

Synthesis and properties of allylic, benzylic, propargylic and allenylic oxonium ions

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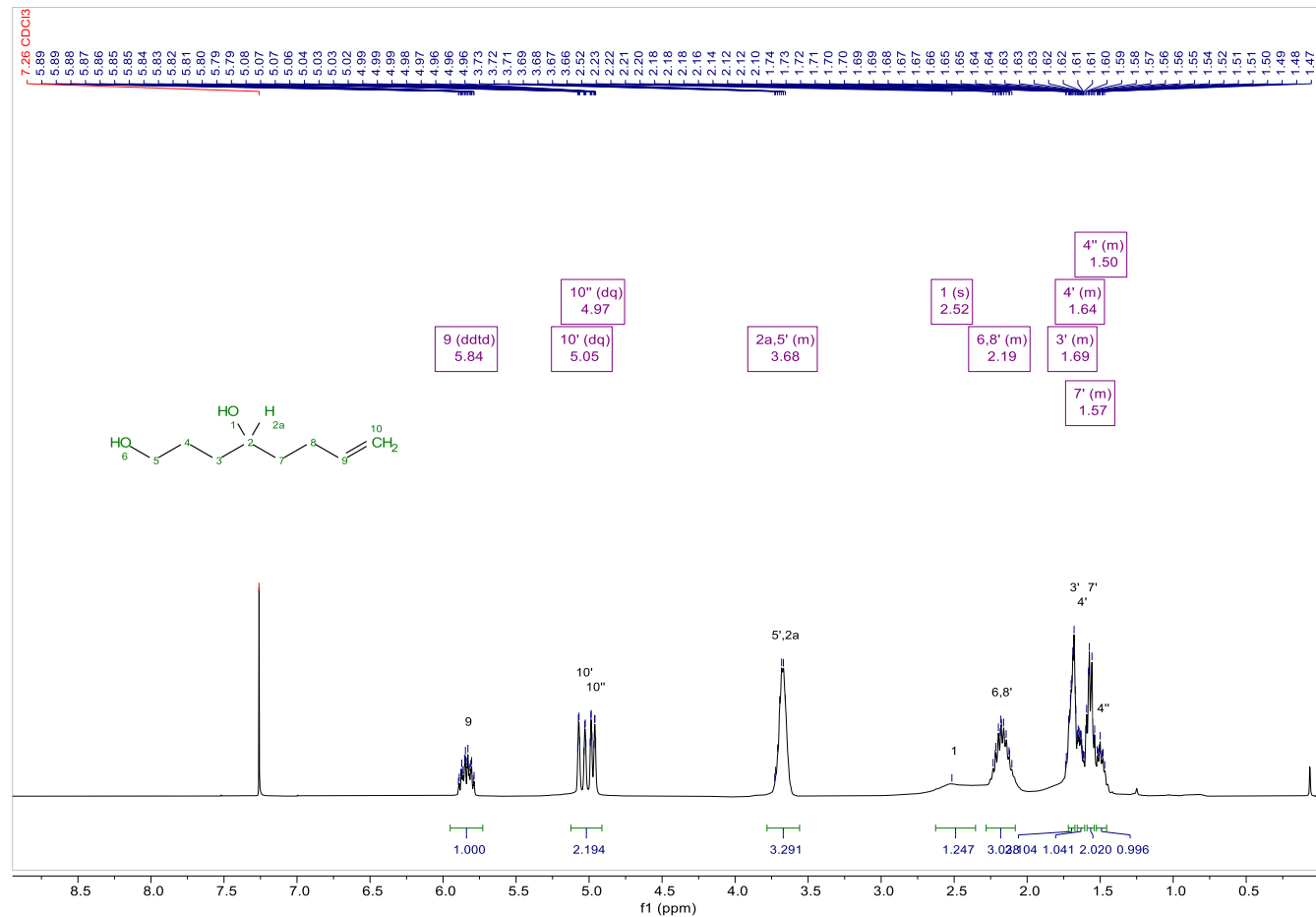
E-mail: robert.paton@colostate.edu; homepage: <https://patonlab.com>

jonathan.burton@chem.ox.ac.uk; homepage: <http://burton.chem.ox.ac.uk>

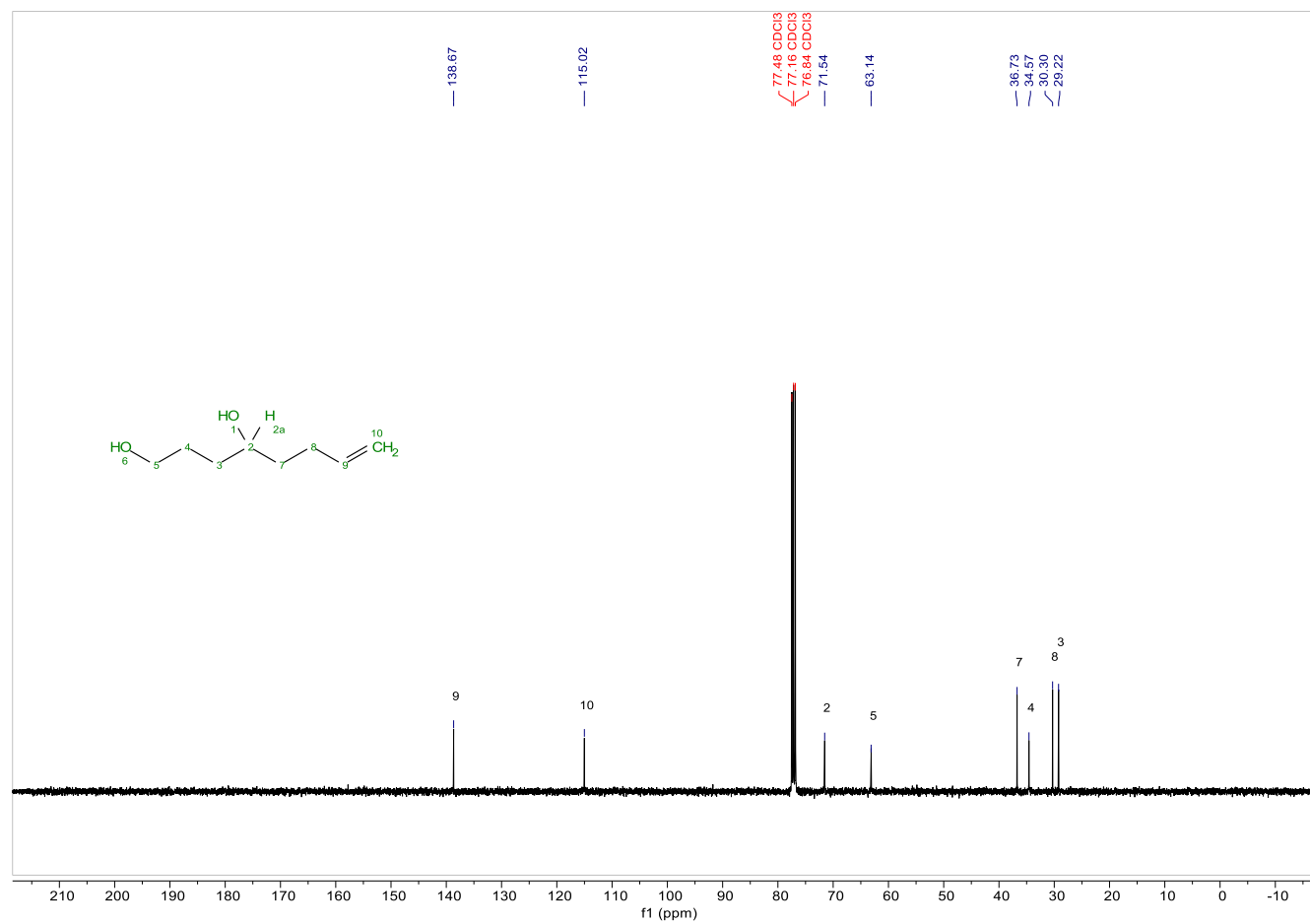
Supplementary Information NMR Spectra

NMR Spectra

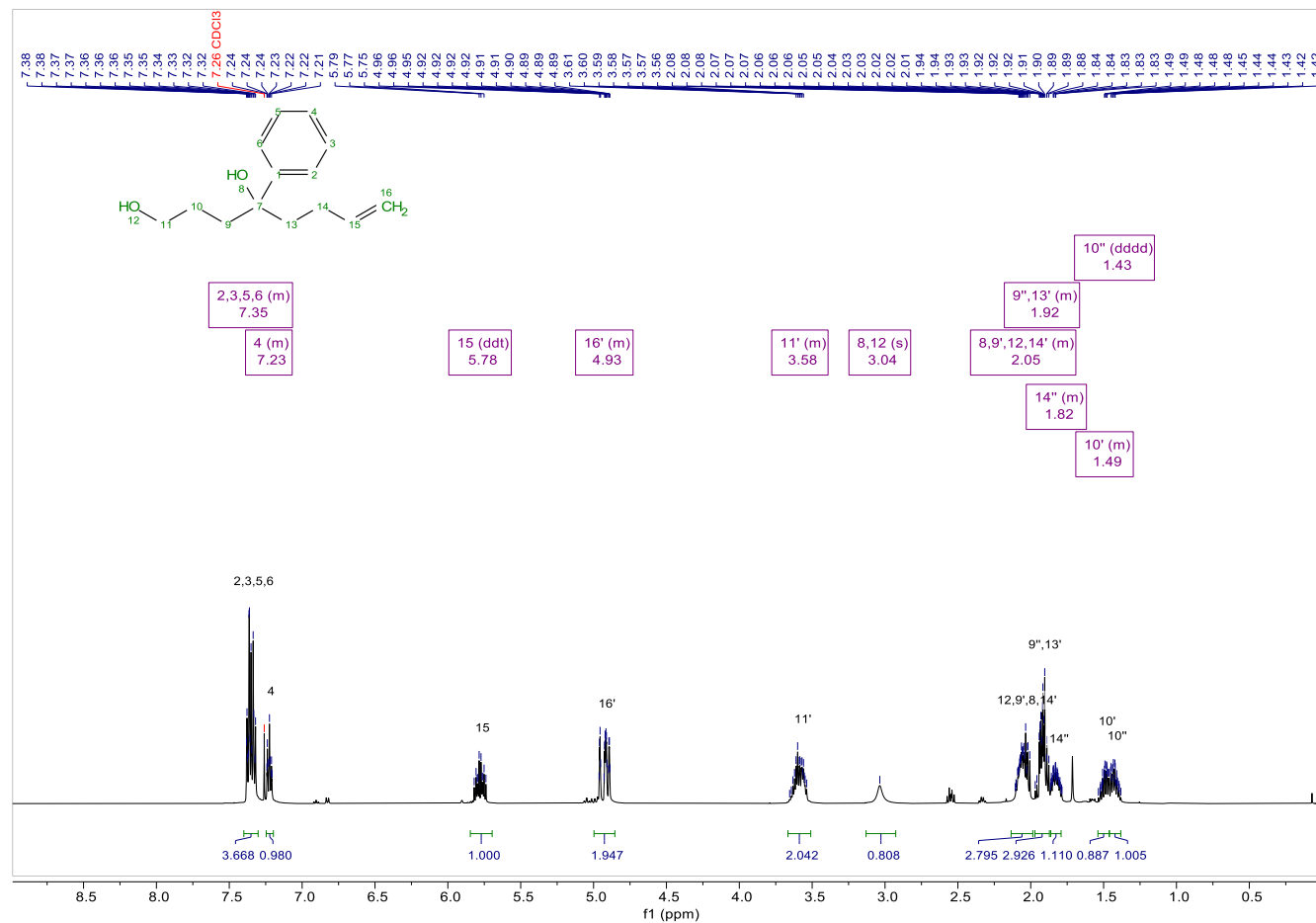
Oct-7-ene-1,4-diol (S6d), CDCl₃, ¹H NMR, 400 MHz



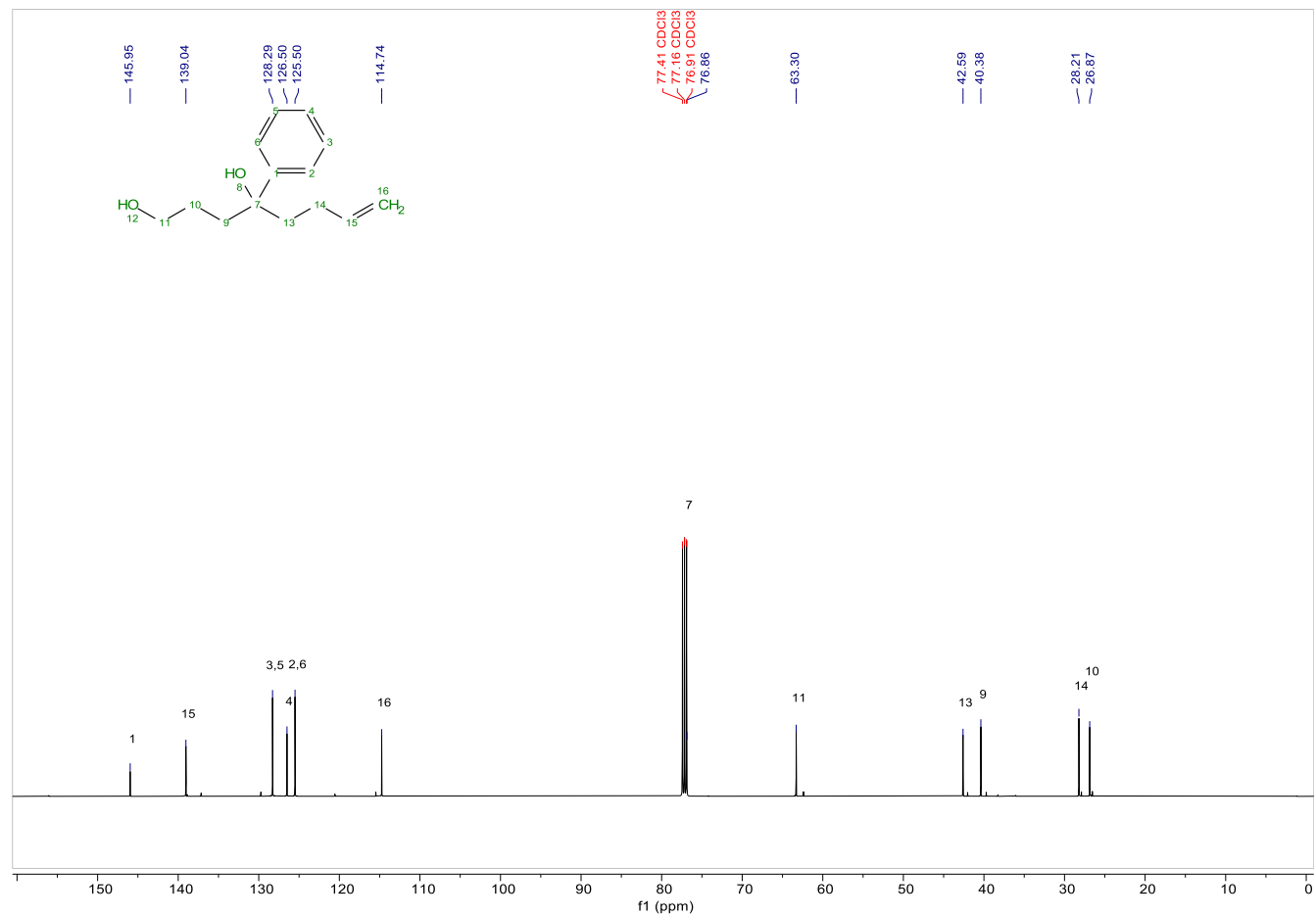
Oct-7-ene-1,4-diol (S6d), CDCl₃, ¹H NMR, 100 MHz



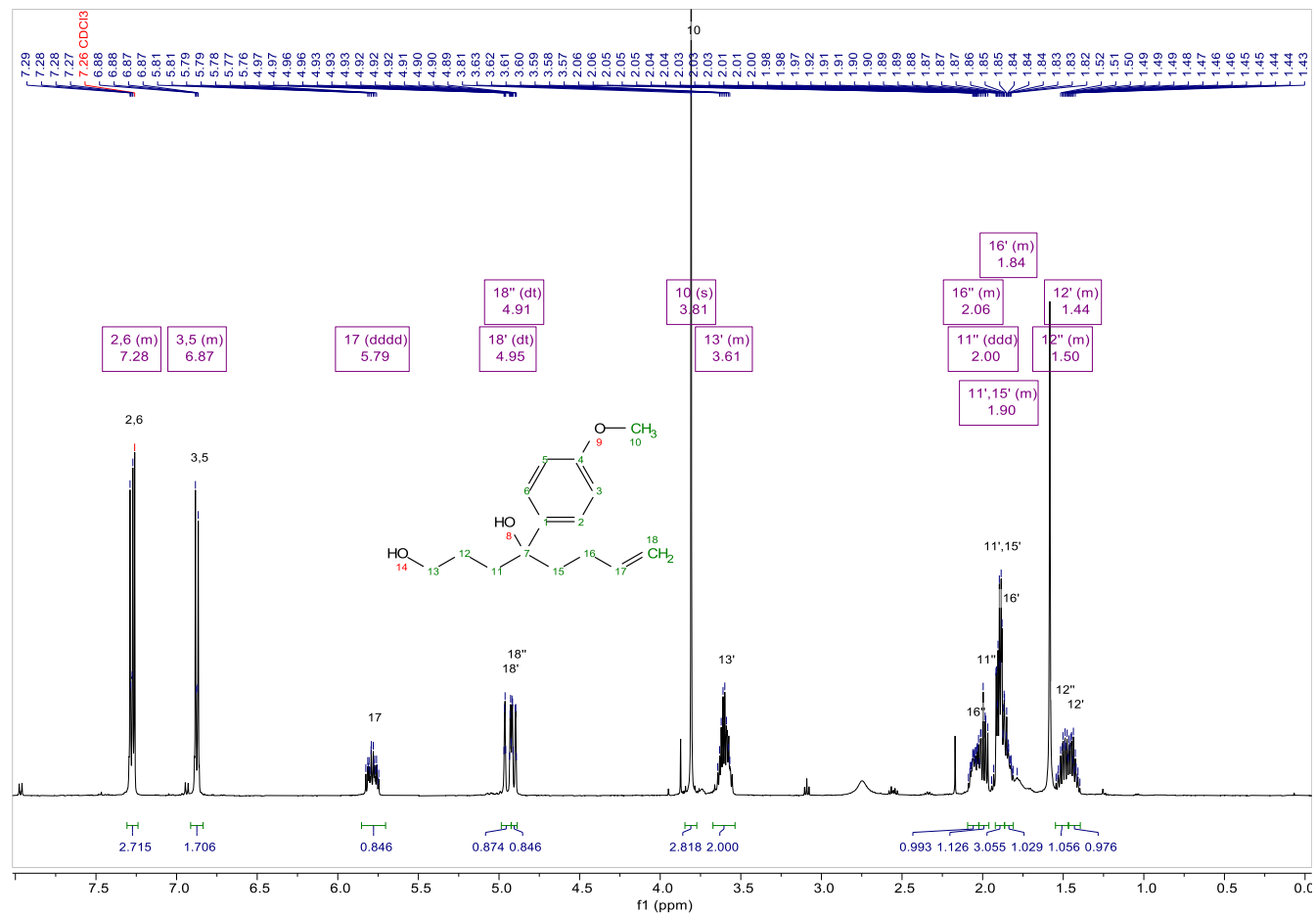
4-Phenyloct-7-ene-1,4-diol (S6e), CDCl₃, ¹H NMR, 500 MHz



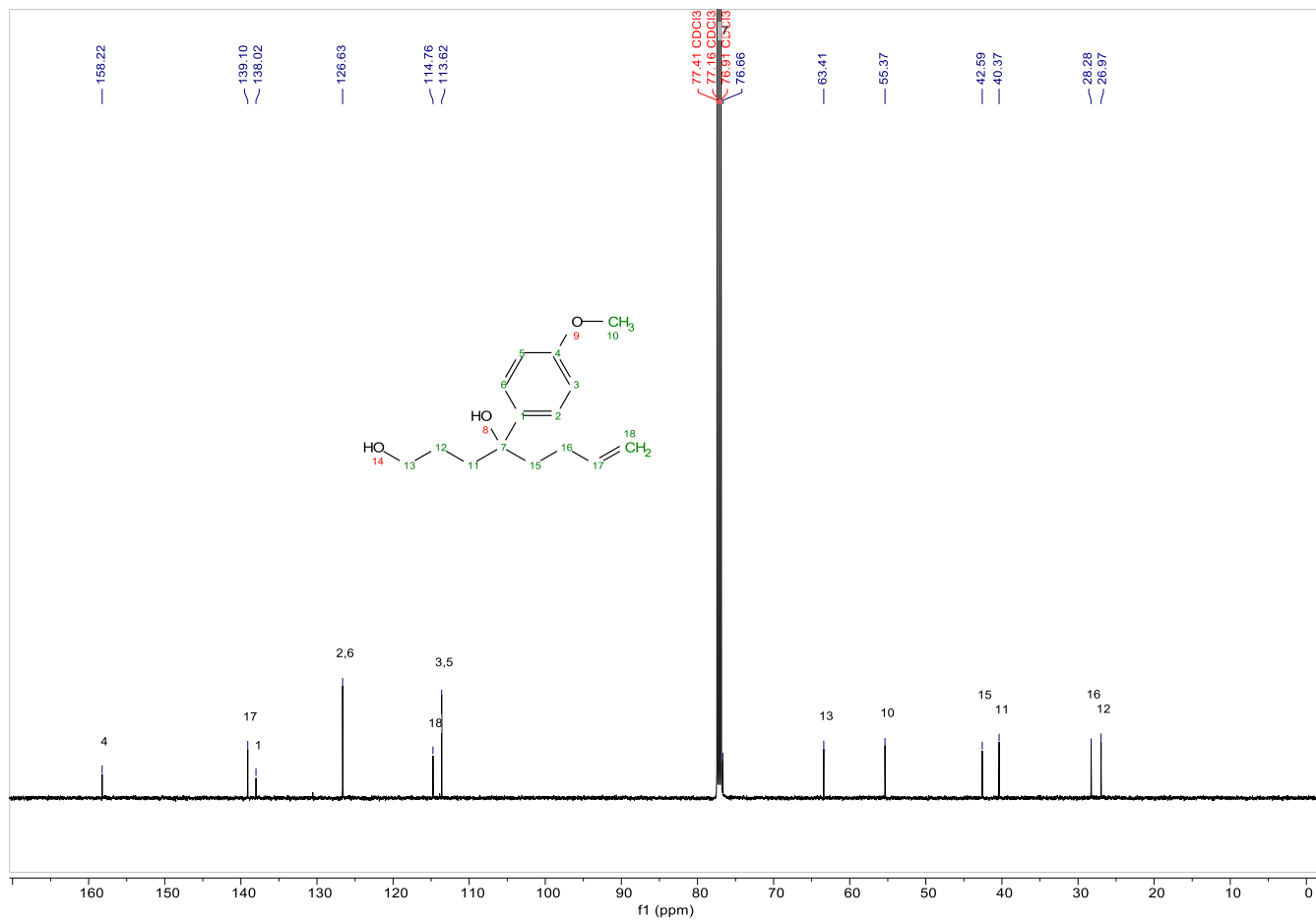
4-Phenyl-7-ene-1,4-diol (S6e), CDCl₃, ¹³C NMR, 126 MHz



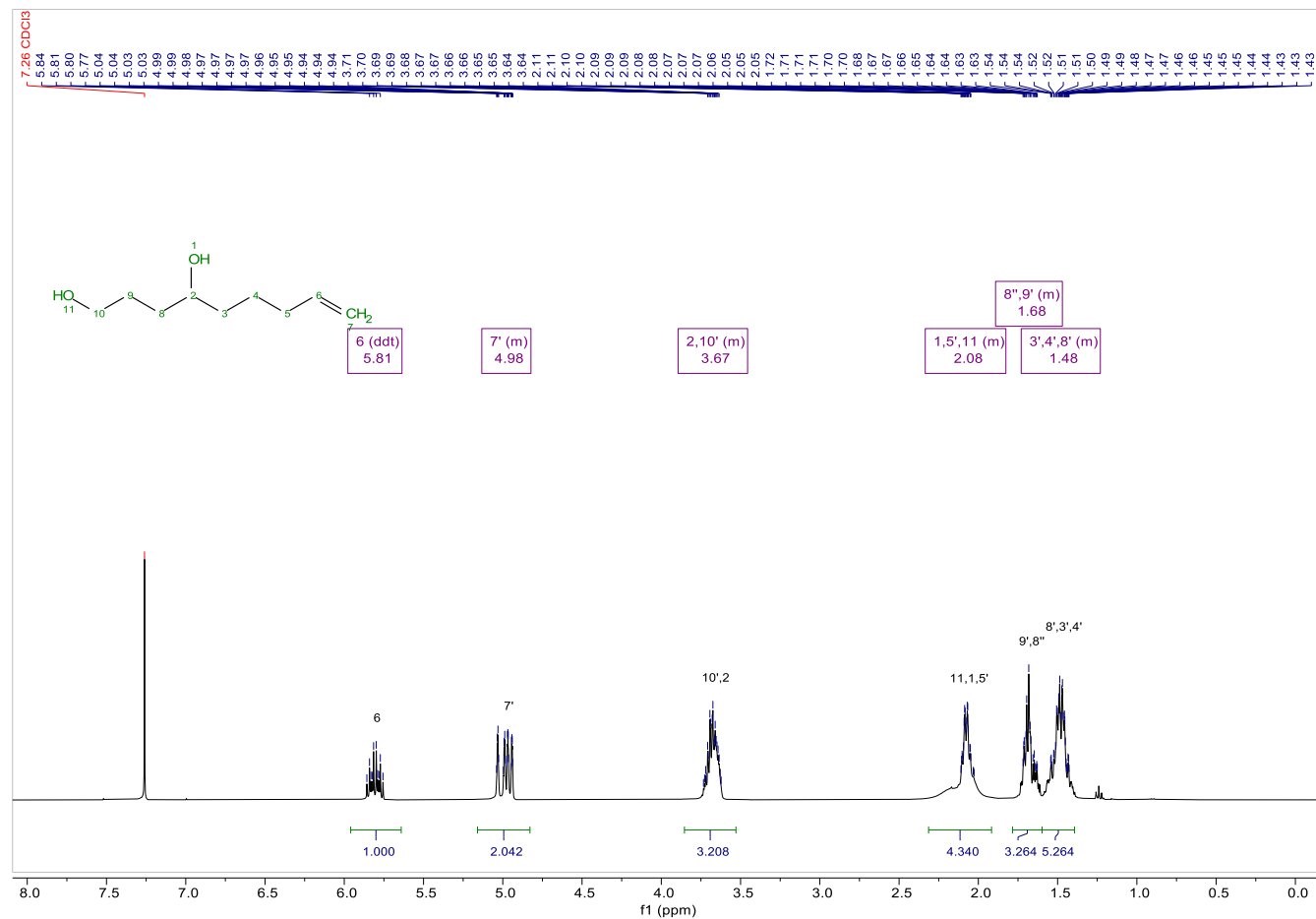
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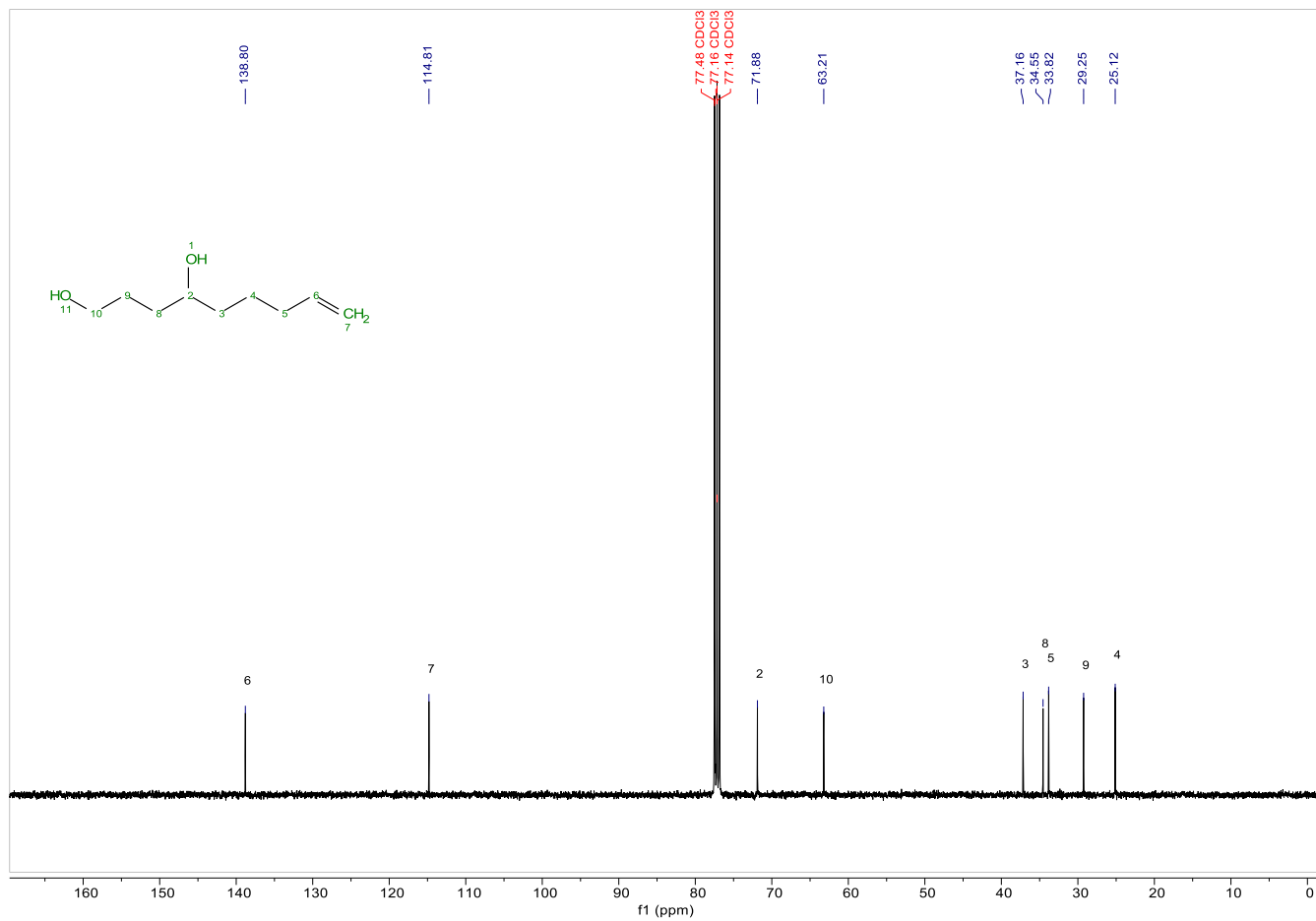
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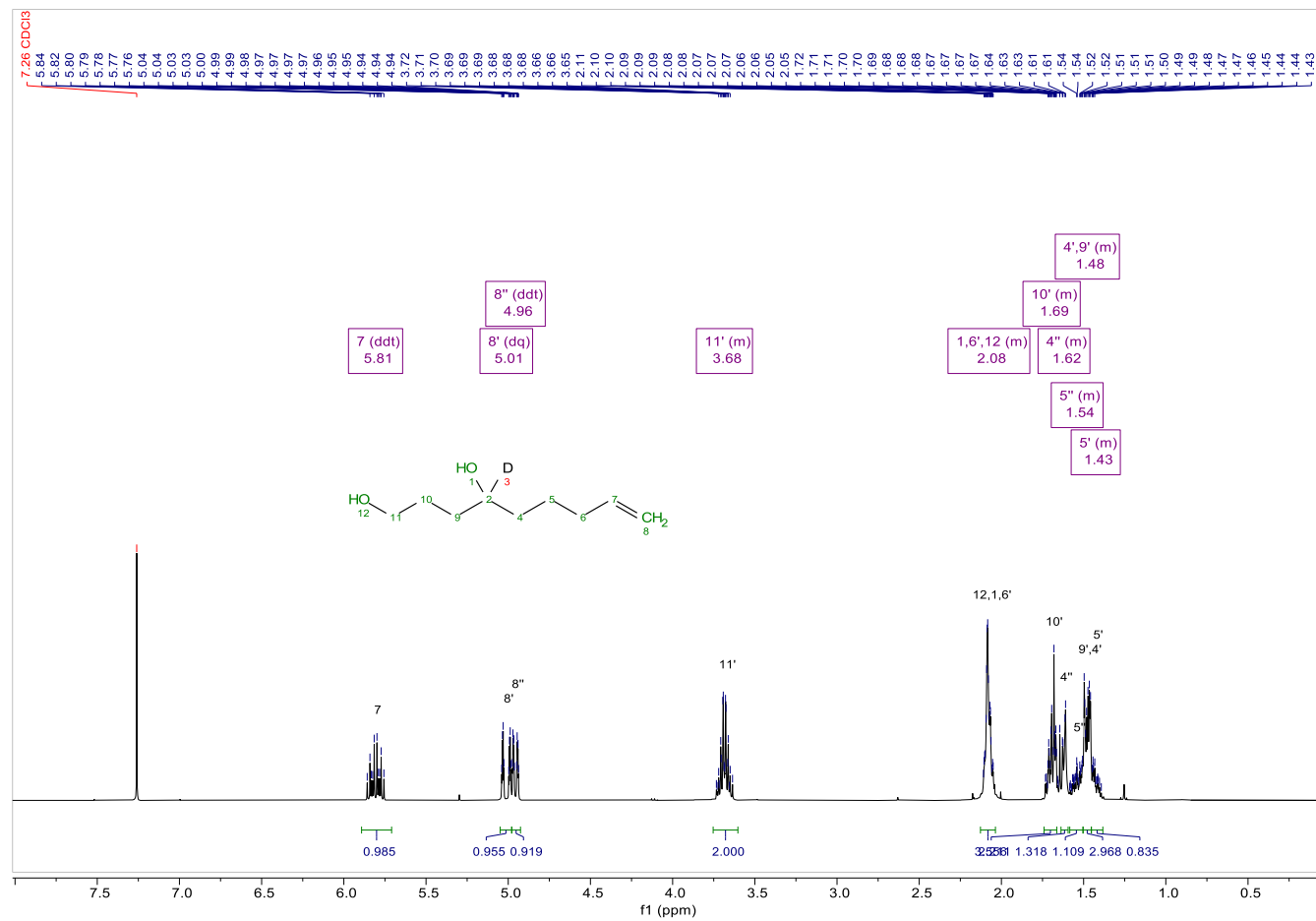
Non-8-ene-1,4-diol (S6c), CDCl₃, ¹H NMR, 400 MHz



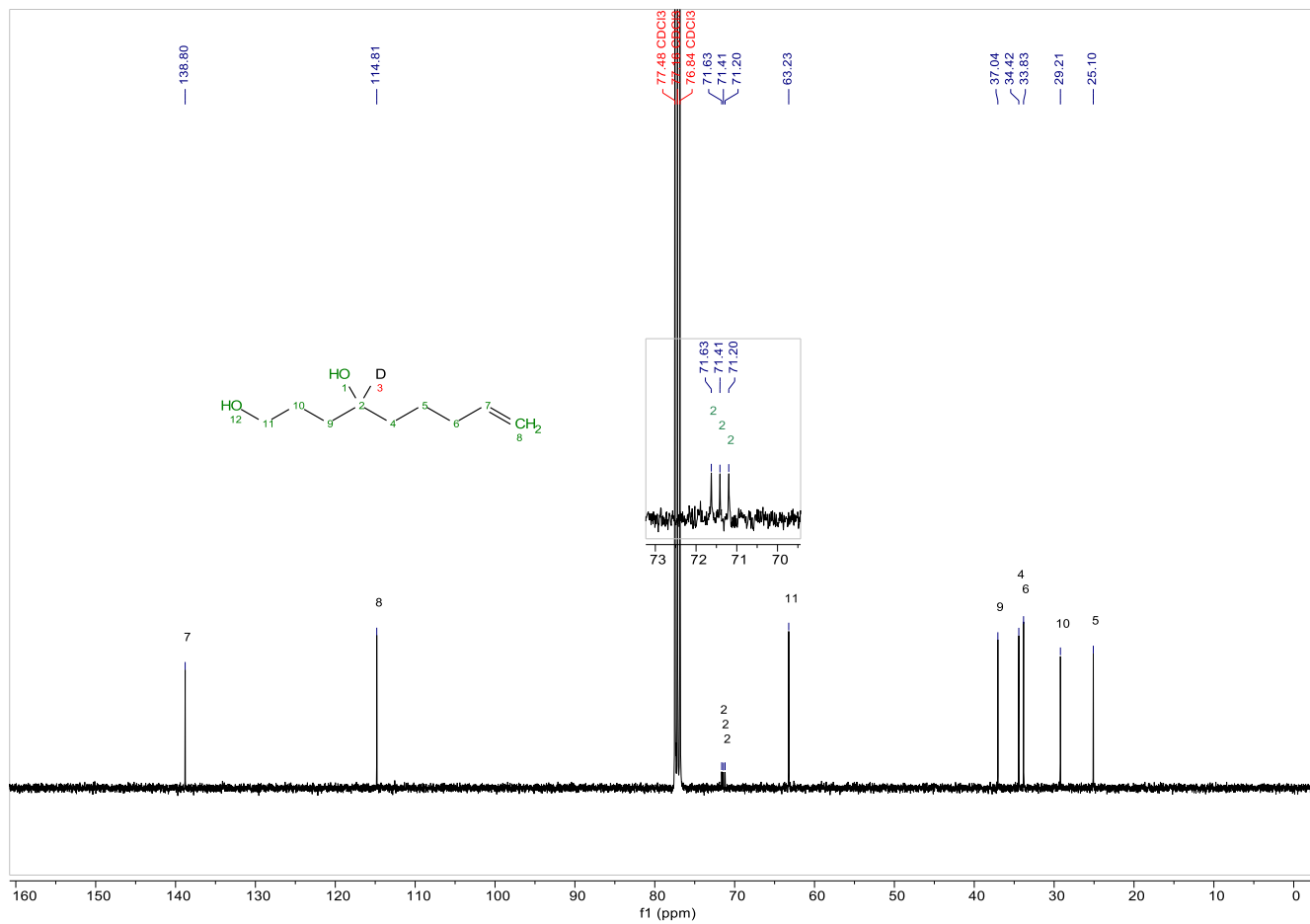
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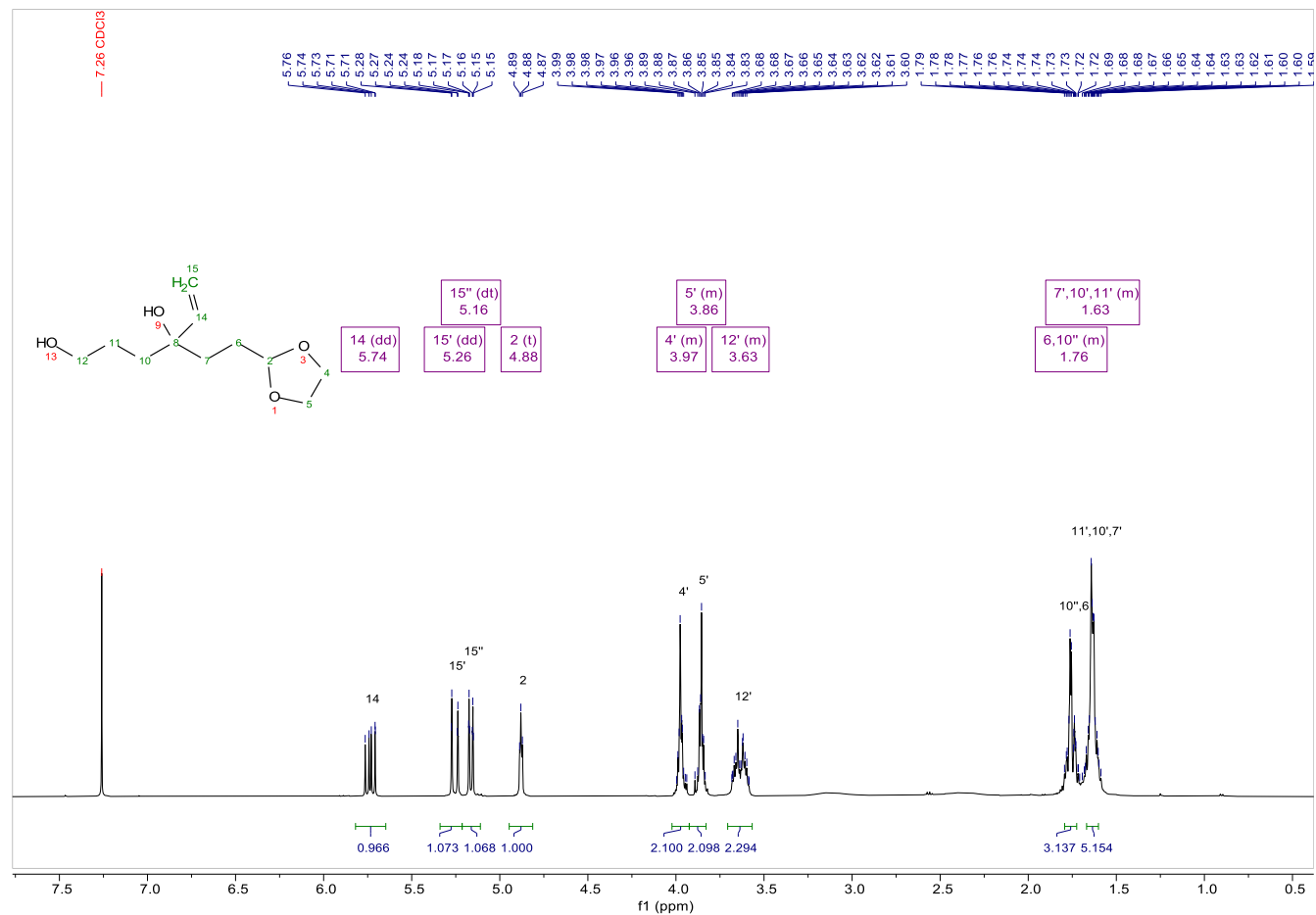
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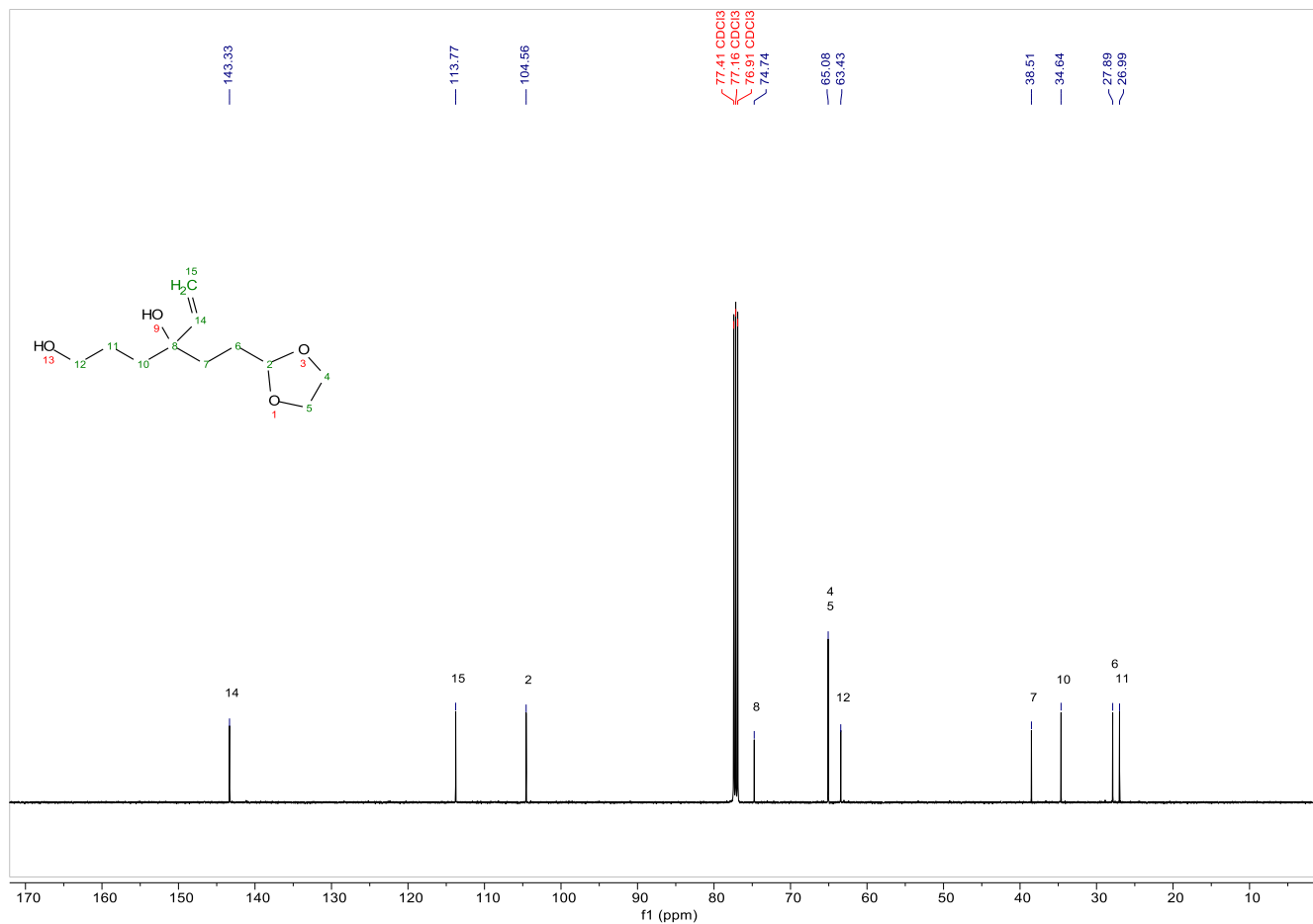
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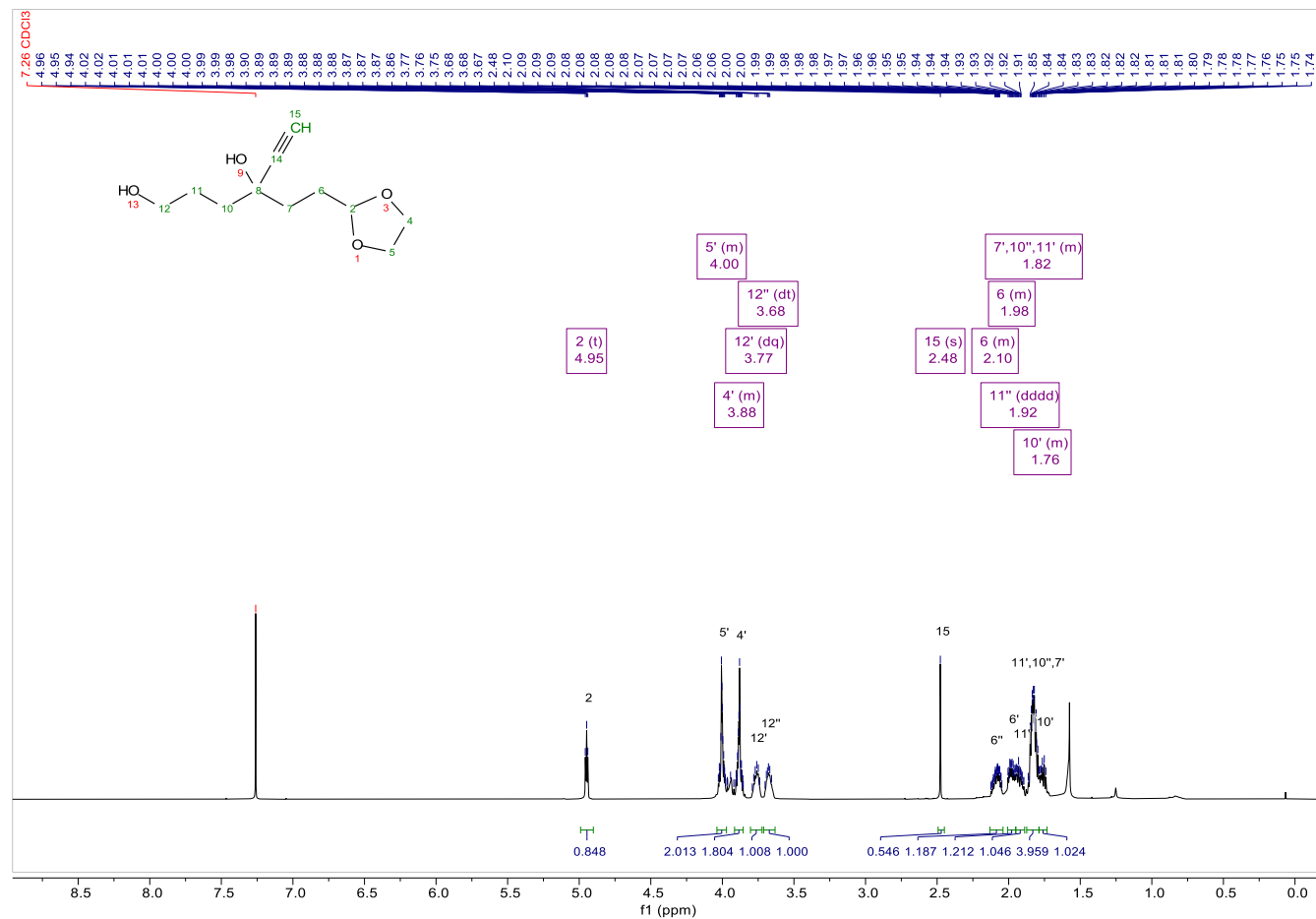
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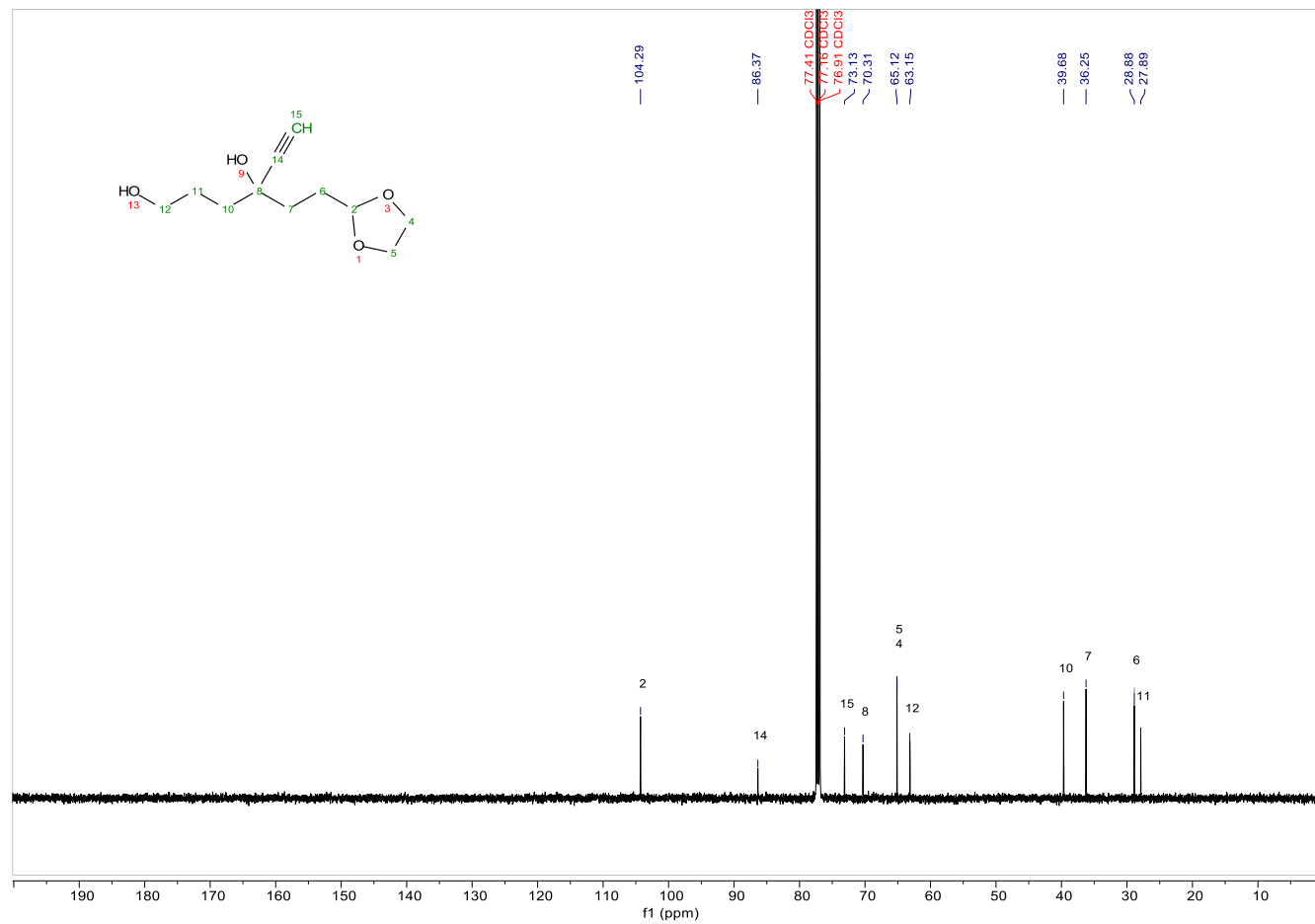
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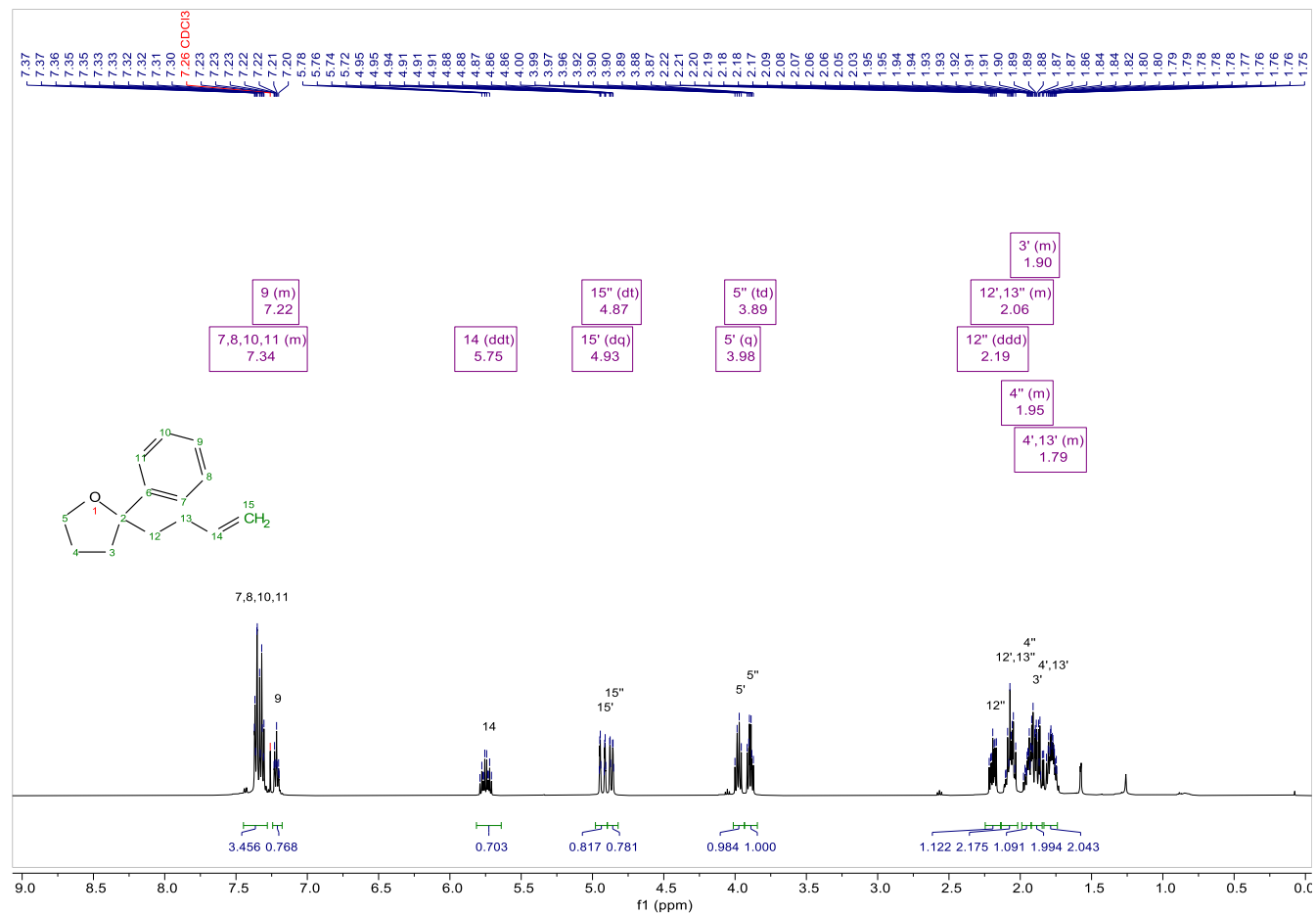
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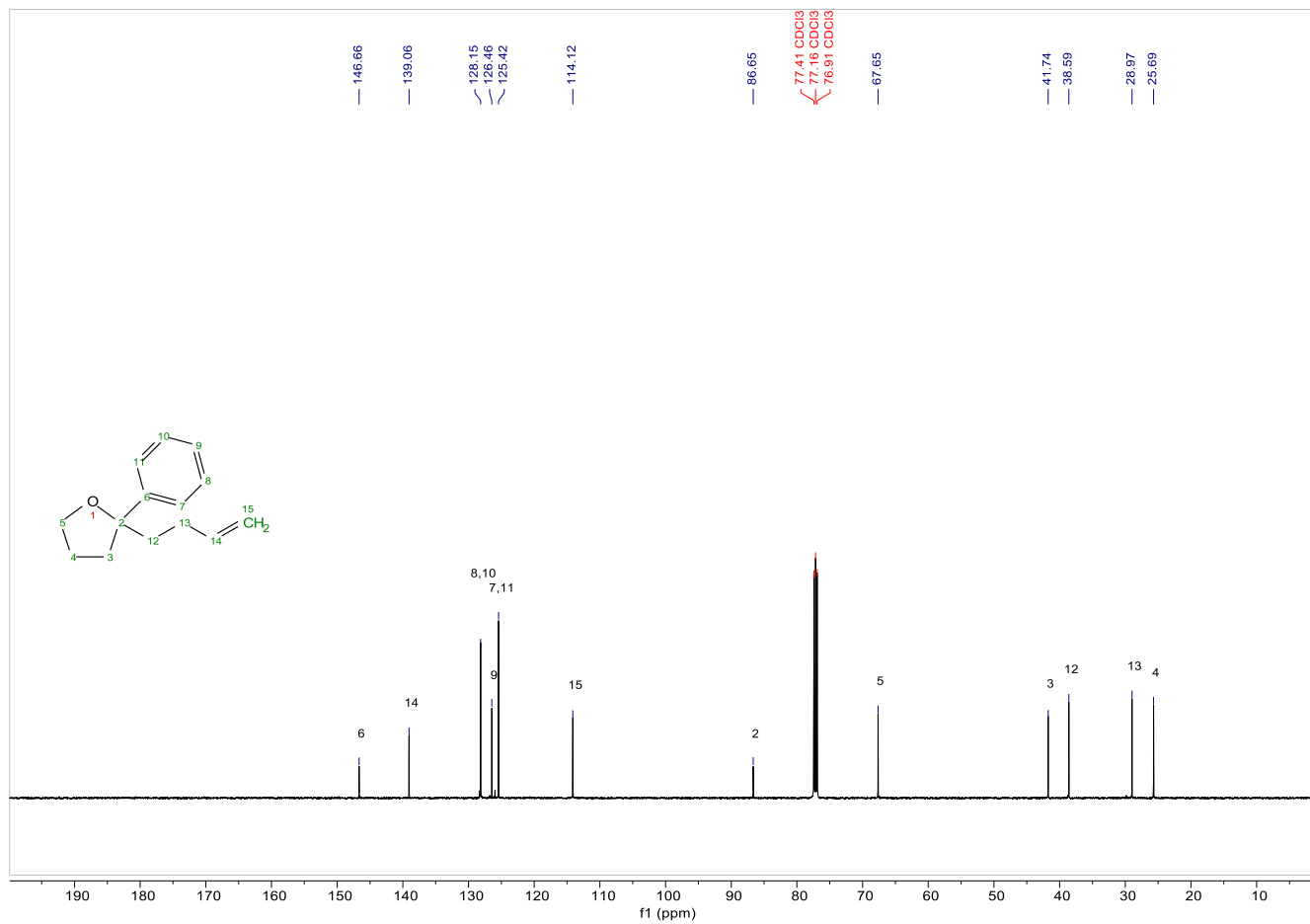
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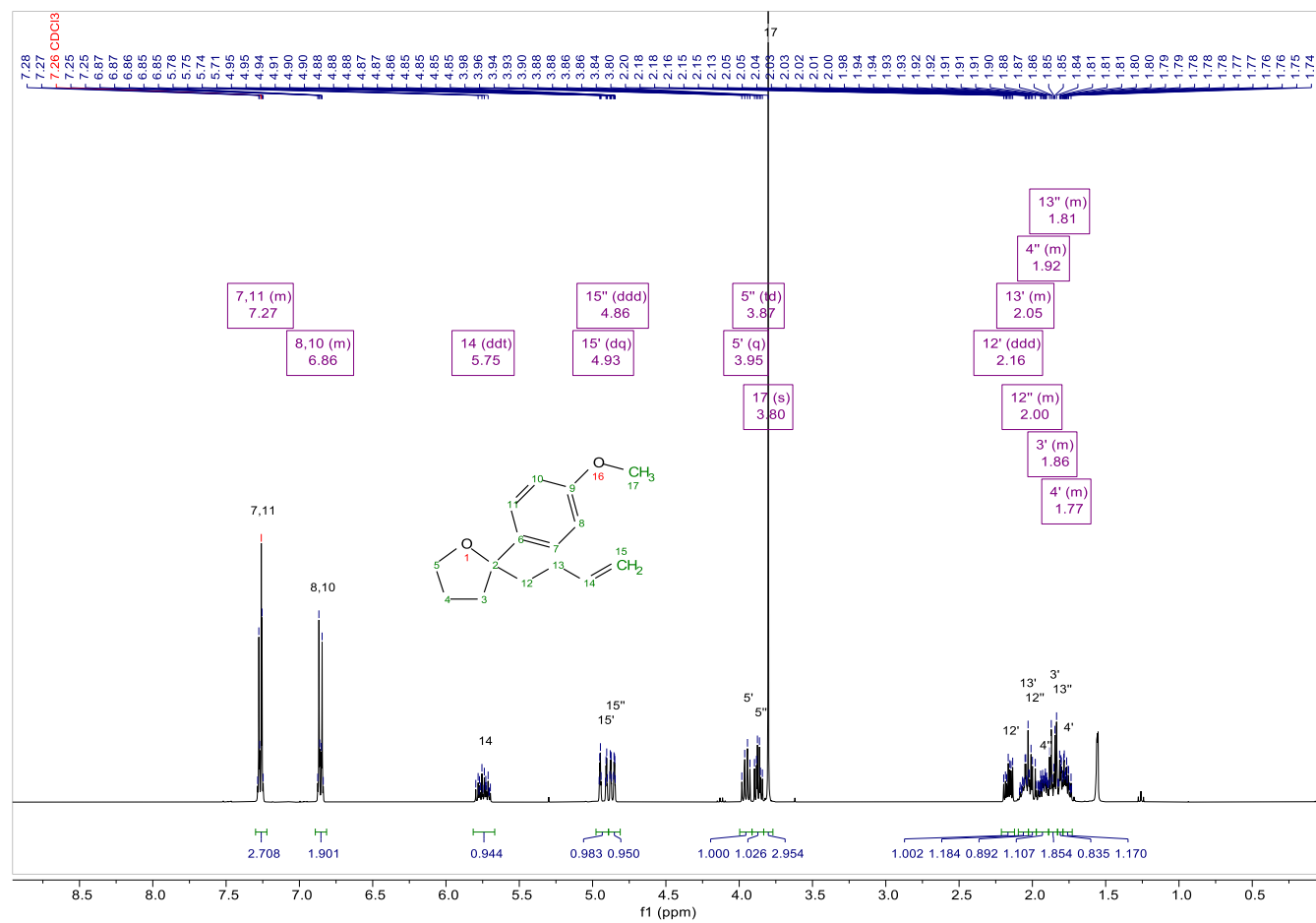
2-(But-3-en-1-yl)-2-phenyltetrahydrofuran (S7e), CDCl₃, ¹H NMR, 500 MHz



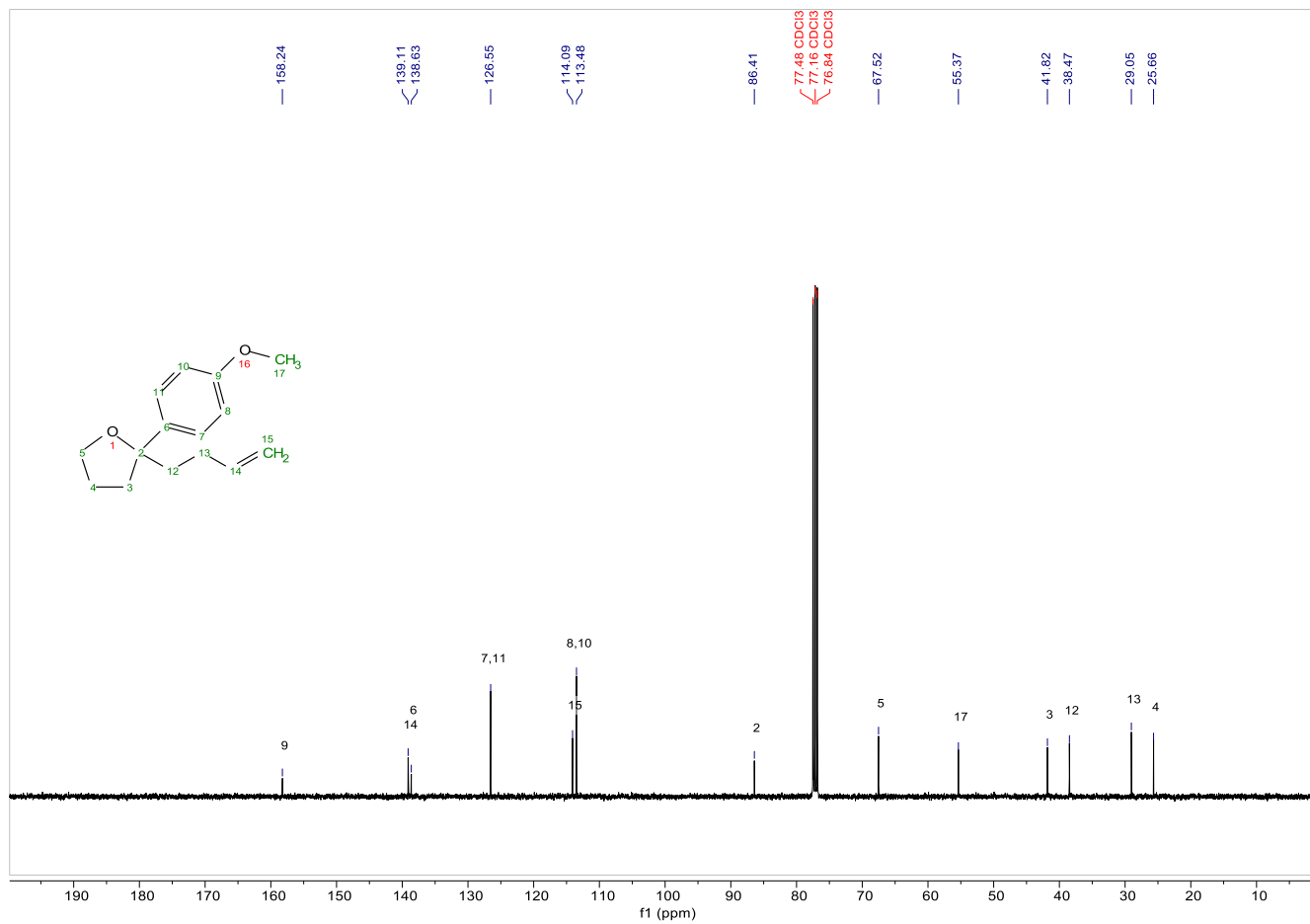
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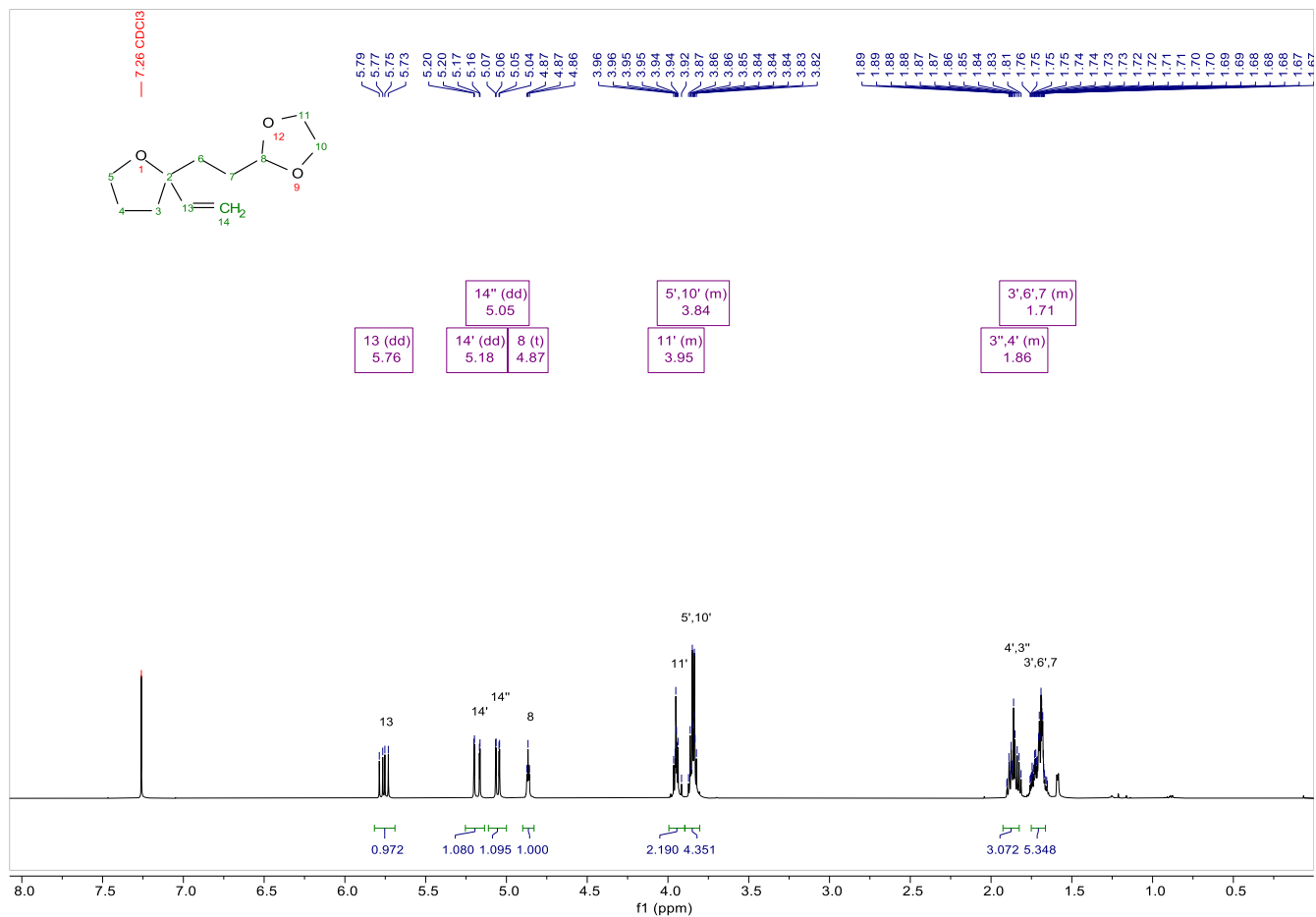
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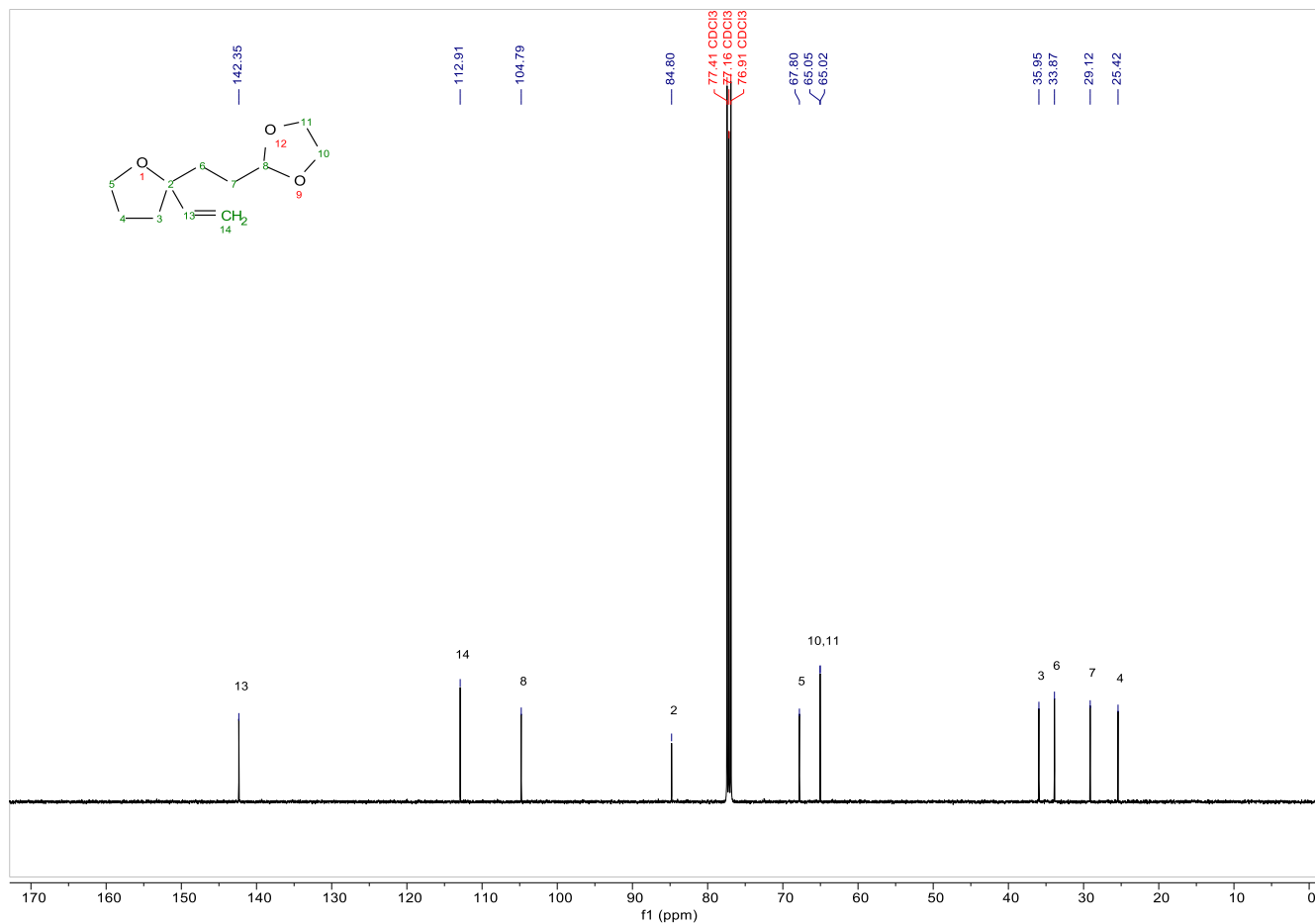
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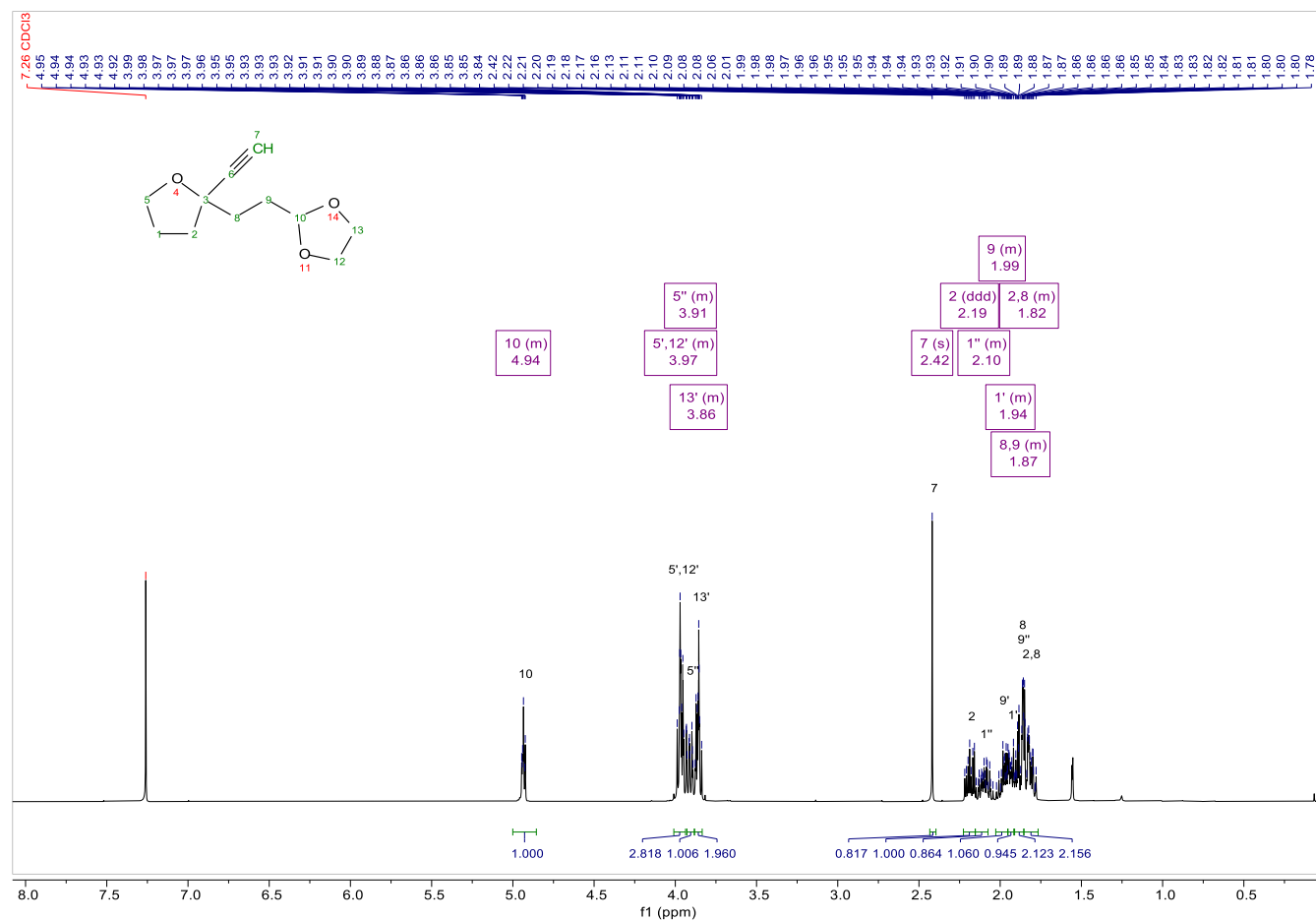
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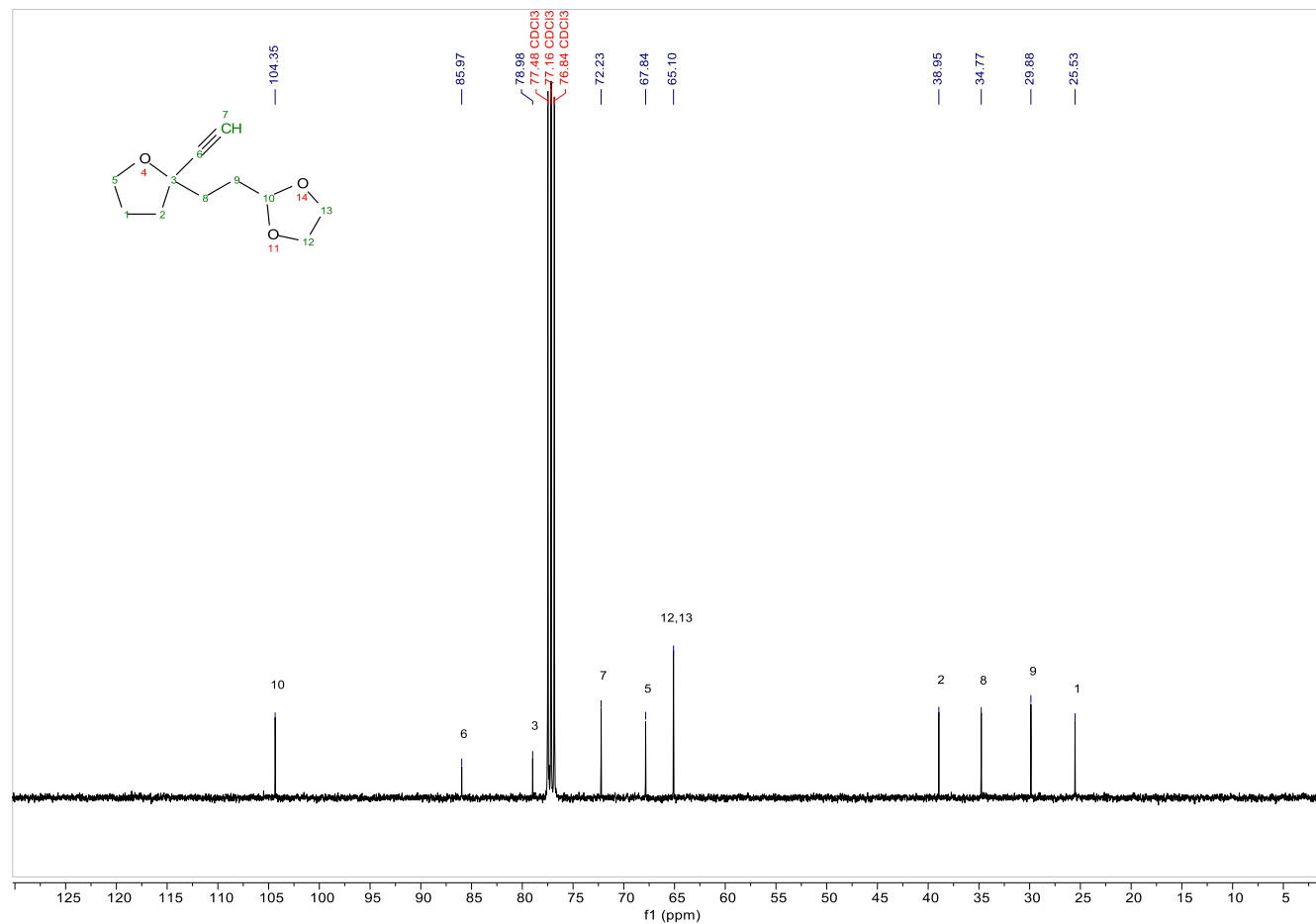
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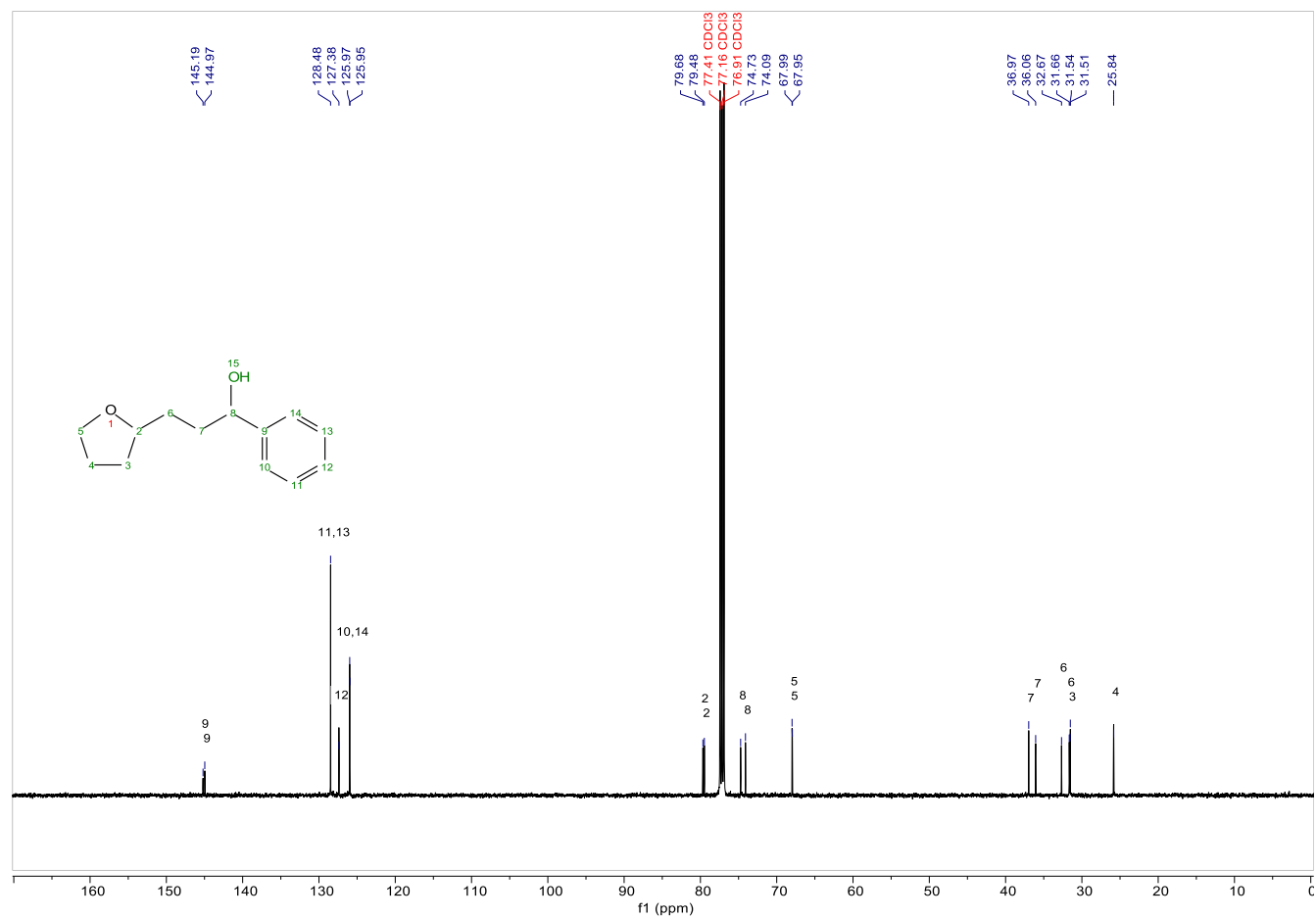
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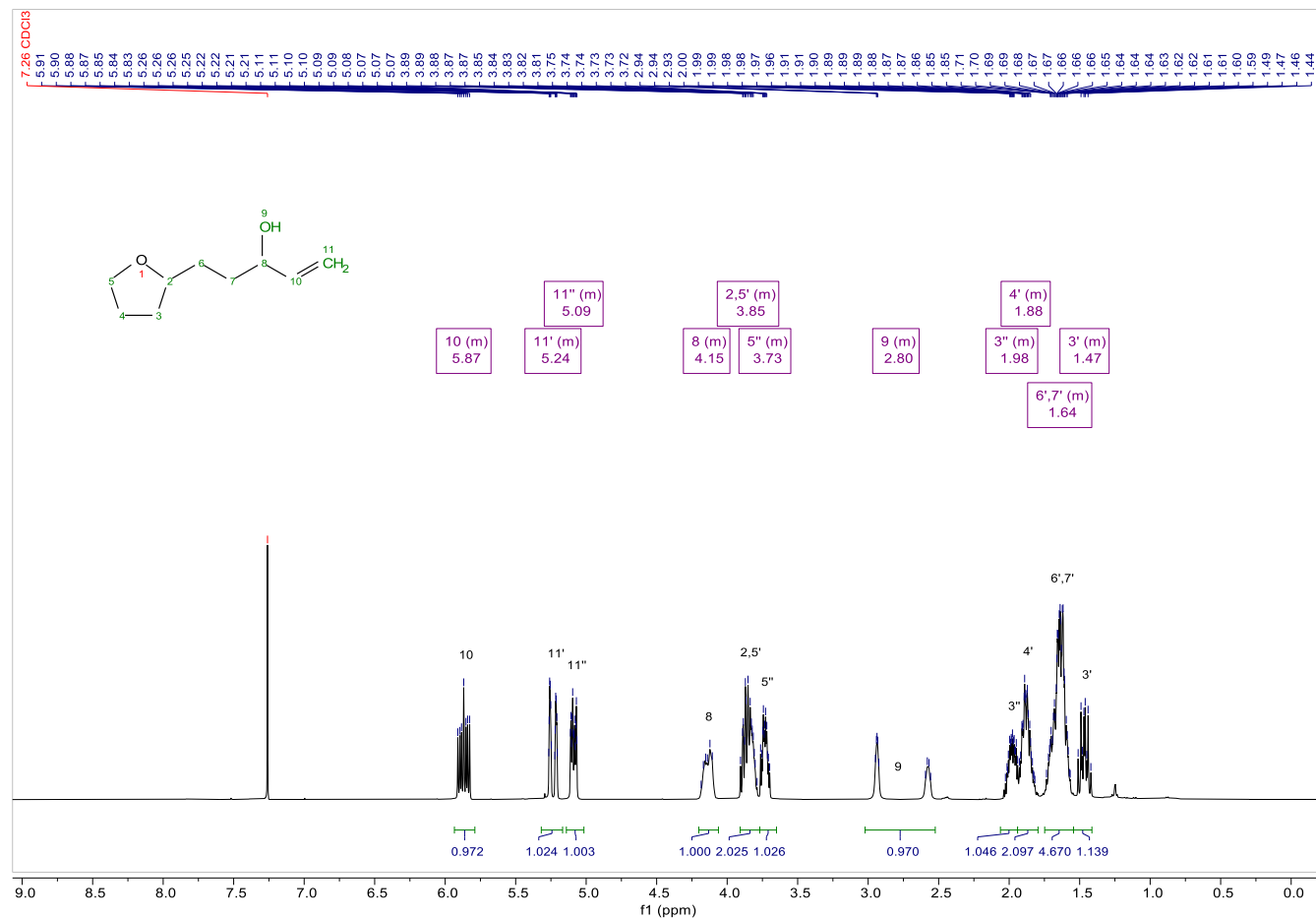
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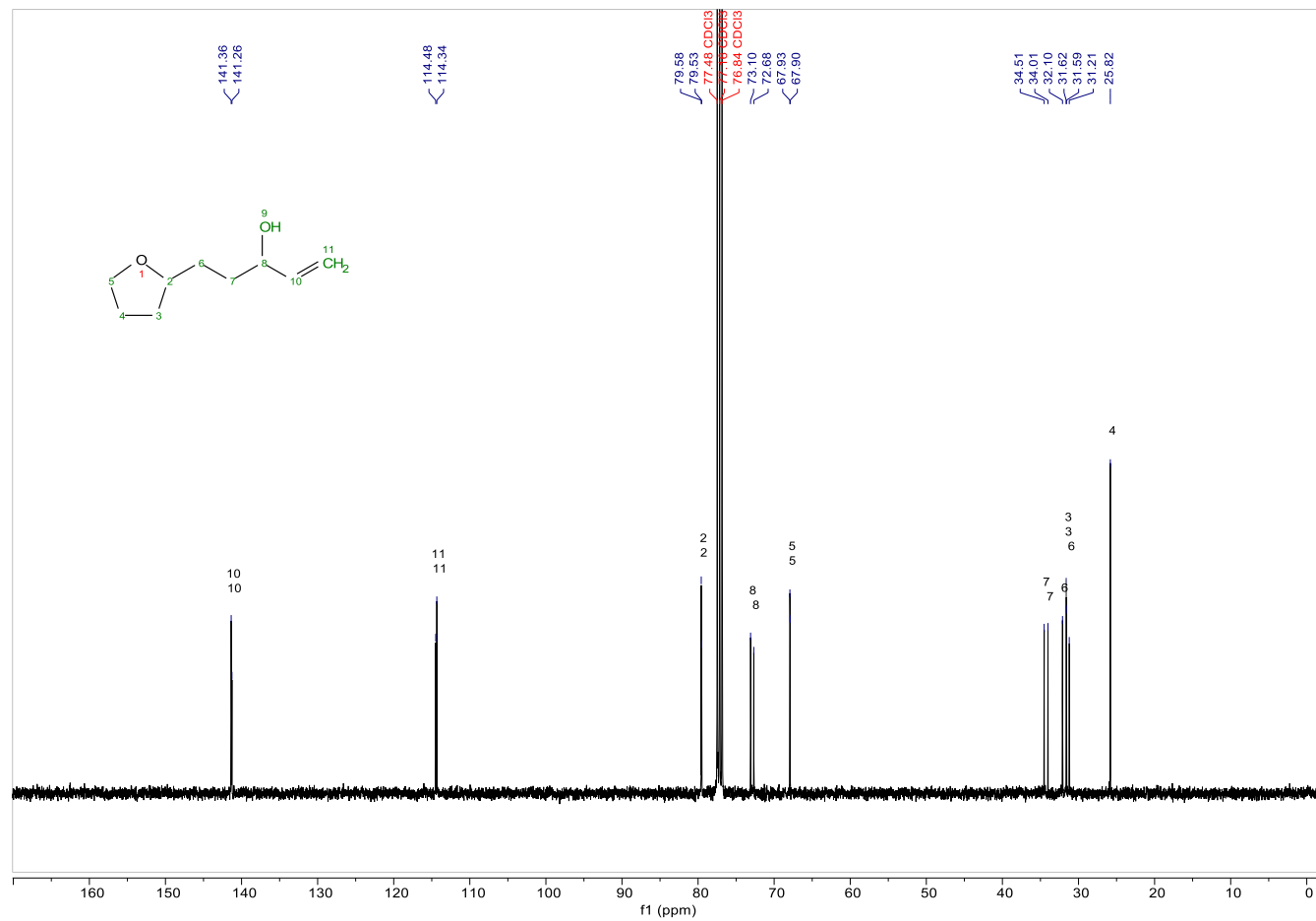
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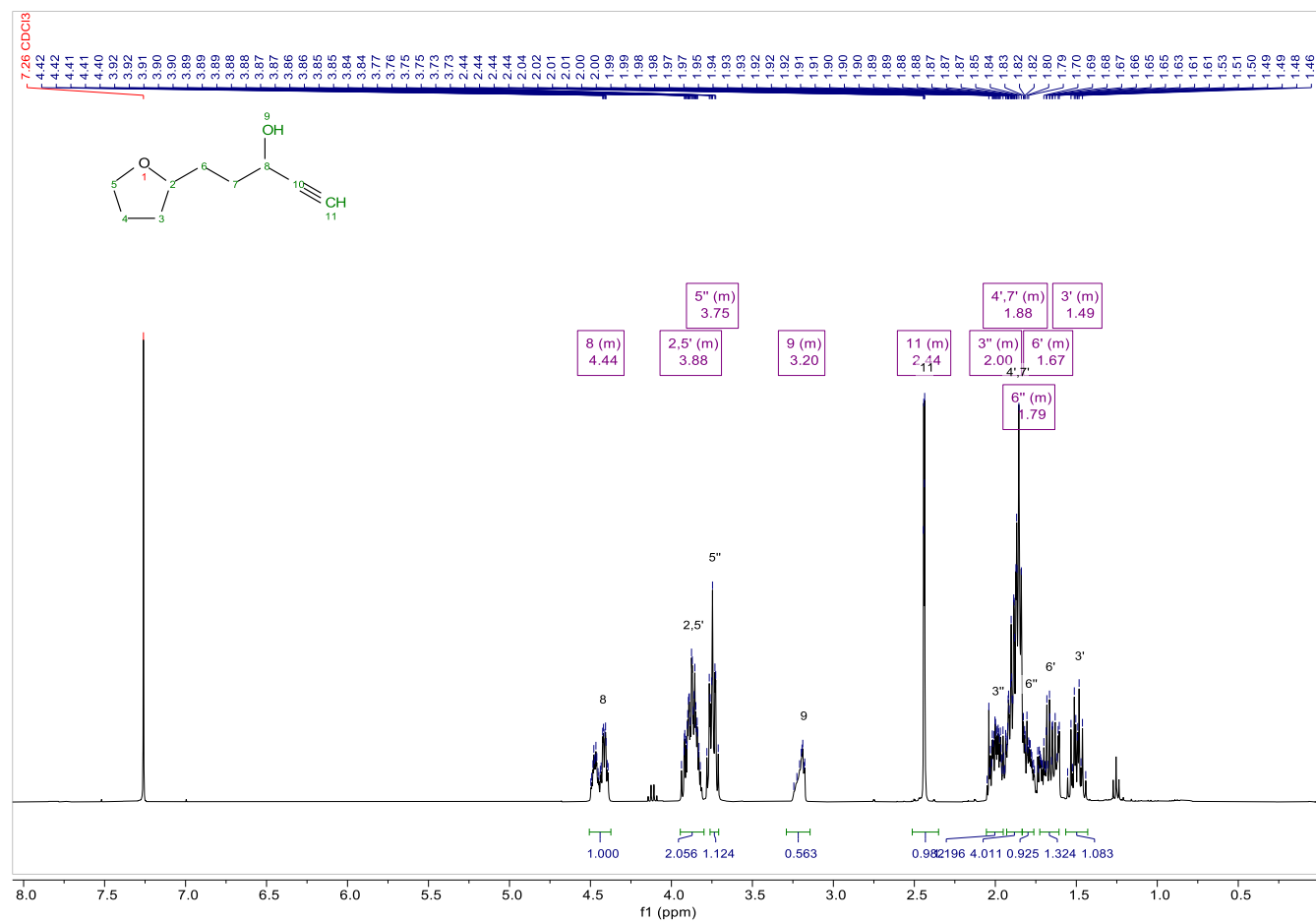
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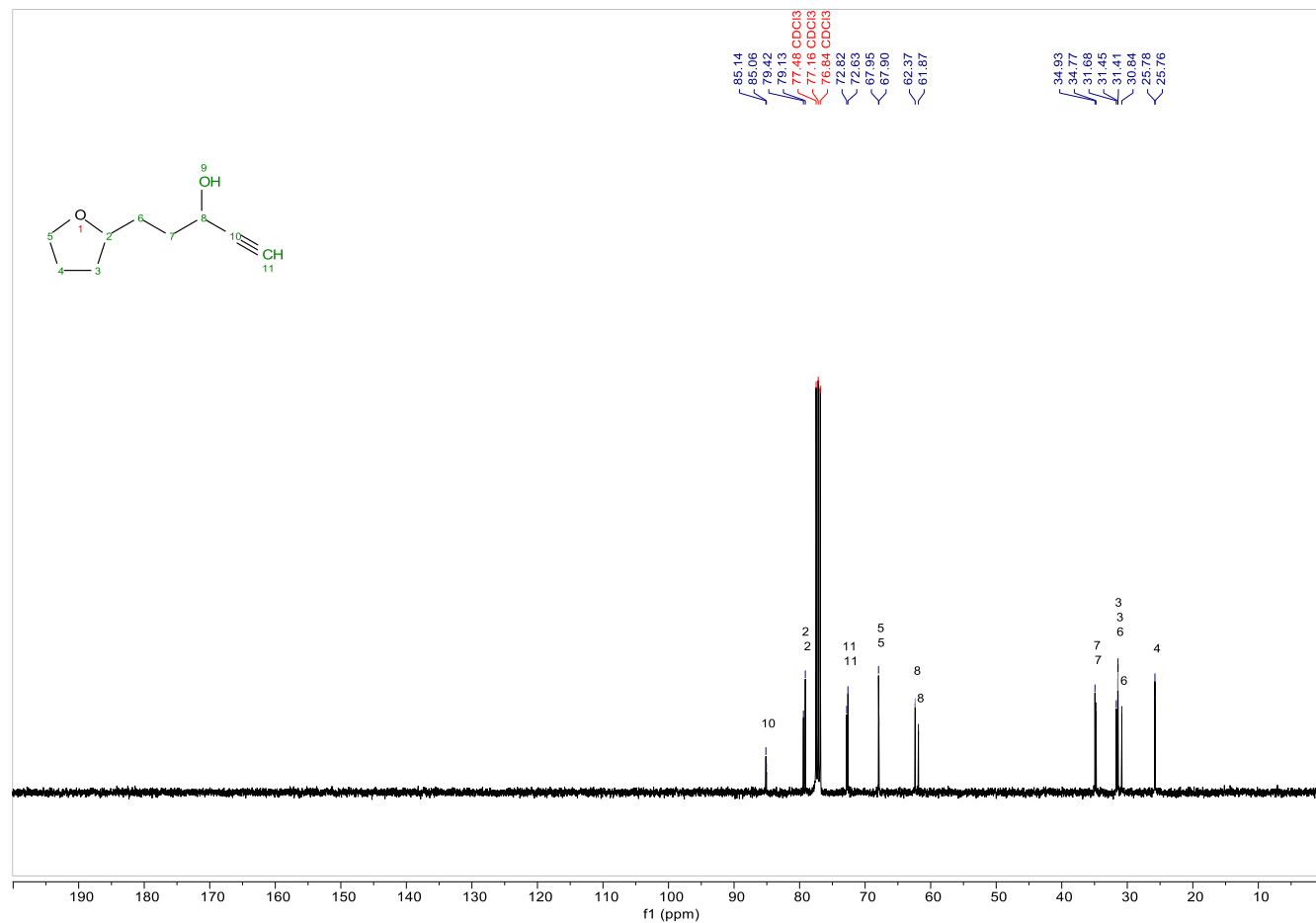
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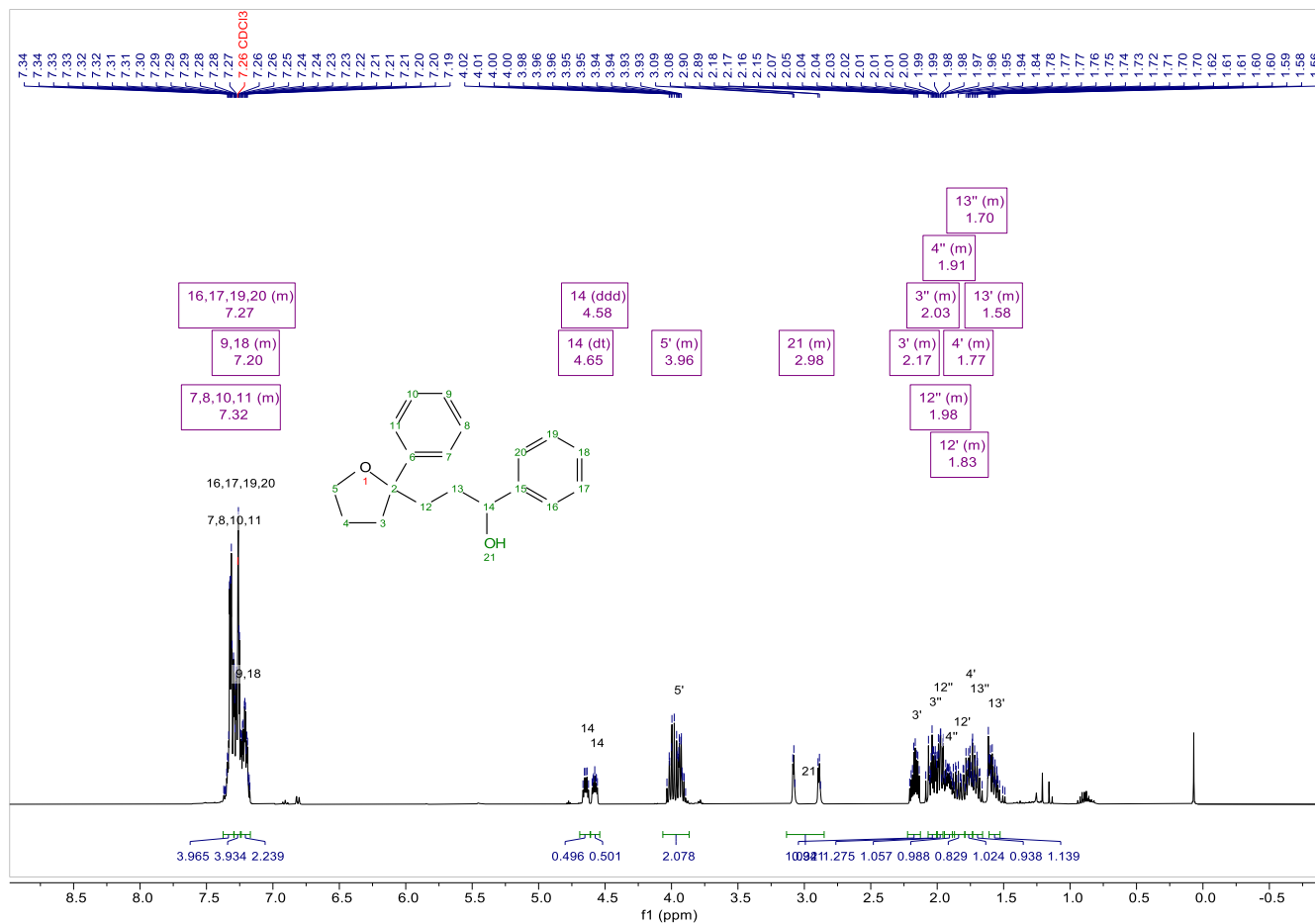
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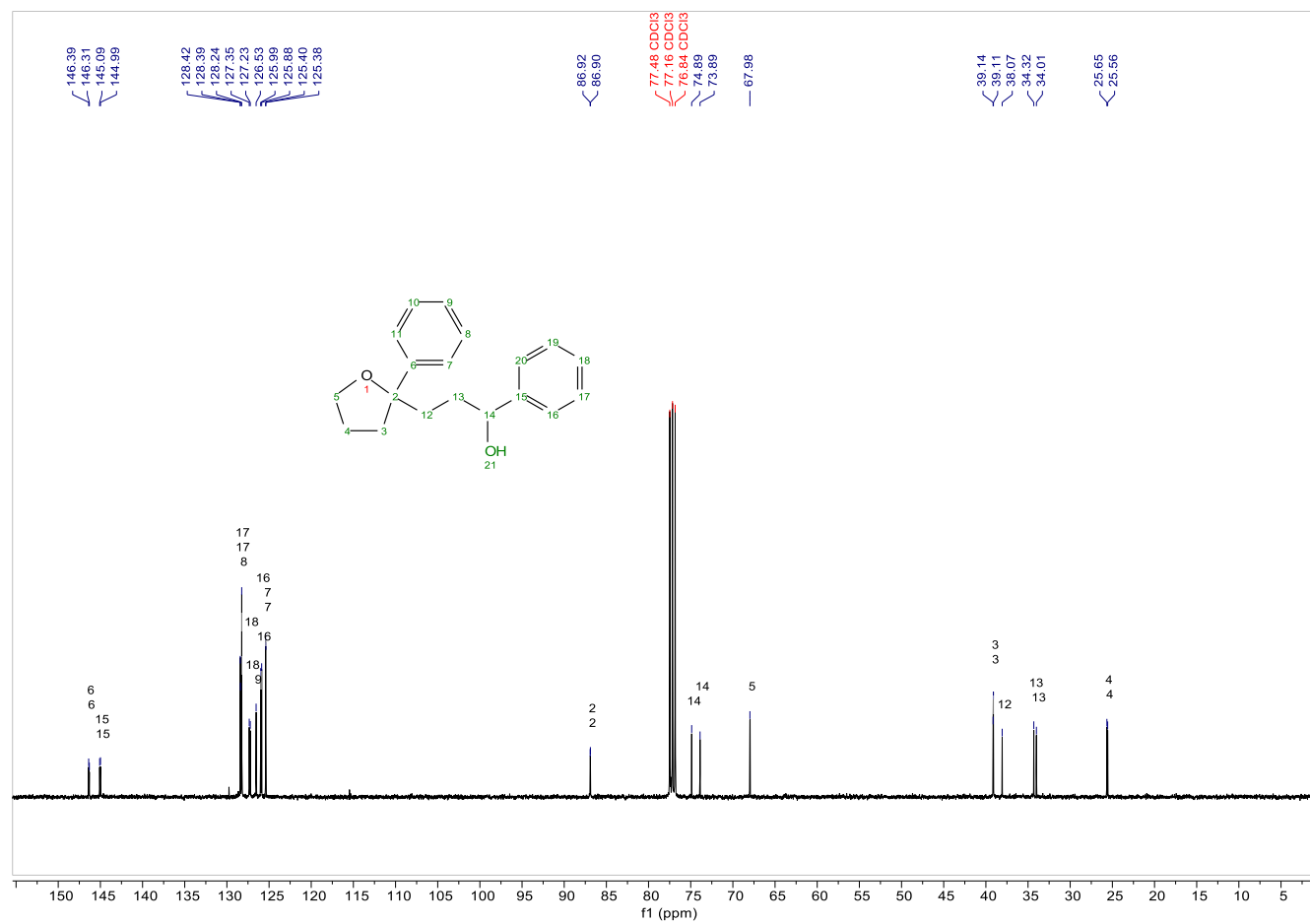
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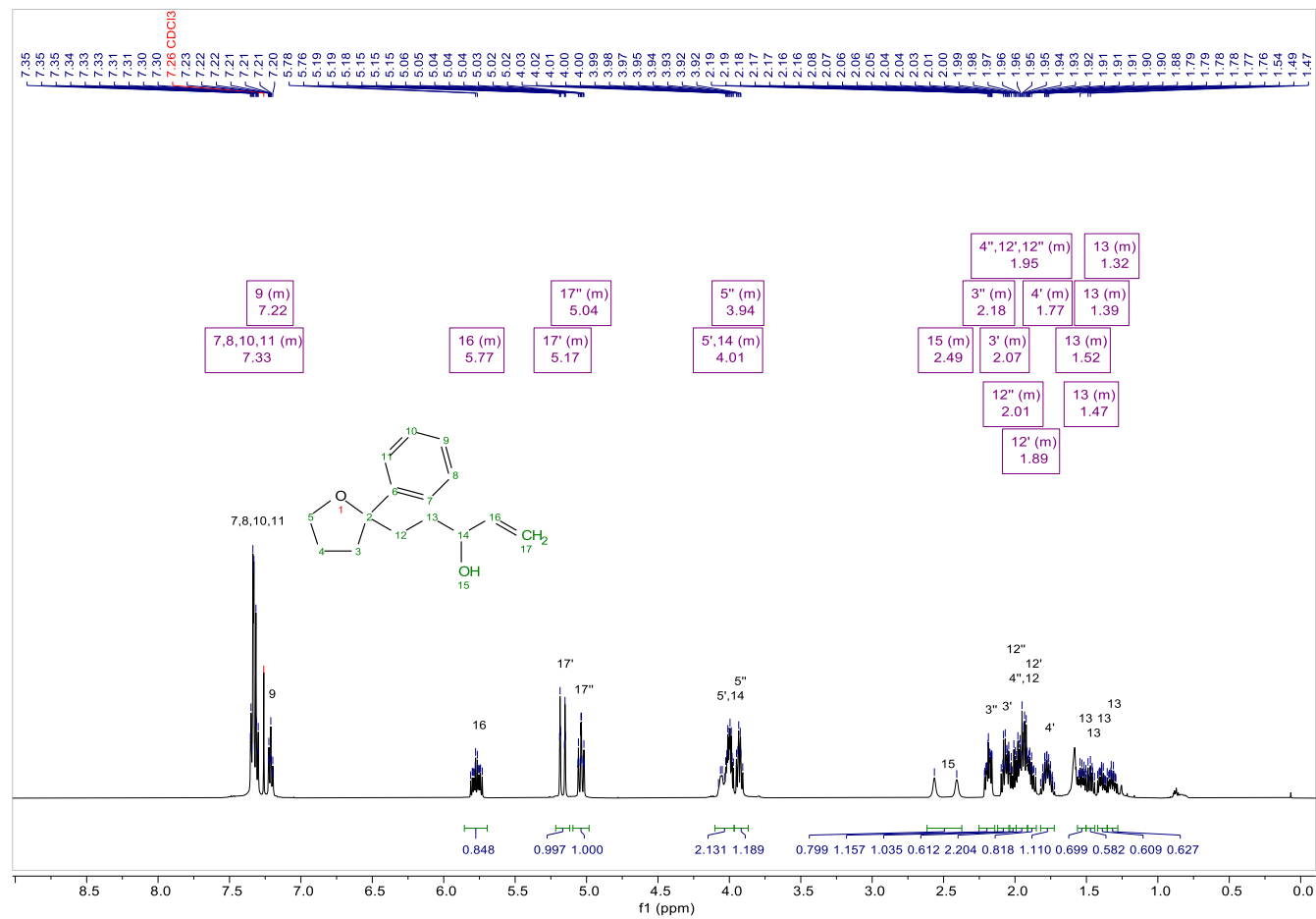
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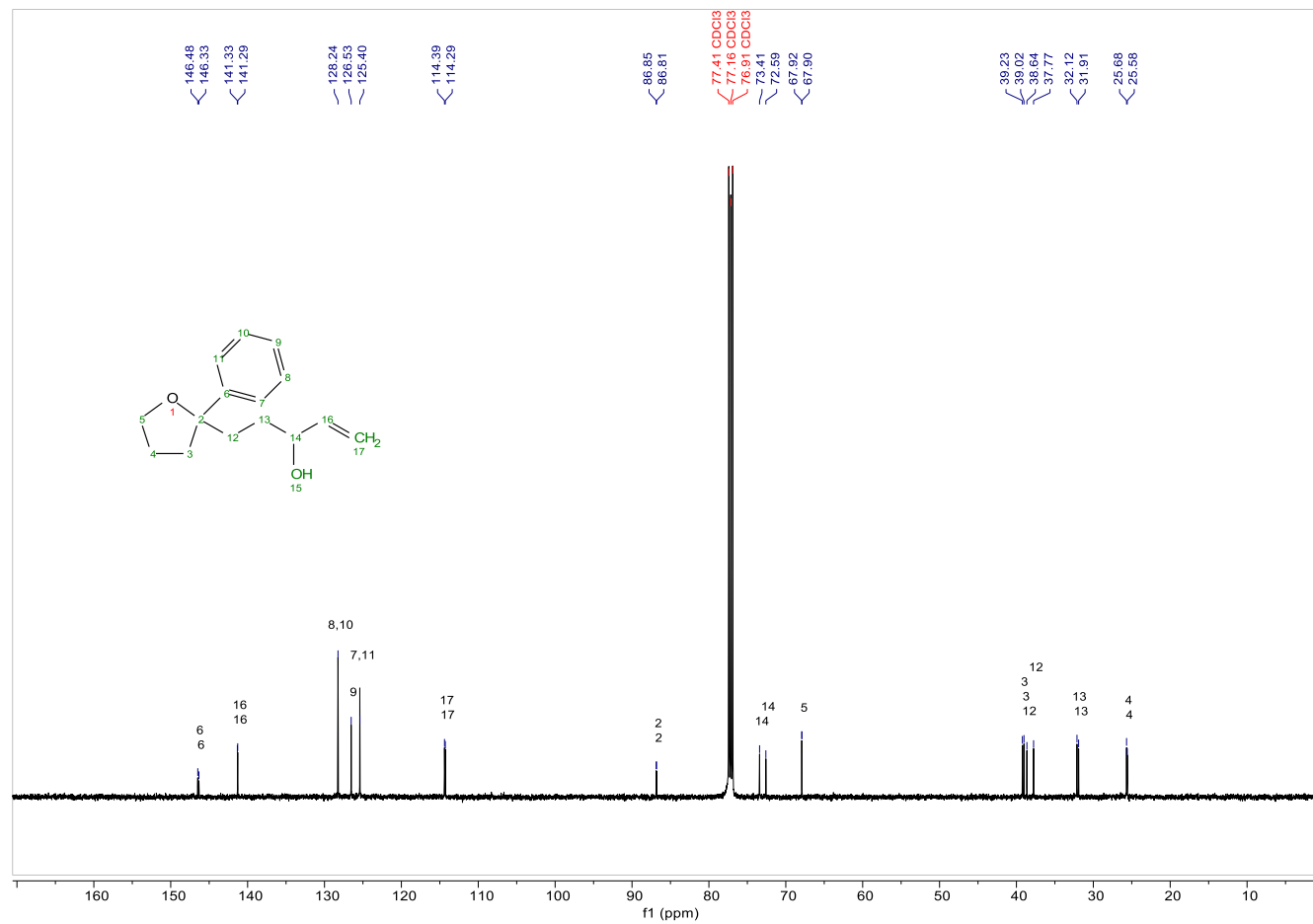
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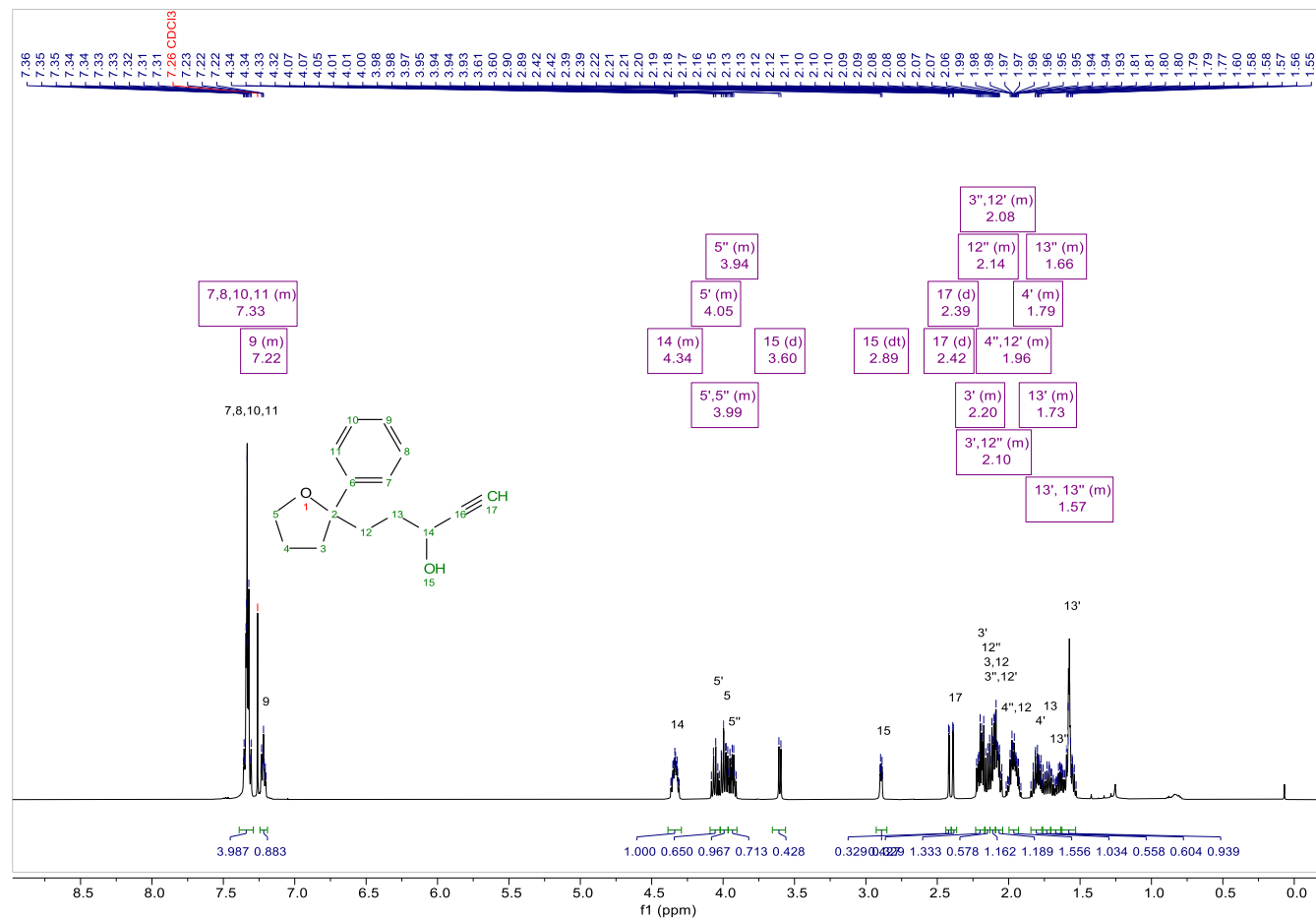
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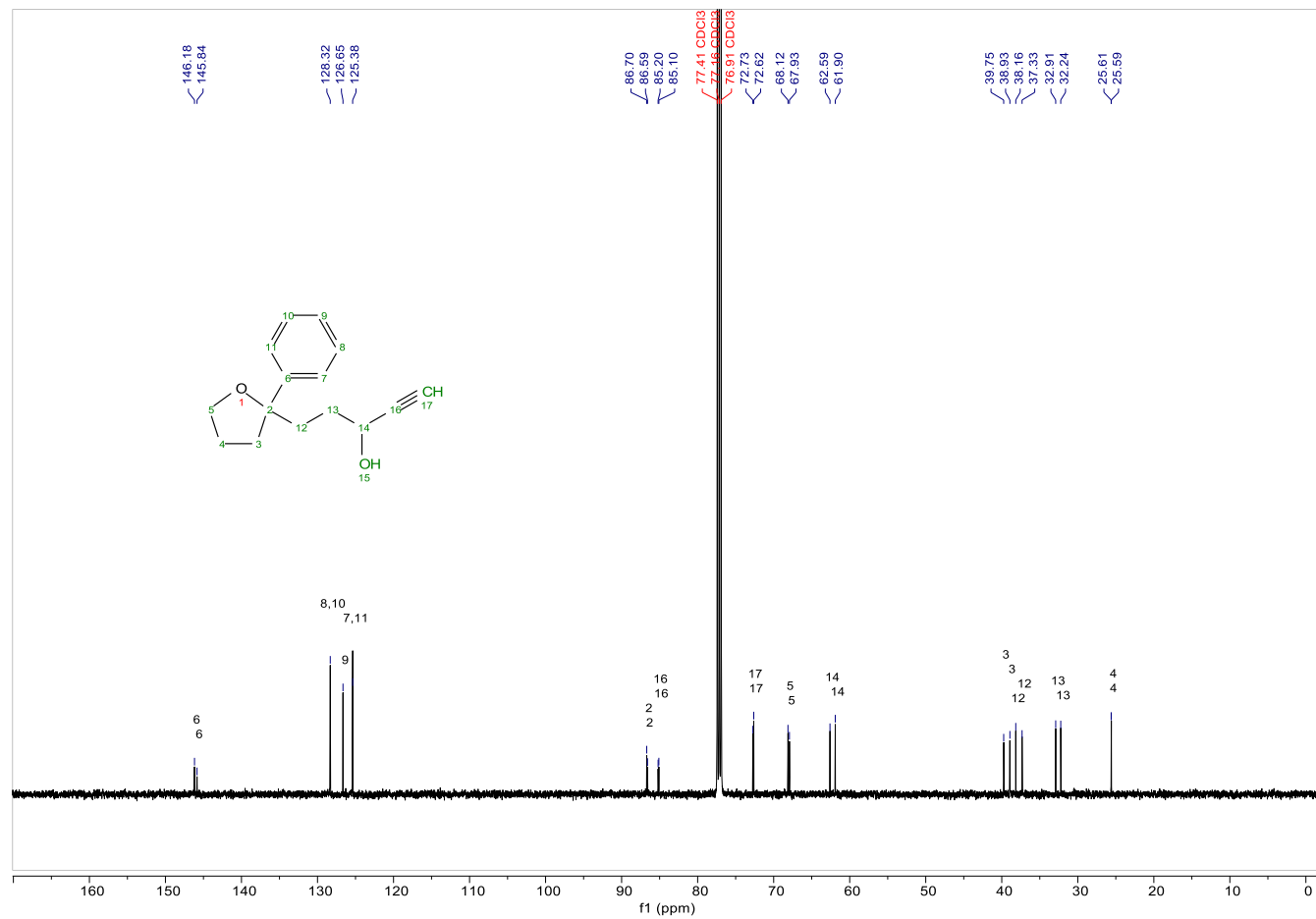
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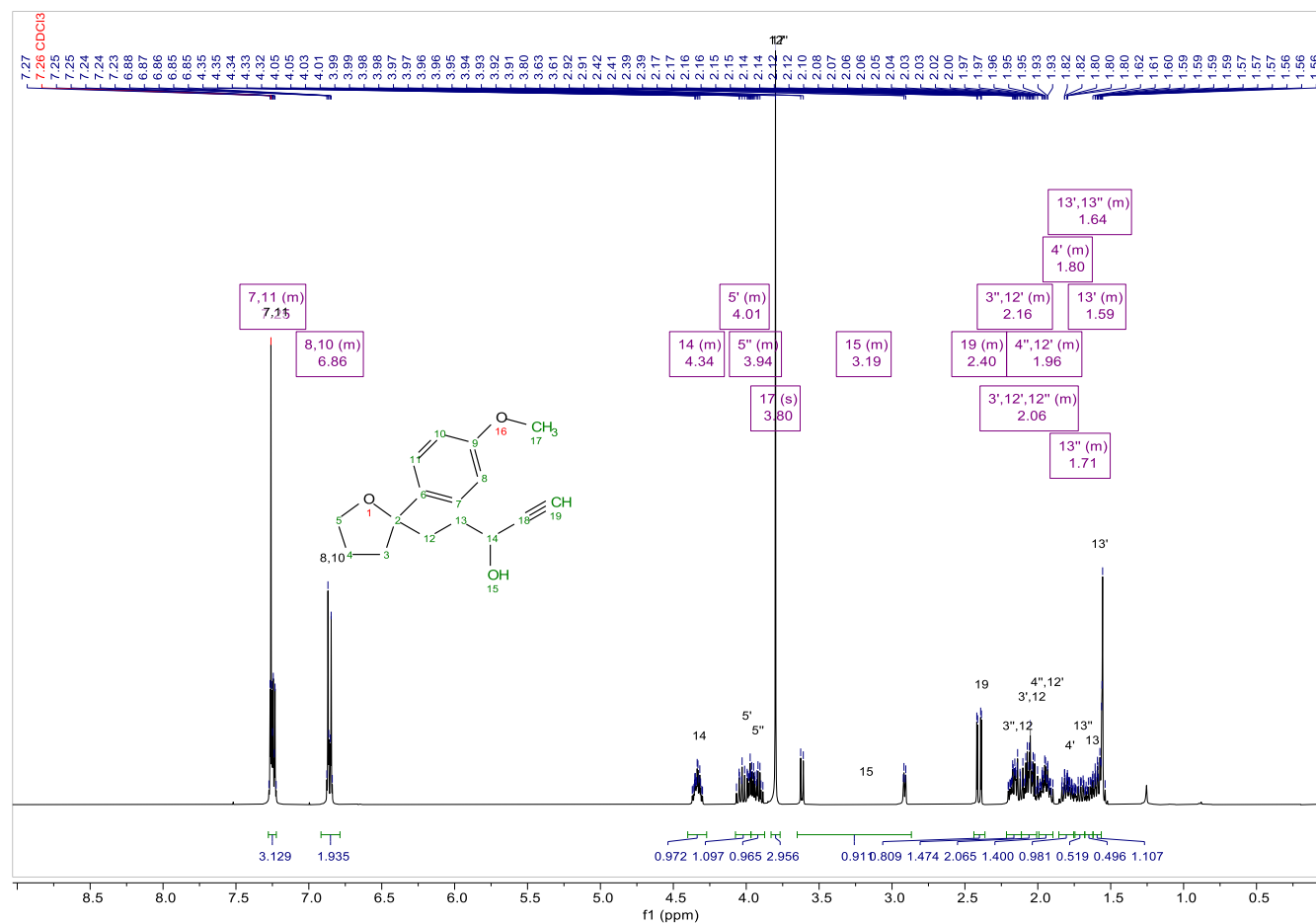
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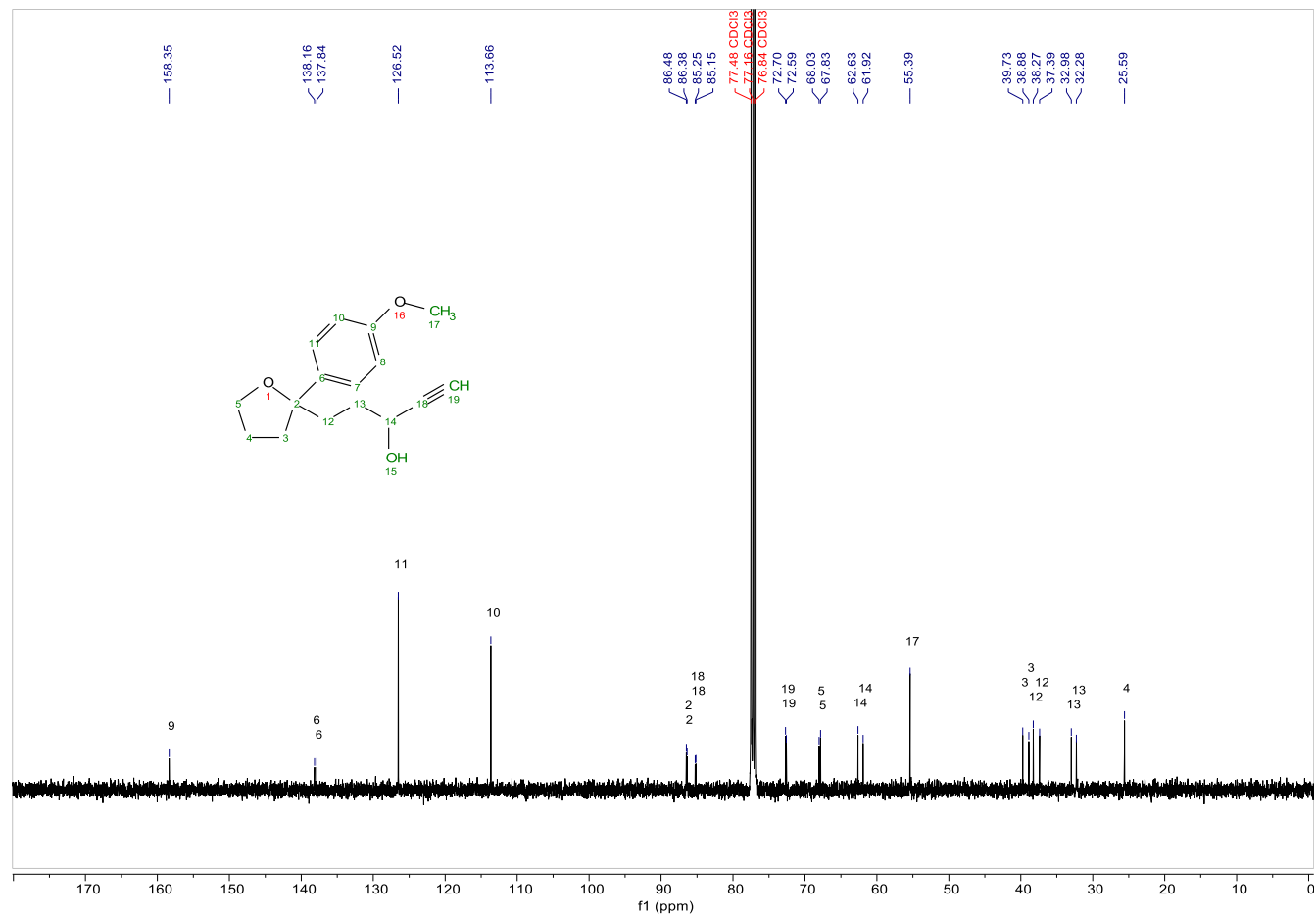
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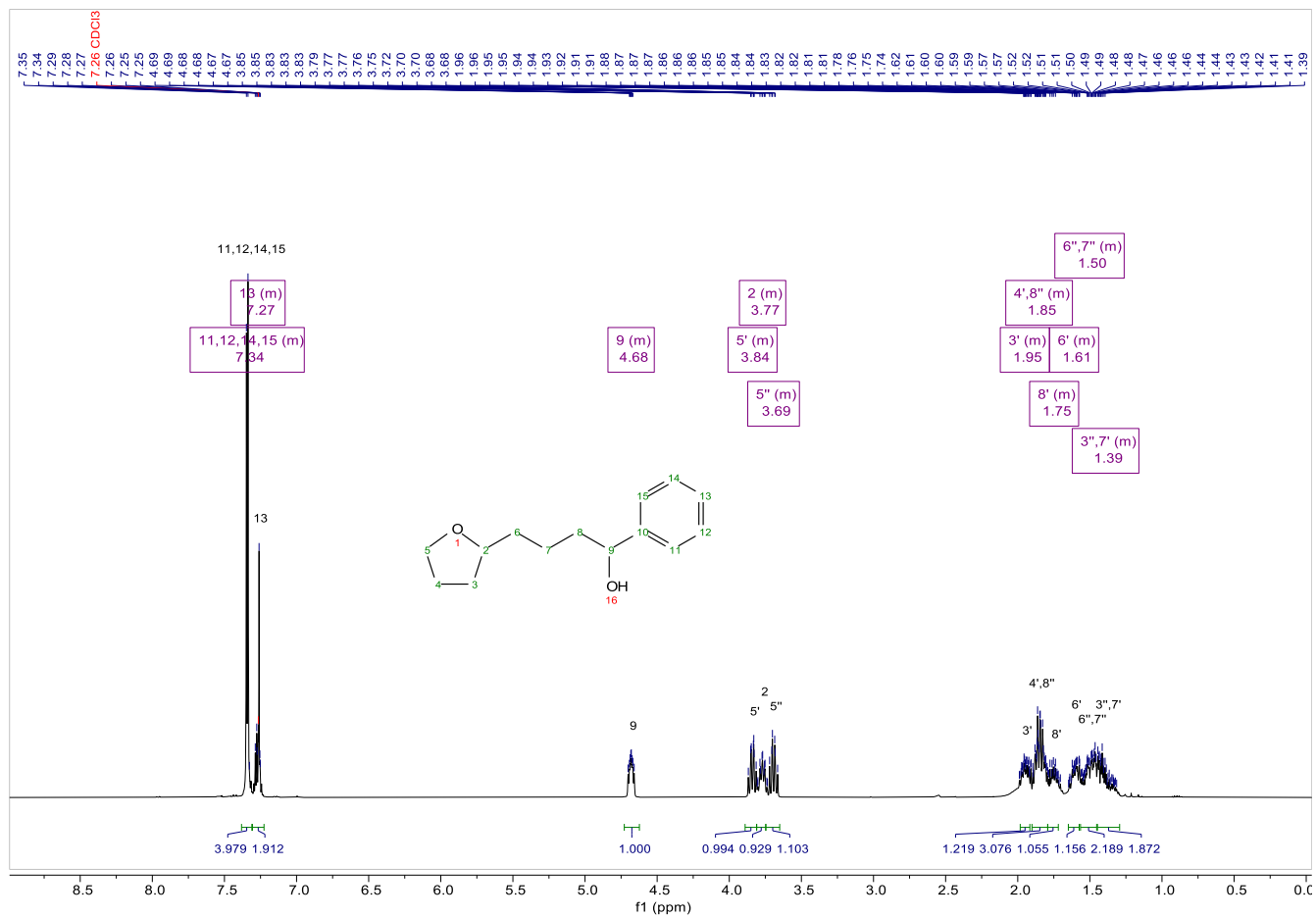
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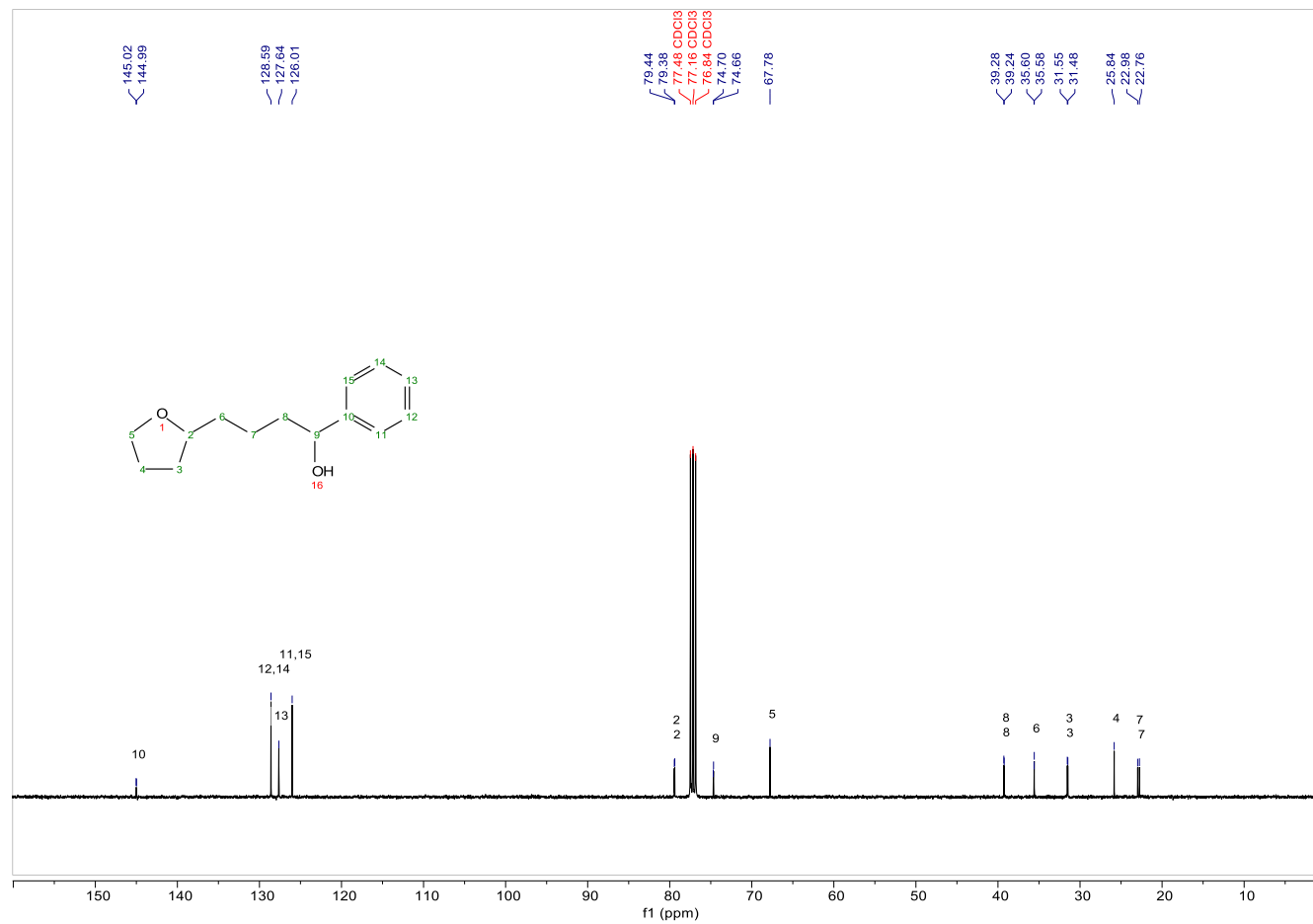
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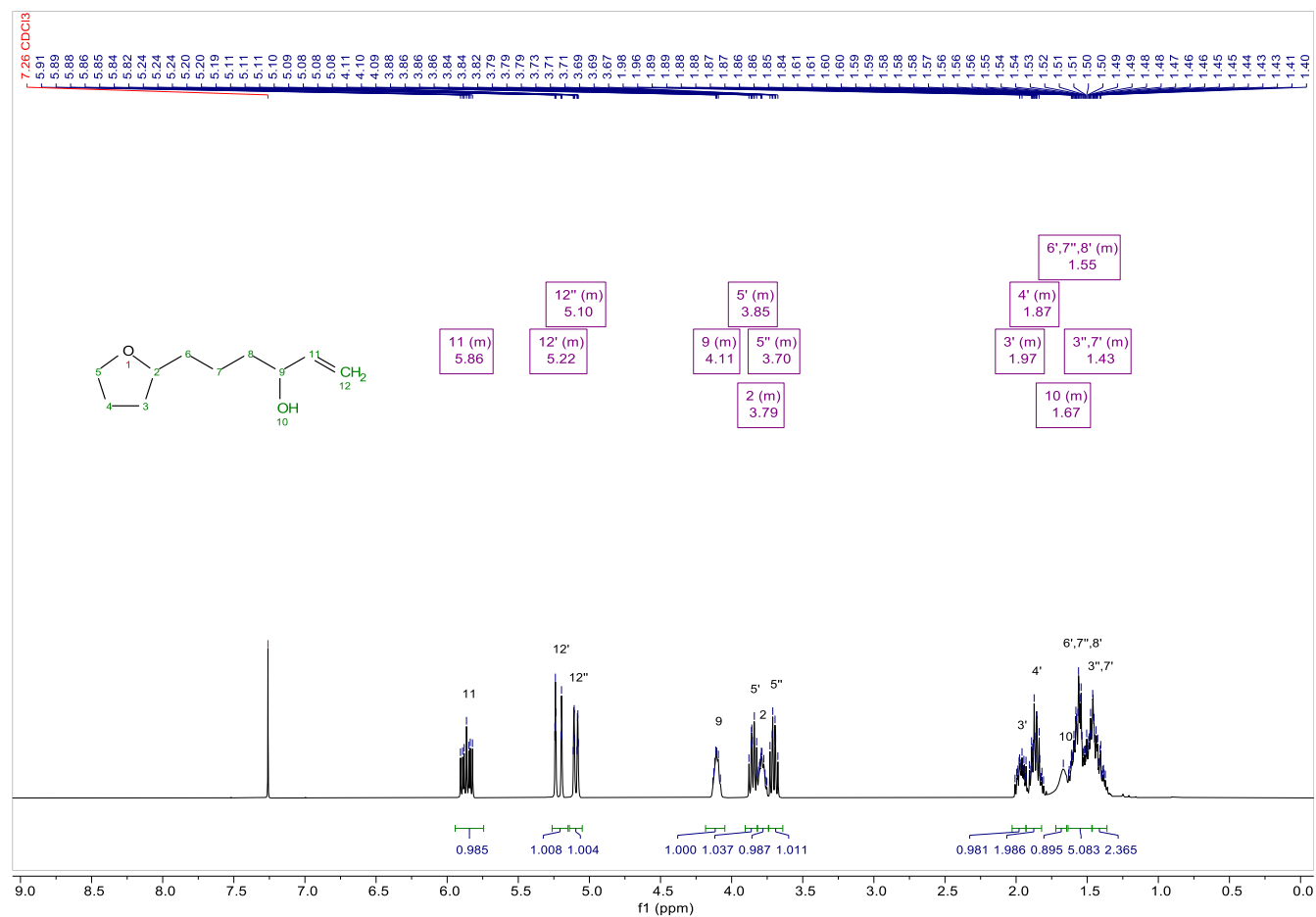
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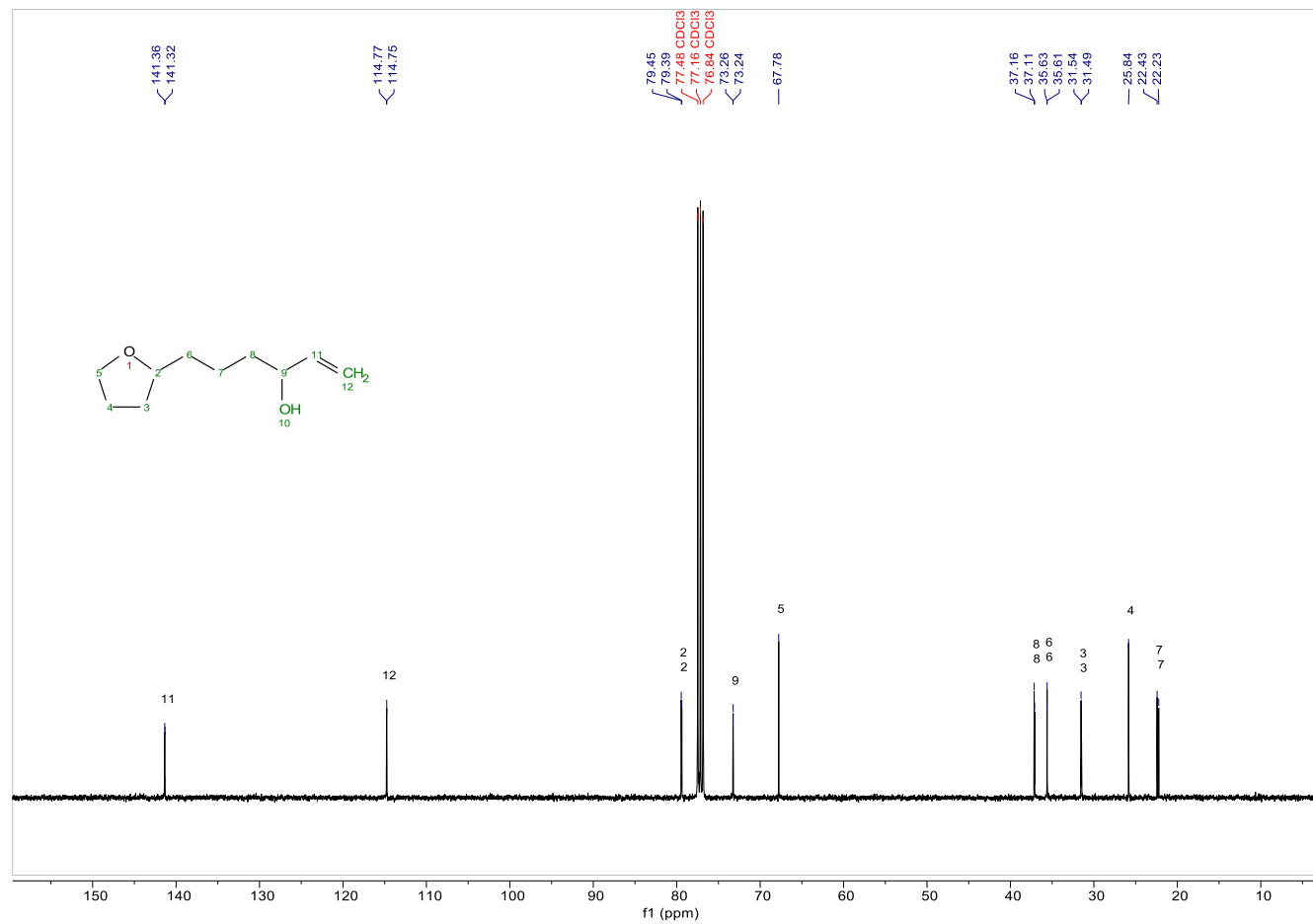
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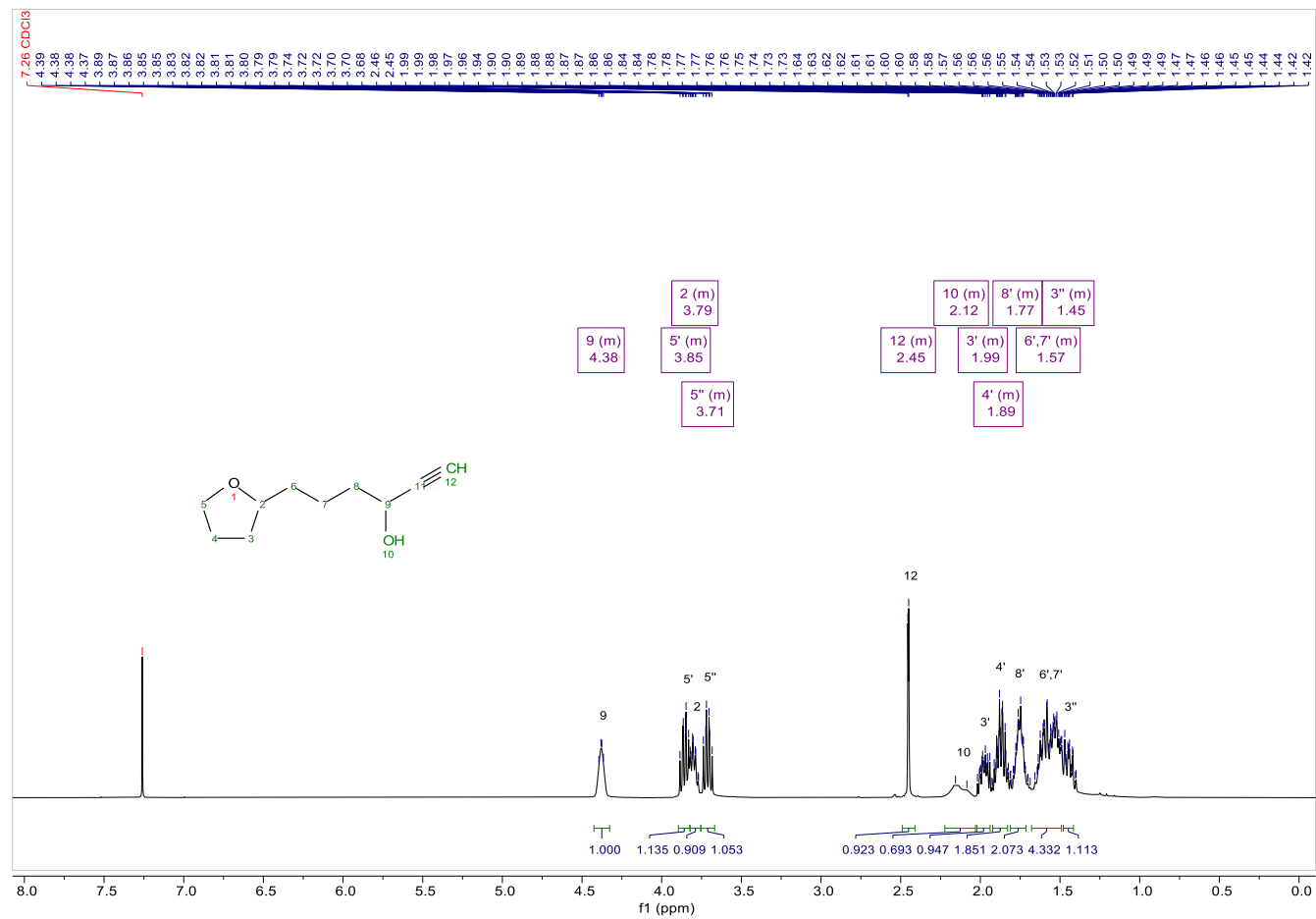
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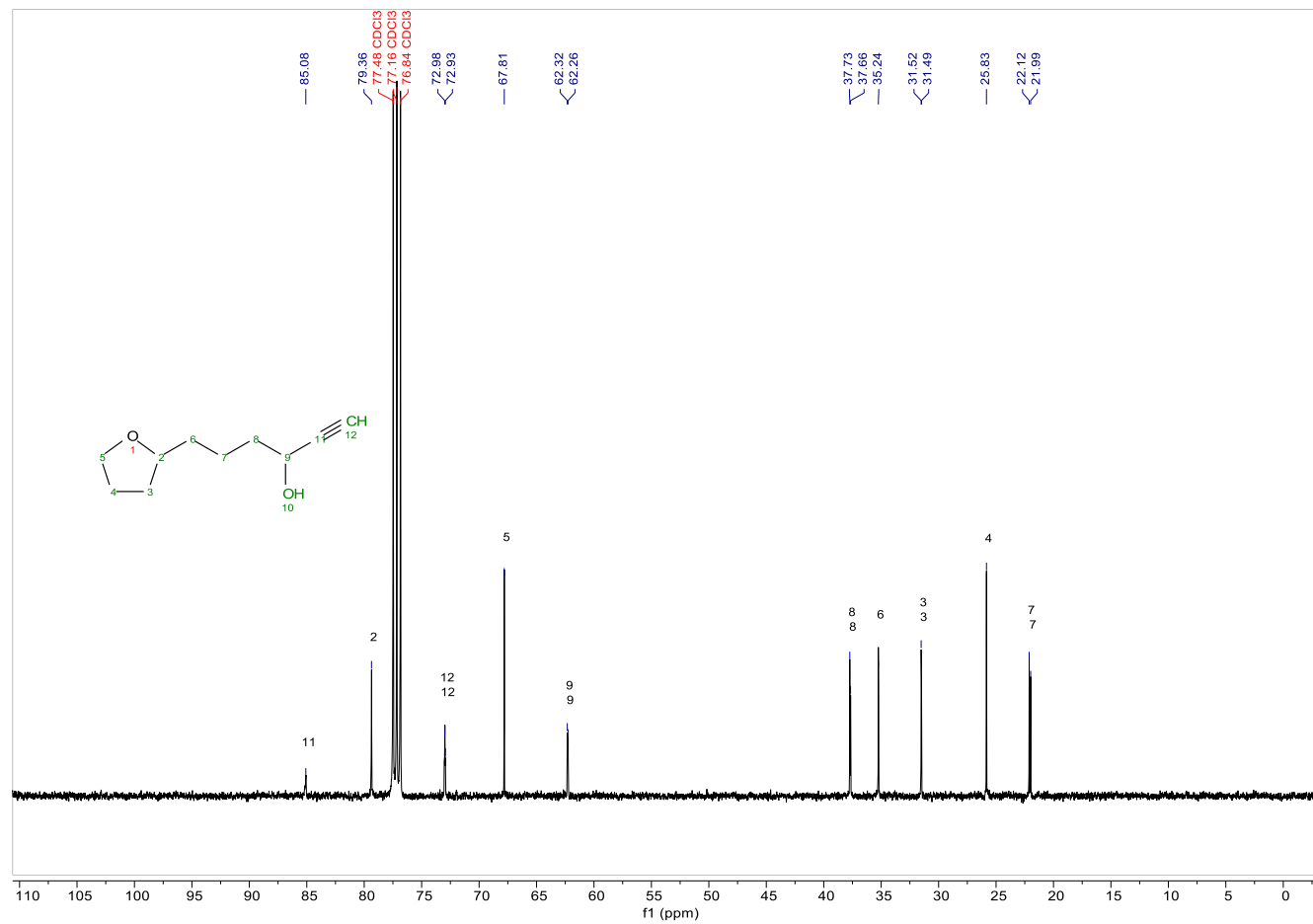
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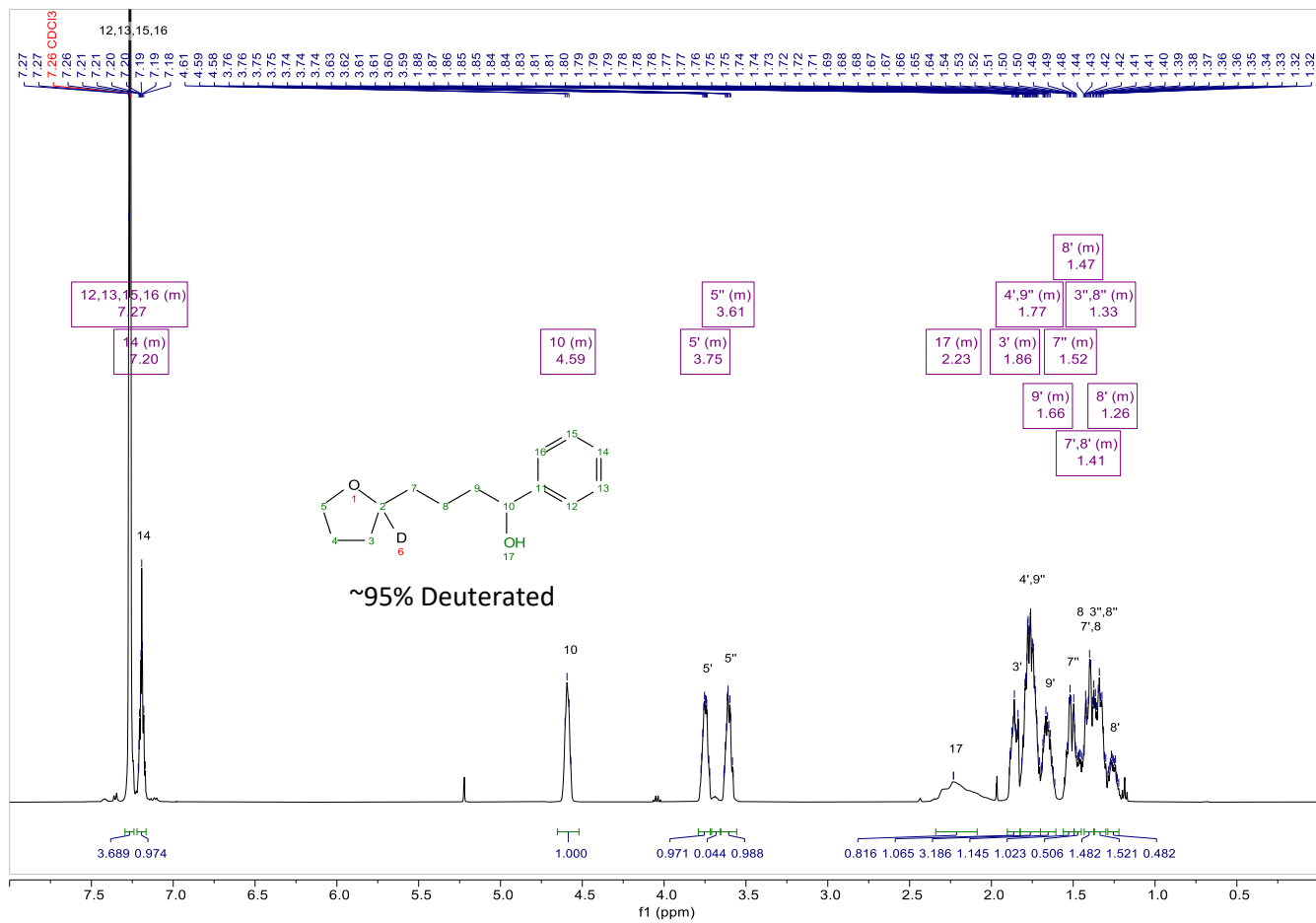
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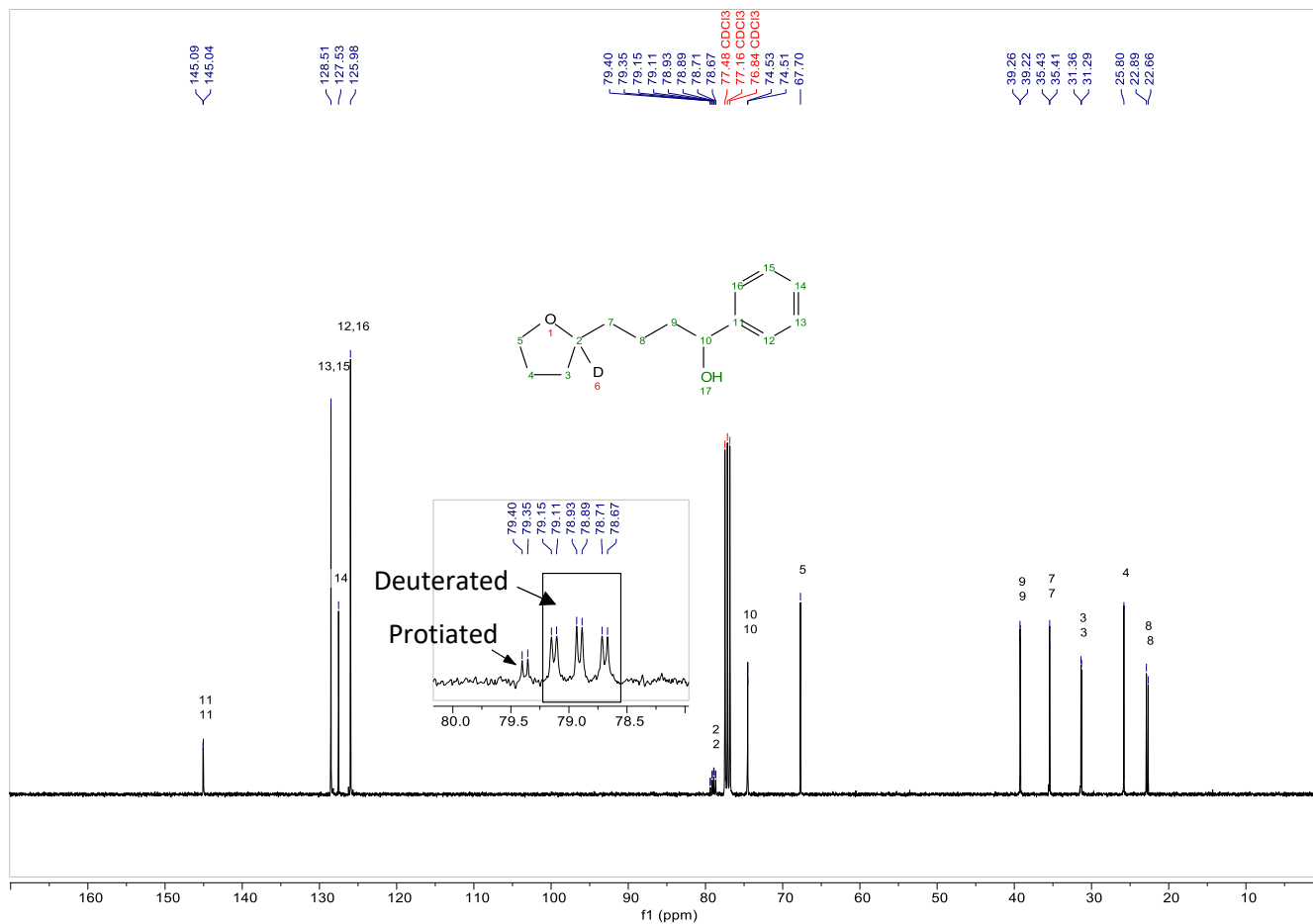
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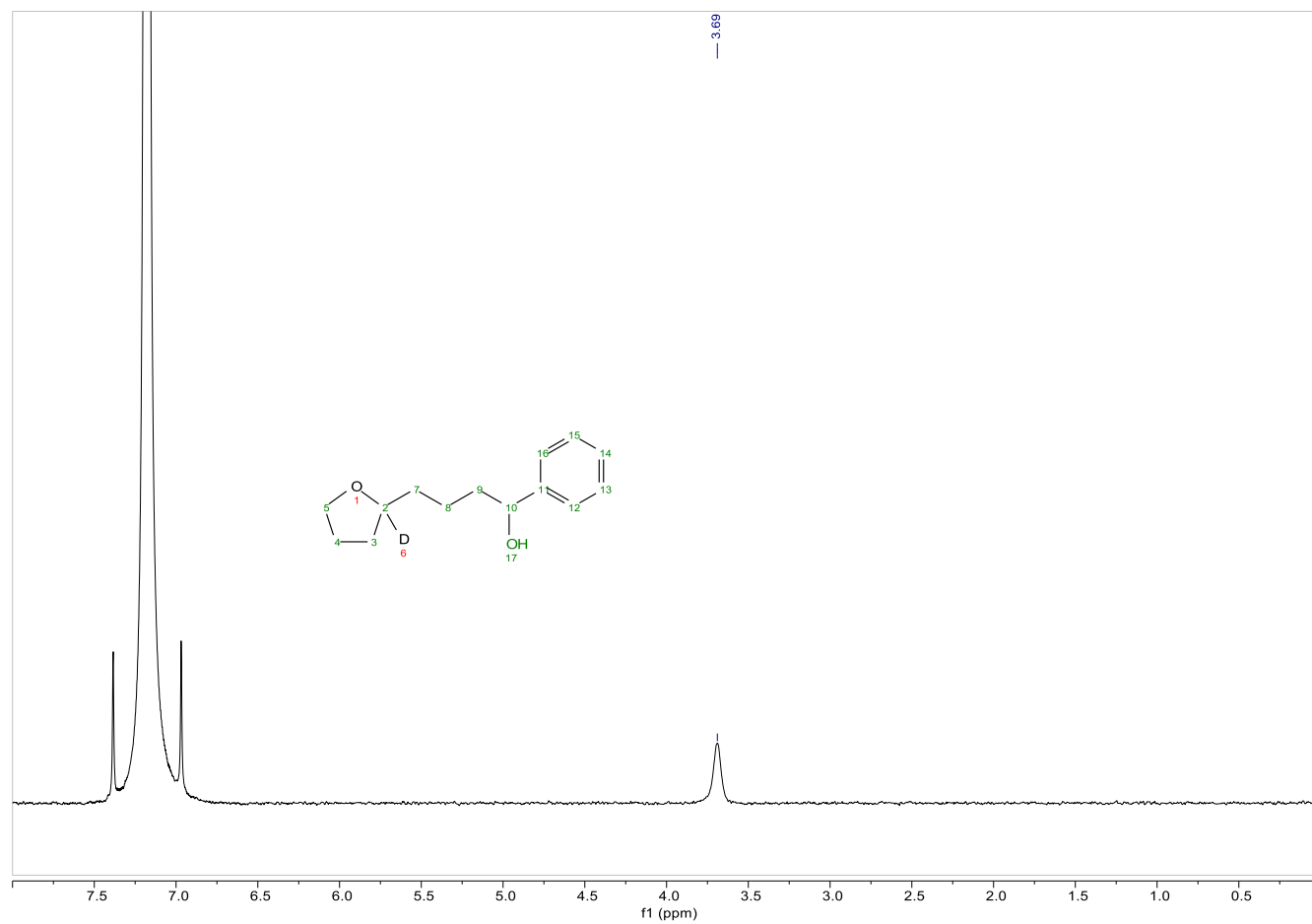
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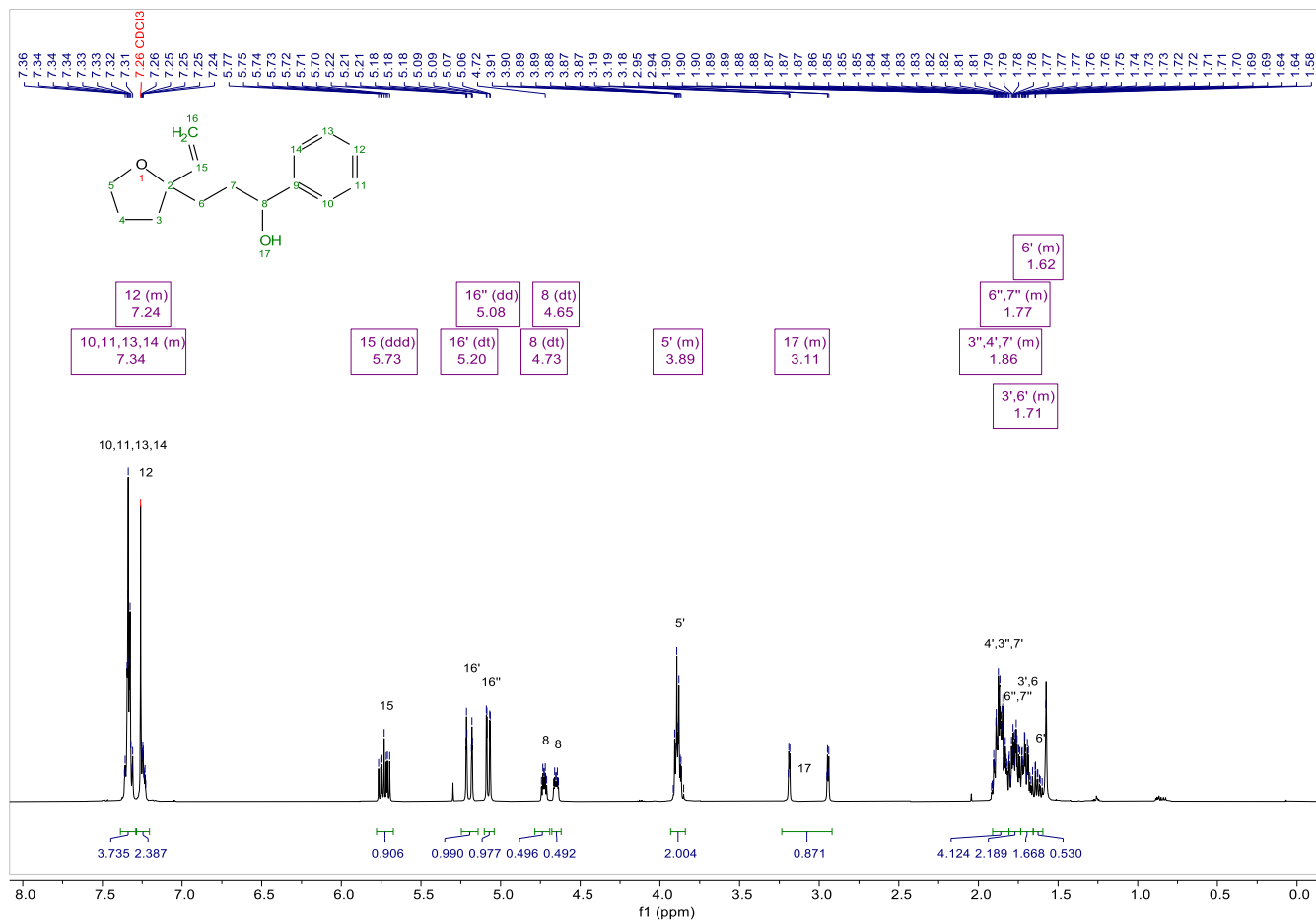
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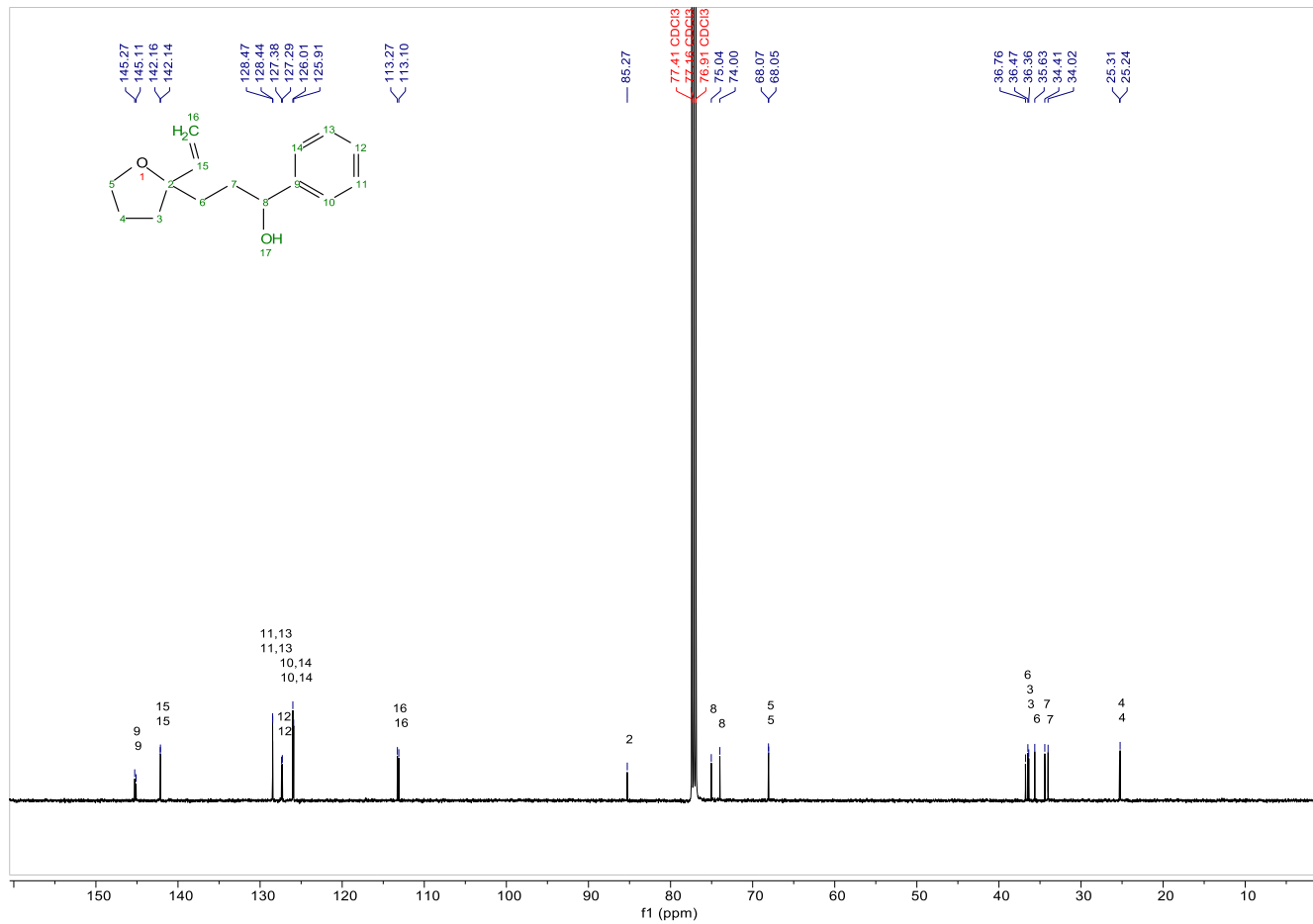
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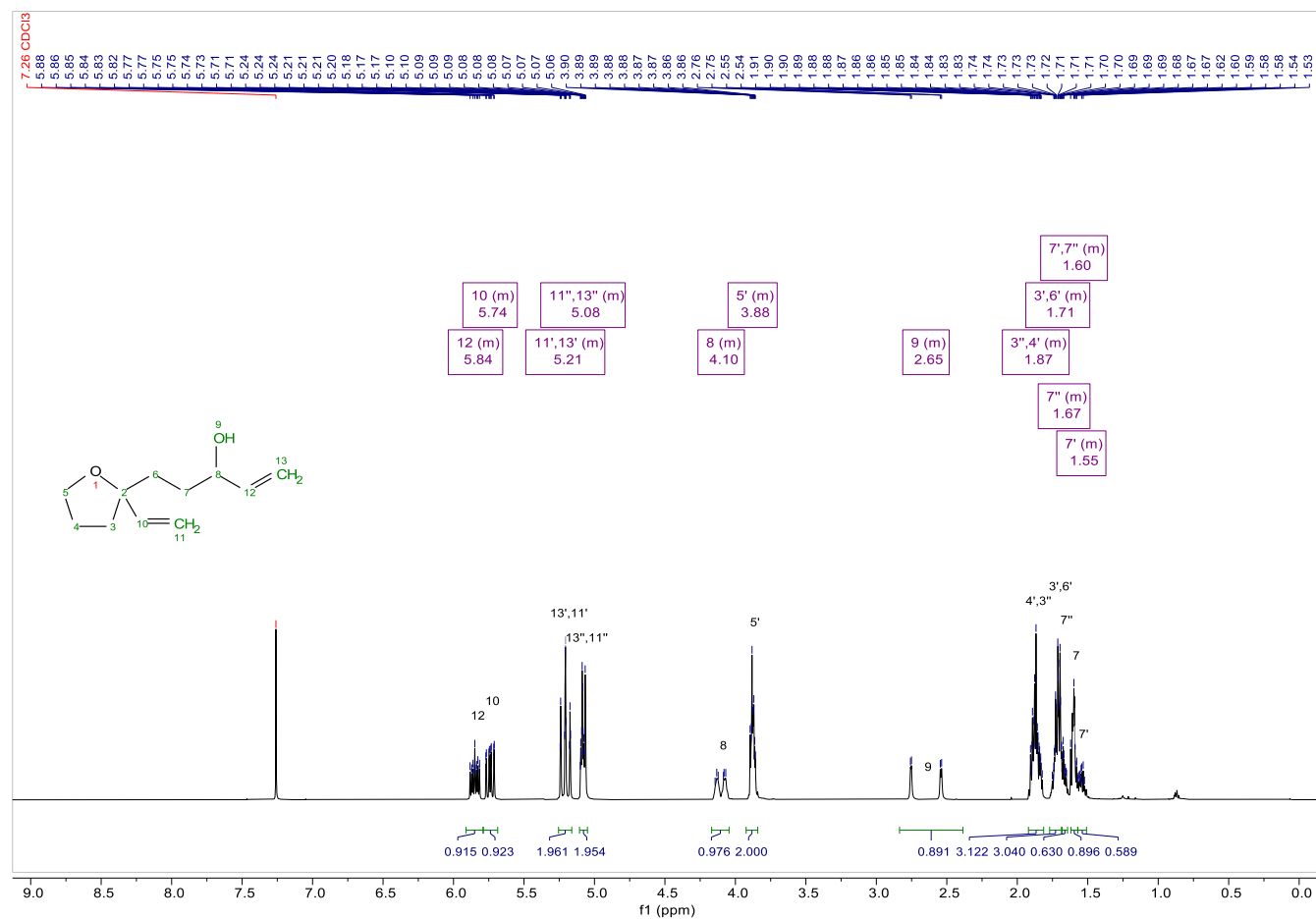
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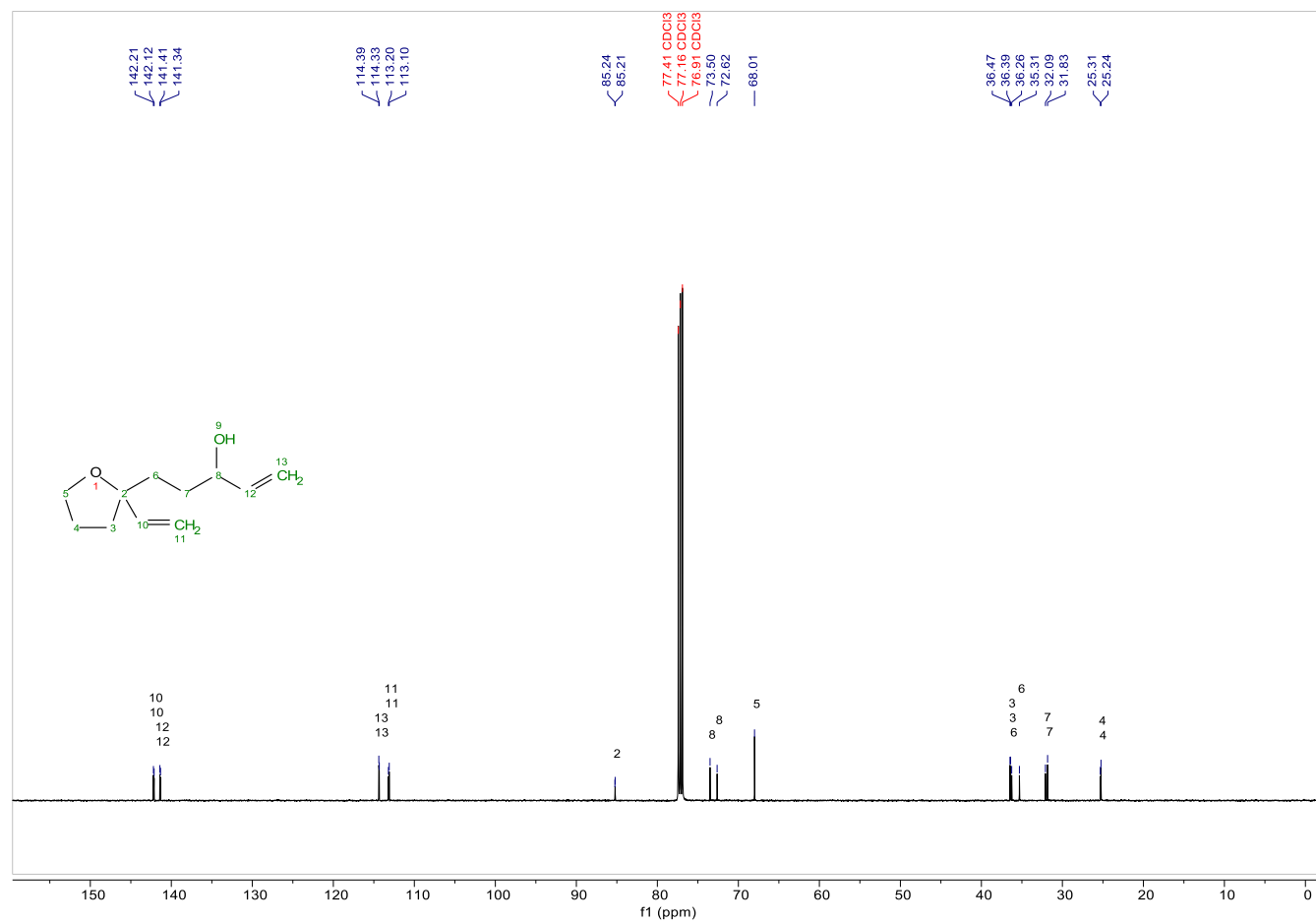
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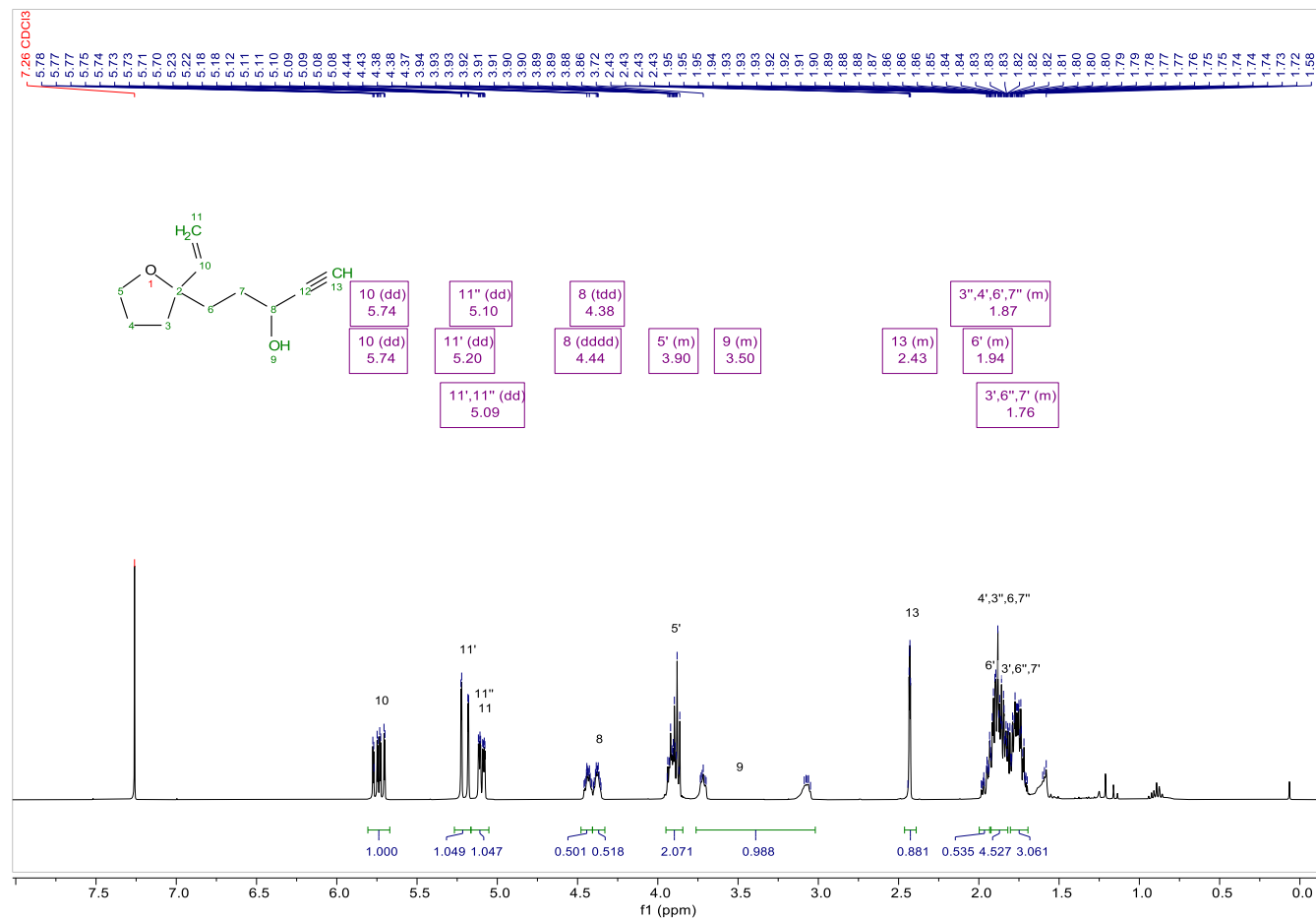
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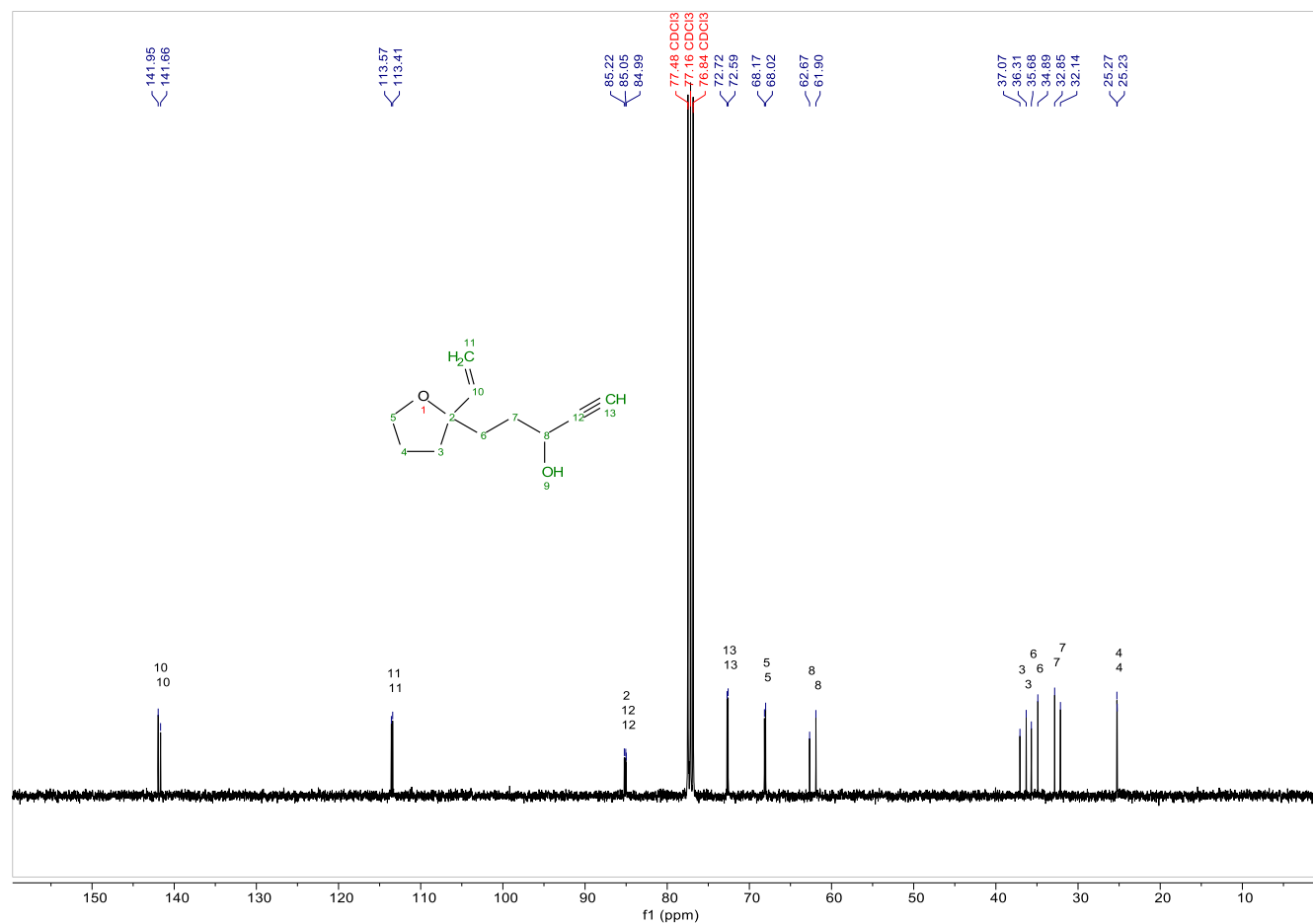
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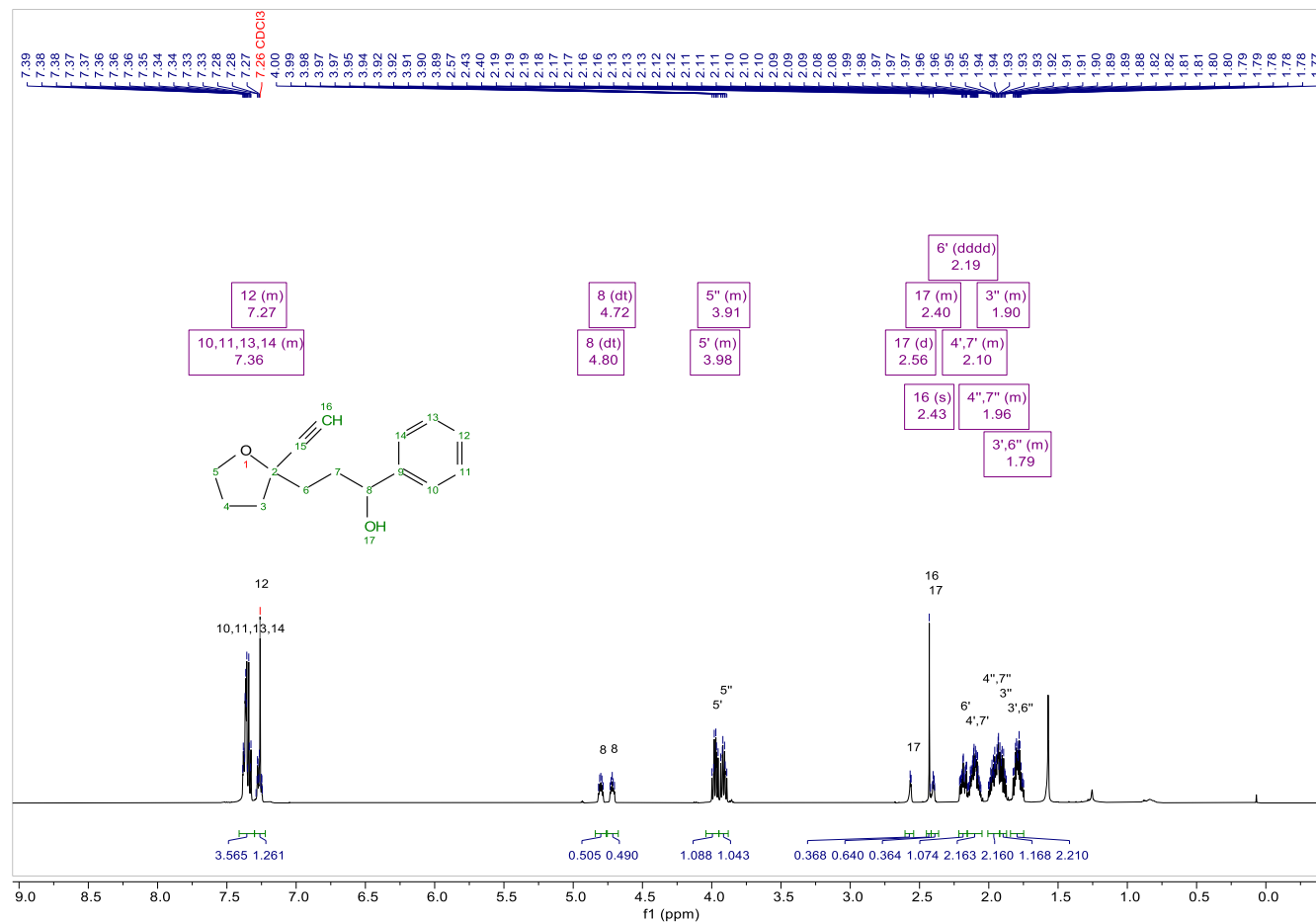
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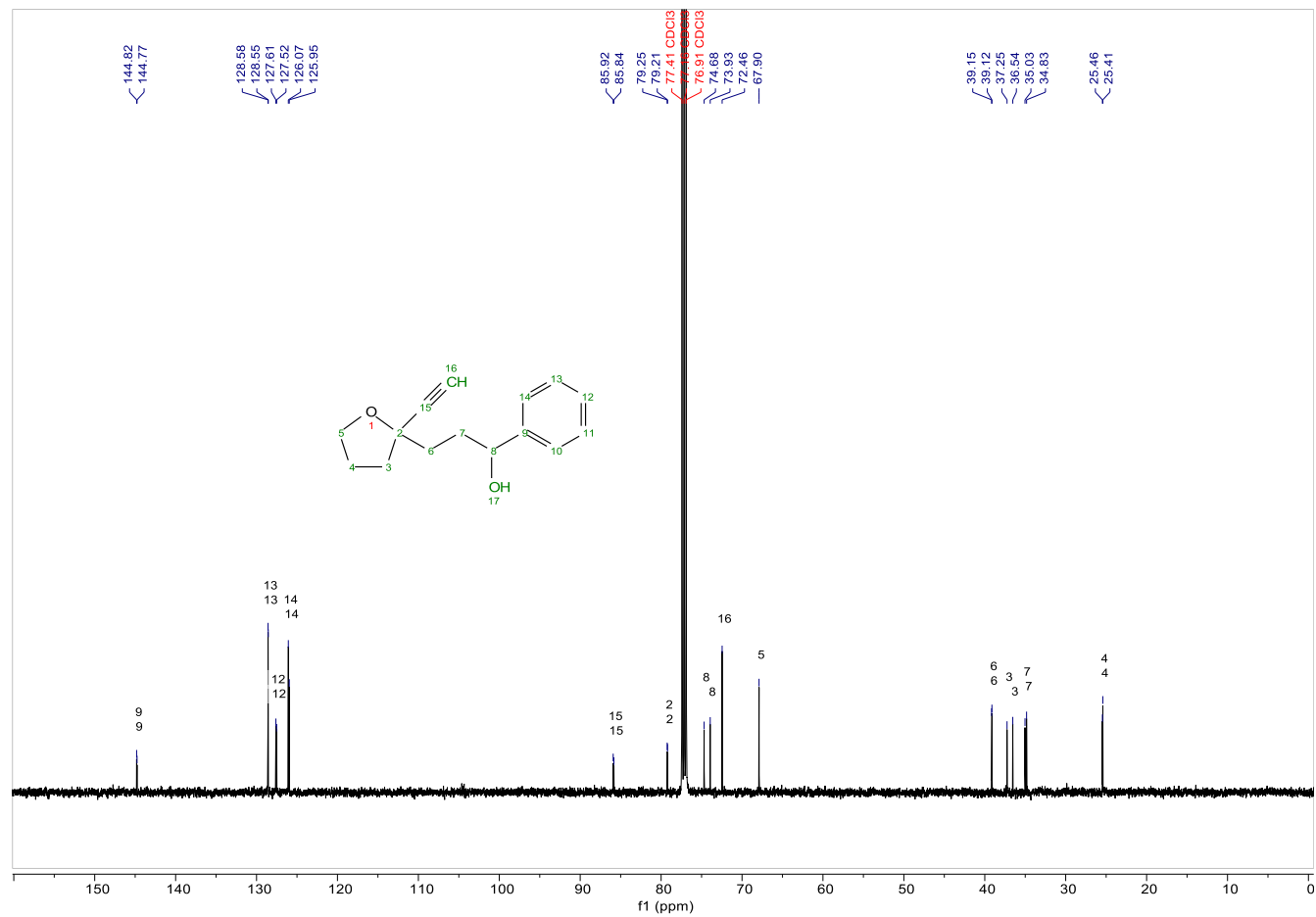
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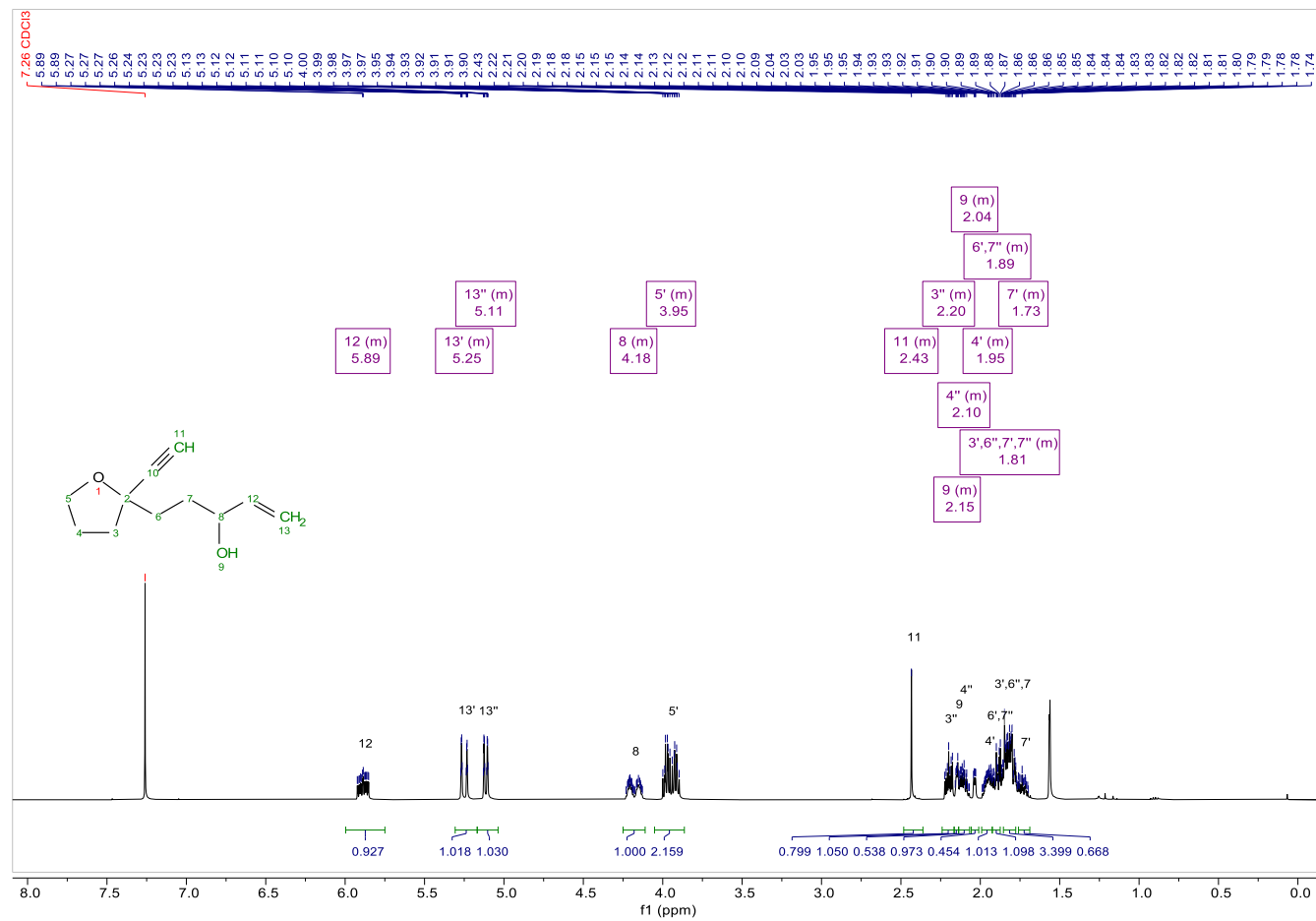
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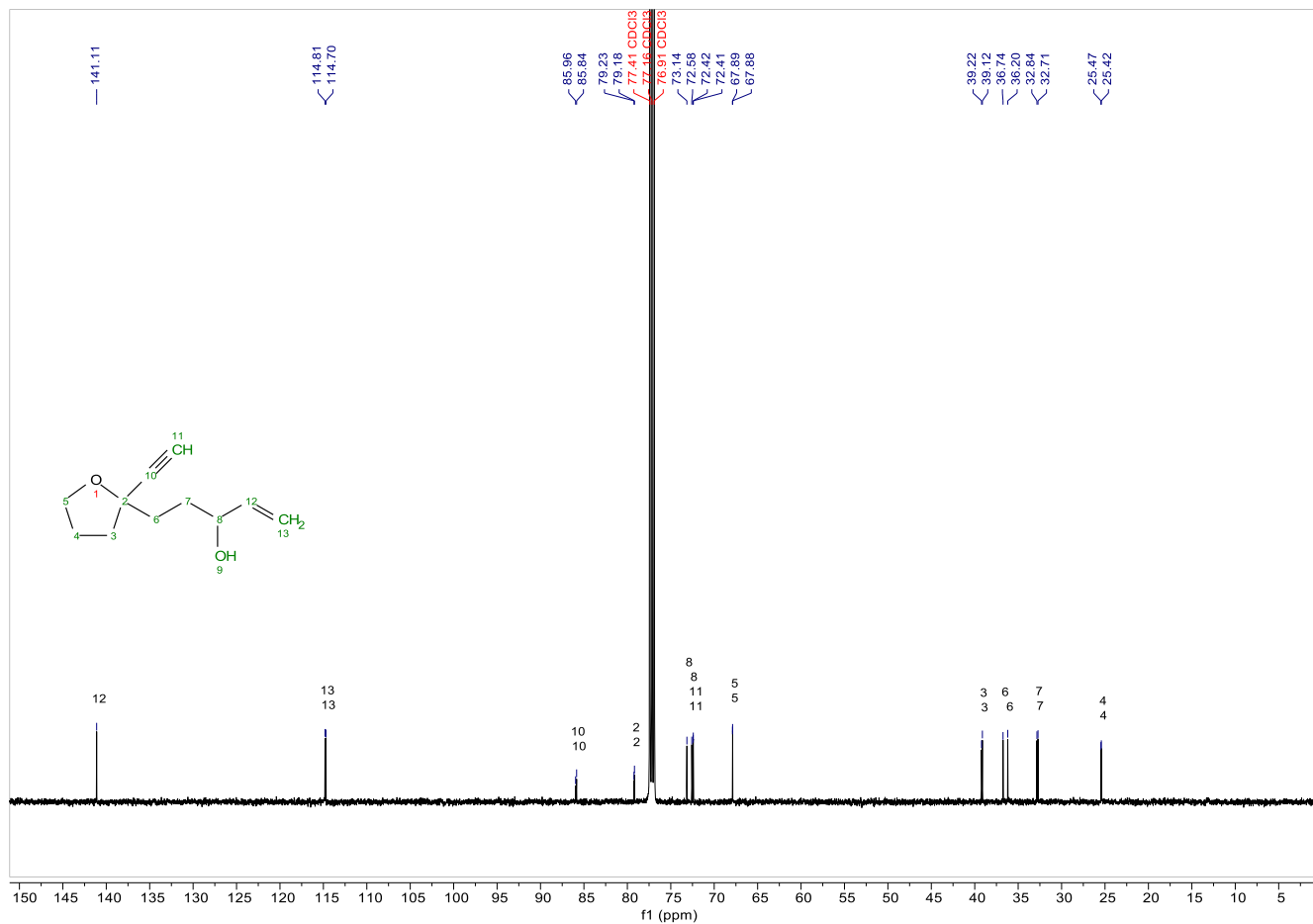
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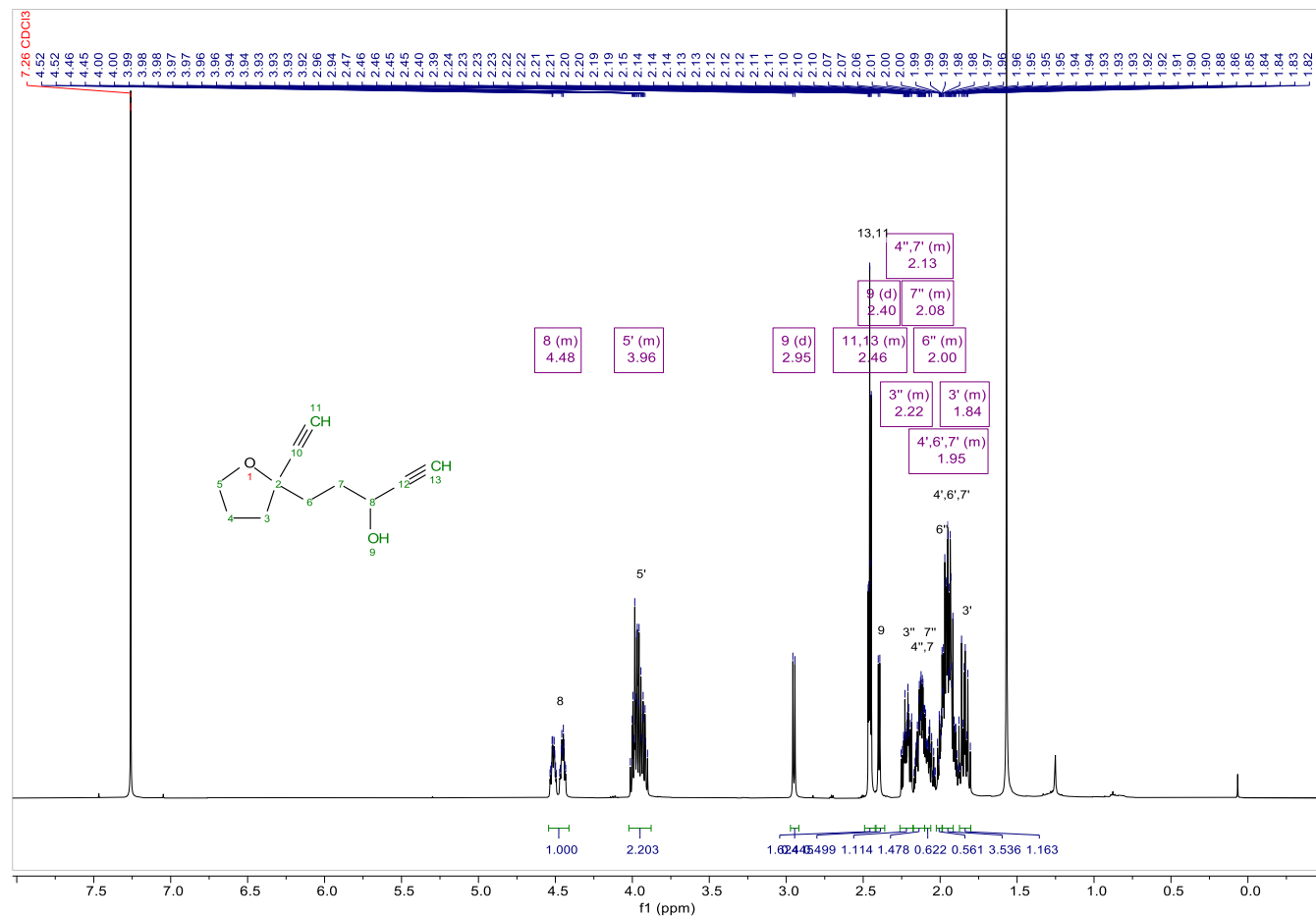
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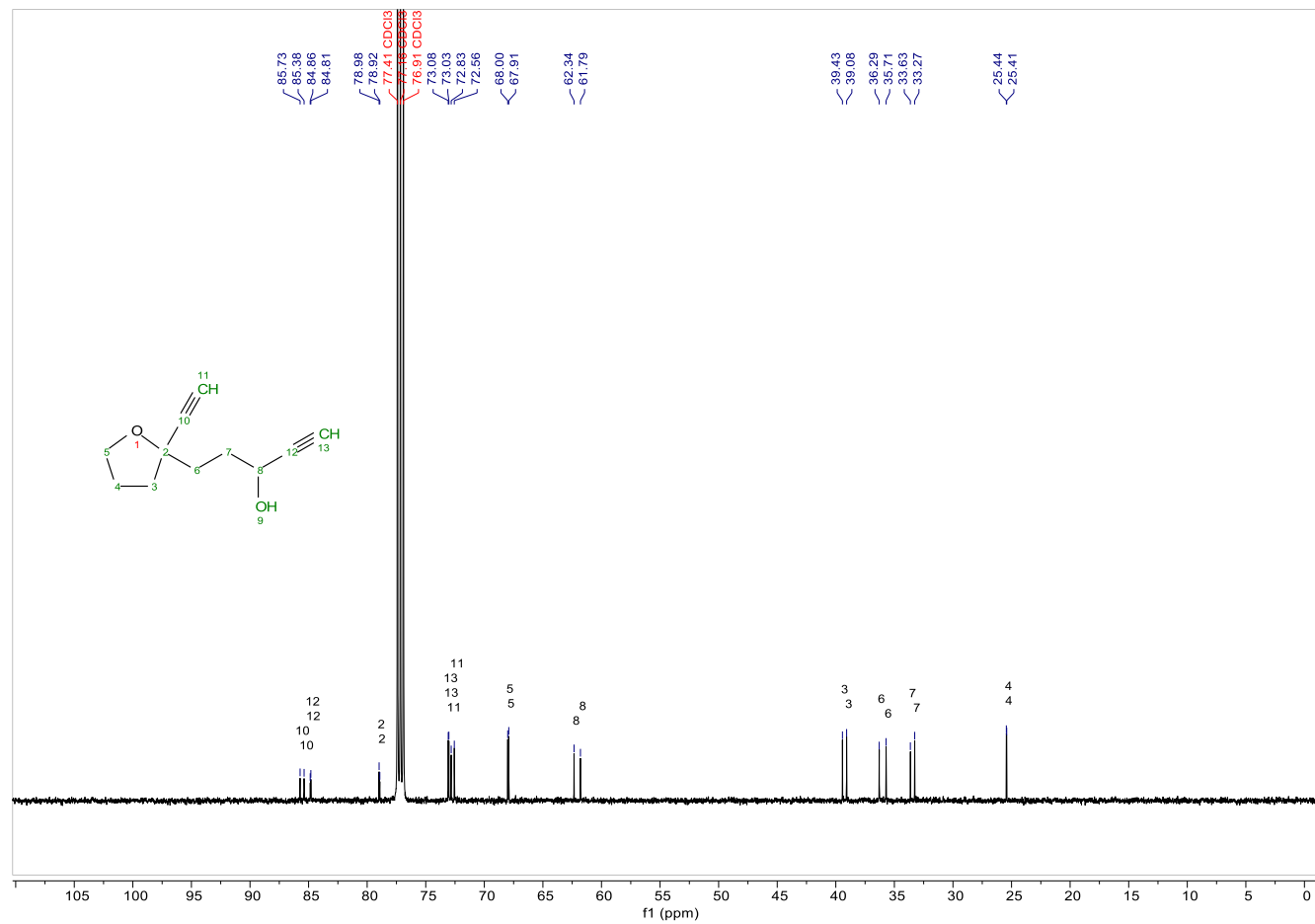
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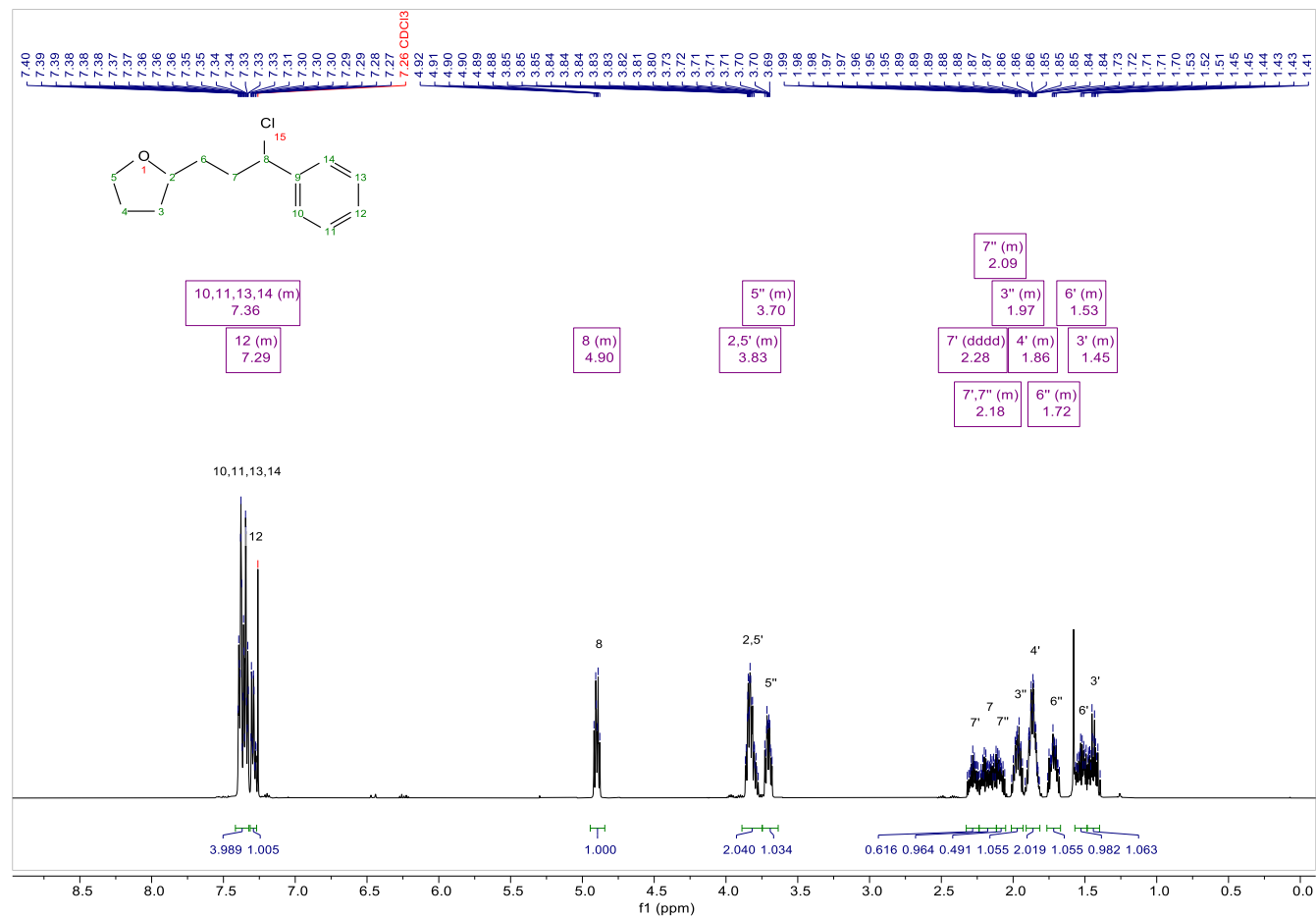
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5-(2-Ethynyltetrahydrofuran-2-yl)pent-1-yn-3-ol (S8t), CDCl₃, ¹³C NMR, 126 MHz



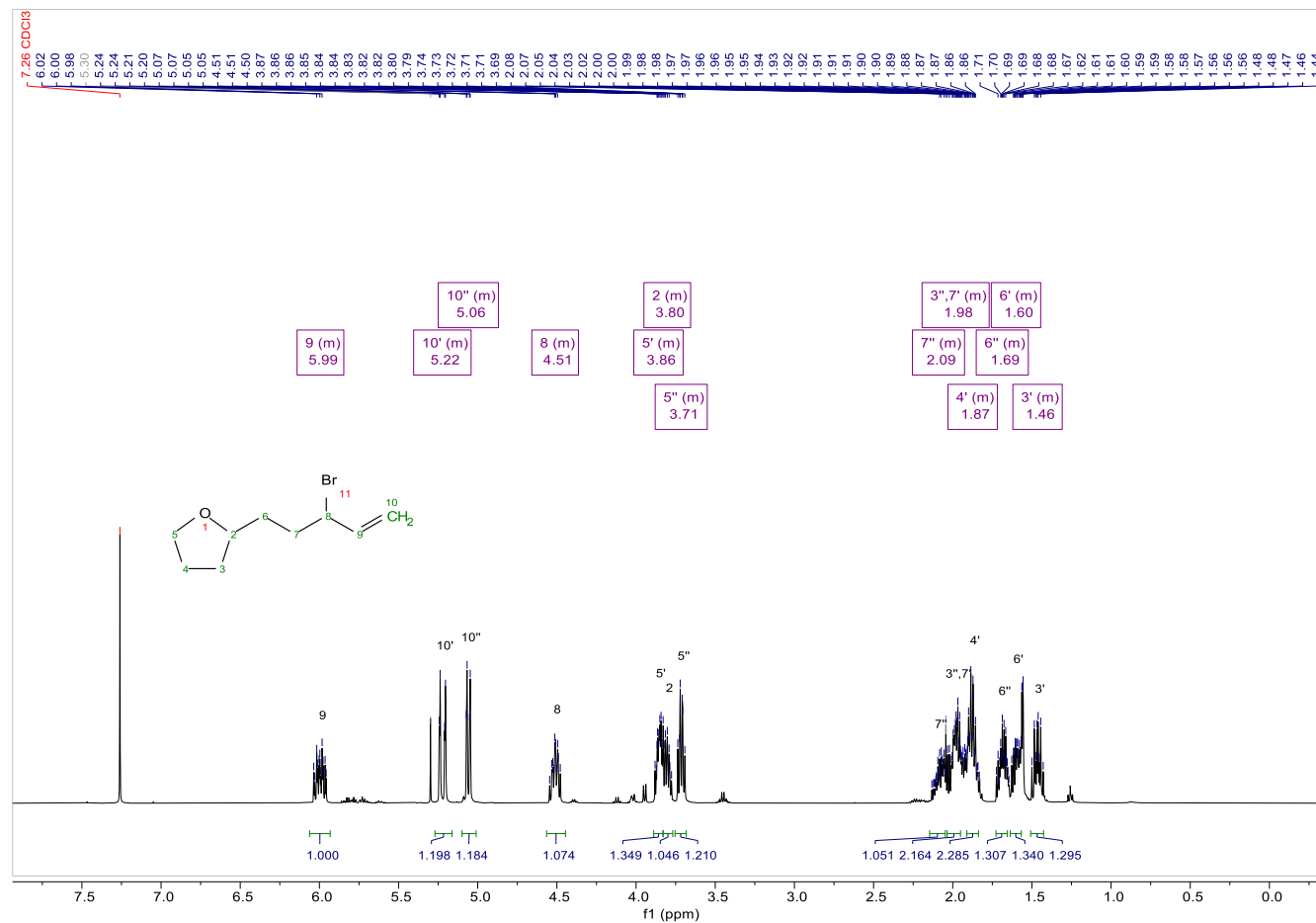
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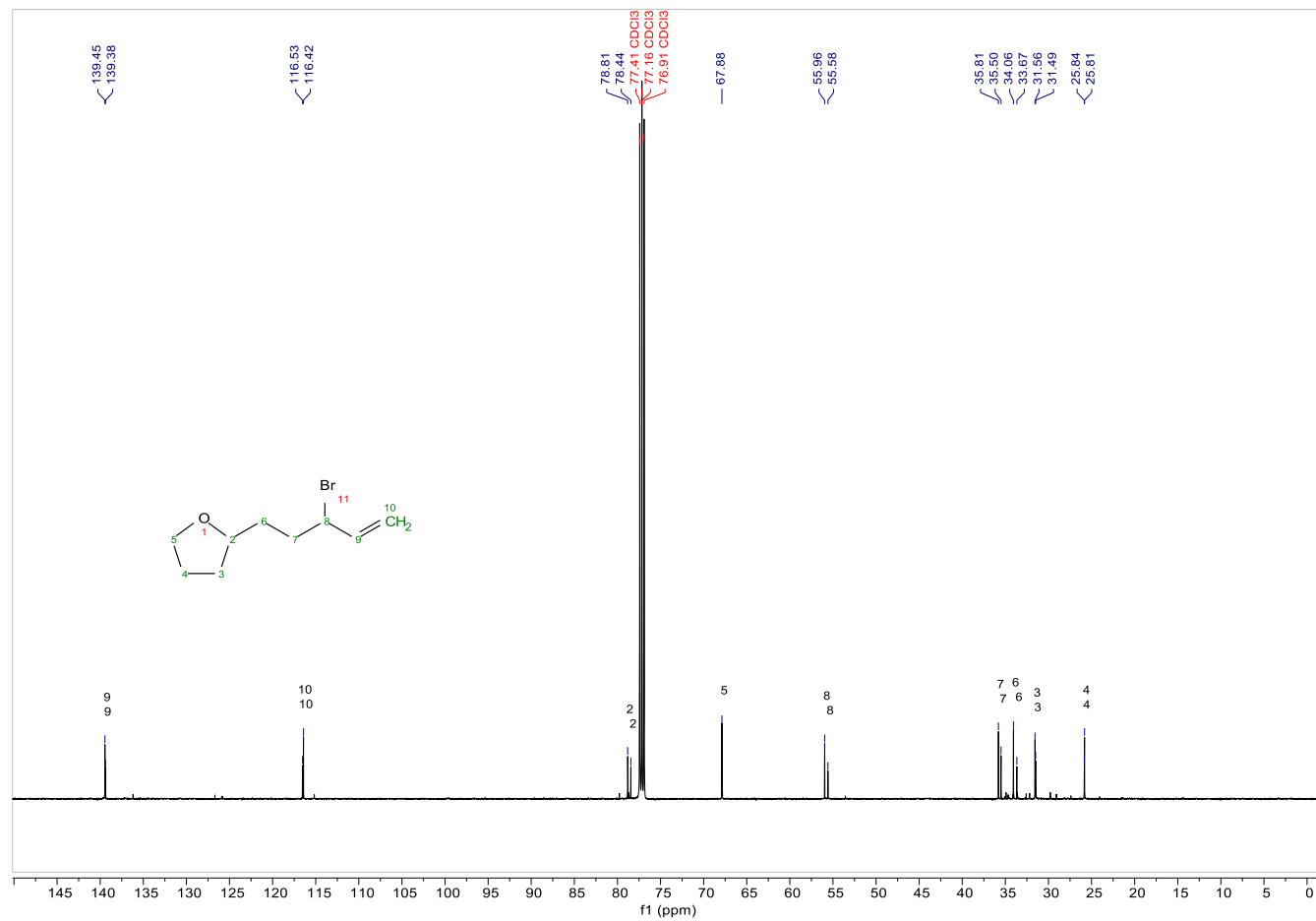
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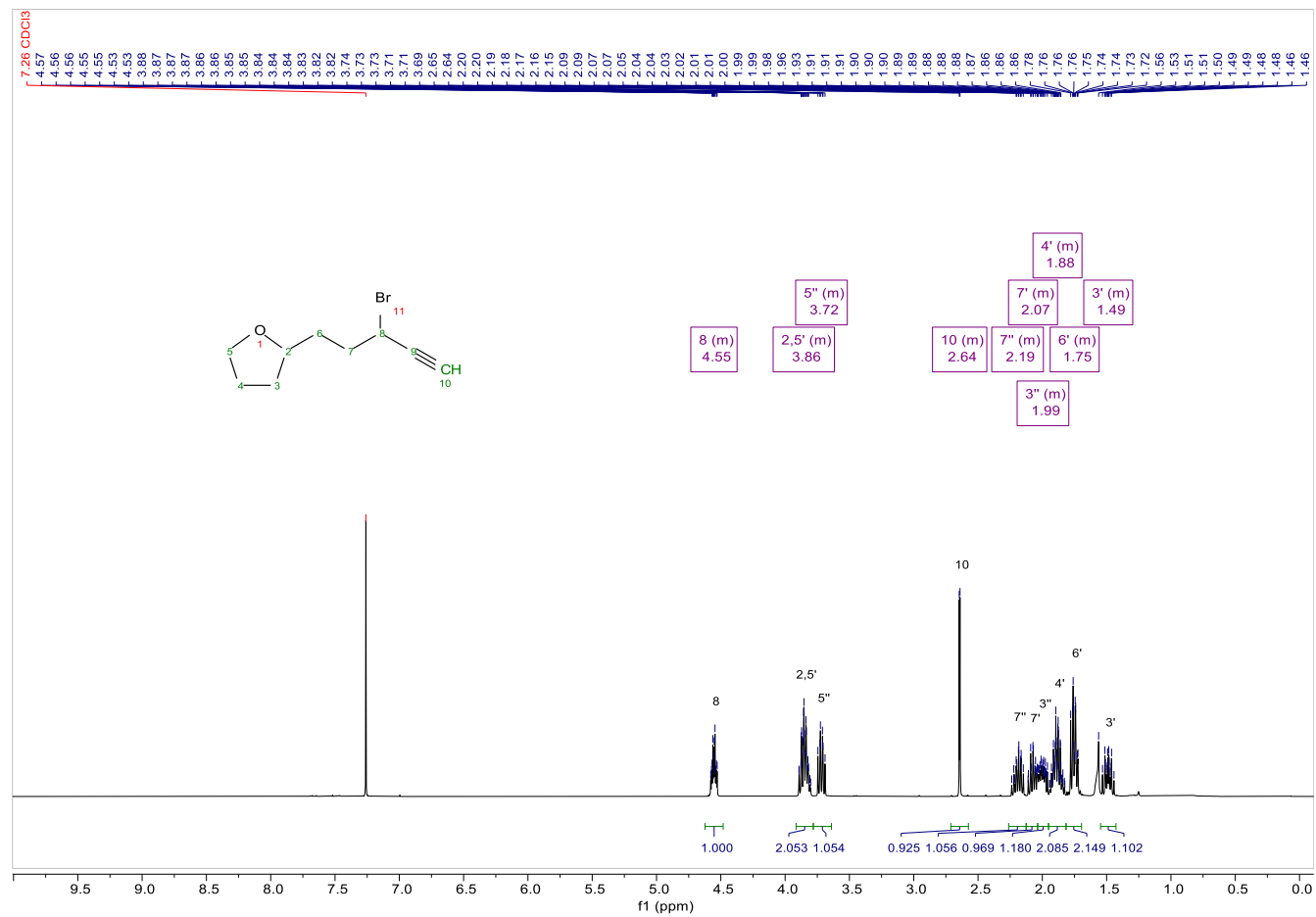
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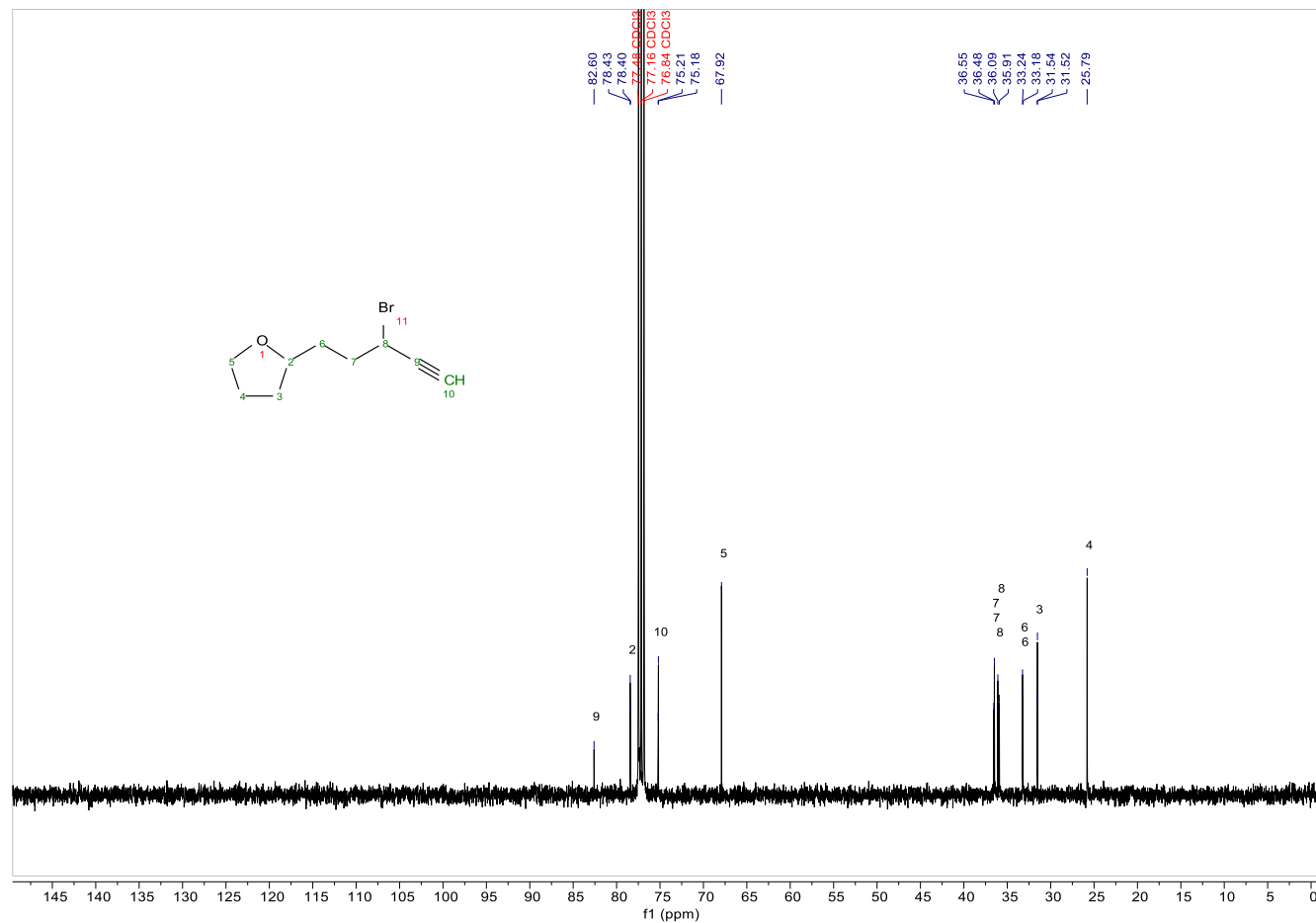
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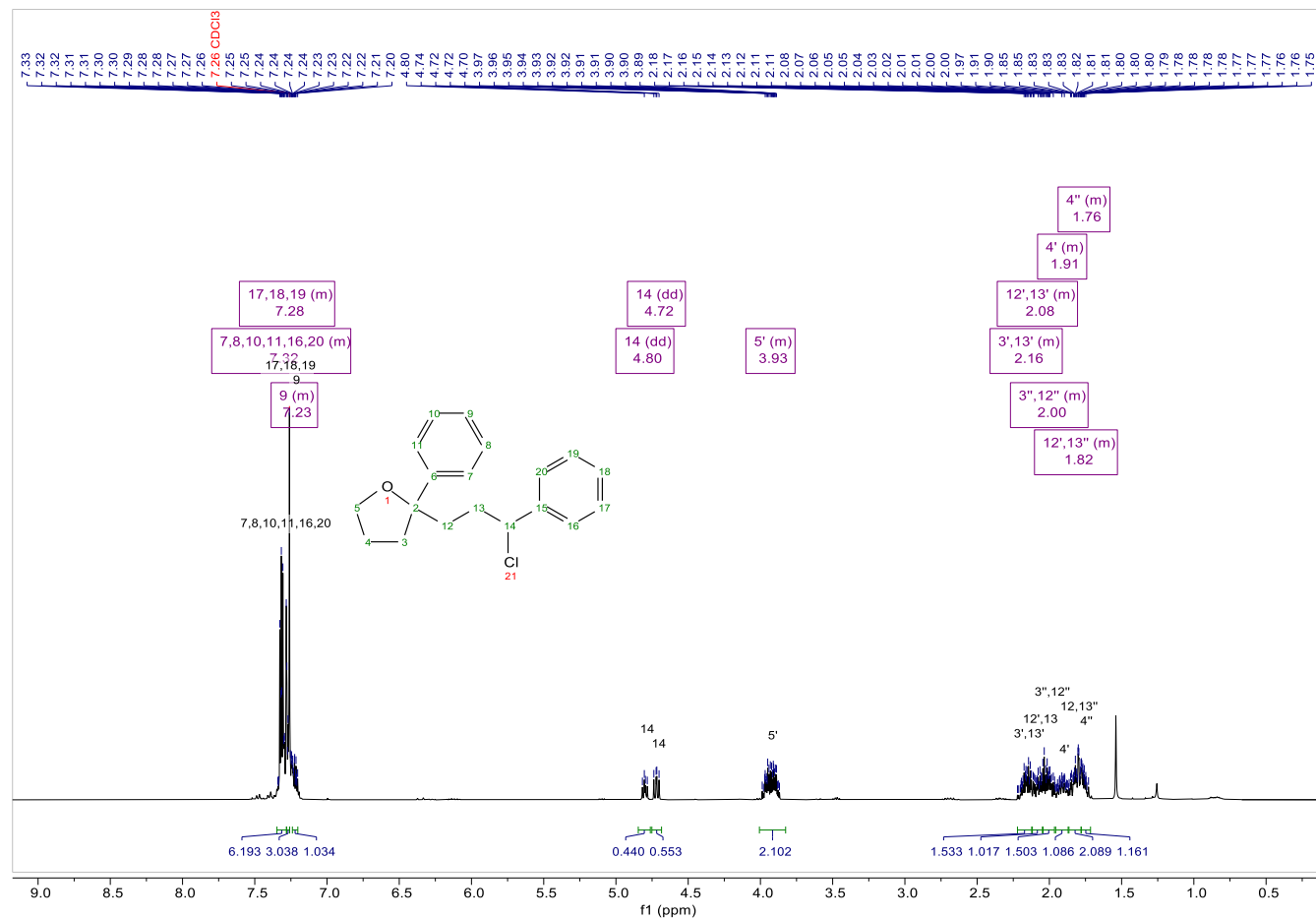
2-(3-Bromopent-4-yn-1-yl)tetrahydrofuran (23s), CDCl₃, ¹H NMR, 400 MHz



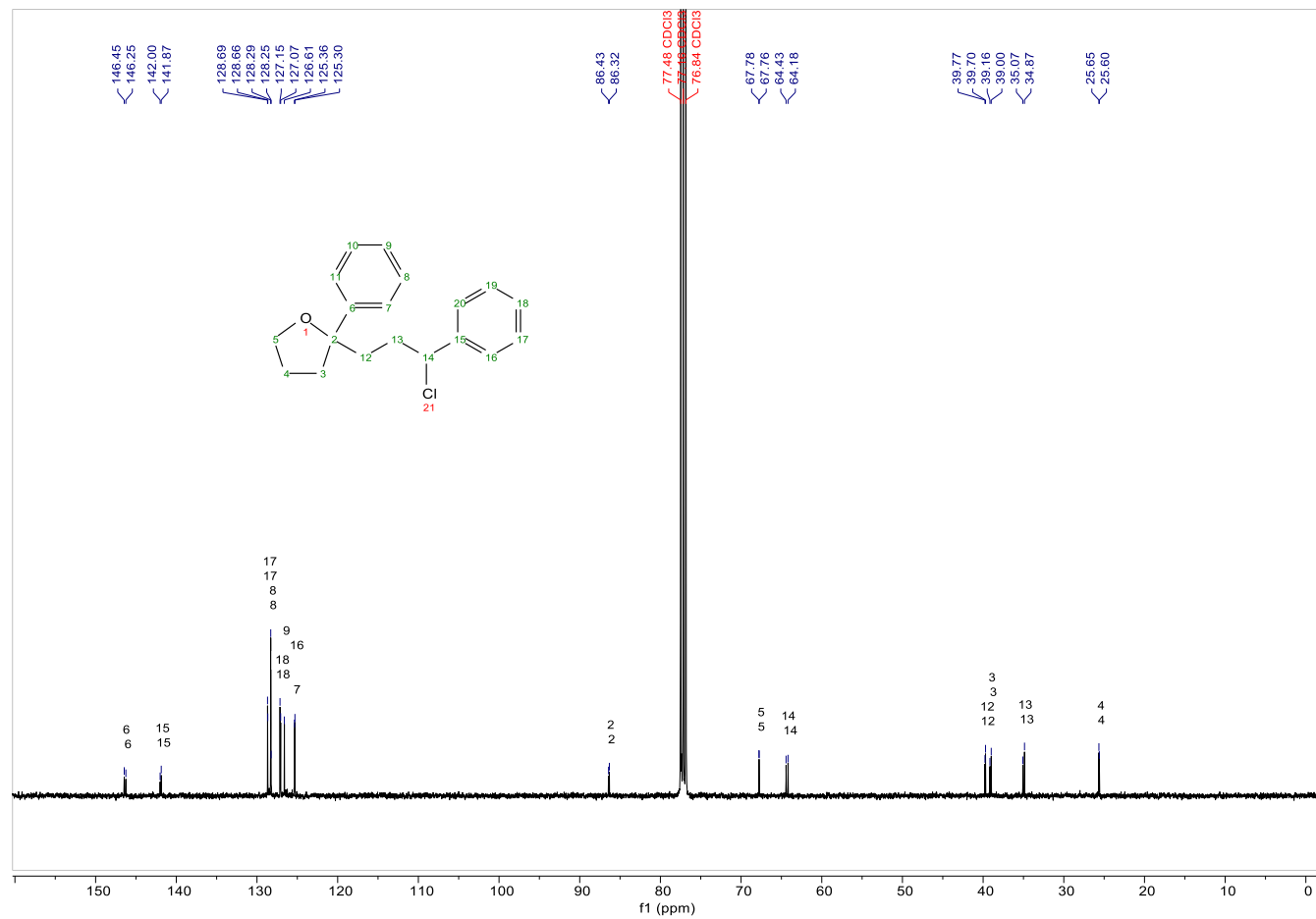
2-(3-Bromopent-4-yn-1-yl)tetrahydrofuran (23s), CDCl₃, ¹³C NMR, 100 MHz



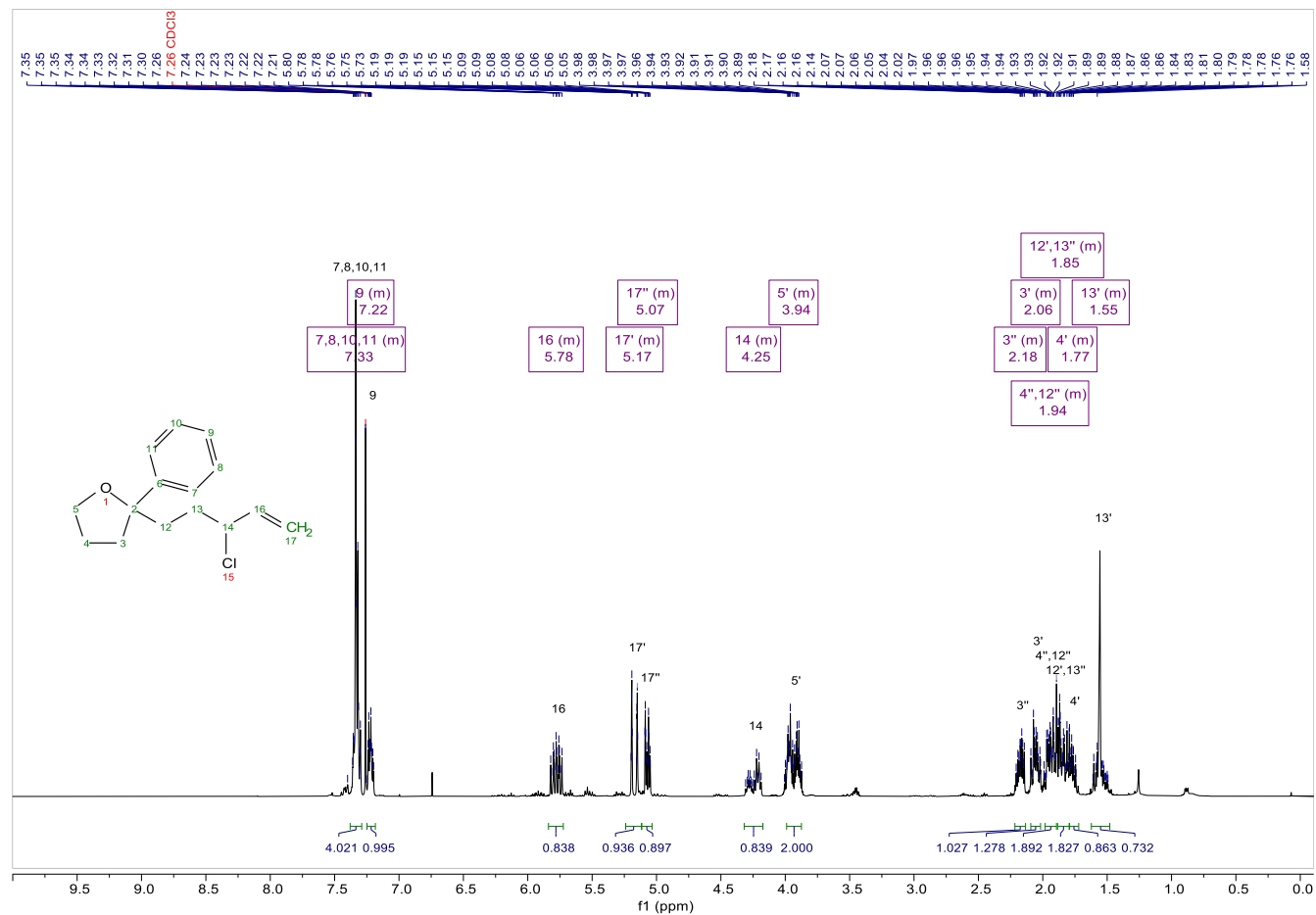
2-(3-Chloro-3-phenylpropyl)-2-phenyltetrahydrofuran (23l), CDCl₃, ¹H NMR, 400 MHz



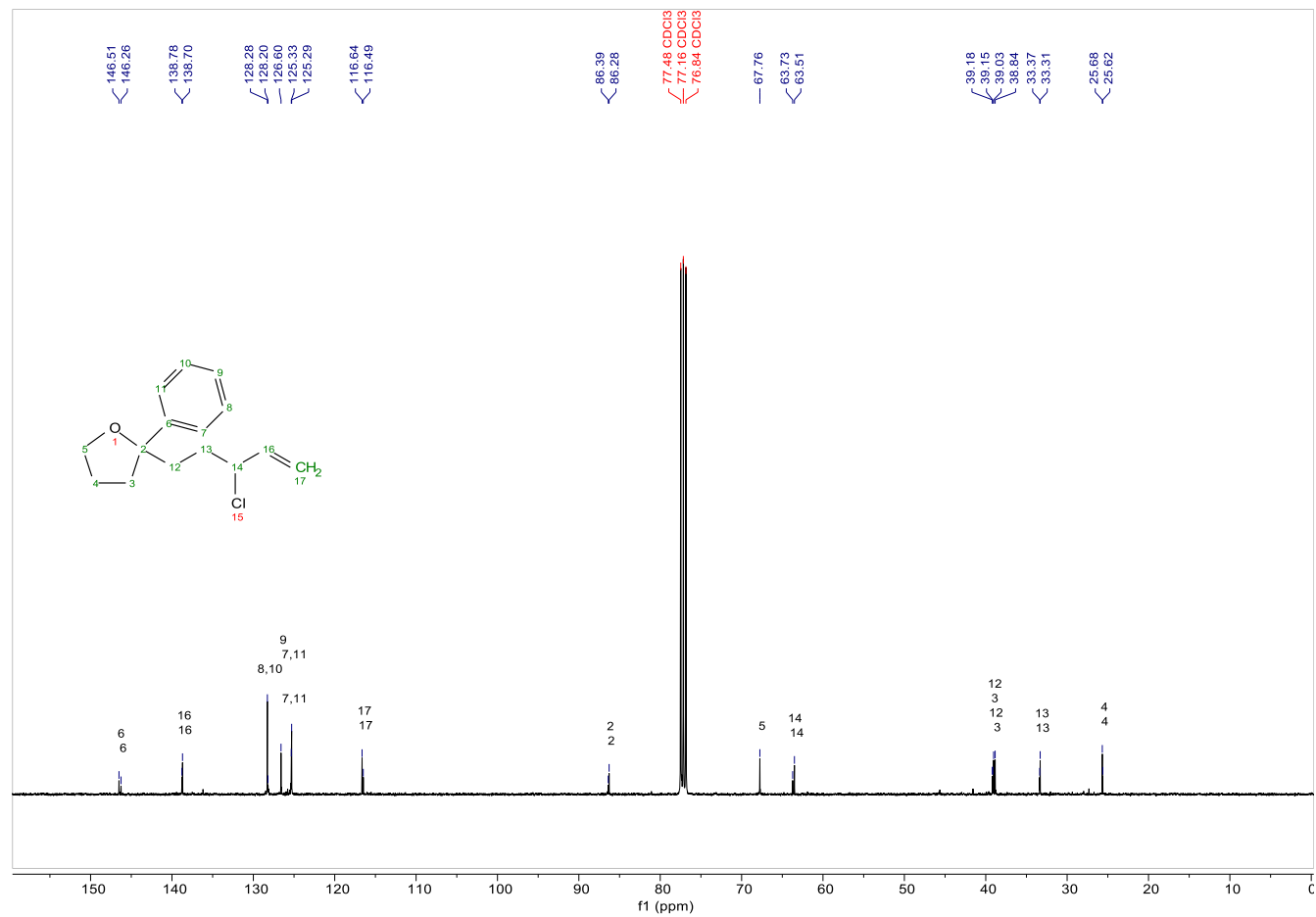
2-(3-Chloro-3-phenylpropyl)-2-phenyltetrahydrofuran (23l), CDCl₃, ¹³C NMR, 100 MHz



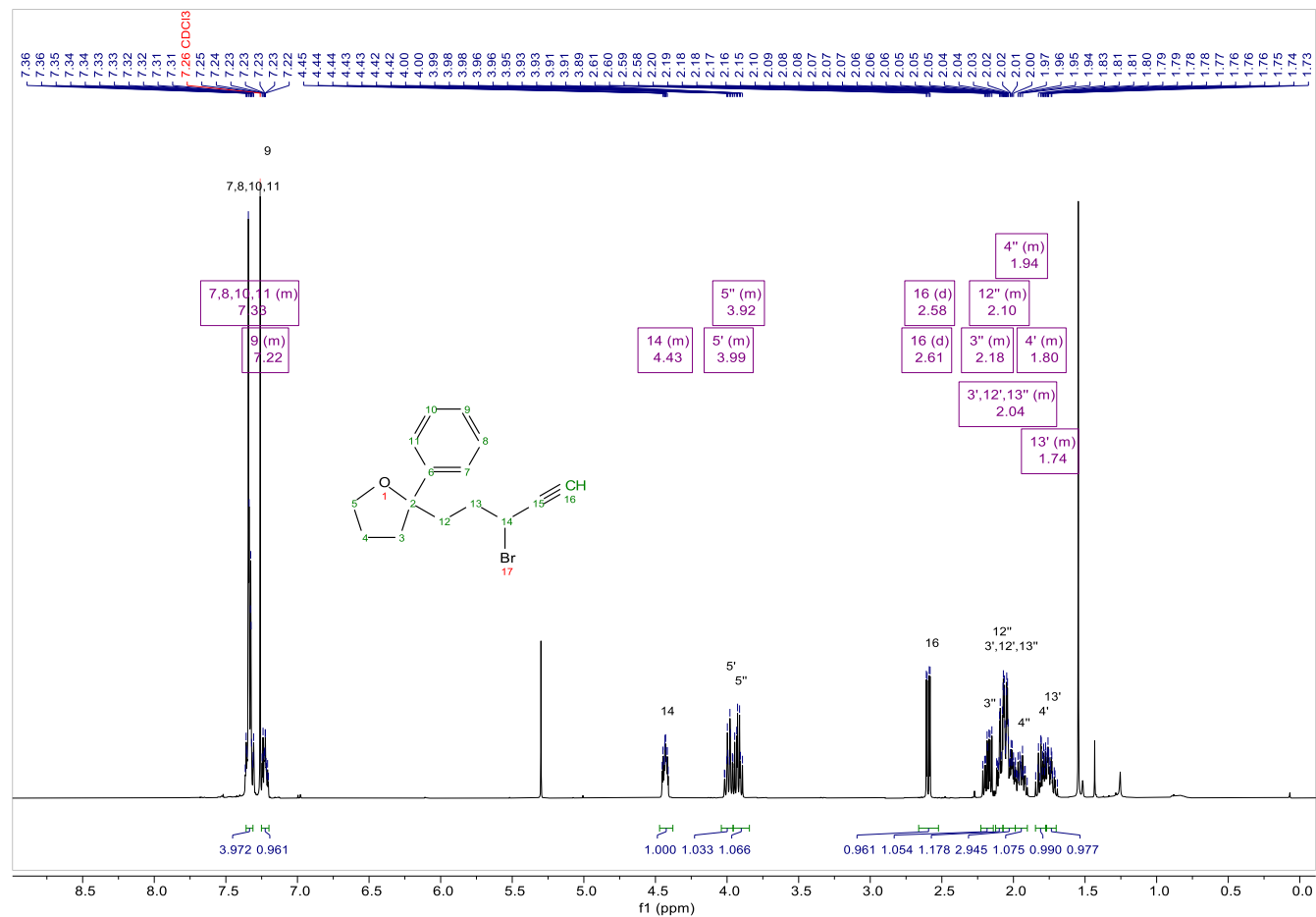
2-(3-Chloropent-4-en-1-yl)-2-phenyltetrahydrofuran (23m), CDCl₃, ¹H NMR, 400 MHz



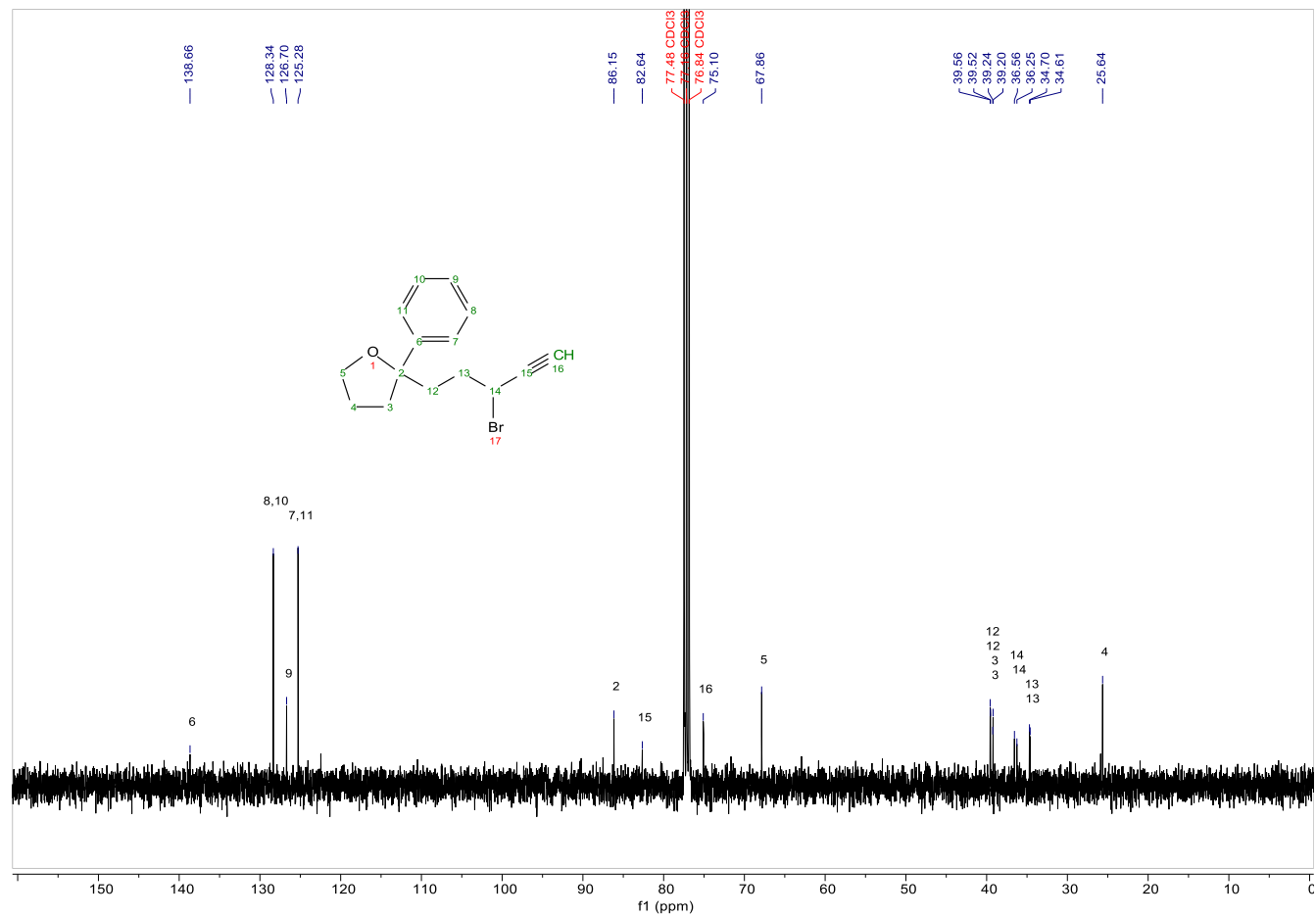
2-(3-Chloropent-4-en-1-yl)-2-phenyltetrahydrofuran (23m), CDCl₃, ¹³C NMR, 100 MHz



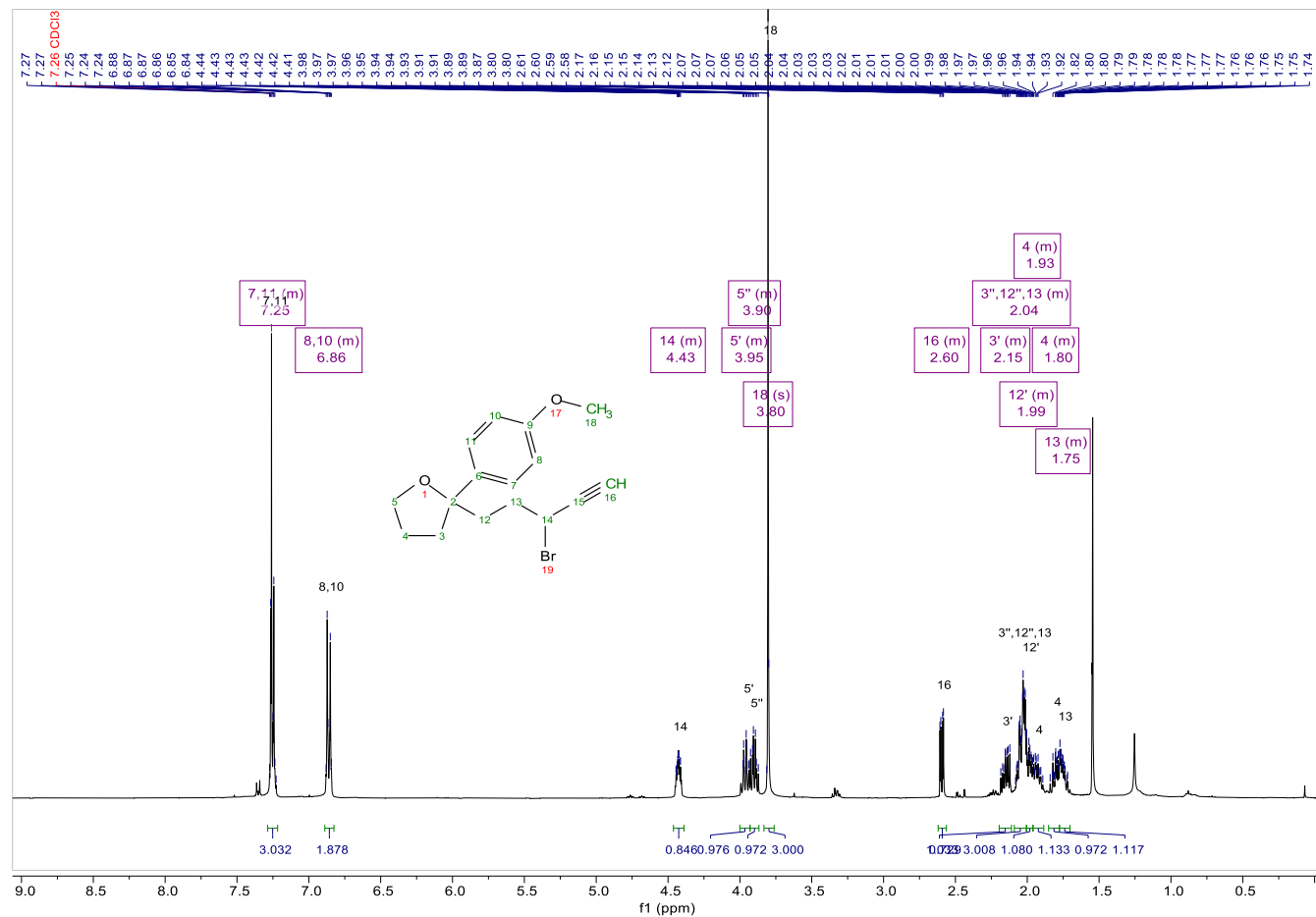
2-(3-Bromopent-4-yn-1-yl)-2-phenyltetrahydrofuran (23s), CDCl₃, ¹H NMR, 400 MHz



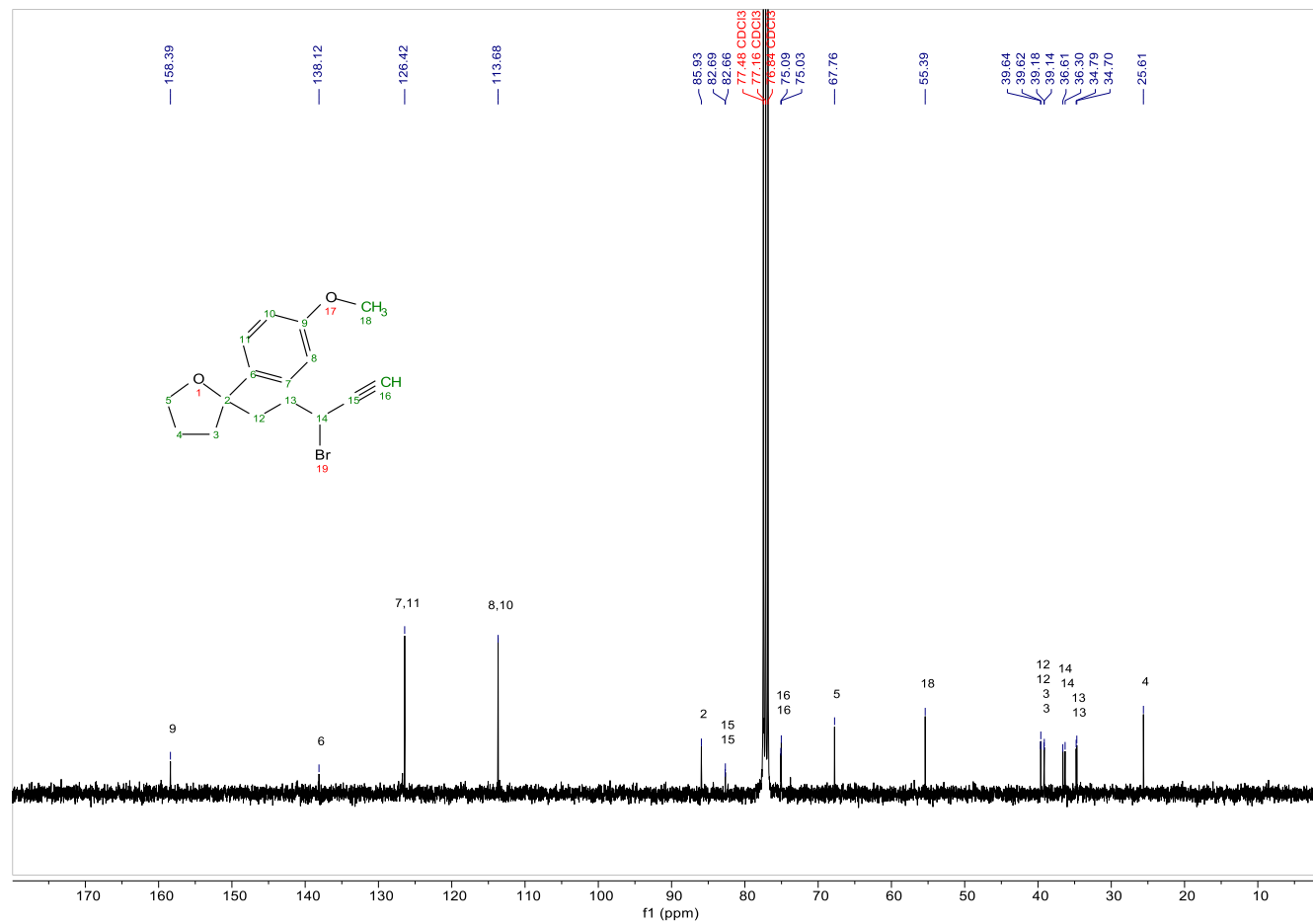
2-(3-Bromopent-4-yn-1-yl)-2-phenyltetrahydrofuran (23s), CDCl₃, ¹³C NMR, 100 MHz



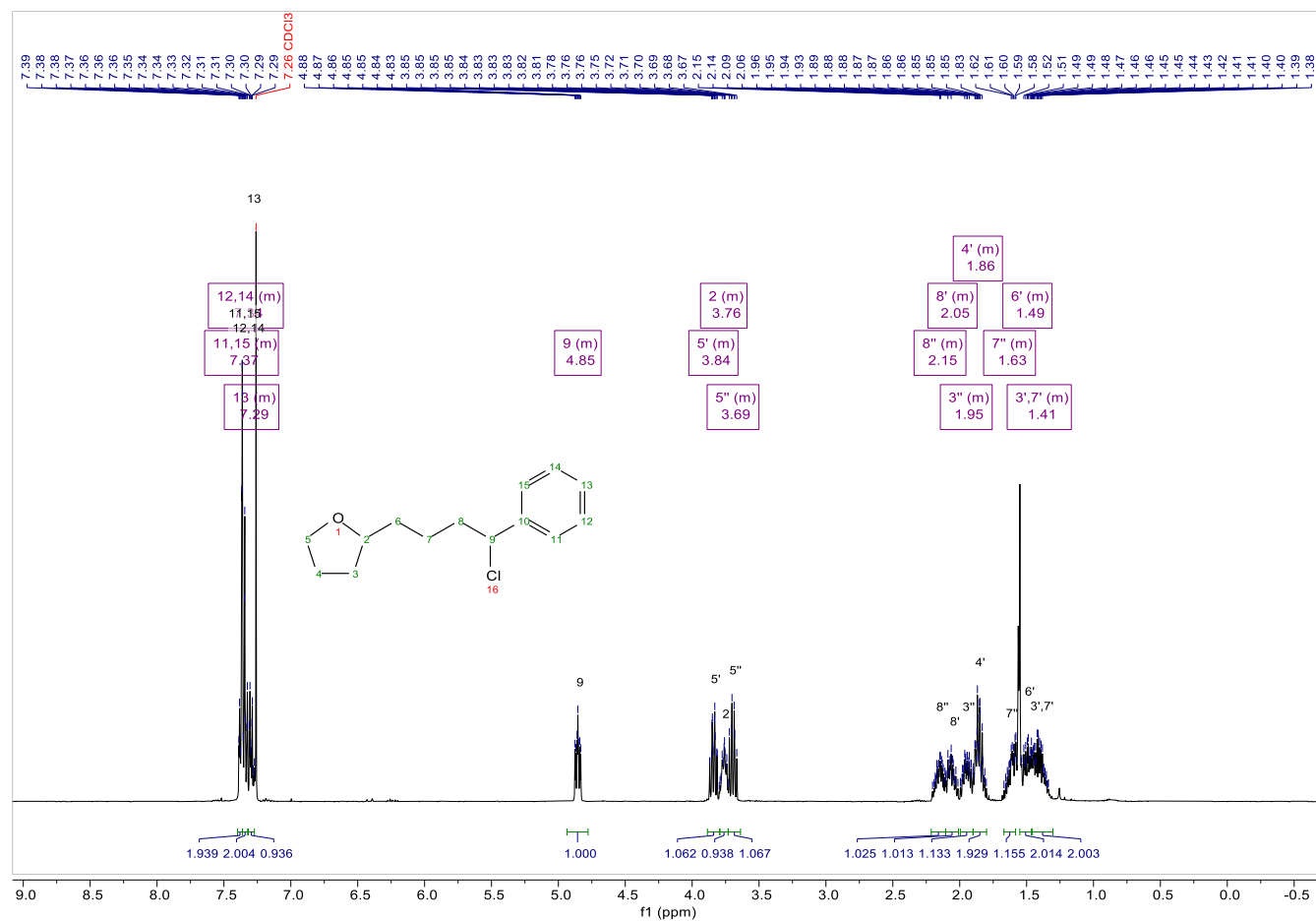
2-(3-Bromopent-4-yn-1-yl)-2-(4-methoxyphenyl)tetrahydrofuran (23v), CDCl₃, ¹H NMR, 400 MHz



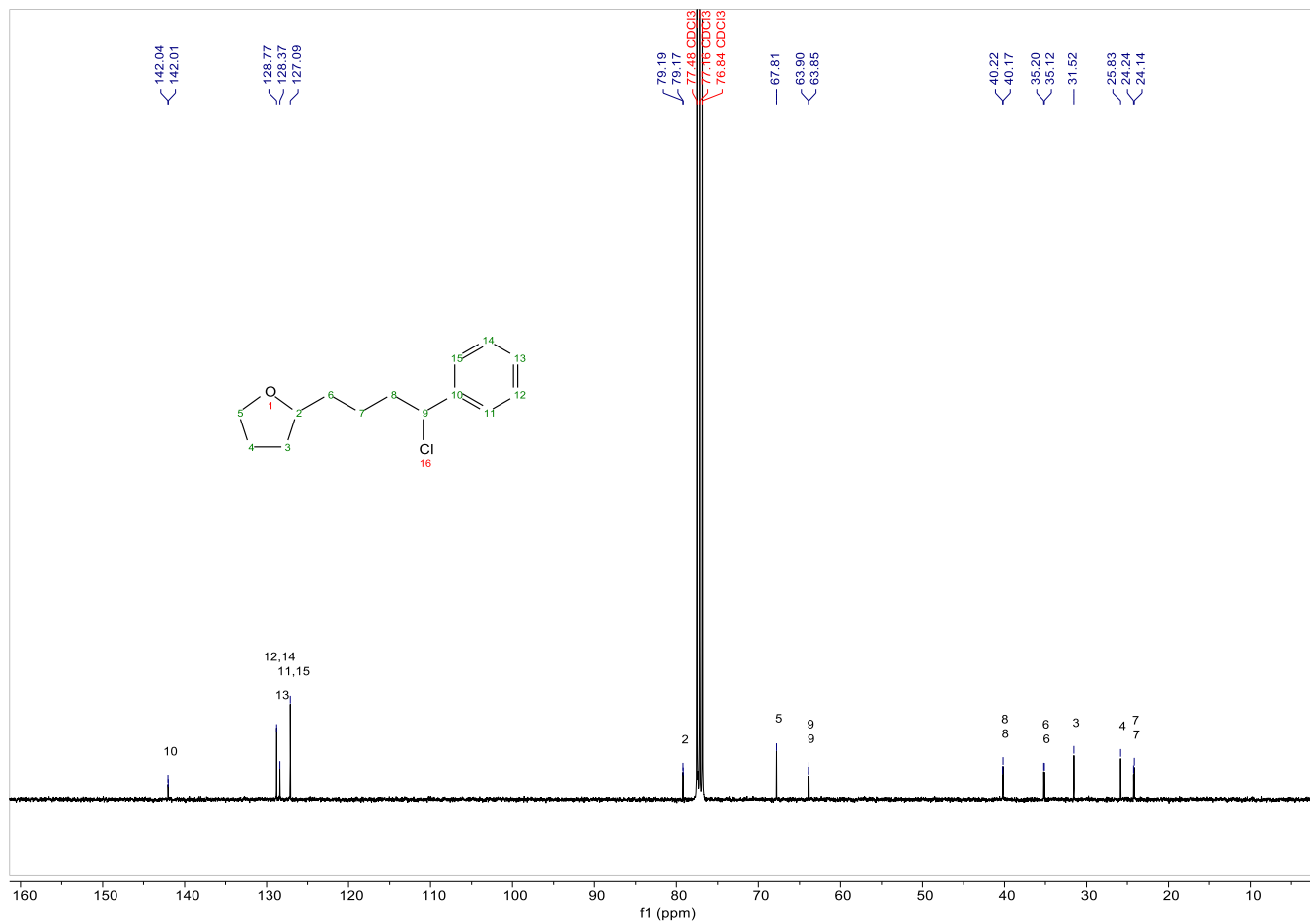
2-(3-Bromopent-4-yn-1-yl)-2-(4-methoxyphenyl)tetrahydrofuran (23v), CDCl₃, ¹³C NMR, 100 MHz



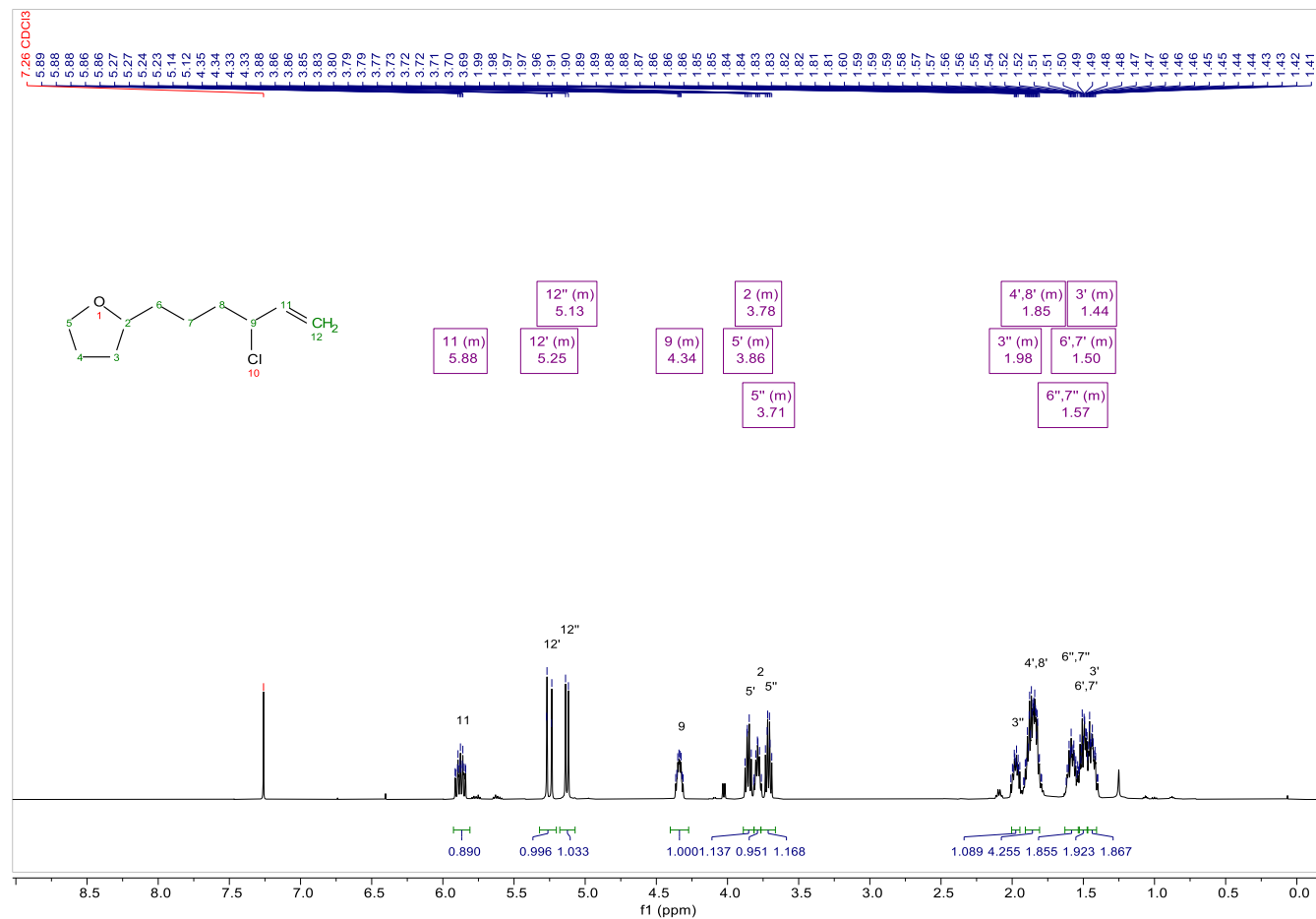
2-(4-Chloro-4-phenylbutyl)tetrahydrofuran (23f), CDCl₃, ¹H NMR, 400 MHz



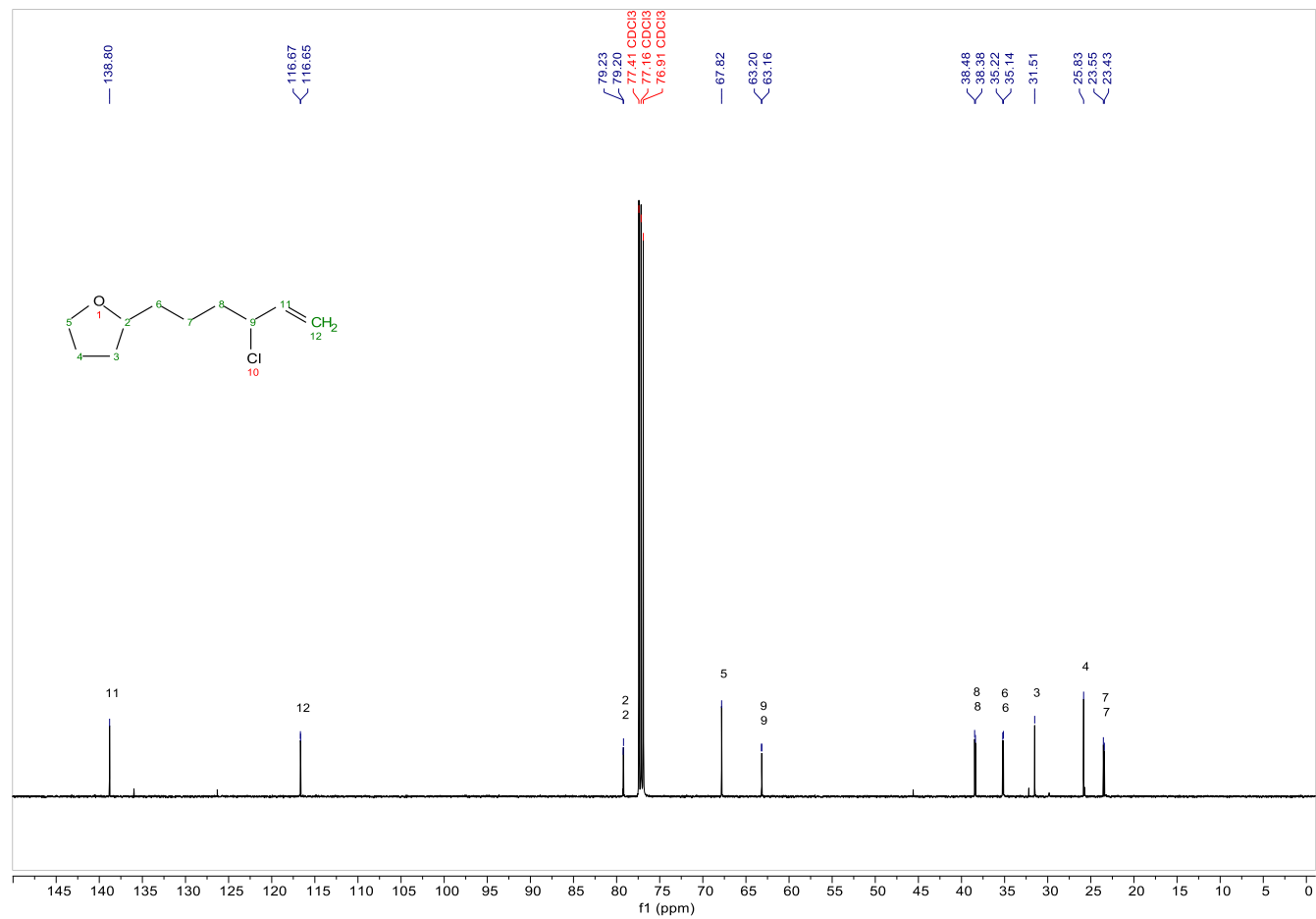
2-(4-Chloro-4-phenylbutyl)tetrahydrofuran (23f), CDCl₃, ¹³C NMR, 100 MHz



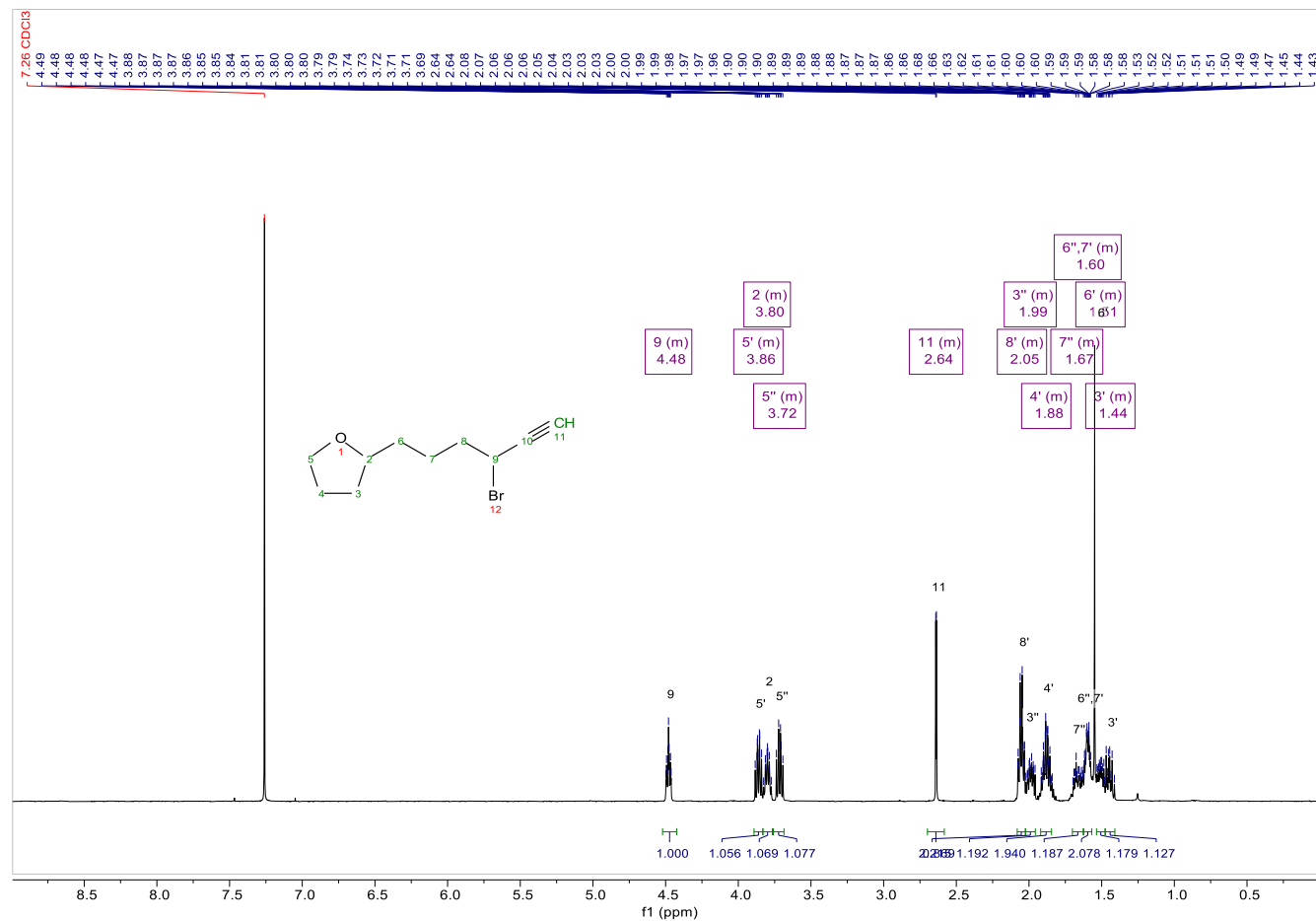
2-(4-Chlorohex-5-en-1-yl)tetrahydrofuran (23e), CDCl₃, ¹H NMR, 500 MHz



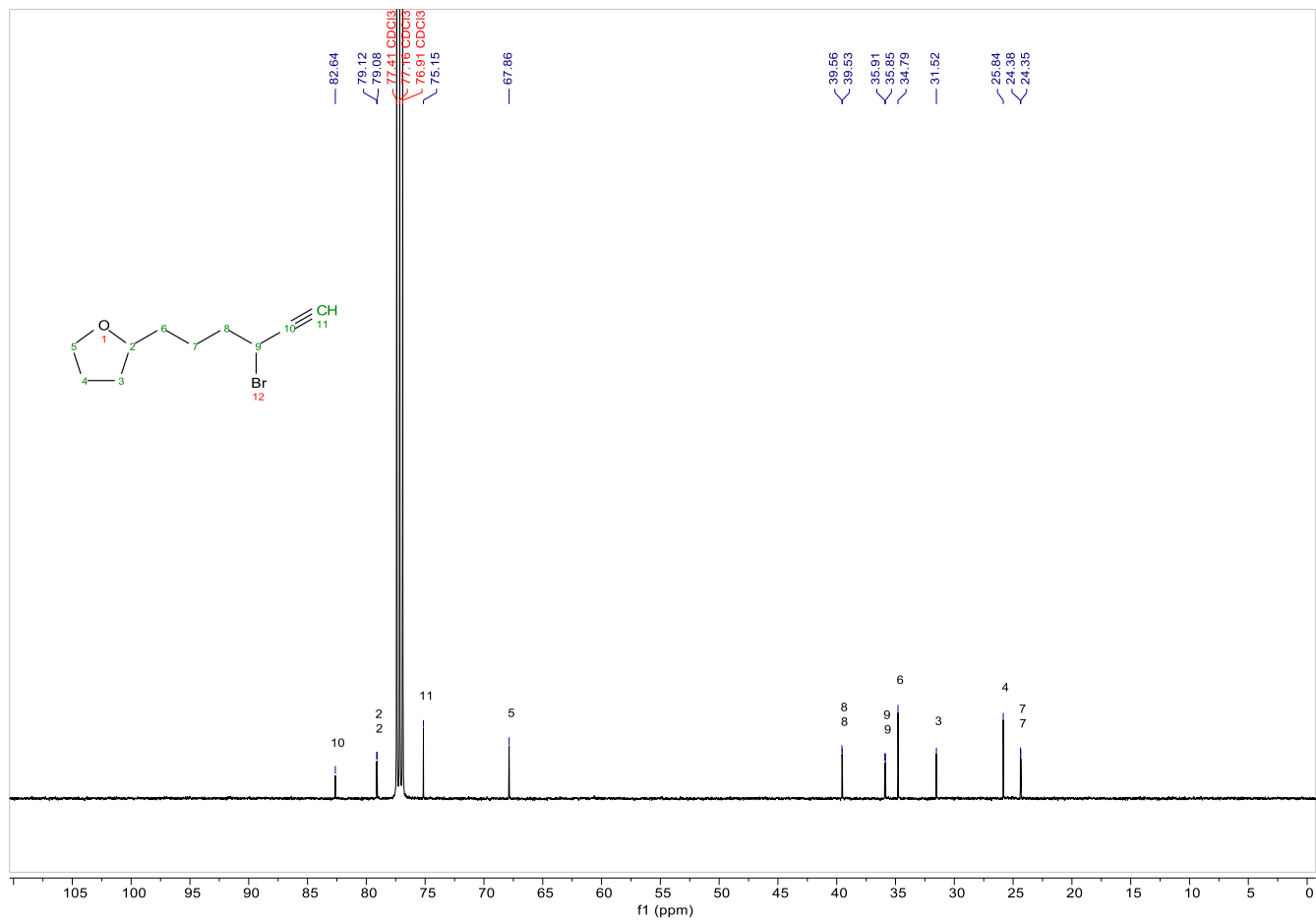
2-(4-Chlorohex-5-en-1-yl)tetrahydrofuran (23e), CDCl₃, ¹³C NMR, 126 MHz



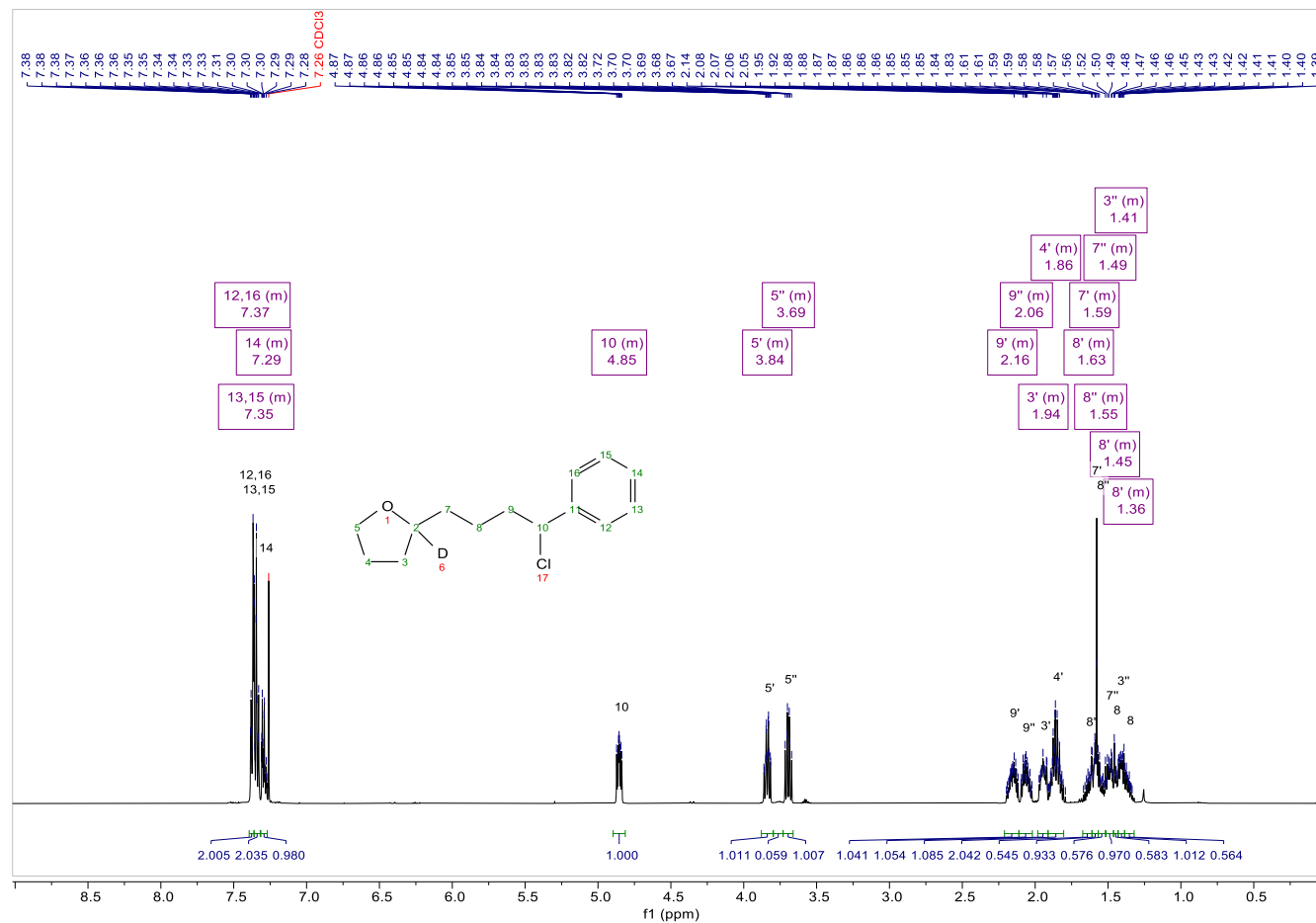
2-(4-Bromohex-5-yn-1-yl)tetrahydrofuran 239g, CDCl₃, ¹H NMR, 500 MHz



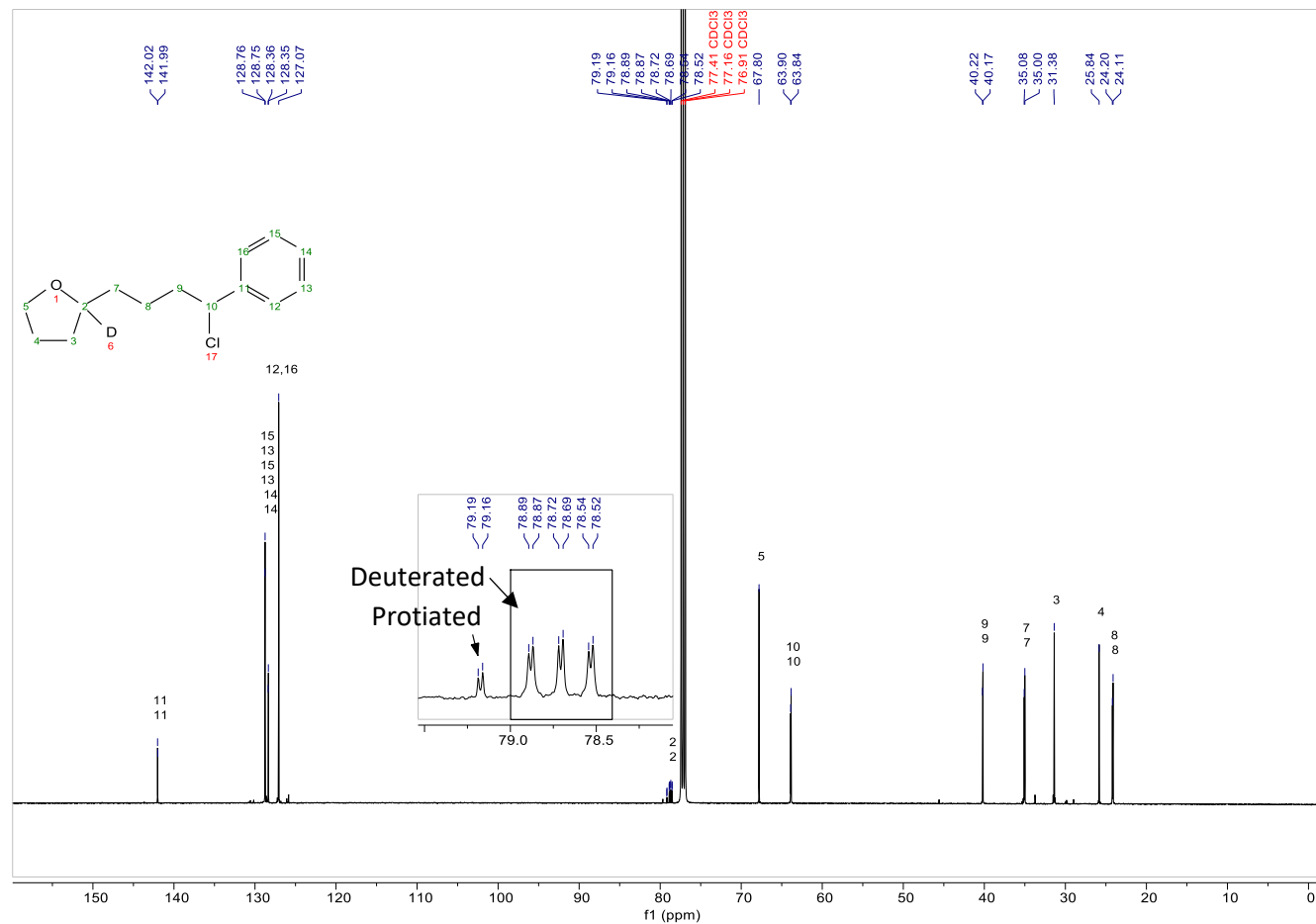
2-(4-Bromohex-5-yn-1-yl)tetrahydrofuran (23g), CDCl₃, ¹³C NMR, 500 MHz



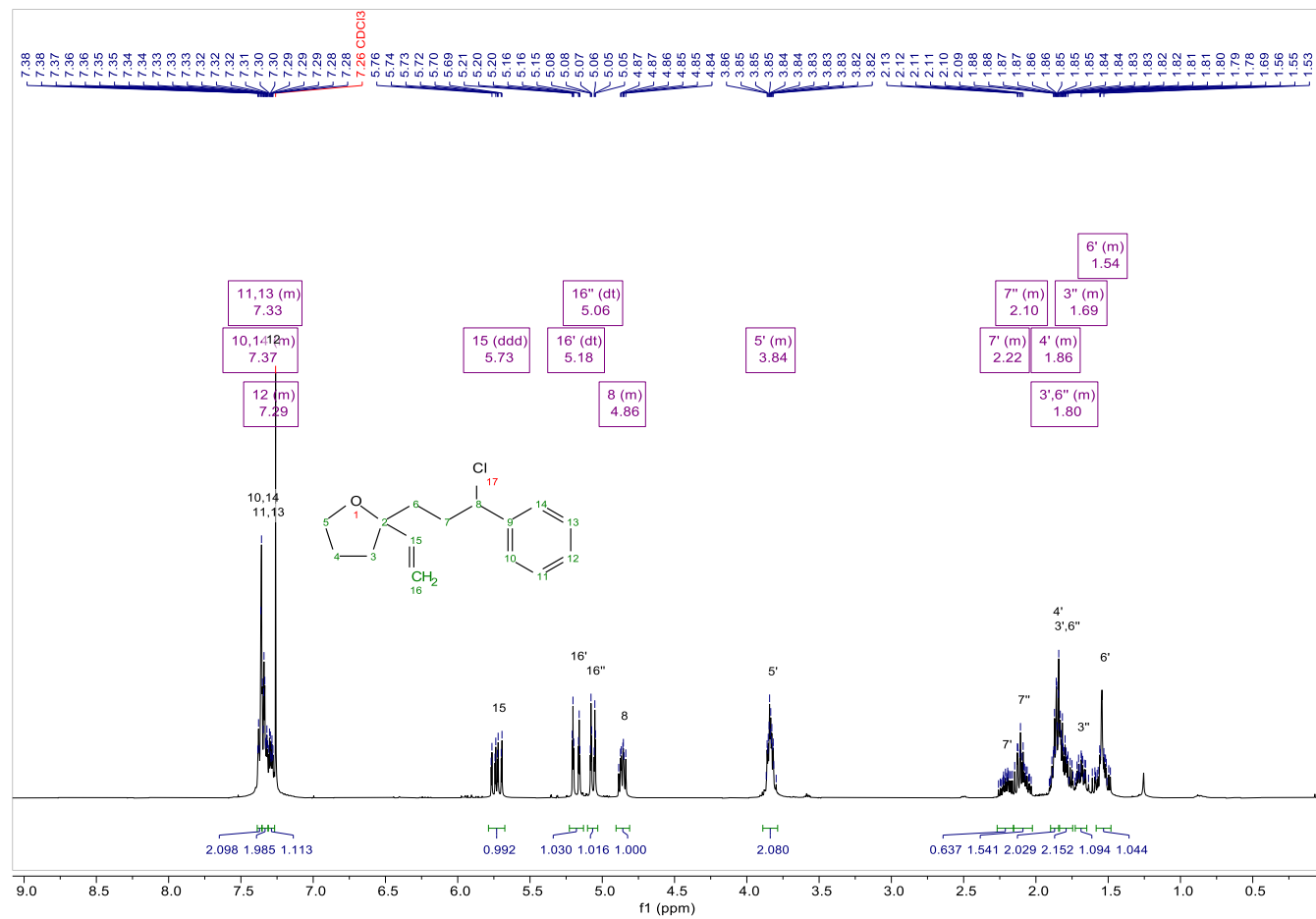
2-(4-Chloro-4-phenylbutyl)tetrahydrofuran-2-d (23f-d), CDCl₃, ¹H NMR, 500 MHz



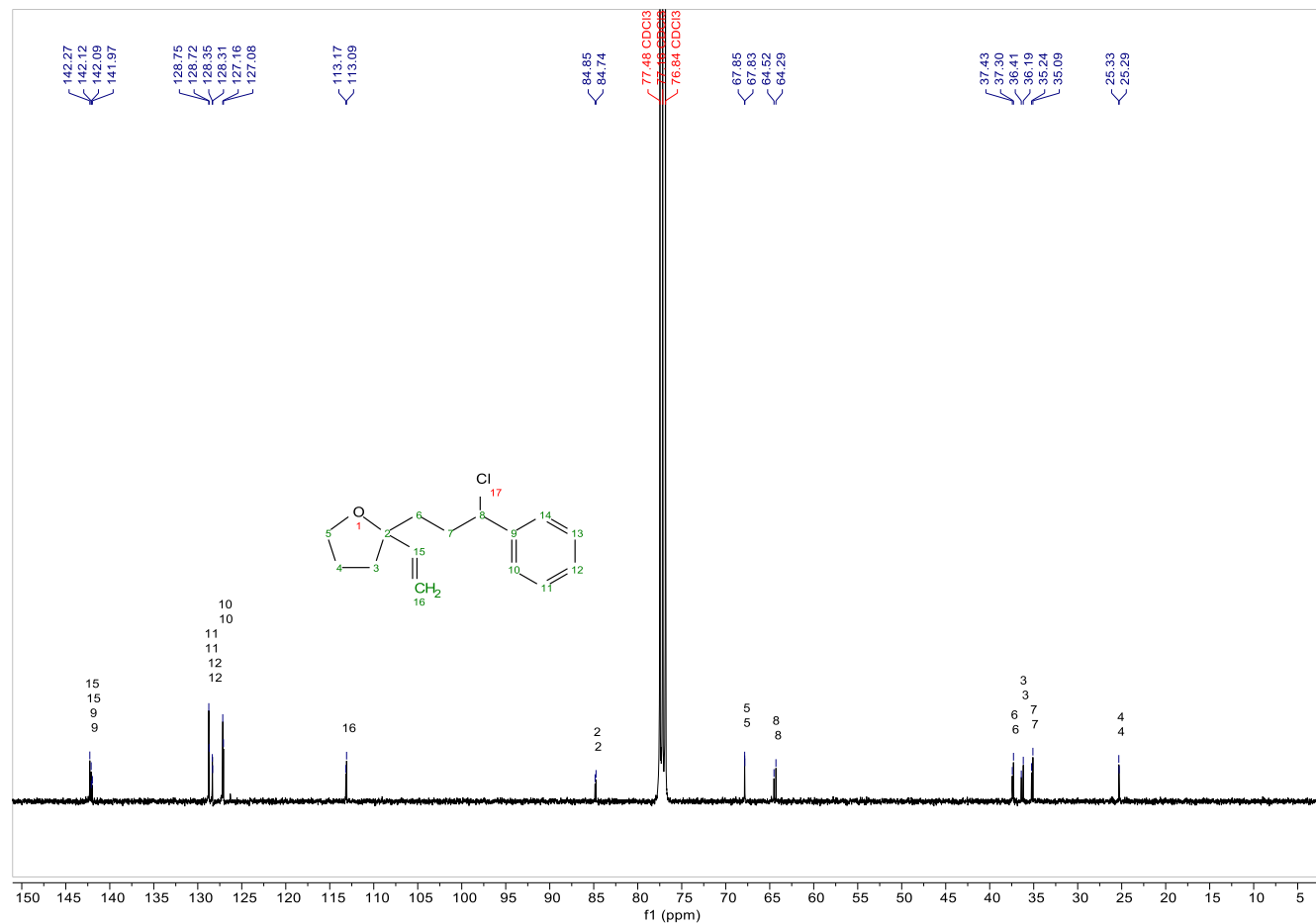
2-(4-Chloro-4-phenylbutyl)tetrahydrofuran-2-d (23f-d), CDCl₃, ¹³C NMR, 126 MHz



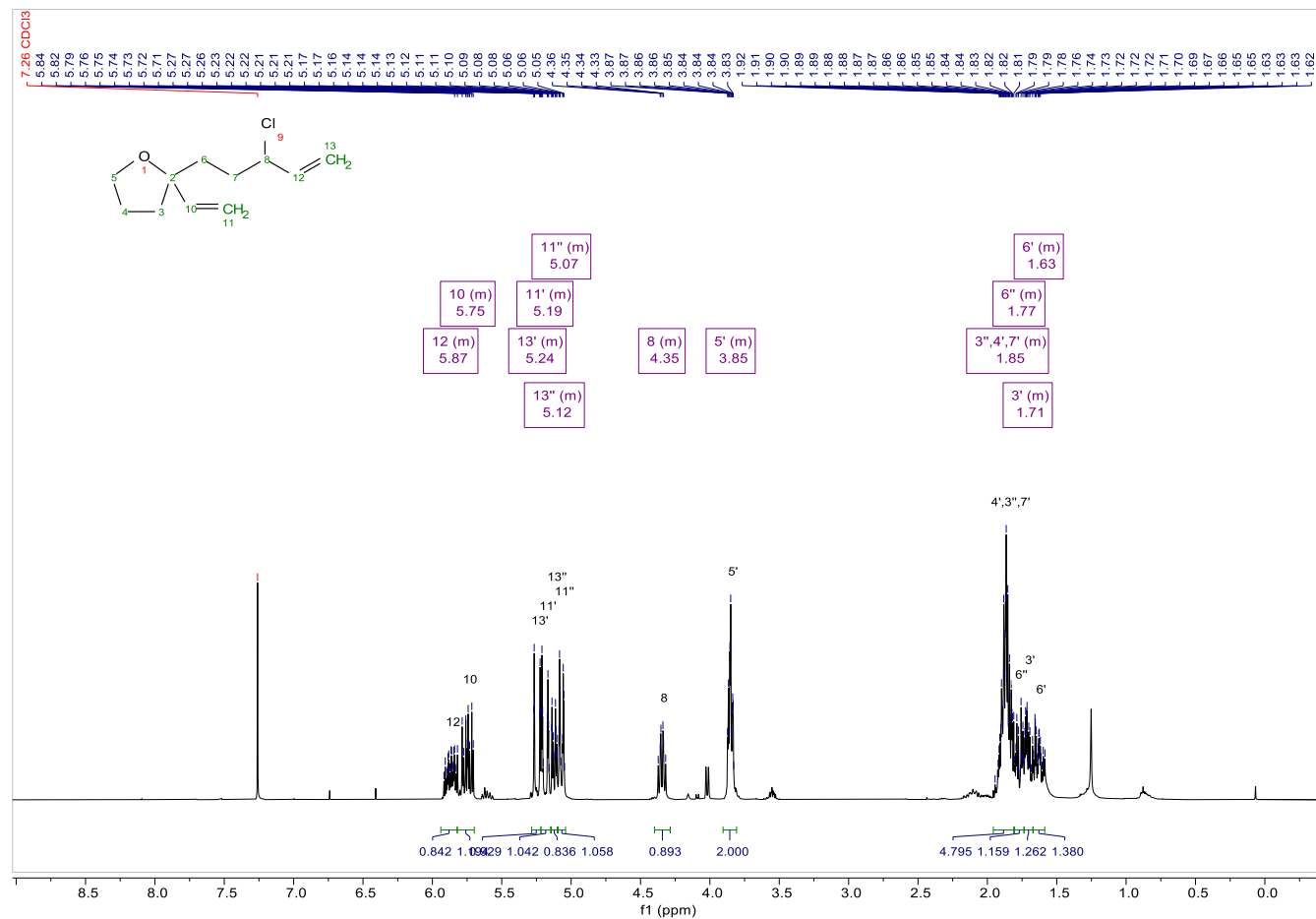
2-(3-Chloro-3-phenylpropyl)-2-vinyltetrahydrofuran (23n), CDCl₃, ¹H NMR, 400 MHz



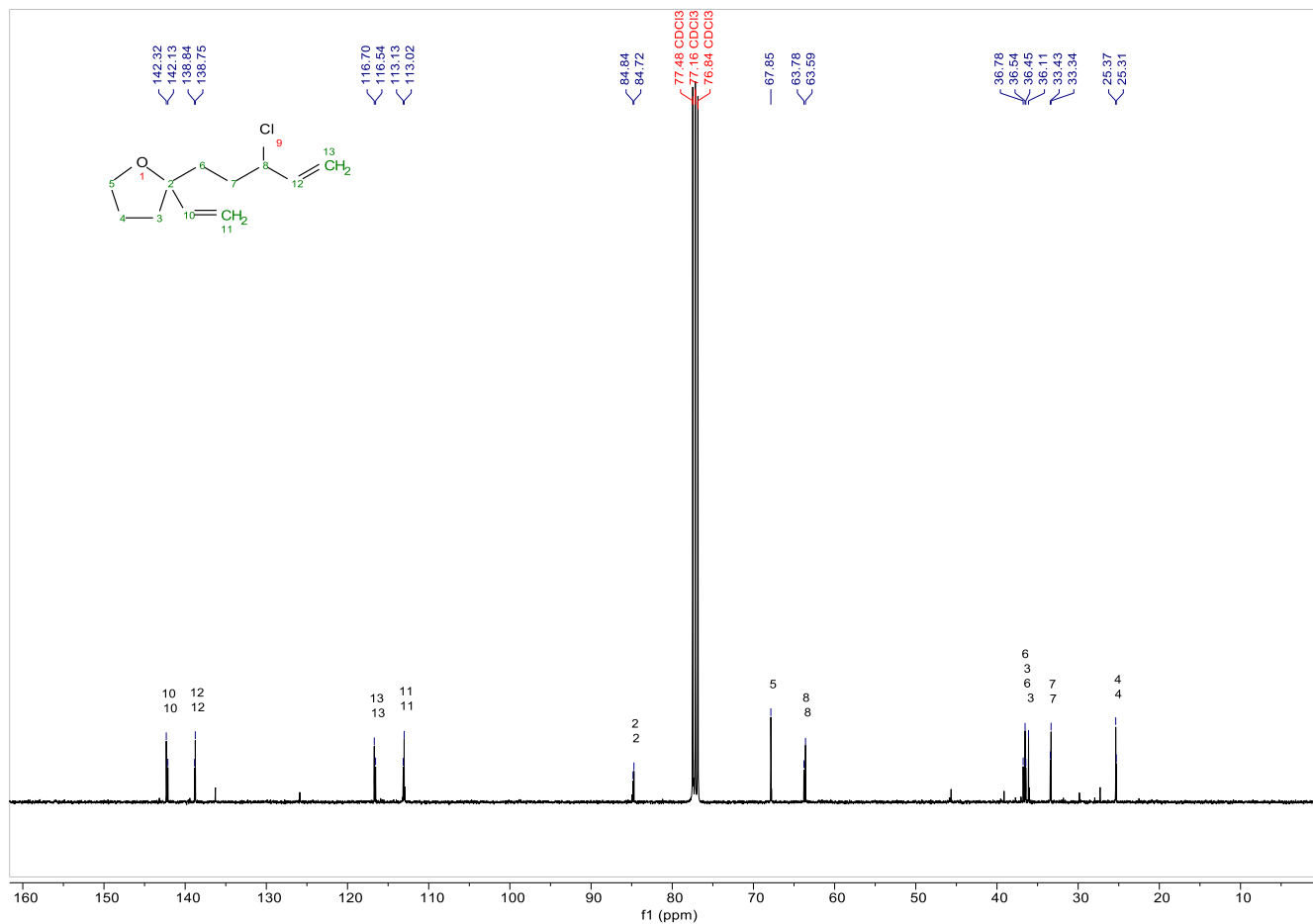
2-(3-Chloro-3-phenylpropyl)-2-vinyltetrahydrofuran (23n), CDCl₃, ¹³C NMR, 100 MHz



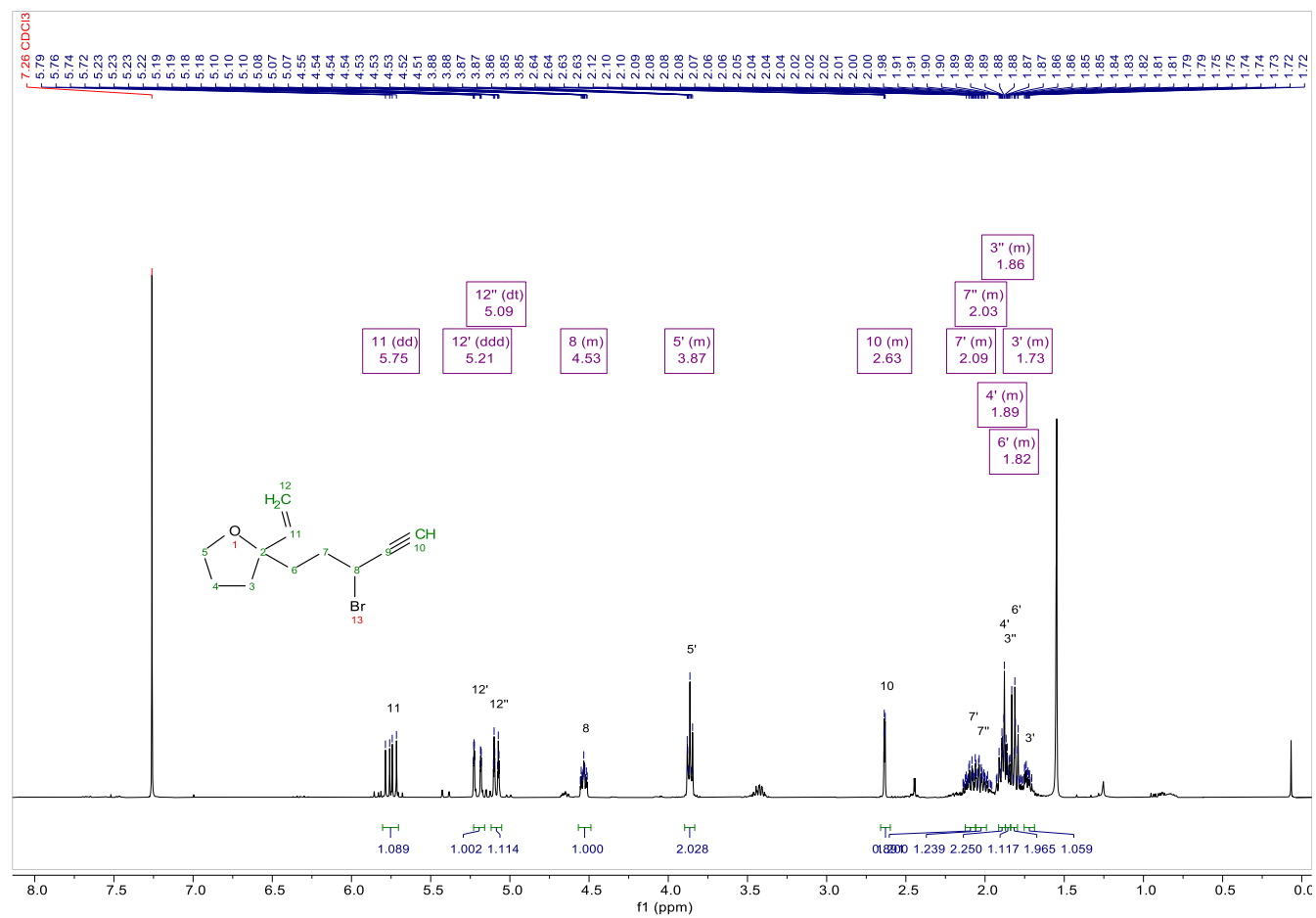
2-(3-Chloropent-4-en-1-yl)-2-vinyltetrahydrofuran (23k), CDCl₃, ¹H NMR, 400 MHz



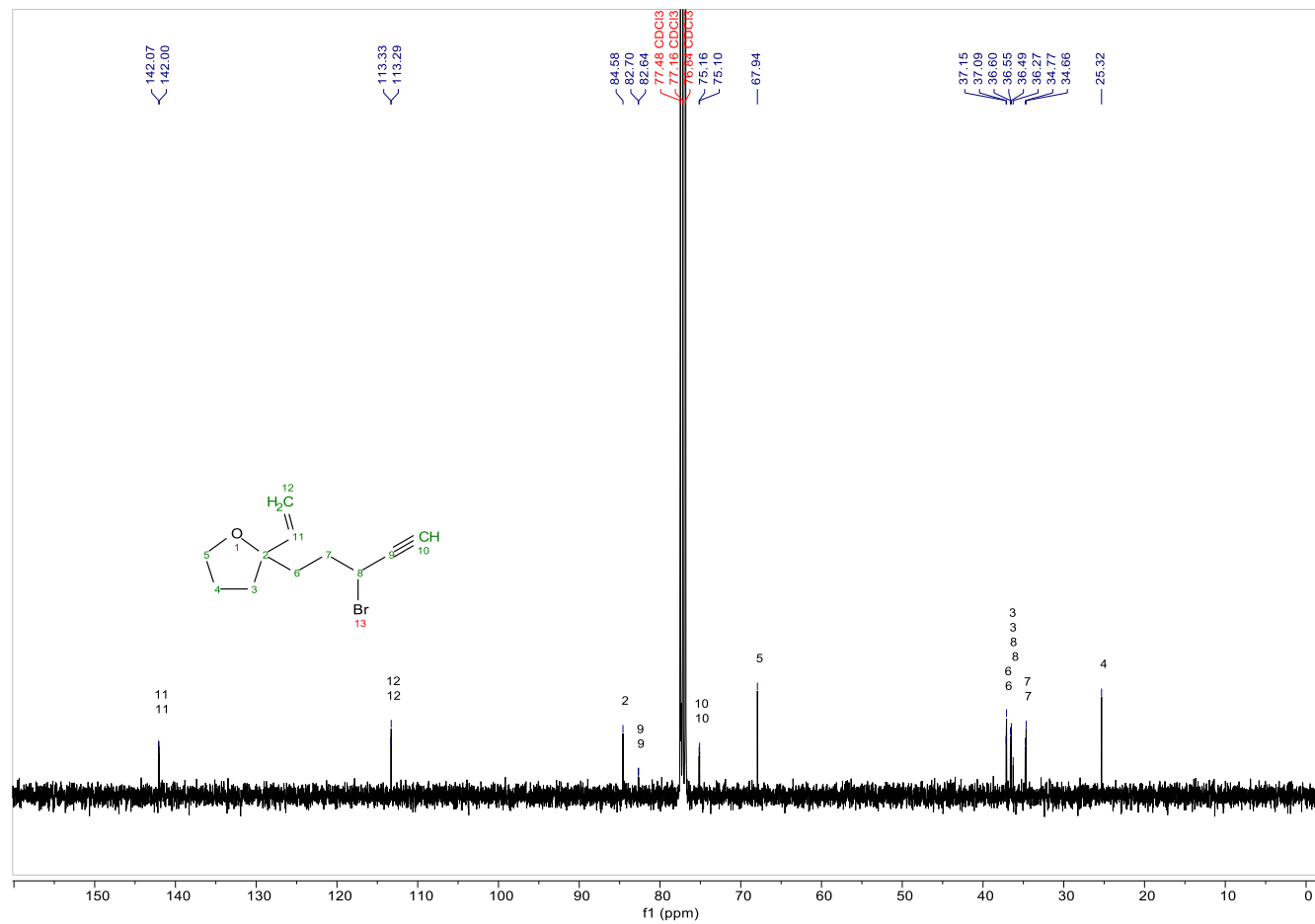
2-(3-Chloropent-4-en-1-yl)-2-vinyltetrahydrofuran (23k), CDCl₃, ¹³C NMR, 100 MHz



2-(3-Bromopent-4-yn-1-yl)-2-vinyltetrahydrofuran (23u), CDCl₃, ¹H NMR, 400 MHz



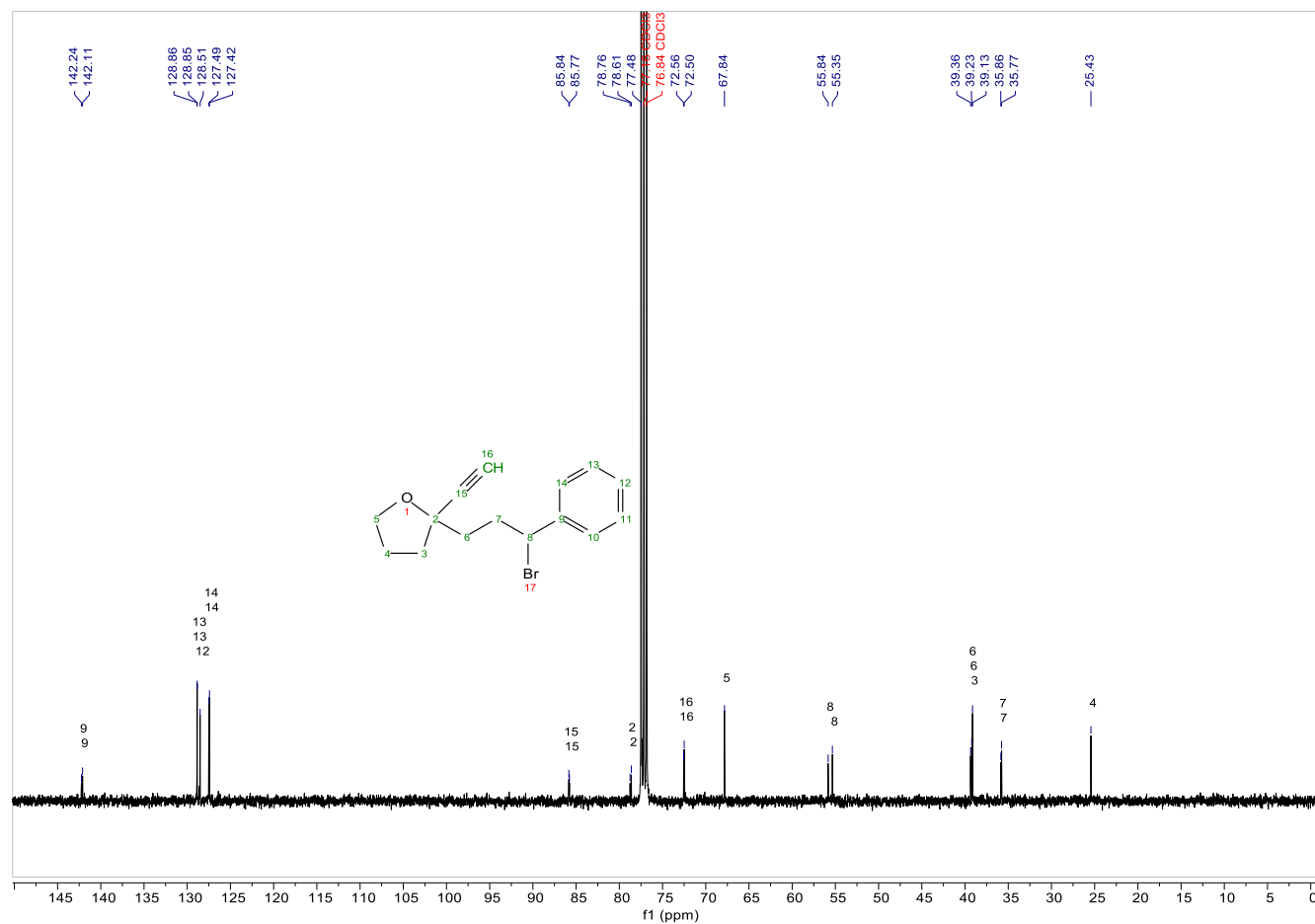
2-(3-Bromopent-4-yn-1-yl)-2-vinyltetrahydrofuran (23u), CDCl₃, ¹³C NMR, 100 MHz



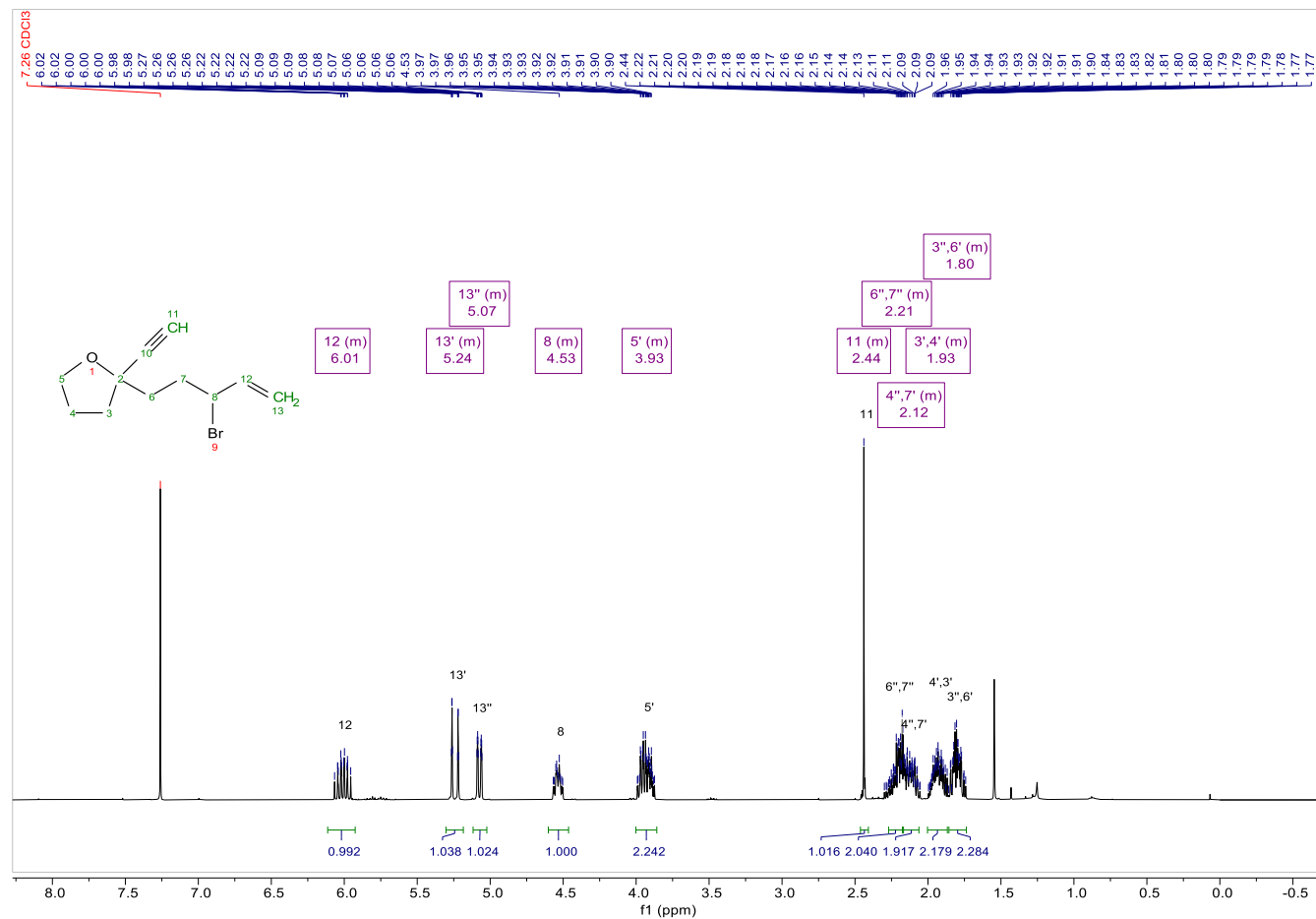
2-(3-Bromo-3-phenylpropyl)-2-ethynyltetrahydrofuran (23w), CDCl₃, ¹H NMR, 400 MHz



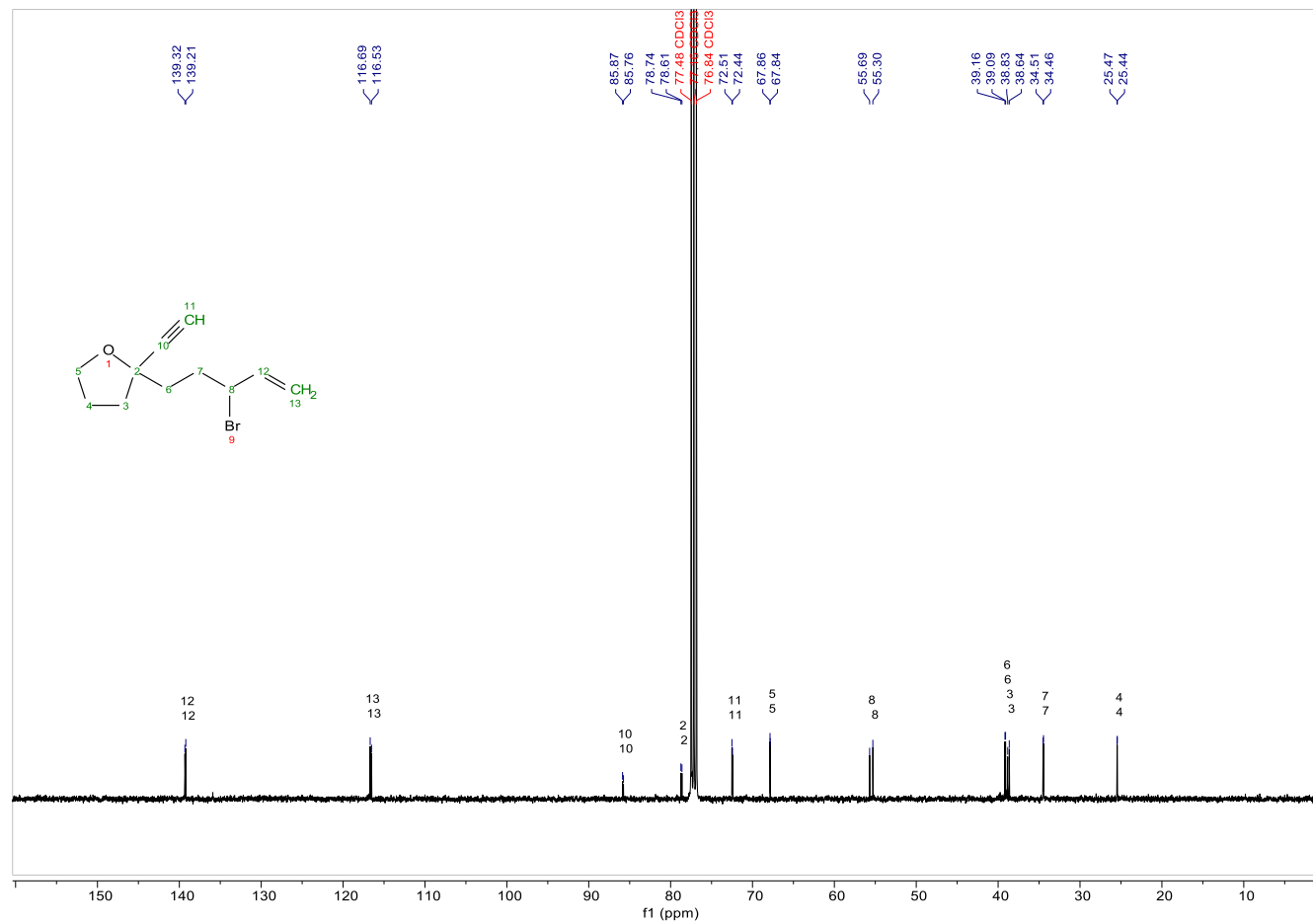
2-(3-Bromo-3-phenylpropyl)-2-ethynyltetrahydrofuran (23w), CDCl₃, ¹³C NMR, 100 MHz



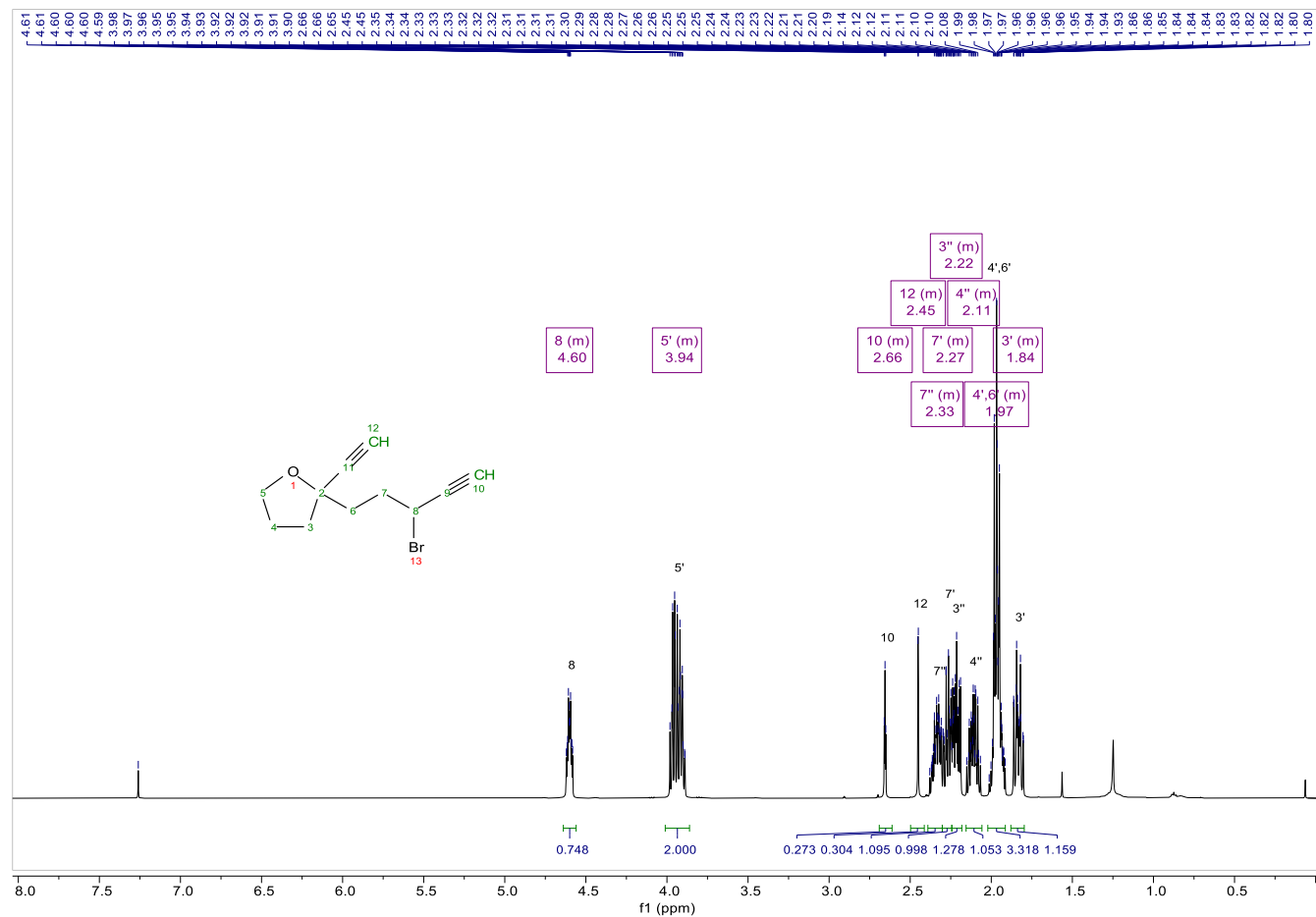
2-(3-Bromopent-4-en-1-yl)-2-ethynyltetrahydrofuran (23o), CDCl₃, ¹H NMR, 400 MHz



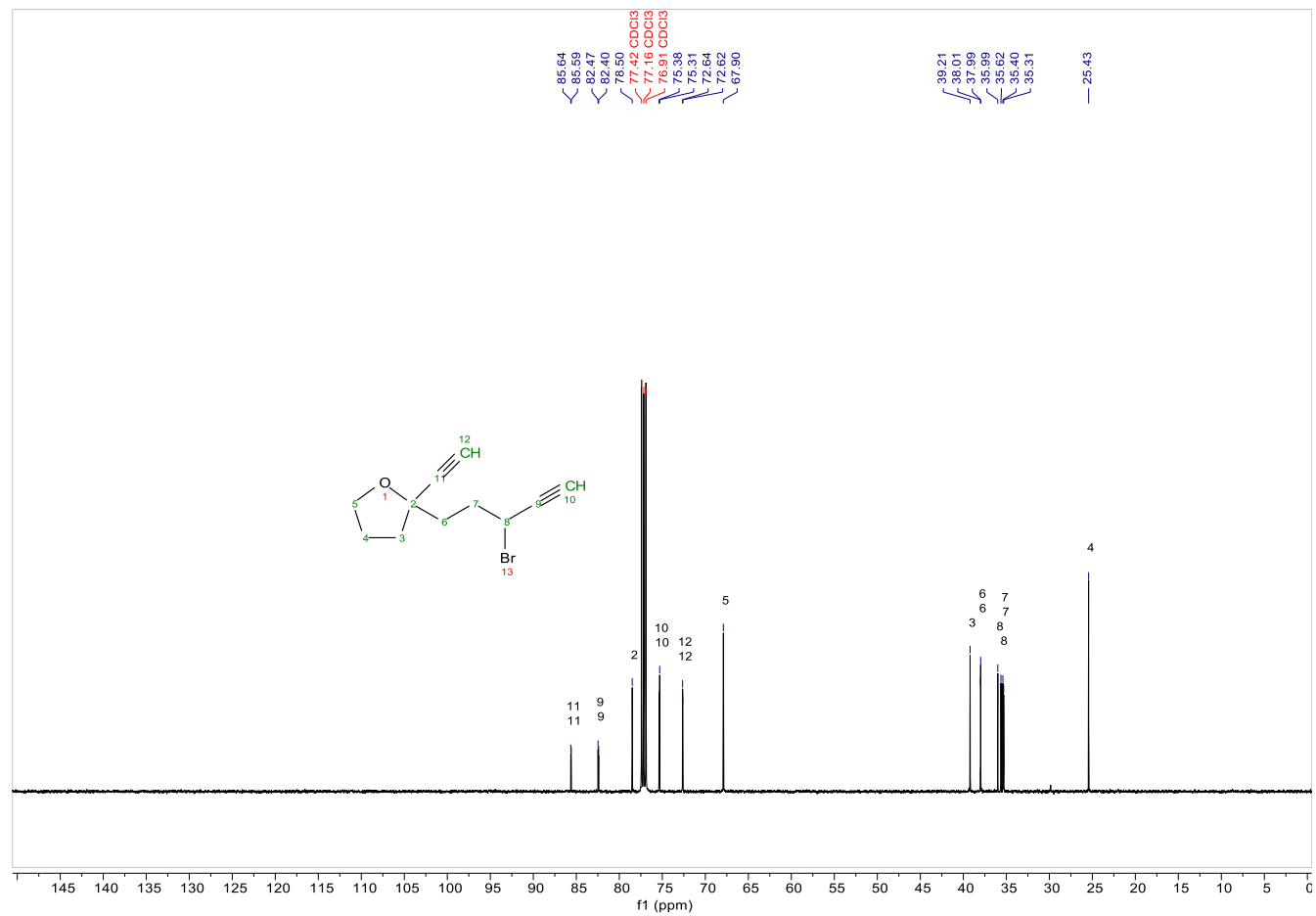
2-(3-Bromopent-4-en-1-yl)-2-ethynyltetrahydrofuran (23o), CDCl₃, ¹³C NMR, 100 MHz



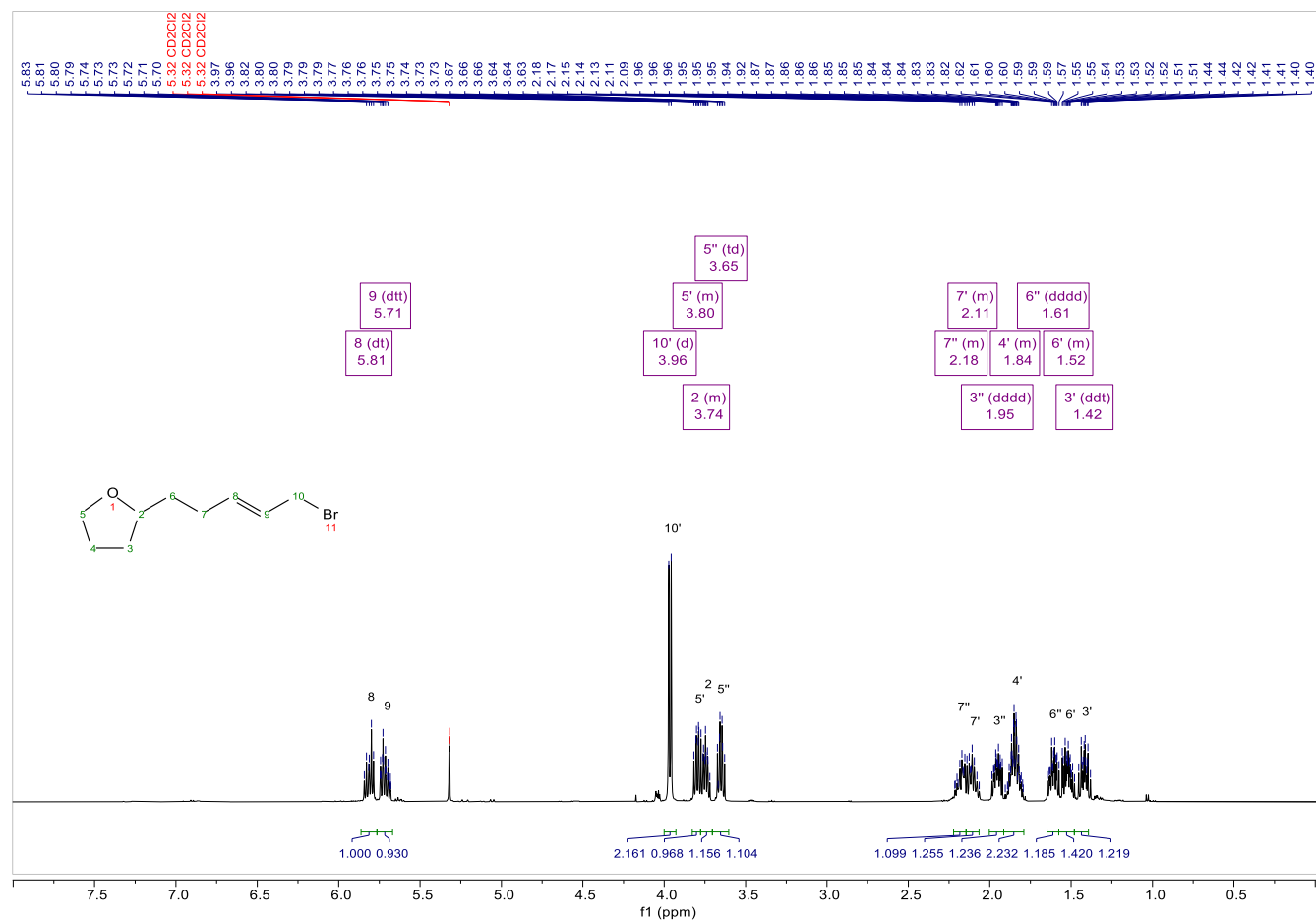
2-(3-Bromopent-4-yn-1-yl)-2-ethynyltetrahydrofuran (23t), CDCl₃, ¹H NMR, 500 MHz



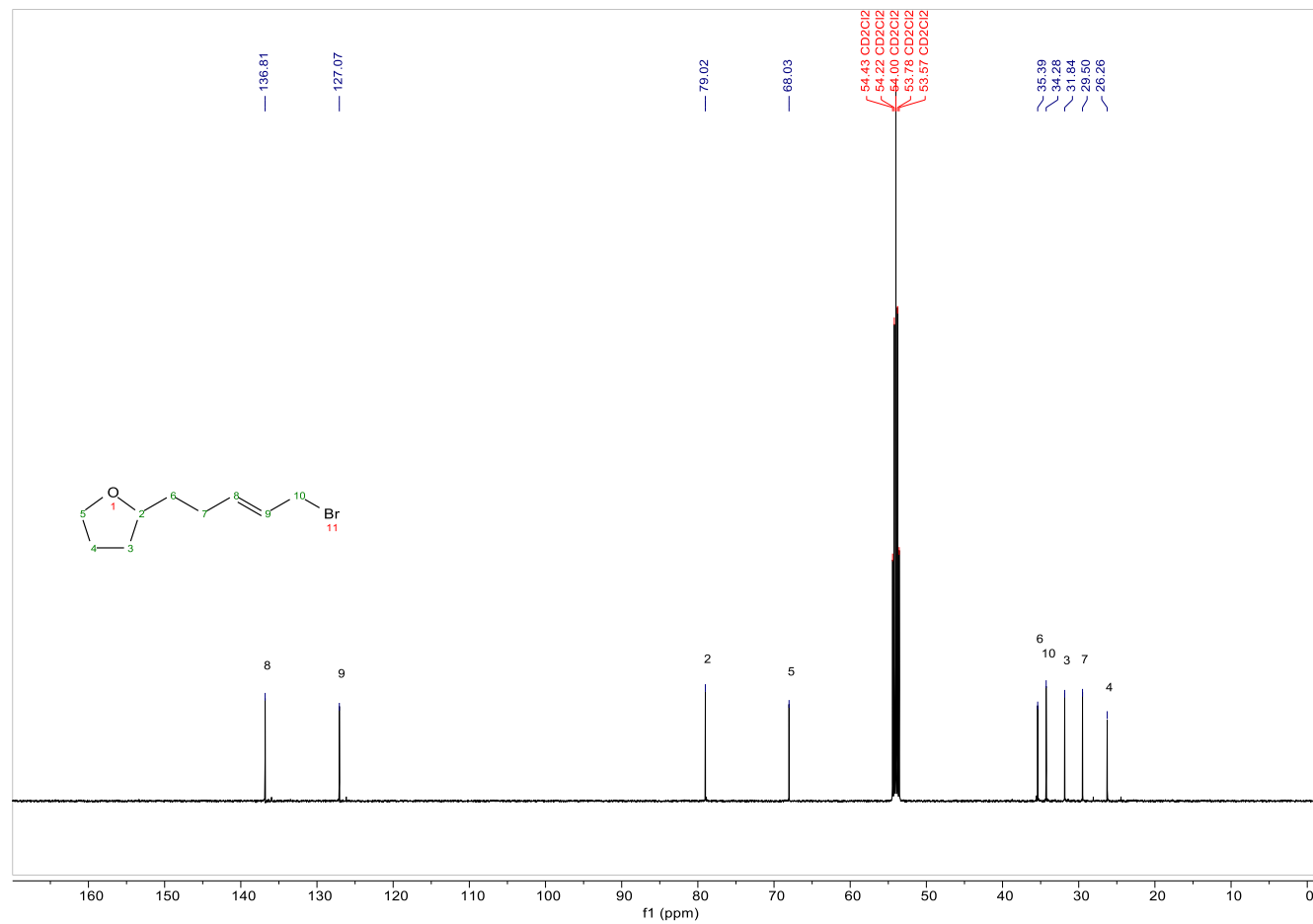
2-(3-Bromopent-4-yn-1-yl)-2-ethynyltetrahydrofuran (23t), CDCl₃, ¹³C NMR, 126 MHz



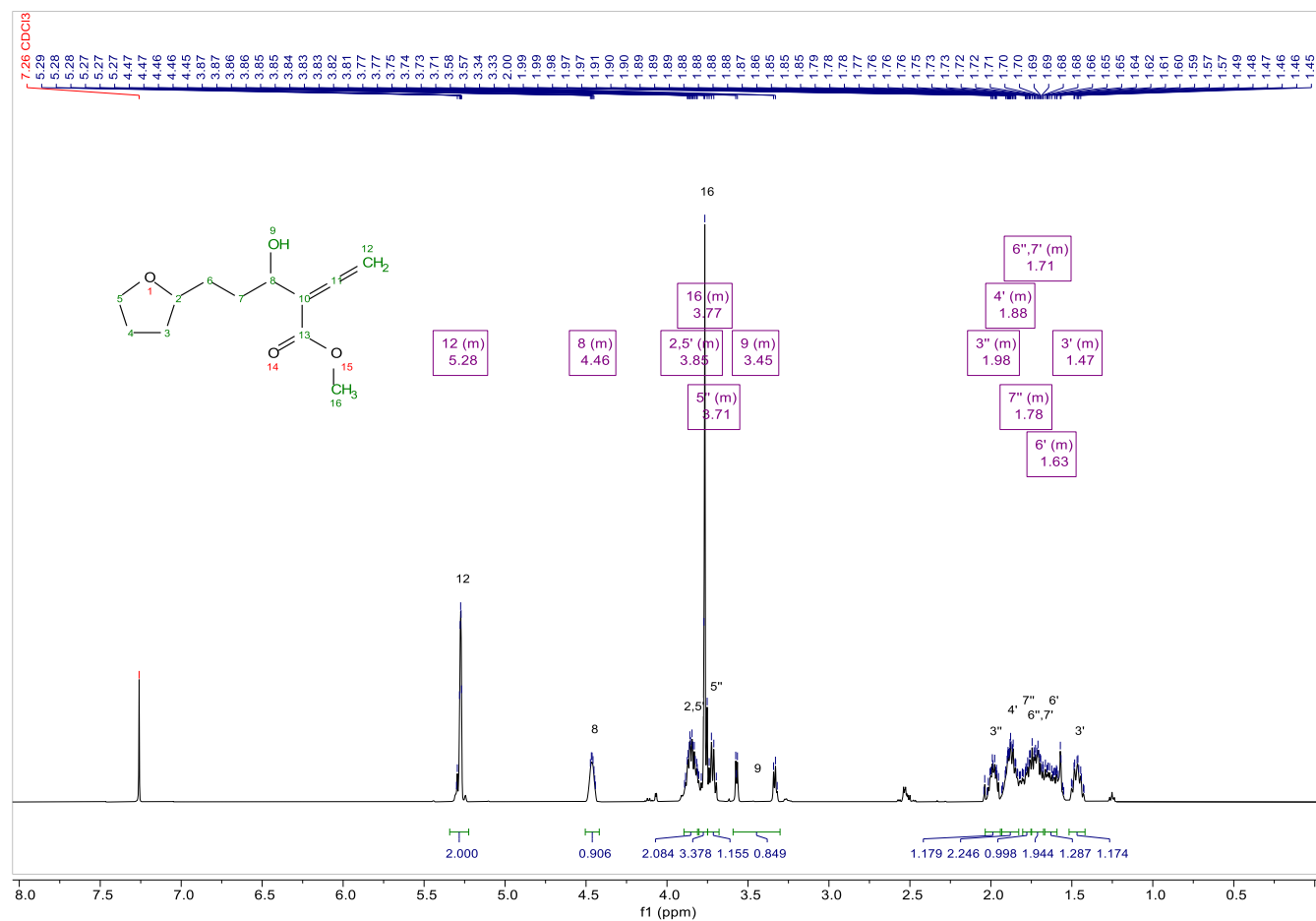
(E)-2-(5-Bromopent-3-en-1-yl)tetrahydrofuran (iso-23a), CDCl₃, ¹H NMR, 500 MHz



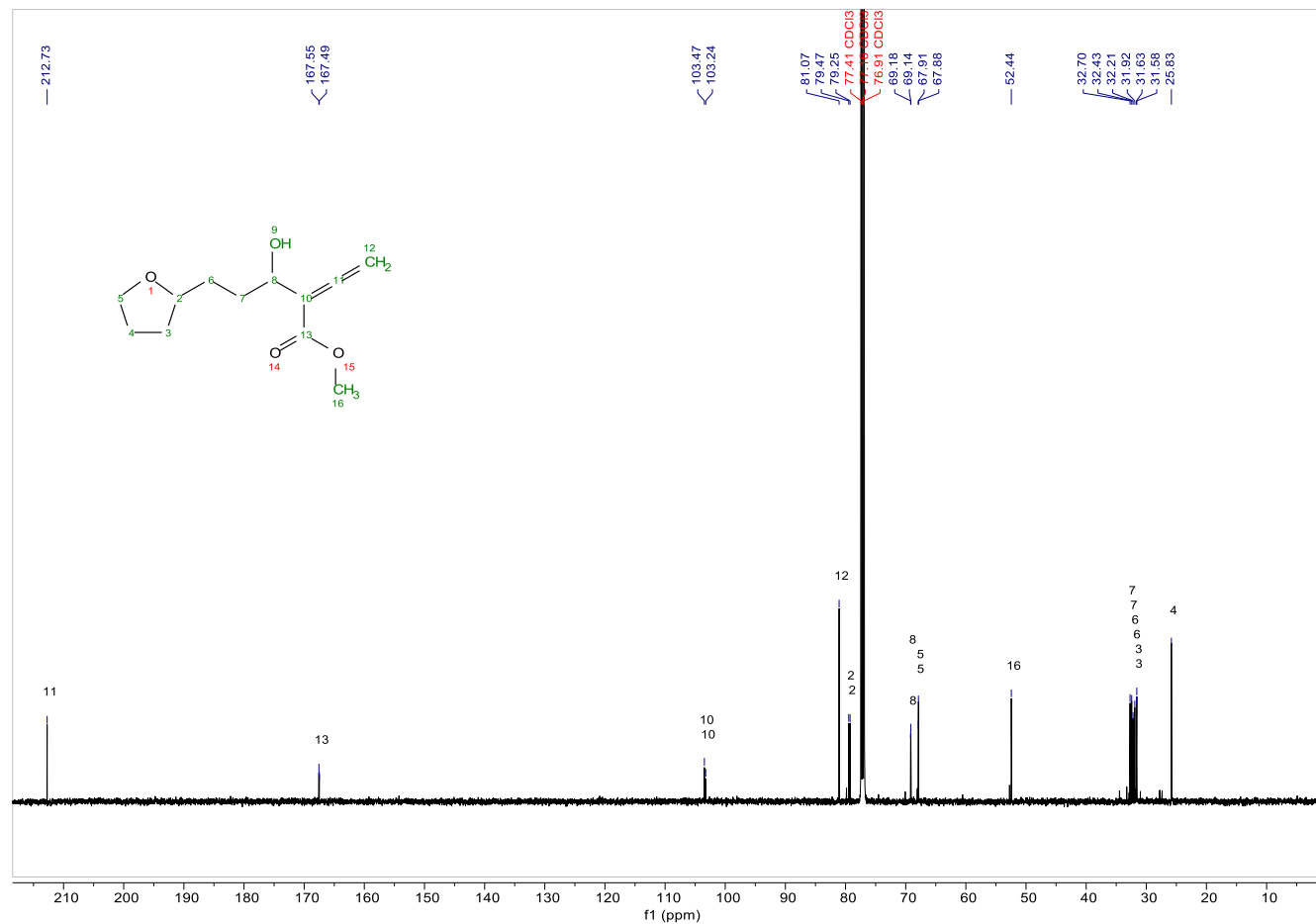
(E)-2-(5-Bromopent-3-en-1-yl)tetrahydrofuran (*iso*-23a), CDCl₃, ¹³CNMR, 126 MHz



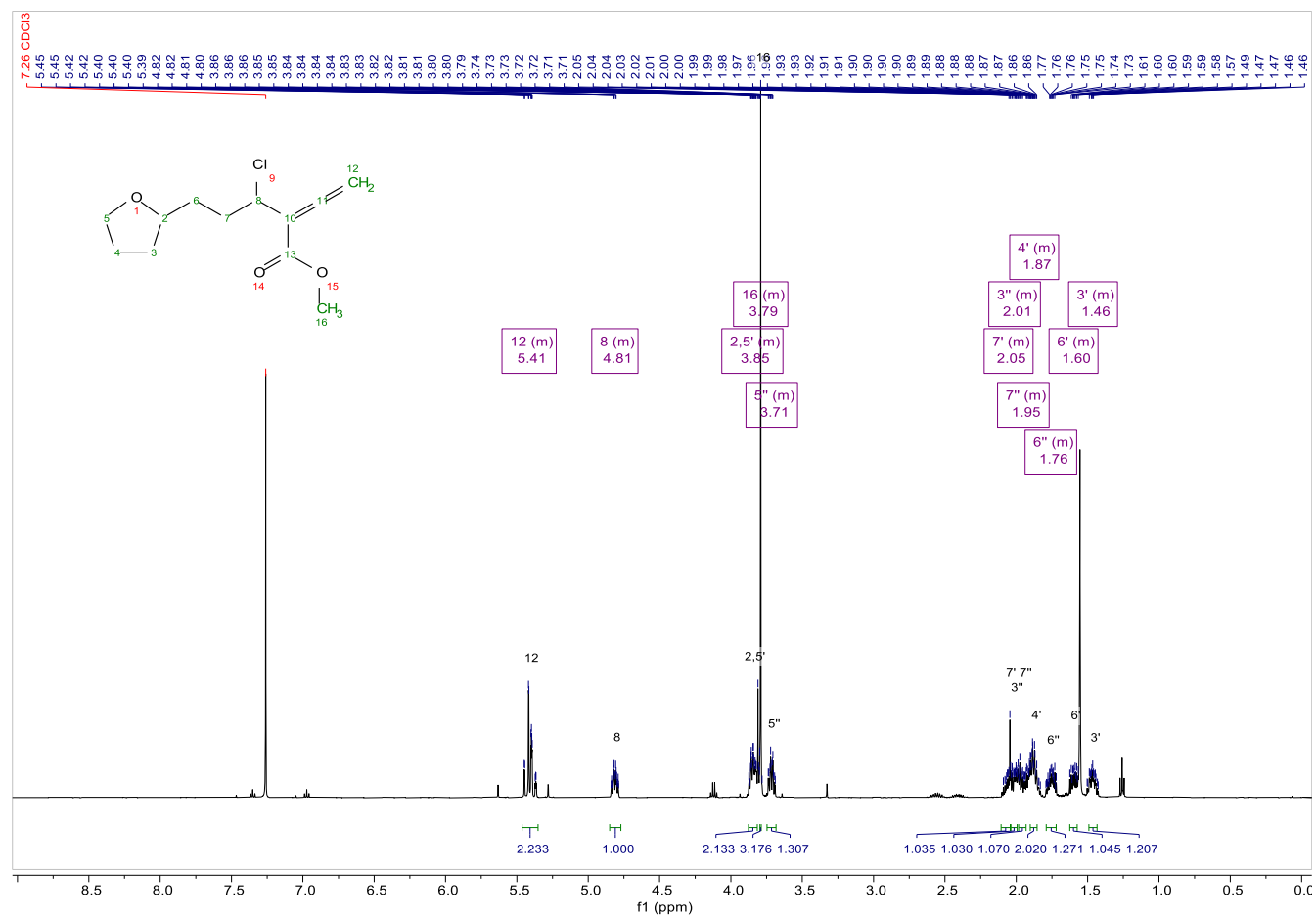
Methyl 3-hydroxy-5-(tetrahydrofuran-2-yl)-2-vinylidenepentanoate (S8j), CDCl₃, ¹H NMR, 500 MHz



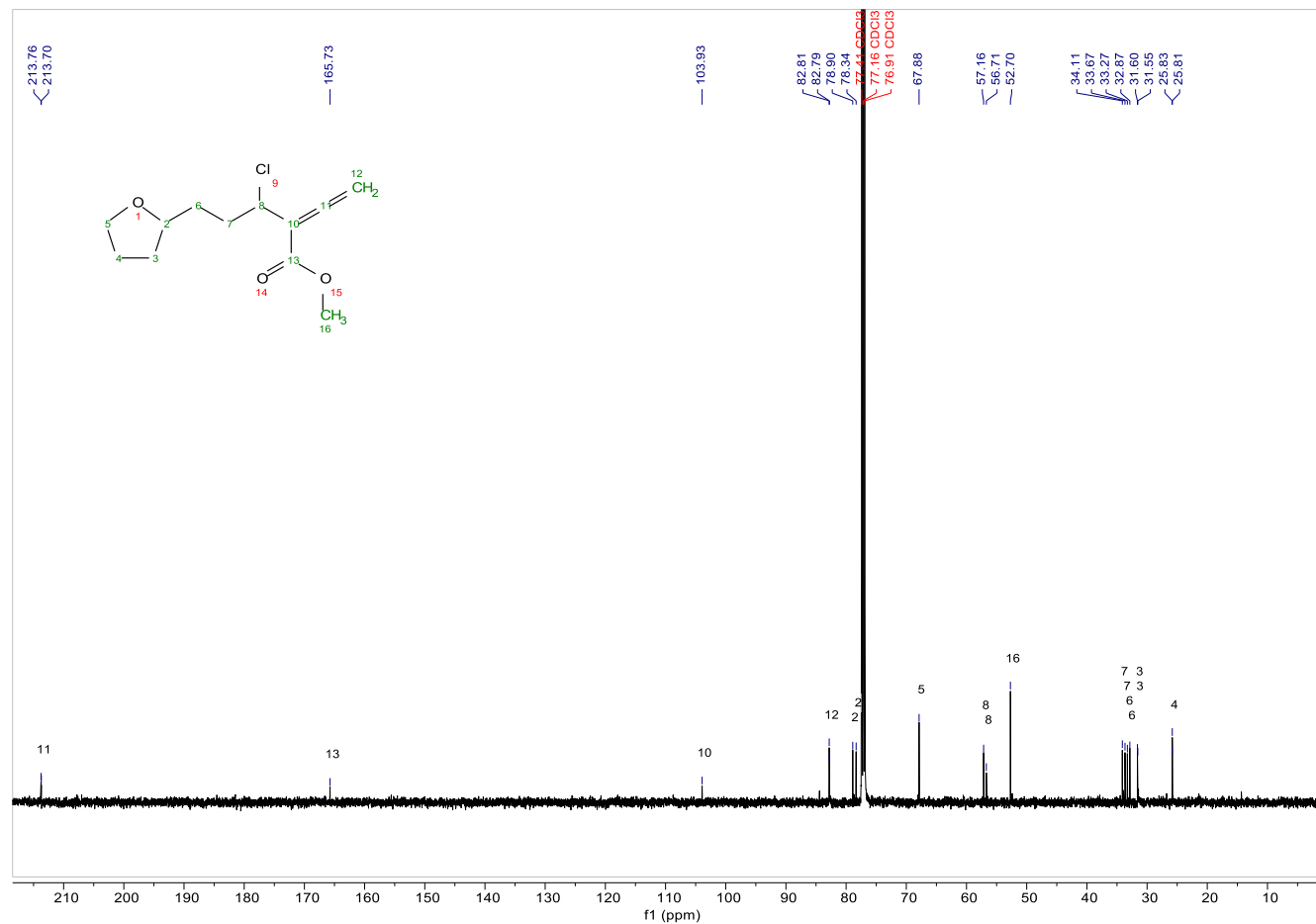
Methyl 3-hydroxy-5-(tetrahydrofuran-2-yl)-2-vinylidenepentanoate (S8j), CDCl₃, ¹³C NMR, 126 MHz



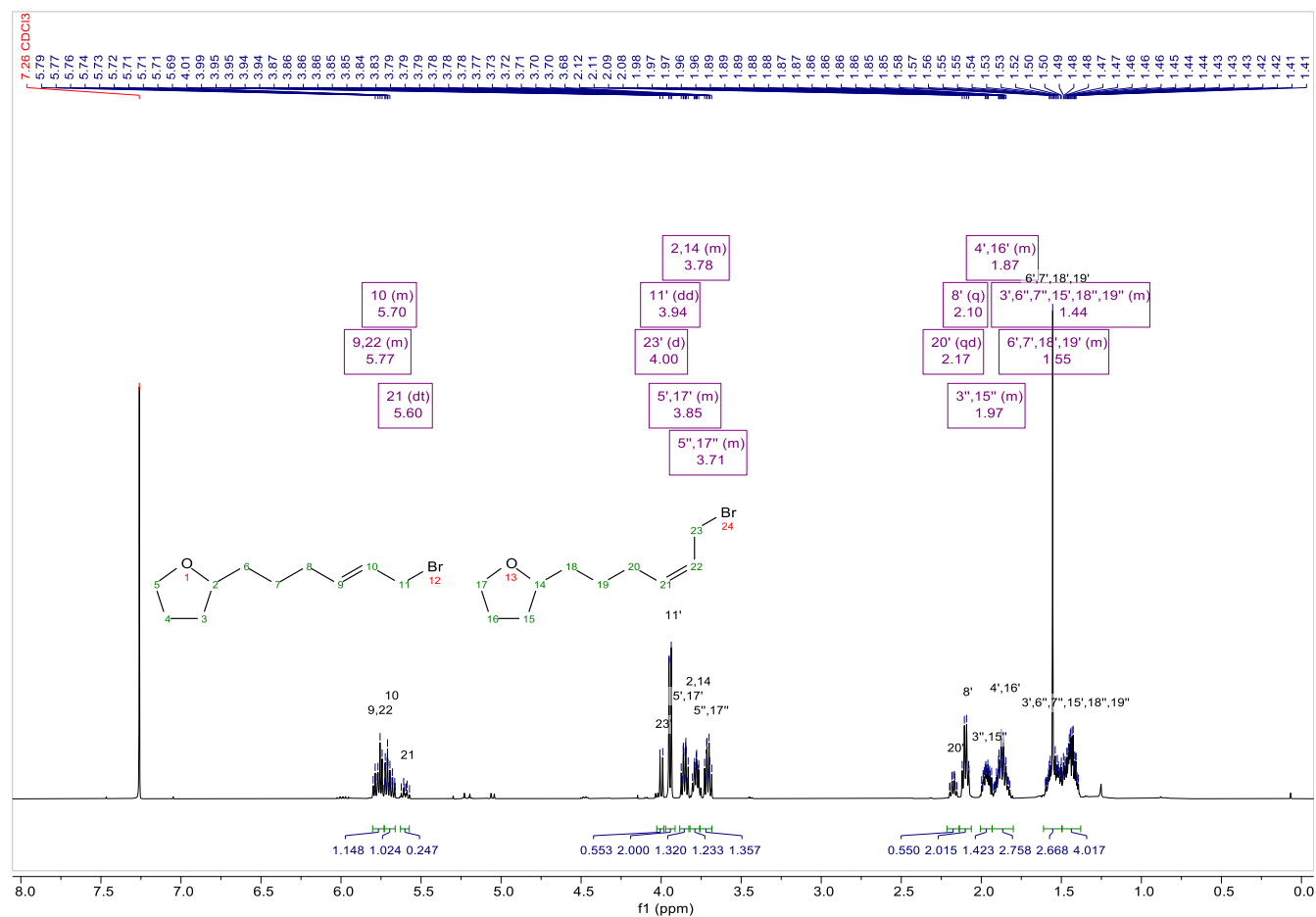
Methyl 3-chloro-5-(tetrahydrofuran-2-yl)-2-vinylidenepentanoate (23j), CDCl₃, ¹H NMR, 500 MHz



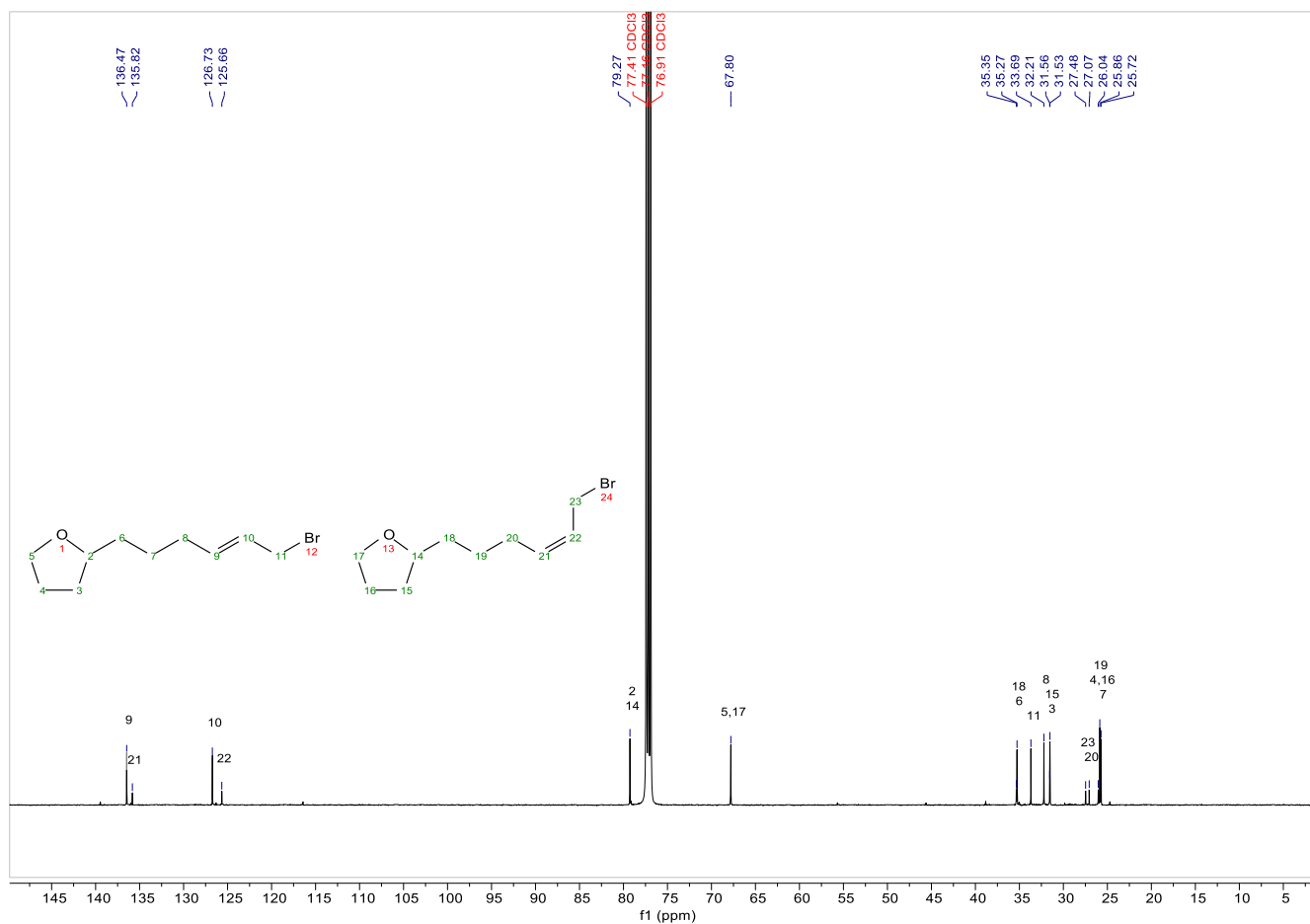
Methyl 3-chloro-5-(tetrahydrofuran-2-yl)-2-vinylidenepentanoate (23j), CDCl₃, ¹³C NMR, 126 MHz



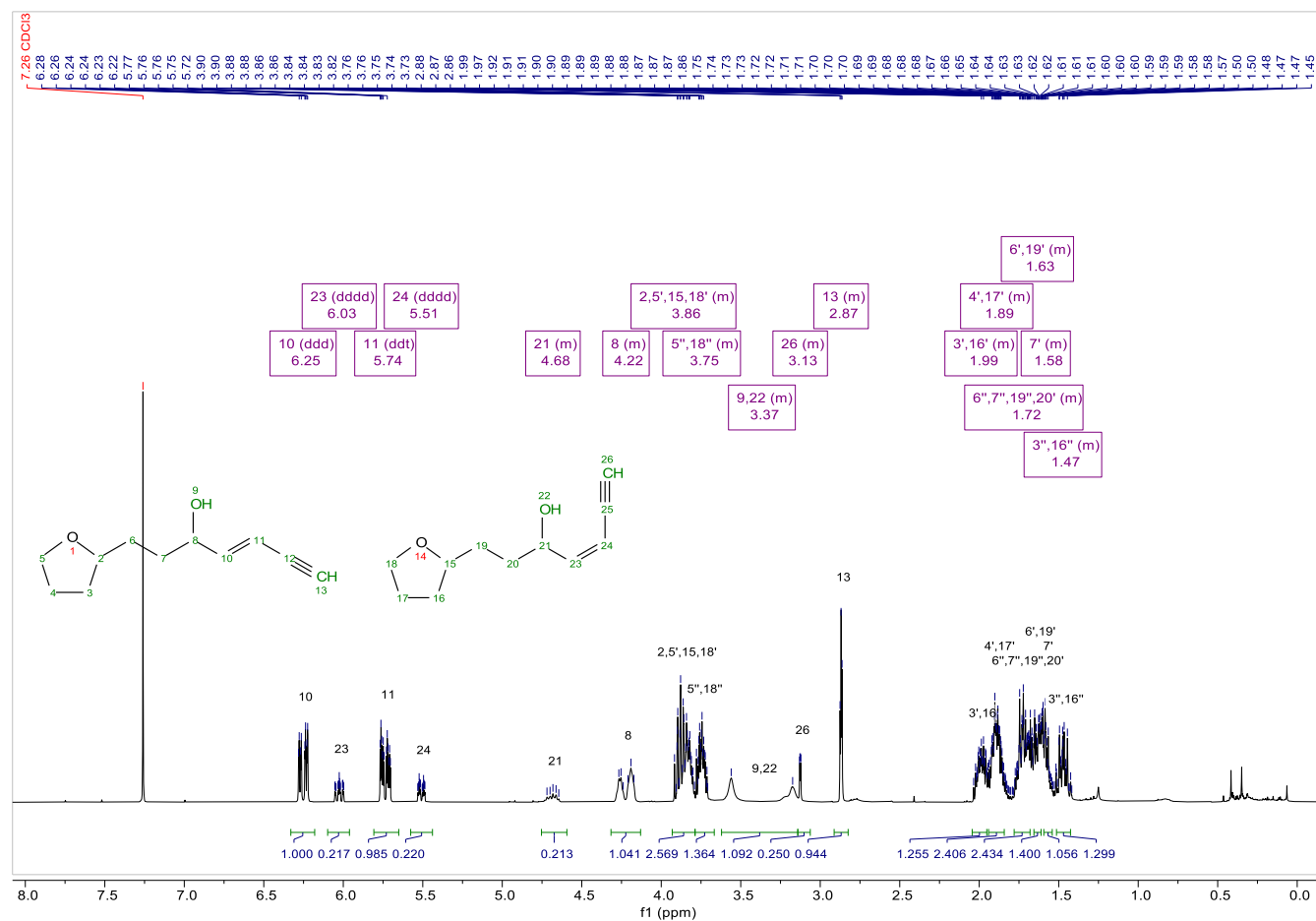
(E)-2-(6-bromohex-4-en-1-yl)tetrahydrofuran ((E)-23e') and (Z)-2-(6-bromohex-4-en-1-yl)tetrahydrofuran ((Z)-23e'), CDCl₃, ¹H NMR, 500 MHz



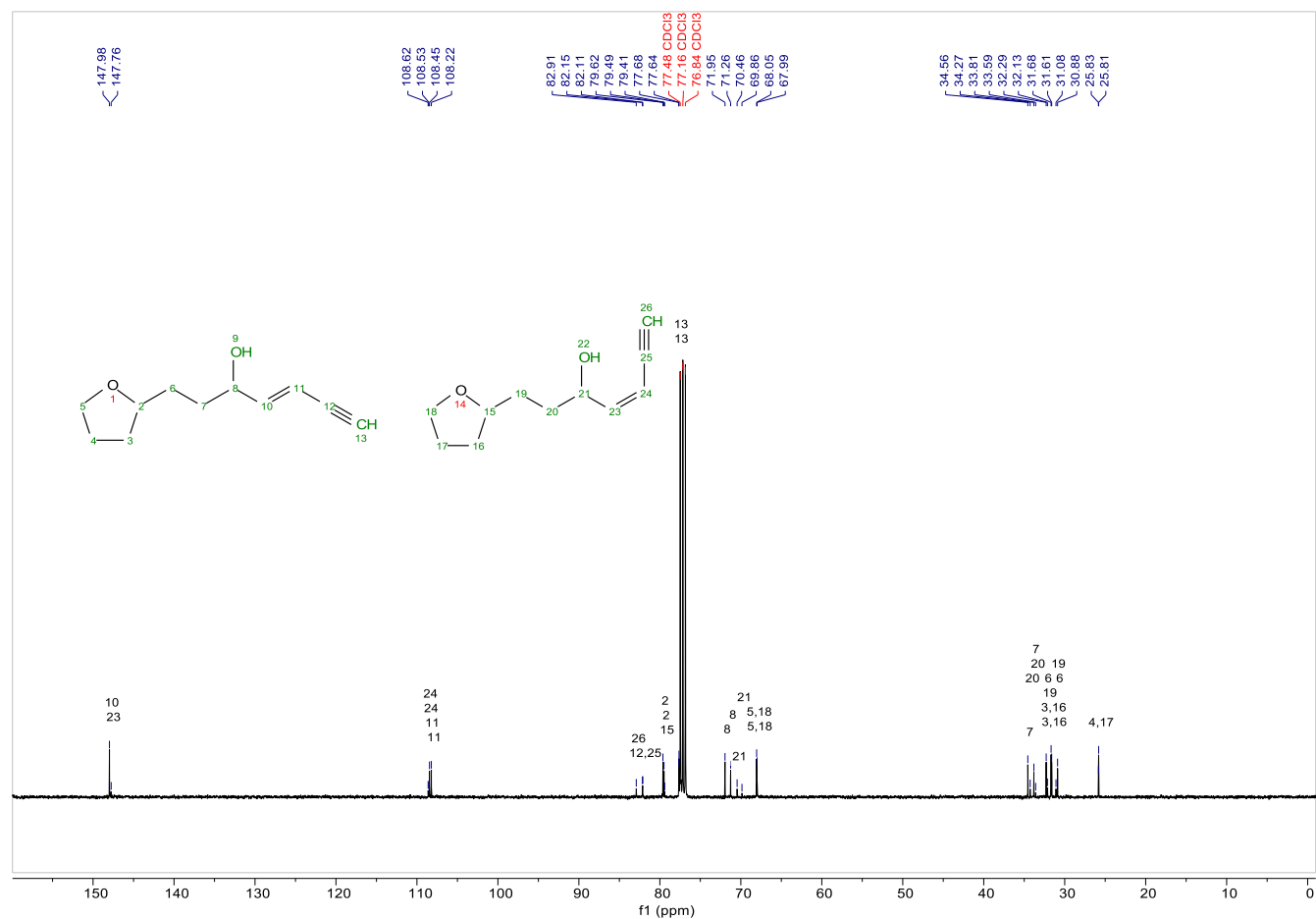
(E)-2-(6-bromohex-4-en-1-yl)tetrahydrofuran ((E)-23e') and (Z)-2-(6-bromohex-4-en-1-yl)tetrahydrofuran ((Z)-23e'), CDCl₃, ¹³C NMR, 126 MHz



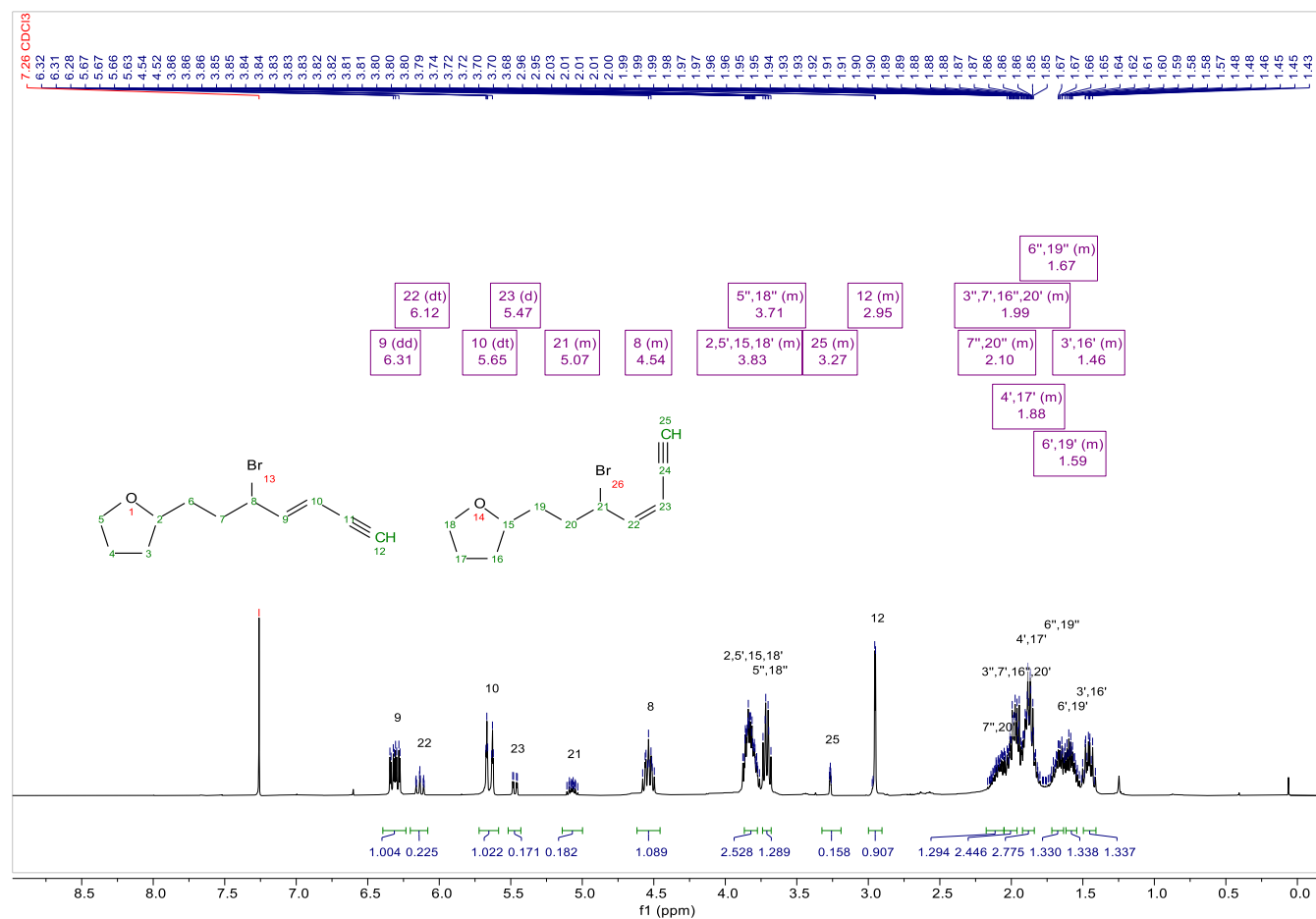
**(E)-1-(tetrahydrofuran-2-yl)hept-4-en-6-yn-3-ol and (Z)-1-(tetrahydrofuran-2-yl)hept-4-en-6-yn-3-ol (S8h),
CDCl₃, ¹H NMR, 400 MHz**



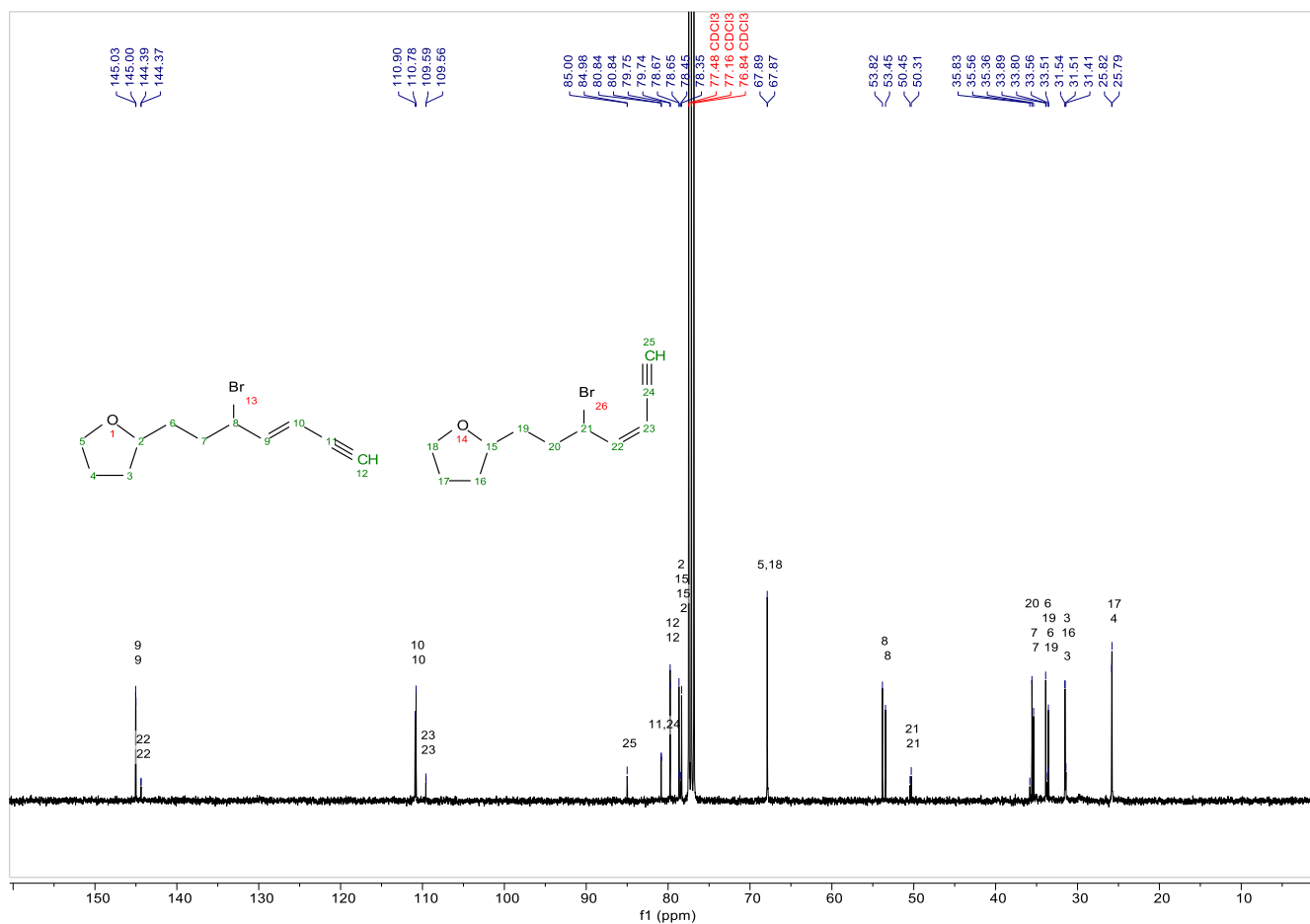
**(E)-1-(tetrahydrofuran-2-yl)hept-4-en-6-yn-3-ol and (Z)-1-(tetrahydrofuran-2-yl)hept-4-en-6-yn-3-ol (S8h),
CDCl₃, ¹³C NMR, 100 MHz**



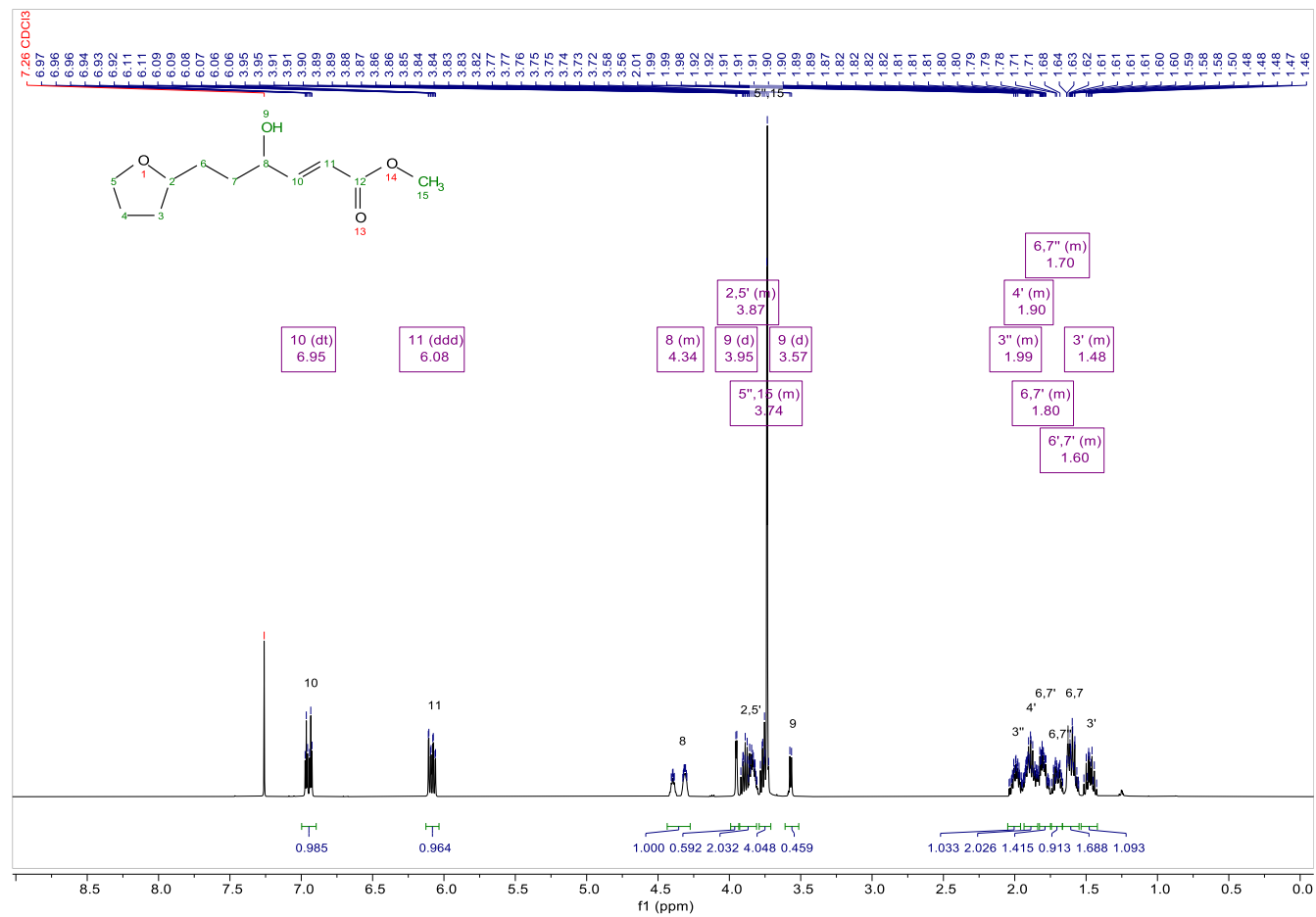
(E)-2-(3-bromohept-4-en-6-yn-1-yl)tetrahydrofuran ((E)-23h) and (Z)-2-(3-bromohept-4-en-6-yn-1-yl)tetrahydrofuran ((Z)-23h), CDCl₃, ¹H NMR, 400 MHz



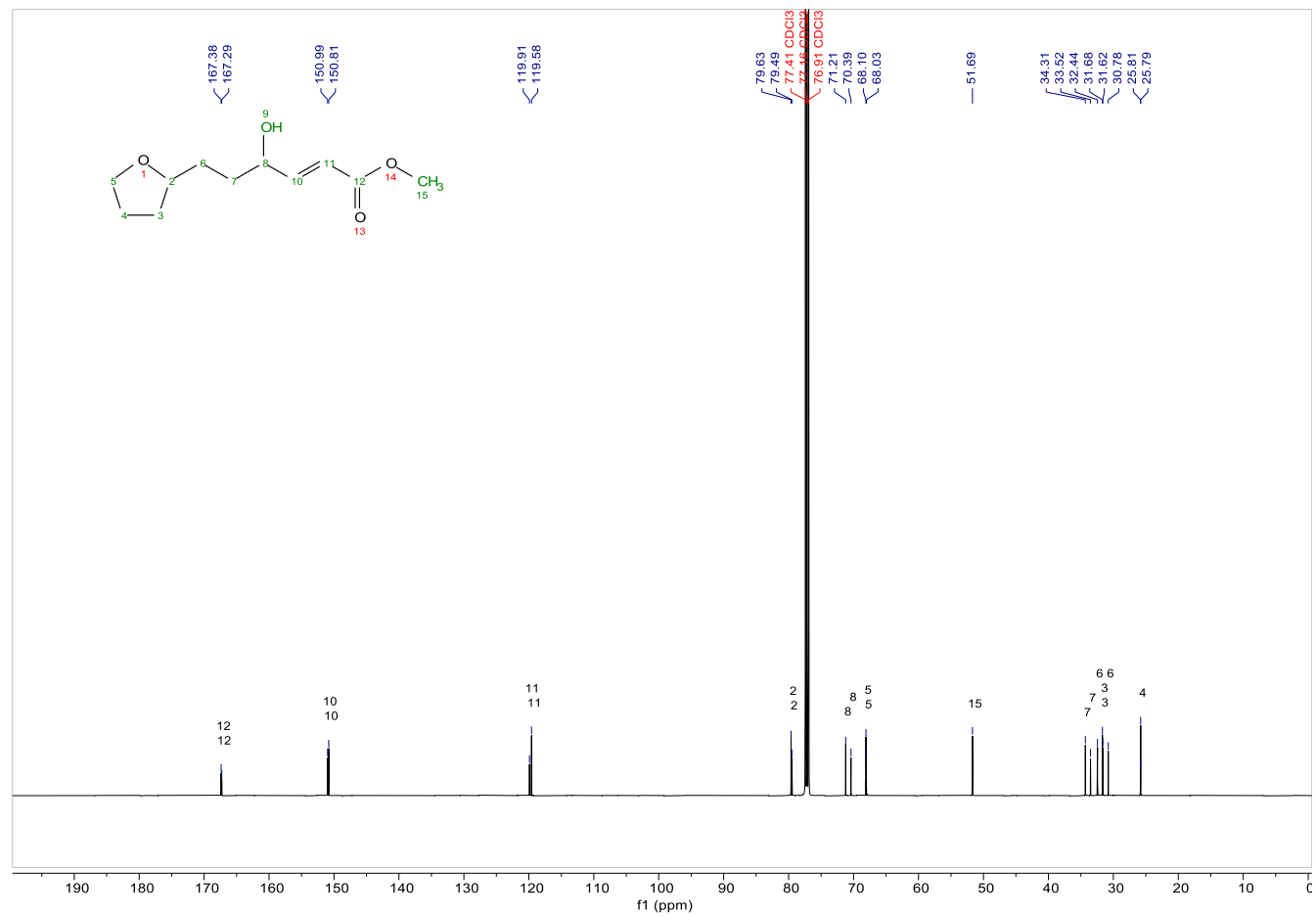
(E)-2-(3-bromohept-4-en-6-yn-1-yl)tetrahydrofuran ((*E*)-23h) and (*Z*)-2-(3-bromohept-4-en-6-yn-1-yl)tetrahydrofuran ((*Z*)-23h), CDCl₃, ¹³C NMR, 100 MHz



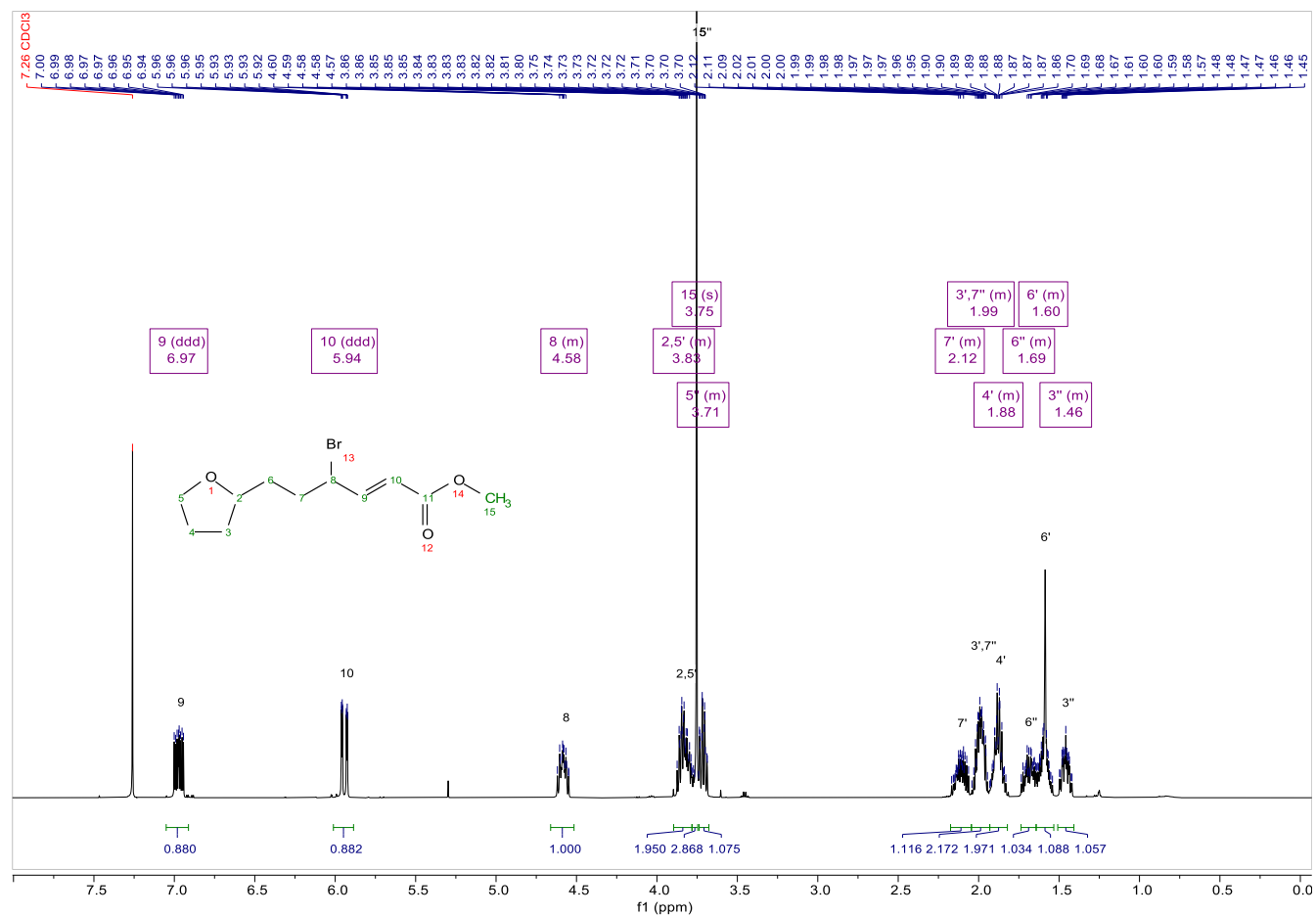
Methyl (*E*)-4-hydroxy-6-(tetrahydrofuran-2-yl)hex-2-enoate (S8d), CDCl₃, ¹H NMR, 500 MHz



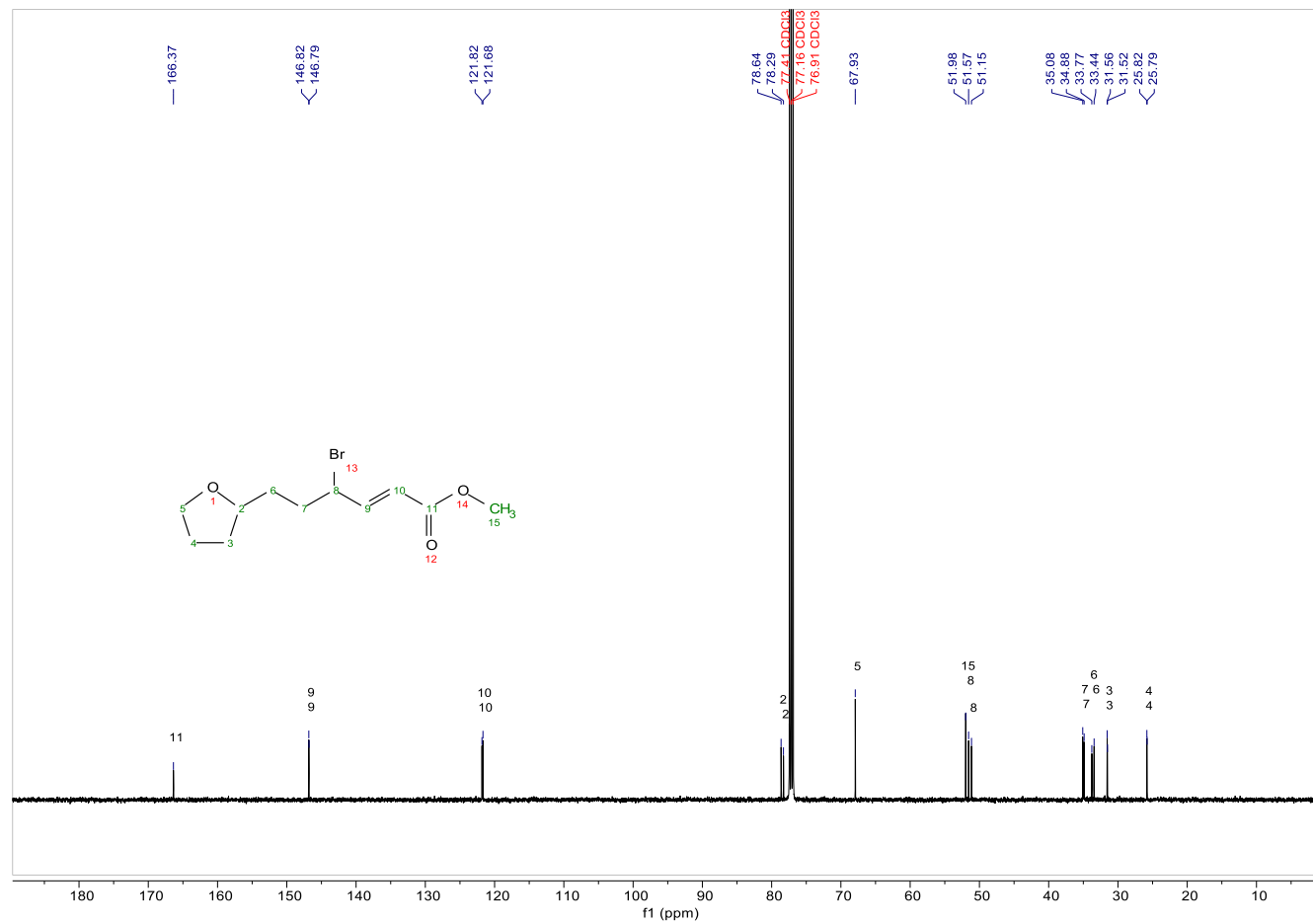
Methyl (*E*)-4-hydroxy-6-(tetrahydrofuran-2-yl)hex-2-enoate (S8d), CDCl₃, ¹³C NMR, 126 MHz



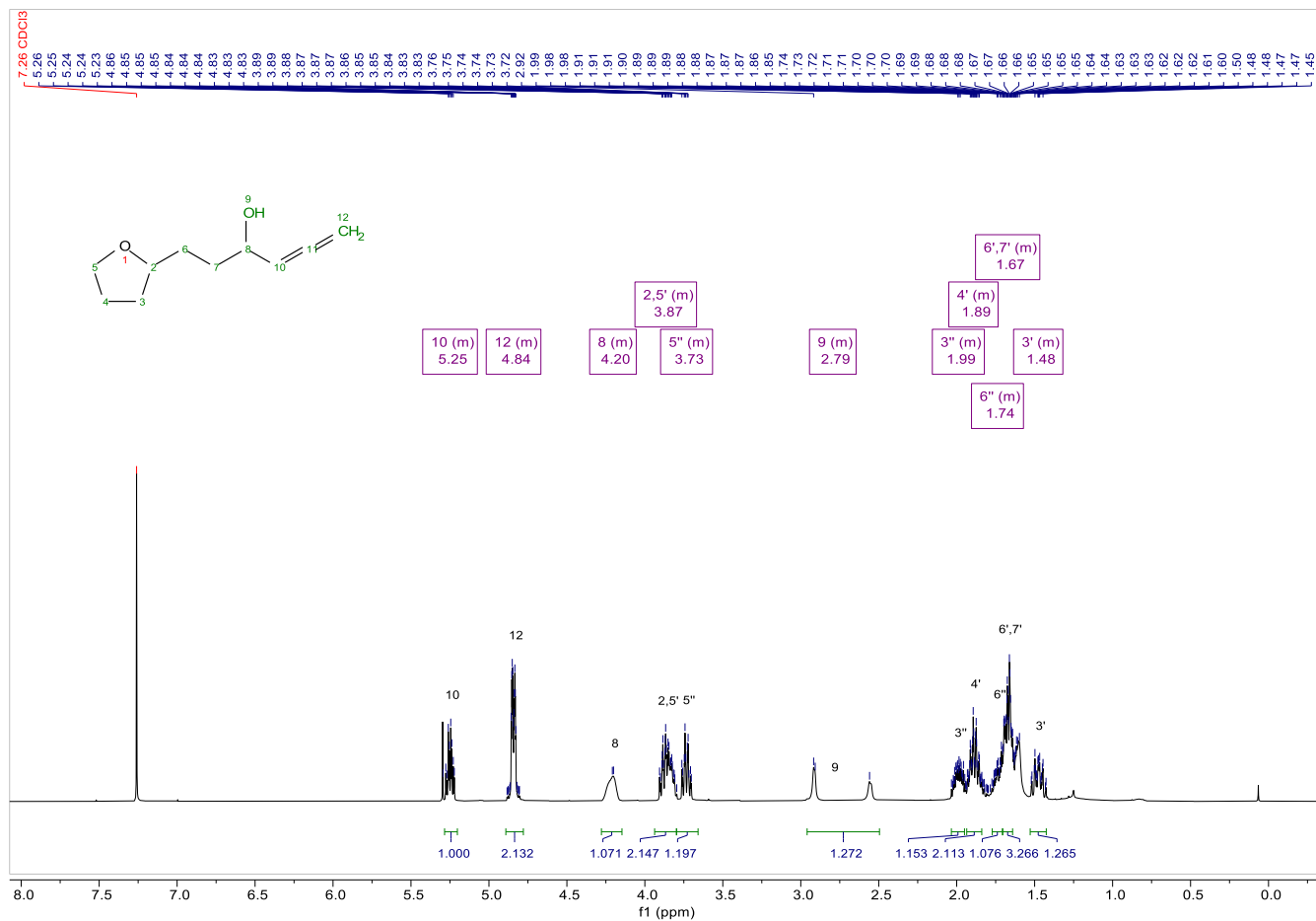
Methyl (*E*)-4-bromo-6-(tetrahydrofuran-2-yl)hex-2-enoate (23d), CDCl₃, ¹H NMR, 500 MHz



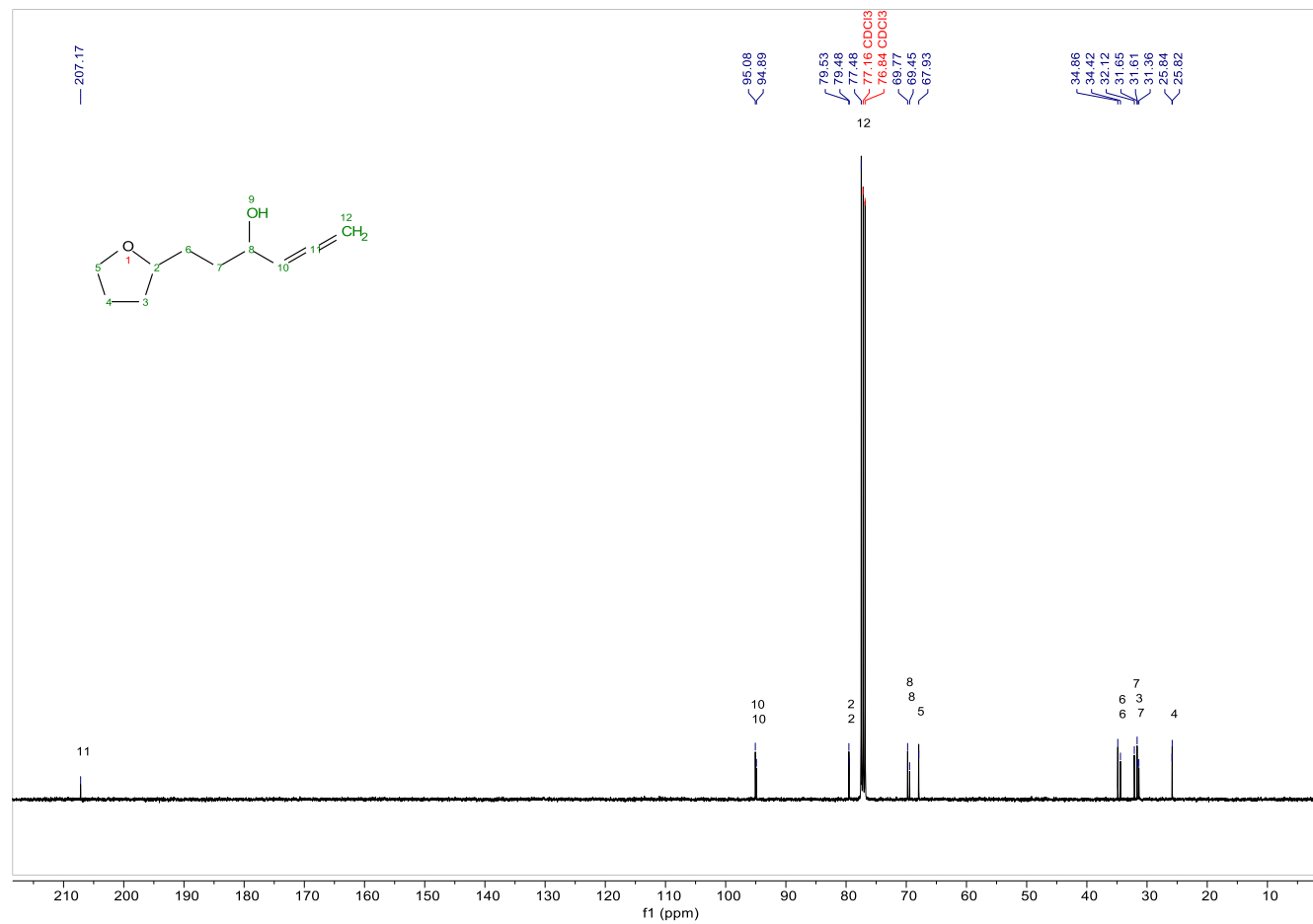
Methyl (*E*)-4-bromo-6-(tetrahydrofuran-2-yl)hex-2-enoate (23d), CDCl₃, ¹³C NMR, 126 MHz



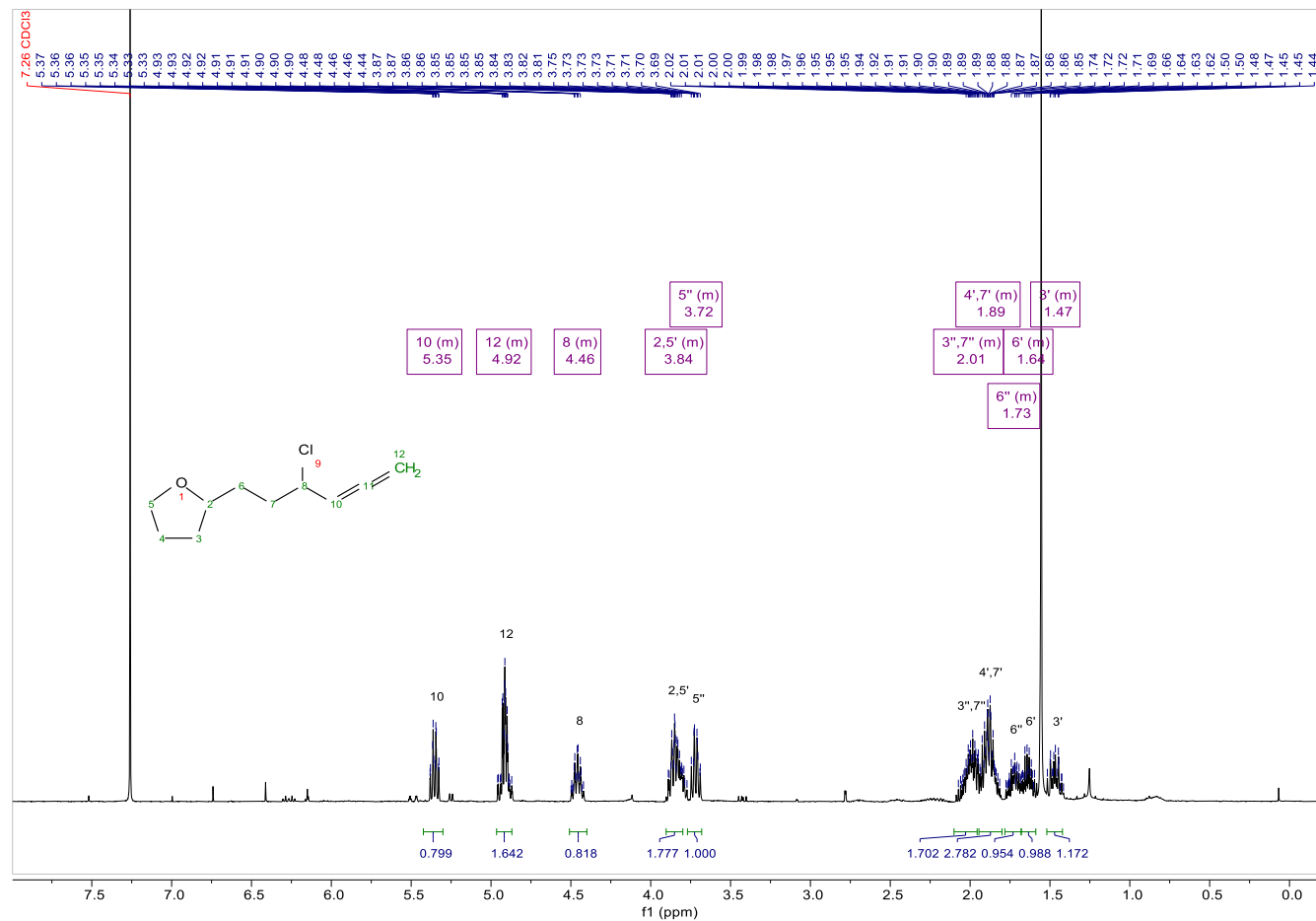
1-(Tetrahydrofuran-2-yl)hexa-4,5-dien-3-ol (S8x), CDCl₃, ¹H NMR, 400 MHz



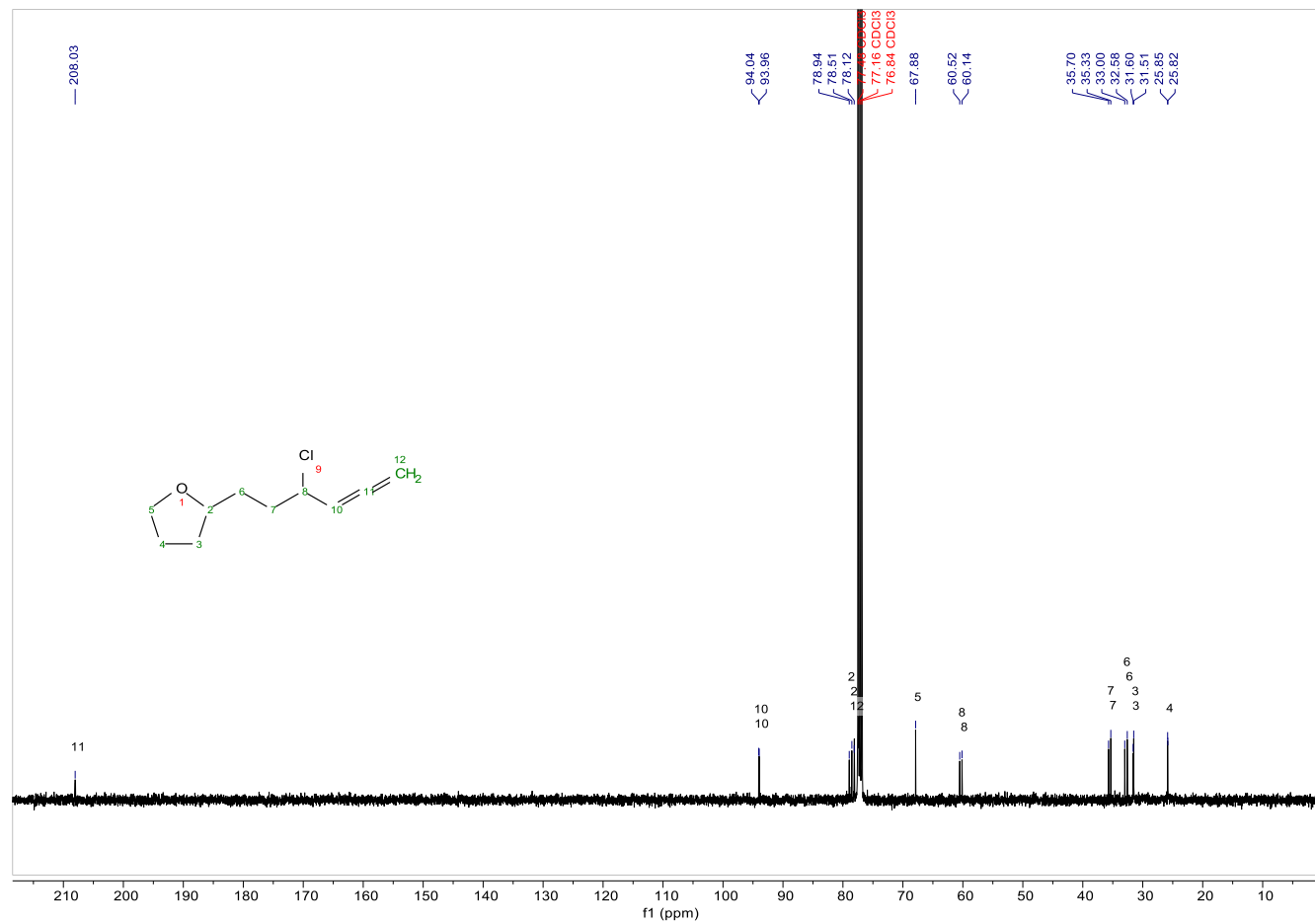
1-(Tetrahydrofuran-2-yl)hexa-4,5-dien-3-ol (S8x), CDCl₃, ¹³C NMR, 100 MHz



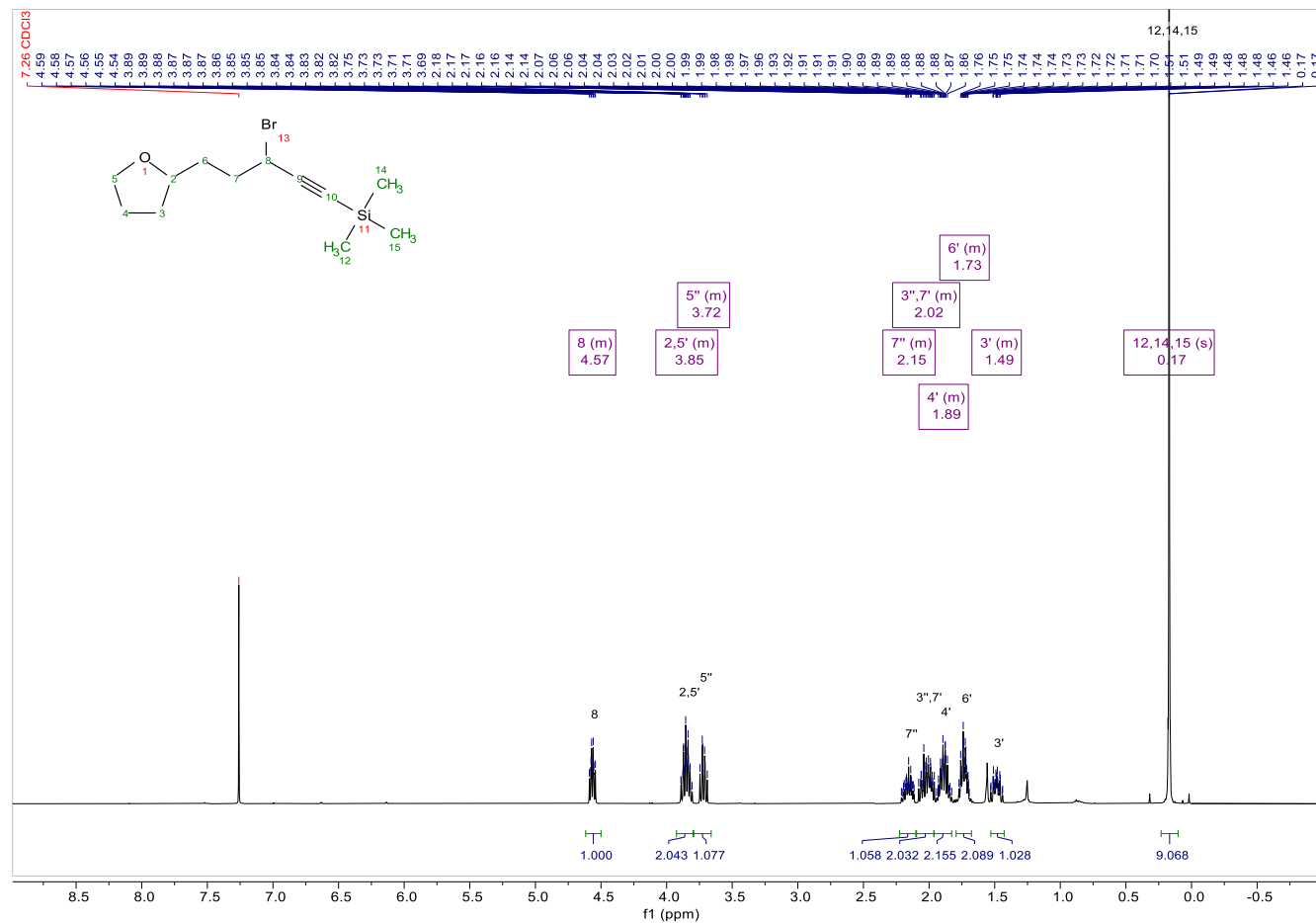
2-(3-Chlorohexa-4,5-dien-1-yl)tetrahydrofuran (23x), CDCl₃, ¹H NMR, 400 MHz



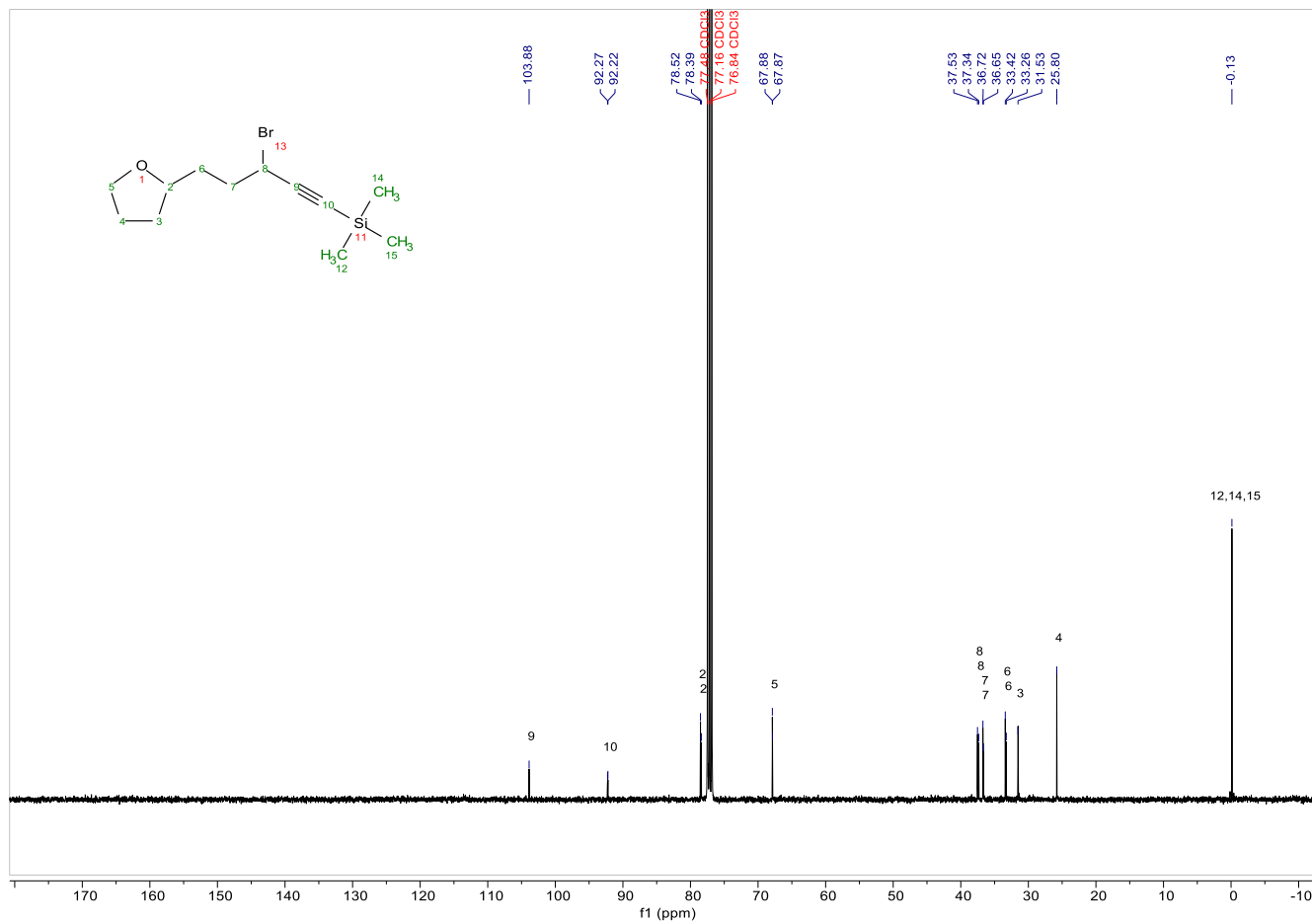
2-(3-Chlorohexa-4,5-dien-1-yl)tetrahydrofuran (23x), CDCl₃, ¹³C NMR, 100 MHz



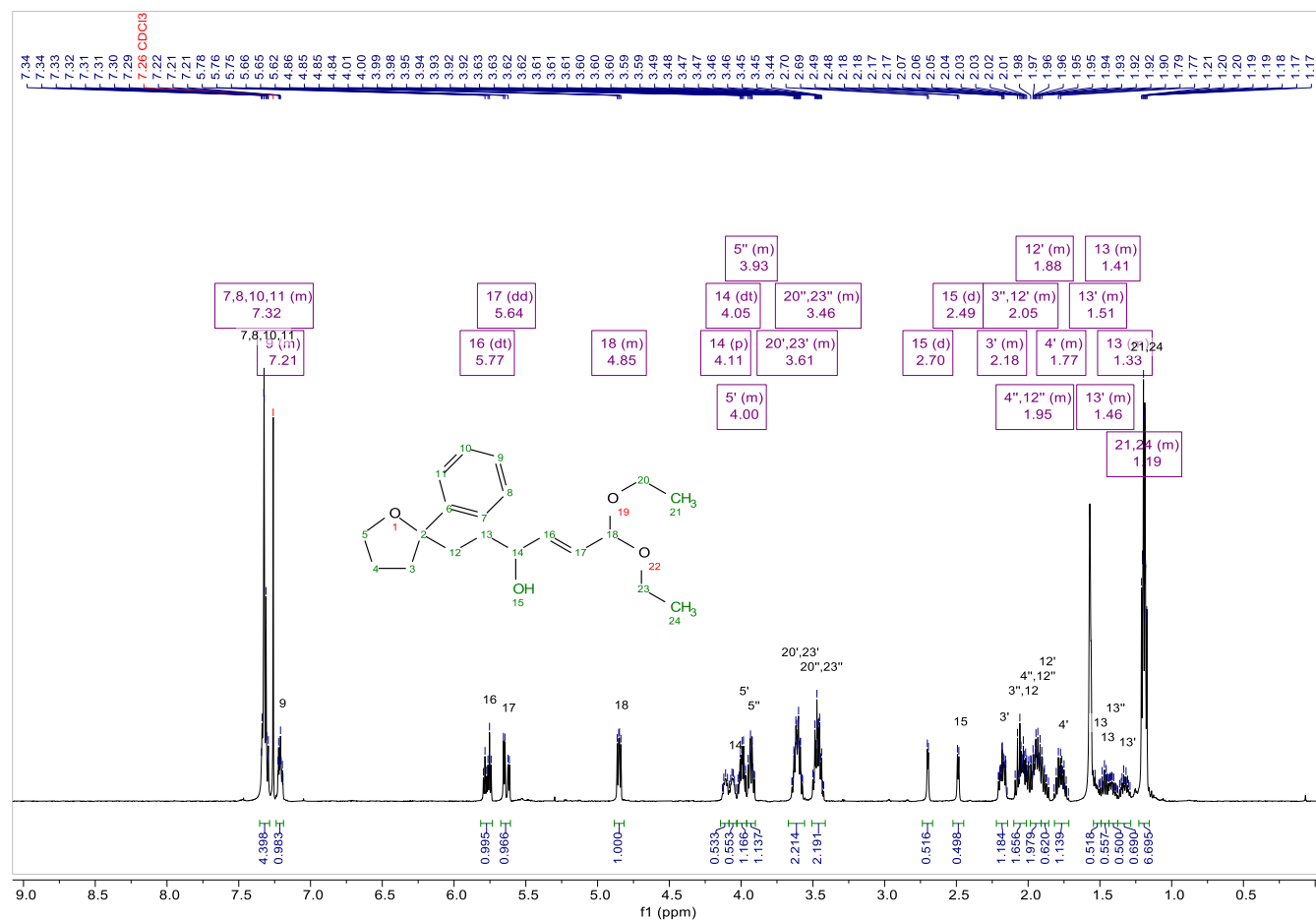
(3-Bromo-5-(tetrahydrofuran-2-yl)pent-1-yn-1-yl)trimethylsilane (23i), CDCl₃, ¹H NMR, 400 MHz



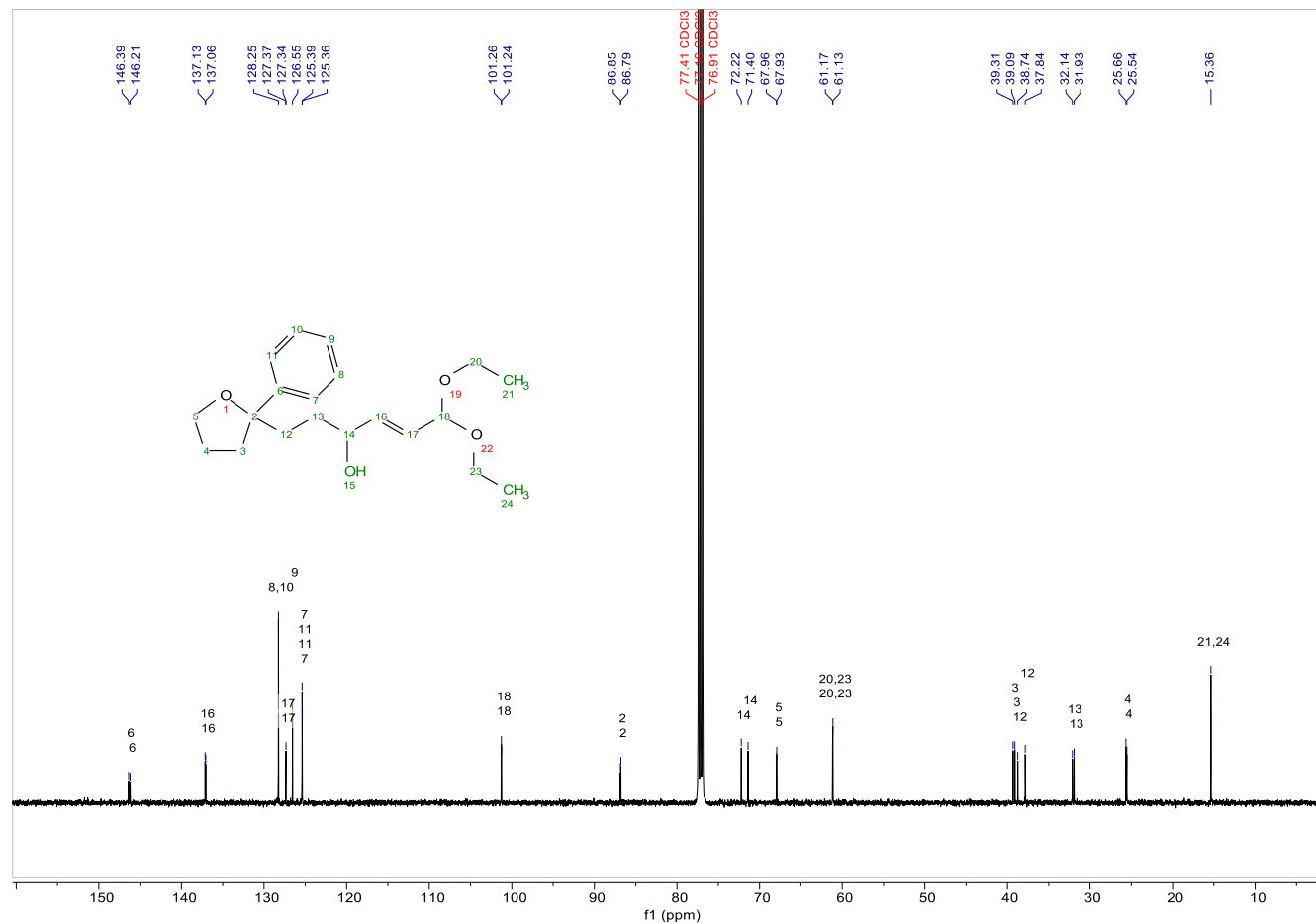
(3-Bromo-5-(tetrahydrofuran-2-yl)pent-1-yn-1-yl)trimethylsilane (23i), CDCl₃, ¹³C NMR, 100 MHz



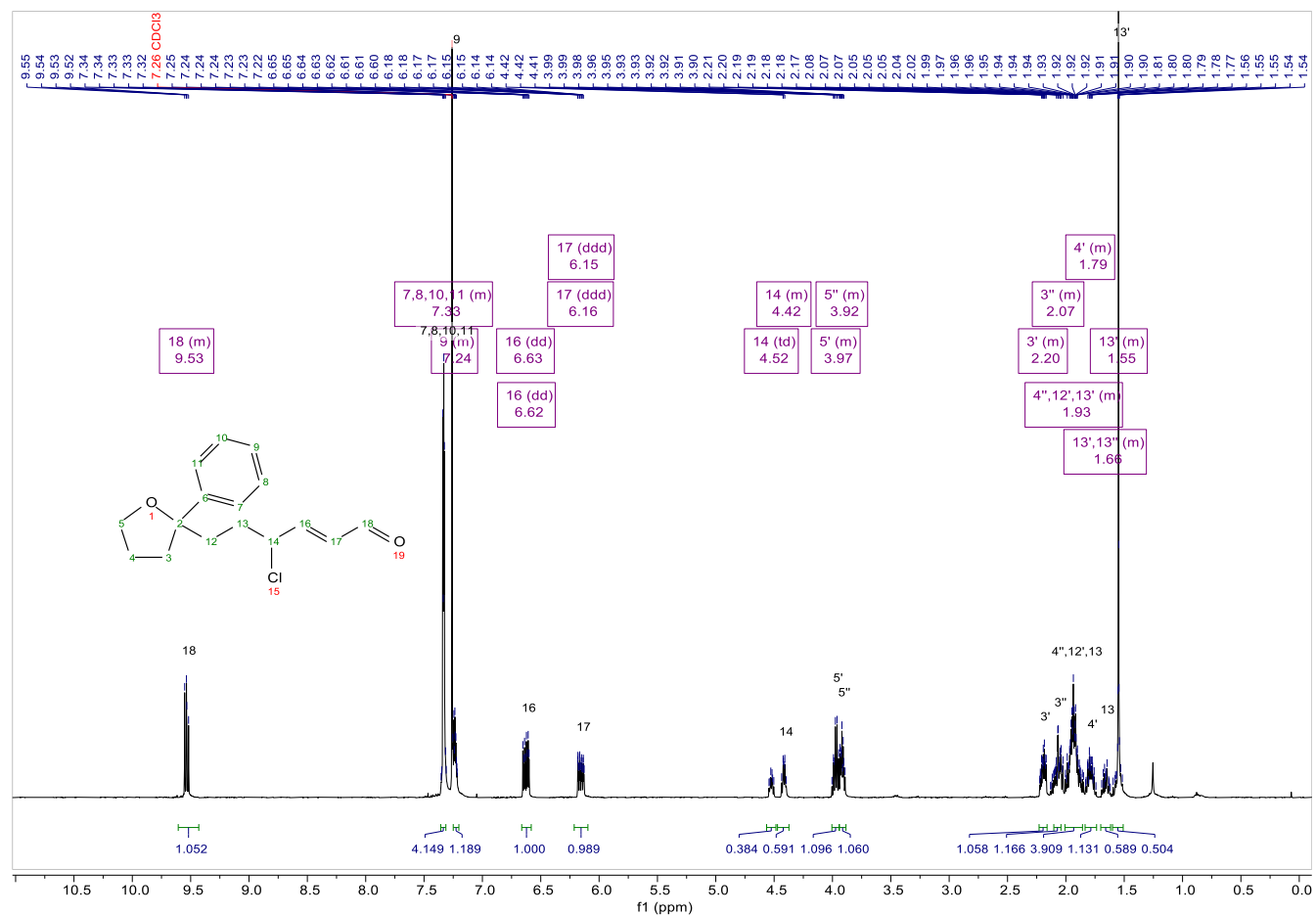
(E)-6,6-diethoxy-1-(2-phenyltetrahydrofuran-2-yl)hex-4-en-3-ol (S8q), CDCl₃, ¹H NMR, 500 MHz



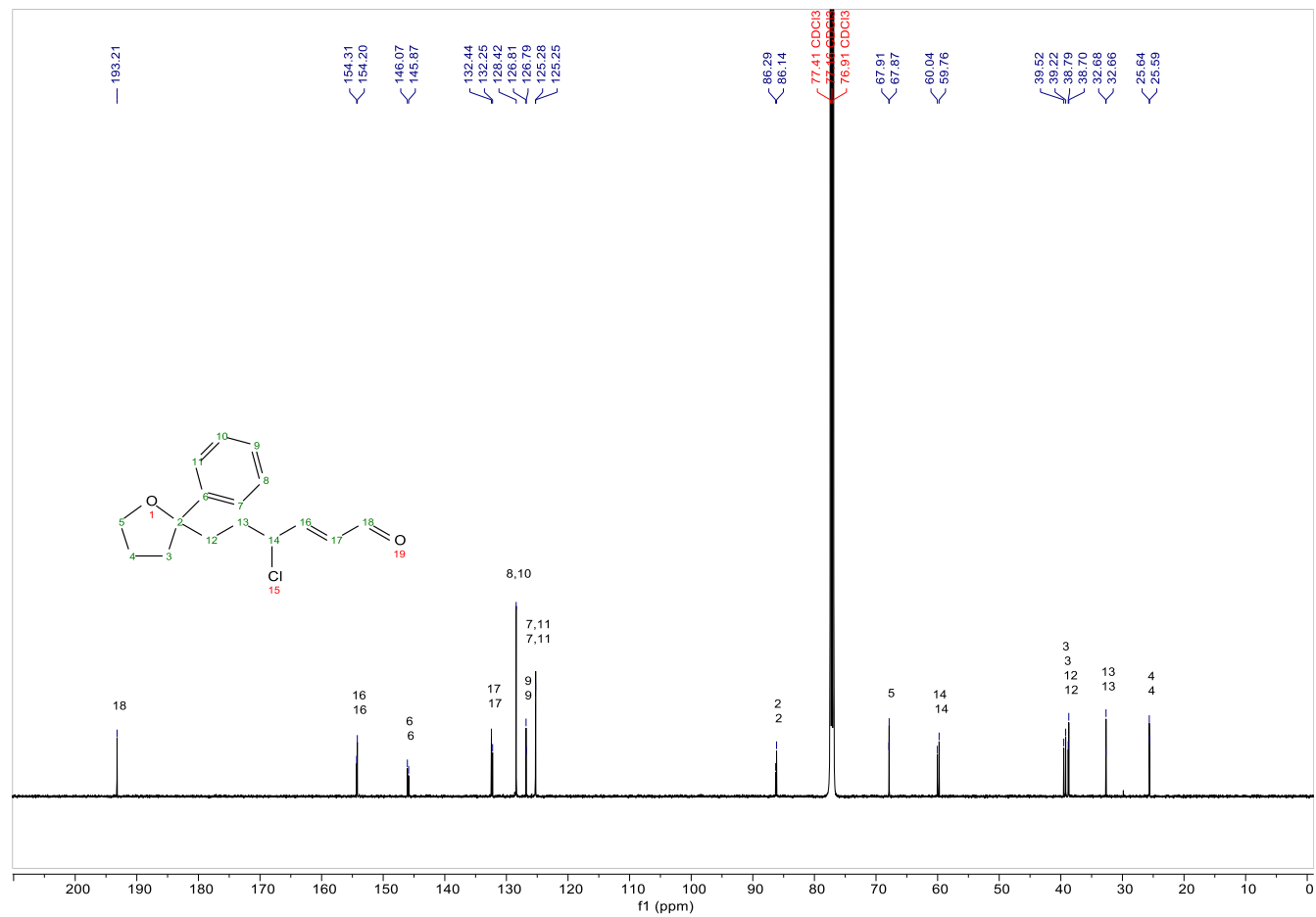
(E)-6,6-diethoxy-1-(2-phenyltetrahydrofuran-2-yl)hex-4-en-3-ol (S8q), CDCl₃, ¹³C NMR, 126 MHz



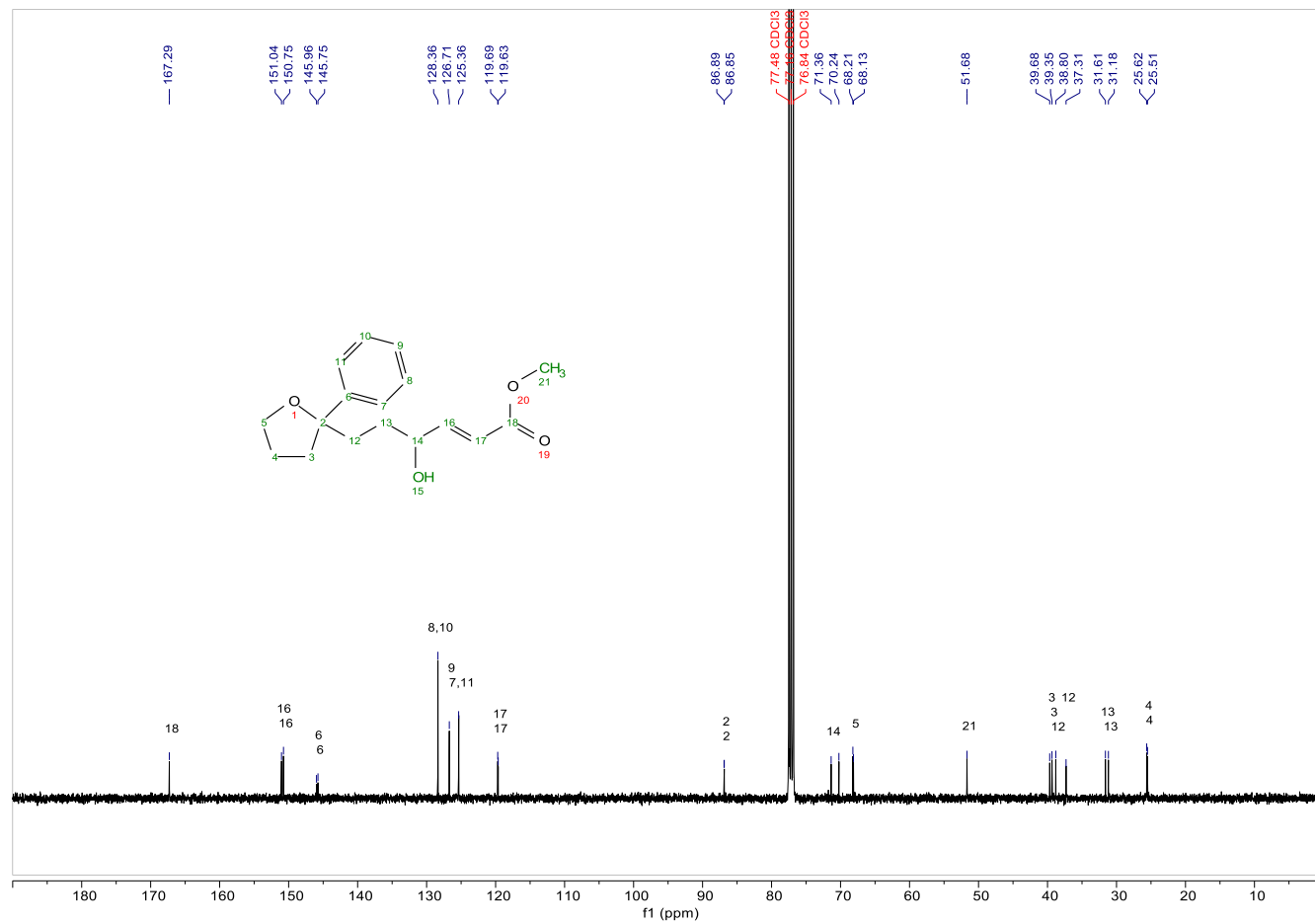
(E)-4-Chloro-6-(2-phenyltetrahydrofuran-2-yl)hex-2-enal (23q), CDCl₃, ¹H NMR, 500 MHz



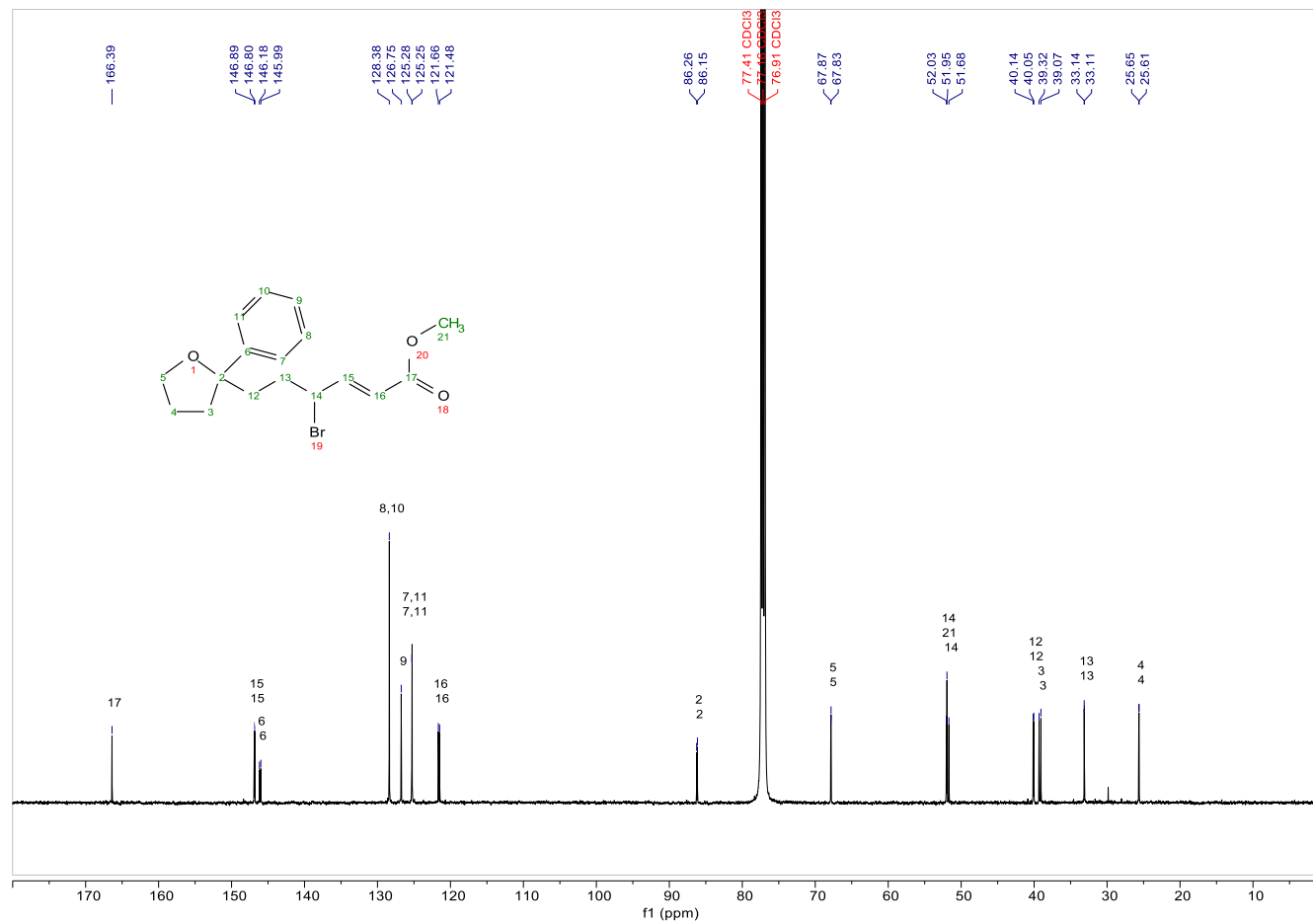
(E)-4-Chloro-6-(2-phenyltetrahydrofuran-2-yl)hex-2-enal (23q), CDCl₃, ¹³C NMR, 126 MHz



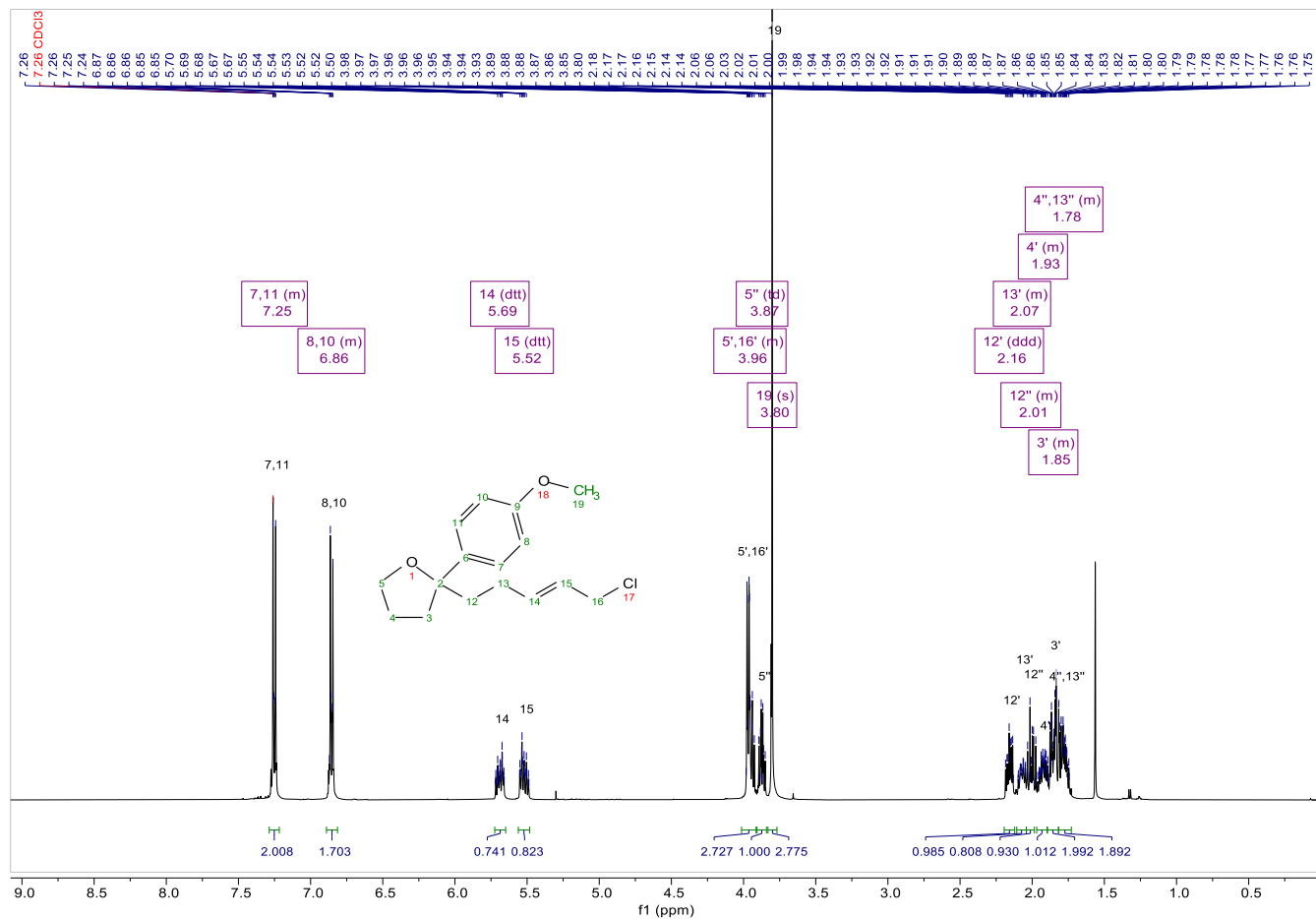
Methyl (*E*)-4-hydroxy-6-(2-phenyltetrahydrofuran-2-yl)hex-2-enoate (S8r), CDCl₃, ¹³C NMR, 100 MHz



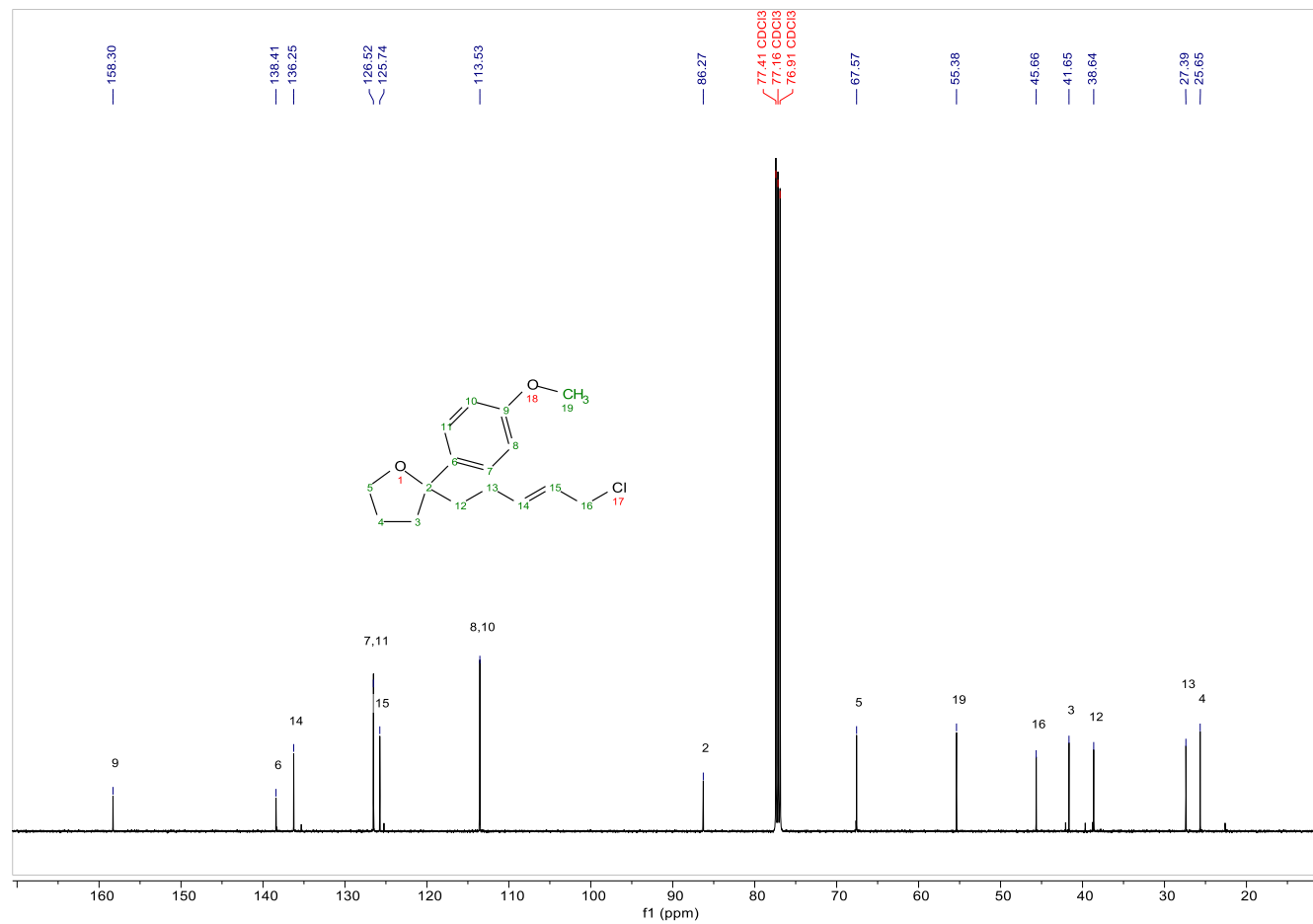
Methyl (*E*)-4-bromo-6-(2-phenyltetrahydrofuran-2-yl)hex-2-enoate (23r), CDCl₃, ¹³C NMR, 126 MHz



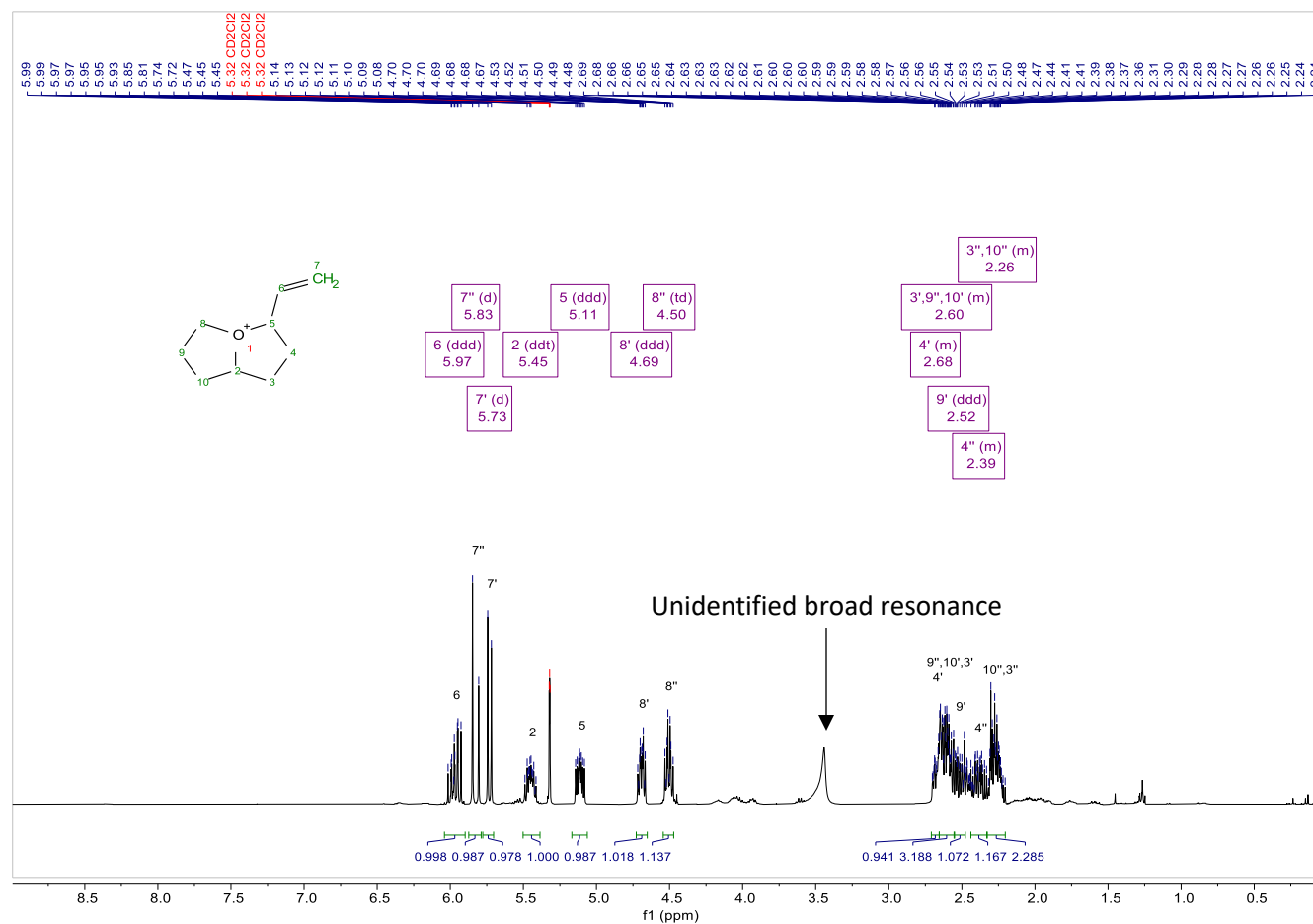
(E)-2-(5-Chloropent-3-en-1-yl)-2-(4-methoxyphenyl)tetrahydrofuran (23p), CDCl₃, ¹H NMR, 500 MHz



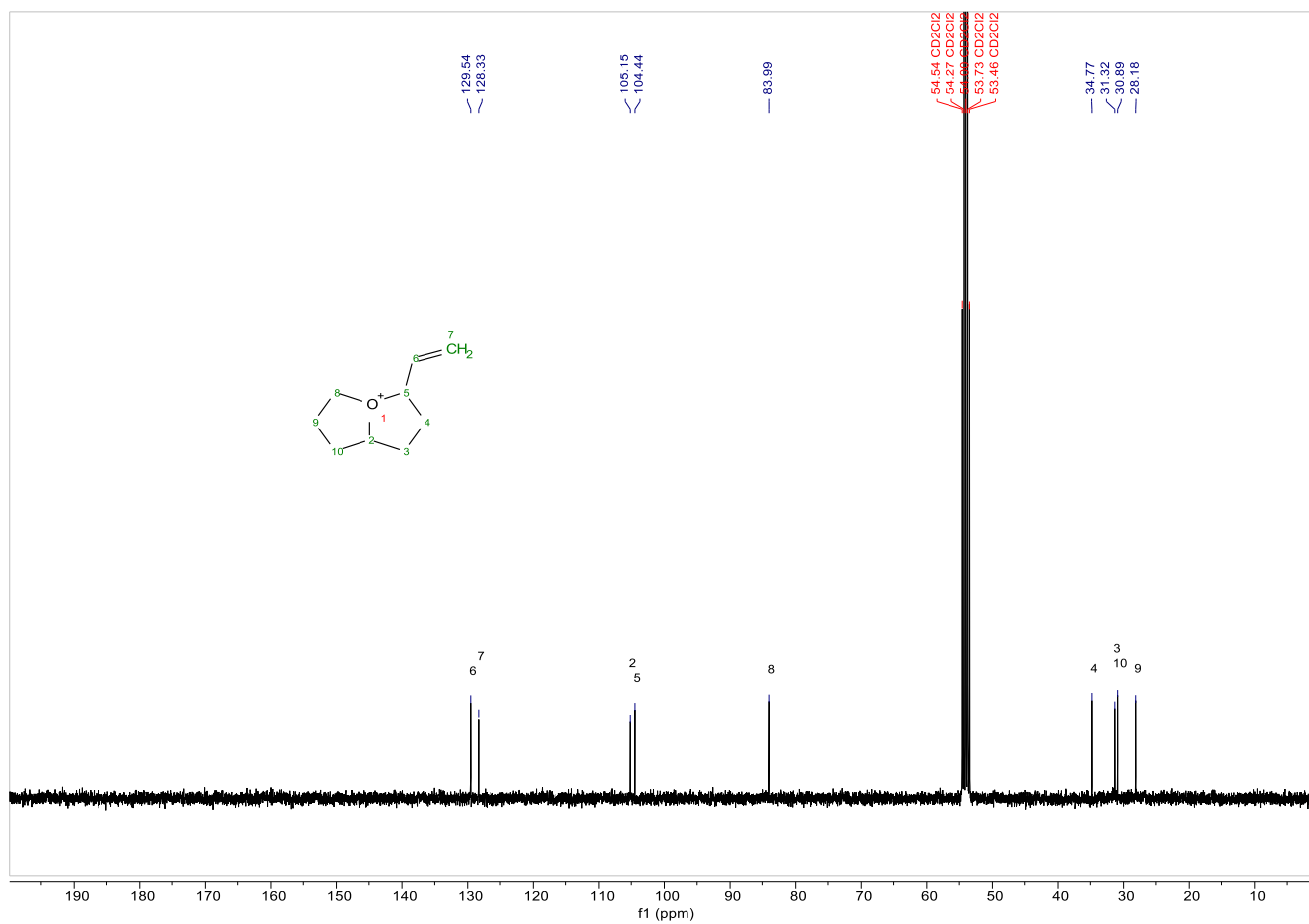
(E)-2-(5-Chloropent-3-en-1-yl)-2-(4-methoxyphenyl)tetrahydrofuran (23p), CDCl₃, ¹³CNMR, 126 MHz



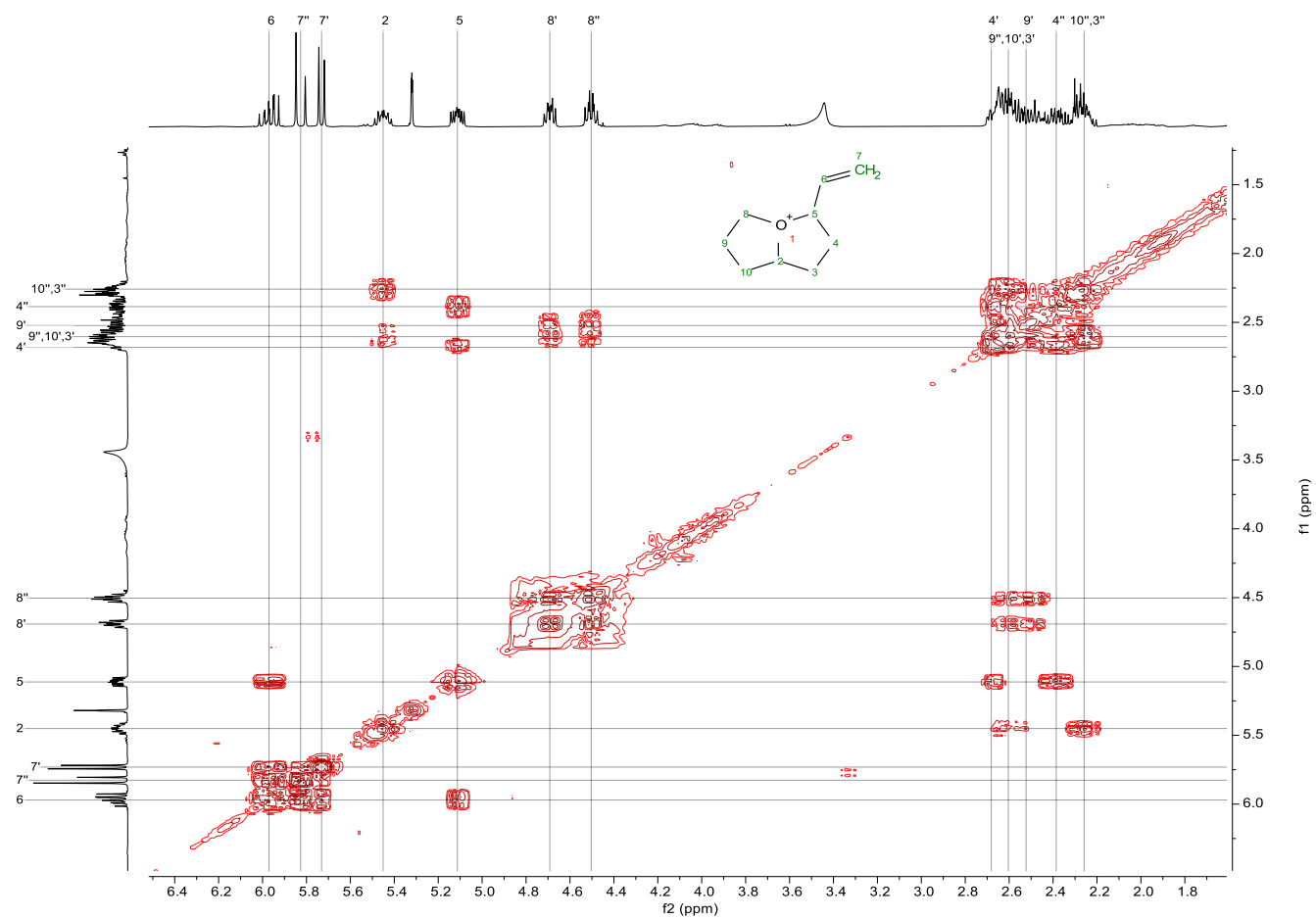
(3*R,7*aS**)-3-Vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium hexafluoroantimonate 24a•SbF₆, CD₂Cl₂, ¹H NMR, 400 MHz**



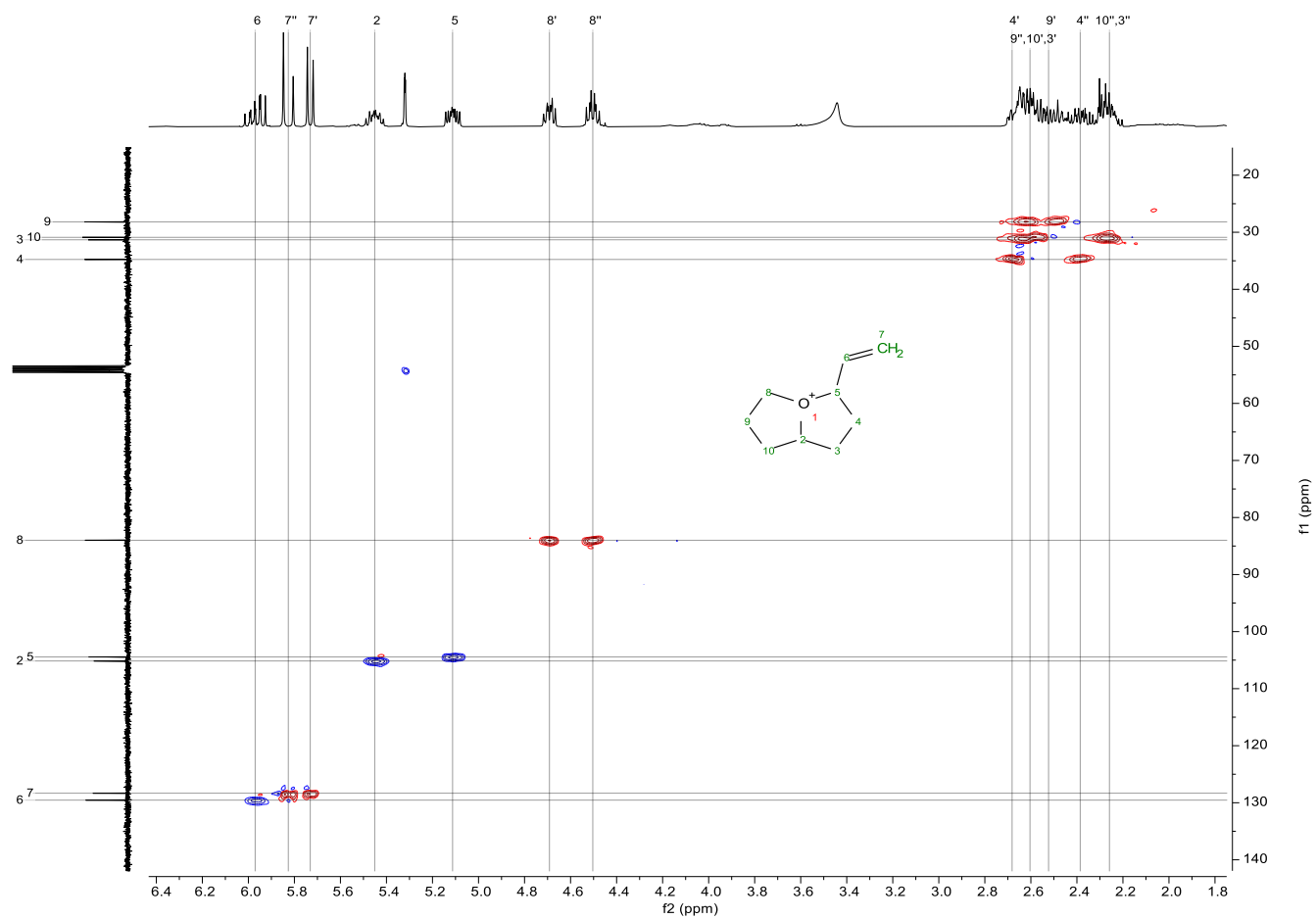
(3*R,7*aS**)-3-Vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium hexafluoroantimonate 24a•SbF₆, CD₂Cl₂, ¹³C NMR, 100 MHz**



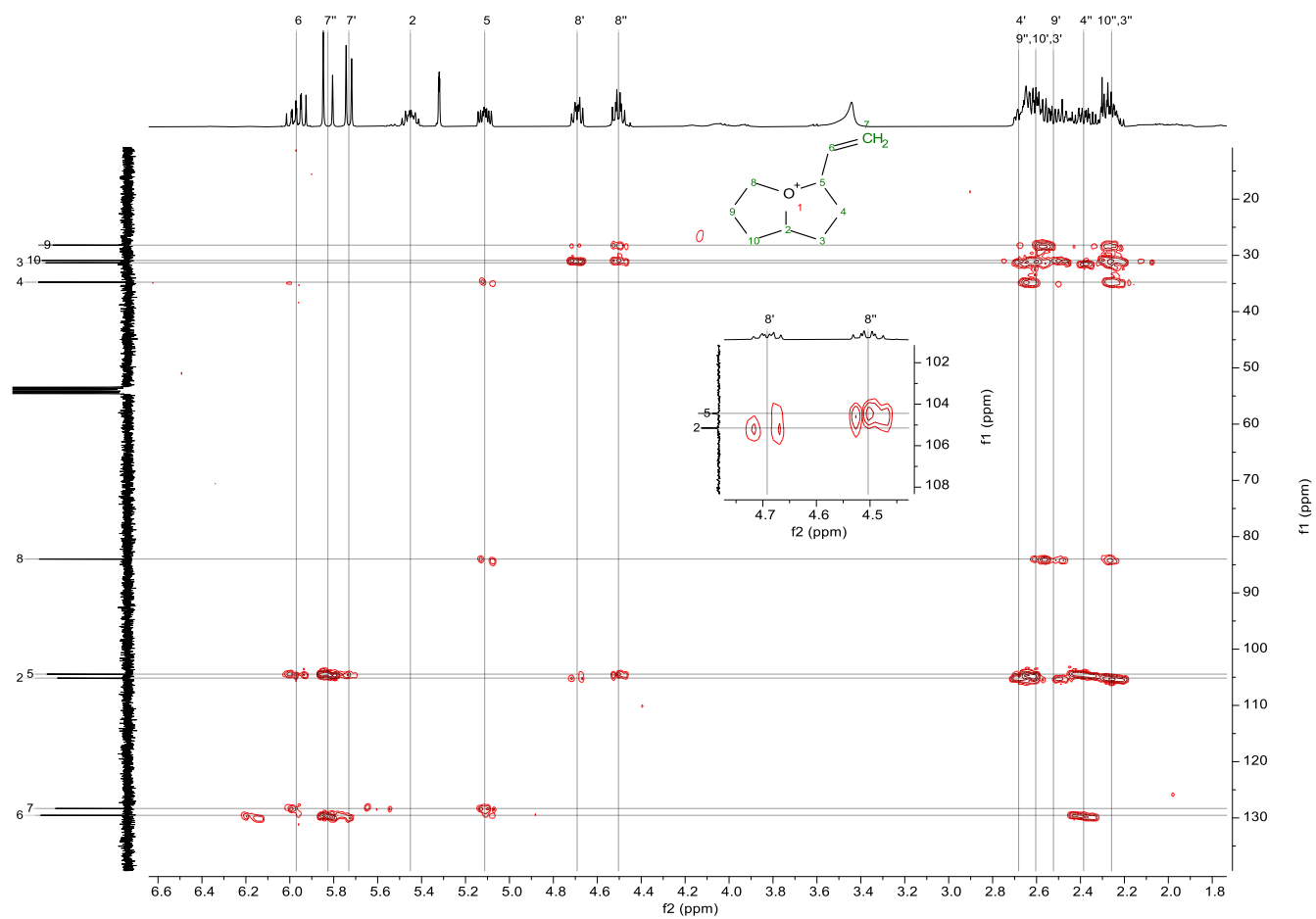
(3*R,7*aS**)-3-Vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium hexafluoroantimonate 24a•SbF₆, CD₂Cl₂, ¹H-¹H
COSY NMR, 400/400 MHz**



(3*R,7*aS**)-3-Vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium hexafluoroantimonate 24a•SbF₆, CD₂Cl₂, ¹H-¹³C HSQC NMR, 400/100 MHz**

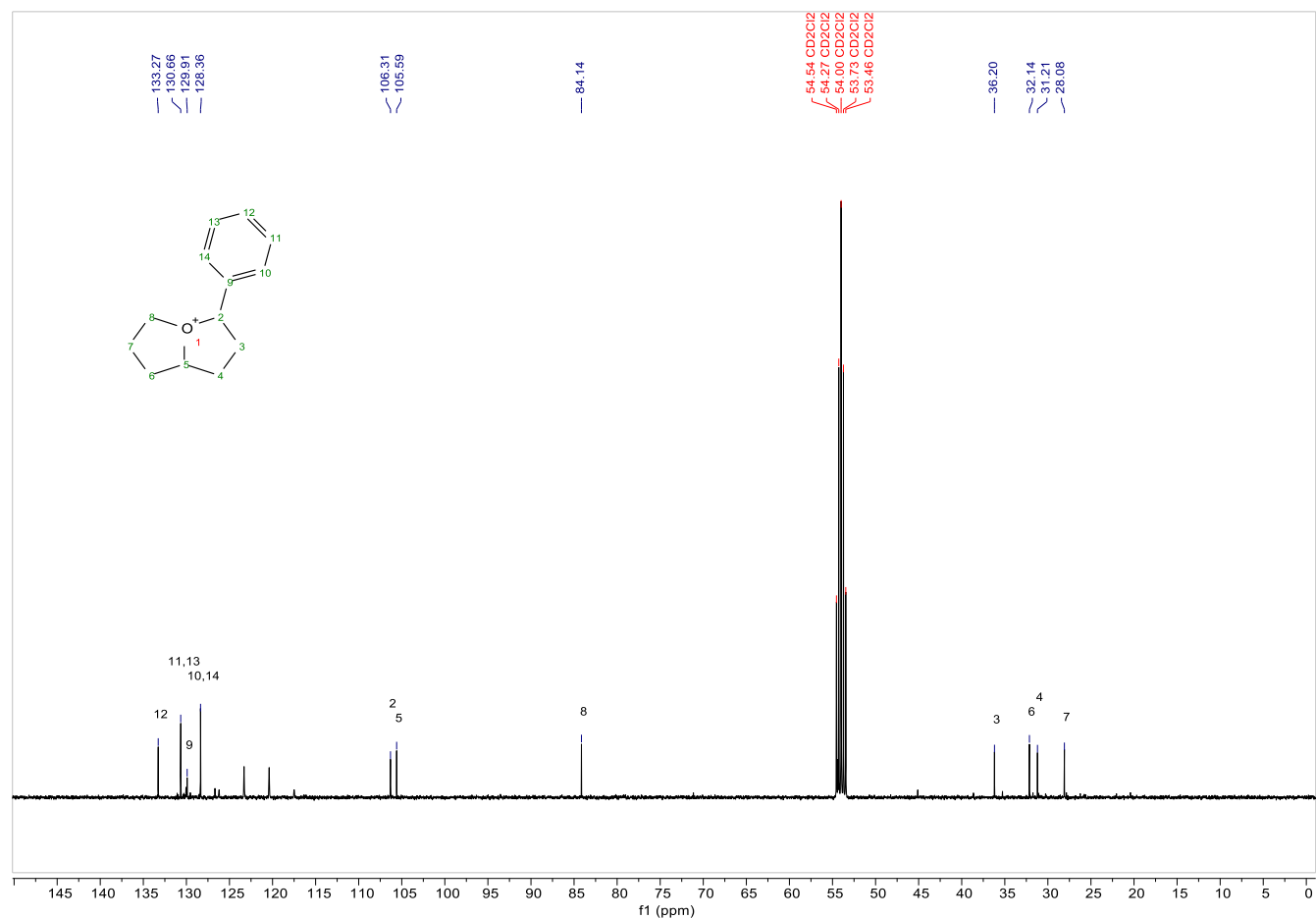


(3*R,7*aS**)-3-Vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium hexafluoroantimonate 24a•SbF₆, CD₂Cl₂, ¹H-¹³C
HMBC NMR, 400/100 MHz**



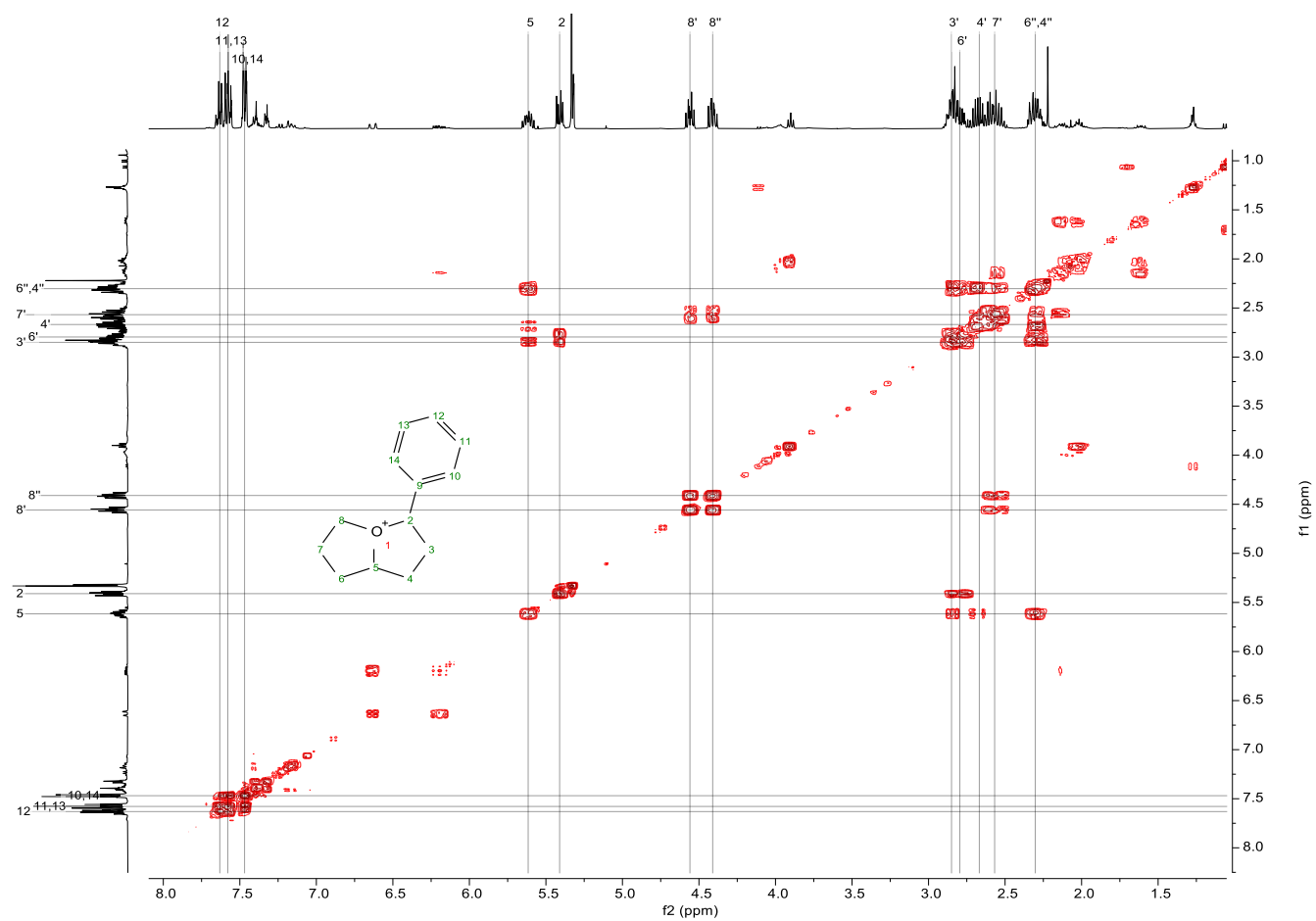
(3*R,7*aS**)-3-Phenylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminate 24b•Al(pftb)₄, CD₂Cl₂, ¹³C NMR, 100 MHz**

2-

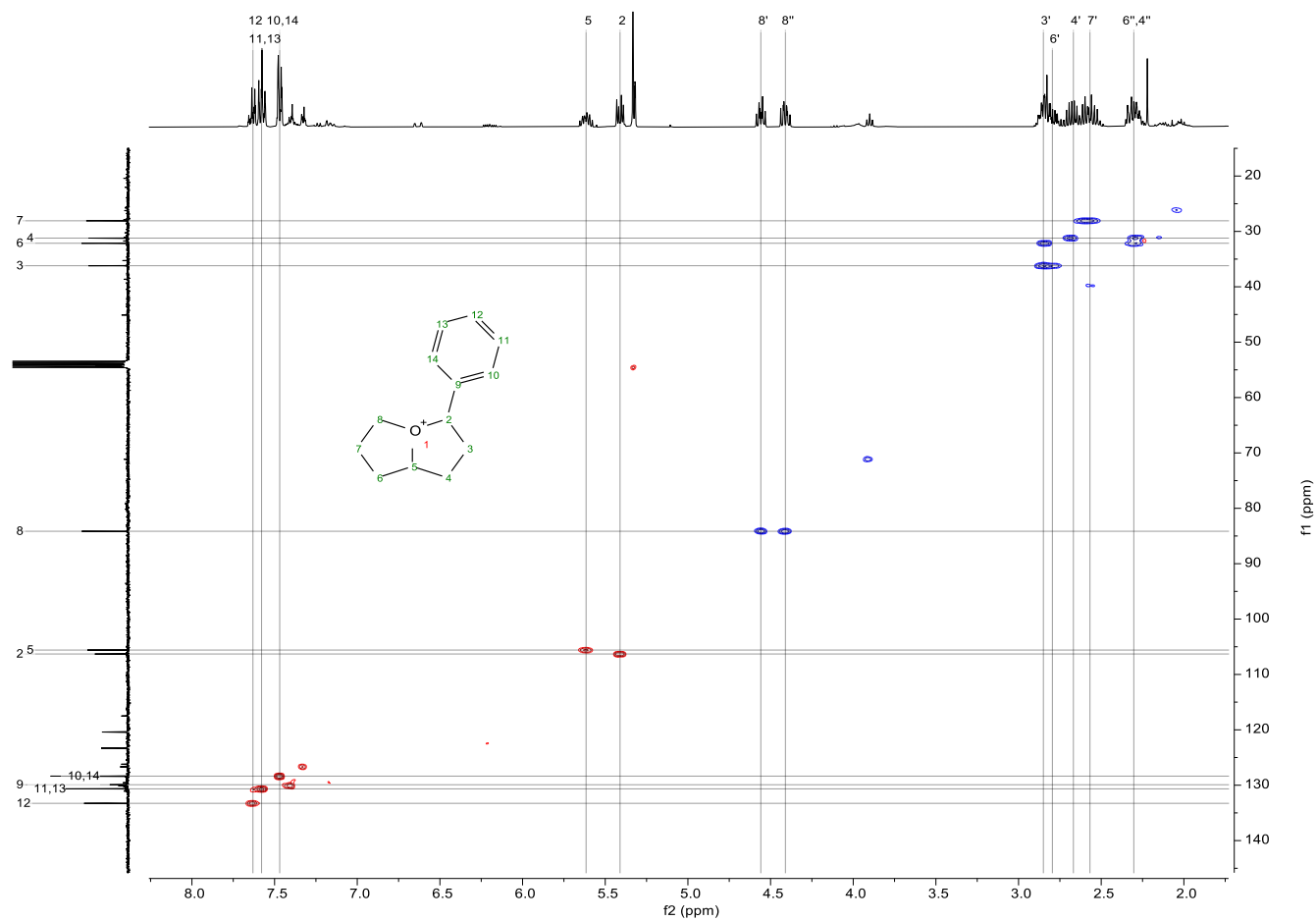


(3*R,7*aS**)-3-Phenylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminate 24b•Al(pftb)₄, CD₂Cl₂, ¹H-¹H COSY NMR, 400/400 MHz**

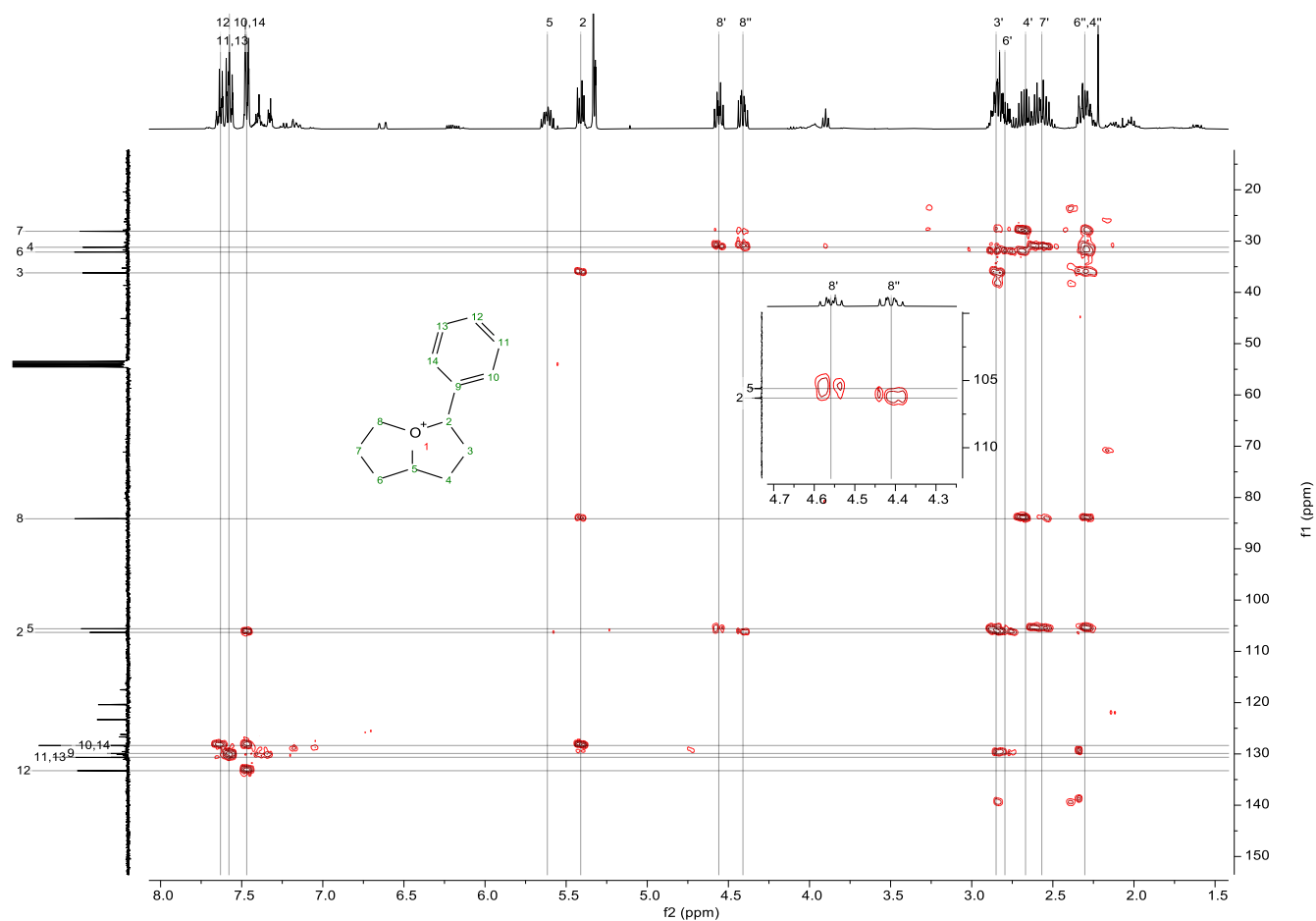
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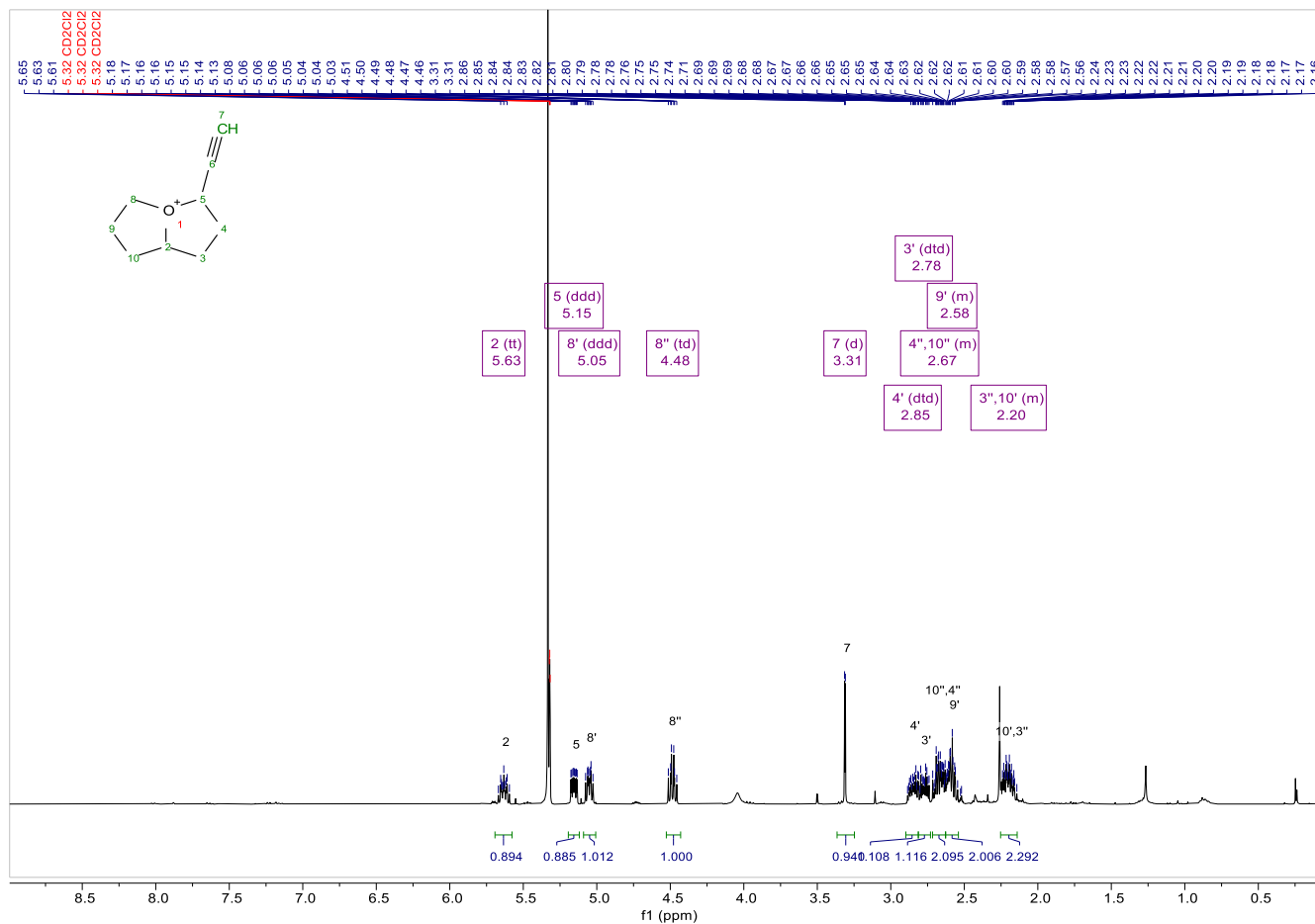
(3*R,7*aS**)-3-Phenylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminate 24b•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HSQC NMR, 400/100 MHz**



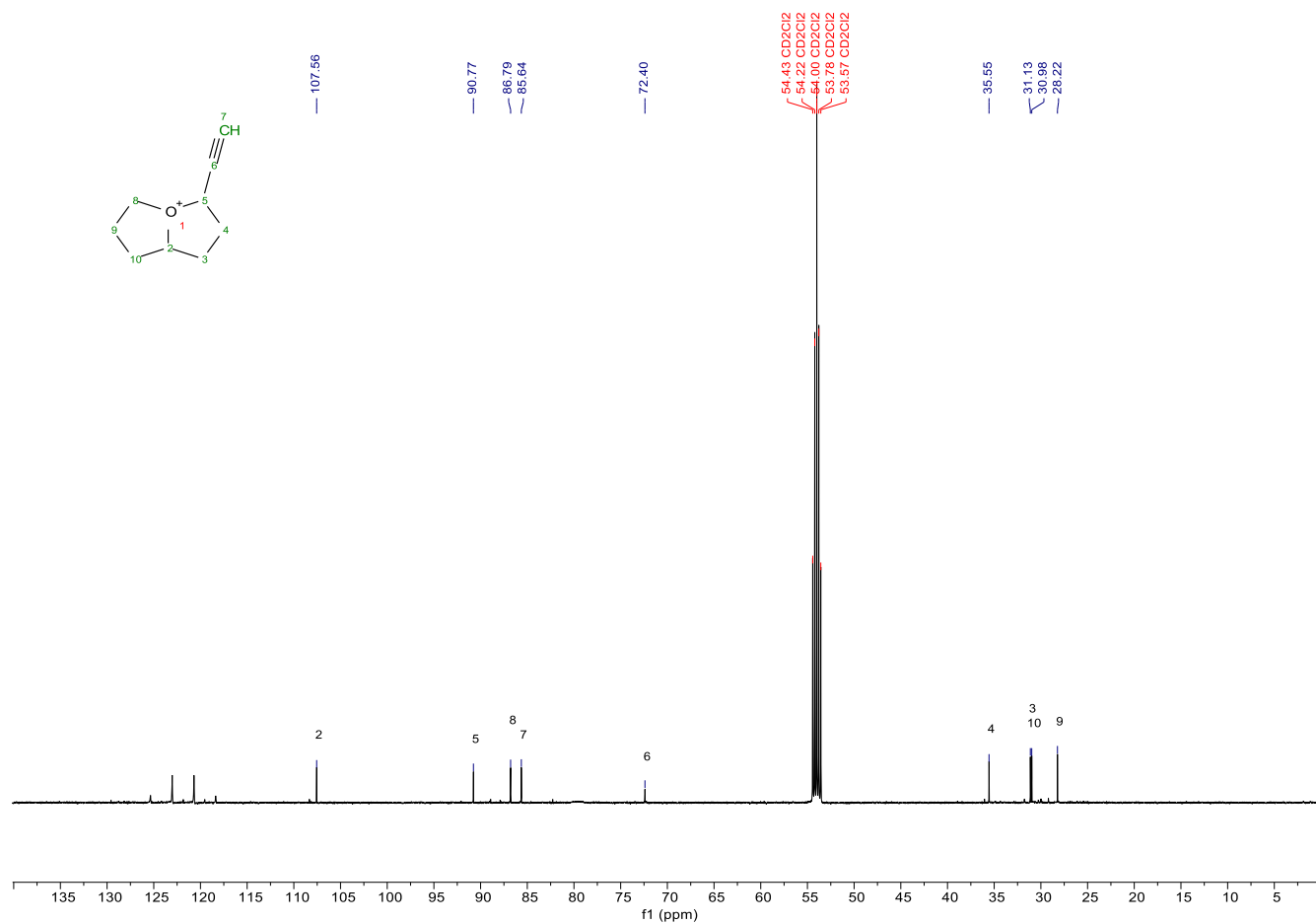
(3*R,7*aS**)-3-Phenylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminate 24b•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HMBC NMR, 400/100 MHz**



(3*R,7*aS**)-3-Ethynylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24c•Al(pftb)₄, CD₂Cl₂, ¹H NMR, 400 MHz**

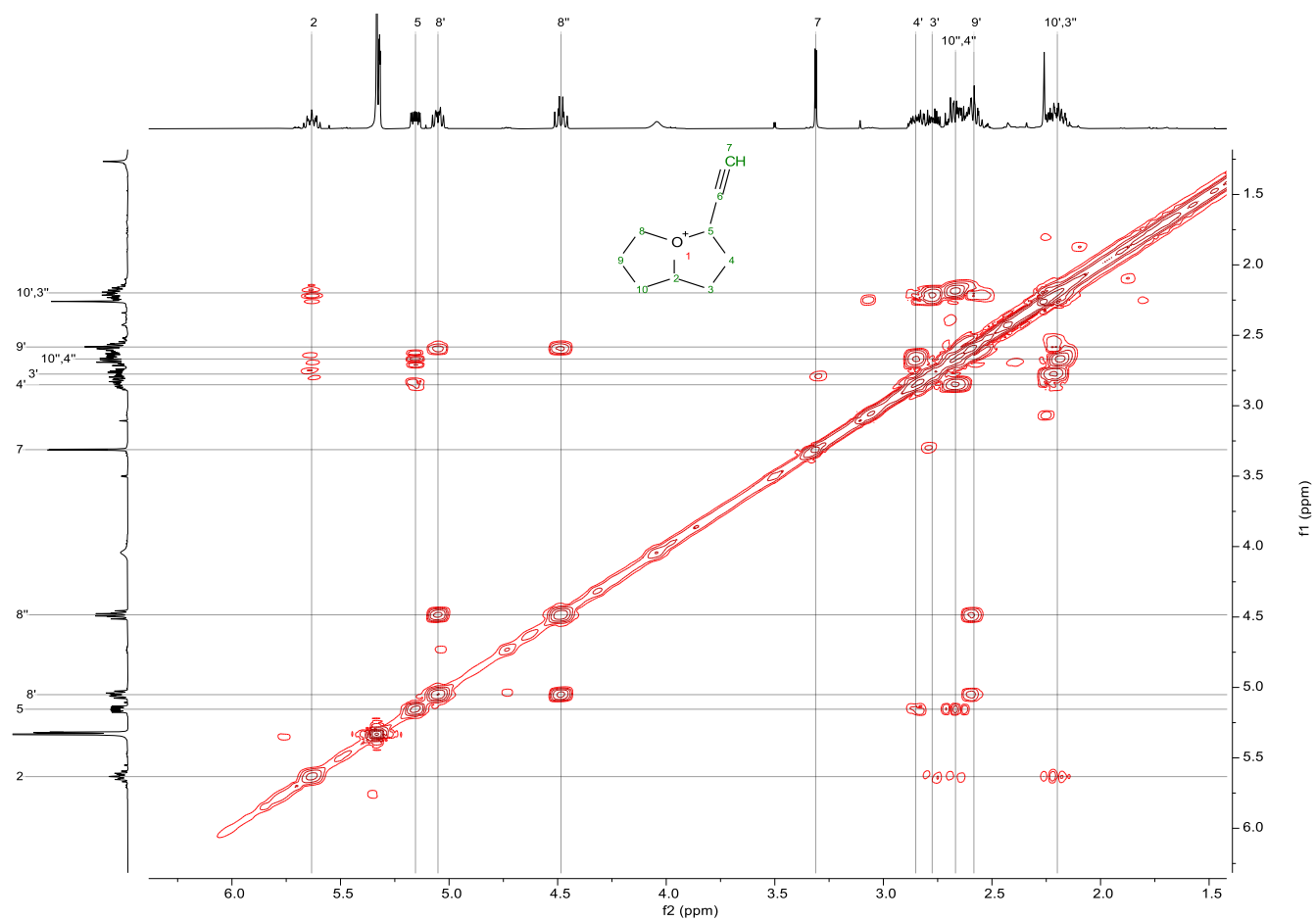


(3*R,7*aS**)-3-Ethynylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro-2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24c•Al(pftb)₄, CD₂Cl₂, ¹³C NMR, 400 MHz**



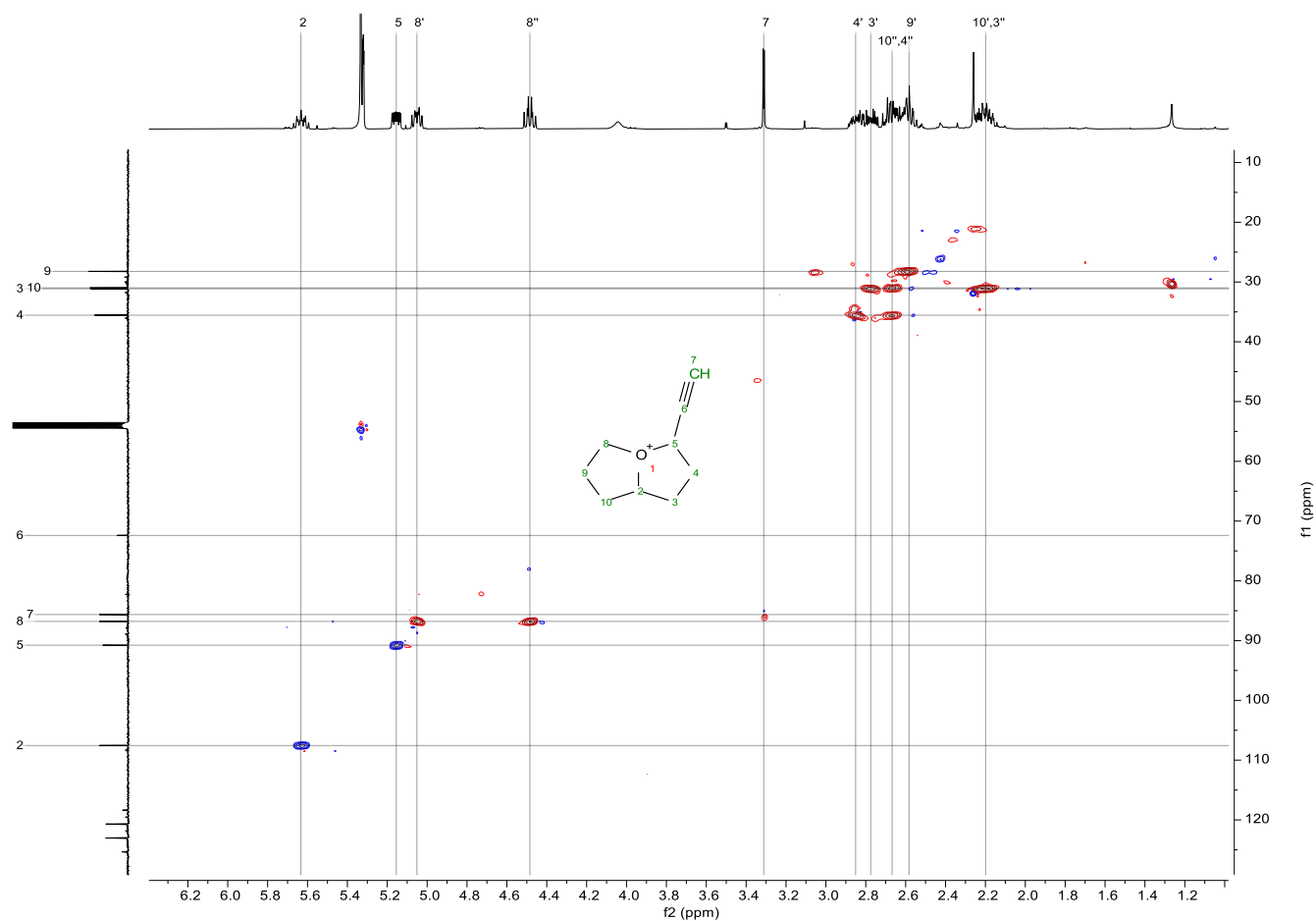
(3*R,7*aS**)-3-Ethynylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminate 24c•Al(pftb)₄, CD₂Cl₂, ¹H-¹H COSY NMR, 400/400 MHz**

2-



(3*R,7*aS**)-3-Ethynylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminate 24c•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HSQC NMR, 400/100 MHz**

2-

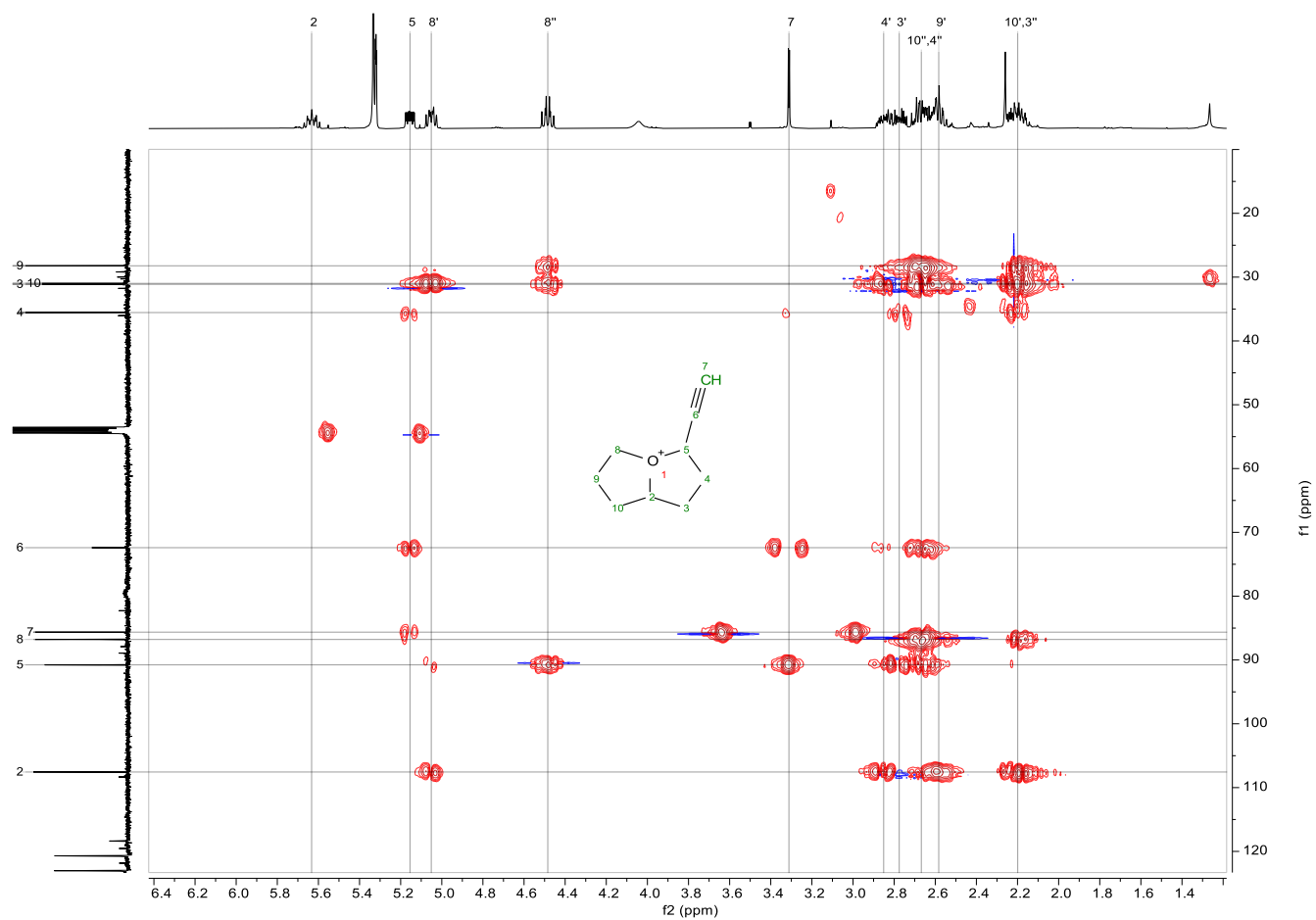


(3*R**,7*aS**)-3-Ethynylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium
(trifluoromethyl)propan-2-yl)oxy)aluminate 24c•Al(pftb)₄

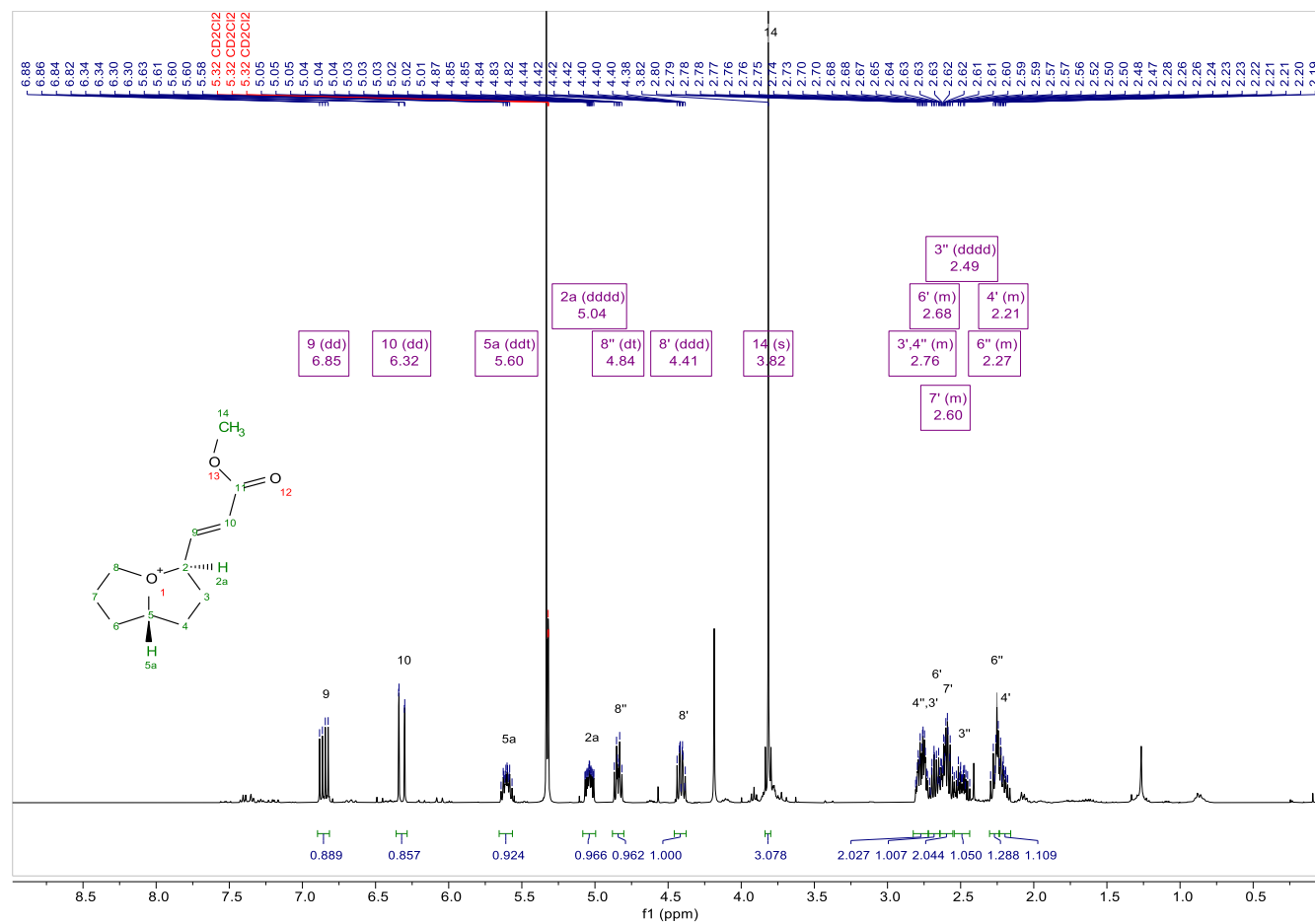
tetrakis((1,1,1,3,3,3-hexafluoro

2-

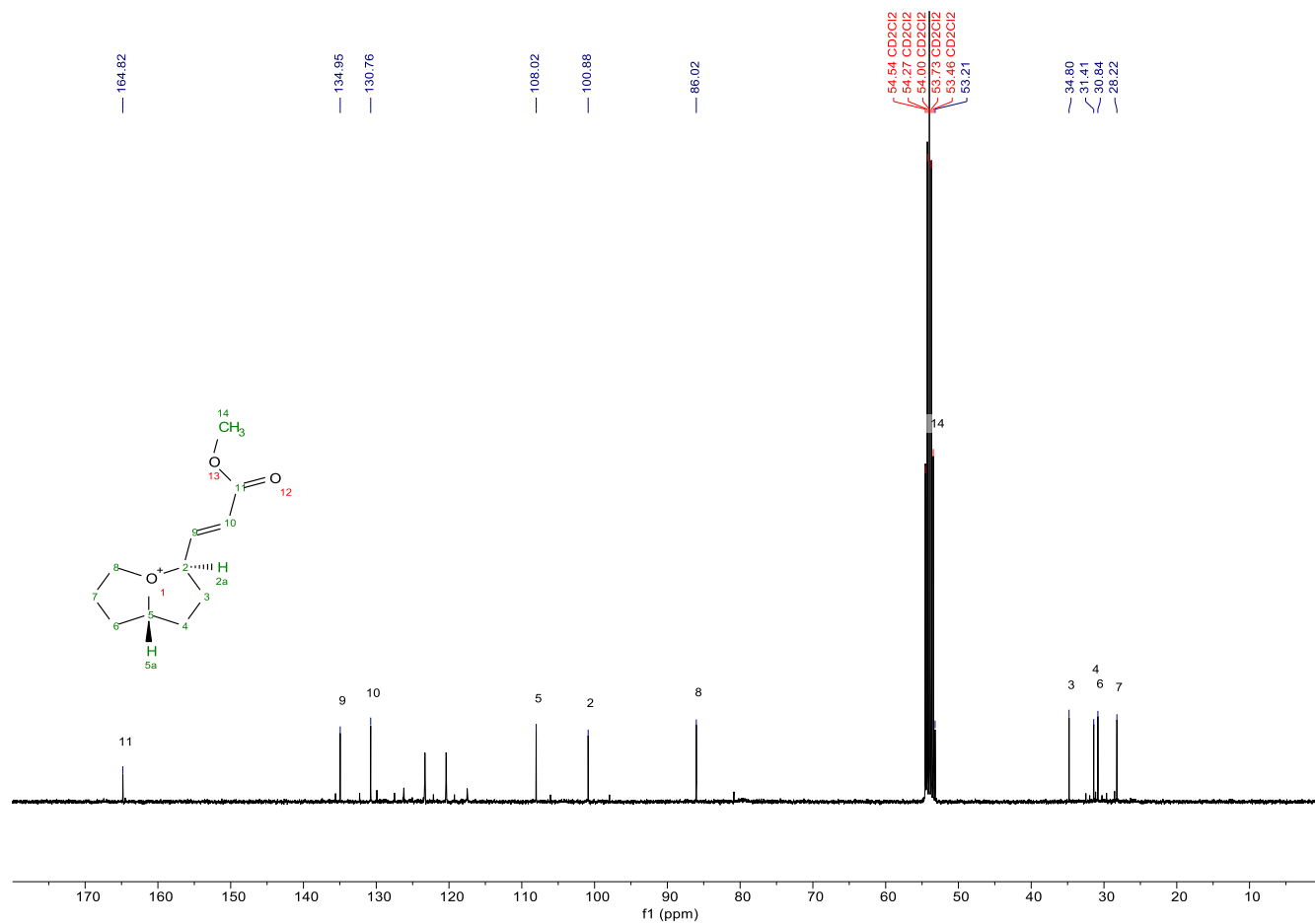
, CD₂Cl₂, ¹H-¹³C HMBC NMR, 400/100 MHz



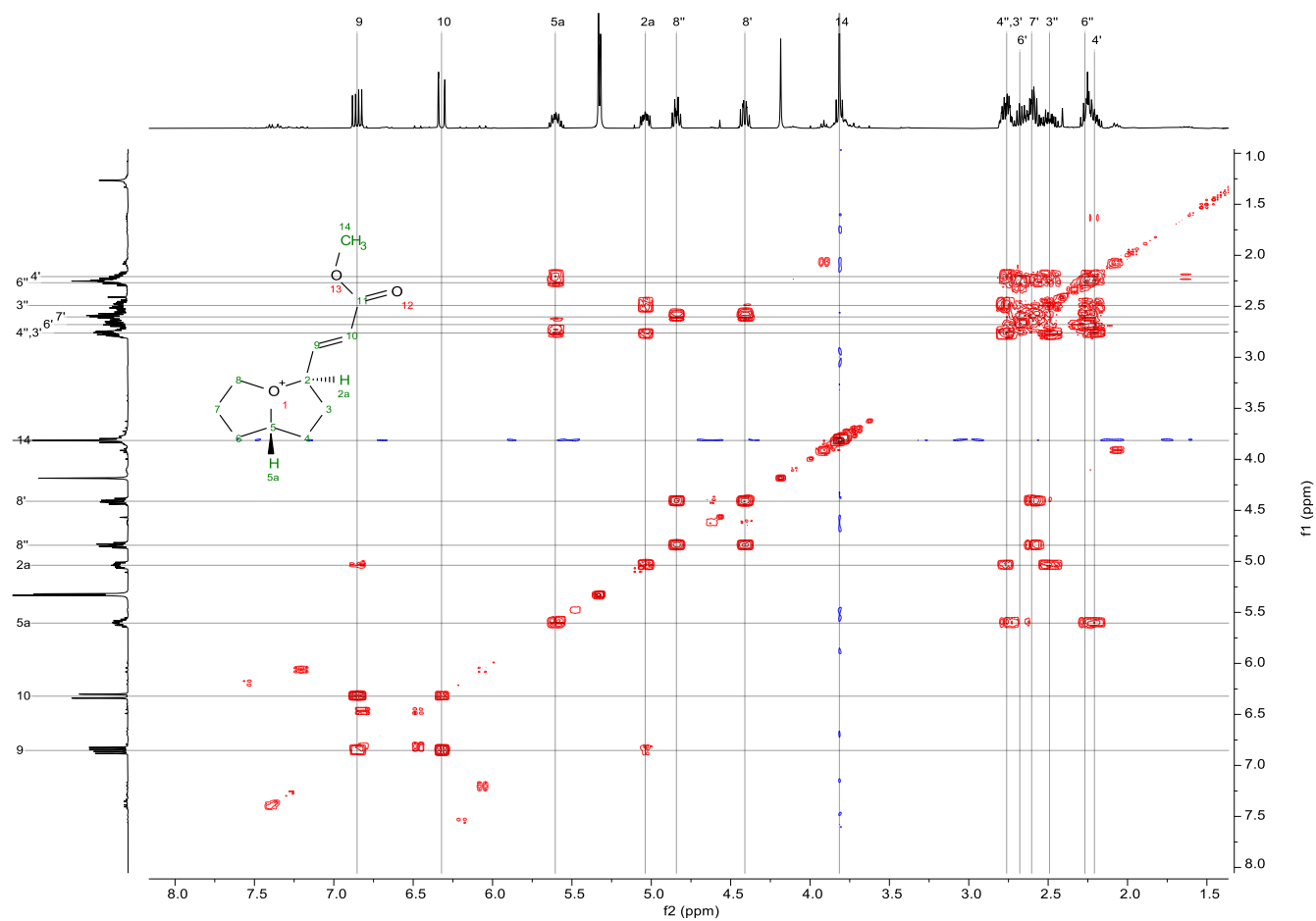
(3*R,7*aS**)-3-((*E*)-3-Methoxy-3-oxoprop-1-en-1-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24d•Al(pftb)₄, CD₂Cl₂, ¹H NMR, 400 MHz**



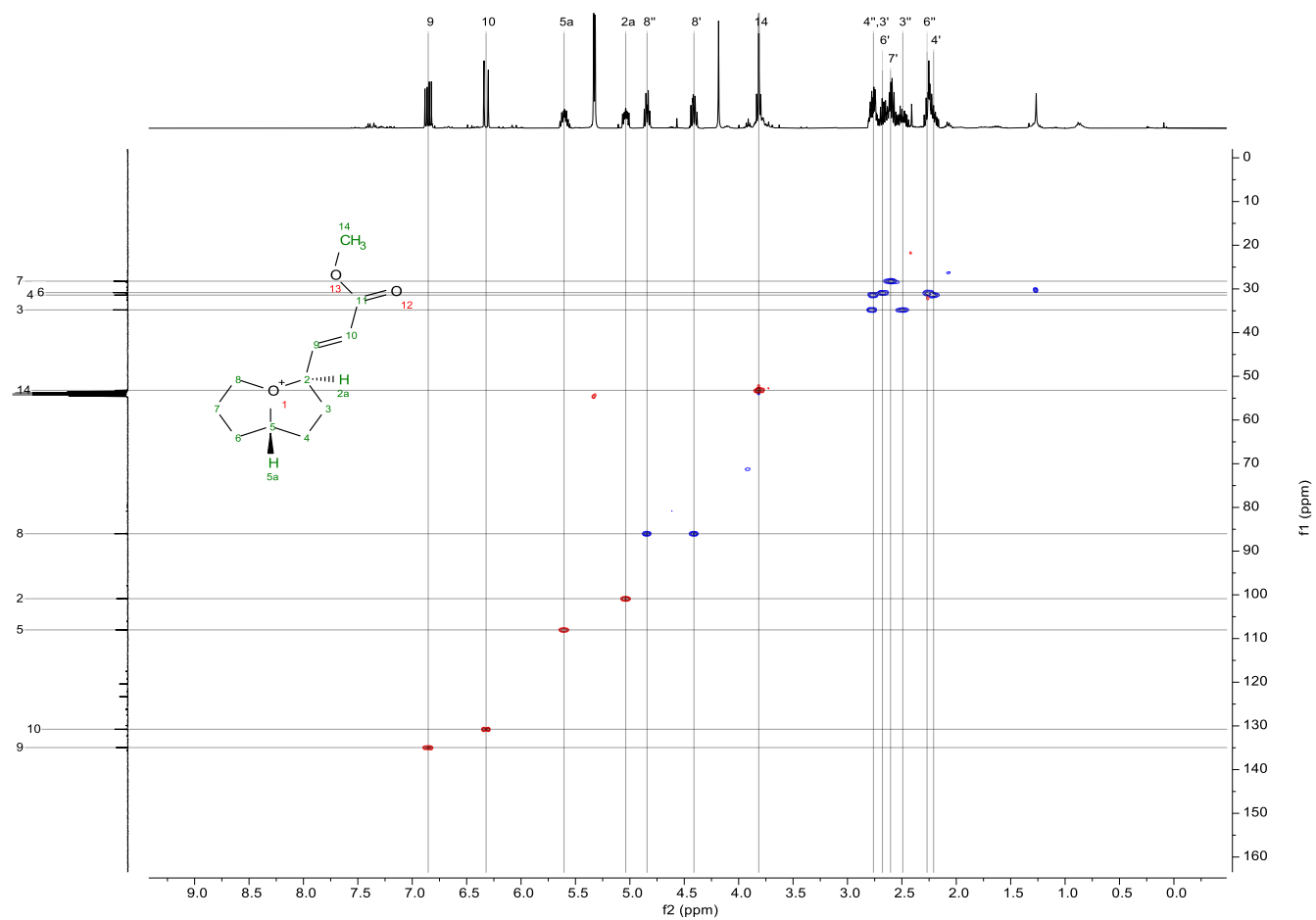
(3*R,7*aS**)-3-((*E*)-3-Methoxy-3-oxoprop-1-en-1-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24d•Al(pftb)₄, CD₂Cl₂, ¹³C NMR, 100 MHz**



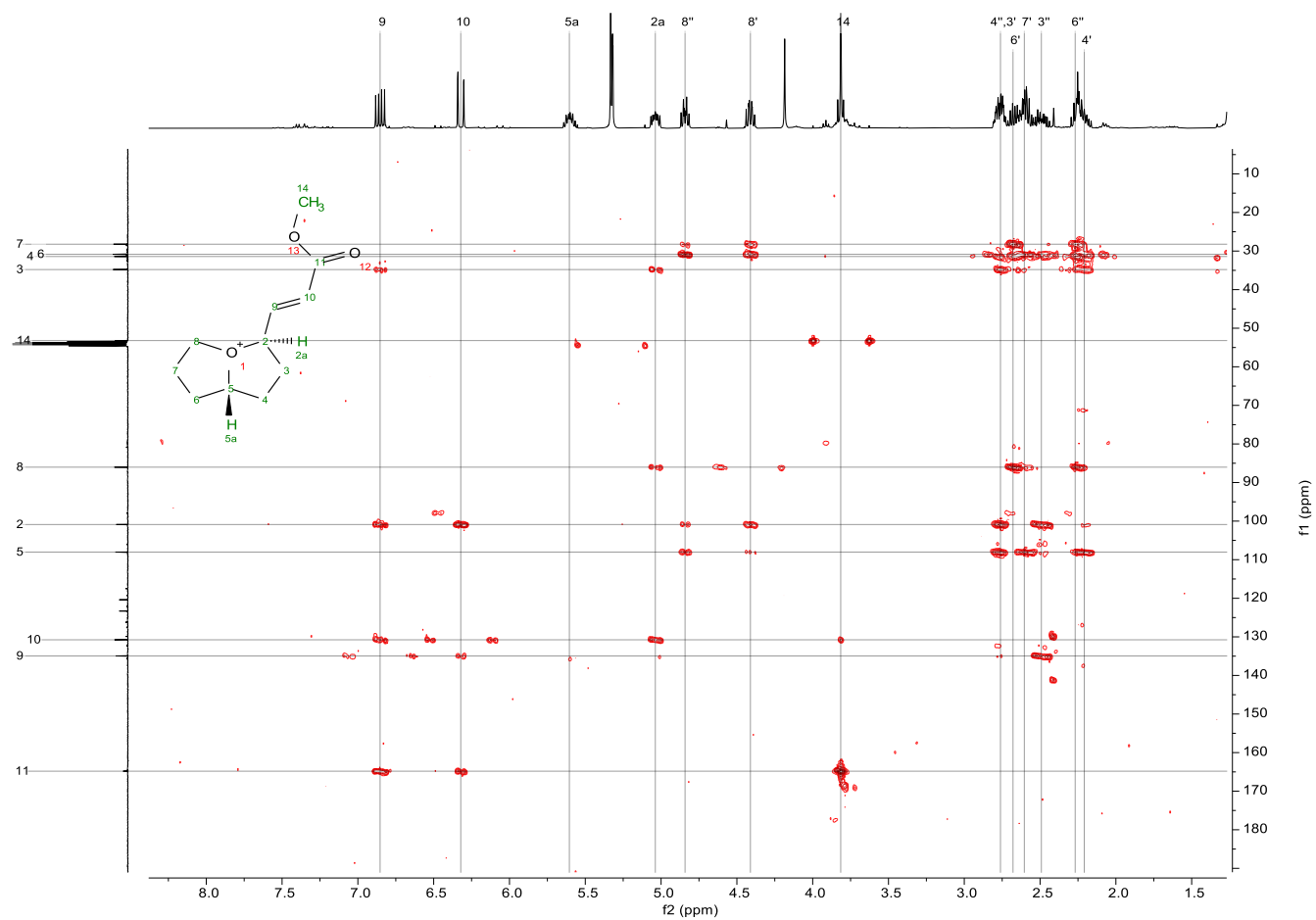
(3*R,7*aS**)-3-((*E*)-3-Methoxy-3-oxoprop-1-en-1-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24d•Al(pftb)₄, CD₂Cl₂, ¹H-¹H COSY NMR, 400/400 MHz**



(3*R,7*aS**)-3-((*E*)-3-Methoxy-3-oxoprop-1-en-1-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium
 tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24d•Al(pftb)₄, CD₂Cl₂, ¹H-
¹³C HSQC NMR, 400/100 MHz**



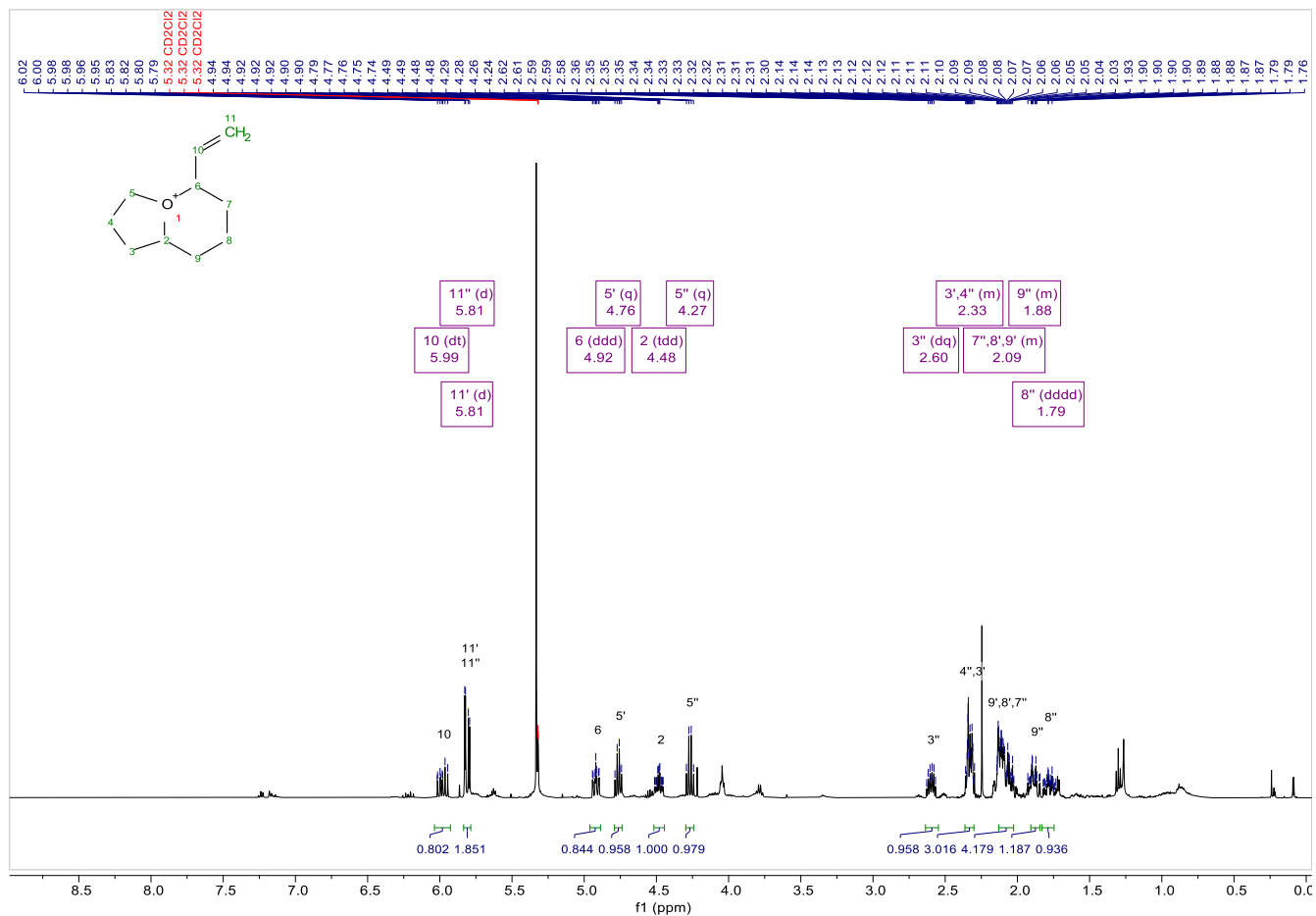
(3*R,7*aS**)-3-((*E*)-3-Methoxy-3-oxoprop-1-en-1-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24d•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HMBC NMR, 400/100 MHz**



(5*S,8*aR**)-5-Vinyloctahydrofuro[1,2-*a*]pyran-4-ium**
(trifluoromethyl)propan-2-yl)oxy)aluminate 24e•Al(pftb)₄, CD₂Cl₂, ¹H NMR, 500 MHz

tetrakis((1,1,1,3,3,3-hexafluoro

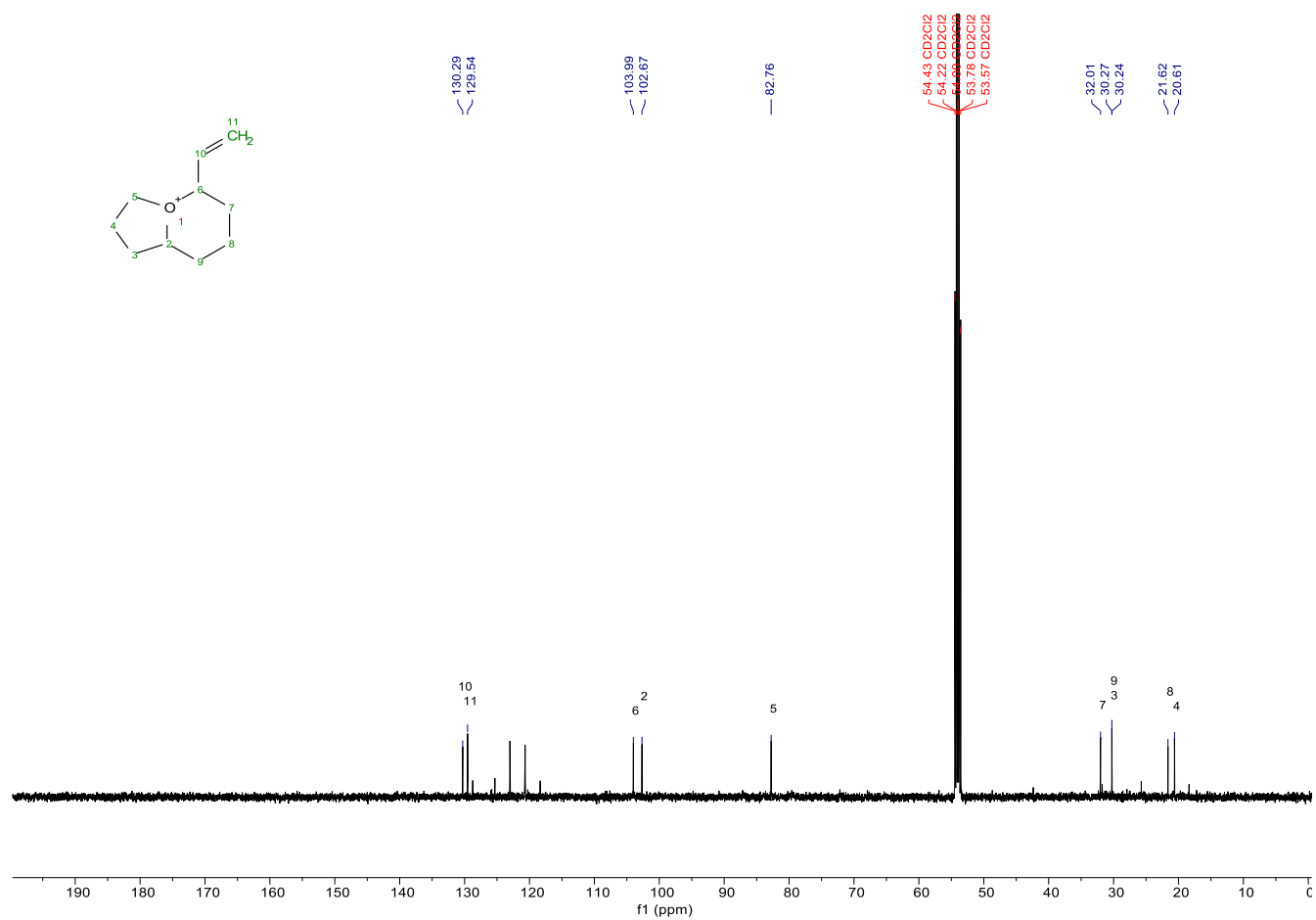
2-



(5*S**,8*aR**)-5-Vinyloctahydrofuro[1,2-*a*]pyran-4-ium
(trifluoromethyl)propan-2-yl)oxy)aluminate 24e•Al(pftb)₄, CD₂Cl₂, ¹³C NMR, 126 MHz

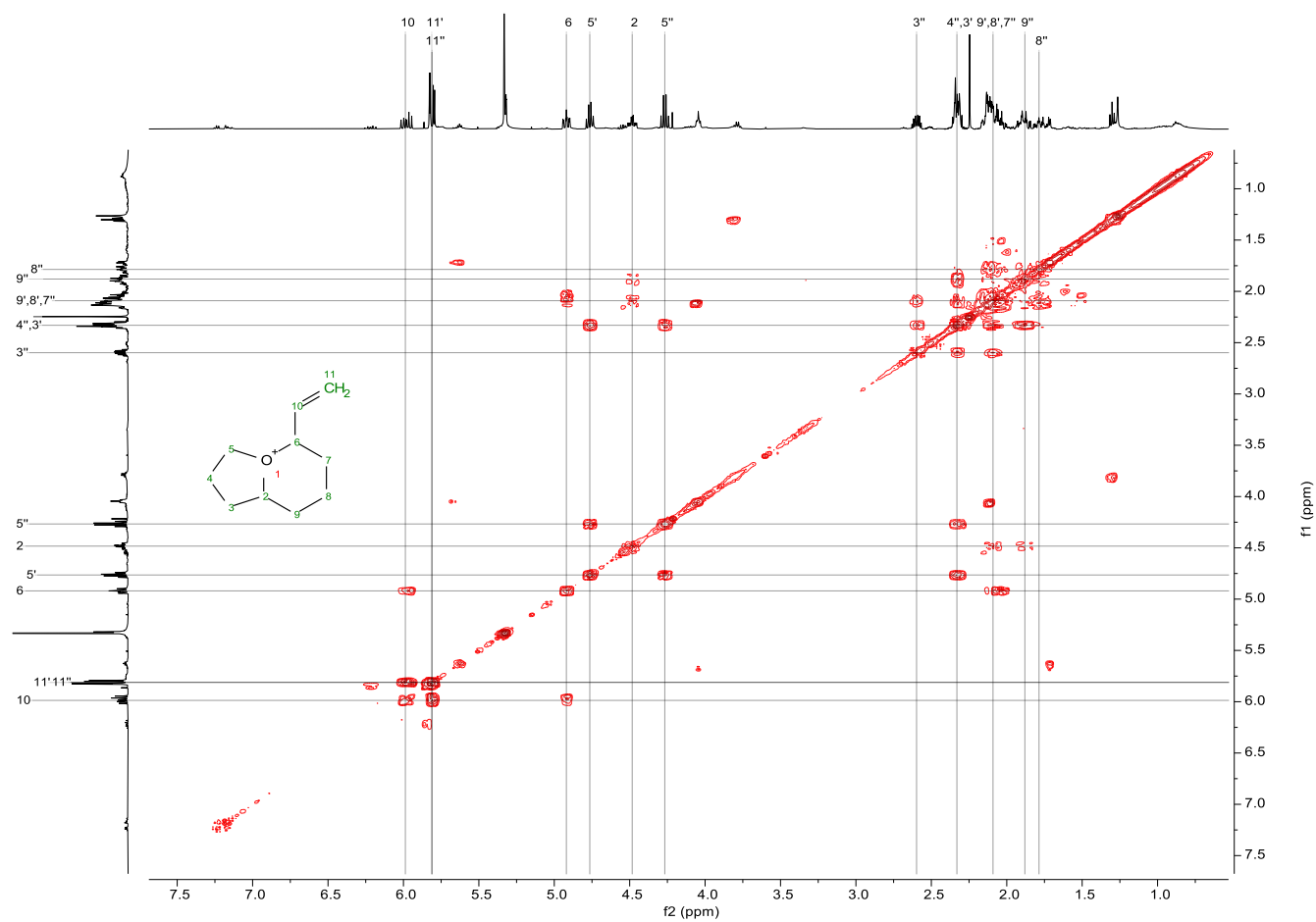
tetrakis((1,1,1,3,3,3-hexafluoro

2-



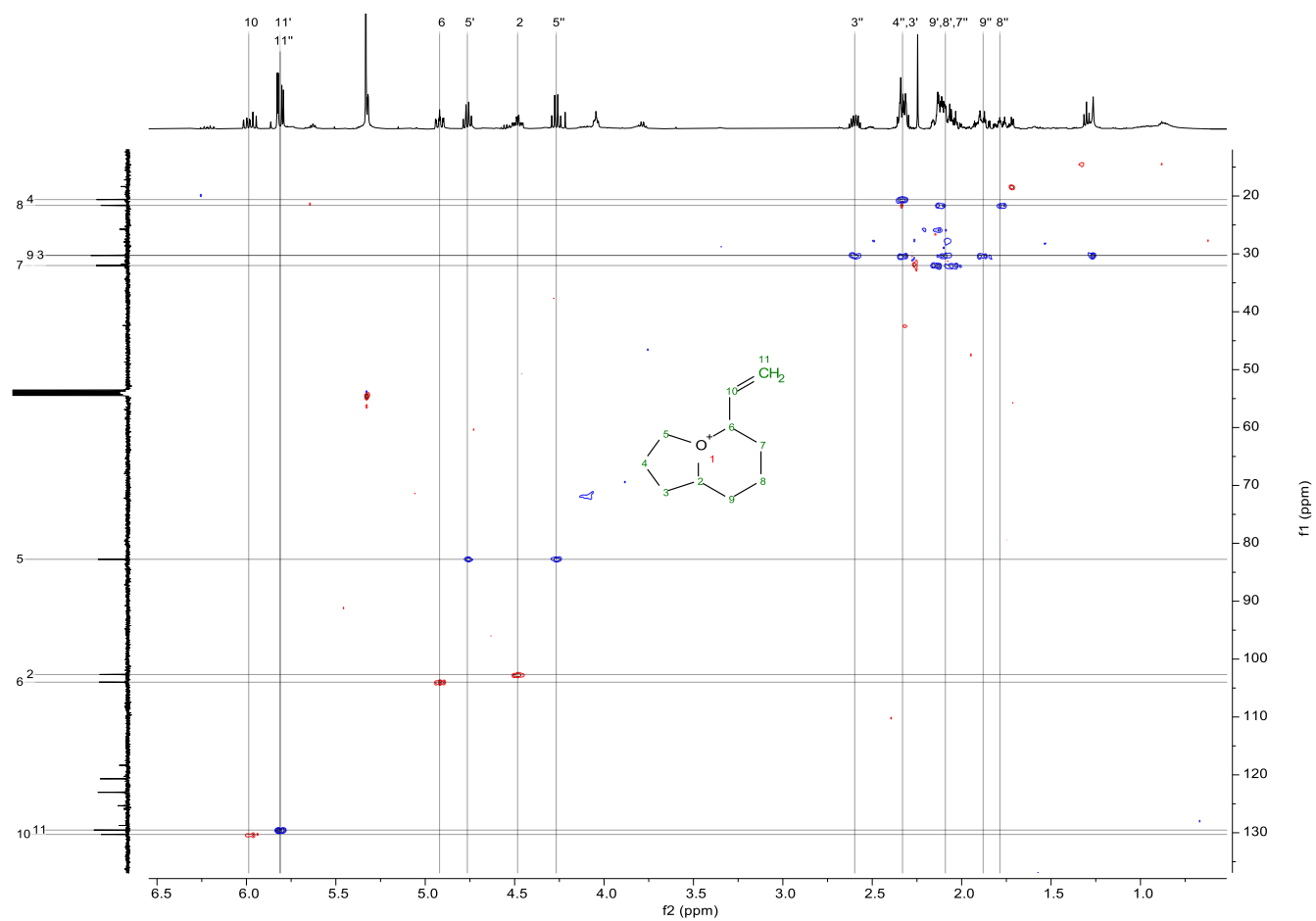
(5*S,8*aR**)-5-Vinyloctahydrofuro[1,2-*a*]pyran-4-ium tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminate 24e•Al(pftb)₄, CD₂Cl₂, ¹H-¹H COSY NMR, 500/500 MHz**

2-



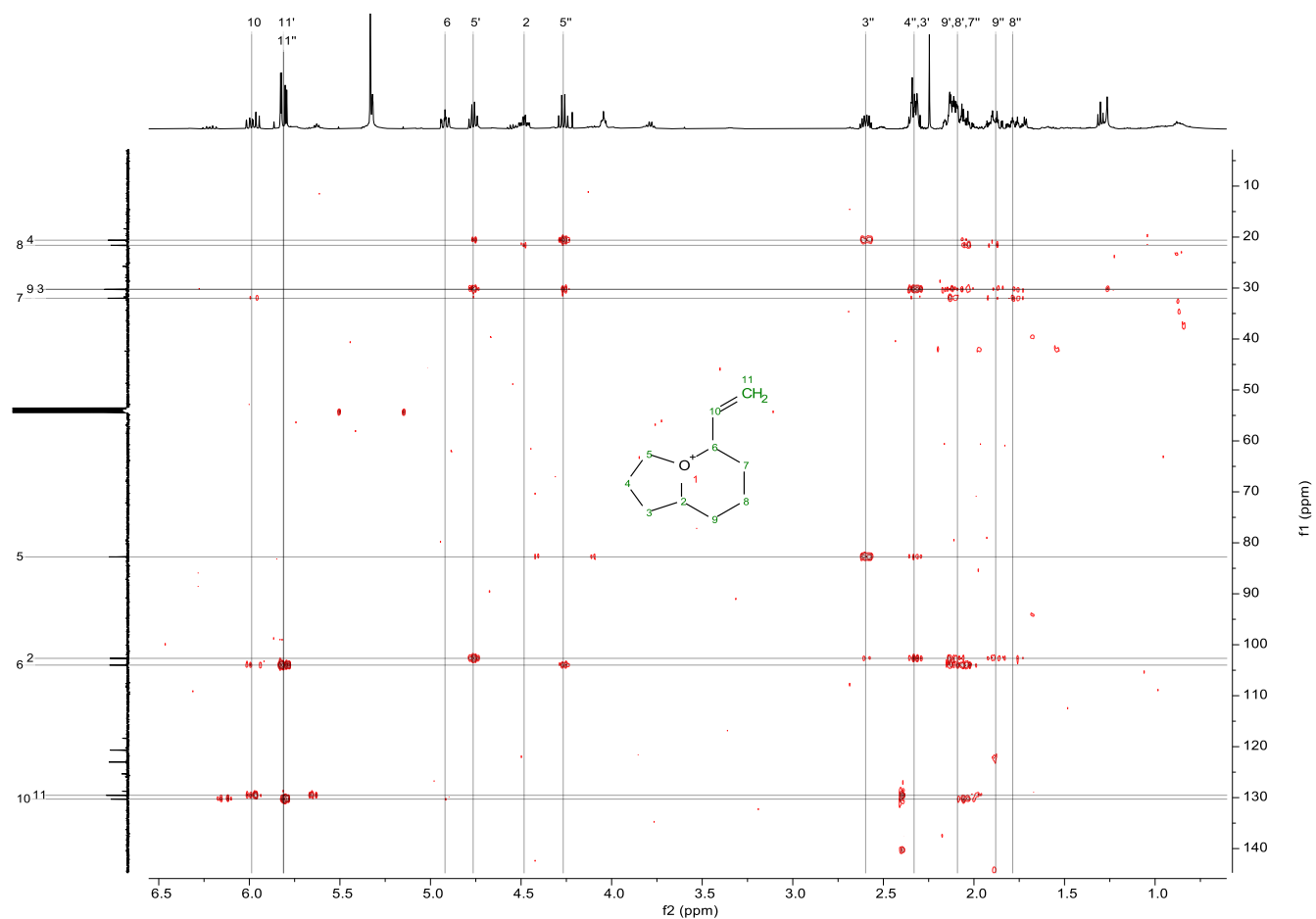
(5*S,8*aR**)-5-Vinyloctahydrofuro[1,2-*a*]pyran-4-ium tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminate 24e•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HSQC NMR, 500/126 MHz**

2-



(5*S,8*aR**)-5-Vinyloctahydrofuro[1,2-*a*]pyran-4-ium tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminate 24e•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HMBC NMR, 500/126 MHz**

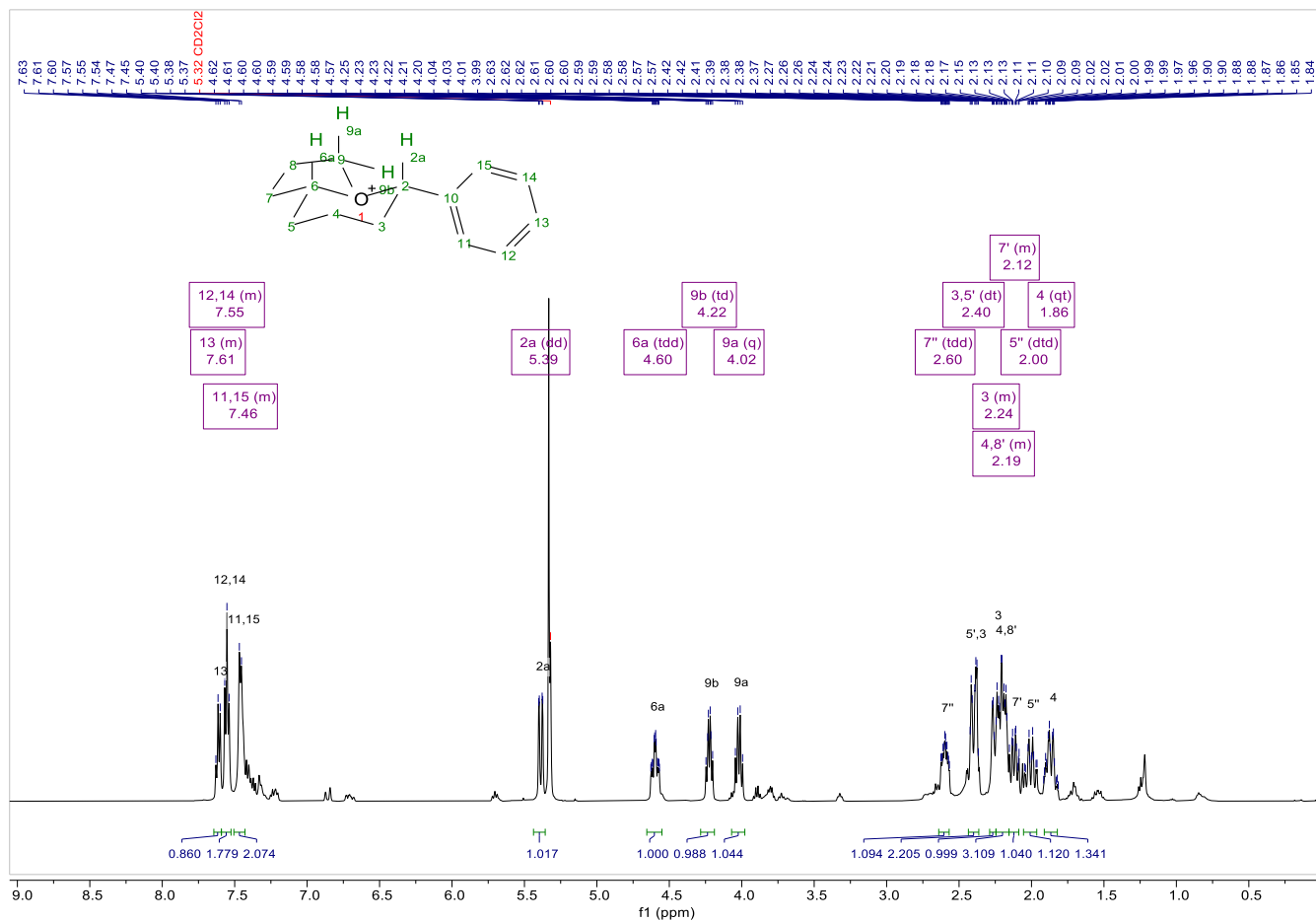
2-



(5*S**,8*aR**)-5-Phenyloctahydrofuro[1,2-*a*]pyran-4-ium
(trifluoromethyl)propan-2-yl)oxy)aluminatate 24f•Al(pftb)₄, CD₂Cl₂, ¹H NMR, 500 MHz

tetrakis((1,1,1,3,3,3-hexafluoro
2-

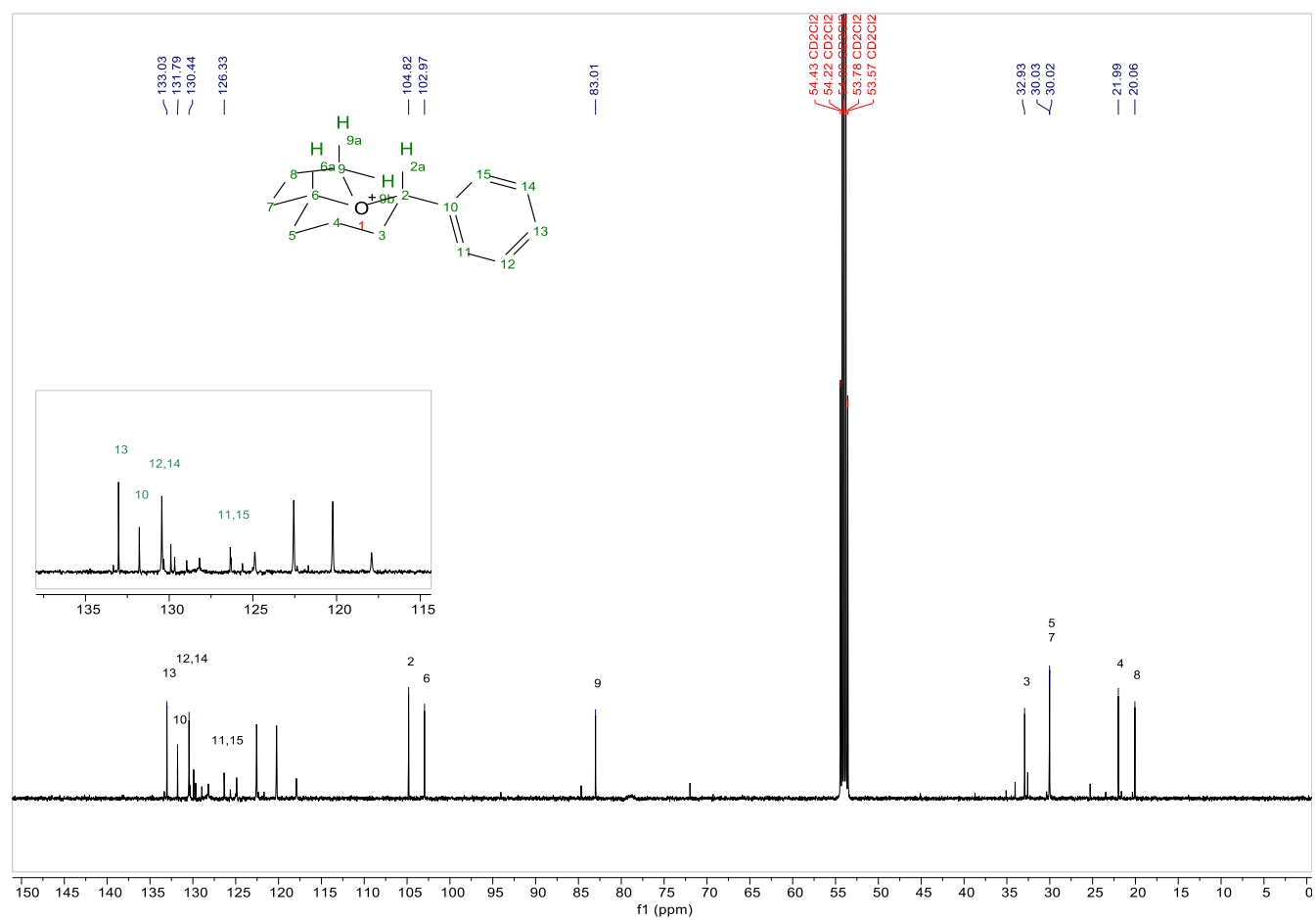
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(5*S**,8*aR**)-5-Phenyloctahydrofuro[1,2-*a*]pyran-4-ium
(trifluoromethyl)propan-2-yl)oxy)aluminate 24f•Al(pftb)₄, CD₂Cl₂, ¹³C NMR, 126 MHz

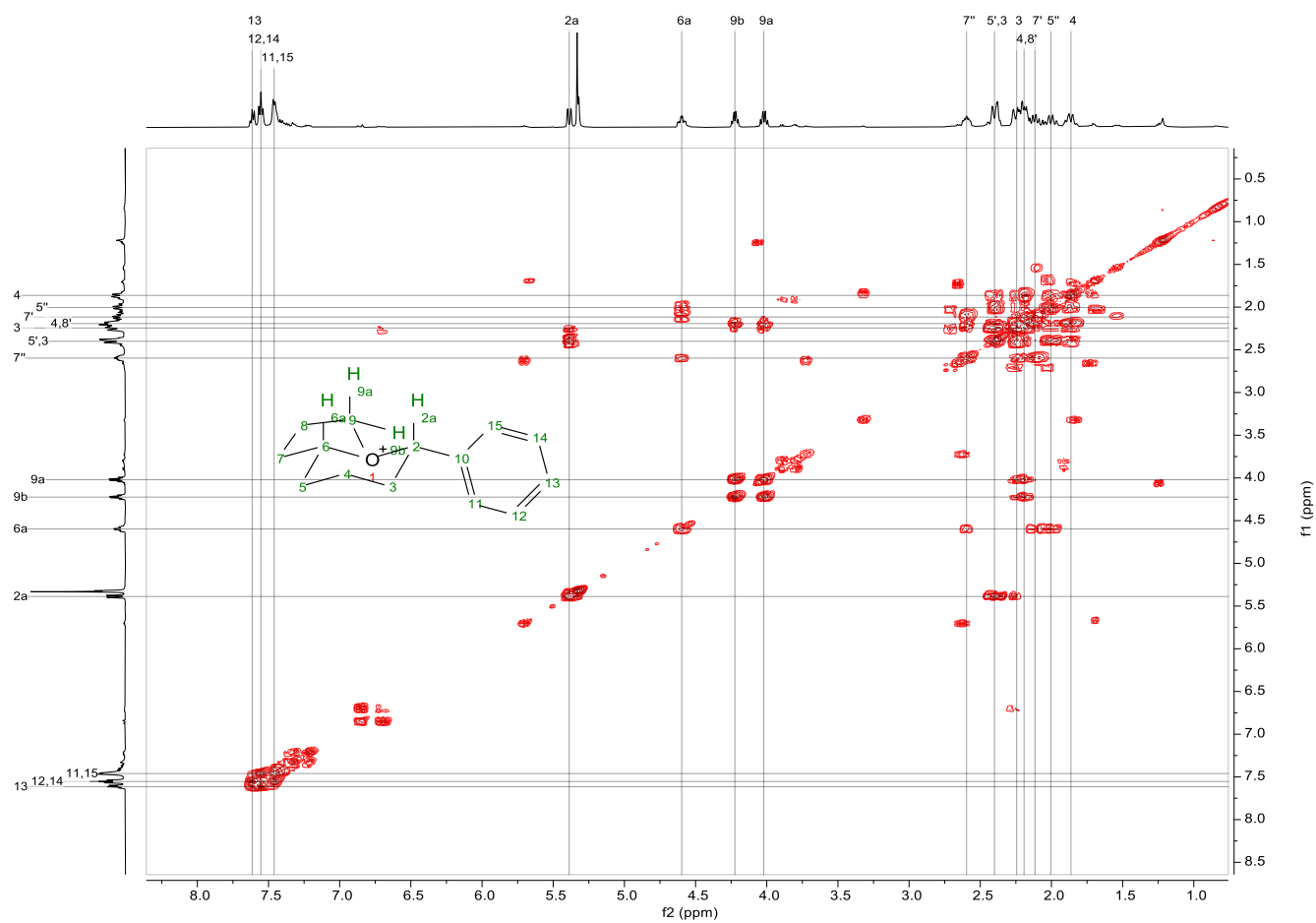
tetrakis((1,1,1,3,3,3-hexafluoro

2-



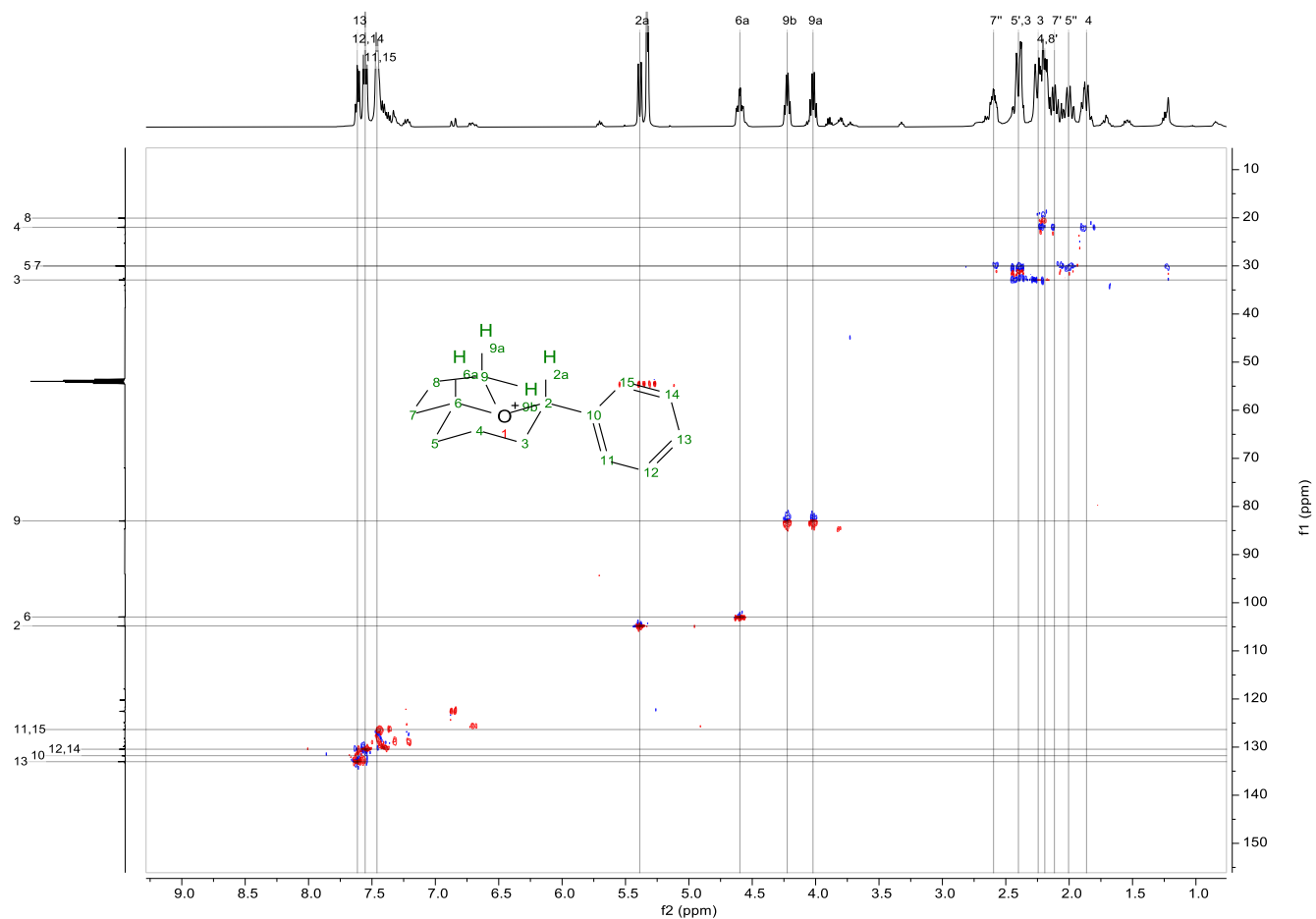
(5*S,8*aR**)-5-Phenyloctahydrofuro[1,2-*a*]pyran-4-ium tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminate 24f•Al(pftb)₄, CD₂Cl₂, ¹H-¹H COSY NMR, 500/500 MHz**

2-



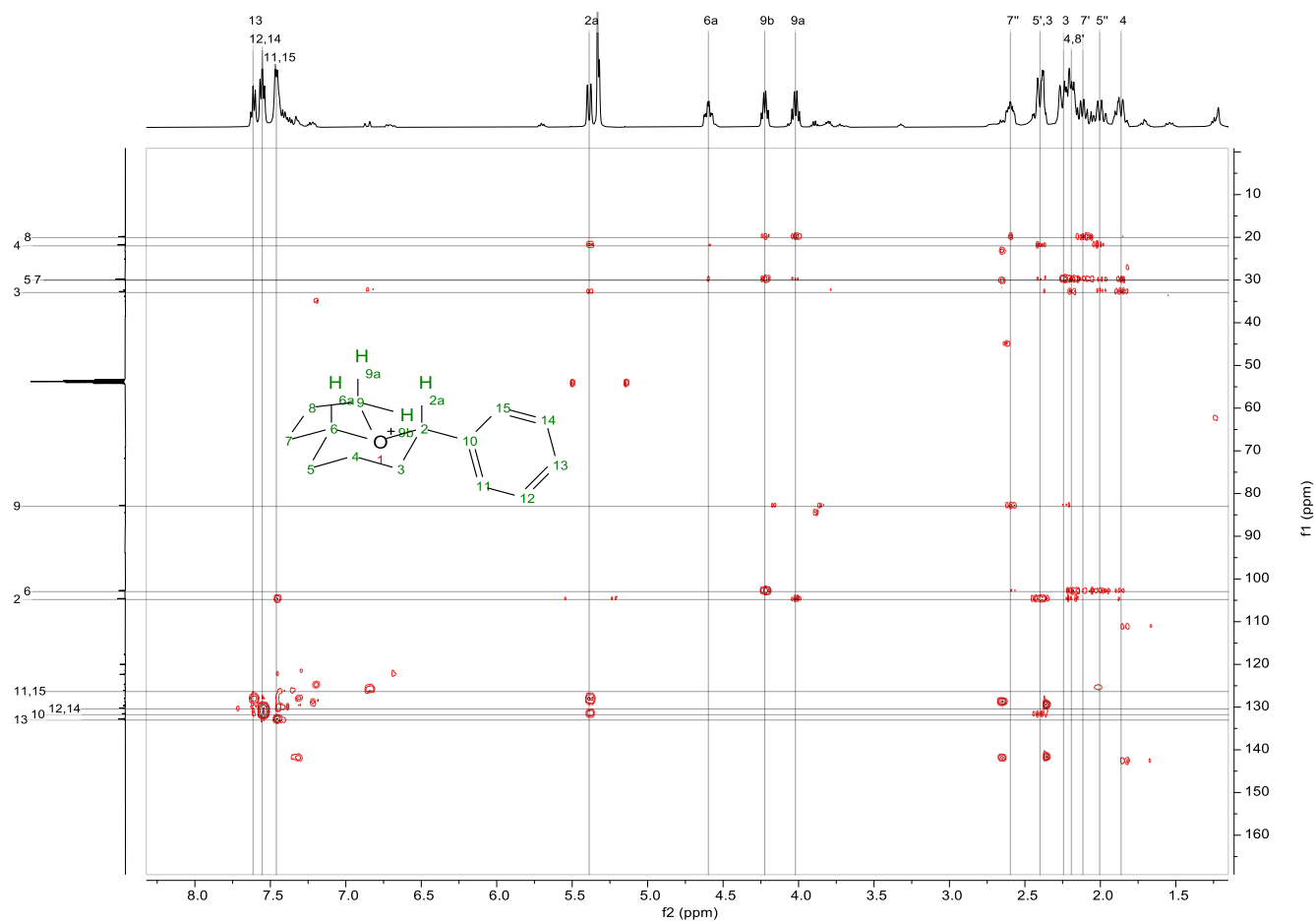
(5*S,8*aR**)-5-Phenyloctahydrofuro[1,2-*a*]pyran-4-ium tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminumate 24f•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HSQC NMR, 500/126 MHz**

2-

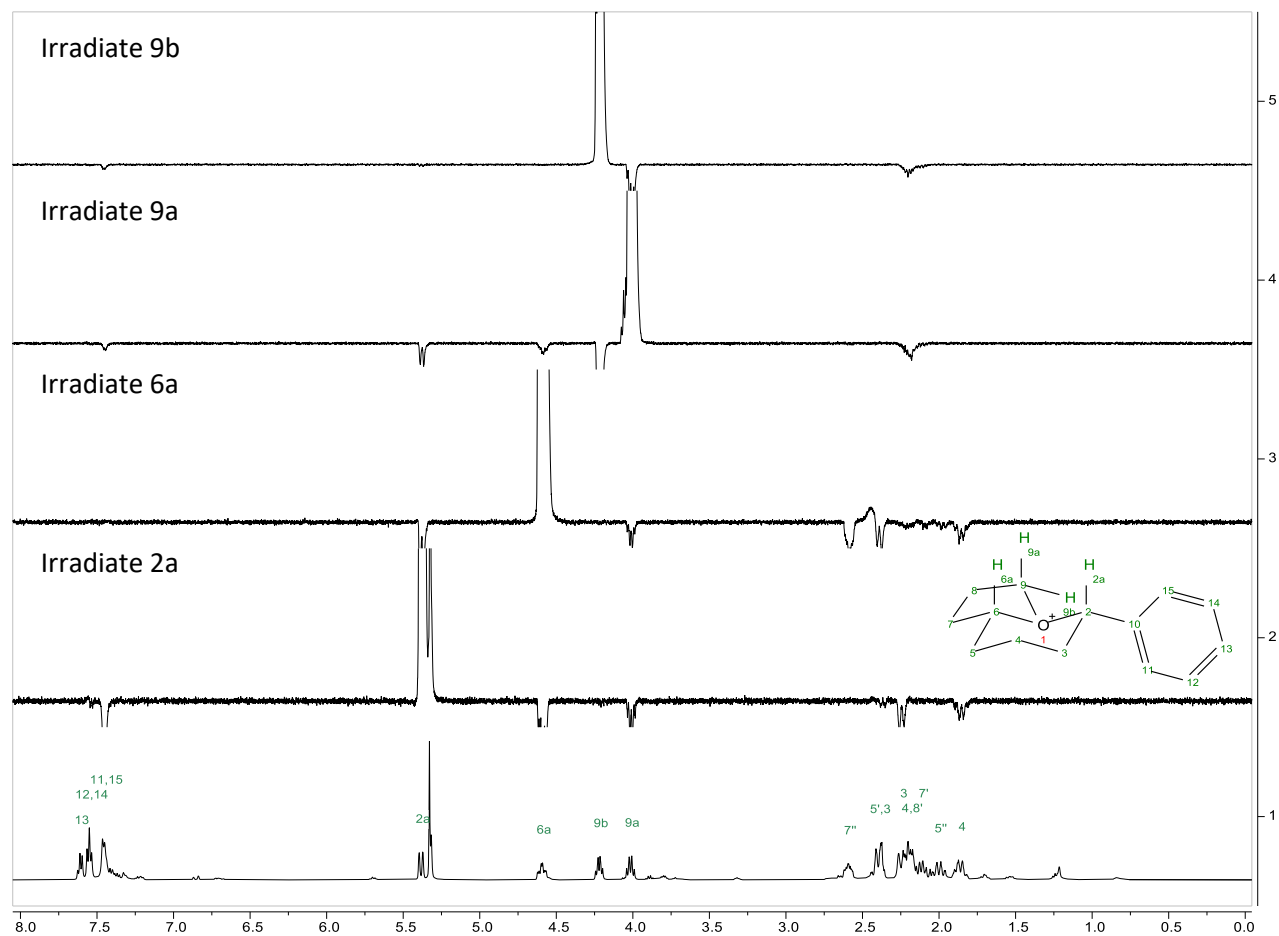


(5*S,8*aR**)-5-Phenyloctahydrofuro[1,2-*a*]pyran-4-ium tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminate 24f•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HMBC NMR, 500/126 MHz**

2-

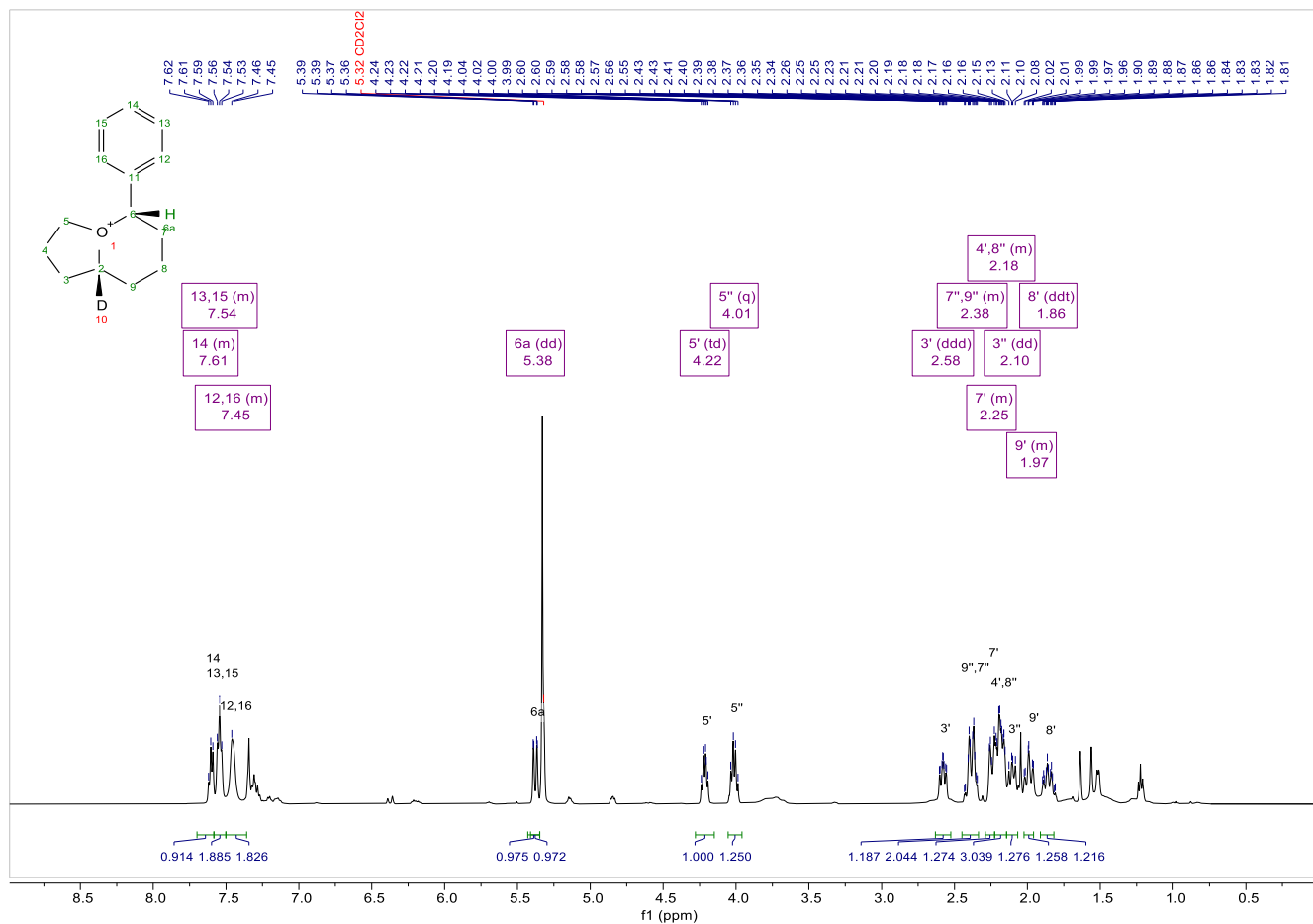


(5*S,8*aR**)-5-Phenyloctahydrofuro[1,2-*a*]pyran-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24f•Al(pftb)₄, CD₂Cl₂, Selective ¹H NOESY NMR, 500 MHz**



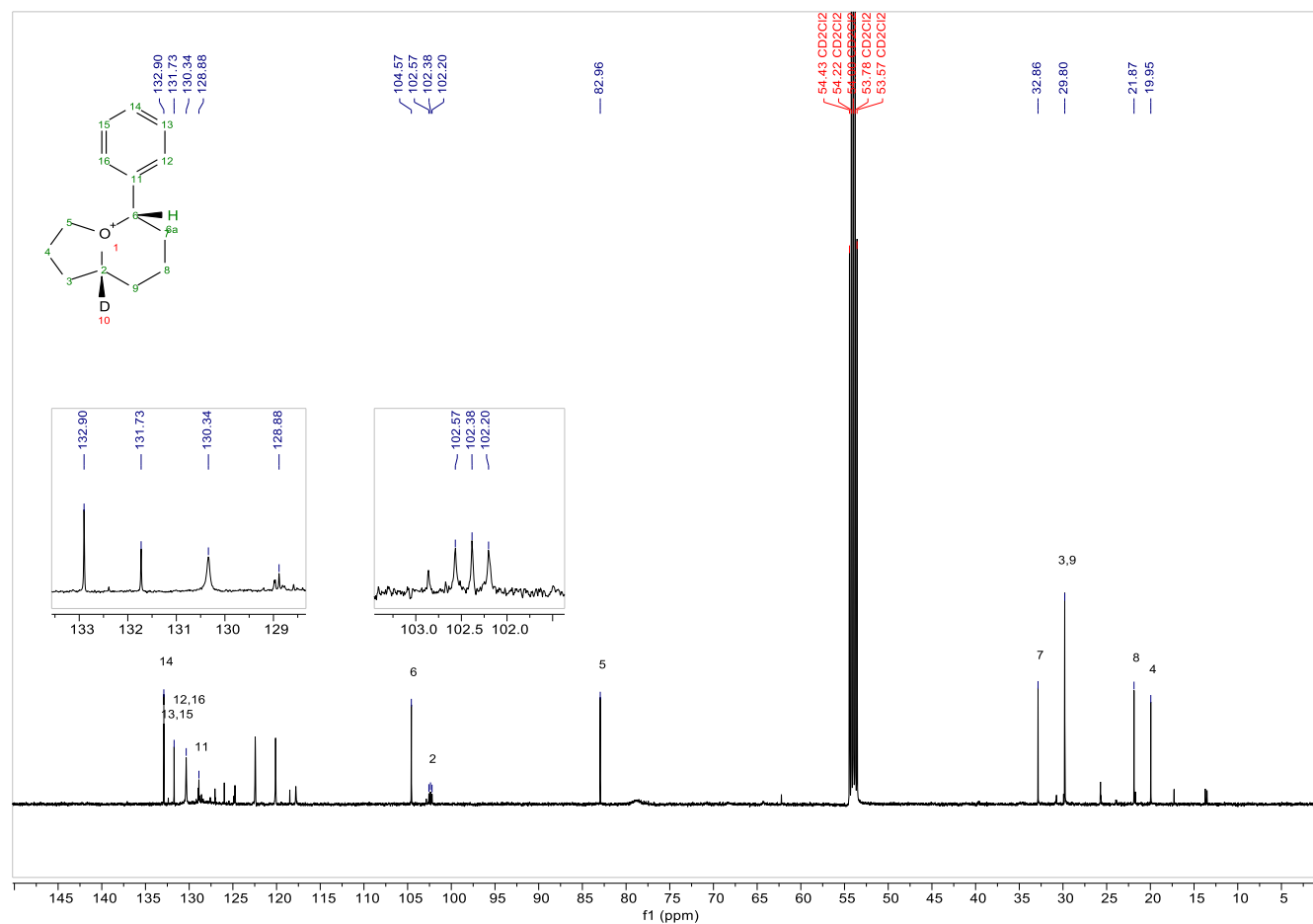
(5*S,8*aR**)-5-Phenyloctahydrofuro[1,2-*a*]pyran-4-ium-8*a-d* tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminate 24*f-d*•Al(pftb)₄, CD₂Cl₂, ¹H NMR, 500 MHz**

2-

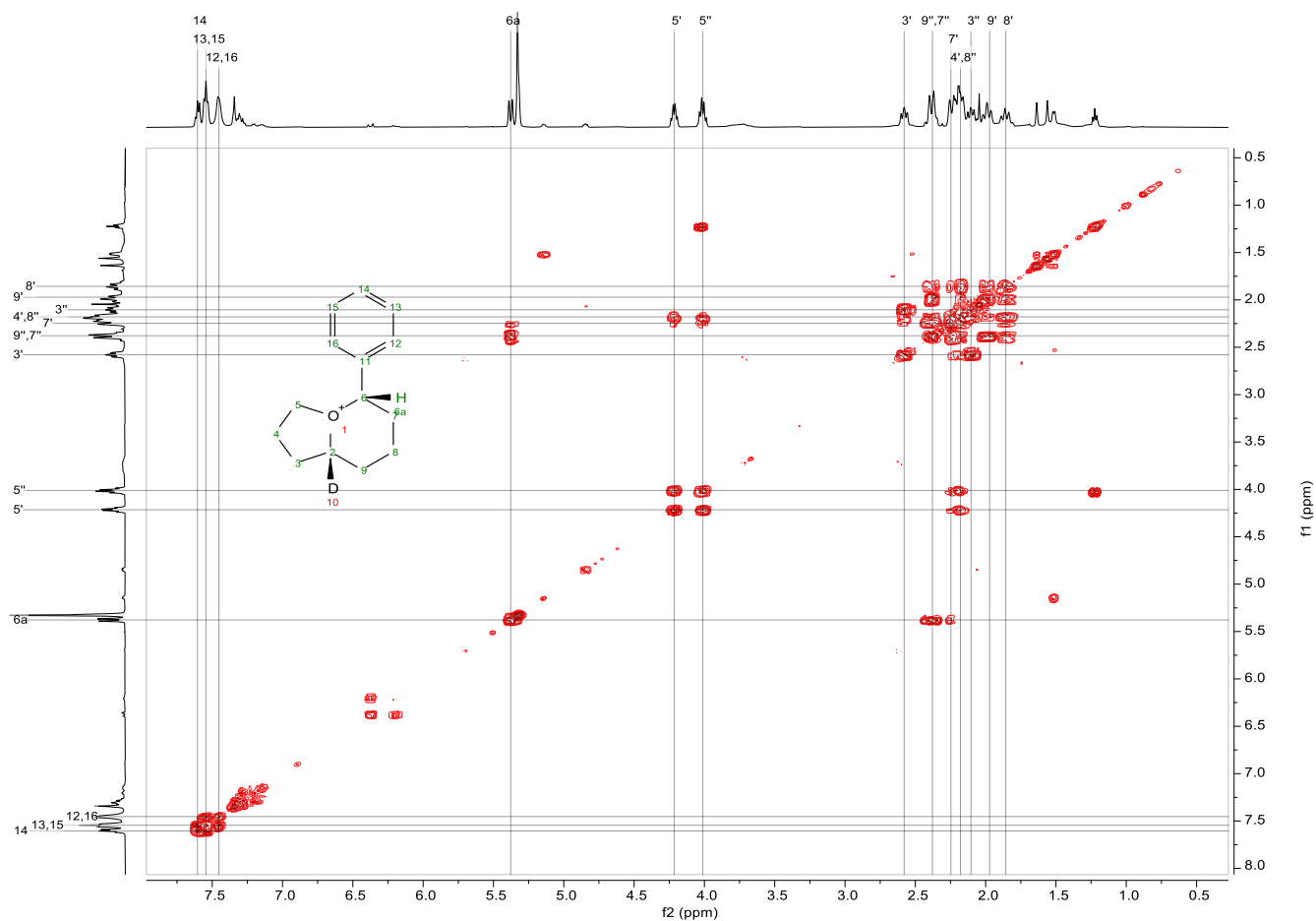


(5*S,8*aR**)-5-Phenyloctahydrofuro[1,2-*a*]pyran-4-ium-8*a-d* tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*f-d*•Al(pftb)₄, CD₂Cl₂, ¹³C NMR, 126 MHz**

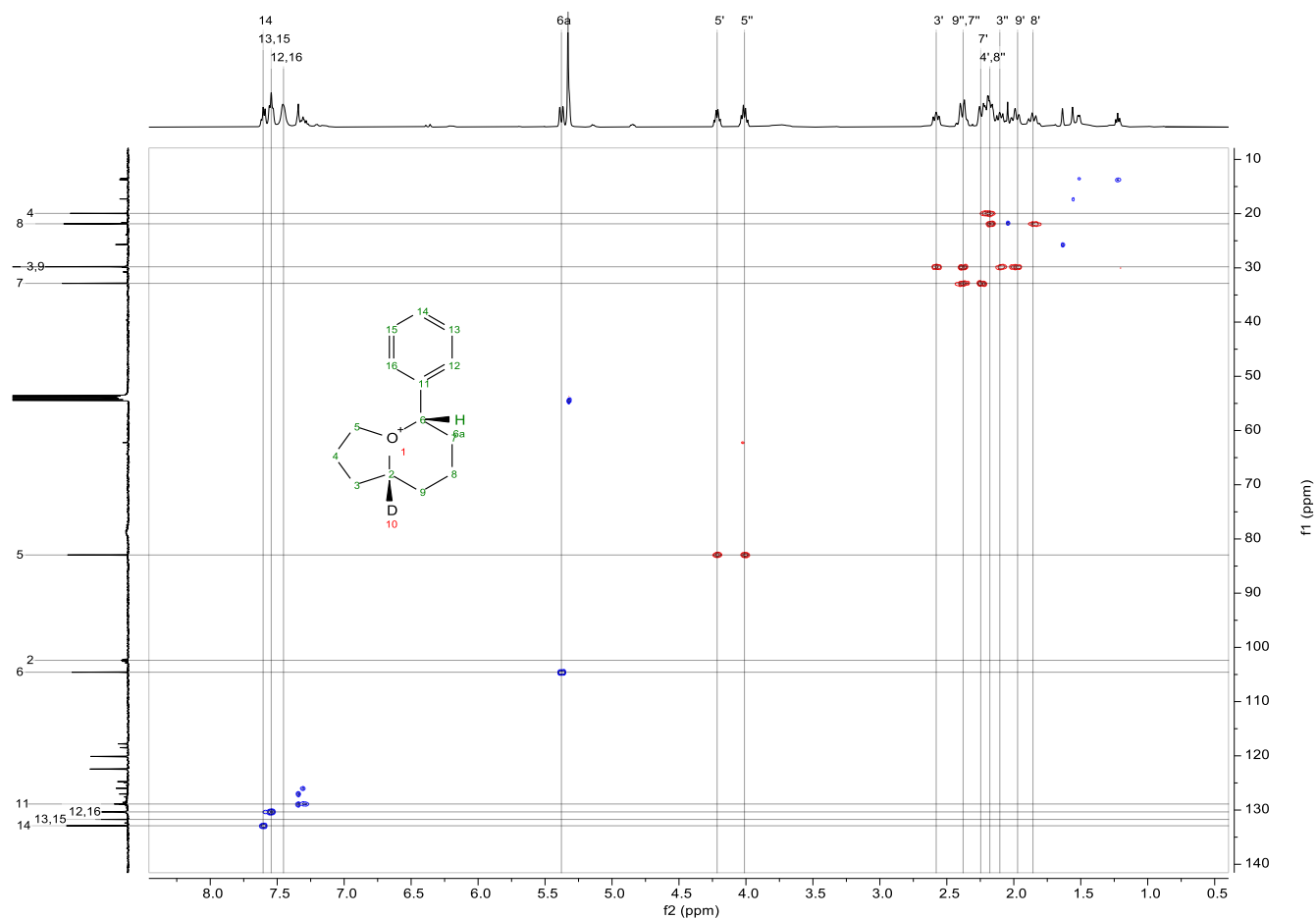
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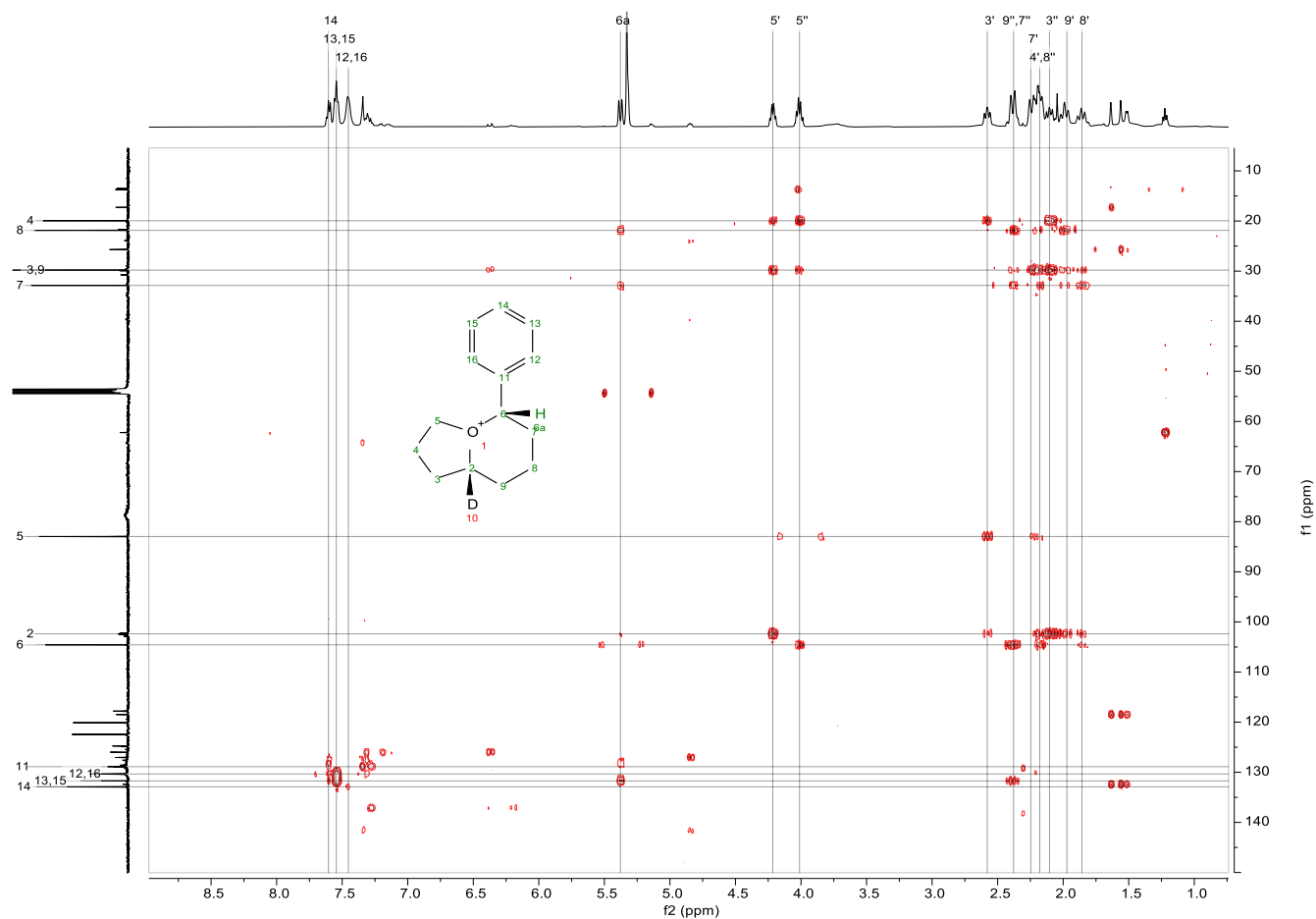
(5*S,8*aR**)-5-Phenyloctahydrofuro[1,2-*a*]pyran-4-ium-8*a-d* tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminate 24*f-d*•Al(pftb)₄, CD₂Cl₂, ¹H-¹H COSY NMR, 500/500 MHz**



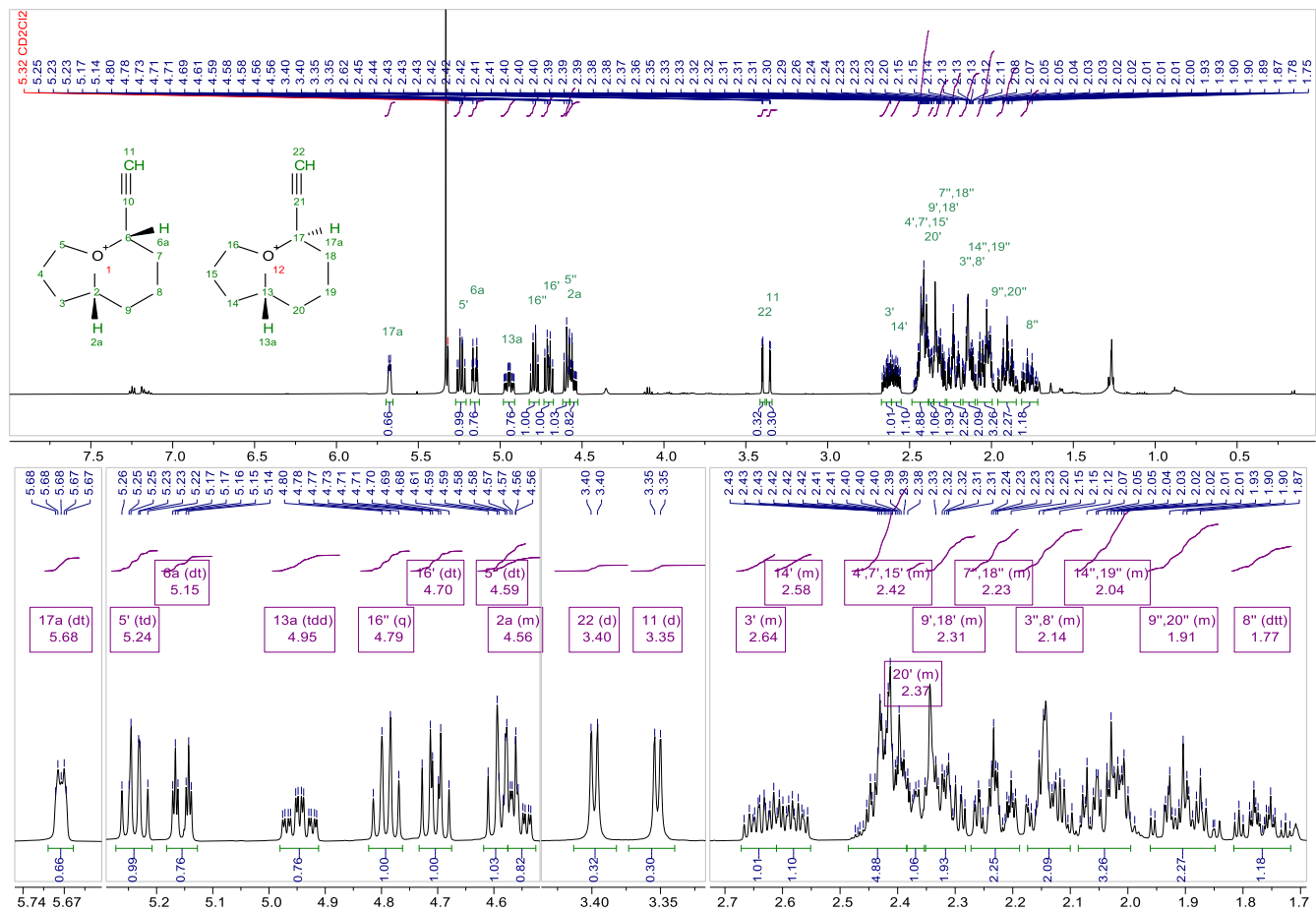
(5*S,8*aR**)-5-Phenyloctahydrofuro[1,2-*a*]pyran-4-ium-8*a-d* tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*f-d*•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HSQC NMR, 500/126 MHz**



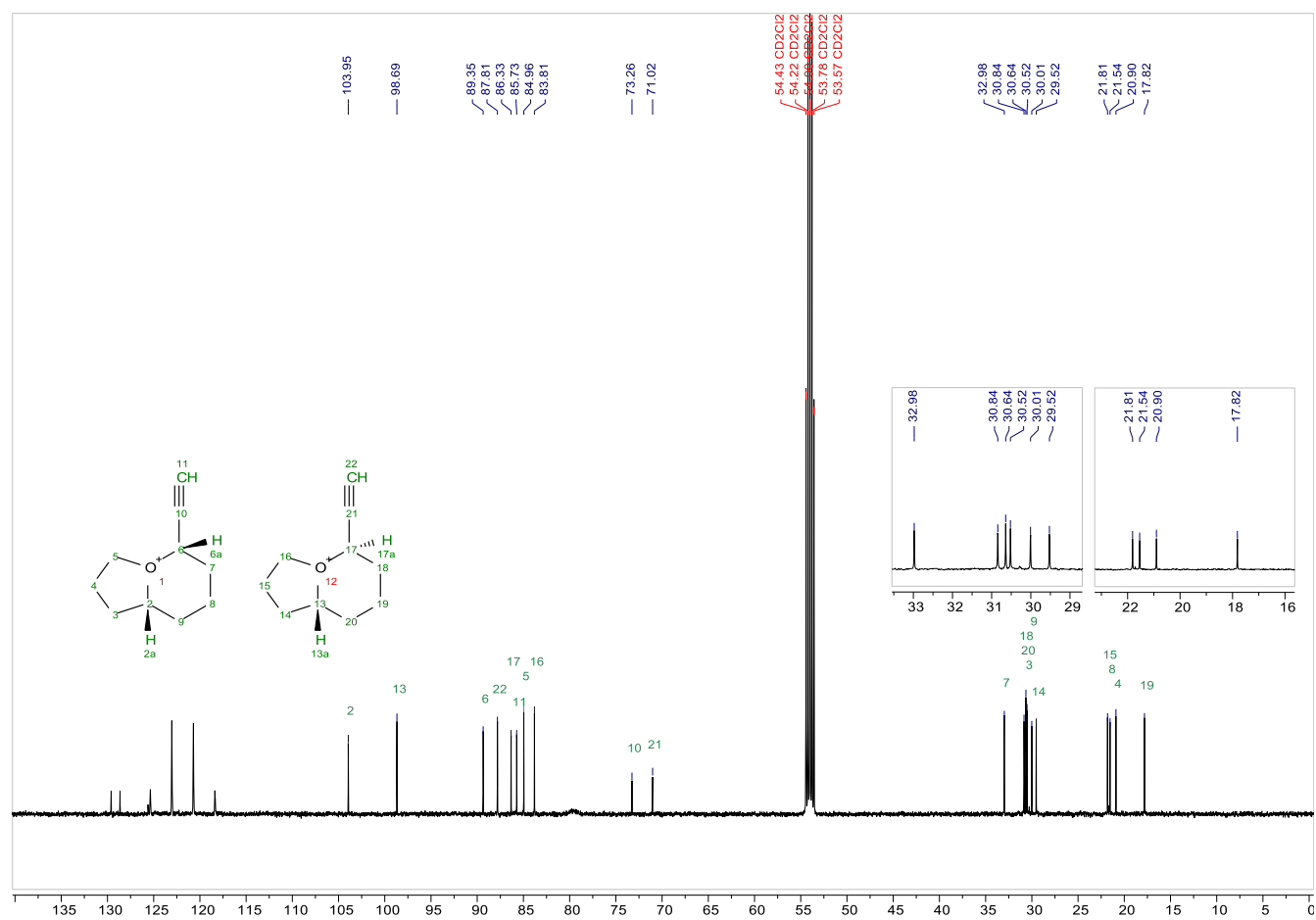
(5*S,8*aR**)-5-Phenyloctahydrofuro[1,2-*a*]pyran-4-ium-8*a-d* tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminumate 24*f-d*•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HMBC NMR, 500/126 MHz**



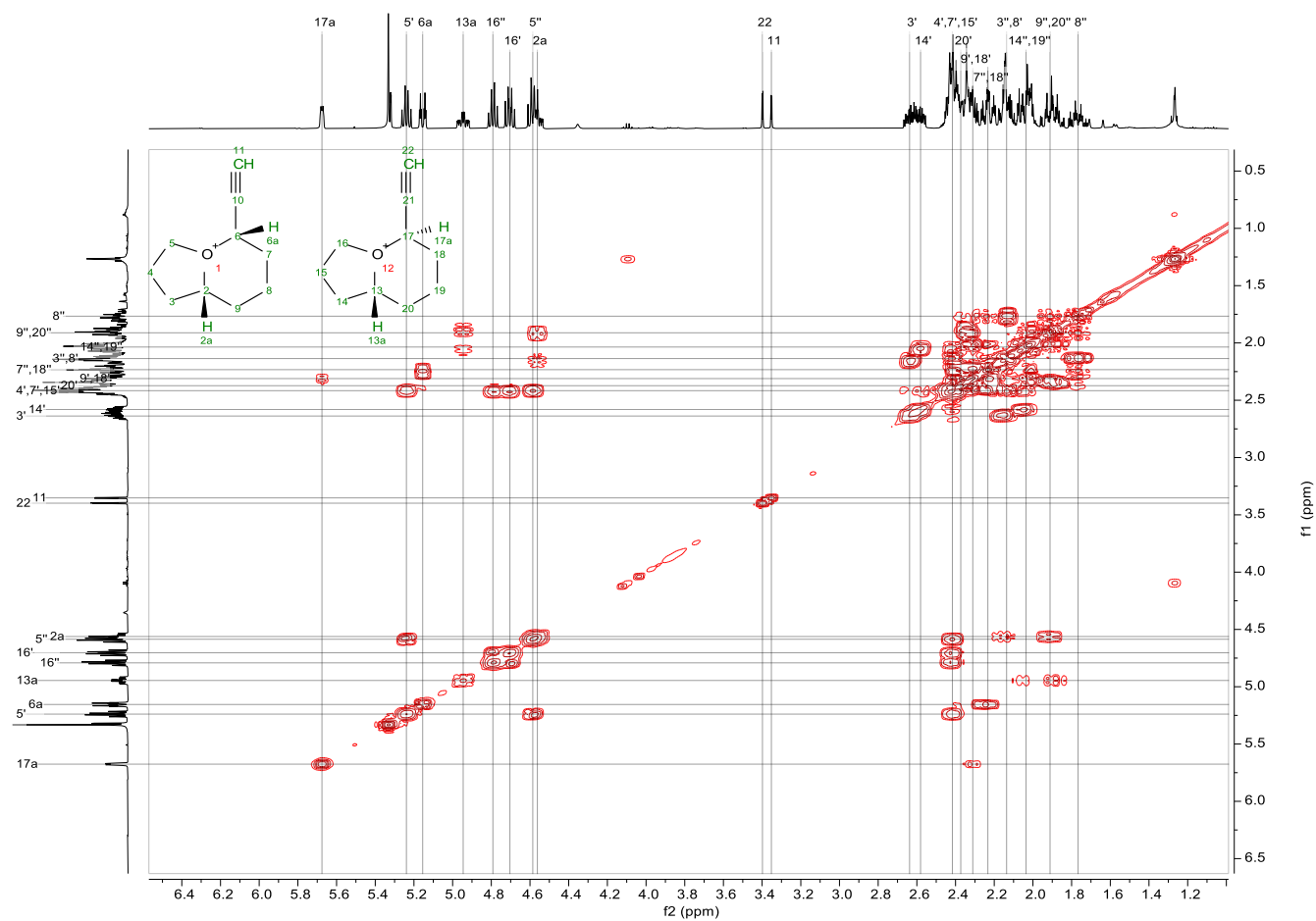
(5*S**,8*aR**)-5-Ethynyloctahydrofuro[1,2-*a*]pyran-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*g*•Al(pftb)₄ and (5*R**,8*aR**)-5-Ethynyloctahydrofuro[1,2-*a*]pyran-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*g*'•Al(pftb)₄ (ca. 1:1 diastereomeric mixture), CD₂Cl₂, ¹H NMR, 500 MHz



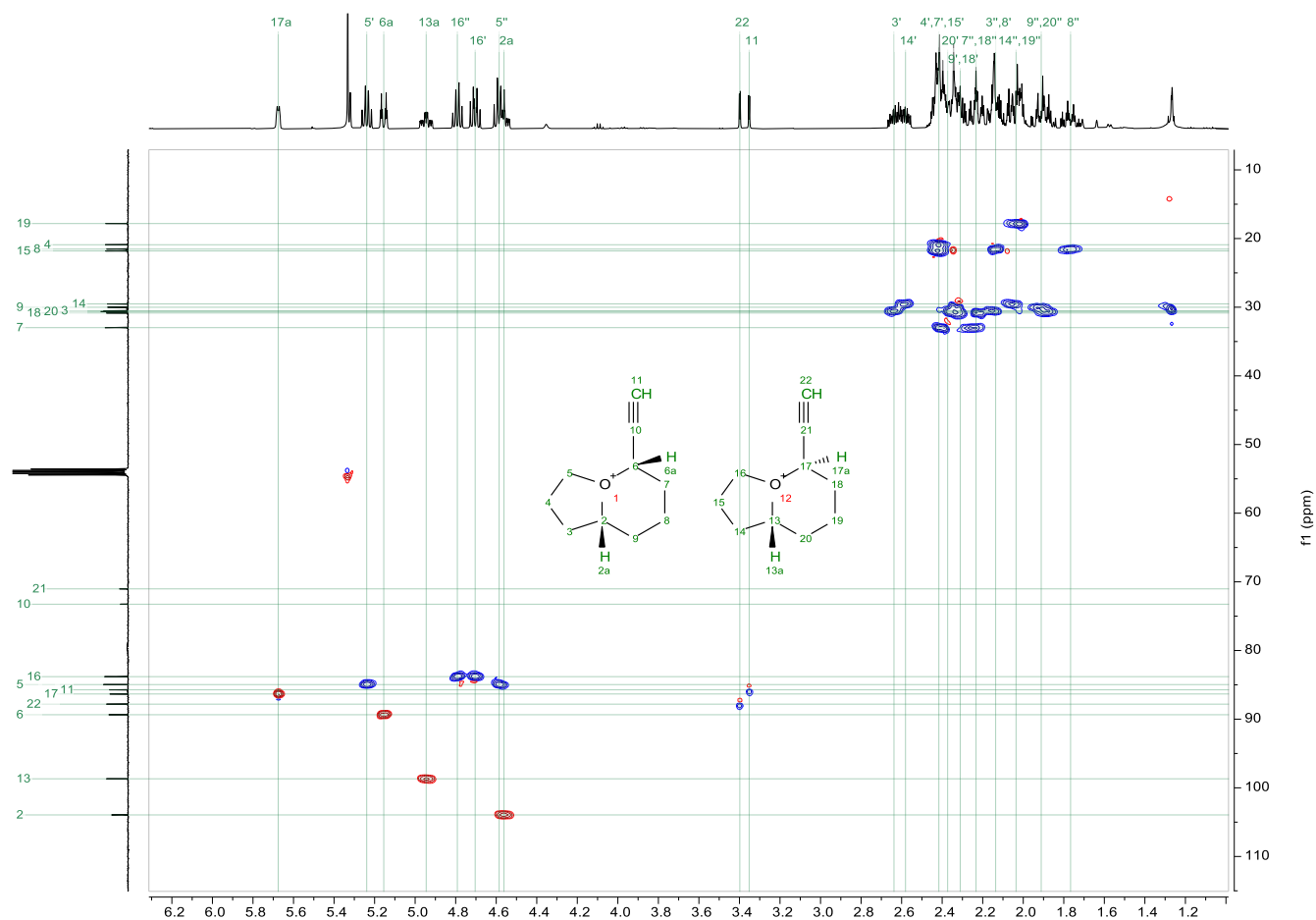
(5*S**,8*aR**)-5-Ethynyloctahydrofuro[1,2-*a*]pyran-4-ium (trifluoromethyl)propan-2-yl)oxy)aluminate 24*g*•Al(pftb)₄ and (5*R**,8*aR**)-5-Ethynyloctahydrofuro[1,2-*a*]pyran-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*g*'•Al(pftb)₄ (ca. 1:1 diastereomeric mixture), CD₂Cl₂, ¹³C NMR, 500 MHz



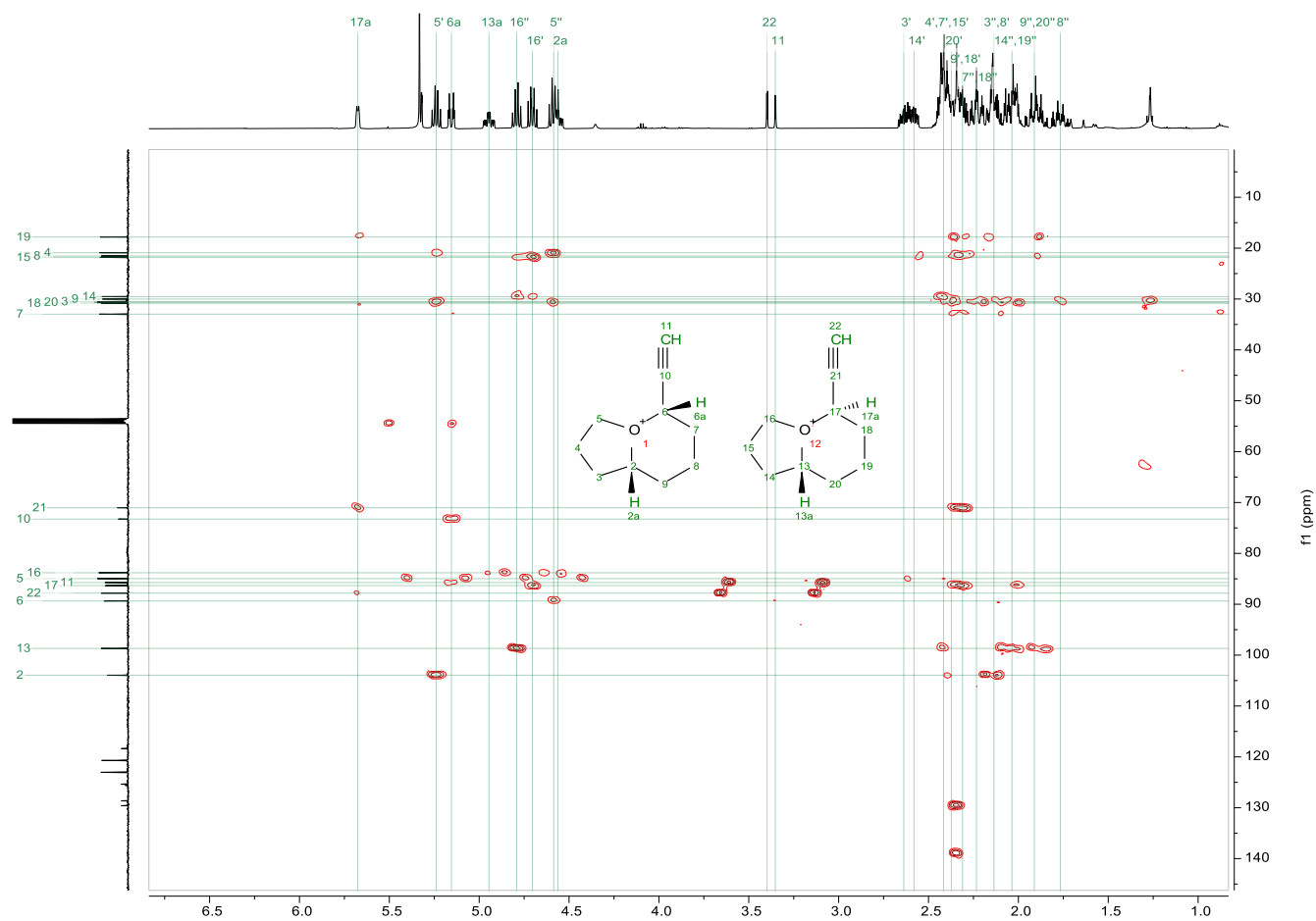
(5*S,8*aR**)-5-Ethynyloctahydrofuro[1,2-*a*]pyran-4-ium** **tetrakis((1,1,1,3,3,3-hexafluoro** **2-**
(trifluoromethyl)propan-2-yl)oxy)aluminate **24g•Al(pftb)₄** **and (5*R**,8*aR**)-5-Ethynyloctahydrofuro[1,2-**
***a*]pyran-4-ium** **tetrakis((1,1,1,3,3,3-hexafluoro** **2-(trifluoromethyl)propan-2-yl)oxy)aluminate**
24g'•Al(pftb)₄ (ca. 1:1 diastereomeric mixture), CD₂Cl₂, ¹H-¹H COSY NMR, 500/500 MHz



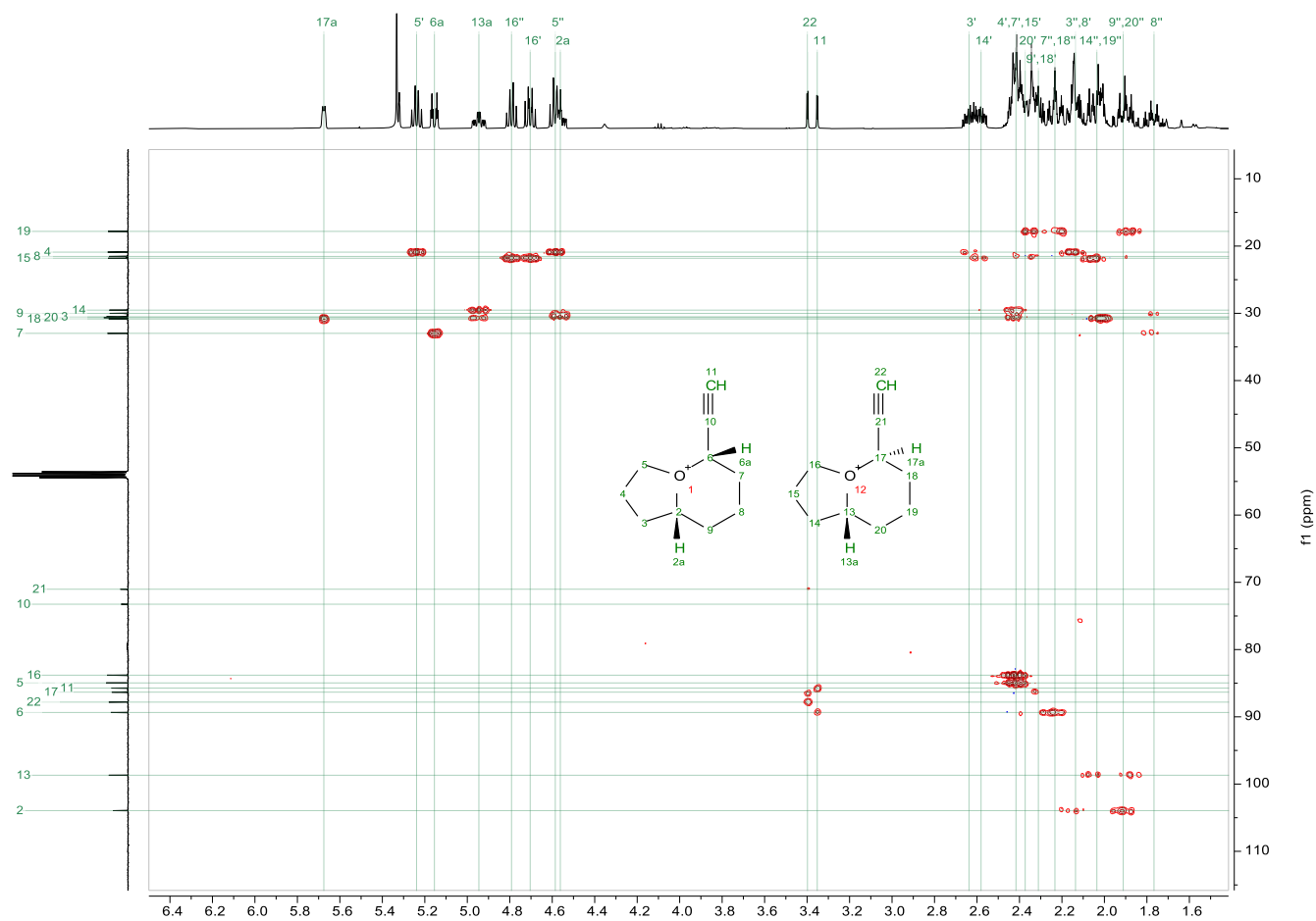
(5*S,8*aR**)-5-Ethynyloctahydrofuro[1,2-*a*]pyran-4-ium** **tetrakis((1,1,1,3,3,3-hexafluoro 2-**
(trifluoromethyl)propan-2-yl)oxy)aluminate 24g•Al(pftb)₄ **and (5*R**,8*aR**)-5-Ethynyloctahydrofuro[1,2-**
***a*]pyran-4-ium** **tetrakis((1,1,1,3,3,3-hexafluoro**
2-(trifluoromethyl)propan-2-yl)oxy)aluminate
24g'•Al(pftb)₄ (ca. 1:1 diastereomeric mixture), CD₂Cl₂, ¹H-¹³C HSQC NMR, 500/126 MHz



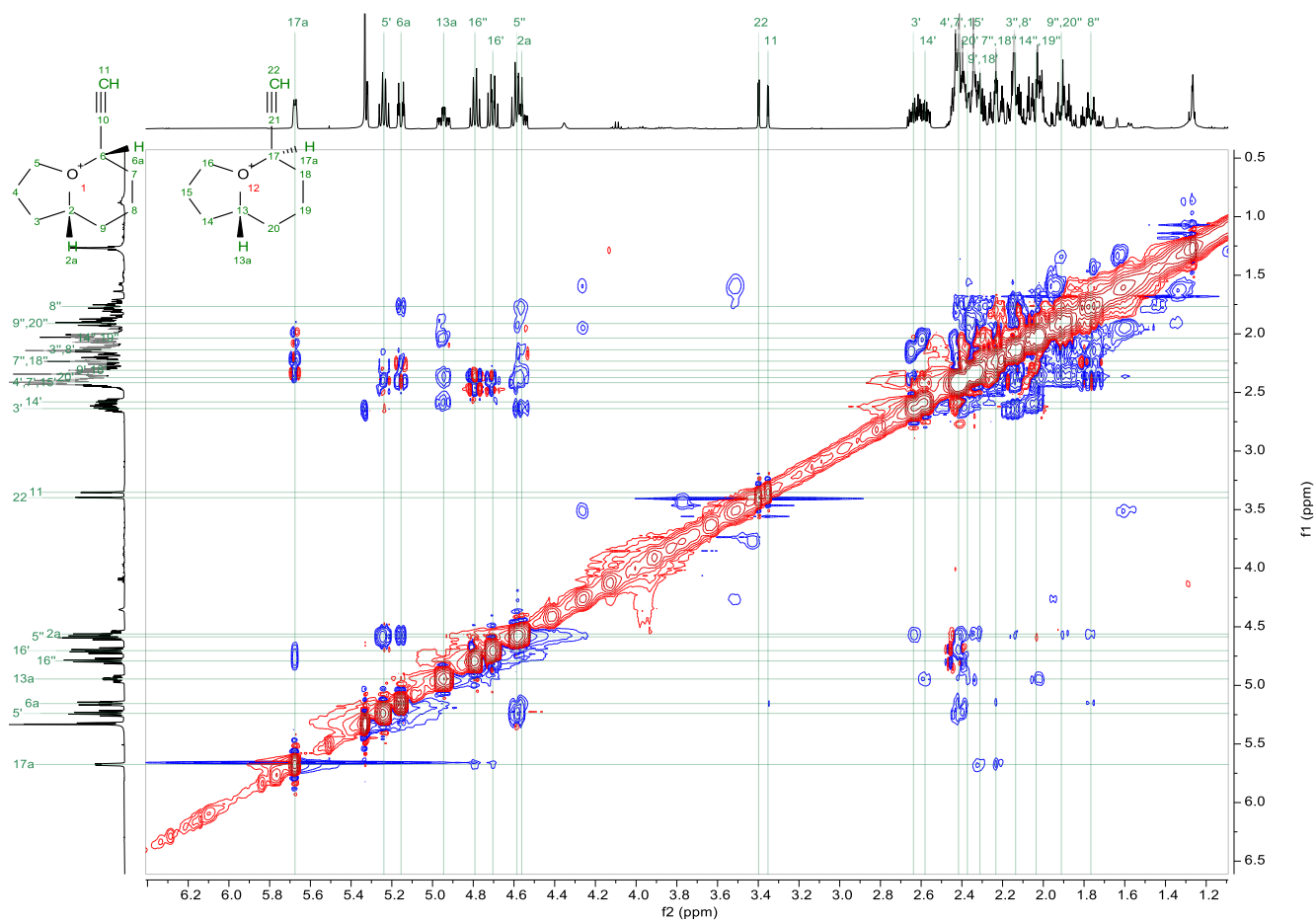
(5*S,8*aR**)-5-Ethynyloctahydrofuro[1,2-*a*]pyran-4-ium** **tetrakis((1,1,1,3,3,3-hexafluoro 2-**
(trifluoromethyl)propan-2-yl)oxy)aluminate 24g•Al(pftb)₄ **and (5*R**,8*aR**)-5-Ethynyloctahydrofuro[1,2-**
***a*]pyran-4-ium** **tetrakis((1,1,1,3,3,3-hexafluoro 2-**
2-(trifluoromethyl)propan-2-yl)oxy)aluminate
24g'•Al(pftb)₄ (ca. 1:1 diastereomeric mixture), CD₂Cl₂, ¹H-¹³C HMBC NMR, 500/126 MHz



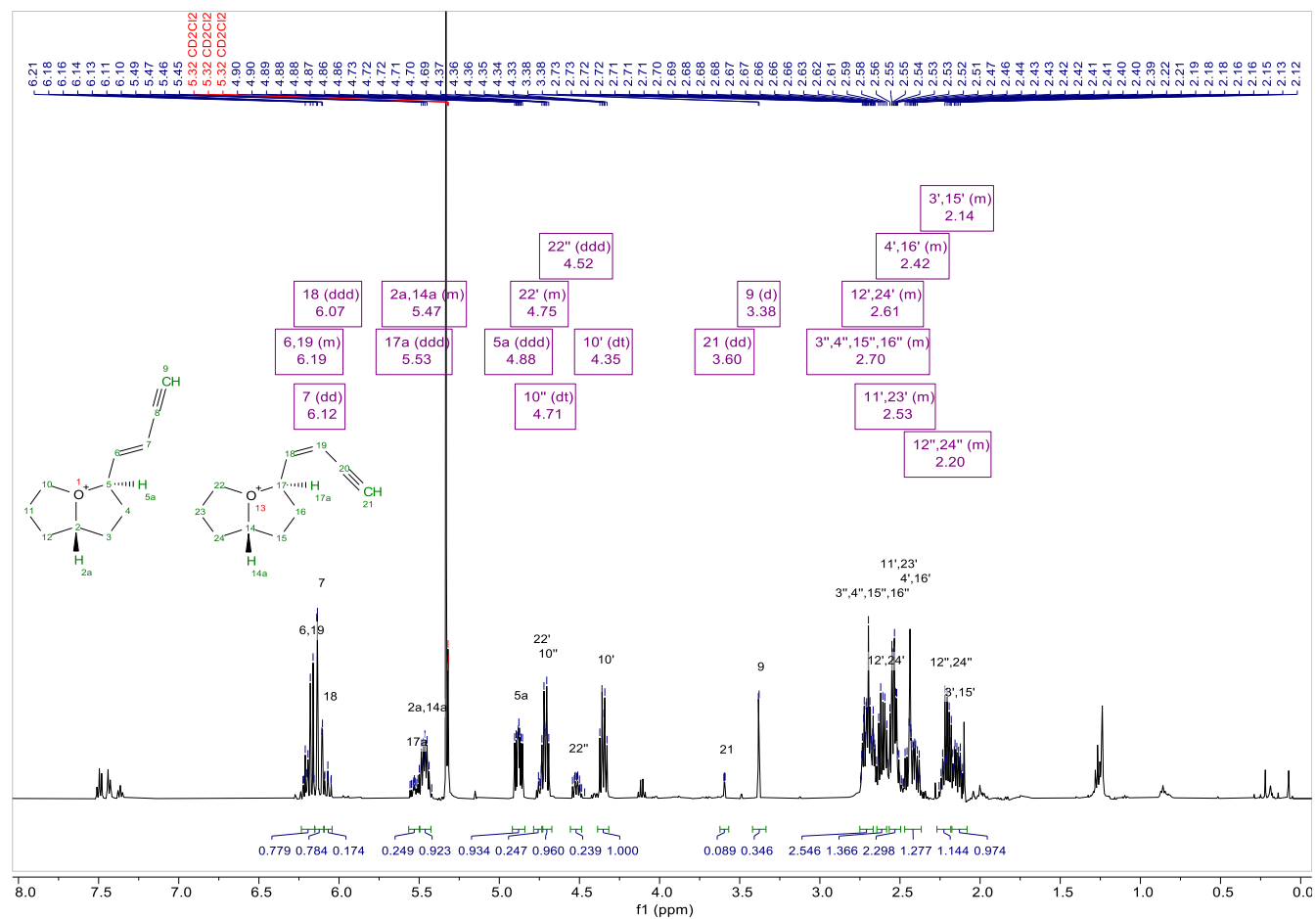
(5*S,8*aR**)-5-Ethynyloctahydrofuro[1,2-*a*]pyran-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24g•Al(pftb)₄ and (5*R**,8*aR**)-5-Ethynyloctahydrofuro[1,2-*a*]pyran-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24g'•Al(pftb)₄ (ca. 1:1 diastereomeric mixture), CD₂Cl₂, ¹H-¹³C H2BC NMR, 500/126 MHz**



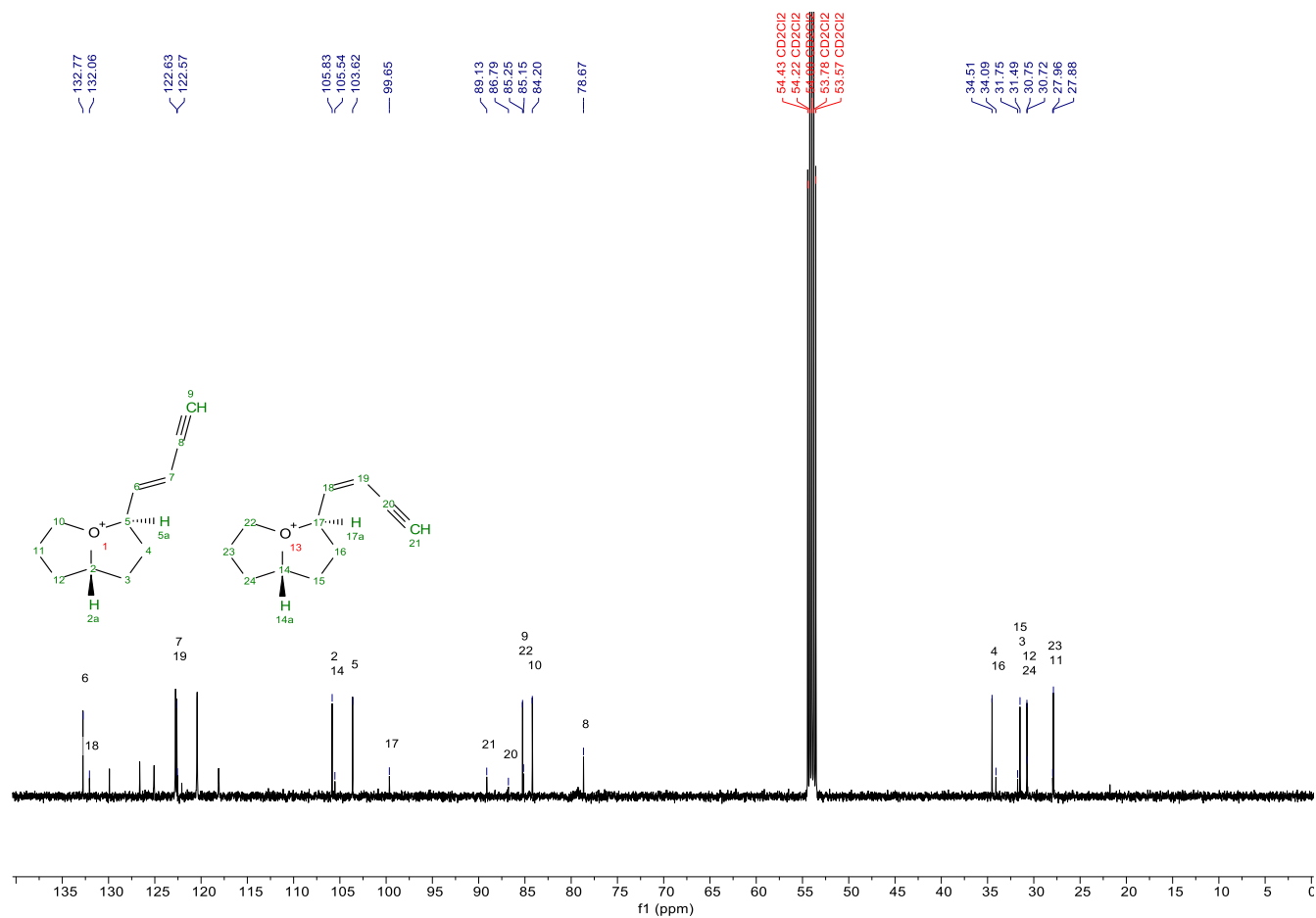
(5*S,8*aR**)-5-Ethynyloctahydrofuro[1,2-*a*]pyran-4-ium** **tetrakis((1,1,1,3,3,3-hexafluoro** **2-**
(trifluoromethyl)propan-2-yl)oxy)aluminate 24*g*•Al(pftb)₄ **and (5*R**,8*aR**)-5-Ethynyloctahydrofuro[1,2-**
***a*]pyran-4-ium** **tetrakis((1,1,1,3,3,3-hexafluoro** **2-(trifluoromethyl)propan-2-yl)oxy)aluminate**
24*g*'•Al(pftb)₄ (ca. 1:1 diastereomeric mixture), CD₂Cl₂, ¹H-¹H NOESY NMR, 500/500 MHz



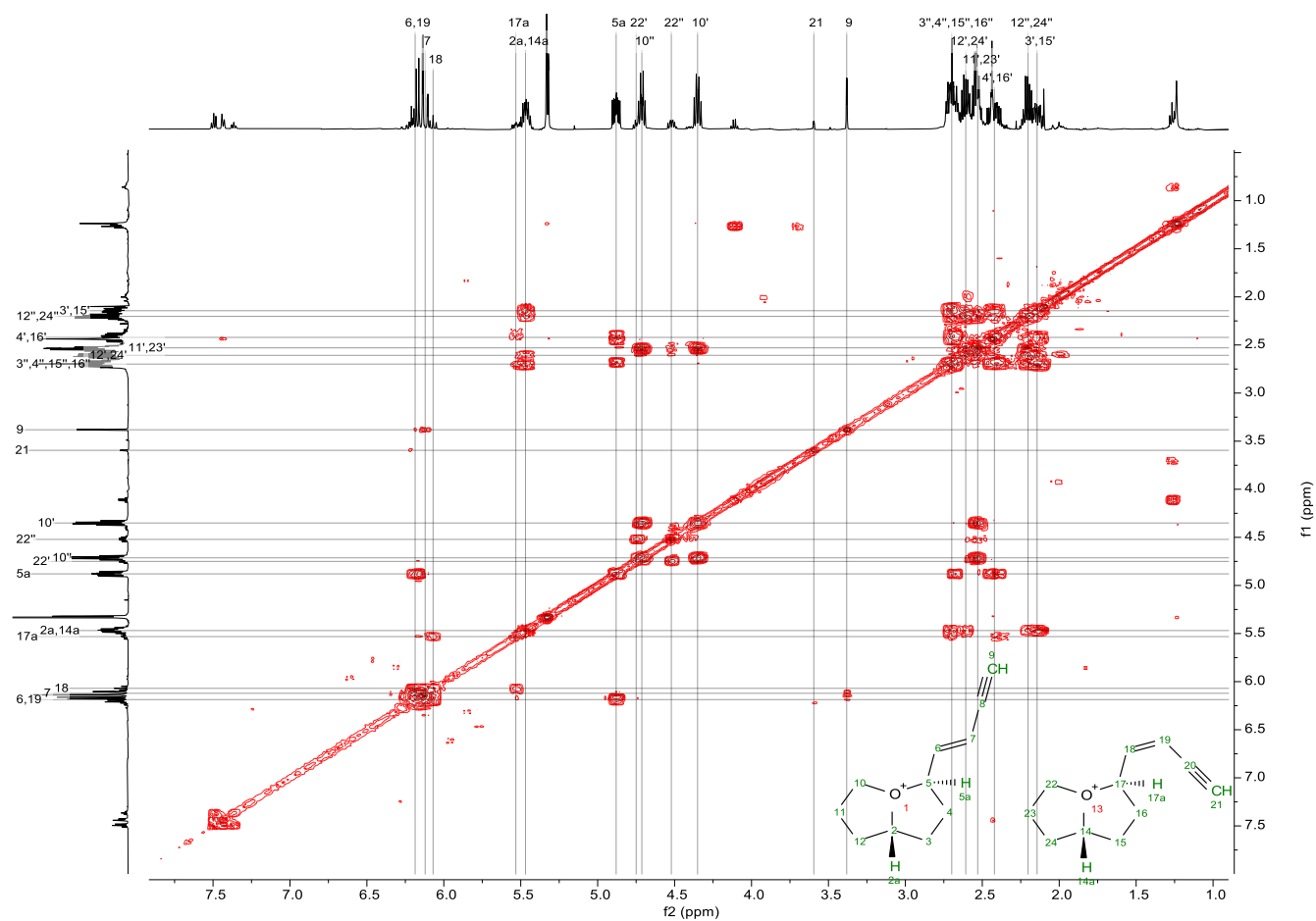
(3*R,7*aS**)-3-((*E*)-But-1-en-3-yn-1-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat (*E*)-24*h*•Al(pftb)₄ and (3*R**,7*aS**)-3-((*Z*)-But-1-en-3-yn-1-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat (*Z*)-24*h*•Al(pftb)₄ (ca. 4:1 diastereomeric mixture), CD₂Cl₂, ¹H NMR, 500 MHz**



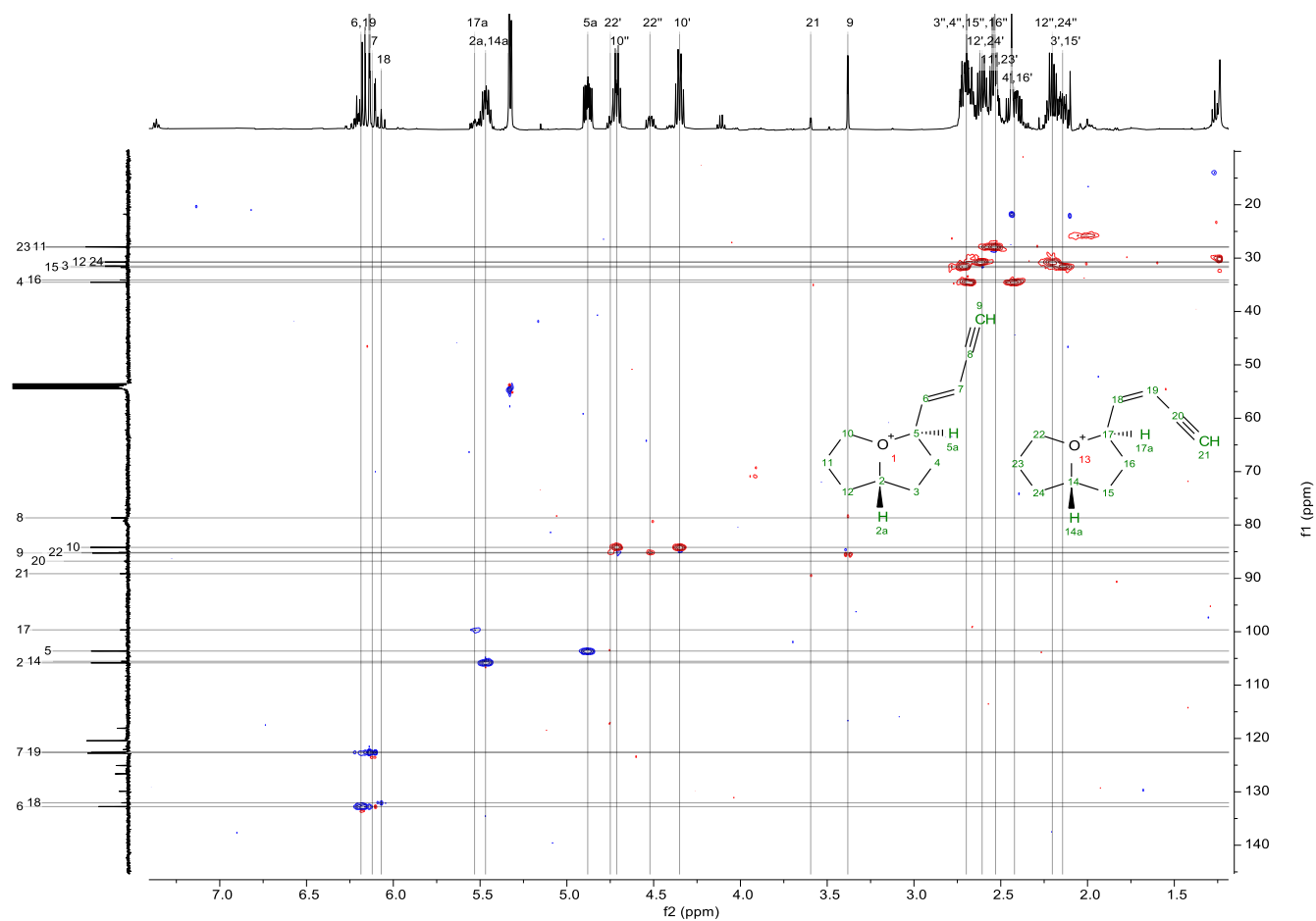
(3*R,7*aS**)-3-((*E*)-But-1-en-3-yn-1-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat (*E*)-24*h*•Al(pftb)₄ and (3*R**,7*aS**)-3-((*Z*)-But-1-en-3-yn-1-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat (*Z*)-24*h*•Al(pftb)₄ (ca. 4:1 diastereomeric mixture), CD₂Cl₂, ¹³C NMR, 126MHz**



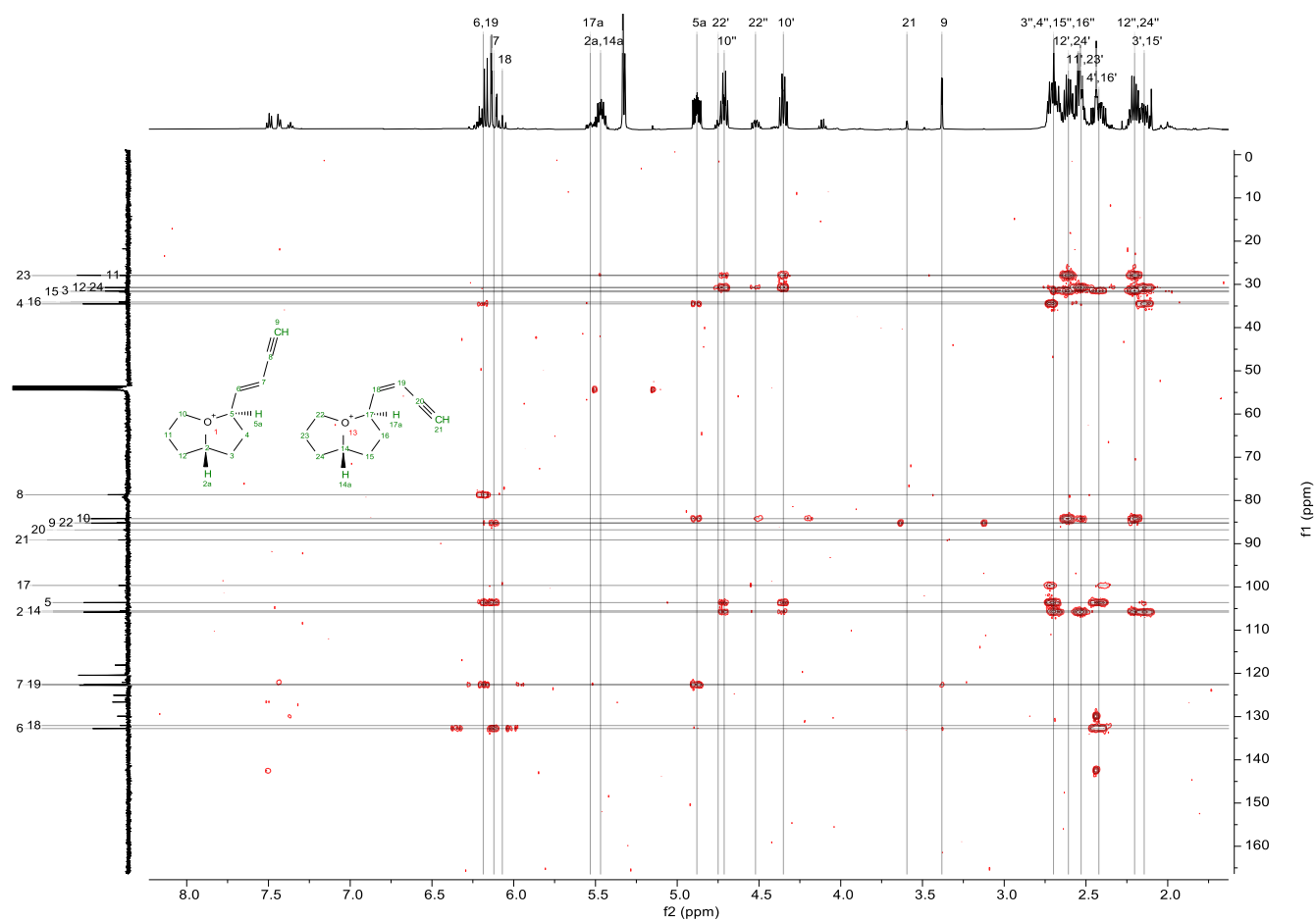
(3*R,7*aS**)-3-((*E*)-But-1-en-3-yn-1-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate (*E*)-24*h*•Al(pftb)₄ and (3*R**,7*aS**)-3-((*Z*)-But-1-en-3-yn-1-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate (*Z*)-24*h*•Al(pftb)₄ (ca. 4:1 diastereomeric mixture), CD₂Cl₂, ¹H-¹H COSY NMR, 500/500 MHz**



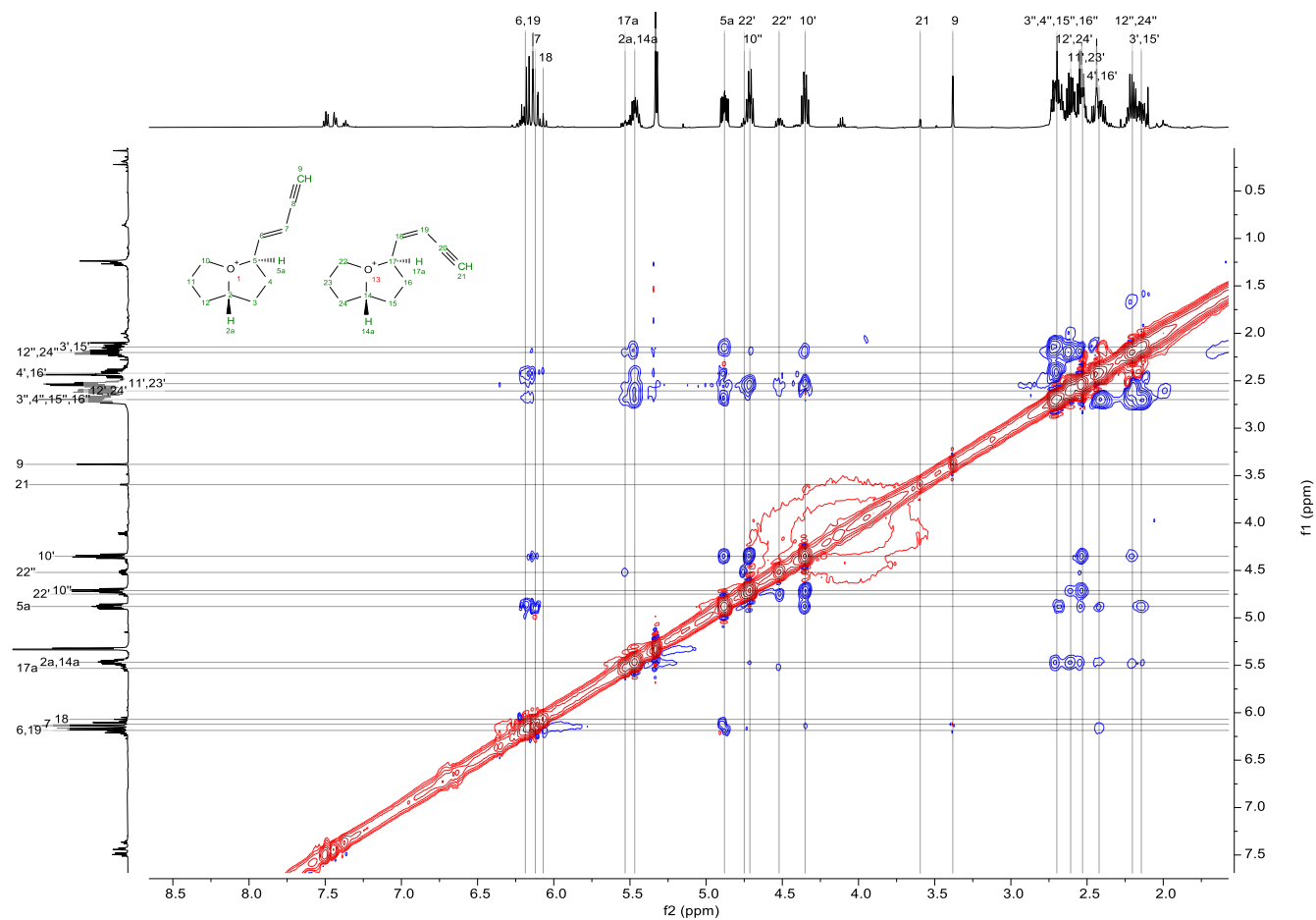
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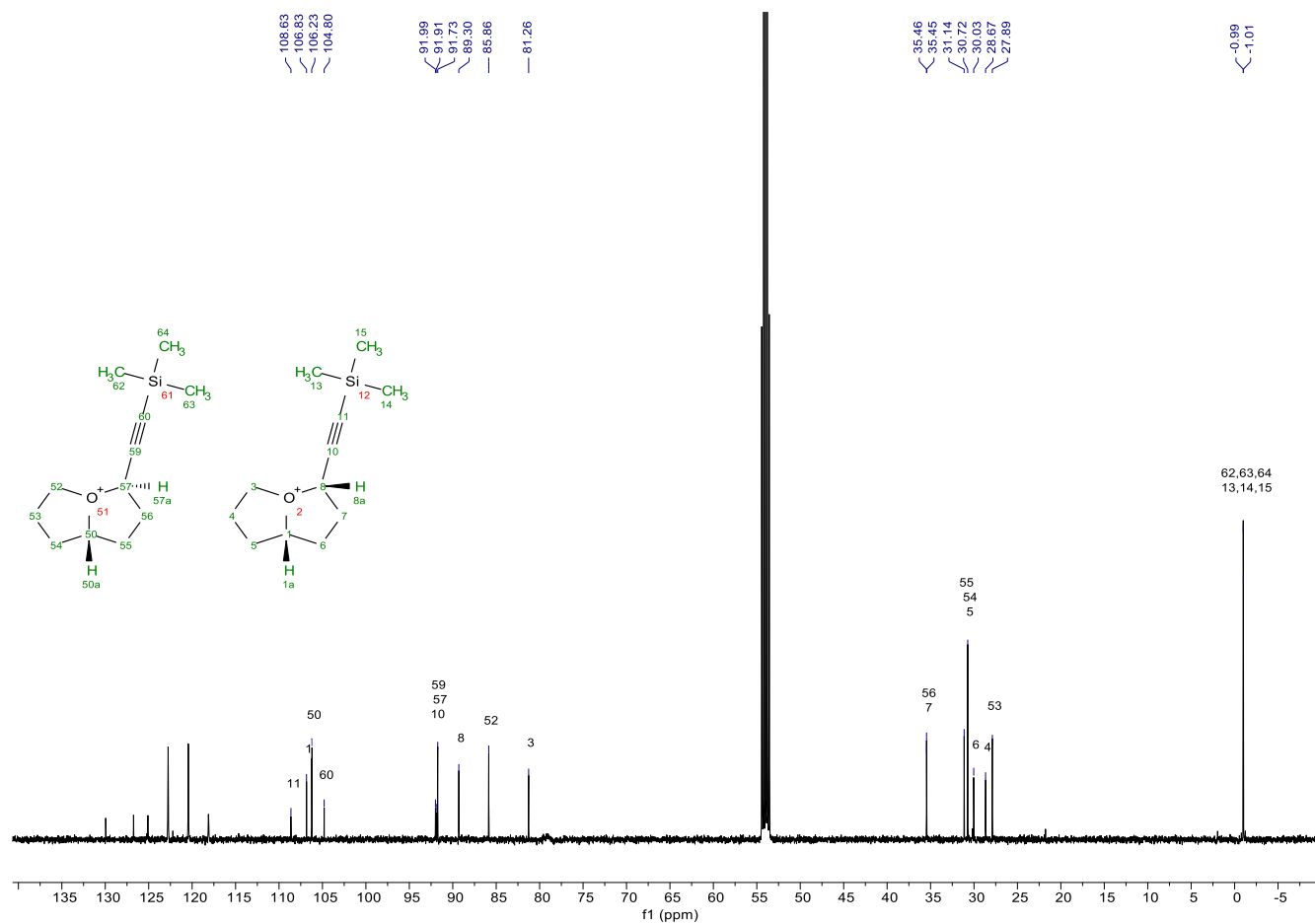
(3*R,7*aS**)-3-((*E*)-But-1-en-3-yn-1-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate (*E*)-24*h*•Al(pftb)₄ and (3*R**,7*aS**)-3-((*Z*)-But-1-en-3-yn-1-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate (*Z*)-24*h*•Al(pftb)₄ (ca. 4:1 diastereomeric mixture), CD₂Cl₂, ¹H-¹³C HMBC NMR, 500/126 MHz**



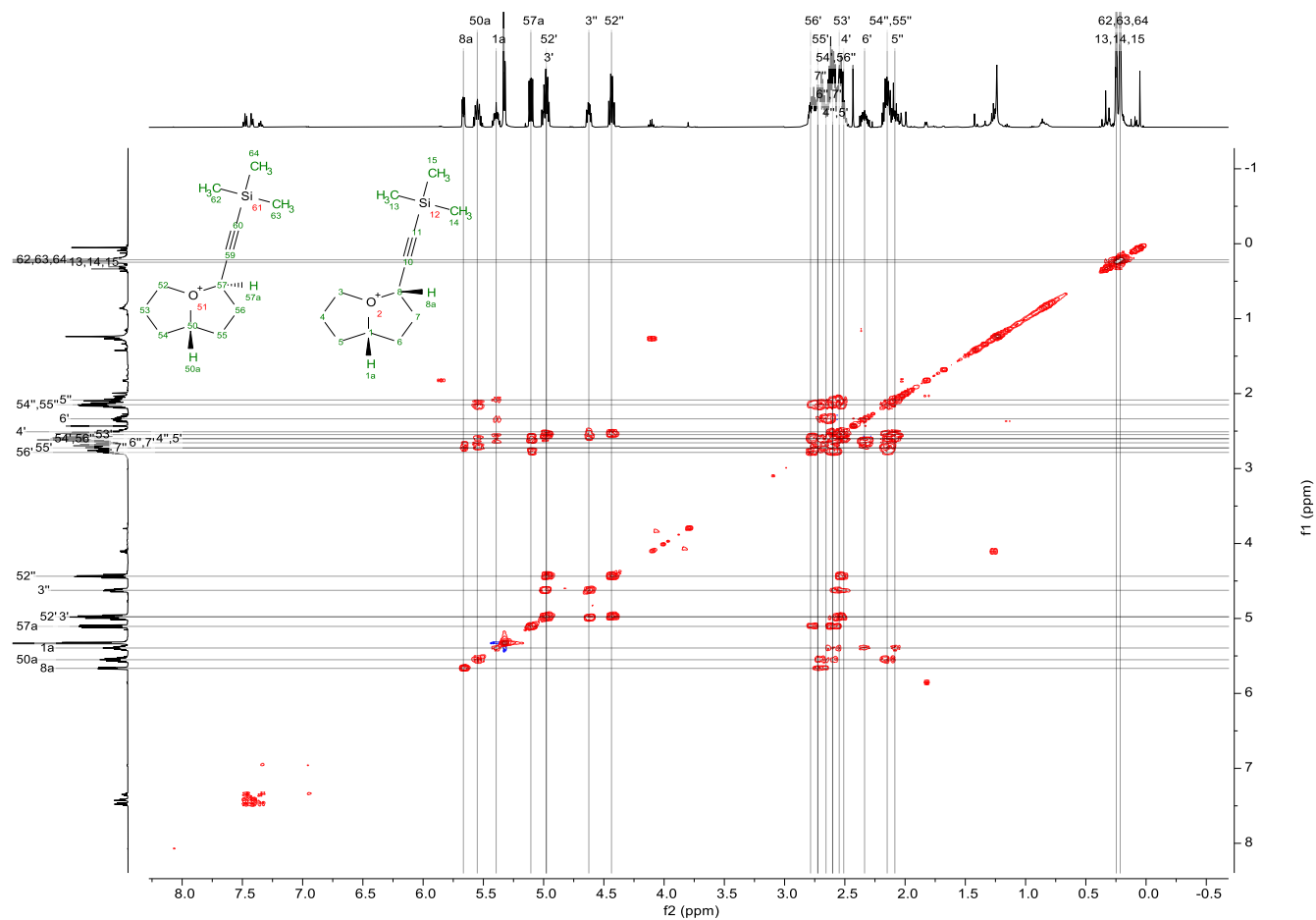
(3*R,7*aS**)-3-((*E*)-But-1-en-3-yn-1-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate (*E*)-24*h*•Al(pftb)₄ and (3*R**,7*aS**)-3-((*Z*)-But-1-en-3-yn-1-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate (*Z*)-24*h*•Al(pftb)₄ (ca. 4:1 diastereomeric mixture), CD₂Cl₂, ¹H-¹H NOESY NMR, 500/500 MHz**



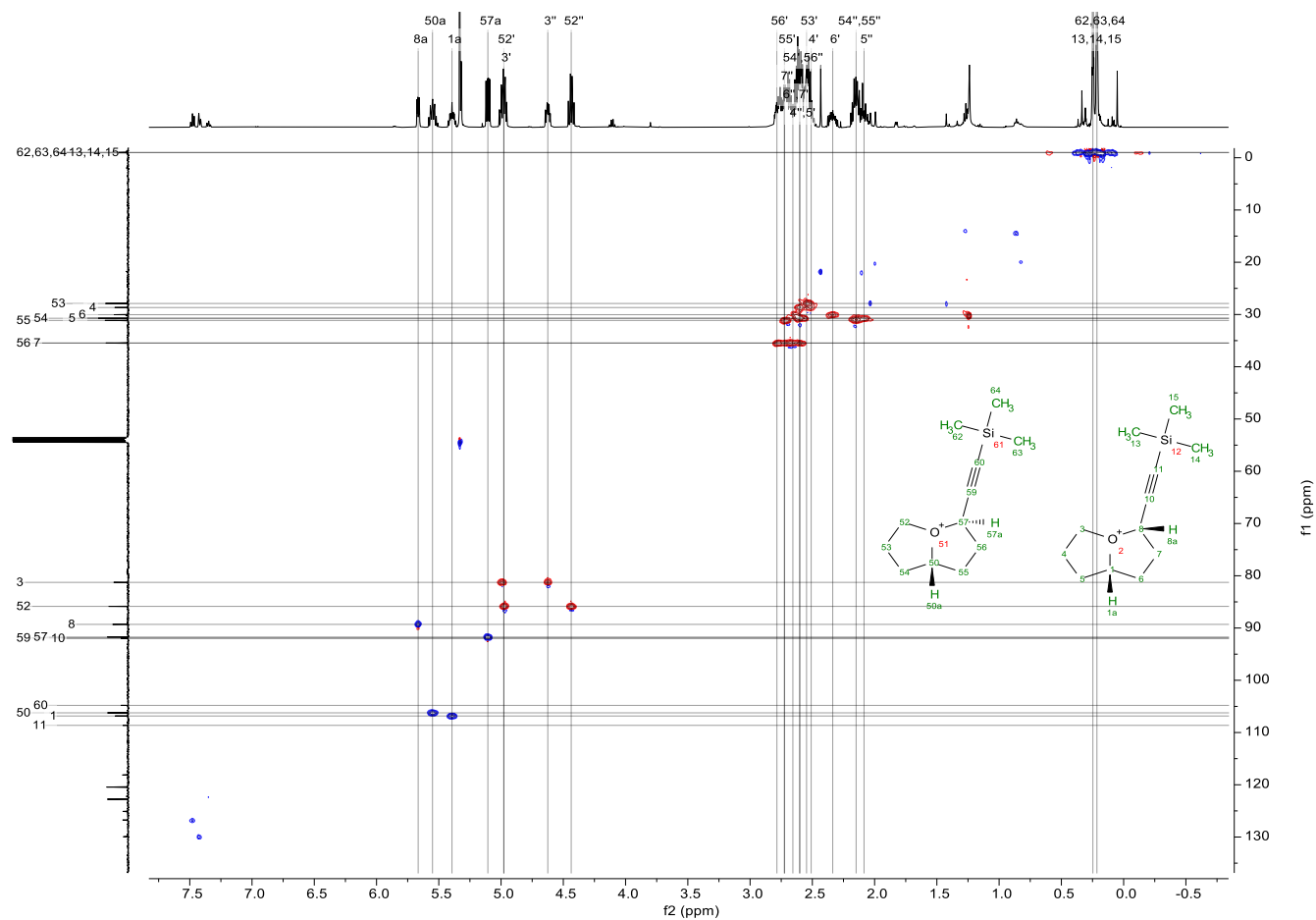
(3*R,7*aS**)-3-((Trimethylsilyl)ethynyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24i•Al(pftb)₄ and (3*S**,7*aS**)-3-((Trimethylsilyl)ethynyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24i'•Al(pftb)₄ (ca. 1.4:1 diastereomeric mixture), CD₂Cl₂, ¹³C NMR, 126 MHz**



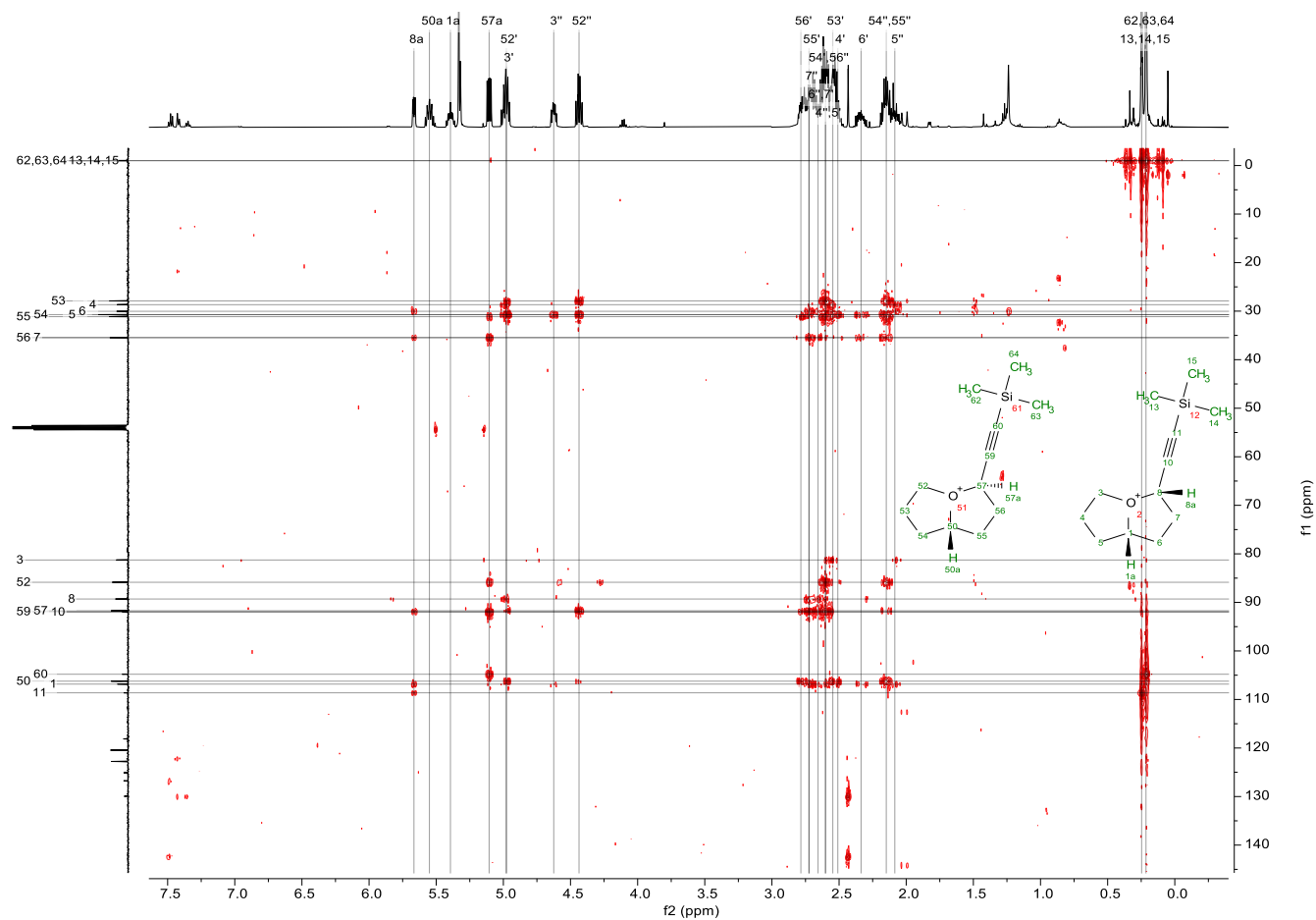
(3*R,7*aS**)-3-((Trimethylsilyl)ethynyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*i*•Al(pftb)₄ and (3*S**,7*aS**)-3-((Trimethylsilyl)ethynyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*i*'•Al(pftb)₄ (ca. 1.4:1 diastereomeric mixture), CD₂Cl₂, ¹H-¹H COSY NMR, 500/500 MHz**



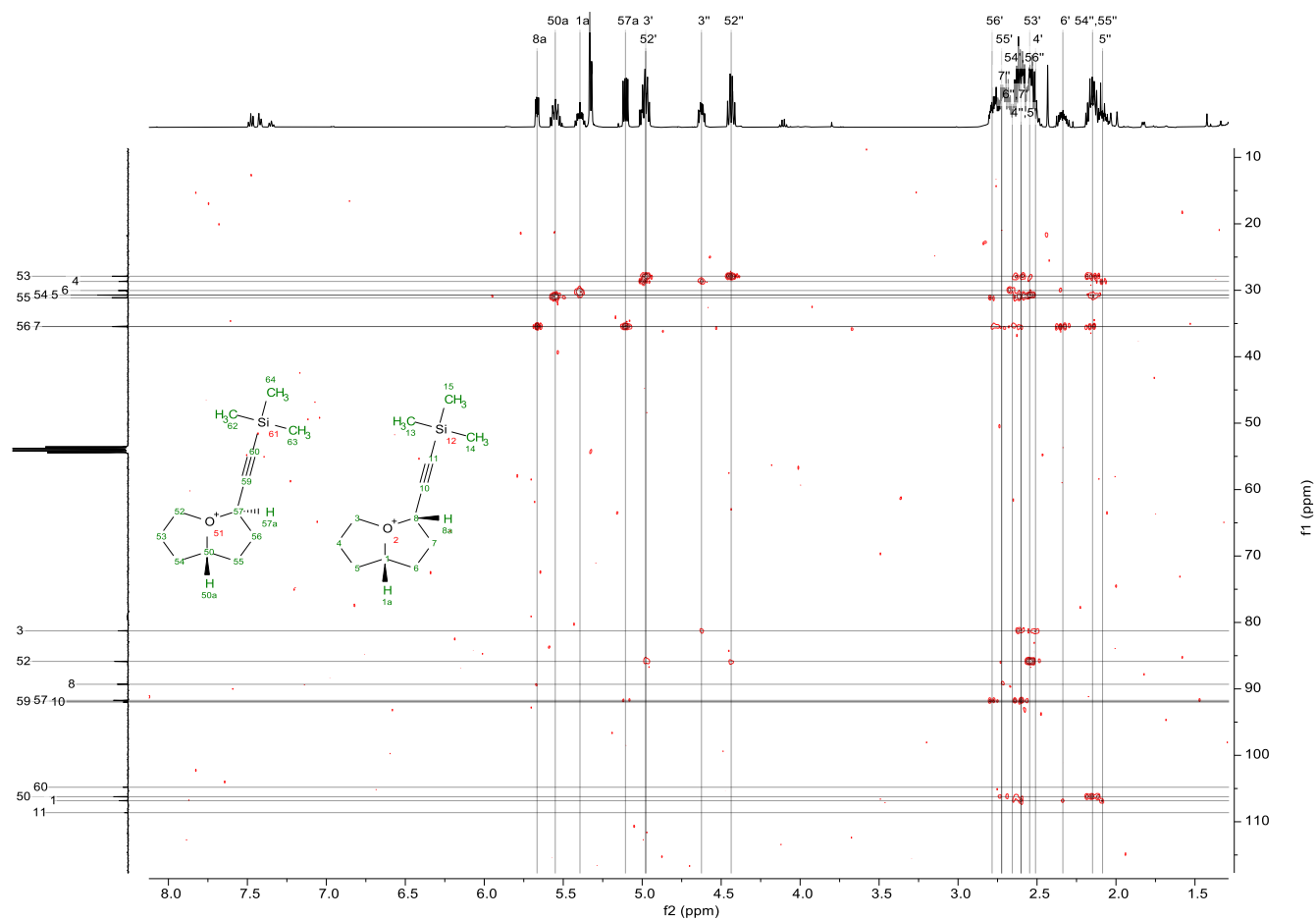
(3*R,7*aS**)-3-((Trimethylsilyl)ethynyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*i*•Al(pftb)₄ and (3*S**,7*aS**)-3-((Trimethylsilyl)ethynyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*i*'•Al(pftb)₄ (ca. 1.4:1 diastereomeric mixture), CD₂Cl₂, ¹H-¹³C HSQC NMR, 500/126 MHz**



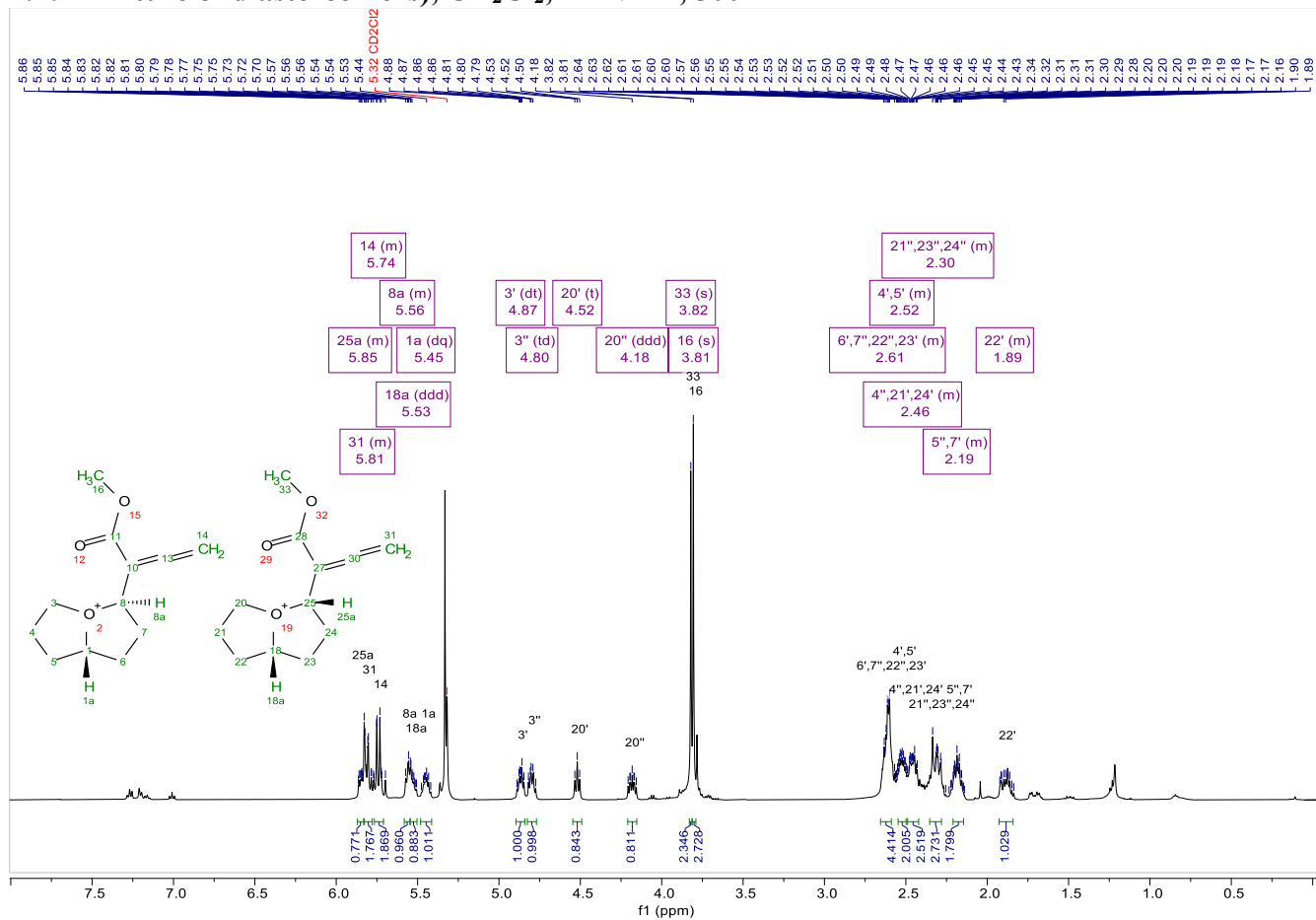
(3*R,7*aS**)-3-((Trimethylsilyl)ethynyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24i•Al(pftb)₄ and (3*S**,7*aS**)-3-((Trimethylsilyl)ethynyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24i'•Al(pftb)₄ (ca. 1.4:1 diastereomeric mixture), CD₂Cl₂, ¹H-¹³C HMBC NMR, 500/126 MHz**



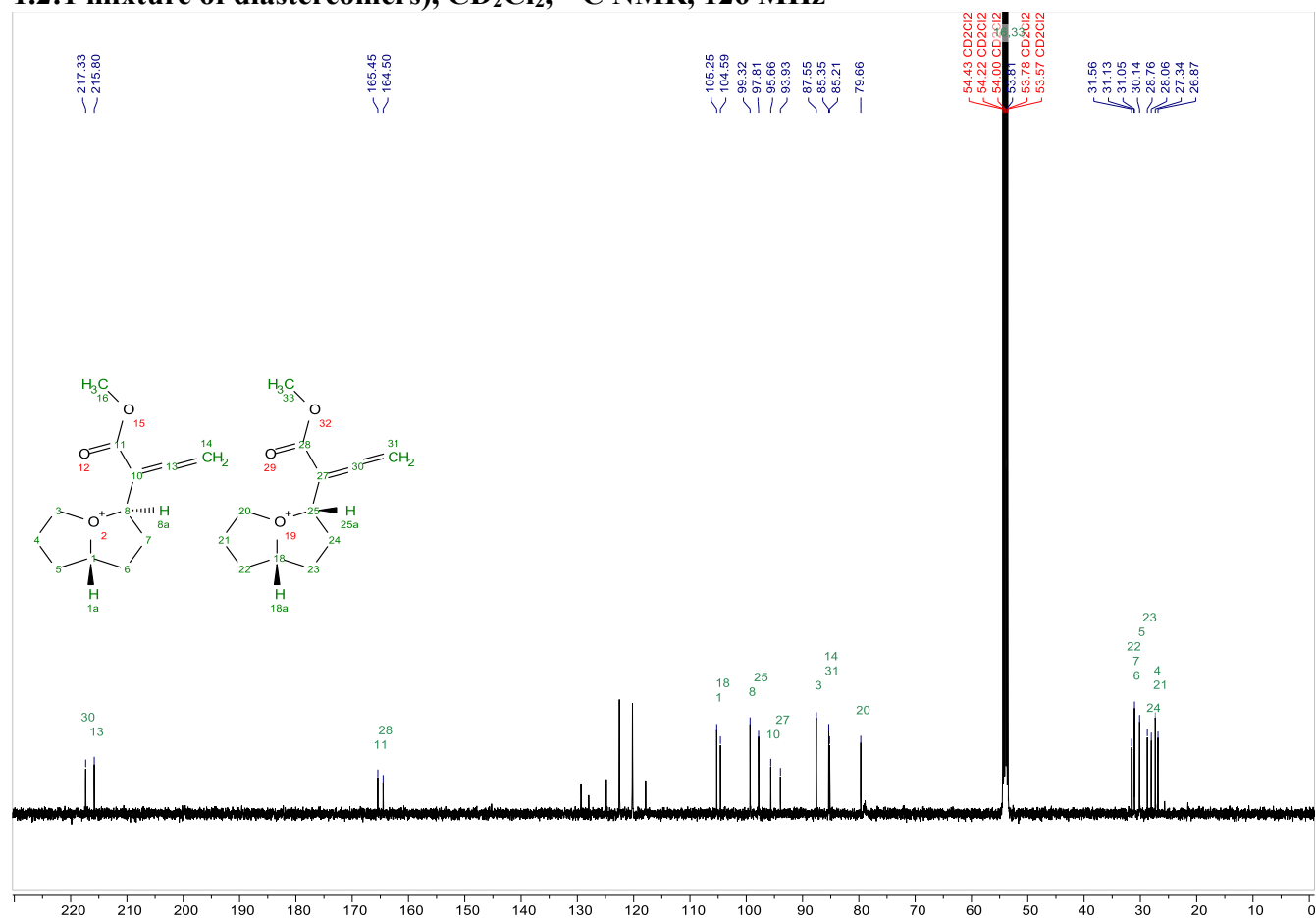
(3*R,7*aS**)-3-((Trimethylsilyl)ethynyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*i*•Al(pftb)₄ and (3*S**,7*aS**)-3-((Trimethylsilyl)ethynyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*i*'•Al(pftb)₄ (ca. 1.4:1 diastereomeric mixture), CD₂Cl₂, ¹H-¹³C H2BC NMR, 500/126 MHz**



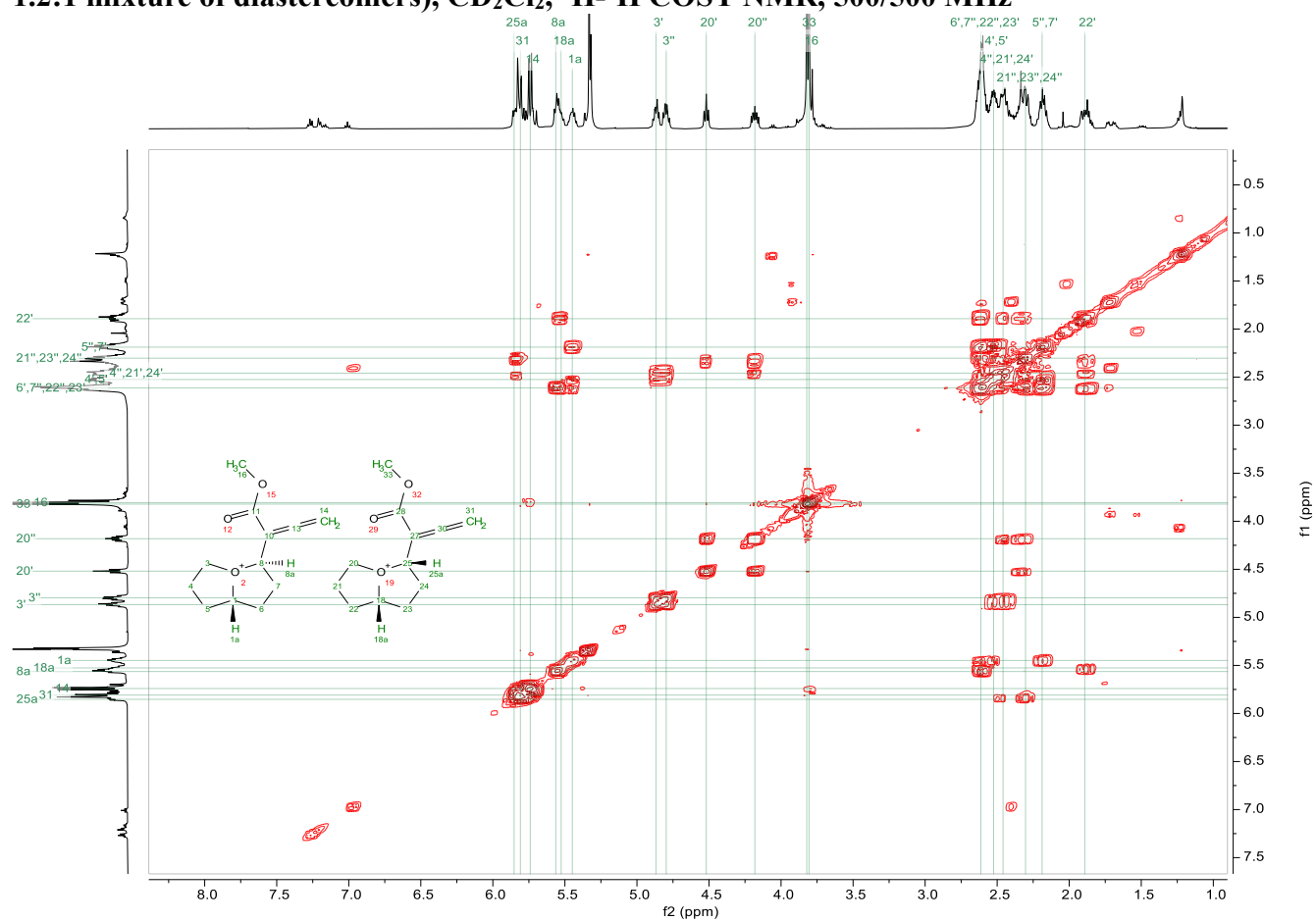
(3*R,7*aS**)-3-(1-Methoxy-1-oxobuta-2,3-dien-2-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24j•Al(pftb)₄ and (3*S**,7*aS**)-3-(1-Methoxy-1-oxobuta-2,3-dien-2-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24j'•Al(pftb)₄ (ca. 1.2:1 mixture of diastereomers), CD₂Cl₂, ¹H NMR, 500 MHz**



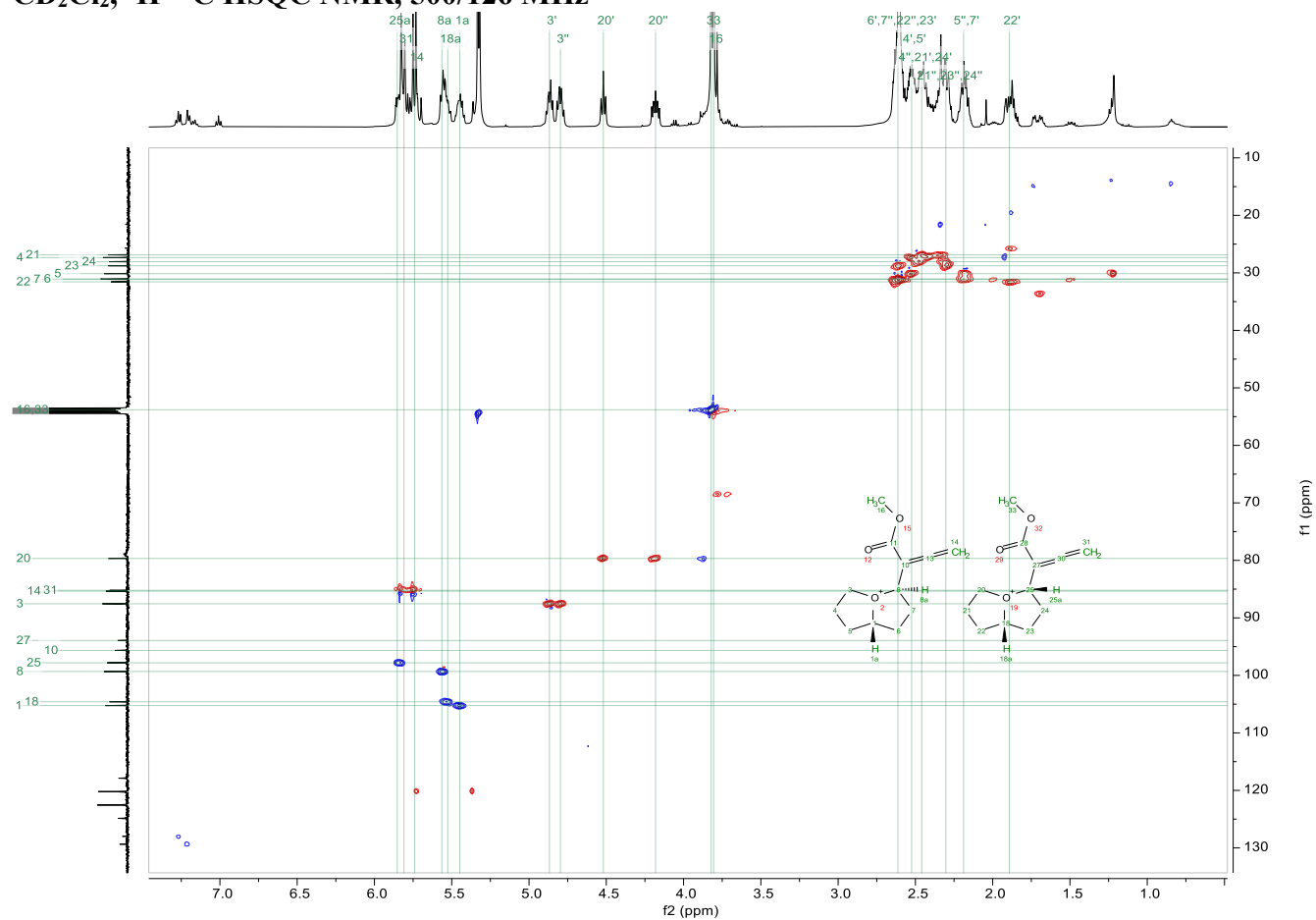
(3*R,7*aS**)-3-(1-Methoxy-1-oxobuta-2,3-dien-2-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24j•Al(pftb)₄ and (3*S**,7*aS**)-3-(1-Methoxy-1-oxobuta-2,3-dien-2-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24j'•Al(pftb)₄ (ca. 1.2:1 mixture of diastereomers), CD₂Cl₂, ¹³C NMR, 126 MHz**



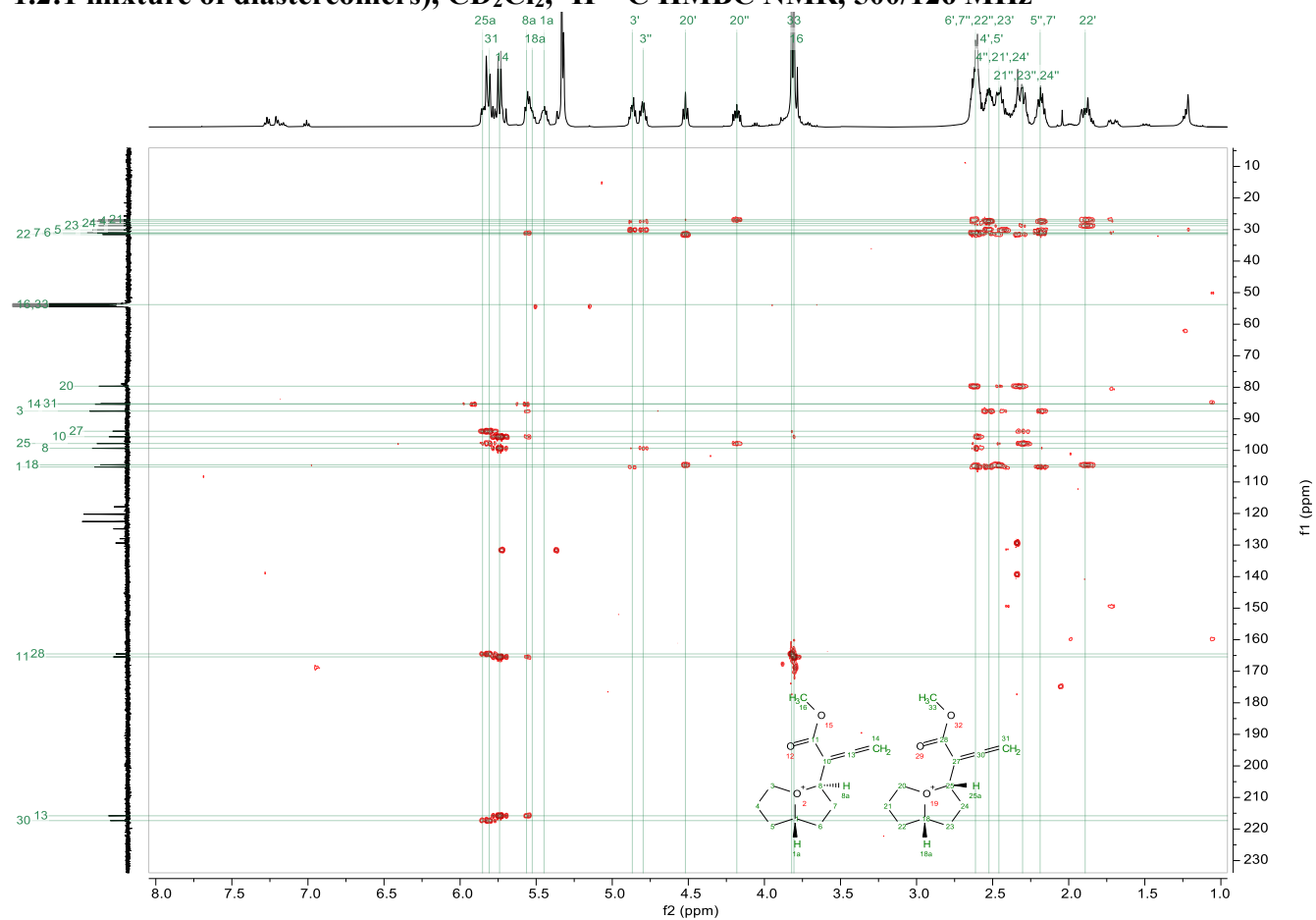
(3*R,7*aS**)-3-(1-Methoxy-1-oxobuta-2,3-dien-2-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminumate 24j•Al(pftb)₄ and (3*S**,7*aS**)-3-(1-Methoxy-1-oxobuta-2,3-dien-2-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminumate 24j'•Al(pftb)₄ (ca. 1.2:1 mixture of diastereomers), CD₂Cl₂, ¹H-¹H COSY NMR, 500/500 MHz**



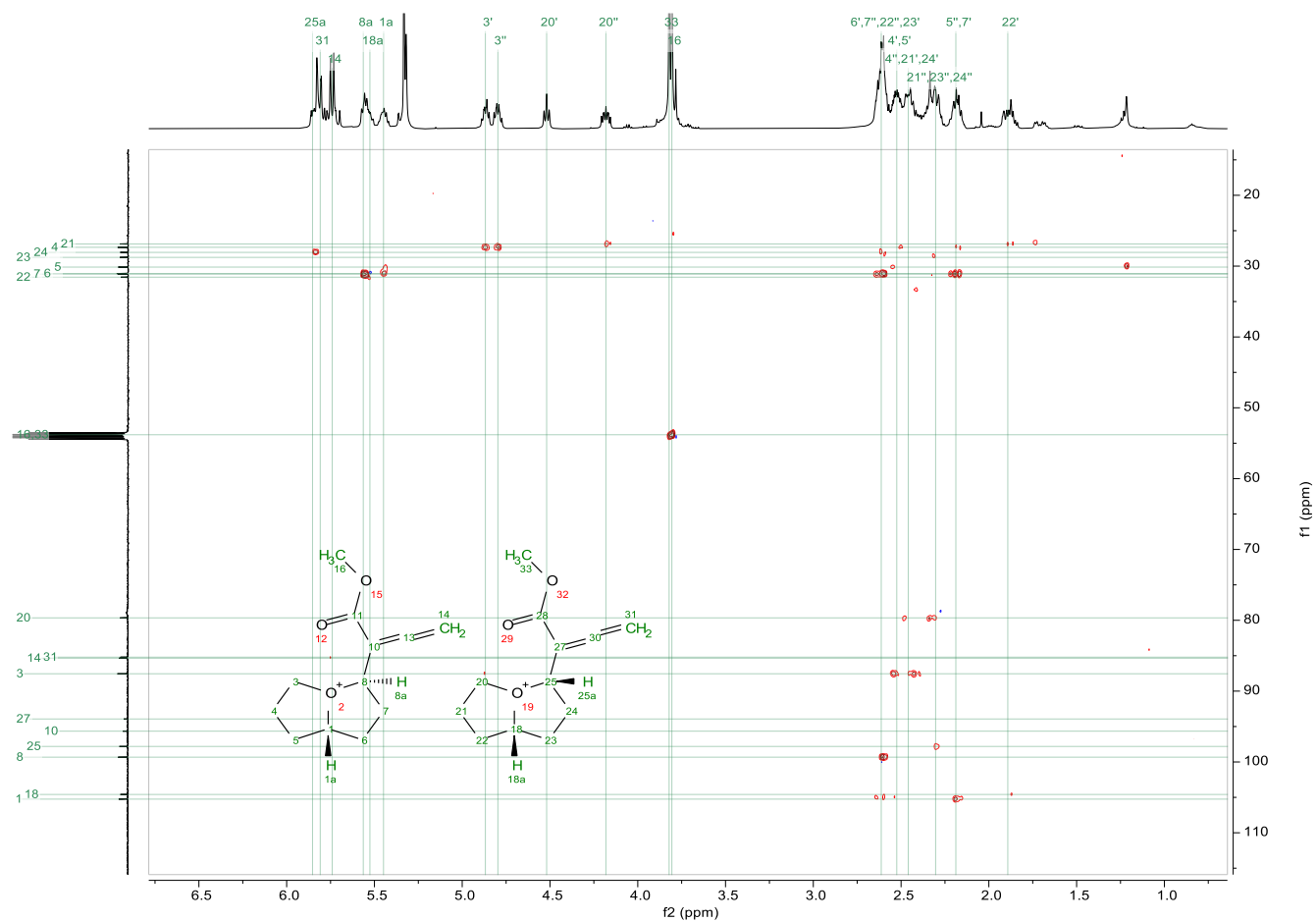
(3*R,7*aS**)-3-(1-Methoxy-1-oxobuta-2,3-dien-2-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24j and (3*S**,7*aS**)-3-(1-Methoxy-1-oxobuta-2,3-dien-2-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24j' (ca. 1.2:1 mixture of diastereomers), CD₂Cl₂, ¹H-¹³C HSQC NMR, 500/126 MHz**



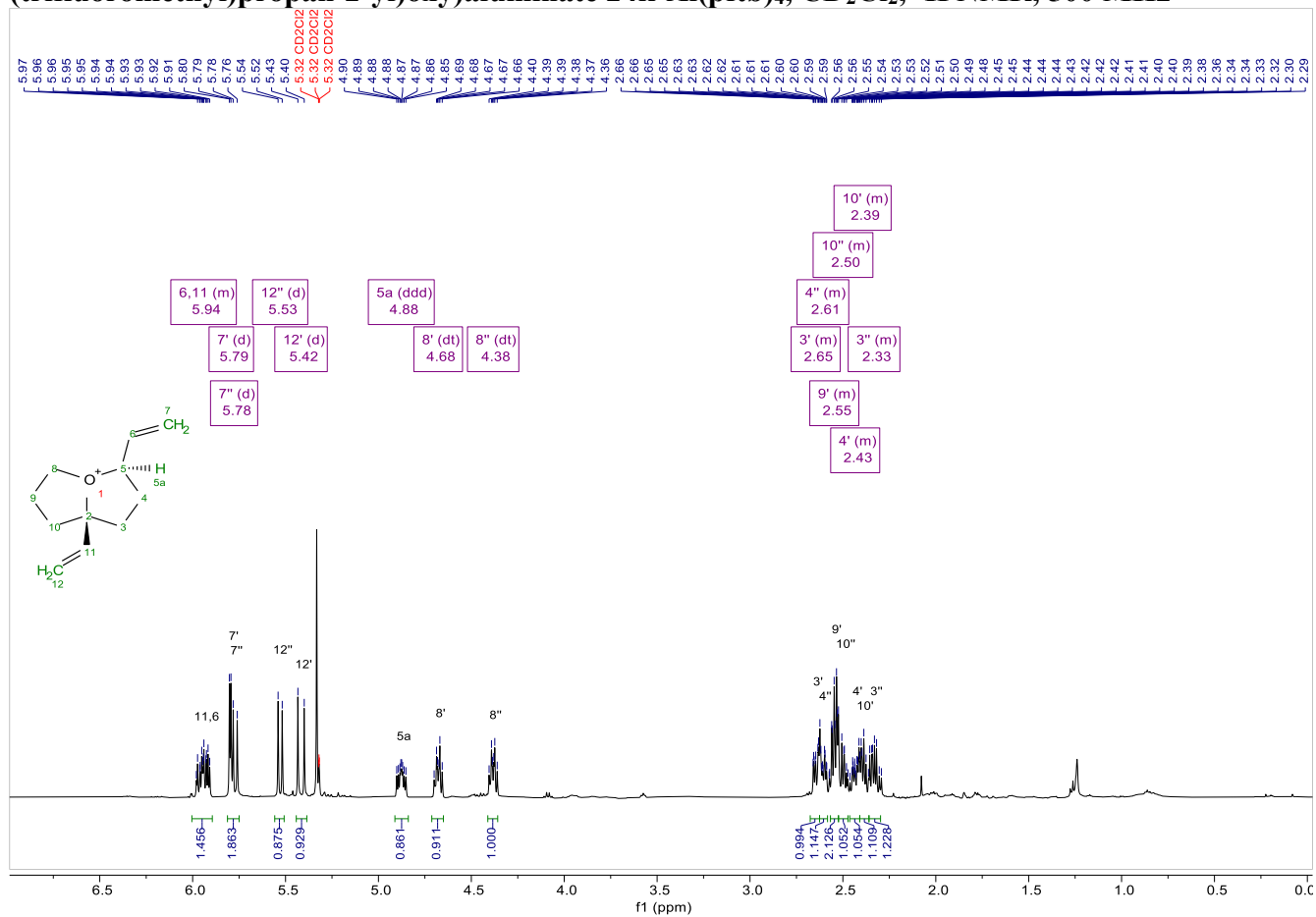
(3*R,7*aS**)-3-(1-Methoxy-1-oxobuta-2,3-dien-2-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24j•Al(pftb)₄ and (3*S**,7*aS**)-3-(1-Methoxy-1-oxobuta-2,3-dien-2-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24j'•Al(pftb)₄ (ca. 1.2:1 mixture of diastereomers), CD₂Cl₂, ¹H-¹³C HMBC NMR, 500/126 MHz**



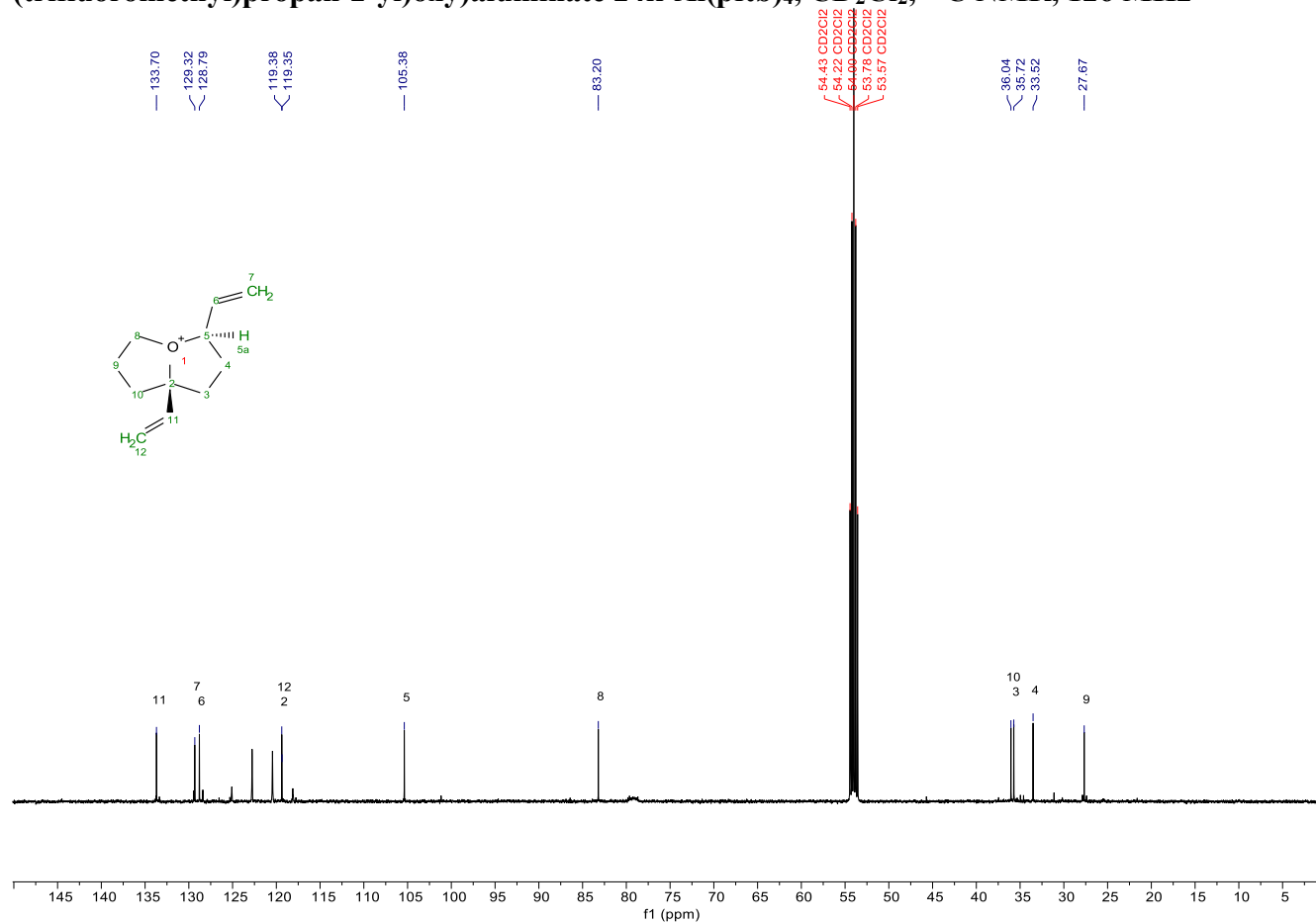
(3*R,7*aS**)-3-(1-Methoxy-1-oxobuta-2,3-dien-2-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminumate 24j•Al(pftb)₄ and (3*S**,7*aS**)-3-(1-Methoxy-1-oxobuta-2,3-dien-2-yl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminumate 24j'•Al(pftb)₄ (ca. 1.2:1 mixture of diastereomers), CD₂Cl₂, ¹H-¹³C H2BC NMR, 500/126 MHz**



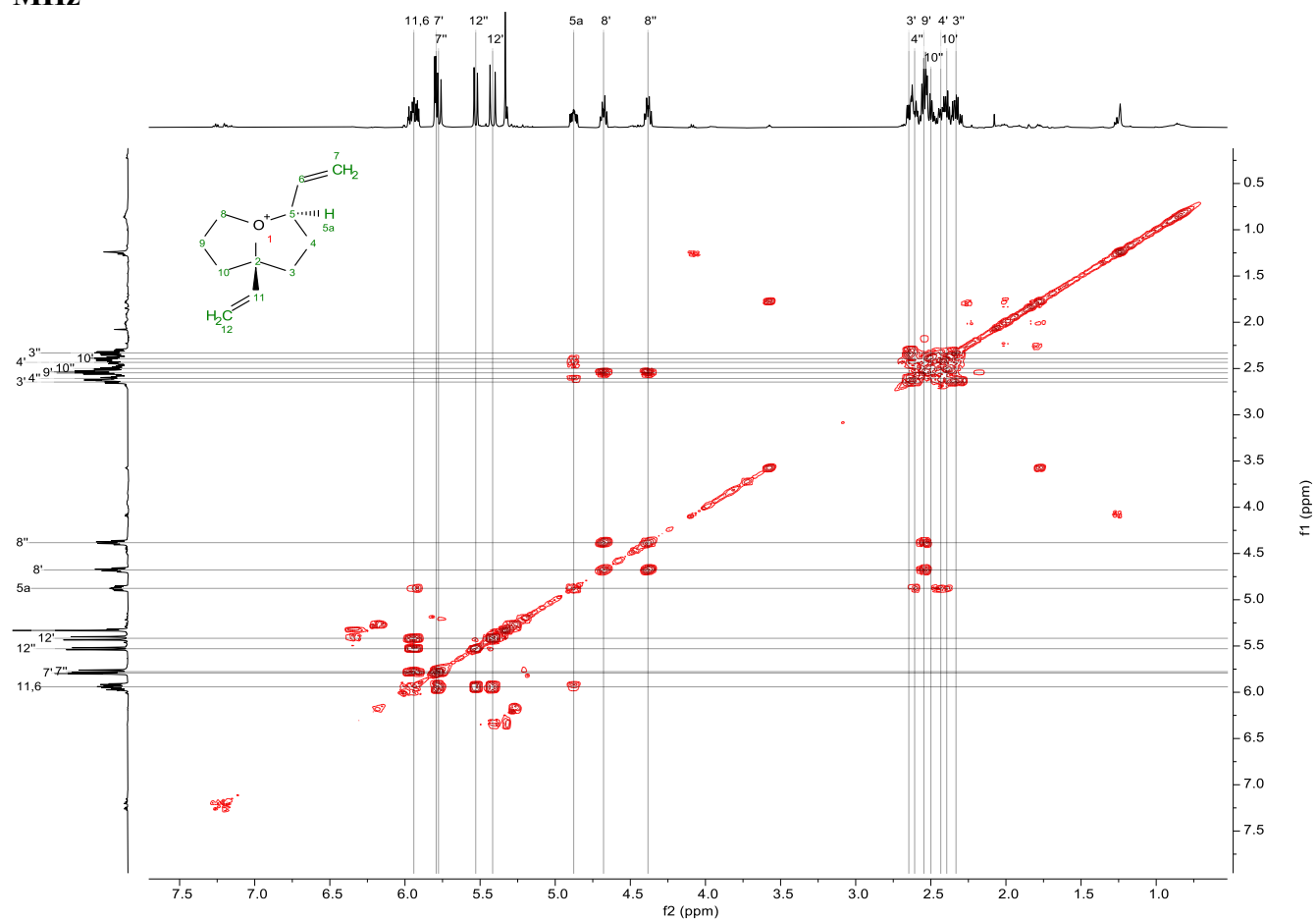
(3*R,7*aS**)-3,7*a*-Divinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24*k*·Al(pftb)₄, CD₂Cl₂, ¹H NMR, 500 MHz**



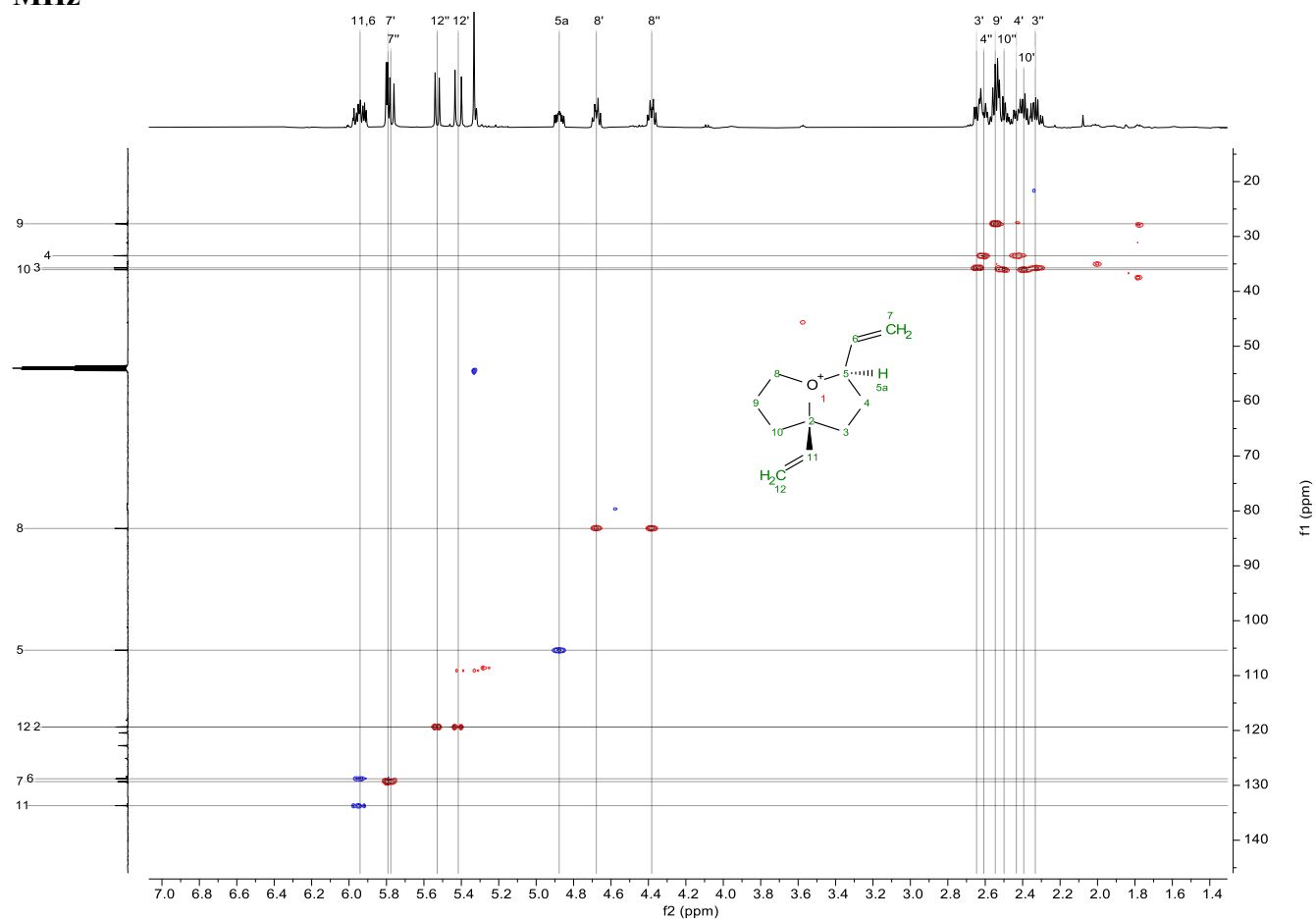
(3*R,7*aS**)-3,7*a*-Divinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24k•Al(pftb)₄, CD₂Cl₂, ¹³C NMR, 126 MHz**



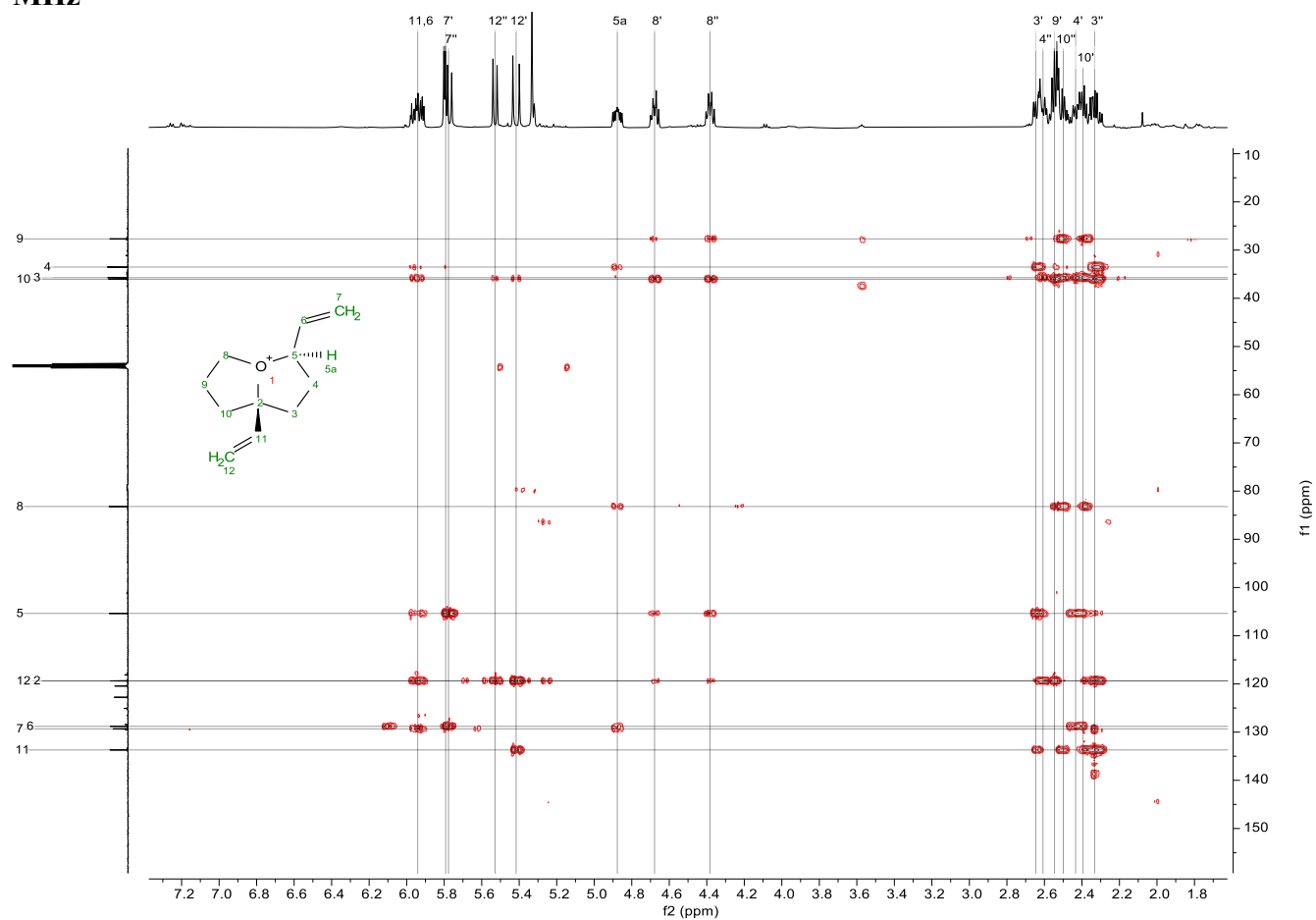
(3*R,7*aS**)-3,7*a*-Divinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24k•Al(pftb)₄, CD₂Cl₂, ¹H-¹H COSY NMR, 500/500 MHz**



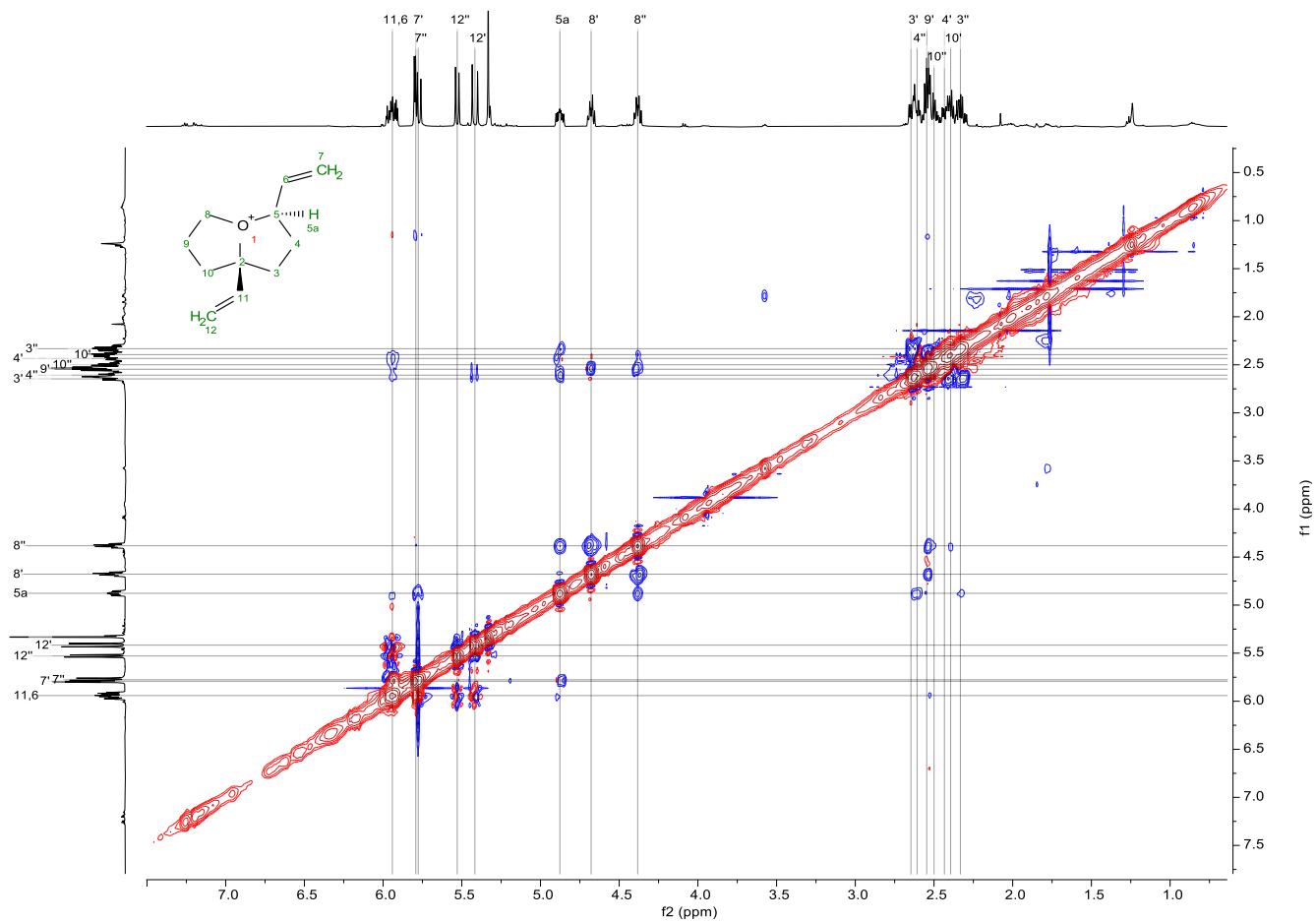
(3*R,7*aS**)-3,7*a*-Divinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24k•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HSQC NMR, 500/126 MHz**



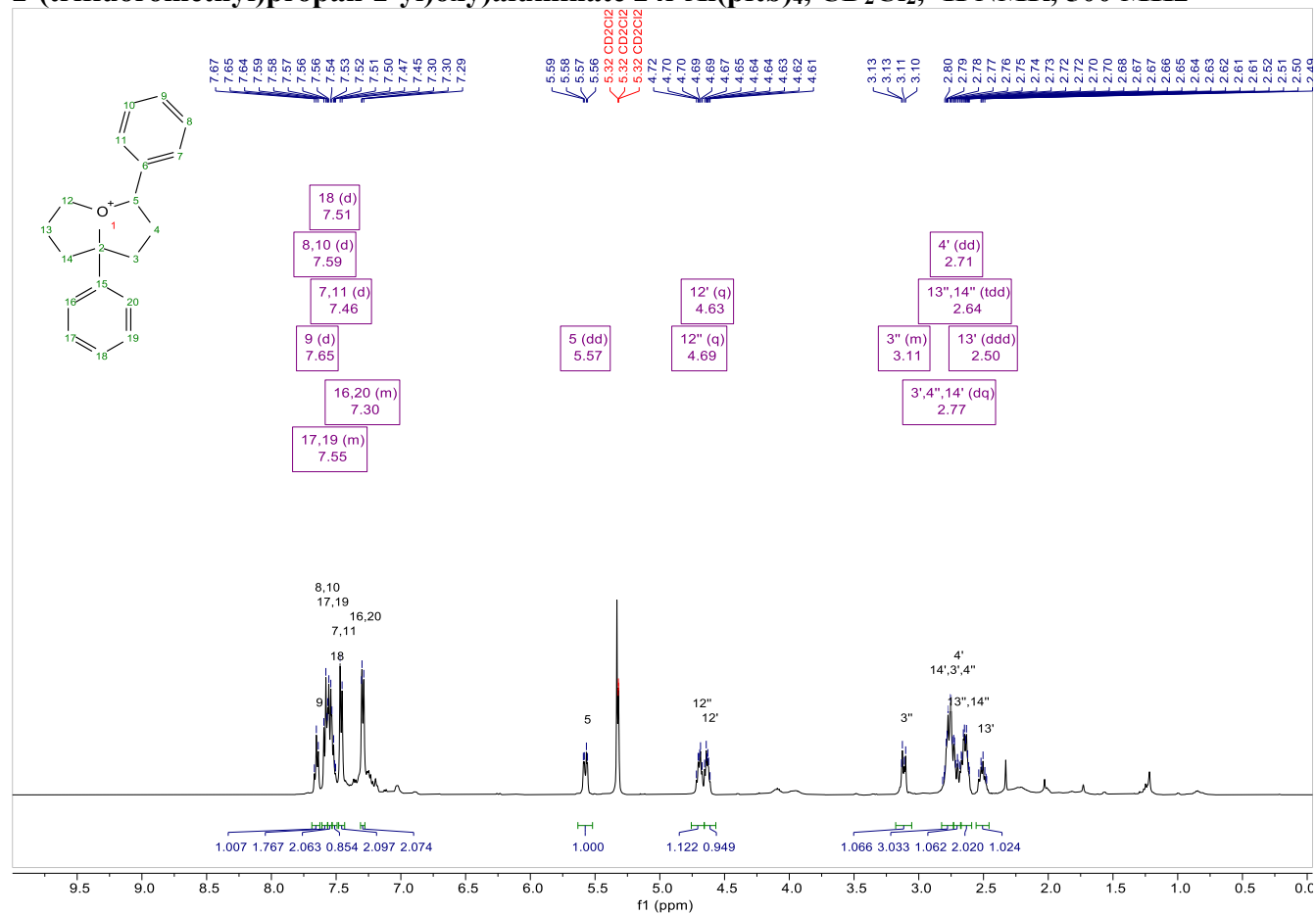
(3*R,7*aS**)-3,7*a*-Divinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24k•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HMBC NMR, 500/126 MHz**



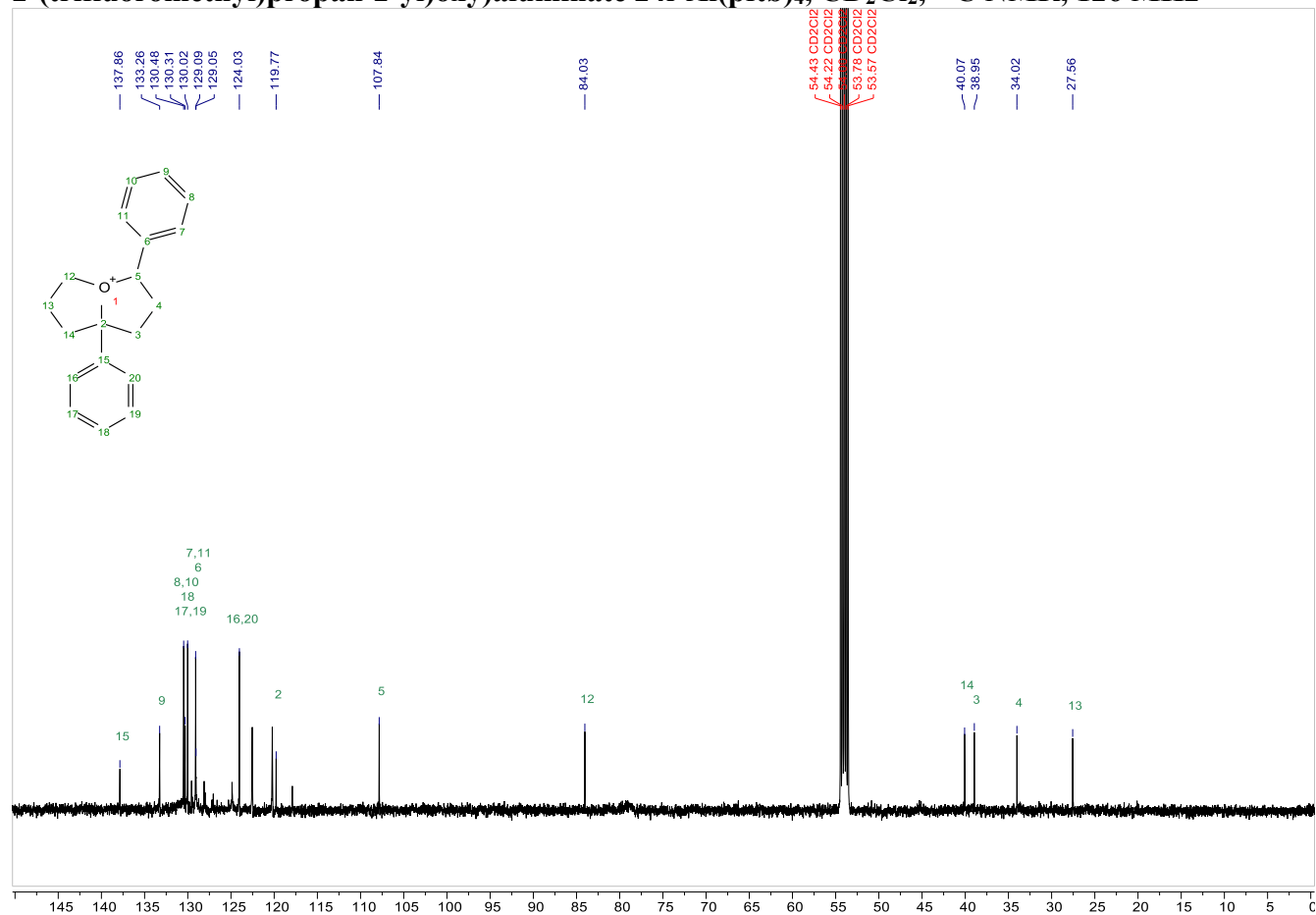
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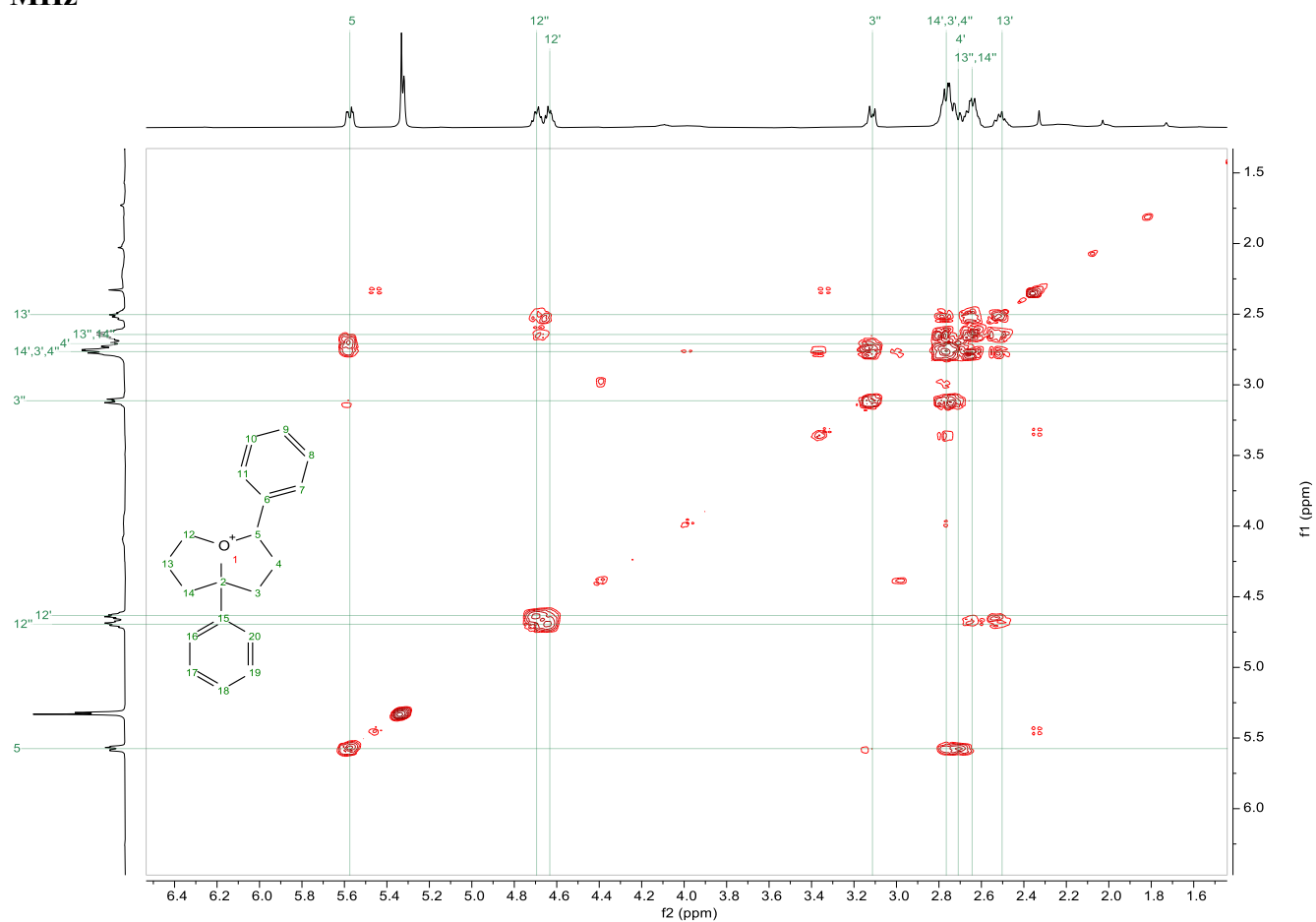
(3*R,7*aS**)-3,7*a*-Diphenylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro-2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24I•Al(pftb)₄, CD₂Cl₂, ¹H NMR, 500 MHz**



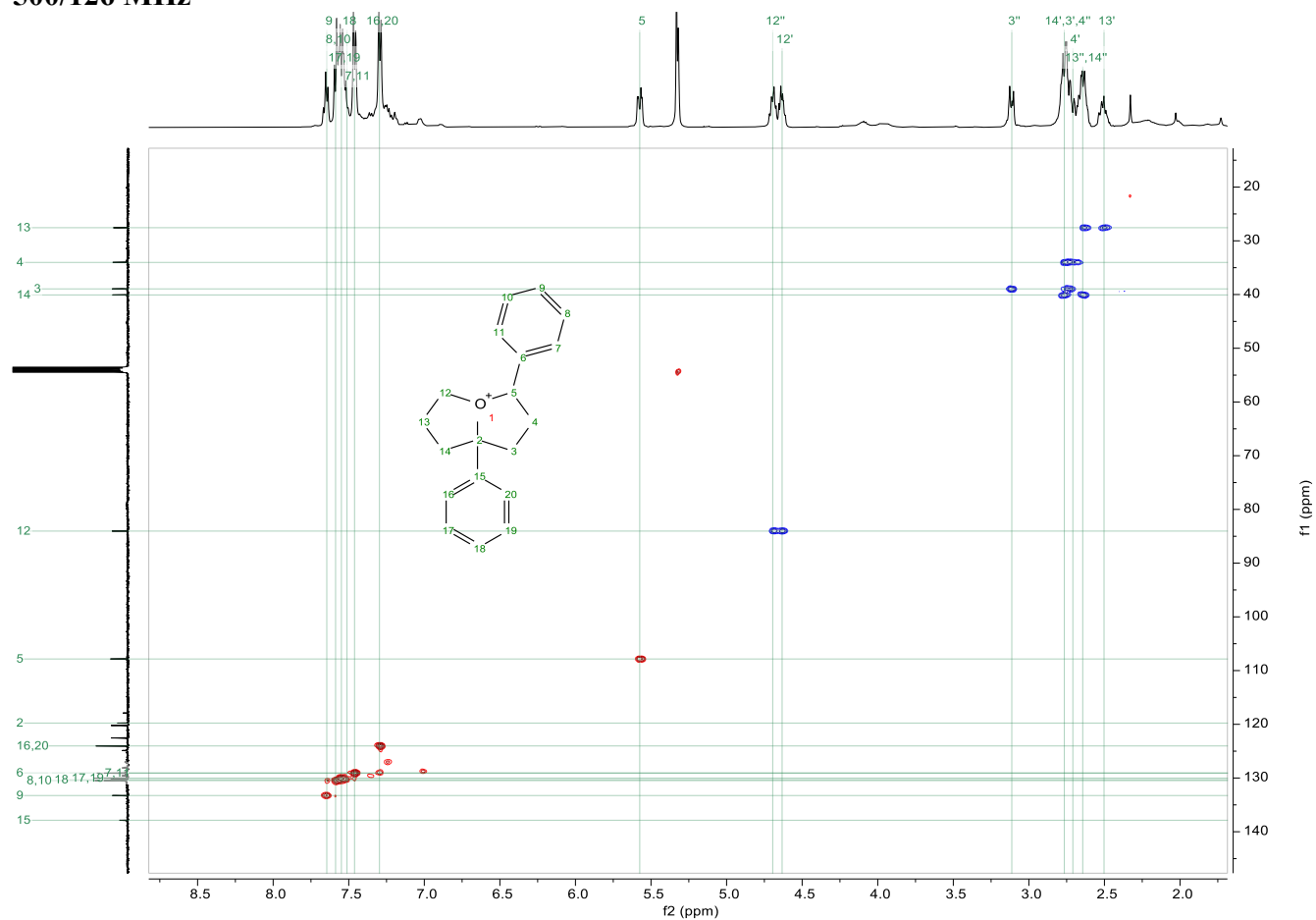
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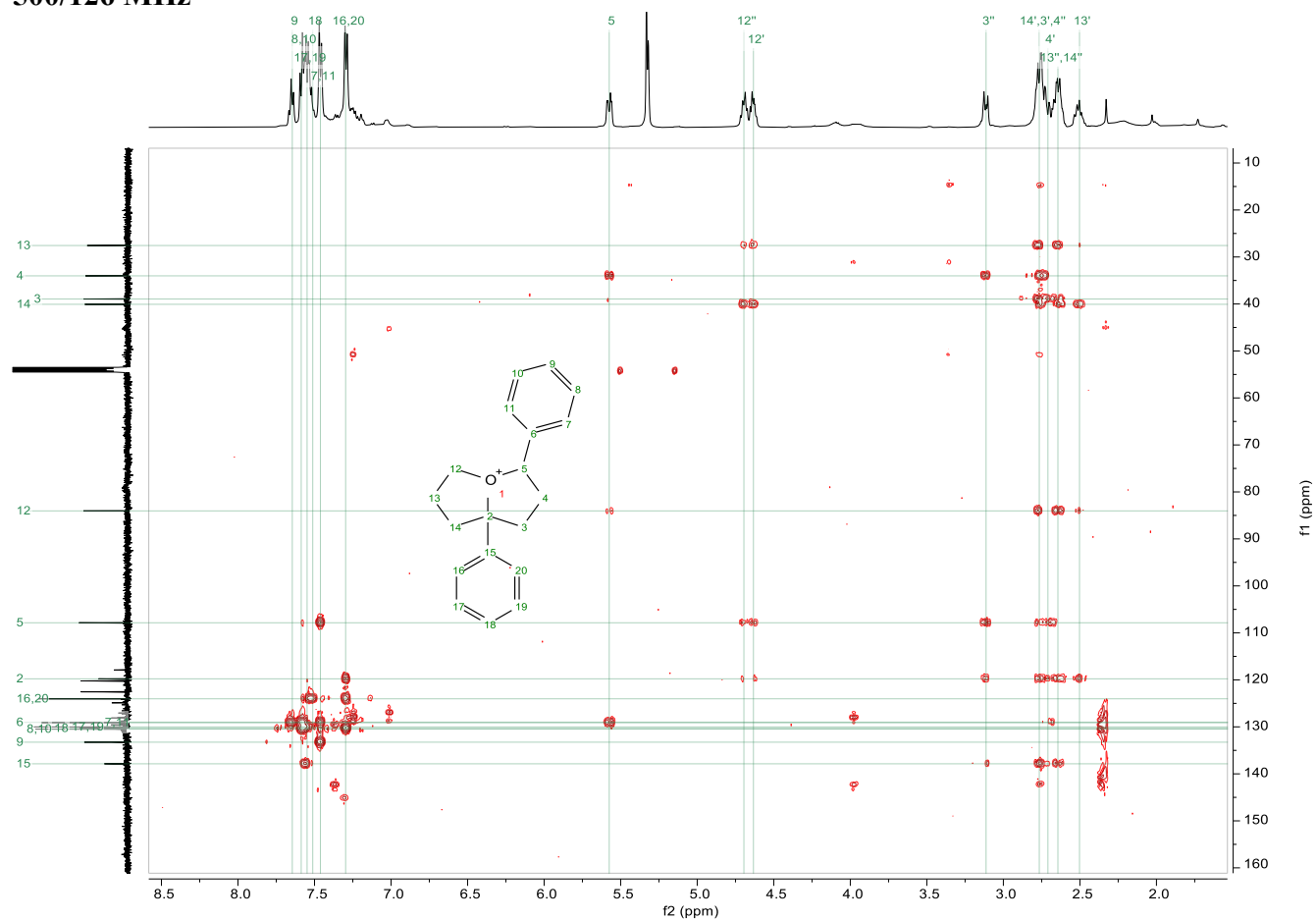
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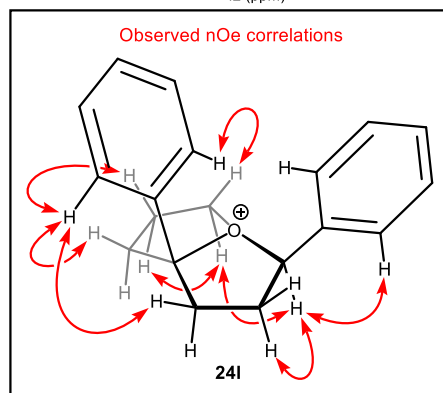
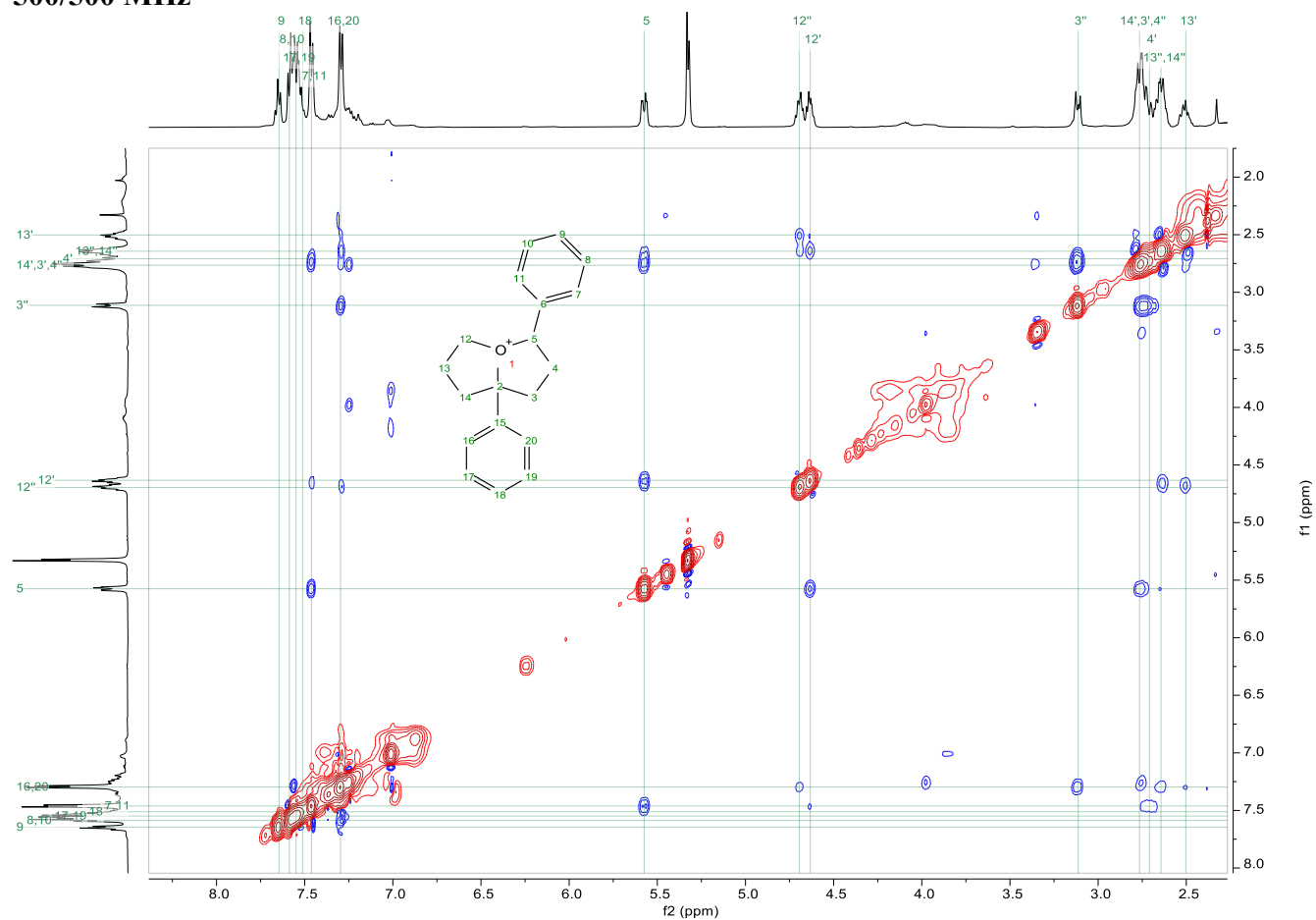
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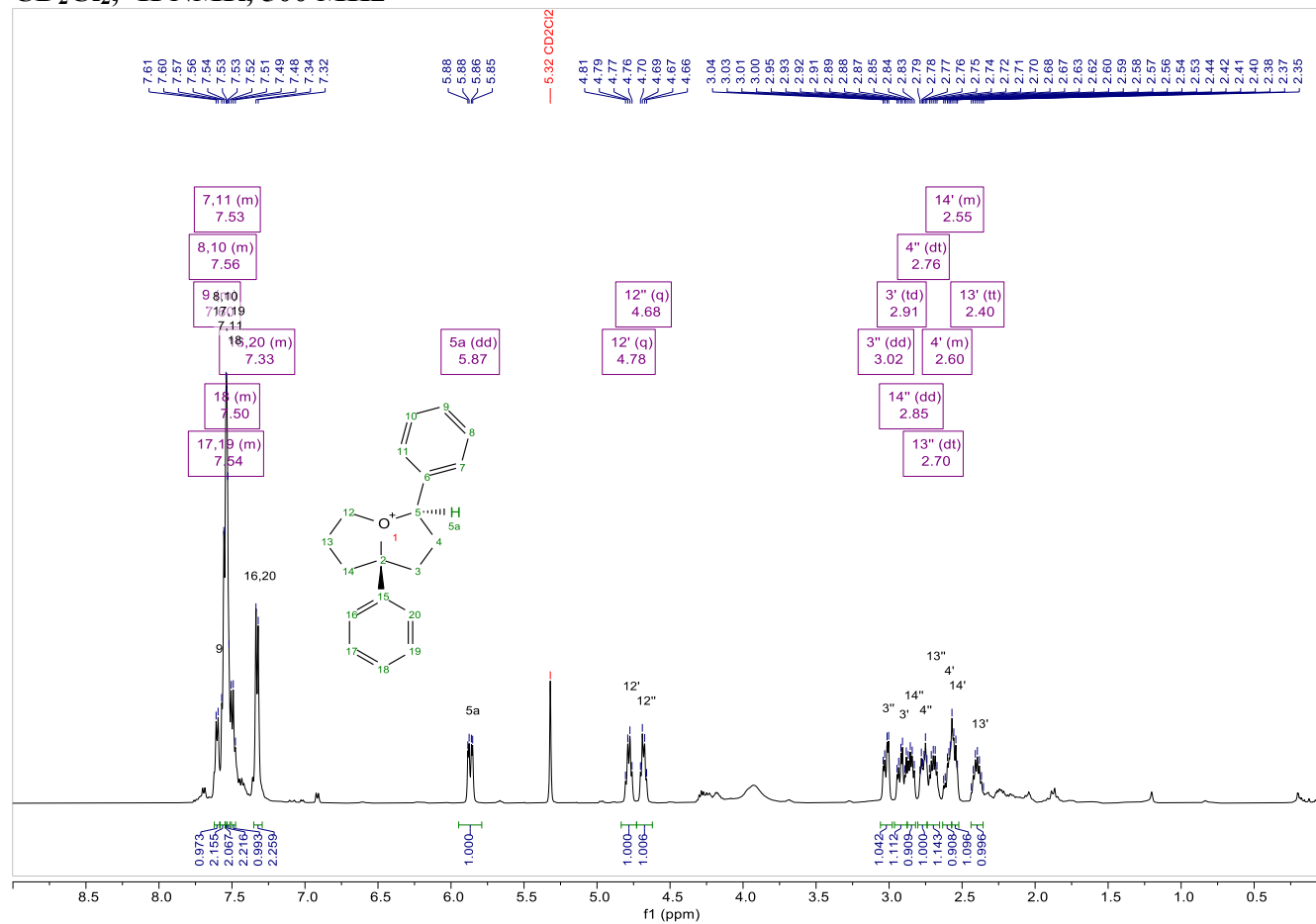
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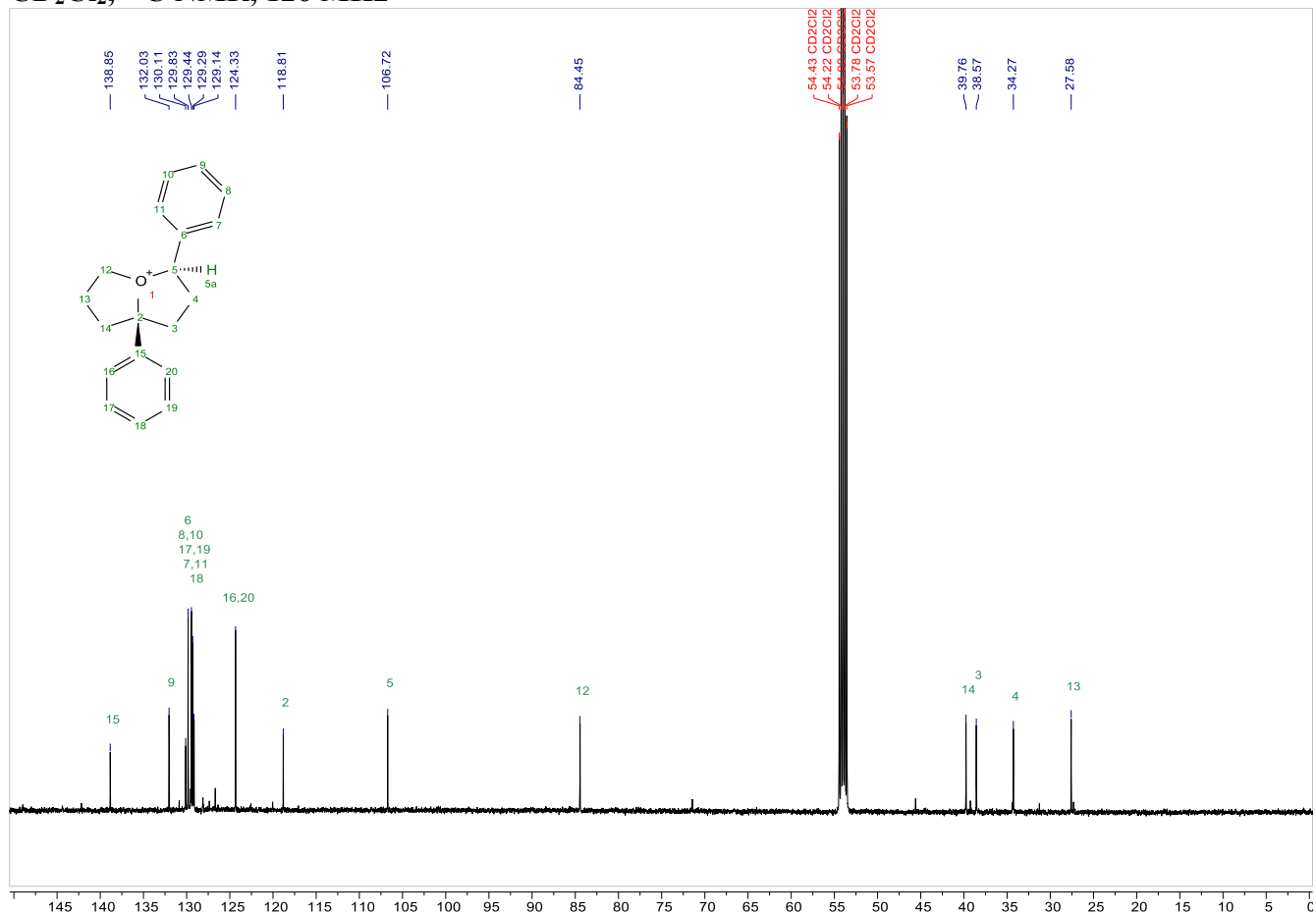
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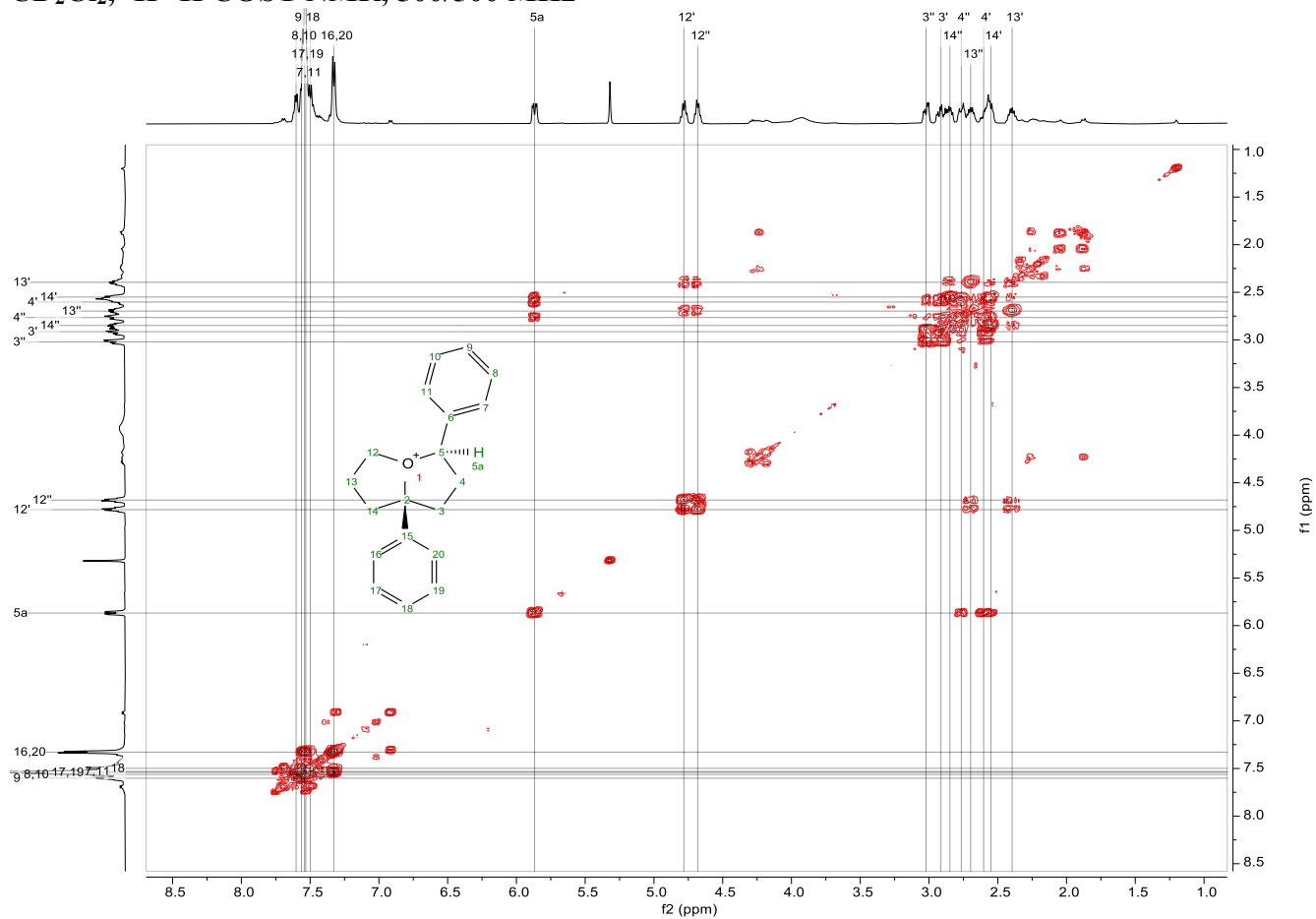
(3*R,7*aS**)-3,7*a*-Diphenylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium hexafluoroantimonate 241•SbF₆, CD₂Cl₂, ¹H NMR, 500 MHz**



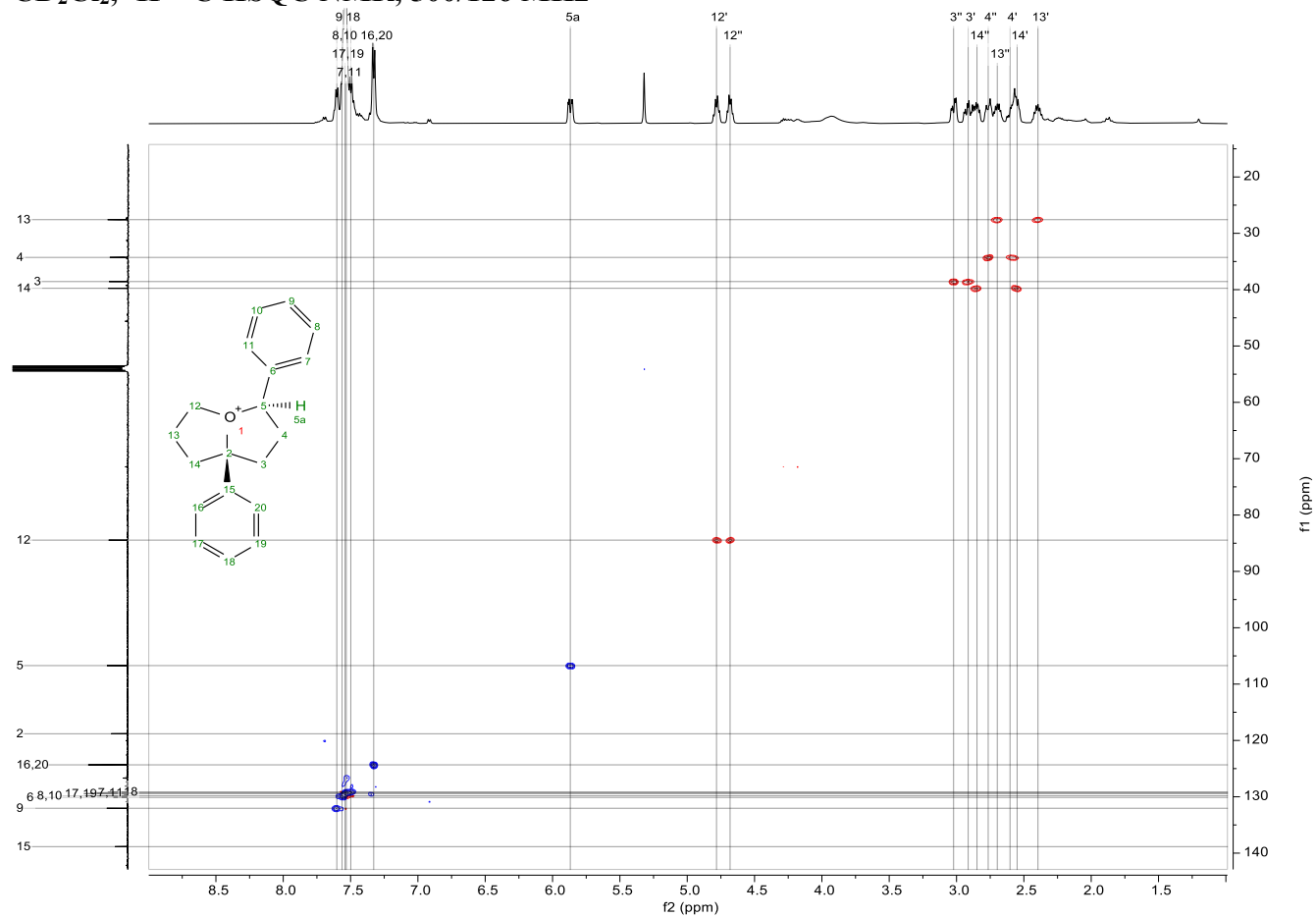
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CD₂Cl₂, ¹³C NMR, 126 MHz**



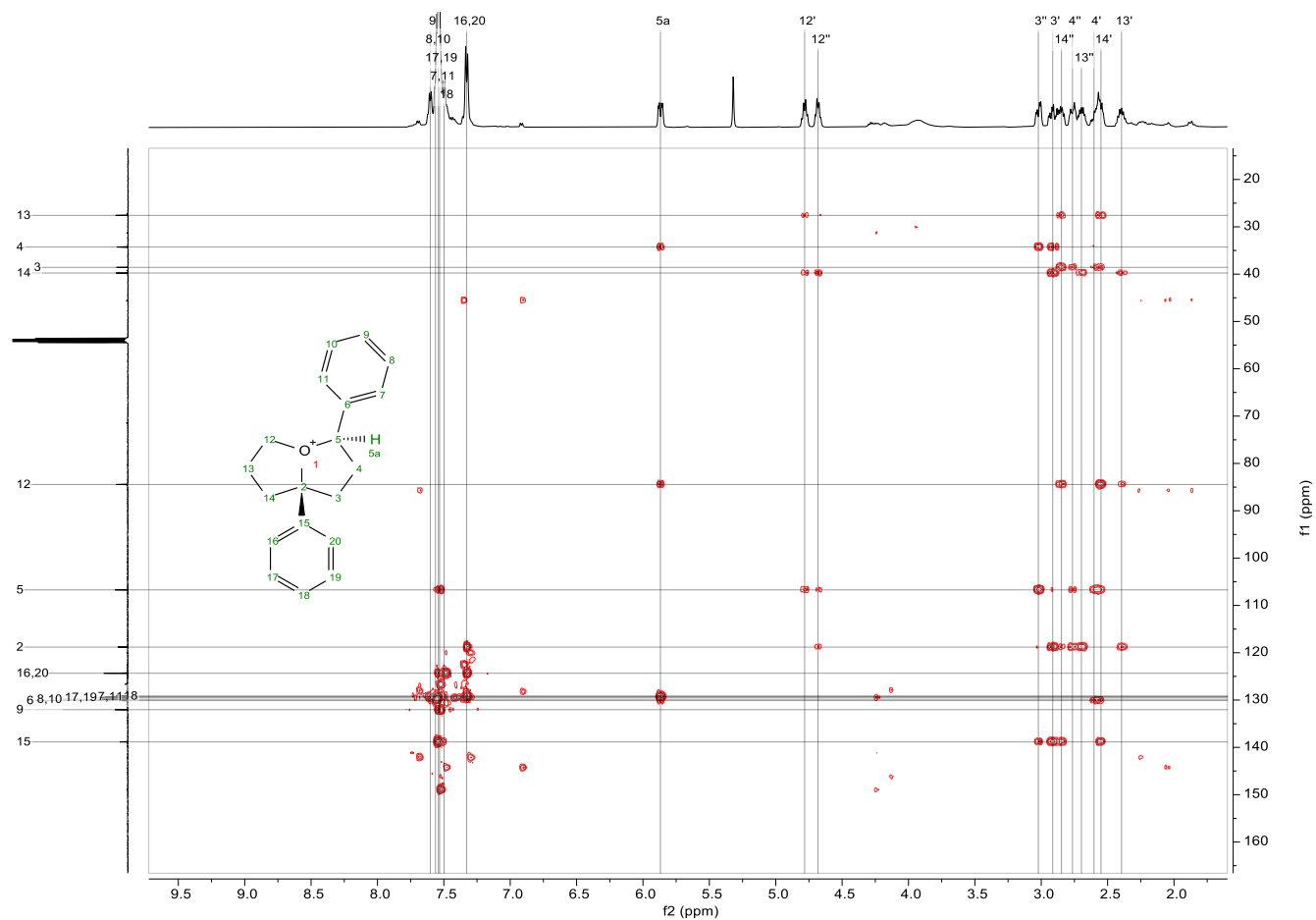
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CD₂Cl₂, ¹H-¹H COSY NMR, 500/500 MHz**



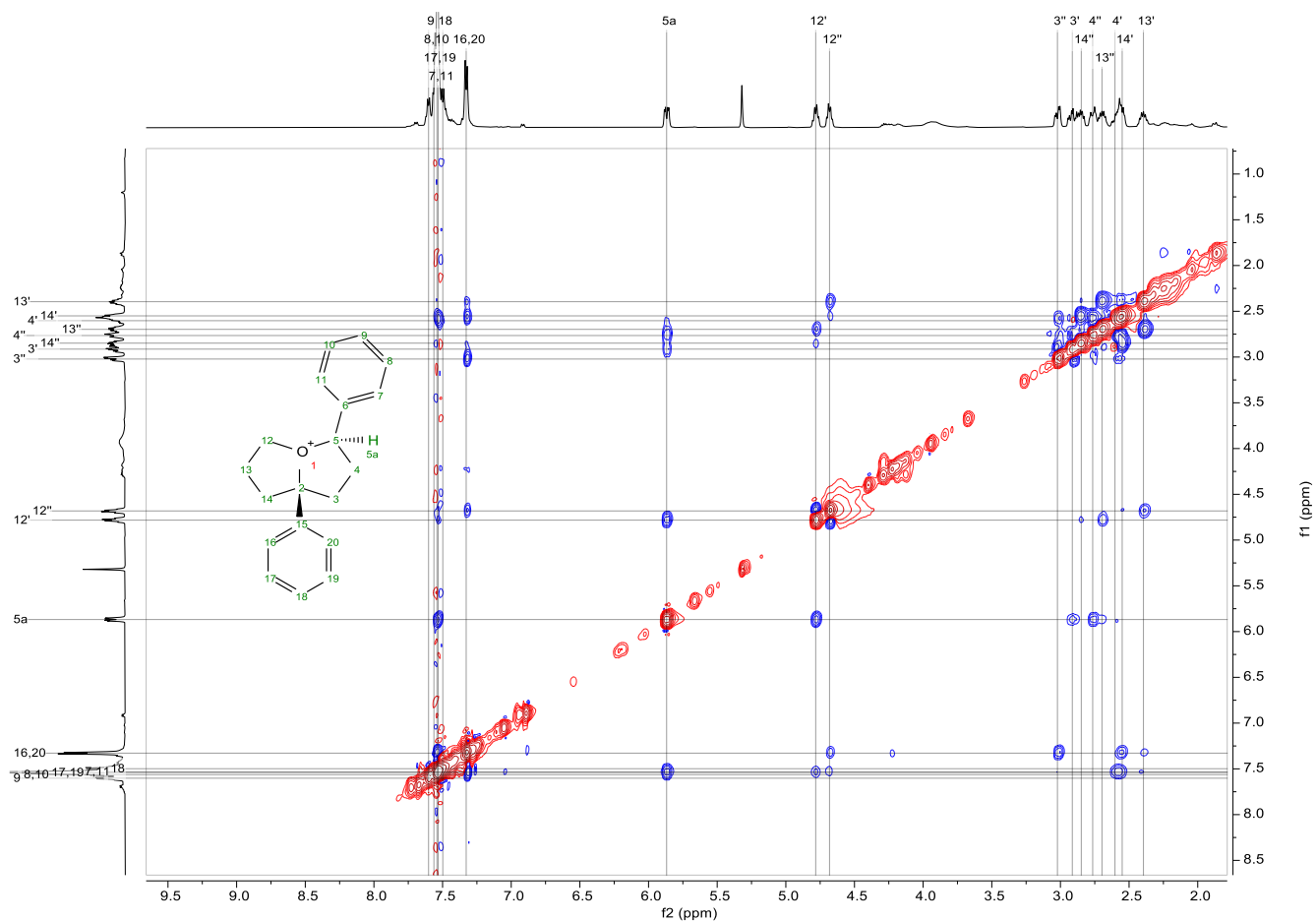
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CD₂Cl₂, ¹H-¹³C HSQC NMR, 500/126 MHz**



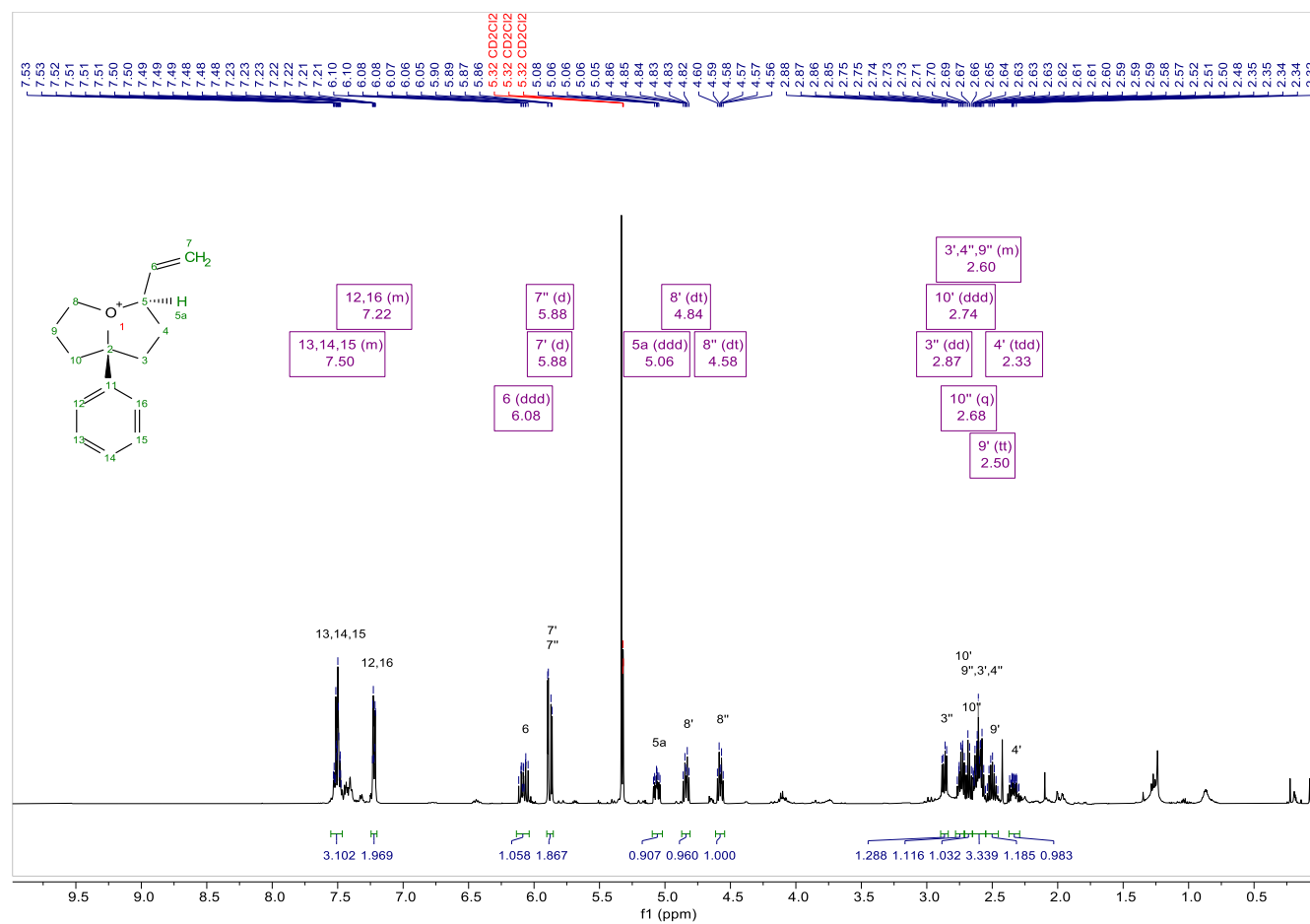
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CD₂Cl₂, ¹H-¹³C HMBC NMR, 500/126 MHz**



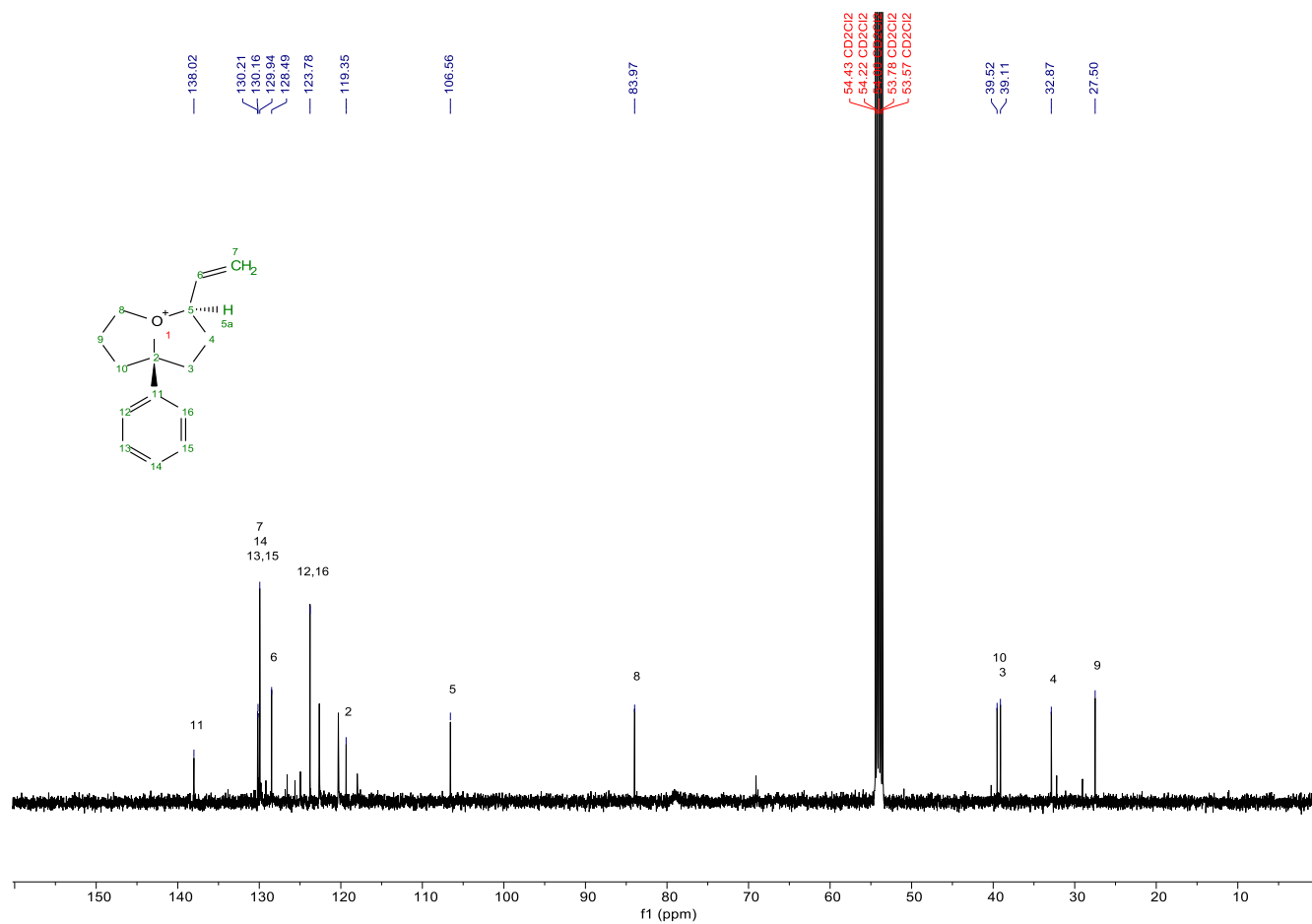
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CD₂Cl₂, ¹H-¹H NOESY NMR, 500/500 MHz**



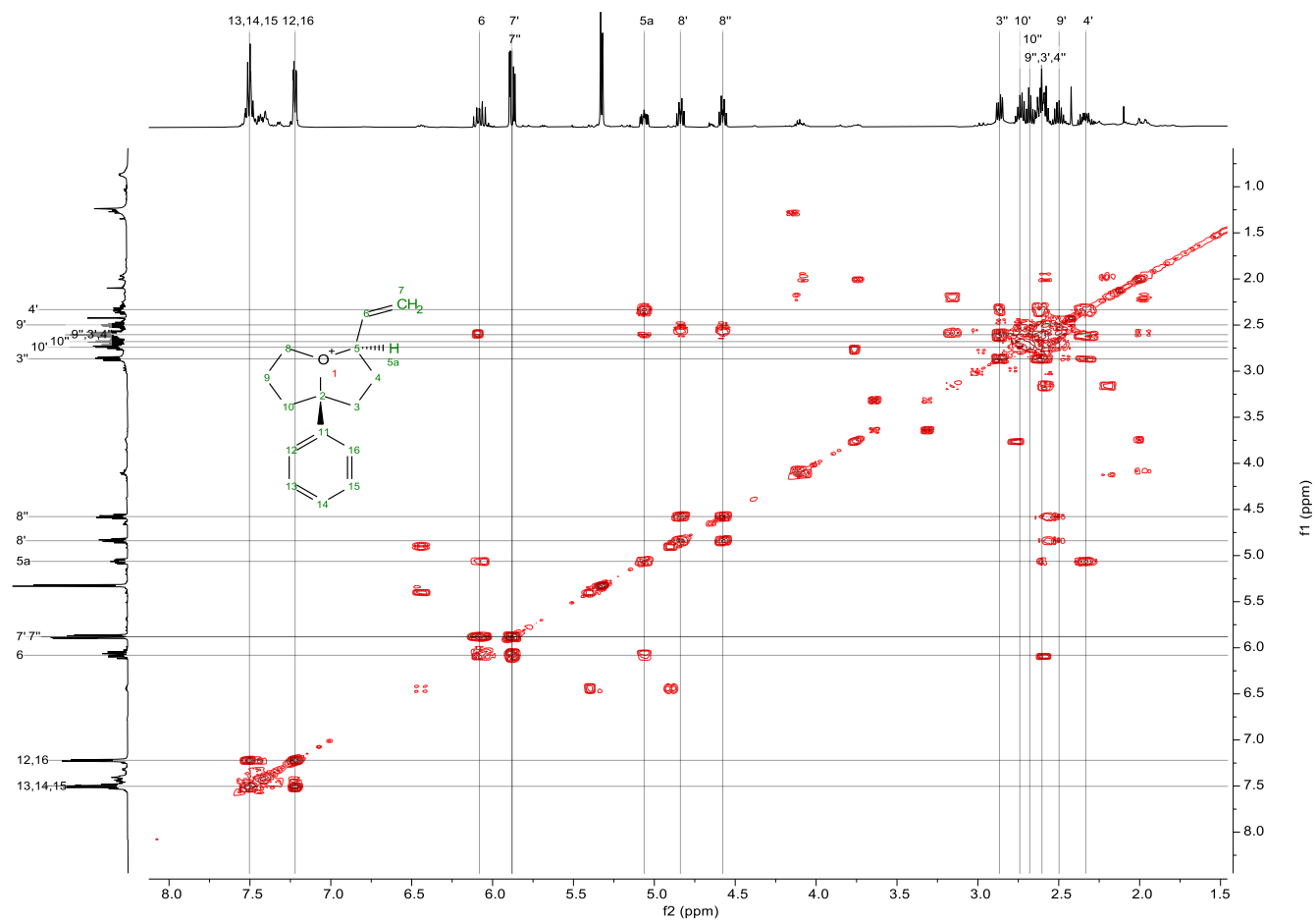
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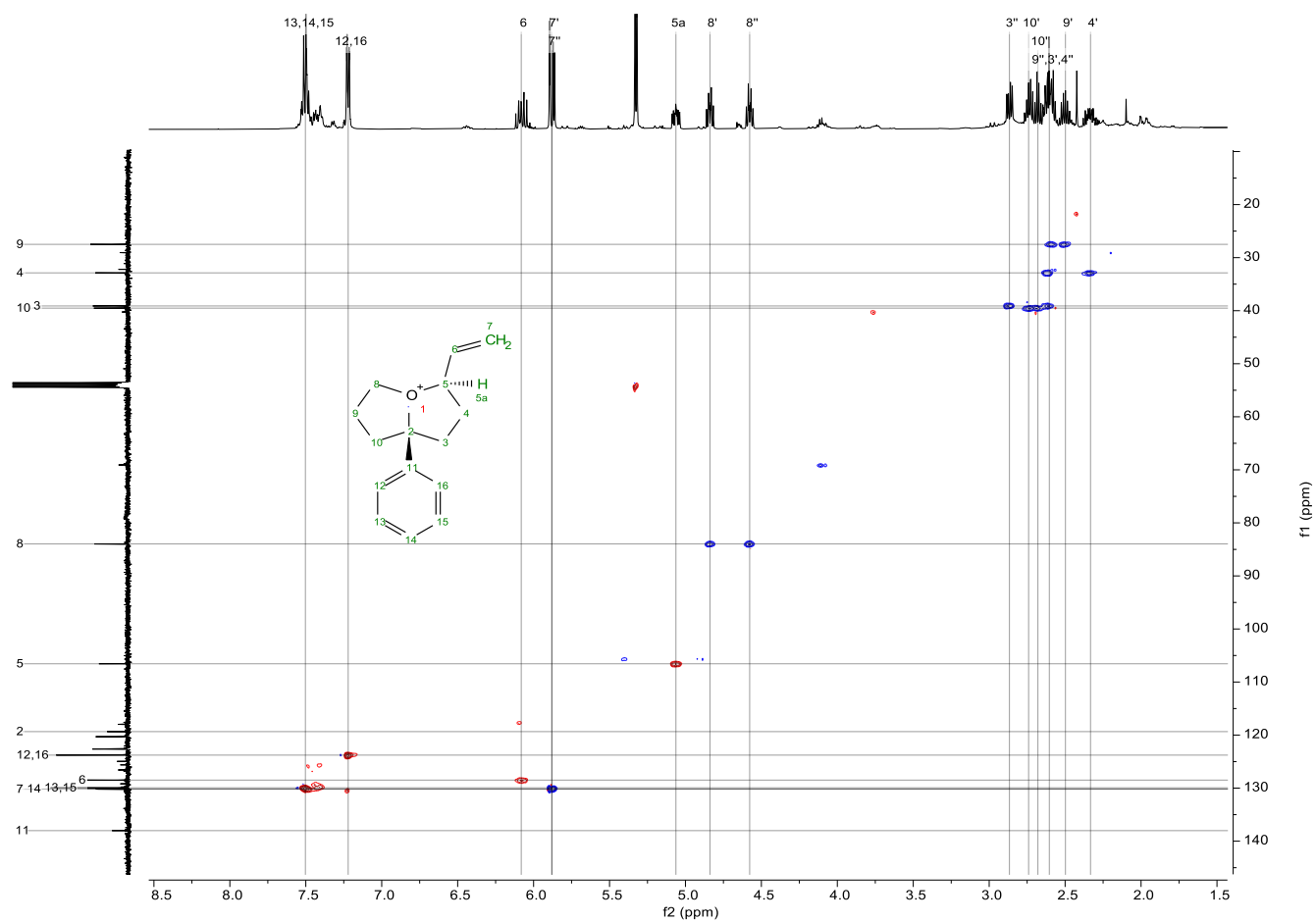
(3*R,7*aS**)-7*a*-Phenyl-3-vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*m*•Al(pftb)₄, CD₂Cl₂, ¹³C NMR, 126 MHz**



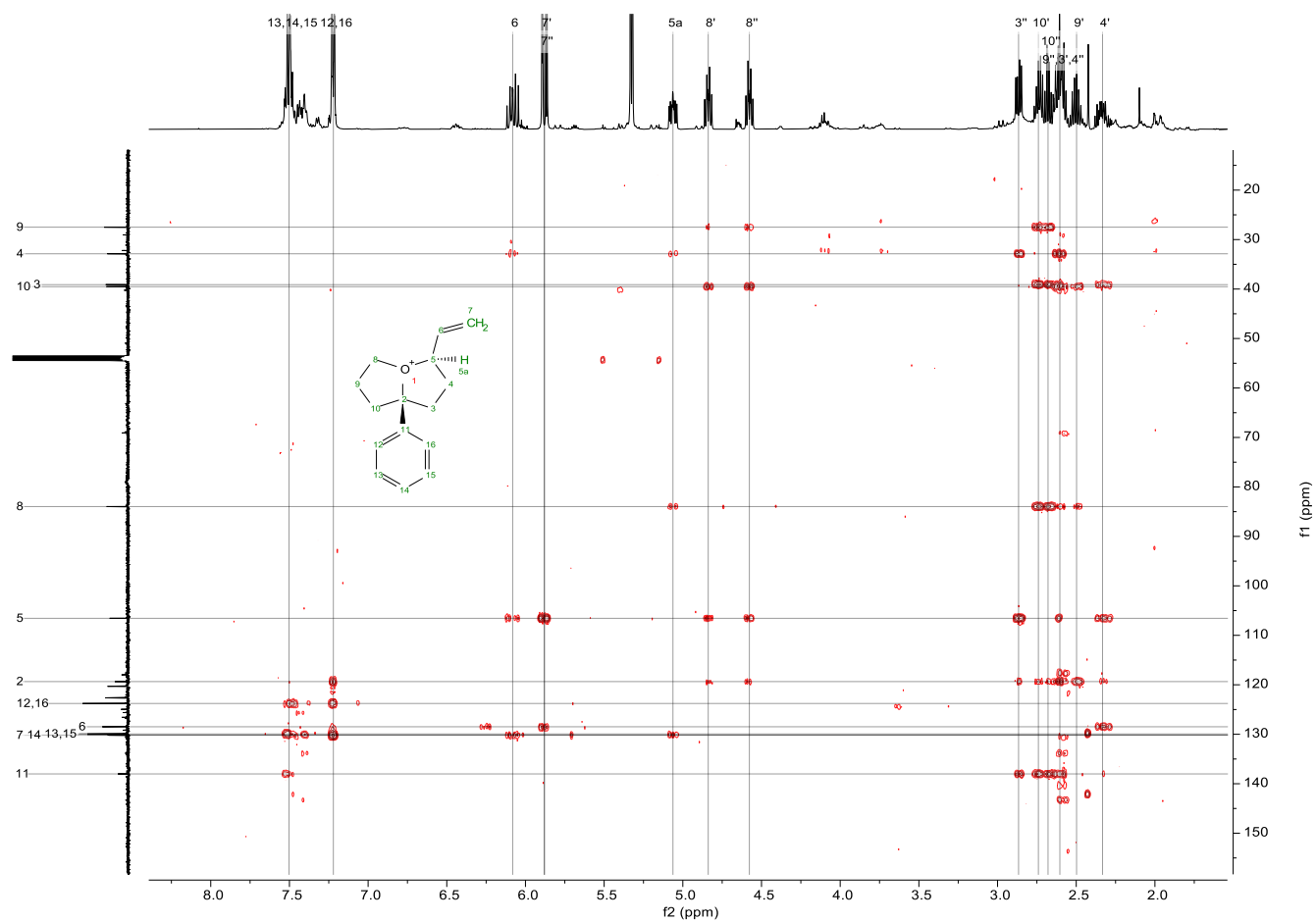
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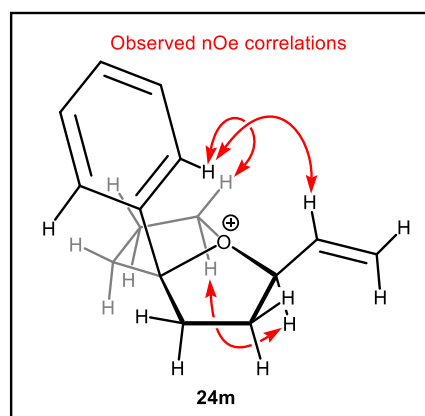
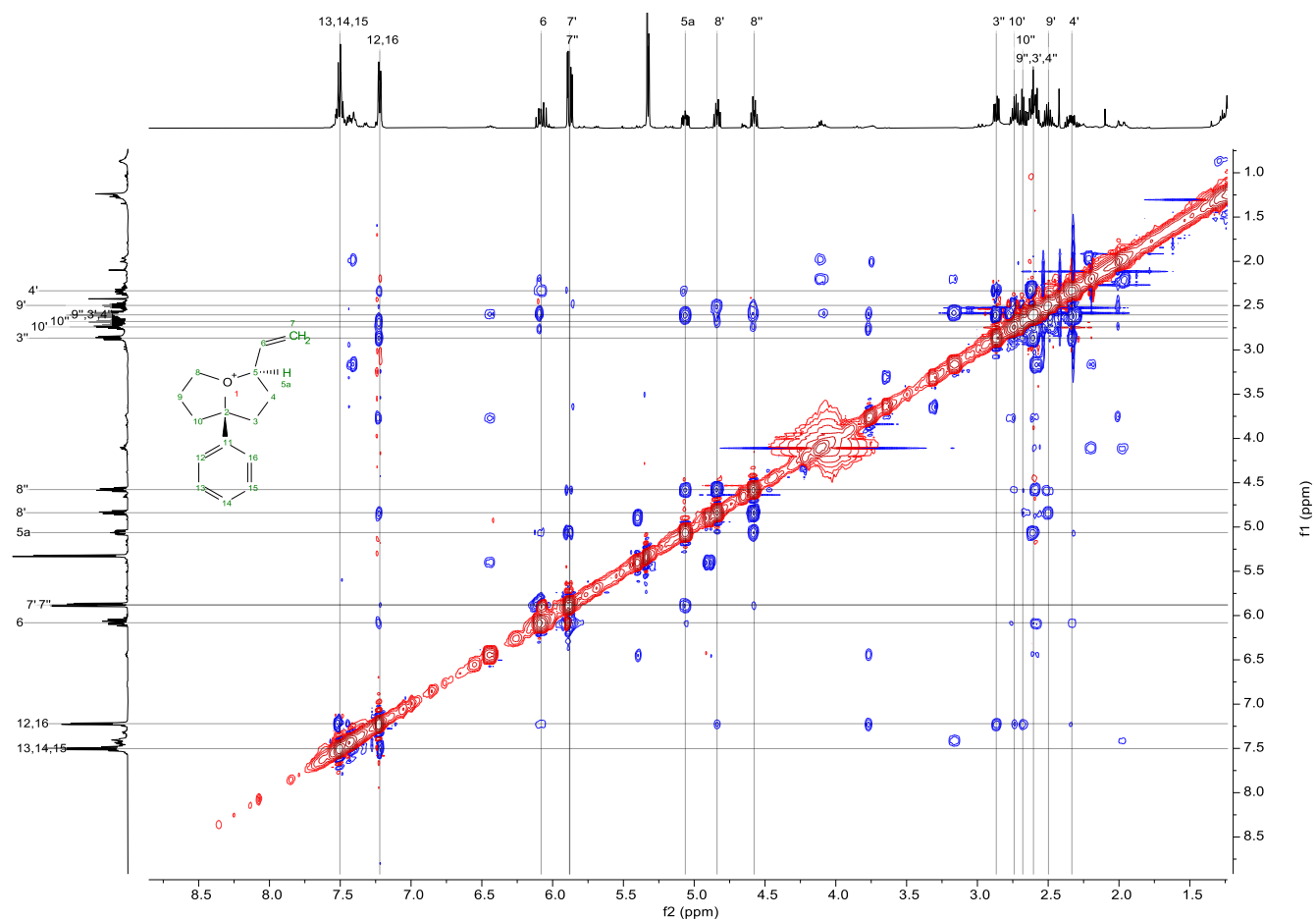
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(3*R,7*aS**)-7*a*-Phenyl-3-vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24*m*•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HMBC NMR, 500/126 MHz**

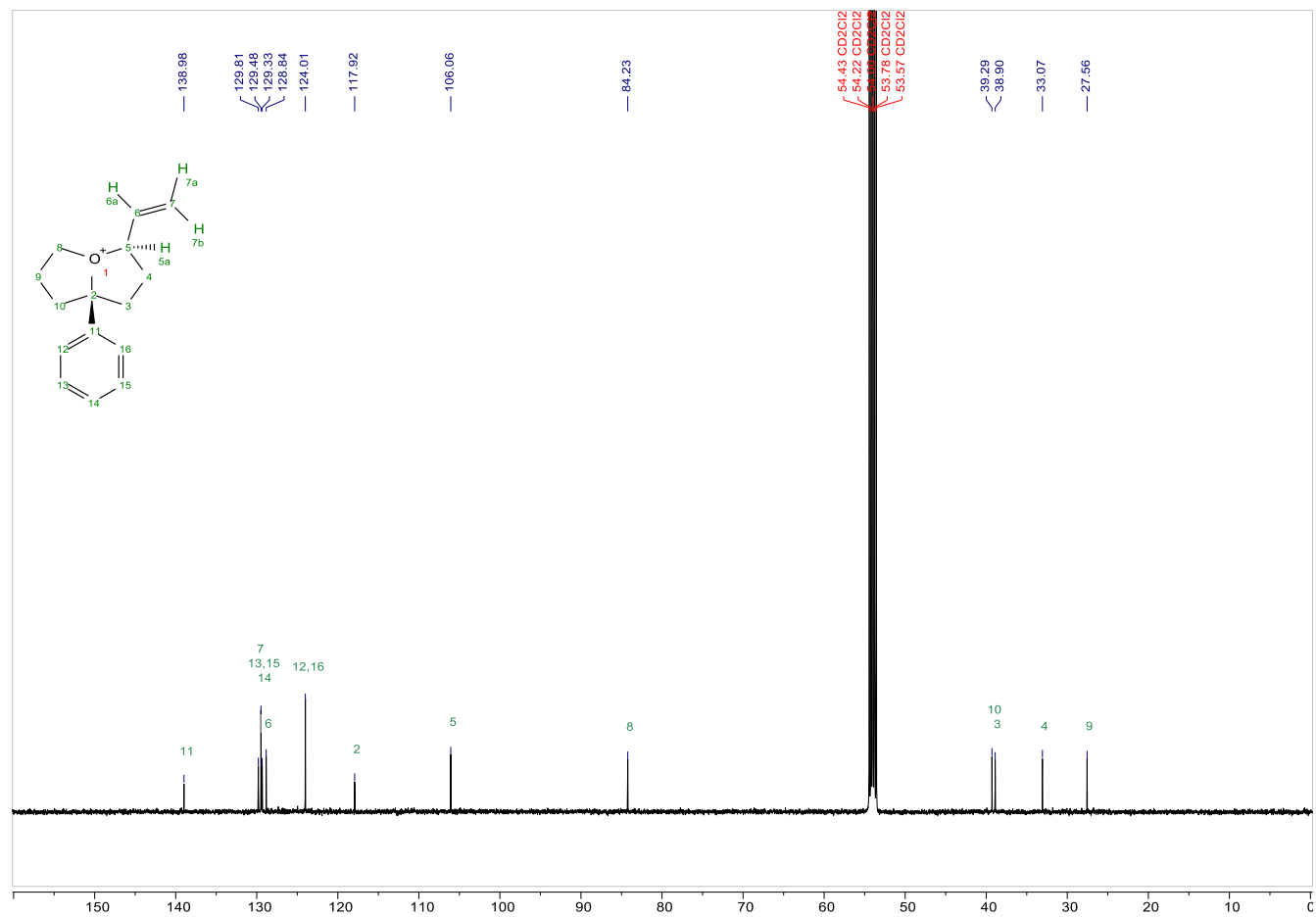


(3*R,7*aS**)-7*a*-Phenyl-3-vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminumate 24*m*•Al(pftb)₄, CD₂Cl₂, ¹H-¹H NOESY NMR, 500/500 MHz**



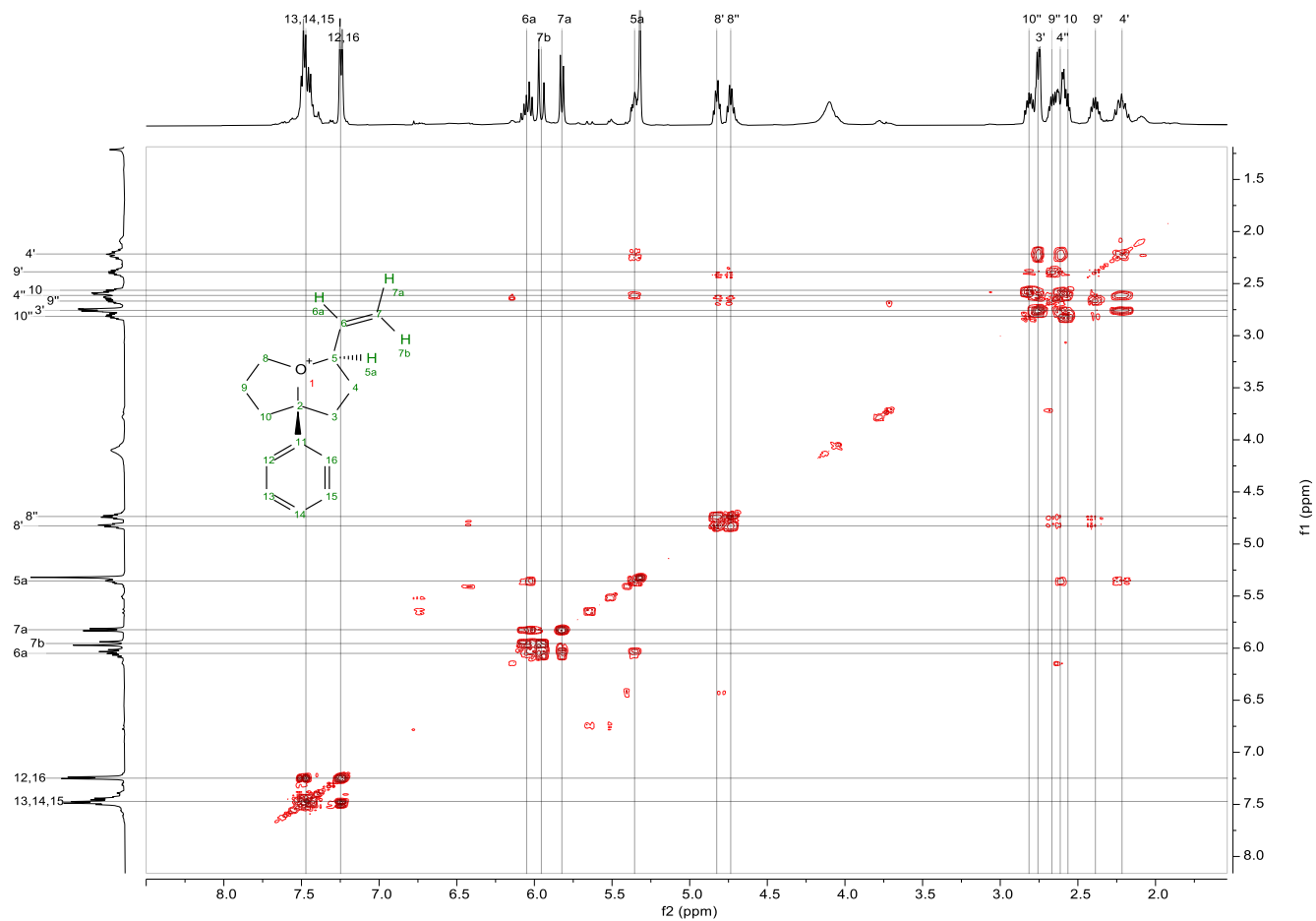
(3*R,7*aS**)-7*a*-Phenyl-3-vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium**
24*m*•SbF₆, CD₂Cl₂, ¹³C NMR, 126 MHz

hexafluoroantimonate



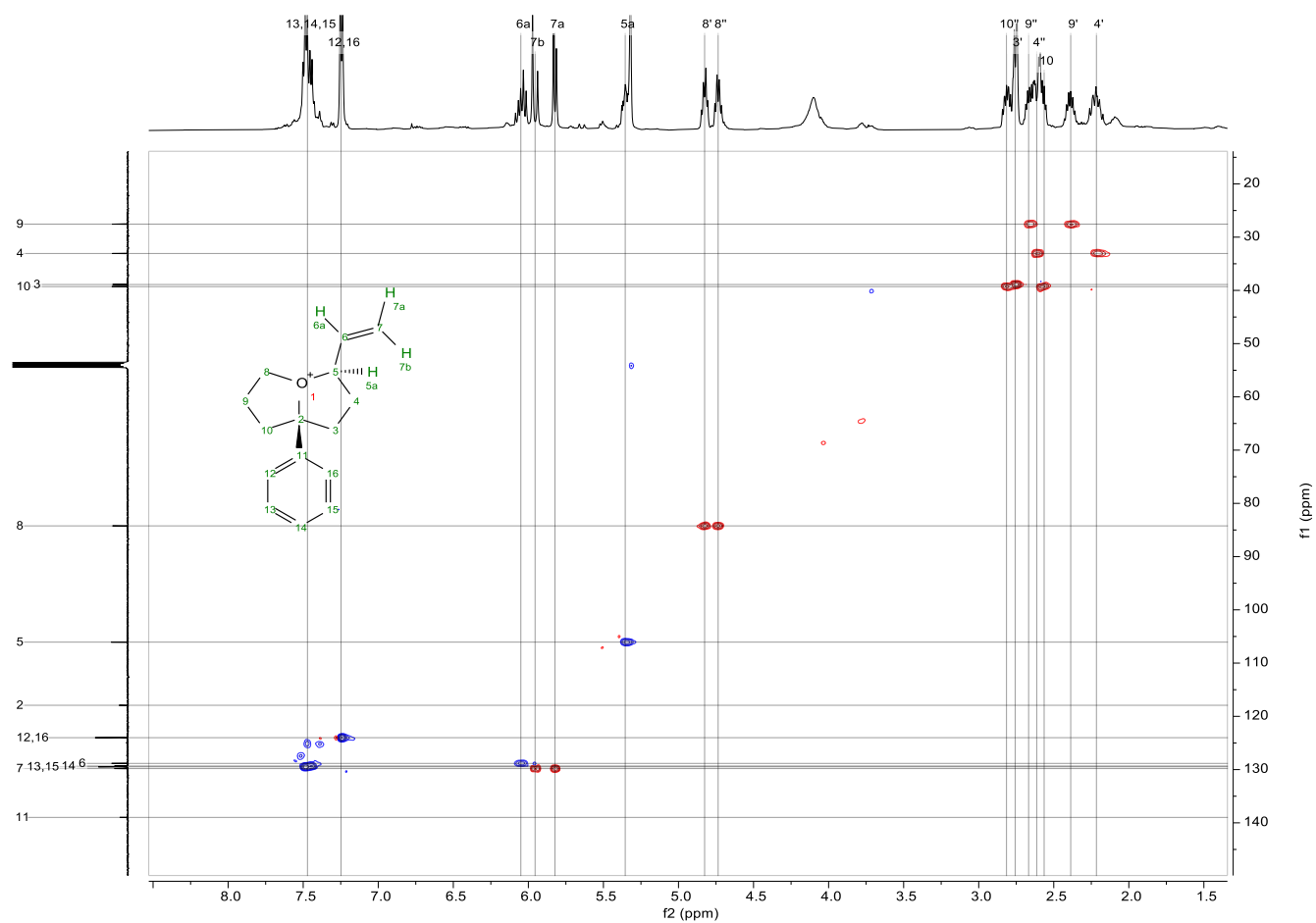
(3*R,7*aS**)-7*a*-Phenyl-3-vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium**
24*m*•SbF₆, CD₂Cl₂, ¹H-¹H COSY NMR, 500/500 MHz

hexafluoroantimonate



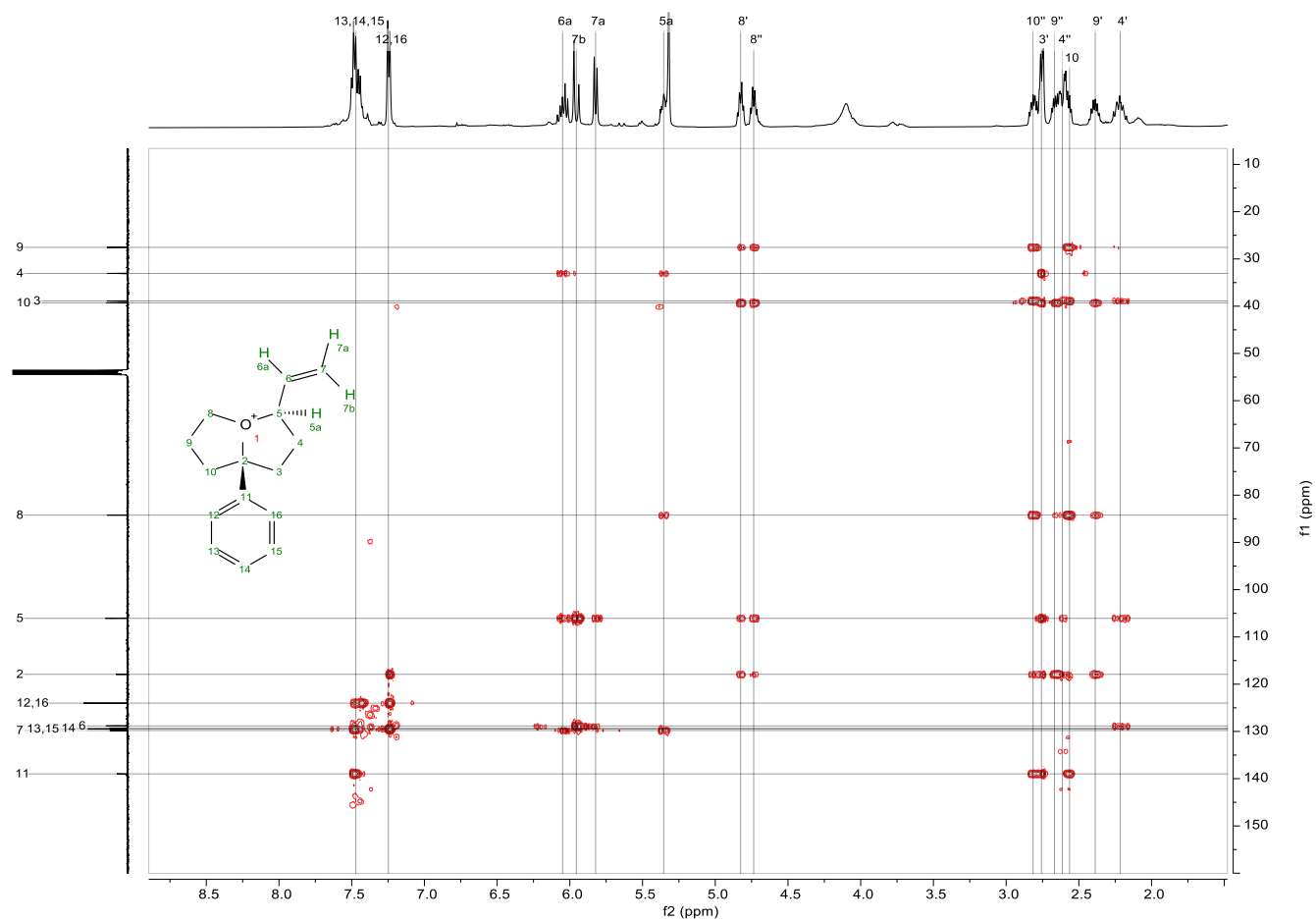
(3*R,7*aS**)-7*a*-Phenyl-3-vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium**
24*m*•SbF₆, CD₂Cl₂, ¹H-¹³C HSQC NMR, 500/126 MHz

hexafluoroantimonate



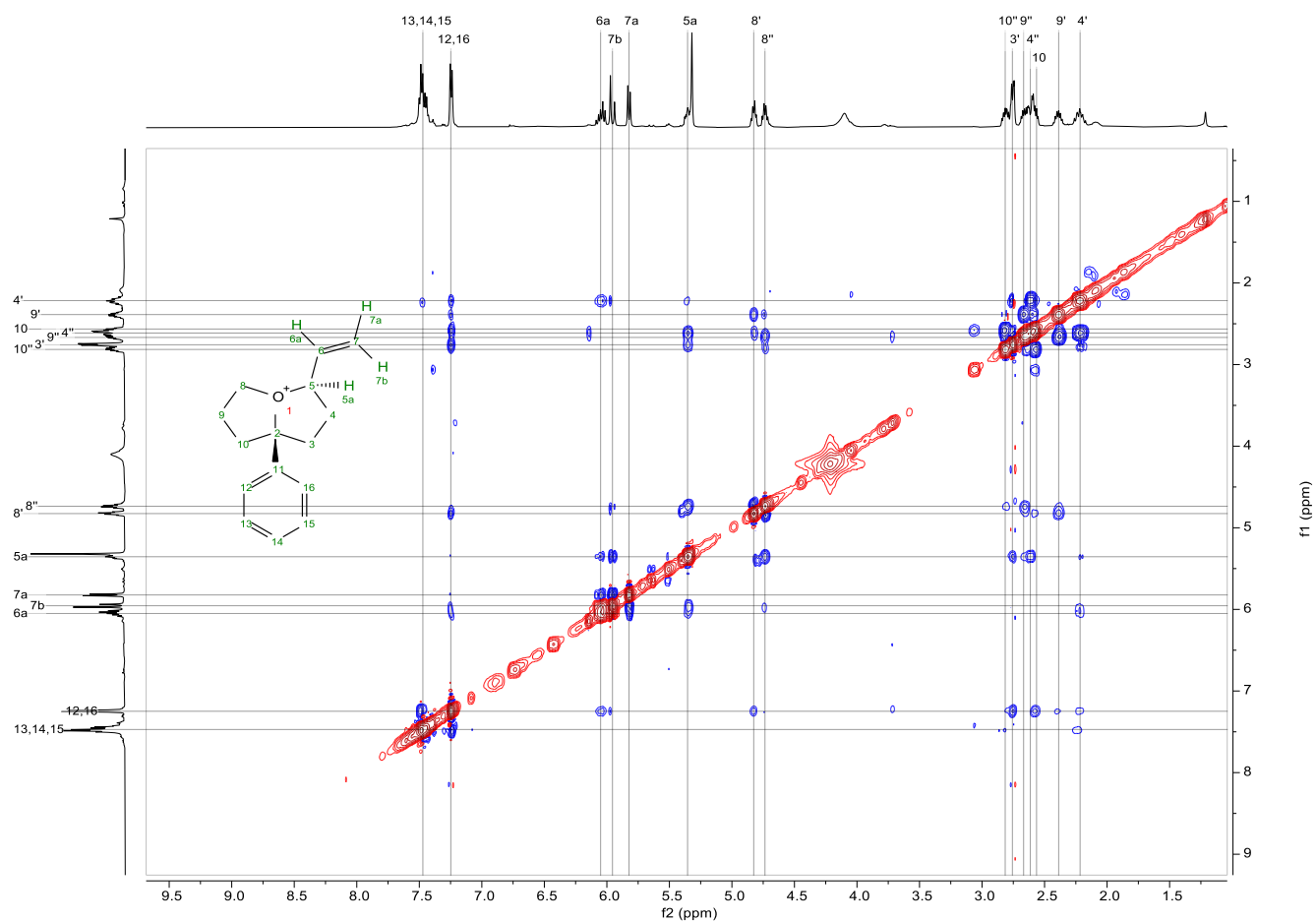
(3*R,7*aS**)-7*a*-Phenyl-3-vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium**
24*m*•SbF₆, CD₂Cl₂, ¹H-¹³C HMBC NMR, 500/126 MHz

hexafluoroantimonate

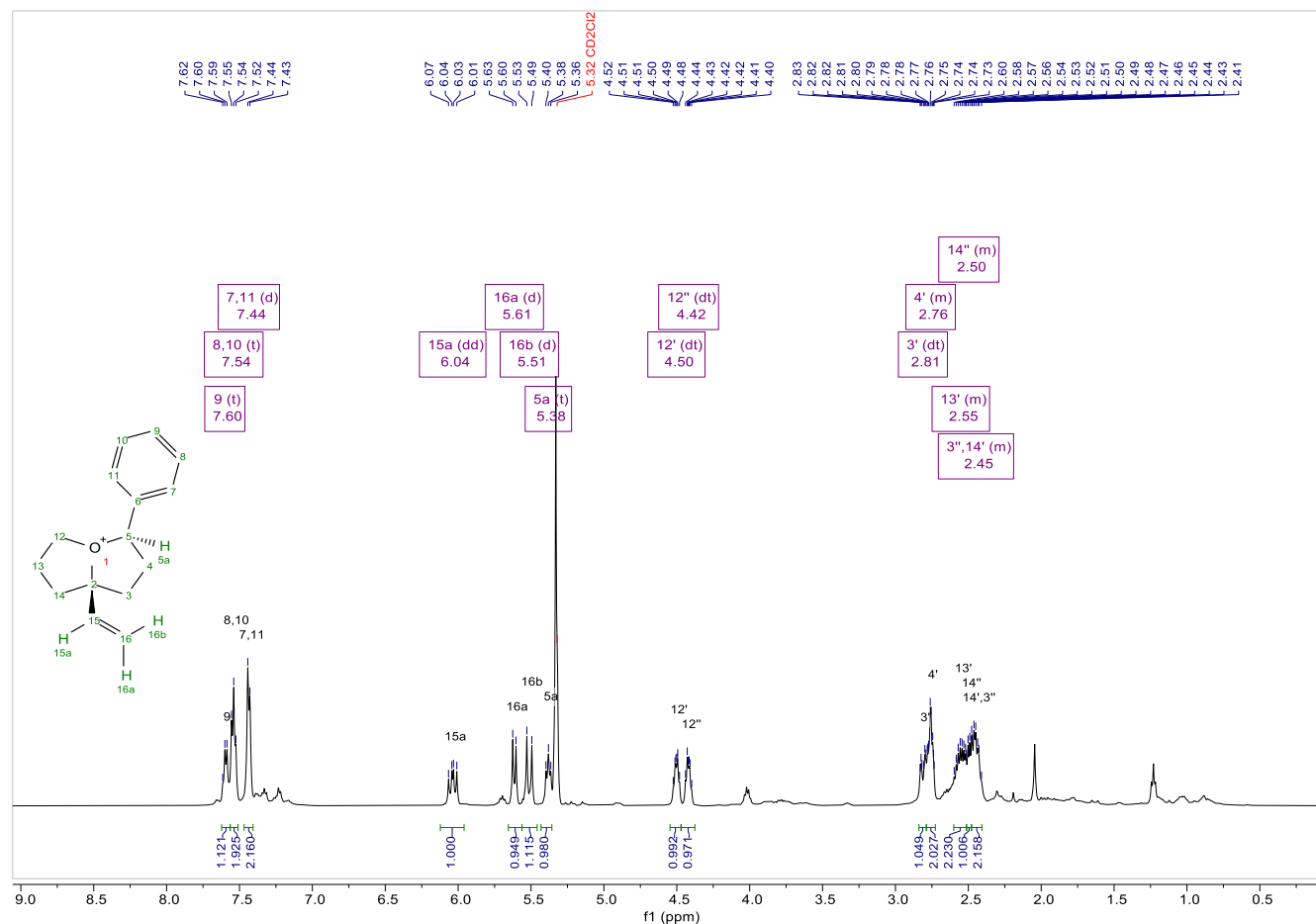


(3*R,7*aS**)-7*a*-Phenyl-3-vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium
24*m*•SbF₆, CD₂Cl₂, ¹H-¹H NOESY NMR, 500/500 MHz**

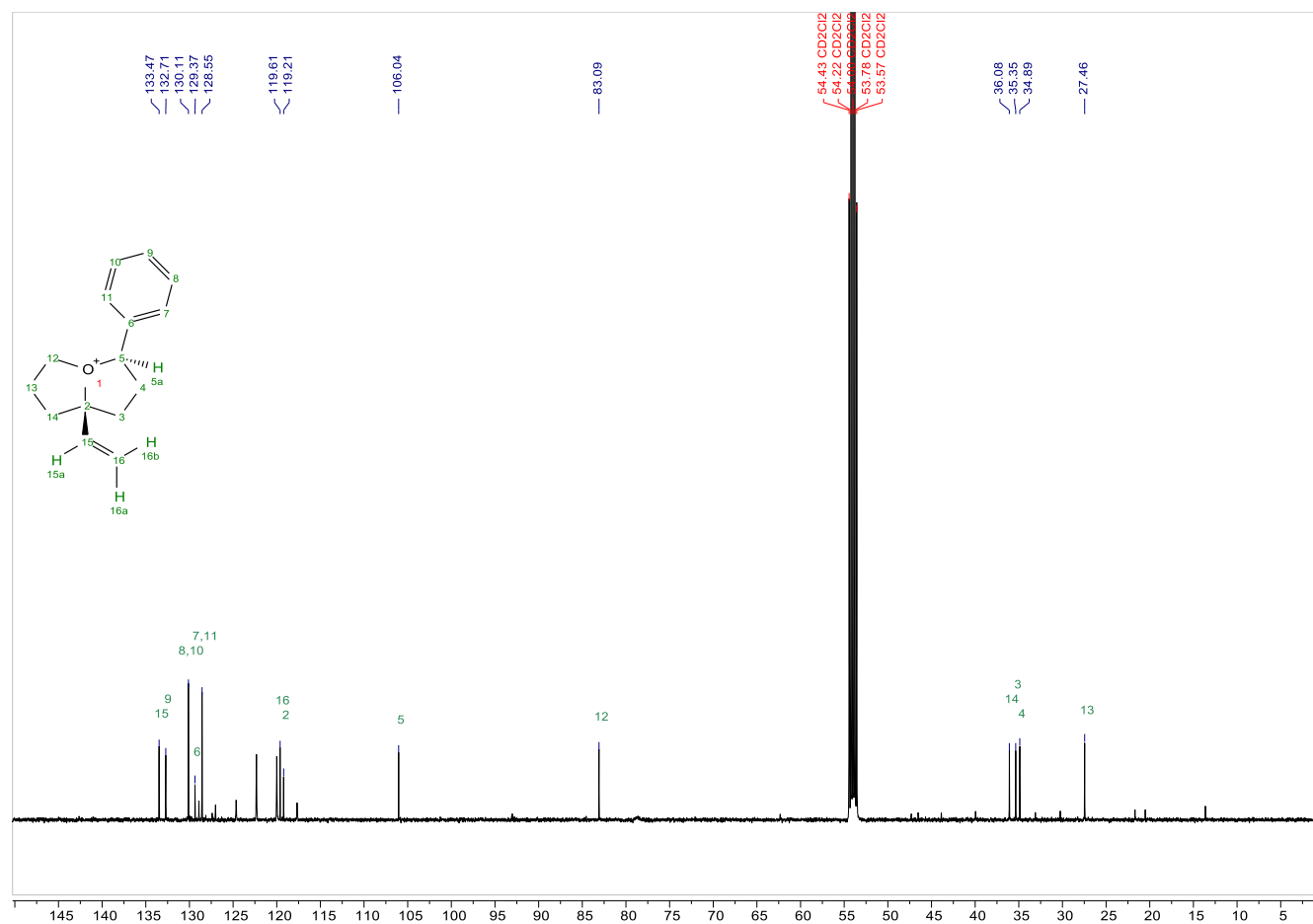
hexafluoroantimonate



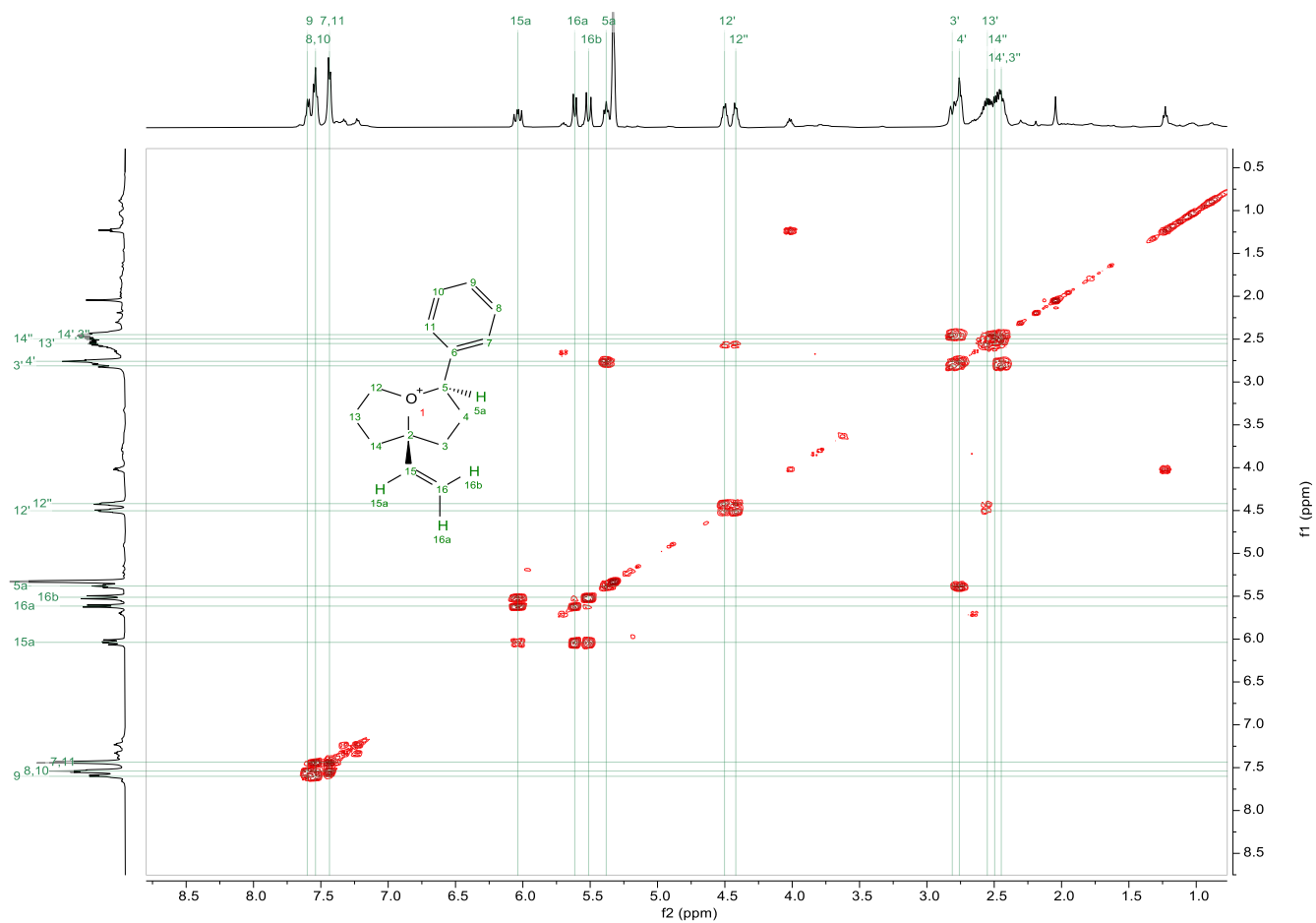
(3*R,7*aS**)-3-Phenyl-7*a*-vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24n•Al(pftb)₄, CD₂Cl₂, ¹H NMR, 500 MHz**



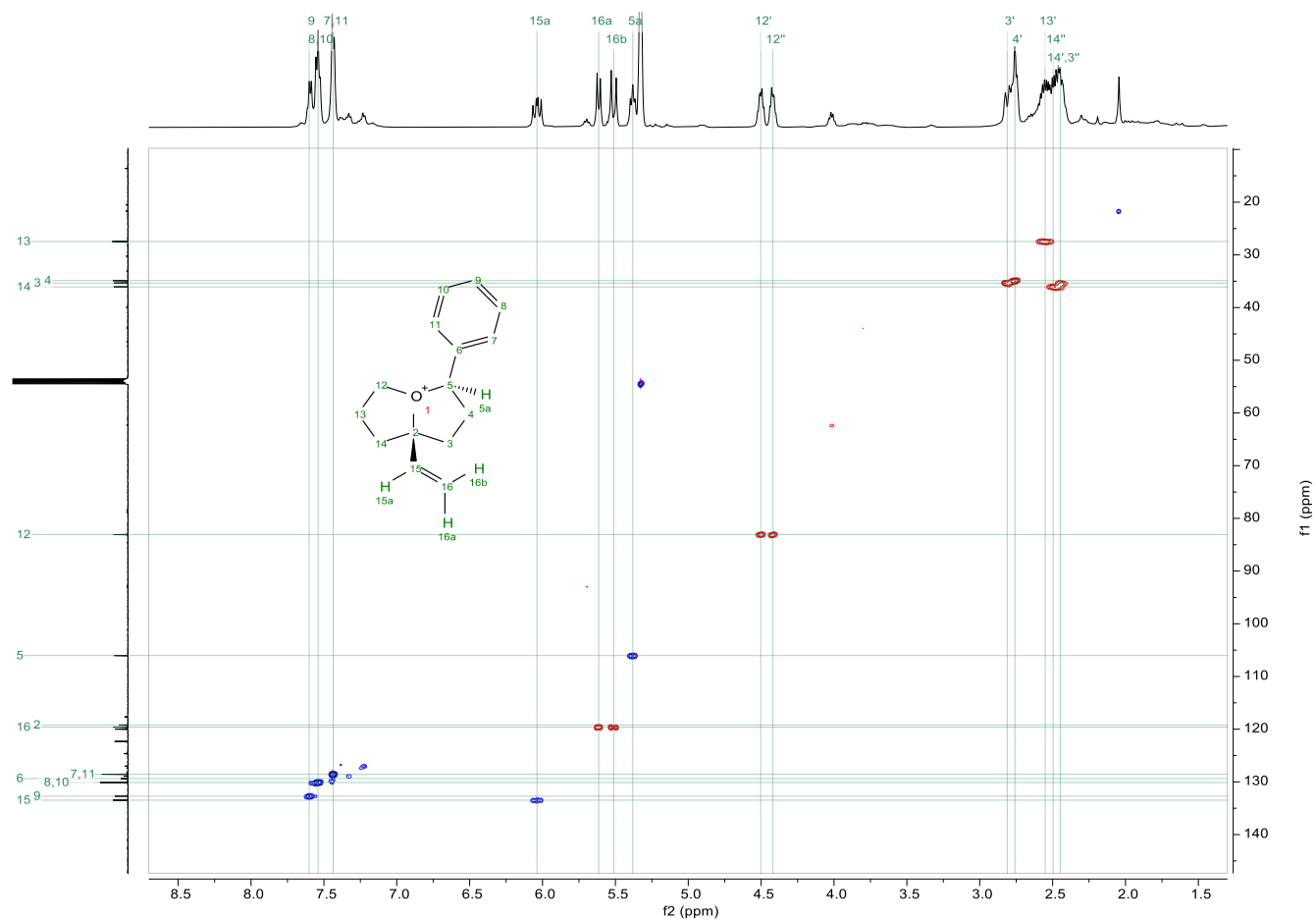
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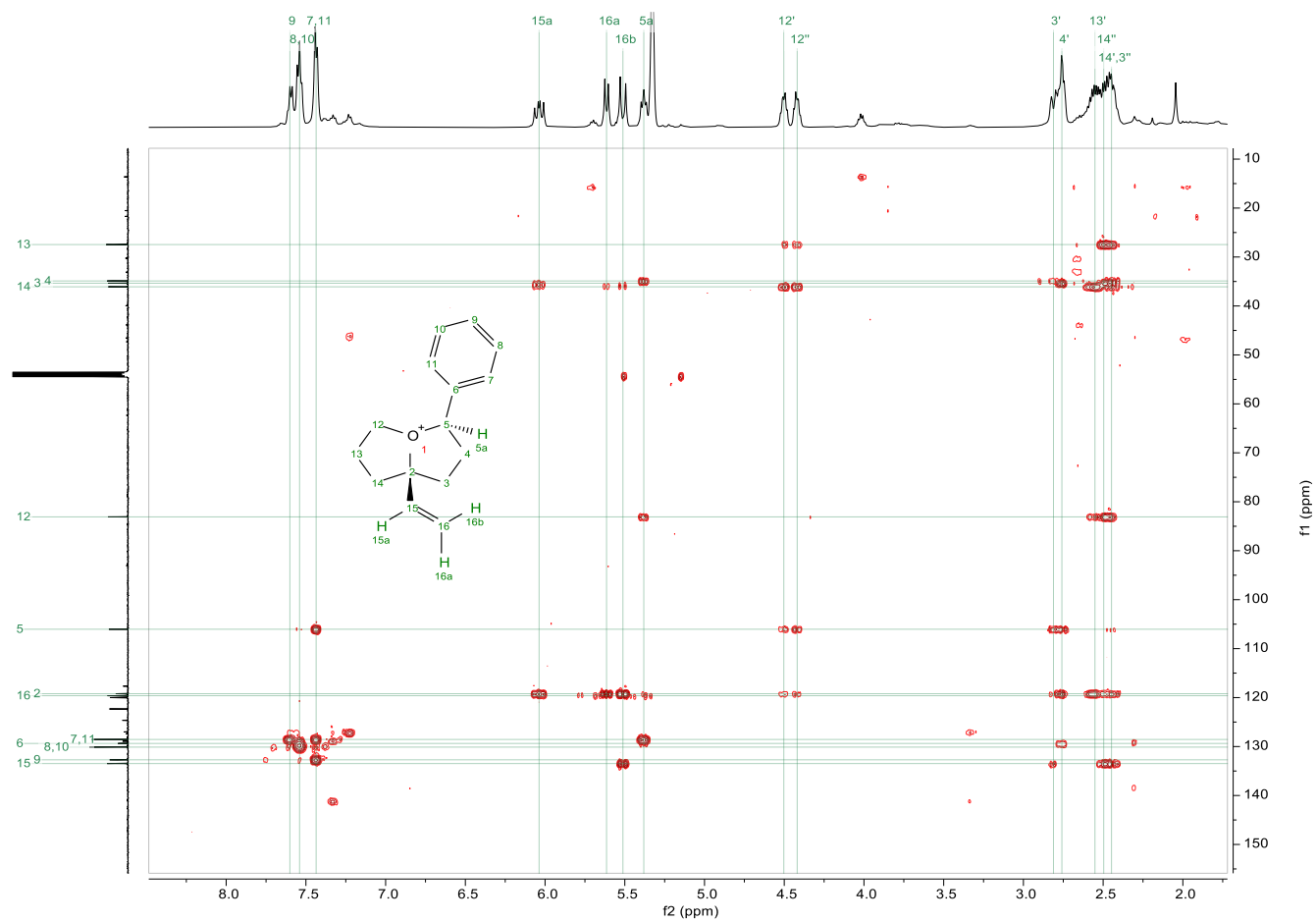
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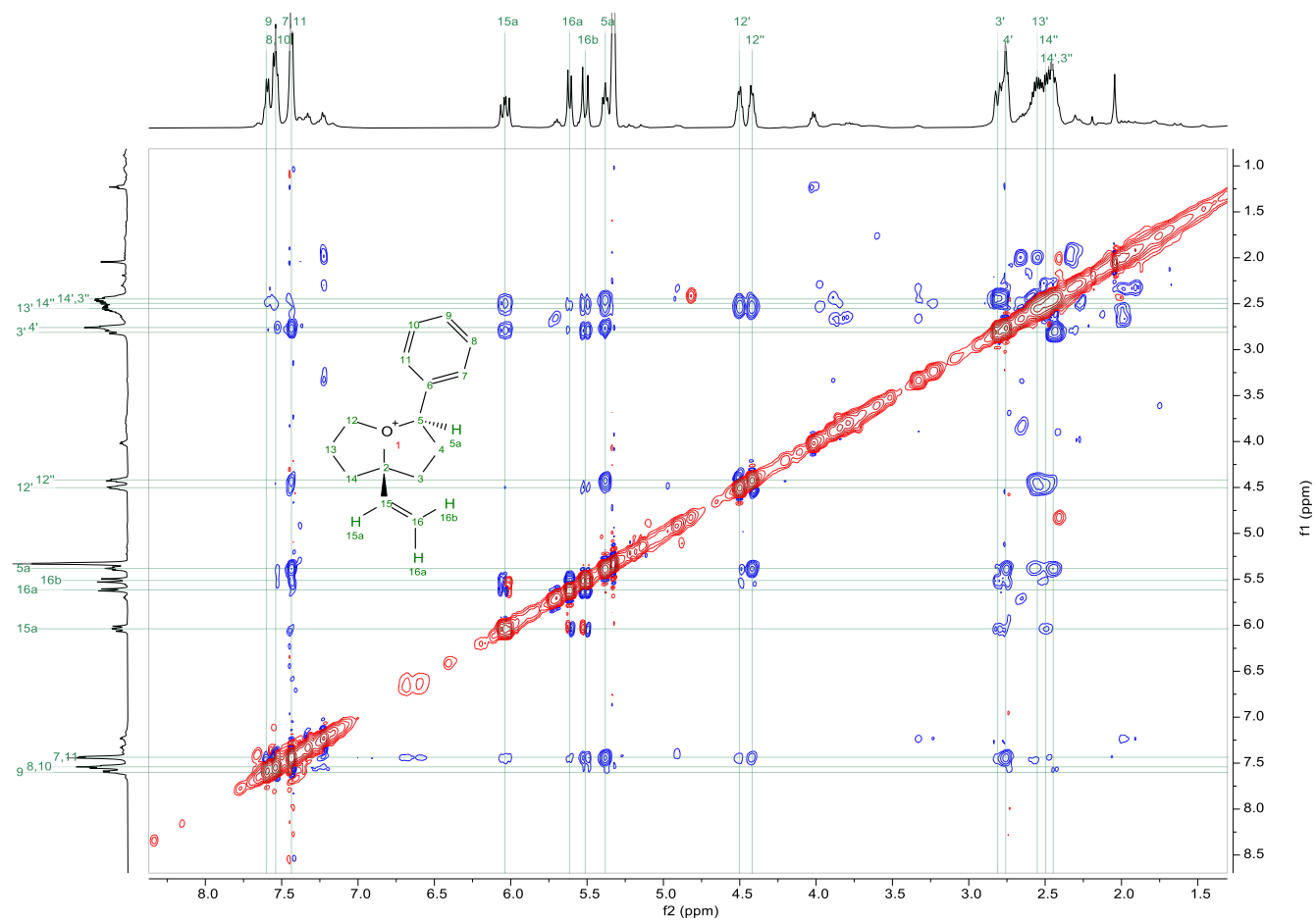
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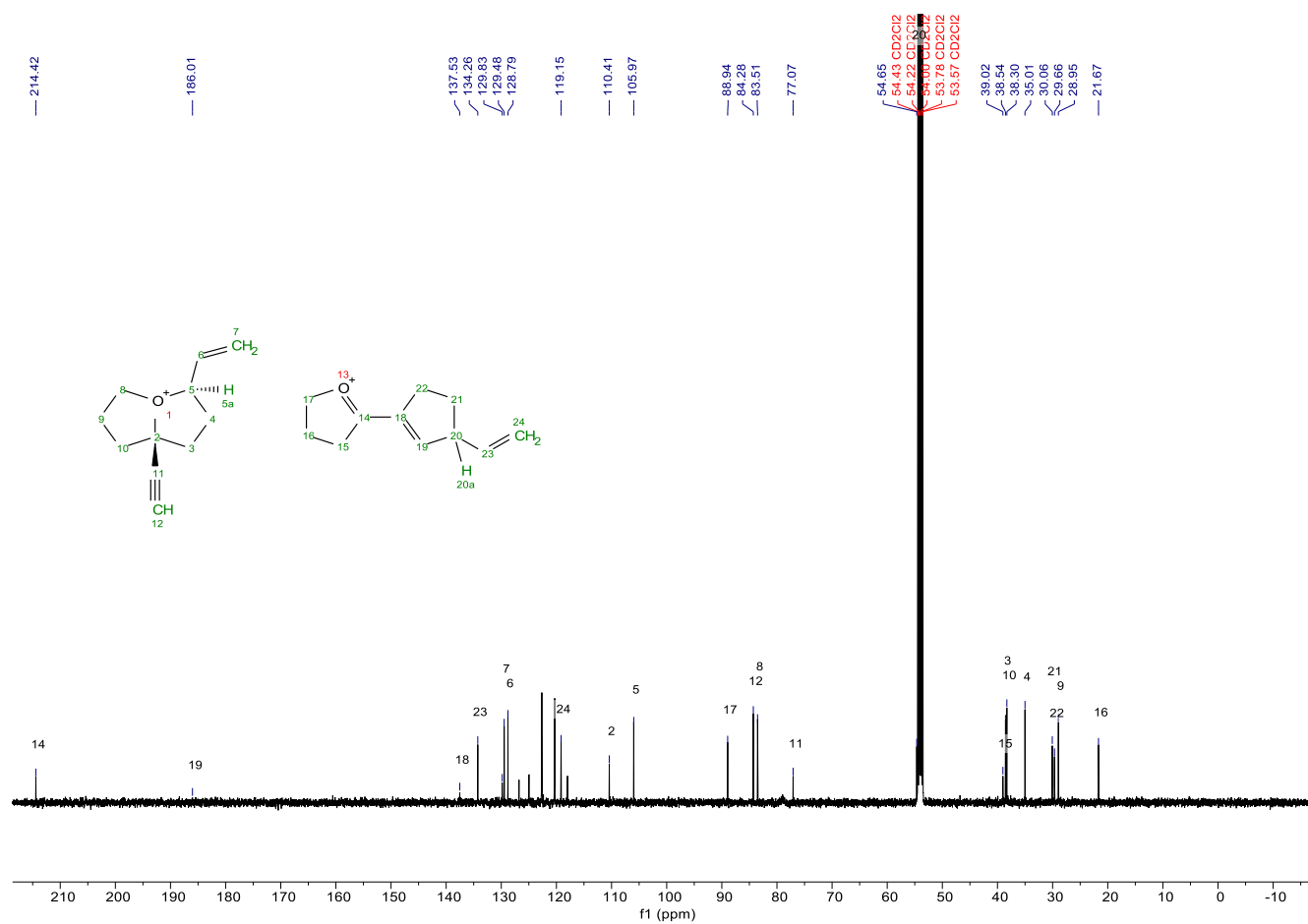
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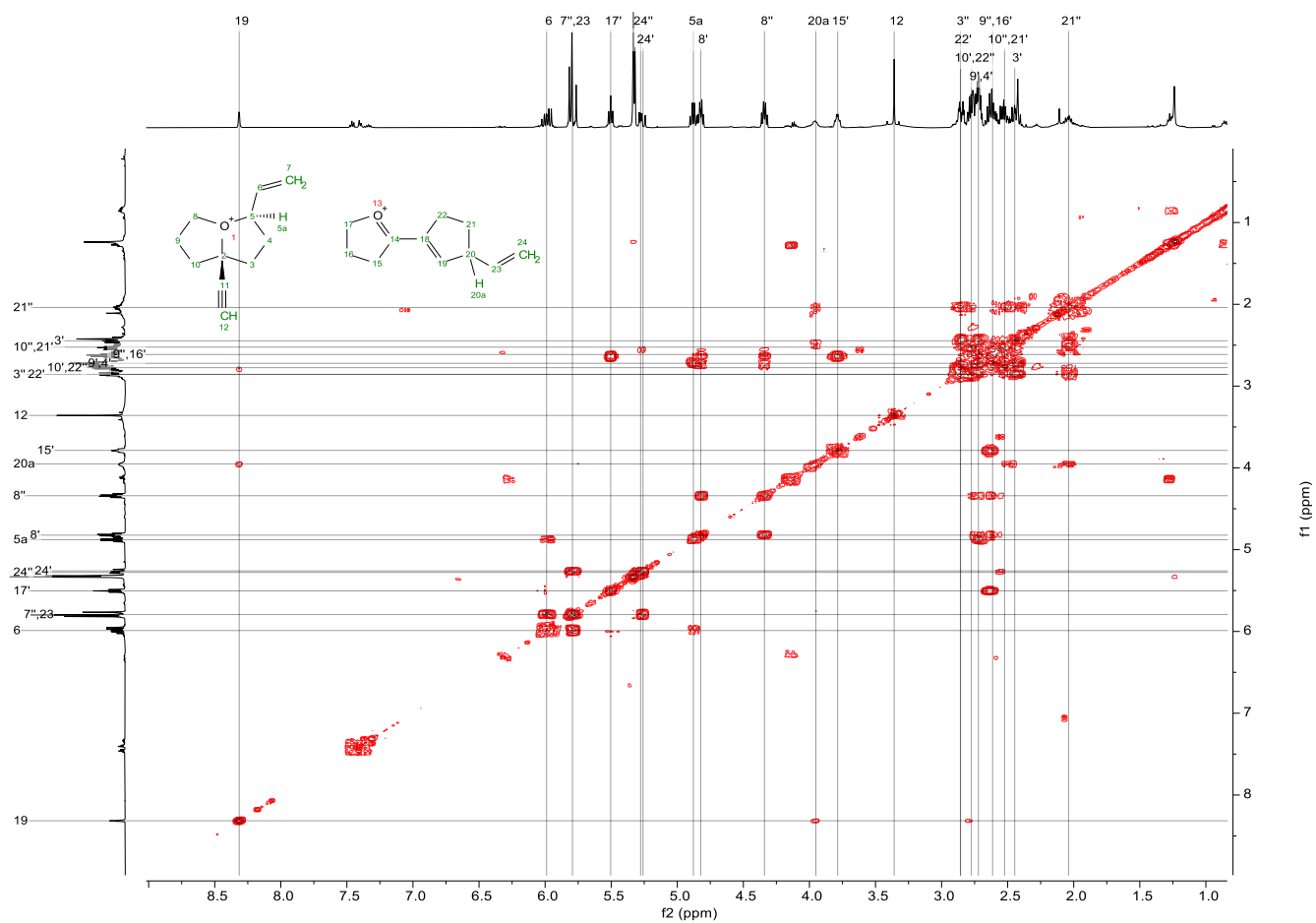
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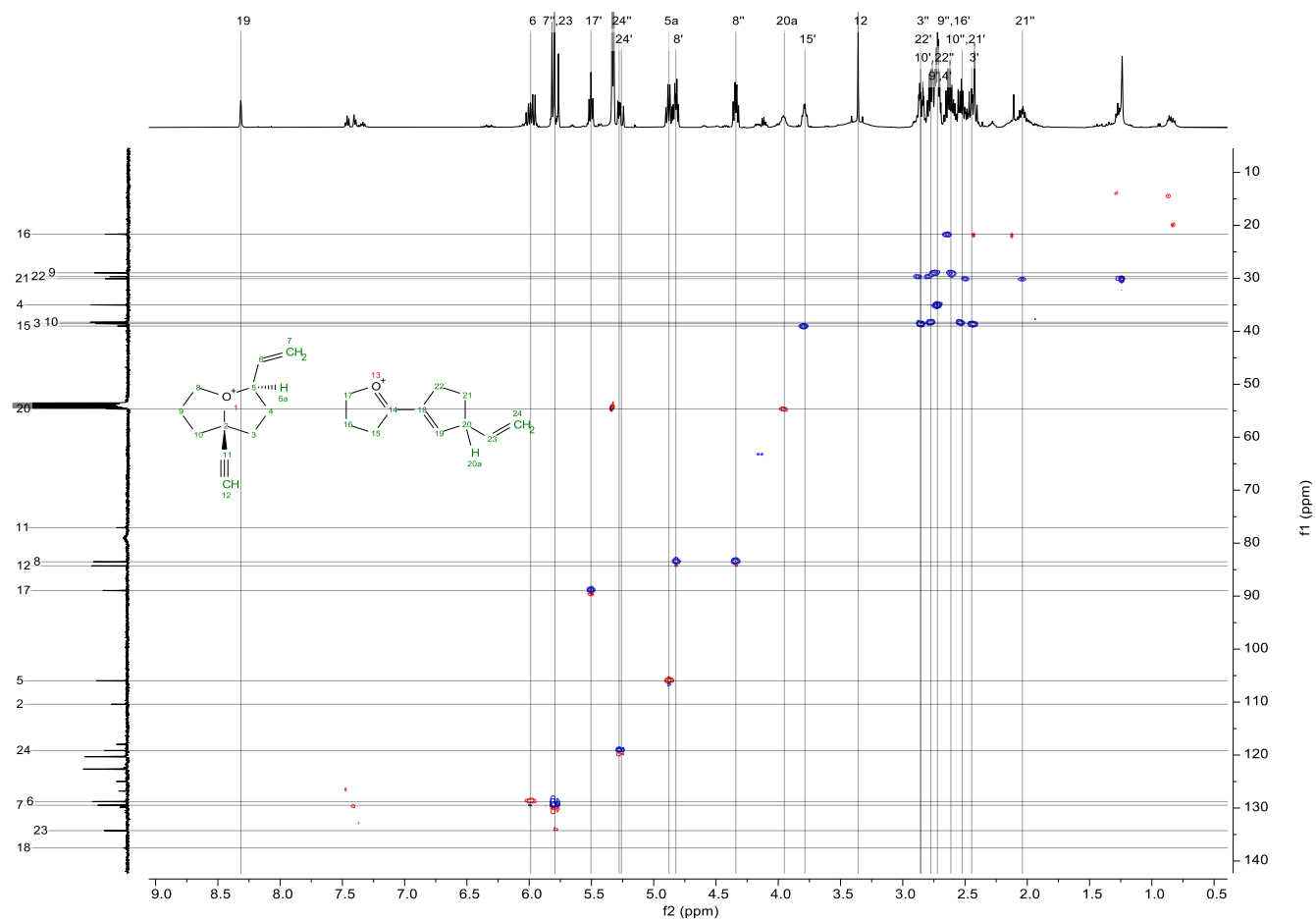
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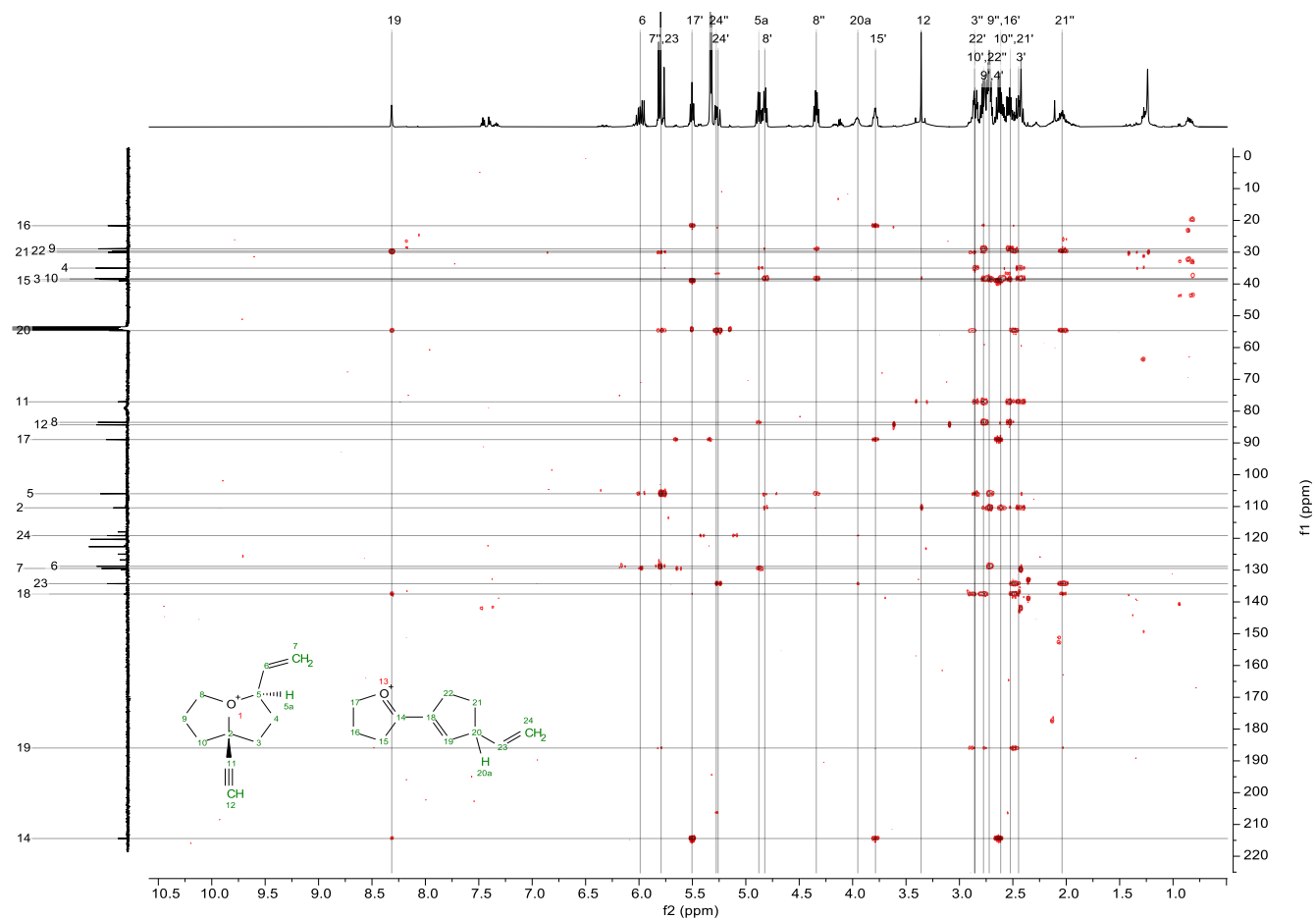
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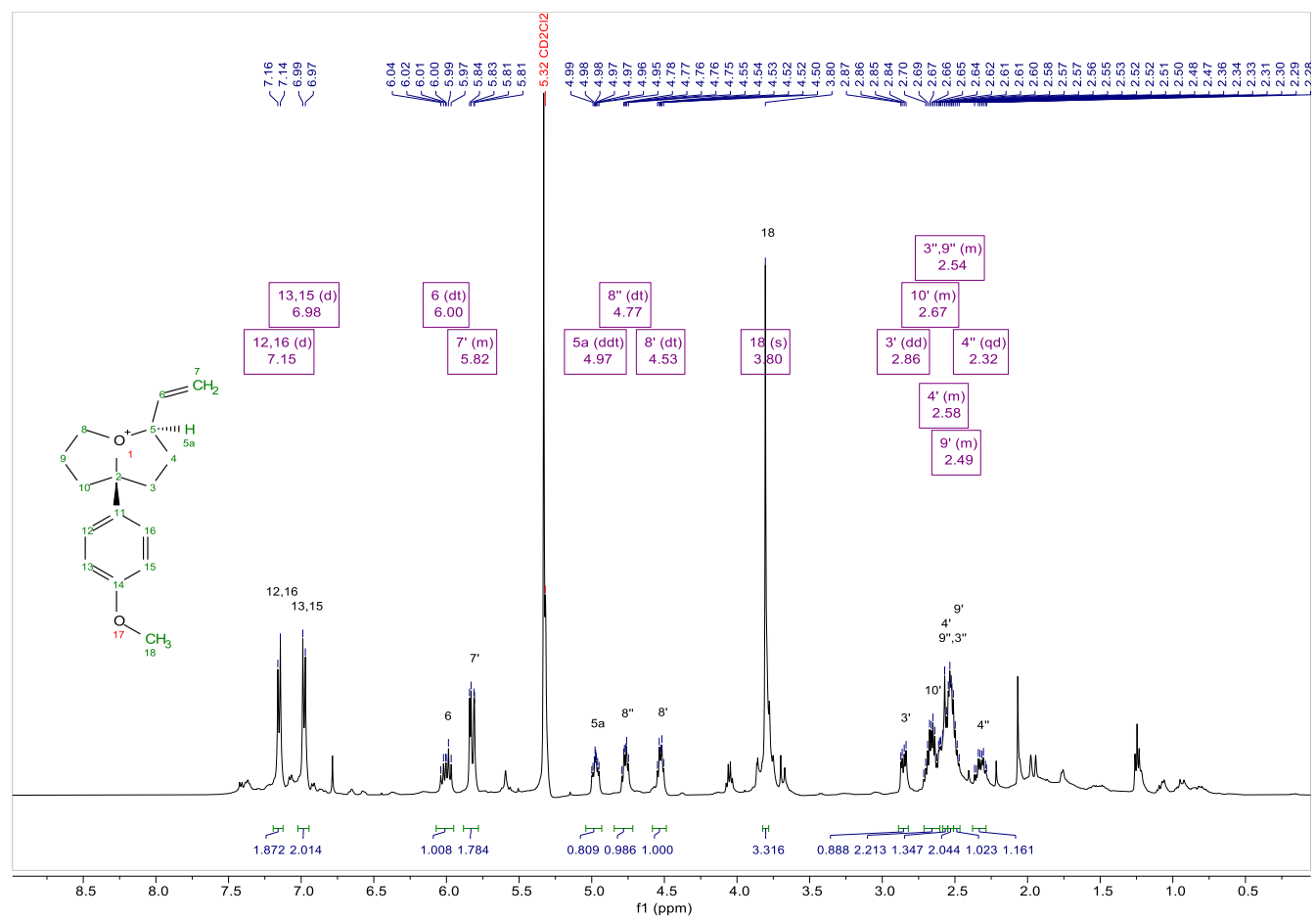
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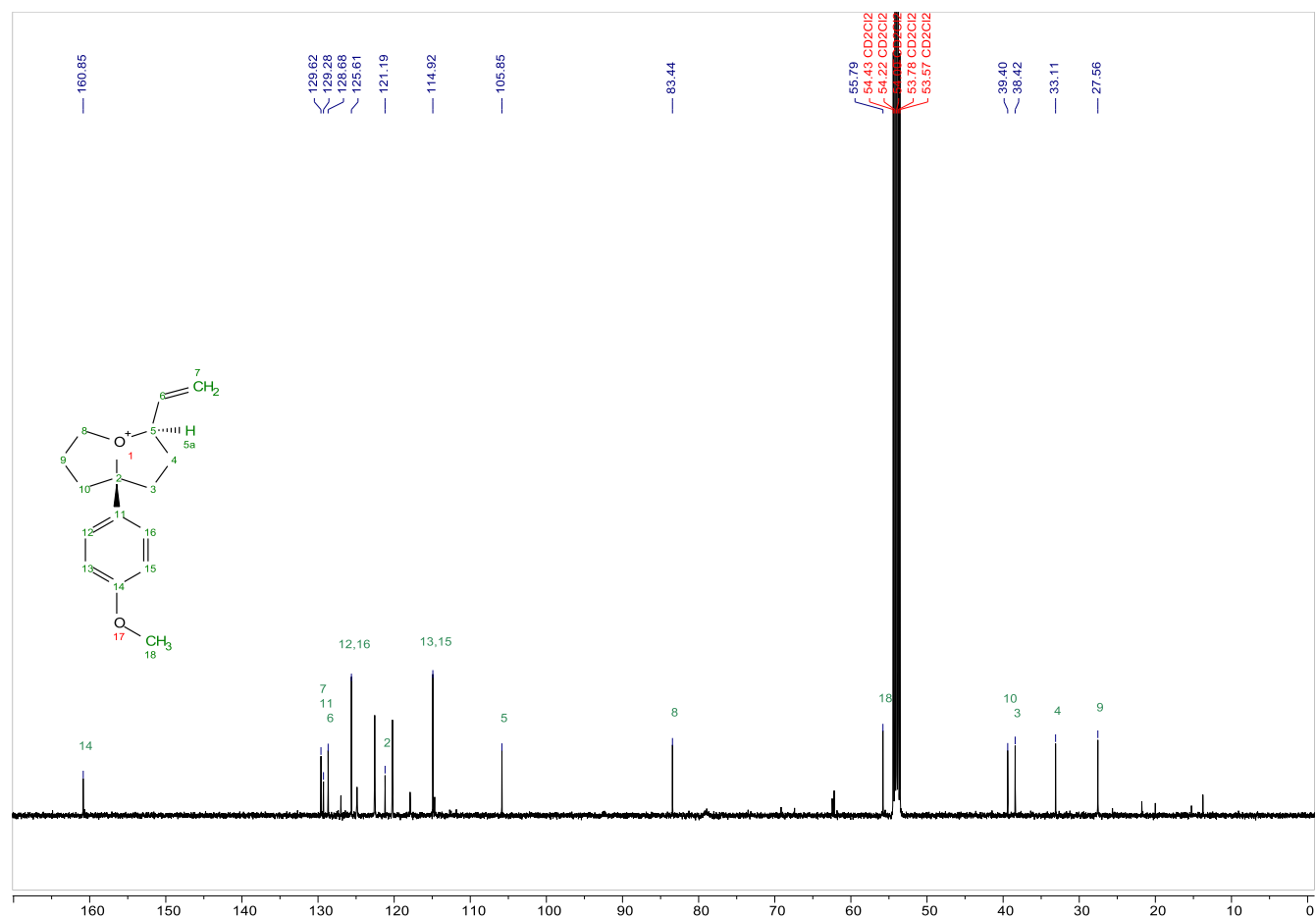
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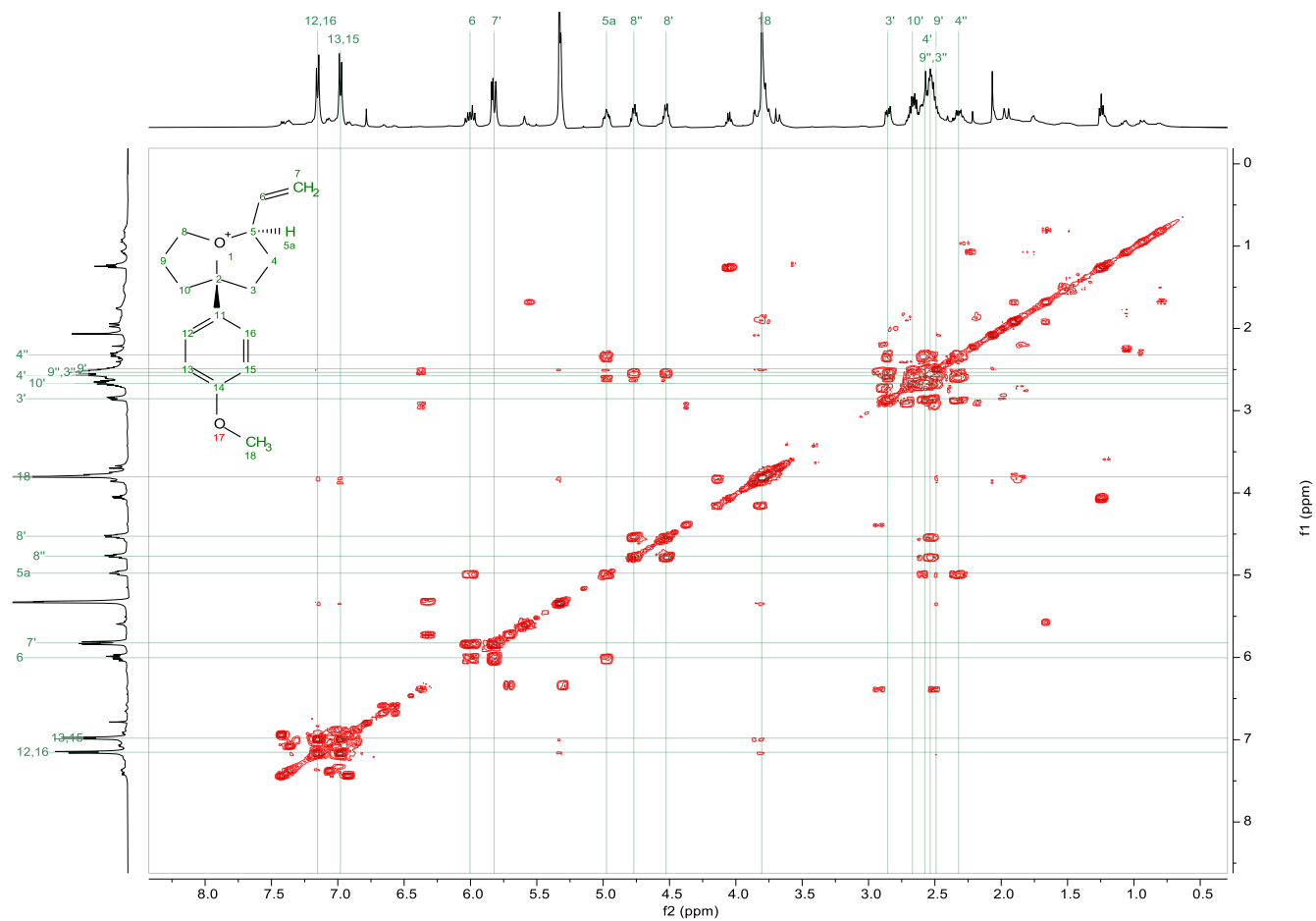
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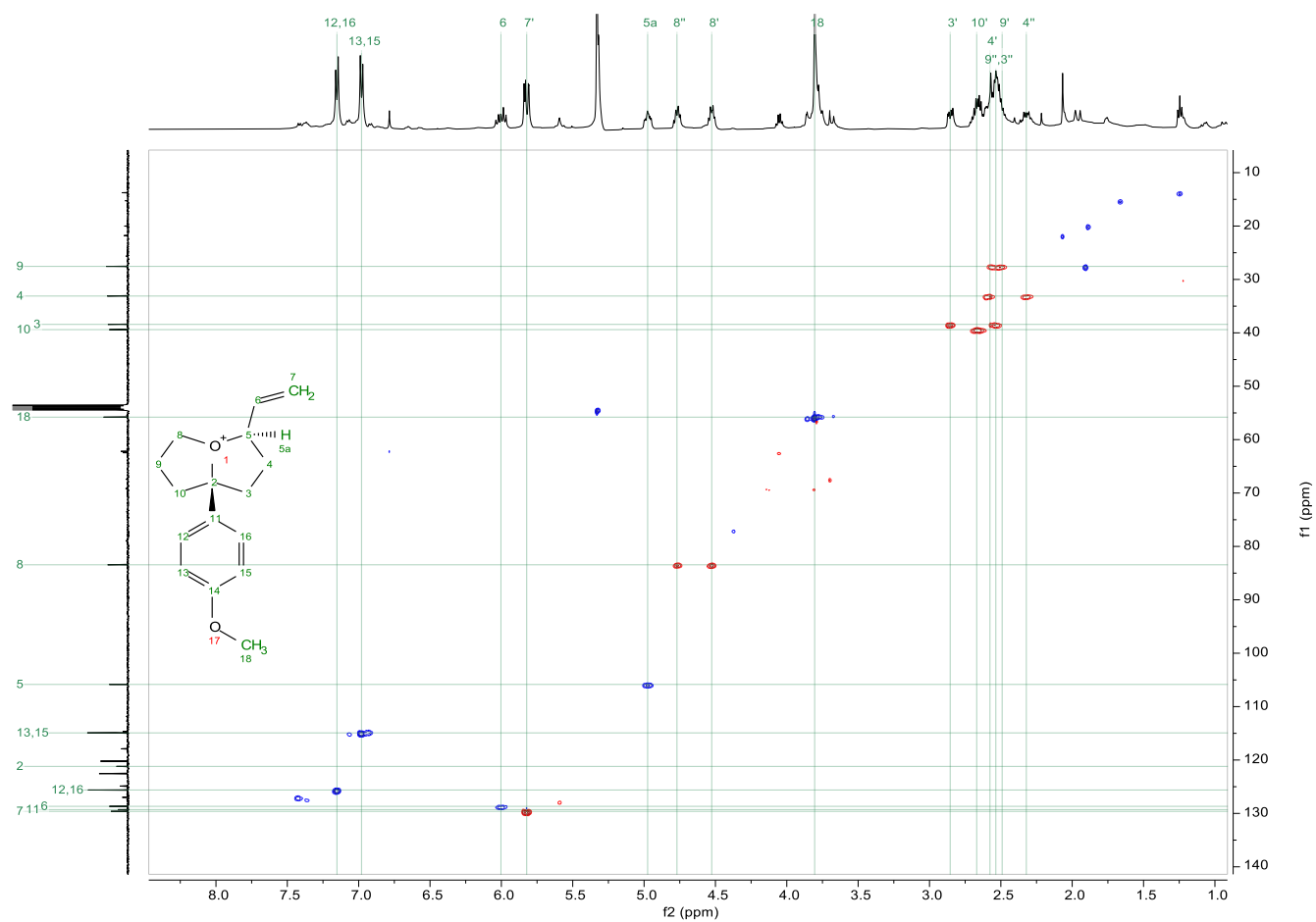
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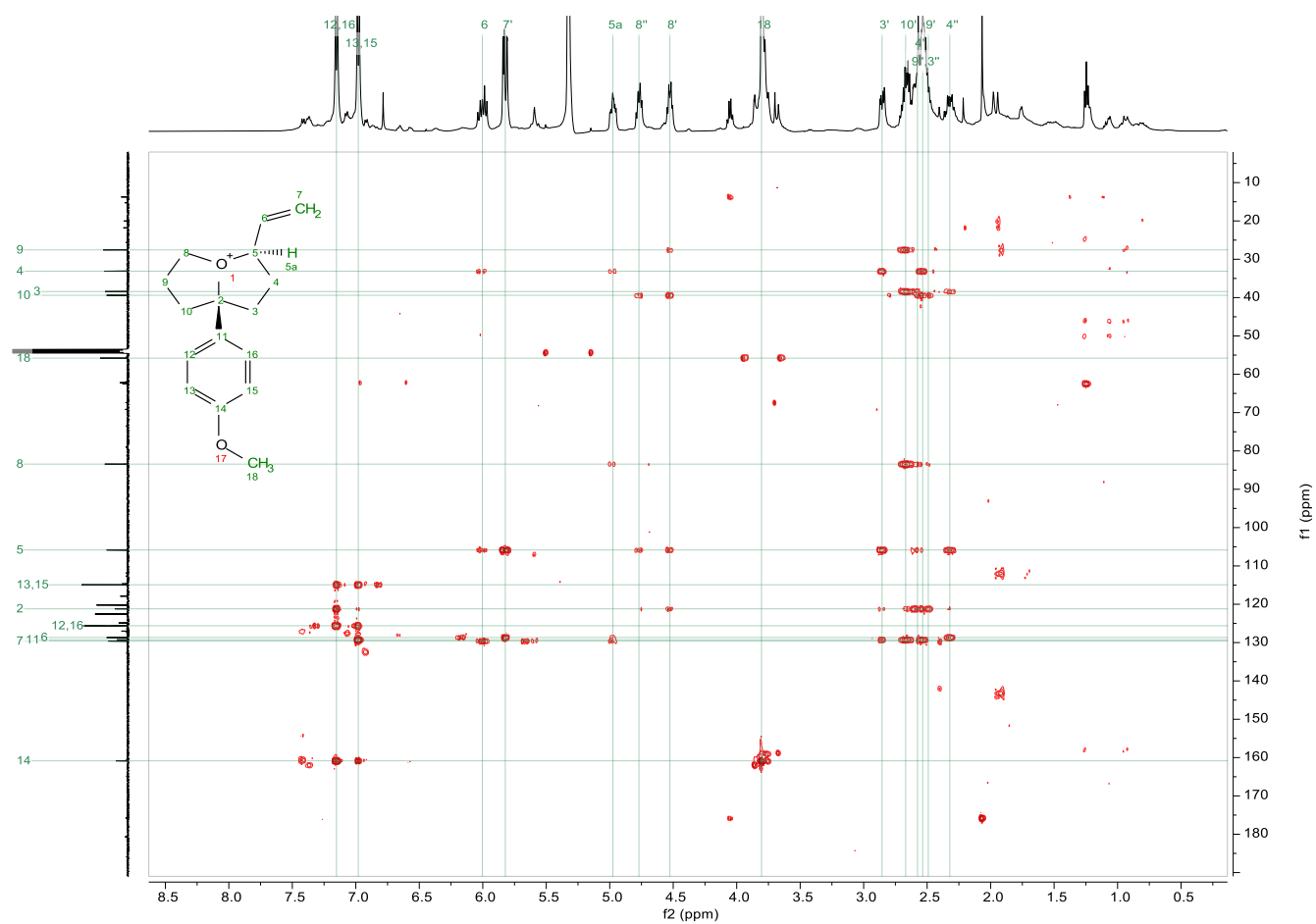
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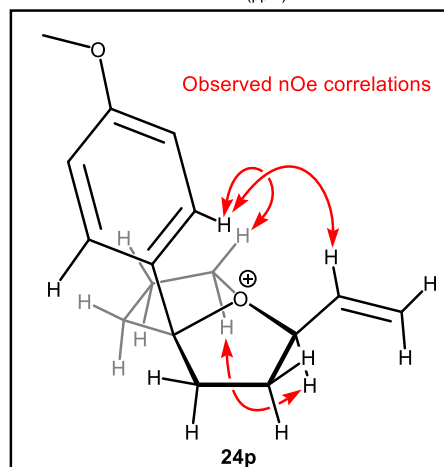
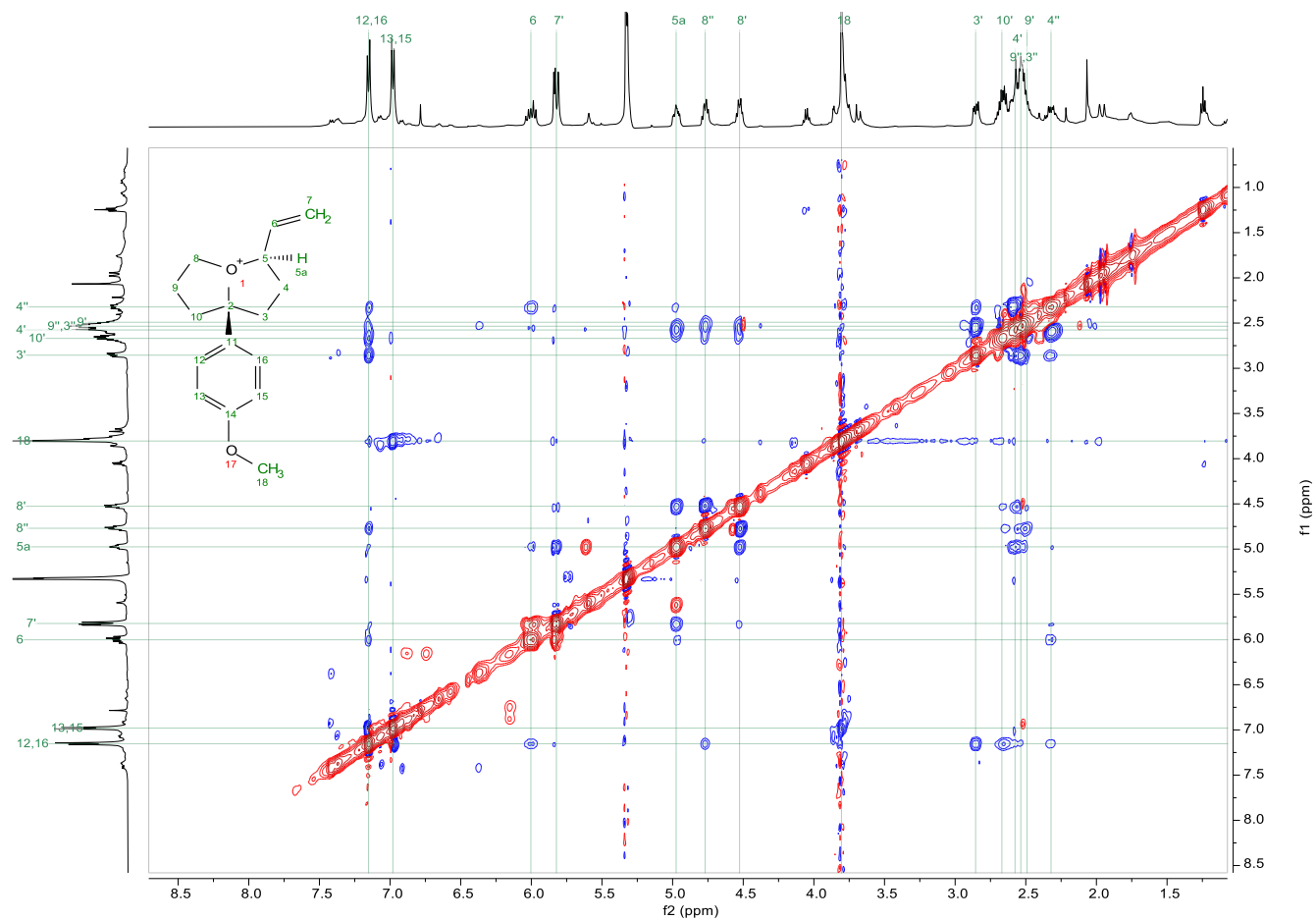
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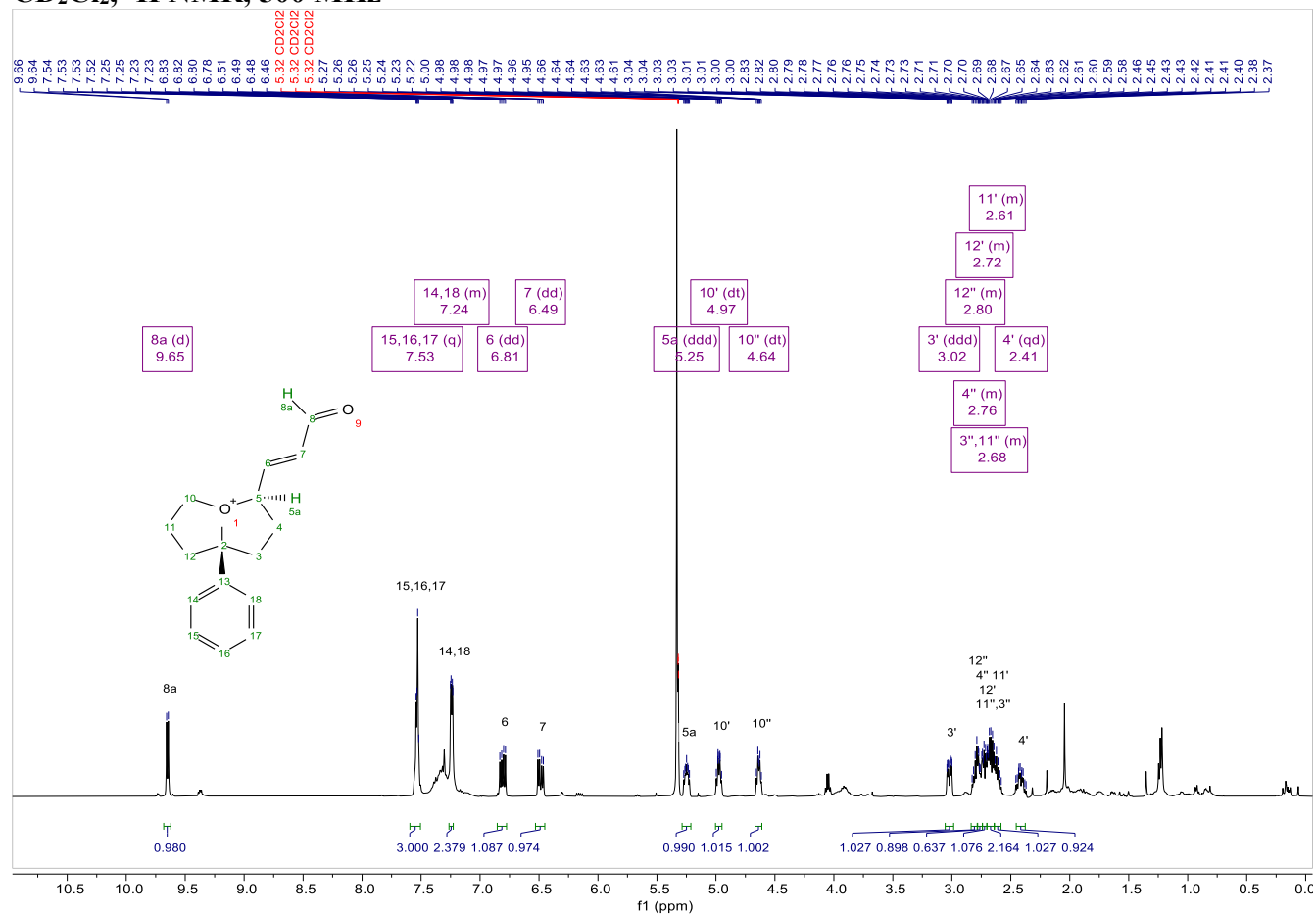
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tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminumate 24p•Al(pftb)₄,
CD₂Cl₂, ¹H-¹³C HMBC NMR, 500/126 MHz**



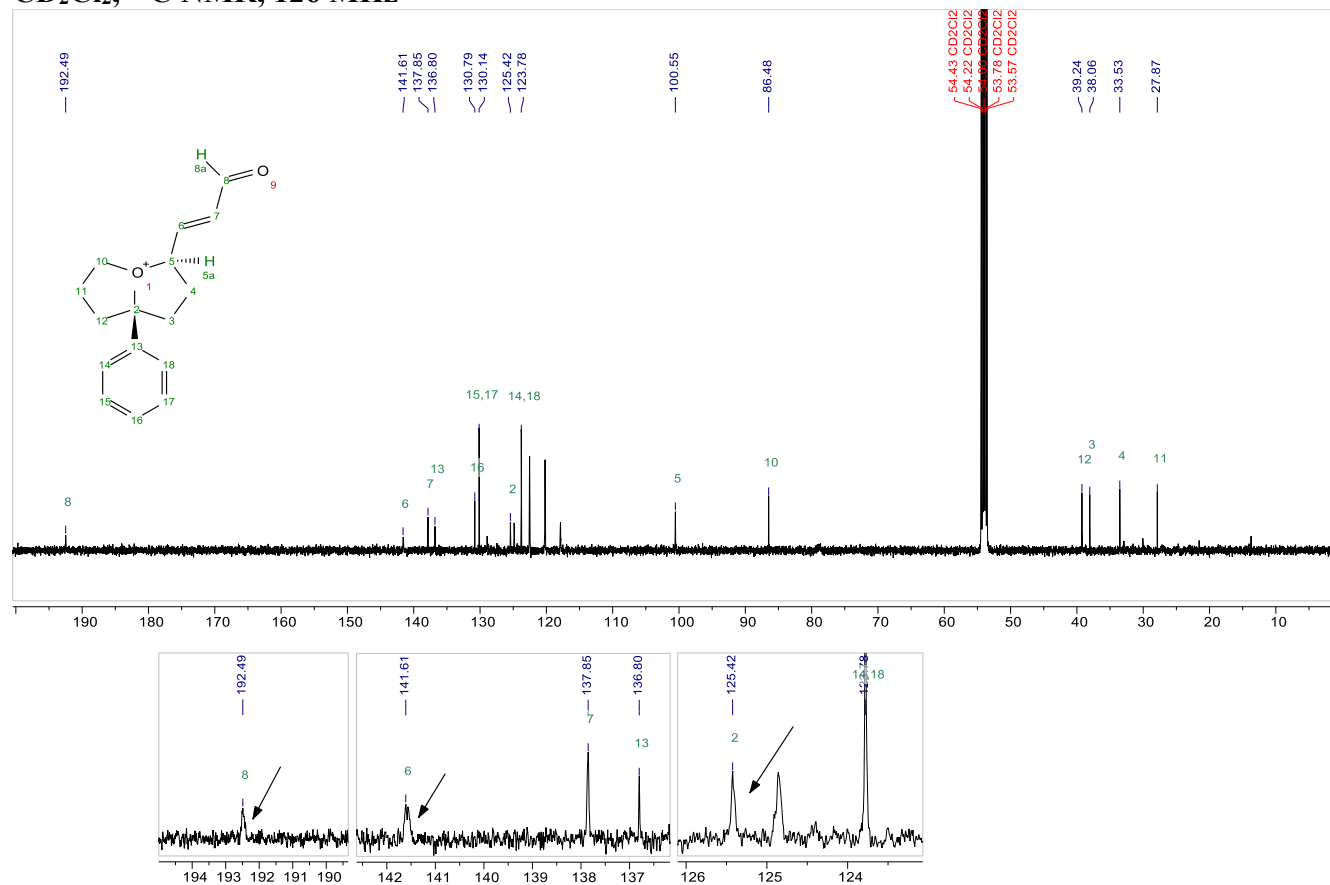
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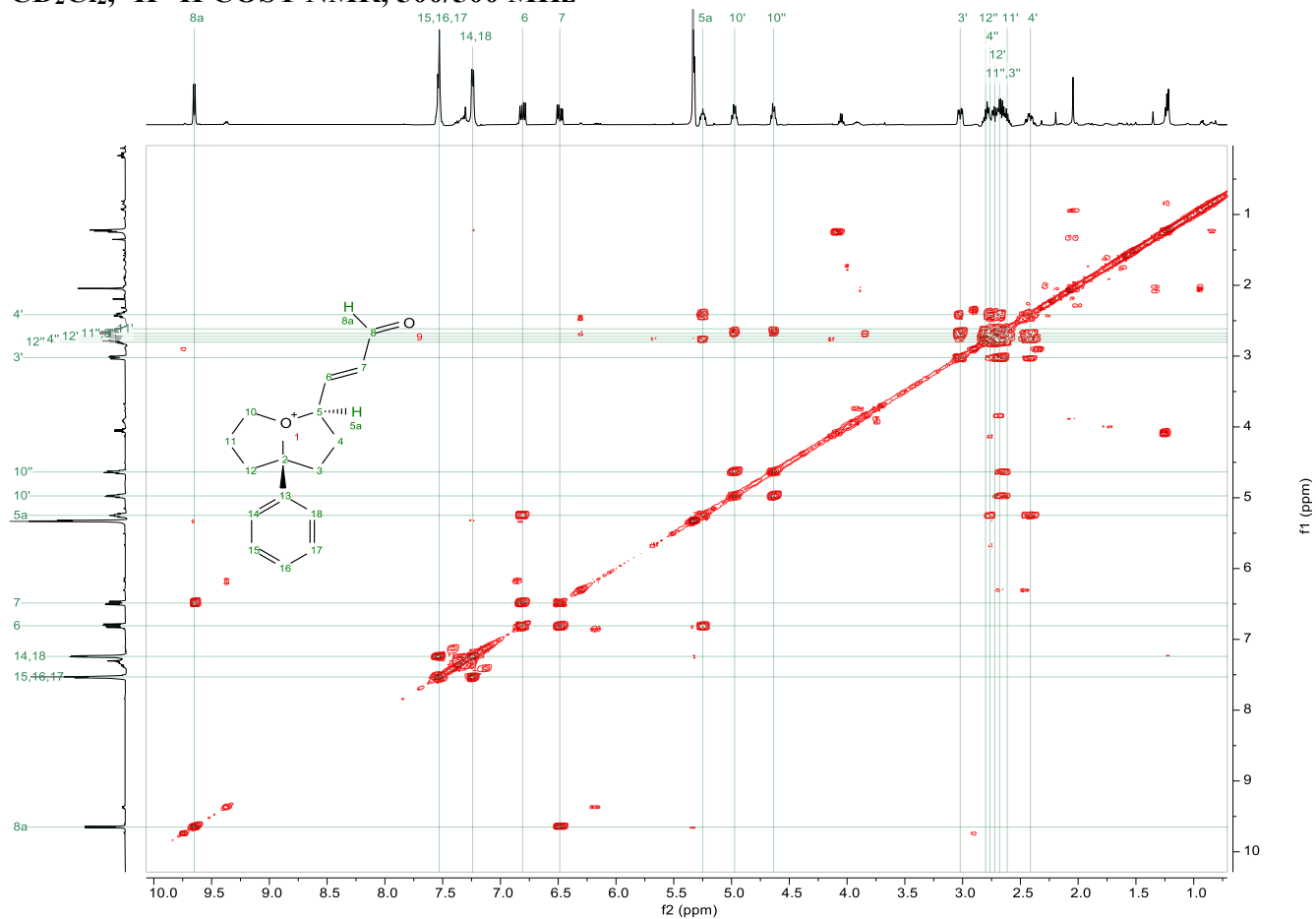
(3*R,7*aS**)-3-((*E*)-3-Oxoprop-1-en-1-yl)-7*a*-phenylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminumate 24*q*•Al(pftb)₄, CD₂Cl₂, ¹H NMR, 500 MHz**



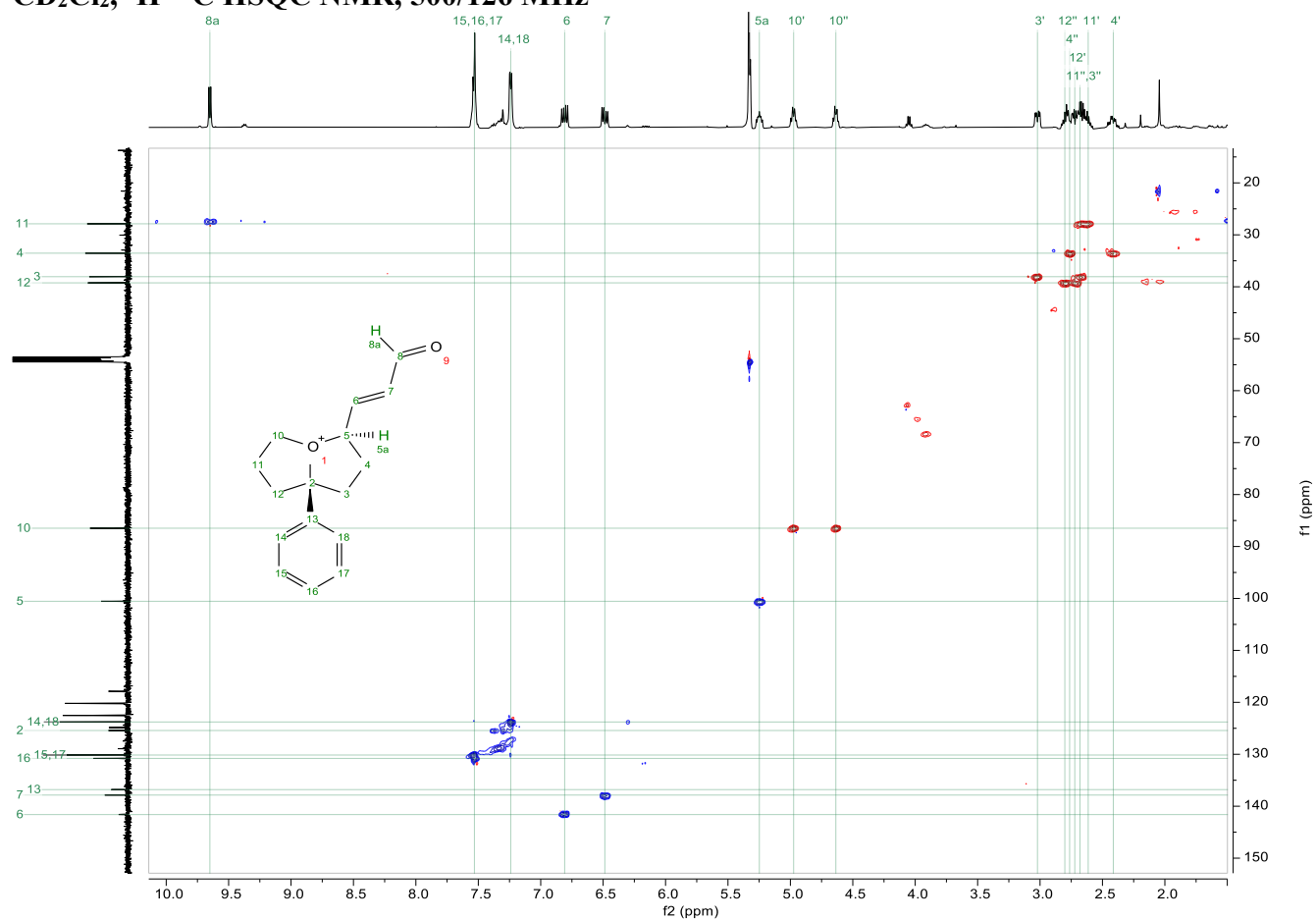
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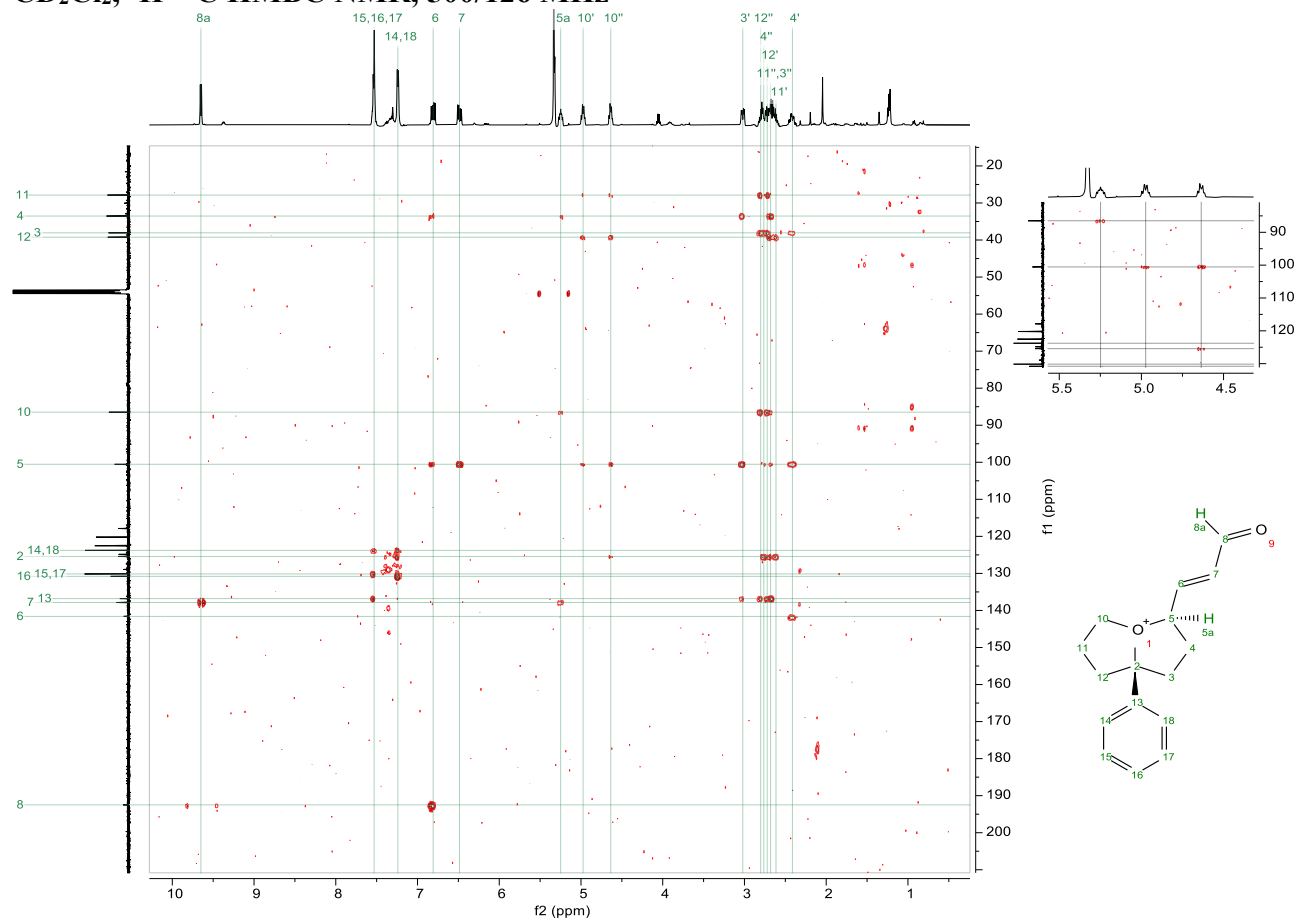
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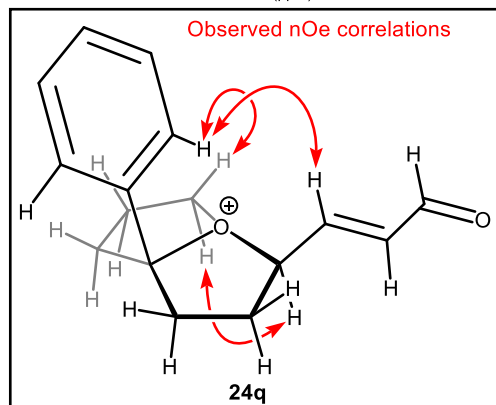
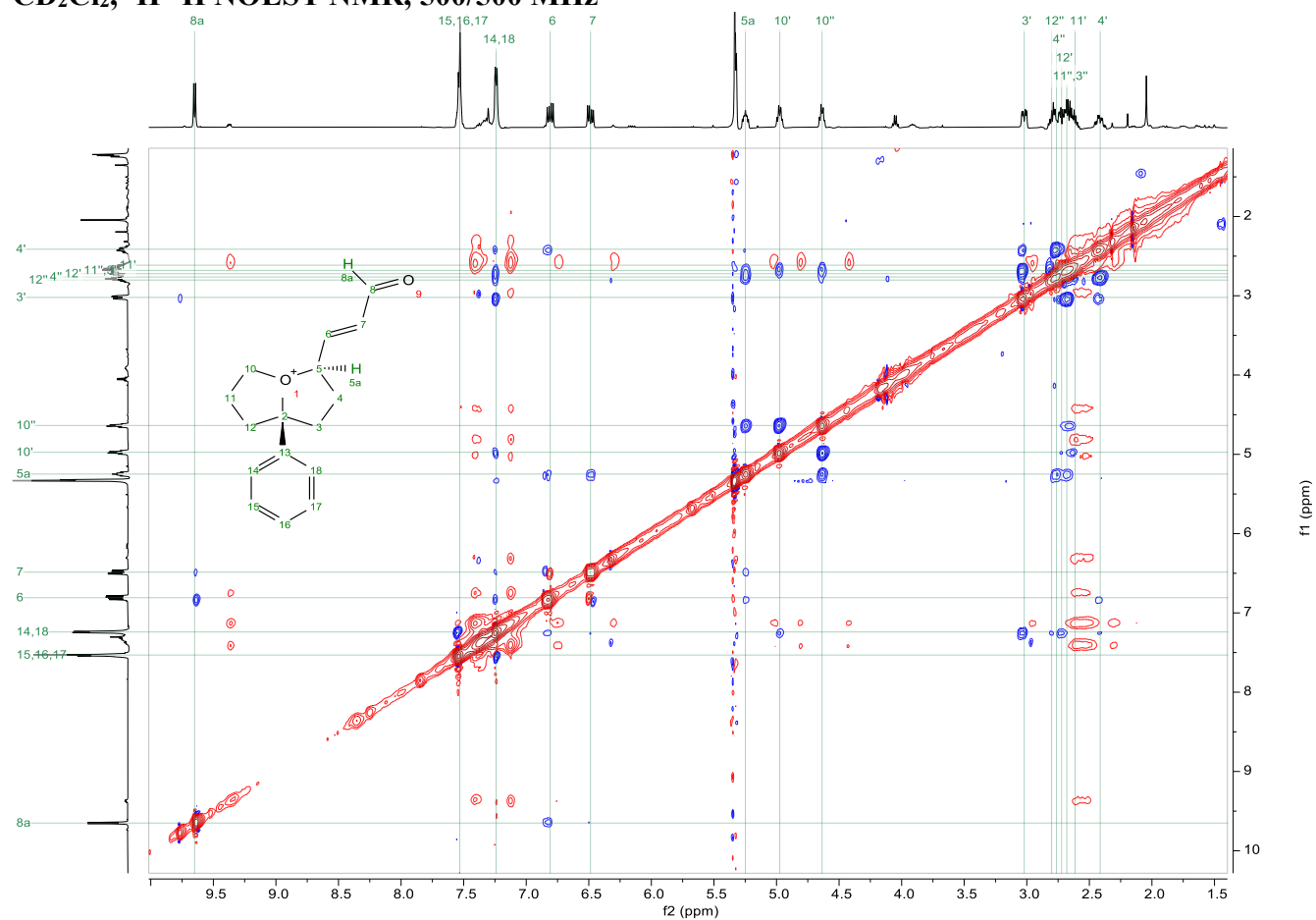
(3*R,7*aS**)-3-((*E*)-3-Oxoprop-1-en-1-yl)-7*a*-phenylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24q•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HSQC NMR, 500/126 MHz**



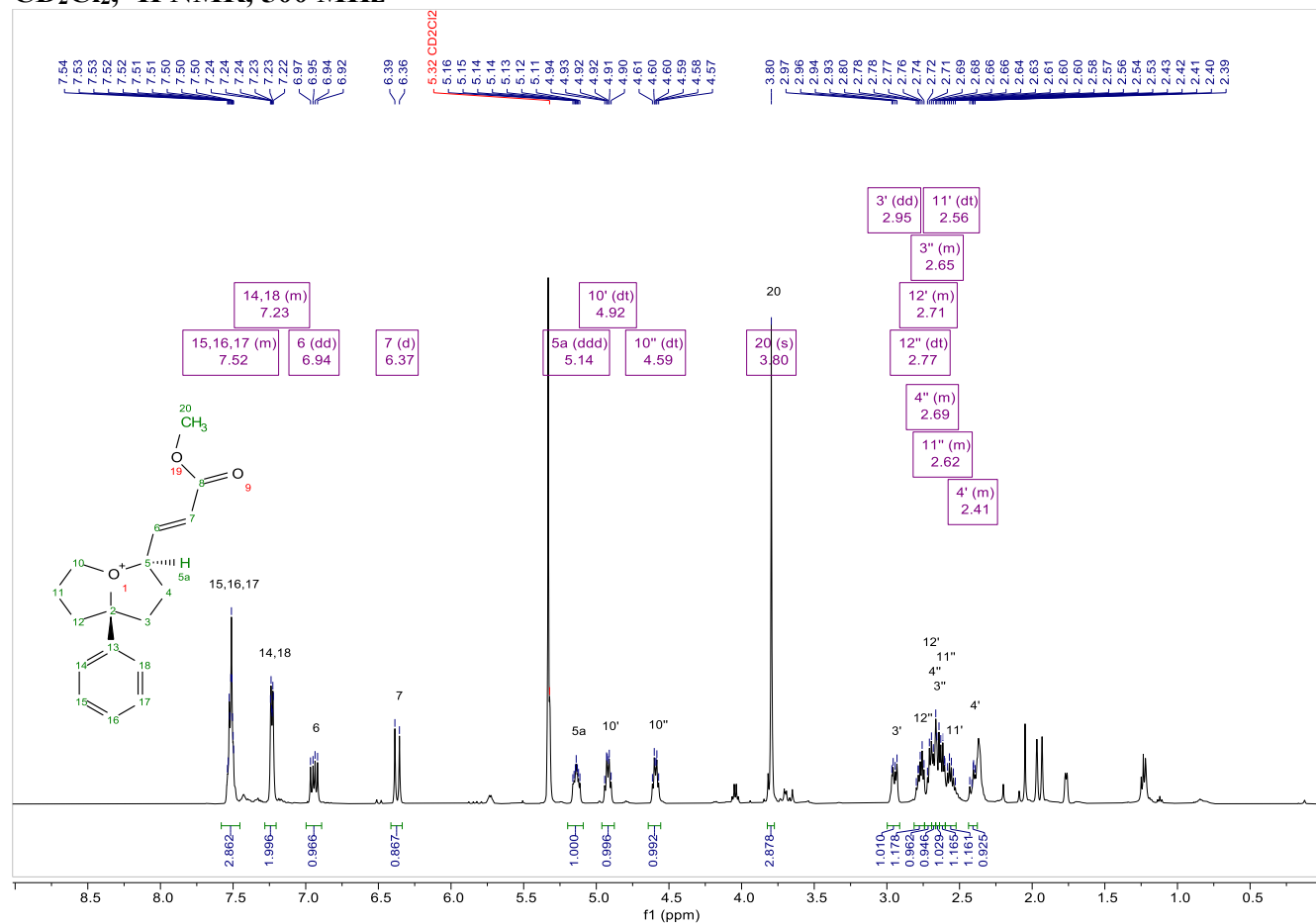
(3*R,7*aS**)-3-((*E*)-3-Oxoprop-1-en-1-yl)-7*a*-phenylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24q•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HMBC NMR, 500/126 MHz**



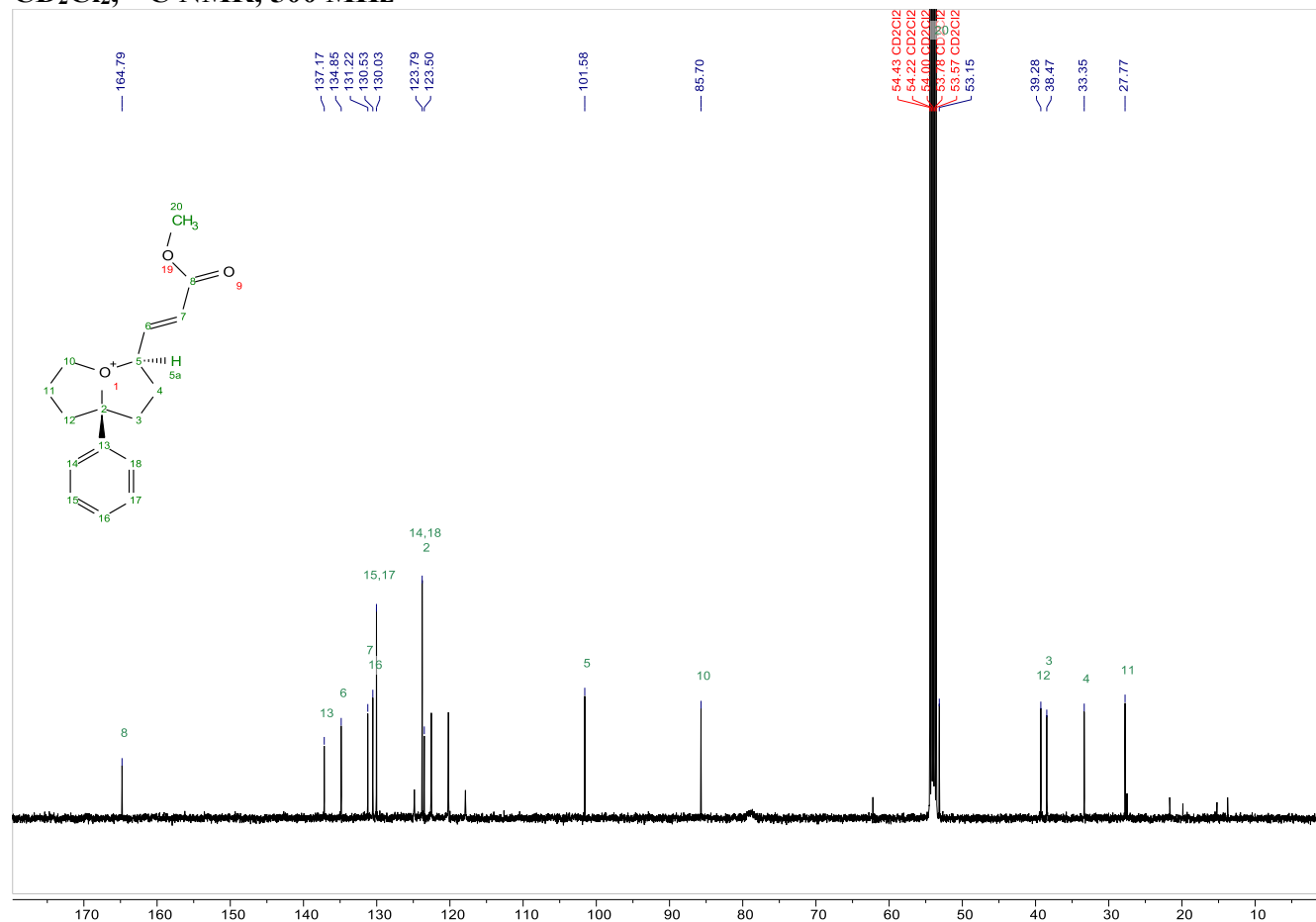
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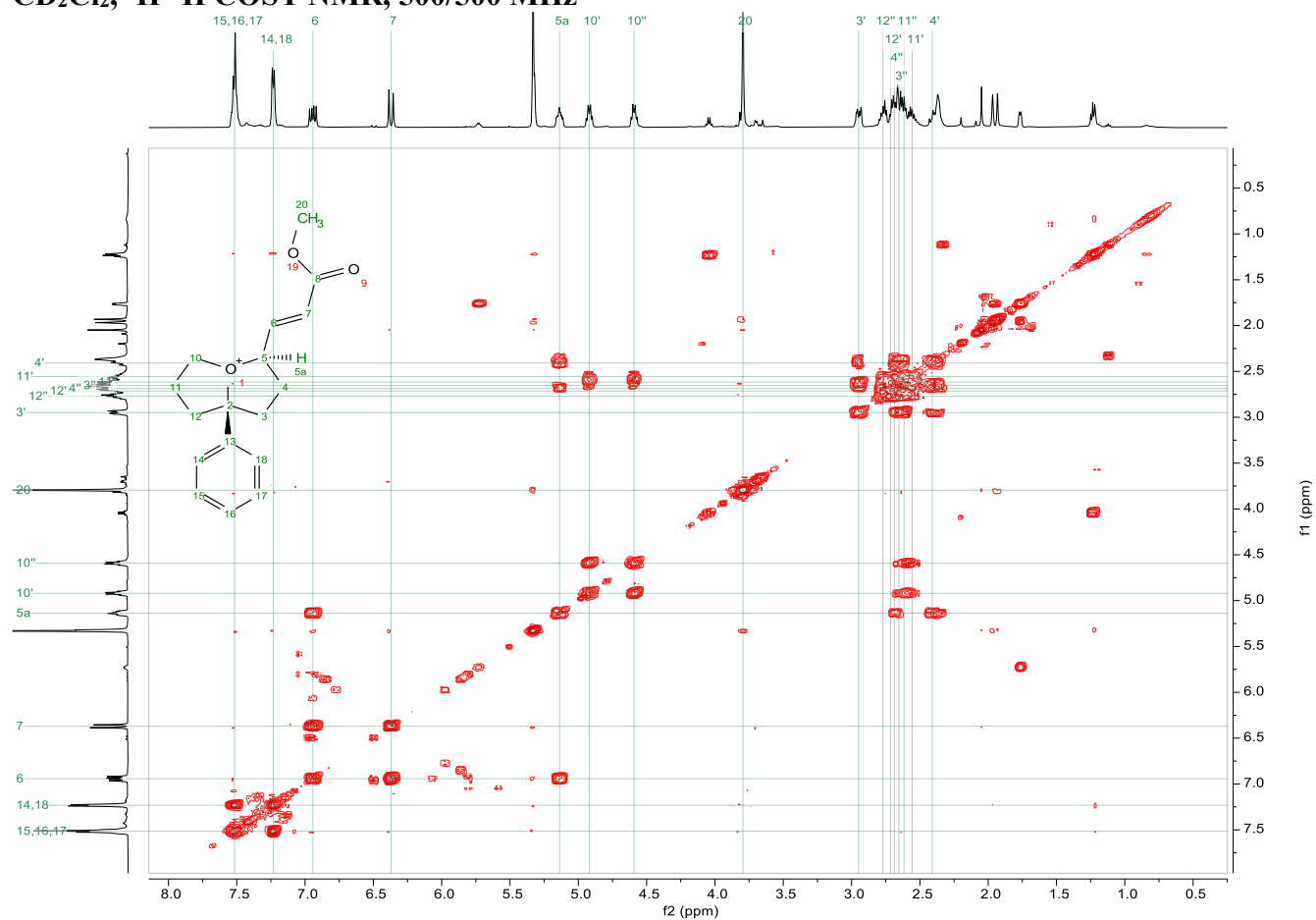
(3*R,7*aS**)-3-((*E*)-3-Methoxy-3-oxoprop-1-en-1-yl)-7*a*-phenylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminumate 24r•Al(pftb)₄, CD₂Cl₂, ¹H NMR, 500 MHz**



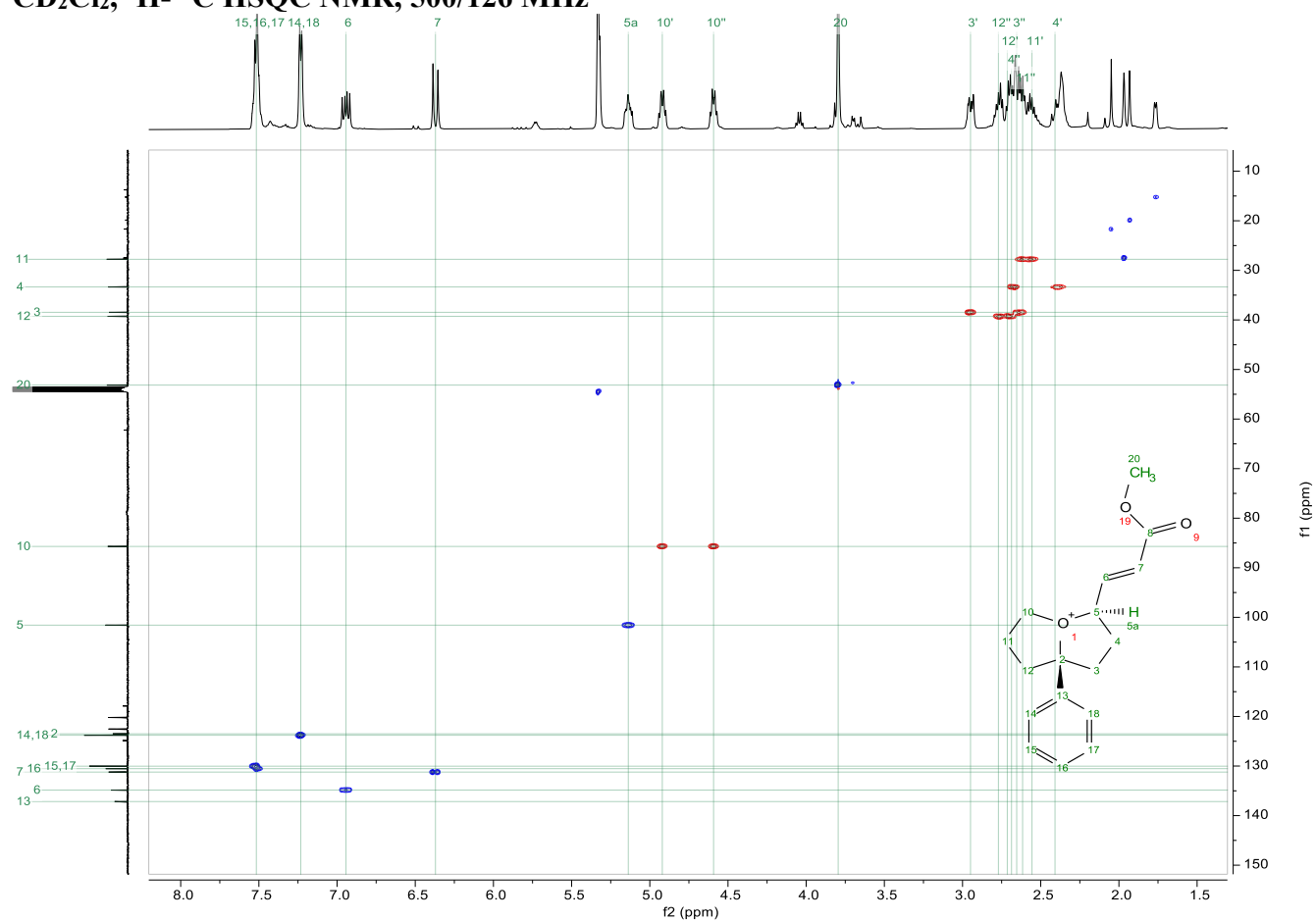
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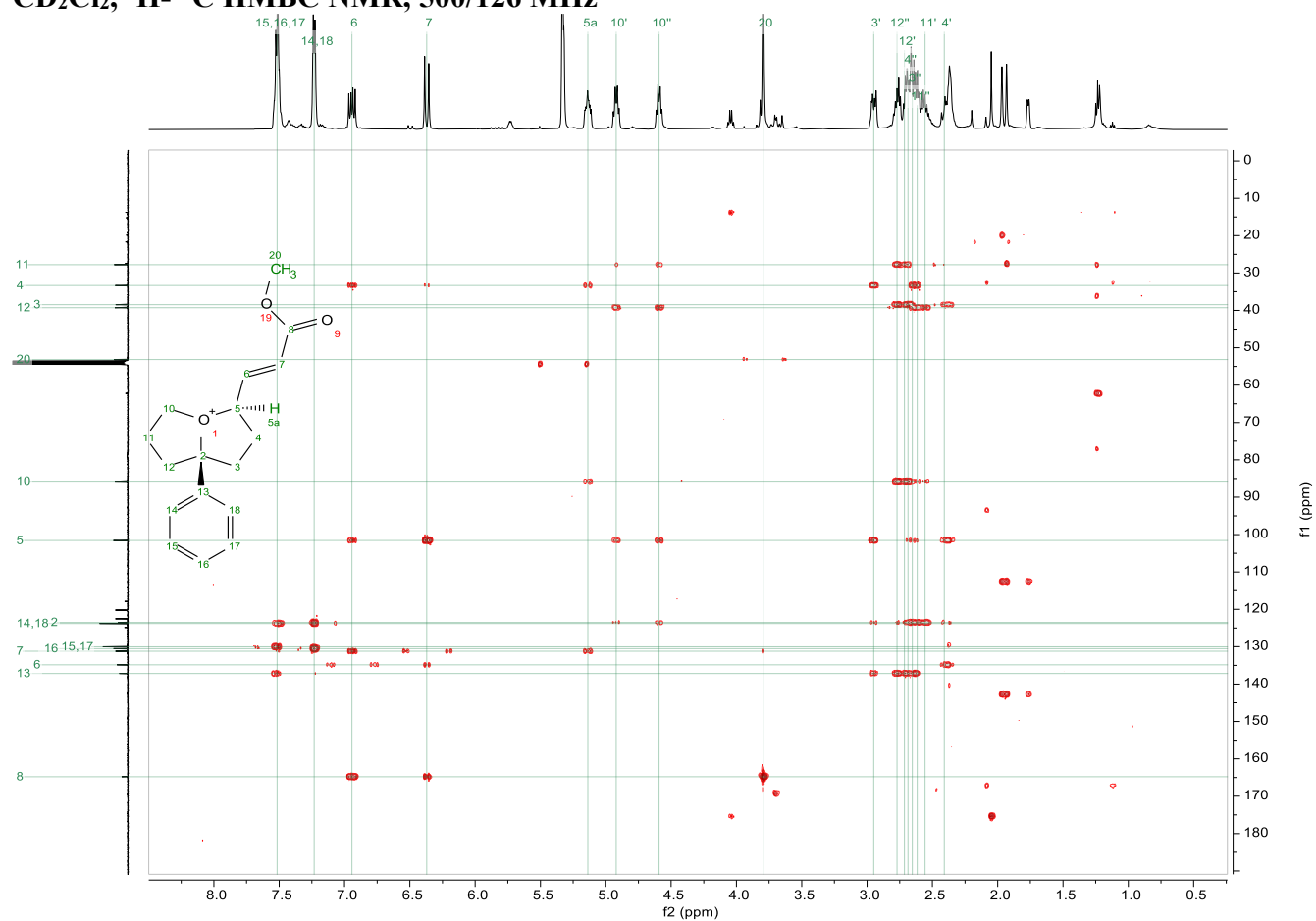
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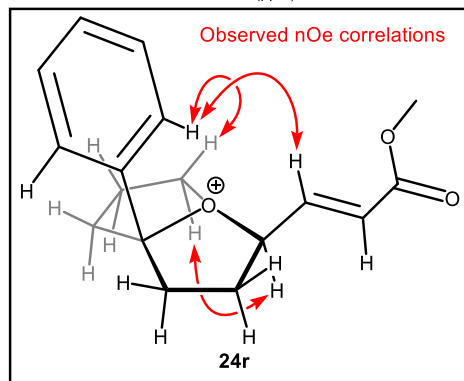
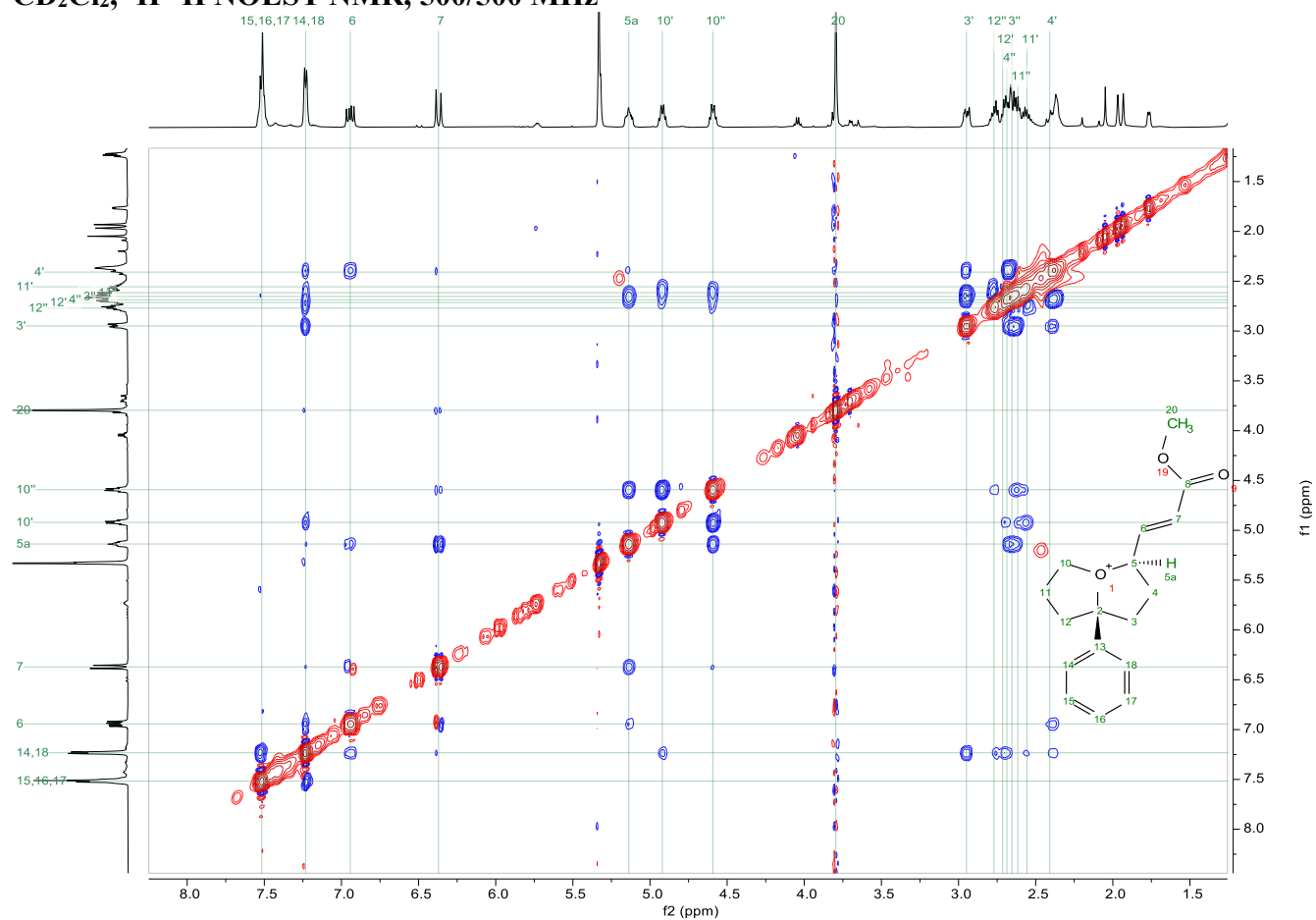
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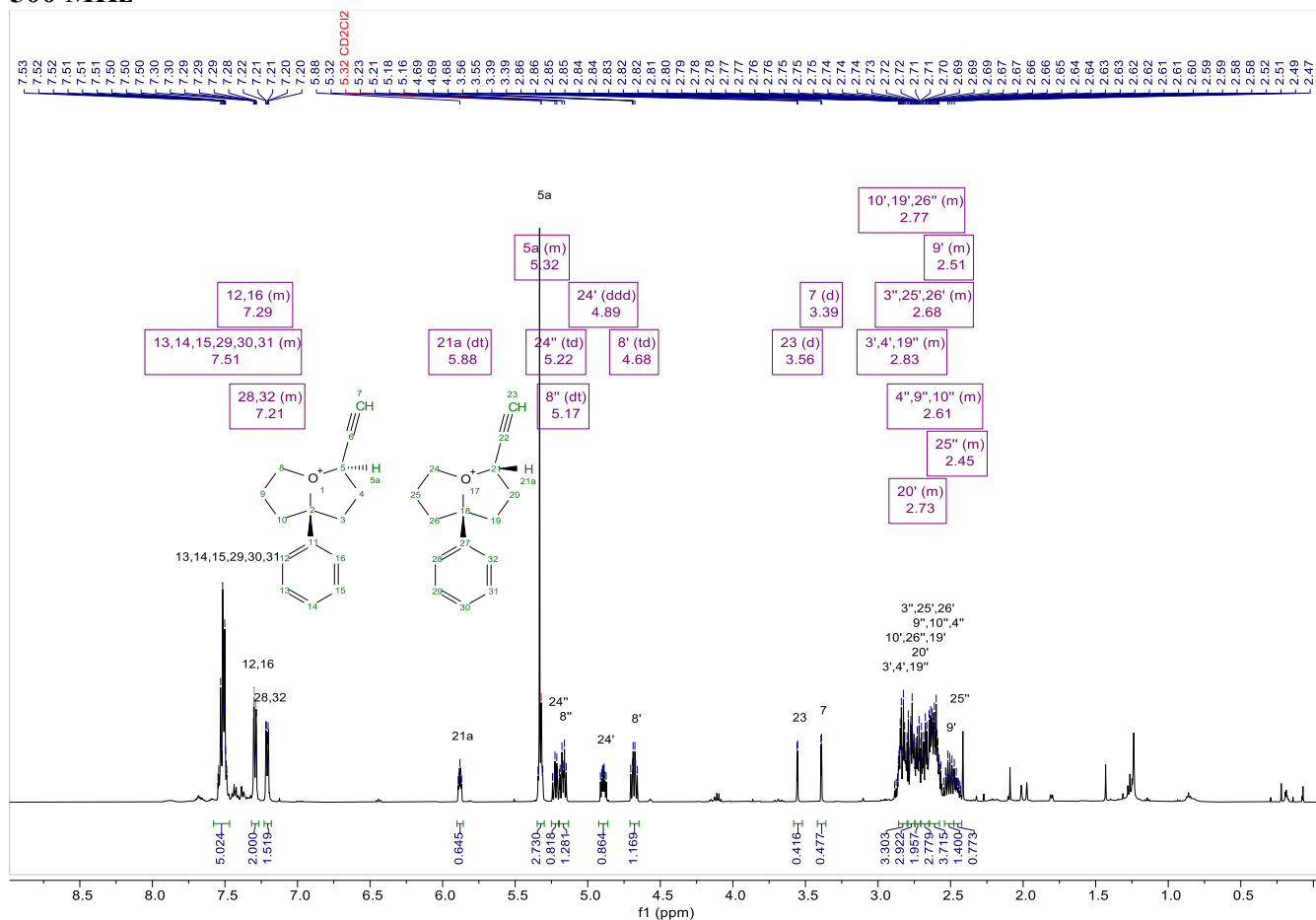
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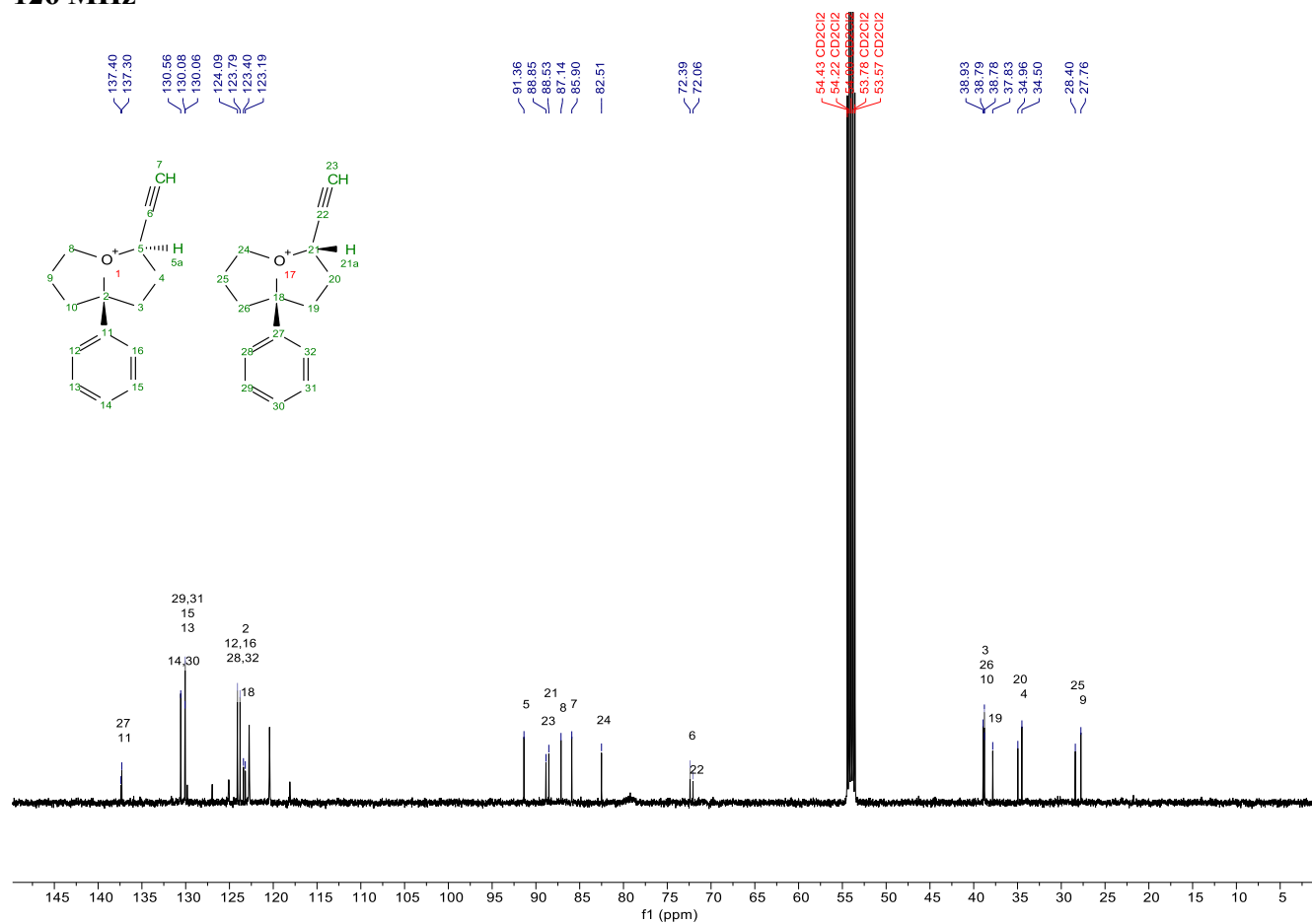
(3*R,7*aS**)-3-((*E*)-3-Methoxy-3-oxoprop-1-en-1-yl)-7*a*-phenylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24r•Al(pftb)₄, CD₂Cl₂, ¹H-¹H NOESY NMR, 500/500 MHz**



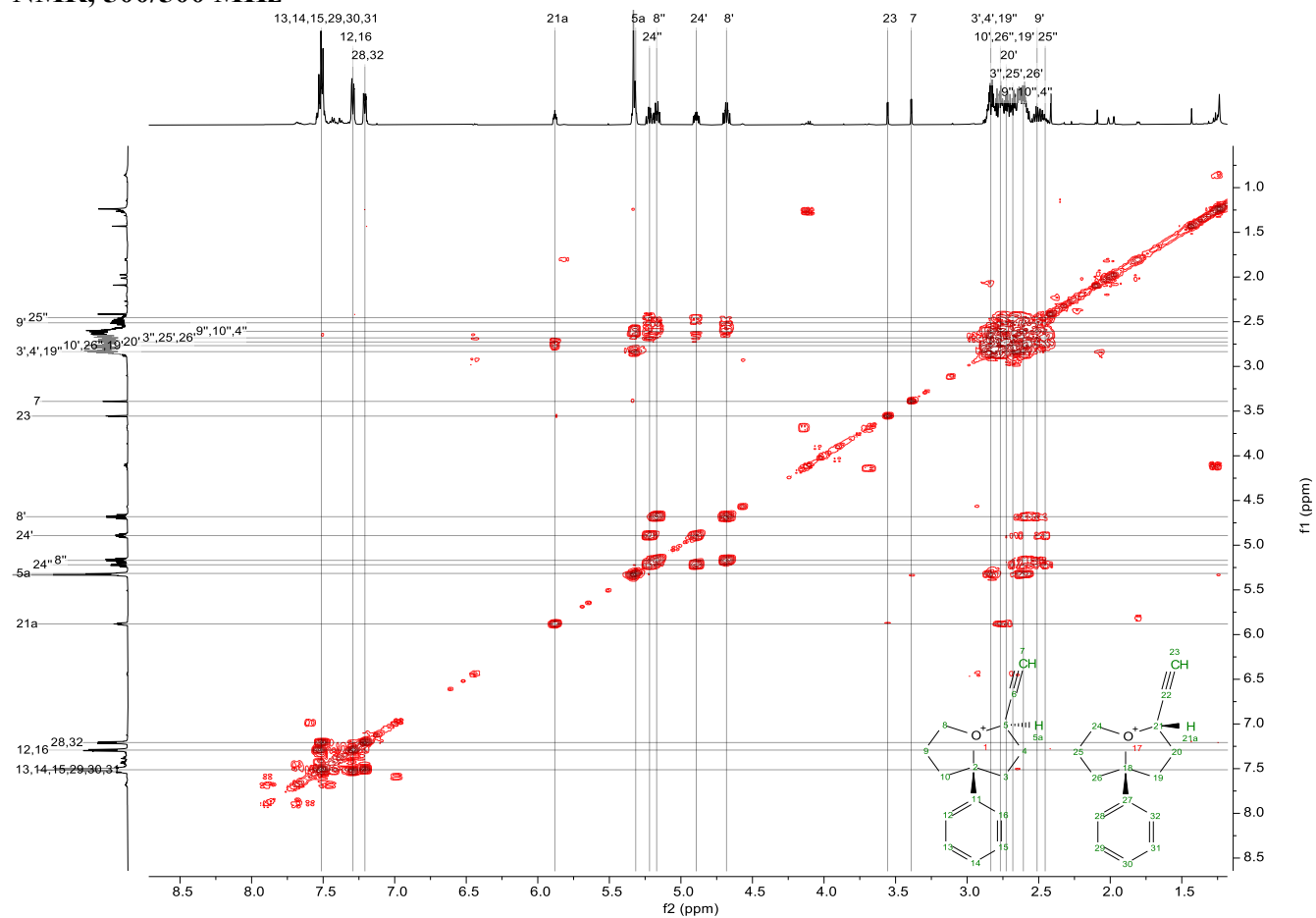
(3*R,7*aS**)-3-Ethynyl-7*a*-phenylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24*s*•Al(pftb)₄ and (3*S**,7*aS**)-3-Ethynyl-7*a*-phenylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24*s*'•Al(pftb)₄ (24*s*:24*s*' = 1.3:1), CD₂Cl₂, ¹H NMR, 500 MHz**



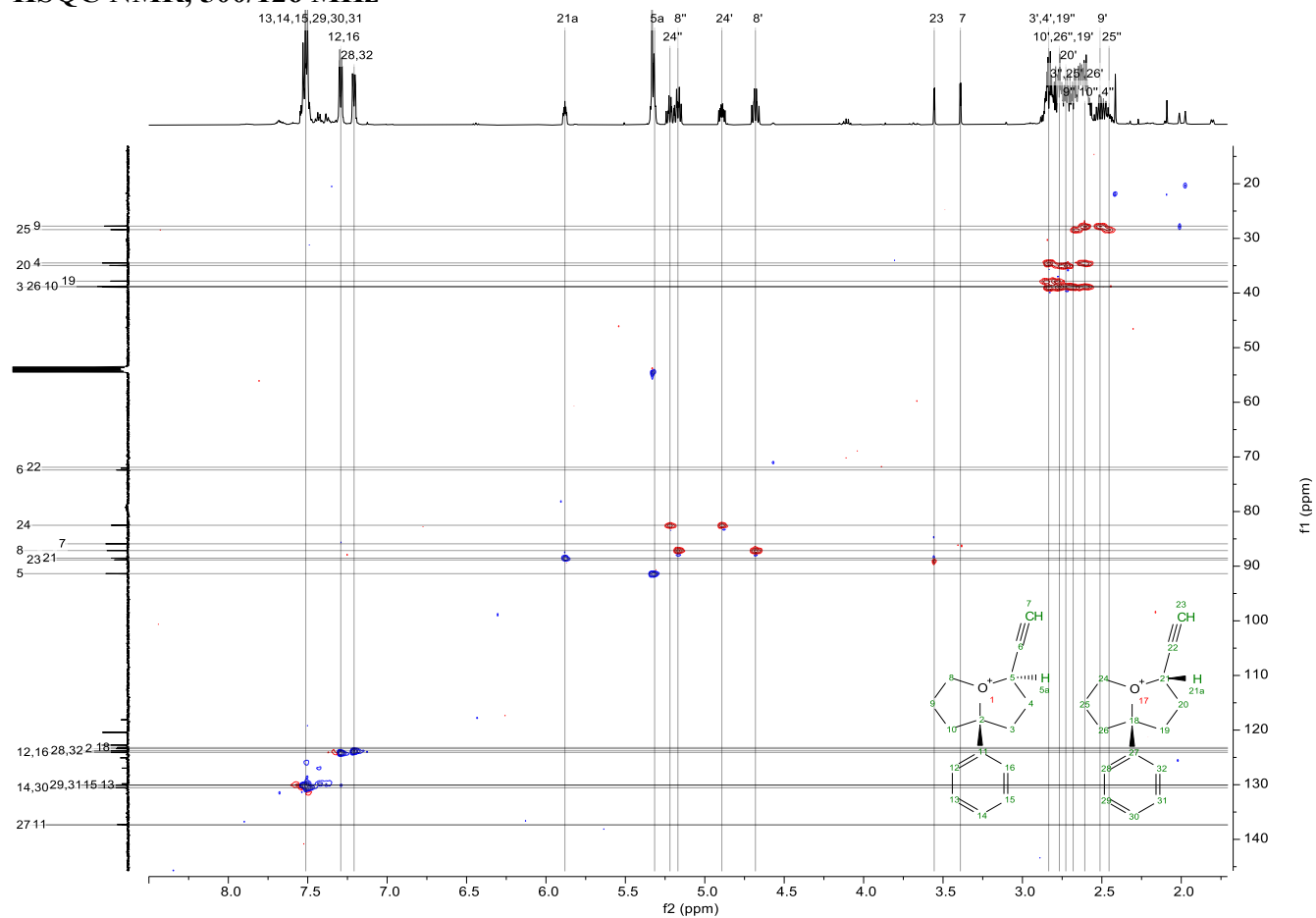
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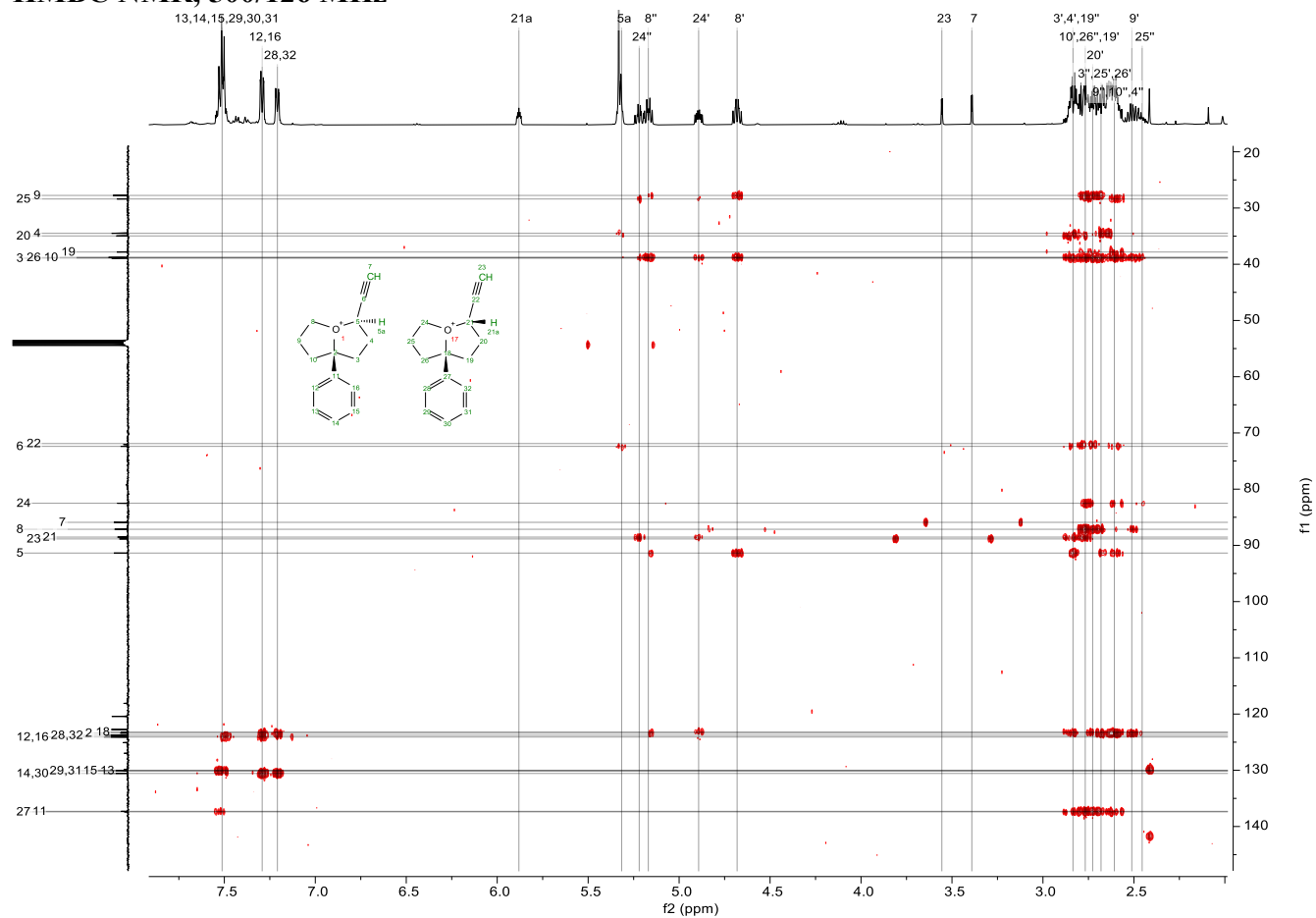
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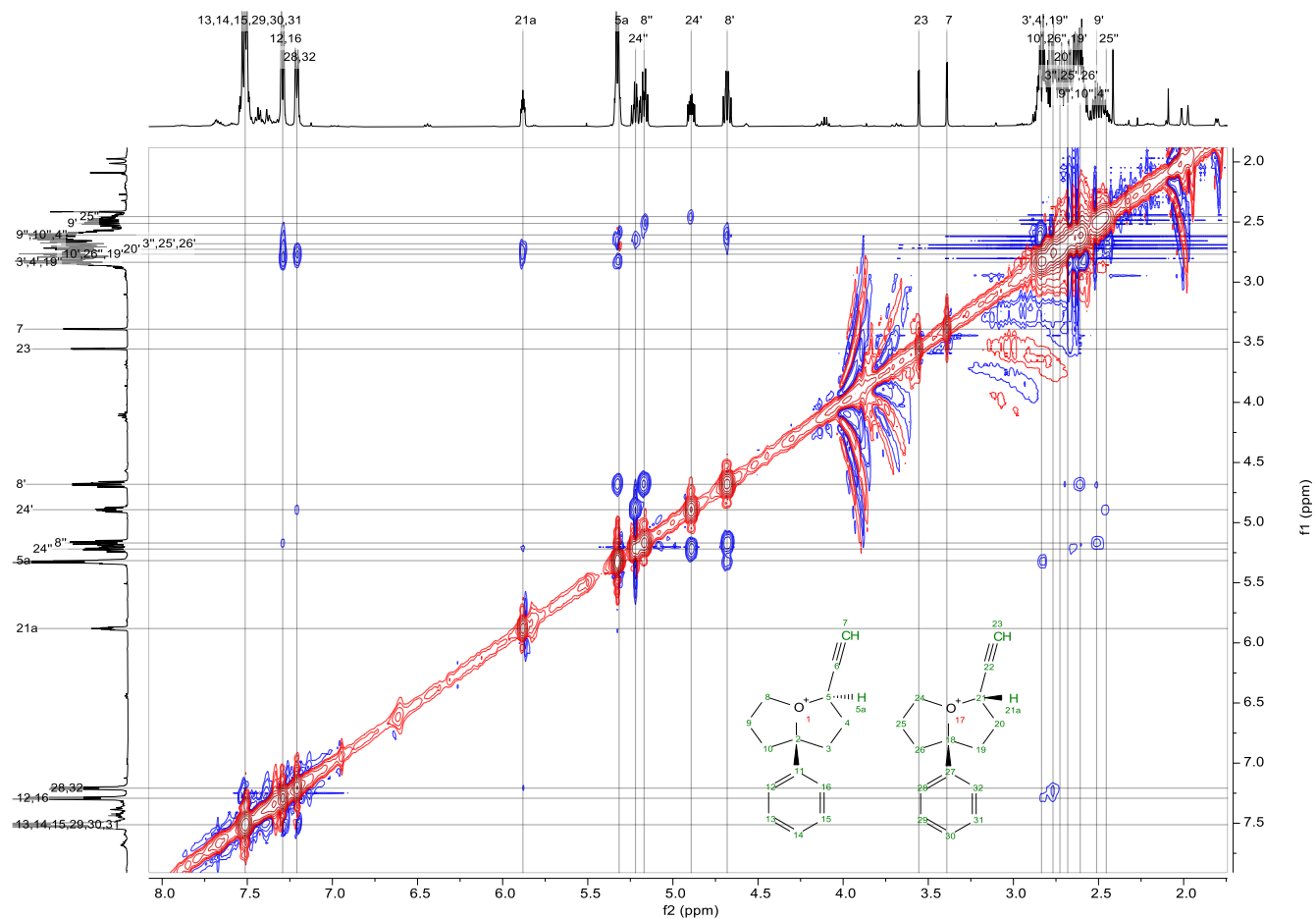
(3*R,7*aS**)-3-Ethynyl-7*a*-phenylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*s*•Al(pftb)₄ and (3*S**,7*aS**)-3-Ethynyl-7*a*-phenylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*s*'•Al(pftb)₄ (24*s*:24*s*' = 1.3:1), CD₂Cl₂, ¹H-¹³C HSQC NMR, 500/126 MHz**



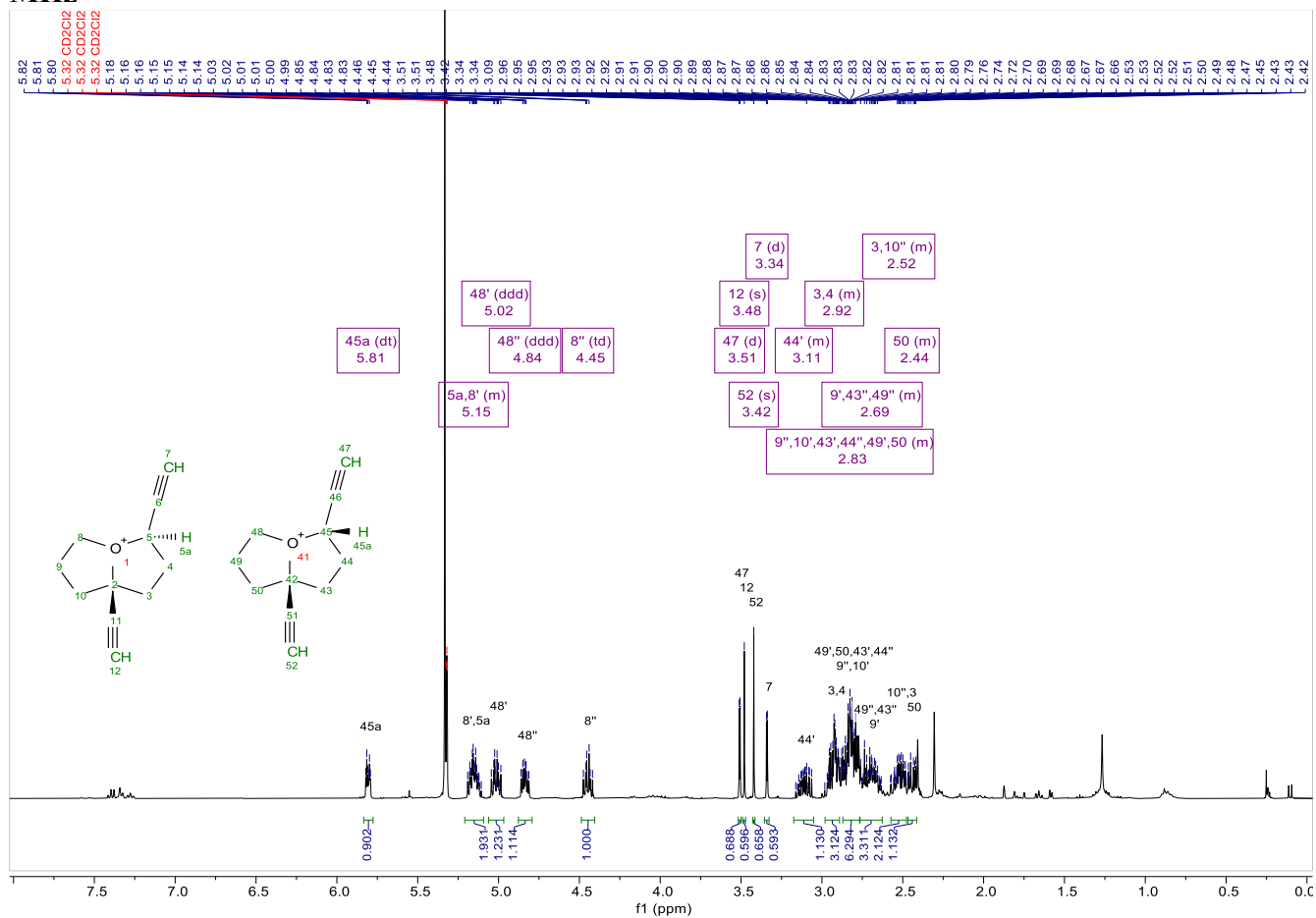
(3*R,7*aS**)-3-Ethynyl-7*a*-phenylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminumate 24*s*•Al(pftb)₄ and (3*S**,7*aS**)-3-Ethynyl-7*a*-phenylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminumate 24*s*'•Al(pftb)₄ (24*s*:24*s*' = 1.3:1), CD₂Cl₂, ¹H-¹³C HMBC NMR, 500/126 MHz**



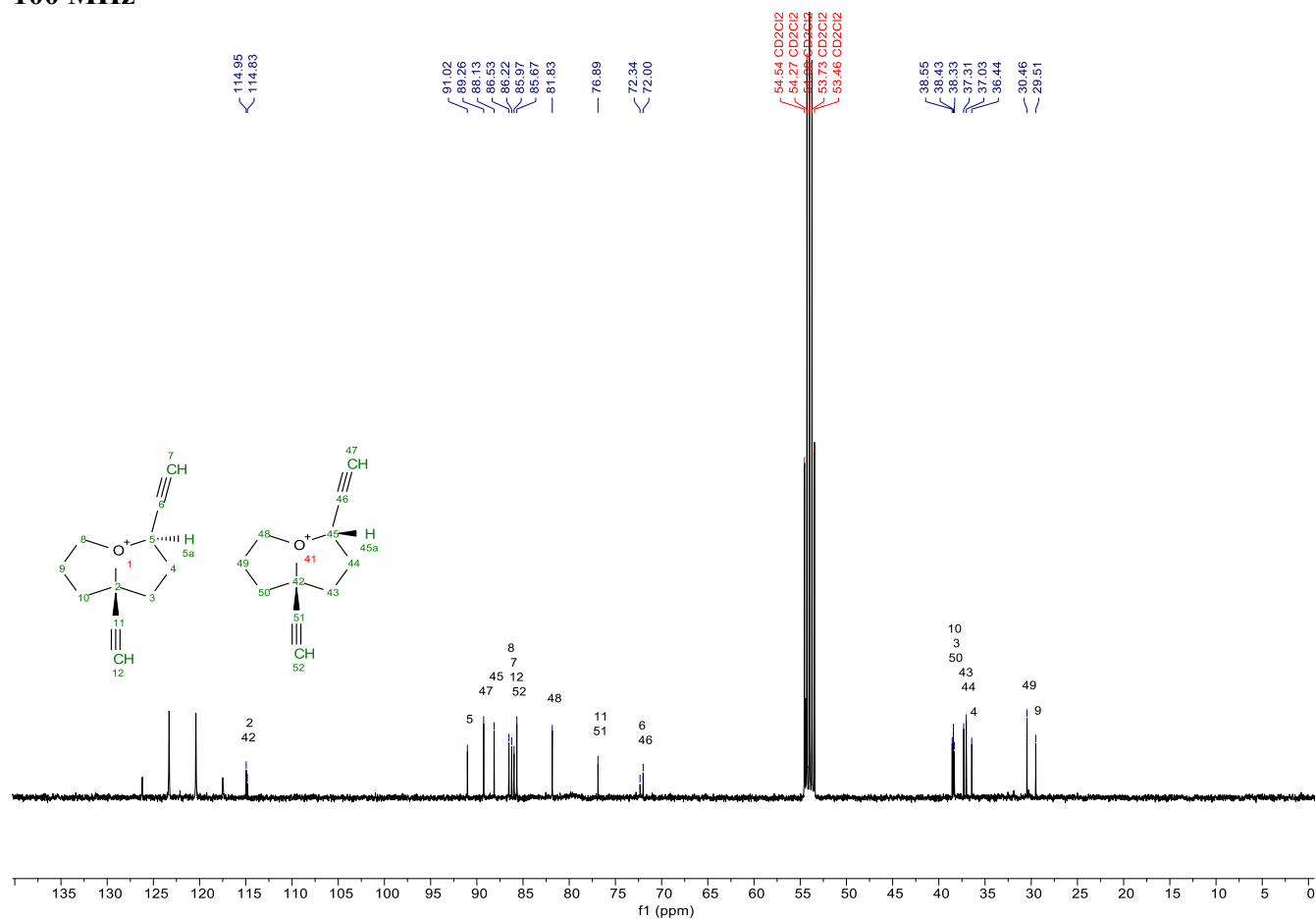
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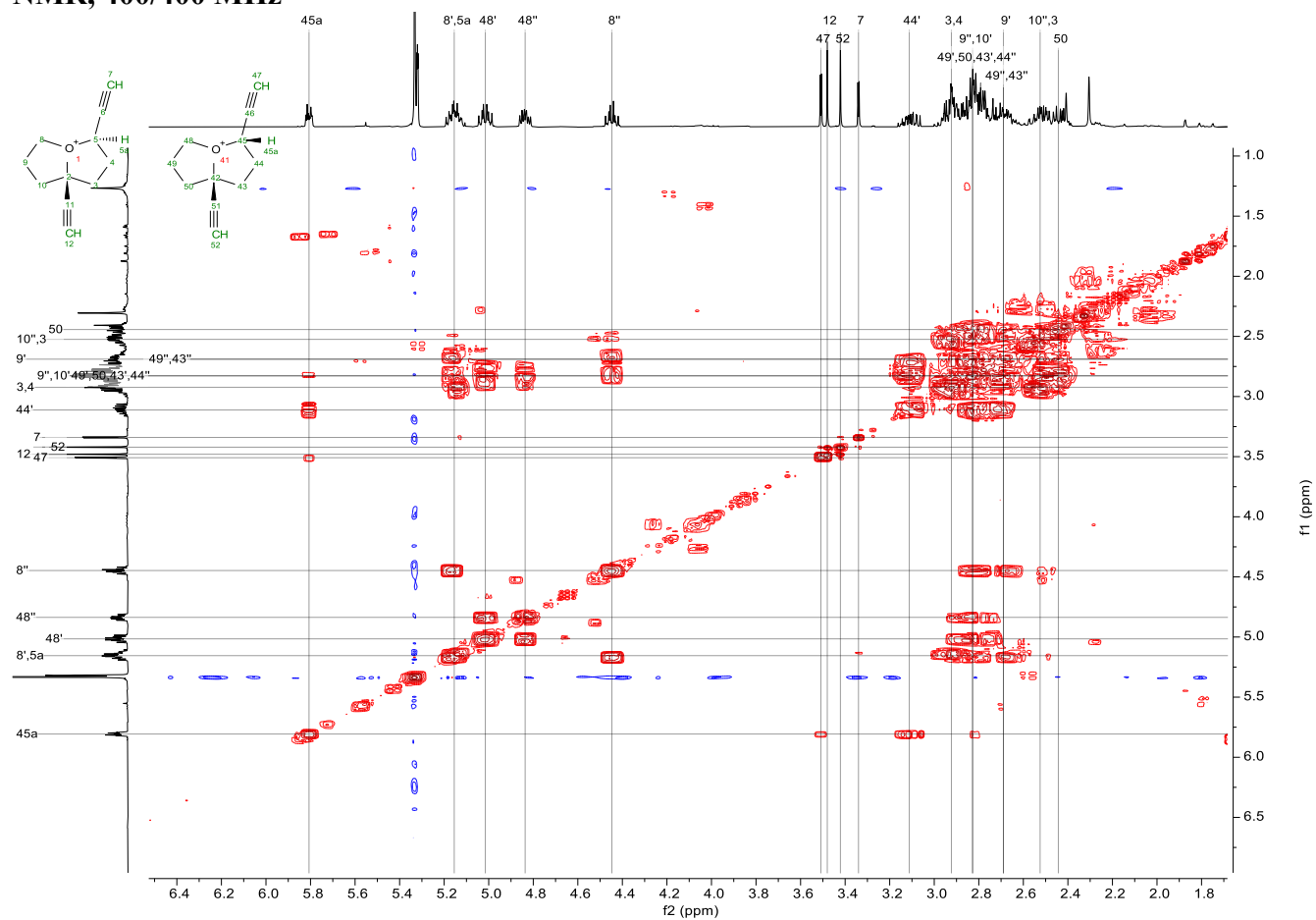
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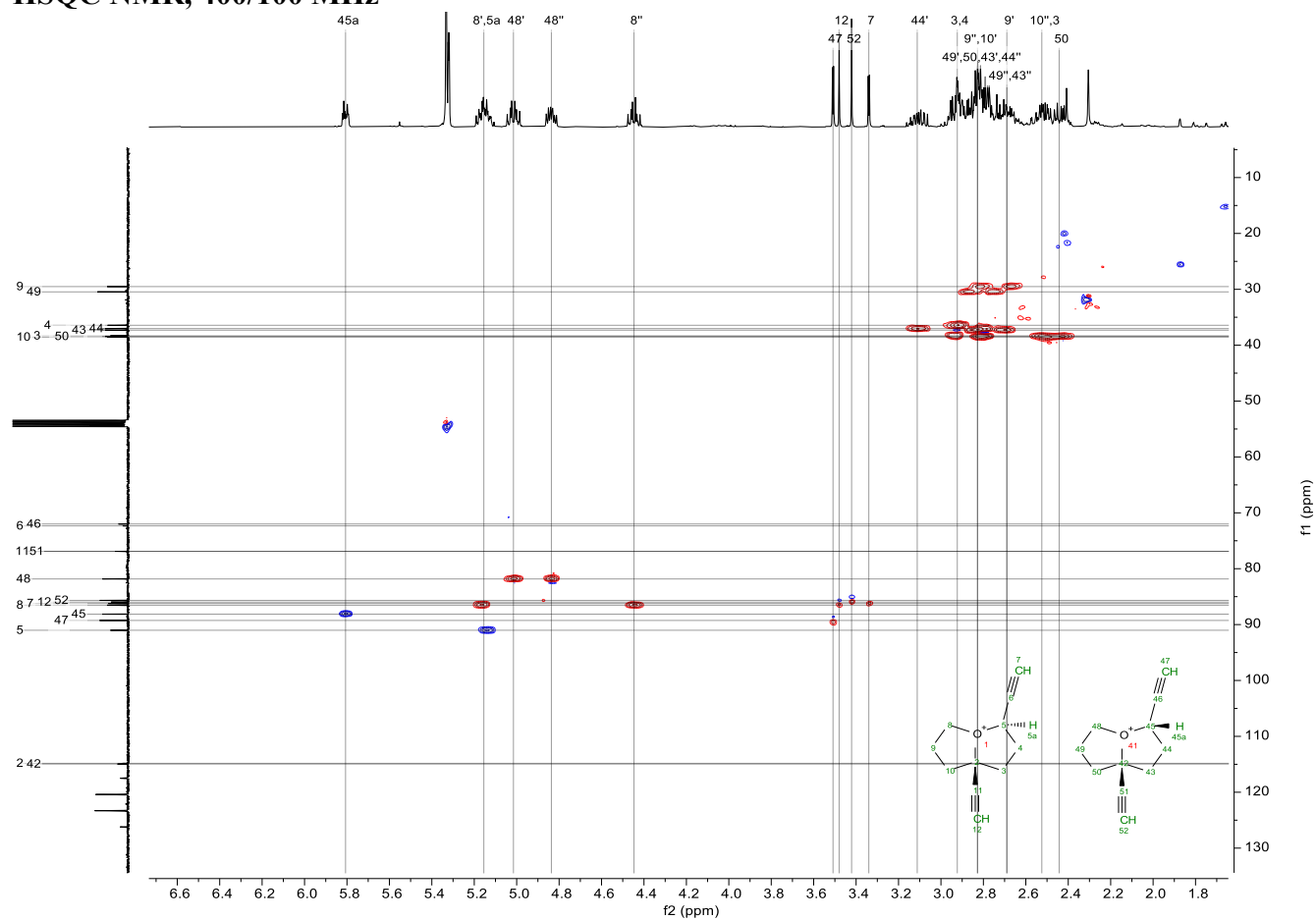
(3*R,7*aS**)-3,7*a*-Diethynylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*t*•Al(pftb)₄ and (3*S**,7*aS**)-3,7*a*-Diethynylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*t*'•Al(pftb)₄ (24*t*:24*t*' = 1:1.1), CD₂Cl₂, ¹³C NMR, 100 MHz**



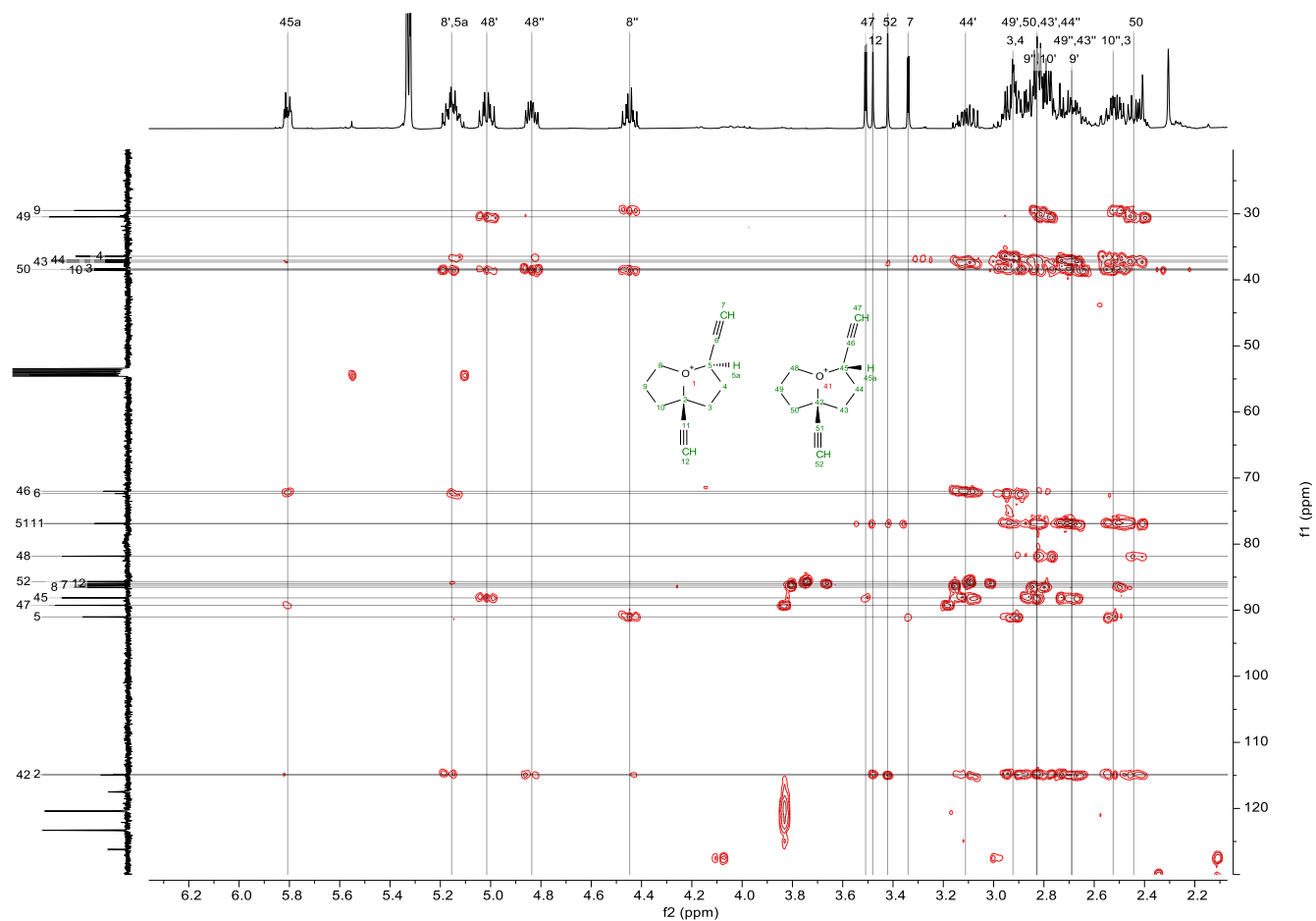
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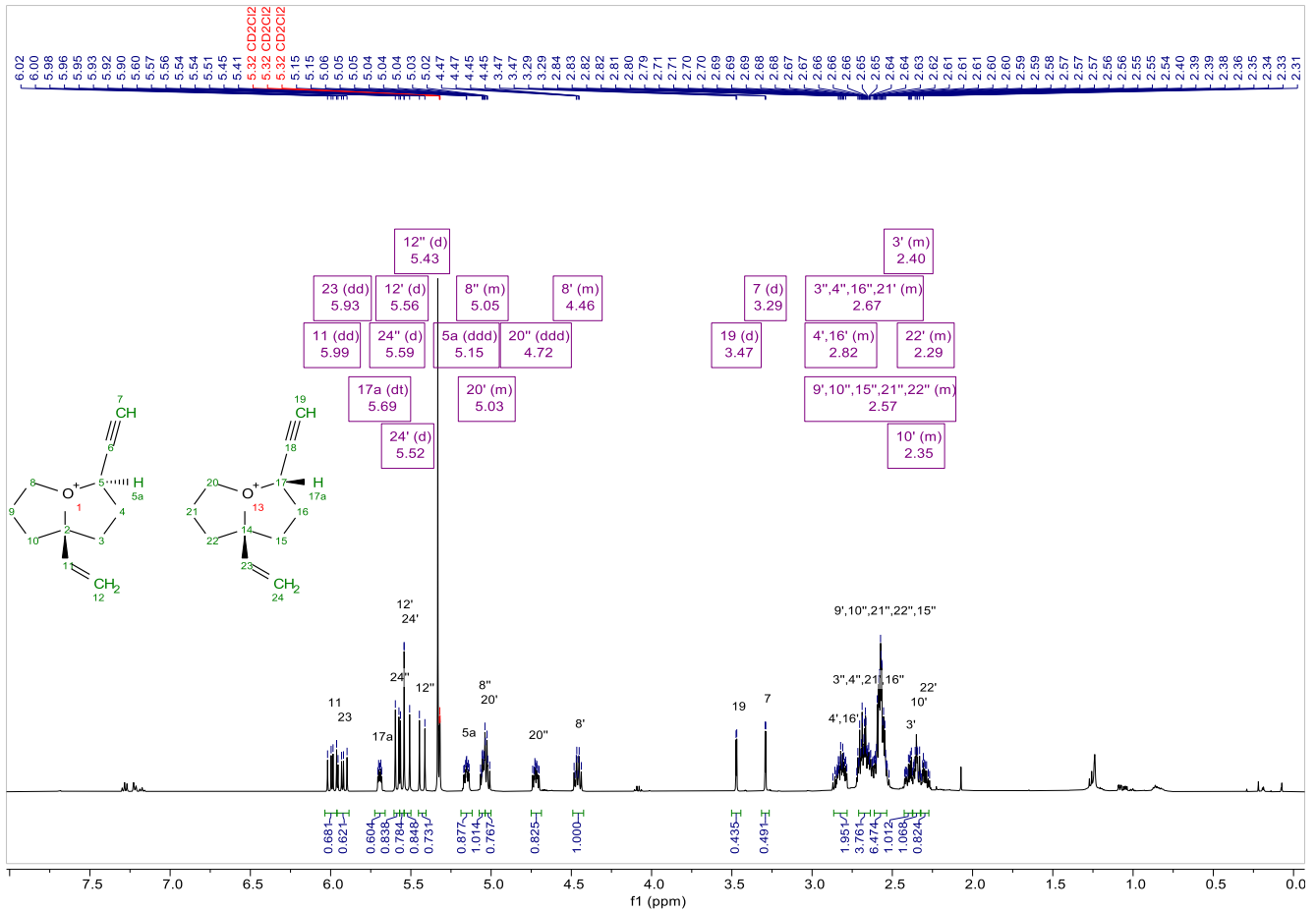
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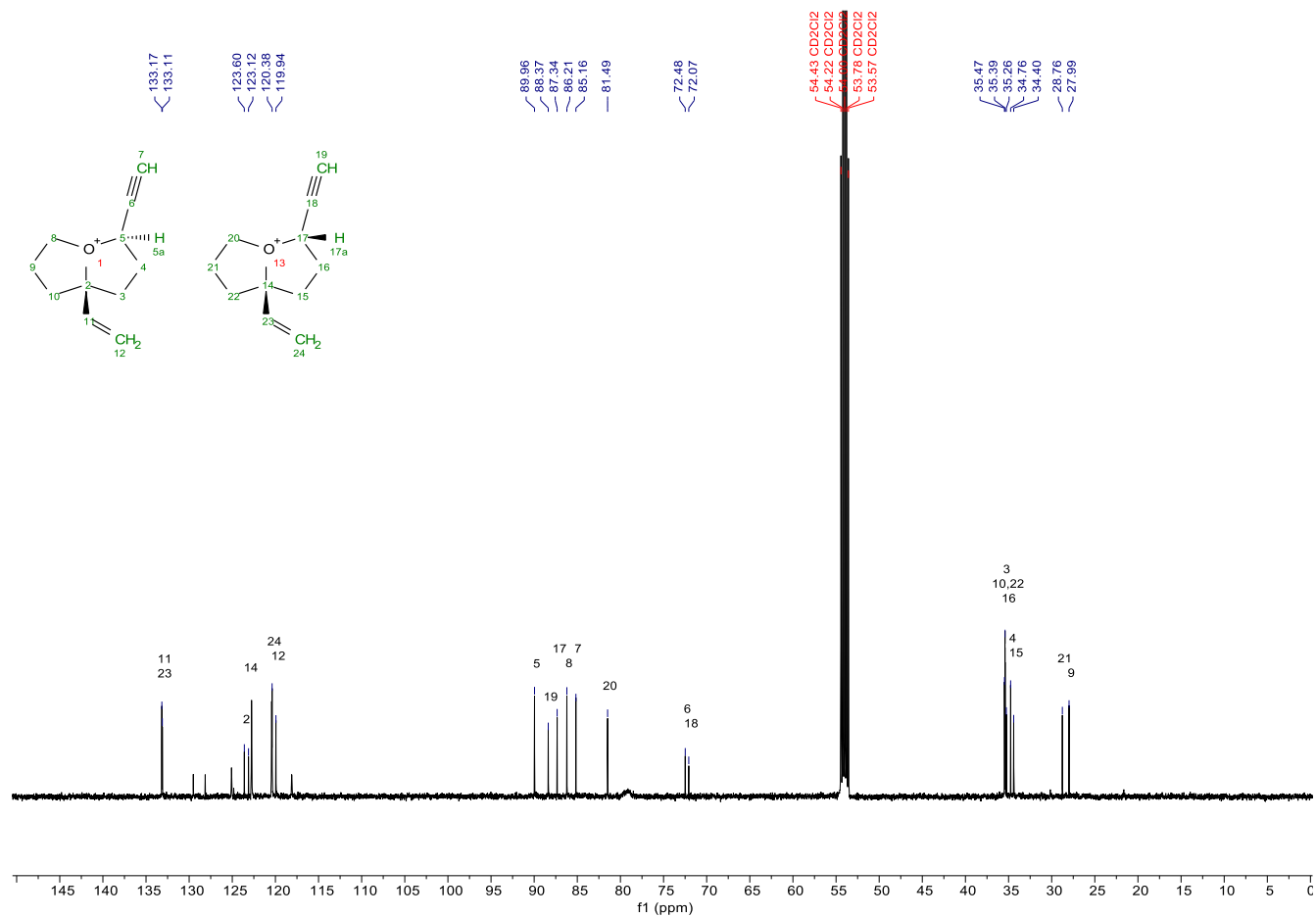
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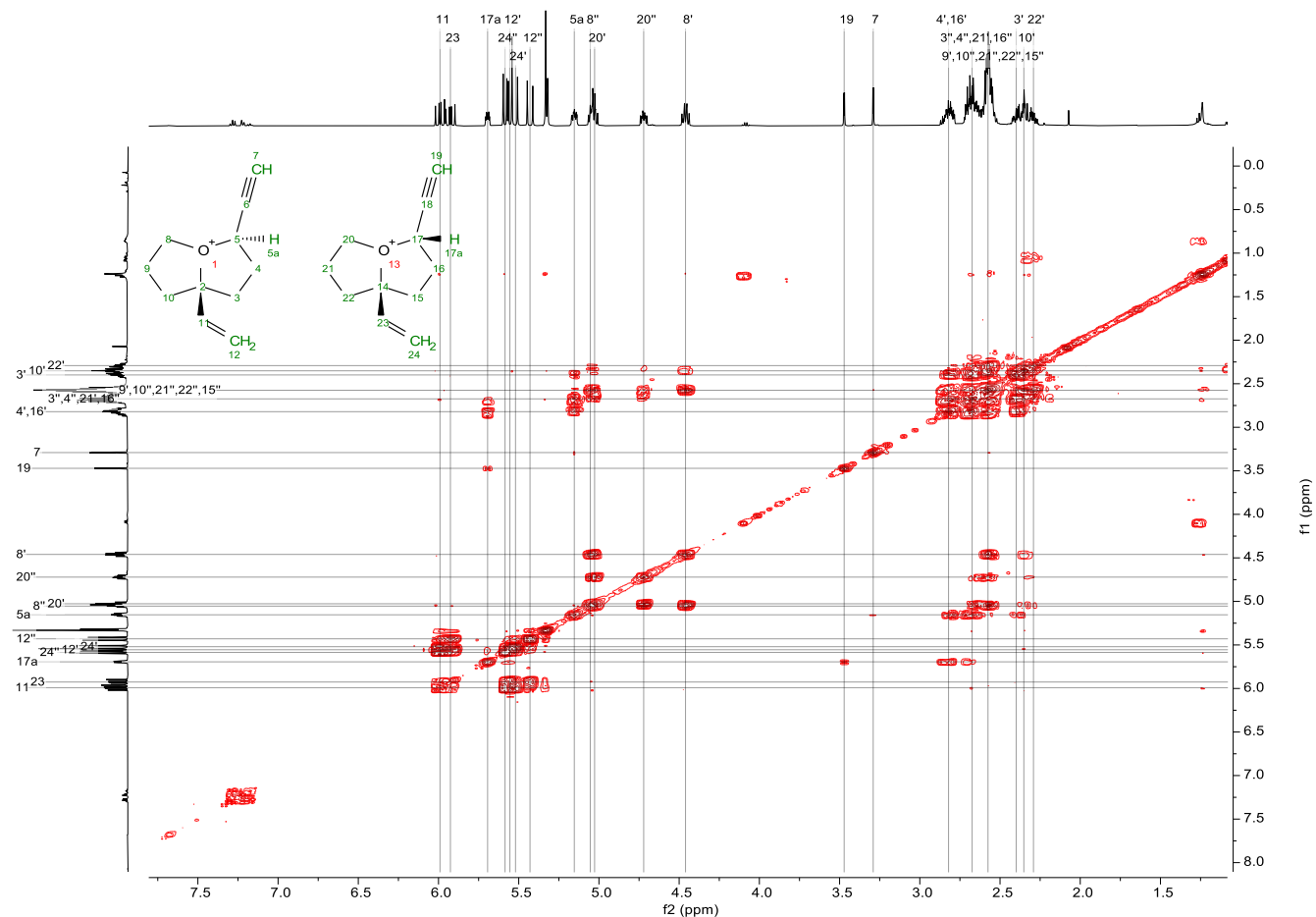
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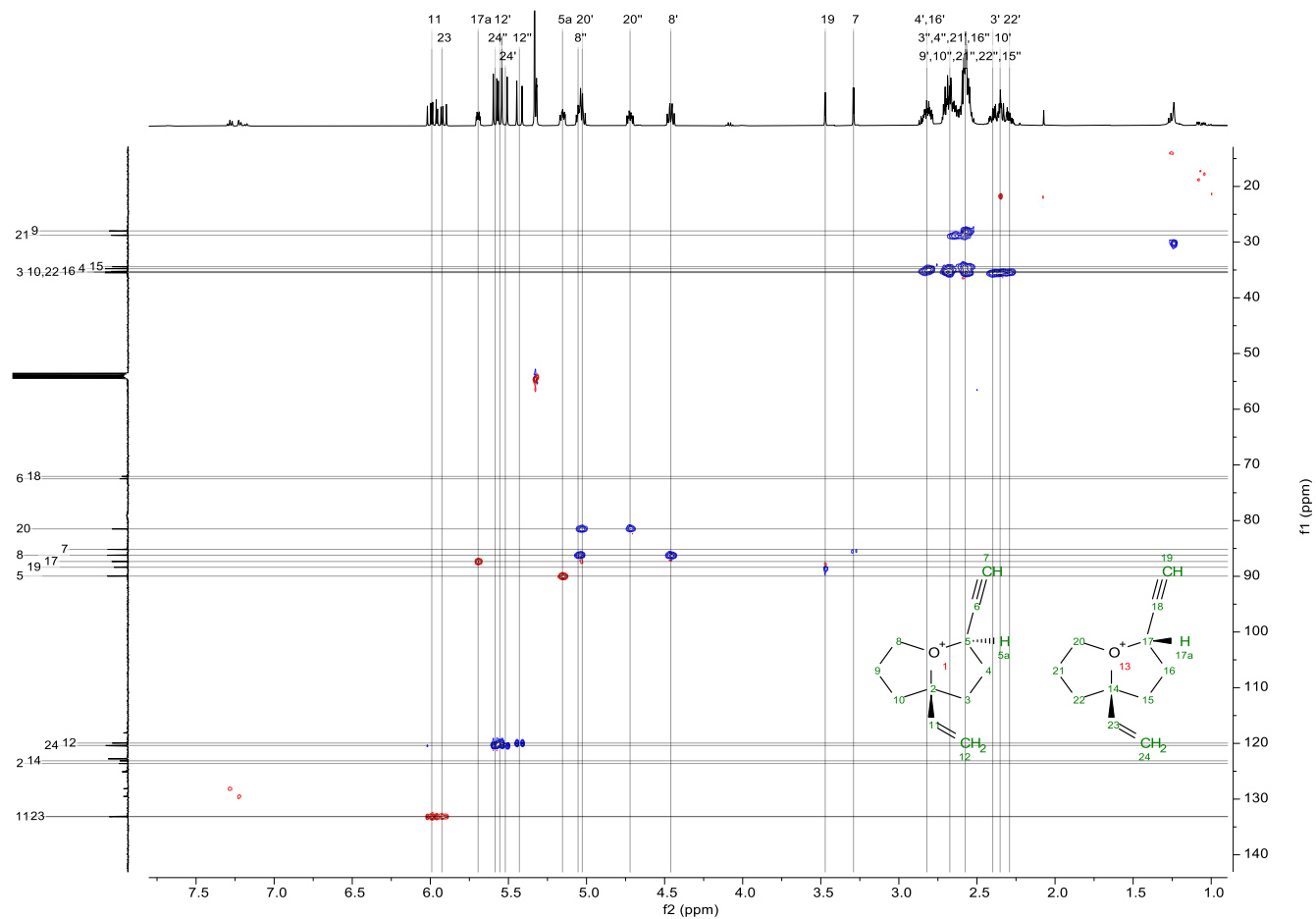
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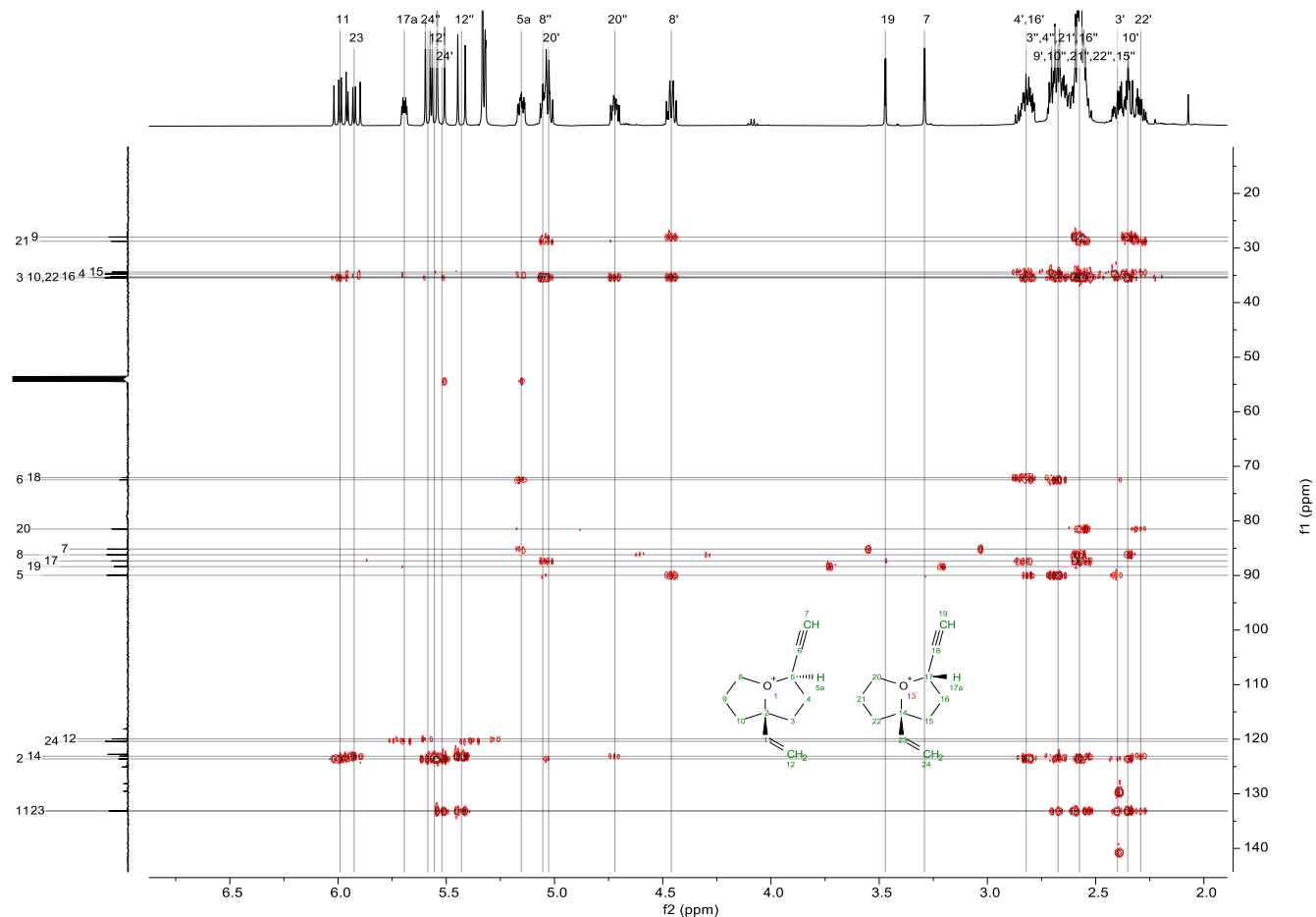
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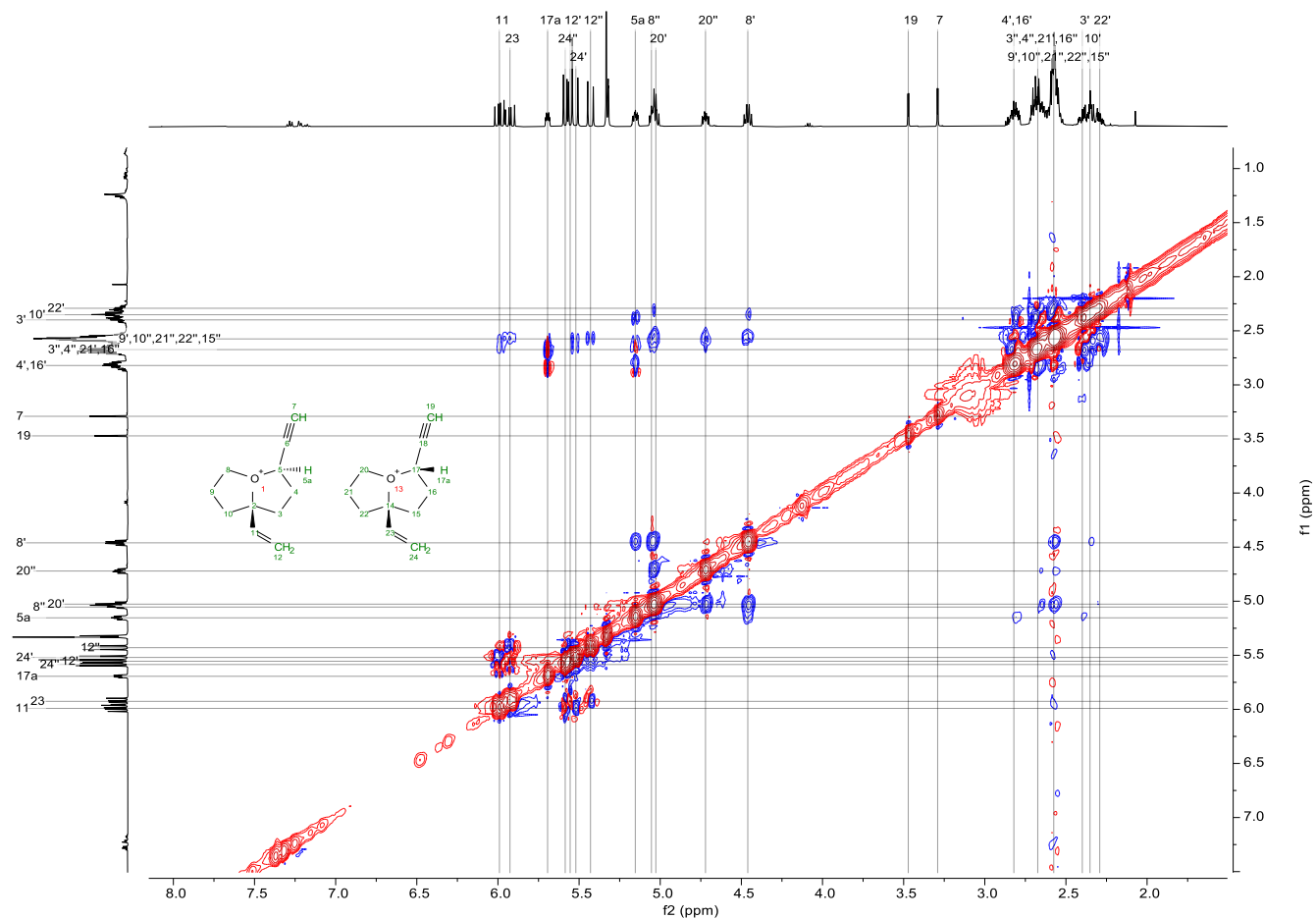
(3*R,7*aS**)-3-Ethynyl-7*a*-vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*u*•Al(pftb)₄ and (3*S**,7*aS**)-3-Ethynyl-7*a*-vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*u*'•Al(pftb)₄ (24*u*:24*u*' = 1.2:1), CD₂Cl₂, ¹H-¹³C HSQC NMR, 500/126 MHz**



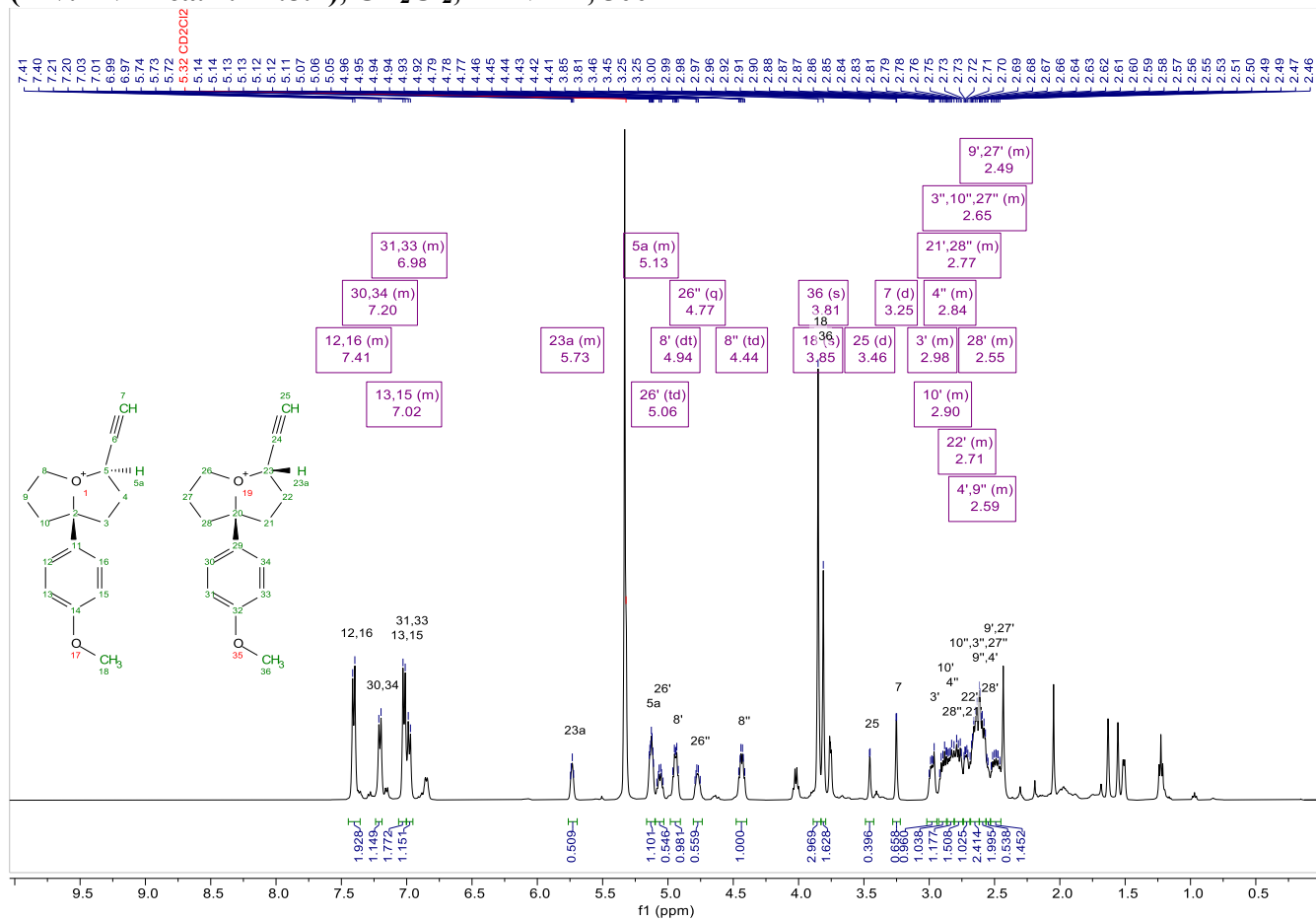
(3*R,7*aS**)-3-Ethynyl-7*a*-vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*u*•Al(pftb)₄ and (3*S**,7*aS**)-3-Ethynyl-7*a*-vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*u*'•Al(pftb)₄ (24*u*:24*u*' = 1.2:1), CD₂Cl₂, ¹H-¹³C HMBC NMR, 500/126 MHz**



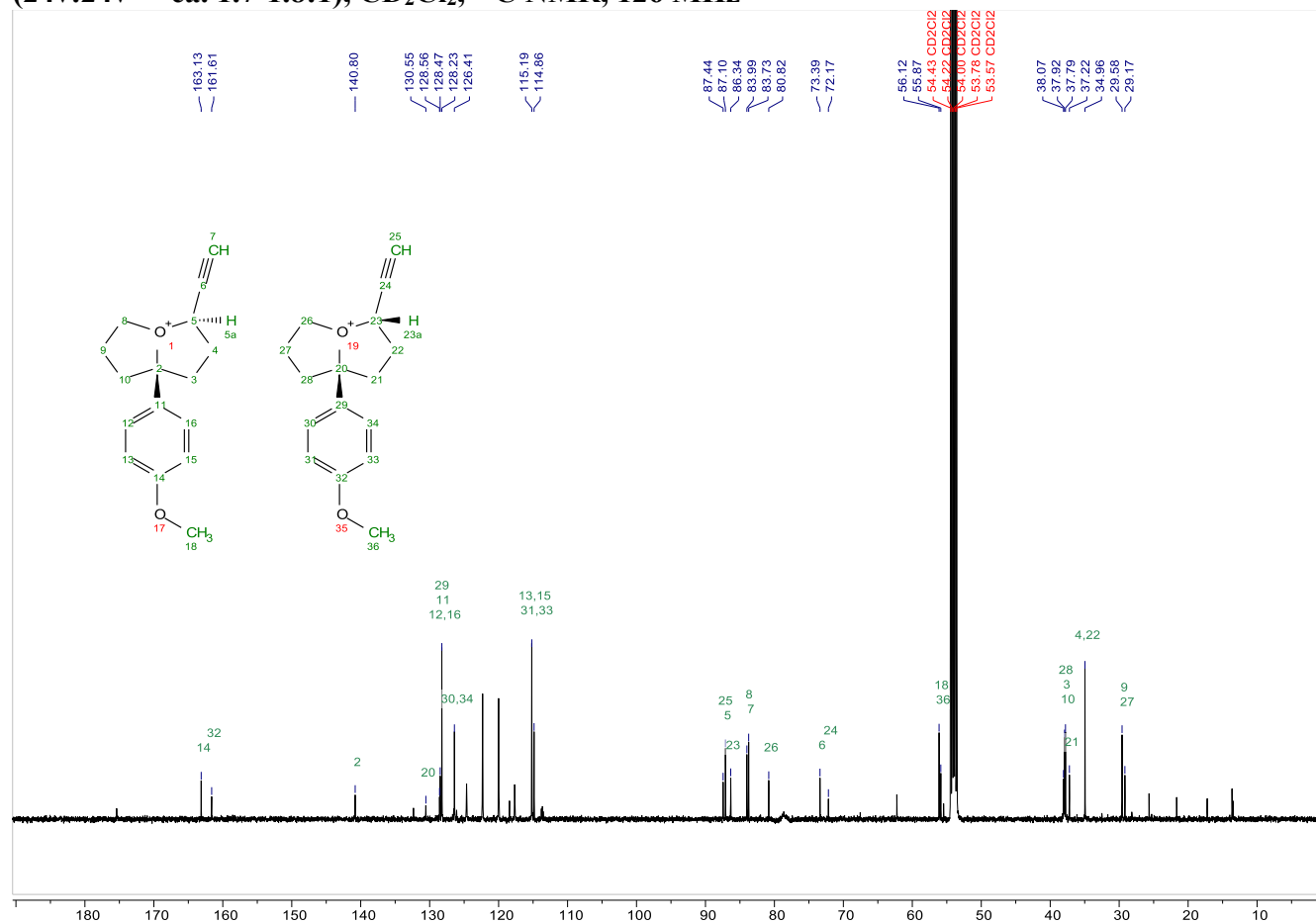
(3*R,7*aS**)-3-Ethynyl-7*a*-vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminumate 24*u*•Al(pftb)₄ and (3*S**,7*aS**)-3-Ethynyl-7*a*-vinylhexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminumate 24*u*'•Al(pftb)₄ (24*u*:24*u*' = 1.2:1), CD₂Cl₂, ¹H-¹H NOESY NMR, 500/500 MHz**



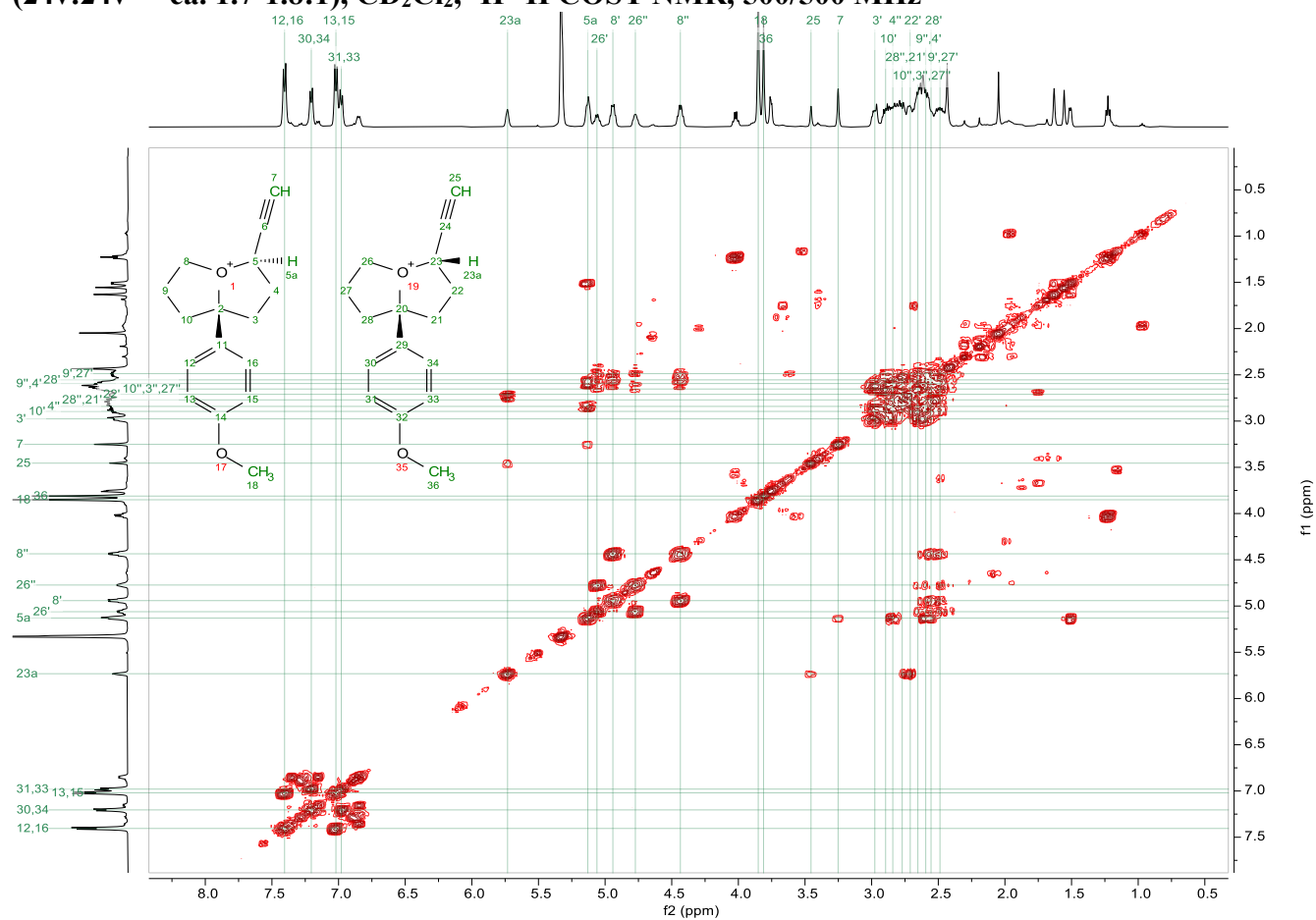
(3*R,7*aS**)-3-Ethynyl-7*a*-(4-methoxyphenyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*v*•Al(pftb)₄ and (3*S**,7*aS**)-3-Ethynyl-7*a*-(4-methoxyphenyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 24*v*'•Al(pftb)₄ (24*v*:24*v*' = ca. 1.7-1.8:1), CD₂Cl₂, ¹H NMR, 500 MHz**



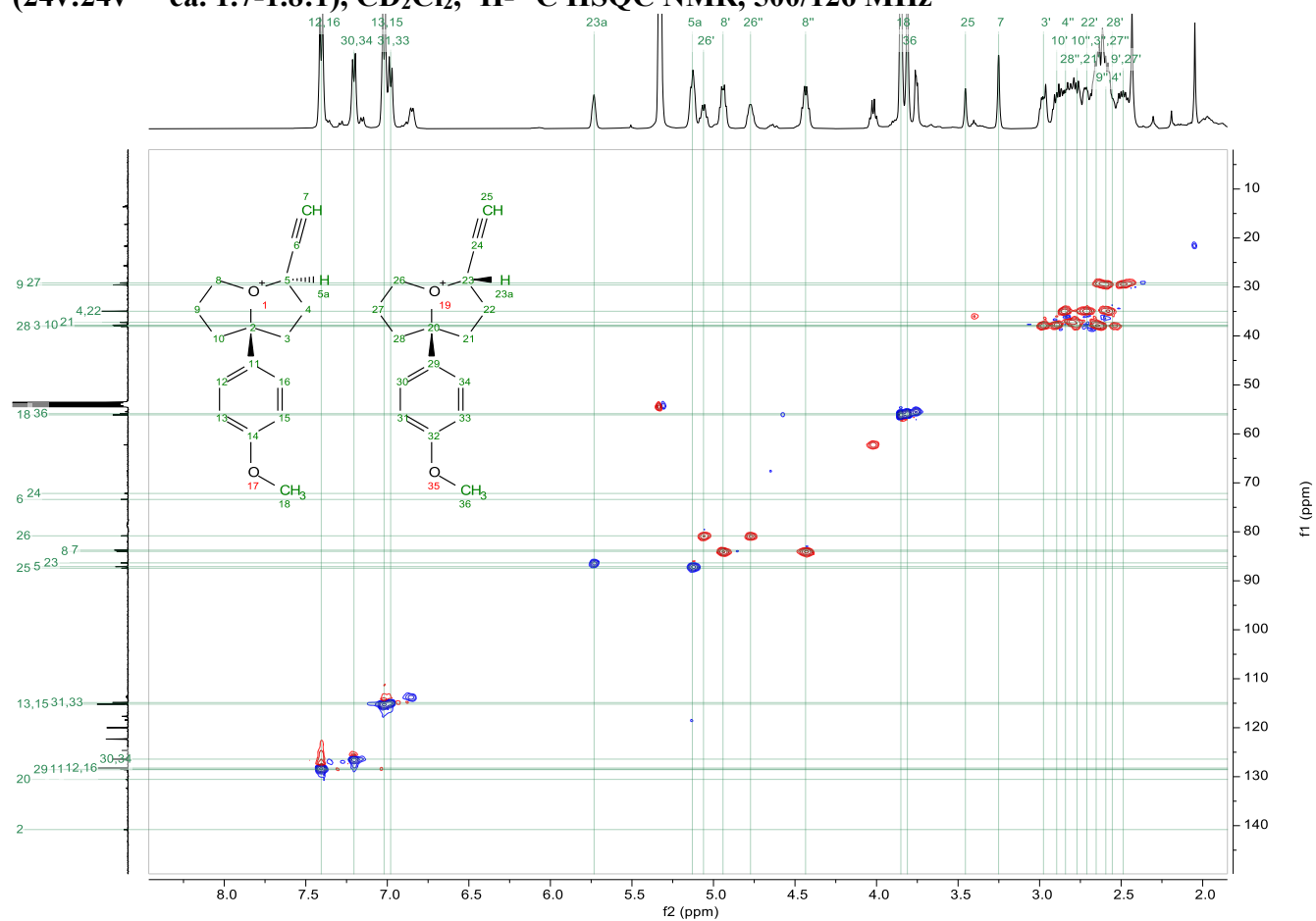
(3*R,7*aS**)-3-Ethynyl-7*a*-(4-methoxyphenyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminumate 24*v*•Al(pftb)₄ and (3*S**,7*aS**)-3-Ethynyl-7*a*-(4-methoxyphenyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminumate 24*v*'•Al(pftb)₄ (24*v*:24*v*' = ca. 1.7-1.8:1), CD₂Cl₂, ¹³C NMR, 126 MHz**



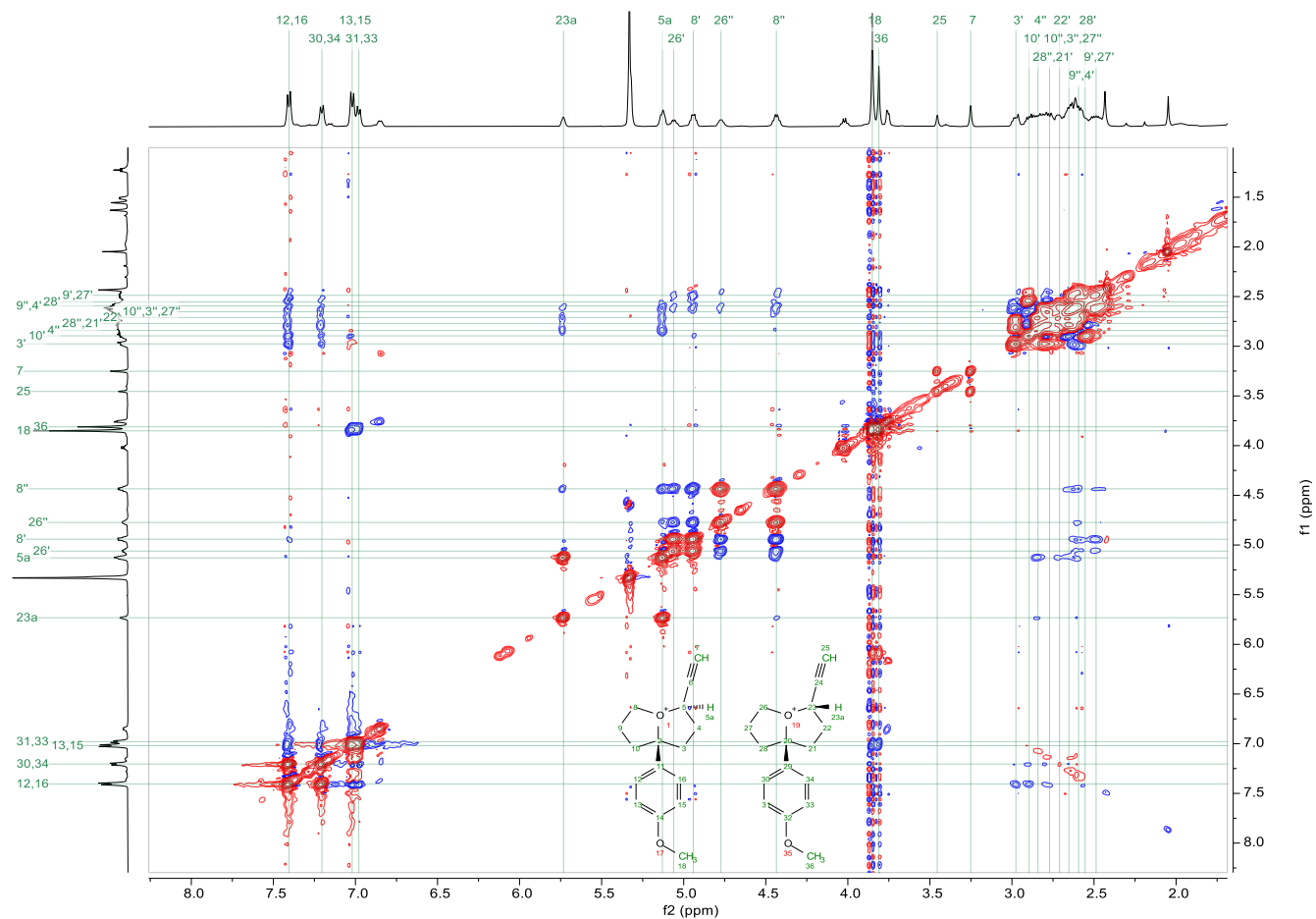
(3*R,7*aS**)-3-Ethynyl-7*a*-(4-methoxyphenyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24*v*•Al(pftb)₄ and (3*S**,7*aS**)-3-Ethynyl-7*a*-(4-methoxyphenyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24*v*'•Al(pftb)₄ (24*v*:24*v*' = ca. 1.7-1.8:1), CD₂Cl₂, ¹H-¹H COSY NMR, 500/500 MHz**



(3*R,7*aS**)-3-Ethynyl-7*a*-(4-methoxyphenyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24*v*•Al(pftb)₄ and (3*S**,7*aS**)-3-Ethynyl-7*a*-(4-methoxyphenyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 24*v*'•Al(pftb)₄ (24*v*:24*v*' = ca. 1.7-1.8:1), CD₂Cl₂, ¹H-¹³C HSQC NMR, 500/126 MHz**



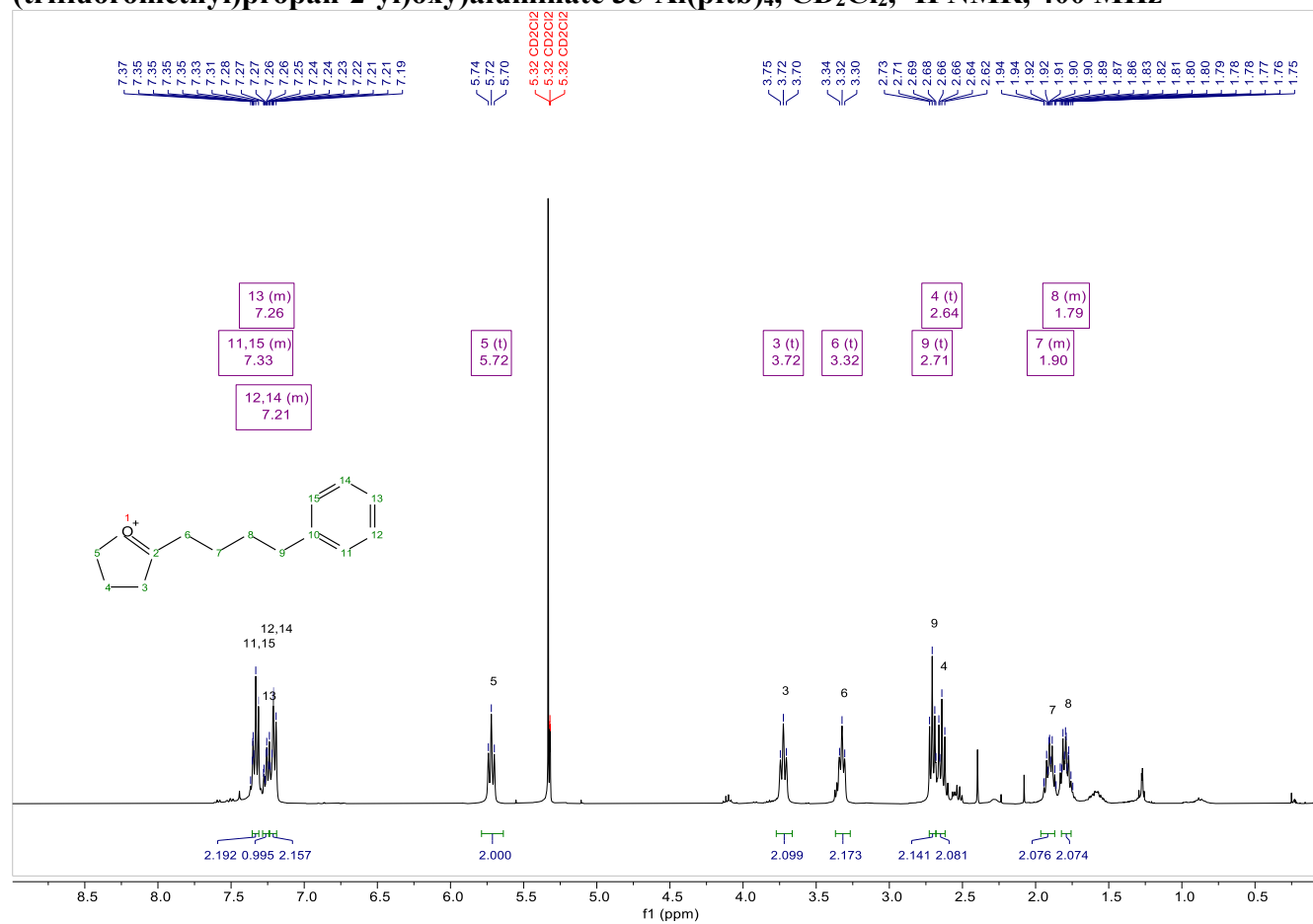
(3*R,7*aS**)-3-Ethynyl-7*a*-(4-methoxyphenyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminumate 24*v*•Al(pftb)₄ and (3*S**,7*aS**)-3-Ethynyl-7*a*-(4-methoxyphenyl)hexahydro-1*H*-furo[1,2-*a*]furan-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminumate 24*v*'•Al(pftb)₄ (24*v*:24*v*' = ca. 1.7-1.8:1), CD₂Cl₂, ¹H-¹H NOESY NMR, 500/500 MHz**



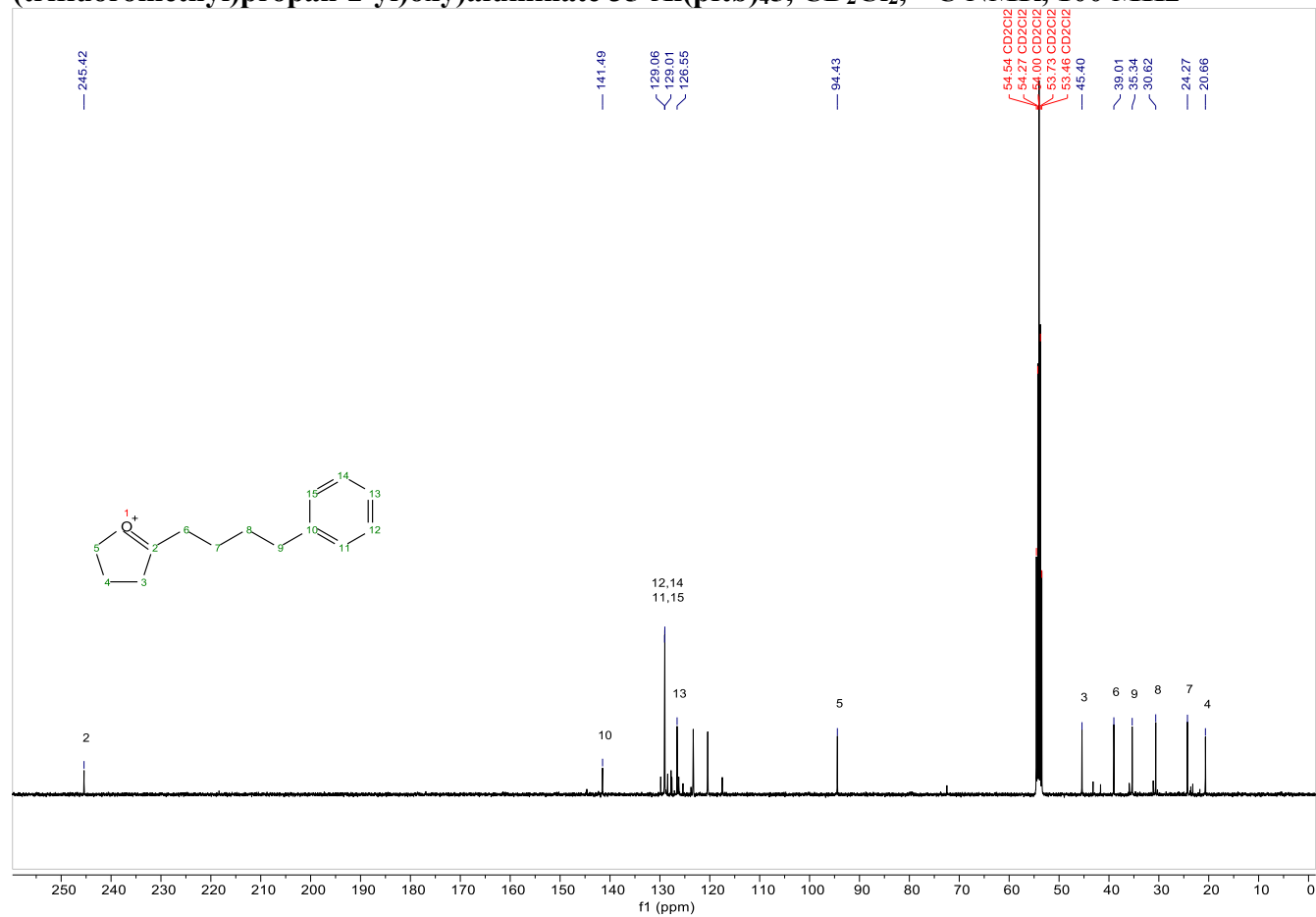
5-(4-Phenylbutyl)-3,4-dihydro-2H-furan-1-ium
 (trifluoromethyl)propan-2-yl)oxy)aluminat 35•Al(pftb)₄, CD₂Cl₂, ¹H NMR, 400 MHz

tetrakis((1,1,1,3,3,3-hexafluoro
 (trifluoromethyl)propan-2-yl)oxy)aluminat 35•Al(pftb)₄, CD₂Cl₂, ¹H NMR, 400 MHz

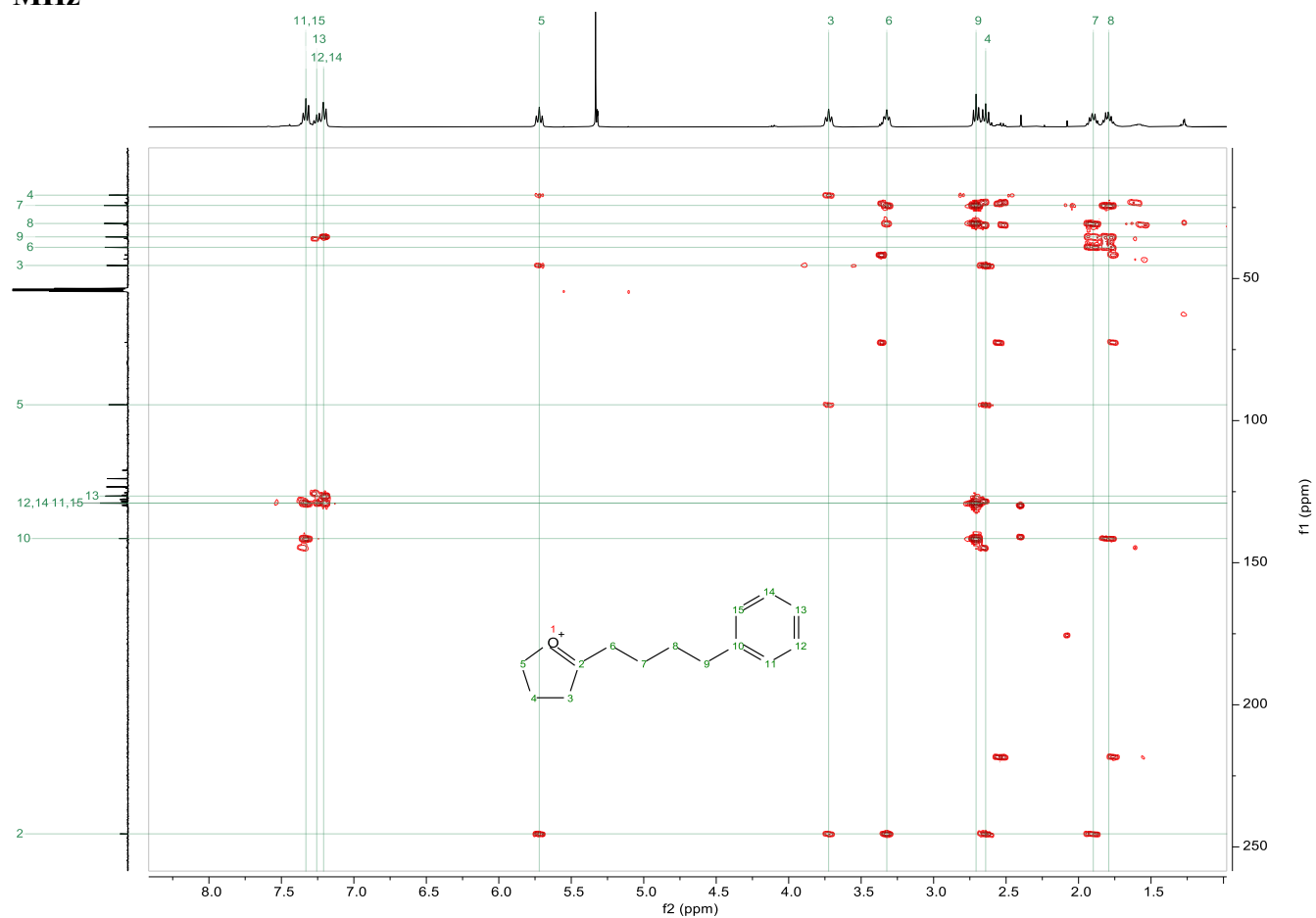
2-



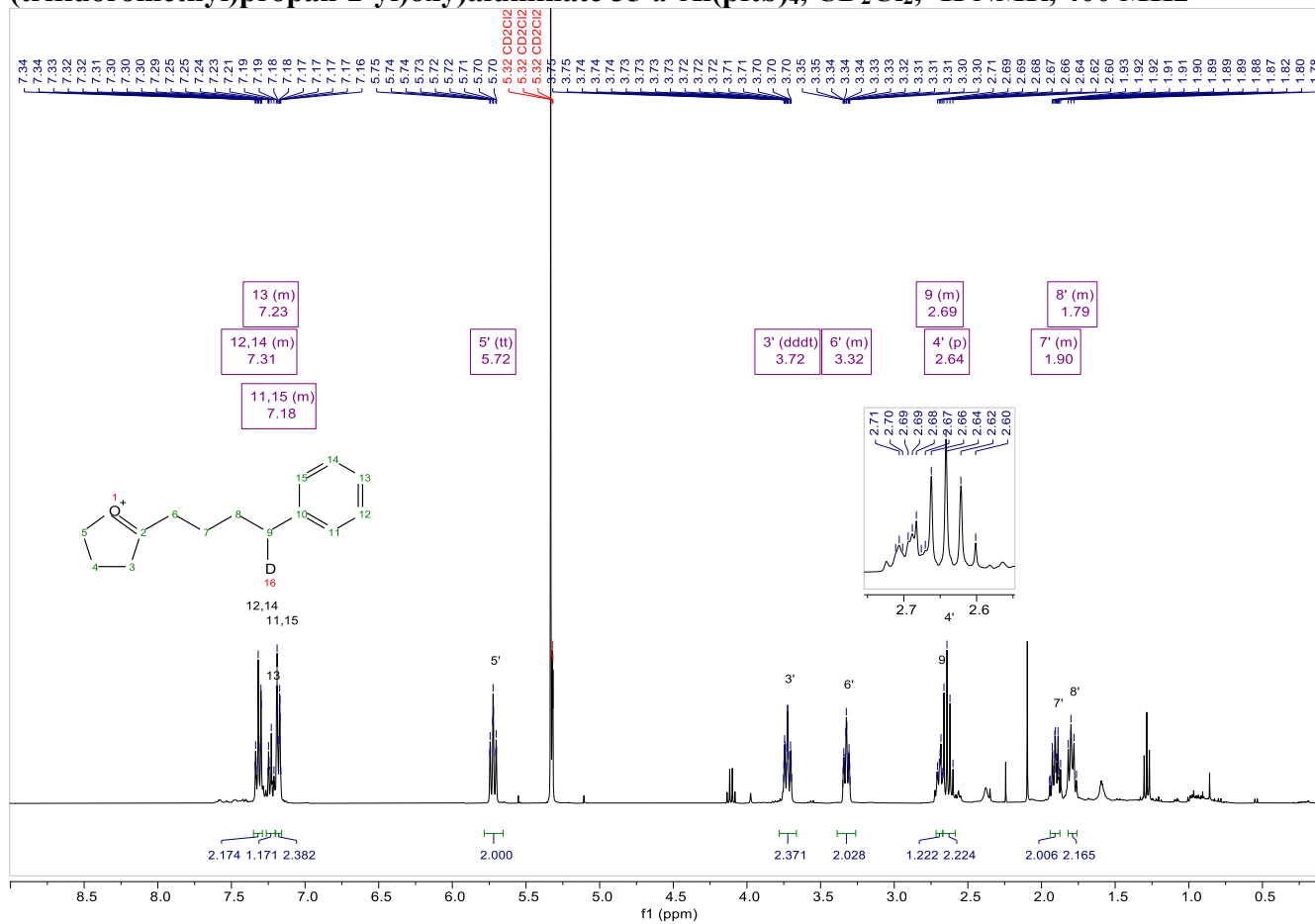
5-(4-Phenylbutyl)-3,4-dihydro-2H-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 35•Al(pftb)₄5, CD₂Cl₂, ¹³C NMR, 100 MHz



5-(4-Phenylbutyl)-3,4-dihydro-2*H*-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 35•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HMBC NMR, 400/100 MHz

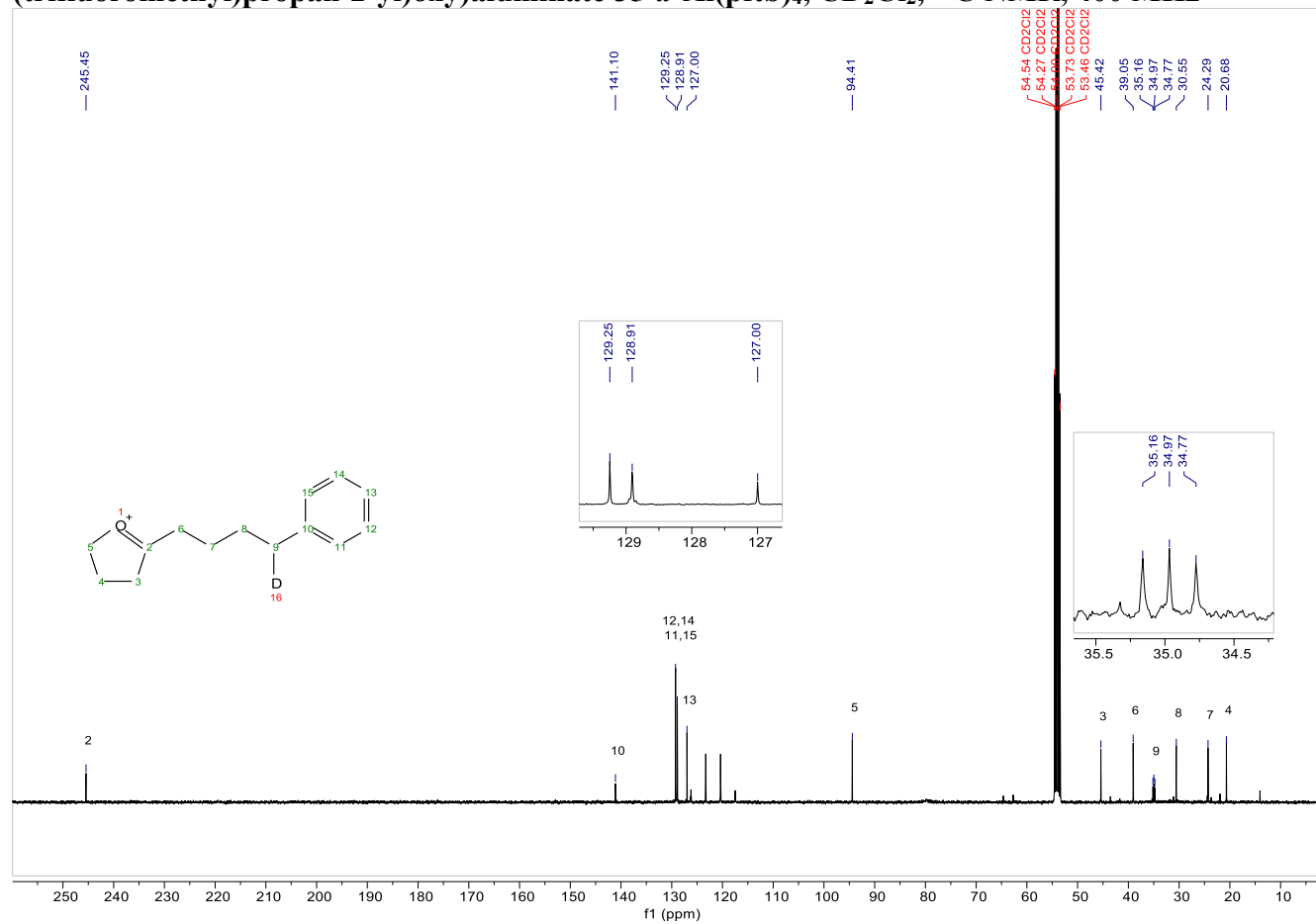


5-(4-Phenylbutyl-4-*d*)-3,4-dihydro-2*H*-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminat 35-*d*-Al(pftb)₄, CD₂Cl₂, ¹H NMR, 400 MHz

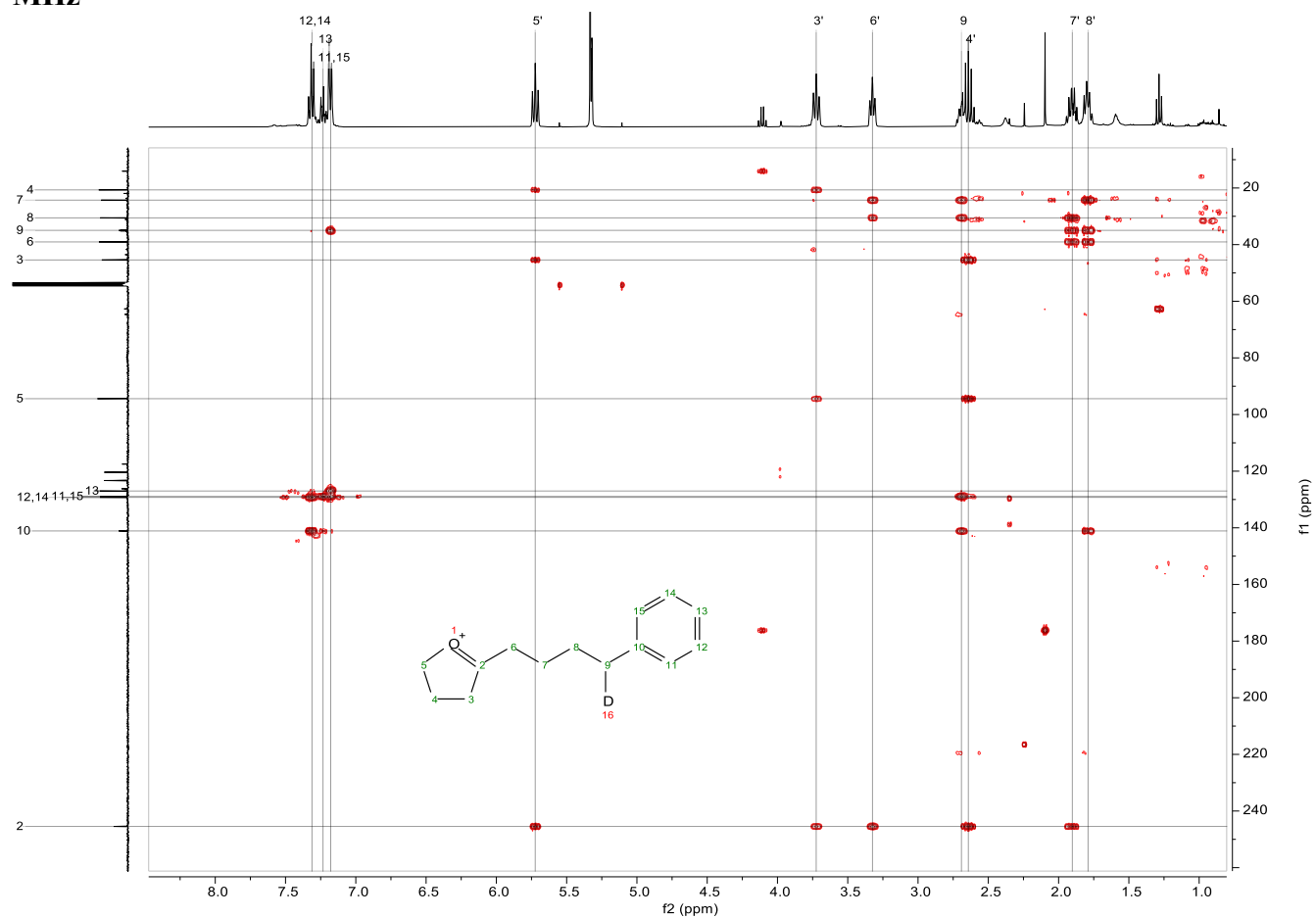


5-(4-Phenylbutyl-4-*d*)-3,4-dihydro-2*H*-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminate 35-*d*-Al(pftb)₄, CD₂Cl₂, ¹³C NMR, 400 MHz

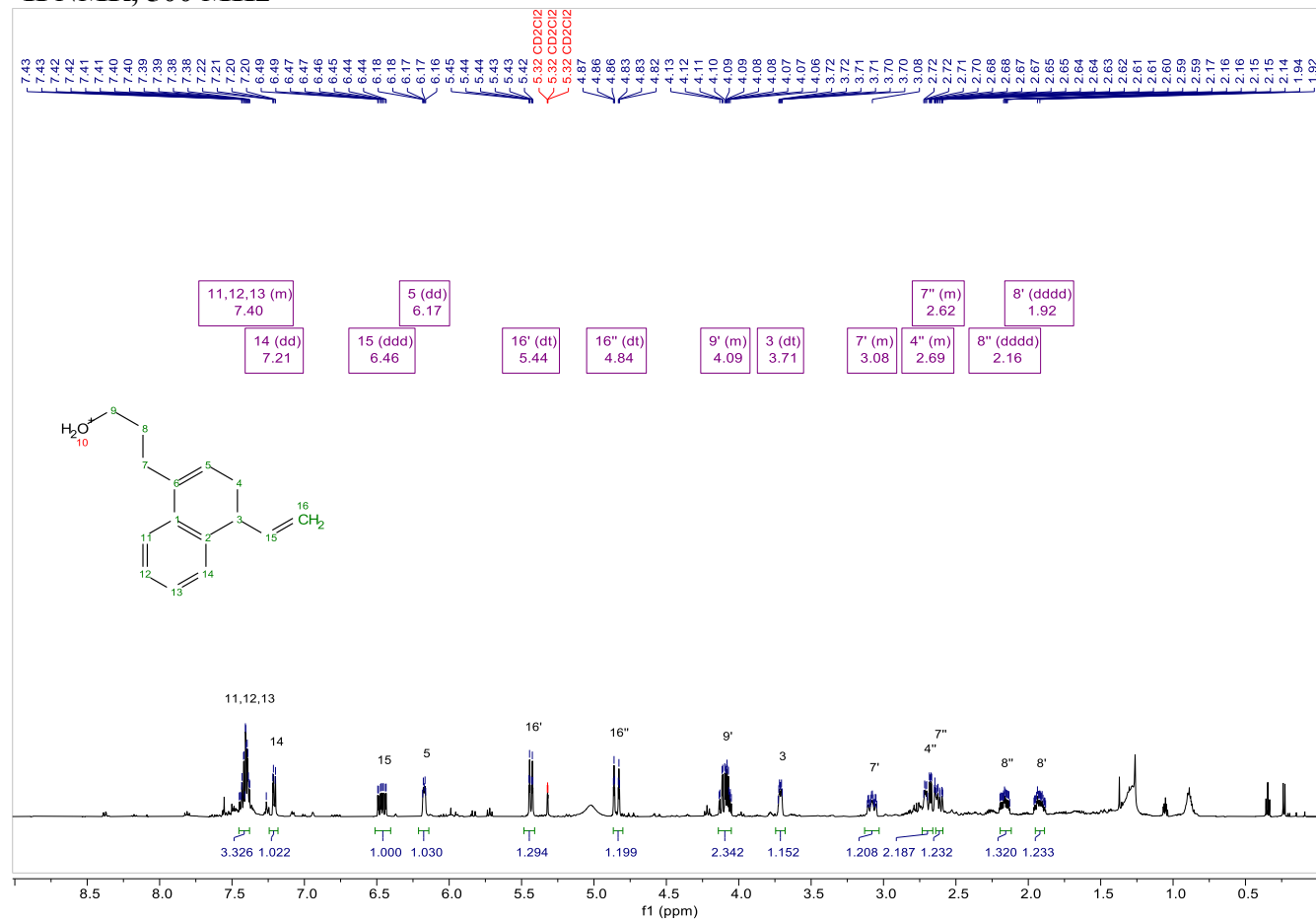
2-



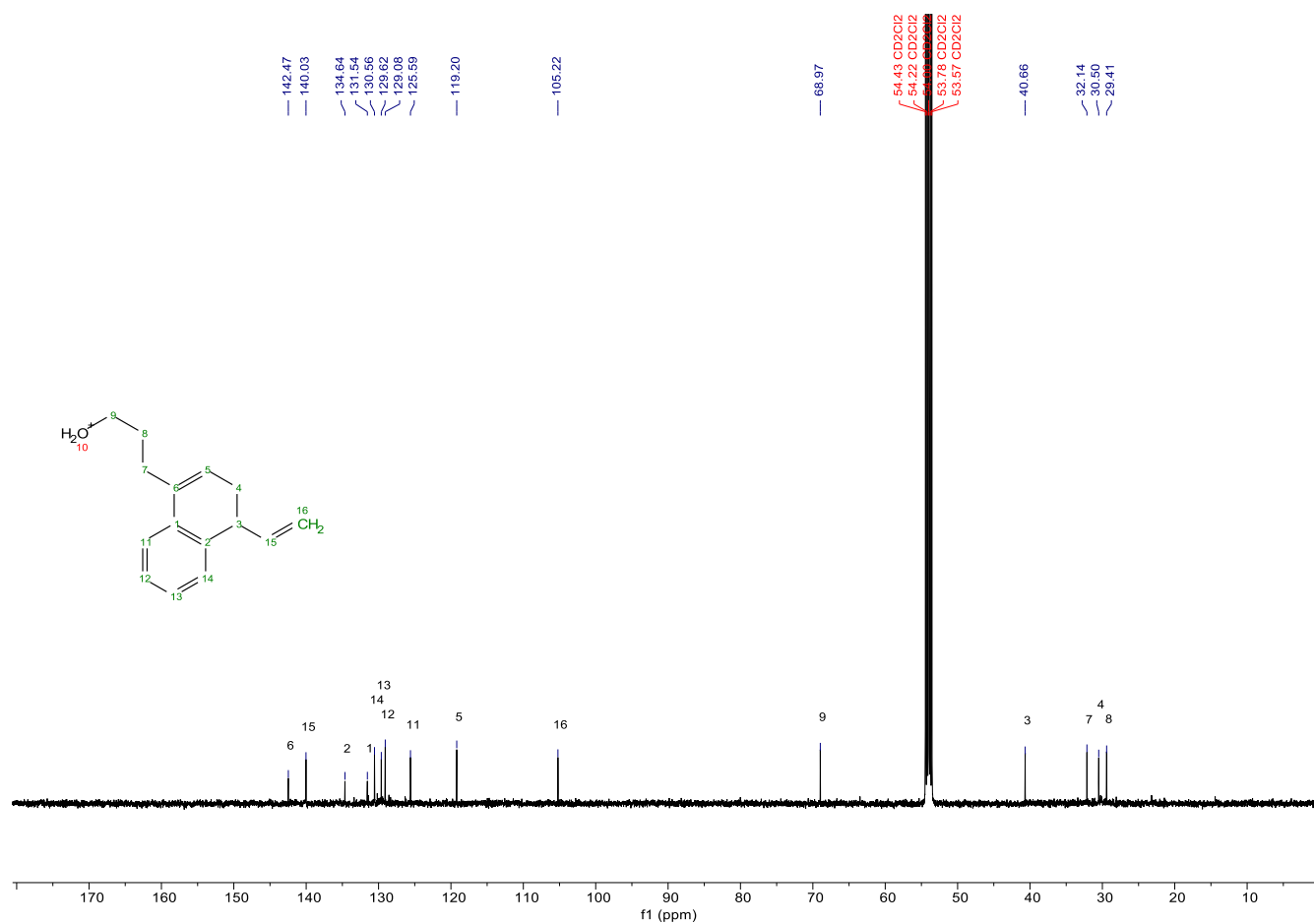
5-(4-Phenylbutyl-4-*d*)-3,4-dihydro-2*H*-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 35-*d*-Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HMBC NMR, 400/100 MHz



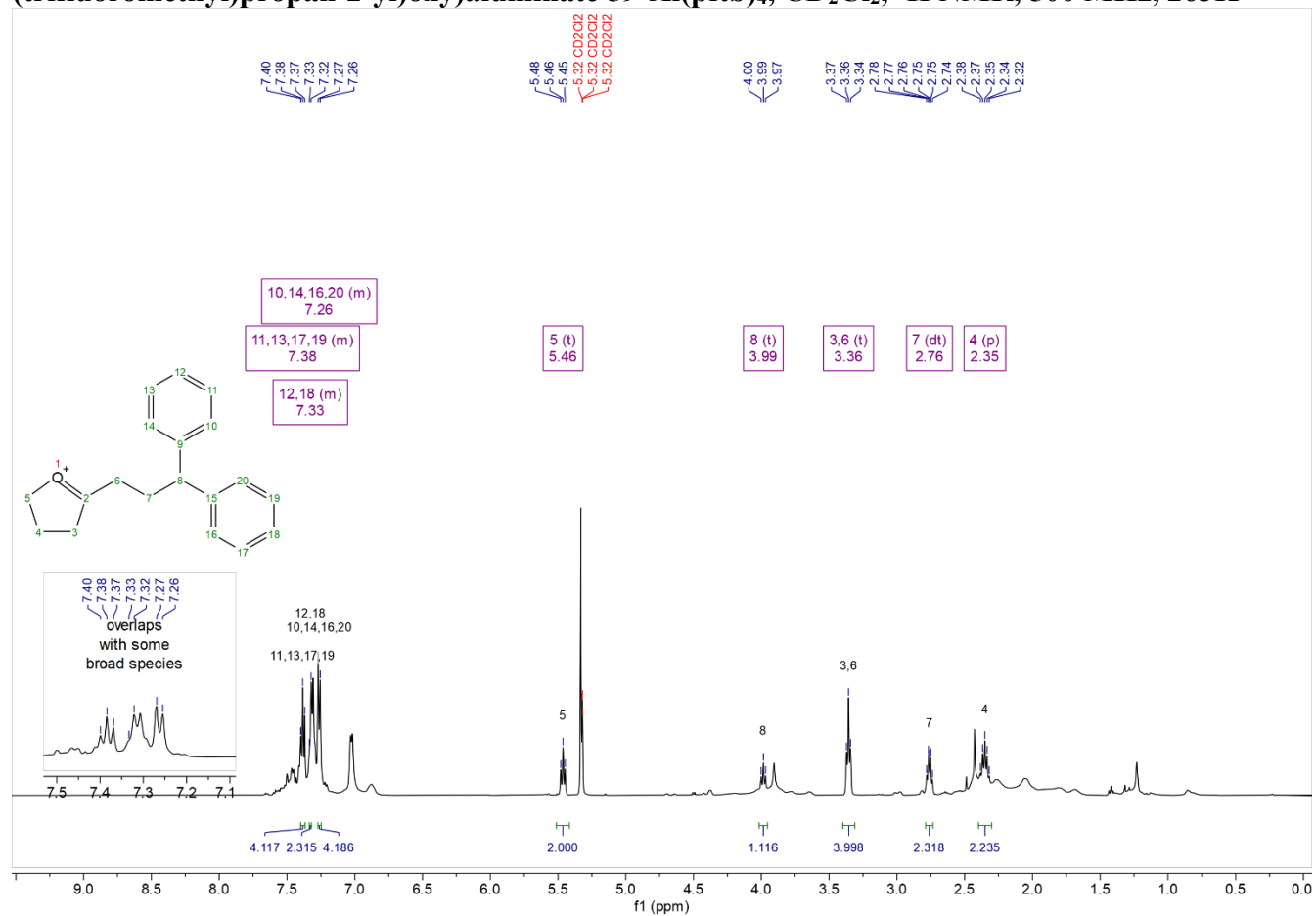
**(3-(4-Vinyl-3,4-dihydronaphthalen-1-yl)propyl)oxonium hexafluoroantimonate 52•SbF₆, CD₂Cl₂,
¹H NMR, 500 MHz**



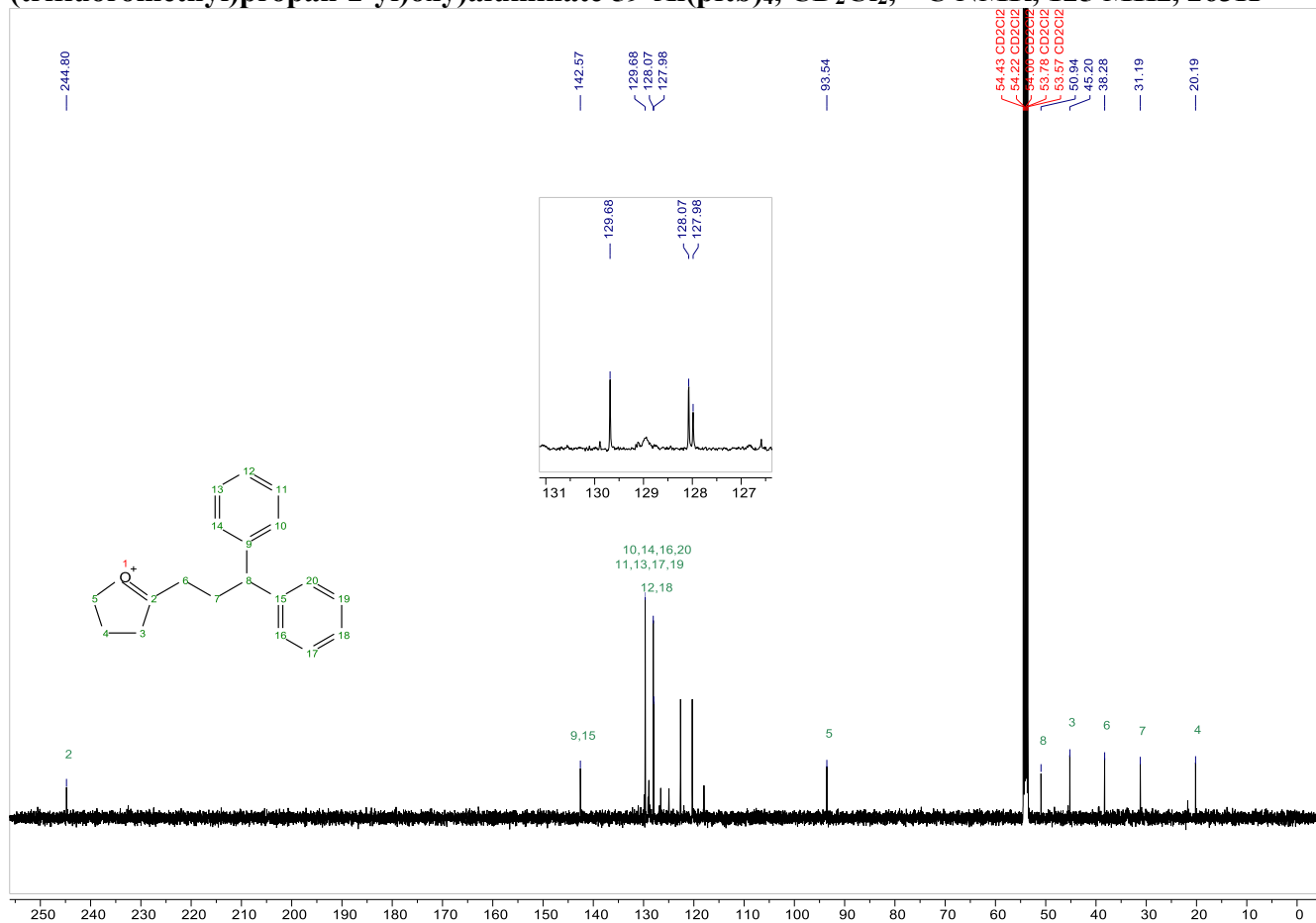
**(3-(4-Vinyl-3,4-dihydronaphthalen-1-yl)propyl)oxonium hexafluoroantimonate 52•SbF₆, CD₂Cl₂,
¹³C NMR, 125 MHz**



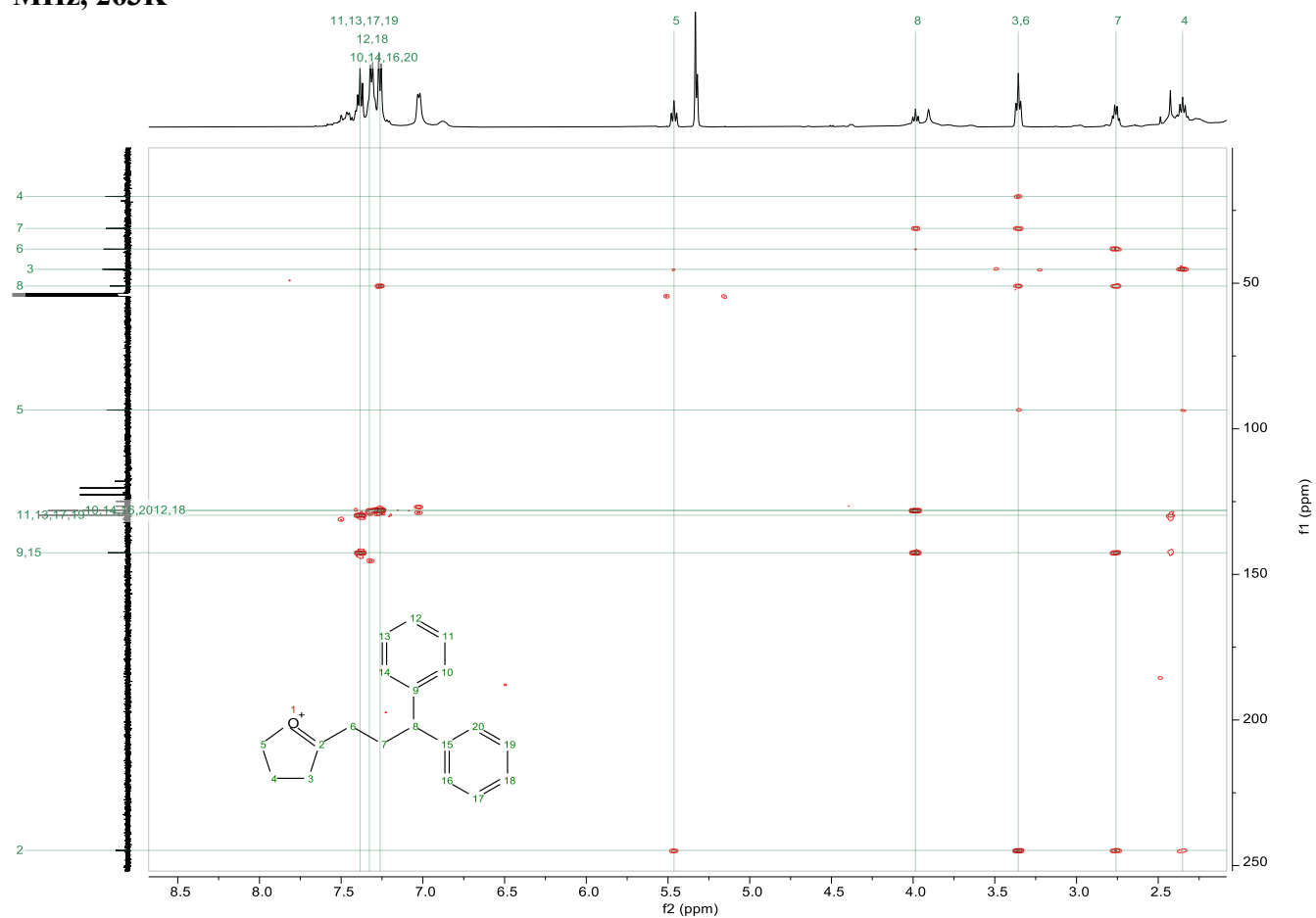
5-(3,3-Diphenylpropyl)-3,4-dihydro-2H-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminate 59•Al(pftb)₄, CD₂Cl₂, ¹H NMR, 500 MHz, 263K



5-(3,3-Diphenylpropyl)-3,4-dihydro-2H-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro (trifluoromethyl)propan-2-yl)oxy)aluminate 5•Al(pftb)₄, CD₂Cl₂, ¹³C NMR, 125 MHz, 263K



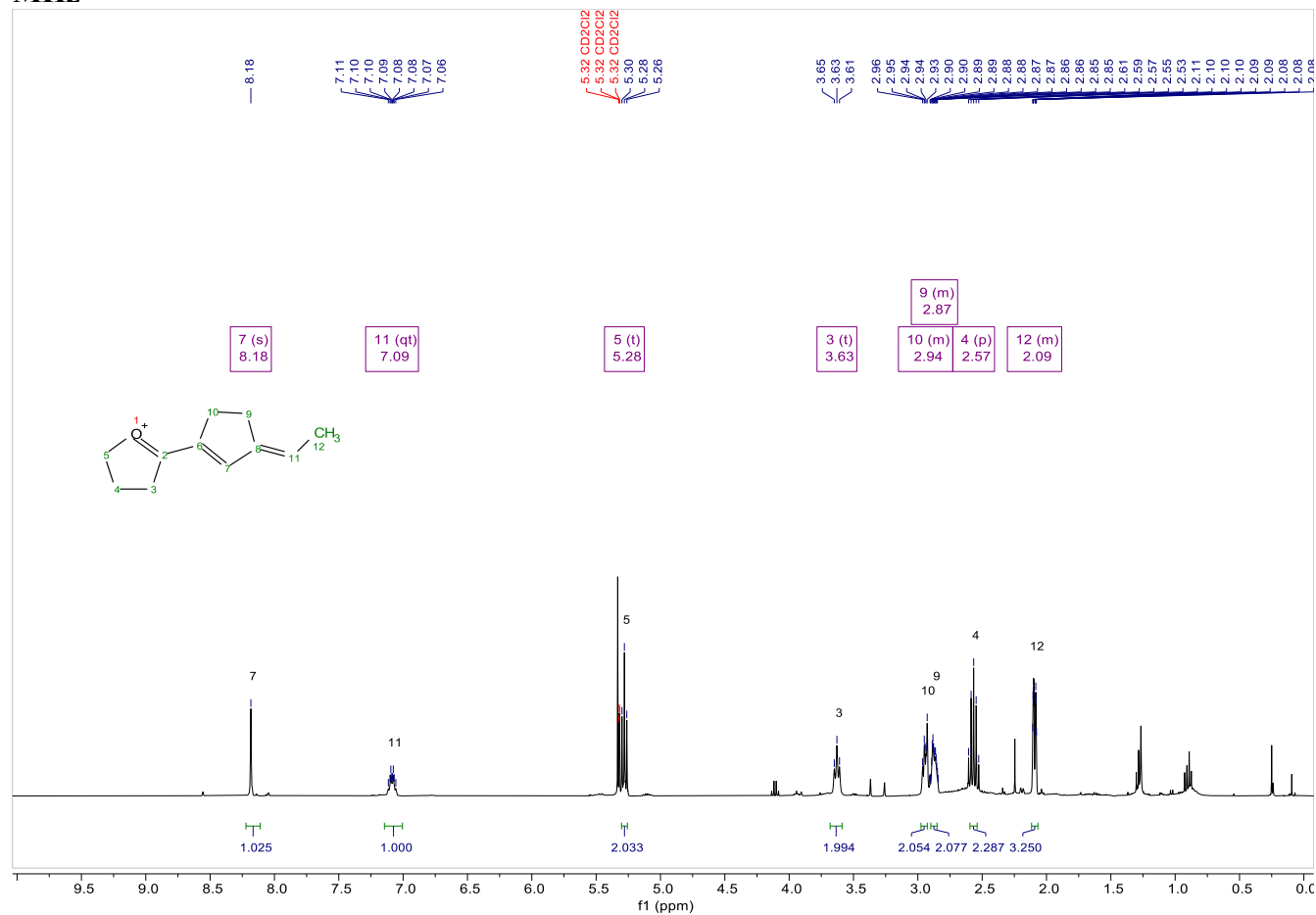
5-(3,3-Diphenylpropyl)-3,4-dihydro-2H-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 59•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HMBC NMR, 500/125 MHz, 263K



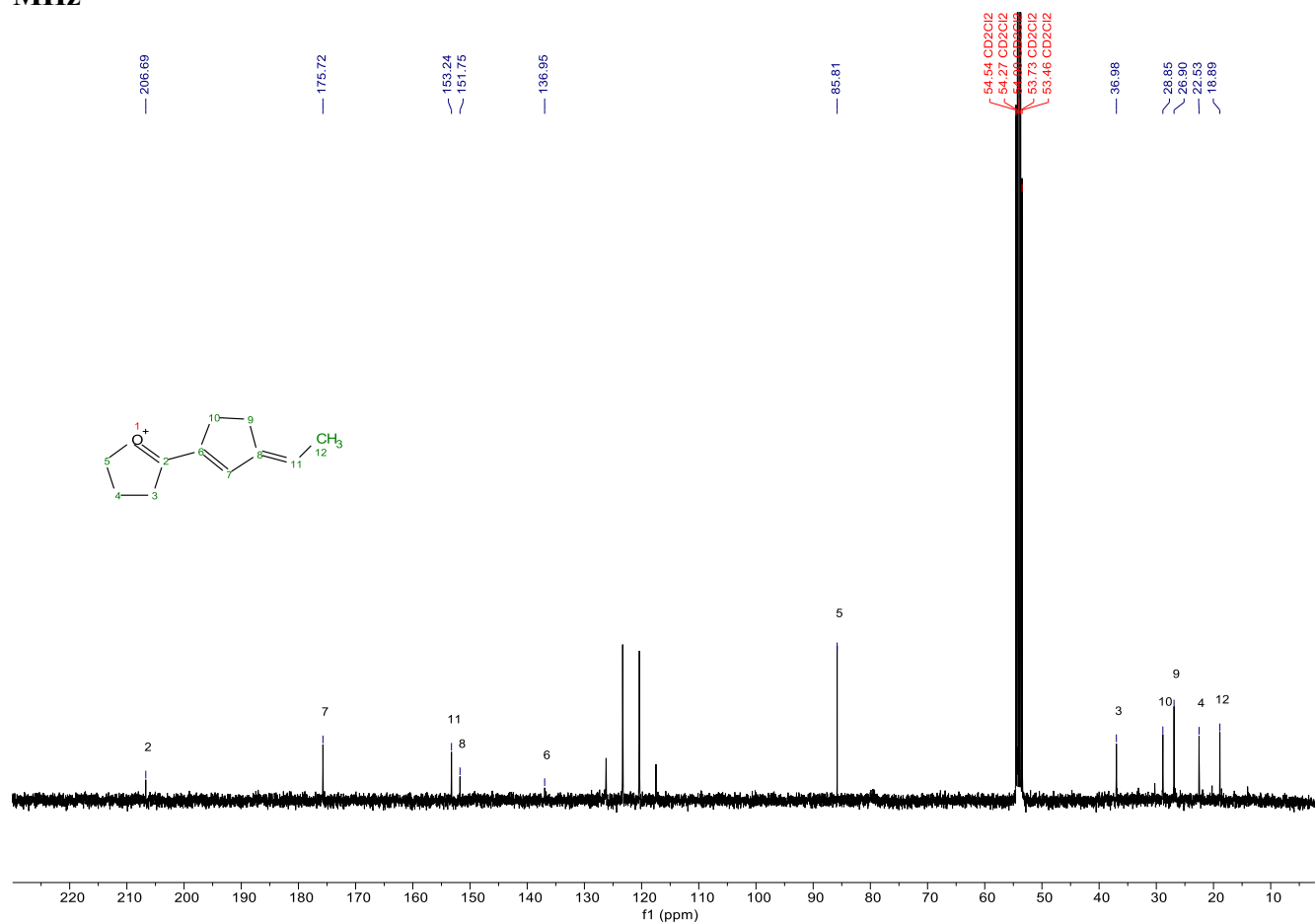
5-(3-Vinylcyclopent-1-en-1-yl)-3,4-dihydro-2*H*-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 39•Al(pftb)₄

See NMR spectra of oxonium ion **24o•Al(pftb)₄**.

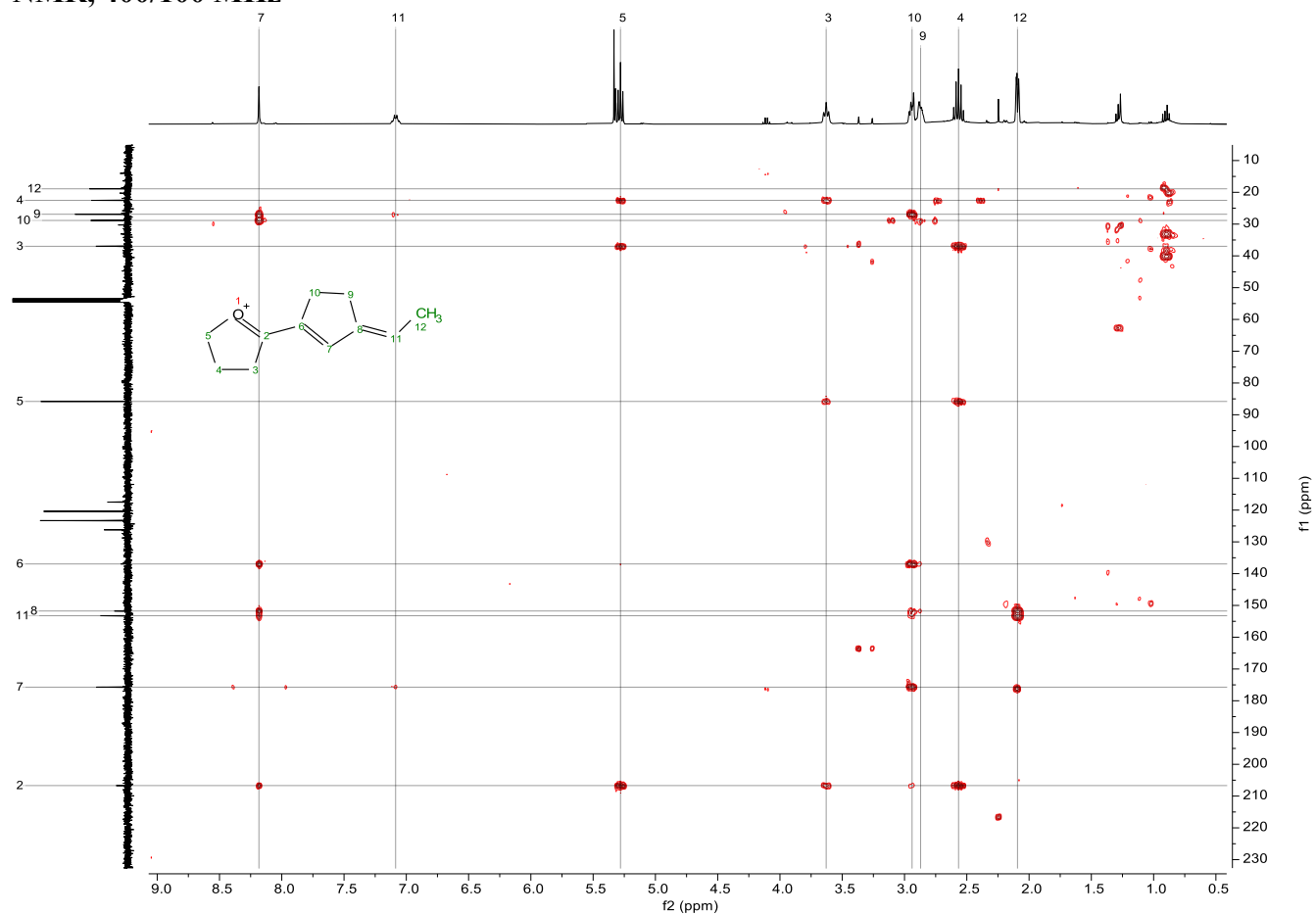
(E)-5-(3-Ethylidenecyclopent-1-en-1-yl)-3,4-dihydro-2H-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminatate 40•Al(pftb)₄, CD₂Cl₂, ¹H NMR, 400 MHz



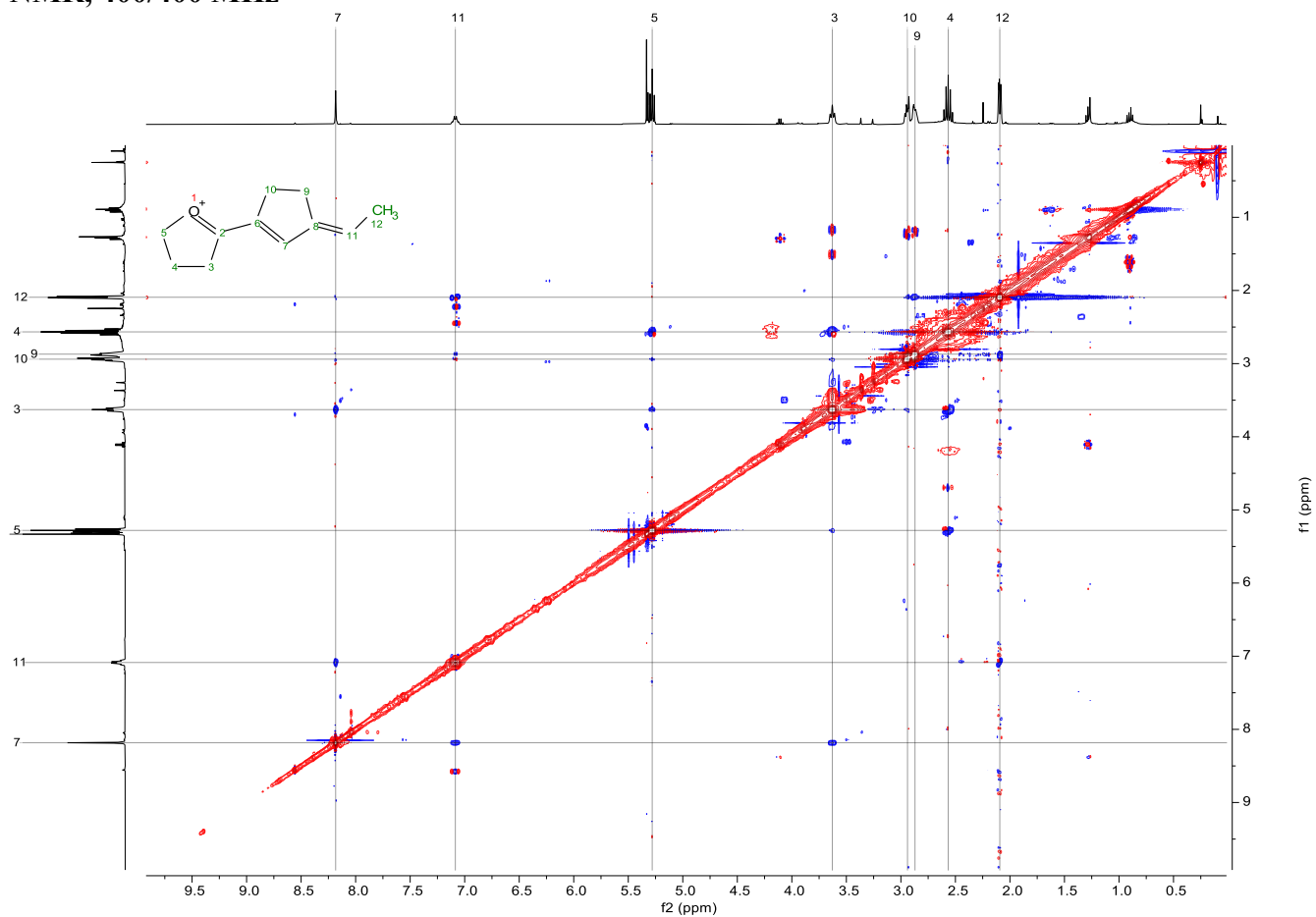
(E)-5-(3-Ethylidenecyclopent-1-en-1-yl)-3,4-dihydro-2H-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 40•Al(pftb)₄, CD₂Cl₂, ¹³C NMR, 100 MHz



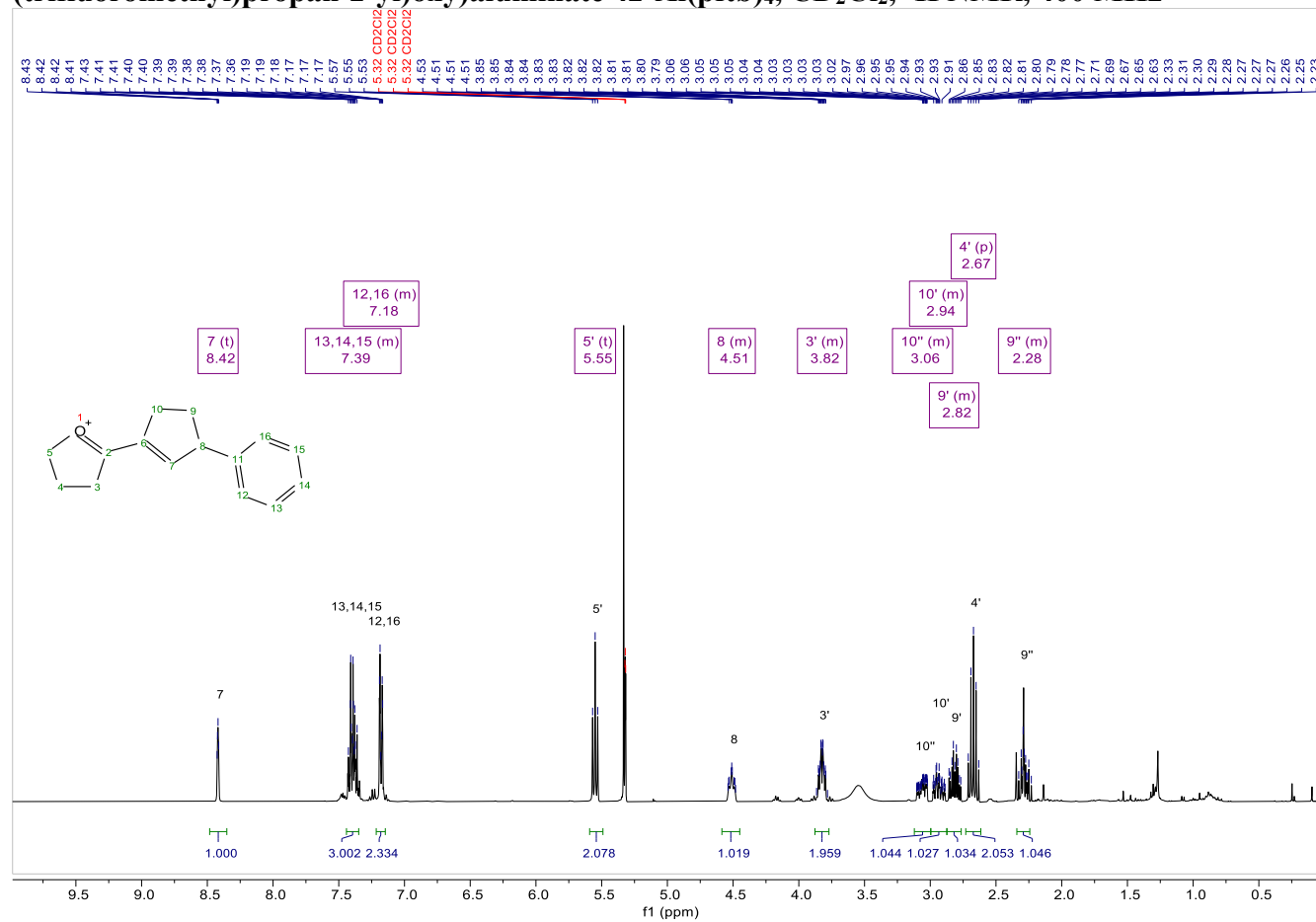
(E)-5-(3-Ethylidenecyclopent-1-en-1-yl)-3,4-dihydro-2H-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 40•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HMBC NMR, 400/100 MHz



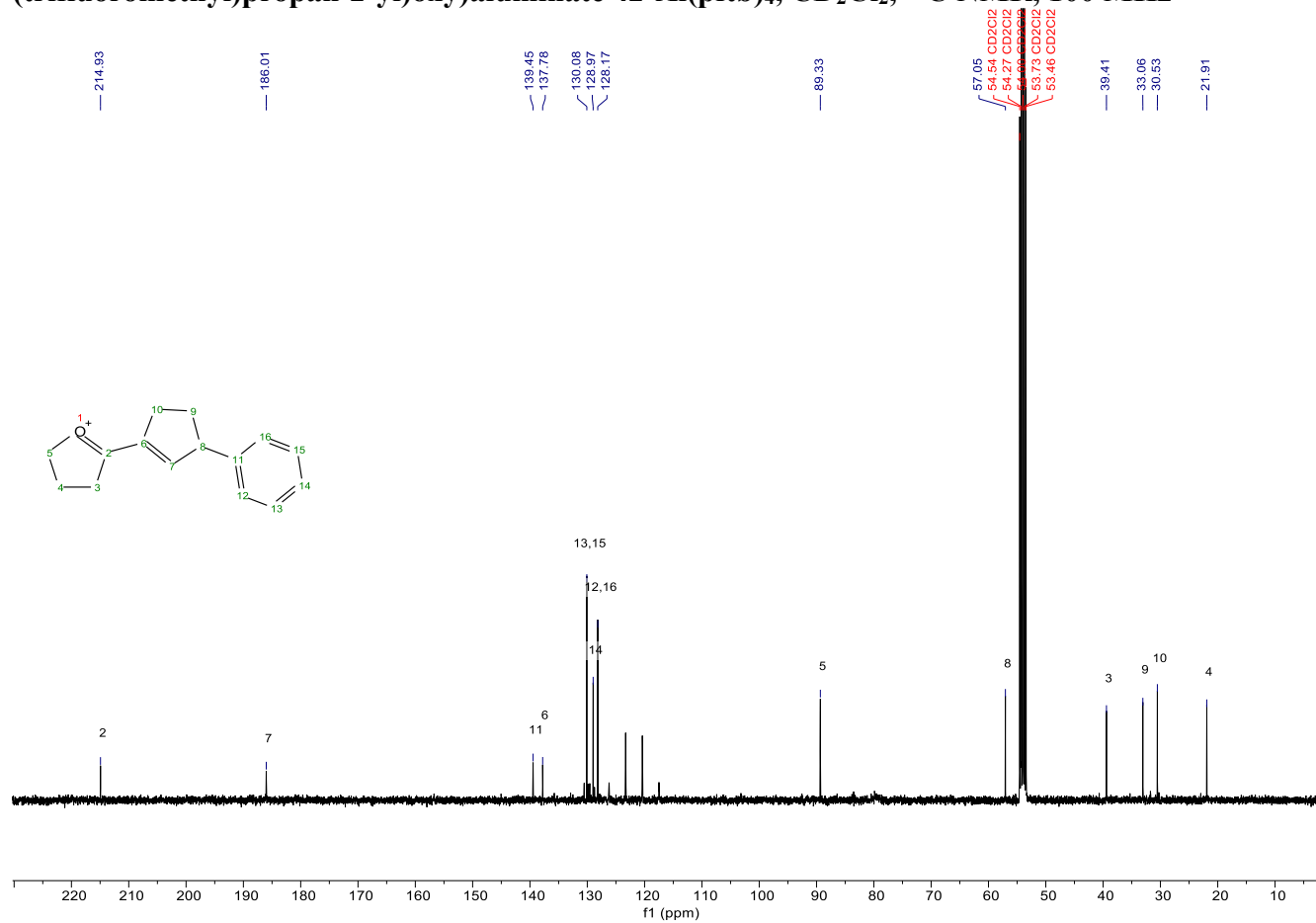
(*E*)-5-(3-Ethylidenecyclopent-1-en-1-yl)-3,4-dihydro-2*H*-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 40•Al(pftb)₄, CD₂Cl₂, ¹H-¹H NOESY NMR, 400/400 MHz



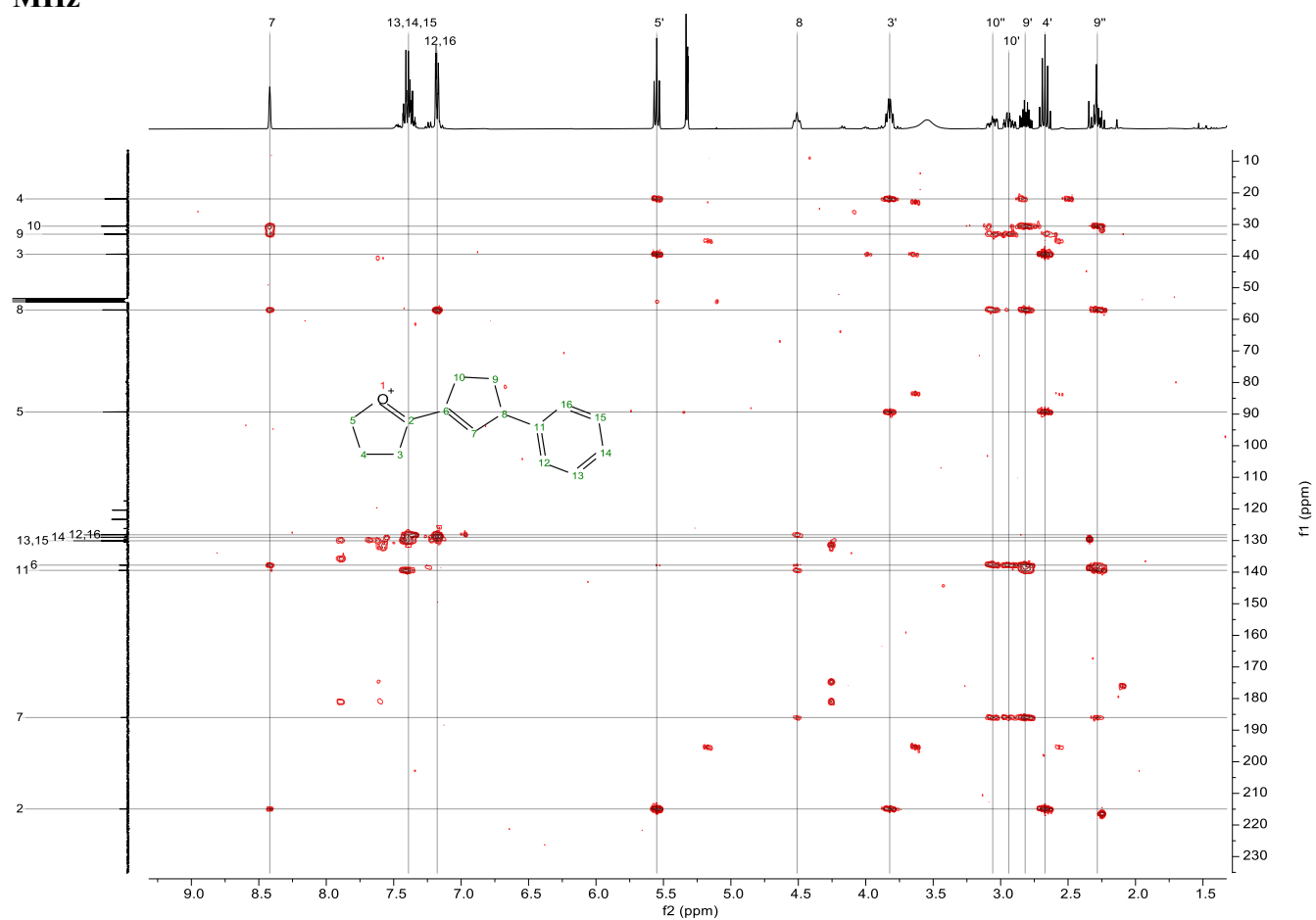
5-(3-Phenylcyclopent-1-en-1-yl)-3,4-dihydro-2H-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminatate 42•Al(pftb)₄, CD₂Cl₂, ¹H NMR, 400 MHz



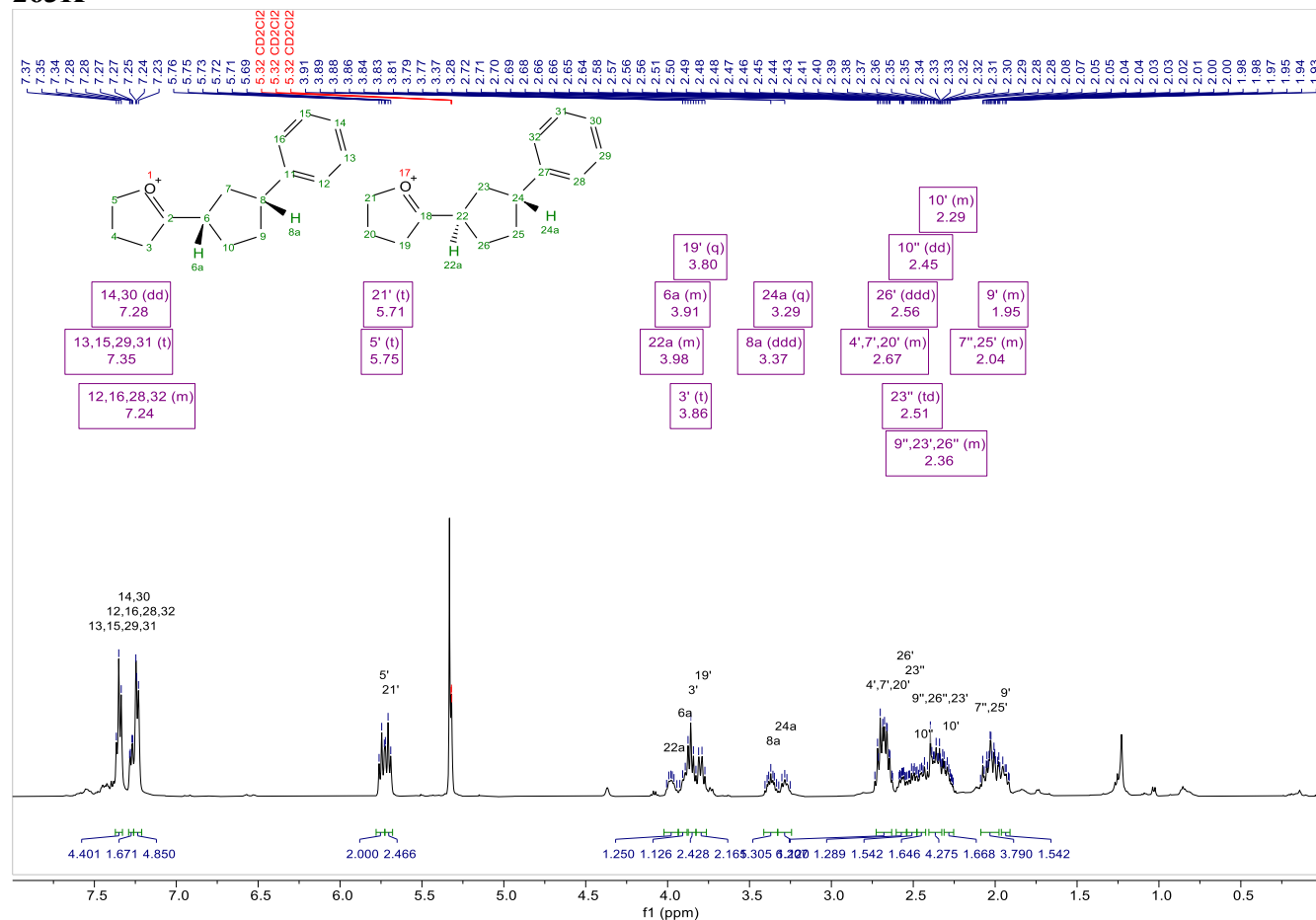
5-(3-Phenylcyclopent-1-en-1-yl)-3,4-dihydro-2H-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminatate 42•Al(pftb)₄, CD₂Cl₂, ¹³C NMR, 100 MHz



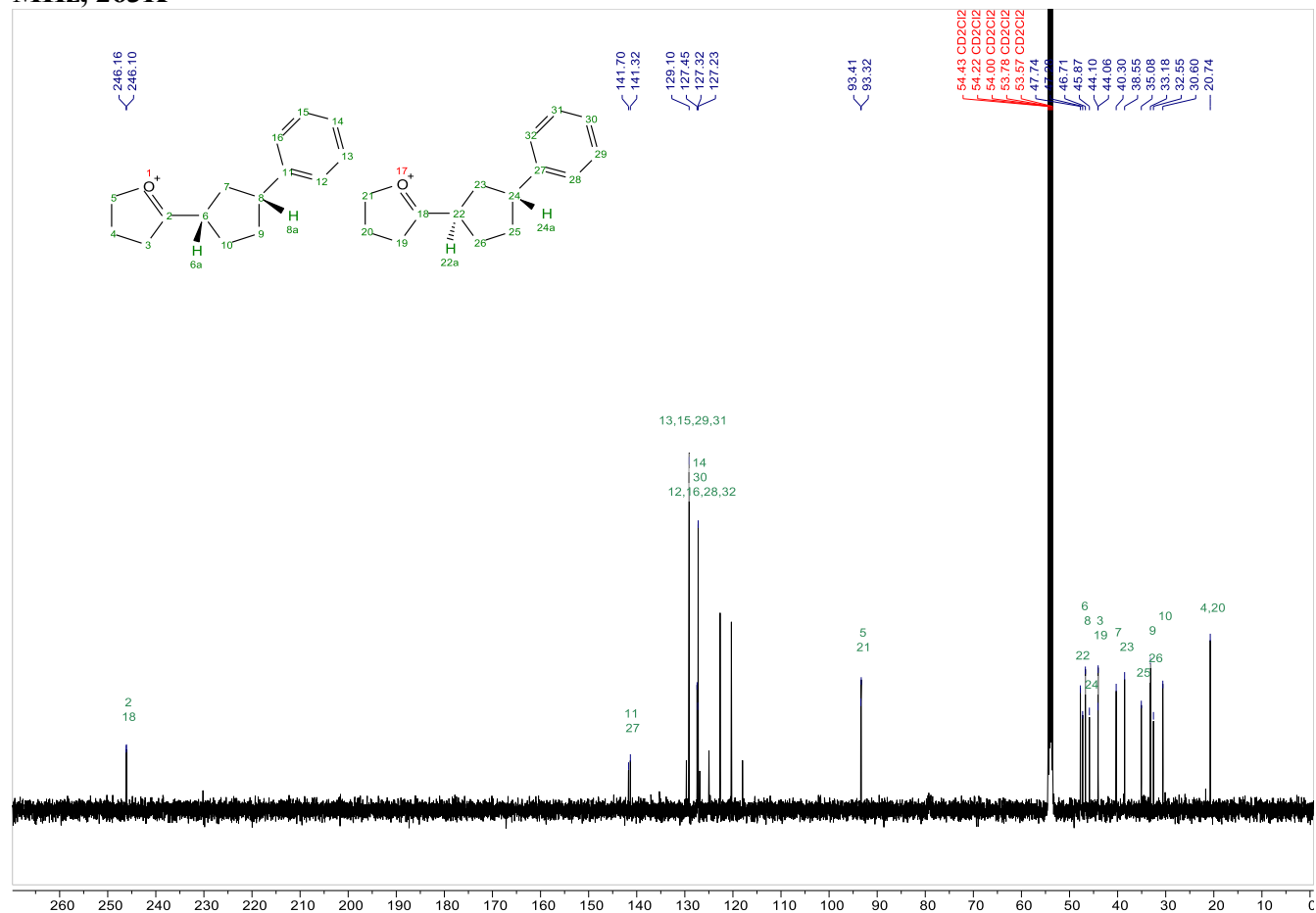
5-(3-Phenylcyclopent-1-en-1-yl)-3,4-dihydro-2H-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 42•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HMBC NMR, 400/100 MHz



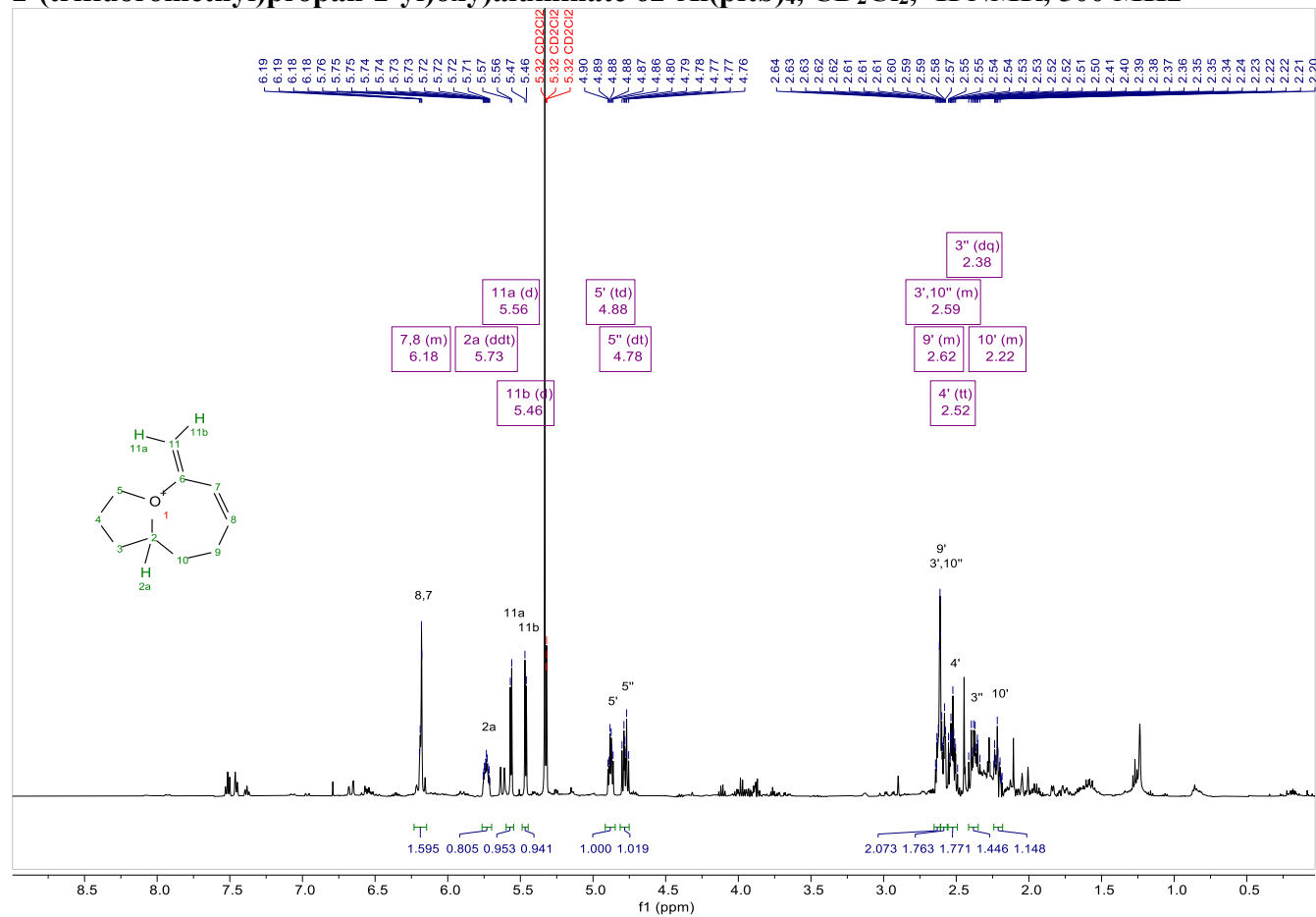
5-(3-Phenylcyclopentyl)-3,4-dihydro-2H-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 46•Al(pftb)₄ (d.r. ca. 1:1), CD₂Cl₂, ¹H NMR, 500 MHz, 263K



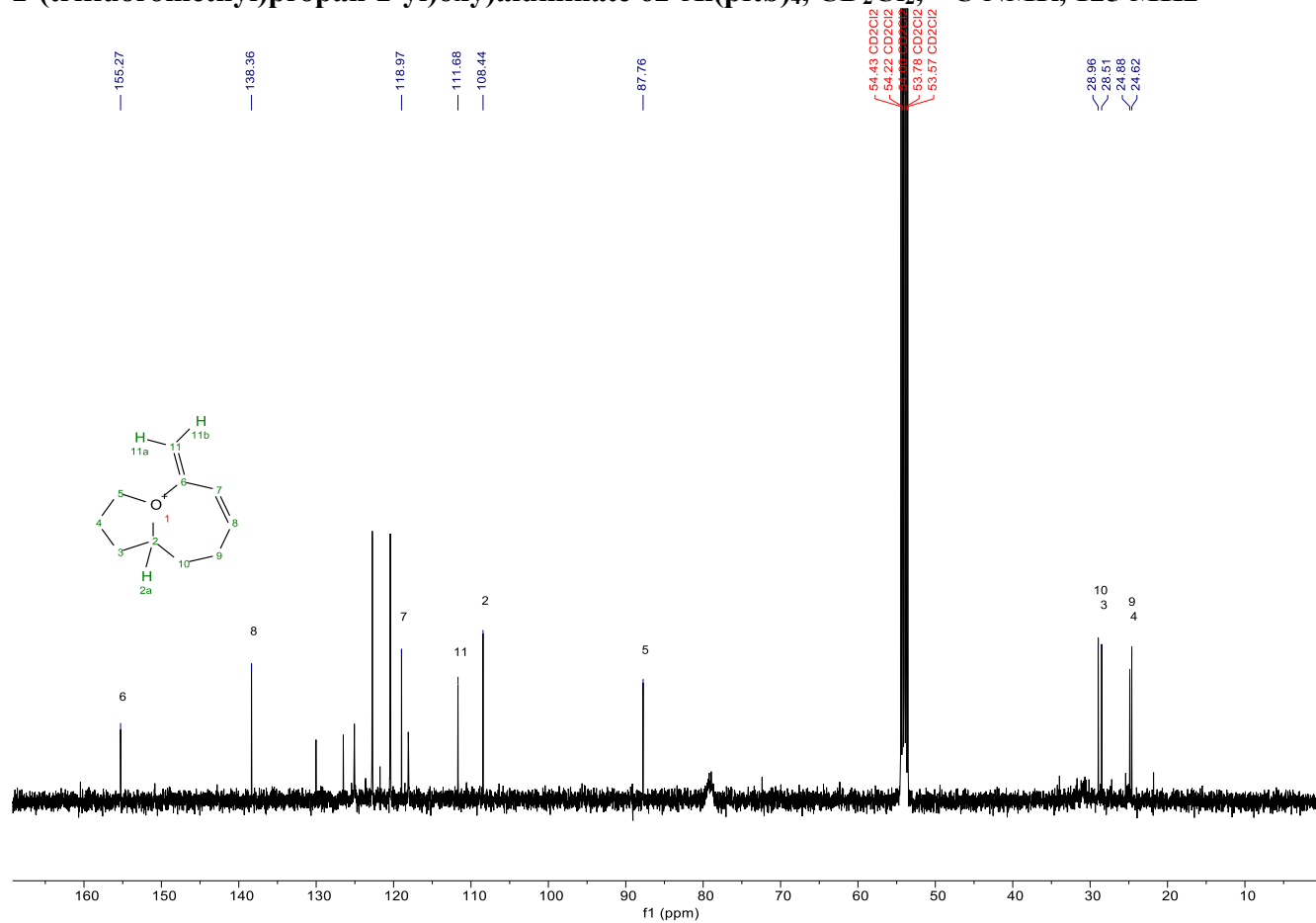
5-(3-Phenylcyclopentyl)-3,4-dihydro-2H-furan-1-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminatate 46•Al(pftb)₄ (d.r. ca. 1:1), CD₂Cl₂, ¹³C NMR, 125 MHz, 263K



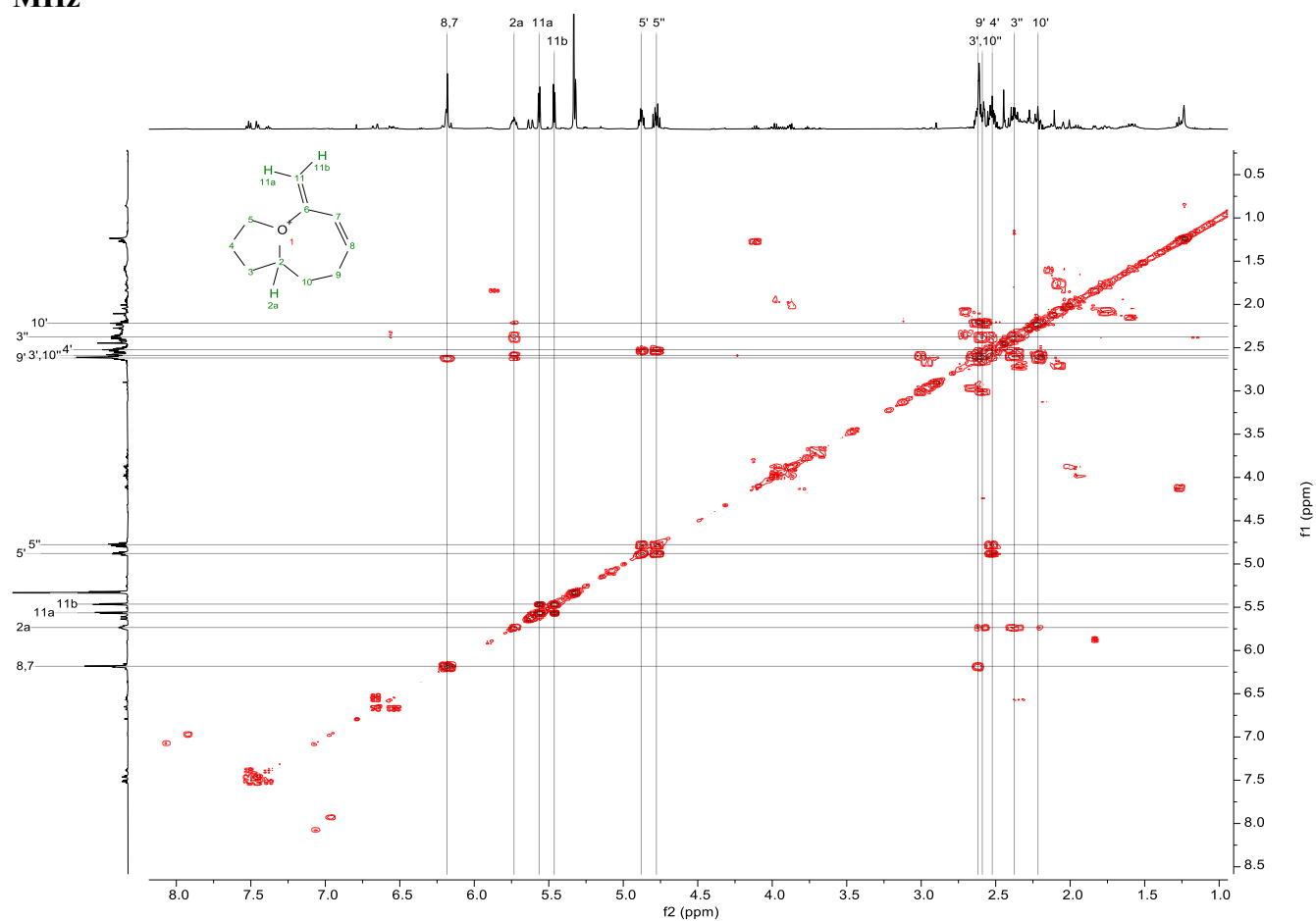
5-Methylene-2,3,5,8,9,9a-hexahydro-1*H*-furo[1,2-*a*]oxepin-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminat 62•Al(pftb)₄, CD₂Cl₂, ¹H NMR, 500 MHz



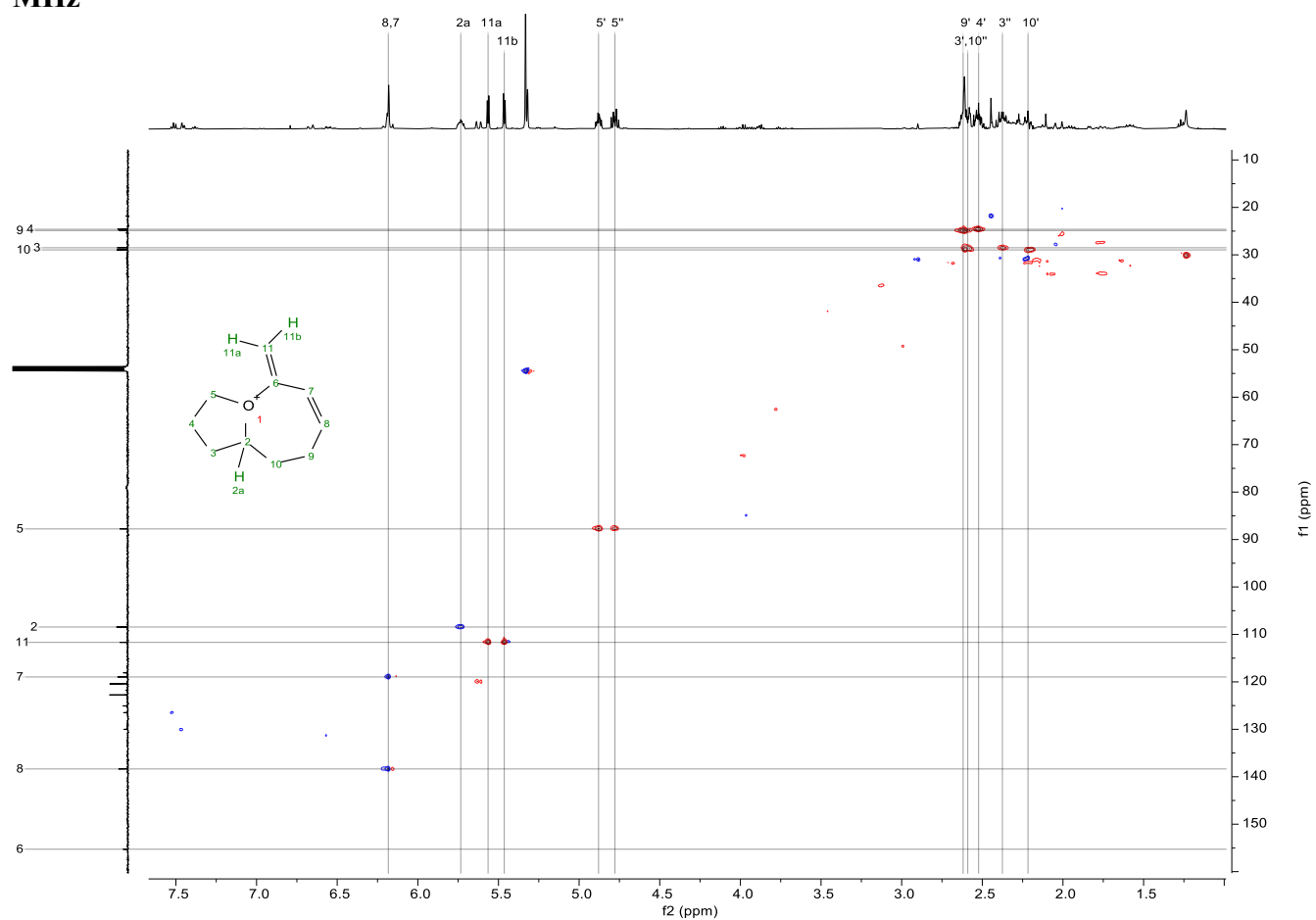
5-Methylene-2,3,5,8,9,9a-hexahydro-1H-furo[1,2-a]oxepin-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 62•Al(pftb)₄, CD₂Cl₂, ¹³C NMR, 125 MHz



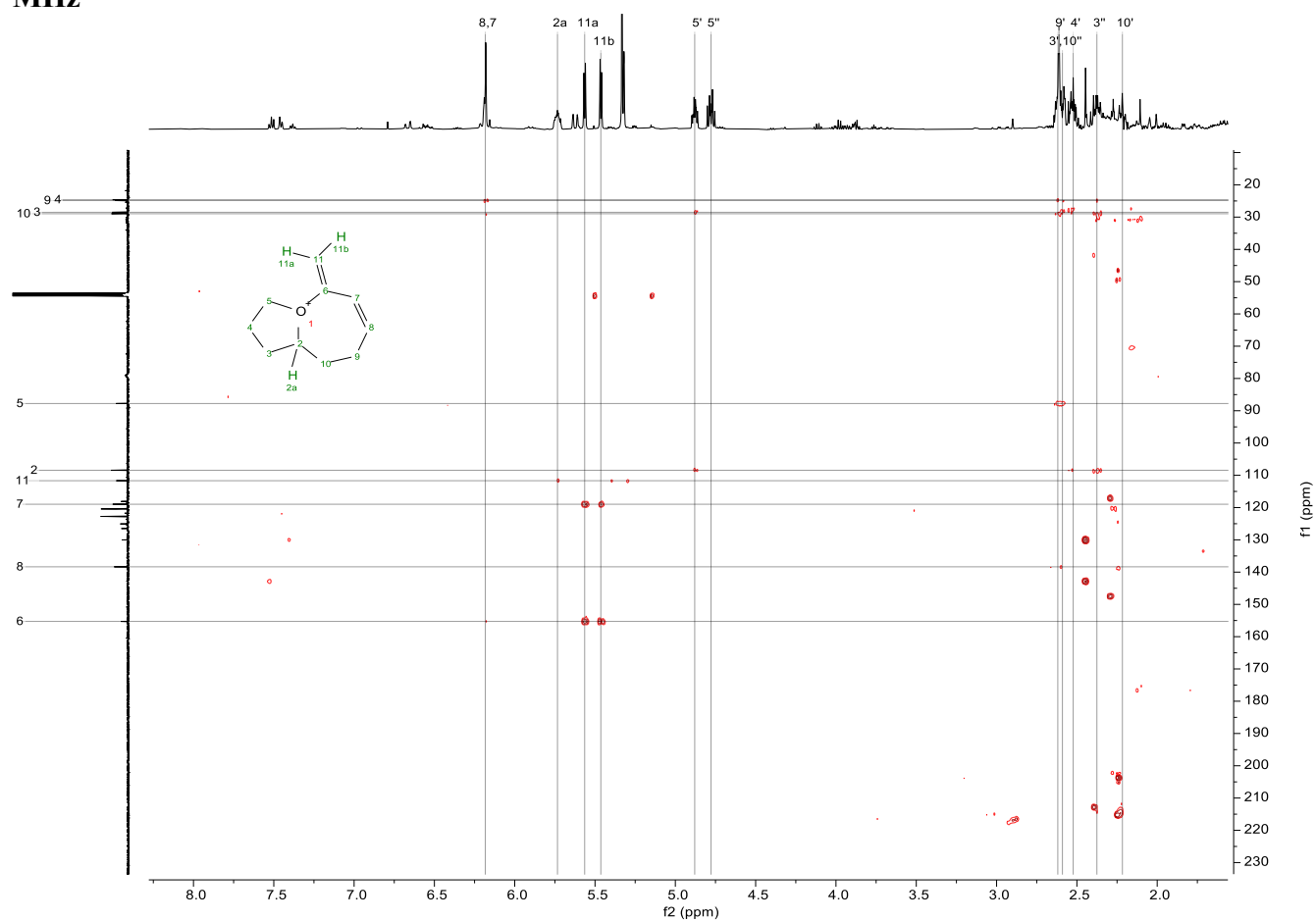
5-Methylene-2,3,5,8,9,9a-hexahydro-1*H*-furo[1,2-*a*]oxepin-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 62•Al(pftb)₄, CD₂Cl₂, ¹H-¹H COSY NMR, 500/500 MHz



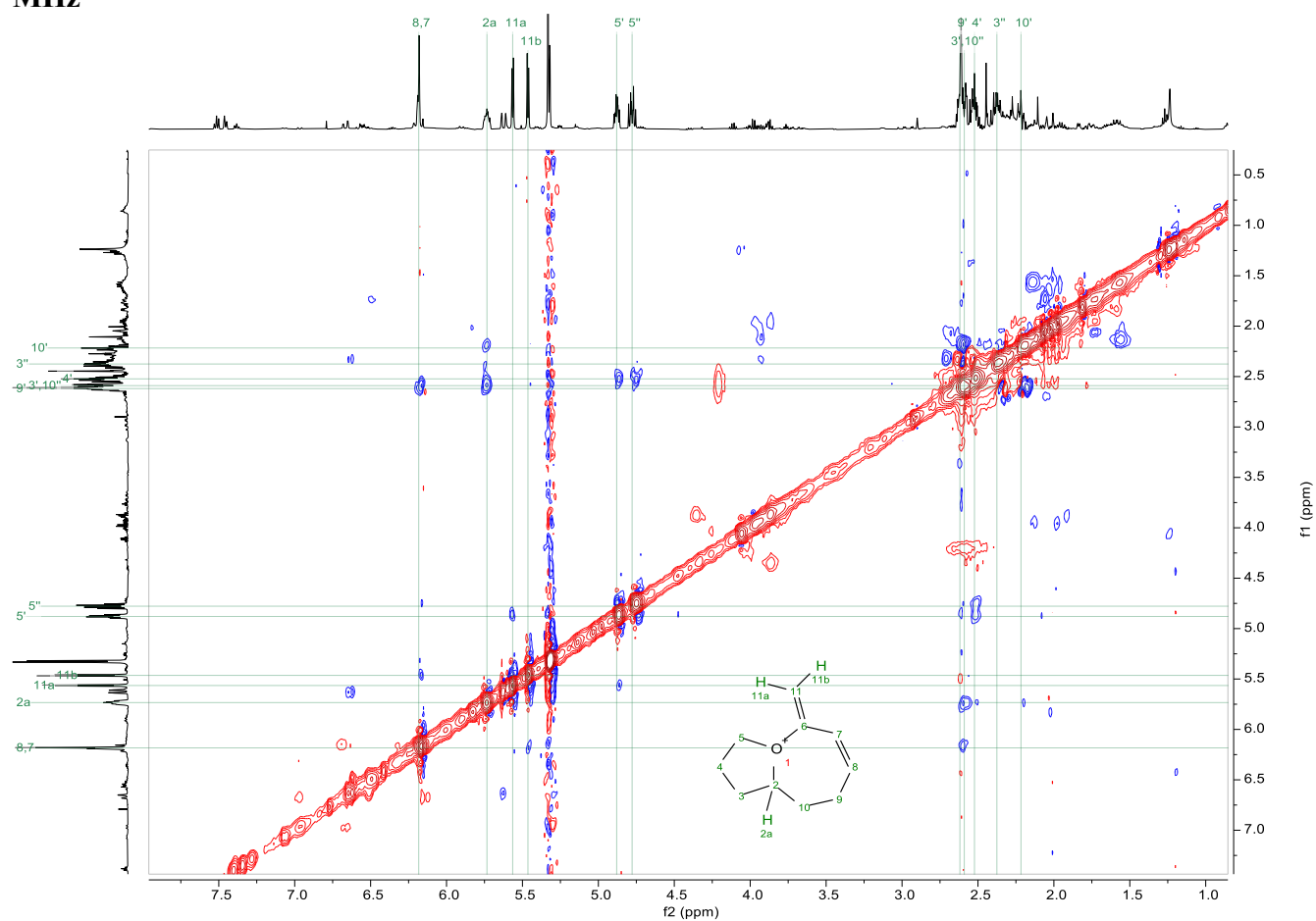
5-Methylene-2,3,5,8,9,9a-hexahydro-1*H*-furo[1,2-*a*]oxepin-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 62•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HSQC NMR, 500/125 MHz



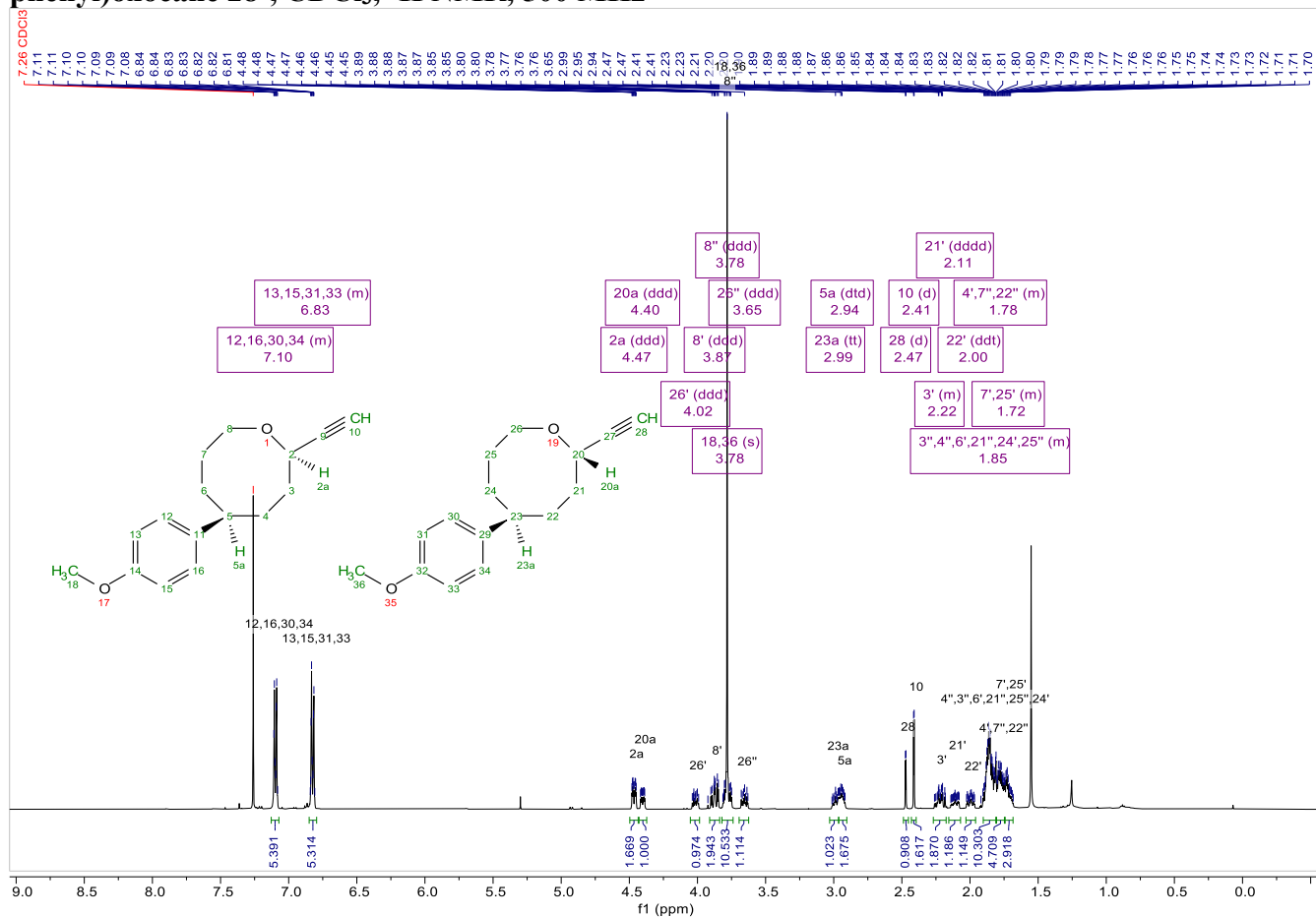
5-Methylene-2,3,5,8,9,9a-hexahydro-1*H*-furo[1,2-*a*]oxepin-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 62•Al(pftb)₄, CD₂Cl₂, ¹H-¹³C HMBC NMR, 500/125 MHz



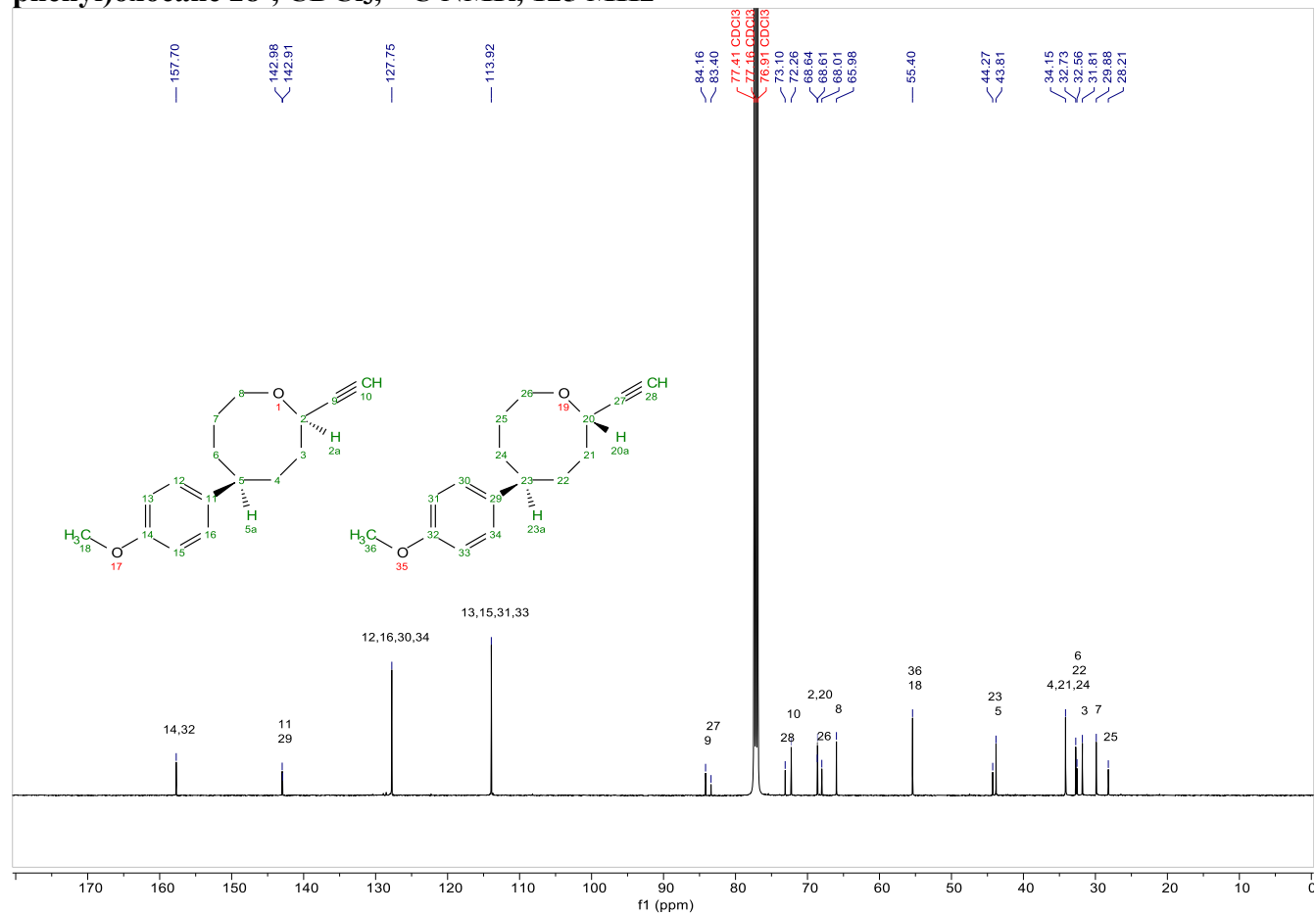
5-Methylene-2,3,5,8,9,9a-hexahydro-1*H*-furo[1,2-*a*]oxepin-4-ium tetrakis((1,1,1,3,3,3-hexafluoro 2-(trifluoromethyl)propan-2-yl)oxy)aluminate 62•Al(pftb)₄, CD₂Cl₂, ¹H-¹H NOESY NMR, 500/500 MHz



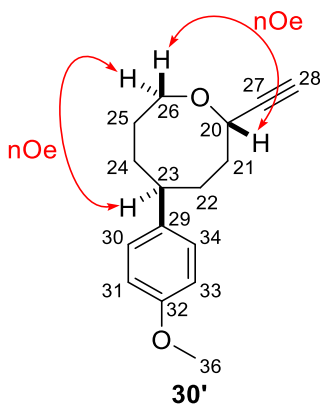
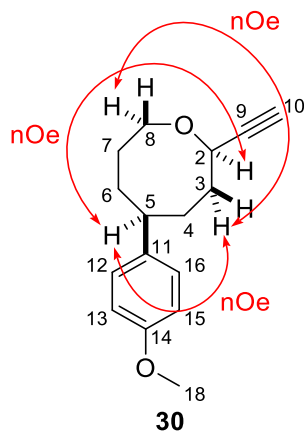
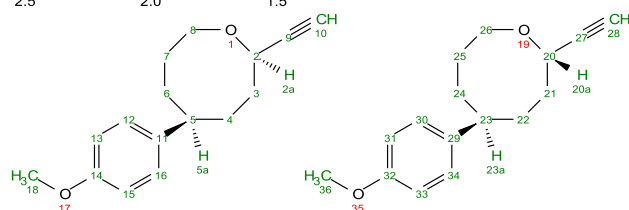
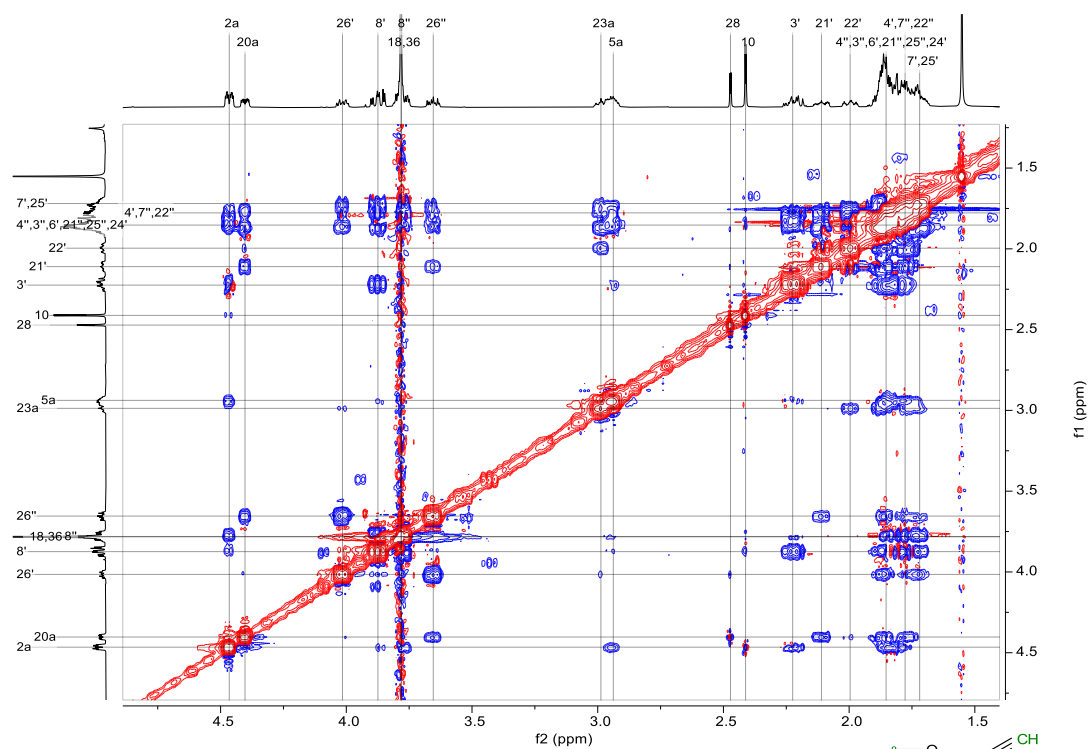
(2*R,5*S**)-2-Ethynyl-5-(4-methoxyphenyl)oxocane 28 and (2*S**,5*S**)-2-ethynyl-5-(4-methoxyphenyl)oxocane 28', CDCl₃, ¹H NMR, 500 MHz**



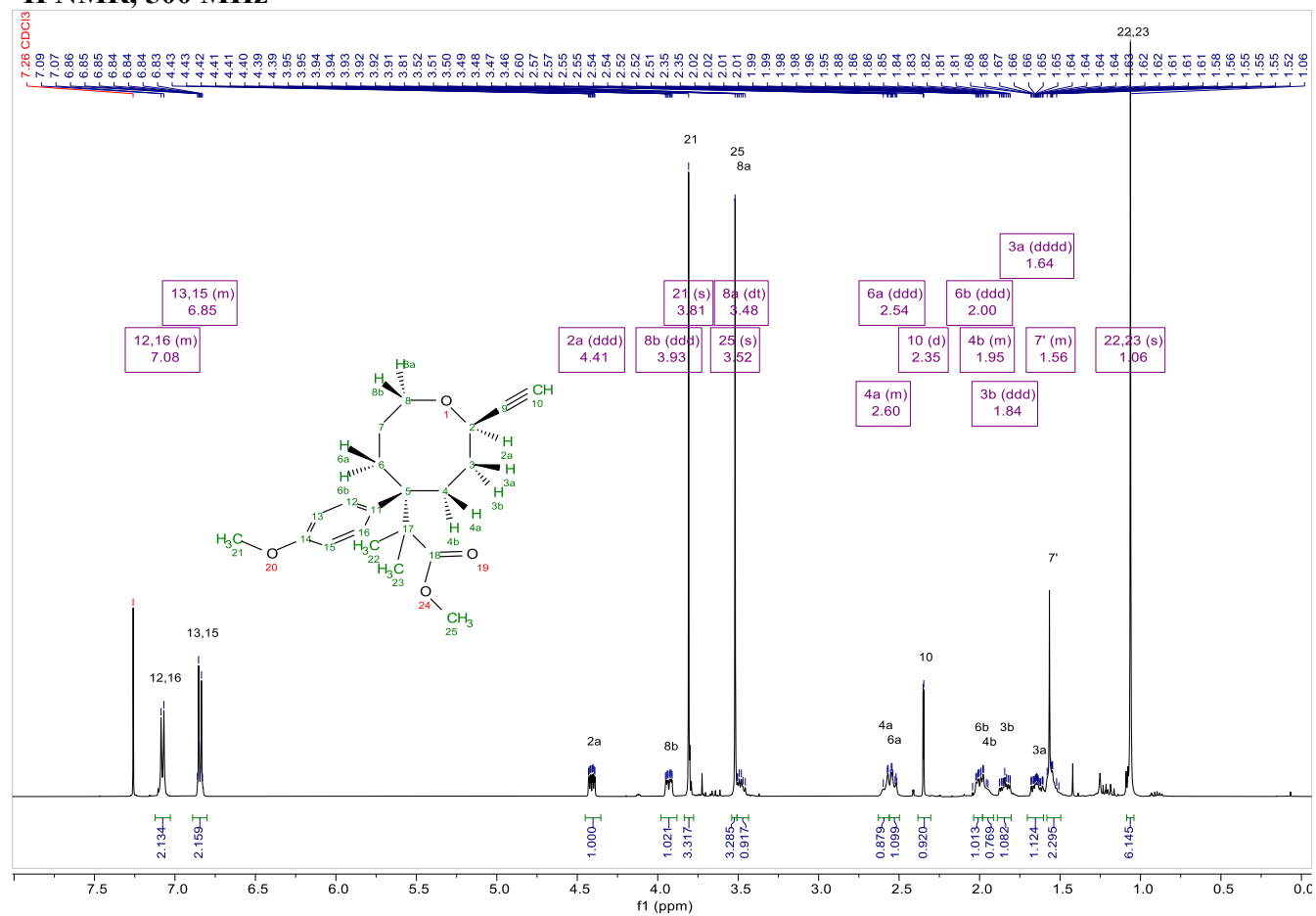
(2*R,5*S**)-2-Ethynyl-5-(4-methoxyphenyl)oxocane 28 and (2*S**,5*S**)-2-ethynyl-5-(4-methoxyphenyl)oxocane 28', CDCl₃, ¹³C NMR, 125 MHz**



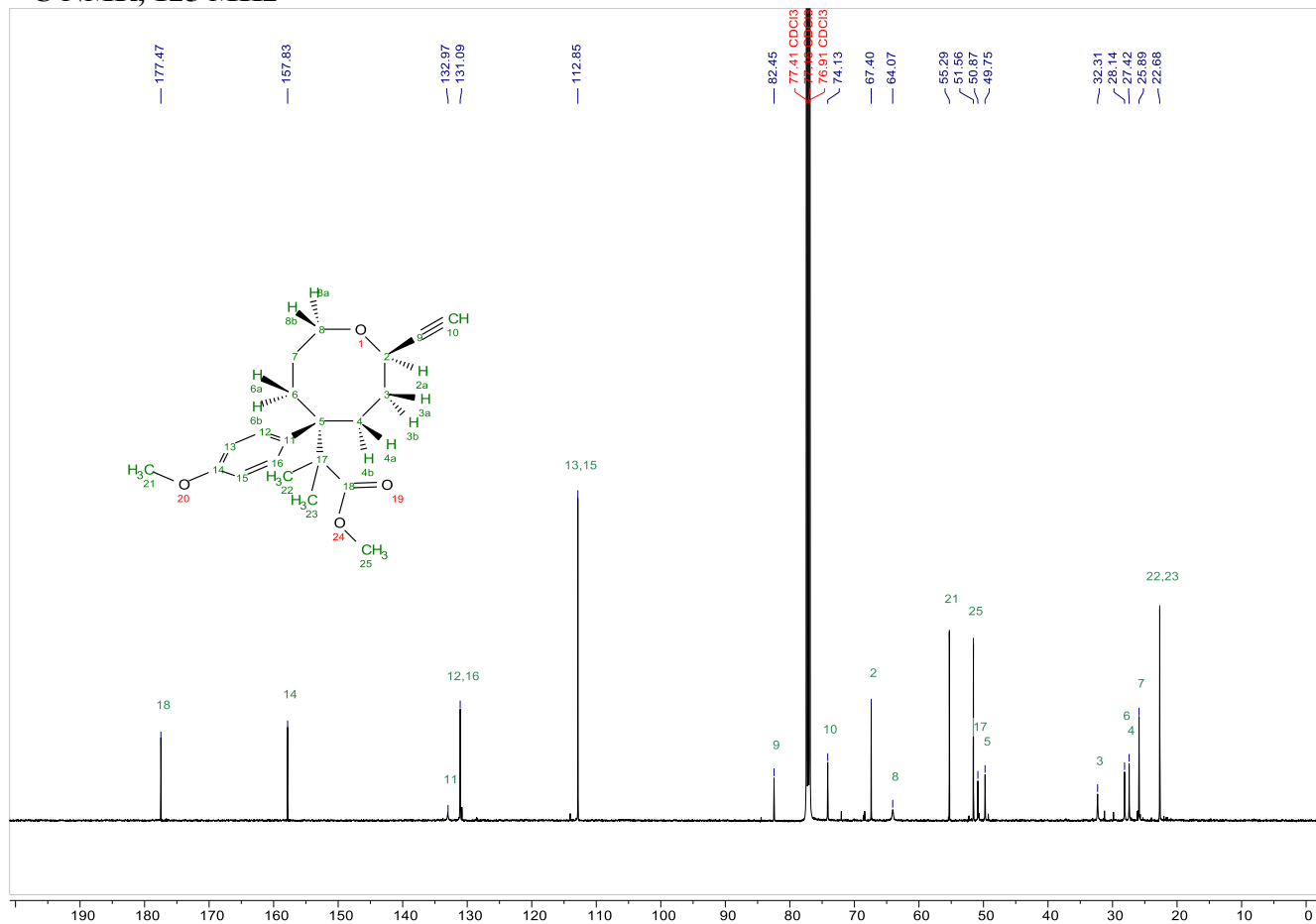
(2*R,5*S**)-2-Ethynyl-5-(4-methoxyphenyl)oxocane 28 and (2*S**,5*S**)-2-ethynyl-5-(4-methoxyphenyl)oxocane 28', CDCl₃, ¹H-¹H NOESY NMR, 500/500 MHz**



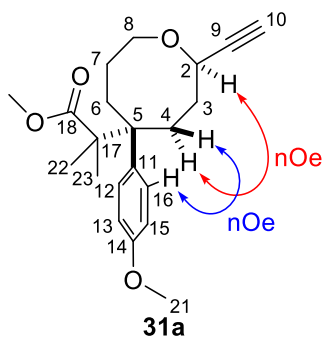
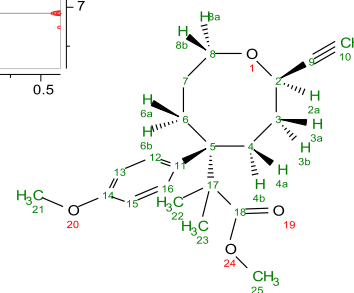
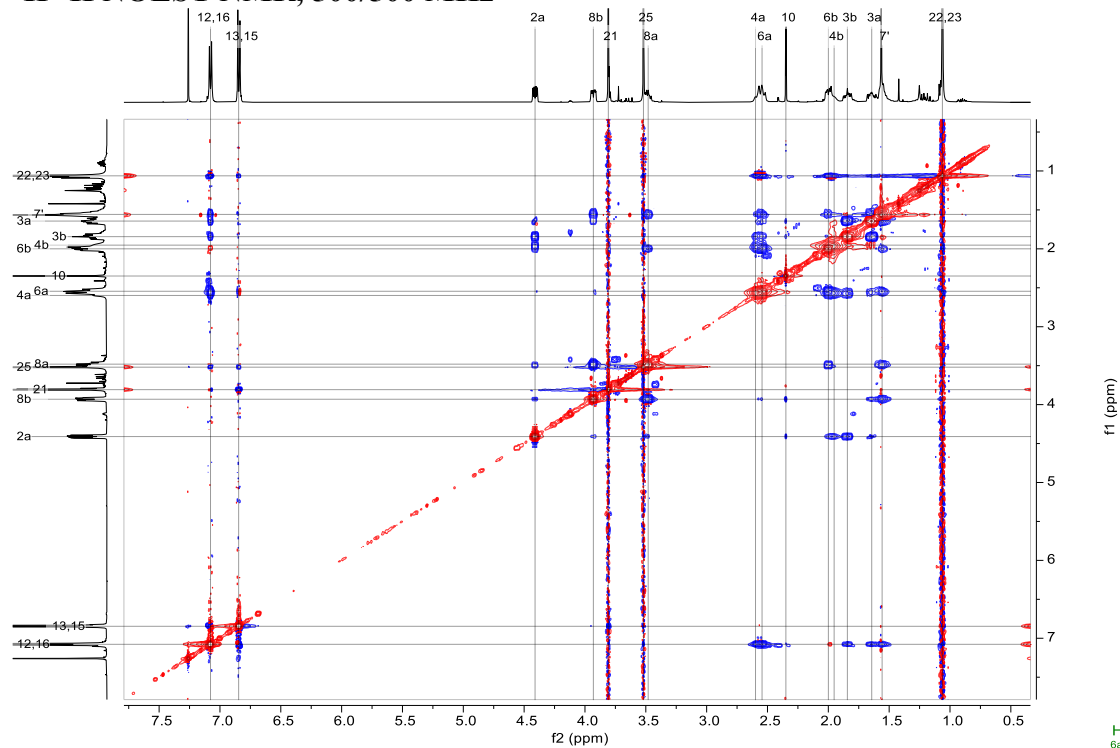
Methyl 2-((2*R,5*R**)-2-ethynyl-5-(4-methoxyphenyl)oxocan-5-yl)-2-methylpropanoate 29, CDCl₃,
¹H NMR, 500 MHz**



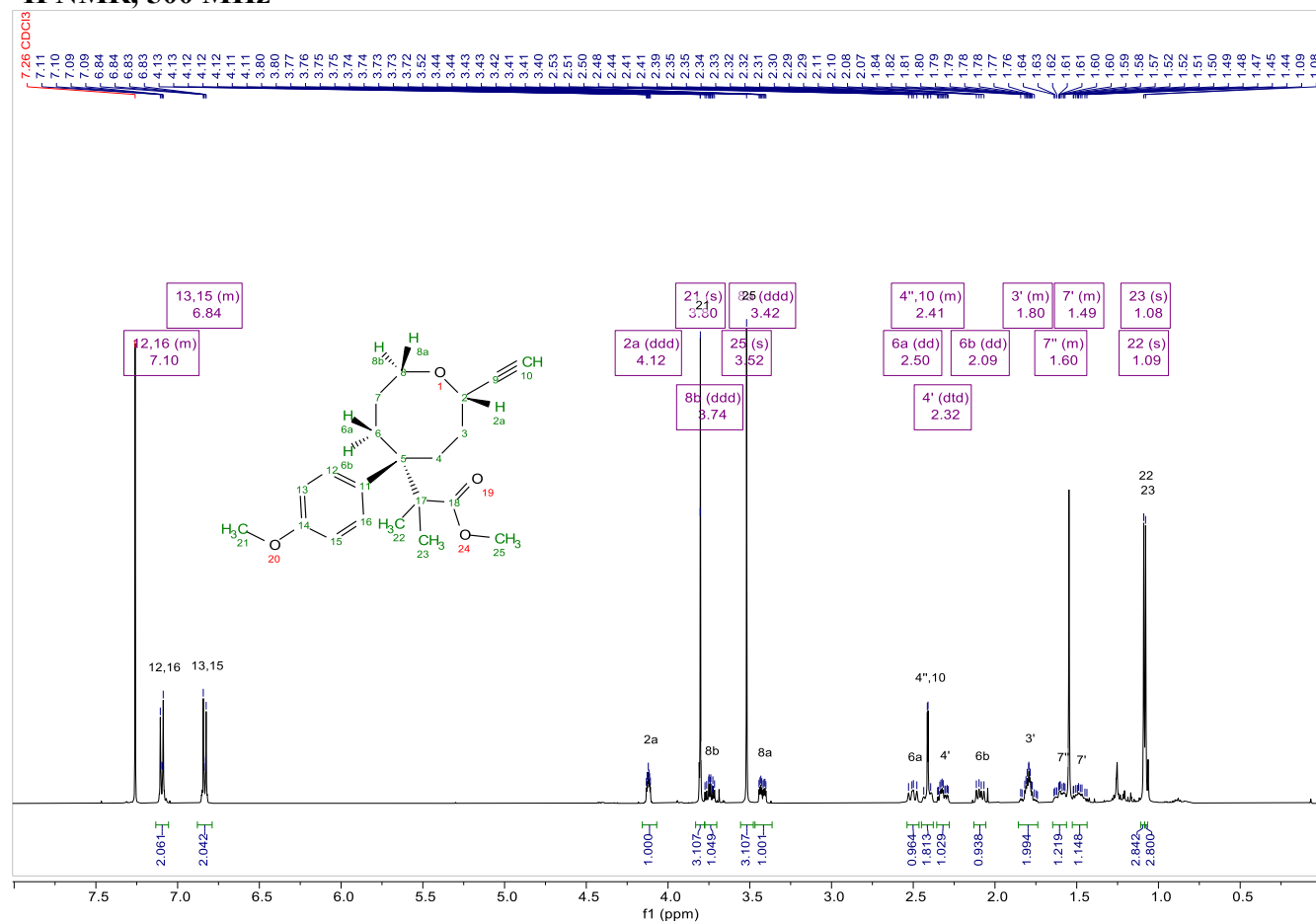
Methyl 2-((2*R**,5*R**)-2-ethynyl-5-(4-methoxyphenyl)oxocan-5-yl)-2-methylpropanoate 29, CDCl₃,
¹³C NMR, 125 MHz



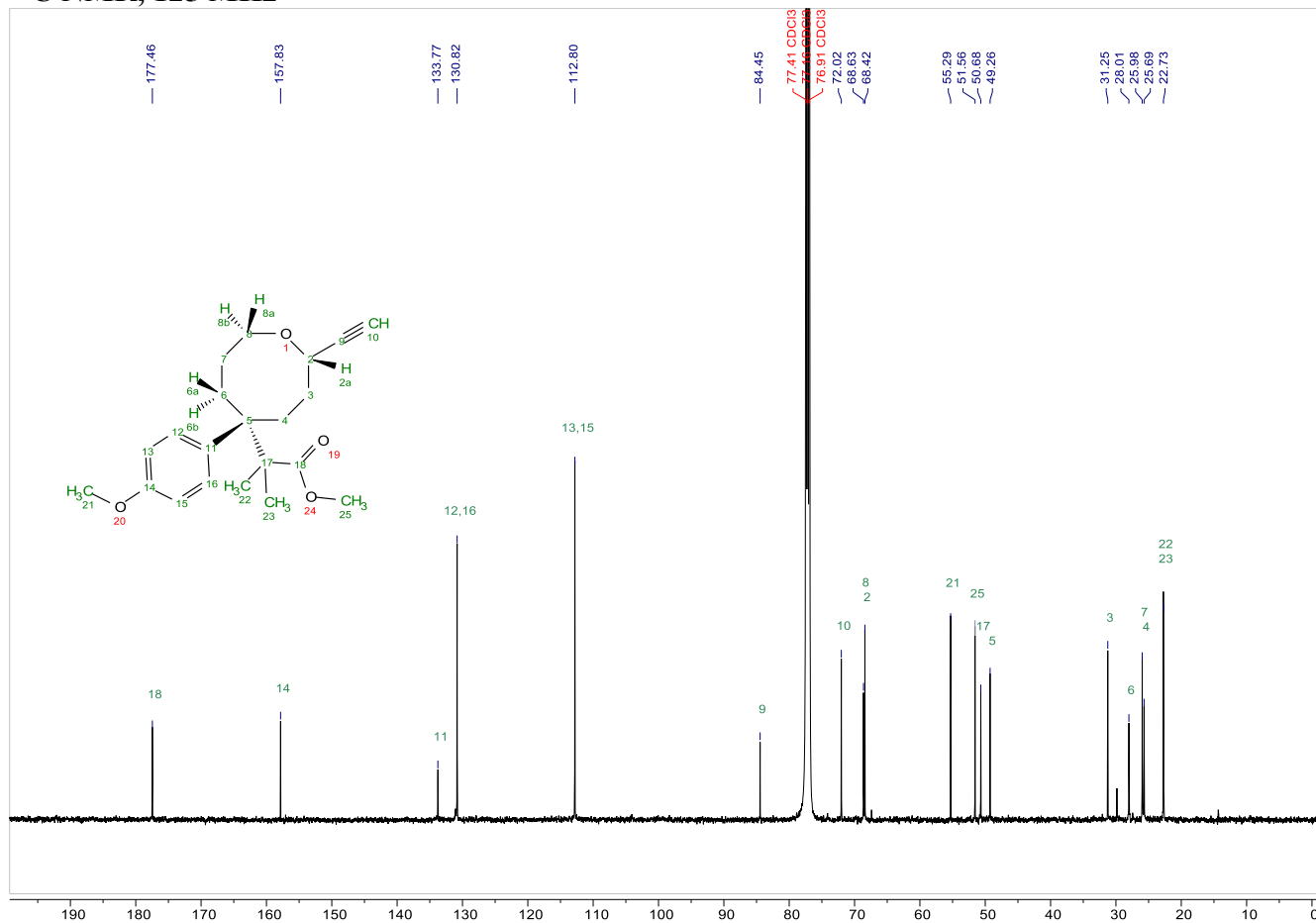
Methyl 2-((2*R,5*R**)-2-ethynyl-5-(4-methoxyphenyl)oxocan-5-yl)-2-methylpropanoate 20, CDCl₃,
¹H-¹H NOESY NMR, 500/500 MHz**



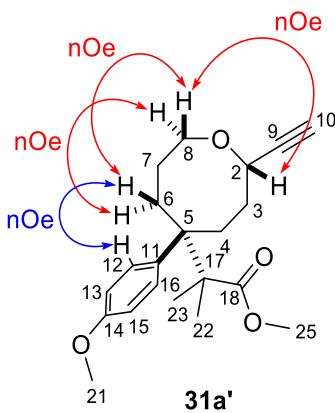
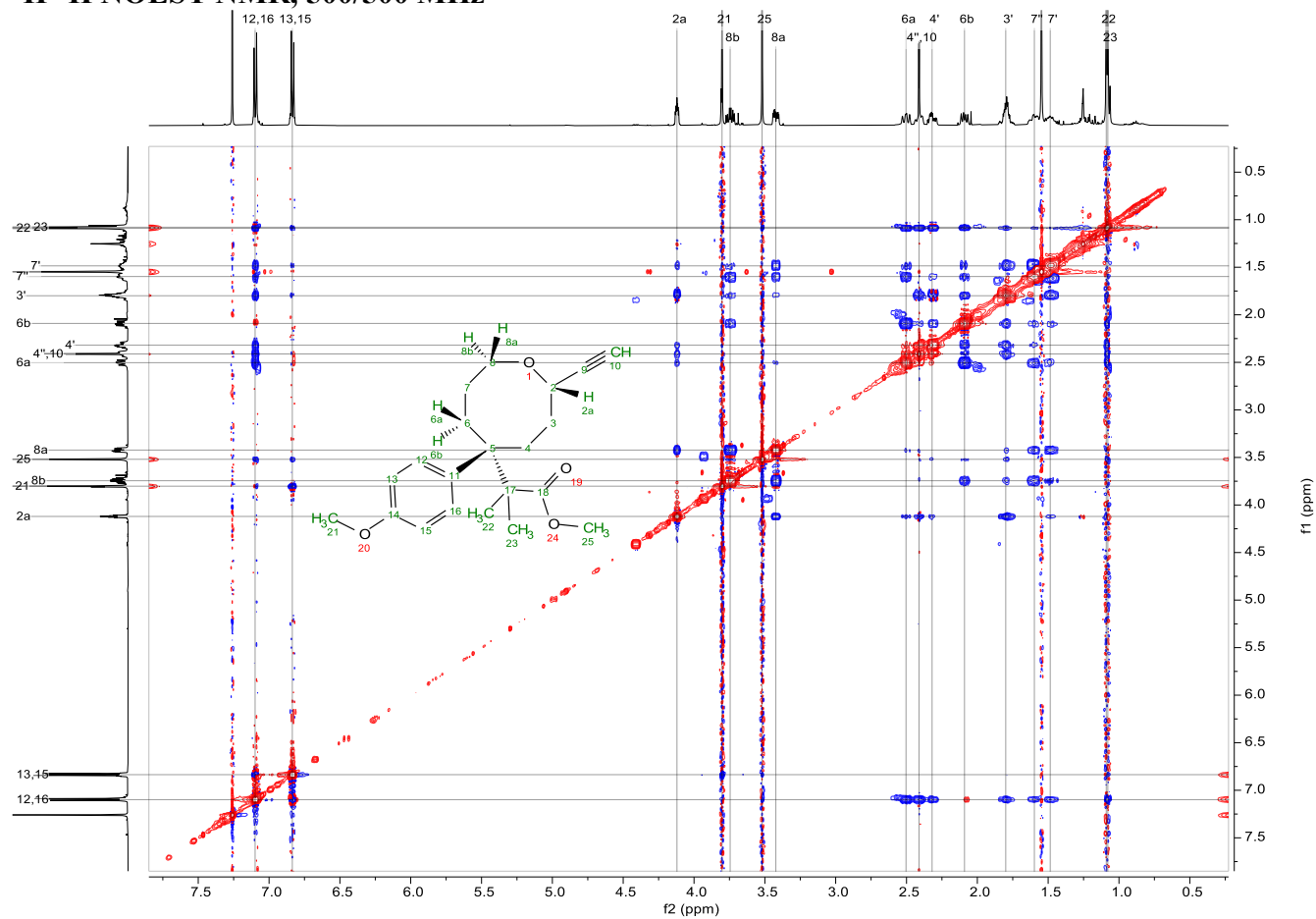
Methyl 2-((2*S,5*R**)-2-ethynyl-5-(4-methoxyphenyl)oxocan-5-yl)-2-methylpropanoate 29', CDCl₃,
¹H NMR, 500 MHz**



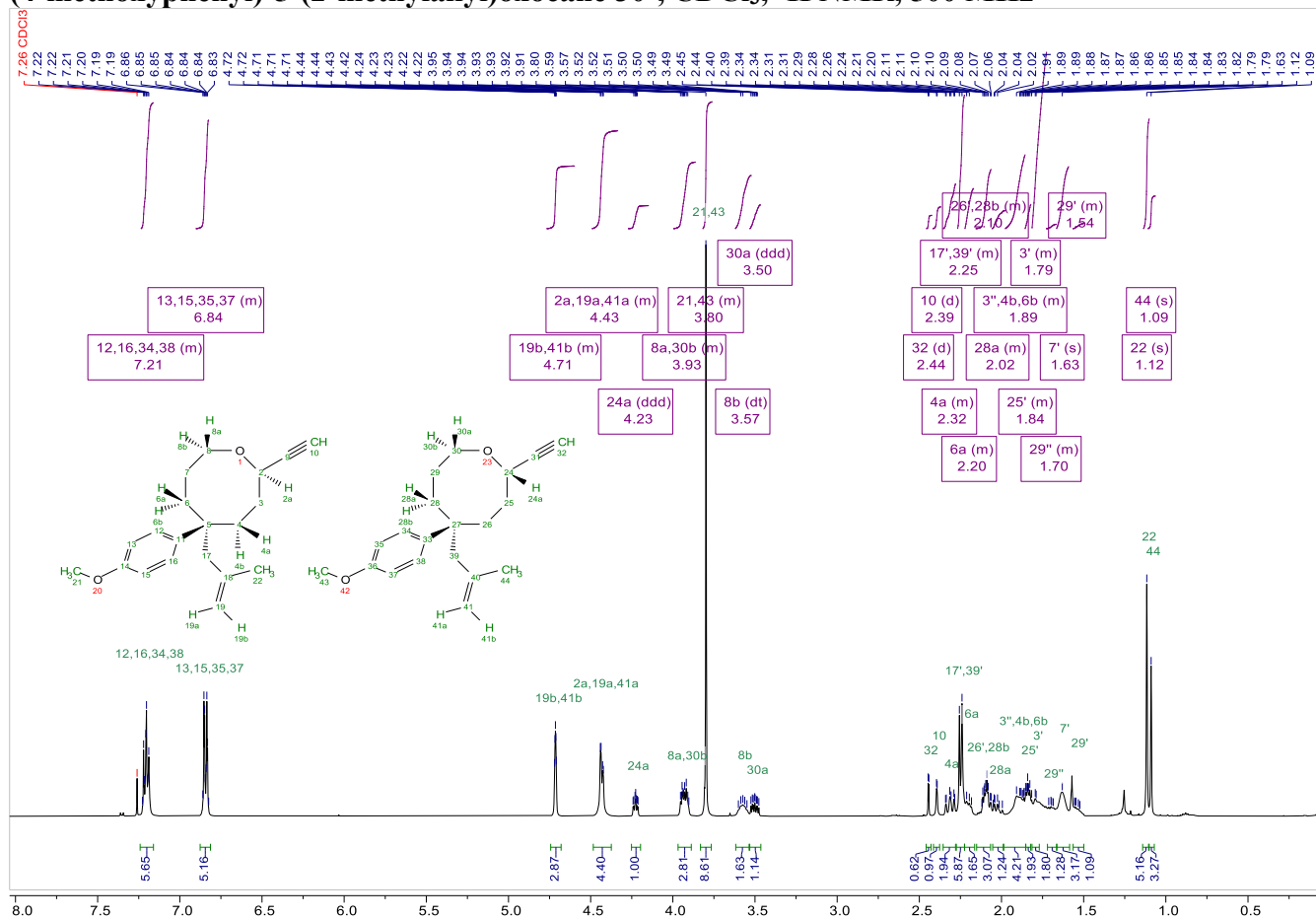
Methyl 2-((2*S**,5*R**)-2-ethynyl-5-(4-methoxyphenyl)oxocan-5-yl)-2-methylpropanoate 29', CDCl₃,
¹³C NMR, 125 MHz



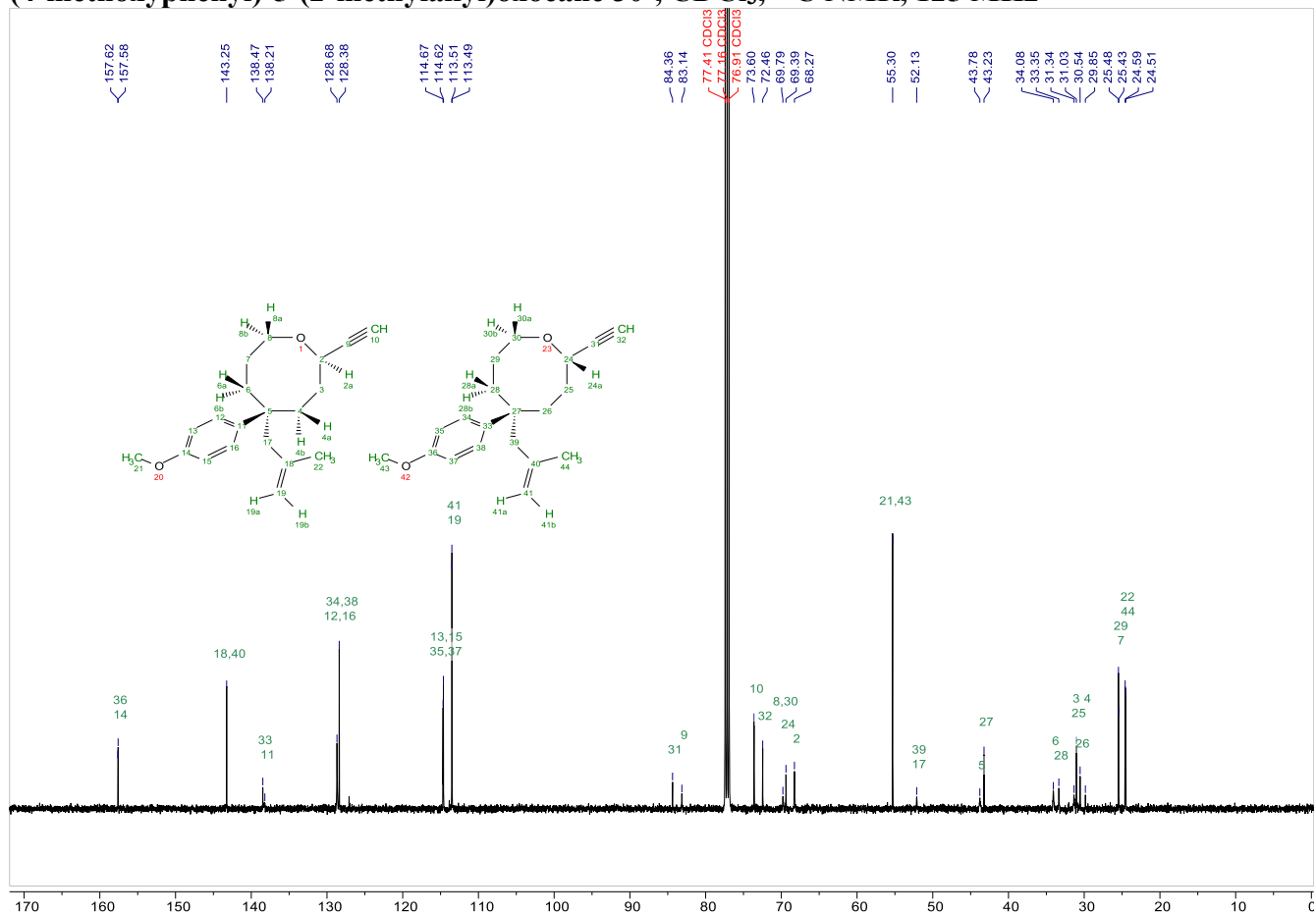
Methyl 2-((2*S,5*R**)-2-ethynyl-5-(4-methoxyphenyl)oxocan-5-yl)-2-methylpropanoate 29', CDCl₃,
¹H-¹H NOESY NMR, 500/500 MHz**



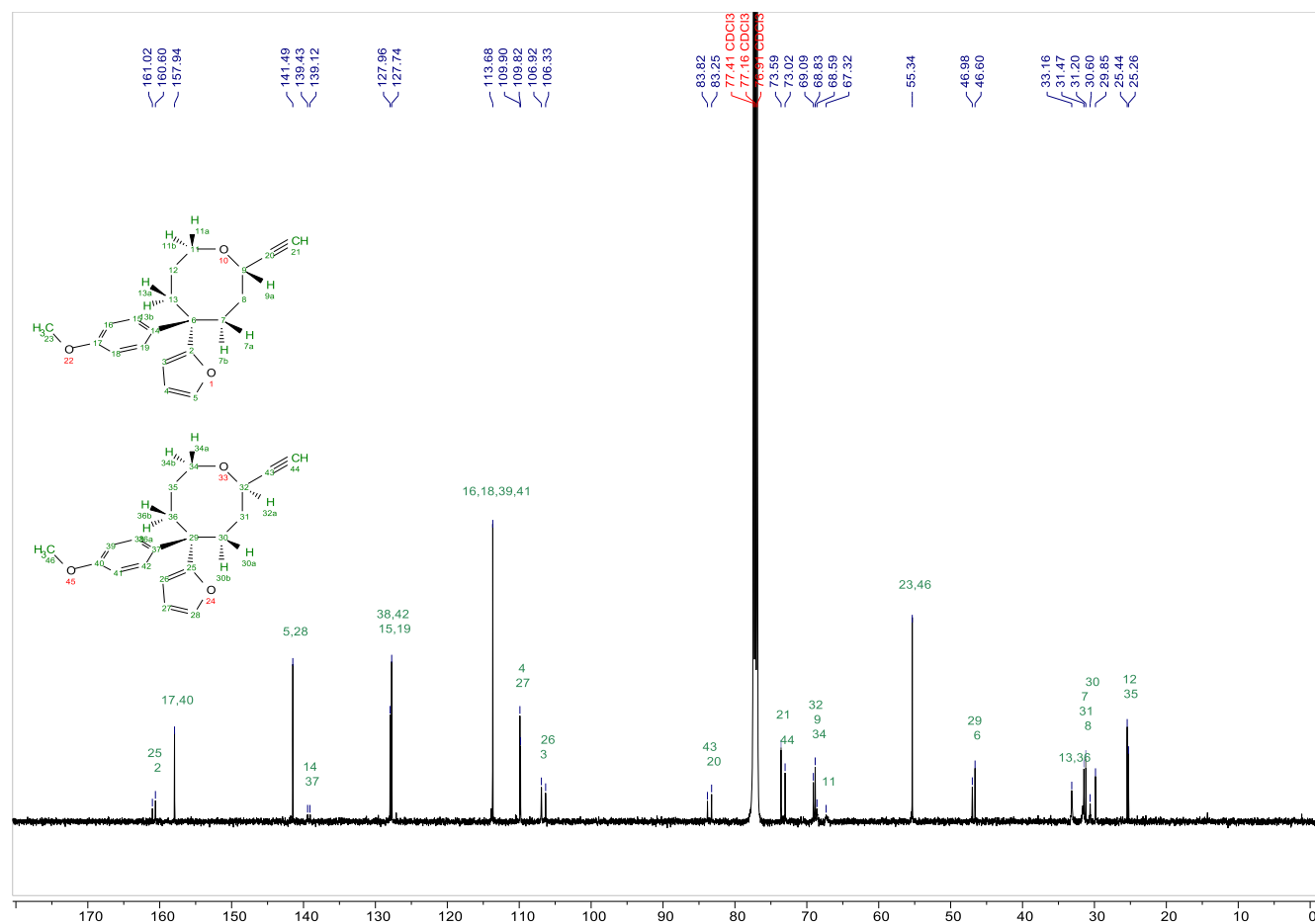
(2*R,5*S**)-2-Ethynyl-5-(4-methoxyphenyl)-5-(2-methylallyl)oxocane 20 and (2*S**,5*S**)-2-ethynyl-5-(4-methoxyphenyl)-5-(2-methylallyl)oxocane 30', CDCl₃, ¹H NMR, 500 MHz**



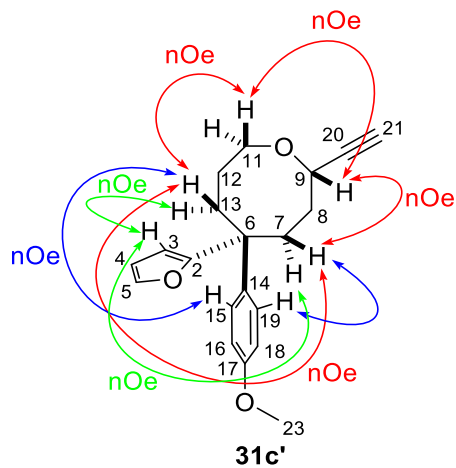
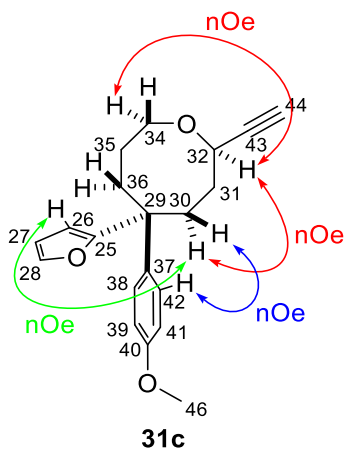
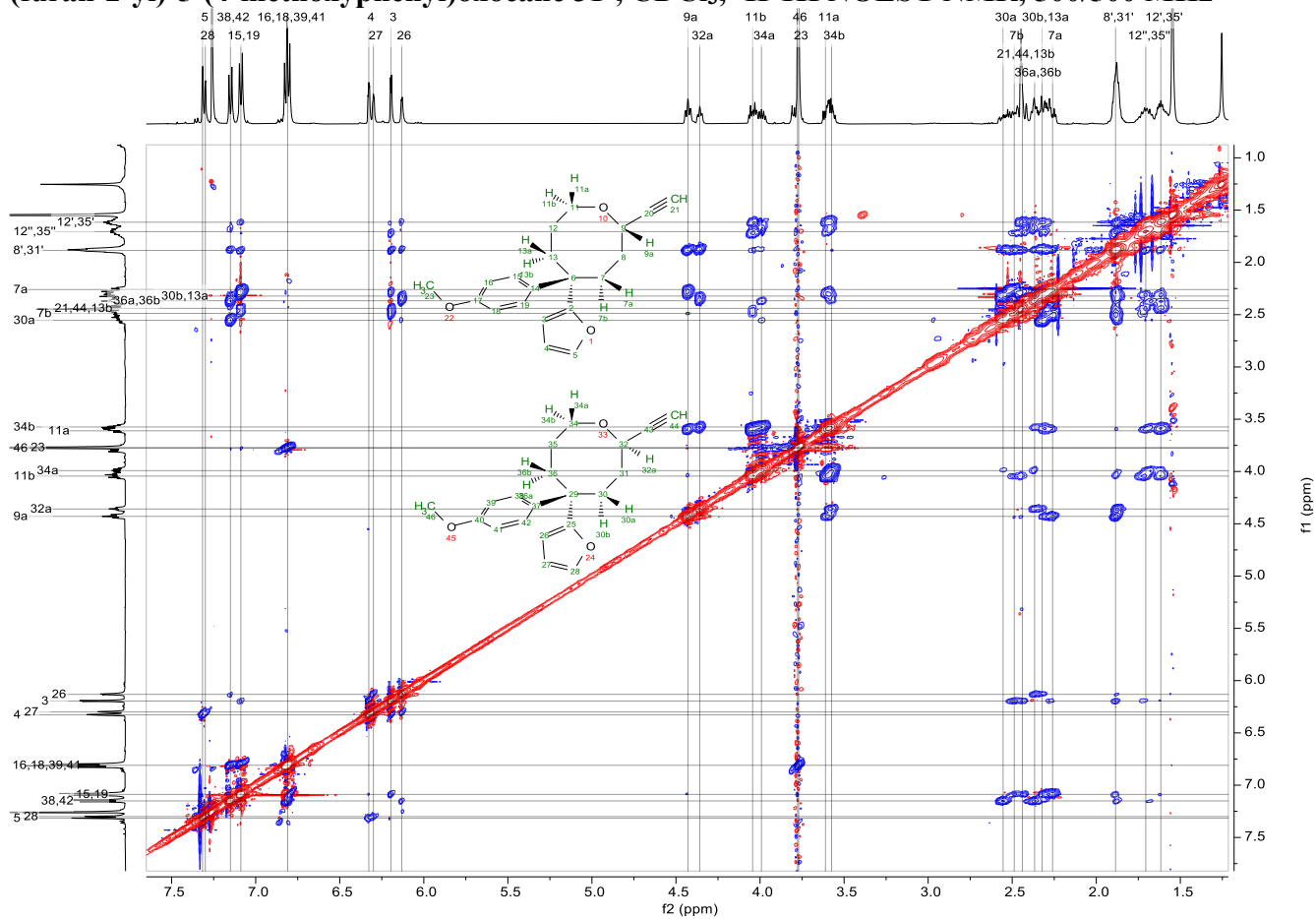
(2*R,5*S**)-2-Ethynyl-5-(4-methoxyphenyl)-5-(2-methylallyl)oxocane 30 and (2*S**,5*S**)-2-ethynyl-5-(4-methoxyphenyl)-5-(2-methylallyl)oxocane 30', CDCl₃, ¹³C NMR, 125 MHz**



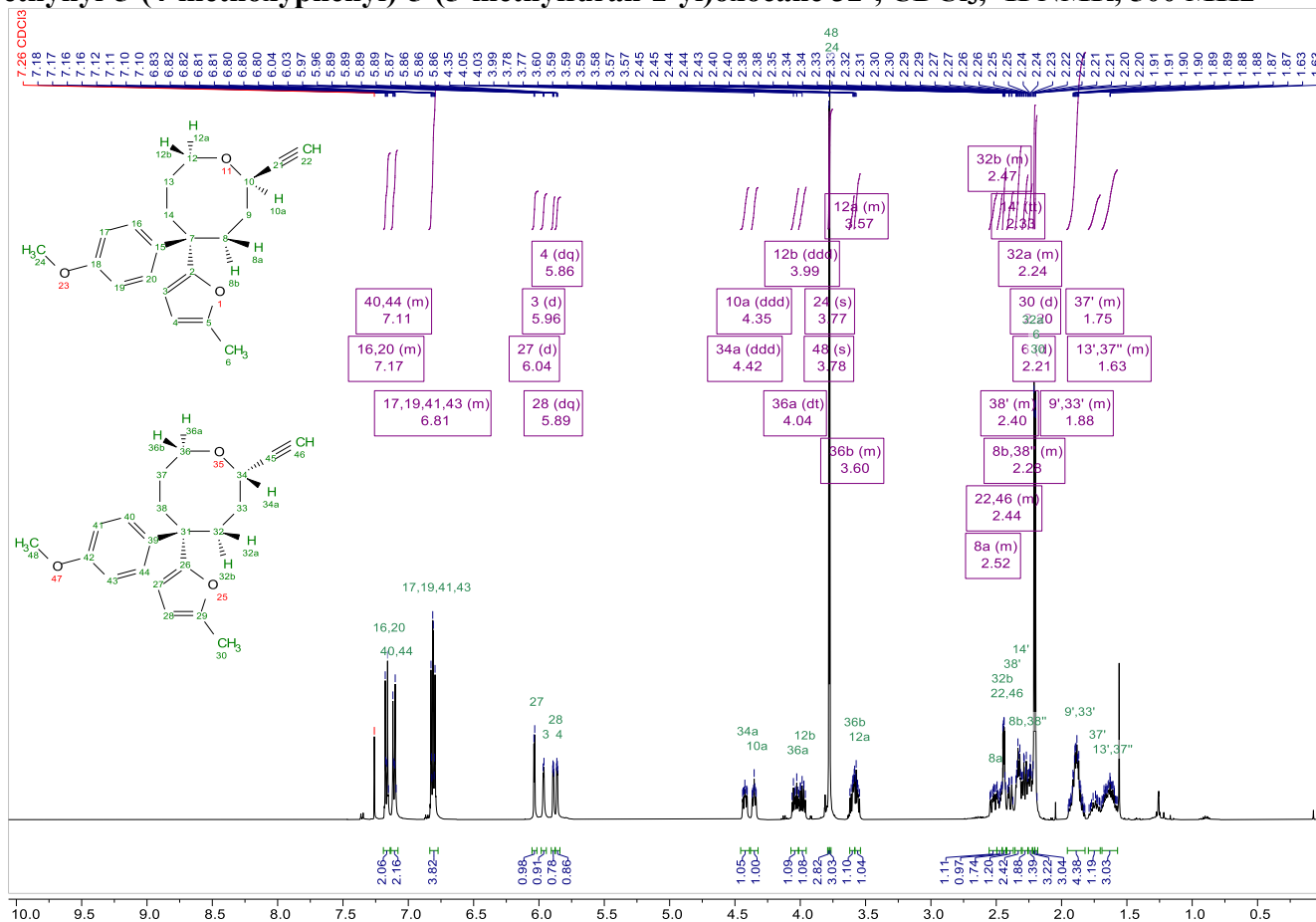
(2*R,5*R**)-2-Ethynyl-5-(furan-2-yl)-5-(4-methoxyphenyl)oxocane 31 and (2*S**,5*R**)-2-ethynyl-5-(furan-2-yl)-5-(4-methoxyphenyl)oxocane 31', CDCl₃, ¹³C NMR, 125 MHz**



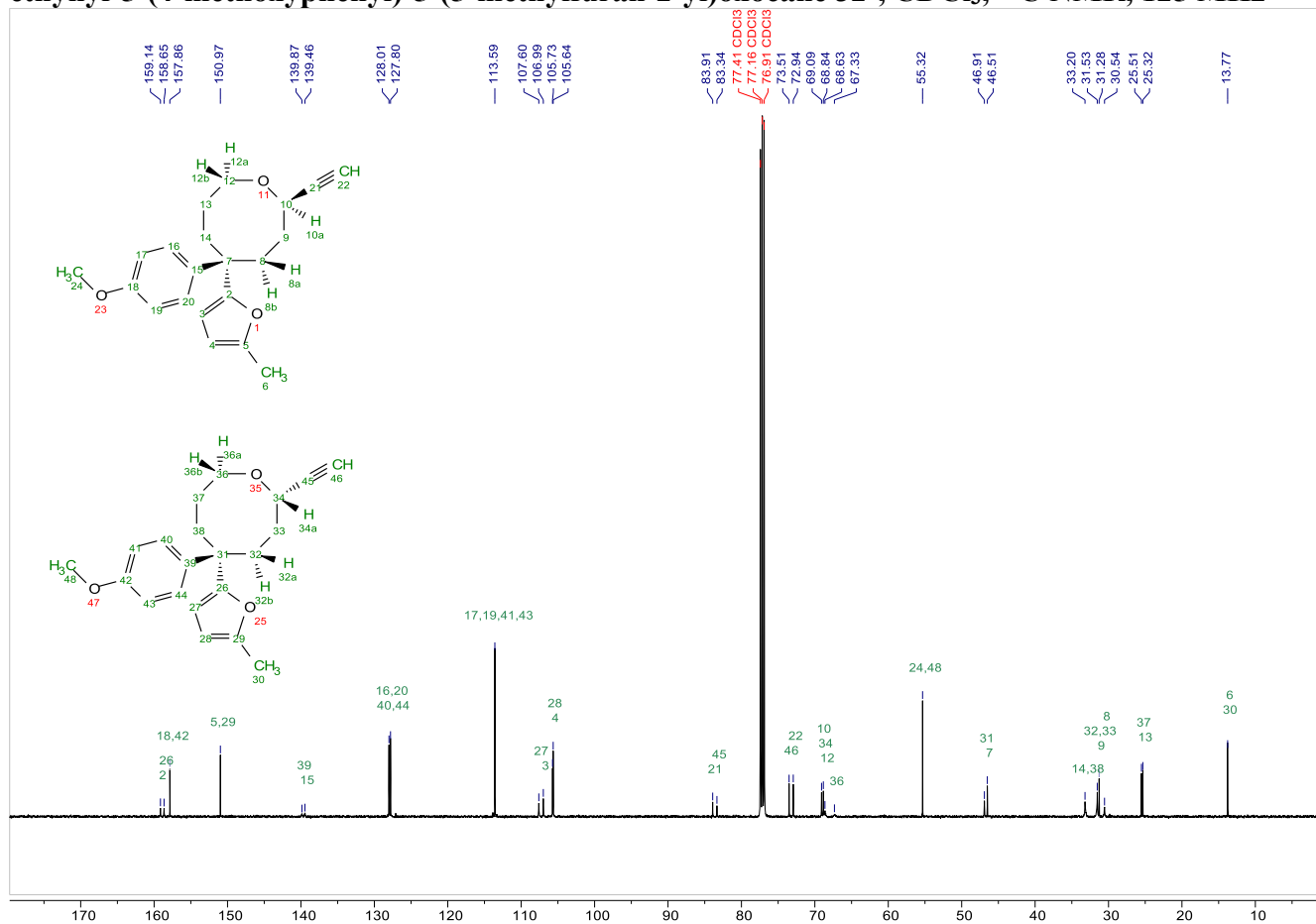
(2*R,5*R**)-2-Ethynyl-5-(furan-2-yl)-5-(4-methoxyphenyl)oxocane 31 and (2*S**,5*R**)-2-ethynyl-5-(furan-2-yl)-5-(4-methoxyphenyl)oxocane 31', CDCl₃, ¹H-1H NOESY NMR, 500/500 MHz**



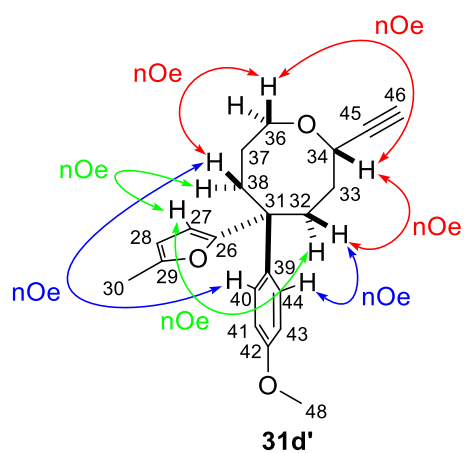
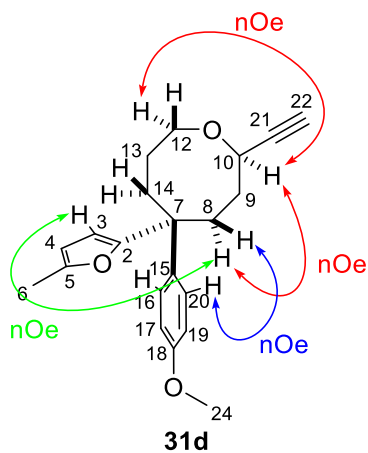
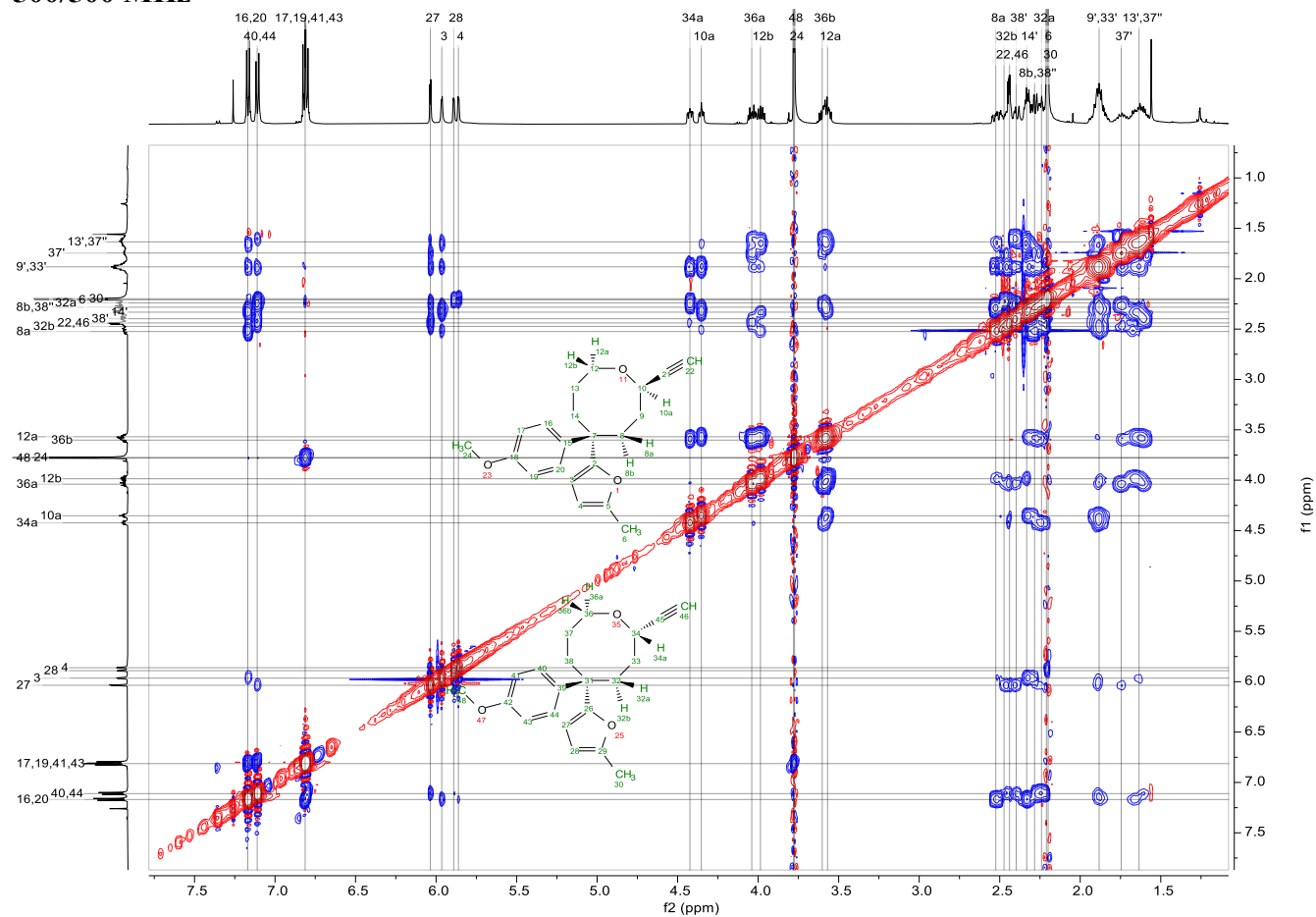
(2*R,5*R**)-2-ethynyl-5-(4-methoxyphenyl)-5-(5-methylfuran-2-yl)oxocane 32 and (2*S**,5*R**)-2-ethynyl-5-(4-methoxyphenyl)-5-(5-methylfuran-2-yl)oxocane 32', CDCl₃, ¹H NMR, 500 MHz**



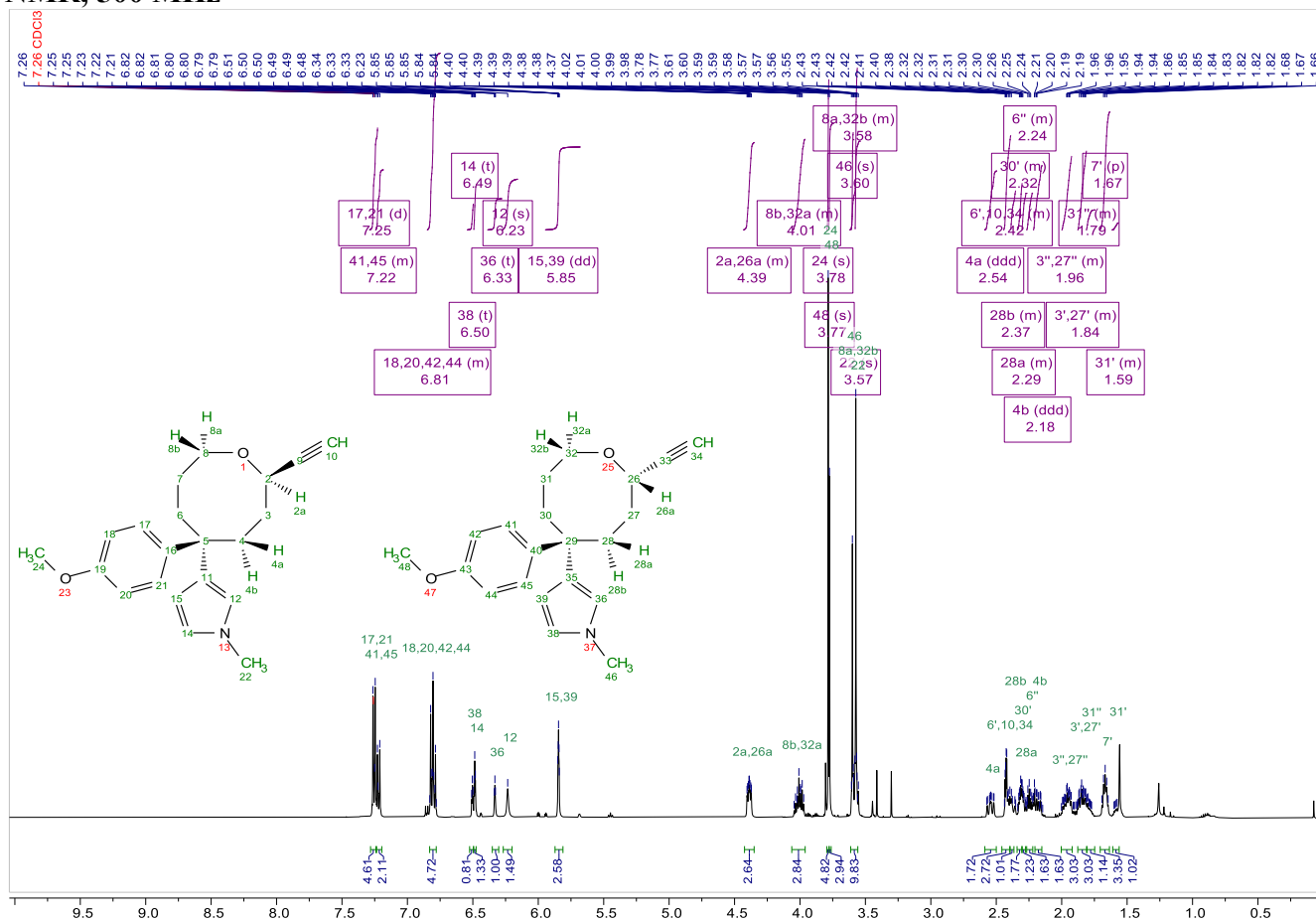
(2*R,5*R**)-2-ethynyl-5-(4-methoxyphenyl)-5-(5-methylfuran-2-yl)oxocane 32 and (2*S**,5*R**)-2-ethynyl-5-(4-methoxyphenyl)-5-(5-methylfuran-2-yl)oxocane 32', CDCl₃, ¹³C NMR, 125 MHz**



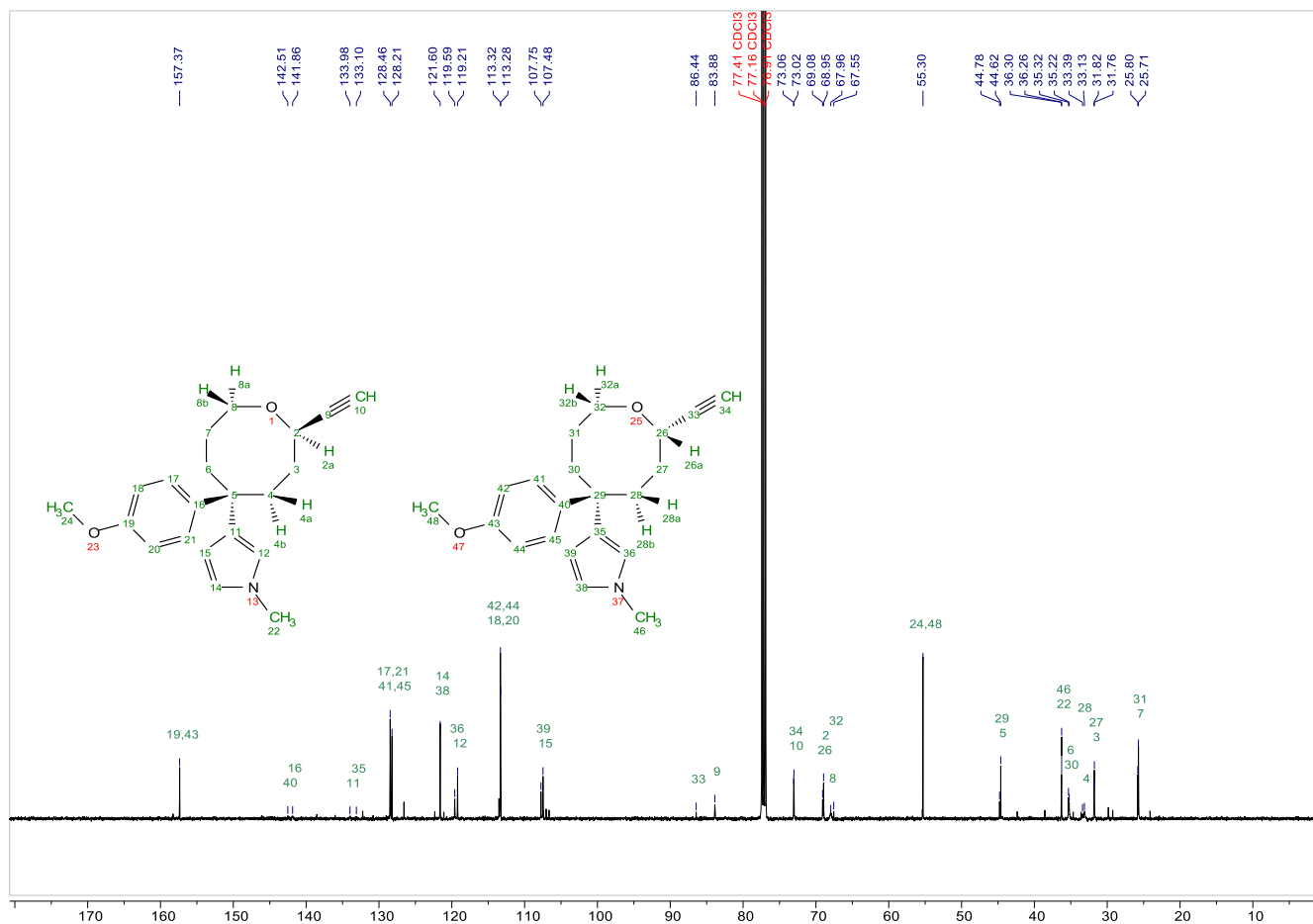
(2*R,5*R**)-2-ethynyl-5-(4-methoxyphenyl)-5-(5-methylfuran-2-yl)oxocane 32 and (2*S**,5*R**)-2-ethynyl-5-(4-methoxyphenyl)-5-(5-methylfuran-2-yl)oxocane 32', CDCl₃, ¹H-¹H NOESY NMR, 500/500 MHz**



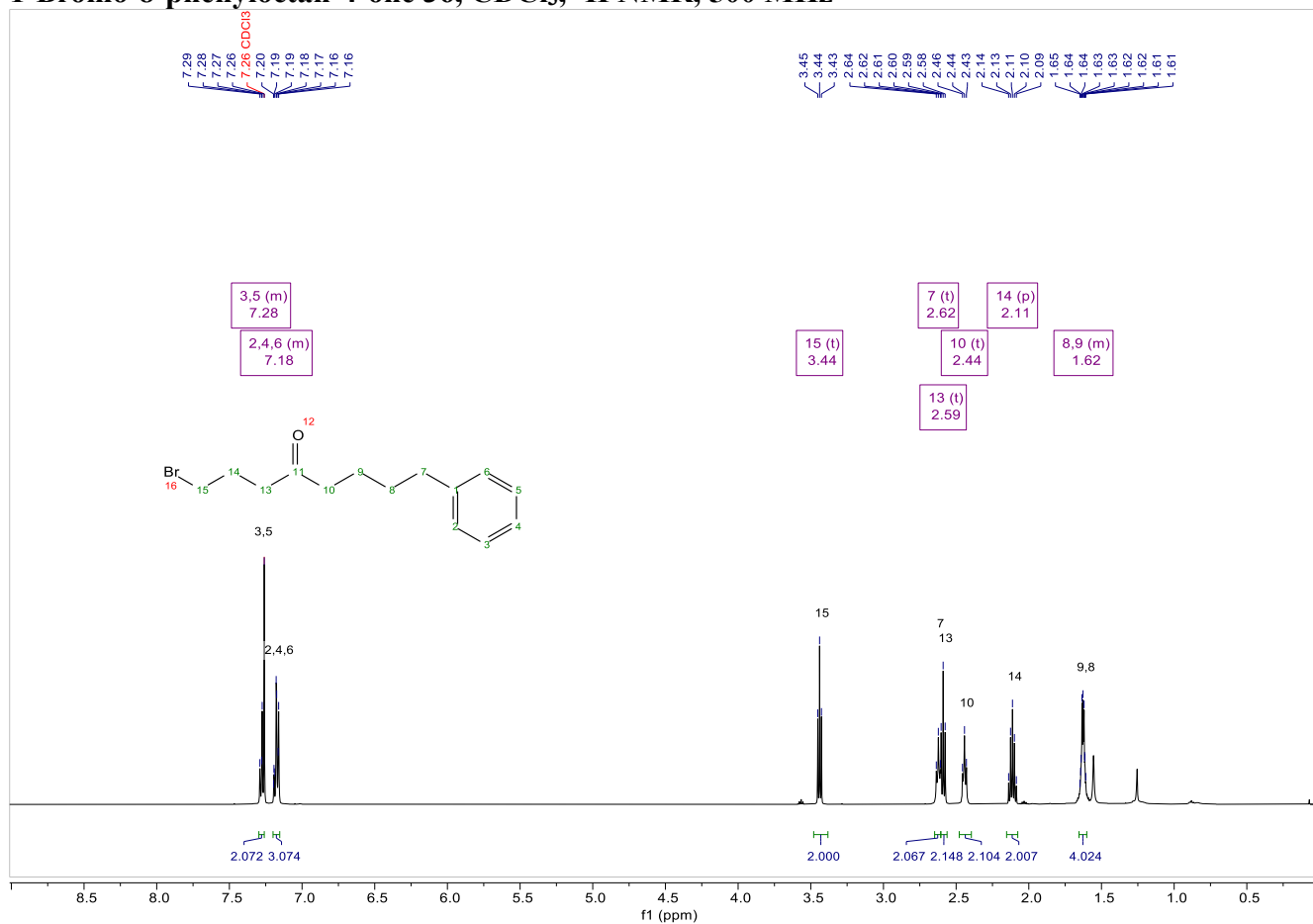
3-((2*R,5*R**)-2-Ethynyl-5-(4-methoxyphenyl)oxocan-5-yl)-1-methyl-1*H*-pyrrole 33 and 3-((2*S**,5*R**)-2-Ethynyl-5-(4-methoxyphenyl)oxocan-5-yl)-1-methyl-1*H*-pyrrole 33', CDCl₃, ¹H NMR, 500 MHz**



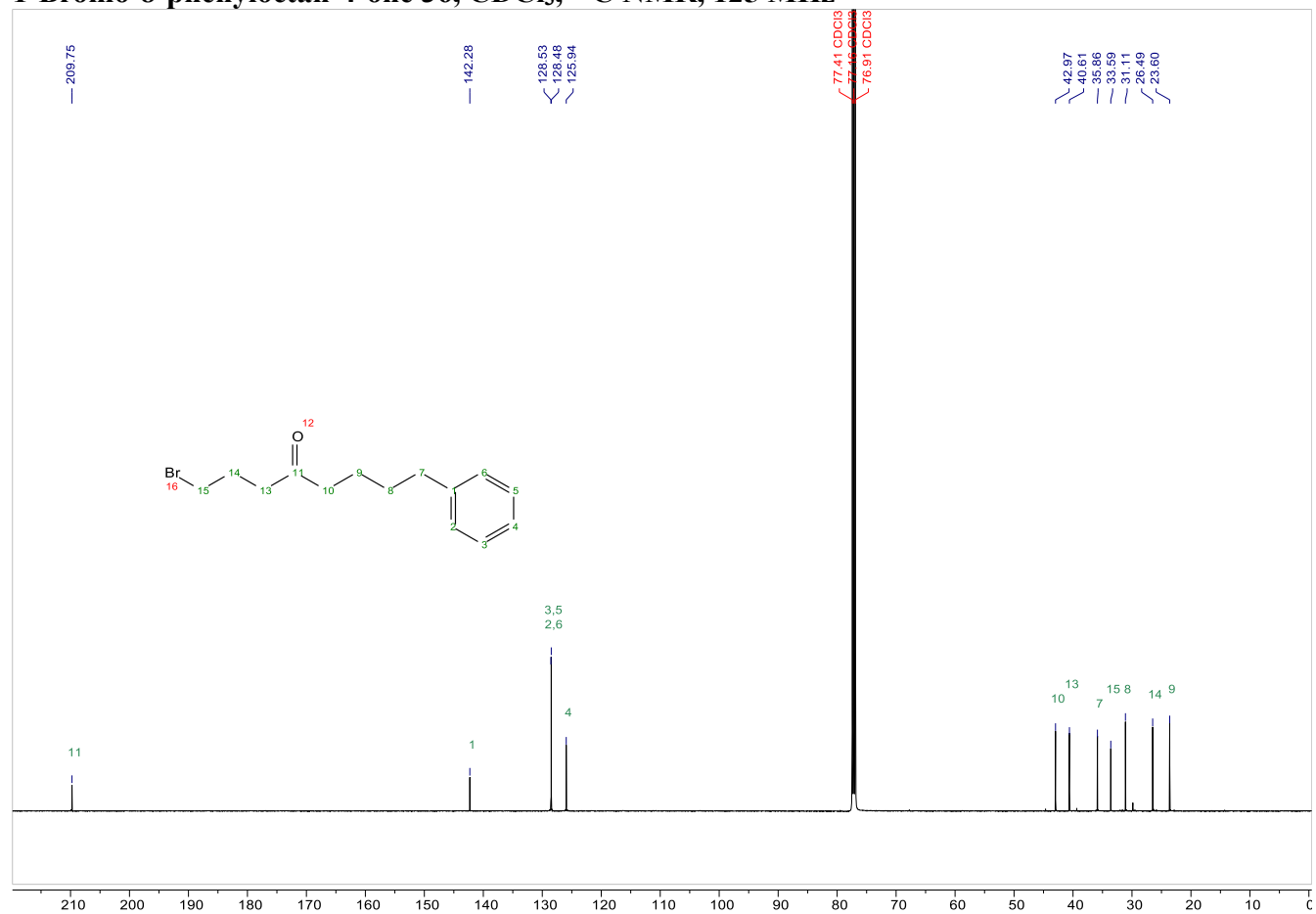
3-((2*R,5*R**)-2-Ethynyl-5-(4-methoxyphenyl)oxocan-5-yl)-1-methyl-1*H*-pyrrole 33e and 3-((2*S**,5*R**)-2-Ethynyl-5-(4-methoxyphenyl)oxocan-5-yl)-1-methyl-1*H*-pyrrole 33e', CDCl₃, ¹³C NMR, 125 MHz**



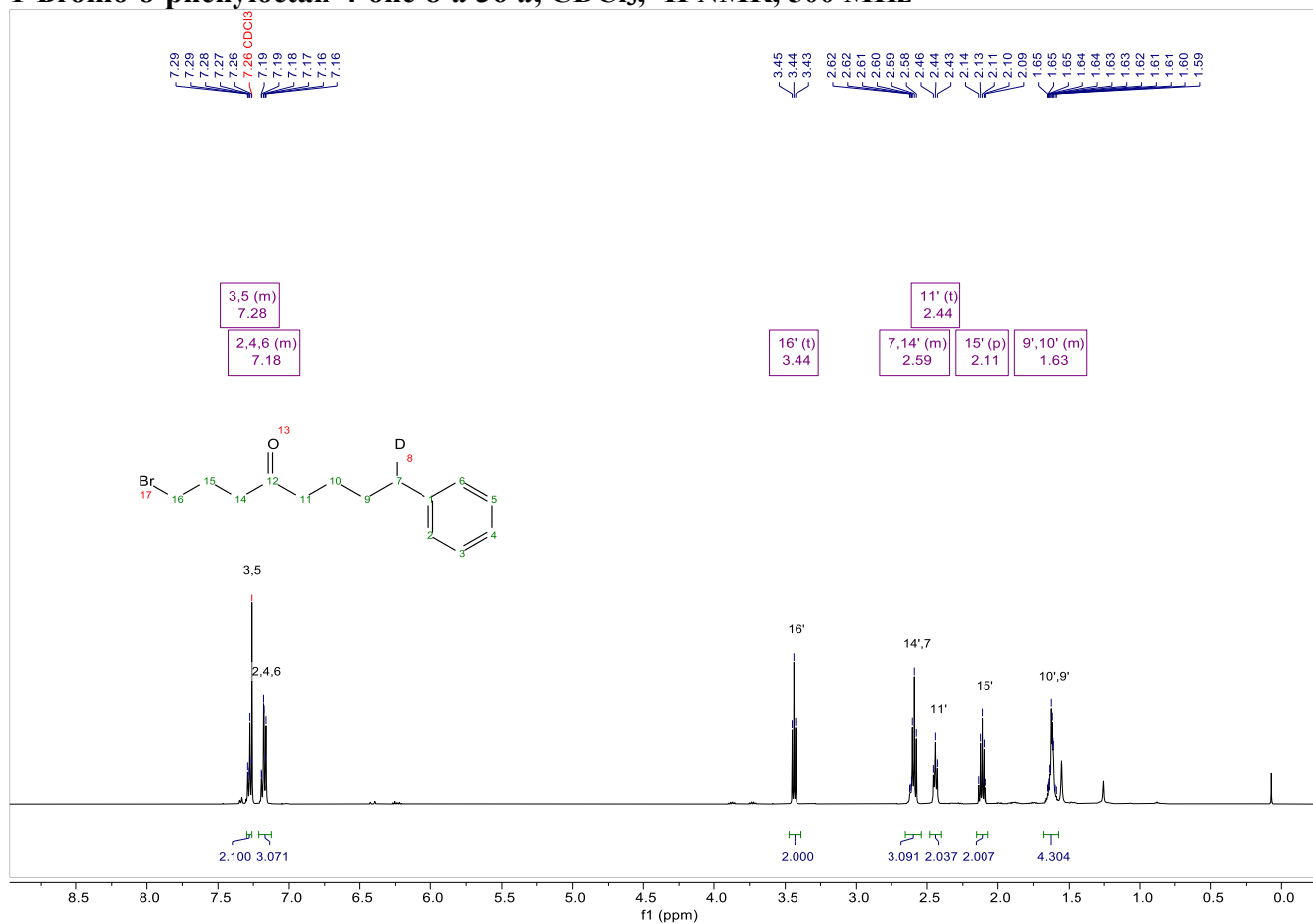
1-Bromo-8-phenyloctan-4-one 36, CDCl₃, ¹H NMR, 500 MHz



1-Bromo-8-phenyloctan-4-one 36, CDCl₃, ¹³C NMR, 125 MHz



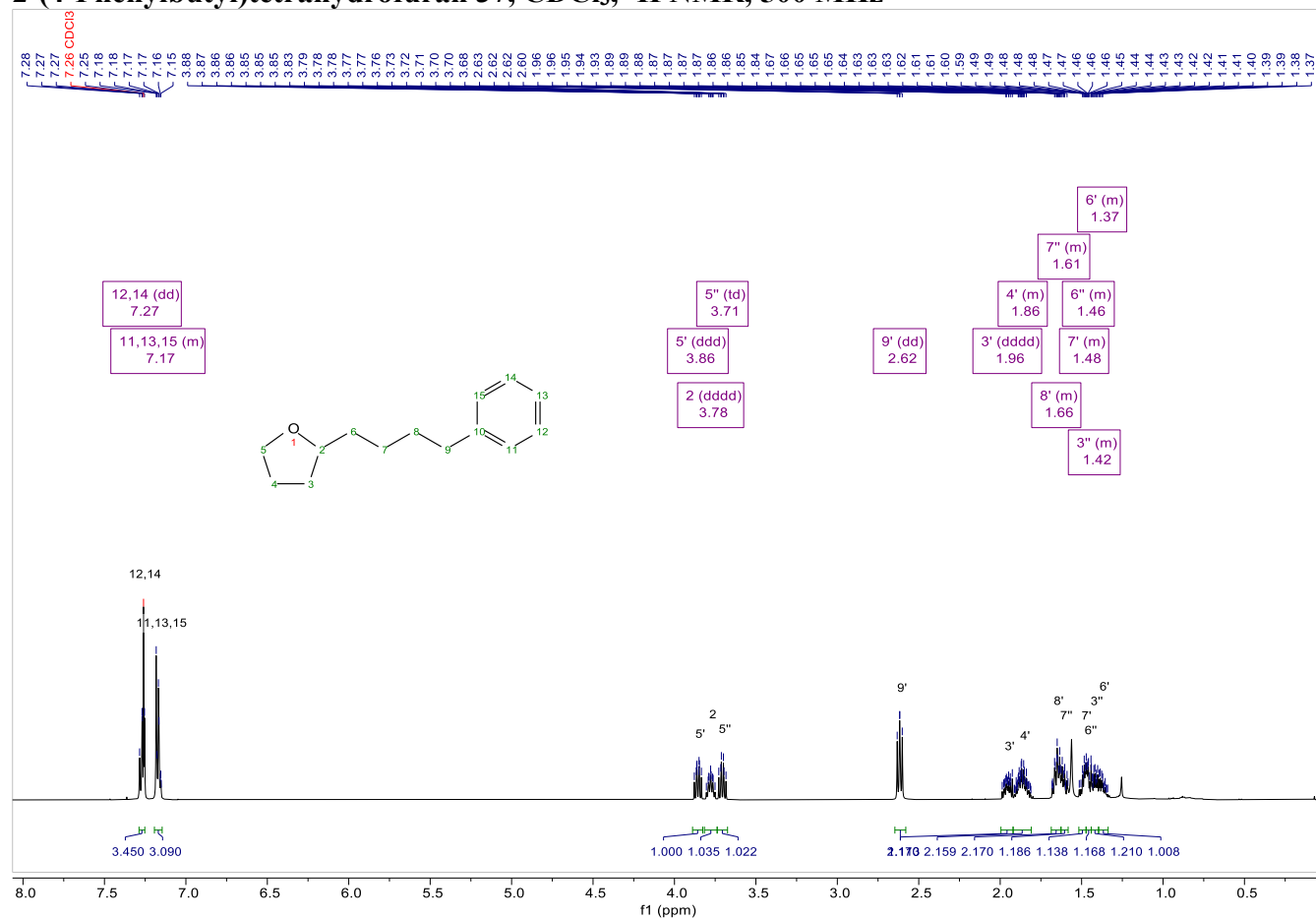
1-Bromo-8-phenyloctan-4-one-8-d 36-d, CDCl₃, ¹H NMR, 500 MHz



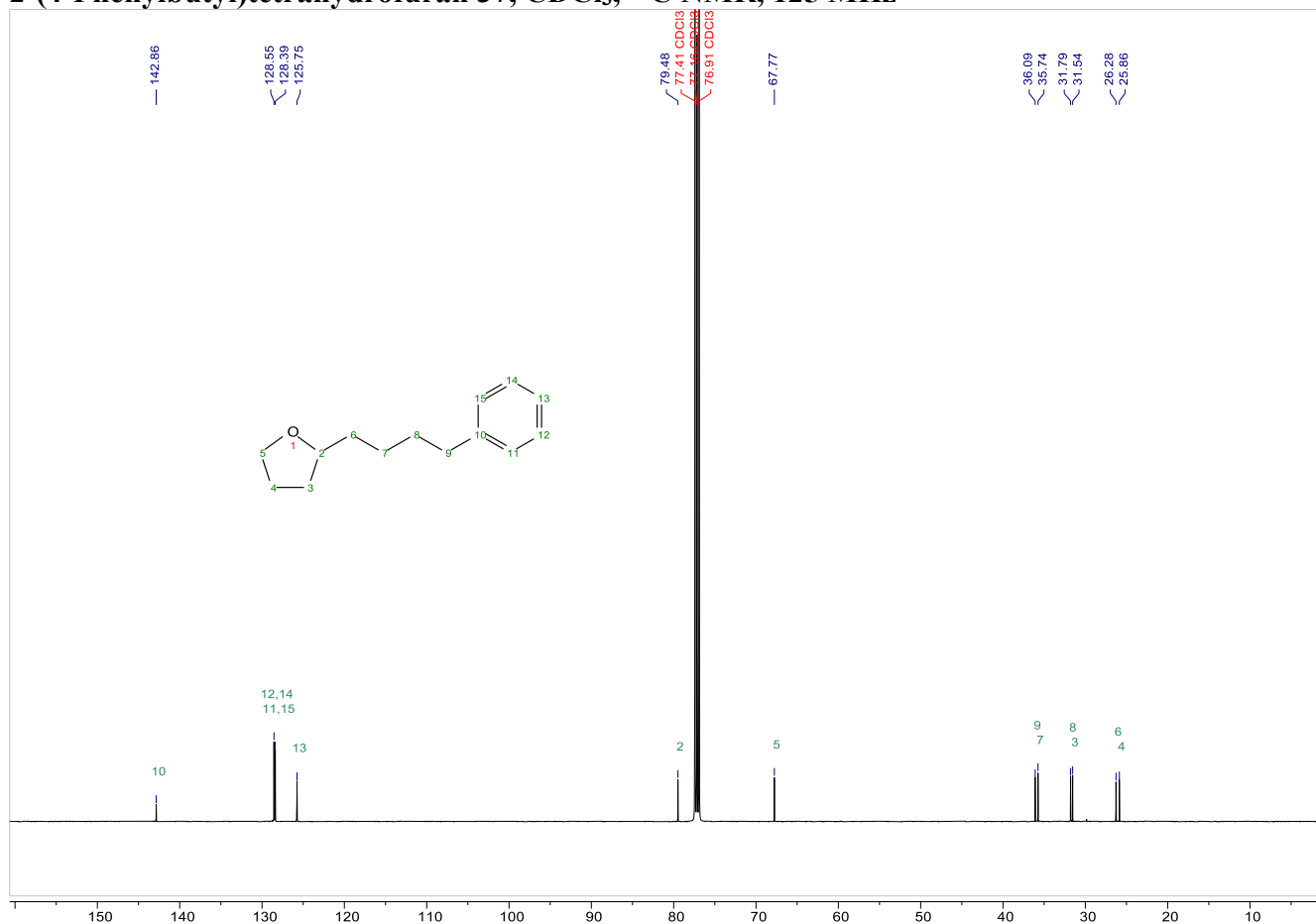
1-Bromo-8-phenyloctan-4-one-8-d 36-d, CDCl₃, ¹³C NMR, 125 MHz



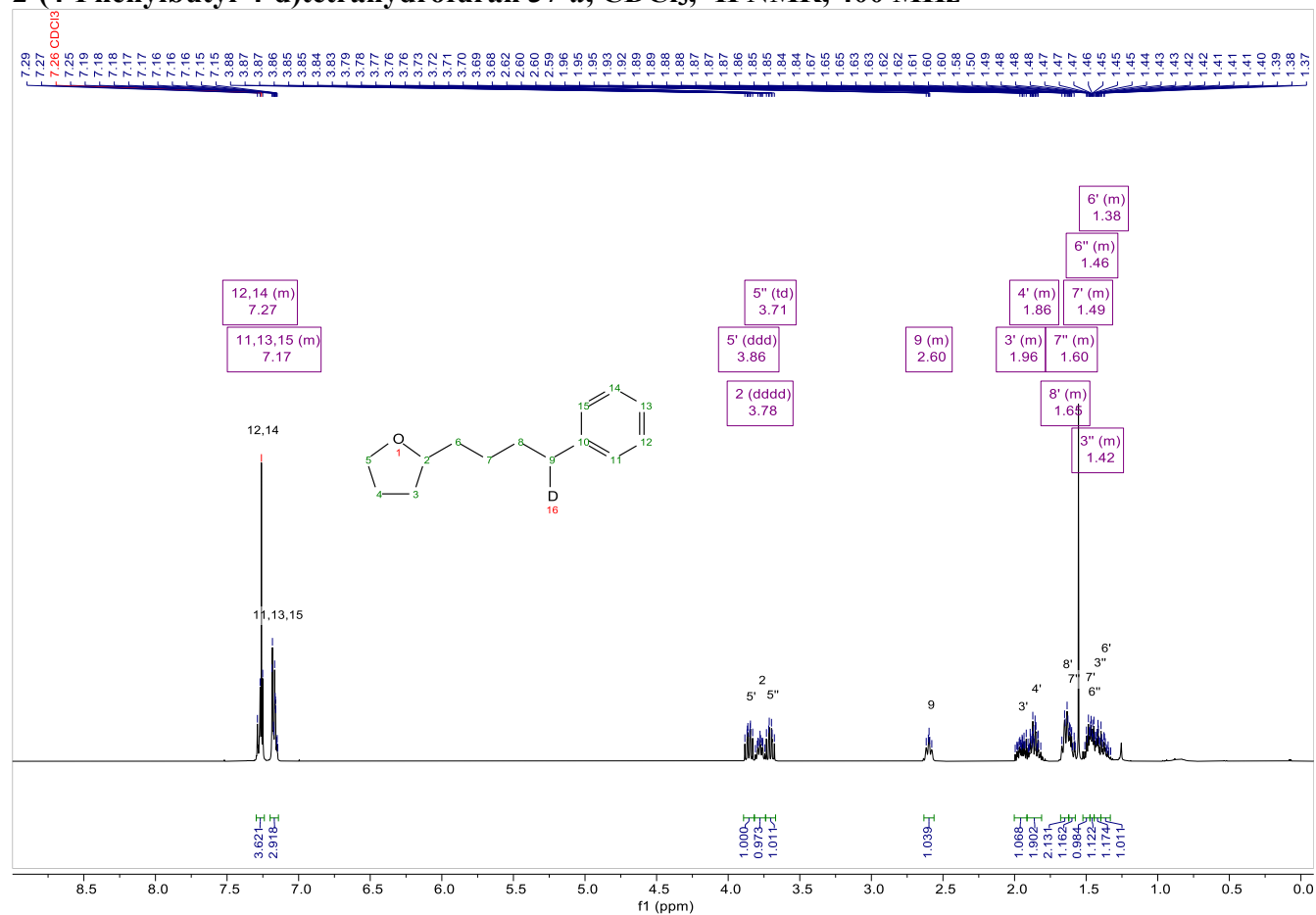
2-(4-Phenylbutyl)tetrahydrofuran 37, CDCl₃, ¹H NMR, 500 MHz



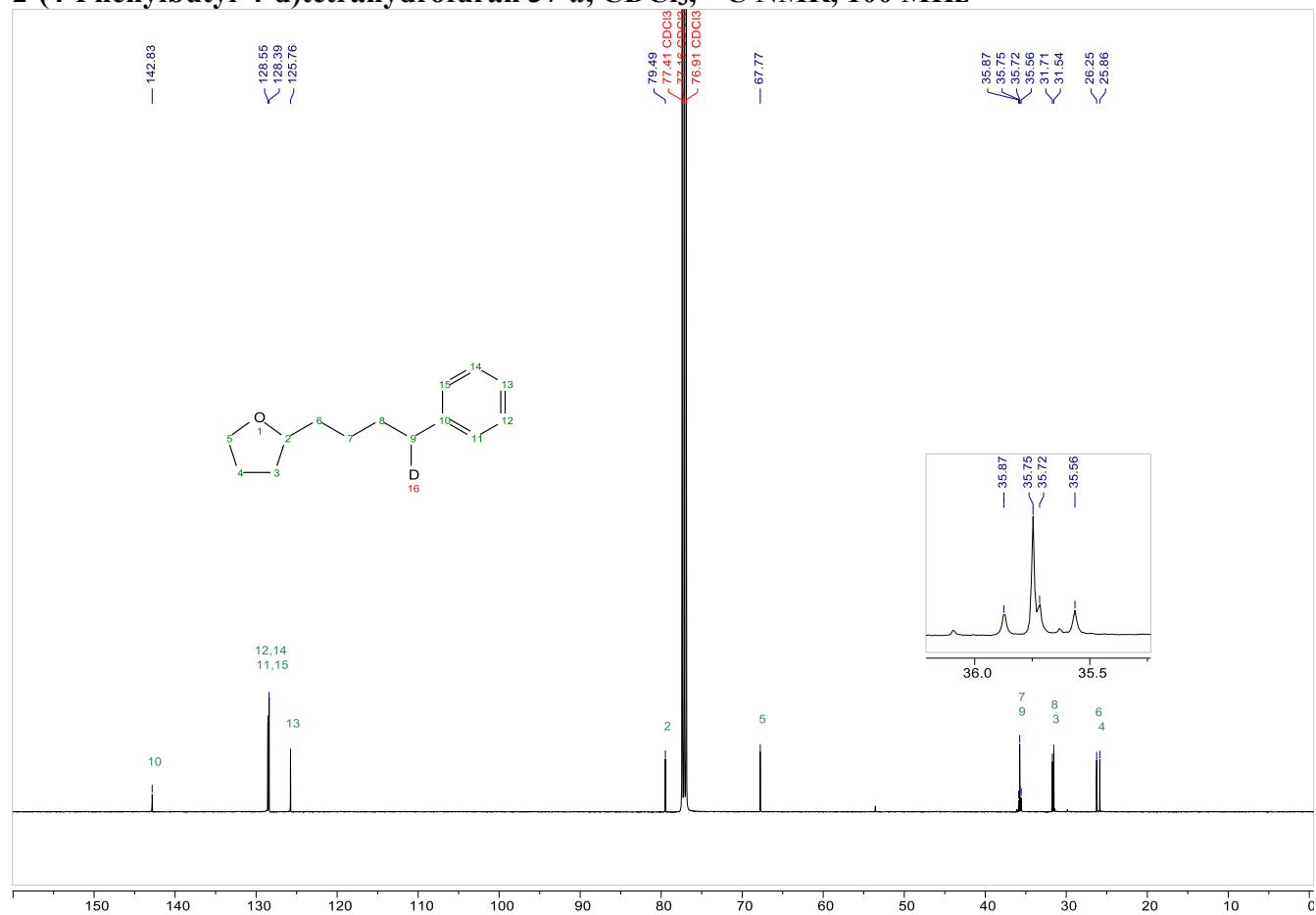
2-(4-Phenylbutyl)tetrahydrofuran 37, CDCl₃, ¹³C NMR, 125 MHz



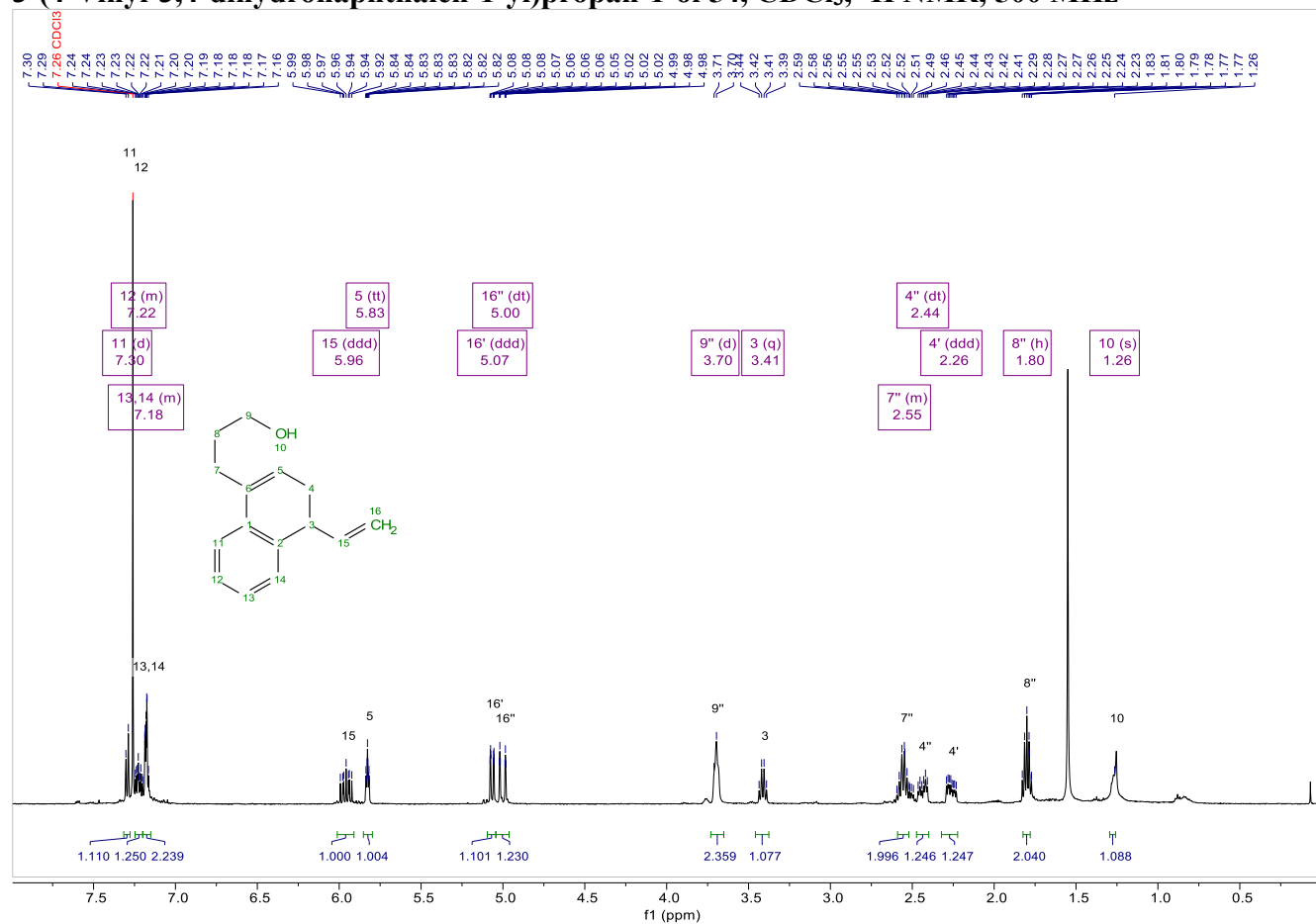
2-(4-Phenylbutyl-4-d)tetrahydrofuran 37-d, CDCl₃, ¹H NMR, 400 MHz



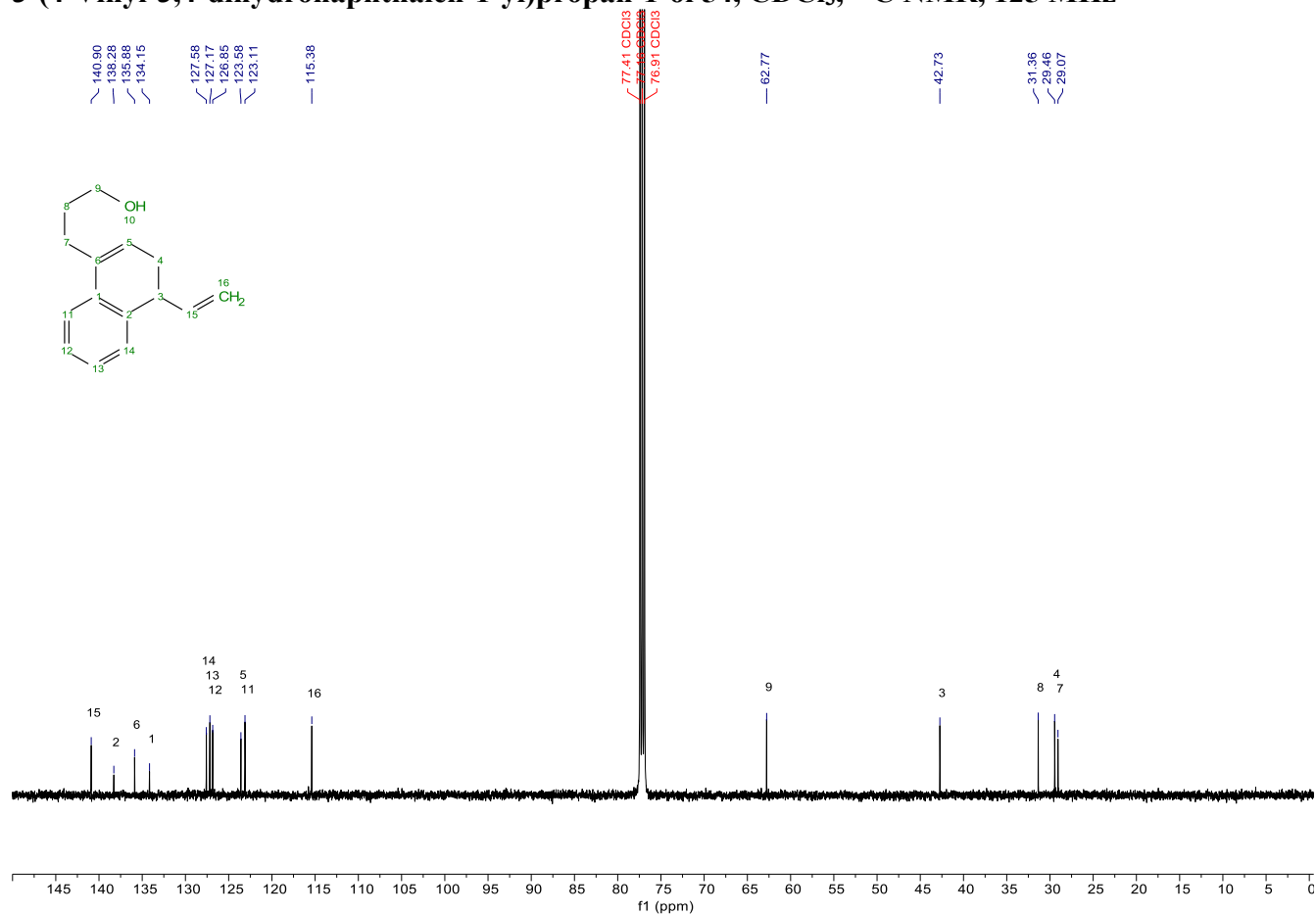
2-(4-Phenylbutyl-4-d)tetrahydrofuran 37-d, CDCl₃, ¹³C NMR, 100 MHz



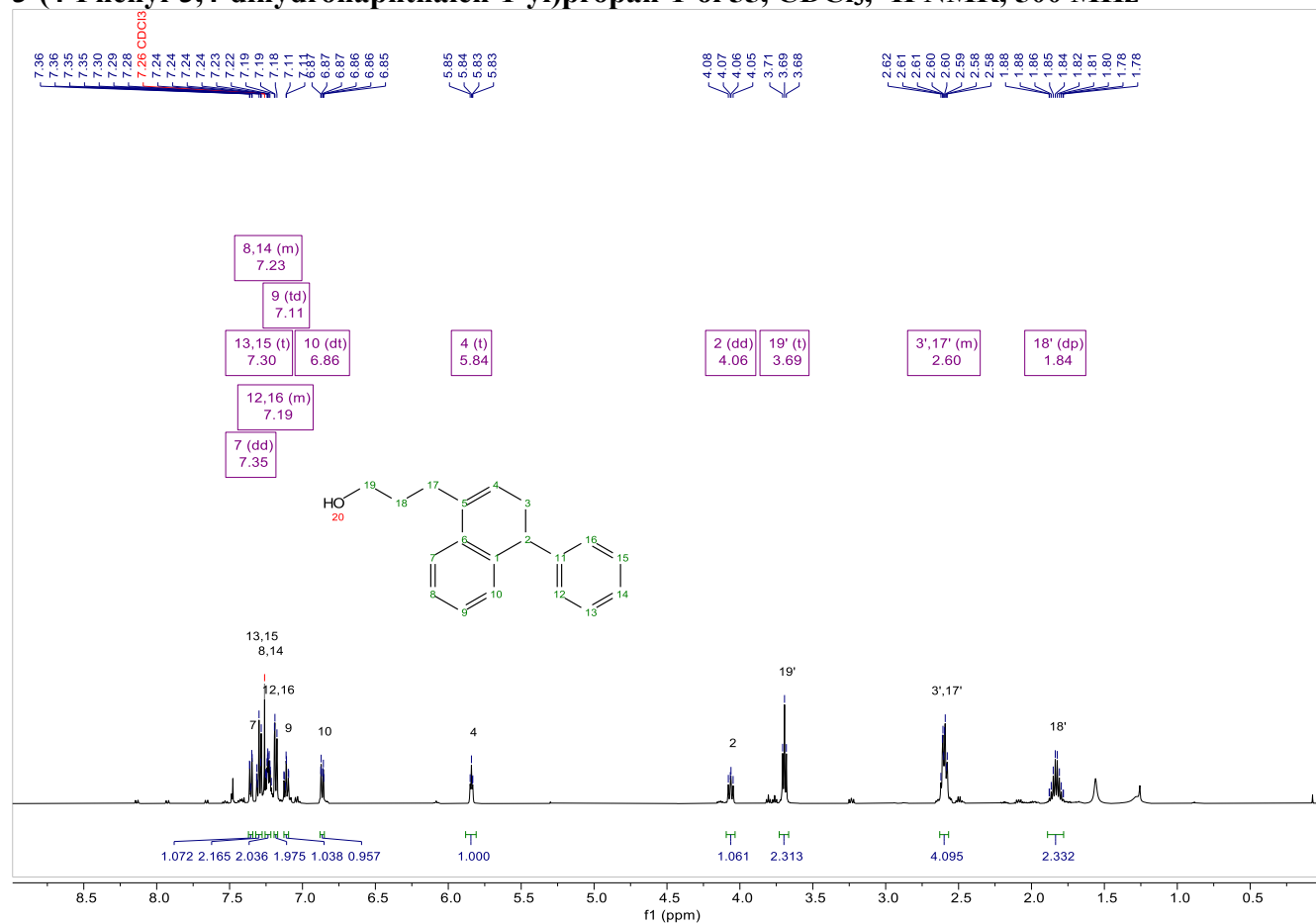
3-(4-Vinyl-3,4-dihydronaphthalen-1-yl)propan-1-ol 54, CDCl₃, ¹H NMR, 500 MHz



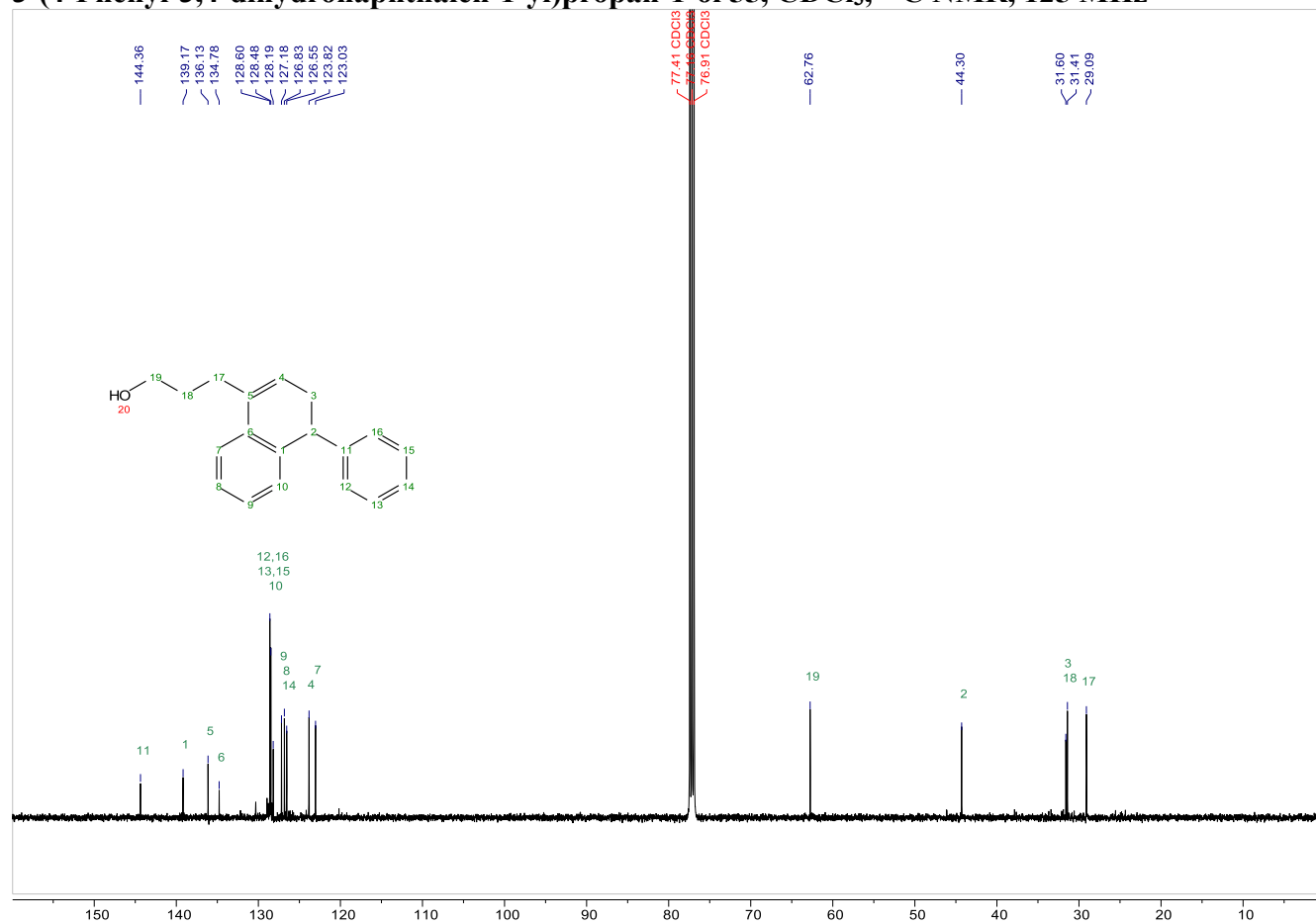
3-(4-Vinyl-3,4-dihydronaphthalen-1-yl)propan-1-ol 54, CDCl₃, ¹³C NMR, 125 MHz



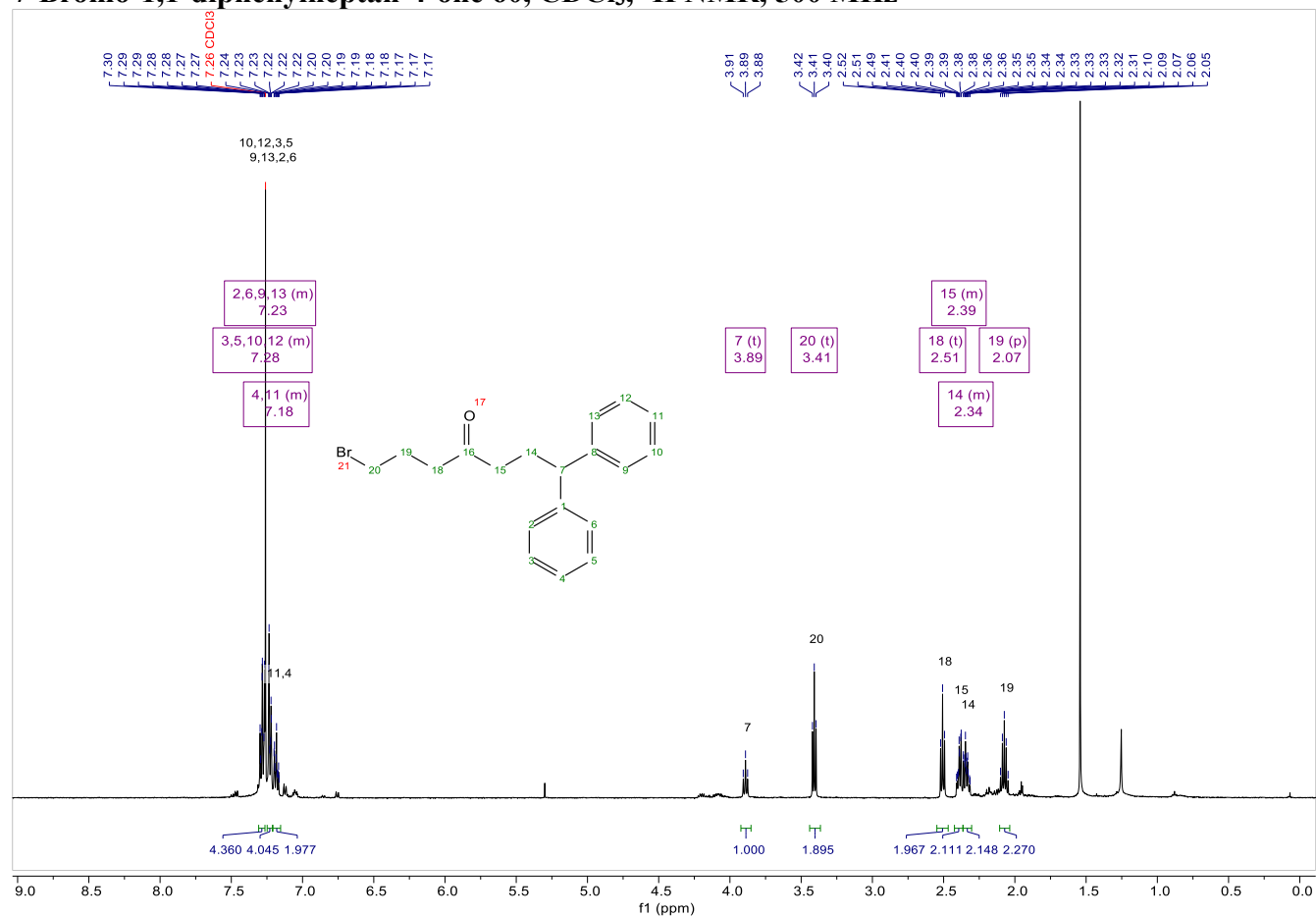
3-(4-Phenyl-3,4-dihydronaphthalen-1-yl)propan-1-ol 55, CDCl₃, ¹H NMR, 500 MHz



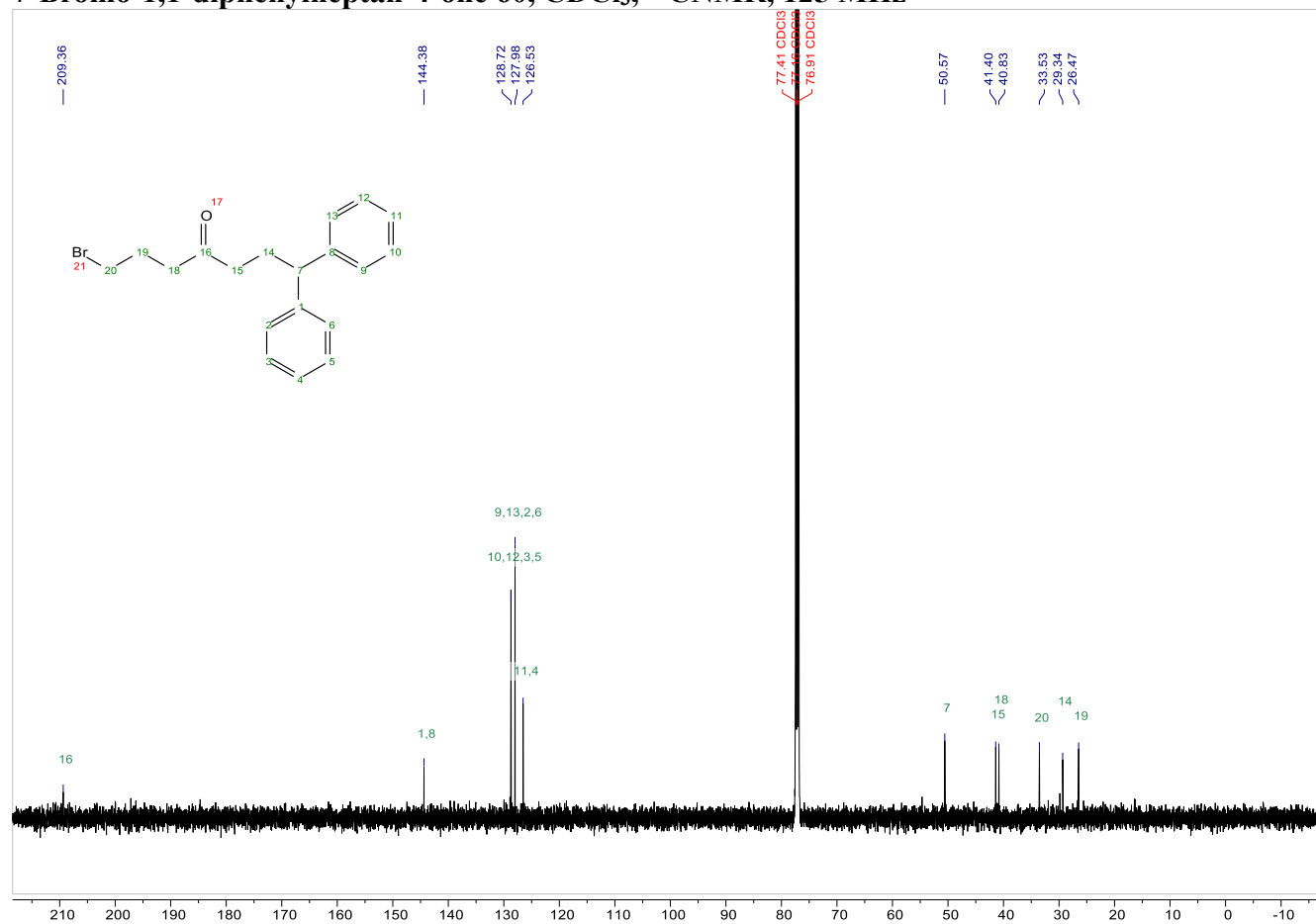
3-(4-Phenyl-3,4-dihydronaphthalen-1-yl)propan-1-ol 55, CDCl₃, ¹³C NMR, 125 MHz



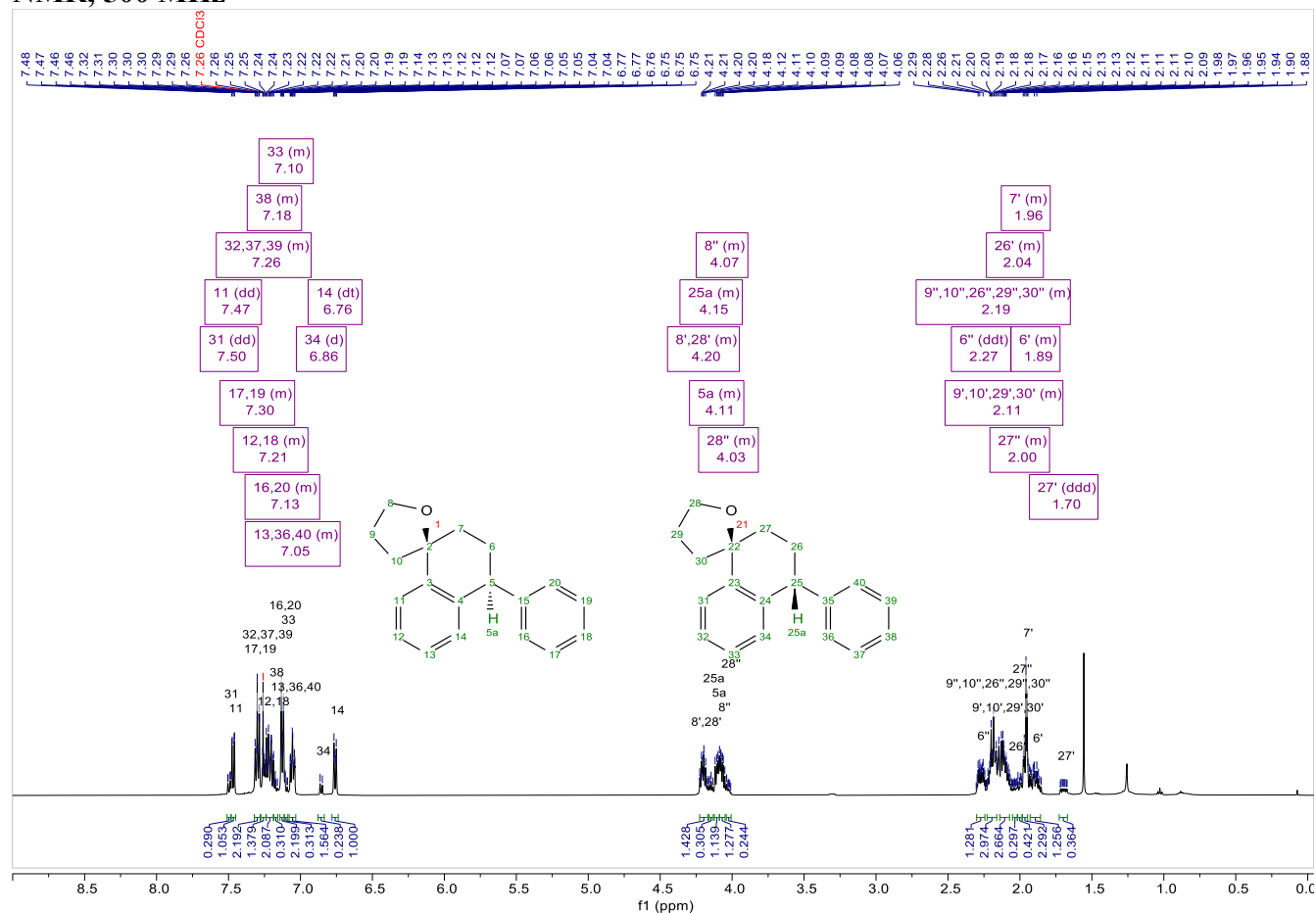
7-Bromo-1,1-diphenylheptan-4-one 60, CDCl₃, ¹H NMR, 500 MHz



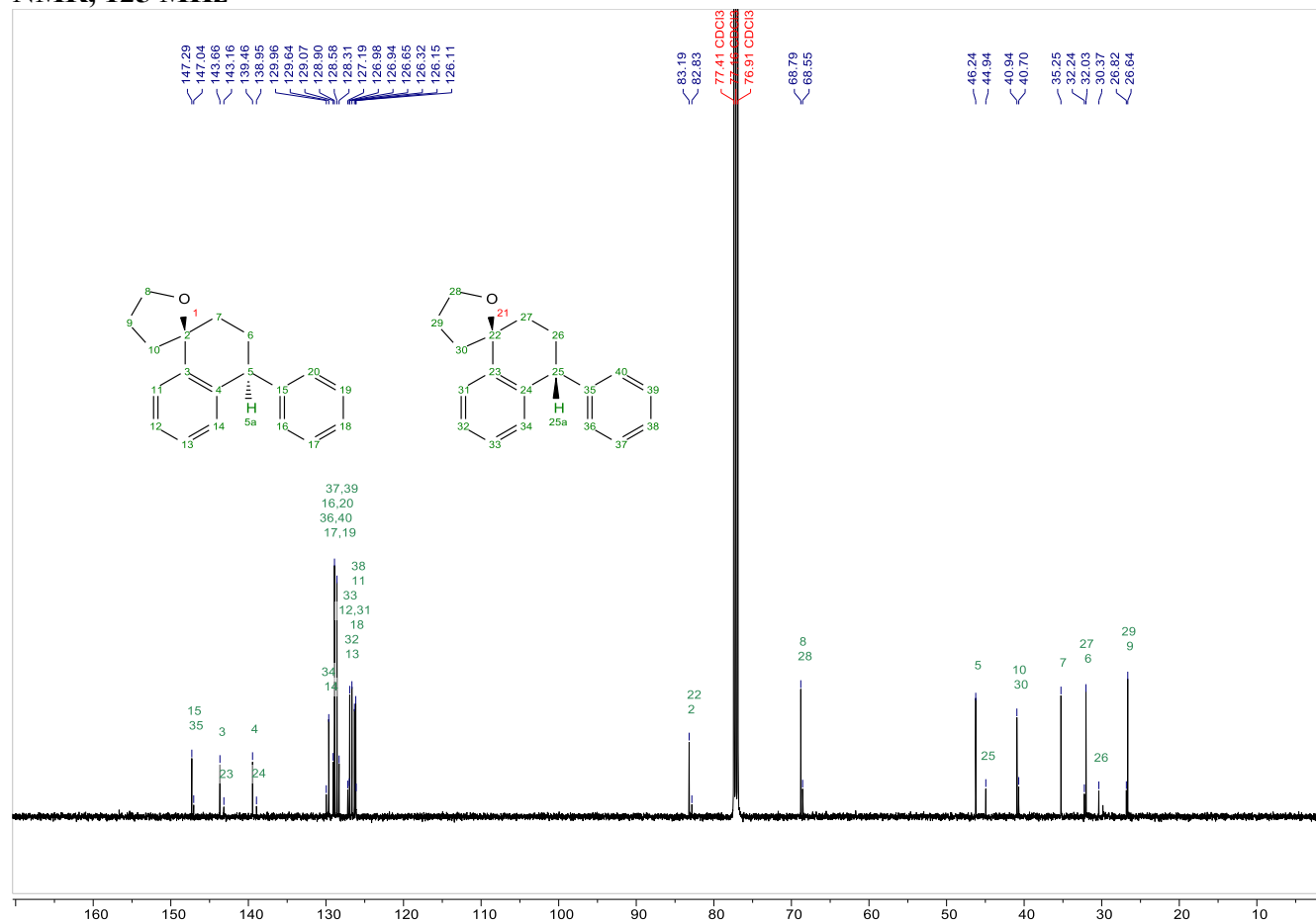
7-Bromo-1,1-diphenylheptan-4-one 60, CDCl₃, ¹³CNMR, 125 MHz



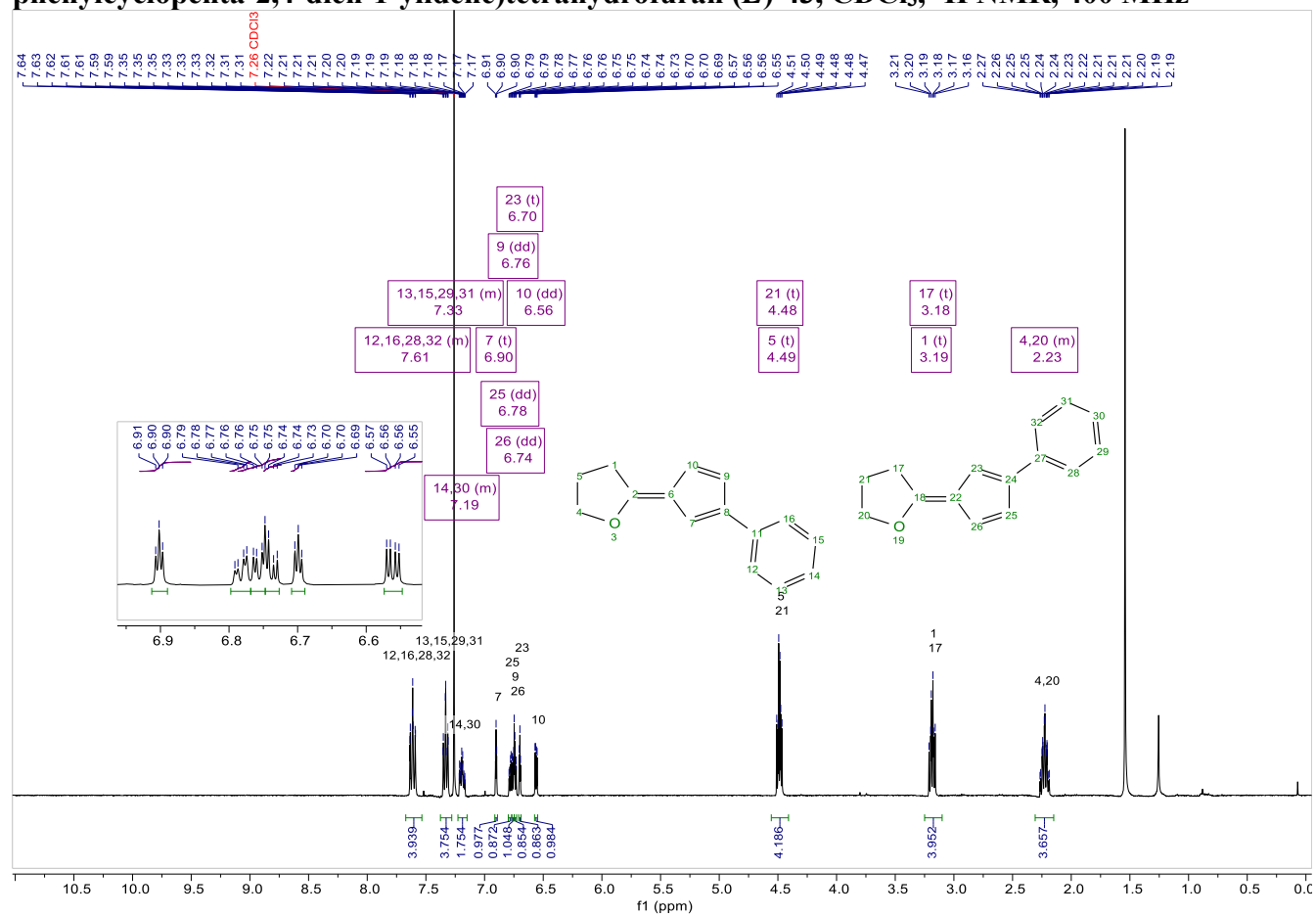
(2*R,4'*S*'*)-4'-Phenyl-3',4,4',5-tetrahydro-2'*H*,3*H*-spiro[furan-2,1'-naphthalene] 61 and (2*R**,4'*R*'*)-4'-Phenyl-3',4,4',5-tetrahydro-2'*H*,3*H*-spiro[furan-2,1'-naphthalene] 61', CDCl₃, ¹H NMR, 500 MHz**



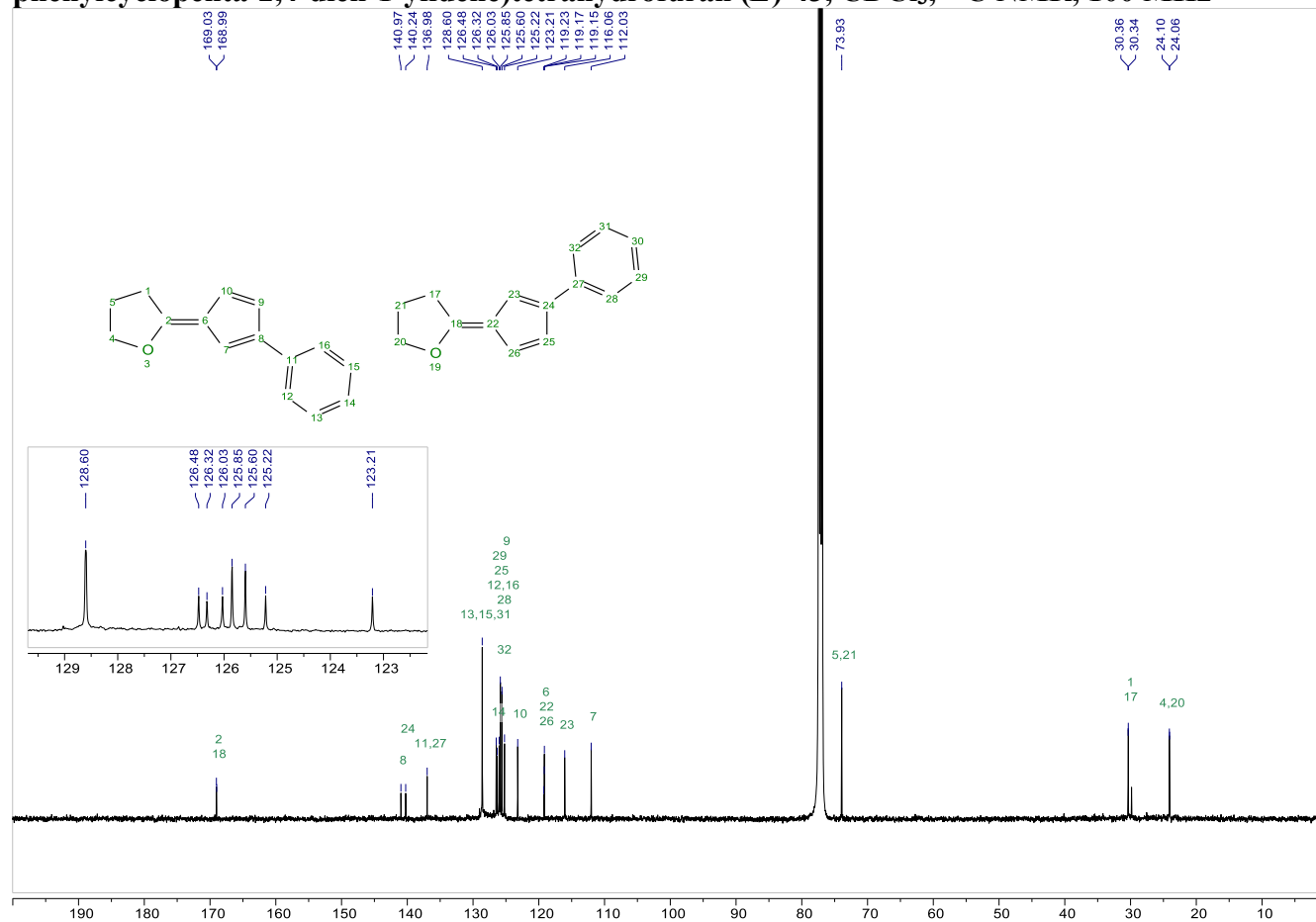
(2*R,4'*S*'*)-4'-Phenyl-3',4,4',5-tetrahydro-2'*H*,3*H*-spiro[furan-2,1'-naphthalene] 61 and (2*R**,4'*R*'*)-4'-Phenyl-3',4,4',5-tetrahydro-2'*H*,3*H*-spiro[furan-2,1'-naphthalene] 61', CDCl₃, ¹³C NMR, 125 MHz**



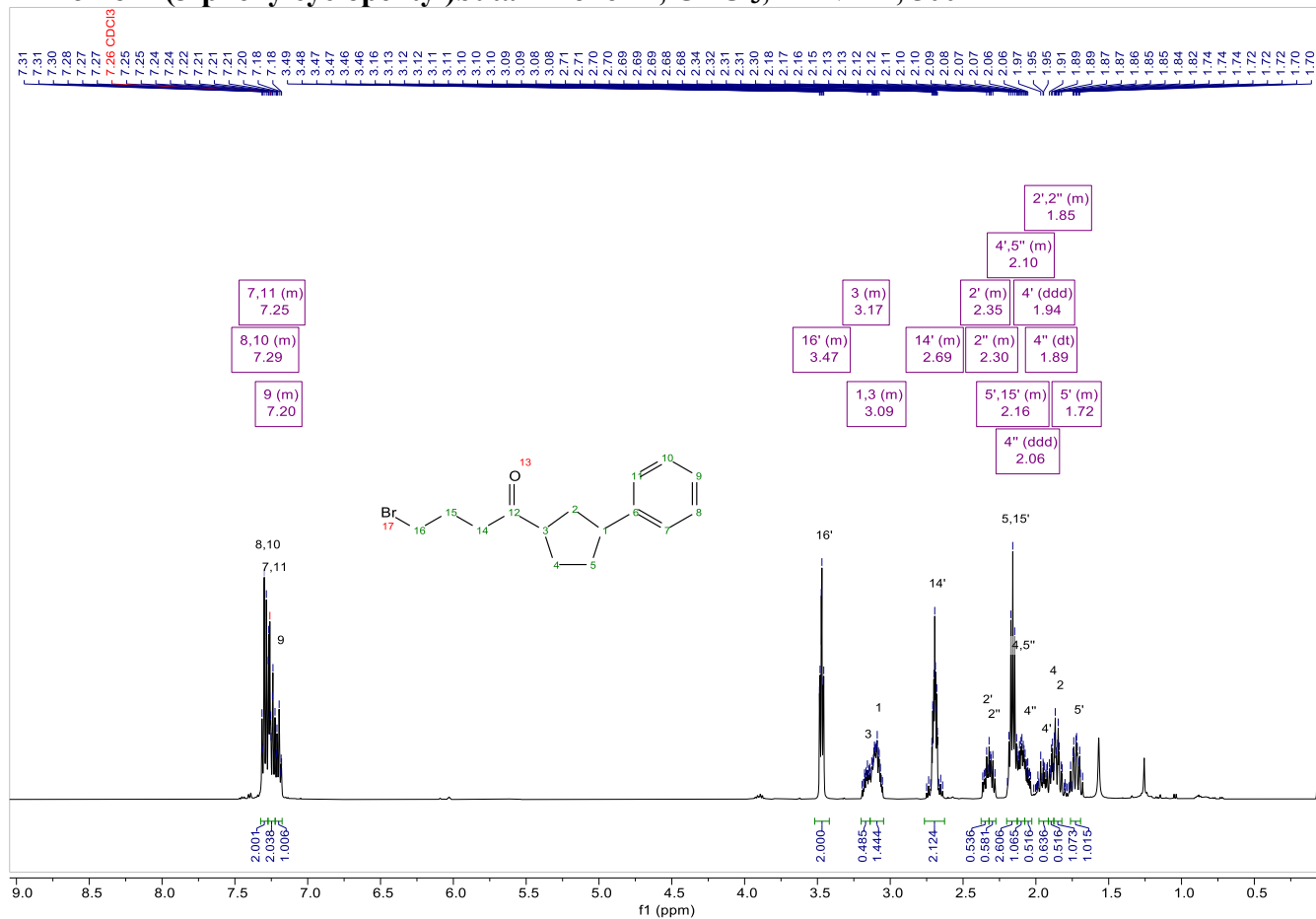
(Z)-2-(3-phenylcyclopenta-2,4-dien-1-ylidene)tetrahydrofuran (Z)-43 and (E)-2-(3-phenylcyclopenta-2,4-dien-1-ylidene)tetrahydrofuran (E)-43, CDCl₃, ¹H NMR, 400 MHz



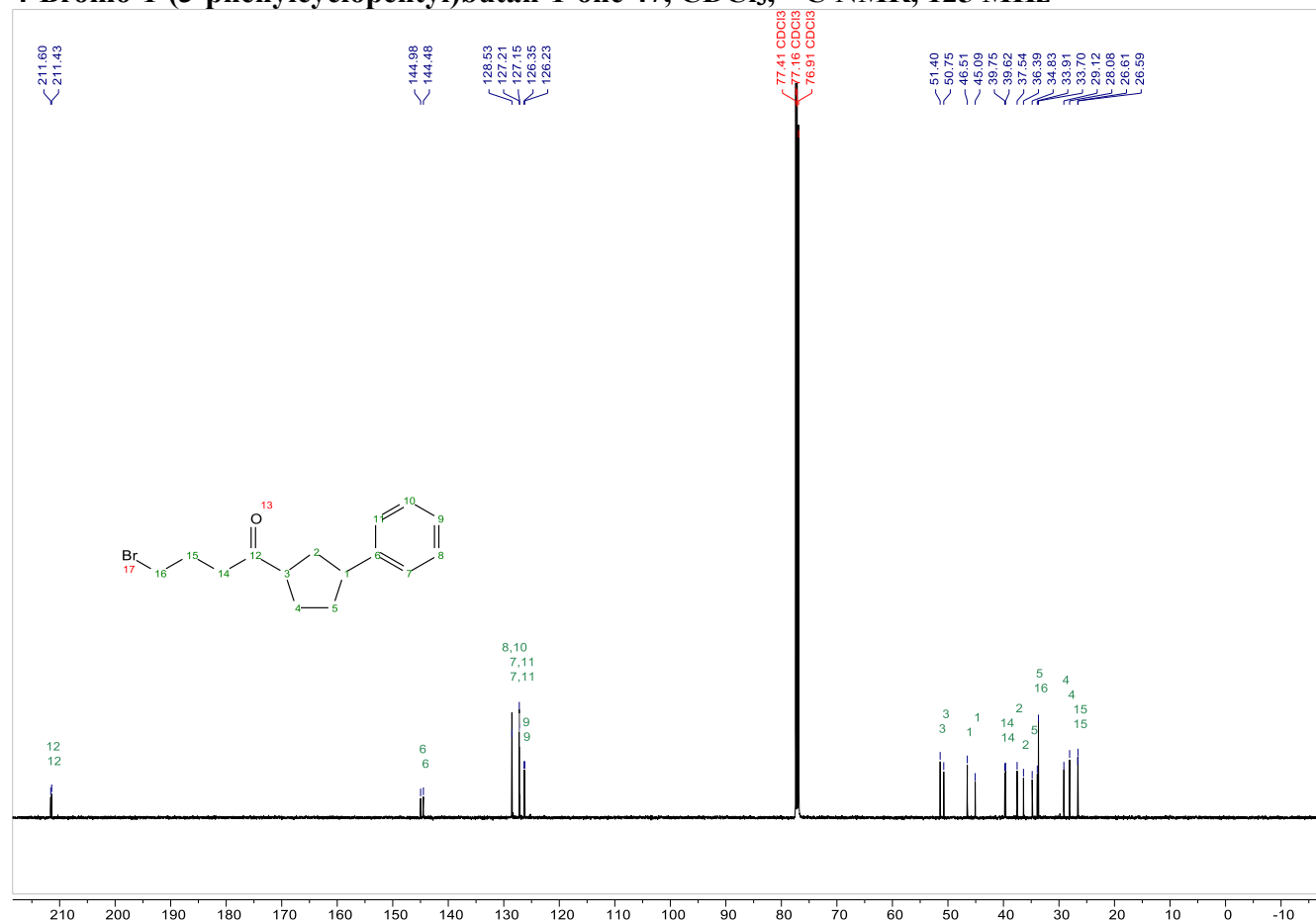
(Z)-2-(3-phenylcyclopenta-2,4-dien-1-ylidene)tetrahydrofuran (Z)-43 and (E)-2-(3-phenylcyclopenta-2,4-dien-1-ylidene)tetrahydrofuran (E)-43, CDCl₃, ¹³C NMR, 100 MHz



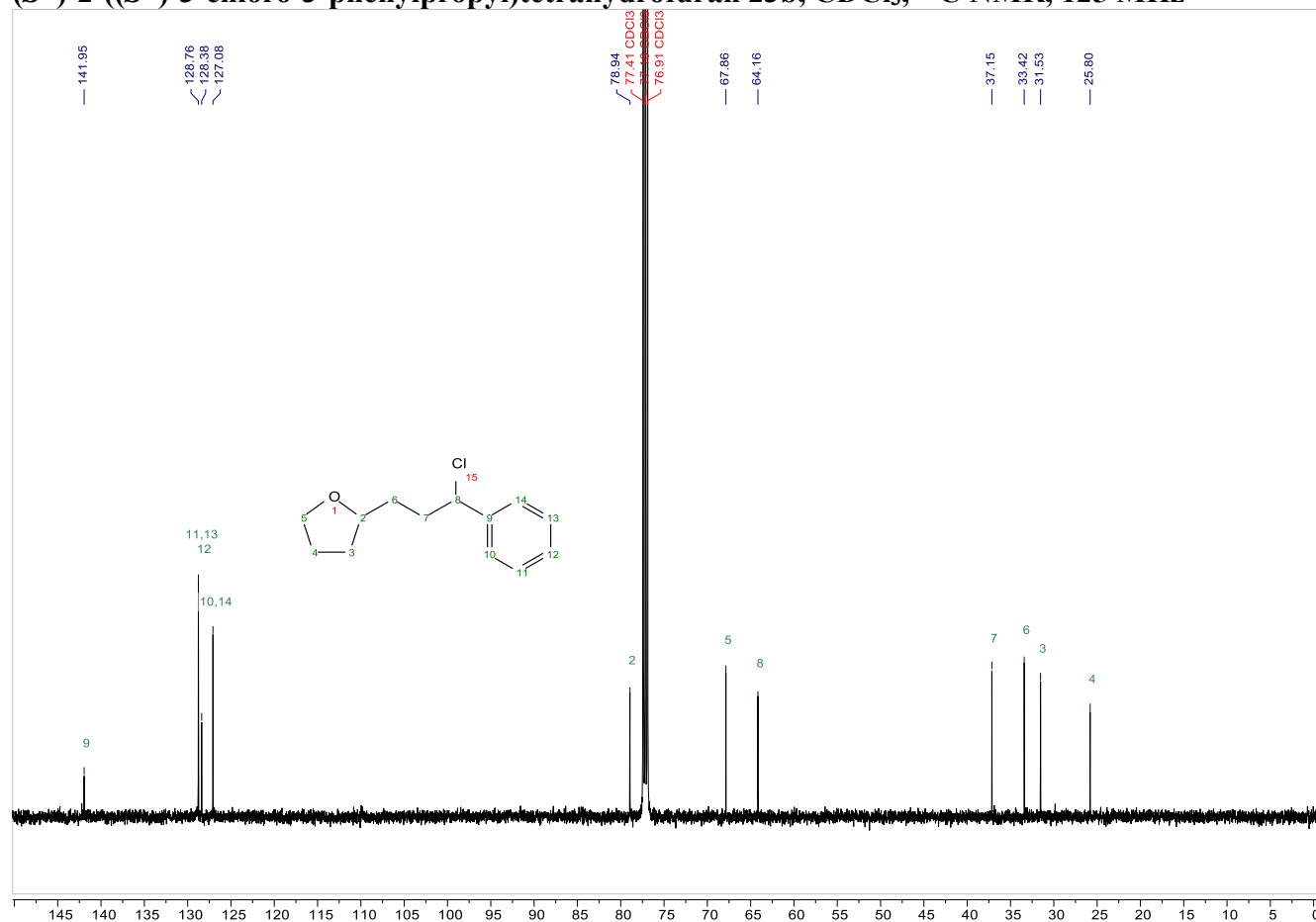
4-Bromo-1-(3-phenylcyclopentyl)butan-1-one 47, CDCl₃, ¹H NMR, 500 MHz



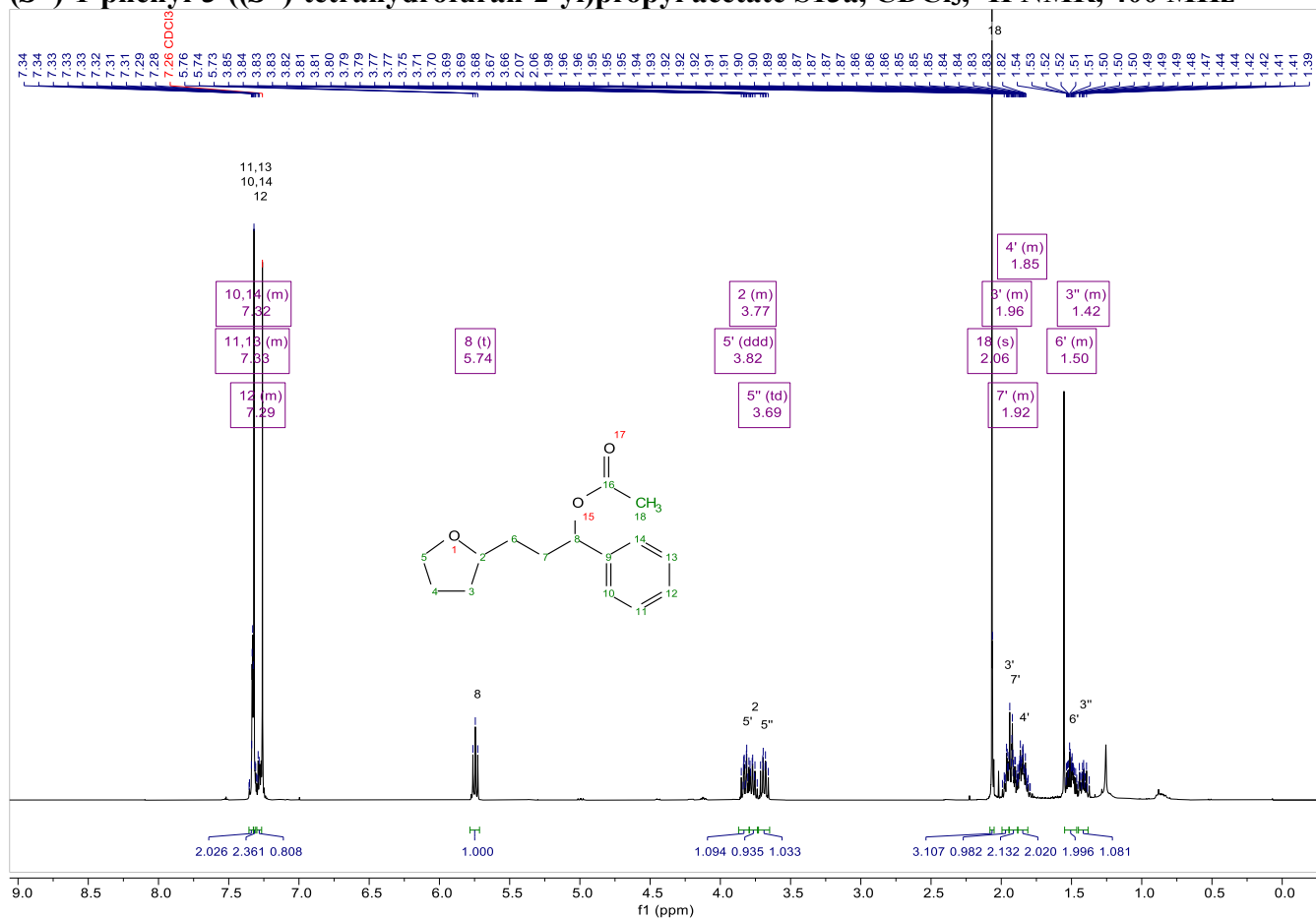
4-Bromo-1-(3-phenylcyclopentyl)butan-1-one 47, CDCl₃, ¹³C NMR, 125 MHz



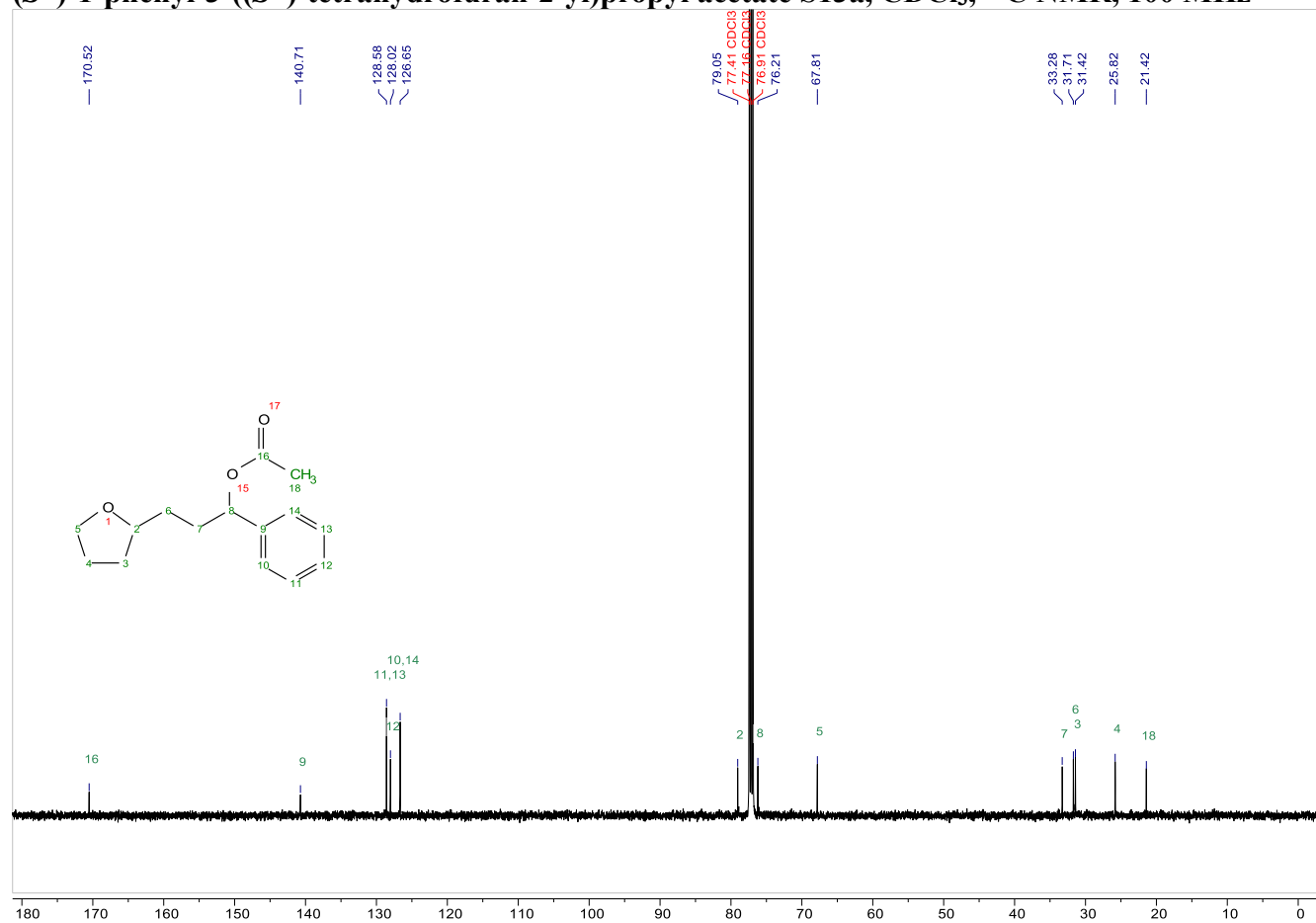
(S*)-2-((S*)-3-chloro-3-phenylpropyl)tetrahydrofuran 23b, CDCl₃, ¹³C NMR, 125 MHz



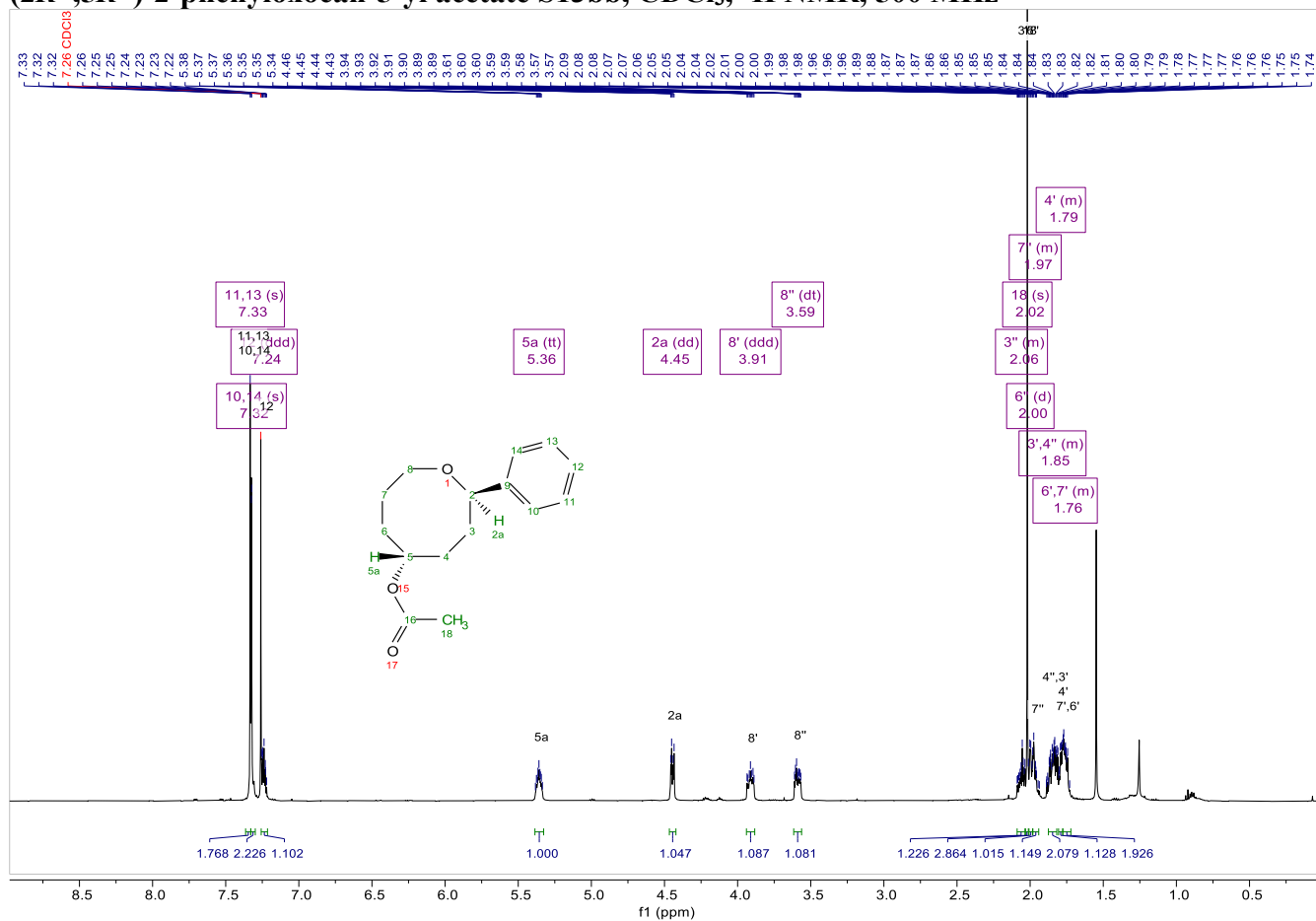
(S*)-1-phenyl-3-((S*)-tetrahydrofuran-2-yl)propyl acetate S13a, CDCl₃, ¹H NMR, 400 MHz



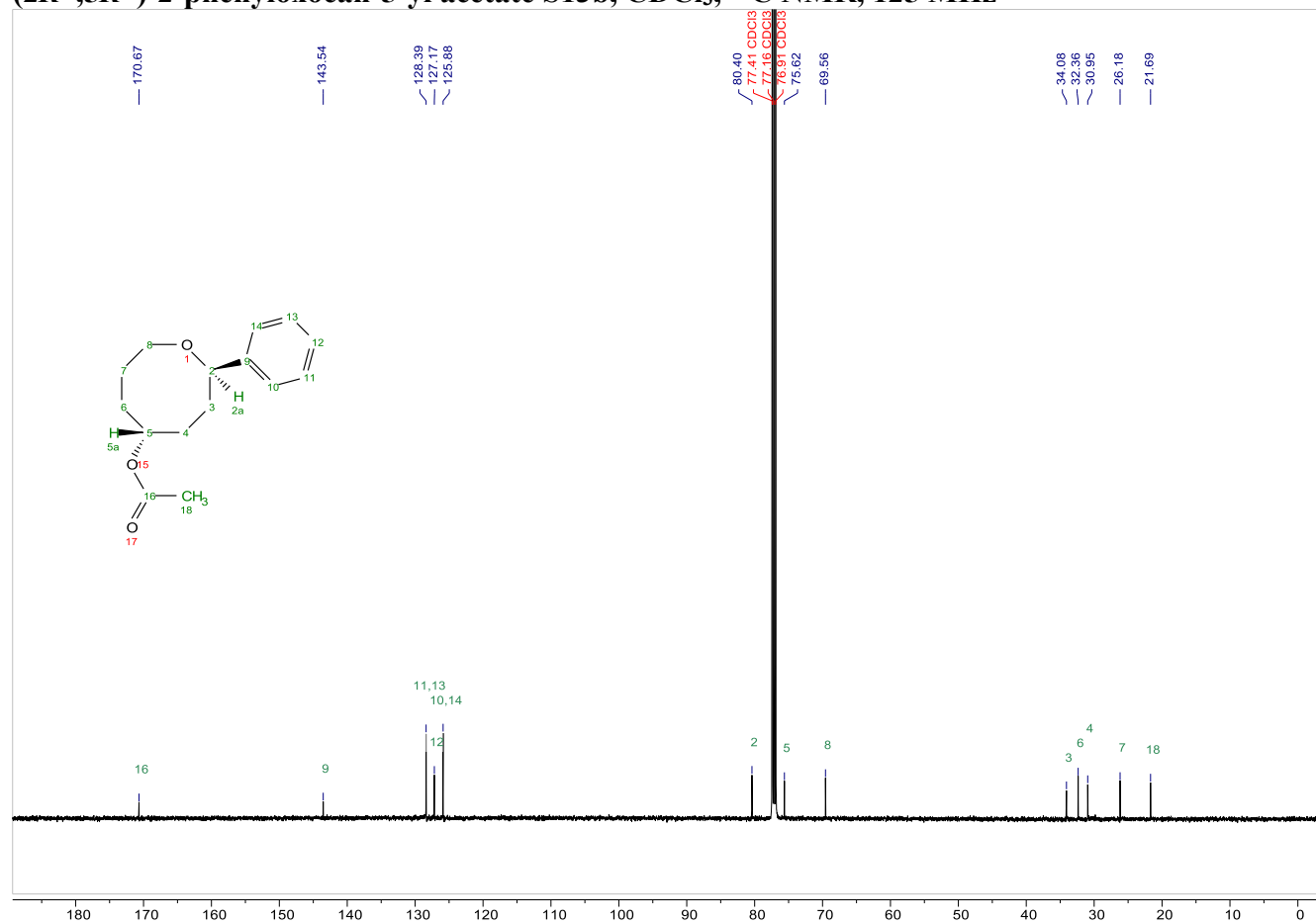
(S*)-1-phenyl-3-((S*)-tetrahydrofuran-2-yl)propyl acetate S13a, CDCl₃, ¹³C NMR, 100 MHz



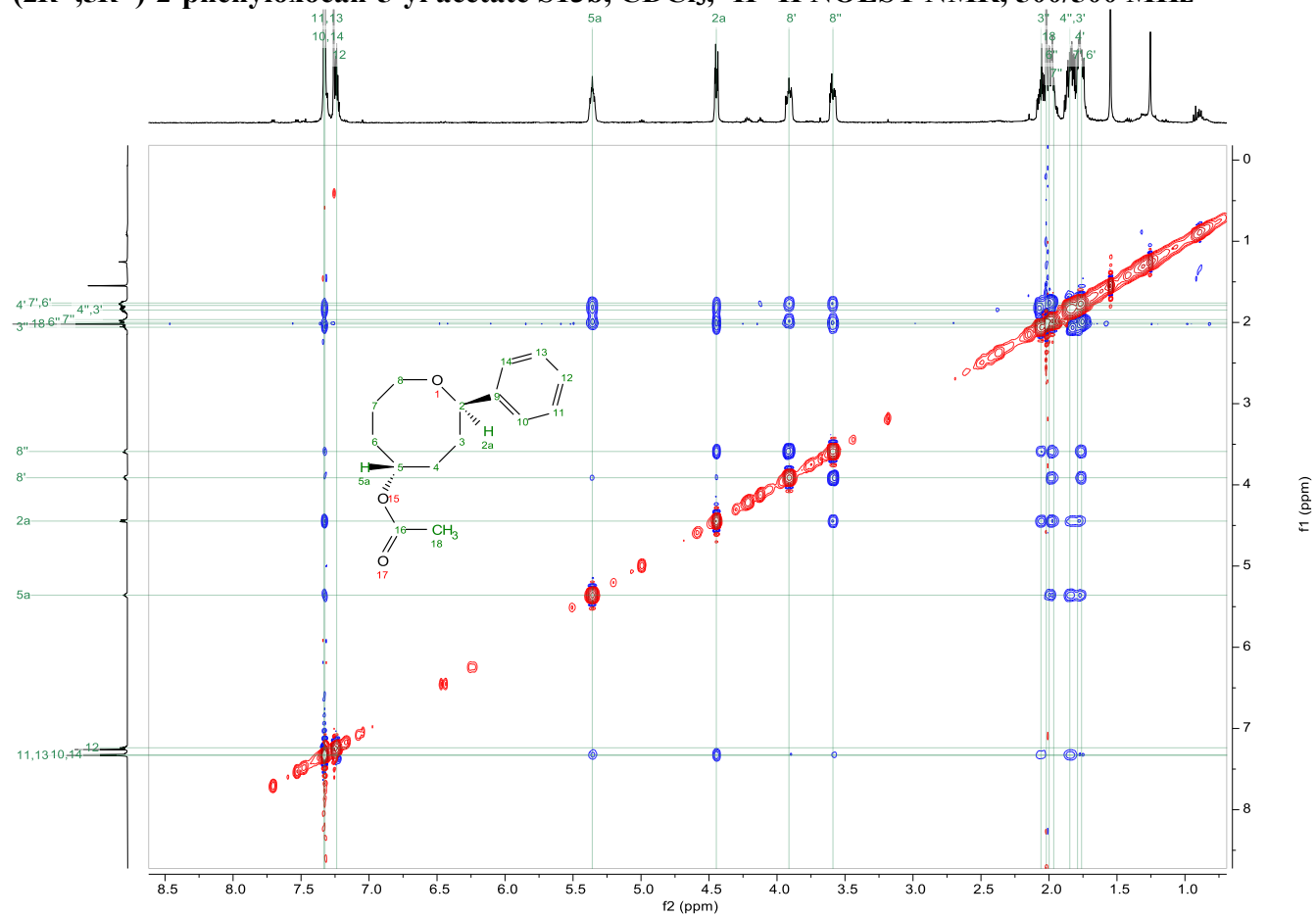
(2*R**,5*R**)-2-phenyloxocan-5-yl acetate S13bb, CDCl₃, ¹H NMR, 500 MHz



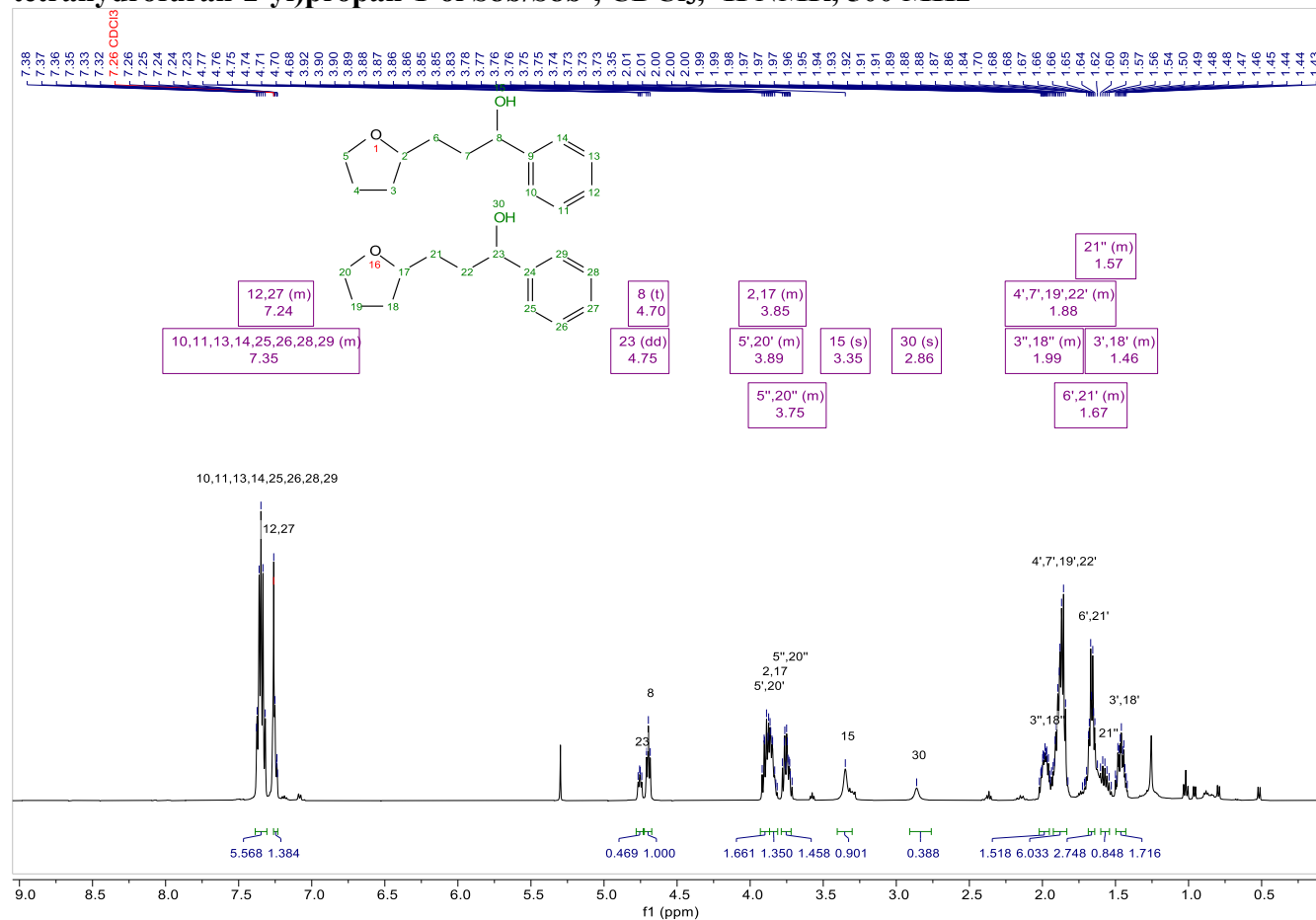
(2*R,5*R**)-2-phenyloxocan-5-yl acetate S13b, CDCl₃, ¹³C NMR, 125 MHz**



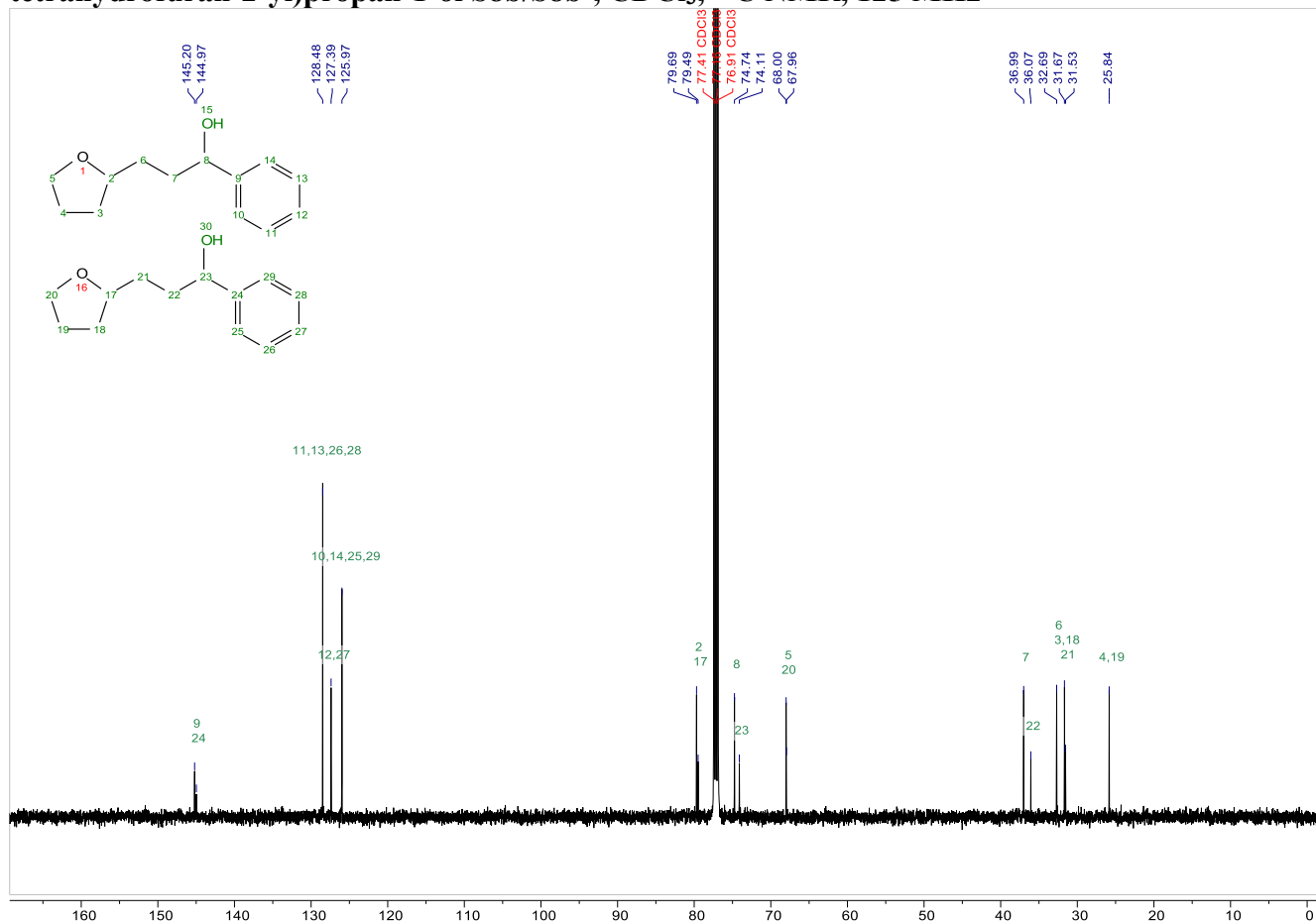
(2*R,5*R**)-2-phenyloxocan-5-yl acetate S13b, CDCl₃, ¹H-¹H NOESY NMR, 500/500 MHz**



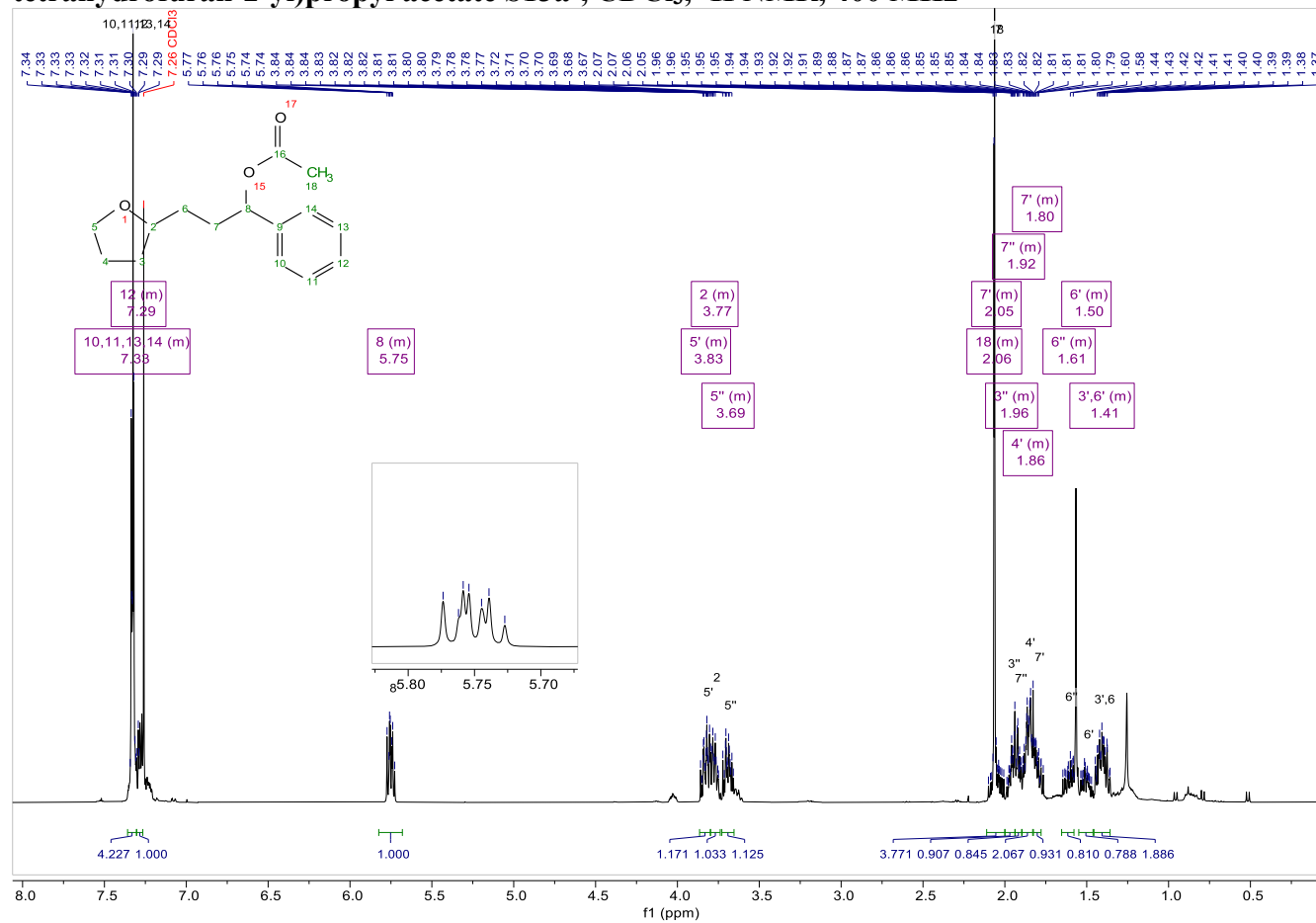
(S*)-1-phenyl-3-((S*)-tetrahydrofuran-2-yl)propan-1-ol and (R*)-1-phenyl-3-((S)-tetrahydrofuran-2-yl)propan-1-ol S8b/S8b', CDCl₃, ¹H NMR, 500 MHz



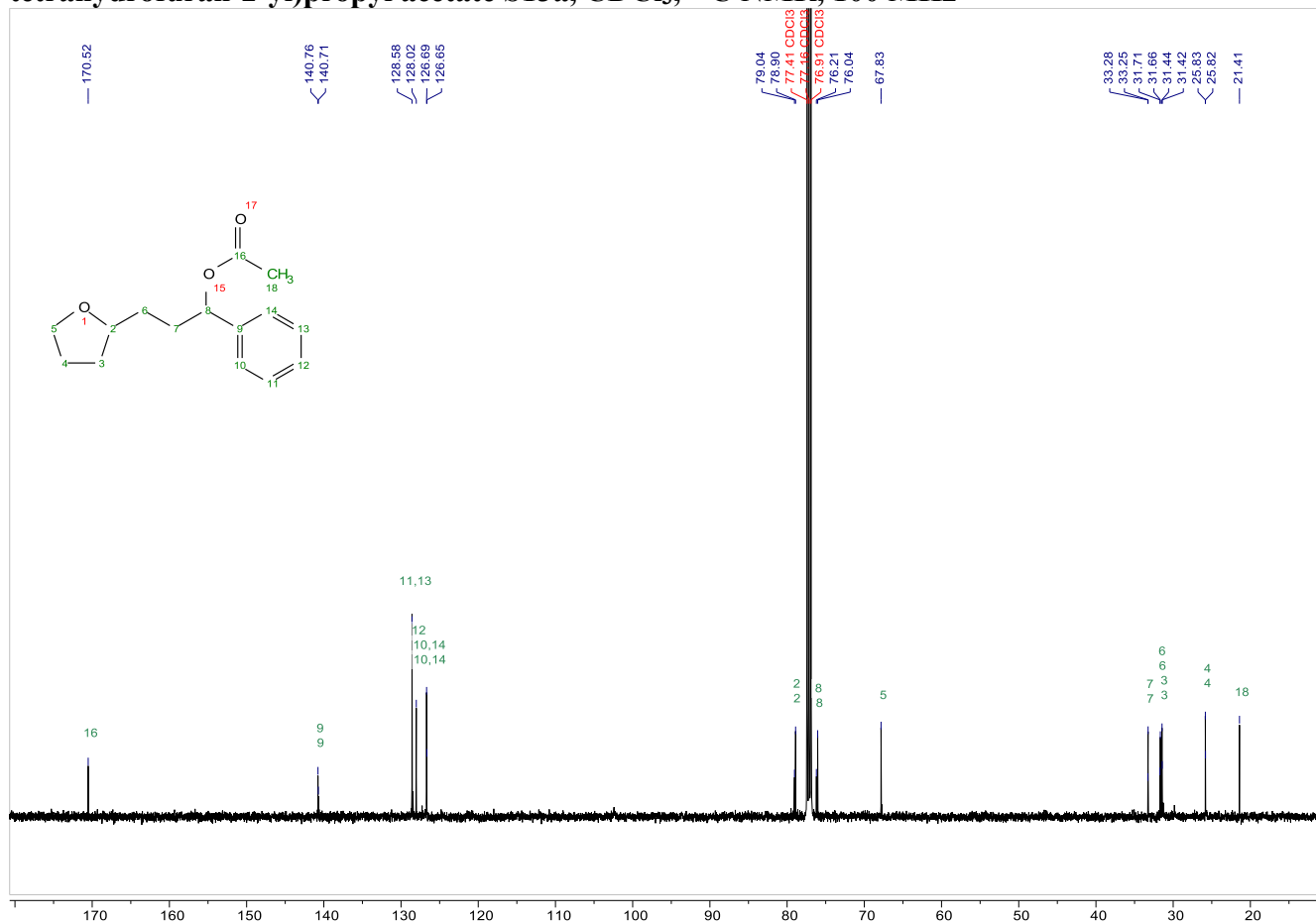
(*S*^{*})-1-phenyl-3-((*S*^{*})-tetrahydrofuran-2-yl)propan-1-ol and (*R*^{*})-1-phenyl-3-((*S*^{*})-tetrahydrofuran-2-yl)propan-1-ol S8b/S8b', CDCl₃, ¹³C NMR, 125 MHz



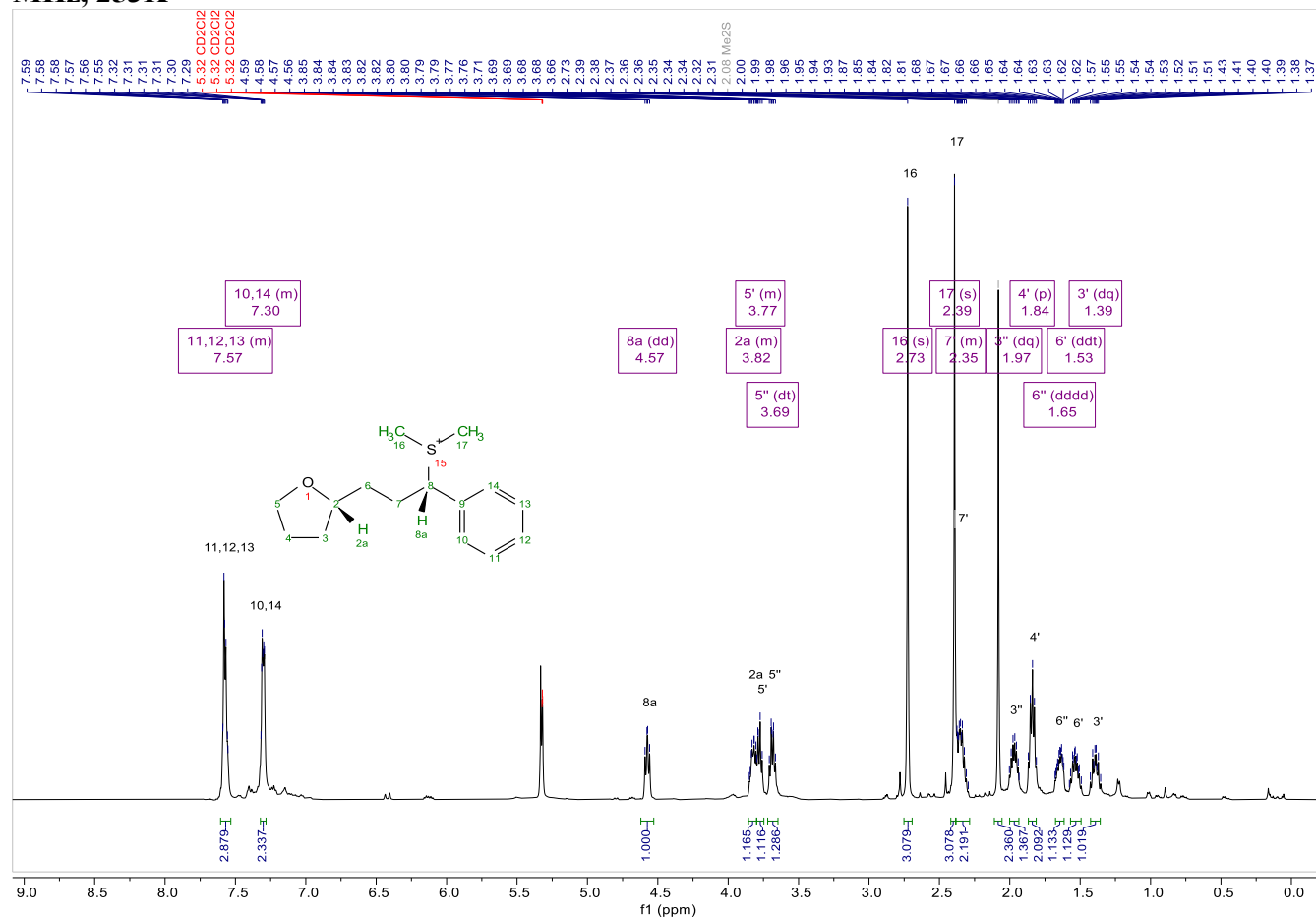
(*R)-1-phenyl-3-((*S**)-tetrahydrofuran-2-yl)propyl acetate S13a and (*S**)-1-phenyl-3-((*S**)-tetrahydrofuran-2-yl)propyl acetate S13a', CDCl₃, ¹H NMR, 400 MHz**



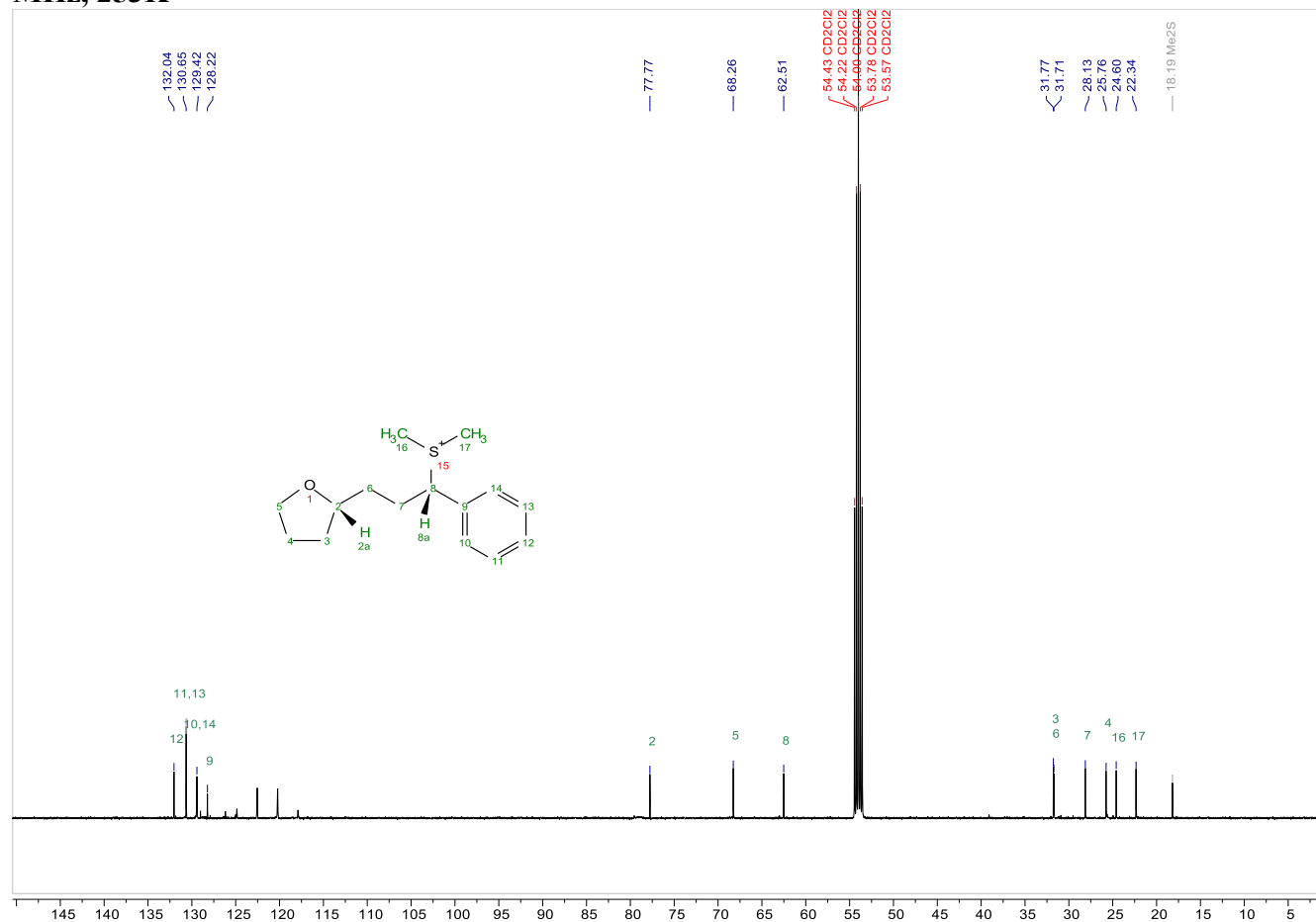
(R*)-1-phenyl-3-((S*)-tetrahydrofuran-2-yl)propyl acetate S13a' and (S*)-1-phenyl-3-((S*)-tetrahydrofuran-2-yl)propyl acetate S13a, CDCl₃, ¹³C NMR, 100 MHz



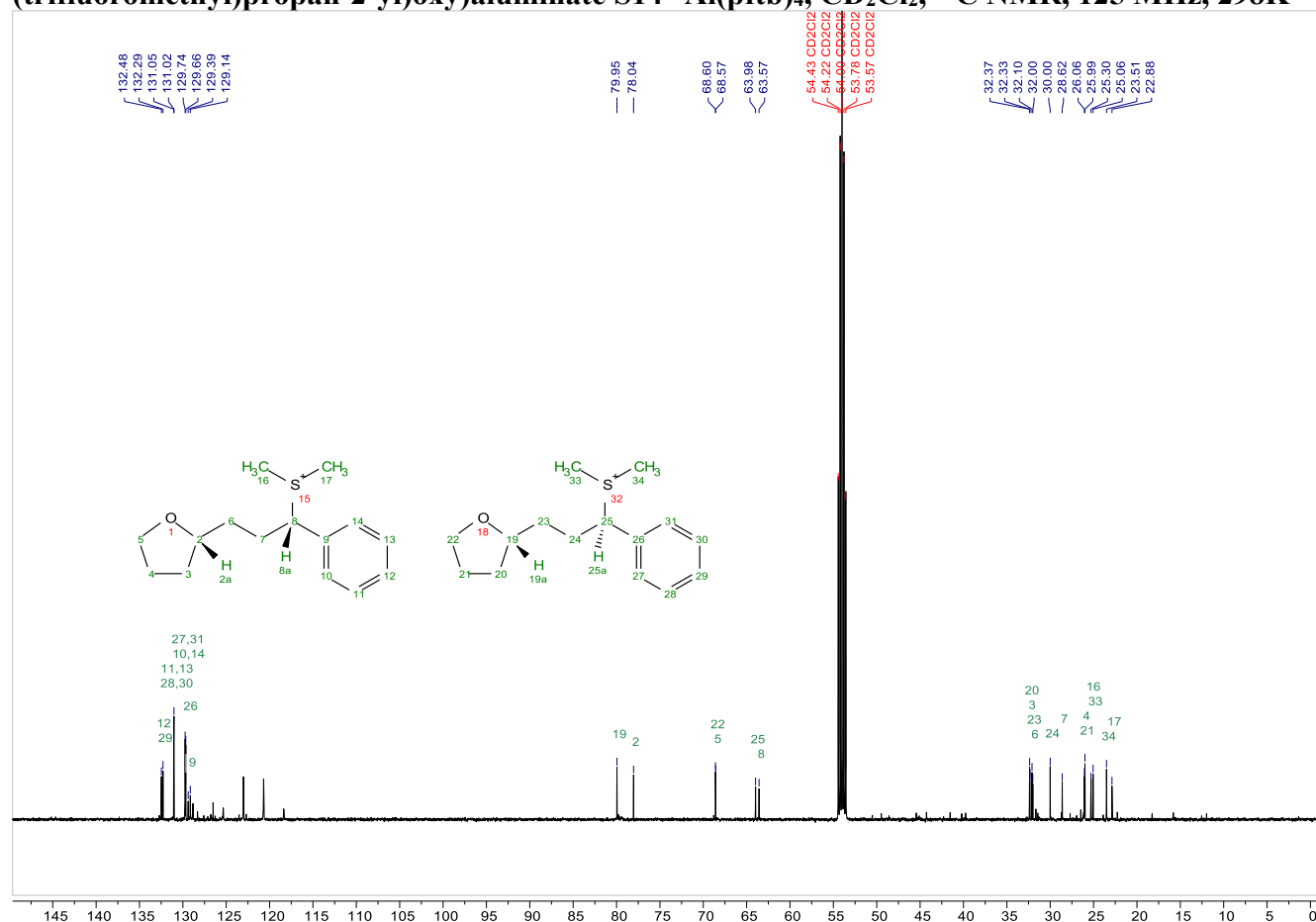
Dimethyl(*S*^{*})-1-phenyl-3-((*S*^{*})-tetrahydrofuran-2-yl)propyl)sulfonium tetrakis((1,1,1,3,3,3-hexafluoro-2-(trifluoromethyl)propan-2-yl)oxy)aluminumate S14•Al(pftb)₄, CD₂Cl₂, ¹H NMR, 500 MHz, 253K



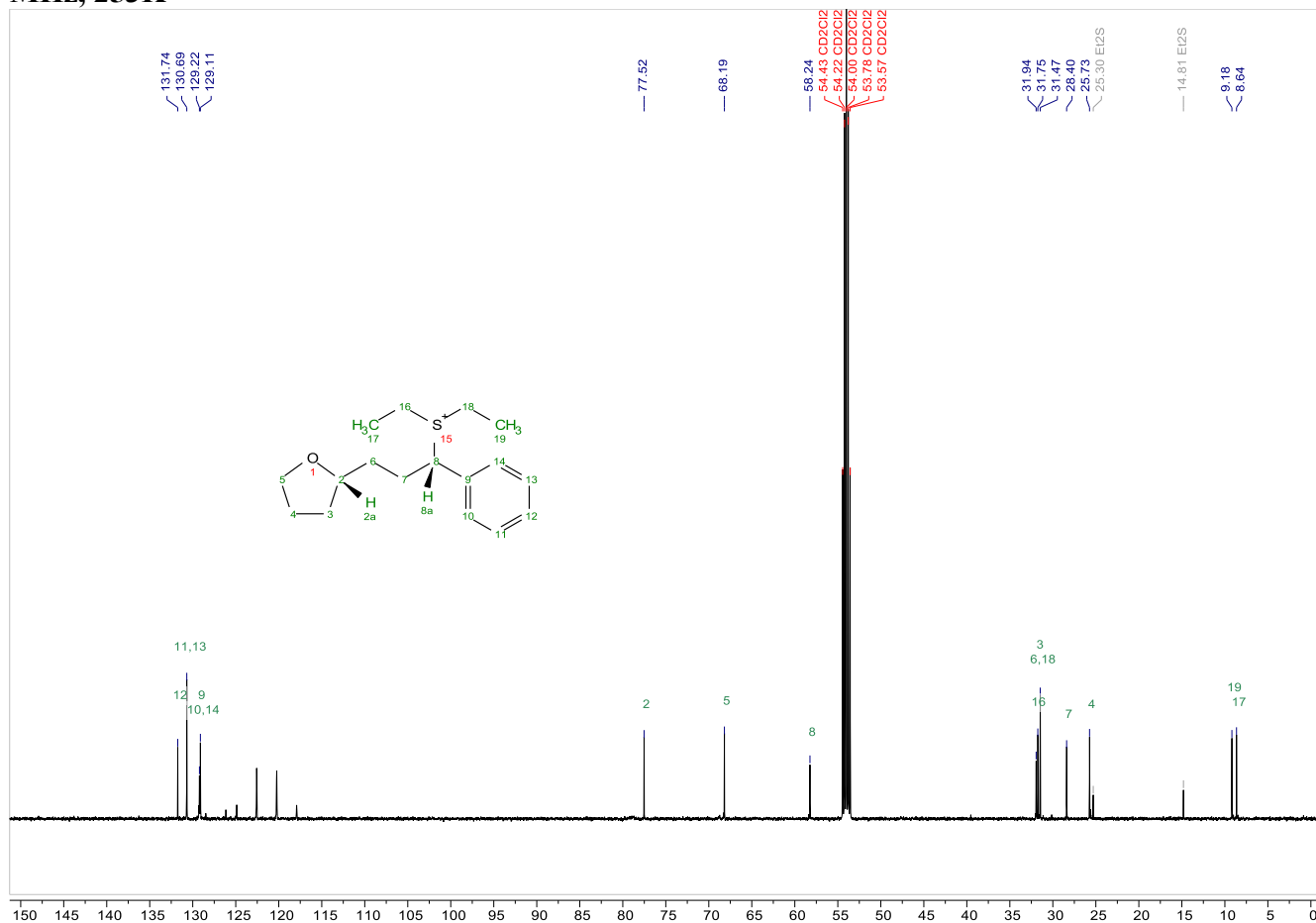
Dimethyl(*S*^{*})-1-phenyl-3-((*S*^{*})-tetrahydrofuran-2-yl)propyl)sulfonium tetrakis((1,1,1,3,3,3-hexafluoro-2-(trifluoromethyl)propan-2-yl)oxy)aluminum S14•Al(pftb)₄, CD₂Cl₂, ¹³C NMR, 125 MHz, 253K



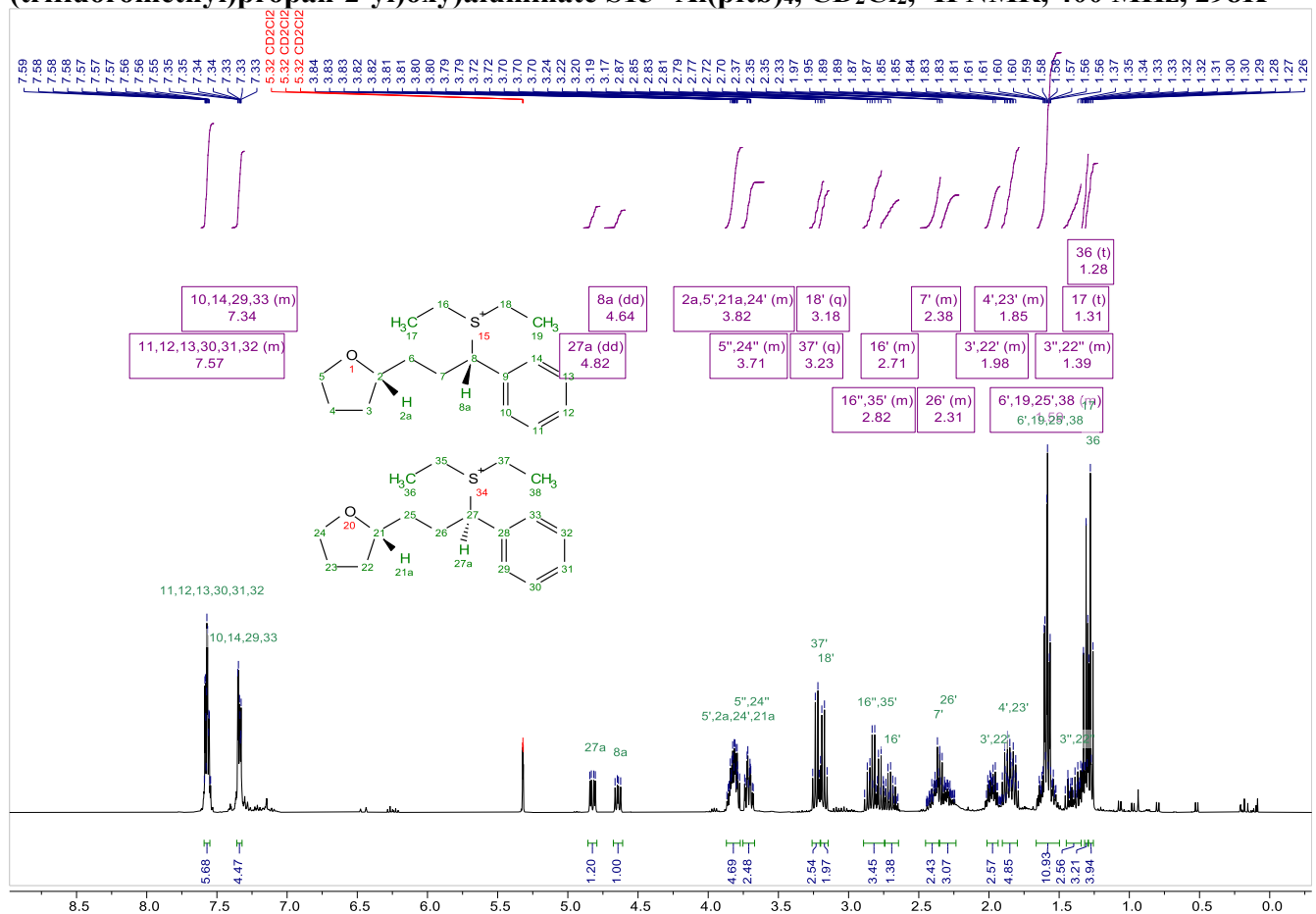
Dimethyl(*S*^{*})-1-phenyl-3-((*S*^{*})-tetrahydrofuran-2-yl)propyl)sulfonium tetrakis((1,1,1,3,3,3-hexafluoro-2-(trifluoromethyl)propan-2-yl)oxy)aluminumate S14•Al(pftb)₄ and Dimethyl(*R*^{*})-1-phenyl-3-((*S*^{*})-tetrahydrofuran-2-yl)propyl)sulfonium tetrakis((1,1,1,3,3,3-hexafluoro-2-(trifluoromethyl)propan-2-yl)oxy)aluminumate S14'•Al(pftb)₄, CD₂Cl₂, ¹³C NMR, 125 MHz, 298K



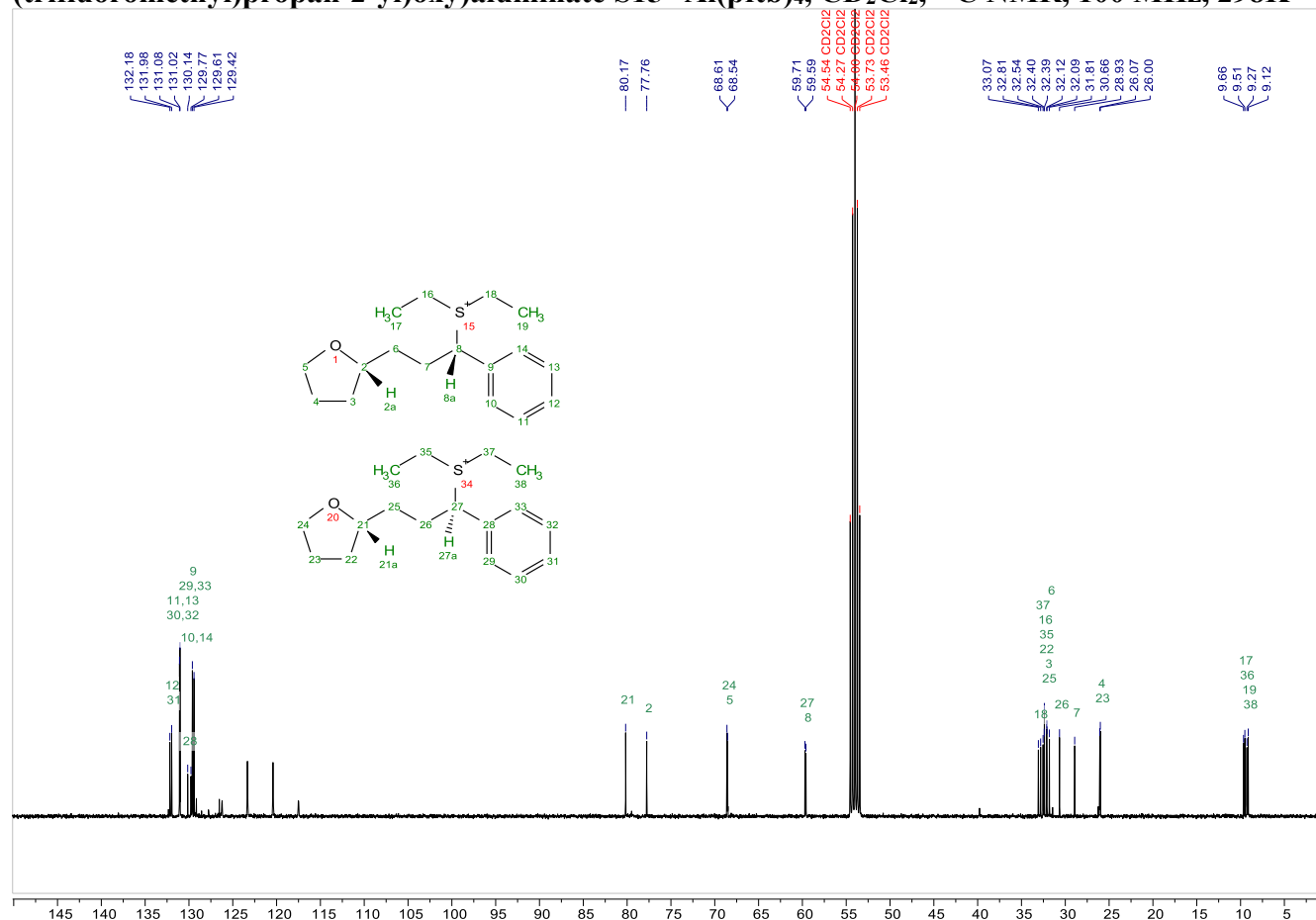
Diethyl((*S*^{*})-1-phenyl-3-((*S*^{*})-tetrahydrofuran-2-yl)propyl)sulfonium tetrakis((1,1,1,3,3,3-hexafluoro-2-(trifluoromethyl)propan-2-yl)oxy)aluminate S15•Al(pftb)₄, CD₂Cl₂, ¹³C NMR, 125 MHz, 253K



Diethyl((*S*^{*})-1-phenyl-3-((*S*^{*})-tetrahydrofuran-2-yl)propyl)sulfonium tetrakis((1,1,1,3,3,3-hexafluoro-2-(trifluoromethyl)propan-2-yl)oxy)aluminumate S15•Al(pftb)₄ and Diethyl((*R*^{*})-1-phenyl-3-((*S*^{*})-tetrahydrofuran-2-yl)propyl)sulfonium tetrakis((1,1,1,3,3,3-hexafluoro-2-(trifluoromethyl)propan-2-yl)oxy)aluminumate S15^{*}•Al(pftb)₄, CD₂Cl₂, ¹H NMR, 400 MHz, 298K



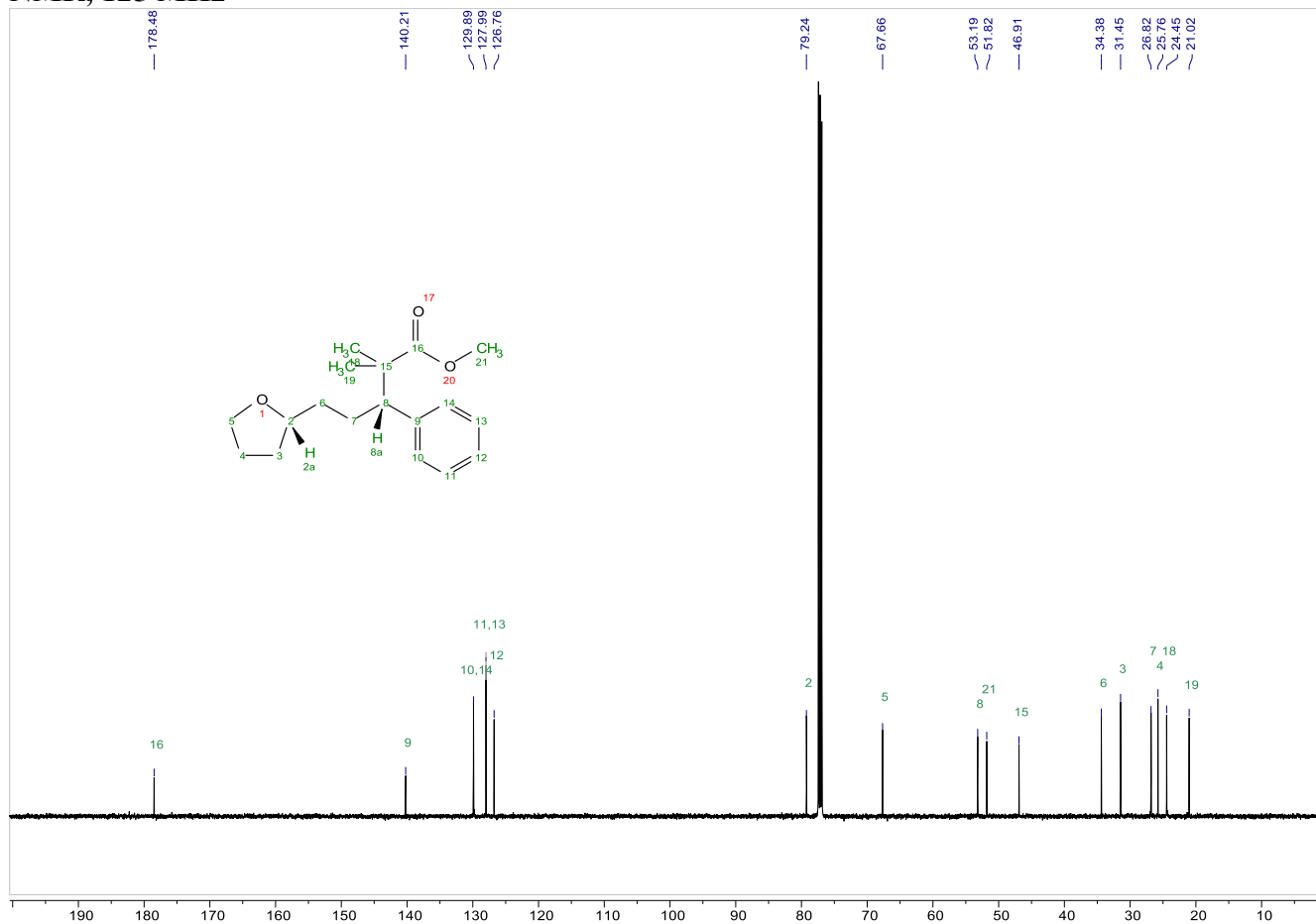
Diethyl((*S*^{*})-1-phenyl-3-((*S*^{*})-tetrahydrofuran-2-yl)propyl)sulfonium tetrakis((1,1,1,3,3,3-hexafluoro-2-(trifluoromethyl)propan-2-yl)oxy)aluminate S15•Al(pftb)₄ and Diethyl((*R*^{*})-1-phenyl-3-((*S*^{*})-tetrahydrofuran-2-yl)propyl)sulfonium tetrakis((1,1,1,3,3,3-hexafluoro-2-(trifluoromethyl)propan-2-yl)oxy)aluminate S15^{*}•Al(pftb)₄, CD₂Cl₂, ¹³C NMR, 100 MHz, 298K



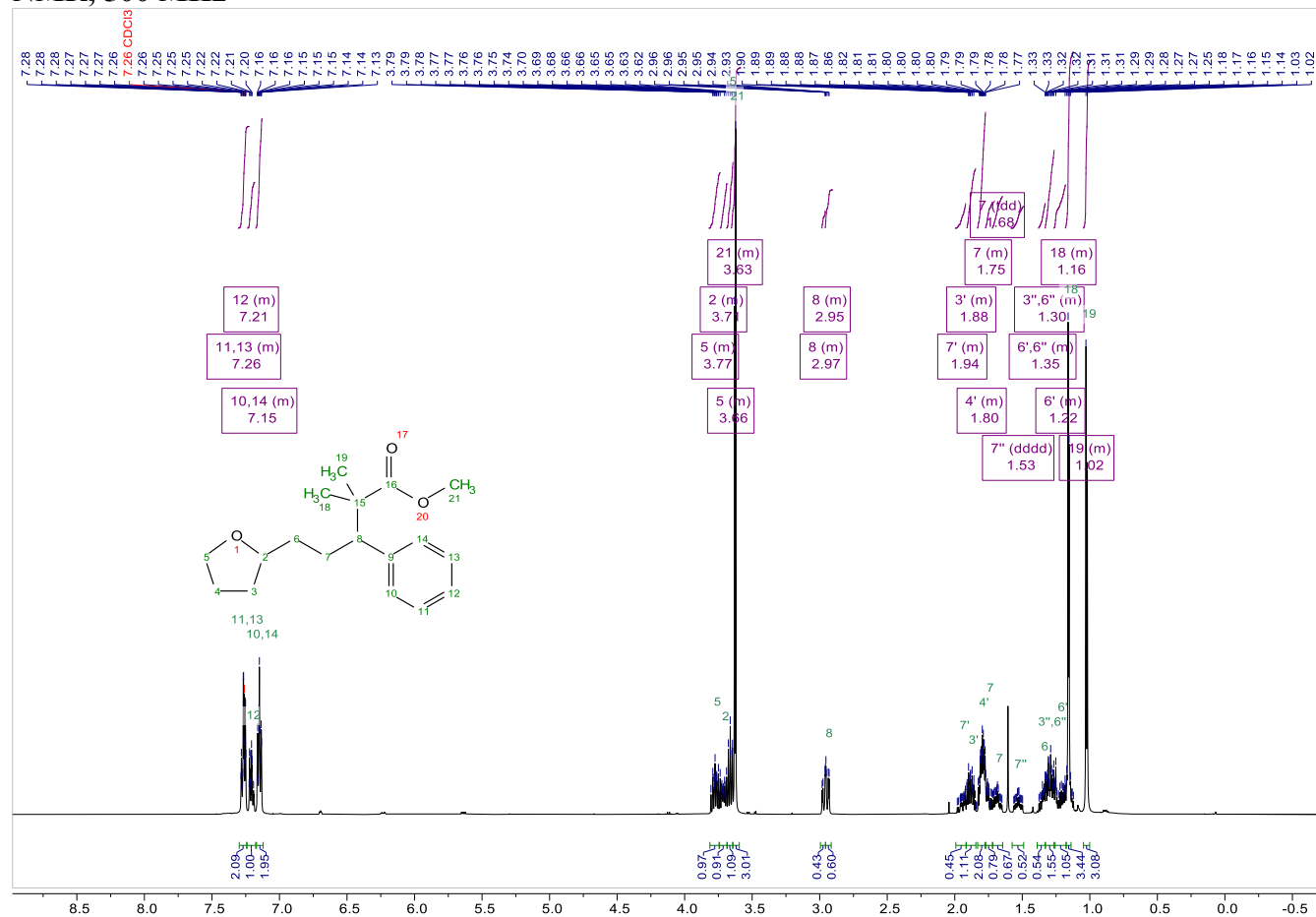
Methyl (*S*^{*})-2,2-dimethyl-3-phenyl-5-((*R*^{*})-tetrahydrofuran-2-yl)pentanoate S16, CDCl₃, ¹H NMR, 500 MHz



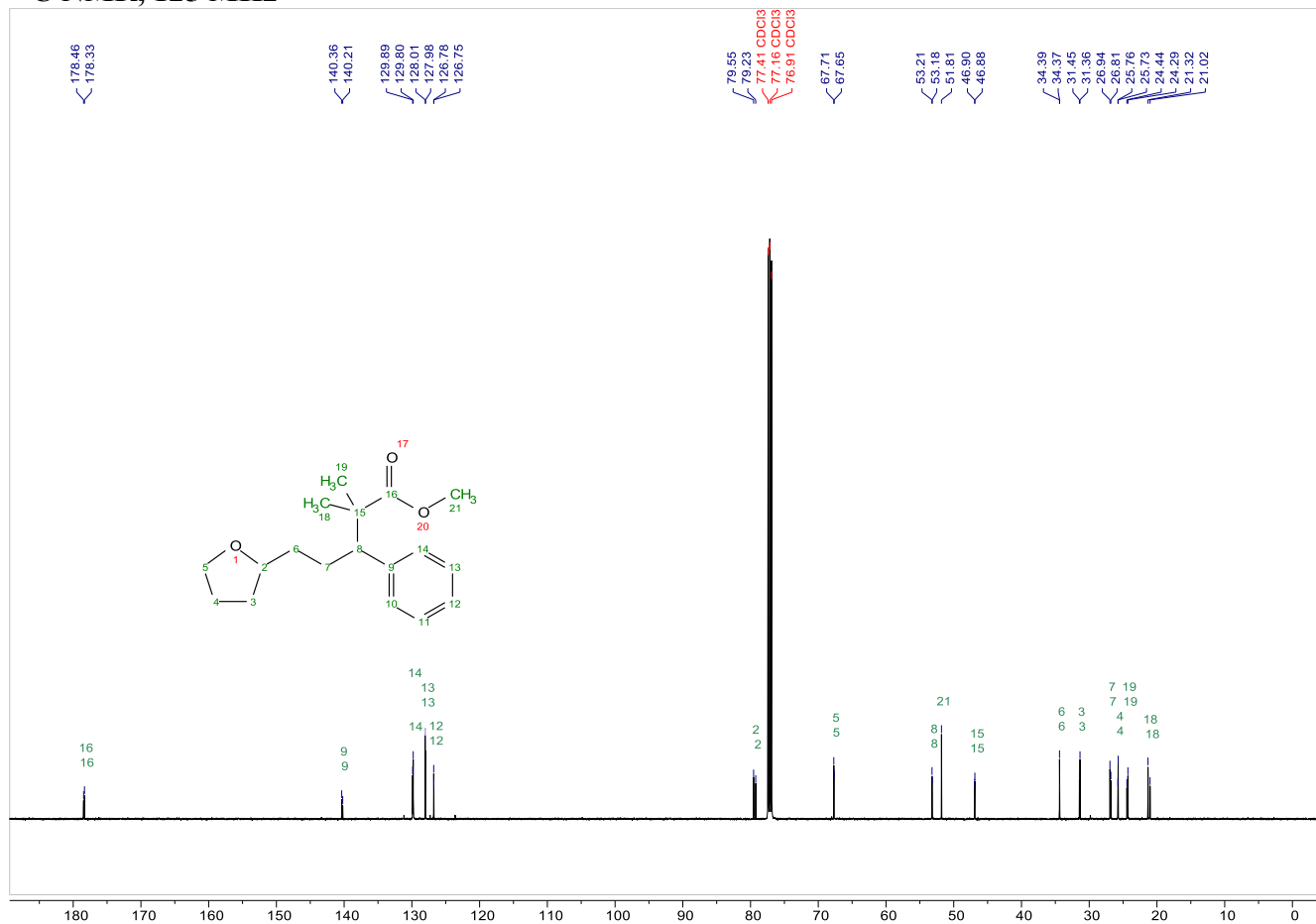
Methyl (*S**)-2,2-dimethyl-3-phenyl-5-((*R**)-tetrahydrofuran-2-yl)pentanoate S16, CDCl₃, ¹³C NMR, 125 MHz



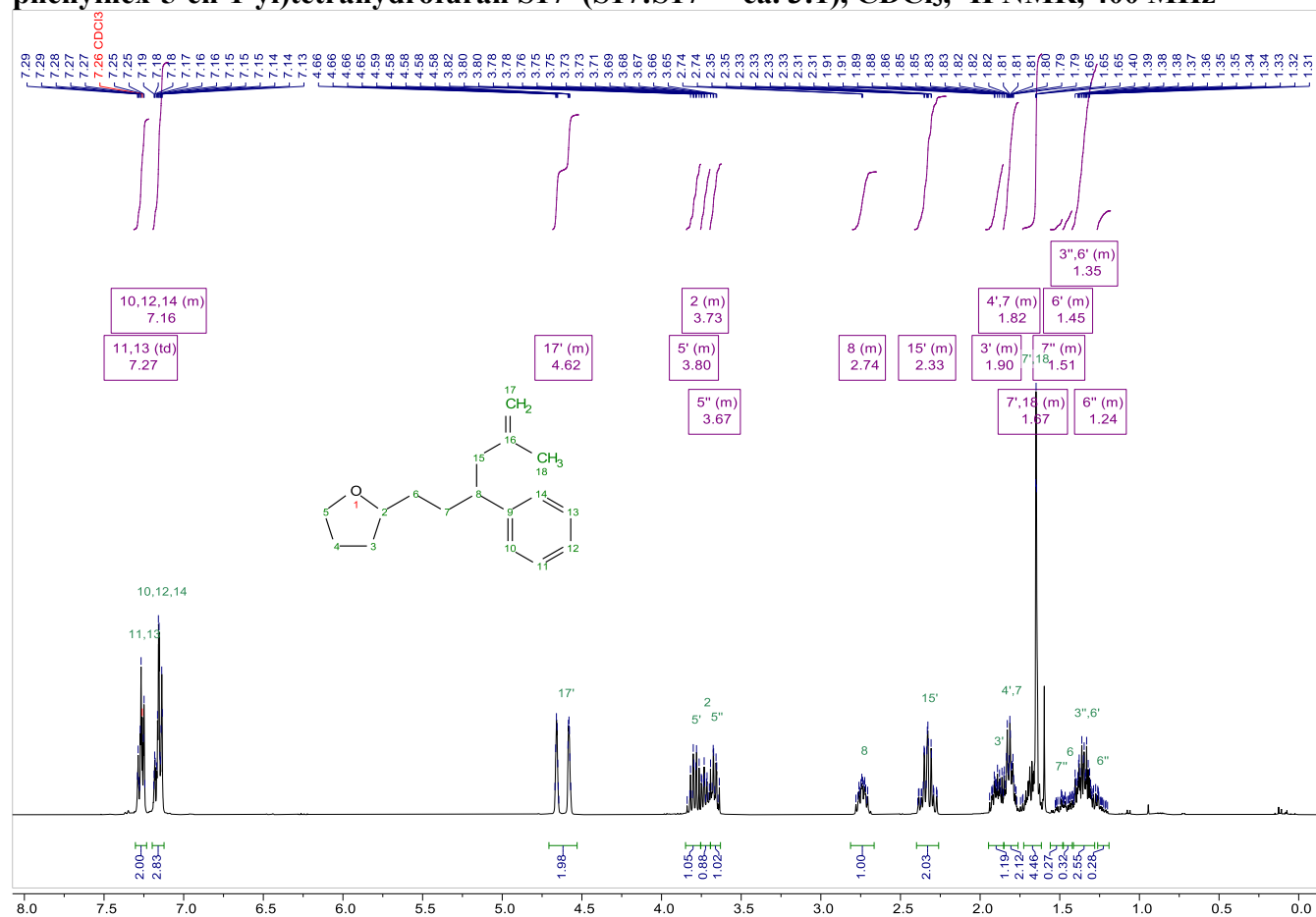
Methyl 2,2-dimethyl-3-phenyl-5-(tetrahydrofuran-2-yl)pentanoate S16/S16' (d.r. = 1:1), CDCl₃, ¹H NMR, 500 MHz



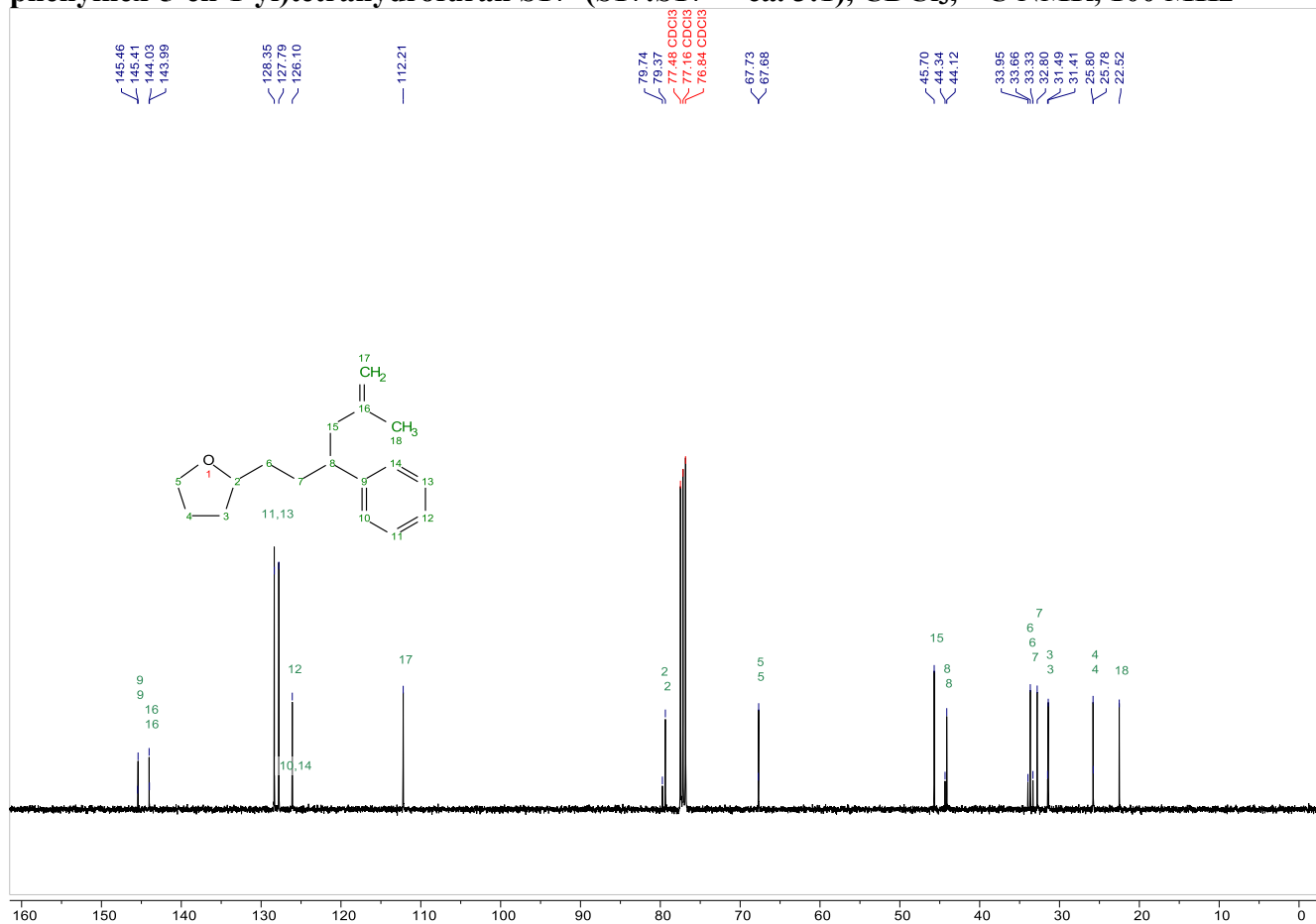
**Methyl 2,2-dimethyl-3-phenyl-5-(tetrahydrofuran-2-yl)pentanoate S16/S16' (d.r. = 1:1), CDCl₃,
¹³C NMR, 125 MHz**



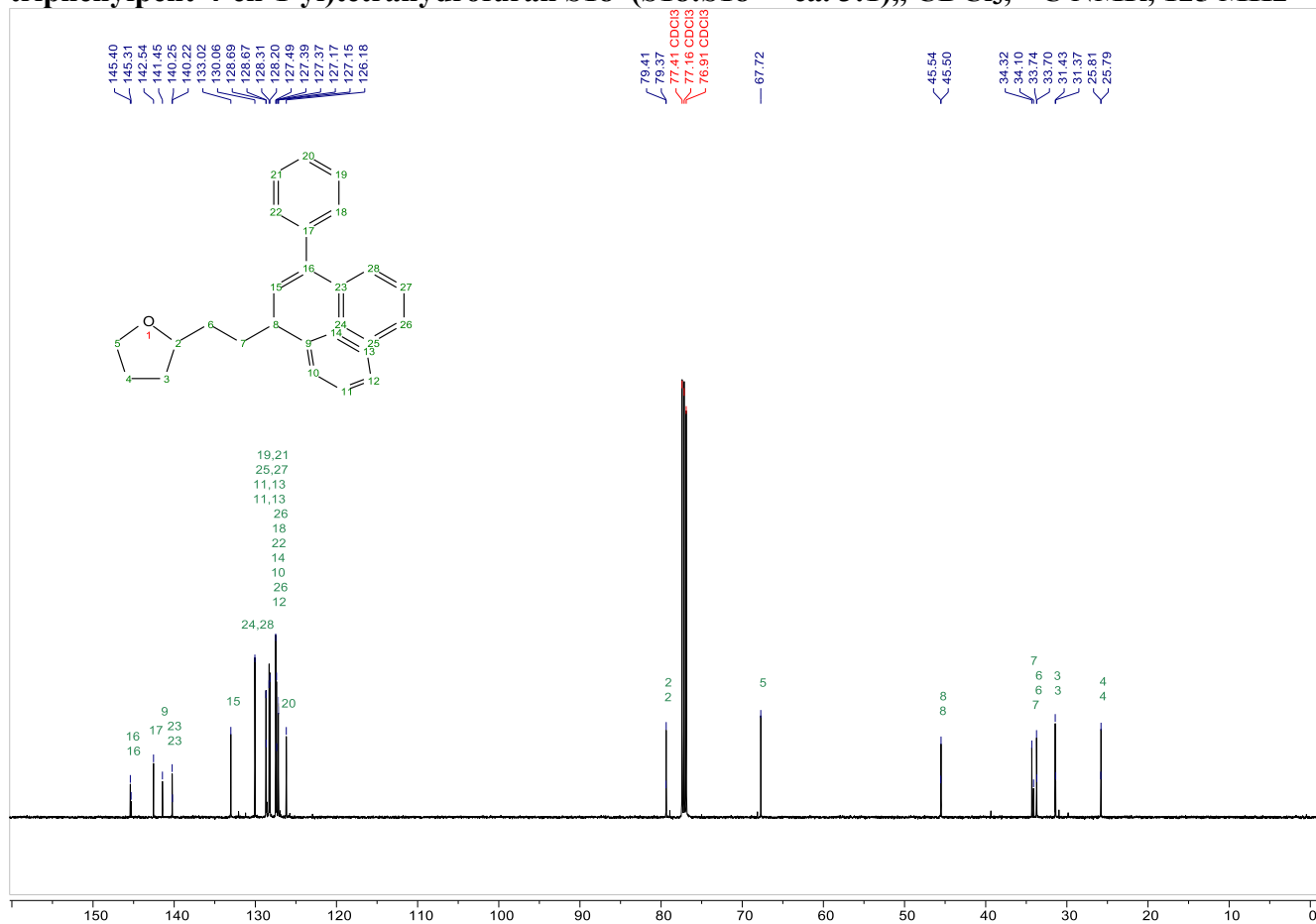
(*R*^{*})-2-((*R*^{*})-5-methyl-3-phenylhex-5-en-1-yl)tetrahydrofuran S17 and (*R*^{*})-2-((*S*^{*})-5-methyl-3-phenylhex-5-en-1-yl)tetrahydrofuran S17' (S17:S17' = ca. 3:1), CDCl₃, ¹H NMR, 400 MHz



(*R*^{*})-2-((*R*^{*})-5-methyl-3-phenylhex-5-en-1-yl)tetrahydrofuran S17 and (*R*^{*})-2-((*S*^{*})-5-methyl-3-phenylhex-5-en-1-yl)tetrahydrofuran S17' (S17:S17' = ca. 3:1), CDCl₃, ¹³C NMR, 100 MHz



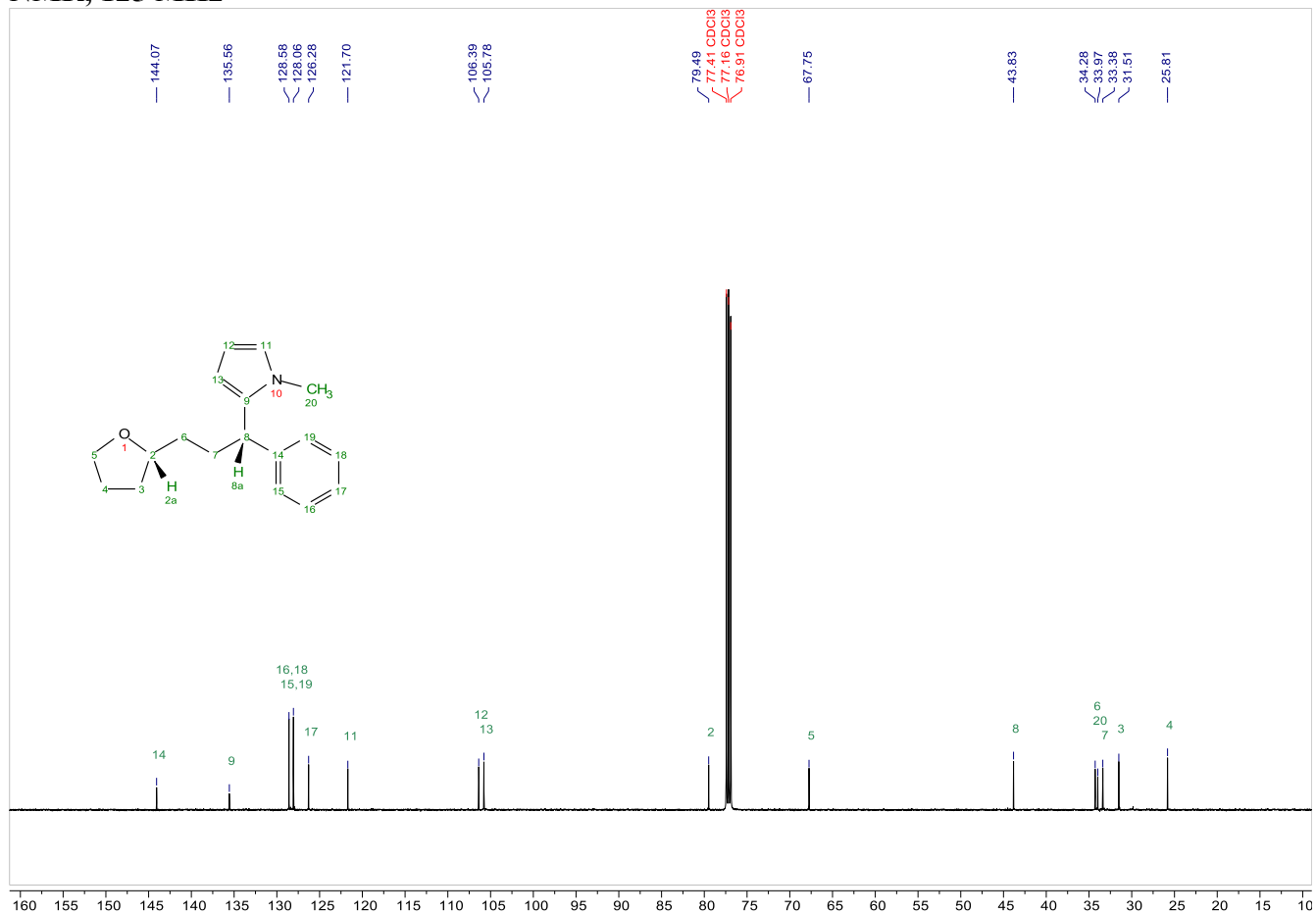
(*R*^{*})-2-((*R*^{*})-3,5,5-triphenylpent-4-en-1-yl)tetrahydrofuran 18 and (*R*^{*})-2-((*R*^{*})-3,5,5-triphenylpent-4-en-1-yl)tetrahydrofuran S18' (S18:S18' = ca. 3:1), CDCl₃, ¹³C NMR, 125 MHz



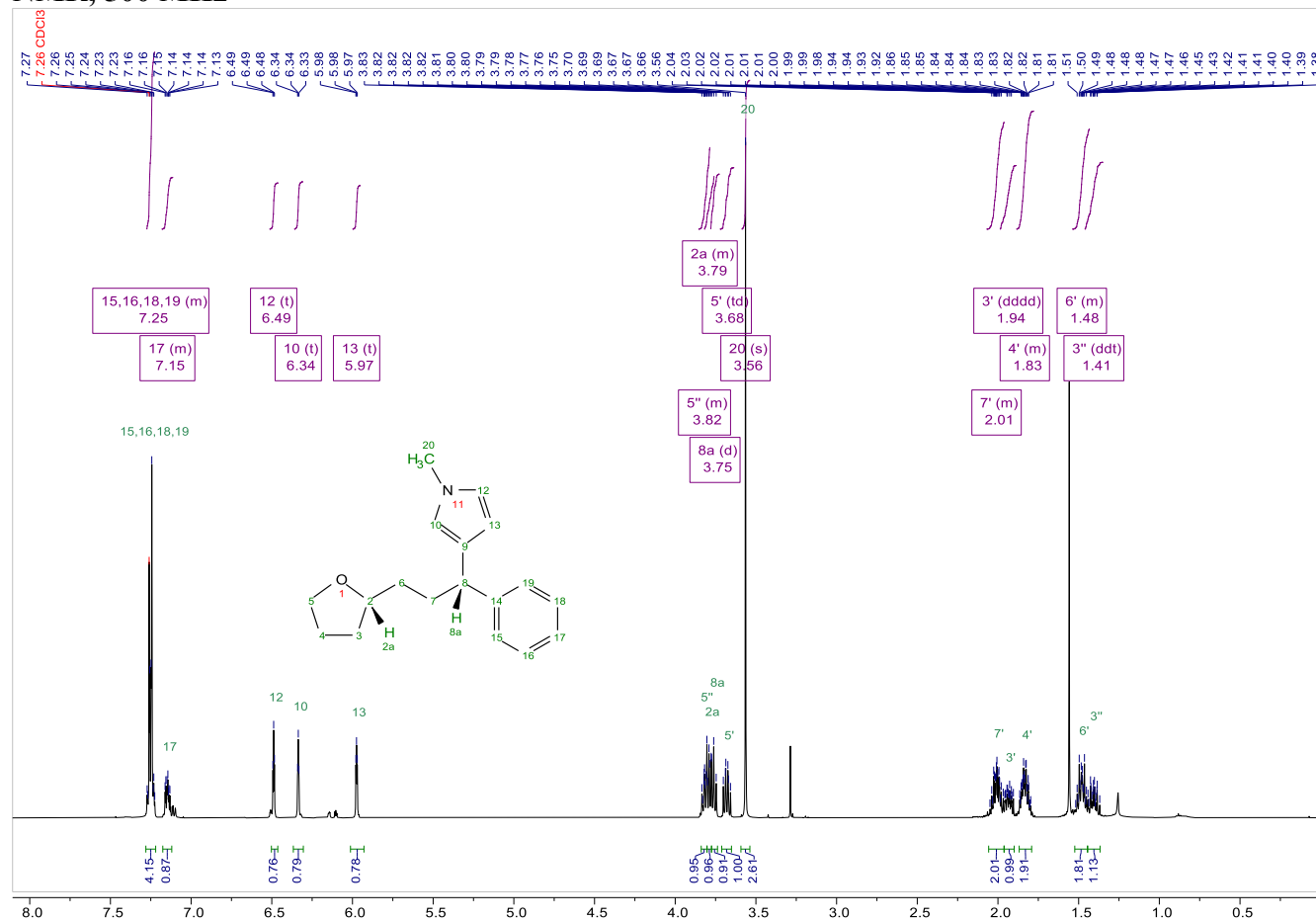
1-Methyl-2-((*S)-1-phenyl-3-((*R**)-tetrahydrofuran-2-yl)propyl)-1*H*-pyrrole S19a, CDCl₃, ¹H NMR, 500 MHz**



1-Methyl-2-((*S*^{*})-1-phenyl-3-((*R*^{*})-tetrahydrofuran-2-yl)propyl)-1*H*-pyrrole S19a, CDCl₃, ¹³C NMR, 125 MHz



1-Methyl-3-((S*)-1-phenyl-3-((R*)-tetrahydrofuran-2-yl)propyl)-1H-pyrrole S19b, CDCl₃, ¹H NMR, 500 MHz



1-Methyl-3-((S*)-1-phenyl-3-((R*)-tetrahydrofuran-2-yl)propyl)-1H-pyrrole S19b, CDCl₃, ¹³C NMR, 125 MHz

