

Supporting Information

Stereochemically Defined Various Multi-substituted Alkenes Bearing a Tetrafluoroethylene ($-\text{CF}_2\text{CF}_2-$) Fragment

Yukiho Sakaguchi^a, Shigeyuki Yamada^a, Tsutomu Konno^{a},
Tomohiro Agou^b, and Toshio Kubota^b*

*^a Faculty of Molecular Chemistry and Engineering,
Kyoto Institute of Technology,
Matsugasaki, Sakyo-ku, Kyoto 606-8585, Japan*

E-mail: konno@kit.ac.jp, Fax: +81-75-724-7504

*^b Department of Materials Science,
Ibaraki University, 4-12-1 Nakanarusawa, Hitachi 316-8511, Japan*

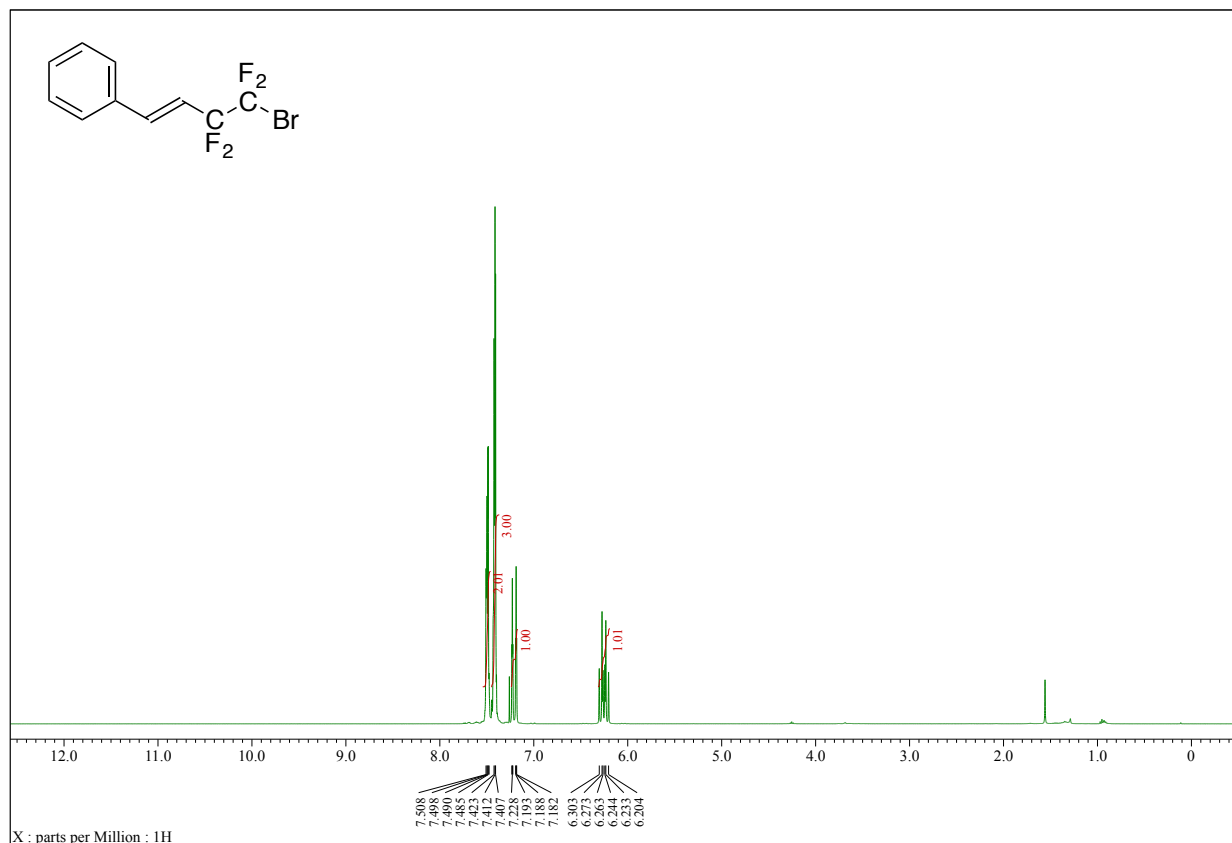
Table of Contents

¹H and ¹³C NMR spectra of

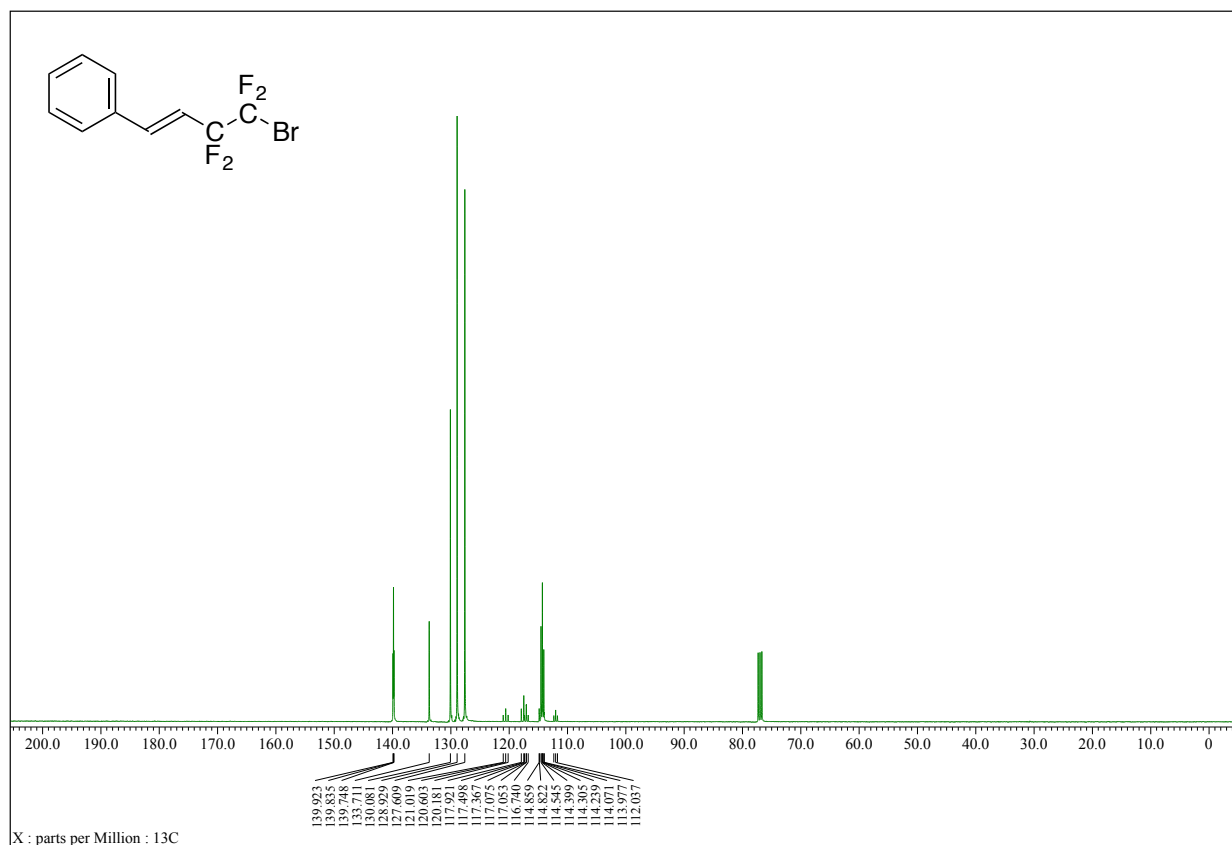
<i>(E)</i> -4-Bromo-3,3,4,4-tetrafluoro-1-phenylbut-1-ene (4a)	S2
<i>(E)</i> -4-Bromo-3,3,4,4-tetrafluoro-1-(4-methylphenyl)but-1-ene (4b)	S3
<i>(E)</i> -4-Bromo-3,3,4,4-tetrafluoro-1-(3-methylphenyl)but-1-ene (4c)	S4
<i>(E)</i> -4-Bromo-3,3,4,4-tetrafluoro-1-(2-methylphenyl)but-1-ene (4d)	S5
<i>(E)</i> -4-Bromo-1-(4-chlorophenyl)-3,3,4,4-tetrafluorobut-1-ene (4f)	S6
<i>(E)</i> -Ethyl 4-(4-bromo-3,3,4,4-tetrafluorobut-1-en-1-yl)benzoate (4g)	S7
<i>(E)</i> -4-Bromo-3,3,4,4-tetrafluoro-1-(4-nitrophenyl)but-1-ene (4h)	S8
4-Bromo-3,3,4,4-tetrafluoro-1,1-diphenylbut-1-ene (5a)	S9
4-Bromo-3,3,4,4-tetrafluoro-1-(4-methylphenyl)-1-phenylbut-1-ene (5b)	S10
4-Bromo-3,3,4,4-tetrafluoro-1-(3-methylphenyl)-1-phenylbut-1-ene (5c)	S11
4-Bromo-3,3,4,4-tetrafluoro-1-(4-methoxyphenyl)-1-phenylbut-1-ene (5e)	S12
4-Bromo-1-(4-chlorophenyl)-3,3,4,4-tetrafluoro-1-phenylbut-1-ene (5f)	S13
Crystal structure of (E)- 5f , which is shown as 50% of the elipsoid contour probability level.	S14
Ethyl 4-[(4-bromo-3,3,4,4-tetrafluoro-1-phenyl)but-1-en-1-yl]benzoate (5g)	S15
4-Bromo-3,3,4,4-tetrafluoro-1-(4-nitrophenyl)-1-phenylbut-1-ene (5h)	S16
1,2,4-Tribromo-3,3,4,4-tetrafluorobutane (6)	S17
2,4-Dibromo-3,3,4,4-tetrafluorobut-1-ene (7)	S18
4-Bromo-3,3,4,4-tetrafluoro-2-phenylbut-1-ene (8a)	S19
4-Bromo-3,3,4,4-tetrafluoro-2-(4-methylphenyl)but-1-ene (8b)	S20
4-(4-Bromo-3,3,4,4-tetrafluorobut-1-en-2-yl)phenyl methyl ketone (8c)	S21
4-Bromo-3,3,4,4-tetrafluoro-2-(3-thienyl)but-1-ene (8d)	S22
<i>(E)</i> -4-Bromo-3,3,4,4-tetrafluoro-1,2-diphenylbut-1-ene (E-10a)	S23
Crystal structure of (E)- 10a , which is shown as 50% of the elipsoid contour probability level.	S24
<i>(E)</i> -4-Bromo-3,3,4,4-tetrafluoro-1-(4-methylphenyl)-2-phenylbut-1-ene (E-10b)	S25
<i>(E)</i> -4-Bromo-3,3,4,4-tetrafluoro-1-(3-methylphenyl)-2-phenylbut-1-ene (E-10c)	S26
<i>(E)</i> -4-Bromo-3,3,4,4-tetrafluoro-1-(2-methylphenyl)-2-phenylbut-1-ene (E-10d)	S27
<i>(E)</i> -4-Bromo-3,3,4,4-tetrafluoro-1-(4-methoxyphenyl)-2-phenylbut-1-ene (E-10e)	S28
<i>(E)</i> -4-Bromo-1-(4-chlorophenyl)-3,3,4,4-tetrafluoro-2-phenylbut-1-ene (E-10f)	S29
<i>(E)</i> -Ethyl 4-(4-bromo-3,3,4,4-tetrafluoro-2-phenylbut-1-en-1-yl)benzoate (E-10g)	S30
<i>(E)</i> -4-Bromo-3,3,4,4-tetrafluoro-1-(4-nitrophenyl)-2-phenylbut-1-ene (E-10h)	S31
<i>(E)</i> -4-Bromo-3,3,4,4-tetrafluoro-2-(4-methylphenyl)-1-phenylbut-1-ene (E-10i)	S32
<i>(E)</i> -(4-Bromo-3,3,4,4-tetrafluoro-1-phenylbut-1-en-2-yl)phenyl methyl ketone (E-10j)	S33
<i>(E)</i> -2,2,3,3-Tetrafluoro-1,5-diphenylpent-4-en-1-ol (11a)	S34
<i>(E)</i> -5,5,6,6-Tetrafluoro-8-phenyl-oct-7-en-4-ol (11b)	S35
<i>(E)</i> -2,2,3,3-Tetrafluoro-5-(4-methylphenyl)-1-phenylpent-4-en-1-ol (11c)	S36
<i>(E)</i> -5,5,6,6-Tetrafluoro-8-(4-methylphenyl)oct-7-en-4-ol (11d)	S37
<i>(E)</i> -Ethyl 4-(3,3,4,4-tetrafluoro-5-hydroxy-5-phenylpent-1-en-1-yl)benzoate (11e)	S38
<i>(E)</i> -Ethyl 4-(3,3,4,4-tetrafluoro-5-hydroxyoct-4-en-1-yl)benzoate (11f)	S39
2,2,3,3-Tetrafluoro-1,5,5-triphenylpent-4-en-1-ol (11g)	S40
2,2,3,3-Tetrafluoro-1,4-diphenylpent-4-en-1-ol (11h)	S41
<i>(E)</i> -2,2,3,3-Tetrafluoro-1,4,5-triphenylpent-4-en-1-ol (11i)	S42

(E)-4-Bromo-3,3,4,4-tetrafluoro-1-phenylbut-1-ene (4a)

¹H NMR

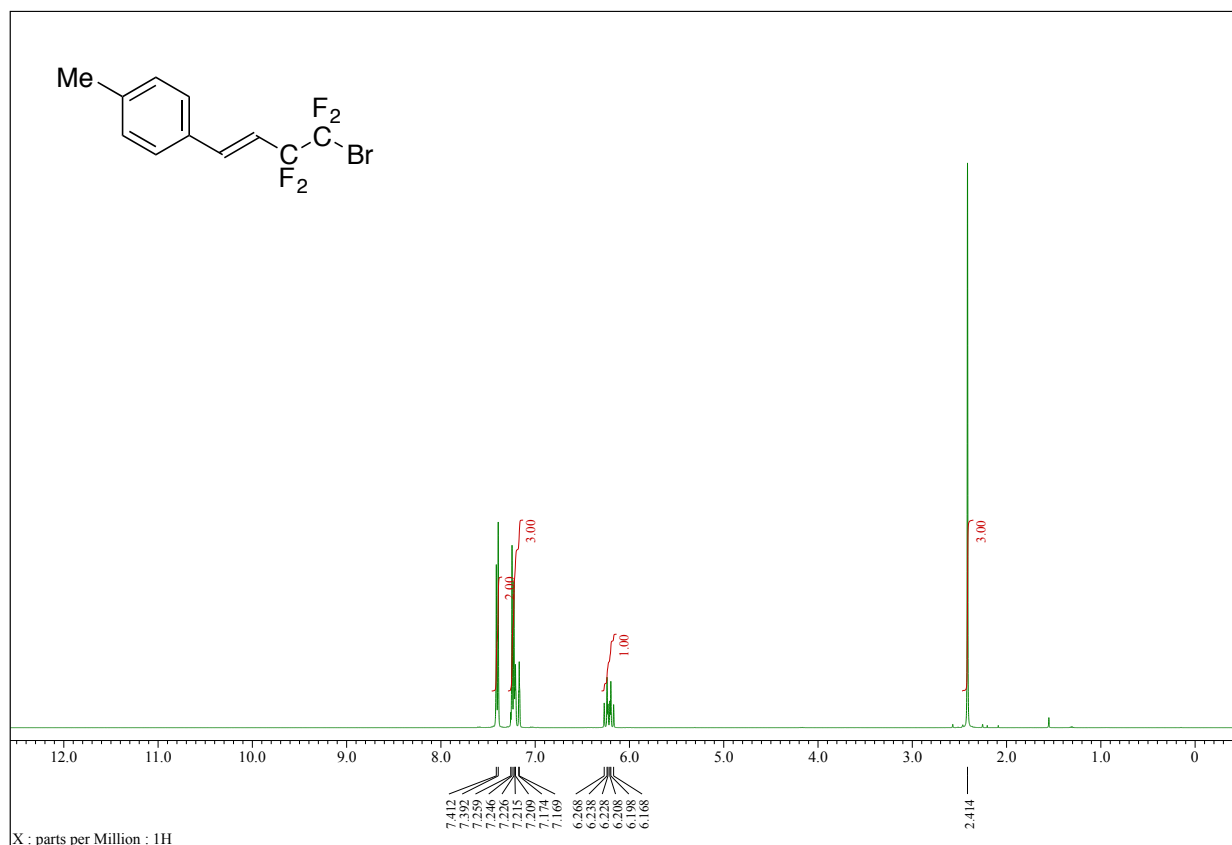


¹³C NMR

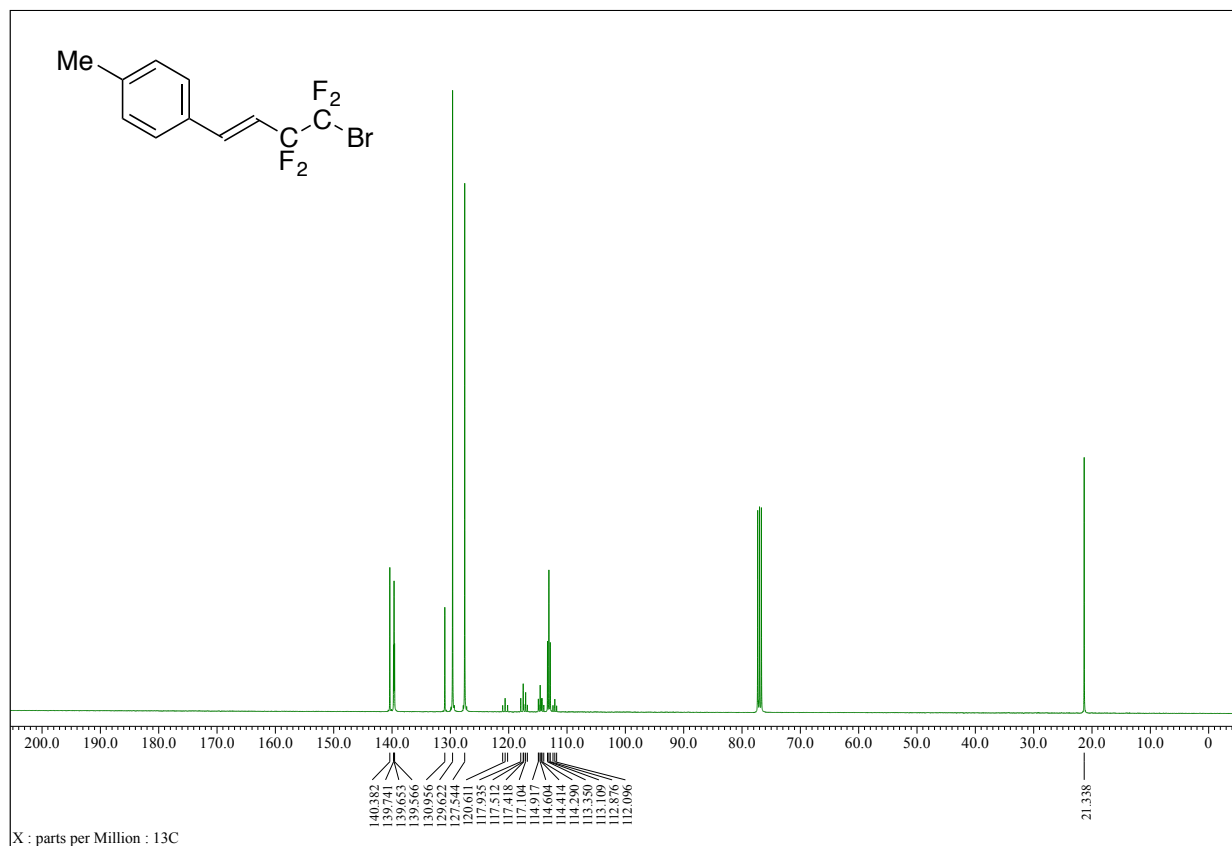


(E)-4-Bromo-3,3,4,4-tetrafluoro-1-(4-methylphenyl)but-1-ene (4b)

¹H NMR

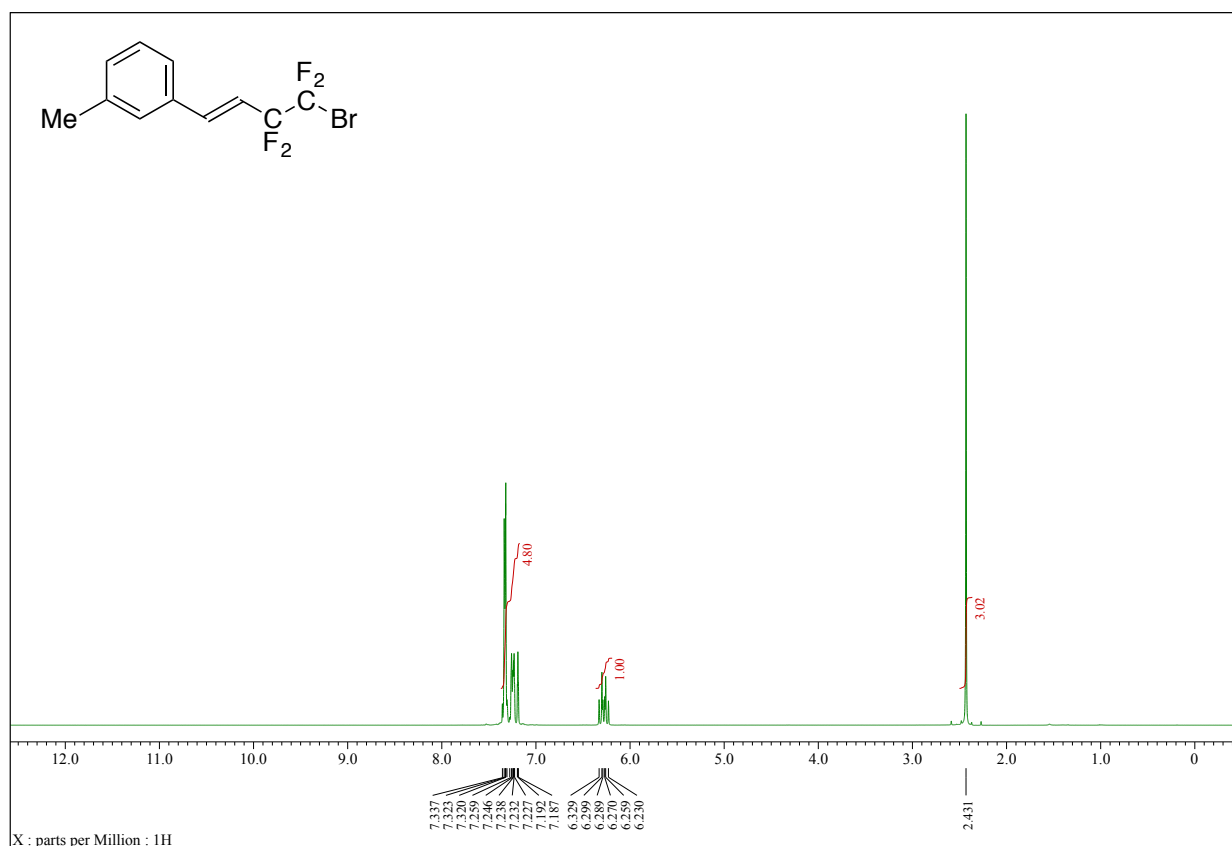


¹³C NMR

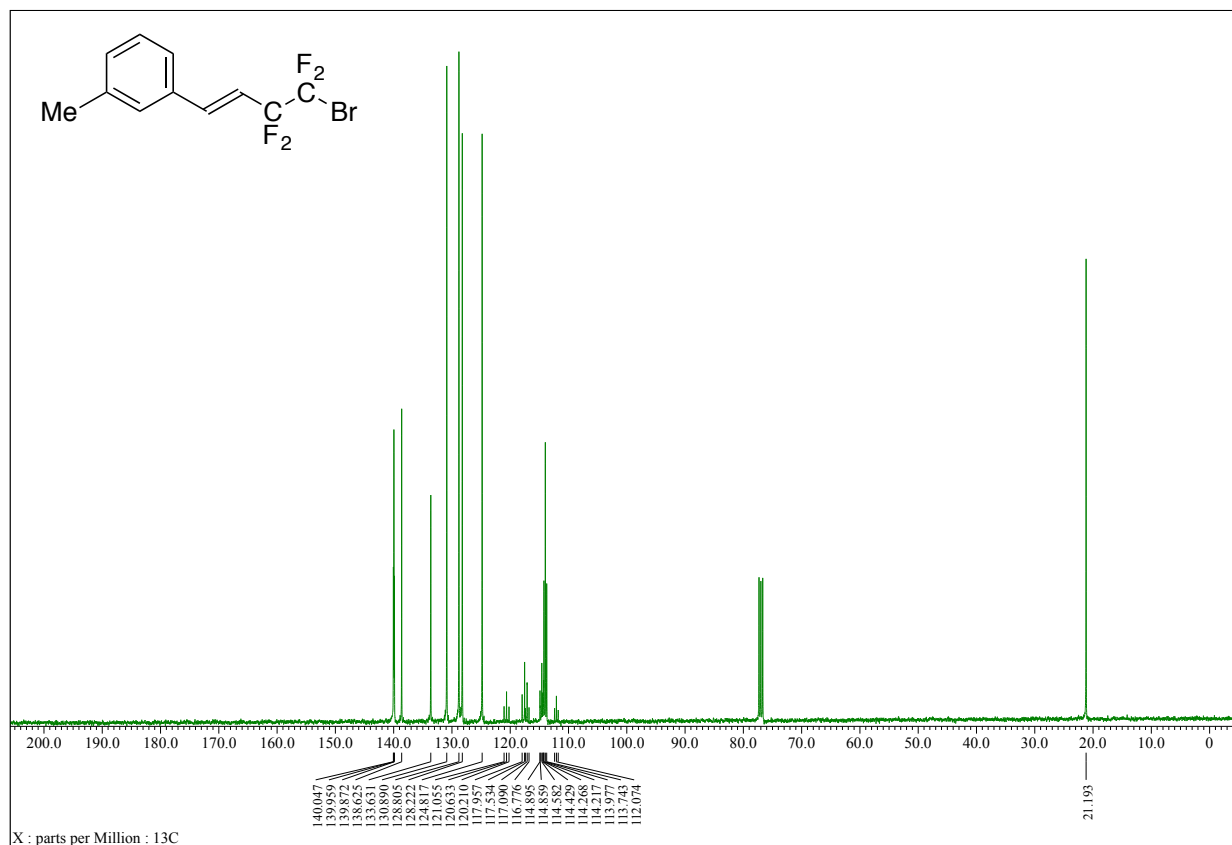


(E)-4-Bromo-3,3,4,4-tetrafluoro-1-(3-methylphenyl)but-1-ene (4c)

¹H NMR

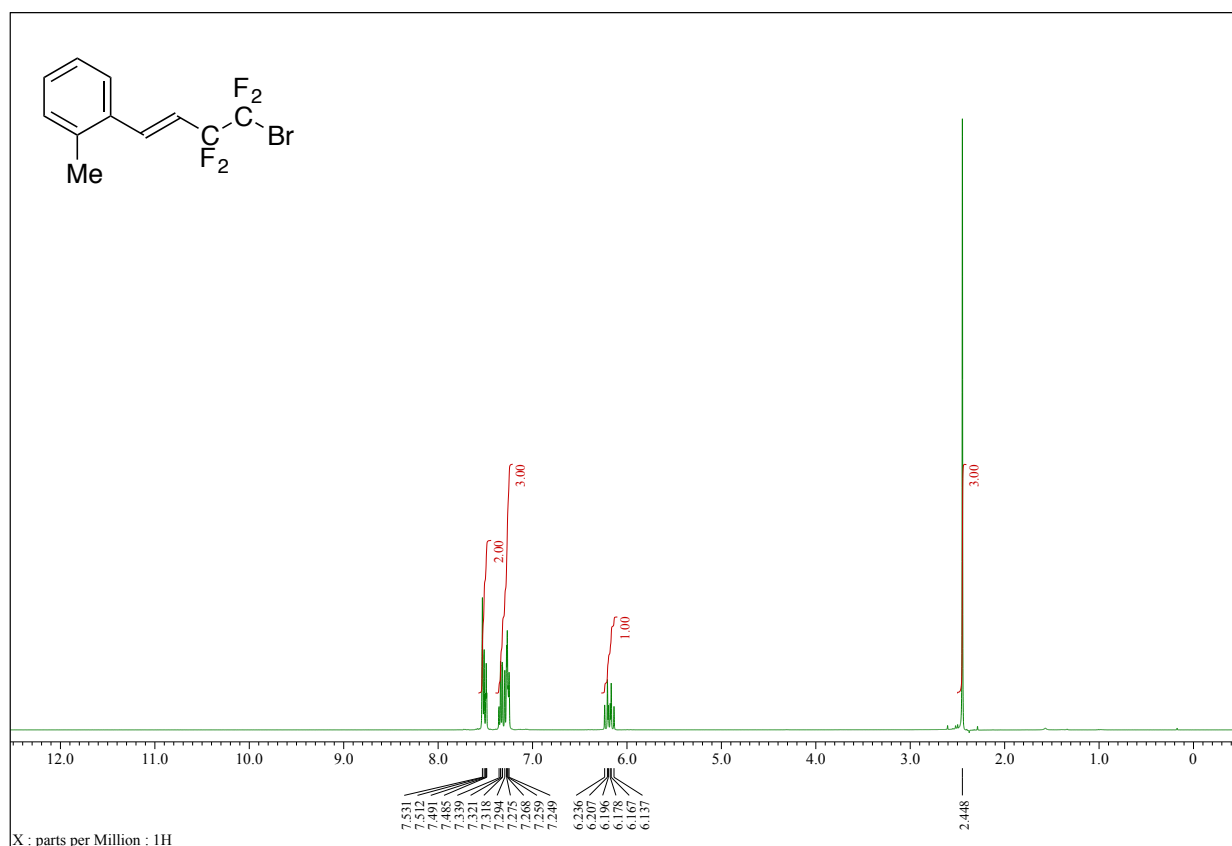


¹³C NMR

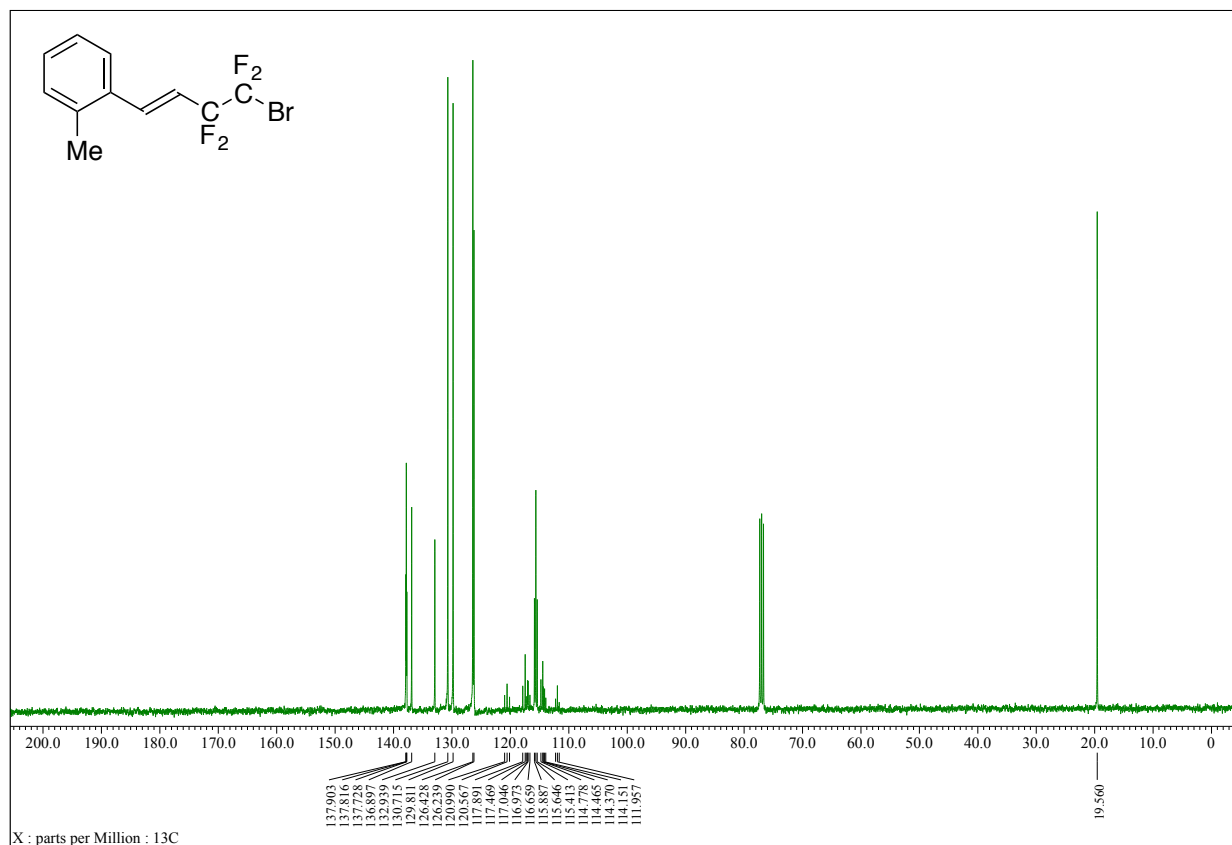


(E)-4-Bromo-3,3,4,4-tetrafluoro-1-(2-methylphenyl)but-1-ene (4d)

¹H NMR

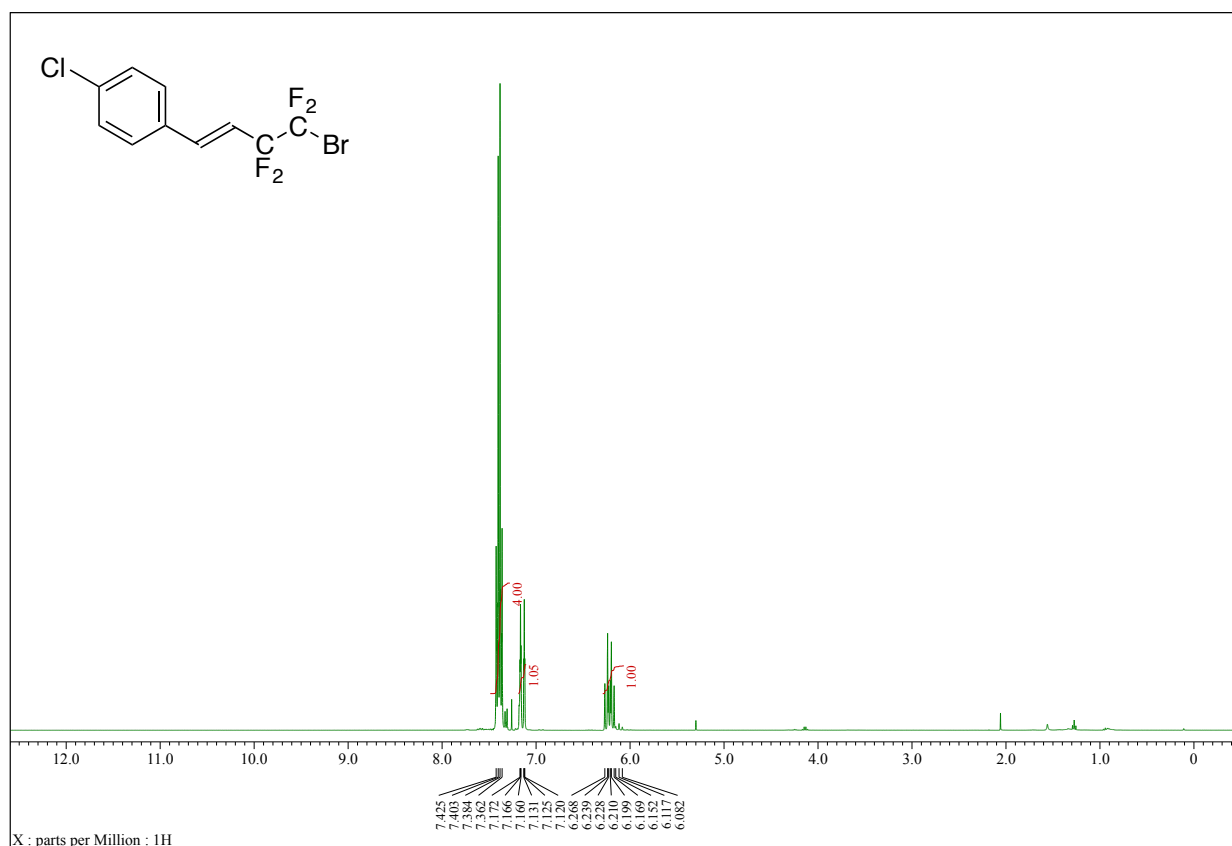


¹³C NMR

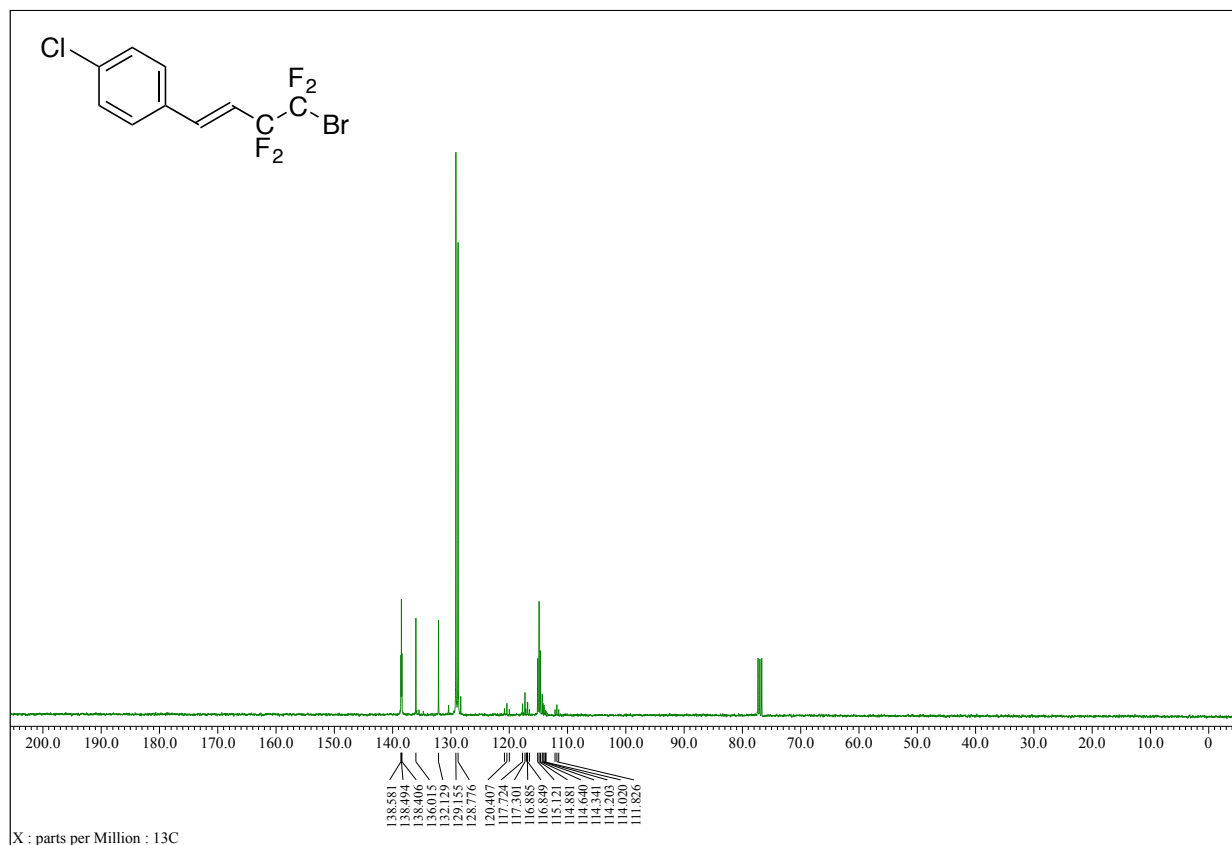


(E)-4-Bromo-1-(4-chlorophenyl)-3,3,4,4-tetrafluorobut-1-ene (4f)

¹H NMR

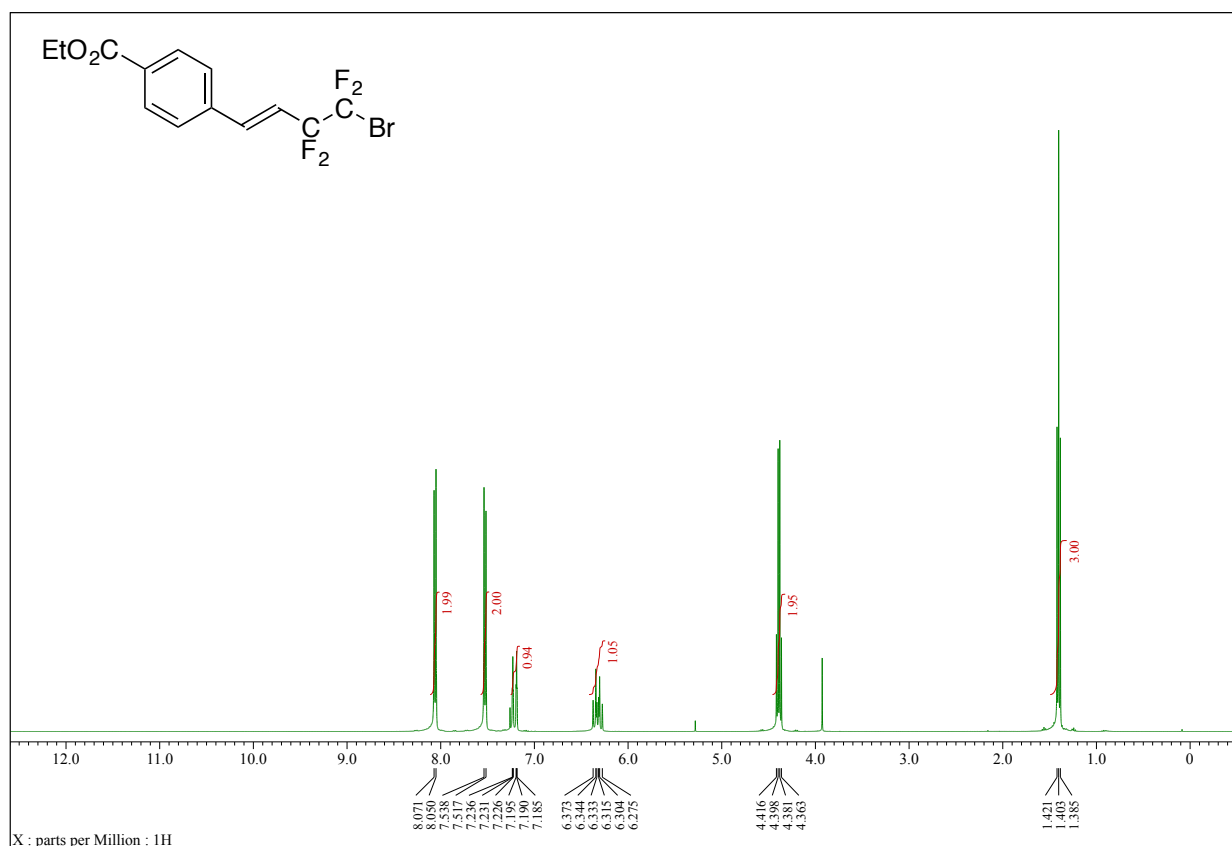


¹³C NMR

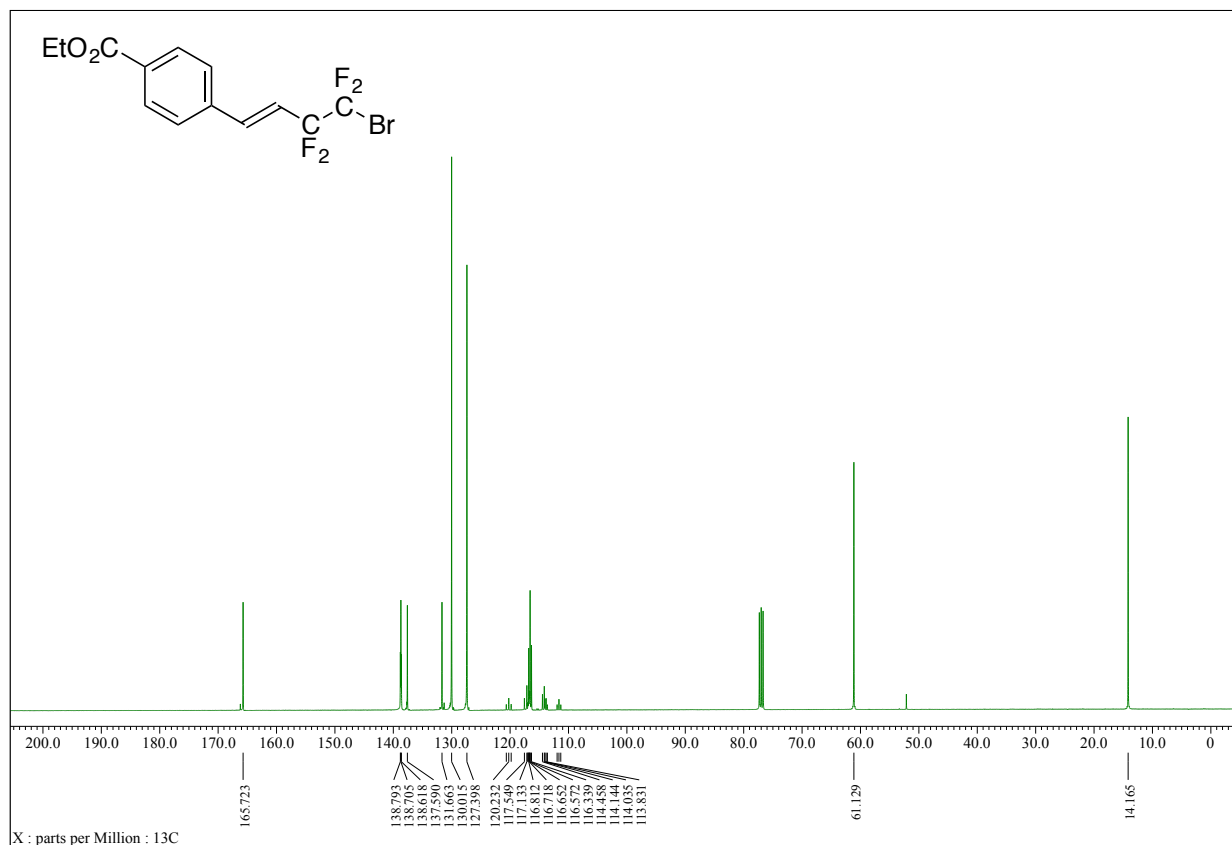


(E)-Ethyl 4-(4-bromo-3,3,4,4-tetrafluorobut-1-en-1-yl)benzoate (4g)

¹H NMR

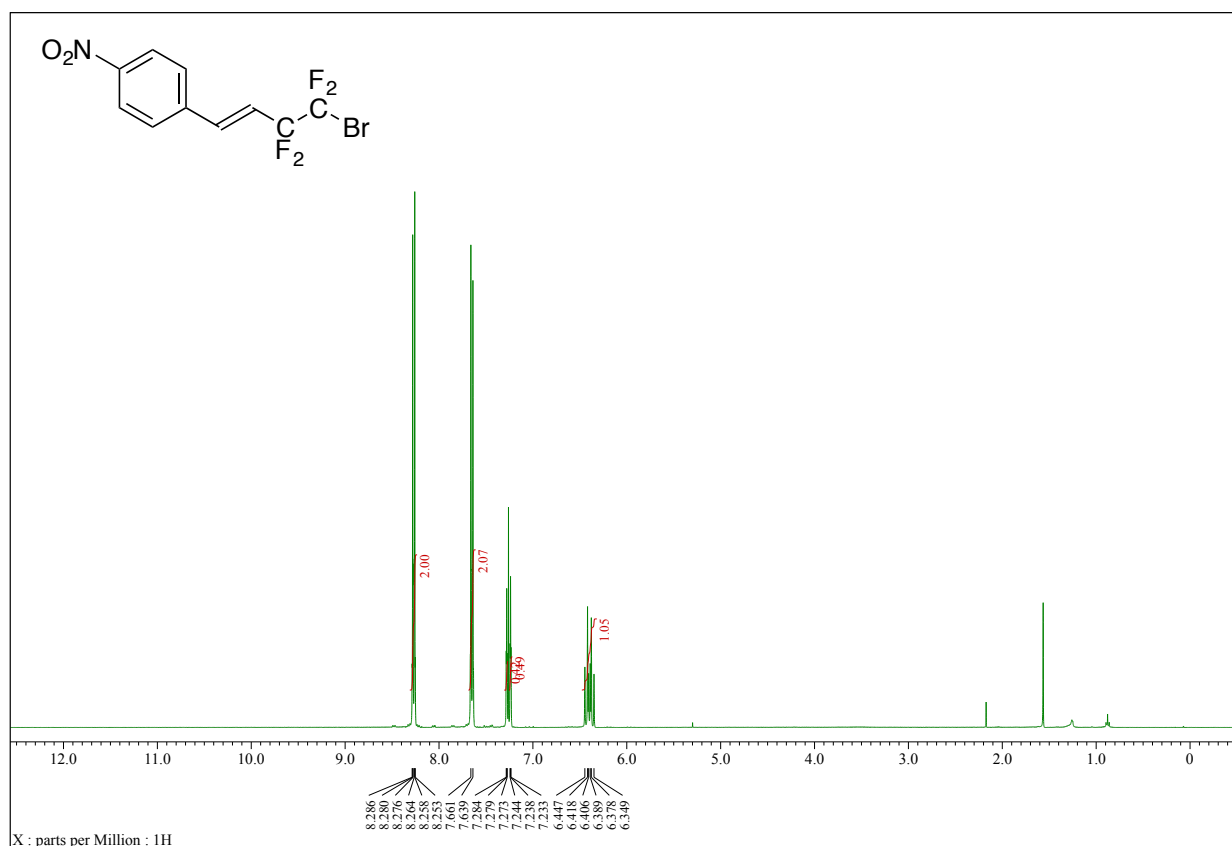


¹³C NMR

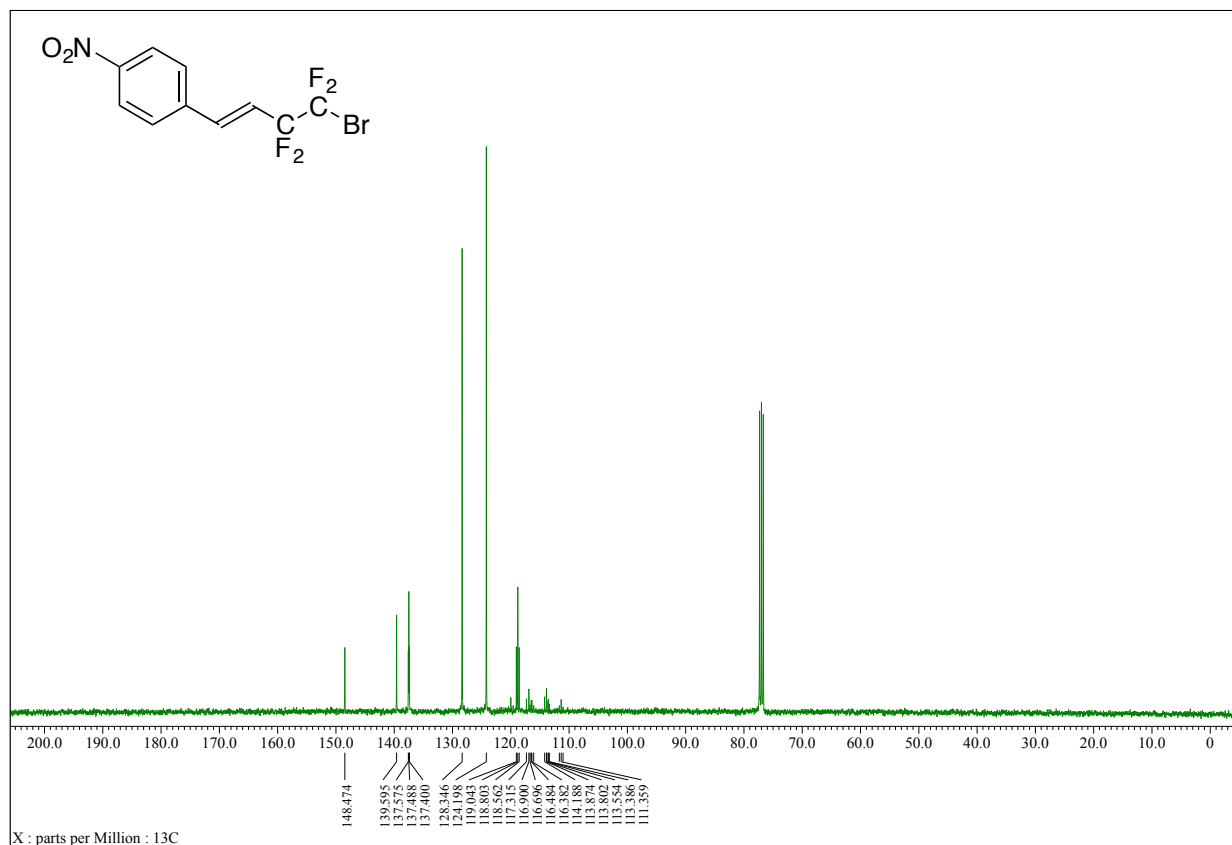


***(E)*-4-Bromo-3,3,4,4-tetrafluoro-1-(4-nitrophenyl)but-1-ene (4h)**

¹H NMR

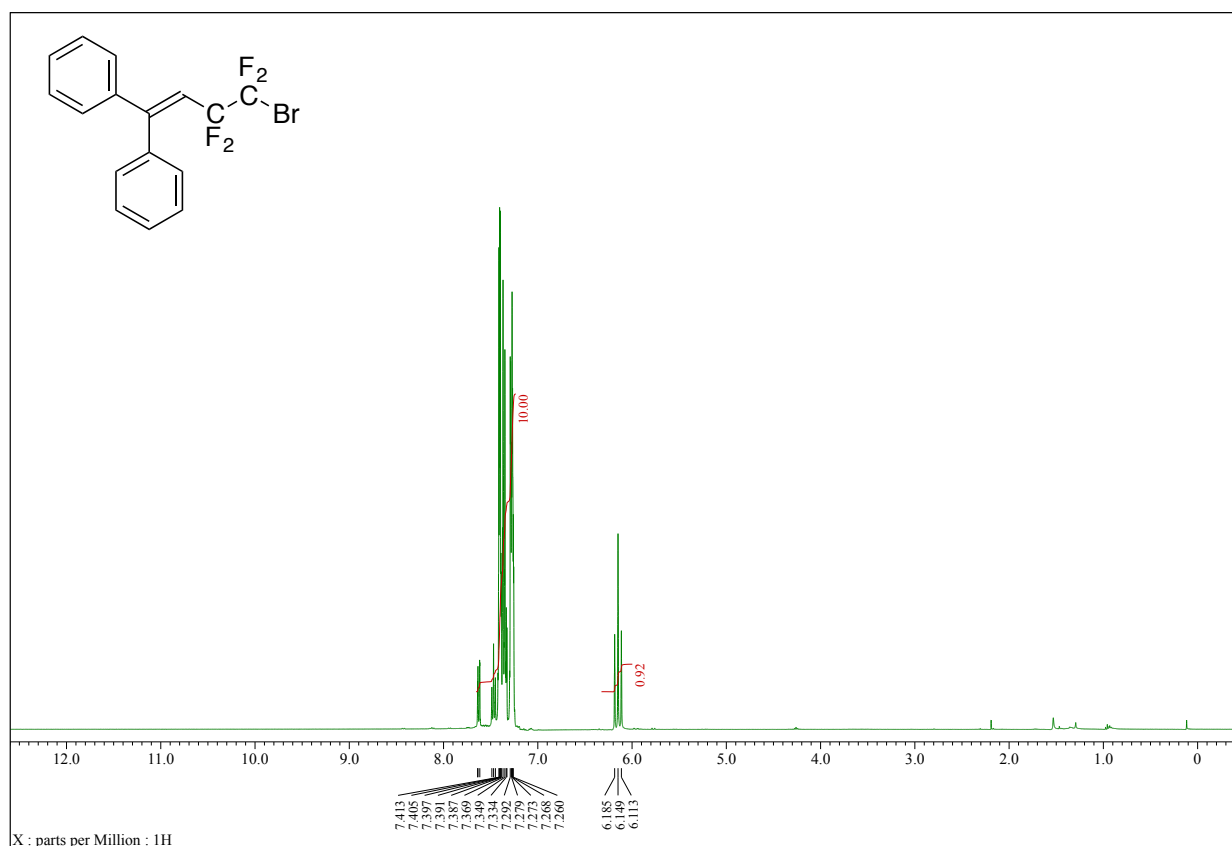


¹³C NMR

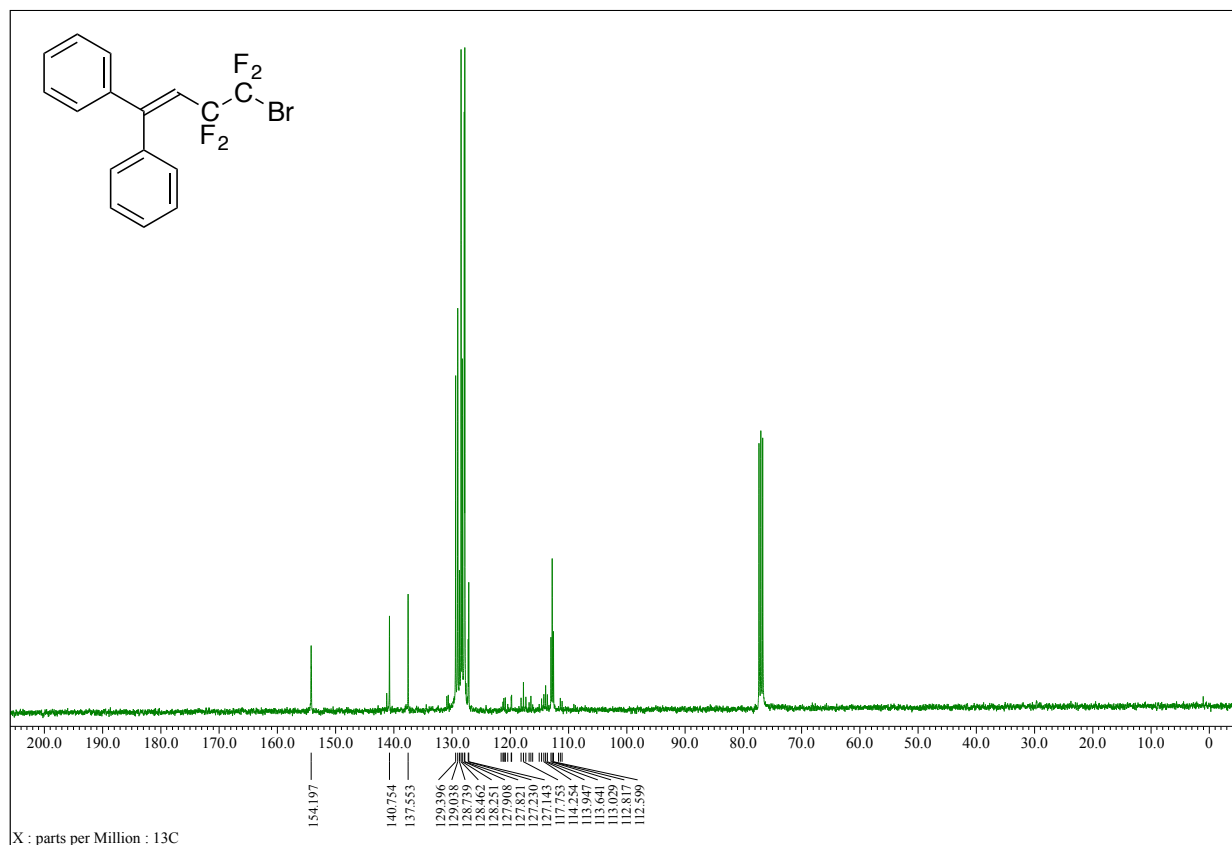


4-Bromo-3,3,4,4-tetrafluoro-1,1-diphenylbut-1-ene (5a)

¹H NMR

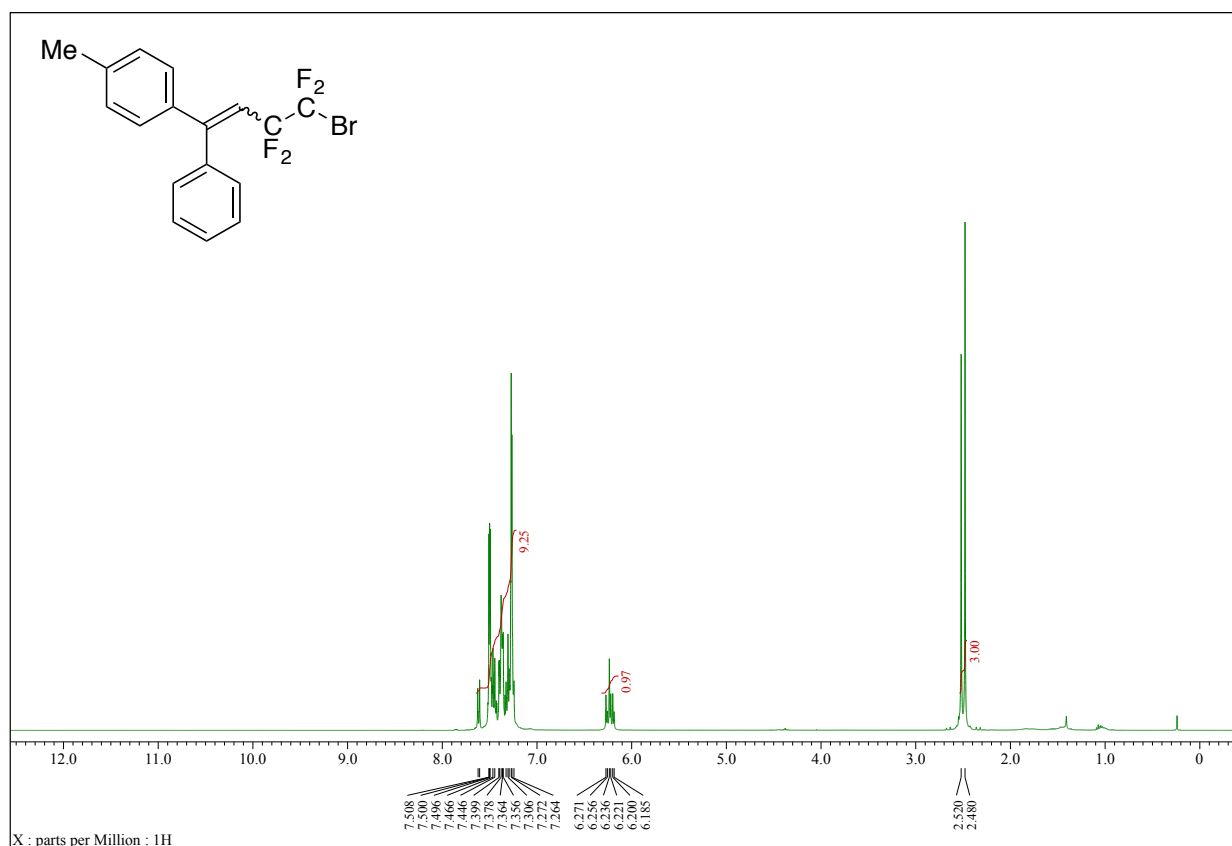


¹³C NMR

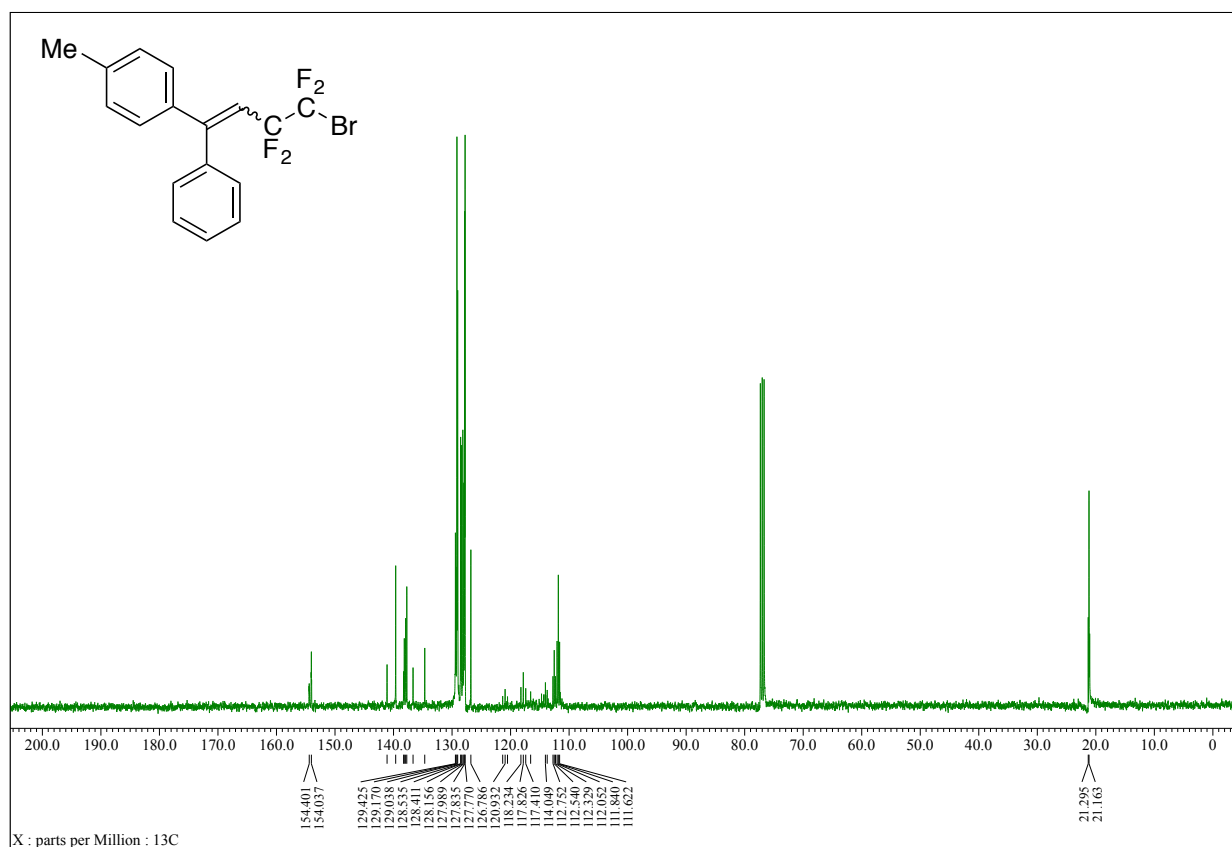


4-Bromo-3,3,4,4-tetrafluoro-1-(4-methylphenyl)-1-phenylbut-1-ene (5b)

¹H NMR

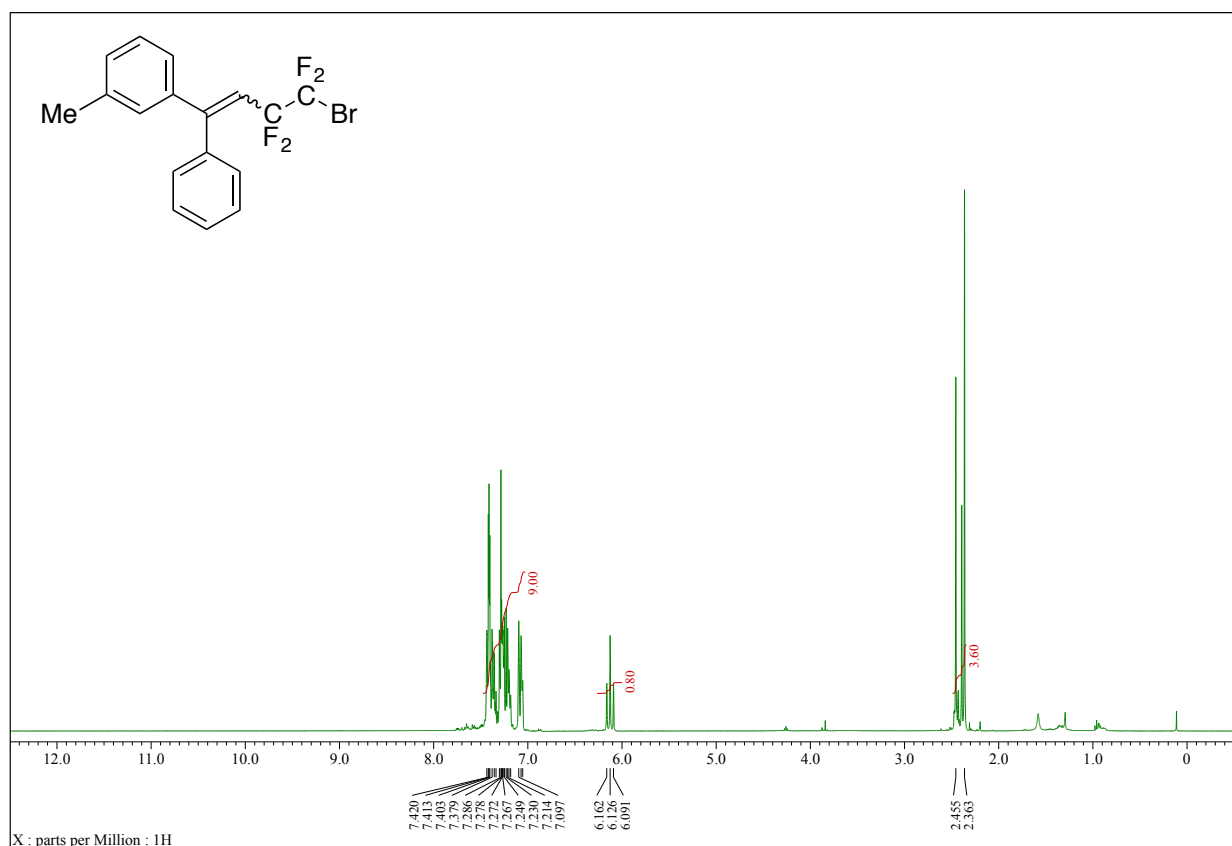


¹³C NMR

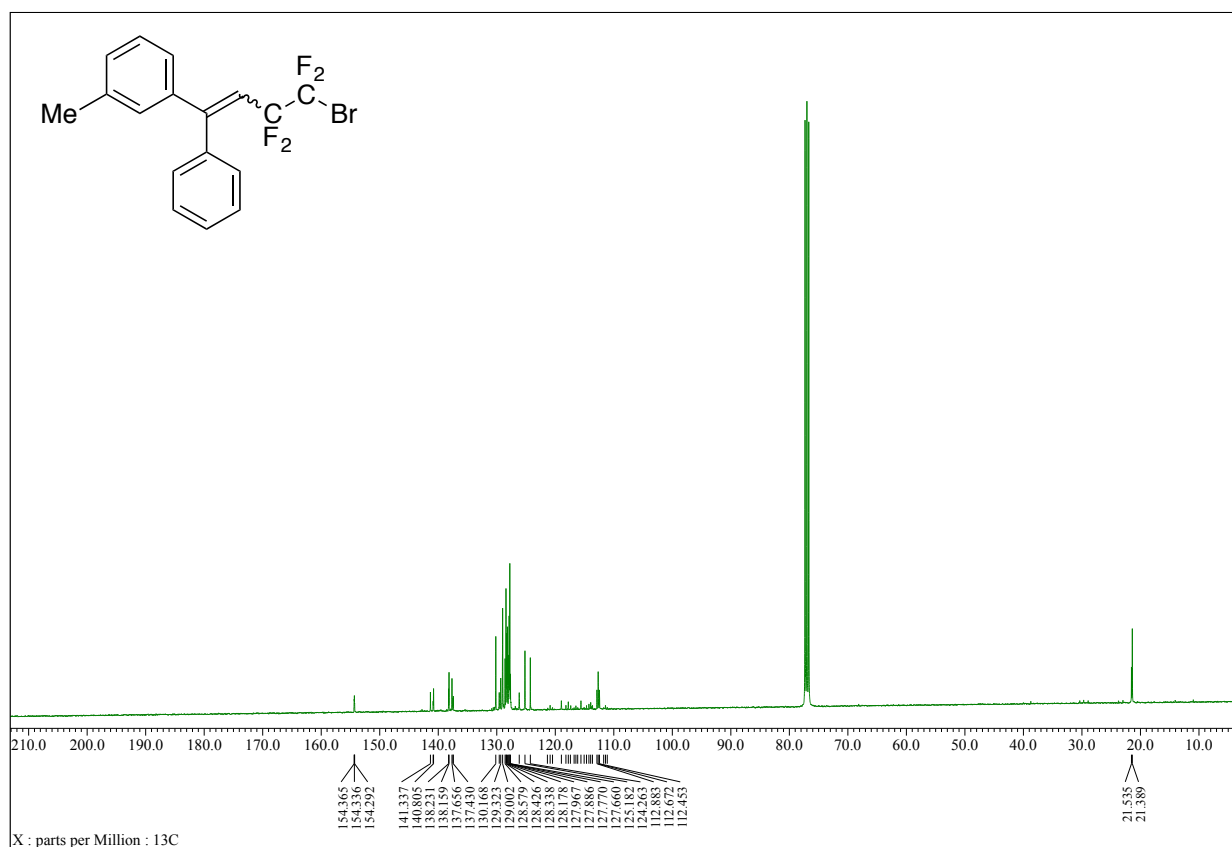


4-Bromo-3,3,4,4-tetrafluoro-1-(3-methylphenyl)-1-phenylbut-1-ene (5c)

¹H NMR

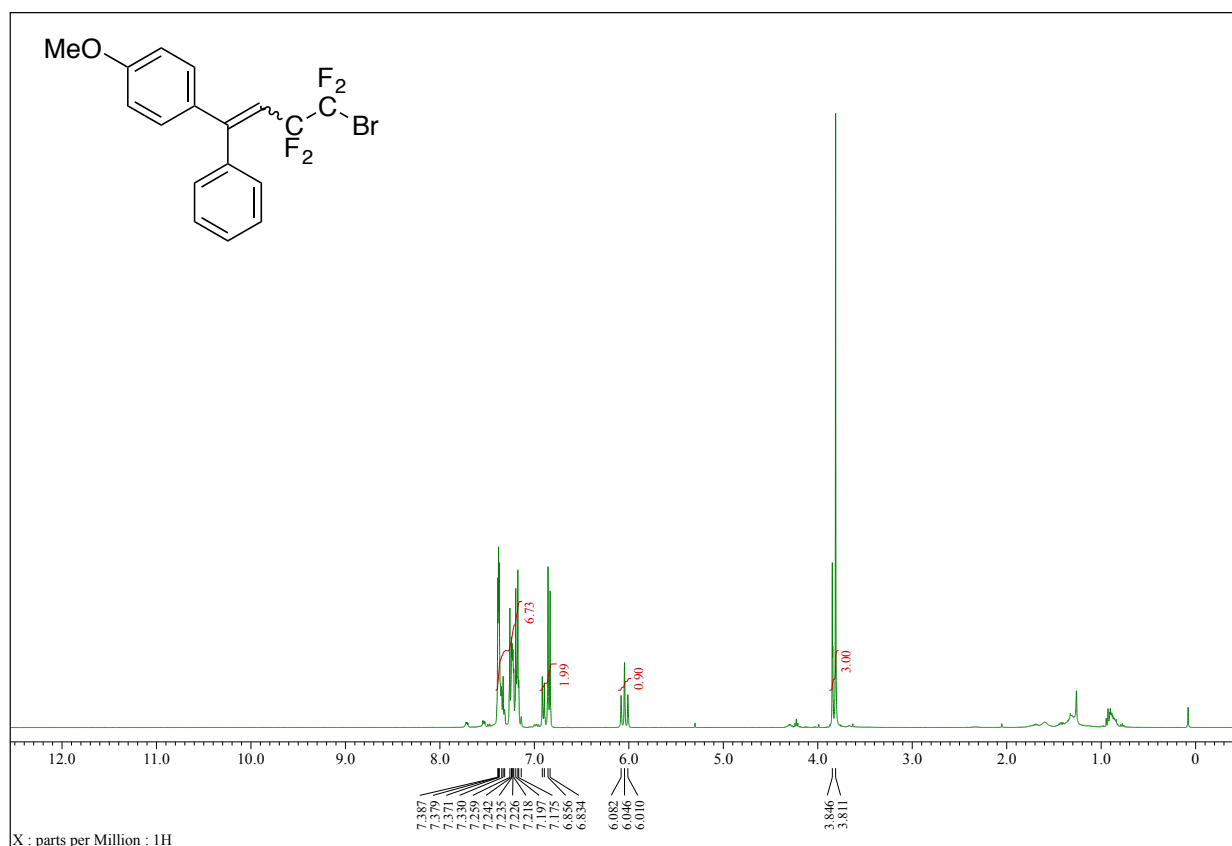


¹³C NMR

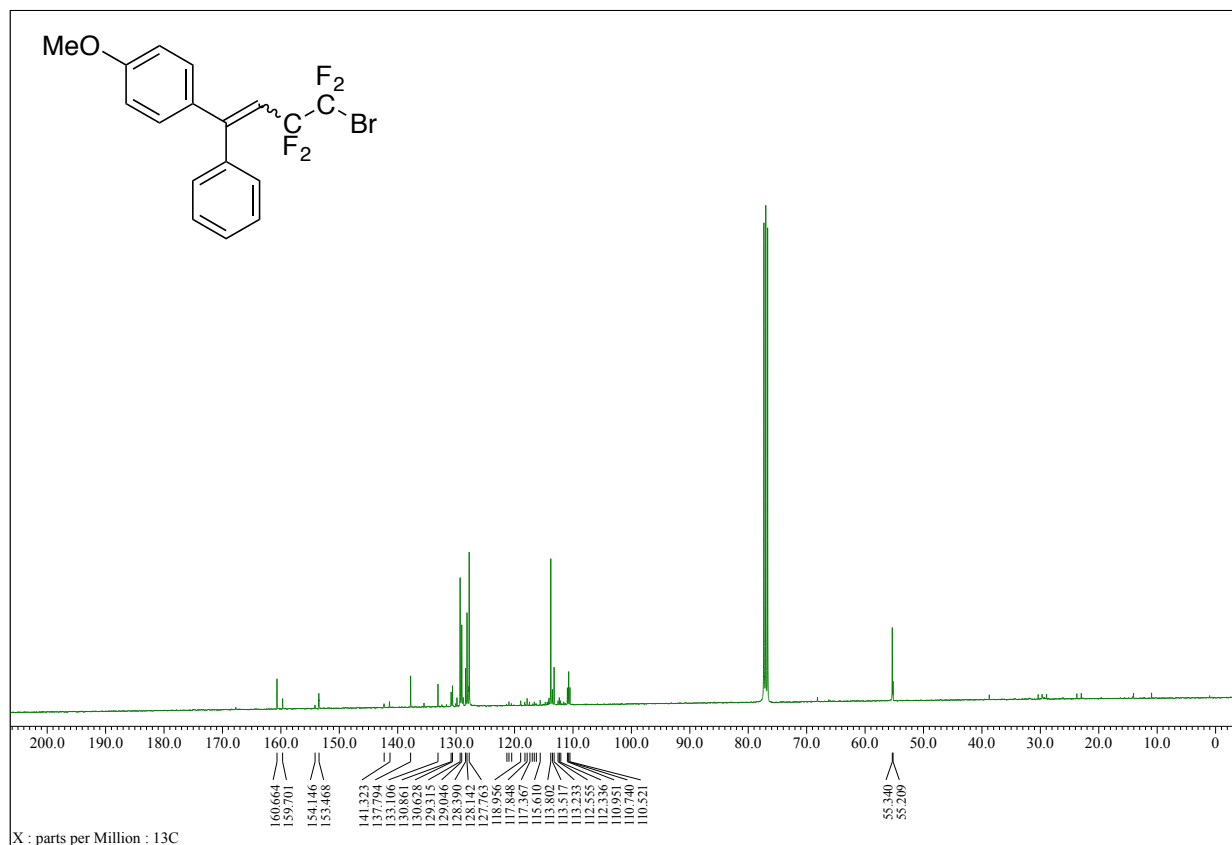


4-Bromo-3,3,4,4-tetrafluoro-1-(4-methoxyphenyl)-1-phenylbut-1-ene (5e)

¹H NMR

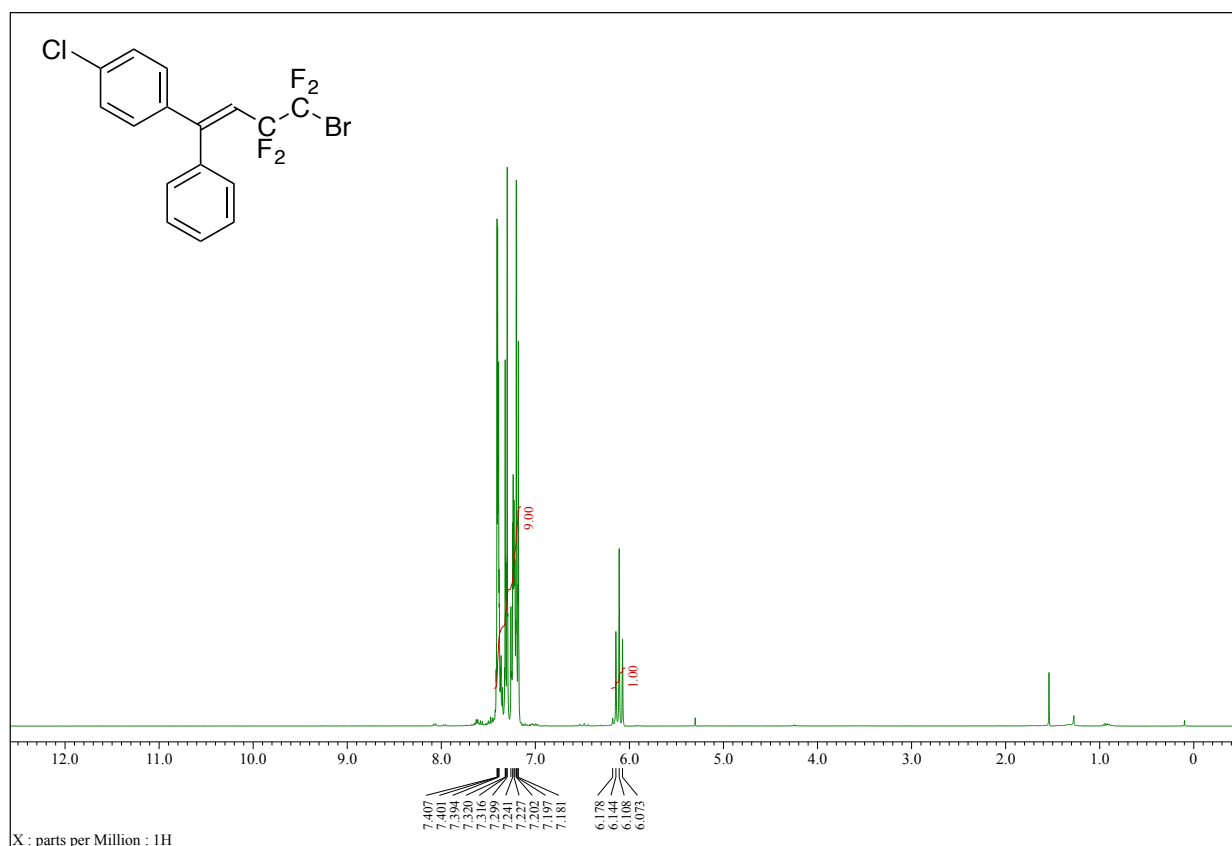


¹³C NMR

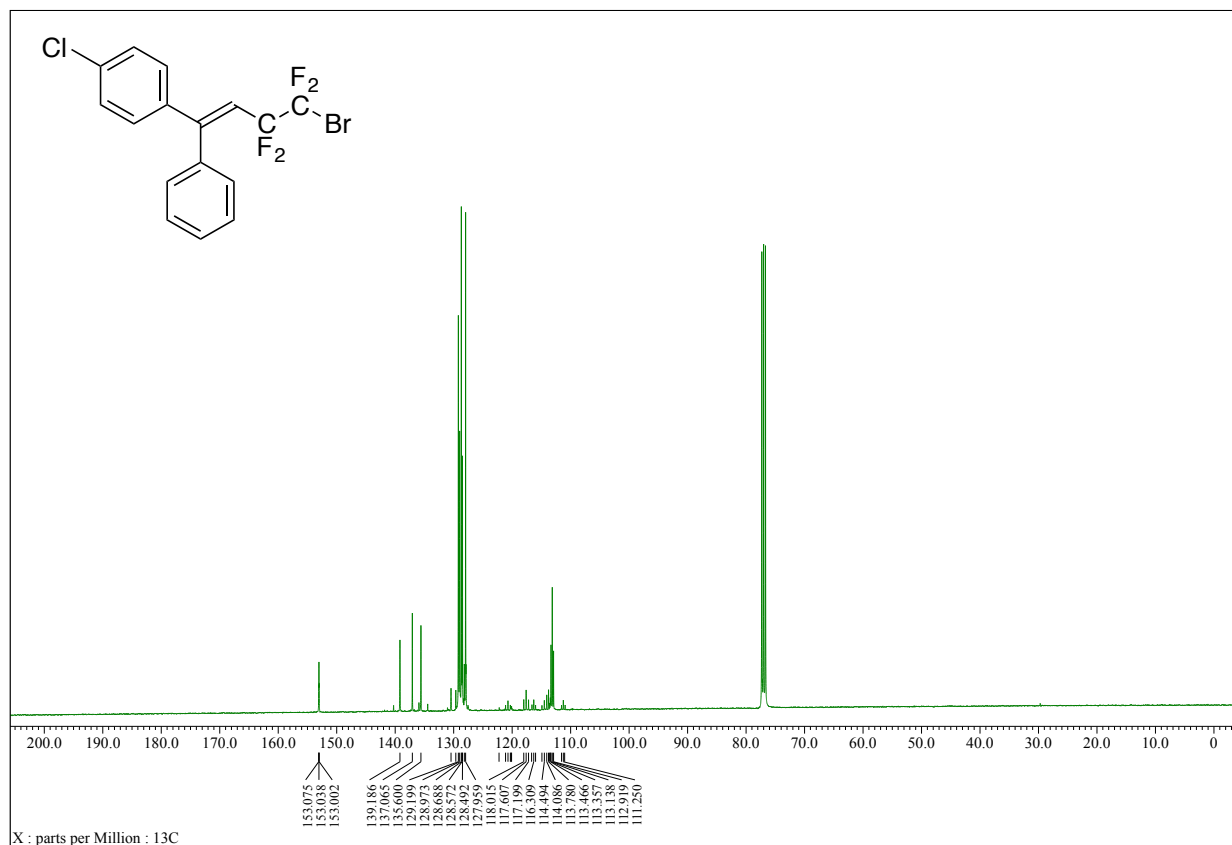


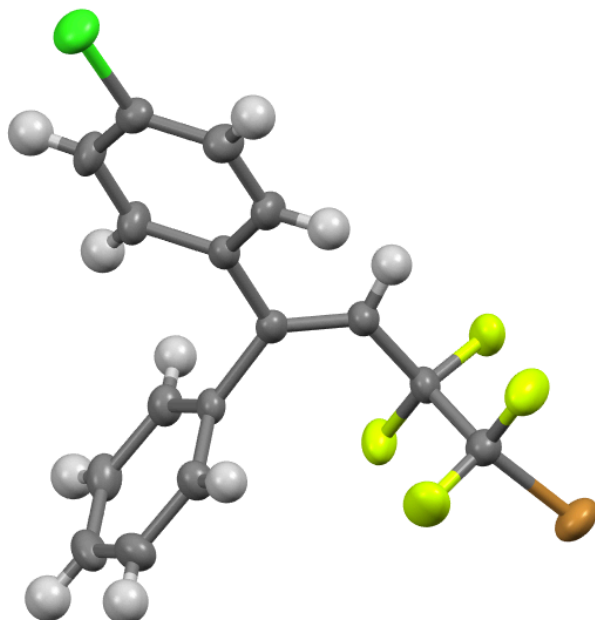
4-Bromo-1-(4-chlorophenyl)-3,3,4,4-tetrafluoro-1-phenylbut-1-ene (5f)

¹H NMR



¹³C NMR

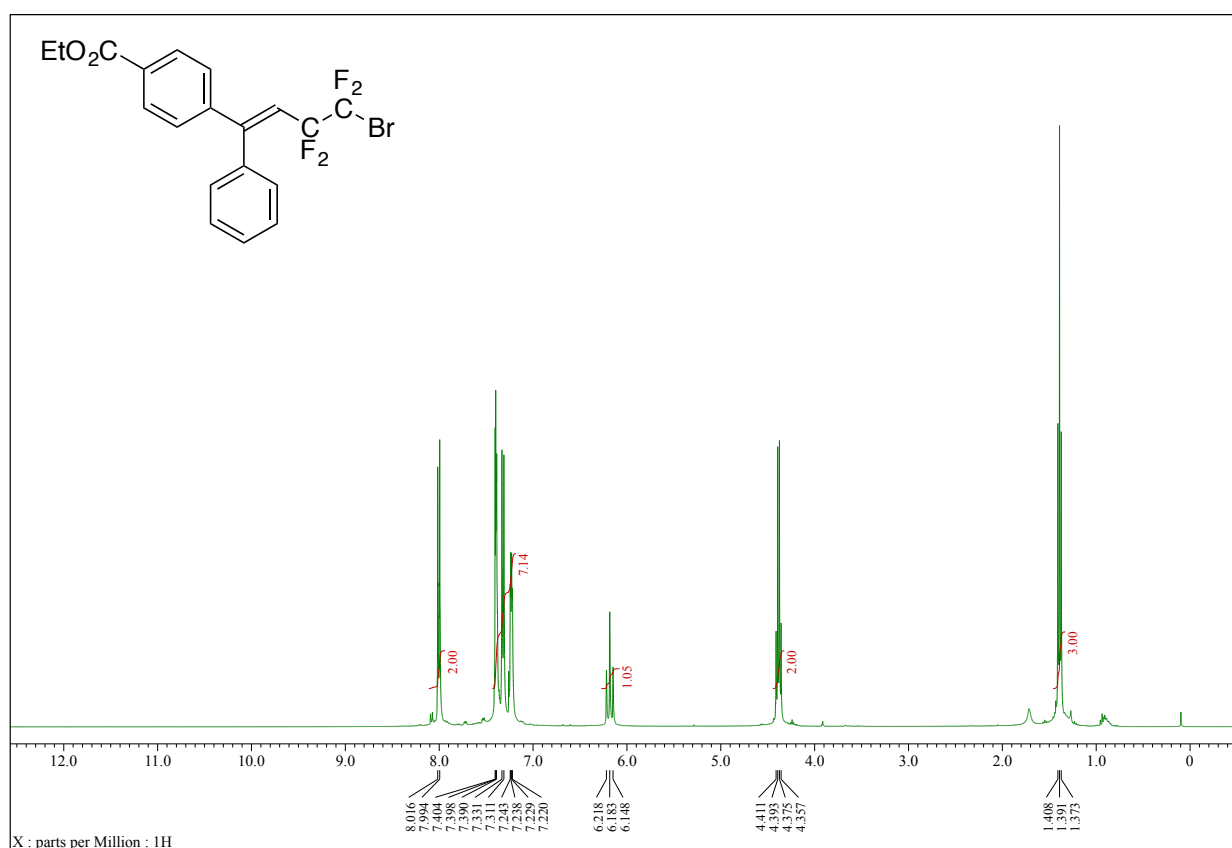




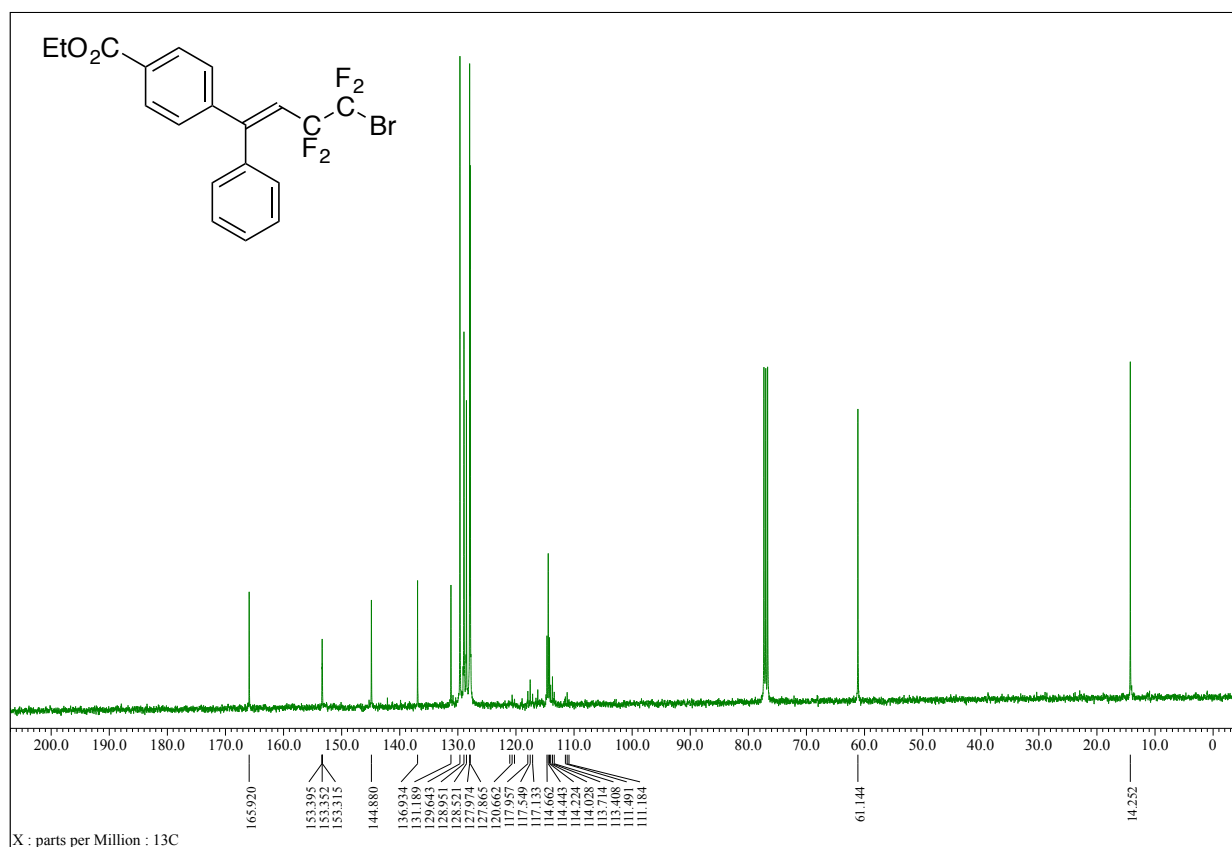
Crystal structure of (*E*)-**5f**, which is shown as 50% of the elipsoid contour probability level.

Ethyl 4-[(4-bromo-3,3,4,4-tetrafluoro-1-phenyl)but-1-en-1-yl]benzoate (5g)

¹H NMR

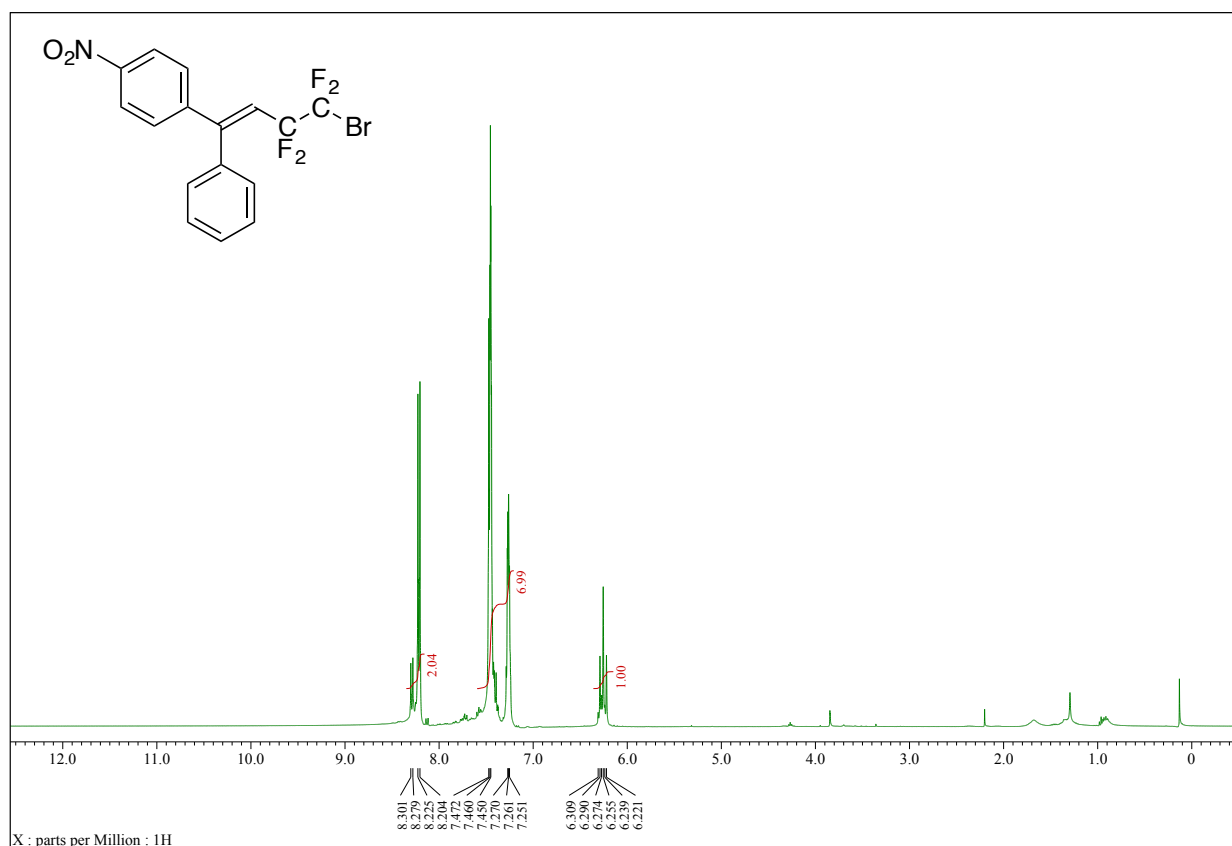


¹³C NMR

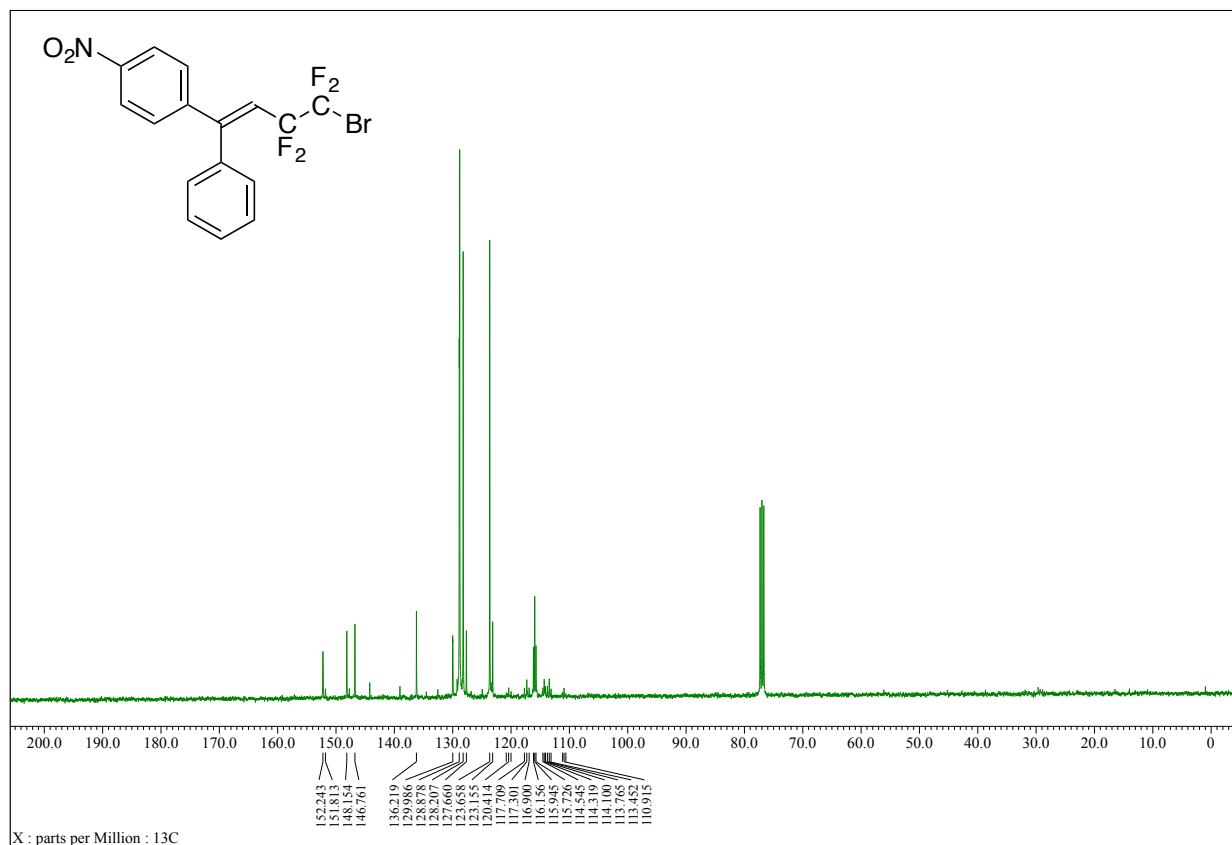


4-Bromo-3,3,4,4-tetrafluoro-1-(4-nitrophenyl)-1-phenylbut-1-ene (5h)

¹H NMR

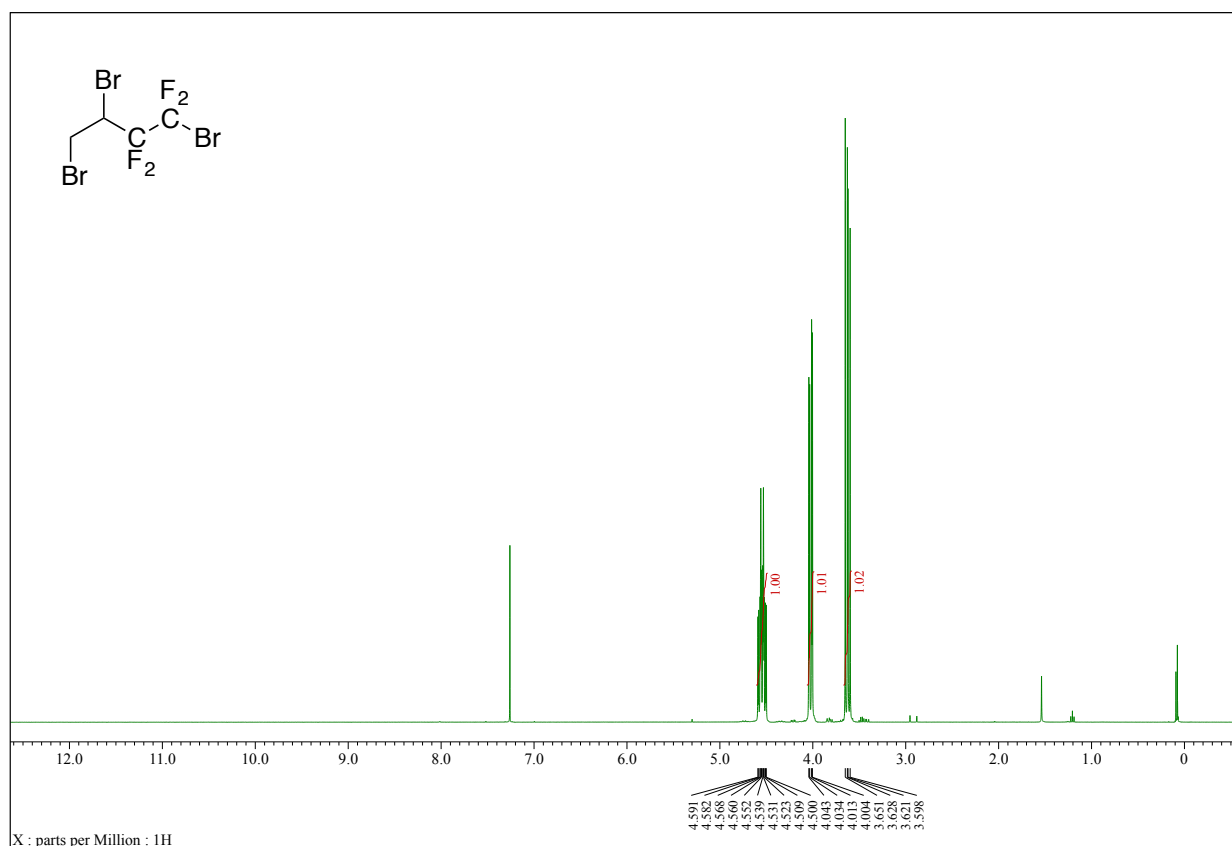


¹³C NMR

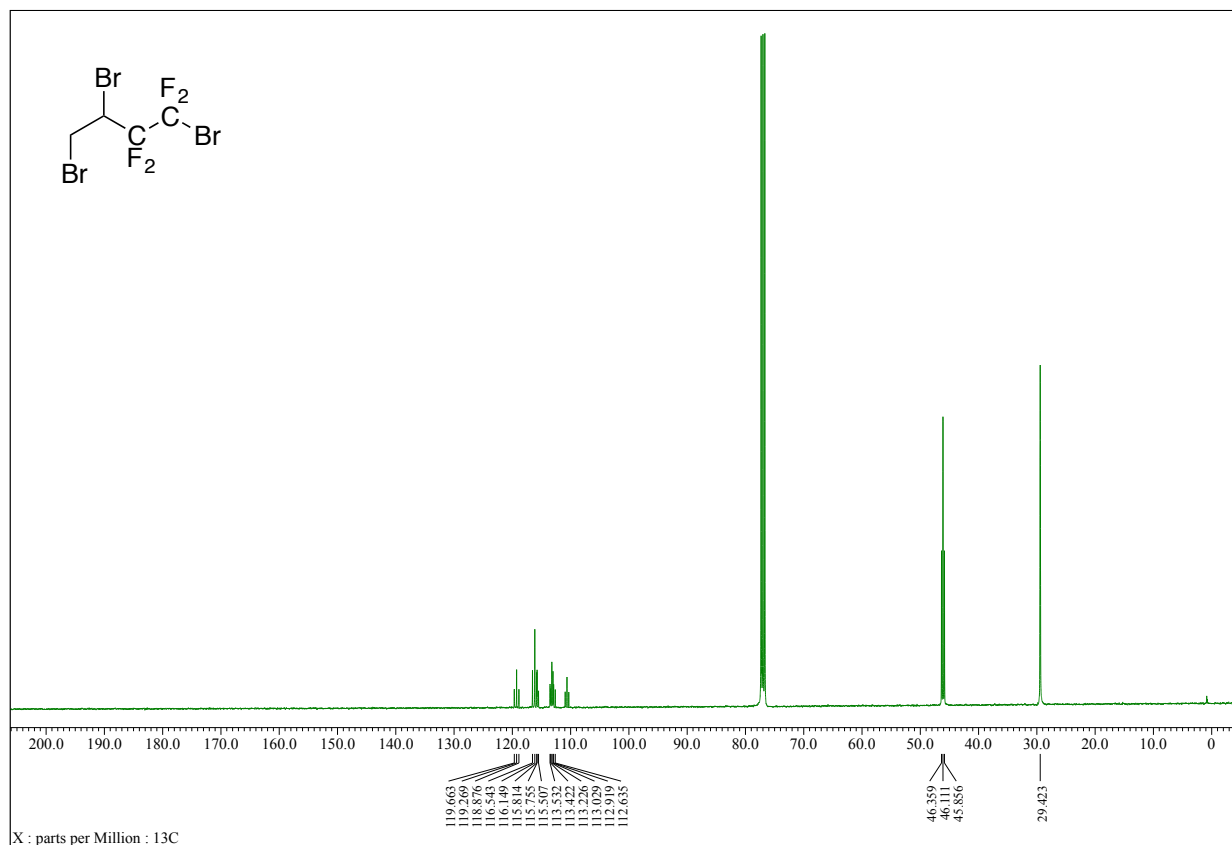


1,2,4-Tribromo-3,3,4,4-tetrafluorobutane (6)

¹H NMR

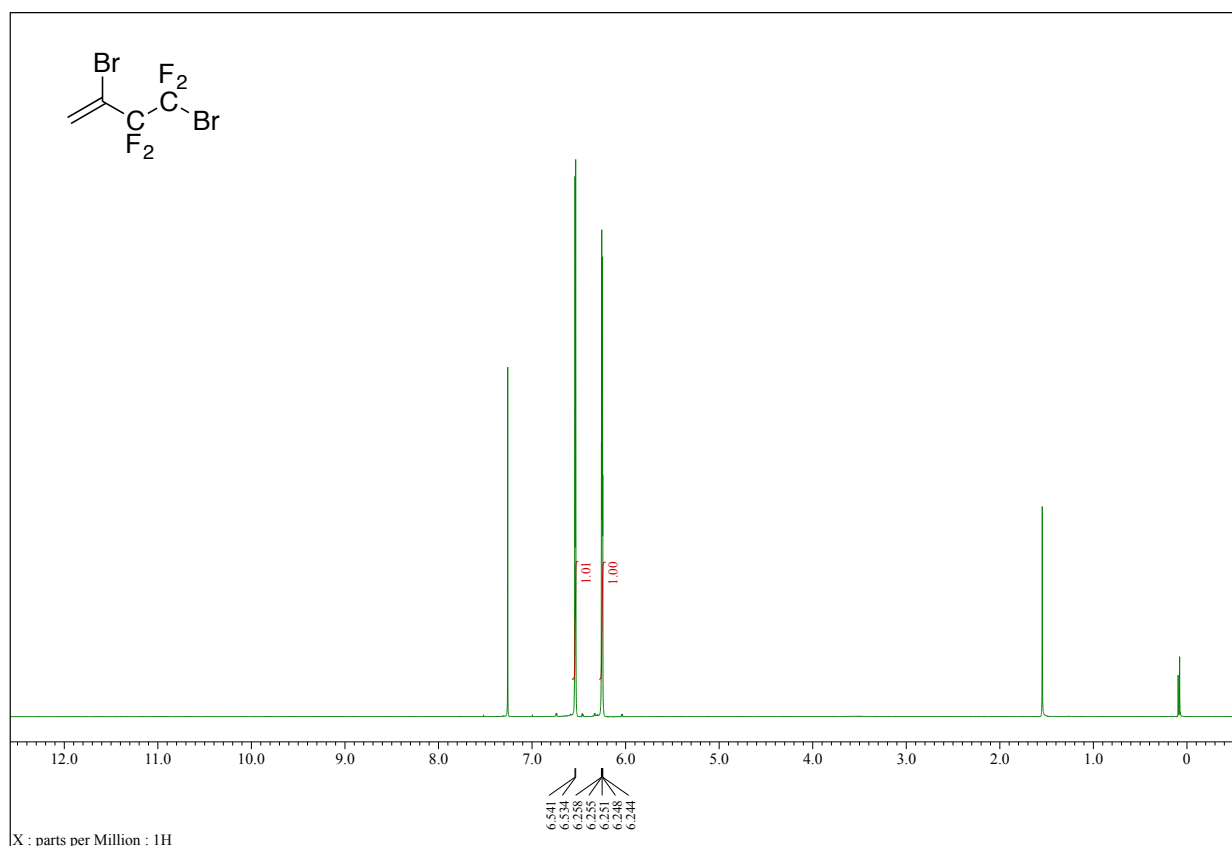


¹³C NMR

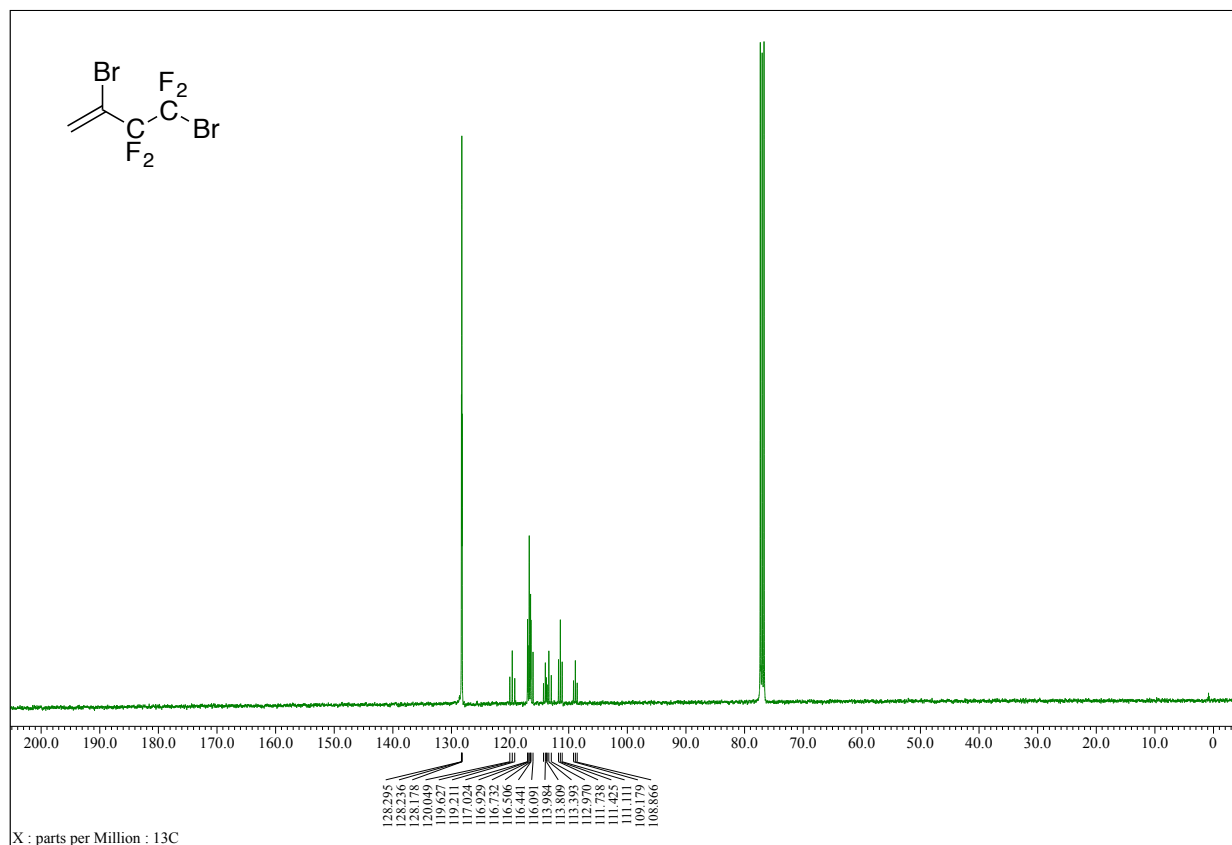


2,4-Dibromo-3,3,4,4-tetrafluorobut-1-ene (7)

¹H NMR

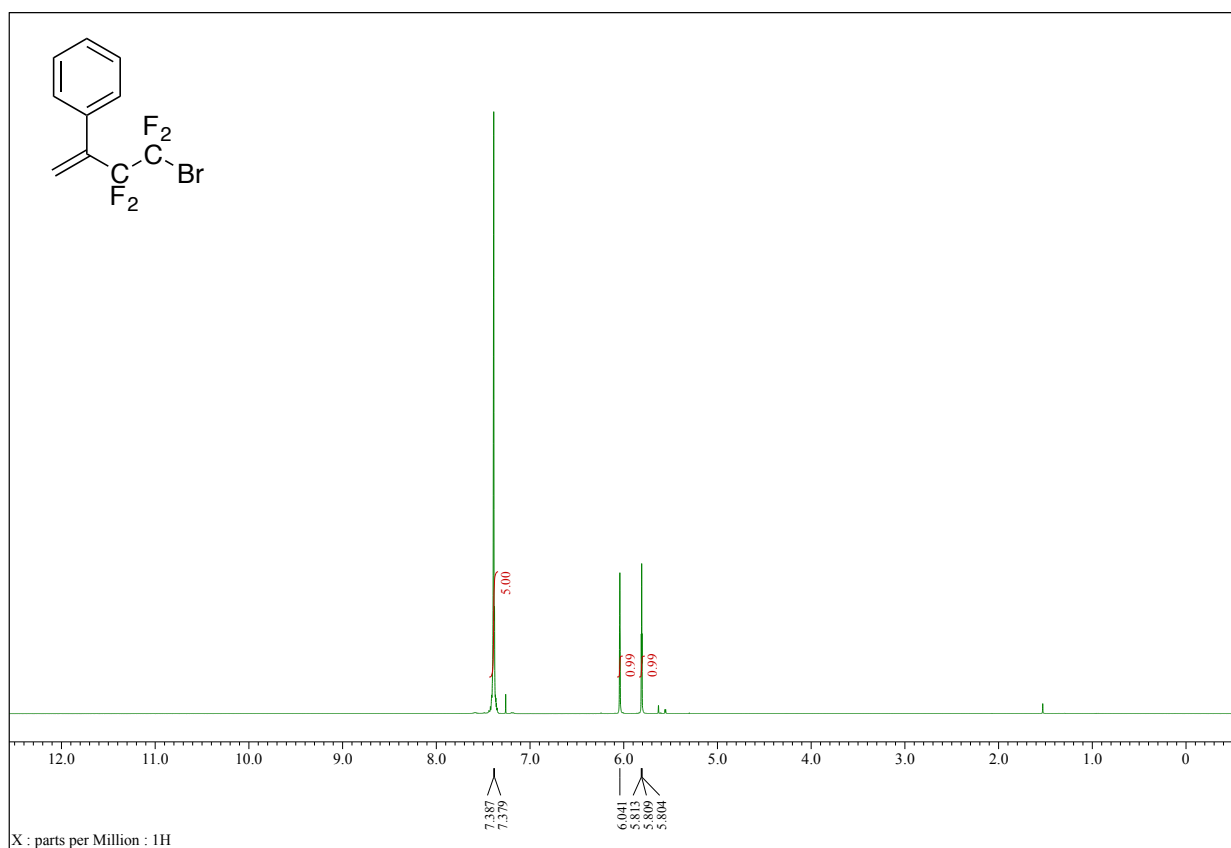


¹³C NMR

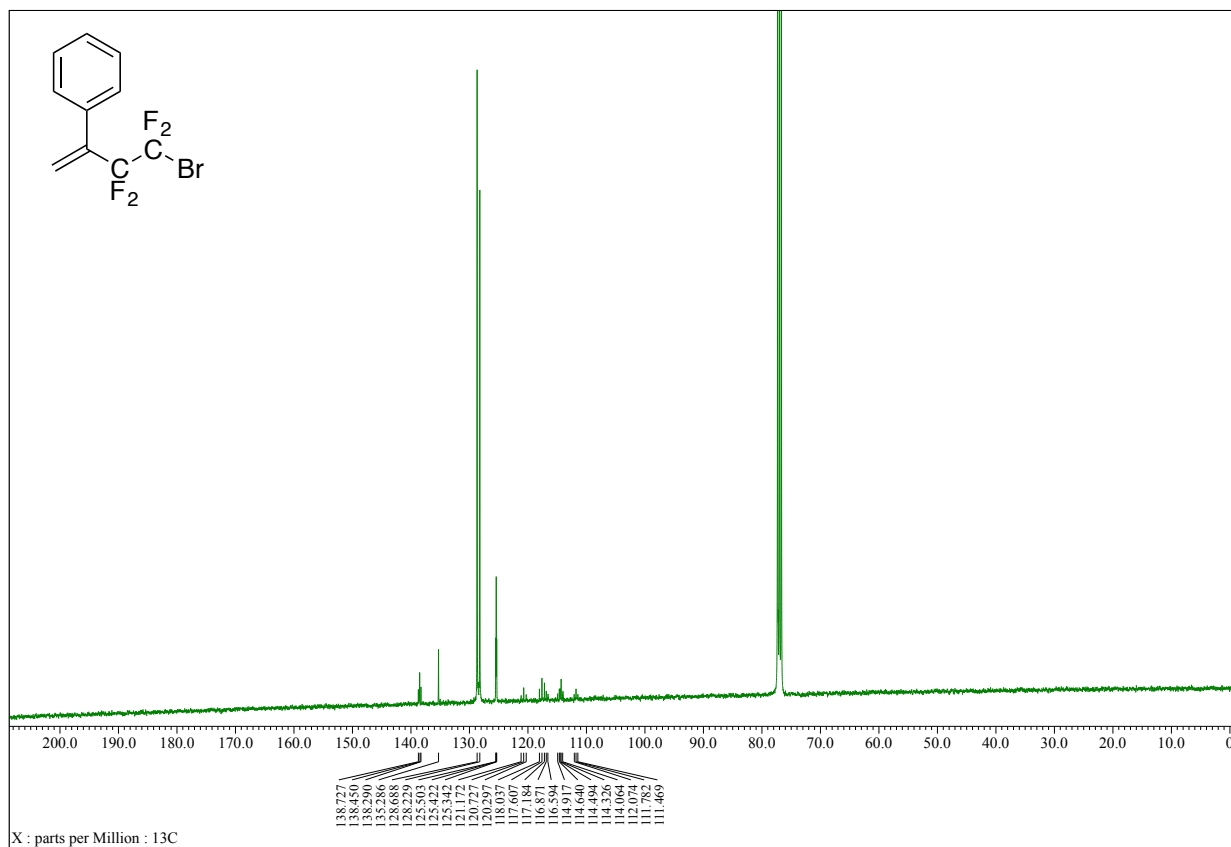


4-Bromo-3,3,4,4-tetrafluoro-2-phenylbut-1-ene (8a)

¹H NMR

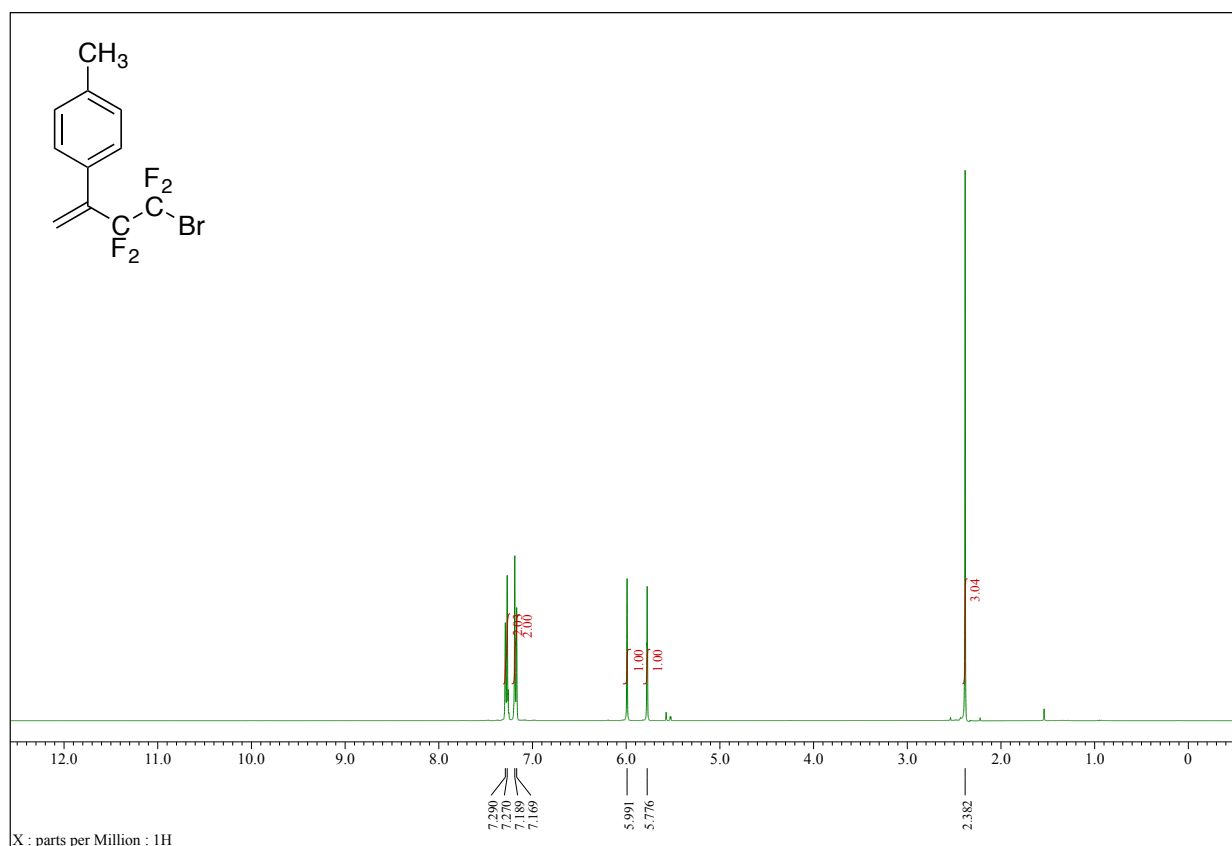


¹³C NMR

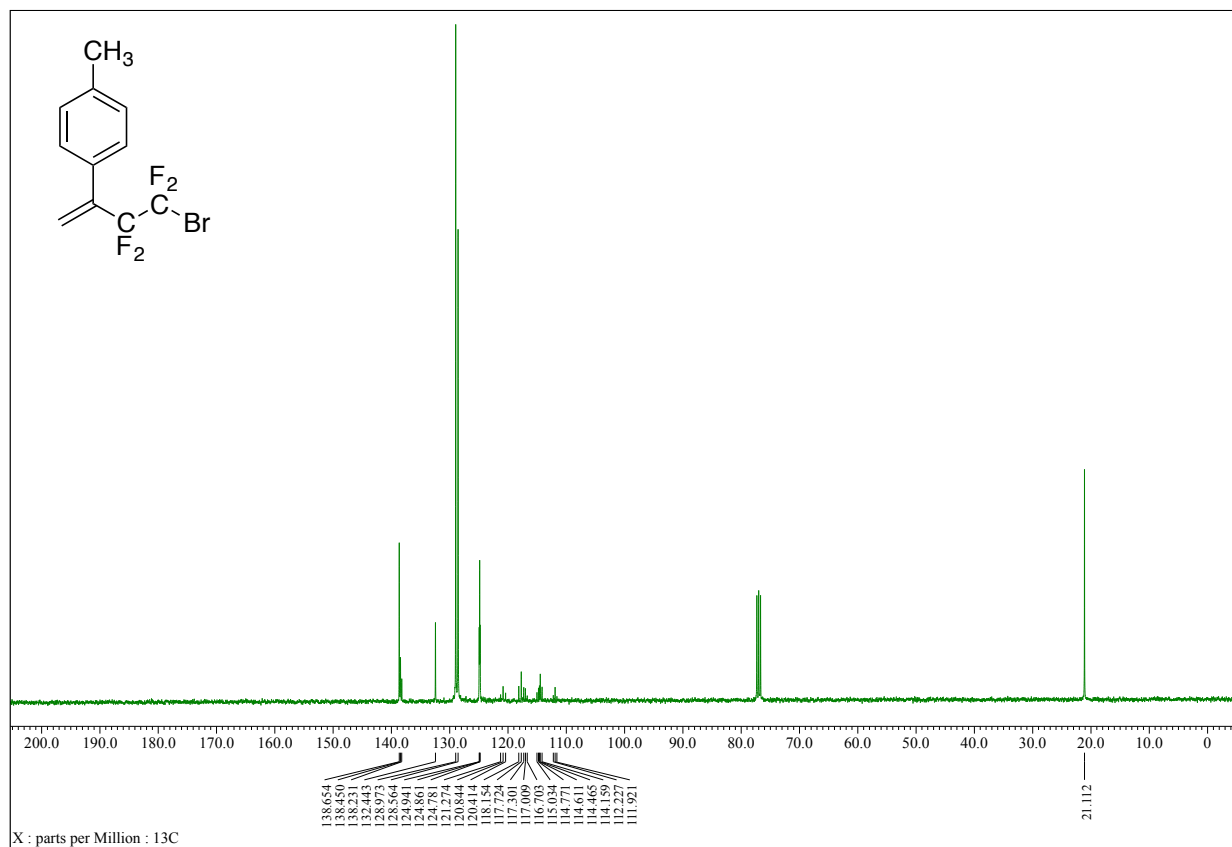


4-Bromo-3,3,4,4-tetrafluoro-2-(4-methylphenyl)but-1-ene (8b)

¹H NMR

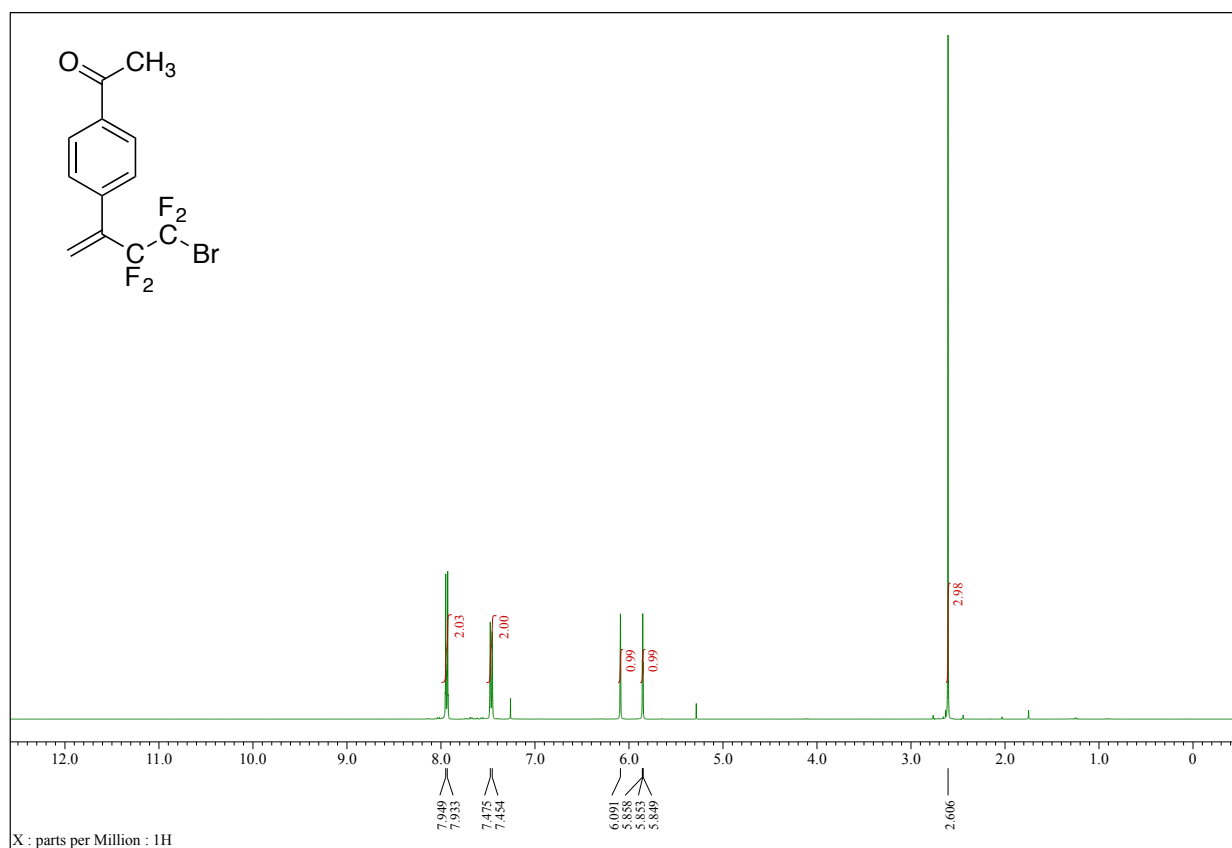


¹³C NMR

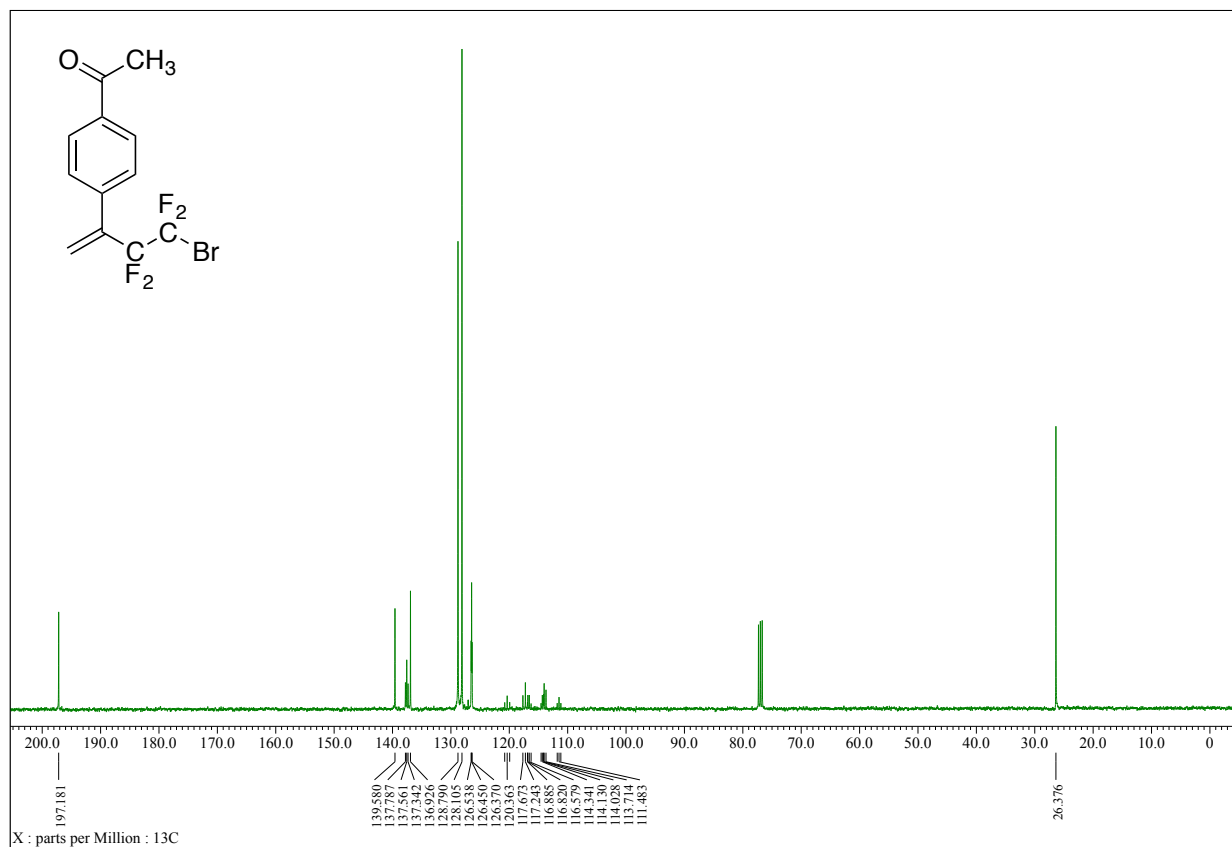


4-(4-Bromo-3,3,4,4-tetrafluorobut-1-en-2-yl)phenyl methyl ketone (8c)

¹H NMR

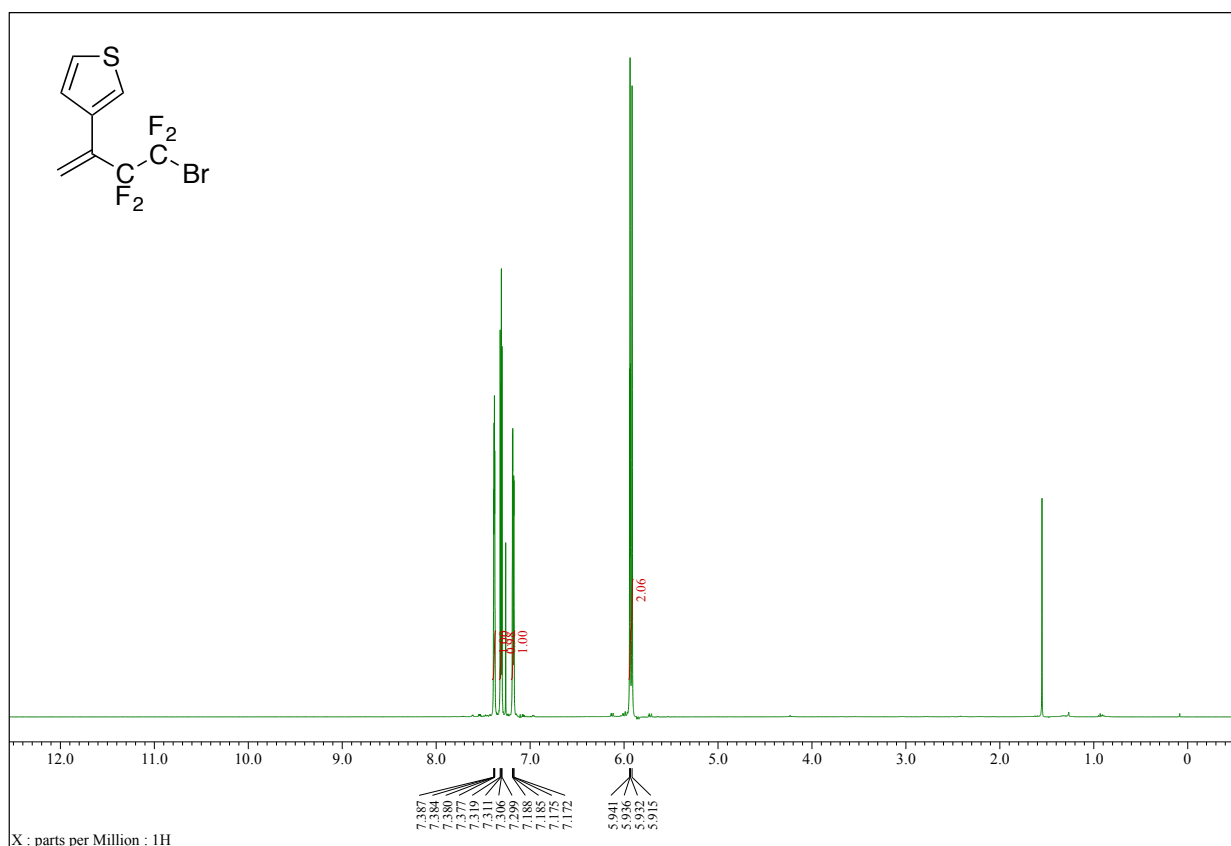


¹³C NMR

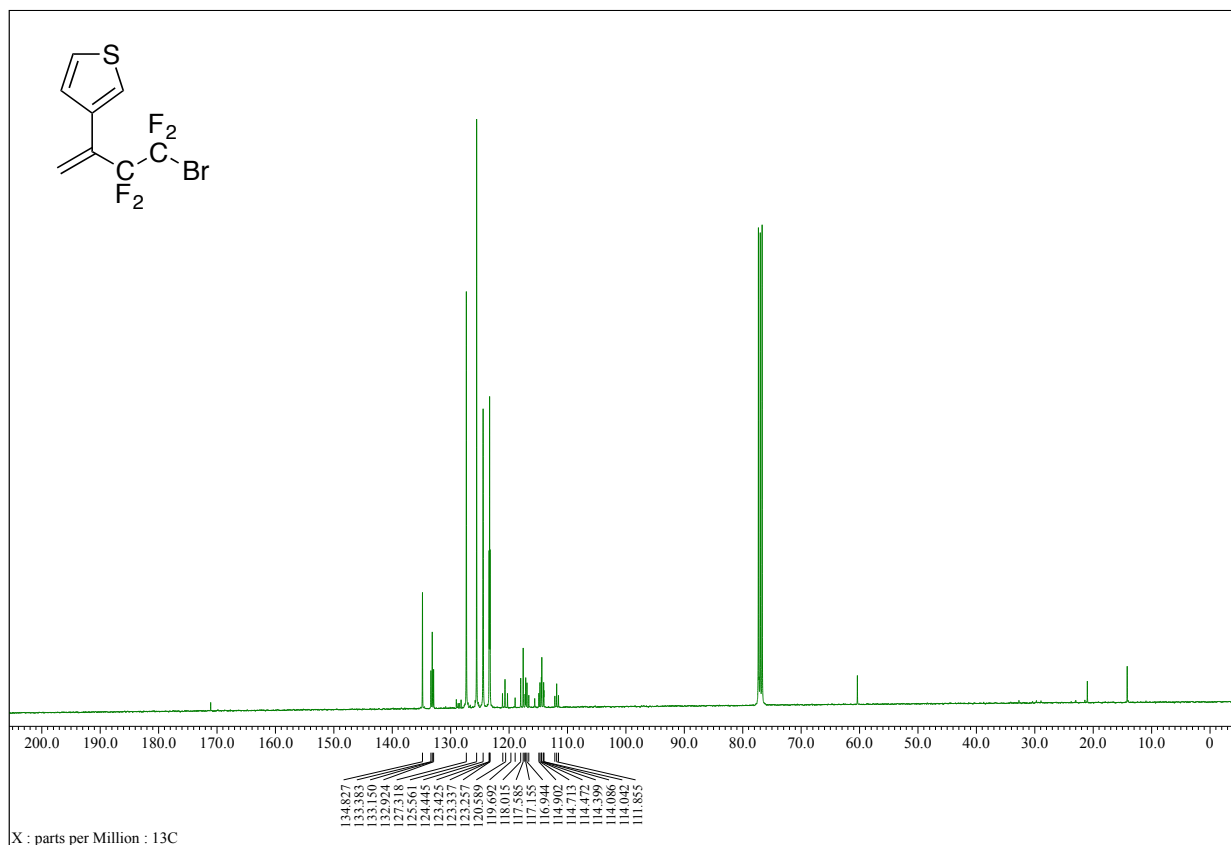


4-Bromo-3,3,4,4-tetrafluoro-2-(3-thienyl)but-1-ene (8d)

¹H NMR

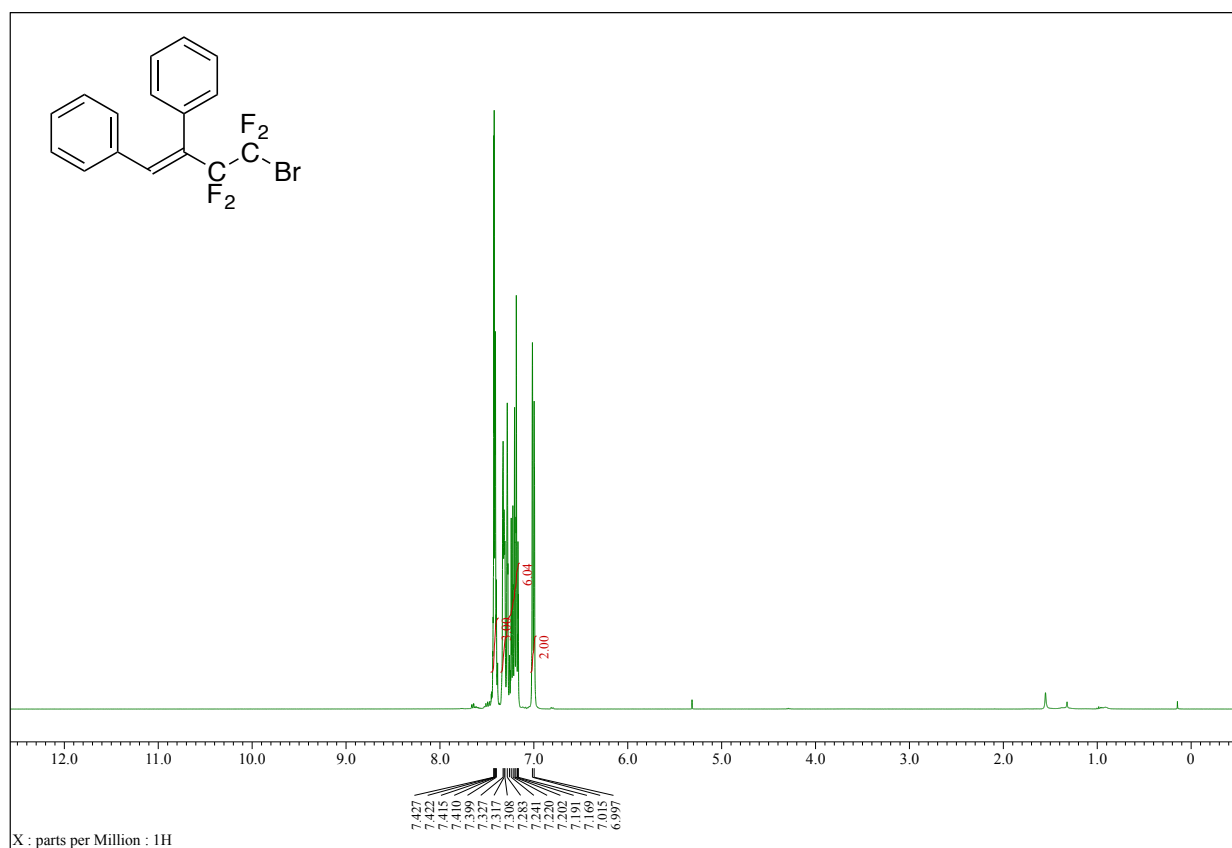


¹³C NMR

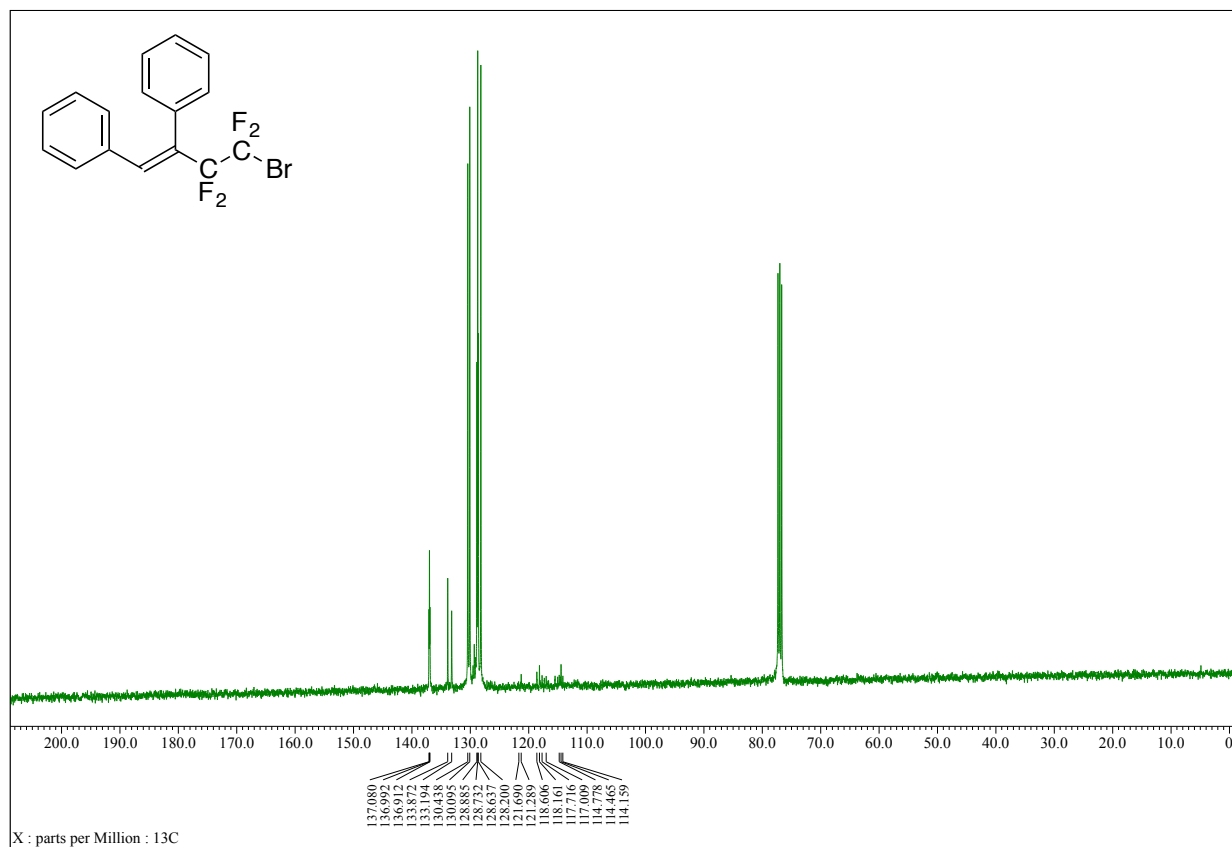


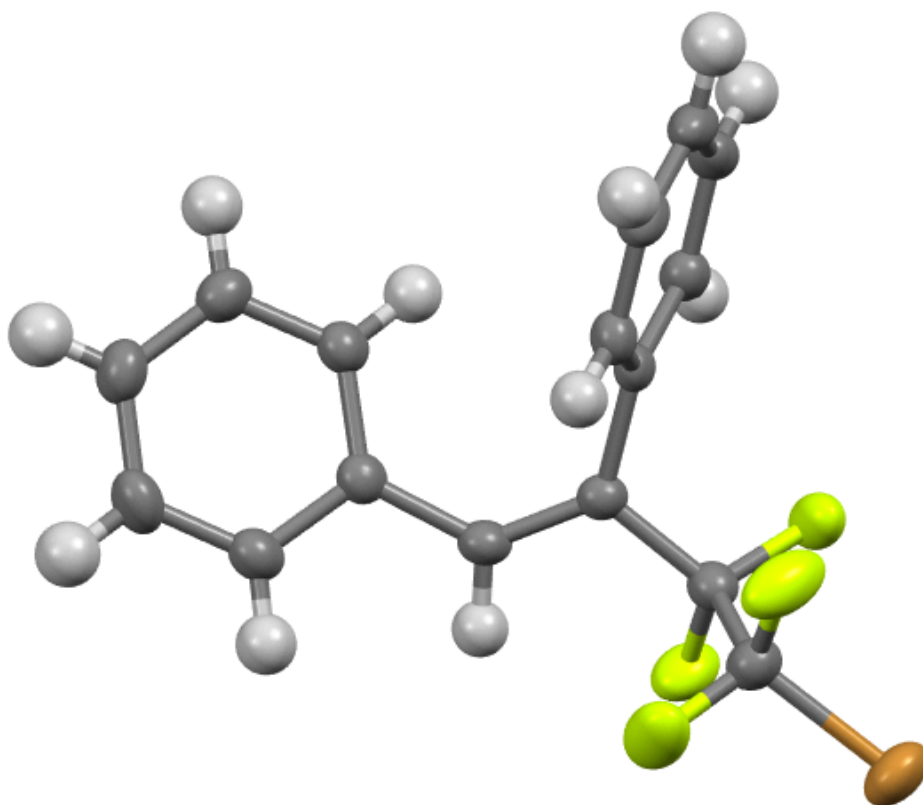
***(E)*-4-Bromo-3,3,4,4-tetrafluoro-1,2-diphenylbut-1-ene (*E*-10a)**

¹H NMR



¹³C NMR

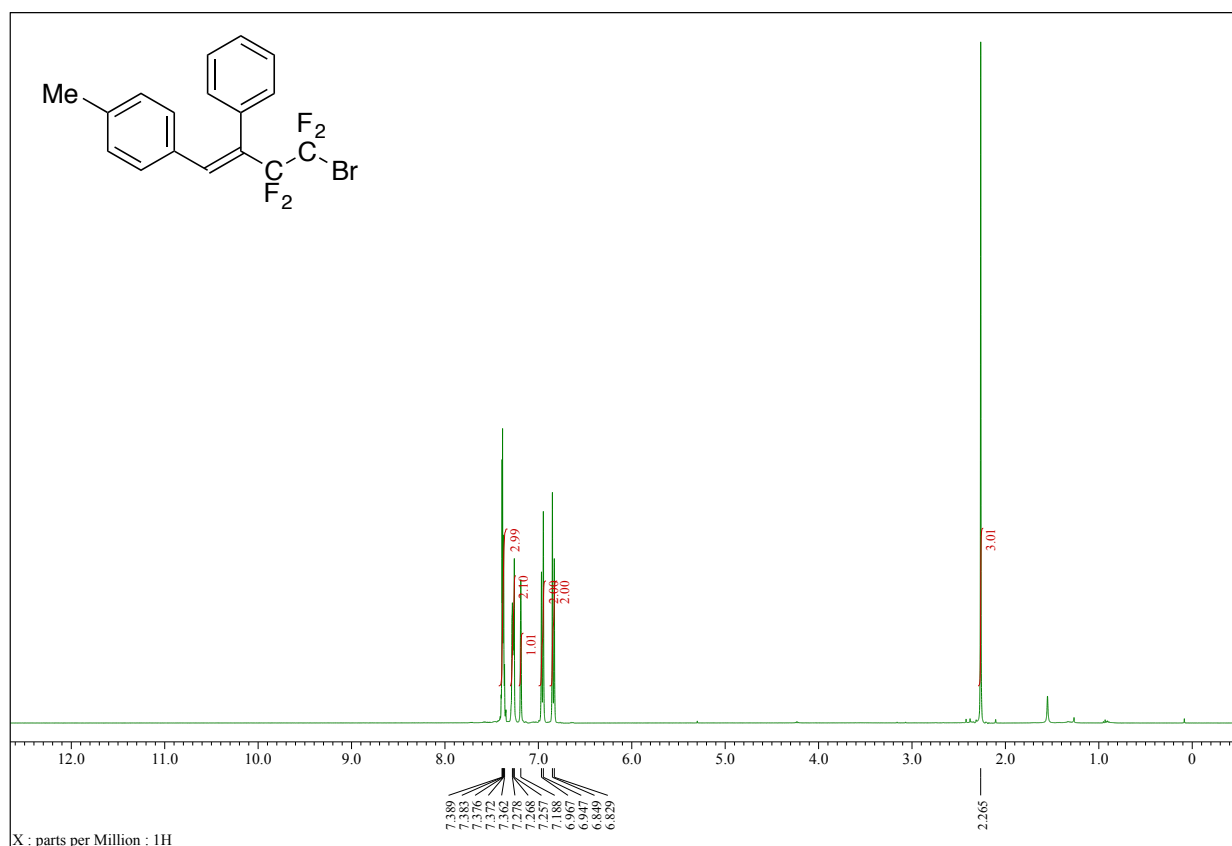




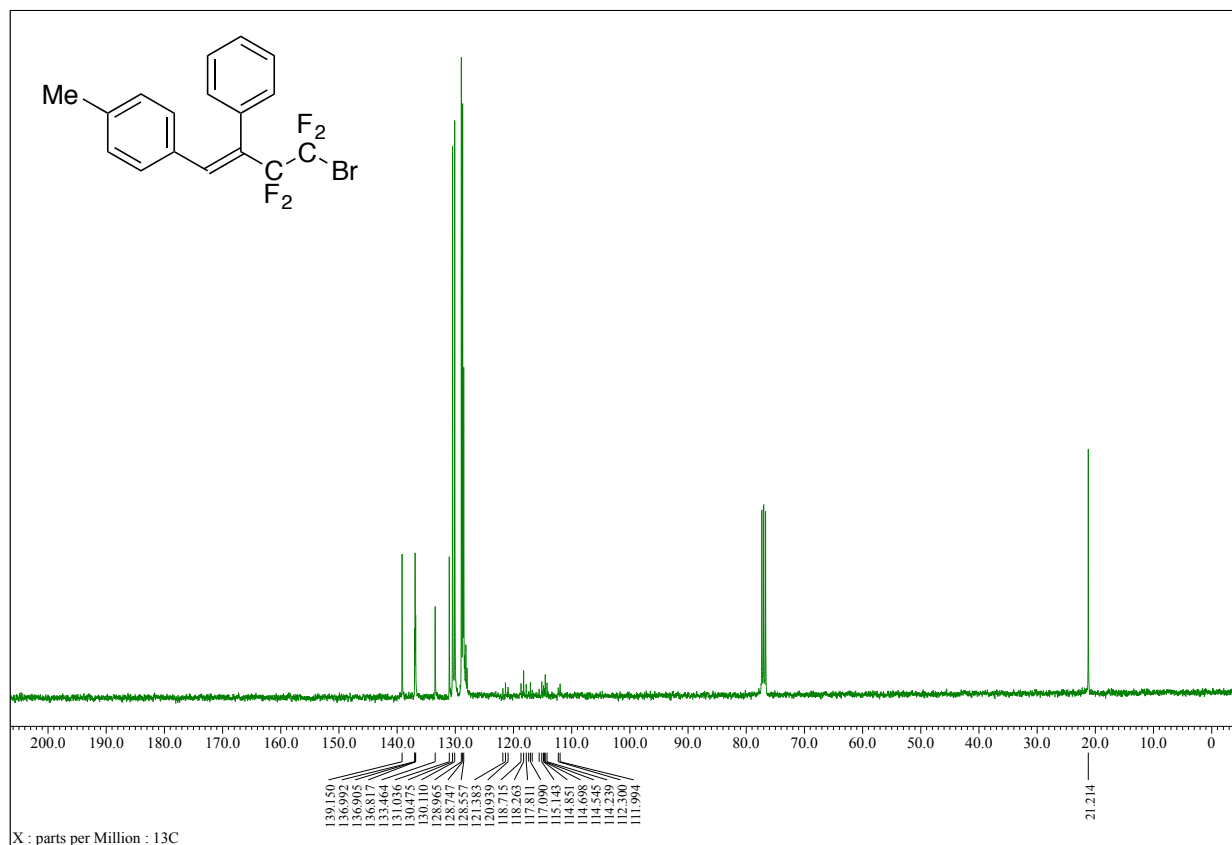
Crystal structure of (*E*)-**10a**, which is shown as 50% of the elipsoid contour probability level.

(E)-4-Bromo-3,3,4,4-tetrafluoro-1-(4-methylphenyl)-2-phenylbut-1-ene (E-10b)

¹H NMR

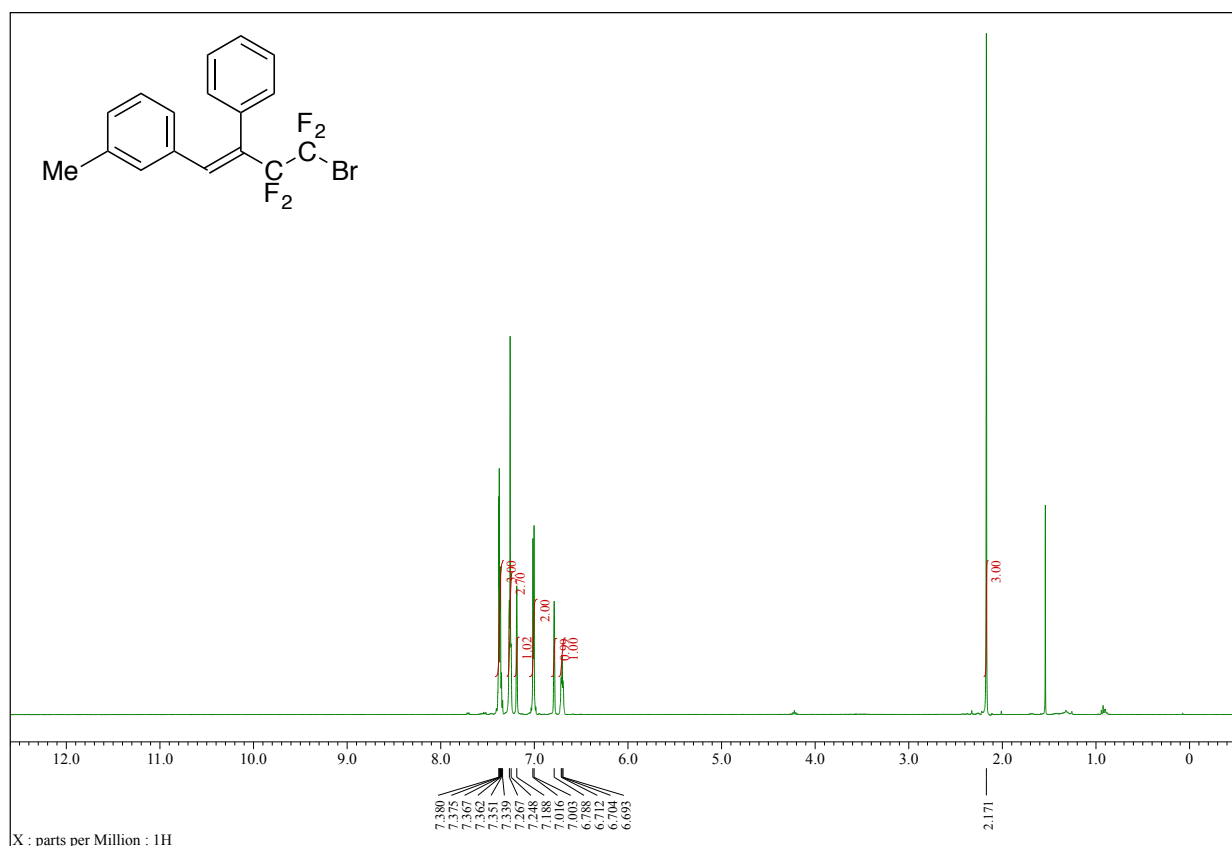


¹³C NMR

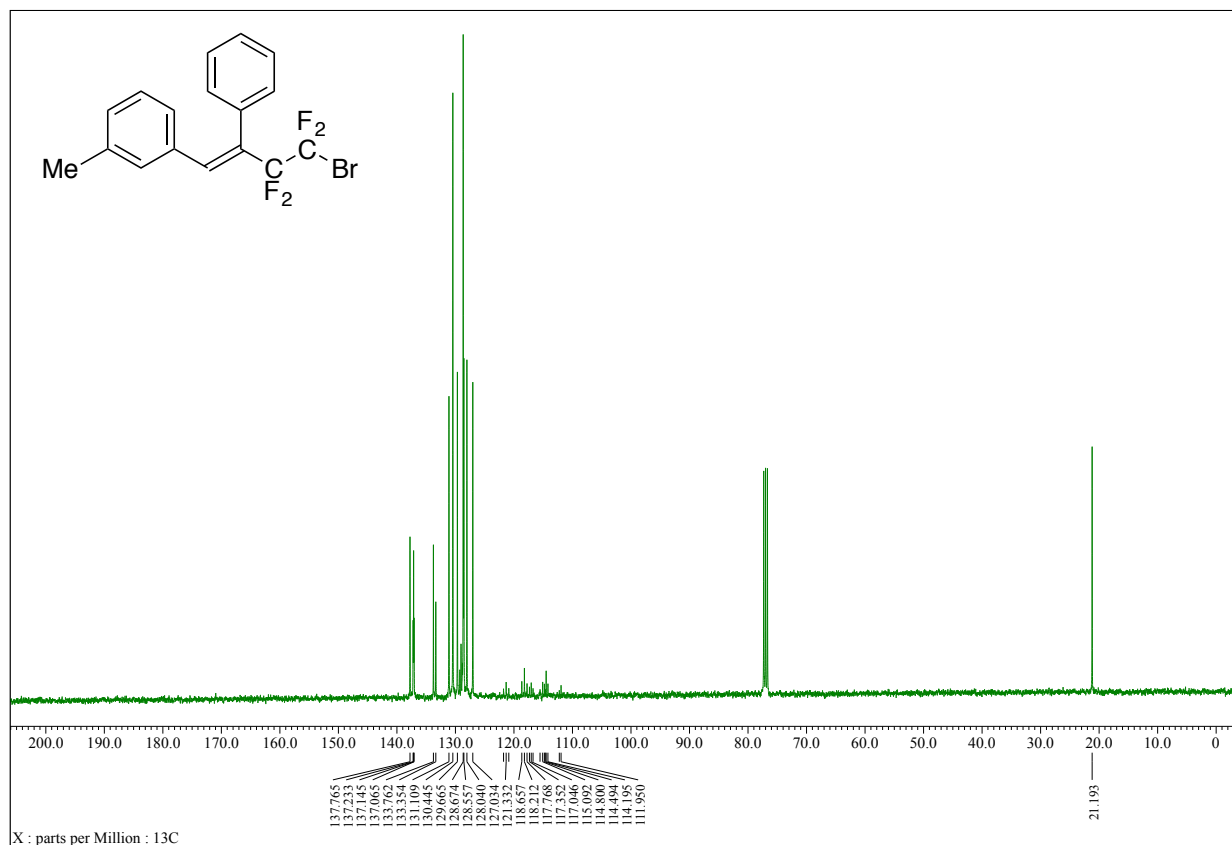


(E)-4-Bromo-3,3,4,4-tetrafluoro-1-(3-methylphenyl)-2-phenylbut-1-ene (E-10c)

¹H NMR

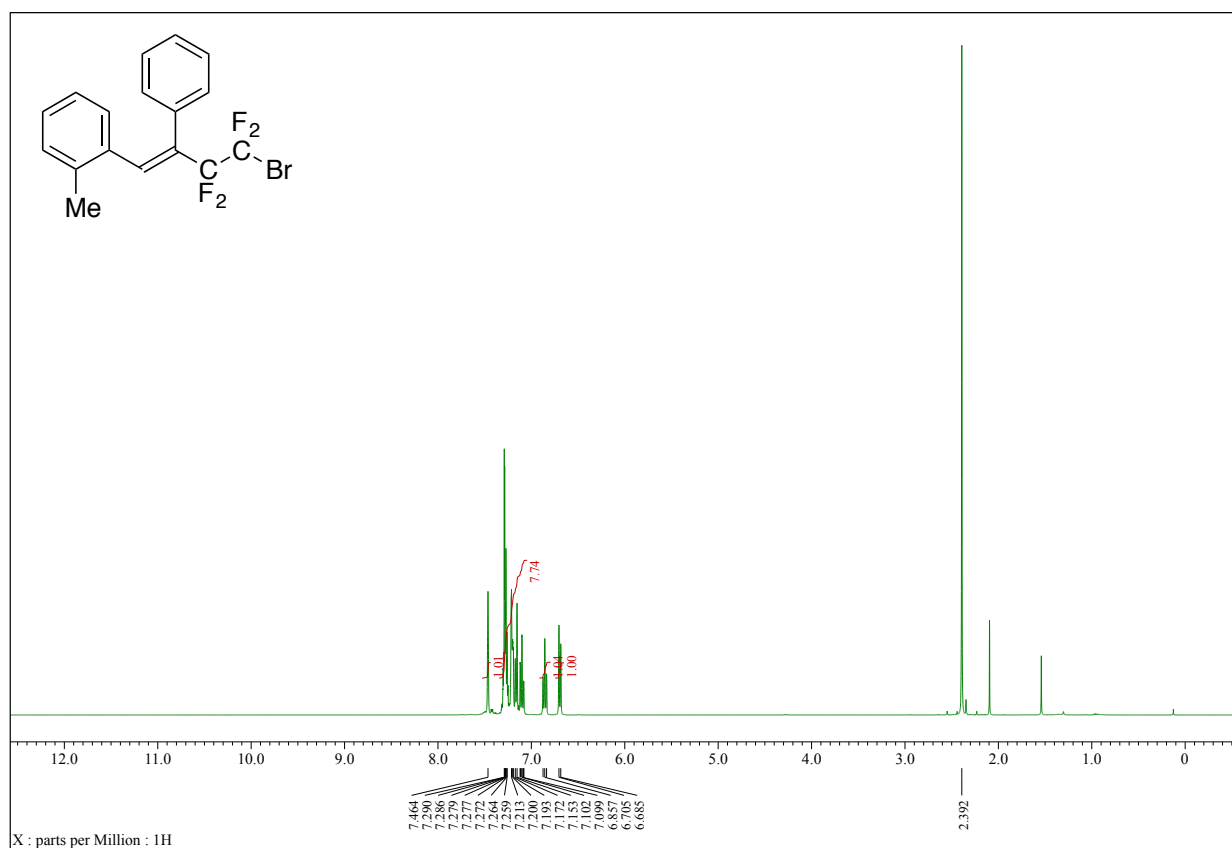


¹³C NMR

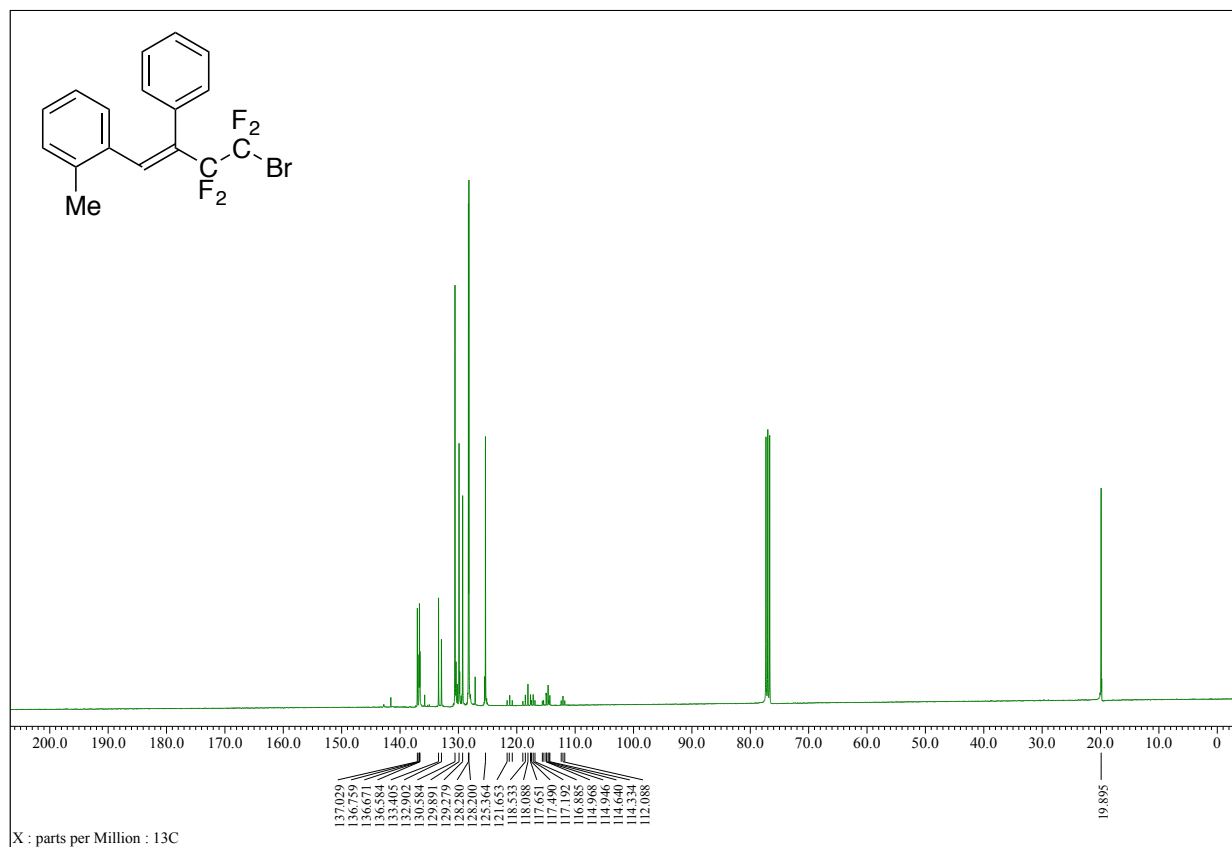


(E)-4-Bromo-3,3,4,4-tetrafluoro-1-(2-methylphenyl)-2-phenylbut-1-ene (E-10d)

¹H NMR

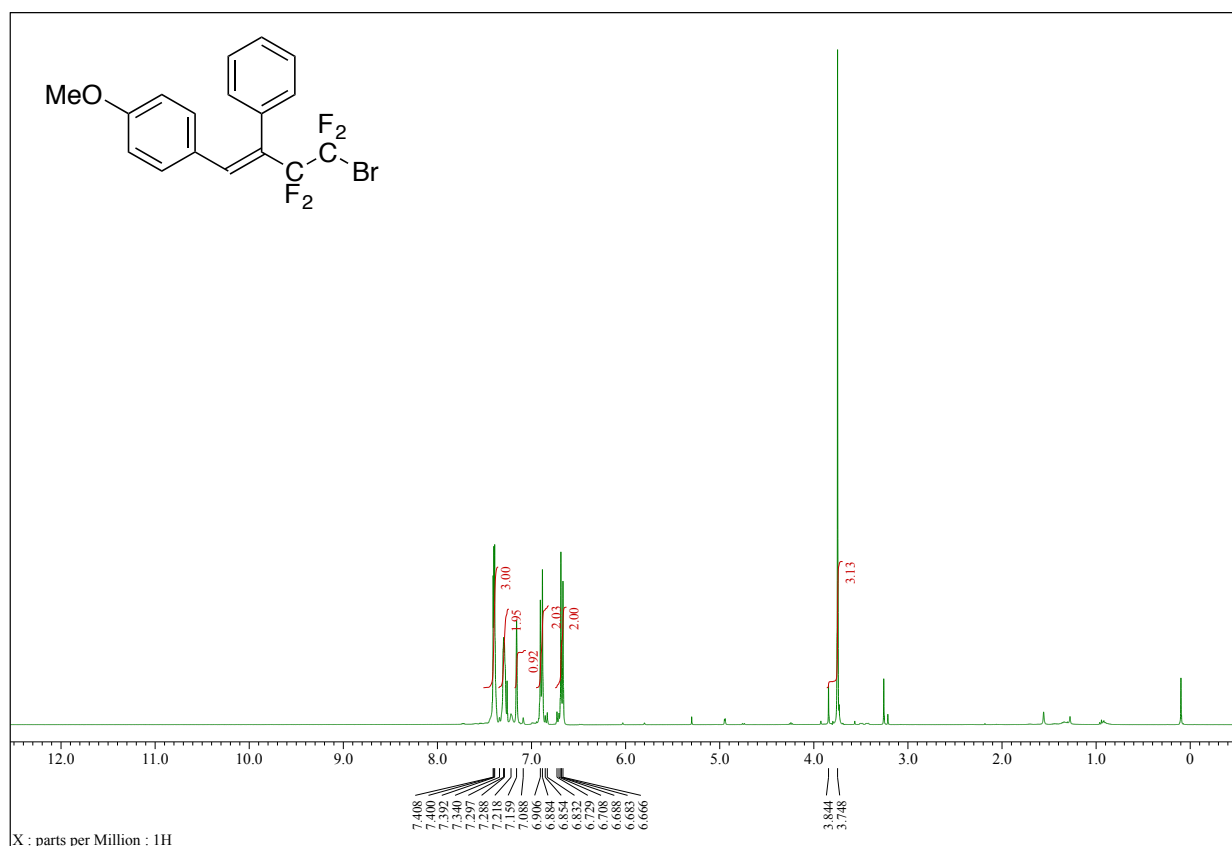


¹³C NMR

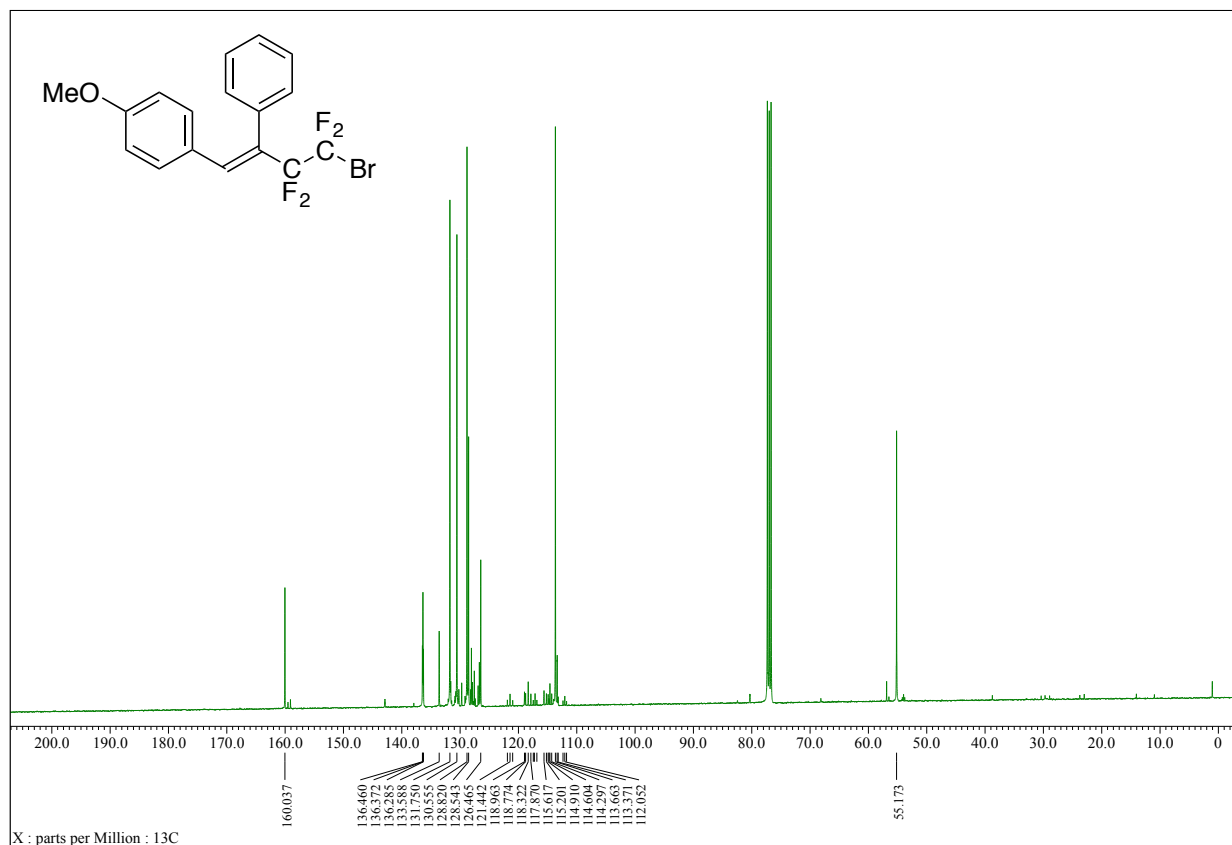


(E)-4-Bromo-3,3,4,4-tetrafluoro-1-(4-methoxyphenyl)-2-phenylbut-1-ene (E-10e)

¹H NMR

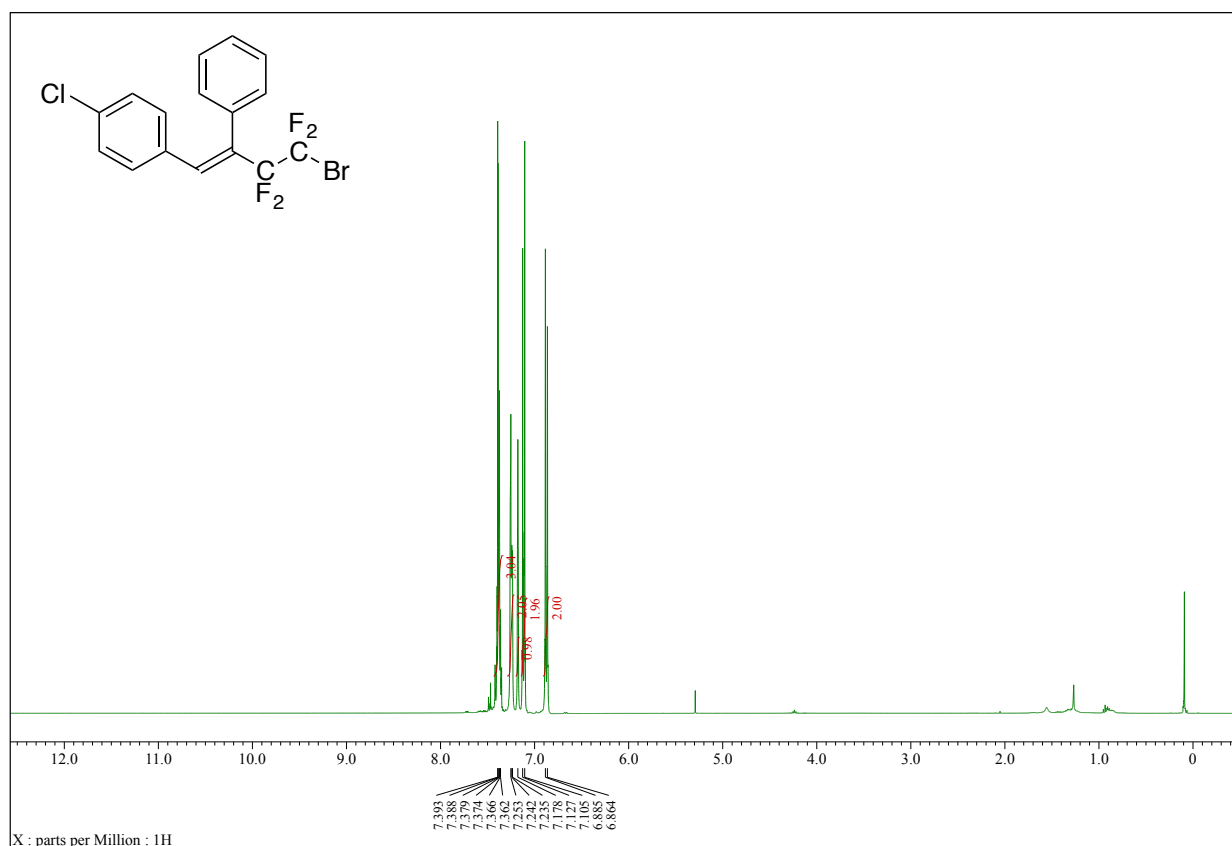


¹³C NMR

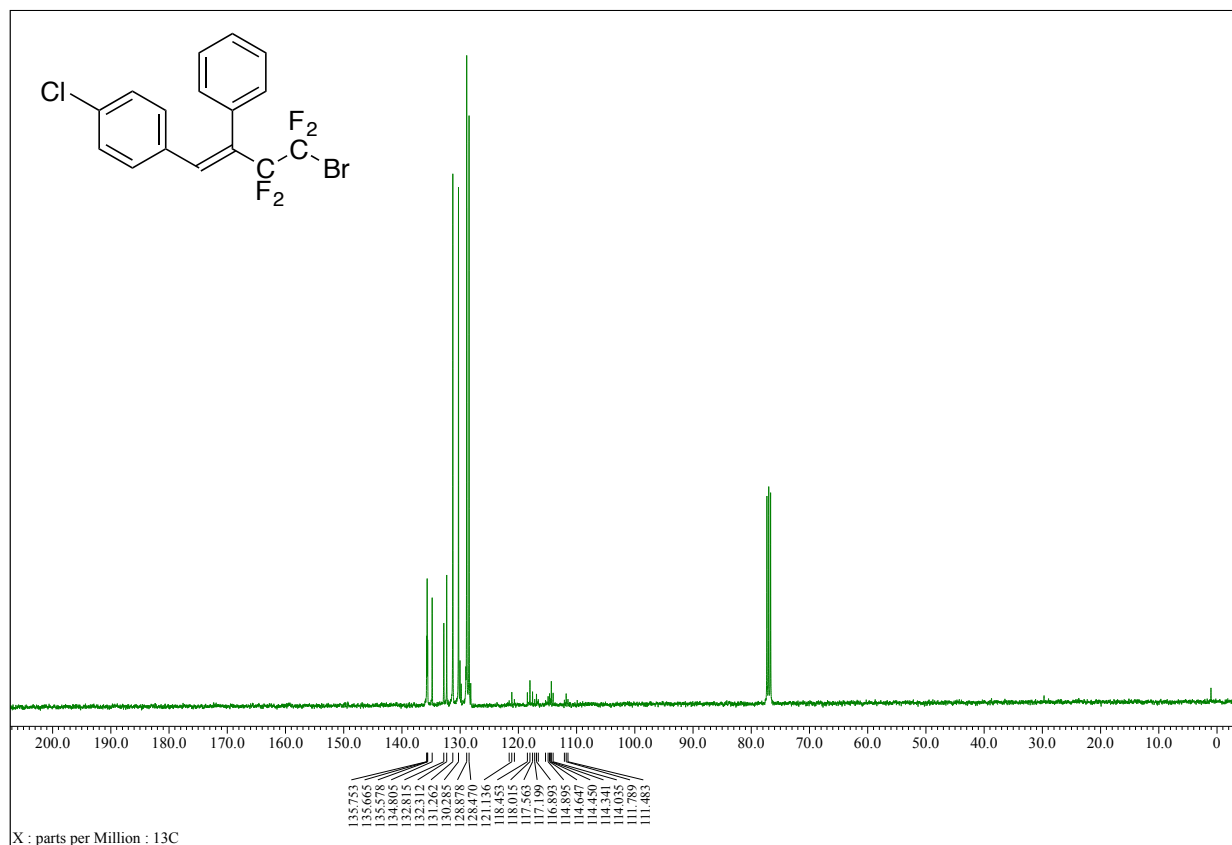


(E)-4-Bromo-1-(4-chlorophenyl)-3,3,4,4-tetrafluoro-2-phenylbut-1-ene (E-10f)

¹H NMR

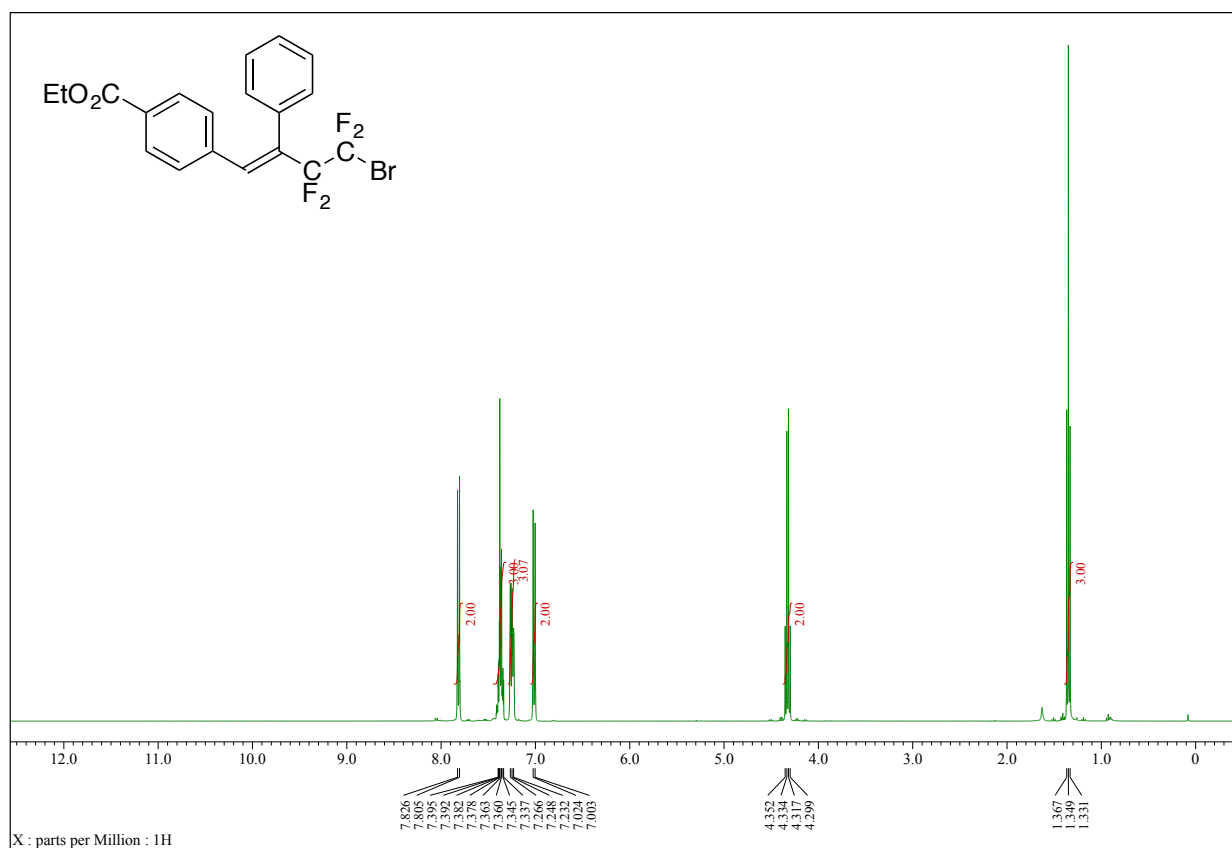


¹³C NMR

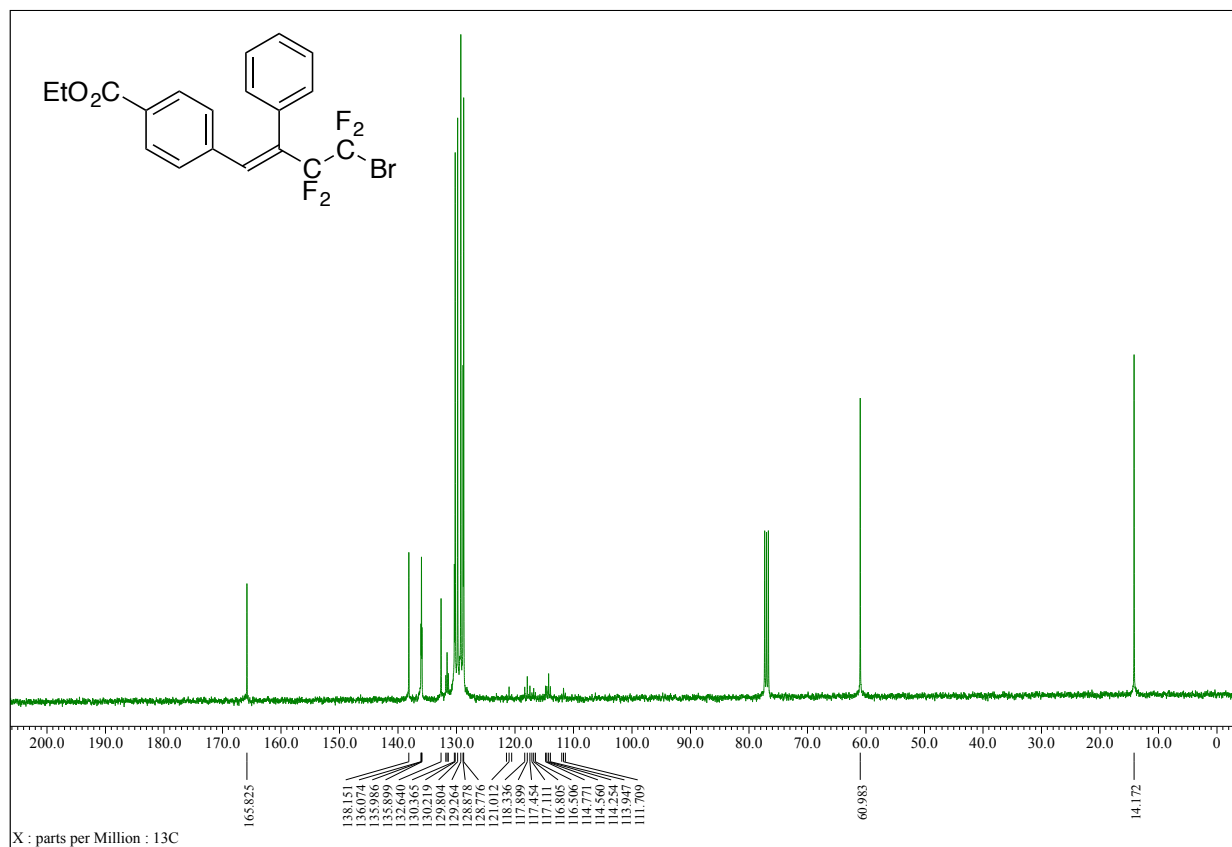


(E)-Ethyl 4-(4-bromo-3,3,4,4-tetrafluoro-2-phenylbut-1-en-1-yl)benzoate (E-10g)

¹H NMR



¹³C NMR

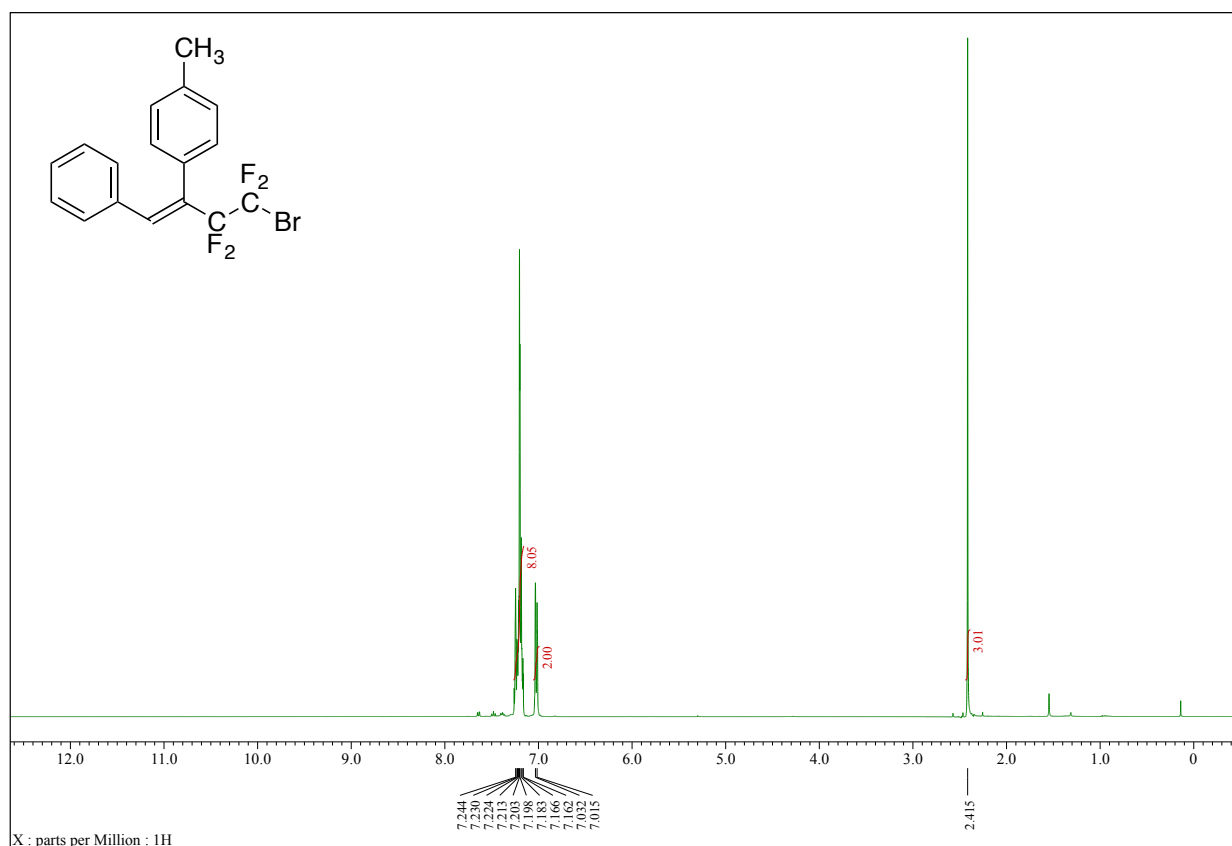


¹H NMR

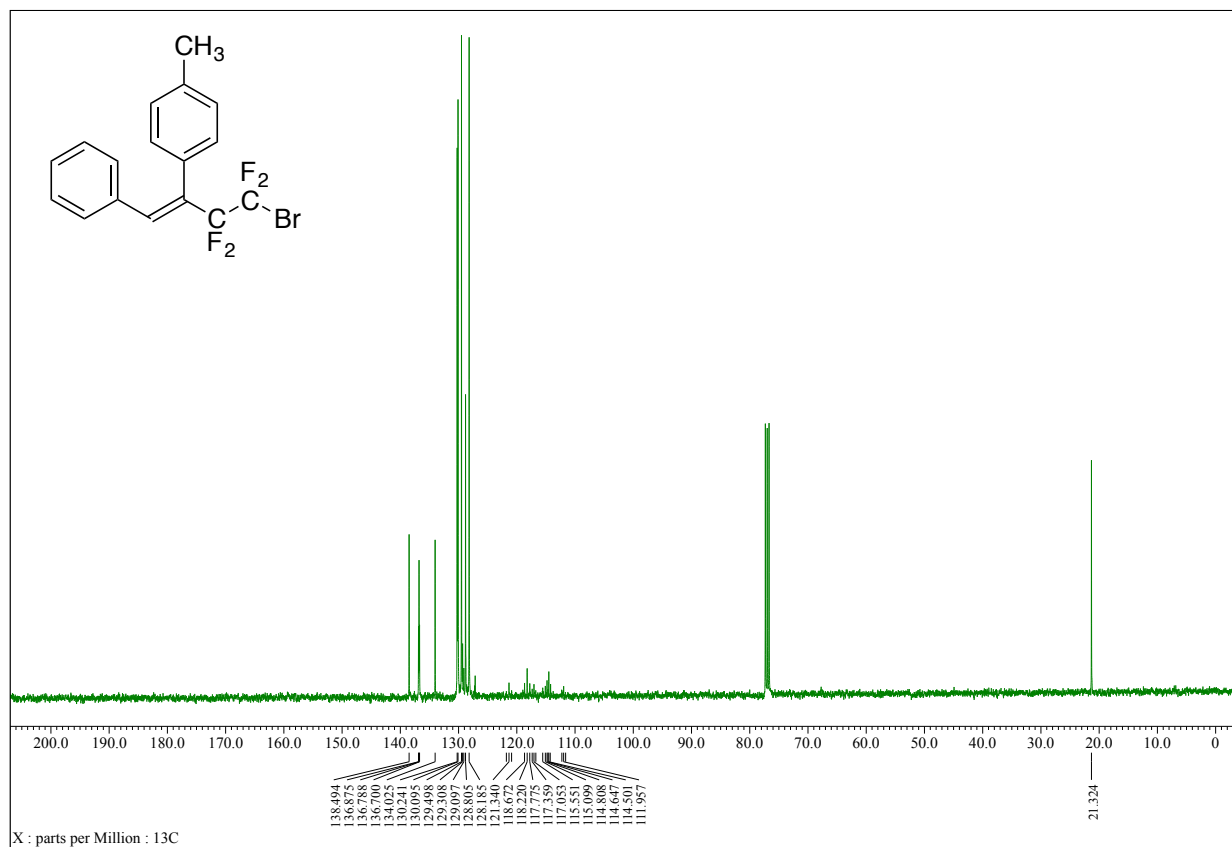


(E)-4-Bromo-3,3,4,4-tetrafluoro-2-(4-methylphenyl)-1-phenylbut-1-ene (E-10i)

¹H NMR

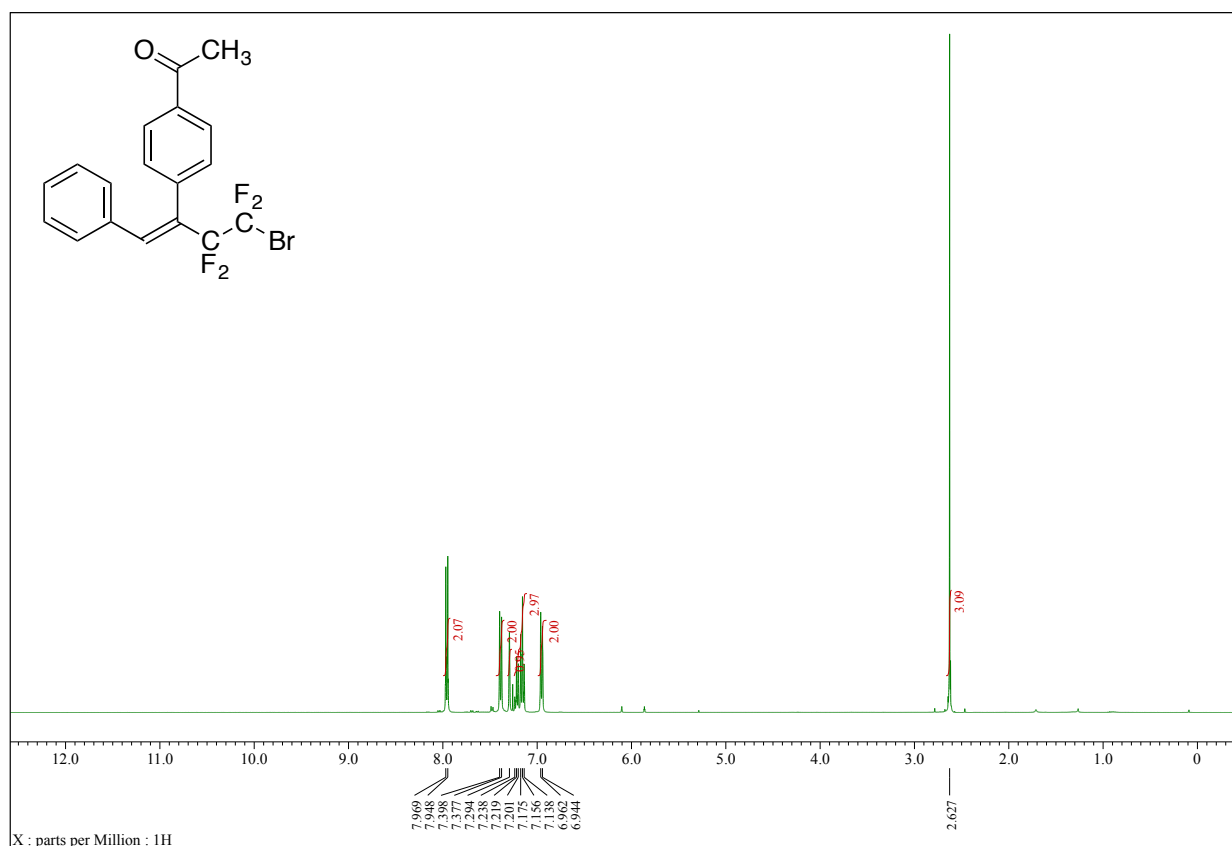


¹³C NMR

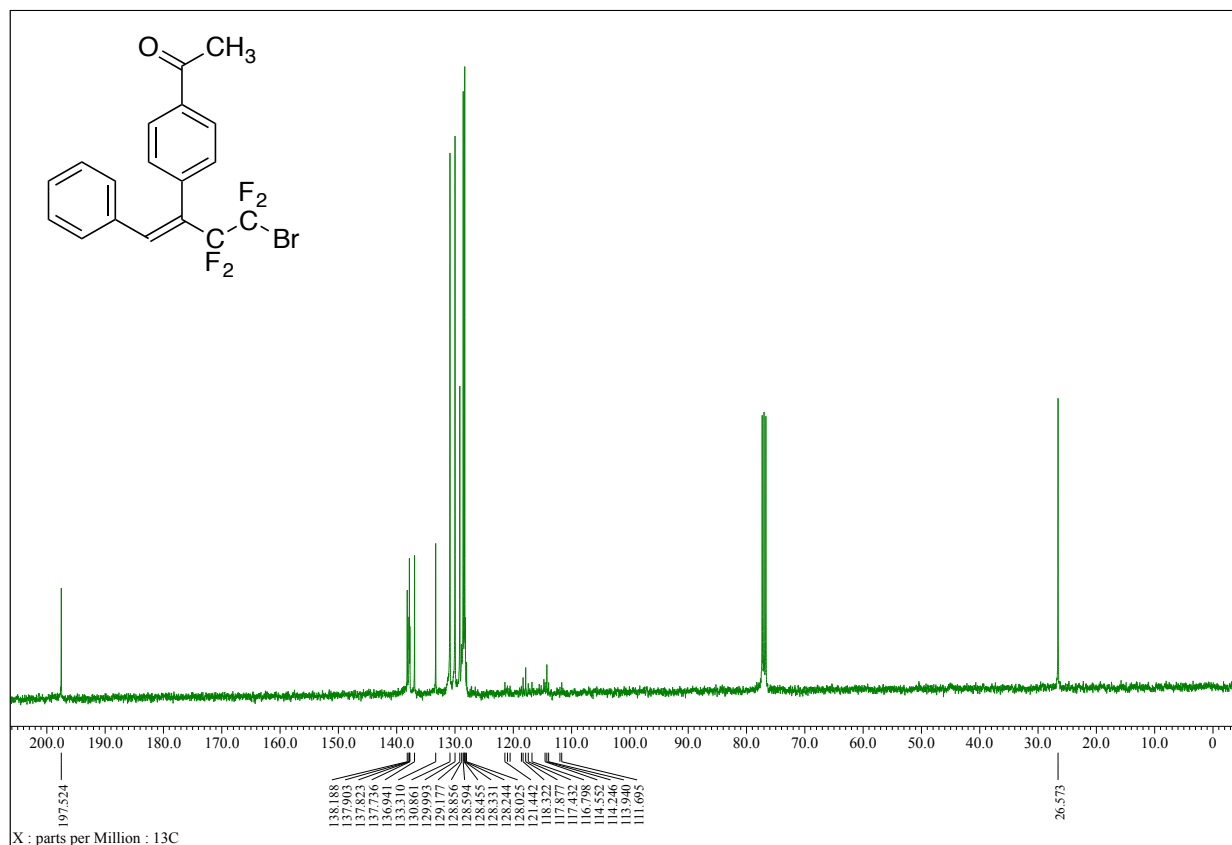


(E)-(4-Bromo-3,3,4,4-tetrafluoro-1-phenylbut-1-en-2-yl)phenyl methyl ketone (E-10j)

¹H NMR

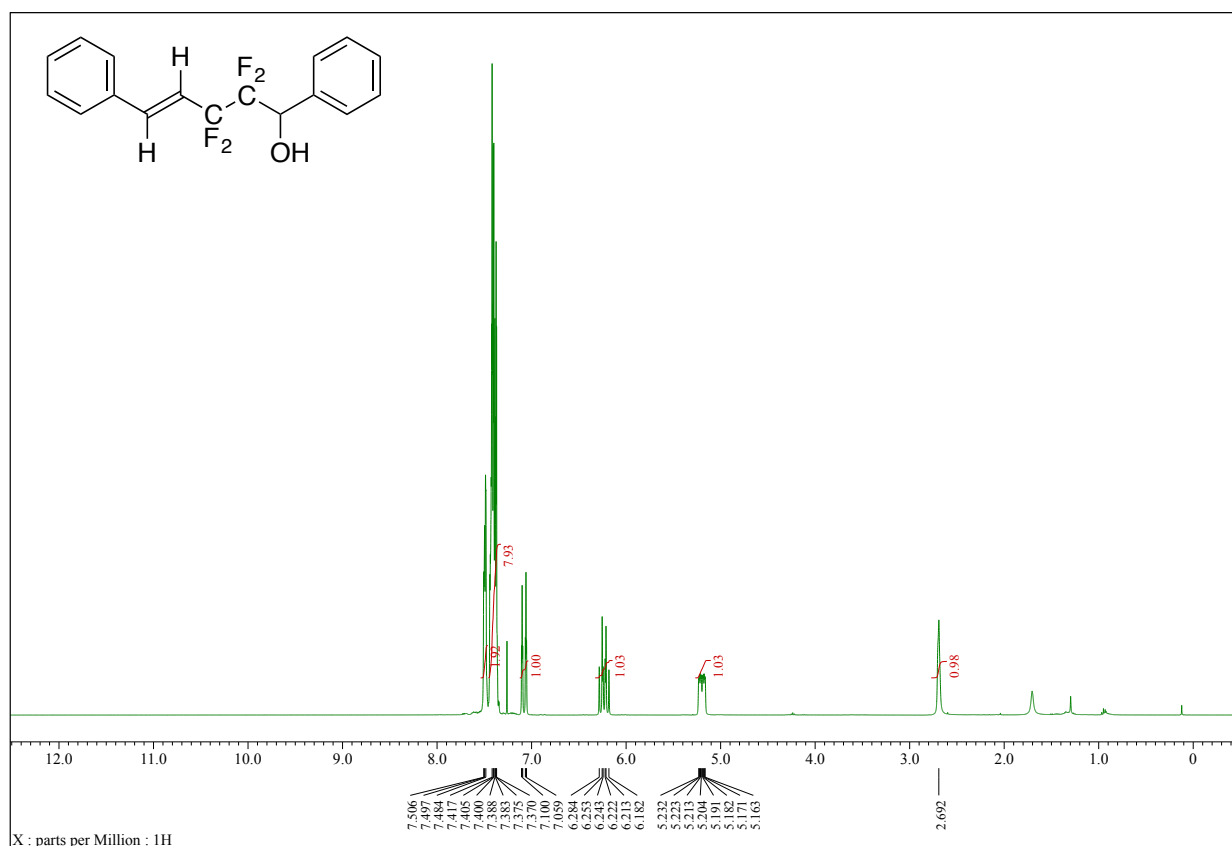


¹³C NMR

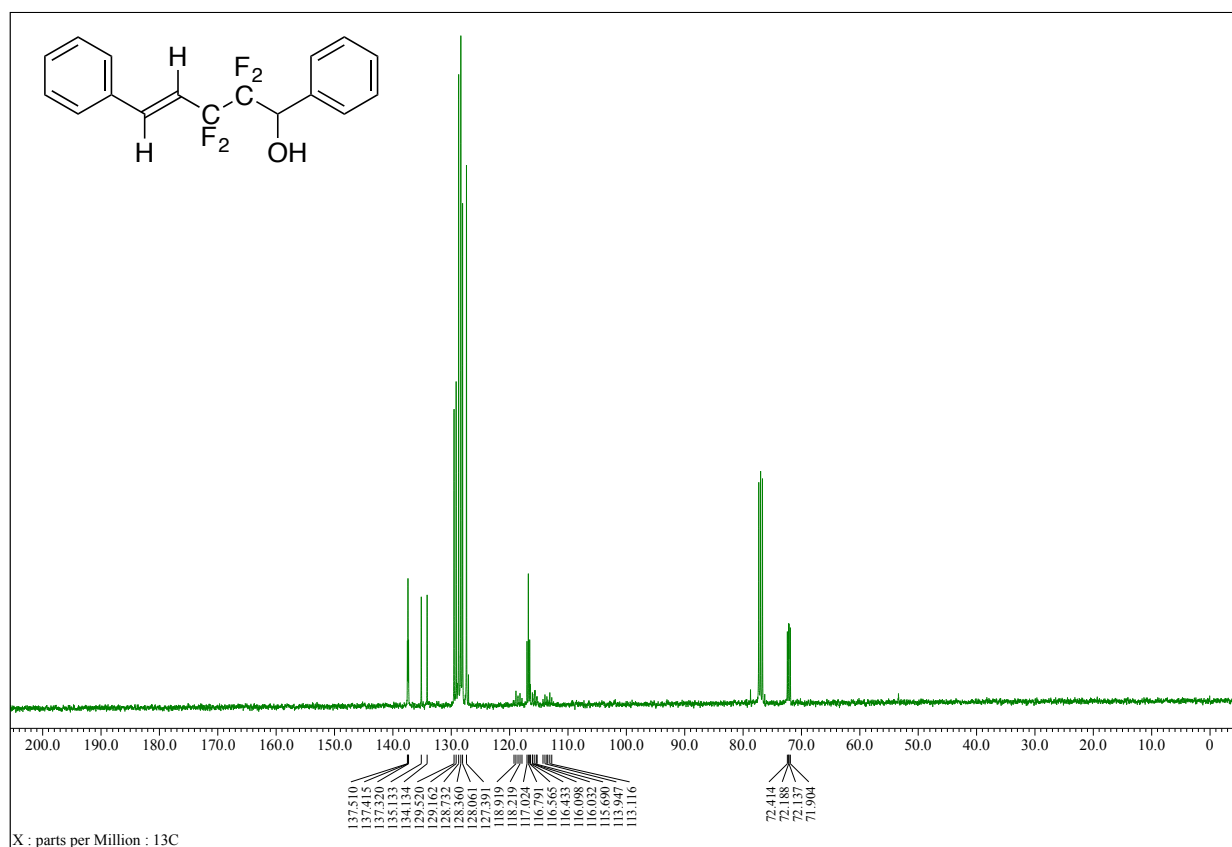


(E)-2,2,3,3-Tetrafluoro-1,5-diphenylpent-4-en-1-ol (**11a**)

^1H NMR

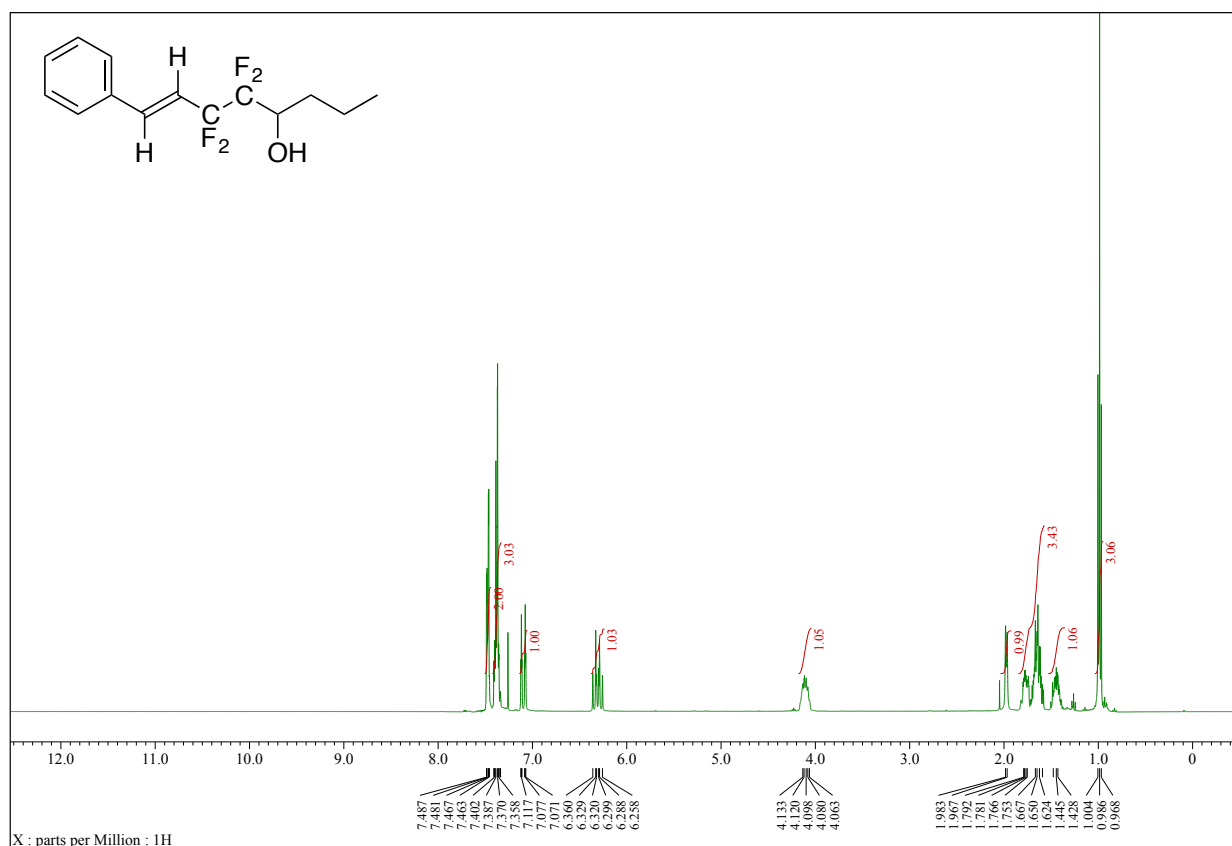


^{13}C NMR

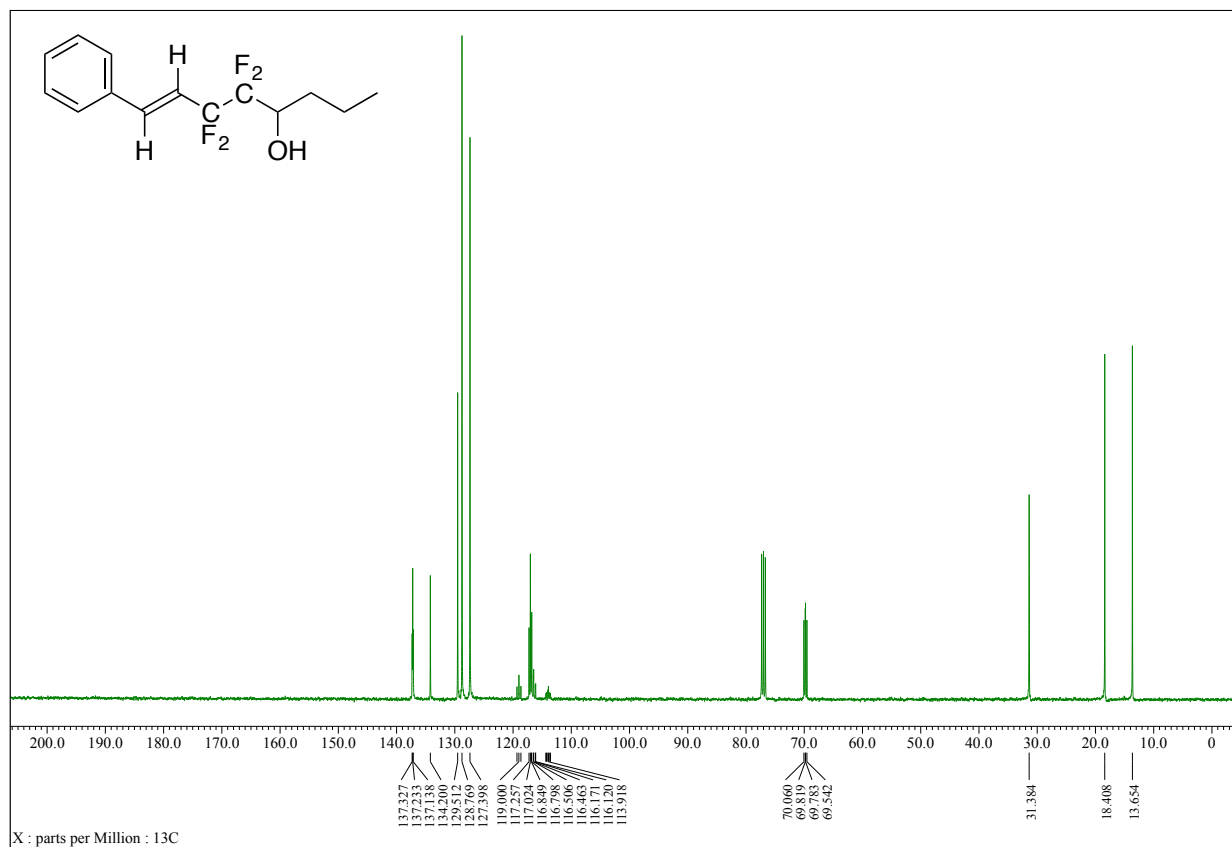


(E)-5,5,6,6-Tetrafluoro-8-phenyl-oct-7-en-4-ol (11b)

¹H NMR

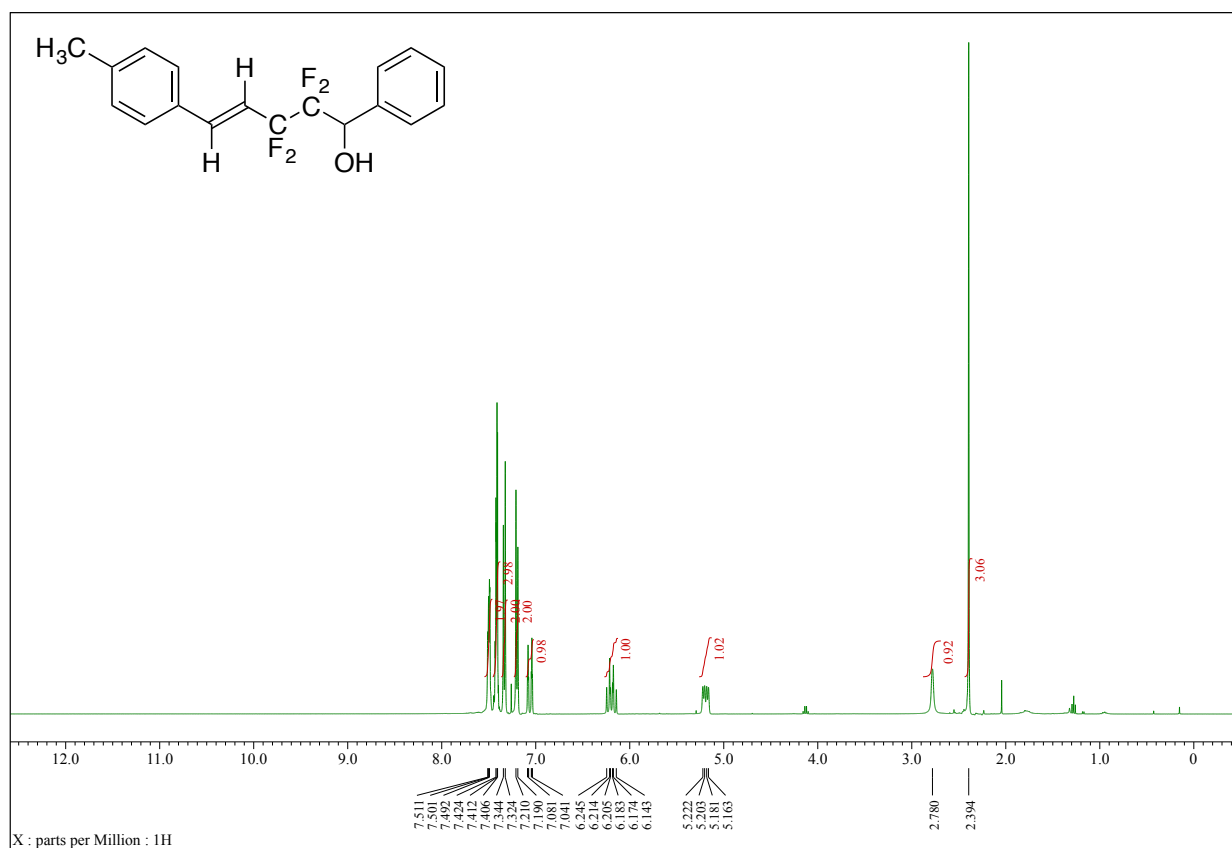


¹³C NMR

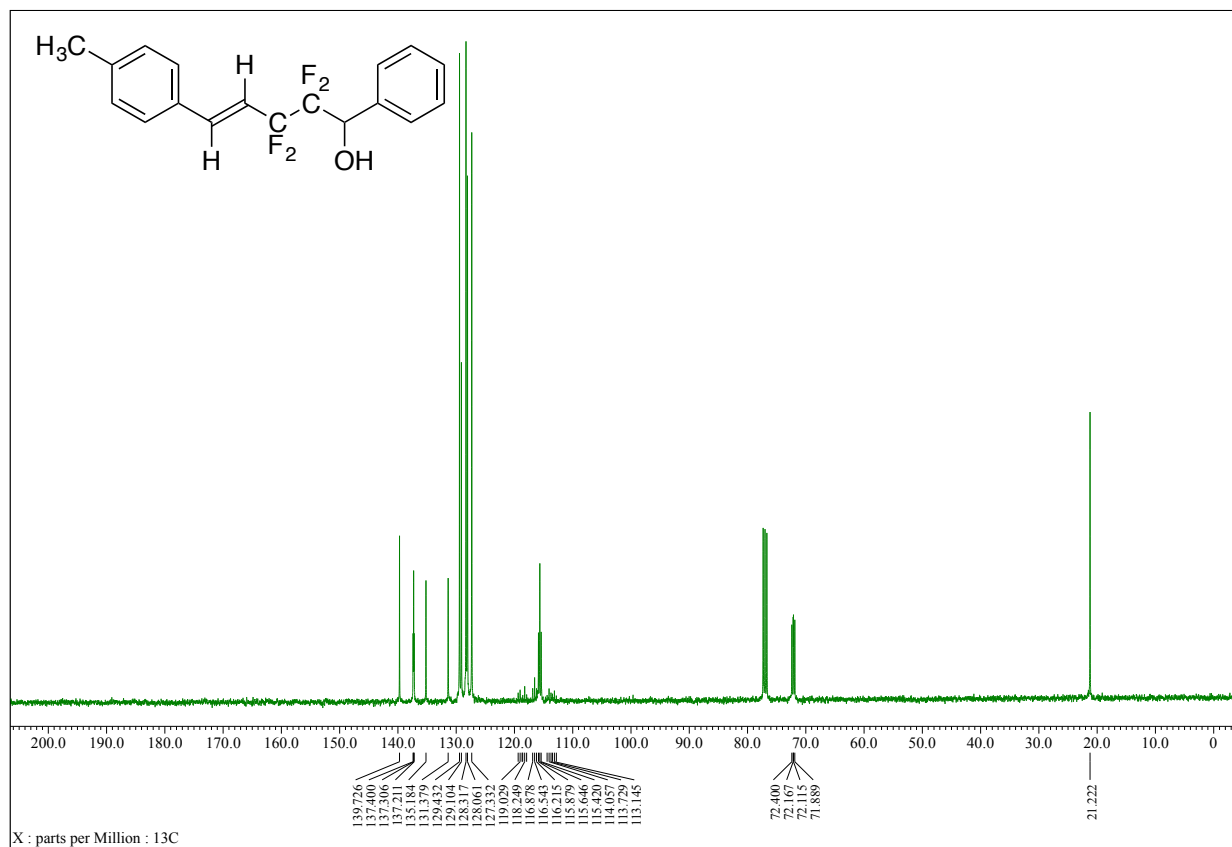


(E)-2,2,3,3-Tetrafluoro-5-(4-methylphenyl)-1-phenylpent-4-en-1-ol (11c)

¹H NMR

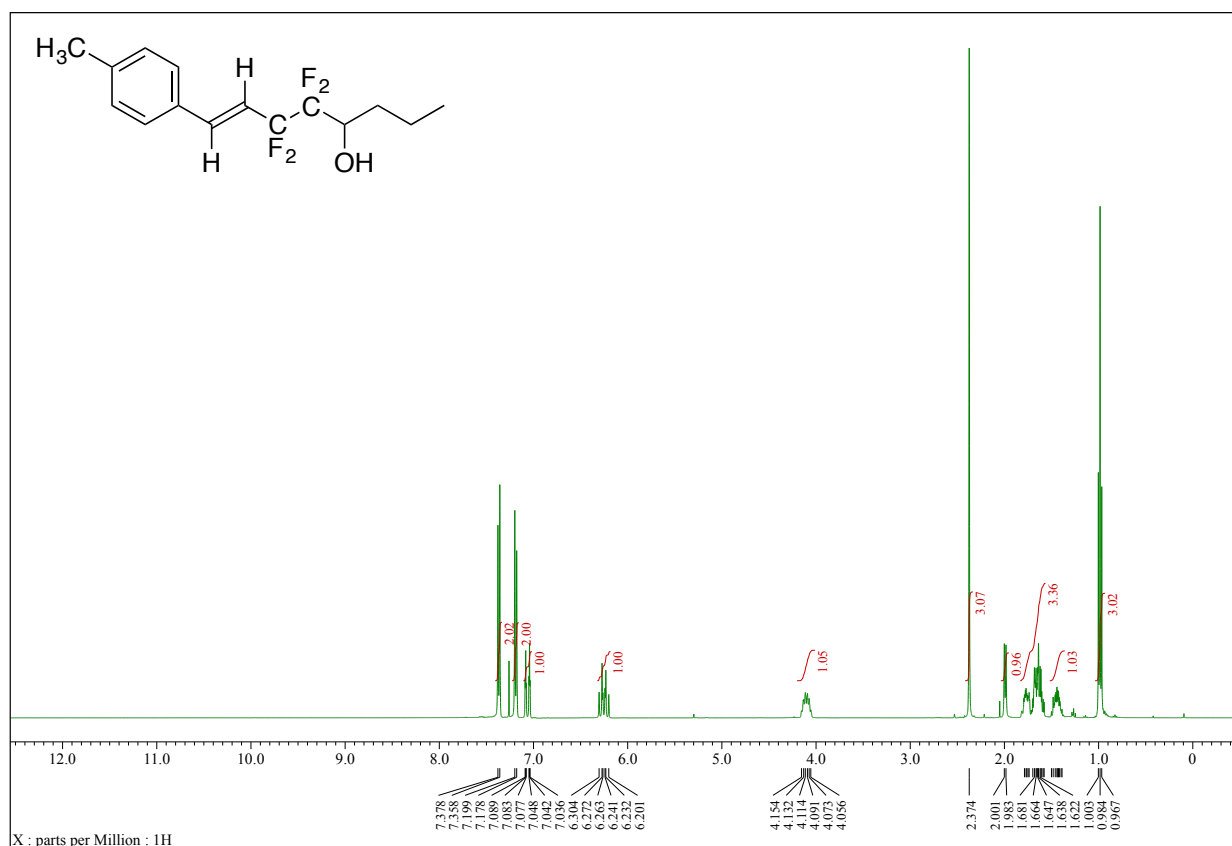


¹³C NMR

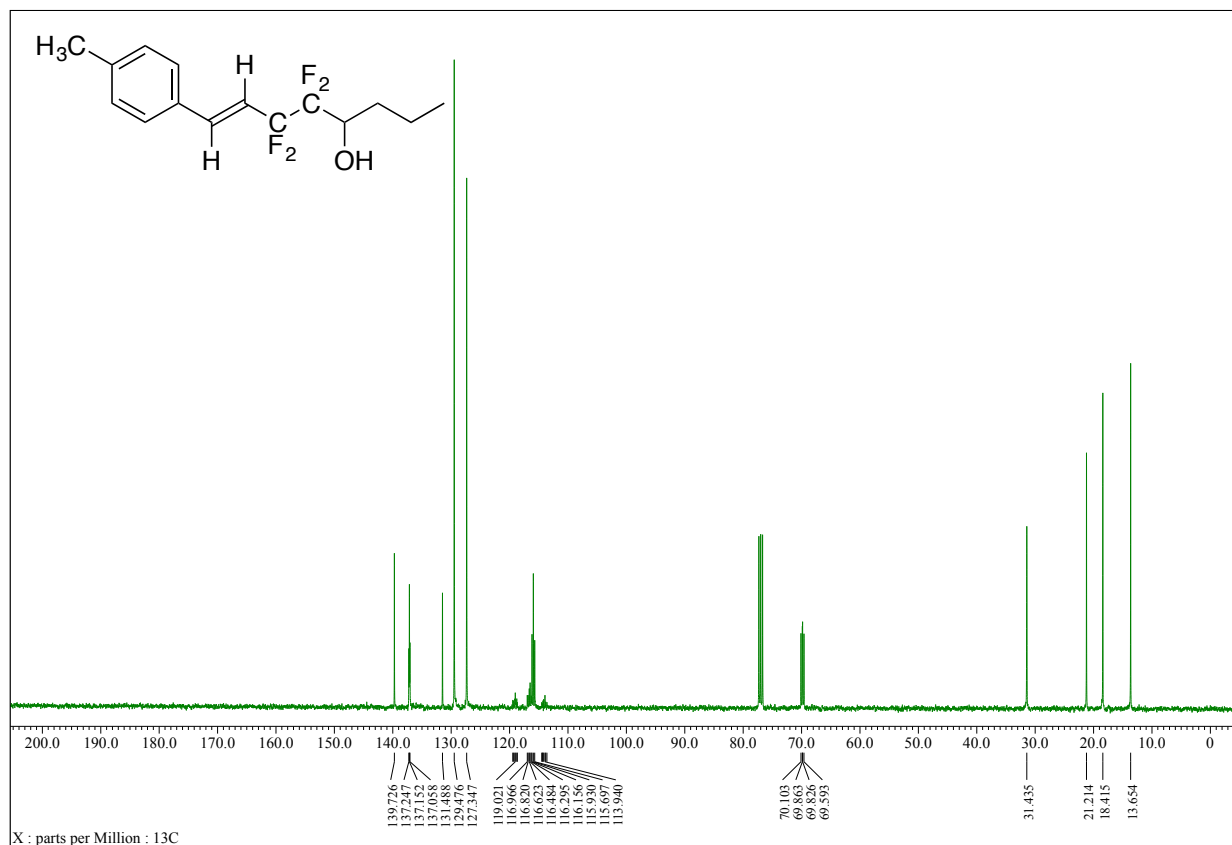


(E)-5,5,6,6-Tetrafluoro-8-(4-methylphenyl)oct-7-en-4-ol (**11d**)

^1H NMR

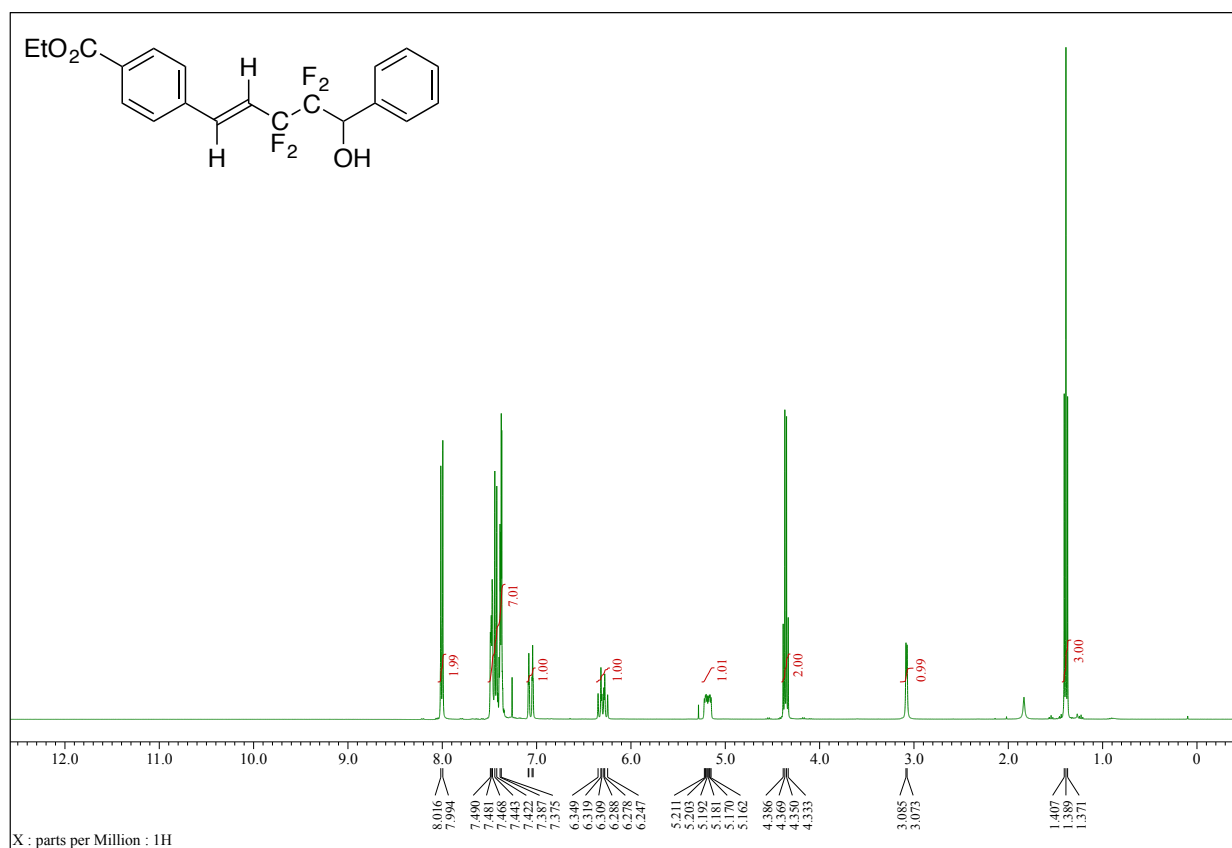


^{13}C NMR

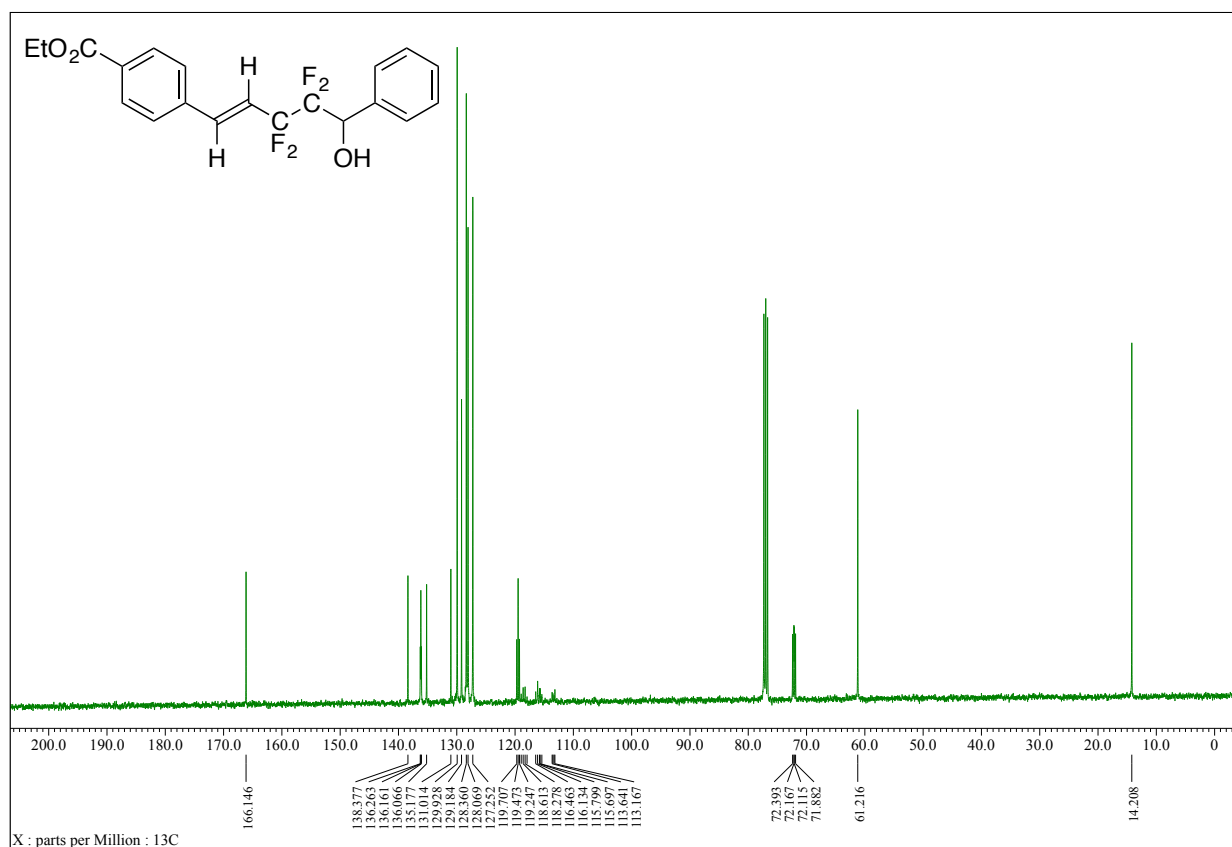


(E)-Ethyl 4-(3,3,4,4-tetrafluoro-5-hydroxy-5-phenylpent-1-en-yl)benzoate (11e)

¹H NMR

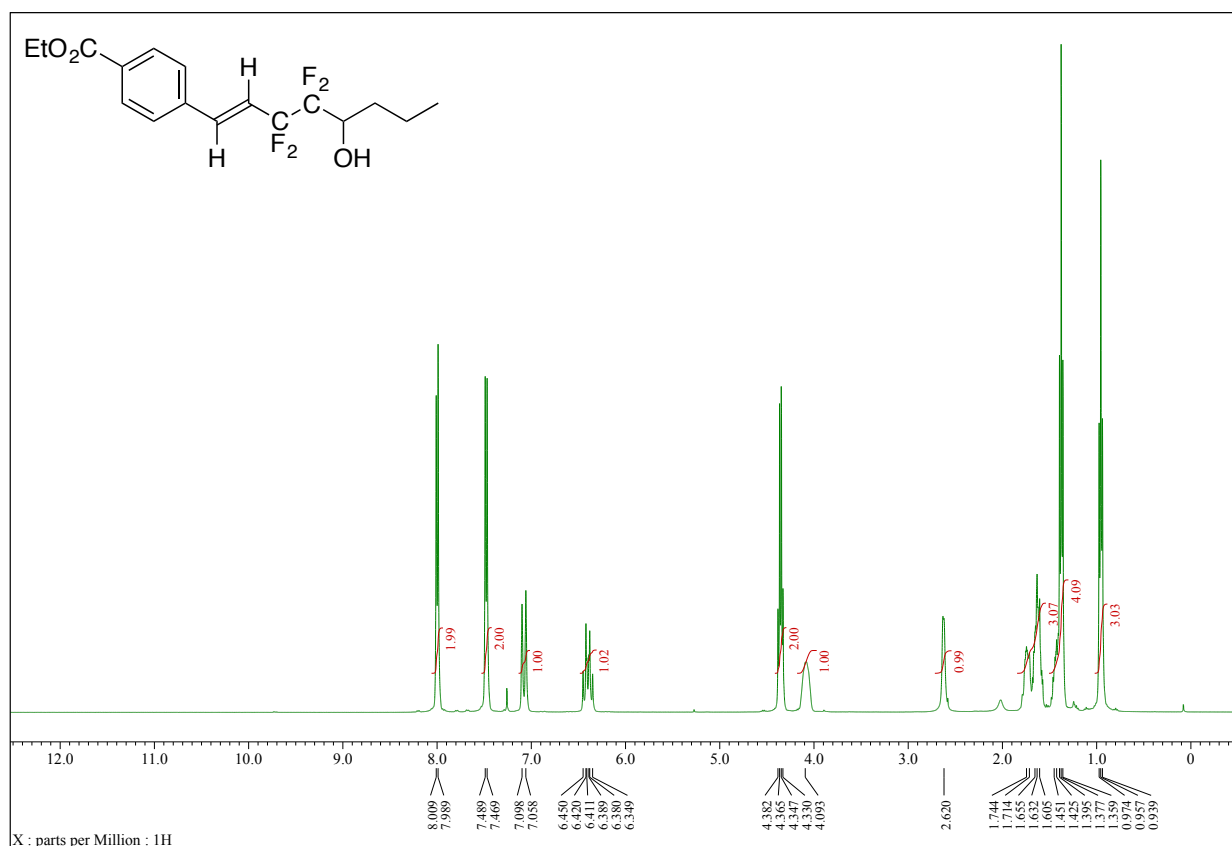


¹³C NMR

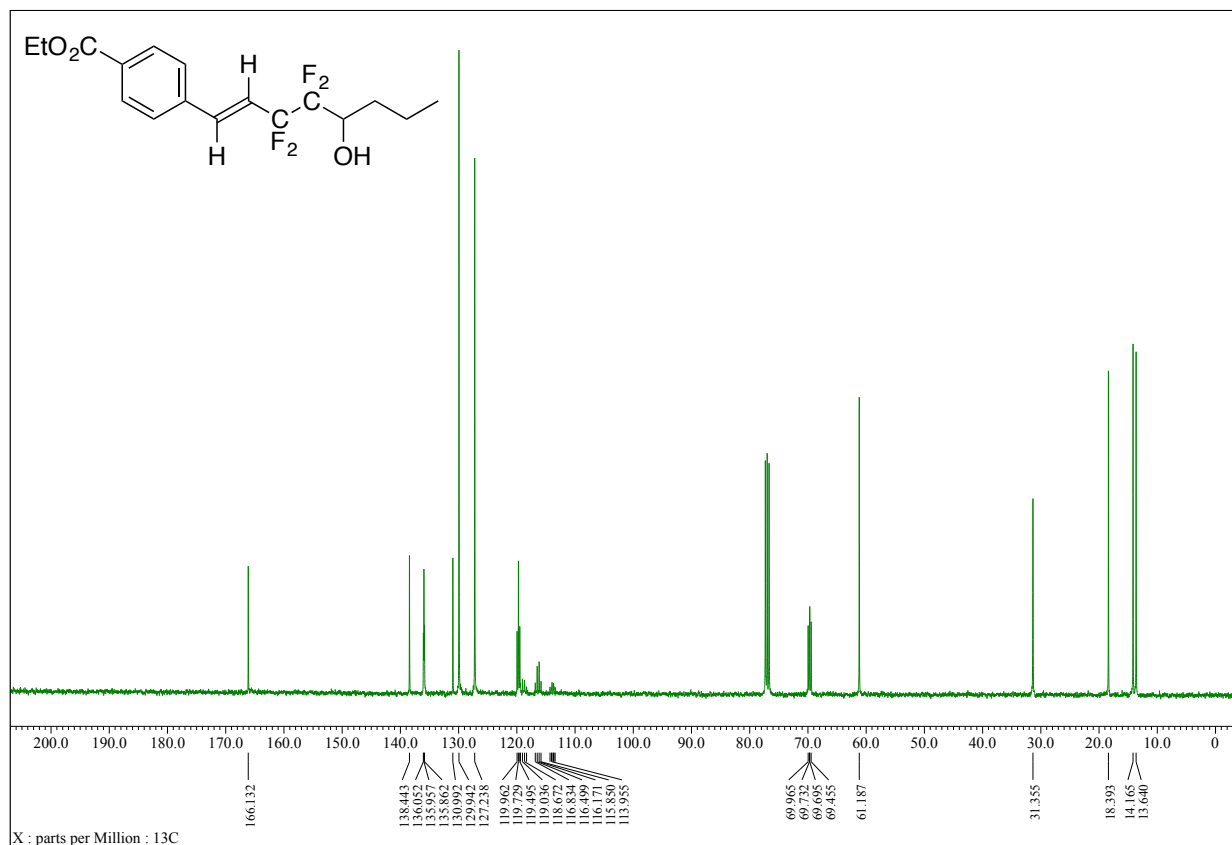


(E)-Ethyl 4-(3,3,4,4-tetrafluoro-5-hydroxyoct-4-en-1-yl)benzoate (11f)

¹H NMR

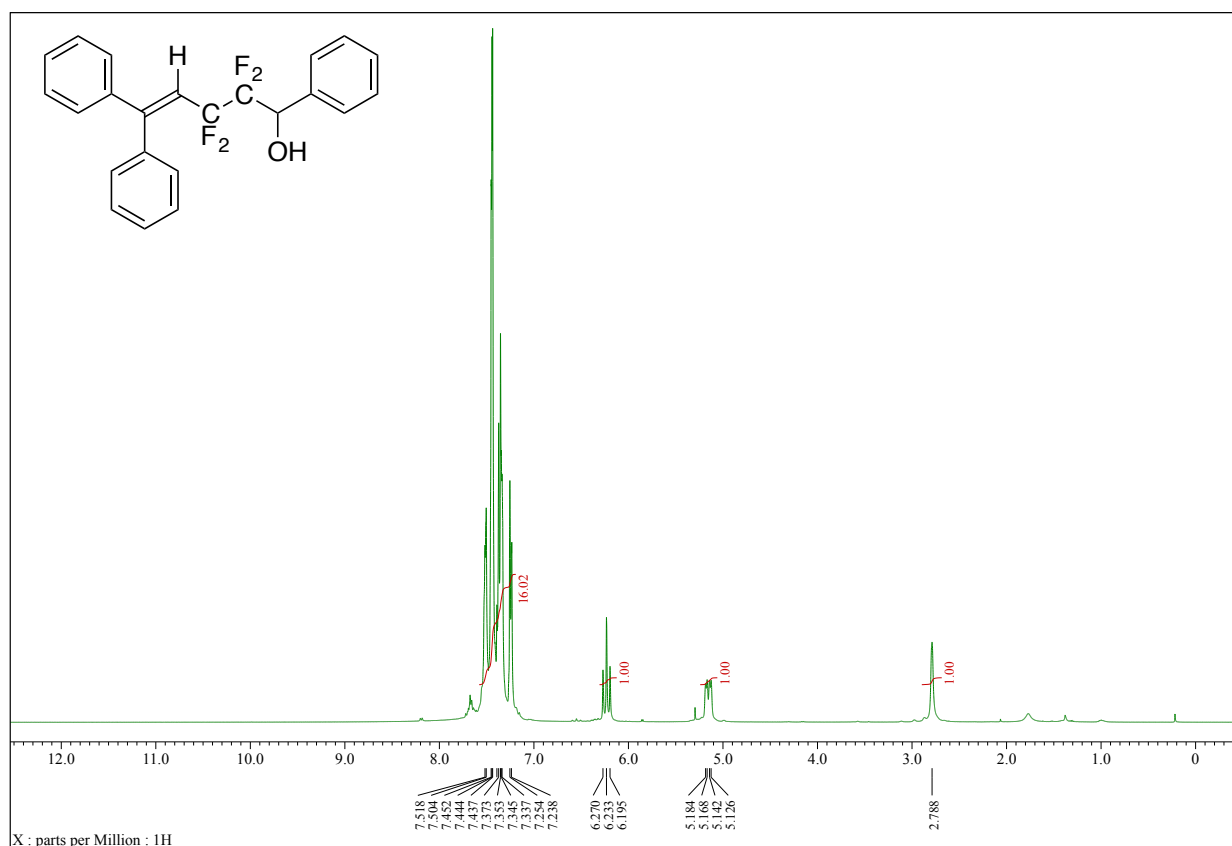


¹³C NMR

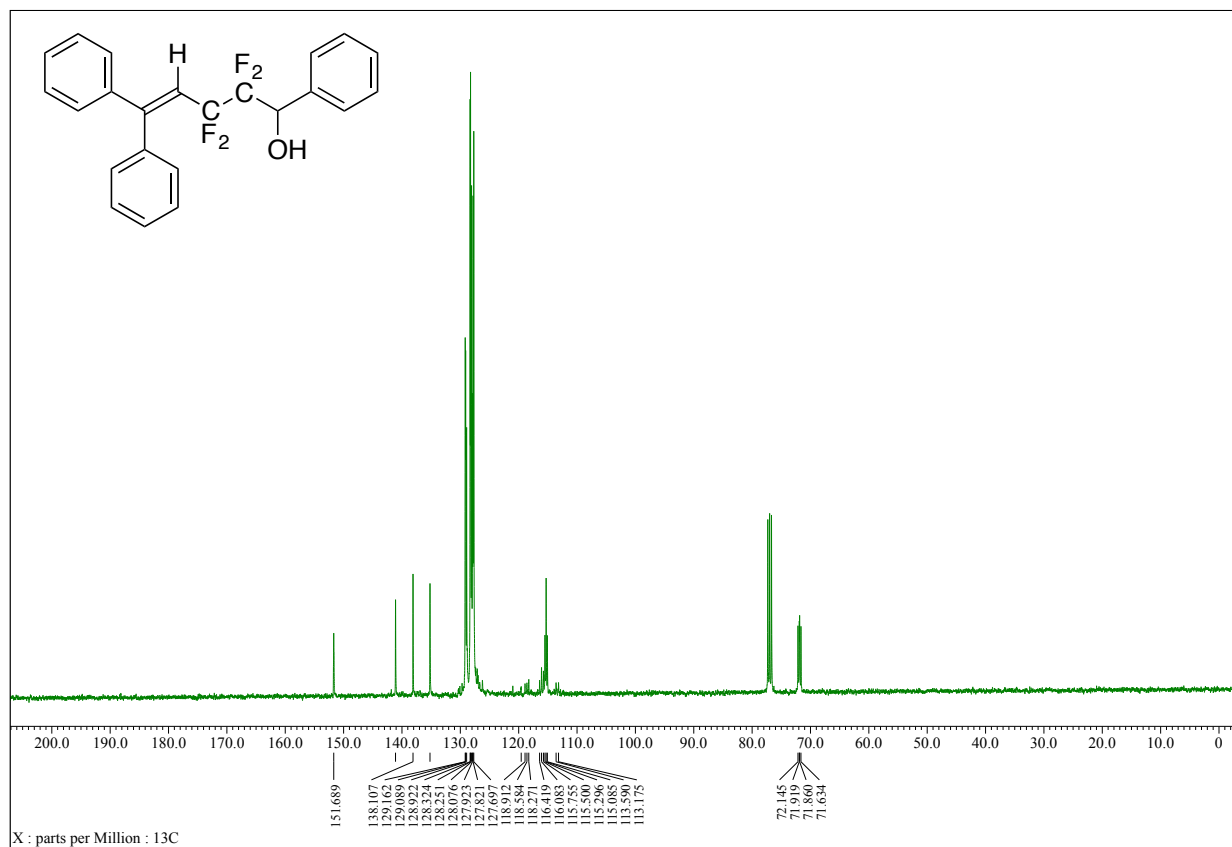


2,2,3,3-Tetrafluoro-1,5,5-triphenylpent-4-en-1-ol (11g)

¹H NMR

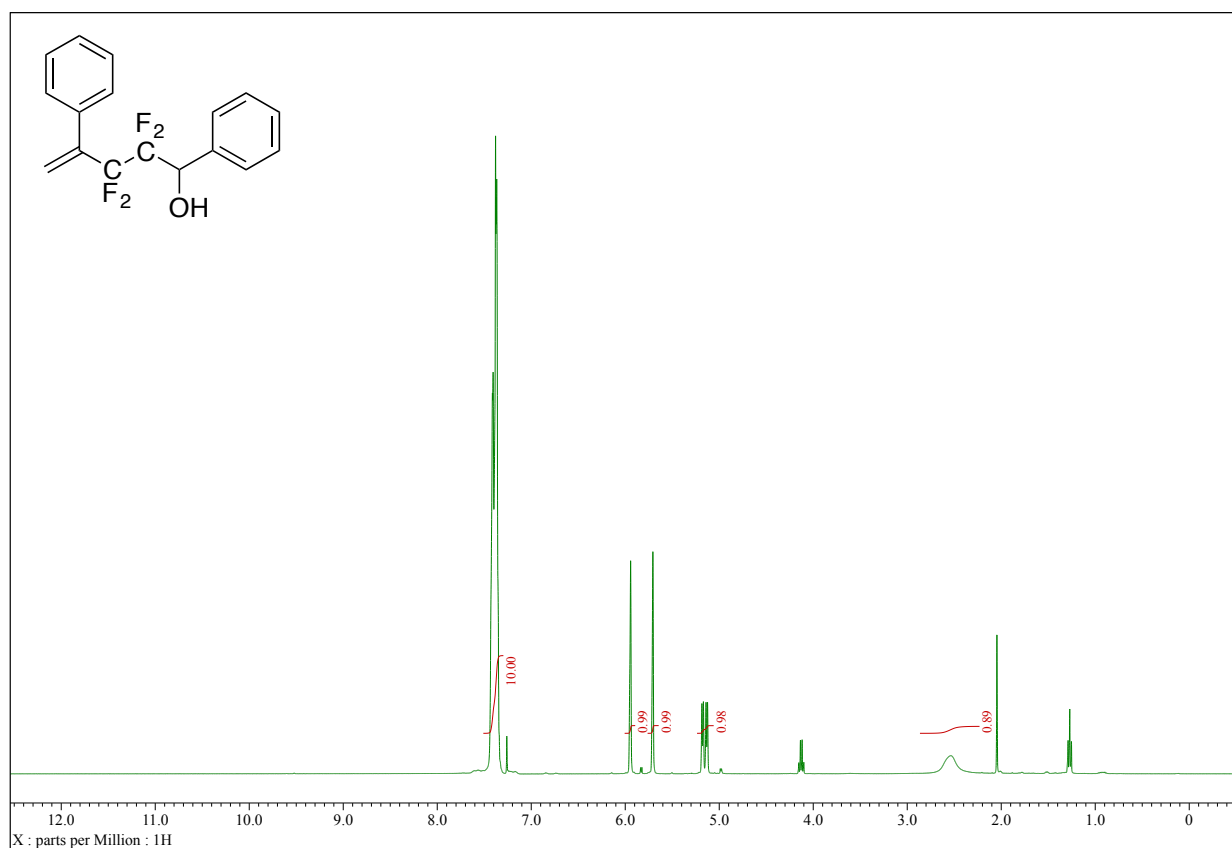


¹³C NMR

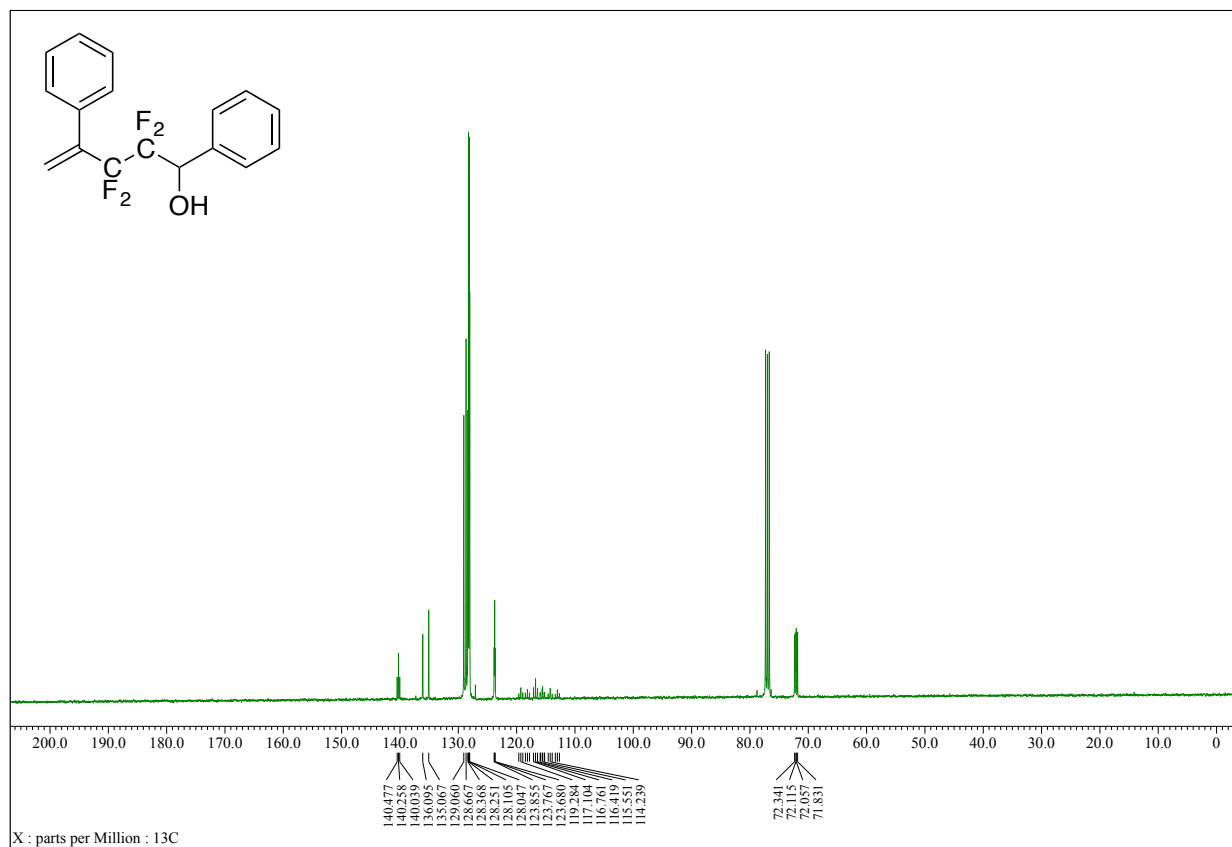


2,2,3,3-Tetrafluoro-1,4-diphenylpent-4-en-1-ol (11h)

¹H NMR

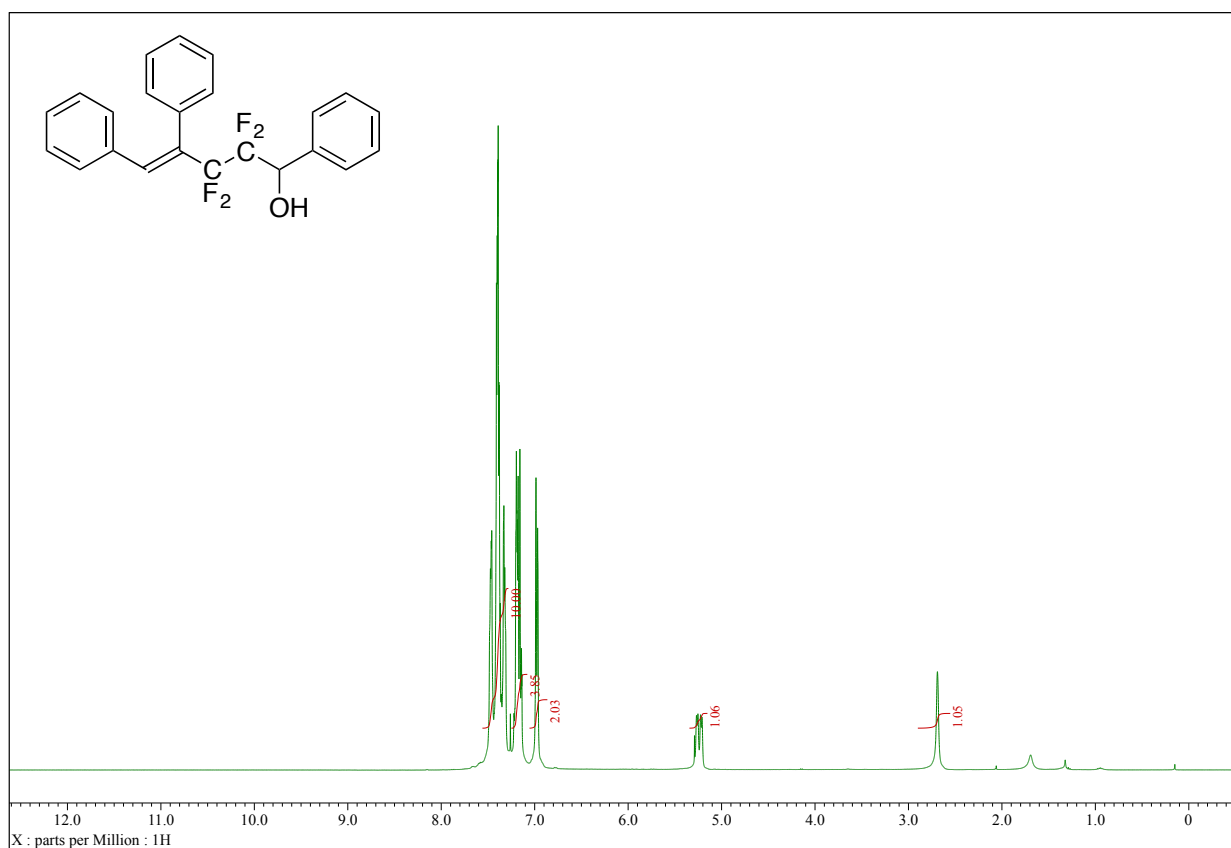


¹³C NMR



(E)-2,2,3,3-Tetrafluoro-1,4,5-triphenylpent-4-en-1-ol (11i)

¹H NMR



¹³C NMR

