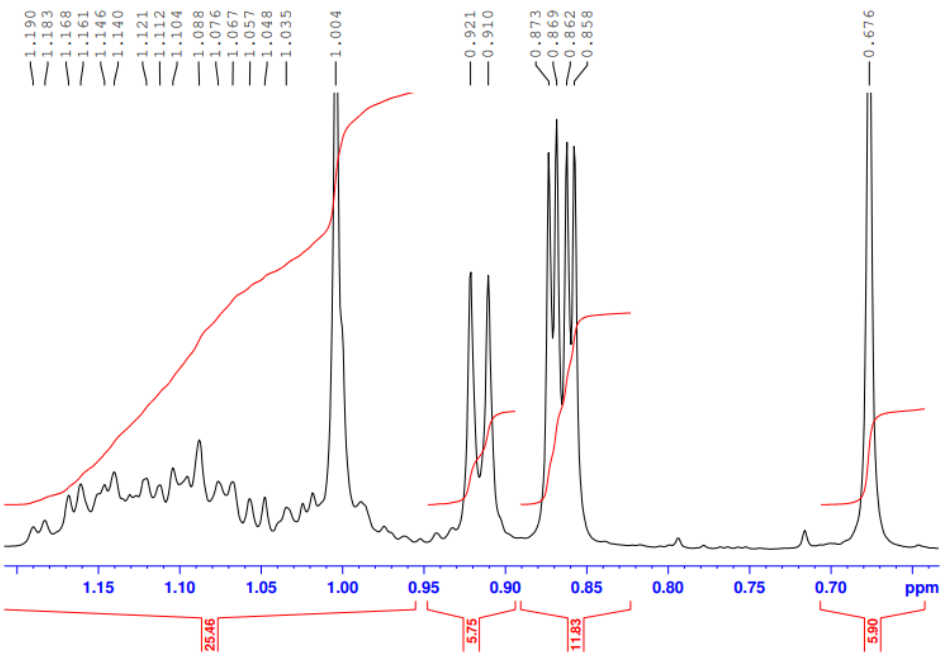

Fig. S28. Cross-section in the ^{1}H NMR spectrum of compound **5**.

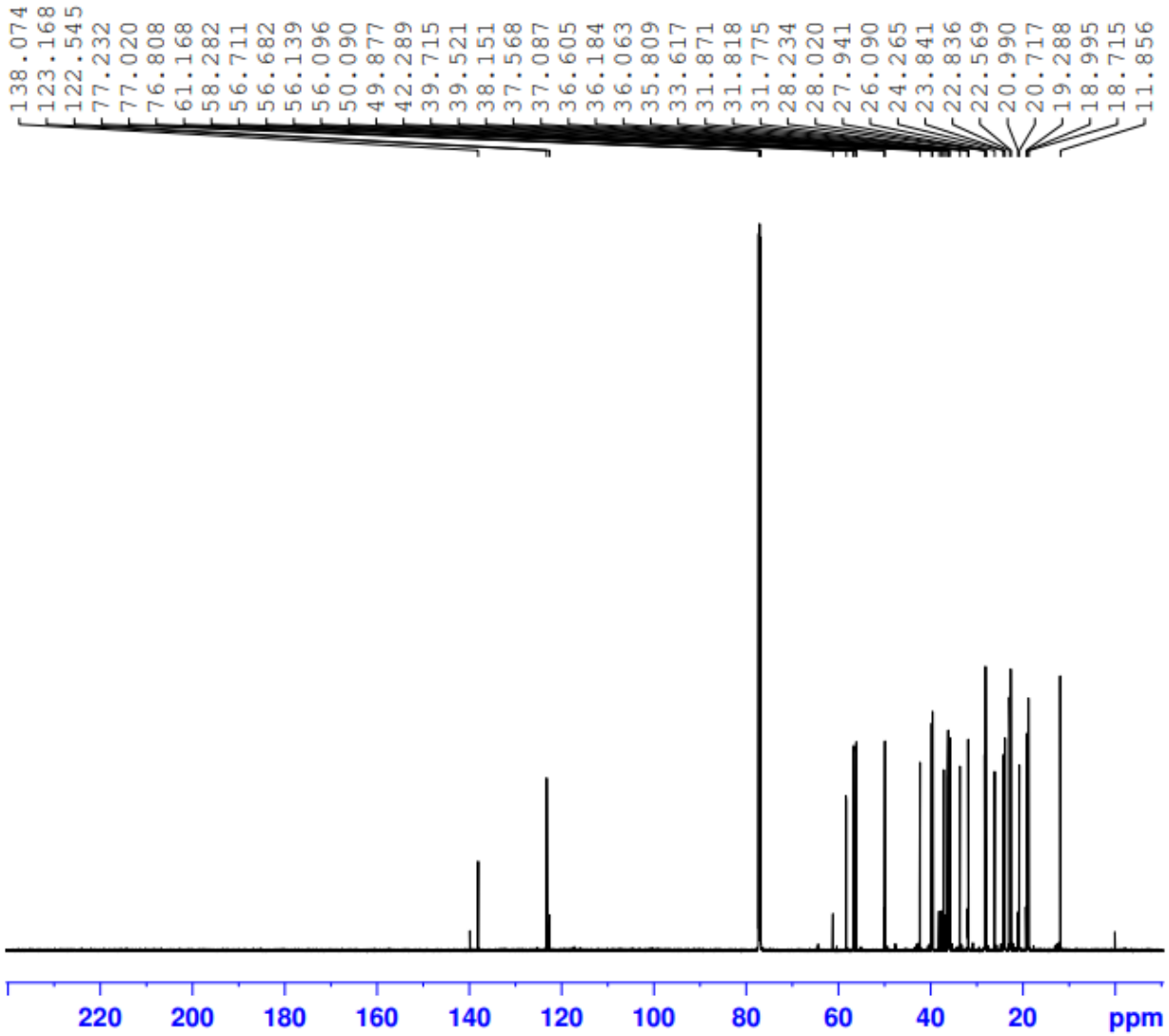

Fig. S29. ^{13}C {^{1}H} NMR spectrum (150 MHz, $CDCl_3$) of compound **5**. This spectrum was slightly adapted from [9] ("Synthesis, antimicrobial and cytotoxicity evaluation of new cholesterol congeners", © 2015 M. R. E. S. Aly et al., published by the Beilstein-Institut, distributed under the terms of the Creative Commons Attribution 2.0 Generic License, https://creativecommons.org/licenses/by/2.0). This spectrum was incorrectly assigned to 3β-azidocholest-5-ene in [9].

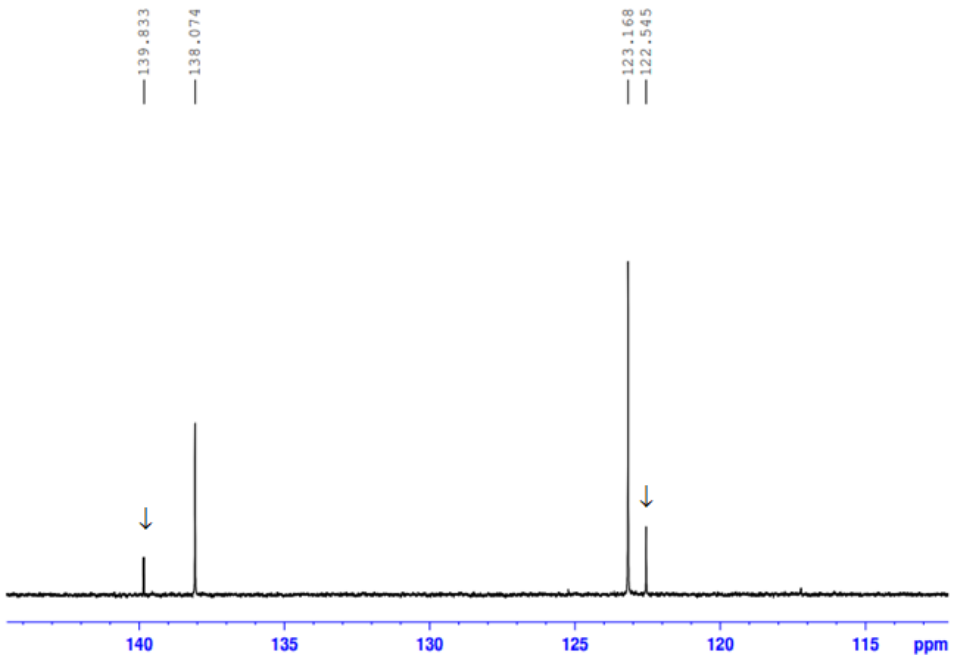

Fig. S30. Cross-section in the ^{13}C {^{1}H} NMR spectrum (150 MHz, $CDCl_3$) of compound **5**. The arrows here and in the next cross-sections denote to the signals arising from the presence of trace of 3β-azidocholest-5-ene [10].

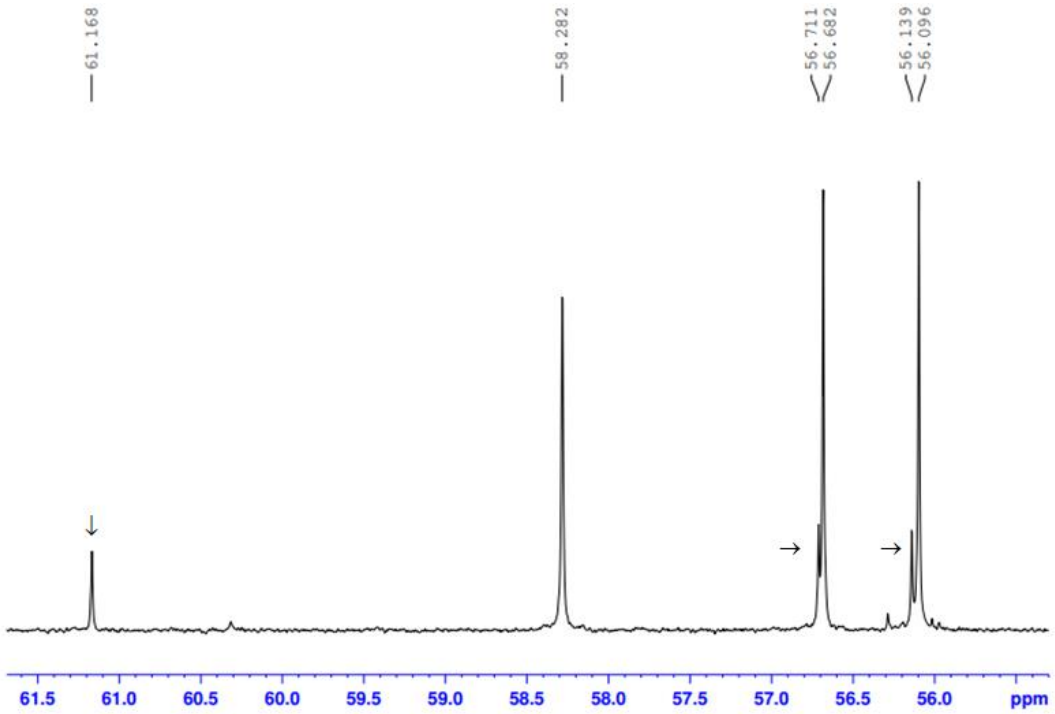

Fig. S31. Cross-section in the ^{13}C {^{1}H} NMR spectrum (150 MHz, $CDCl_3$) of compound **5**.

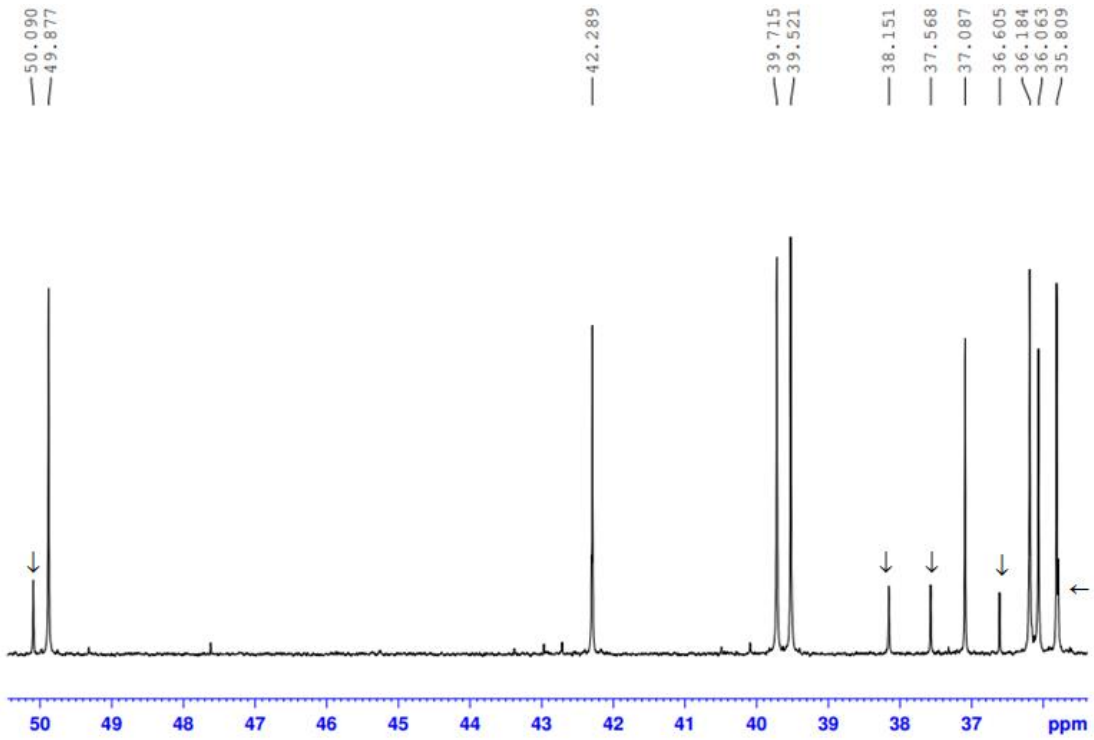

Fig. S32. Cross-section in the ^{13}C {^{1}H} NMR spectrum (150 MHz, $CDCl_3$) of compound **5**.

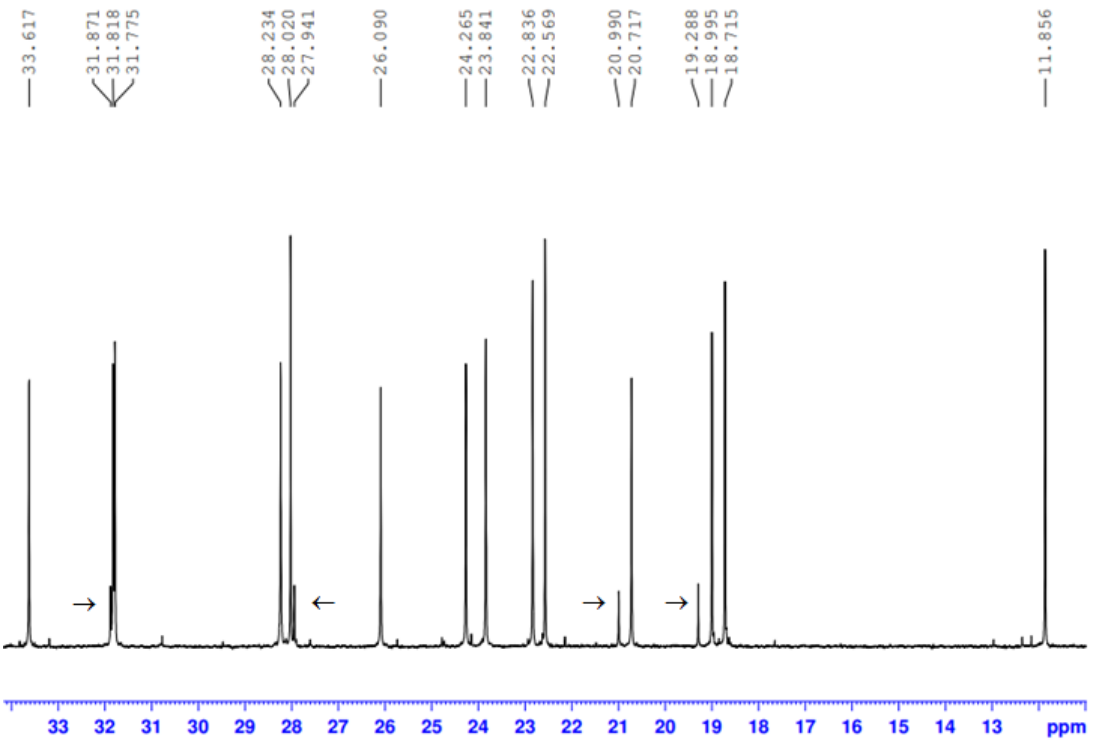

Fig. S33 . Cross-section in the ^{13}C {^{1}H} NMR spectrum (150 MHz, $CDCl_3$) of compound **5**.

III. References

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