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APPENDIX

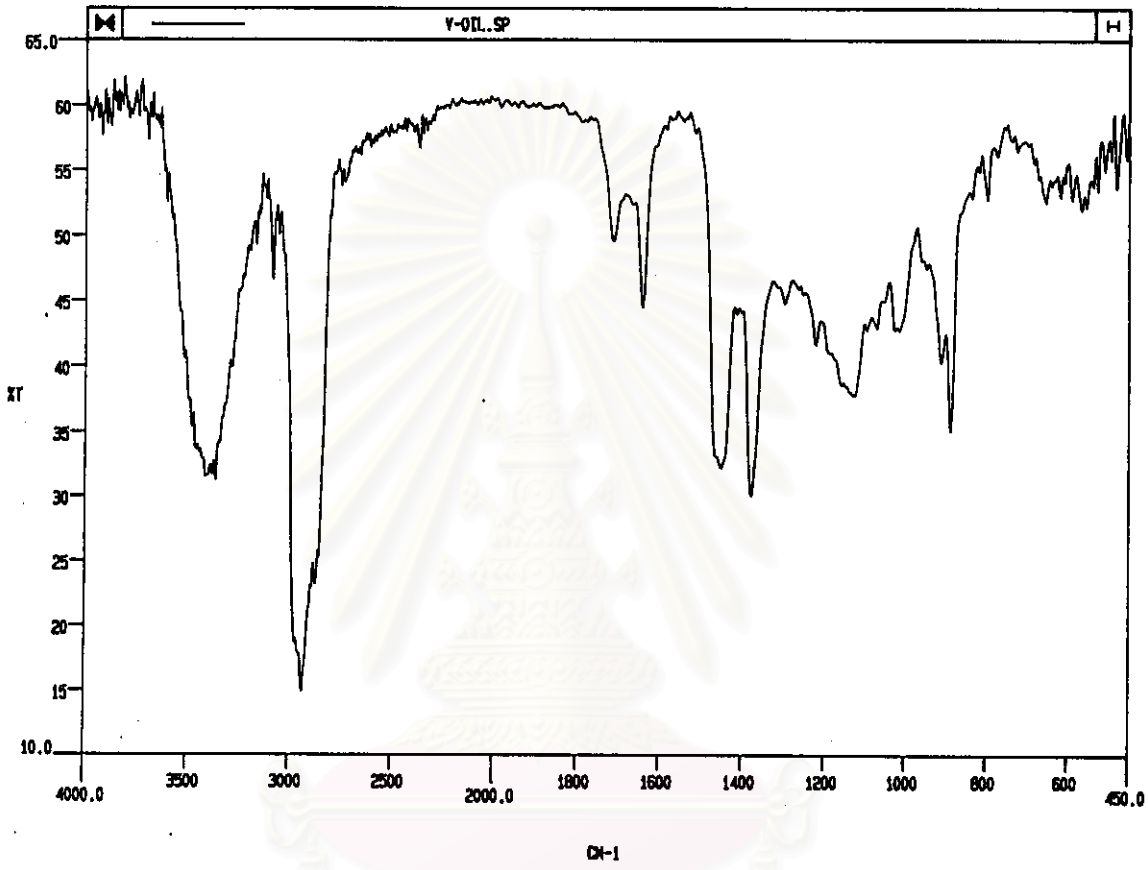

Figure 4 The IR spectrum of Essential oil

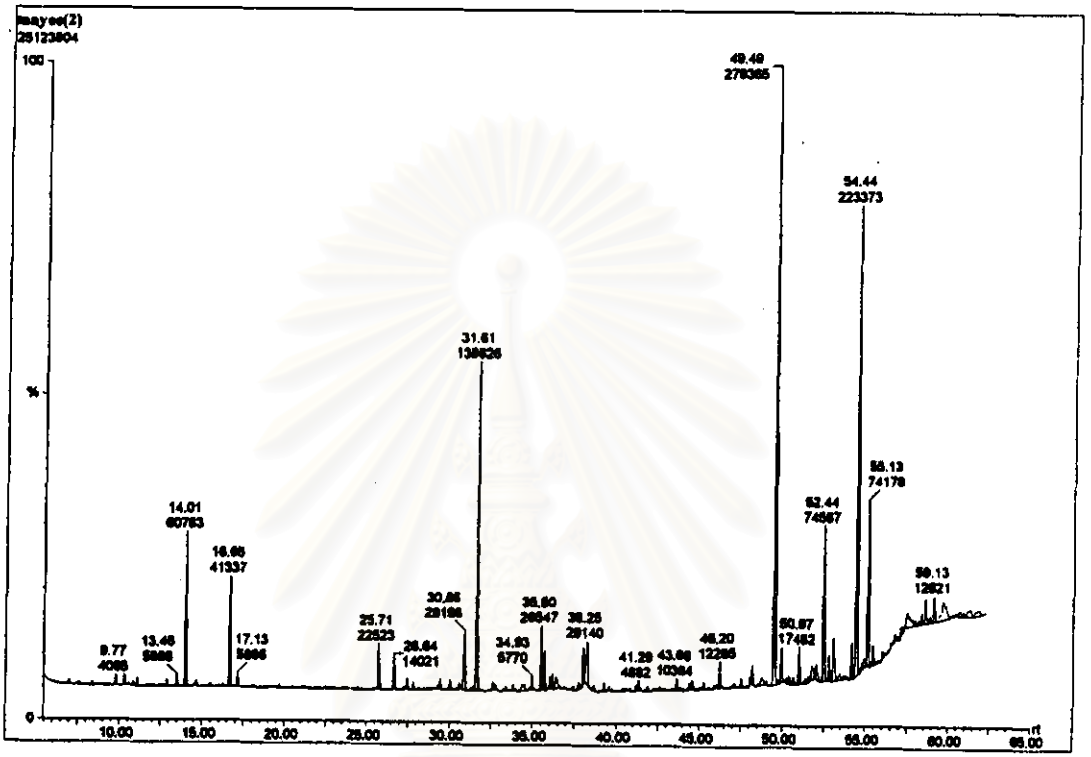

Figure 5 The GC-MS chromatogram of Essential oil

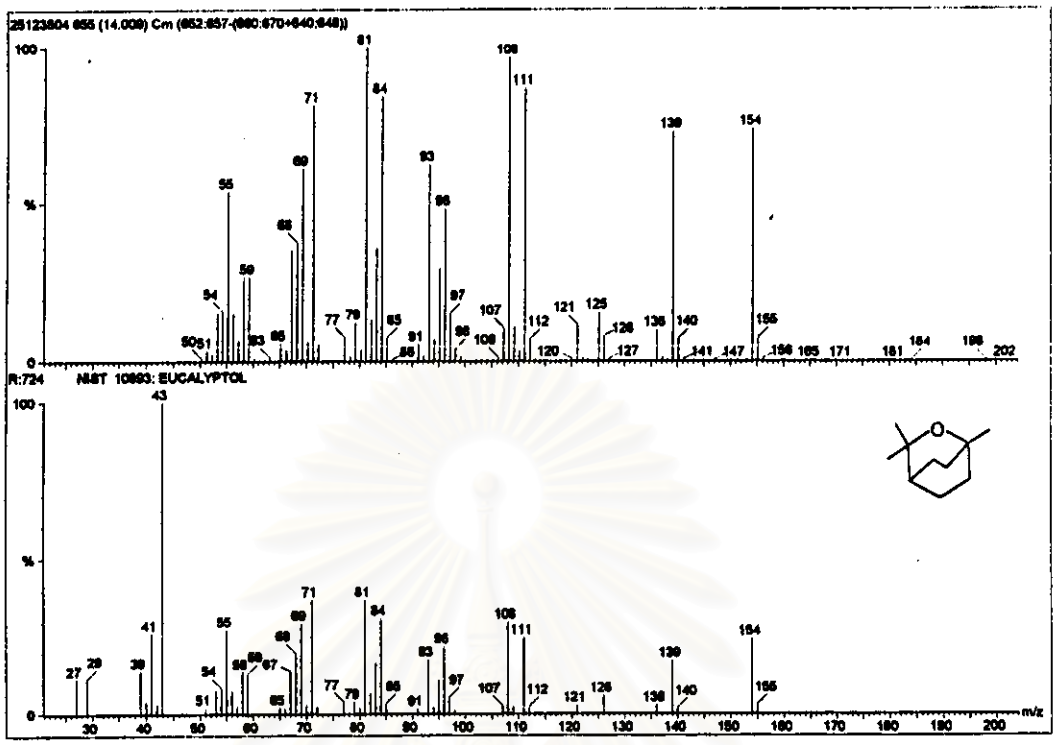

Figure 6 The mass spectrum of essential oil at retention time 14.00 min

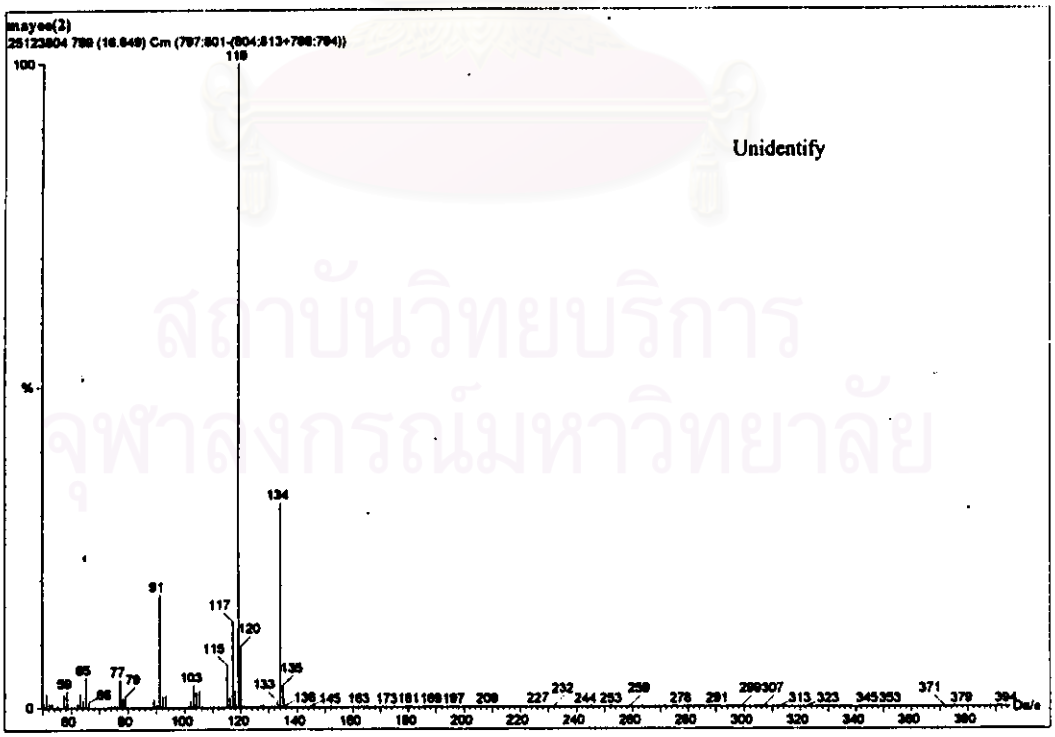

Figure 7 The mass spectrum of essential oil at retention time 16.64 min

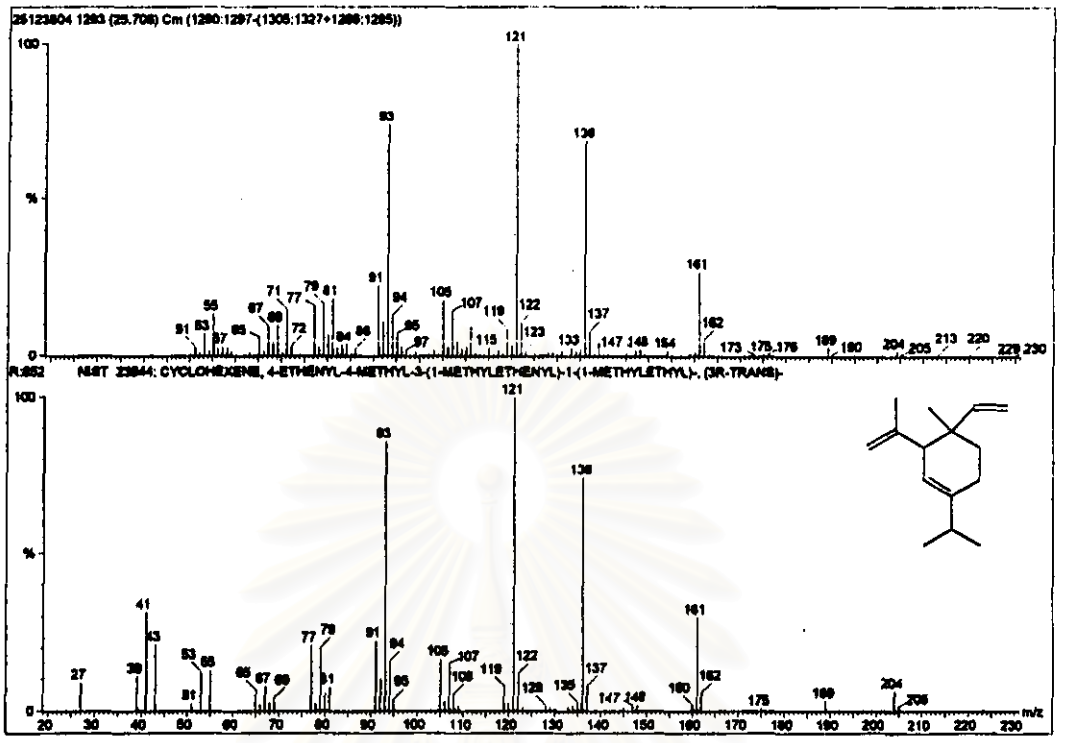

Figure 8 The mass spectrum of essential oil at retention time 25.70 min

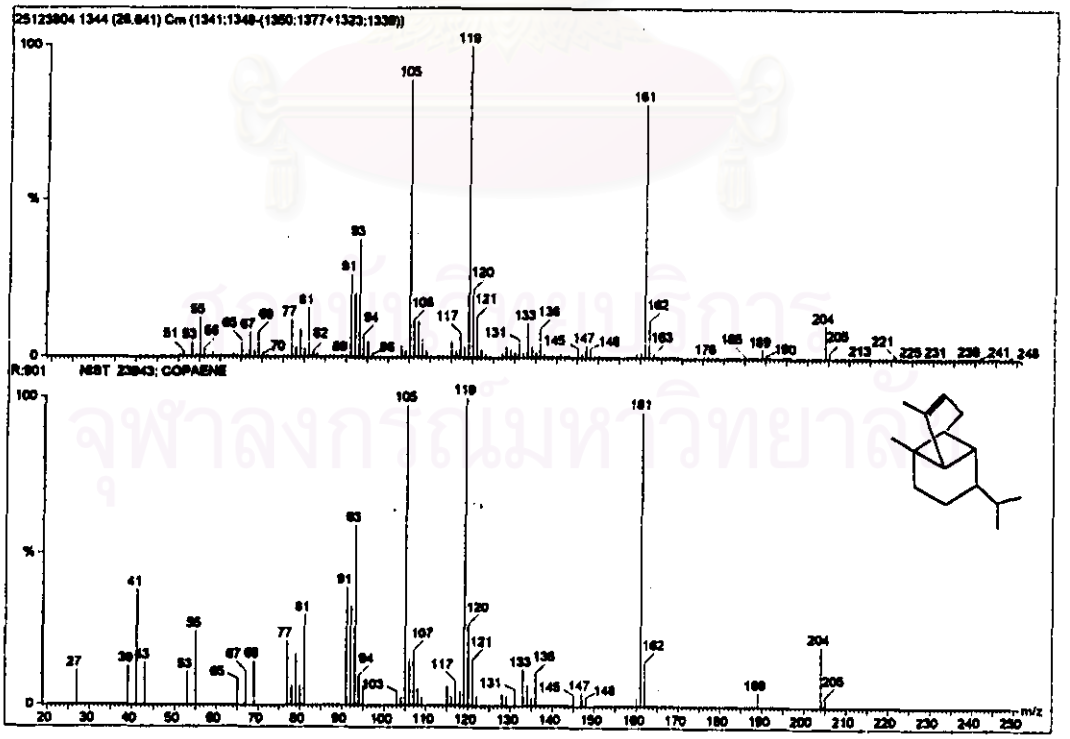

Figure 9 The mass spectrum of essential oil at retention time 26.64 min

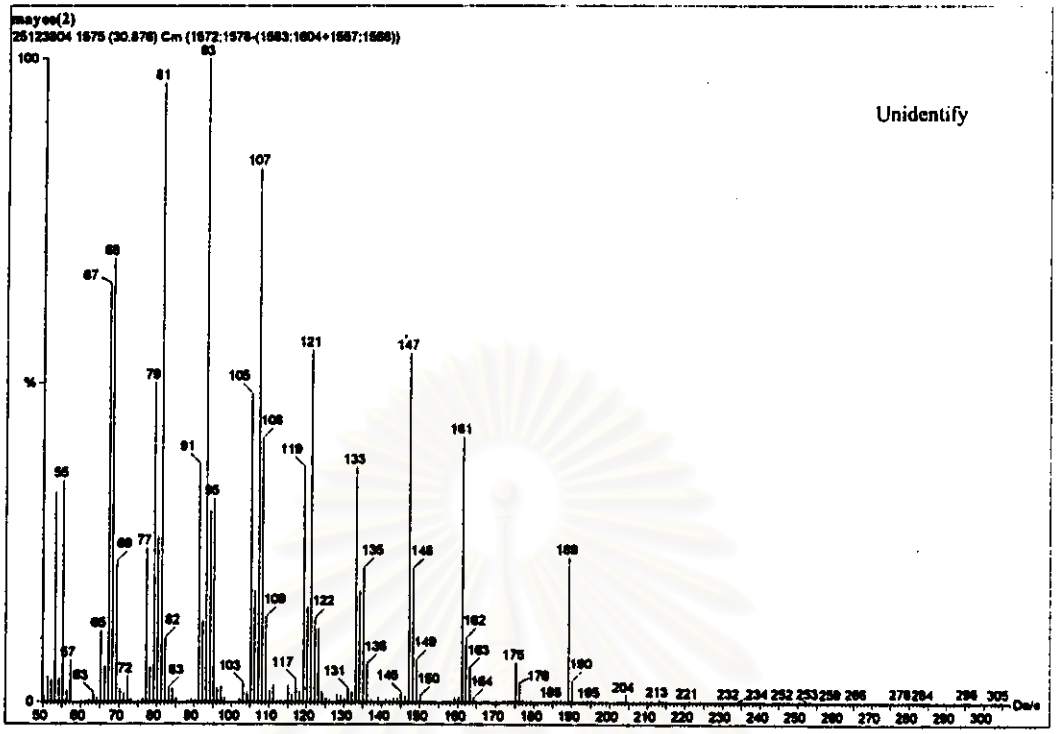

Figure 10 The mass spectrum of essential oil at retention time 30.87 min

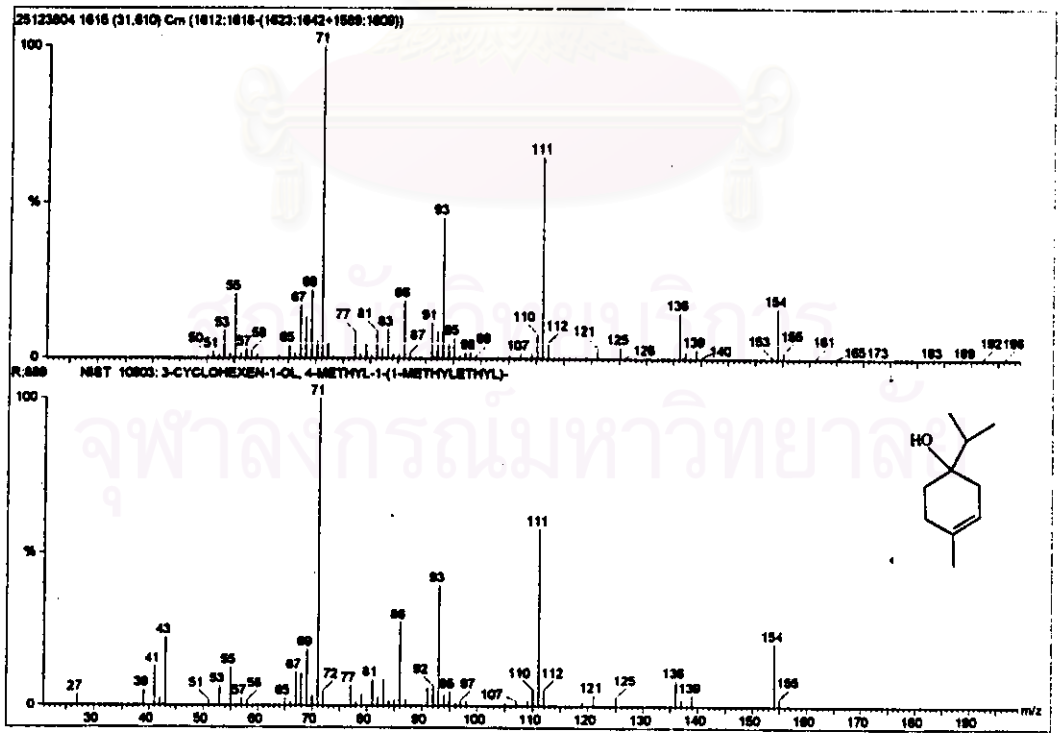

Figure 11 The mass spectrum of essential oil at retention time 31.61 min

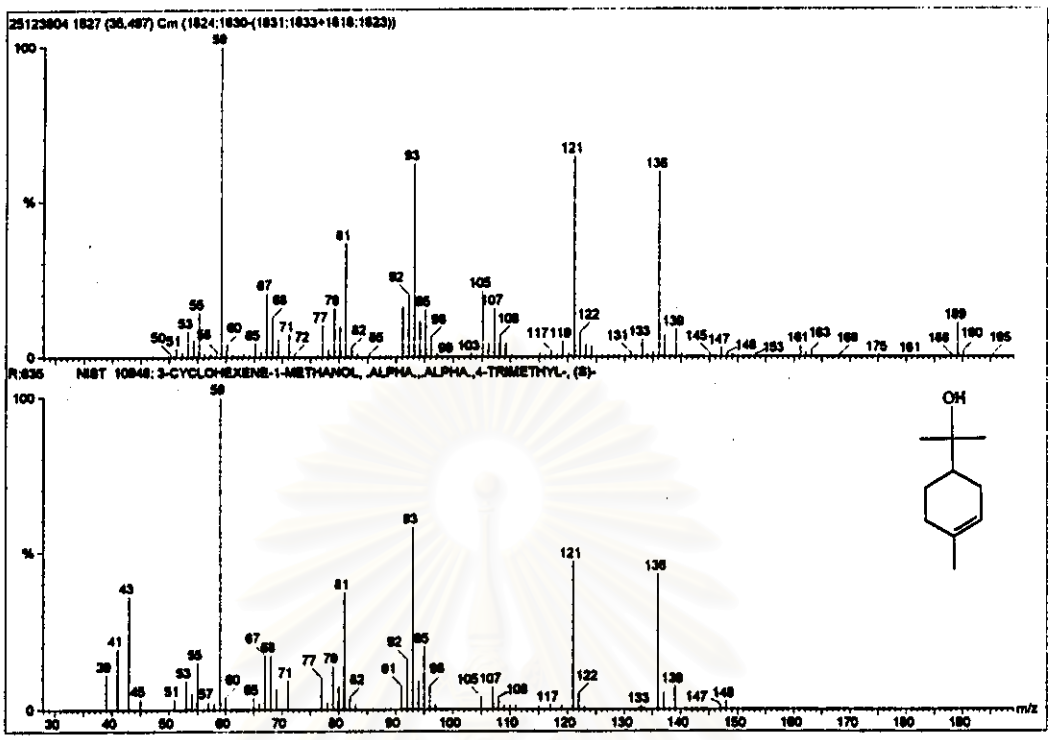

Figure 12 The mass spectrum of essential oil at retention time 35.49 min

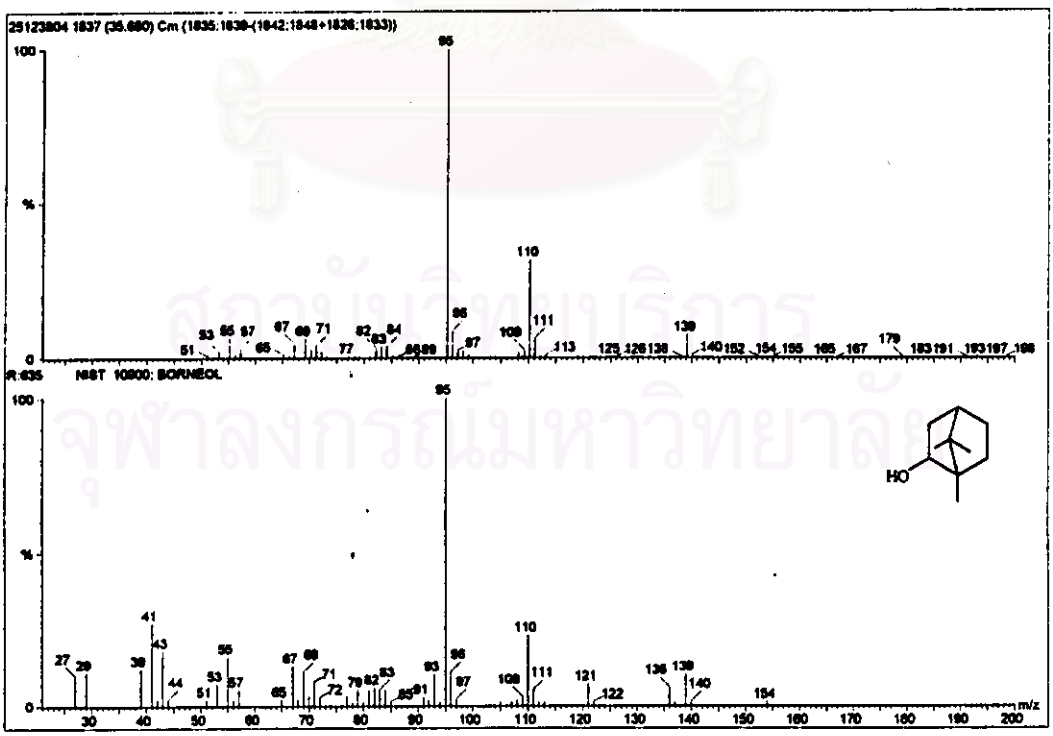

Figure 13 The mass spectrum of essential oil at retention time 35.68 min

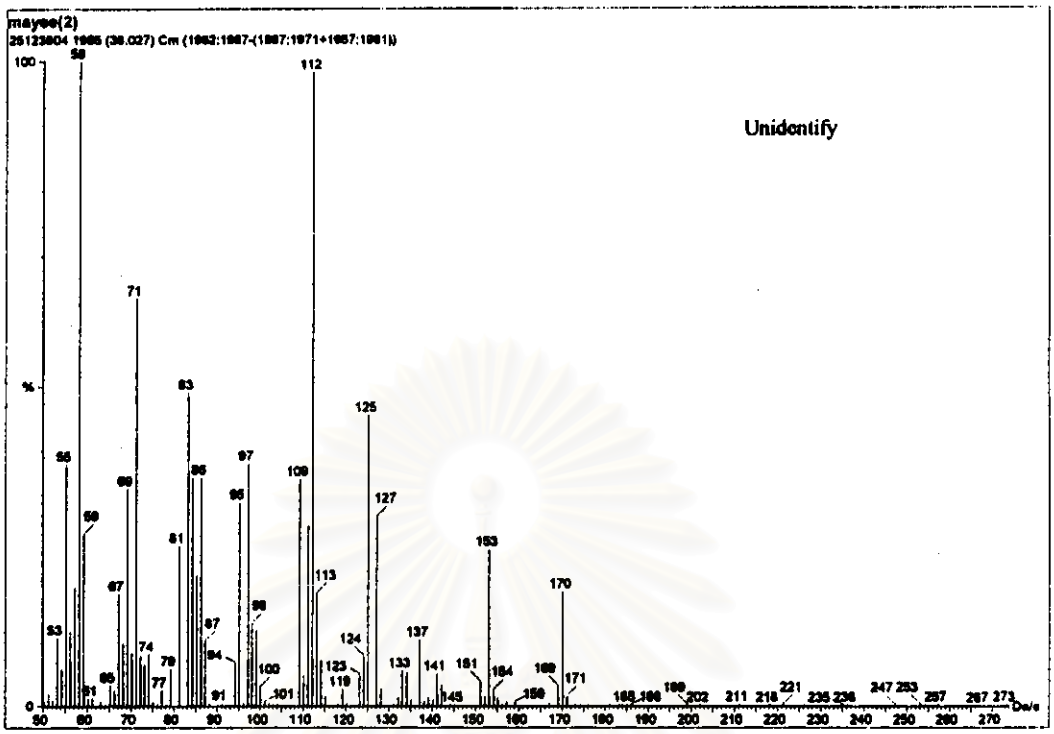

Figure 14 The mass spectrum of essential oil at retention time 38.02 min

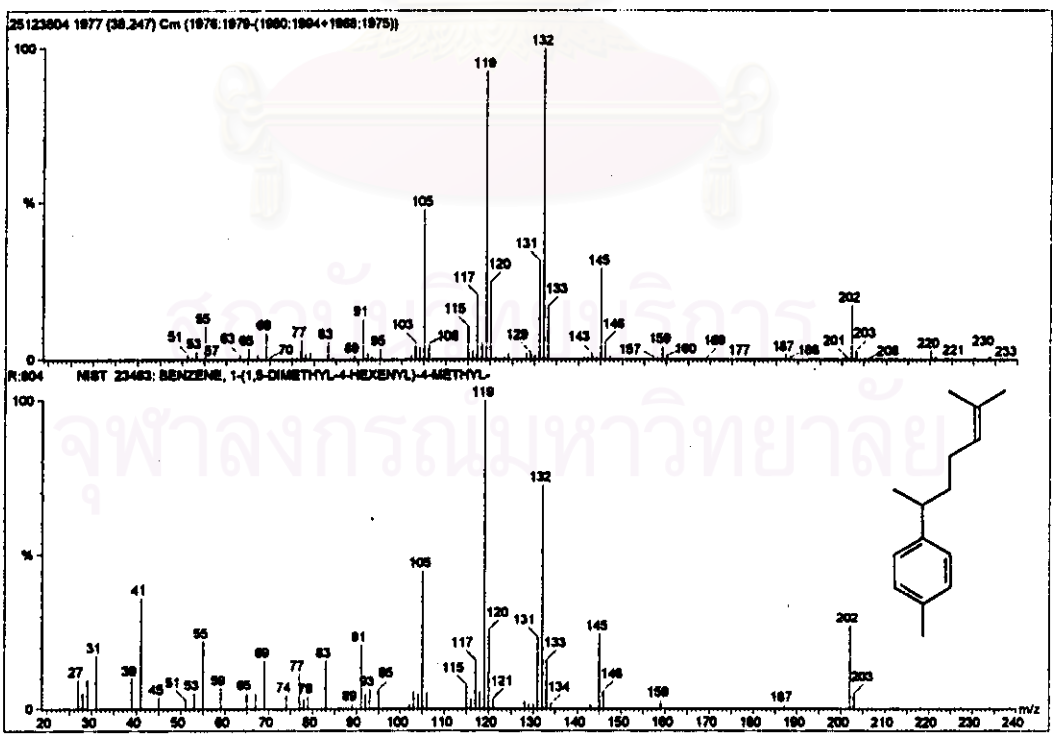

Figure 15 The mass spectrum of essential oil at retention time 38.24 min

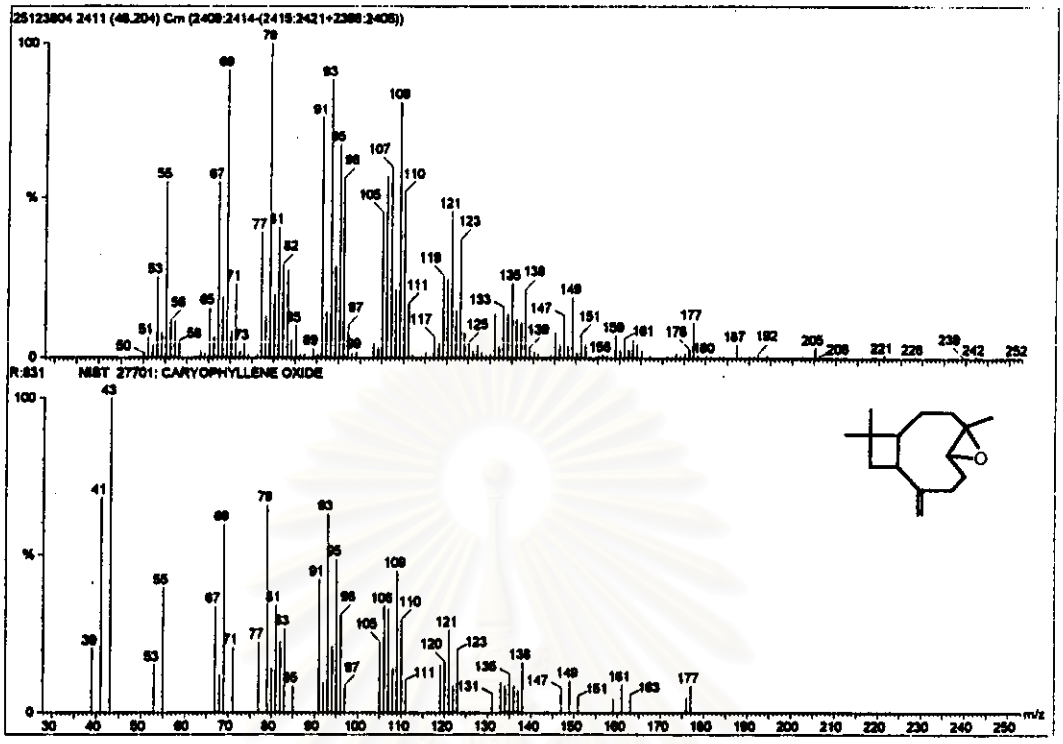

Figure16 The mass spectrum of essential oil at retention time 46.20 min

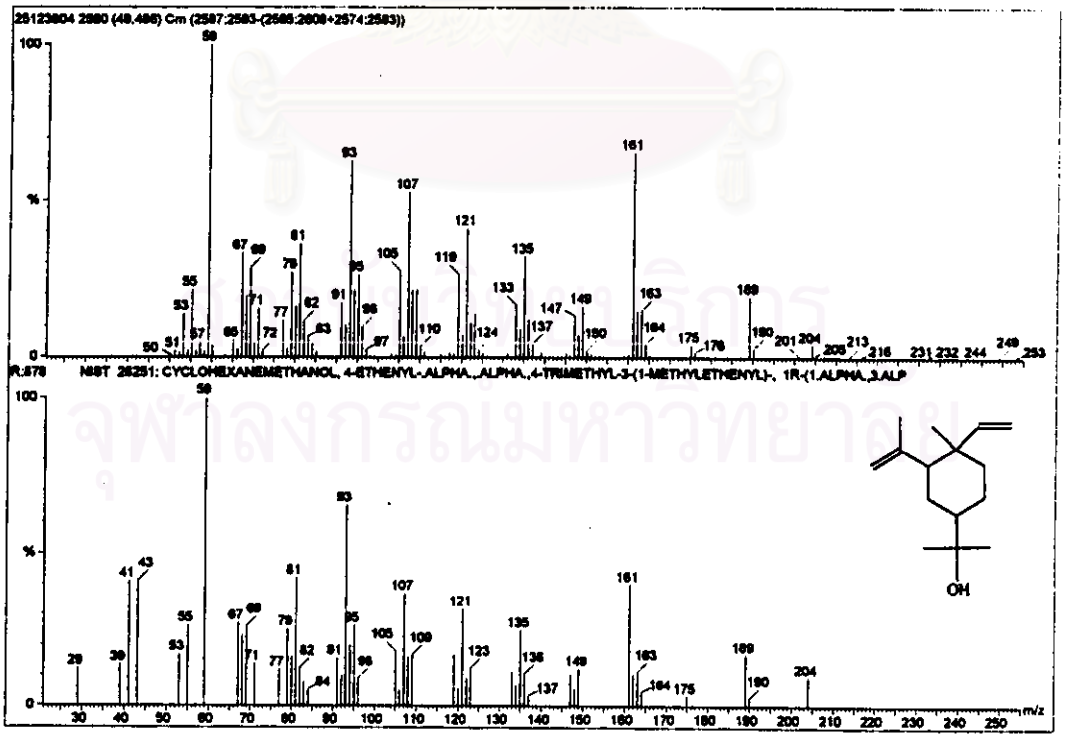

Figure 17 The mass spectrum of essential oil at retention time 49.48 min

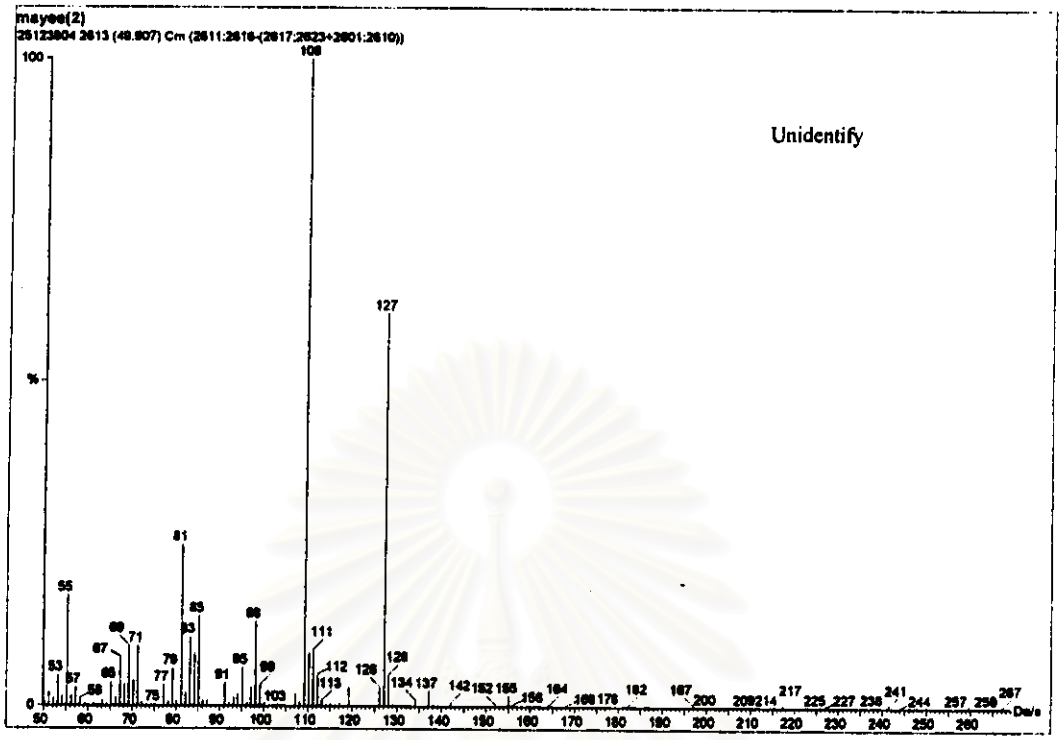

Figure 18 The mass spectrum of essential oil at retention time 49.90 min

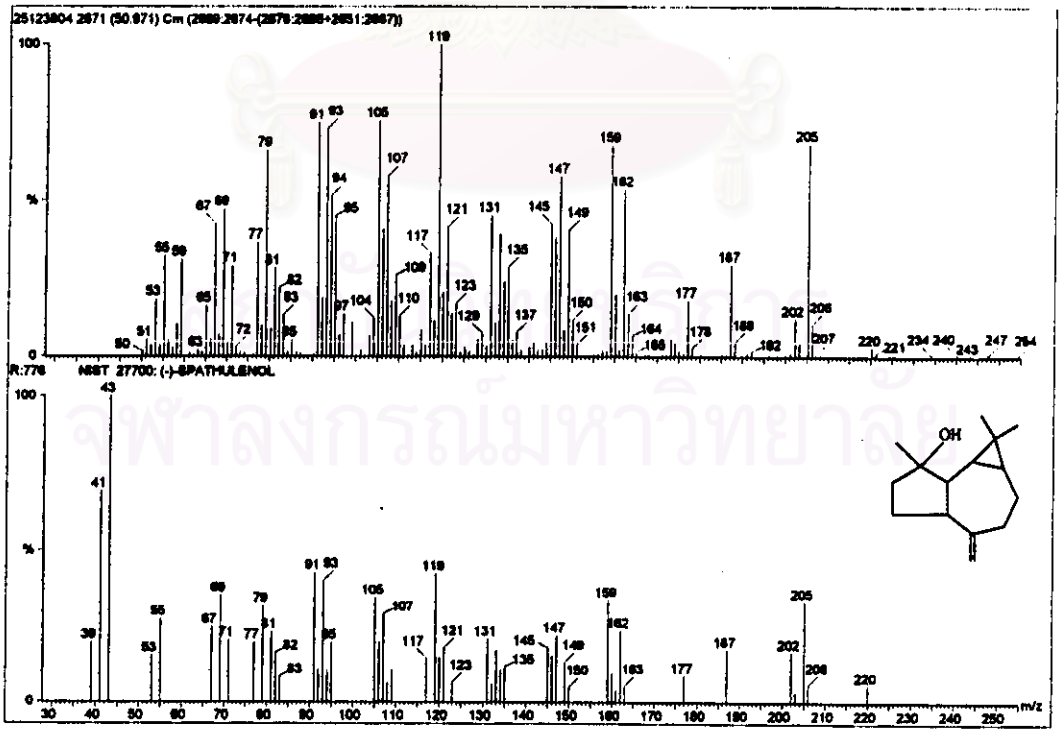

Figure 19 The mass spectrum of essential oil at retention time 50.97 min

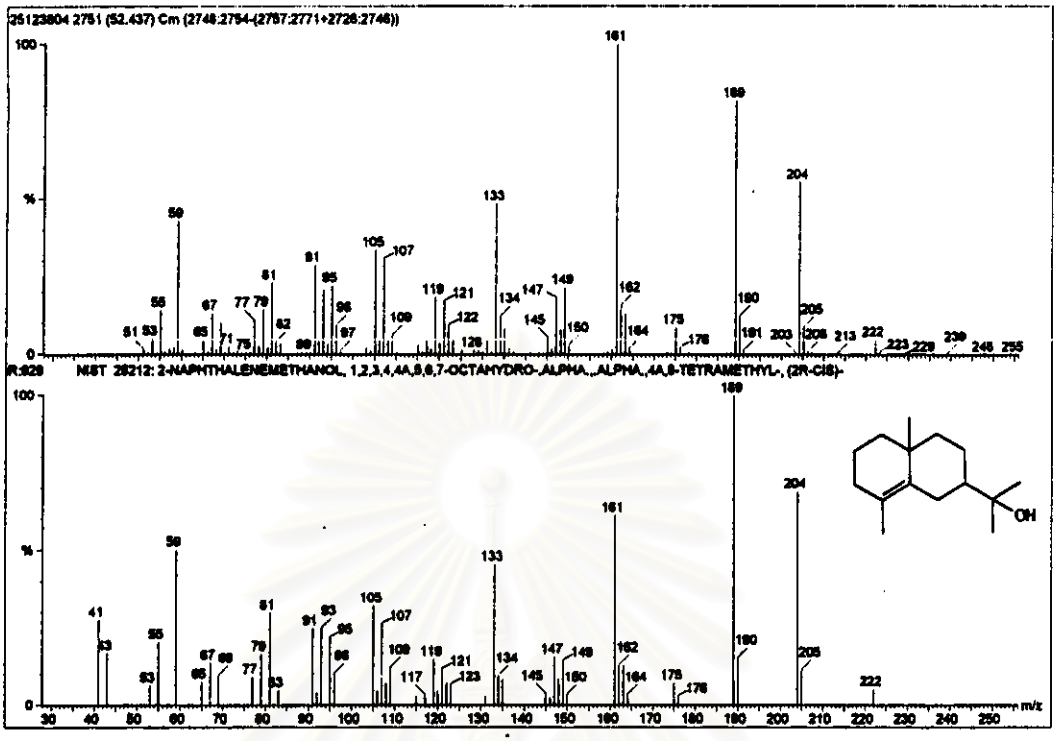

Figure 20 The mass spectrum of essential oil at retention time 52.43 min

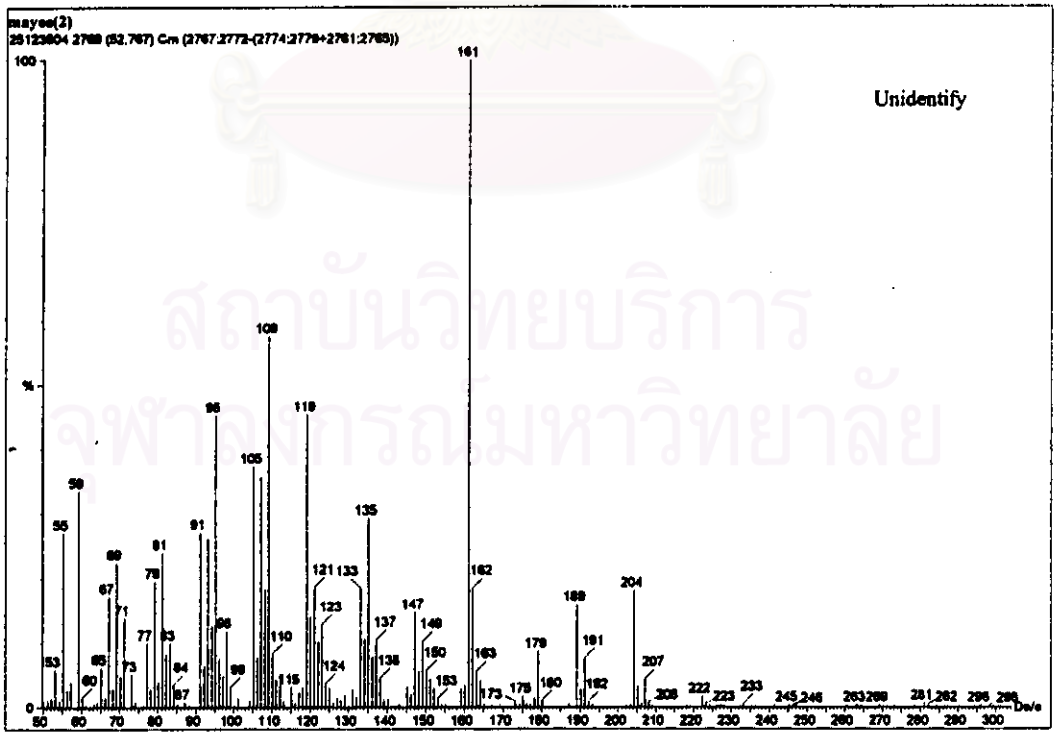

Figure 21 The mass spectrum of essential oil at retention time 52.76 min

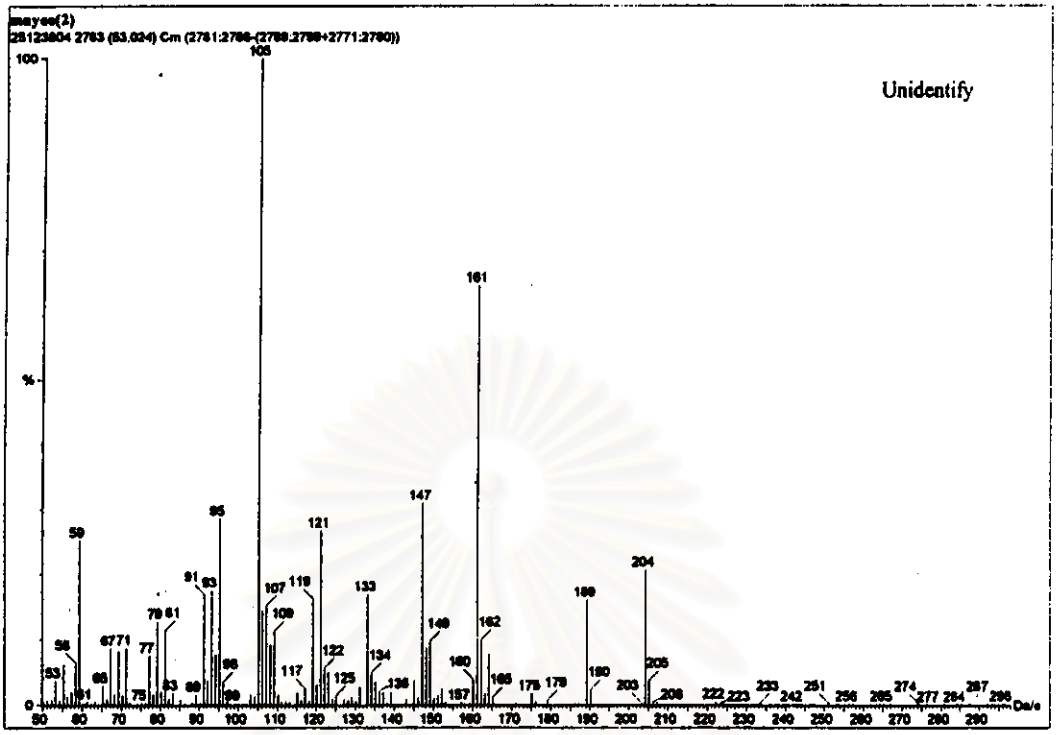

Figure 22 The mass spectrum of essential oil at retention time 53.02 min

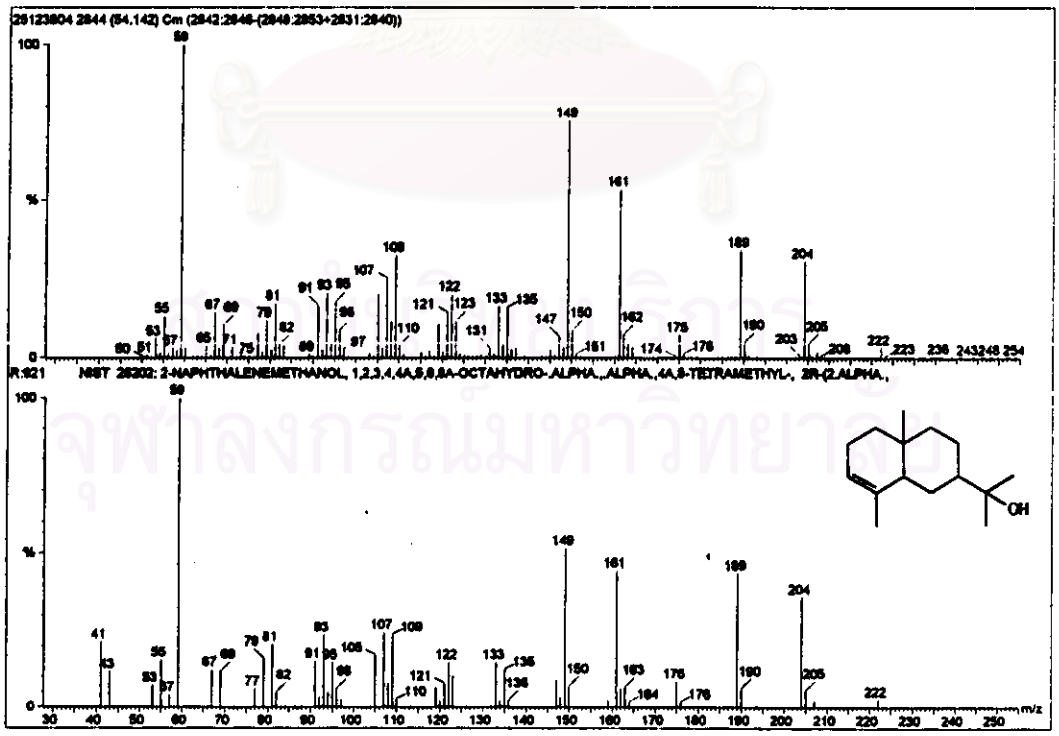

Figure 23 The mass spectrum of essential oil at retention time 54.14 min

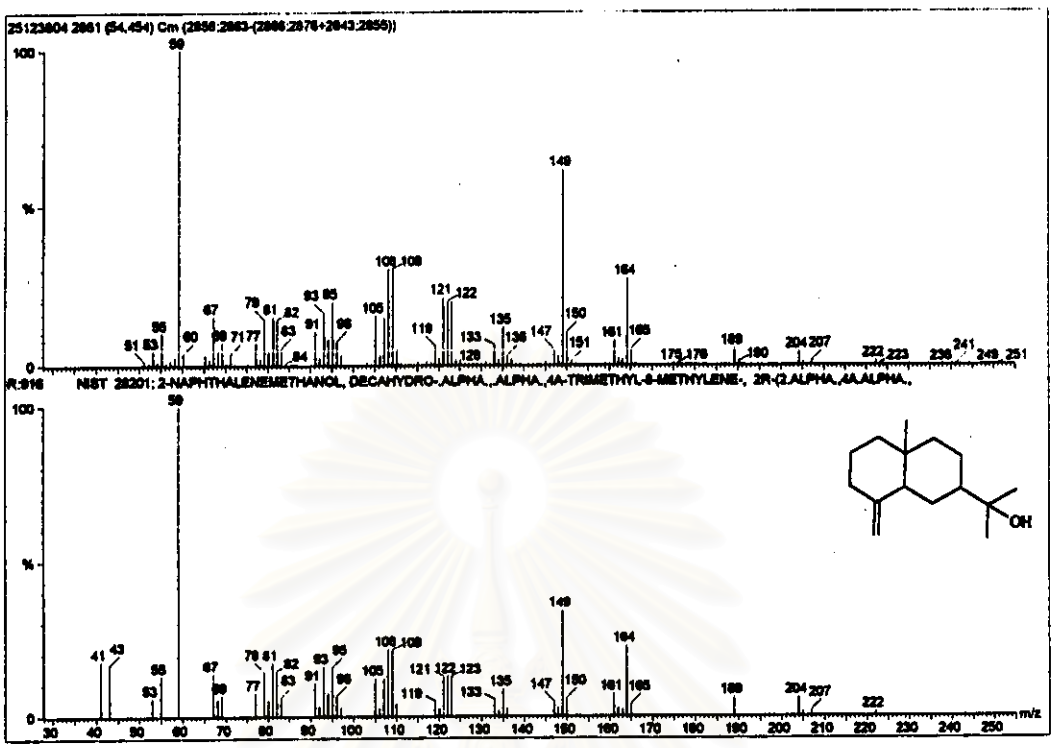

Figure 24 The mass spectrum of essential oil at retention time 54.45 min

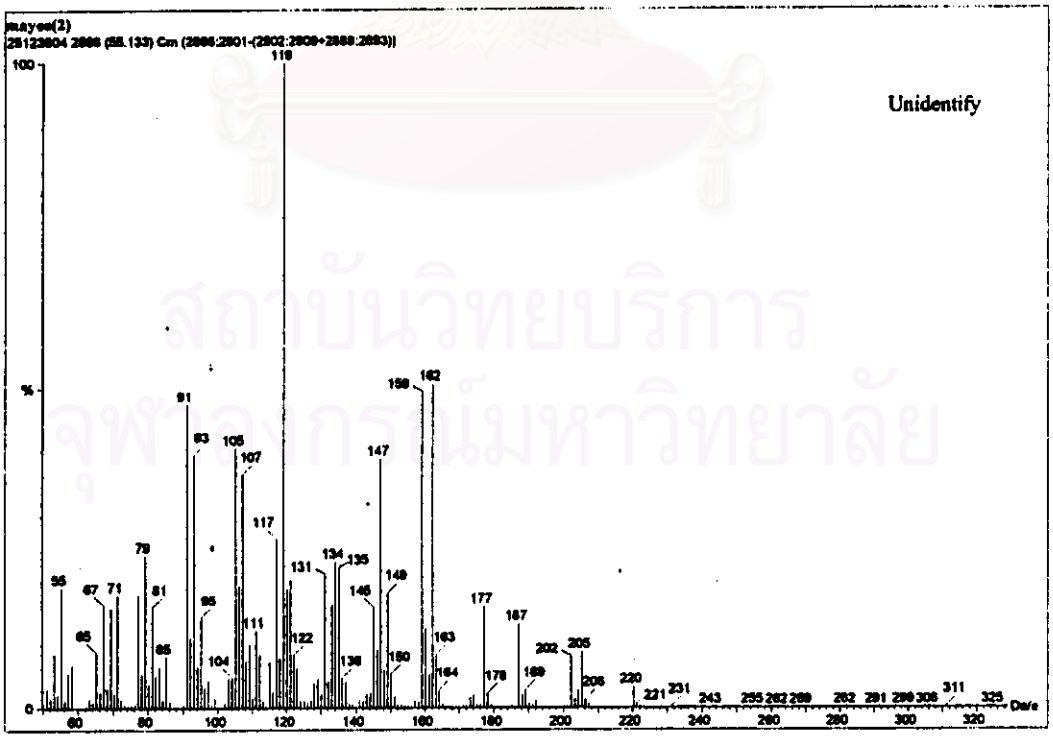

Figure 25 The mass spectrum of essential oil at retention time 55.13 min

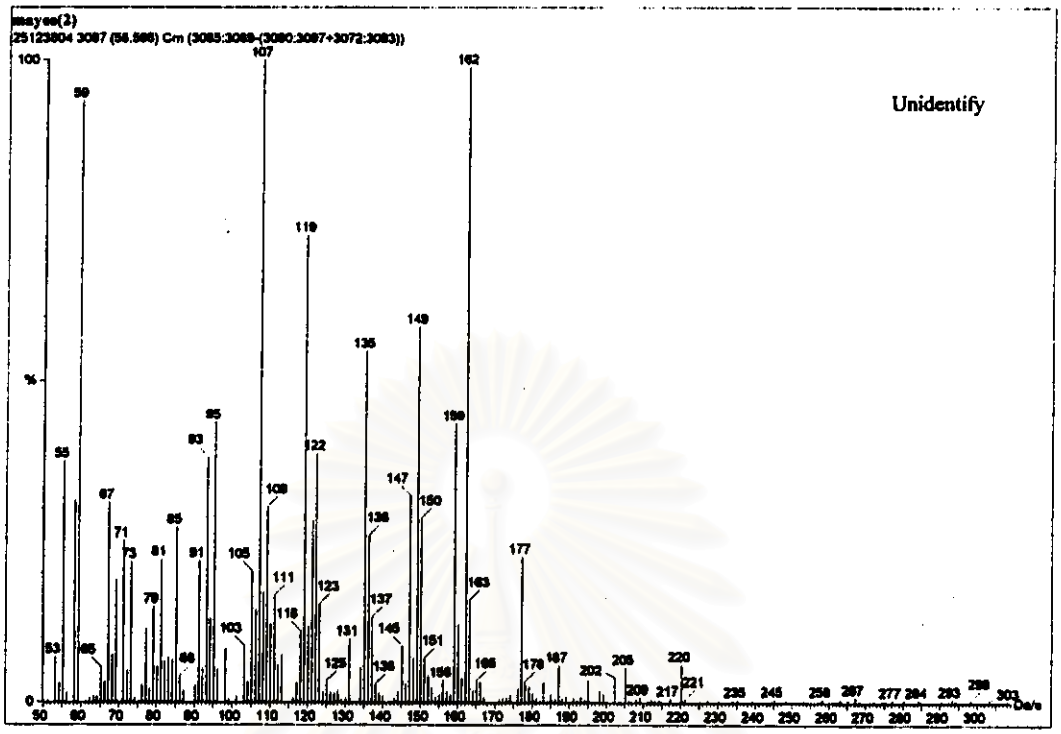

Figure 26 The mass spectrum of essential oil at retention time 58.59 min

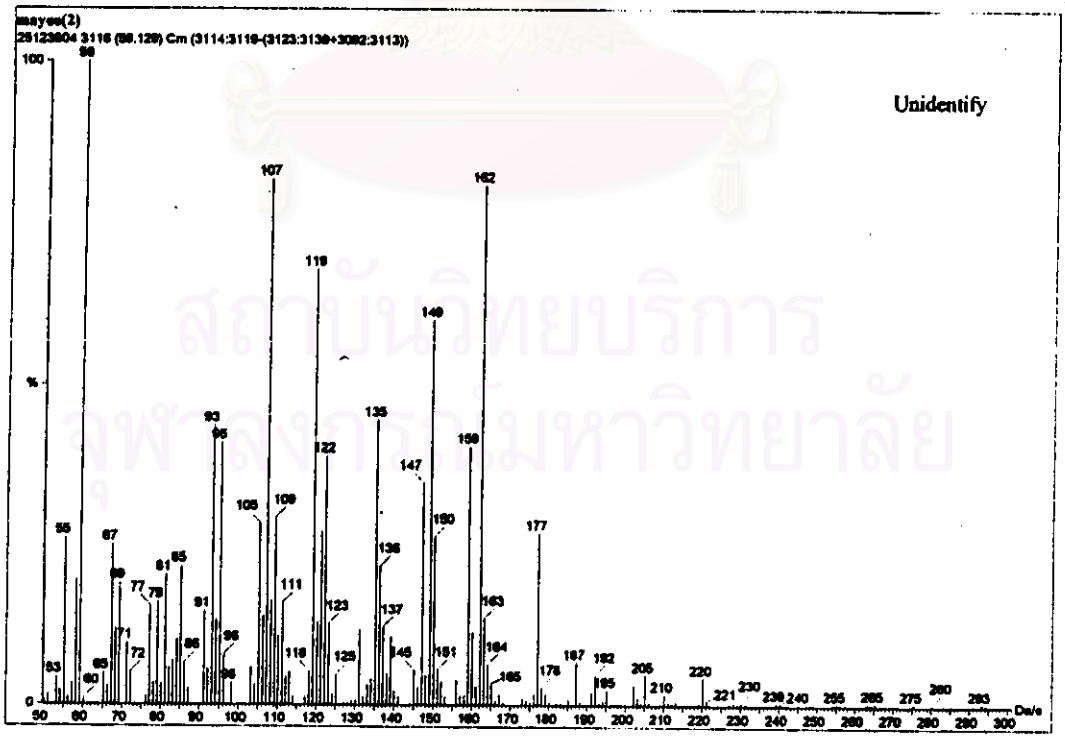

Figure 27 The mass spectrum of essential oil at retention time 59.12 min

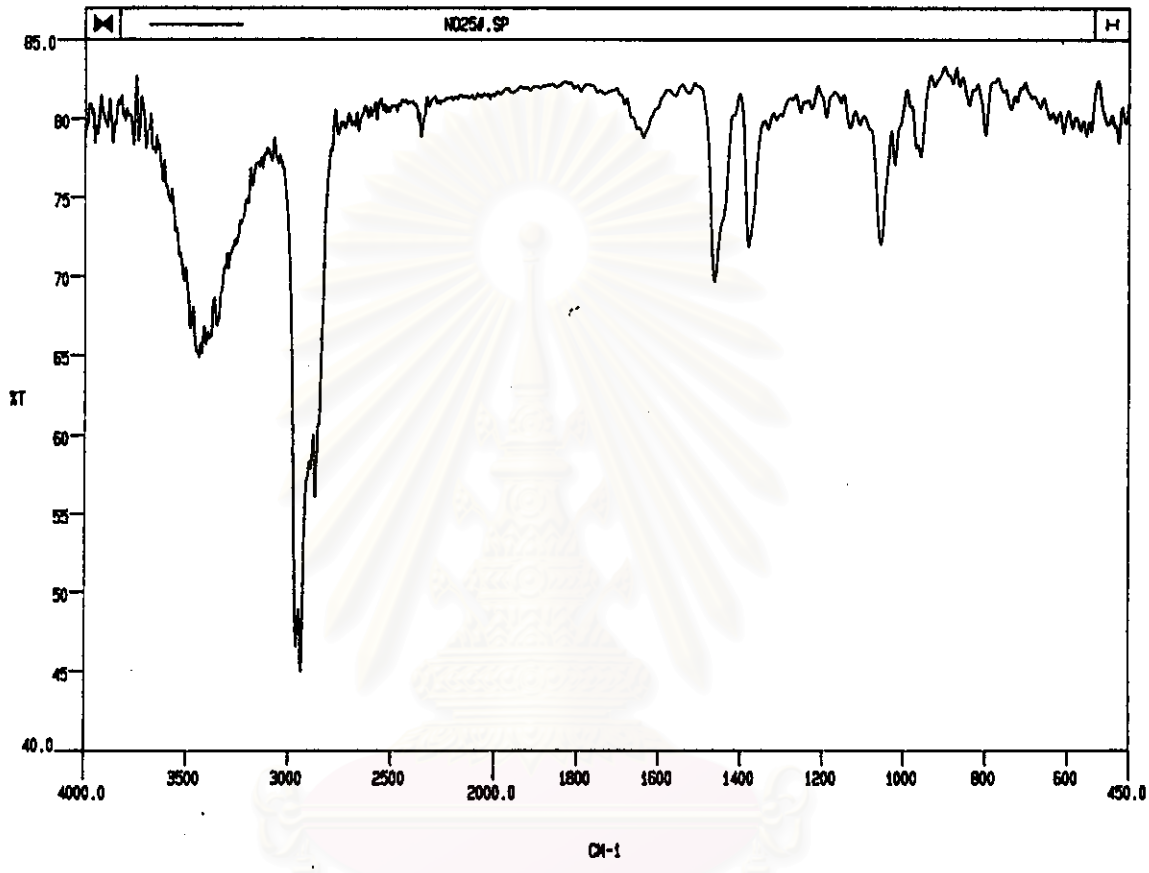

Figure 28 The IR spectrum of Mixture 1

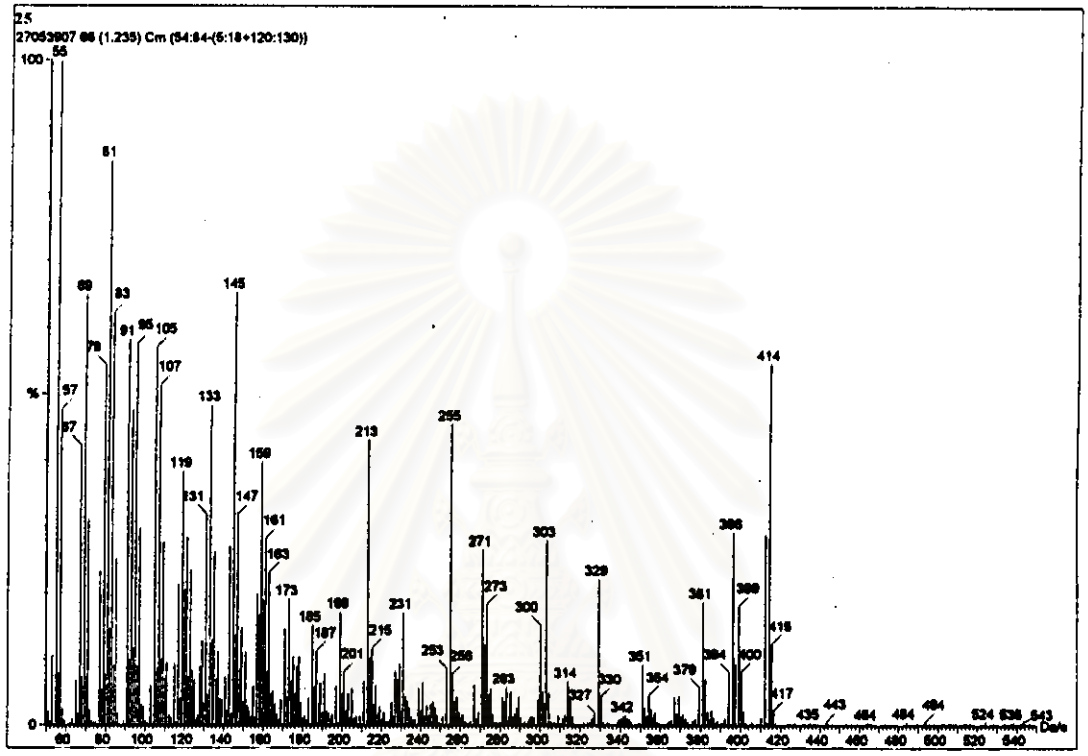

Figure 29 The mass spectrum of Mixtrue 1

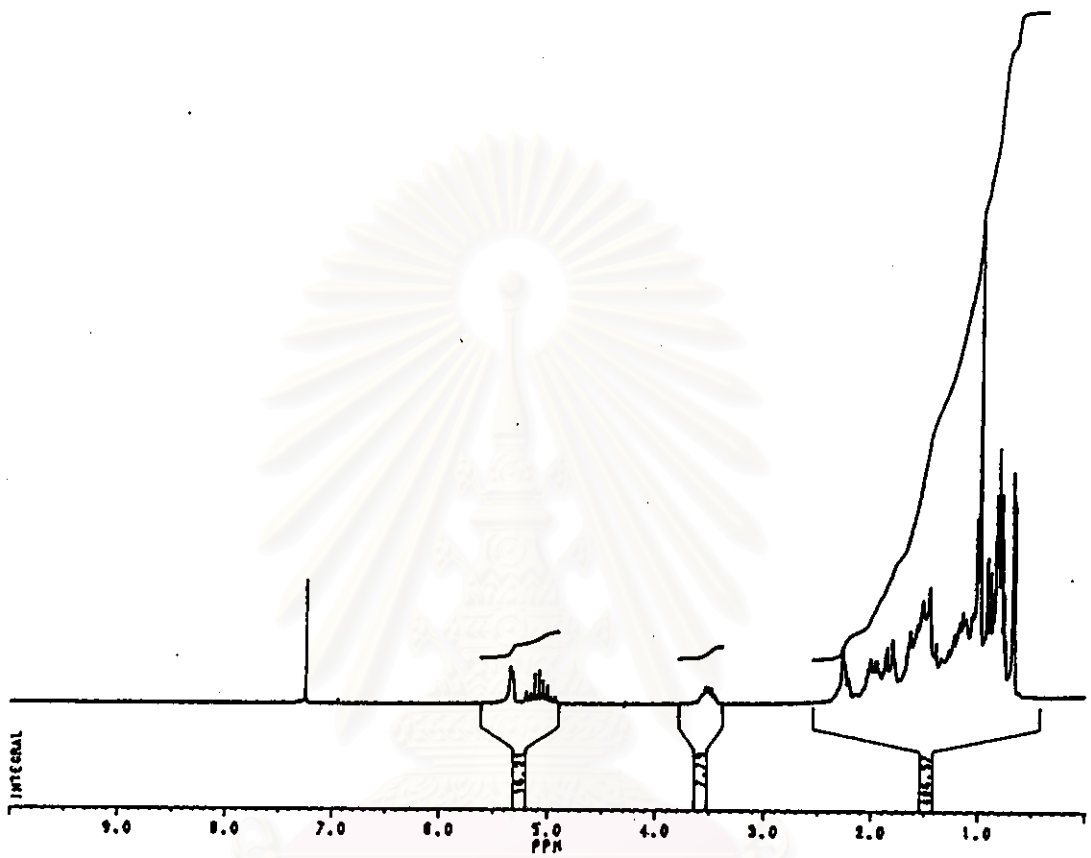

Figure 30 The ^{1}H-NMR spectrum of Mixture 1

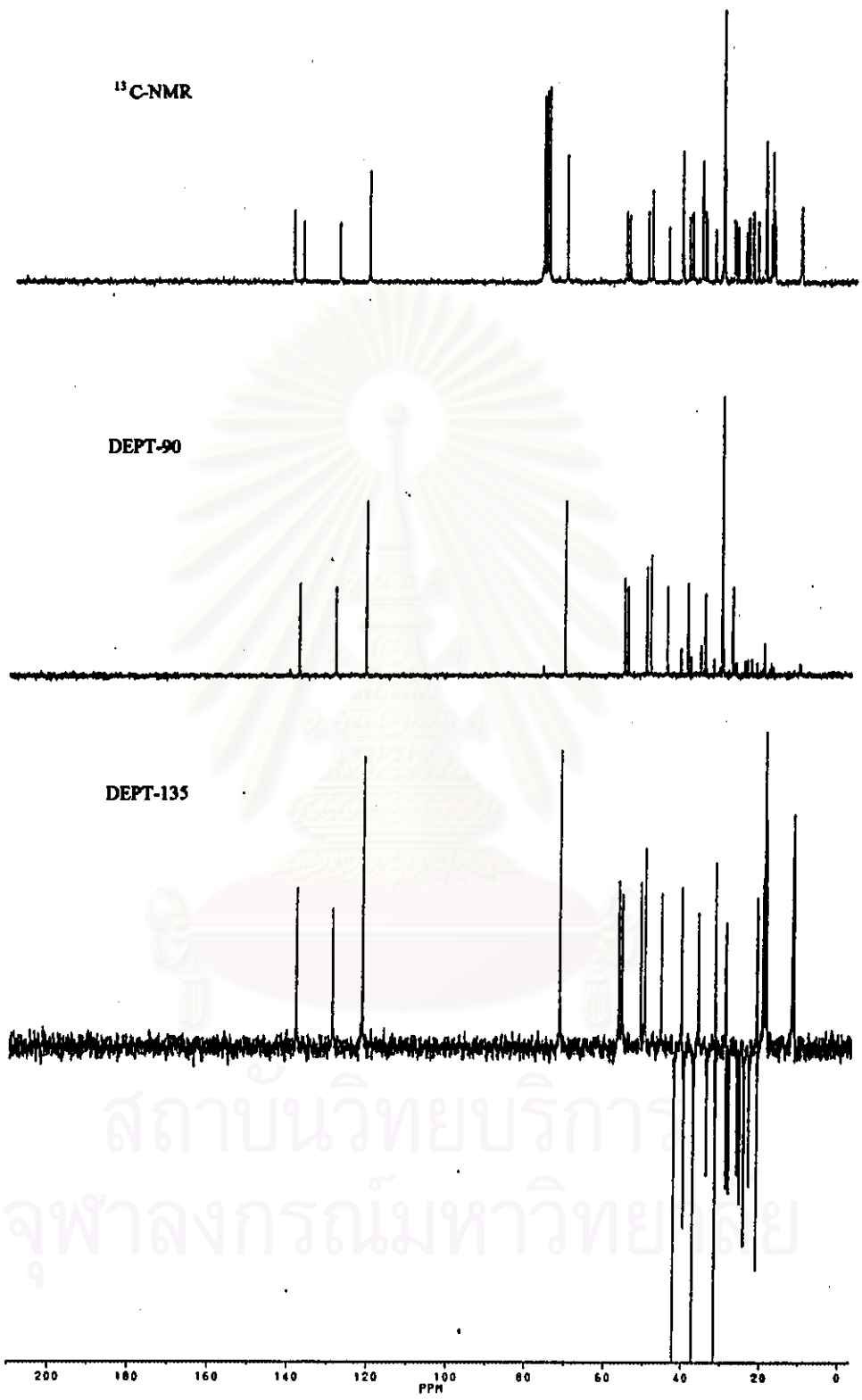

Figure 31 The ^{13}C, DEPT 90,DEPT 135-NMR spectrum of Mixture 1

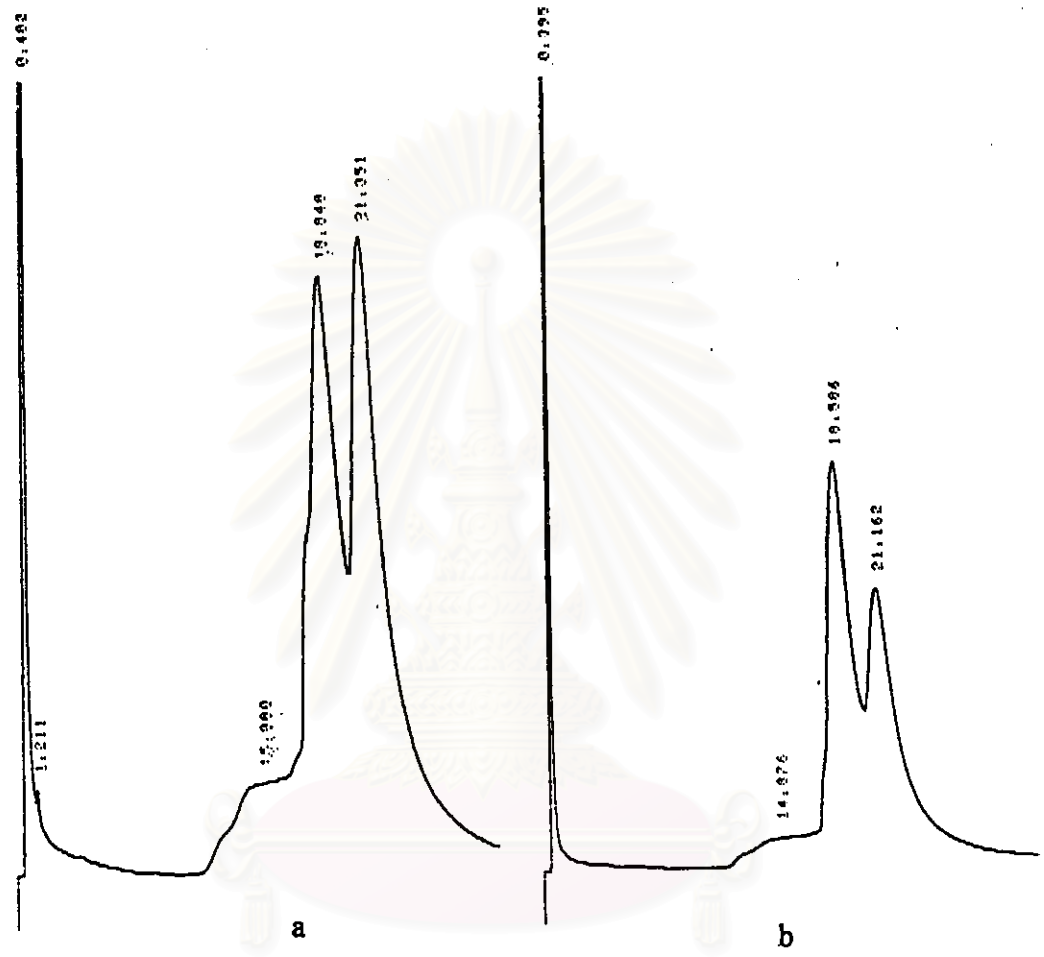

Figure 32 The GLC analysis results of

a) standard steroid campesterol, stigmasterol, β-sitosterol

b) Mixture 1

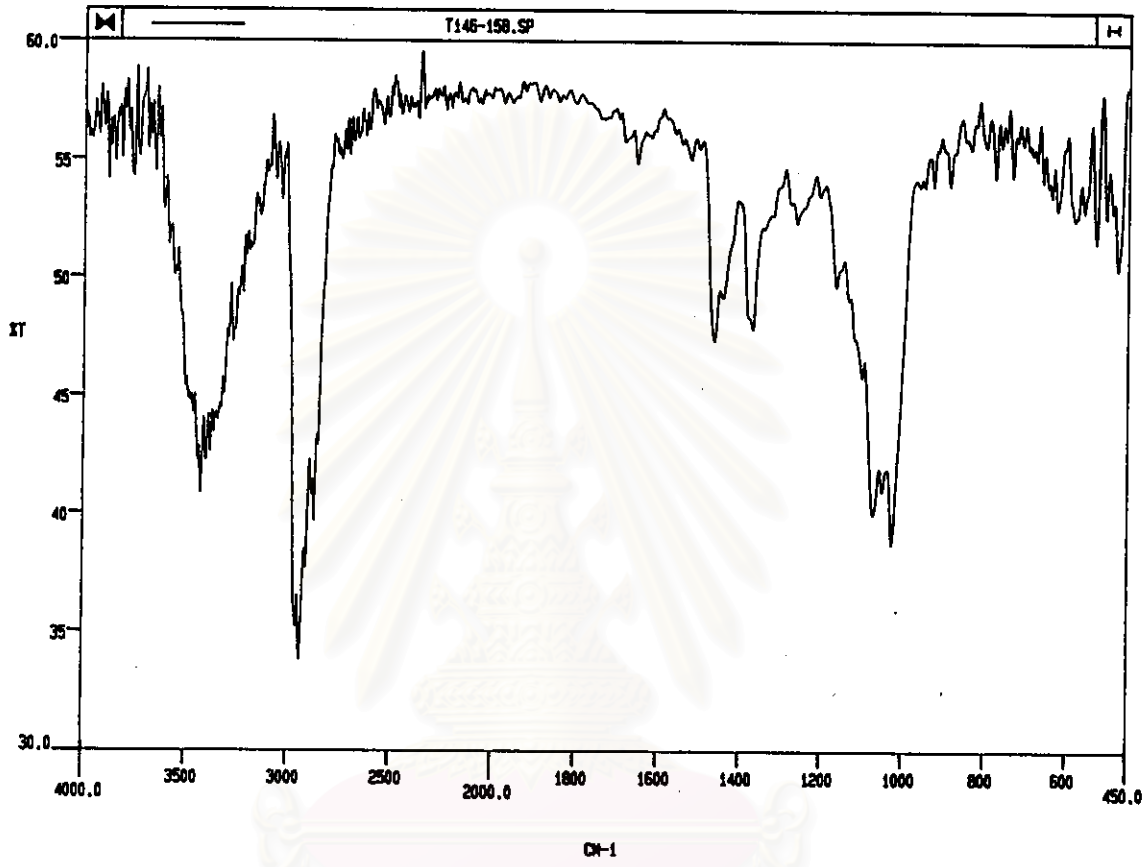

Figure 33 The IR spectrum of Mixture 2

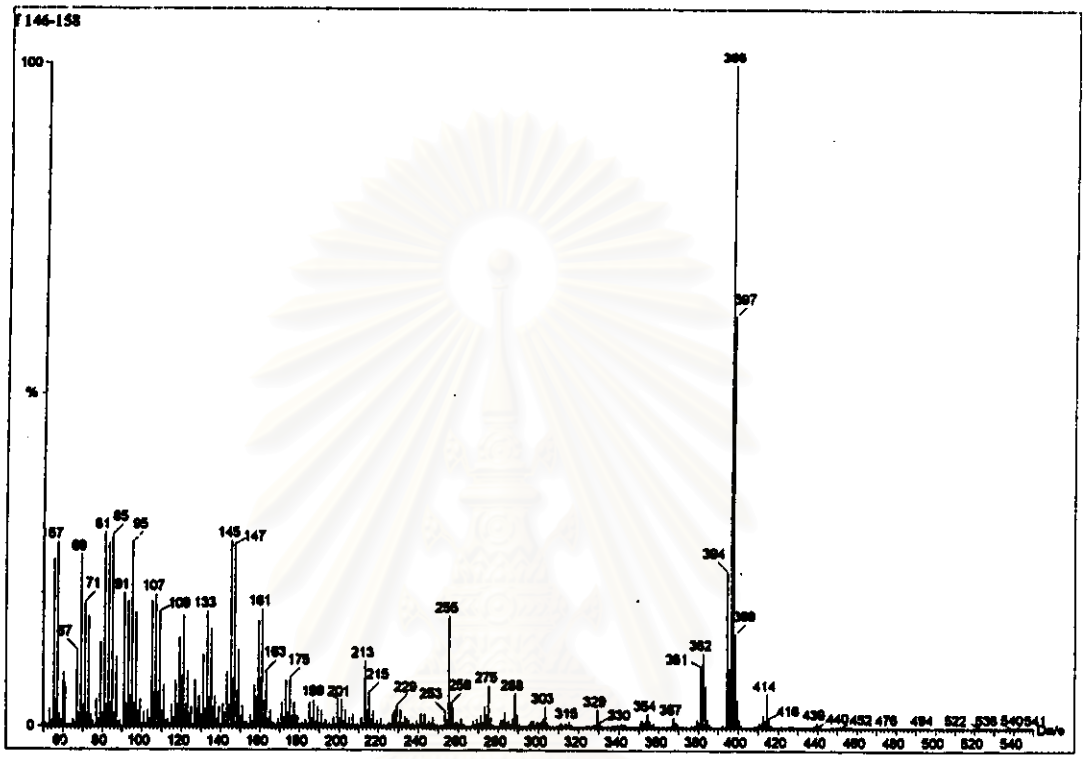

Figure 34 The mass spectrum of Mixture 2

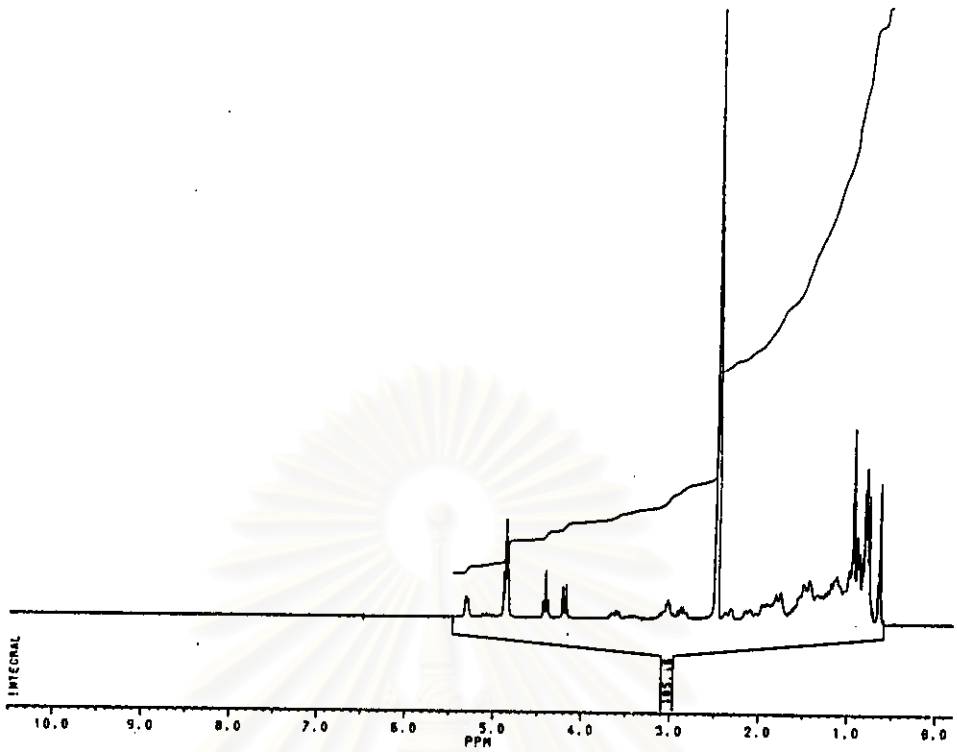

Figure 35 The ^{1}H-NMR spectrum of Mixture 2

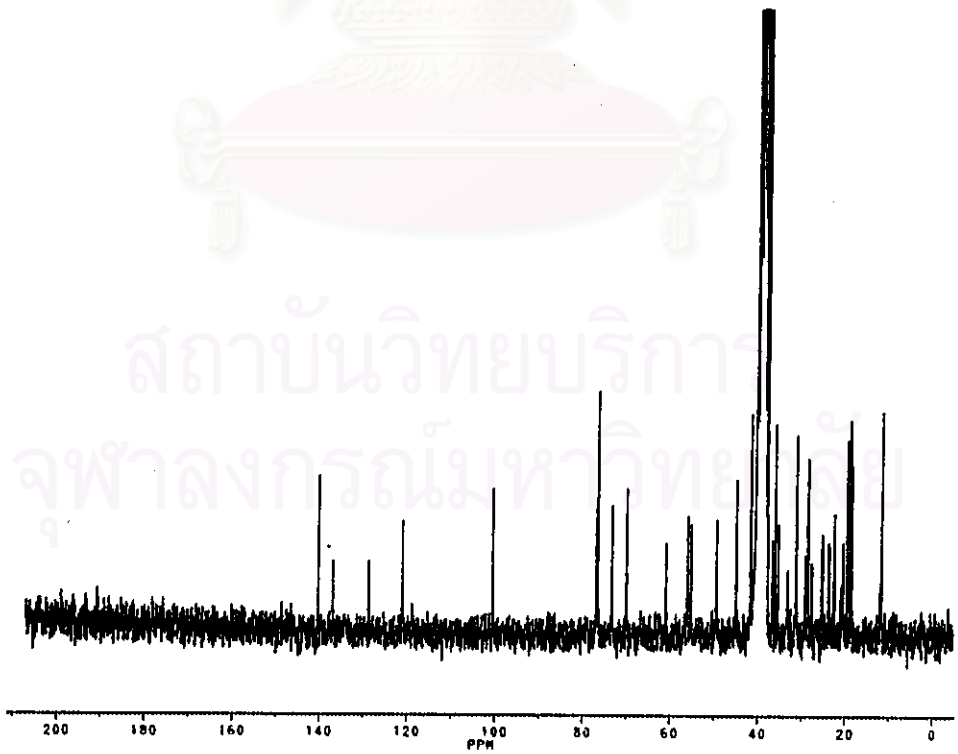

Figure 36 The ^{13}C-NMR spectrum of Mixture 2

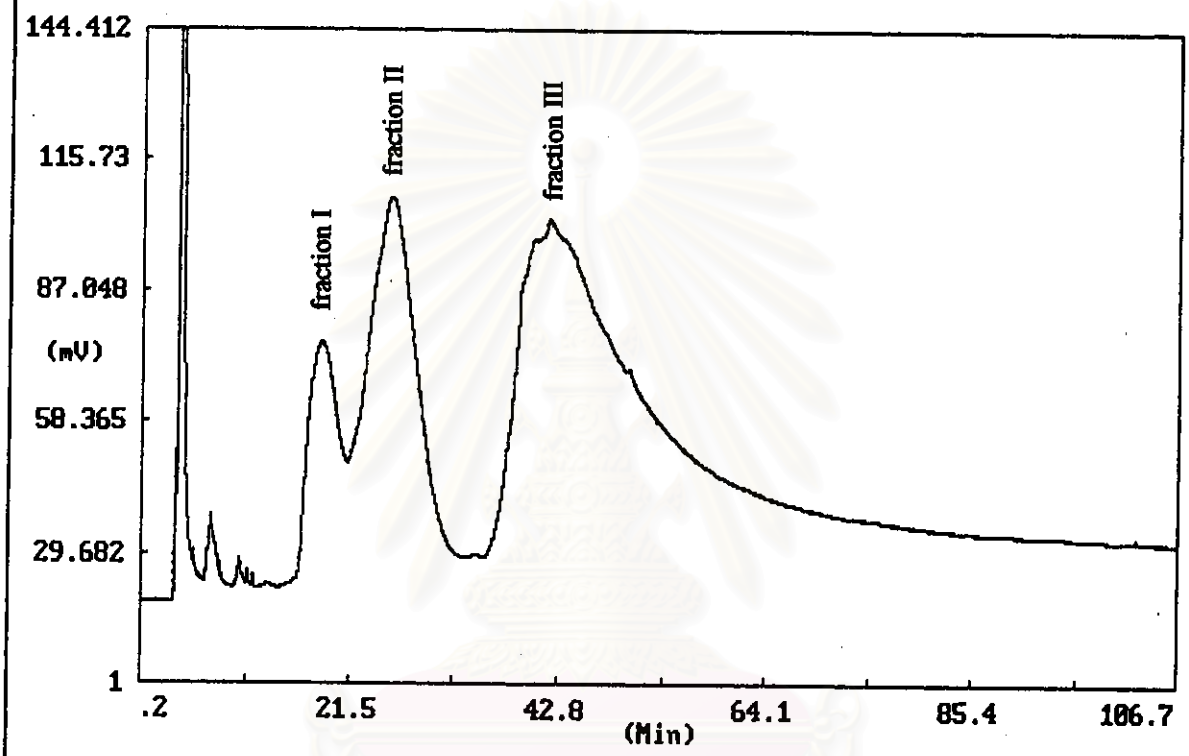

Figure 37 The GLC analysis results of Compound 3 (fraction No.19-22)

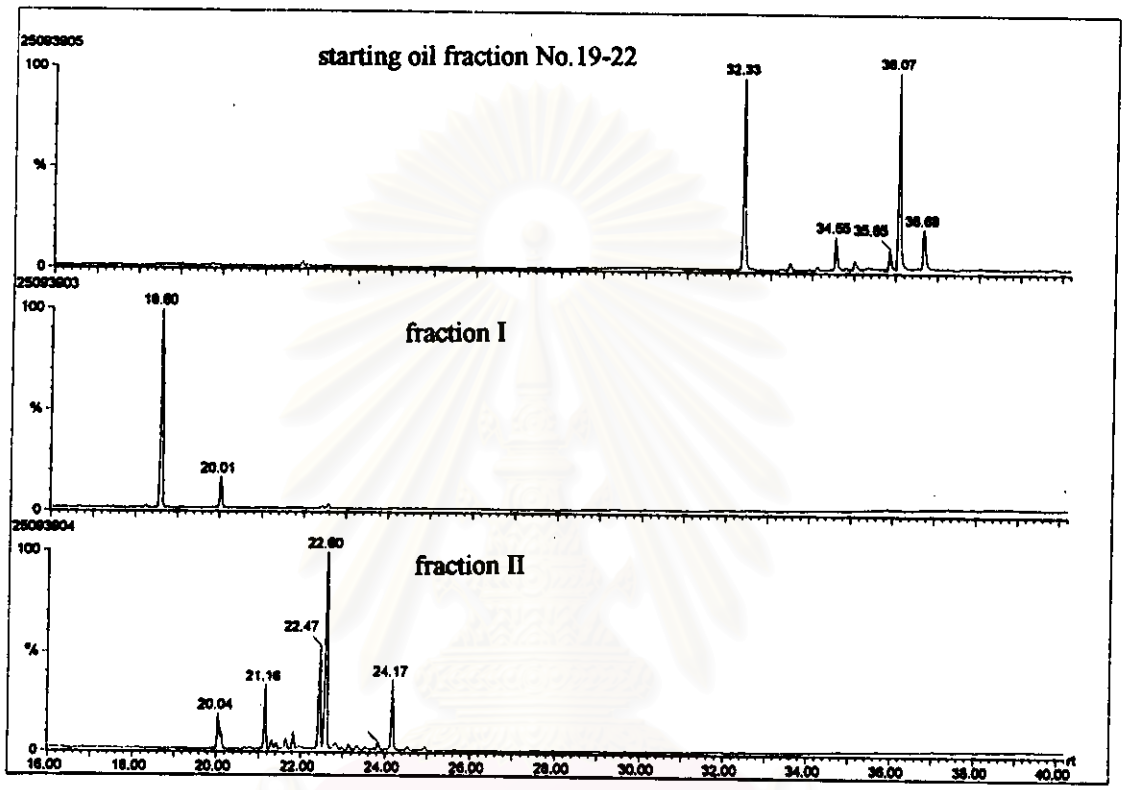

Figure 38 The GC-MS chromatogram of Compound 3 (fraction No.19-22)

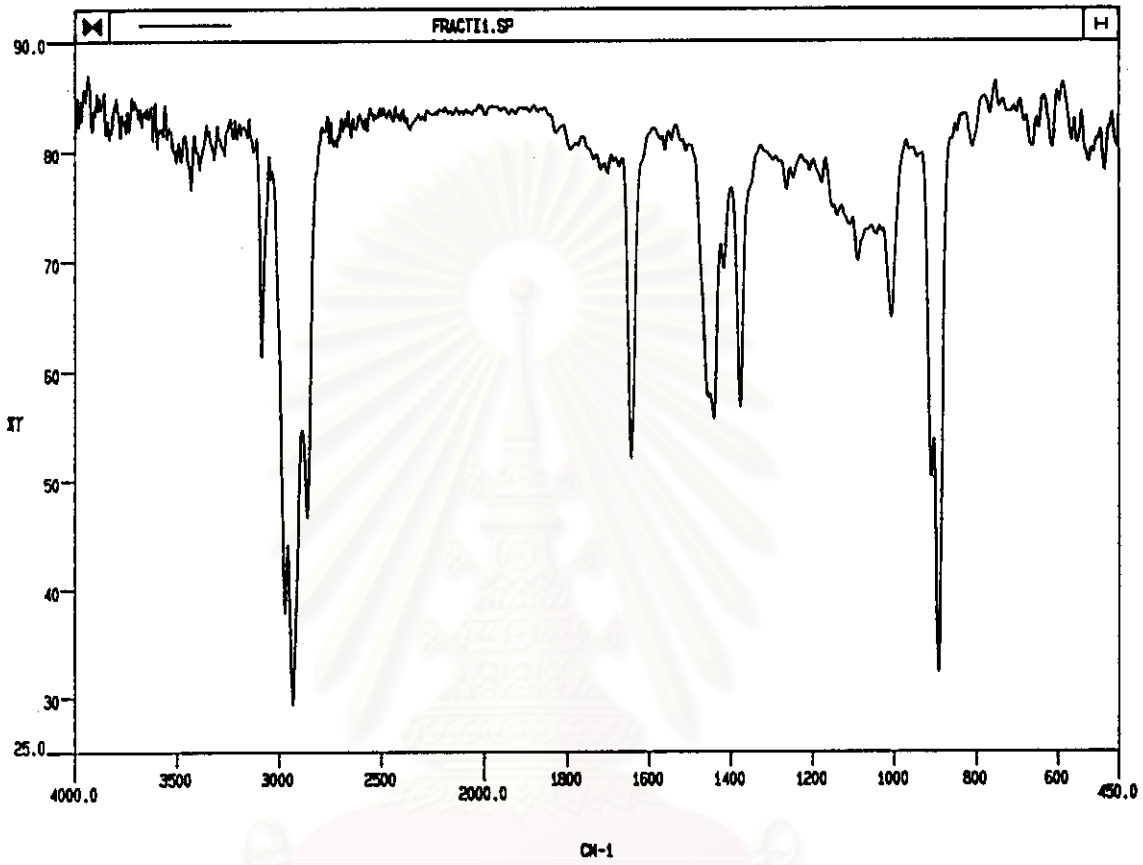

Figure 39 The IR spectrum of Compound 3A

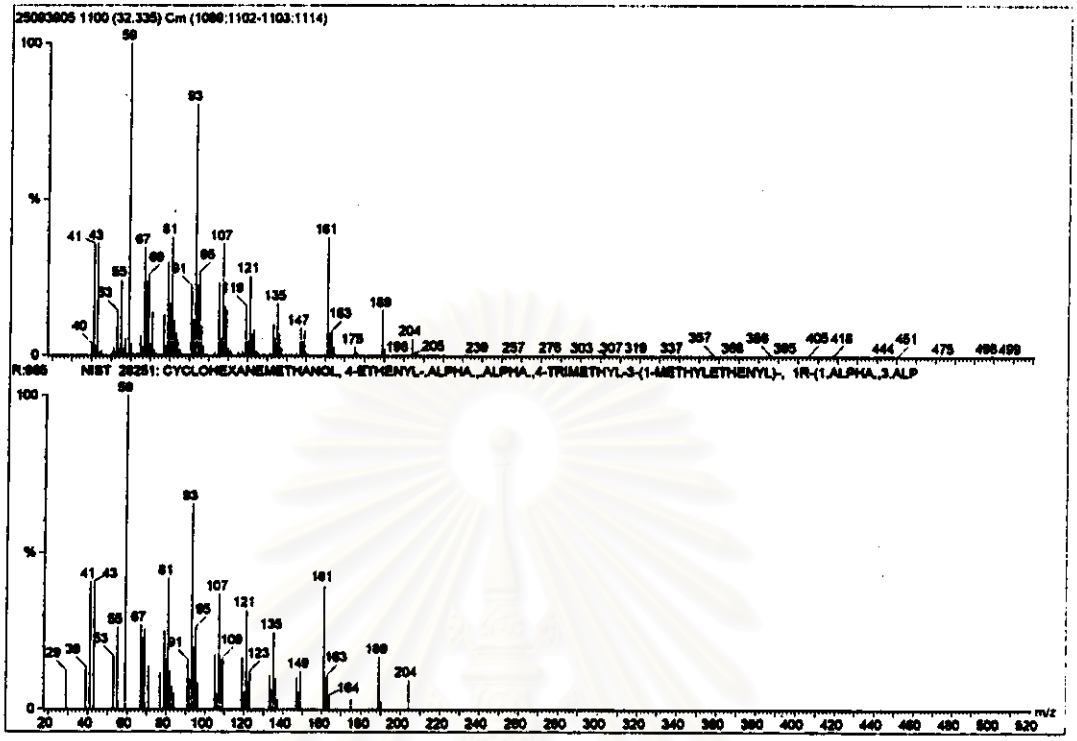

Figure 40 The mass spectrum of Compound 3 (fraction No.19-22) at retention time 32.33 min

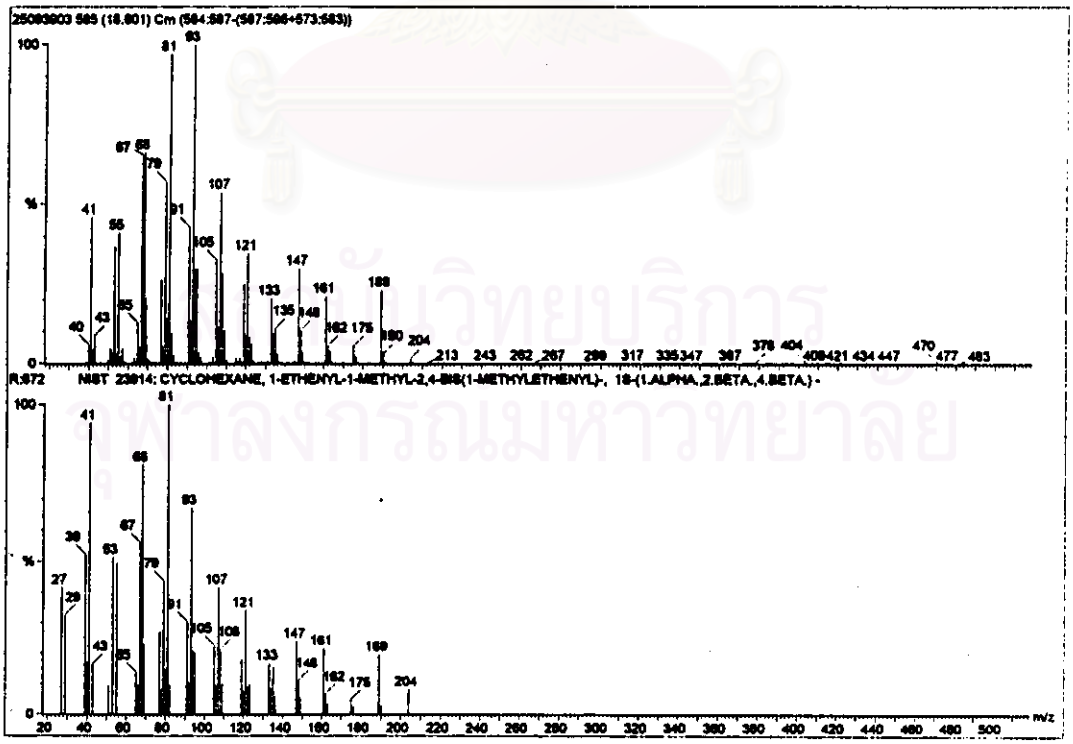

Figure 41 The mass spectrum of Compound 3A (fraction I) at retention time 18.60 min

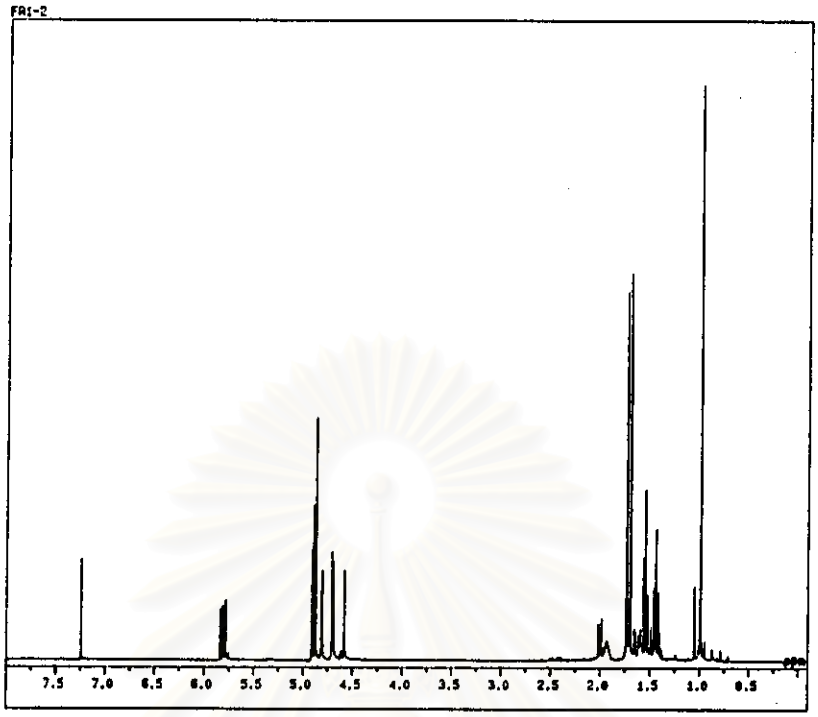

Figure 42 The ^{1}H-NMR spectrum of Compound 3A

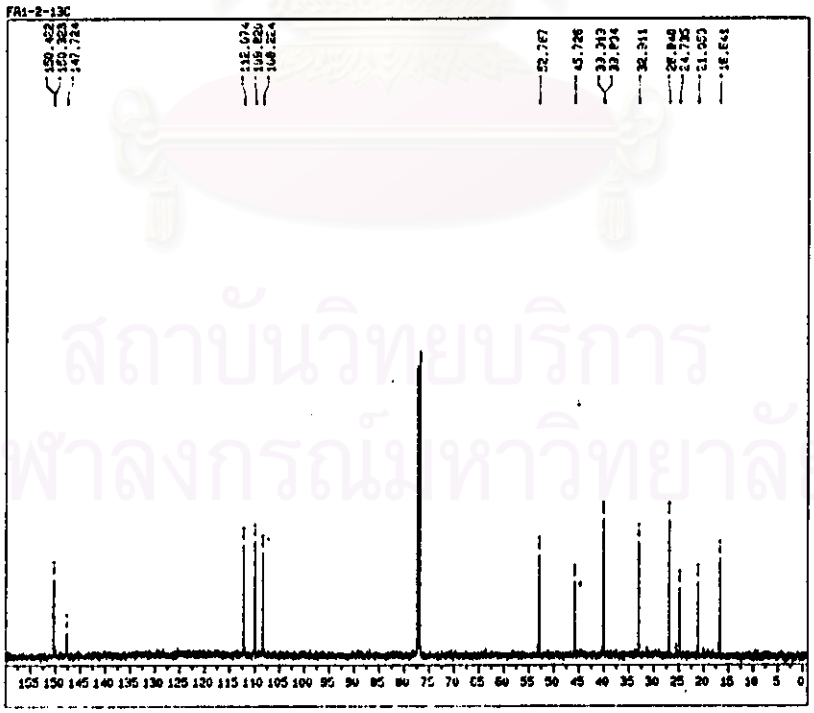

Figure 43 The ^{13}C-NMR spectrum of Compound 3A

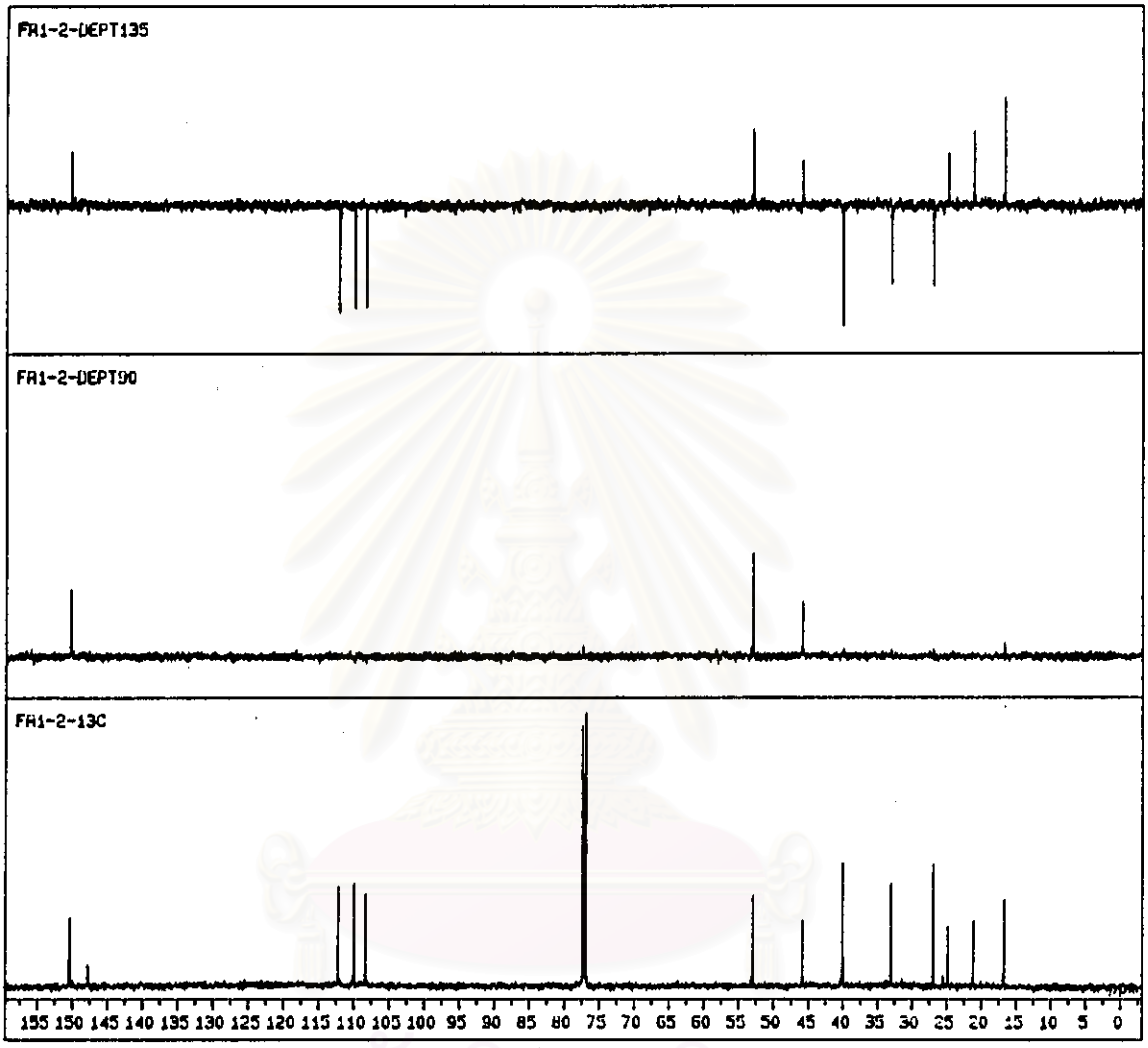

Figure 44 The DEPT 90,135 ^{13}C-NMR spectrum of Compound 3A

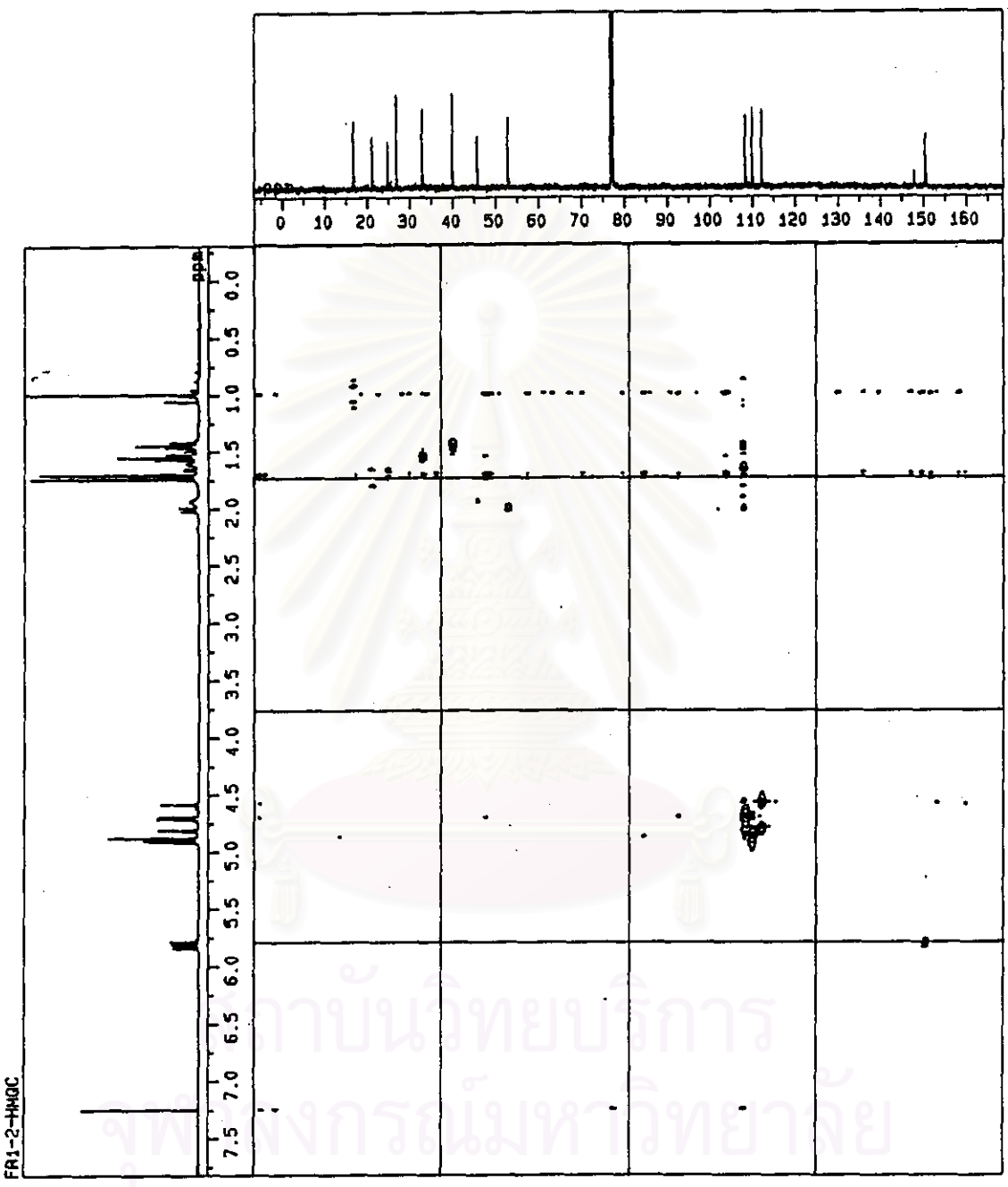

Figure 45 The HMQC spectrum of Compound 3A

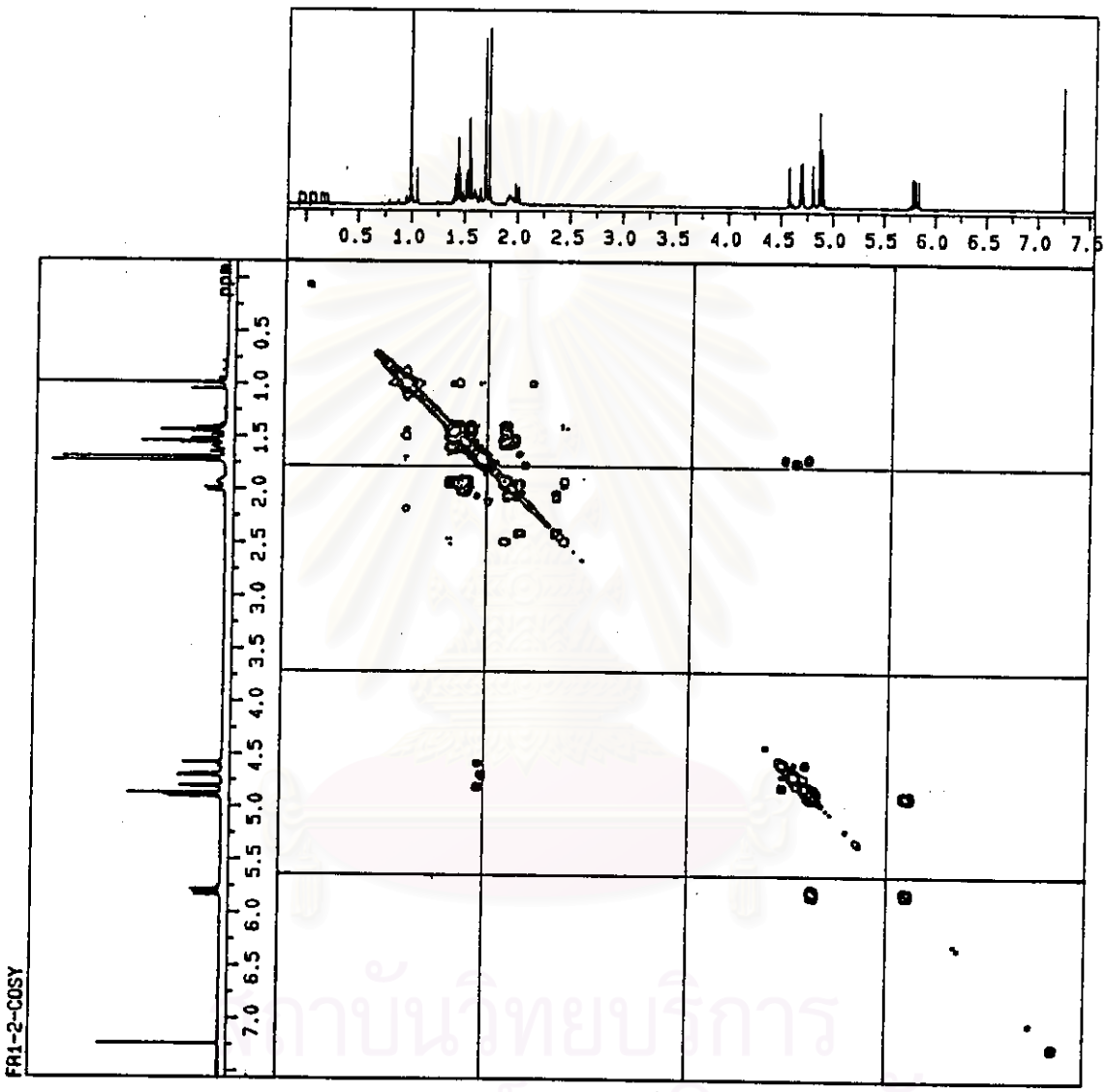

Figure 46 The H-H cosy spectrum of Conpound 3A

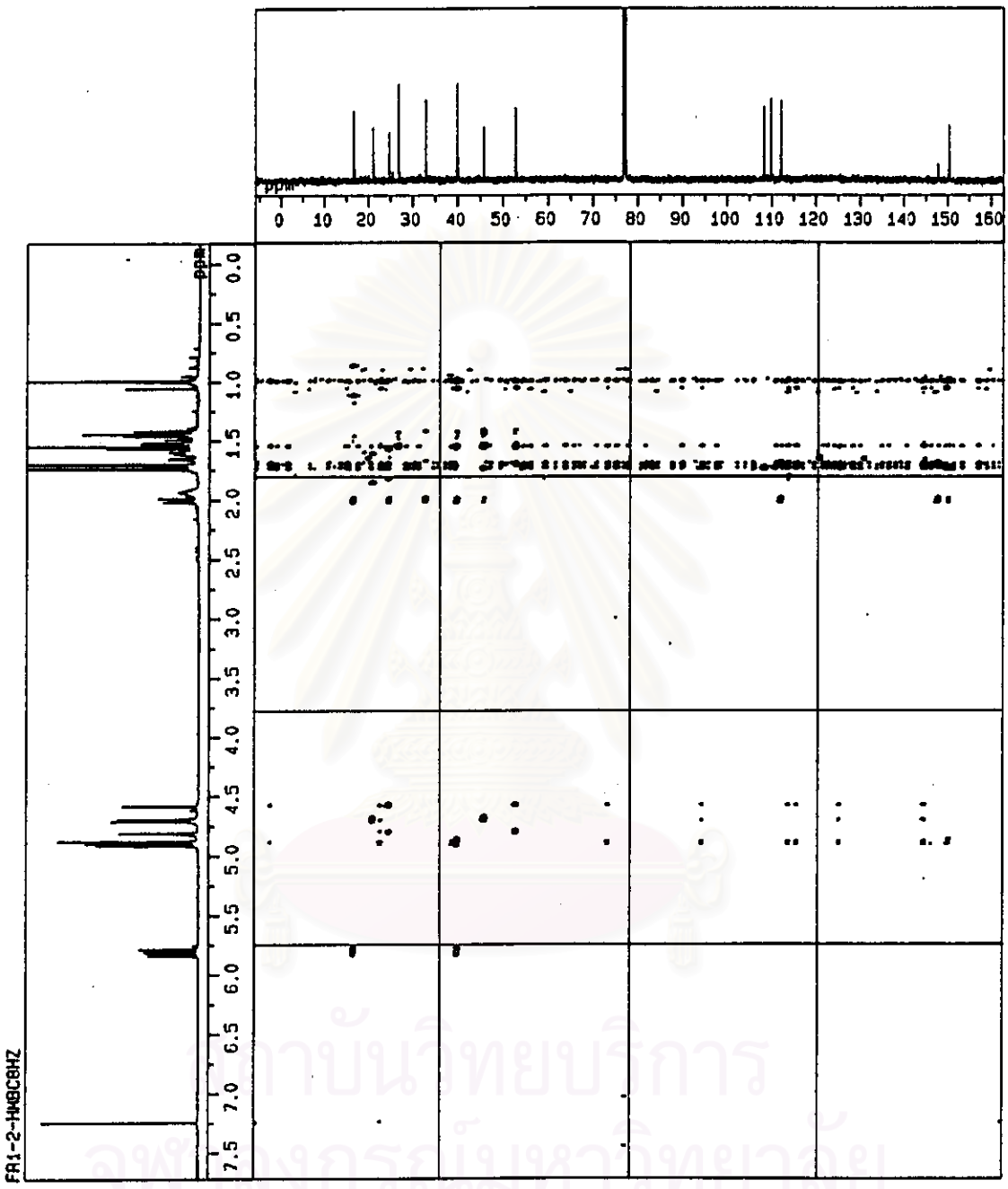

Figure 47 The HMBC spectrum of Compound 3A

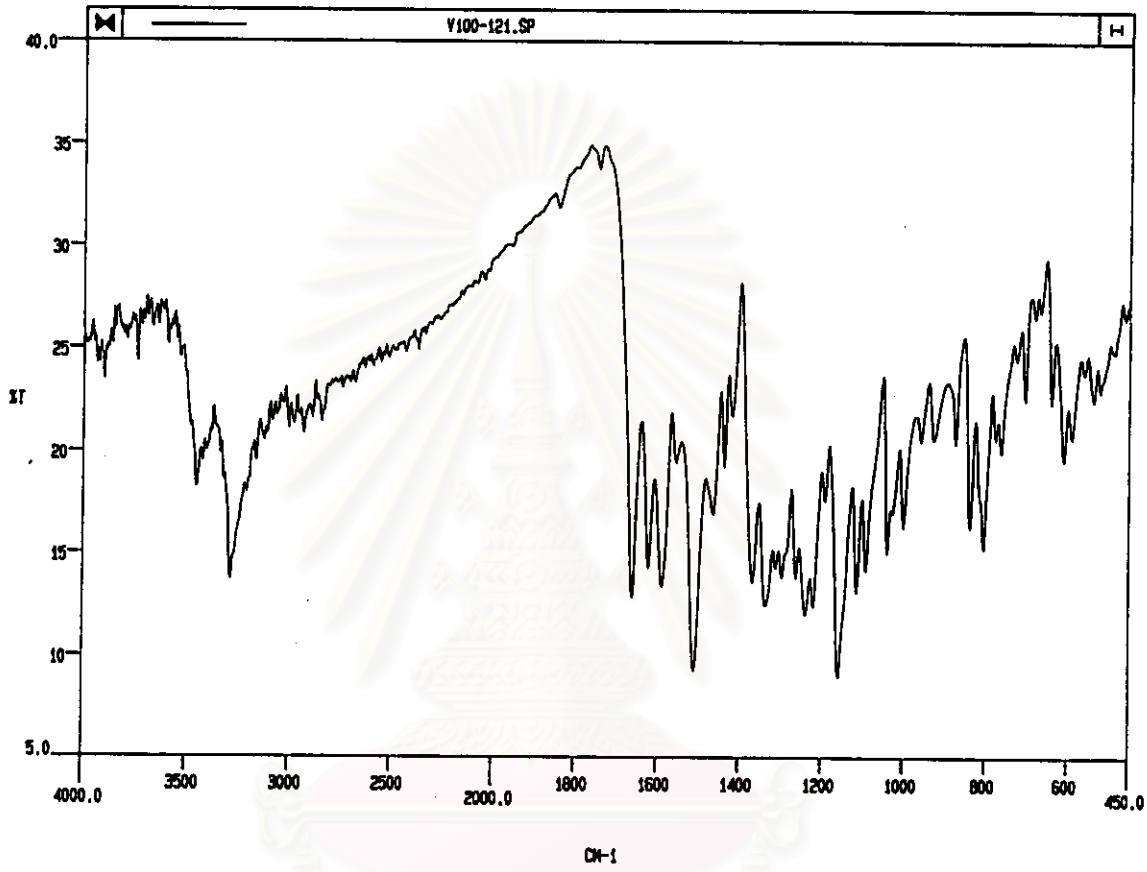

Figure 48 The IR spectrum of Compound 4

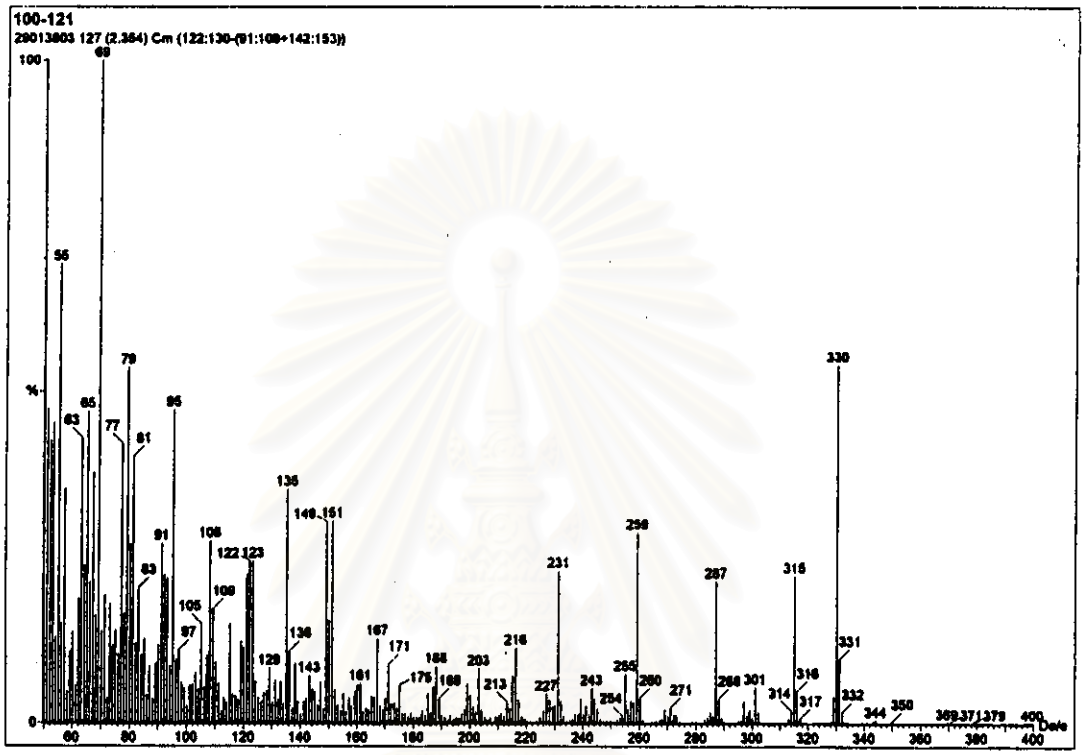

Figure 49 The mass spectrum of Compound 4

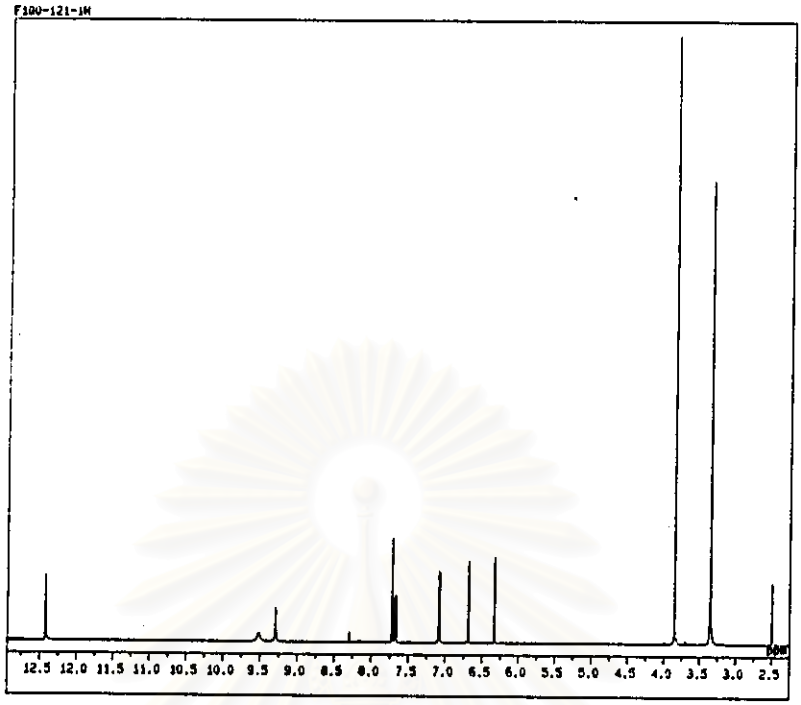

Figure 50 The ^{1}H-NMR spectrum of Compound 4

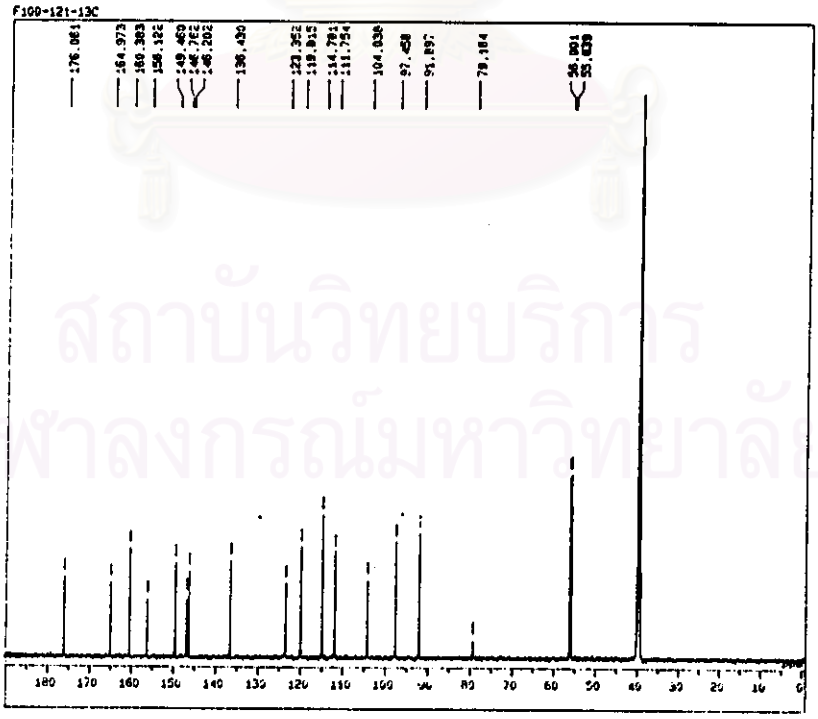

Figure 51 The ^{13}C-NMR spectrum of Compound 4

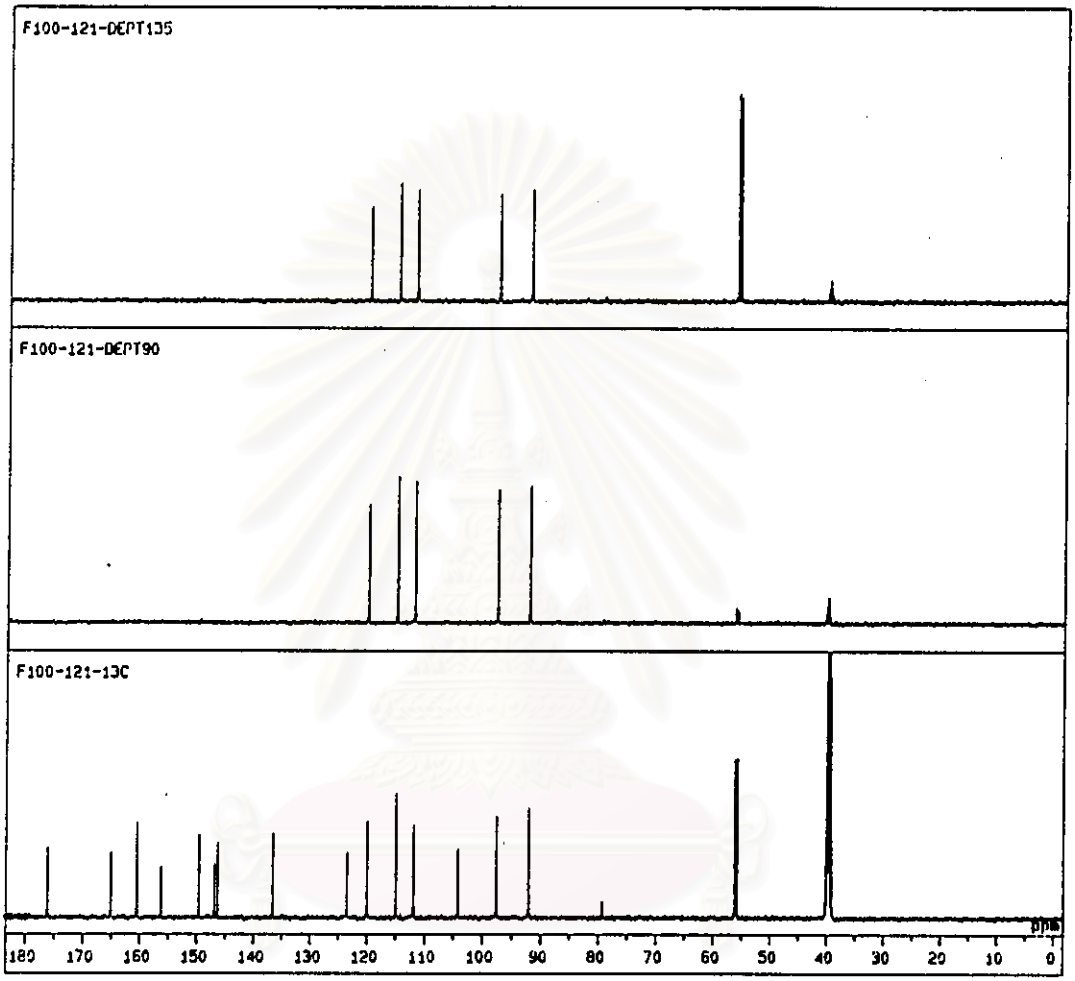

Figure 52 The DEPT 90, 135 ^{13}C-NMR spectrum of Compound 4

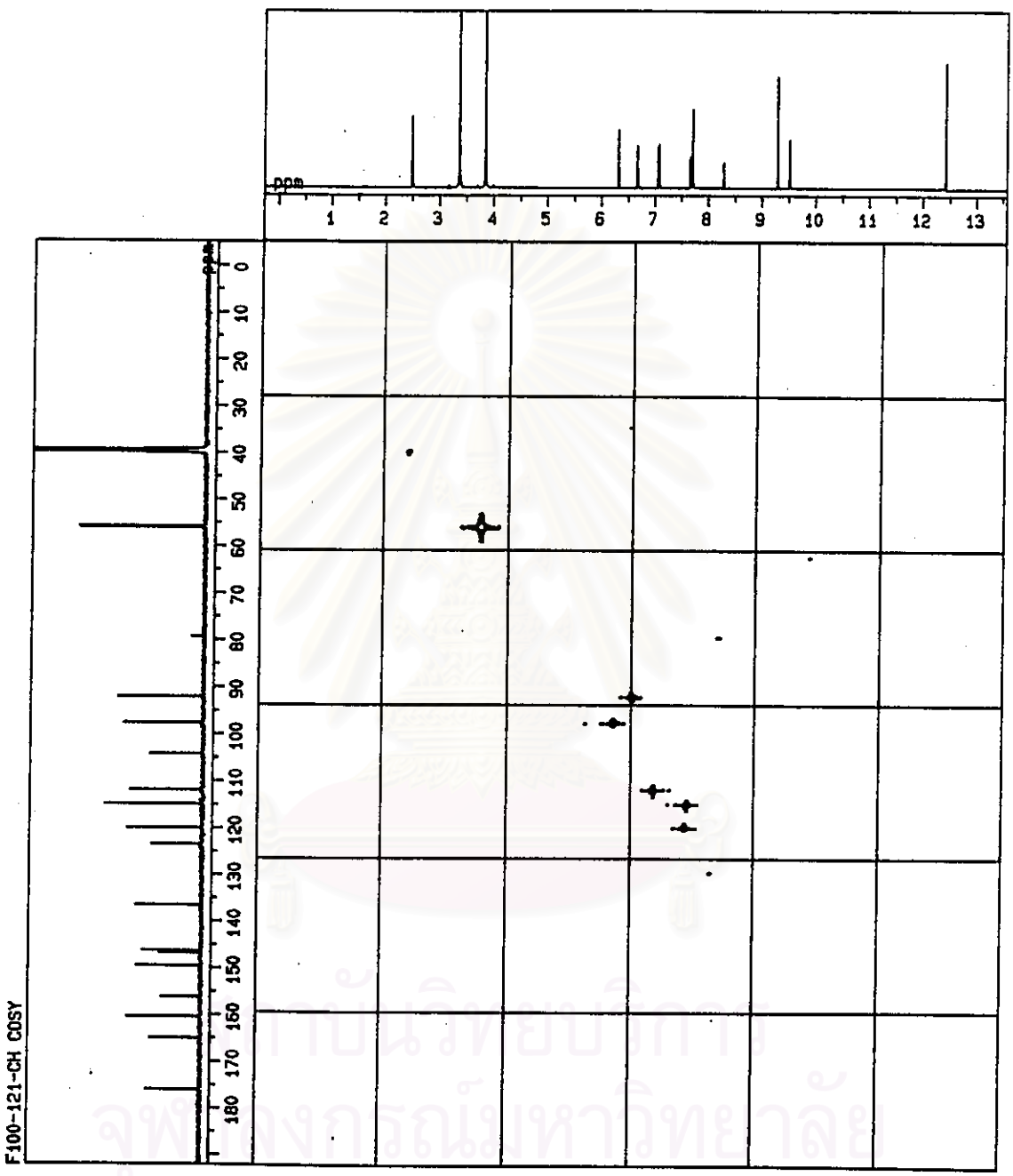

Figure 53 The HMQC spectrum of Compound 4

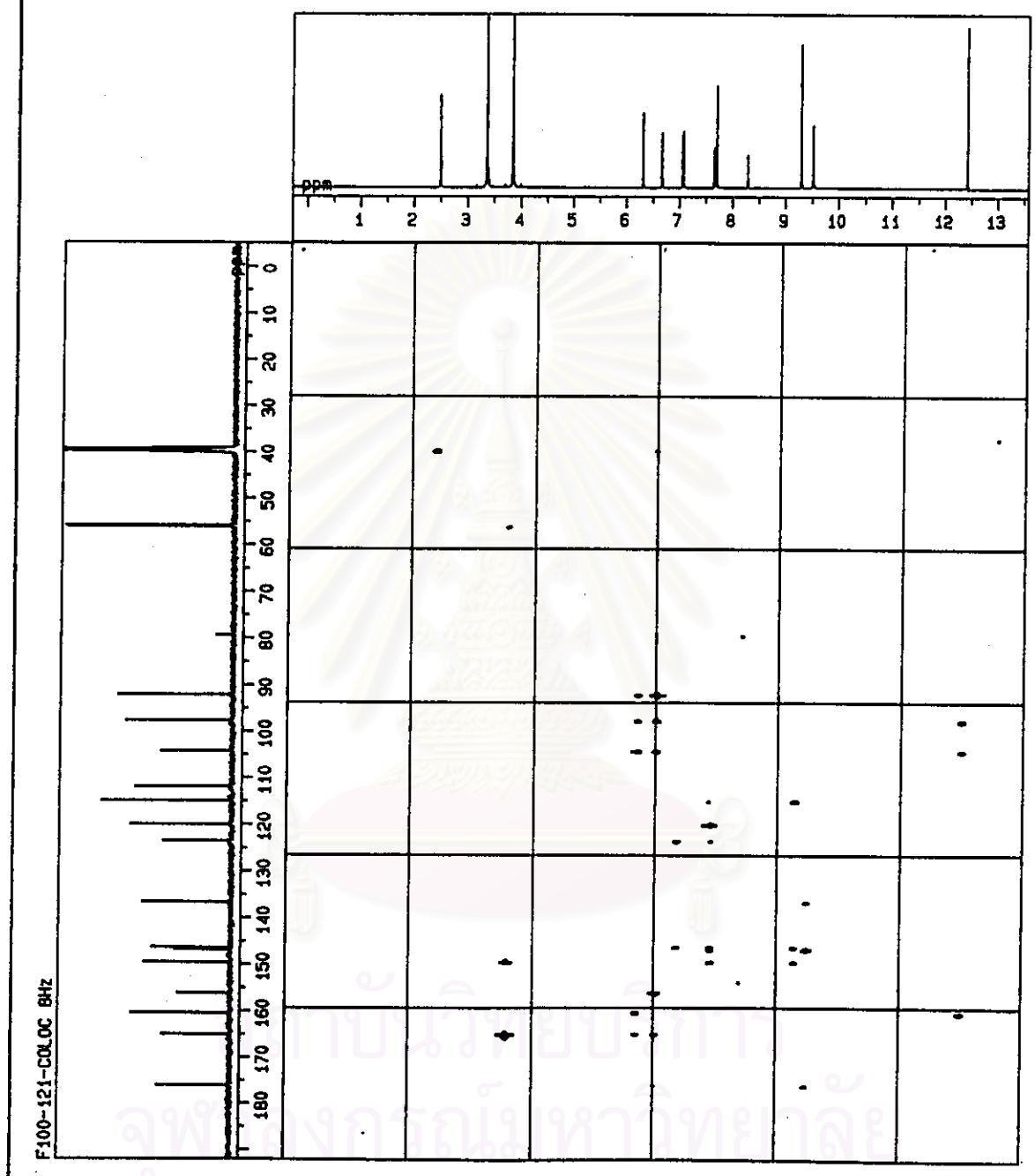

Figure 54 The MHBC spectrum of Compound 4

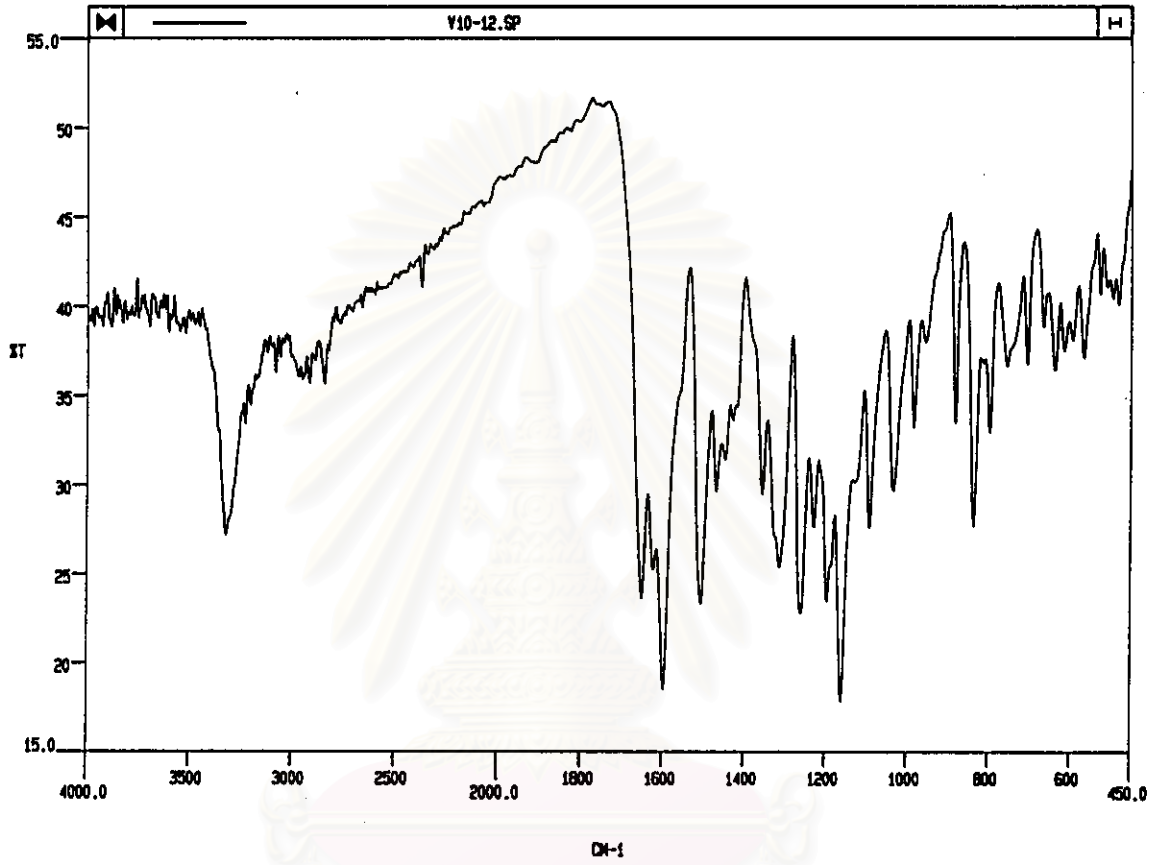

Figure 55 The IR spectrum of Compound 5

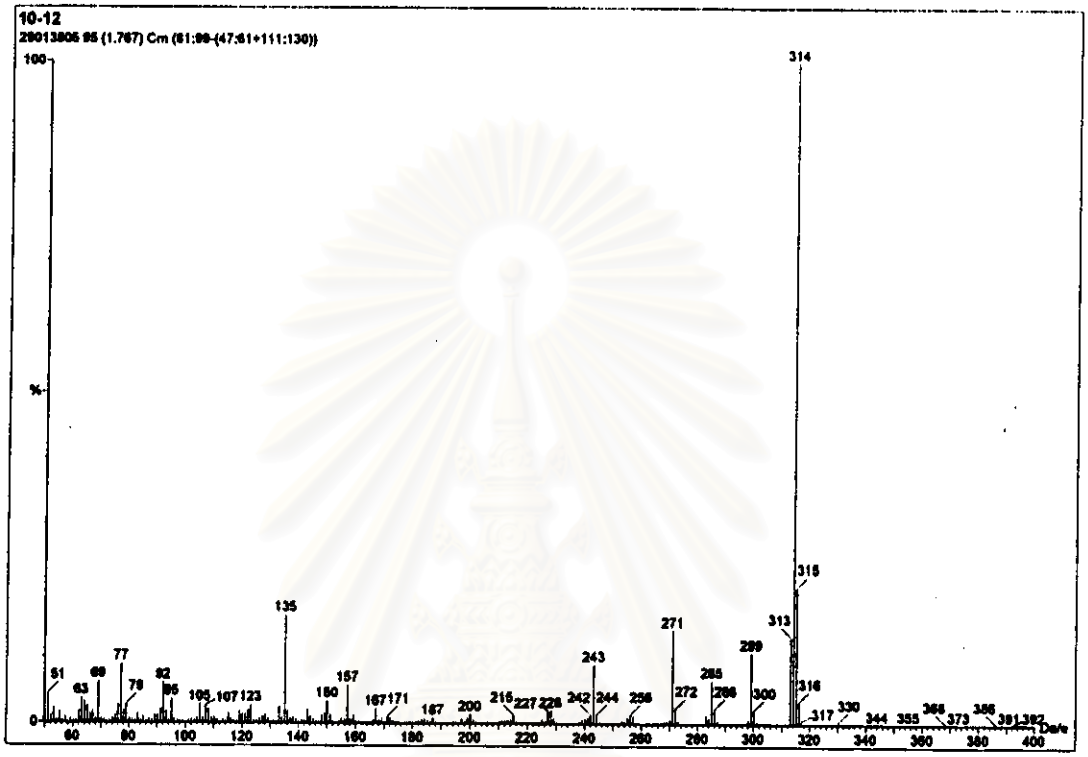

Figure 56 The mass spectrum of Compound 5

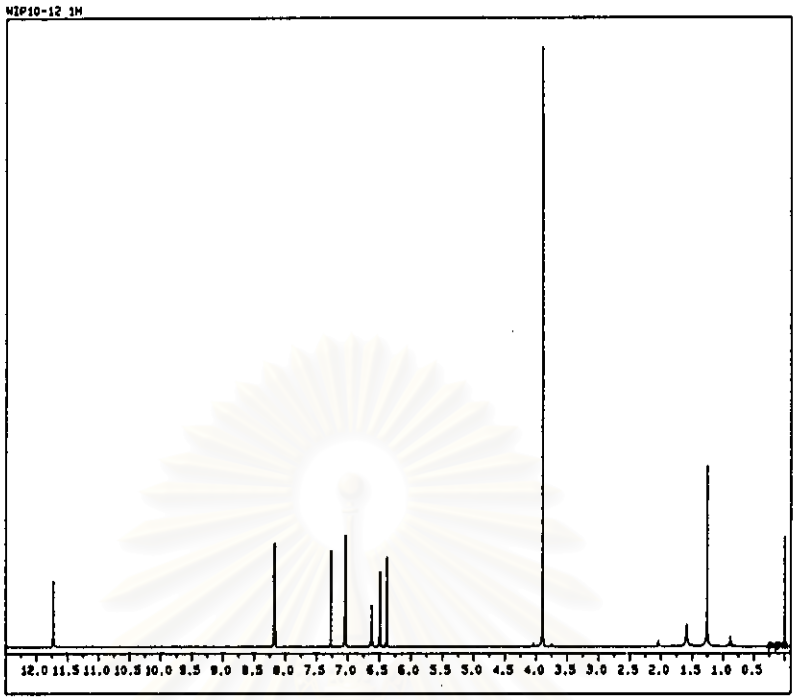

Figure 57 The ^{1}H-NMR spectrum of Compound 5

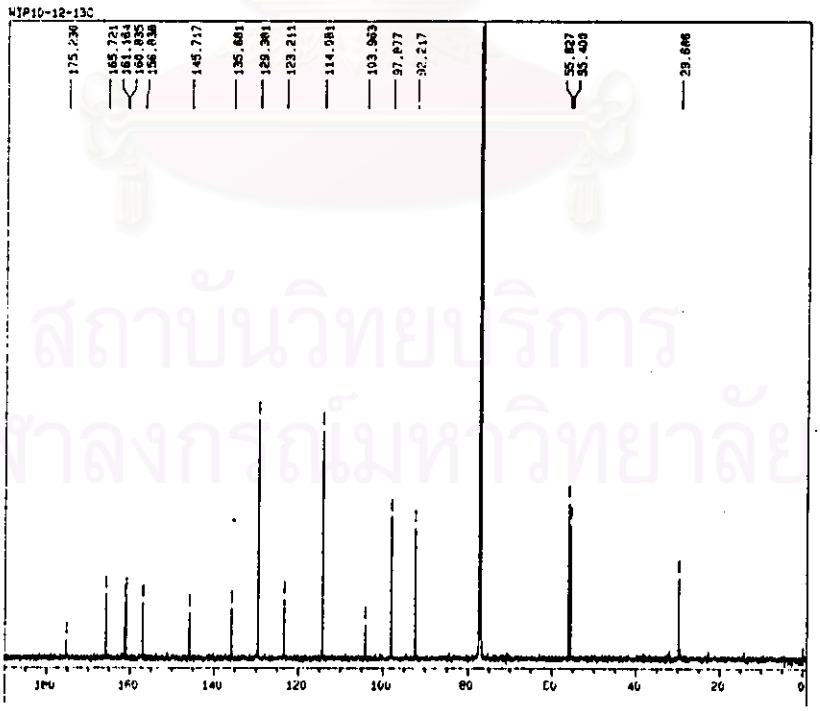

Figure 58 The ^{13}C-NMR spectrum of Compound 5

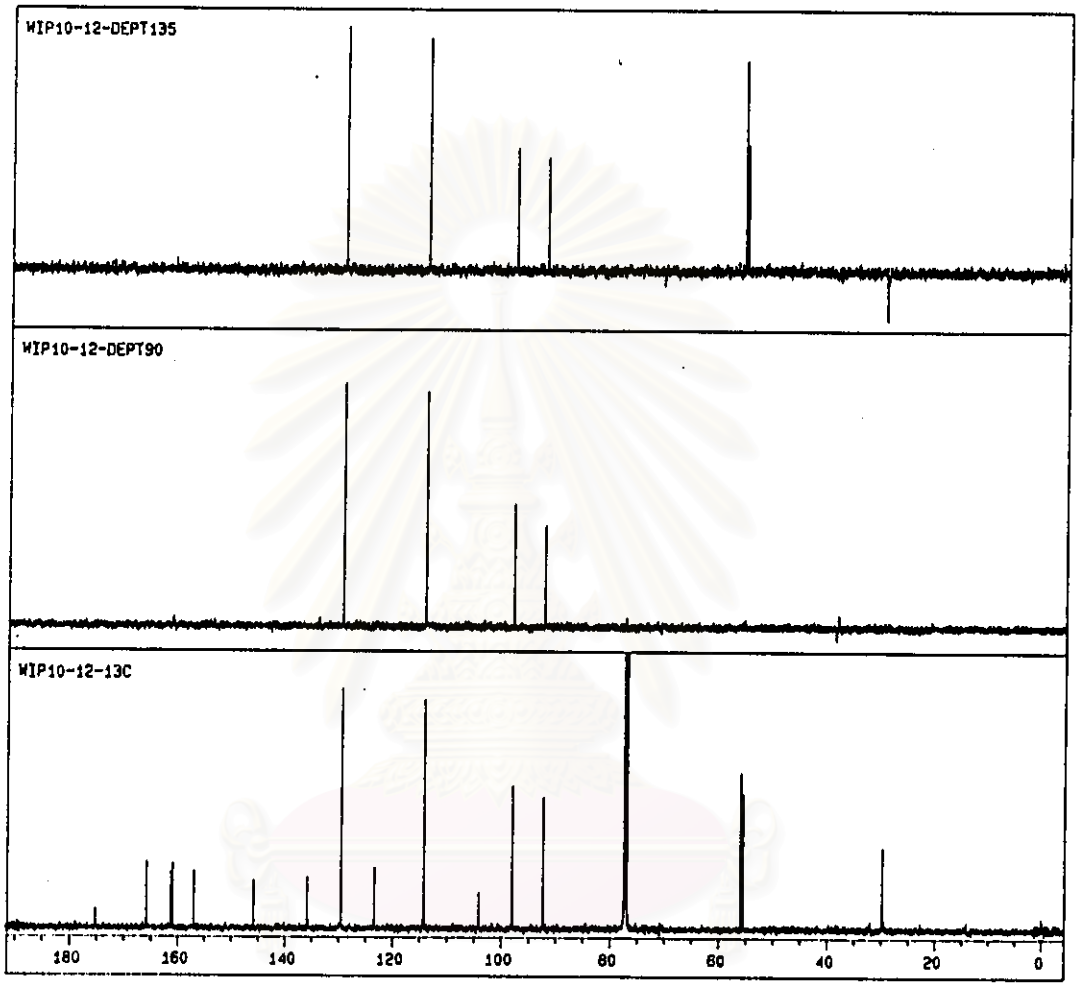

Figure 59 The DEPT 90, 135 ^{13}C-NMR spectrum of Compound 5

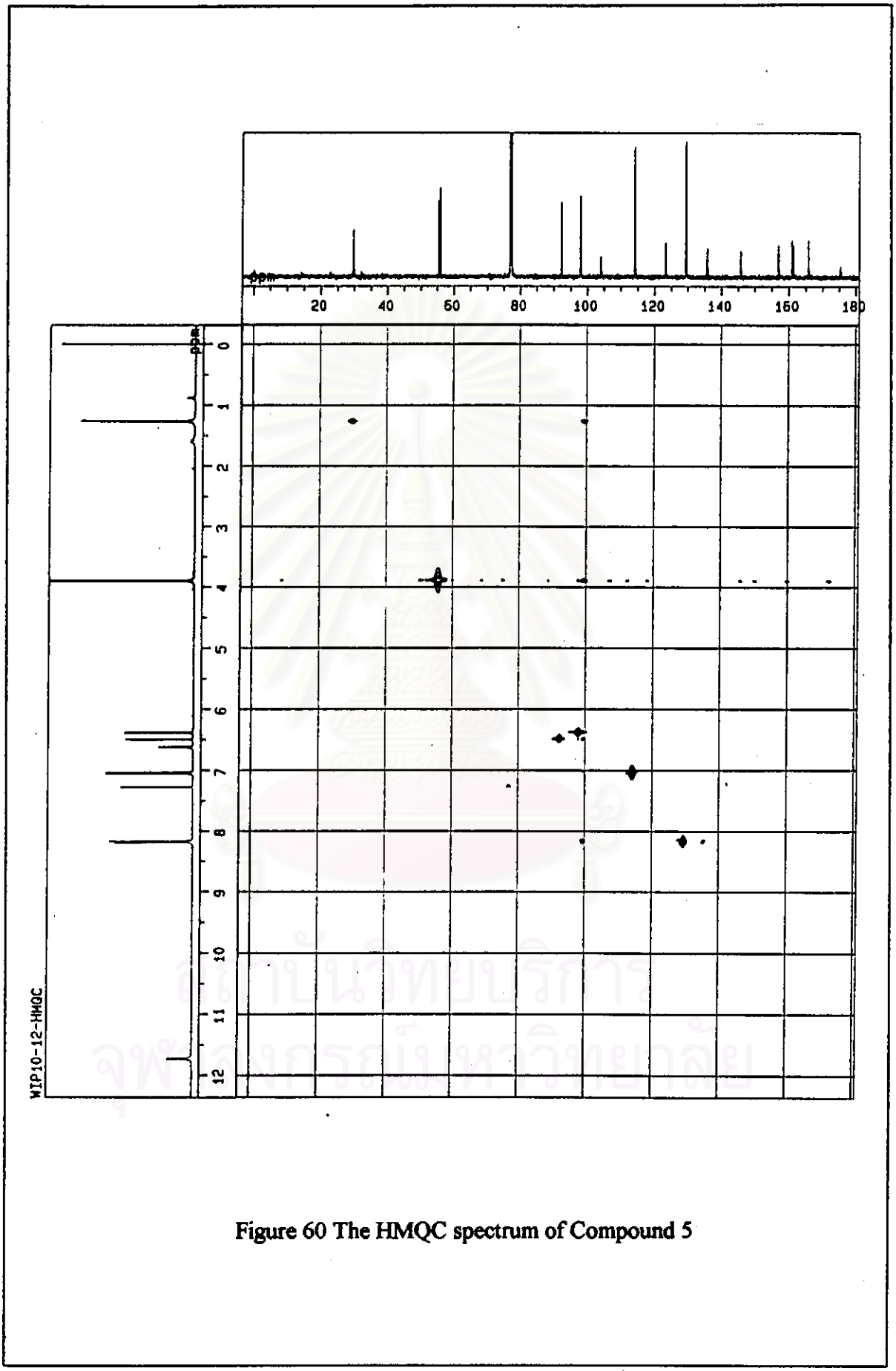

Figure 60 The HMQC spectrum of Compound 5

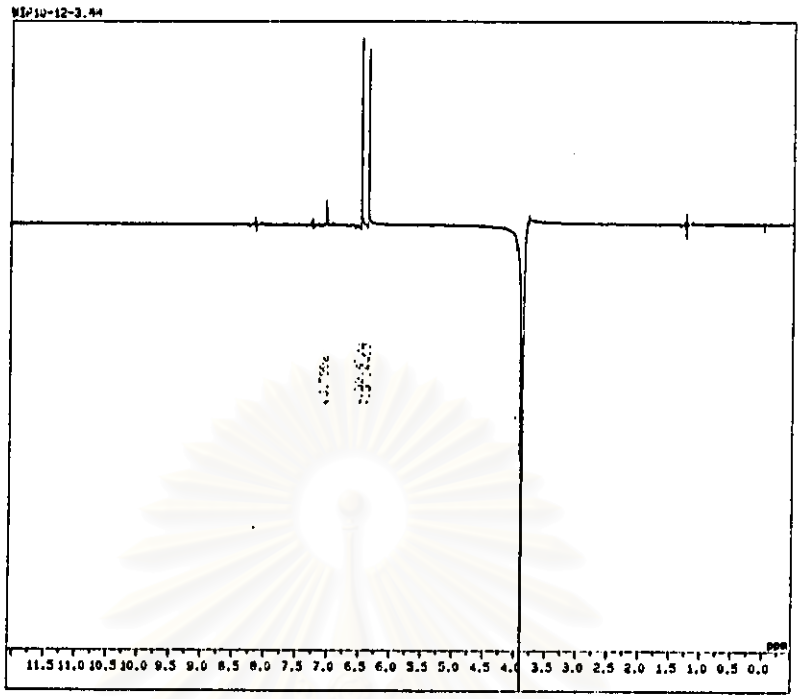

Figure 61 The NOE difference spectrum of Compound 5

(irradiate at δ 3.88 ppm.)

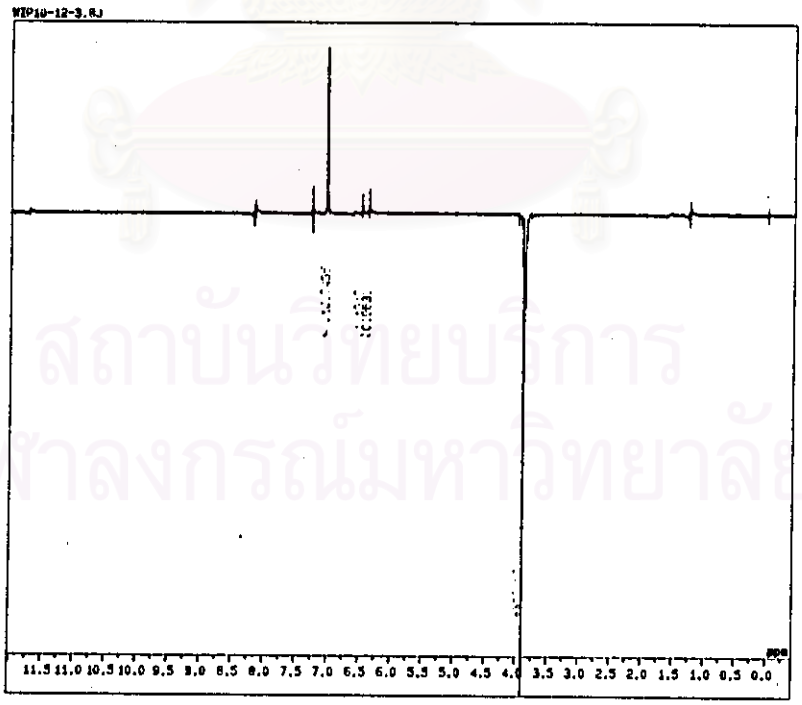

Figure 62 The NOE difference spectrum of Compound 5

(irradiate at δ 3.89 ppm.)

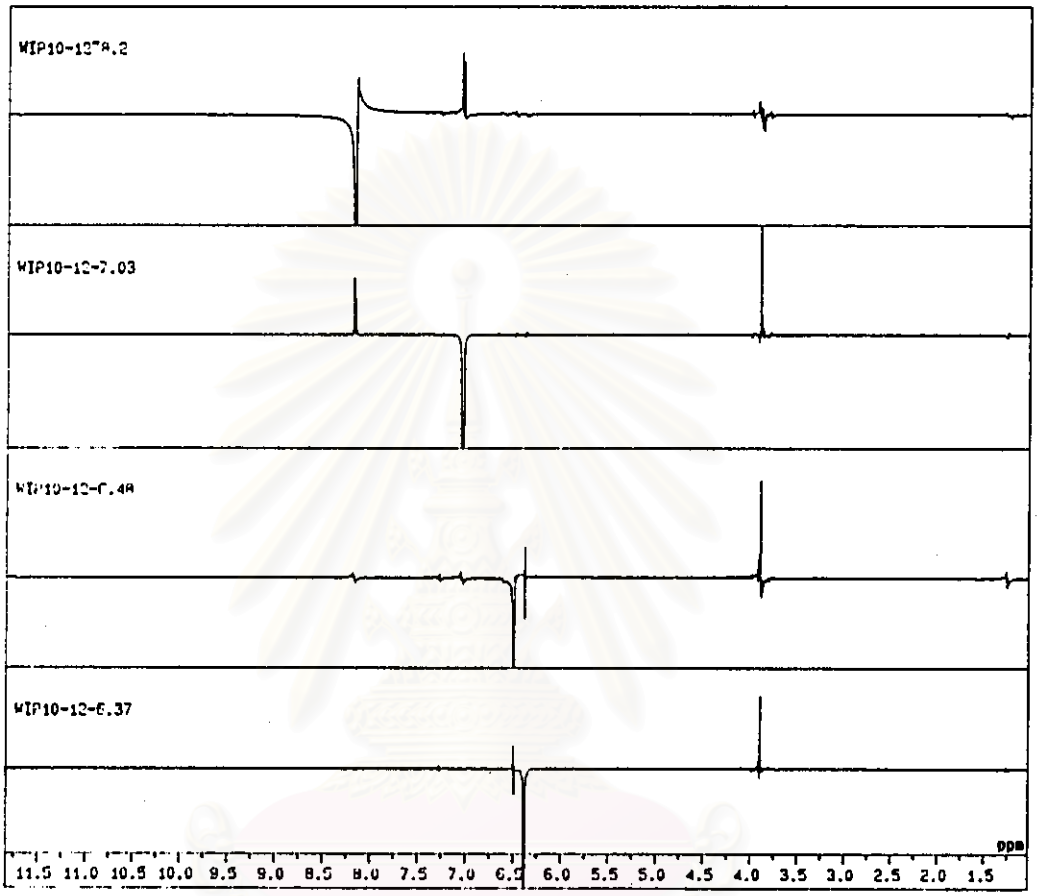

Figure 63 The NOE difference spectrum of Compound 5

(irradiate at δ 8.16, 7.03, 6.48, 6.37 ppm.)

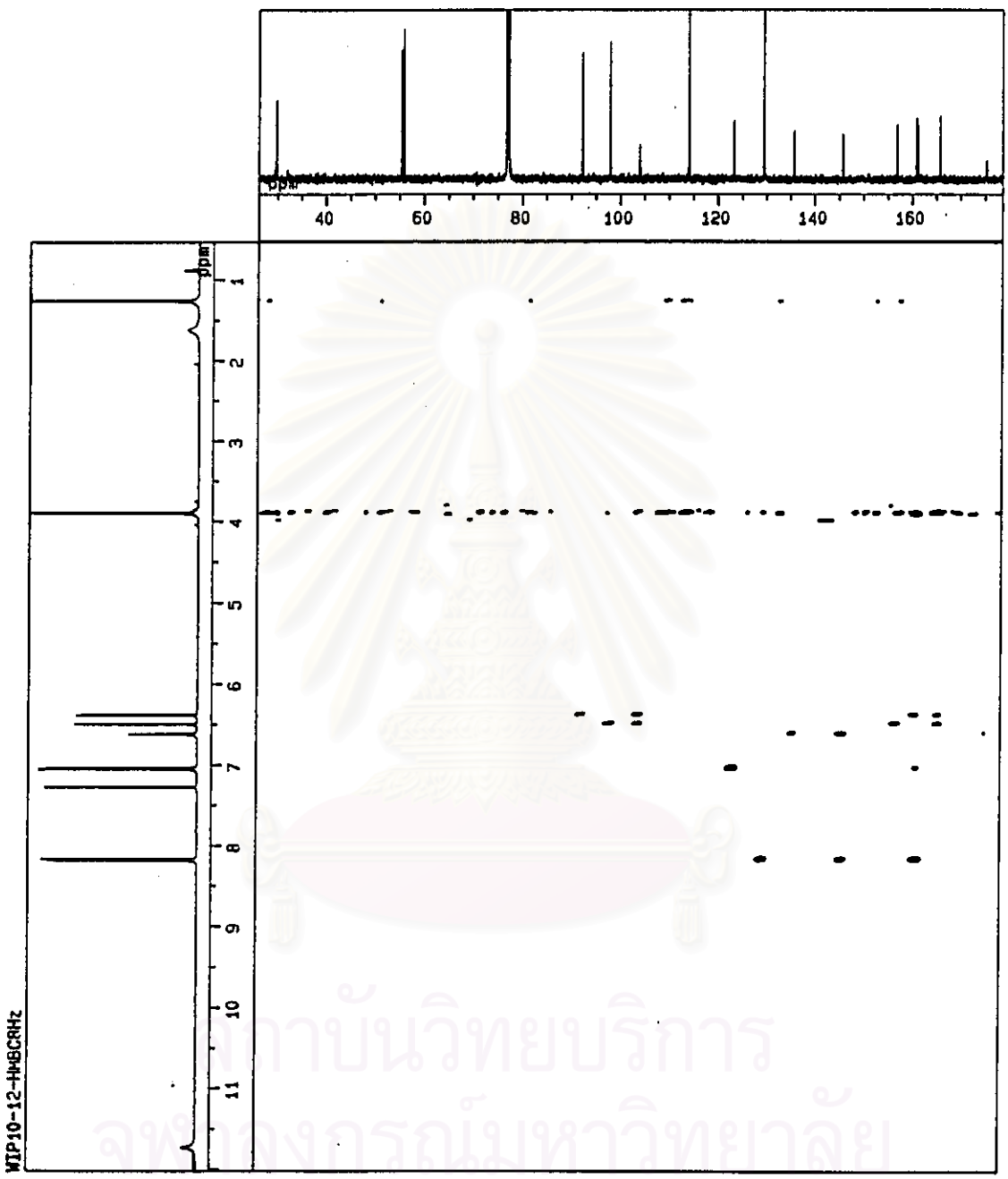

Figure 64 The HMBC spectrum of Compund 5

VITA

Miss Wipawee Chuntaruchi was born on July 15, 1971 in Chonburi province, Thailand. She received the Bachelor of Science Degree in Chemistry at Ramkhamhang University in 1992. Since 1994 she has been a graduate student studying Organic Chemistry at Chulalongkorn University. During her studies towards the Master's degree, she was awarded the National Science and Technology Development Agency in 1995, a teaching assistantship by the Faculty of Science in 1996 and was supported by a research grant for her Master degree's thesis from the Graduate School, Chulalongkorn University.