

Dibenzofuran derivatives inspired from cercosporamide as dual inhibitors of Pim and CLK1 kinases

Viet Hung Dao ^{1,†}, Isabelle Ourliac-Garnier ¹, Cédric Logé ¹, Florence O. McCarthy ², Stéphane Bach ^{3,4,5}, Teresinha Gonçalves da Silva ⁶, Caroline Denevault-Sabourin ⁷, Jérôme Thiéfaine ¹, Blandine Baratte ^{3,4}, Thomas Robert ^{3,4}, Fabrice Gouilleux ⁸, Marie Brachet-Botineau ⁸, Marc-Antoine Bazin ¹ and Pascal Marchand ^{1,*}

¹ Cibles et Médicaments des Infections et du Cancer, IICiMed, EA 1155, Université de Nantes, 44000 Nantes, France; daoviethung@live.com (V.H.D.); isabelle.ourliac@univ-nantes.fr (I.O.-G.); cedric.loge@univ-nantes.fr (C.L.); jerome.thiefaine@univ-nantes.fr (J.T.); marc-antoine.bazin@univ-nantes.fr (M.-A.B.)

² School of Chemistry, Analytical and Biological Chemistry Research Facility, University College Cork, Western Road, T12 K8AF Cork, Ireland; f.mccarthy@ucc.ie (F.O.M.)

³ Sorbonne Université, CNRS, UMR8227, Integrative Biology of Marine Models Laboratory (LBI2M), Station Biologique de Roscoff, 29680, Roscoff, France; bach@sb-roscocff.fr (S.B.); baratte@sb-roscocff.fr (B.B.); thomas.robert@sb-roscocff.fr (T.R.)

⁴ Sorbonne Université, CNRS, FR2424, Plateforme de Criblage KISSf (Kinase Inhibitor Specialized Screening Facility), Station Biologique de Roscoff, 29680, Roscoff, France

⁵ Centre of Excellence for Pharmaceutical Sciences, North-West University, Private Bag X6001, 2520 Potchefstroom, South Africa

⁶ Departamento de Antibióticos, Universidade Federal de Pernambuco, Recife, PE 50670-901, Brazil; teresinha.goncalves@ufpe.br (T.G.d.S.)

⁷ EA GICC-ERL 7001 CNRS, Team IMT, University of Tours, 37200 Tours, France; caroline.denevault@univ-tours.fr (C.D.-S.)

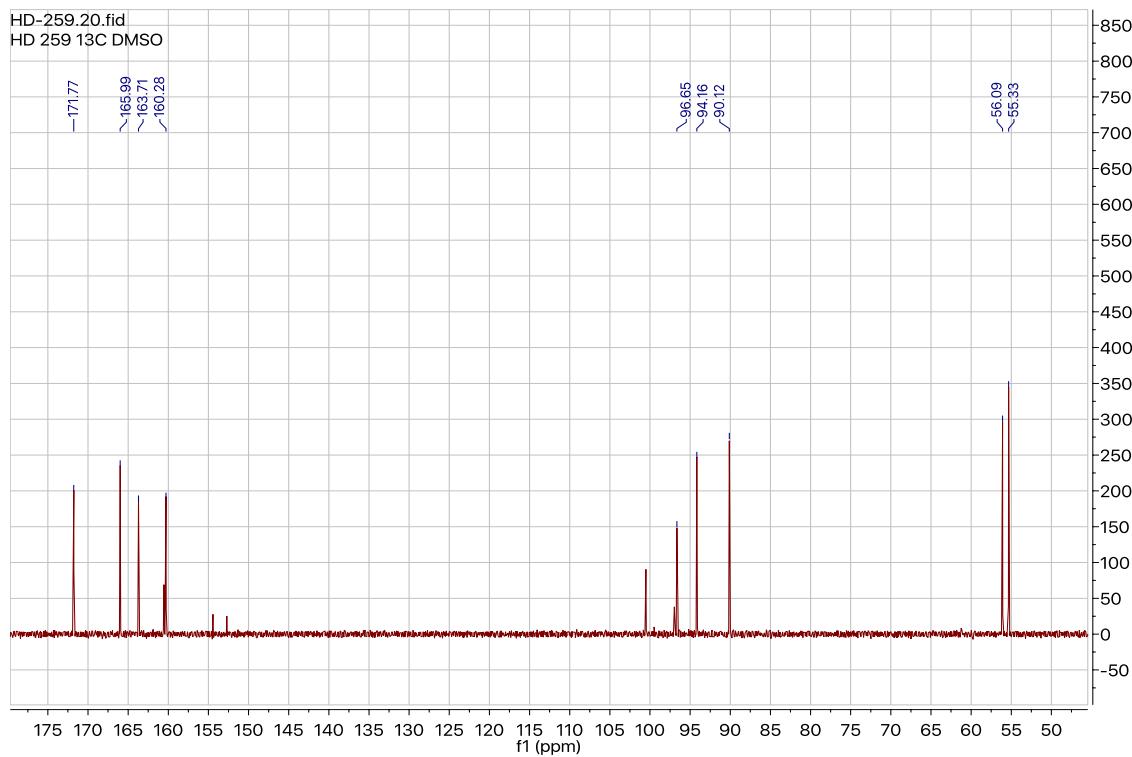
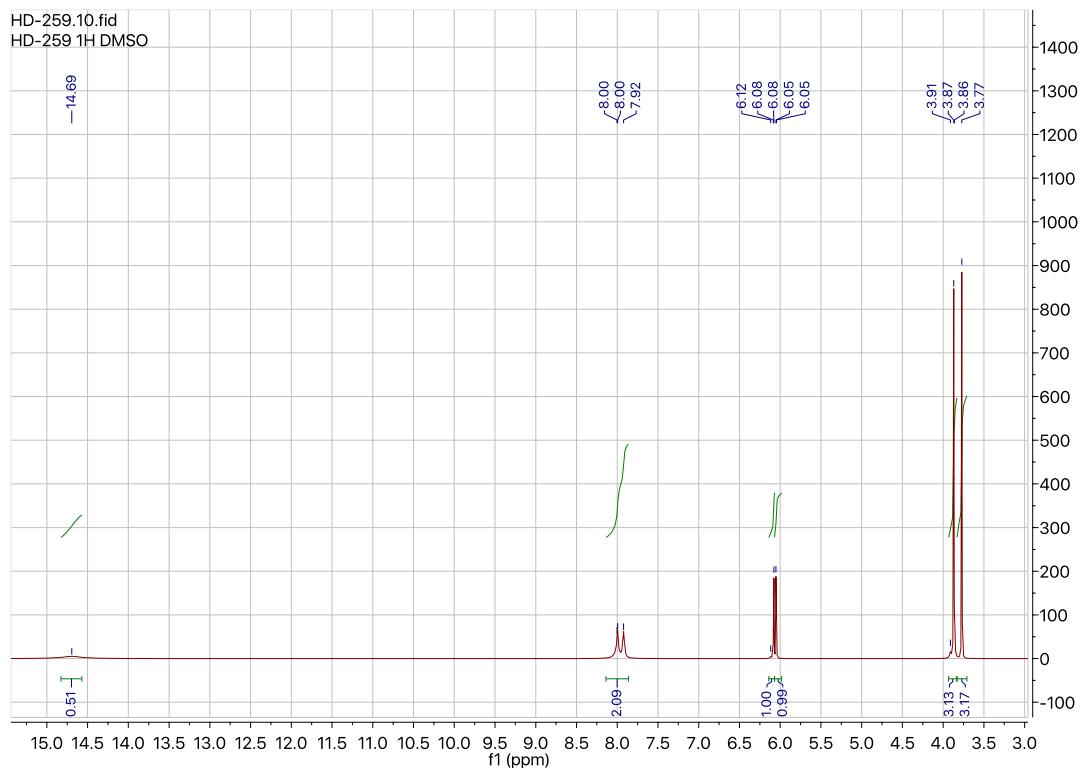
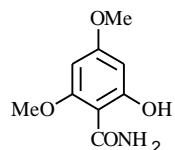
⁸ CNRS ERL7001 LNOx « Leukemic Niche and redOx Metabolism », EA GICC, University of Tours, 37000 Tours, France; fabrice.gouilleux@univ-tours.fr (F.G.); marie.brachet.botineau@gmail.com (M.B.-B.)

* Correspondence: pascal.marchand@univ-nantes.fr; Tel.: +33-253-009-155

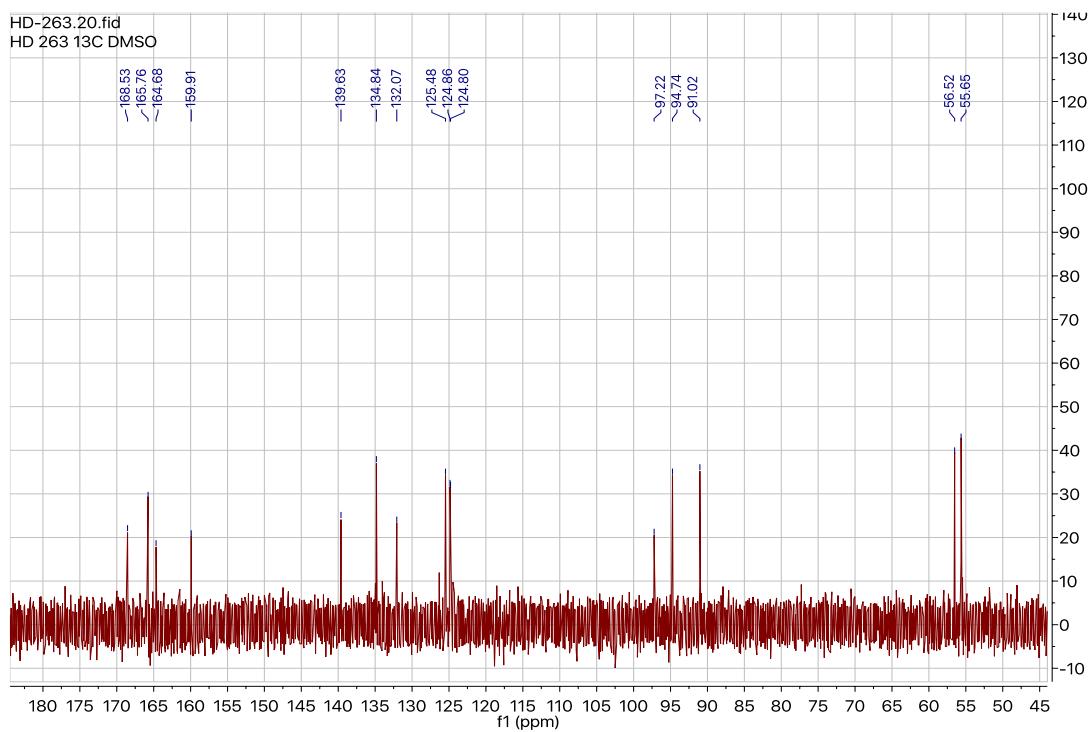
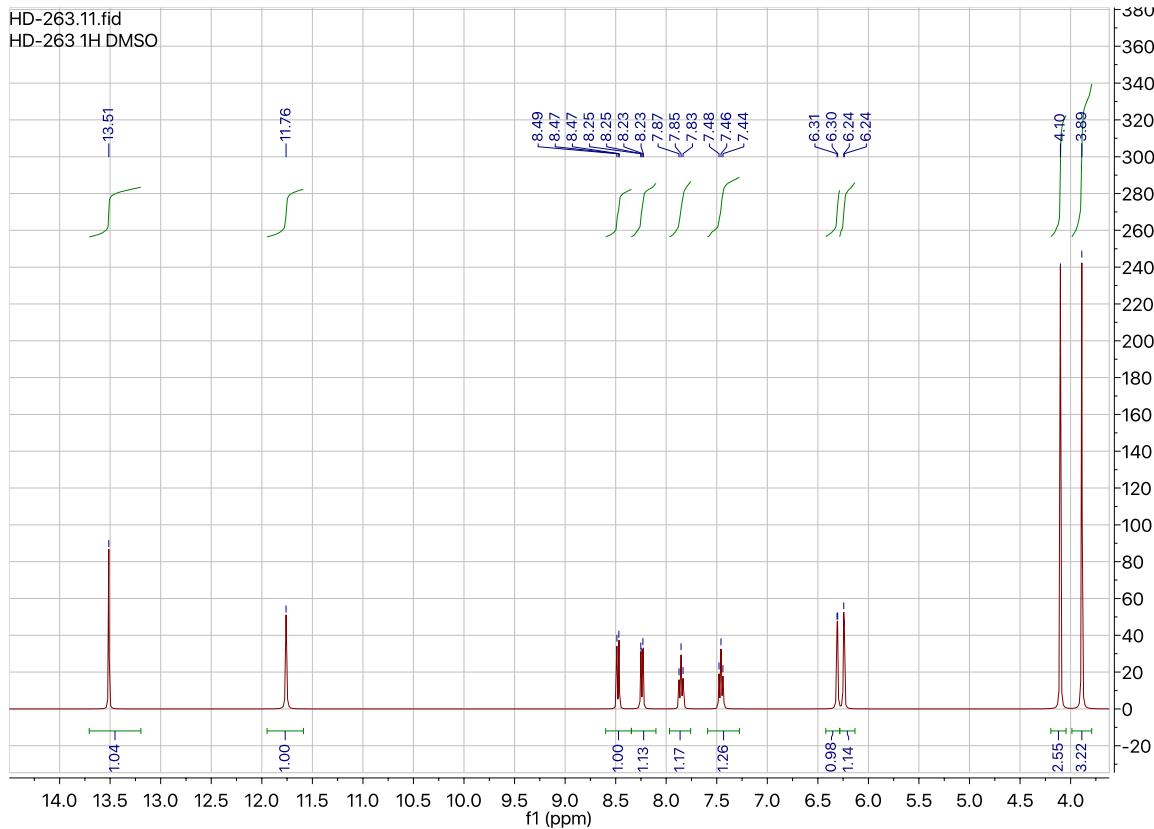
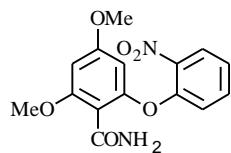
† Current address: Phu Tho College of Medicine and Pharmacy, Viet Tri, Phu Tho 290000, Vietnam.

Spectroscopic data (¹H and ¹³C NMR spectra) for all the compounds

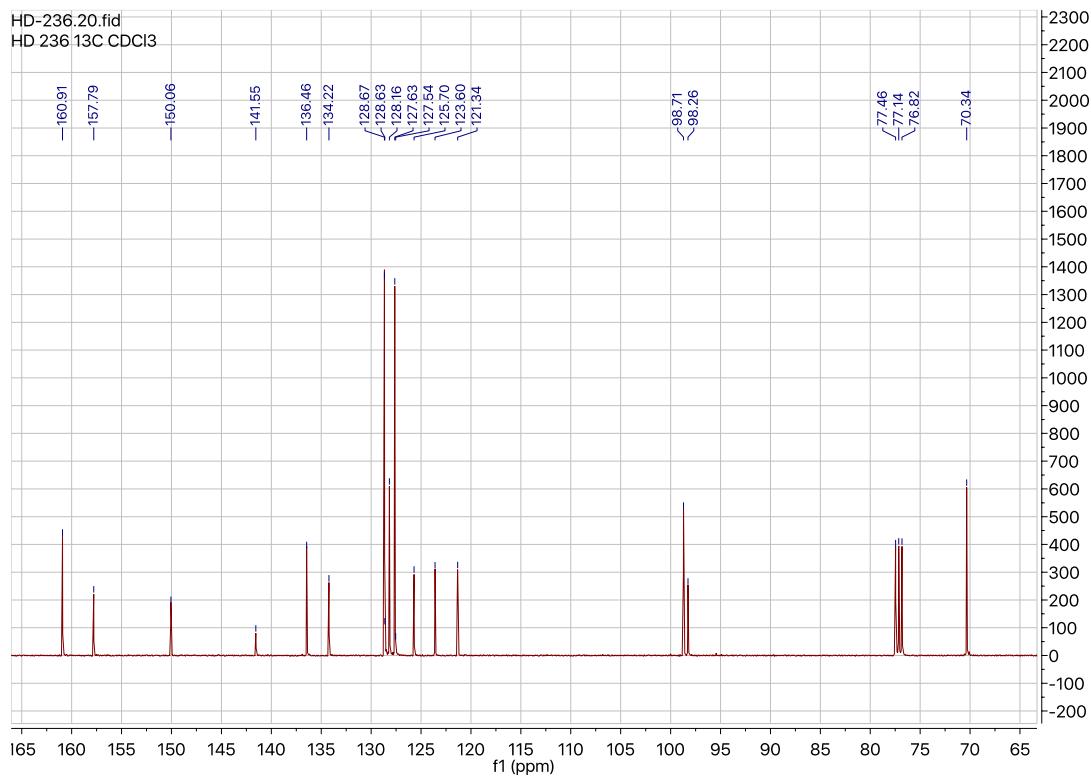
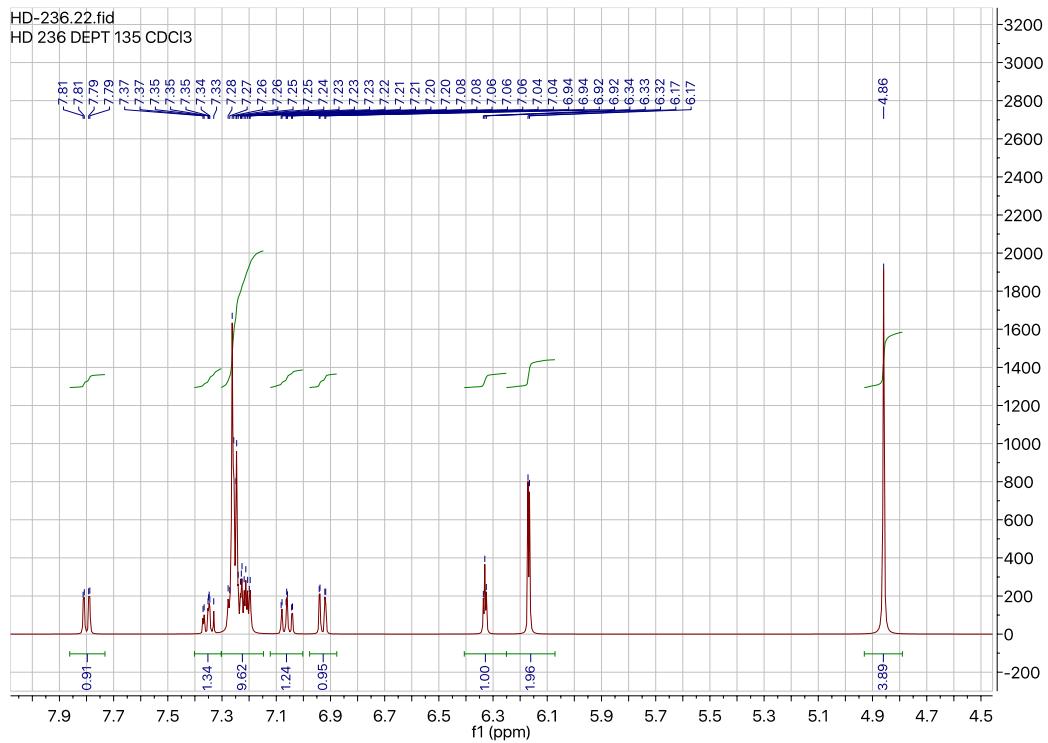
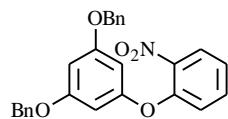
2-Hydroxy-4,6-dimethoxybenzamide (2)



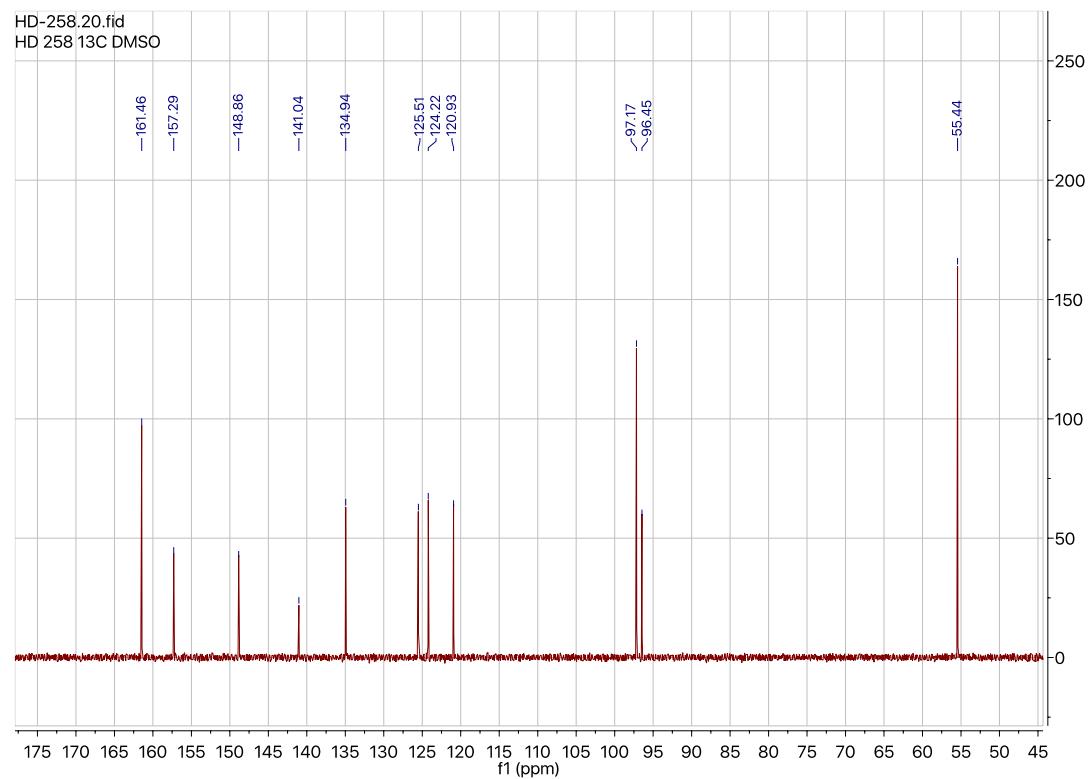
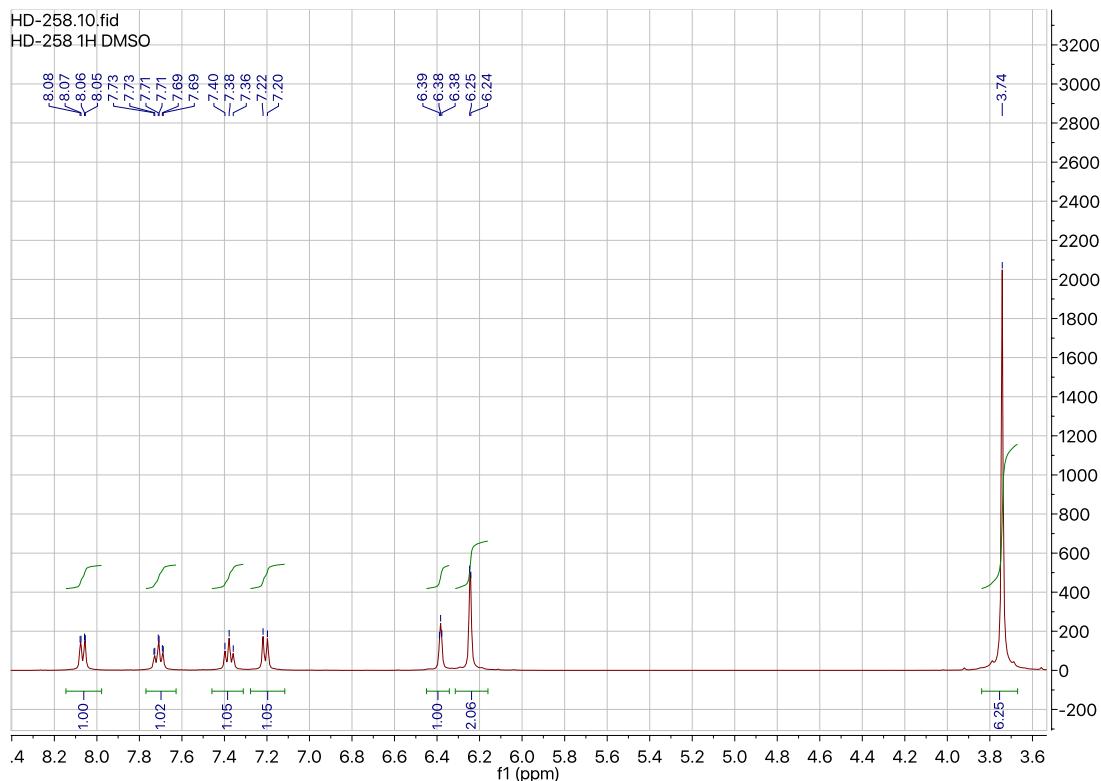
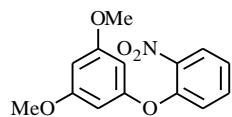
2,4-Dimethoxy-6-(2'-nitrophenoxy)benzamide (6)



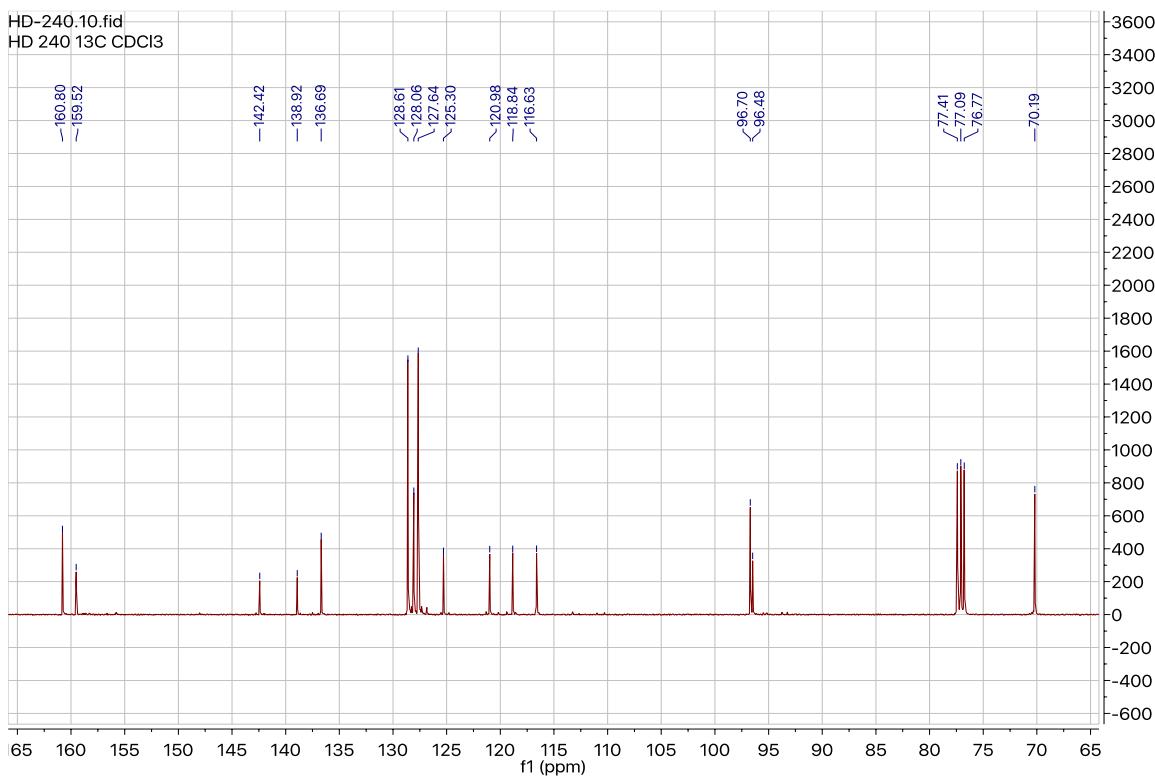
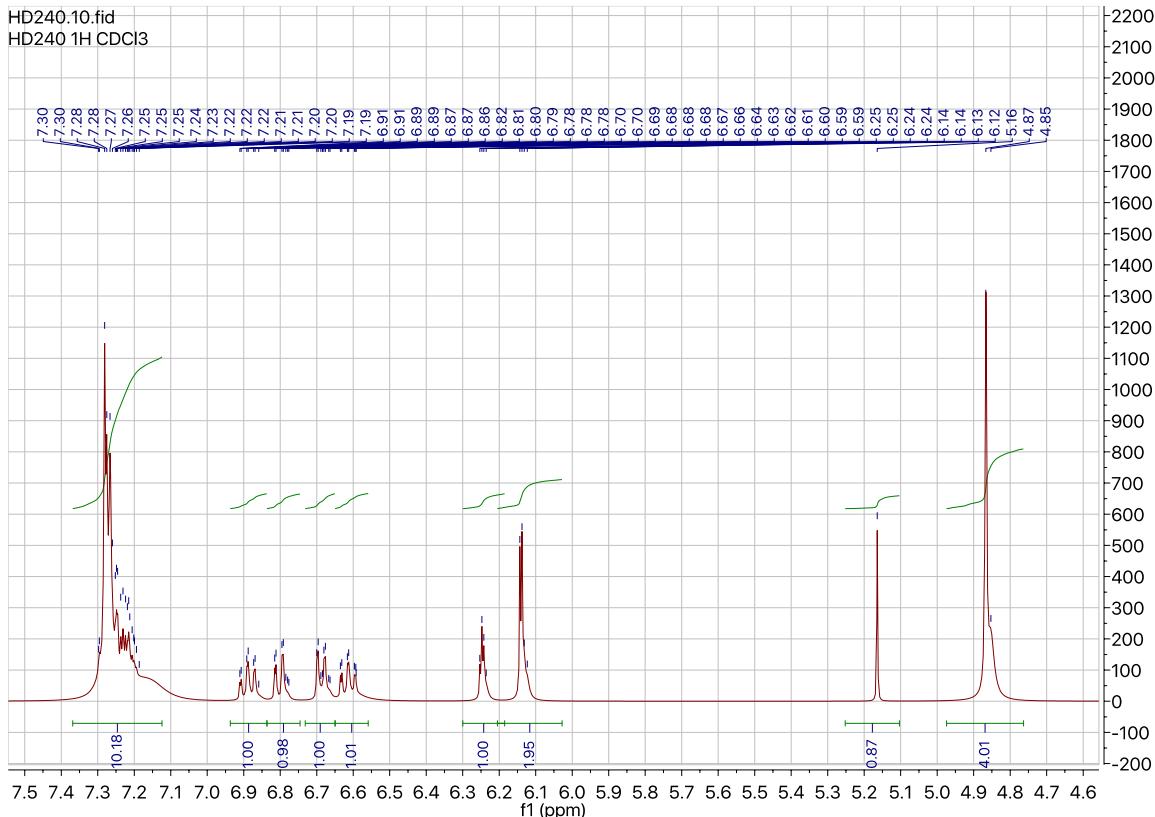
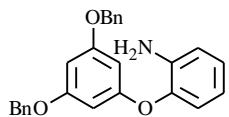
1,3-Dibenzylxy-5-(2'-nitrophenoxy)benzene (7)



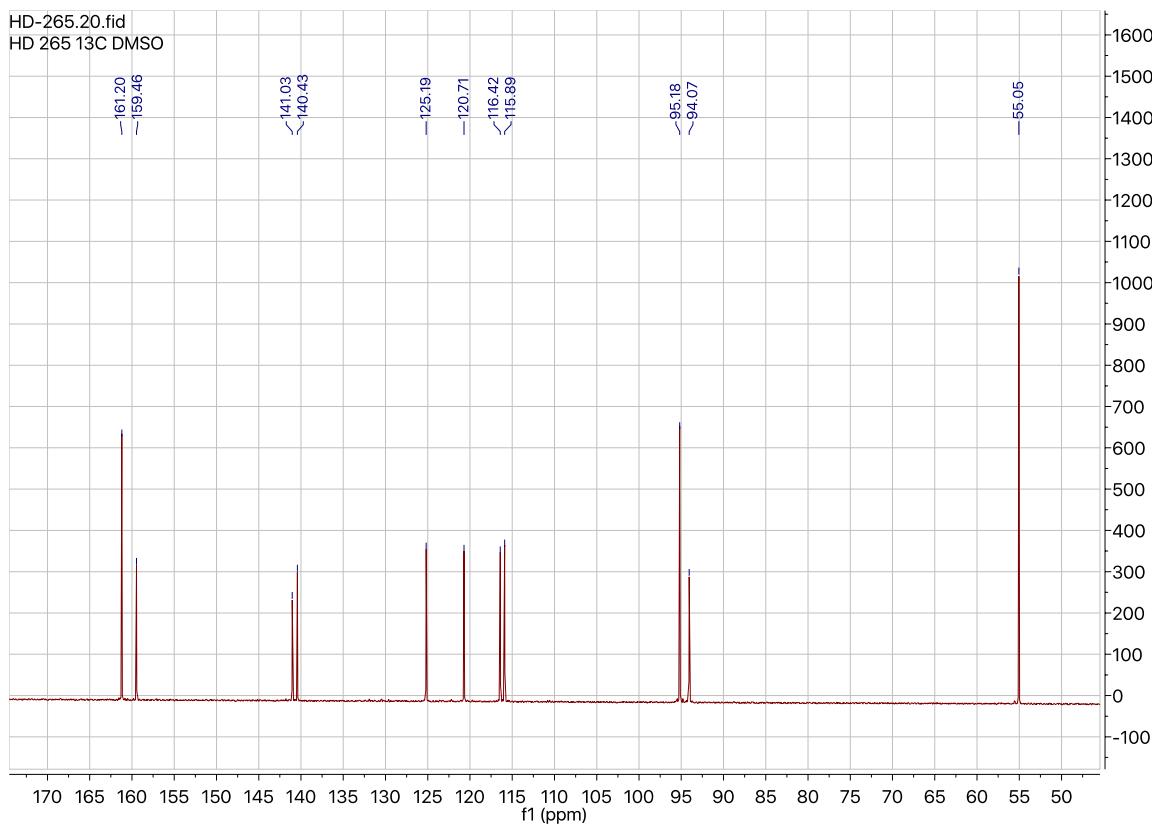
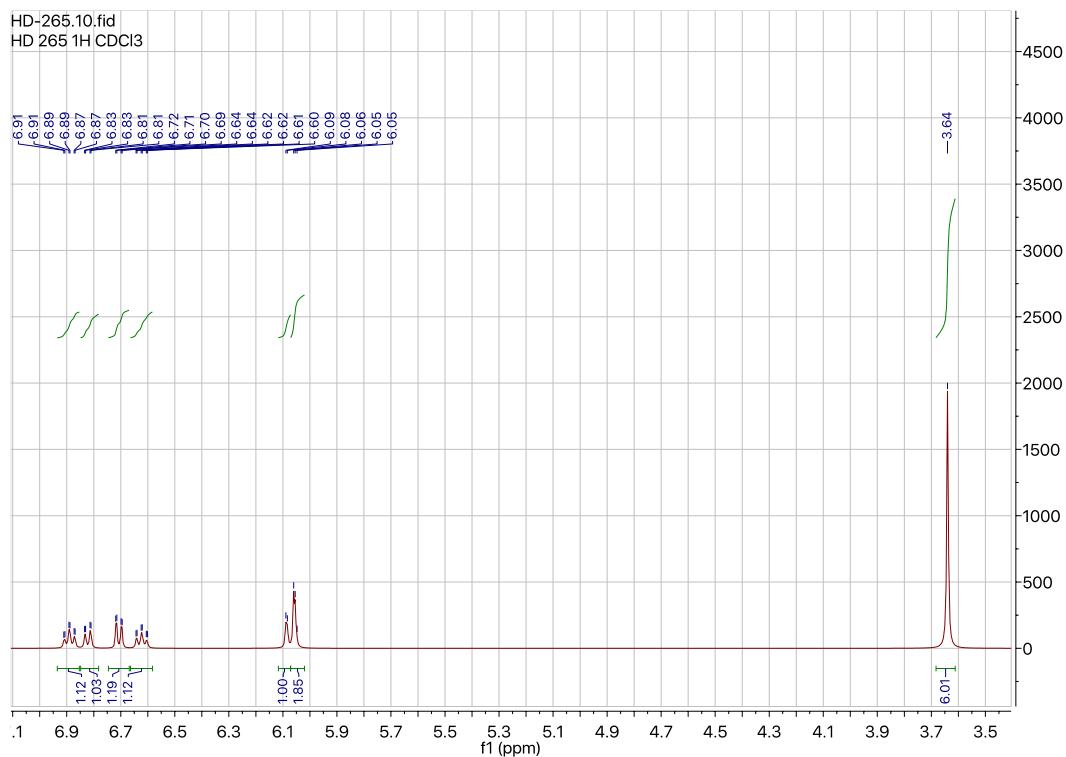
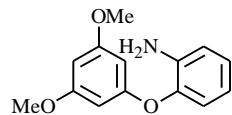
1,3-Dimethoxy-5-(2'-nitrophenoxy)benzene (8)



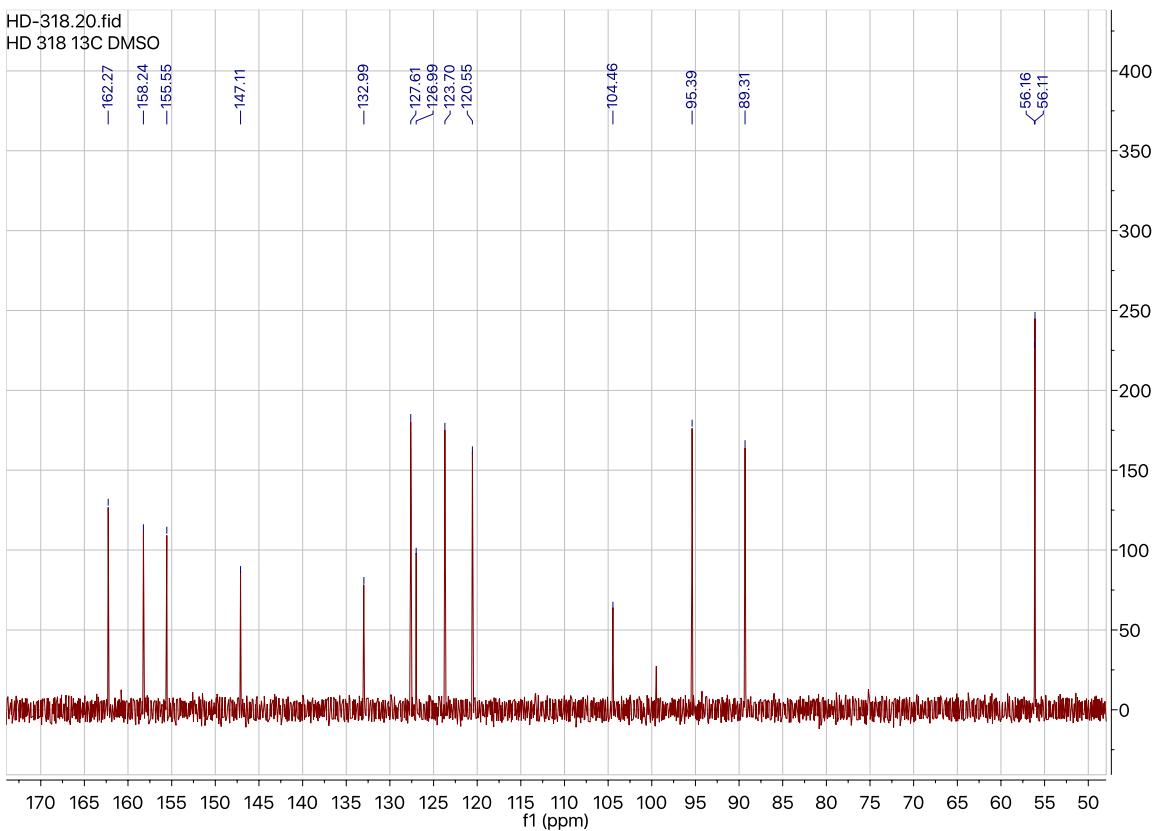
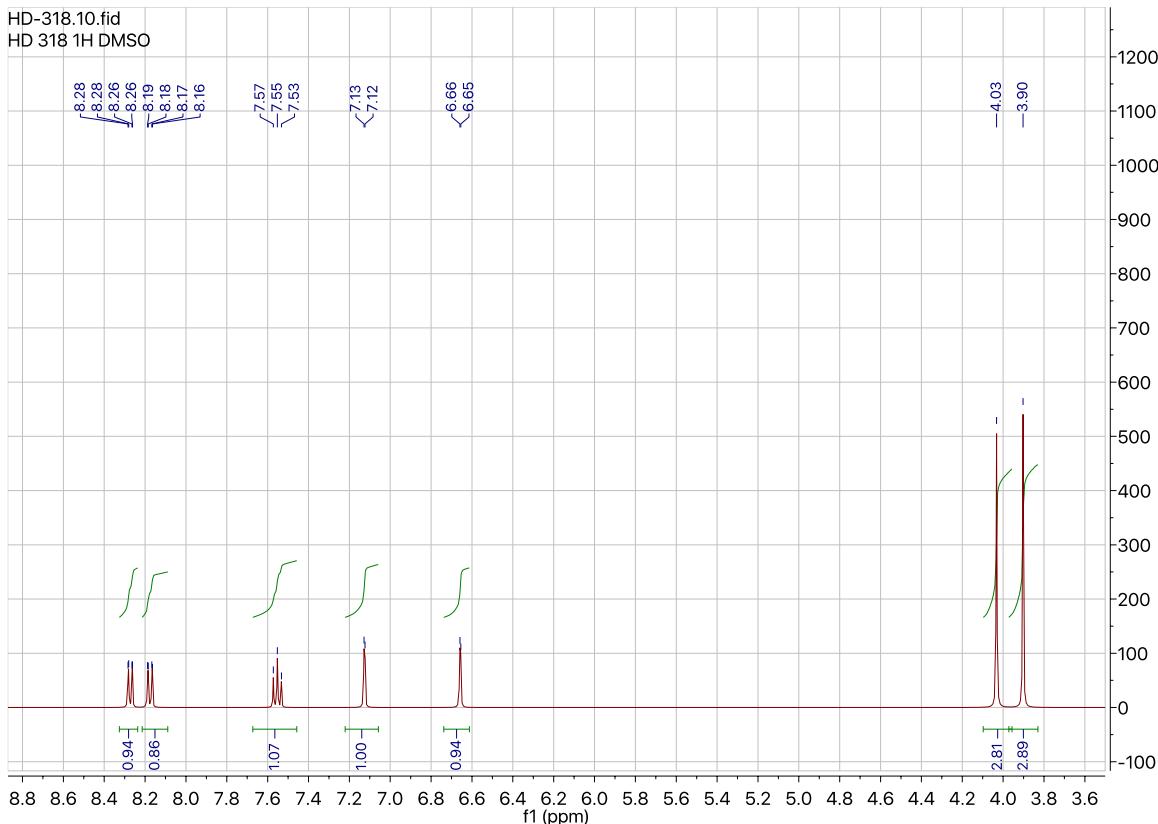
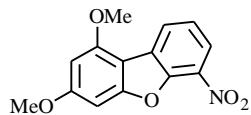
2-(3',5'-Dibenzyloxyphenoxy)aniline (9)



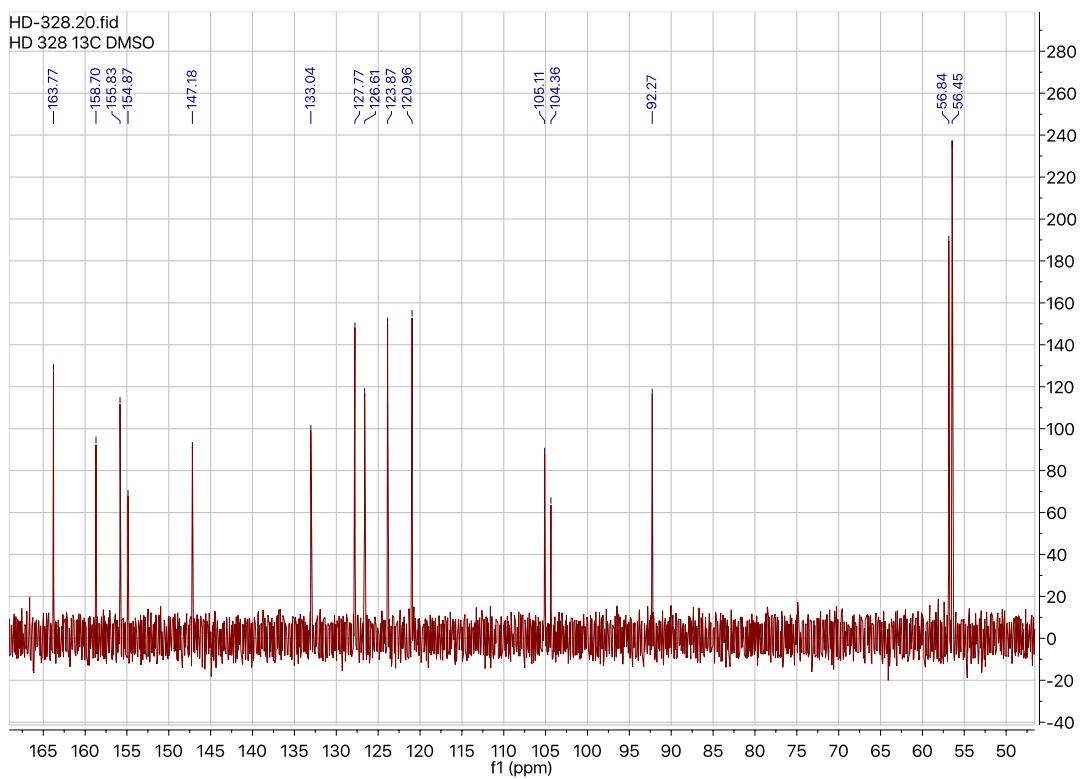
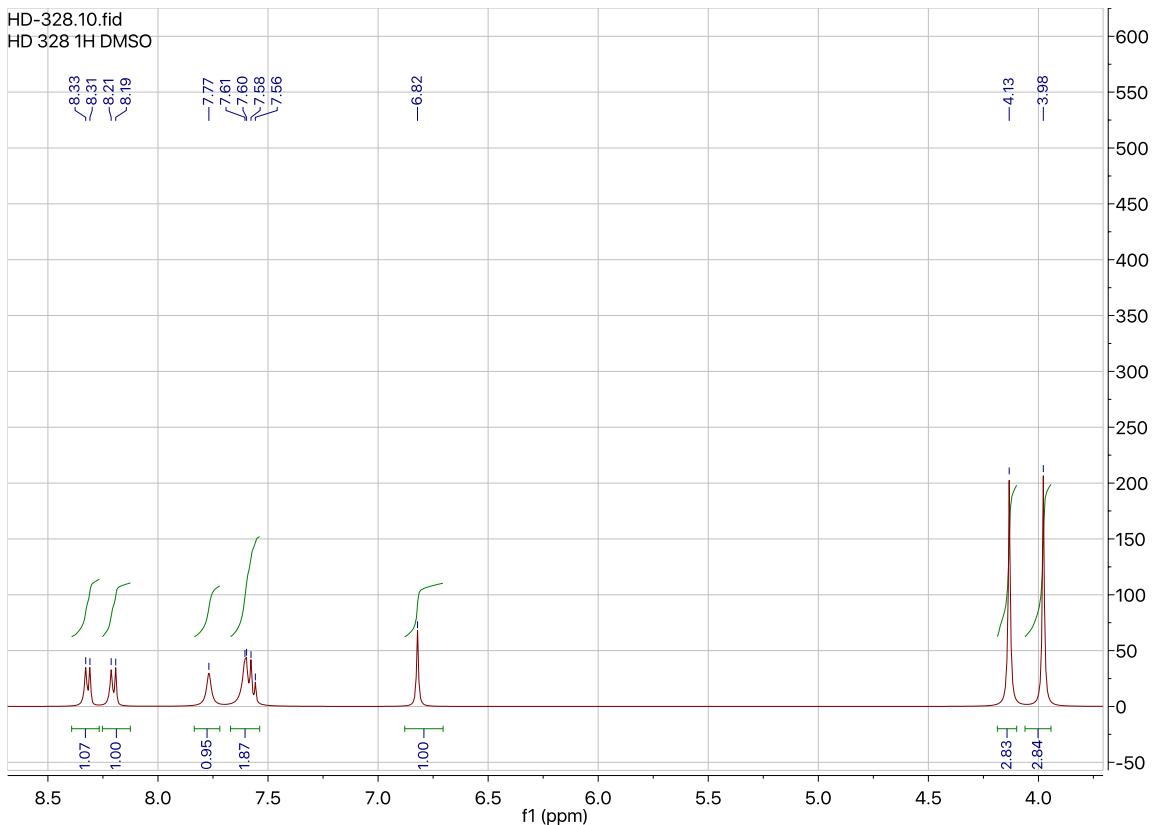
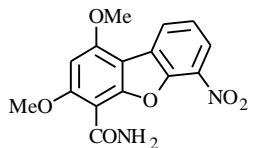
2-(3',5'-Dimethoxyphenoxy)aniline (10)



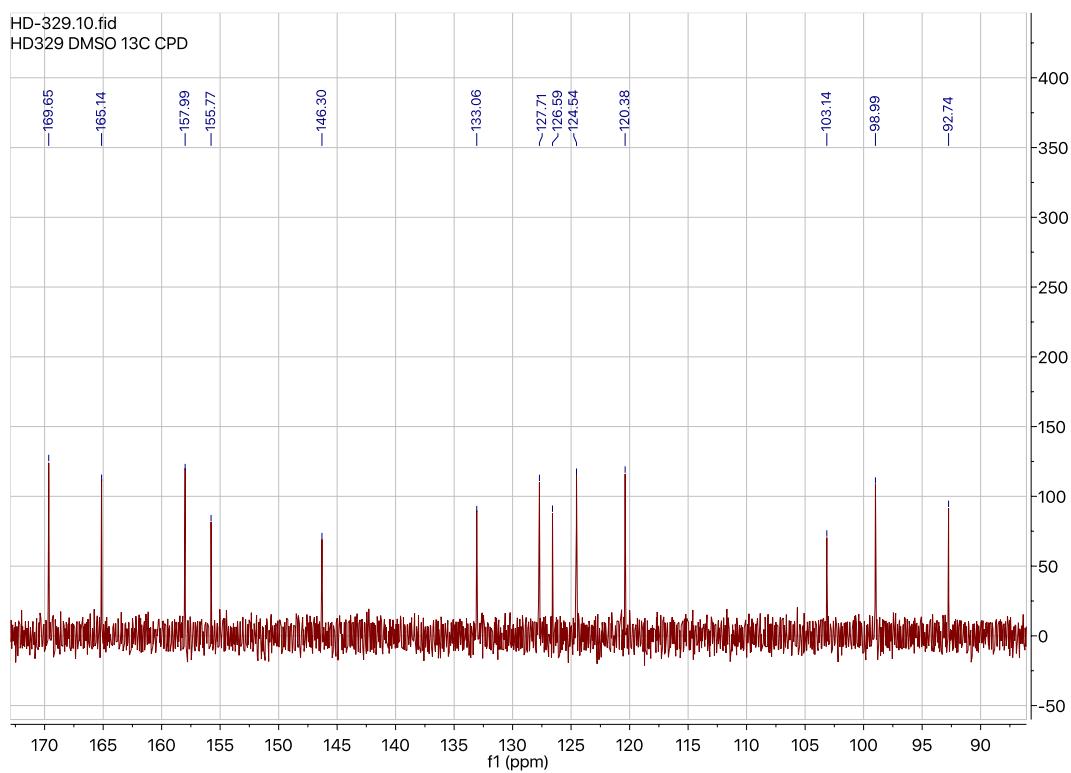
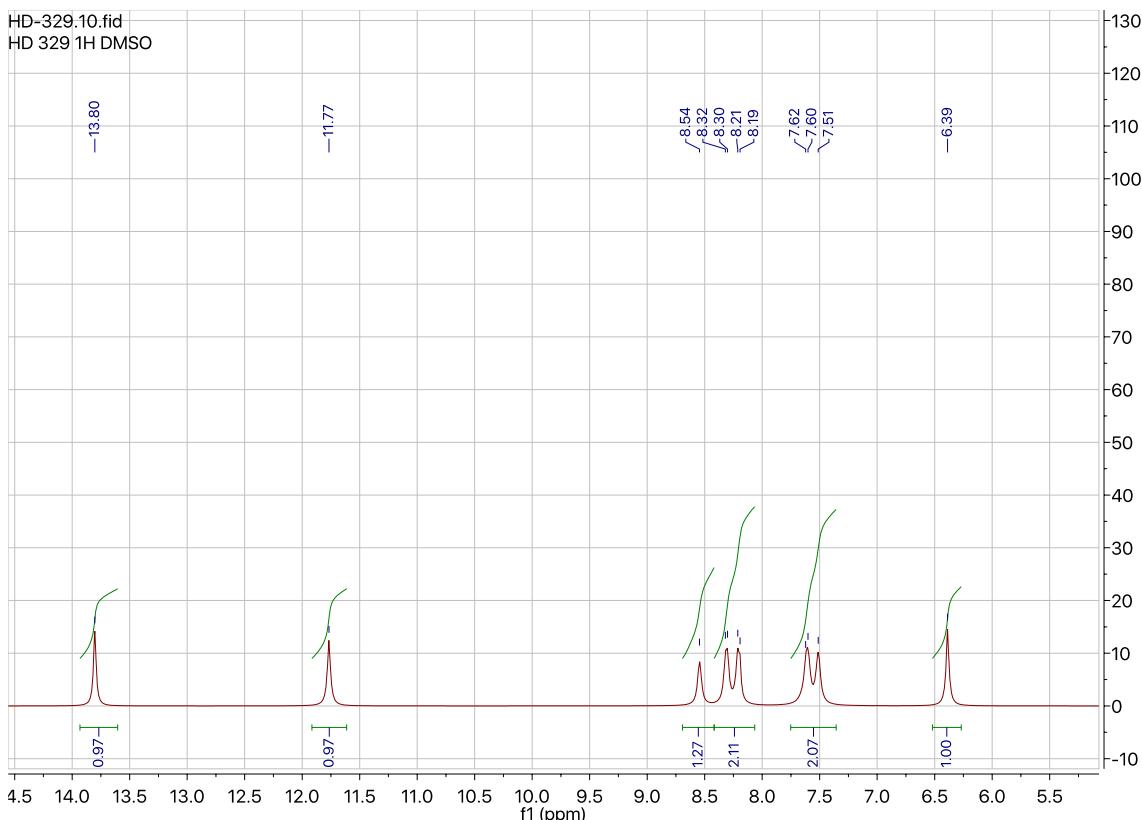
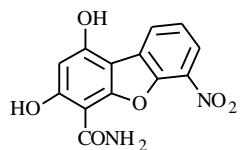
1,3-Dimethoxy-6-nitrodibenzo[*b,d*]furan (13)



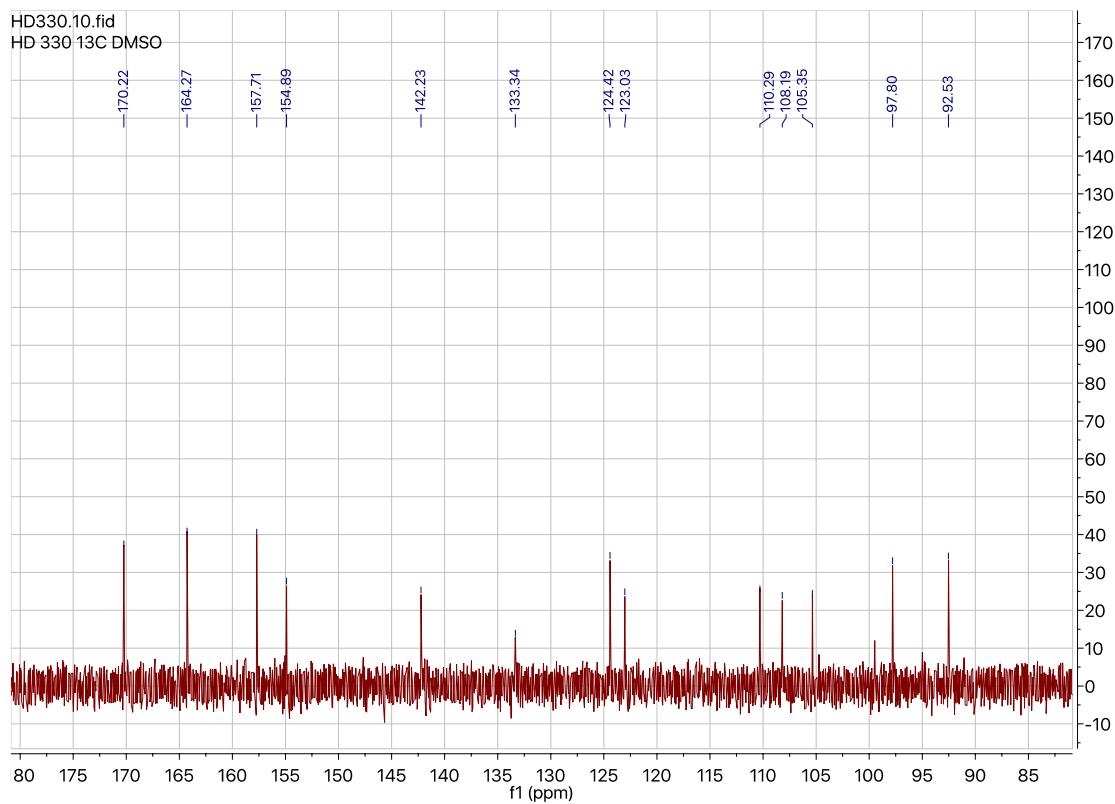
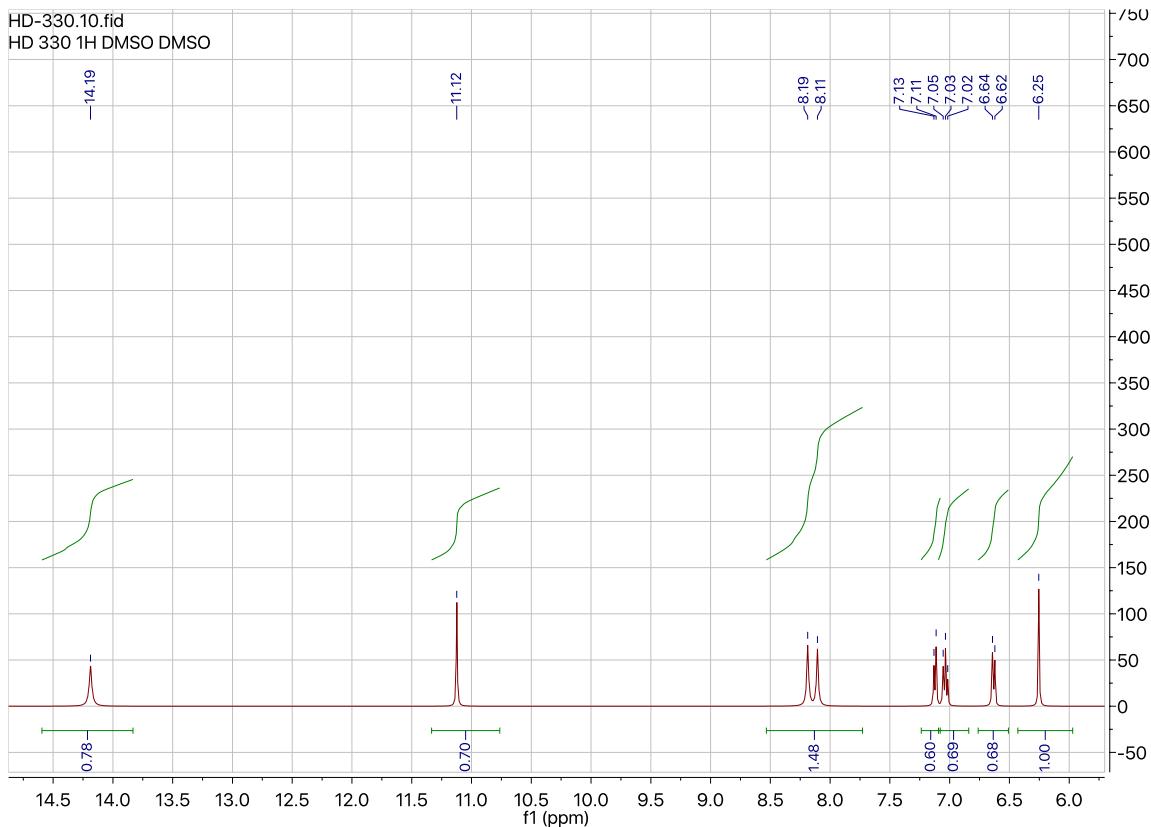
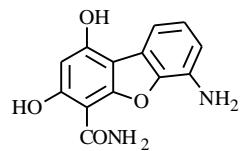
1,3-Dimethoxy-6-nitrodibenzo[*b,d*]furan-4-carboxamide (14)

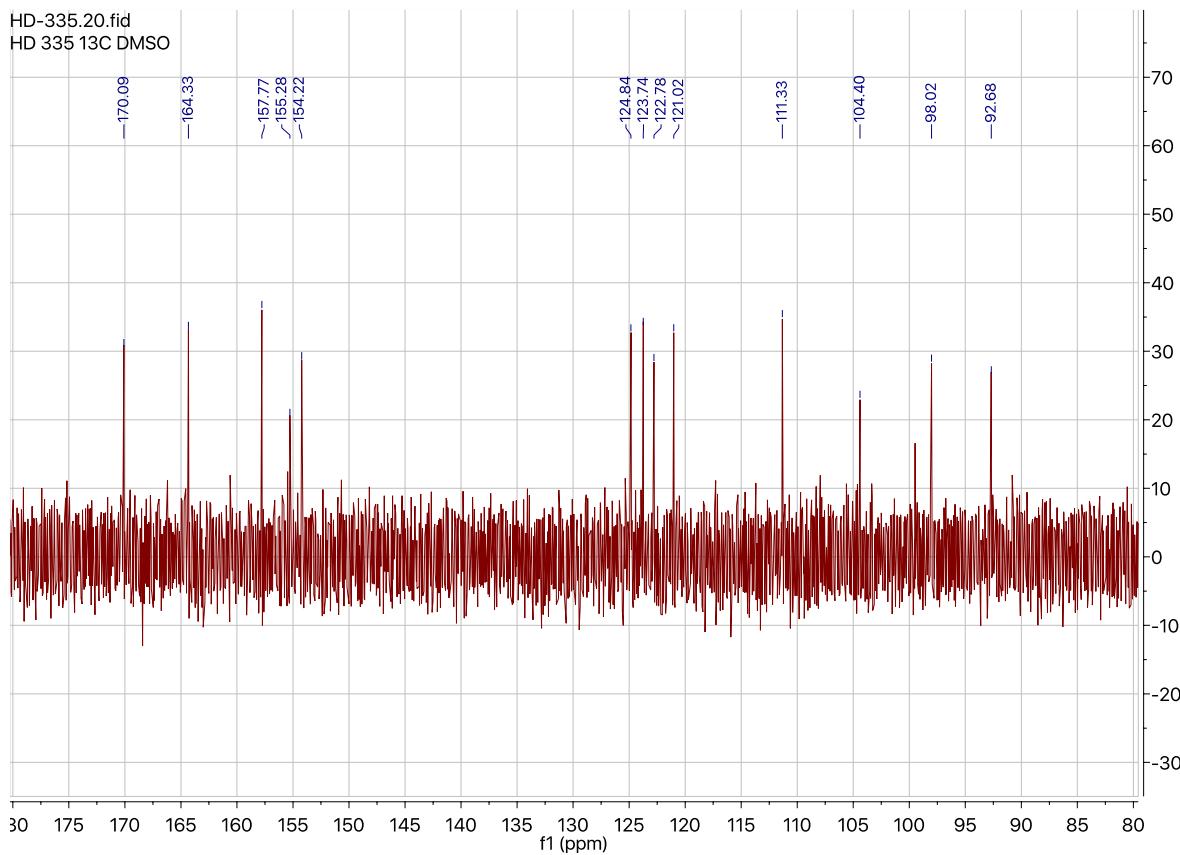
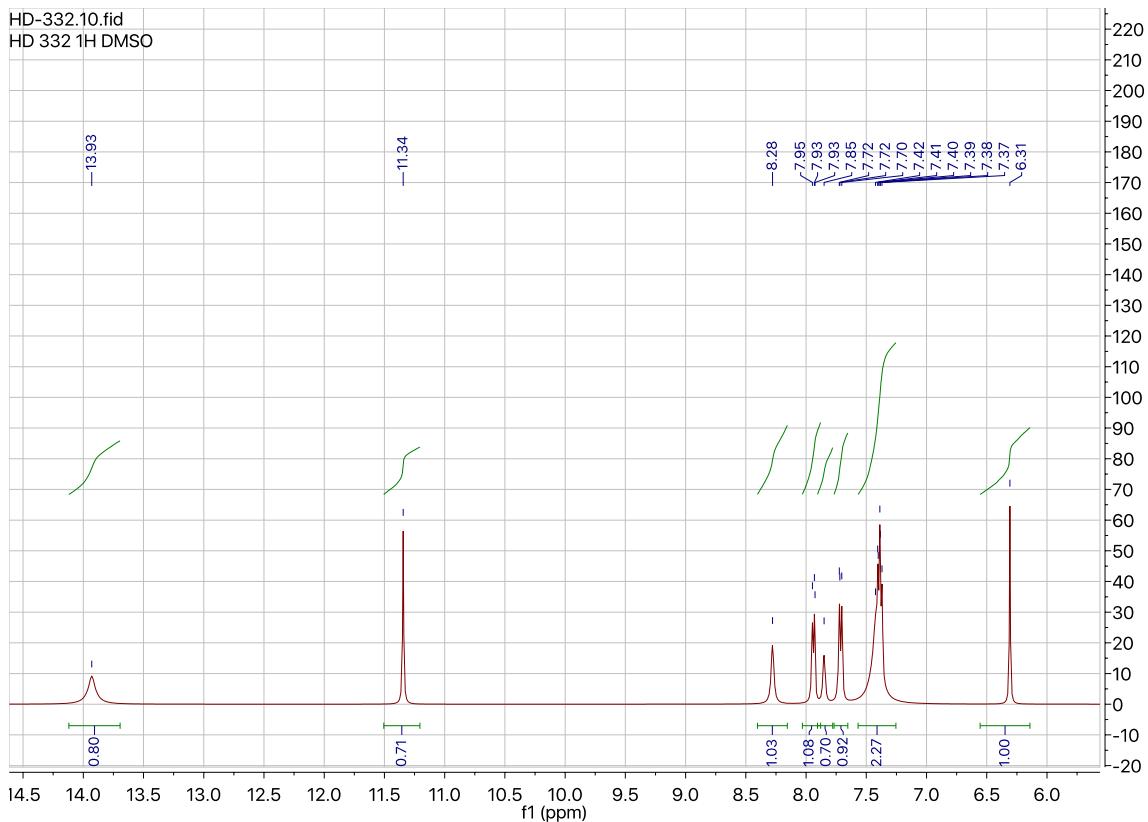
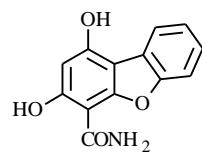


1,3-Dihydroxy-6-nitrodibenzo[*b,d*]furan-4-carboxamide (15)

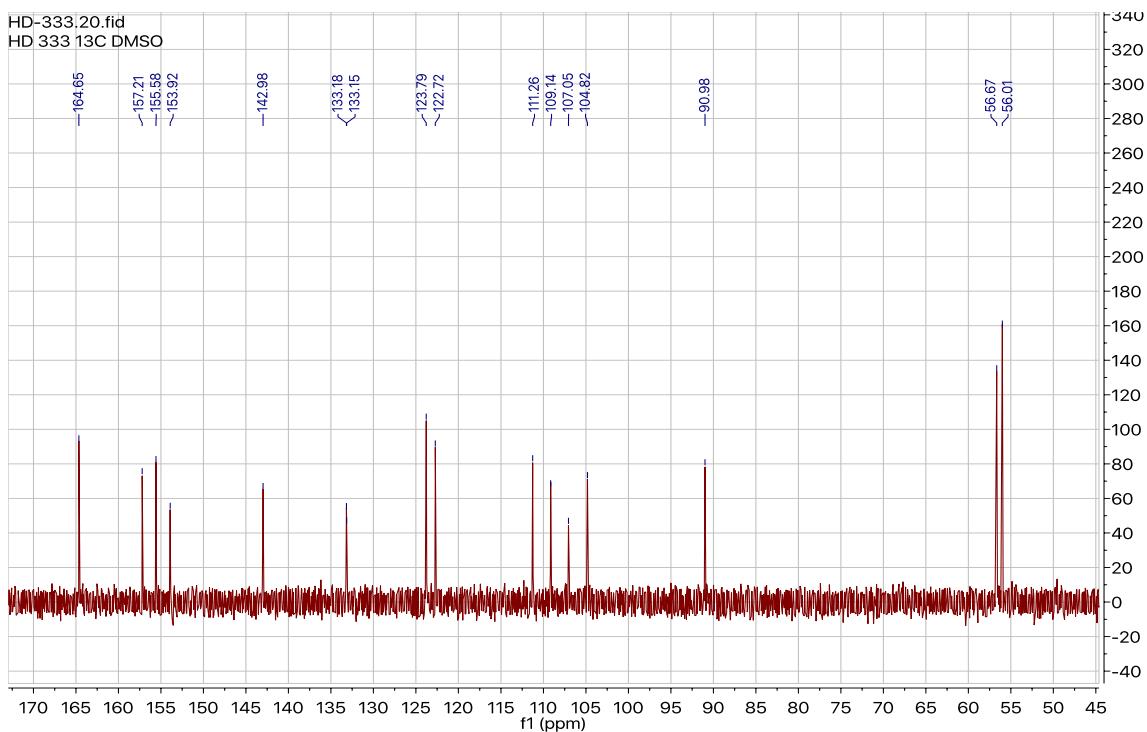
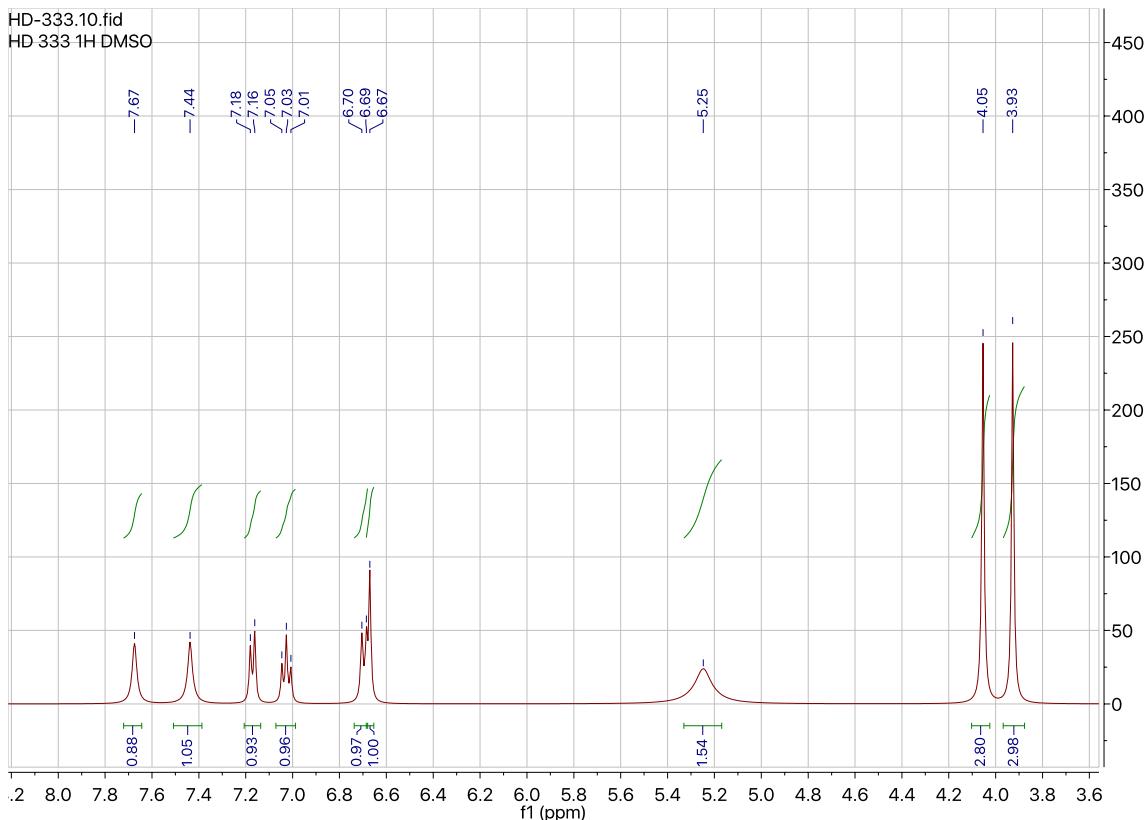
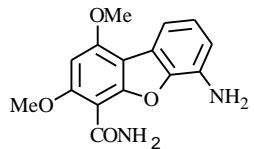


6-Amino-1,3-dihydroxydibenzo[*b,d*]furan-4-carboxamide (16)

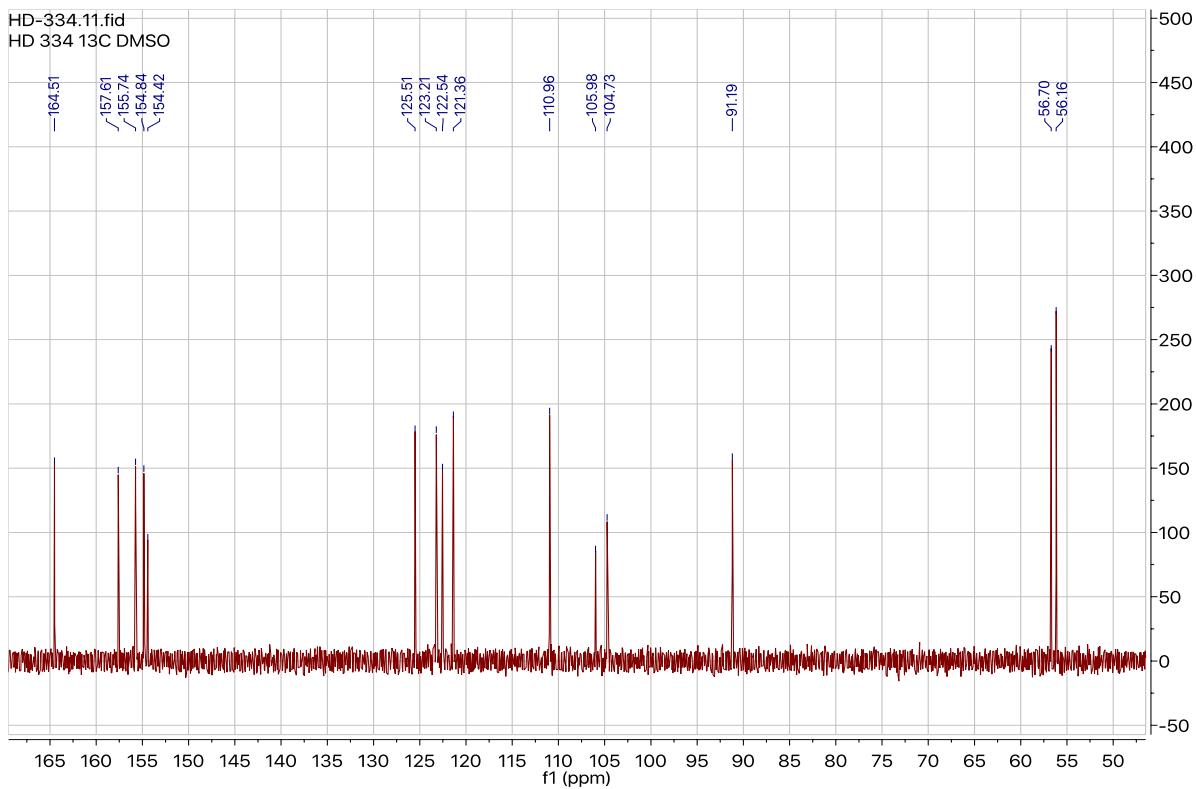
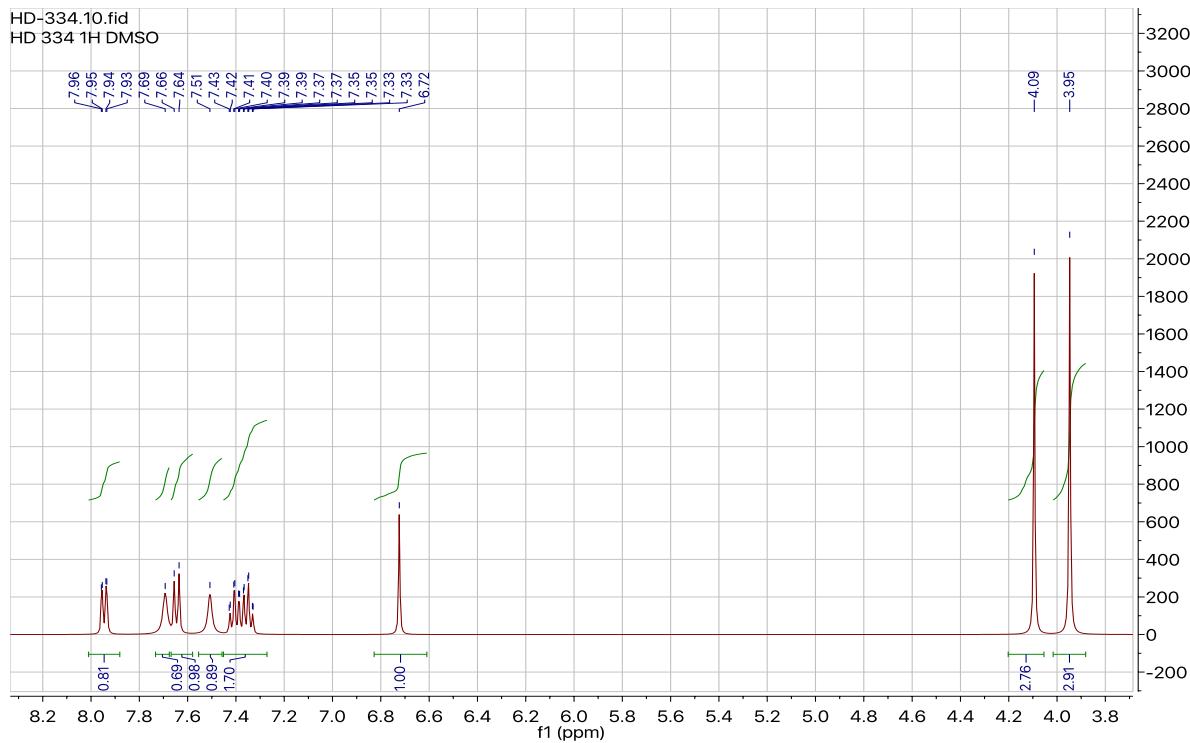
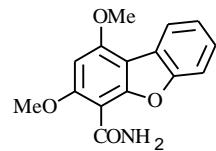


1,3-Dihydroxydibenzo[*b,d*]furan-4-carboxamide (17)

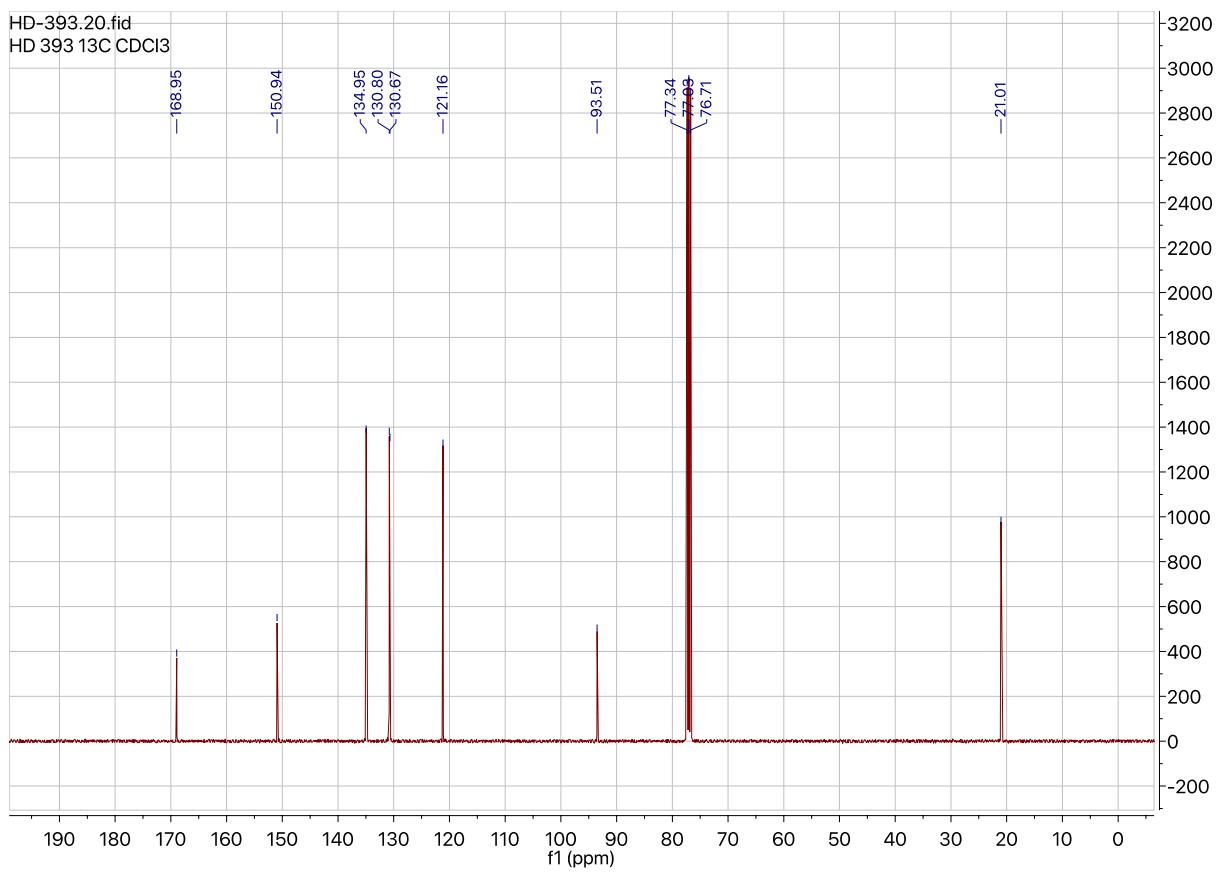
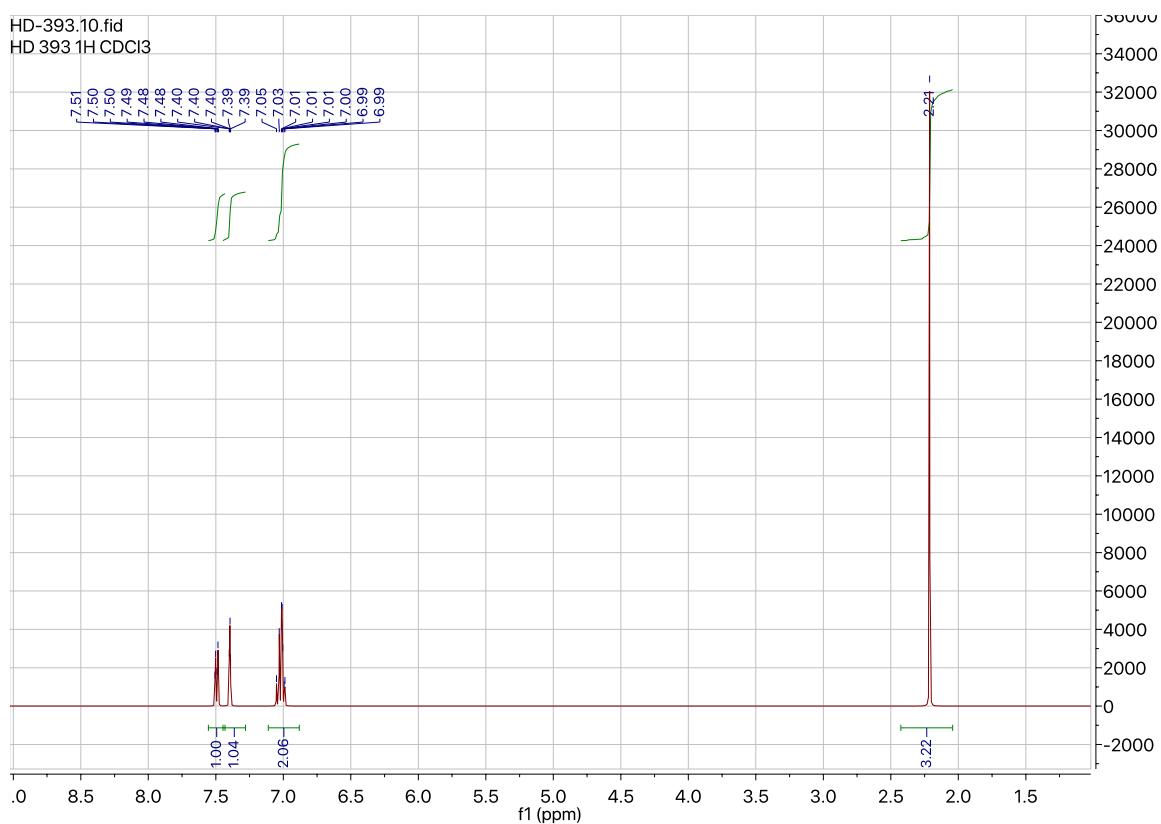
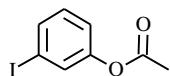
6-Amino-1,3-dimethoxydibenzo[*b,d*]furan-4-carboxamide (18)



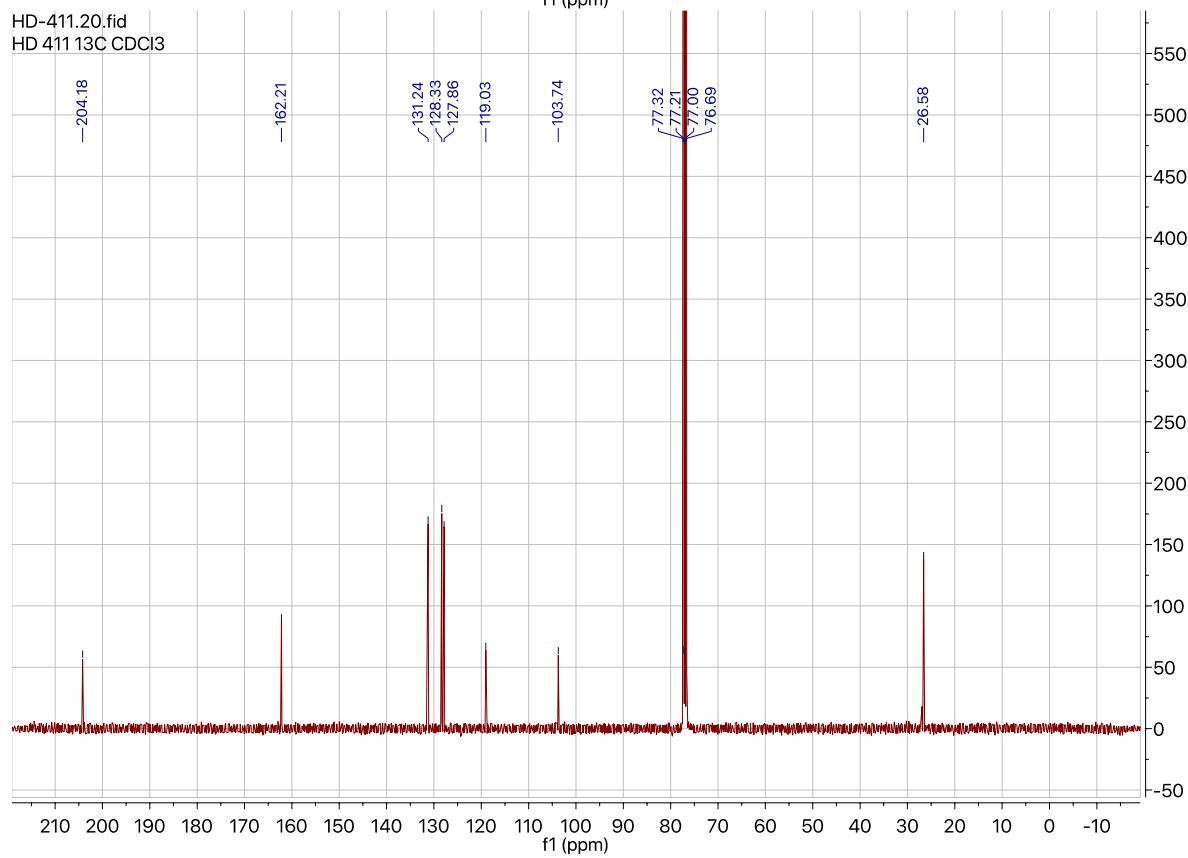
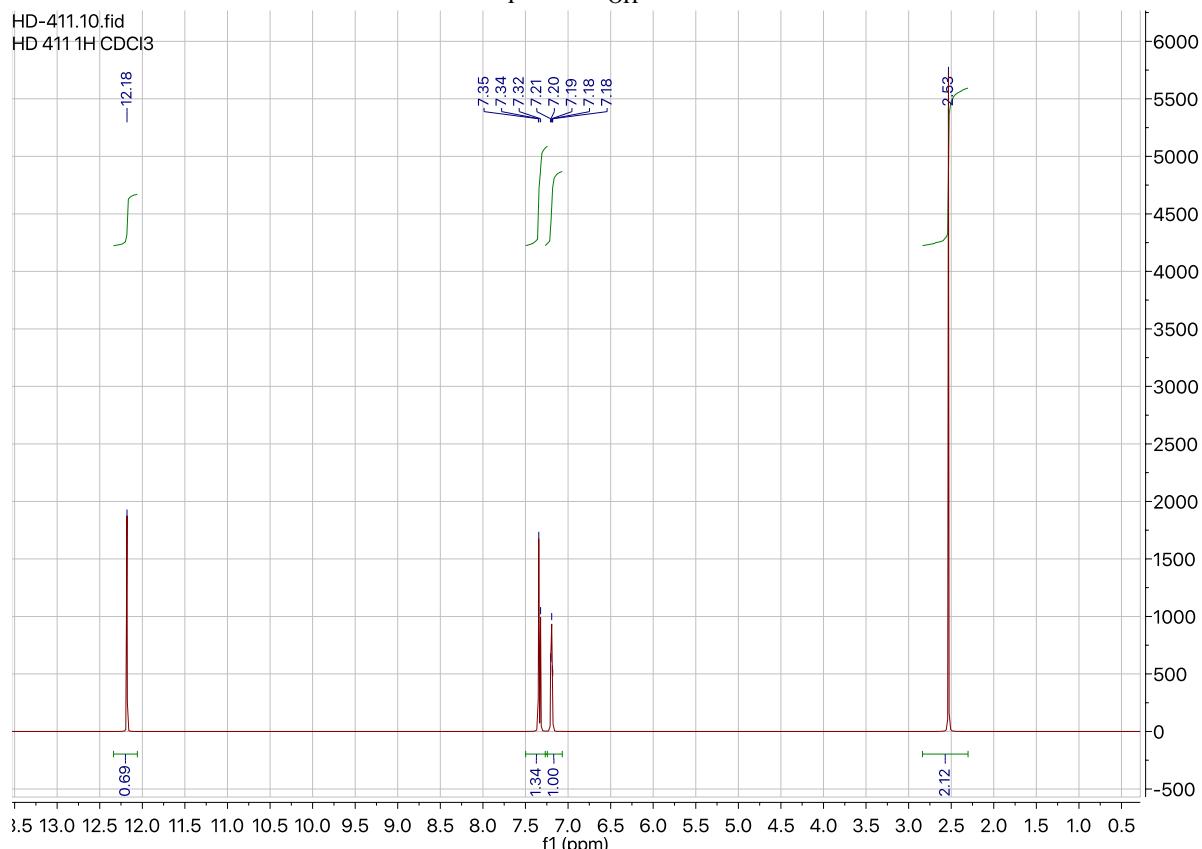
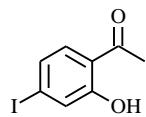
1,3-Dimethoxydibenzo[*b,d*]furan-4-carboxamide (19)



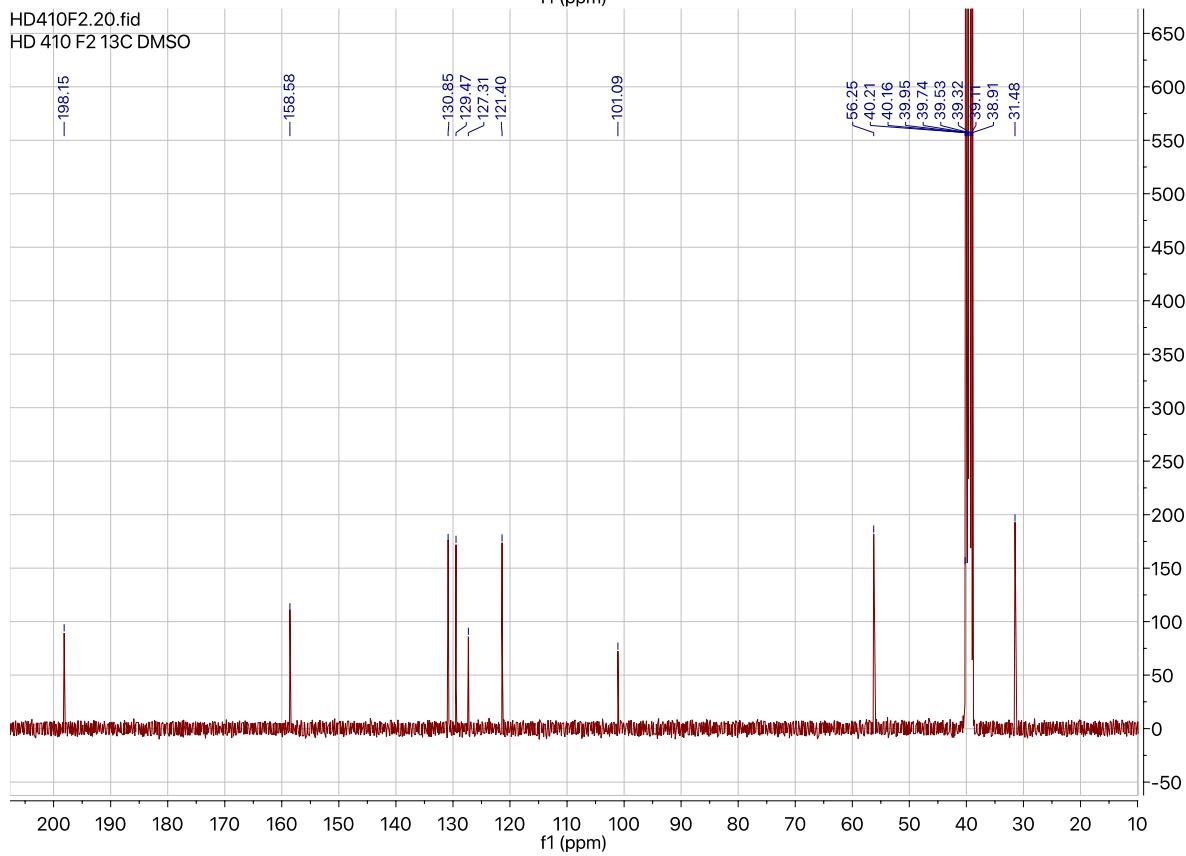
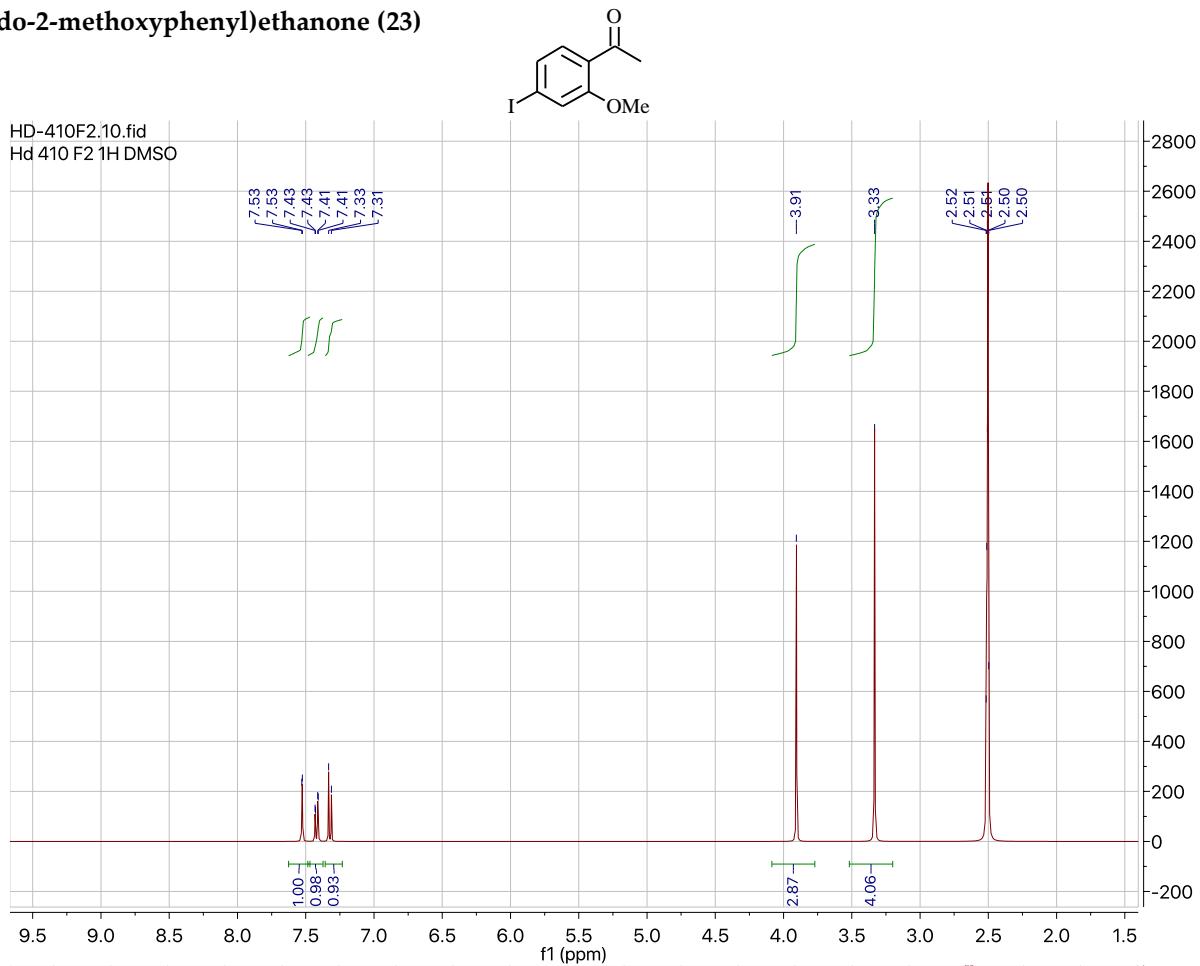
3- Iodophenyl acetate (21)



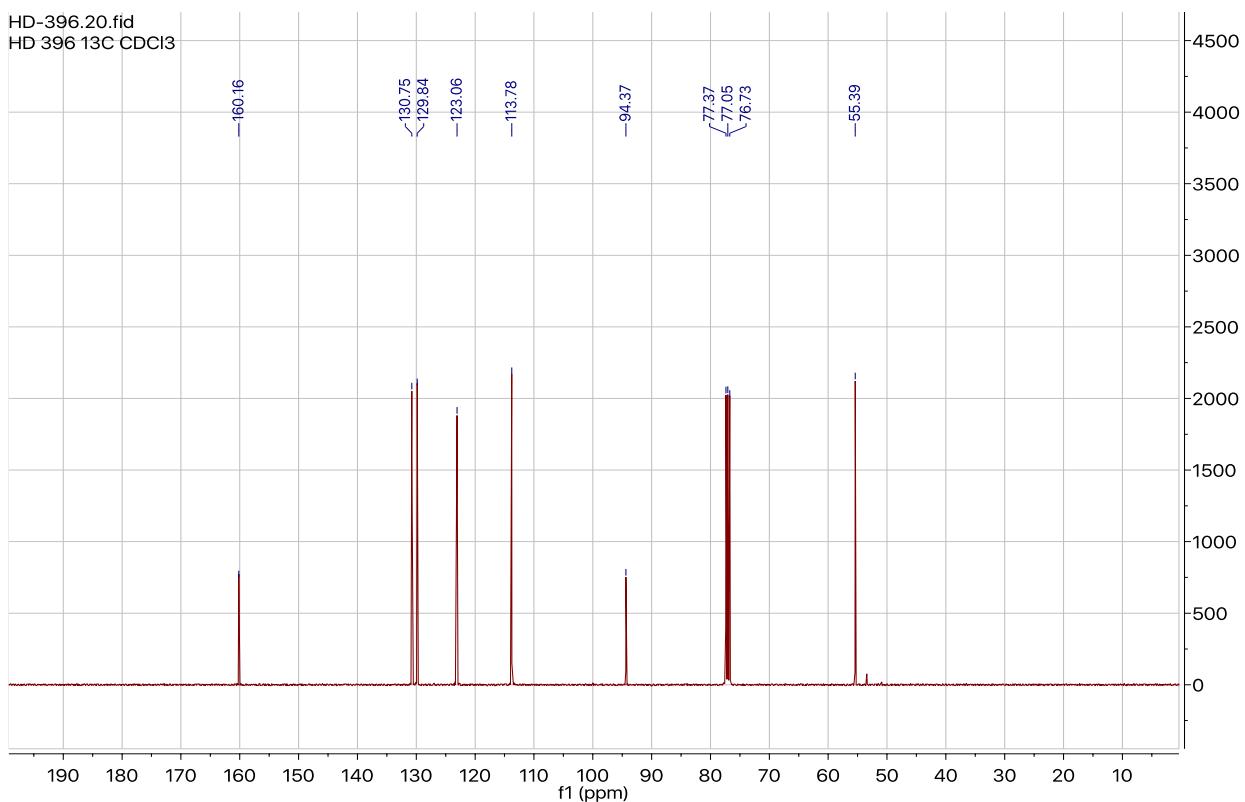
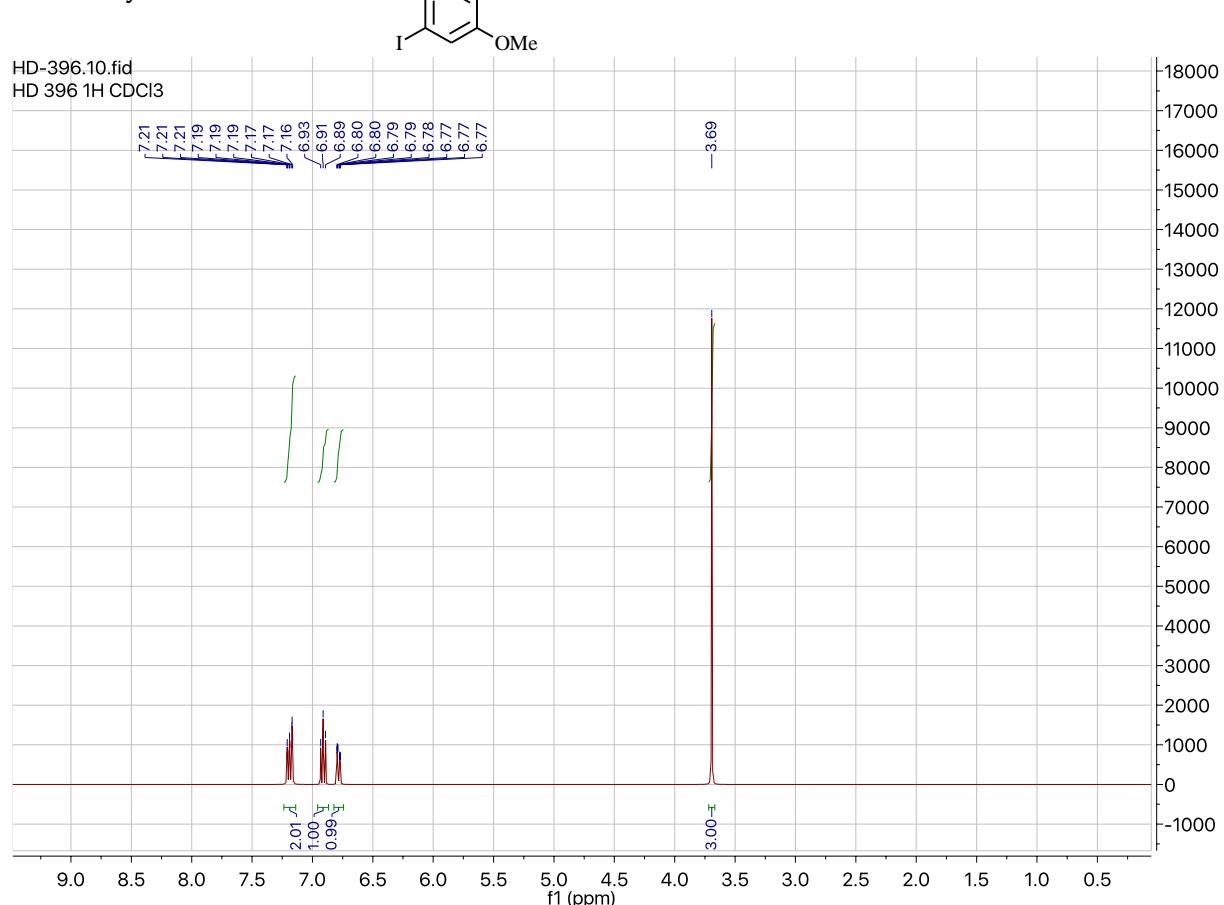
1-(2-Hydroxy-4-iodophenyl)ethanone (22)



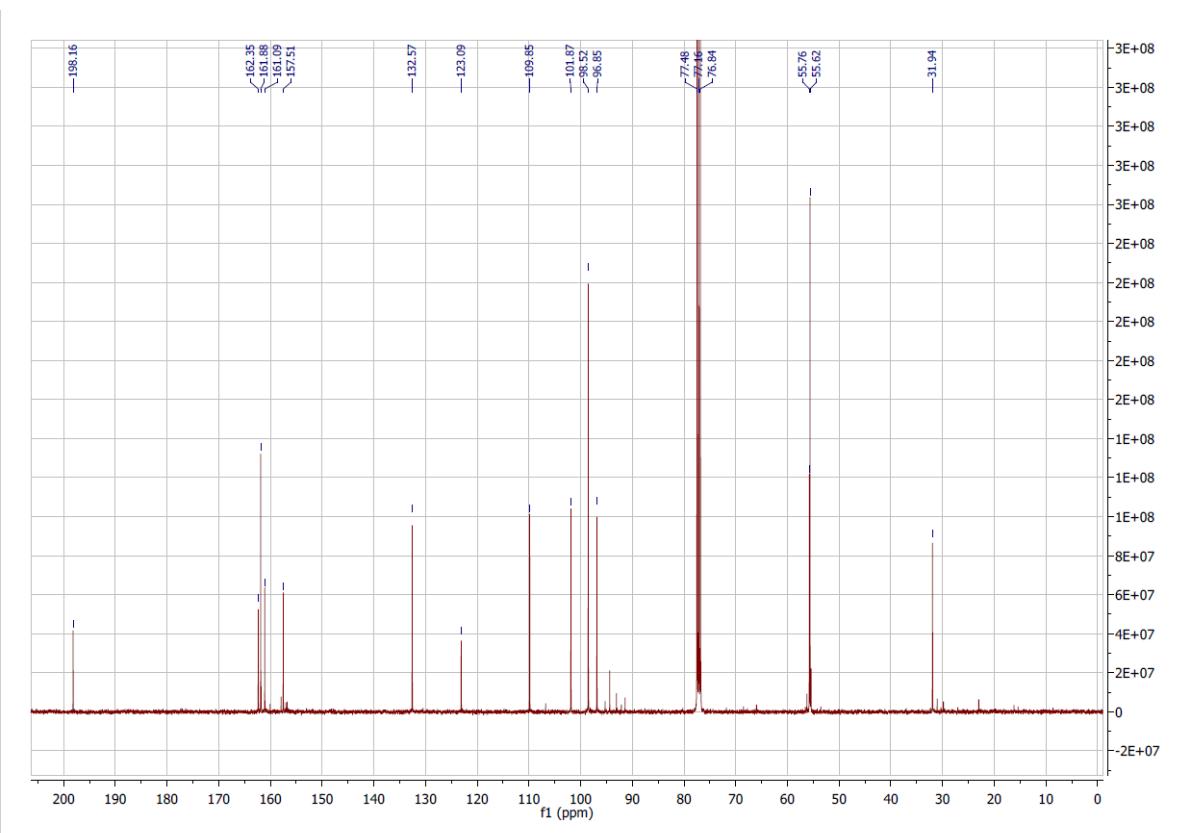
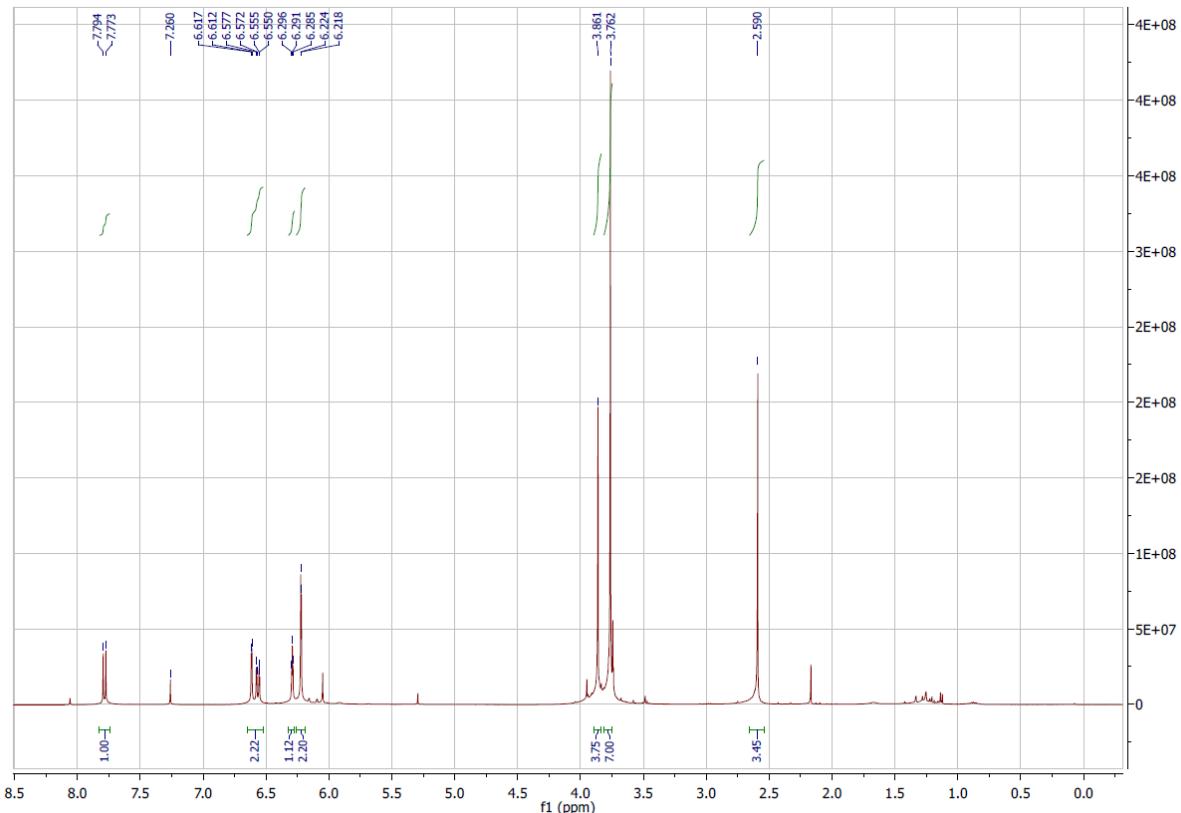
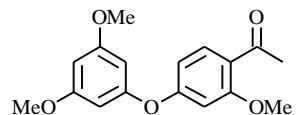
1-(4-Iodo-2-methoxyphenyl)ethanone (23)



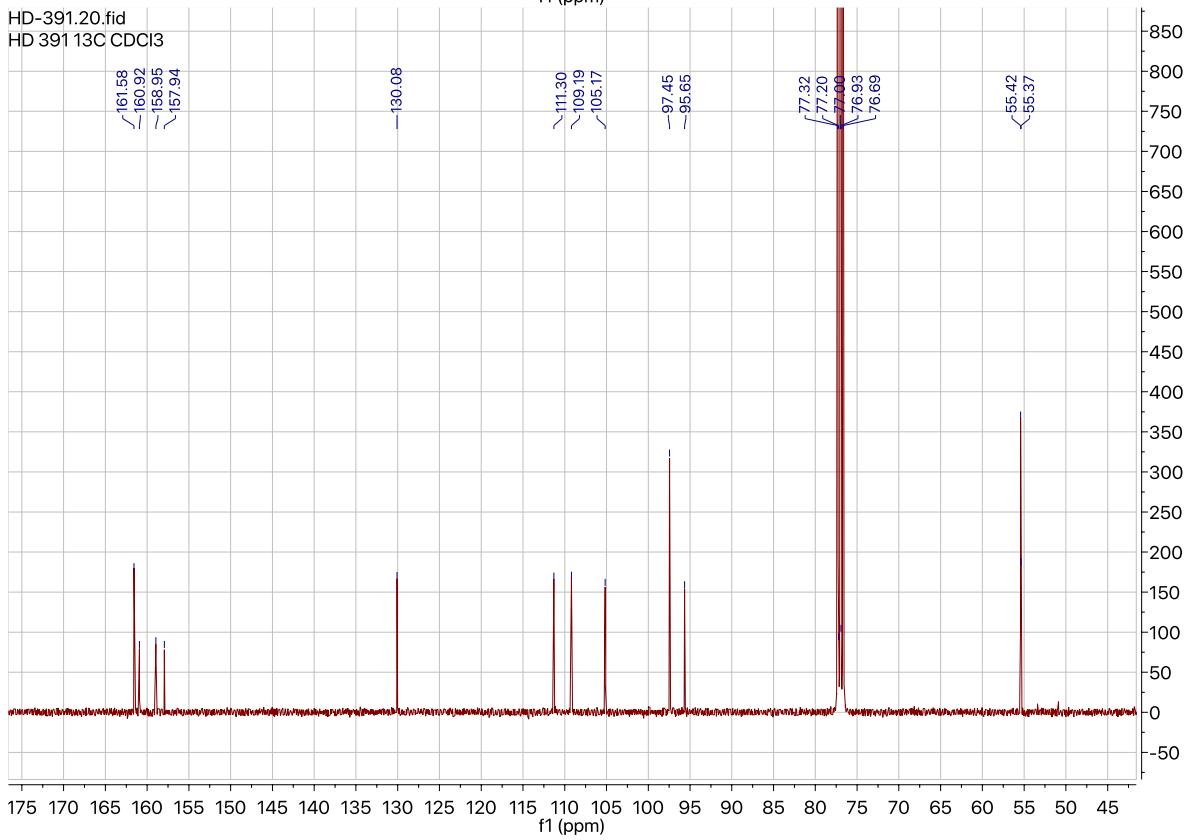
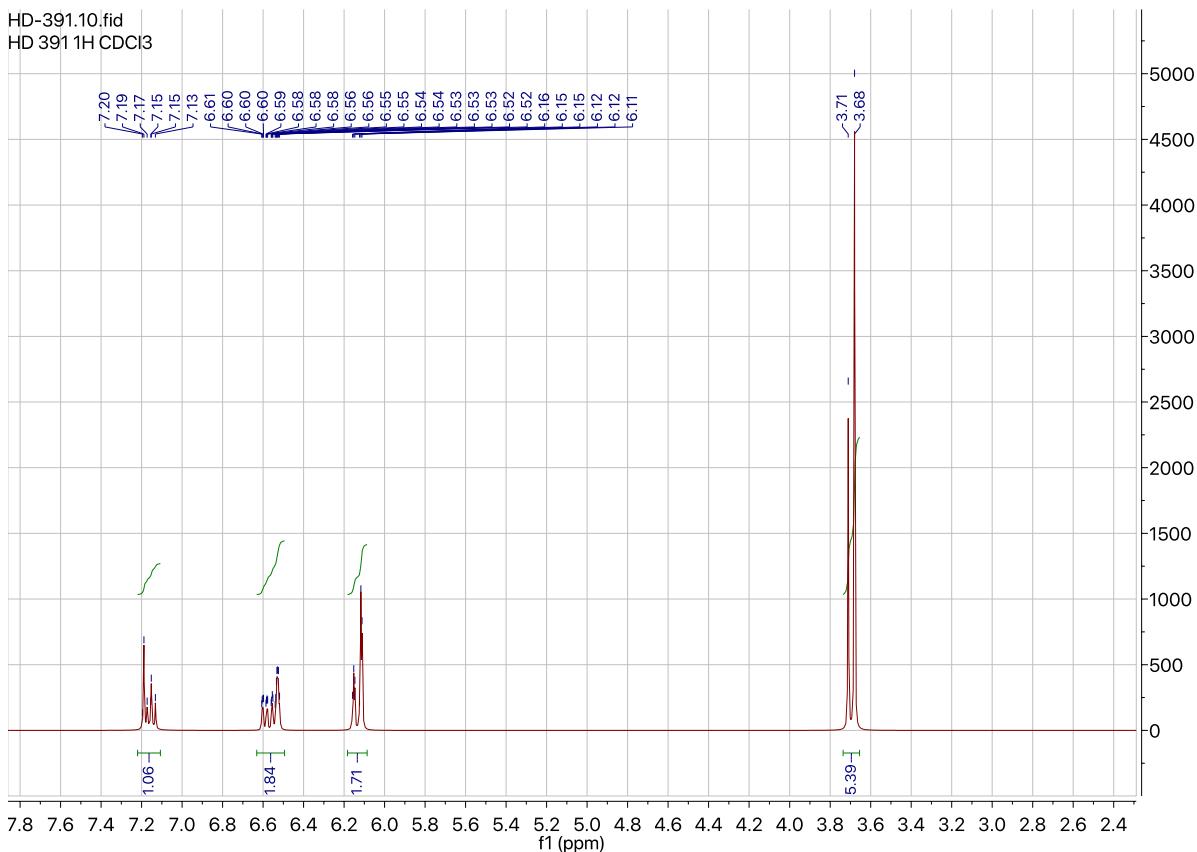
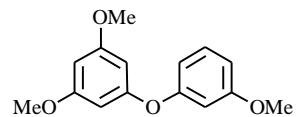
1-Iodo-3-methoxybenzene (24)



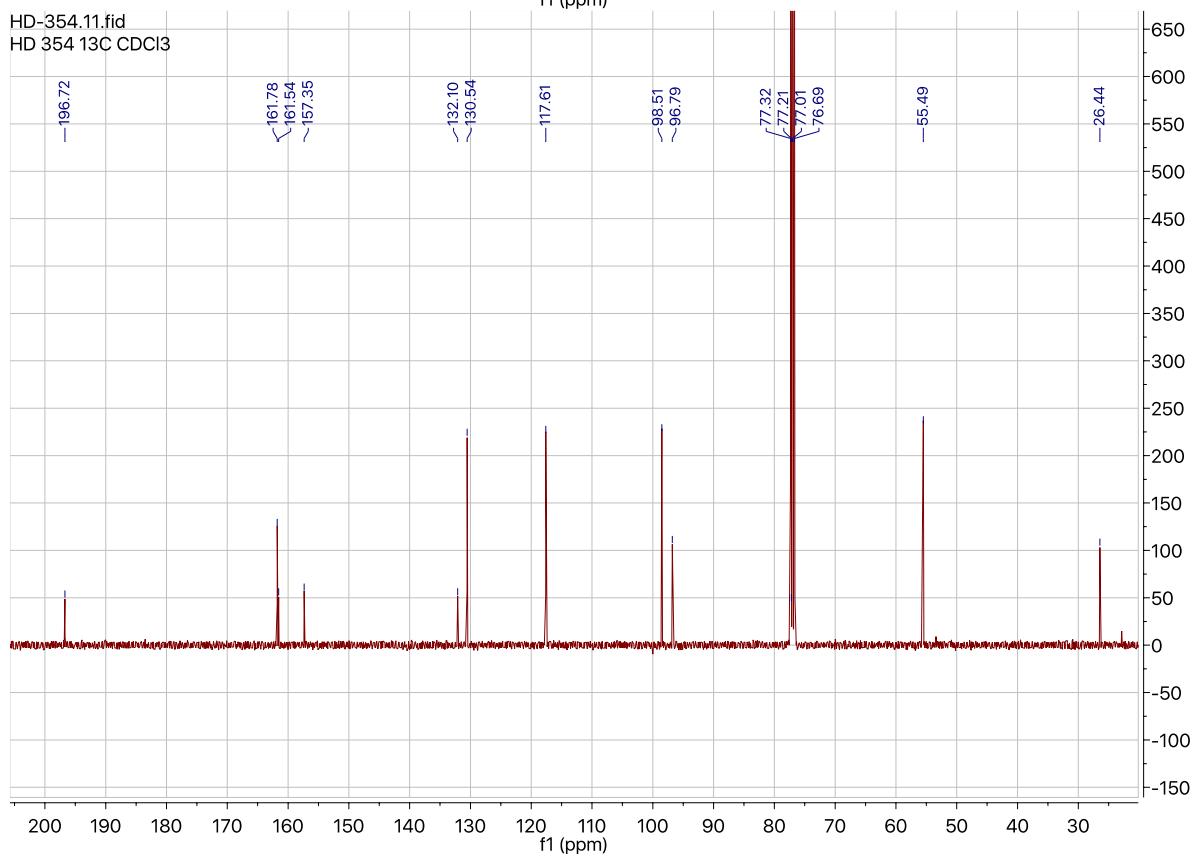
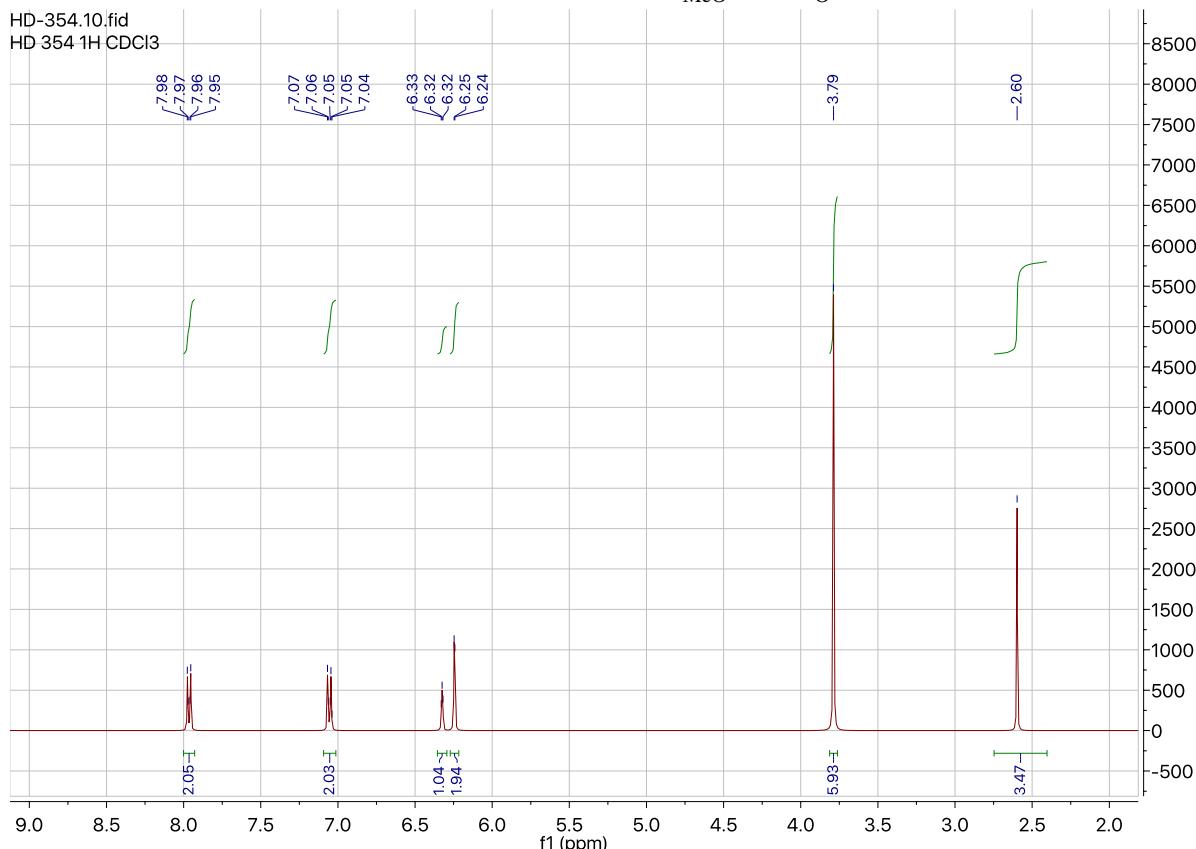
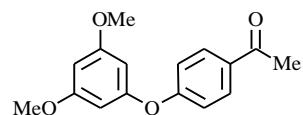
1-[4-(3',5'-Dimethoxyphenoxy)-2-methoxyphenyl]ethanone (28)



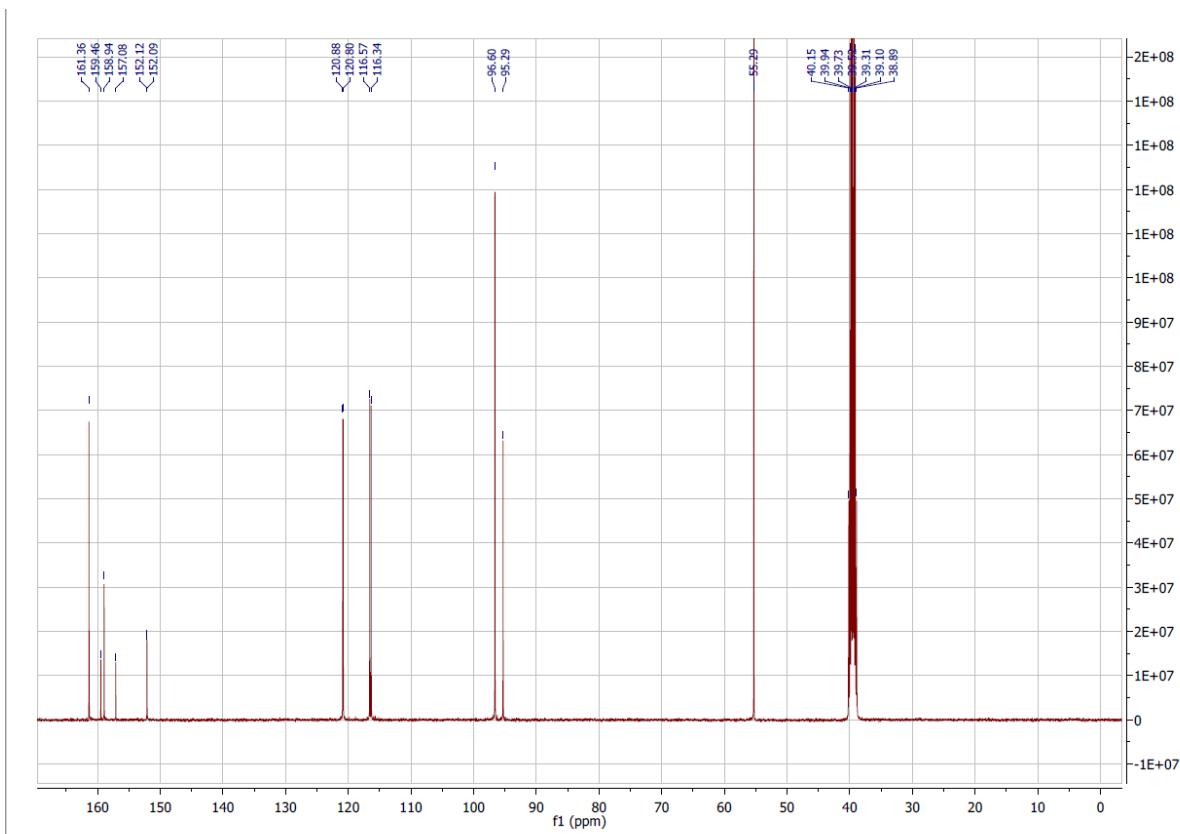
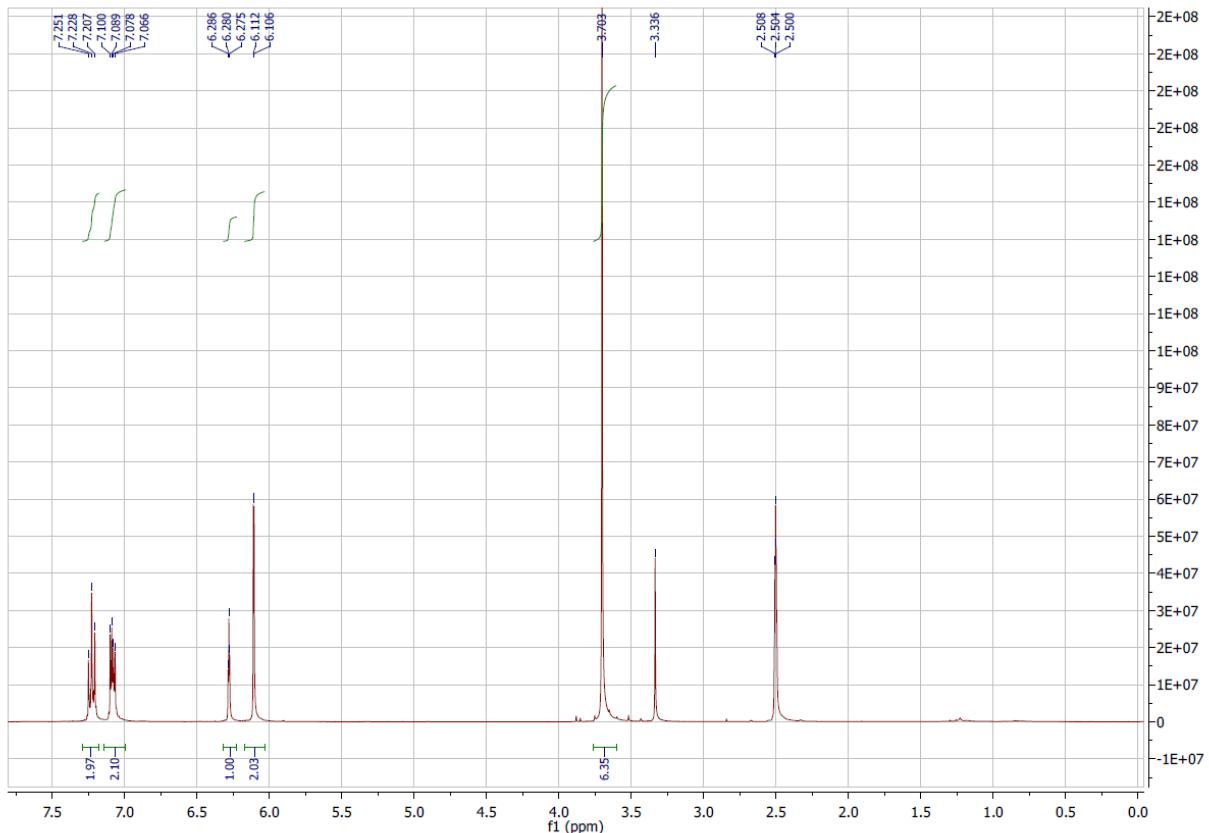
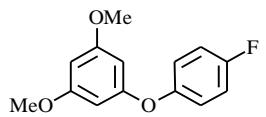
1,3-Dimethoxy-5-(3'-methoxyphenoxy)benzene (29)



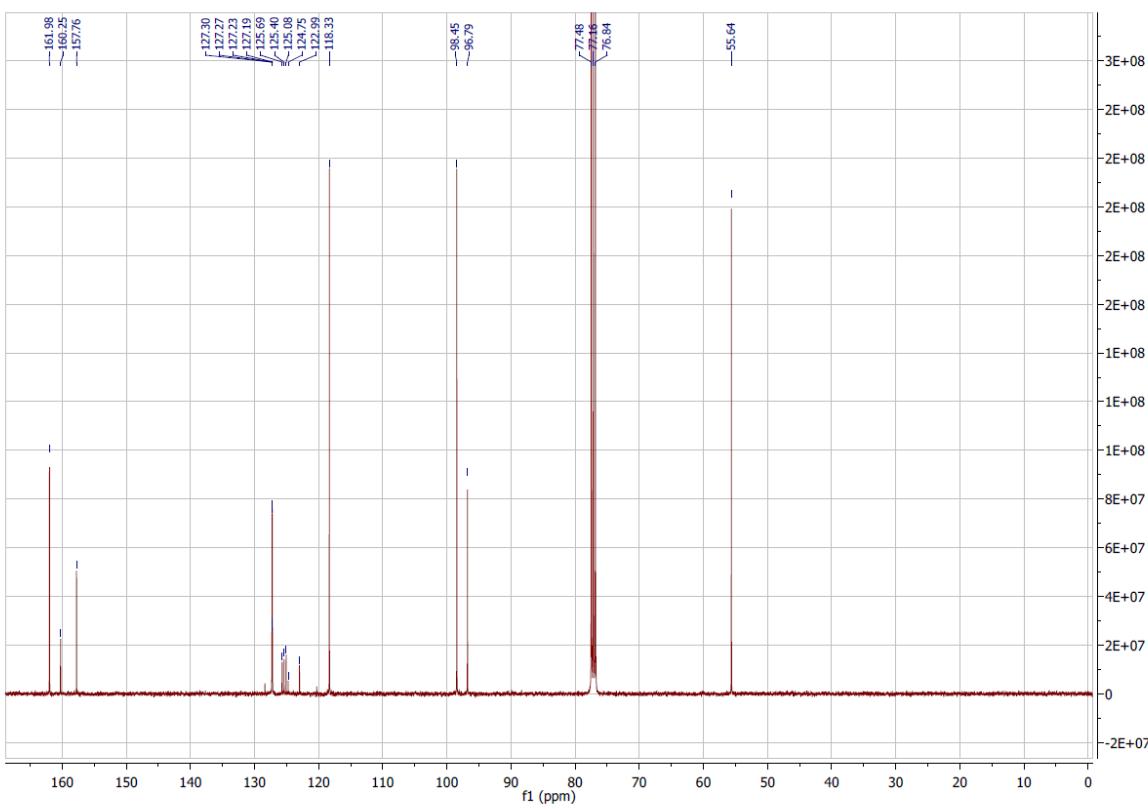
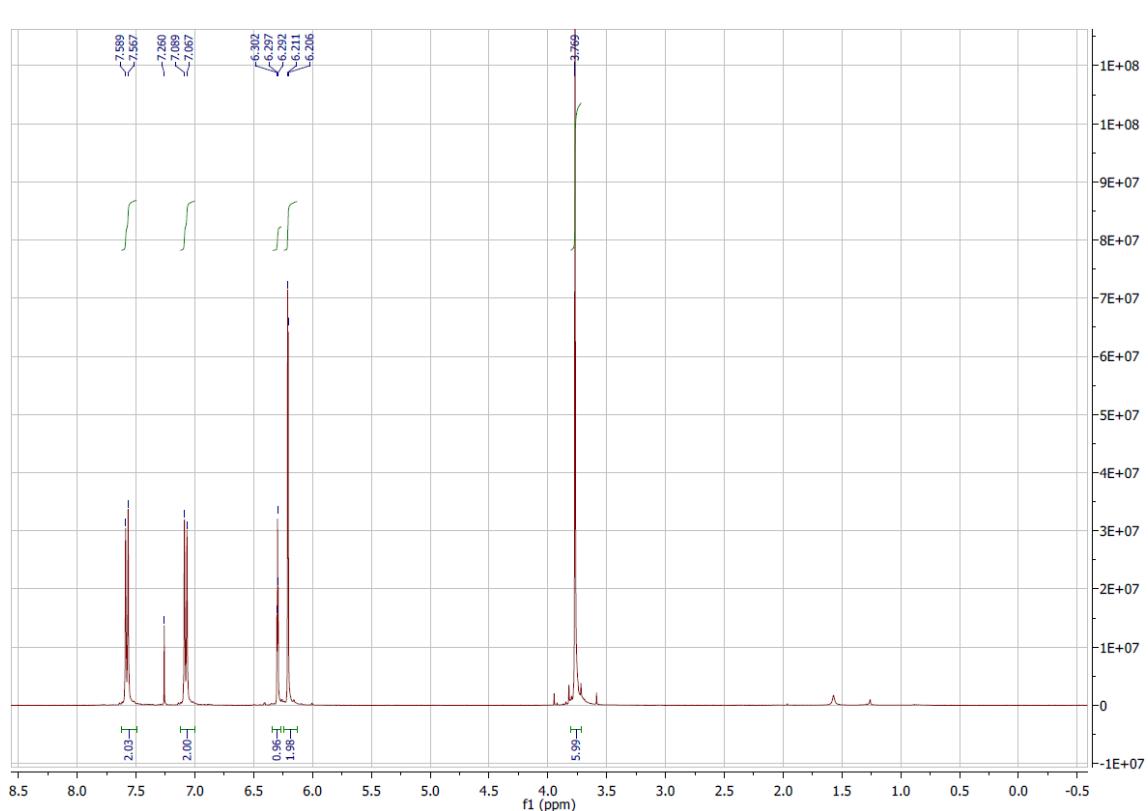
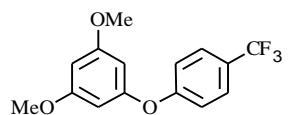
1-[4-(3',5'-Dimethoxyphenoxy)phenyl]ethanone (30)



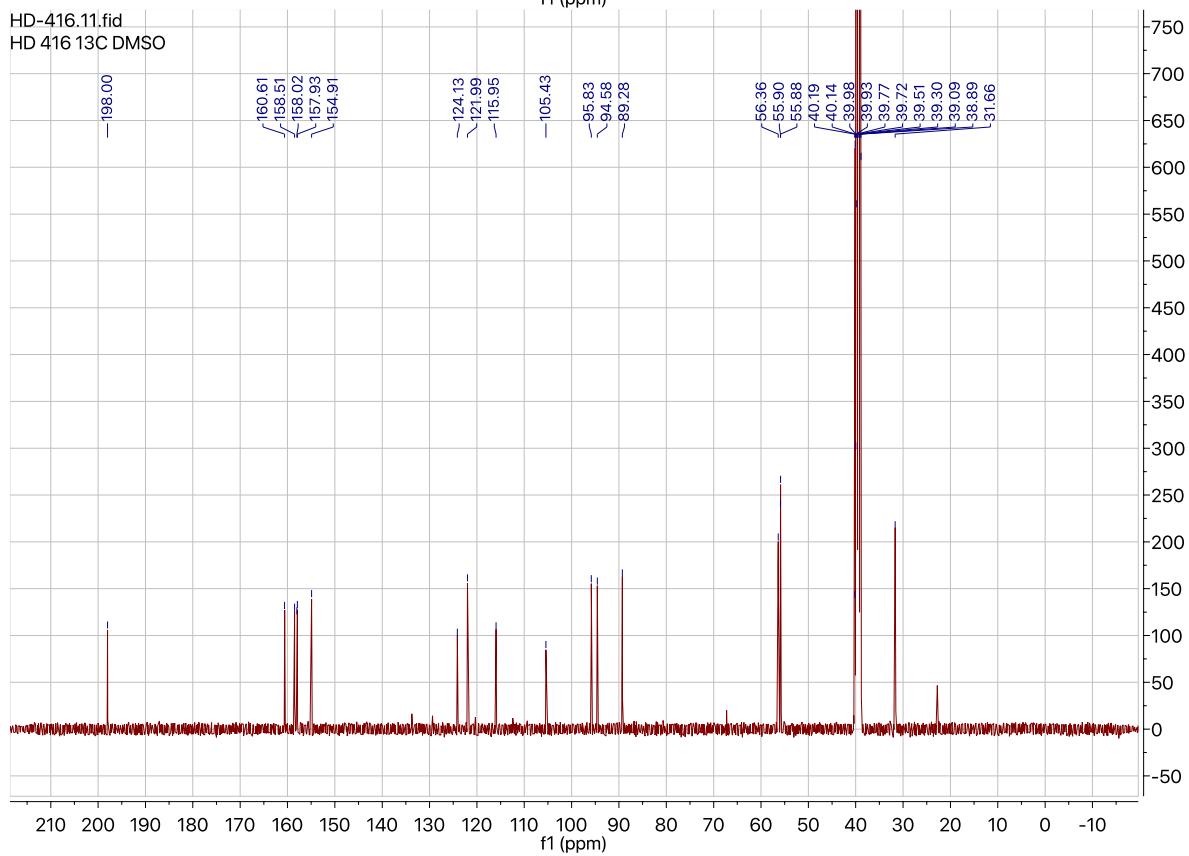
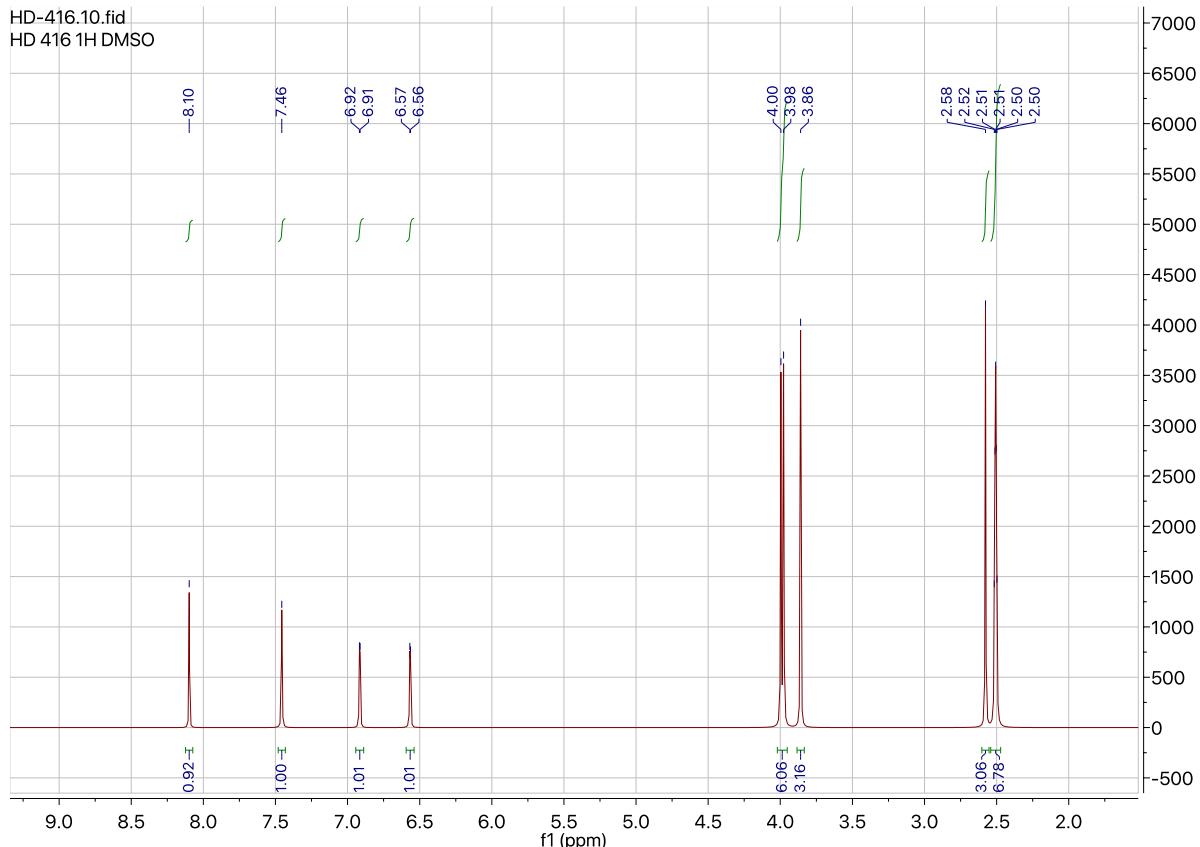
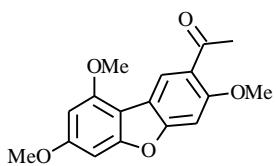
1-(4'-Fluorophenoxy)-3,5-dimethoxybenzene (31)



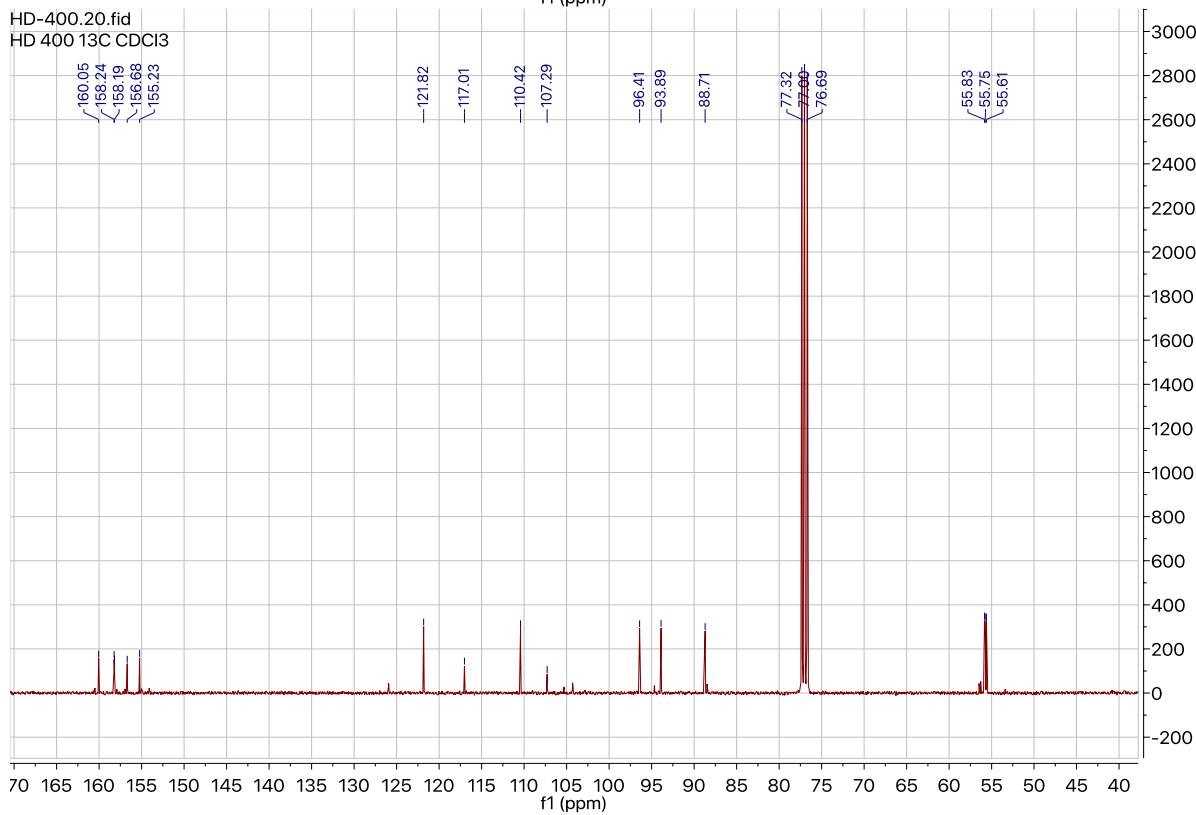
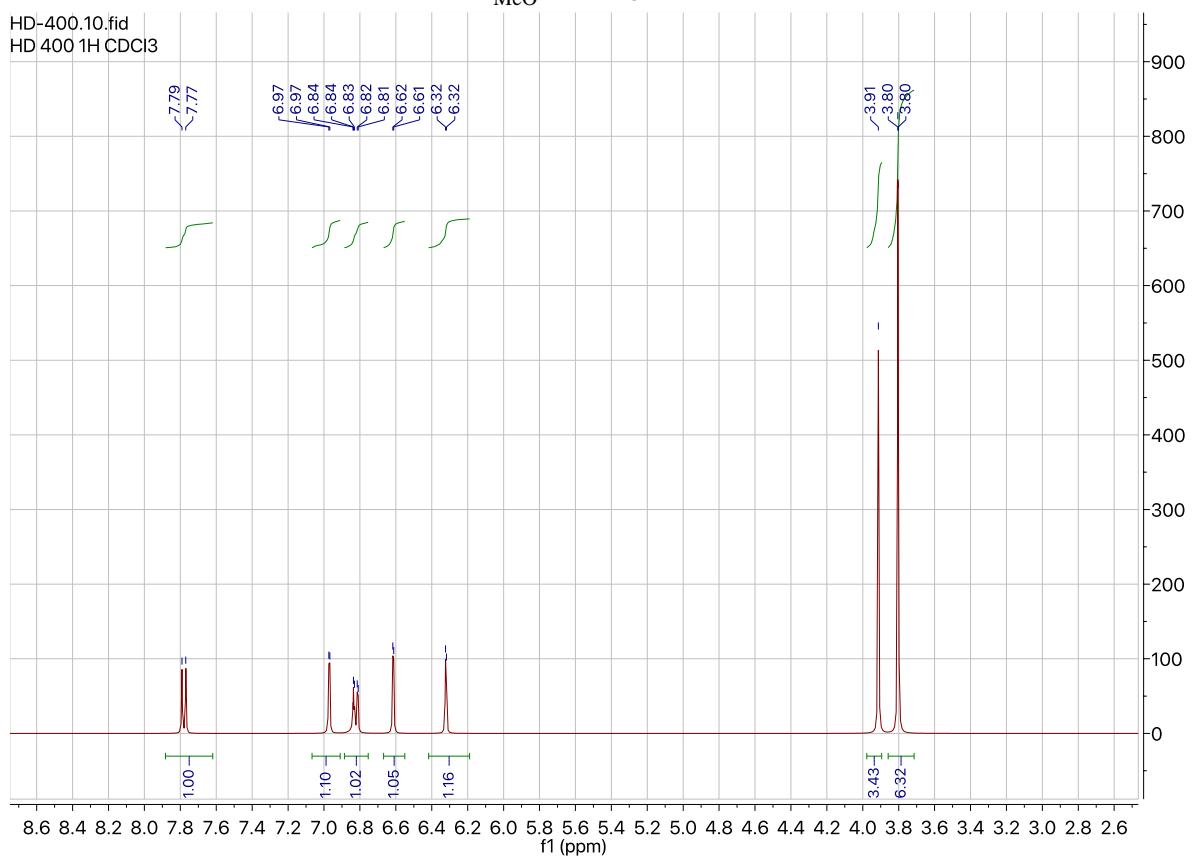
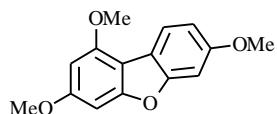
1,3-Dimethoxy-5-[4'-(trifluoromethyl)phenoxy]benzene (32)



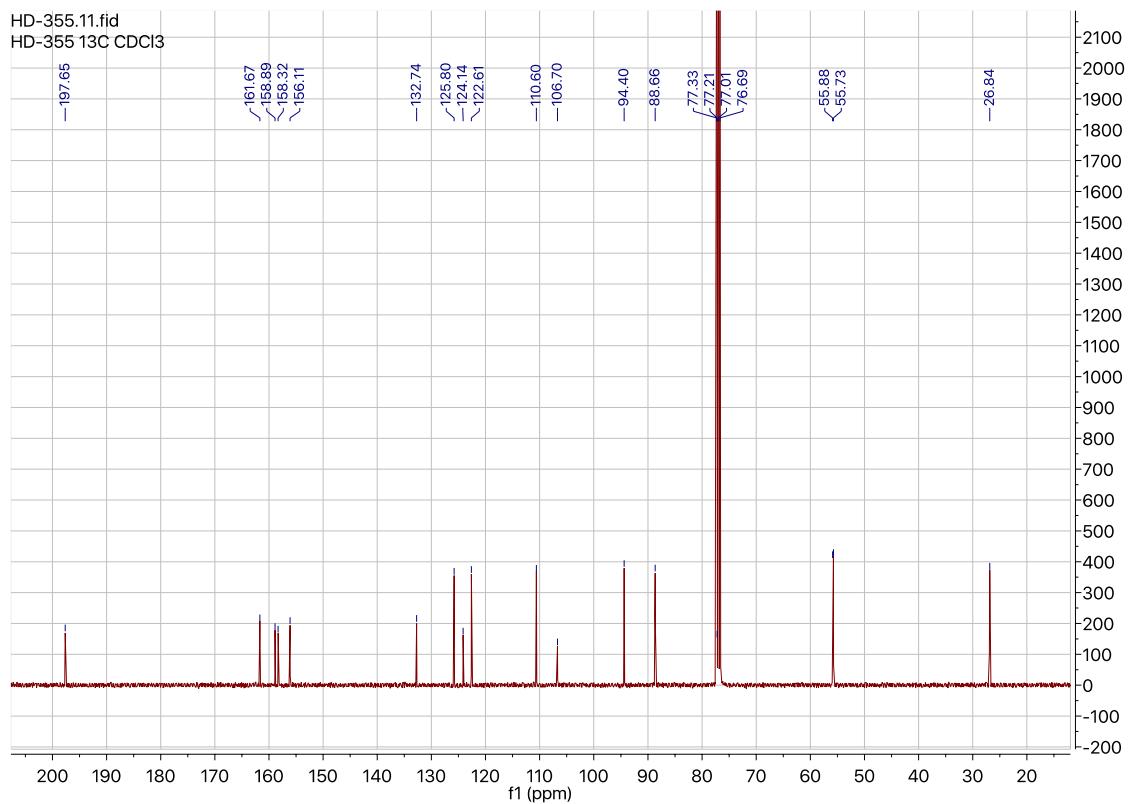
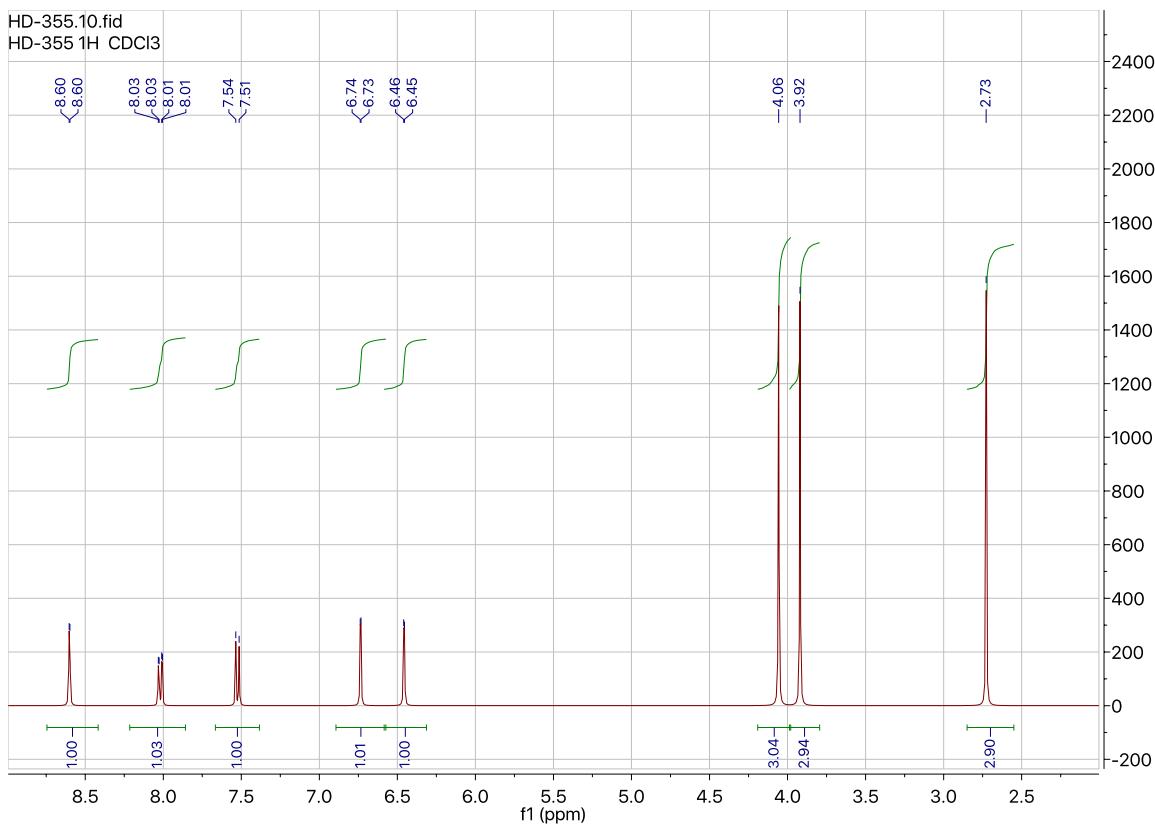
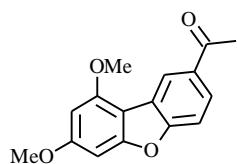
1-(3,7,9-Trimethoxydibenzo[*b,d*]furan-2-yl)ethanone (33)



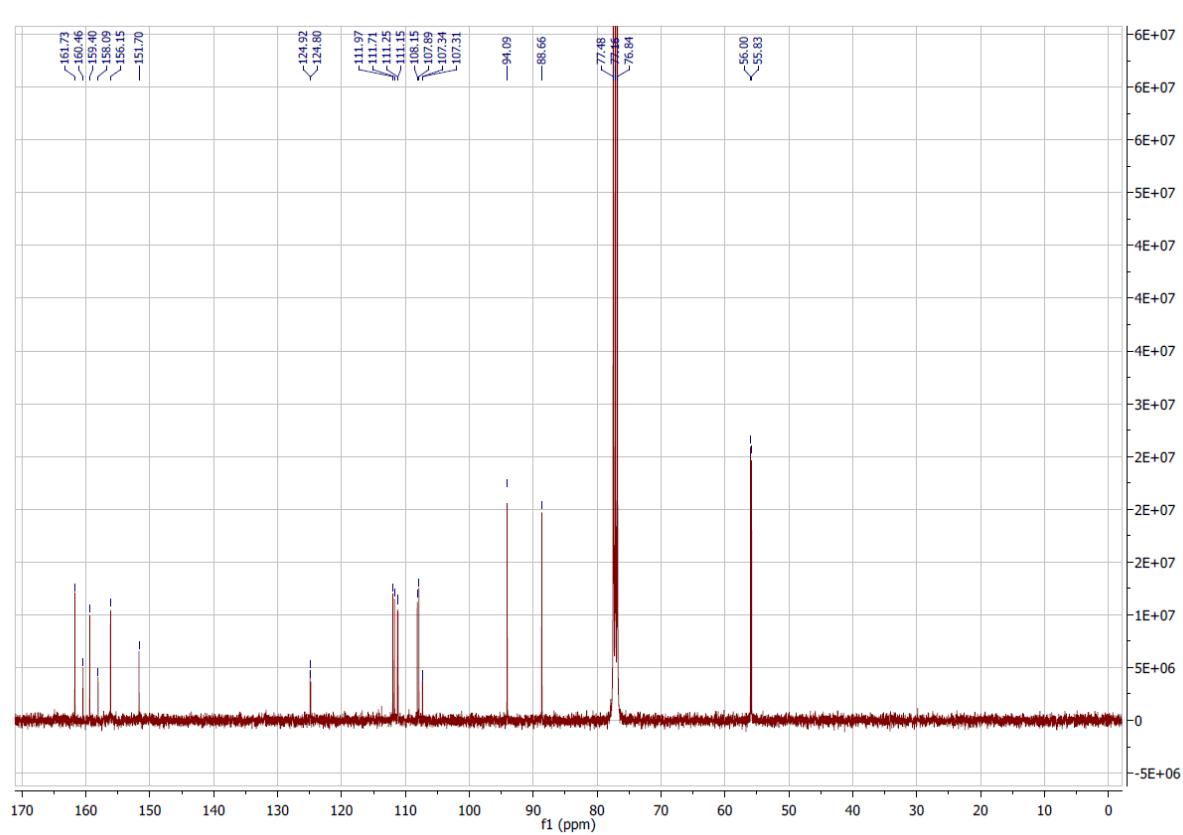
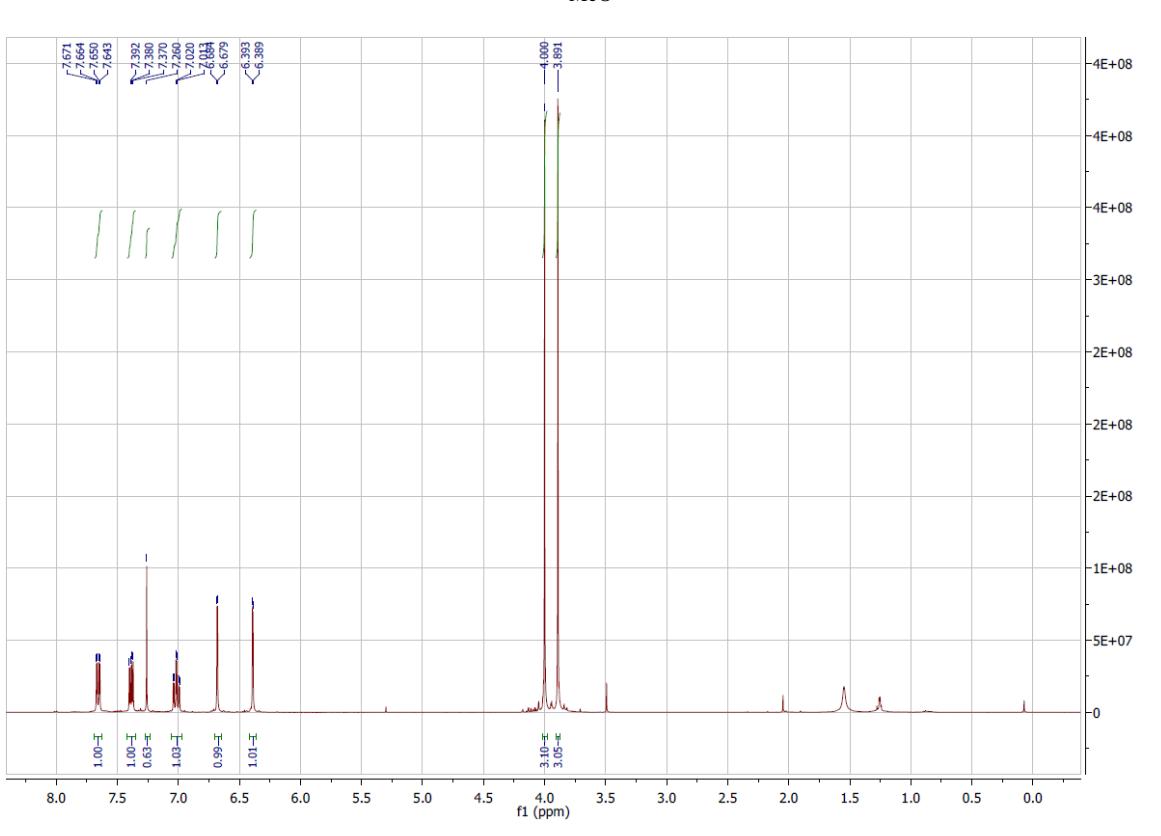
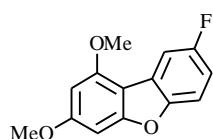
1,3,7-Trimethoxydibenzo[*b,d*]furan (34)



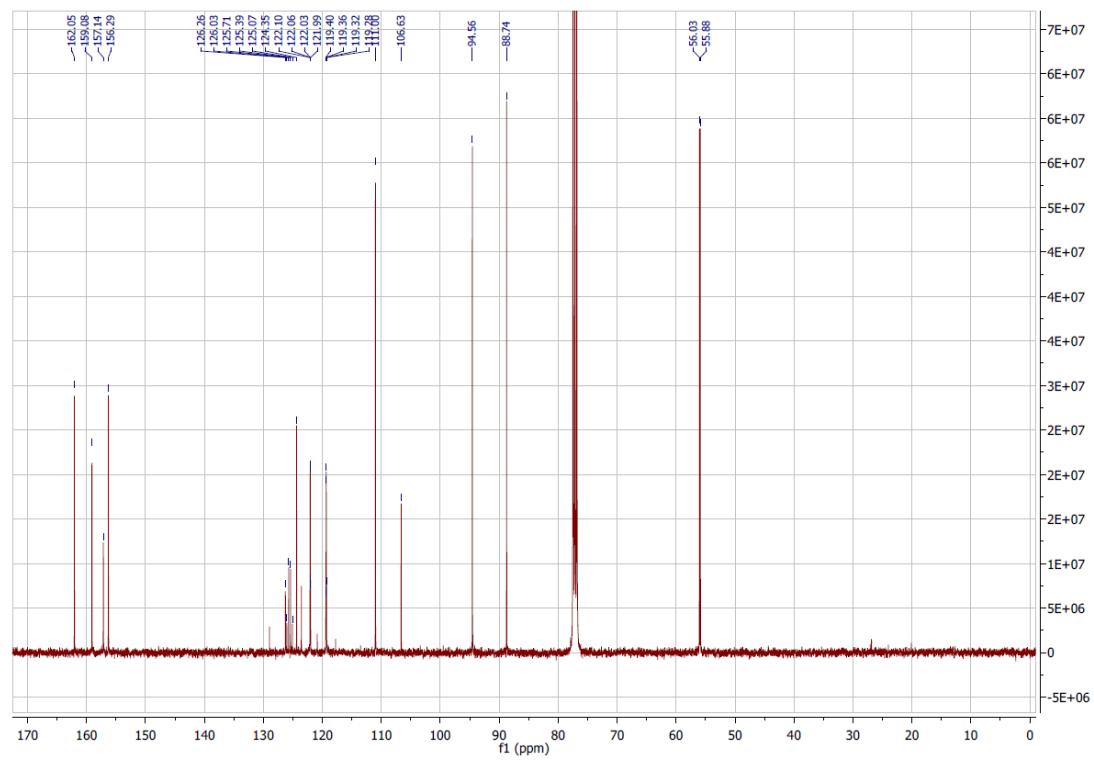
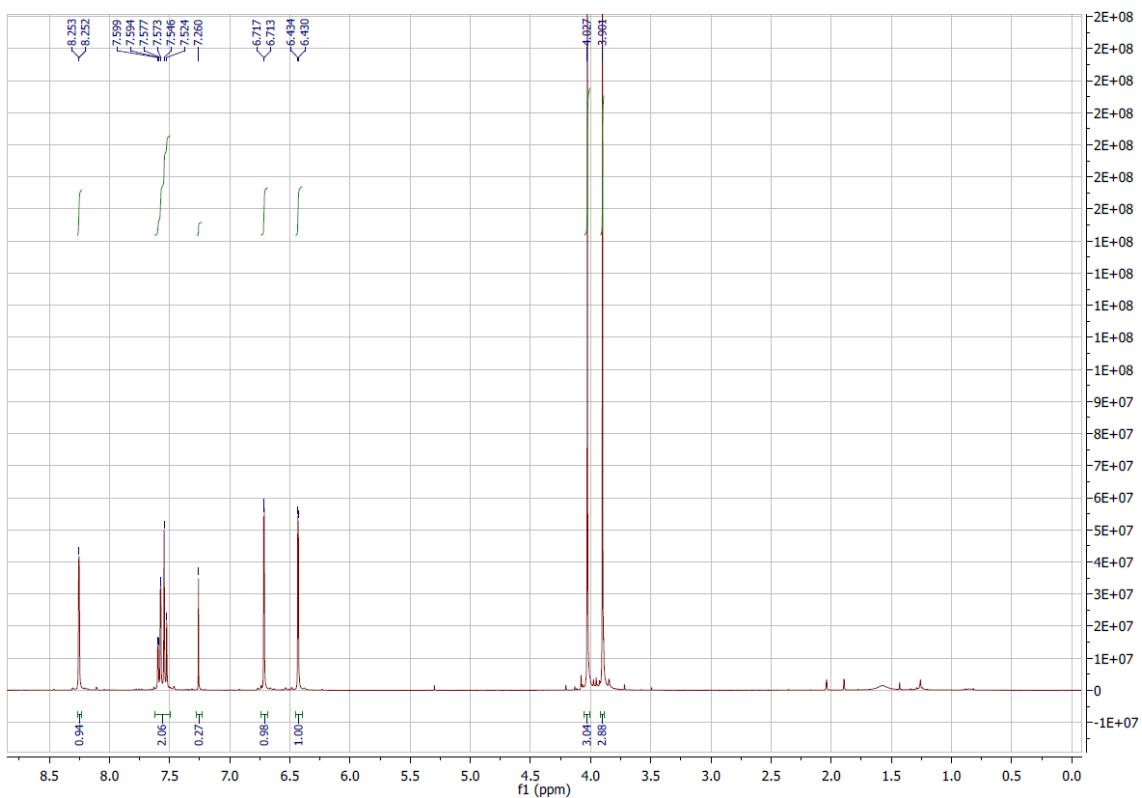
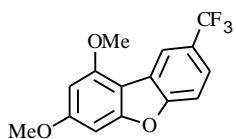
1-(7,9-Dimethoxydibenzo[*b,d*]furan-2-yl)ethanone (35)



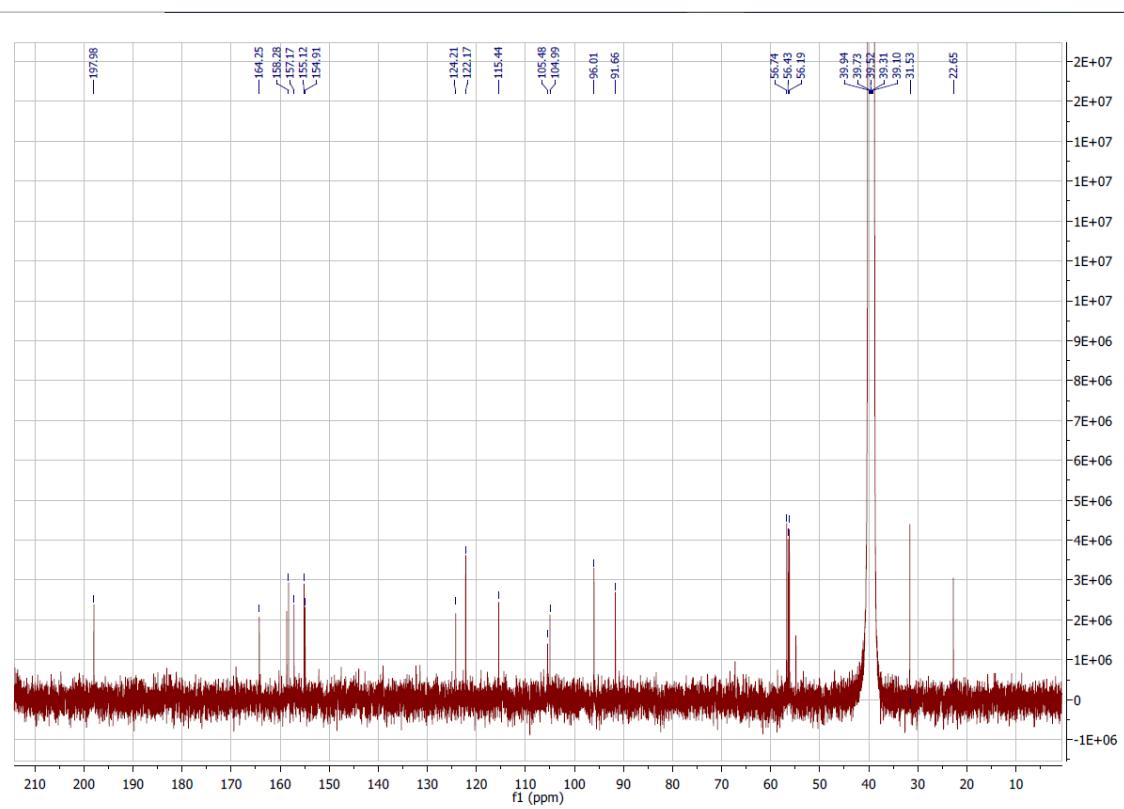
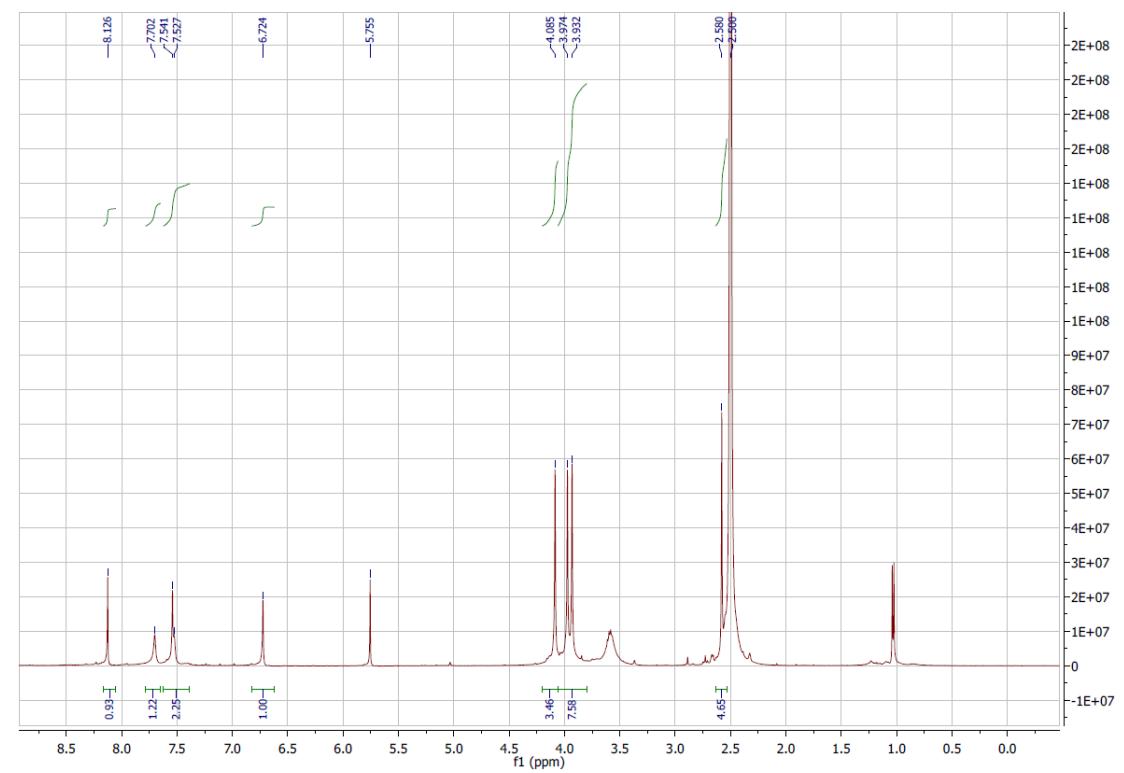
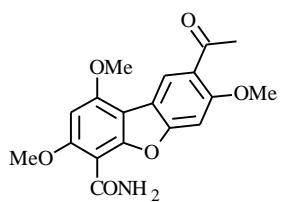
8-Fluoro-1,3-dimethoxydibenzo[*b,d*]furan (36)



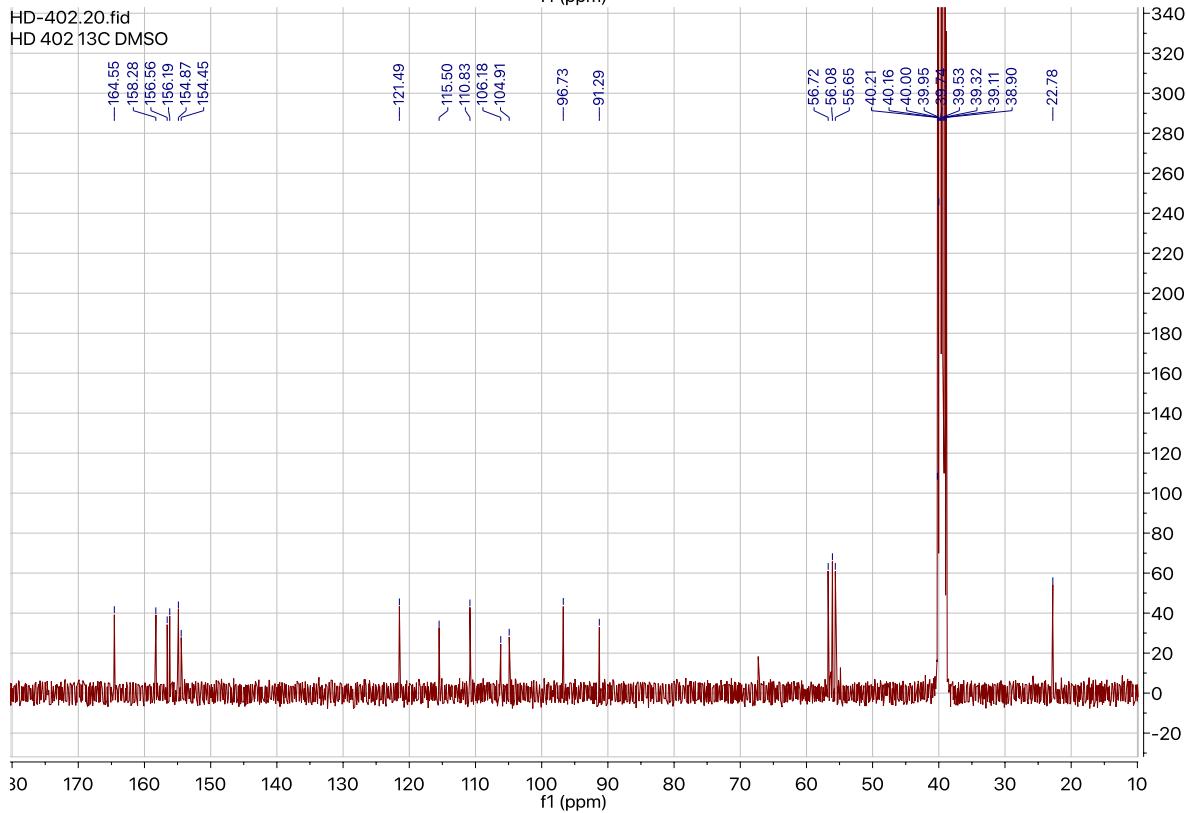
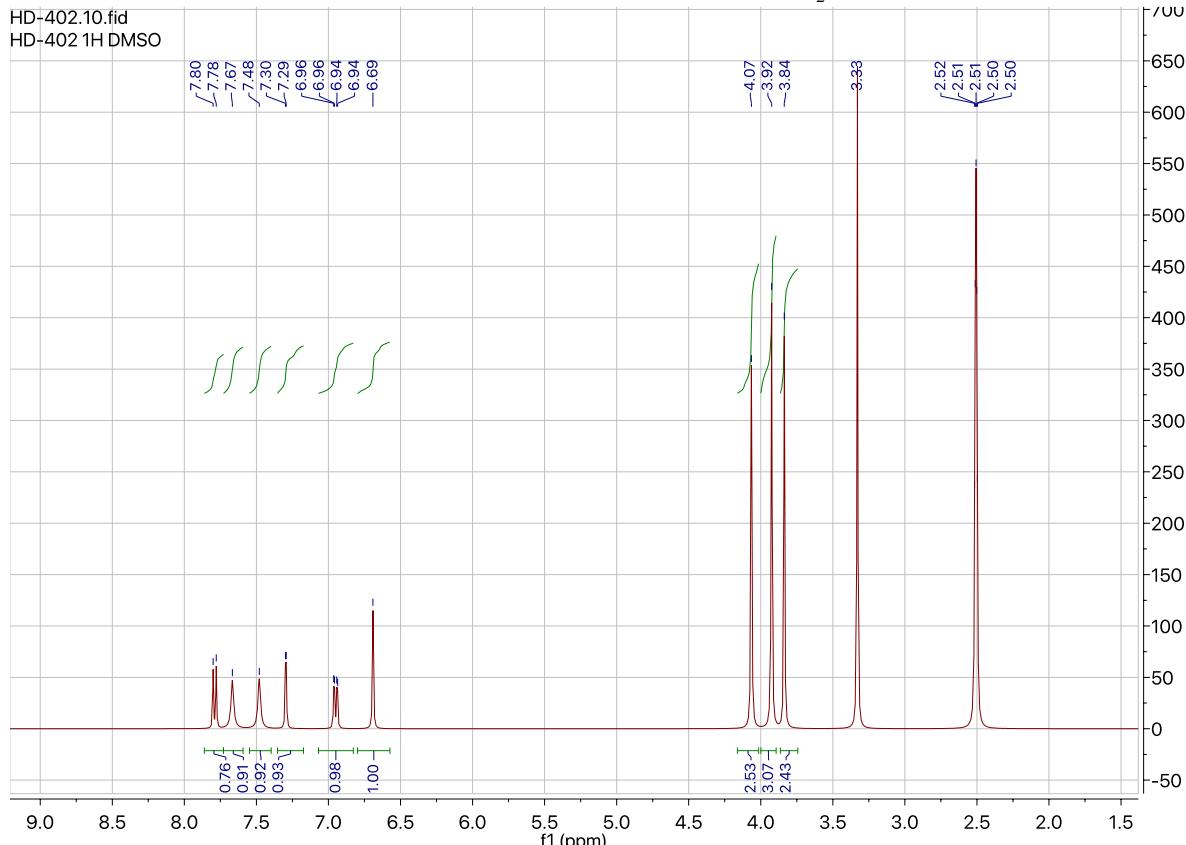
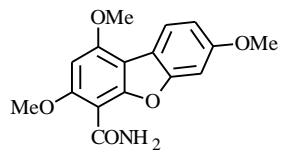
1,3-Dimethoxy-8-(trifluoromethyl)dibenzo[*b,d*]furan (37)



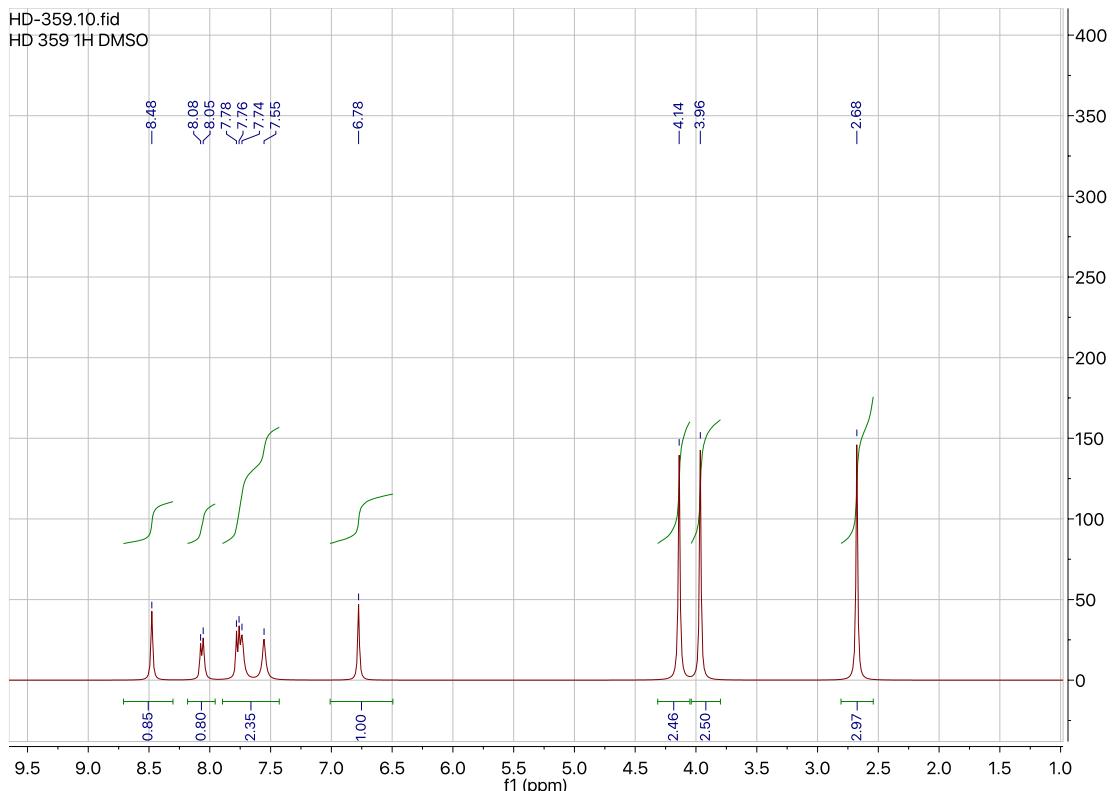
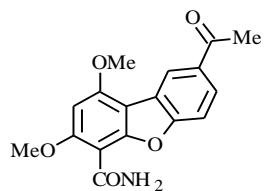
8-Acetyl-1,3,7-trimethoxydibenzo[*b,d*]furan-4-carboxamide (38)



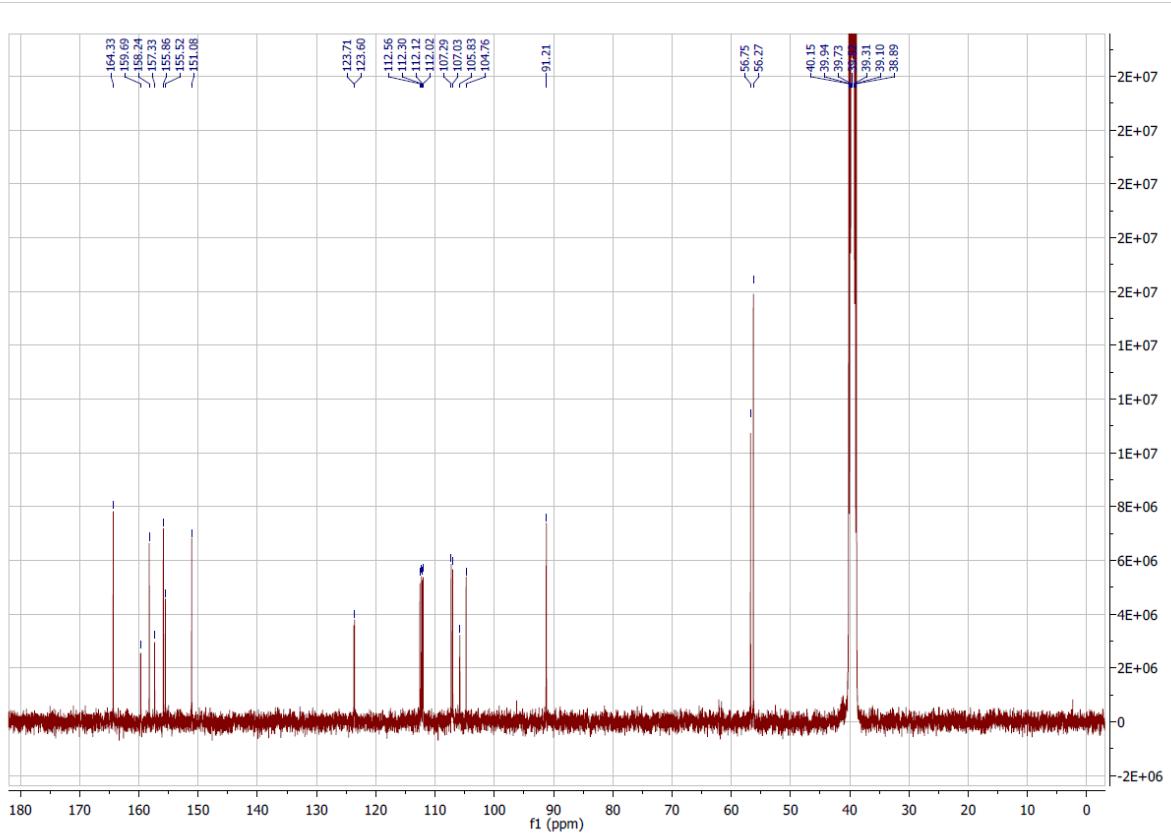
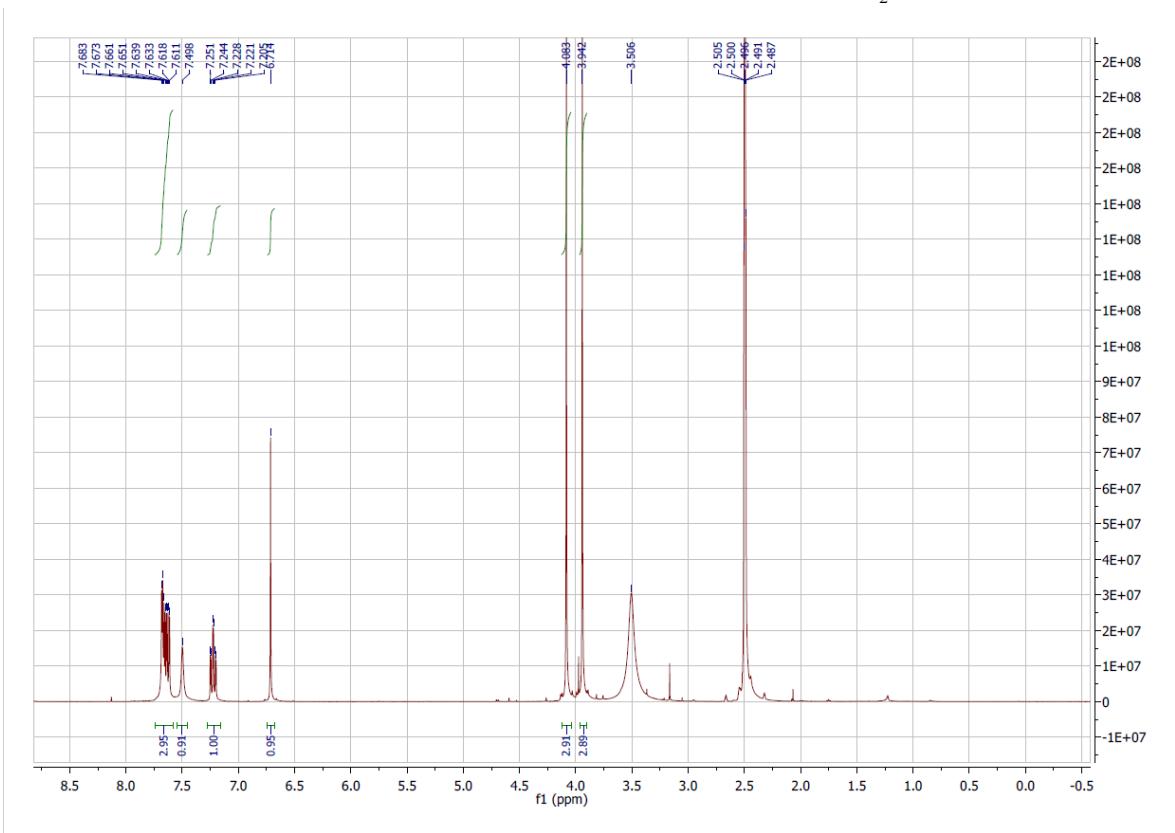
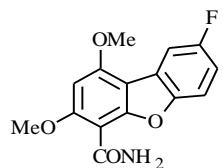
1,3,7-Trimethoxydibenzo[*b,d*]furan-4-carboxamide (39)



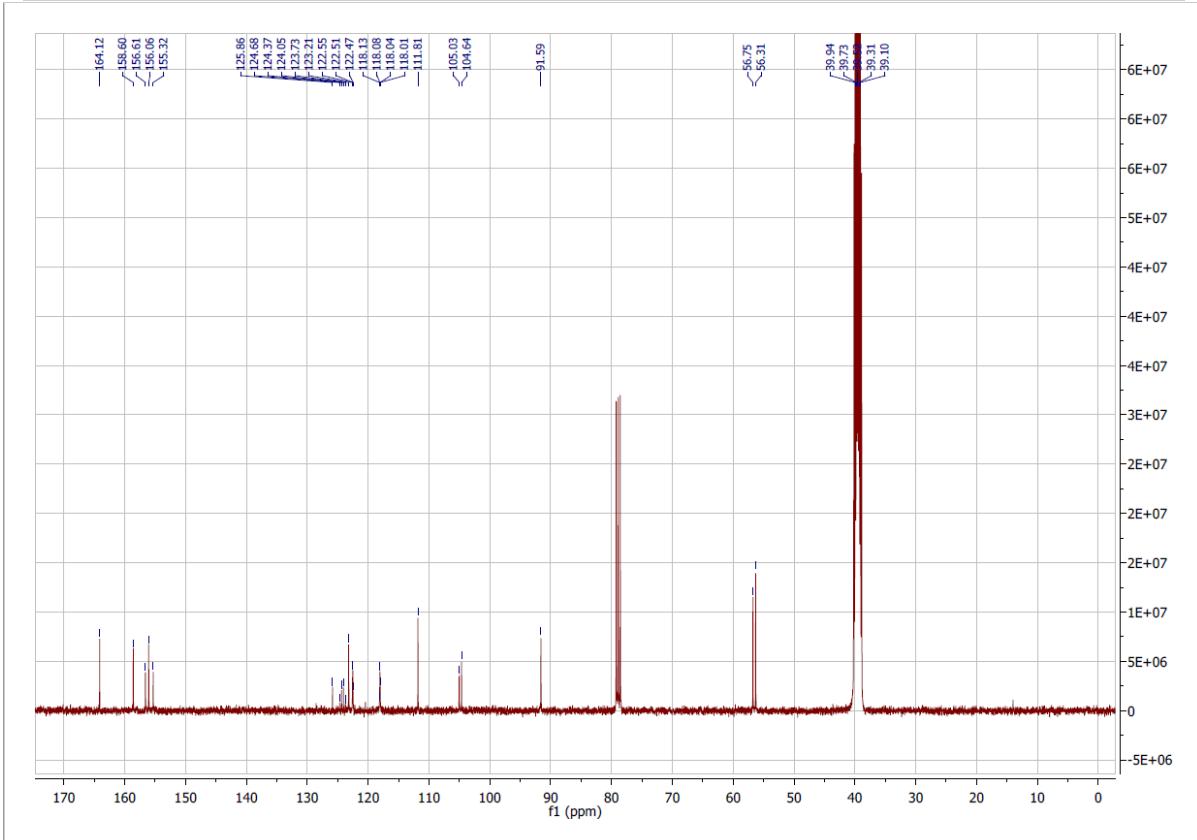
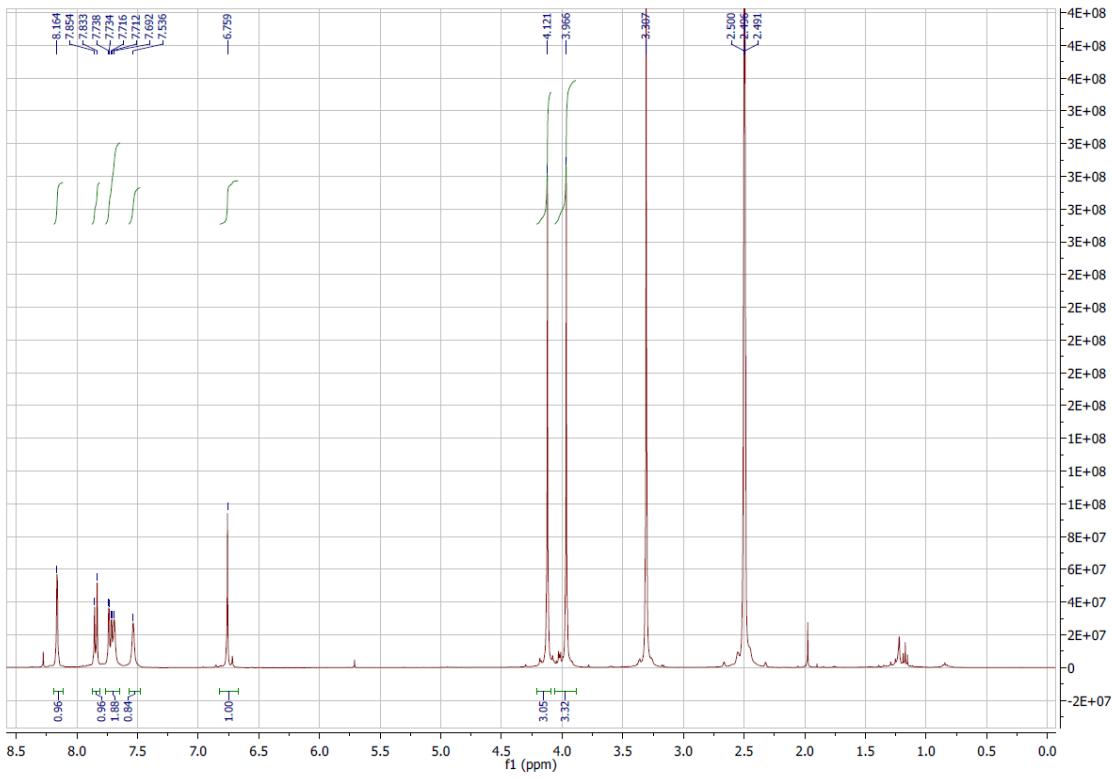
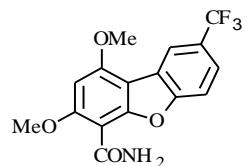
8-Acetyl-1,3-dimethoxydibenzo[*b,d*]furan-4-carboxamide (40)



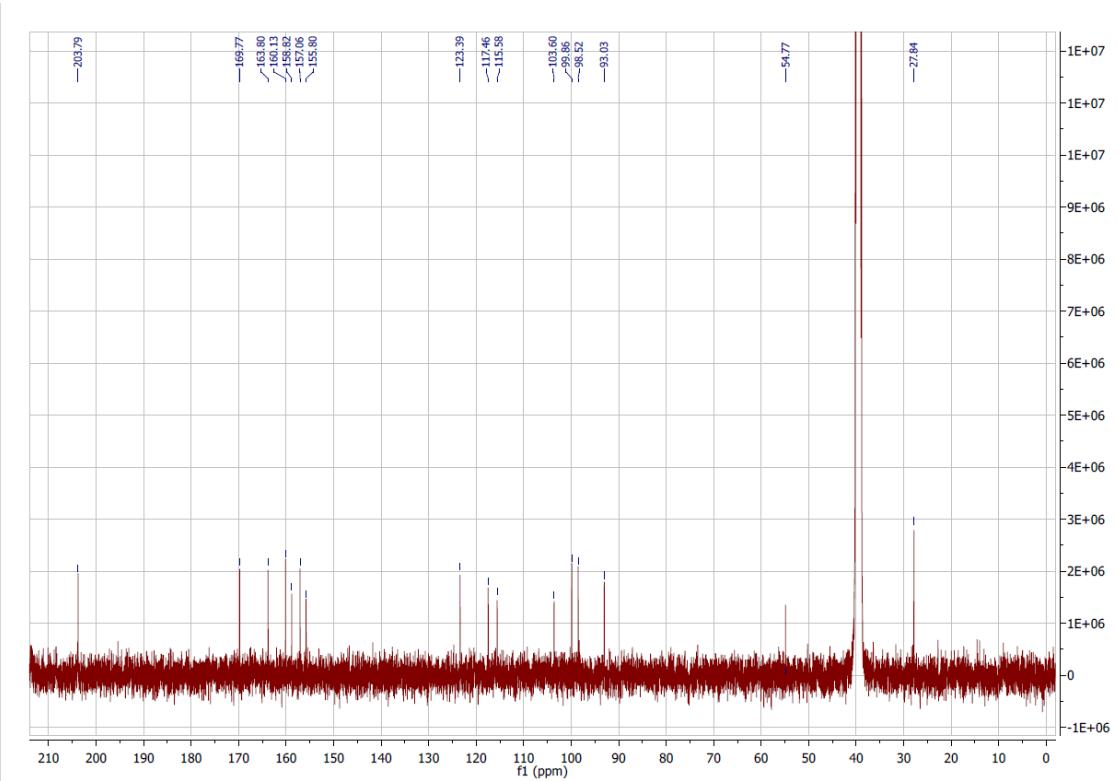
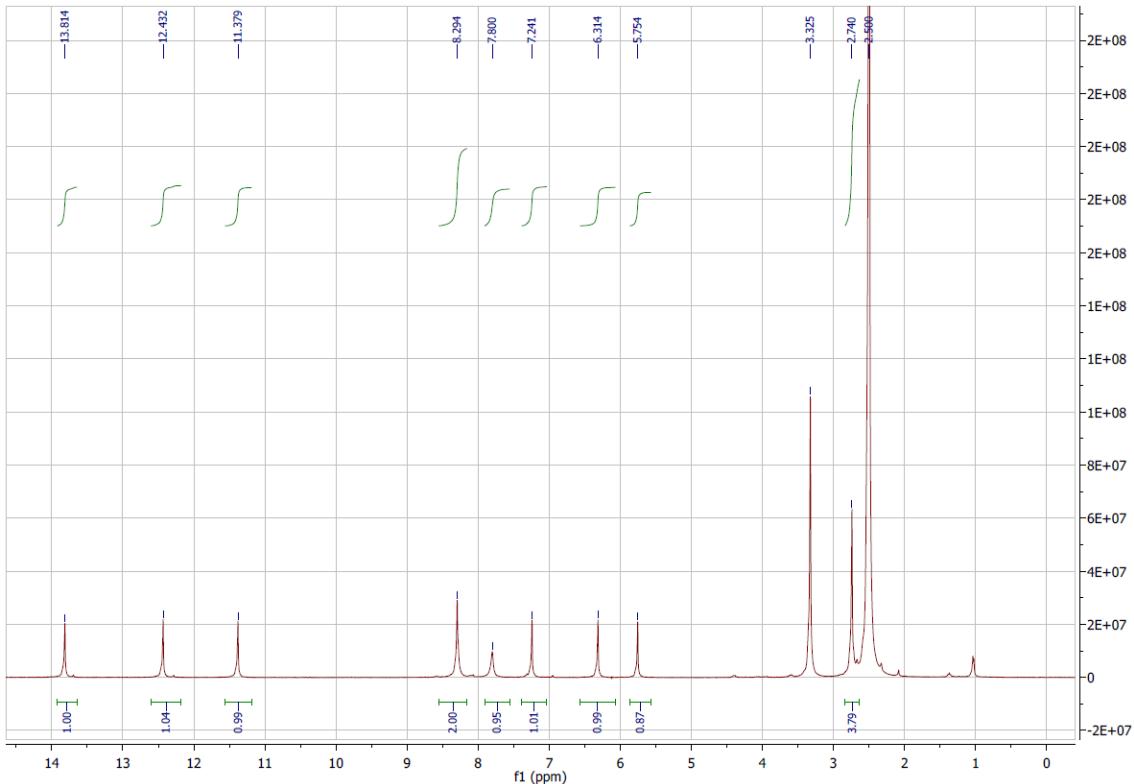
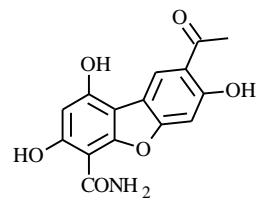
8-Fluoro-1,3-dimethoxydibenzo[*b,d*]furan-4-carboxamide (41)



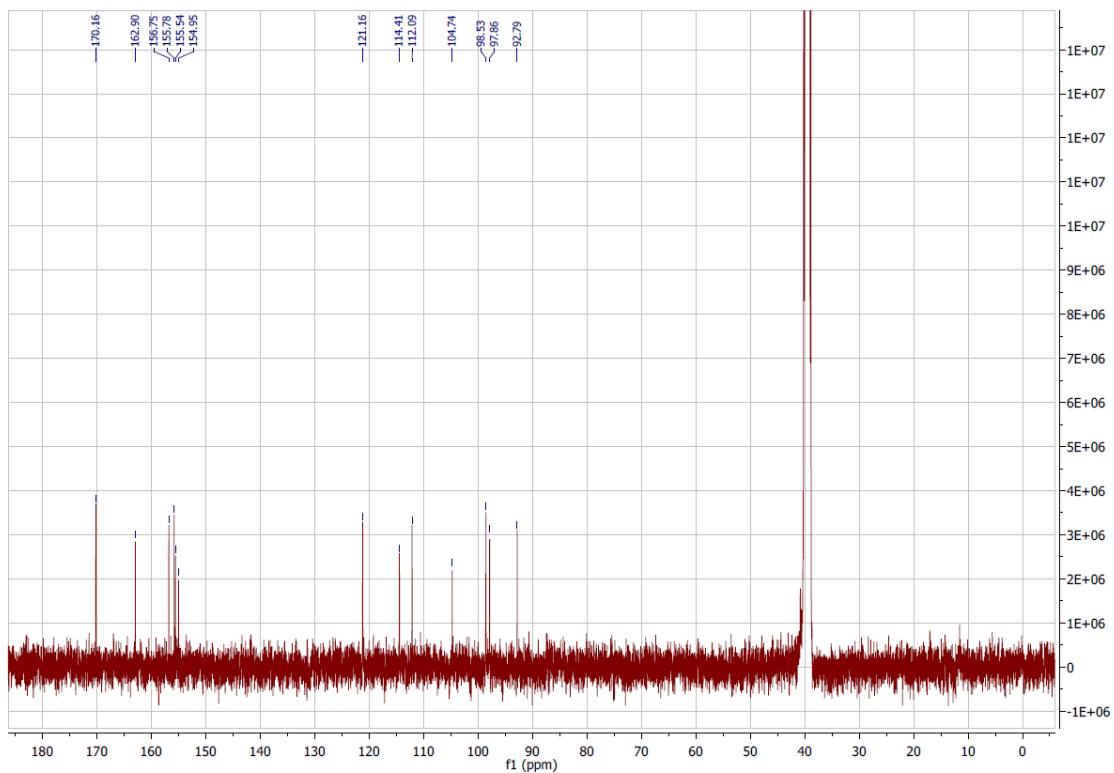
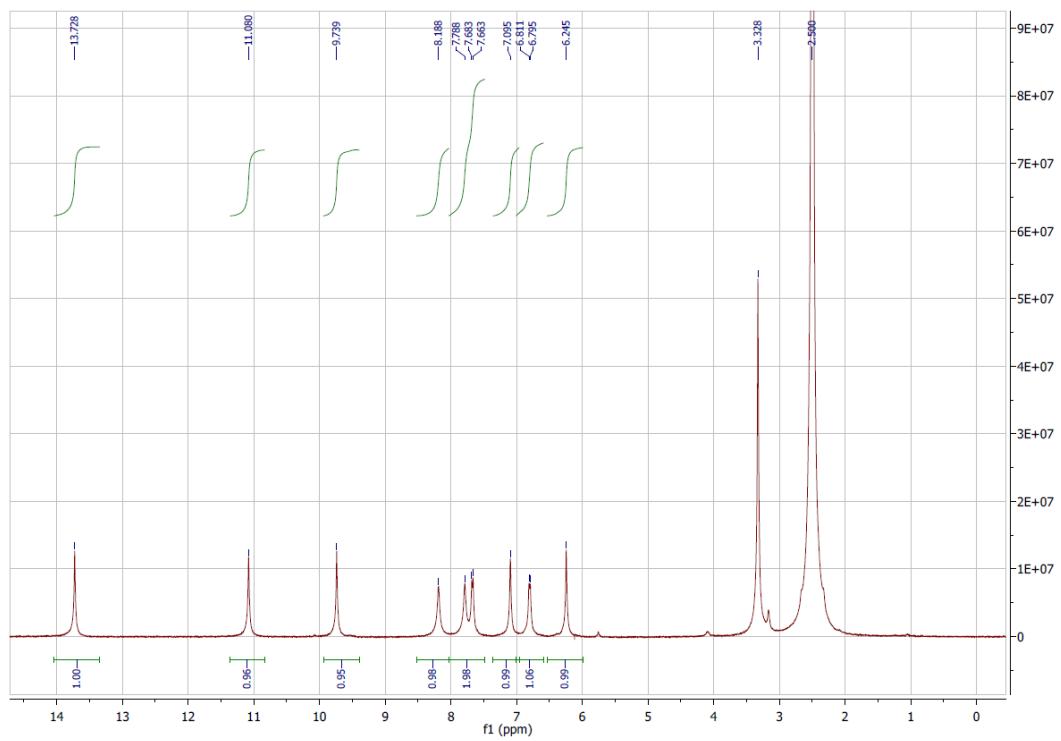
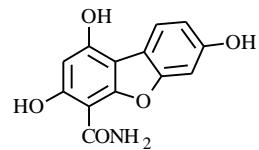
1,3-Dimethoxy-8-(trifluoromethyl)dibenzo[*b,d*]furan-4-carboxamide (42)



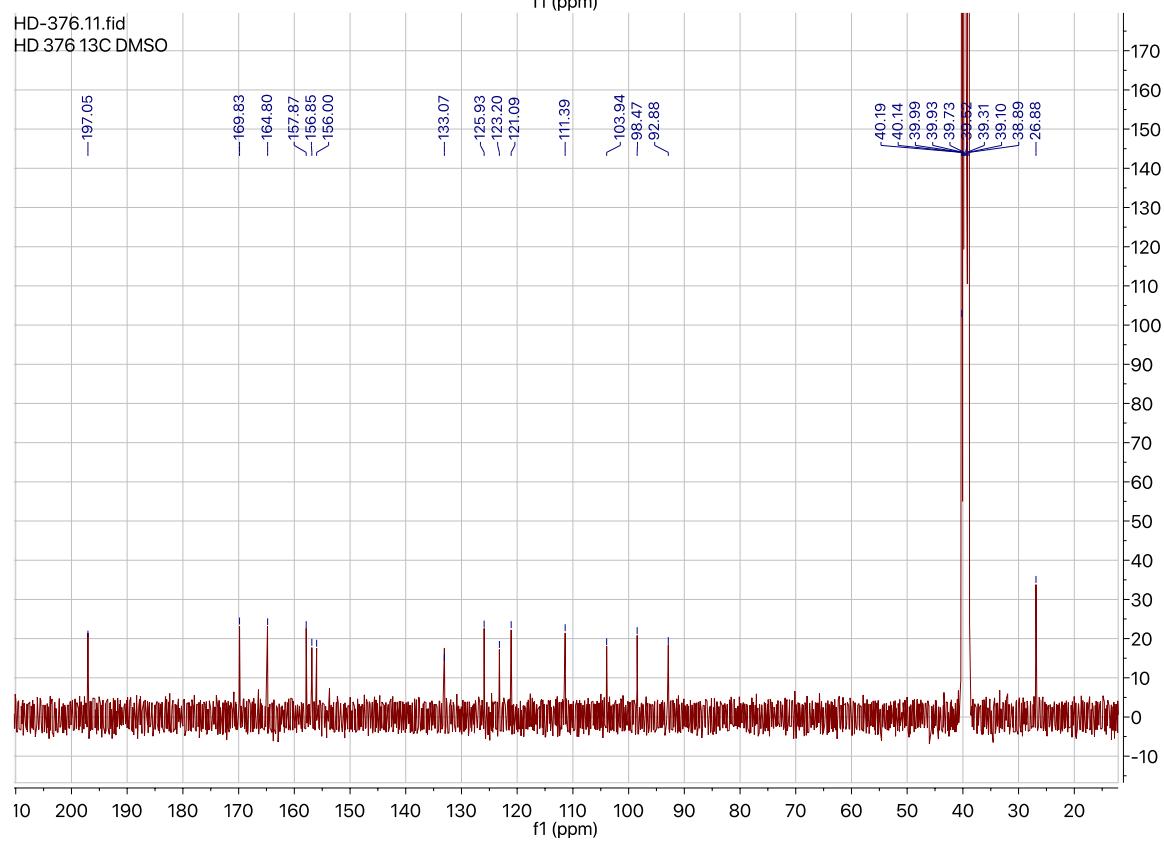
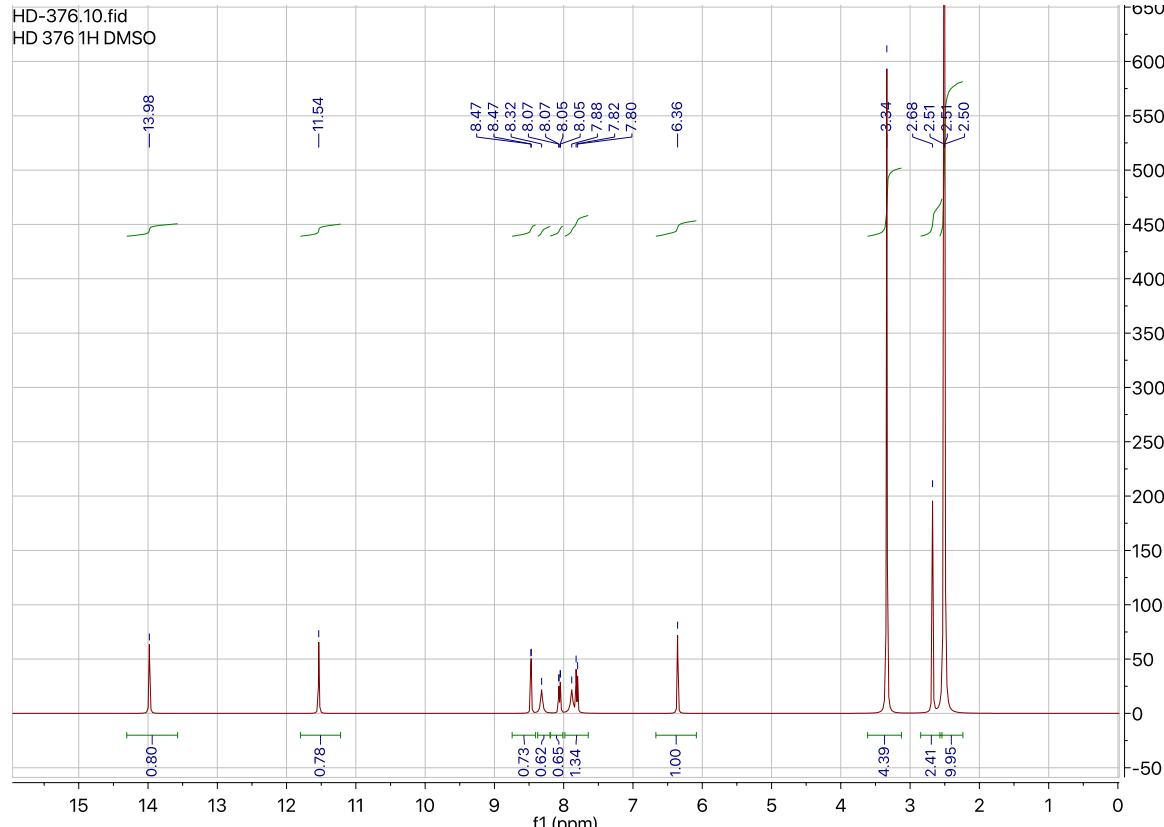
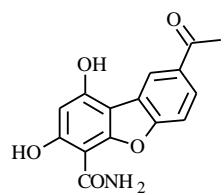
8-Acetyl-1,3,7-trihydroxydibenzo[*b,d*]furan-4-carboxamide (43)



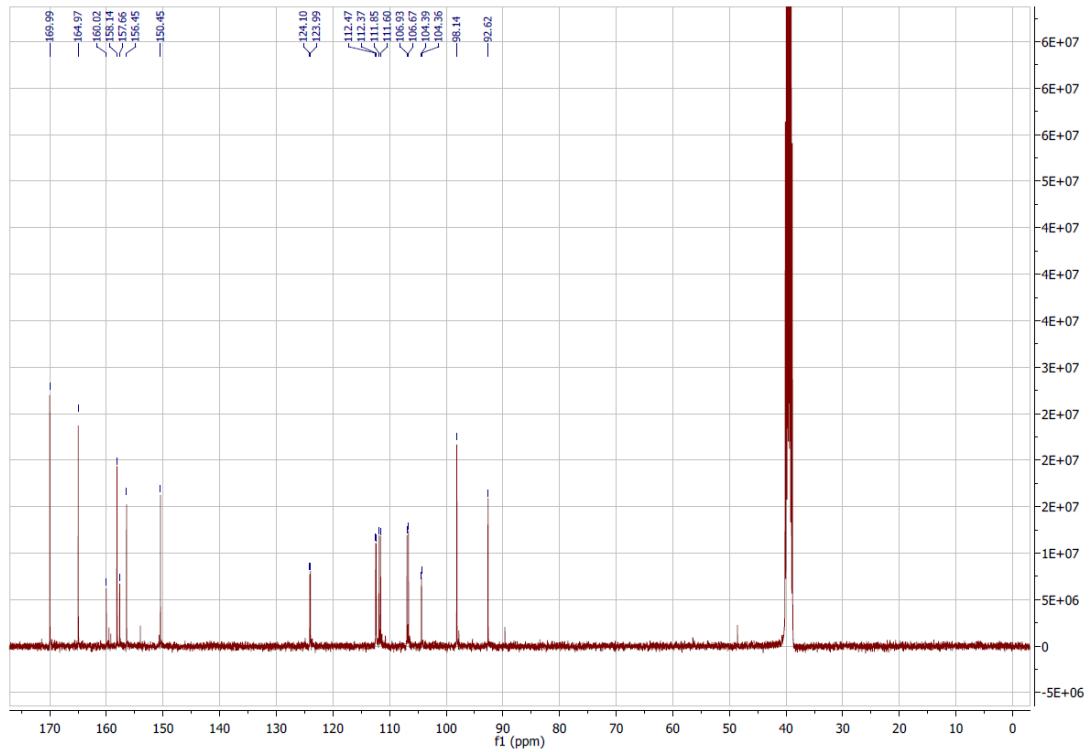
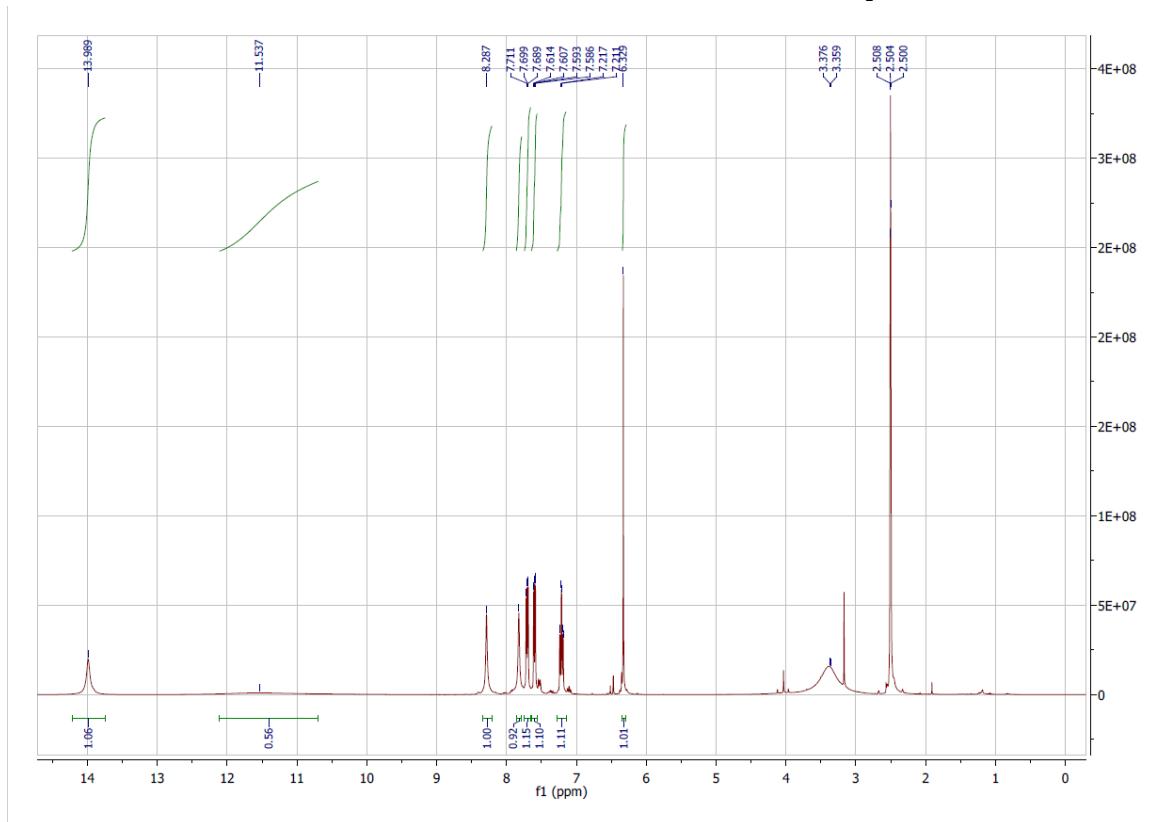
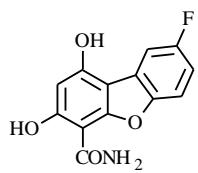
1,3,7-Trihydroxydibenzo[*b,d*]furan-4-carboxamide (44)



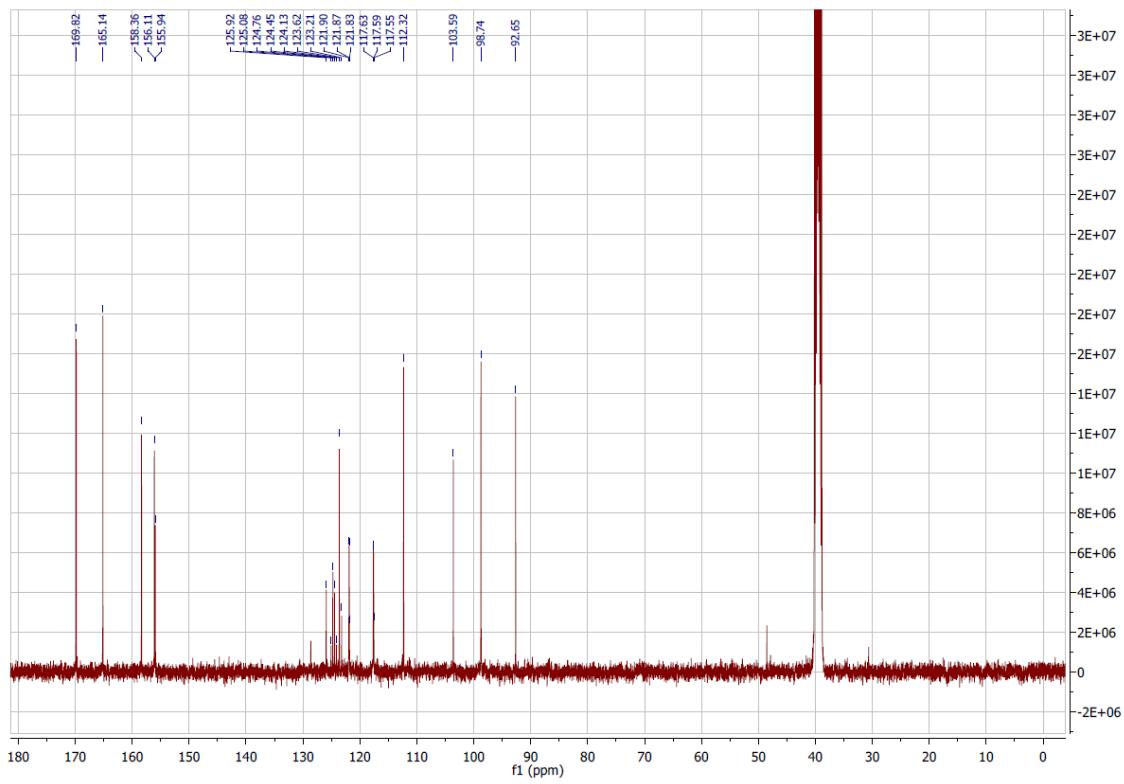
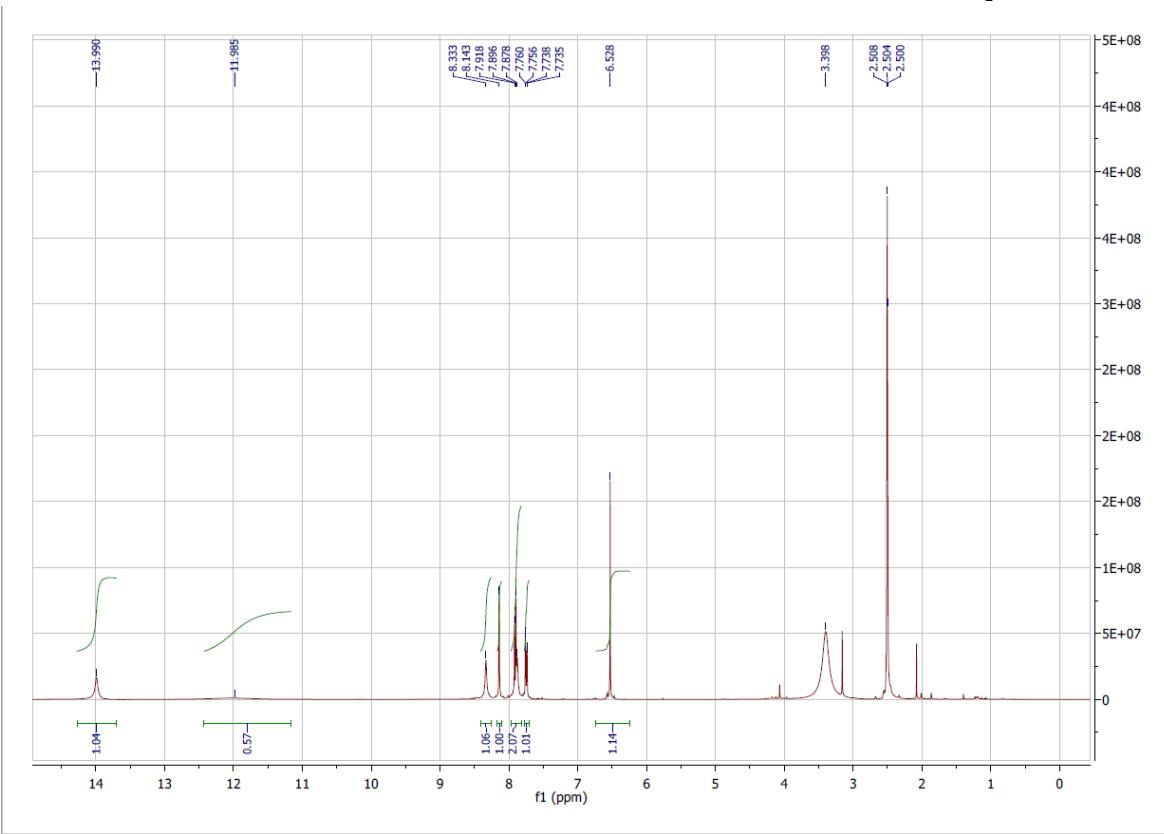
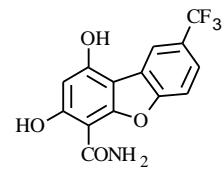
8-Acetyl-1,3-dihydroxydibenzo[*b,d*]furan-4-carboxamide (45)



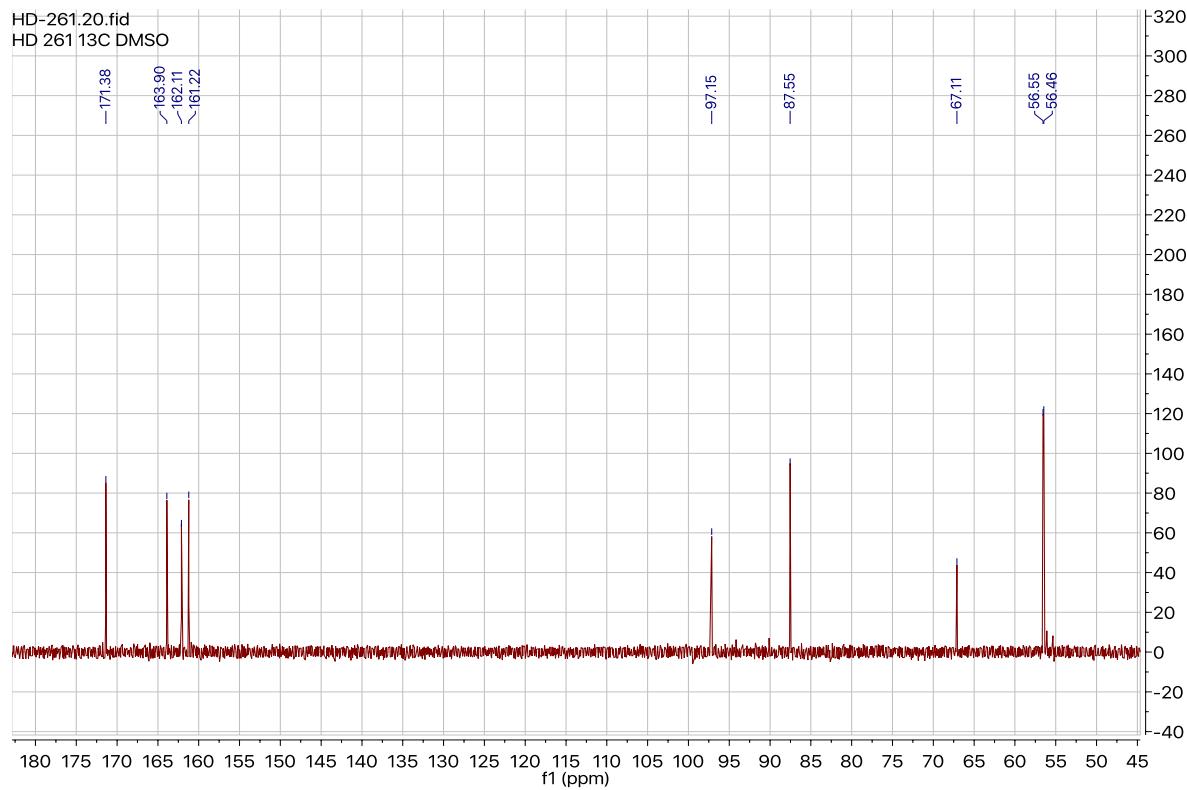
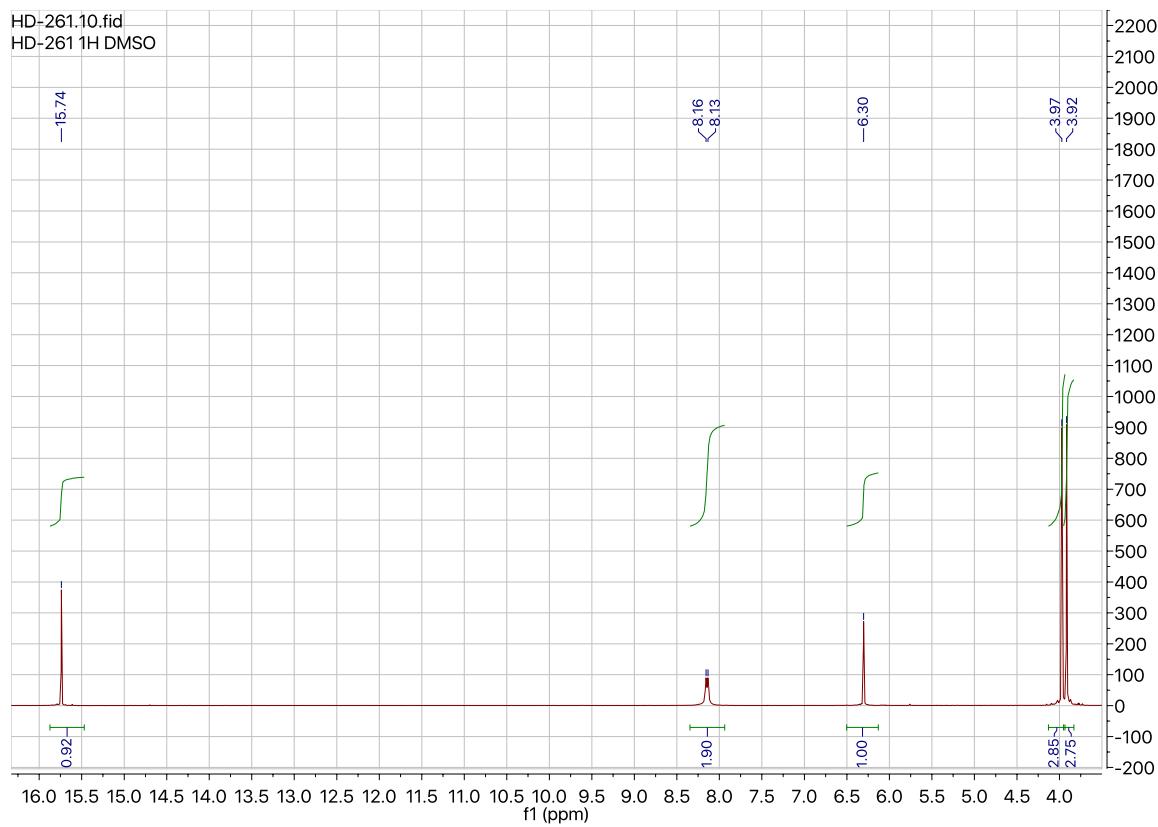
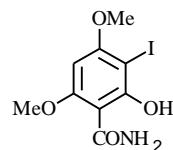
8-Fluoro-1,3-dihydroxydibenzo[*b,d*]furan-4-carboxamide (46)



1,3-Dihydroxy-8-(trifluoromethyl)dibenzo[*b,d*]furan-4-carboxamide (47)



2-Hydroxy-3-iodo-4,6-dimethoxybenzamide (48)



2'-Fluoro-2-hydroxy-4,6-dimethoxybiphenyl-3-carboxamide (49)

