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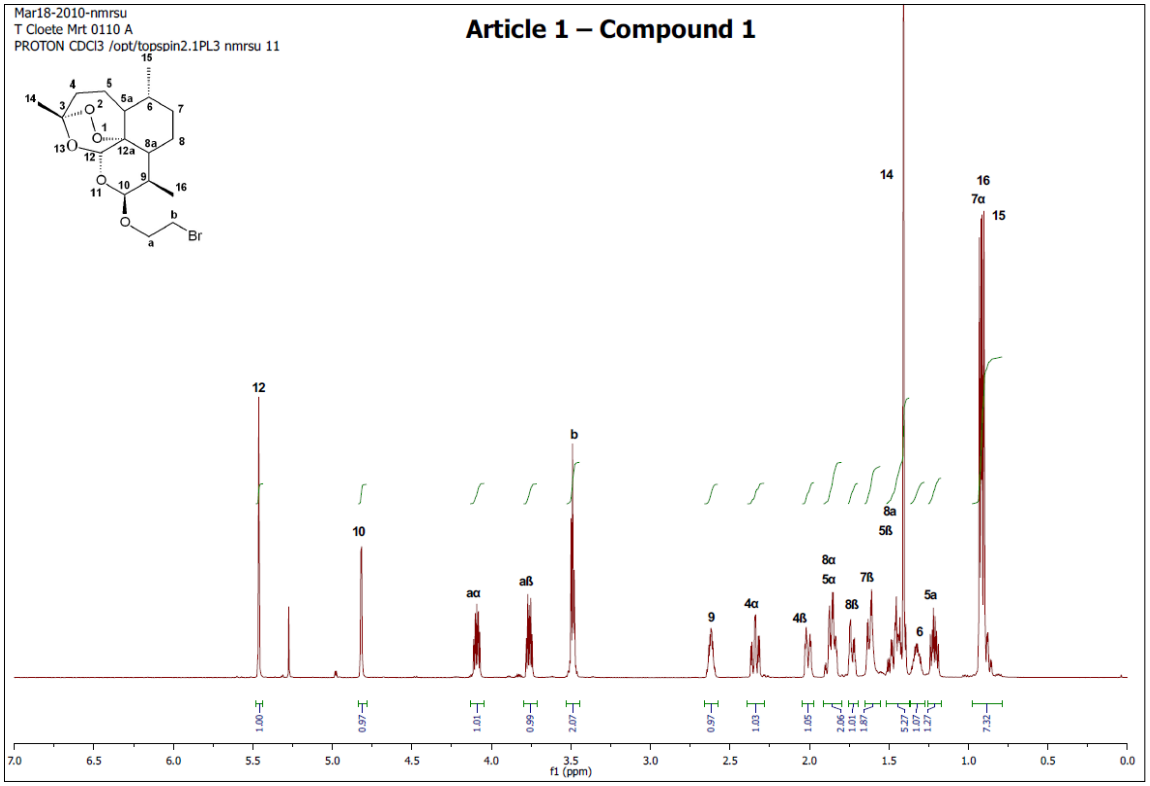
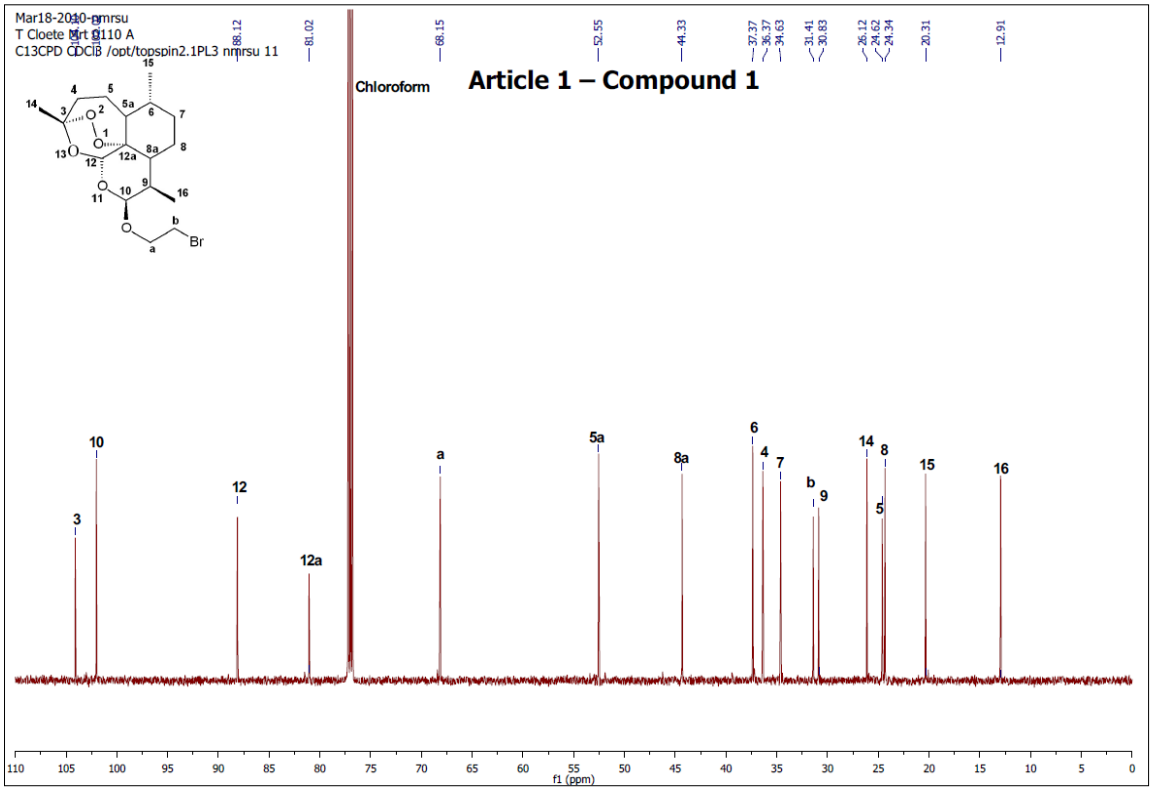
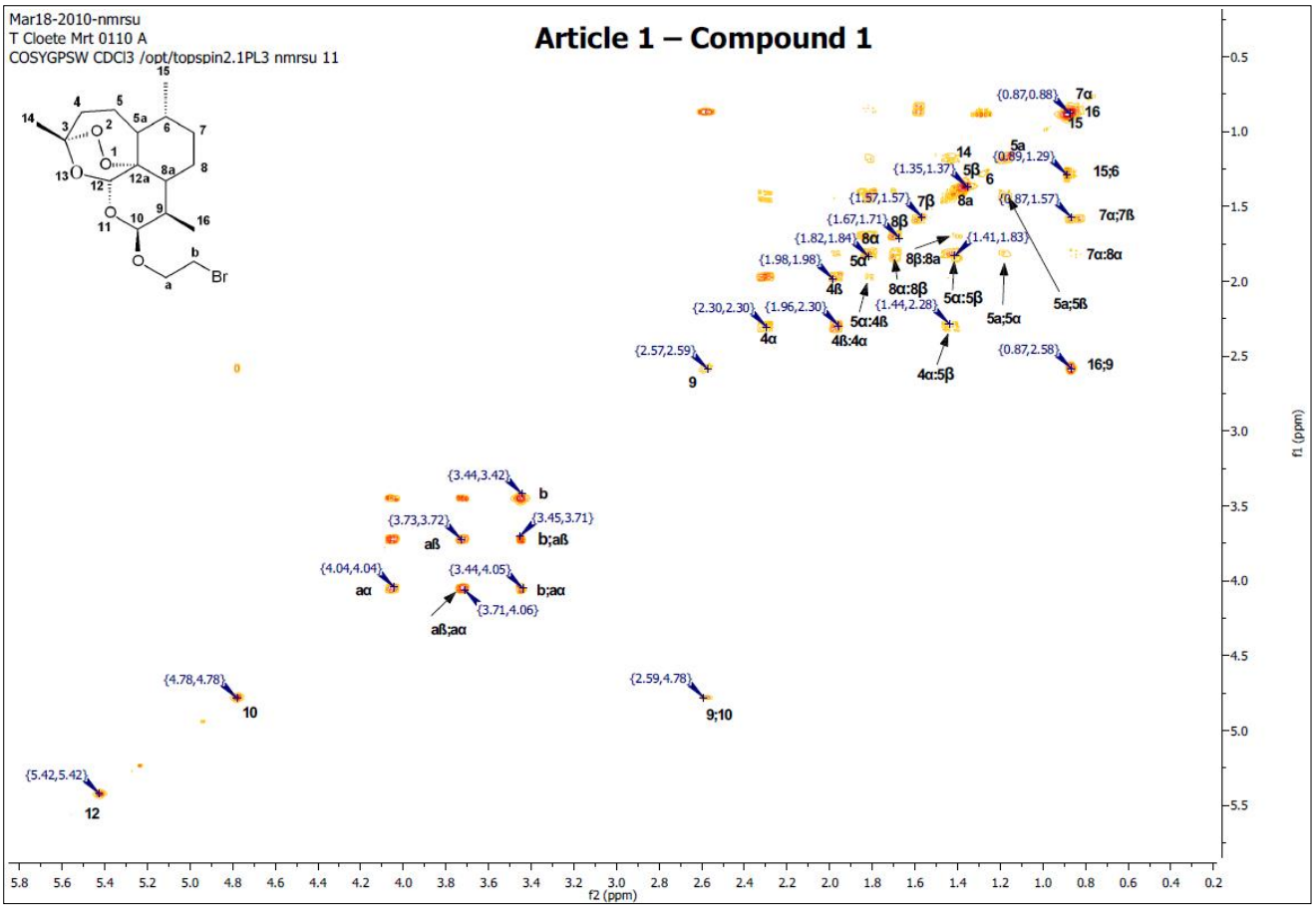
Annexure A

NMR & MS spectra - Chapter 3 (Article 1)



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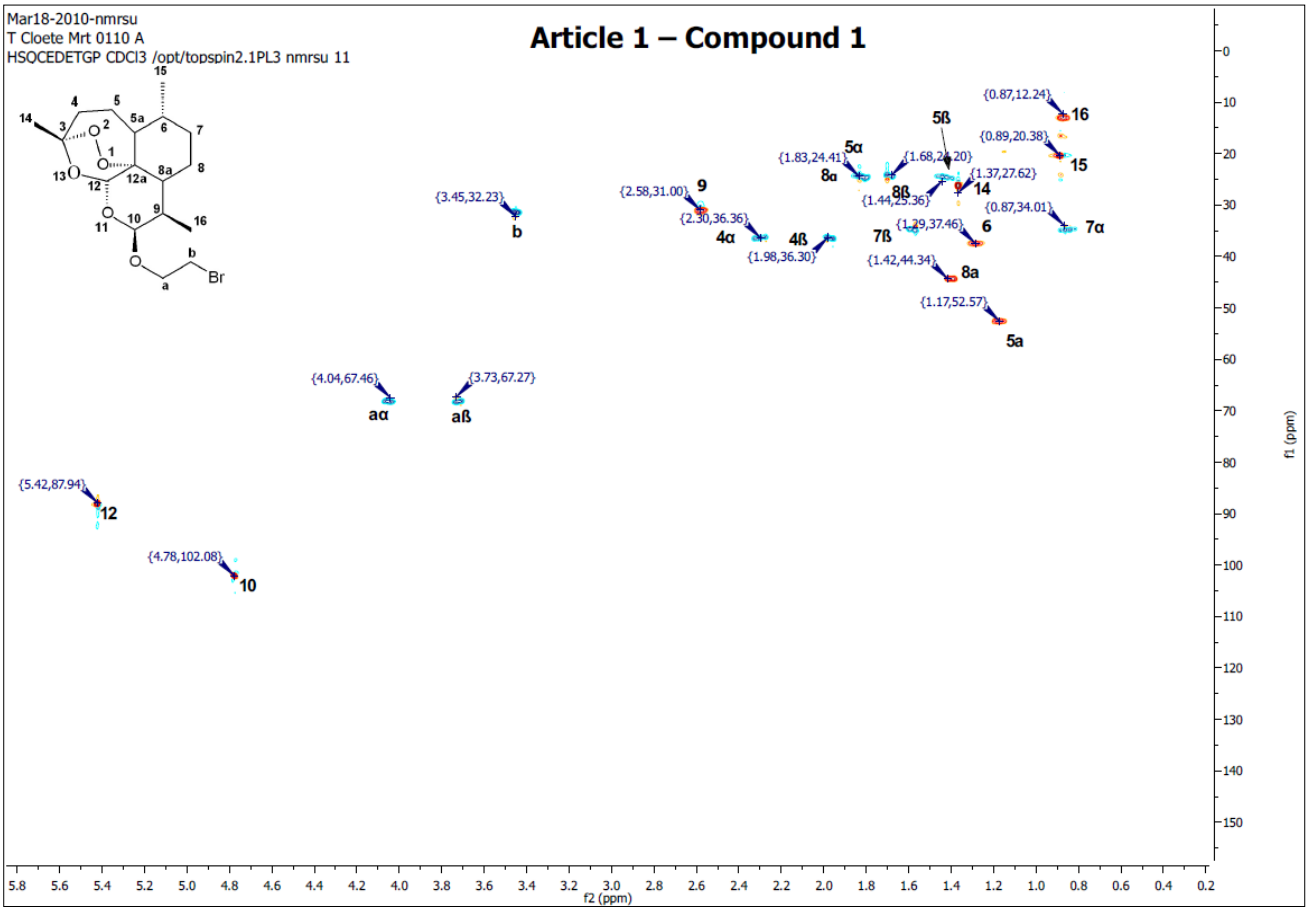
f1 (ppm)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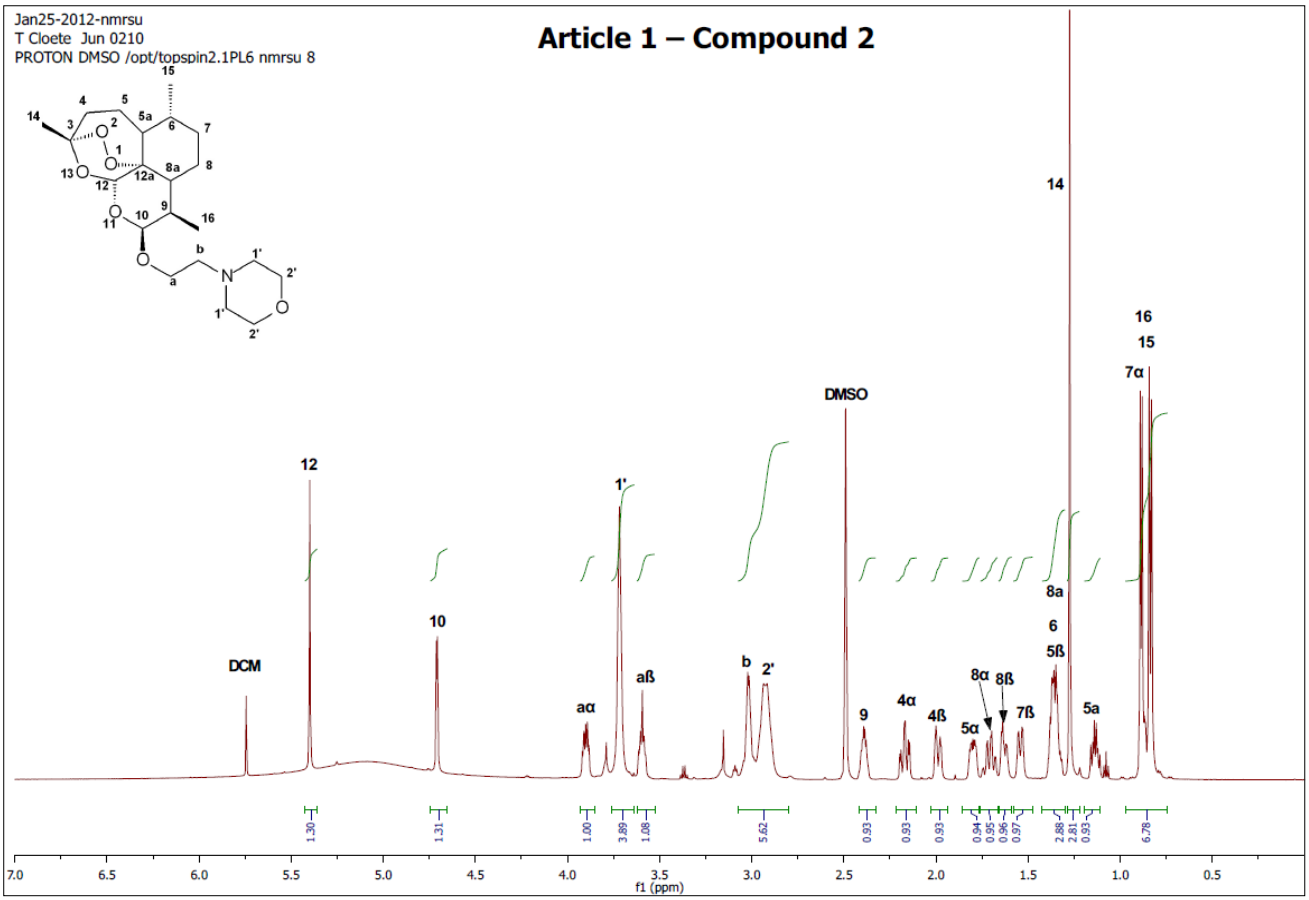
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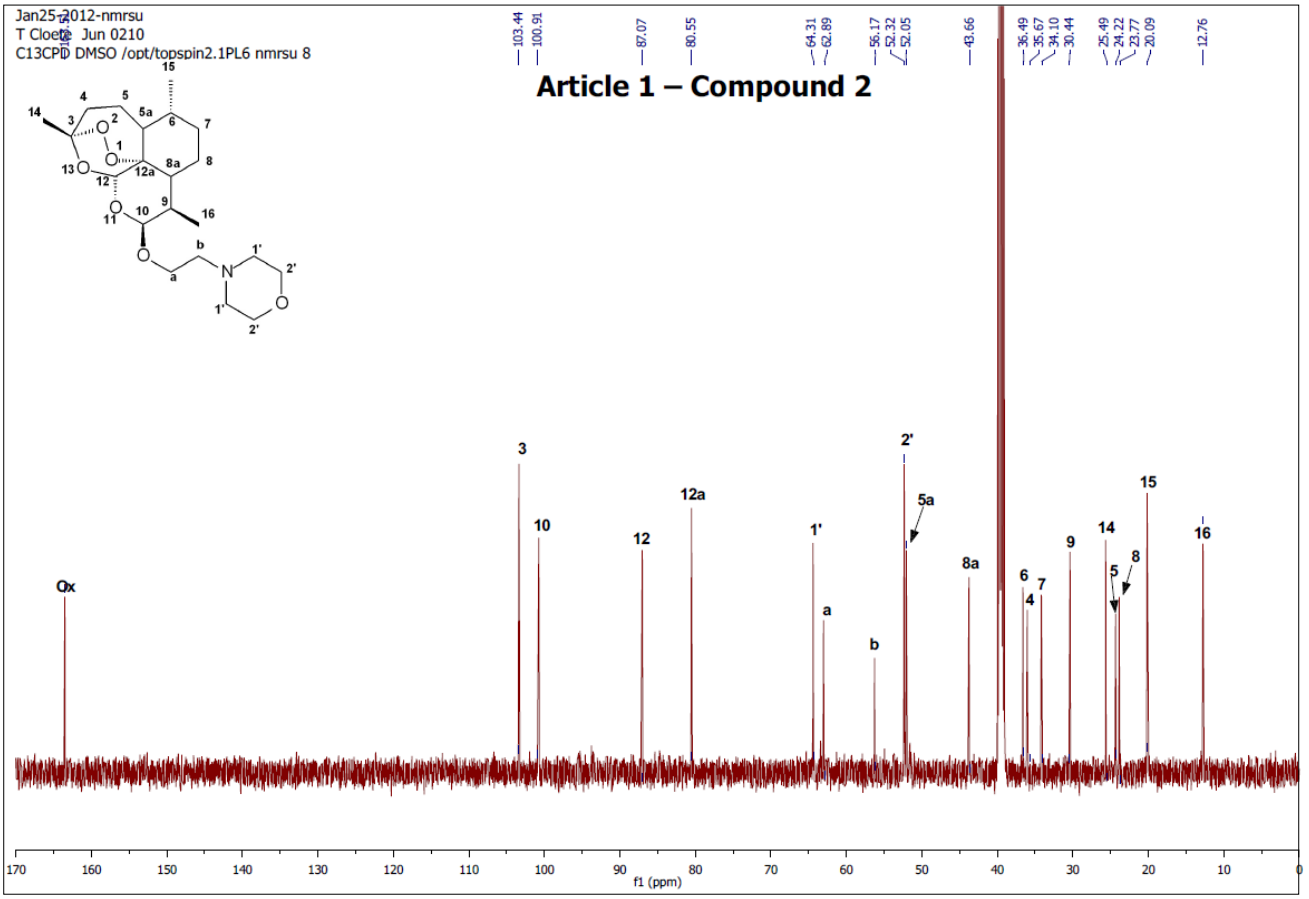
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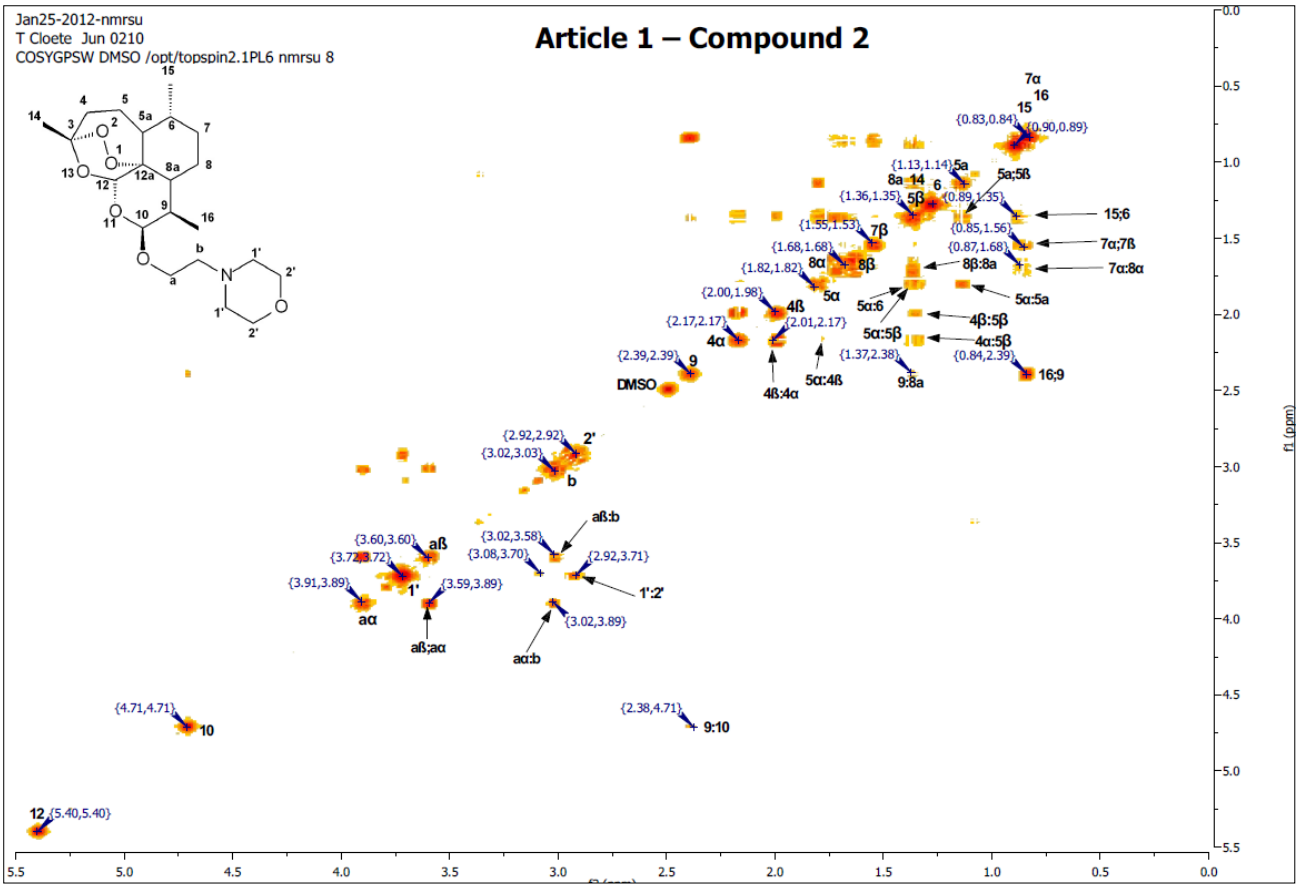
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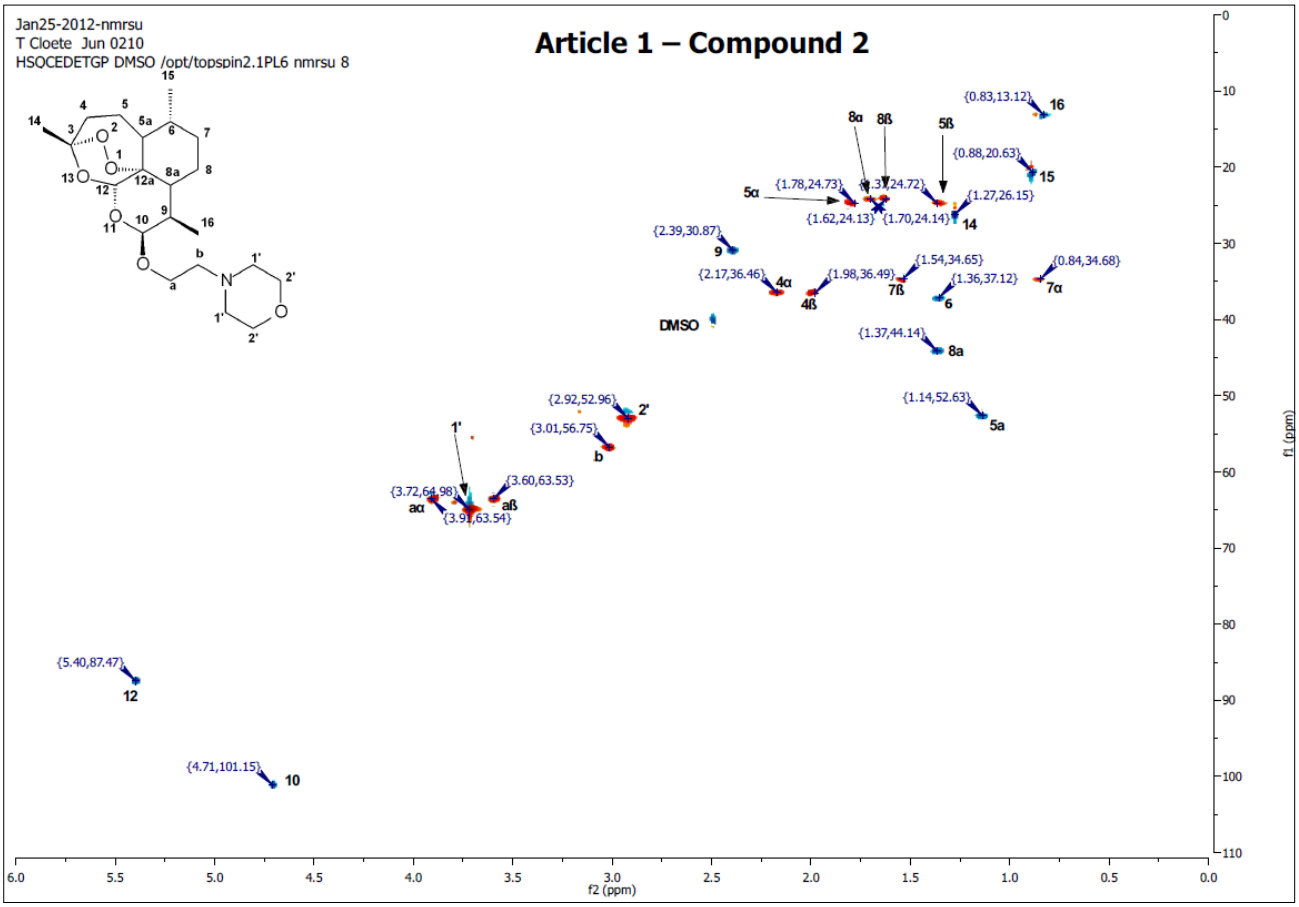
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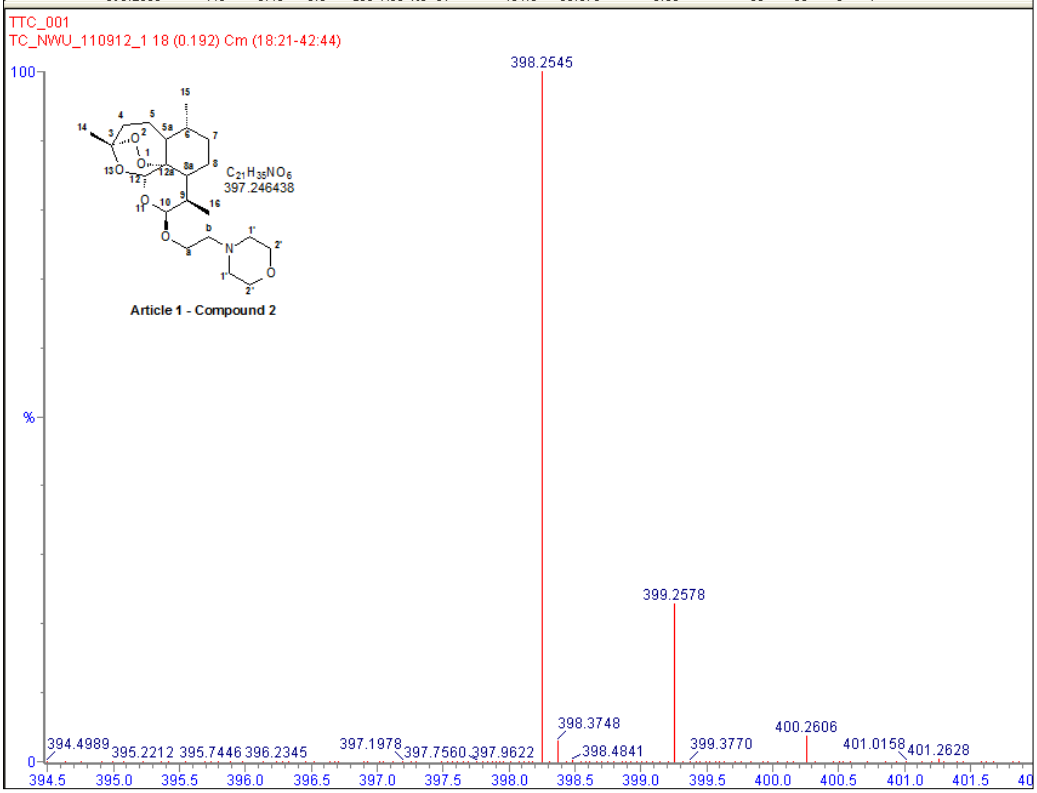
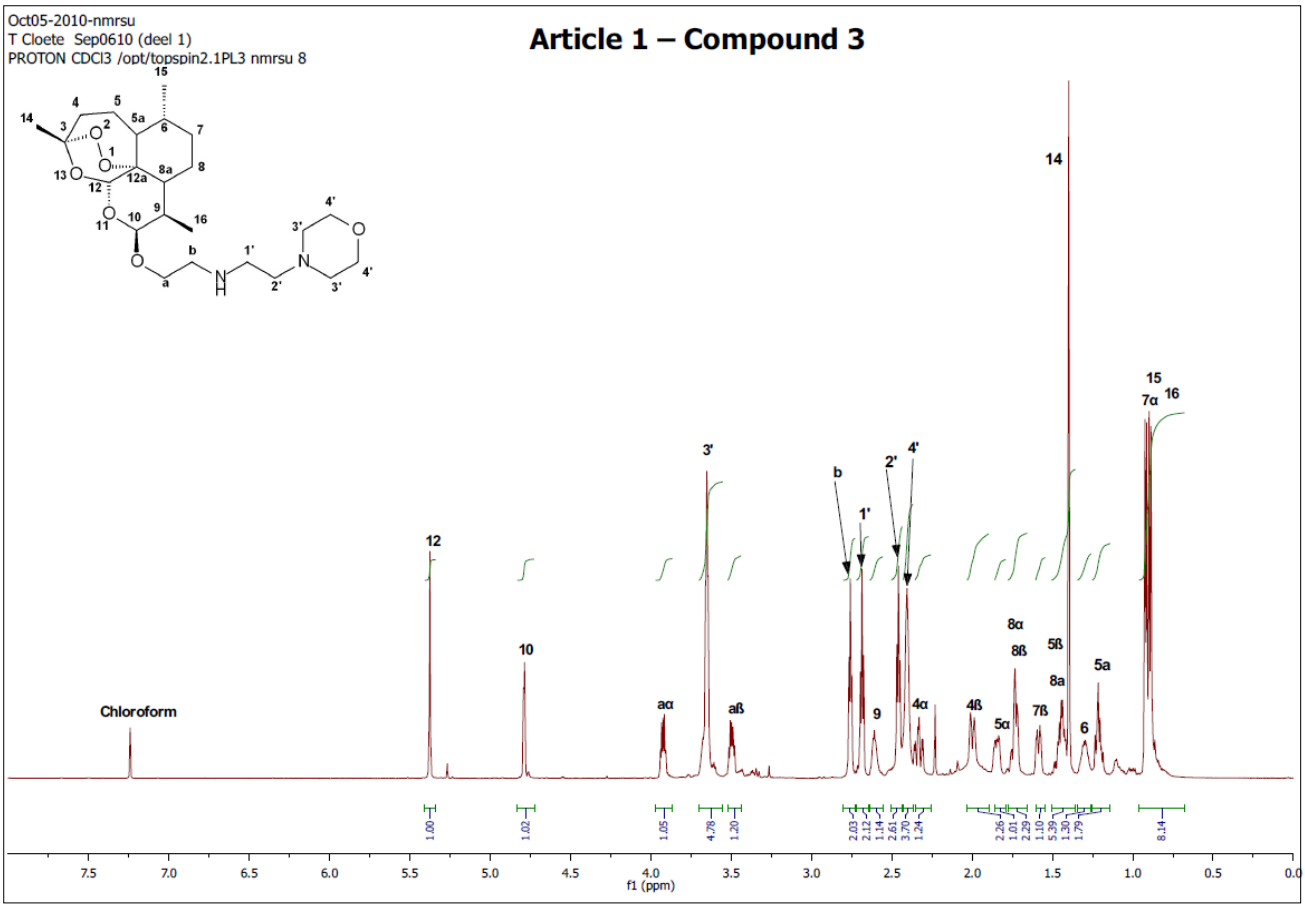
DMSO
f2 (ppm)
f1 (ppm)

398.2545	398.2543	0.2	0.5	4.5	C21 H36 N O6	405.2	1.718	17.94	21	36	1	6	
	398.2556	-1.1	-2.8	9.5	C22 H32 N5 O2	410.4	6.959	0.10	22	32	5	2	
	398.2532	1.3	3.3	6.5	C20 H33 N5 O2 Na	408.7	5.261	0.52	20	33	5	2	1
	398.2519	2.6	6.5	1.5	C19 H37 N O6 Na	407.3	3.871	2.08	19	37	1	6	1
	398.2572	-2.7	-6.8	10.5	C25 H33 N3 Na	412.4	8.938	0.01	25	33	3		1
	398.2502	4.3	10.8	0.5	C16 H36 N3 O8	412.6	9.097	0.01	16	36	3	8	
	398.2596	-5.1	-12.8	13.5	C27 H32 N3	413.7	10.263	0.00	27	32	3		
	398.2484	6.1	15.3	13.5	C28 H32 N O	414.3	10.872	0.00	28	32	1	1	
	398.2615	-7.0	-17.6	0.5	C15 H36 N5 O7	414.1	10.578	0.00	15	36	5	7	

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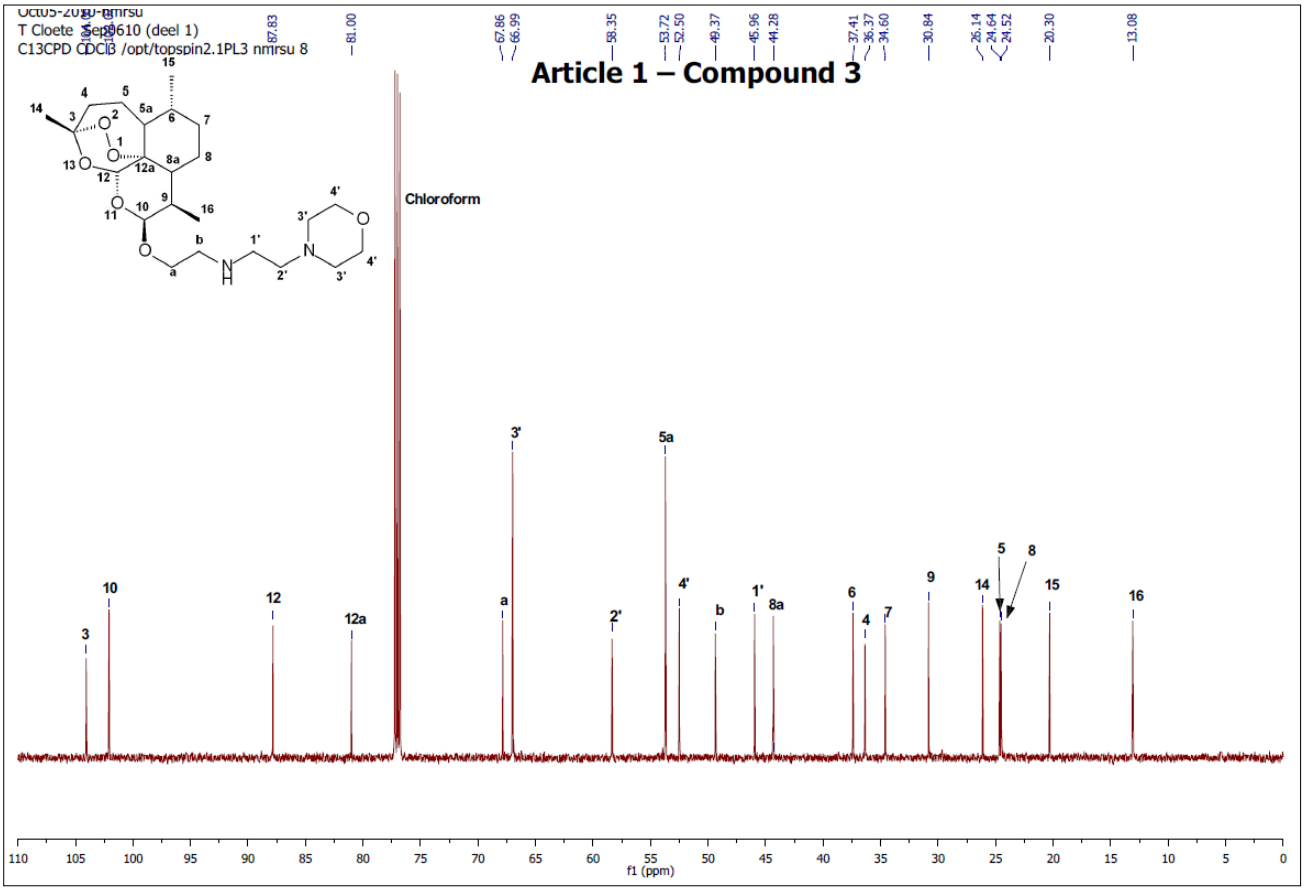
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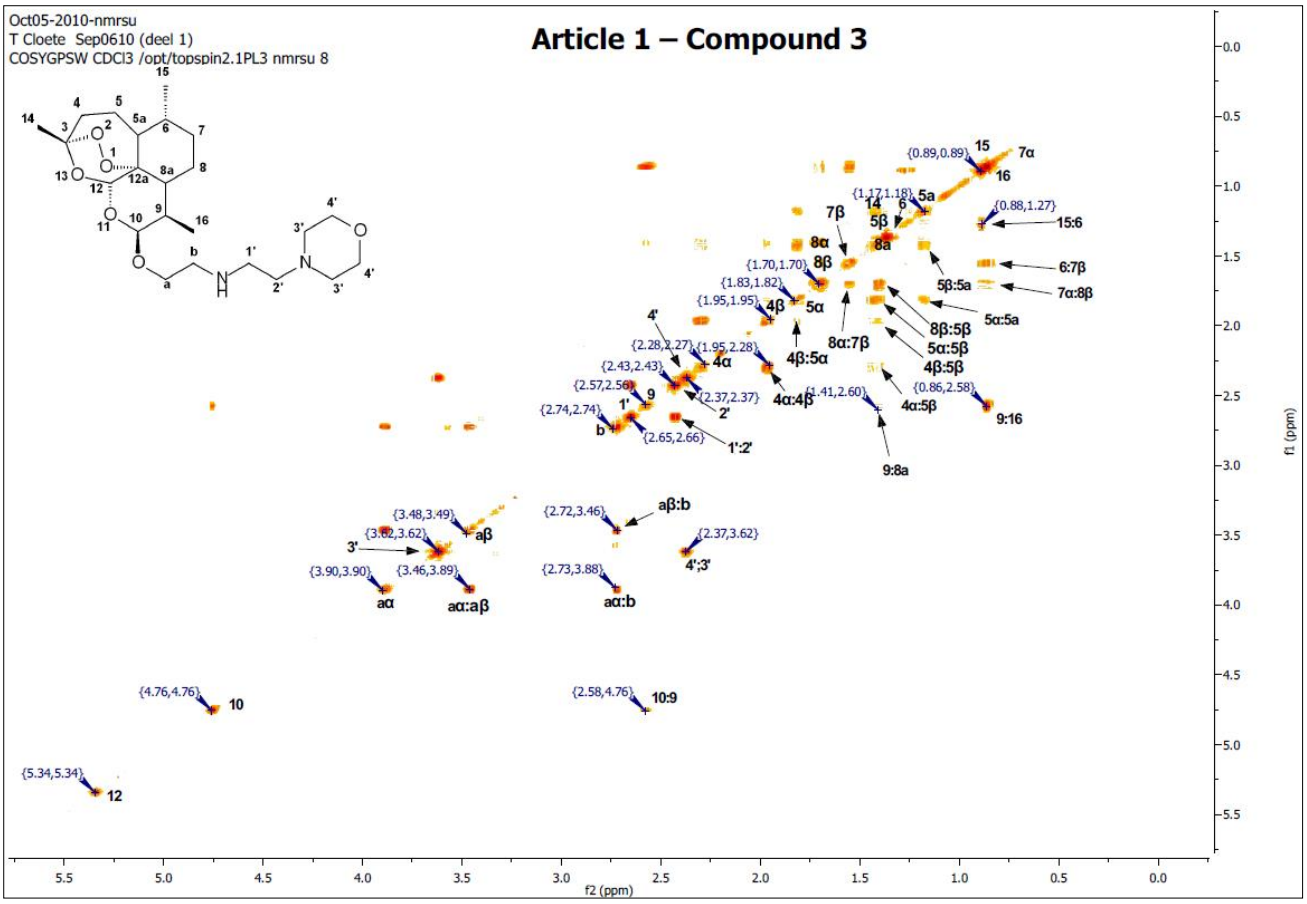
Chloroform
f1 (ppm)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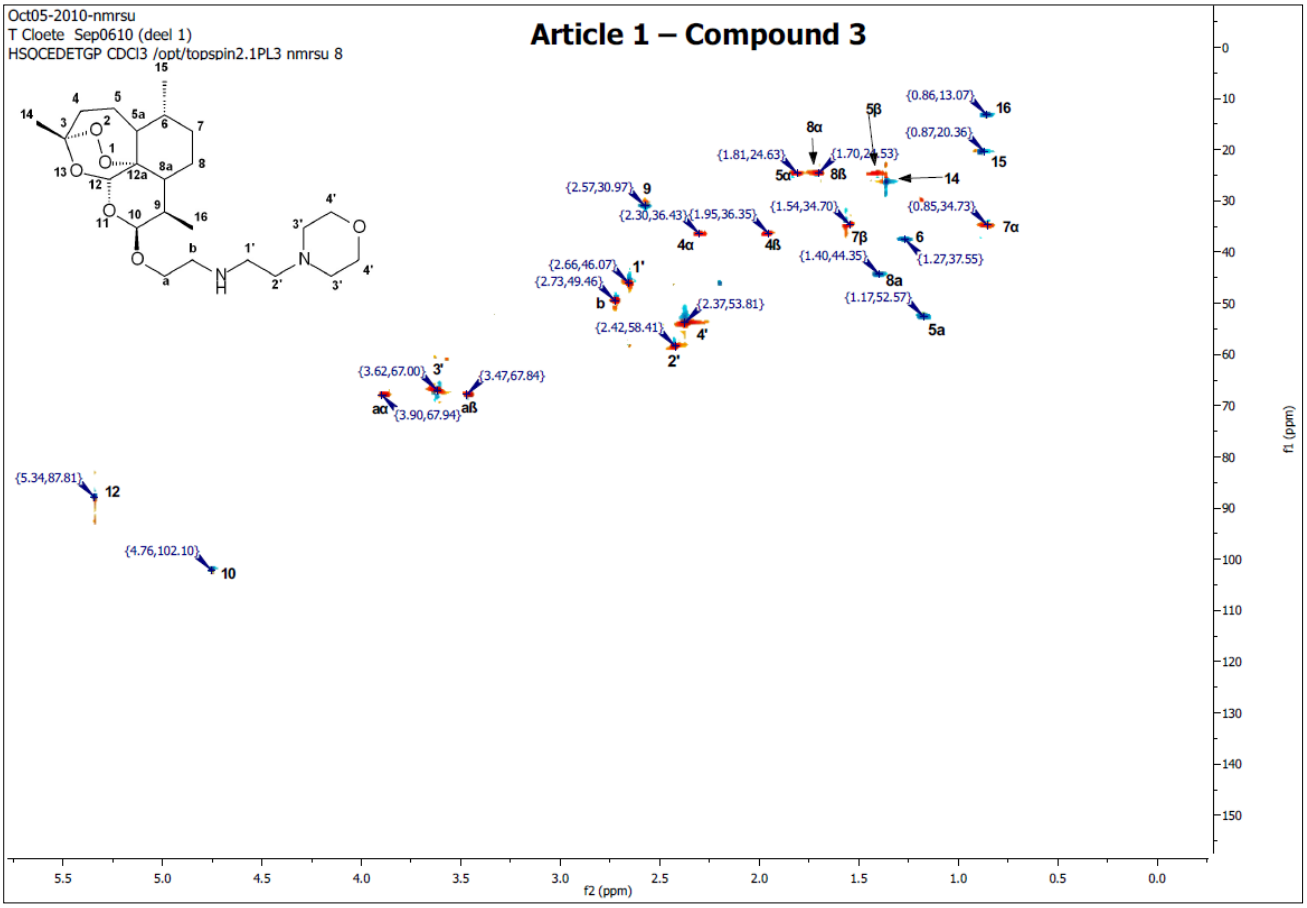
f1 (ppm)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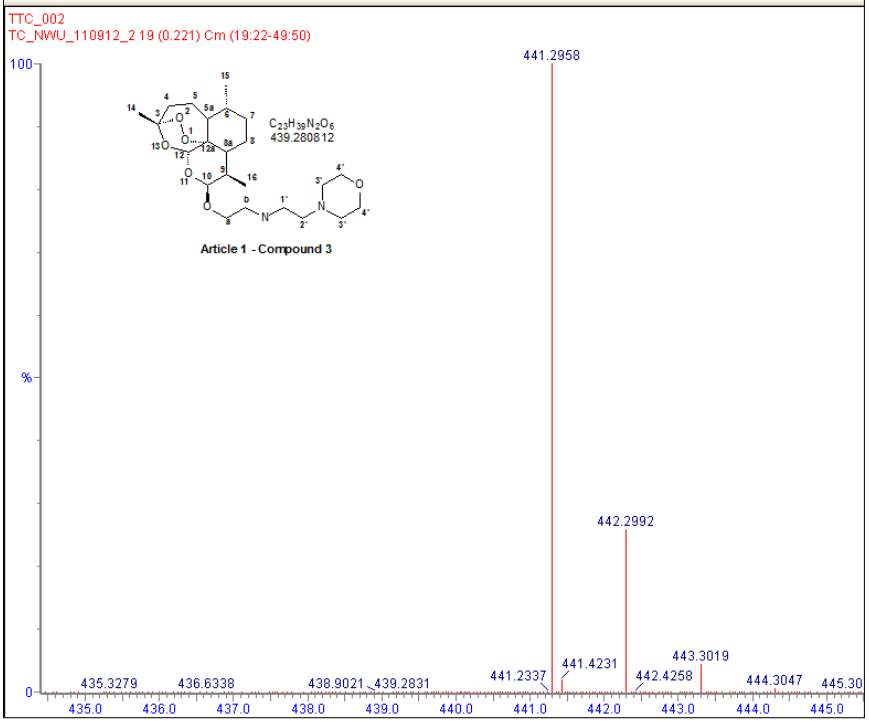
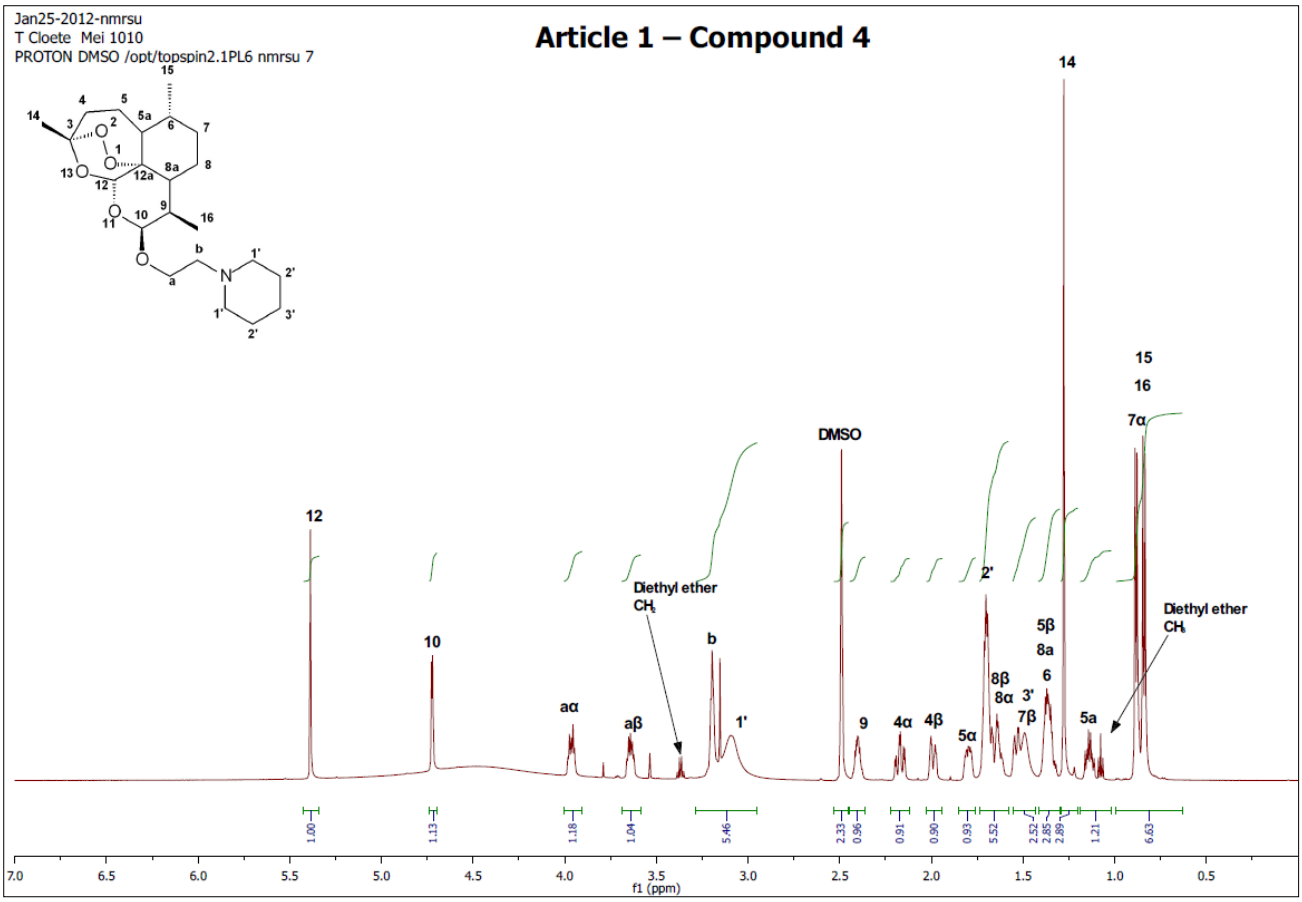
f2 (ppm)
f1 (ppm)

Mass	Calc. Mass	mDa	PPM	DBE	Formula	i-FIT	i-FIT Norm	Fit Conf %	C	H	N	O	Na
441.2958	441.2965	-0.7	-1.6	4.5	C23 H41 N2 O6	485.7	5.561	0.38	23	41	2	6	
	441.2941	1.7	3.9	1.5	C21 H42 N2 O6 Na	489.3	9.165	0.01	21	42	2	6	1
	441.2981	-2.3	-5.2	5.5	C26 H42 O4 Na	491.3	11.139	0.00	26	42		4	1
	441.2924	3.4	7.7	0.5	C18 H41 N4 O8	493.9	13.712	0.00	18	41	4	8	
	441.2994	-3.6	-8.2	10.5	C27 H38 N4 Na	493.4	13.290	0.00	27	38	4		1
	441.3005	-4.7	-10.7	8.5	C28 H41 O4	493.7	13.557	0.00	28	41		4	
	441.2906	5.2	11.8	13.5	C30 H37 N2 O	495.4	15.236	0.00	30	37	2	1	
	441.3018	-6.0	-13.6	13.5	C29 H37 N4	495.0	14.809	0.00	29	37	4		
	441.2882	7.6	17.2	10.5	C28 H38 N2 O Na	494.0	13.897	0.00	28	38	2	1	1

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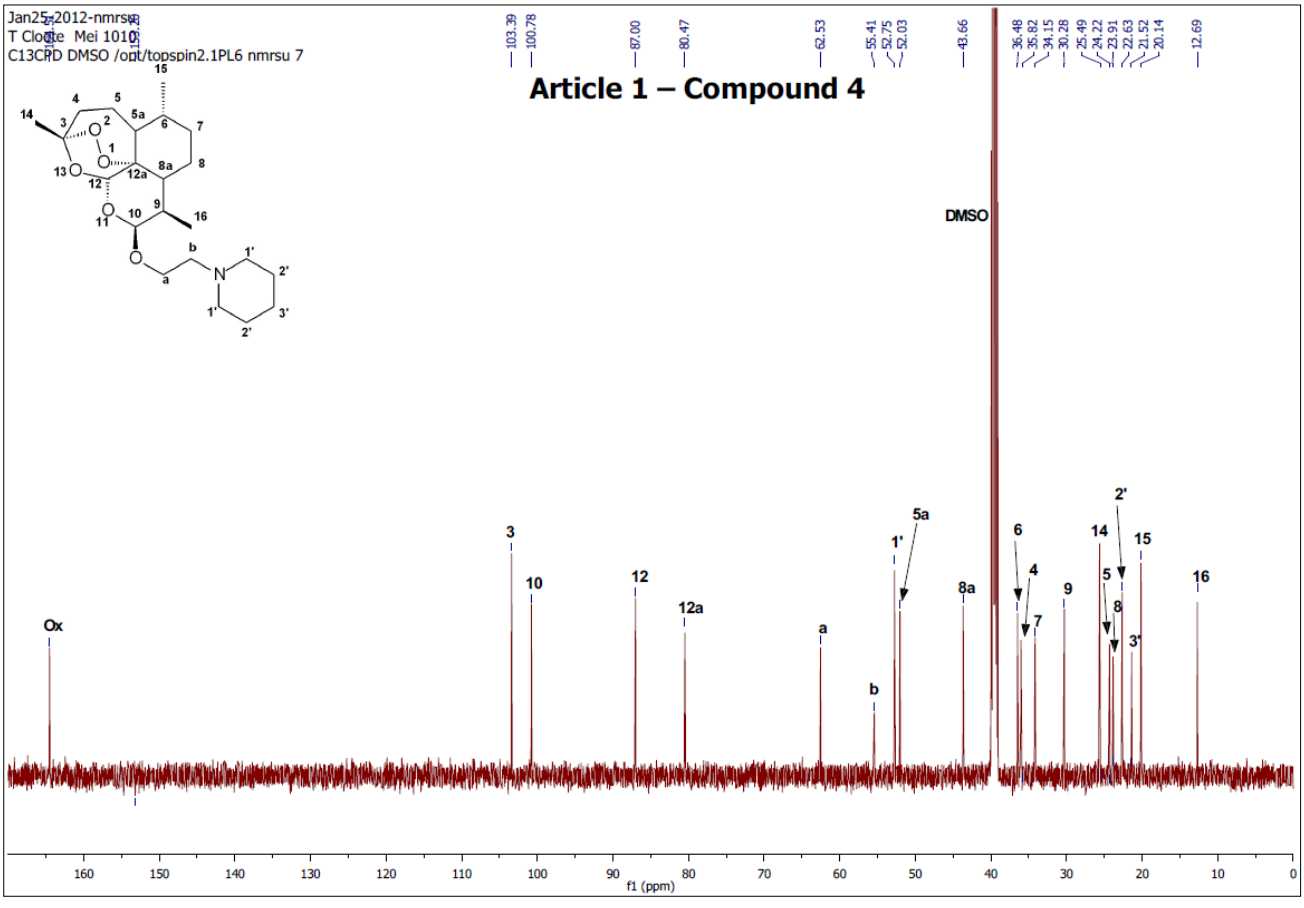
Diethyl ether
f1 (ppm)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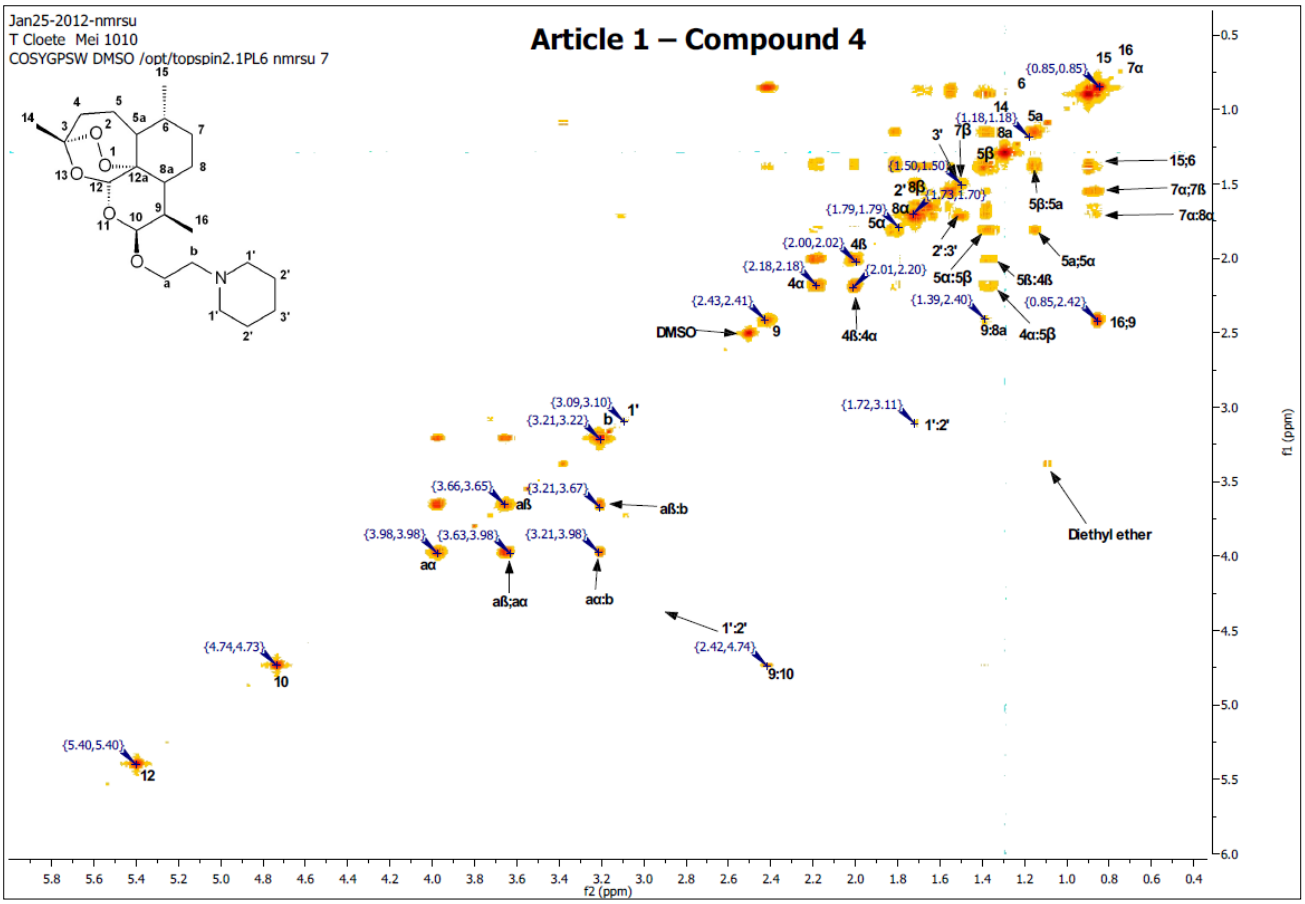
Ox
f1 (ppm)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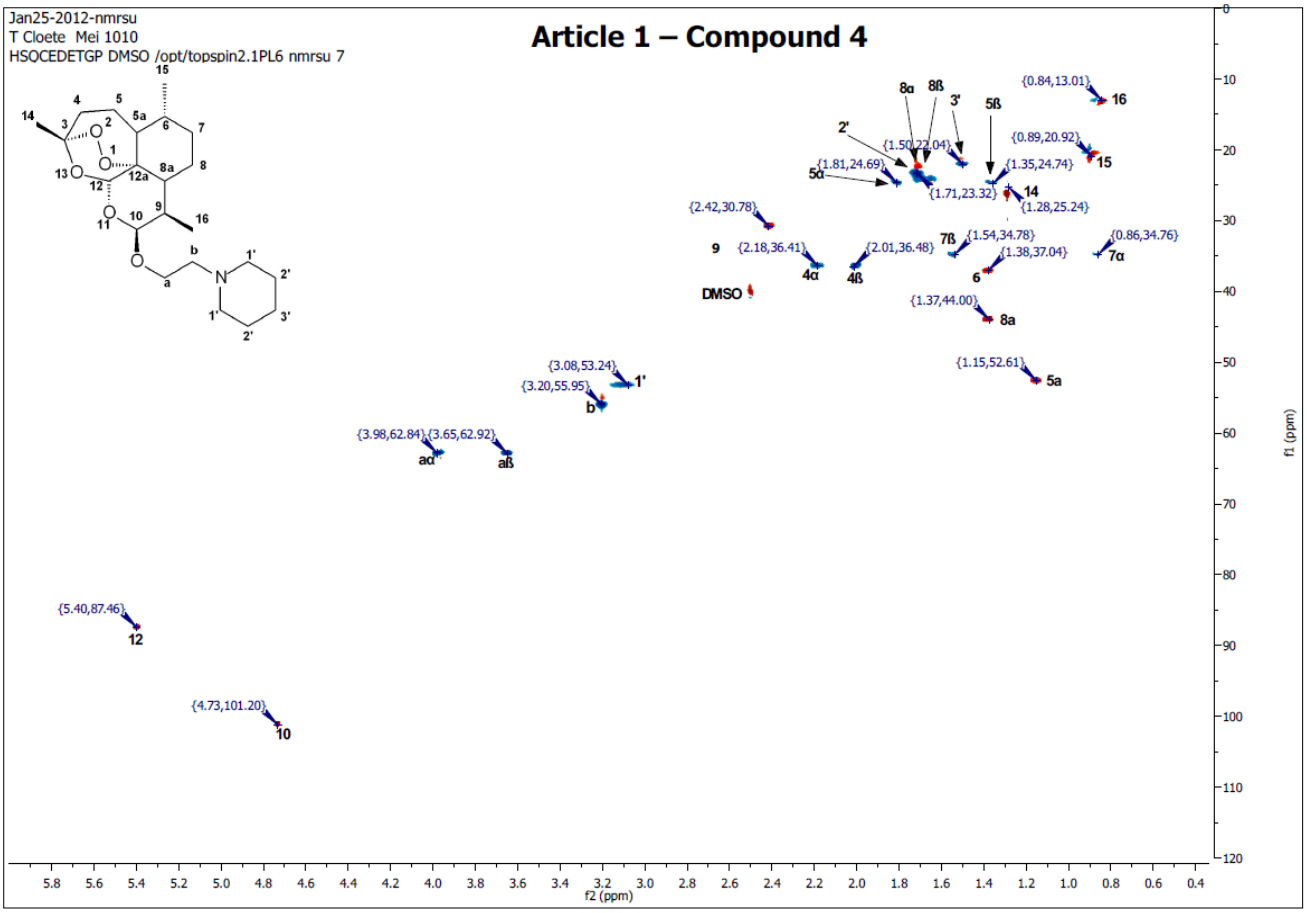
f2 (ppm)
f1 (ppm)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f2 (ppm)
f1 (ppm)

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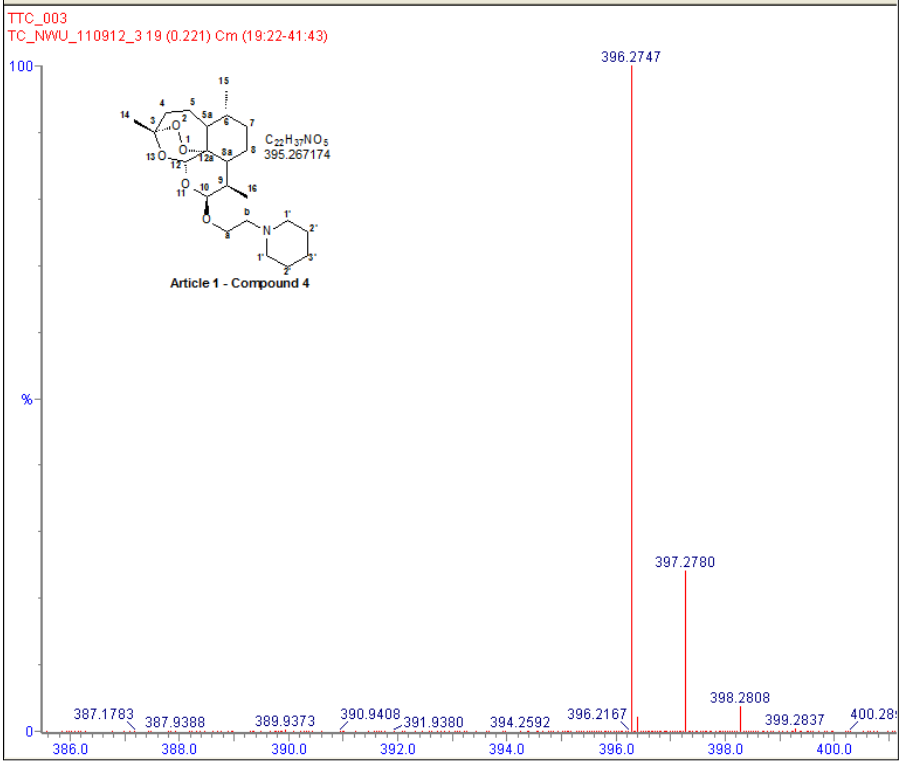
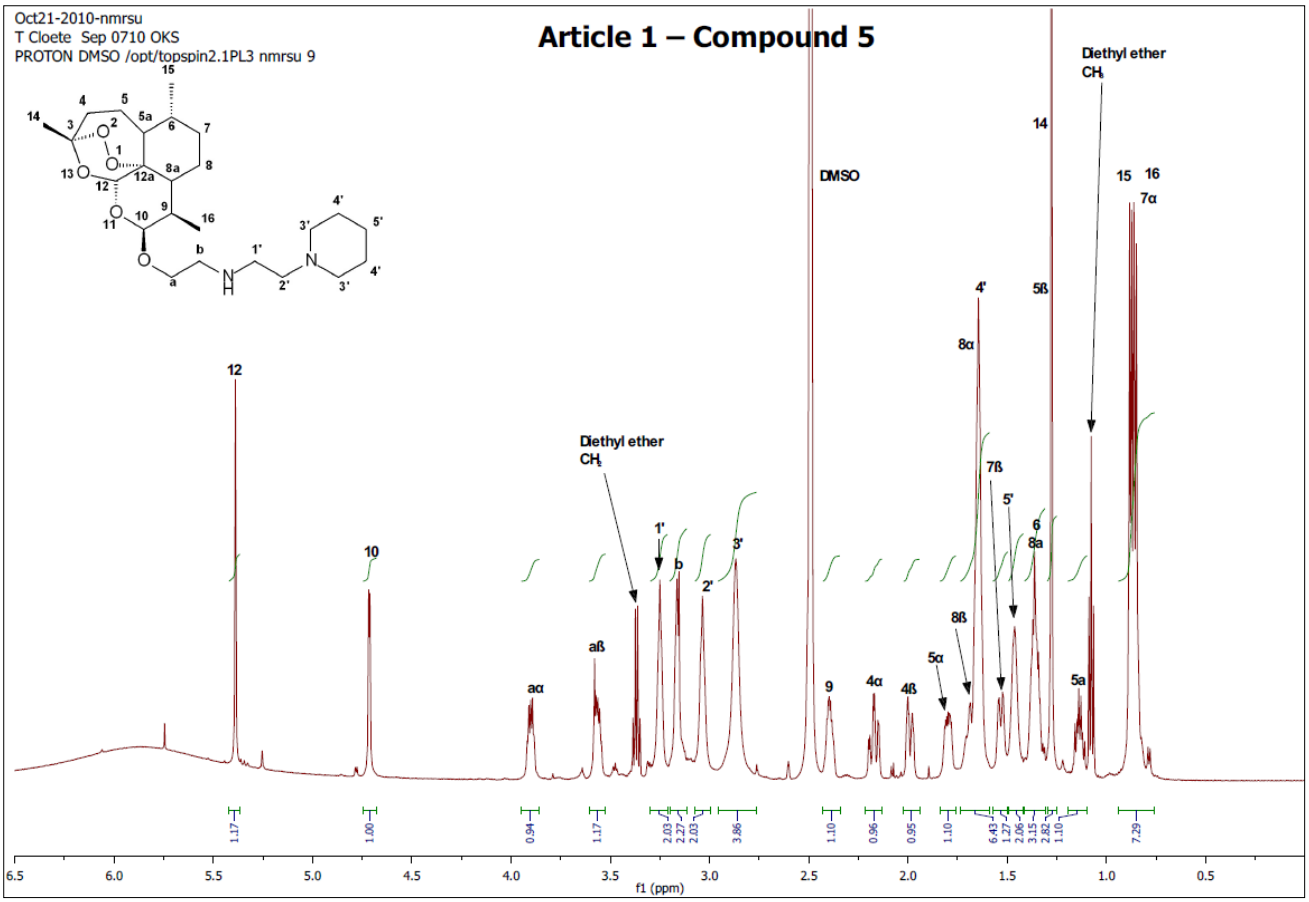
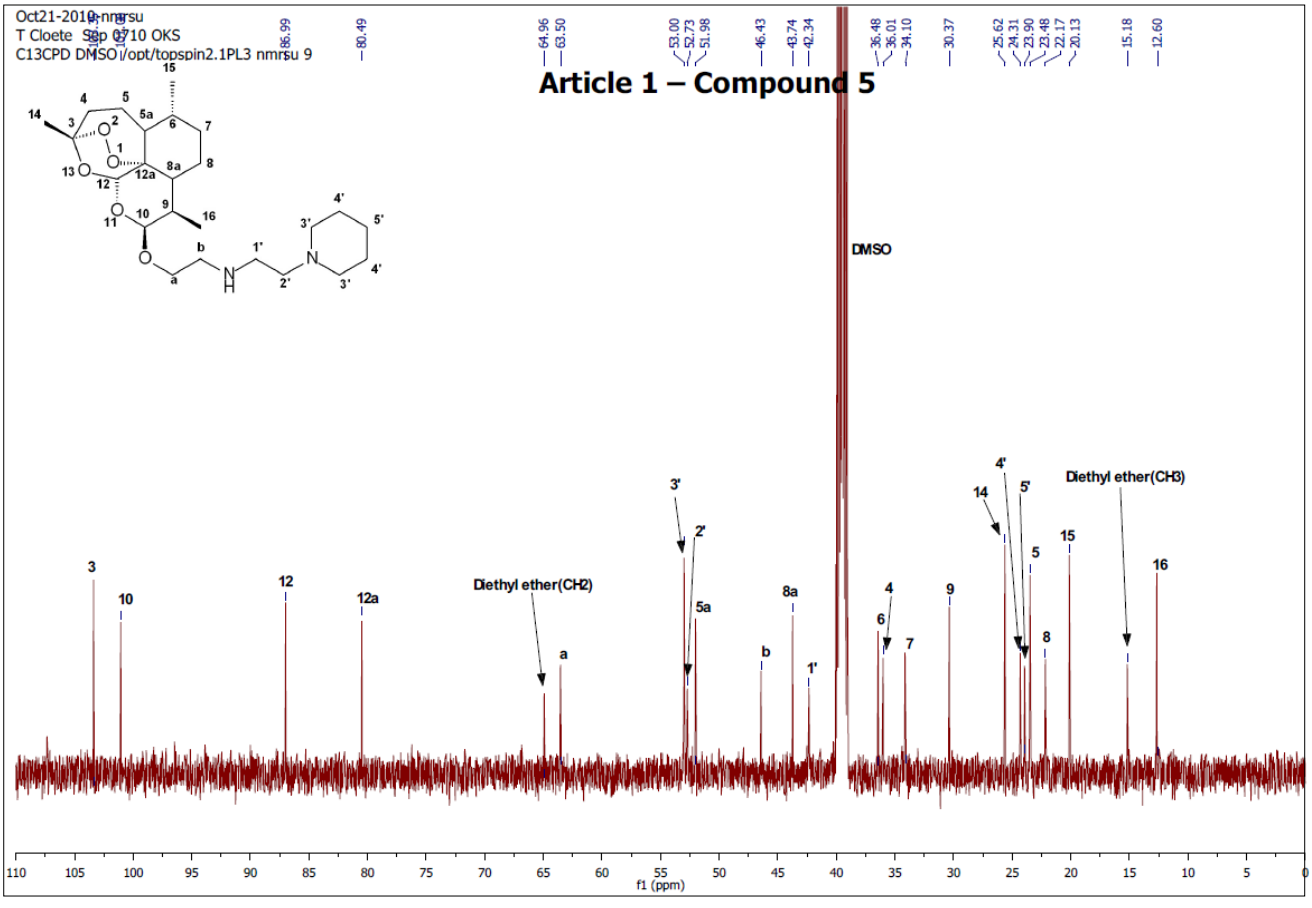
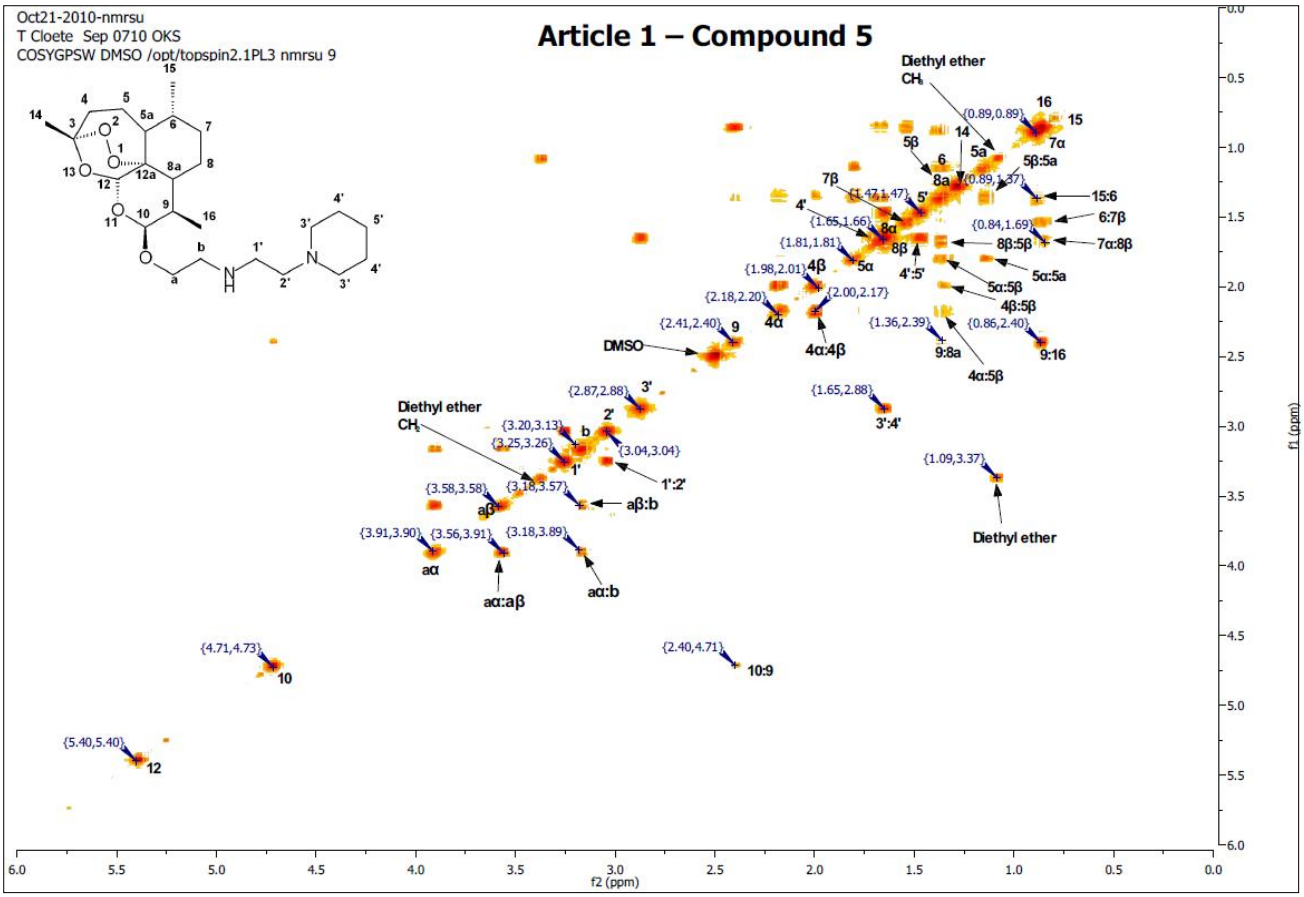
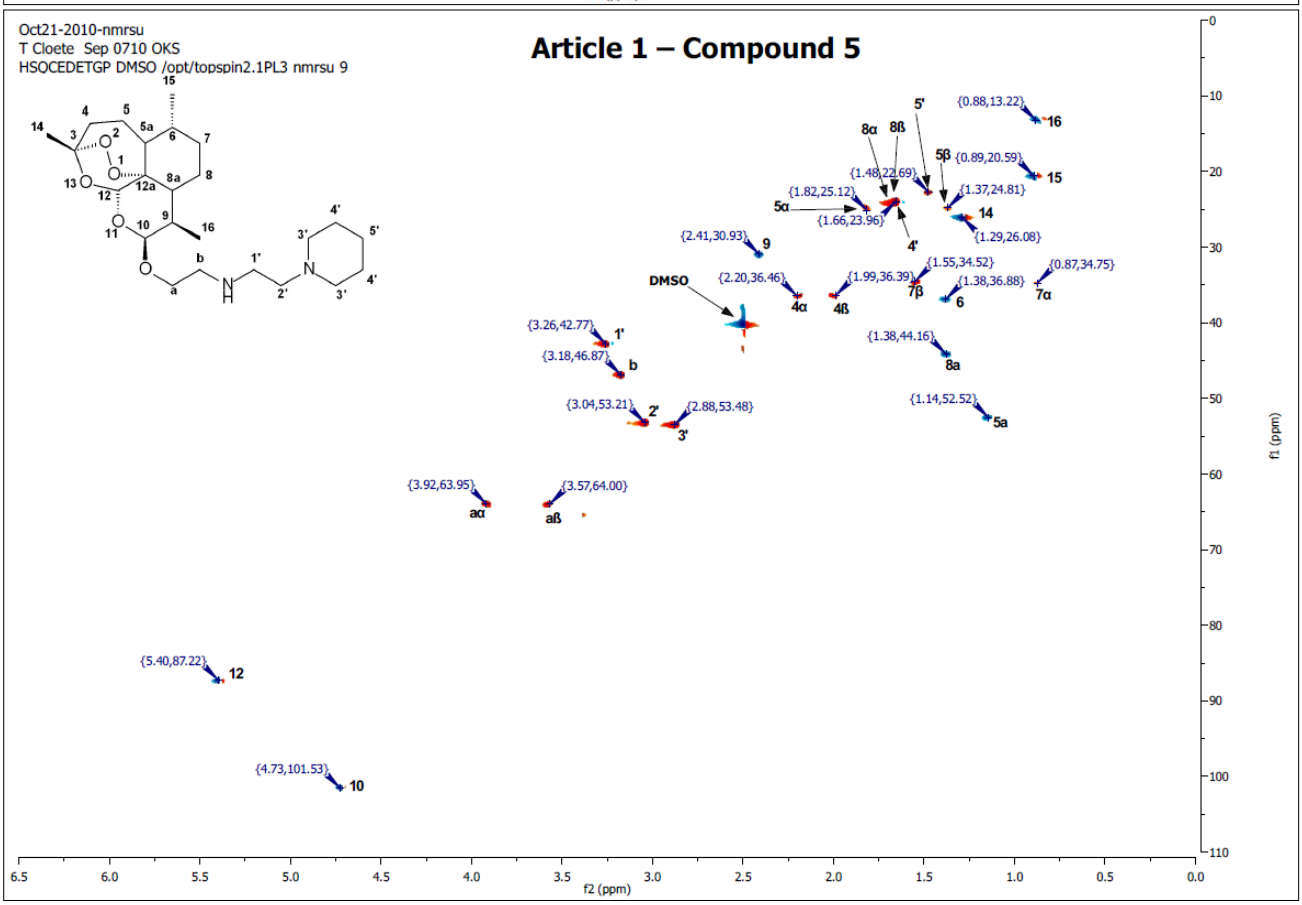
	396.2739	0.8	2.0	6.5	C21 H35 N5 O Na	471.1	6.134	0.22	21	35	5	1	1
	396.2763	-1.6	-4.0	9.5	C23 H34 N5 O	473.3	8.337	0.02	23	34	5	1	
	396.2726	2.1	5.3	1.5	C20 H39 N O5 Na	470.4	5.352	0.47	20	39	1	5	1
	396.2710	3.7	9.3	0.5	C17 H38 N3 O7	475.5	10.494	0.00	17	38	3	7	
	396.2691	5.6	14.1	13.5	C29 H34 N	477.9	12.900	0.00	29	34	1		
	396.2822	-7.5	-18.9	0.5	C16 H38 N5 O6	477.0	12.002	0.00	16	38	5	6	
	396.2667	8.0	20.2	10.5	C27 H35 N Na	476.7	11.665	0.00	27	35	1		1
	396.2838	-9.1	-23.0	1.5	C19 H39 N3 O4 Na	472.5	7.544	0.05	19	39	3	4	1



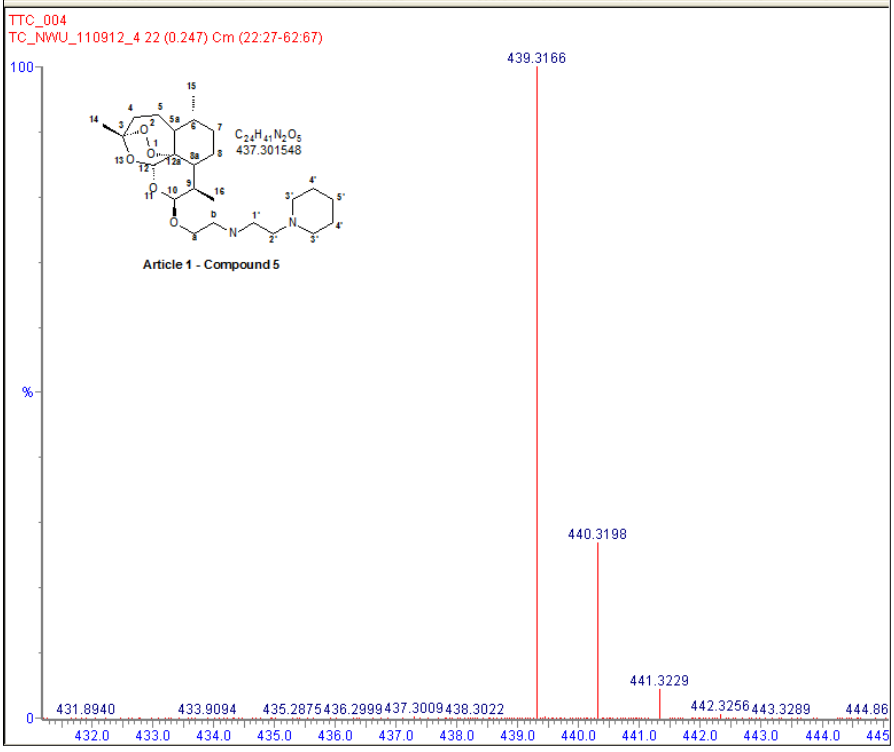

Oct21-2010-nmrsu
T Cloete Sep 0710 OKS
PROTON DMSO /opt/topspin2.1PL3 nmrsu 9
Article 1 – Compound 5
Diethyl ether CH3
DMSO
f1 (ppm)

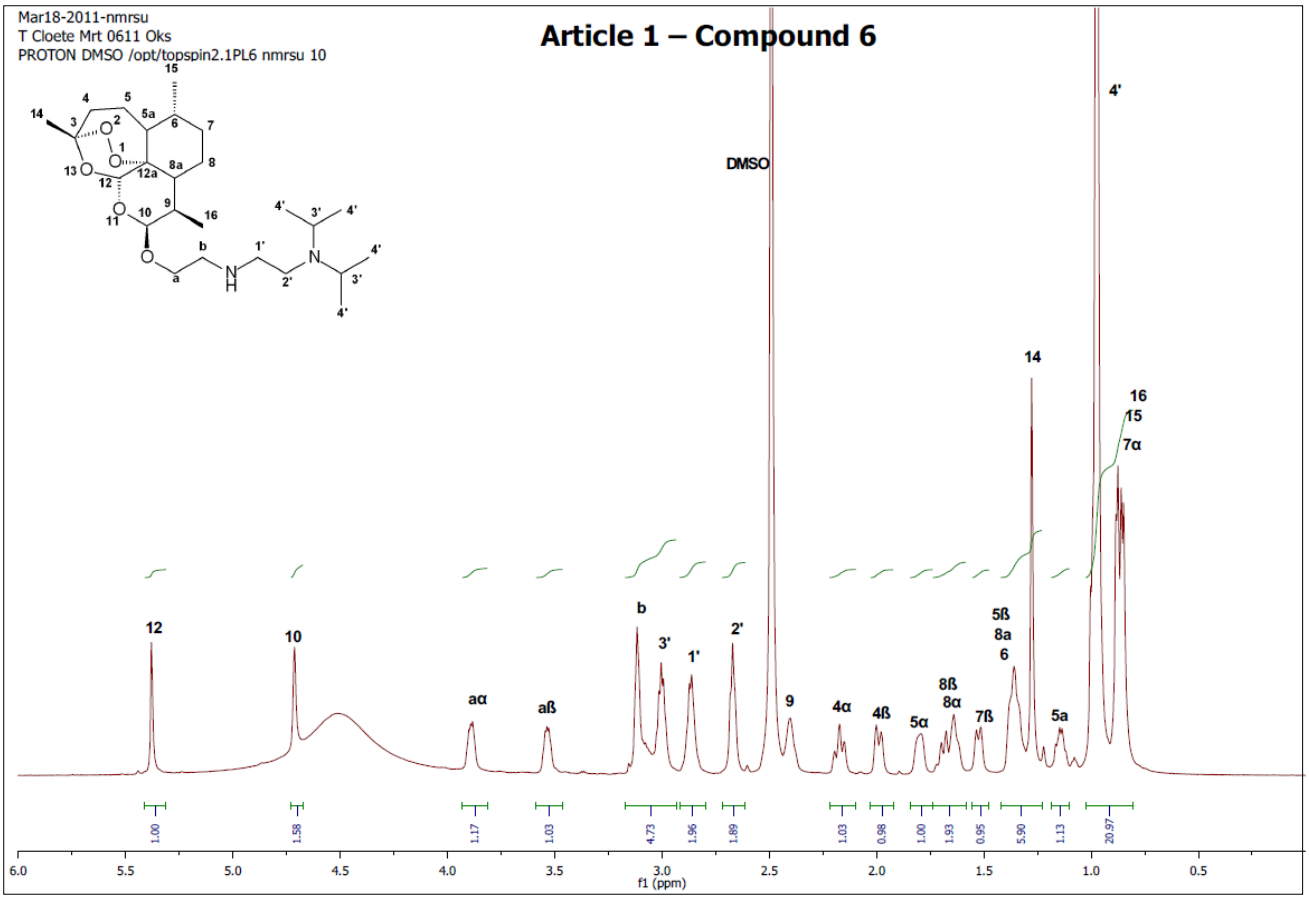

Oct21-2010-nmrsu
T Cloete Sep 0710 OKS
C13CPD DMSO /opt/topspin2.1PL3 nmrsu 9
Article 1 – Compound 5
DMSO
Diethyl ether(CH2)
Diethyl ether(CH3)
f1 (ppm)

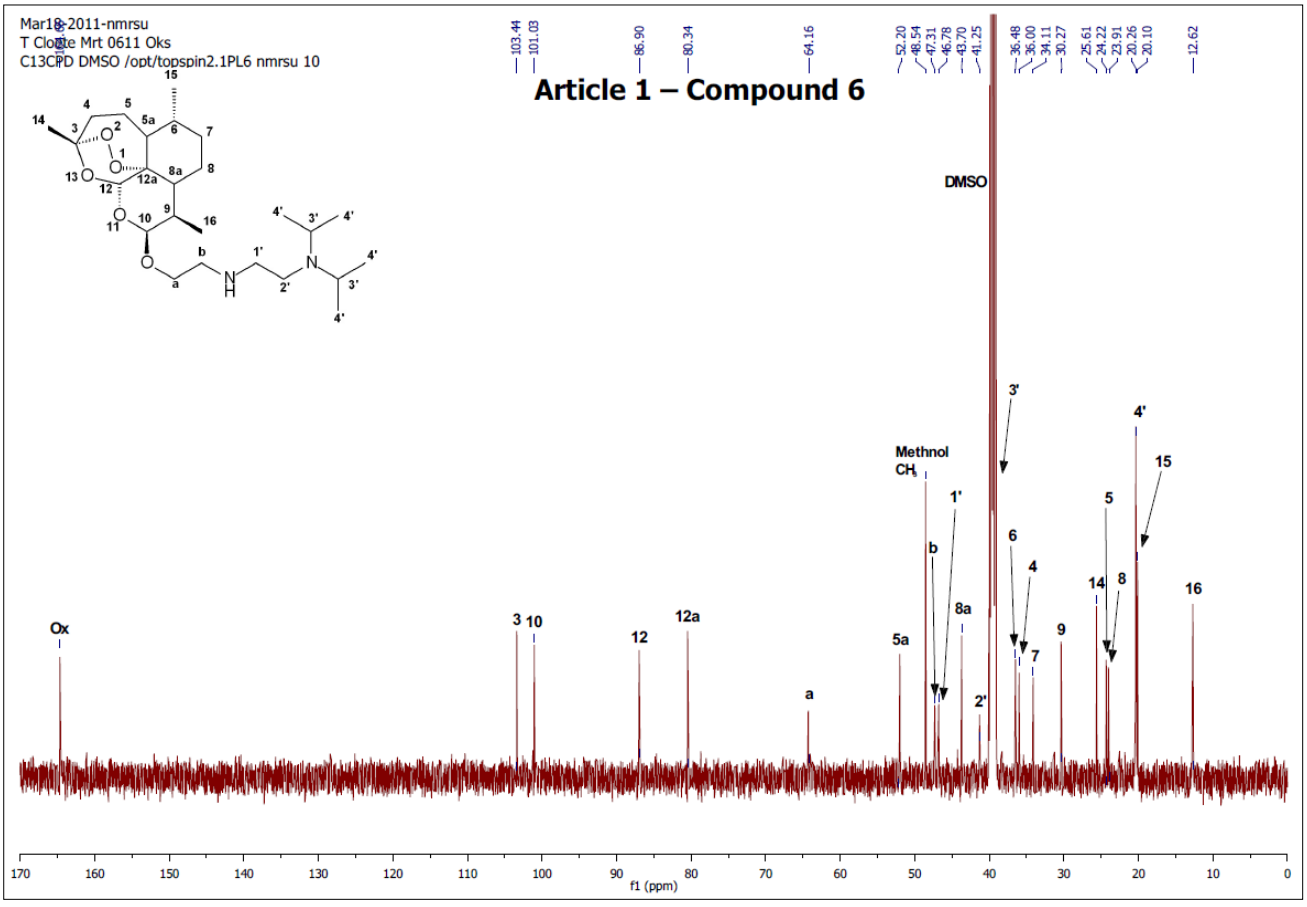

Oct21-2010-nmrsu
T Cloete Sep 0710 OKS
COSYGPSW DMSO /opt/topspin2.1PL3 nmrsu 9
Article 1 – Compound 5
Diethyl ether
DMSO
f2 (ppm)
f1 (ppm)

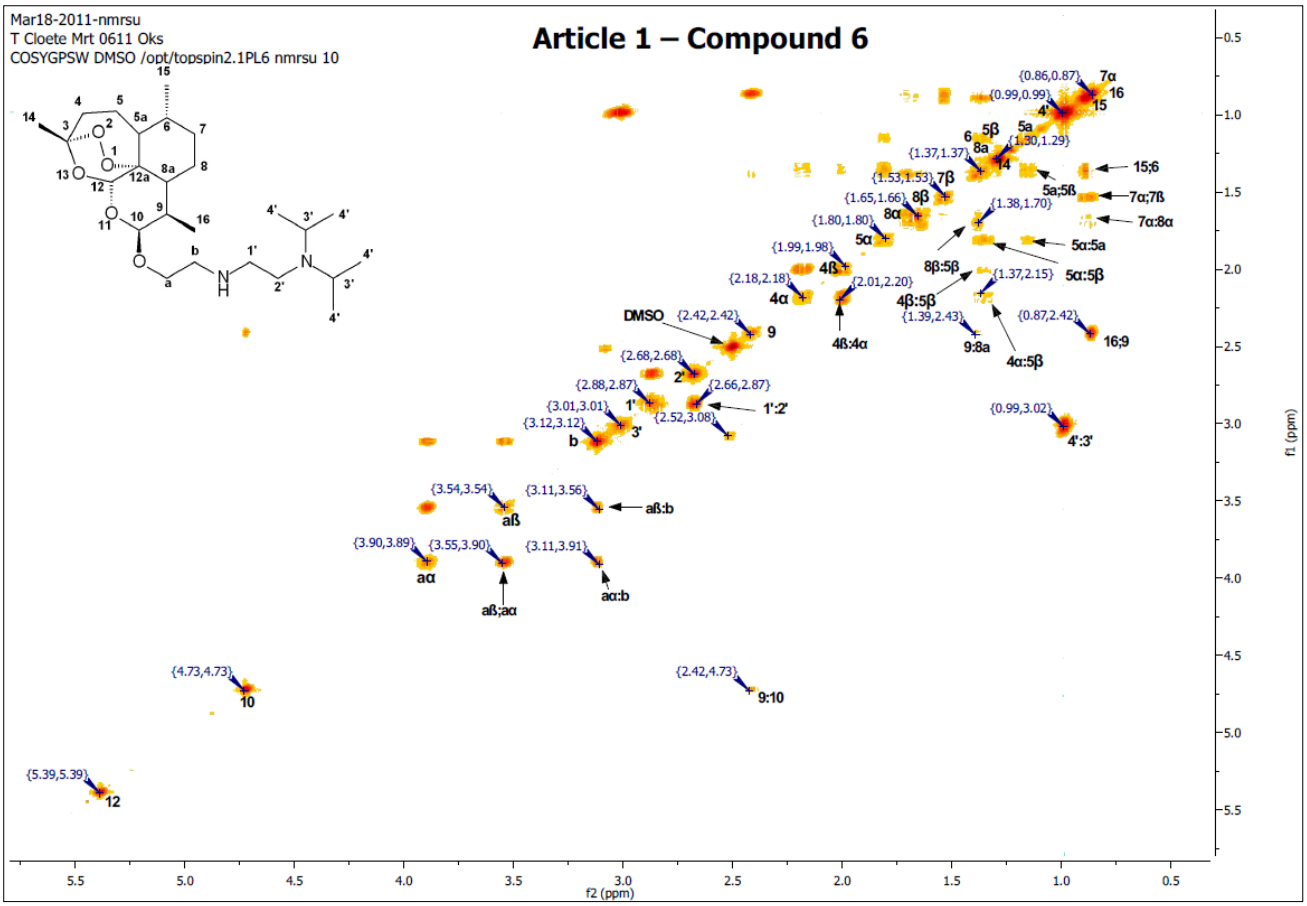

Oct21-2010-nmrsu
T Cloete Sep 0710 OKS
HSQCEDETGP DMSO /opt/topspin2.1PL3 nmrsu 9
Article 1 – Compound 5
DMSO
f2 (ppm)
f1 (ppm)

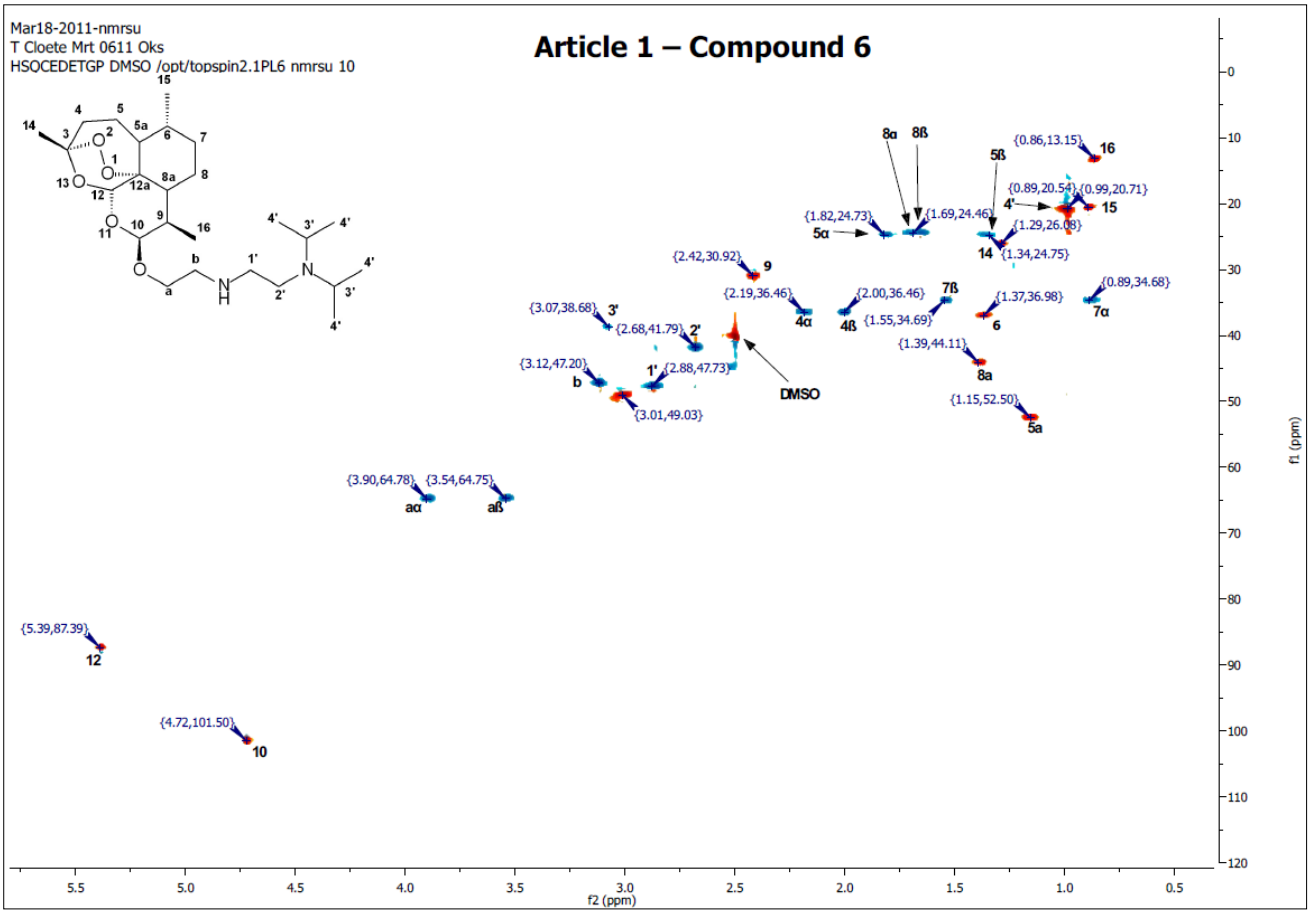
Mass	Calc. Mass	mDa	PPM	DBE	Formula	i-FIT	i-FIT Norm	Fit Conf %	C	H	N	O	Na
439.3166	439.3172	-0.6	-1.4	4.5	C24 H43 N2 O5	388.4	5.688	0.34	24	43	2	5	
	439.3148	1.8	4.1	1.5	C22 H44 N2 O5 Na	391.2	8.458	0.02	22	44	2	5	1
	439.3188	-2.2	-5.0	5.5	C27 H44 O3 Na	393.3	10.509	0.00	27	44		3	1
	439.3132	3.4	7.7	0.5	C19 H43 N4 O7	396.1	13.339	0.00	19	43	4	7	
	439.3212	-4.6	-10.5	8.5	C29 H43 O3	395.6	12.835	0.00	29	43		3	
	439.3089	7.7	17.5	10.5	C29 H40 N2 Na	395.7	12.988	0.00	29	40	2		1
	439.3073	9.3	21.2	9.5	C26 H39 N4 O2	393.7	10.954	0.00	26	39	4	2	
	439.3260	-9.4	-21.4	1.5	C21 H44 N4 O4 Na	393.3	10.569	0.00	21	44	4	4	1
	439.3060	10.6	24.1	4.5	C25 H43 O6	391.3	8.591	0.02	25	43		6	



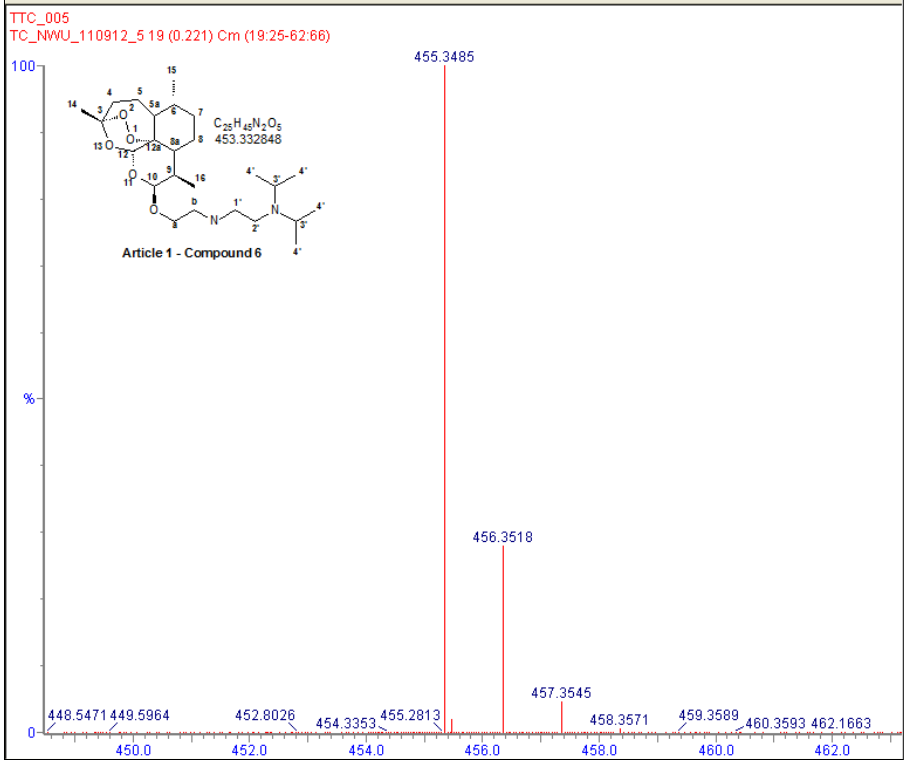

Mar18-2011-nmrsu
T Cloete Mrt 0611 Oks
PROTON DMSO /opt/topspin2.1PL6 nmrsu 10
Article 1 – Compound 6
DMSO
f1 (ppm)

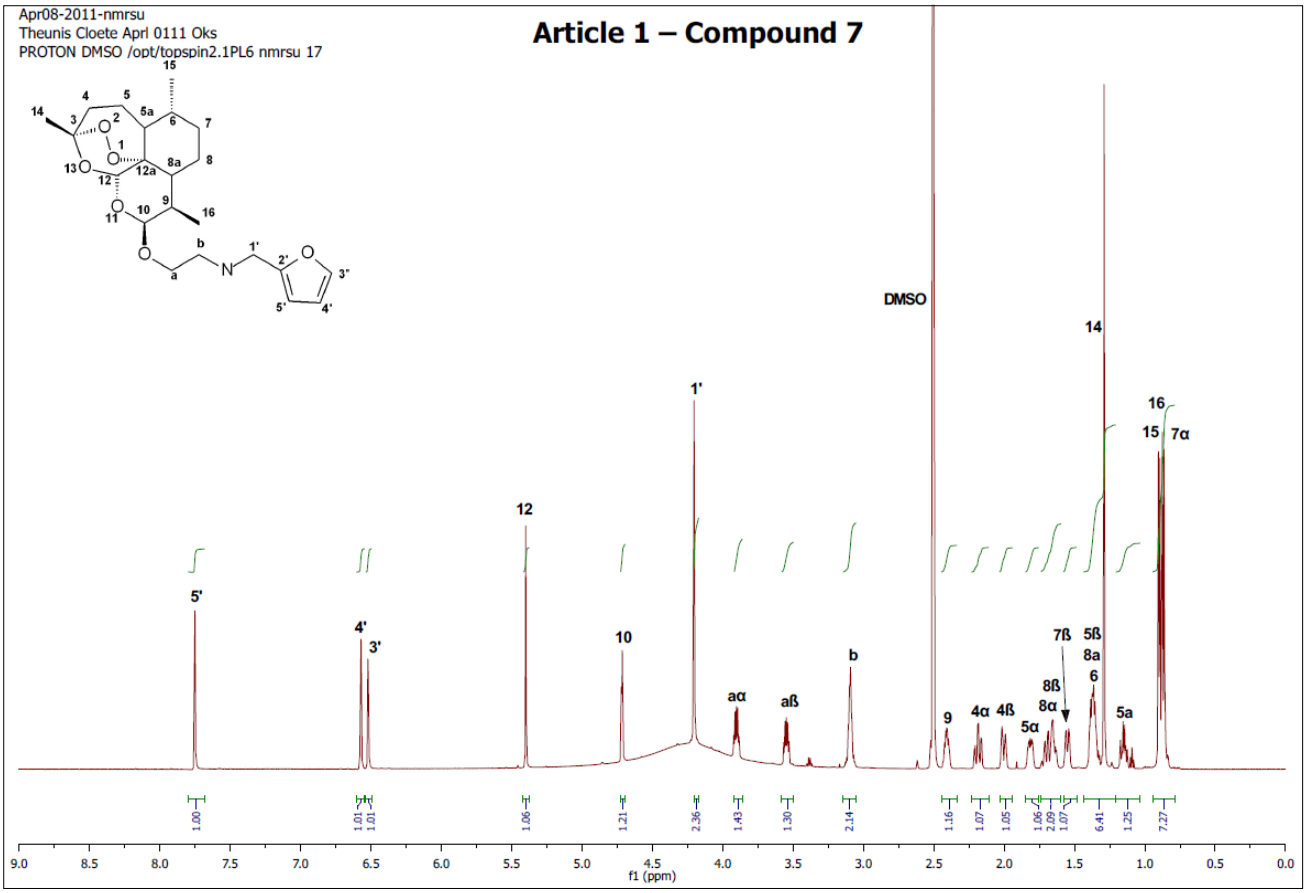

Mar18-2011-nmrsu
T Cloete Mrt 0611 Oks
C13CPD DMSO /opt/topspin2.1PL6 nmrsu 10
Article 1 – Compound 6
DMSO
Methnol
CH3
Ox
f1 (ppm)

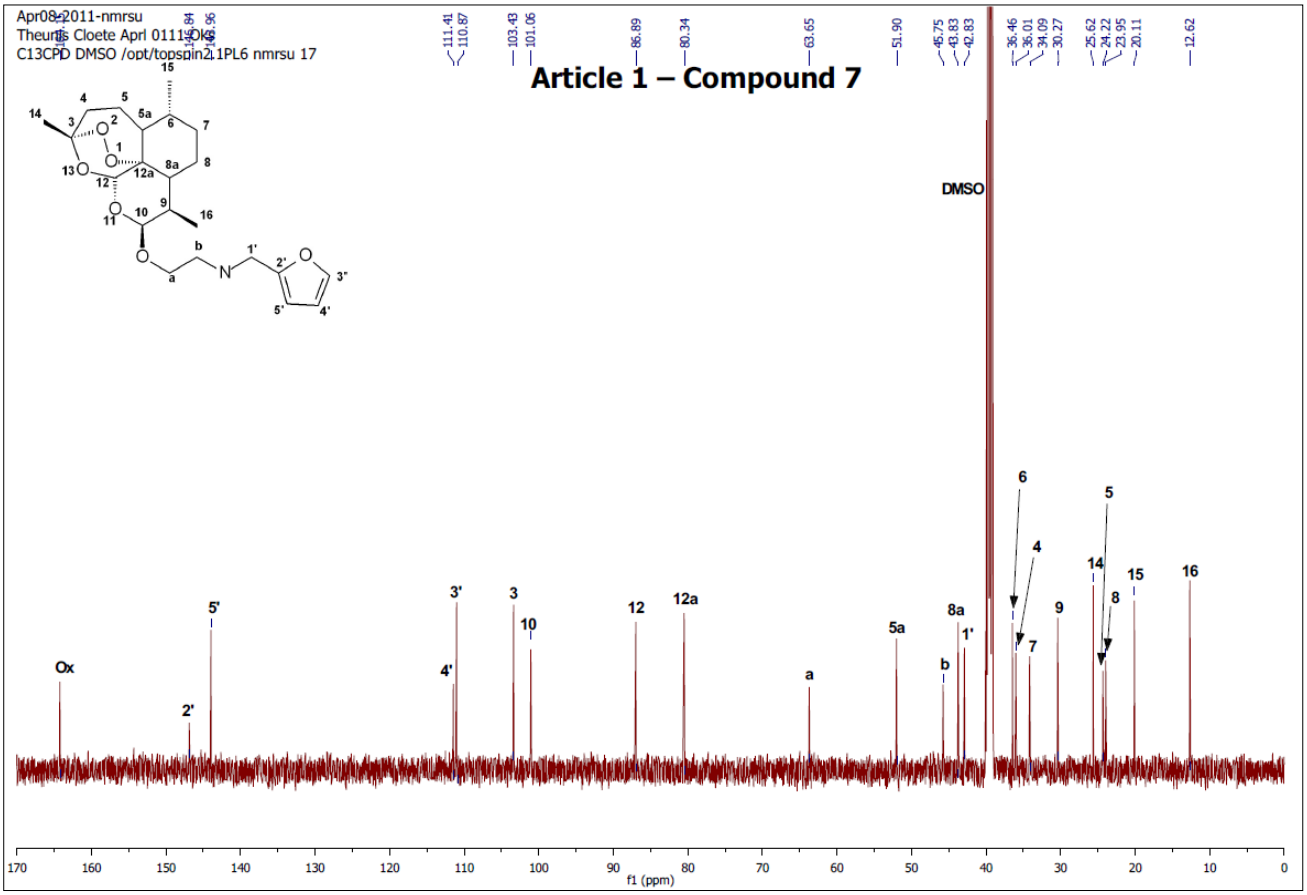

Mar18-2011-nmrsu
T Cloete Mrt 0611 Oks
COSYGPSW DMSO /opt/topspin2.1PL6 nmrsu 10
Article 1 – Compound 6
f2 (ppm)
f1 (ppm)

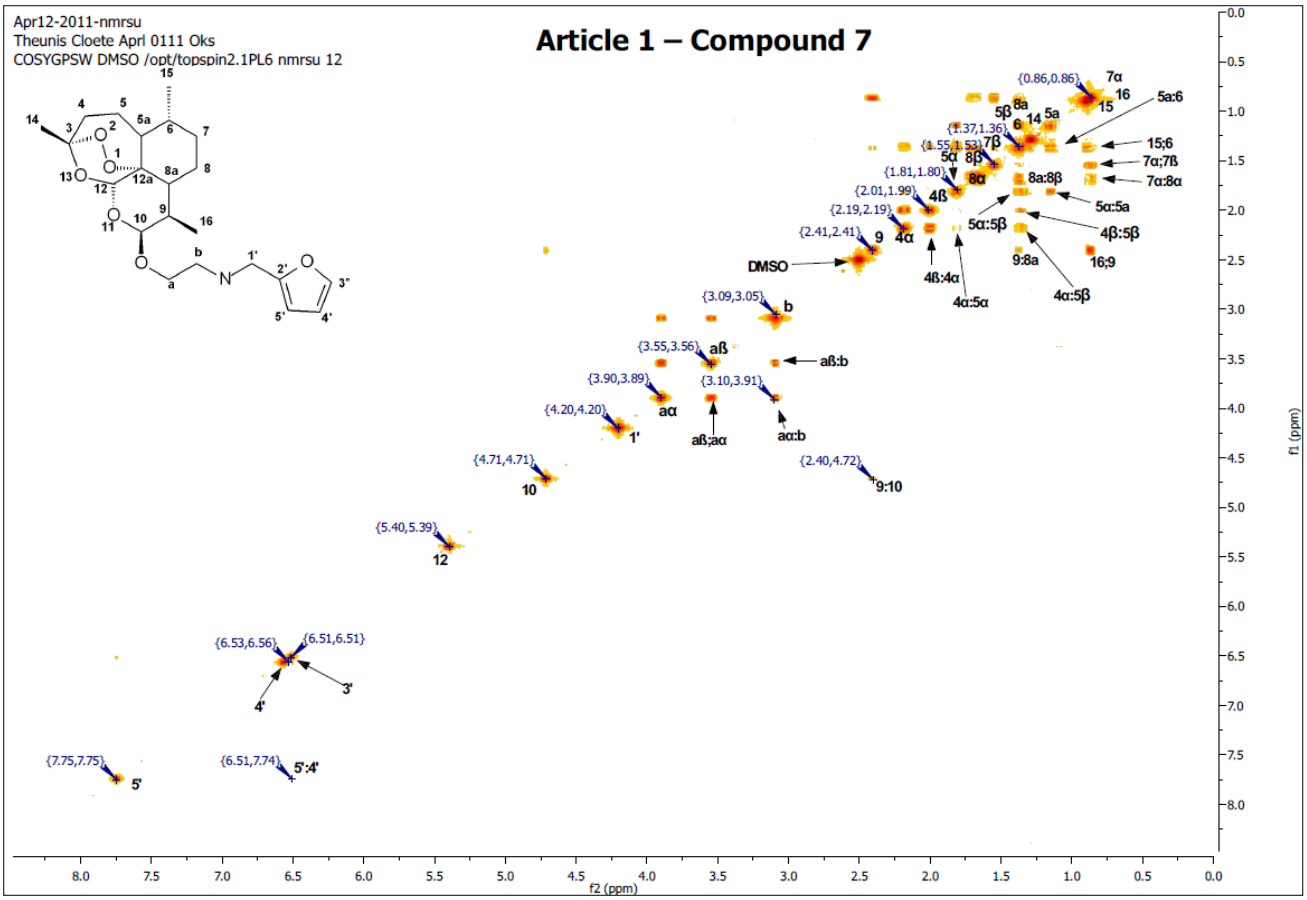

Mar18-2011-nmrsu
T Cloete Mrt 0611 Oks
HSQCEDETGP DMSO /opt/topspin2.1PL6 nmrsu 10
Article 1 – Compound 6
f2 (ppm)
f1 (ppm)

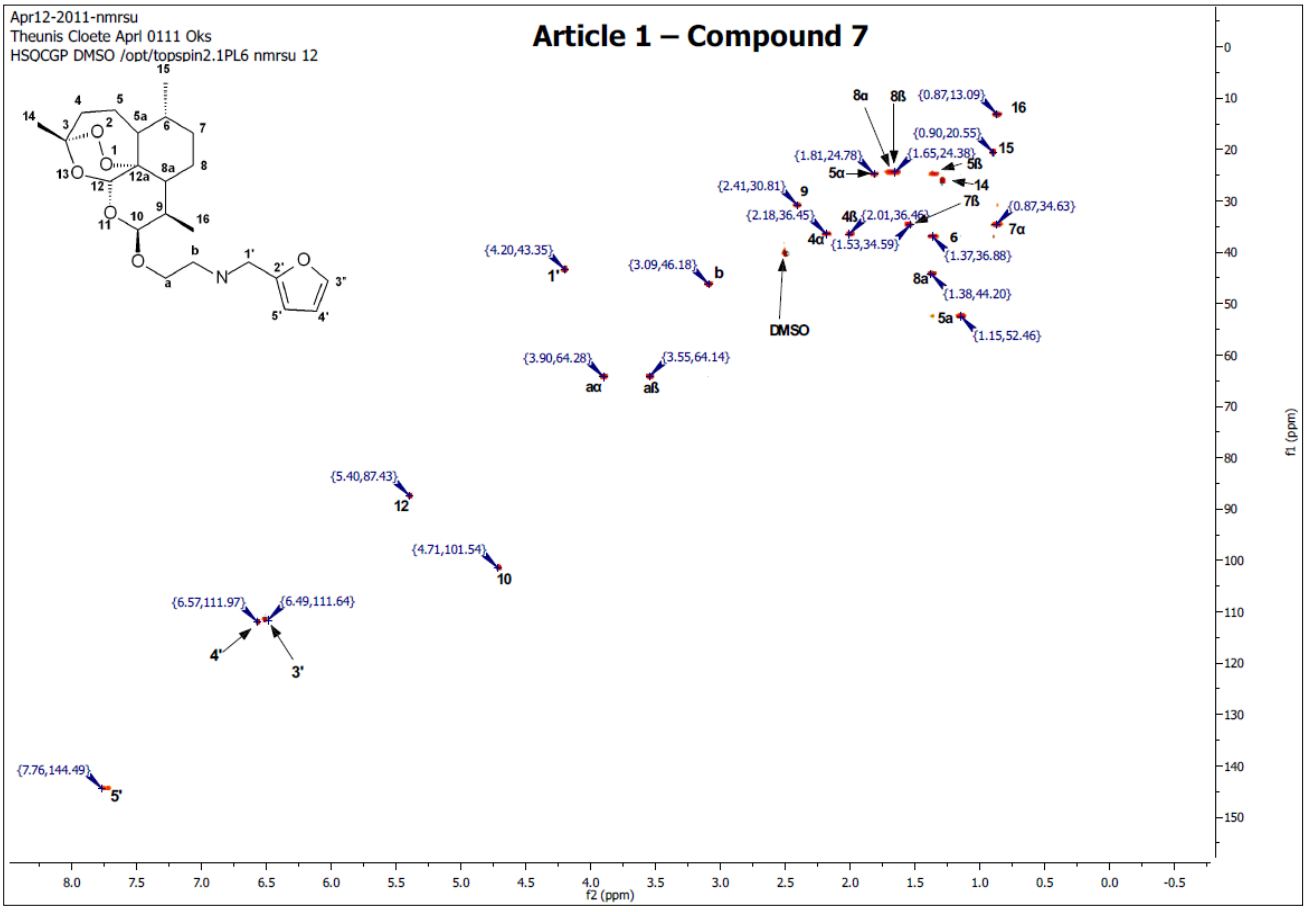
Mass	Calc. Mass	mDa	PPM	DBE	Formula	i-FIT	i-FIT Norm	Fit Conf %	C	H	N	O	Na
455.3485	455.3485	0.0	0.0	3.5	C25 H47 N2 O5	529.2	8.109	0.03	25	47	2	5	
	455.3501	-1.6	-3.5	4.5	C28 H48 O3 Na	534.5	13.484	0.00	28	48		3	1
	455.3461	2.4	5.3	0.5	C23 H48 N2 O5 Na	531.7	10.615	0.00	23	48	2	5	1
	455.3445	4.0	8.8	-0.5	C20 H47 N4 O7	535.8	14.731	0.00	20	47	4	7	
	455.3525	-4.0	-8.8	7.5	C30 H47 O3	537.0	15.916	0.00	30	47		3	
	455.3402	8.3	18.2	9.5	C30 H44 N2 Na	537.3	16.231	0.00	30	44	2		1
	455.3573	-8.8	-19.3	0.5	C22 H48 N4 O4 Na	533.4	12.340	0.00	22	48	4	4	1
	455.3386	9.9	21.7	8.5	C27 H43 N4 O2	534.5	13.475	0.00	27	43	4	2	
	455.3373	11.2	24.6	3.5	C26 H47 O6	532.3	11.234	0.00	26	47		6	



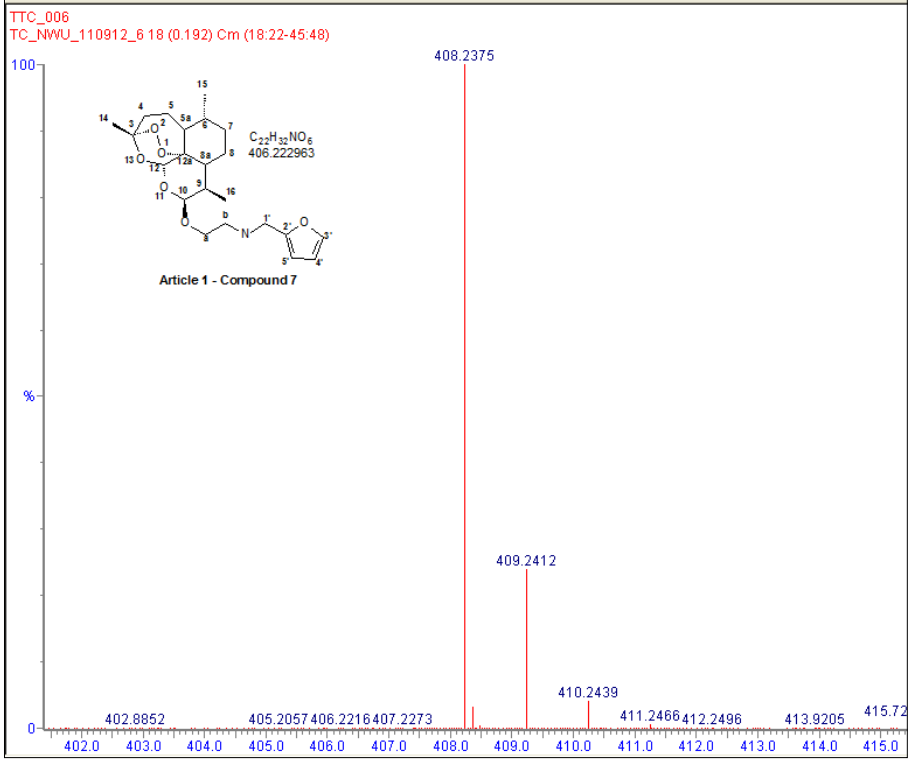

Apr08-2011-nmrsu
Theunis Cloete Aprl 0111 Oks
PROTON DMSO /opt/topspin2.1PL6 nmrsu 17
Article 1 – Compound 7
DMSO
f1 (ppm)

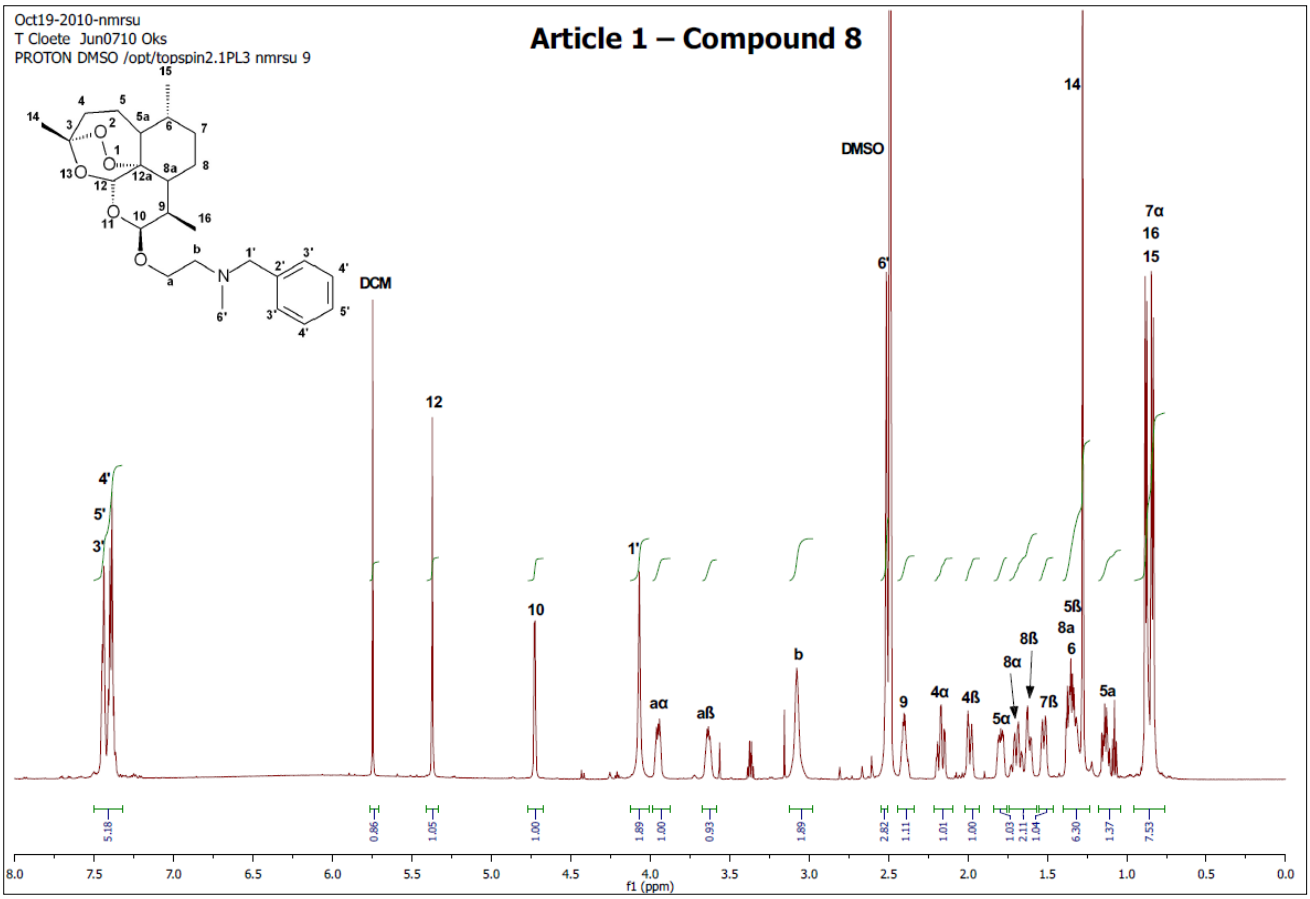

Apr08-2011-nmrsu
Theunis Cloete Aprl 0111 Oks
C13CPD DMSO /opt/topspin2.1PL6 nmrsu 17
Article 1 – Compound 7
DMSO
f1 (ppm)

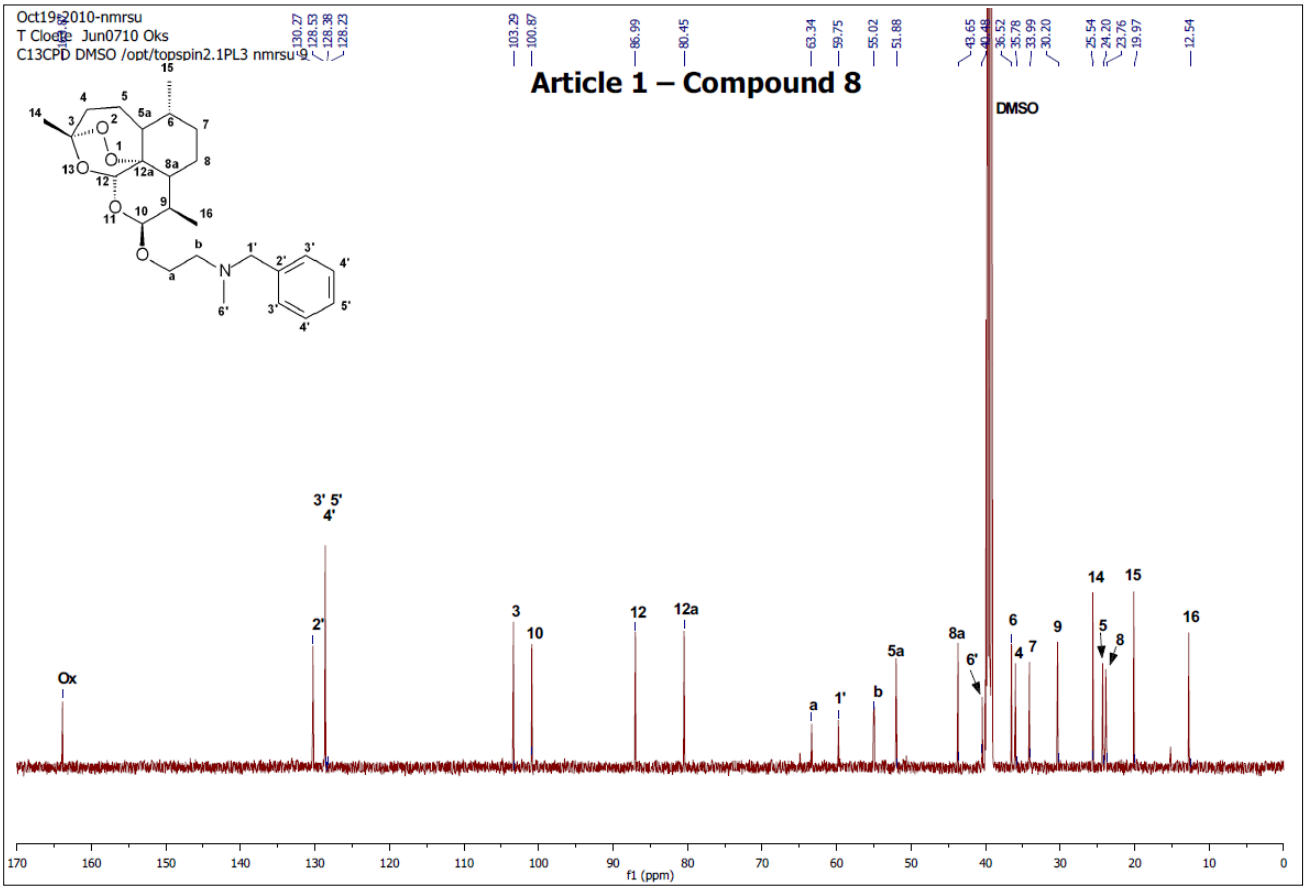

Apr12-2011-nmrsu
Theunis Cloete Aprl 0111 Oks
COSYGPSW DMSO /opt/topspin2.1PL6 nmrsu 12
Article 1 – Compound 7
DMSO
f2 (ppm)
f1 (ppm)

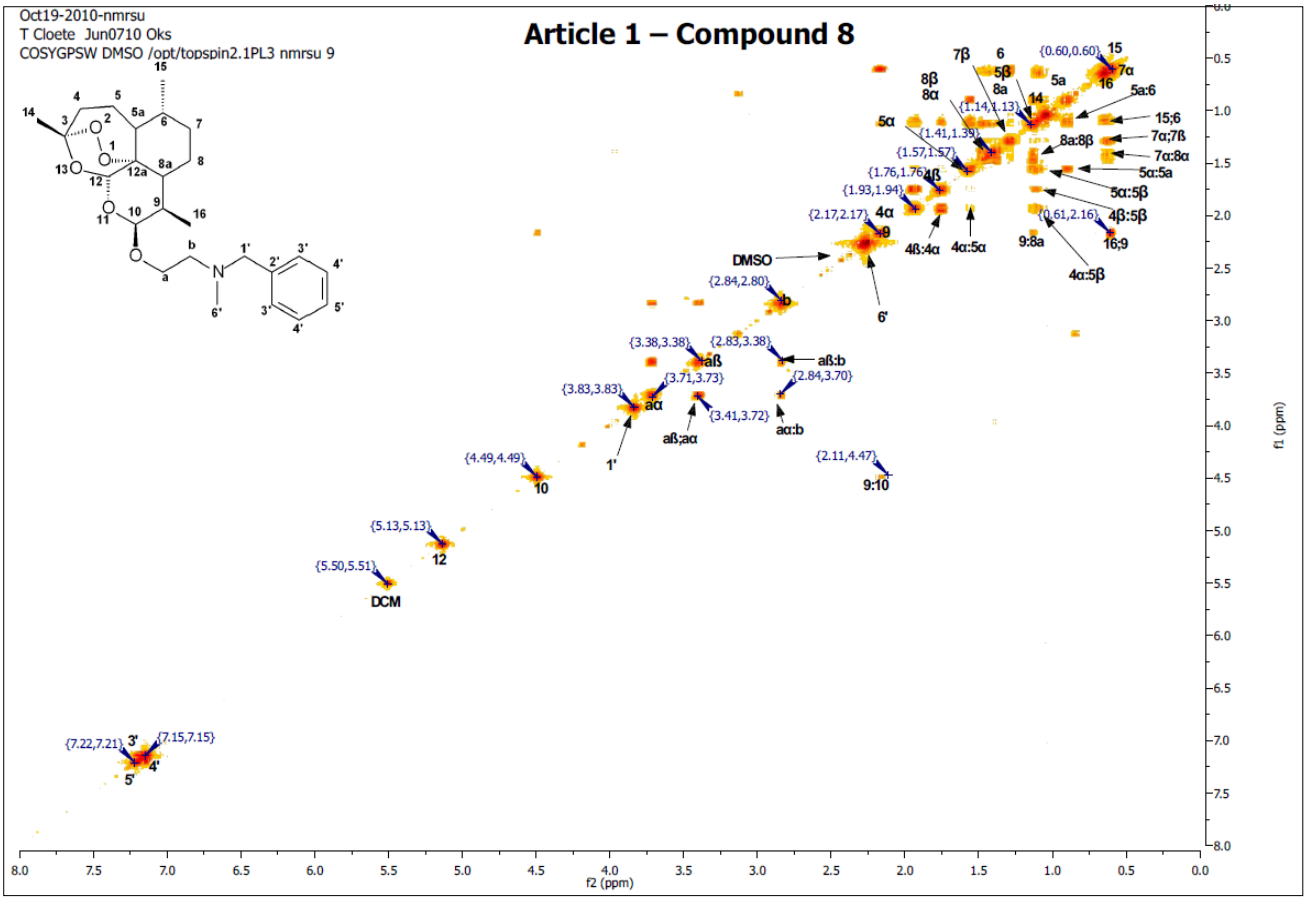

Apr12-2011-nmrsu
Theunis Cloete Aprl 0111 Oks
HSOCGP DMSO /opt/topspin2.1PL6 nmrsu 12
Article 1 – Compound 7
DMSO
f2 (ppm)
f1 (ppm)

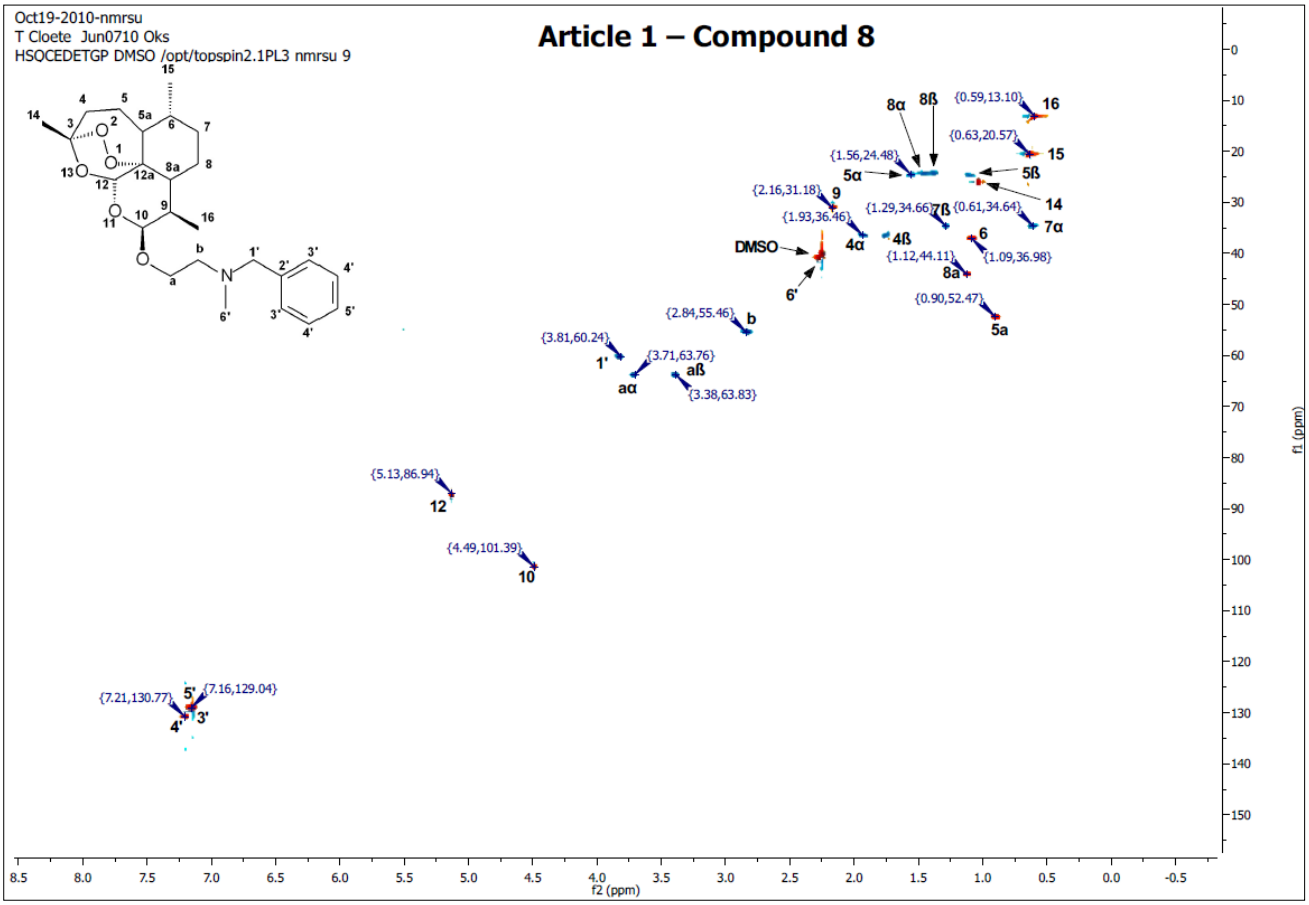
Mass	Calc. Mass	mDa	PPM	DBE	Formula	i-FIT	i-FIT Norm	Fit Conf %	C	H	N	O	Na
408.2375	408.2375	0.0	0.0	8.5	C21 H31 N5 O2 Na	506.1	5.657	0.35	21	31	5	2	1
	408.2386	-1.1	-2.7	6.5	C22 H34 N O6	502.4	1.924	14.60	22	34	1	6	
	408.2362	1.3	3.2	3.5	C20 H35 N O6 Na	504.2	3.791	2.26	20	35	1	6	1
	408.2400	-2.5	-6.1	11.5	C23 H30 N5 O2	507.9	7.481	0.06	23	30	5	2	
	408.2346	2.9	7.1	2.5	C17 H34 N3 O8	509.7	9.282	0.01	17	34	3	8	
	408.2416	-4.1	-10.0	12.5	C26 H31 N3 Na	509.5	9.047	0.01	26	31	3		1
	408.2327	4.8	11.8	15.5	C29 H30 N O	511.0	10.525	0.00	29	30	1	1	
	408.2322	5.3	13.0	-0.5	C15 H35 N3 O8 Na	512.1	11.692	0.00	15	35	3	8	1
	408.2434	-5.9	-14.5	-0.5	C14 H35 N5 O7 Na	513.3	12.843	0.00	14	35	5	7	1



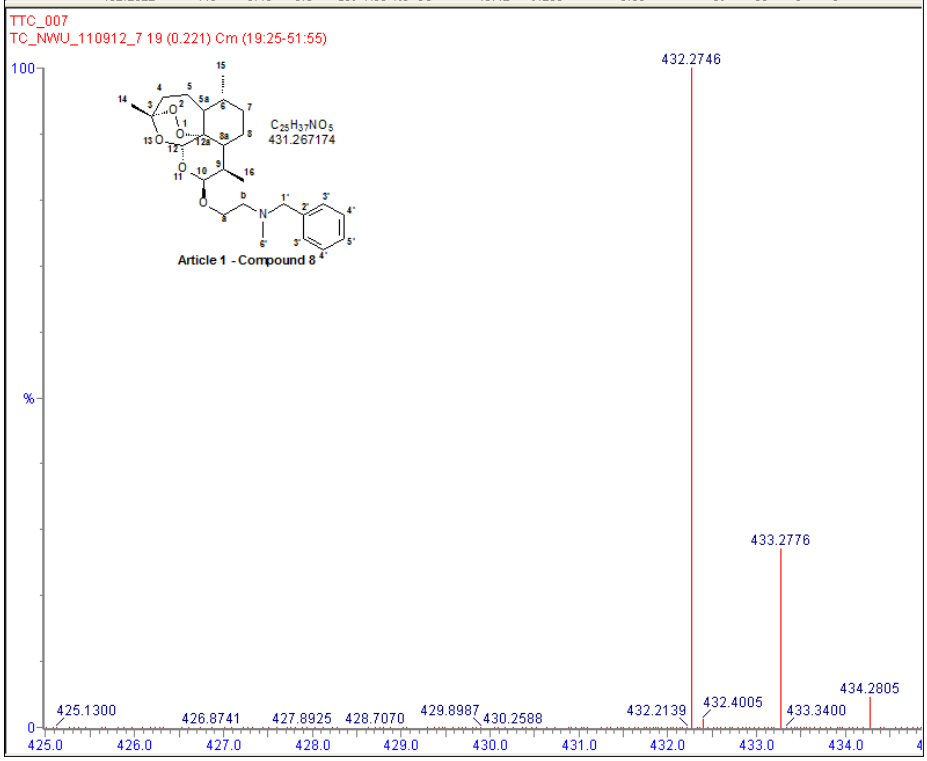

Oct19-2010-nmrsu
T Cloete Jun0710 Oks
PROTON DMSO /opt/topspin2.1PL3 nmrsu 9
Article 1 – Compound 8
DMSO
DCM
f1 (ppm)

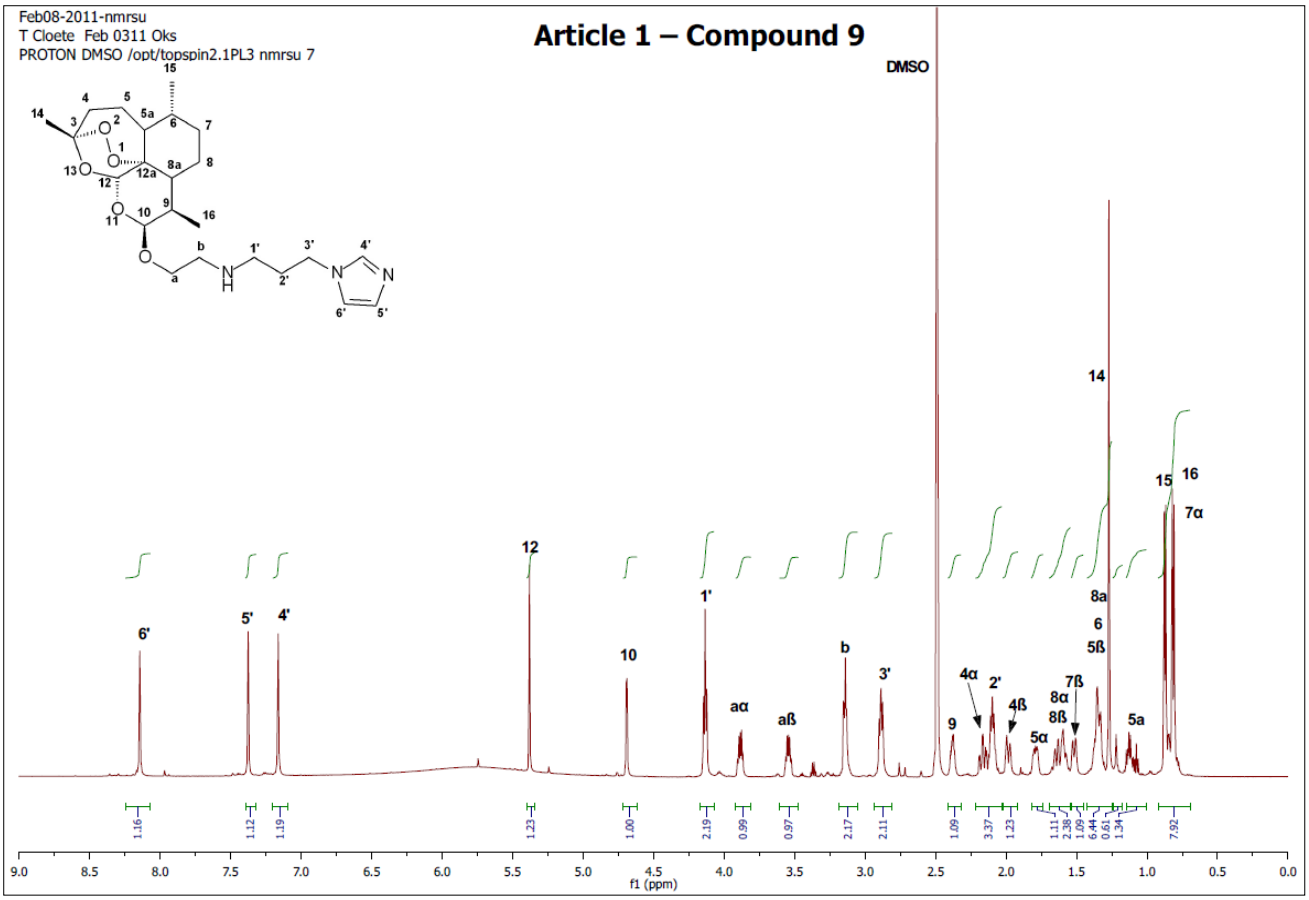

Oct19-2010-nmrsu
T Cloete Jun0710 Oks
C13CPD DMSO /opt/topspin2.1PL3 nmrsu 9
Article 1 – Compound 8
DMSO
Ox
f1 (ppm)

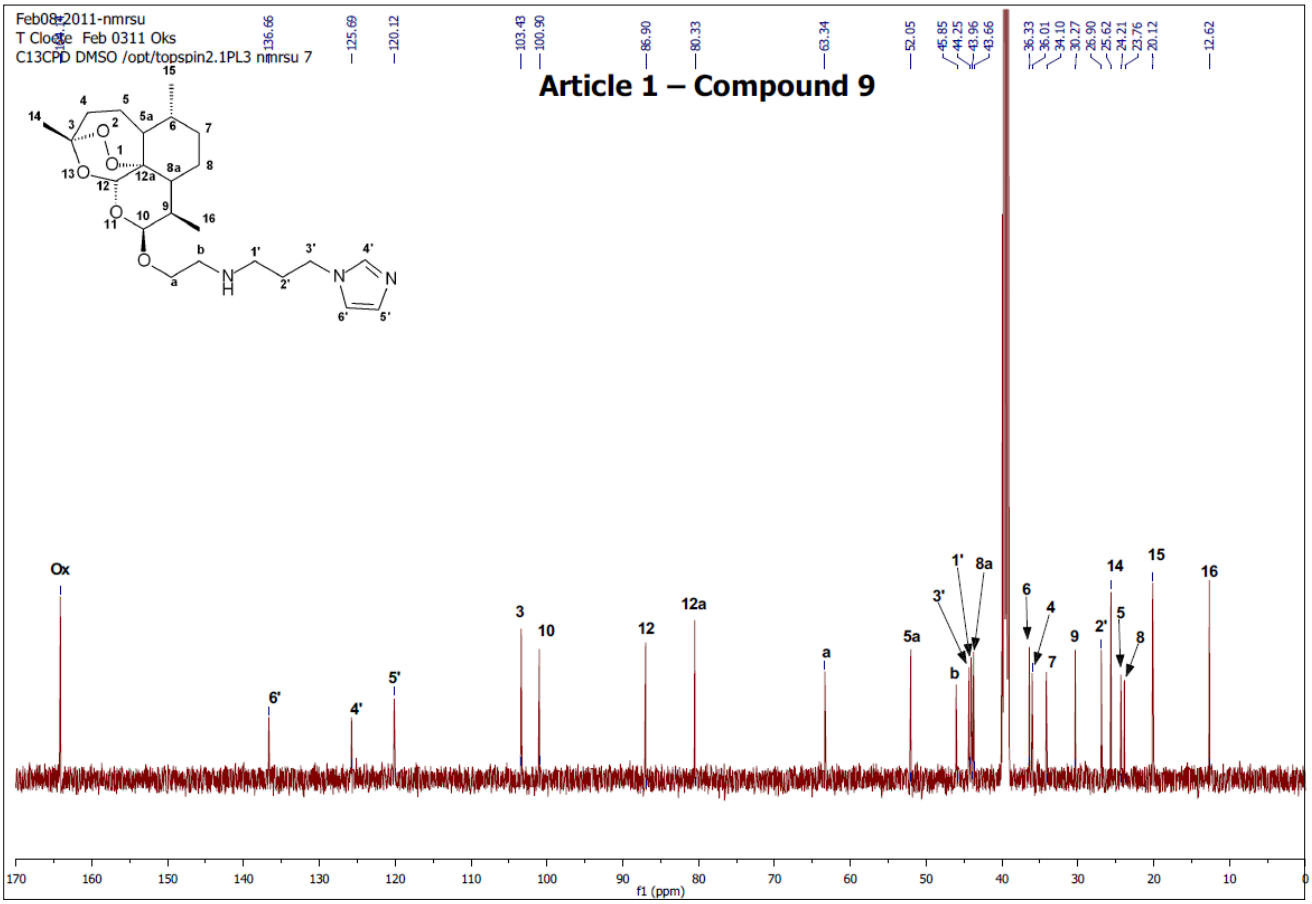

Oct19-2010-nmrsu
T Cloete Jun0710 Oks
COSYGPSW DMSO /opt/topspin2.1PL3 nmrsu 9
Article 1 – Compound 8
DMSO
DCM
f2 (ppm)
f1 (ppm)

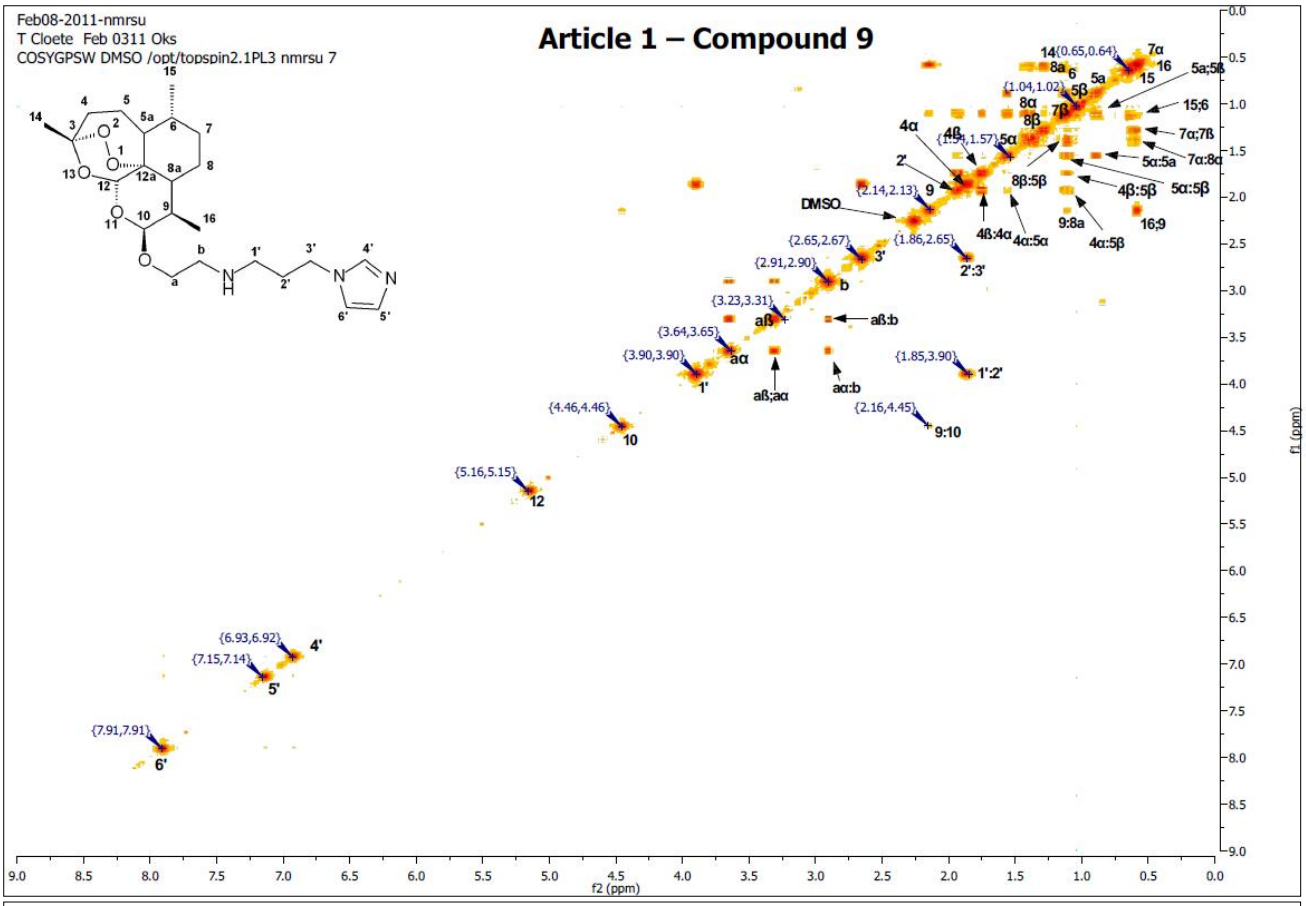

Oct19-2010-nmrsu
T Cloete Jun0710 Oks
HSQCEDETGP DMSO /opt/topspin2.1PL3 nmrsu 9
Article 1 – Compound 8
DMSO
f2 (ppm)
f1 (ppm)

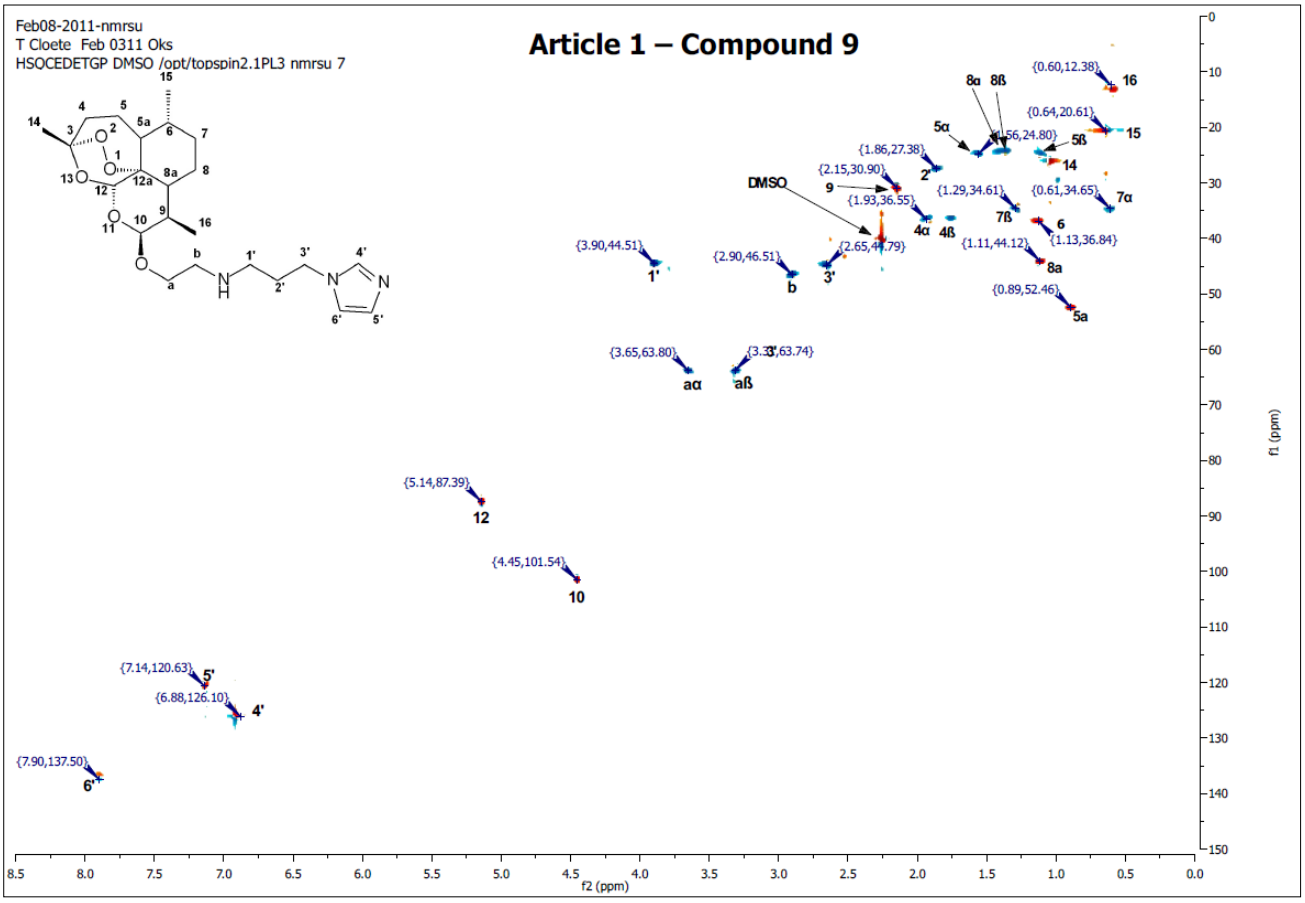
Mass	Calc. Mass	mDa	PPM	DBE	Formula	i-FIT	i-FIT Norm	Fit Conf %	C	H	N	O	Na
432.2746	432.2750	-0.4	-0.9	7.5	C25 H38 N O5	411.2	3.257	3.85	25	38	1	5	
	432.2739	0.7	1.6	9.5	C24 H35 N5 O Na	412.6	4.663	0.94	24	35	5	1	1
	432.2763	-1.7	-3.9	12.5	C26 H34 N5 O	414.9	6.995	0.09	26	34	5	1	
	432.2726	2.0	4.6	4.5	C23 H39 N O5 Na	411.6	3.674	2.54	23	39	1	5	1
	432.2710	3.6	8.3	3.5	C20 H38 N3 O7	416.1	8.154	0.03	20	38	3	7	
	432.2798	-5.2	-12.0	0.5	C17 H39 N5 O6 Na	419.3	11.379	0.00	17	39	5	6	1
	432.2686	6.0	13.9	0.5	C18 H39 N3 O7 Na	418.4	10.495	0.00	18	39	3	7	1
	432.2809	-6.3	-14.6	-1.5	C18 H42 N O10	419.1	11.207	0.00	18	42	1	10	
	432.2822	-7.6	-17.6	3.5	C19 H38 N5 O6	417.2	9.266	0.01	19	38	5	6	



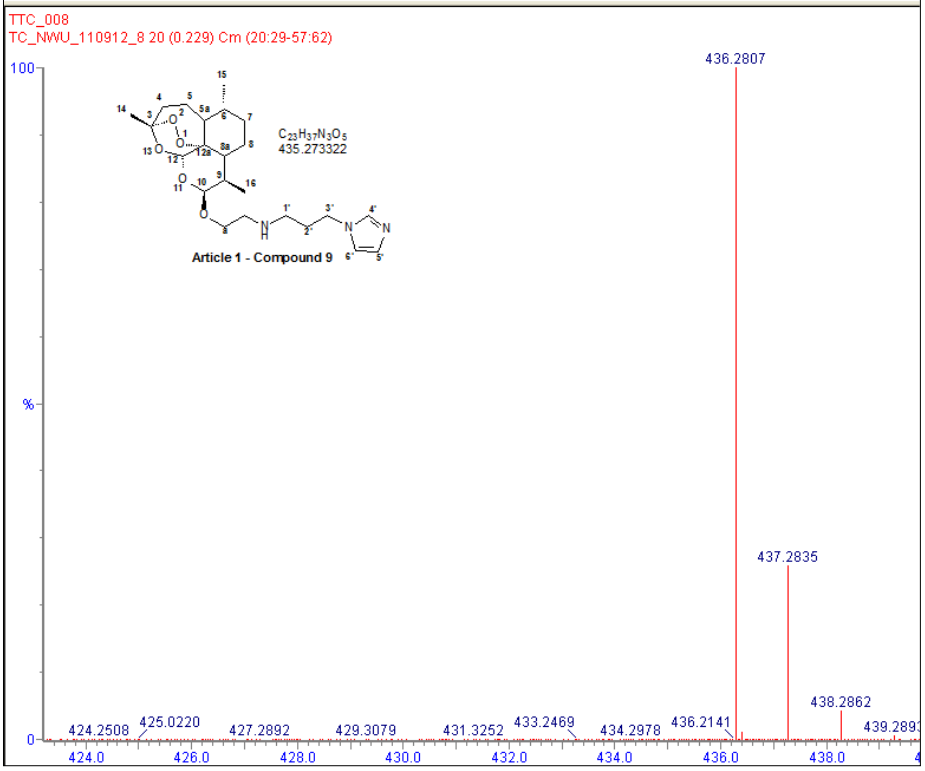

Feb08-2011-nmrsu
T Cloete Feb 0311 Oks
PROTON DMSO /opt/topspin2.1PL3 nmrsu 7
Article 1 – Compound 9
DMSO
6'
5'
4'
12
10
1'
aα
aß
b
3'
4α
2'
4ß
9
5α
8α
8ß
7ß
8a
6
5ß
5a
14
15
16
7α
f1 (ppm)

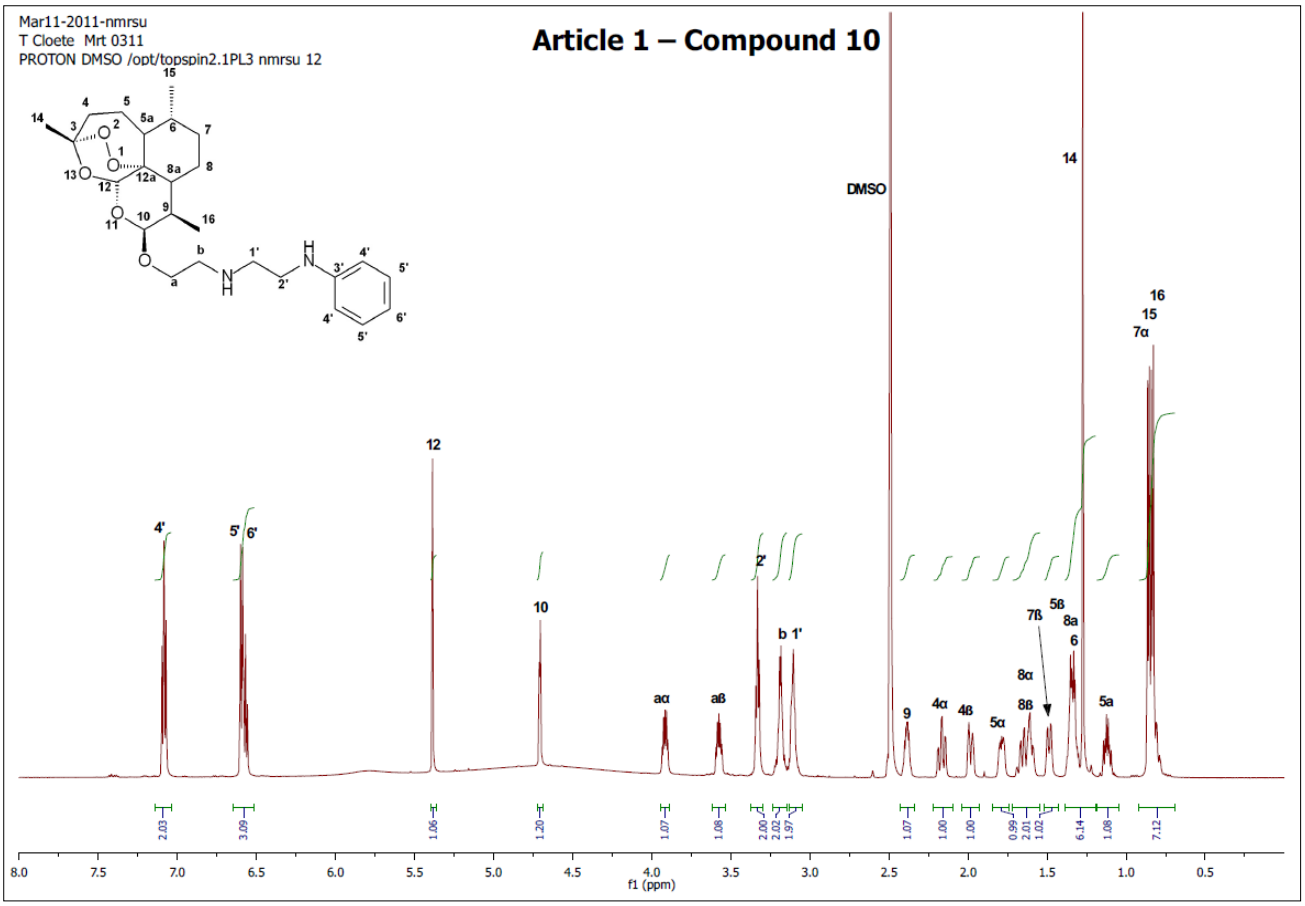

Feb08-2011-nmrsu
T Cloete Feb 0311 Oks
C13CPD DMSO /opt/topspin2.1PL3 nmrsu 7
Article 1 – Compound 9
Ox
6'
4'
5'
3
10
12
12a
a
5a
b
3'
1'
8a
6
4
9
7
2'
14
5
8
15
16
f1 (ppm)

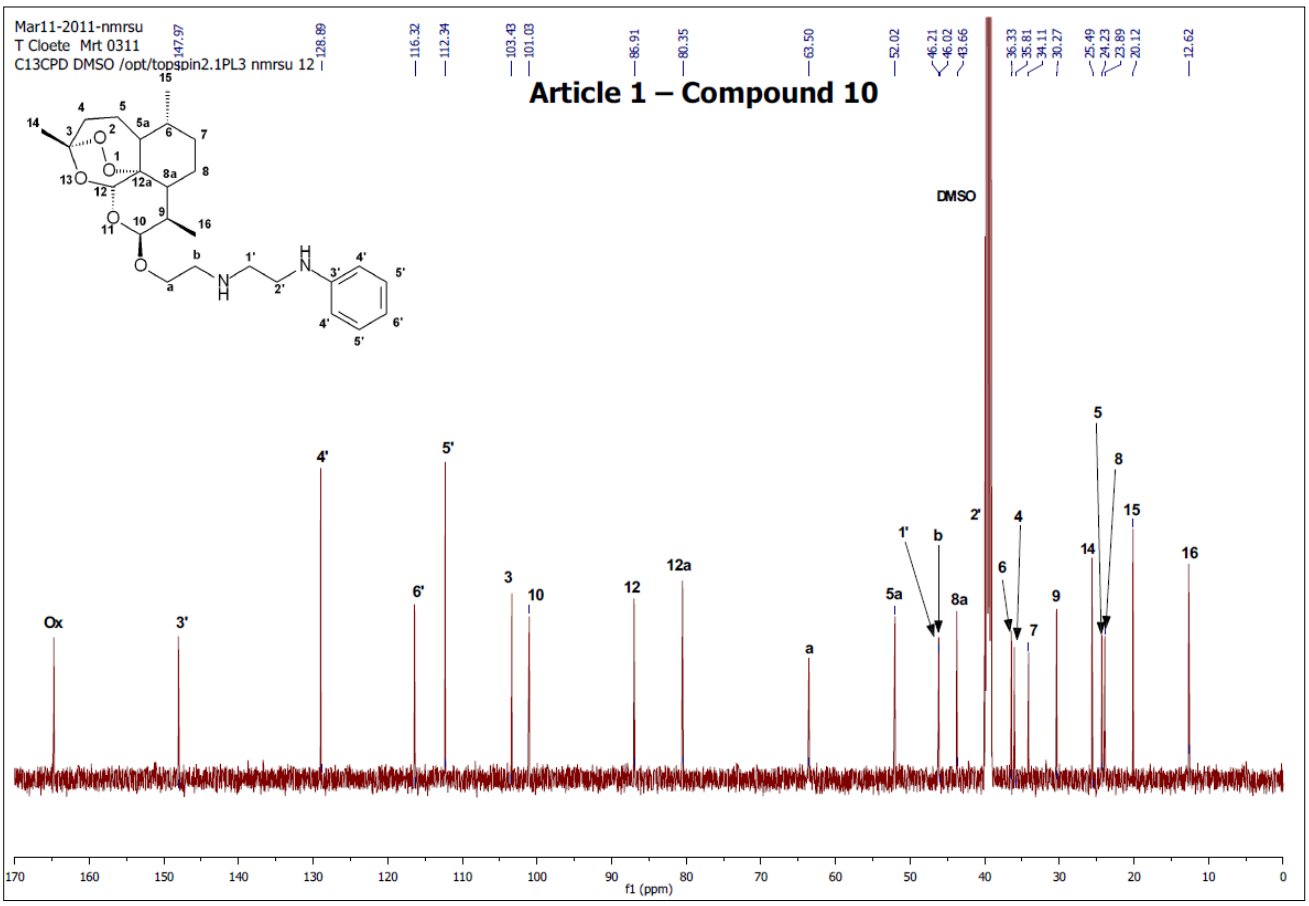

Feb08-2011-nmrsu
T Cloete Feb 0311 Oks
COSYGPSW DMSO /opt/topspin2.1PL3 nmrsu 7
Article 1 – Compound 9
DMSO
f2 (ppm)
f1 (ppm)

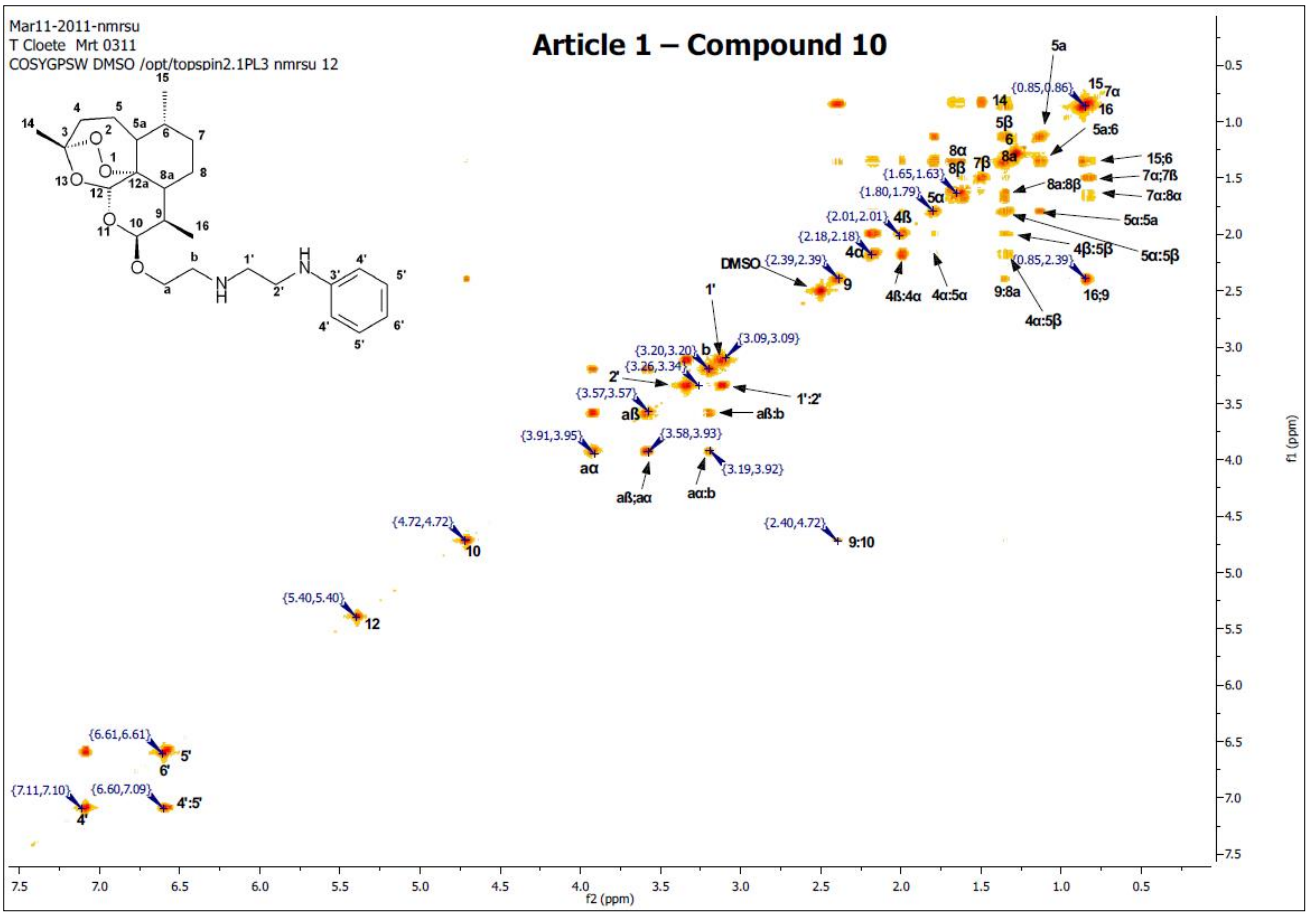

Feb08-2011-nmrsu
T Cloete Feb 0311 Oks
HSQCEDETGP DMSO /opt/topspin2.1PL3 nmrsu 7
Article 1 – Compound 9
DMSO
f2 (ppm)
f1 (ppm)

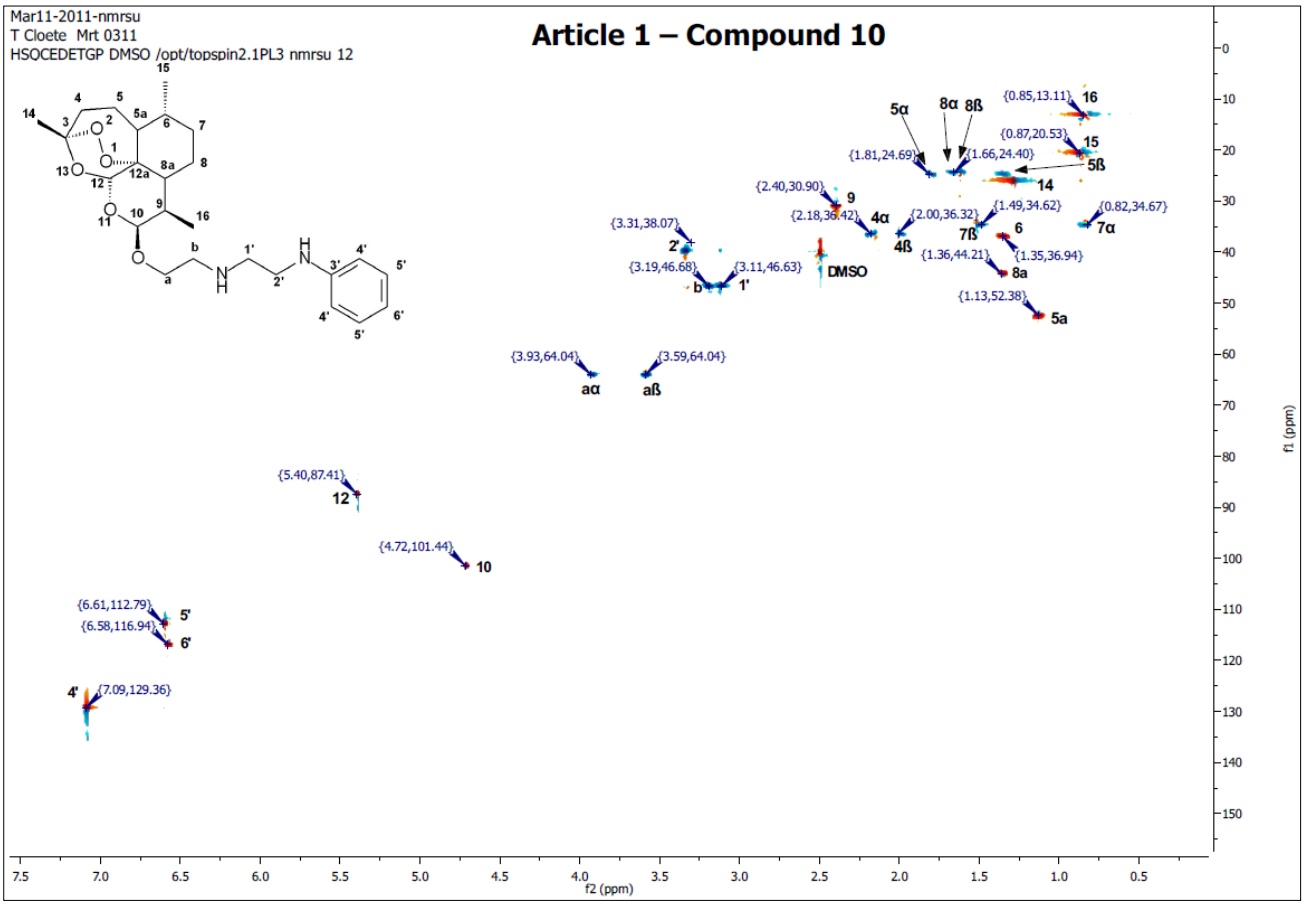
Mass	Calc. Mass	mDa	PPM	DBE	Formula	i-FIT	i-FIT Norm	Fit Conf %	C	H	N	O	Na
436.2807	436.2811	-0.4	-0.9	6.5	C23 H38 N3 O5	549.6	6.444	0.16	23	38	3	5	
	436.2787	2.0	4.6	3.5	C21 H39 N3 O5 Na	552.0	8.839	0.01	21	39	3	5	1
	436.2828	-2.1	-4.8	7.5	C26 H39 N O3 Na	555.7	12.613	0.00	26	39	1	3	1
	436.2771	3.6	8.3	2.5	C18 H38 N5 O7	555.8	12.677	0.00	18	38	5	7	
	436.2852	-4.5	-10.3	10.5	C28 H38 N O3	558.1	14.982	0.00	28	38	1	3	
	436.2753	5.4	12.4	15.5	C30 H34 N3	559.6	16.518	0.00	30	34	3		
	436.2747	6.0	13.8	-0.5	C16 H39 N5 O7 Na	557.9	14.807	0.00	16	39	5	7	1
	436.2729	7.8	17.9	12.5	C28 H35 N3 Na	558.3	15.207	0.00	28	35	3		1
	436.2886	-7.9	-18.1	-1.5	C19 H43 N O8 Na	556.4	13.237	0.00	19	43	1	8	1



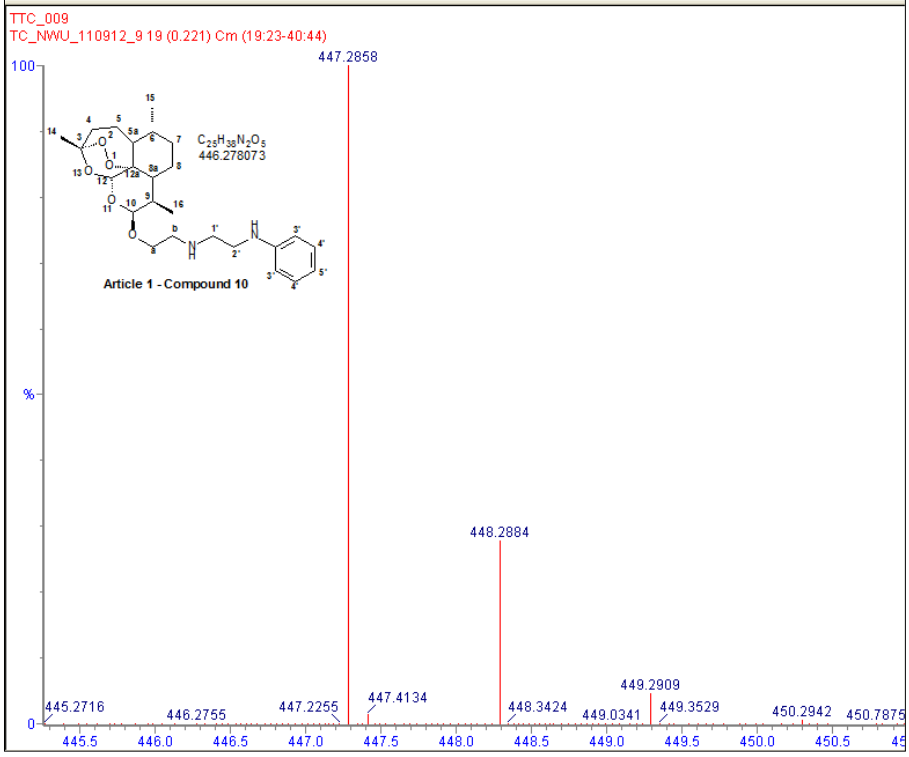

Mar11-2011-nmrsu
T Cloete Mrt 0311
PROTON DMSO /opt/topspin2.1PL3 nmrsu 12
Article 1 – Compound 10
DMSO
f1 (ppm)

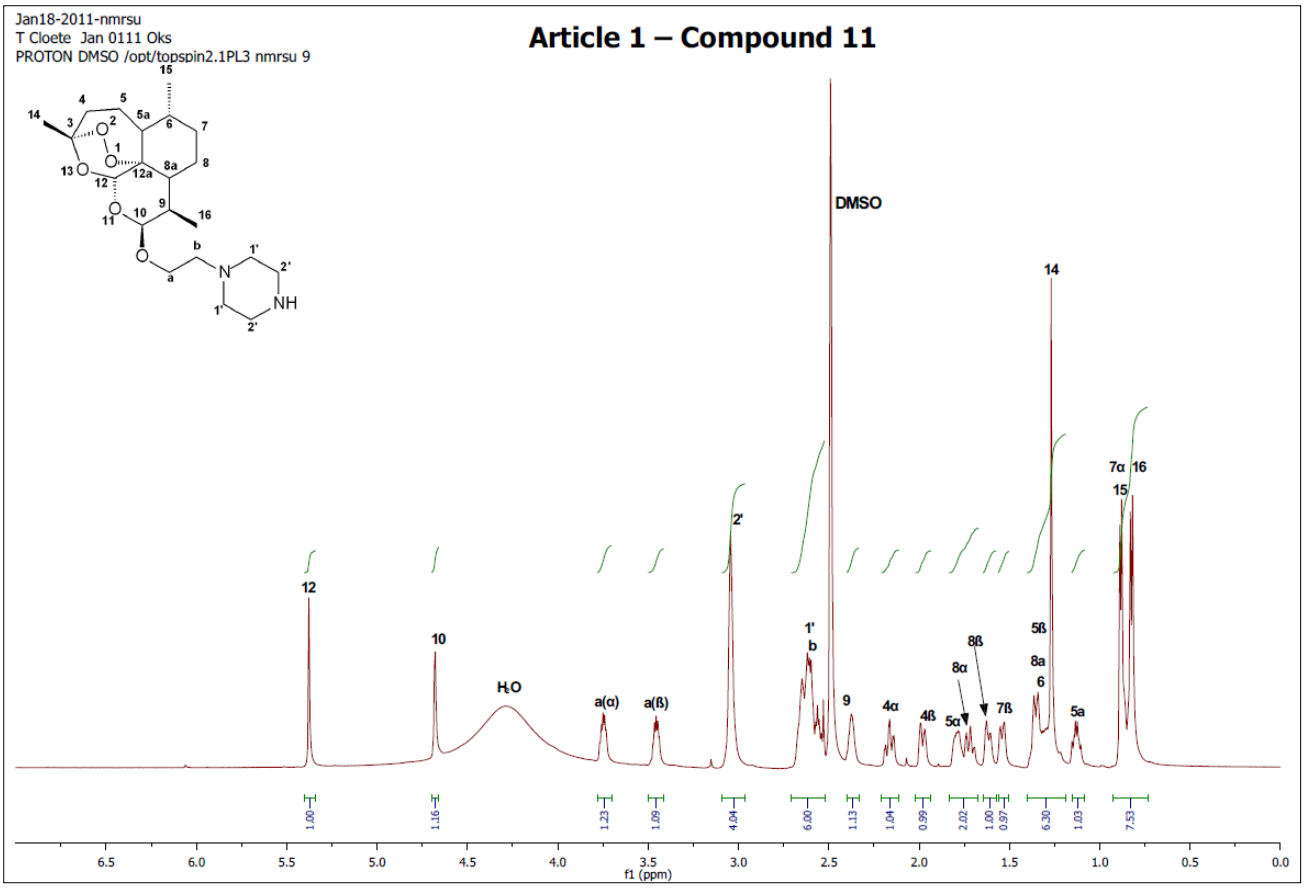

Mar11-2011-nmrsu
T Cloete Mrt 0311
C13CPD DMSO /opt/topspin2.1PL3 nmrsu 12
Article 1 – Compound 10
DMSO
f1 (ppm)

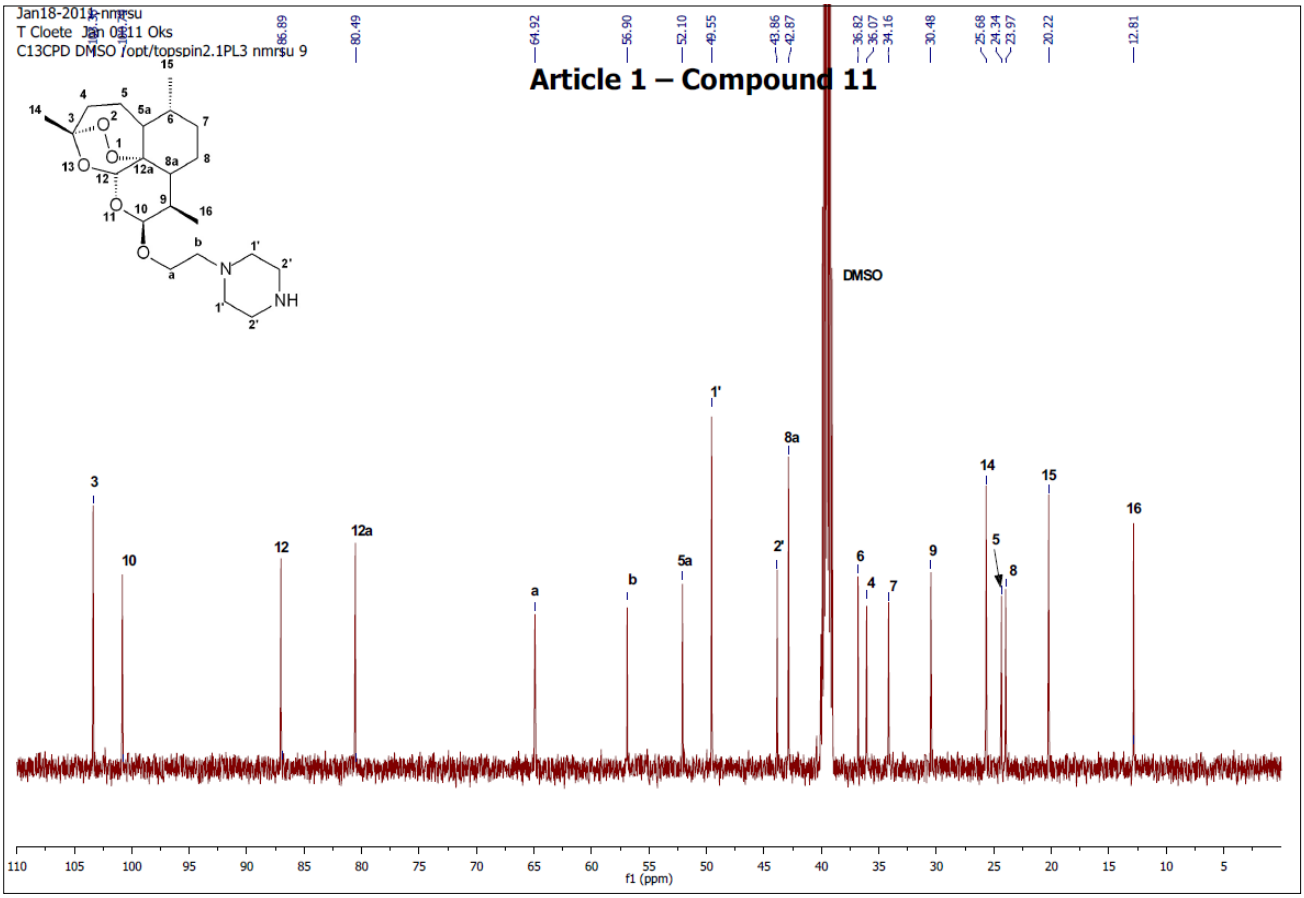

Mar11-2011-nmrsu
T Cloete Mrt 0311
COSYGPSW DMSO /opt/topspin2.1PL3 nmrsu 12
Article 1 – Compound 10
f2 (ppm)
f1 (ppm)

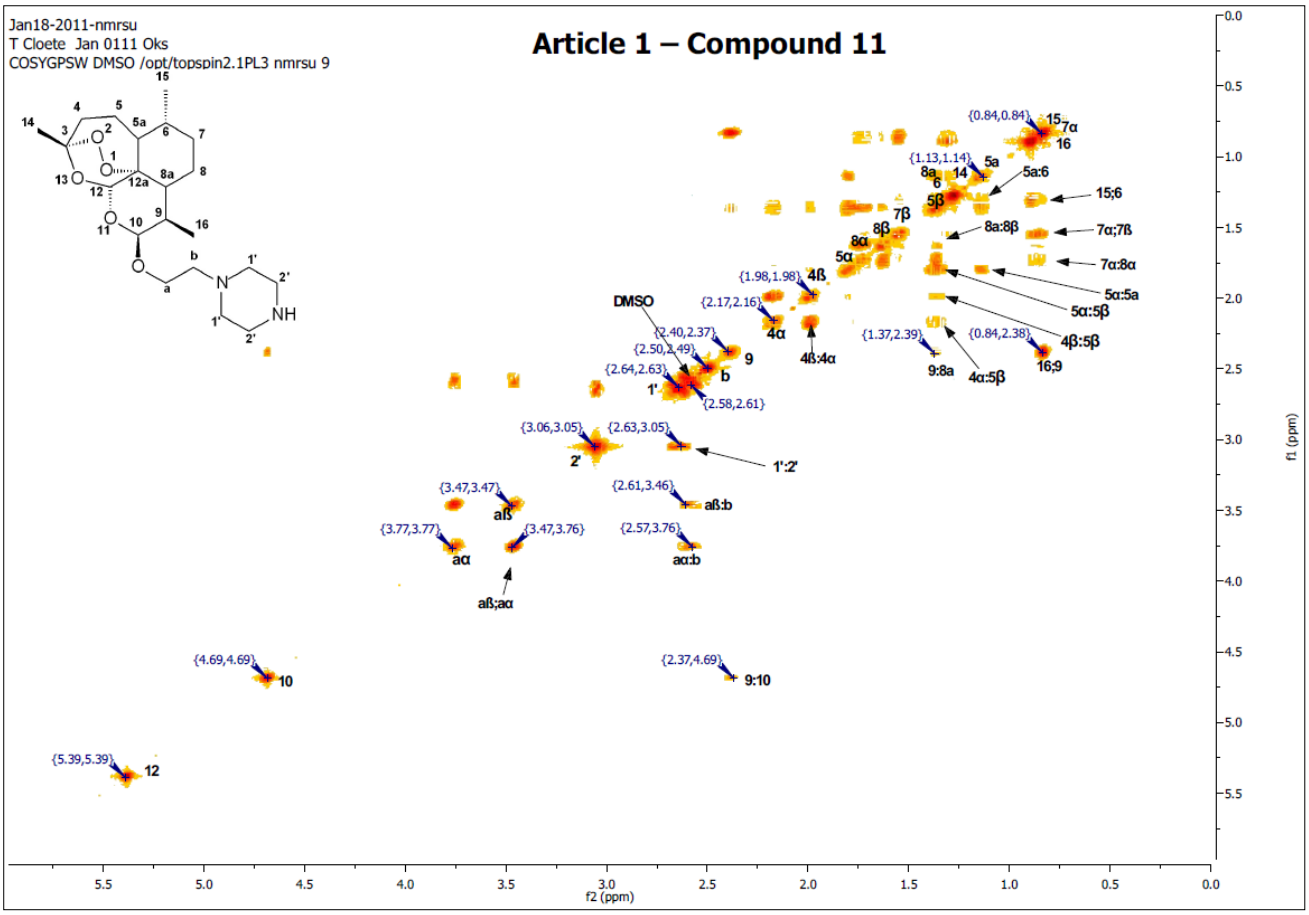

Mar11-2011-nmrsu
T Cloete Mrt 0311
HSOCEDETGP DMSO /opt/topspin2.1PL3 nmrsu 12
Article 1 – Compound 10
f2 (ppm)
f1 (ppm)

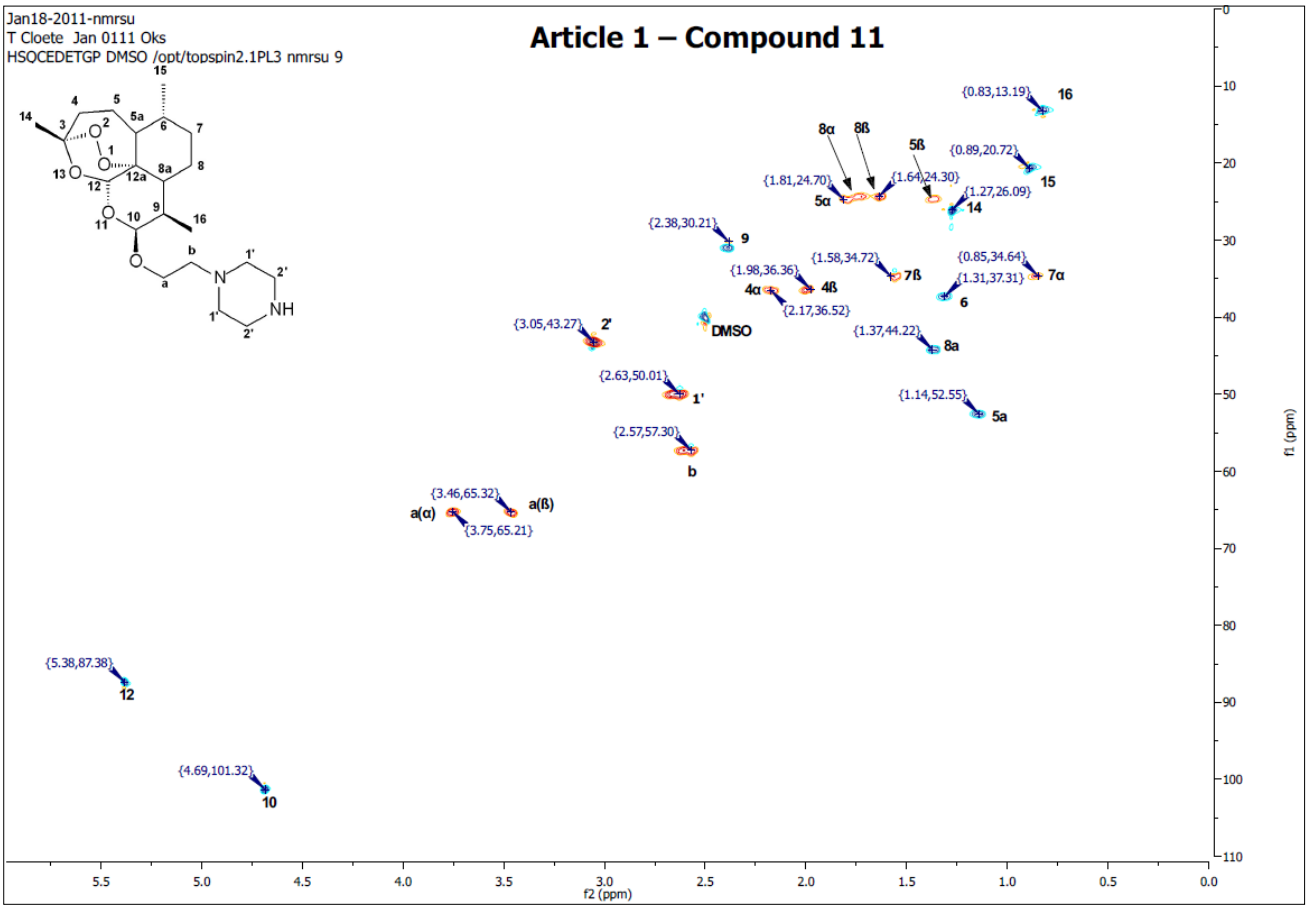
Mass	Calc. Mass	mDa	PPM	DBE	Formula	i-FIT	i-FIT Norm	Fit Conf %	C	H	N	O	Na
447.2858	447.2859	-0.1	-0.2	7.5	C25 H39 N2 O5	468.3	5.968	0.26	25	39	2	5	
	447.2875	-1.7	-3.8	8.5	C28 H40 O3 Na	474.6	12.218	0.00	28	40		3	1
	447.2835	2.3	5.1	4.5	C23 H40 N2 O5 Na	470.6	8.255	0.03	23	40	2	5	1
	447.2819	3.9	8.7	3.5	C20 H39 N4 O7	473.3	10.955	0.00	20	39	4	7	
	447.2899	-4.1	-9.2	11.5	C30 H39 O3	476.9	14.541	0.00	30	39		3	
	447.2918	-6.0	-13.4	-1.5	C18 H43 N2 O10	475.7	13.325	0.00	18	43	2	10	
	447.2795	6.3	14.1	0.5	C18 H40 N4 O7 Na	475.1	12.788	0.00	18	40	4	7	1
	447.2934	-7.6	-17.0	-0.5	C21 H44 O8 Na	474.5	12.202	0.00	21	44		8	1
	447.2776	8.2	18.3	13.5	C30 H36 N2 Na	477.0	14.678	0.00	30	36	2		1



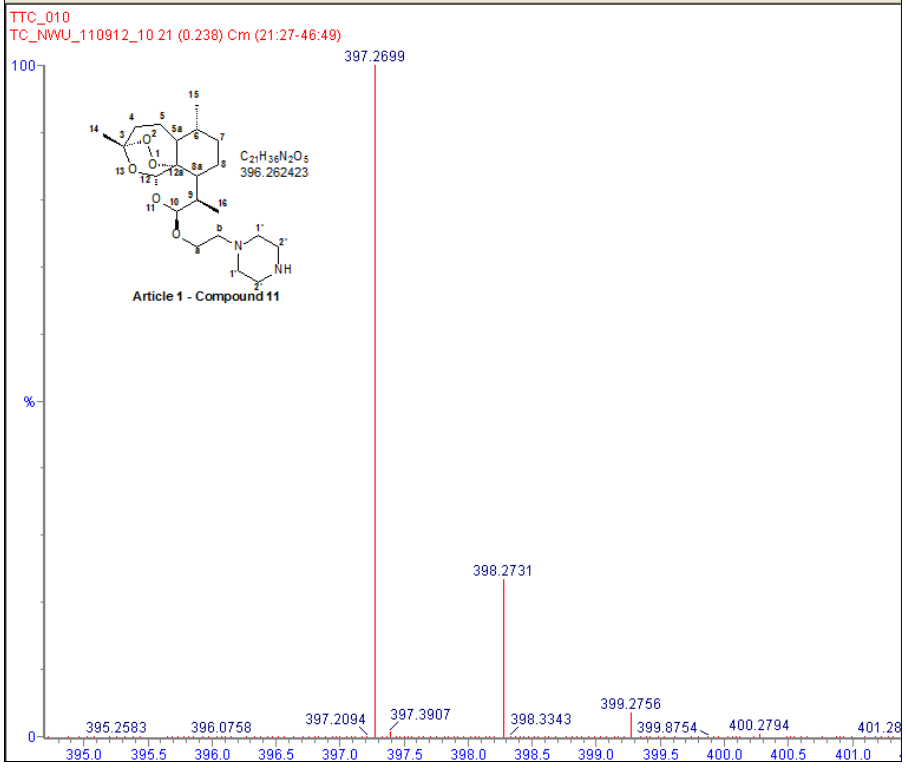

Jan18-2011-nmrsu
T Cloete Jan 0111 Oks
PROTON DMSO /opt/topspin2.1PL3 nmrsu 9
Article 1 – Compound 11
DMSO
H2O
f1 (ppm)

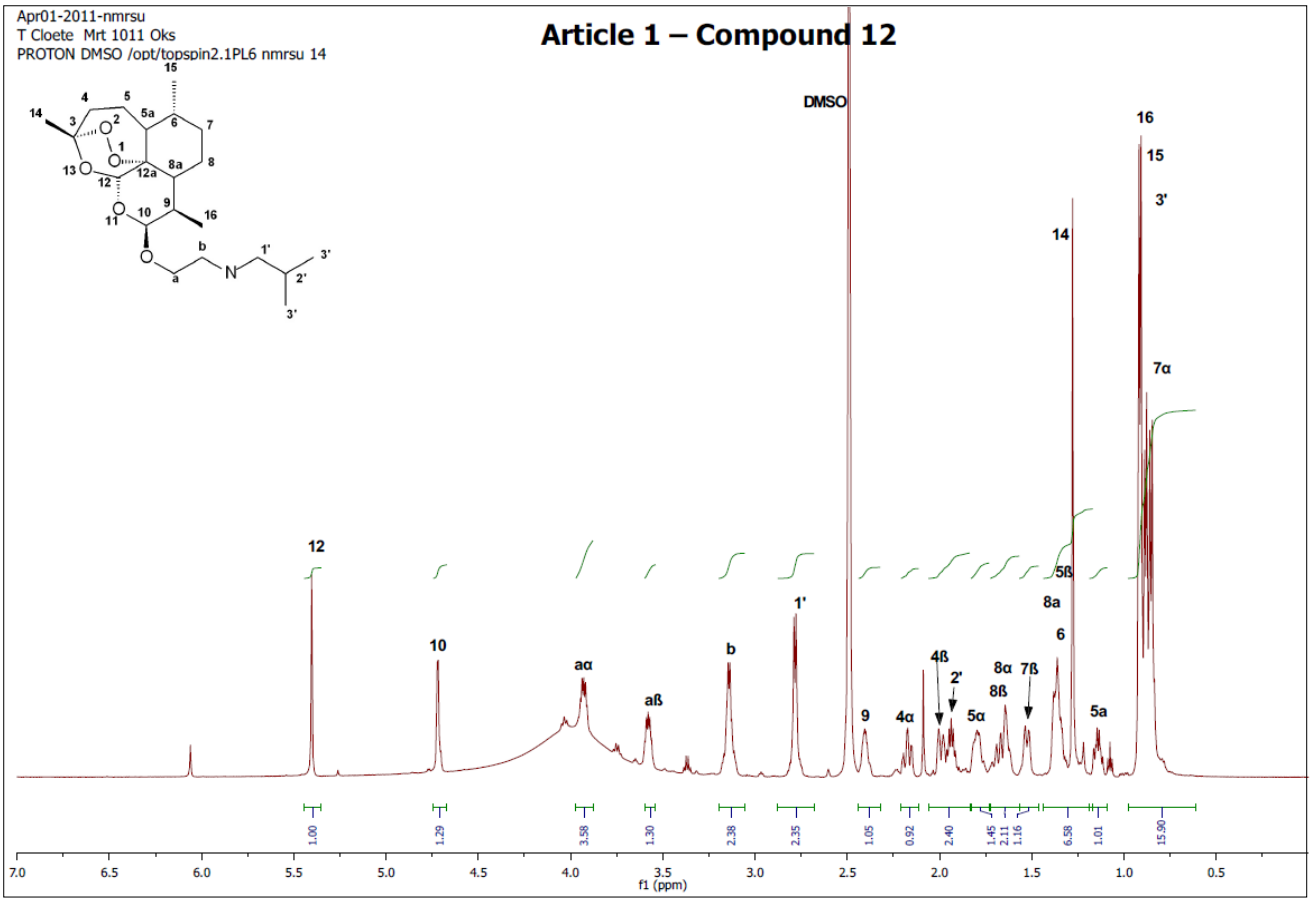

Jan18-2011-nmrsu
T Cloete Jan 0111 Oks
C13CPD DMSO /opt/topspin2.1PL3 nmrsu 9
Article 1 – Compound 11
DMSO
f1 (ppm)

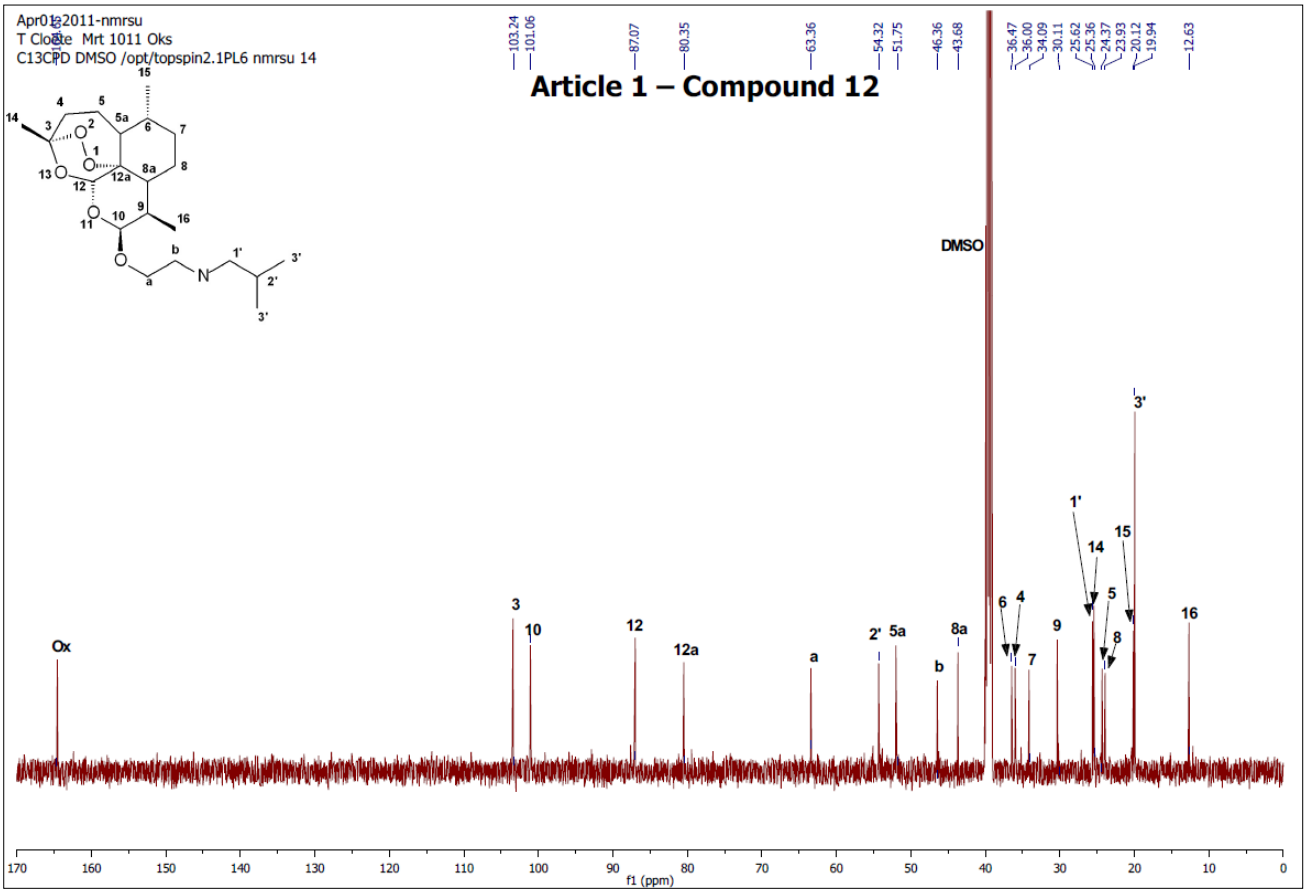

Jan18-2011-nmrsu
T Cloete Jan 0111 Oks
COSYGPSW DMSO /opt/topspin2.1PL3 nmrsu 9
Article 1 – Compound 11
DMSO
f2 (ppm)
f1 (ppm)

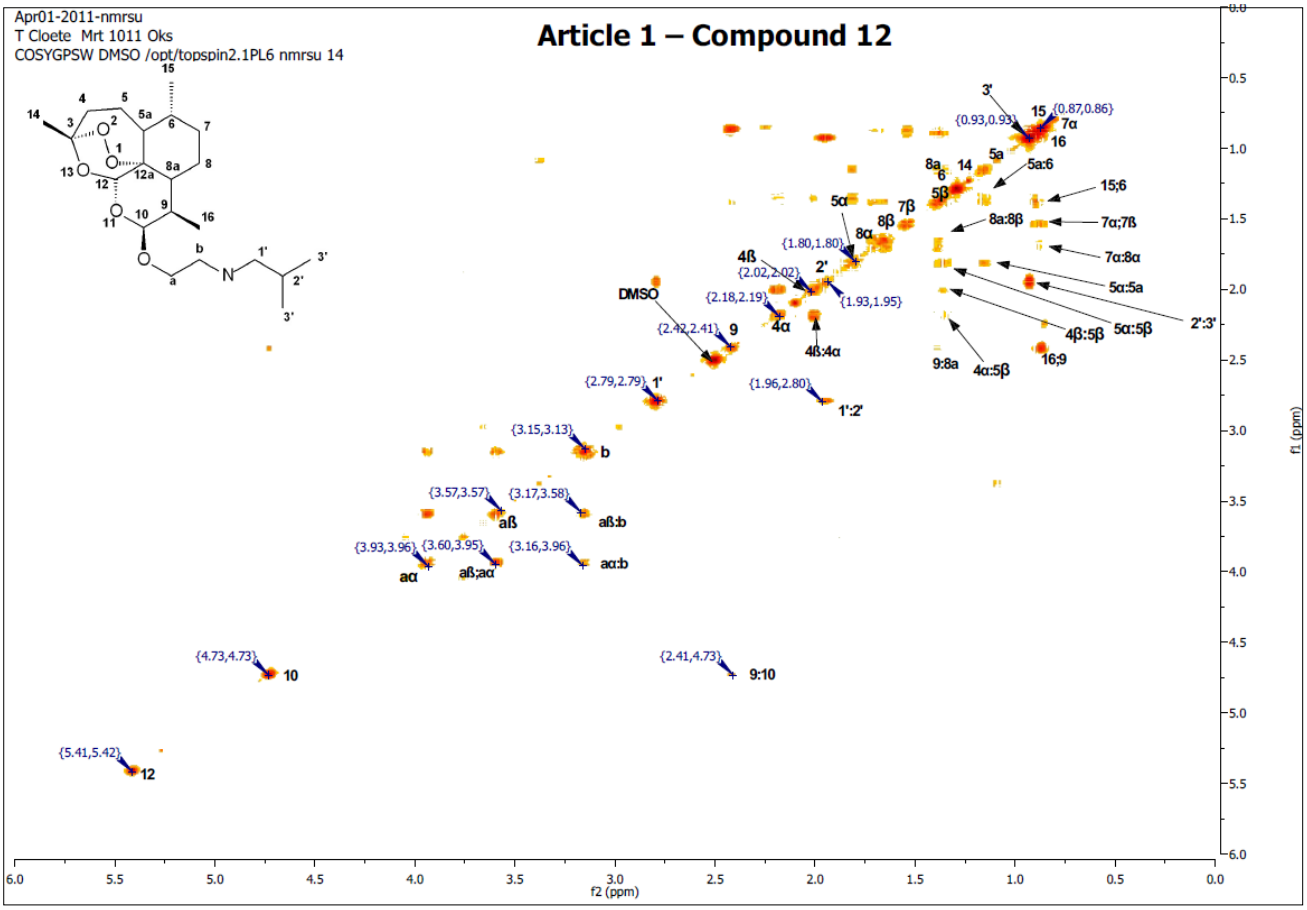

Jan18-2011-nmrsu
T Cloete Jan 0111 Oks
HSQCEDETGP DMSO /opt/topspin2.1PL3 nmrsu 9
Article 1 – Compound 11
DMSO
f2 (ppm)
f1 (ppm)

Mass	Calc. Mass	mDa	PPM	DBE	Formula	i-FIT	i-FIT Norm	Fit Conf %	C	H	N	O	Na
397.2699	397.2702	-0.3	-0.8	4.5	C21 H37 N2 O5	442.0	4.212	1.48	21	37	2	5	
	397.2719	-2.0	-5.0	5.5	C24 H38 O3 Na	447.4	9.591	0.01	24	38		3	1
	397.2678	2.1	5.3	1.5	C19 H38 N2 O5 Na	442.8	5.008	0.67	19	38	2	5	1
	397.2662	3.7	9.3	0.5	C16 H37 N4 O7	447.6	9.756	0.01	16	37	4	7	
	397.2743	-4.4	-11.1	8.5	C26 H37 O3	449.7	11.843	0.00	26	37		3	
	397.2644	5.5	13.8	13.5	C28 H33 N2	451.4	13.584	0.00	28	33	2		
	397.2620	7.9	19.9	10.5	C26 H34 N2 Na	450.2	12.393	0.00	26	34	2		1
	397.2791	-9.2	-23.2	1.5	C18 H38 N4 O4 Na	444.8	6.989	0.09	18	38	4	4	1
	397.2604	9.5	23.9	9.5	C23 H33 N4 O2	446.9	9.121	0.01	23	33	4	2	

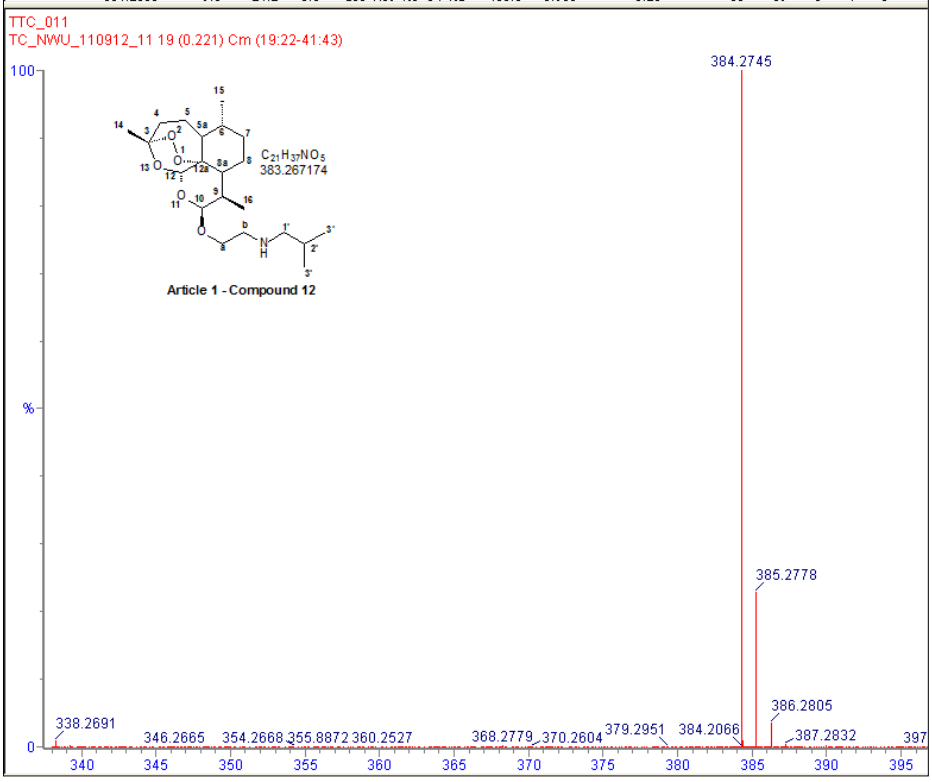



Apr01-2011-nmrsu
T Cloete Mrt 1011 Oks
PROTON DMSO /opt/topspin2.1PL6 nmrsu 14
Article 1 – Compound 12
DMSO
f1 (ppm)


Apr01-2011-nmrsu
T Cloete Mrt 1011 Oks
C13CPD DMSO /opt/topspin2.1PL6 nmrsu 14
Article 1 – Compound 12
DMSO
Ox
f1 (ppm)

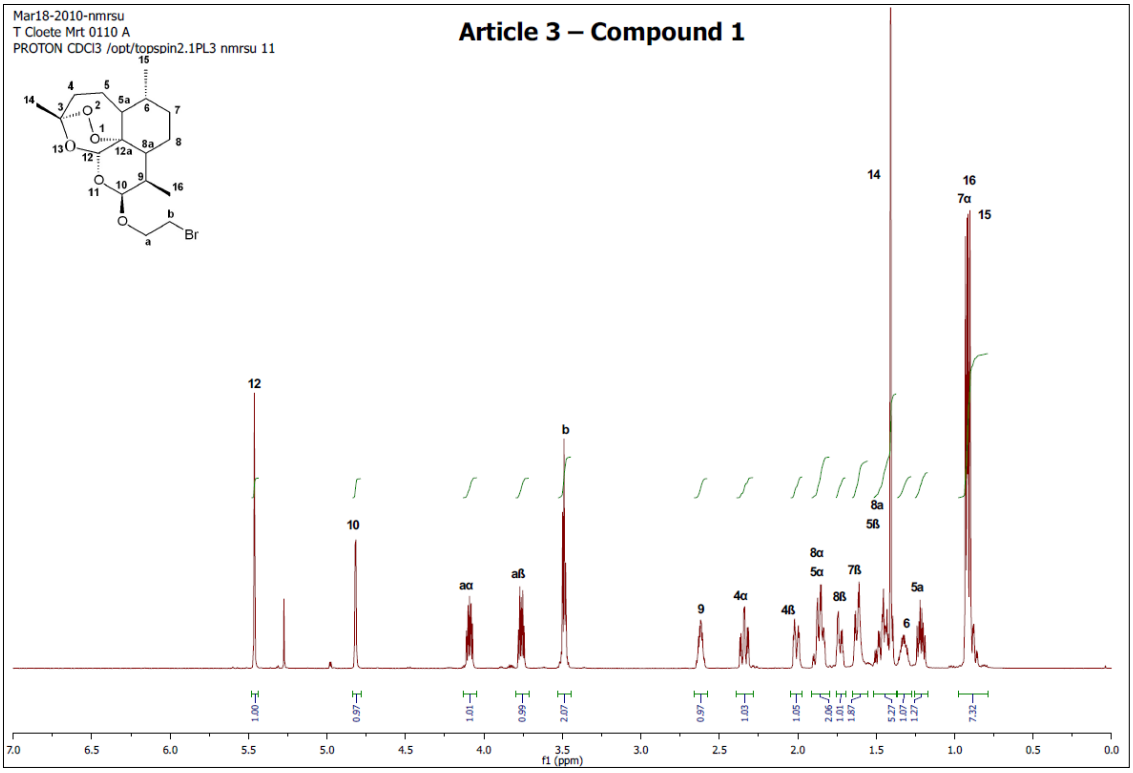


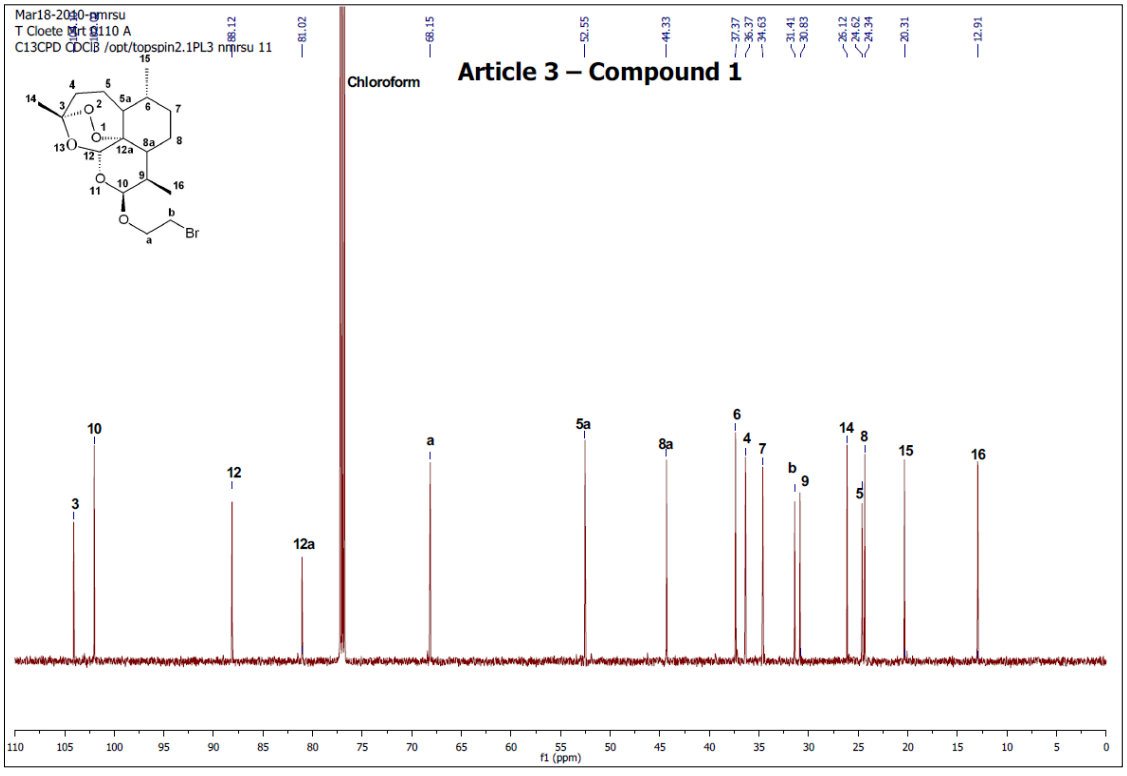
Mass	Calc. Mass	mDa	PPM	DBE	Formula	i-FIT	i-FIT Norm	Fit Conf %	C	H	N	O	Na
384.2745	384.2750	-0.5	-1.3	5.5	C21 H38 N O5	411.4	1.825	16.12	21	38	1	5	
	384.2739	0.6	1.6	5.5	C20 H35 N5 O Na	414.8	5.200	0.55	20	35	5	1	1
	384.2763	-1.8	-4.7	8.5	C22 H34 N5 O	416.5	6.919	0.10	22	34	5	1	
	384.2726	1.9	4.9	0.5	C19 H39 N O5 Na	413.2	3.672	2.54	19	39	1	5	1
	384.2710	3.5	9.1	-0.5	C16 H38 N3 O7	418.3	8.700	0.02	16	38	3	7	
	384.2691	5.4	14.1	12.5	C28 H34 N	421.3	11.725	0.00	28	34	1		
	384.2822	-7.7	-20.0	-0.5	C15 H38 N5 O6	419.8	10.276	0.00	15	38	5	6	
	384.2667	7.8	20.3	9.5	C26 H35 N Na	420.1	10.540	0.00	26	35	1		1
	384.2838	-9.3	-24.2	0.5	C18 H39 N3 O4 Na	415.5	5.956	0.26	18	39	3	4	1

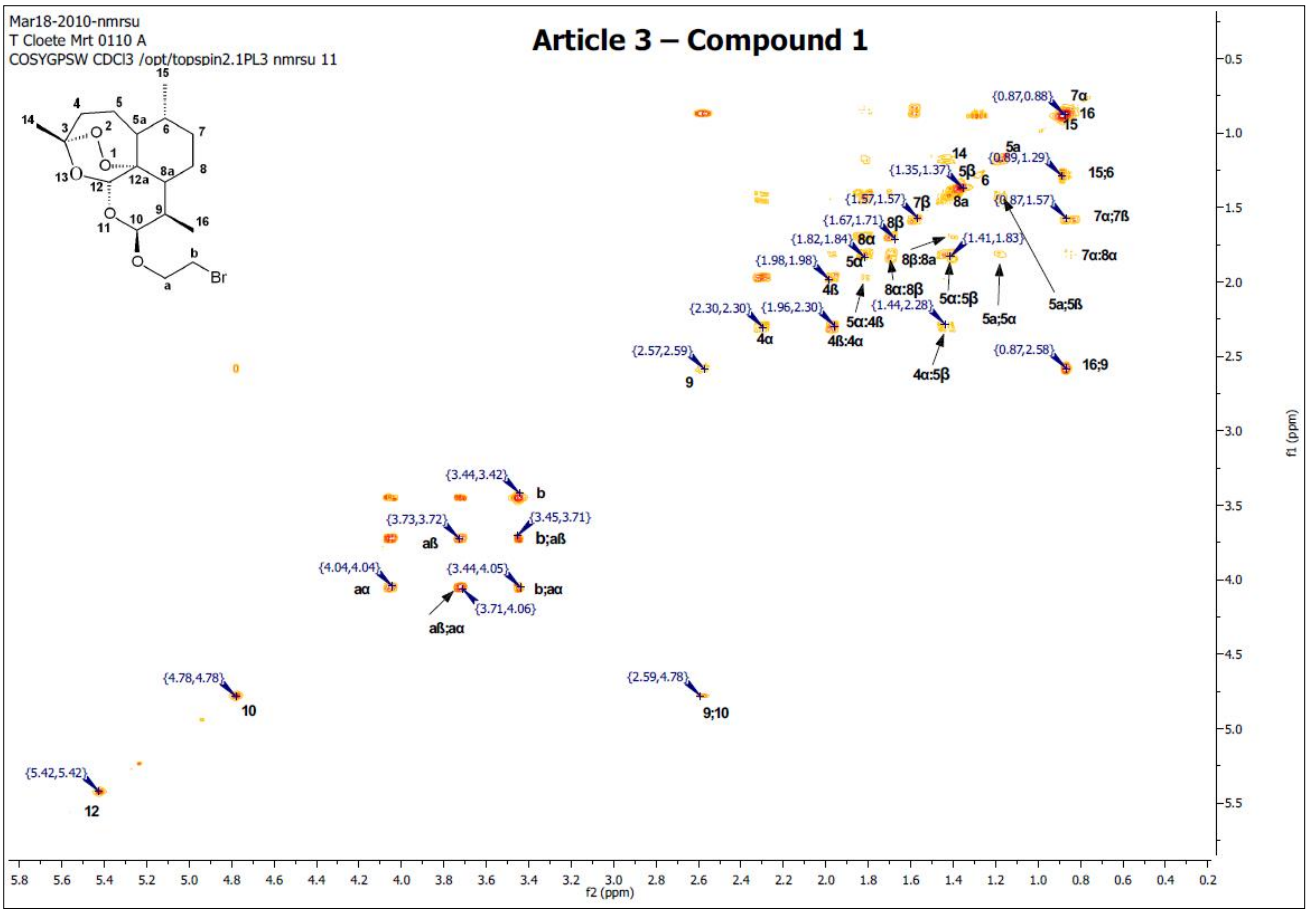


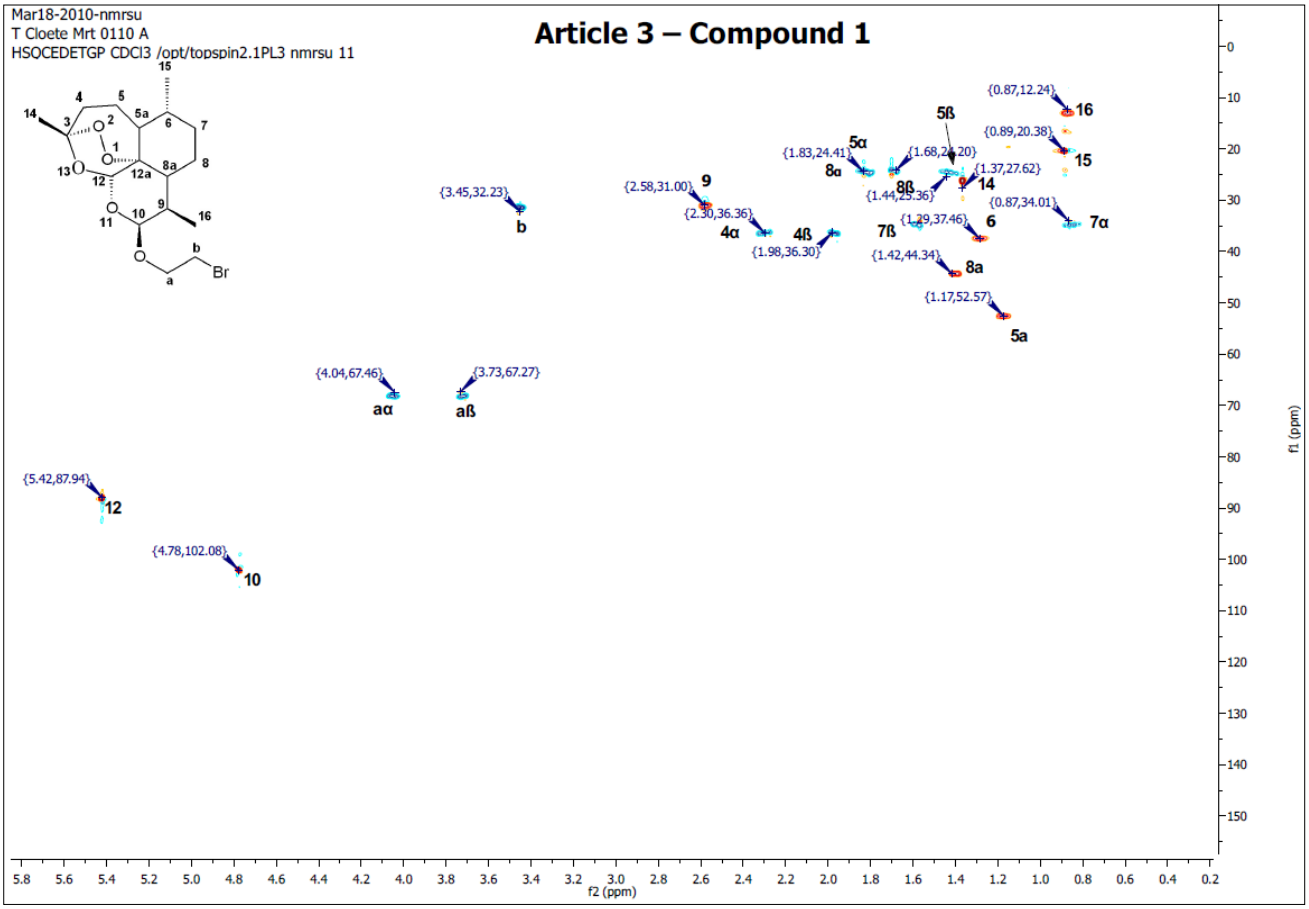
Annexure B

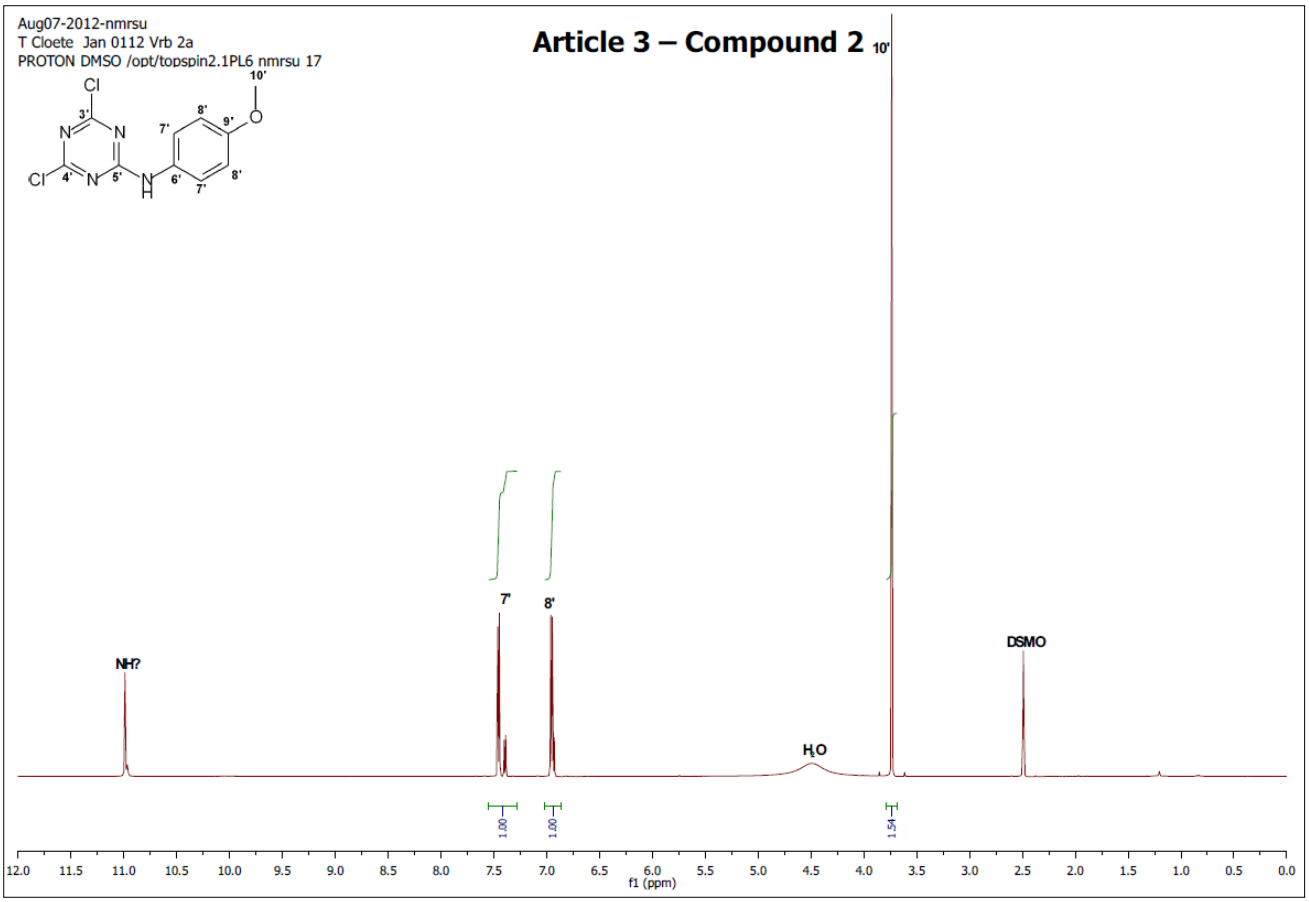
NMR & MS spectra - Chapter 5 (Article 3)

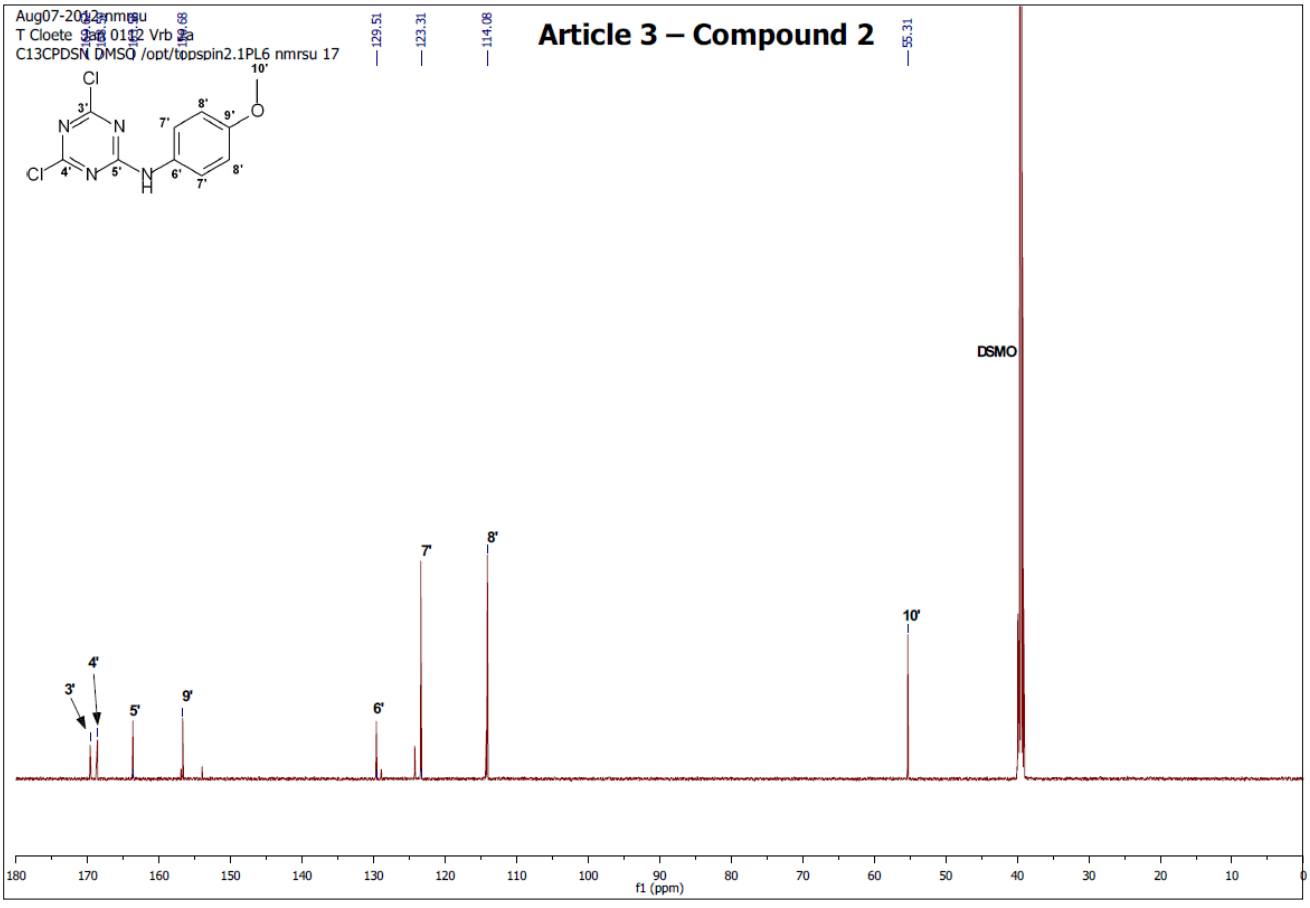


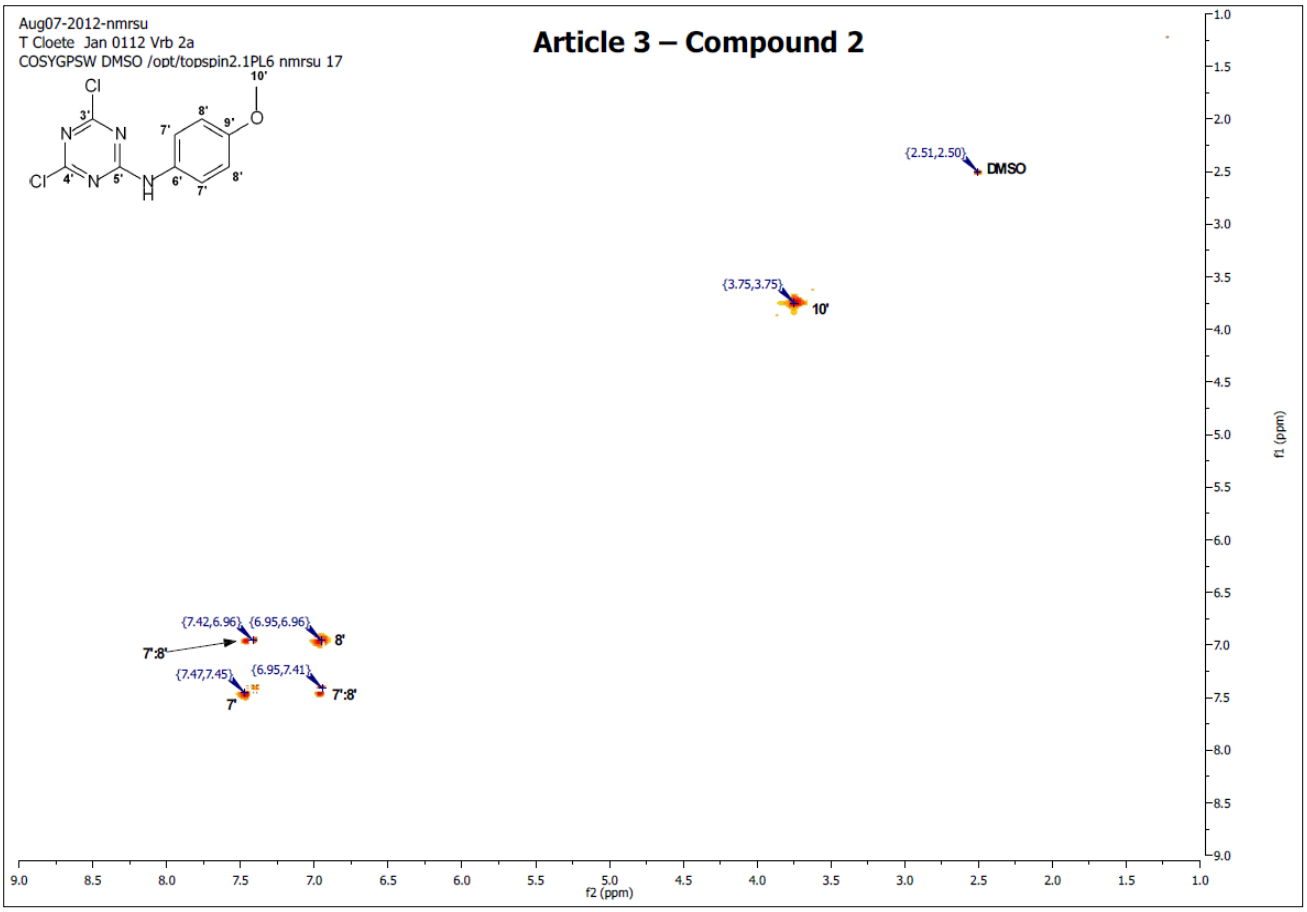


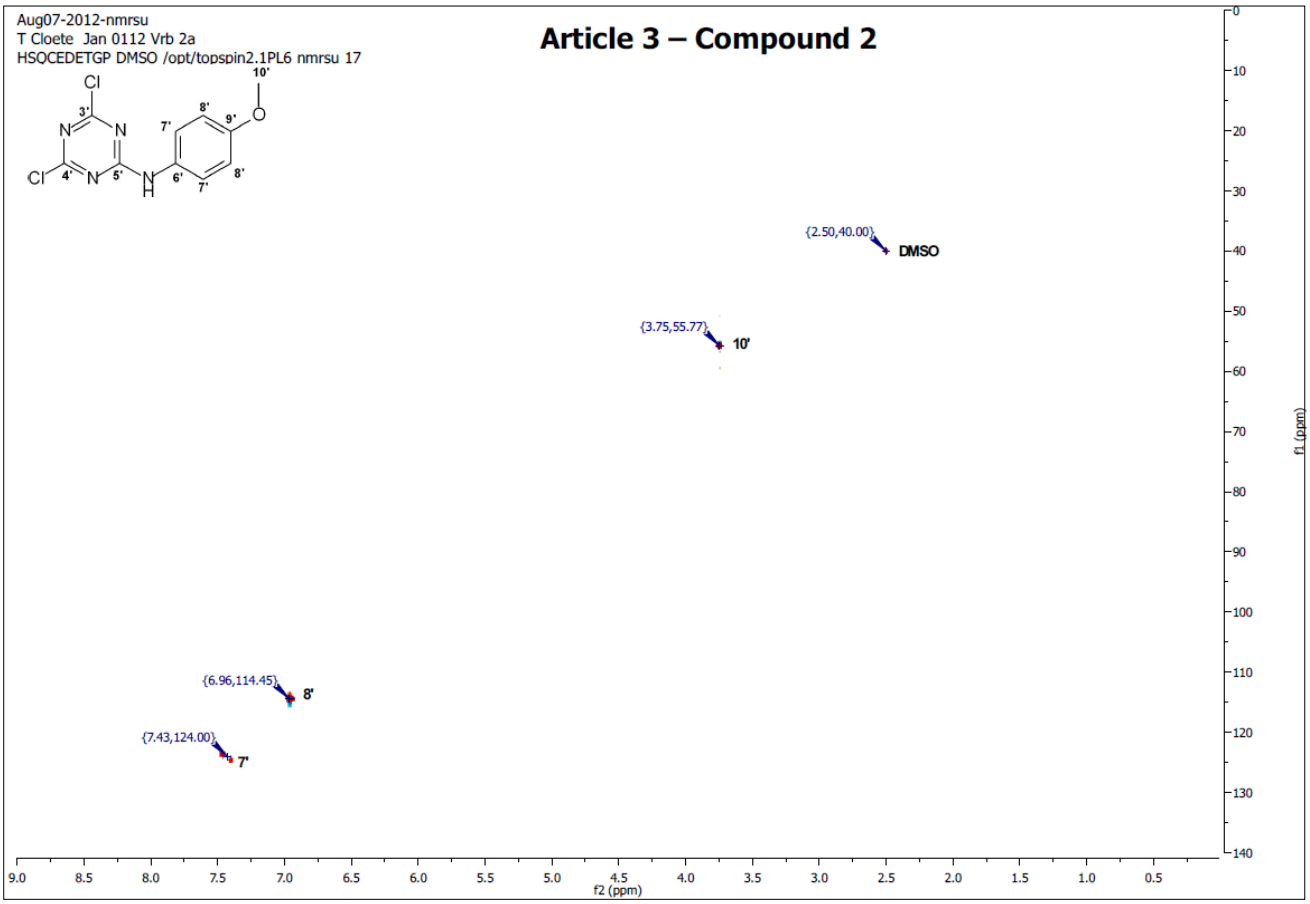

Mar18-2010-nmrsu
T Cloete Mrt 0110 A
COSYGPSW CDCl3 /opt/topspin2.1PL3 nmrsu 11
Article 3 – Compound 1
f2 (ppm)
f1 (ppm)

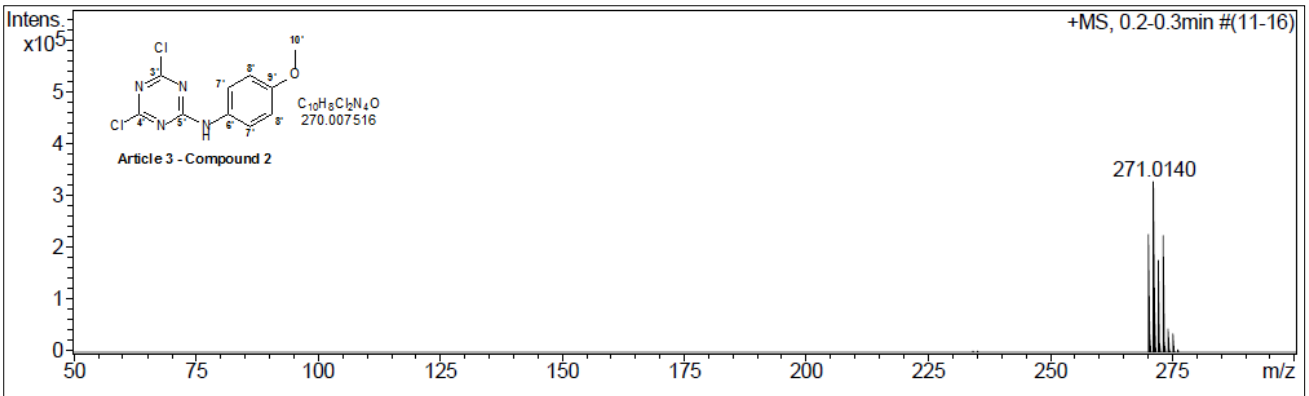

Mar18-2010-nmrsu
T Cloete Mrt 0110 A
HSOCEDETGP CDCl3 /opt/topspin2.1PL3 nmrsu 11
Article 3 – Compound 1
f2 (ppm)
f1 (ppm)


Aug07-2012-nmrsu
T Cloete Jan 0112 Vrb 2a
PROTON DMSO /opt/topspin2.1PL6 nmrsu 17
Article 3 – Compound 2
NH?
7'
8'
H2O
DSMO
10'
f1 (ppm)

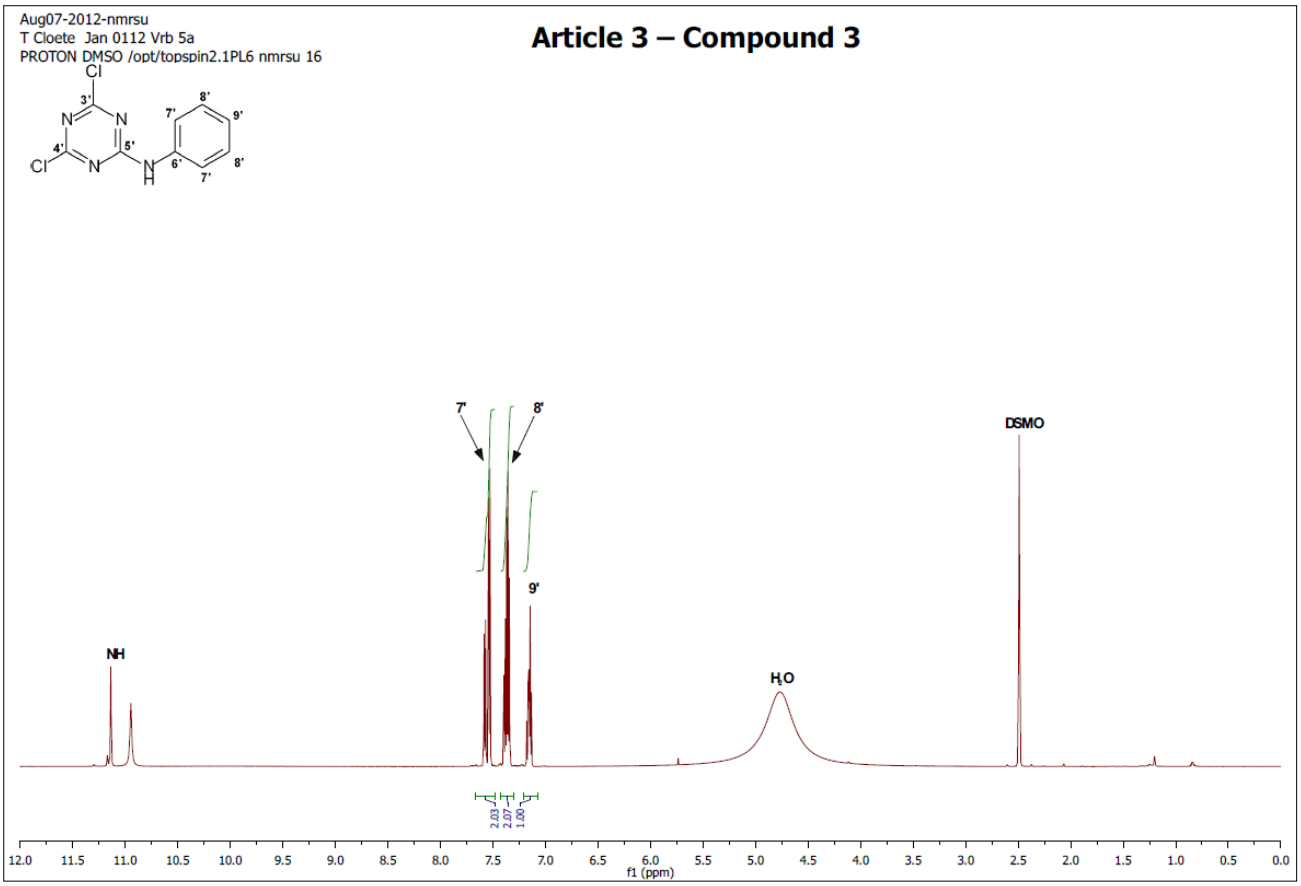

Aug07-2012-nmrsu
T Cloete Jan 0112 Vrb 2a
C13CPDSN DMSO /opt/topspin2.1PL6 nmrsu 17
Article 3 – Compound 2
129.51
123.31
114.08
55.31
DSMO
7'
8'
10'
4'
3'
5'
9'
6'
f1 (ppm)

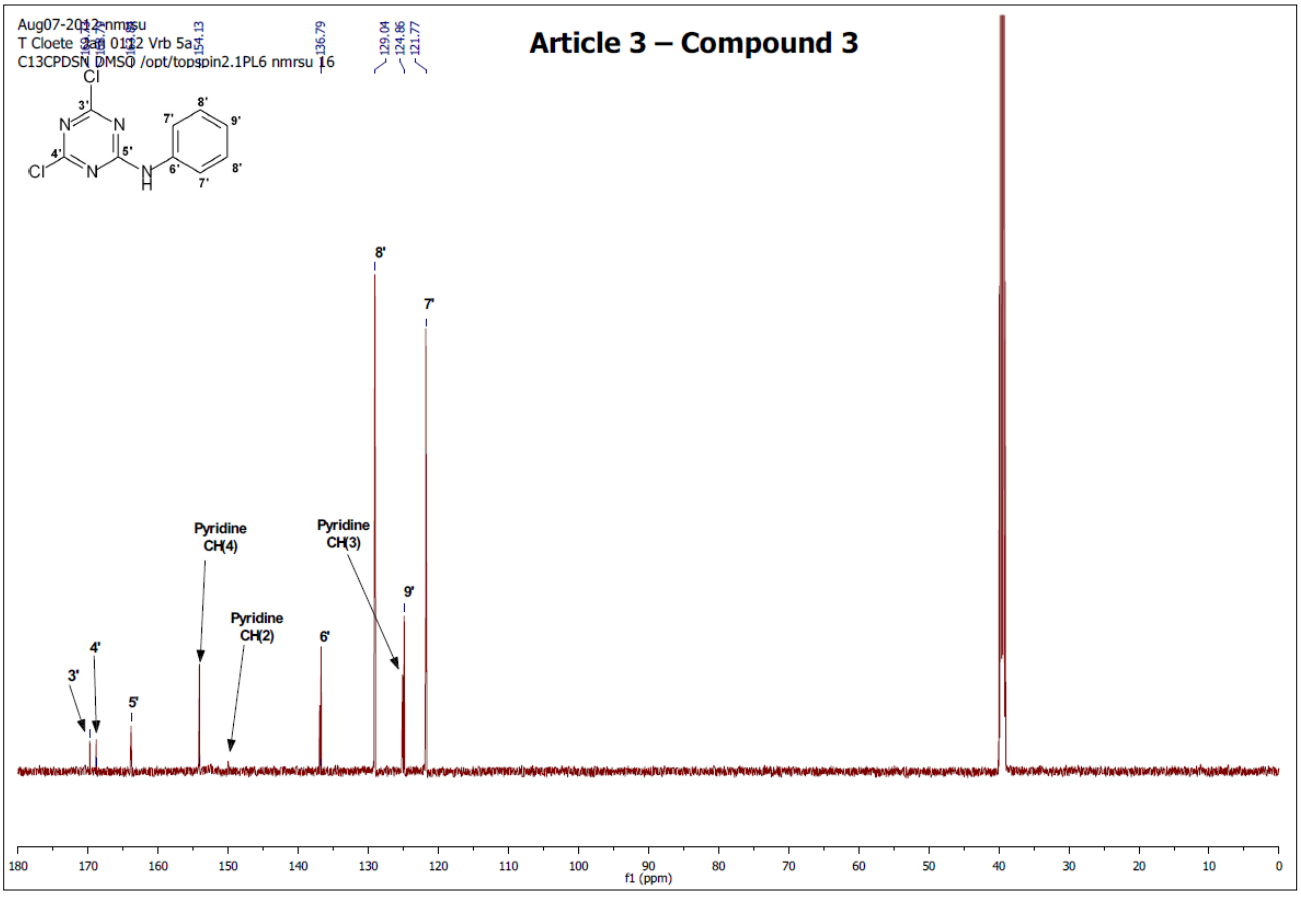

Aug07-2012-nmrsu
T Cloete Jan 0112 Vrb 2a
COSYGPSW DMSO /opt/topspin2.1PL6 nmrsu 17
Article 3 – Compound 2
{2.51,2.50}
DMSO
{3.75,3.75}
10'
{7.42,6.96}
{6.95,6.96}
8'
7':8'
{7.47,7.45}
{6.95,7.41}
7'
7':8'
f2 (ppm)
f1 (ppm)

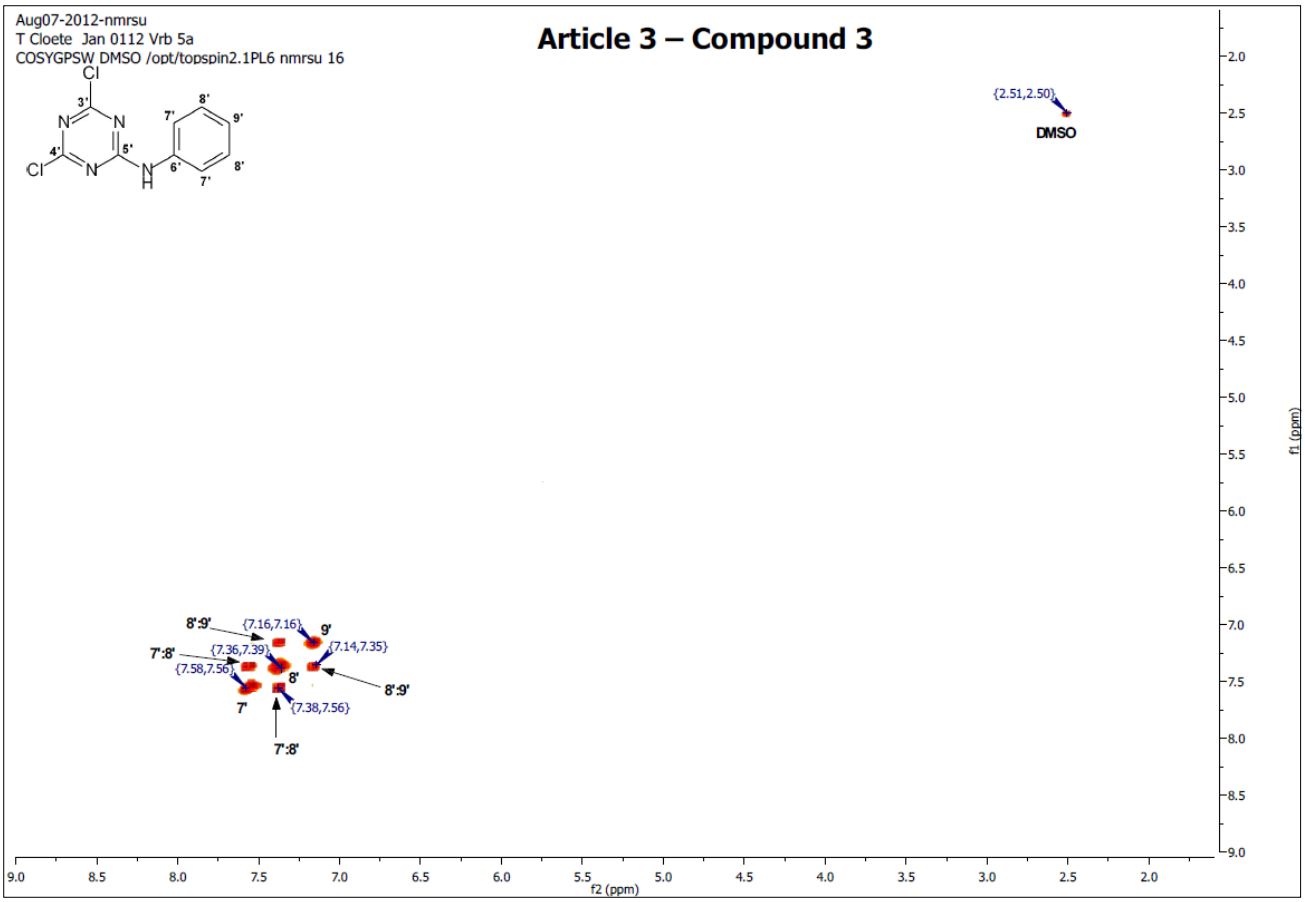

Aug07-2012-nmrsu
T Cloete Jan 0112 Vrb 2a
HSQCEDETGP DMSO /opt/topspin2.1PL6 nmrsu 17
Article 3 – Compound 2
{2.50,40.00}
DMSO
{3.75,55.77}
10'
{6.96,114.45}
8'
{7.43,124.00}
7'
f2 (ppm)
f1 (ppm)

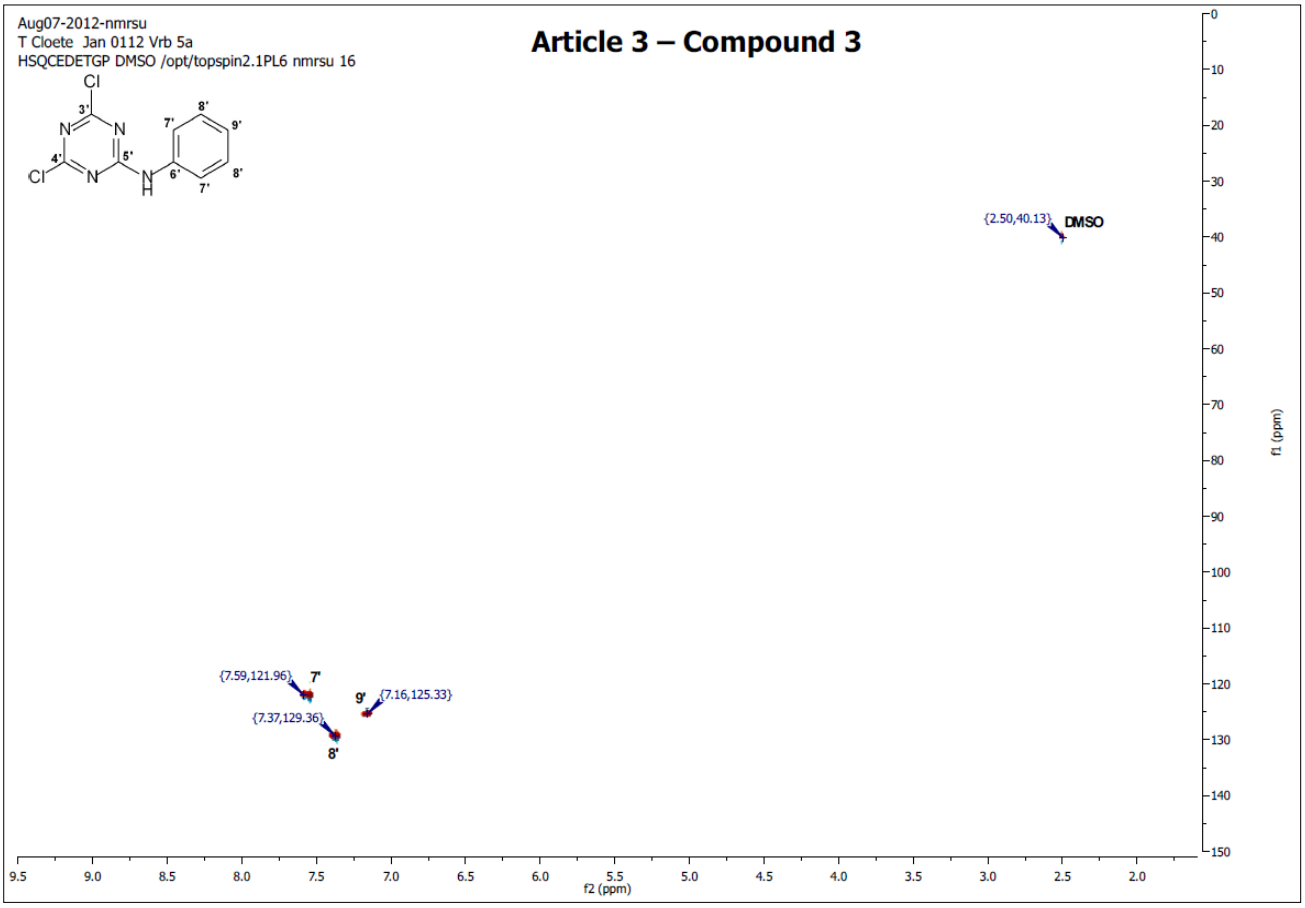


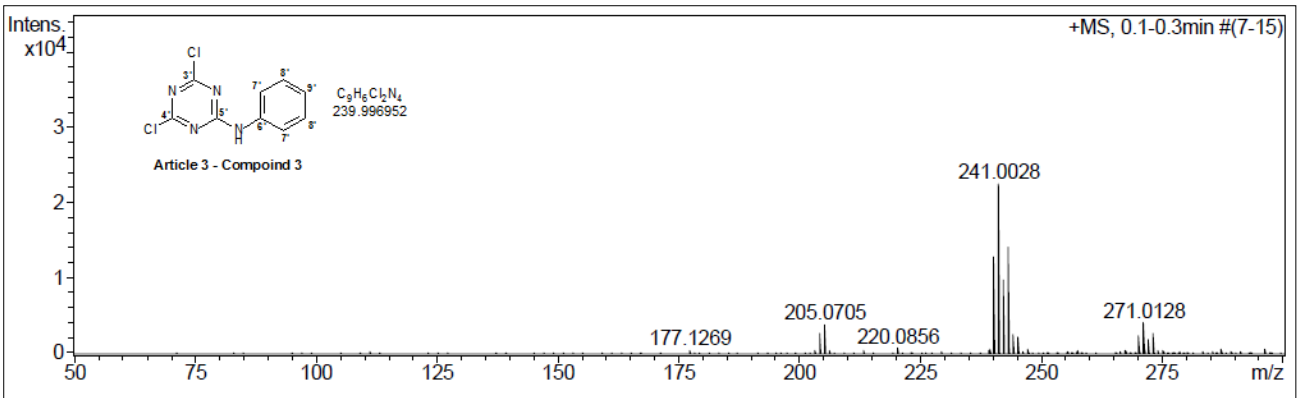
Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdb	e¯ Conf	N-Rule
271.0140	1	C 10 H 9 Cl 2 N 4 O	100.00	271.0148	0.8	3.0	172.1	7.5	even	ok
	2	C 9 H 13 Cl 2 O 5	49.52	271.0135	-0.5	-2.0	183.1	2.5	even	ok
	3	C 15 H 8 Cl O 3	0.26	271.0156	1.7	6.1	235.3	11.5	even	ok
	4	C 11 H 4 Cl N 6 O	0.01	271.0130	-1.0	-3.8	269.4	12.5	even	ok
	5	C 10 H 8 Cl N 2 O 5	0.00	271.0116	-2.4	-8.7	277.3	7.5	even	ok
	6	C 16 H 3 N 2 O 3	0.00	271.0138	-0.2	-0.6	433.2	16.5	even	ok
	7	C 4 H 7 N 4 O 10	0.00	271.0157	1.7	6.2	469.8	3.5	even	ok


Aug07-2012-nmrsu
T Cloete Jan 0112 Vrb 5a
PROTON DMSO /opt/topspin2.1PL6 nmrsu 16
Article 3 – Compound 3
7'
8'
9'
NH
H2O
DSMO
f1 (ppm)

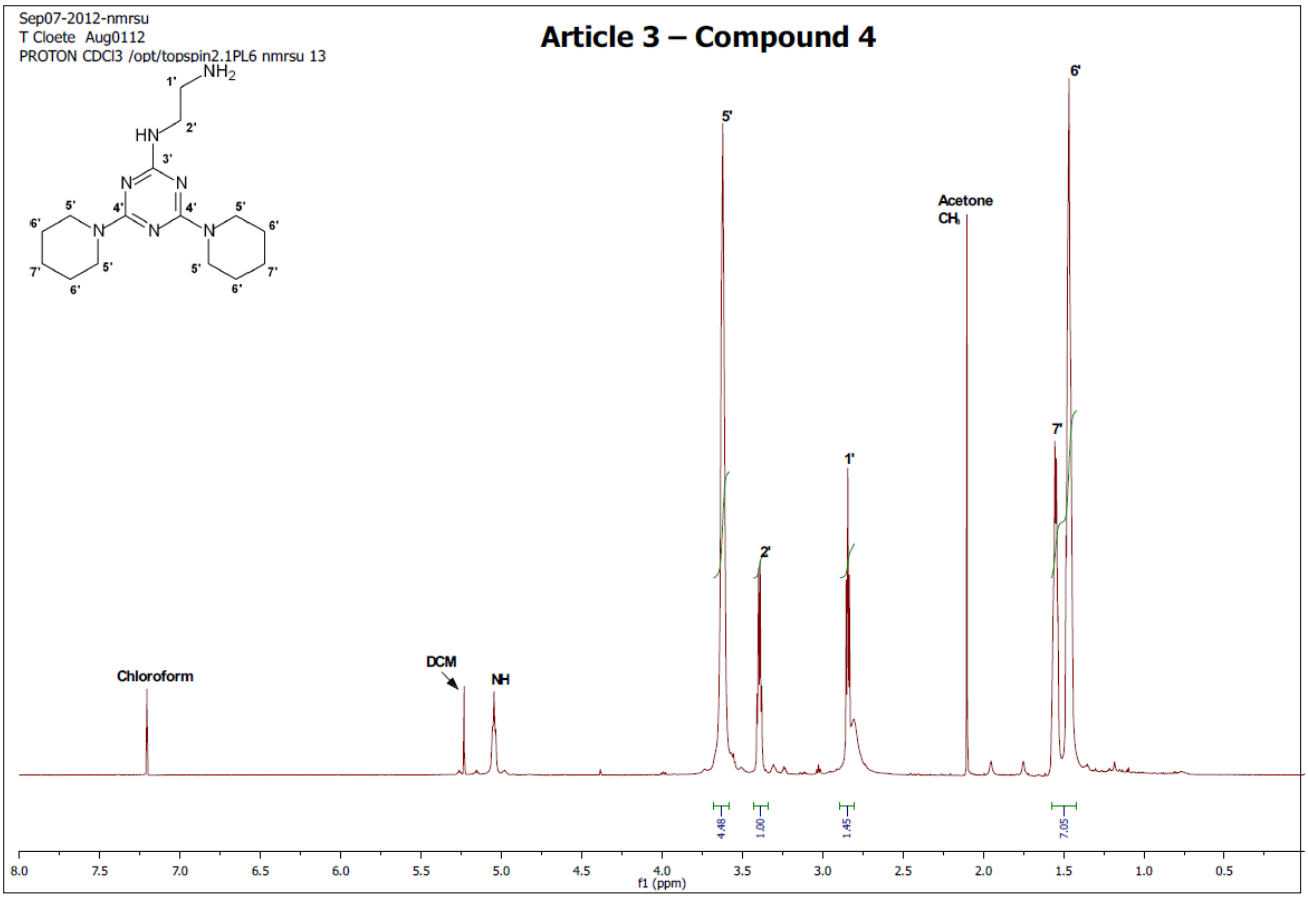

Aug07-2012-nmrsu
T Cloete Jan 0112 Vrb 5a
C13CPDSN DMSO /opt/topspin2.1PL6 nmrsu 16
Article 3 – Compound 3
8'
7'
9'
Pyridine CH(4)
Pyridine CH(3)
Pyridine CH(2)
6'
4'
3'
5'
f1 (ppm)

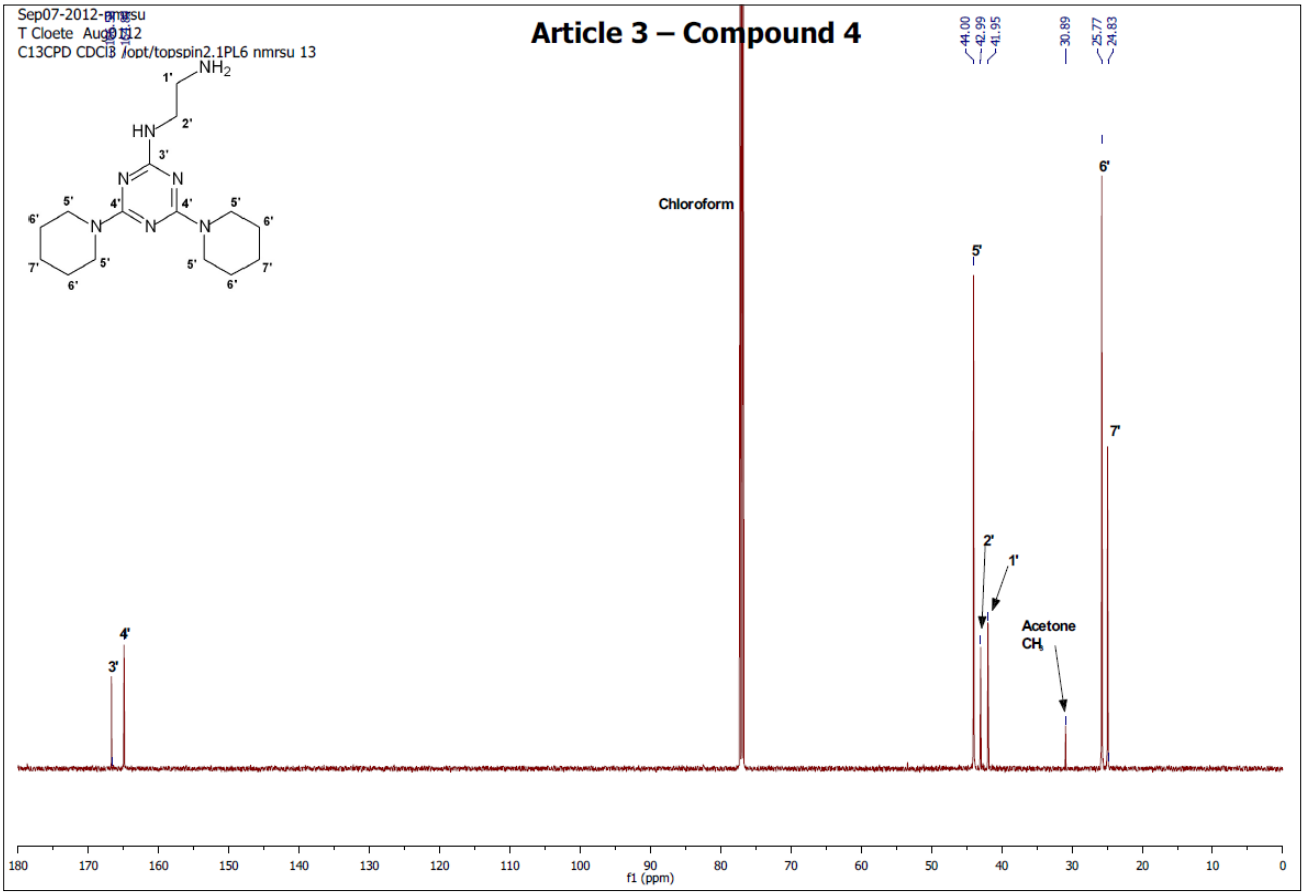

Aug07-2012-nmrsu
T Cloete Jan 0112 Vrb 5a
COSYGPSW DMSO /opt/topspin2.1PL6 nmrsu 16
Article 3 – Compound 3
{2.51,2.50}
DMSO
8':9'
{7.16,7.16}
9'
{7.14,7.35}
7':8'
{7.36,7.39}
{7.58,7.56}
8'
8':9'
7'
{7.38,7.56}
7':8'
f2 (ppm)
f1 (ppm)

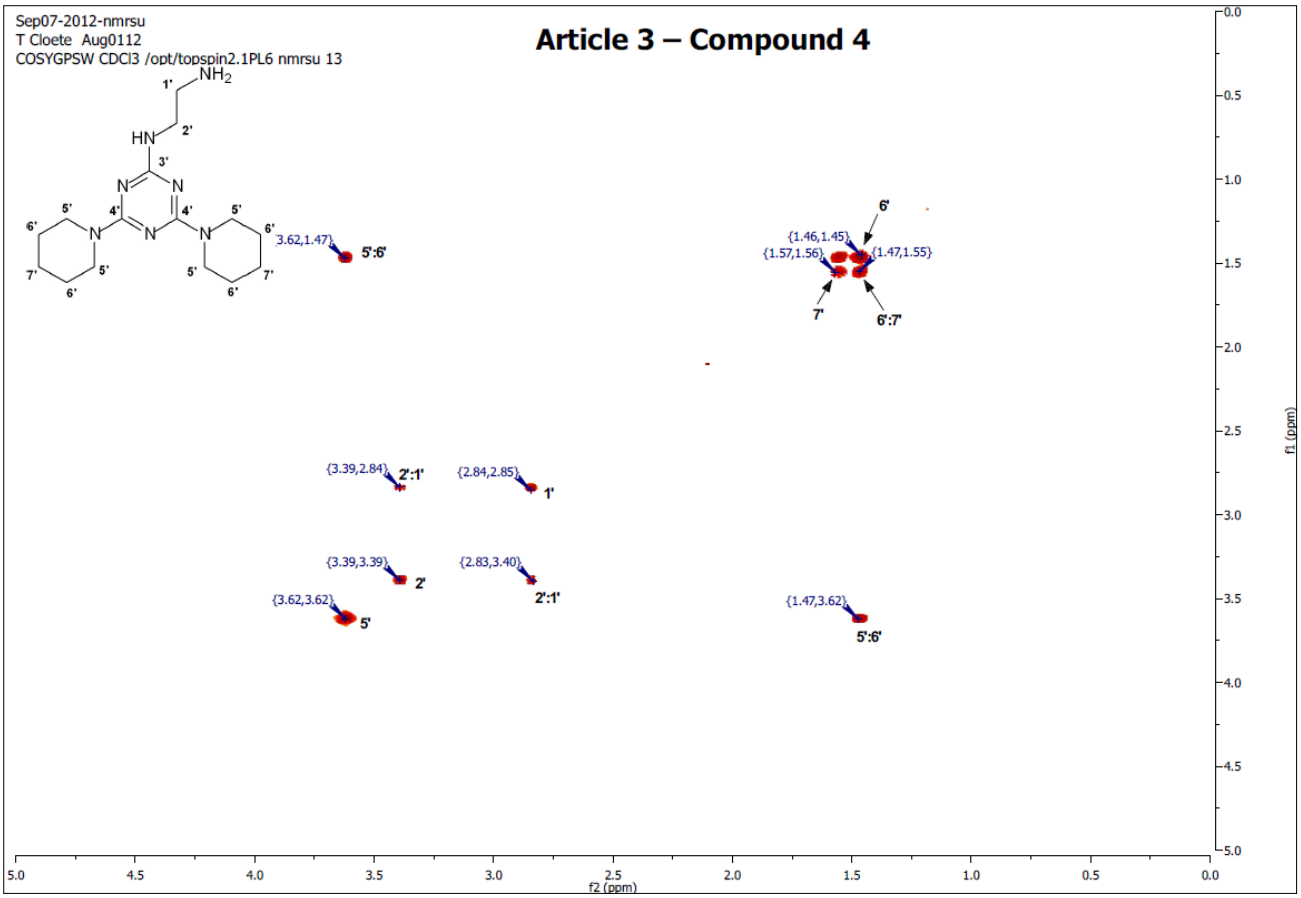

Aug07-2012-nmrsu
T Cloete Jan 0112 Vrb 5a
HSQCEDETGP DMSO /opt/topspin2.1PL6 nmrsu 16
Article 3 – Compound 3
{2.50,40.13}
DMSO
{7.59,121.96}
7'
9'
{7.16,125.33}
{7.37,129.36}
8'
f2 (ppm)
f1 (ppm)

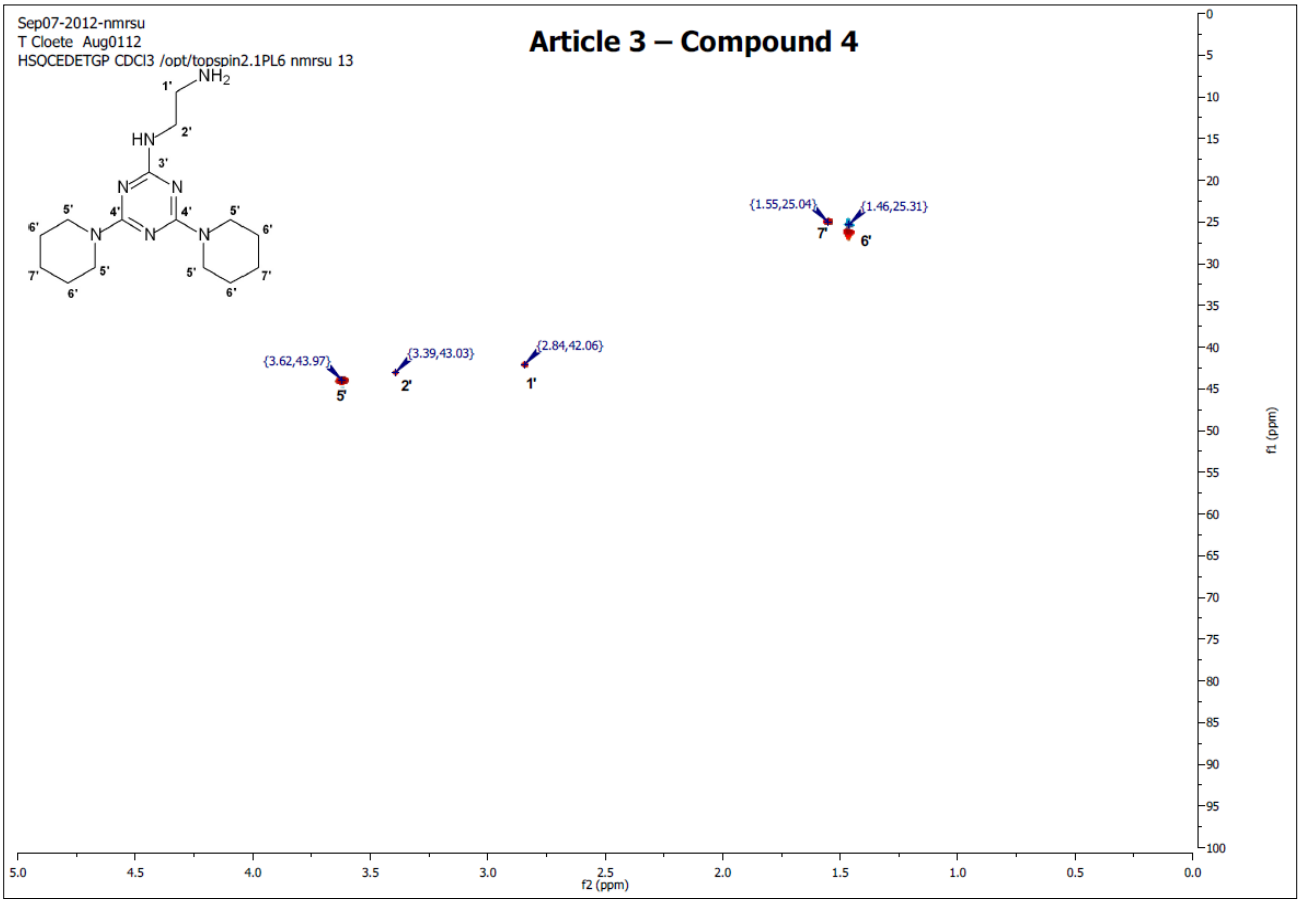


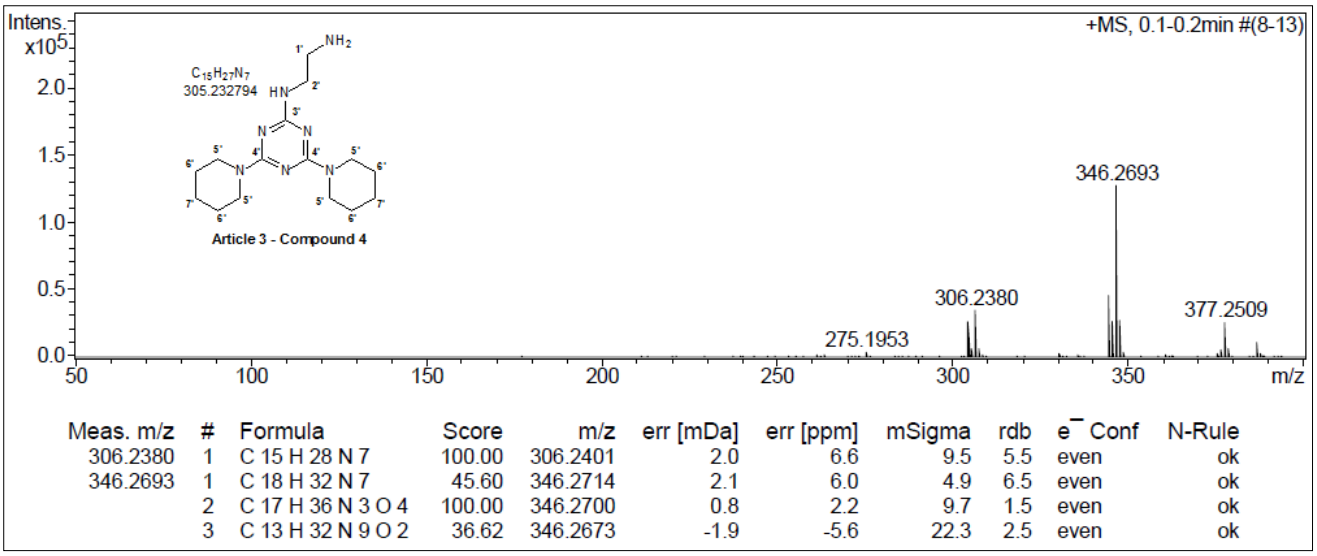
Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdb	e⁻ Conf	N-Rule
241.0028	1	C 9 H 7 Cl 2 N 4	99.16	241.0042	1.4	6.0	134.0	7.5	even	ok
	2	C 8 H 11 Cl 2 O 4	100.00	241.0029	0.1	0.5	145.3	2.5	even	ok
	3	C 14 H 6 Cl O 2	0.24	241.0051	2.3	9.6	207.3	11.5	even	ok
	4	C 10 H 2 Cl N 6	0.32	241.0024	-0.4	-1.6	217.7	12.5	even	ok
	5	C 9 H 6 Cl N 2 O 4	0.07	241.0011	-1.7	-7.1	225.8	7.5	even	ok
	6	C 15 H N 2 O 2	0.00	241.0033	0.5	2.0	384.4	16.5	even	ok
	7	C 3 H 5 N 4 O 9	0.00	241.0051	2.3	9.6	417.1	3.5	even	ok


Sep07-2012-nmrsu
T Cloete Aug0112
PROTON CDCl3 /opt/topspin2.1PL6 nmrsu 13
Article 3 – Compound 4
Chloroform
DCM
NH
Acetone
f1 (ppm)

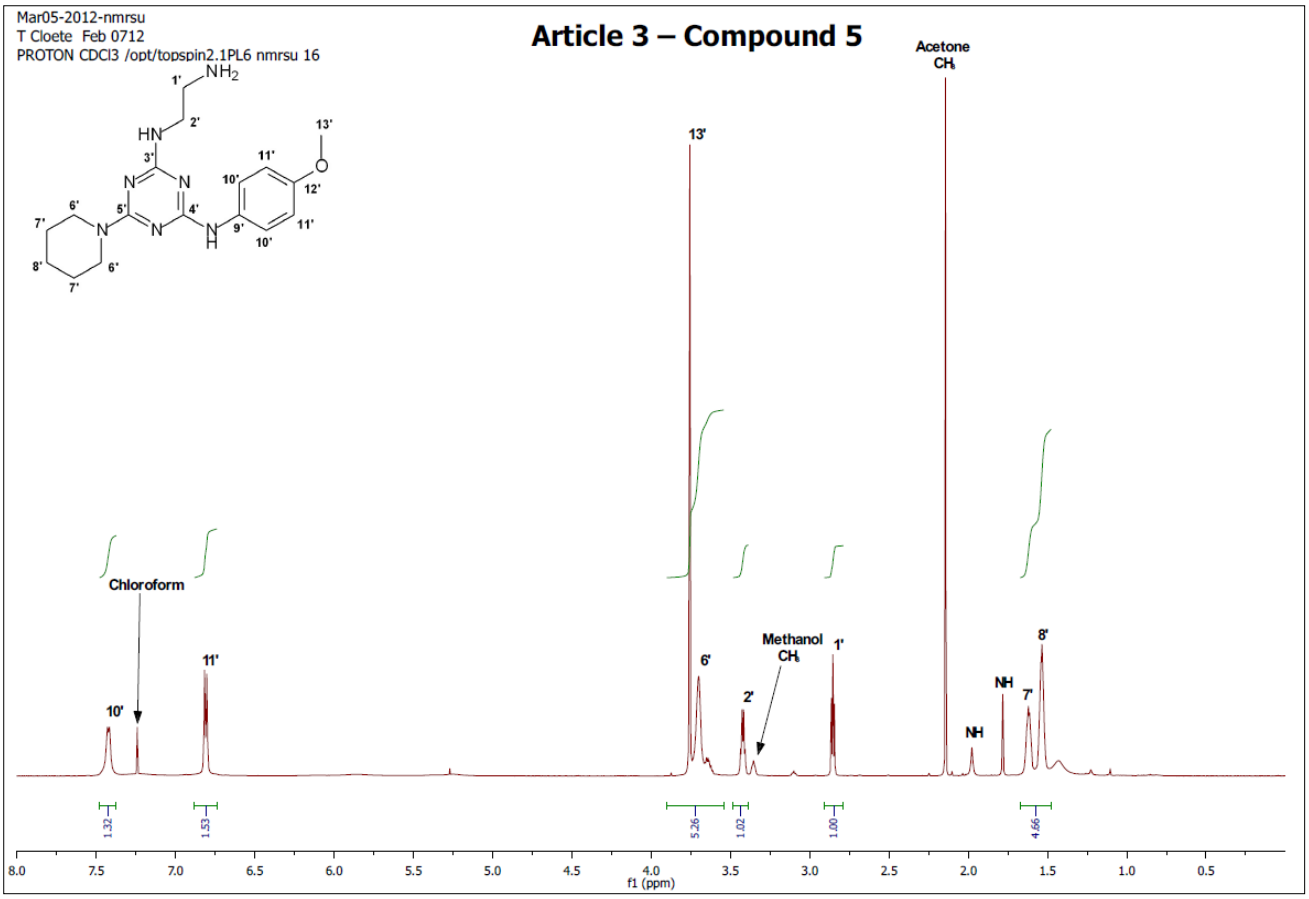

Sep07-2012-nmrsu
T Cloete Aug0112
C13CPD CDCl3 /opt/topspin2.1PL6 nmrsu 13
Article 3 – Compound 4
Chloroform
Acetone
f1 (ppm)

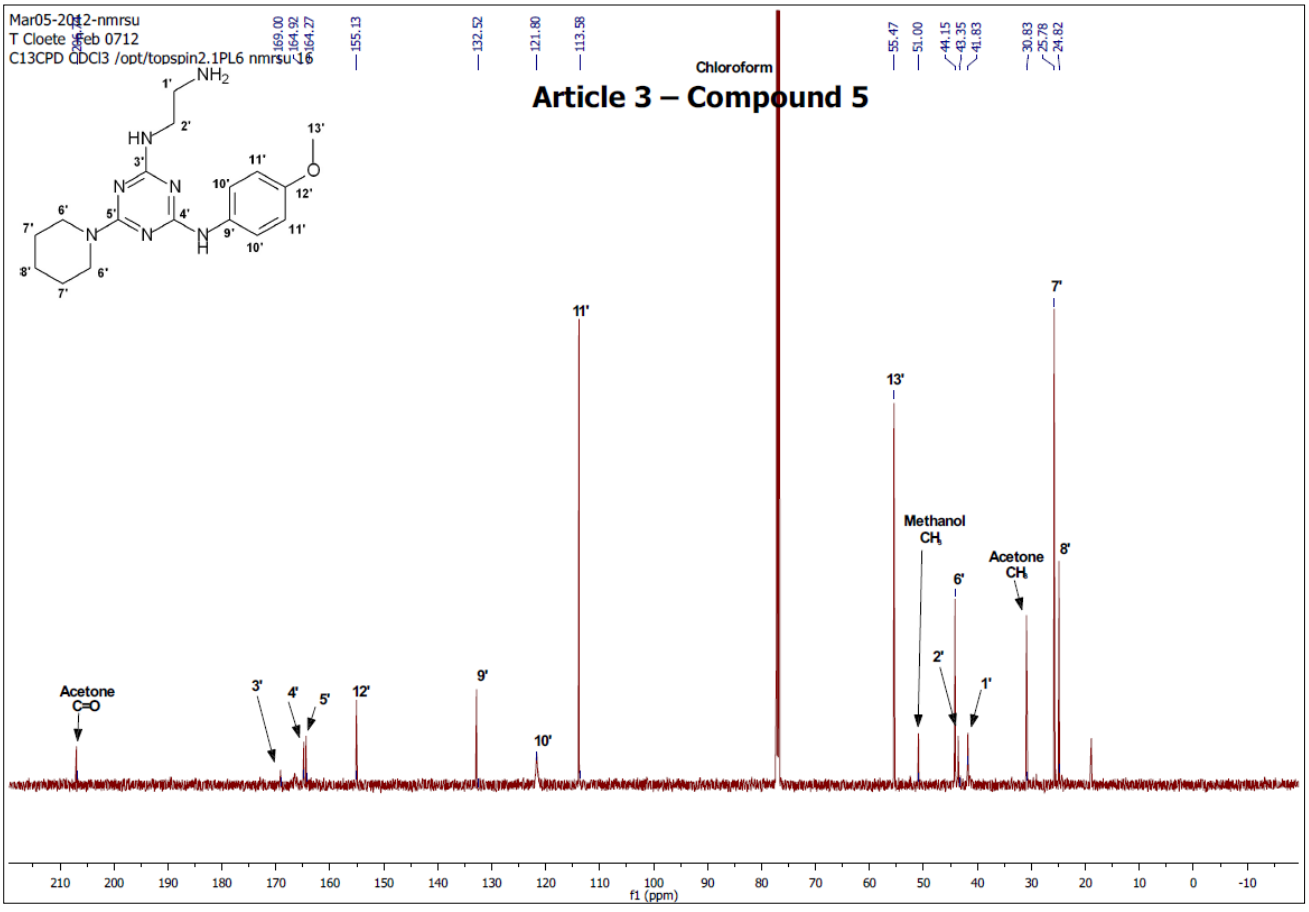

Sep07-2012-nmrsu
T Cloete Aug0112
COSYGPSW CDCl3 /opt/topspin2.1PL6 nmrsu 13
Article 3 – Compound 4
NH2
HN
{3.62,1.47}
5':6'
{1.46,1.45}
{1.57,1.56}
{1.47,1.55}
6'
7'
6':7'
{3.39,2.84}
2':1'
{2.84,2.85}
1'
{3.39,3.39}
2'
{2.83,3.40}
2':1'
{3.62,3.62}
5'
{1.47,3.62}
5':6'
f2 (ppm)
f1 (ppm)

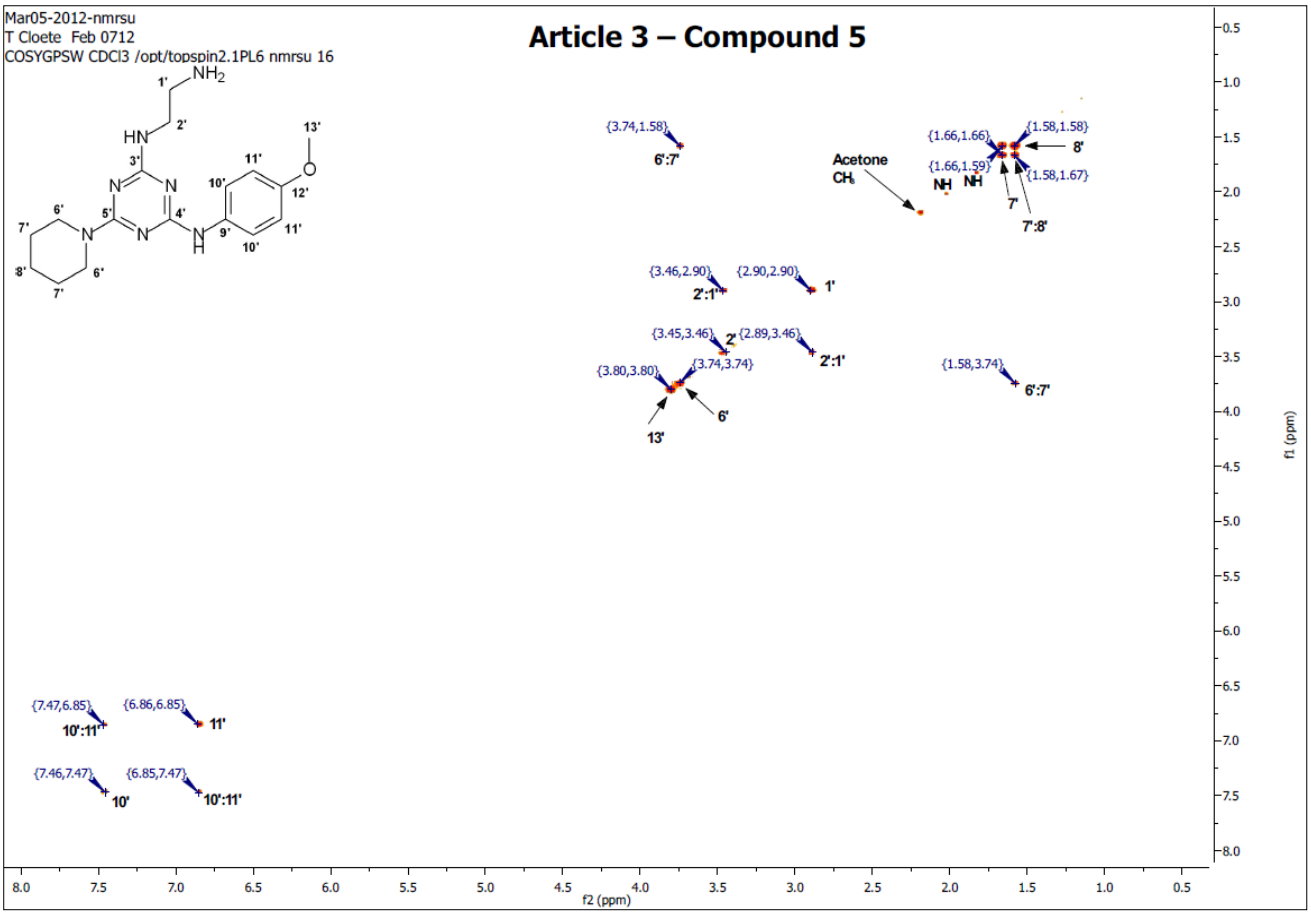

Sep07-2012-nmrsu
T Cloete Aug0112
HSQCEDETGP CDCl3 /opt/topspin2.1PL6 nmrsu 13
Article 3 – Compound 4
NH2
HN
{1.55,25.04}
{1.46,25.31}
7'
6'
{3.62,43.97}
5'
{3.39,43.03}
2'
{2.84,42.06}
1'
f2 (ppm)
f1 (ppm)

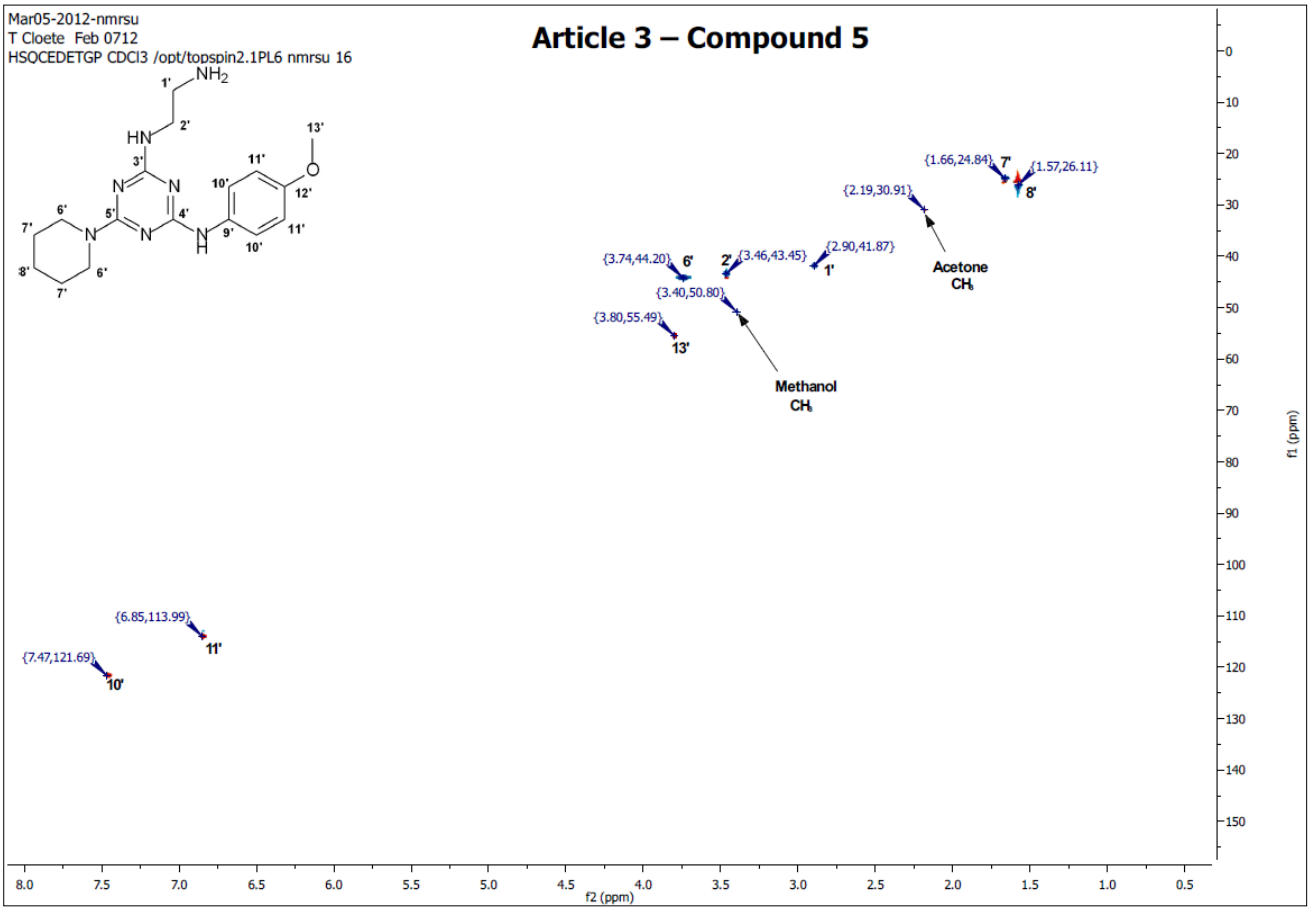


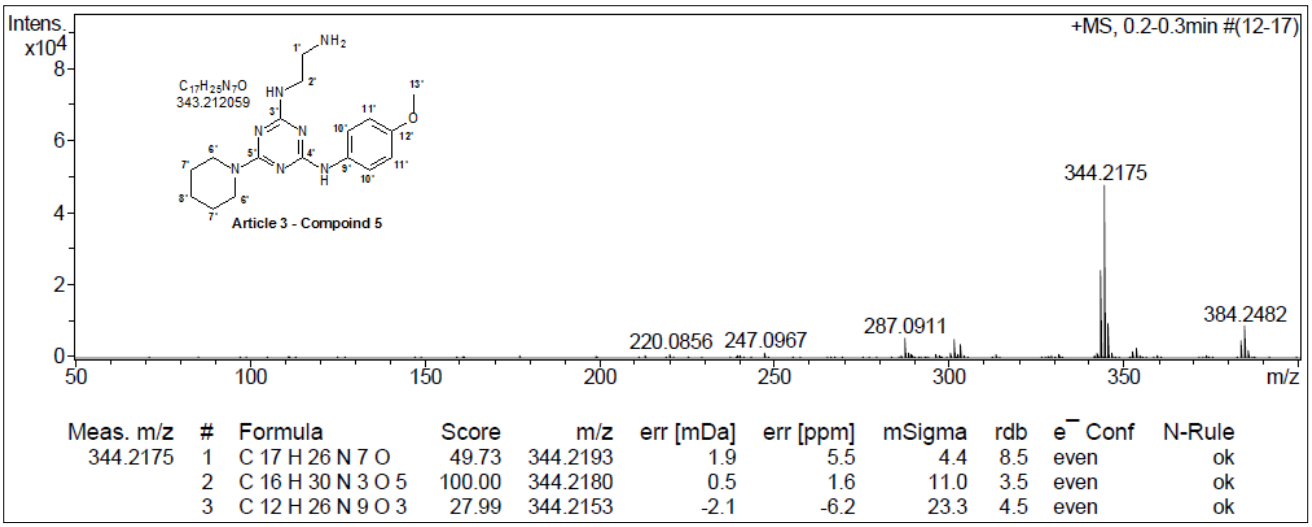
Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdb	e¯ Conf	N-Rule
306.2380	1	C 15 H 28 N 7	100.00	306.2401	2.0	6.6	9.5	5.5	even	ok
346.2693	1	C 18 H 32 N 7	45.60	346.2714	2.1	6.0	4.9	6.5	even	ok
	2	C 17 H 36 N 3 O 4	100.00	346.2700	0.8	2.2	9.7	1.5	even	ok
	3	C 13 H 32 N 9 O 2	36.62	346.2673	-1.9	-5.6	22.3	2.5	even	ok


Mar05-2012-nmrsu
T Cloete Feb 0712
PROTON CDCl3 /opt/topspin2.1PL6 nmrsu 16
Article 3 – Compound 5
Acetone CH3
Chloroform
Methanol CH3
f1 (ppm)

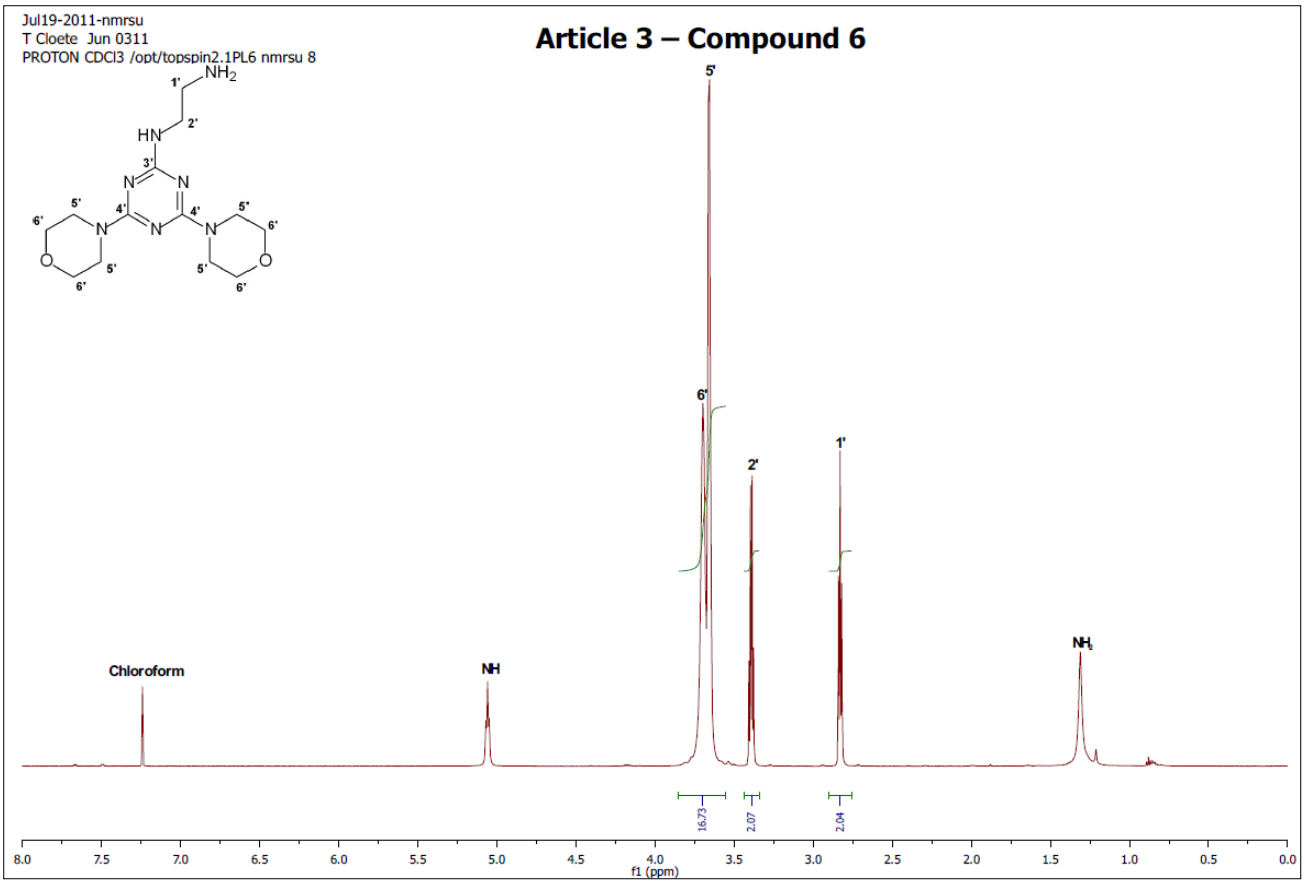

Mar05-2012-nmrsu
T Cloete Feb 0712
C13CPD CDCl3 /opt/topspin2.1PL6 nmrsu 16
Article 3 – Compound 5
Chloroform
Acetone C=O
Methanol CH3
Acetone CH3
f1 (ppm)

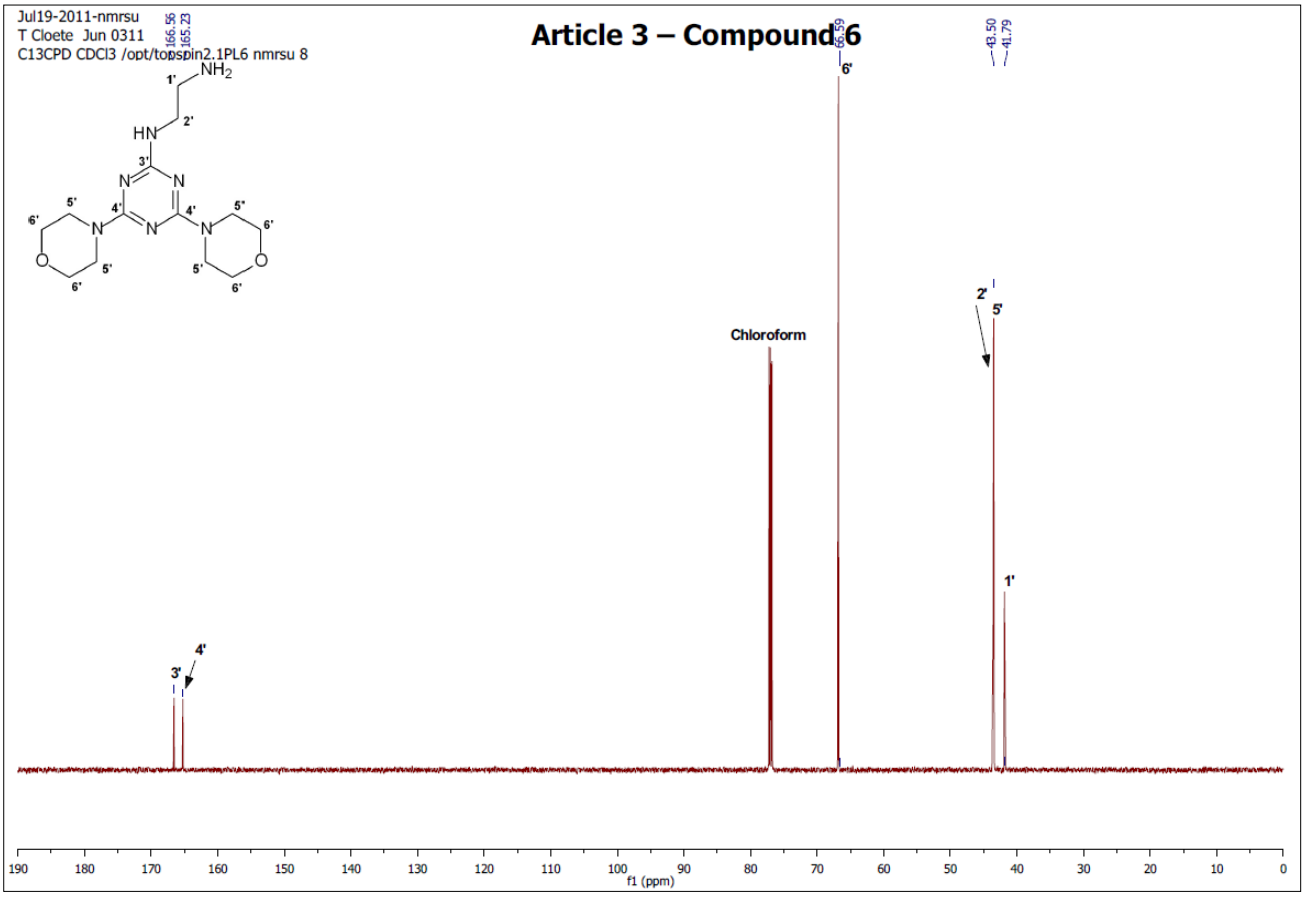

Mar05-2012-nmrsu
T Cloete Feb 0712
COSYGPSW CDCl3 /opt/topspin2.1PL6 nmrsu 16
Article 3 – Compound 5
{3.74,1.58}
6':7'
Acetone
CH3
{1.66,1.66}
{1.58,1.58}
8'
{1.66,1.59}
{1.58,1.67}
NH
NH
7'
7':8'
{3.46,2.90}
{2.90,2.90}
2':1'
1'
{3.45,3.46}
2'
{2.89,3.46}
2':1'
{3.80,3.80}
{3.74,3.74}
6'
13'
{1.58,3.74}
6':7'
{7.47,6.85}
10':11'
{6.86,6.85}
11'
{7.46,7.47}
10'
{6.85,7.47}
10':11'
f2 (ppm)
f1 (ppm)

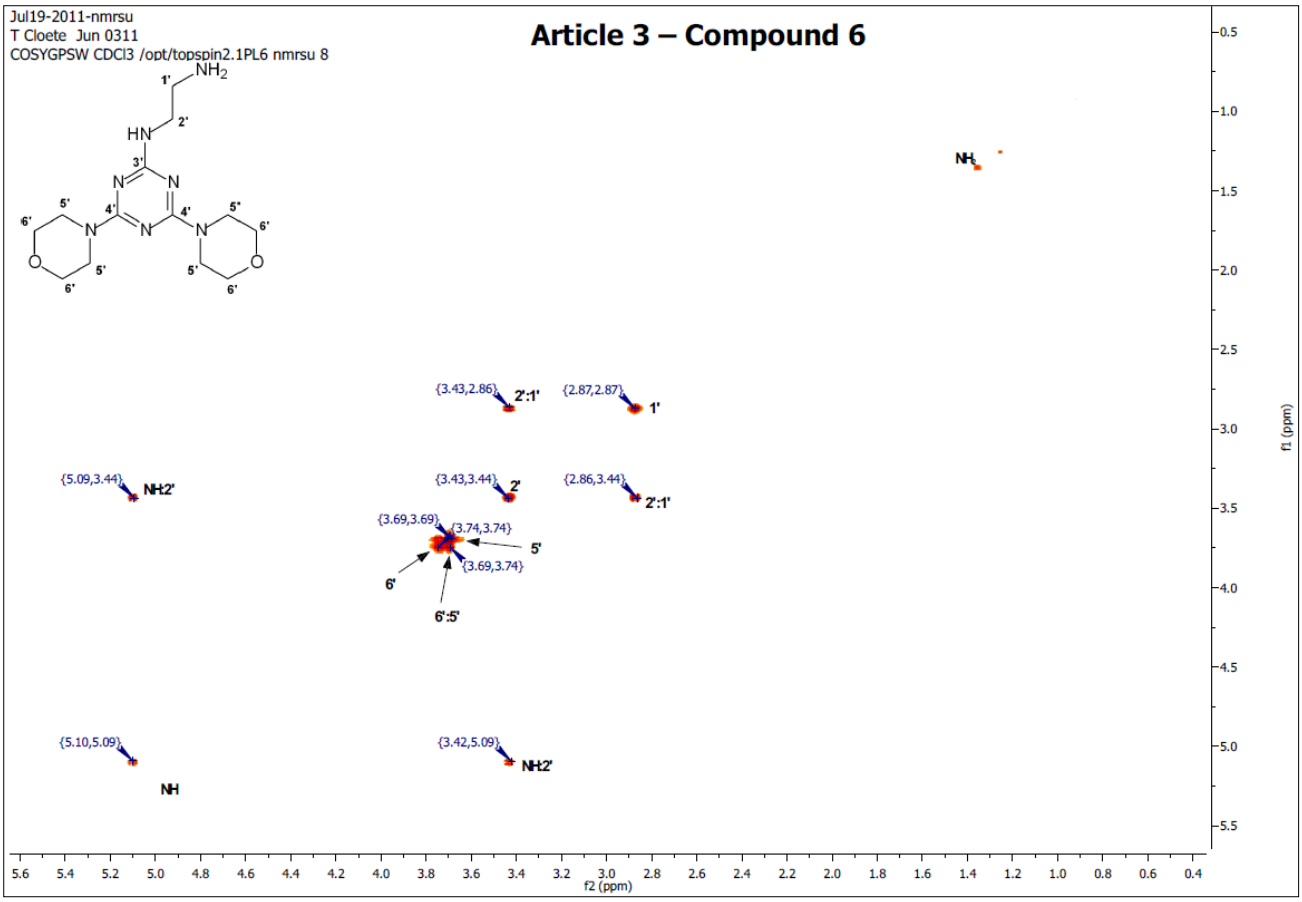

Mar05-2012-nmrsu
T Cloete Feb 0712
HSQCEDETGP CDCl3 /opt/topspin2.1PL6 nmrsu 16
Article 3 – Compound 5
{1.66,24.84}
7'
{1.57,26.11}
8'
{2.19,30.91}
{3.74,44.20}
6'
2'
{3.46,43.45}
{2.90,41.87}
1'
Acetone
CH3
{3.40,50.80}
{3.80,55.49}
13'
Methanol
CH3
{6.85,113.99}
11'
{7.47,121.69}
10'
f2 (ppm)
f1 (ppm)

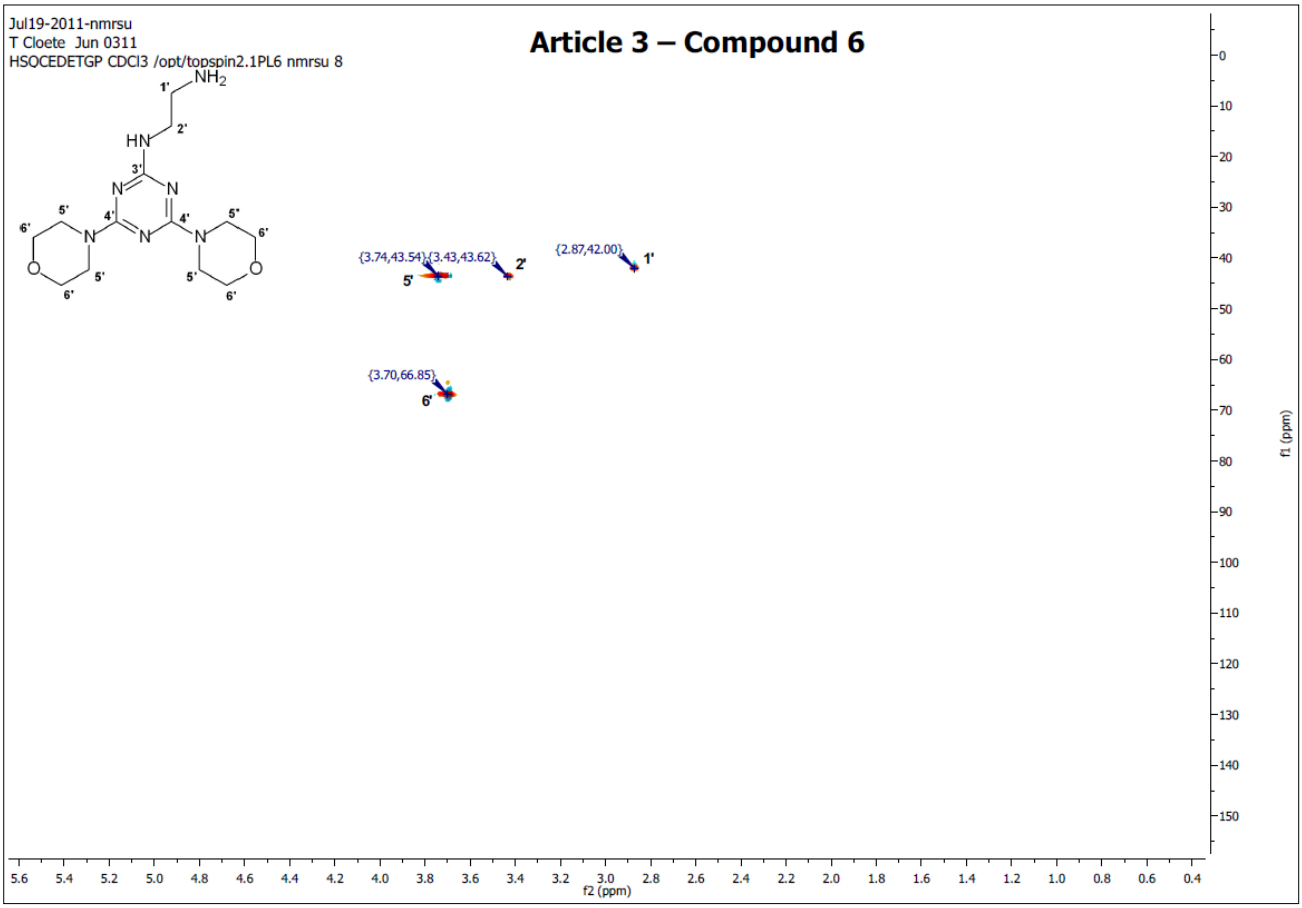


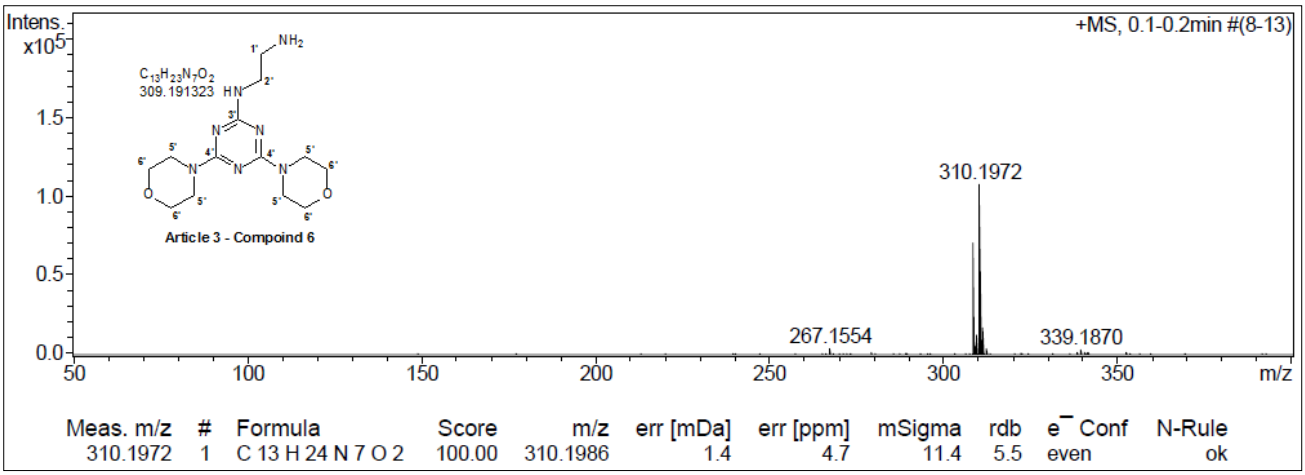
Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdb	e¯ Conf	N-Rule
344.2175	1	C 17 H 26 N 7 O	49.73	344.2193	1.9	5.5	4.4	8.5	even	ok
	2	C 16 H 30 N 3 O 5	100.00	344.2180	0.5	1.6	11.0	3.5	even	ok
	3	C 12 H 26 N 9 O 3	27.99	344.2153	-2.1	-6.2	23.3	4.5	even	ok


Jul19-2011-nmrsu
T Cloete Jun 0311
PROTON CDCl3 /opt/topspin2.1PL6 nmrsu 8
Article 3 – Compound 6
Chloroform
NH
NH2
16.73
2.07
2.04
f1 (ppm)

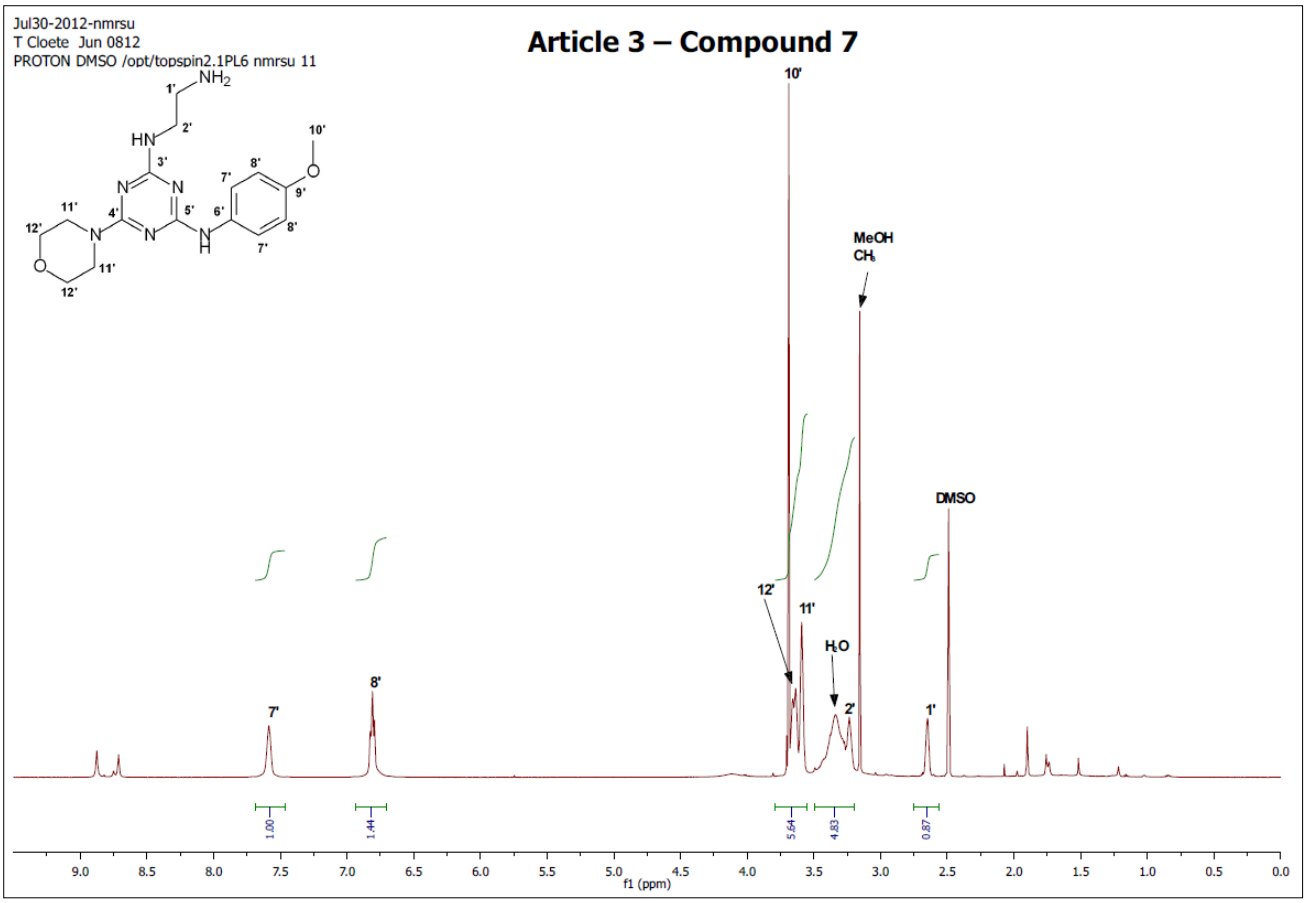

Jul19-2011-nmrsu
T Cloete Jun 0311
C13CPD CDCl3 /opt/topspin2.1PL6 nmrsu 8
Article 3 – Compound 6
166.55
165.23
66.59
43.50
41.79
Chloroform
f1 (ppm)

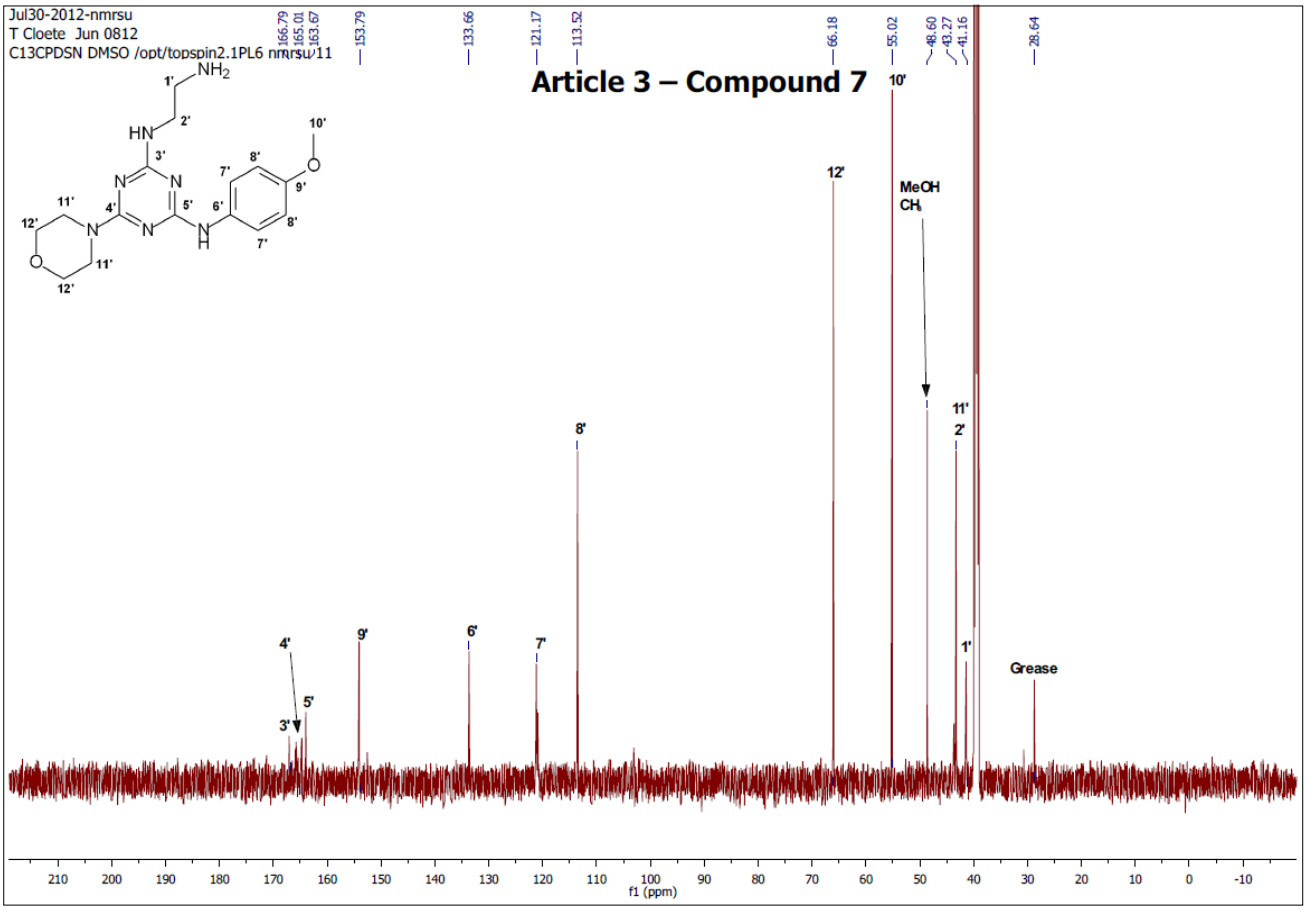

Jul19-2011-nmrsu
T Cloete Jun 0311
COSYGPSW CDCl3 /opt/topspin2.1PL6 nmrsu 8
Article 3 – Compound 6
{3.43,2.86} 2':1'
{2.87,2.87} 1'
{5.09,3.44} NH:2'
{3.43,3.44} 2'
{2.86,3.44} 2':1'
{3.69,3.69}
{3.74,3.74}
{3.69,3.74}
5'
6'
6':5'
{5.10,5.09}
NH
{3.42,5.09} NH:2'
f2 (ppm)
f1 (ppm)

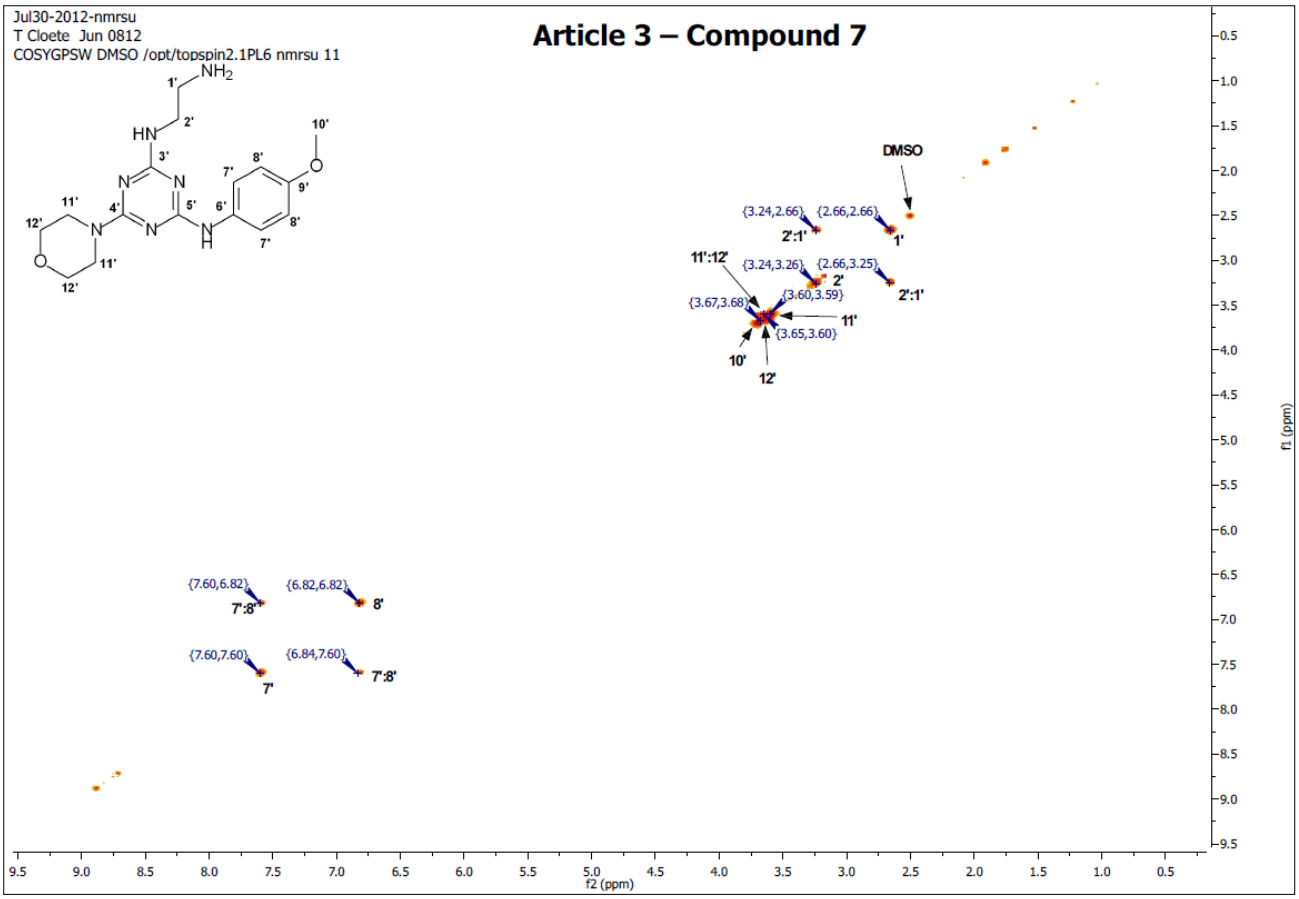

Jul19-2011-nmrsu
T Cloete Jun 0311
HSQCEDETGP CDCl3 /opt/topspin2.1PL6 nmrsu 8
Article 3 – Compound 6
{3.74,43.54} {3.43,43.62} 2'
5'
{2.87,42.00} 1'
{3.70,66.85} 6'
f2 (ppm)
f1 (ppm)

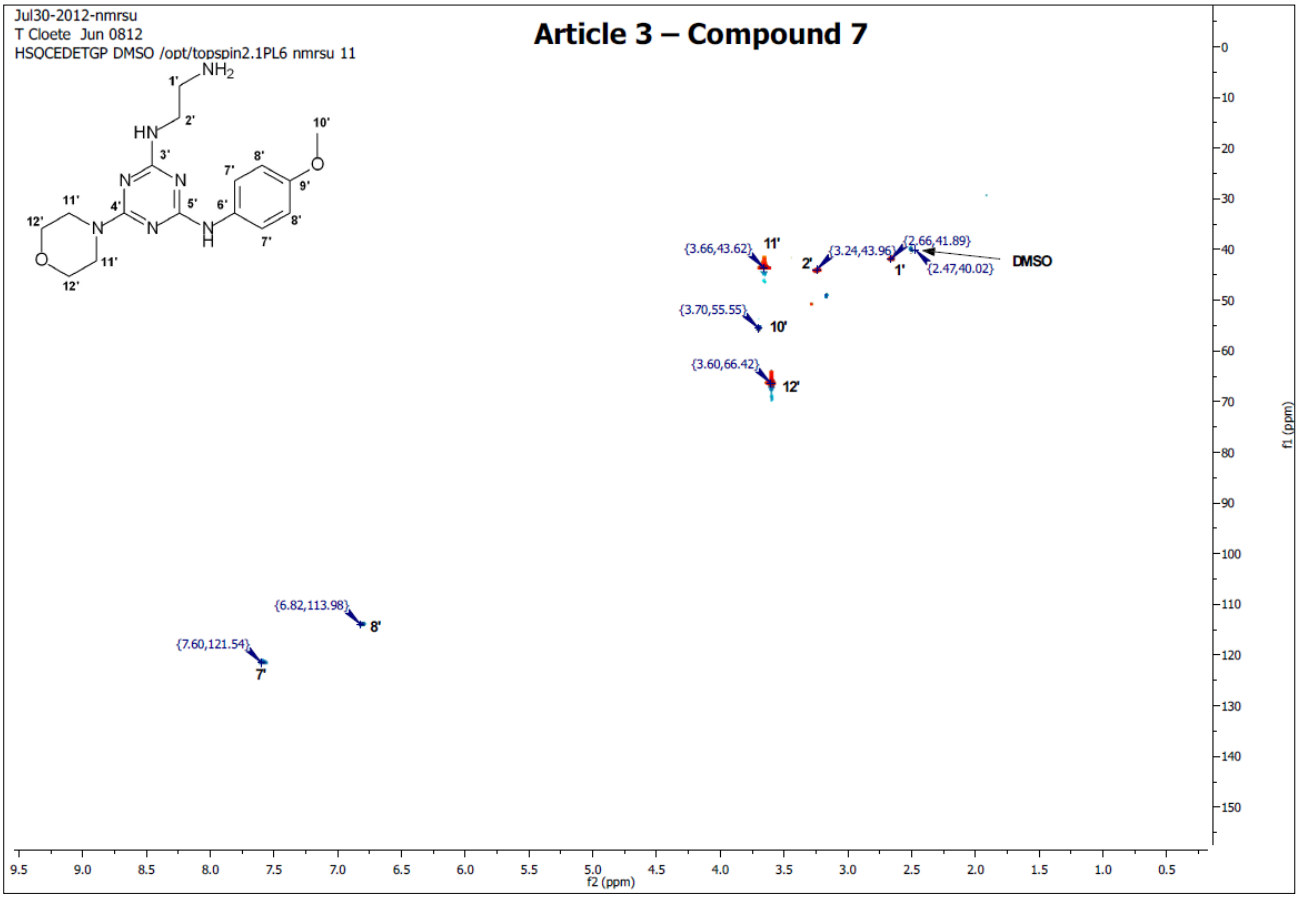


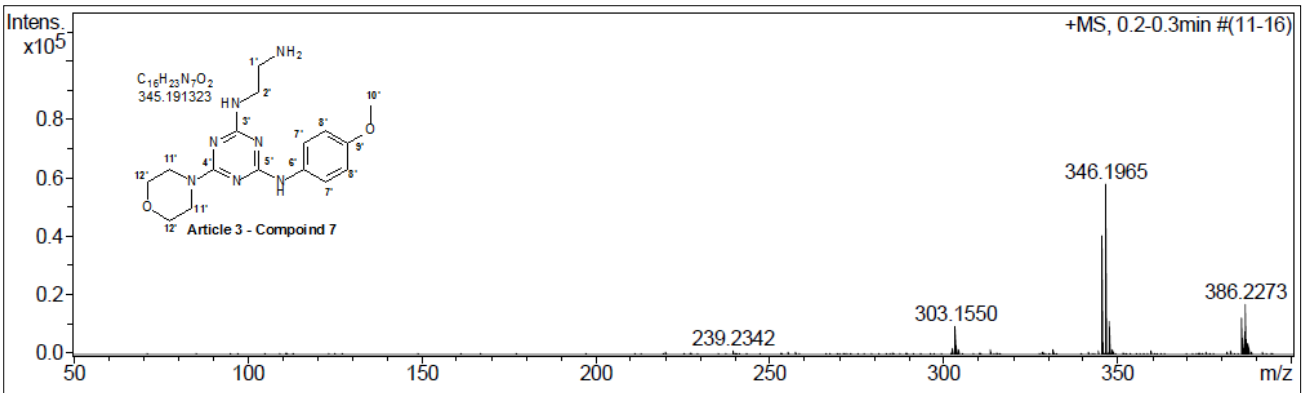
Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdb	e⁻ Conf	N-Rule
310.1972	1	C 13 H 24 N 7 O 2	100.00	310.1986	1.4	4.7	11.4	5.5	even	ok


Jul30-2012-nmrsu
T Cloete Jun 0812
PROTON DMSO /opt/topspin2.1PL6 nmrsu 11
Article 3 – Compound 7
MeOH
CH3
DMSO
H2O
f1 (ppm)

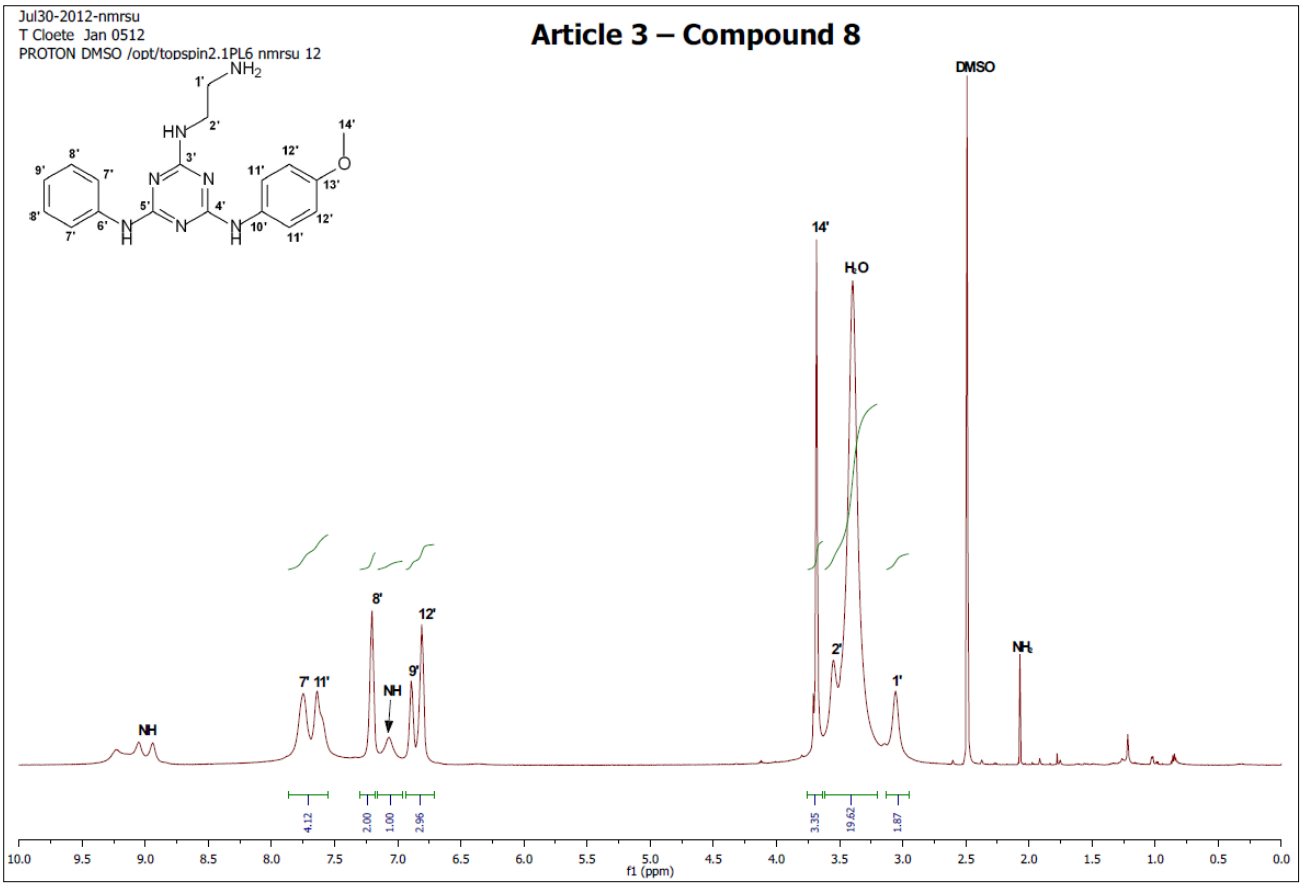

Jul30-2012-nmrsu
T Cloete Jun 0812
C13CPDSN DMSO /opt/topspin2.1PL6 nmrsu 11
Article 3 – Compound 7
MeOH
CH3
Grease
f1 (ppm)

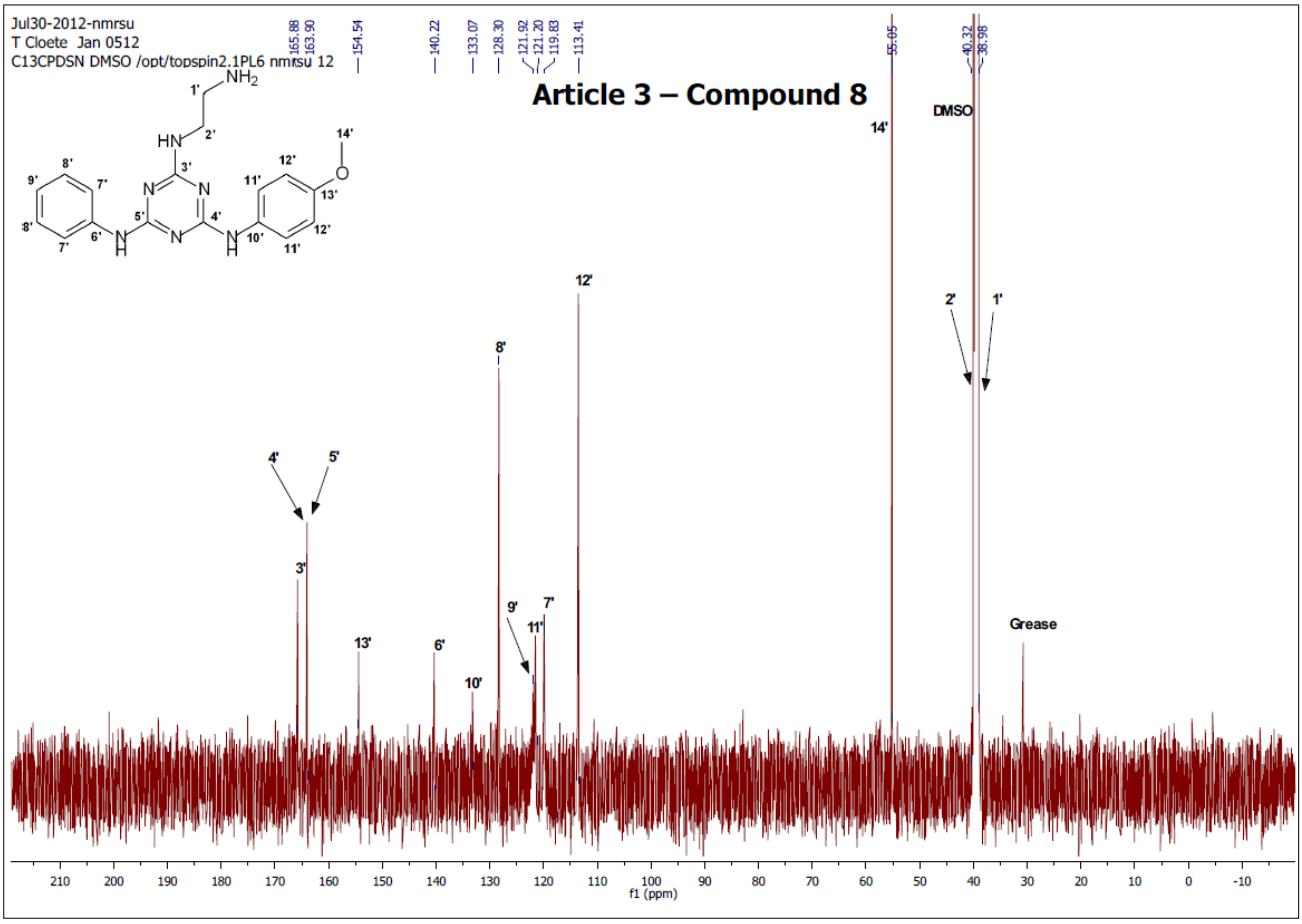

Jul30-2012-nmrsu
T Cloete Jun 0812
COSYGPSW DMSO /opt/topspin2.1PL6 nmrsu 11
Article 3 – Compound 7
DMSO
{3.24,2.66}
{2.66,2.66}
2':1'
1'
11':12'
{3.24,3.26}
{2.66,3.25}
2'
2':1'
{3.67,3.68}
{3.60,3.59}
11'
{3.65,3.60}
10'
12'
{7.60,6.82}
{6.82,6.82}
7':8'
8'
{7.60,7.60}
{6.84,7.60}
7'
7':8'
f2 (ppm)
f1 (ppm)

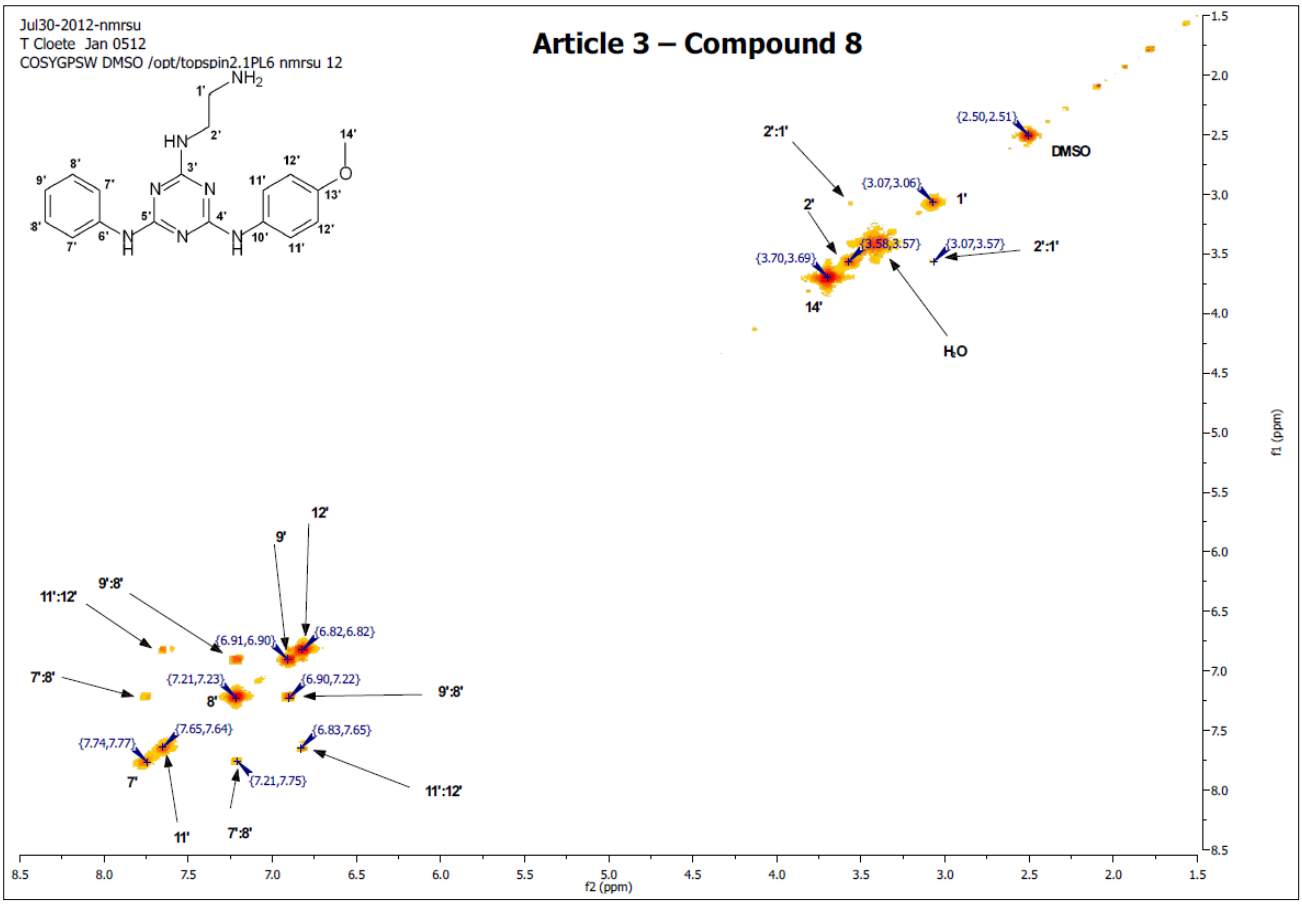

Jul30-2012-nmrsu
T Cloete Jun 0812
HSOCEDETGP DMSO /opt/topspin2.1PL6 nmrsu 11
Article 3 – Compound 7
{3.66,43.62}
11'
2'
{3.24,43.96}
{2.66,41.89}
1'
{2.47,40.02}
DMSO
{3.70,55.55}
10'
{3.60,66.42}
12'
{6.82,113.98}
8'
{7.60,121.54}
7'
f2 (ppm)
f1 (ppm)

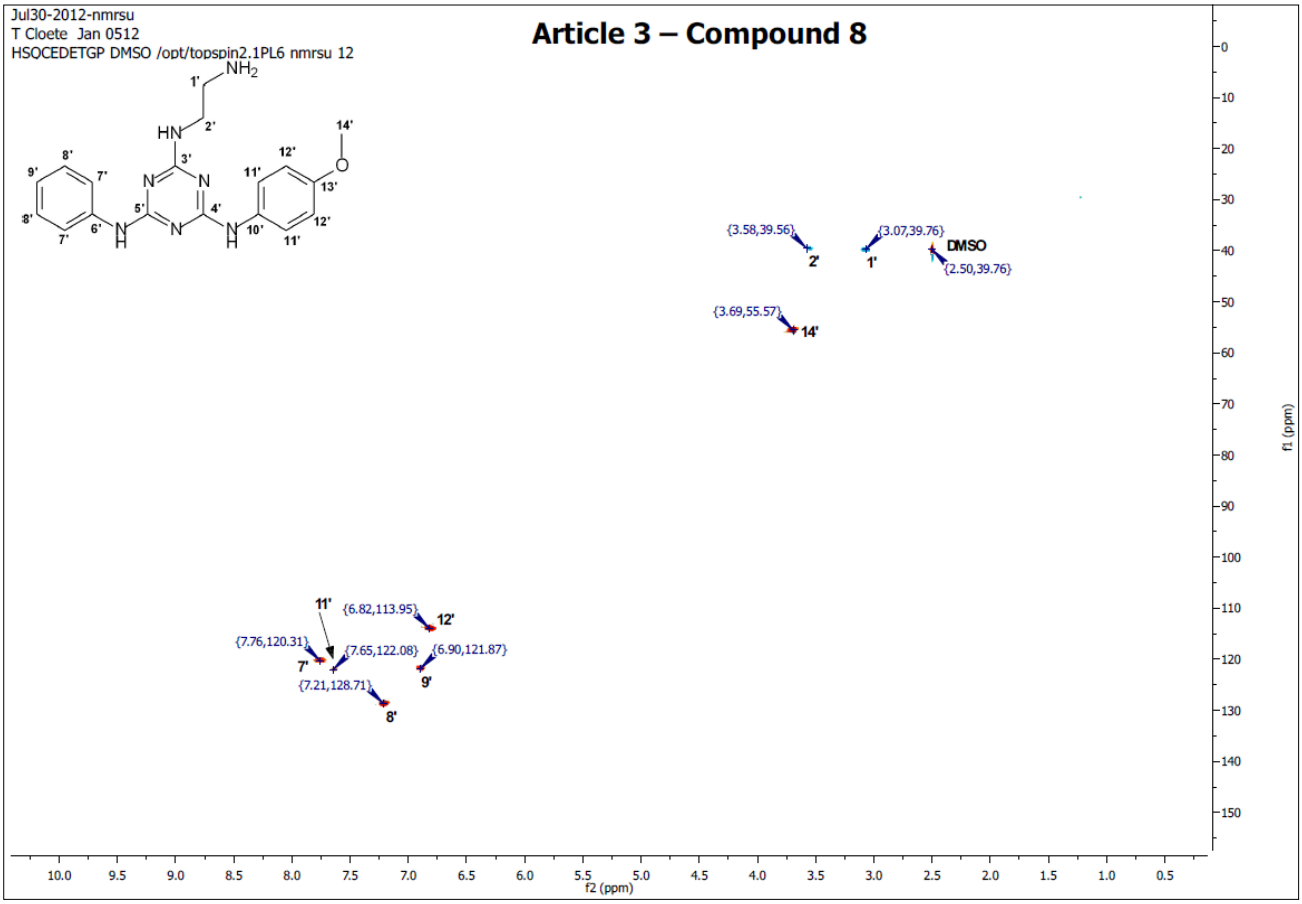


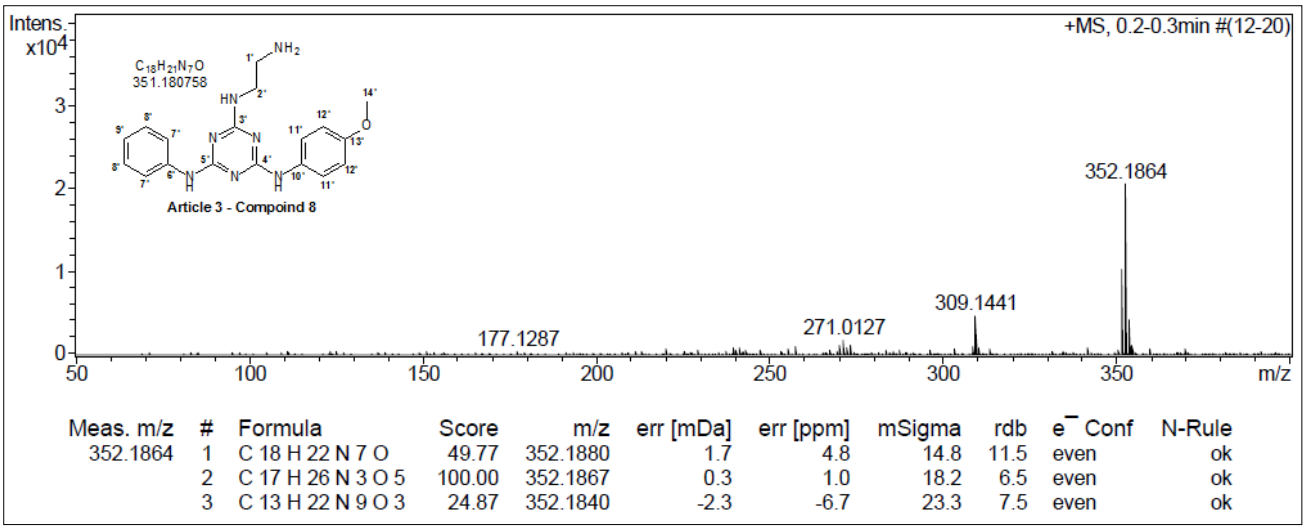
Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdb	e⁻ Conf	N-Rule
346.1965	1	C 16 H 24 N 7 O 2	39.41	346.1986	2.1	6.2	5.8	8.5	even	ok
	2	C 15 H 28 N 3 O 6	89.07	346.1973	0.8	2.3	9.5	3.5	even	ok
	3	C 12 H 20 N 13	100.00	346.1959	-0.6	-1.6	10.0	9.5	even	ok
	4	C 11 H 24 N 9 O 4	34.47	346.1946	-1.9	-5.5	22.1	4.5	even	ok


Jul30-2012-nmrsu
T Cloete Jan 0512
PROTON DMSO /opt/topspin2.1PL6 nmrsu 12
Article 3 – Compound 8
DMSO
14'
H2O
8'
12'
7' 11'
9'
NH
2'
1'
NH2
NH
4.12
2.00
1.00
2.96
3.35
19.62
1.87
f1 (ppm)

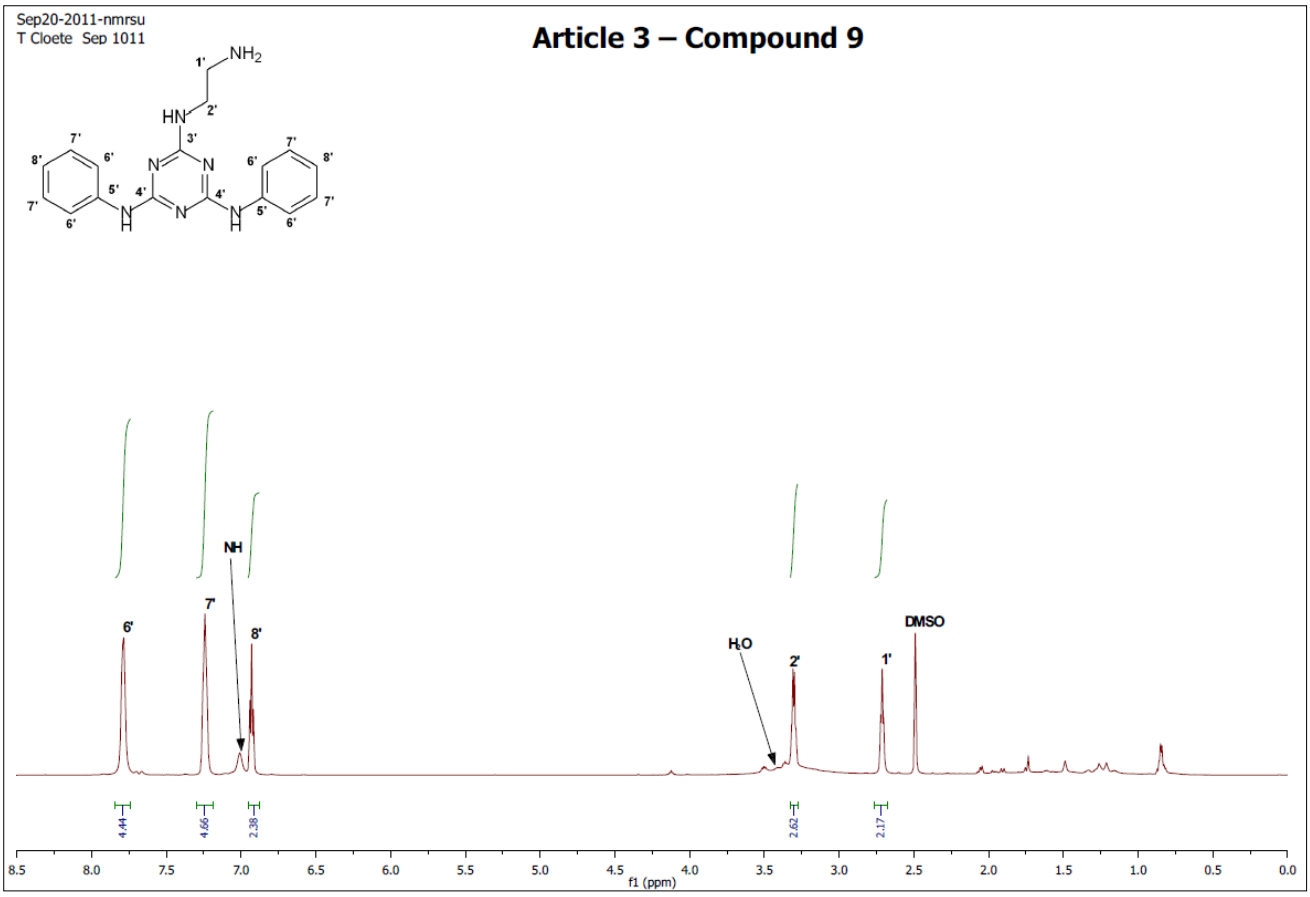

Jul30-2012-nmrsu
T Cloete Jan 0512
C13CPDSN DMSO /opt/topspin2.1PL6 nmrsu 12
165.88
163.90
154.54
140.22
133.07
128.30
121.92
121.20
119.83
113.41
55.05
40.32
38.98
Article 3 – Compound 8
14'
DMSO
12'
2'
1'
8'
4'
5'
3'
9'
7'
11'
13'
6'
10'
Grease
f1 (ppm)

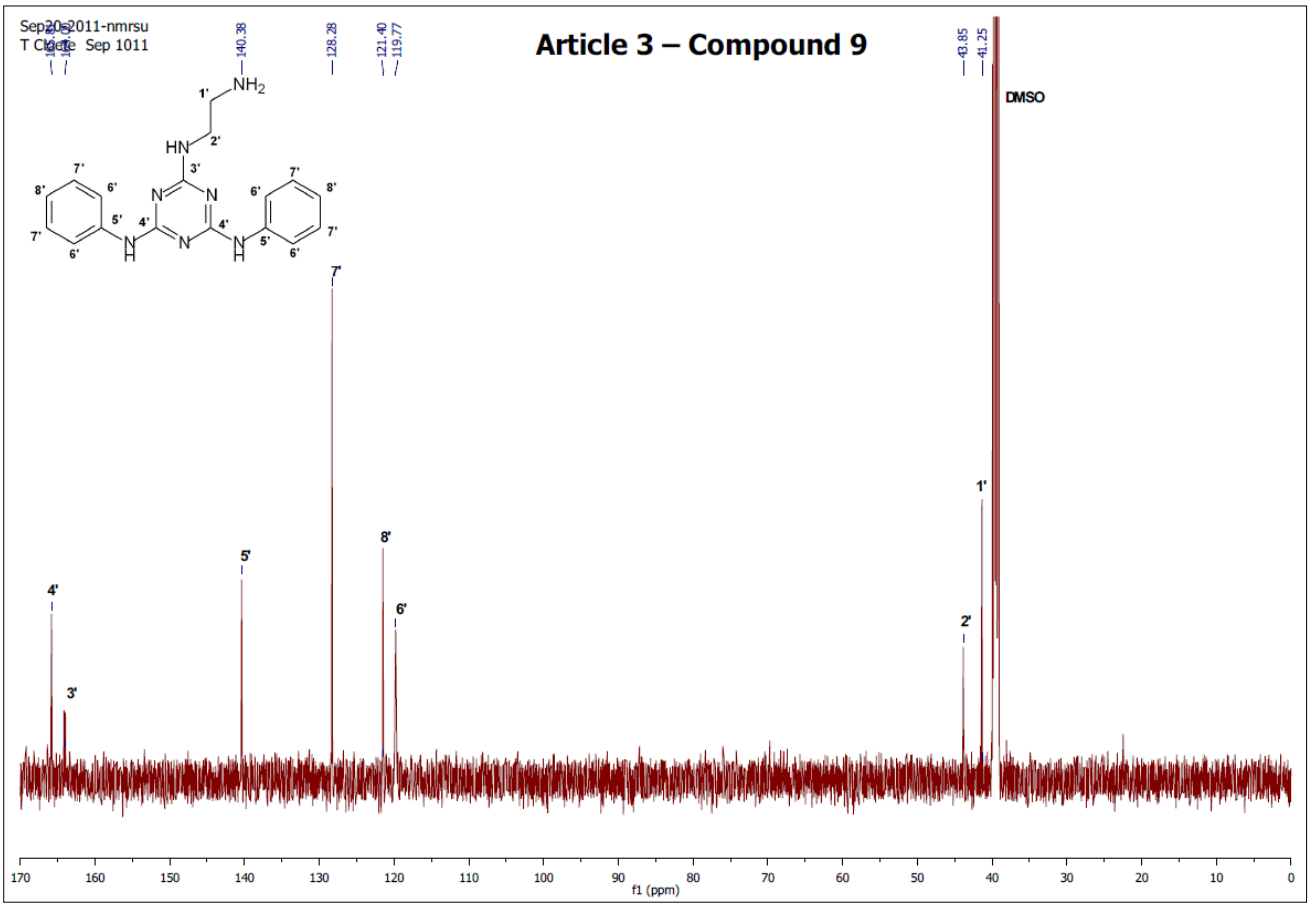

Jul30-2012-nmrsu
T Cloete Jan 0512
COSYGPSW DMSO /opt/topspin2.1PL6 nmrsu 12
Article 3 – Compound 8
{2.50,2.51}
DMSO
2':1'
{3.07,3.06}
1'
2'
{3.58,3.57}
{3.07,3.57}
2':1'
{3.70,3.69}
14'
H2O
12'
9'
11':12'
9':8'
{6.91,6.90}
{6.82,6.82}
7':8'
{7.21,7.23}
8'
{6.90,7.22}
9':8'
{7.74,7.77}
{7.65,7.64}
{6.83,7.65}
7'
{7.21,7.75}
11':12'
11'
7':8'
f2 (ppm)
f1 (ppm)

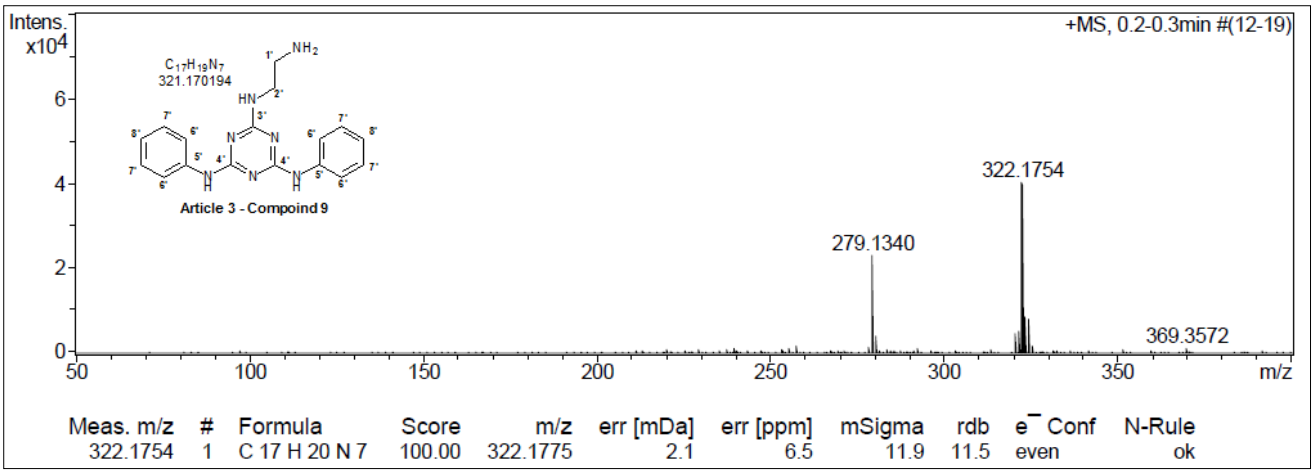

Jul30-2012-nmrsu
T Cloete Jan 0512
HSOCEDETGP DMSO /opt/topspin2.1PL6 nmrsu 12
Article 3 – Compound 8
{3.58,39.56}
2'
{3.07,39.76}
1'
DMSO
{2.50,39.76}
{3.69,55.57}
14'
11'
{6.82,113.95}
12'
{7.76,120.31}
{7.65,122.08}
{6.90,121.87}
7'
9'
{7.21,128.71}
8'
f2 (ppm)
f1 (ppm)



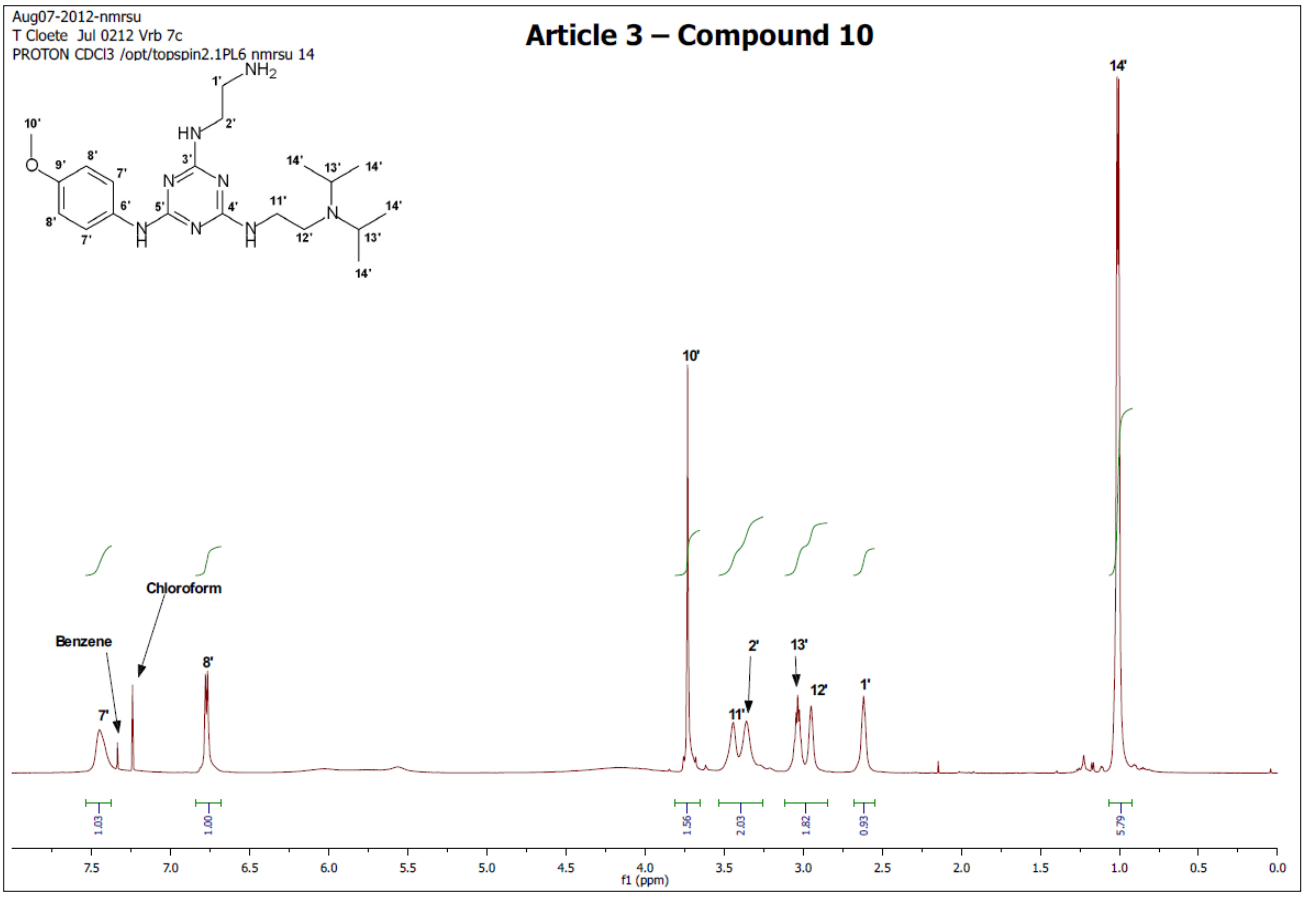
Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdb	e⁻ Conf	N-Rule
352.1864	1	C 18 H 22 N 7 O	49.77	352.1880	1.7	4.8	14.8	11.5	even	ok
	2	C 17 H 26 N 3 O 5	100.00	352.1867	0.3	1.0	18.2	6.5	even	ok
	3	C 13 H 22 N 9 O 3	24.87	352.1840	-2.3	-6.7	23.3	7.5	even	ok

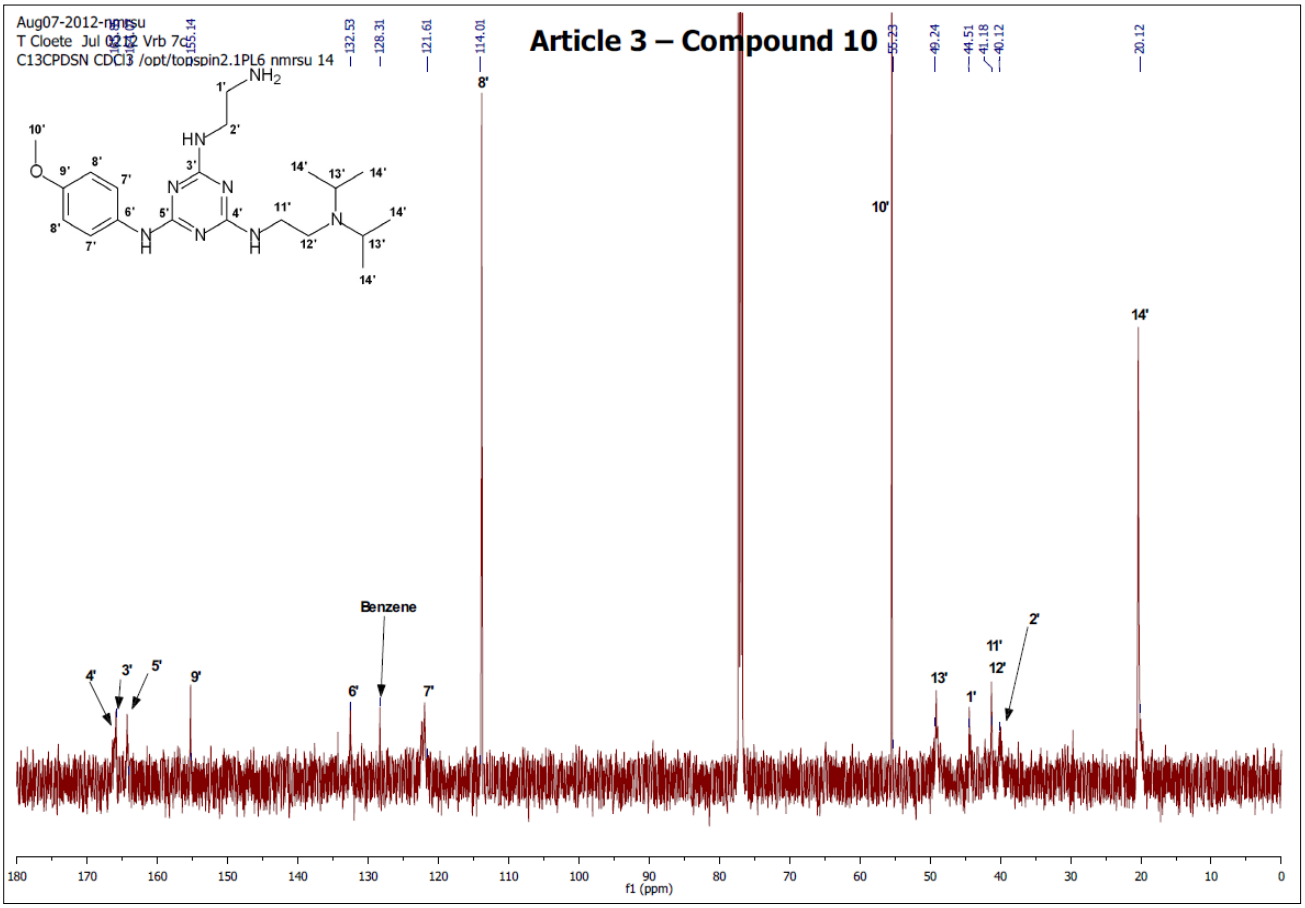

Sep20-2011-nmrsu
T Cloete Sep 1011
Article 3 – Compound 9
NH
6'
7'
8'
H2O
2'
1'
DMSO
4.44
4.66
2.38
2.62
2.17
f1 (ppm)

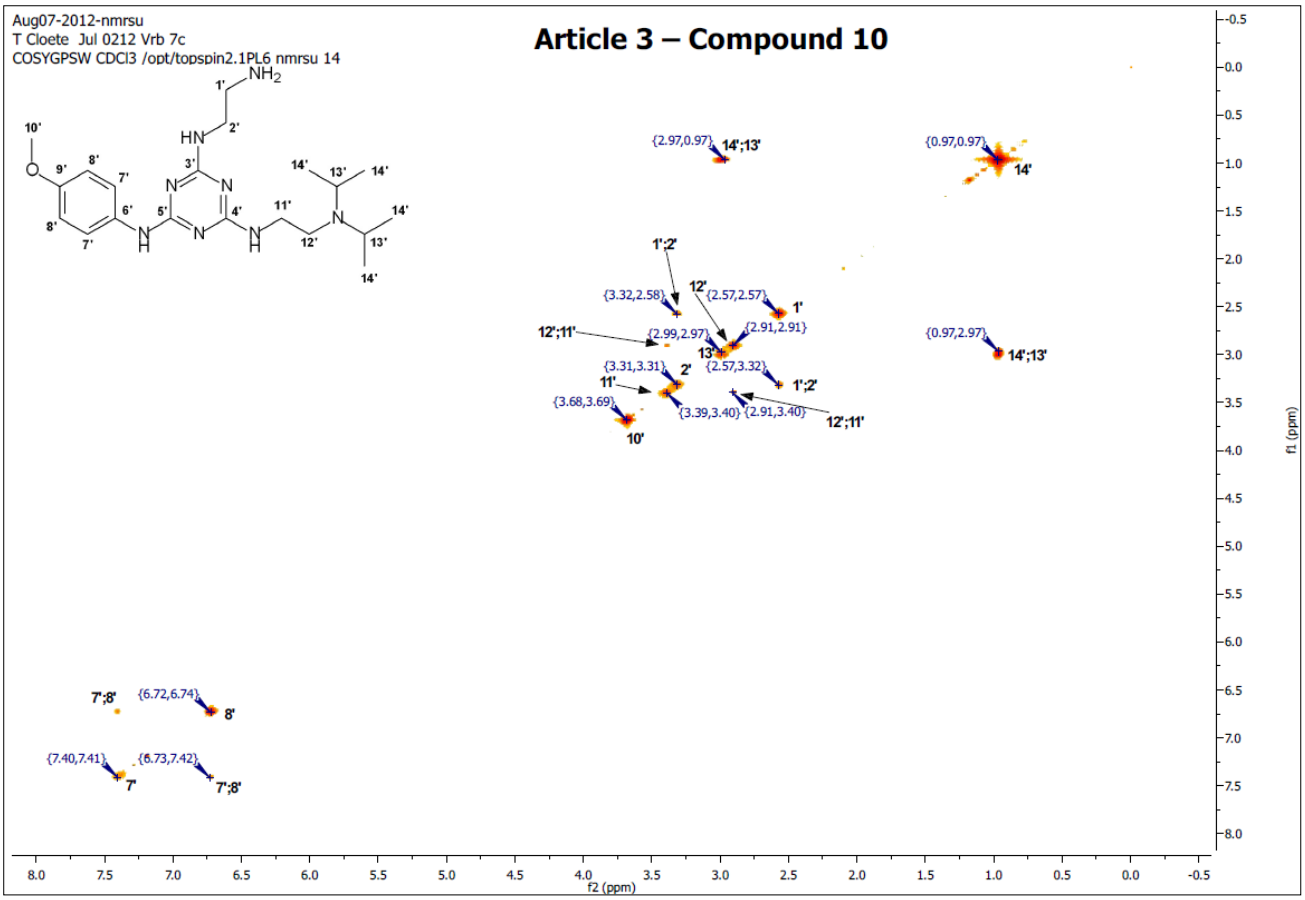

Sep20-2011-nmrsu
T Cloete Sep 1011
Article 3 – Compound 9
140.38
128.28
121.40
119.77
43.85
41.25
DMSO
7'
1'
8'
5'
6'
4'
2'
3'
f1 (ppm)

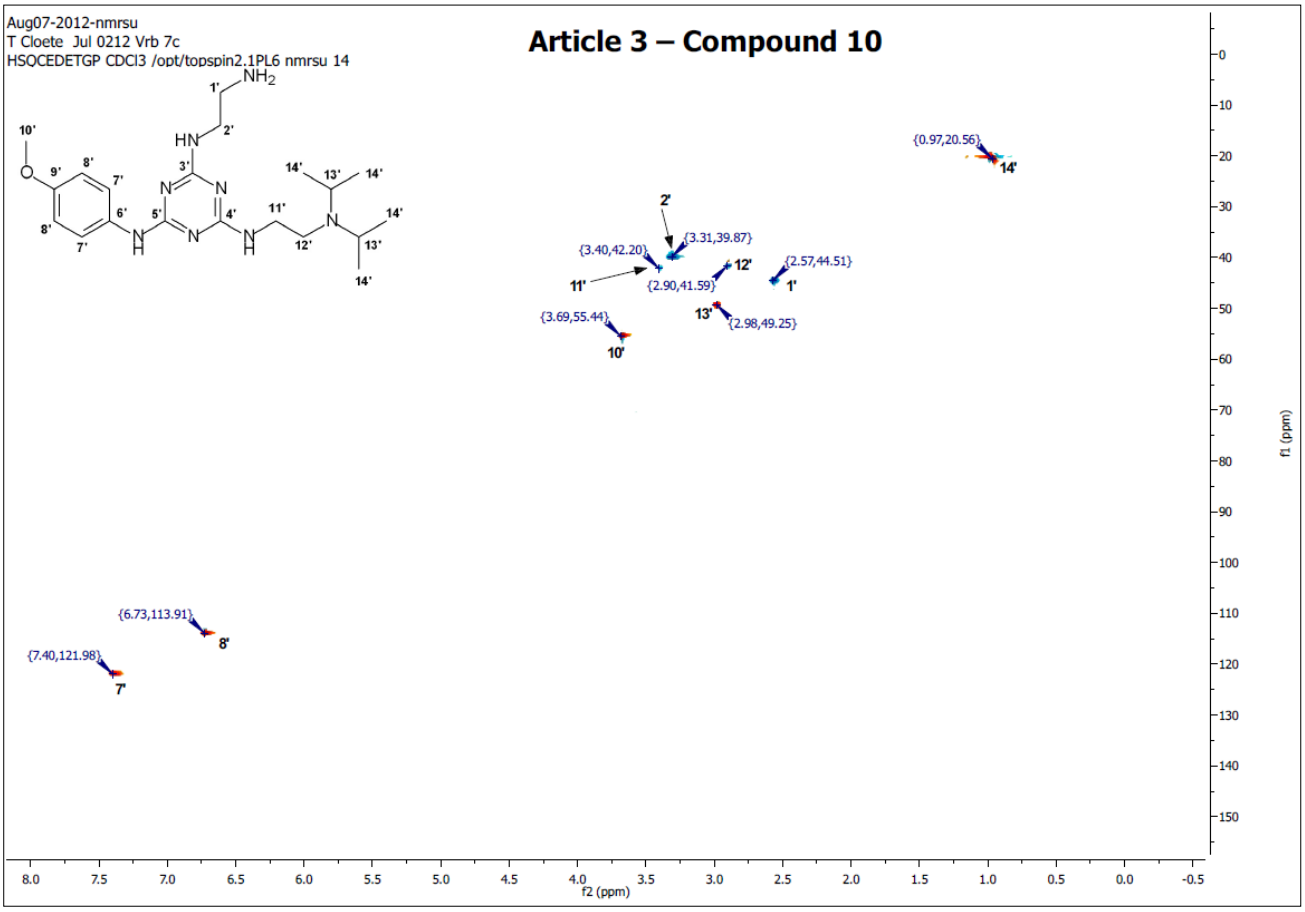


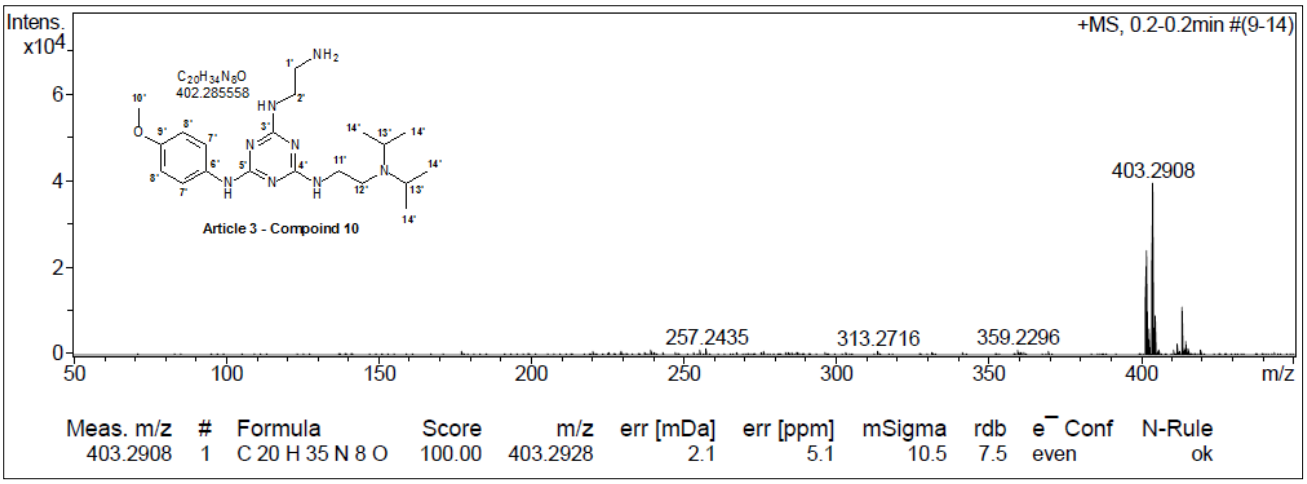
Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdb	e⁻ Conf	N-Rule
322.1754	1	C 17 H 20 N 7	100.00	322.1775	2.1	6.5	11.9	11.5	even	ok


Aug07-2012-nmrsu
T Cloete Jul 0212 Vrb 7c
PROTON CDCl3 /opt/topspin2.1PL6 nmrsu 14
Article 3 – Compound 10
Chloroform
Benzene
f1 (ppm)

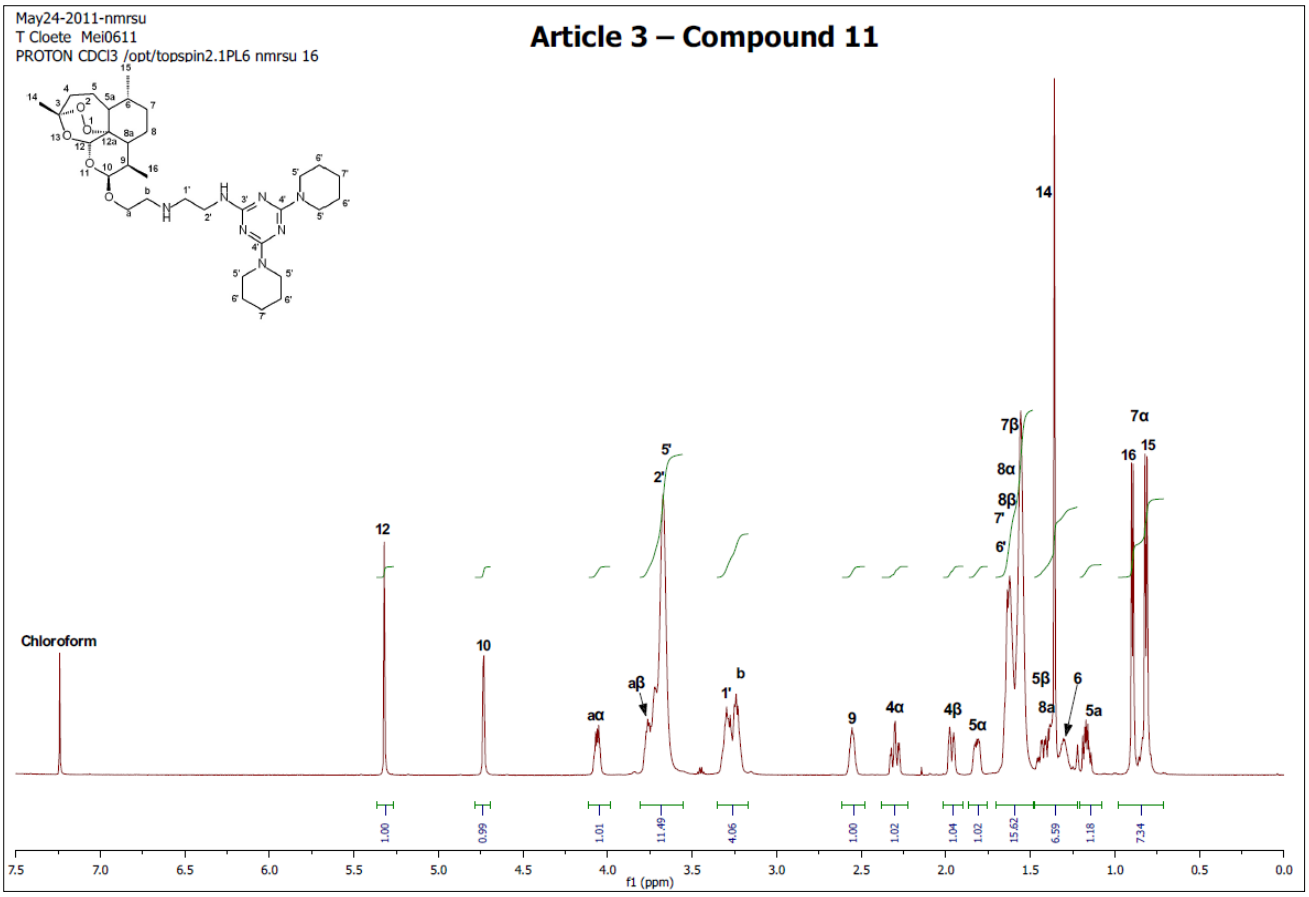

Aug07-2012-nmrsu
T Cloete Jul 0212 Vrb 7c
C13CPDSN CDCl3 /opt/topspin2.1PL6 nmrsu 14
Article 3 – Compound 10
Benzene
f1 (ppm)

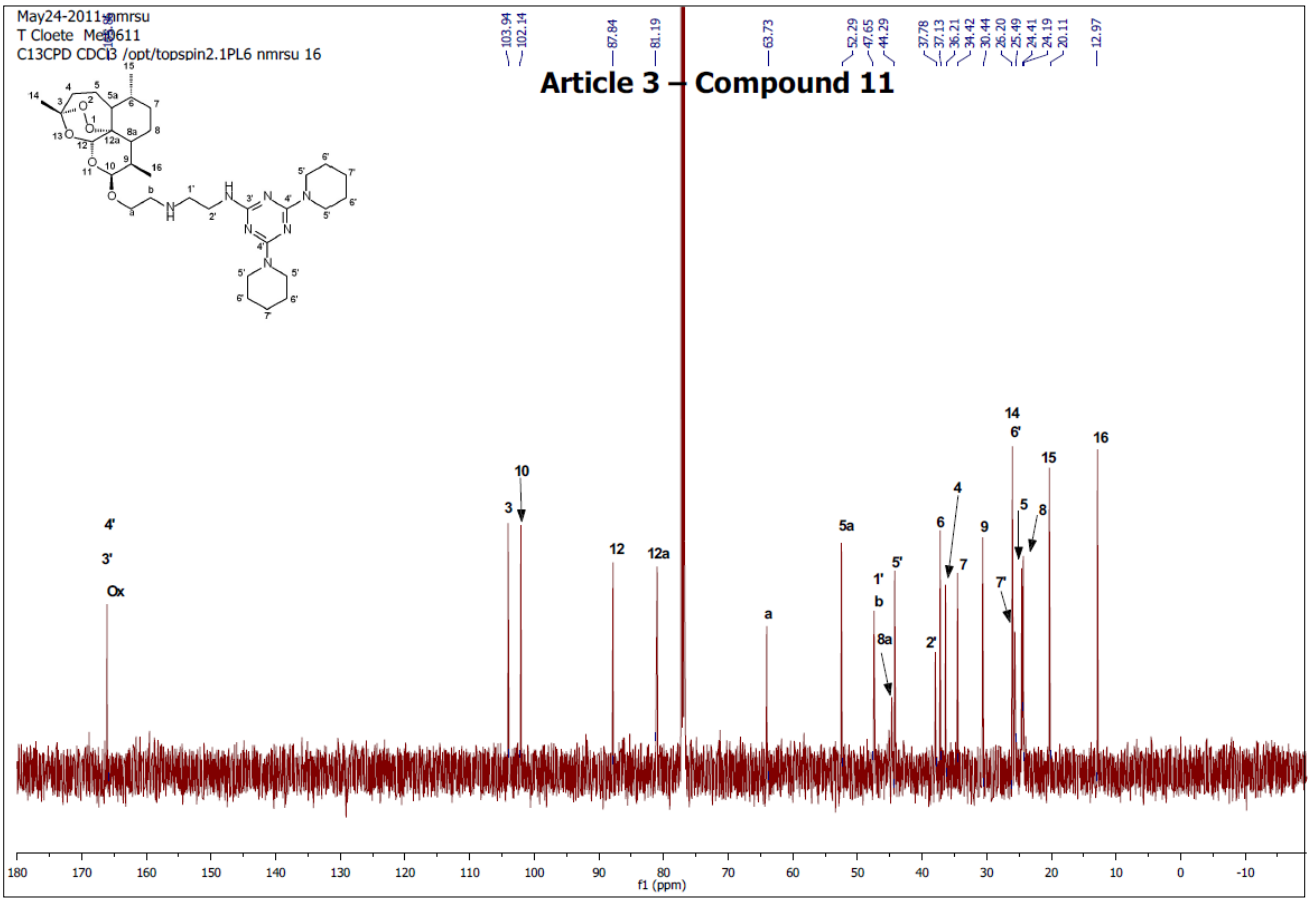

Aug07-2012-nmrsu
T Cloete Jul 0212 Vrb 7c
COSYGPSW CDCl3 /opt/topspin2.1PL6 nmrsu 14
Article 3 – Compound 10
f2 (ppm)
f1 (ppm)

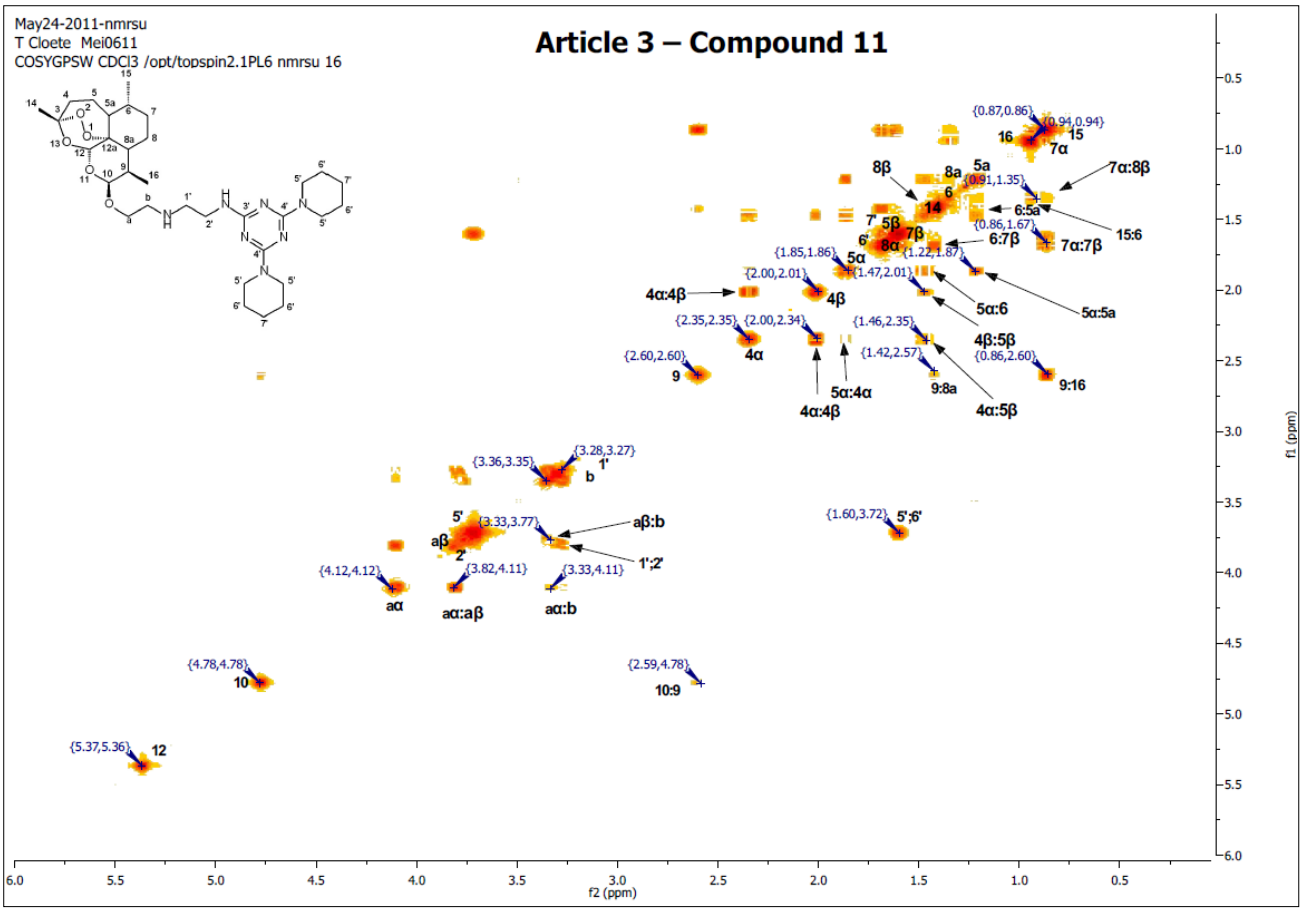

Aug07-2012-nmrsu
T Cloete Jul 0212 Vrb 7c
HSQCEDETGP CDCl3 /opt/topspin2.1PL6 nmrsu 14
Article 3 – Compound 10
f2 (ppm)
f1 (ppm)

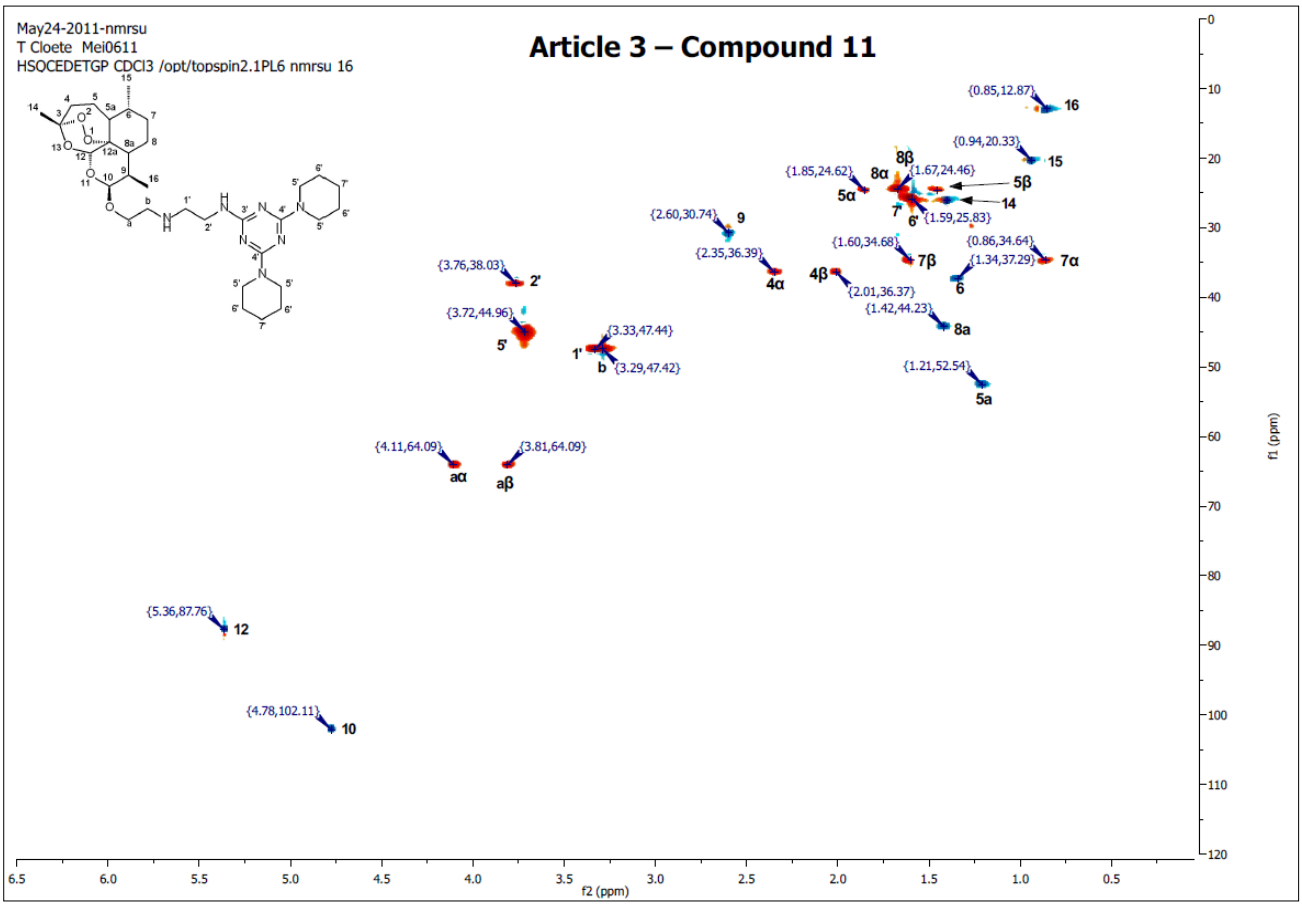


Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdb	e⁻ Conf	N-Rule
403.2908	1	C 20 H 35 N 8 O	100.00	403.2928	2.1	5.1	10.5	7.5	even	ok

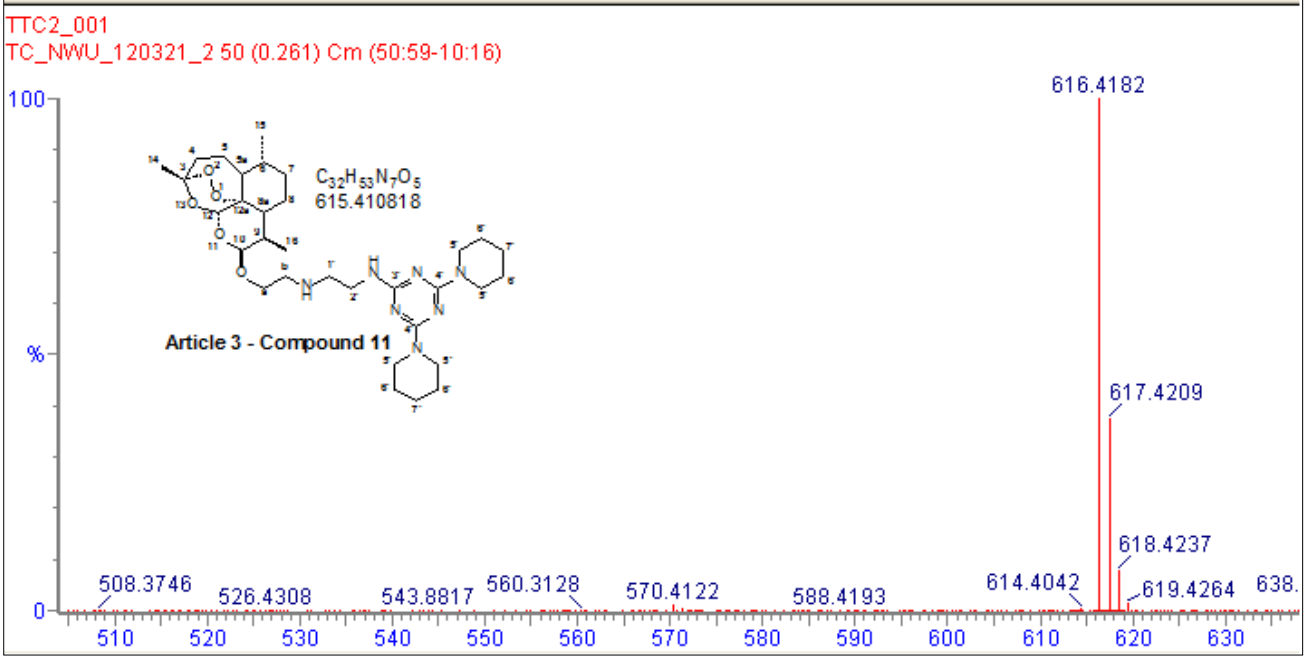

May24-2011-nmrsu
T Cloete Mei0611
PROTON CDCl3 /opt/topspin2.1PL6 nmrsu 16
Article 3 – Compound 11
Chloroform
12
10
aα
aβ
b
1'
9
4α
4β
5α
5β
8a
6
5a
7β
8α
8β
7'
6'
5'
2'
14
16
15
7α
1.00
0.99
1.01
11.49
4.06
1.00
1.02
1.04
1.02
15.62
6.59
1.18
7.34
f1 (ppm)

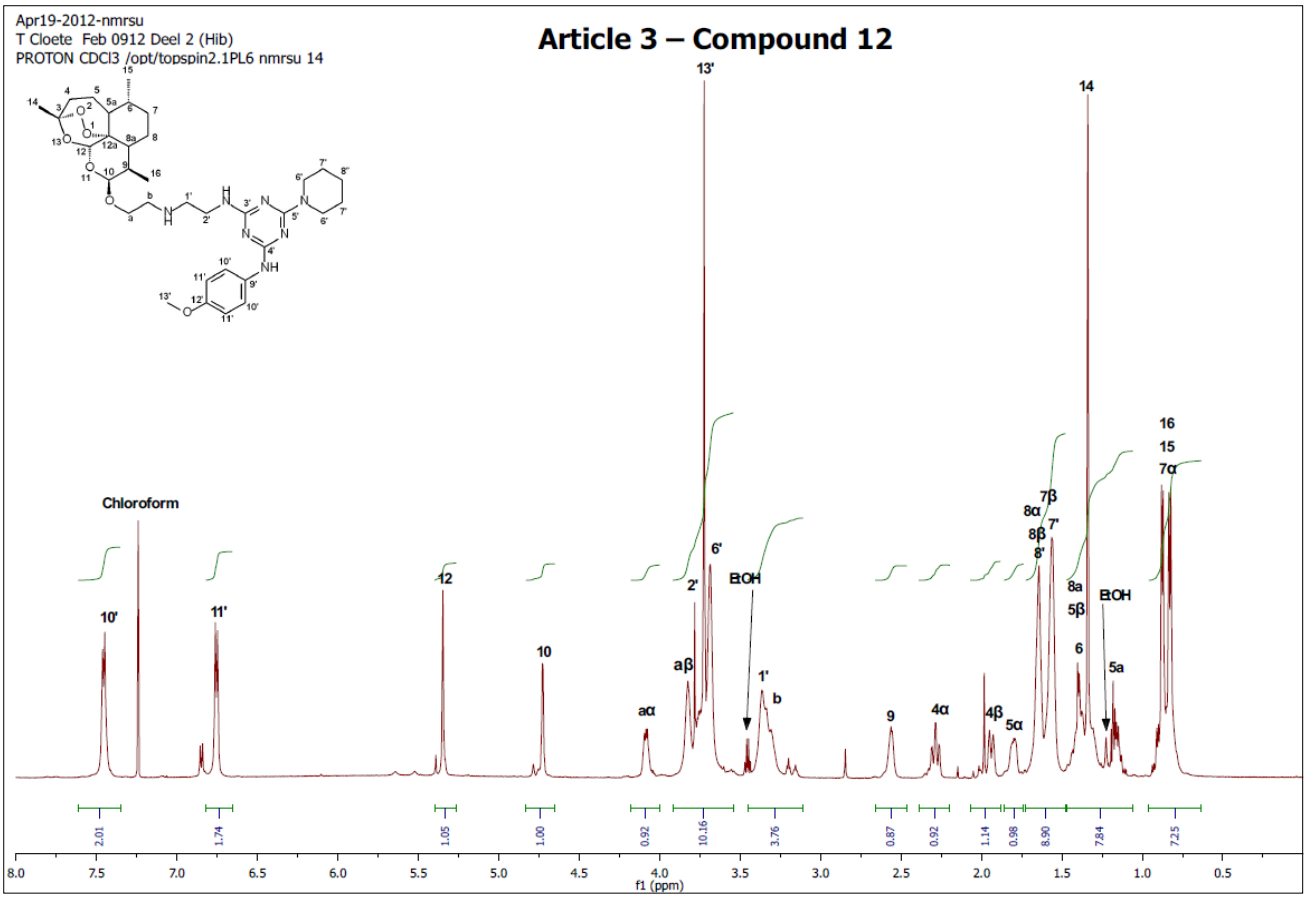

May24-2011-nmrsu
T Cloete Mei0611
C13CPD CDCl3 /opt/topspin2.1PL6 nmrsu 16
Article 3 – Compound 11
103.94
102.14
87.84
81.19
63.73
52.29
47.65
44.29
37.78
37.13
36.21
34.42
30.44
26.20
25.49
24.41
24.19
20.11
12.97
4'
3'
Ox
10
3
12
12a
a
5a
1'
b
8a
5'
2'
6
4
7
9
7'
5
8
14
6'
15
16
f1 (ppm)

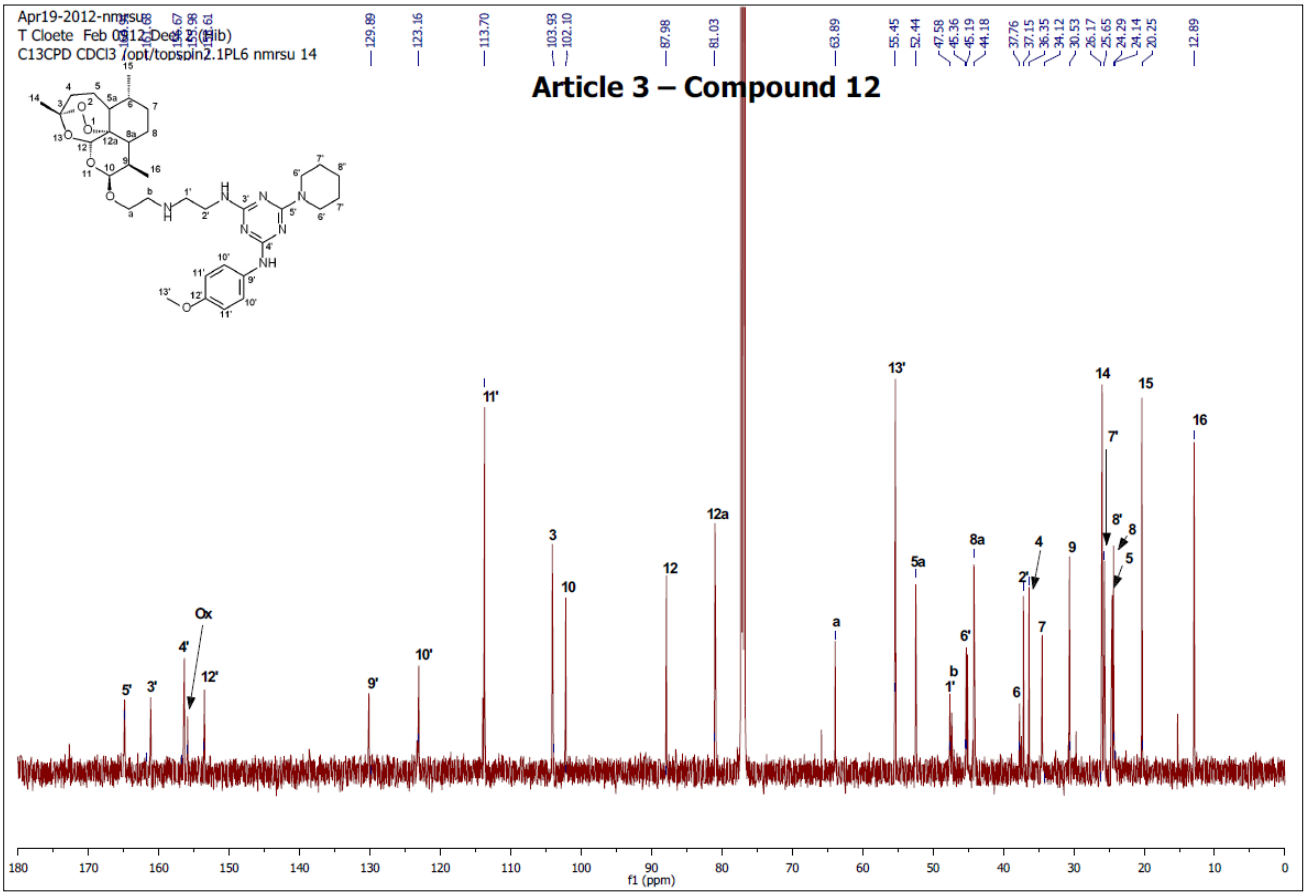

May24-2011-nmrsu
T Cloete Mei0611
COSYGPSW CDCl3 /opt/topspin2.1PL6 nmrsu 16
Article 3 – Compound 11
f2 (ppm)
f1 (ppm)

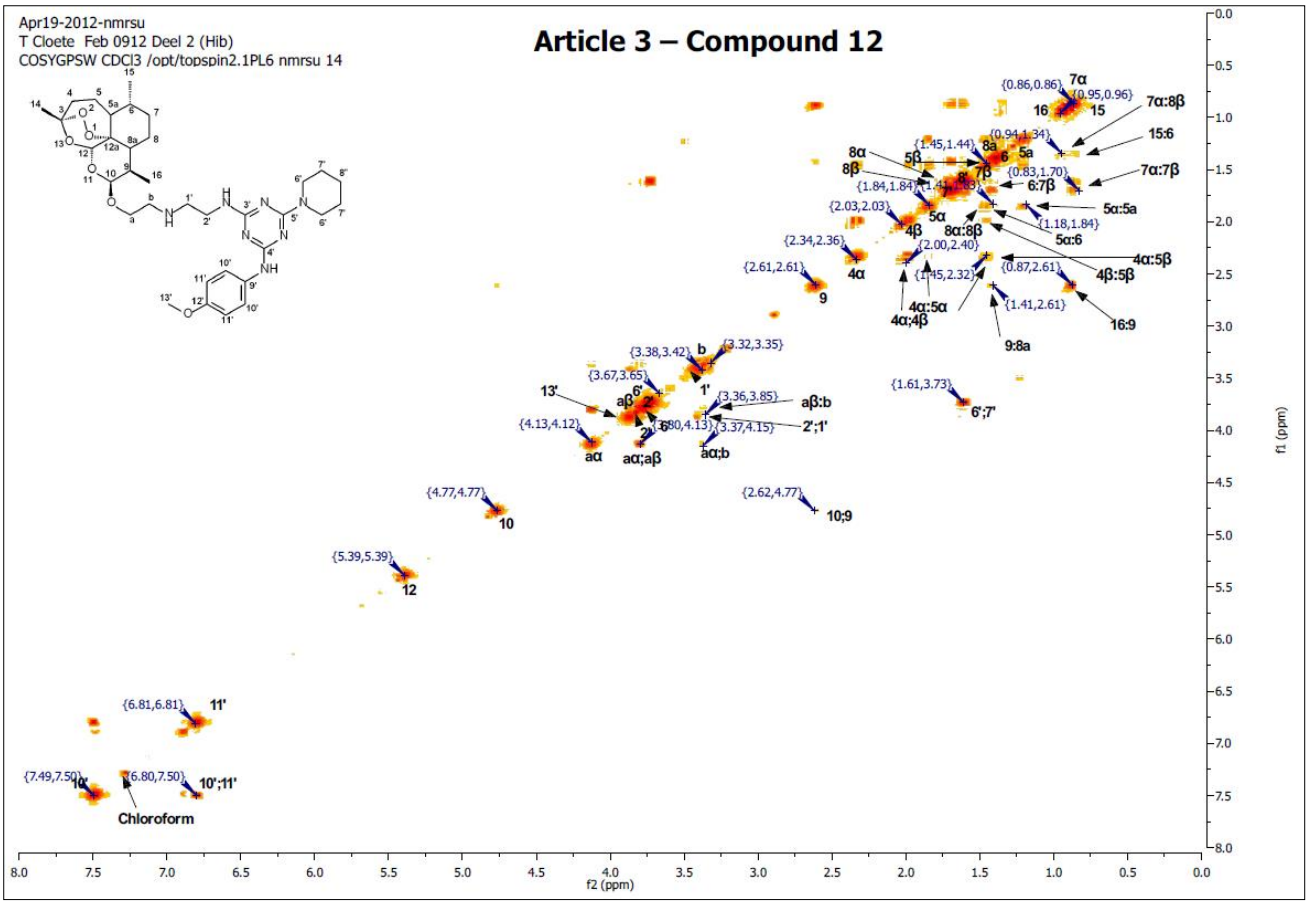

May24-2011-nmrsu
T Cloete Mei0611
HSQCEDETGP CDCl3 /opt/topspin2.1PL6 nmrsu 16
Article 3 – Compound 11
f2 (ppm)
f1 (ppm)

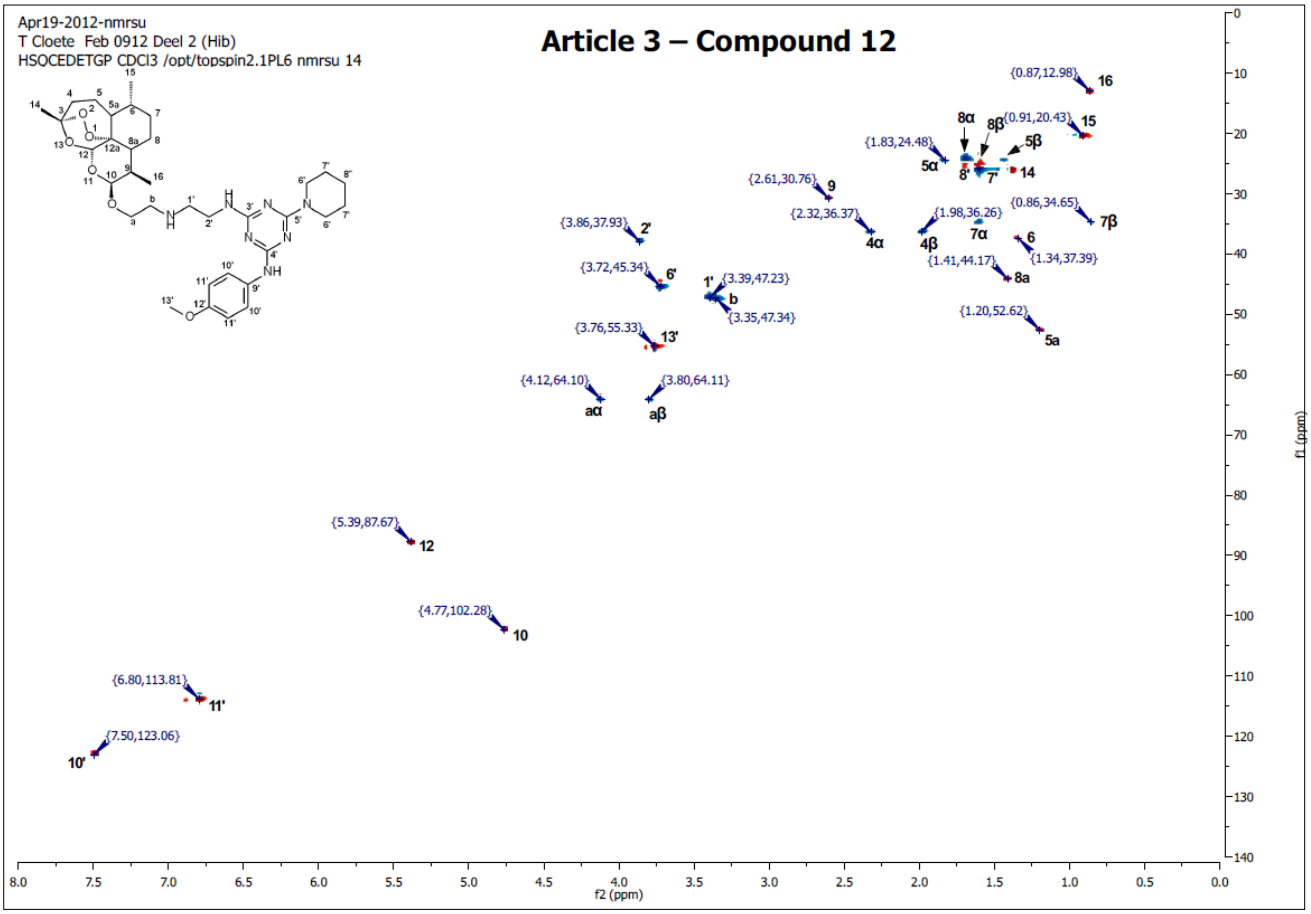
Mass	Calc. Mass	mDa	PPM	DBE	Formula	i-FIT	i-FIT Norm	Fit Conf %	C	H	N	O
616.4182	616.4186	-0.4	-0.6	9.5	C32 H54 N7 O5	353.4	6.561	0.14	32	54	7	5
	616.4173	0.9	1.5	4.5	C31 H58 N3 O9	357.6	10.751	0.00	31	58	3	9
	616.4155	2.7	4.4	17.5	C43 H54 N O2	365.1	18.280	0.00	43	54	1	2
	616.4213	-3.1	-5.0	8.5	C36 H58 N O7	360.8	13.958	0.00	36	58	1	7
	616.4146	3.6	5.8	5.5	C27 H54 N9 O7	360.4	13.575	0.00	27	54	9	7
	616.4227	-4.5	-7.3	13.5	C37 H54 N5 O3	361.7	14.804	0.00	37	54	5	3
	616.4128	5.4	8.8	18.5	C39 H50 N7	363.0	16.197	0.00	39	50	7	
	616.4245	-6.3	-10.2	0.5	C25 H58 N7 O10	362.5	15.651	0.00	25	58	7	10
	616.4114	6.8	11.0	13.5	C38 H54 N3 O4	362.5	15.616	0.00	38	54	3	4



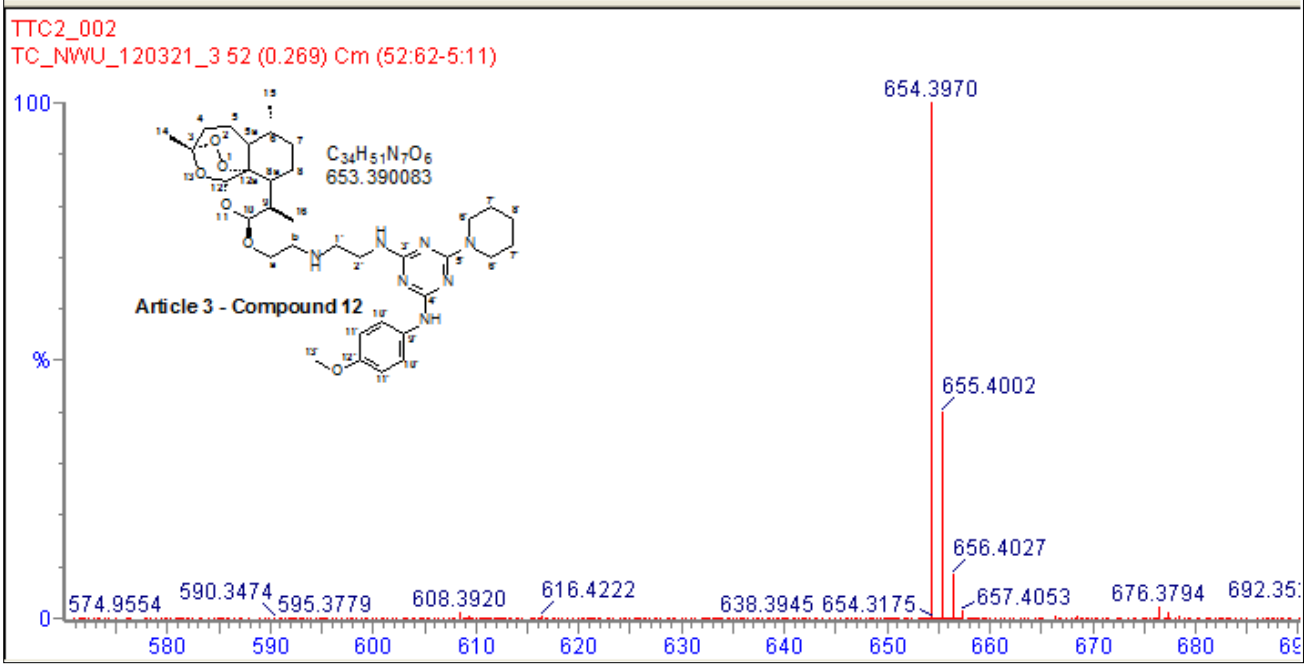

Apr19-2012-nmrsu
T Cloete Feb 0912 Deel 2 (Hib)
PROTON CDCl3 /opt/topspin2.1PL6 nmrsu 14
Article 3 – Compound 12
Chloroform
EtOH
EtOH
f1 (ppm)

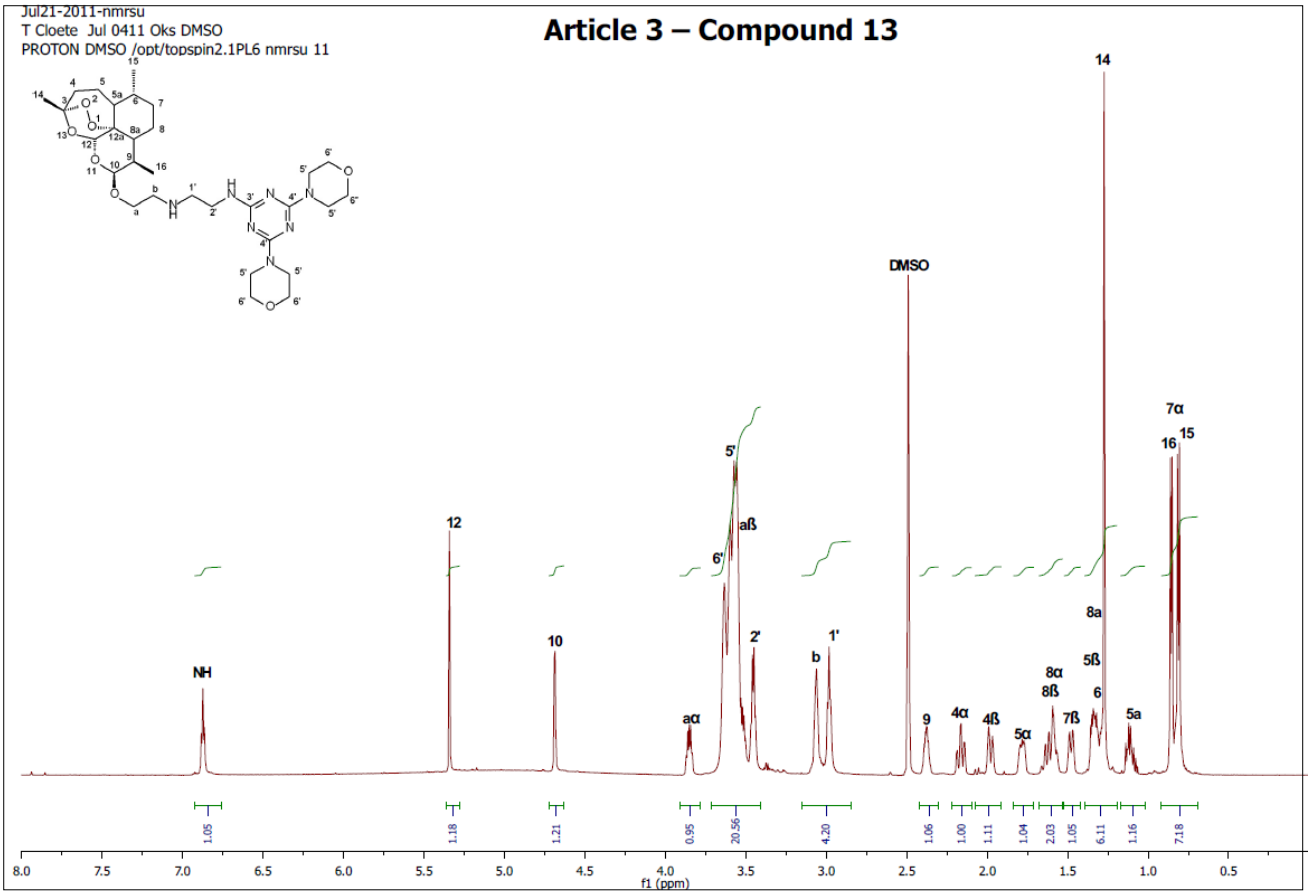

Apr19-2012-nmrsu
T Cloete Feb 0912 Deel 2 (Hib)
C13CPD CDCl3 /opt/topspin2.1PL6 nmrsu 14
Article 3 – Compound 12
Ox
f1 (ppm)

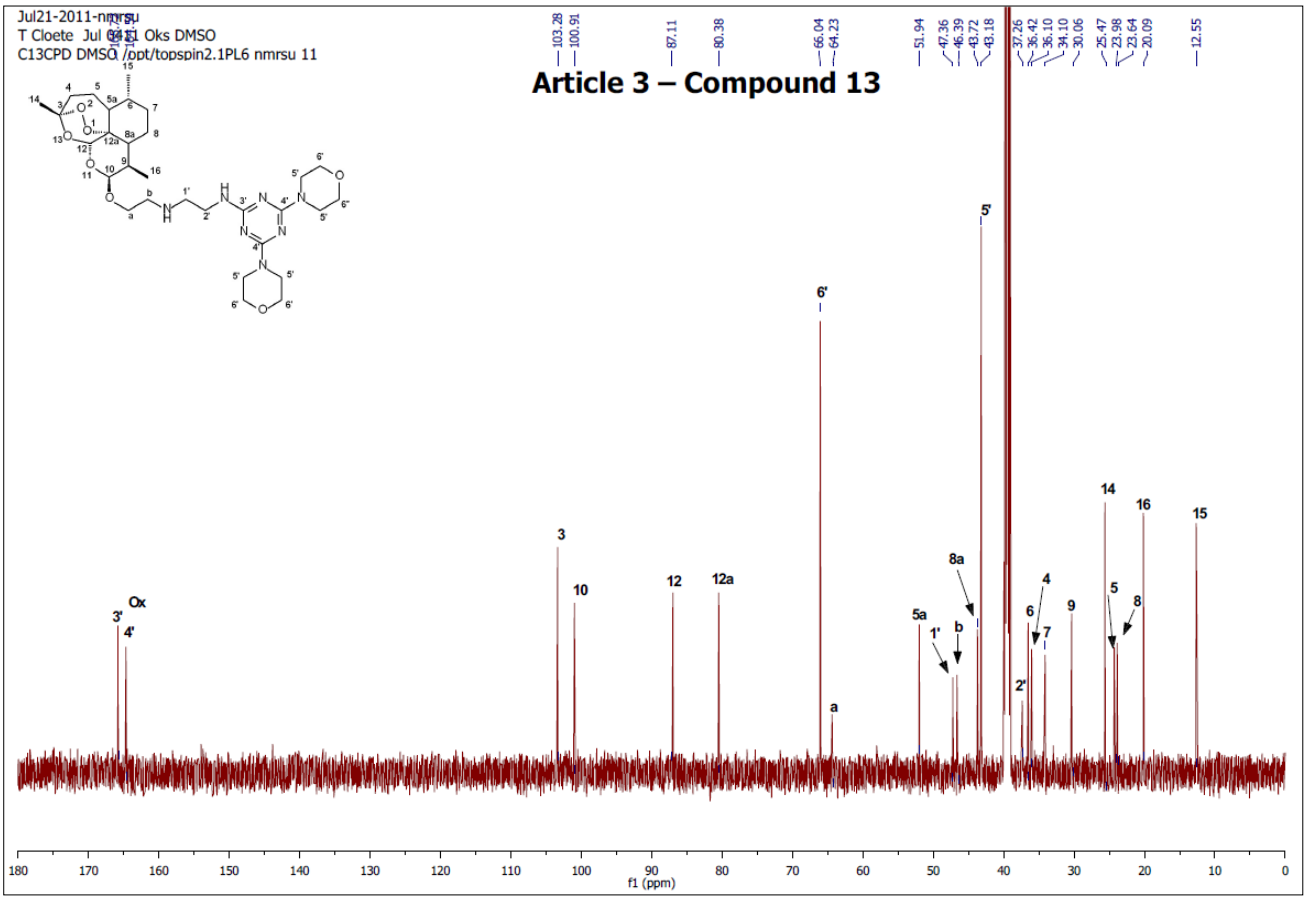

Apr19-2012-nmrsu
T Cloete Feb 0912 Deel 2 (Hib)
COSYGPSW CDCl3 /opt/topspin2.1PL6 nmrsu 14
Article 3 – Compound 12
Chloroform
f2 (ppm)
f1 (ppm)

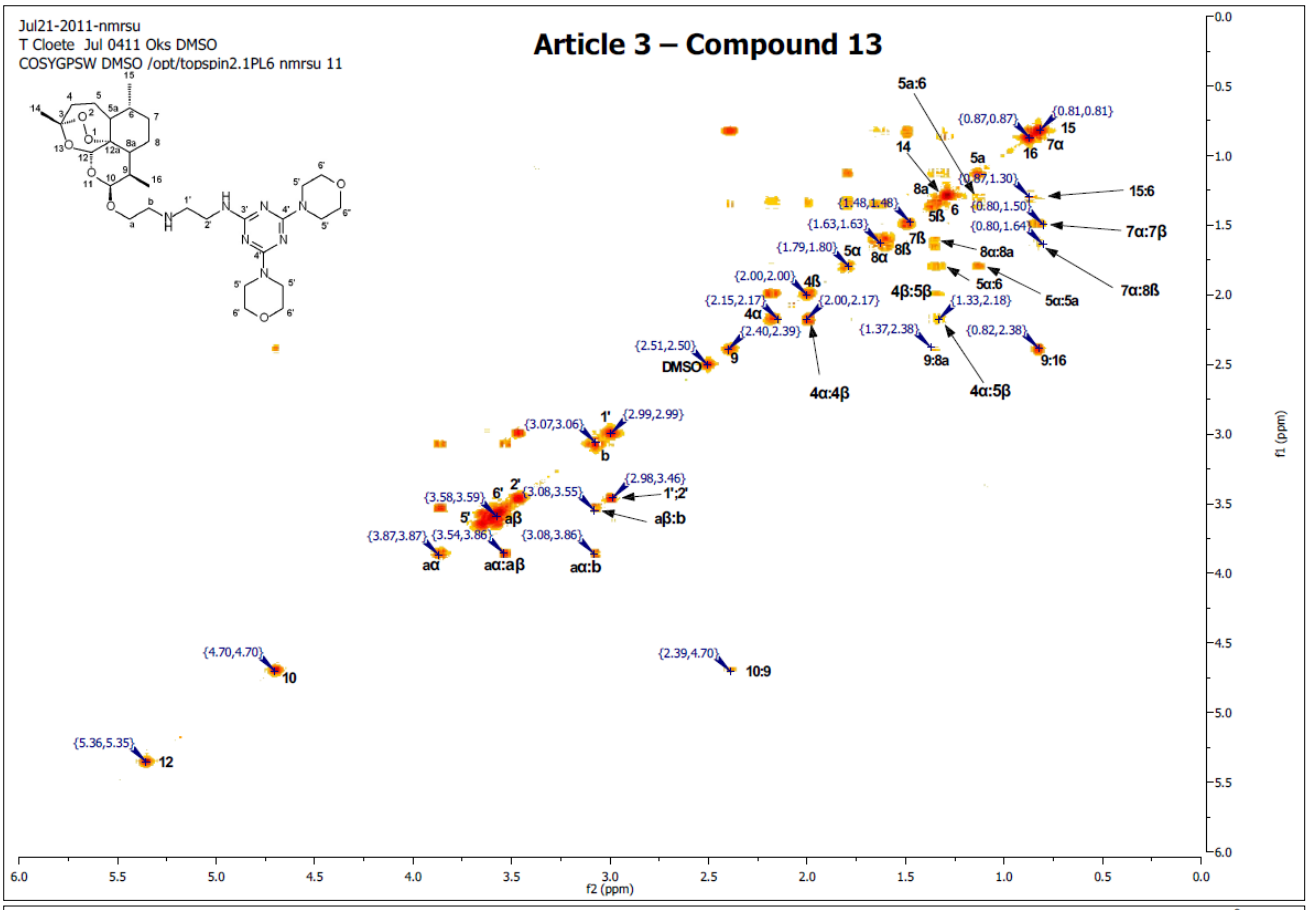

Apr19-2012-nmrsu
T Cloete Feb 0912 Deel 2 (Hib)
HSQCEDETGP CDCl3 /opt/topspin2.1PL6 nmrsu 14
Article 3 – Compound 12
f2 (ppm)
f1 (ppm)

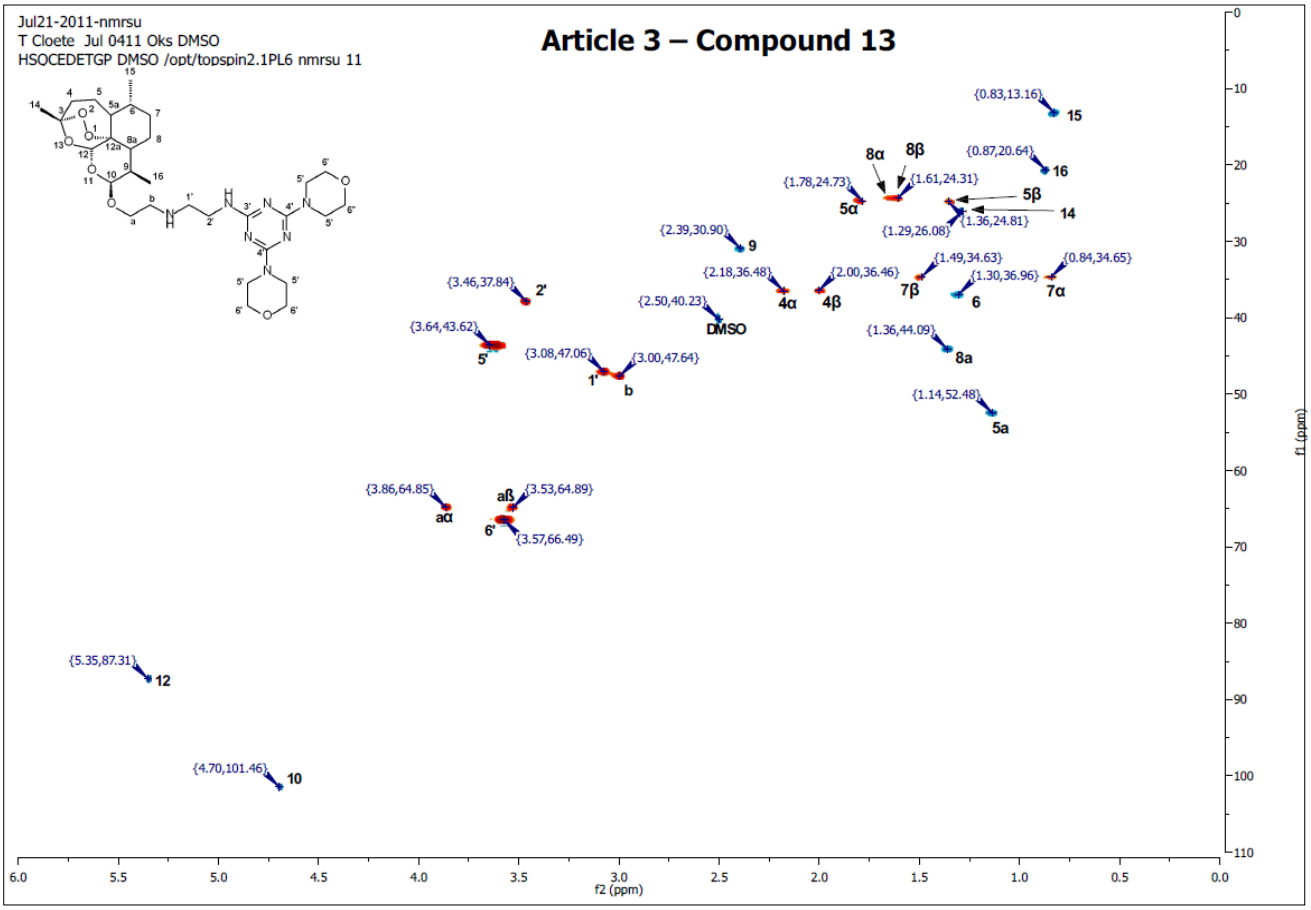
654.3970	654.3979	-0.9	-1.4	12.5	C34 H52 N7 O6	341.3	3.318	3.62	34	52	7	6
	654.3947	2.3	3.5	20.5	C45 H52 N O3	350.7	12.736	0.00	45	52	1	3
	654.3939	3.1	4.7	8.5	C29 H52 N9 O8	346.5	8.486	0.02	29	52	9	8
	654.4006	-3.6	-5.5	11.5	C38 H56 N O8	346.7	8.675	0.02	38	56	1	8
	654.4019	-4.9	-7.5	16.5	C39 H52 N5 O4	347.5	9.547	0.01	39	52	5	4
	654.3920	5.0	7.6	21.5	C41 H48 N7 O	348.9	10.955	0.00	41	48	7	1
	654.3907	6.3	9.6	16.5	C40 H52 N3 O5	348.2	10.248	0.00	40	52	3	5
	654.4033	-6.3	-9.6	21.5	C40 H48 N9	348.6	10.606	0.00	40	48	9	
	654.3880	9.0	13.8	17.5	C36 H48 N9 O3	345.3	7.290	0.07	36	48	9	3



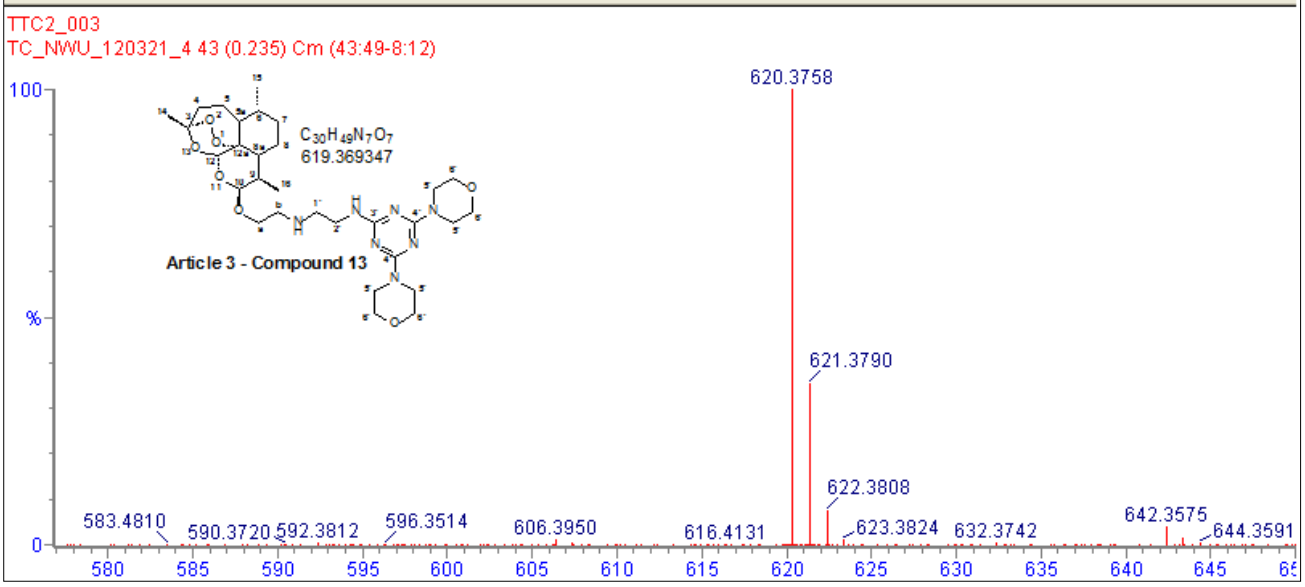

Jul21-2011-nmrsu
T Cloete Jul 0411 Oks DMSO
PROTON DMSO /opt/topspin2.1PL6 nmrsu 11
Article 3 – Compound 13
14
DMSO
7α
16
15
5'
12
aß
6'
8a
10
2'
1'
b
NH
8α
8ß
5ß
6
aα
9
4α
4ß
5α
7ß
5a
1.05
1.18
1.21
0.95
20.56
4.20
1.06
1.00
1.11
1.04
2.03
1.05
6.11
1.16
7.18
f1 (ppm)

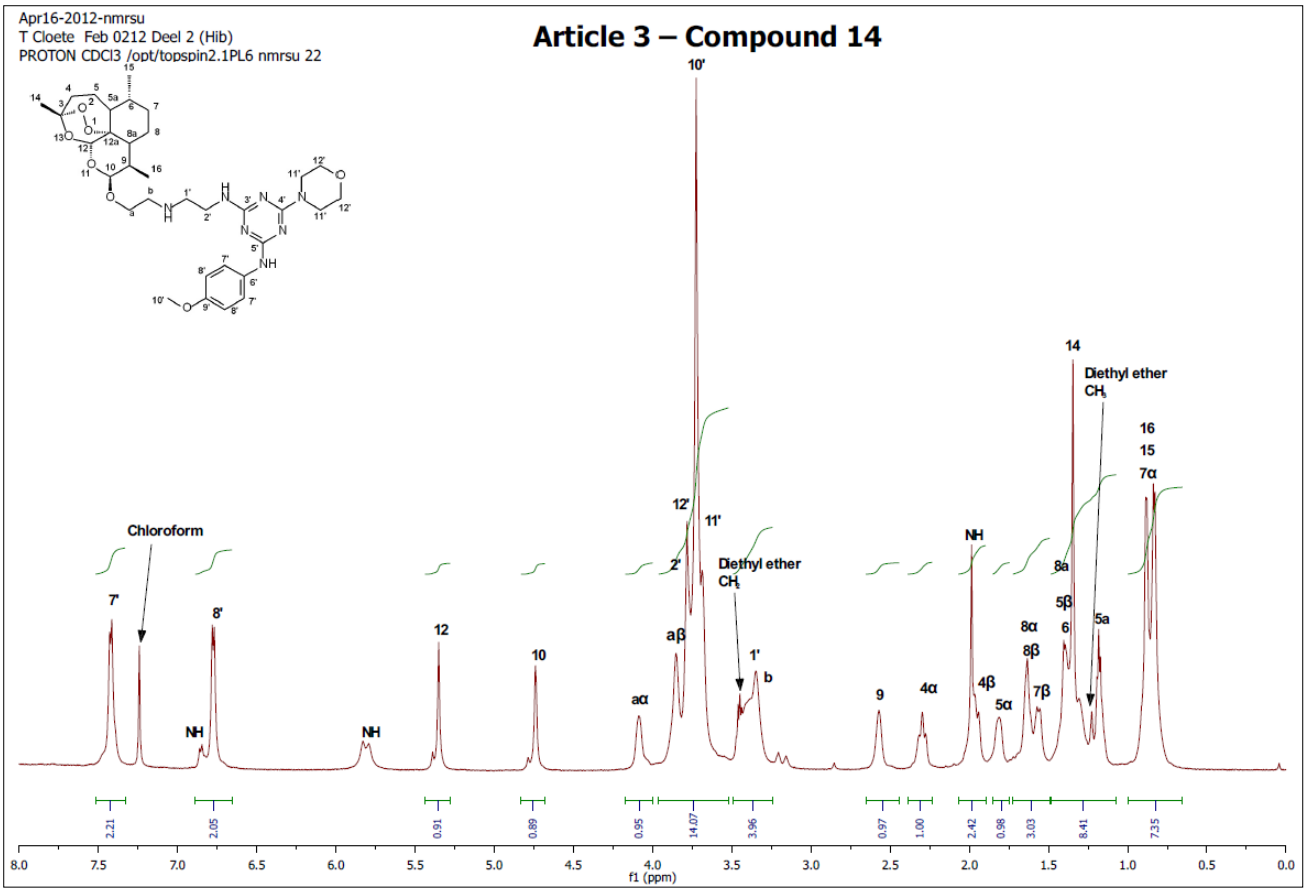

Jul21-2011-nmrsu
T Cloete Jul 0411 Oks DMSO
C13CPD DMSO /opt/topspin2.1PL6 nmrsu 11
Article 3 – Compound 13
103.28
100.91
87.11
80.38
66.04
64.23
51.94
47.36
46.39
43.72
43.18
37.26
36.42
36.10
34.10
30.06
25.47
23.98
23.64
20.09
12.55
6'
5'
14
16
15
3
Ox
3'
4'
10
12
12a
8a
5a
1'
b
4
6
9
5
8
7
2'
a
f1 (ppm)

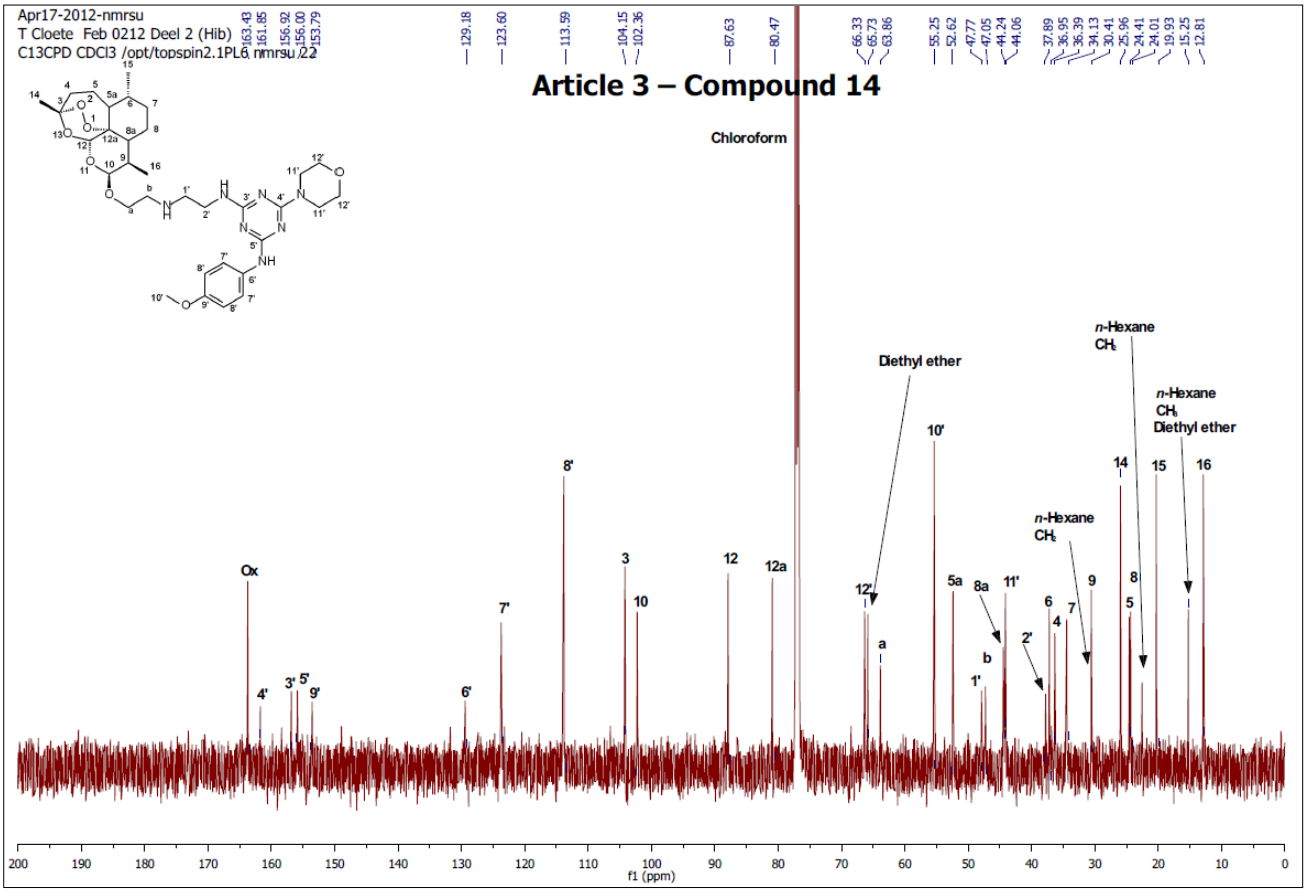

Jul21-2011-nmrsu
T Cloete Jul 0411 Oks DMSO
COSYGPSW DMSO /opt/topspin2.1PL6 nmrsu 11
Article 3 – Compound 13
5a:6
15:6
7α:7β
8α:8a
7α:8ß
5α:5a
4β:5β
4α:4β
4α:5β
9:8a
9:16
10:9
aα
aα:aβ
aα:b
aβ:b
1';2'
DMSO
f2 (ppm)
f1 (ppm)

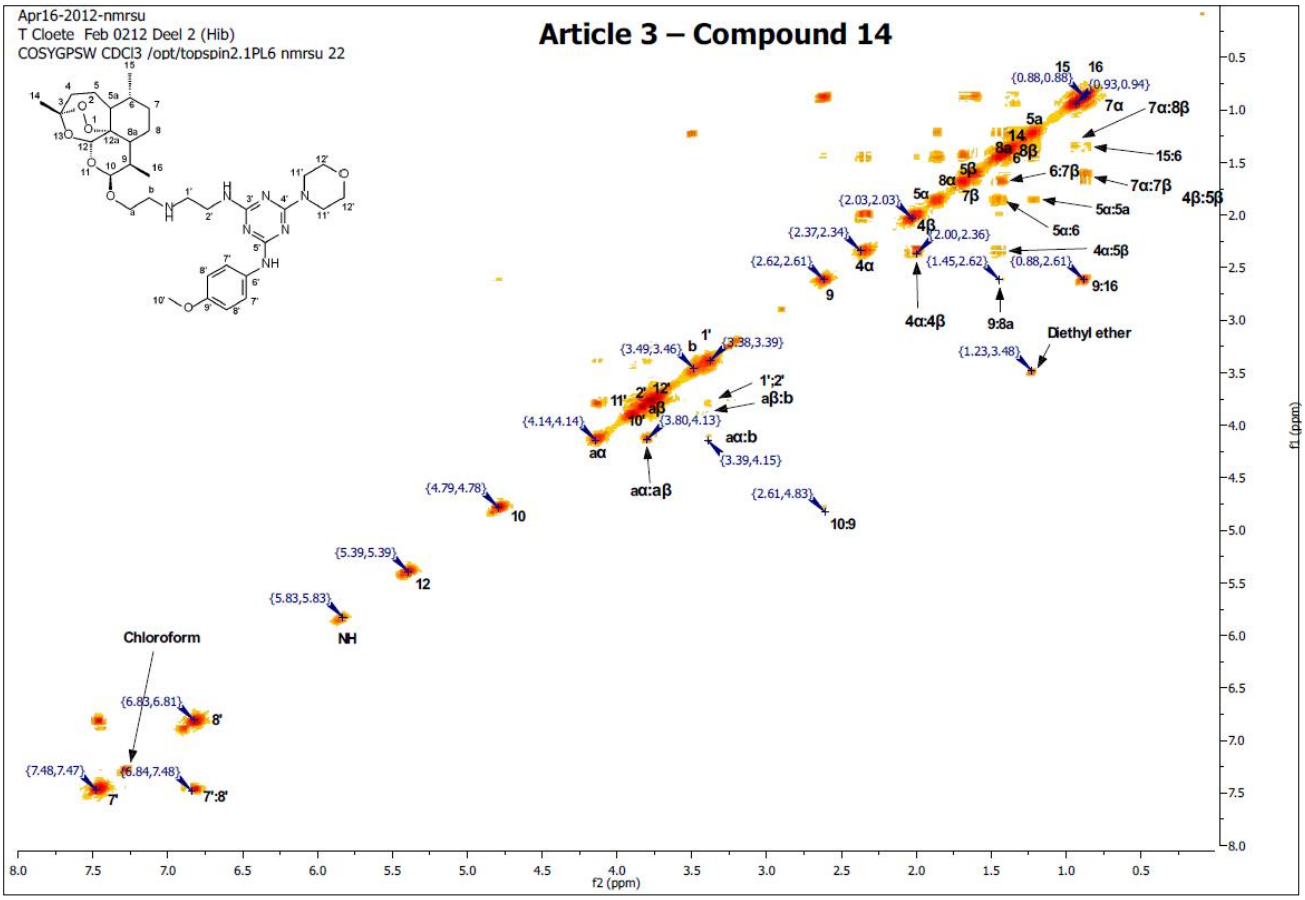

Jul21-2011-nmrsu
T Cloete Jul 0411 Oks DMSO
HSQCEDETGP DMSO /opt/topspin2.1PL6 nmrsu 11
Article 3 – Compound 13
DMSO
f2 (ppm)
f1 (ppm)

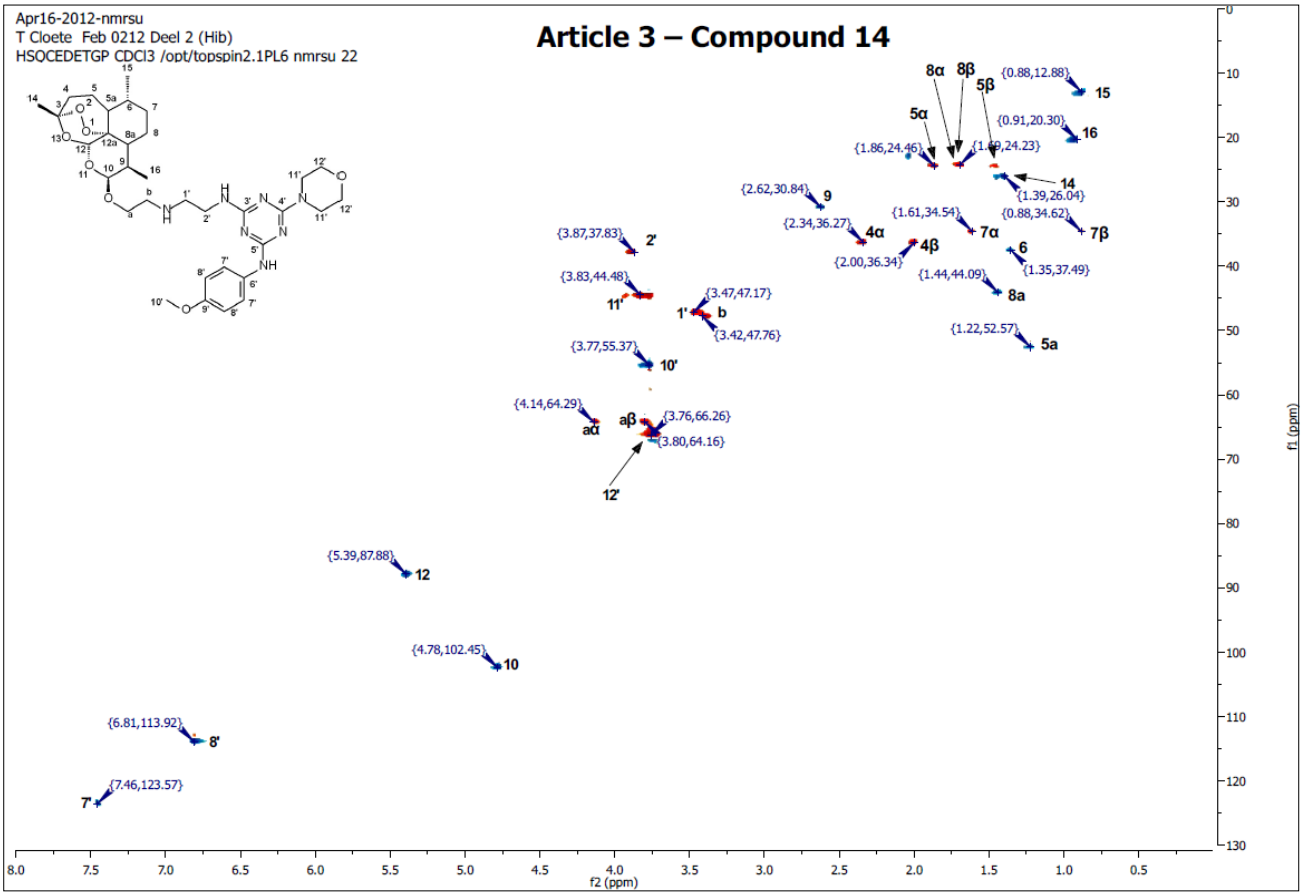
Mass	Calc. Mass	mDa	PPM	DBE	Formula	i-FIT	i-FIT Norm	Fit Conf %	C	H	N	O
620.3758	620.3753	0.5	0.8	22.5	C42 H46 N5	215.1	16.664	0.00	42	46	5	
	620.3772	-1.4	-2.3	9.5	C30 H50 N7 O7	204.0	5.482	0.42	30	50	7	7
	620.3740	1.8	2.9	17.5	C41 H50 N O4	215.0	16.499	0.00	41	50	1	4
	620.3731	2.7	4.4	5.5	C25 H50 N9 O9	209.2	10.688	0.00	25	50	9	9
	620.3799	-4.1	-6.6	8.5	C34 H54 N O9	210.4	11.934	0.00	34	54	1	9
	620.3713	4.5	7.3	18.5	C37 H46 N7 O2	212.9	14.393	0.00	37	46	7	2
	620.3812	-5.4	-8.7	13.5	C35 H50 N5 O5	211.4	12.961	0.00	35	50	5	5
	620.3700	5.8	9.3	13.5	C36 H50 N3 O6	212.2	13.683	0.00	36	50	3	6
	620.3825	-6.7	-10.8	18.5	C36 H46 N9 O	212.3	13.847	0.00	36	46	9	1



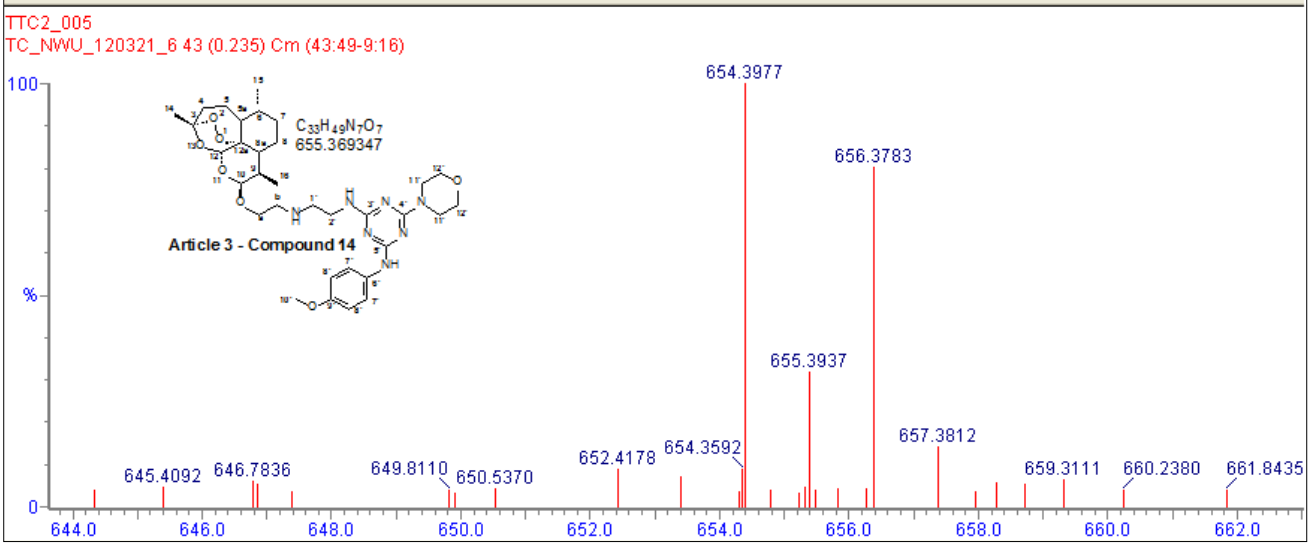

Apr16-2012-nmrsu
T Cloete Feb 0212 Deel 2 (Hib)
PROTON CDCl3 /opt/topspin2.1PL6 nmrsu 22
Article 3 – Compound 14
Chloroform
Diethyl ether
CH2
NH
f1 (ppm)

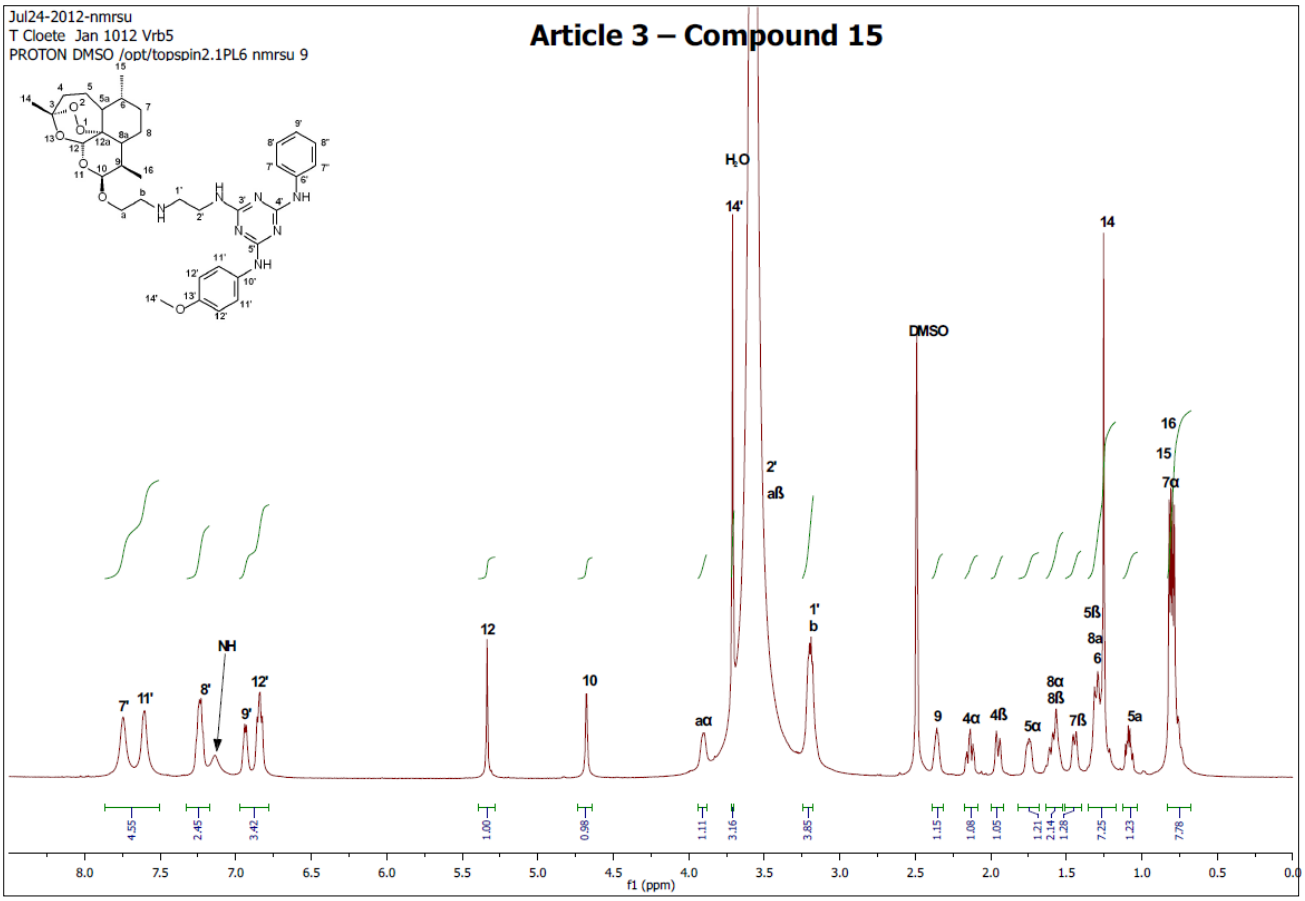

Apr17-2012-nmrsu
T Cloete Feb 0212 Deel 2 (Hib)
C13CPD CDCl3 /opt/topspin2.1PL6 nmrsu 22
Article 3 – Compound 14
Chloroform
Diethyl ether
n-Hexane
CH2
Ox
f1 (ppm)

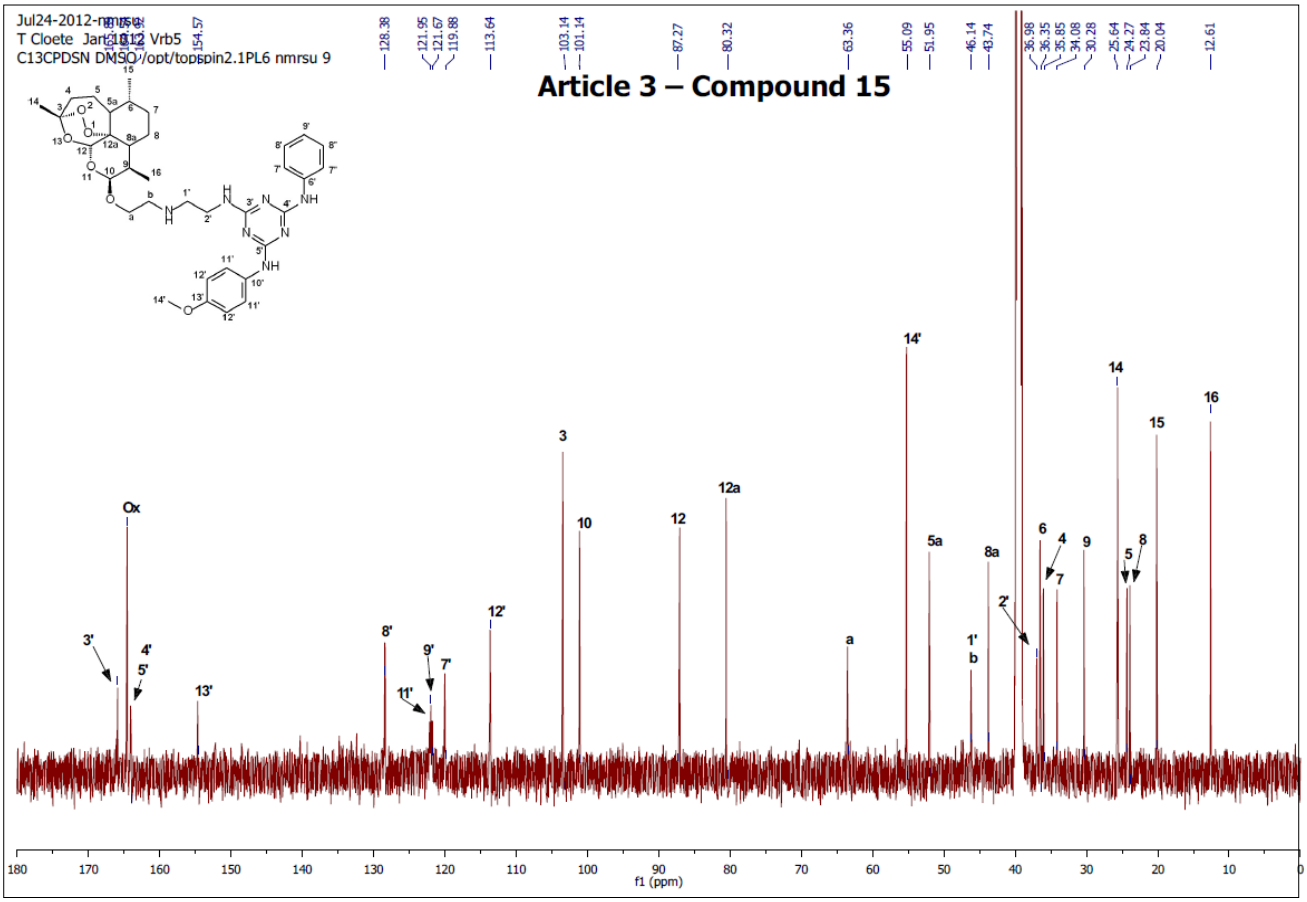

Apr16-2012-nmrsu
T Cloete Feb 0212 Deel 2 (Hib)
COSYGPSW CDCl3 /opt/topspin2.1PL6 nmrsu 22
Article 3 – Compound 14
{0.88,0.88}
{0.93,0.94}
15
16
7α
7α:8β
5a
14
8a
8β
15:6
5β
8α
6:7β
7α:7β
4β:5β
7β
{2.03,2.03}
5α
5α:5a
4β
{2.00,2.36}
5α:6
{2.37,2.34}
4α
4α:5β
{2.62,2.61}
{1.45,2.62}
{0.88,2.61}
9
9:16
4α:4β
9:8a
Diethyl ether
{1.23,3.48}
{3.49,3.46}
b
1'
{3.38,3.39}
1':2'
11'
2'
12'
aβ:b
aβ
{4.14,4.14}
10'
{3.80,4.13}
aα:b
aα
{3.39,4.15}
aα:aβ
{4.79,4.78}
10
{2.61,4.83}
10:9
{5.39,5.39}
12
{5.83,5.83}
NH
Chloroform
{6.83,6.81}
8'
{7.48,7.47}
{6.84,7.48}
7'
7':8'
f2 (ppm)
f1 (ppm)

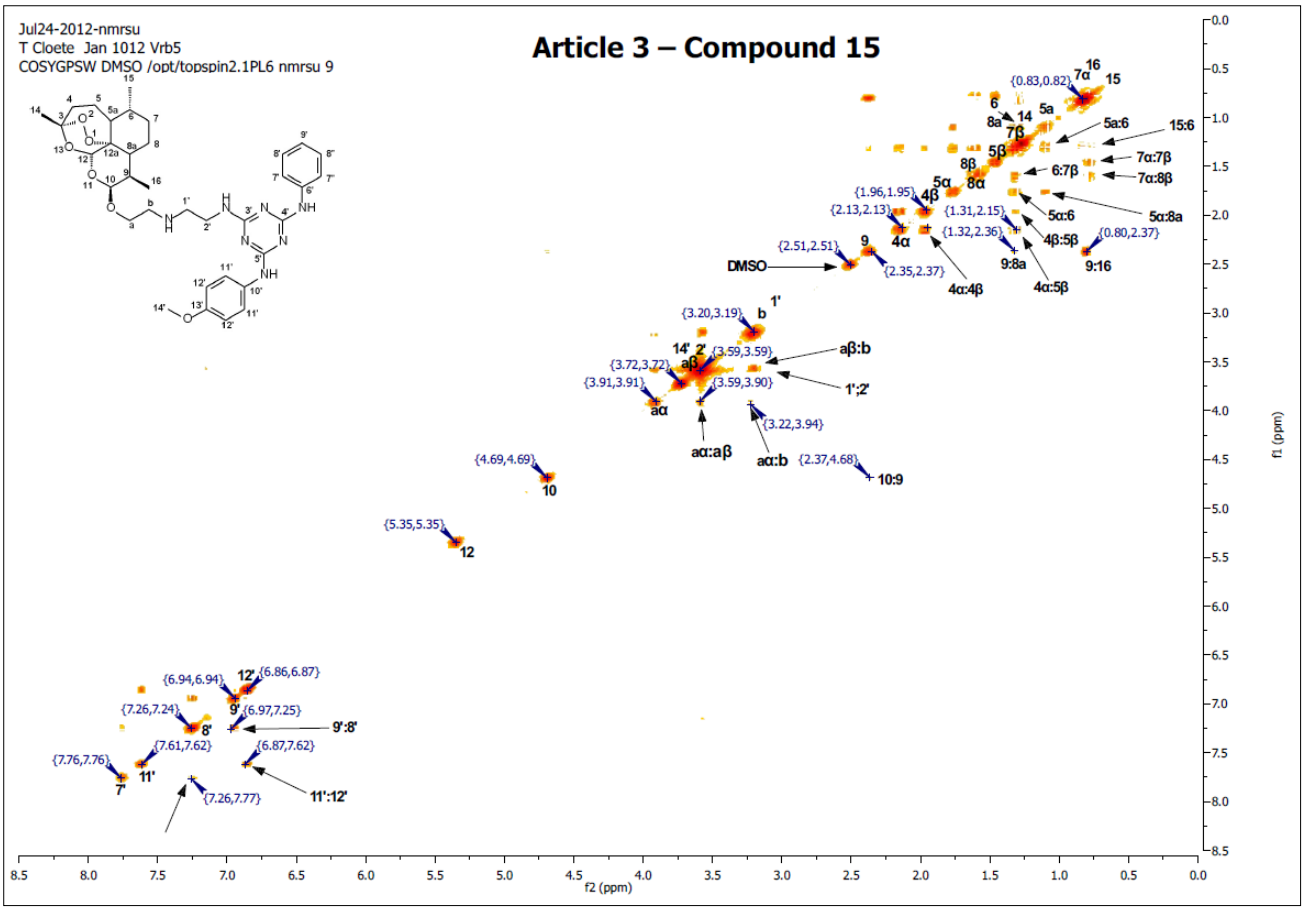

Apr16-2012-nmrsu
T Cloete Feb 0212 Deel 2 (Hib)
HSQCEDETGP CDCl3 /opt/topspin2.1PL6 nmrsu 22
Article 3 – Compound 14
8α
8β
5β
{0.88,12.88}
15
5α
{0.91,20.30}
16
{1.86,24.46}
{1.49,24.23}
14
{1.39,26.04}
{2.62,30.84}
9
{2.34,36.27}
4α
{1.61,34.54}
7α
{0.88,34.62}
7β
4β
6
{2.00,36.34}
{1.44,44.09}
{1.35,37.49}
8a
{3.87,37.83}
2'
{3.83,44.48}
11'
{3.47,47.17}
1'
b
{3.42,47.76}
{1.22,52.57}
5a
{3.77,55.37}
10'
{4.14,64.29}
aα
aβ
{3.76,66.26}
{3.80,64.16}
12'
{5.39,87.88}
12
{4.78,102.45}
10
{6.81,113.92}
8'
{7.46,123.57}
7'
f2 (ppm)
f1 (ppm)

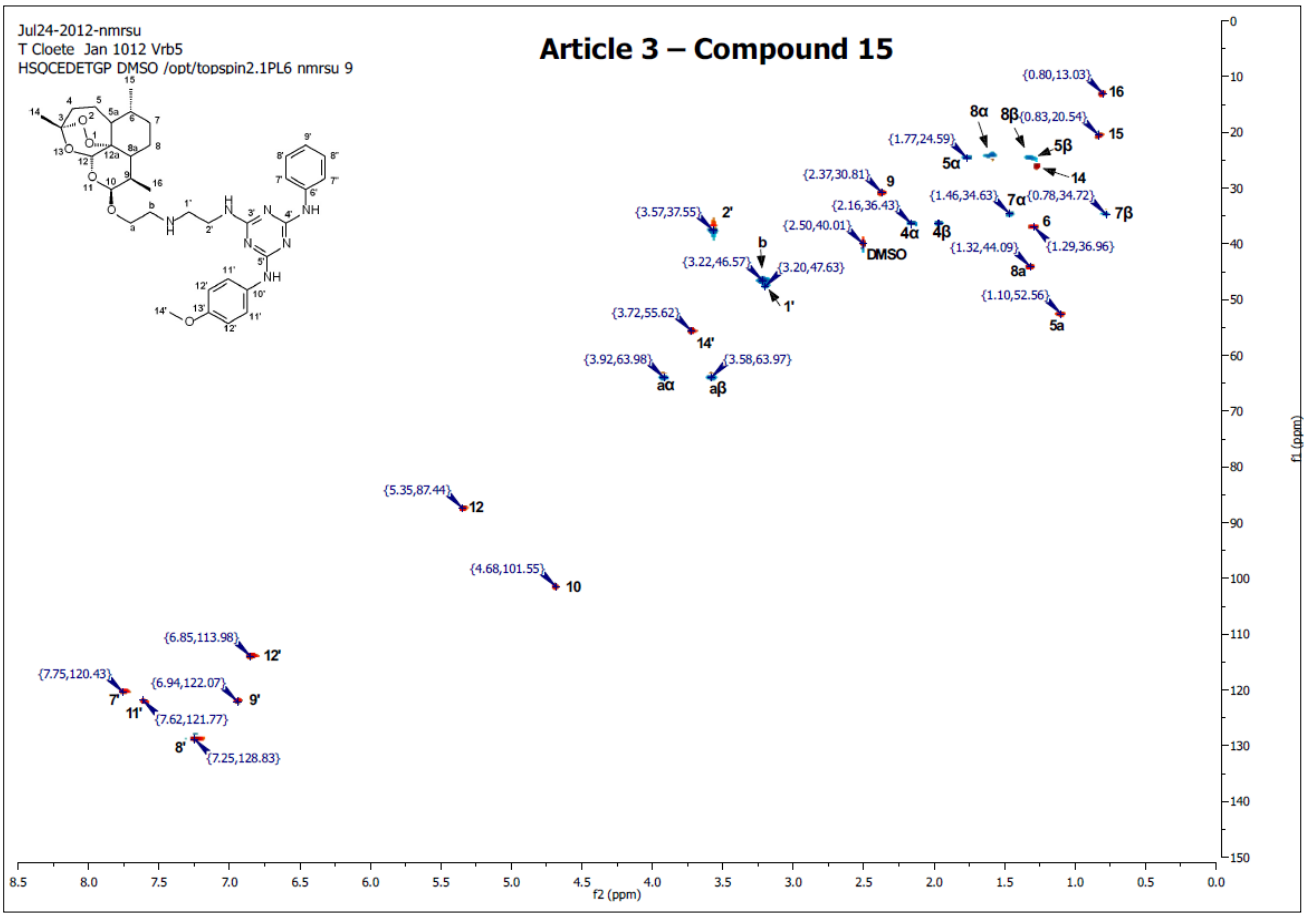
Mass	Calc. Mass	mDa	PPM	DBE	Formula	i-FIT	i-FIT Norm	Fit Conf %	C	H	N	O
656.3783	656.3772	1.1	1.7	12.5	C33 H50 N7 O7	42.7	4.847	0.78	33	50	7	7
	656.3799	-1.6	-2.4	11.5	C37 H54 N O9	42.9	5.052	0.64	37	54	1	9
	656.3812	-2.9	-4.4	16.5	C38 H50 N5 O5	42.9	5.054	0.64	38	50	5	5
	656.3753	3.0	4.6	25.5	C45 H46 N5	43.2	5.287	0.51	45	46	5	
	656.3825	-4.2	-6.4	21.5	C39 H46 N9 O	43.0	5.070	0.63	39	46	9	1
	656.3740	4.3	6.6	20.5	C44 H50 N O4	43.2	5.294	0.50	44	50	1	4
	656.3731	5.2	7.9	8.5	C28 H50 N9 O9	42.6	4.667	0.94	28	50	9	9
	656.3852	-6.9	-10.5	20.5	C43 H50 N3 O3	43.2	5.281	0.51	43	50	3	3
	656.3713	7.0	10.7	21.5	C40 H46 N7 O2	43.0	5.153	0.58	40	46	7	2



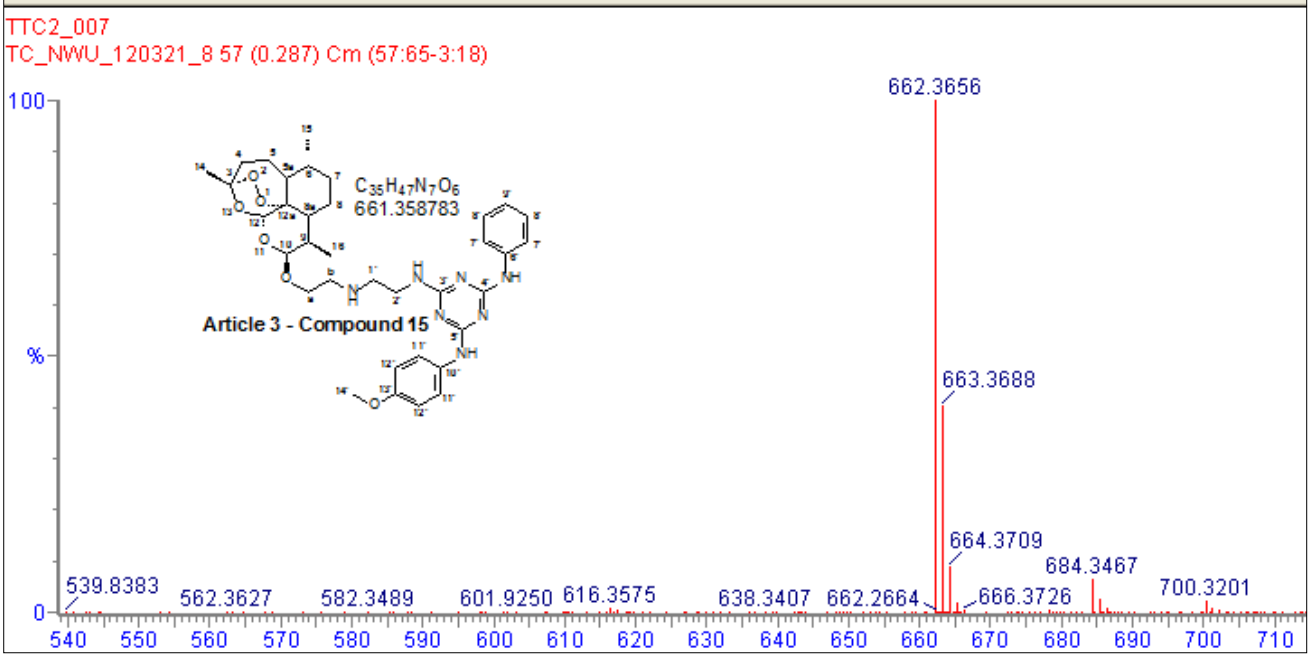

Jul24-2012-nmrsu
T Cloete Jan 1012 Vrb5
PROTON DMSO /opt/topspin2.1PL6 nmrsu 9
Article 3 – Compound 15
H2O
14'
14
DMSO
2'
aß
16
15
7α
1'
b
12
10
NH
7'
11'
8'
12'
9'
aα
5ß
8a
6
8α
8ß
9
4α
4ß
5α
7ß
5a
f1 (ppm)

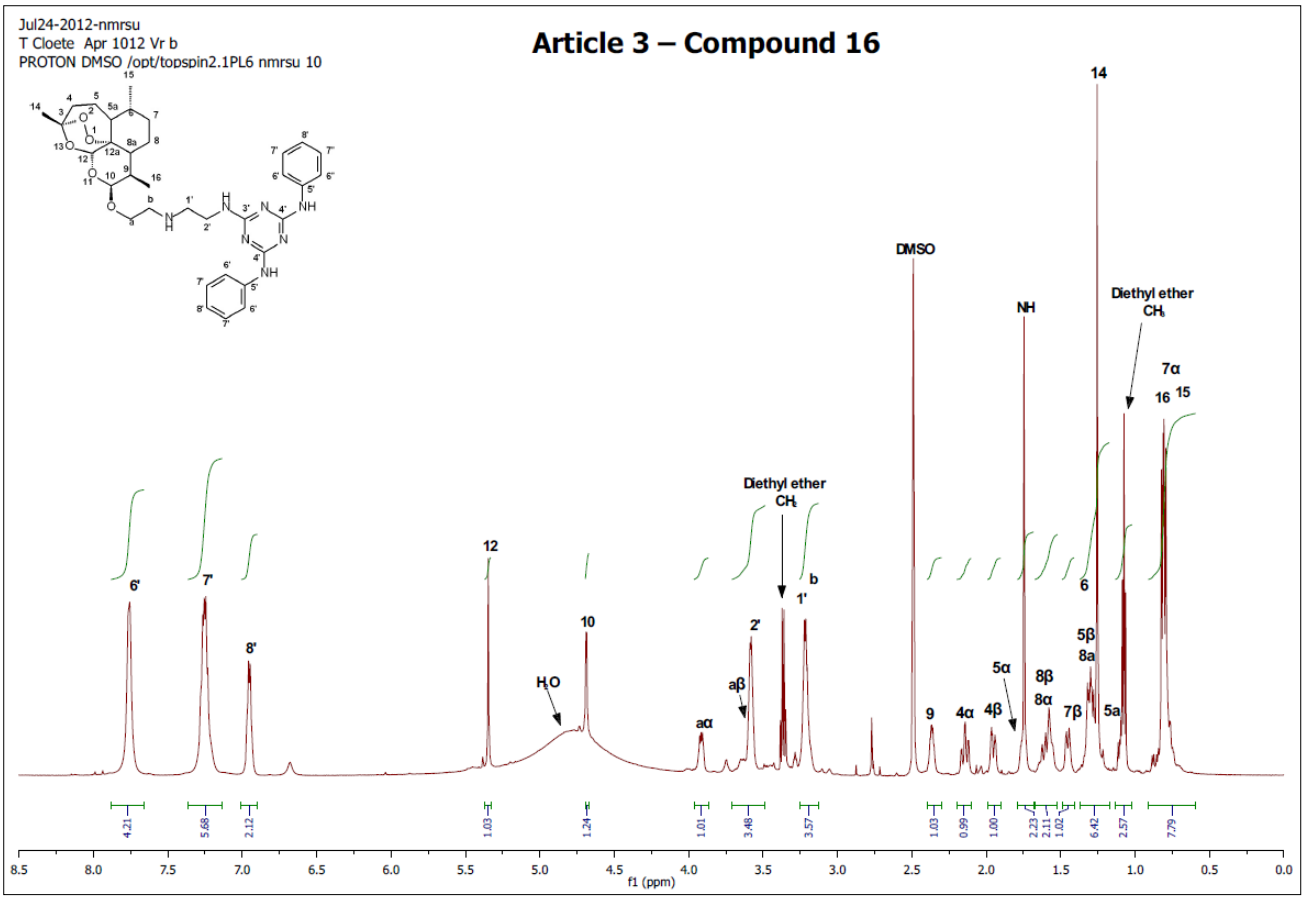

Jul24-2012-nmrsu
T Cloete Jan 1012 Vrb5
C13CPDSN DMSO /opt/topspin2.1PL6 nmrsu 9
Article 3 – Compound 15
Ox
14'
14
16
15
3
10
12
12a
5a
8a
6
4
9
5
8
7
2'
1'
b
a
12'
8'
9'
7'
11'
13'
5'
4'
3'
f1 (ppm)

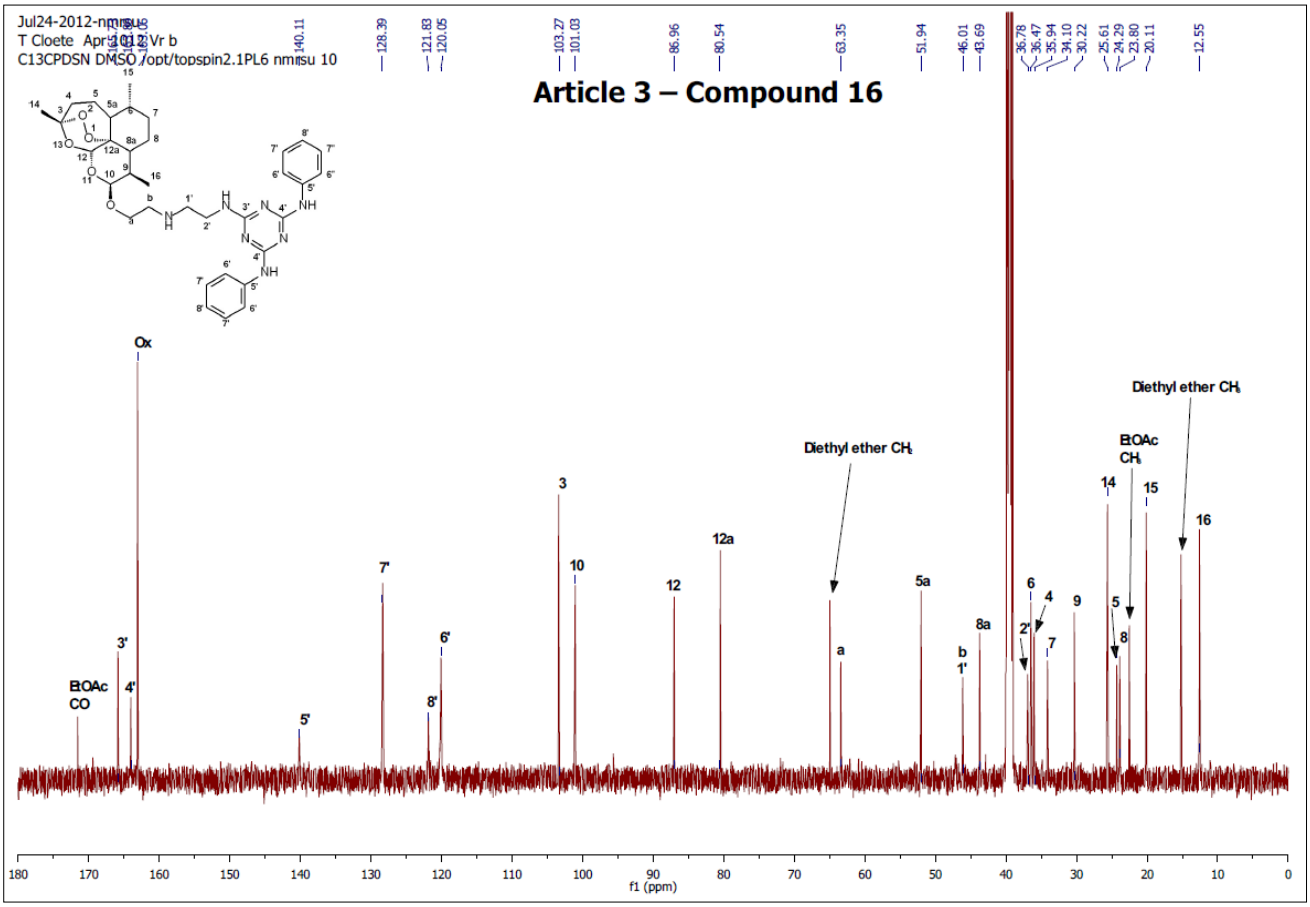

Jul24-2012-nmrsu
T Cloete Jan 1012 Vrb5
COSYGPSW DMSO /opt/topspin2.1PL6 nmrsu 9
Article 3 – Compound 15
DMSO
f2 (ppm)
f1 (ppm)

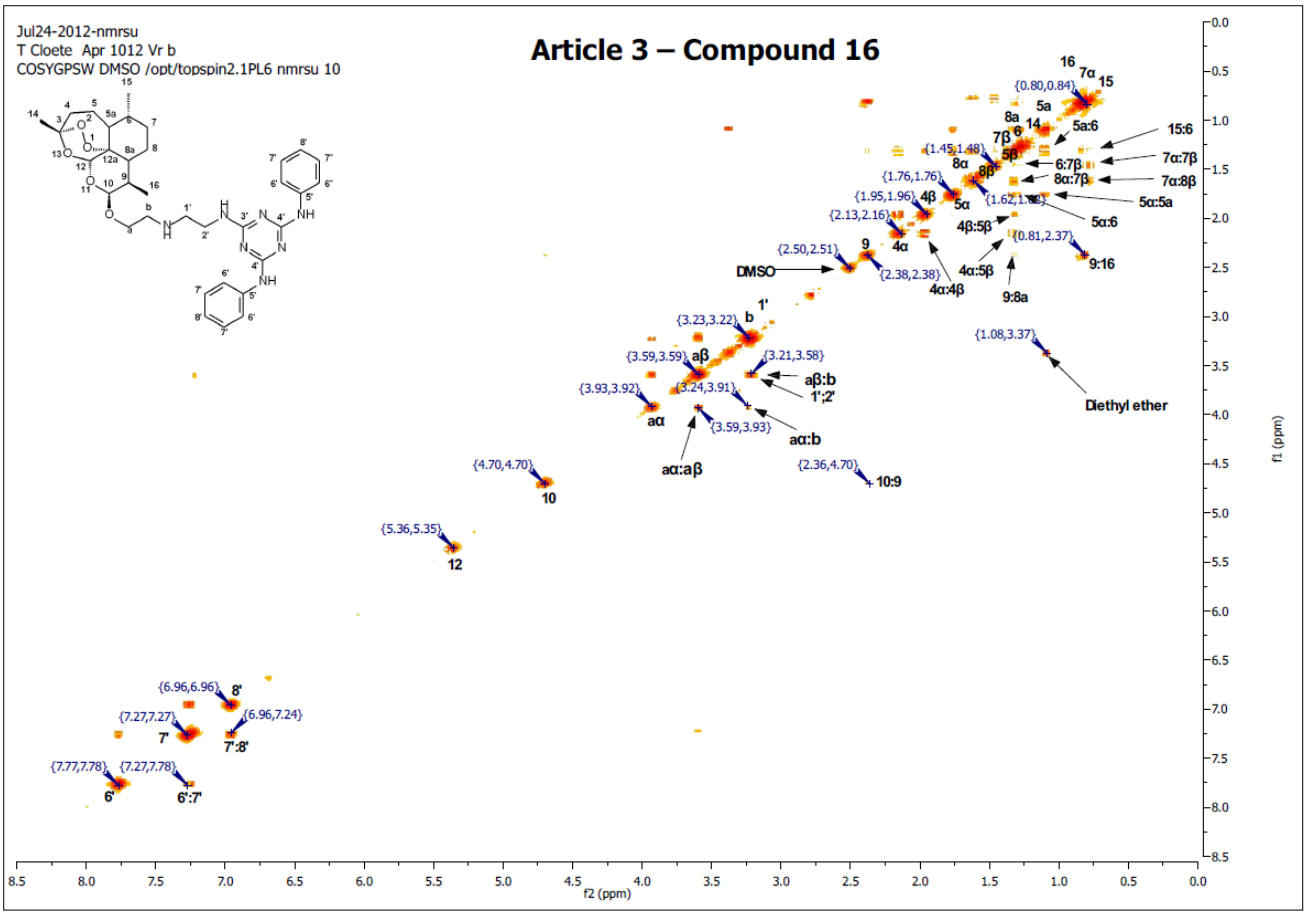

Jul24-2012-nmrsu
T Cloete Jan 1012 Vrb5
HSOCEDETGP DMSO /opt/topspin2.1PL6 nmrsu 9
Article 3 – Compound 15
DMSO
f2 (ppm)
f1 (ppm)

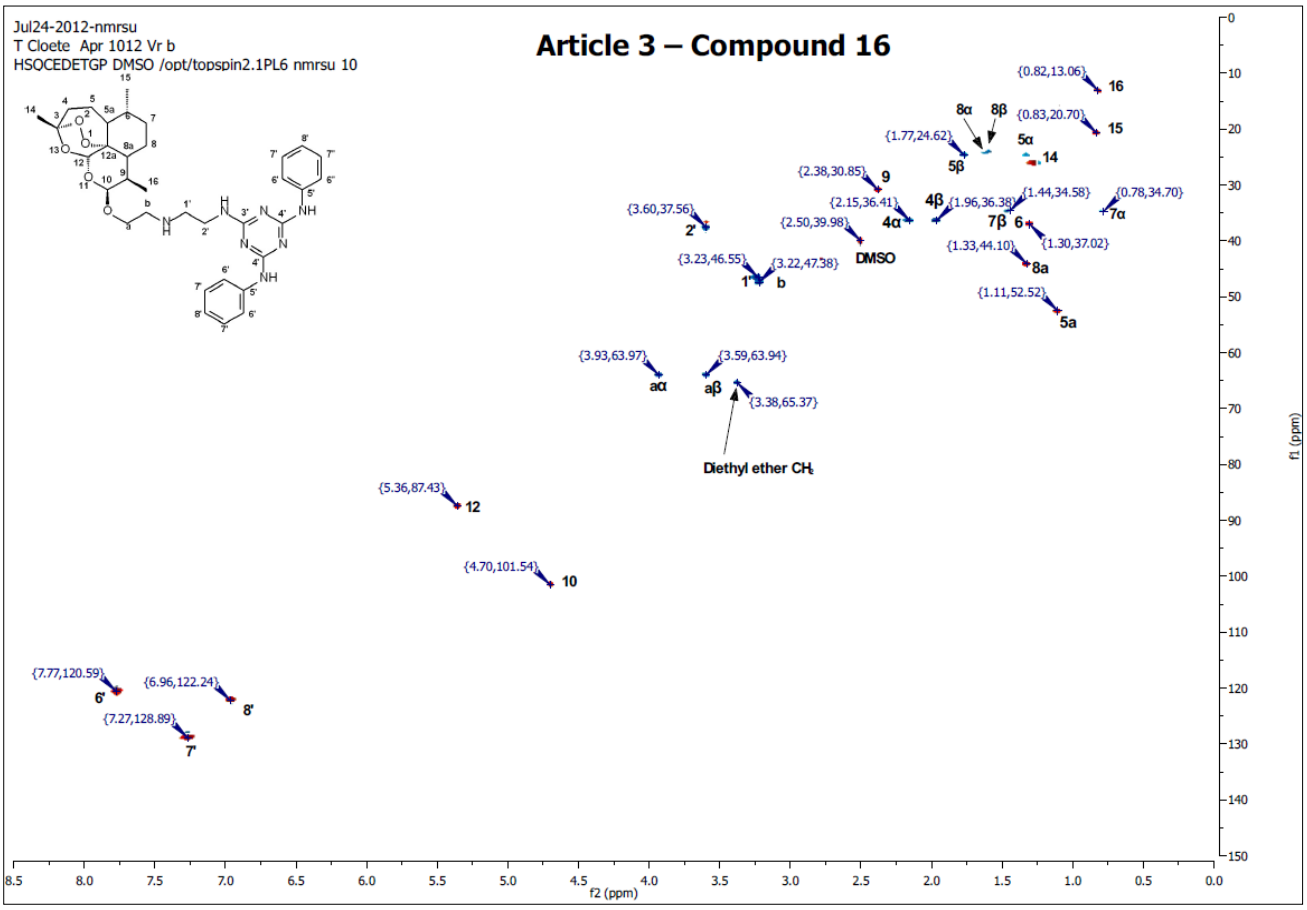
Mass	Calc. Mass	mDa	PPM	DBE	Formula	i-FIT	i-FIT Norm	Fit Conf %	C	H	N	O
662.3656	662.3653	0.3	0.5	10.5	C34 H52 N3 O10	123.9	5.200	0.55	34	52	3	10
	662.3666	-1.0	-1.5	15.5	C35 H48 N7 O6	122.7	4.017	1.80	35	48	7	6
	662.3634	2.2	3.3	23.5	C46 H48 N O3	132.3	13.656	0.00	46	48	1	3
	662.3626	3.0	4.5	11.5	C30 H48 N9 O8	126.6	7.954	0.04	30	48	9	8
	662.3693	-3.7	-5.6	14.5	C39 H52 N O8	128.2	9.545	0.01	39	52	1	8
	662.3607	4.9	7.4	24.5	C42 H44 N7 O	130.5	11.823	0.00	42	44	7	1
	662.3706	-5.0	-7.5	19.5	C40 H48 N5 O4	129.1	10.477	0.00	40	48	5	4
	662.3594	6.2	9.4	19.5	C41 H48 N3 O5	129.8	11.135	0.00	41	48	3	5
	662.3720	-6.4	-9.7	24.5	C41 H44 N9	129.9	11.266	0.00	41	44	9	

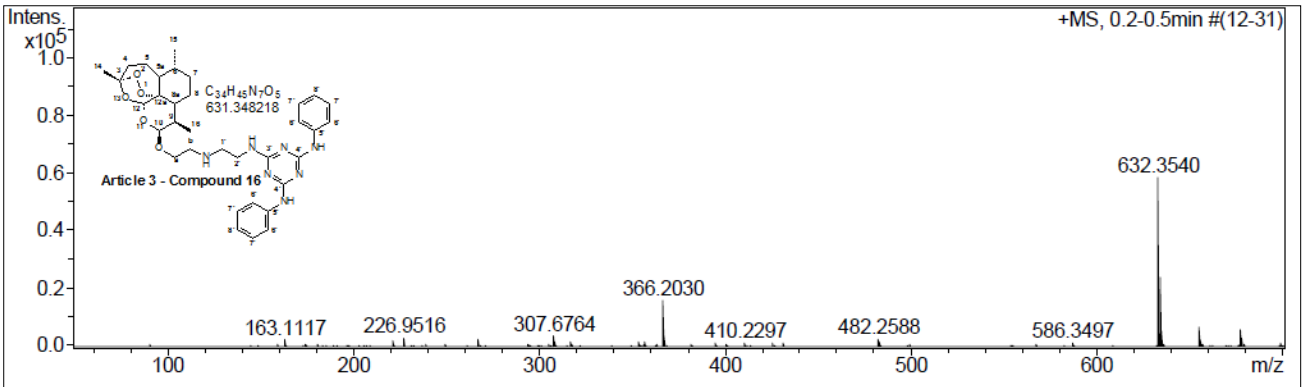



Jul24-2012-nmrsu
T Cloete Apr 1012 Vr b
PROTON DMSO /opt/topspin2.1PL6 nmrsu 10
Article 3 – Compound 16
DMSO
NH
Diethyl ether CH3
H2O
f1 (ppm)

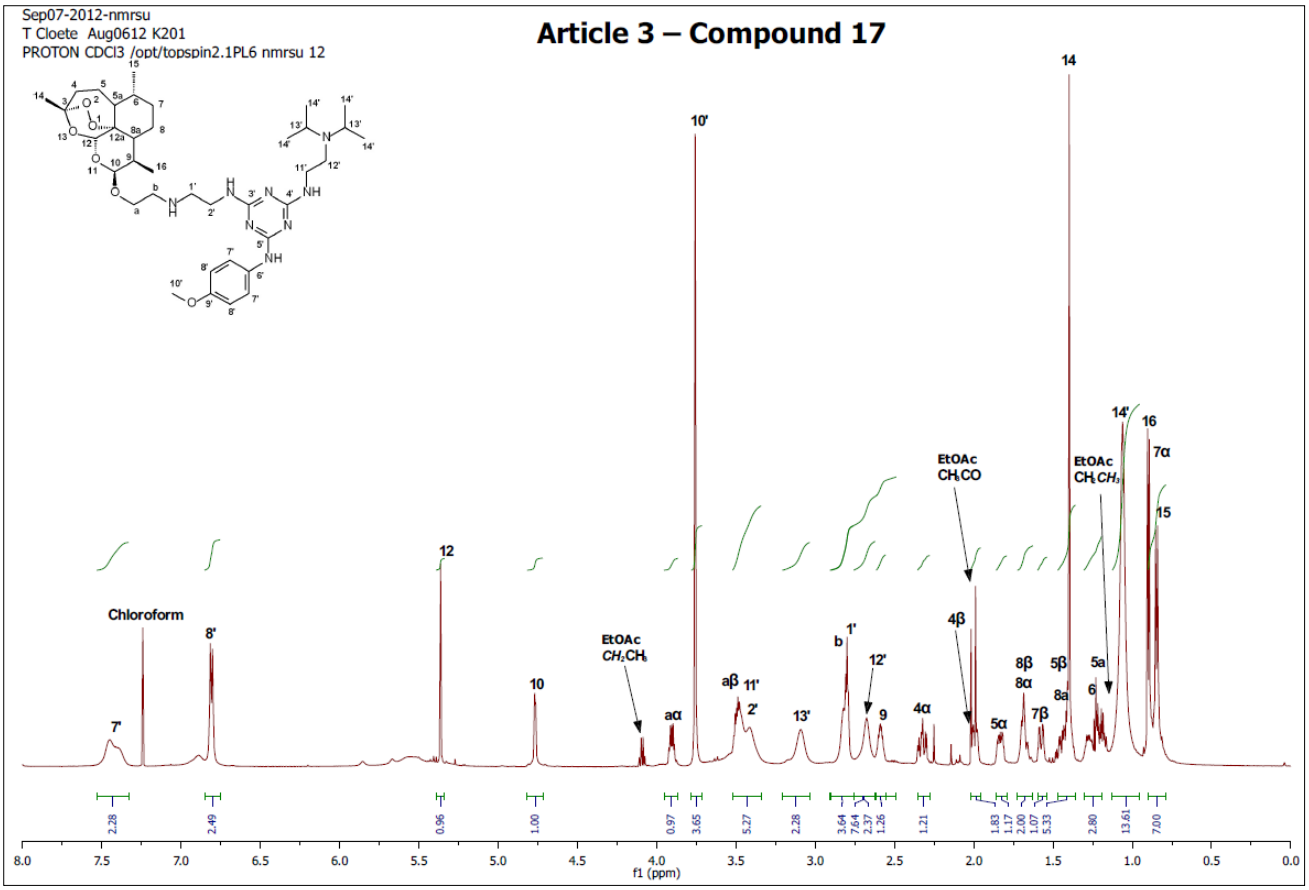

Jul24-2012-nmrsu
T Cloete Apr 1012 Vr b
C13CPDSN DMSO /opt/topspin2.1PL6 nmrsu 10
Article 3 – Compound 16
Ox
Diethyl ether CH3
EtOAc CH3
EtOAc CO
f1 (ppm)

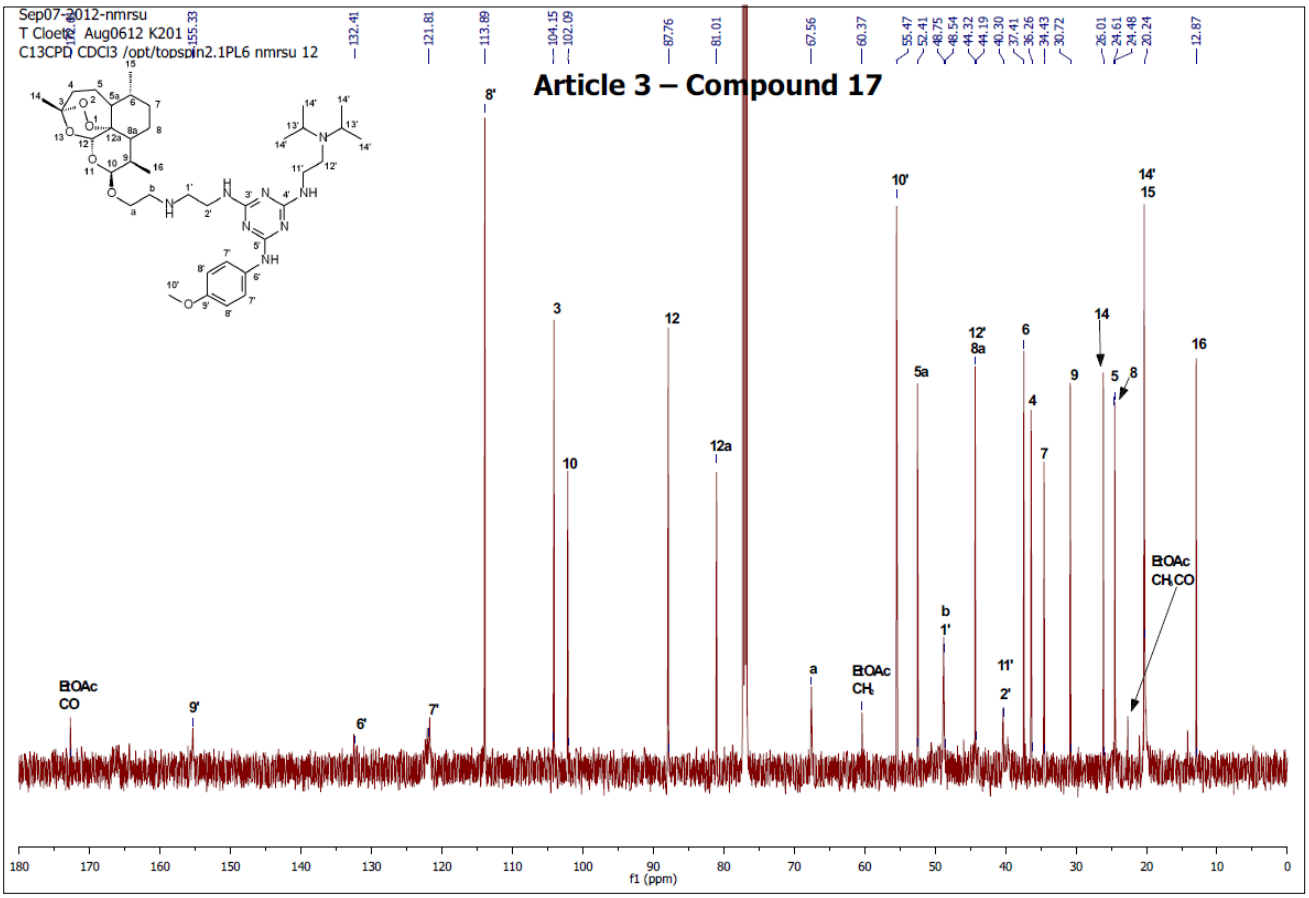

Jul24-2012-nmrsu
T Cloete Apr 1012 Vr b
COSYGPSW DMSO /opt/topspin2.1PL6 nmrsu 10
Article 3 – Compound 16
DMSO
Diethyl ether
f2 (ppm)
f1 (ppm)

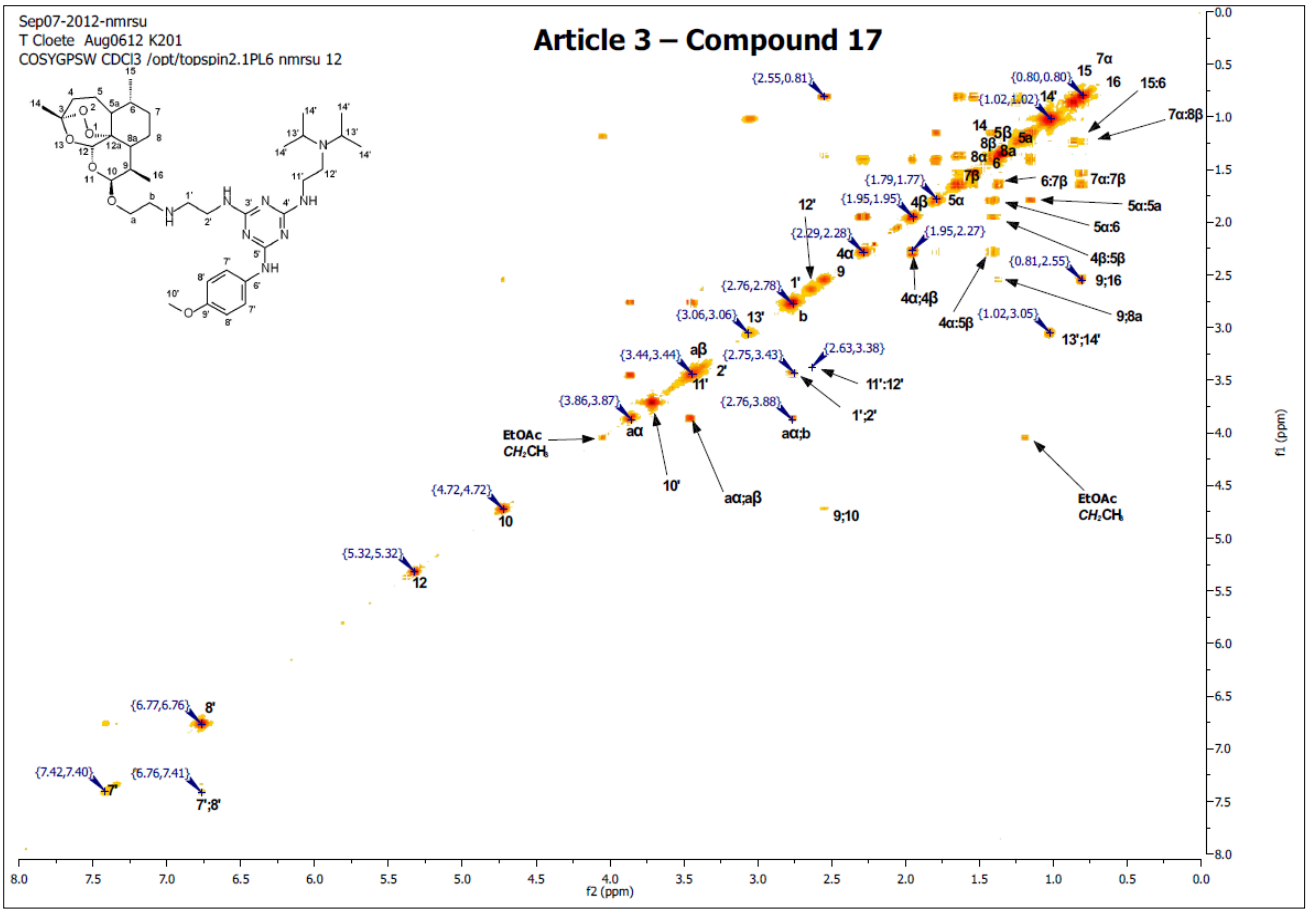

Jul24-2012-nmrsu
T Cloete Apr 1012 Vr b
HSQCEDETGP DMSO /opt/topspin2.1PL6 nmrsu 10
Article 3 – Compound 16
DMSO
Diethyl ether CH2
f2 (ppm)
f1 (ppm)

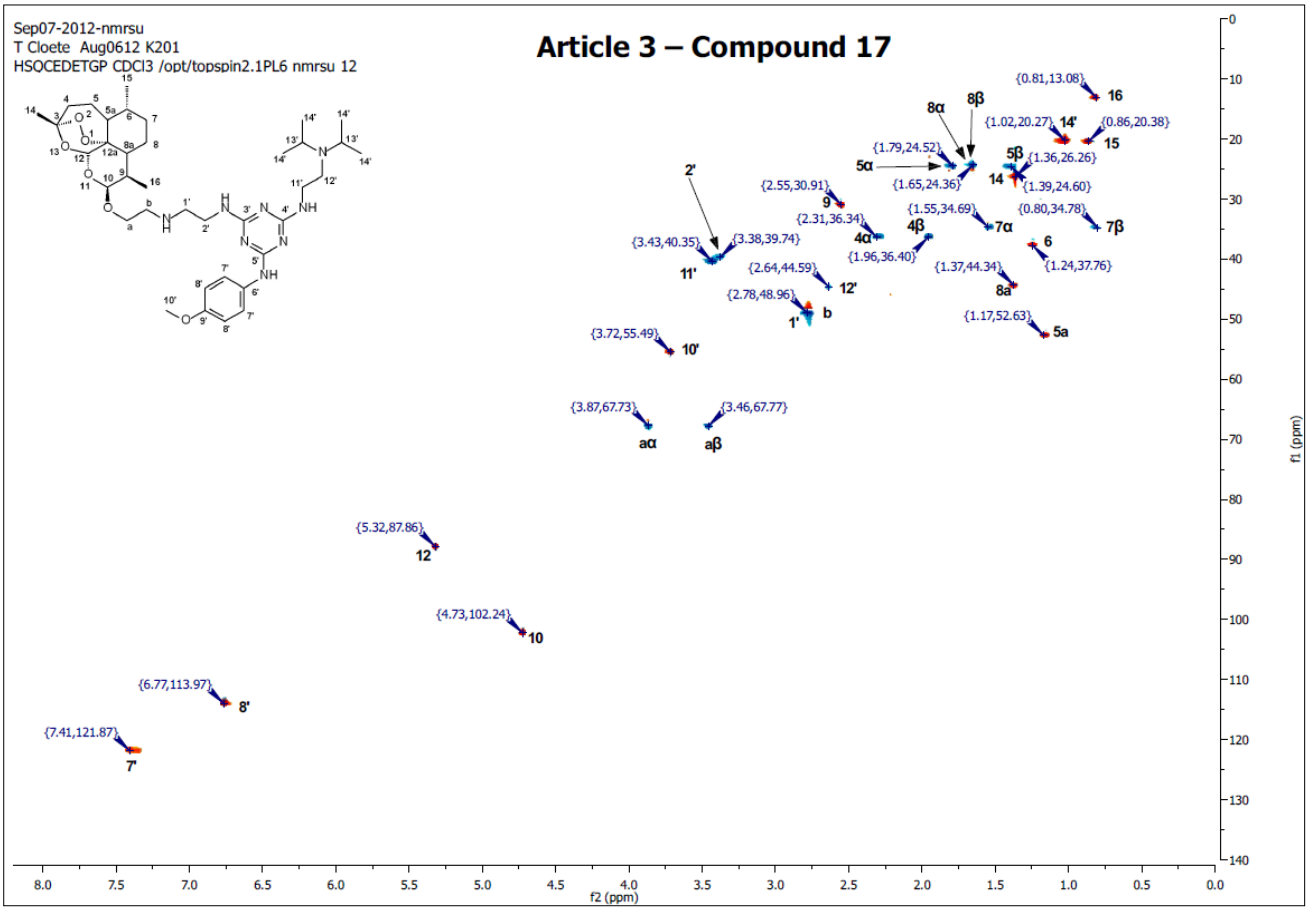


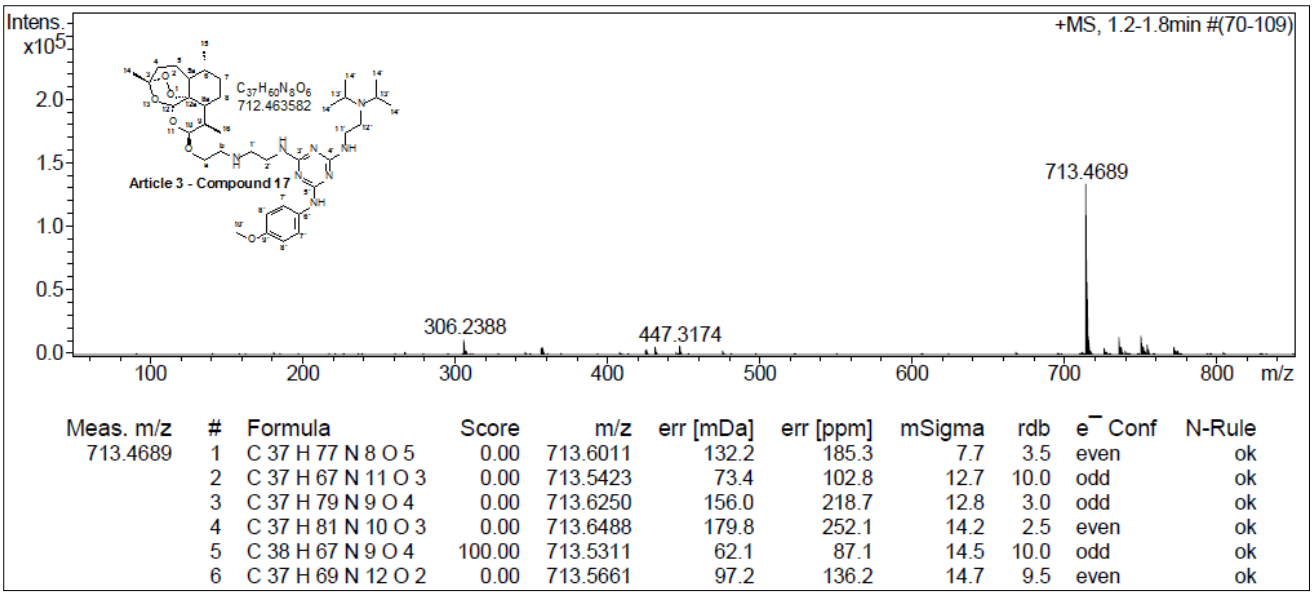
Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdb	e¯ Conf	N-Rule
366.2030	1	C 19 H 24 N 7 O	100.00	366.2037	0.7	2.0	2.7	11.5	even	ok
	2	C 21 H 26 N 4 O 2	40.52	366.2050	2.1	5.7	4.7	11.0	odd	ok
	3	C 17 H 22 N 10	96.01	366.2023	-0.6	-1.7	8.6	12.0	odd	ok
	4	C 20 H 30 O 6	86.13	366.2037	0.7	2.0	11.0	6.0	odd	ok
	5	C 23 H 28 N O 3	10.50	366.2064	3.4	9.3	11.4	10.5	even	ok
	6	C 18 H 28 N 3 O 5	82.58	366.2023	-0.6	-1.7	16.6	6.5	even	ok
	7	C 16 H 26 N 6 O 4	31.40	366.2010	-1.9	-5.3	22.7	7.0	odd	ok
	8	C 15 H 30 N 2 O 8	6.68	366.1997	-3.3	-9.0	37.4	2.0	odd	ok
632.3540	1	C 36 H 48 N 4 O 6	20.73	632.3568	2.8	4.4	0.9	15.0	odd	ok
	2	C 33 H 40 N 14	55.32	632.3555	1.5	2.3	5.8	21.0	odd	ok
	3	C 34 H 46 N 7 O 5	54.84	632.3555	1.5	2.3	6.1	15.5	even	ok
	4	C 38 H 50 N O 7	4.45	632.3582	4.1	6.6	6.7	14.5	even	ok


Sep07-2012-nmrsu
T Cloete Aug0612 K201
PROTON CDCl3 /opt/topspin2.1PL6 nmrsu 12
Article 3 – Compound 17
Chloroform
EtOAc
EtOAc
EtOAc
f1 (ppm)


Sep07-2012-nmrsu
T Cloete Aug0612 K201
C13CPD CDCl3 /opt/topspin2.1PL6 nmrsu 12
Article 3 – Compound 17
EtOAc
EtOAc
EtOAc
f1 (ppm)


Sep07-2012-nmrsu
T Cloete Aug0612 K201
COSYGPSW CDCl3 /opt/topspin2.1PL6 nmrsu 12
Article 3 – Compound 17
f2 (ppm)
f1 (ppm)

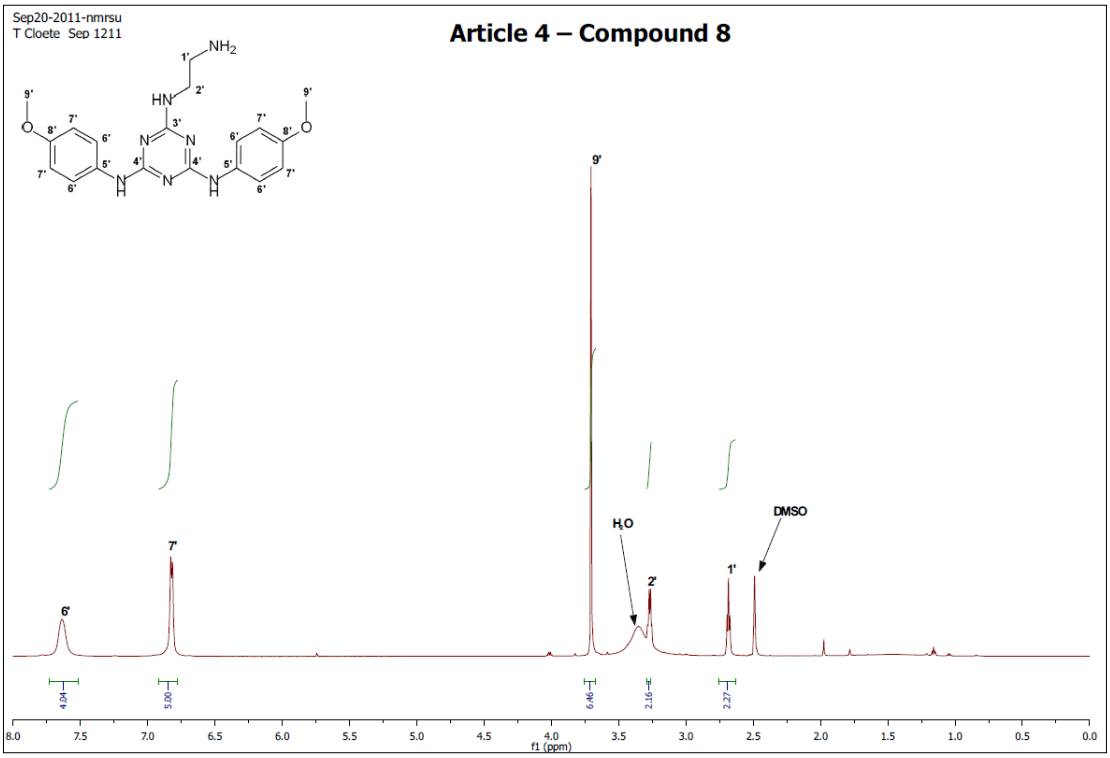

Sep07-2012-nmrsu
T Cloete Aug0612 K201
HSQCEDETGP CDCl3 /opt/topspin2.1PL6 nmrsu 12
Article 3 – Compound 17
f2 (ppm)
f1 (ppm)

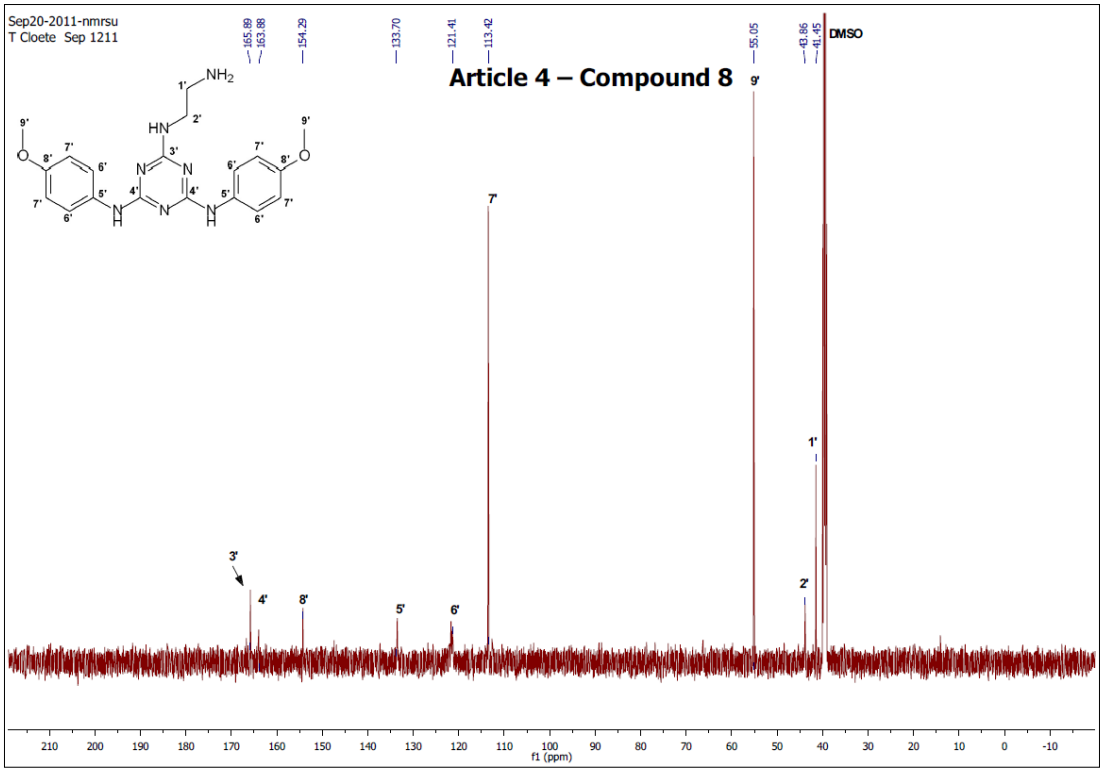


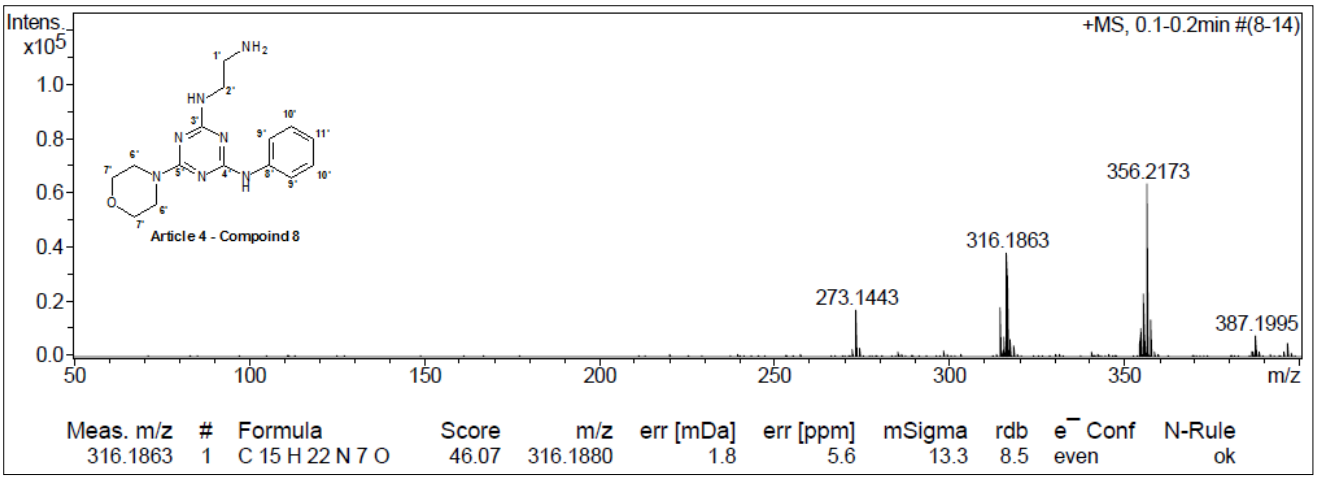
Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdb	e¯ Conf	N-Rule
713.4689	1	C 37 H 77 N 8 O 5	0.00	713.6011	132.2	185.3	7.7	3.5	even	ok
	2	C 37 H 67 N 11 O 3	0.00	713.5423	73.4	102.8	12.7	10.0	odd	ok
	3	C 37 H 79 N 9 O 4	0.00	713.6250	156.0	218.7	12.8	3.0	odd	ok
	4	C 37 H 81 N 10 O 3	0.00	713.6488	179.8	252.1	14.2	2.5	even	ok
	5	C 38 H 67 N 9 O 4	100.00	713.5311	62.1	87.1	14.5	10.0	odd	ok
	6	C 37 H 69 N 12 O 2	0.00	713.5661	97.2	136.2	14.7	9.5	even	ok

Annexure C

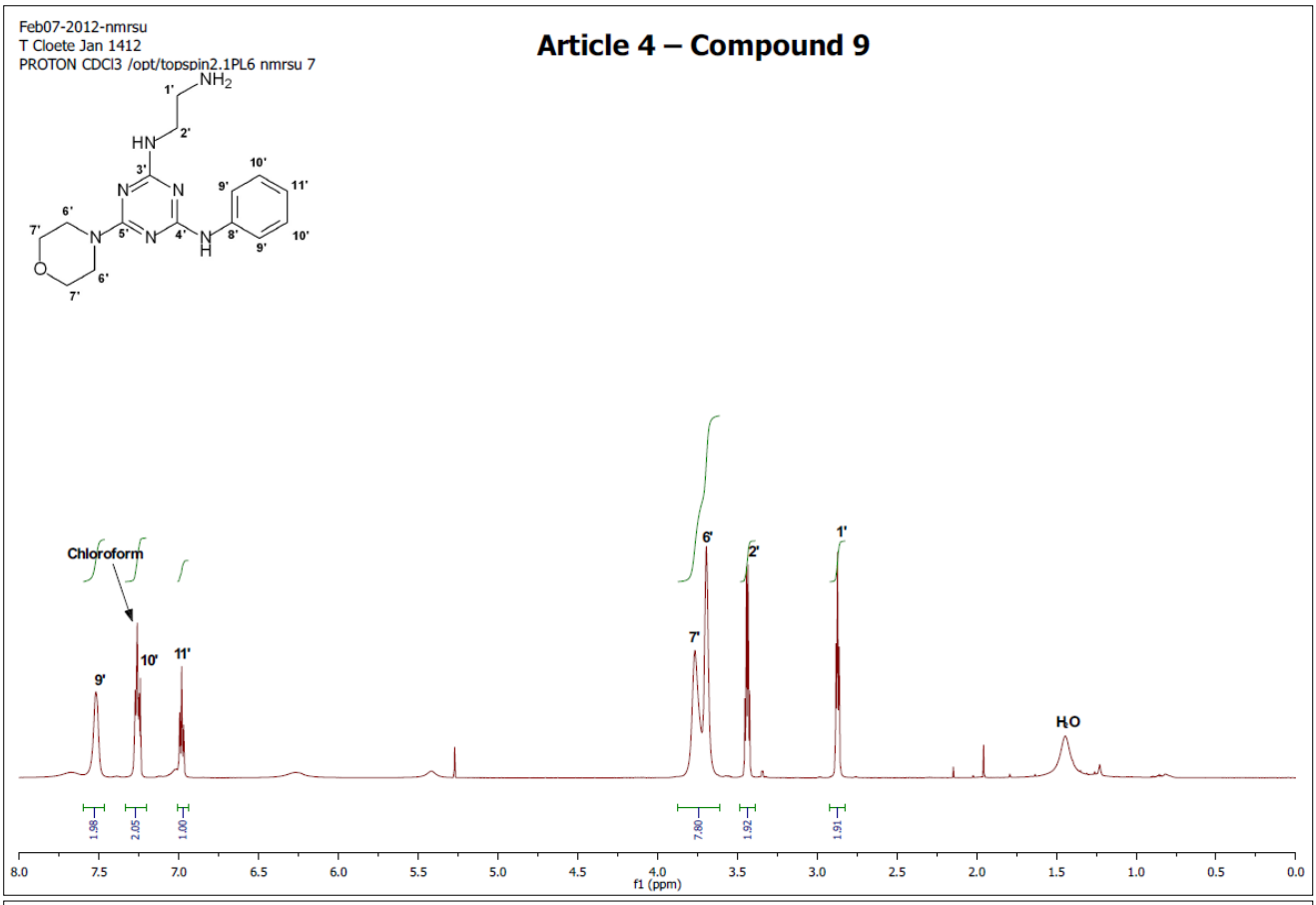
NMR & MS spectra - Chapter 6 (Article 4)

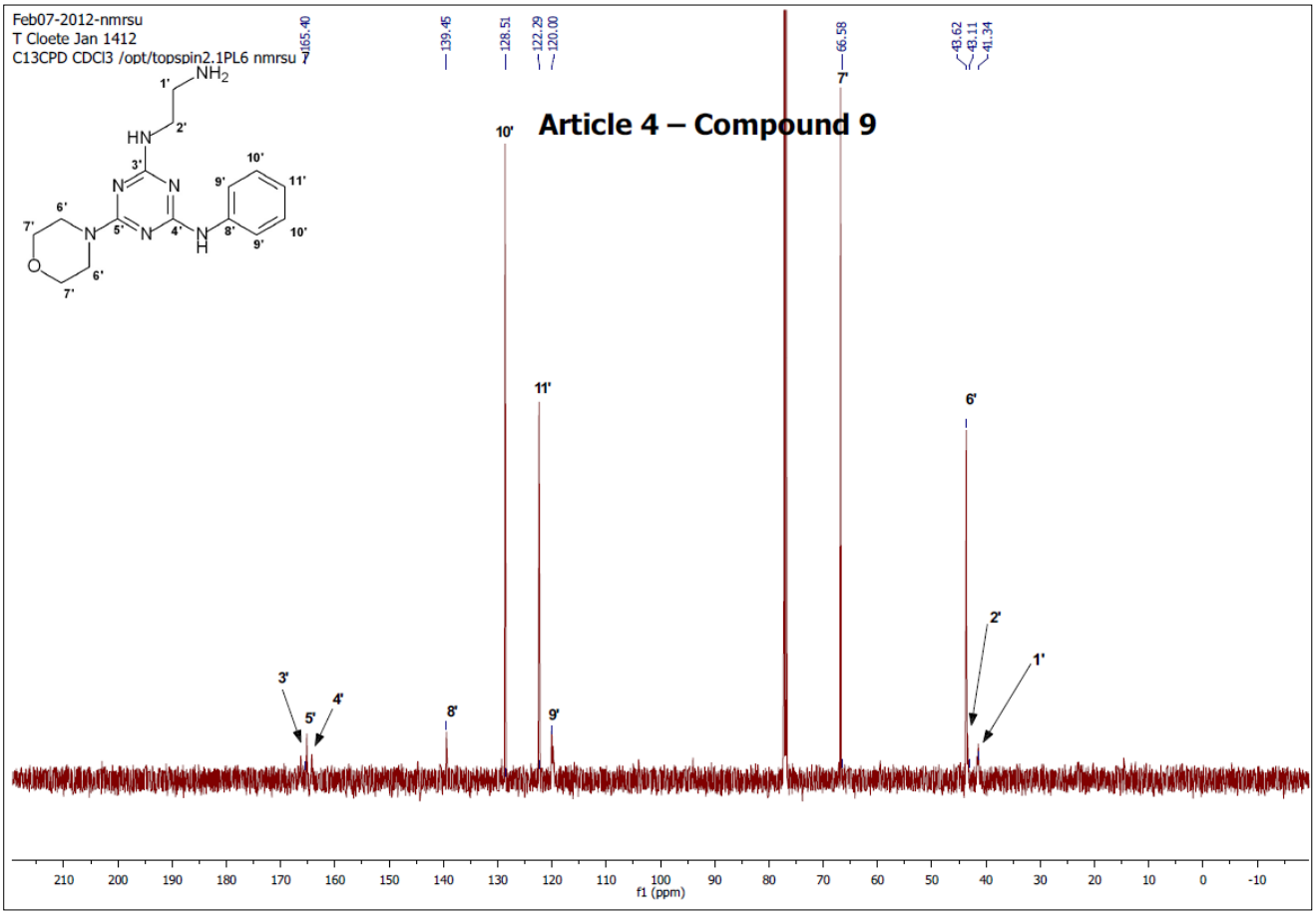


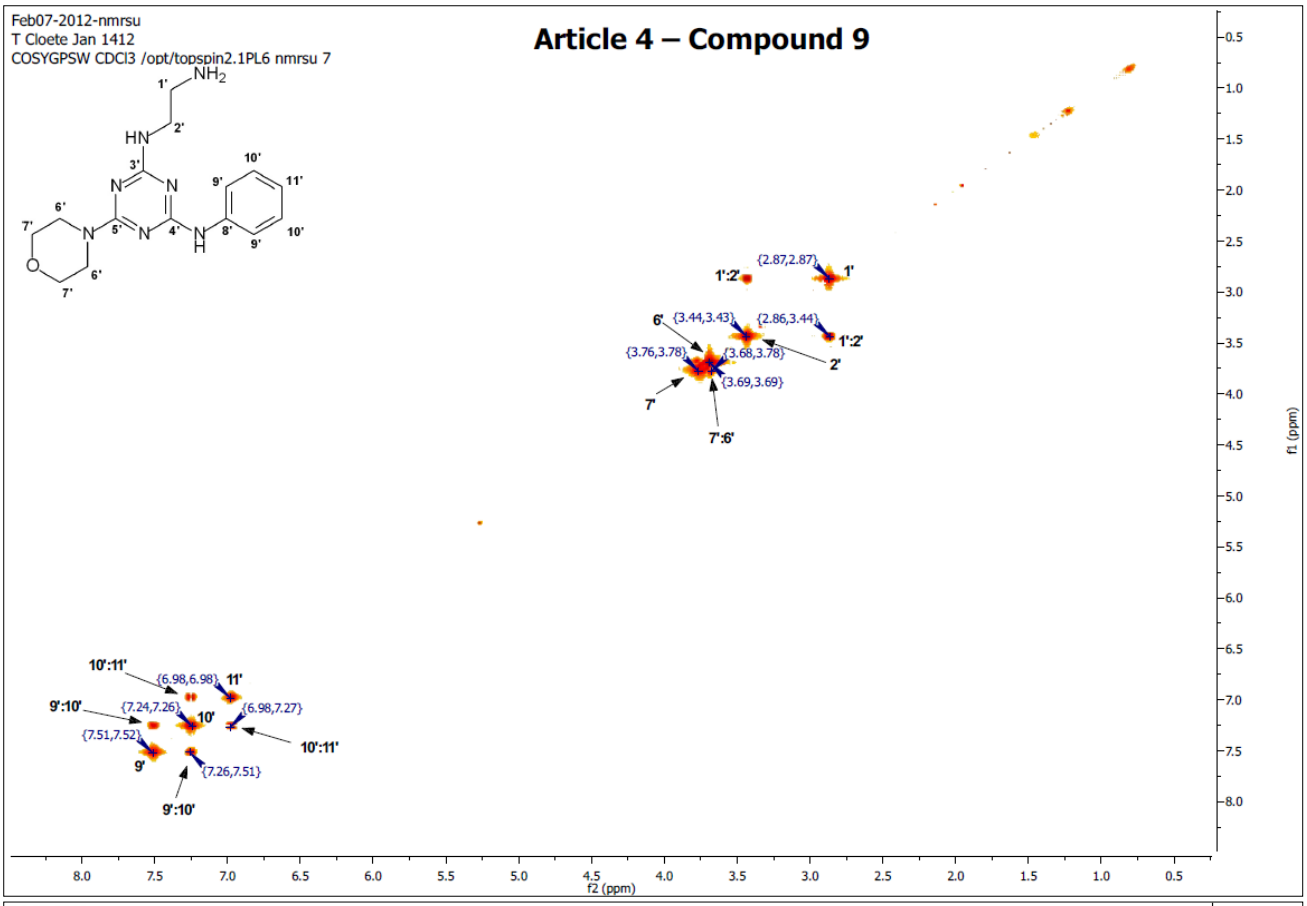


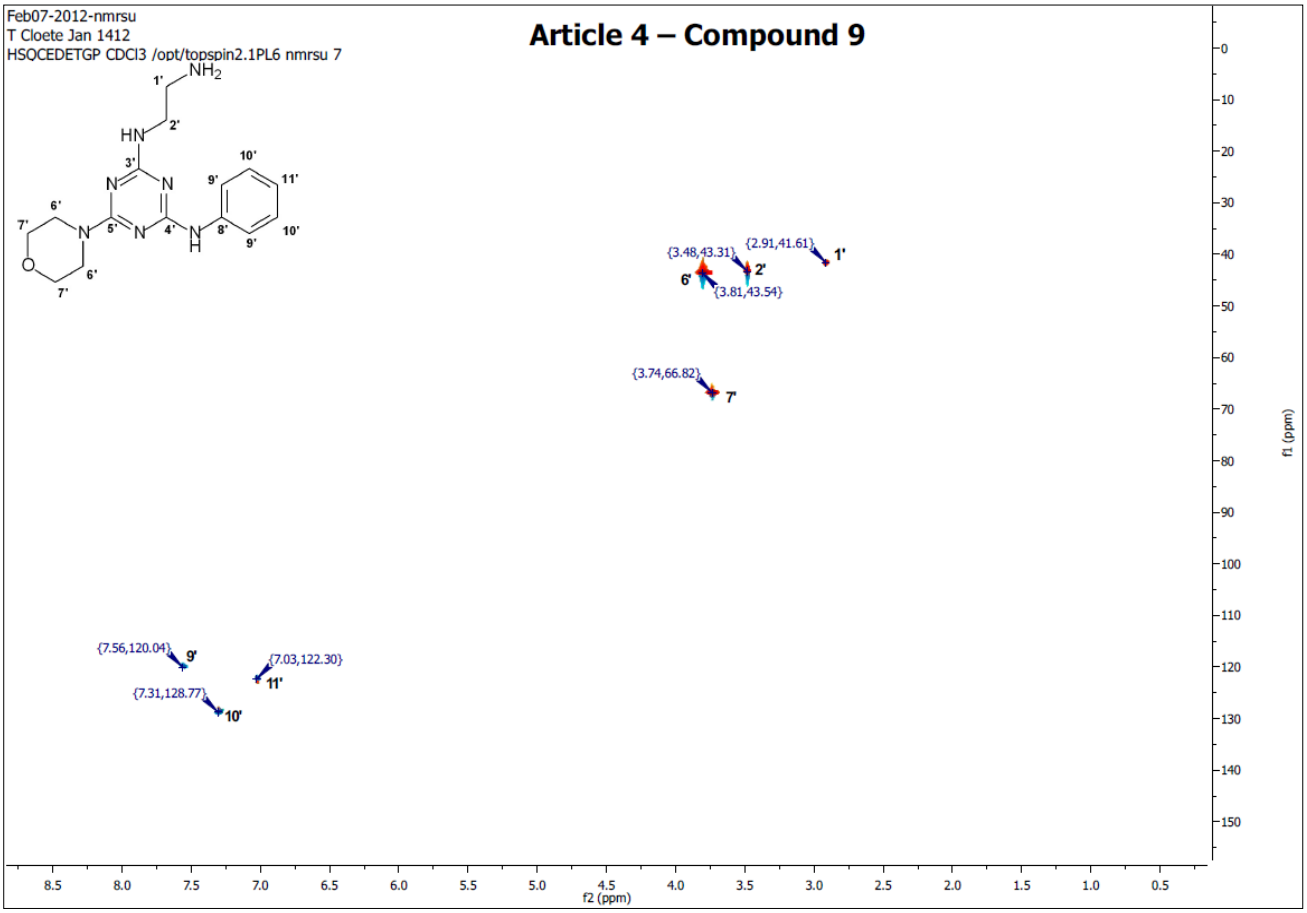


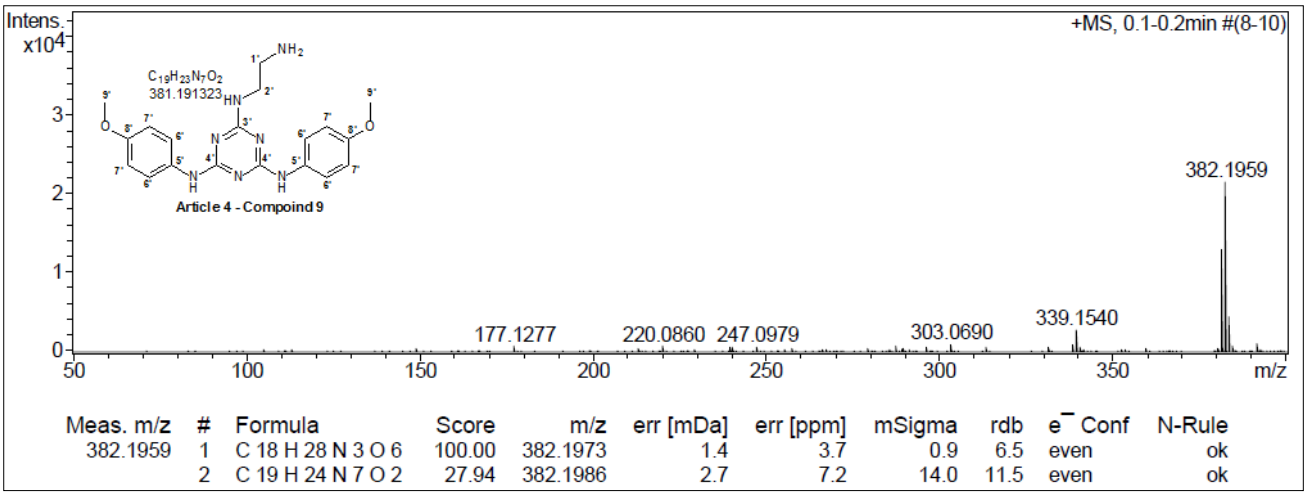
Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdb	e⁻ Conf	N-Rule
316.1863	1	C 15 H 22 N 7 O	46.07	316.1880	1.8	5.6	13.3	8.5	even	ok


Feb07-2012-nmrsu
T Cloete Jan 1412
PROTON CDCl3 /opt/topspin2.1PL6 nmrsu 7
Article 4 – Compound 9
Chloroform
H2O
f1 (ppm)

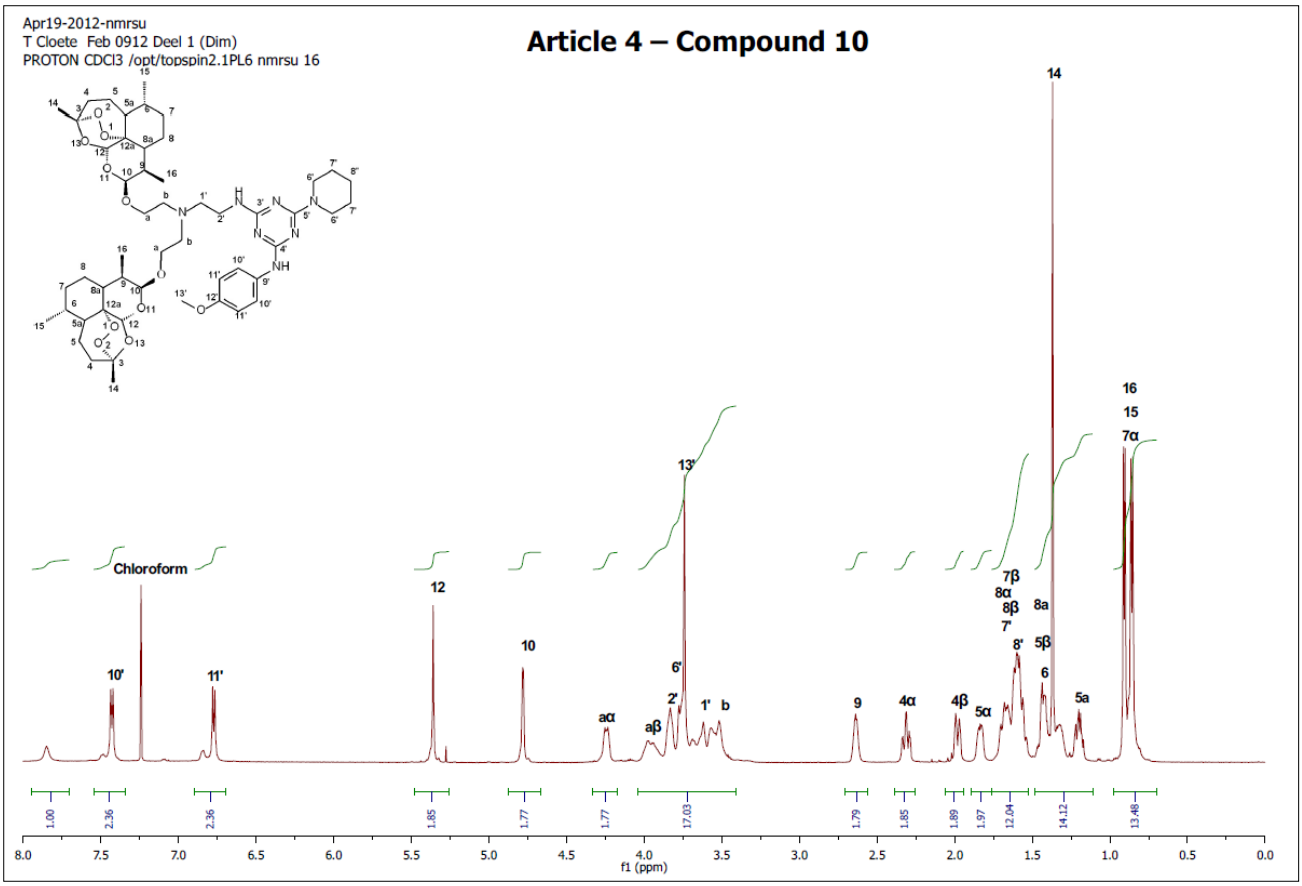

Feb07-2012-nmrsu
T Cloete Jan 1412
C13CPD CDCl3 /opt/topspin2.1PL6 nmrsu 7
Article 4 – Compound 9
f1 (ppm)

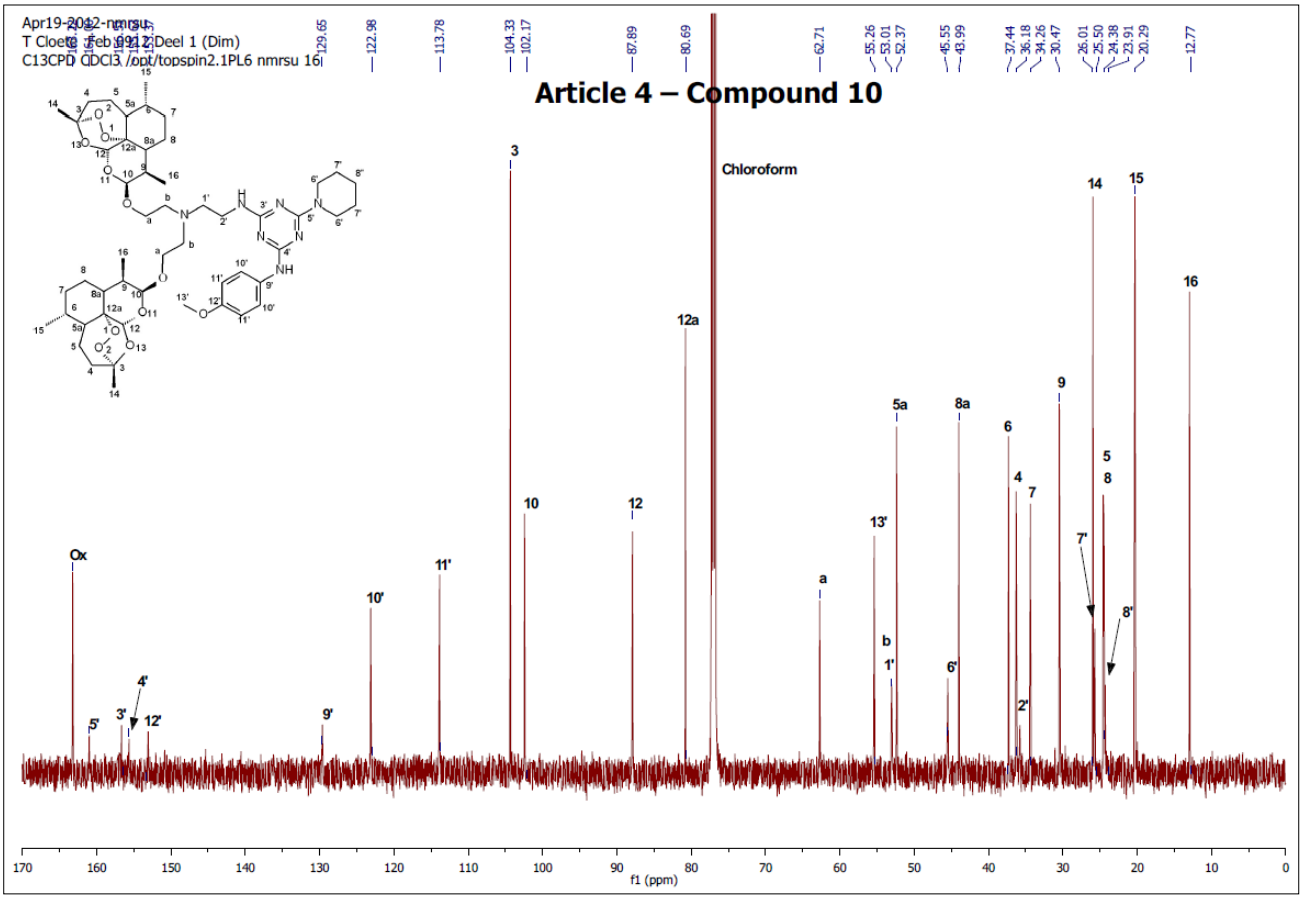

Feb07-2012-nmrsu
T Cloete Jan 1412
COSYGPSW CDCl3 /opt/topspin2.1PL6 nmrsu 7
Article 4 – Compound 9
{2.87,2.87}
1':2'
1'
6'
{3.44,3.43}
{2.86,3.44}
1':2'
{3.76,3.78}
{3.68,3.78}
2'
{3.69,3.69}
7'
7':6'
10':11'
{6.98,6.98}
11'
9':10'
{7.24,7.26}
10'
{6.98,7.27}
{7.51,7.52}
10':11'
9'
{7.26,7.51}
9':10'
f2 (ppm)
f1 (ppm)

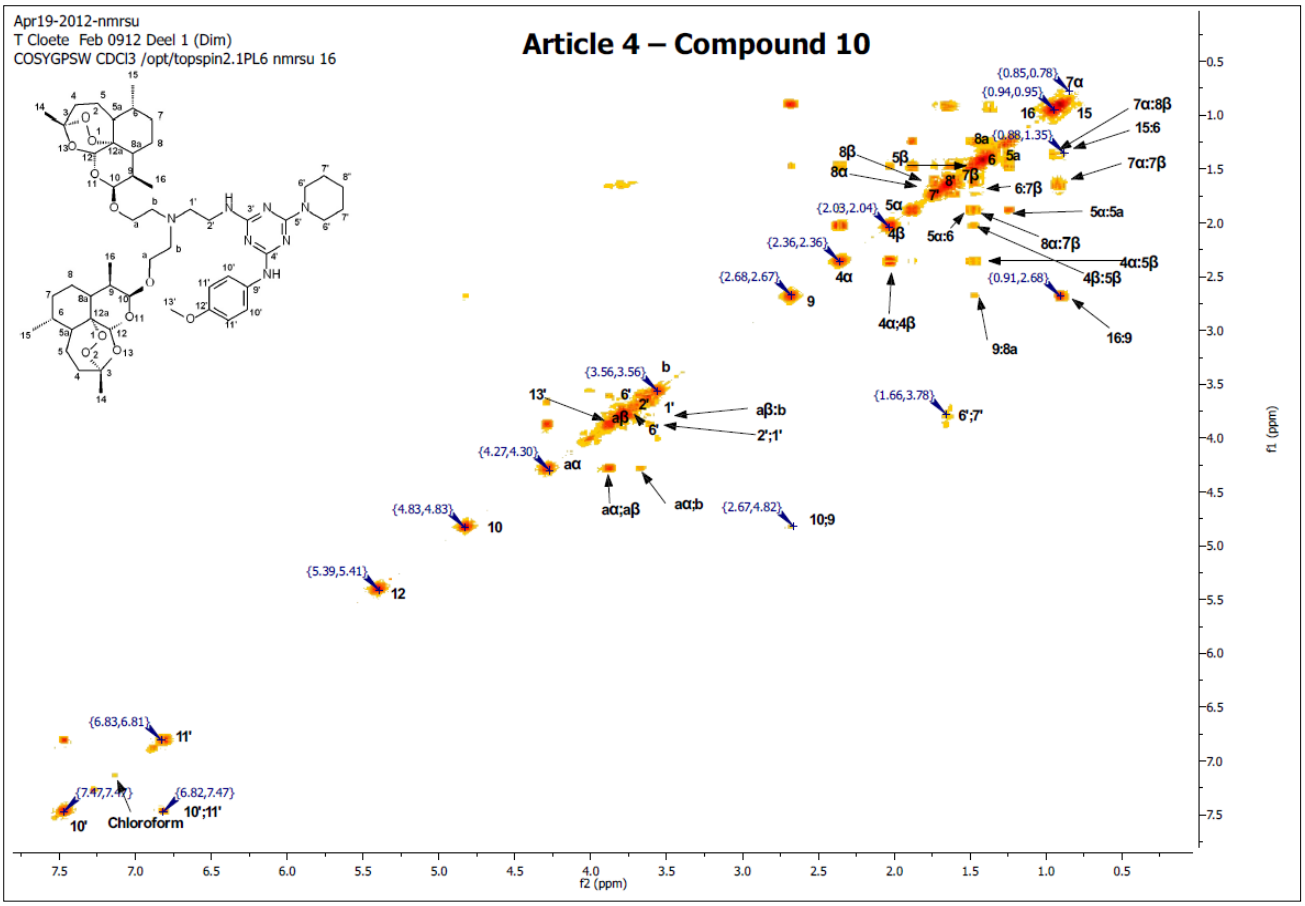

Feb07-2012-nmrsu
T Cloete Jan 1412
HSQCEDETGP CDCl3 /opt/topspin2.1PL6 nmrsu 7
Article 4 – Compound 9
{3.48,43.31}
{2.91,41.61}
1'
6'
2'
{3.81,43.54}
{3.74,66.82}
7'
{7.56,120.04}
9'
{7.03,122.30}
11'
{7.31,128.77}
10'
f2 (ppm)
f1 (ppm)

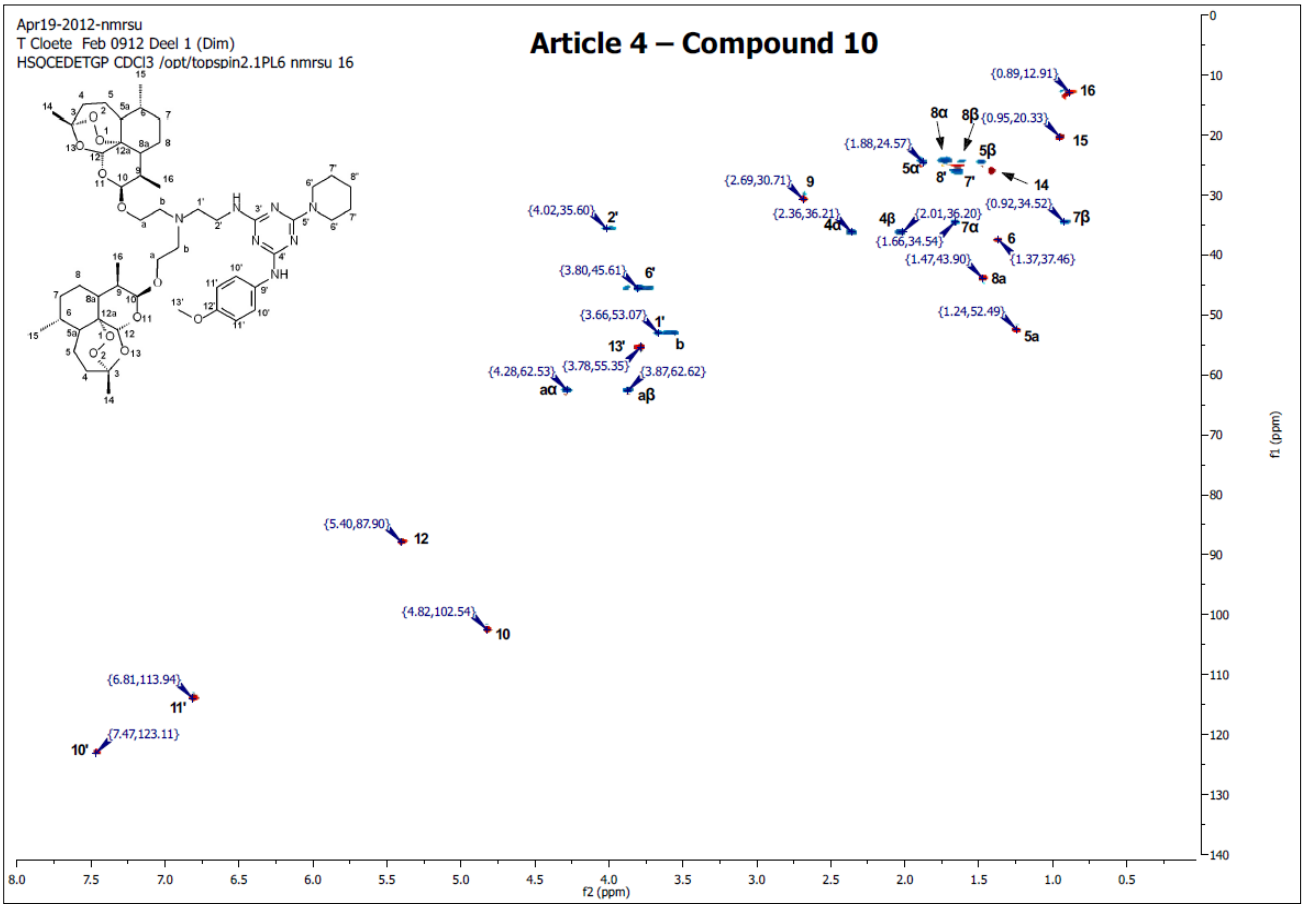


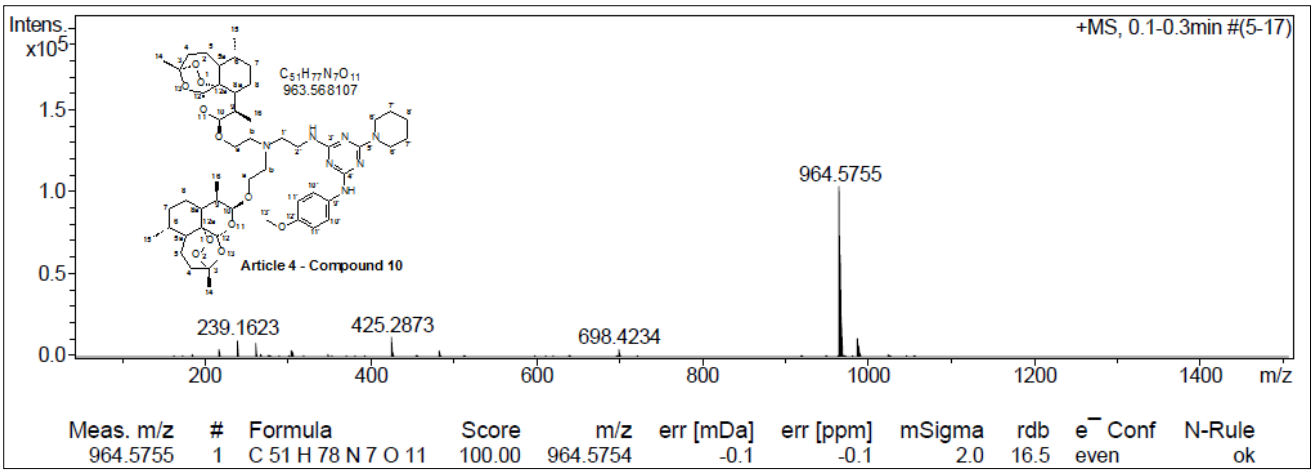
Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdb	e⁻ Conf	N-Rule
382.1959	1	C 18 H 28 N 3 O 6	100.00	382.1973	1.4	3.7	0.9	6.5	even	ok
	2	C 19 H 24 N 7 O 2	27.94	382.1986	2.7	7.2	14.0	11.5	even	ok


Apr19-2012-nmrsu
T Cloete Feb 0912 Deel 1 (Dim)
PROTON CDCl3 /opt/topspin2.1PL6 nmrsu 16
Article 4 – Compound 10
Chloroform
f1 (ppm)

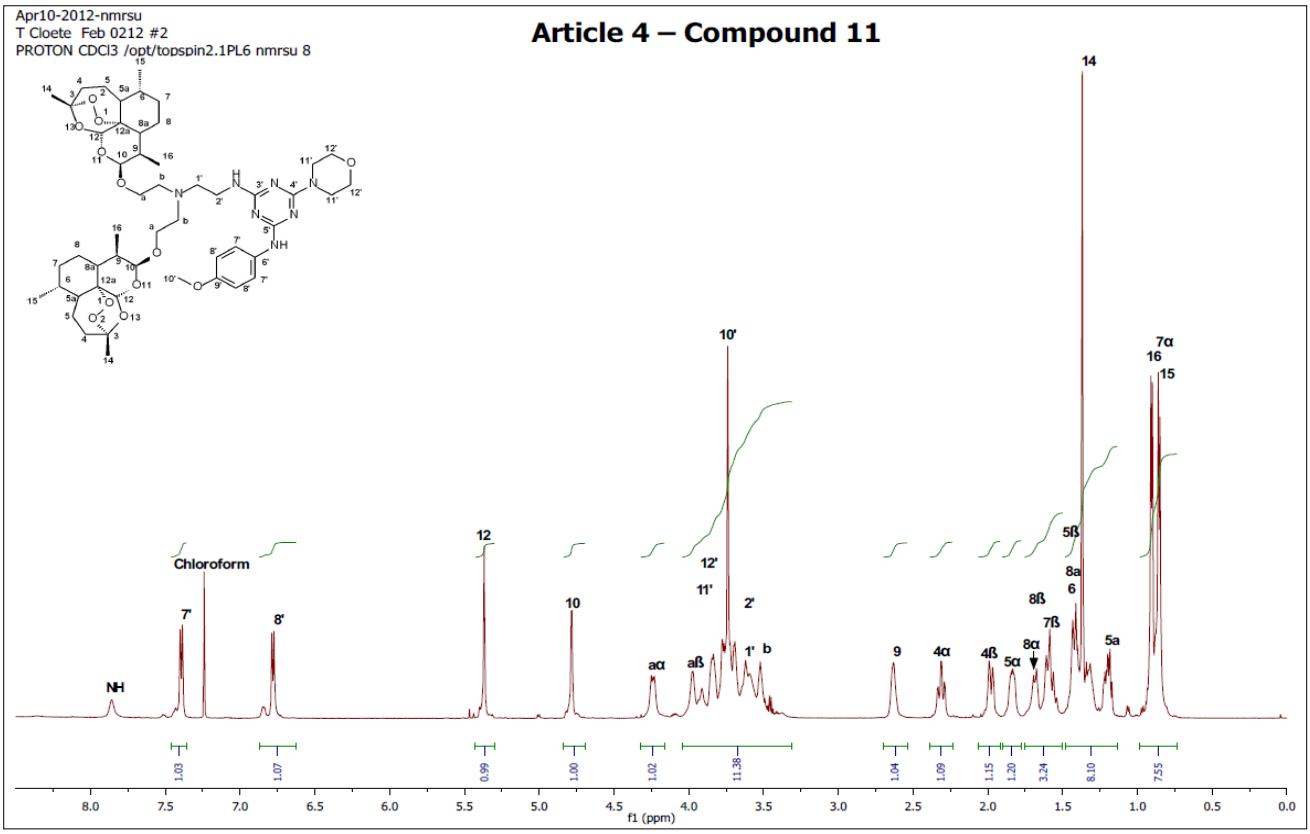

Apr19-2012-nmrsu
T Cloete Feb 0912 Deel 1 (Dim)
C13CPD CDCl3 /opt/topspin2.1PL6 nmrsu 16
Article 4 – Compound 10
Chloroform
f1 (ppm)

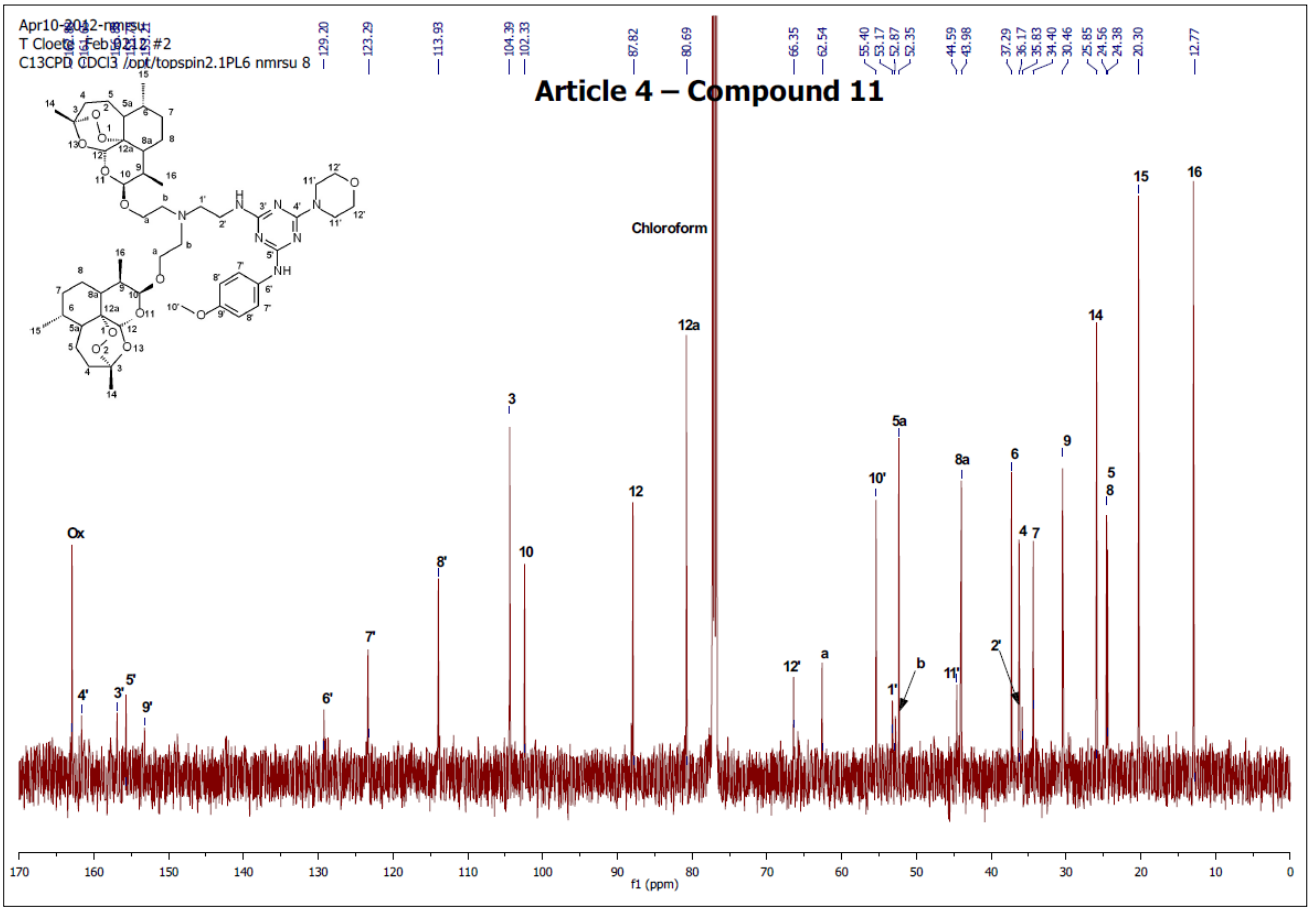

Apr19-2012-nmrsu
T Cloete Feb 0912 Deel 1 (Dim)
COSYGPSW CDCl3 /opt/topspin2.1PL6 nmrsu 16
Article 4 – Compound 10
{0.85,0.78} 7α
{0.94,0.95} 16
15
7α:8β
15:6
{0.88,1.35} 8a
8β
5β
6
5a
8α
7β
7α:7β
7'
8'
6:7β
{2.03,2.04} 5α
5α:5a
4β
5α:6
8α:7β
{2.36,2.36} 4α
4α:5β
{2.68,2.67} 9
{0.91,2.68} 4β:5β
4α;4β
9:8a
16:9
{3.56,3.56} b
13'
6'
2'
1'
aβ
aβ:b
6'
2';1'
{1.66,3.78} 6';7'
{4.27,4.30} aα
aα;aβ
aα;b
{4.83,4.83} 10
{2.67,4.82} 10;9
{5.39,5.41} 12
{6.83,6.81} 11'
{7.47,7.47} 10'
{6.82,7.47} 10';11'
Chloroform
f2 (ppm)
f1 (ppm)

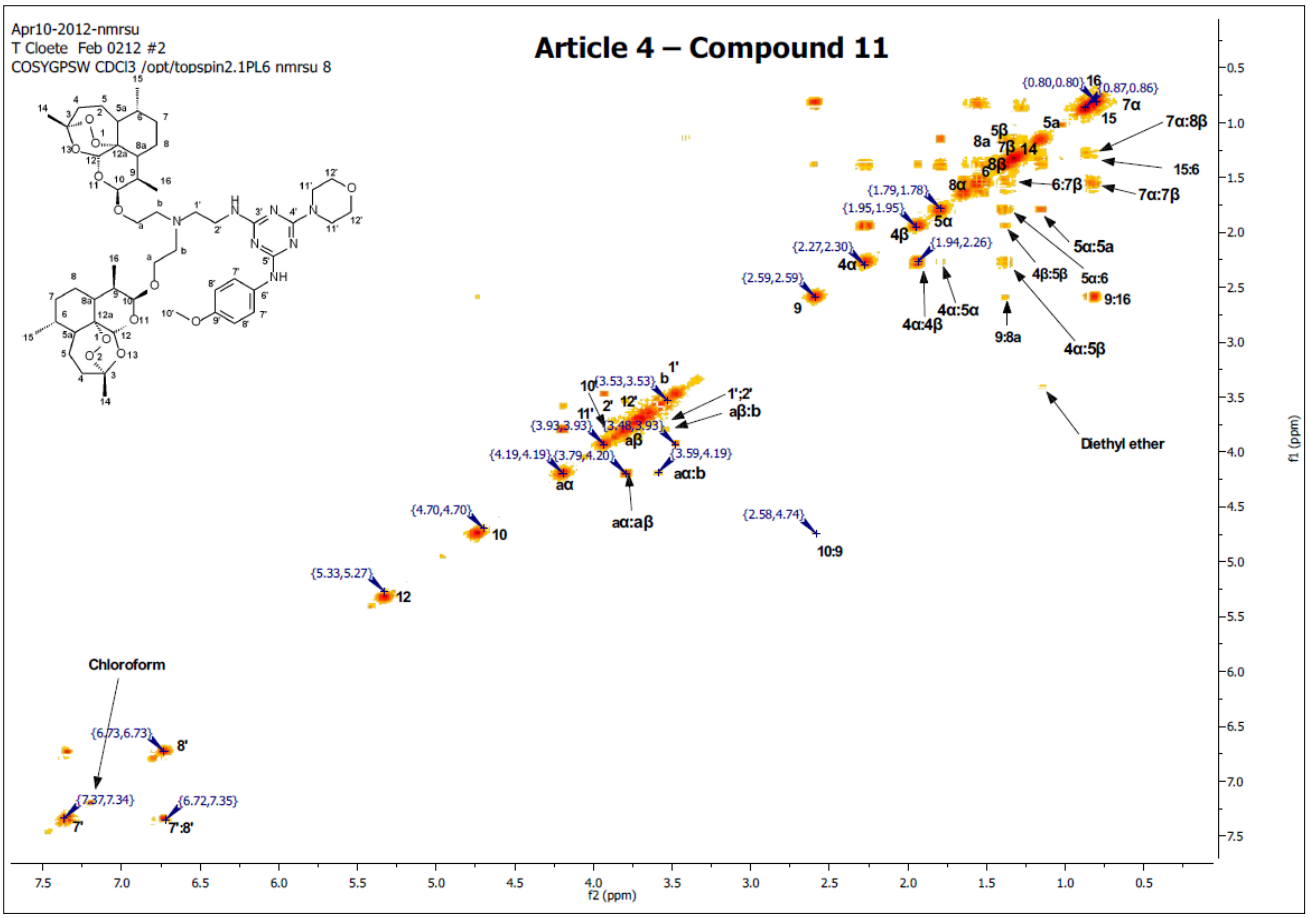

Apr19-2012-nmrsu
T Cloete Feb 0912 Deel 1 (Dim)
HSQCEDETGP CDCl3 /opt/topspin2.1PL6 nmrsu 16
Article 4 – Compound 10
{0.89,12.91} 16
8α
8β
{0.95,20.33} 15
{1.88,24.57}
5β
5α
8'
7'
14
{2.69,30.71} 9
{2.36,36.21} 4α
4β
{2.01,36.20} 7α
{0.92,34.52} 7β
{1.66,34.54}
6
{1.37,37.46}
{1.47,43.90} 8a
{1.24,52.49} 5a
{4.02,35.60} 2'
{3.80,45.61} 6'
{3.66,53.07} 1'
13'
b
{4.28,62.53} aα
{3.78,55.35}
{3.87,62.62} aβ
{5.40,87.90} 12
{4.82,102.54} 10
{6.81,113.94} 11'
{7.47,123.11} 10'
f2 (ppm)
f1 (ppm)

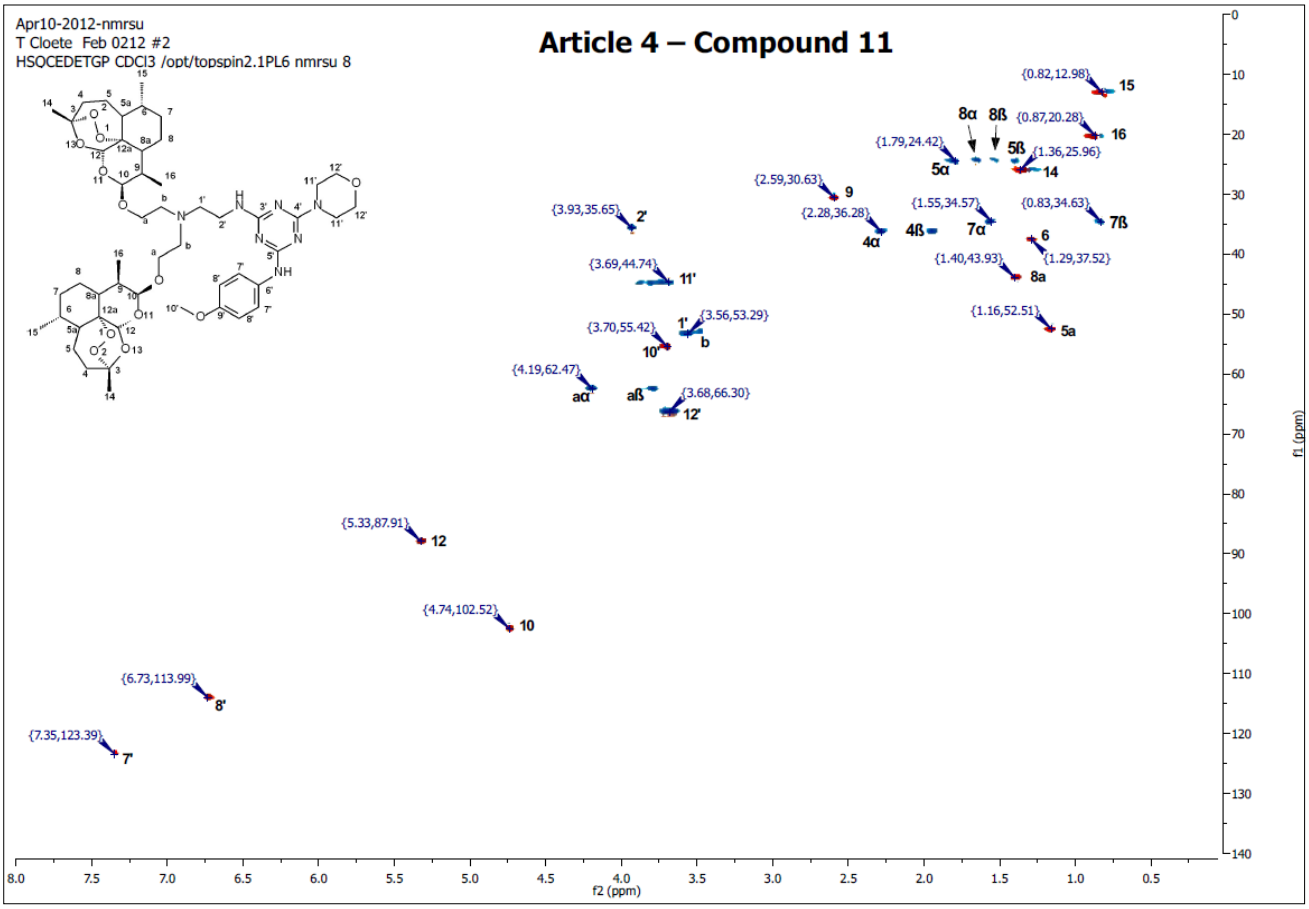


Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdb	e¯ Conf	N-Rule
964.5755	1	C 51 H 78 N 7 O 11	100.00	964.5754	-0.1	-0.1	2.0	16.5	even	ok


Apr10-2012-nmrsu
T Cloete Feb 0212 #2
PROTON CDCl3 /opt/topspin2.1PL6 nmrsu 8
Article 4 – Compound 11
Chloroform
NH
7'
8'
12
10
10'
12'
11'
2'
1' b
aα
aβ
9
4α
4β
5α
8α
8β
7β
5β
8a
6
5a
7α
16
15
14
1.03
1.07
0.99
1.00
1.02
11.38
1.04
1.09
1.15
1.20
3.24
8.10
7.55
f1 (ppm)


Apr10-2012-nmrsu
T Cloete Feb 0212 #2
C13CPD CDCl3 /opt/topspin2.1PL6 nmrsu 8
Article 4 – Compound 11
Chloroform
Ox
4'
3'
5'
9'
6'
7'
8'
3
10
12
12a
5a
10'
8a
6
9
14
5
8
4
7
15
16
12'
a
b
1'
11'
2'
f1 (ppm)


Apr10-2012-nmrsu
T Cloete Feb 0212 #2
COSYGPSW CDCl3 /opt/topspin2.1PL6 nmrsu 8
Article 4 – Compound 11
{0.80,0.80}
16
{0.87,0.86}
7α
15
7α:8β
5a
5β
8a
7β
14
15:6
8β
6:7β
8α
7α:7β
{1.79,1.78}
{1.95,1.95}
5α
4β
{2.27,2.30}
4α
{1.94,2.26}
5α:5a
4β:5β
5α:6
{2.59,2.59}
9
9:16
4α:4β
4α:5α
9:8a
4α:5β
Diethyl ether
{3.53,3.53}
b
1'
10
2'
12'
11'
1':2'
aβ:b
{3.93,3.93}
{3.48,3.93}
aβ
{4.19,4.19}
{3.79,4.20}
{3.59,4.19}
aα
aα:b
aα:aβ
{4.70,4.70}
10
{2.58,4.74}
10:9
{5.33,5.27}
12
Chloroform
{6.73,6.73}
8'
{7.37,7.34}
{6.72,7.35}
7'
7':8'
f2 (ppm)
f1 (ppm)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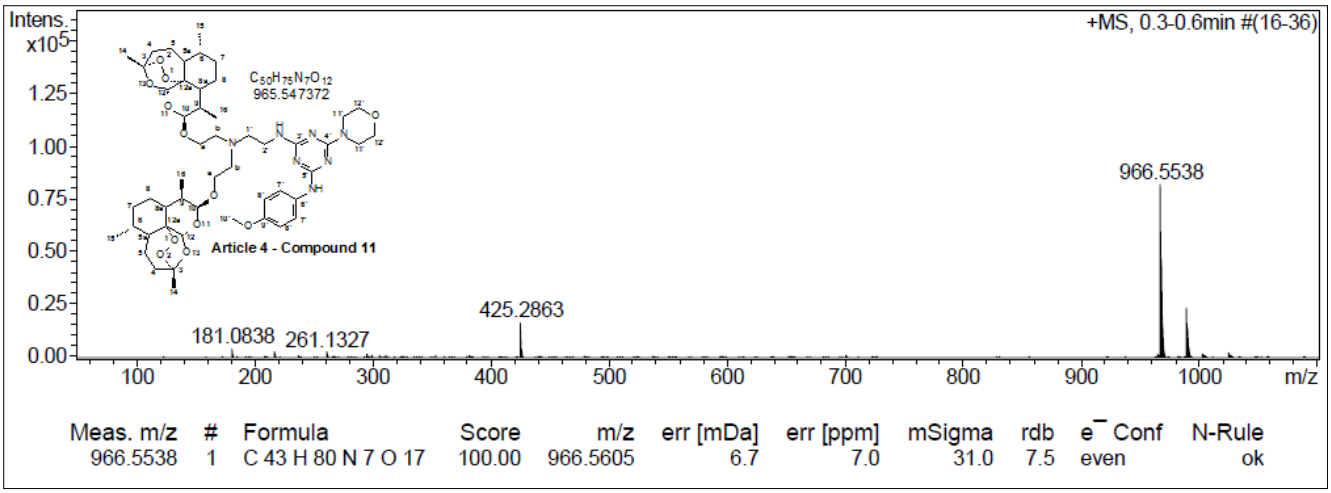
Article 4 – Compound 11
{0.82,12.98}
15
8α
8ß
{0.87,20.28}
16
{1.79,24.42}
5ß
{1.36,25.96}
5α
14
{2.59,30.63}
9
{2.28,36.28}
{1.55,34.57}
{0.83,34.63}
7ß
4ß
7α
4α
6
{1.40,43.93}
{1.29,37.52}
8a
{3.93,35.65}
2'
{1.16,52.51}
5a
{3.69,44.74}
11'
{3.70,55.42}
1'
{3.56,53.29}
b
10'
{4.19,62.47}
aα
aß
{3.68,66.30}
12'
{5.33,87.91}
12
{4.74,102.52}
10
{6.73,113.99}
8'
{7.35,123.39}
7'
f2 (ppm)
f1 (ppm)



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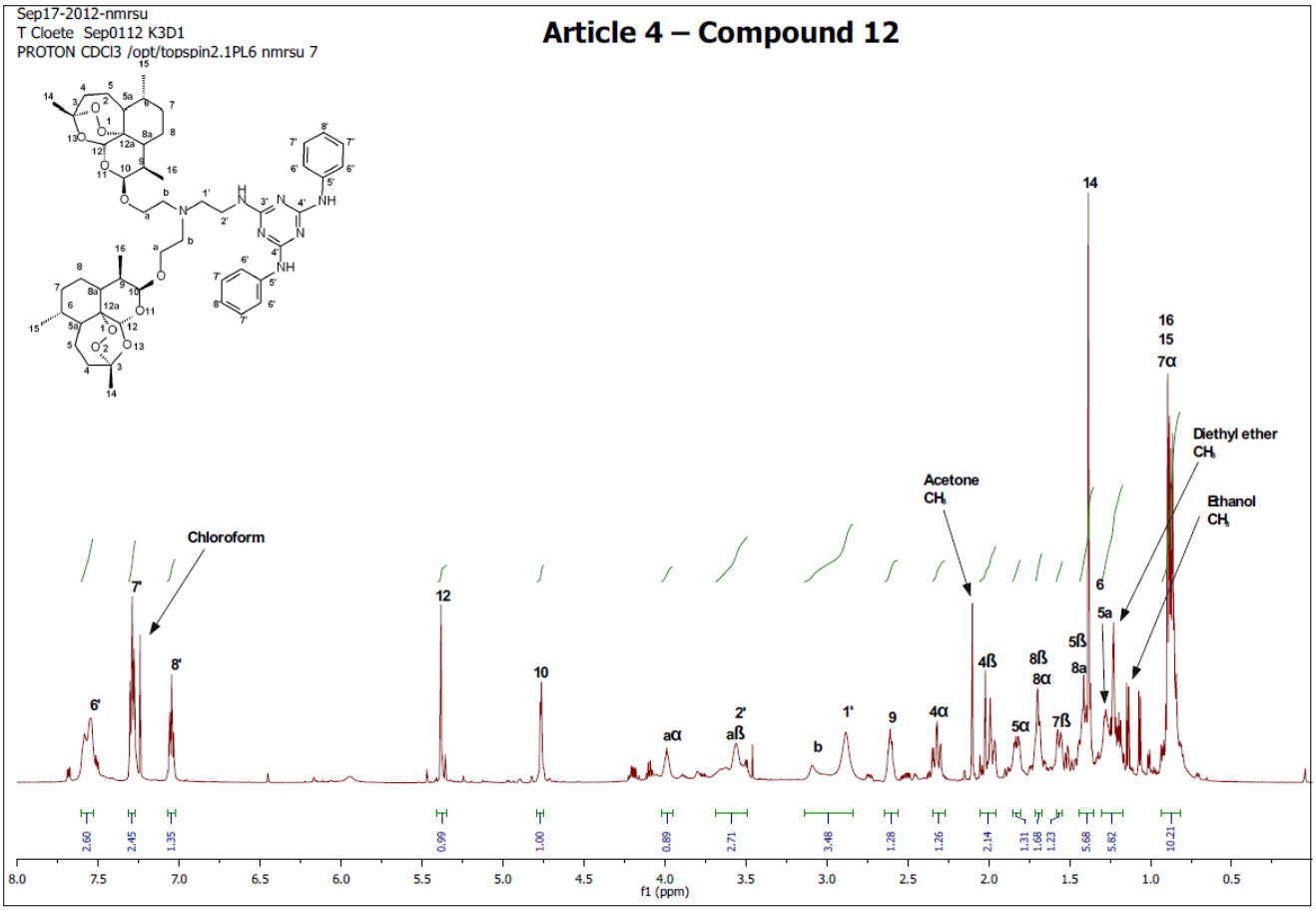
Sep17-2012-nmrsu
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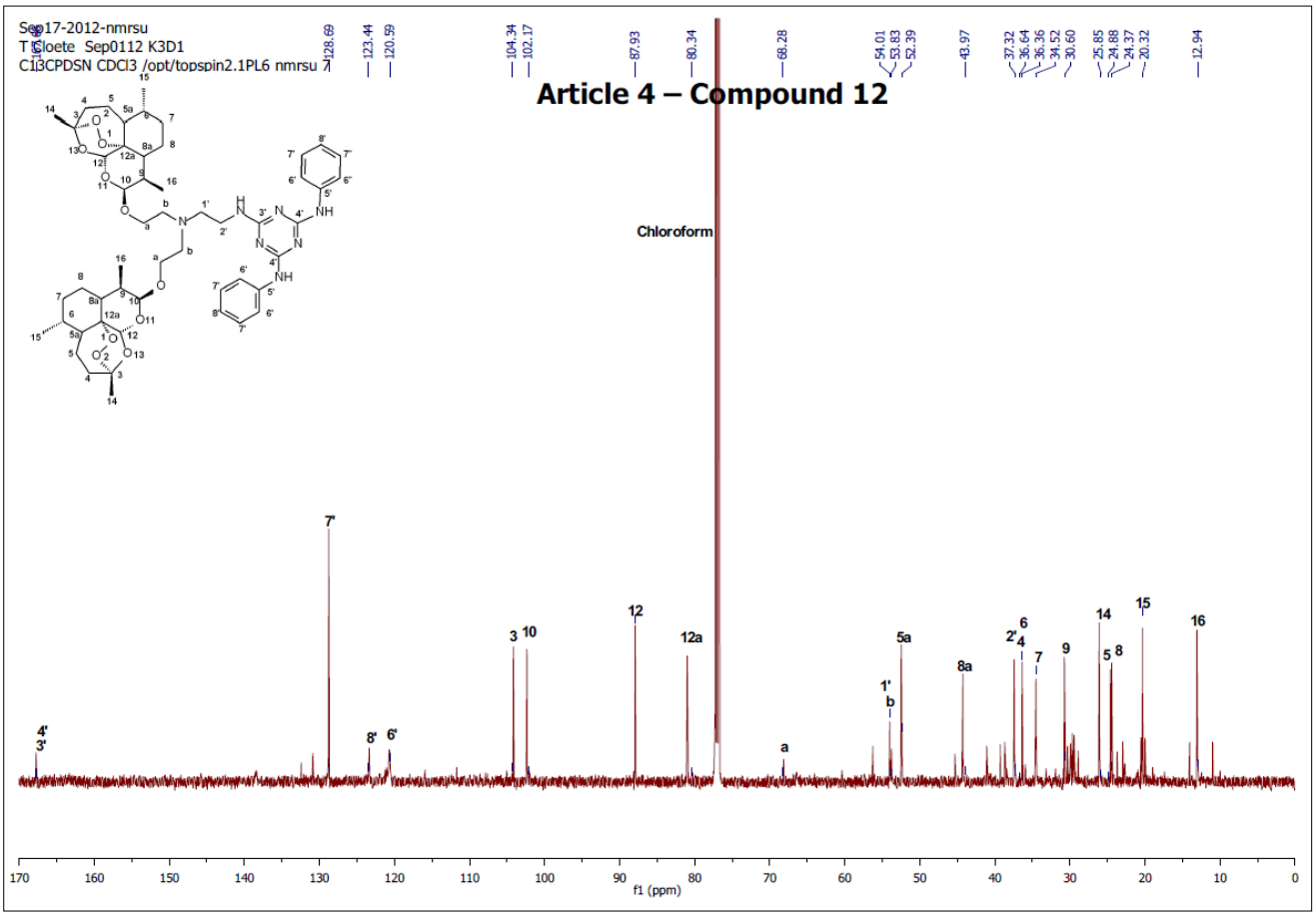
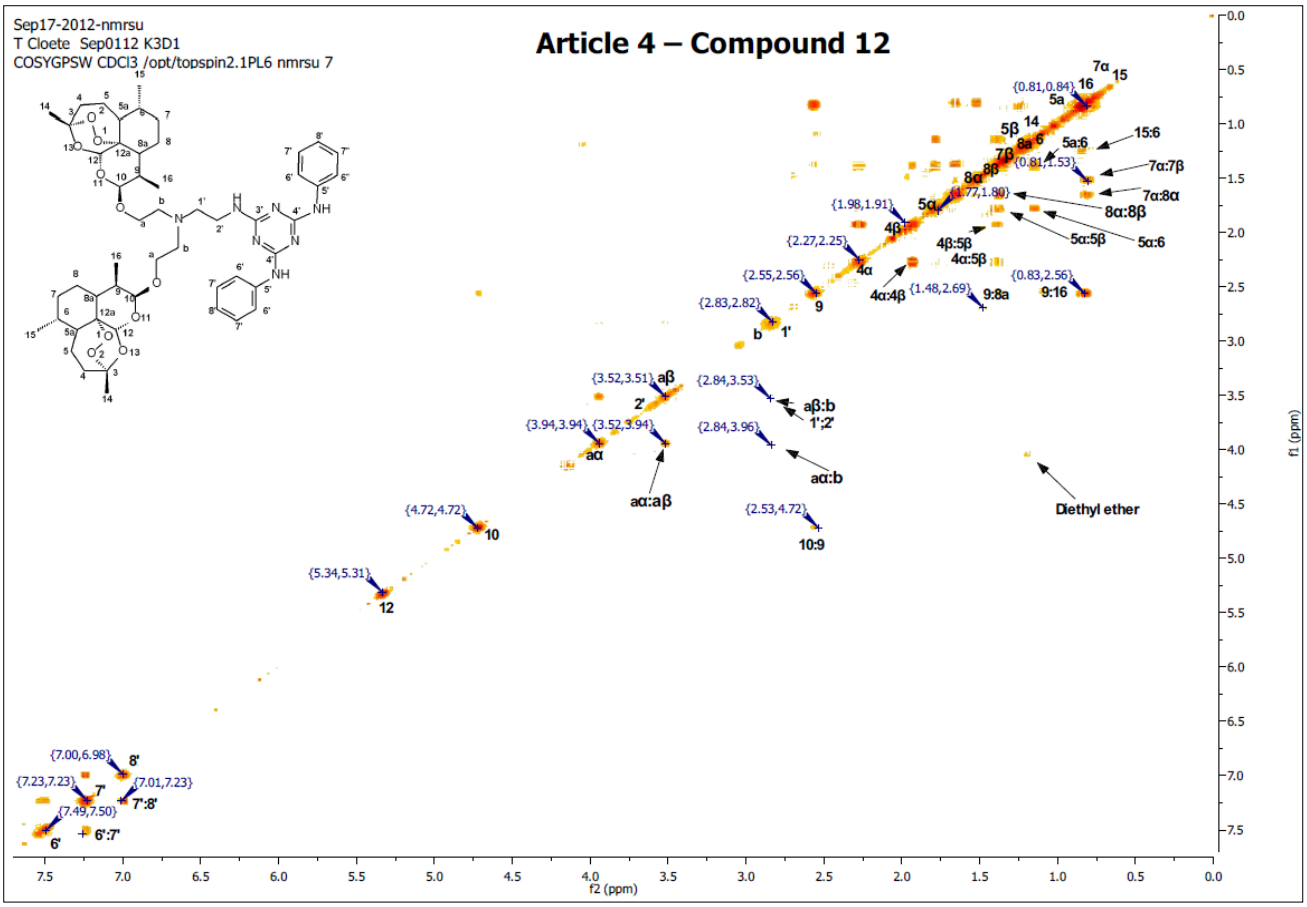
PROTON CDCl3 /opt/topspin2.1PL6 nmrsu 7
Article 4 – Compound 12
Chloroform
Acetone
CH3
Diethyl ether
CH3
Ethanol
CH3
f1 (ppm)


Sep17-2012-nmrsu
T Cloete Sep0112 K3D1
C13CPDSN CDCl3 /opt/topspin2.1PL6 nmrsu 7
Article 4 – Compound 12
Chloroform
f1 (ppm)


Sep17-2012-nmrsu
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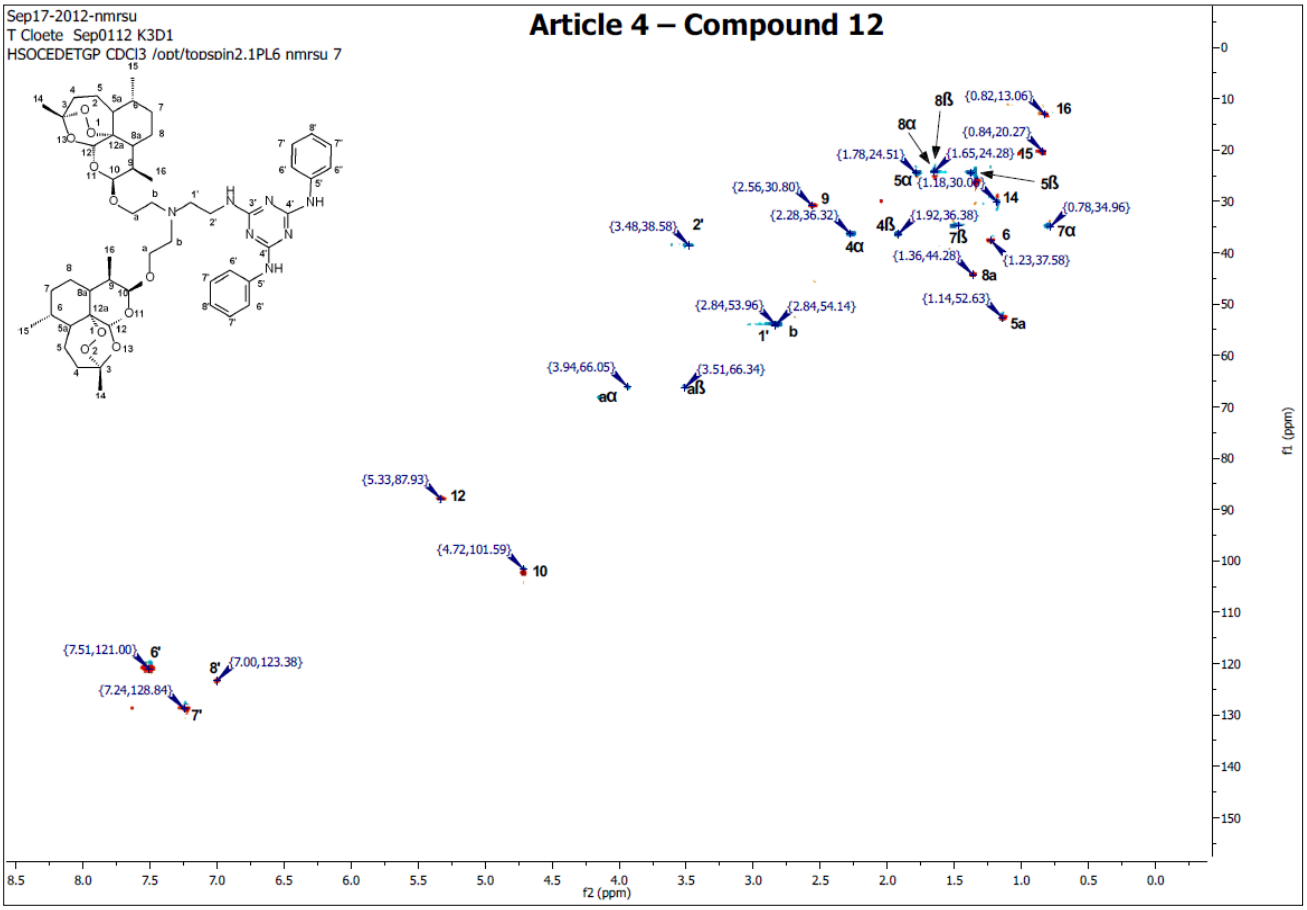
COSYGPSW CDCl3 /opt/topspin2.1PL6 nmrsu 7
Article 4 – Compound 12
Diethyl ether
f2 (ppm)
f1 (ppm)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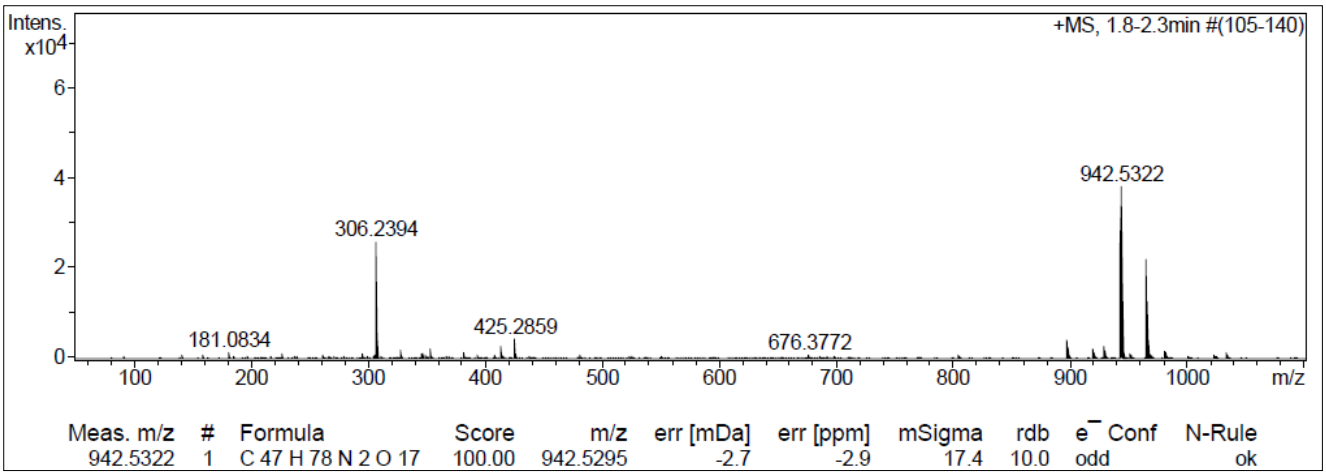
HSOCEDETGP CDCl3 /opt/topspin2.1PL6 nmrsu 7
Article 4 – Compound 12
f2 (ppm)
f1 (ppm)



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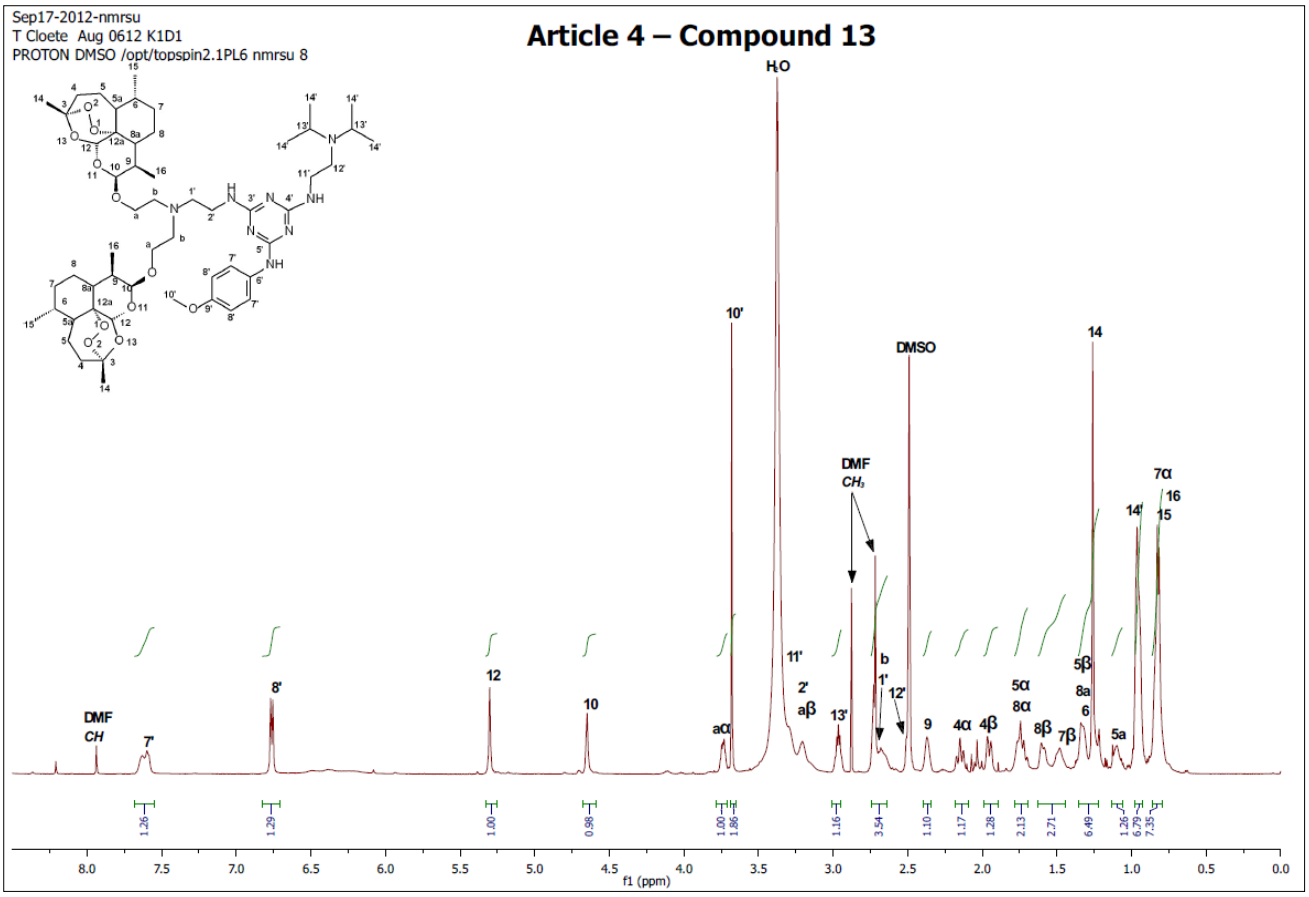
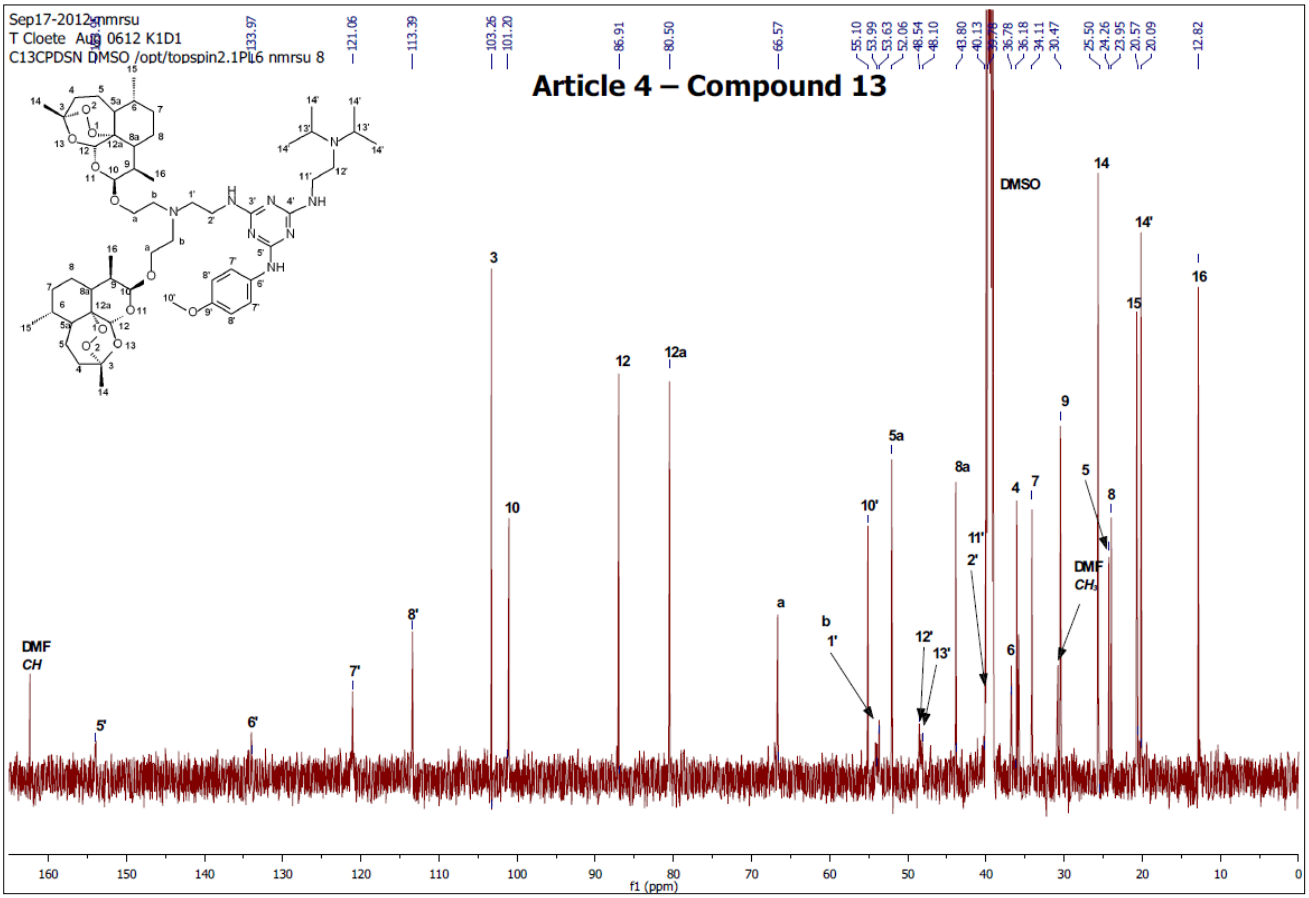
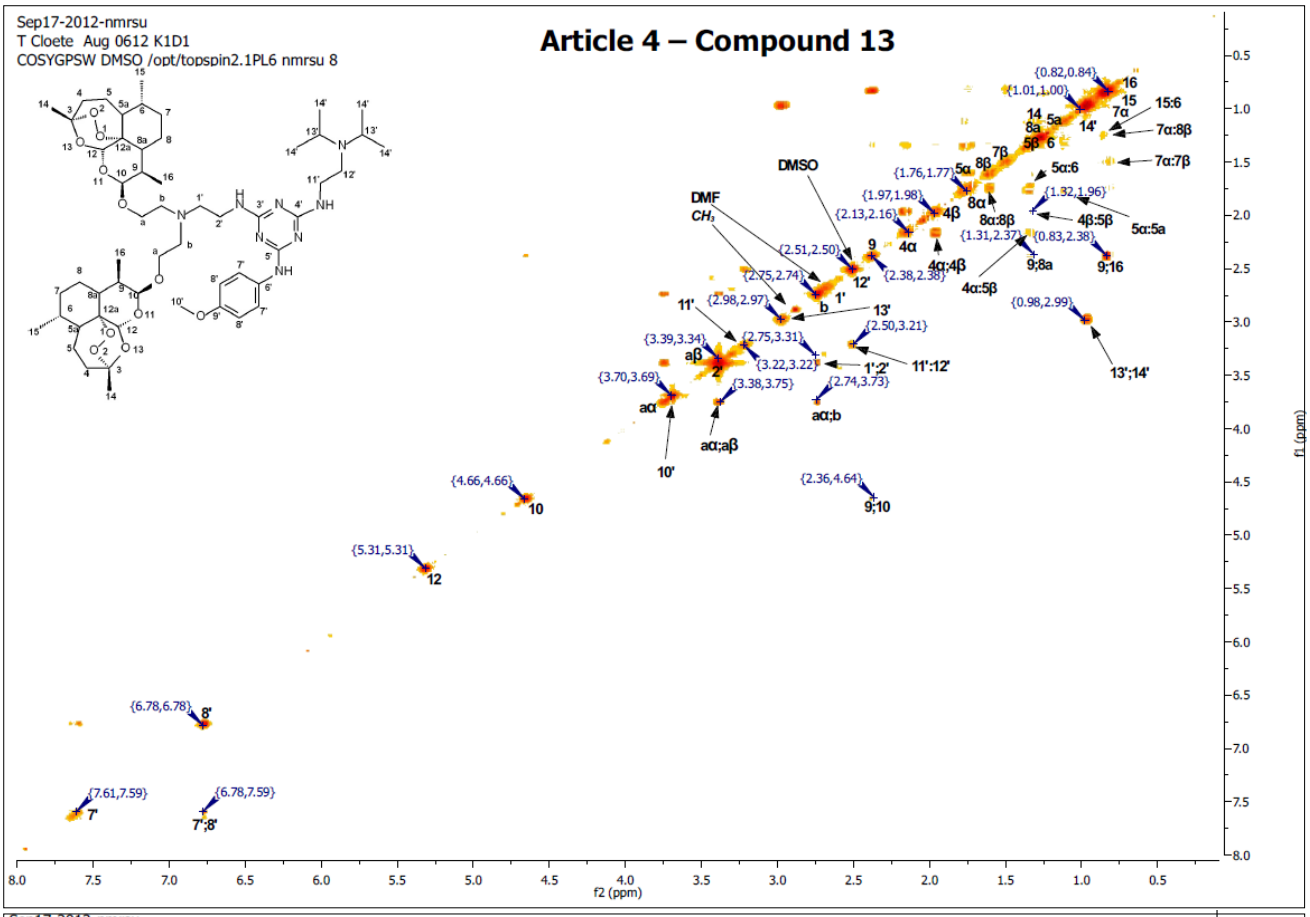

Sep17-2012-nmrsu
T Cloete Aug 0612 K1D1
PROTON DMSO /opt/topspin2.1PL6 nmrsu 8
Article 4 – Compound 13
H2O
DMSO
DMF
CH3
DMF
CH
f1 (ppm)


Sep17-2012-nmrsu
T Cloete Aug 0612 K1D1
C13CPDSN DMSO /opt/topspin2.1PL6 nmrsu 8
Article 4 – Compound 13
DMSO
DMF
CH2
DMF
CH
f1 (ppm)


Sep17-2012-nmrsu
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COSYGPSW DMSO /opt/topspin2.1PL6 nmrsu 8
Article 4 – Compound 13
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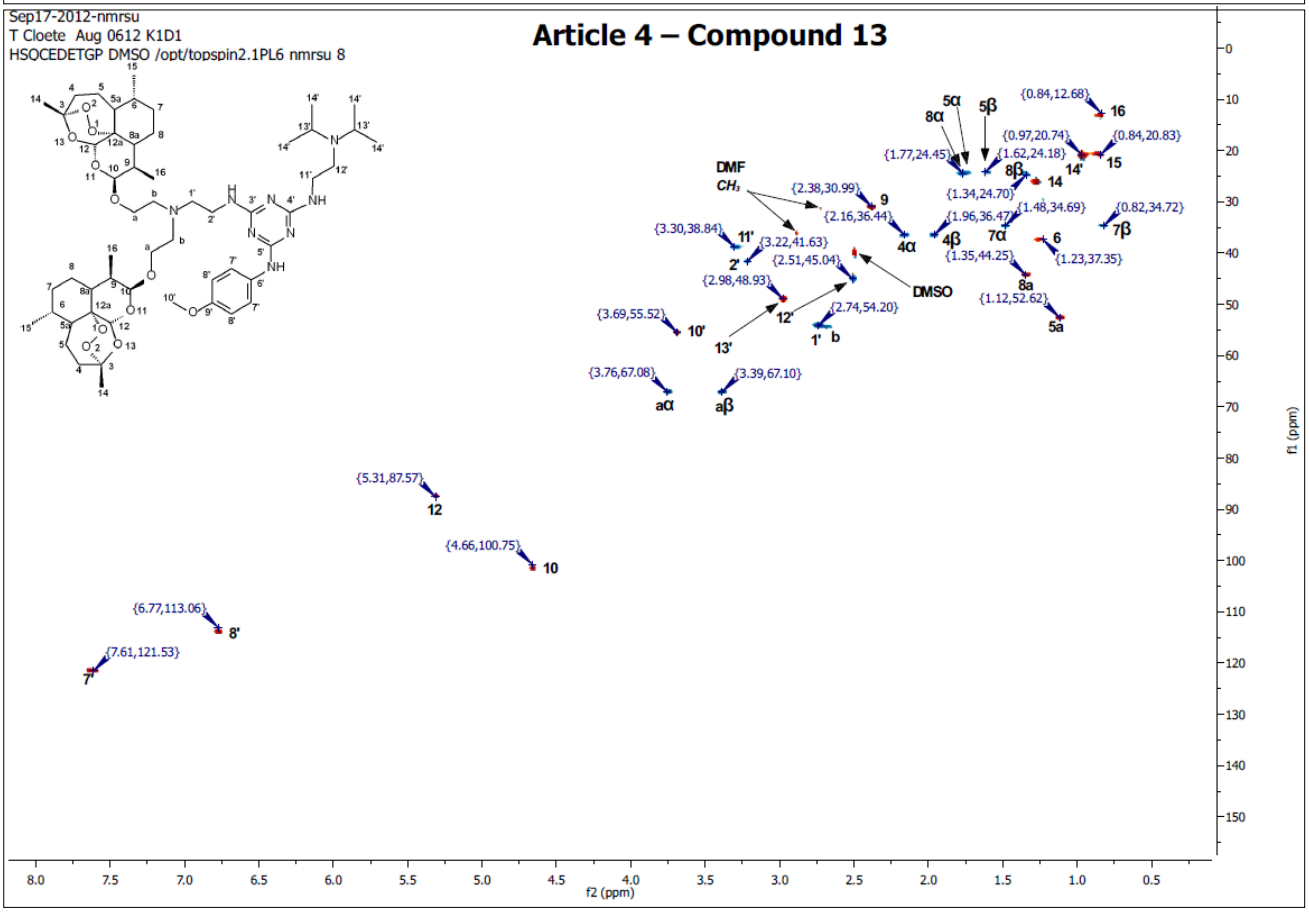
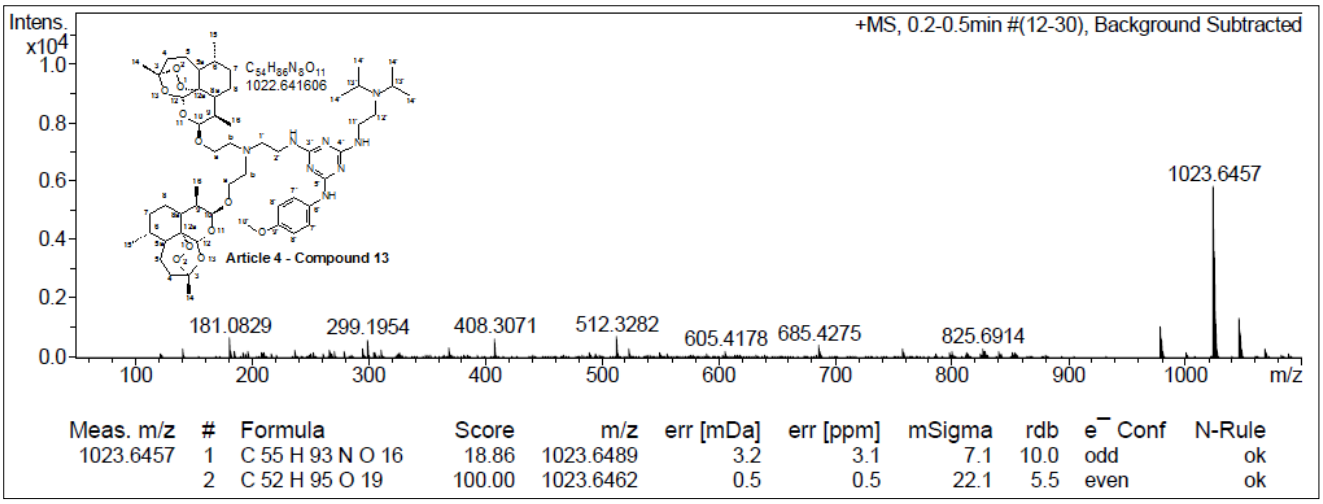
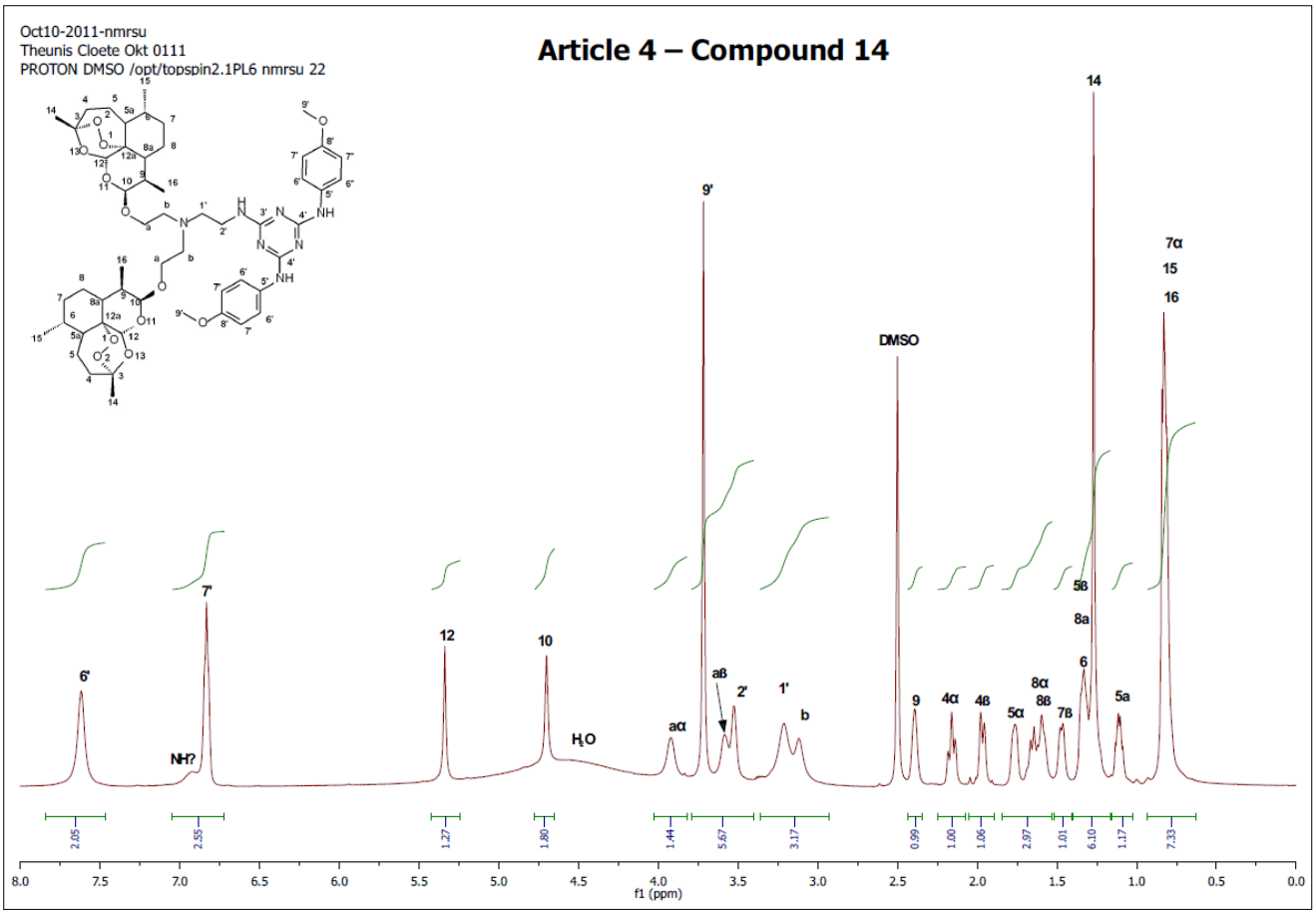
DMF
CH3
{0.82,0.84}
{1.01,1.00}
{1.76,1.77}
{1.97,1.98}
{2.13,2.16}
{2.51,2.50}
{2.75,2.74}
{2.98,2.97}
{3.39,3.34}
{3.70,3.69}
{3.38,3.75}
{2.75,3.31}
{3.22,3.22}
{2.50,3.21}
{2.74,3.73}
{1.32,1.96}
{1.31,2.37}
{0.83,2.38}
{2.38,2.38}
{0.98,2.99}
{2.36,4.64}
{4.66,4.66}
{5.31,5.31}
{6.78,6.78}
{7.61,7.59}
{6.78,7.59}
f2 (ppm)
f1 (ppm)


Sep17-2012-nmrsu
T Cloete Aug 0612 K1D1
HSQCEDETGP DMSO /opt/topspin2.1PL6 nmrsu 8
Article 4 – Compound 13
DMF
CH3
DMSO
{0.84,12.68}
{0.97,20.74}
{0.84,20.83}
{1.77,24.45}
{1.62,24.18}
{1.34,24.70}
{2.38,30.99}
{2.16,36.44}
{1.96,36.47}
{1.48,34.69}
{0.82,34.72}
{3.30,38.84}
{3.22,41.63}
{2.51,45.04}
{1.35,44.25}
{1.23,37.35}
{2.98,48.93}
{1.12,52.62}
{3.69,55.52}
{2.74,54.20}
{3.76,67.08}
{3.39,67.10}
{5.31,87.57}
{4.66,100.75}
{6.77,113.06}
{7.61,121.53}
f2 (ppm)
f1 (ppm)



Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdb	e⁻ Conf	N-Rule
1023.6457	1	C 55 H 93 N O 16	18.86	1023.6489	3.2	3.1	7.1	10.0	odd	ok
	2	C 52 H 95 O 19	100.00	1023.6462	0.5	0.5	22.1	5.5	even	ok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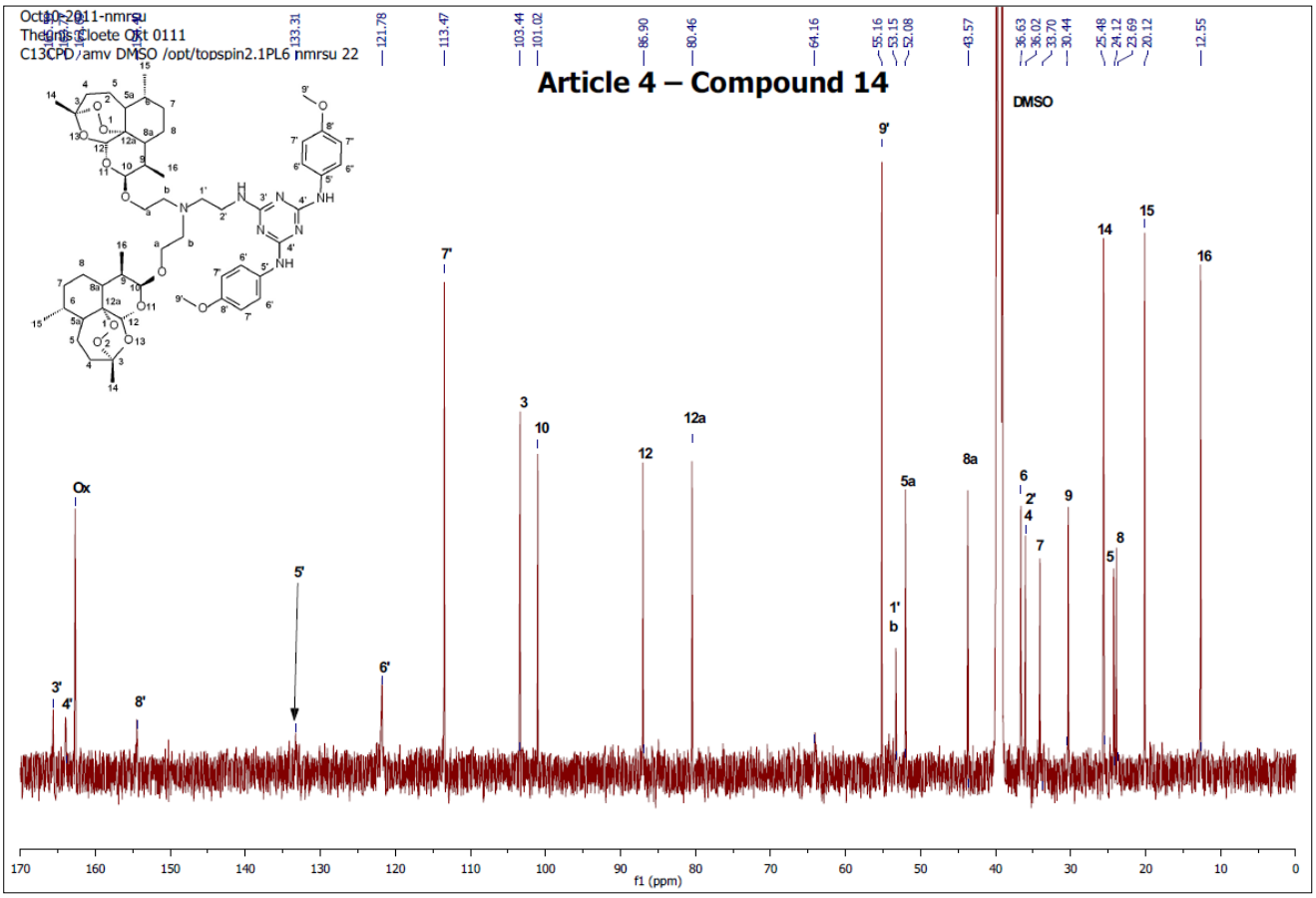
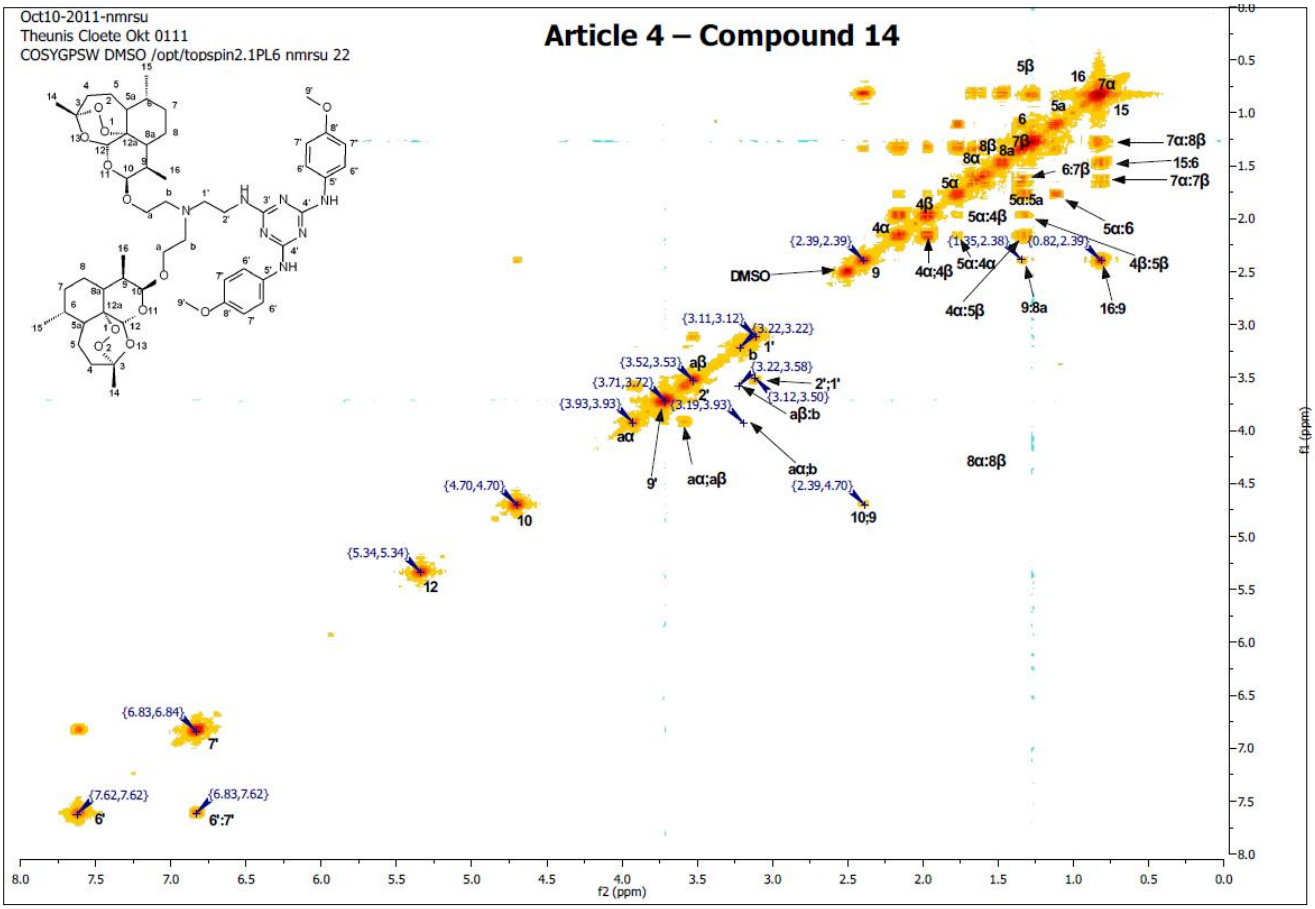
PROTON DMSO /opt/topspin2.1PL6 nmrsu 22
Article 4 – Compound 14
DMSO
H2O
NH?
f1 (ppm)


Oct10-2011-nmrsu
Theunis Cloete Okt 0111
C13CPD /amv DMSO /opt/topspin2.1PL6 nmrsu 22
Article 4 – Compound 14
DMSO
f1 (ppm)


Oct10-2011-nmrsu
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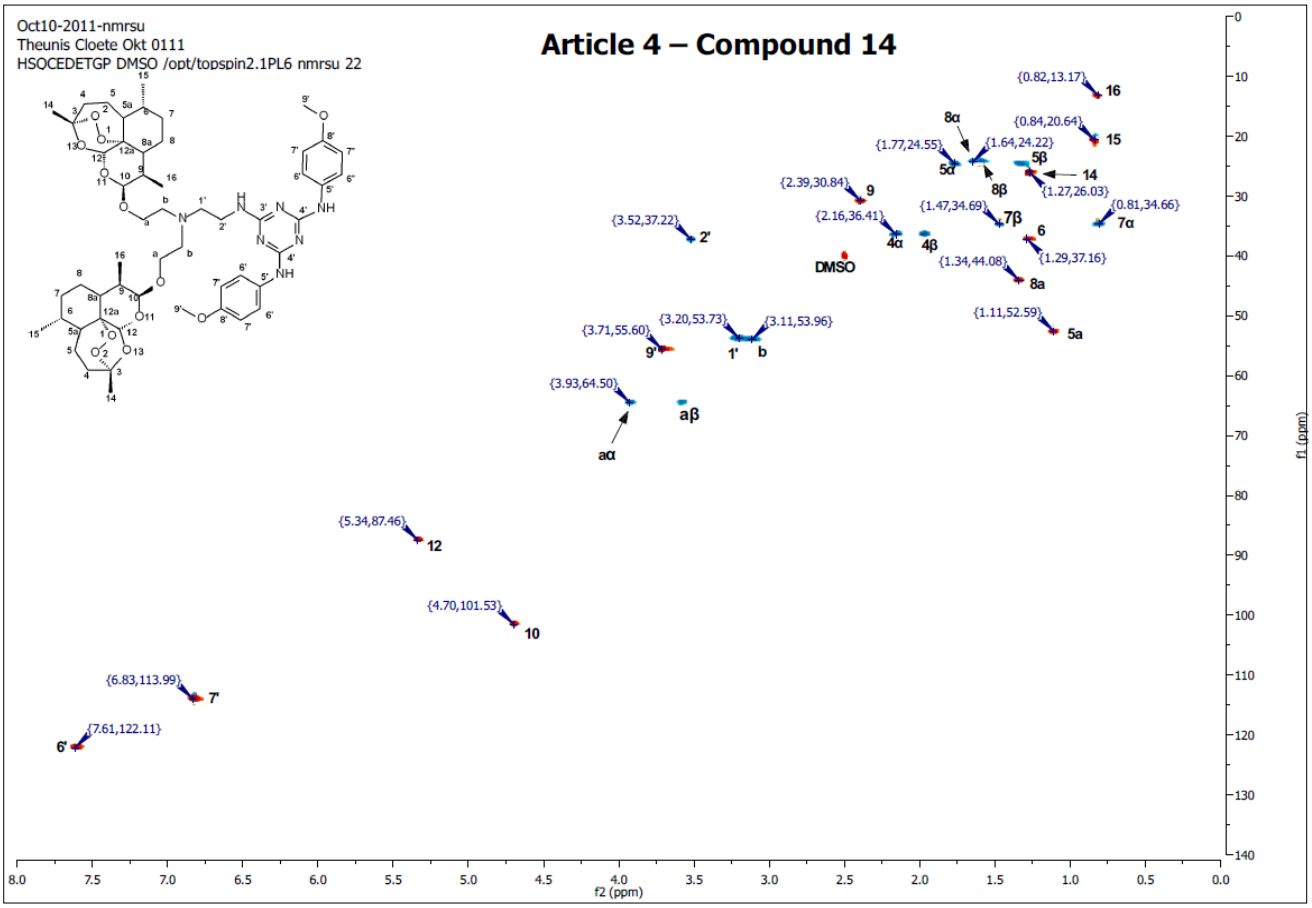
Article 4 – Compound 14
DMSO
f2 (ppm)
f1 (ppm)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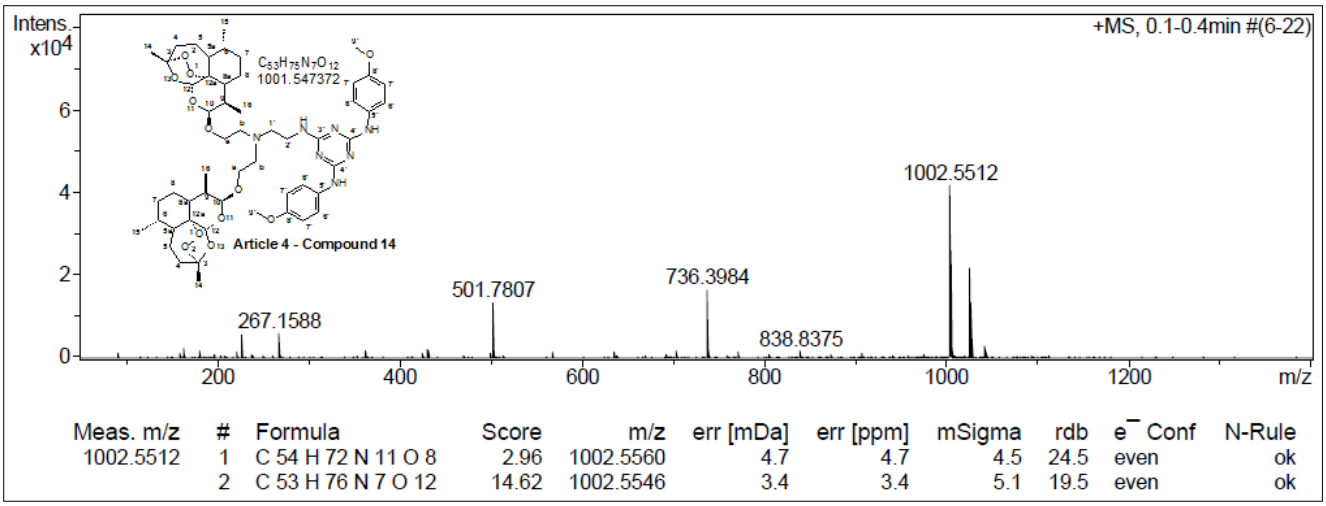
Article 4 – Compound 14
DMSO
f2 (ppm)
f1 (ppm)



Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdb	e⁻ Conf	N-Rule
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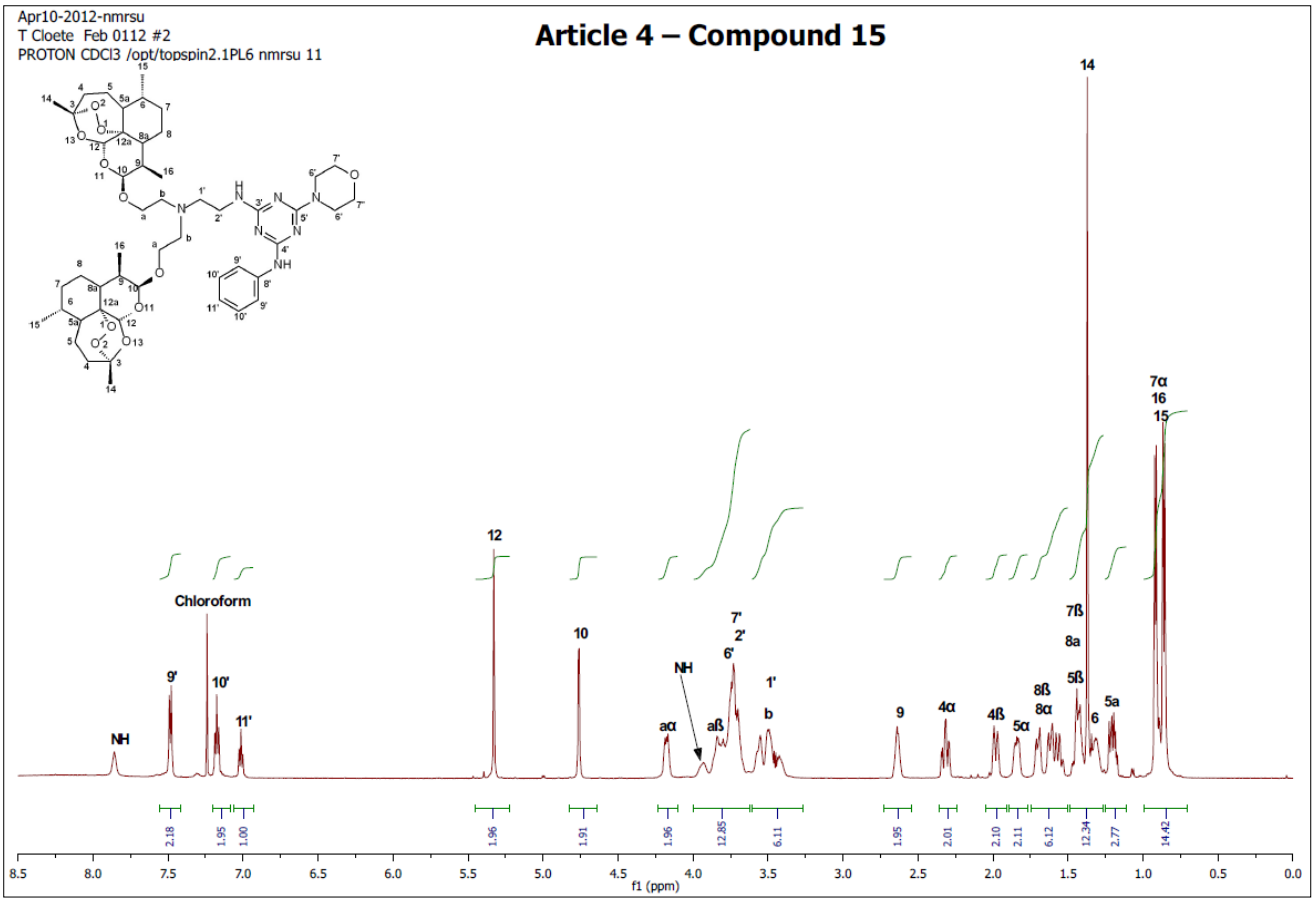
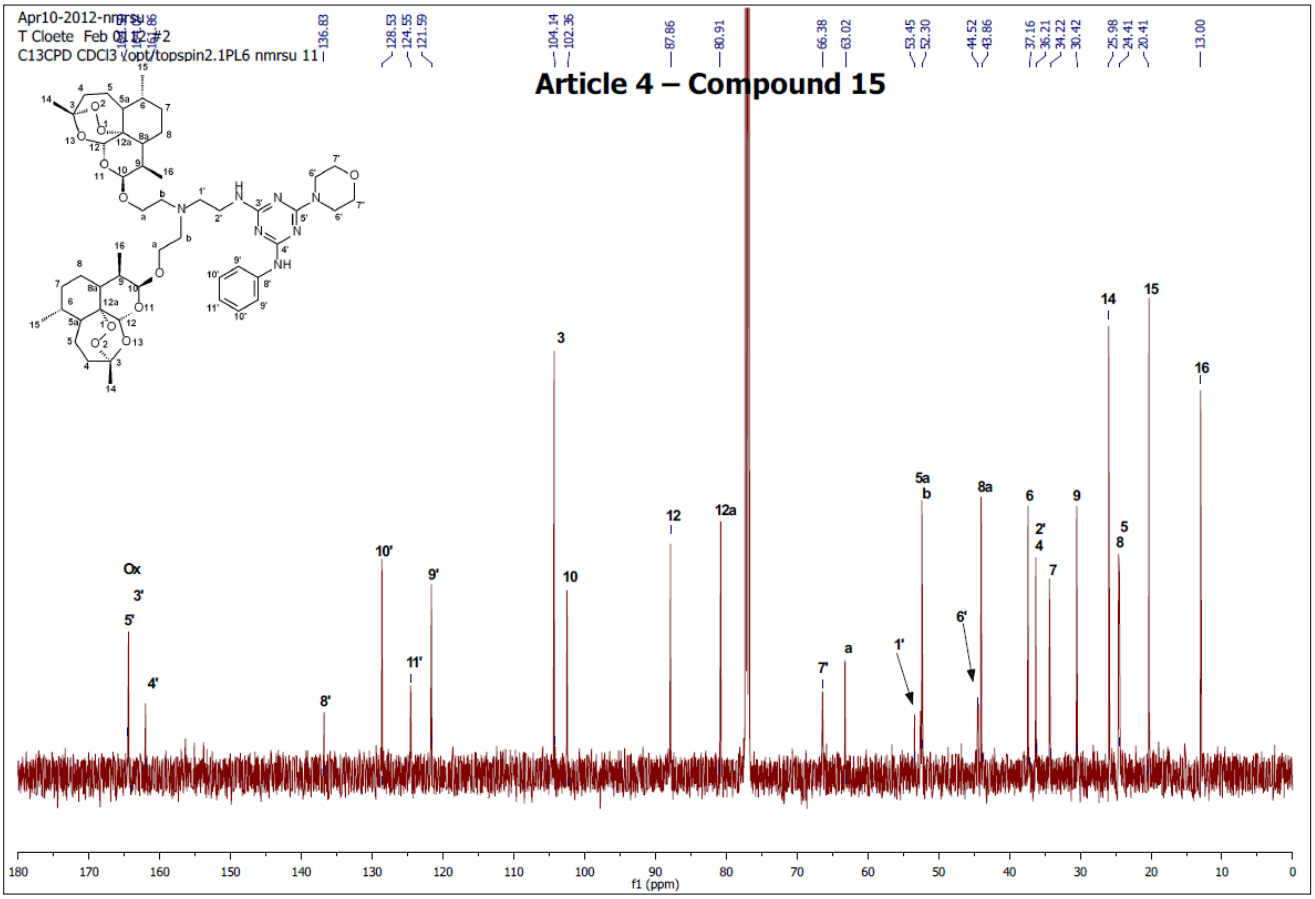

Apr10-2012-nmrsu
T Cloete Feb 0112 #2
PROTON CDCl3 /opt/topspin2.1PL6 nmrsu 11
Article 4 – Compound 15
Chloroform
NH
9'
10'
11'
12
10
aα
aß
NH
7'
2'
6'
1'
b
9
4α
4ß
5α
8ß
8α
5ß
6
5a
7ß
8a
7α
16
15
14
f1 (ppm)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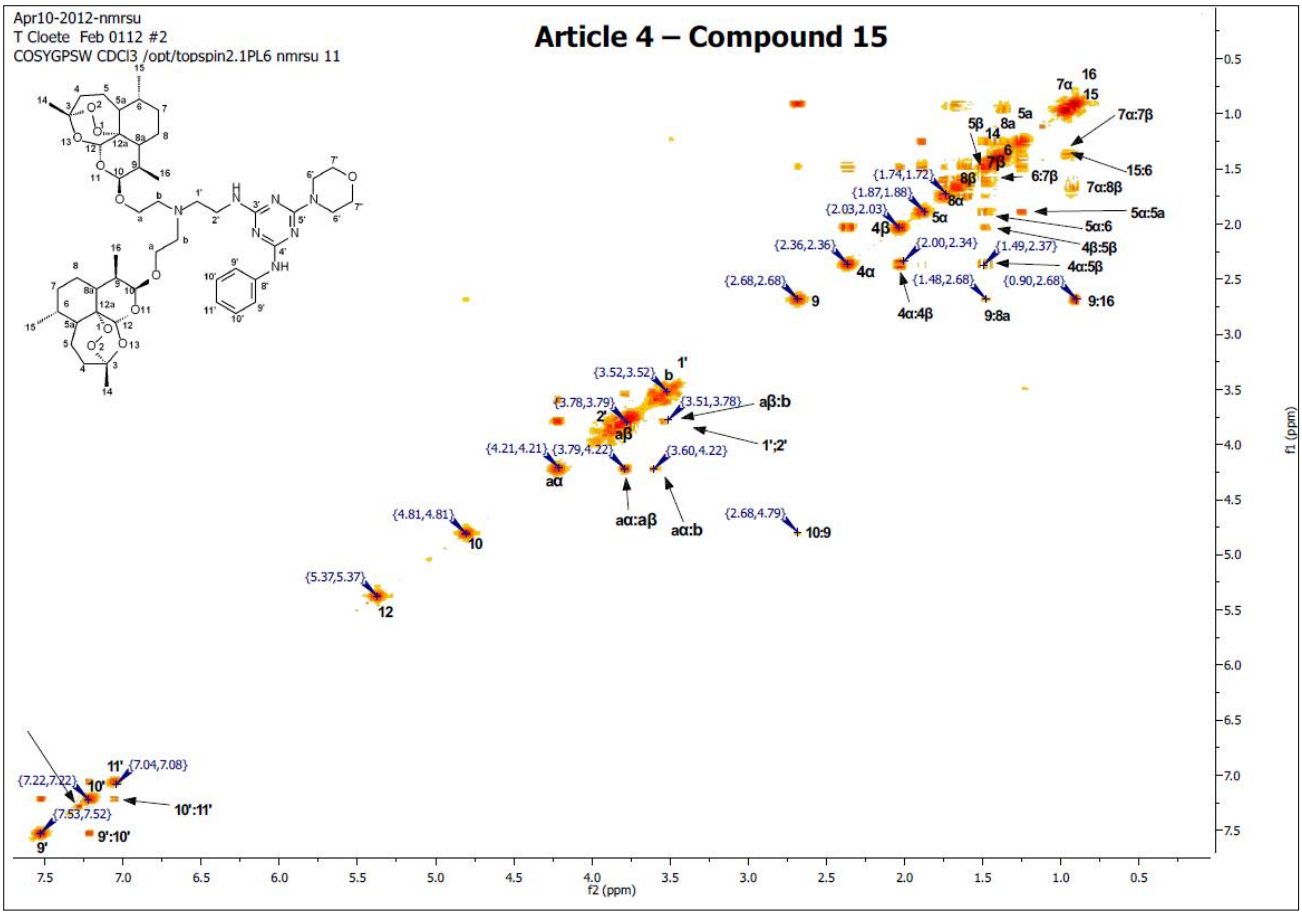
Article 4 – Compound 15
Ox
3'
5'
4'
8'
10'
11'
9'
3
10
12
12a
7'
a
1'
6'
5a
b
8a
6
2'
4
9
14
5
8
7
15
16
f1 (ppm)


Apr10-2012-nmrsu
T Cloete Feb 0112 #2
COSYGPSW CDCl3 /opt/topspin2.1PL6 nmrsu 11
Article 4 – Compound 15
{3.52,3.52}
b
1'
{3.78,3.79}
2'
{3.51,3.78}
aβ:b
aβ
1';2'
{4.21,4.21}
{3.79,4.22}
{3.60,4.22}
aα
aα:aβ
aα:b
{4.81,4.81}
10
{5.37,5.37}
12
{2.68,4.79}
10:9
{2.68,2.68}
9
{2.36,2.36}
4α
{2.03,2.03}
4β
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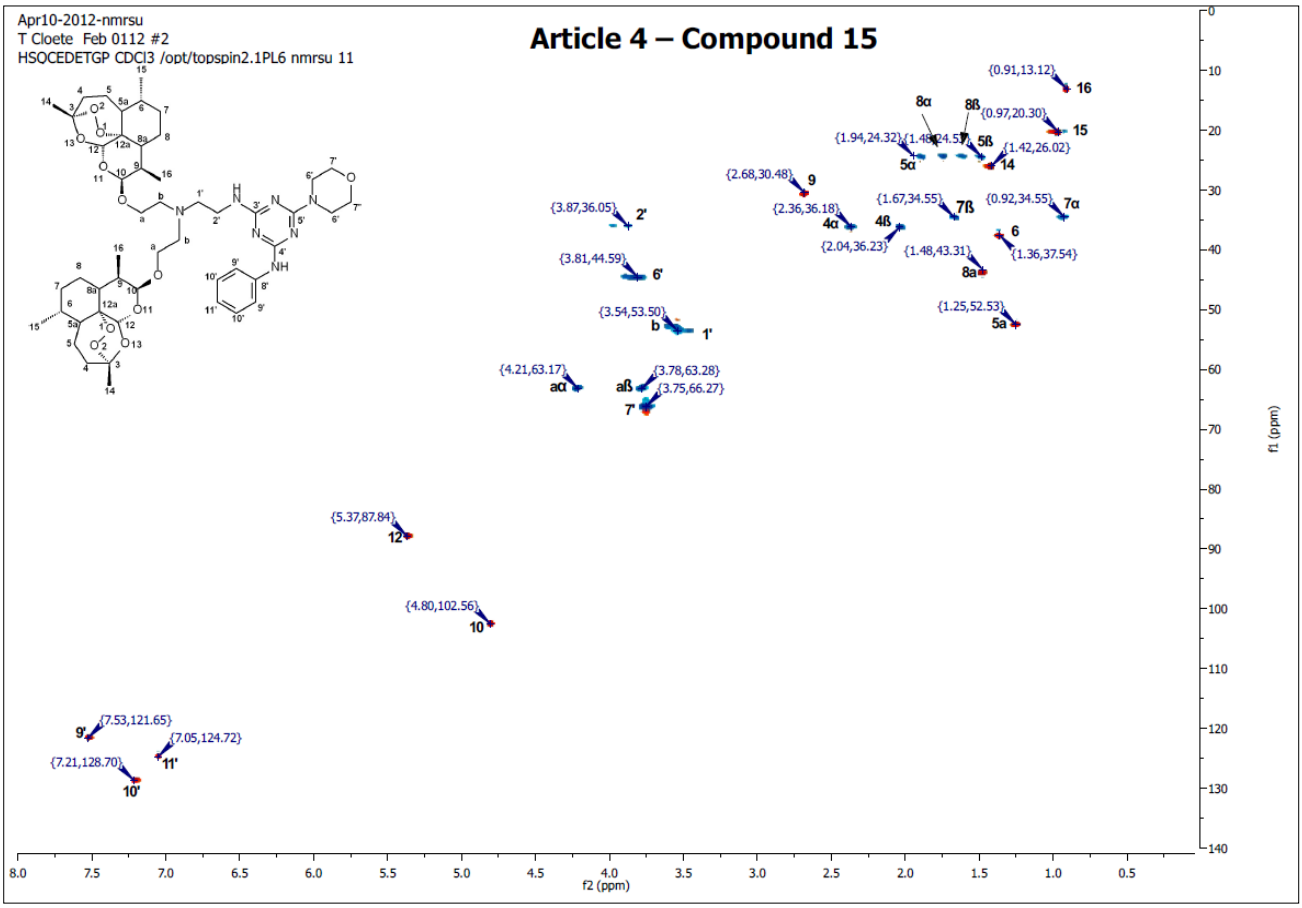
5α
{1.74,1.72}
8β
8α
{2.00,2.34}
{1.49,2.37}
{1.48,2.68}
4α:4β
9:8a
{0.90,2.68}
9:16
4α:5β
5α:6
5α:5a
6:7β
7α:8β
15:6
7α:7β
7α
16
15
5β
5a
8a
14
6
7β
{7.22,7.22}
11'
{7.04,7.08}
10'
{7.53,7.52}
10':11'
9'
9':10'
f2 (ppm)
f1 (ppm)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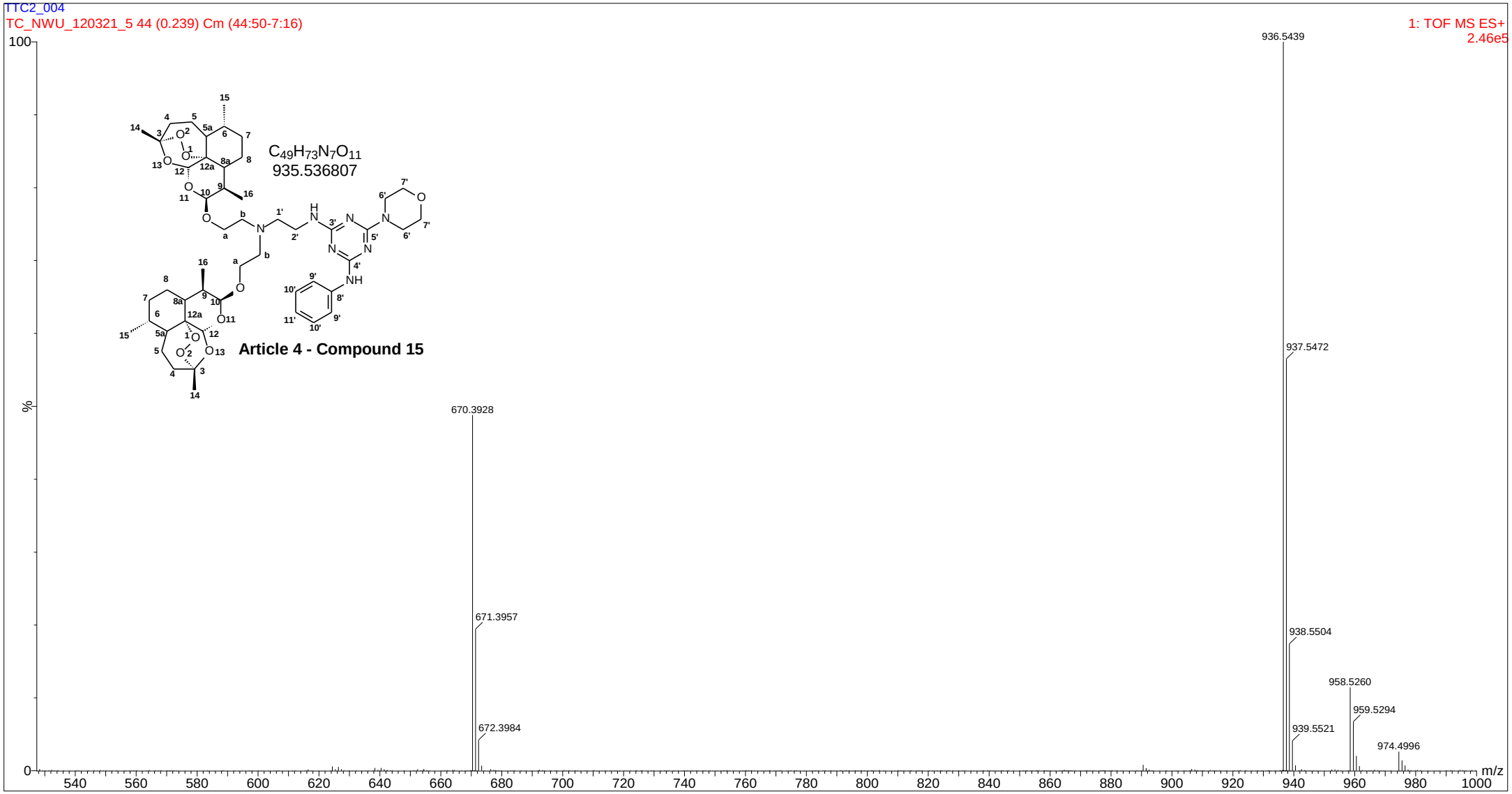
Article 4 – Compound 15
{0.91,13.12}
16
8α
8ß
{0.97,20.30}
15
{1.94,24.32}
{1.48,24.57}
5ß
{1.42,26.02}
5α
14
{2.68,30.48}
9
{3.87,36.05}
2'
{2.36,36.18}
4α
{1.67,34.55}
7ß
{0.92,34.55}
7α
4ß
6
{2.04,36.23}
{1.48,43.31}
{1.36,37.54}
8a
{3.81,44.59}
6'
{1.25,52.53}
5a
{3.54,53.50}
b
1'
{4.21,63.17}
aα
aß
{3.78,63.28}
{3.75,66.27}
7'
{5.37,87.84}
12
{4.80,102.56}
10
{7.53,121.65}
9'
{7.05,124.72}
{7.21,128.70}
11'
10'
f2 (ppm)
f1 (ppm)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100
%
0
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937.5472
670.3928
671.3957
938.5504
672.3984
958.5260
959.5294
939.5521
974.4996
540
560
580
600
620
640
660
680
700
720
740
760
780
800
820
840
860
880
900
920
940
960
980
1000
m/z
C49H73N7O11
935.536807
Article 4 - Compound 15

Annexure D

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journal homepage: www.elsevier.com/locate/bmc

Synthesis, antimalarial activity and cytotoxicity of 10-aminoethylether derivatives of artemisinin

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Malaria

ABSTRACT

In this study, a series of 11 10-aminoethylether derivatives of artemisinin were synthesised and their antimalarial activity against both the chloroquine sensitive (D10) and resistant (Dd2) strains of *Plasmodium falciparum* was determined. The compounds were prepared by introducing aliphatic, alicyclic and aromatic amine groups with linkers of various chain lengths through an ethyl ether bridge at C-10 of artemisinin using conventional and microwave assisted syntheses, and their structures were confirmed by NMR and HRMS. All derivatives proved to be active against both strains of the parasite. The highest overall activity was displayed by the short chain aromatic derivative 8 (IC_{50} = 1.44 nM), containing only one nitrogen atom, while long chain polyamine derivatives were found to have the lowest activity against both strains. An interesting correlation between the IC_{50}, pK_a values and resistance index (RI) was found.

1. Introduction

Malaria is a protozoan infection transmitted to humans by the bite of an infected female anopheline mosquito. It is estimated that malaria kills about 655,000 people each year, 91% of whom are living in Africa and, most of them children under the age of 5 years.[1]

An increase in resistance against most of the drugs currently used against malaria has led to the dramatic increase in the global death toll. Chloroquine (CQ) and other synthetic quinoline compounds has been the mainstay of malaria chemotherapy for five decades, but resistance against these and the antifolate antimalarials have spread rapidly making these drugs obsolete in most of the areas afflicted by this disease.[2,3]

The artemisinin class of compounds (Fig. 1) are currently the basis of treatment preferred by the World Health Organization.[4] Artemisinin, a trioxane endoperoxide compound, is one of the most rapidly acting antimalarials with the broadest effective range but is however poorly soluble in both oil and water. In an effort to overcome this solubility problem, the first generation analogs of artemisinin, viz. artemether, arteether and sodium artesunate, were synthesised. Unfortunately these derivatives have relatively short elimination half-lives creating an elevated risk of high recrudescence rates.[5–7]

In an effort to prevent the artemisinin class of compounds from suffering the same fate as the classic antimalarial drugs, they are mostly used in artemisinin-based combination therapies (ACTs) which entail combining a semi-synthetic artemisinin derivative with another drug of a different chemical class. These ACTs do not only compensate for artemisinin's poor pharmacokinetic properties, but also decrease the likelihood that resistance against this class would emerge. Despite these efforts, resistance against artesunate has already been reported at the Thai-Cambodian and Thai-Myanmar borders, where significantly prolonged in vivo parasite clearance times have been observed.[8,9] This is a stark reminder of the exceptional ability of the malaria parasite to acquire resistance against a huge variety of chemical compounds, and a realisation that the loss of this important drug class would have dire consequences for millions of people around the world.

Polyamine compounds have been found to have implications in a great number of various processes in the malaria parasite. The natural occurring polyamines spermidine, putrescine and spermine have an important function in the regulation of growth and differentiation in an array of cell types.[10] These polyamine compounds, existing as polycations in vivo, are taken up by the malaria parasite through a polyamine transport system that recognises specific point charges on these compounds and then actively transports them into the malarial cells. The rapidly growing malaria parasite needs a substantial amount of these polyamine compounds and is reliant on exogenous sources of polyamines together with the polyamine transport system to provide it with the necessary quantities.[11] Researchers have proposed that a moiety that has the capability of being recognised by the polyamine transport system could act as a vector when coupled to another

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Annexure E

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Antimalarial activity of 10-alkyl/aryl esters and -aminoethylethers of artemisinin

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ABSTRACT

A series of *n*-alkyl/aryl esters were synthesized and their *in vitro* antiplasmodial activity was measured alongside that of previously synthesized aminoethylethers of artemisinin ozonides against various strains of *Plasmodium falciparum*. The cytotoxicity against human cell lines was also assessed. The esters were synthesized in a one-step reaction by derivatization on carbon C-10 of dihydroartemisinin. Both classes were active against both the 3D7 and K1 strains of *P. falciparum*, with all compounds being significantly more potent than artemether against both strains. The majority of compounds possessed potency either comparable or more than artesunate with a high degree of selectivity towards the parasitic cells. The 10α-*n*-propyl **11** and 10α-benzyl **18** esters were the most potent of all synthesized ozonides, possessing a moderate (~3-fold) and significant (22- and 12-fold, respectively) potency increases against the 3D7 and K1 strains, respectively, in comparison with artesunate.

1. Introduction

Each year roughly 800,000 people die of malaria, with 95% being African children [1]. The development and spread of multidrug resistant (MDR) *Plasmodium falciparum* has led to the adoption of artemisinin-based combination therapies (ACTs) as the first-line treatment for *falciparum* malaria in most malaria-endemic countries of the world [2]. However, the recently confirmed emergence of artemisinin resistance in western Cambodia is a major threat for current initiatives to control and eliminate malaria [3–5]. While artemisinin resistance has not yet spread to other areas [6], the World Health Organization (WHO) is coordinating a large-scale elimination campaign in this region aiming to contain the spread of resistance [7,8].

The ACTs combine fast-acting artemisinin (ART) derived drugs with other antimalarials possessing longer half-lives such as mefloquine. Because the utility of artemisinin is limited by its solubility in both oil and water, this sesquiterpene has been structurally modified by derivatization into short-chain oil soluble ether derivatives of dihydroartemisinin (DHA, **2**), such as artemether (AM, **2a**) and arteether (AE, **2b**), and the water soluble sodium artesunate (AS, **2c**) (Fig. 1).

Thus, all derivatives currently in use are either alkyl acetals or an ester acetal derivative of dihydroartemisinin (DHA, **2**). The problem with these semi-synthetic compounds, however, is their short pharmacological half-lives, a reflection of their acid lability, and facile metabolism to DHA [9–12]. In particular, artesunate is hydrolytically unstable, even at neutral pH, and has a half-life of only a few minutes [13].

A large amount of work has been carried out with the aim of generating new derivatives [14–16]. Artemisone (Fig. 2) is thus far the only second-generation semi-synthetic artemisinin derivative that has been found suitable for further clinical development, progressing through Phase II but showing no major benefits over existing derivatives [17]. Arterolane [18], a synthetic ozonide (Fig. 2, OZ277) has a longer half-life, is fast acting, well tolerated, and effective. It is now in Phase III clinical trials in combination with piperaquine [19,20]. OZ439 (Fig. 2), a purely synthetic ozonide, is a drug candidate designed to provide a single-dose oral cure in humans. It has successfully completed Phase I clinical trials, where it was shown to be safe at doses up to 1.6 g, and is currently undergoing Phase IIa trials in malaria patients [21]. In *in vitro* and *vivo* animal studies, OZ439 has been reported to have a better antimalarial drug profile than OZ277 and all other semi-synthetic artemisinin derivatives. On the basis of their structural differences, it is believed that these synthetic ozonides may replace the standard artemisinins if they become obsolete [17]. Nevertheless, the shortcomings of the current drugs, the emergence of *P. falciparum* resistance to the artemisinin class of compounds and the fact that the mechanism by which the parasite acquires resistance is still largely unknown, warrant the search for new classes or derivatives.

In this communication, we report the synthesis of series of alkyl/aryl esters and their antimalarial activity as well as cytotoxicity.

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Original article

Synthesis and *in vitro* antimalarial activity of a series of bisquinoline and bispyrrolo[1,2a]quinoxaline compounds

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ABSTRACT

Series of bisquinolines **4–15** and bispyrrolo[1,2a]quinoxalines **16–20** containing various polyamine linkers were synthesized. The aqueous solubility and distribution coefficient were experimentally determined. The compounds were screened for antimalarial activity alongside chloroquine against D10 and Dd2 strains of *Plasmodium falciparum*. The growth inhibitory effects of biscompounds **4–9** were assessed against various cancer cell lines. The aqueous solubility was found to increase with an increase in potential protonation sites. Bisquinolines **8** and **9** featuring triethylenetetramine and *N,N'*-bis(3-aminopropyl)ethylene-diamine linkers, respectively, were the most active of all synthesized compounds. They were found as potent as chloroquine against D10 but significantly more potent against the Dd2 strain, with good selectivity towards parasitic cells. Compound **4** containing a diethylenetriamine bridge displayed the most important anticancer activity of the series, and was a more effective antiproliferative inhibitor than etoposide against all three TK10, UACC62 and MCF7 cancer cell lines.

1. Introduction

Malaria affects an estimated 250 million people and accounts for almost 1 million deaths annually, with over 90% of these fatalities recorded in Africa [1–3]. The disease's incidence has increased during the last decade as a result of the rise in resistance to existing antimalarial drugs such as chloroquine, mefloquine, suphadoxine and pyrimethamine. The emergence of resistant parasite strains severely limits the choice of available antimalarial medicines, and has driven the search for new drugs that might circumvent resistance mechanisms. The aminoquinoline, chloroquine, was for much of the last 40 years the drug of choice for malaria chemotherapy as it was highly effective, save and cheap [4,5]. However, the spread of chloroquine-resistant strains has limited its use to *Plasmodium falciparum* resistance free areas of the world. Chloroquine resistance is associated with reduced accumulation of the drug inside the digestive vacuole, which is connected to a *P. falciparum* chloroquine resistance transporter (PfCRT) or ATP-dependant P-glycoprotein efflux pump (Pgh1) [6]. Despite this drawback, the 4-aminoquinoline pharmacophore remains an attractive scaffold in design of new drugs, since it demonstrates a unique affinity for haematin and is known to be the (Fe^{3+}) ferri-protoporphyrin complex formation template [7,8].

Many studies on bisquinolines have indicated an increase in activity against chloroquine-resistant strains. Piperaquine **A** was the first bisquinoline drug synthesized in 1960 and was active *in vitro* against both CQS and CQR strains, but further development was suspended for toxicity reasons [9,10]. Vennerstrom et al. synthesized a series of bisquinoline analogues linked by various alkanediamines or heteroalkanediamines of which the most promising was WR 268,668 **B**. This compound exhibited potent *in vivo* antimalarial activity but development was stopped due to phototoxicity [11,12]. Girault et al. [13] synthesized a series of bisquinolines **C**, tri- and tetraquinolines with increased steric hindrance that displayed good activity against resistant *P. falciparum* strains, suggesting that the greater bulkiness results in a weaker efflux by PfCRT. However, the increased rigidity by cyclisation reduced toxicity but did not increase activity in comparison with their linear counterparts. Bisquinoline compounds **D** displayed superior activity compared to chloroquine against the resistant K1 strain [14] (Fig. 1).

Chloroquine and other 4-aminoquinoline antimalarials are weak bases which traverse down the pH gradient to concentrate inside the acidic food vacuole. The protonation of the drug inside the vacuole increases its accumulation *via* a pH-trapping mechanism that

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