

# Supplementary materials

## Carotenoid composition of *Telekia speciosa*

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**Figure S1.** Structure of carotenoids

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**Figure S2-5.** <sup>1</sup>H-, <sup>13</sup>C-, <sup>1</sup>H,<sup>1</sup>H-COSY, and <sup>1</sup>H,<sup>13</sup>C-HMQC NMR spectra of β-carotene 5,6-epoxide (**10**)

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**Figure S6-9.** <sup>1</sup>H-, <sup>13</sup>C-, <sup>1</sup>H,<sup>1</sup>H-COSY, and <sup>1</sup>H,<sup>13</sup>C-HMQC NMR spectra of β-carotene 5,6,5',6'-diepoxide (**11**)

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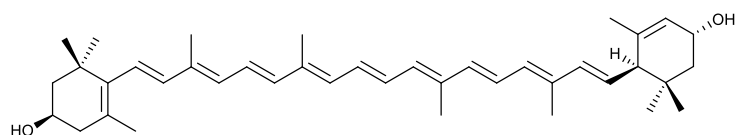
**Figure S10.** UV-vis and EIC chromatogram of *Teleki speciosa* flower extract

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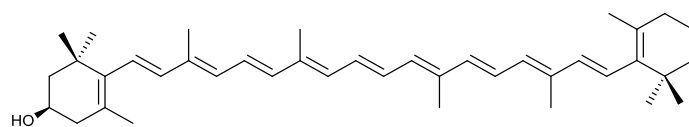
**Figure S11.** UV-vis spectra of carotenoids in *Teleki speciosa* flower extract detected by HPLC-DAD

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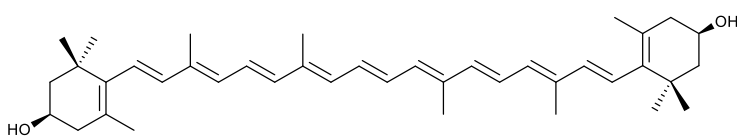
**Figure S1.** Structure of carotenoids



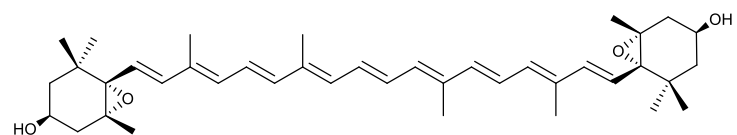
Lutein (1)



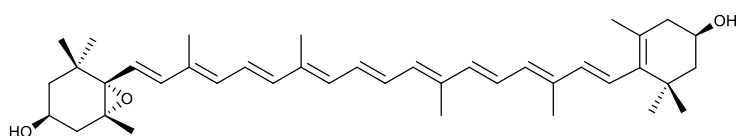
$\beta$ -Cryptoxanthin (2)



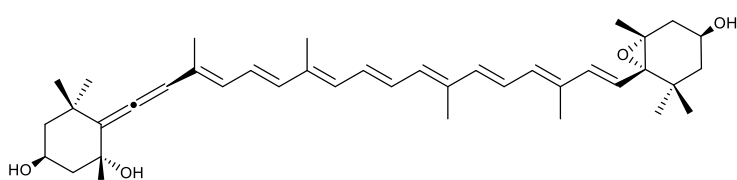
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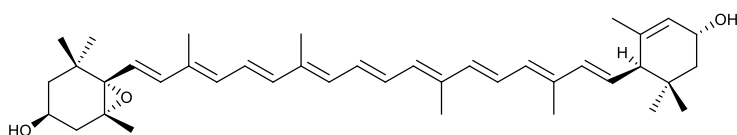
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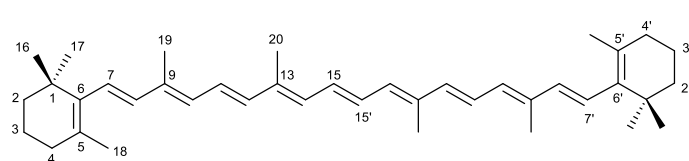
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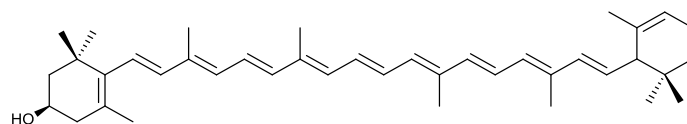
(all-*E*)-Neoxanthin (6)



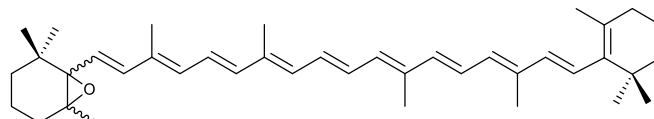
Lutein 5,6-epoxide (7)



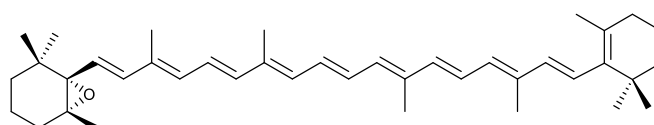
$\beta$ -Carotene (8)



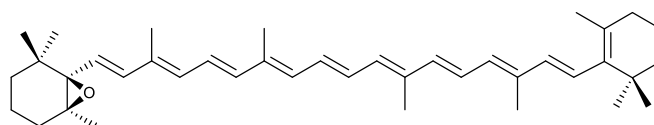
$\alpha$ -Cryptoxanthin (9)



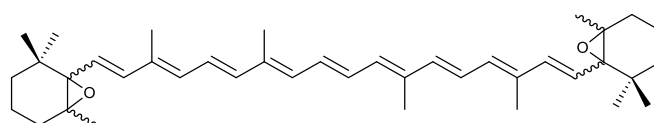
$\beta$ -Carotene 5,6-epoxide (10)



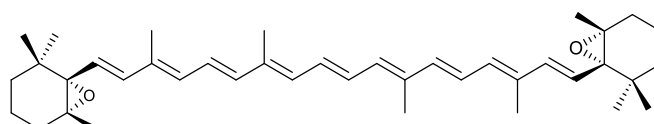
(5R,6S)- $\beta$ -Carotene 5,6-epoxide (10a)



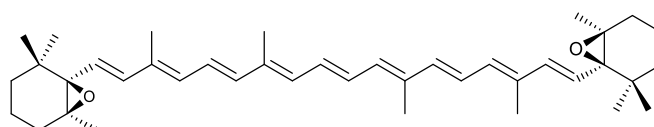
(5S,6R)- $\beta$ -Carotene 5,6-epoxide (10b)



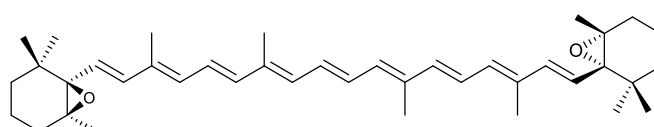
$\beta$ -Carotene 5,6,5',6'-diepoxide (11)



(5R,6S,5'R,6'S)- $\beta$ -Carotene 5,6,5',6'-diepoxide (11a)

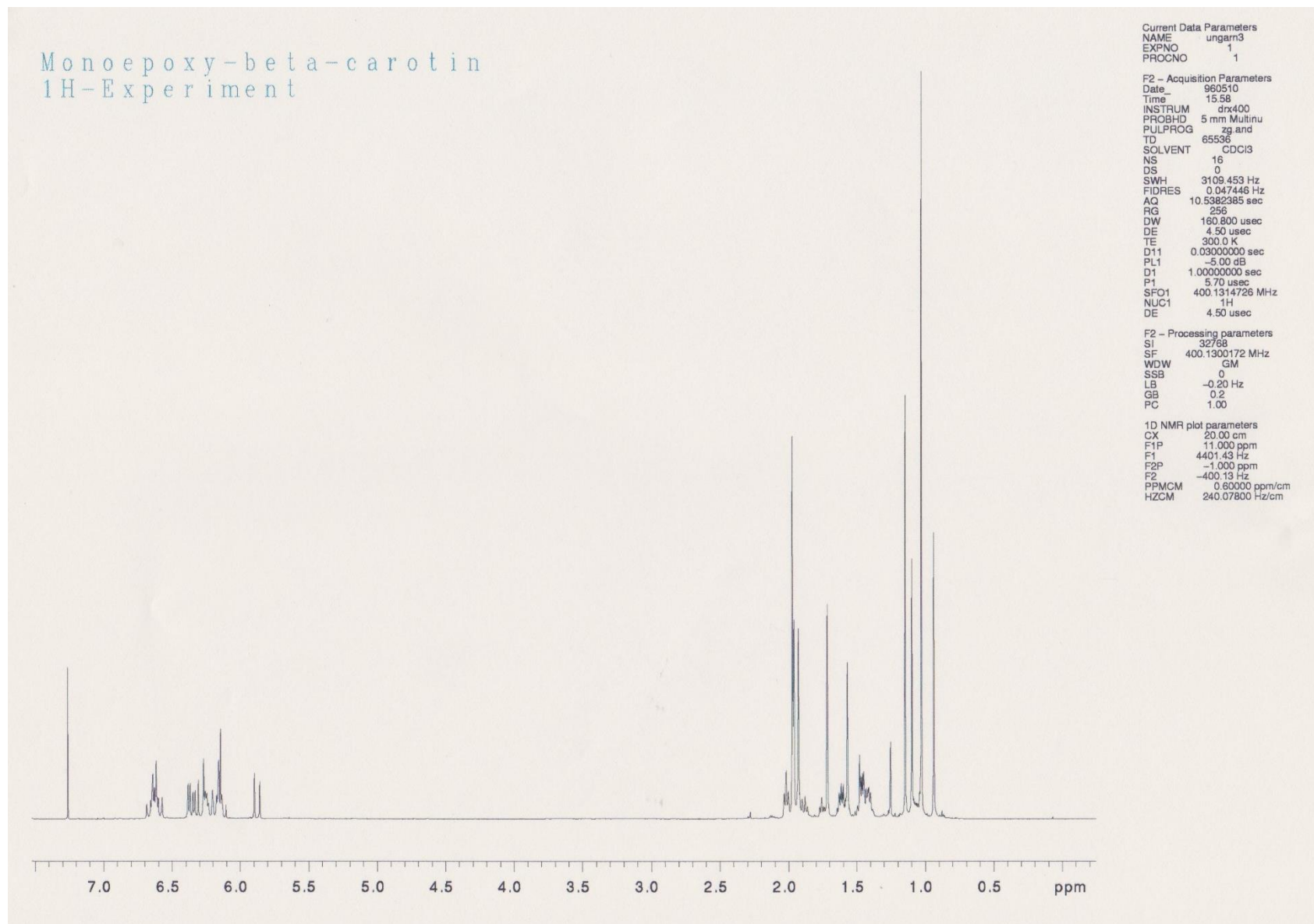


(5S,6R,5'S,6'R)- $\beta$ -Carotene 5,6,5',6'-diepoxide (11b)

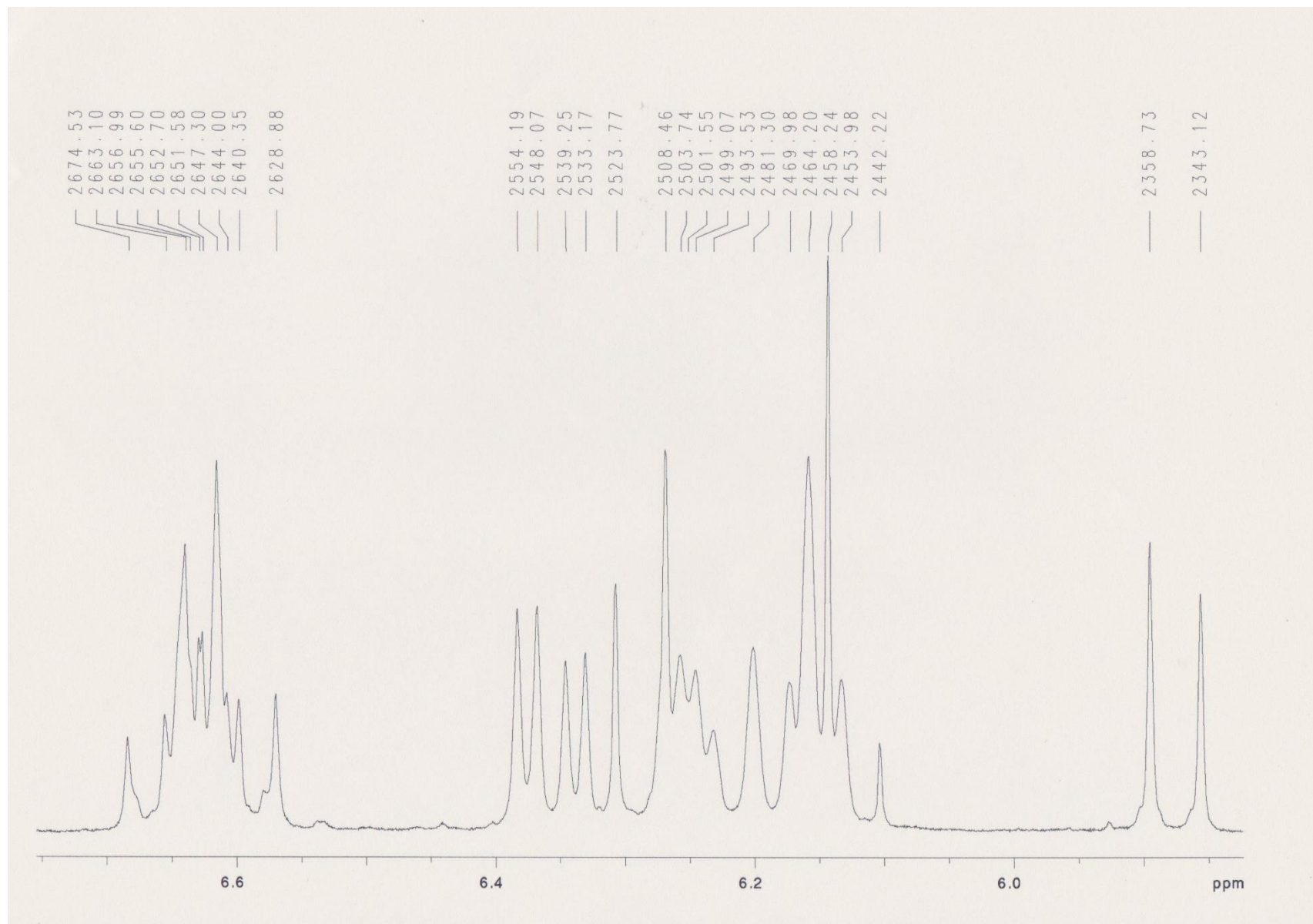


(5S,6R,5'R,6'S)- $\beta$ -Carotene-5,6,5',6'-diepoxide (11c)

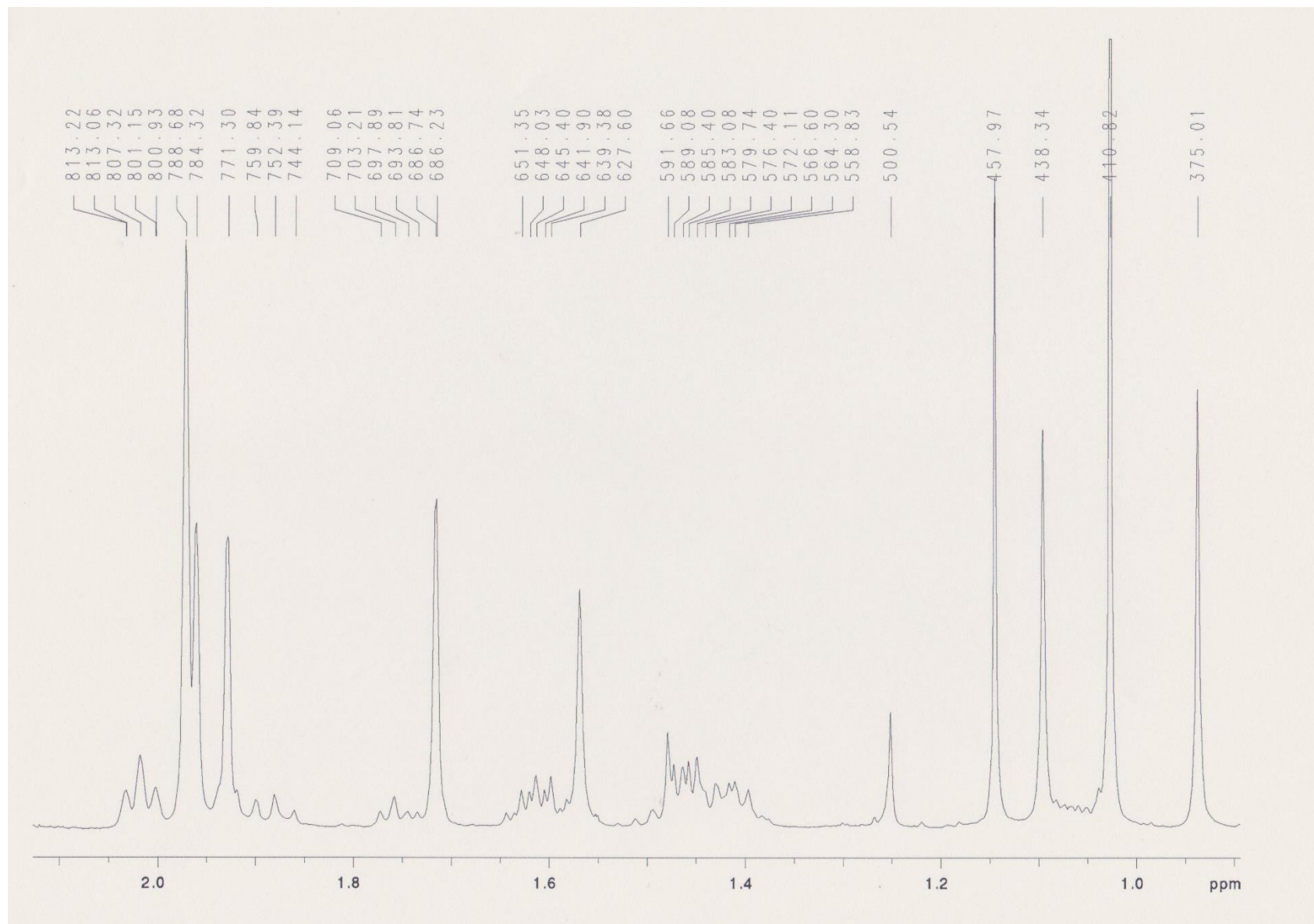
**Figure S2.a.**  $^1\text{H}$ -NMR spectrum of  $\beta$ -carotene 5,6-epoxide (**10**) in  $\text{CDCl}_3$  (400 MHz)



**Figure S2.b.**  $^1\text{H}$ -NMR spectrum of  $\beta$ -carotene 5,6-epoxide (**10**) in  $\text{CDCl}_3$  (400 MHz) (5.8-6.7 ppm)

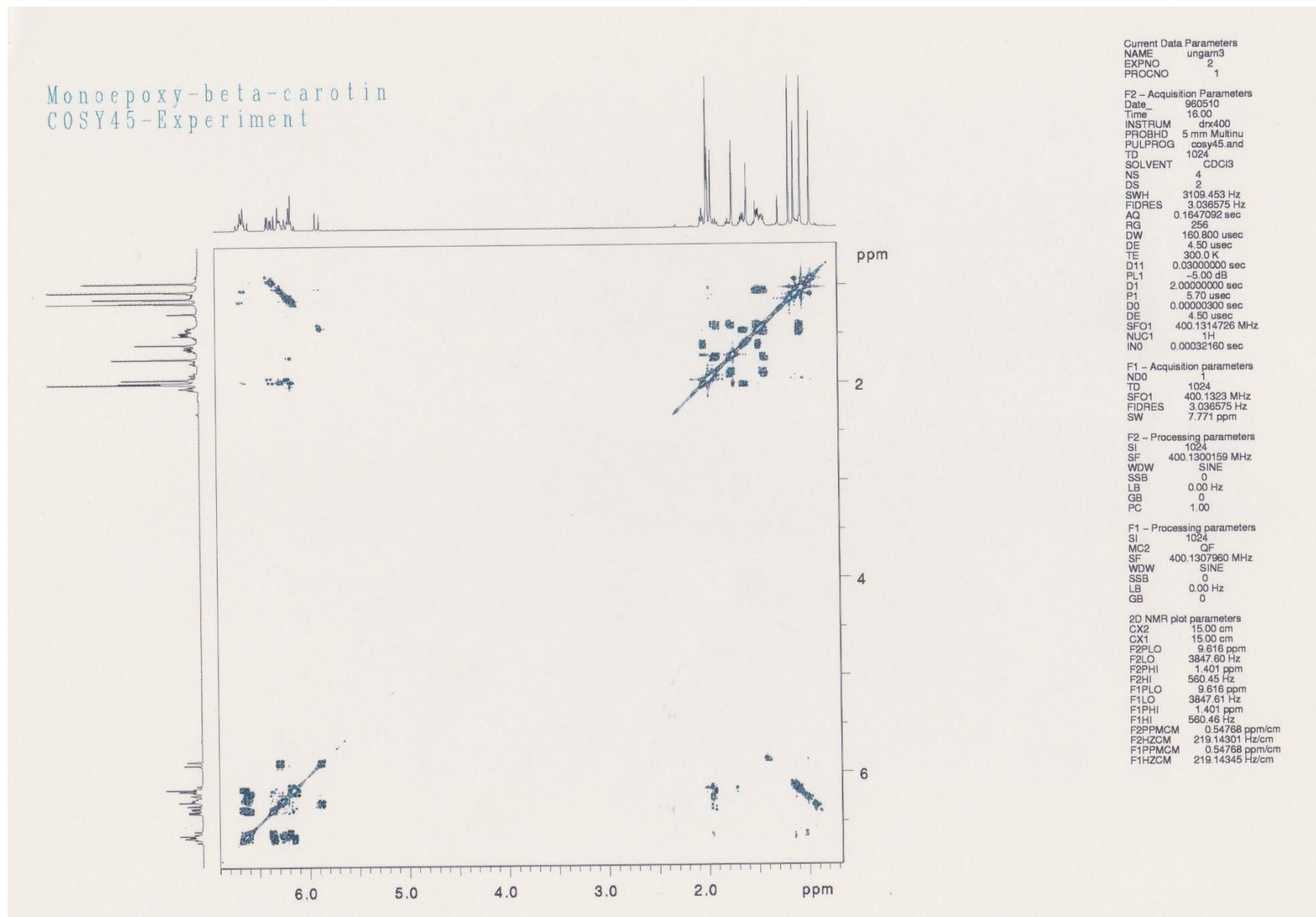


**Figure S2.c.**  $^1\text{H}$ -NMR spectrum of  $\beta$ -carotene 5,6-epoxide (**10**) in  $\text{CDCl}_3$  (400 MHz) (0.9-2.1 ppm)

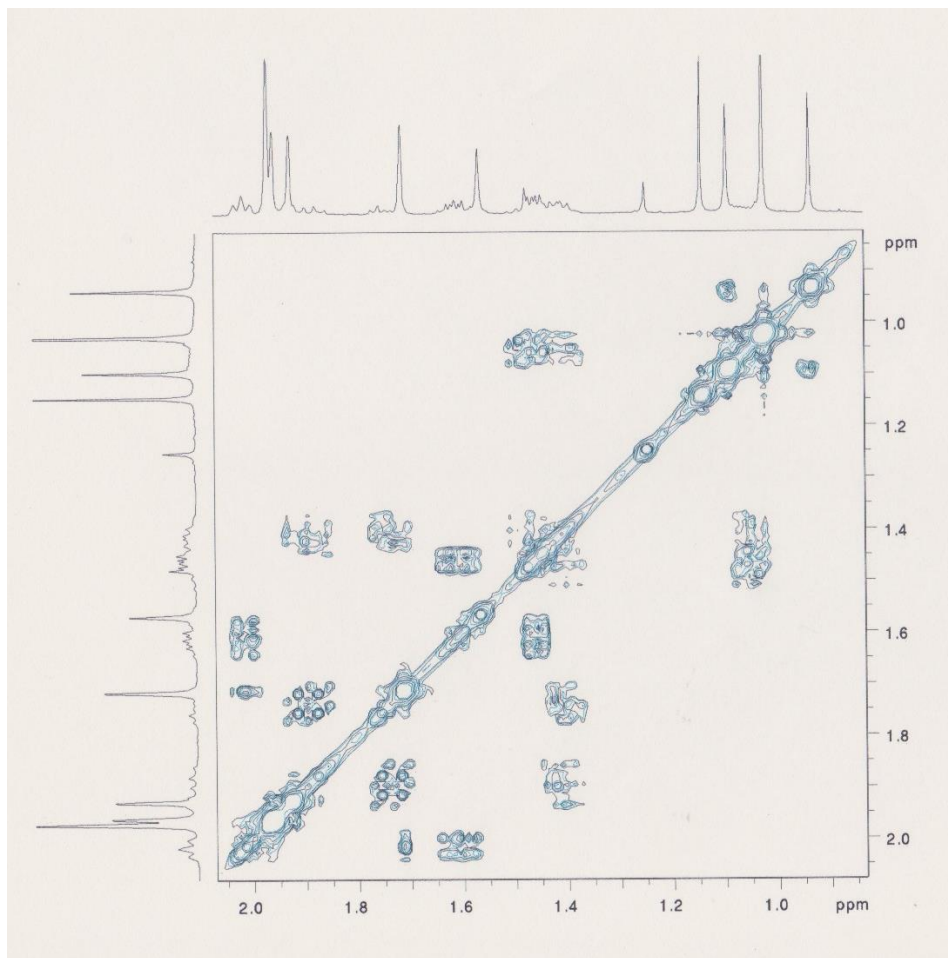
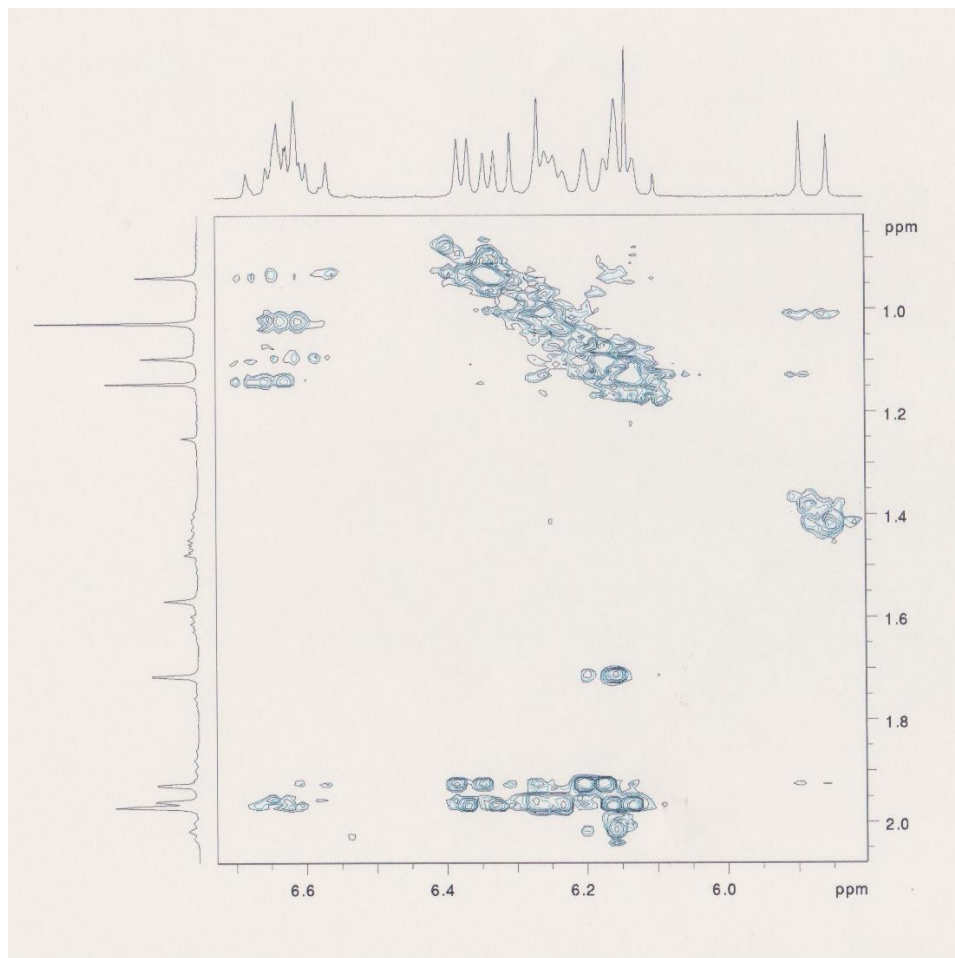




**Figure S3.a.**  $^1\text{H}$ ,  $^1\text{H}$ -COSY NMR spectrum of  $\beta$ -carotene 5,6-epoxide (**10**) in  $\text{CDCl}_3$  (400 MHz)

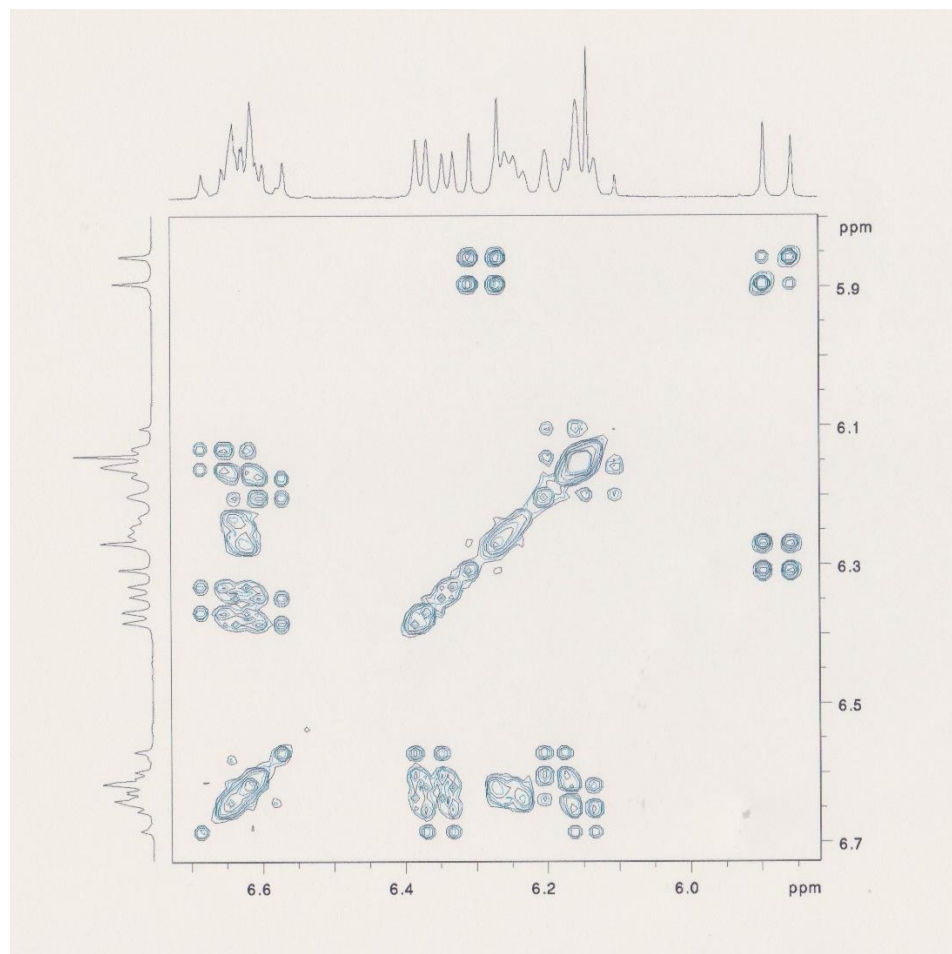


**Figure S3.b.**  $^1\text{H}$ ,  $^1\text{H}$ -COSY NMR spectrum of  $\beta$ -carotene 5,6-epoxide (**10**) in  $\text{CDCl}_3$  (400 MHz) (0-2.1 ppm)

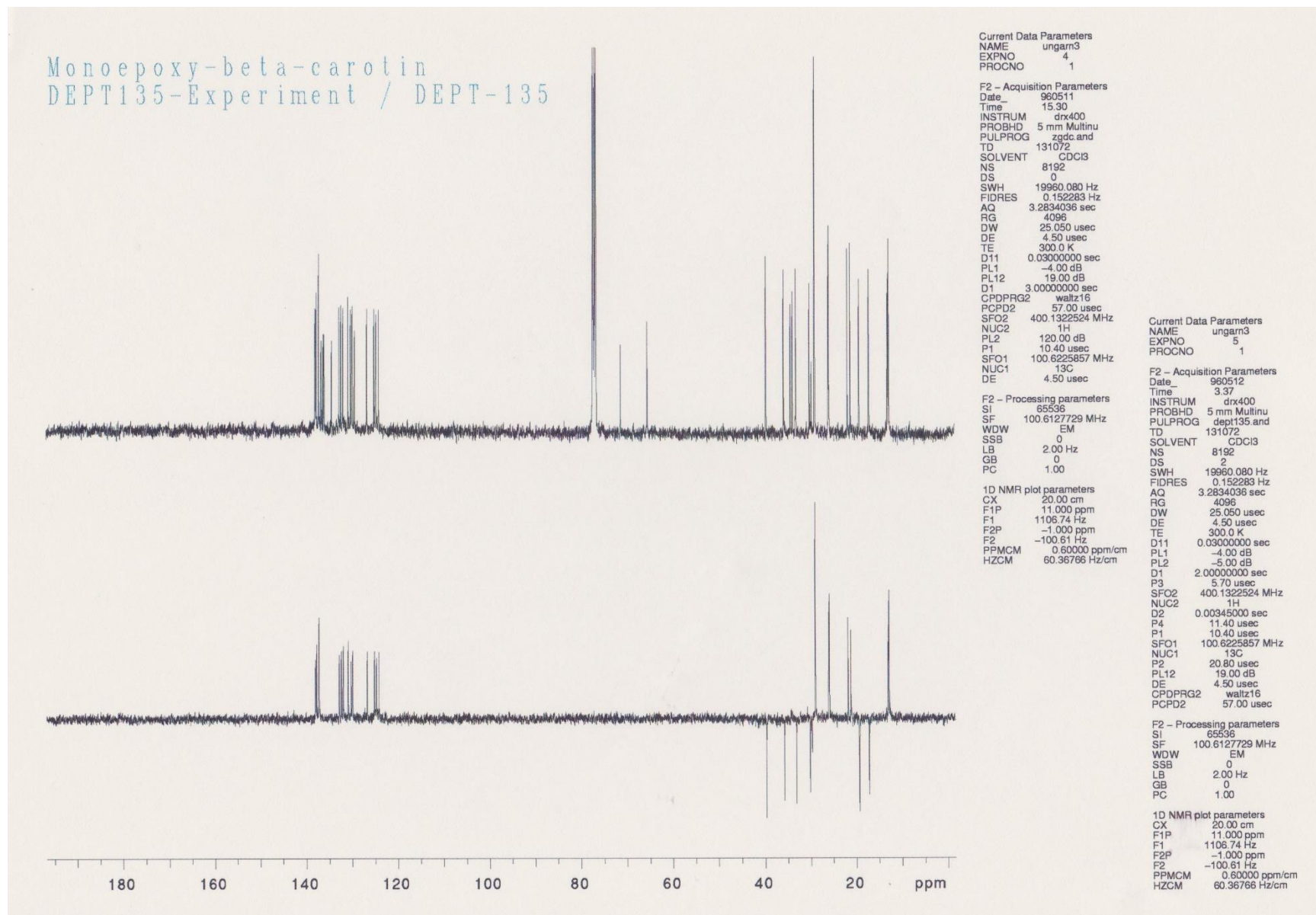




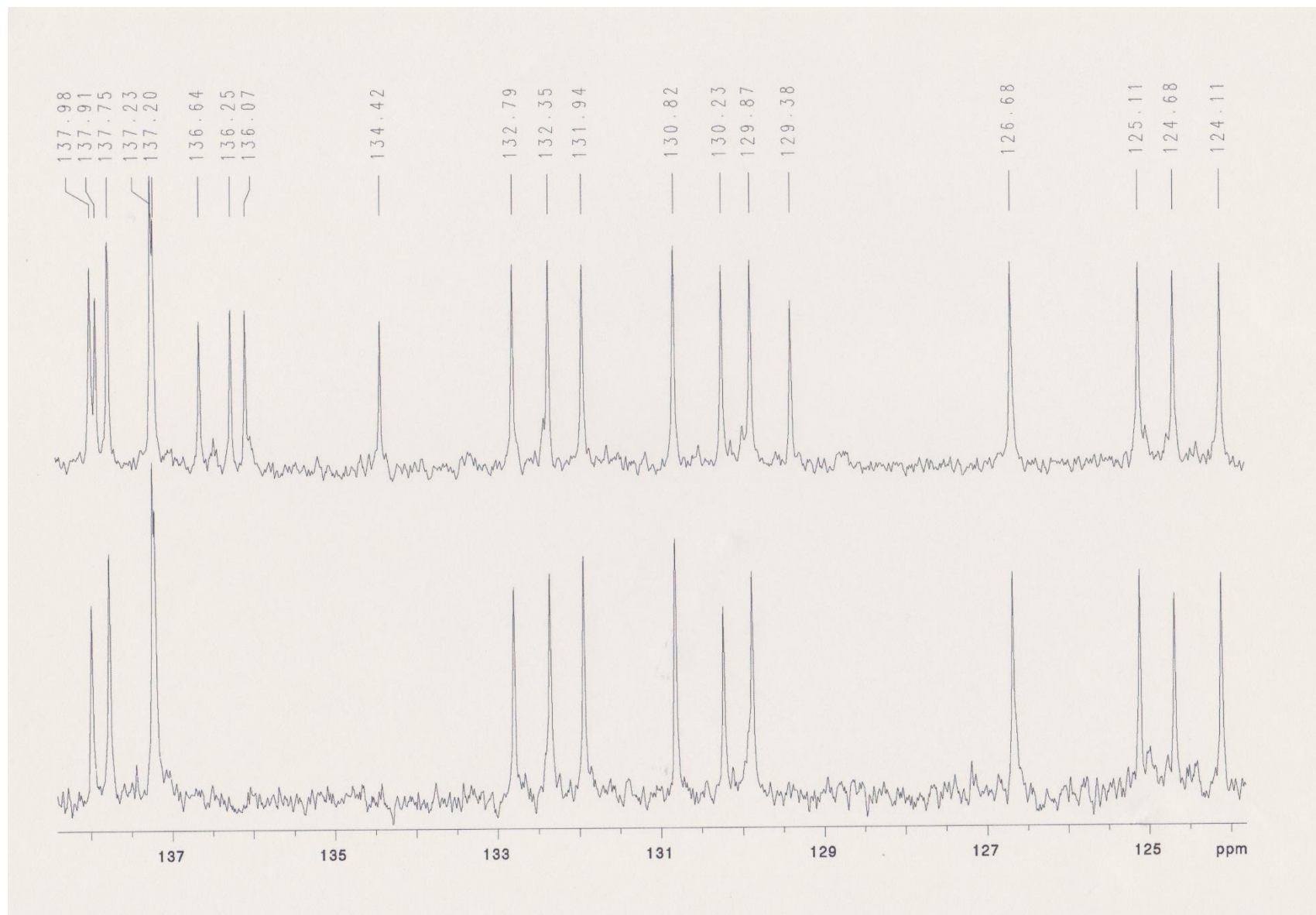
**Figure S3.c.**  $^1\text{H},^1\text{H}$ -COSY NMR spectrum of  $\beta$ -carotene 5,6-epoxide (**10**) in  $\text{CDCl}_3$  (400 MHz) (5.8-6.7 ppm)



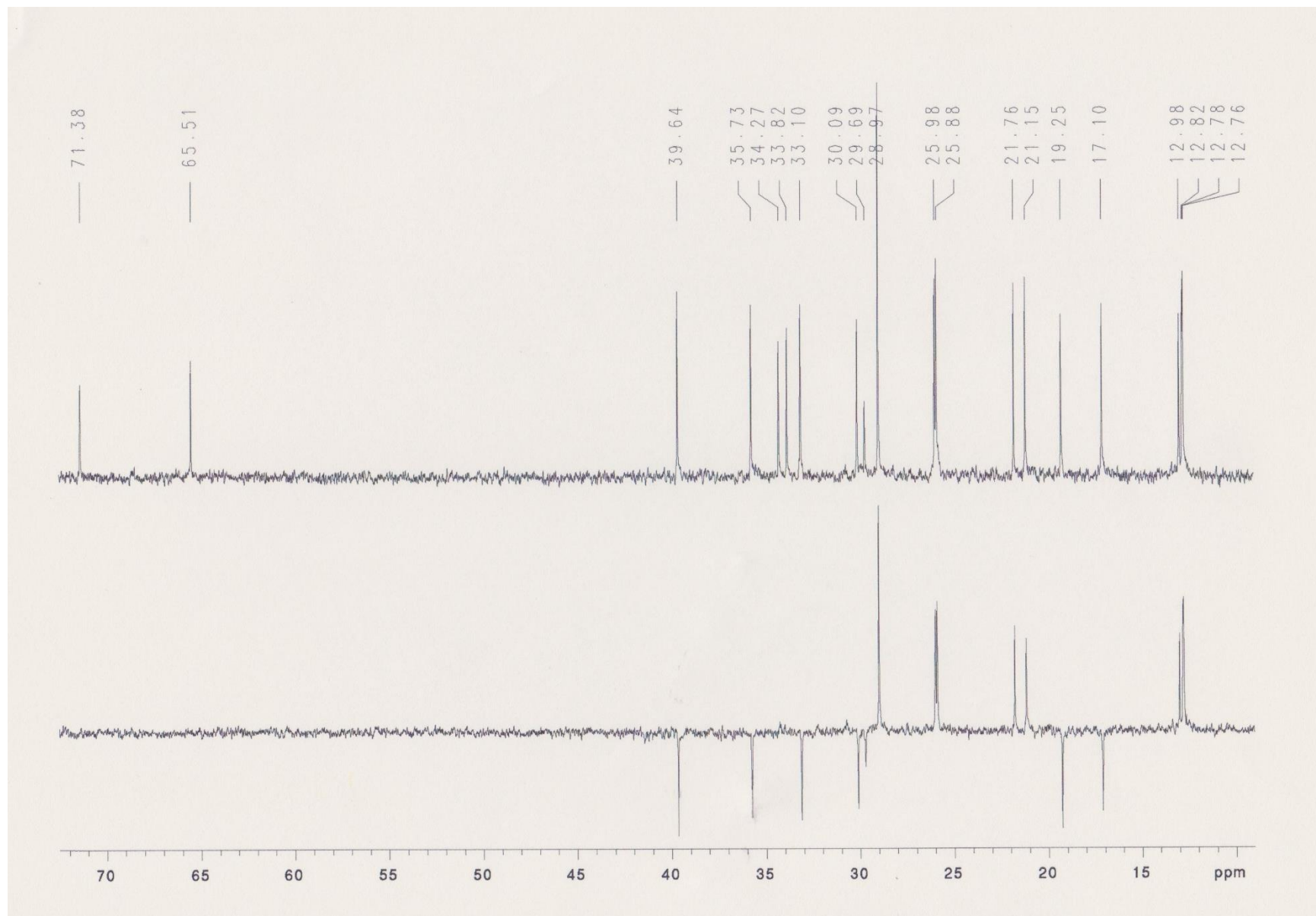
**Figure S4.a.**  $^{13}\text{C}$ -NMR spectrum of  $\beta$ -carotene 5,6-epoxide (**10**) in  $\text{CDCl}_3$



**Figure S4.b.**  $^{13}\text{C}$ -NMR spectrum of  $\beta$ -carotene 5,6-epoxide (**10**) in  $\text{CDCl}_3$  (124-138 ppm)

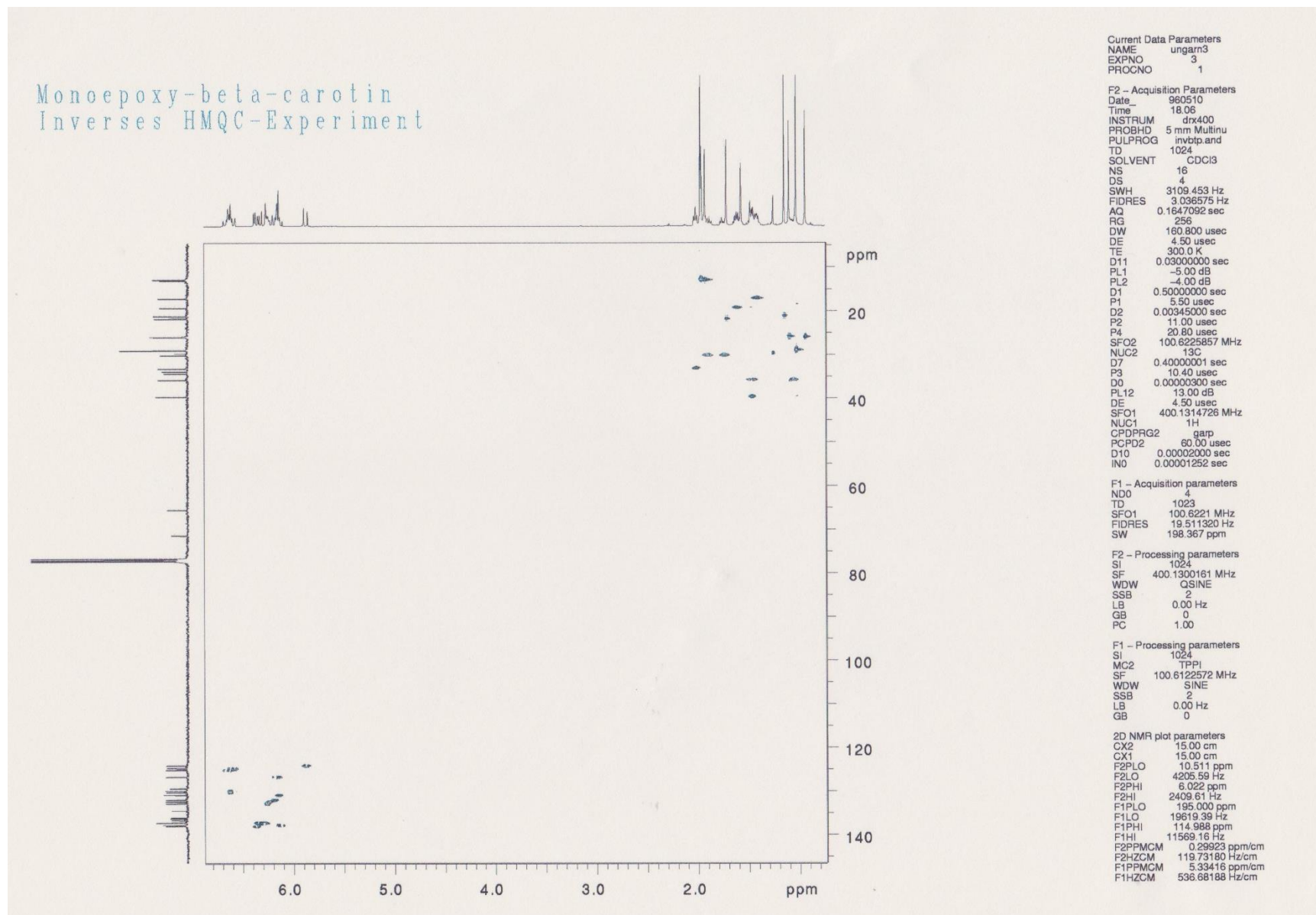


**Figure S4.c.**  $^{13}\text{C}$ -NMR spectrum of  $\beta$ -carotene 5,6-epoxide (**10**) in  $\text{CDCl}_3$  (10-72 ppm)

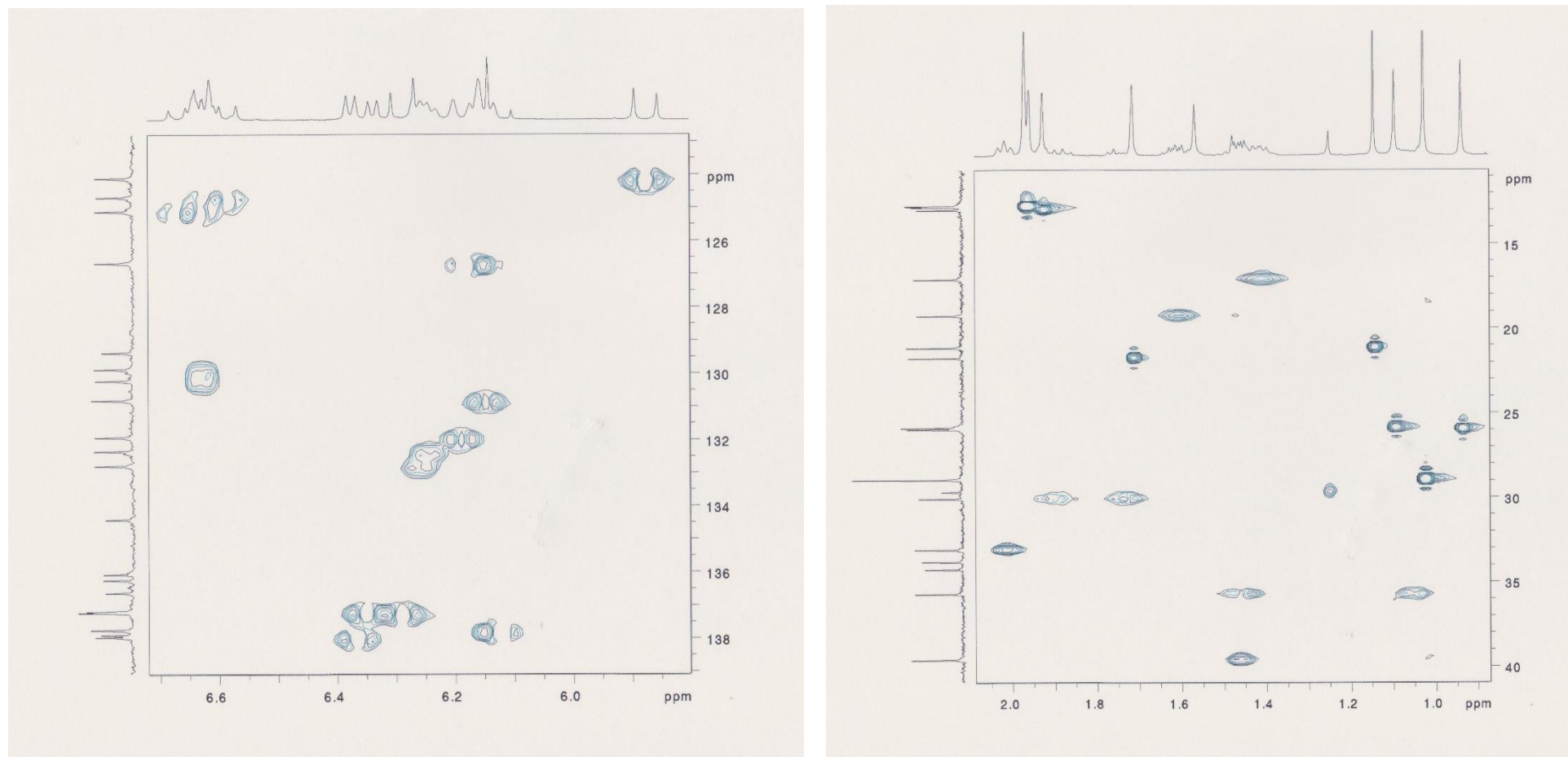




**Figure S5.a**  $^1\text{H}$ ,  $^{13}\text{C}$ -HMQC NMR spectrum of  $\beta$ -carotene 5,6-epoxide (**10**) in  $\text{CDCl}_3$

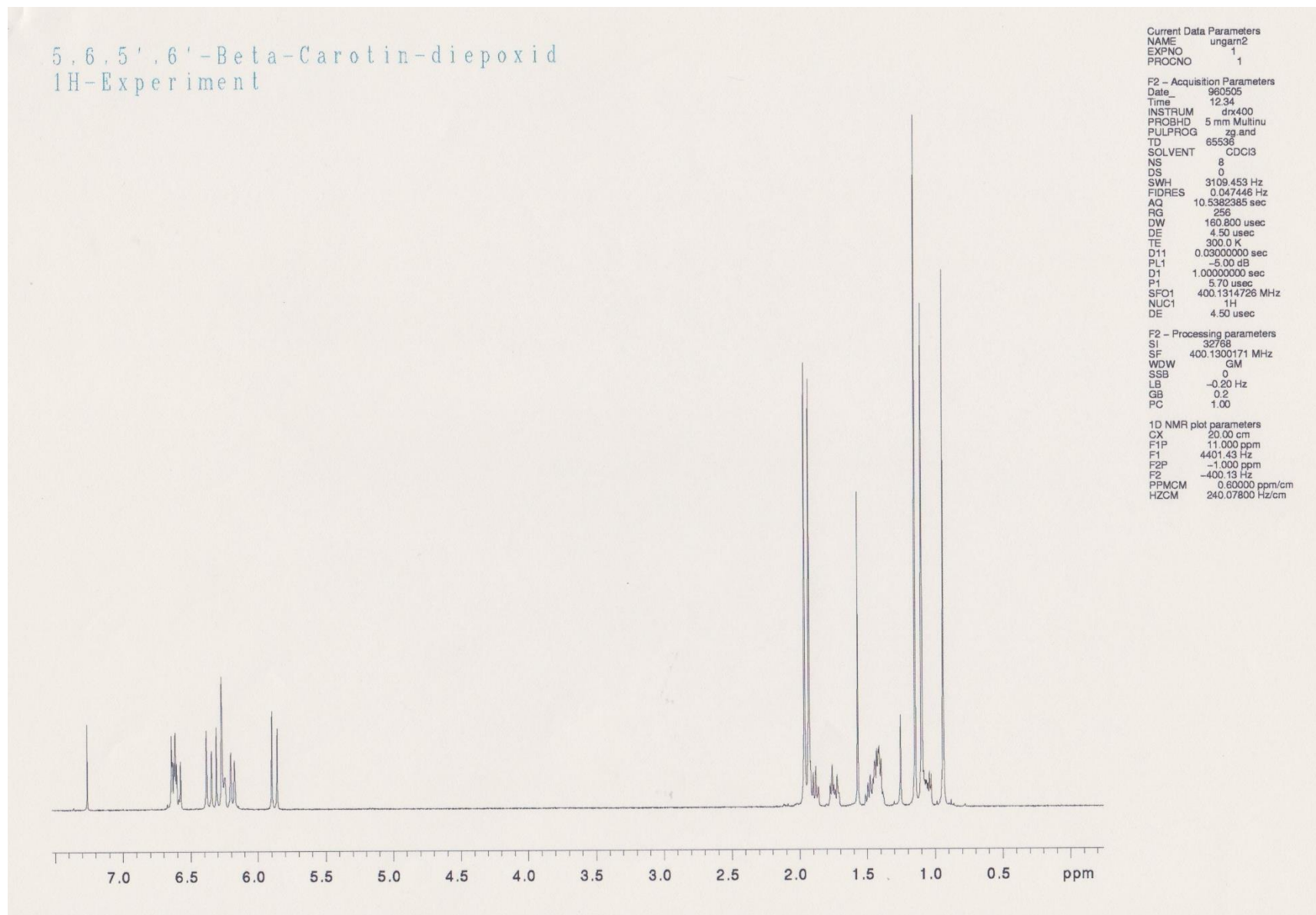


**Figure S5.b**  $^1\text{H}$ ,  $^{13}\text{C}$ -HMQC NMR spectrum of  $\beta$ -carotene 5,6-epoxide (**10**) in  $\text{CDCl}_3$  (10-72 ppm)

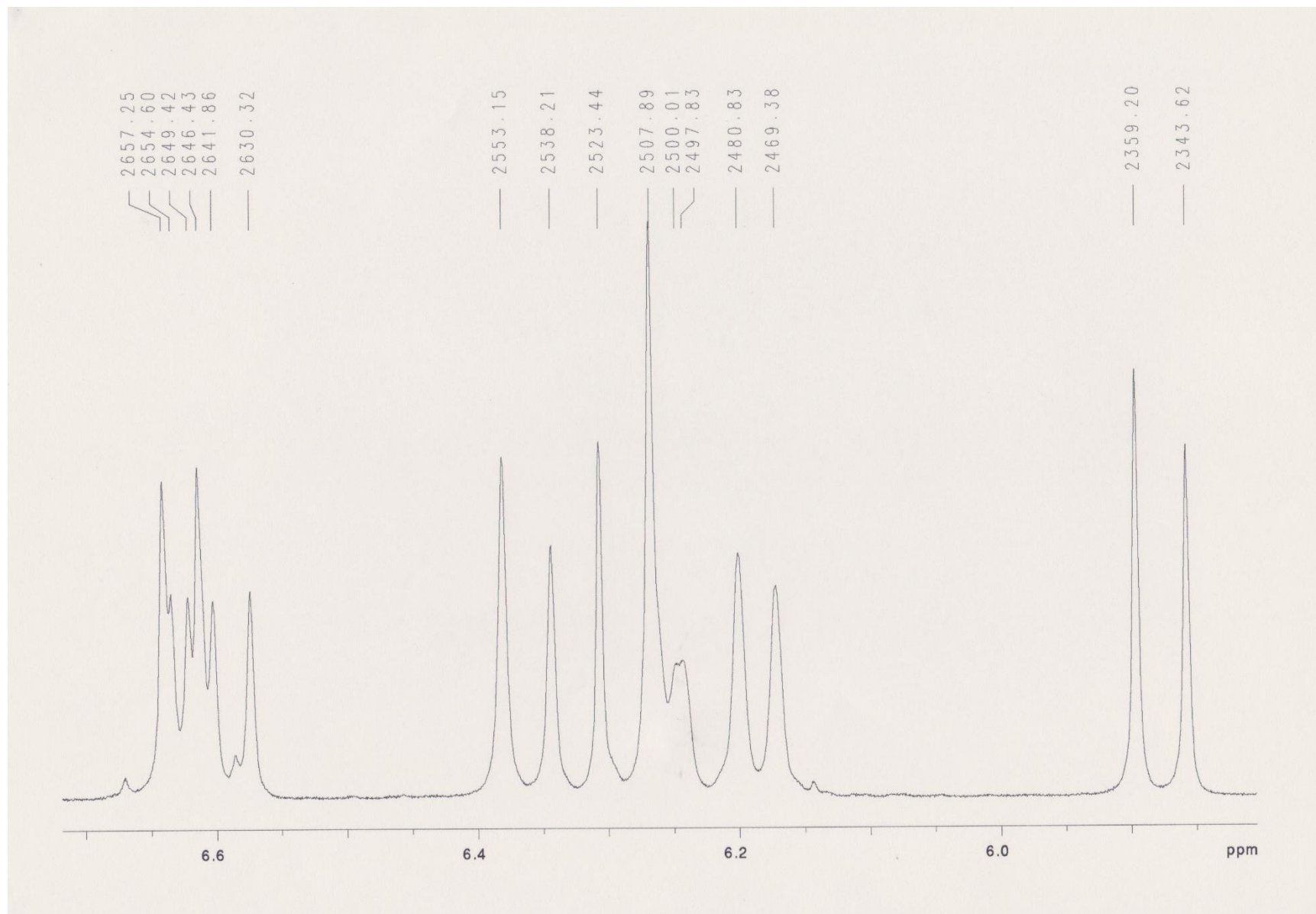




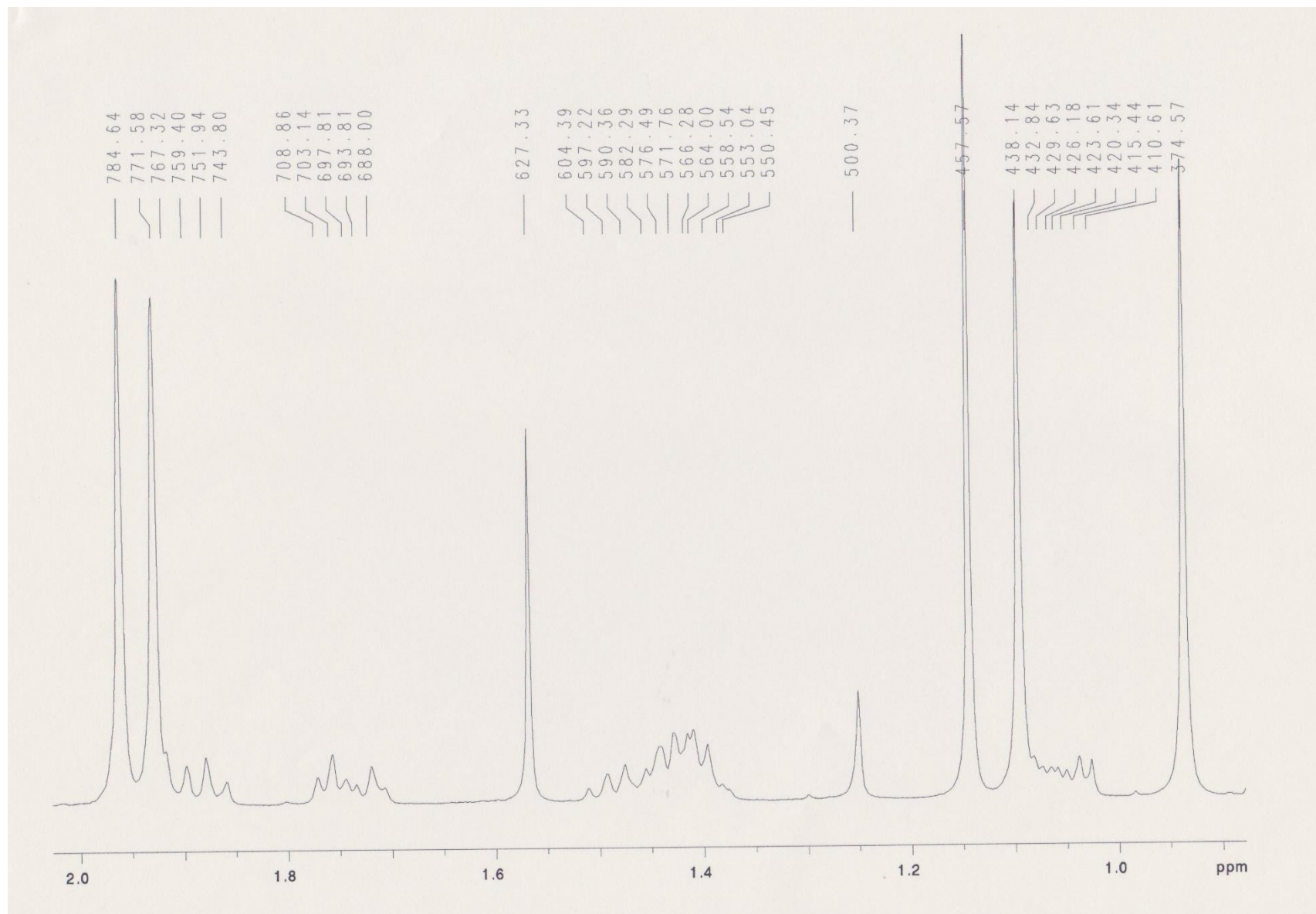
**Figure S6.a.**  $^1\text{H}$ -NMR spectrum of  $\beta$ -carotene 5,6,5',6'-diepoxide (**11**) in  $\text{CDCl}_3$  (400 MHz)



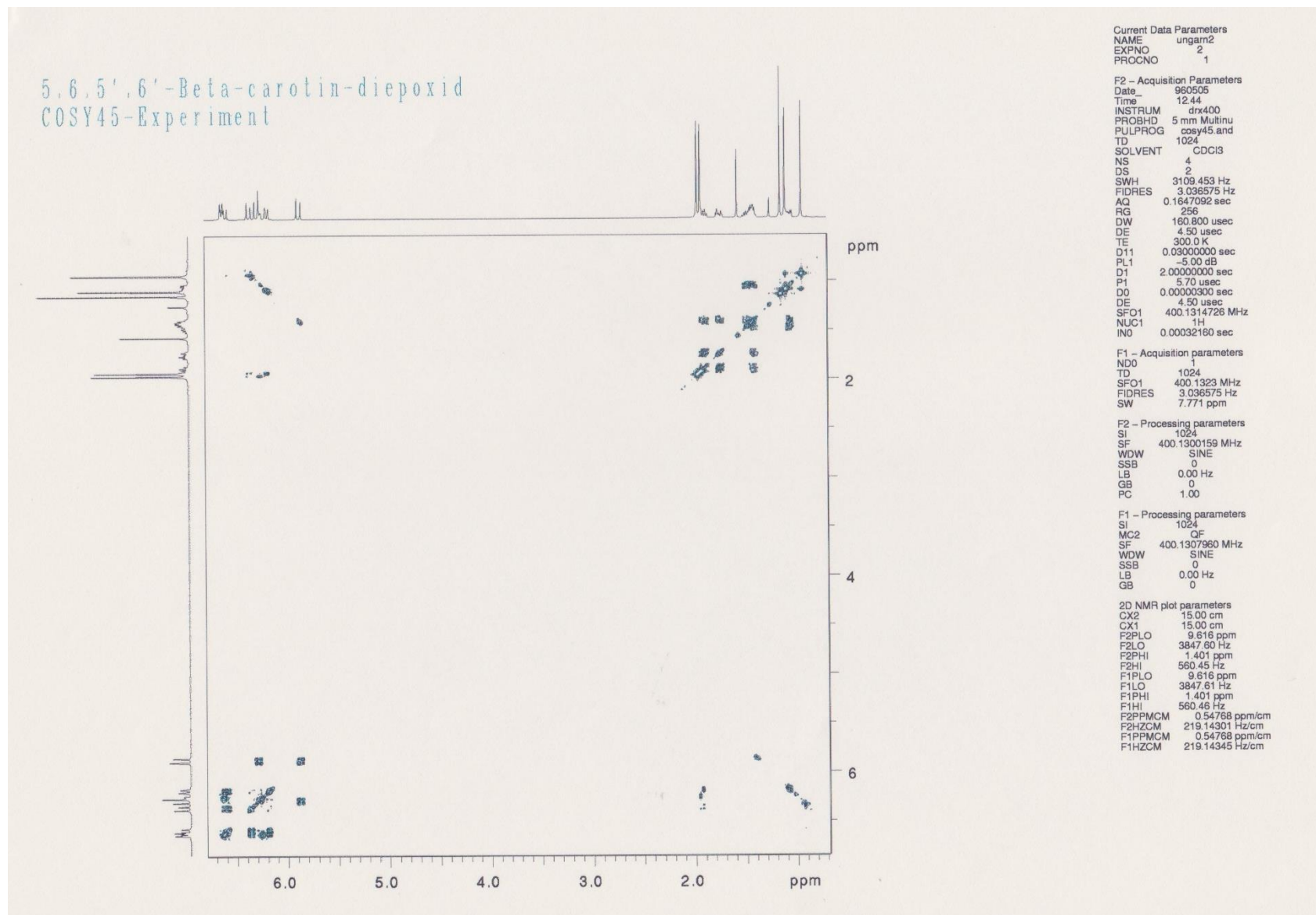
**Figure S6.b.**  $^1\text{H}$ -NMR spectrum of  $\beta$ -carotene 5,6,5',6'-diepoxide (**11**) in  $\text{CDCl}_3$  (400 MHz) (5.8-6.7 ppm)



**Figure S6.c.**  $^1\text{H}$ -NMR spectrum of  $\beta$ -carotene 5,6,5',6'-diepoxide (**11**) in  $\text{CDCl}_3$  (400 MHz) (0.9-2.0 ppm)

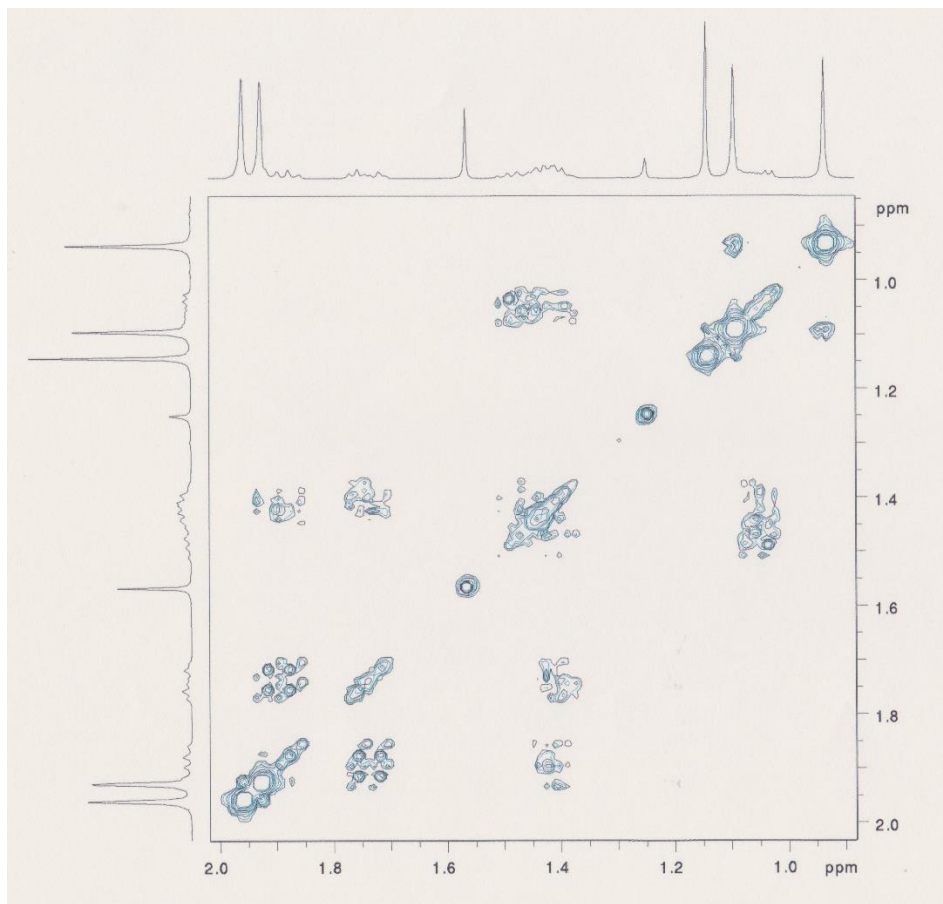
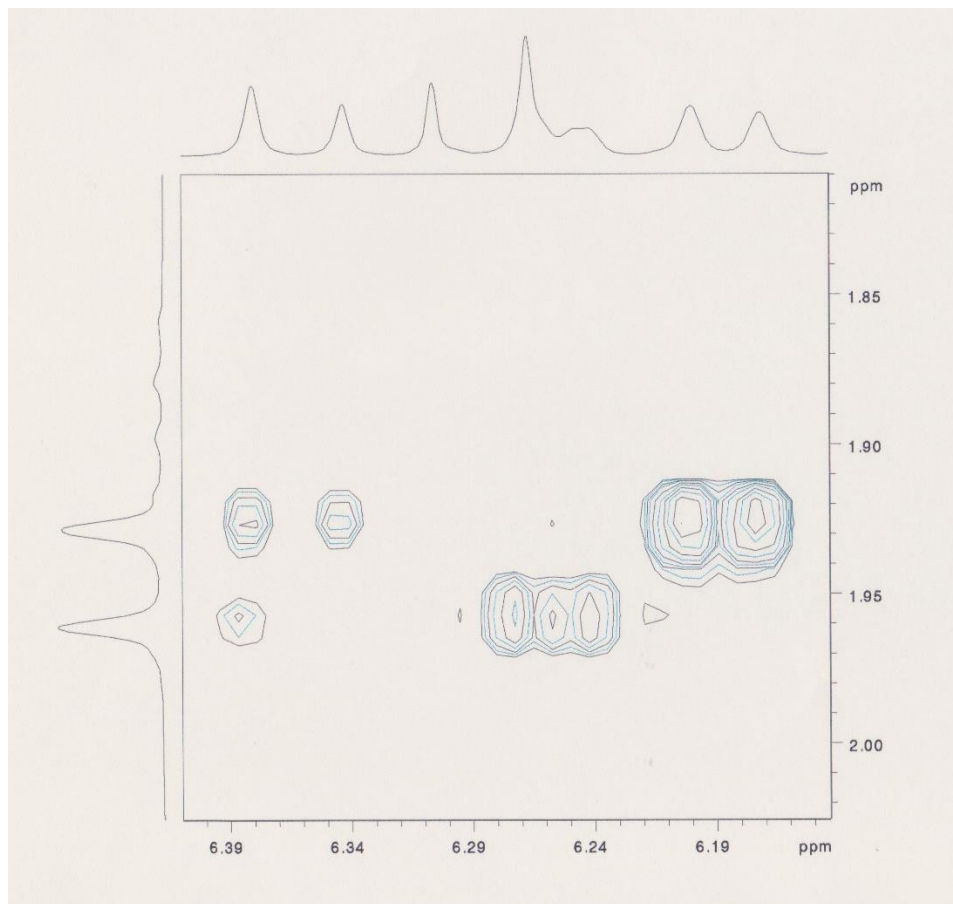


**Figure S7.a.**  $^1\text{H}$ ,  $^1\text{H}$ -COSY NMR spectrum of  $\beta$ -carotene 5,6,5',6'-diepoxide (**11**) in  $\text{CDCl}_3$  (400 MHz)

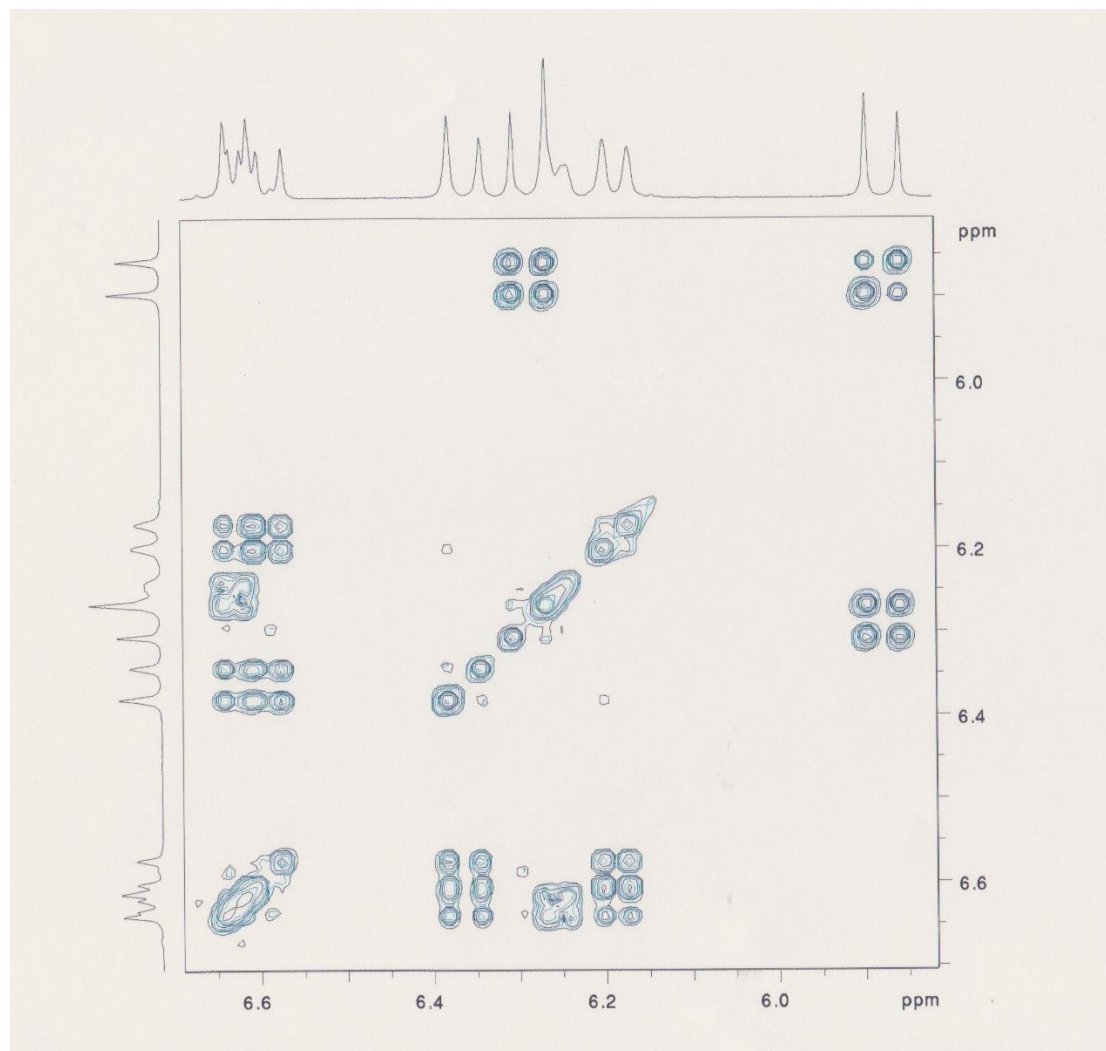




**Figure S7.b.**  $^1\text{H}$ ,  $^1\text{H}$ -COSY NMR spectrum of  $\beta$ -carotene 5,6,5',6'-diepoxide (**11**) in  $\text{CDCl}_3$  (400 MHz) (0.9-2.0 ppm)

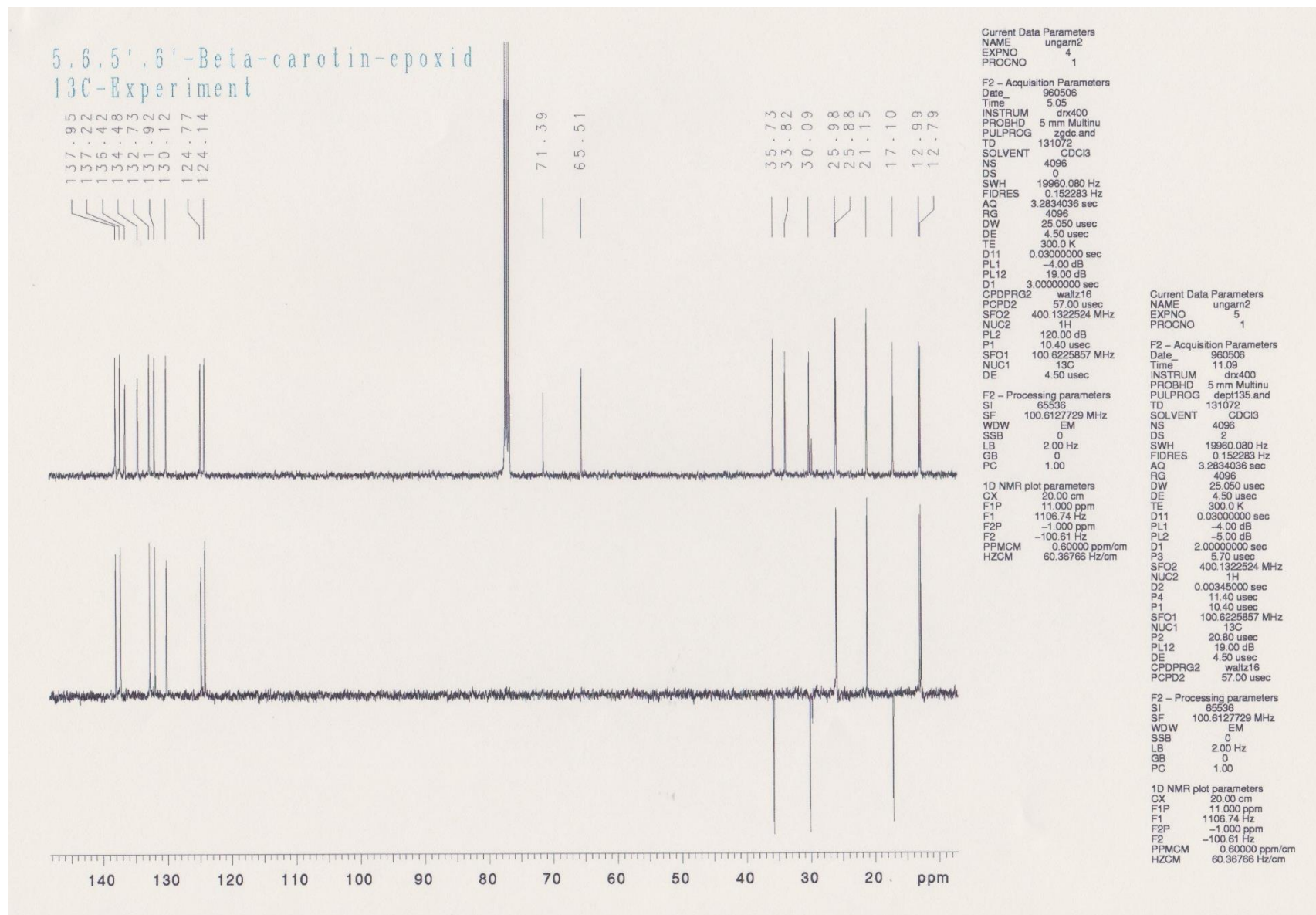


**Figure S7.c.**  $^1\text{H}$ ,  $^1\text{H}$ -COSY NMR spectrum of  $\beta$ -carotene 5,6,5',6'-diepoxide (**11**) in  $\text{CDCl}_3$  (400 MHz) (5.7-6.7 ppm)

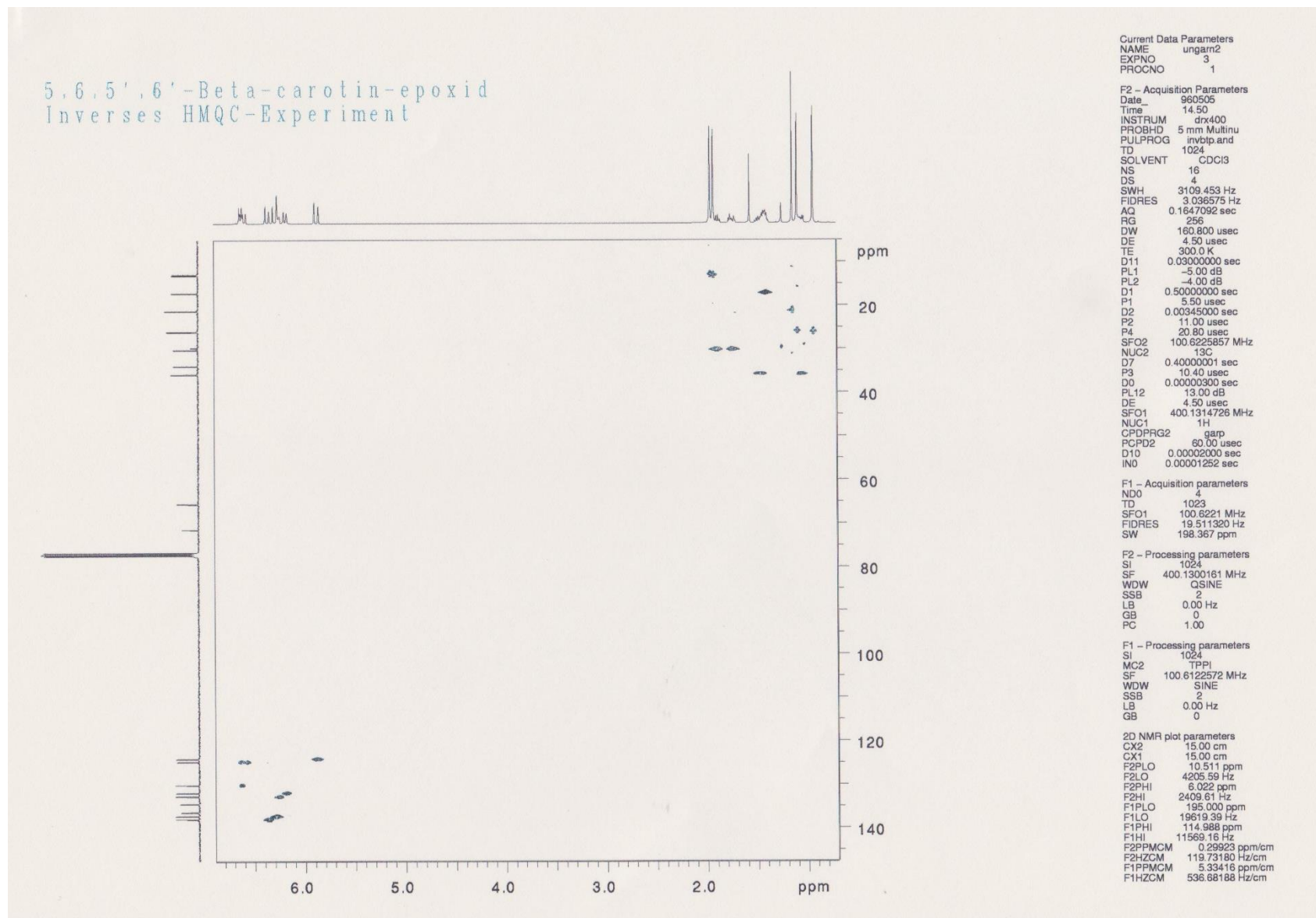




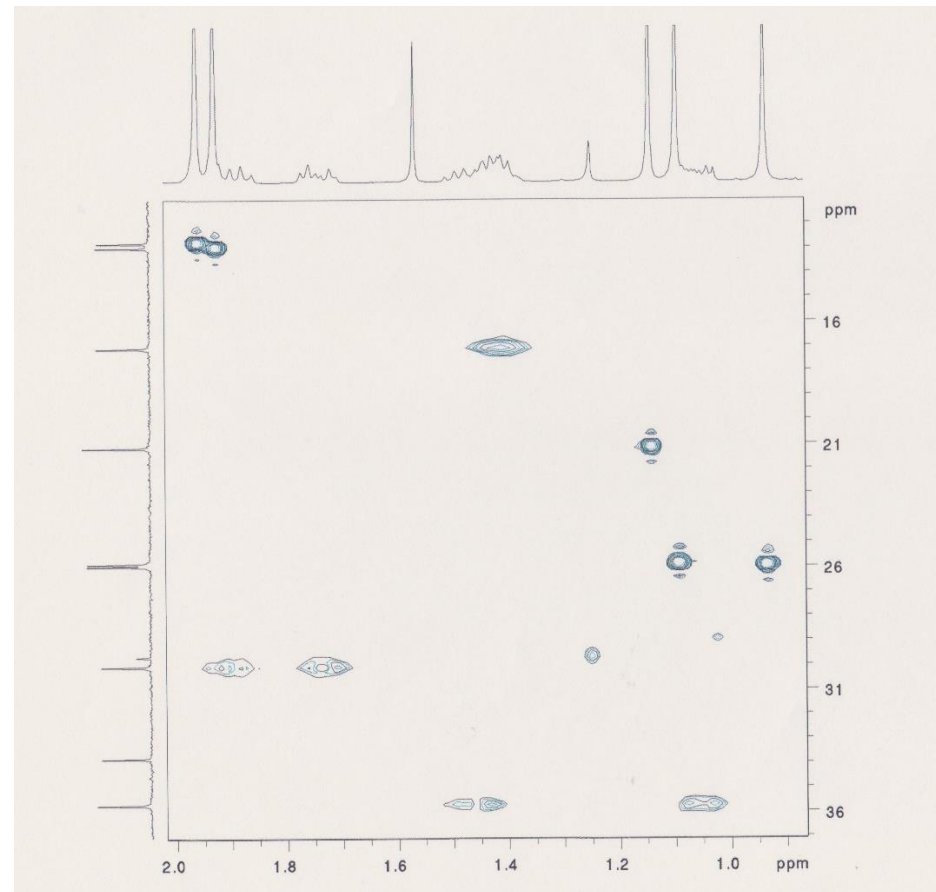
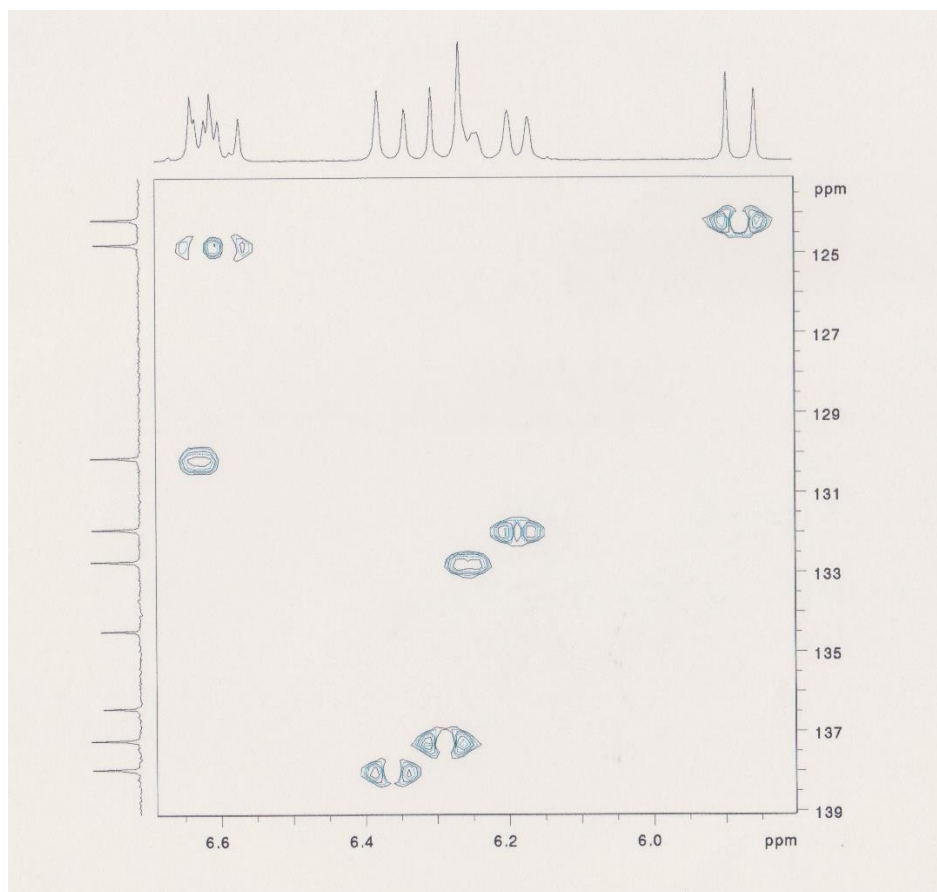
**Figure S8.**  $^{13}\text{C}$ -NMR spectrum of  $\beta$ -carotene 5,6,5',6'-diepoxide (**11**) in  $\text{CDCl}_3$



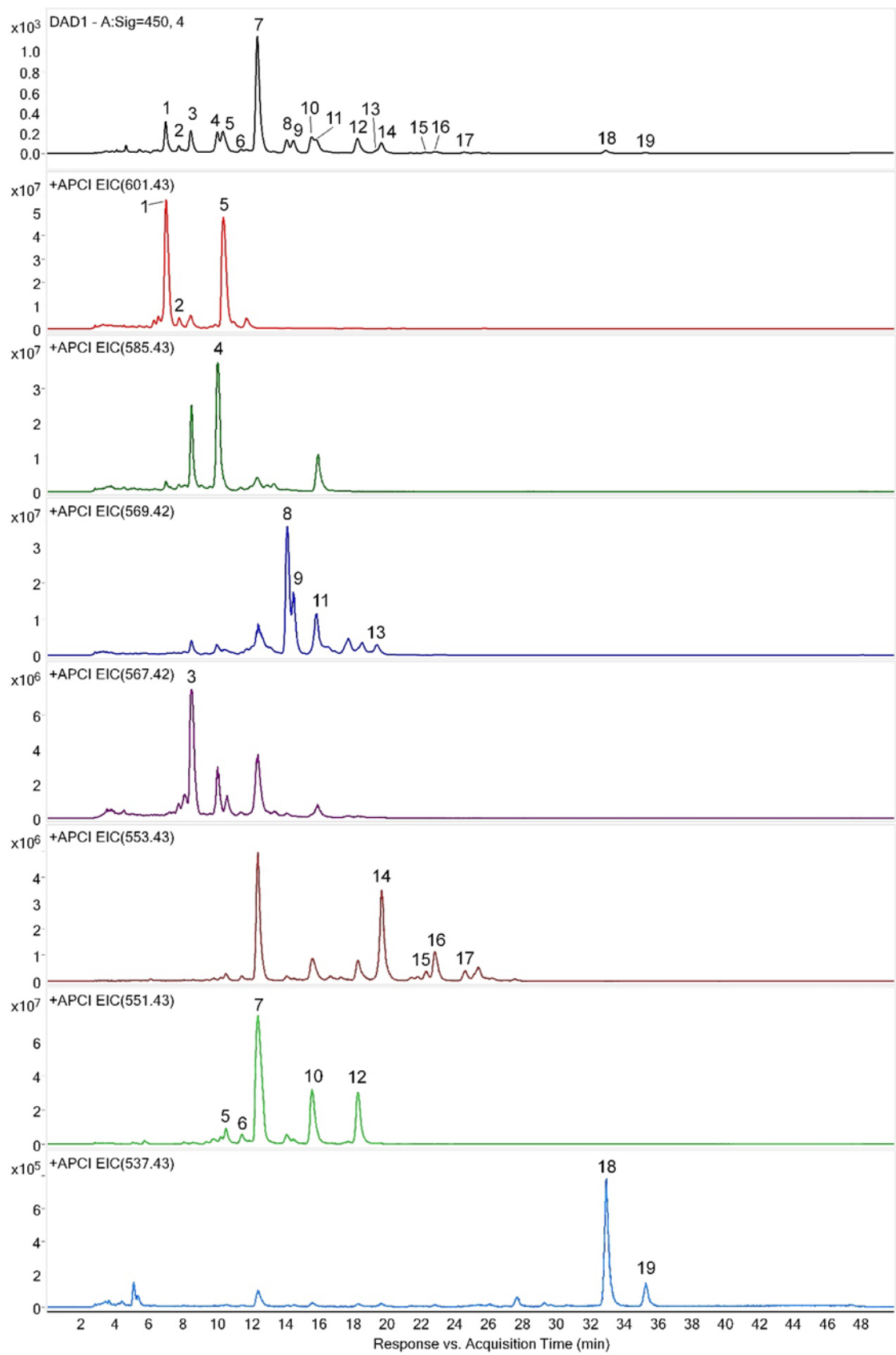
**Figure S9.a.**  $^1\text{H}$ ,  $^{13}\text{C}$ -HMQC NMR spectrum of  $\beta$ -carotene 5,6,5',6'-diepoxide (**11**) in  $\text{CDCl}_3$



**Figure S9.b.**  $^1\text{H}$ ,  $^{13}\text{C}$ -HMQC NMR spectrum of  $\beta$ -carotene 5,6,5',6'-diepoxide (**11**) in  $\text{CDCl}_3$

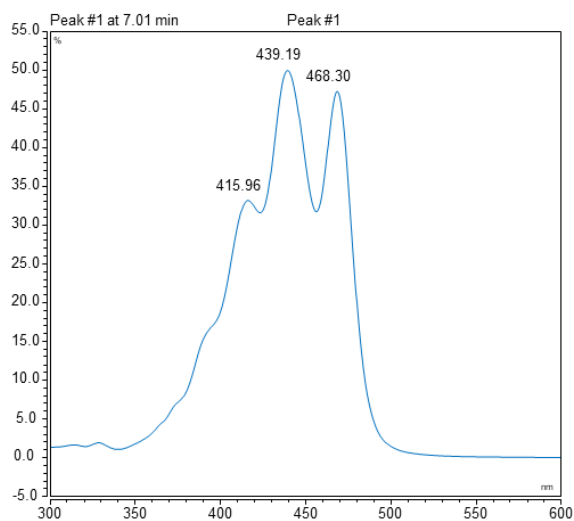


**Figure S10.** UV-vis and EIC chromatogram of *Teleki speciosa* flower extract.

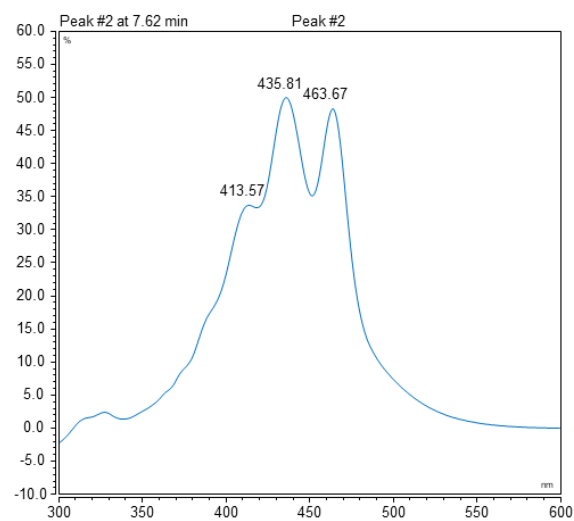


**Figure S11.** UV-vis spectra of catotenoids in *Telekia speciosa* flower extract detected by HPLC-DAD

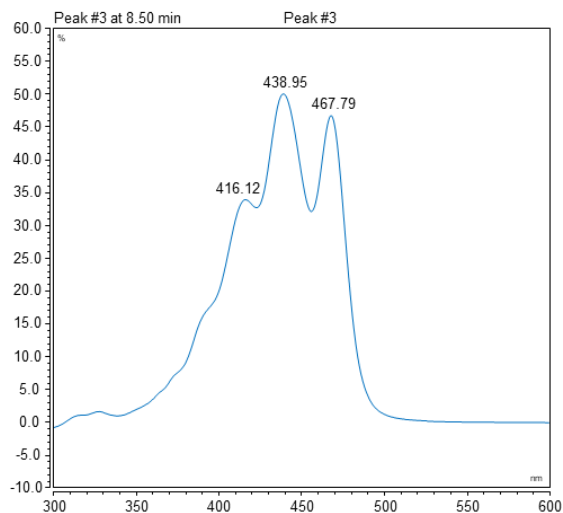
Peak 1: Violaxanthin



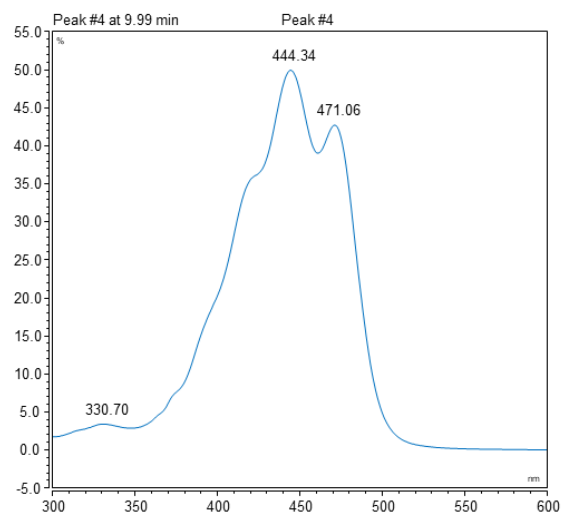
Peak 2: (9Z)-Neoxanthin



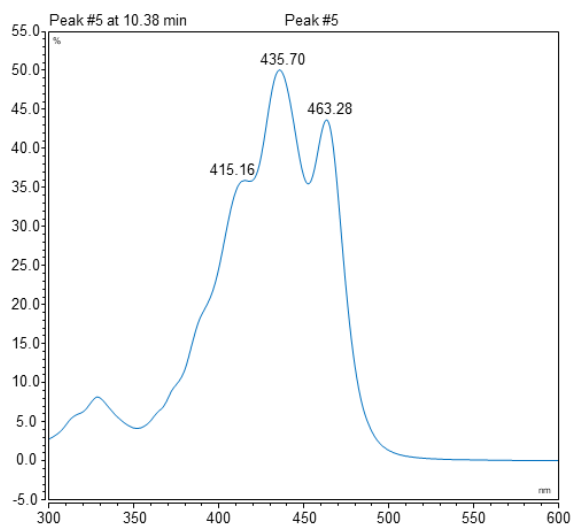
Peak 3: Lutein 5,6-epoxide



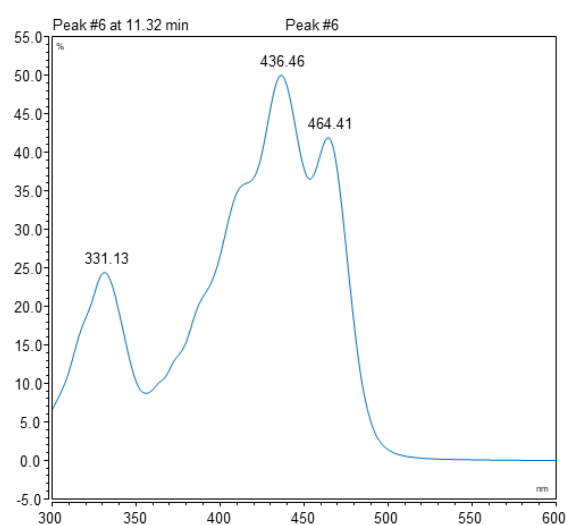
Peak 4: Antheraxanthin



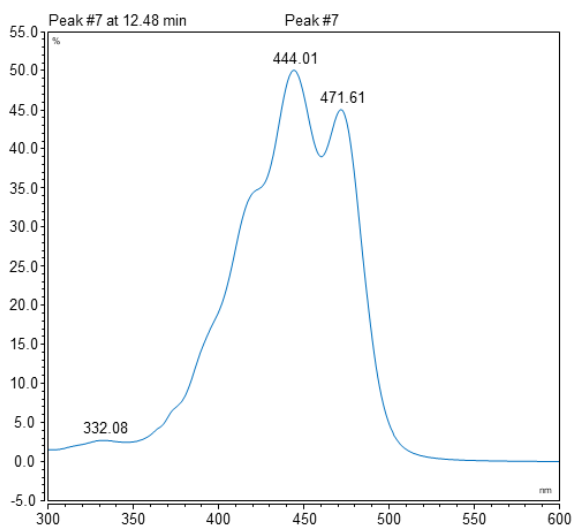
Peak 5: (9Z)-Violaxanthin



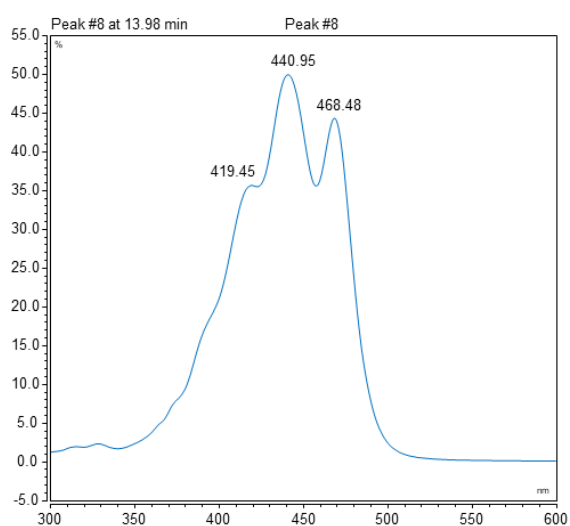
Peak 6: (13'Z)-Lutein



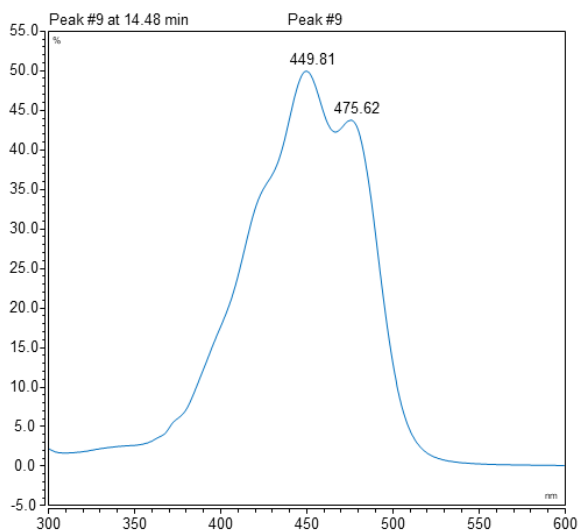
Peak 7: Lutein



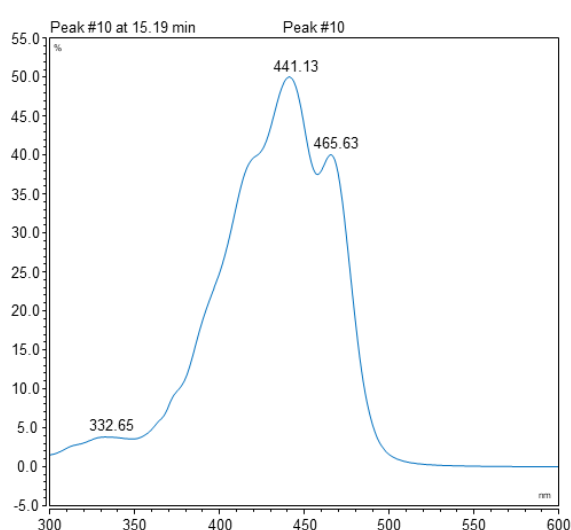
Peak 8:  $\beta$ -Carotene diepoxide



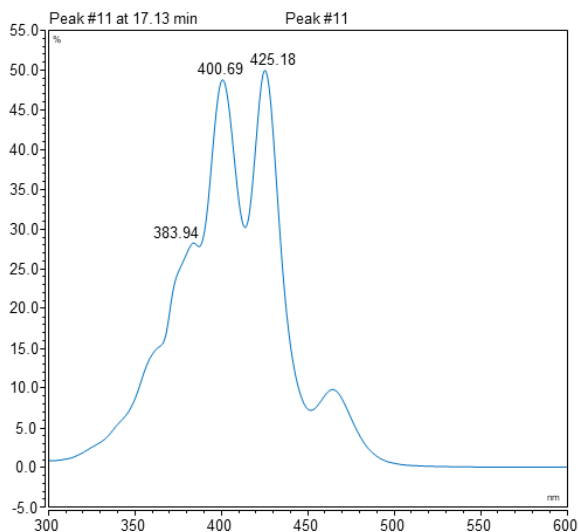
Peak 9: Zeaxanthin



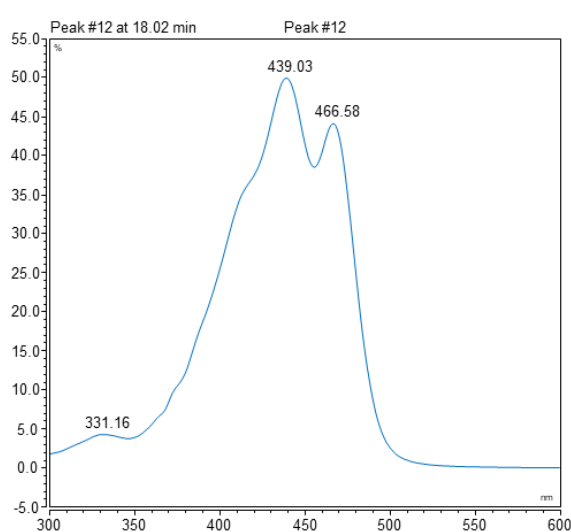
Peak 10: (9Z)-Lutein



Peak 11: Aurochrome

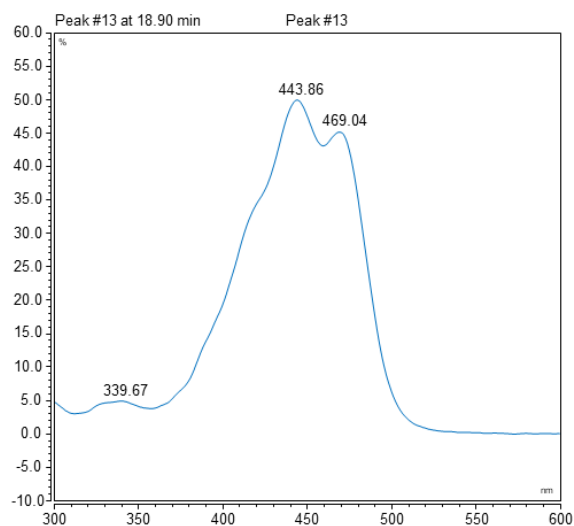


Peak 12: (9'Z)-Lutein

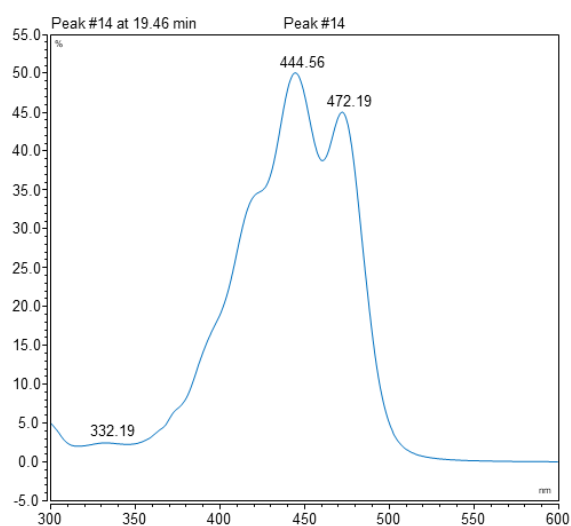




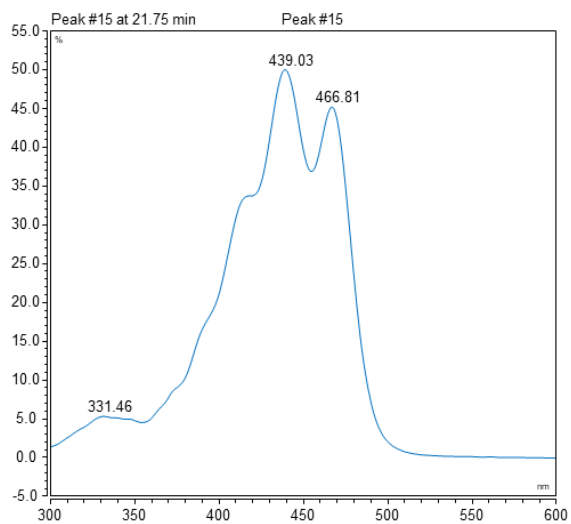
Peak 13: (9Z)-Zeaxanthin



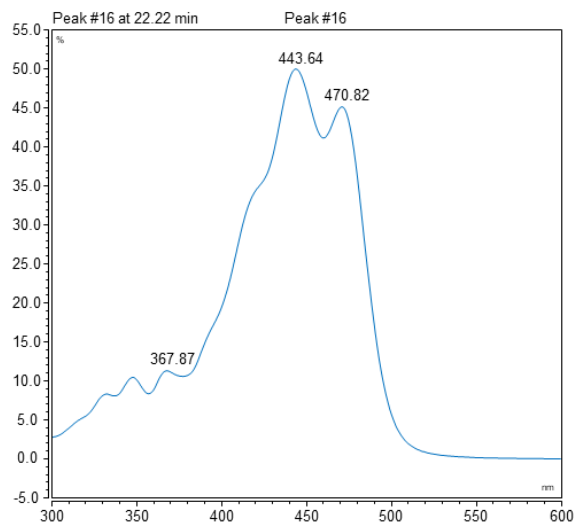
Peak 14:  $\alpha$ -Cryptoxanthin



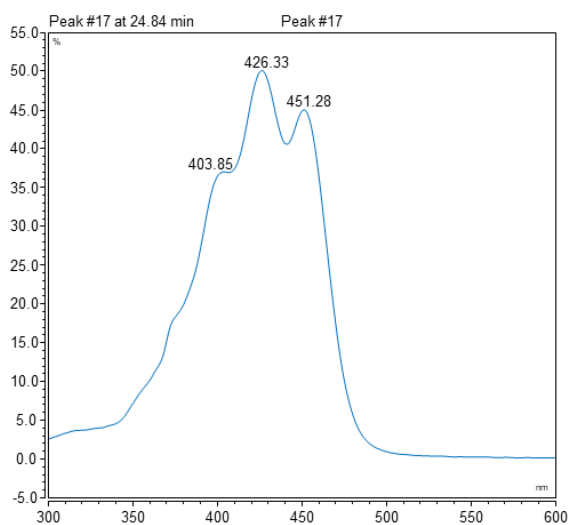
Peak 15: (9Z)- $\alpha$ -Cryptoxanthin



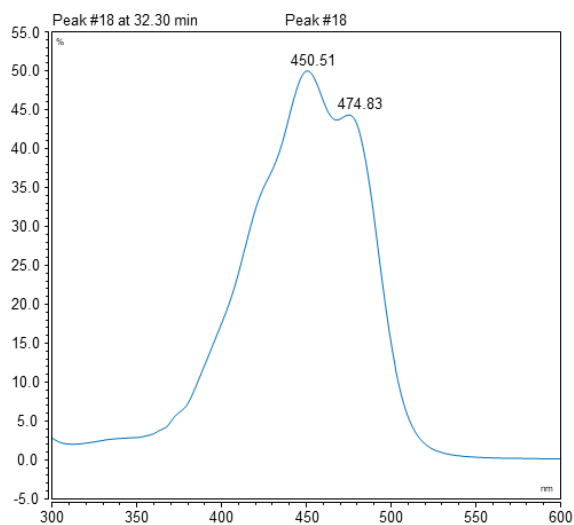
Peak 16:  $\beta$ -Carotene 5,6-epoxide



Peak 17:  $\beta$ -Carotene 5,8-epoxide



Peak 18:  $\beta$ -Carotene



Peak 19: (9Z)-β-Carotene

