

Synthesis of unsymmetrical cage phosphonates from heterocyclic systems based on 2*H*-1,2-benzoxaphosphinine

**Yulia M. Sadykova^{1*}, Alena V. Zalaltdinova², Atabek K. Smailov²,
Larisa M. Trofimova³, Julia K. Voronina^{4,5},
Alexander R. Burilov¹, Mikhail A. Pudovik¹**

¹ *A. E. Arbuzov Institute of Organic and Physical Chemistry of the Kazan Scientific Center, Russian Academy of Sciences,
8 Akademika Arbuzova St., Kazan 420088, Russia; e-mail: jsadykova@mail.ru*

² *Kazan National Research Technological University,
68 Karla Marksa St., Kazan 420015, Russia*

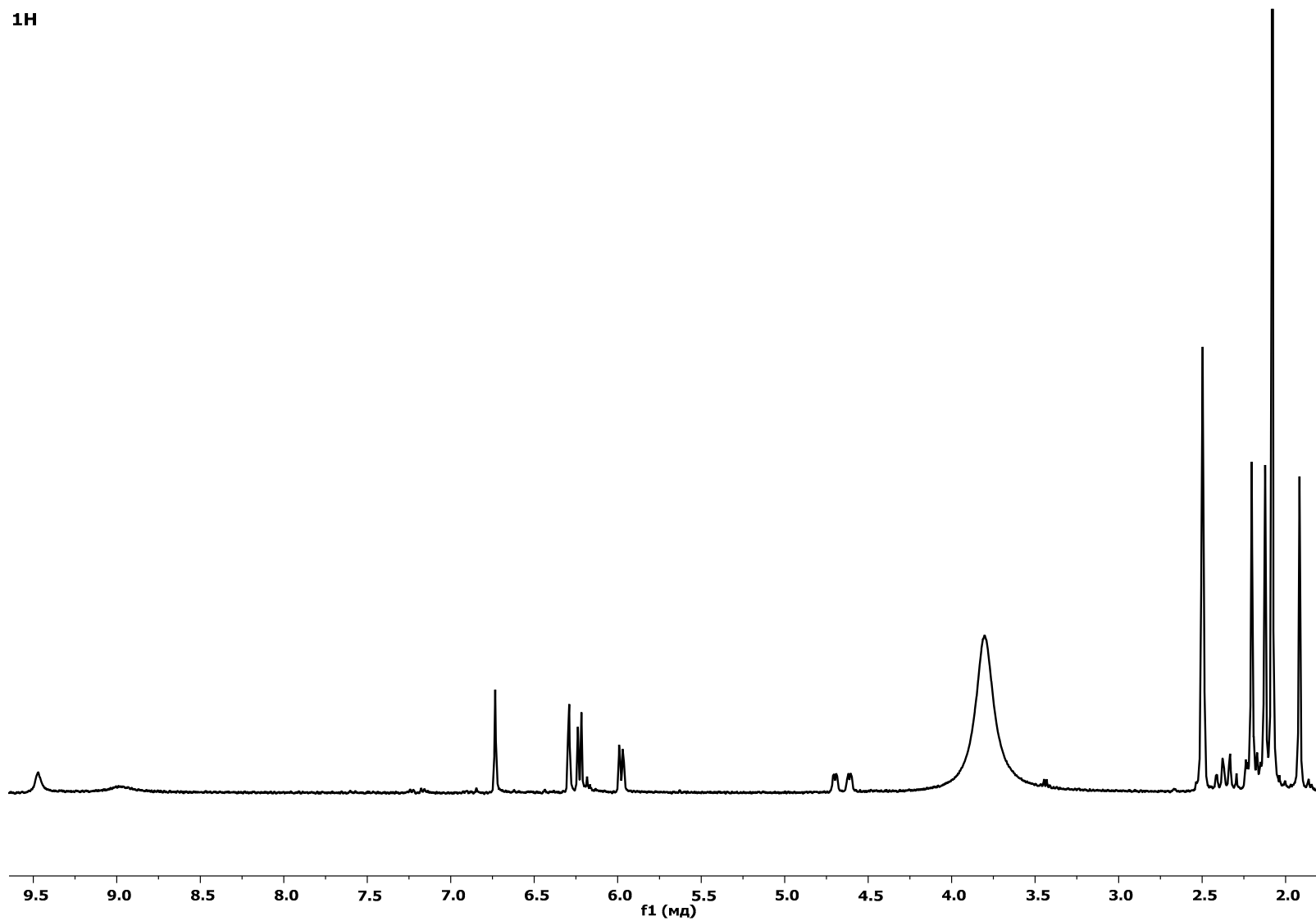
³ *Chuvash State University named after I. N. Ulianov,
19 Moskovskiy Ave., Cheboksary 428015, Russia*

⁴ *Kurnakov Institute of General and Inorganic Chemistry, Russian Academy of Sciences,
31 Leninsky Ave., Moscow 119991, Russia; e-mail: juliavoronina@mail.ru*

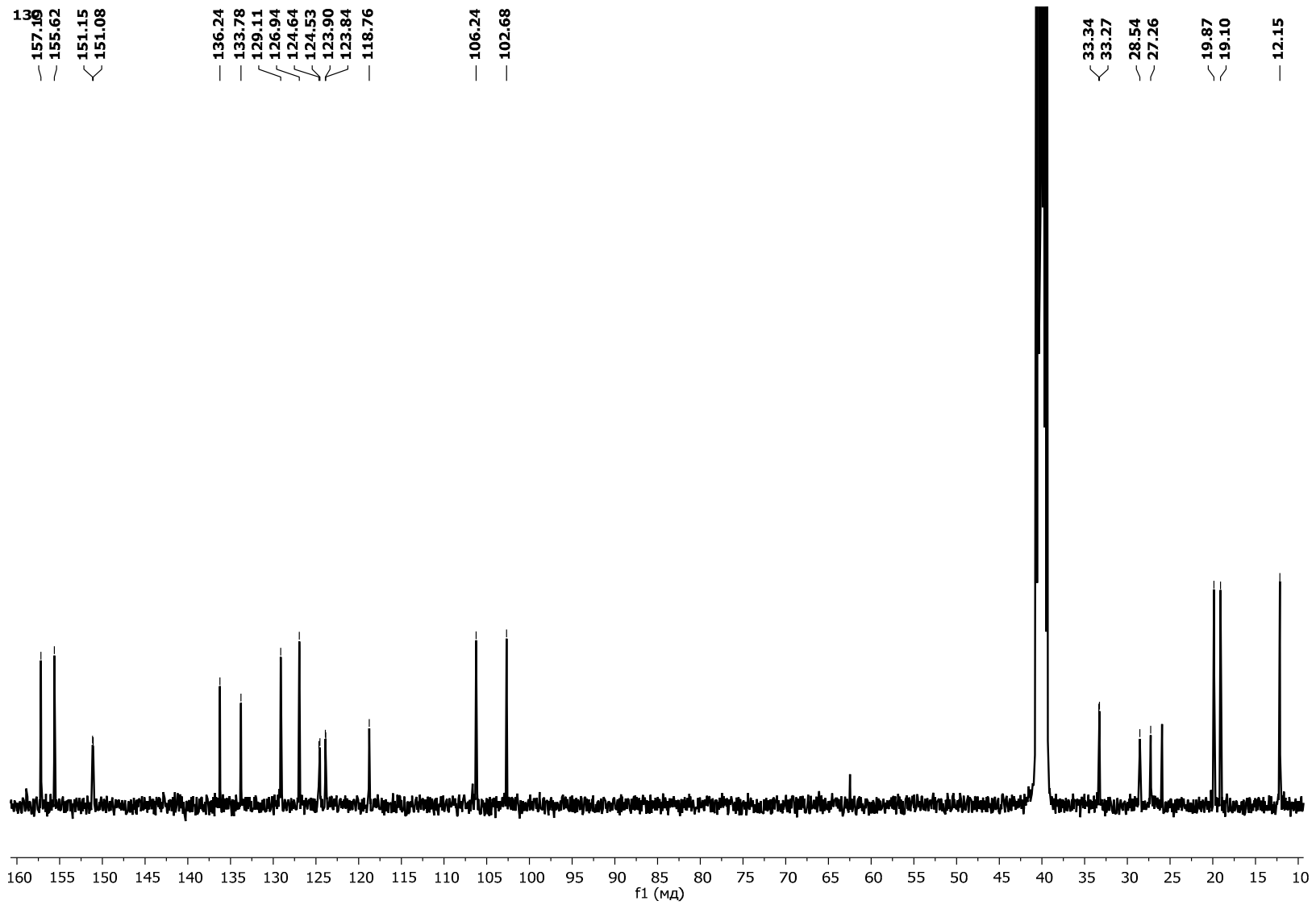
⁵ *Plekhanov Russian University of Economics,
36 Stremyanny Lane, Moscow 117997, Russia*

SUPPLEMENTARY INFORMATION

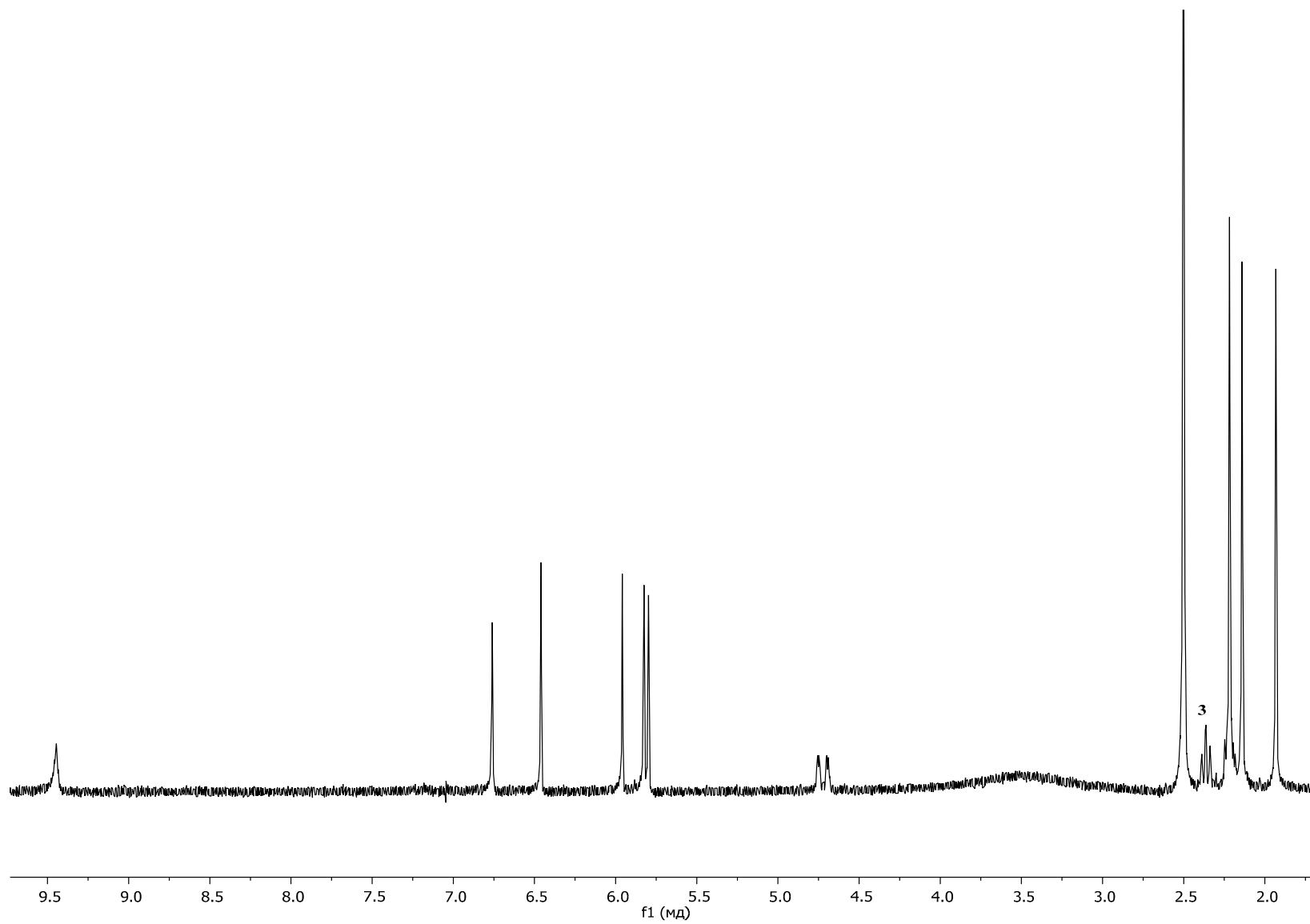
¹H



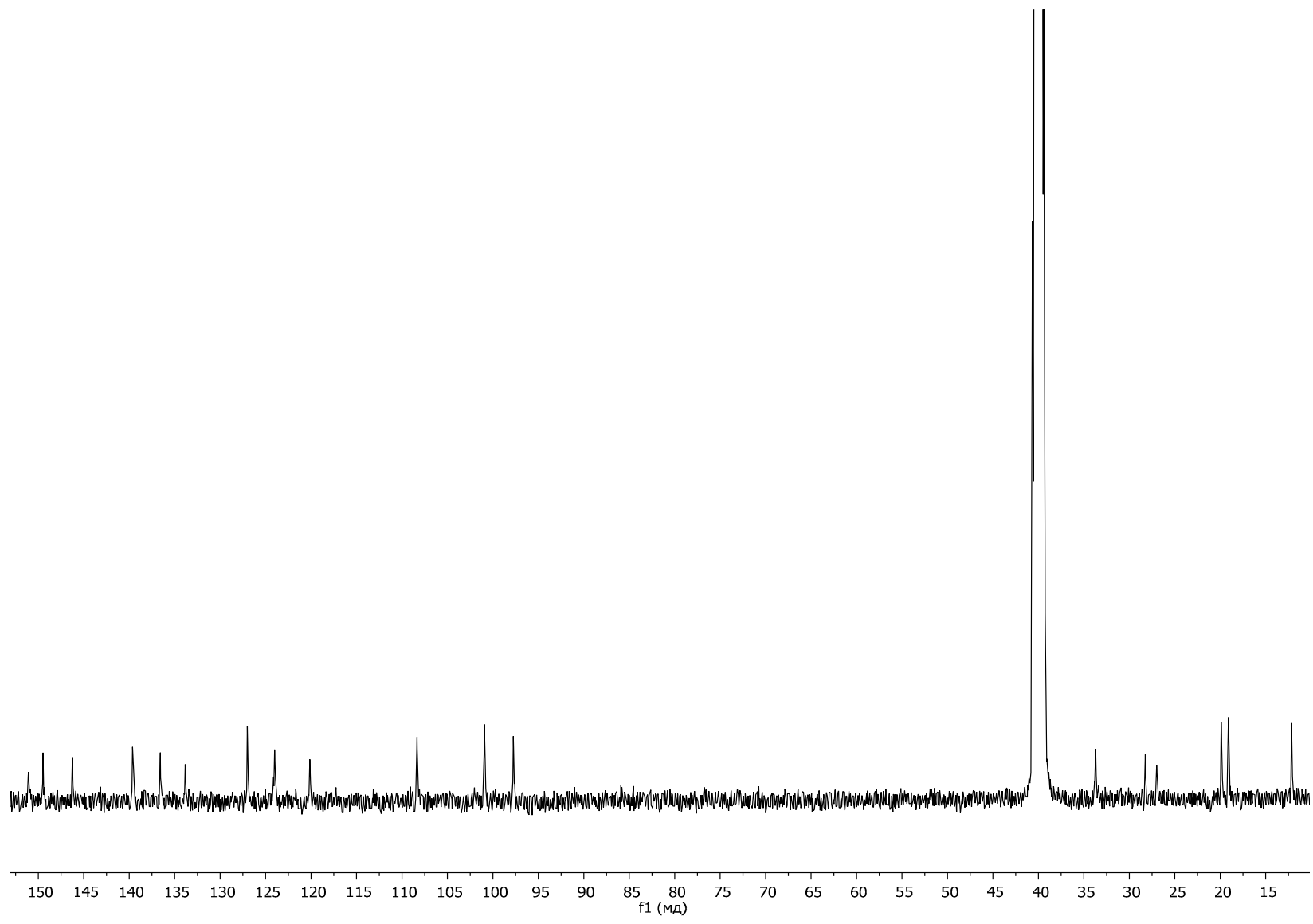
¹H NMR Spectrum for compounds 3a



¹³C NMR Spectrum for compounds 3a

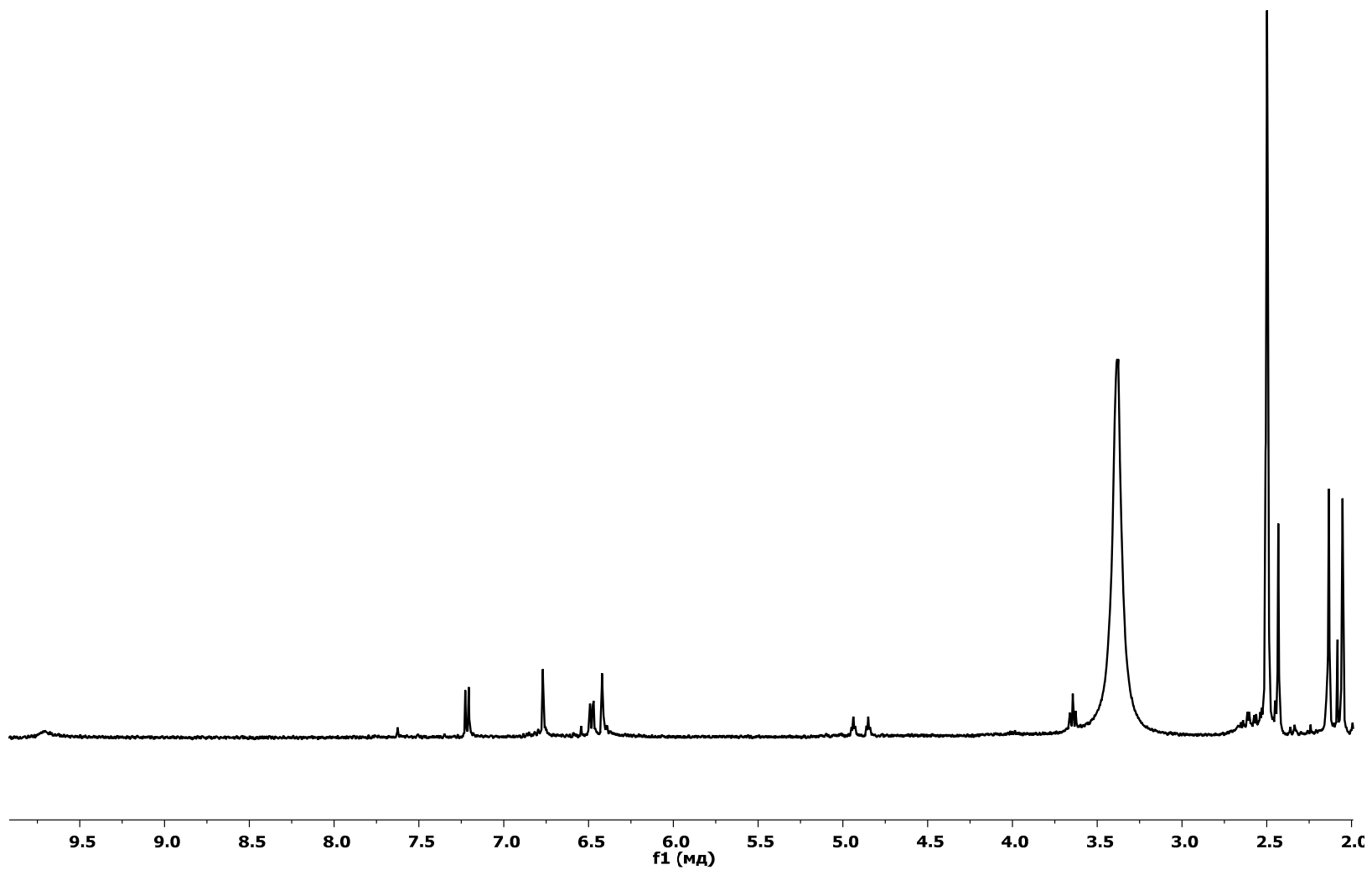


^1H NMR Spectrum for compounds 5



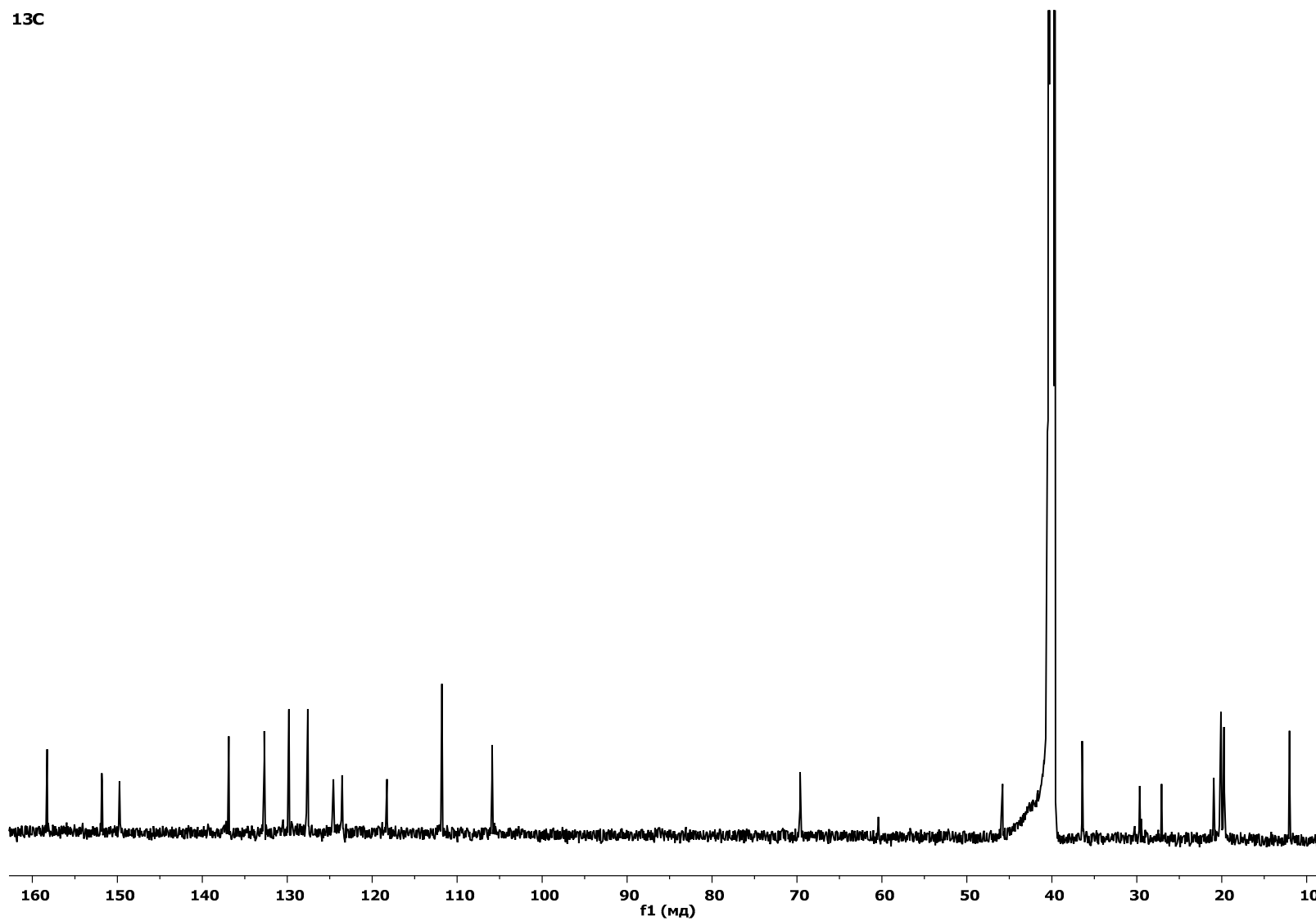
^{13}C NMR Spectrum for compounds 5

¹H



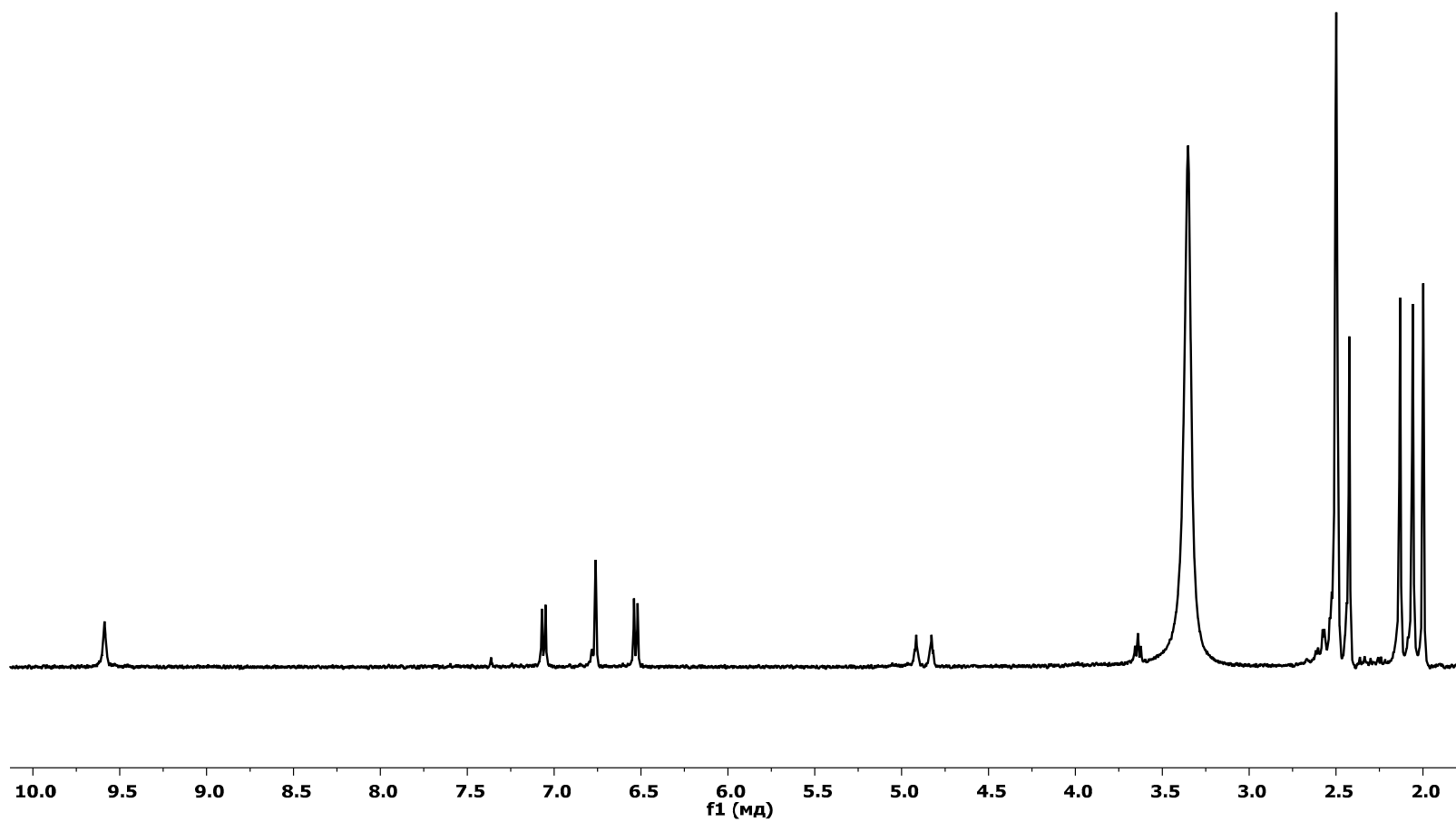
¹H NMR Spectrum for compounds 7a

13C

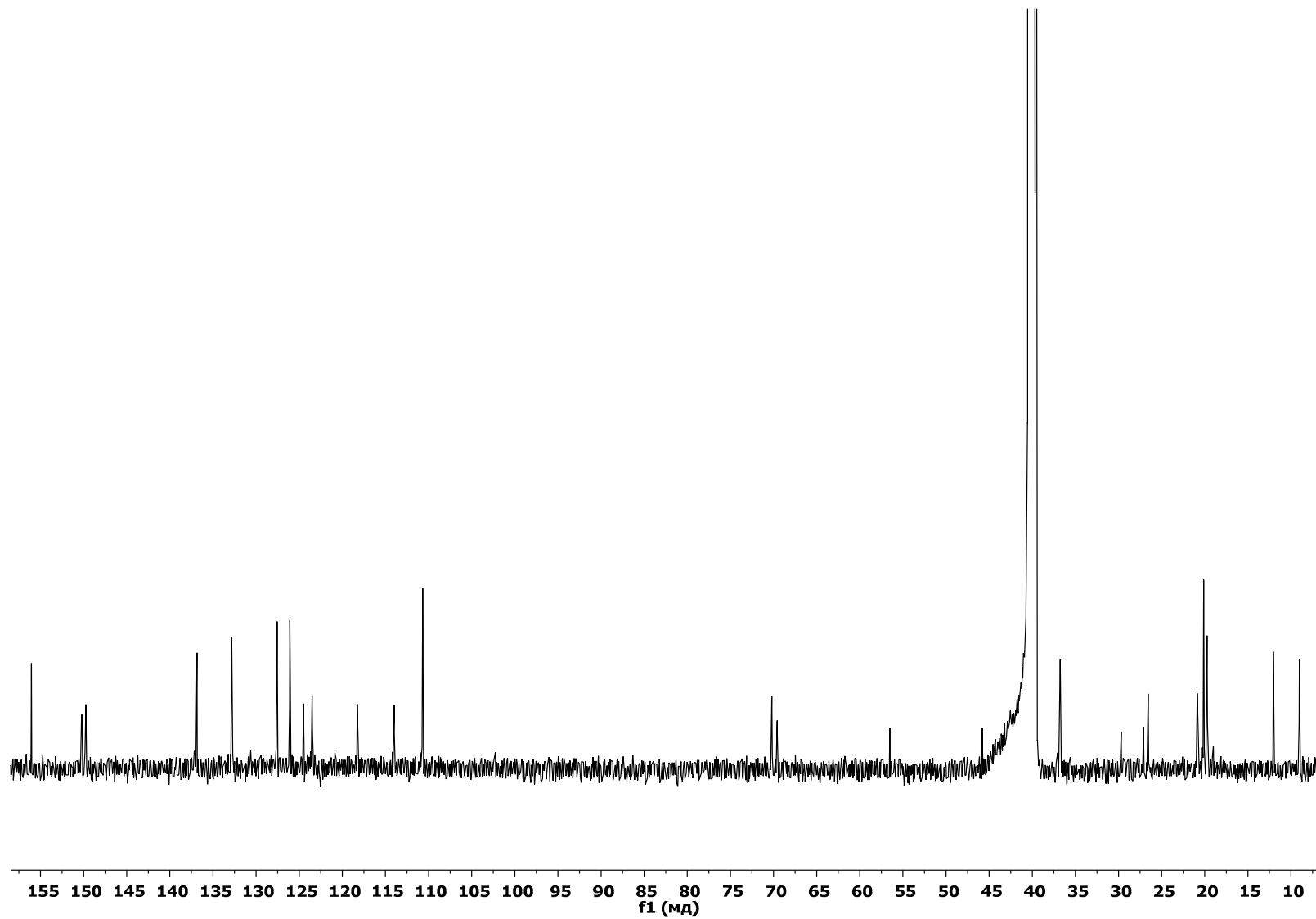


^{13}C NMR Spectrum for compounds 7a

¹H

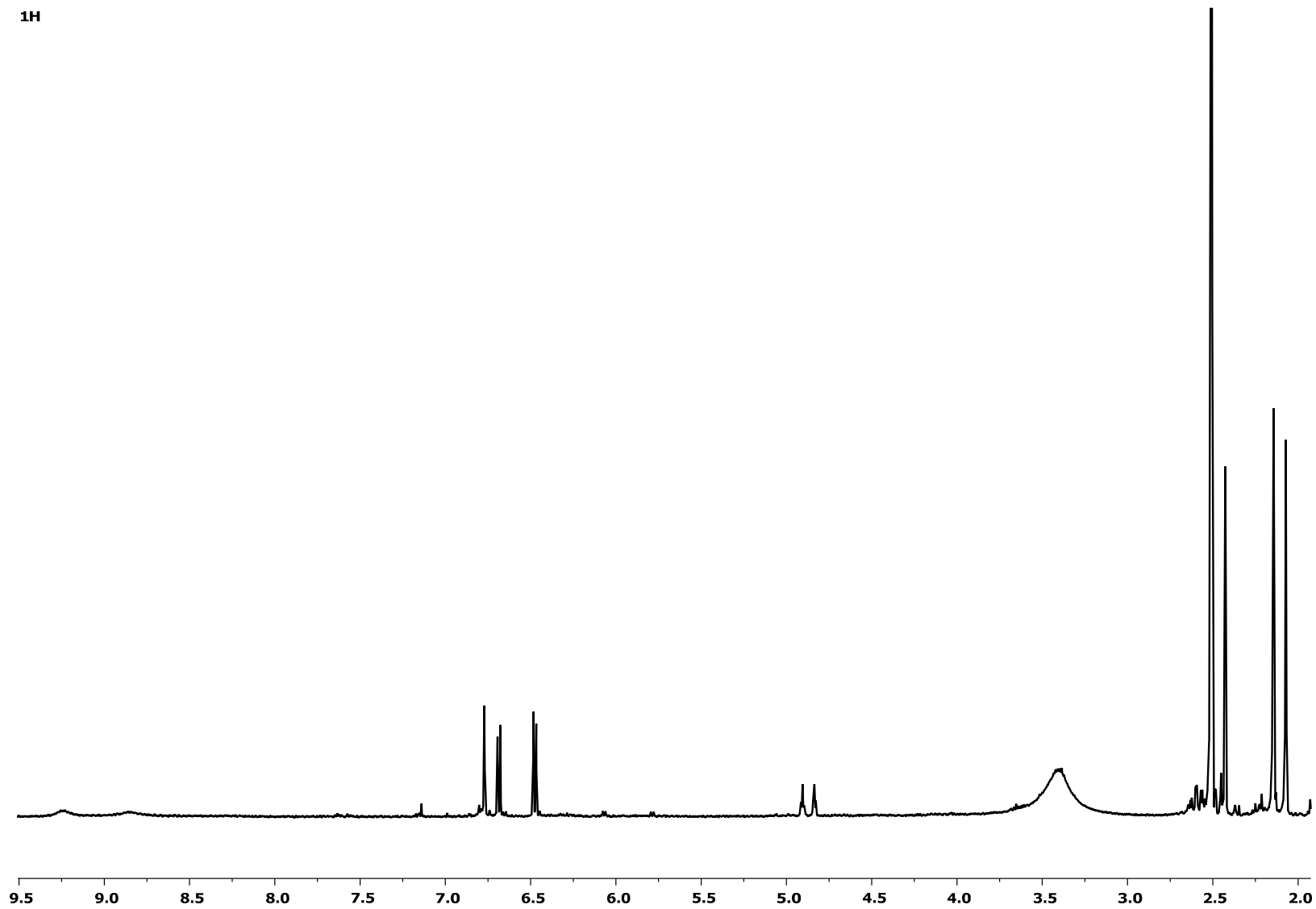


¹H NMR Spectrum for compounds 7b



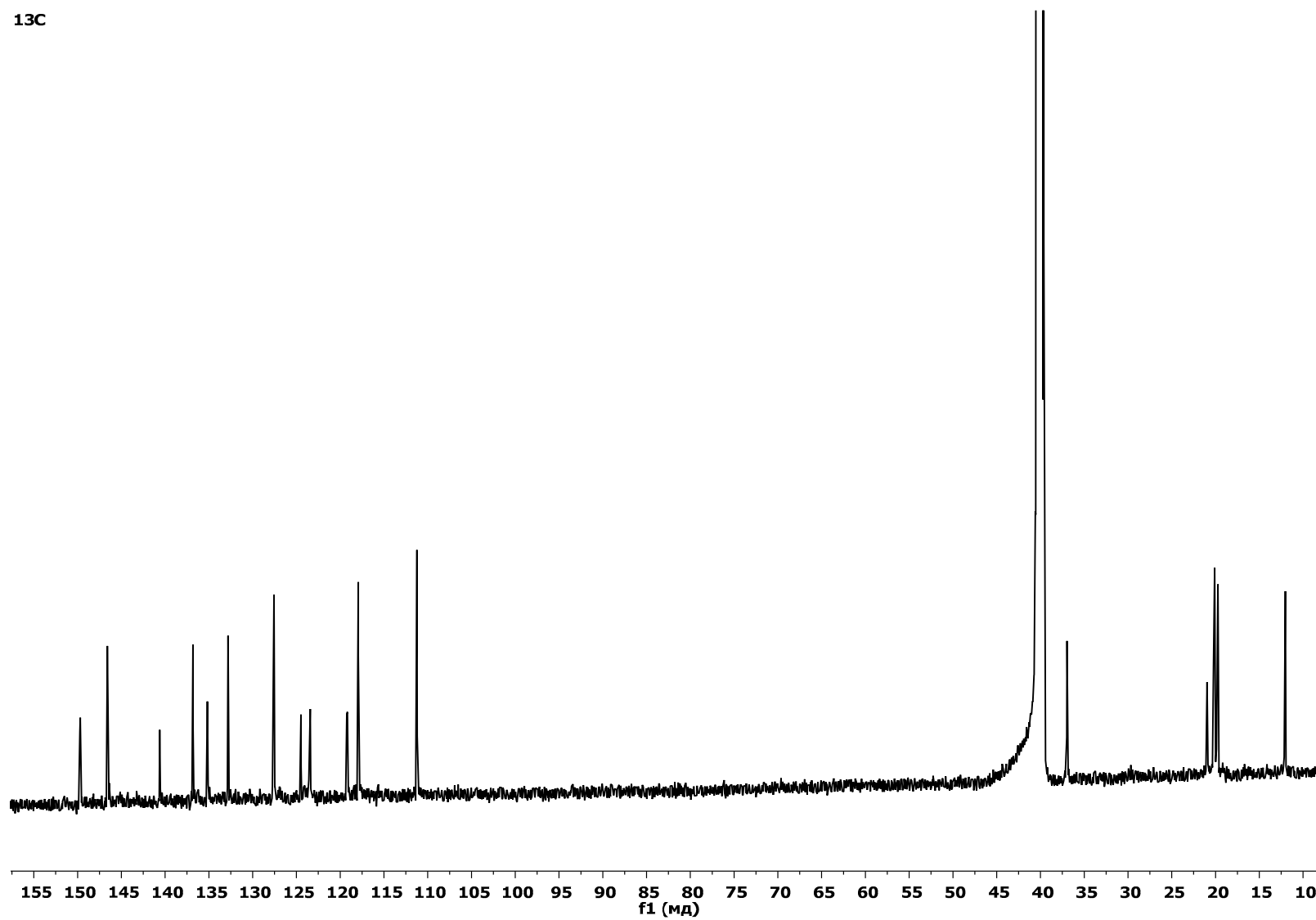
^{13}C NMR Spectrum for compounds 7b

1H

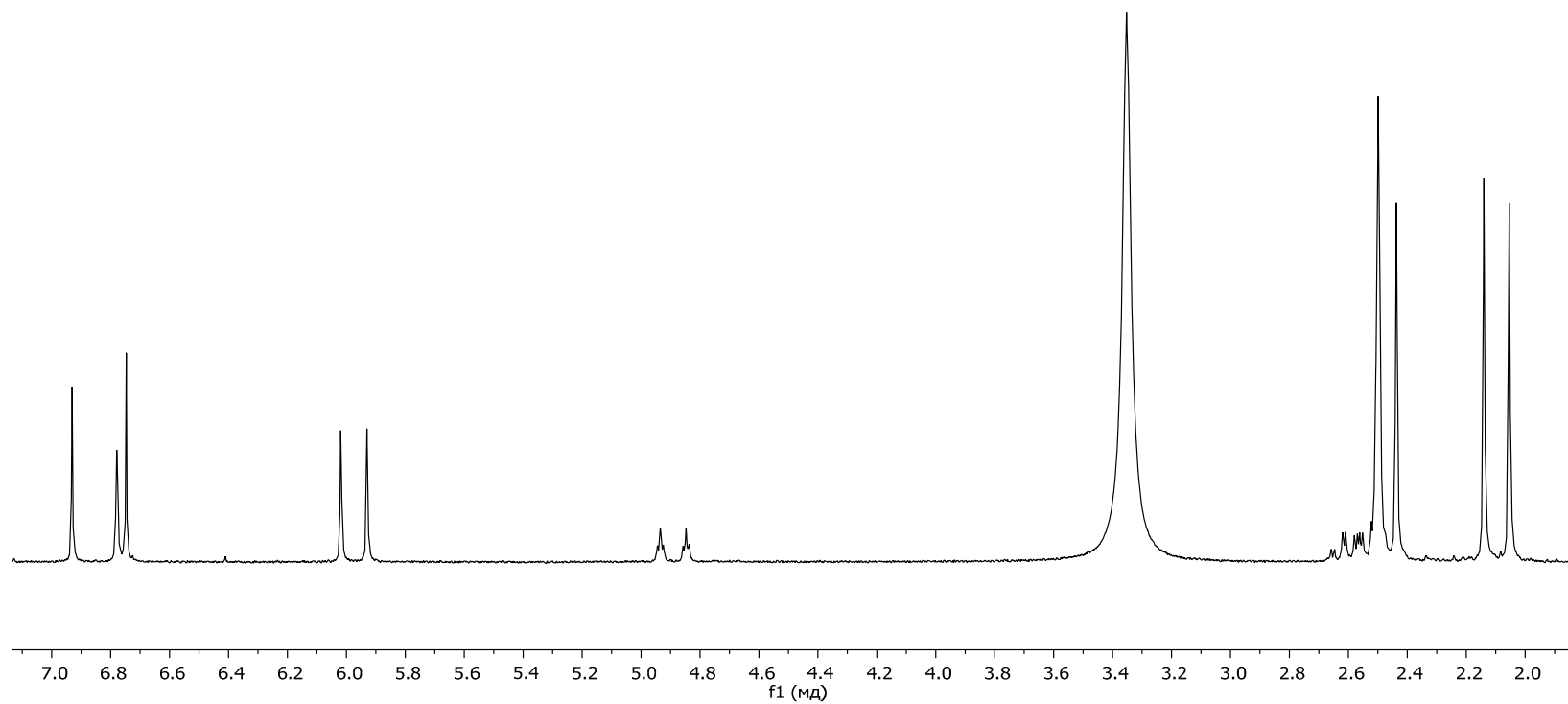


¹H NMR Spectrum for compounds 7c

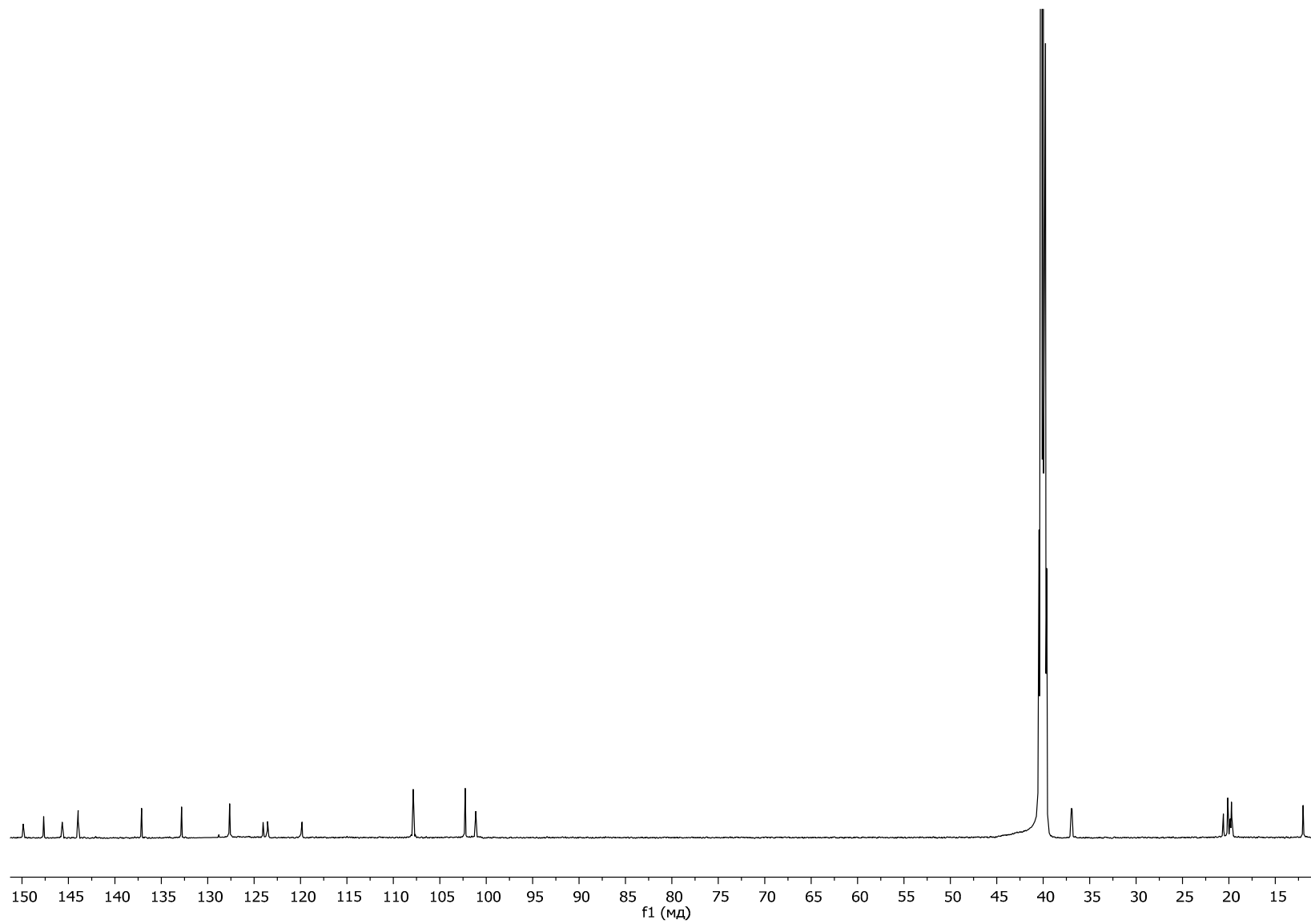
13C



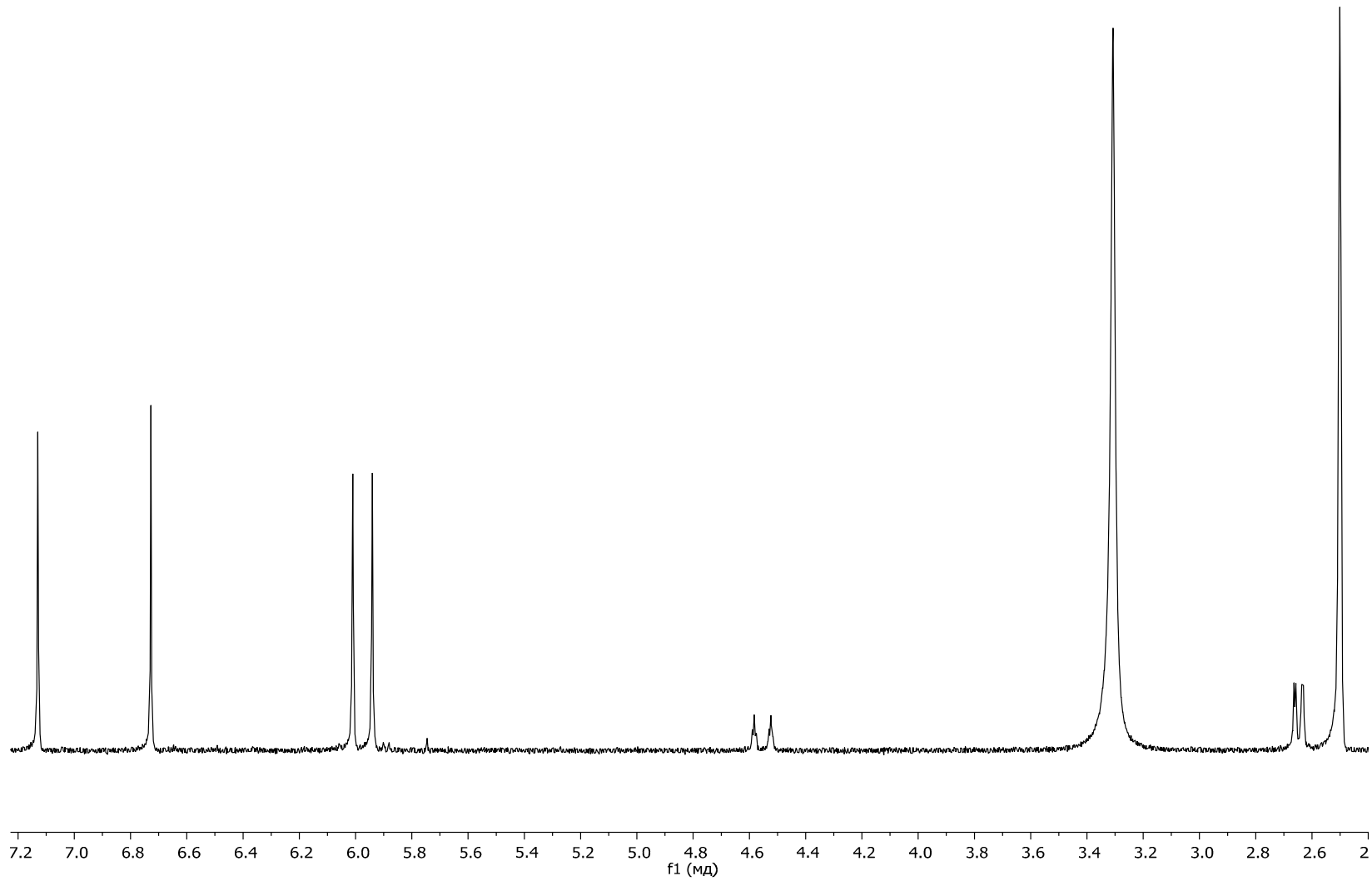
^{13}C NMR Spectrum for compounds 7c



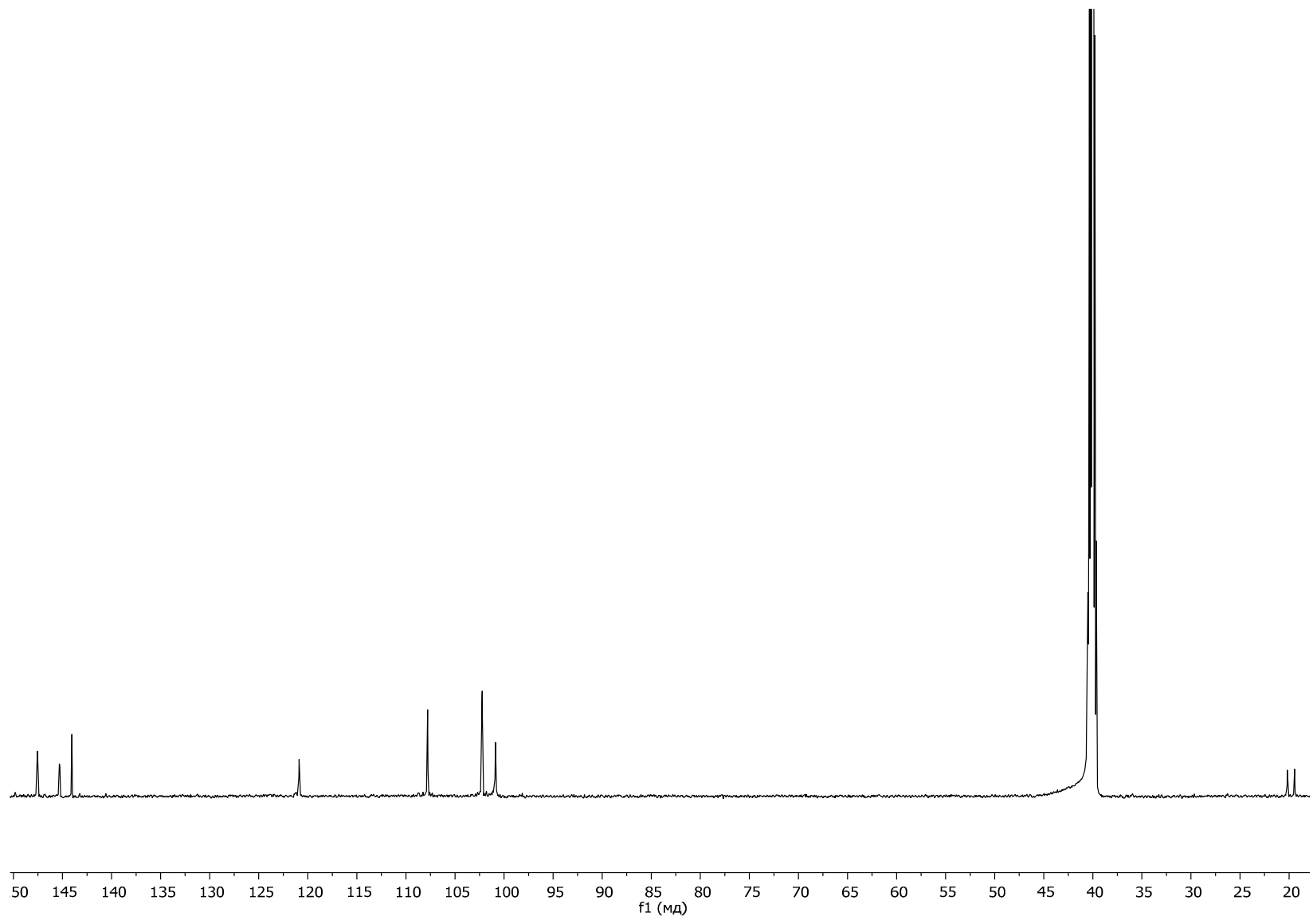
^1H NMR Spectrum for compounds 9



^{13}C NMR Spectrum for compounds 9



^1H NMR Spectrum for compounds **10**



^{13}C NMR Spectrum for compounds 10