

*Supporting Information*

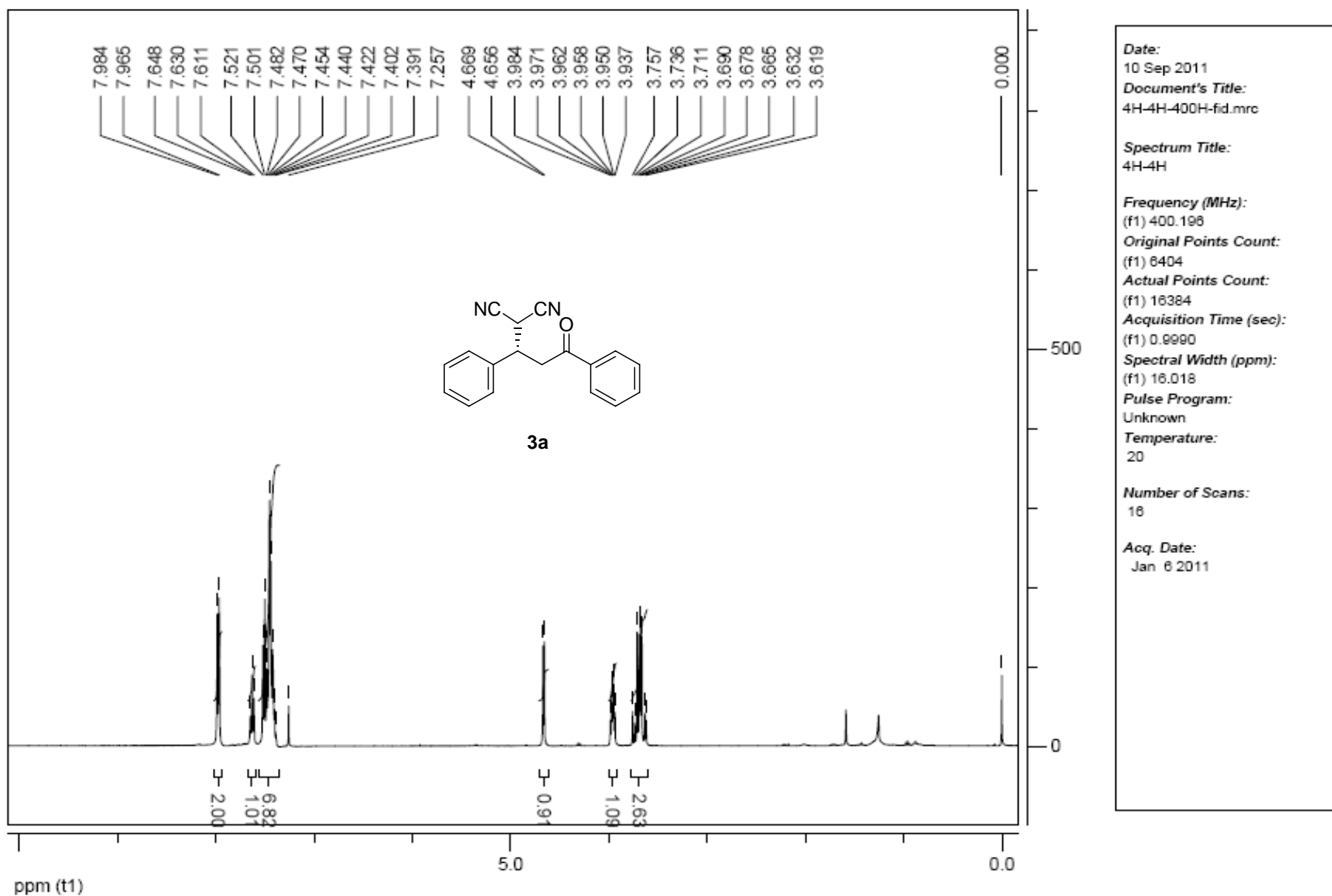
**Squaramide-Catalyzed Enantioselective Michael Addition of Malononitrile  
to Chalcones**

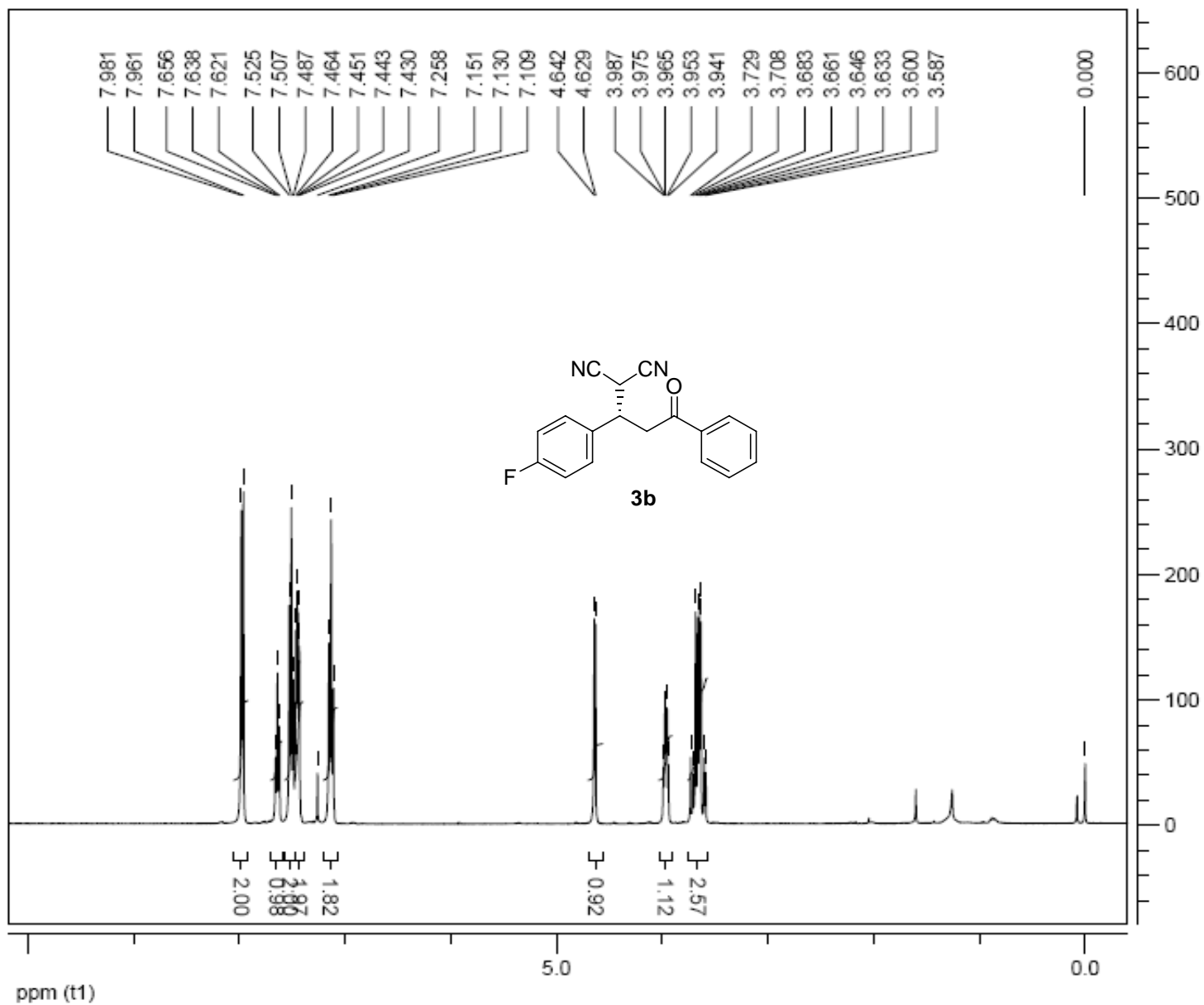
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*School of Chemical Engineering and Environment, Beijing Institute of Technology,  
Beijing 100081, People's Republic of China*

[dudm@bit.edu.cn](mailto:dudm@bit.edu.cn)

Copies of $^1\text{H}$ and $^{13}\text{C}$ NMR spectra of compounds <b>3-7</b> .....	S1
Copies of HPLC profiles of Michael addition products.....	S27





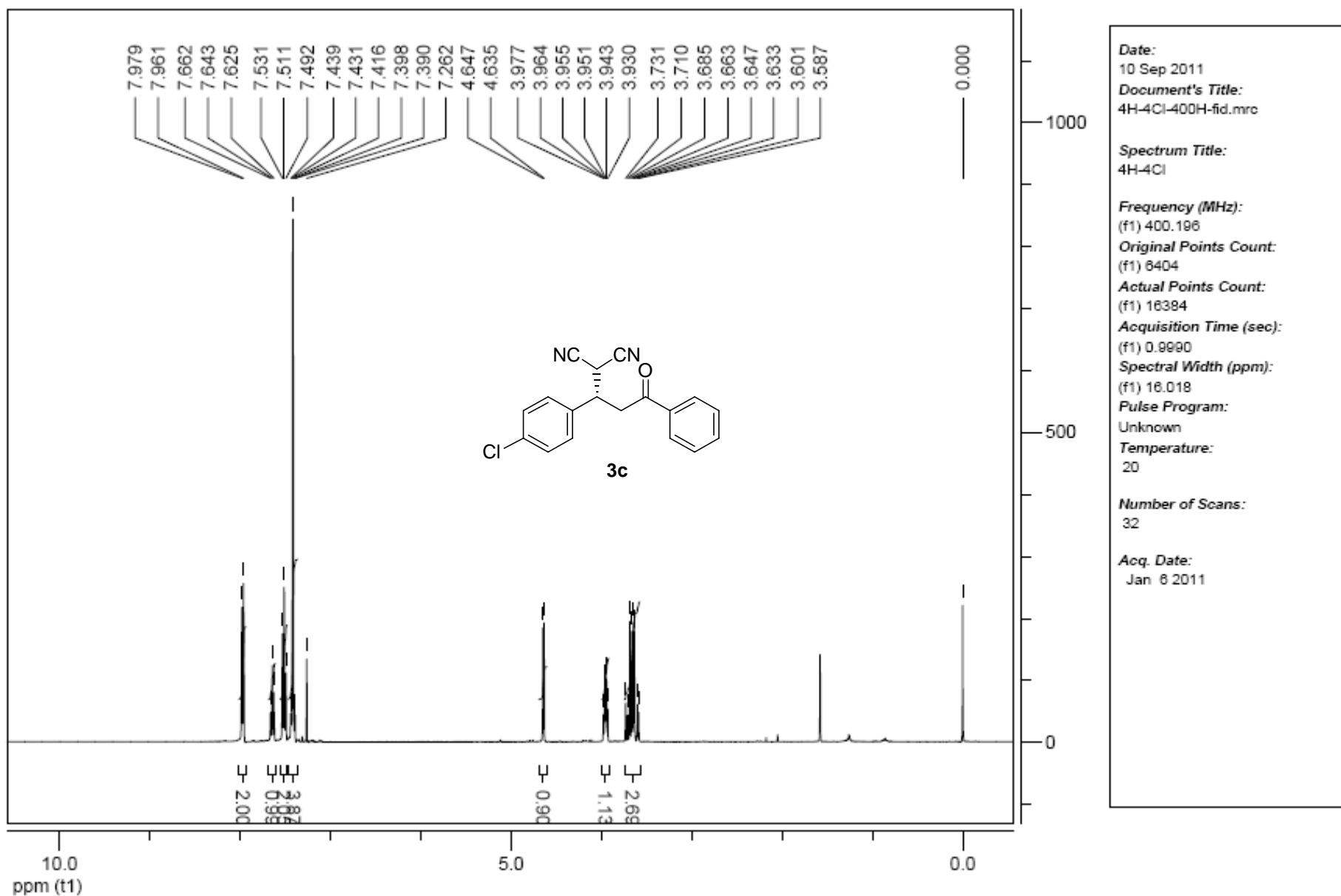
Date:  
10 Sep 2011  
Document's Title:  
4H-4F-400H-fid.mrc

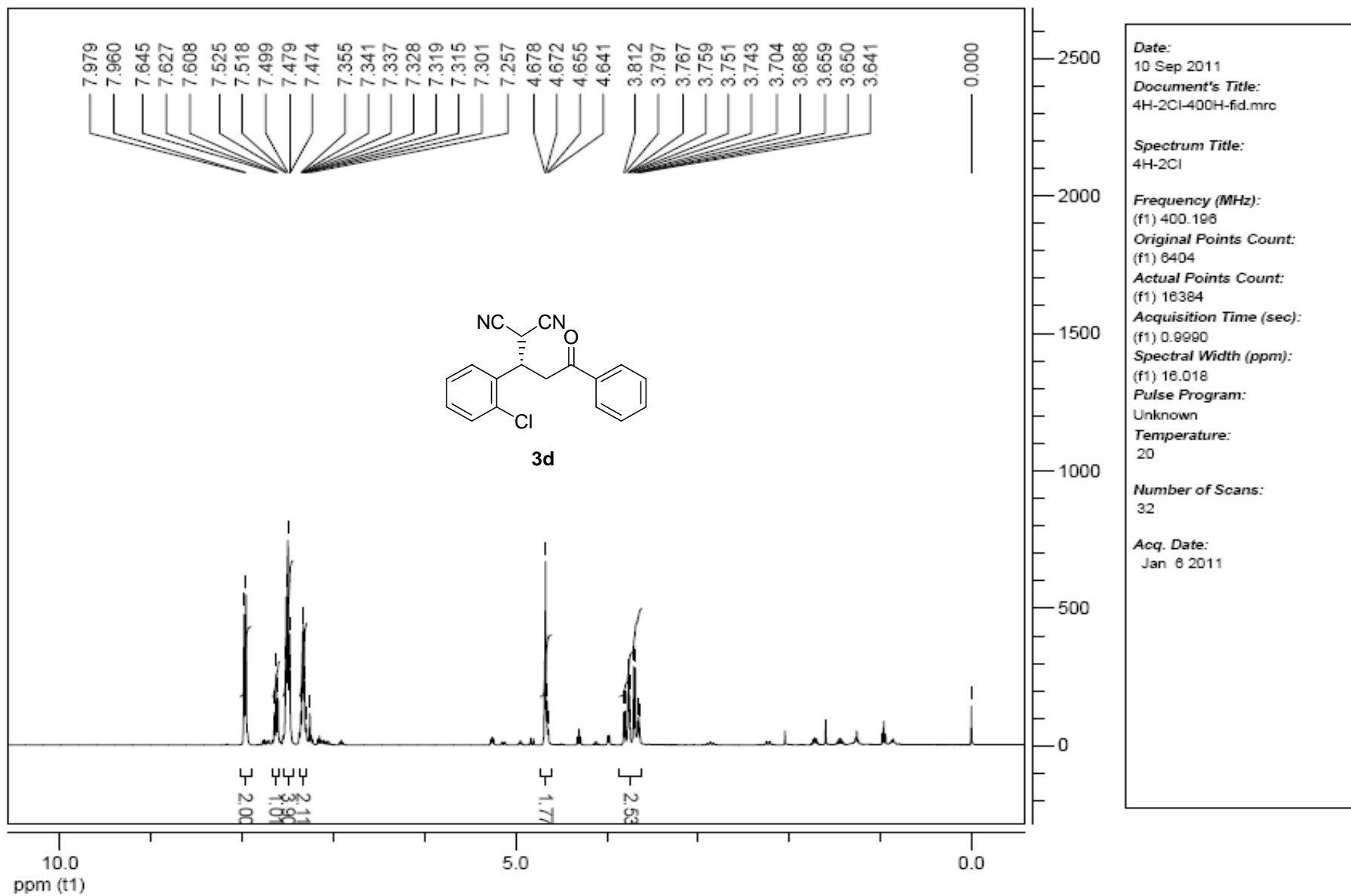
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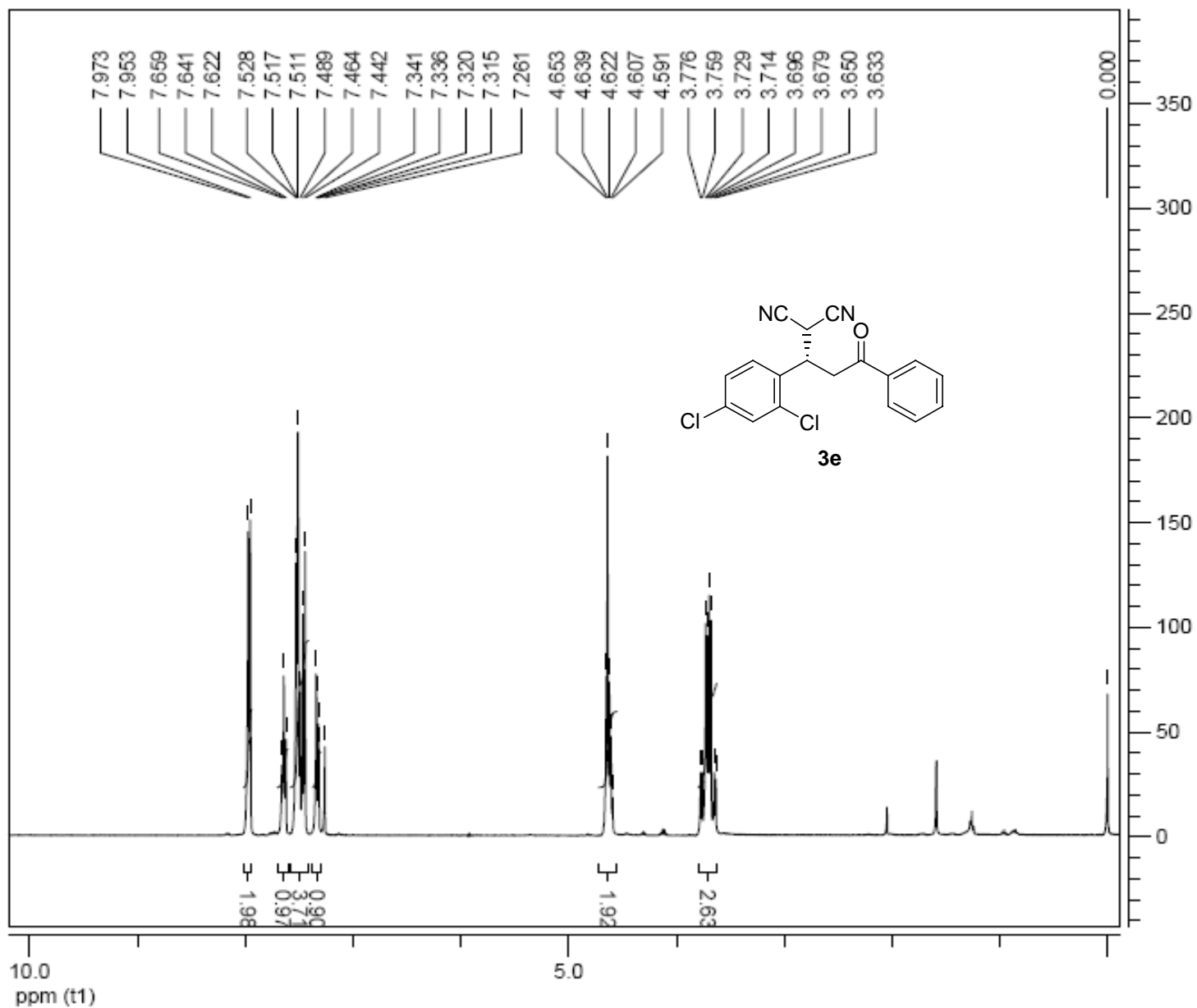
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Pulse Program:  
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Temperature:  
20

Number of Scans:  
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Acq. Date:  
Jan 6 2011







Date:  
10 Sep 2011  
Document's Title:  
4H-2,4Cl2-400H-fid.mrc

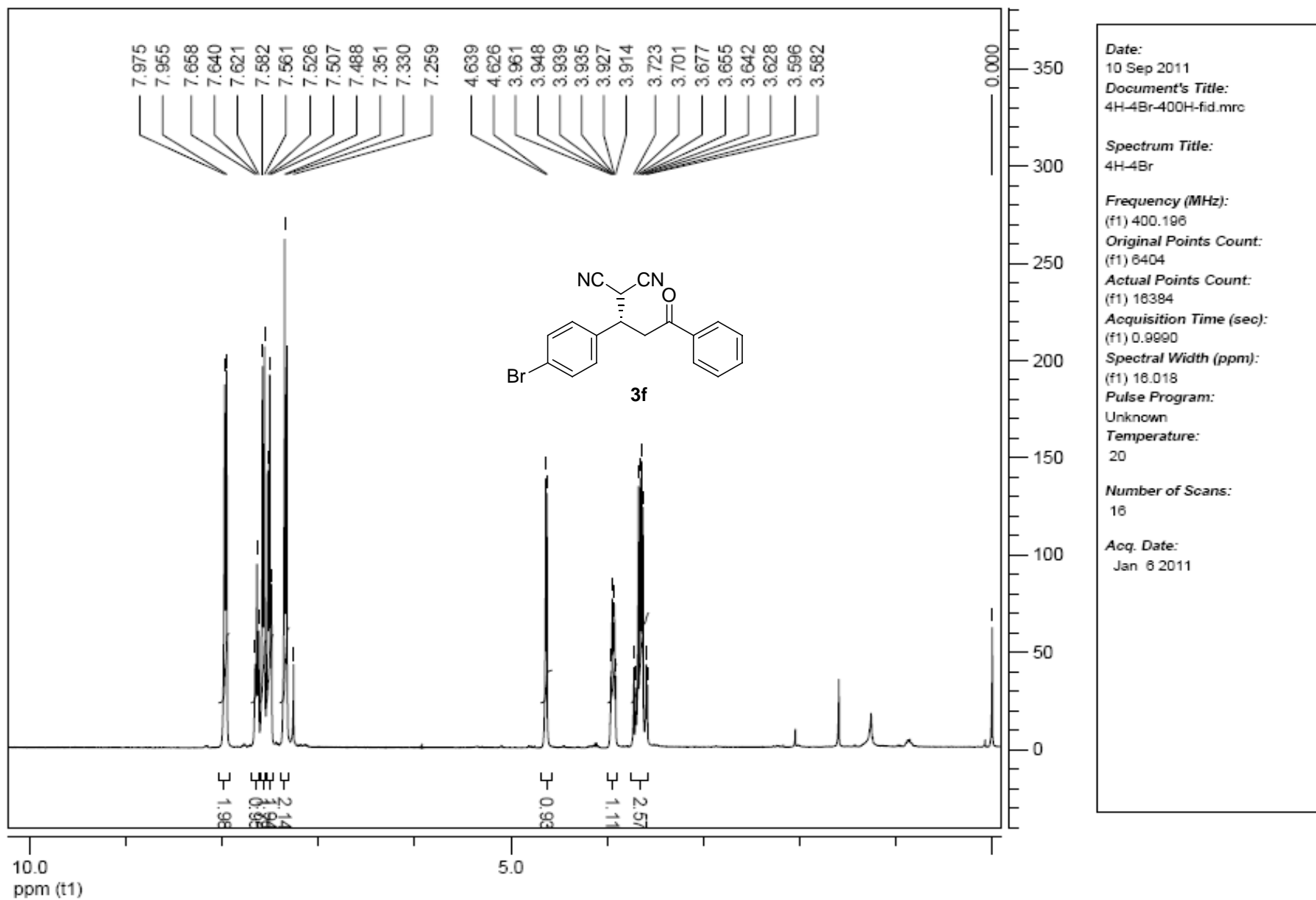
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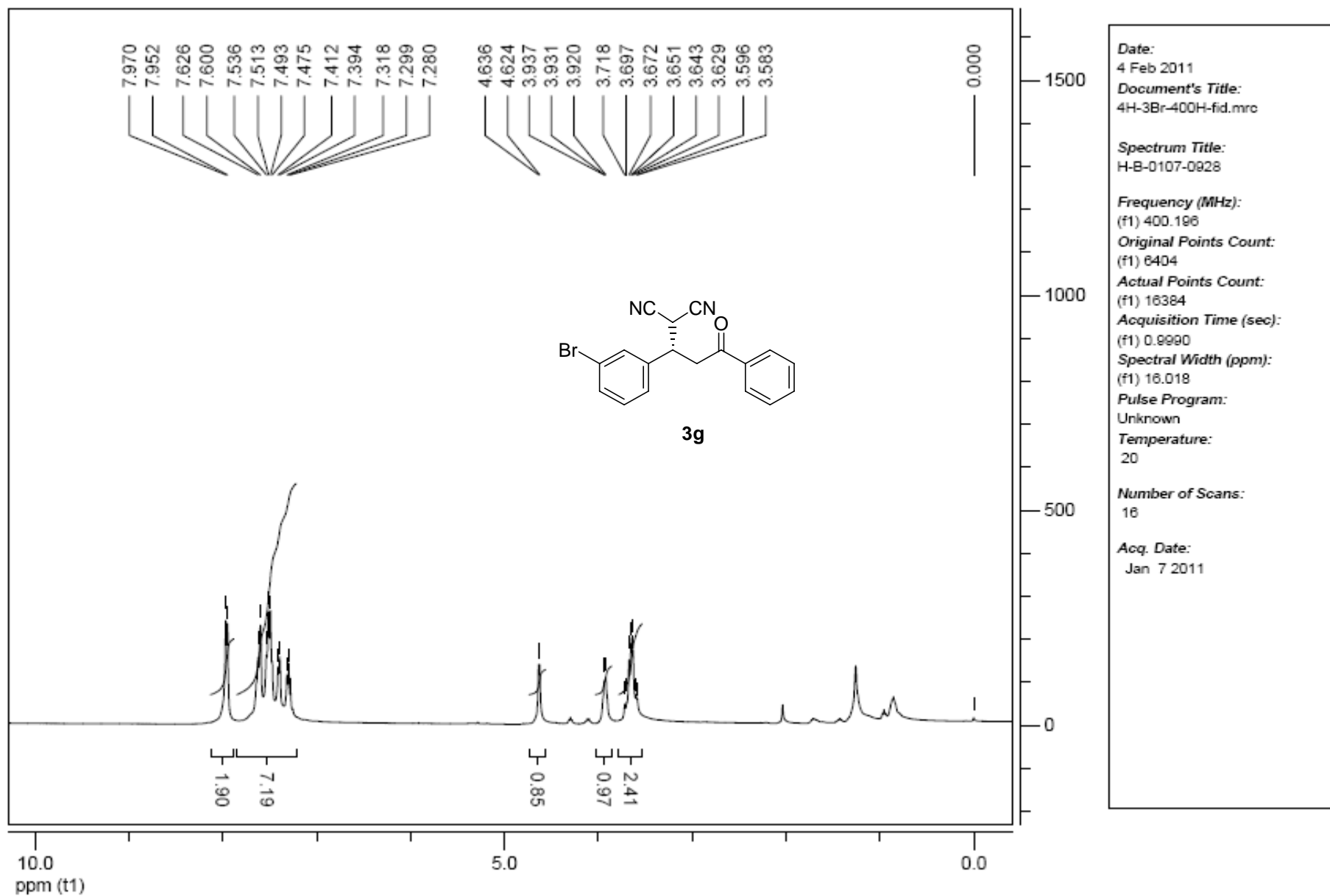
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Temperature:  
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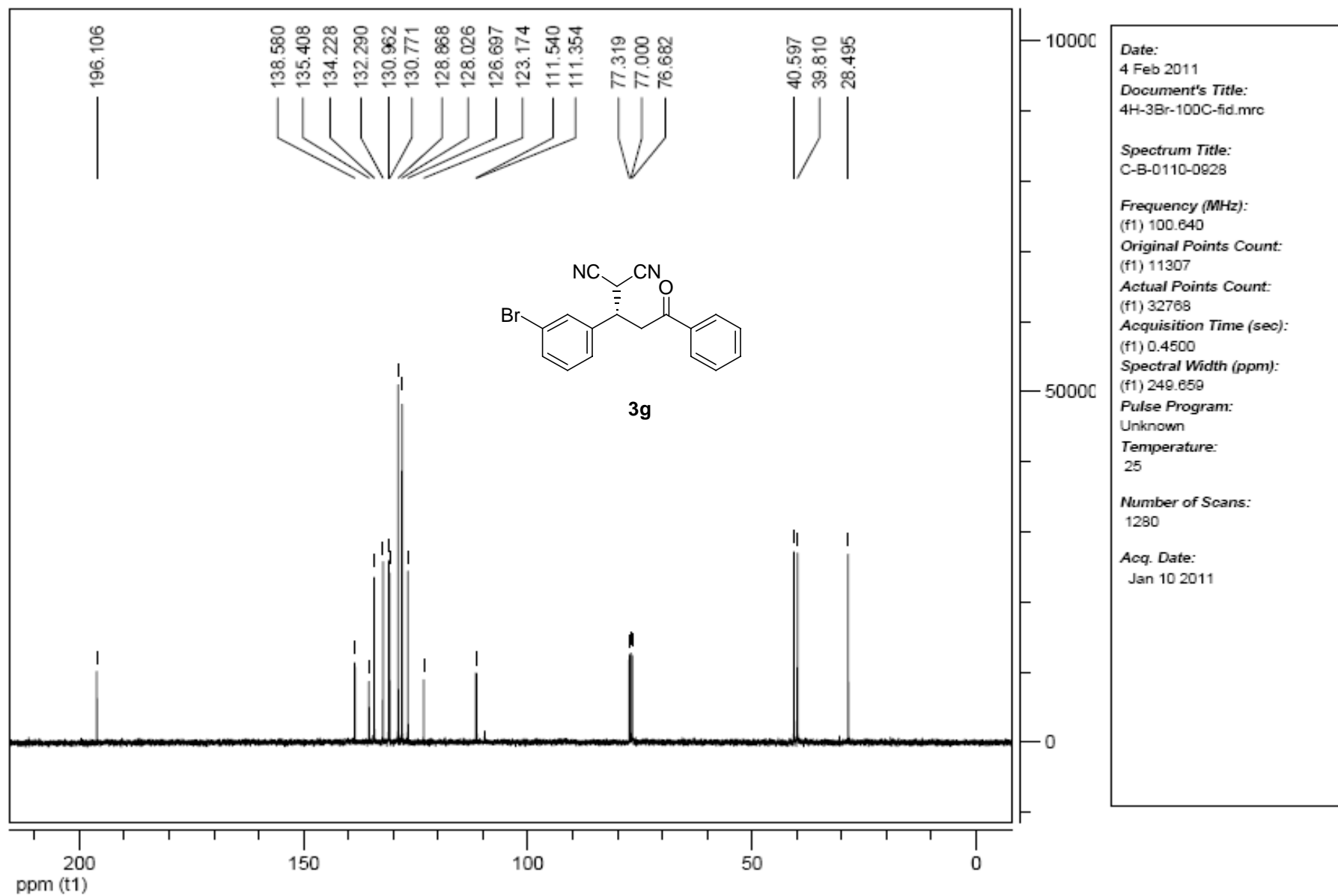
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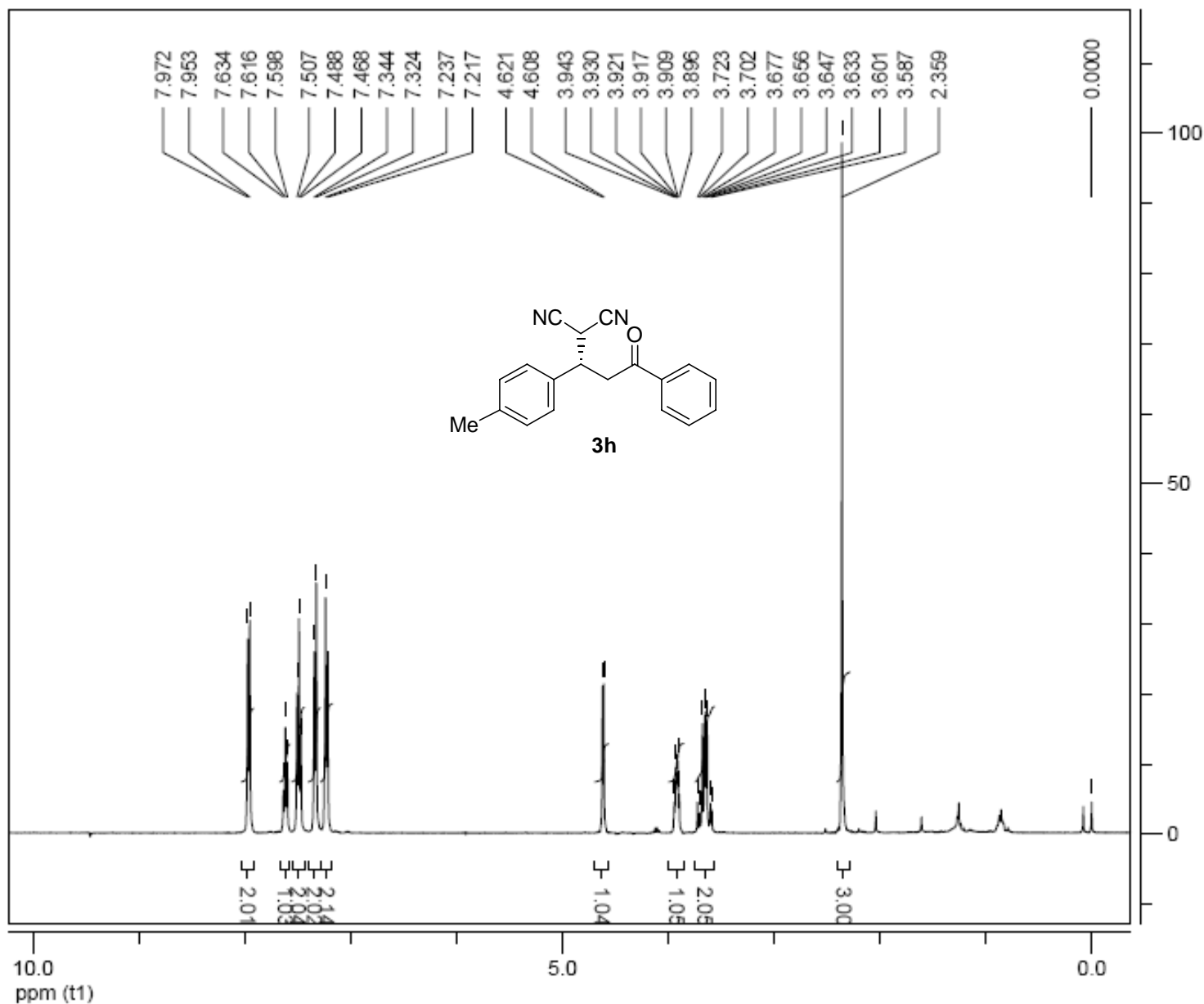
Acq. Date:  
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Date:  
10 Sep 2011  
Document's Title:  
4H-4Me-400H-fid.mrc

Spectrum Title:  
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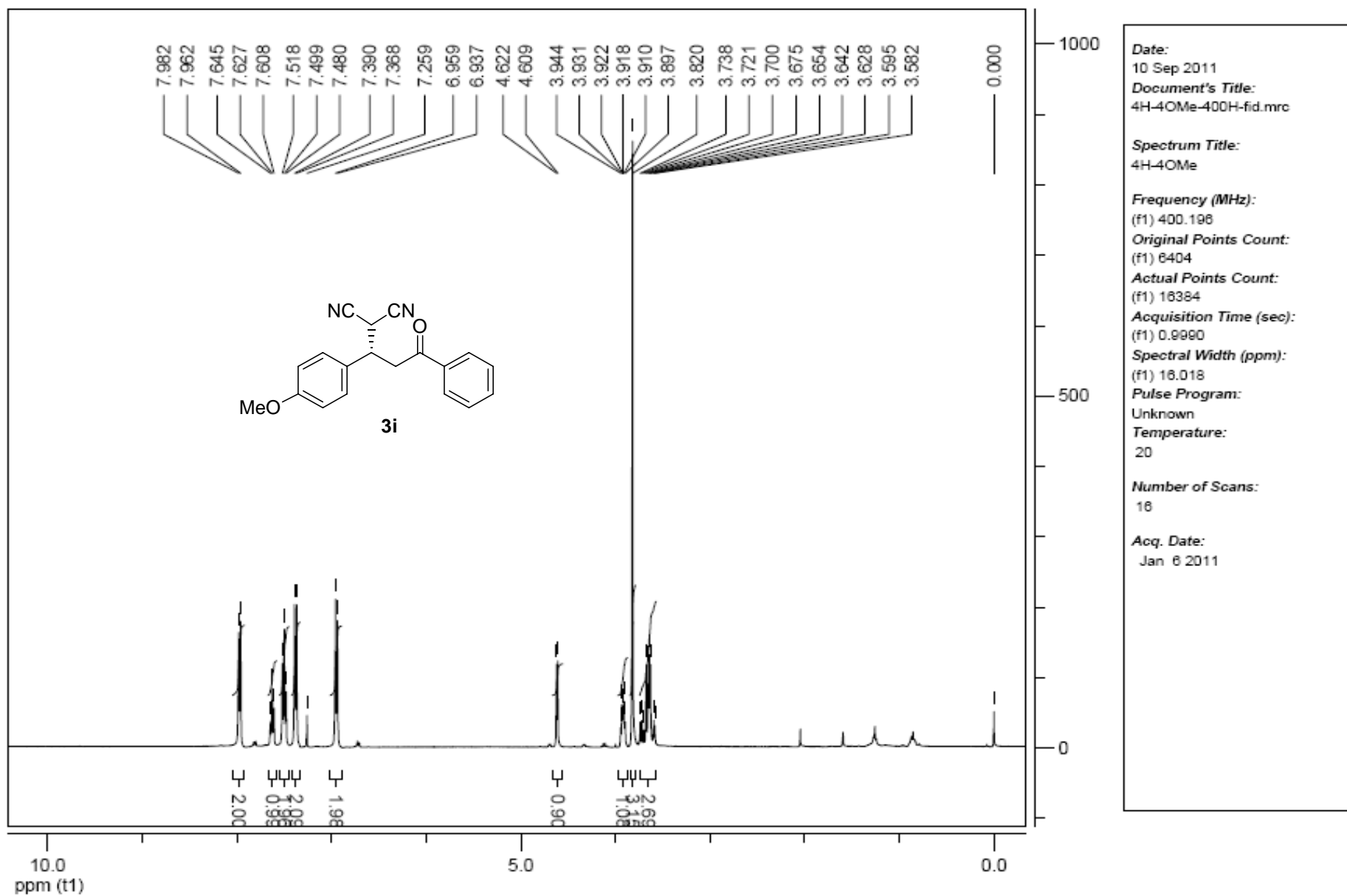
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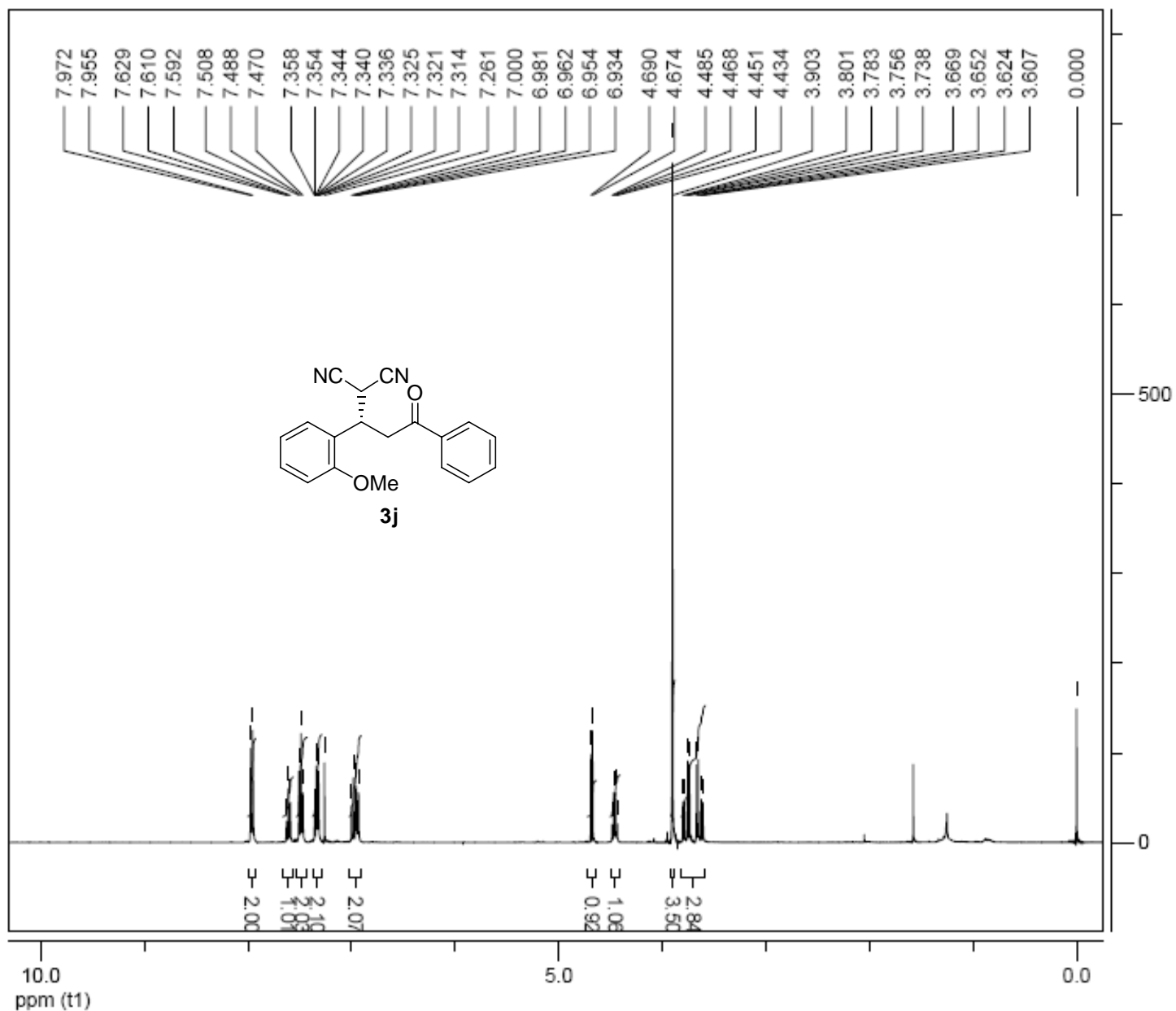
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Temperature:  
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Number of Scans:  
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Acq. Date:  
Jan 6 2011





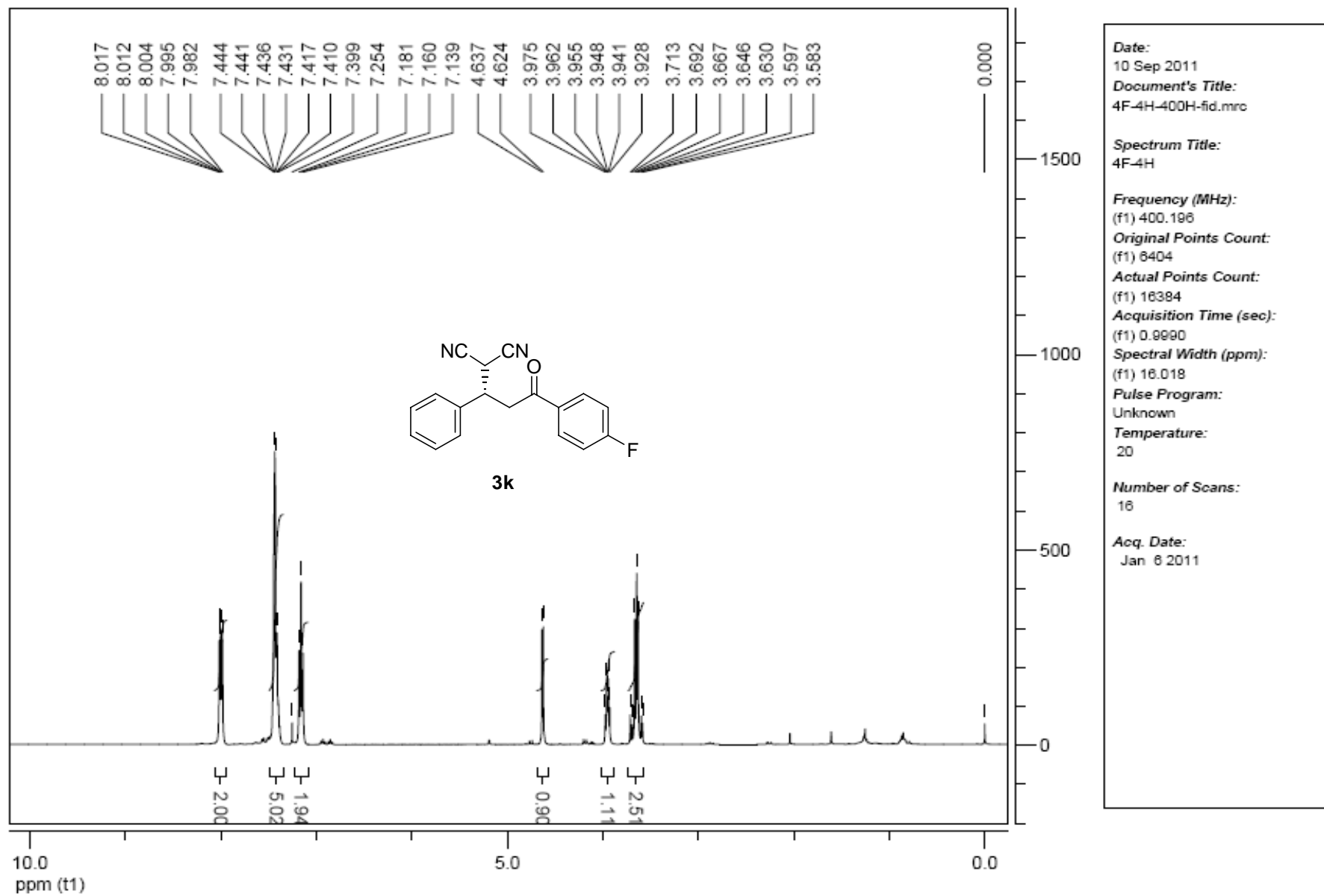
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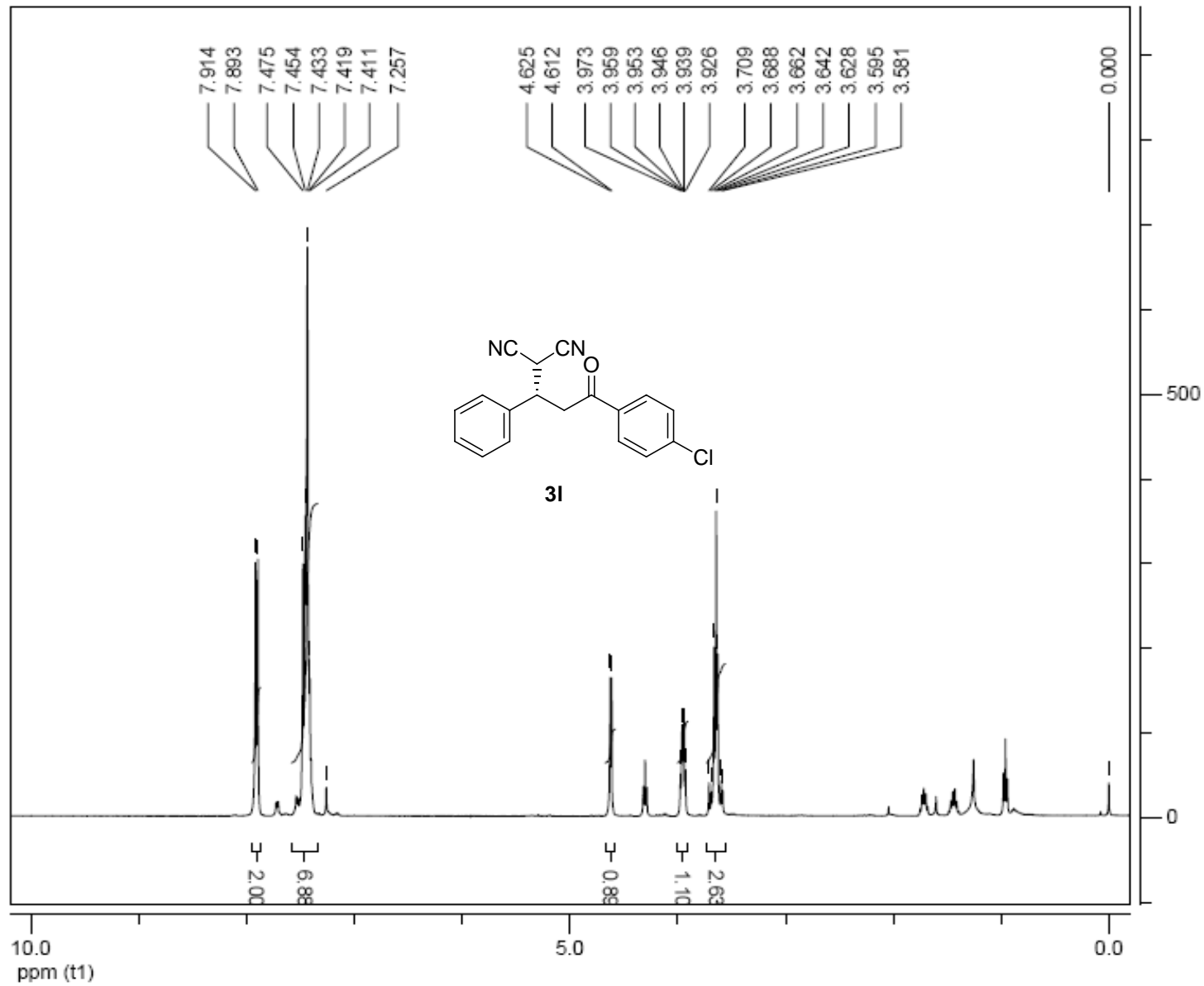
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Pulse Program:  
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Temperature:  
20

Number of Scans:  
18

Acq. Date:  
Jan 10 2011





Date:  
10 Sep 2011  
Document's Title:  
4Cl-4H-400H-fid.mrc

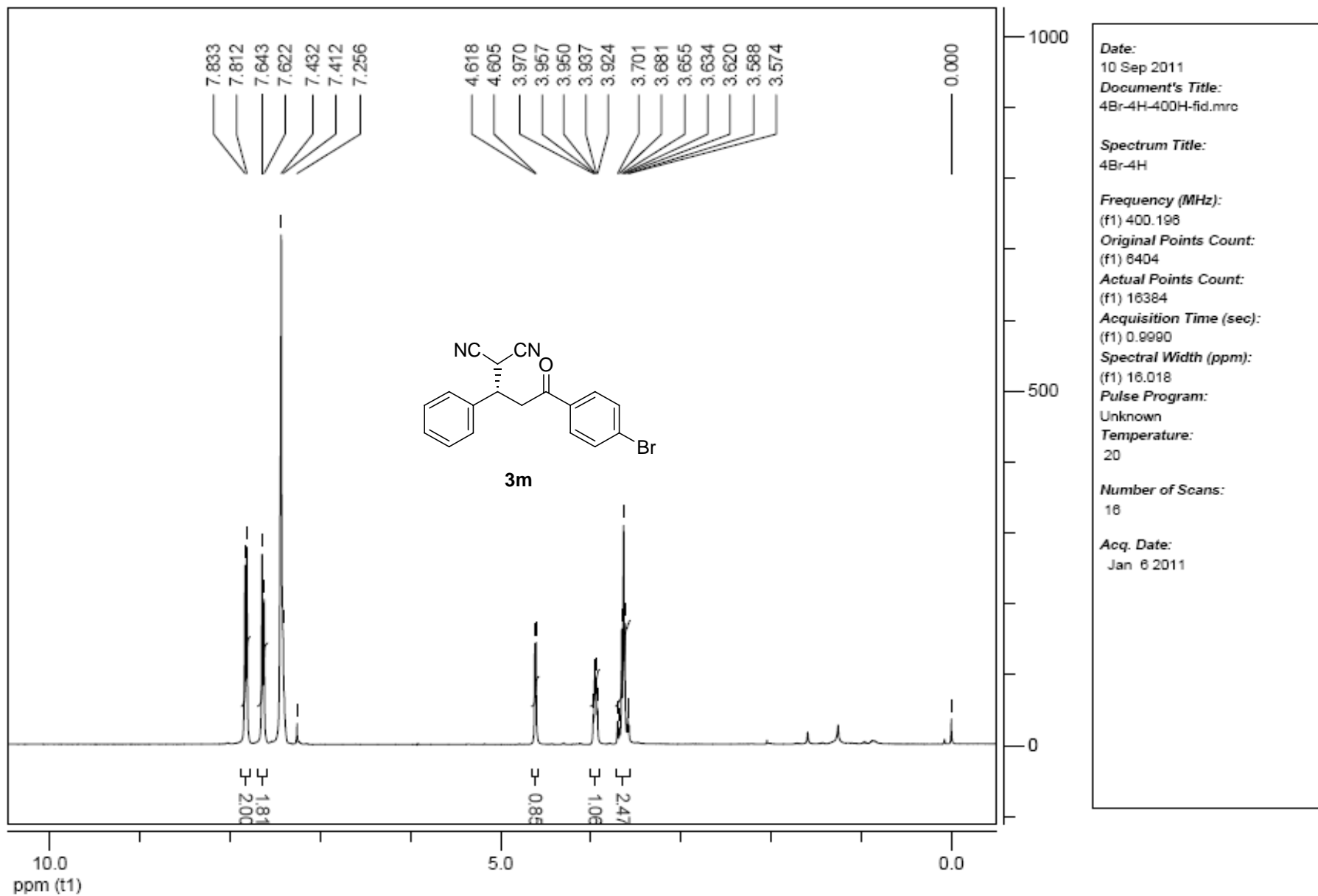
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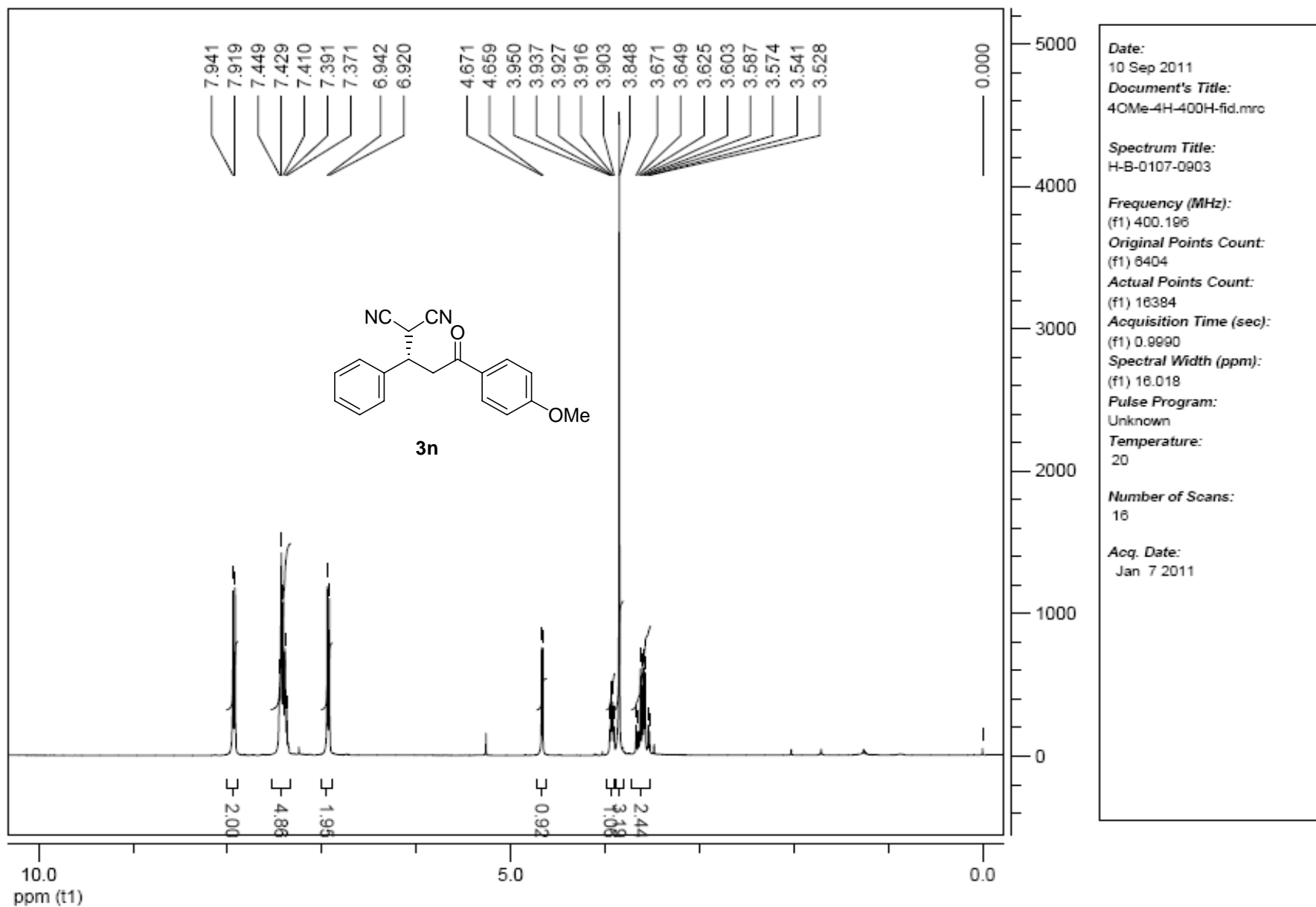
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Pulse Program:  
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Temperature:  
20

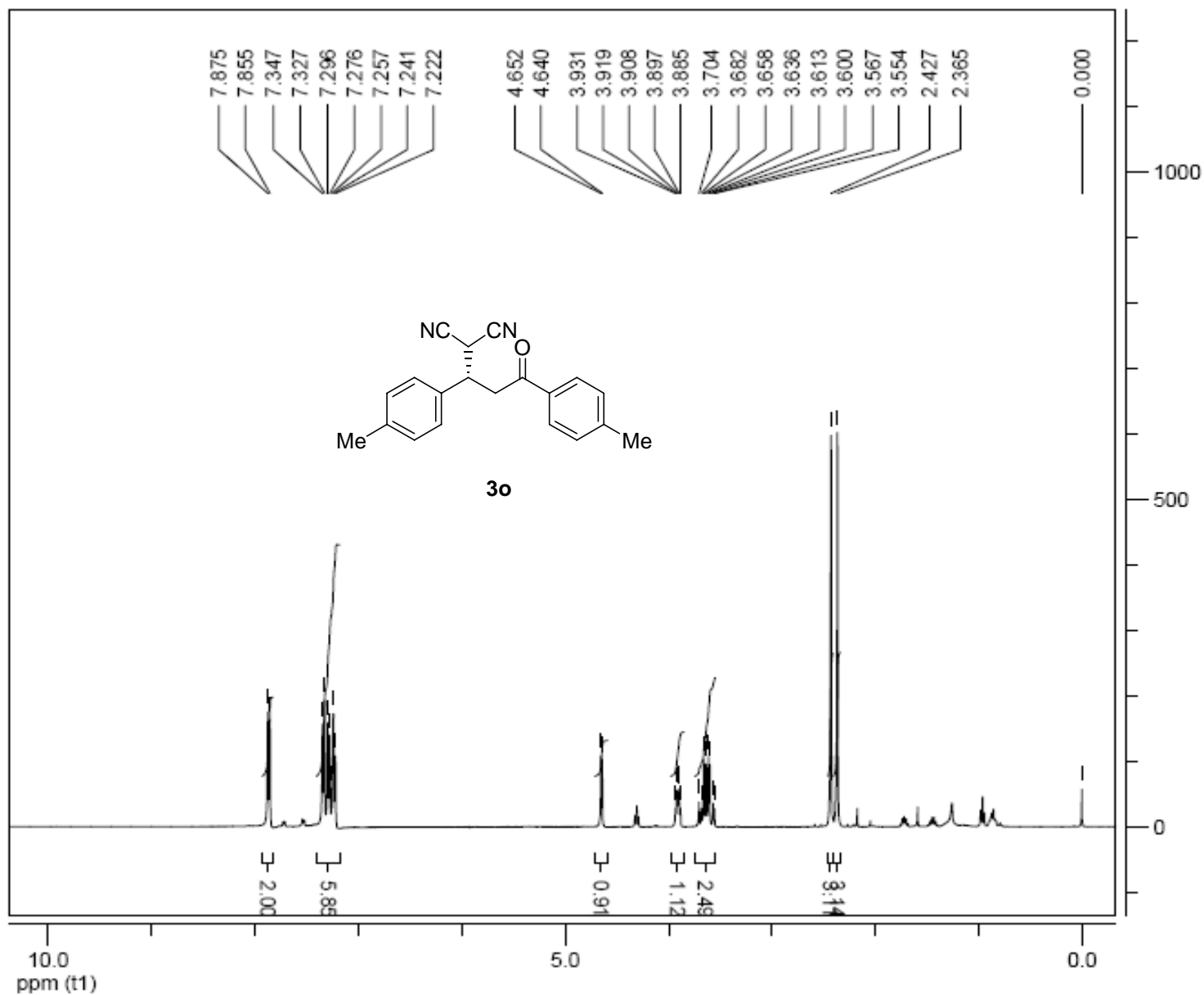
Number of Scans:  
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Acq. Date:  
Jan 6 2011









Date:  
1 Feb 2011  
Document's Title:  
4Me-4Me-400H-fid.mrc

Spectrum Title:  
4Me-4Me

Frequency (MHz):

(f1) 400.196

Original Points Count:

(f1) 6404

Actual Points Count:

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Acquisition Time (sec):

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Spectral Width (ppm):

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Pulse Program:

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Temperature:

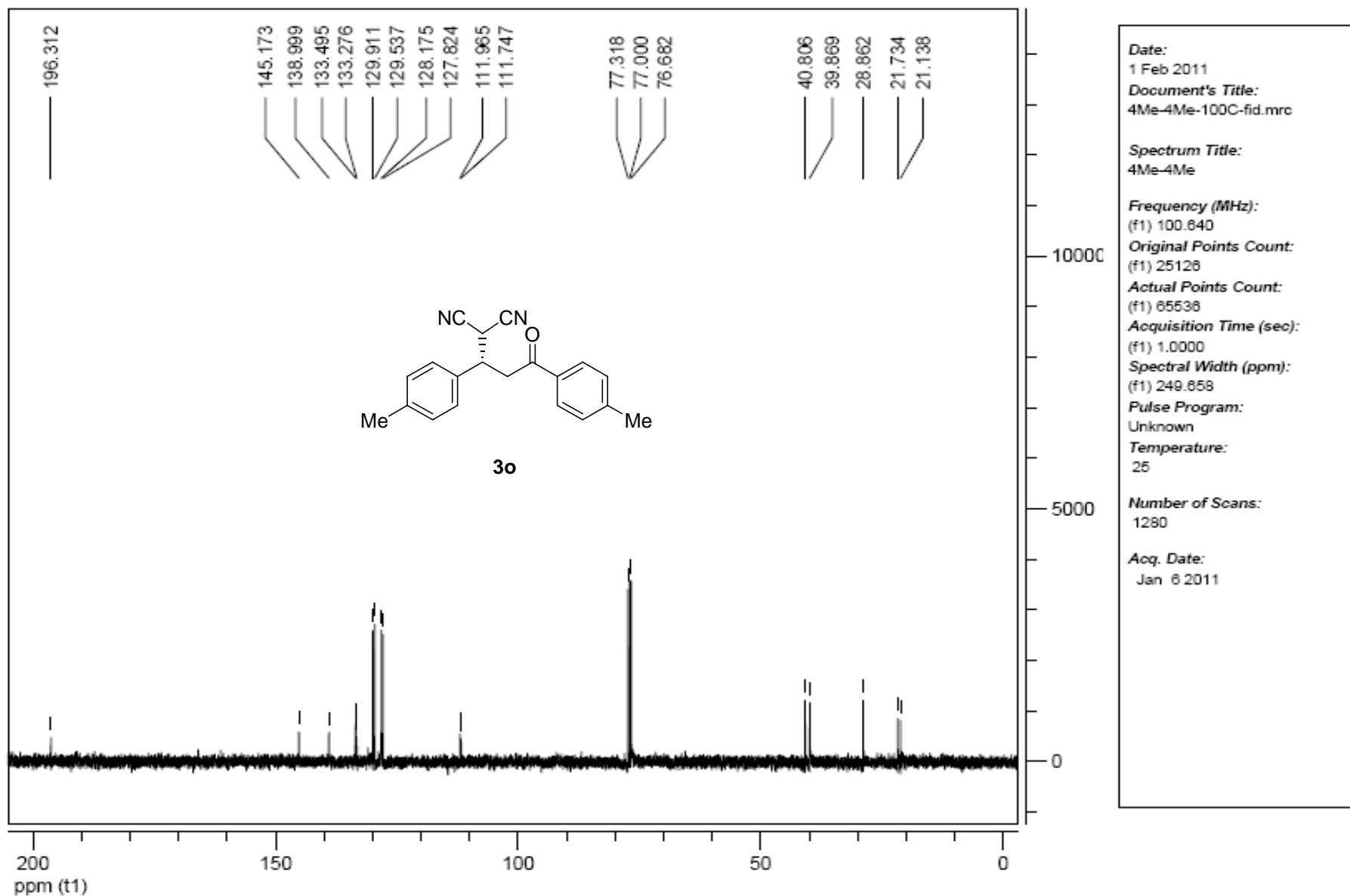
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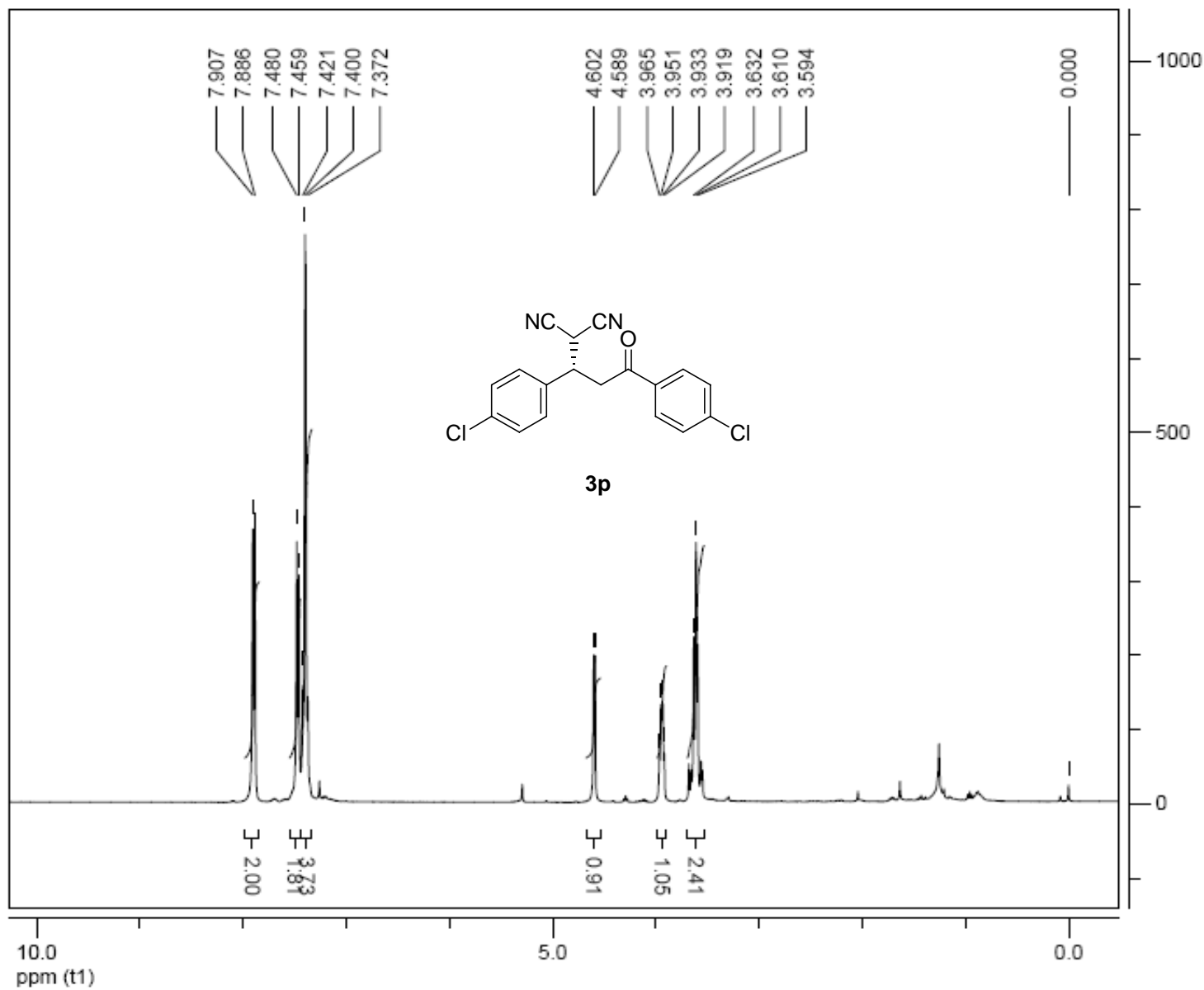
Number of Scans:

16

Acq. Date:

Jan 6 2011





**Date:**  
10 Sep 2011

**Document's Title:**  
4Cl-4Cl-YW-999-H-fid.mrc

**Spectrum Title:**  
H-B-0401-YW-999

**Frequency (MHz):**  
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**Original Points Count:**  
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**Actual Points Count:**  
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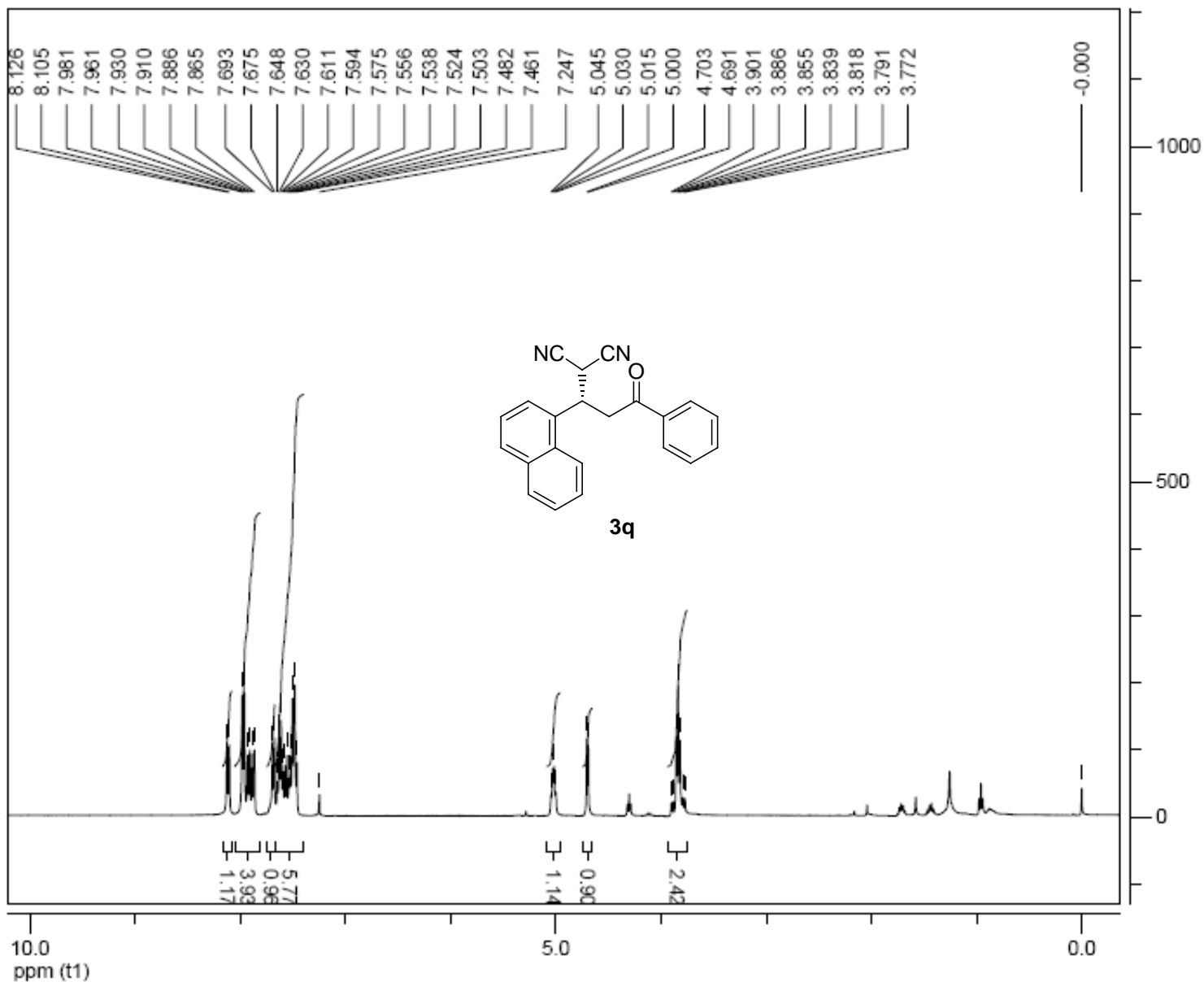
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**Temperature:**  
20

**Number of Scans:**  
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**Acq. Date:**  
Apr 1 2011



Date:  
1 Feb 2011  
Document's Title:  
4H-1Nap-400H-fid.mrc

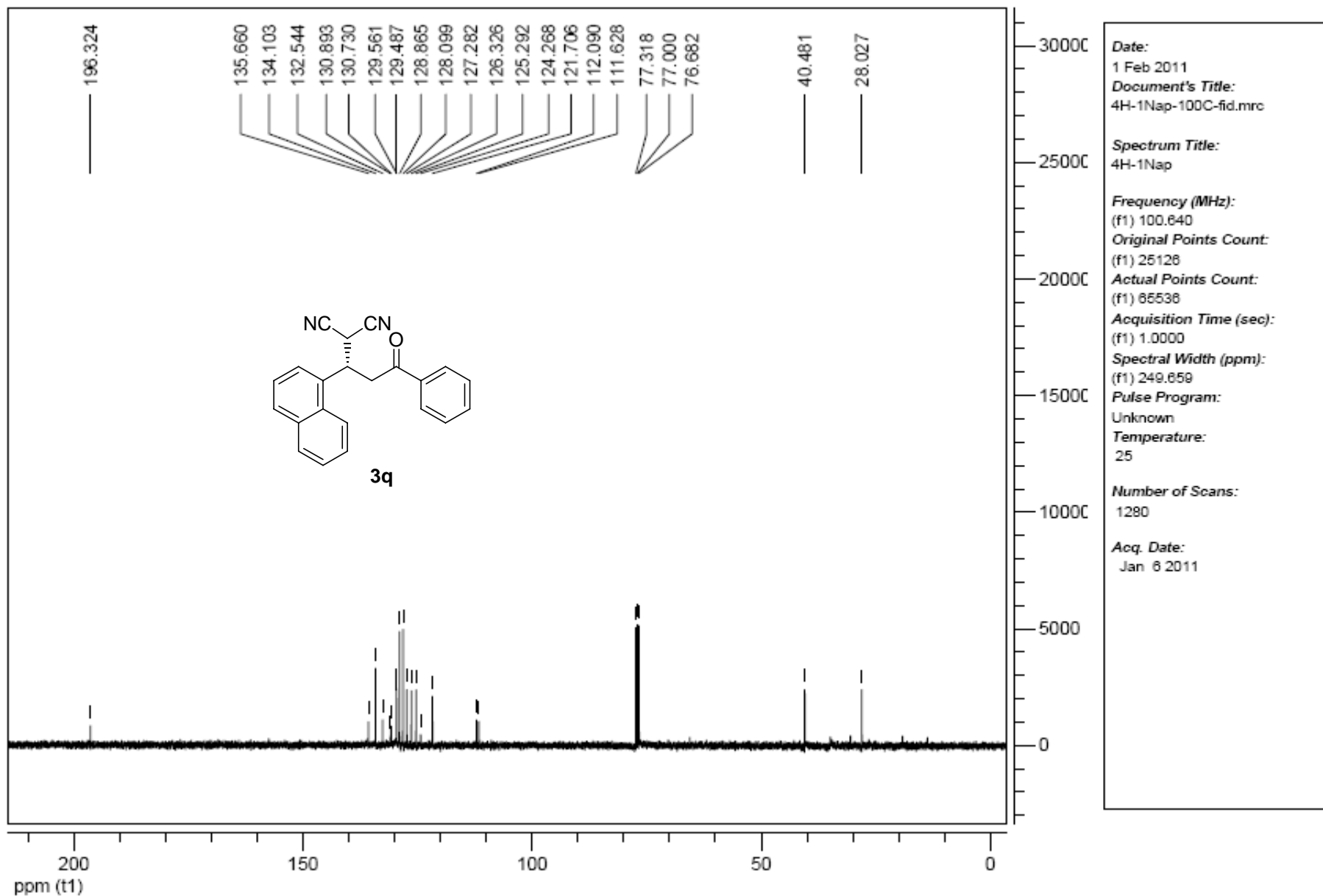
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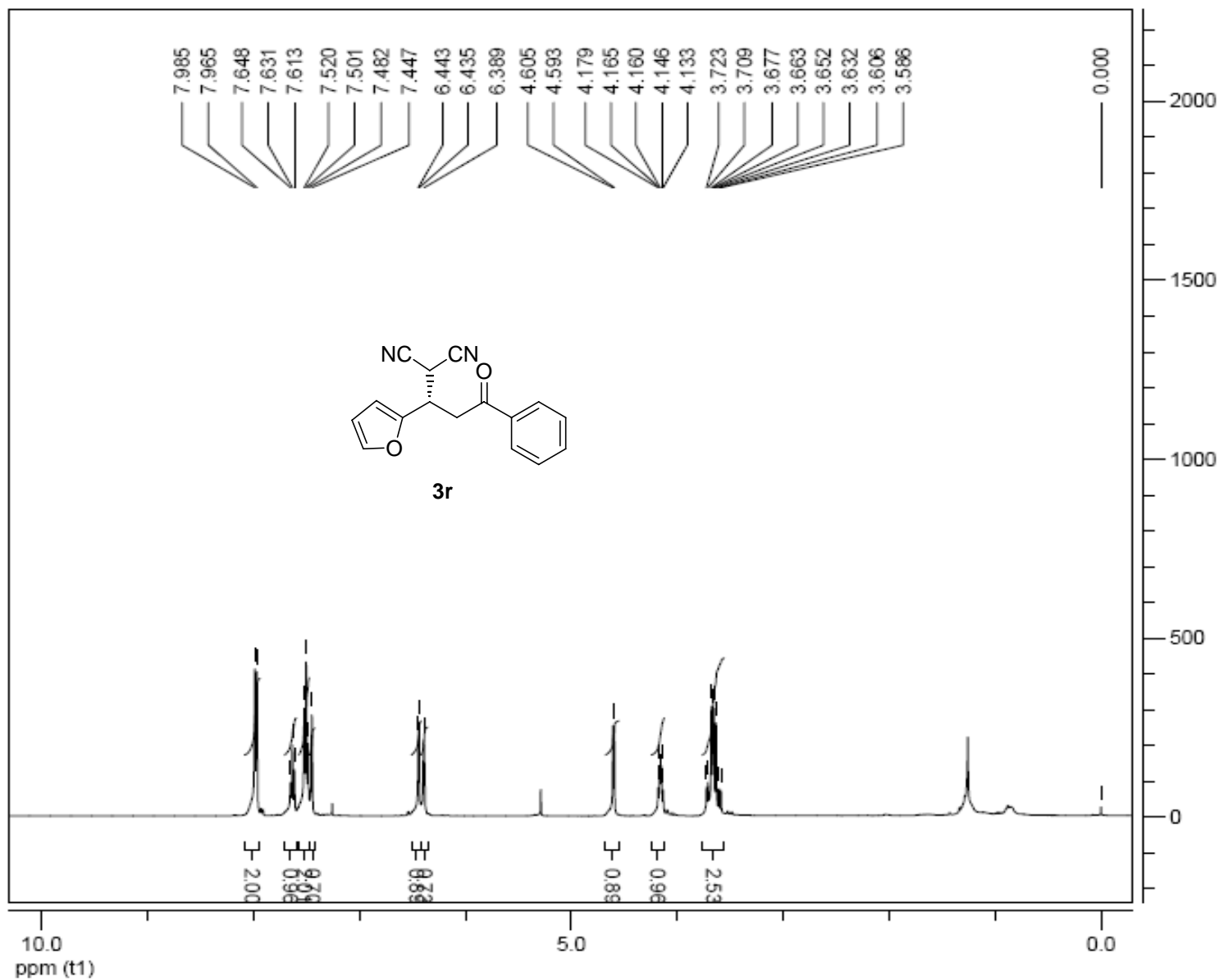
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Actual Points Count:  
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Acquisition Time (sec):  
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Spectral Width (ppm):  
(f1) 16.018  
Pulse Program:  
Unknown  
Temperature:  
20

Number of Scans:  
18

Acq. Date:  
Jan 6 2011





Date:  
4 Feb 2011  
Document's Title:  
4H-2furan-400H-fid.mrc

Spectrum Title:  
H-B-0107-0923

Frequency (MHz):

(f1) 400.196

Original Points Count:

(f1) 6404

Actual Points Count:

(f1) 16394

Acquisition Time (sec):

(f1) 0.9990

Spectral Width (ppm):

(f1) 16.018

Pulse Program:

Unknown

Temperature:

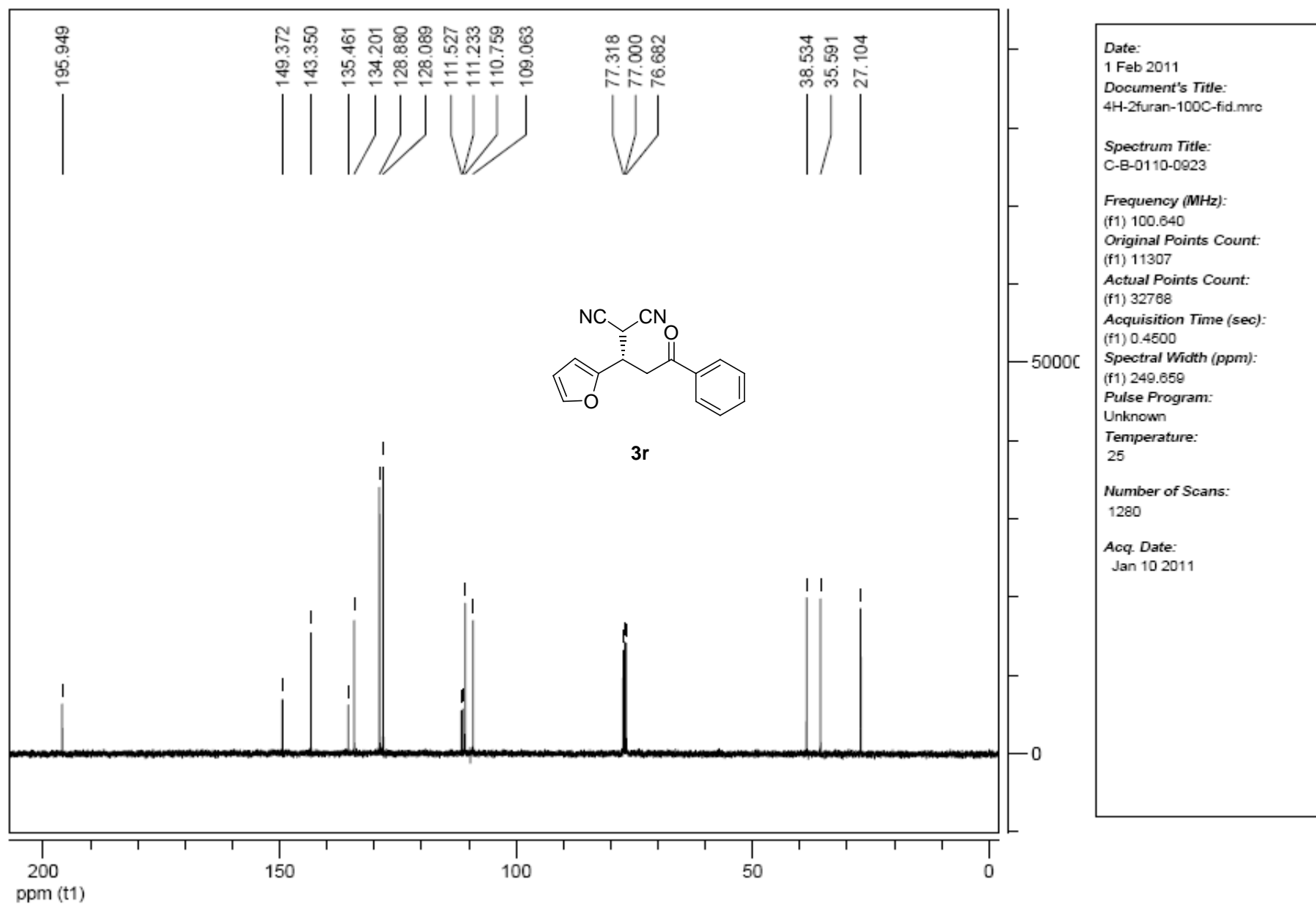
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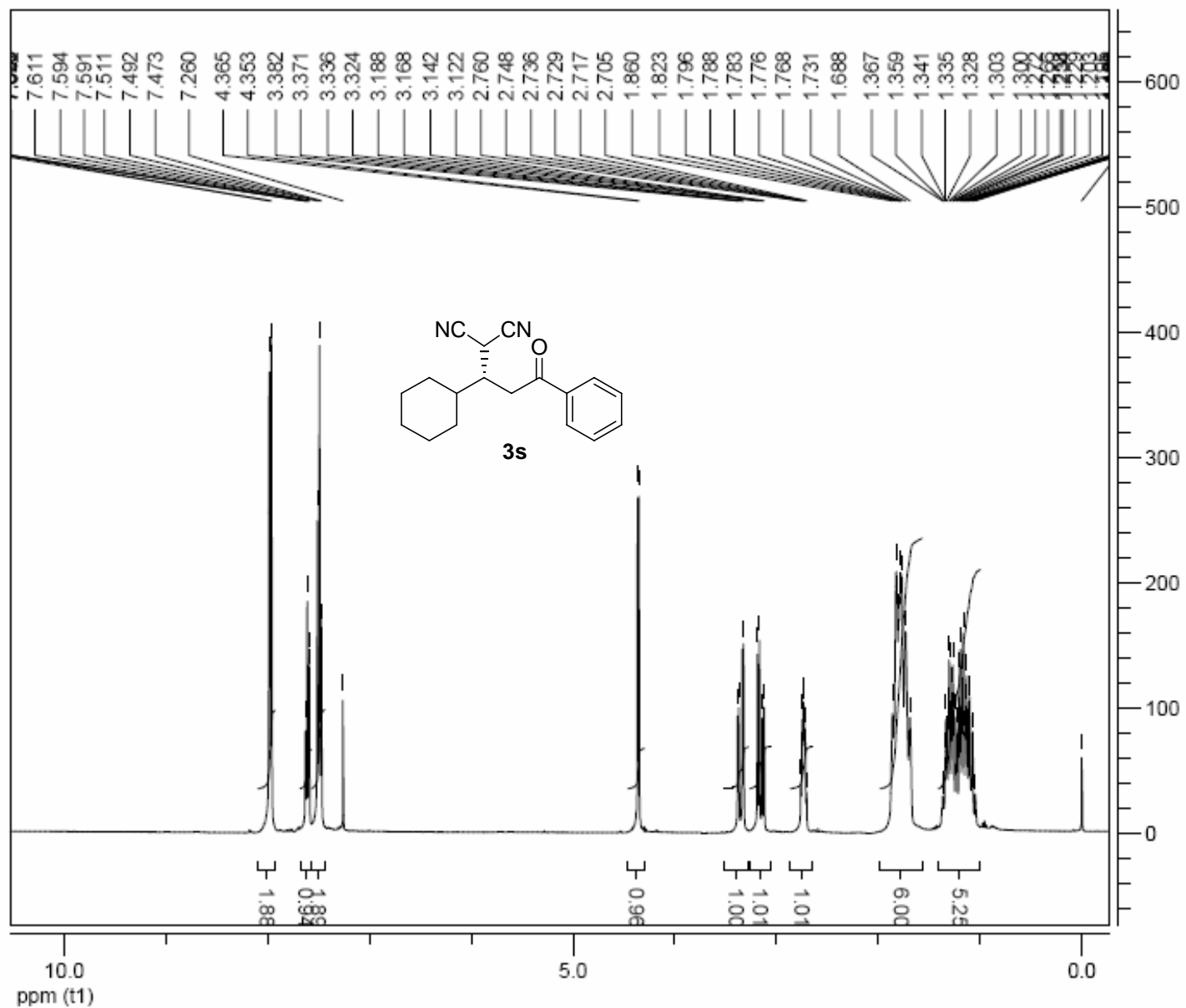
Number of Scans:

16

Acq. Date:

Jan 7 2011





**Date:**  
24 Sep 2011

**Document's Title:**  
4H-cyclohexyl-400M-H-JYY-83-fid.mrc

**Spectrum Title:**  
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**Frequency (MHz):**  
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**Original Points Count:**  
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**Actual Points Count:**  
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**Acquisition Time (sec):**  
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**Spectral Width (ppm):**  
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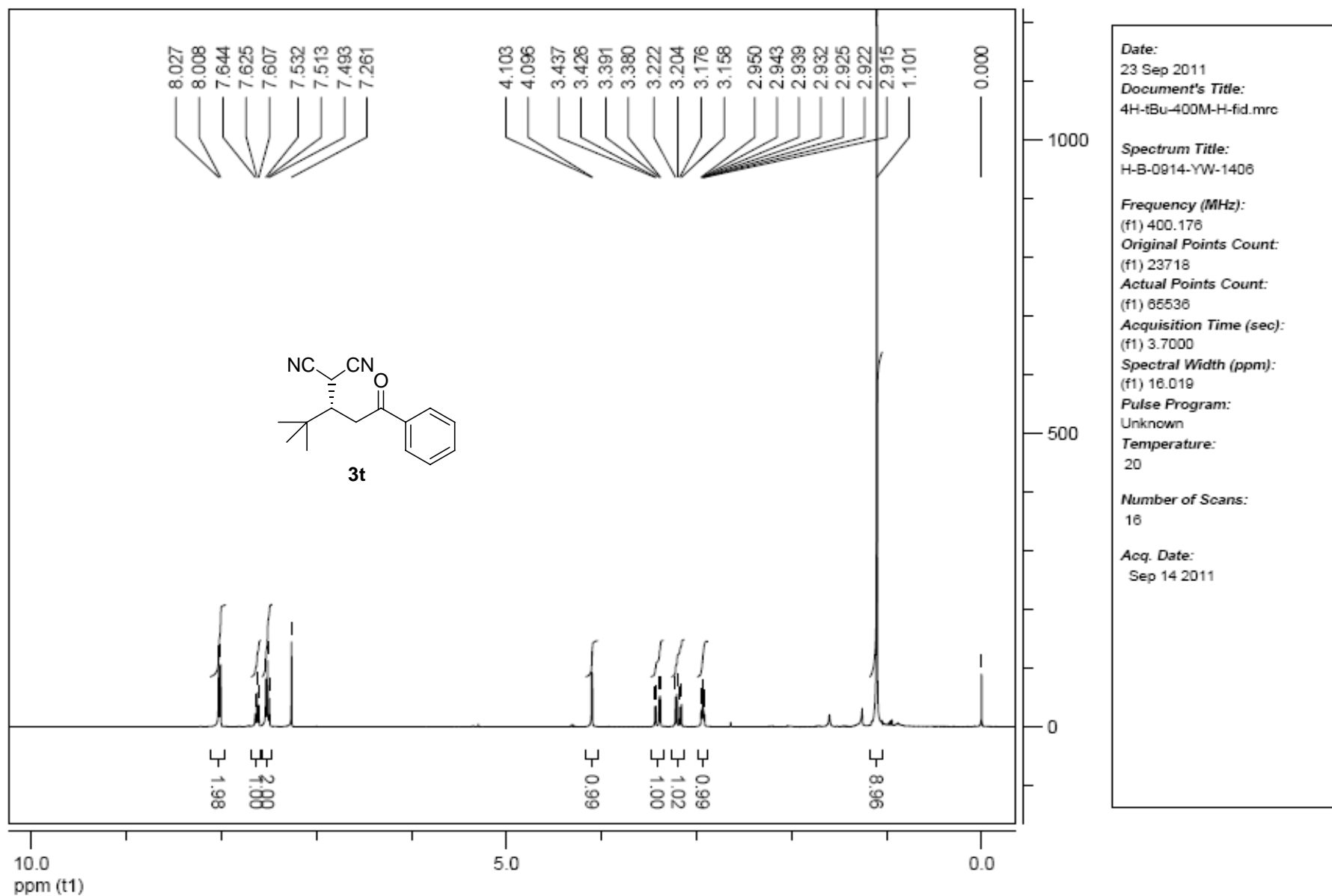
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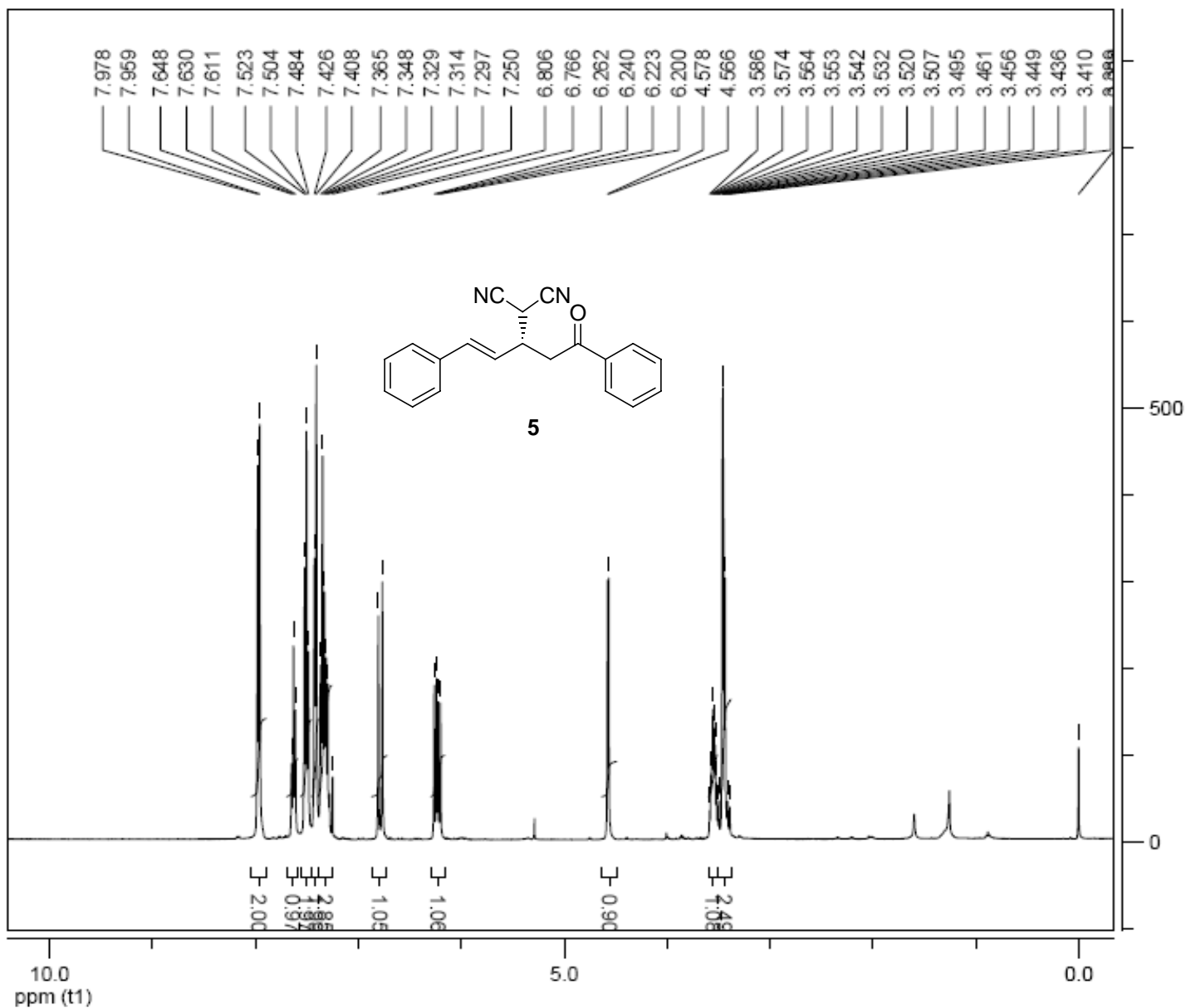
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**Number of Scans:**  
16

**Acq. Date:**  
Sep 22 2011



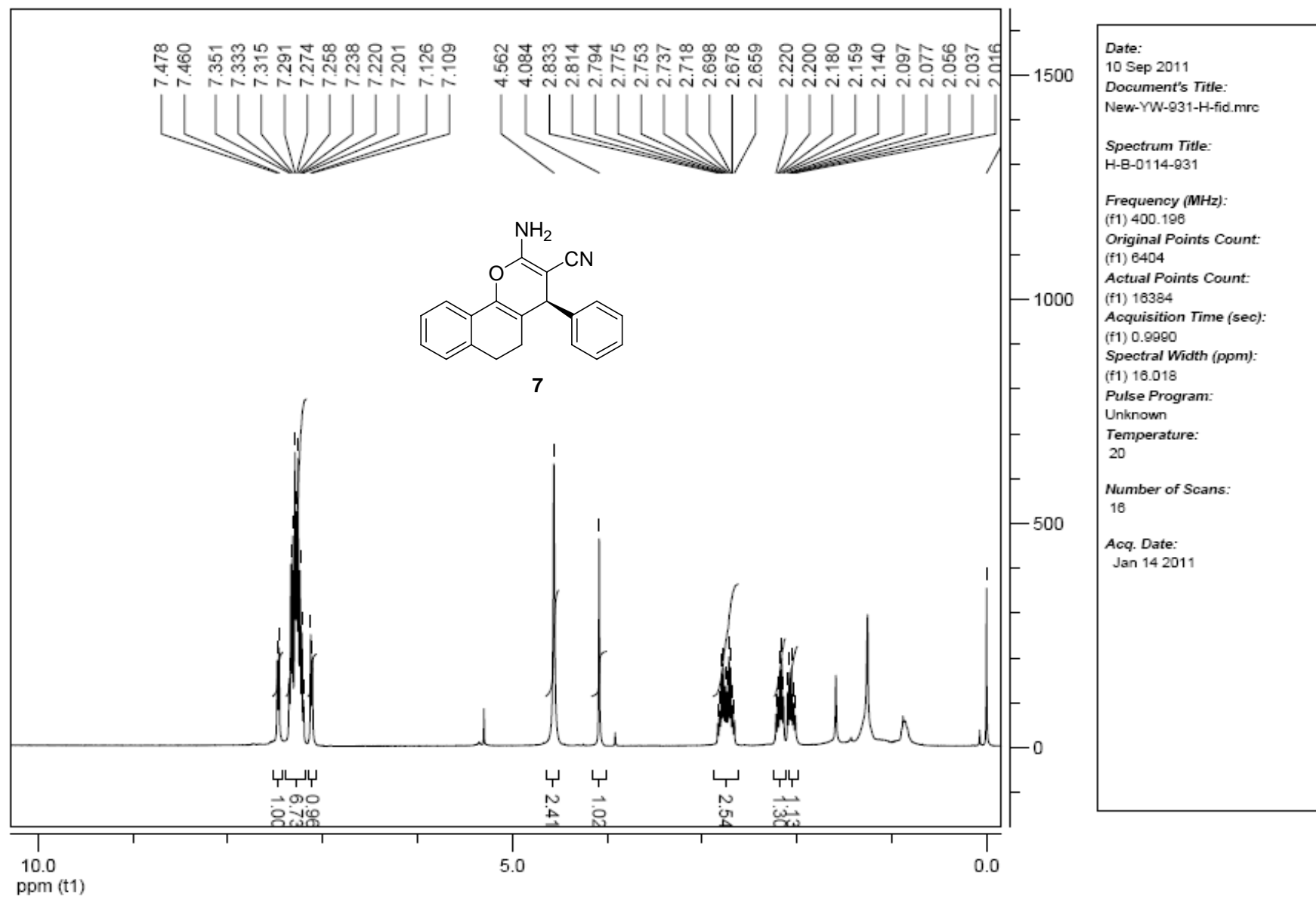




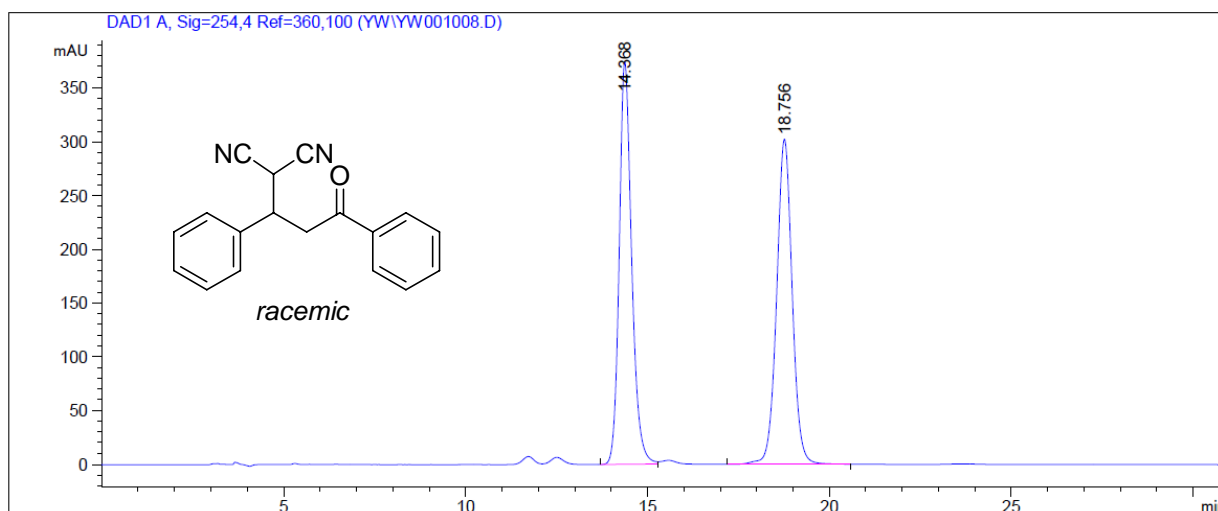
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10 Sep 2011  
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Spectrum Title:  
H-B-0114-930

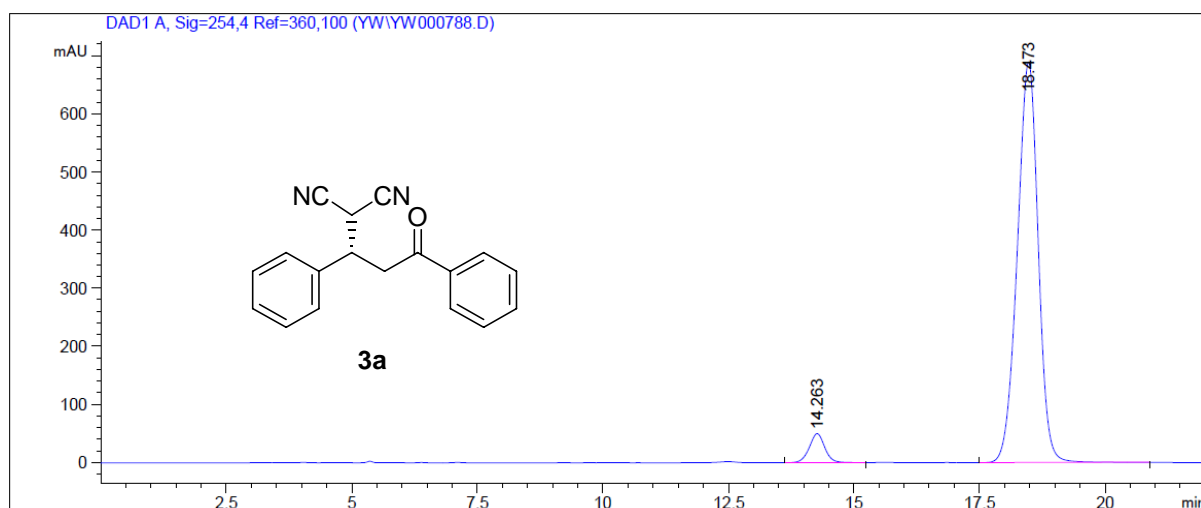
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Spectral Width (ppm):  
(f1) 16.018  
Pulse Program:  
Unknown  
Temperature:  
20  
Number of Scans:  
16  
Acq. Date:  
Jan 14 2011



**(S)-2-(3-Oxo-1,3-diphenylpropyl)malononitrile (3a)**

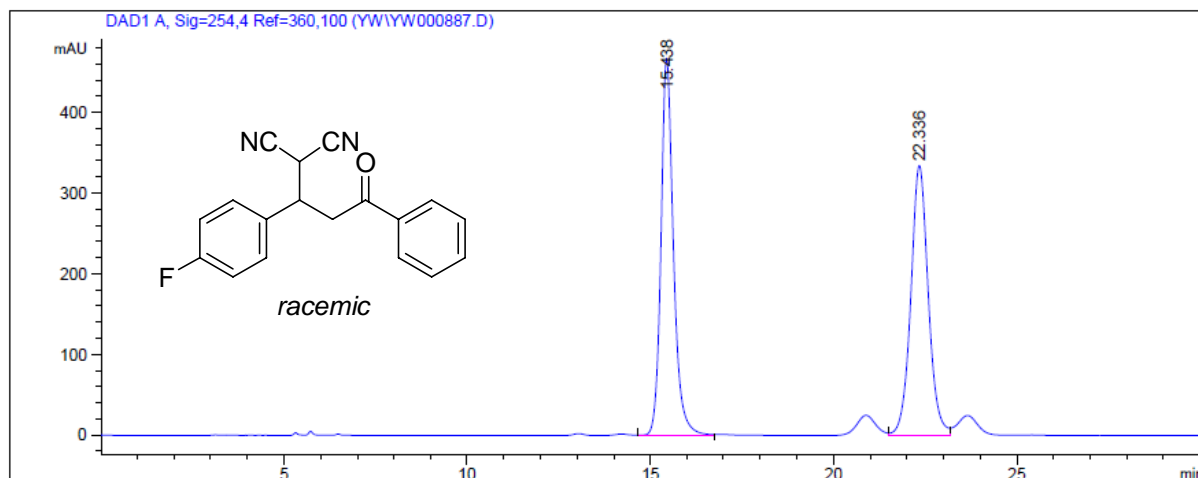


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1	14.368	BV	0.3574	8912.15430	374.83420	49.7349
2	18.756	BB	0.4555	9007.14551	302.40970	50.2651

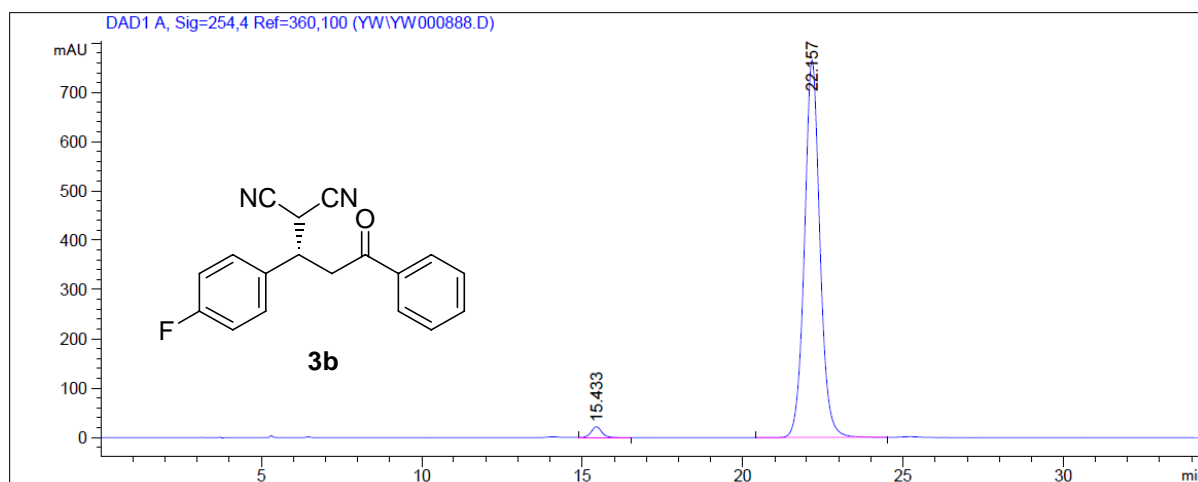


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	14.263	BB	0.3264	1082.52502	50.02990	5.1462
2	18.473	BB	0.4457	1.99527e4	689.30444	94.8538

**(S)-2-[1-(4-Fluorophenyl)-3-oxo-3-phenylpropyl]malononitrile (3b)**

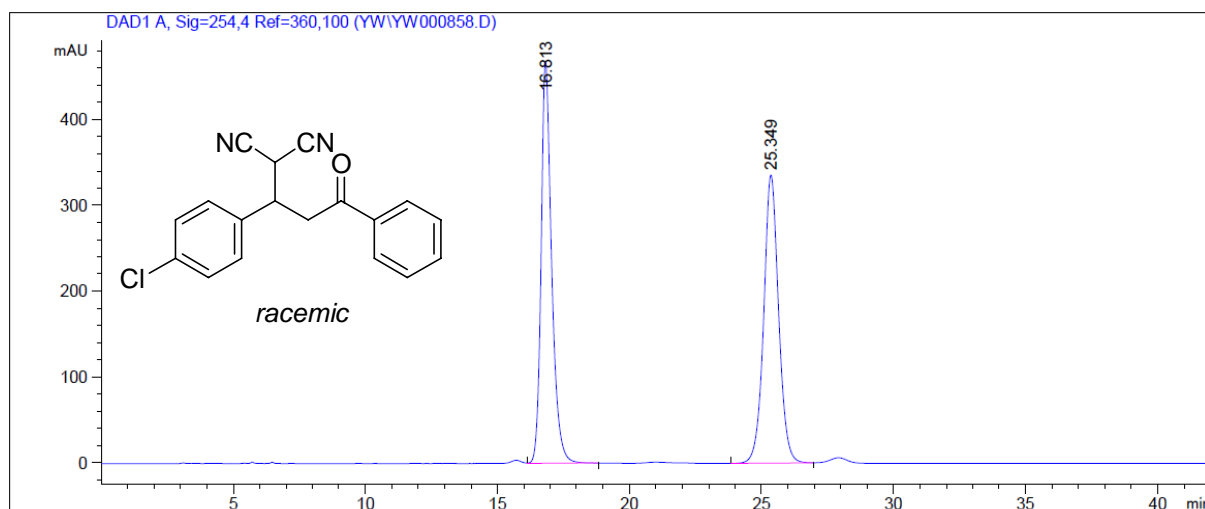


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1	15.438	VV	0.3547	1.10895e4	467.62329	49.9906
2	22.336	VV	0.4988	1.10937e4	334.64383	50.0094

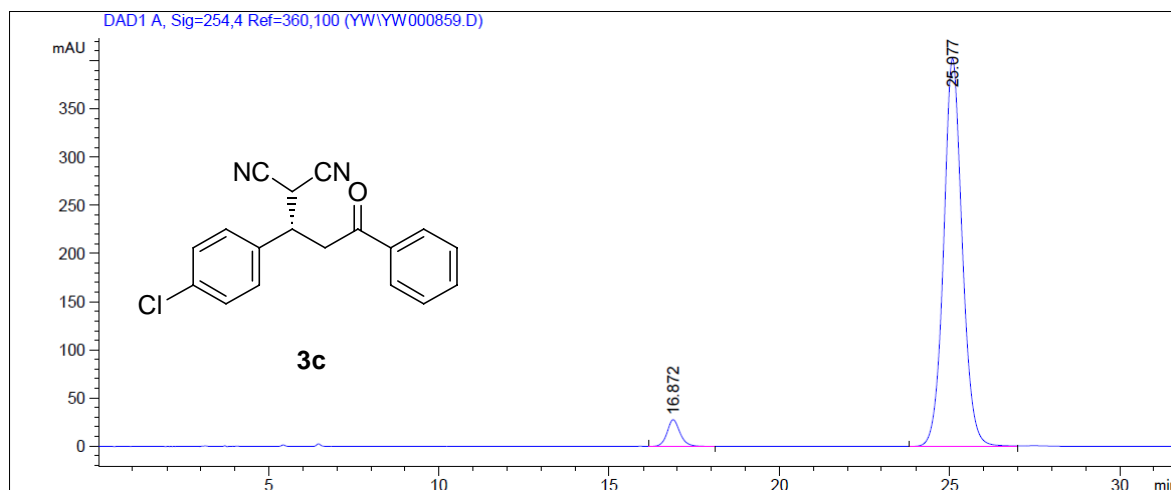


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1	15.433	VB	0.3506	517.31329	22.13981	1.9734
2	22.157	BB	0.5099	2.56977e4	765.07239	98.0266

**(S)-2-[1-(4-Chlorophenyl)-3-oxo-3-phenylpropyl]malononitrile (3c)**

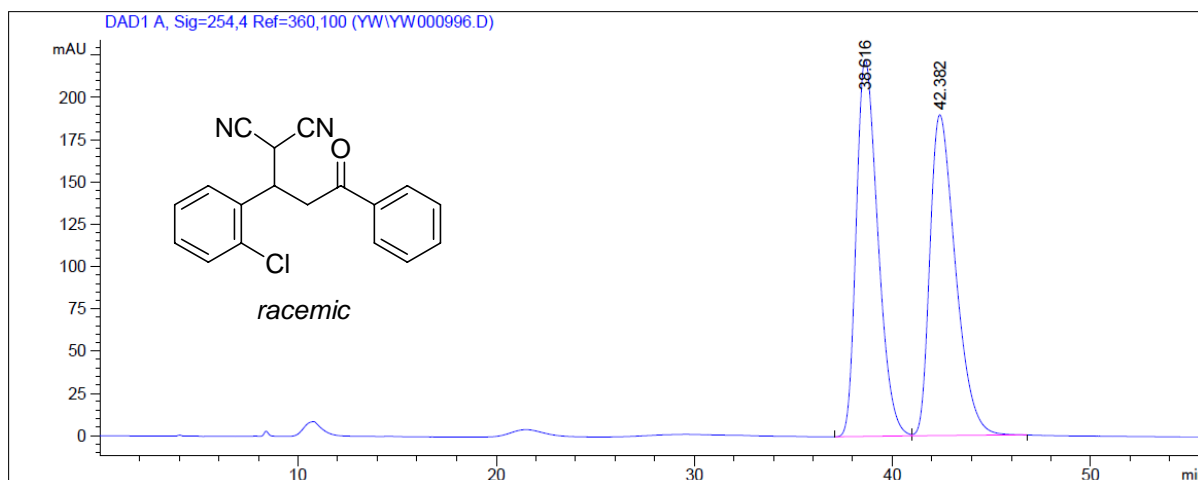


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1	16.813	VB	0.4078	1.29234e4	468.53159	49.4501
2	25.349	BV	0.5907	1.32108e4	336.00107	50.5499

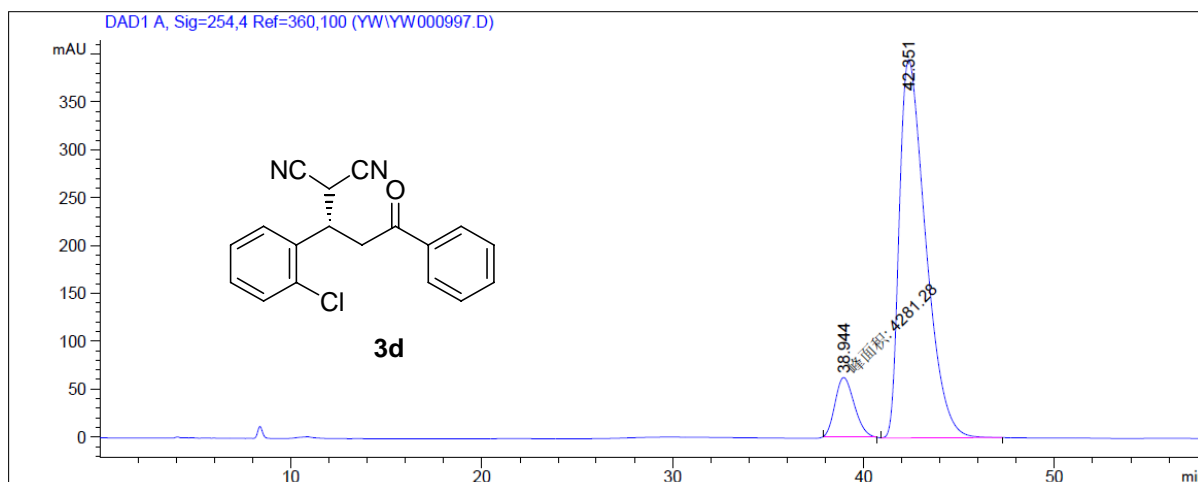


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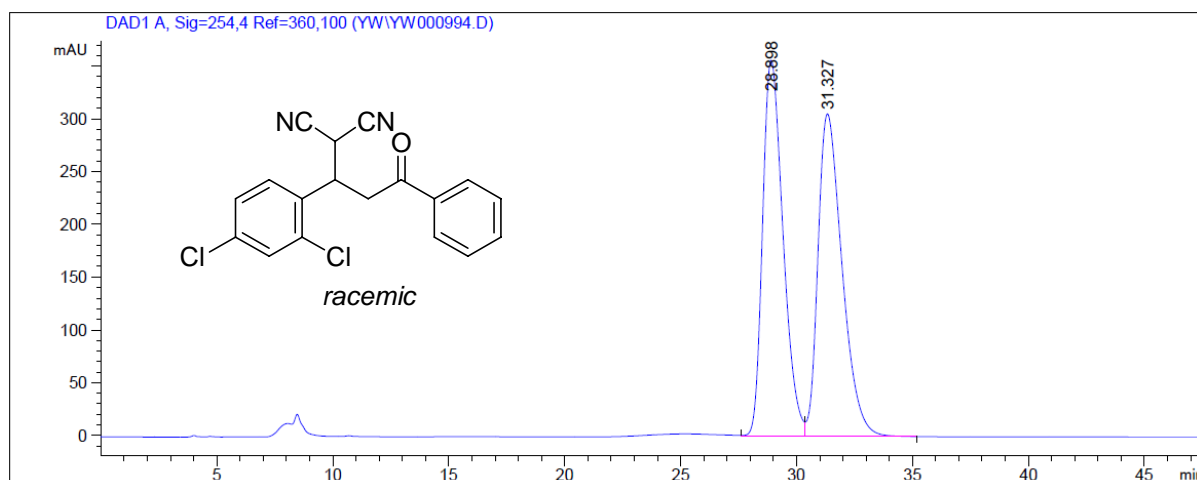


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1	38.616	BV	1.1753	1.69347e4	223.16640	49.7605
2	42.382	VB	1.3975	1.70977e4	190.06827	50.2395

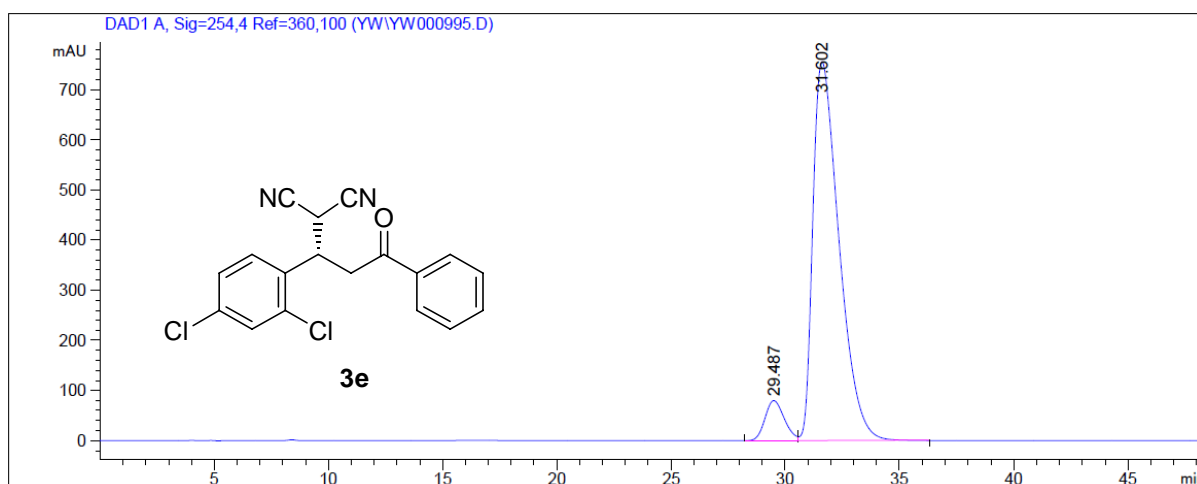


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1	38.944	MM	1.1534	4281.28418	61.86706	10.1447
2	42.351	VB	1.4692	3.79208e4	395.28488	89.8553

**(S)-2-[1-(2,4-Dichlorophenyl)-3-oxo-3-phenylpropyl]malononitrile (3e)**



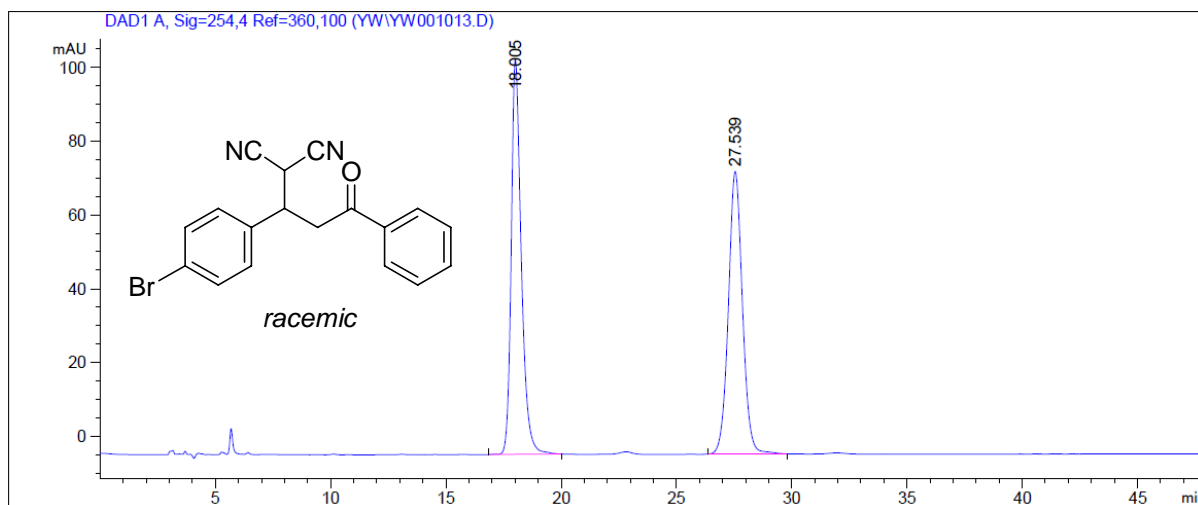
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1	28.898	VV	0.9508	2.19176e4	356.72403	49.7169
2	31.327	VB	1.1093	2.21672e4	305.93655	50.2831



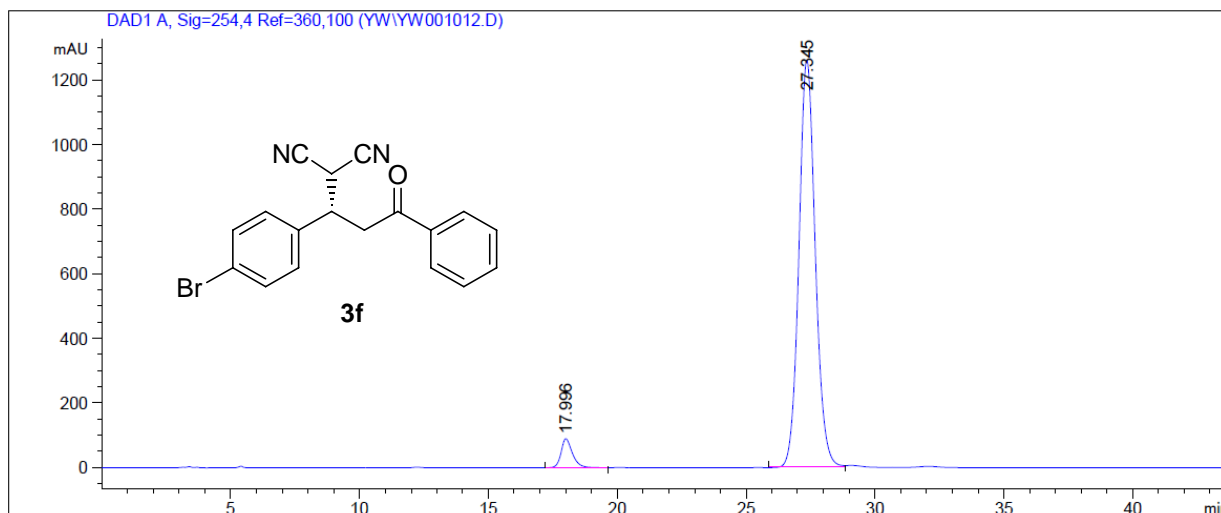
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峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	29.487	BV	0.9075	4695.04443	79.91061	7.2345
2	31.602	VB	1.2253	6.02033e4	755.82147	92.7655



**(S)-2-[1-(4-Bromophenyl)-3-oxo-3-phenylpropyl]malononitrile (3f)**

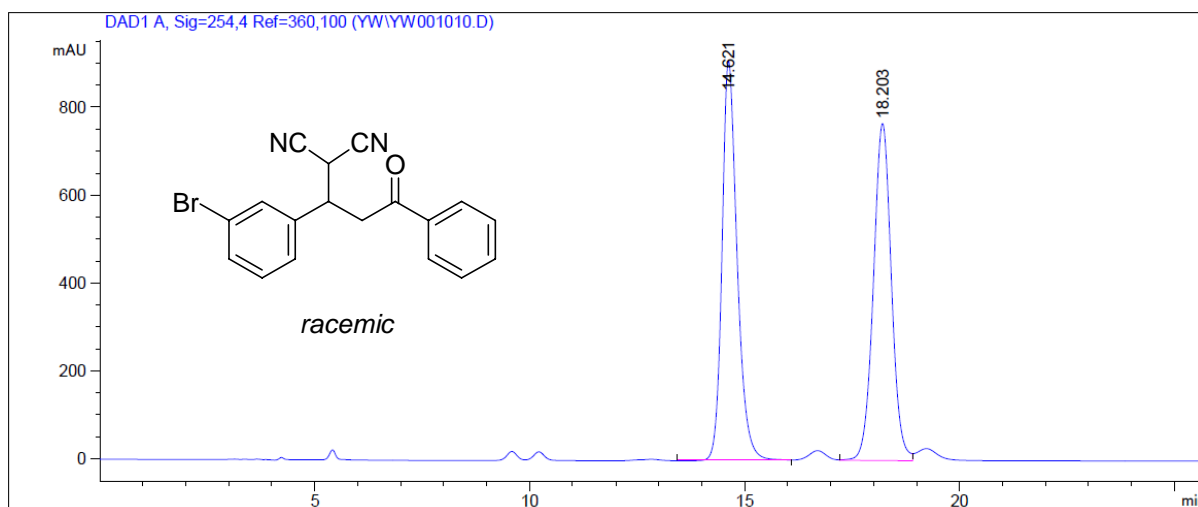


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	18.005	BB	0.4517	3243.17505	106.96651	49.9554
2	27.539	BB	0.6469	3248.96851	76.59796	50.0446

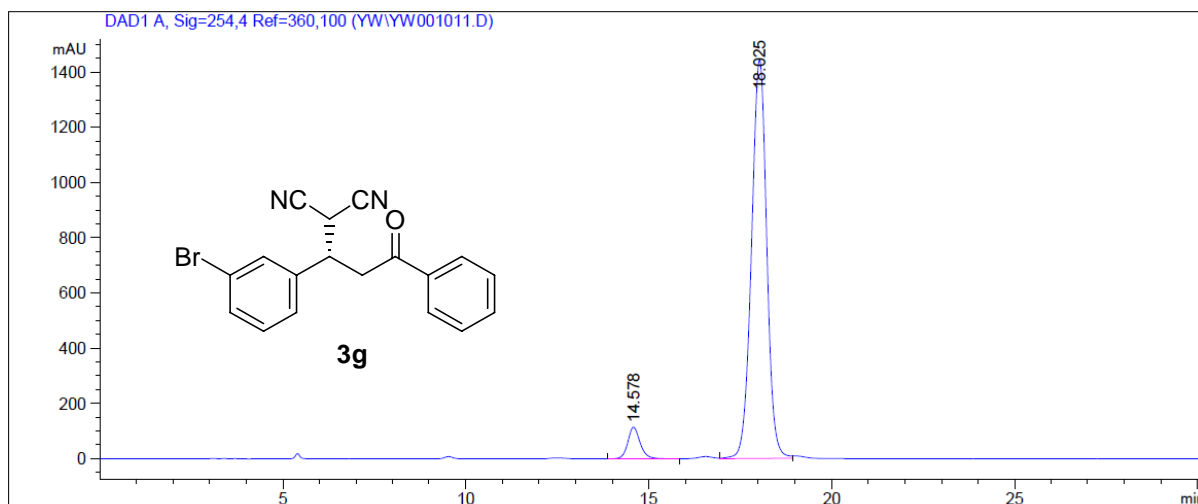


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	17.996	BB	0.4553	2748.38550	89.74360	4.6914
2	27.345	VV	0.6782	5.58356e4	1262.02600	95.3086

**(S)-2-[1-(3-Bromophenyl)-3-oxo-3-phenylpropyl]malononitrile (3g)**

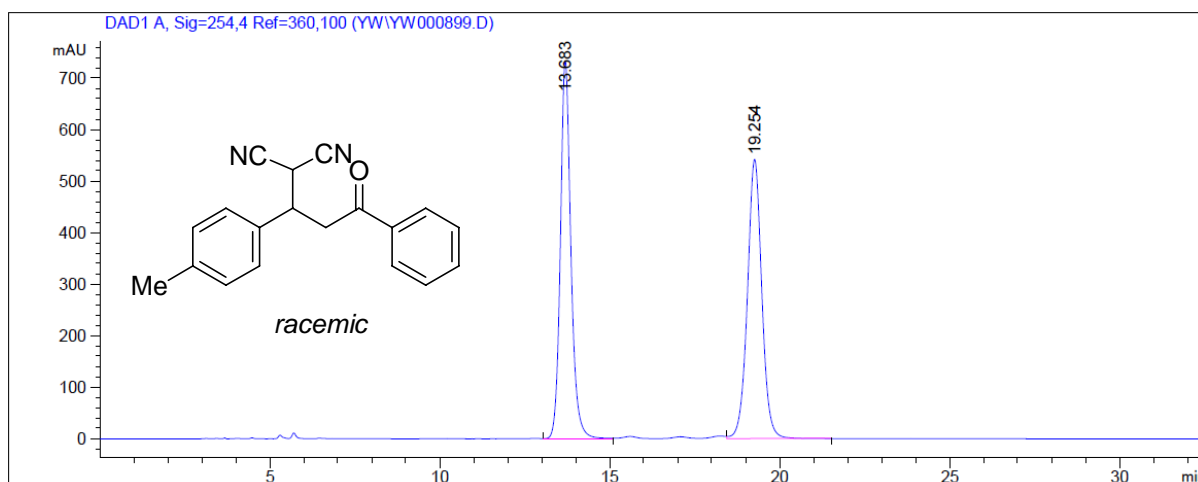


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峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	14.621	VV	0.3682	2.23172e4	909.63275	50.0059
2	18.203	VV	0.4474	2.23120e4	767.03943	49.9941

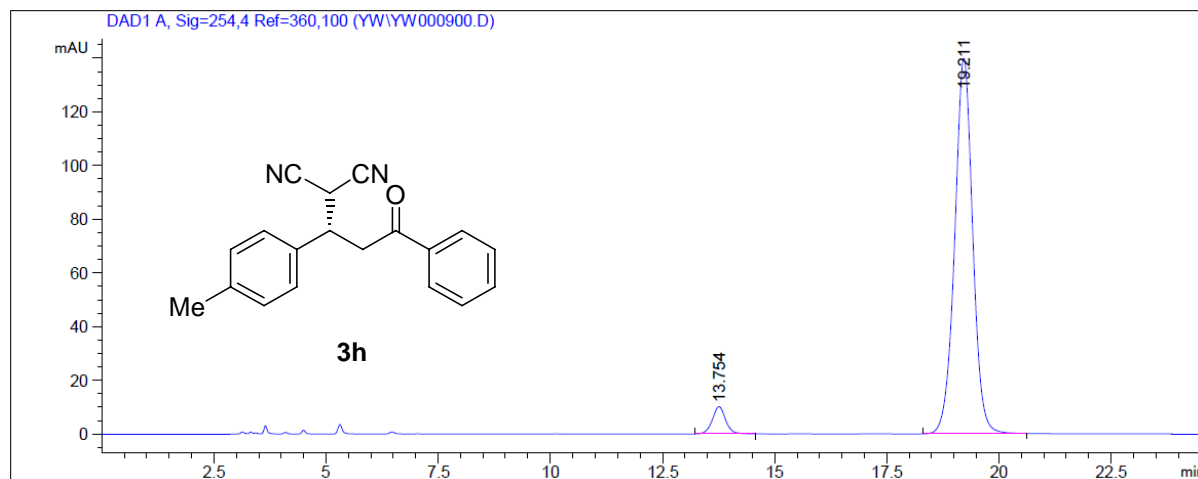


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	14.578	VB	0.3536	2684.62036	114.46403	6.0156
2	18.025	VV	0.4487	4.19433e4	1444.64233	93.9844

**(S)-2-[1-(4-Methylphenyl)-3-oxo-3-phenylpropyl]malononitrile (3h)**

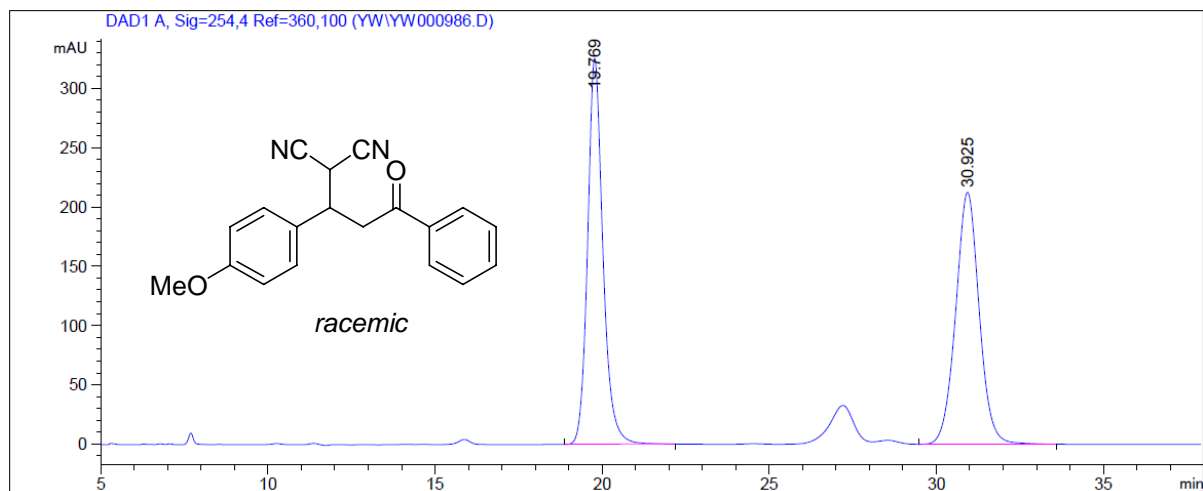


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	13.683	VV	0.3230	1.58015e4	734.41718	49.7132
2	19.254	VB	0.4479	1.59838e4	542.17102	50.2868

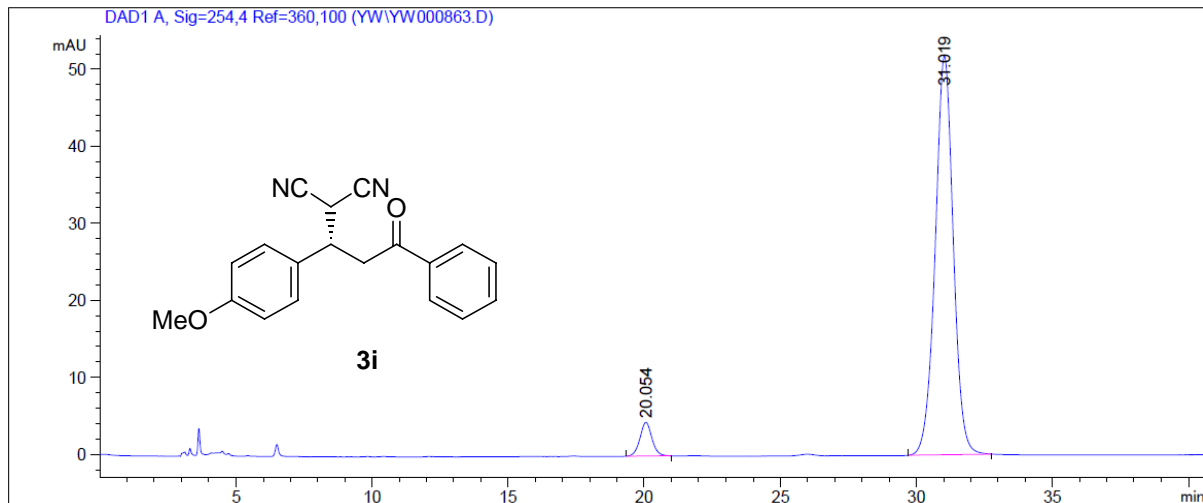


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	13.754	BB	0.3140	211.27029	10.18671	5.1216
2	19.211	BB	0.4265	3913.80225	139.83768	94.8784

**(S)-2-[1-(4-Methoxyphenyl)-3-oxo-3-phenylpropyl]malononitrile (3i)**

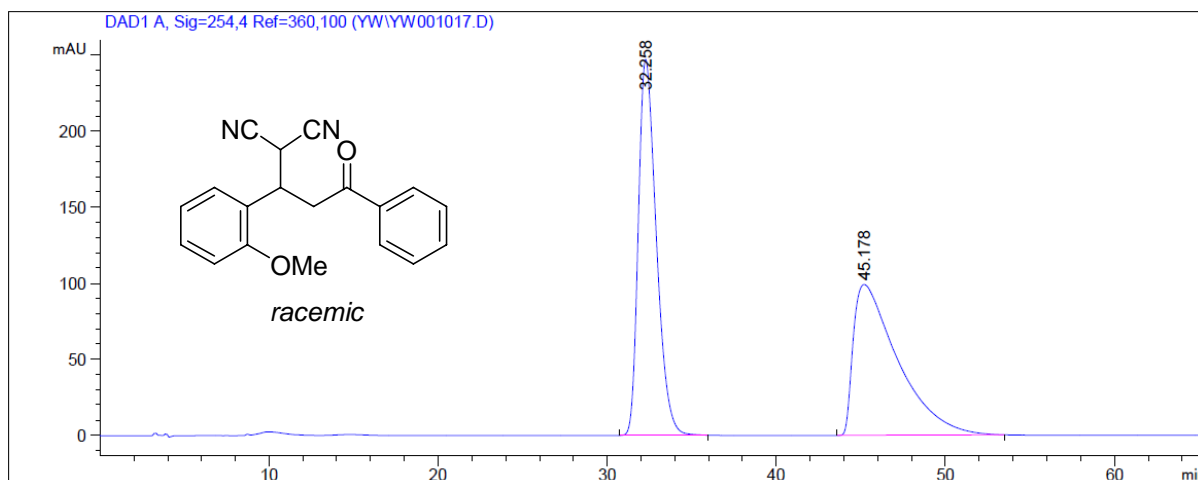


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	19.769	VB	0.4786	1.04006e4	325.64334	49.9366
2	30.925	VB	0.7441	1.04270e4	212.63647	50.0634

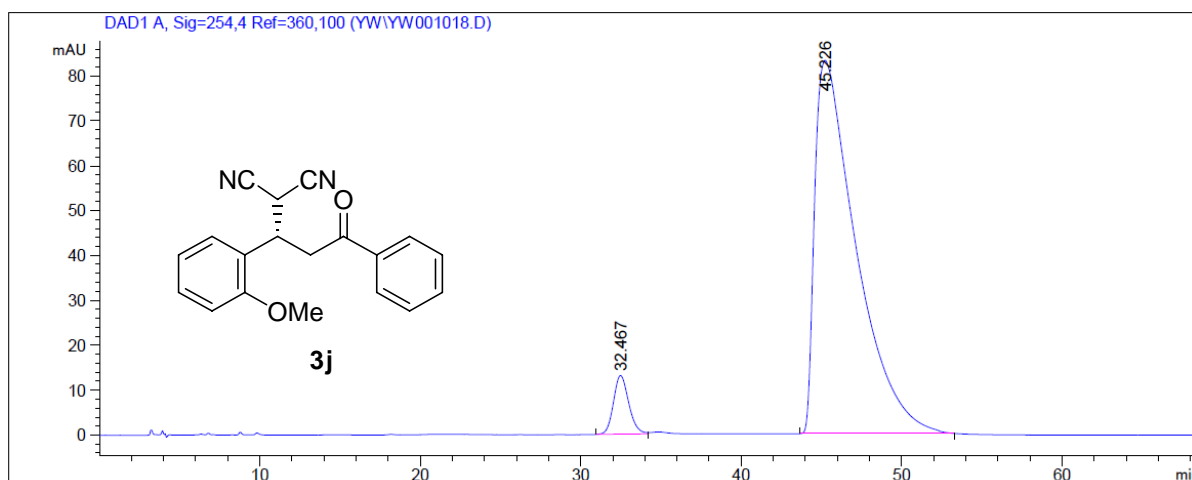


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	20.054	BB	0.4709	136.90283	4.40148	5.4038
2	31.019	BB	0.7060	2396.54492	51.78197	94.5962

**(S)-2-[1-(2-Methoxyphenyl)-3-oxo-3-phenylpropyl]malononitrile (3j)**

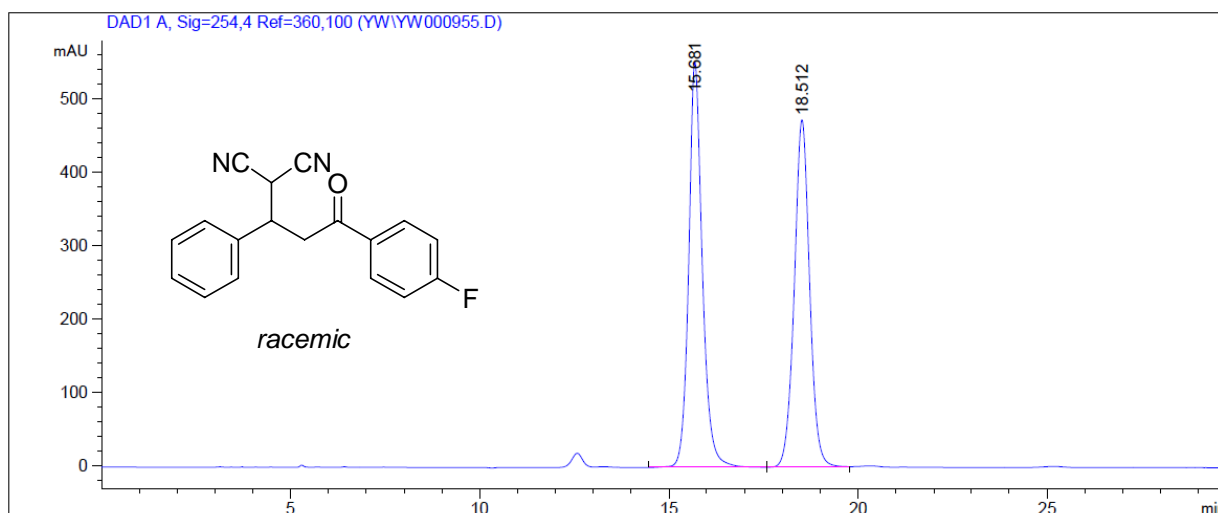


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	32.258	BB	1.1429	1.82568e4	247.41263	50.0871
2	45.178	BB	2.6458	1.81933e4	99.28517	49.9129

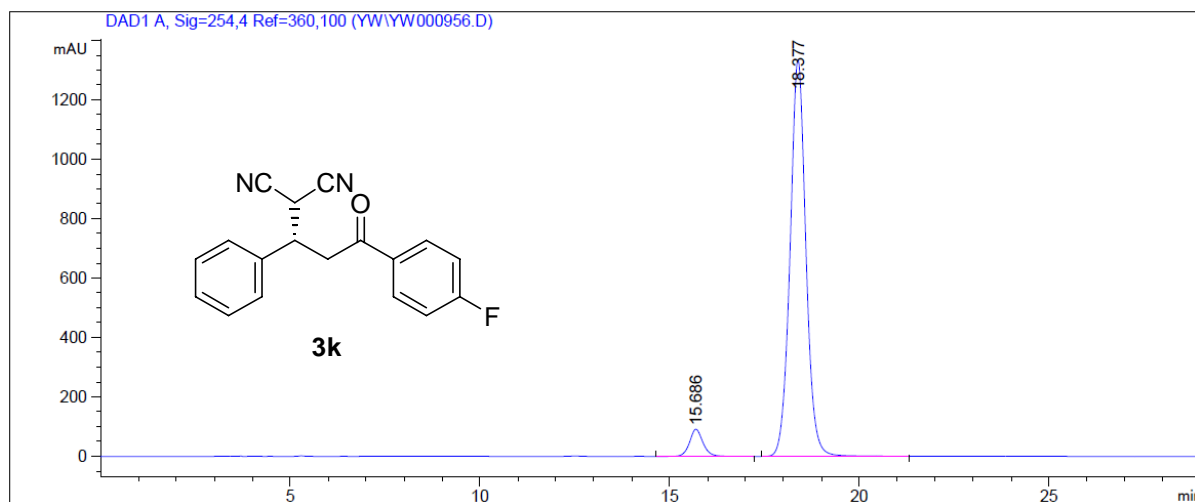


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	32.467	BB	1.0013	871.79602	13.08558	5.5239
2	45.226	BB	2.5008	1.49104e4	83.20131	94.4761

**(S)-2-[3-(4-Fluorophenyl)-3-oxo-1-phenylpropyl]malononitrile (3k)**

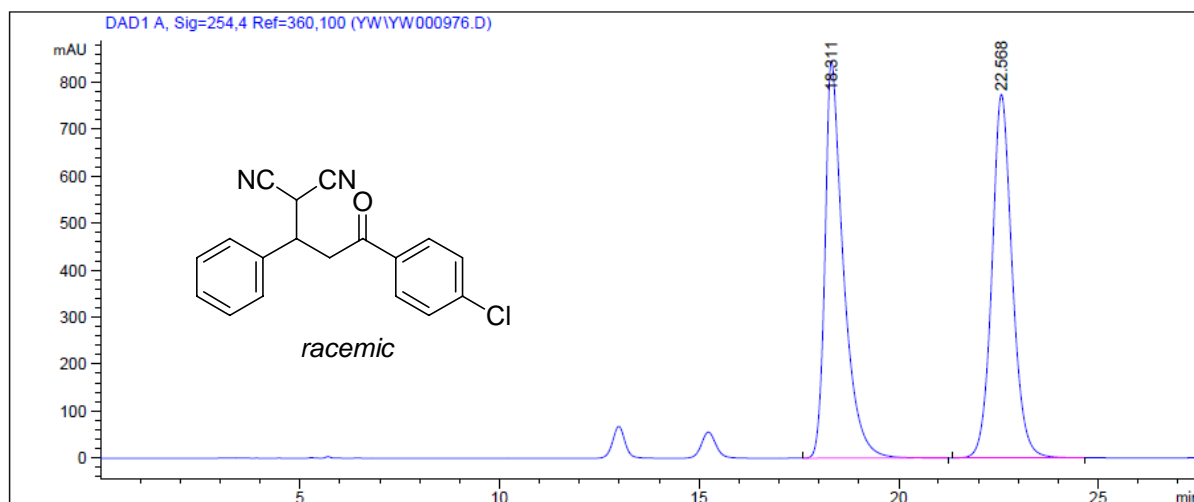


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	15.681	BV	0.3707	1.38644e4	552.58948	50.8437
2	18.512	VV	0.4263	1.34042e4	473.46561	49.1563

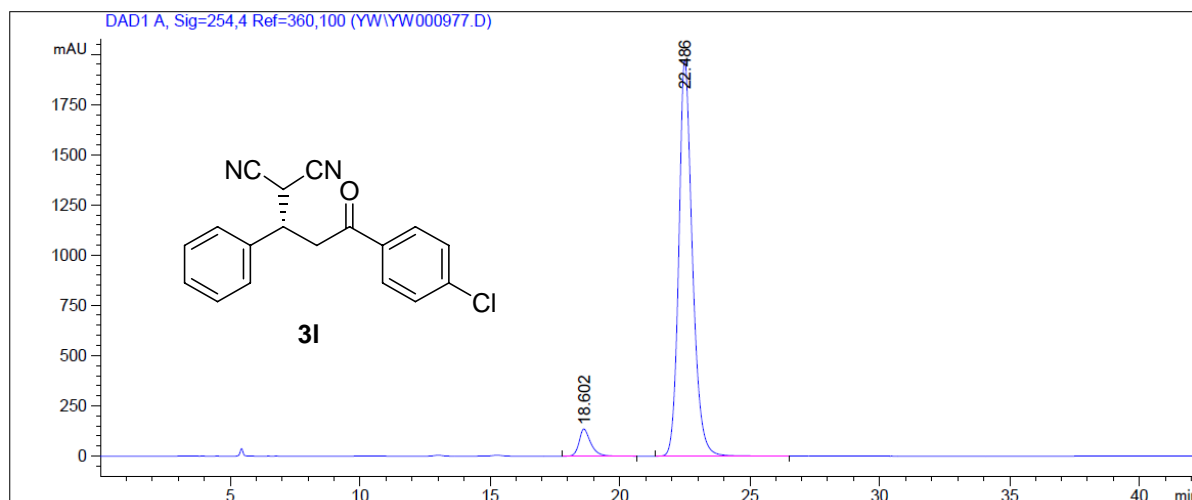


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	15.686	VB	0.3700	2259.34937	91.51333	5.5044
2	18.377	BB	0.4389	3.87871e4	1335.43201	94.4956

**(S)-2-[3-(4-Chlorophenyl)-3-oxo-1-phenylpropyl]malononitrile (31)**

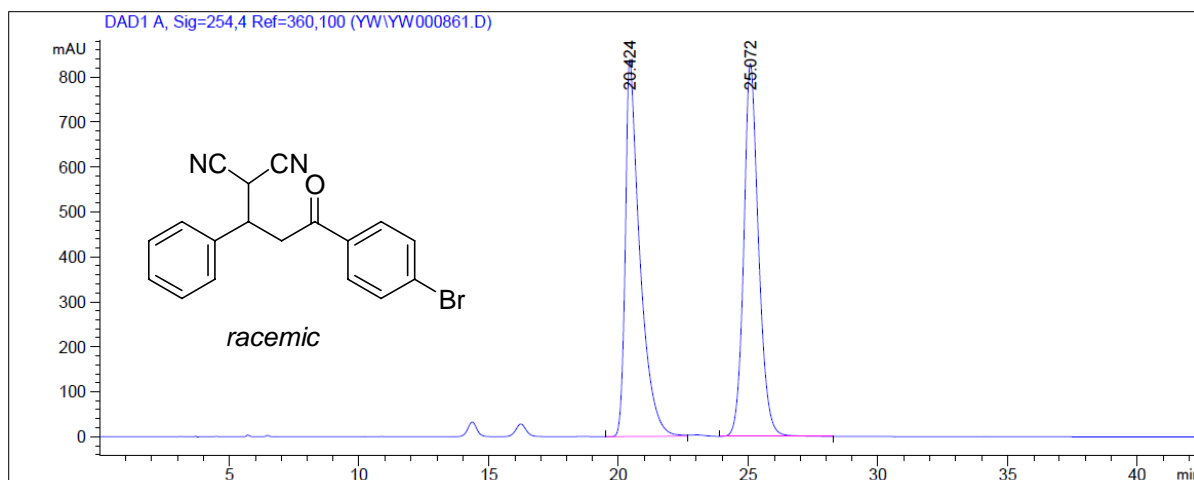


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	18.311	VB	0.4633	2.71977e4	845.49963	49.8088
2	22.568	BB	0.5313	2.74065e4	773.64331	50.1912

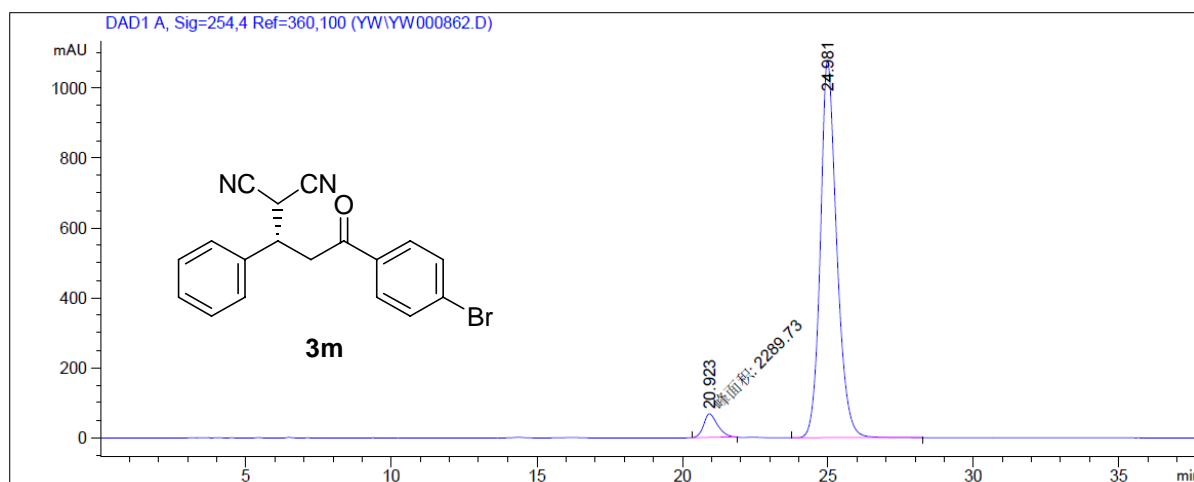


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	18.602	BB	0.4607	4235.37451	135.48839	5.5668
2	22.486	BB	0.5422	7.18468e4	1975.77979	94.4332

**(S)-2-[3-(4-Bromophenyl)-3-oxo-1-phenylpropyl]malononitrile (3m)**



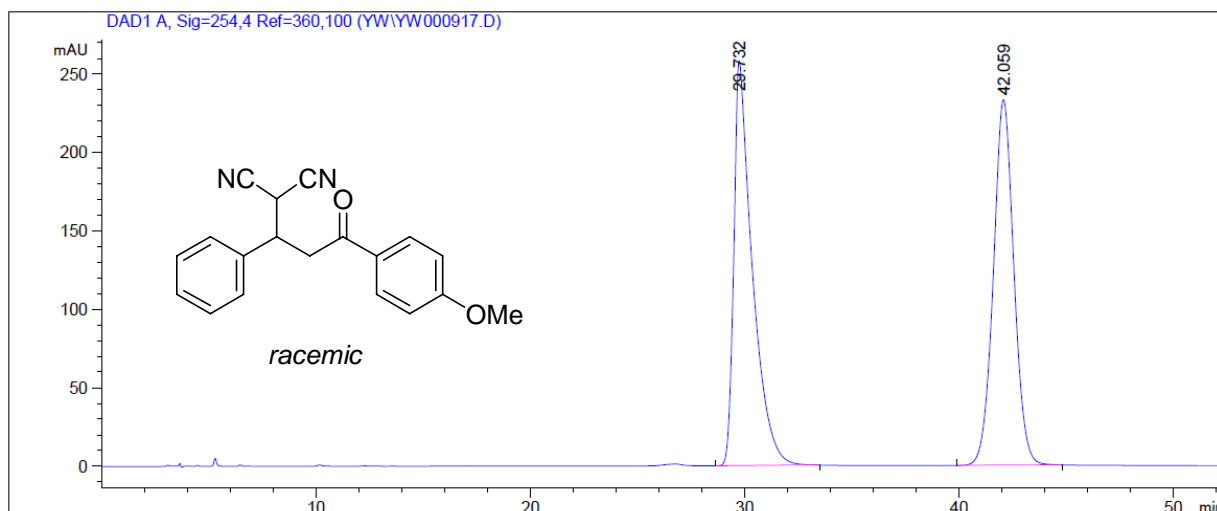
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	20.424	VV	0.5501	3.28348e4	839.90942	49.9649
2	25.072	VB	0.5899	3.28808e4	830.54205	50.0351



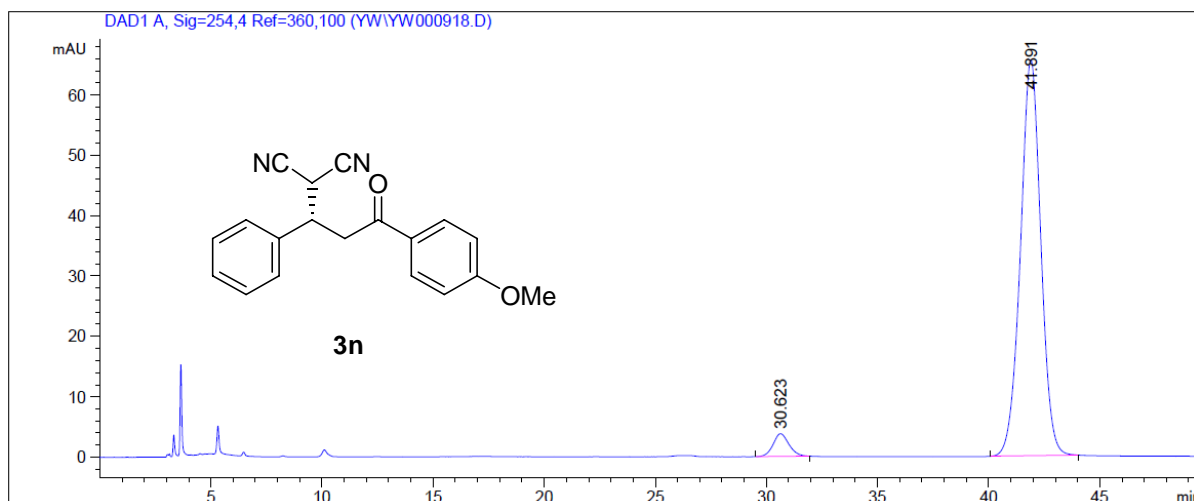
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	20.923	MM	0.5604	2289.73096	68.10350	5.1286
2	24.981	BB	0.5838	4.23570e4	1079.37158	94.8714



**(S)-2-[3-(4-Methoxyphenyl)-3-oxo-1-phenylpropyl]malononitrile (3n)**

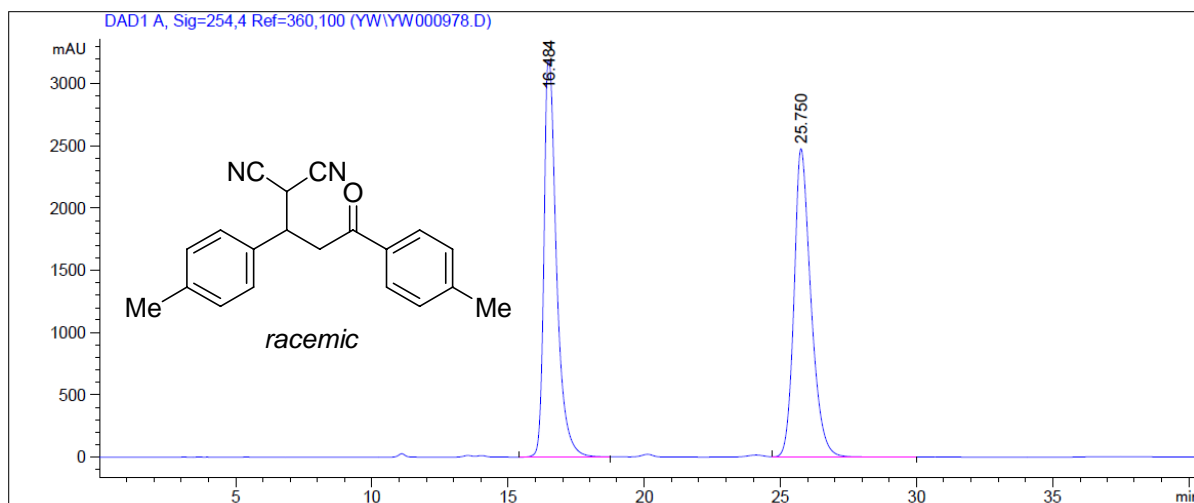


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	29.732	BB	0.8214	1.54251e4	258.03769	49.8754
2	42.059	BB	1.0081	1.55021e4	233.03828	50.1246

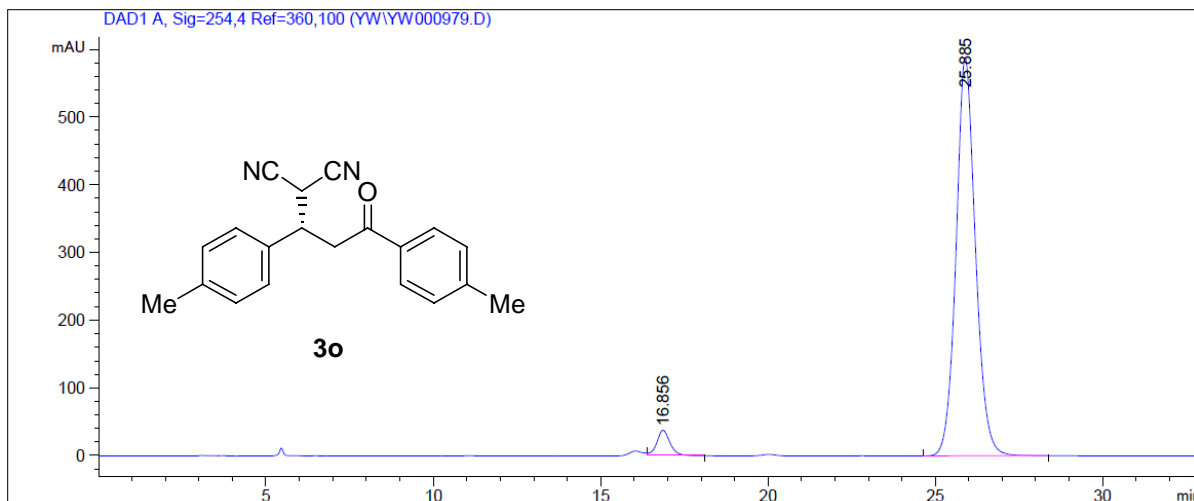


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	30.623	BB	0.7411	190.62492	3.80074	4.3563
2	41.891	BB	0.9736	4185.19141	65.66267	95.6437

**(S)-2-[1,3-Bis(4-methylphenyl)-3-oxopropyl]malononitrile (3o)**

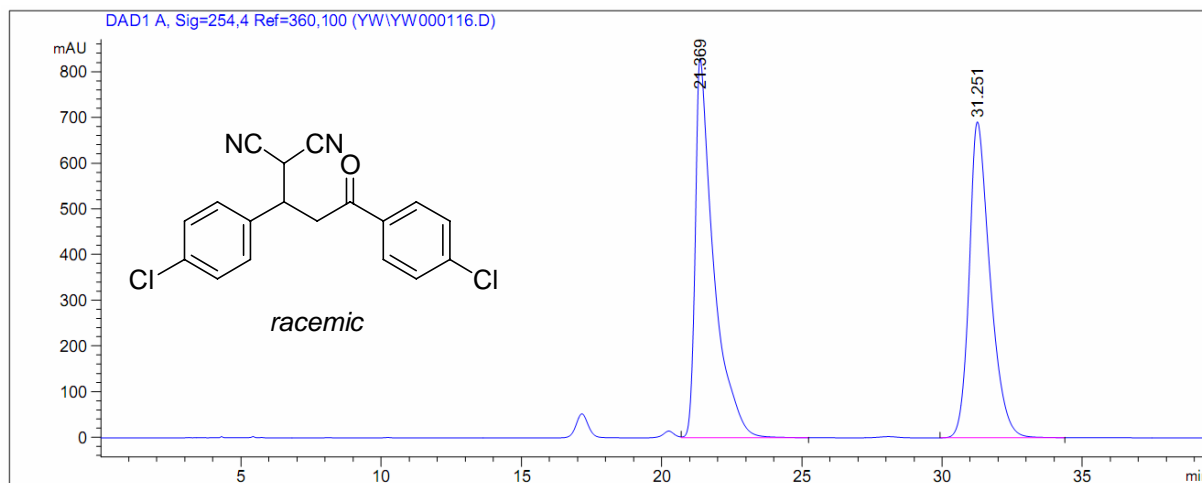


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	16.484	VV	0.4774	1.02820e5	3195.19263	48.9845
2	25.750	VB	0.6359	1.07083e5	2479.24268	51.0155

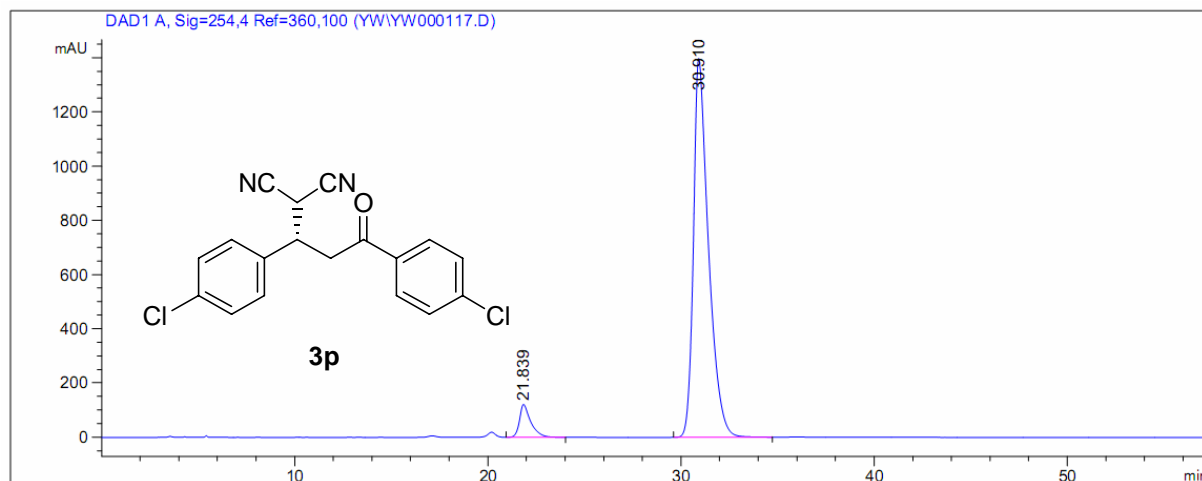


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	16.856	VB	0.4184	1060.25696	37.89257	4.2780
2	25.885	BB	0.6046	2.37235e4	588.09277	95.7220

**(S)-2-[1,3-Bis(4-chlorophenyl)-3-oxopropyl]malononitrile (3p)**

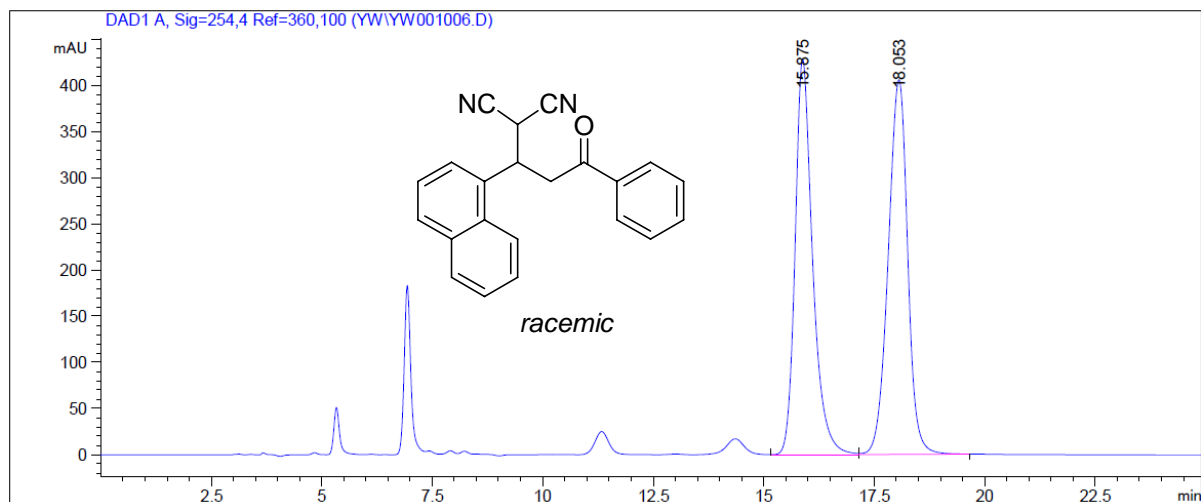


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	21.369	VB	0.6344	3.77397e4	830.09680	51.3433
2	31.251	BB	0.7596	3.57648e4	691.22485	48.6567

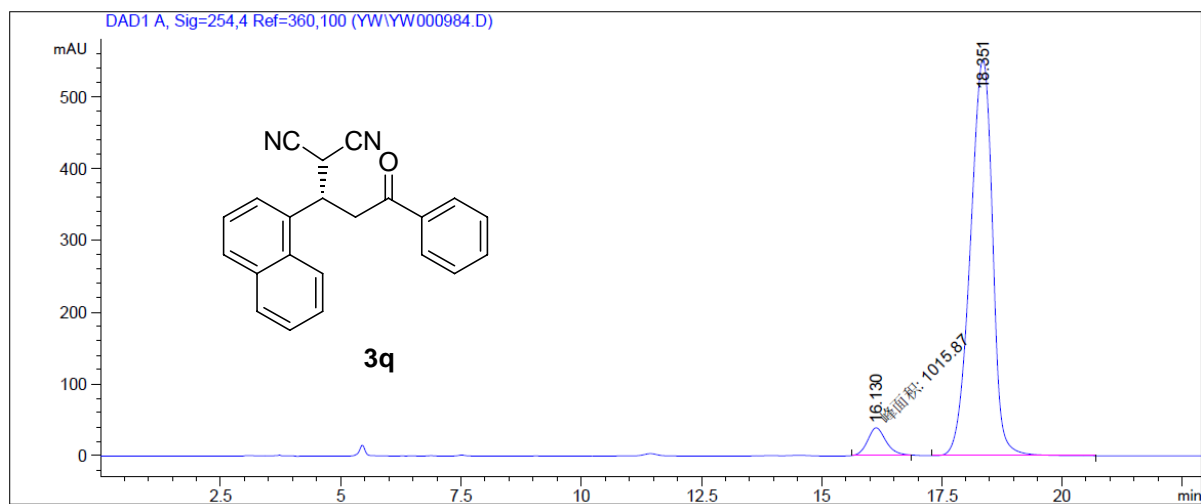


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	21.839	VB	0.5826	4935.71582	121.33971	6.1252
2	30.910	BB	0.7835	7.56442e4	1397.46997	93.8748

**(S)-2-[1-(Naphthalen-1-yl)-3-oxo-3-phenylpropyl]malononitrile (3q)**

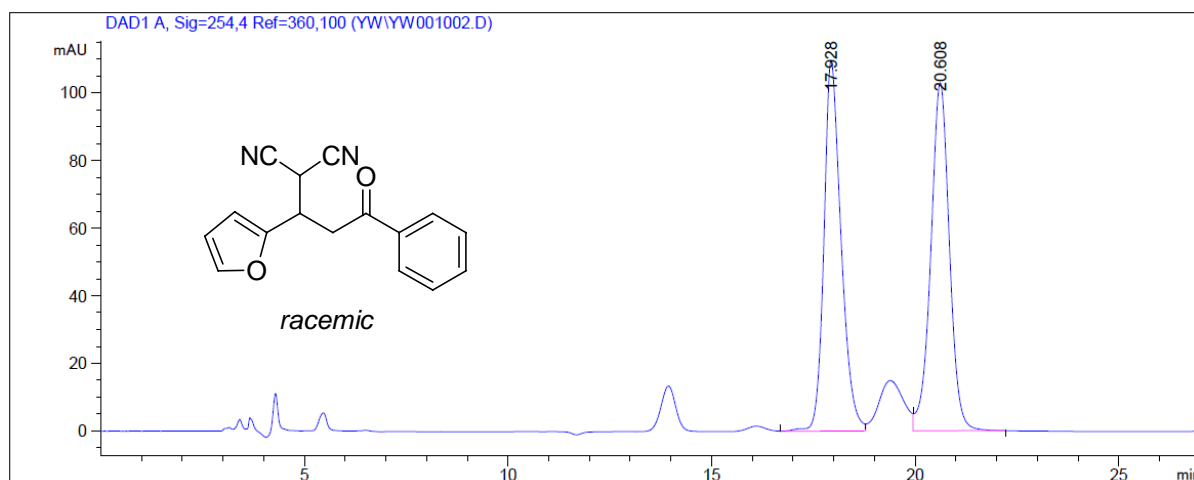


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.875	VV	0.4098	1.18450e4	429.40793	48.7548
2	18.053	VB	0.4774	1.24500e4	406.35880	51.2452

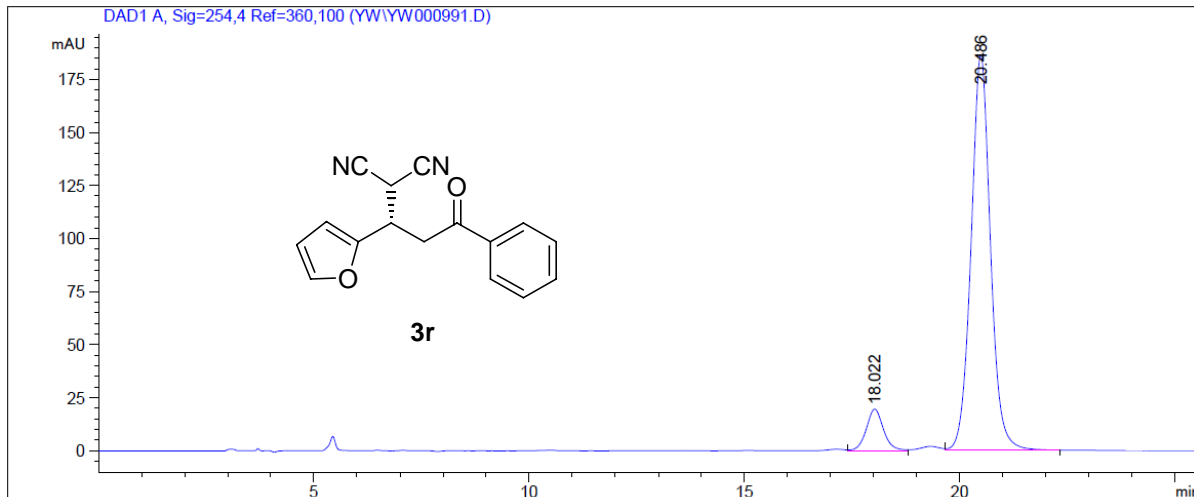


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.130	MM	0.4422	1015.87054	38.29277	5.4260
2	18.351	VB	0.5063	1.77066e4	551.90820	94.5740

**(S)-2-[1-(Furan-2-yl)-3-oxo-3-phenylpropyl]malononitrile (3r)**

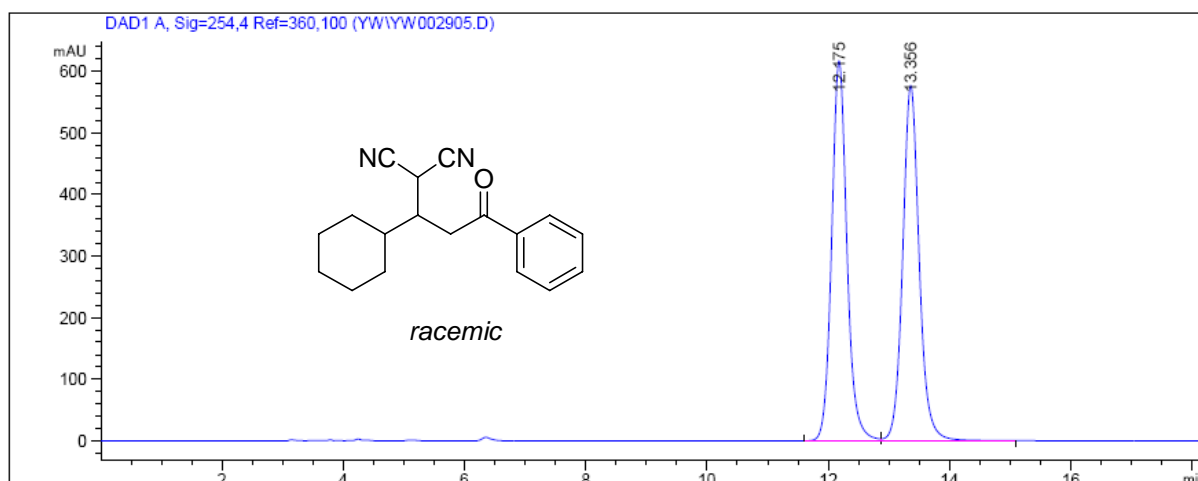


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	17.928	VV	0.4343	3220.03198	109.74249	49.5303
2	20.608	VB	0.4835	3281.10156	103.04713	50.4697

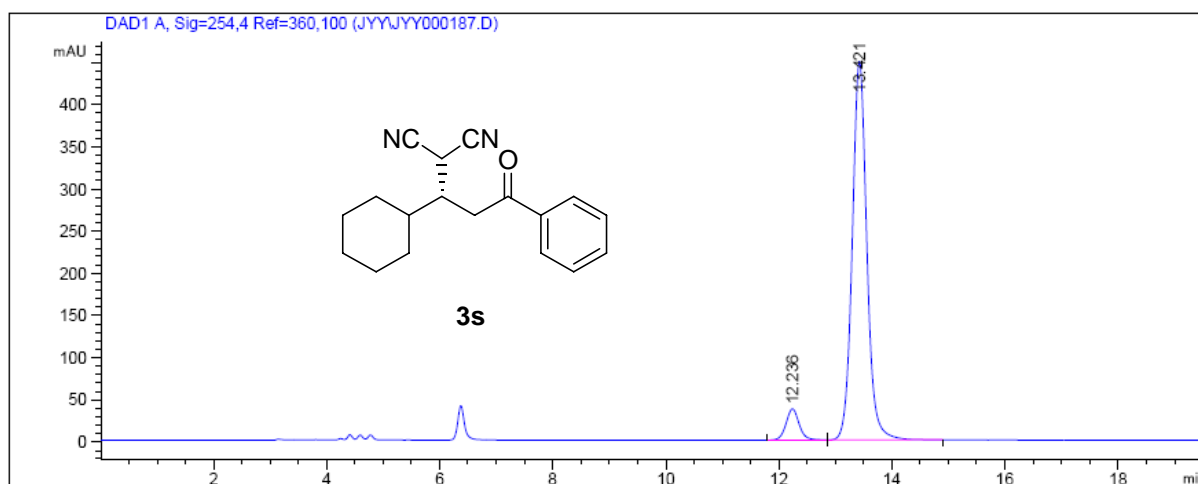


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	18.022	VV	0.4168	542.20996	19.59564	8.4879
2	20.486	VB	0.4734	5845.84473	186.65543	91.5121

**(R)-2-(1-Cyclohexyl-3-oxo-3-phenylpropyl)malononitrile (3s)**

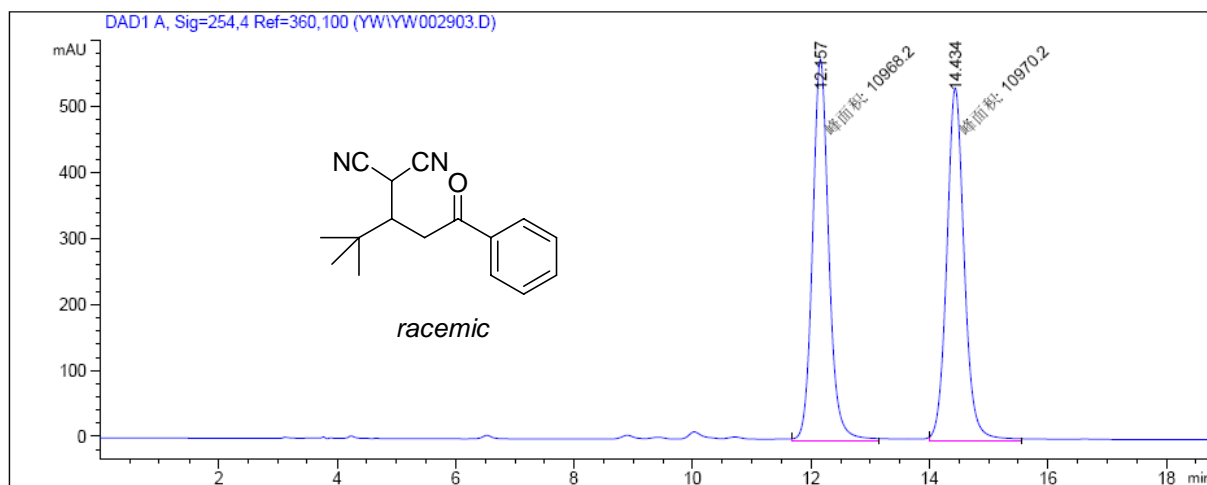


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	12.175	BV	0.2685	1.08099e4	616.80310	49.7168
2	13.356	VB	0.2892	1.09330e4	576.73749	50.2832

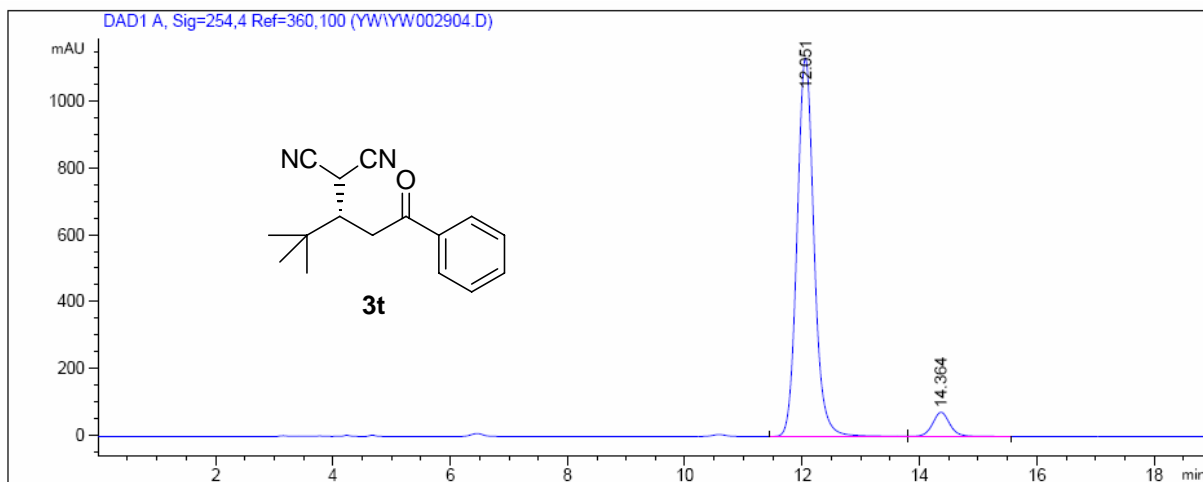


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	12.236	BV	0.2449	599.13562	37.00409	6.9126
2	13.421	VB	0.2736	8068.14209	449.08121	93.0874

**(S)-2-(2, 2-Methyl-5-oxo-5-phenylpentyl)malononitrile (3t)**

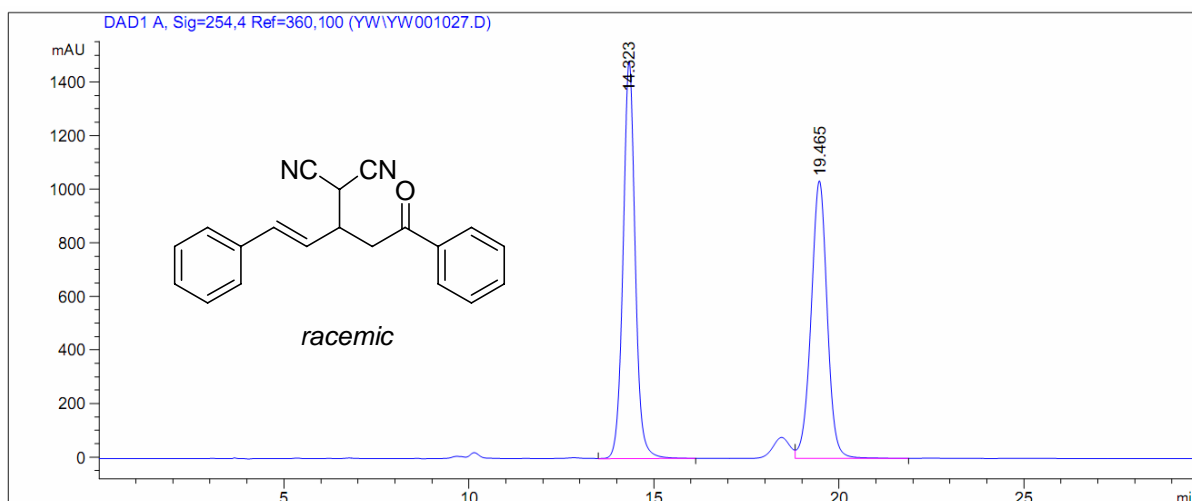


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	12.157	MM	0.3165	1.09682e4	577.51807	49.9956
2	14.434	MM	0.3422	1.09702e4	534.33423	50.0044

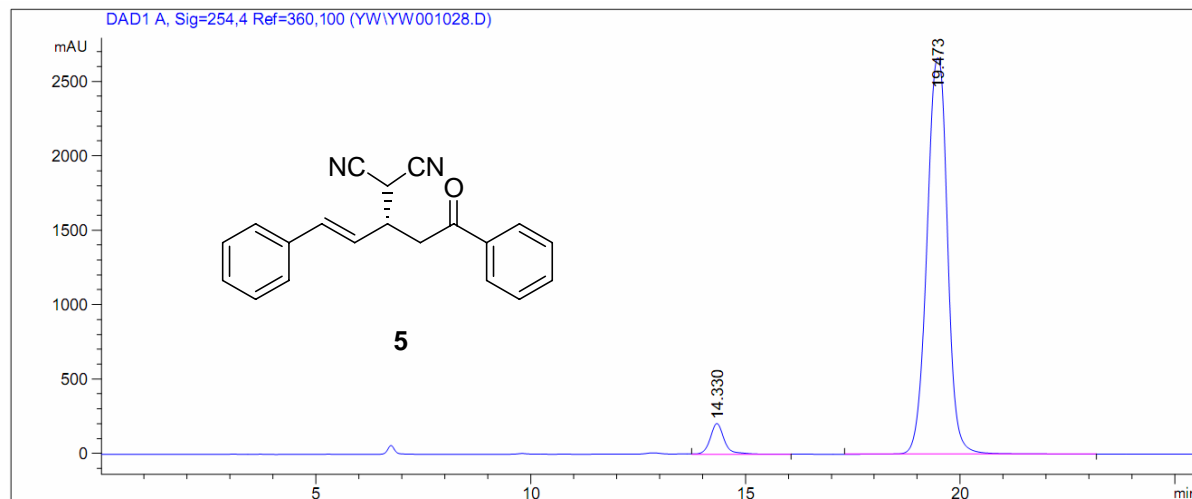


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	12.051	BV	0.3105	2.27979e4	1134.37585	93.8267
2	14.364	VB	0.3127	1499.98352	72.69466	6.1733

**(*R,E*)-2-(5-oxo-1,5-diphenylpent-1-en-3-yl)malononitrile (5)**



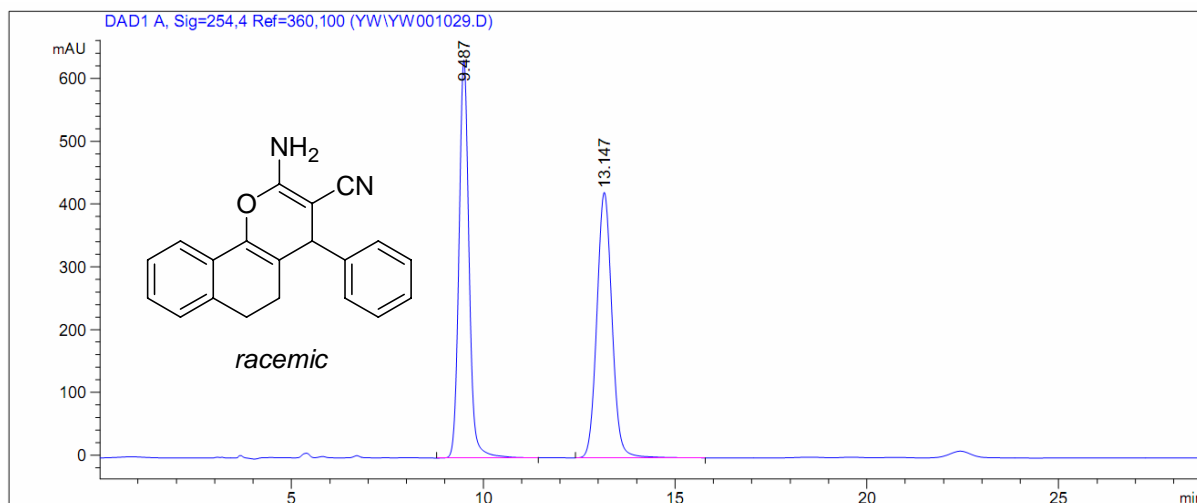
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	14.323	VV	0.3469	3.39559e4	1484.03088	51.8297
2	19.465	VB	0.4631	3.15584e4	1036.73706	48.1703



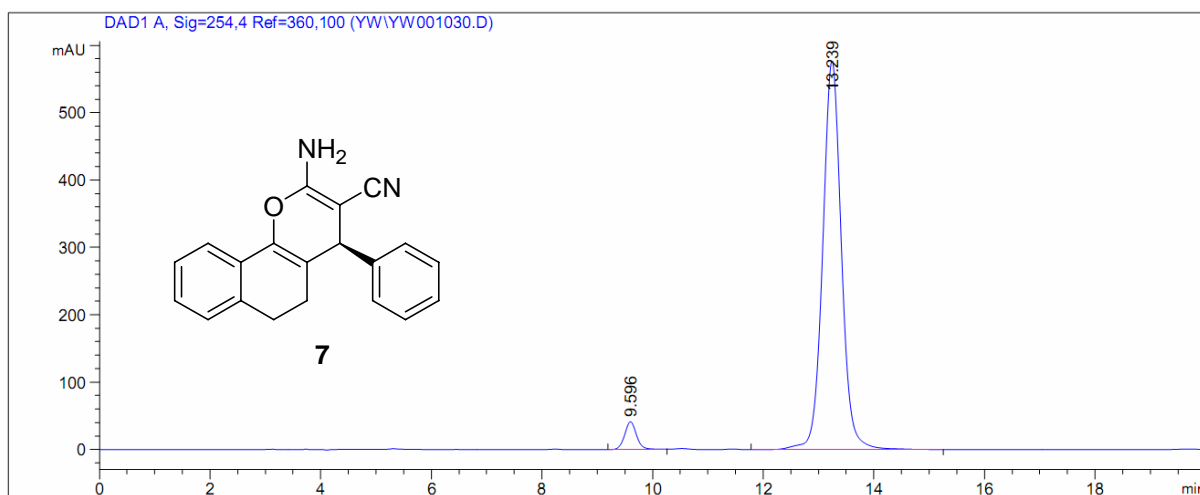
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	14.330	VV	0.3496	4782.04199	206.90544	5.1347
2	19.473	BB	0.5150	8.83495e4	2663.58252	94.8653



**(S)-2-amino-4-phenyl-5,6-dihydro-4H-benzo[h]chromene-3-carbonitrile (7)**



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	9.487	VB	0.2813	1.15993e4	634.42230	50.0699
2	13.147	BB	0.4231	1.15669e4	422.88986	49.9301



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
峰 #	保留时间 [min]	类型	峰宽 [min]	峰面积 [mAU*s]	峰高 [mAU]	峰面积 %
1	9.596	BV	0.2328	634.73022	41.41168	4.4728
2	13.239	VB	0.3601	1.35561e4	577.07764	95.5272