

Catalysis Science & Technology

Electronic Supporting Information

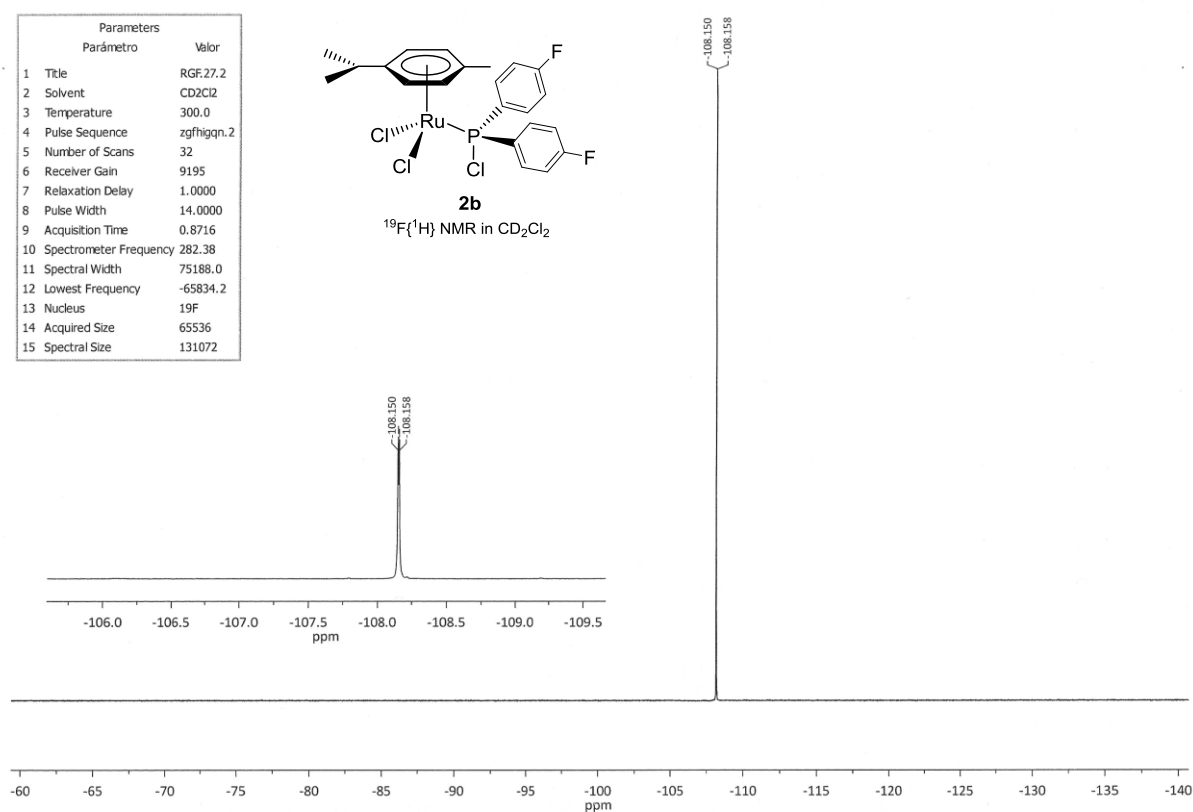
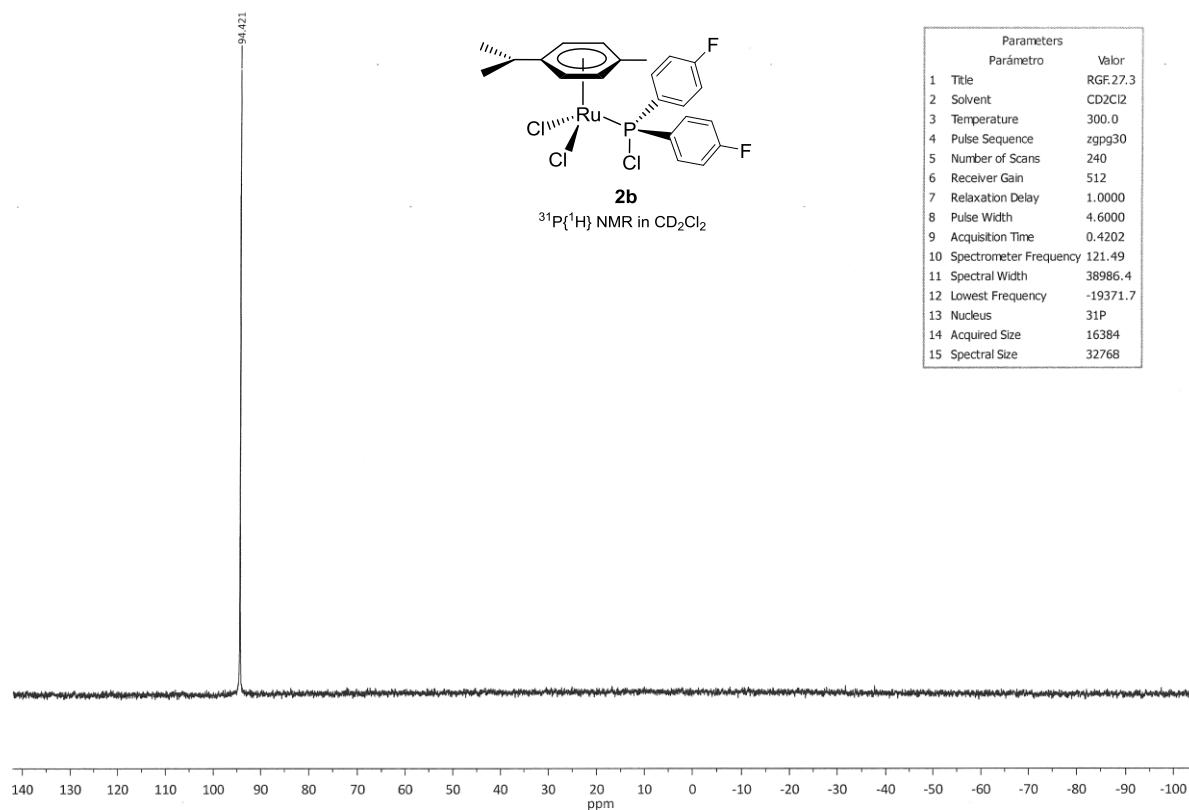
Chlorophosphines as auxiliary ligands in ruthenium-catalyzed nitrile hydration reactions: Application to the preparation of β -ketoamides

Rebeca González-Fernández,^a Pedro J. González-Liste,^a Javier Borge,^b Pascale Crochet*^a and Victorio Cadierno*^a

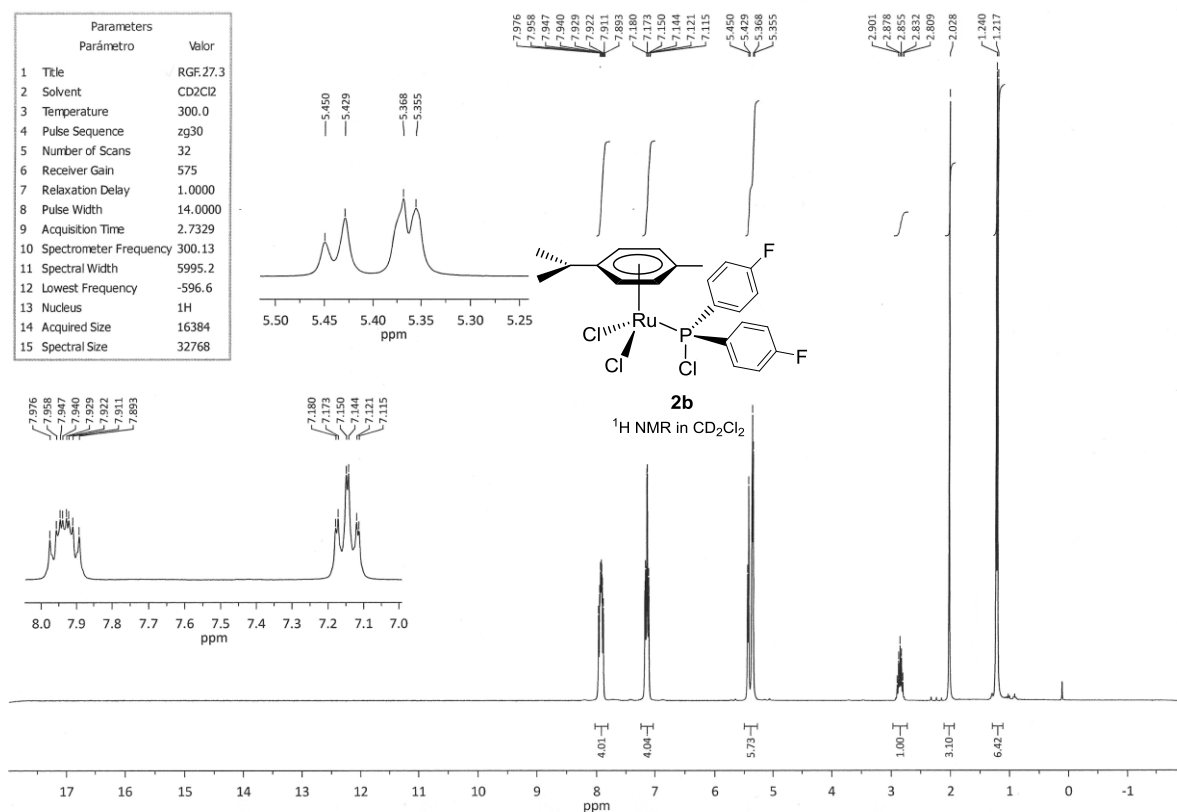
^a *Laboratorio de Compuestos Organometálicos y Catálisis (Unidad Asociada al CSIC), Centro de Innovación en Química Avanzada (ORFEO-CINQA), Departamento de Química Orgánica e Inorgánica, IUQOEM, Universidad de Oviedo, Julián Clavería 8, E-33006 Oviedo, Spain. E-mail: crochetpascale@uniovi.es (P.C.), vcm@uniovi.es (V.C.); Fax: +(34) 985103446; Tel.: +(34) 985103453.*

^b *Departamento de Química Física y Analítica, Centro de Innovación en Química Avanzada (ORFEO-CINQA), Universidad de Oviedo, Julián Clavería 8, E-33006 Oviedo, Spain.*

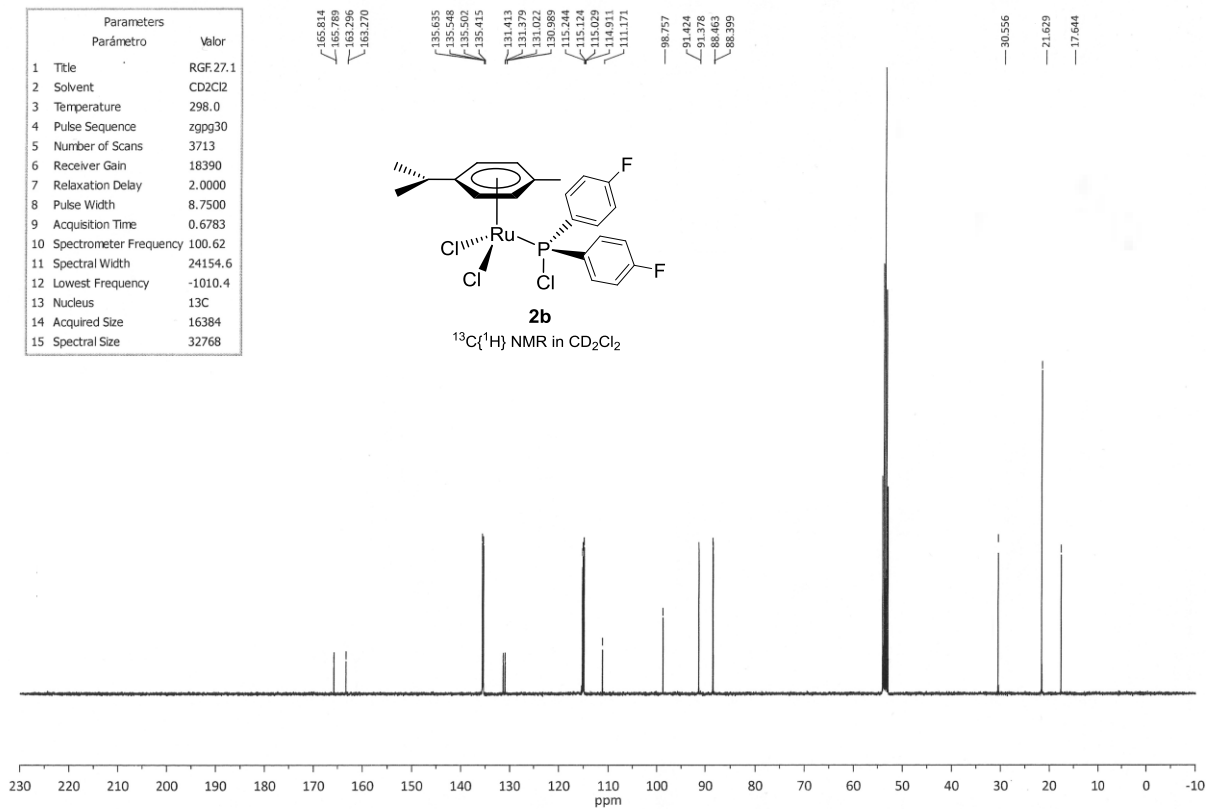
Copies of the NMR spectra of complexes 2b, 3 and 4b, and all the amides generated in this work



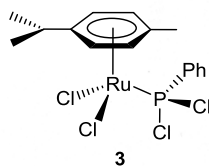
Parameters	
Parámetro	Valor
1 Title	RGF.27.3
2 Solvent	CD ₂ Cl ₂
3 Temperature	300.0
4 Pulse Sequence	zg30
5 Number of Scans	32
6 Receiver Gain	575
7 Relaxation Delay	1.0000
8 Pulse Width	14.0000
9 Acquisition Time	2.7329
10 Spectrometer Frequency	300.13
11 Spectral Width	5995.2
12 Lowest Frequency	-596.6
13 Nucleus	¹ H
14 Acquired Size	16384
15 Spectral Size	32768



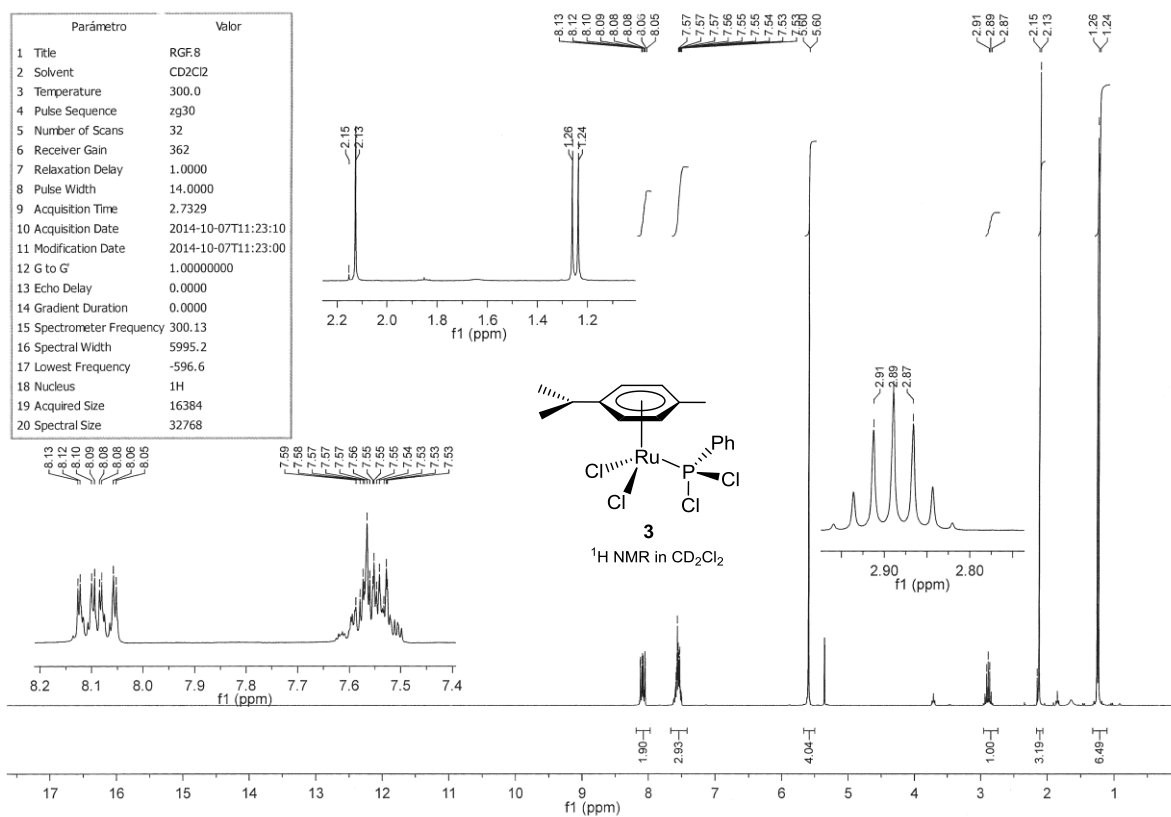
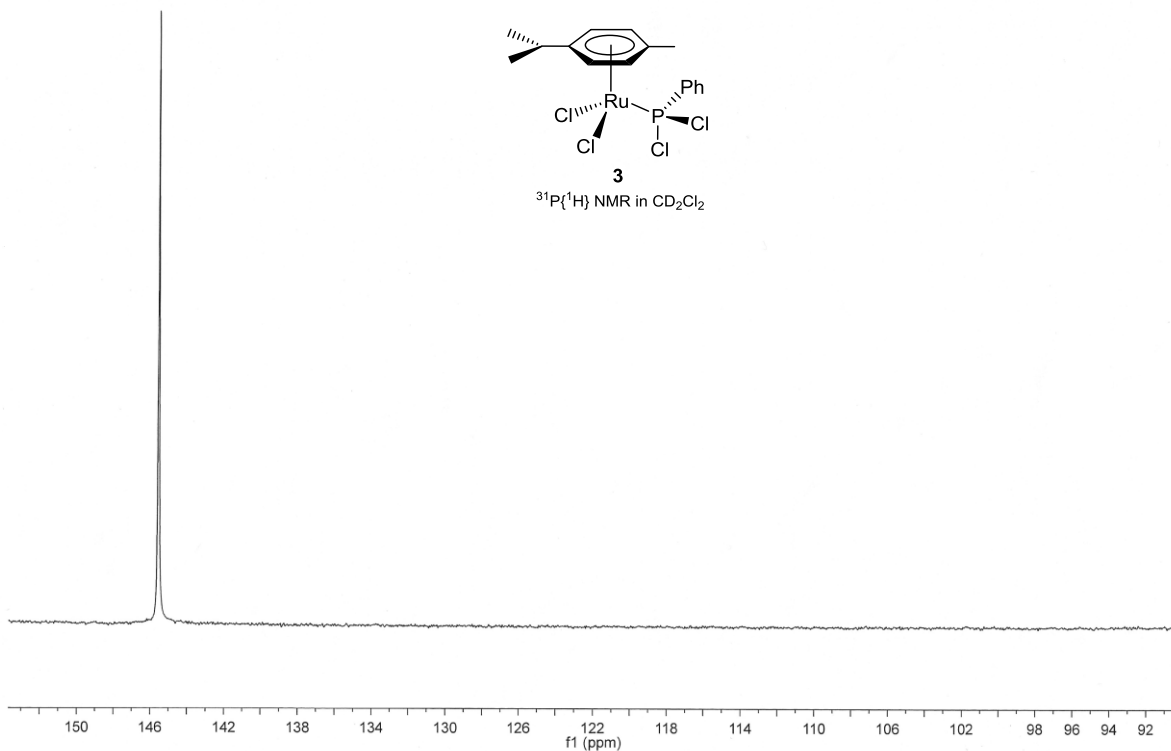
Parameters	
Parámetro	Valor
1 Title	RGF.27.1
2 Solvent	CD ₂ Cl ₂
3 Temperature	298.0
4 Pulse Sequence	zgpg30
5 Number of Scans	3713
6 Receiver Gain	18390
7 Relaxation Delay	2.0000
8 Pulse Width	8.7500
9 Acquisition Time	0.6783
10 Spectrometer Frequency	100.62
11 Spectral Width	24154.6
12 Lowest Frequency	-1010.4
13 Nucleus	¹³ C
14 Acquired Size	16384
15 Spectral Size	32768



RGF.8
facturar a VCM
p31.300 CD2Cl2 (C:\Bruker\bacs) Bruker 19

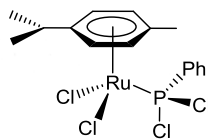


$^{31}\text{P}\{^1\text{H}\}$ NMR in CD_2Cl_2

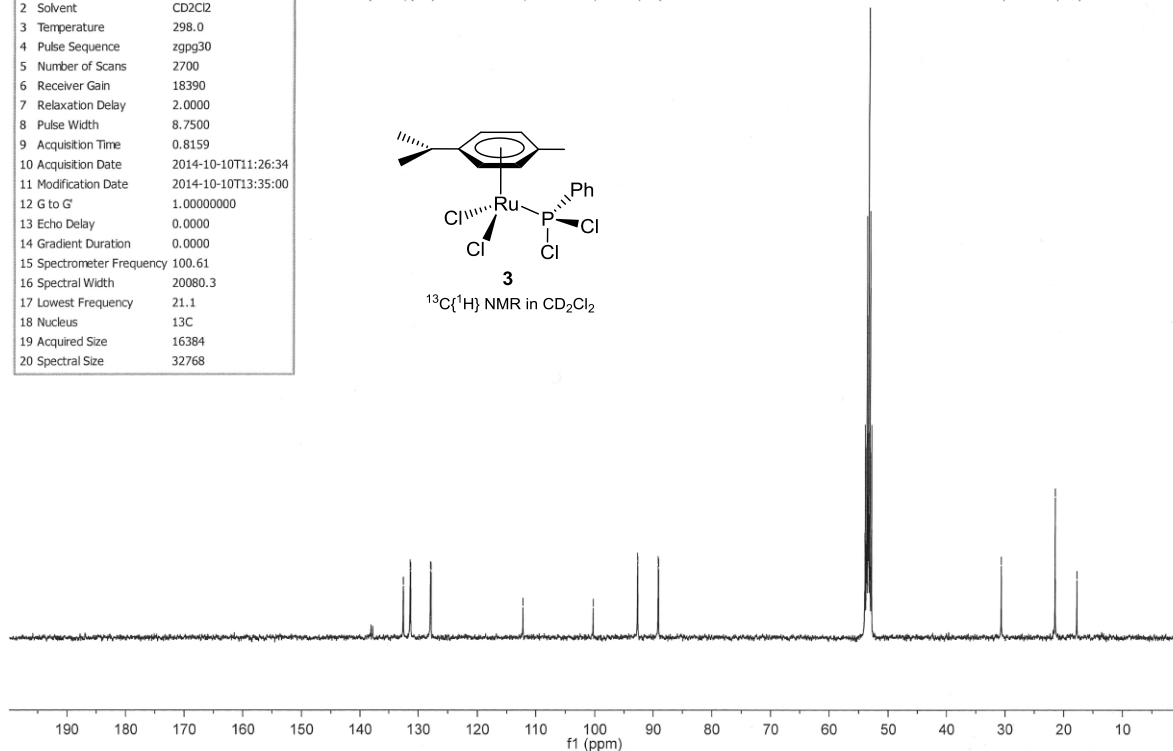


Parámetro	Valor
1 Title	RGF.8.01
2 Solvent	CD ₂ Cl ₂
3 Temperature	298.0
4 Pulse Sequence	zgpg30
5 Number of Scans	2700
6 Receiver Gain	18390
7 Relaxation Delay	2.0000
8 Pulse Width	8.7500
9 Acquisition Time	0.8159
10 Acquisition Date	2014-10-10T11:26:34
11 Modification Date	2014-10-10T13:35:00
12 G to G	1.00000000
13 Echo Delay	0.0000
14 Gradient Duration	0.0000
15 Spectrometer Frequency	100.61
16 Spectral Width	20080.3
17 Lowest Frequency	21.1
18 Nucleus	¹³ C
19 Acquired Size	16384
20 Spectral Size	32768

¹³C{¹H} NMR in CD₂Cl₂
 138.19, 137.95, 132.58, 131.42, 131.29, 127.95, 127.63, 112.21, 100.30, 92.74, 92.68, 88.19, 88.12, 30.67, 21.50, 17.79

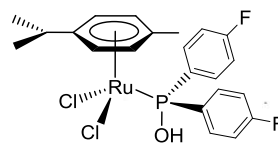


3
¹³C{¹H} NMR in CD₂Cl₂

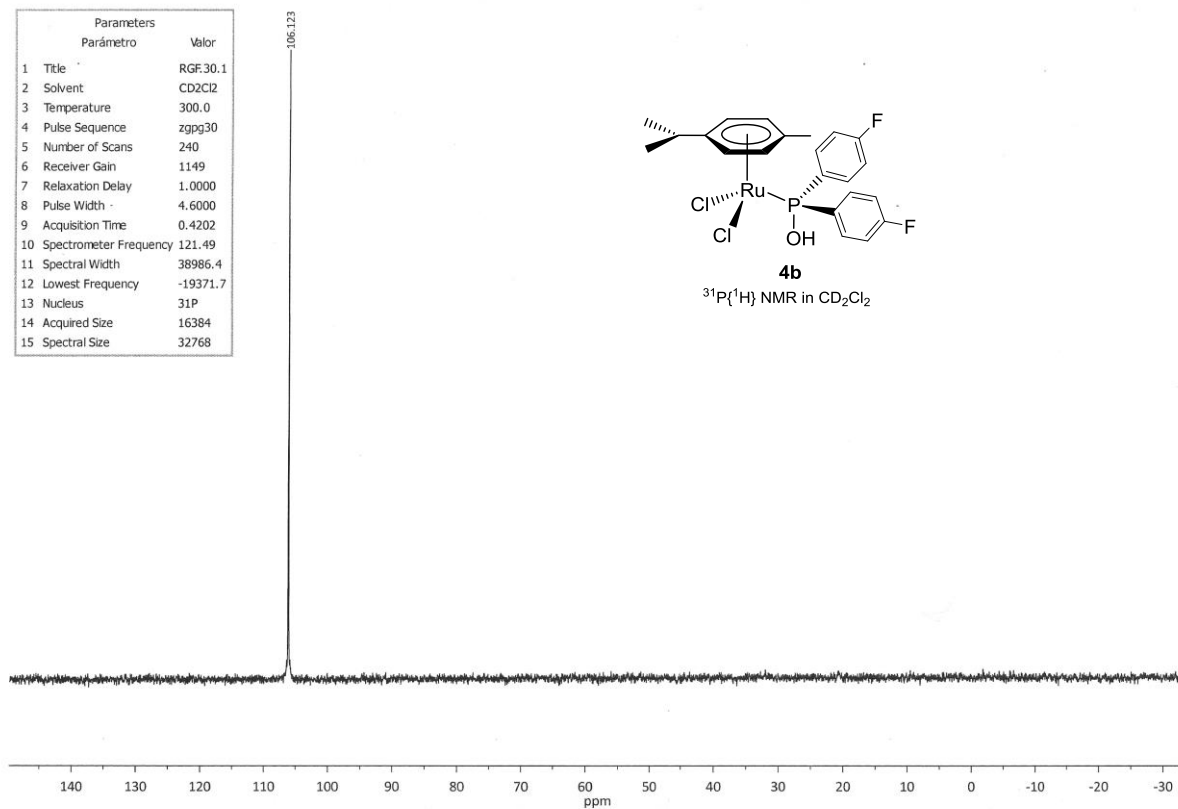


Parameters	Valor
Parámetro	Valor
1 Title	RGF.30.1
2 Solvent	CD ₂ Cl ₂
3 Temperature	300.0
4 Pulse Sequence	zgpg30
5 Number of Scans	240
6 Receiver Gain	1149
7 Relaxation Delay	1.0000
8 Pulse Width	4.6000
9 Acquisition Time	0.4202
10 Spectrometer Frequency	121.49
11 Spectral Width	38986.4
12 Lowest Frequency	-19371.7
13 Nucleus	³¹ P
14 Acquired Size	16384
15 Spectral Size	32768

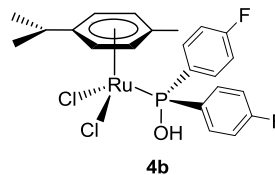
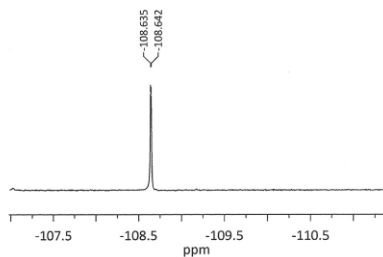
106.123



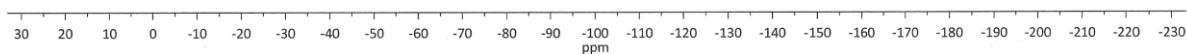
4b
³¹P{¹H} NMR in CD₂Cl₂



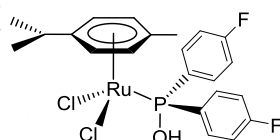
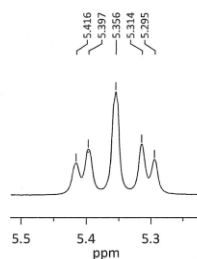
Parameters	
Parámetro	Valor
1 Title	RGF.30.3
2 Solvent	CD ₂ Cl ₂
3 Temperature	300.0
4 Pulse Sequence	zgfhigqn.2
5 Number of Scans	32
6 Receiver Gain	7298
7 Relaxation Delay	1.0000
8 Pulse Width	14.0000
9 Acquisition Time	0.8716
10 Spectrometer Frequency	282.38
11 Spectral Width	75188.0
12 Lowest Frequency	-65834.2
13 Nucleus	¹⁹ F
14 Acquired Size	65536
15 Spectral Size	131072



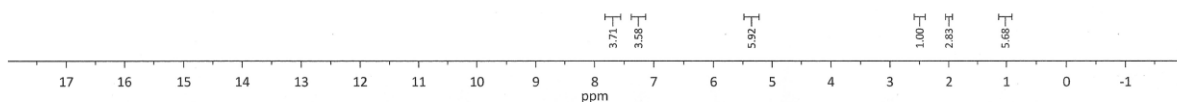
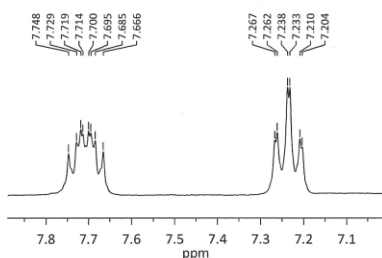
4b
¹⁹F{¹H} NMR in CD₂Cl₂



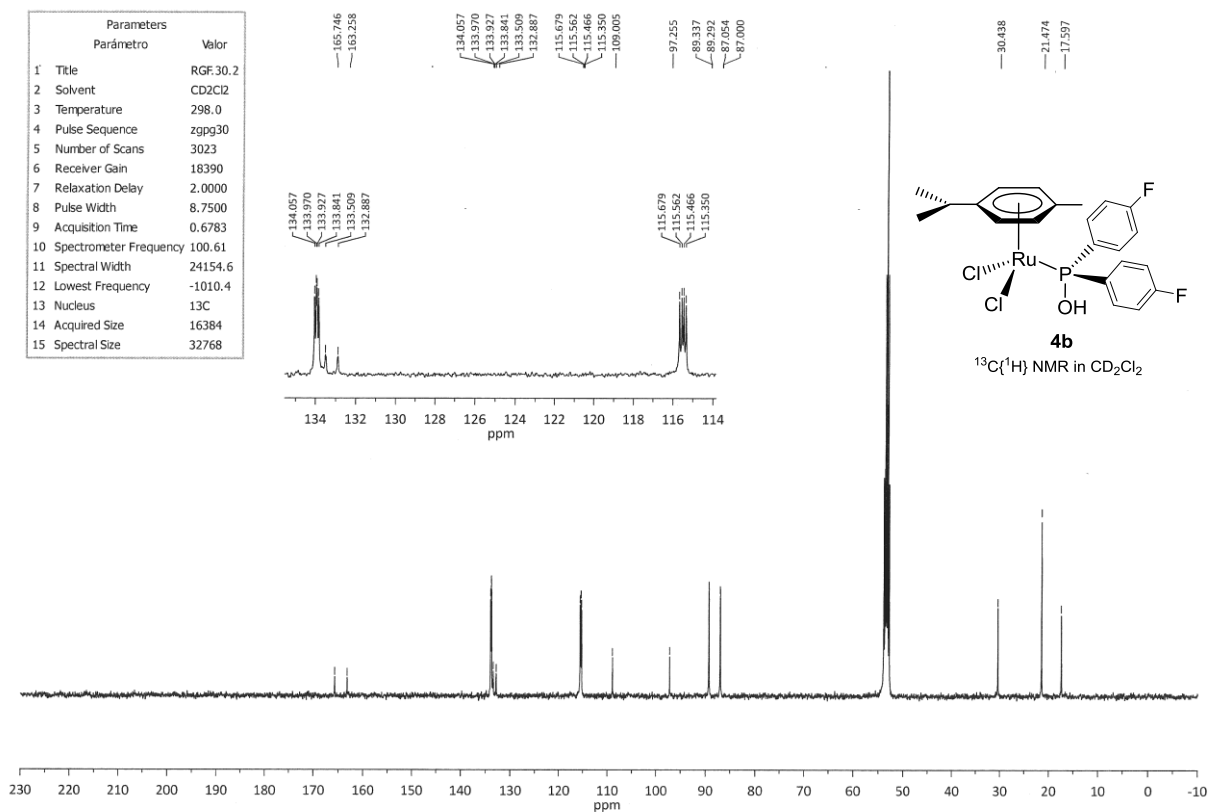
Parameters	
Parámetro	Valor
1 Title	RGF.30.1
2 Solvent	CD ₂ Cl ₂
3 Temperature	300.0
4 Pulse Sequence	zg30
5 Number of Scans	32
6 Receiver Gain	813
7 Relaxation Delay	1.0000
8 Pulse Width	14.0000
9 Acquisition Time	2.7329
10 Spectrometer Frequency	300.13
11 Spectral Width	5995.2
12 Lowest Frequency	-596.6
13 Nucleus	¹ H
14 Acquired Size	16384
15 Spectral Size	32768



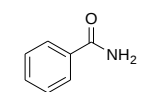
4b
¹H NMR in CD₂Cl₂



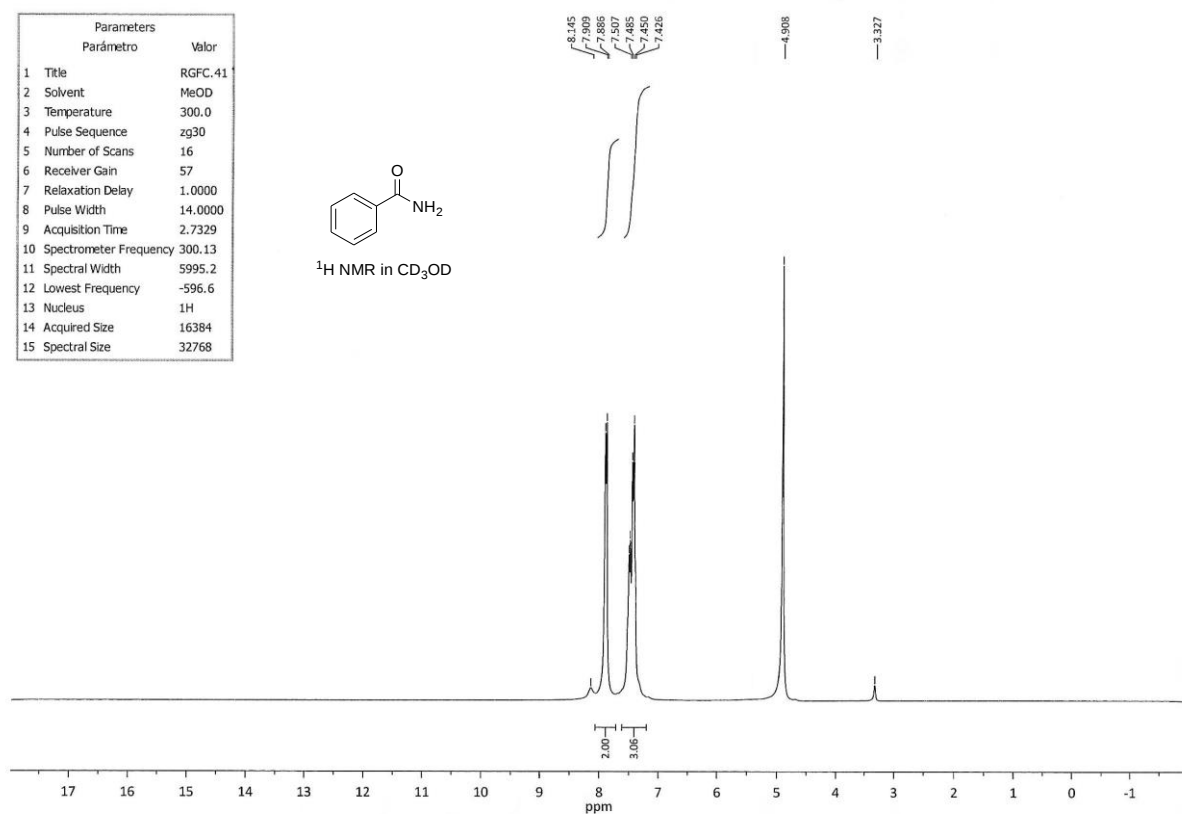
Parameters		
	Parámetro	Valor
1	Title	RGF.30.2
2	Solvent	CD ₂ Cl ₂
3	Temperature	298.0
4	Pulse Sequence	zgpg30
5	Number of Scans	3023
6	Receiver Gain	18390
7	Relaxation Delay	2.0000
8	Pulse Width	8.7500
9	Acquisition Time	0.6783
10	Spectrometer Frequency	100.61
11	Spectral Width	24154.6
12	Lowest Frequency	-1010.4
13	Nucleus	¹³ C
14	Acquired Size	16384
15	Spectral Size	32768



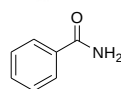
Parameters		
Parámetro	Valor	
1 Title	RGFC.41	
2 Solvent	MeOD	
3 Temperature	300.0	
4 Pulse Sequence	zg30	
5 Number of Scans	16	
6 Receiver Gain	57	
7 Relaxation Delay	1.0000	
8 Pulse Width	14.0000	
9 Acquisition Time	2.7329	
10 Spectrometer Frequency	300.13	
11 Spectral Width	5995.2	
12 Lowest Frequency	-596.6	
13 Nucleus	^1H	
14 Acquired Size	16384	
15 Spectral Size	32768	



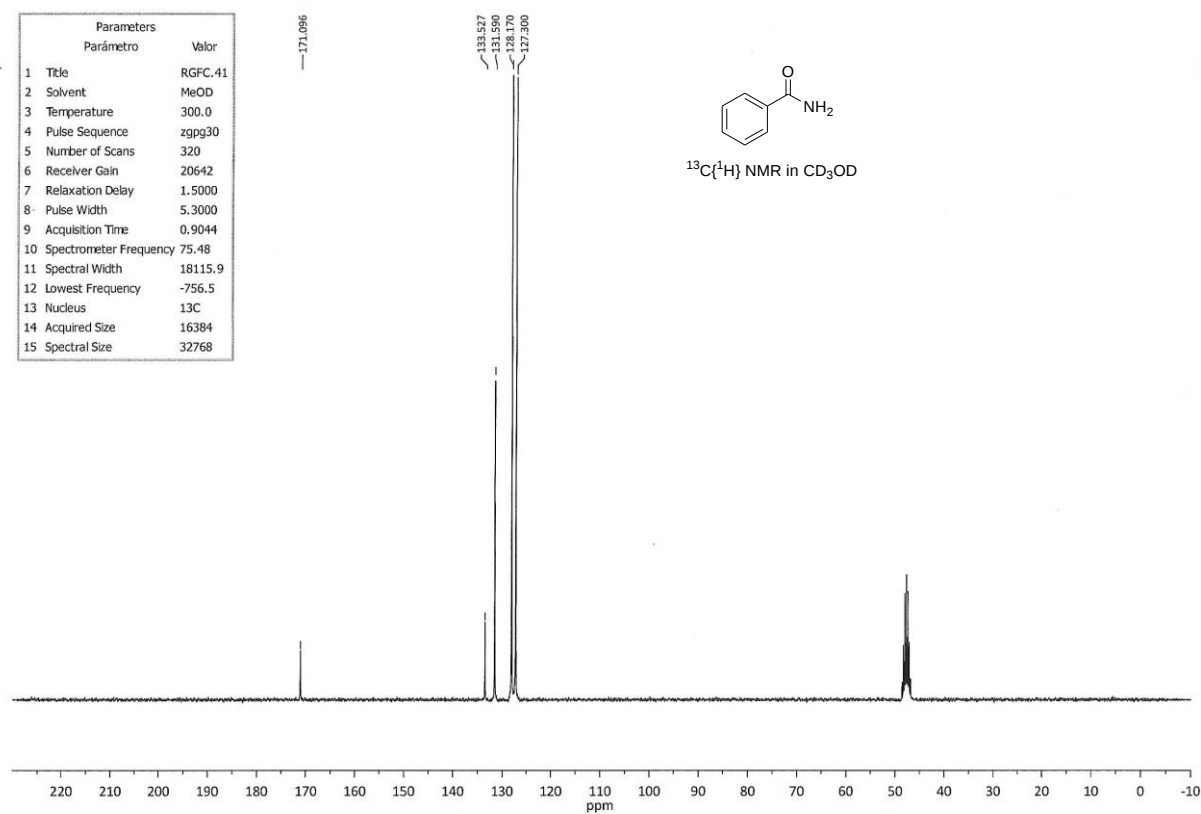
^1H NMR in CD_3OD



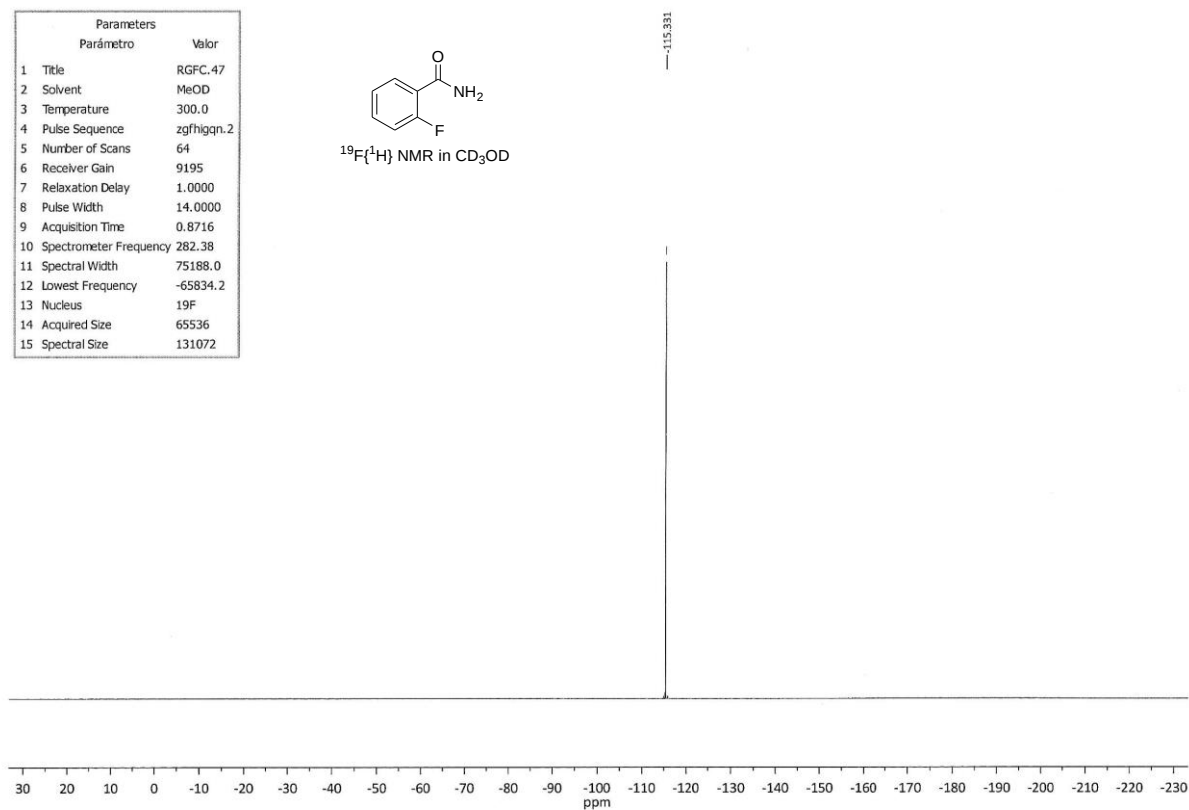
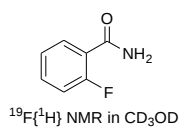
Parameters		
Parámetro	Valor	
1 Title	RGFC.41	
2 Solvent	MeOD	
3 Temperature	300.0	
4 Pulse Sequence	zgpg30	
5 Number of Scans	320	
6 Receiver Gain	20642	
7 Relaxation Delay	1.5000	
8 Pulse Width	5.3000	
9 Acquisition Time	0.9044	
10 Spectrometer Frequency	75.48	
11 Spectral Width	18115.9	
12 Lowest Frequency	-756.5	
13 Nucleus	^{13}C	
14 Acquired Size	16384	
15 Spectral Size	32768	



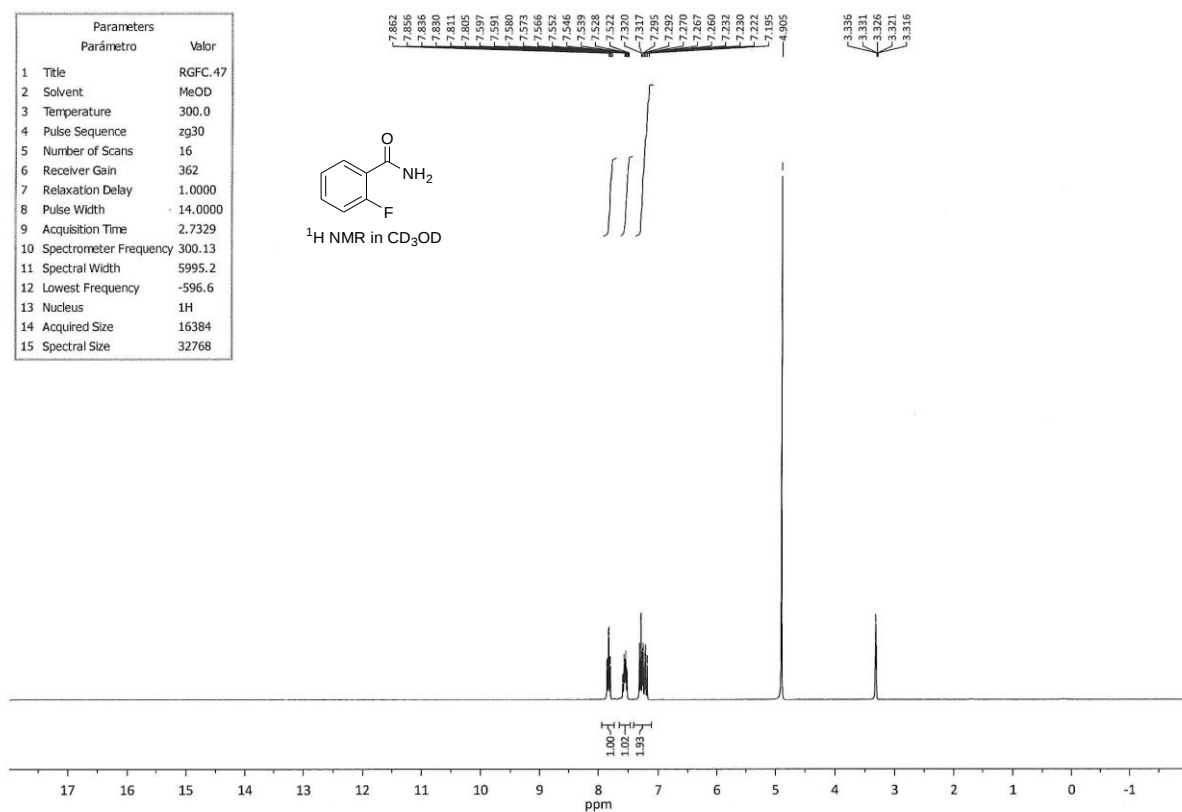
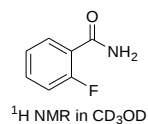
$^{13}\text{C}\{^1\text{H}\}$ NMR in CD_3OD



Parameters		
1	Parámetro	Valor
1	Title	RGFC.47
2	Solvent	MeOD
3	Temperature	300.0
4	Pulse Sequence	zgfhgqn.2
5	Number of Scans	64
6	Receiver Gain	9195
7	Relaxation Delay	1.0000
8	Pulse Width	14.0000
9	Acquisition Time	0.8716
10	Spectrometer Frequency	282.38
11	Spectral Width	75188.0
12	Lowest Frequency	-65834.2
13	Nucleus	19F
14	Acquired Size	65536
15	Spectral Size	131072



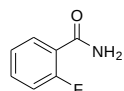
Parameters		
1	Parámetro	Valor
1	Title	RGFC.47
2	Solvent	MeOD
3	Temperature	300.0
4	Pulse Sequence	zg30
5	Number of Scans	16
6	Receiver Gain	362
7	Relaxation Delay	1.0000
8	Pulse Width	14.0000
9	Acquisition Time	2.7329
10	Spectrometer Frequency	300.13
11	Spectral Width	5995.2
12	Lowest Frequency	-596.6
13	Nucleus	1H
14	Acquired Size	16384
15	Spectral Size	32768



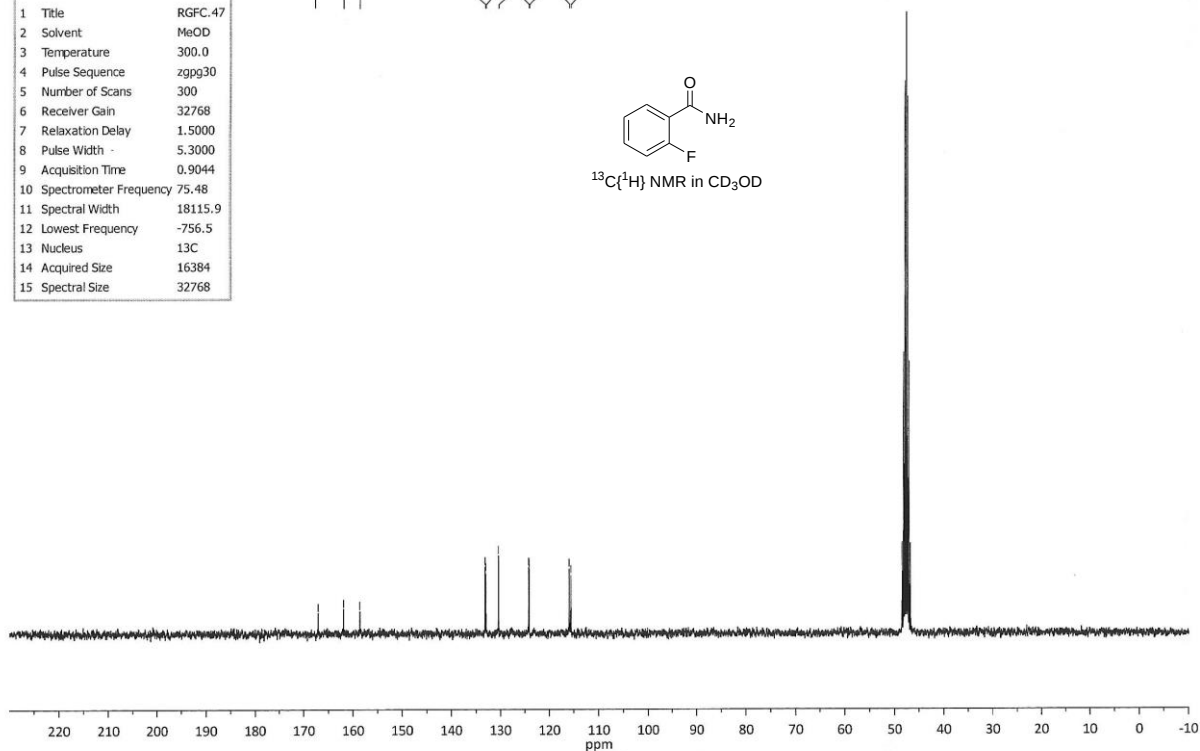
Parameters		
	Parámetro	Valor
1	Title	RGFC.47
2	Solvent	MeOD
3	Temperature	300.0
4	Pulse Sequence	zgpg30
5	Number of Scans	300
6	Receiver Gain	32768
7	Relaxation Delay	1.5000
8	Pulse Width	5.3000
9	Acquisition Time	0.9044
10	Spectrometer Frequency	75.48
11	Spectral Width	18115.9
12	Lowest Frequency	-756.5
13	Nucleus	¹³ C
14	Acquired Size	16384
15	Spectral Size	32768

— 167.182
— 161.942
— 158.654

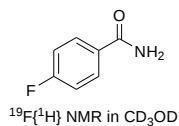
133.188
133.070
130.486
124.245
124.200
115.974
115.663



¹³C{¹H} NMR in CD₃OD

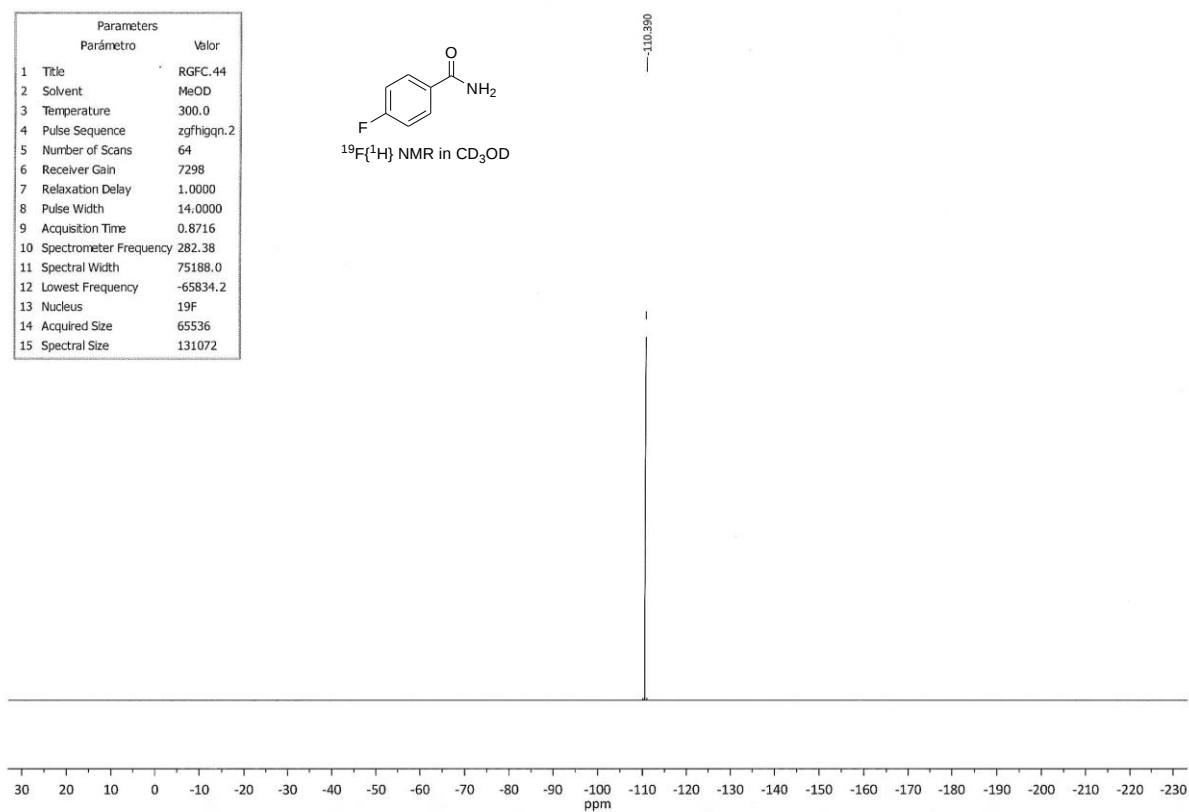


Parameters		
	Parámetro	Valor
1	Title	RGFC.44
2	Solvent	MeOD
3	Temperature	300.0
4	Pulse Sequence	zgfhgqn.2
5	Number of Scans	64
6	Receiver Gain	7298
7	Relaxation Delay	1.0000
8	Pulse Width	14.0000
9	Acquisition Time	0.8716
10	Spectrometer Frequency	282.38
11	Spectral Width	75188.0
12	Lowest Frequency	-65834.2
13	Nucleus	¹⁹ F
14	Acquired Size	65536
15	Spectral Size	131072

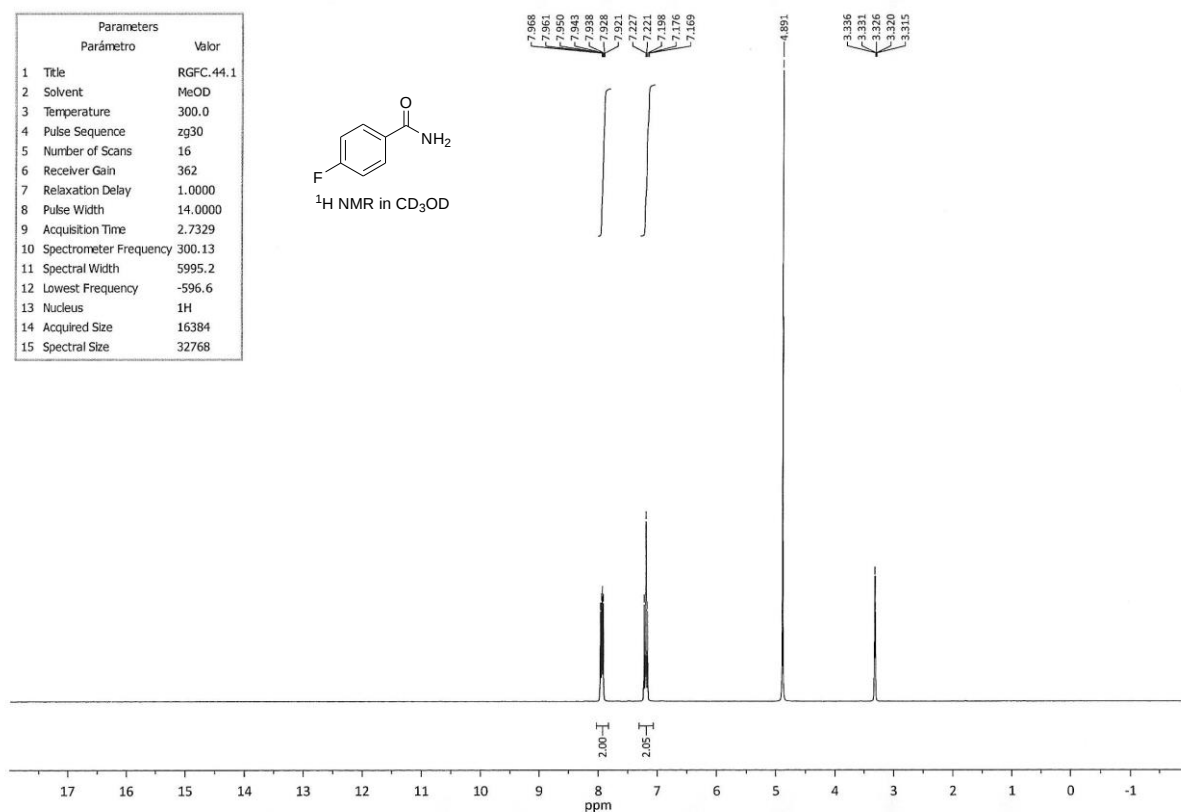
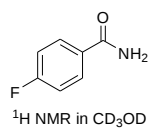


¹⁹F{¹H} NMR in CD₃OD

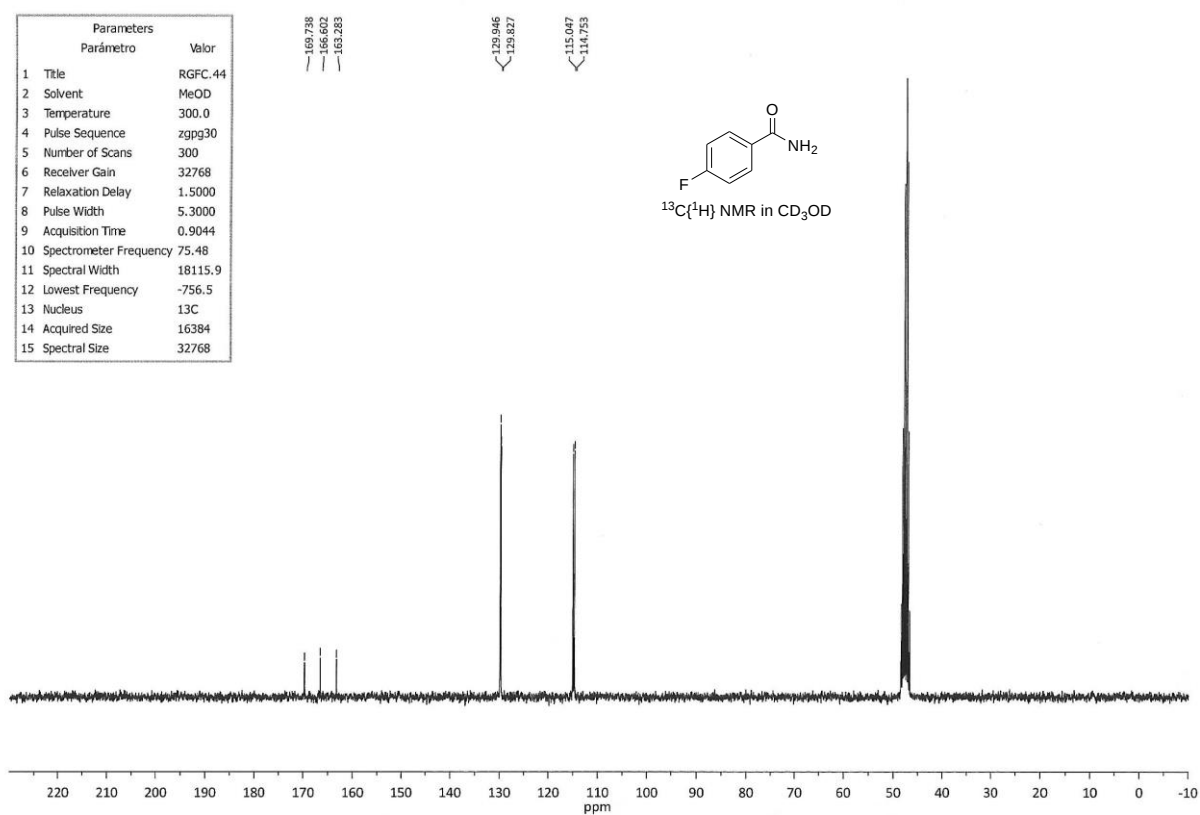
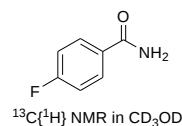
— -110.390



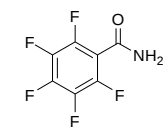
Parameters	
Parámetro	Valor
1 Title	RGFC.44.1
2 Solvent	MeOD
3 Temperature	300.0
4 Pulse Sequence	zg30
5 Number of Scans	16
6 Receiver Gain	362
7 Relaxation Delay	1.0000
8 Pulse Width	14.0000
9 Acquisition Time	2.7329
10 Spectrometer Frequency	300.13
11 Spectral Width	5995.2
12 Lowest Frequency	-596.6
13 Nucleus	¹ H
14 Acquired Size	16384
15 Spectral Size	32768



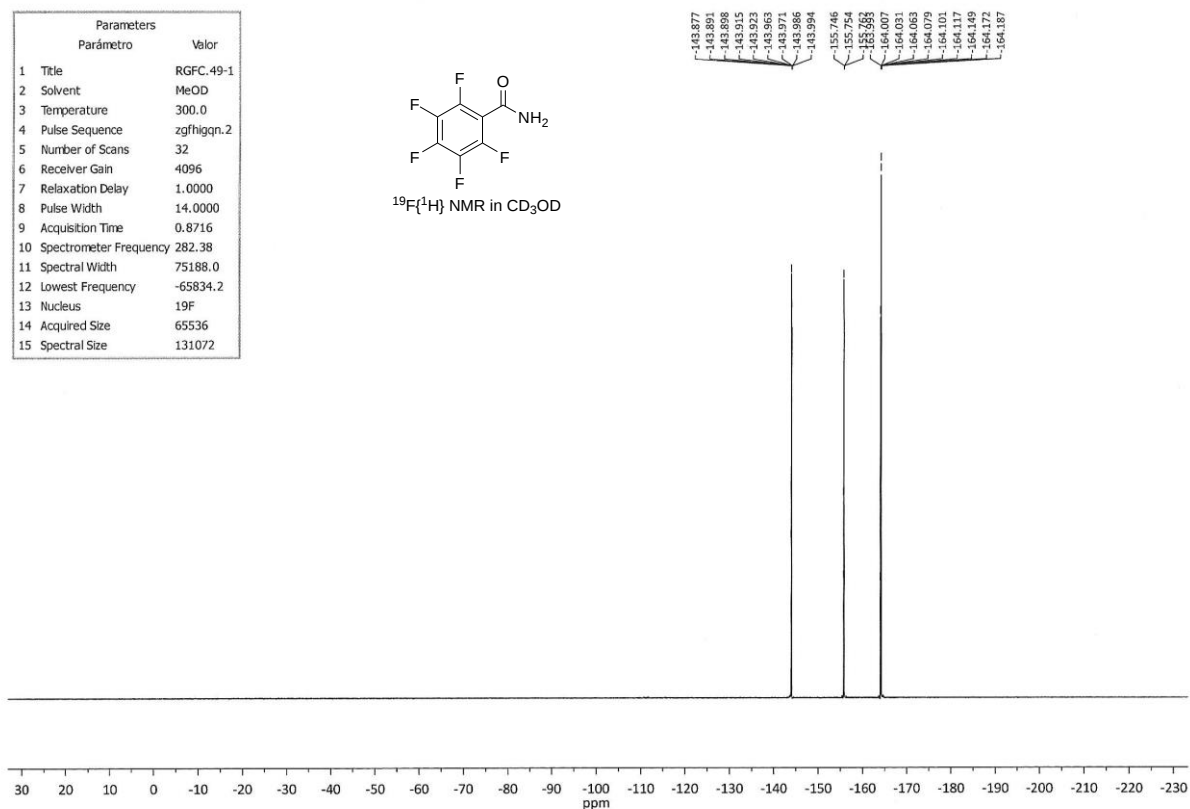
Parameters	
Parámetro	Valor
1 Title	RGFC.44
2 Solvent	MeOD
3 Temperature	300.0
4 Pulse Sequence	zgpg30
5 Number of Scans	300
6 Receiver Gain	32768
7 Relaxation Delay	1.5000
8 Pulse Width	5.3000
9 Acquisition Time	0.9044
10 Spectrometer Frequency	75.48
11 Spectral Width	18115.9
12 Lowest Frequency	-756.5
13 Nucleus	¹³ C
14 Acquired Size	16384
15 Spectral Size	32768



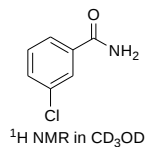
Parameters	
Parámetro	Valor
1 Title	RGFC.49-1
2 Solvent	MeOD
3 Temperature	300.0
4 Pulse Sequence	zgfhgqn.2
5 Number of Scans	32
6 Receiver Gain	4096
7 Relaxation Delay	1.0000
8 Pulse Width	14.0000
9 Acquisition Time	0.8716
10 Spectrometer Frequency	282.38
11 Spectral Width	75188.0
12 Lowest Frequency	-65834.2
13 Nucleus	19F
14 Acquired Size	65536
15 Spectral Size	131072



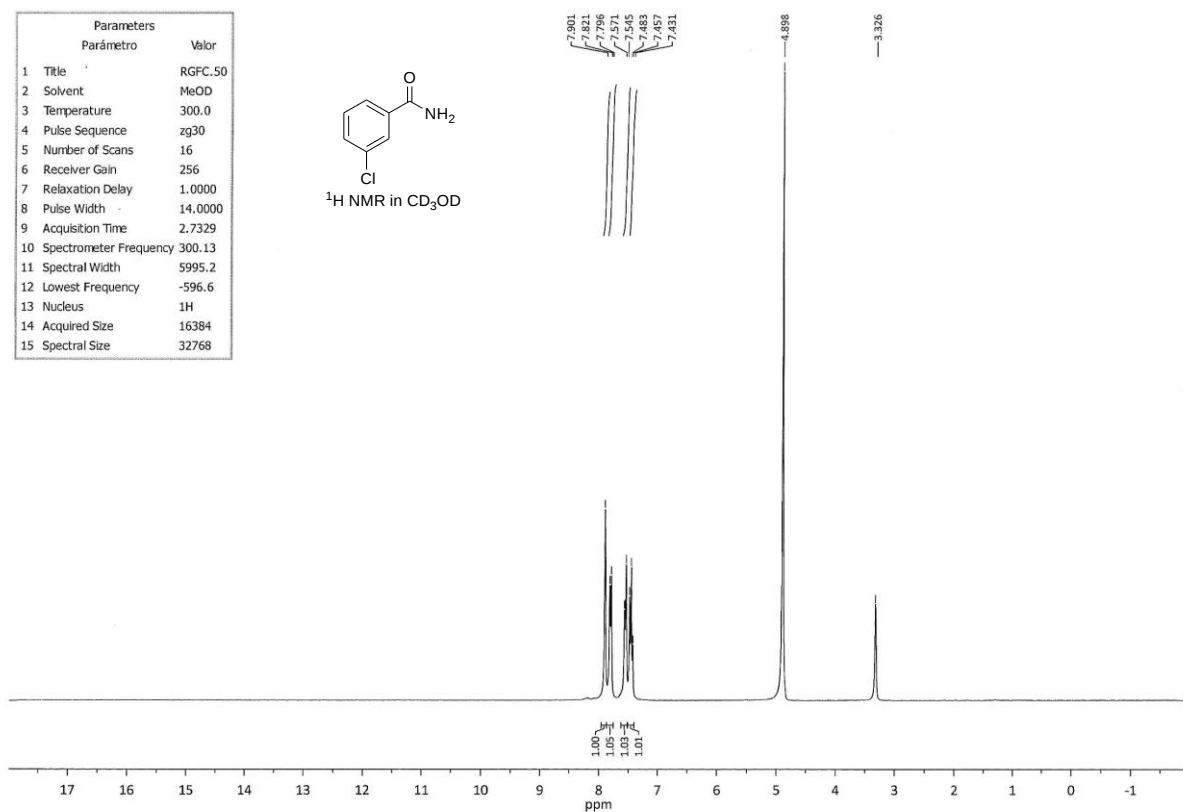
$^{19}\text{F}\{^1\text{H}\}$ NMR in CD_3OD



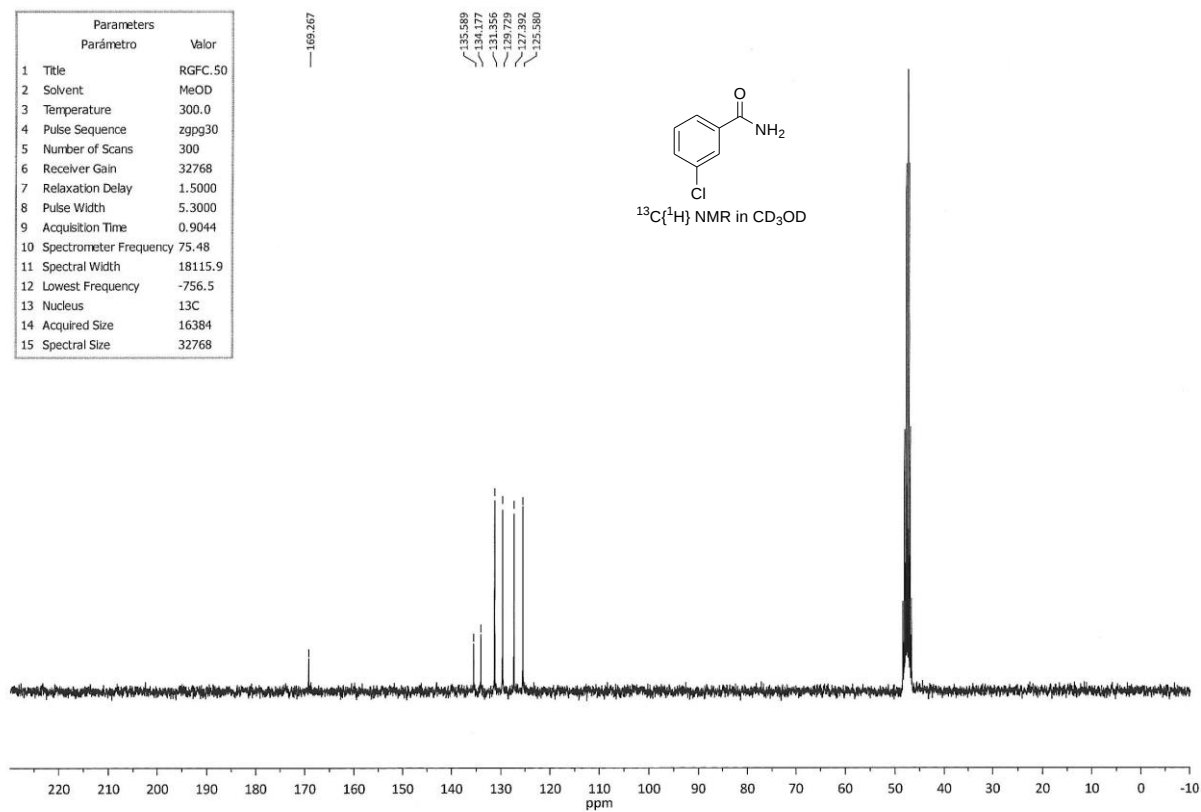
Parameters	
Parámetro	Valor
1 Title	RGFC.50
2 Solvent	MeOD
3 Temperature	300.0
4 Pulse Sequence	zg30
5 Number of Scans	16
6 Receiver Gain	256
7 Relaxation Delay	1.0000
8 Pulse Width	14.0000
9 Acquisition Time	2.7329
10 Spectrometer Frequency	300.13
11 Spectral Width	5995.2
12 Lowest Frequency	-596.6
13 Nucleus	1H
14 Acquired Size	16384
15 Spectral Size	32768



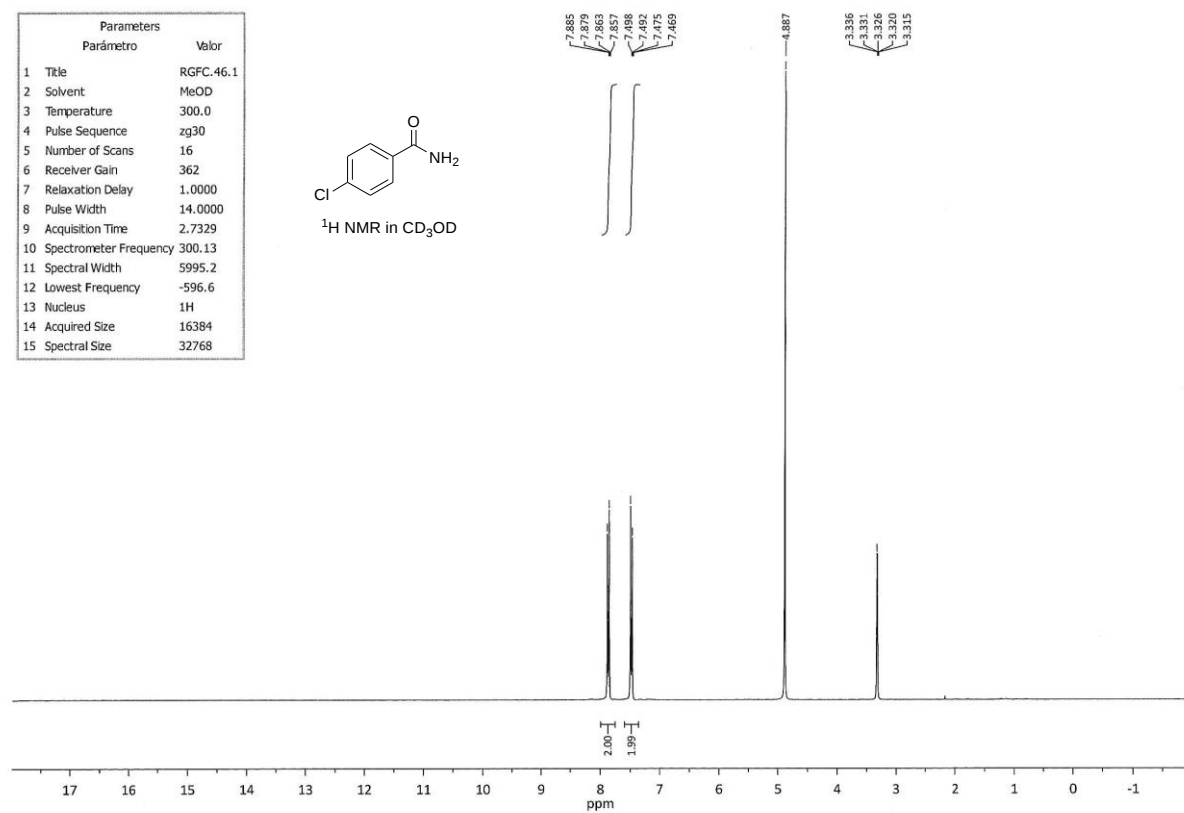
^1H NMR in CD_3OD



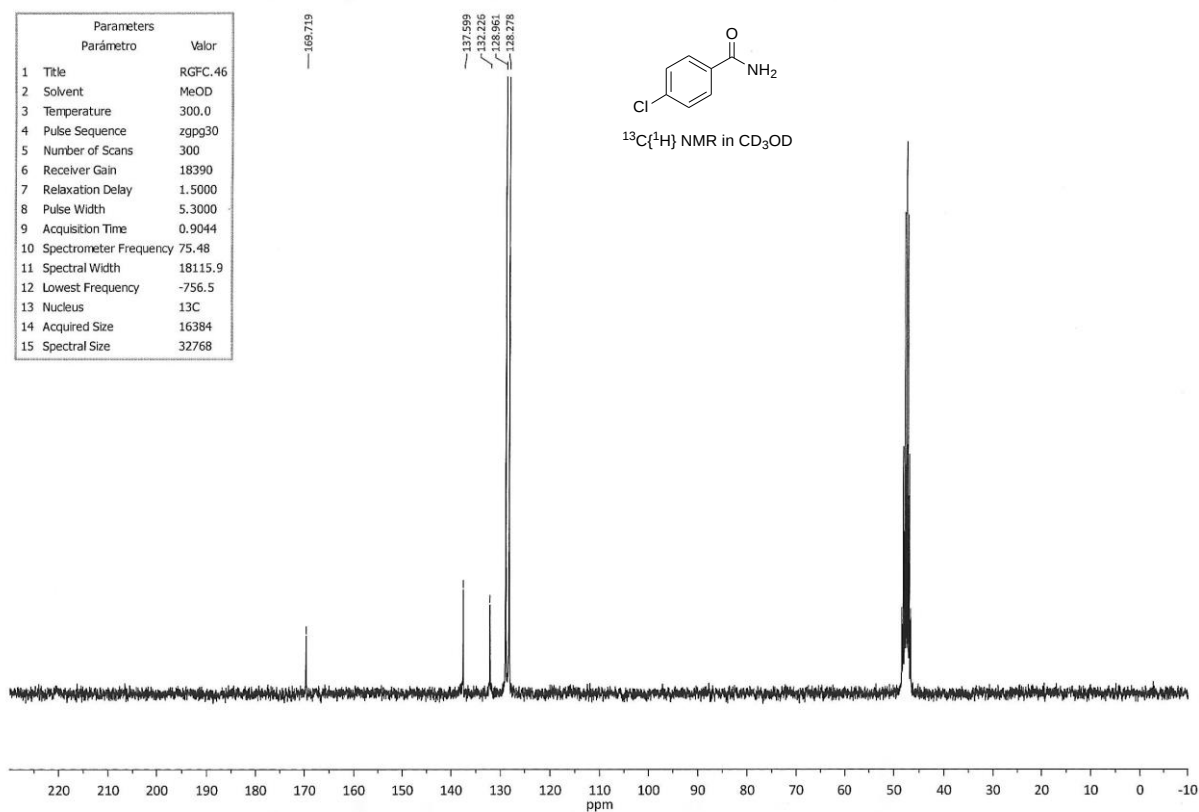
Parameters		
	Parámetro	Valor
1	Title	RGFC.50
2	Solvent	MeOD
3	Temperature	300.0
4	Pulse Sequence	zgpg30
5	Number of Scans	300
6	Receiver Gain	32768
7	Relaxation Delay	1.5000
8	Pulse Width	5.3000
9	Acquisition Time	0.9044
10	Spectrometer Frequency	75.48
11	Spectral Width	18115.9
12	Lowest Frequency	-756.5
13	Nucleus	¹³ C
14	Acquired Size	16384
15	Spectral Size	32768



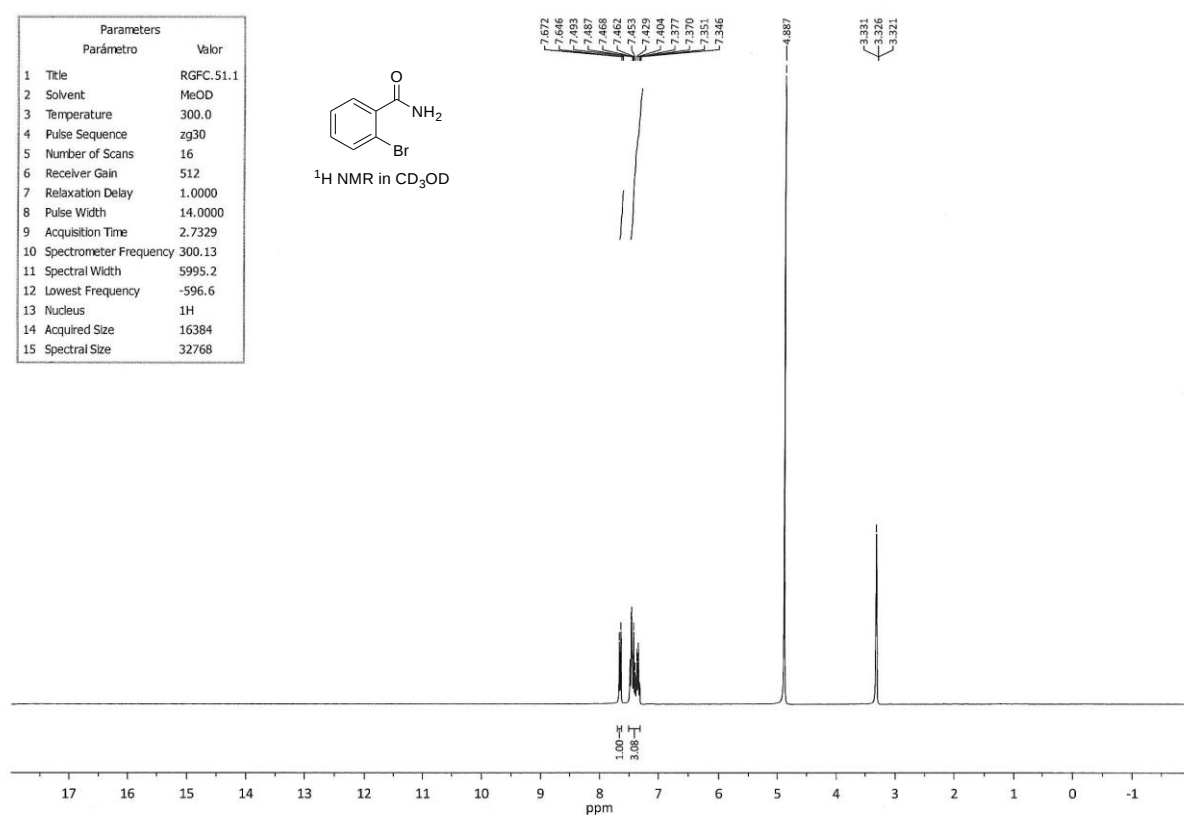
Parameters		
	Parámetro	Valor
1	Title	RGFC.46.1
2	Solvent	MeOD
3	Temperature	300.0
4	Pulse Sequence	zg30
5	Number of Scans	16
6	Receiver Gain	362
7	Relaxation Delay	1.0000
8	Pulse Width	14.0000
9	Acquisition Time	2.7329
10	Spectrometer Frequency	300.13
11	Spectral Width	5995.2
12	Lowest Frequency	-596.6
13	Nucleus	¹ H
14	Acquired Size	16384
15	Spectral Size	32768



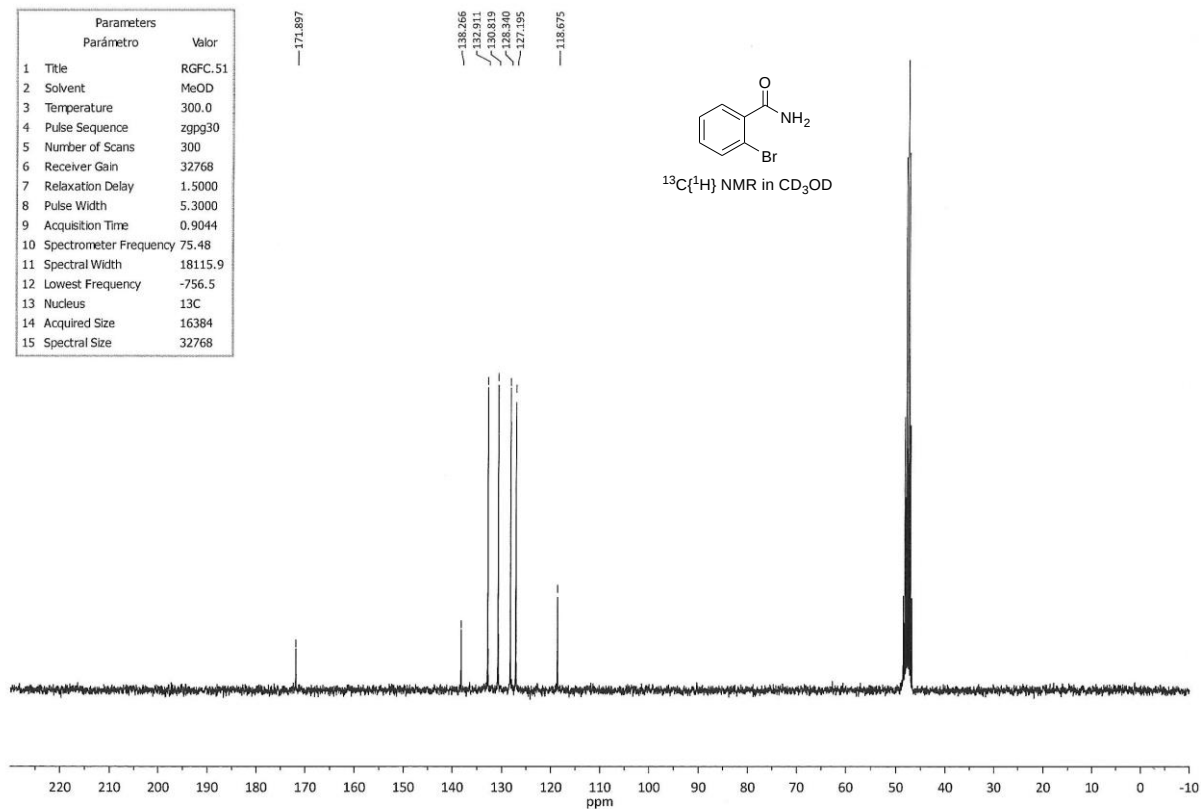
Parameters		
	Parámetro	Valor
1	Title	RGFC.46
2	Solvent	MeOD
3	Temperature	300.0
4	Pulse Sequence	zgpg30
5	Number of Scans	300
6	Receiver Gain	18390
7	Relaxation Delay	1.5000
8	Pulse Width	5.3000
9	Acquisition Time	0.9044
10	Spectrometer Frequency	75.48
11	Spectral Width	18115.9
12	Lowest Frequency	-756.5
13	Nucleus	¹³ C
14	Acquired Size	16384
15	Spectral Size	32768



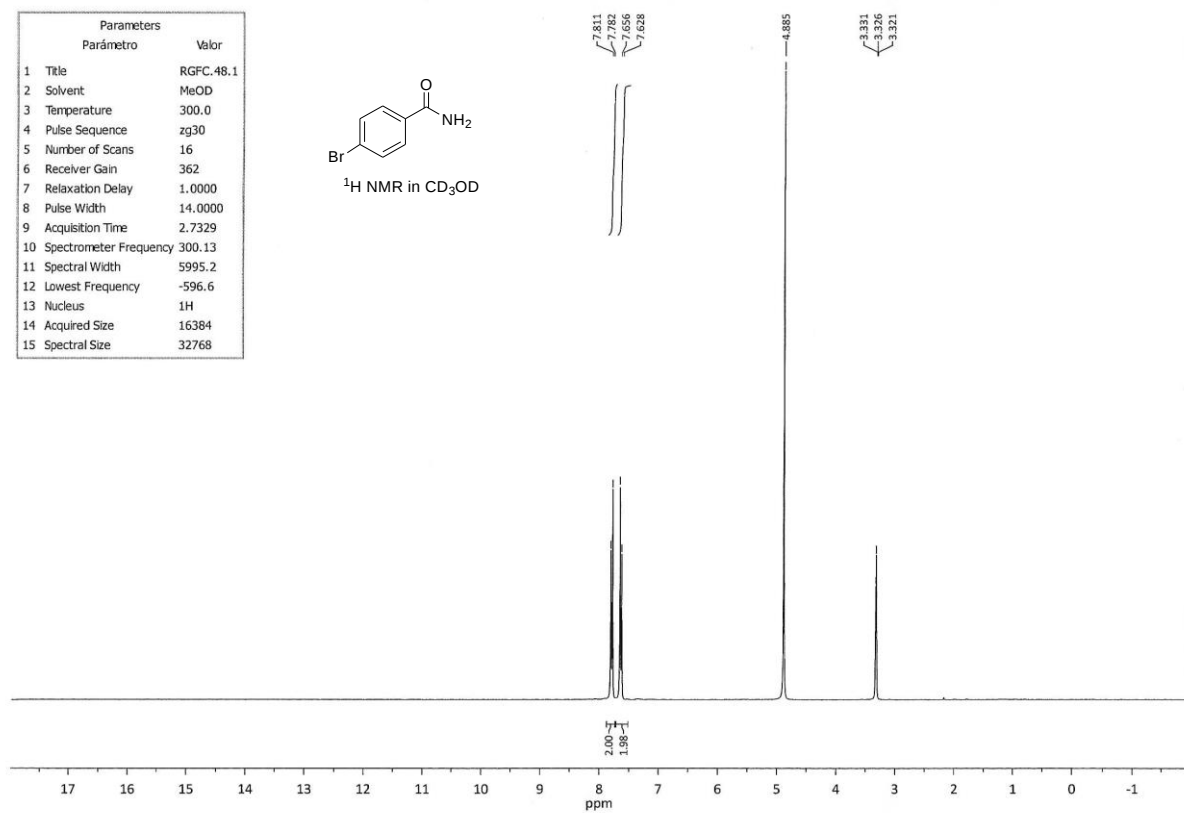
Parameters		
	Parámetro	Valor
1	Title	RGFC.51.1
2	Solvent	MeOD
3	Temperature	300.0
4	Pulse Sequence	zg30
5	Number of Scans	16
6	Receiver Gain	512
7	Relaxation Delay	1.0000
8	Pulse Width	14.0000
9	Acquisition Time	2.7329
10	Spectrometer Frequency	300.13
11	Spectral Width	5995.2
12	Lowest Frequency	-596.6
13	Nucleus	¹ H
14	Acquired Size	16384
15	Spectral Size	32768



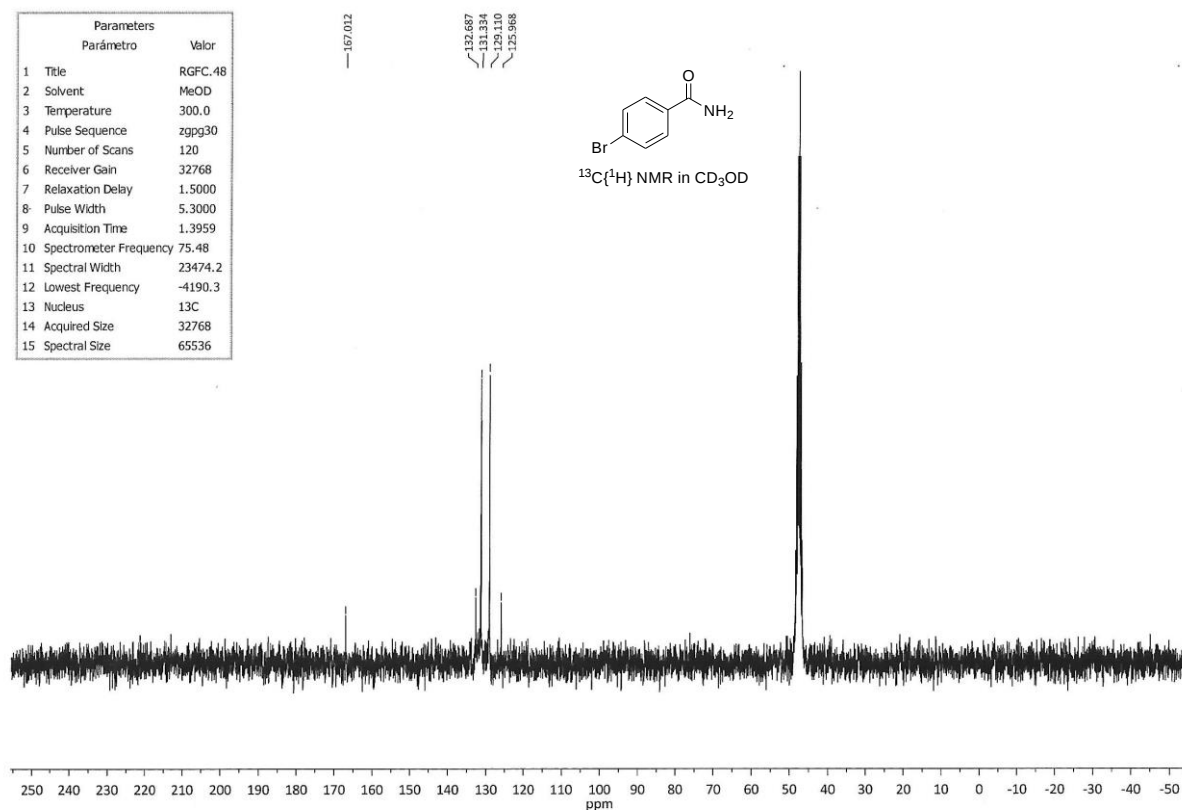
Parameters		
	Parámetro	Valor
1	Title	RGFC.51
2	Solvent	MeOD
3	Temperature	300.0
4	Pulse Sequence	zgpg30
5	Number of Scans	300
6	Receiver Gain	32768
7	Relaxation Delay	1.5000
8	Pulse Width	5.3000
9	Acquisition Time	0.9044
10	Spectrometer Frequency	75.48
11	Spectral Width	18115.9
12	Lowest Frequency	-756.5
13	Nucleus	¹³ C
14	Acquired Size	16384
15	Spectral Size	32768



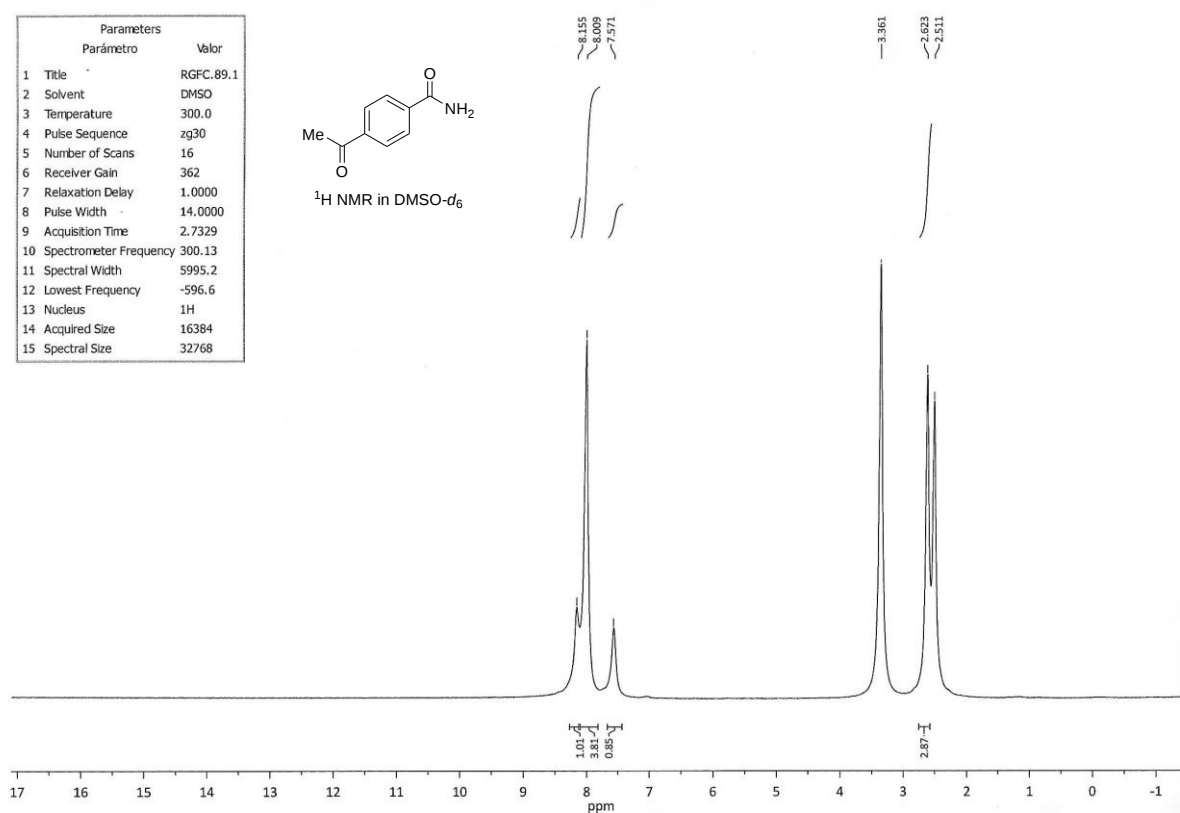
Parameters		
	Parámetro	Valor
1	Title	RGFC.48.1
2	Solvent	MeOD
3	Temperature	300.0
4	Pulse Sequence	zg30
5	Number of Scans	16
6	Receiver Gain	362
7	Relaxation Delay	1.0000
8	Pulse Width	14.0000
9	Acquisition Time	2.7329
10	Spectrometer Frequency	300.13
11	Spectral Width	5995.2
12	Lowest Frequency	-596.6
13	Nucleus	¹ H
14	Acquired Size	16384
15	Spectral Size	32768

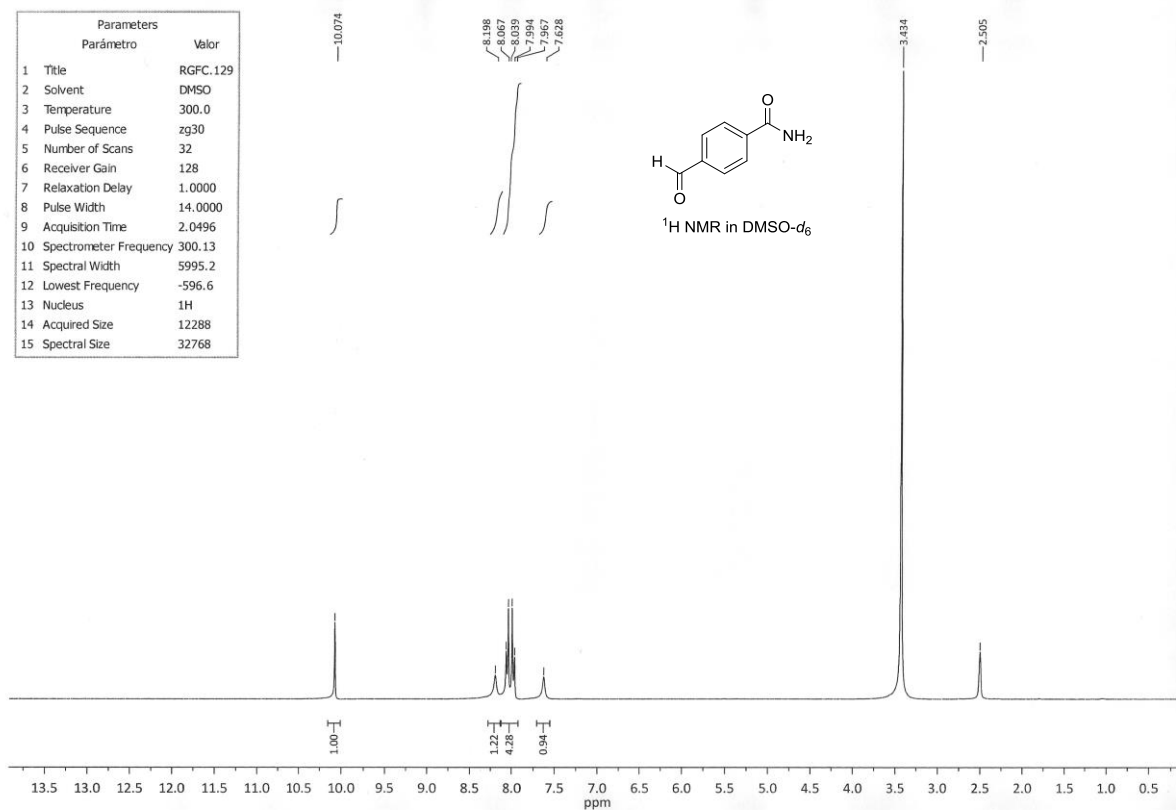
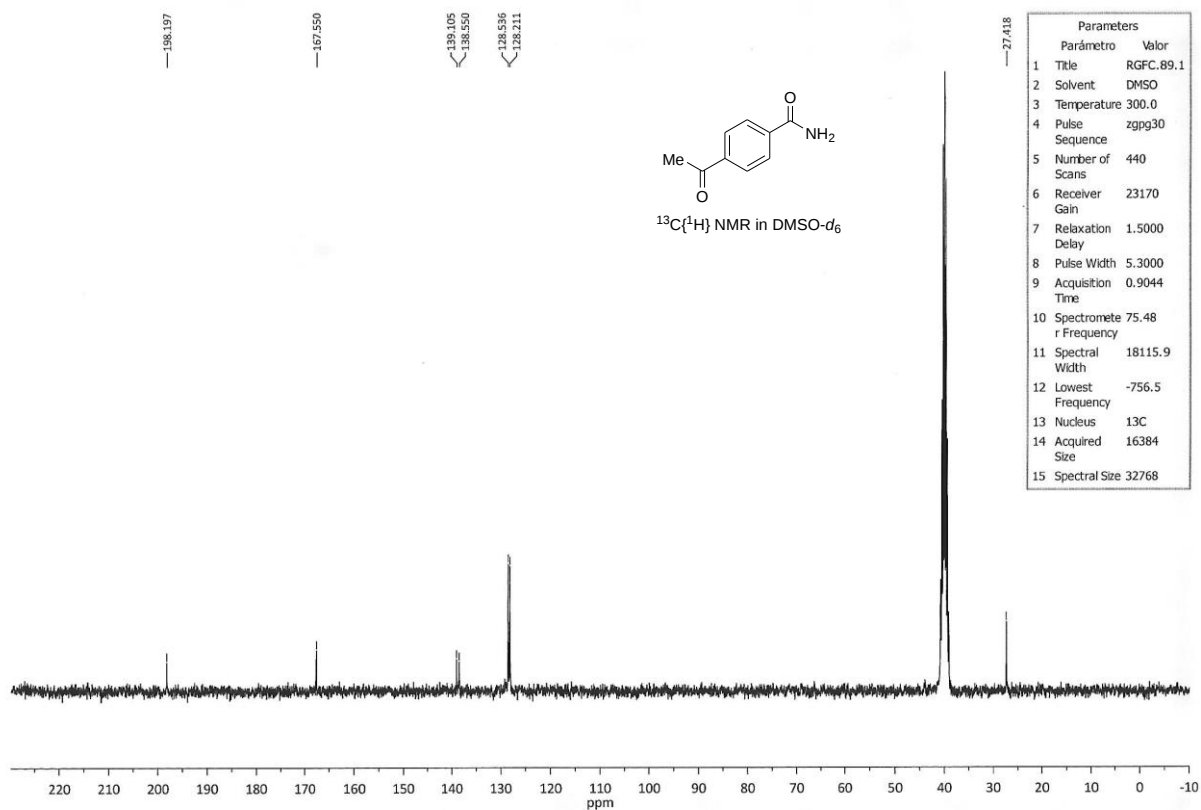


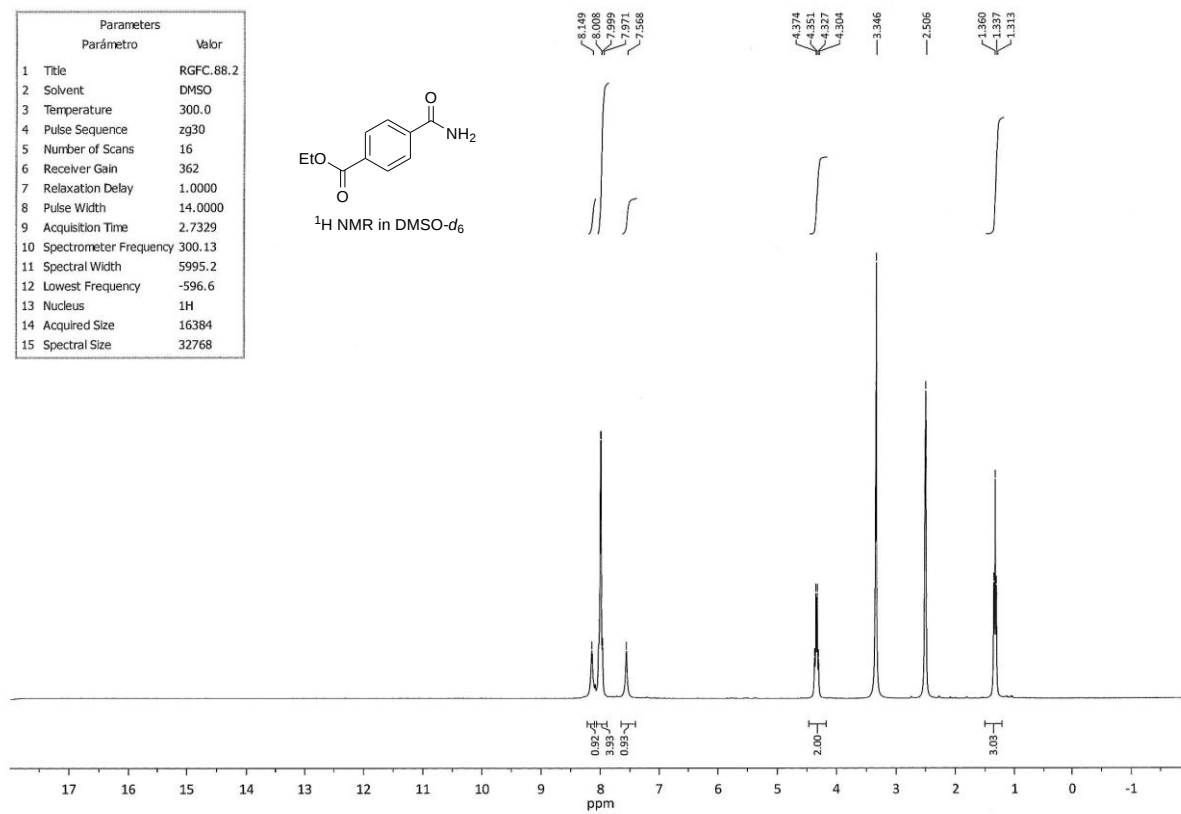
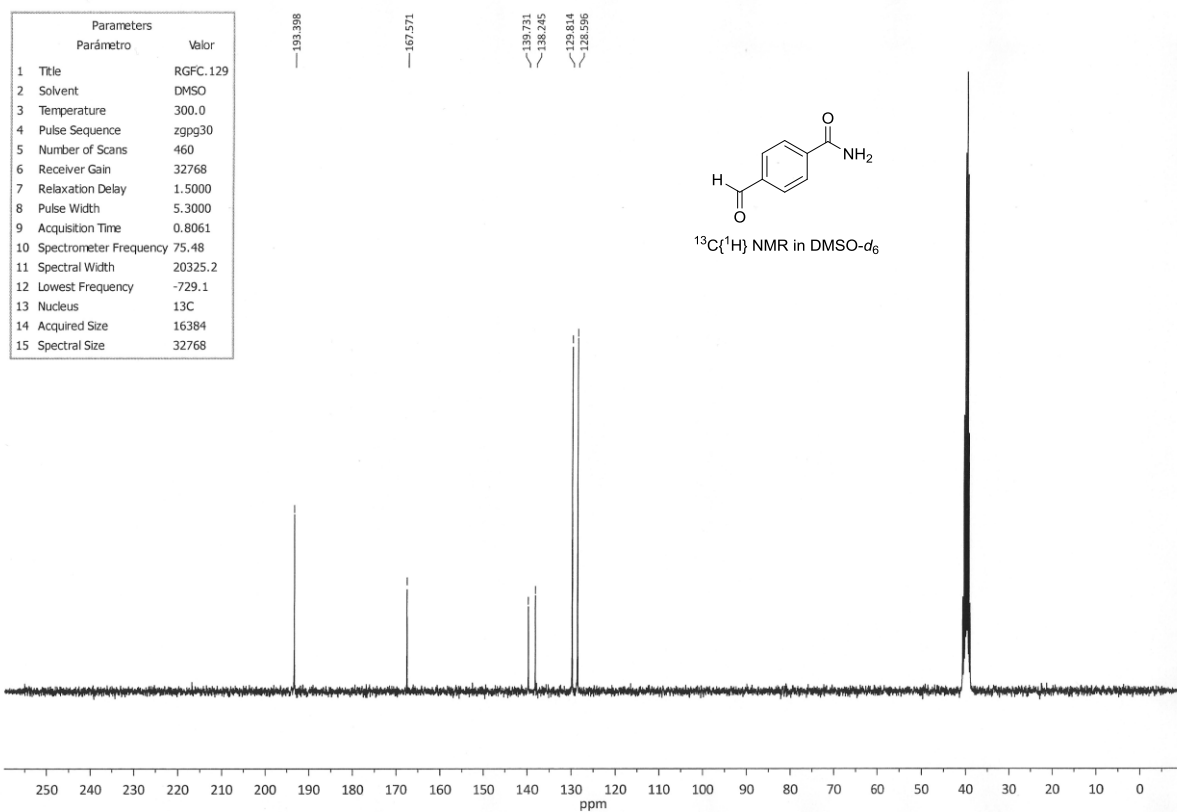
Parameters		
	Parámetro	Valor
1	Title	RGFC.48
2	Solvent	MeOD
3	Temperature	300.0
4	Pulse Sequence	zgpg30
5	Number of Scans	120
6	Receiver Gain	32768
7	Relaxation Delay	1.5000
8	Pulse Width	5.3000
9	Acquisition Time	1.3959
10	Spectrometer Frequency	75.48
11	Spectral Width	23474.2
12	Lowest Frequency	-4190.3
13	Nucleus	¹³ C
14	Acquired Size	32768
15	Spectral Size	65536



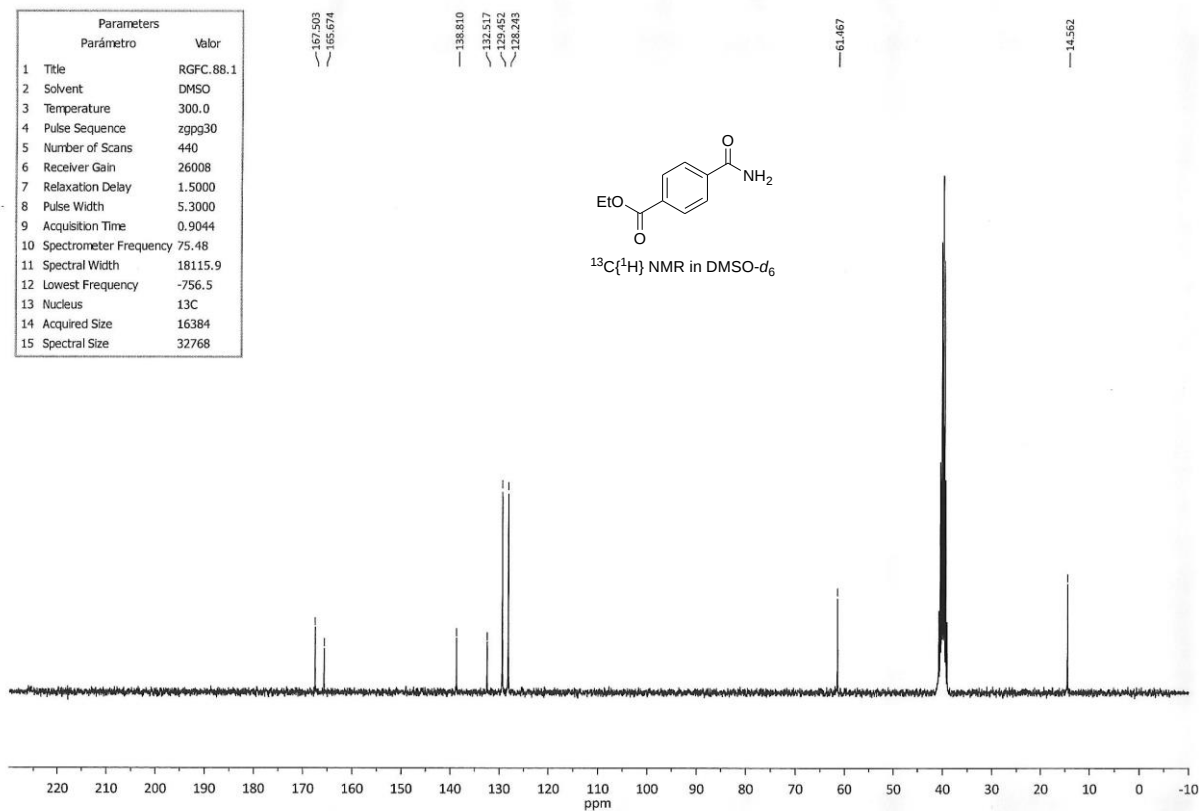
Parameters		
	Parámetro	Valor
1	Title	RGFC.89.1
2	Solvent	DMSO
3	Temperature	300.0
4	Pulse Sequence	zg30
5	Number of Scans	16
6	Receiver Gain	362
7	Relaxation Delay	1.0000
8	Pulse Width	14.0000
9	Acquisition Time	2.7329
10	Spectrometer Frequency	300.13
11	Spectral Width	5995.2
12	Lowest Frequency	-596.6
13	Nucleus	¹ H
14	Acquired Size	16384
15	Spectral Size	32768



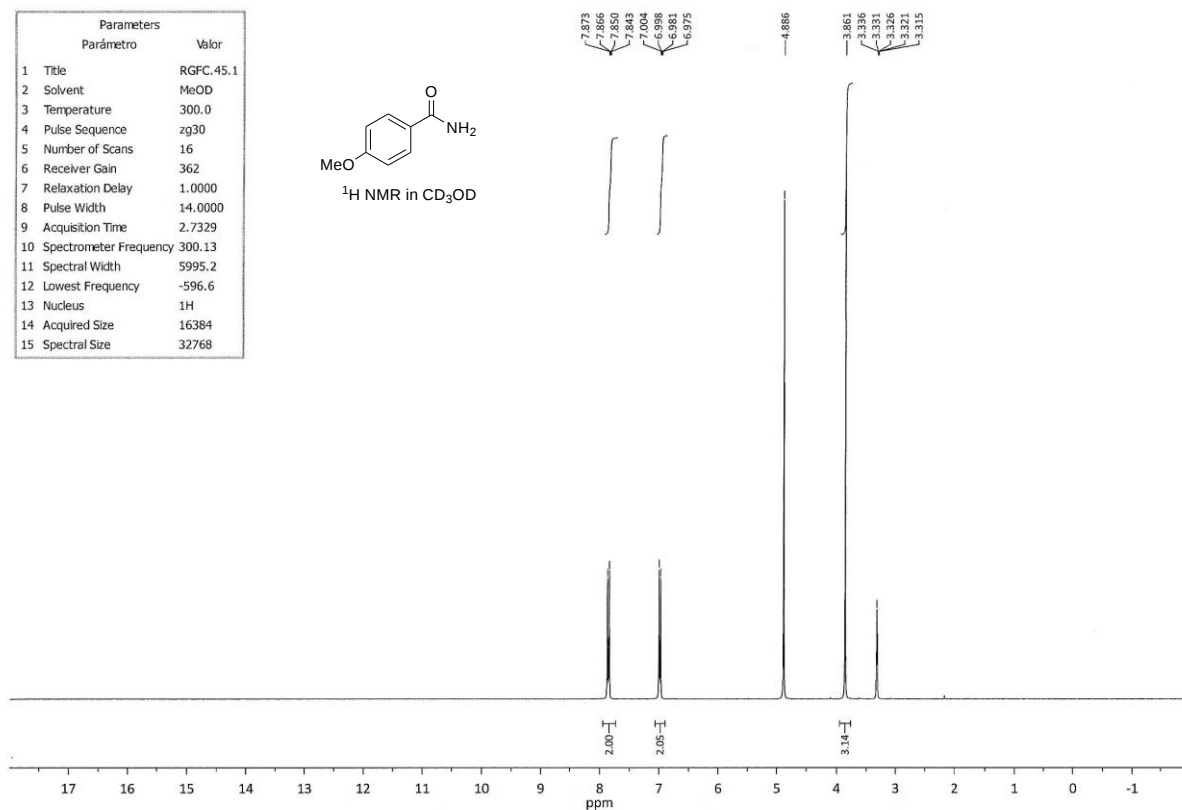




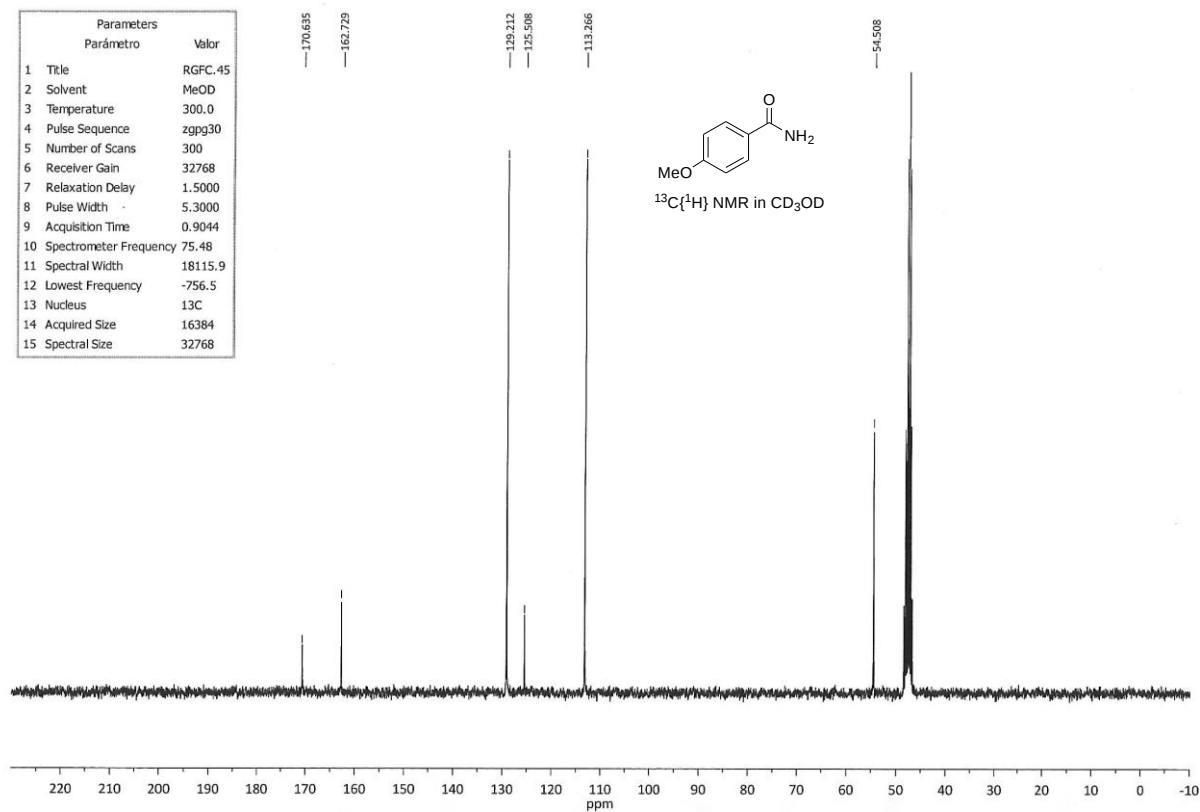
Parameters	
Parámetro	Valor
1 Title	RGFC.88.1
2 Solvent	DMSO
3 Temperature	300.0
4 Pulse Sequence	zgpg30
5 Number of Scans	440
6 Receiver Gain	26008
7 Relaxation Delay	1.5000
8 Pulse Width	5.3000
9 Acquisition Time	0.9044
10 Spectrometer Frequency	75.48
11 Spectral Width	18115.9
12 Lowest Frequency	-756.5
13 Nucleus	13C
14 Acquired Size	16384
15 Spectral Size	32768



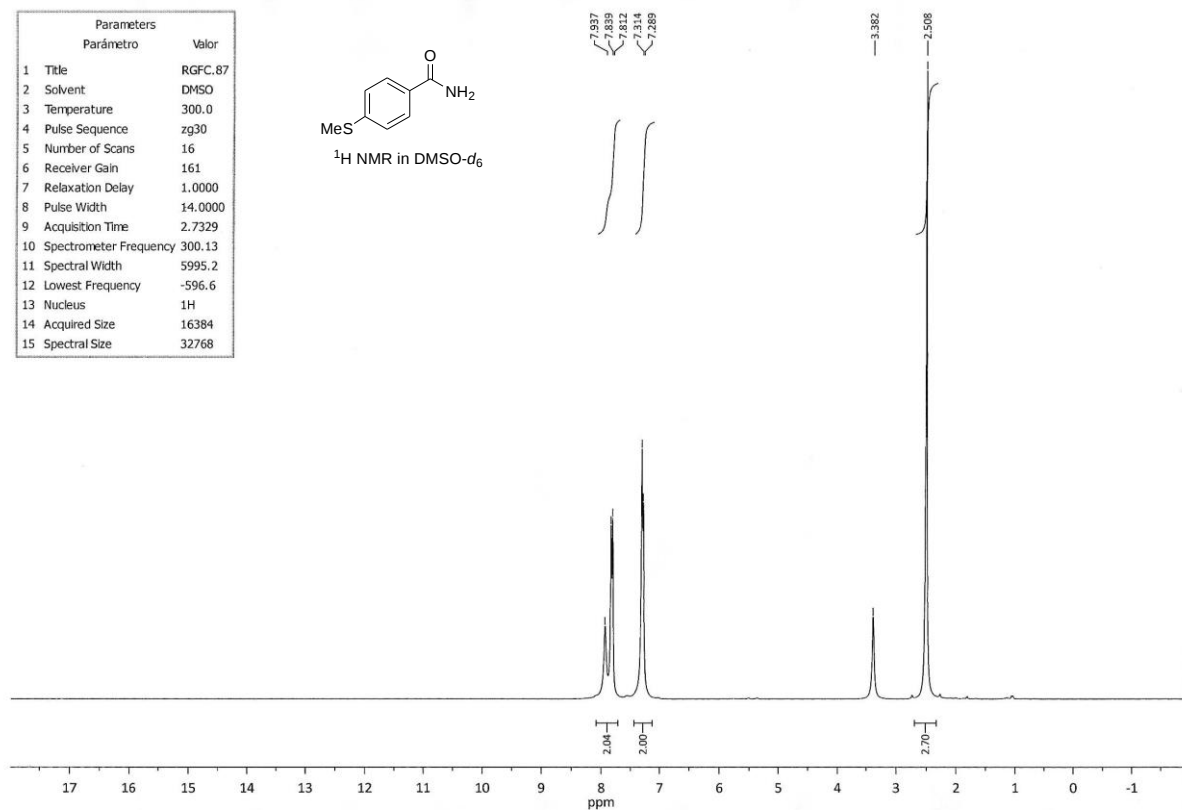
Parameters	
Parámetro	Valor
1 Title	RGFC.45.1
2 Solvent	MeOD
3 Temperature	300.0
4 Pulse Sequence	zg30
5 Number of Scans	16
6 Receiver Gain	362
7 Relaxation Delay	1.0000
8 Pulse Width	14.0000
9 Acquisition Time	2.7329
10 Spectrometer Frequency	300.13
11 Spectral Width	5995.2
12 Lowest Frequency	-596.6
13 Nucleus	1H
14 Acquired Size	16384
15 Spectral Size	32768



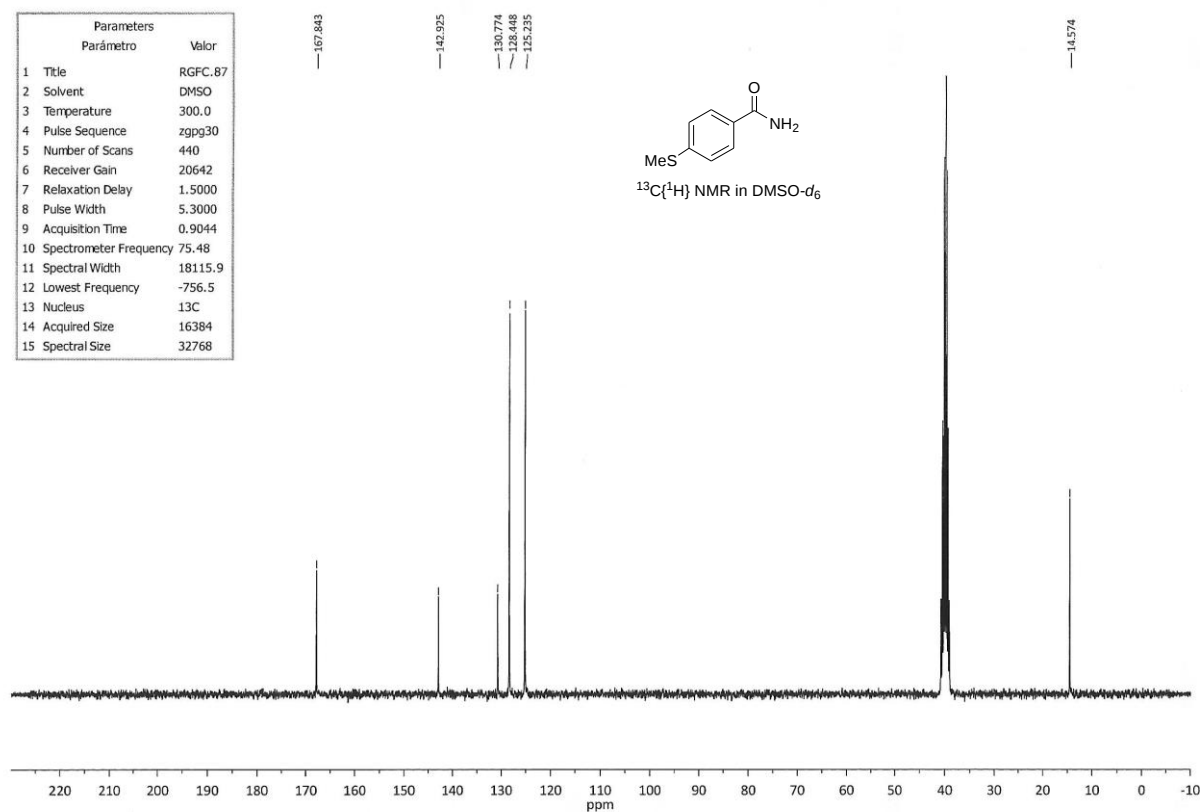
Parameters		Valor
1	Title	RGFC.45
2	Solvent	MeOD
3	Temperature	300.0
4	Pulse Sequence	zgpg30
5	Number of Scans	300
6	Receiver Gain	32768
7	Relaxation Delay	1.5000
8	Pulse Width	5.3000
9	Acquisition Time	0.9044
10	Spectrometer Frequency	75.48
11	Spectral Width	18115.9
12	Lowest Frequency	-756.5
13	Nucleus	^{13}C
14	Acquired Size	16384
15	Spectral Size	32768



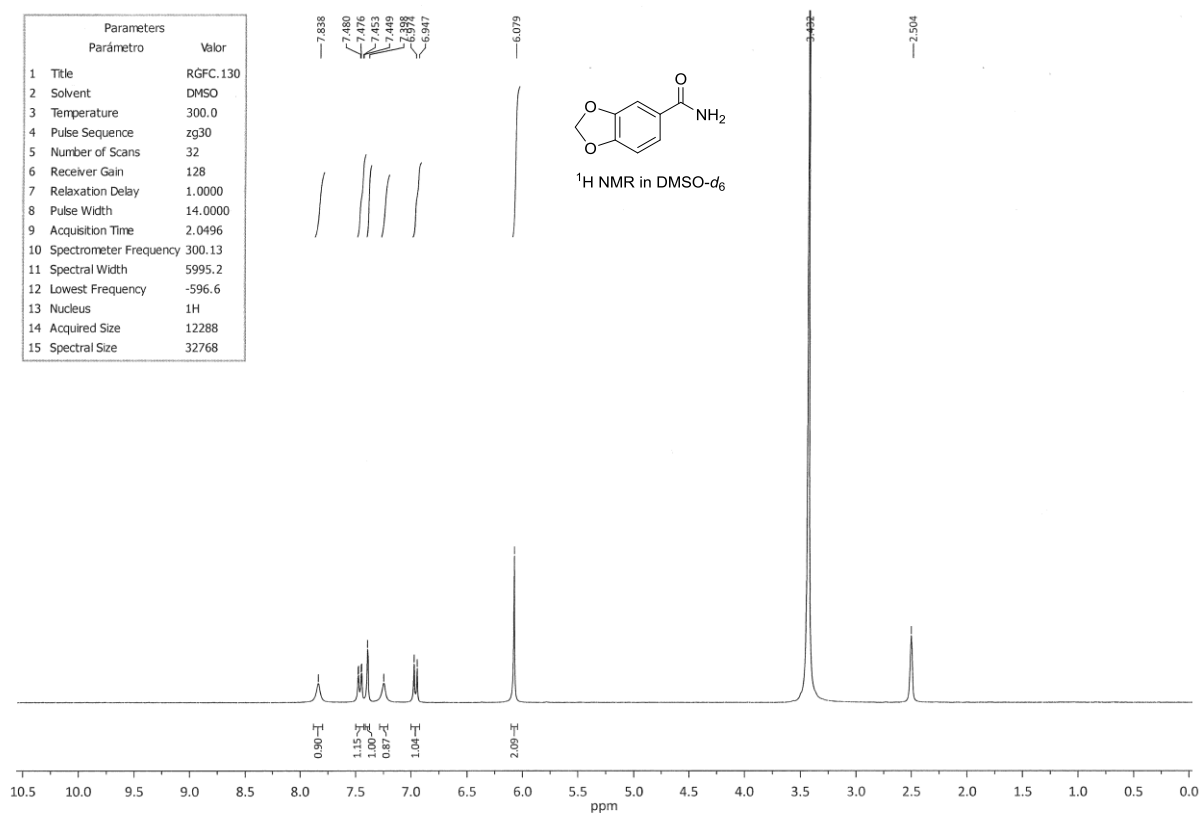
Parameters		Valor
1	Title	RGFC.87
2	Solvent	DMSO
3	Temperature	300.0
4	Pulse Sequence	zg30
5	Number of Scans	16
6	Receiver Gain	161
7	Relaxation Delay	1.0000
8	Pulse Width	14.0000
9	Acquisition Time	2.7329
10	Spectrometer Frequency	300.13
11	Spectral Width	5995.2
12	Lowest Frequency	-596.6
13	Nucleus	^1H
14	Acquired Size	16384
15	Spectral Size	32768



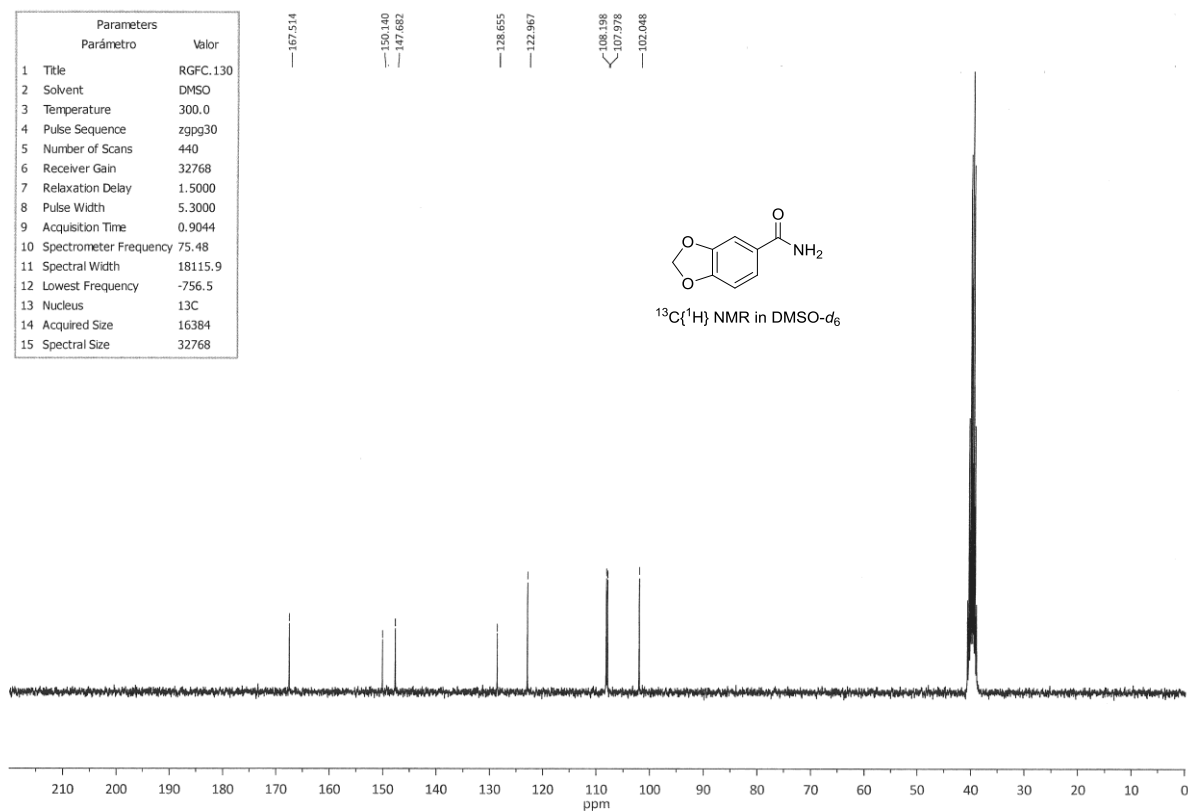
Parameters		
1	Parámetro	Valor
1	Title	RGFC.87
2	Solvent	DMSO
3	Temperature	300.0
4	Pulse Sequence	zgpg30
5	Number of Scans	440
6	Receiver Gain	20642
7	Relaxation Delay	1.5000
8	Pulse Width	5.3000
9	Acquisition Time	0.9044
10	Spectrometer Frequency	75.48
11	Spectral Width	18115.9
12	Lowest Frequency	-756.5
13	Nucleus	¹³ C
14	Acquired Size	16384
15	Spectral Size	32768



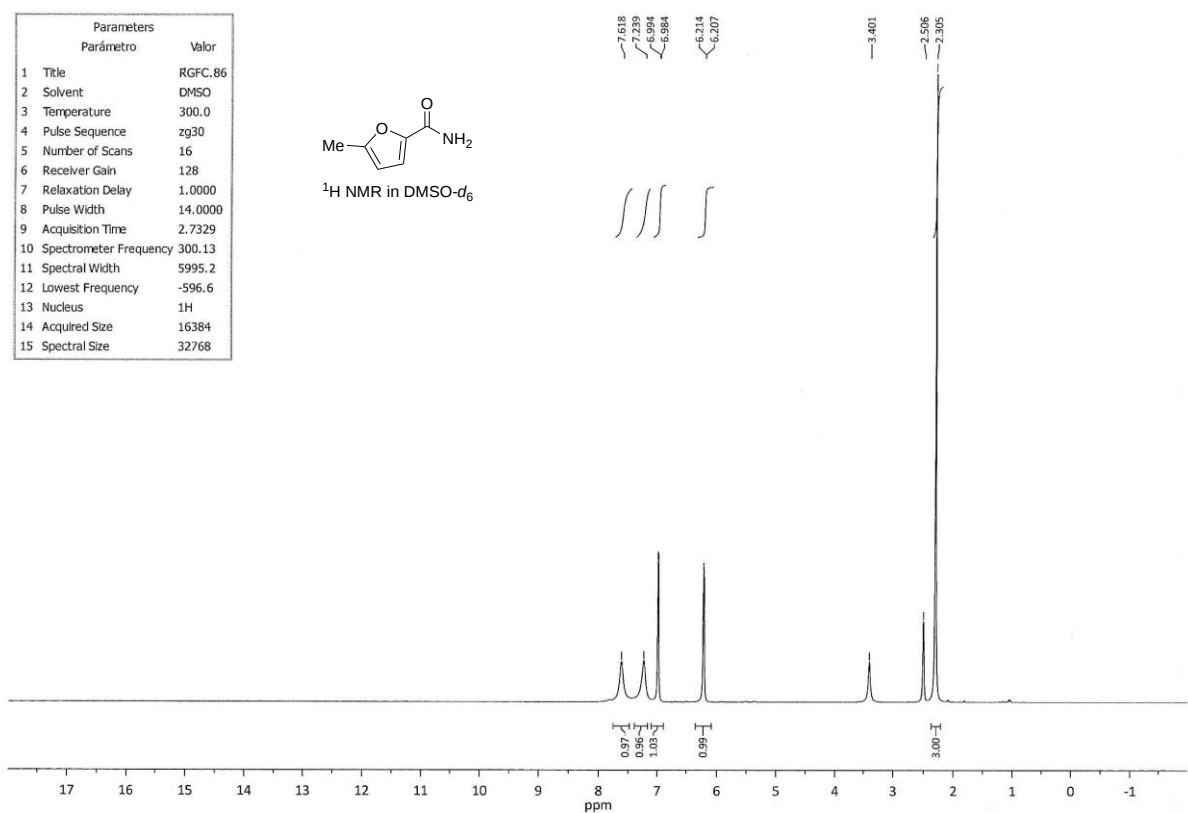
Parameters		
1	Parámetro	Valor
1	Title	RGFC.130
2	Solvent	DMSO
3	Temperature	300.0
4	Pulse Sequence	zg30
5	Number of Scans	32
6	Receiver Gain	128
7	Relaxation Delay	1.0000
8	Pulse Width	14.0000
9	Acquisition Time	2.0496
10	Spectrometer Frequency	300.13
11	Spectral Width	5995.2
12	Lowest Frequency	-596.6
13	Nucleus	¹ H
14	Acquired Size	12288
15	Spectral Size	32768



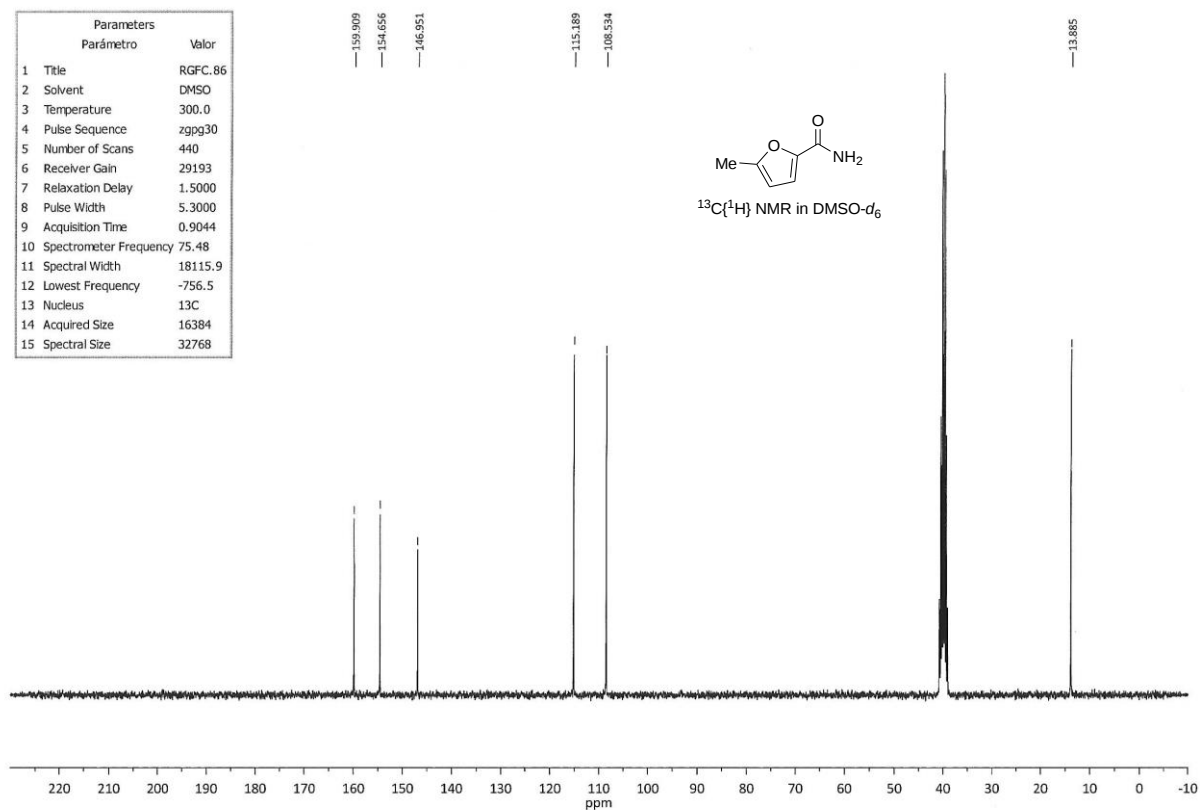
Parameters		
	Parámetro	Valor
1	Title	RGFC.130
2	Solvent	DMSO
3	Temperature	300.0
4	Pulse Sequence	zgpg30
5	Number of Scans	440
6	Receiver Gain	32768
7	Relaxation Delay	1.5000
8	Pulse Width	5.3000
9	Acquisition Time	0.9044
10	Spectrometer Frequency	75.48
11	Spectral Width	18115.9
12	Lowest Frequency	-756.5
13	Nucleus	¹³ C
14	Acquired Size	16384
15	Spectral Size	32768



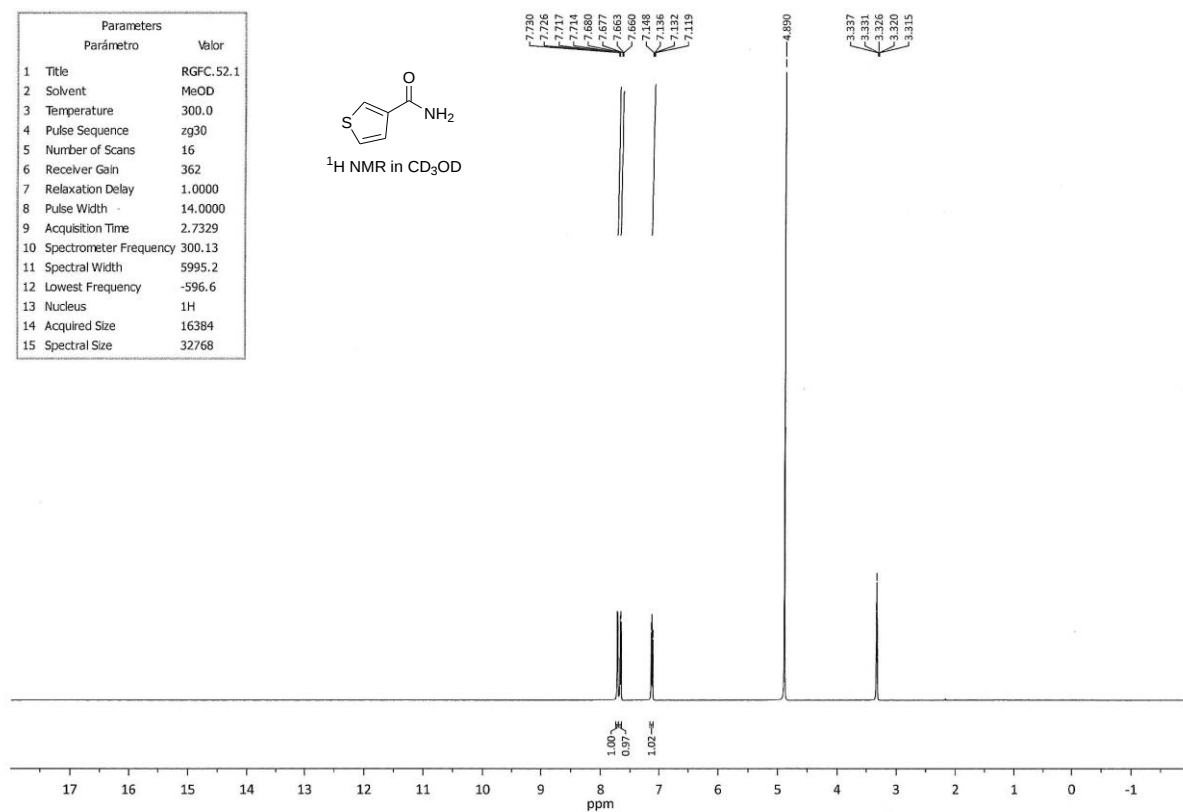
Parameters		
	Parámetro	Valor
1	Title	RGFC.86
2	Solvent	DMSO
3	Temperature	300.0
4	Pulse Sequence	zg30
5	Number of Scans	16
6	Receiver Gain	128
7	Relaxation Delay	1.0000
8	Pulse Width	14.0000
9	Acquisition Time	2.7329
10	Spectrometer Frequency	300.13
11	Spectral Width	5995.2
12	Lowest Frequency	-596.6
13	Nucleus	¹ H
14	Acquired Size	16384
15	Spectral Size	32768



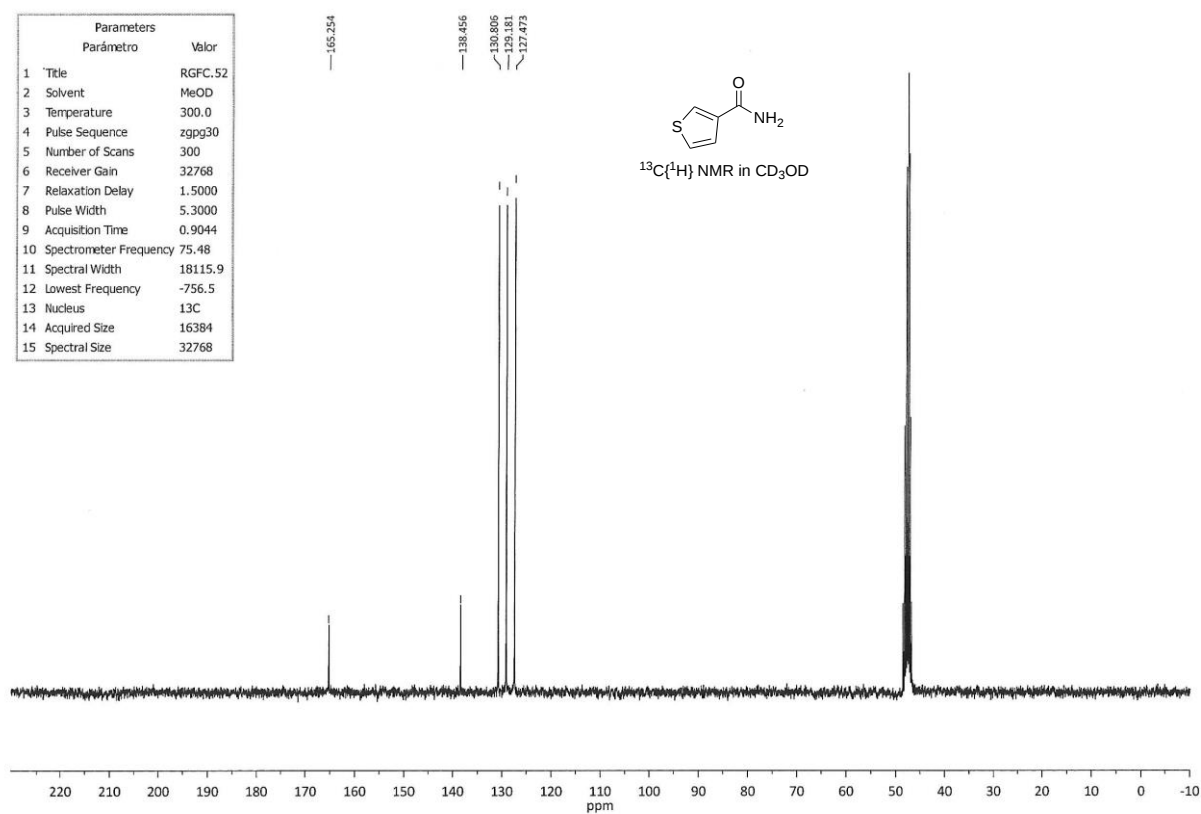
Parameters		
	Parámetro	Valor
1	Title	RGFC.86
2	Solvent	DMSO
3	Temperature	300.0
4	Pulse Sequence	zgpg30
5	Number of Scans	440
6	Receiver Gain	29193
7	Relaxation Delay	1.5000
8	Pulse Width	5.3000
9	Acquisition Time	0.9044
10	Spectrometer Frequency	75.48
11	Spectral Width	18115.9
12	Lowest Frequency	-756.5
13	Nucleus	¹³ C
14	Acquired Size	16384
15	Spectral Size	32768



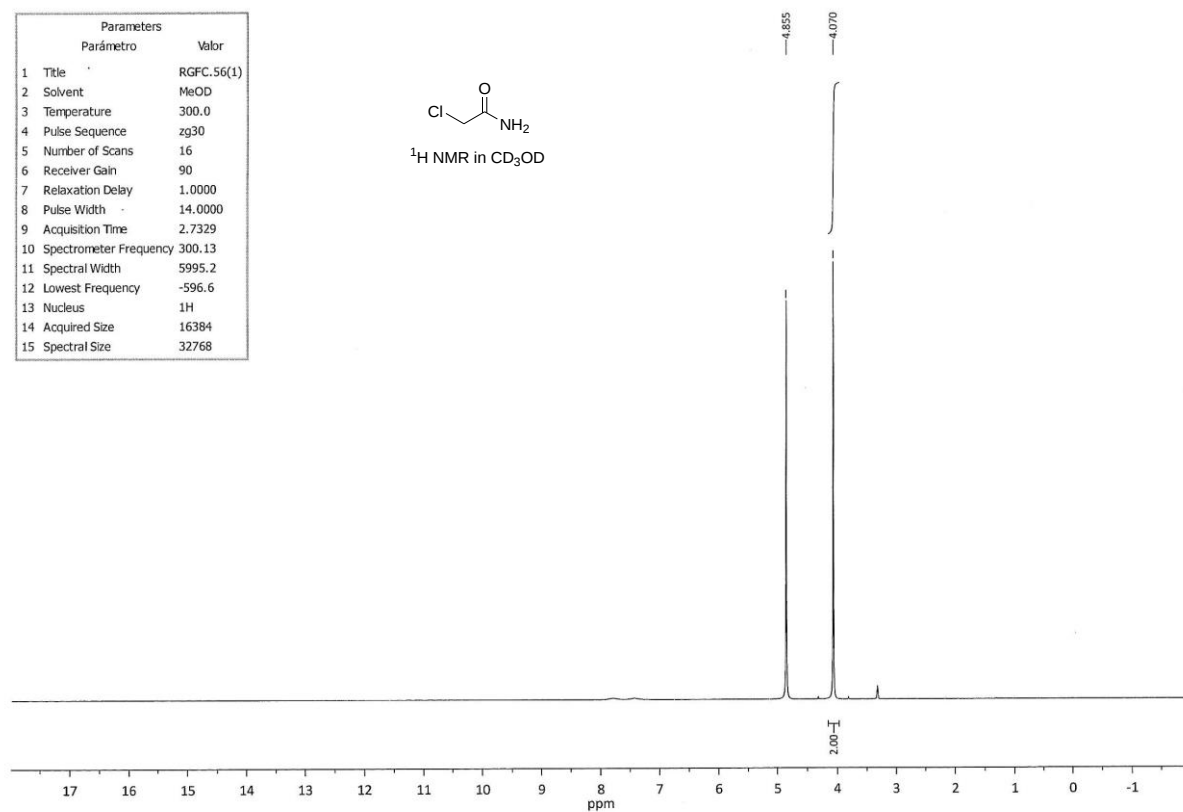
Parameters		
	Parámetro	Valor
1	Title	RGFC.52.1
2	Solvent	MeOD
3	Temperature	300.0
4	Pulse Sequence	zg30
5	Number of Scans	16
6	Receiver Gain	362
7	Relaxation Delay	1.0000
8	Pulse Width	14.0000
9	Acquisition Time	2.7329
10	Spectrometer Frequency	300.13
11	Spectral Width	5995.2
12	Lowest Frequency	-596.6
13	Nucleus	¹ H
14	Acquired Size	16384
15	Spectral Size	32768



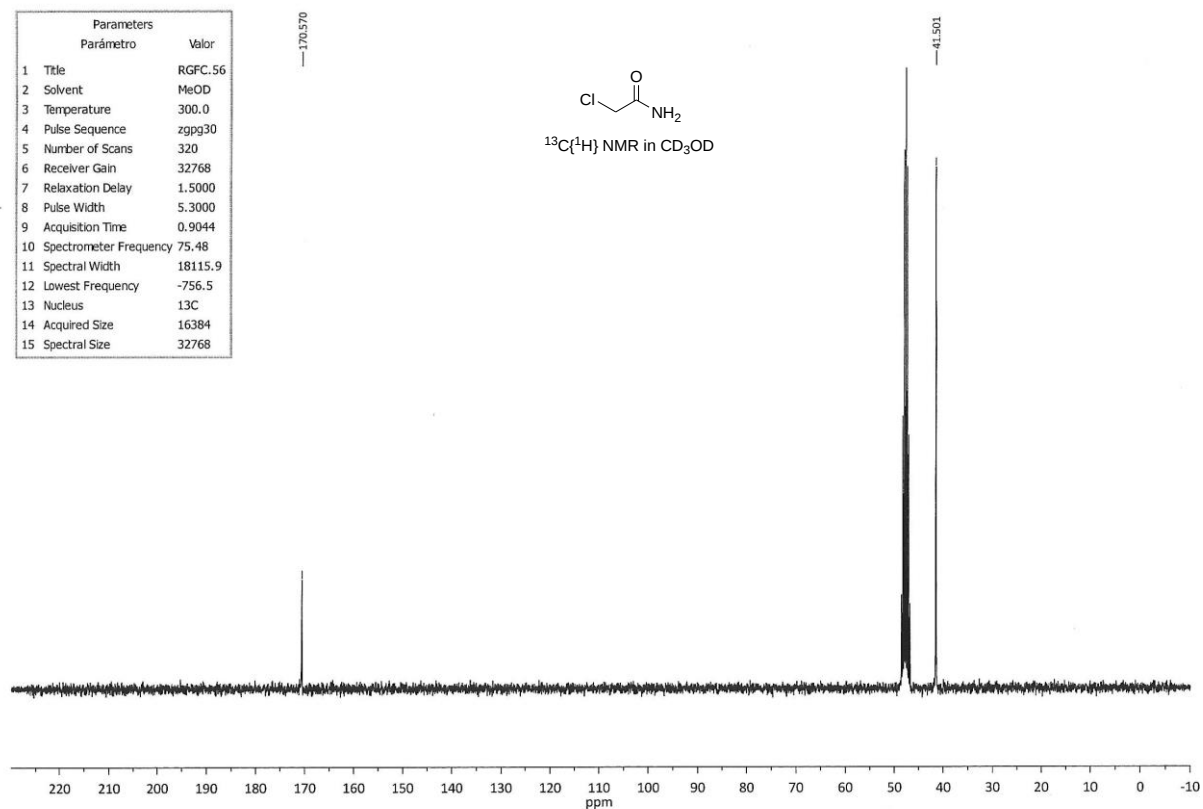
Parameters		
	Parámetro	Valor
1	Title	RGFC.52
2	Solvent	MeOD
3	Temperature	300.0
4	Pulse Sequence	zgpg30
5	Number of Scans	300
6	Receiver Gain	32768
7	Relaxation Delay	1.5000
8	Pulse Width	5.3000
9	Acquisition Time	0.9044
10	Spectrometer Frequency	75.48
11	Spectral Width	18115.9
12	Lowest Frequency	-756.5
13	Nucleus	¹³ C
14	Acquired Size	16384
15	Spectral Size	32768



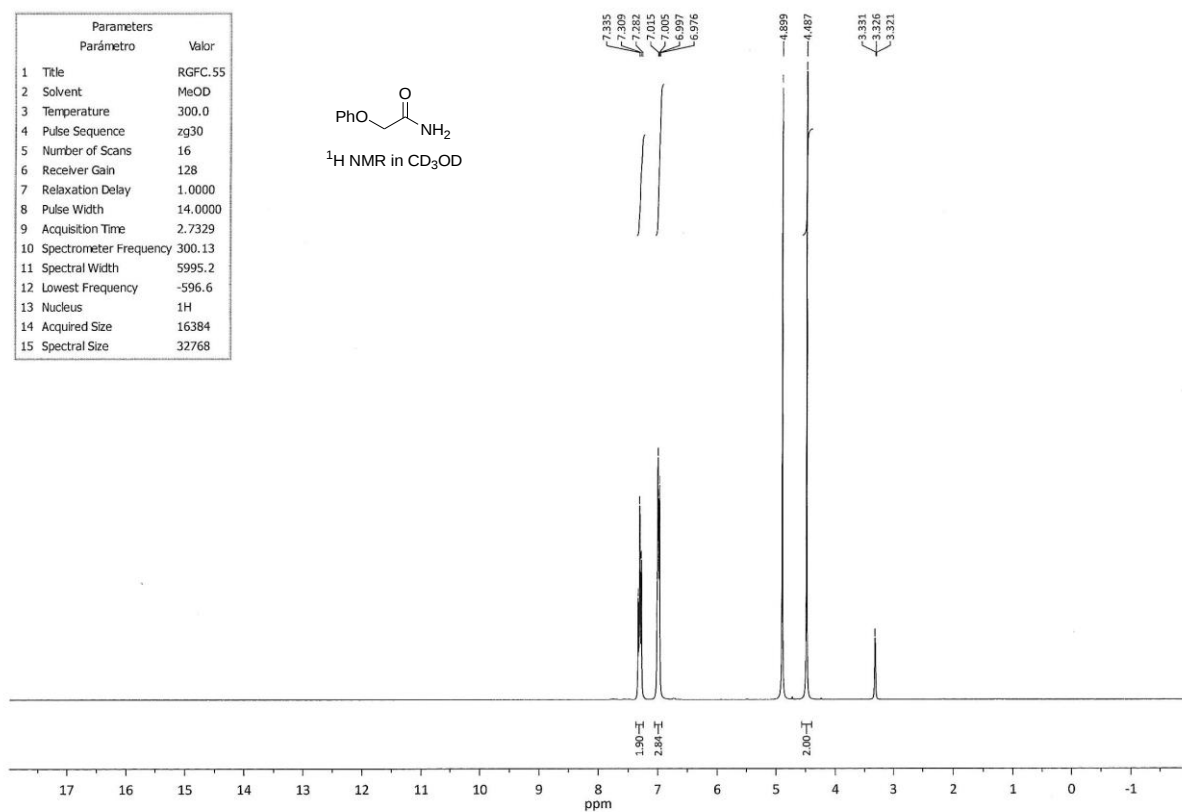
Parameters		
	Parámetro	Valor
1	Title	RGFC.56(1)
2	Solvent	MeOD
3	Temperature	300.0
4	Pulse Sequence	zg30
5	Number of Scans	16
6	Receiver Gain	90
7	Relaxation Delay	1.0000
8	Pulse Width	14.0000
9	Acquisition Time	2.7329
10	Spectrometer Frequency	300.13
11	Spectral Width	5995.2
12	Lowest Frequency	-596.6
13	Nucleus	¹ H
14	Acquired Size	16384
15	Spectral Size	32768



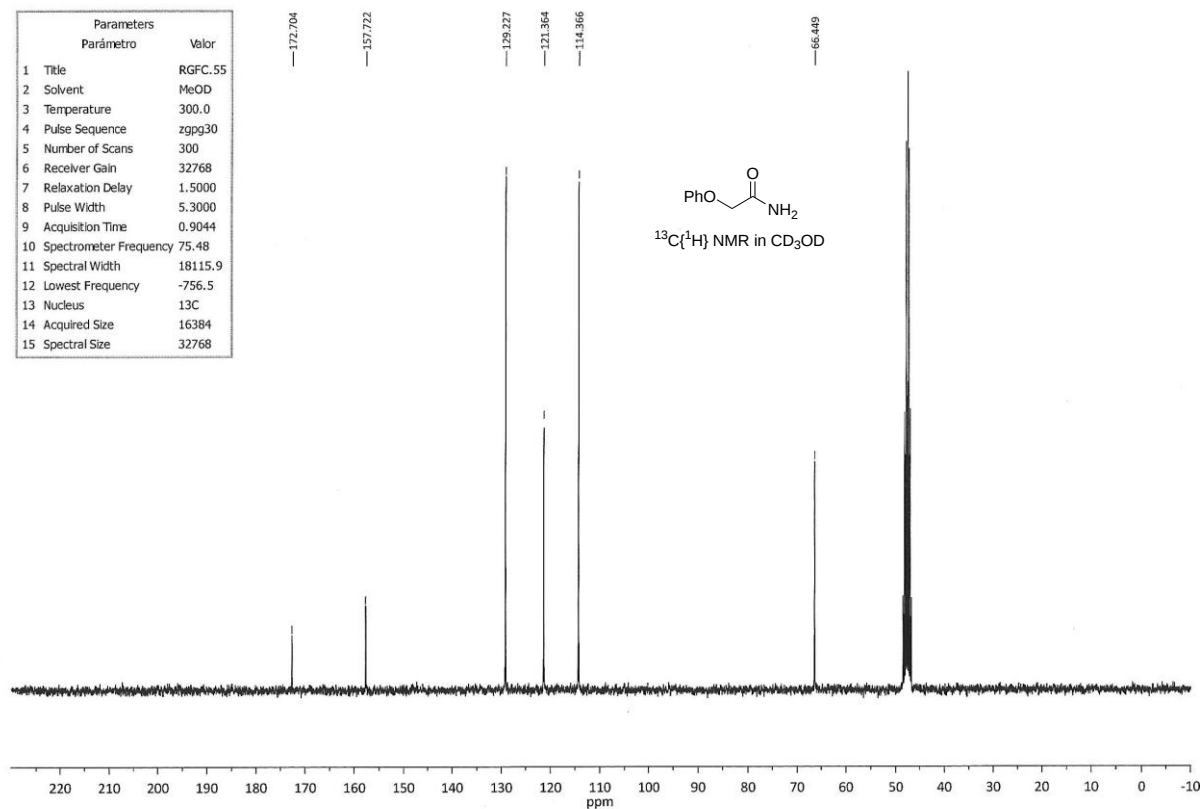
Parameters	Valor
Parámetro	Valor
1 Title	RGFC.56
2 Solvent	MeOD
3 Temperature	300.0
4 Pulse Sequence	zgpg30
5 Number of Scans	320
6 Receiver Gain	32768
7 Relaxation Delay	1.5000
8 Pulse Width	5.3000
9 Acquisition Time	0.9044
10 Spectrometer Frequency	75.48
11 Spectral Width	18115.9
12 Lowest Frequency	-756.5
13 Nucleus	¹³ C
14 Acquired Size	16384
15 Spectral Size	32768



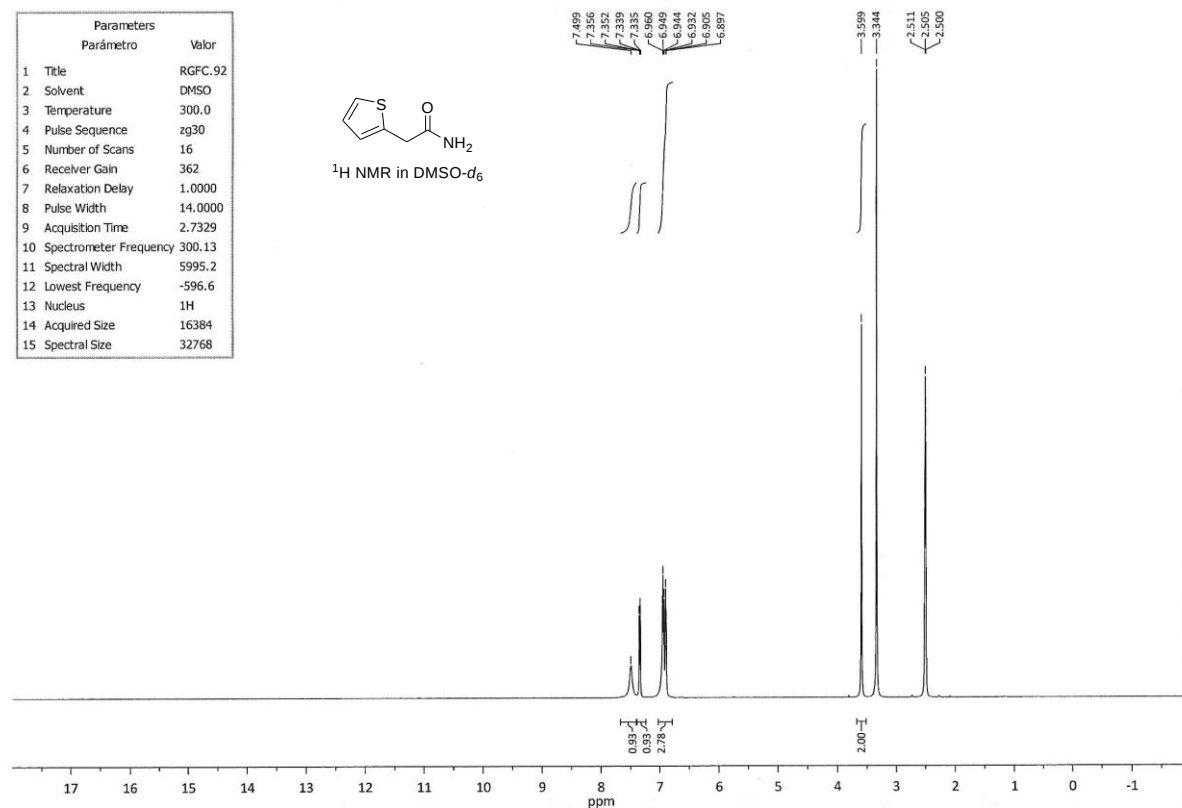
Parameters	Valor
Parámetro	Valor
1 Title	RGFC.55
2 Solvent	MeOD
3 Temperature	300.0
4 Pulse Sequence	zg30
5 Number of Scans	16
6 Receiver Gain	128
7 Relaxation Delay	1.0000
8 Pulse Width	14.0000
9 Acquisition Time	2.7329
10 Spectrometer Frequency	300.13
11 Spectral Width	5995.2
12 Lowest Frequency	-596.6
13 Nucleus	¹ H
14 Acquired Size	16384
15 Spectral Size	32768



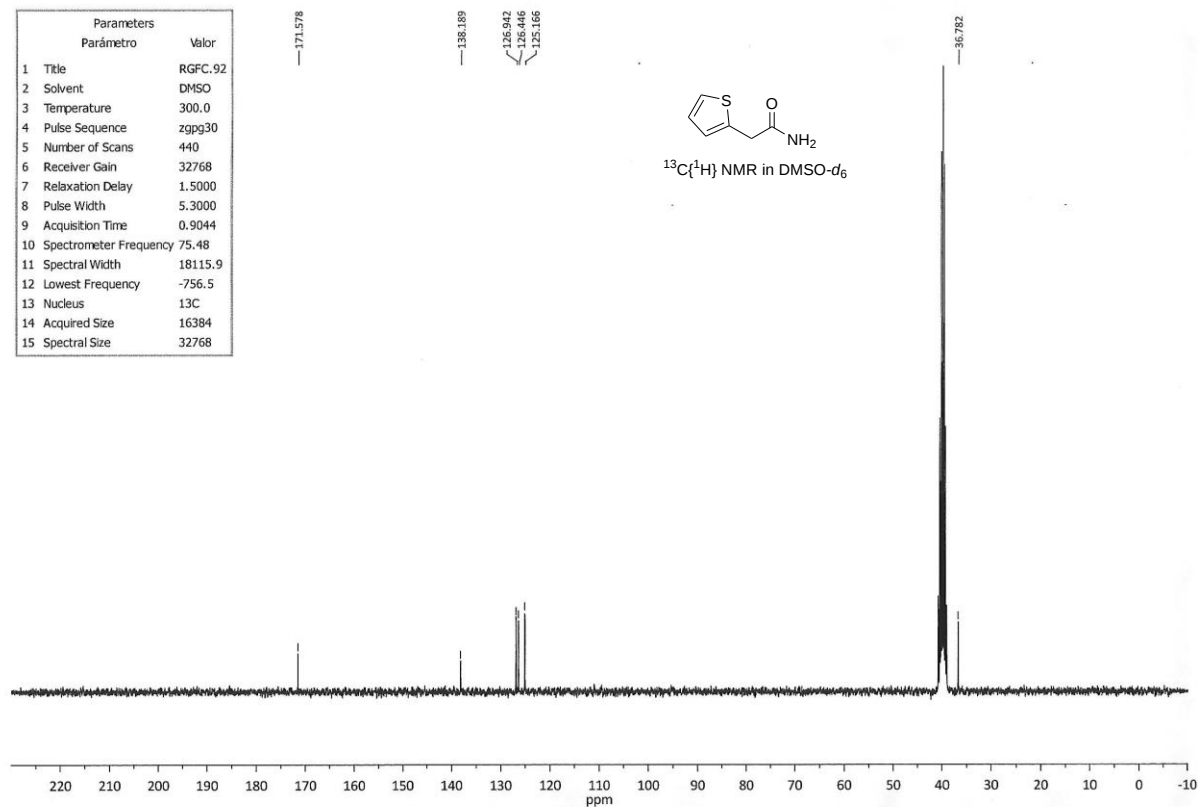
Parameters	Valor
Parámetro	Valor
1 Title	RGFC.55
2 Solvent	MeOD
3 Temperature	300.0
4 Pulse Sequence	zgpg30
5 Number of Scans	300
6 Receiver Gain	32768
7 Relaxation Delay	1.5000
8 Pulse Width	5.3000
9 Acquisition Time	0.9044
10 Spectrometer Frequency	75.48
11 Spectral Width	18115.9
12 Lowest Frequency	-756.5
13 Nucleus	¹³ C
14 Acquired Size	16384
15 Spectral Size	32768



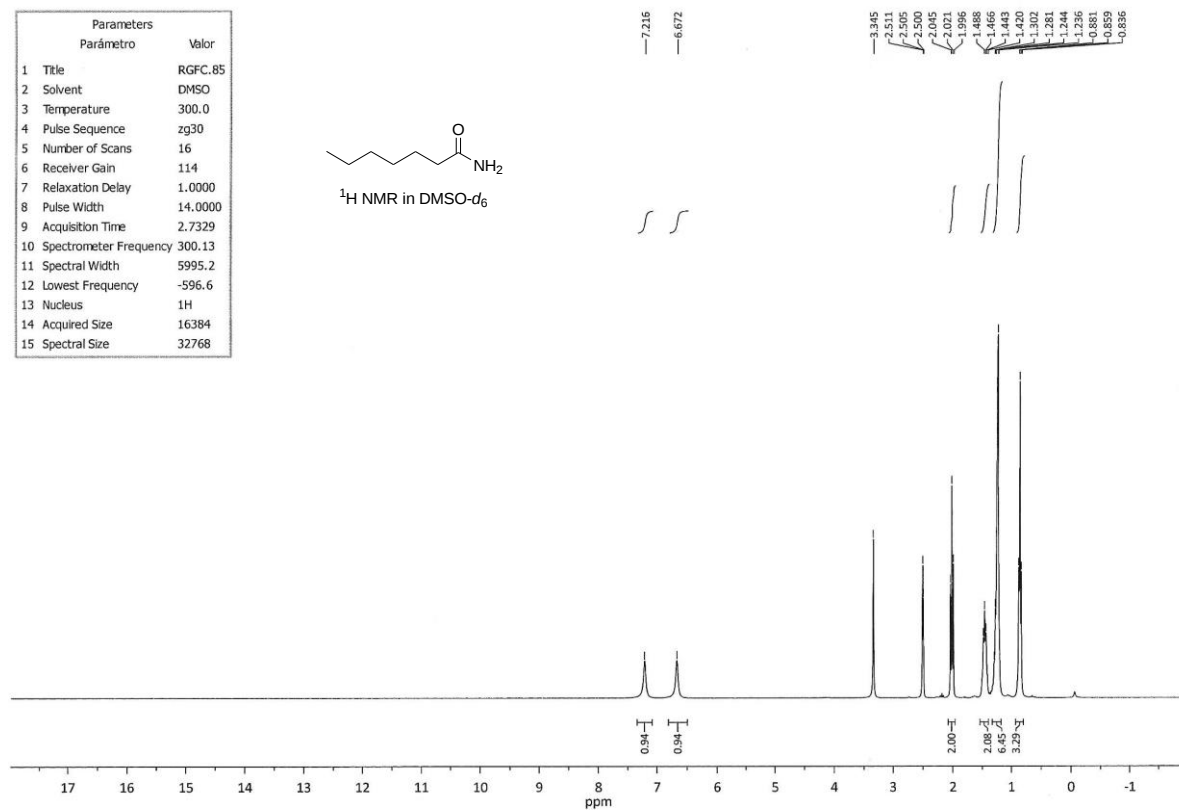
Parameters	Valor
Parámetro	Valor
1 Title	RGFC.92
2 Solvent	DMSO
3 Temperature	300.0
4 Pulse Sequence	zg30
5 Number of Scans	16
6 Receiver Gain	362
7 Relaxation Delay	1.0000
8 Pulse Width	14.0000
9 Acquisition Time	2.7329
10 Spectrometer Frequency	300.13
11 Spectral Width	5995.2
12 Lowest Frequency	-596.6
13 Nucleus	¹ H
14 Acquired Size	16384
15 Spectral Size	32768



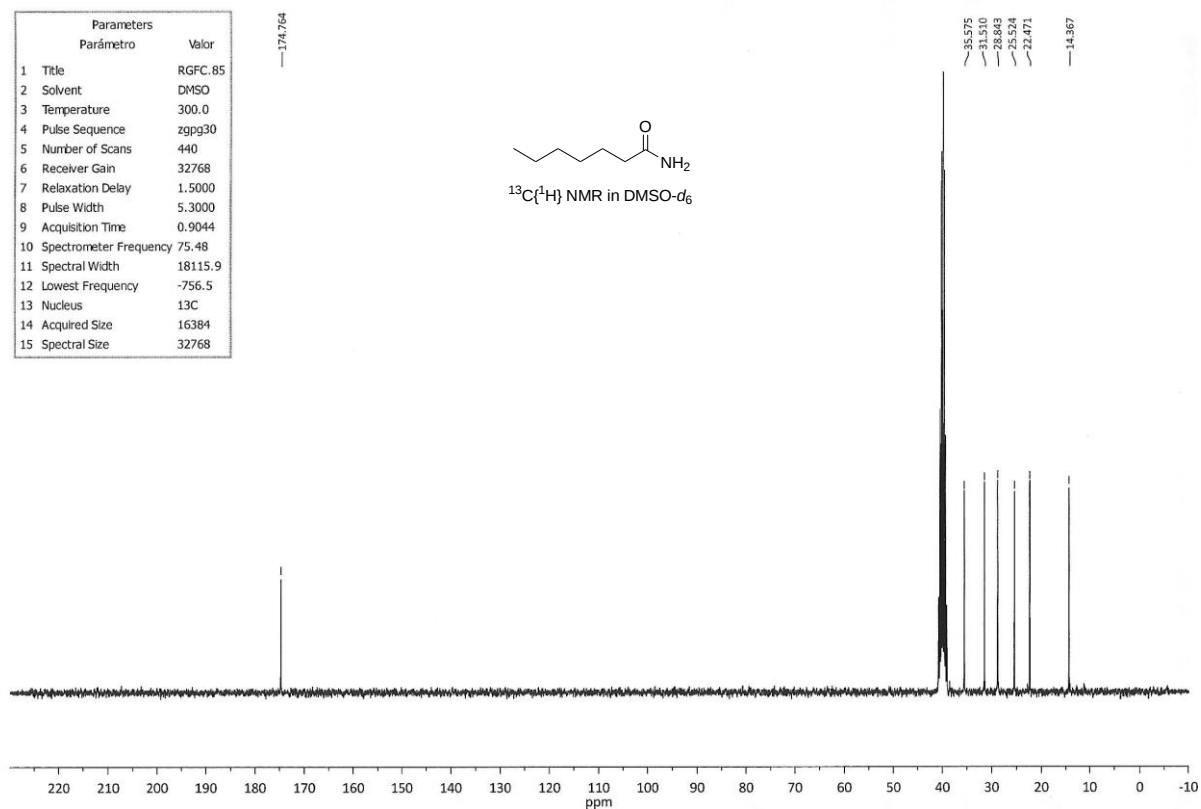
Parameters	
Parámetro	Valor
1 Title	RGFC.92
2 Solvent	DMSO
3 Temperature	300.0
4 Pulse Sequence	zgpg30
5 Number of Scans	440
6 Receiver Gain	32768
7 Relaxation Delay	1.5000
8 Pulse Width	5.3000
9 Acquisition Time	0.9044
10 Spectrometer Frequency	75.48
11 Spectral Width	18115.9
12 Lowest Frequency	-756.5
13 Nucleus	¹³ C
14 Acquired Size	16384
15 Spectral Size	32768



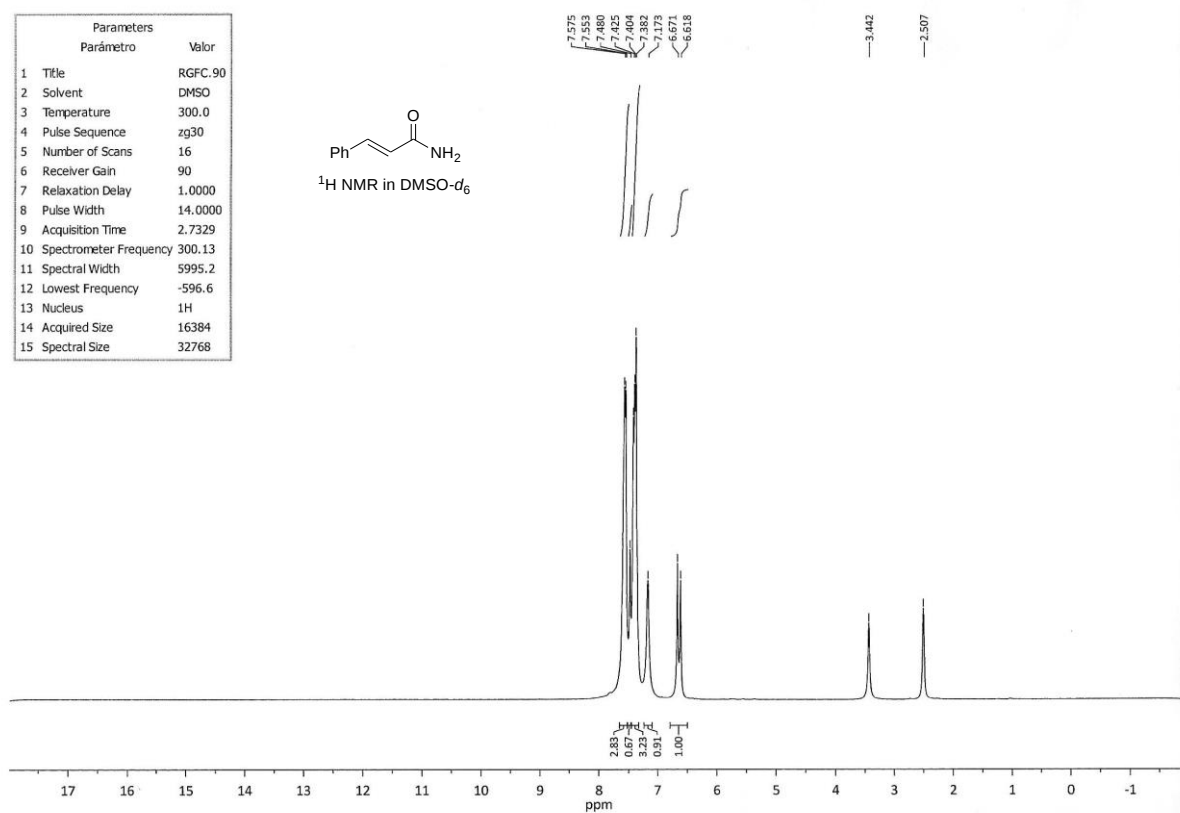
Parameters	
Parámetro	Valor
1 Title	RGFC.85
2 Solvent	DMSO
3 Temperature	300.0
4 Pulse Sequence	zg30
5 Number of Scans	16
6 Receiver Gain	114
7 Relaxation Delay	1.0000
8 Pulse Width	14.0000
9 Acquisition Time	2.7329
10 Spectrometer Frequency	300.13
11 Spectral Width	5995.2
12 Lowest Frequency	-596.6
13 Nucleus	¹ H
14 Acquired Size	16384
15 Spectral Size	32768



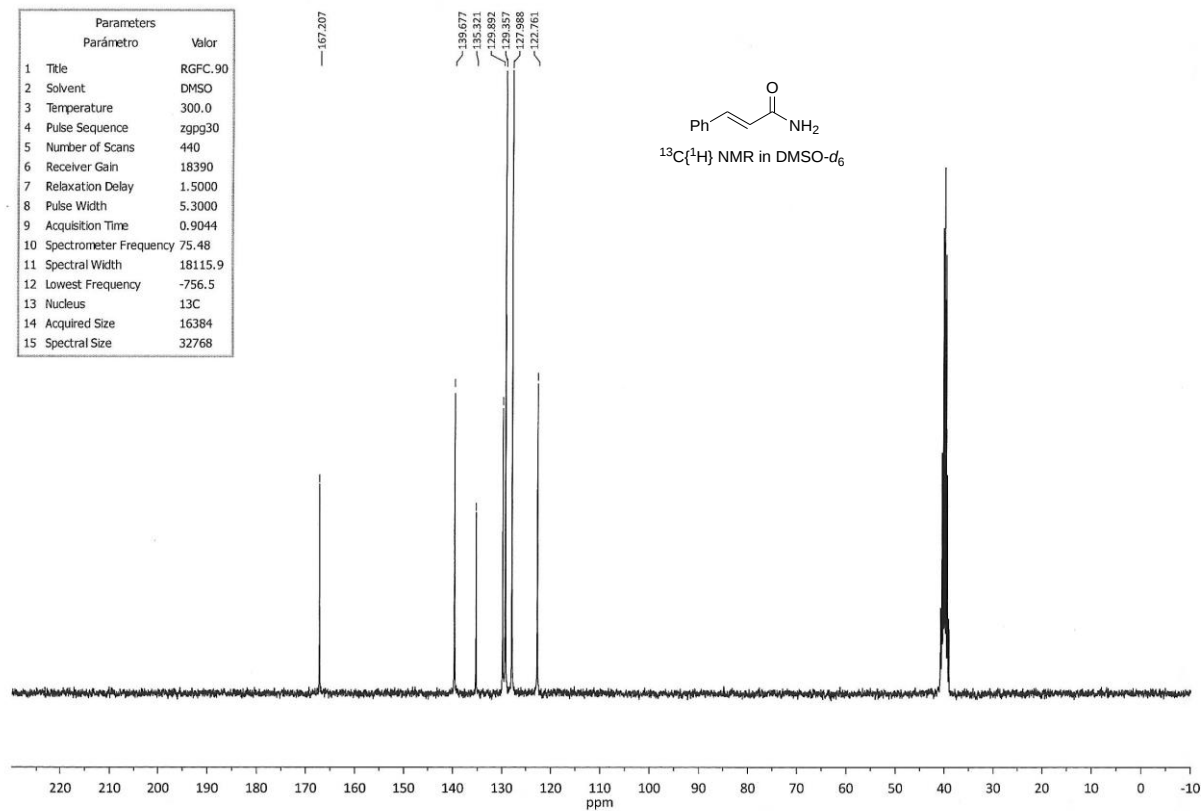
Parameters		
1	Parámetro	Valor
1	Title	RGFC.85
2	Solvent	DMSO
3	Temperature	300.0
4	Pulse Sequence	zgpg30
5	Number of Scans	440
6	Receiver Gain	32768
7	Relaxation Delay	1.5000
8	Pulse Width	5.3000
9	Acquisition Time	0.9044
10	Spectrometer Frequency	75.48
11	Spectral Width	18115.9
12	Lowest Frequency	-756.5
13	Nucleus	¹³ C
14	Acquired Size	16384
15	Spectral Size	32768

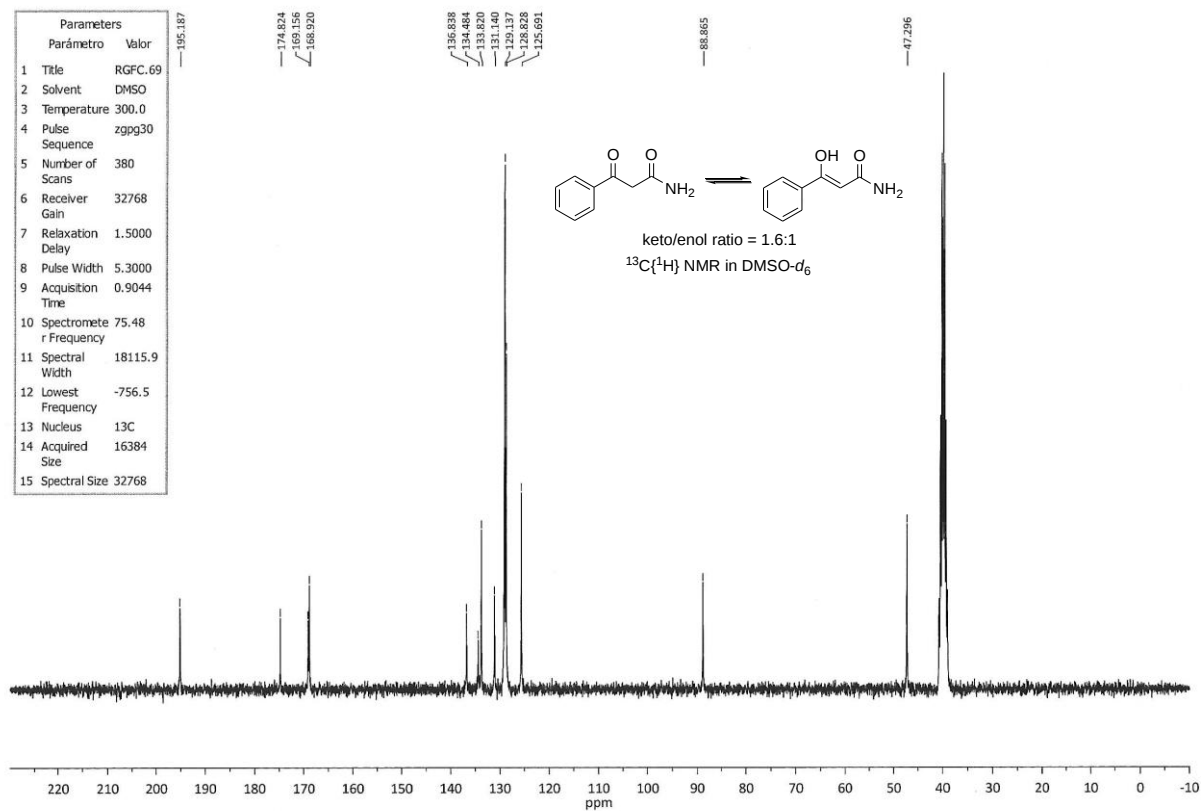
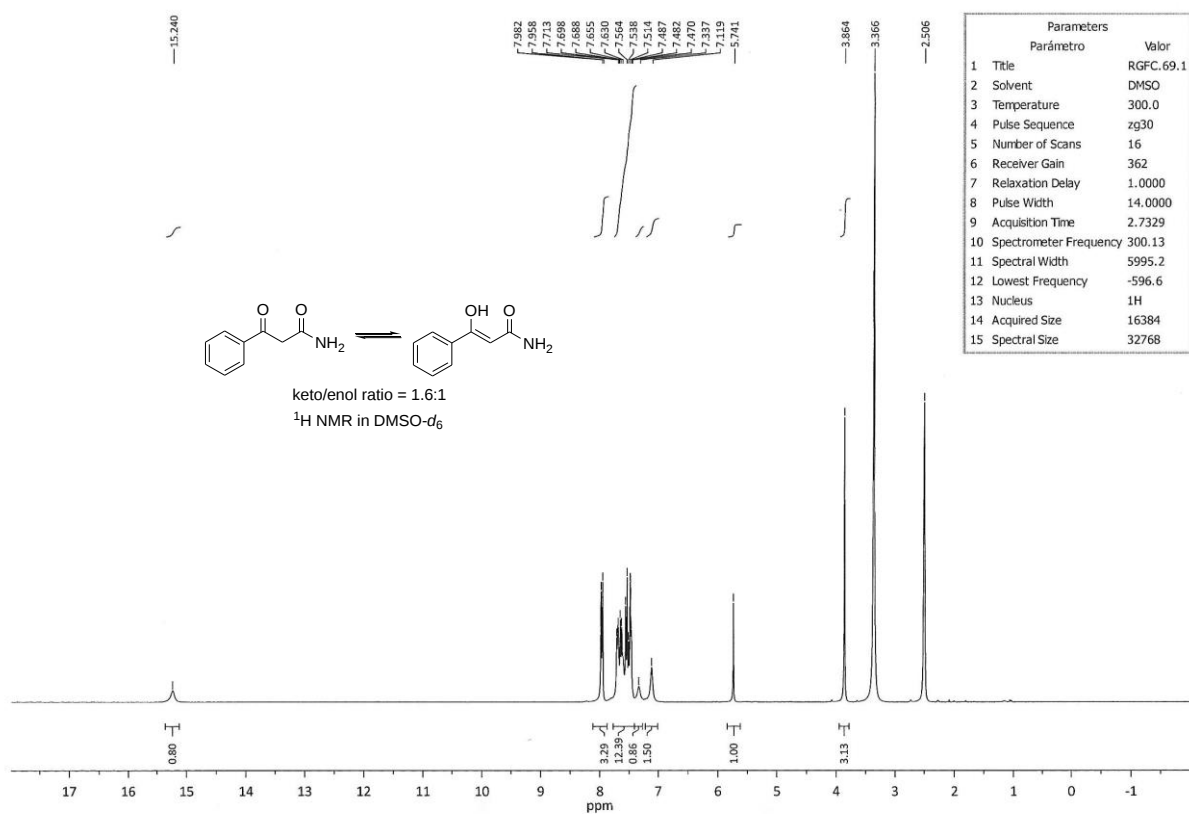


Parameters		
1	Parámetro	Valor
1	Title	RGFC.90
2	Solvent	DMSO
3	Temperature	300.0
4	Pulse Sequence	zg30
5	Number of Scans	16
6	Receiver Gain	90
7	Relaxation Delay	1.0000
8	Pulse Width	14.0000
9	Acquisition Time	2.7329
10	Spectrometer Frequency	300.13
11	Spectral Width	5995.2
12	Lowest Frequency	-596.6
13	Nucleus	¹ H
14	Acquired Size	16384
15	Spectral Size	32768

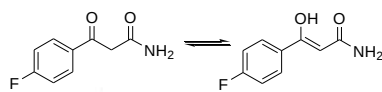


Parameters		
	Parámetro	Valor
1	Title	RGFC.90
2	Solvent	DMSO
3	Temperature	300.0
4	Pulse Sequence	zgpg30
5	Number of Scans	440
6	Receiver Gain	18390
7	Relaxation Delay	1.5000
8	Pulse Width	5.3000
9	Acquisition Time	0.9044
10	Spectrometer Frequency	75.48
11	Spectral Width	18115.9
12	Lowest Frequency	-756.5
13	Nucleus	¹³ C
14	Acquired Size	16384
15	Spectral Size	32768

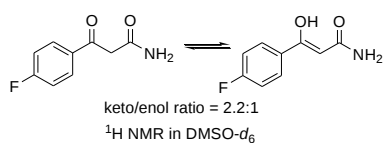
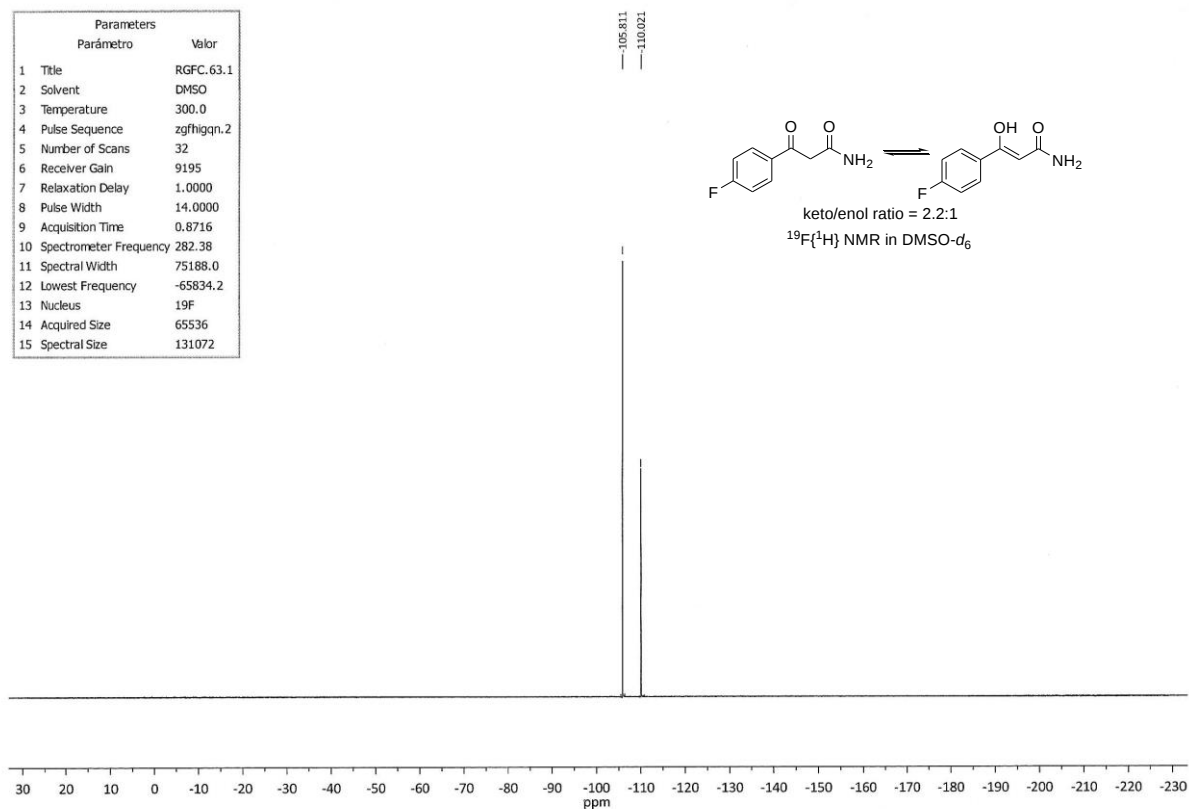




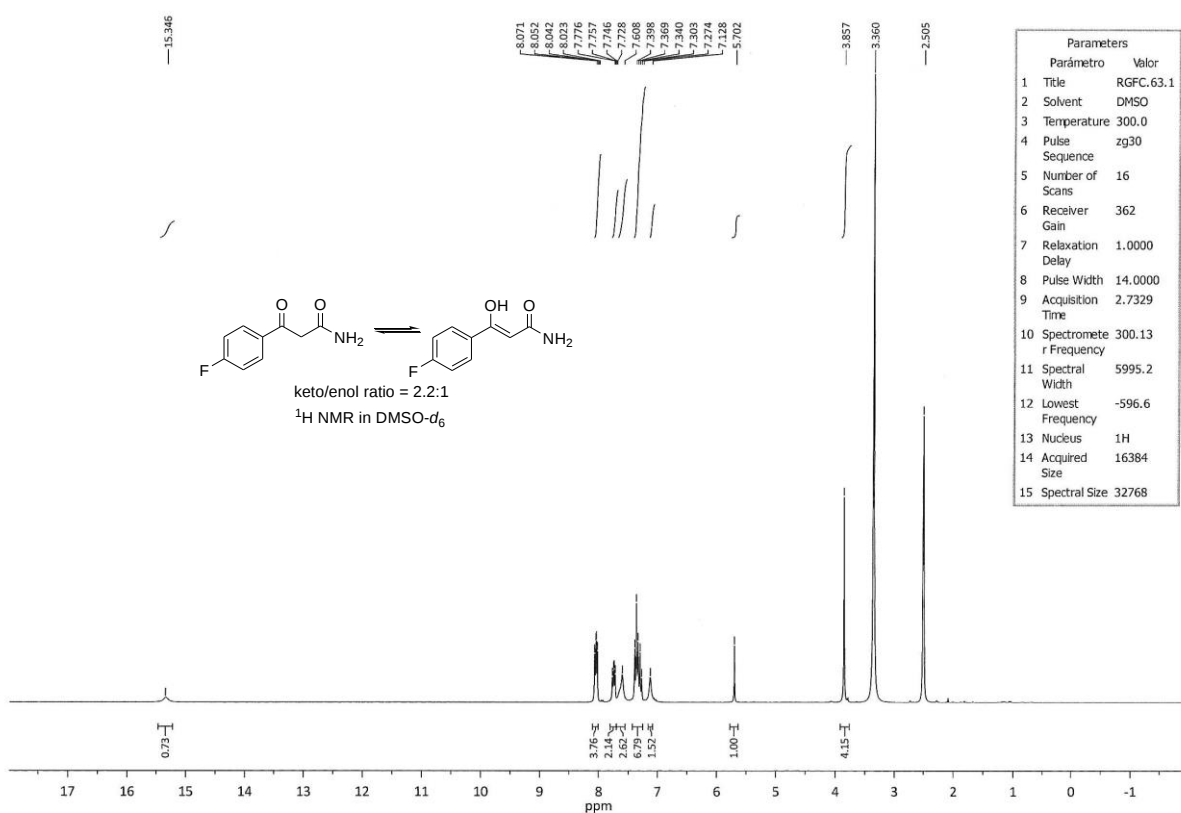
Parameters	
Parámetro	Valor
1 Title	RGFC.63.1
2 Solvent	DMSO
3 Temperature	300.0
4 Pulse Sequence	zgfhgqn.2
5 Number of Scans	32
6 Receiver Gain	9195
7 Relaxation Delay	1.0000
8 Pulse Width	14.0000
9 Acquisition Time	0.8716
10 Spectrometer Frequency	282.38
11 Spectral Width	75188.0
12 Lowest Frequency	-65834.2
13 Nucleus	19F
14 Acquired Size	65536
15 Spectral Size	131072



keto/enol ratio = 2.2:1
 $^{19}\text{F}\{^1\text{H}\}$ NMR in $\text{DMSO}-d_6$

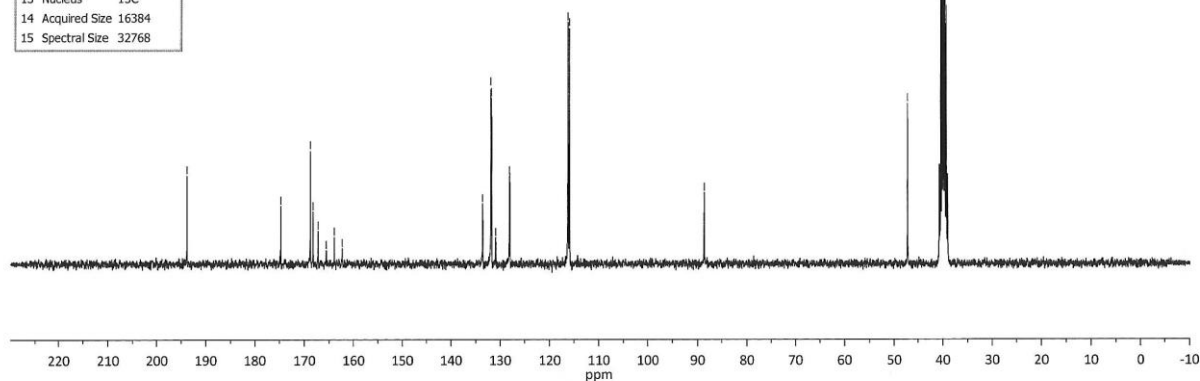
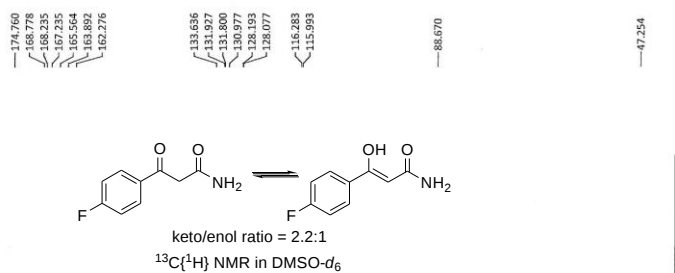


keto/enol ratio = 2.2:1
 ^1H NMR in $\text{DMSO}-d_6$

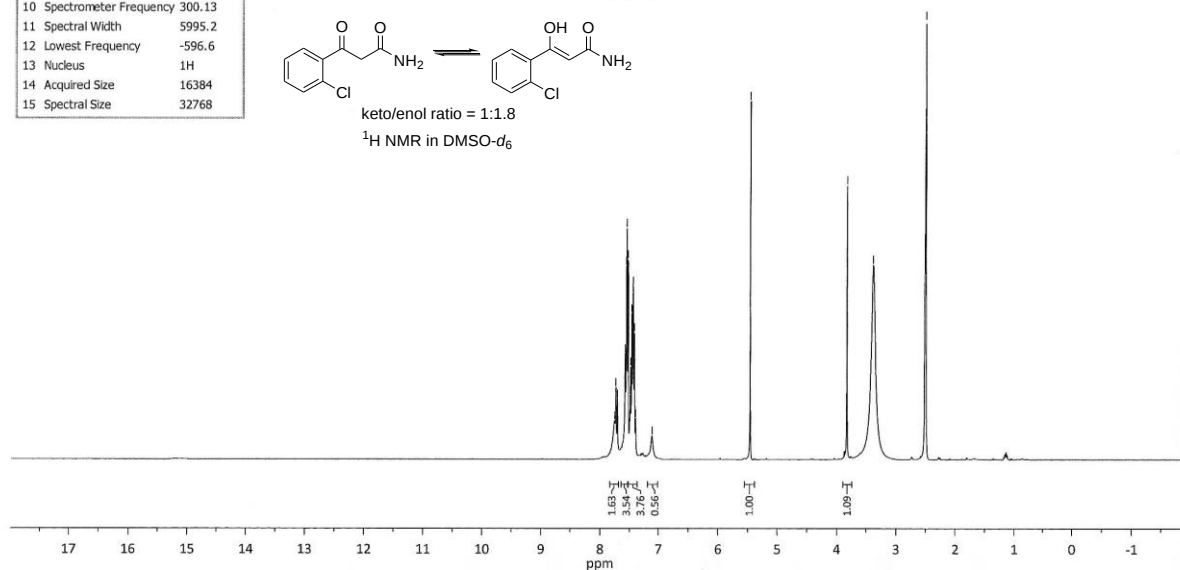
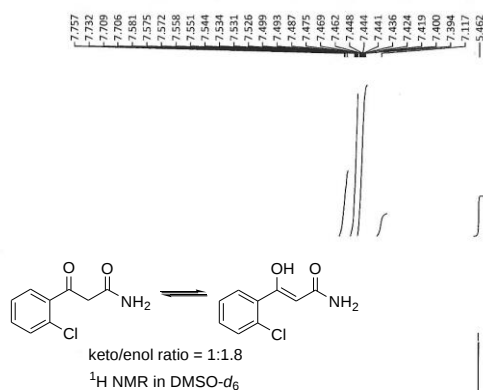


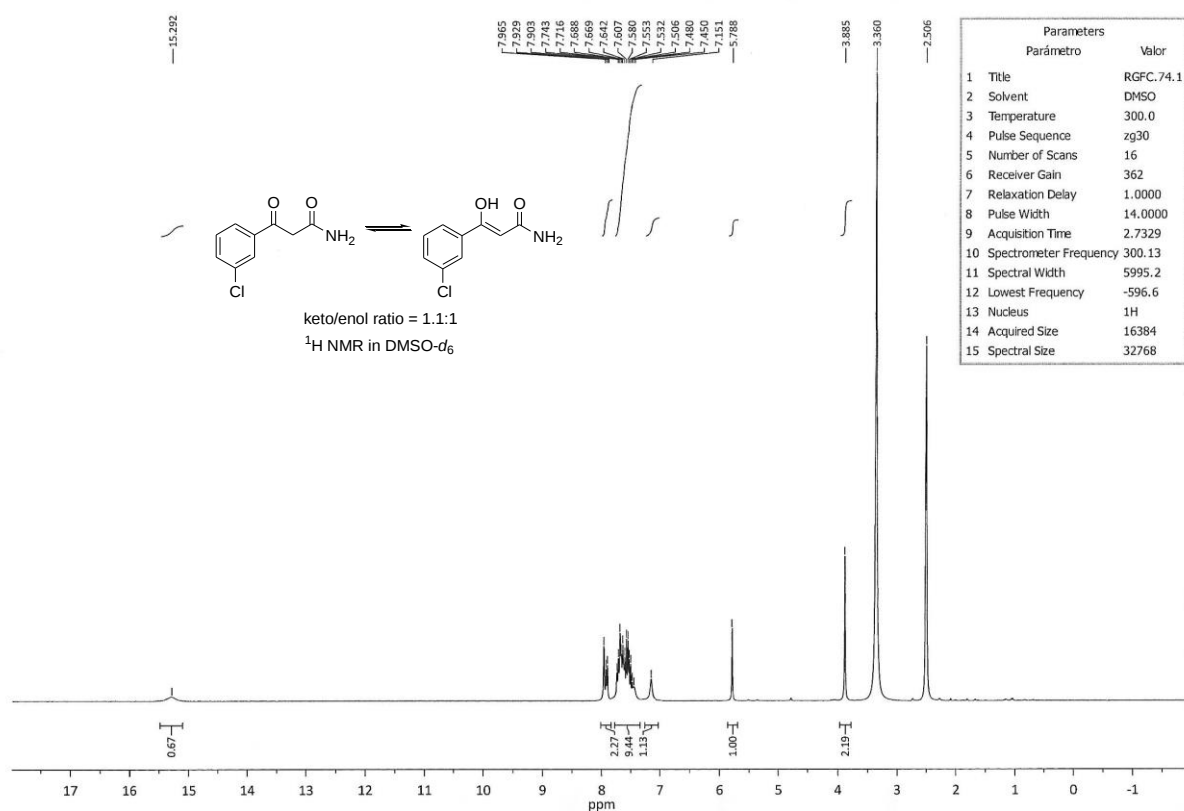
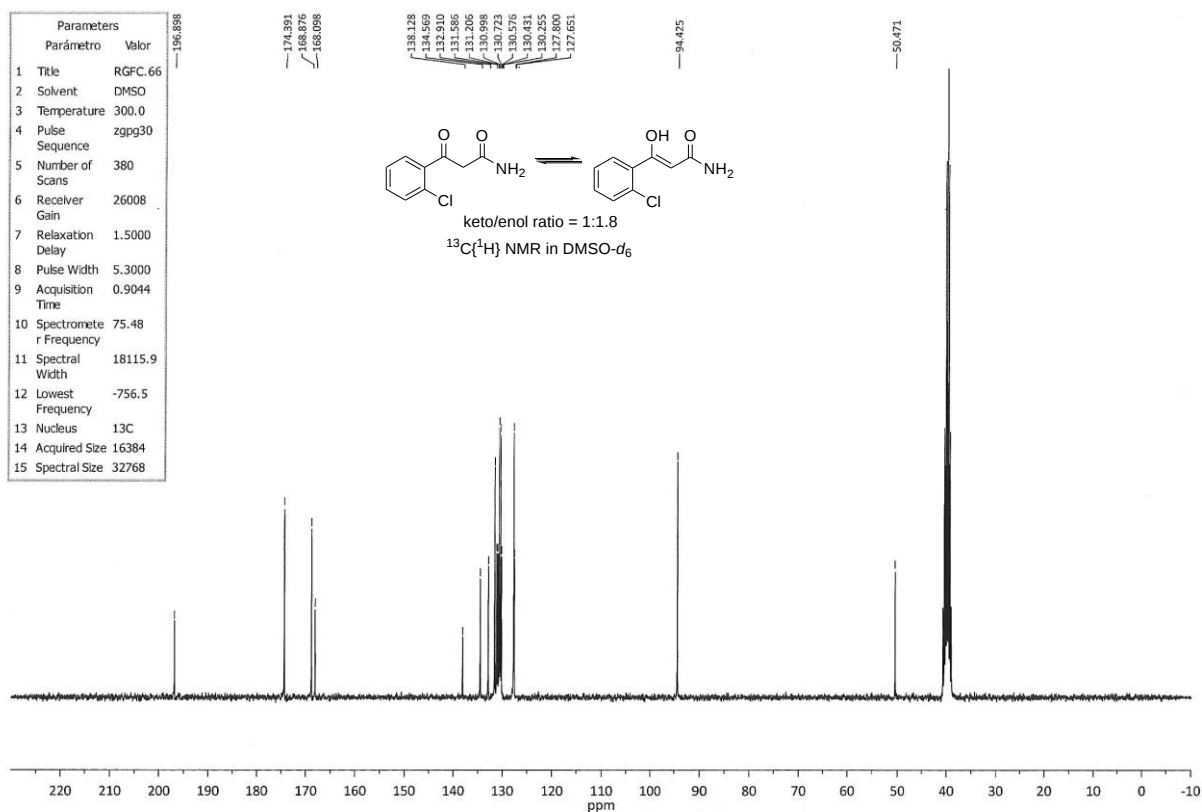
Parameters	
Parámetro	Valor
1 Title	RGFC.63.1
2 Solvent	DMSO
3 Temperature	300.0
4 Pulse Sequence	zg30
5 Number of Scans	16
6 Receiver Gain	362
7 Relaxation Delay	1.0000
8 Pulse Width	14.0000
9 Acquisition Time	2.7329
10 Spectrometer Frequency	300.13
11 Spectral Width	5995.2
12 Lowest Frequency	-596.6
13 Nucleus	^1H
14 Acquired Size	16384
15 Spectral Size	32768

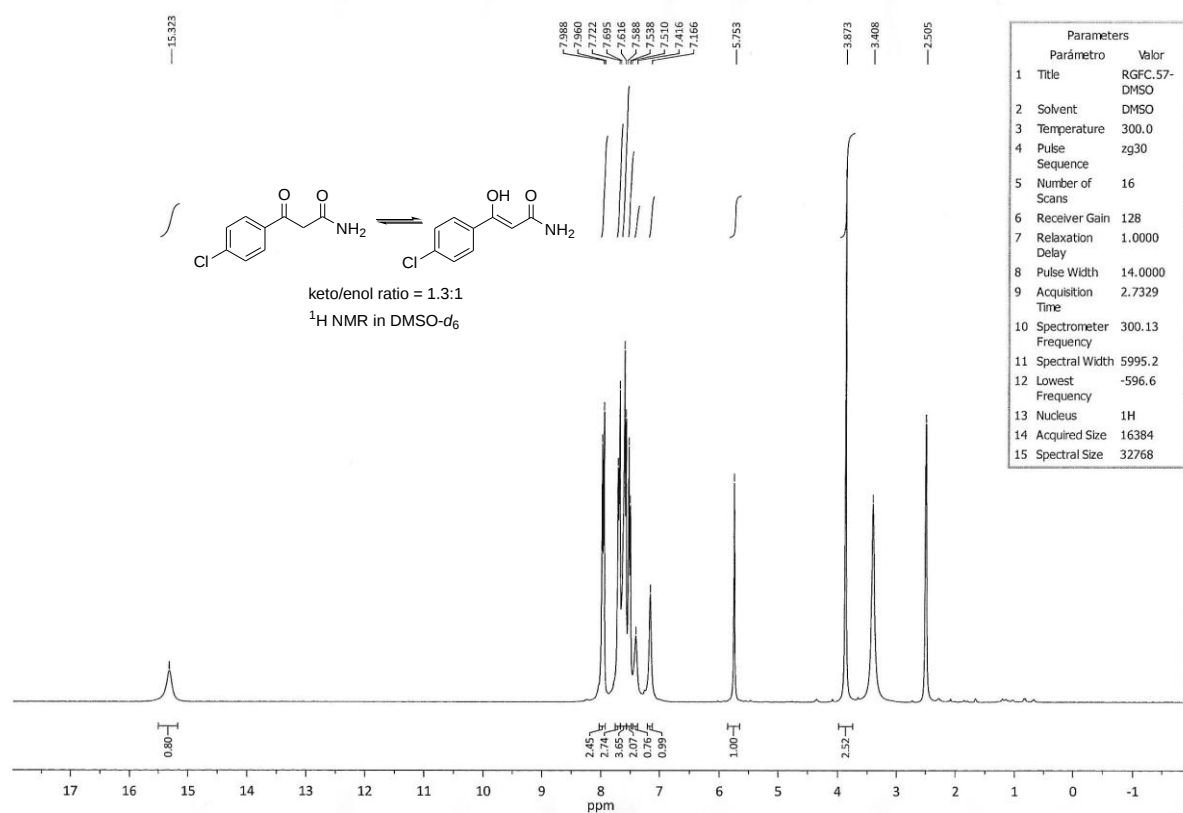
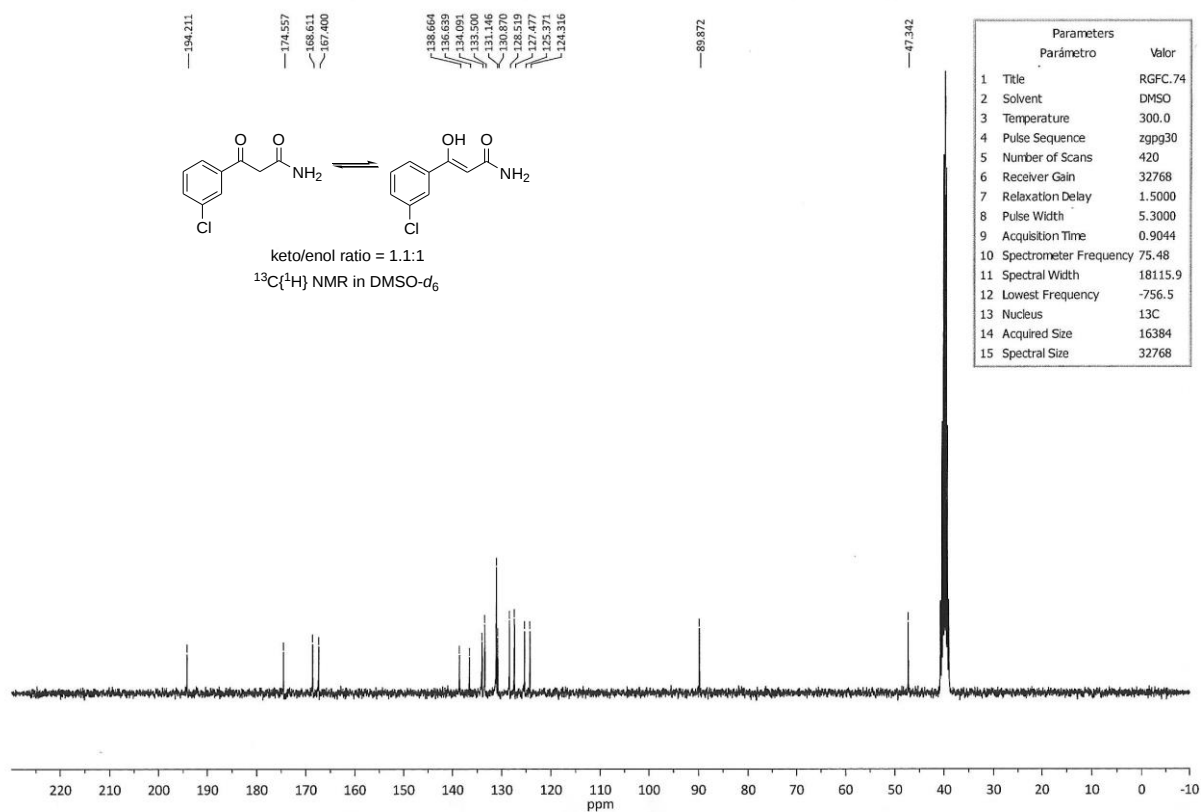
Parameters		
Parámetro	Valor	
1 Title	RGFC.63.2	
2 Solvent	DMSO	
3 Temperature	300.0	
4 Pulse Sequence	zgpg30	
5 Number of Scans	460	
6 Receiver Gain	26008	
7 Relaxation Delay	1.5000	
8 Pulse Width	5.3000	
9 Acquisition Time	0.9044	
10 Spectrometer Frequency	75.48	
11 Spectral Width	18115.9	
12 Lowest Frequency	-756.5	
13 Nucleus	¹³ C	
14 Acquired Size	16384	
15 Spectral Size	32768	

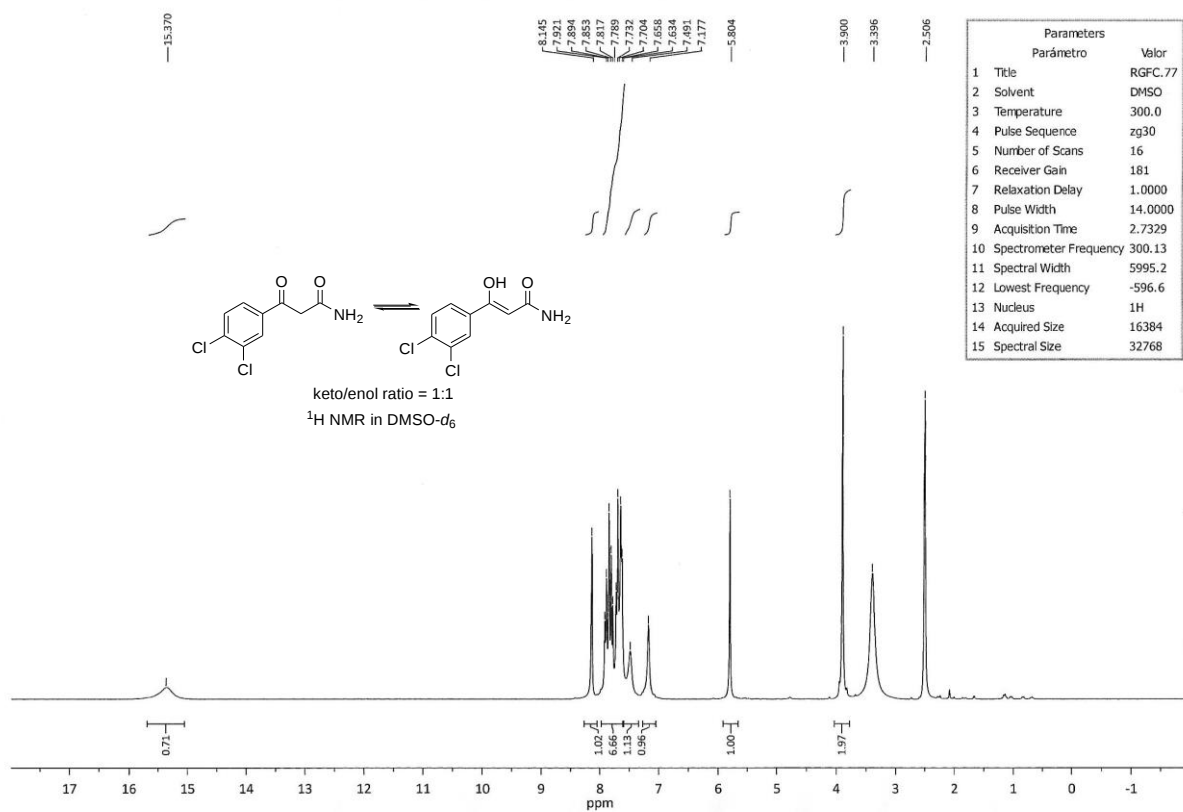
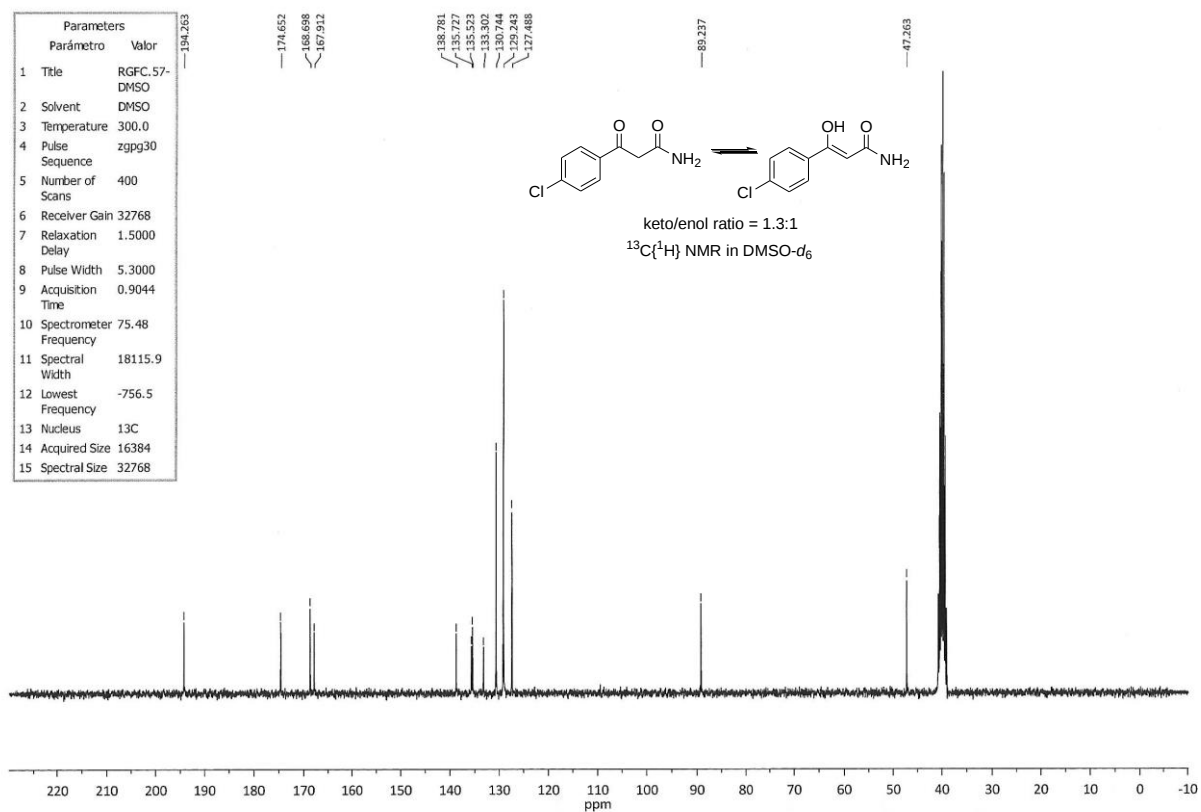


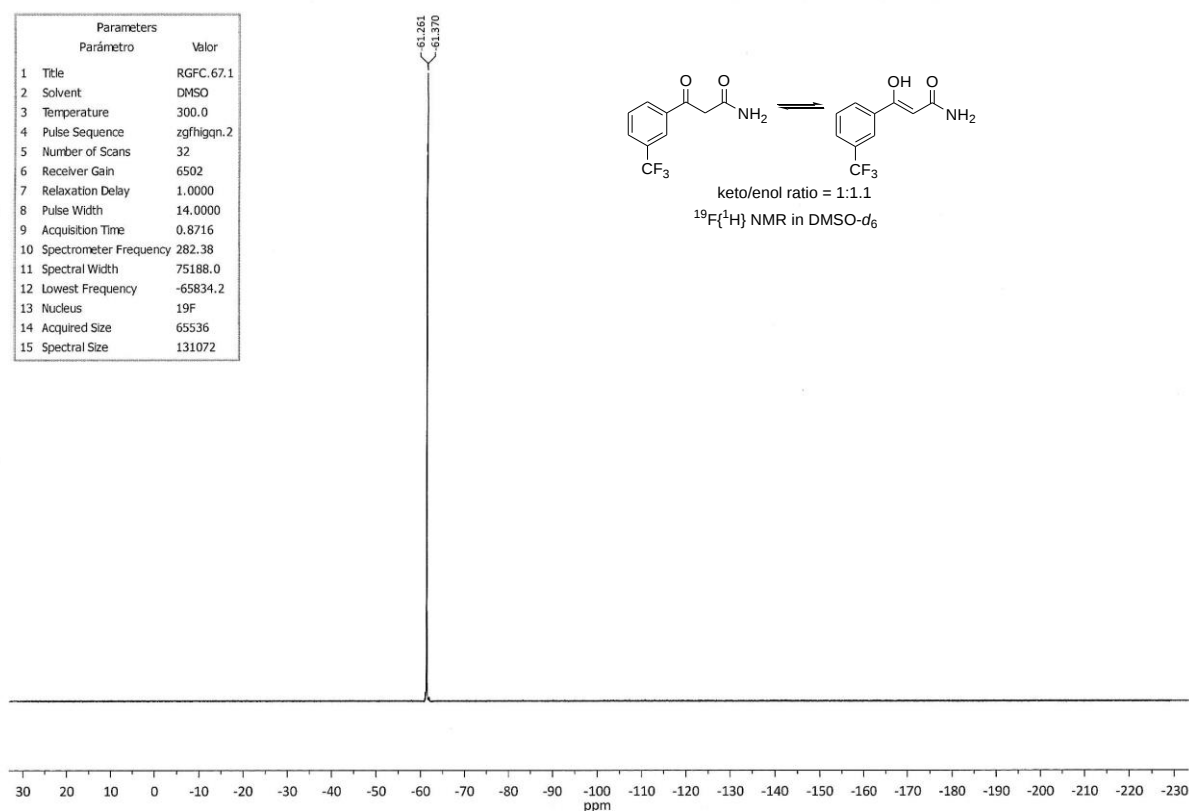
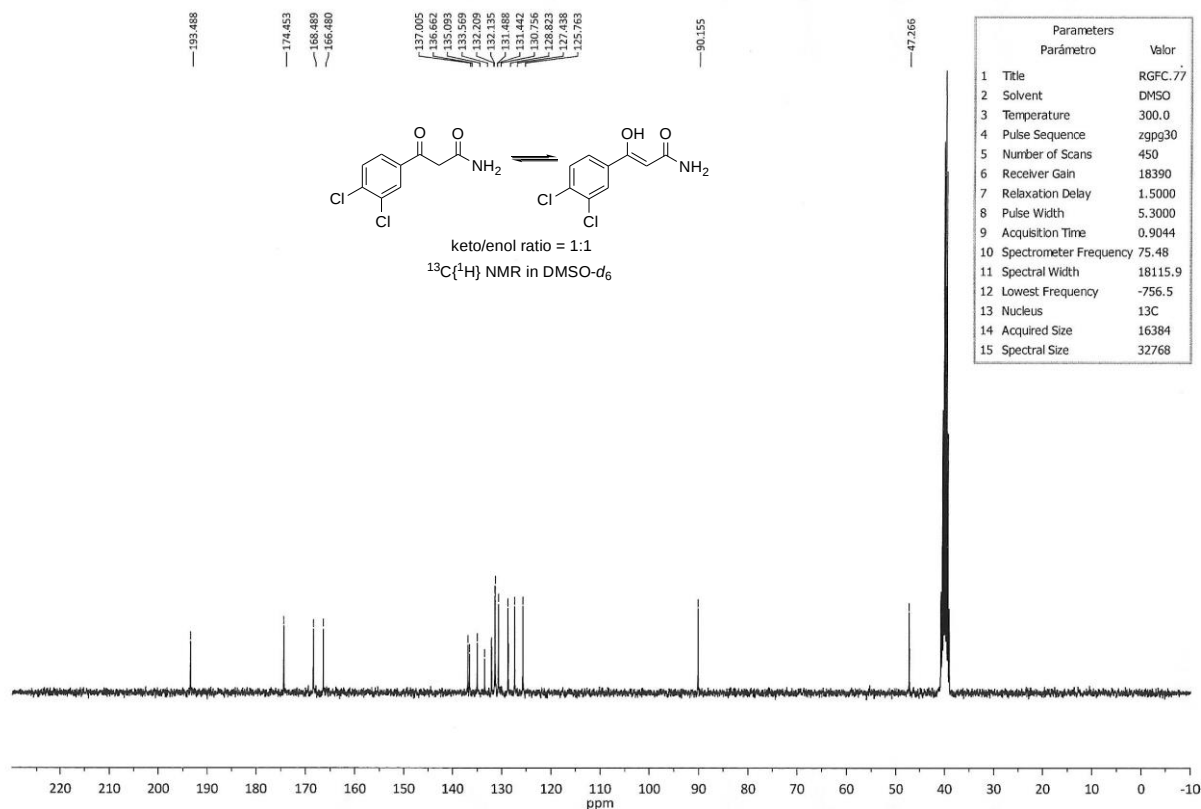
Parameters		
Parámetro	Valor	
1 Title	RGFC.66.1	
2 Solvent	DMSO	
3 Temperature	300.0	
4 Pulse Sequence	zg30	
5 Number of Scans	16	
6 Receiver Gain	256	
7 Relaxation Delay	1.0000	
8 Pulse Width	14.0000	
9 Acquisition Time	2.7329	
10 Spectrometer Frequency	300.13	
11 Spectral Width	5995.2	
12 Lowest Frequency	-596.6	
13 Nucleus	¹ H	
14 Acquired Size	16384	
15 Spectral Size	32768	

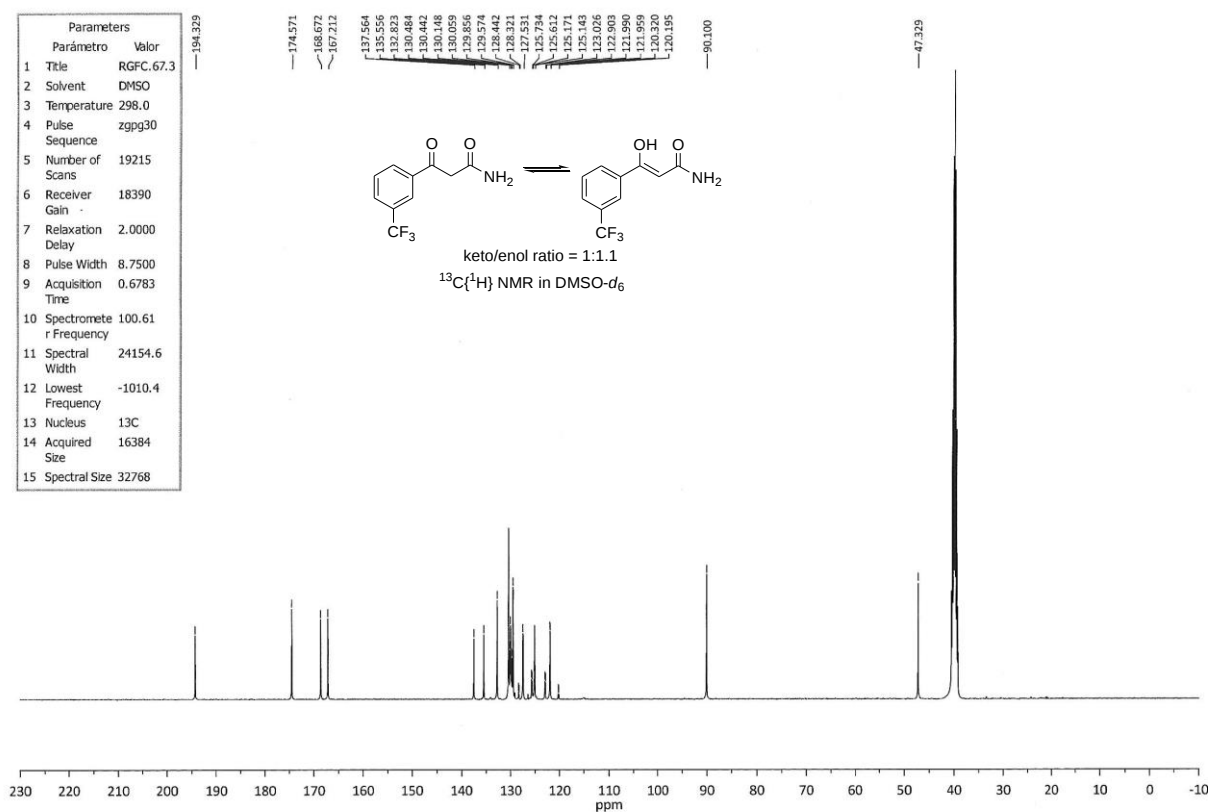
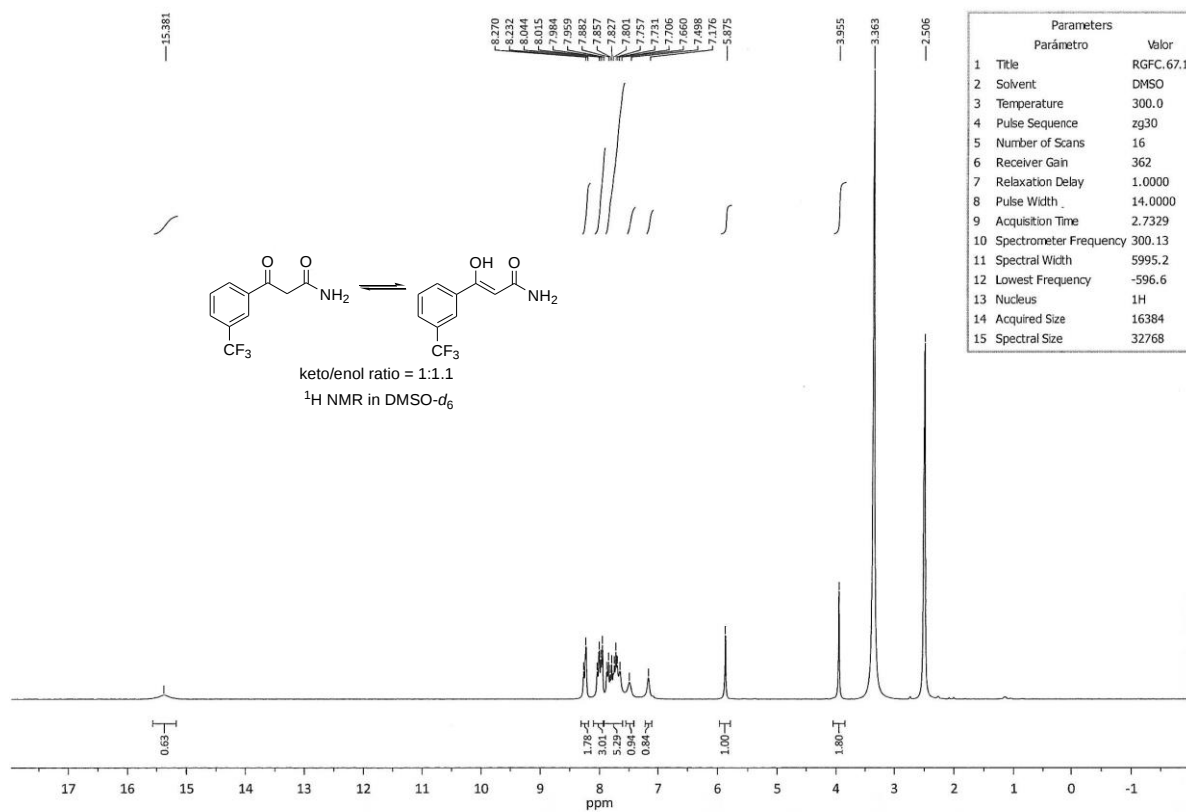


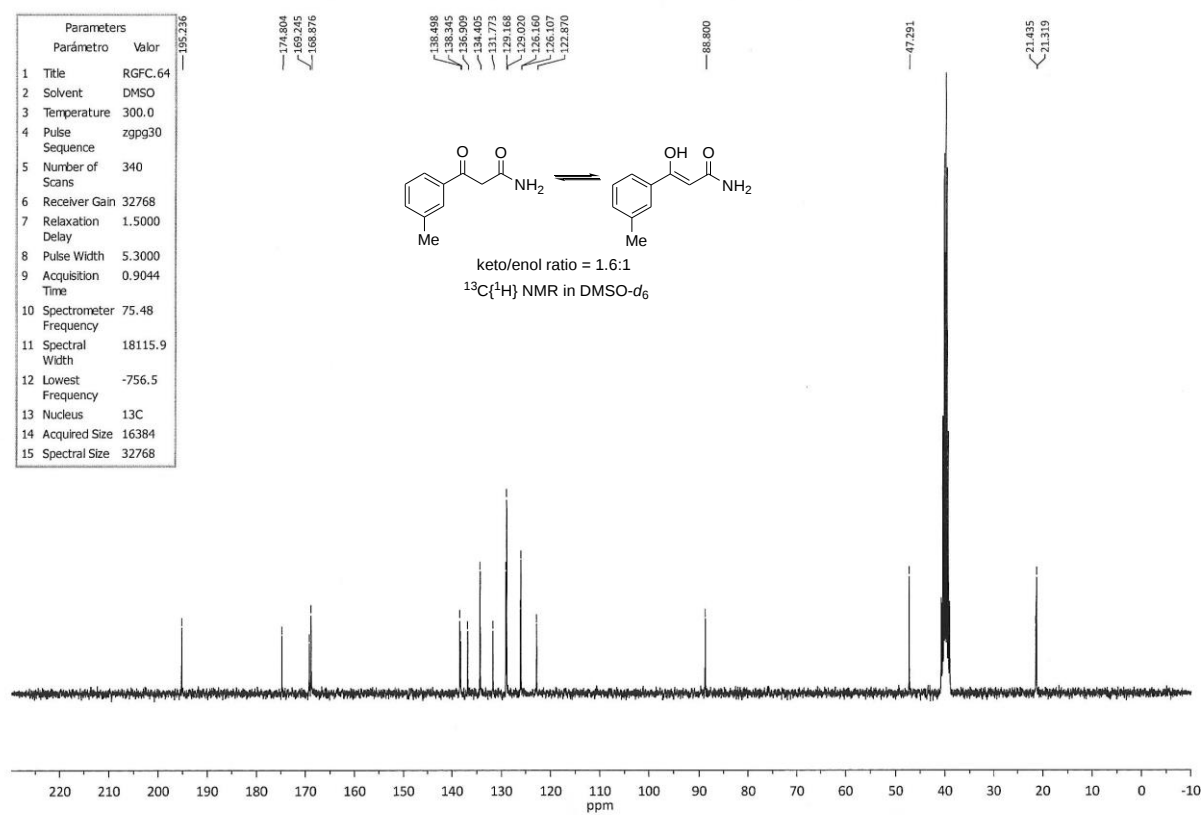
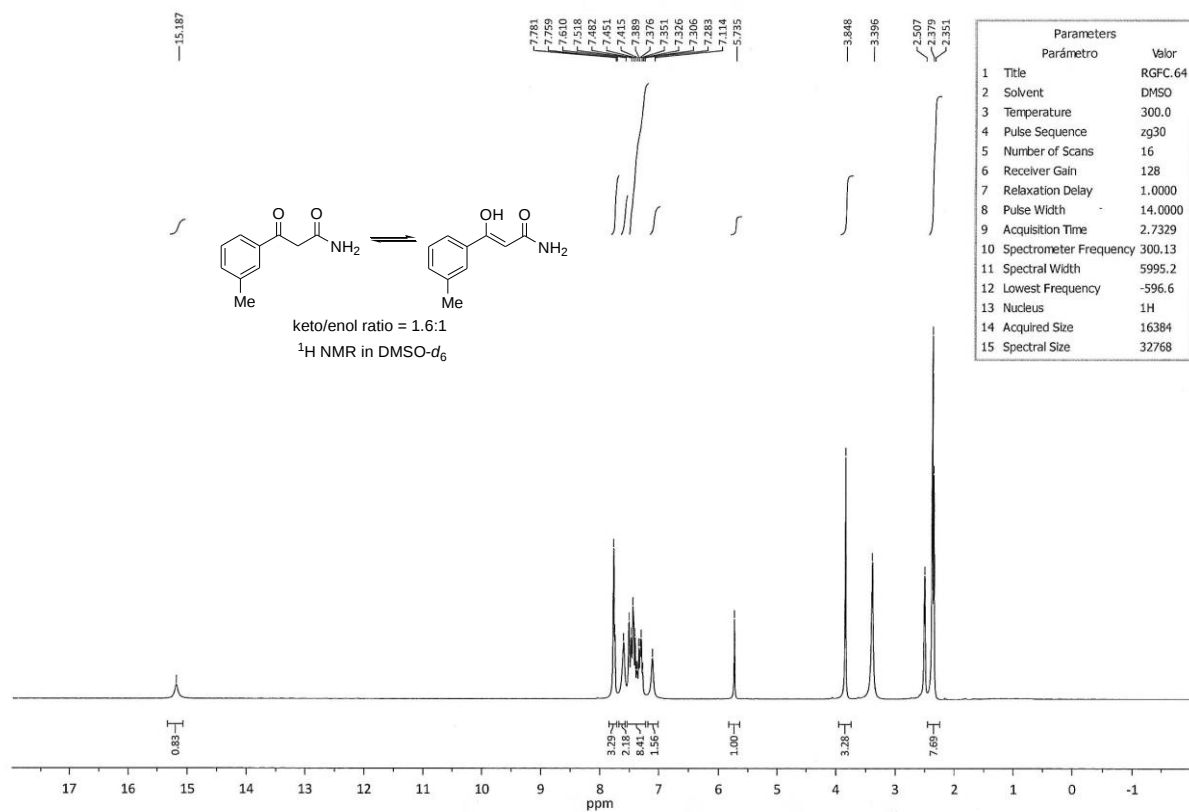


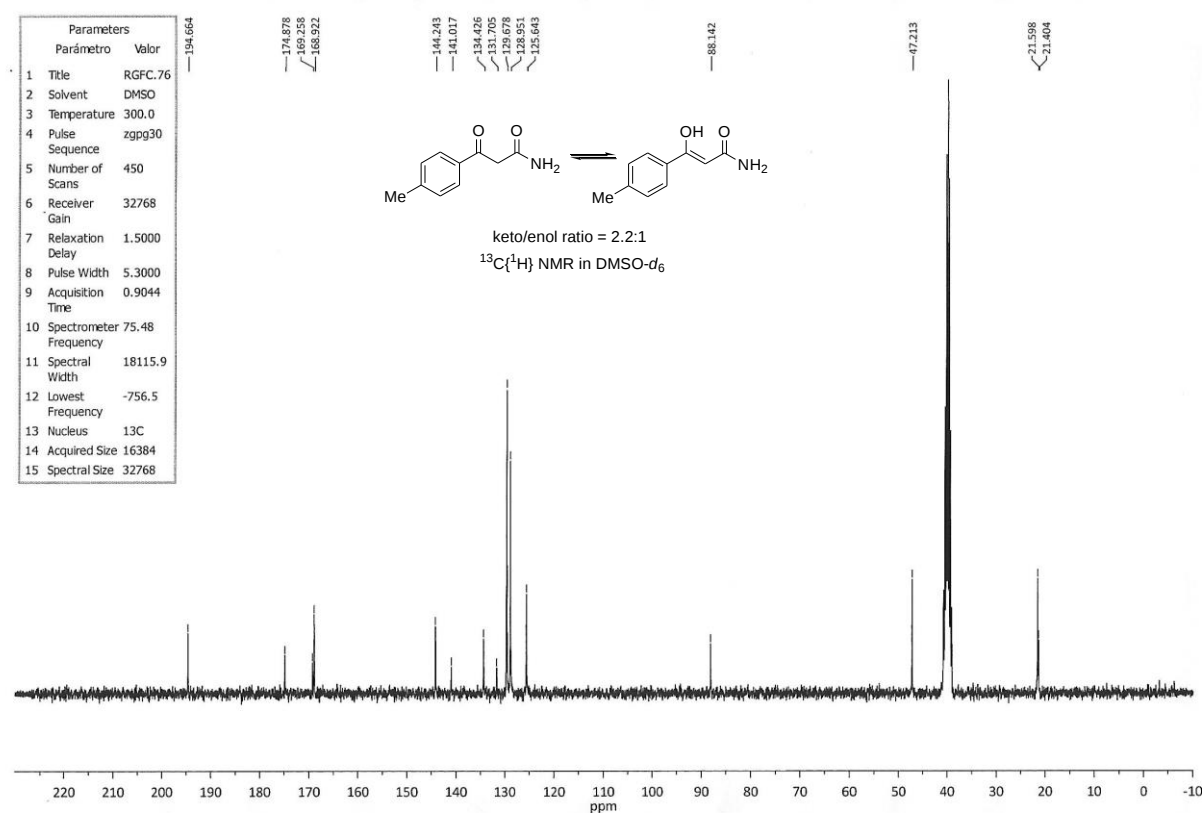
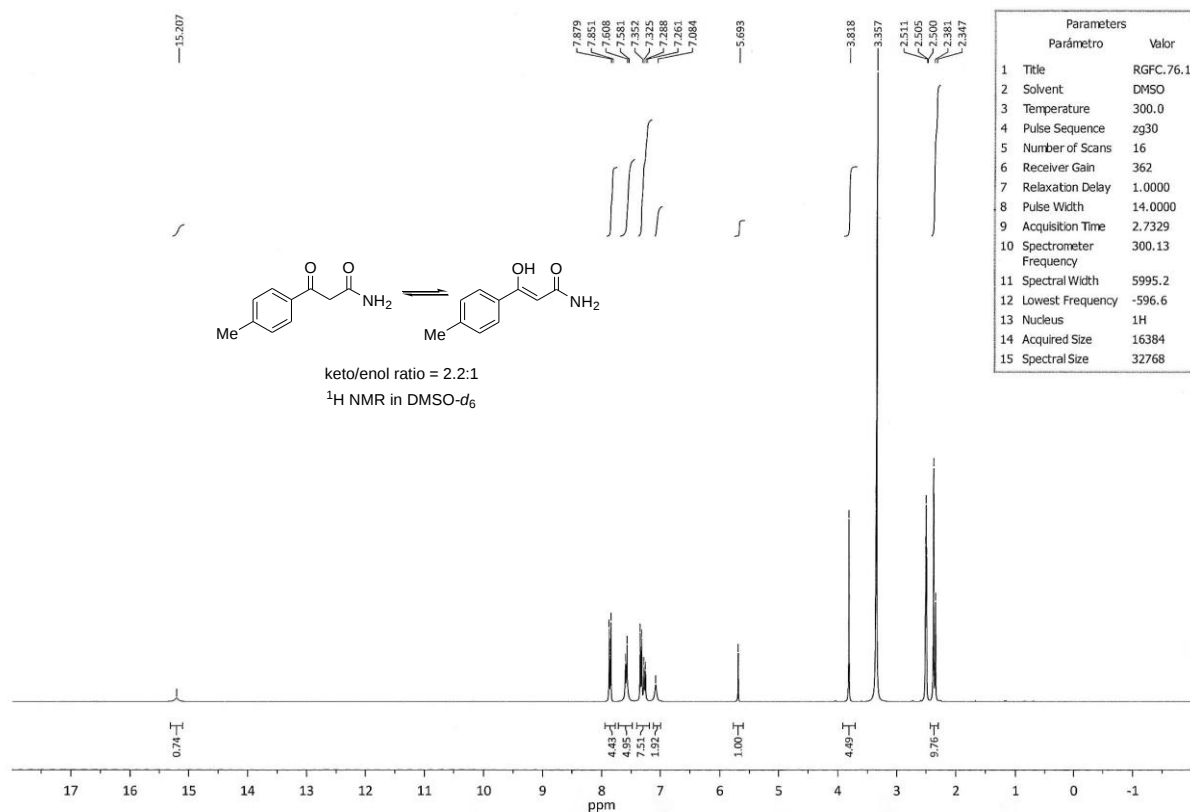


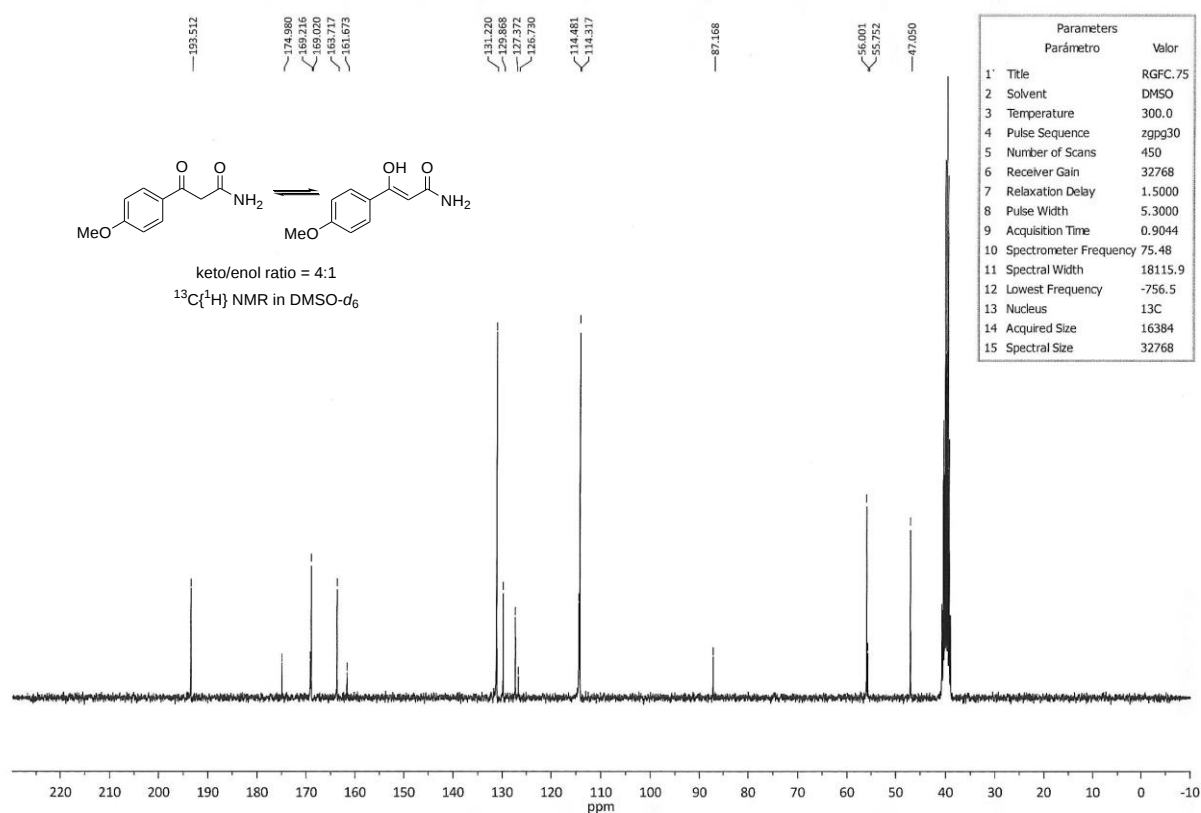
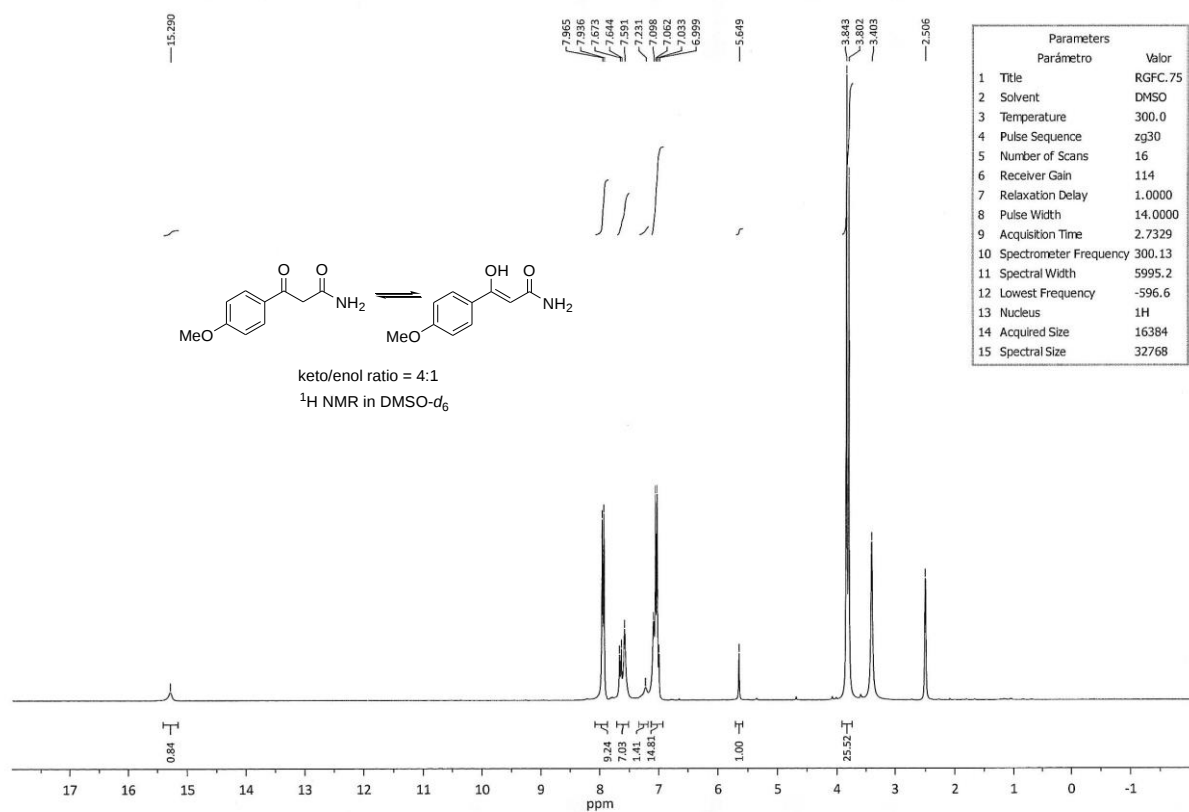


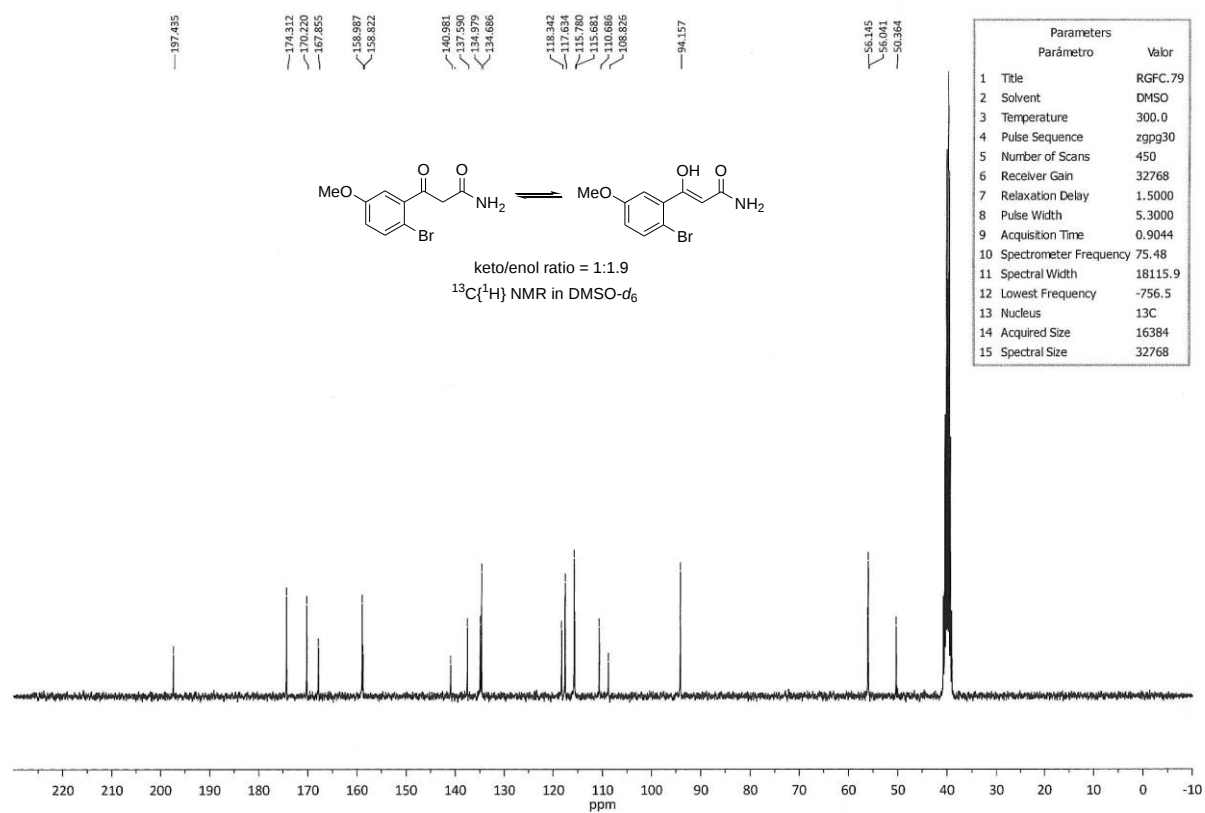
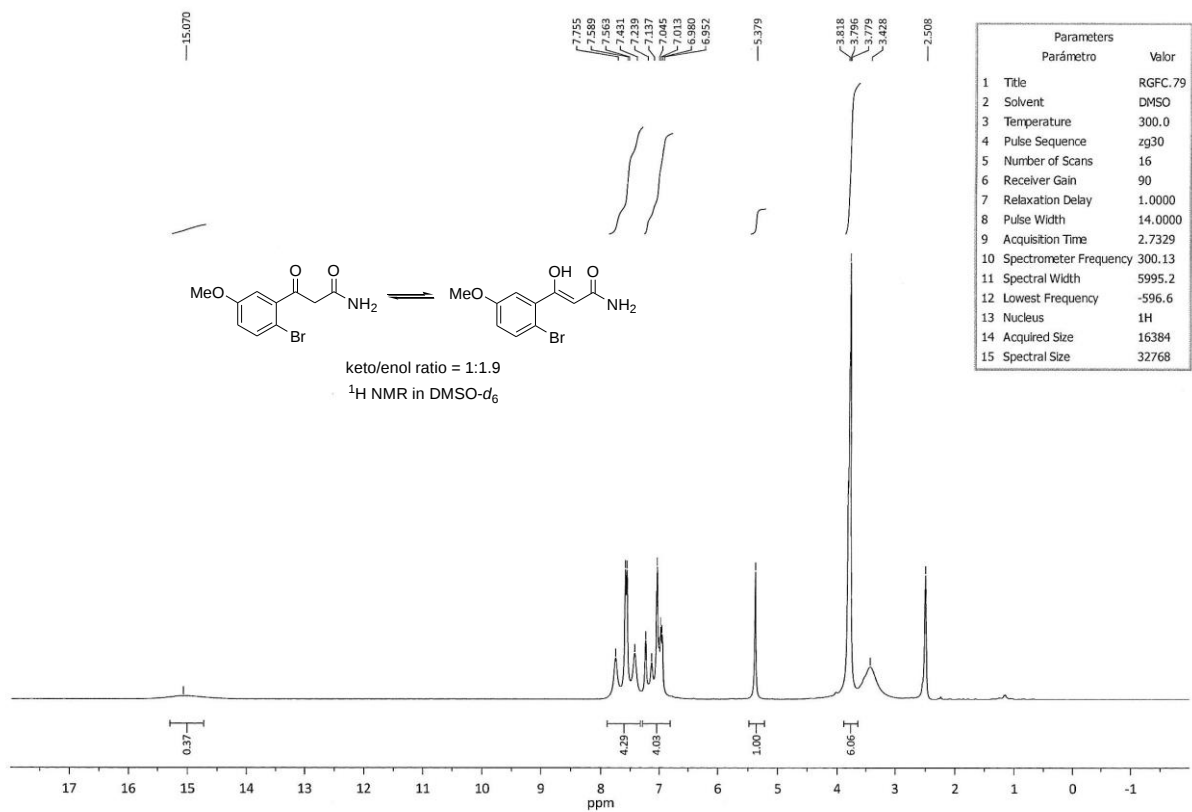




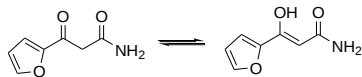






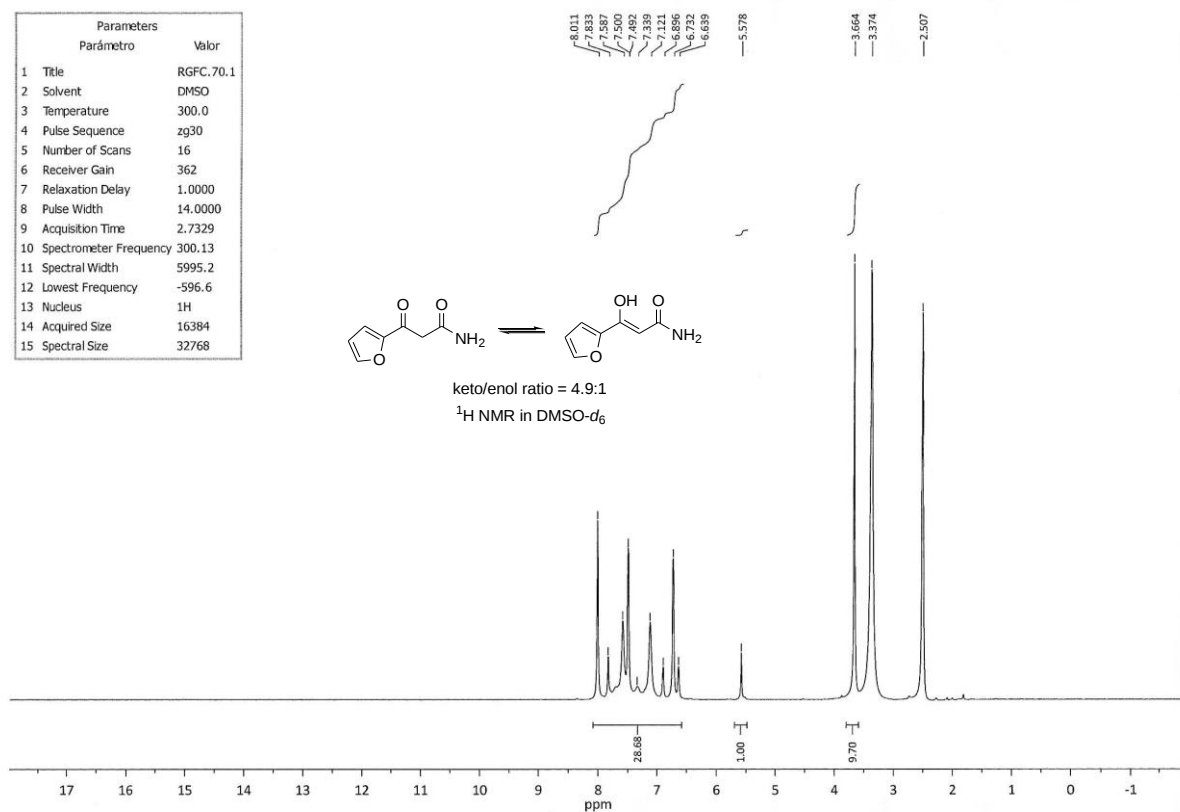


Parameters	
Parámetro	Valor
1 Title	RGFC.70.1
2 Solvent	DMSO
3 Temperature	300.0
4 Pulse Sequence	zg30
5 Number of Scans	16
6 Receiver Gain	362
7 Relaxation Delay	1.0000
8 Pulse Width	14.0000
9 Acquisition Time	2.7329
10 Spectrometer Frequency	300.13
11 Spectral Width	5995.2
12 Lowest Frequency	-596.6
13 Nucleus	¹ H
14 Acquired Size	16384
15 Spectral Size	32768

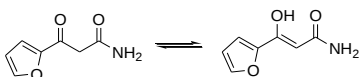


keto/enol ratio = 4.9:1

¹H NMR in DMSO-*d*₆

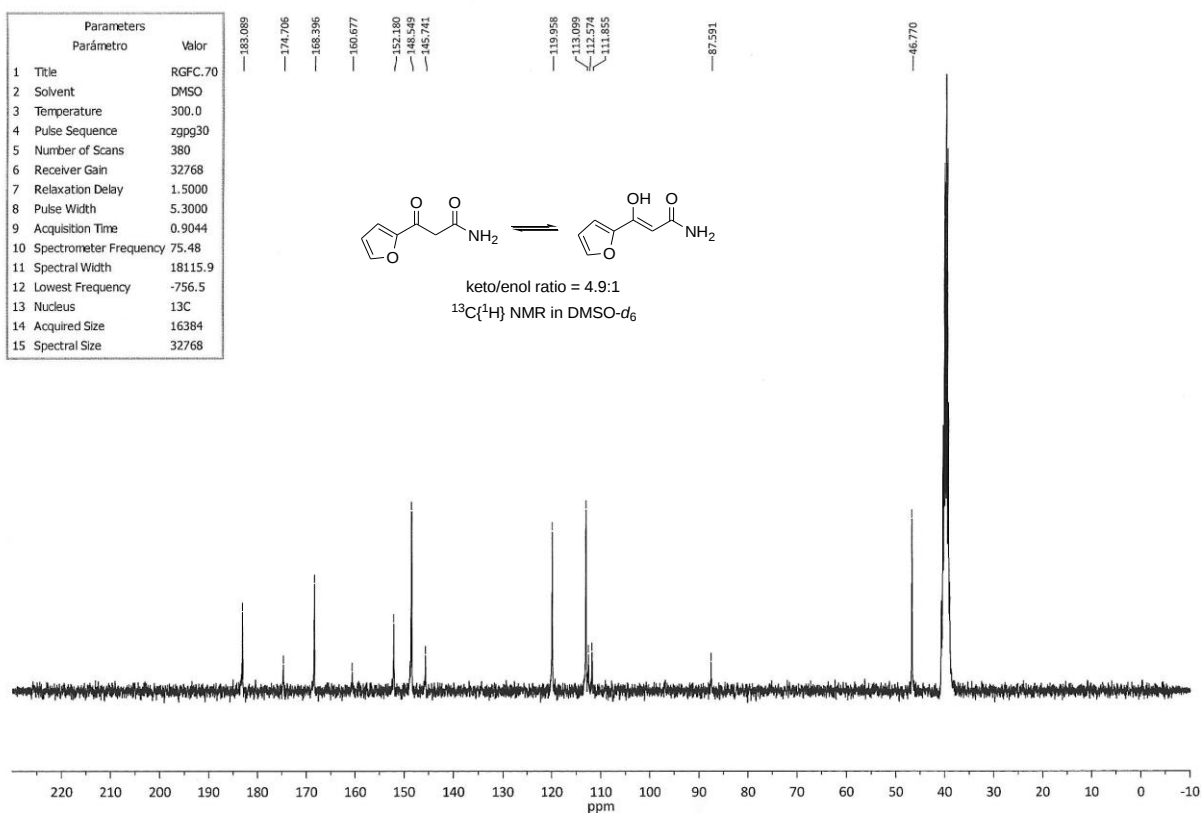


Parameters	
Parámetro	Valor
1 Title	RGFC.70
2 Solvent	DMSO
3 Temperature	300.0
4 Pulse Sequence	zgpg30
5 Number of Scans	380
6 Receiver Gain	32768
7 Relaxation Delay	1.5000
8 Pulse Width	5.3000
9 Acquisition Time	0.9044
10 Spectrometer Frequency	75.48
11 Spectral Width	18115.9
12 Lowest Frequency	-756.5
13 Nucleus	¹³ C
14 Acquired Size	16384
15 Spectral Size	32768

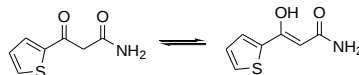


keto/enol ratio = 4.9:1

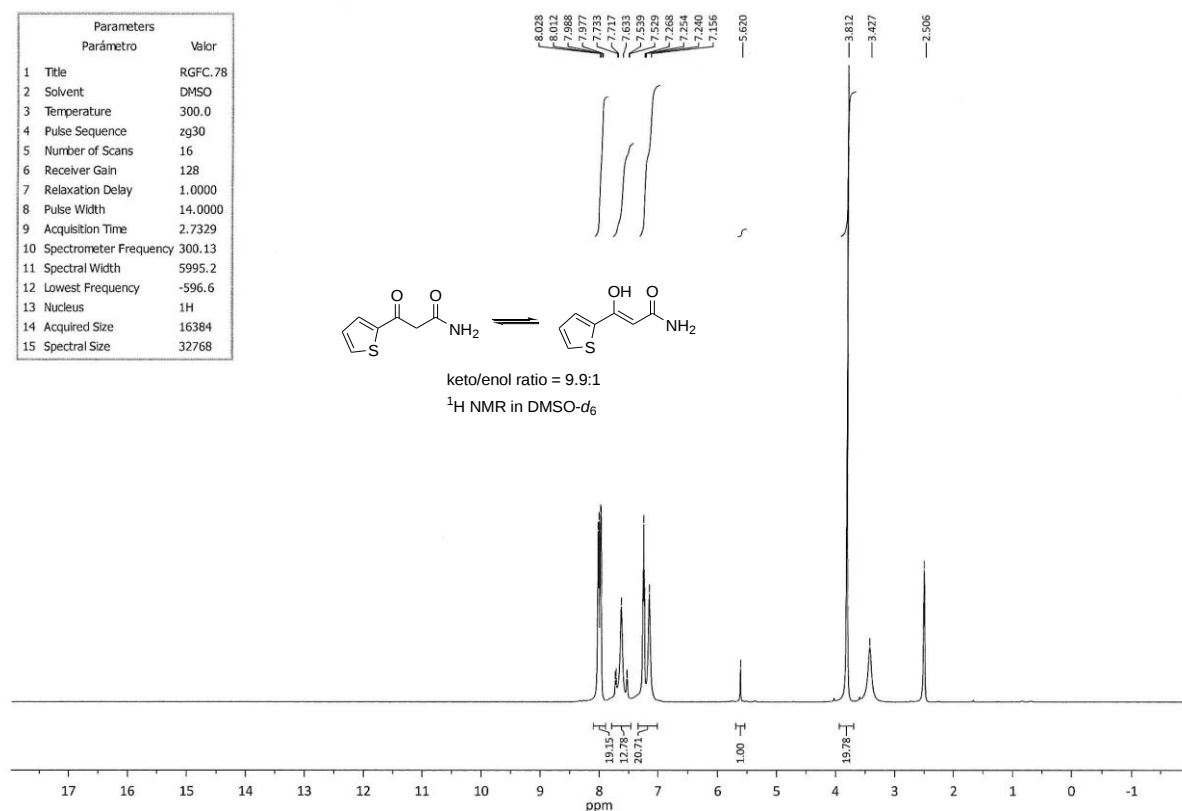
¹³C{¹H} NMR in DMSO-*d*₆



Parameters	
Parámetro	Valor
1 Title	RGFC.78
2 Solvent	DMSO
3 Temperature	300.0
4 Pulse Sequence	zg30
5 Number of Scans	16
6 Receiver Gain	128
7 Relaxation Delay	1.0000
8 Pulse Width	14.0000
9 Acquisition Time	2.7329
10 Spectrometer Frequency	300.13
11 Spectral Width	5995.2
12 Lowest Frequency	-596.6
13 Nucleus	¹ H
14 Acquired Size	16384
15 Spectral Size	32768

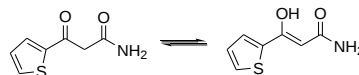


keto/enol ratio = 9.9:1
¹H NMR in DMSO-*d*₆

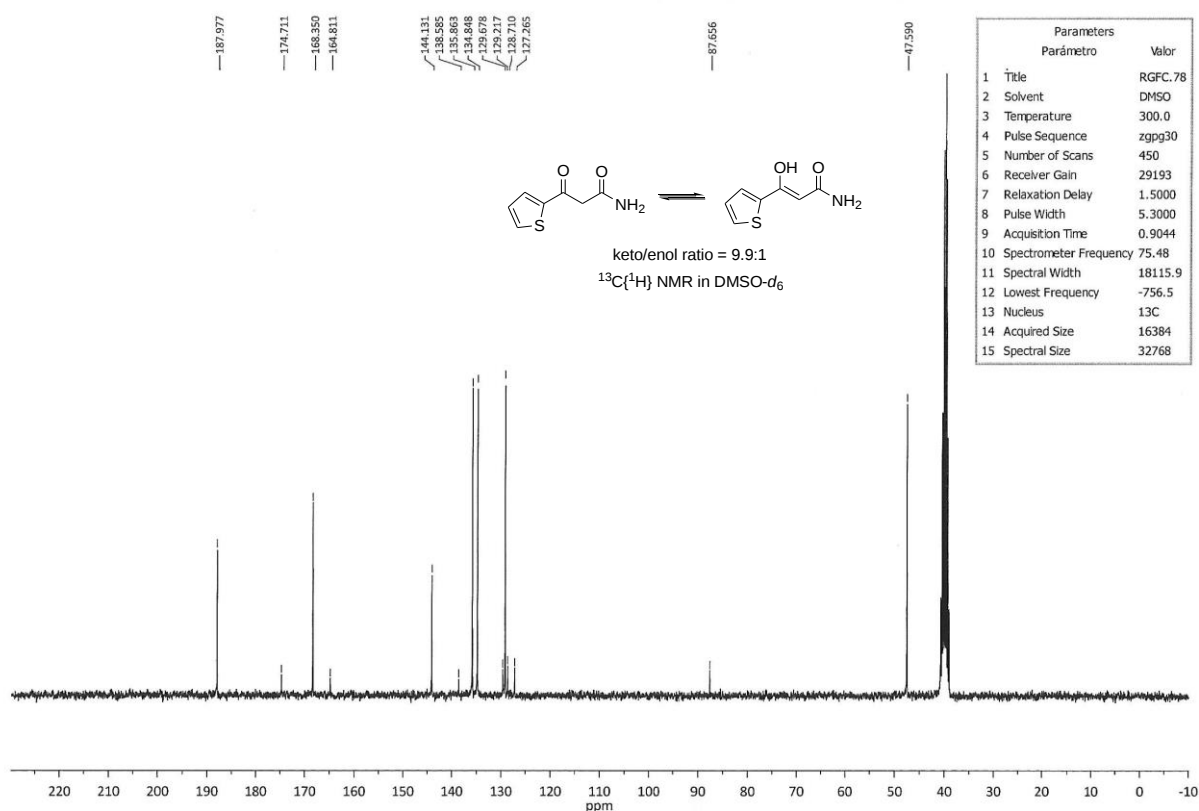


187.977
 174.711
 166.350
 164.811

144.131
 138.585
 135.863
 134.848
 133.775
 128.217
 128.710
 127.265



keto/enol ratio = 9.9:1
¹³C{¹H} NMR in DMSO-*d*₆



Parameters	
Parámetro	Valor
1 Title	RGFC.78
2 Solvent	DMSO
3 Temperature	300.0
4 Pulse Sequence	zgpg30
5 Number of Scans	450
6 Receiver Gain	29193
7 Relaxation Delay	1.5000
8 Pulse Width	5.3000
9 Acquisition Time	0.9044
10 Spectrometer Frequency	75.48
11 Spectral Width	18115.9
12 Lowest Frequency	-756.5
13 Nucleus	¹³ C
14 Acquired Size	16384
15 Spectral Size	32768

