

## Supporting Information

### Asymmetric total synthesis of (1*S*,2*S*,4*S*)- $\beta$ -elemene

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Part 1: NMR spectra comparison-----S1

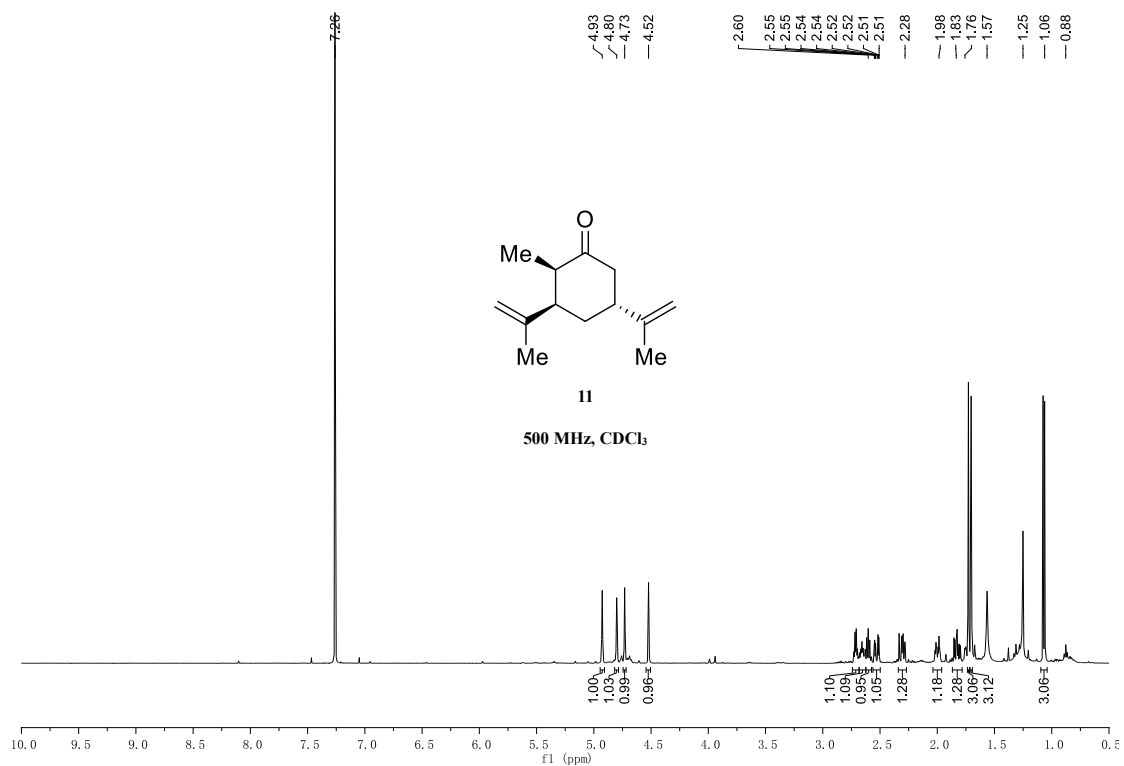
Part 2: Copies of NMR spectra -----S2

## 1. NMR spectra comparison of synthetic 3 and the isolated natural product

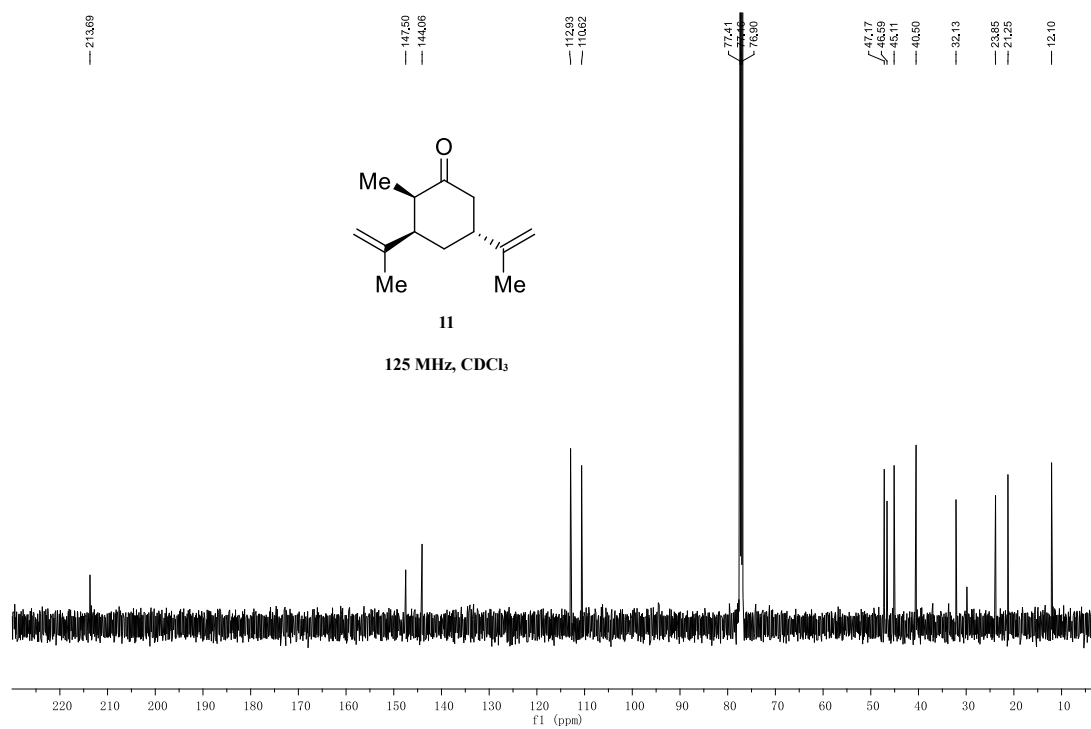
<sup>1</sup> H NMR (δ, ppm) (500 MHz, CDCl <sub>3</sub> ) Shi, et al <sup>[1]</sup>	<sup>1</sup> H NMR (δ, ppm) (500 MHz, CDCl <sub>3</sub> ) This work	<sup>13</sup> C NMR (δ, ppm) (125 MHz, CDCl <sub>3</sub> ) Shi, et al <sup>[1]</sup>	<sup>13</sup> C NMR (δ, ppm) (125 MHz, CDCl <sub>3</sub> ) This work
5.82 (dd, <i>J</i> =17.5, 10.9 Hz, 1H)	5.82 (dd, <i>J</i> =17.5, 11.0 Hz, 1H)	150.22	150.2
4.91 (dd, <i>J</i> =18.1, 1.0 Hz)	4.93 (dd, <i>J</i> =8.3, 1.0 Hz, 1H)	148.18	148.2
4.90 (dd, <i>J</i> =10.5, 1.0 Hz)	4.90 (s, 1H)	147.99	147.9
4.85 (s, 1H)	4.86 (d, <i>J</i> =1.2 Hz, 1H)	112.37	112.4
4.84 (s, 1H)	4.84 (m, 1H)	110.19	110.17
4.79 (s, 1H)	4.79 (s, 1H)	110.11	110.15
4.68 (s, 1H)	4.68 (s, 1H)	47.77	47.7
2.36 (m, 1H)	2.40 – 2.32 (m, 1H)	39.83	39.8
2.18 (dd, <i>J</i> =9.1, 4.6 Hz, 1H)	2.18 (m, 1H)	39.11	39.1
1.75 (s, 3H)	1.75 (s, 3H)	34.74	34.7
1.74 (s, 3H)	1.73 (s, 3H)	30.29	30.2
1.60-1.72 (m, 5H)	1.57-1.78 (m, 5H)	25.46	25.5
1.32 (m, 1H)	1.32 (m, 1H)	24.70	24.6
1.02 (s, 3H)	1.02 (s, 3H)	22.27	22.30
		22.20	22.29

[1] Y. M. Shi, R. Y. Wang, X. Feng, X. T. Chen, J. Li, A. L. He, J. Shi, Y. M. Yuan, Y. C. Wang and S. Liu, *CN Pat.*, CN 109438166 B, 2021.

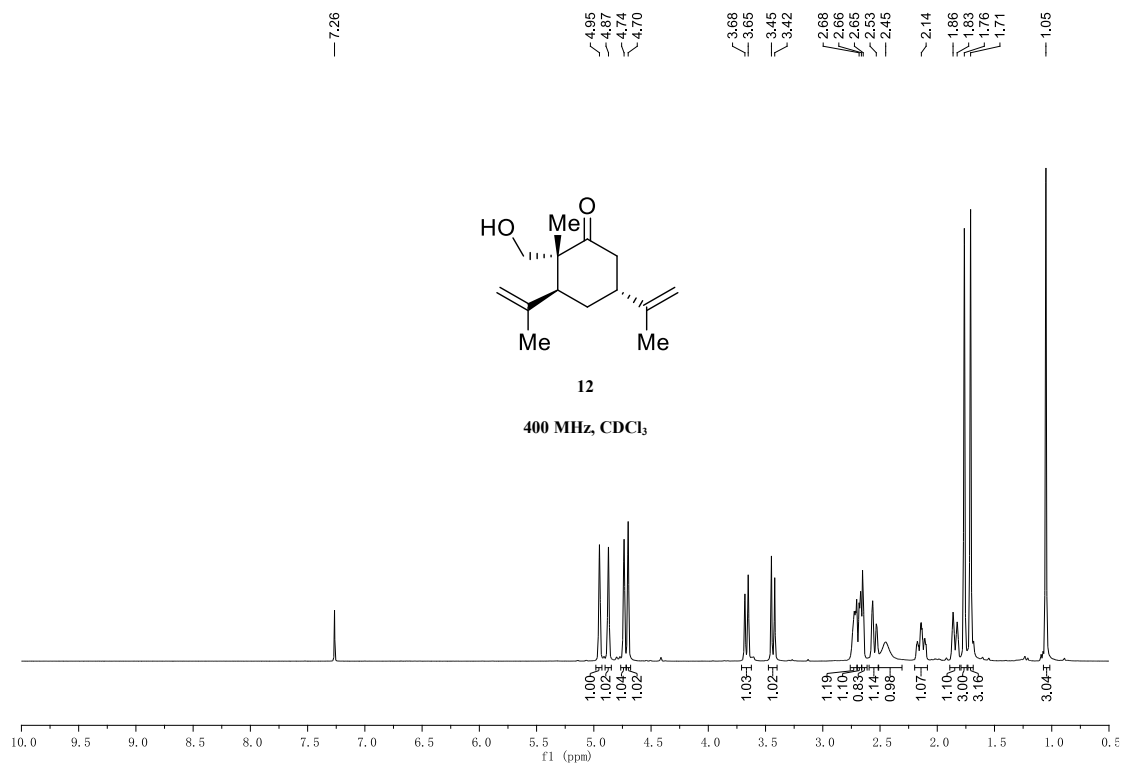
## 2. NMR spectra



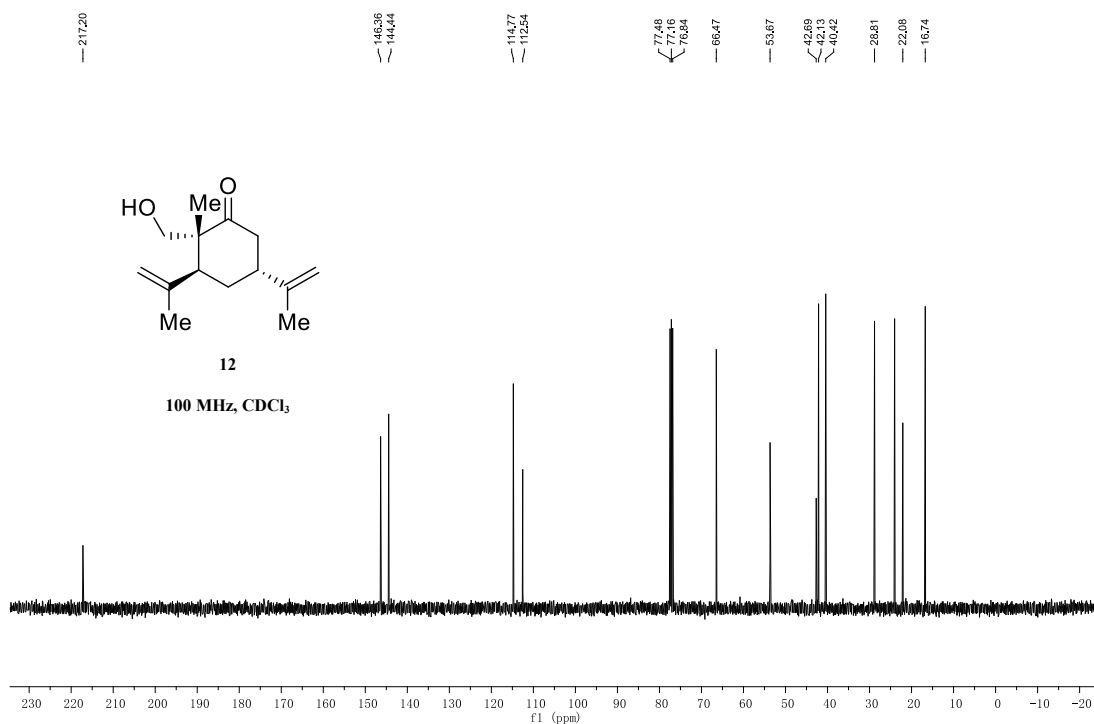
<sup>1</sup>H NMR of compound 11



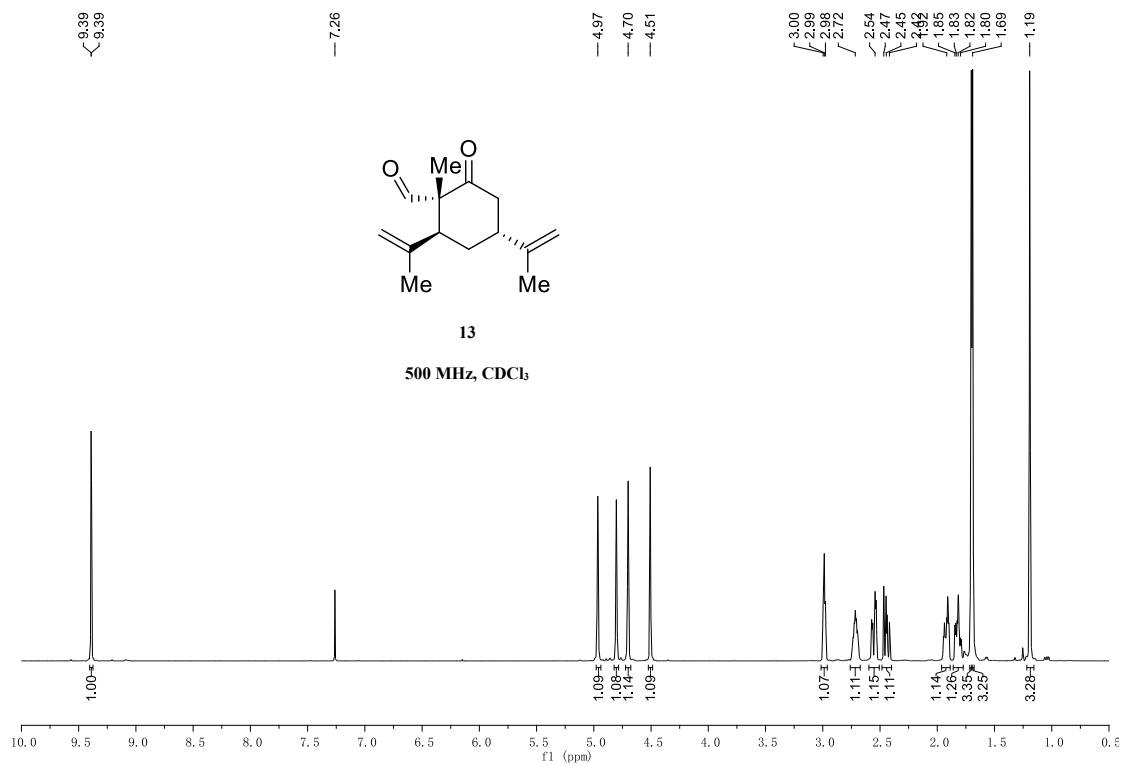
<sup>13</sup>C NMR of compound 11



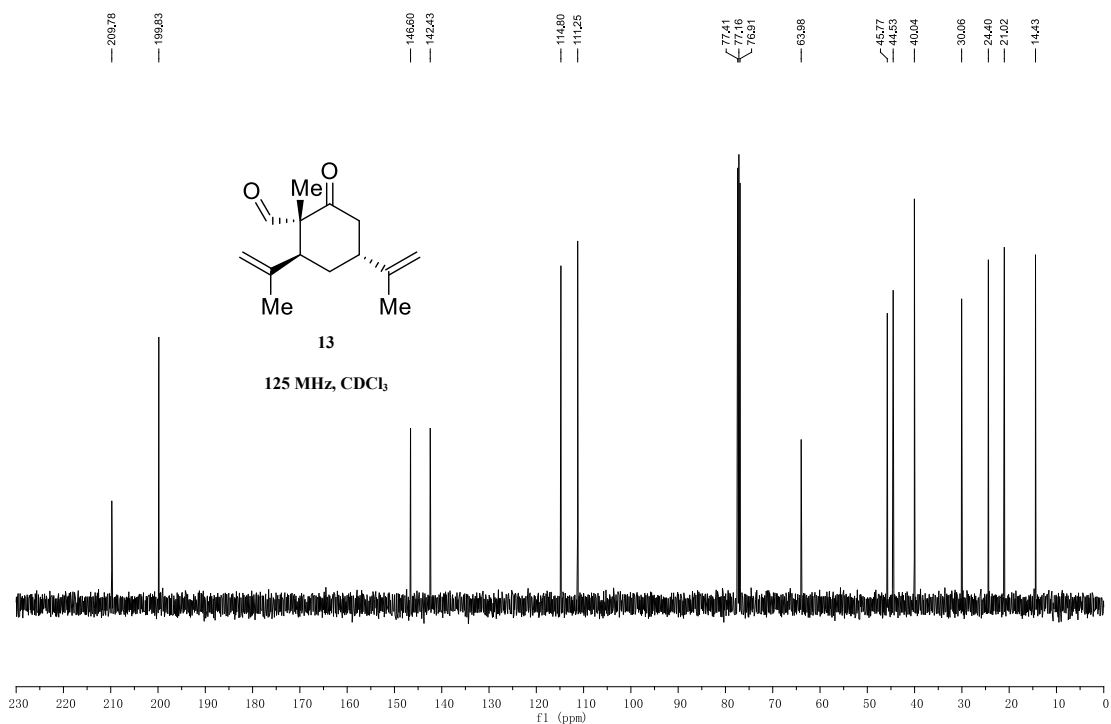
$^1\text{H}$  NMR of compound **12**



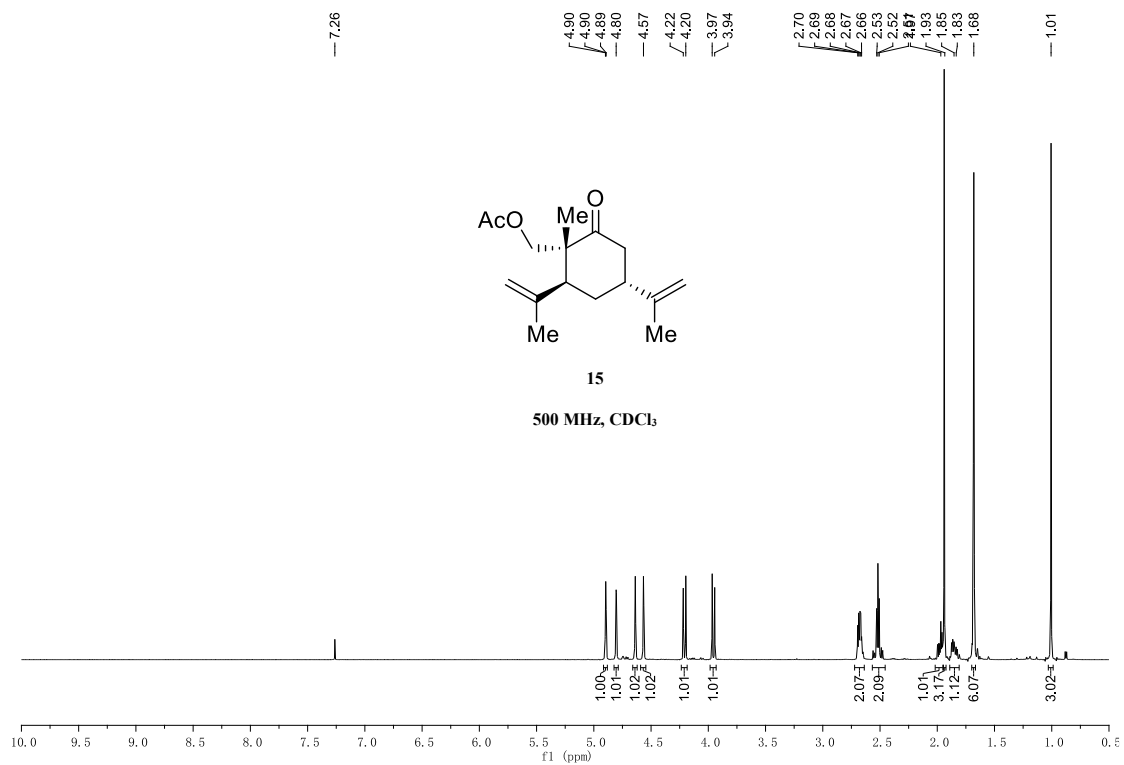
$^{13}\text{C}$  NMR of compound **12**



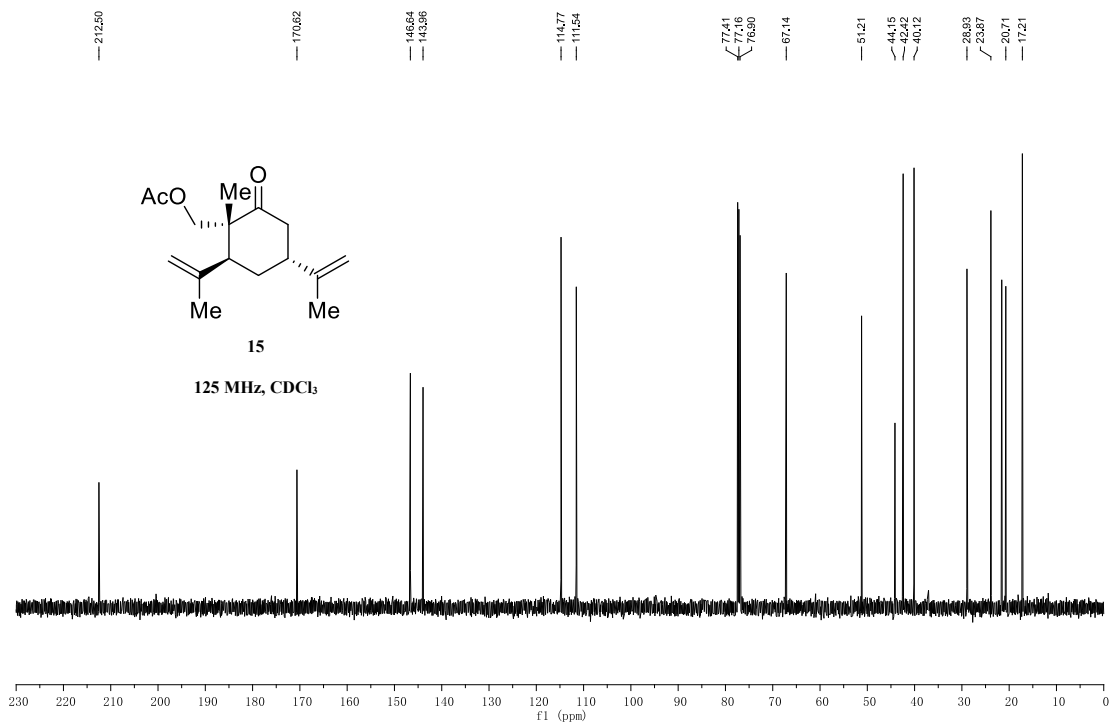
<sup>1</sup>H NMR of compound 13



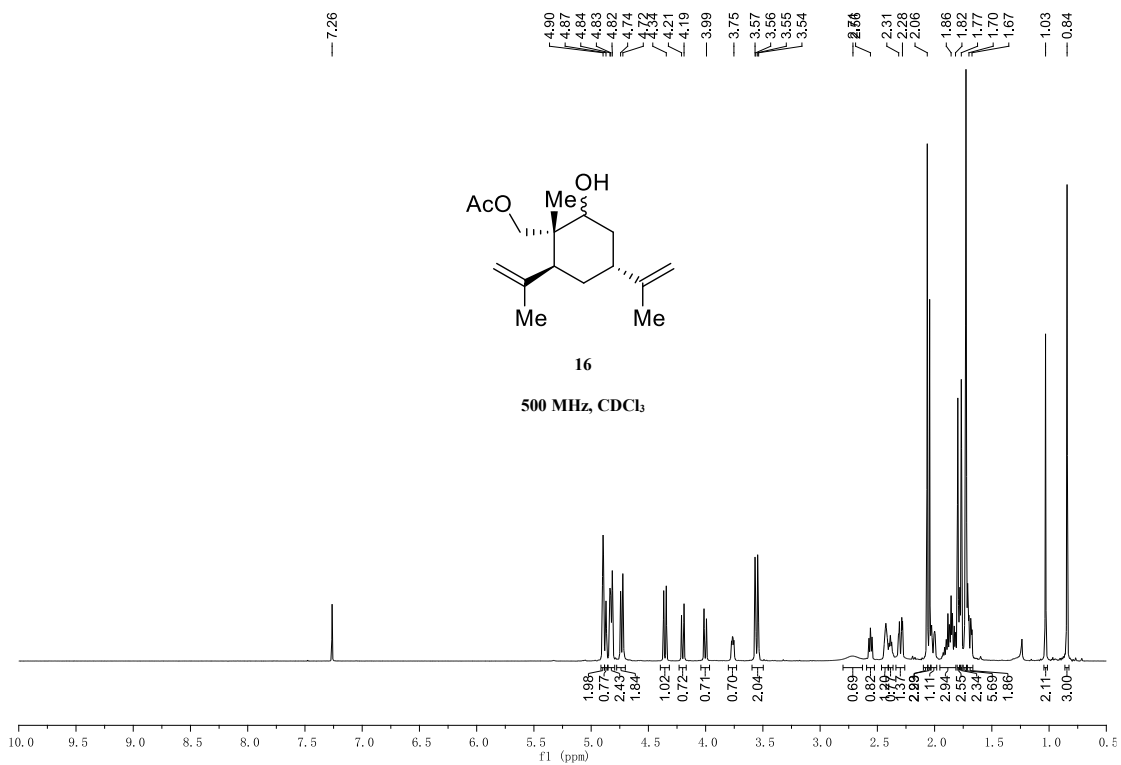
<sup>13</sup>C NMR of compound 13



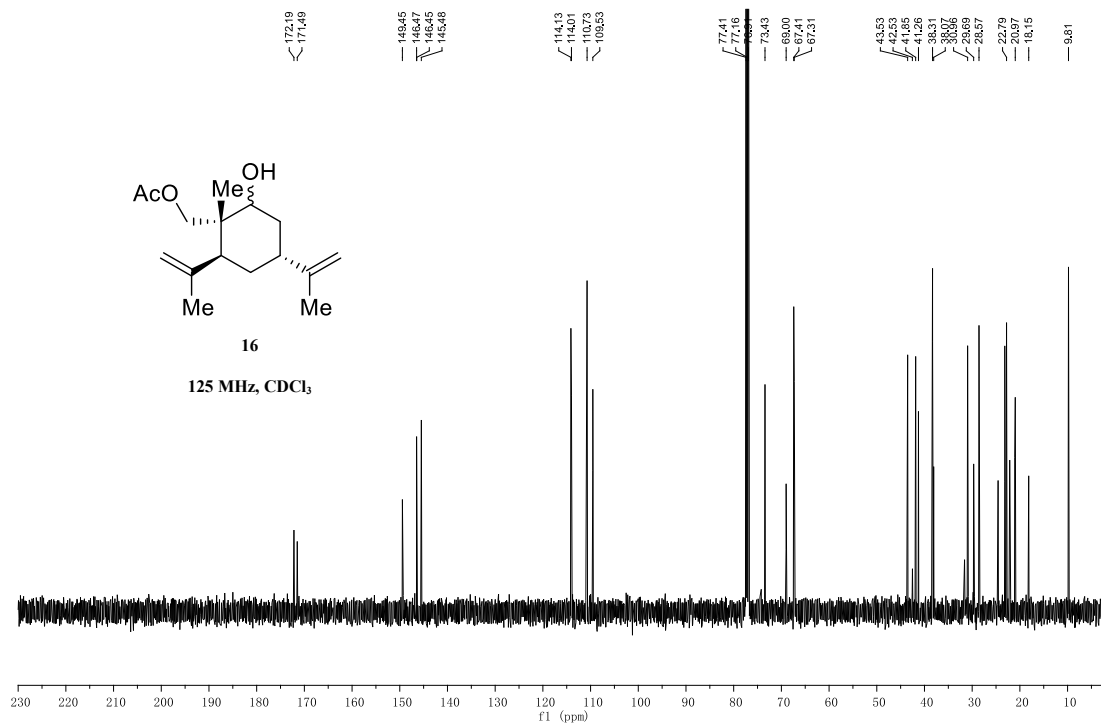
<sup>1</sup>H NMR of compound 15



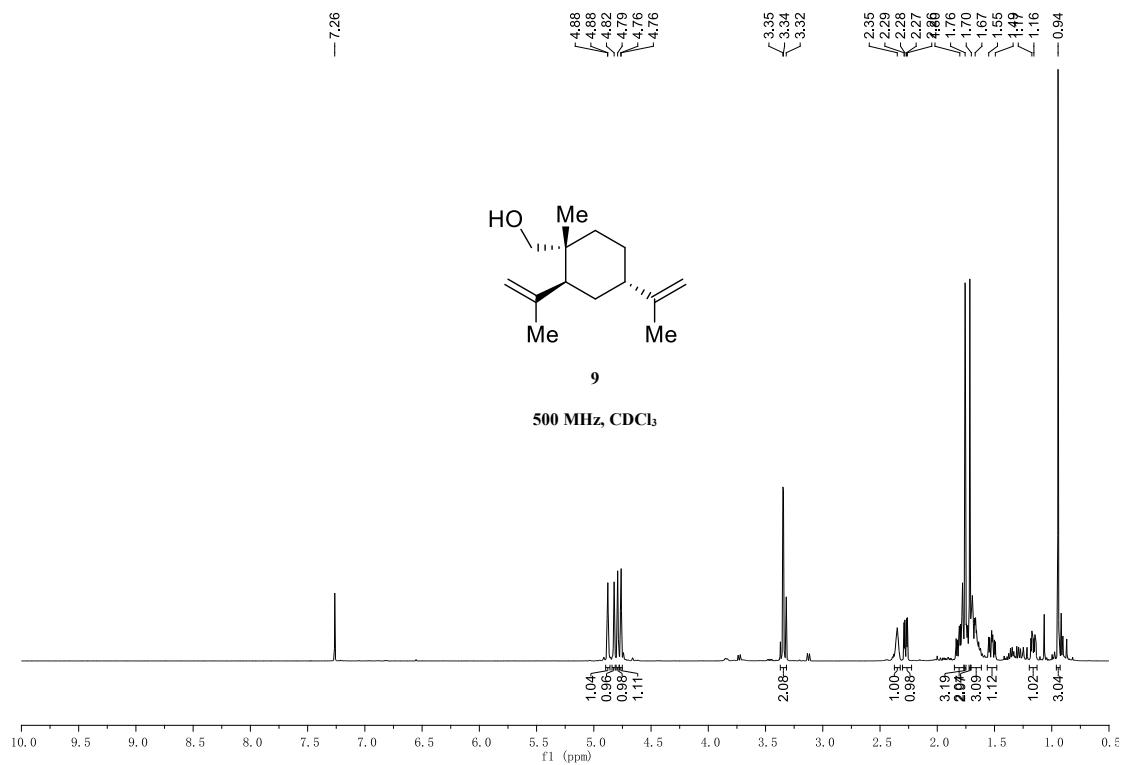
<sup>13</sup>C NMR of compound 15



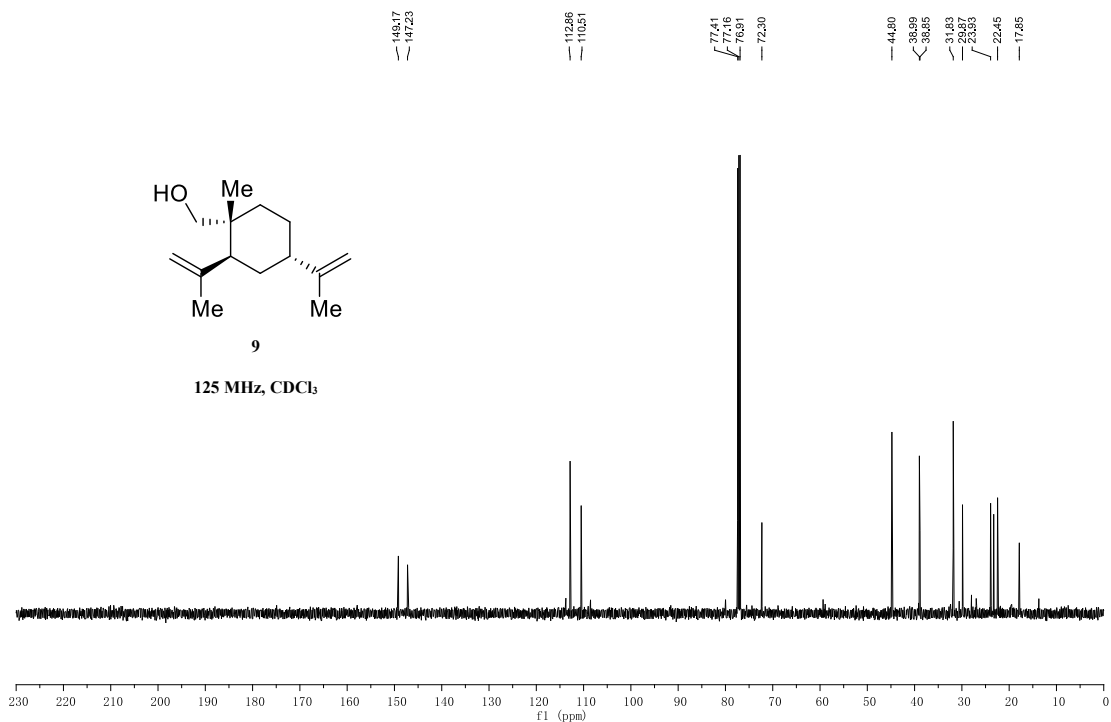
<sup>1</sup>H NMR of compound **16**



<sup>13</sup>C NMR of compound **16**

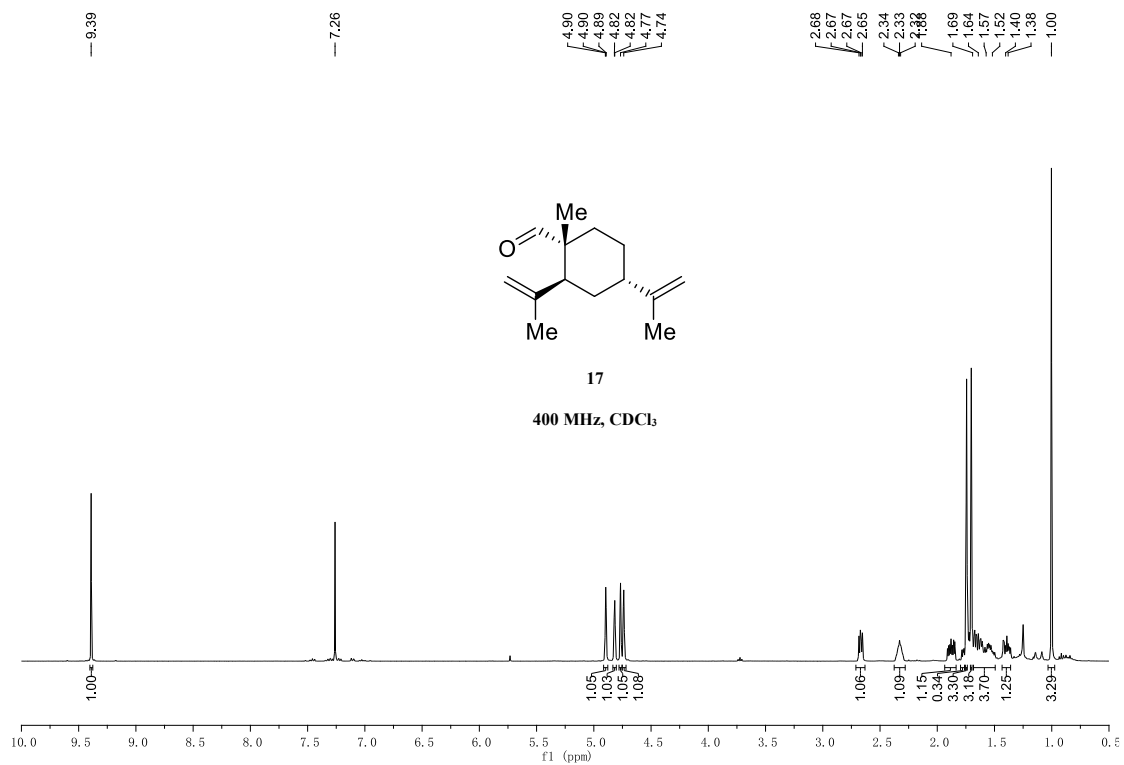


<sup>1</sup>H NMR of compound **9**

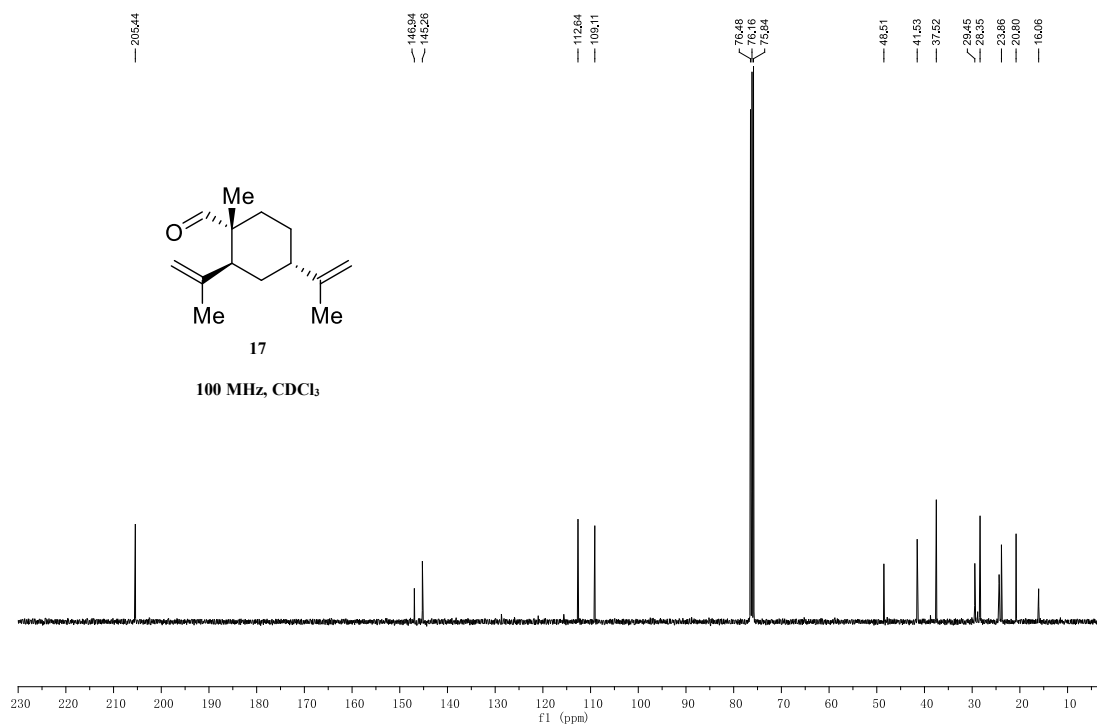


<sup>13</sup>C NMR of compound **9**

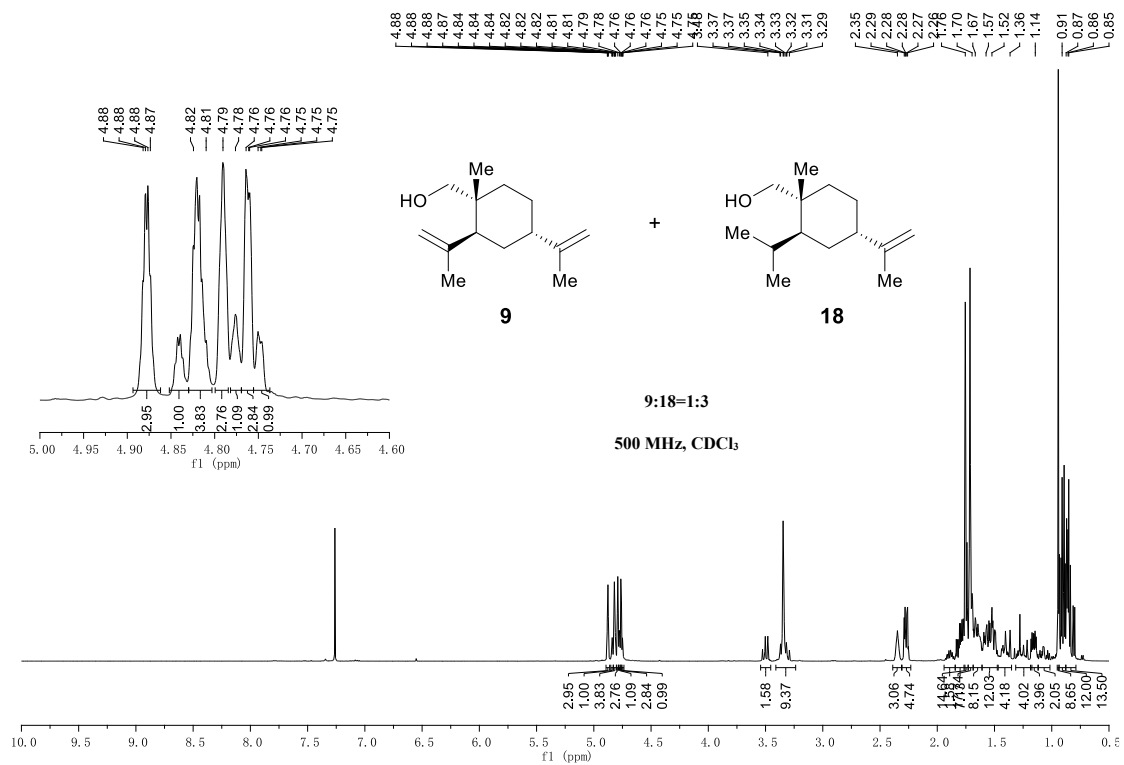




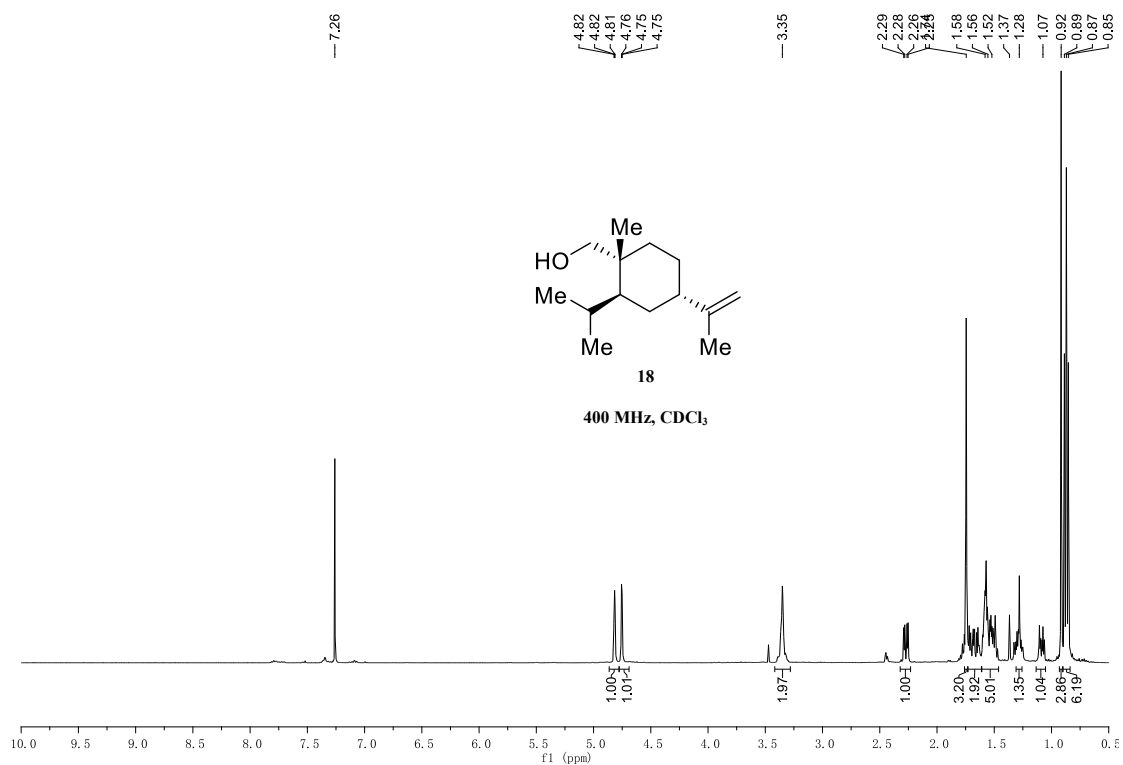
$^1\text{H}$  NMR of compound **17**



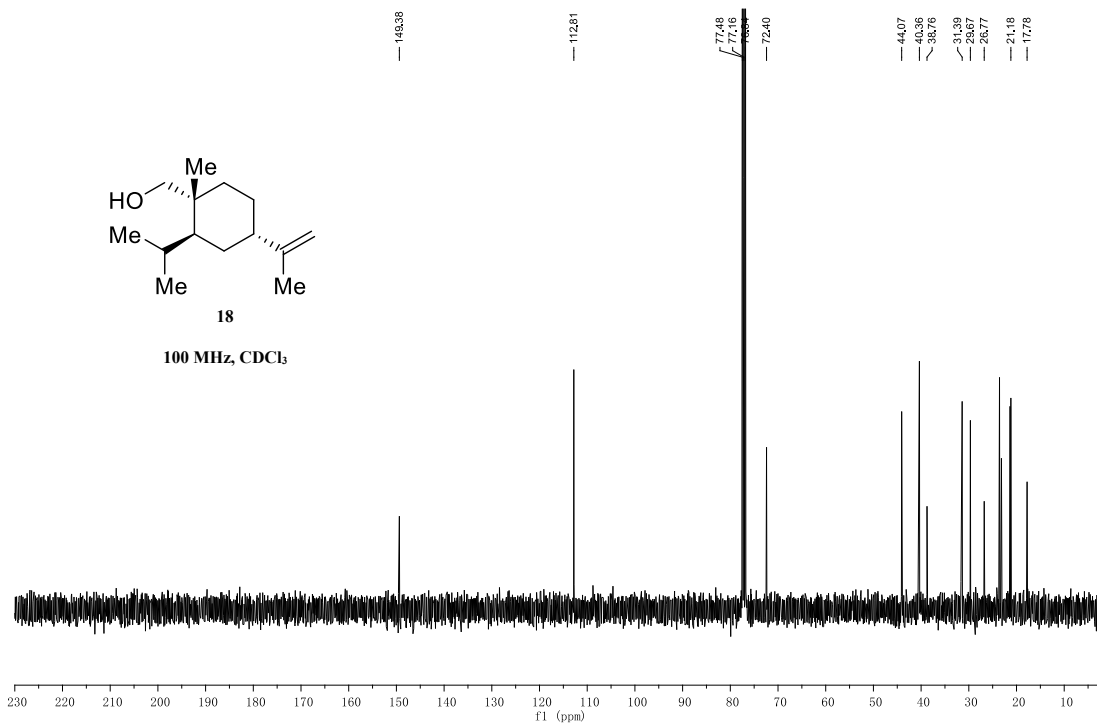
$^{13}\text{C}$  NMR of compound **17**



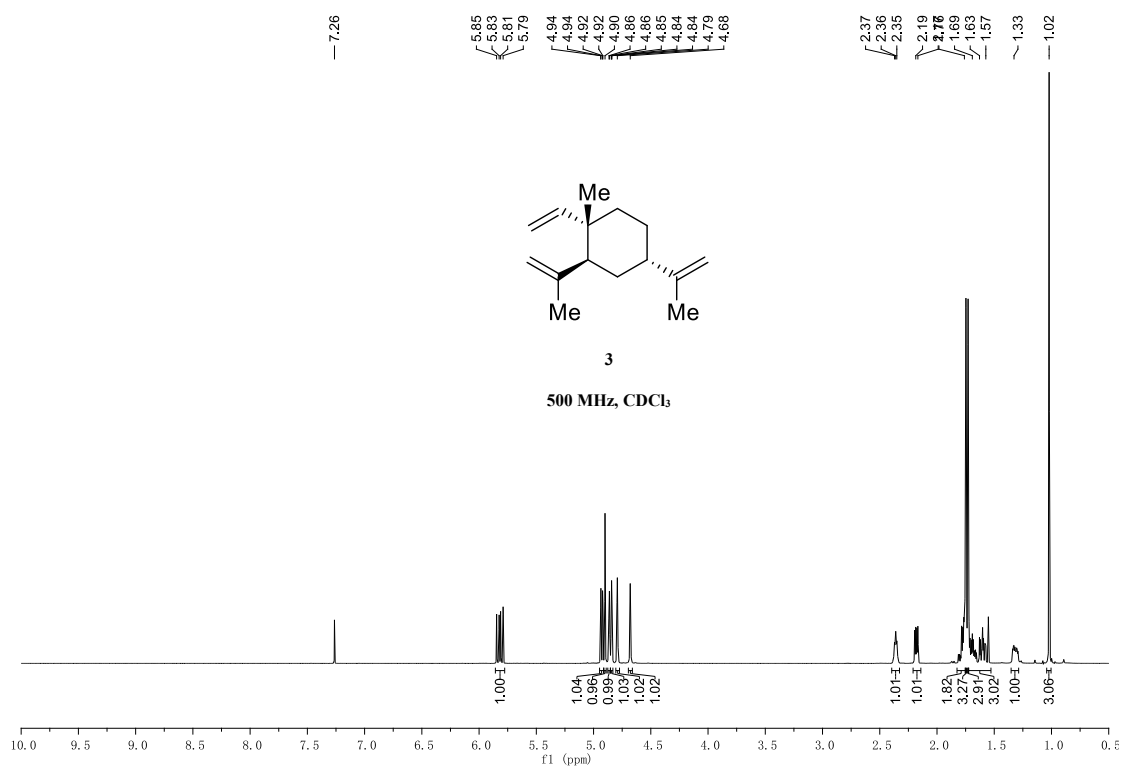
<sup>1</sup>H NMR of compound **9** and **18**



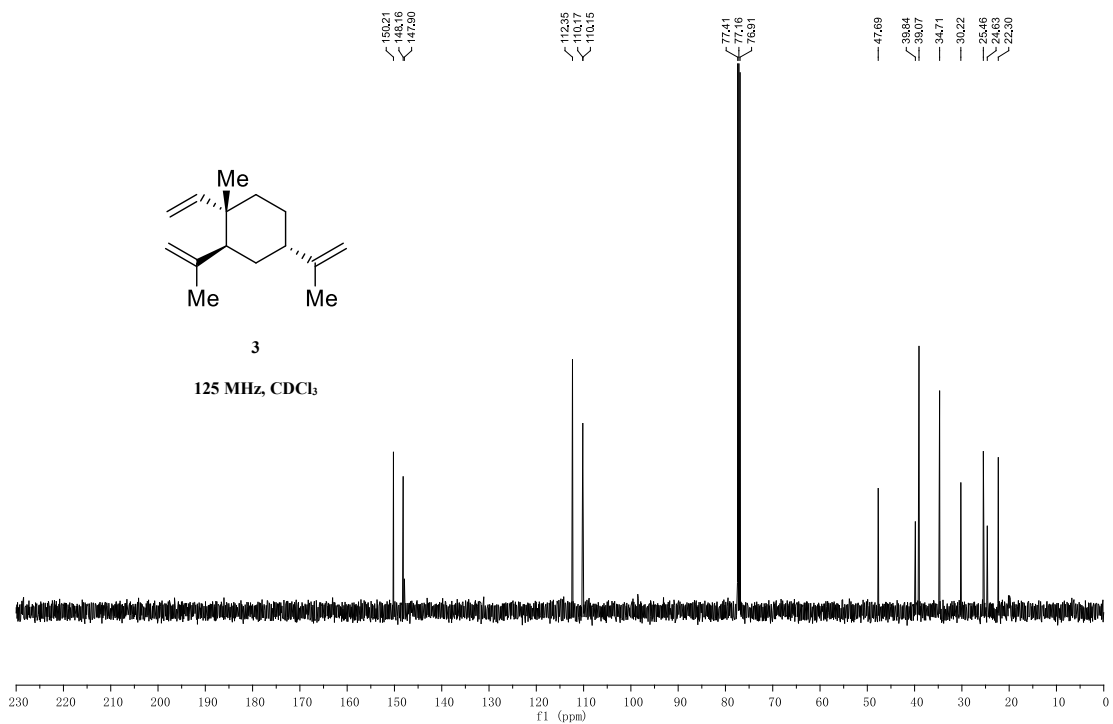
<sup>1</sup>H NMR of compound **18**



<sup>13</sup>C NMR of compound **18**



<sup>1</sup>H NMR of compound (1*S*,2*S*,4*S*)- $\beta$ -elemene (**3**)



$^{13}\text{C}$  NMR of compound (1*S*,2*S*,4*S*)- $\beta$ -elemene (**3**)