

Supporting Information

Two-Chamber Hydrogen Generation and Application: Access to Pressurized Deuterium Gas

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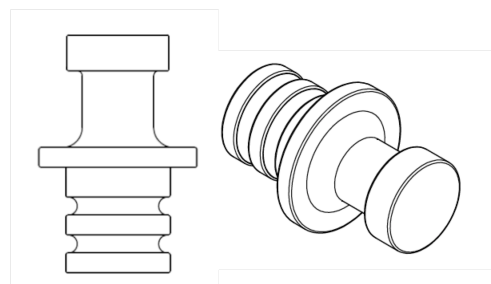
I. General Methods

Dry solvents were prepared according to standard literature procedures.¹ All other chemicals were used as received from the suppliers unless mentioned otherwise. Starting materials were made according to literature procedures. Flash column chromatography was performed on silica gel 60 (230–400 mesh). ¹H and ¹³C NMR spectra were recorded at 400 MHz and 100 MHz, respectively. All D-incorporations were determined by ¹H NMR recorded with the relaxation time set to 60 seconds. Chemical shifts are reported in ppm downfield to TMS ($\delta = 0$) and referenced to the solvent residual peak,² using the following peak pattern abbreviations: br, broad; s, singlet; d, doublet; t, triplet; q, quartet; pent, pentet; sext, sextet; sept, septet; m, multiplet; dd, doublet of doublets; dt, doublet of triplets; ddd, doublet of doublet of doublets; ddt, doublet of doublet of triplets, and td, triplet of doublets. HRMS was recorded on a LC TOF (ES).

COware and the H-Cap system.

H-Caps

PTFE caps sealed with two NBR70, 7.1 x 1.6 mm O-rings for tight fit to the vials of both COware and 3-Chamber system.



COware – Handling of pressurized gas in glassware.

Two glass vials (Chamber A and B) connected with a glass tube to allow gas-transfer.

Total Volume = 20 mL.

The system is sealed using a screw cap lined with a PTFE/silicone seal.

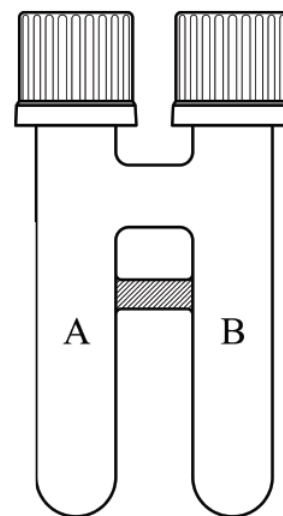
Glass equipment should always be examined for damages to its surface, which may weaken its strength.

One must abide to all laboratory safety procedures and always work behind a shield when working with glass equipment under pressure.

Materials, which solidify upon standing thus causing stress on the glass equipment, should be avoided.

The equipment should not be operated above 60 psi

The user alone is responsible for calculating the resulting internal pressure when operating COware.



¹ Perrin, D.; Armarego, W. *Purification of Laboratory Chemicals 3rd Ed*, Pergamon Press, **1988**

² Gottlieb, H. E., Kotlyar V., Nudelman A. *J. Org. Chem.***1997**, 62, 7512-7515.

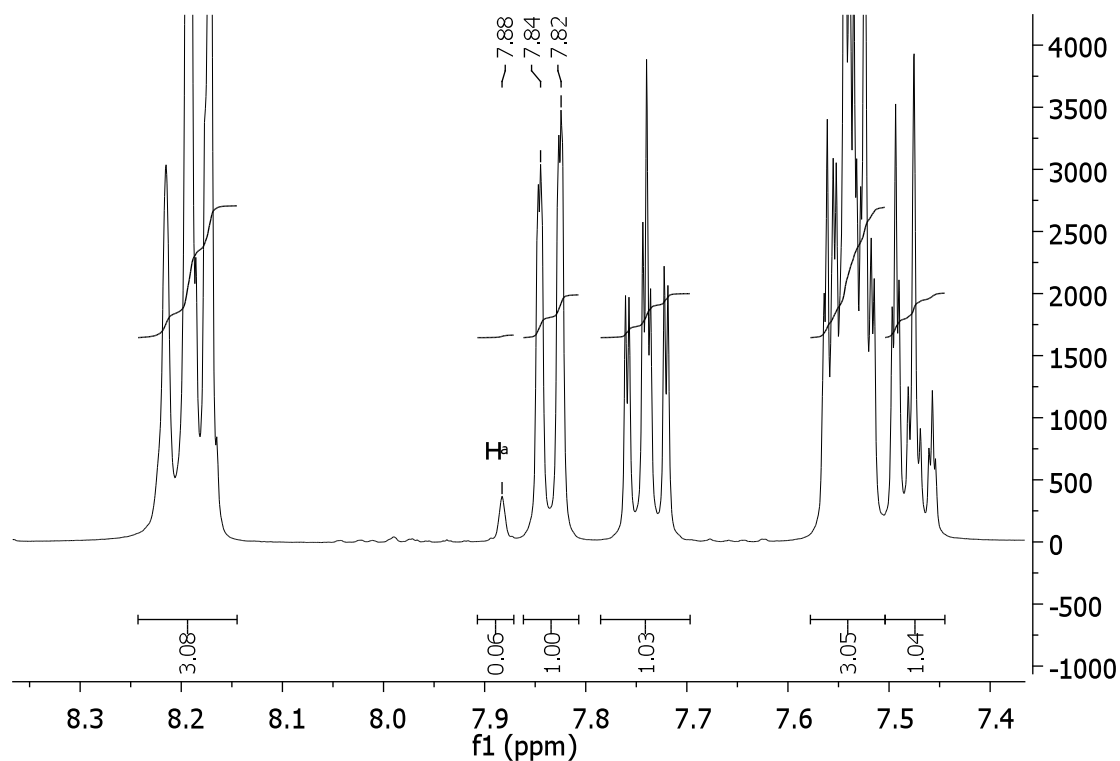
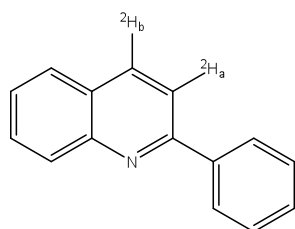
II. Determination of D-incorporation

All spectra were recorded using a 60 second relaxation delay to ensure reliable determination of the integrals. D-incorporation was determined by comparison of the residual ^1H -signal of the deuterated position ($\int_{\text{residual } ^1\text{H}}$) with the normalized integral of a non-deuterated position ($\int_{\text{non-deuterated } ^1\text{H}}$). A general formula is presented below.

$$\text{Deuterium content (\%)} = \left(1 - \frac{\int_{\text{residual } ^1\text{H}}}{\int_{\text{non deuterated } ^1\text{H}}} \right) * 100\%$$

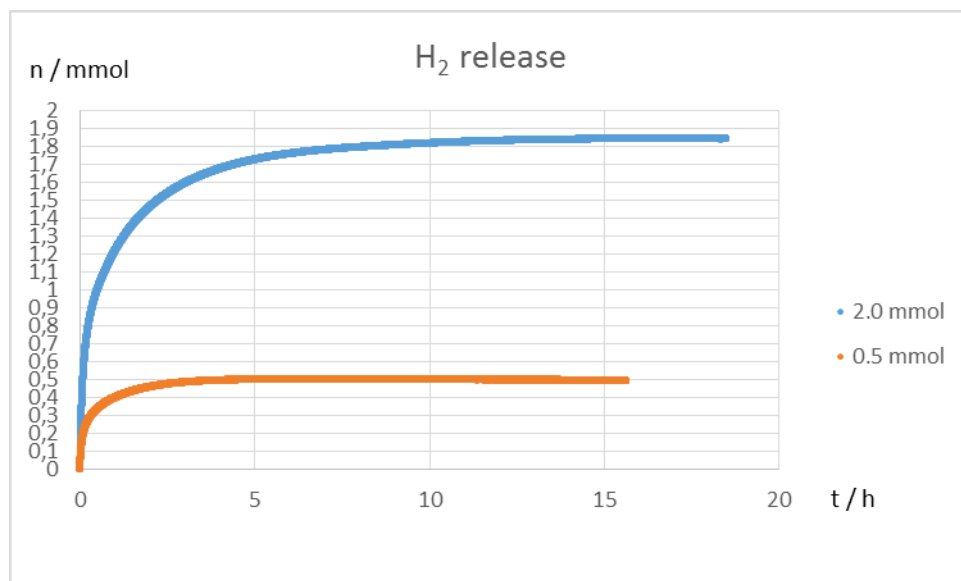
Exemplified below with D-incorporation at position **a** of 2-phenylquinoline (Compound **19b**):

$$\text{Deuterium Content (H}_a\text{) (\%)} = \left(1 - \frac{0.06 \text{ (7.88 ppm)}}{1 \text{ (7.83 ppm)}} \right) * 100\% = 94\%$$



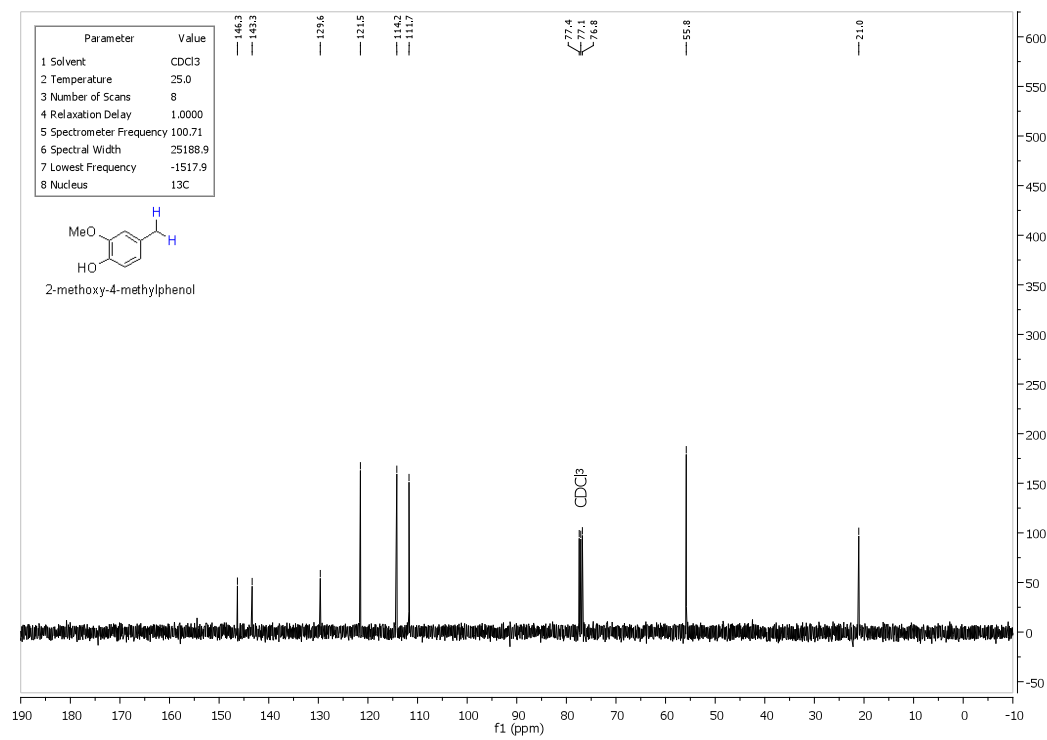
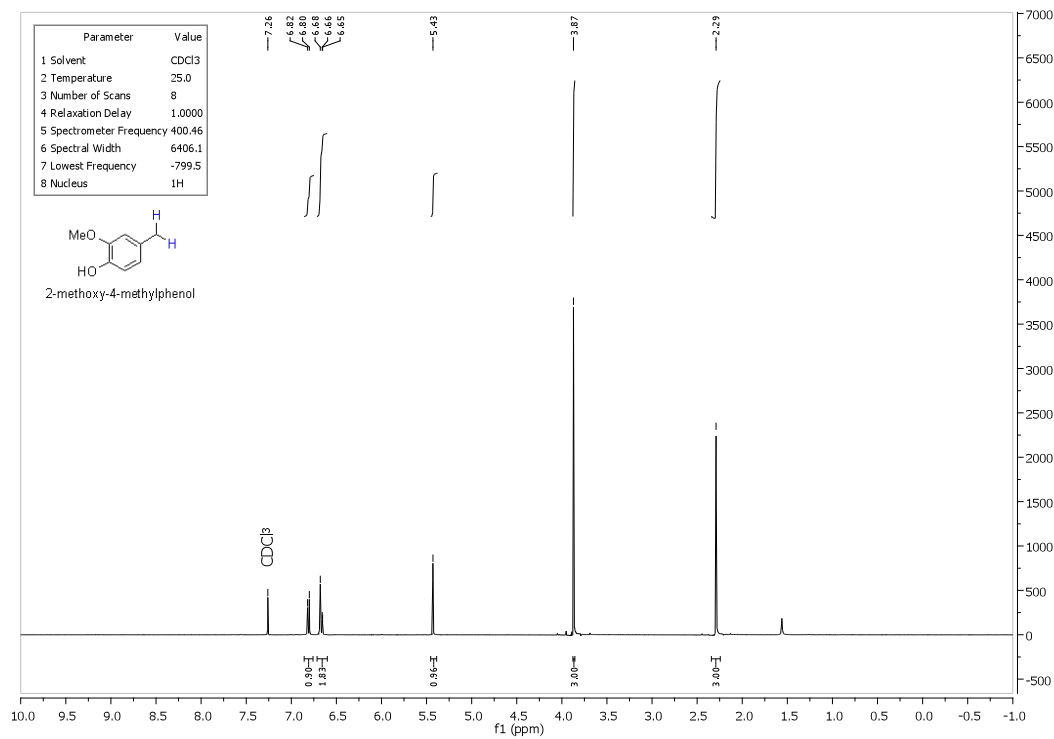
III. Hydrogen release

Measuring of Hydrogen Release Overnight: Chamber B of the COware was fitted with a digital manometer logging the pressure every 3 seconds. In chamber A of the COware was added zinc granular (1 equiv.) and 4M HCl (3 equiv.). Chamber A was sealed with a screw cap fitted with an H-Cap. The reactions were left overnight at room temperature.

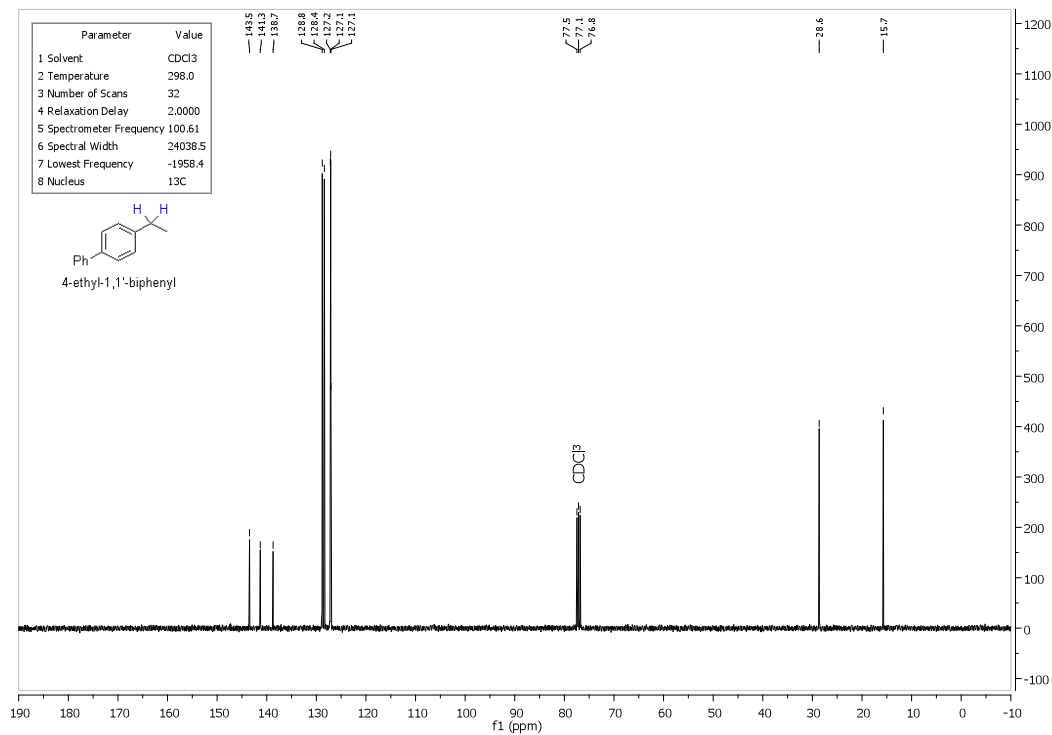
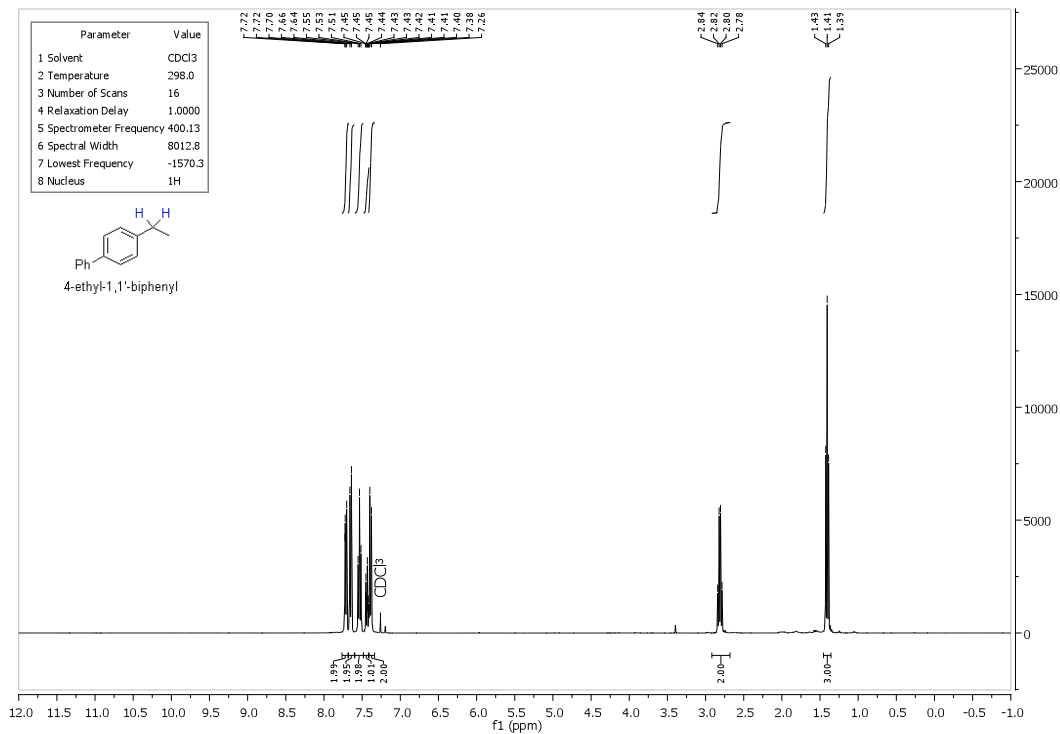


IV. NMR Spectra

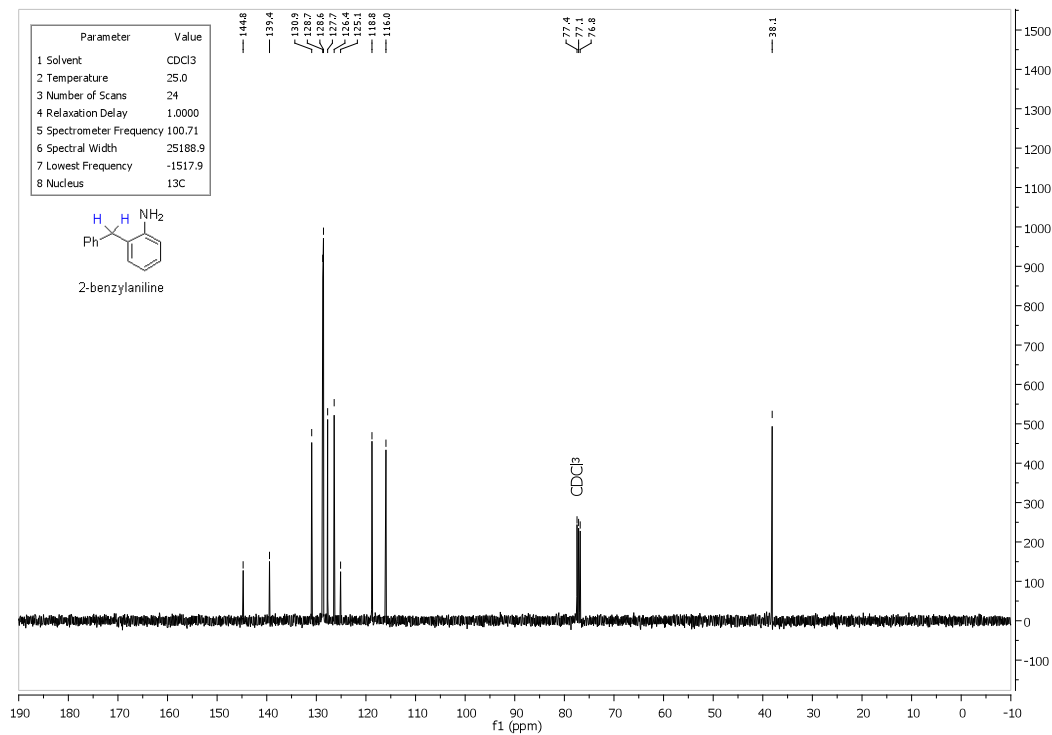
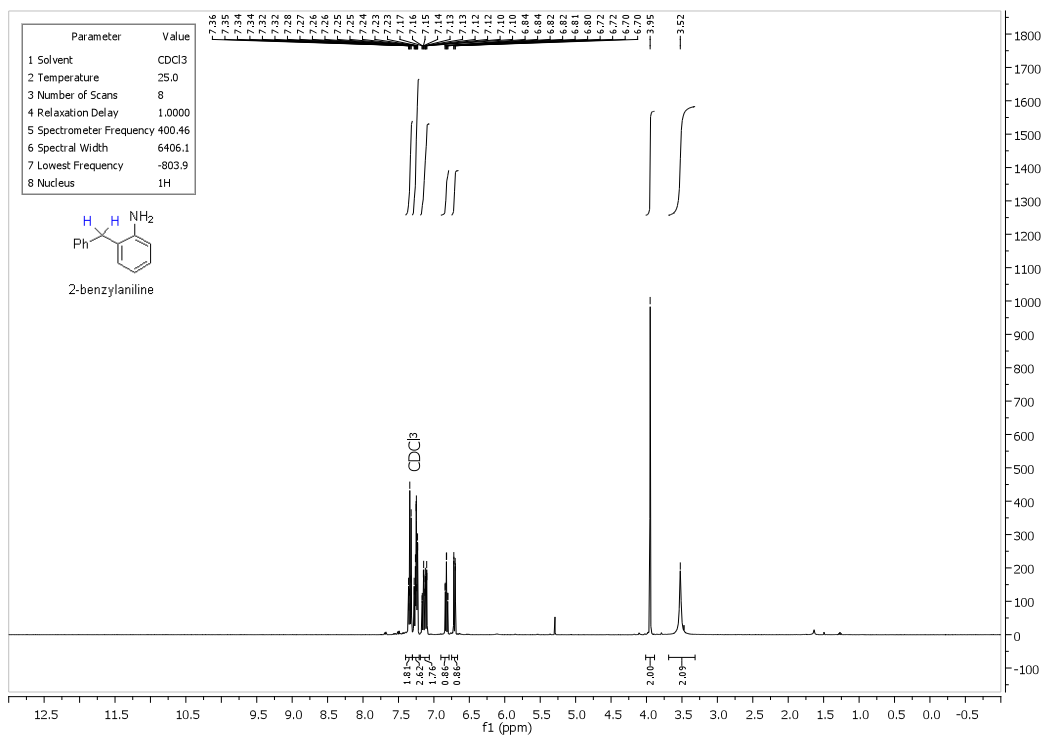
4-Ethyl-2-methoxyphenol (1b).



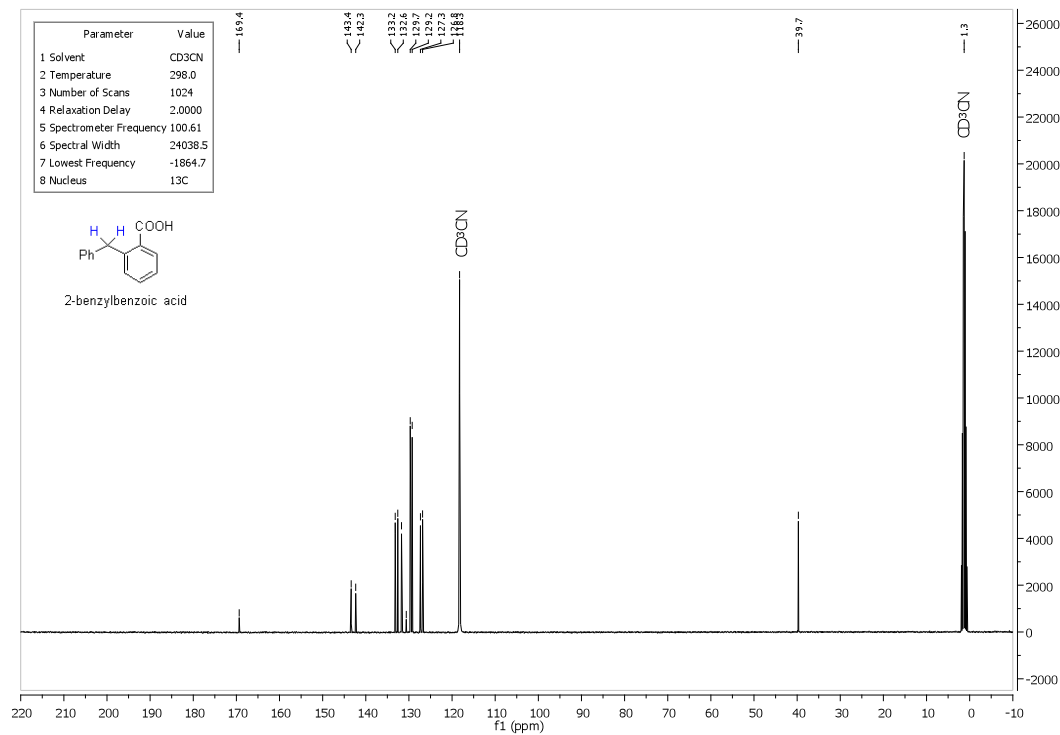
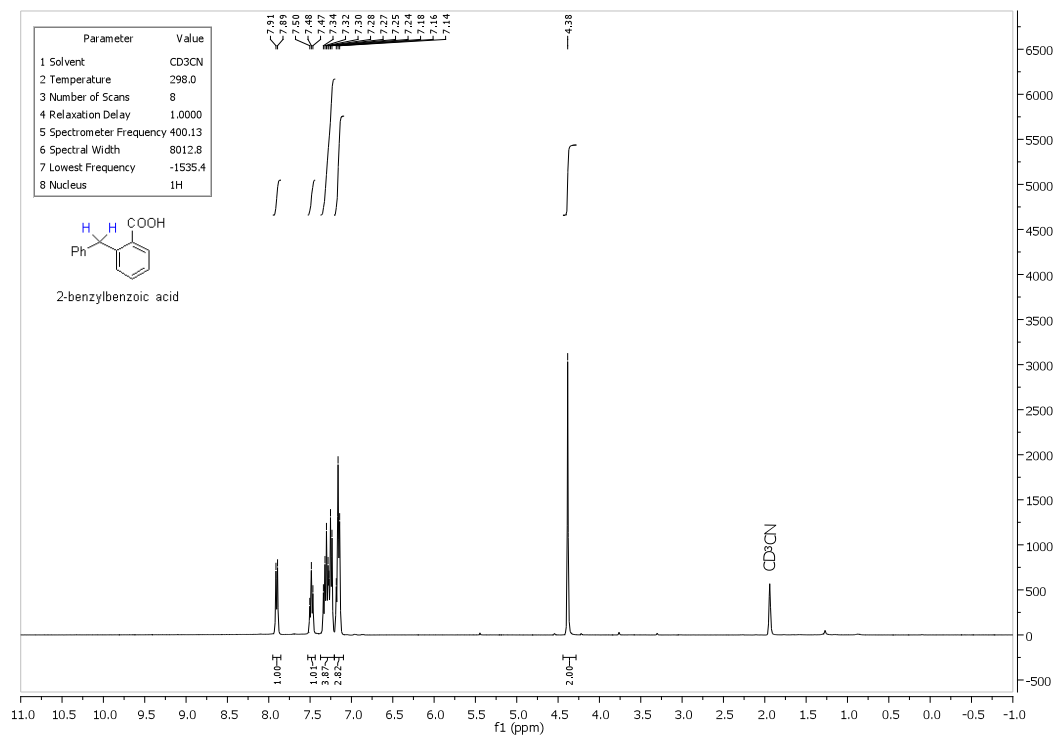
4-Ethyl-1,1'-biphenyl (2b).



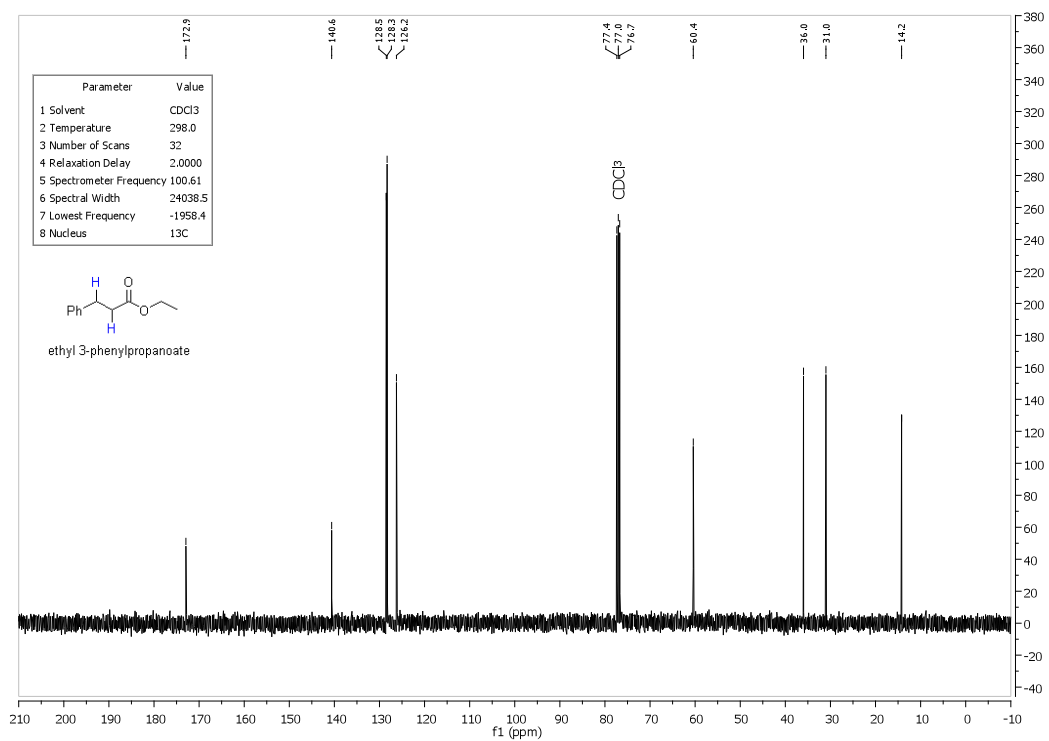
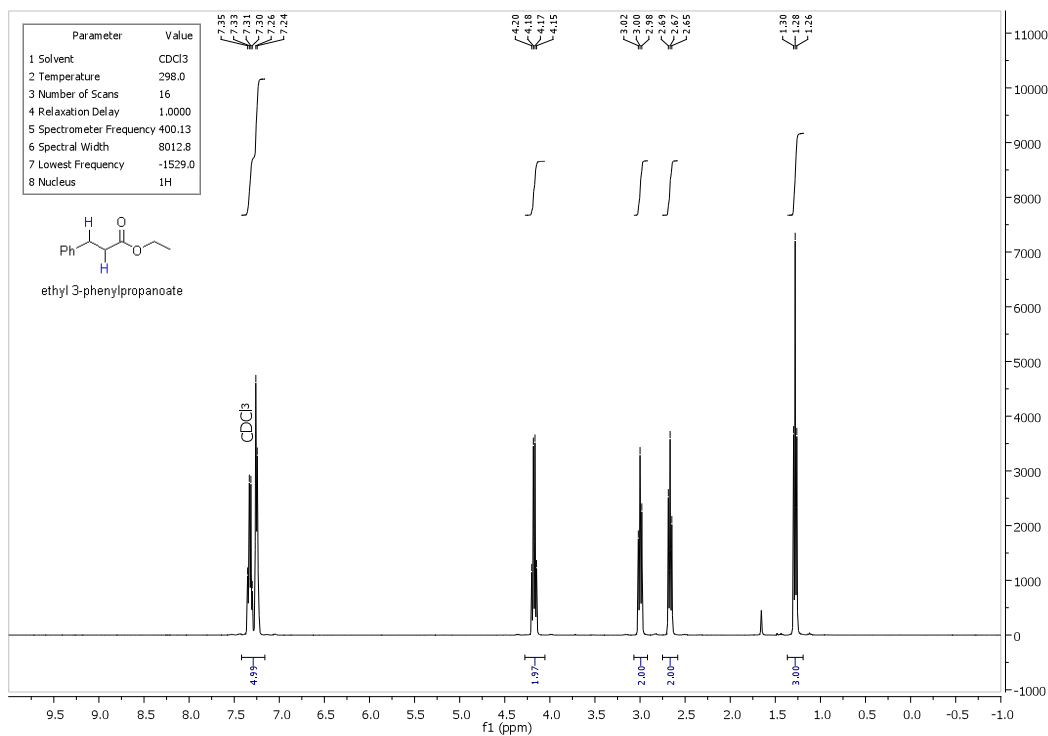
2-Benzylaniline (3b).



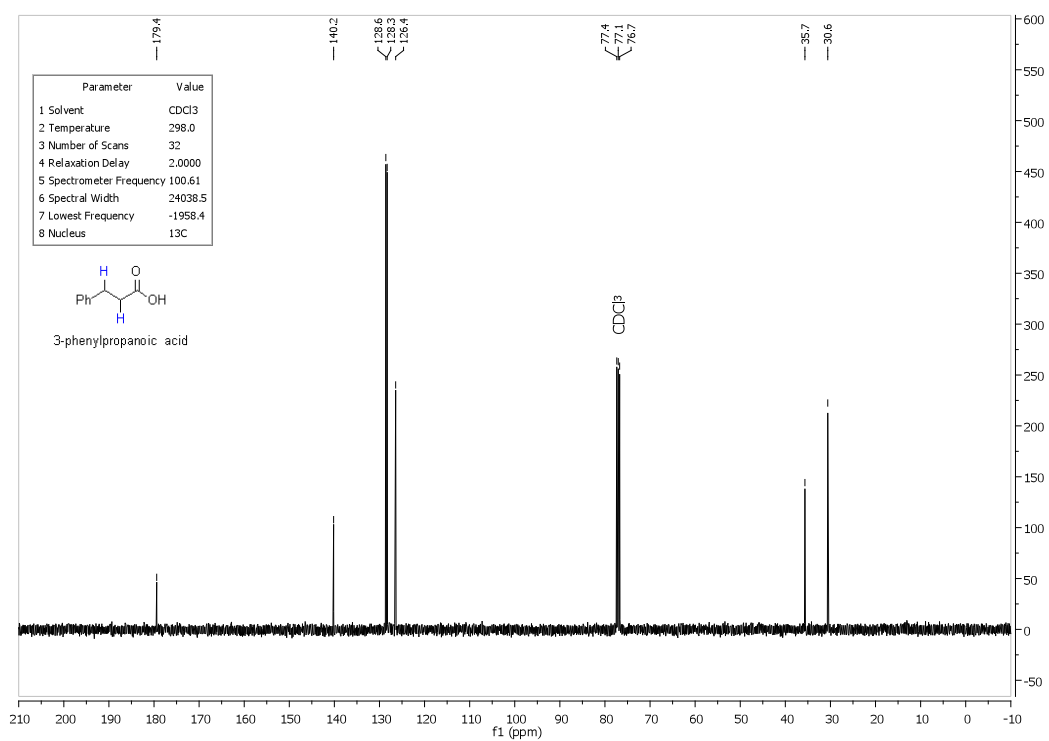
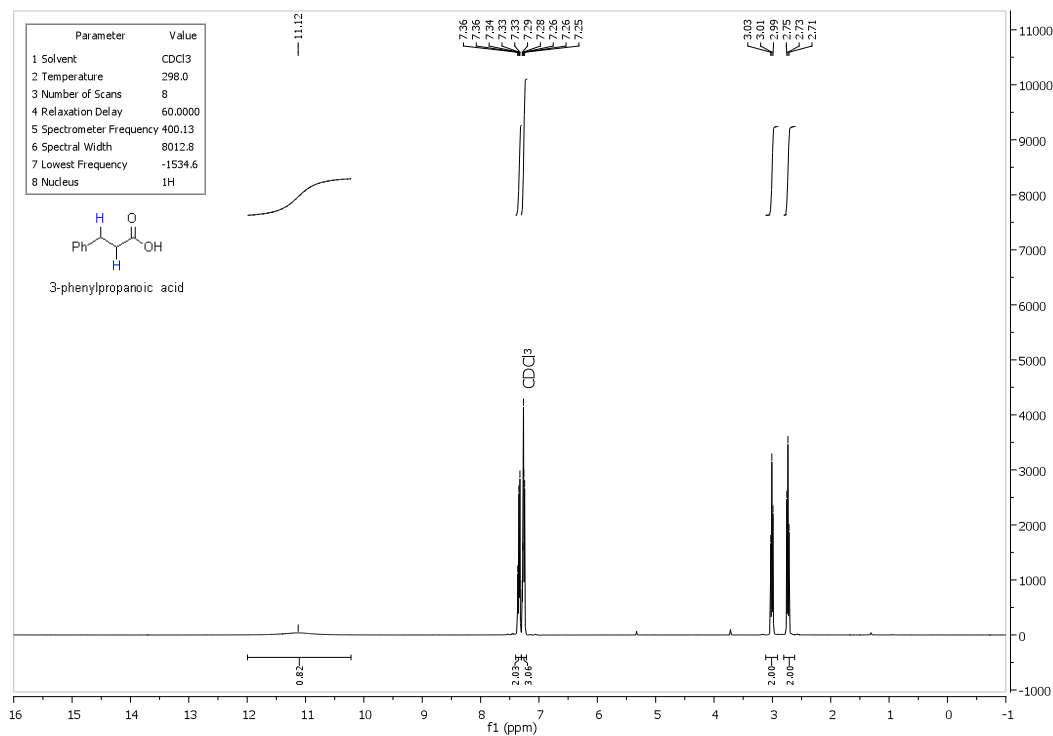
2-Benzylbenzoic acid (4b).



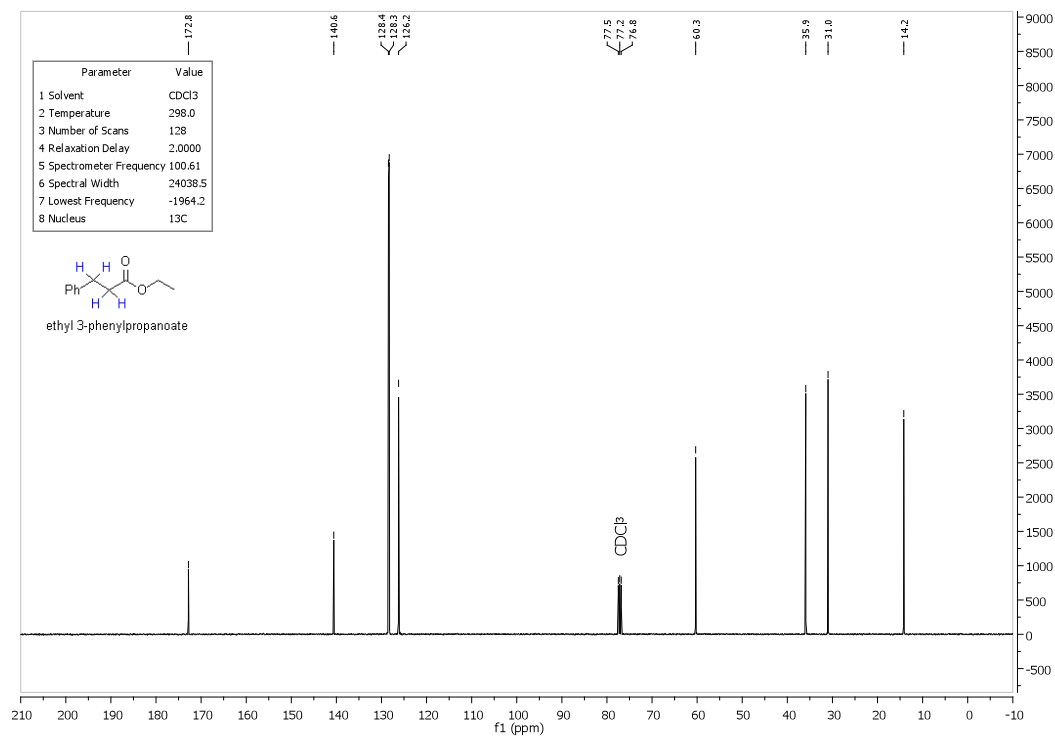
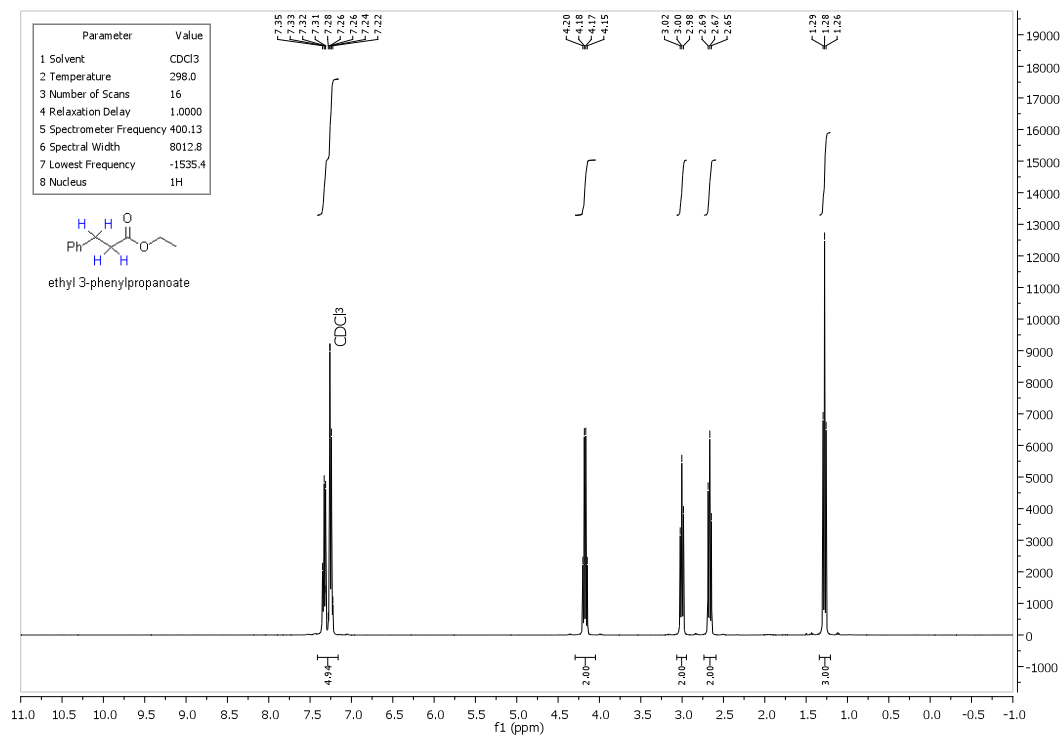
Ethyl-3-phenylpropanoate (5b).



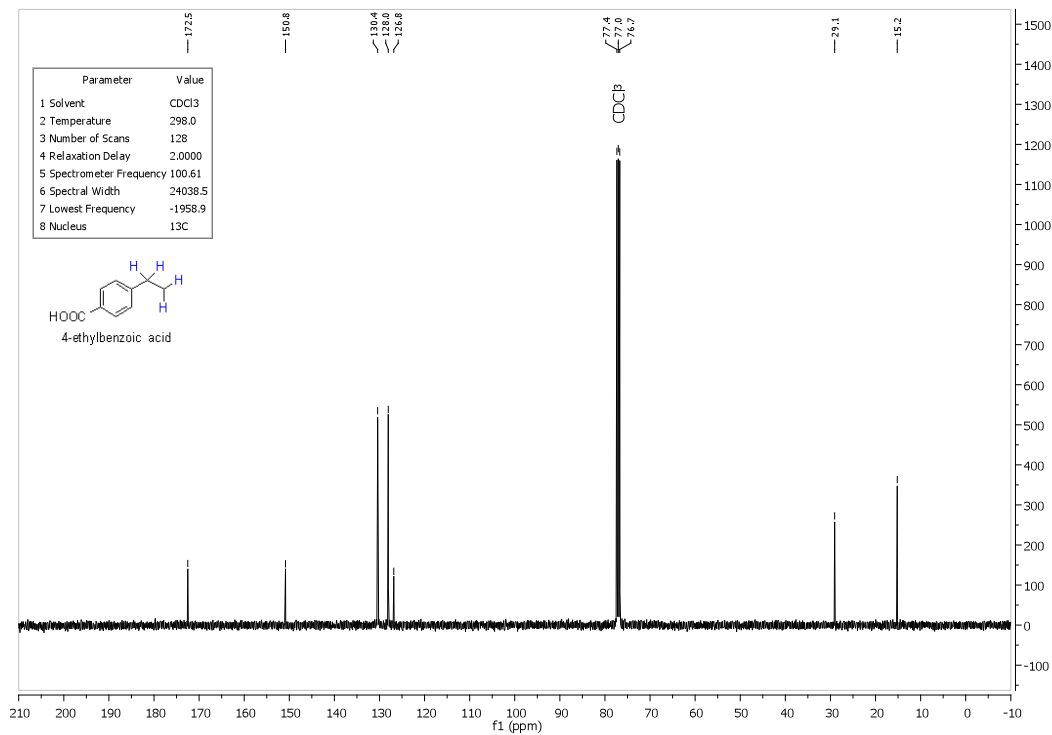
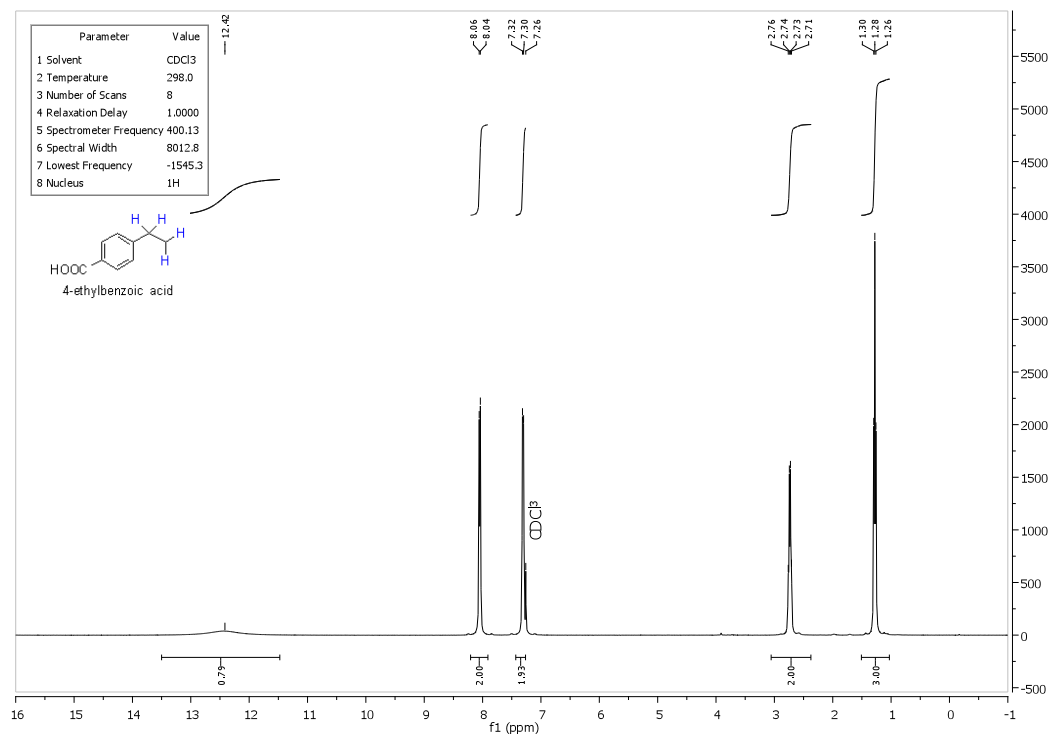
3-Phenylpropanoic acid (6b).



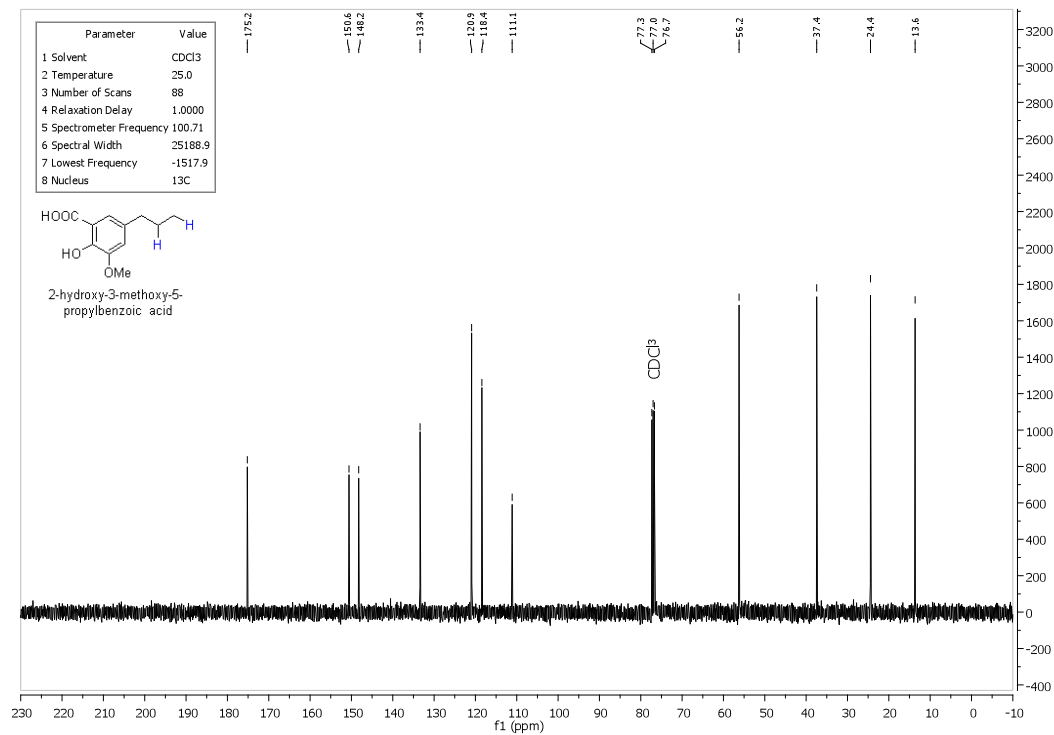
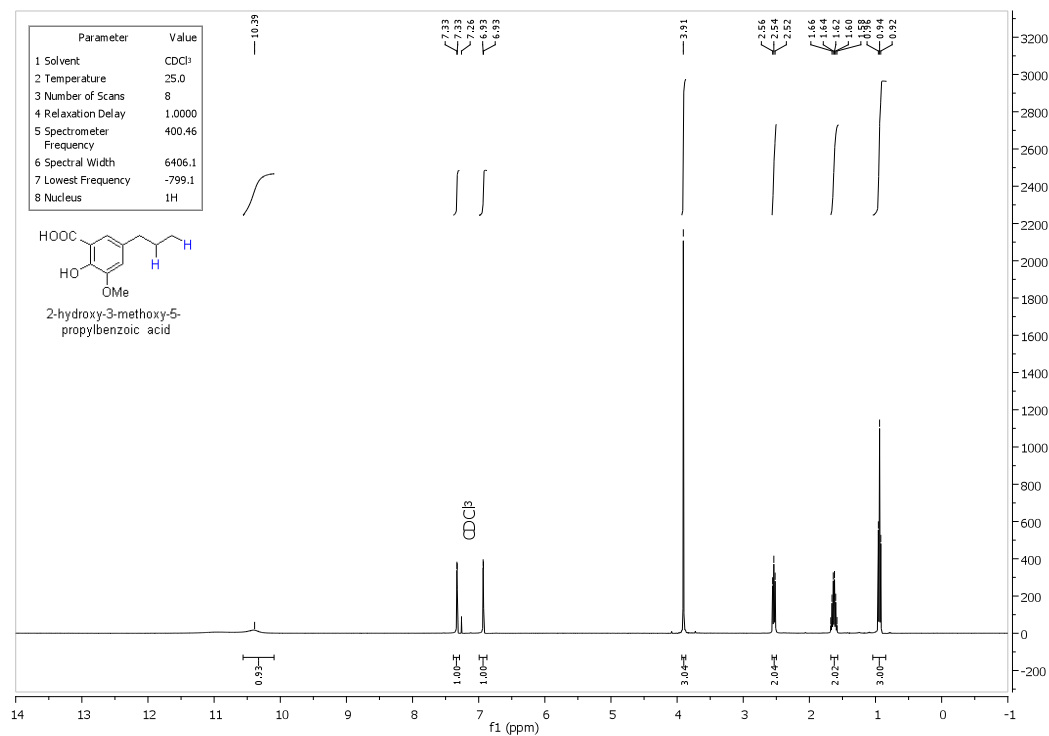
Ethyl 3-phenylpropanoate (7b).



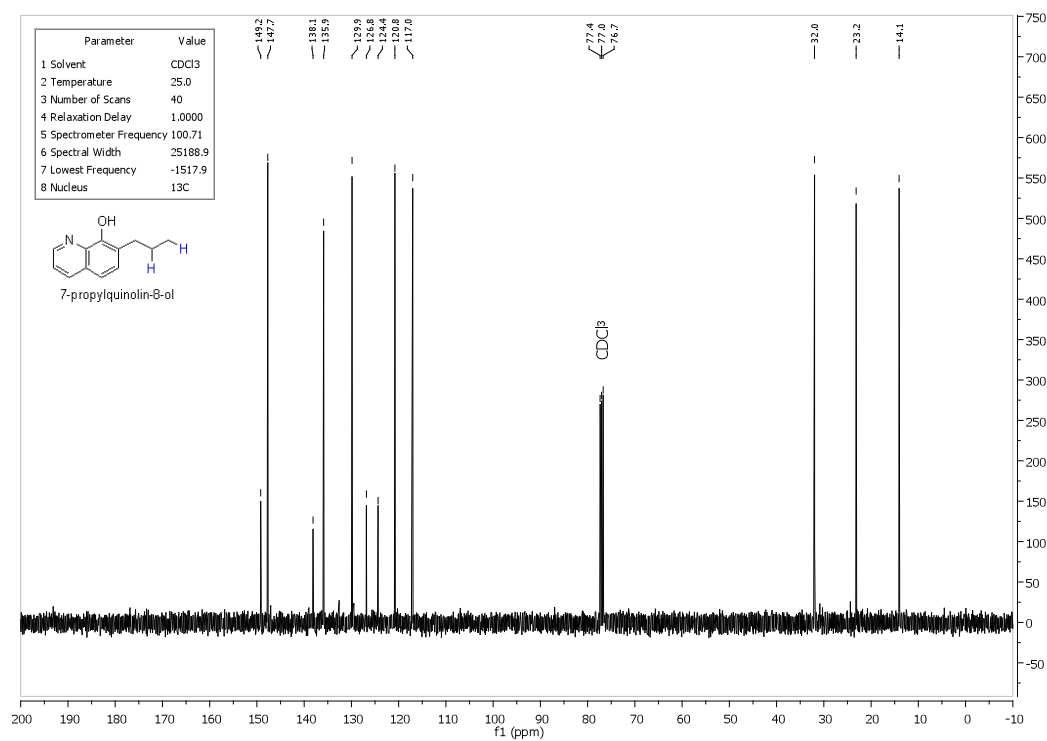
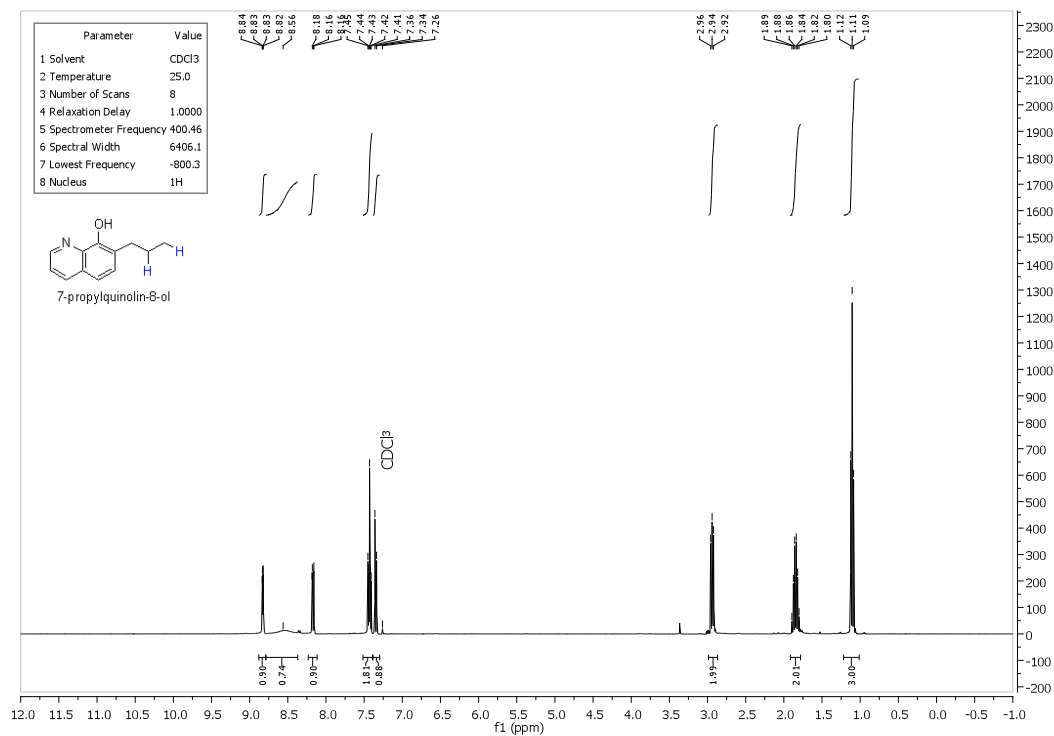
4-Ethylbenzoic acid (8b).



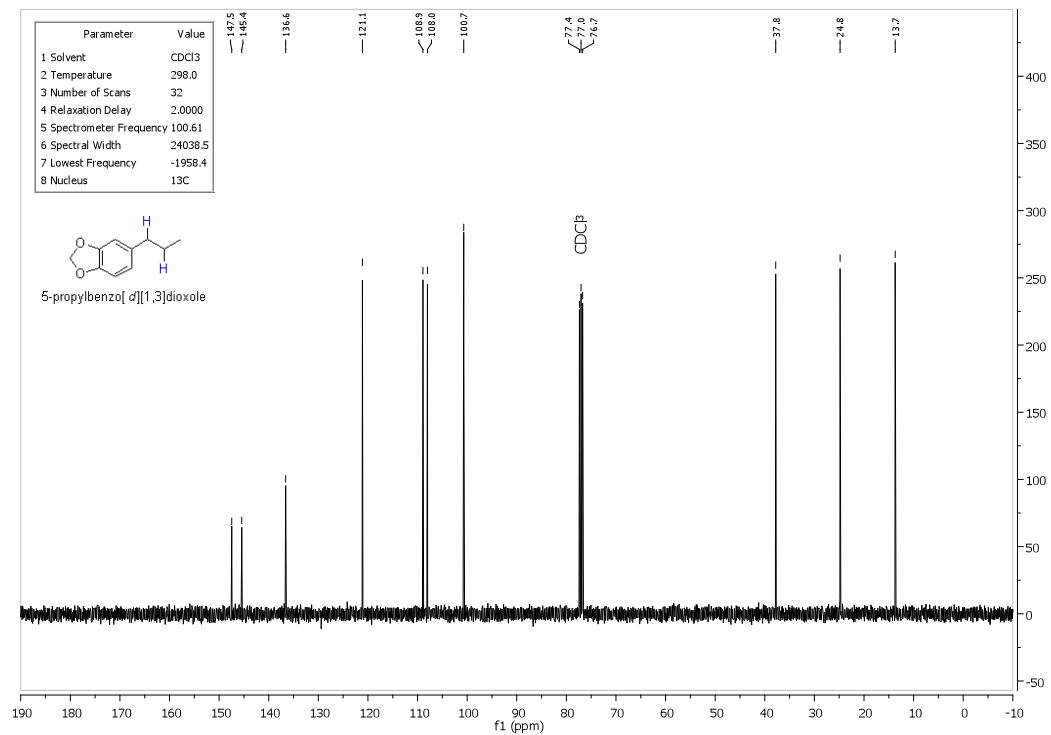
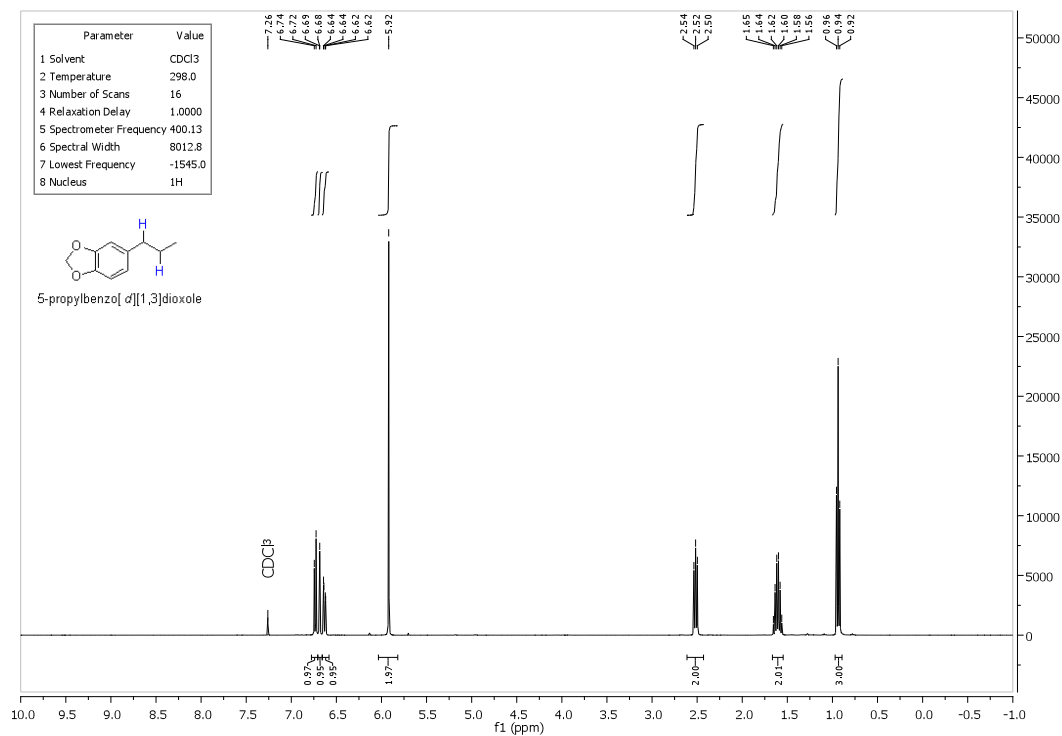
2-Hydroxy-3-methoxy-5-propylbenzoic acid (9b).



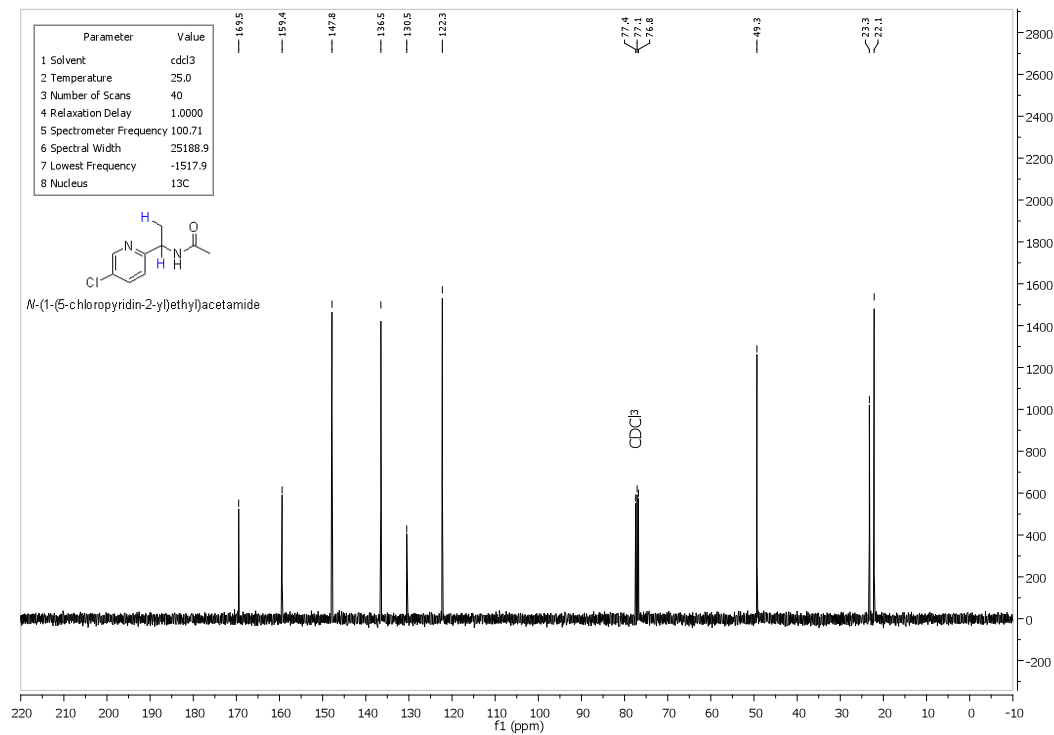
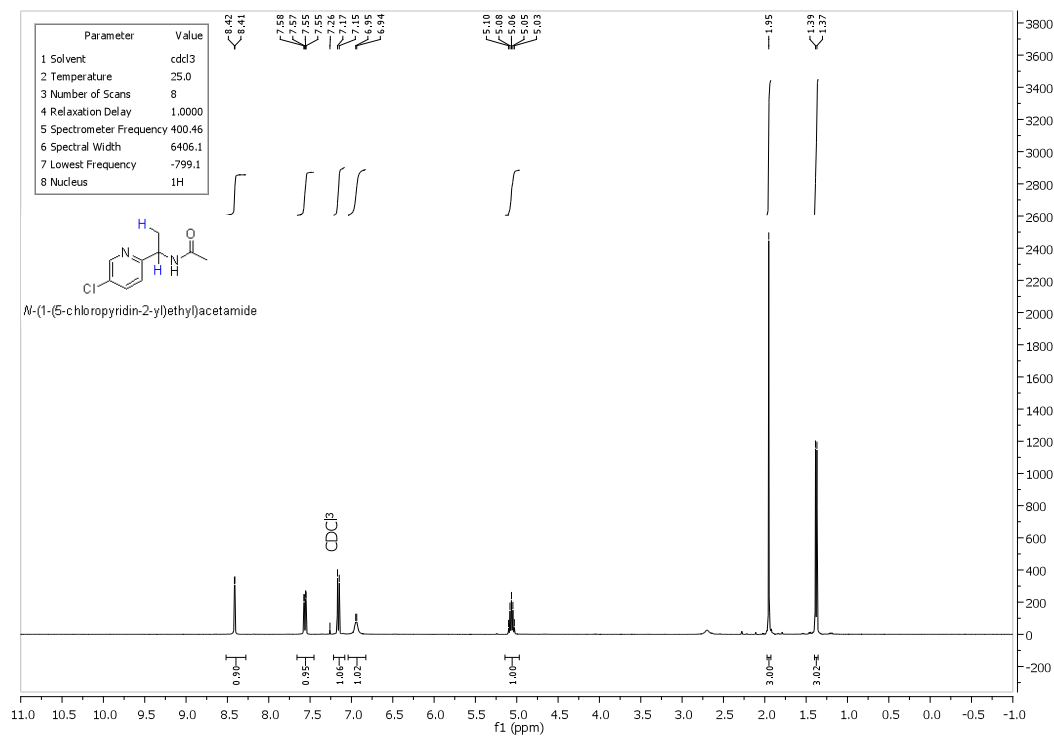
7-Propylquinolin-8-ol (10b).



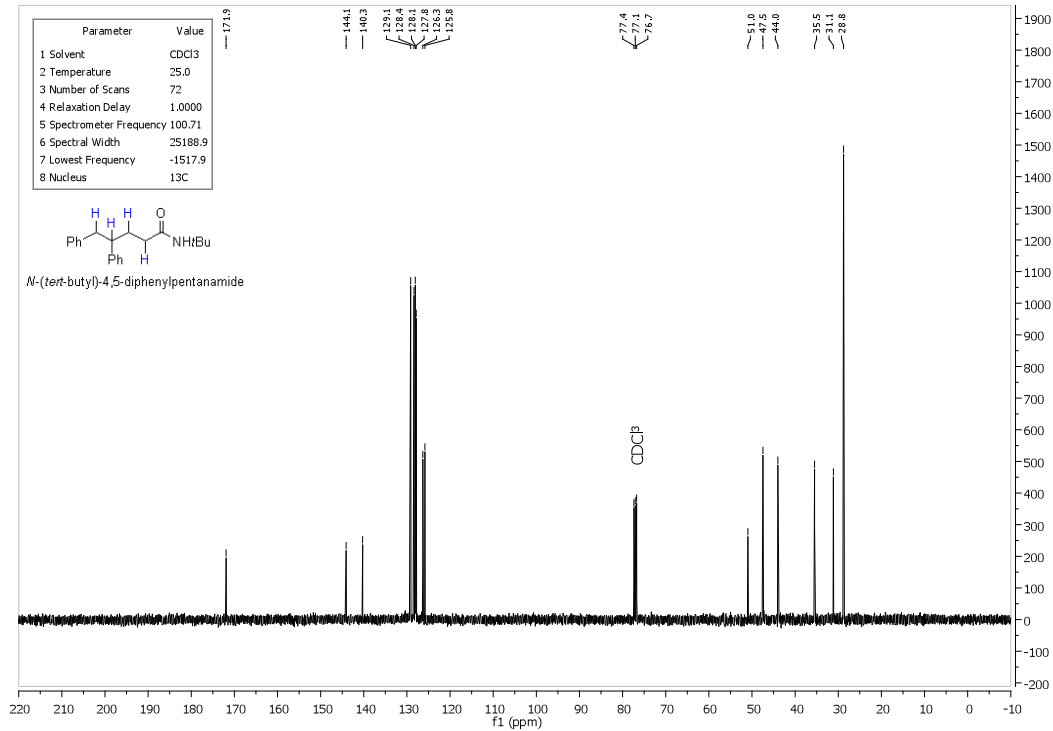
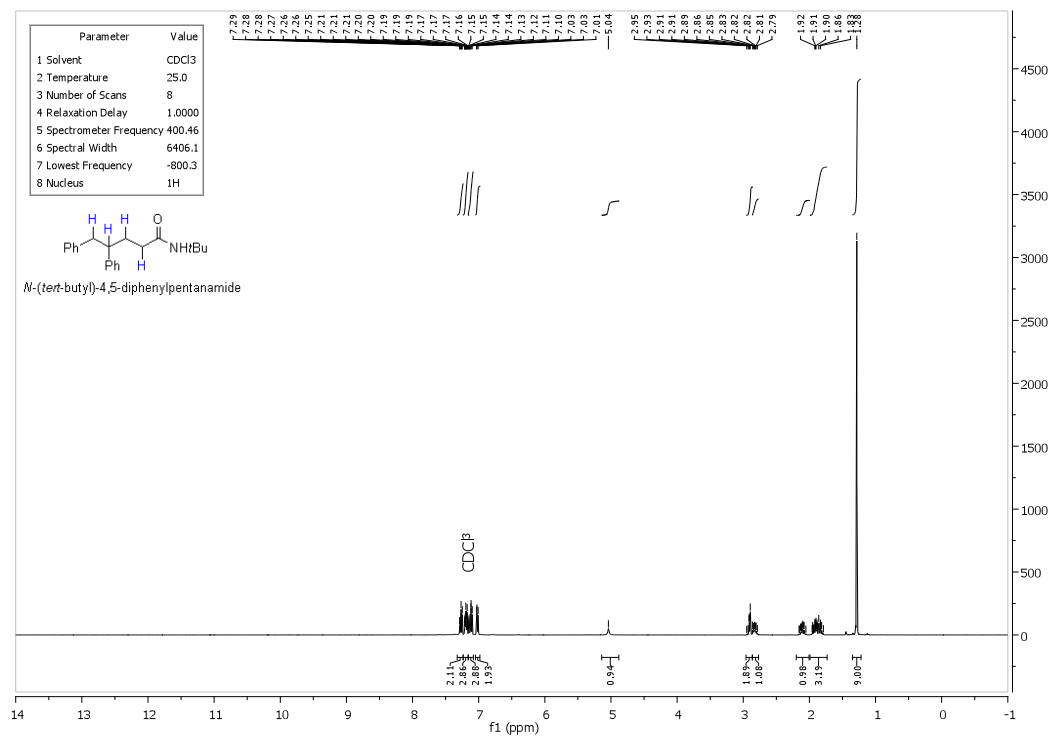
5-Propylbenzo[d][1,3]dioxole (11b).



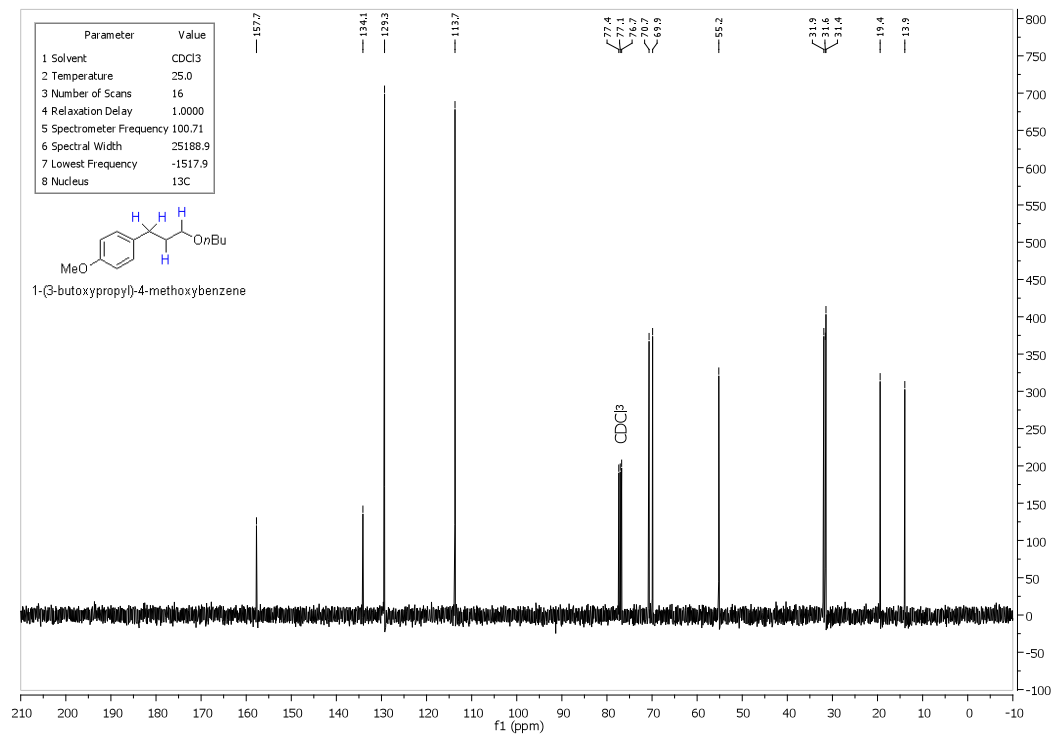
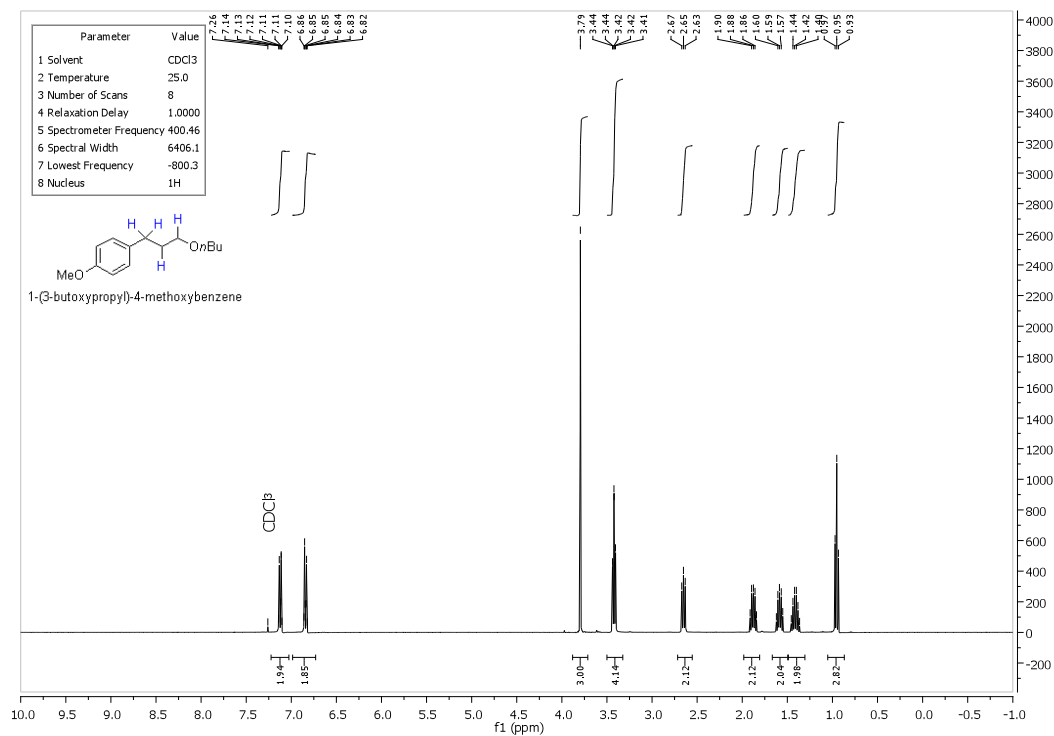
***N*-(1-(5-Chloropyridin-2-yl)ethyl)acetamide (12b).**



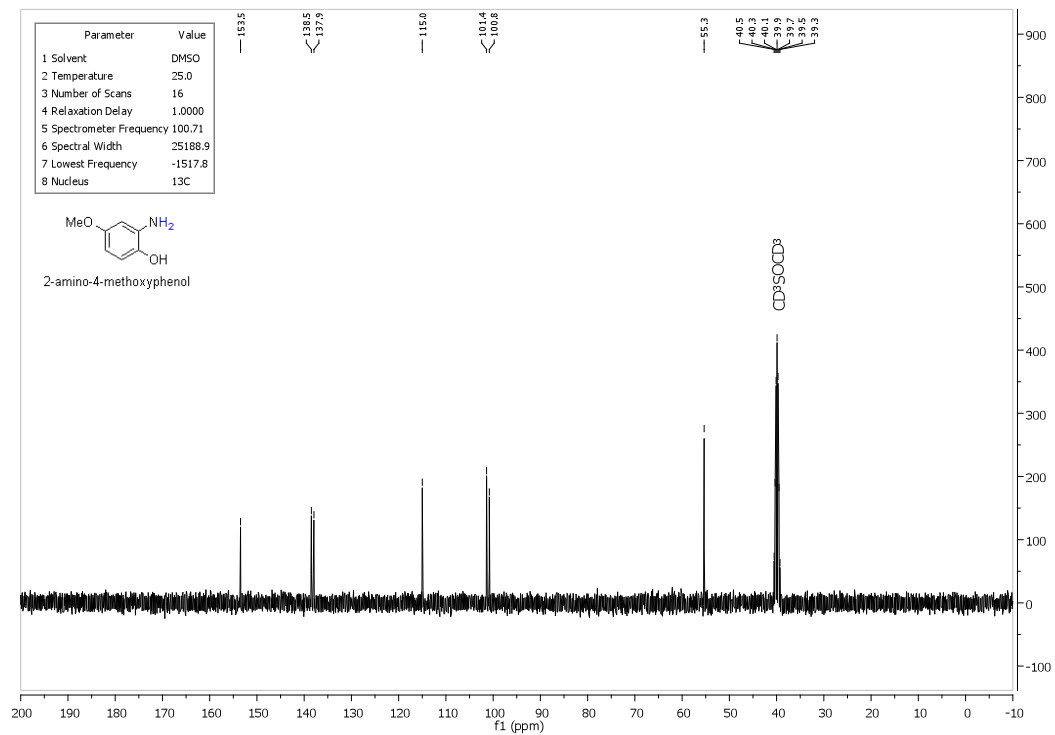
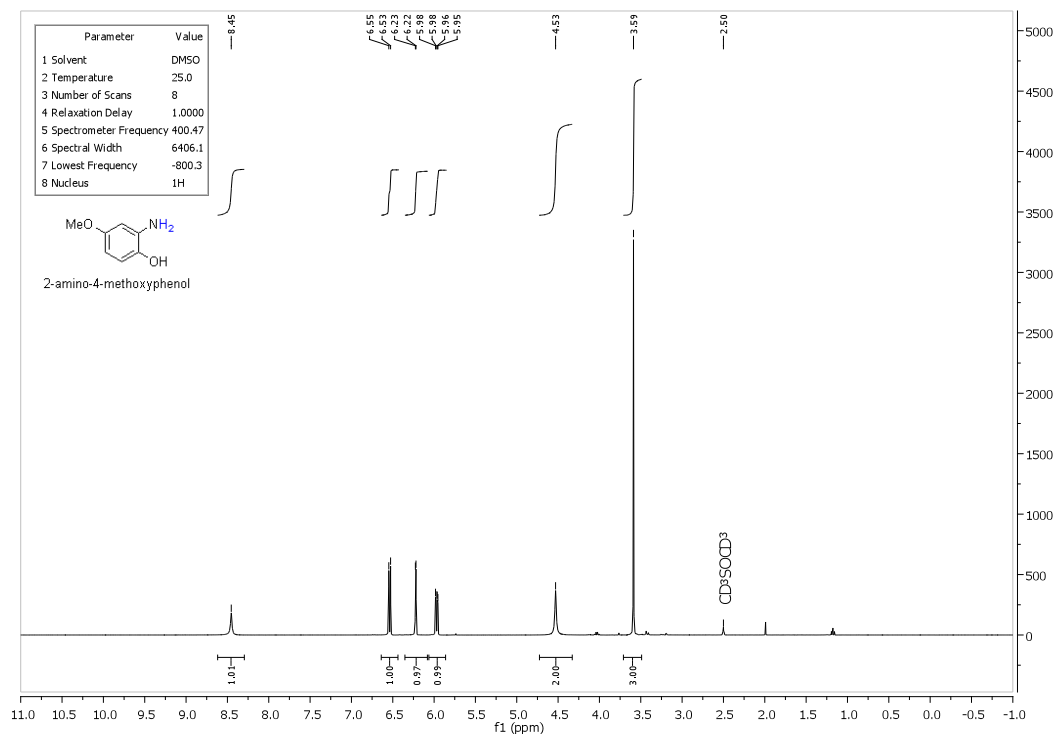
***N*-(*tert*-Butyl)-4,5-diphenylpentanamide (13b).**



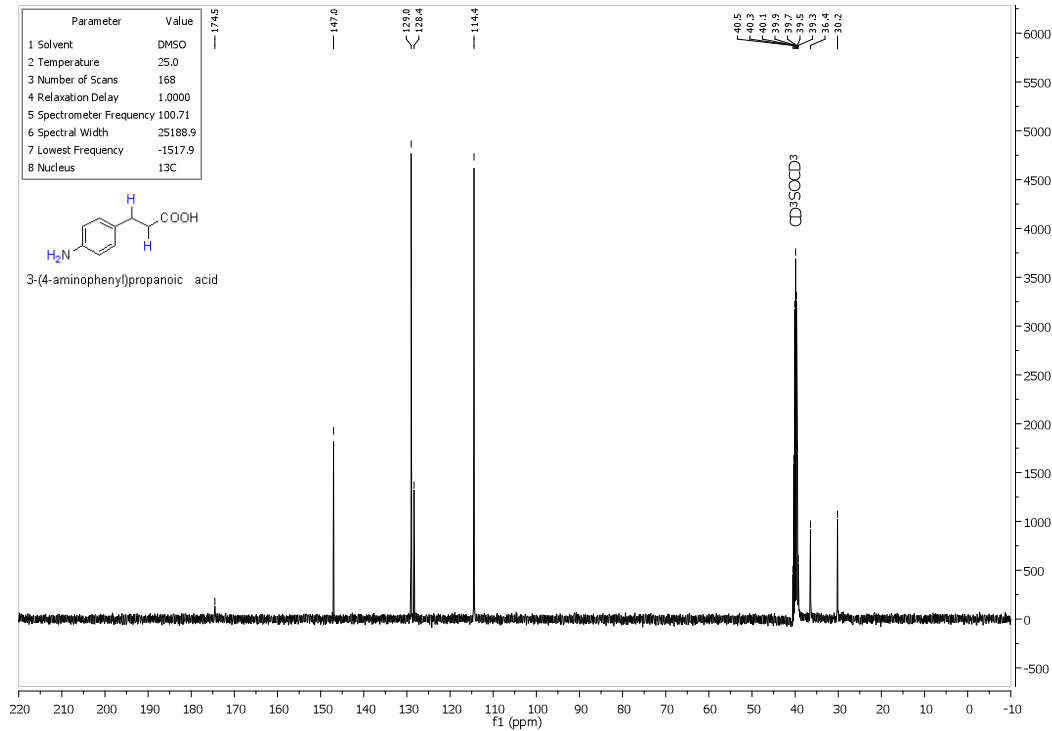
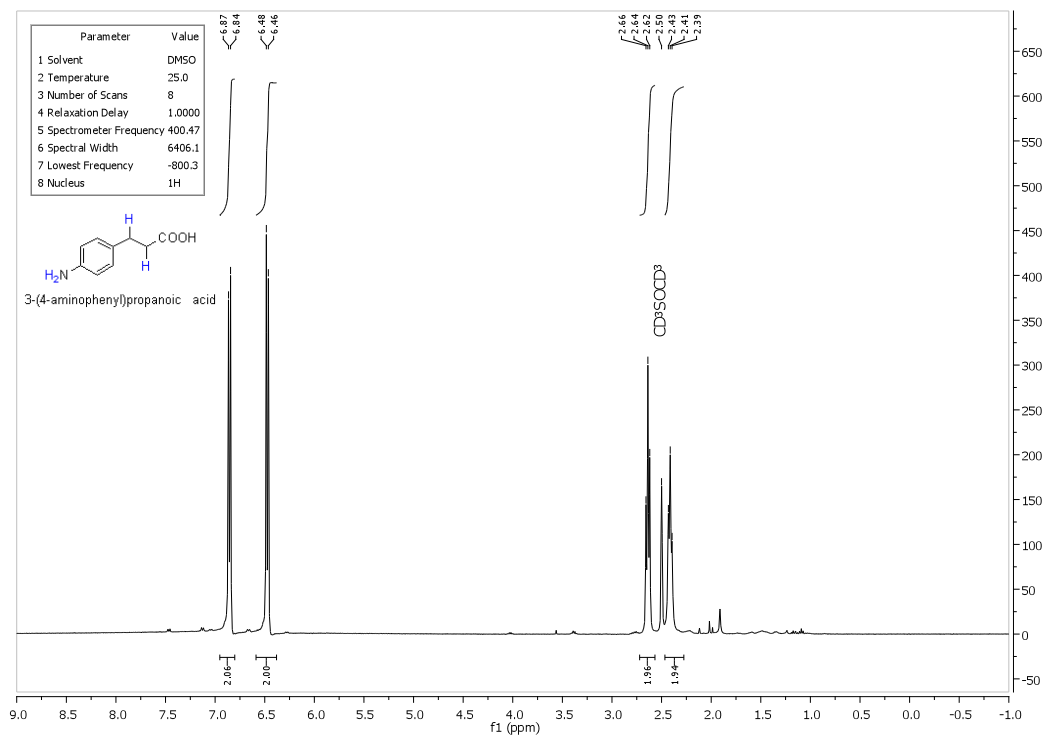
1-(3-Butoxypropyl)-4-methoxybenzene (14b).



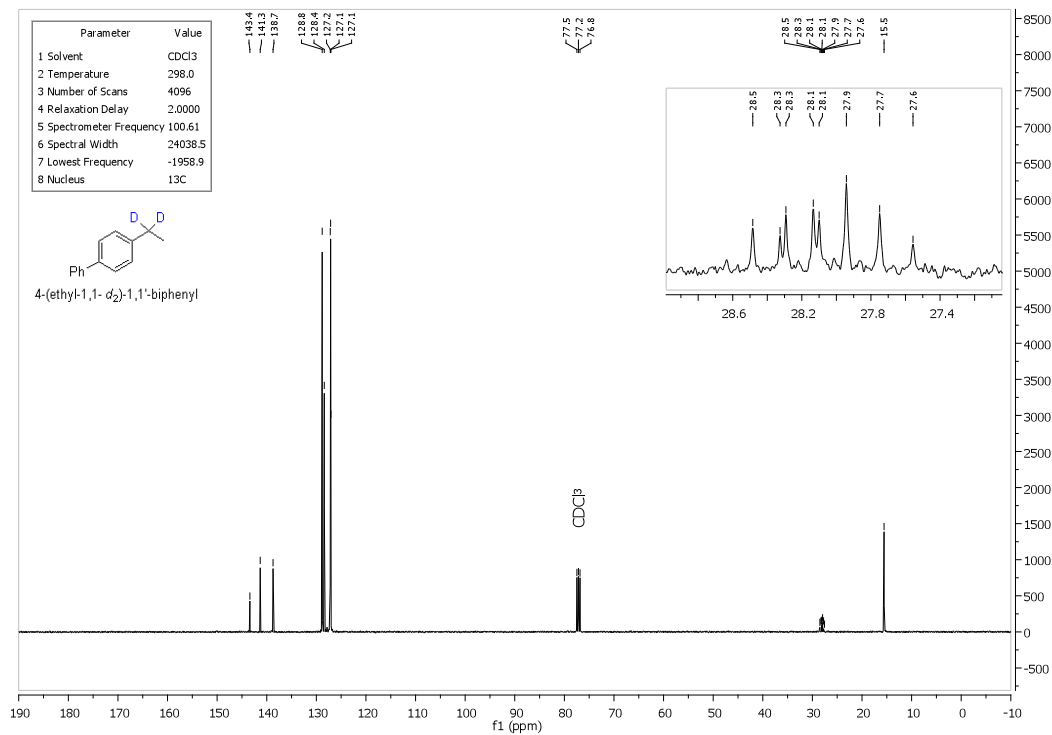
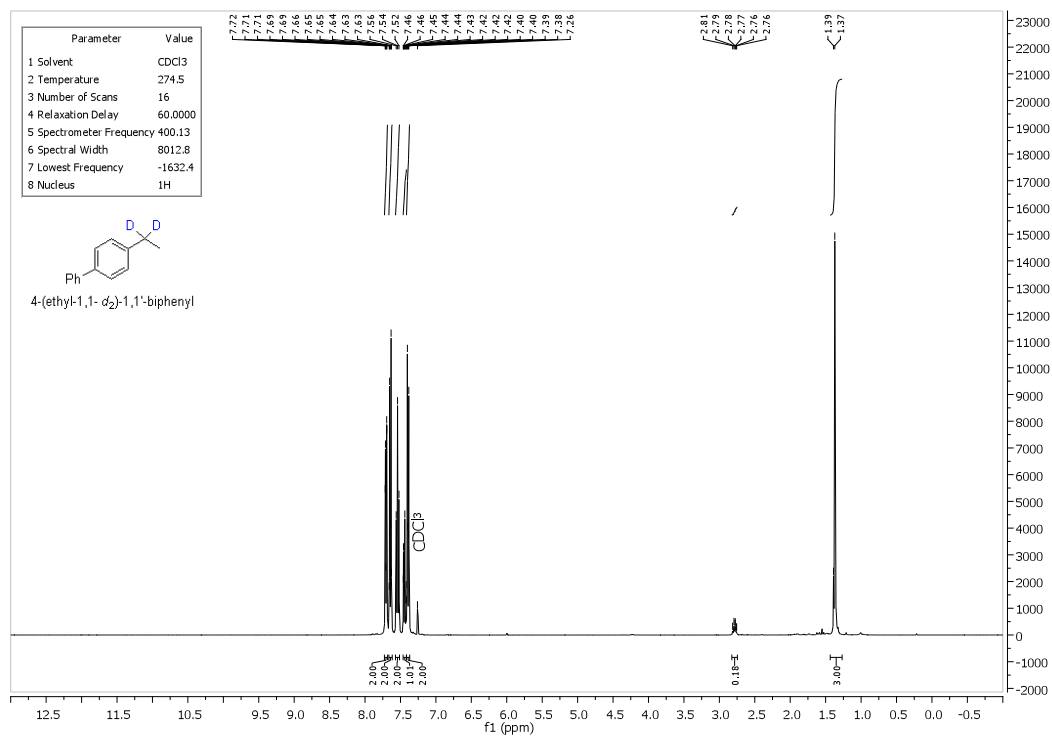
2-Amino-4-methoxyphenol (15b).



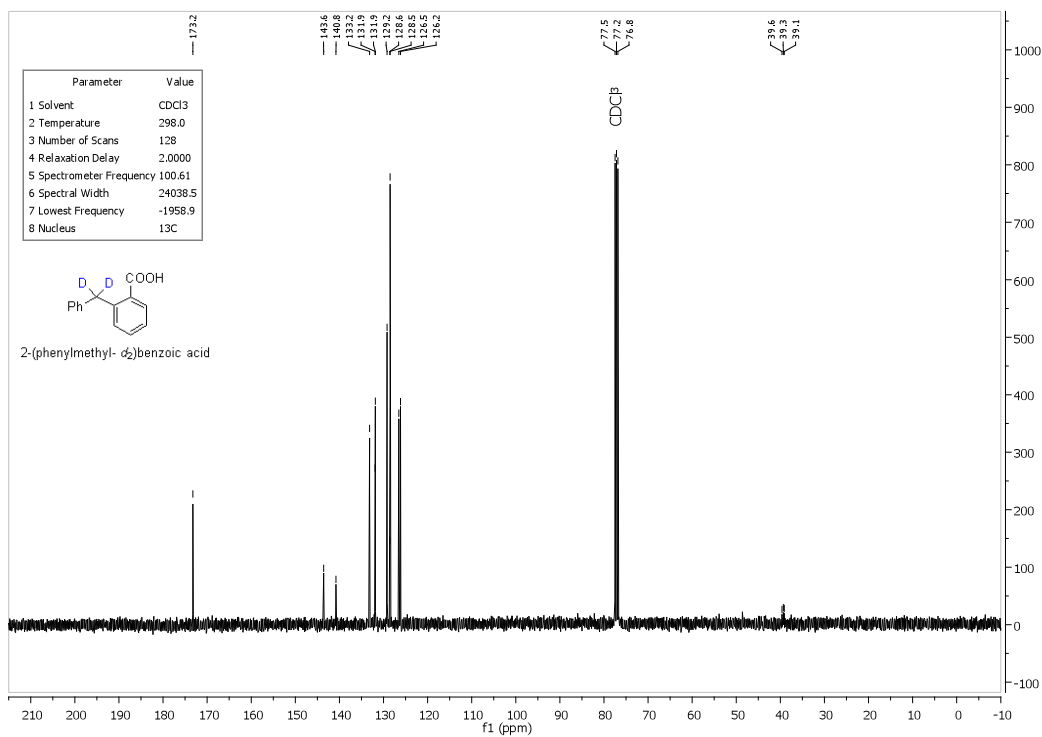
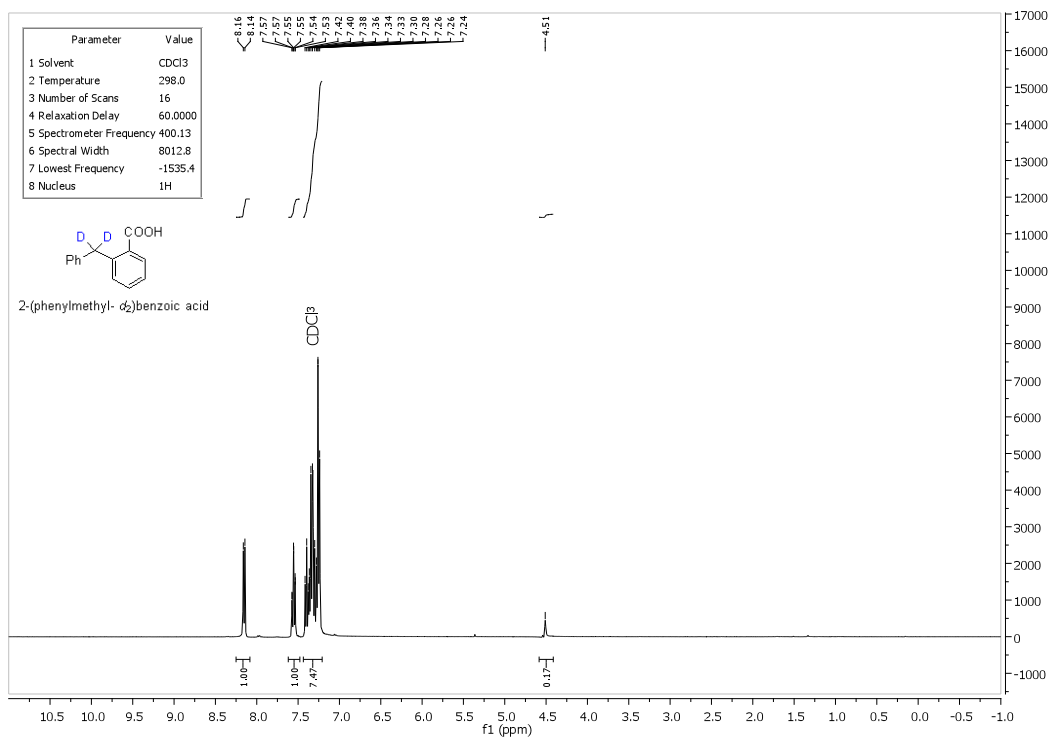
3-(4-Aminophenyl)propanoic acid (16b).



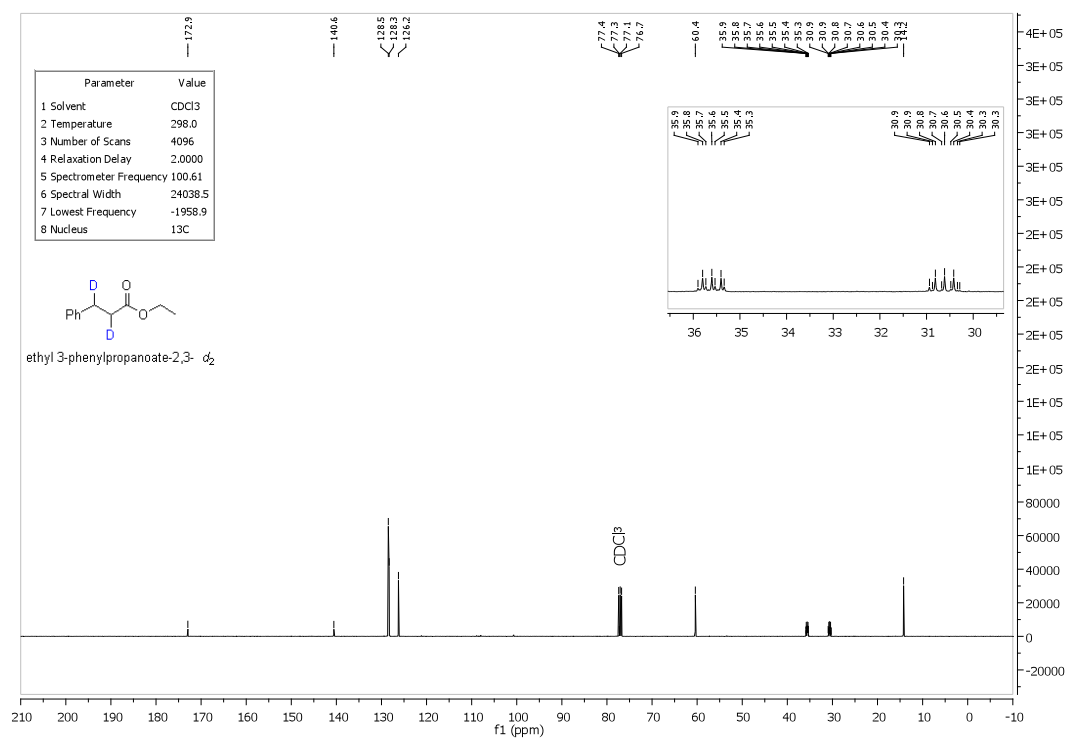
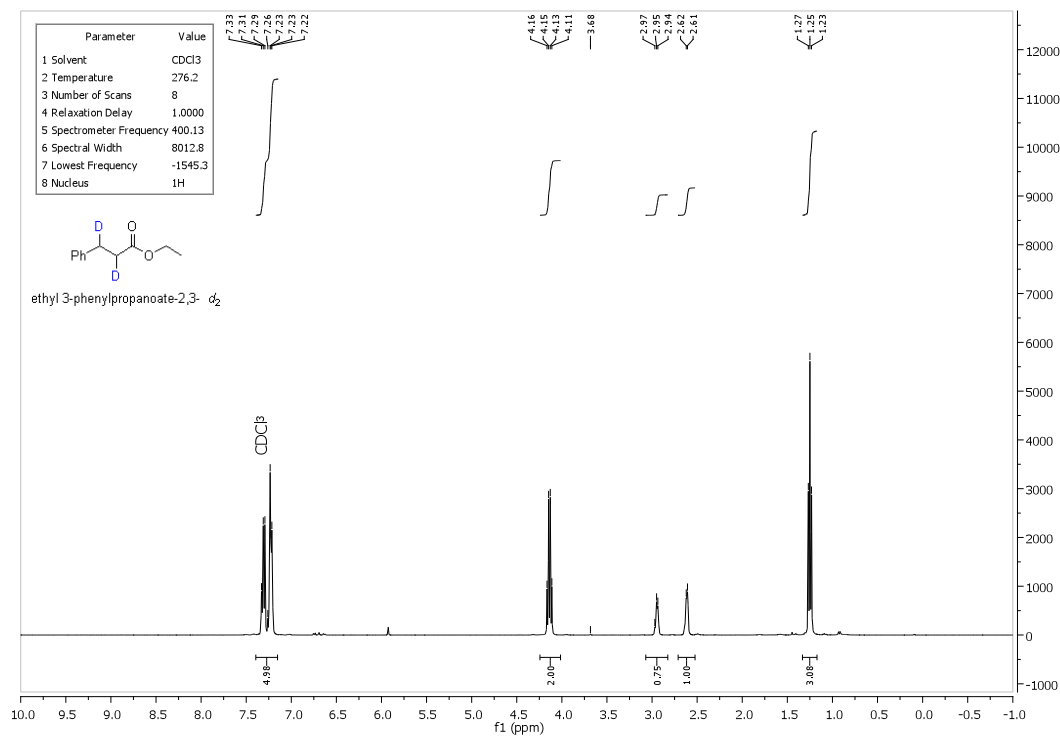
4-(Ethyl-1,1- d_2)-1,1'-biphenyl (2c).



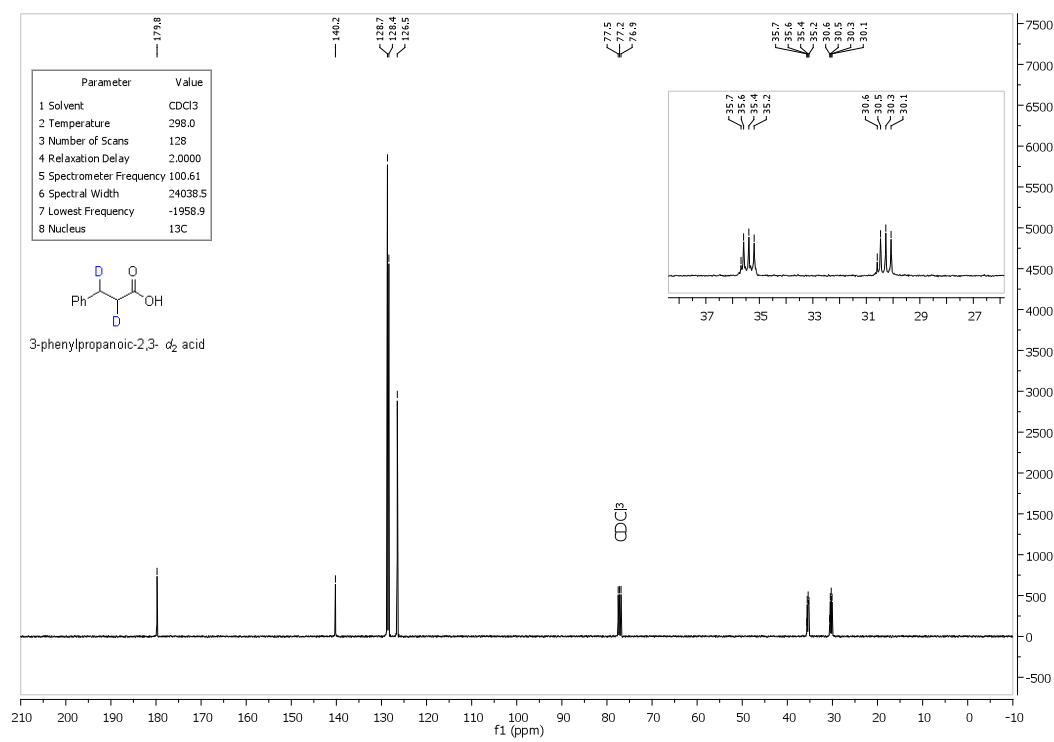
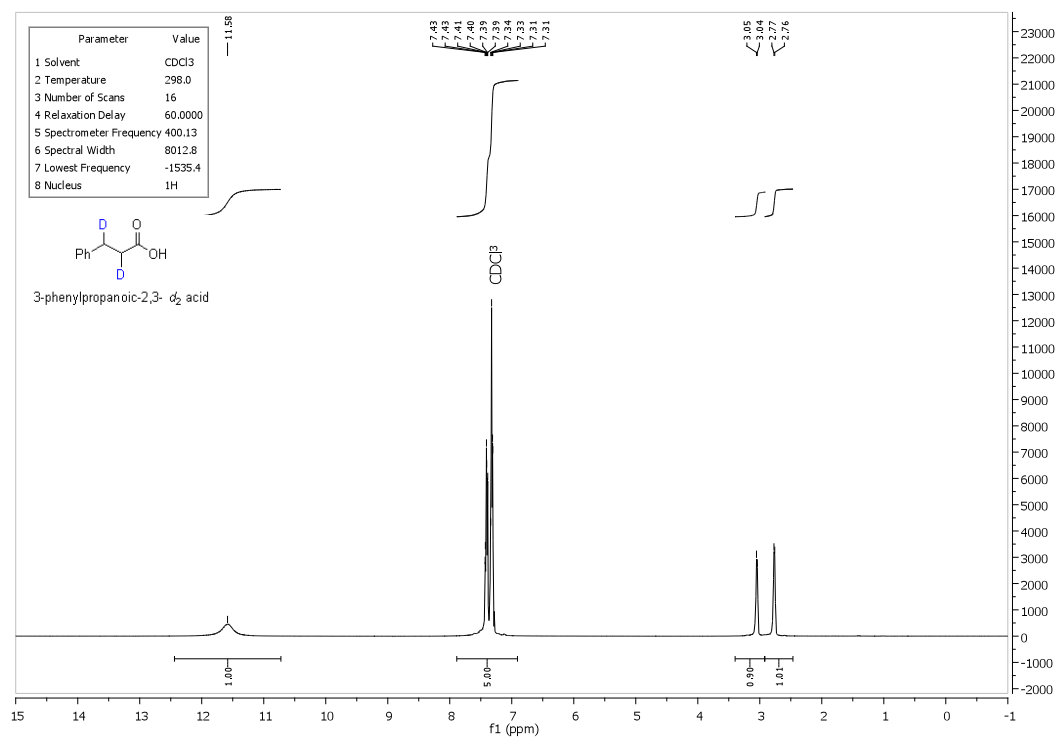
2-(Phenylmethyl- d_2)benzoic acid (4c).



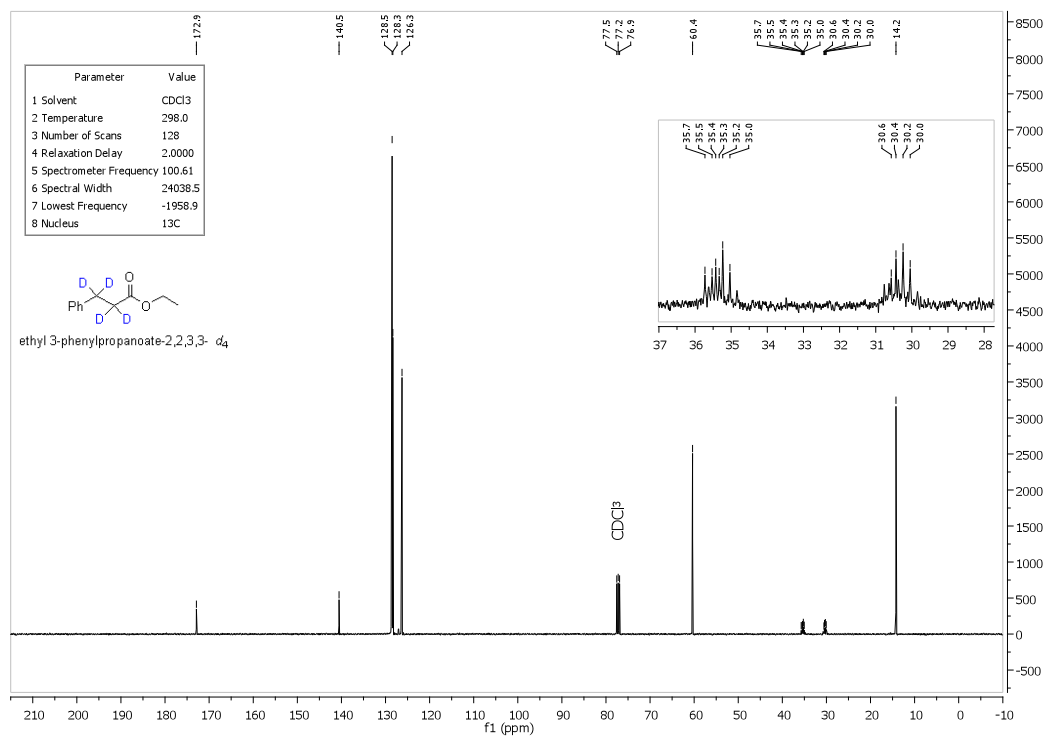
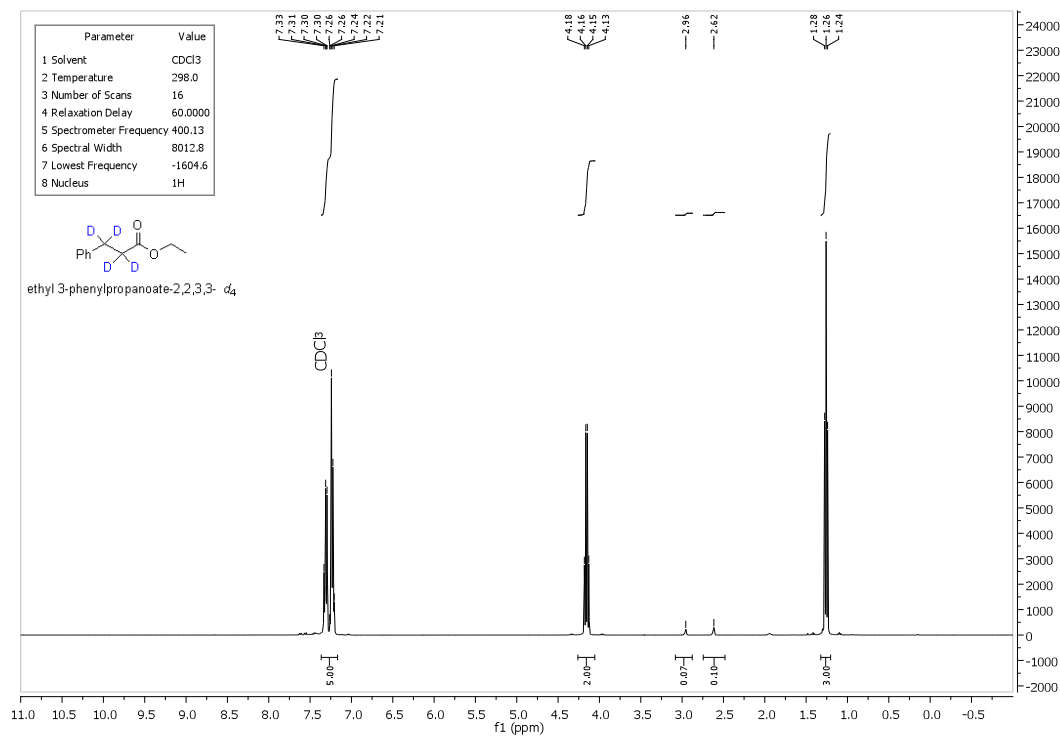
Ethyl 3-Phenylpropanoate-2,3-*d*₂ (5c).



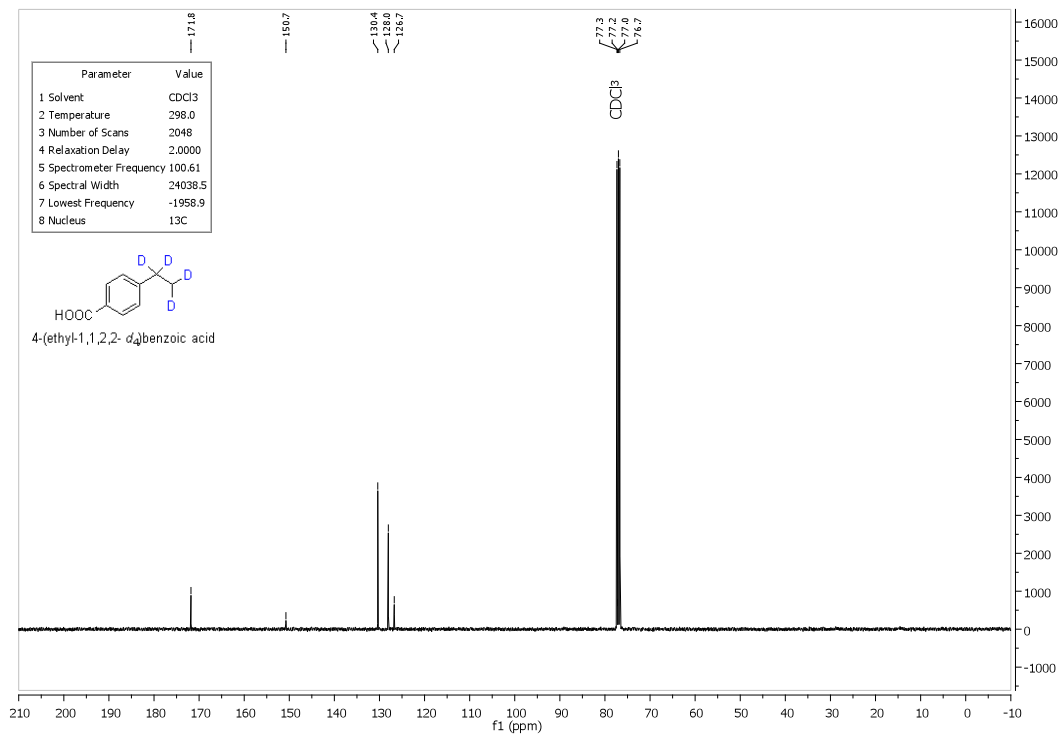
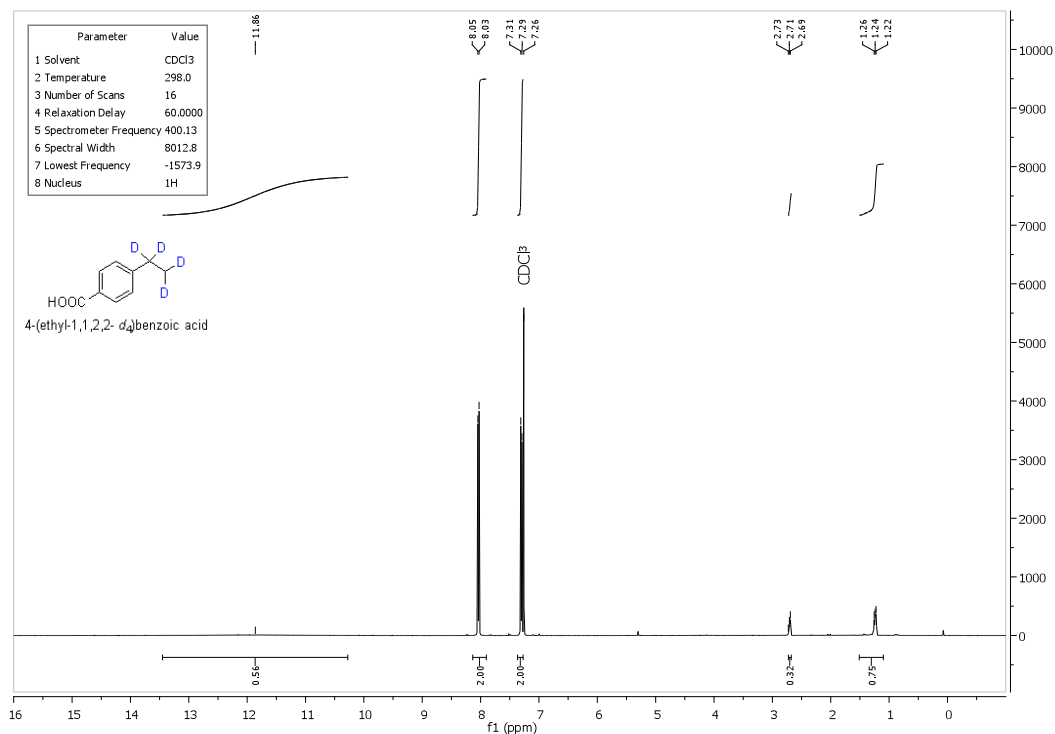
3-Phenylpropanoic-2,3- d_2 acid (6c).



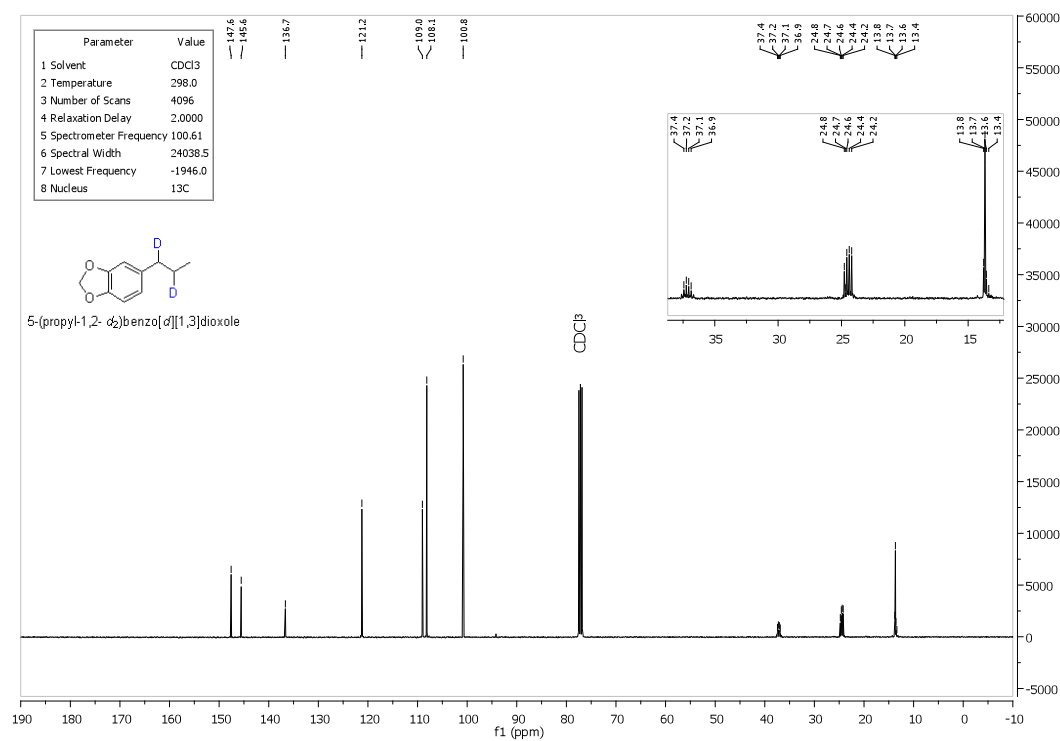
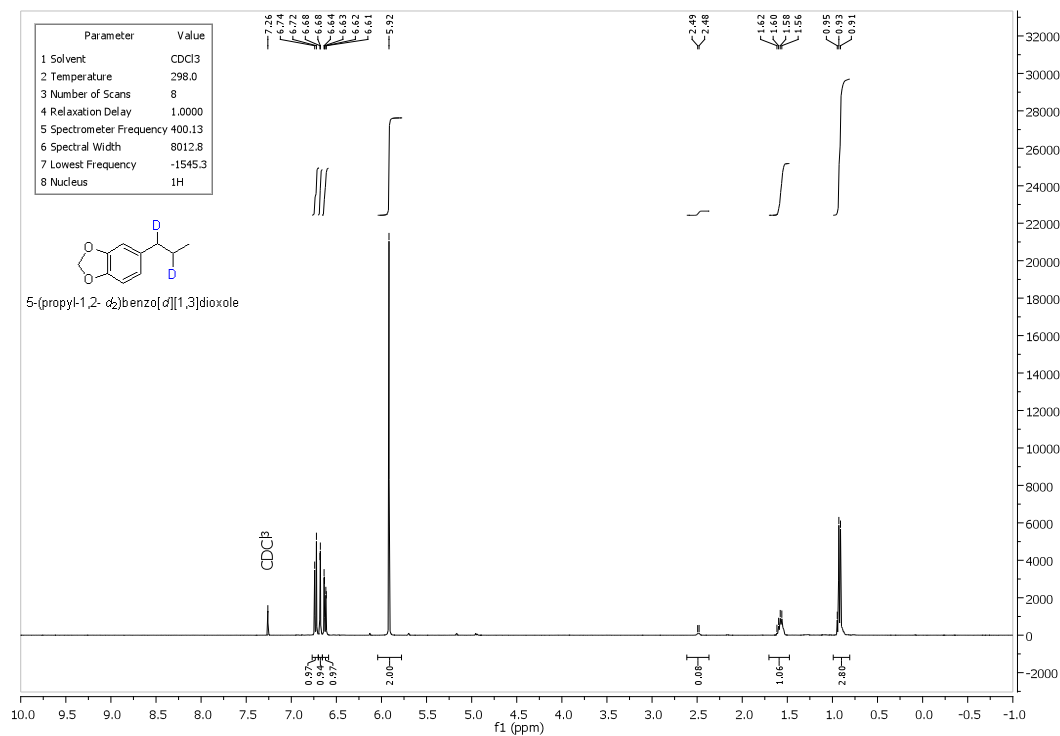
Ethyl 3-Phenylpropanoate-2,2,3,3-*d*₄ (7c).



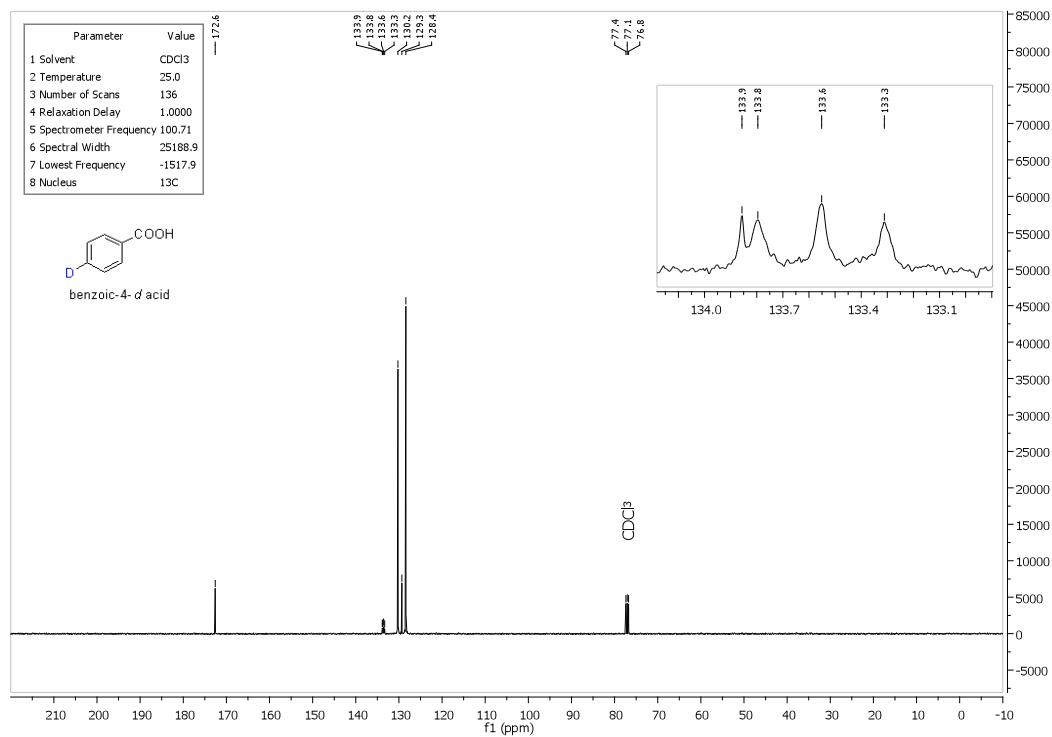
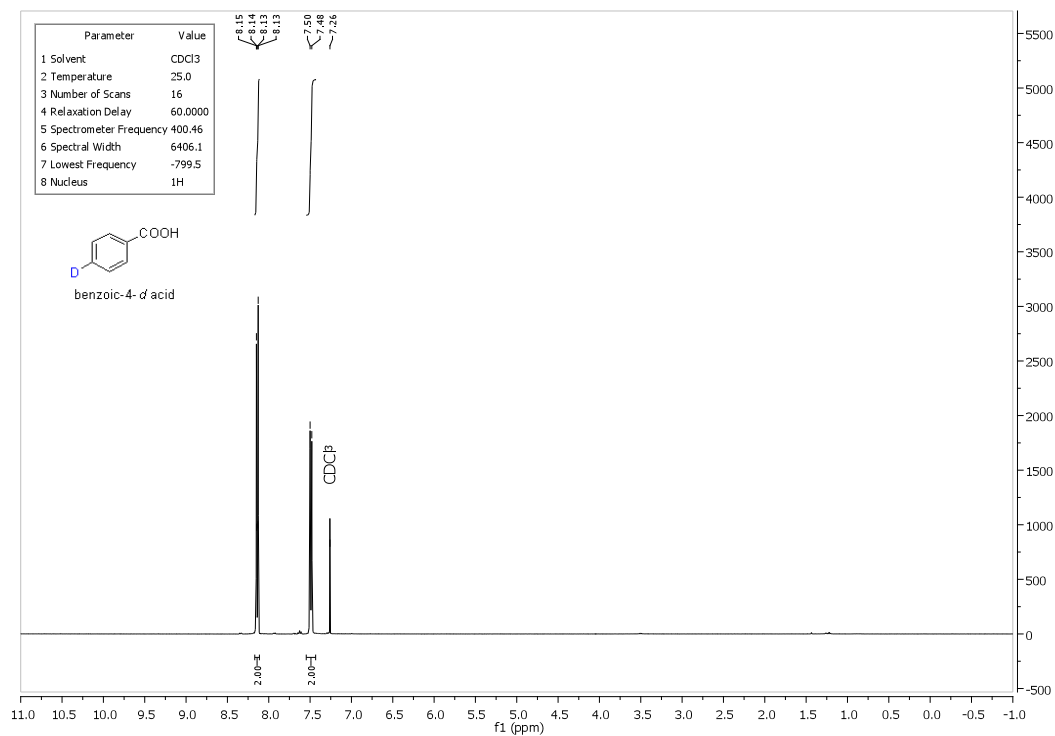
4-(Ethyl-1,1,2,2-*d*₄)benzoic acid (8c).



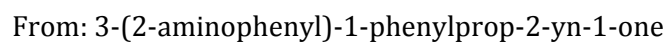
5-(Propyl-1,2-*d*₂)benzo[*d*][1,3]dioxole (11c).

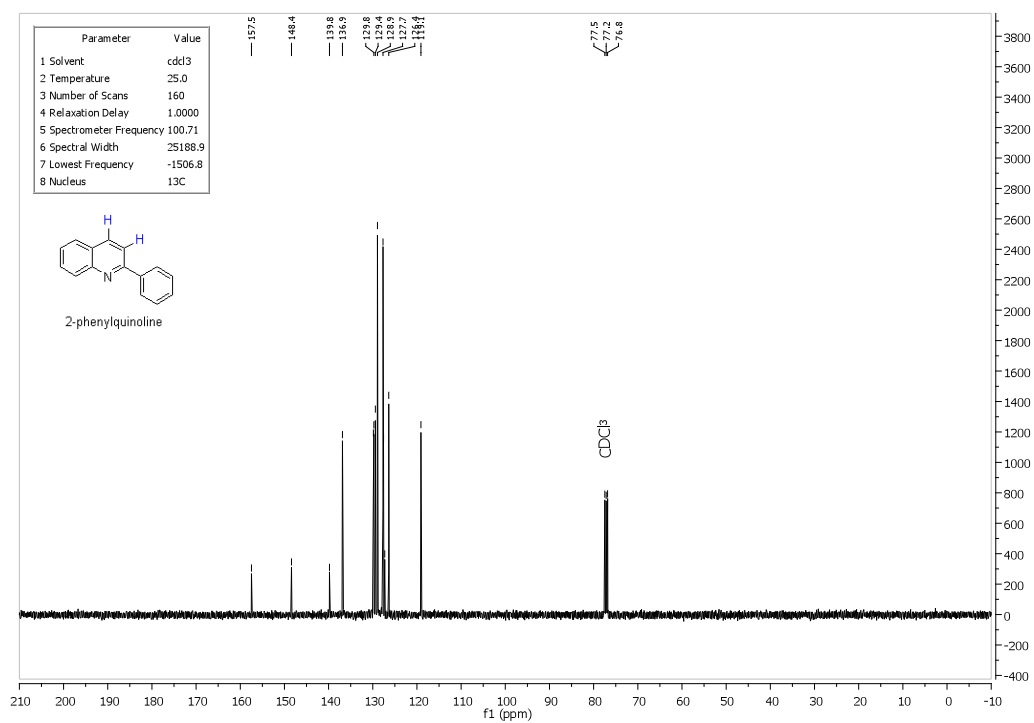


Benzoic-4-d acid (17c).



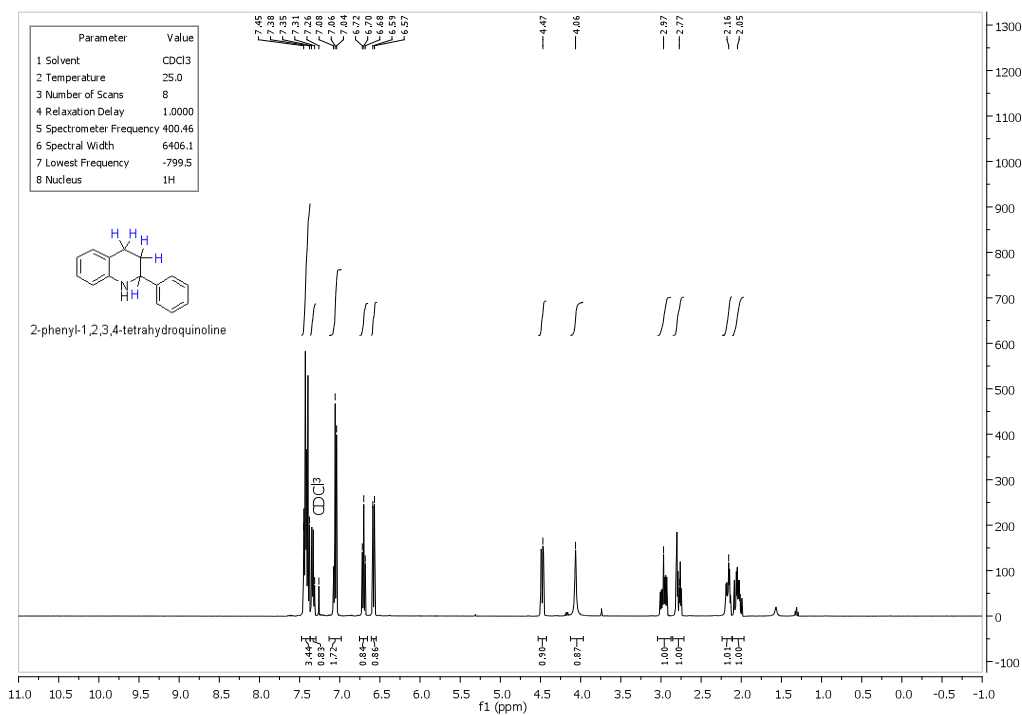
From: (E)-3-(2-aminophenyl)-1-phenylprop-2-en-1-one



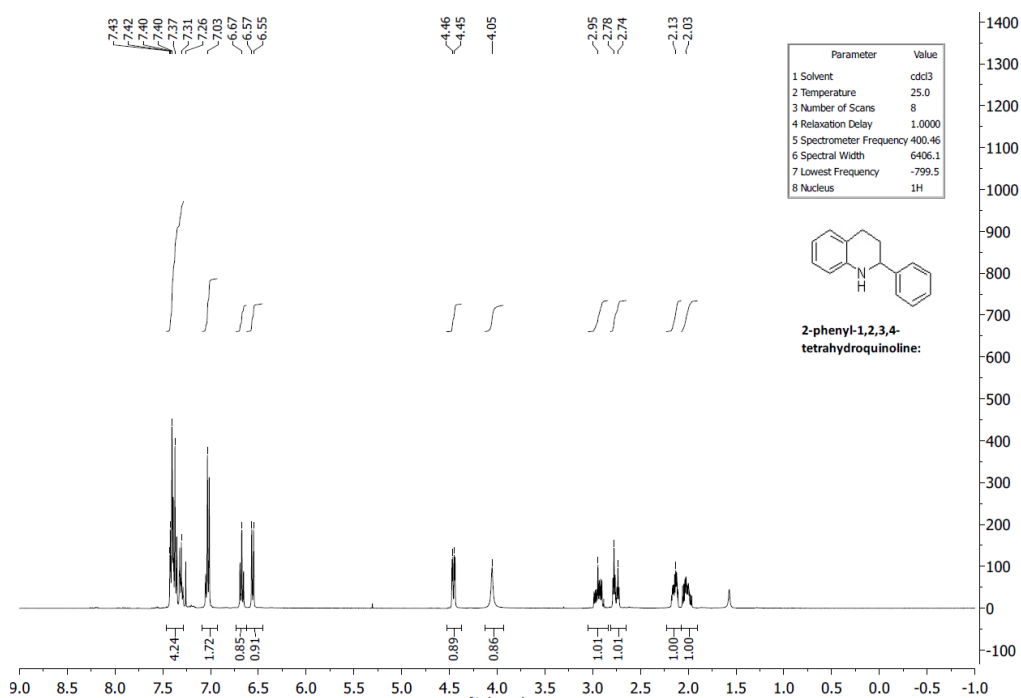


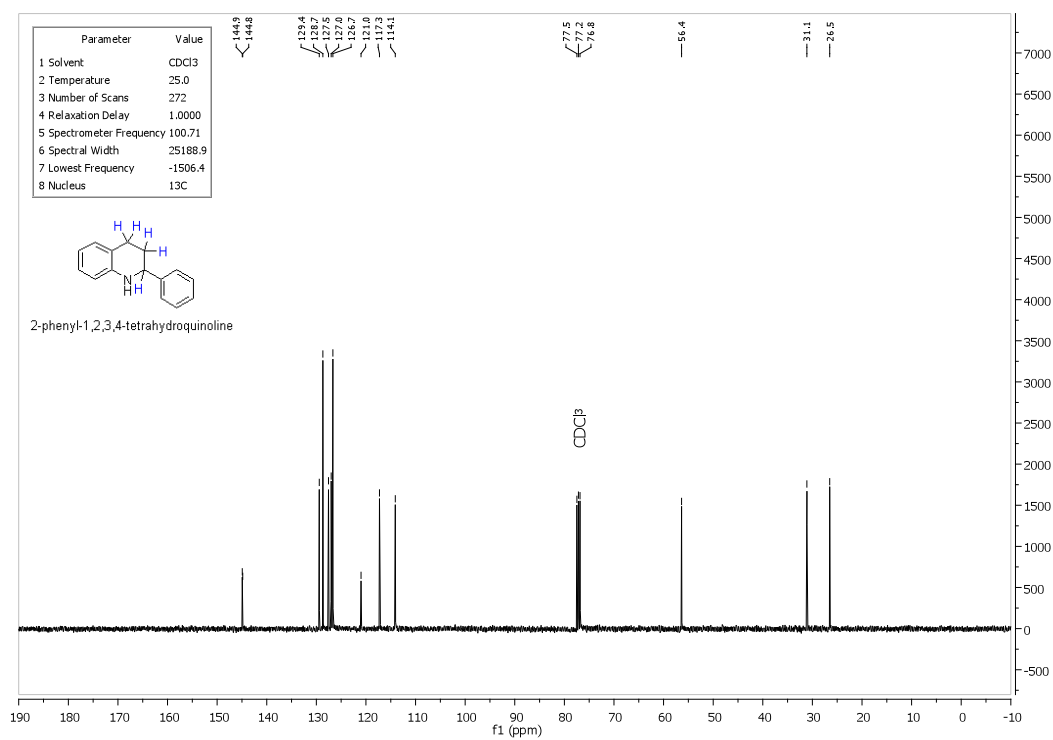
2-Phenyl-1,2,3,4-tetrahydroquinoline (18c).

From: (E)-3-(2-aminophenyl)-1-phenylprop-2-en-1-one

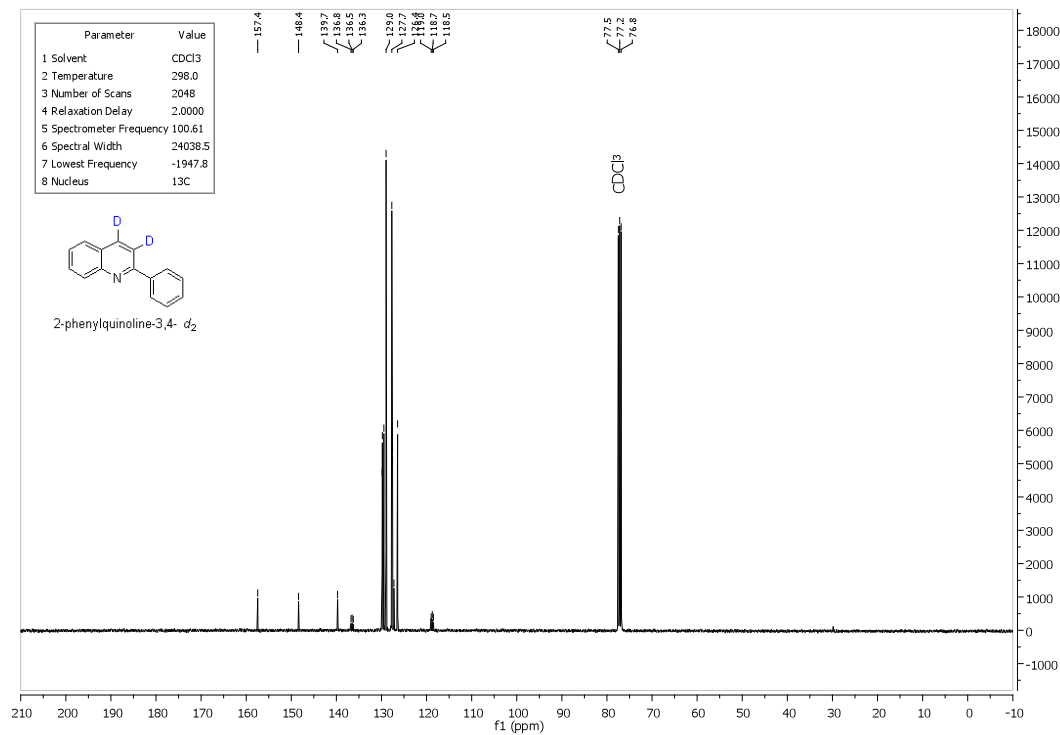
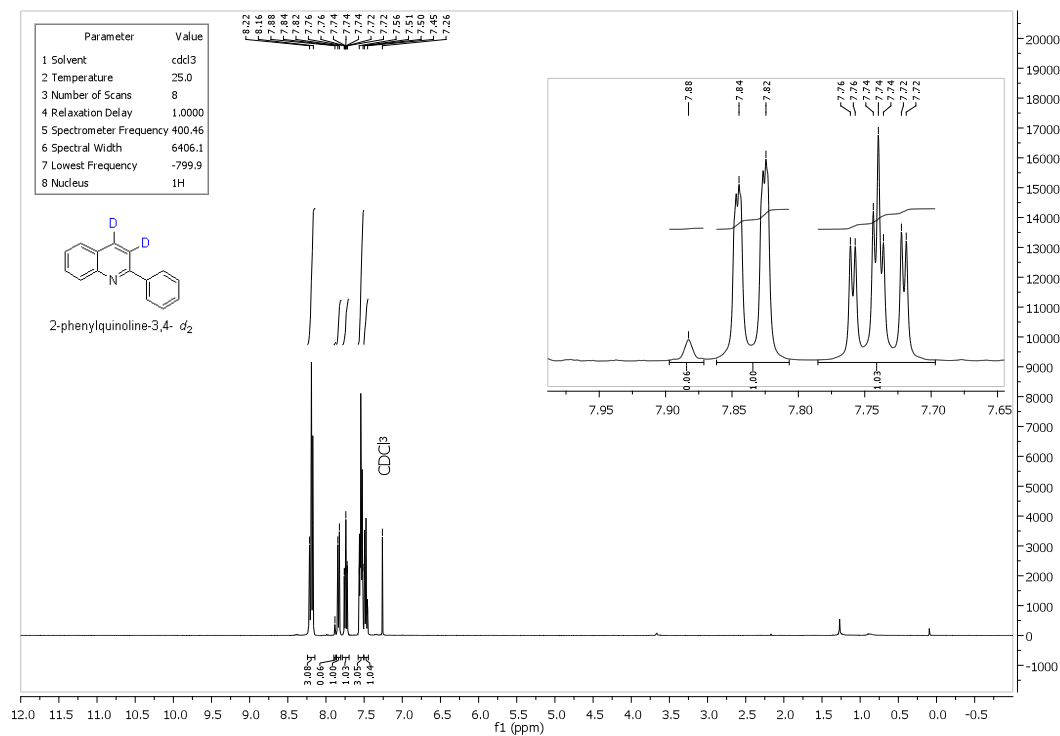


From: 3-(2-aminophenyl)-1-phenylprop-2-yn-1-one

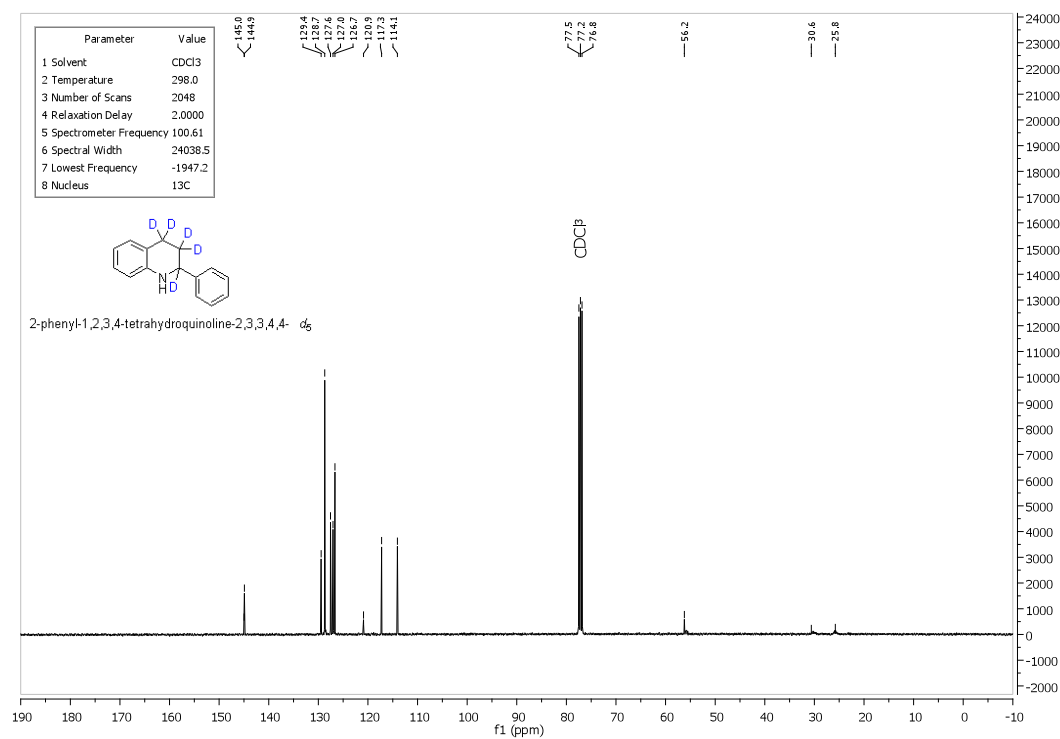
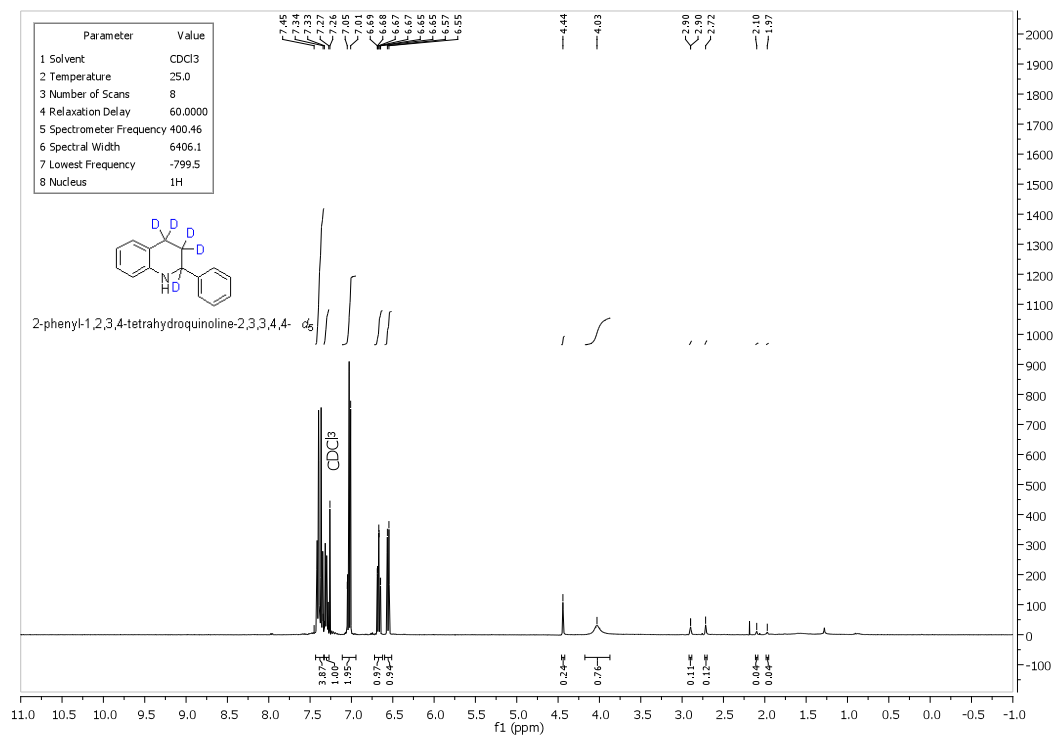




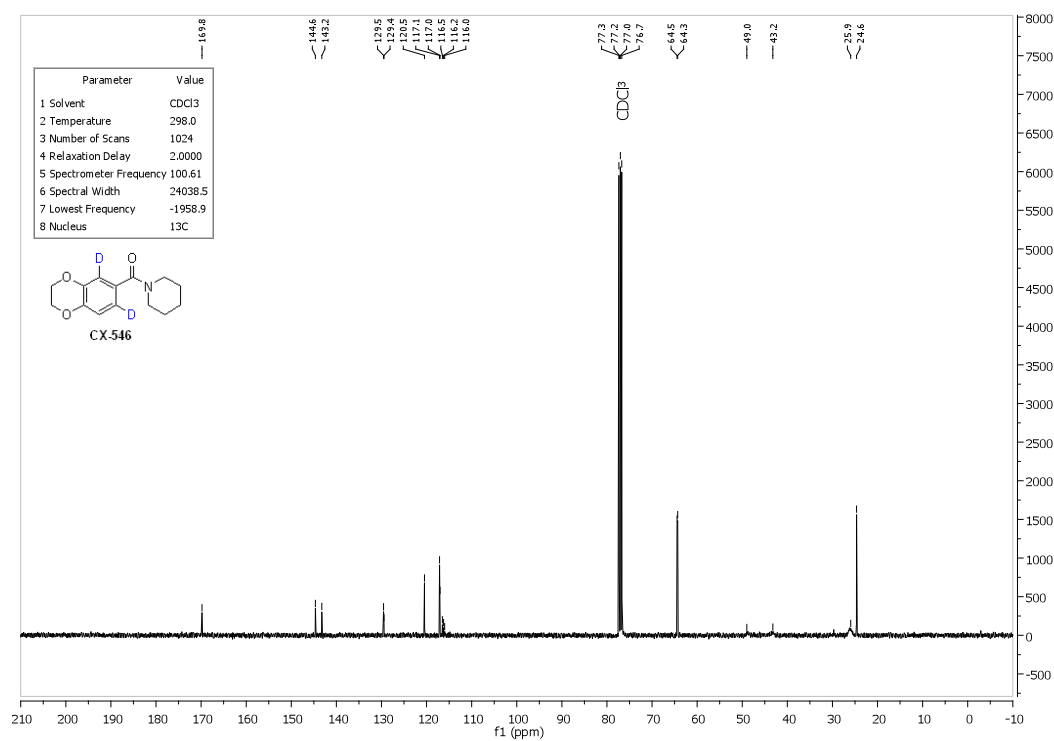
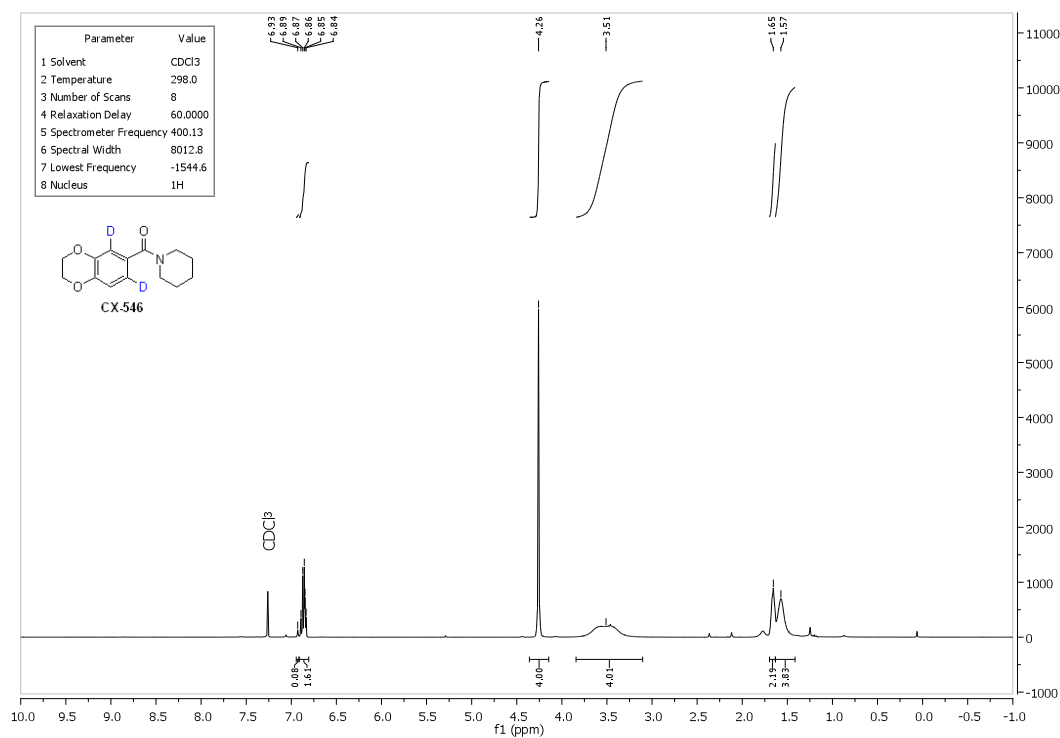
2-Phenylquinoline-3,4-*d*₂ (19b).



2-Phenyl-1,2,3,4-tetrahydroquinoline-2,3,3,4,4-*d*₅ (19c).



(2,3-Dihydrobenzo[b][1,4]dioxin-6-yl-5,7-d2)(piperidin-1-yl)methanone (D-CX-546).



4-(3-(4-(Cyclopropanecarbonyl)piperazine-1-carbonyl)-4-fluorobenzyl)phthalazin-1(2H)-one-8-d (D-Olaparib).

