



Full wwPDB NMR Structure Validation Report ⓘ

Mar 9, 2026 – 05:24 AM UTC

PDB ID : 2B1O / pdb_00002b1o
Title : Solution Structure of Ca²⁺-bound DdCAD-1
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Deposited on : 2005-09-16

This is a Full wwPDB NMR Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/NMRValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
wwPDB-RCI : v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV : Wang et al. (2010)
wwPDB-ShiftChecker : v1.2
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

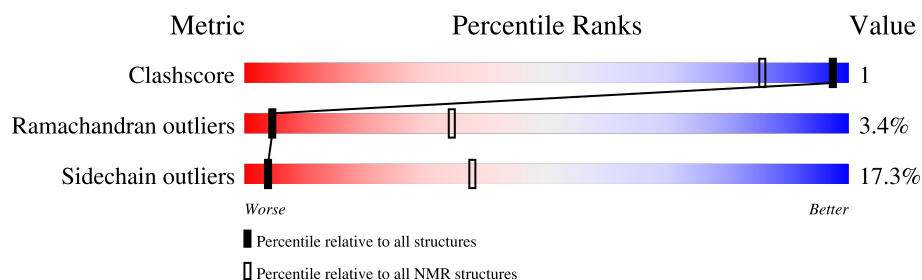
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

SOLUTION NMR

The overall completeness of chemical shifts assignment was not calculated.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	NMR archive (#Entries)
Clashscore	229148	14424
Ramachandran outliers	224038	12848
Sidechain outliers	223484	12823

The table below summarises the geometric issues observed across the polymeric chains and their fit to the experimental data. The red, orange, yellow and green segments indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. A cyan segment indicates the fraction of residues that are not part of the well-defined cores, and a grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	212	 85% 12% •

2 Ensemble composition and analysis

This entry contains 10 models. Model 2 is the overall representative, medoid model (most similar to other models). The authors have identified model 1 as representative, based on the following criterion: *lowest energy*.

The following residues are included in the computation of the global validation metrics.

Well-defined (core) protein residues			
Well-defined core	Residue range (total)	Backbone RMSD (Å)	Medoid model
1	A:3-A:31, A:37-A:213 (206)	0.97	2

Ill-defined regions of proteins are excluded from the global statistics.

Ligands and non-protein polymers are included in the analysis.

The models can be grouped into 1 clusters and 1 single-model cluster was found.

Cluster number	Models
1	1, 2, 3, 4, 5, 6, 8, 9, 10
Single-model clusters	7

3 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 3040 atoms, of which 1361 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Calcium-dependent cell adhesion molecule-1.

Mol	Chain	Residues	Atoms						Trace
1	A	212	Total	C	H	N	O	S	0
			3037	1061	1361	276	332	7	

- Molecule 2 is CALCIUM ION (CCD ID: CA) (formula: Ca).

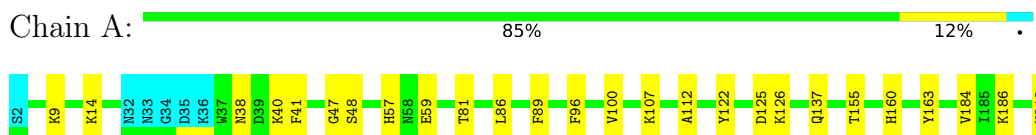
Mol	Chain	Residues	Atoms	
2	A	3	Total	Ca
			3	3

4 Residue-property plots

4.1 Average score per residue in the NMR ensemble

These plots are provided for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic is the same as shown in the summary in section 1 of this report. The second graphic shows the sequence where residues are colour-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. Stretches of 2 or more consecutive residues without any outliers are shown as green connectors. Residues which are classified as ill-defined in the NMR ensemble, are shown in cyan with an underline colour-coded according to the previous scheme. Residues which were present in the experimental sample, but not modelled in the final structure are shown in grey.

- Molecule 1: Calcium-dependent cell adhesion molecule-1

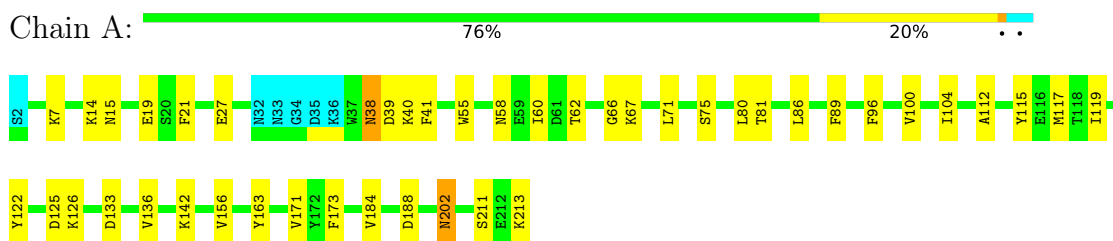


4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

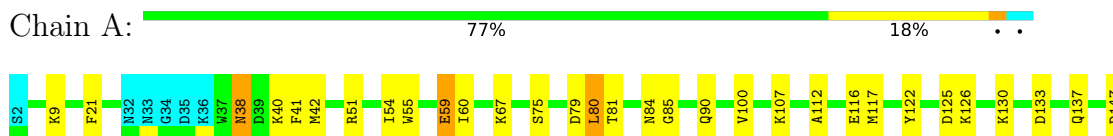
4.2.1 Score per residue for model 1

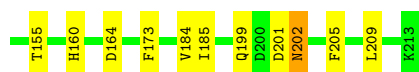
- Molecule 1: Calcium-dependent cell adhesion molecule-1



4.2.2 Score per residue for model 2 (medoid)

- Molecule 1: Calcium-dependent cell adhesion molecule-1

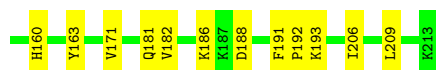
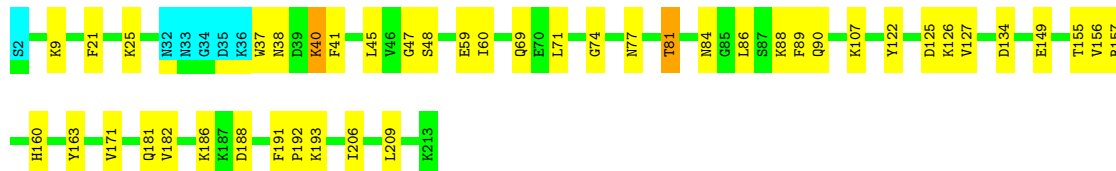




4.2.3 Score per residue for model 3

- Molecule 1: Calcium-dependent cell adhesion molecule-1

Chain A: 76% 20% . .



4.2.4 Score per residue for model 4

- Molecule 1: Calcium-dependent cell adhesion molecule-1

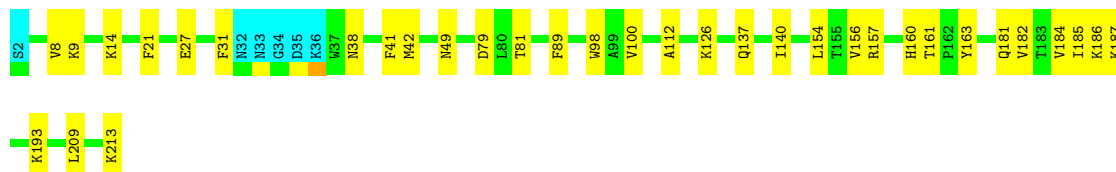
Chain A: 77% 18% . .



4.2.5 Score per residue for model 5

- Molecule 1: Calcium-dependent cell adhesion molecule-1

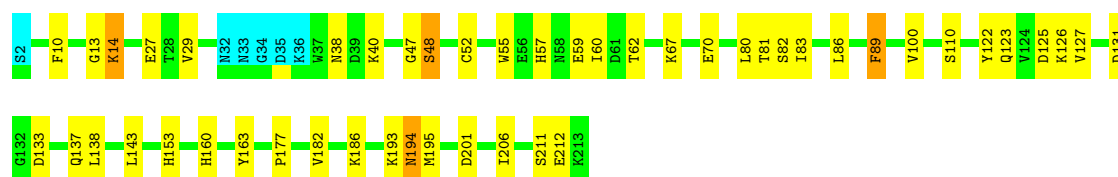
Chain A: 81% 16% .



4.2.6 Score per residue for model 6

- Molecule 1: Calcium-dependent cell adhesion molecule-1

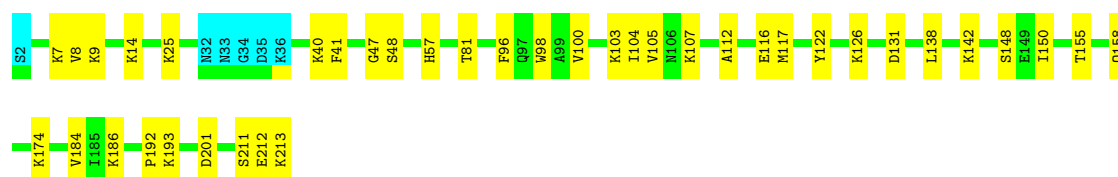
Chain A: 75% 21% . .



4.2.7 Score per residue for model 7

- Molecule 1: Calcium-dependent cell adhesion molecule-1

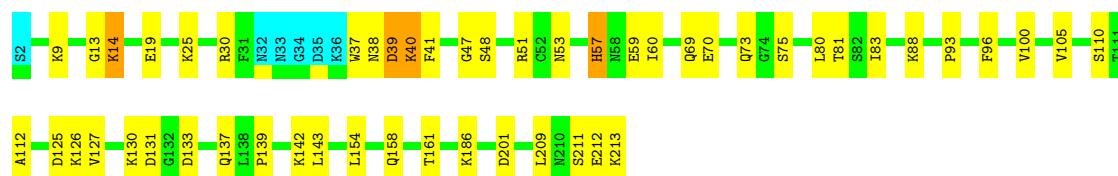
Chain A: 79% 18%



4.2.8 Score per residue for model 8

- Molecule 1: Calcium-dependent cell adhesion molecule-1

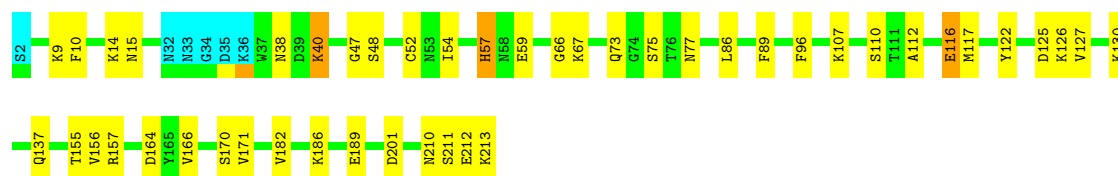
Chain A: 73% 22%



4.2.9 Score per residue for model 9

- Molecule 1: Calcium-dependent cell adhesion molecule-1

Chain A: 75% 20%



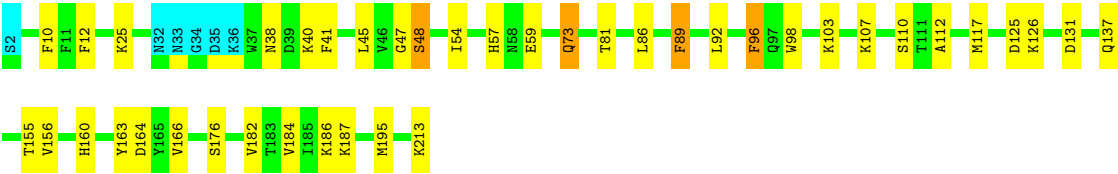
4.2.10 Score per residue for model 10

- Molecule 1: Calcium-dependent cell adhesion molecule-1

Chain A:

78%

17%



5 Refinement protocol and experimental data overview ⓘ

The models were refined using the following method: *torsion angle dynamics*.

Of the 100 calculated structures, 10 were deposited, based on the following criterion: *target function*.

The following table shows the software used for structure solution, optimisation and refinement.

Software name	Classification	Version
CYANA	structure solution	1.0.5
Amber	refinement	7.0

No chemical shift data was provided.

6 Model quality [i](#)

6.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section:
CA

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the (average) root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#Z>5	RMSZ	#Z>5
1	A	0.81±0.02	0±0/1673 (0.0± 0.0%)	1.37±0.03	3±2/2275 (0.1± 0.1%)
All	All	0.81	0/16730 (0.0%)	1.37	33/22750 (0.1%)

There are no bond-length outliers.

All unique angle outliers are listed below. They are sorted according to the Z-score of the worst occurrence in the ensemble.

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)	Models	
								Worst	Total
1	A	96	PHE	CA-CB-CG	7.46	121.26	113.80	7	3
1	A	202	ASN	CA-CB-CG	6.79	119.39	112.60	1	1
1	A	201	ASP	CA-CB-CG	6.34	118.94	112.60	8	4
1	A	89	PHE	CA-CB-CG	5.84	119.64	113.80	3	5
1	A	38	ASN	CA-CB-CG	5.84	118.44	112.60	8	4
1	A	38	ASN	OD1-CG-ND2	-5.83	116.77	122.60	6	1
1	A	39	ASP	CA-CB-CG	5.75	118.36	112.60	8	1
1	A	57	HIS	CA-CB-CG	5.52	119.32	113.80	9	1
1	A	206	ILE	CB-CA-C	5.48	118.11	110.99	6	1
1	A	73	GLN	OE1-CD-NE2	-5.18	117.42	122.60	10	1
1	A	81	THR	CA-CB-CG2	5.16	119.27	110.50	3	1
1	A	177	PRO	CA-C-N	5.15	127.44	120.38	4	2
1	A	177	PRO	C-N-CA	5.15	127.44	120.38	4	2
1	A	176	SER	CA-C-N	5.14	126.27	119.84	10	1
1	A	176	SER	C-N-CA	5.14	126.27	119.84	10	1
1	A	194	ASN	CA-CB-CG	5.13	117.73	112.60	6	1
1	A	173	PHE	CA-CB-CG	5.07	118.87	113.80	2	2
1	A	12	PHE	CA-CB-CG	5.06	118.86	113.80	10	1

There are no chirality outliers.

There are no planarity outliers.

6.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in each chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes averaged over the ensemble.

Mol	Chain	Non-H	H(model)	H(added)	Clashes
1	A	1633	1332	1577	2±1
All	All	16360	13320	15770	20

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 1.

All unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:92:LEU:HD13	1:A:96:PHE:CE1	0.64	2.27	10	1
1:A:92:LEU:HD13	1:A:96:PHE:CE2	0.50	2.41	4	1
1:A:117:MET:HG3	1:A:156:VAL:HG22	0.46	1.86	10	1
1:A:181:GLN:HG2	1:A:182:VAL:H	0.46	1.70	3	2
1:A:3:VAL:HG22	1:A:4:ASP:H	0.46	1.70	4	1
1:A:80:LEU:HD13	1:A:80:LEU:H	0.45	1.71	2	1
1:A:116:GLU:O	1:A:156:VAL:HG23	0.45	2.11	9	1
1:A:104:ILE:HG12	1:A:117:MET:HE2	0.45	1.88	1	1
1:A:191:PHE:CD1	1:A:192:PRO:HD2	0.44	2.47	3	1
1:A:115:TYR:CZ	1:A:156:VAL:HG21	0.44	2.48	1	1
1:A:93:PRO:CG	1:A:96:PHE:CD2	0.43	3.01	8	1
1:A:184:VAL:HG13	1:A:205:PHE:CZ	0.42	2.49	2	1
1:A:156:VAL:HG22	1:A:166:VAL:CG2	0.42	2.44	9	1
1:A:54:ILE:HB	1:A:86:LEU:HD13	0.42	1.91	10	1
1:A:96:PHE:CD2	1:A:139:PRO:CB	0.42	3.03	8	1
1:A:98:TRP:CZ2	1:A:140:ILE:HG21	0.42	2.50	5	1
1:A:117:MET:HE3	1:A:119:ILE:HD11	0.41	1.92	1	1
1:A:41:PHE:CE2	1:A:89:PHE:CE2	0.41	3.09	5	1
1:A:41:PHE:CD1	1:A:41:PHE:C	0.40	2.99	1	1

6.3 Torsion angles

6.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all NMR entries. The Analysed column shows the number of residues for which the backbone conformation

was analysed and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	205/212 (97%)	173±3 (84±2%)	25±4 (12±2%)	7±2 (3±1%)	4	34
All	All	2050/2120 (97%)	1730 (84%)	251 (12%)	69 (3%)	4	34

All 25 unique Ramachandran outliers are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type	Models (Total)
1	A	125	ASP	8
1	A	112	ALA	7
1	A	122	TYR	7
1	A	47	GLY	7
1	A	48	SER	7
1	A	84	ASN	3
1	A	40	LYS	3
1	A	131	ASP	3
1	A	39	ASP	2
1	A	60	ILE	2
1	A	66	GLY	2
1	A	59	GLU	2
1	A	13	GLY	2
1	A	14	LYS	2
1	A	110	SER	2
1	A	71	LEU	1
1	A	85	GLY	1
1	A	202	ASN	1
1	A	74	GLY	1
1	A	3	VAL	1
1	A	86	LEU	1
1	A	212	GLU	1
1	A	192	PRO	1
1	A	193	LYS	1
1	A	57	HIS	1

6.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all NMR entries. The Analysed column shows the number of residues for which the sidechain conformation was analysed and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	188/193 (97%)	156±4 (83±2%)	32±4 (17±2%)	4	38
All	All	1880/1930 (97%)	1555 (83%)	325 (17%)	4	38

All 108 unique residues with a non-rotameric sidechain are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type	Models (Total)
1	A	126	LYS	10
1	A	40	LYS	9
1	A	81	THR	8
1	A	186	LYS	8
1	A	14	LYS	7
1	A	100	VAL	7
1	A	213	LYS	7
1	A	9	LYS	7
1	A	38	ASN	6
1	A	163	TYR	6
1	A	41	PHE	6
1	A	107	LYS	6
1	A	137	GLN	6
1	A	155	THR	6
1	A	160	HIS	6
1	A	21	PHE	5
1	A	75	SER	5
1	A	86	LEU	5
1	A	133	ASP	5
1	A	184	VAL	5
1	A	211	SER	5
1	A	59	GLU	5
1	A	127	VAL	5
1	A	57	HIS	5
1	A	67	LYS	4
1	A	80	LEU	4
1	A	130	LYS	4
1	A	209	LEU	4
1	A	25	LYS	4
1	A	10	PHE	4
1	A	89	PHE	4
1	A	27	GLU	3
1	A	55	TRP	3
1	A	142	LYS	3
1	A	171	VAL	3
1	A	116	GLU	3

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Mol	Chain	Res	Type	Models (Total)
1	A	117	MET	3
1	A	164	ASP	3
1	A	45	LEU	3
1	A	60	ILE	3
1	A	88	LYS	3
1	A	157	ARG	3
1	A	193	LYS	3
1	A	8	VAL	3
1	A	52	CYS	3
1	A	143	LEU	3
1	A	154	LEU	3
1	A	158	GLN	3
1	A	161	THR	3
1	A	182	VAL	3
1	A	212	GLU	3
1	A	73	GLN	3
1	A	7	LYS	2
1	A	15	ASN	2
1	A	19	GLU	2
1	A	58	ASN	2
1	A	62	THR	2
1	A	188	ASP	2
1	A	202	ASN	2
1	A	42	MET	2
1	A	51	ARG	2
1	A	54	ILE	2
1	A	79	ASP	2
1	A	90	GLN	2
1	A	185	ILE	2
1	A	37	TRP	2
1	A	69	GLN	2
1	A	77	ASN	2
1	A	156	VAL	2
1	A	96	PHE	2
1	A	187	LYS	2
1	A	48	SER	2
1	A	70	GLU	2
1	A	83	ILE	2
1	A	138	LEU	2
1	A	195	MET	2
1	A	98	TRP	2
1	A	103	LYS	2

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Mol	Chain	Res	Type	Models (Total)
1	A	105	VAL	2
1	A	110	SER	2
1	A	136	VAL	1
1	A	147	ASP	1
1	A	199	GLN	1
1	A	201	ASP	1
1	A	71	LEU	1
1	A	134	ASP	1
1	A	149	GLU	1
1	A	206	ILE	1
1	A	39	ASP	1
1	A	97	GLN	1
1	A	31	PHE	1
1	A	49	ASN	1
1	A	29	VAL	1
1	A	82	SER	1
1	A	123	GLN	1
1	A	131	ASP	1
1	A	153	HIS	1
1	A	194	ASN	1
1	A	104	ILE	1
1	A	148	SER	1
1	A	150	ILE	1
1	A	174	LYS	1
1	A	30	ARG	1
1	A	53	ASN	1
1	A	170	SER	1
1	A	189	GLU	1
1	A	210	ASN	1
1	A	166	VAL	1

6.3.3 RNA ⓘ

There are no RNA molecules in this entry.

6.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

6.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.6 Ligand geometry [i](#)

Of 3 ligands modelled in this entry, 3 are monoatomic - leaving 0 for Mogul analysis.

6.7 Other polymers [i](#)

There are no such molecules in this entry.

6.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

7 Chemical shift validation

No chemical shift data were provided