Full wwPDB NMR Structure Validation Report (i)

Feb 23, 2022 – 08:57 AM EST

PDB ID	:	1X63
Title	:	Solution structure of the second LIM domain of skeletal muscle LIM protein 1
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Deposited on	:	2005-05-17

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 (i) symbol.

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

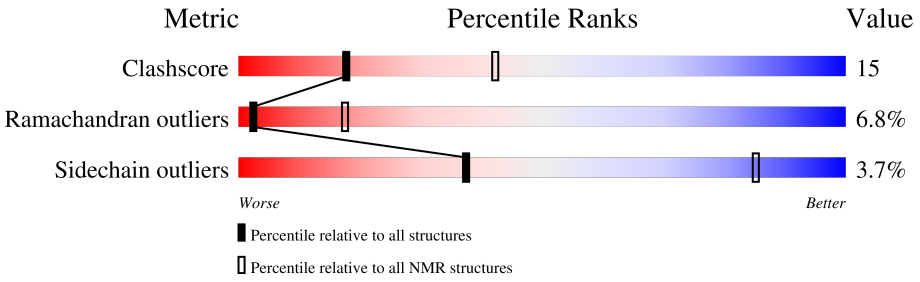
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	2.26
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.26

1 Overall quality at a glance (i)

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	158937	12864
Ramachandran outliers	154571	11451
Sidechain outliers	154315	11428

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 <=5%

Mol	Chain	Length	Quality of chain
1	A	82	48% 21% • 30%

2 Ensemble composition and analysis (i)

This entry contains 20 models. Model 3 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:15-A:60, A:64-A:74 (57)	0.17	3

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 3 clusters. No single-model clusters were found.

Cluster number	Models
1	3, 8, 10, 11, 16, 17, 18, 20
2	2, 4, 5, 6, 13, 14, 19
3	1, 7, 9, 12, 15

3 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 1171 atoms, of which 563 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Skeletal muscle LIM-protein 1.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	82	1169	374	563	103	121	8	0

There are 13 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	GLY	-	cloning artifact	UNP Q13642
A	2	SER	-	cloning artifact	UNP Q13642
A	3	SER	-	cloning artifact	UNP Q13642
A	4	GLY	-	cloning artifact	UNP Q13642
A	5	SER	-	cloning artifact	UNP Q13642
A	6	SER	-	cloning artifact	UNP Q13642
A	7	GLY	-	cloning artifact	UNP Q13642
A	77	SER	-	cloning artifact	UNP Q13642
A	78	GLY	-	cloning artifact	UNP Q13642
A	79	PRO	-	cloning artifact	UNP Q13642
A	80	SER	-	cloning artifact	UNP Q13642
A	81	SER	-	cloning artifact	UNP Q13642
A	82	GLY	-	cloning artifact	UNP Q13642

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	
			Total	Zn
2	A	2	2	2

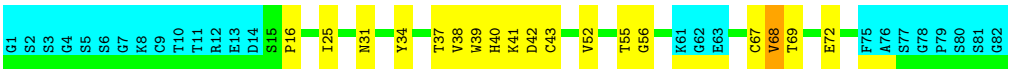
4 Residue-property plots (i)

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: Skeletal muscle LIM-protein 1

Chain A: 48% 21% • 30%



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

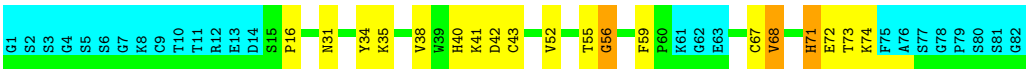
• Molecule 1: Skeletal muscle LIM-protein 1

Chain A: 38% 29% • 30%

4.2.2 Score per residue for model 2

• Molecule 1: Skeletal muscle LIM-protein 1

Chain A: 46% 20% • 30%



4.2.3 Score per residue for model 3 (medoid)

- Molecule 1: Skeletal muscle LIM-protein 1

Chain A: 41% 22% 6% 30%

G1 S2 S3 G4 S5 S6 G7 K8 C9 T10 T11 R12 E13 D14 S15 P16 I25 V26 Q30 N31 Y34 T37 V38 W39 H40 K41 D42 C43 V52 T55 G56 F59 P60 K61 G62 E63 D64 G67 V68 H71 E72 F75 A76 S77 G78 P79 S80 S81 G82

4.2.4 Score per residue for model 4

- Molecule 1: Skeletal muscle LIM-protein 1

Chain A: 48% 20% • 30%

G1 S2 S3 G4 S5 S6 G7 K8 C9 T10 T11 R12 E13 D14 S15 P16 I25 Y34 K35 V38 W39 H40 K41 D42 C43 V52 T55 G56 S57 K61 G62 E63 V68 T69 C70 H71 E72 T73 K74 F75 A76 S77 G78 P79 S80 S81 G82

4.2.5 Score per residue for model 5

- Molecule 1: Skeletal muscle LIM-protein 1

Chain A: 45% 23% • 30%

G1 S2 S3 G4 S5 S6 G7 K8 C9 T10 T11 R12 E13 D14 S15 P16 K17 C18 I25 T37 V38 W39 H40 K41 D42 C43 V52 I53 G56 S57 F58 F59 P60 K61 G62 E63 C67 V68 T69 E72 T73 K74 F75 A76 S77 G78 P79 S80 S81 G82

4.2.6 Score per residue for model 6

- Molecule 1: Skeletal muscle LIM-protein 1

Chain A: 46% 20% • 30%

G1 S2 S3 G4 S5 S6 G7 K8 C9 T10 T11 R12 E13 D14 S15 P16 I25 E33 Y34 V38 W39 H40 K41 D42 C43 V52 I53 G54 T55 G56 K61 G62 E63 D64 V68 T69 C70 H71 E72 T73 K74 F75 A76 S77 G78 P79 S80 S81 G82

4.2.7 Score per residue for model 7

- Molecule 1: Skeletal muscle LIM-protein 1

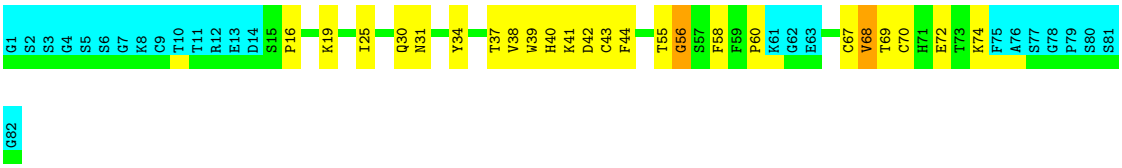
Chain A: 41% 24% • 30%

G1 S2 S3 G4 S5 S6 G7 K8 C9 T10 T11 R12 E13 D14 S15 P16 I25 D29 Q30 N31 Y34 T37 V38 W39 H40 K41 D42 C43 K50 Q51 V52 T55 G56 S57 P60 K61 G62 E63 D64 V68 T69 E72 F75 A76 S77 G78 P79 S80 S81 G82

4.2.8 Score per residue for model 8

- Molecule 1: Skeletal muscle LIM-protein 1

Chain A: 40% 27% • 30%



4.2.9 Score per residue for model 9

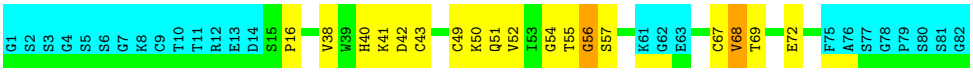
- Molecule 1: Skeletal muscle LIM-protein 1

Chain A: 43% 22% 5% 30%

4.2.10 Score per residue for model 10

- Molecule 1: Skeletal muscle LIM-protein 1

Chain A: 48% 20% • 30%



4.2.11 Score per residue for model 11

- Molecule 1: Skeletal muscle LIM-protein 1

Chain A: 39% 27% • 30%

4.2.12 Score per residue for model 12

- Molecule 1: Skeletal muscle LIM-protein 1

Chain A: 45% 22% • 30%

G1 S2 S3 G4 S5 S6 G7 K8 C9 T10 T11 R12 E13 D14 K19 I25 N31 Y34 T37 V38 W39 H40 C43 K50 Q51 V52 T55 G56 F59 P60 K61 G62 E63 D64 V68 T69 C70 H71 E72 F75 A76 S77 G78 P79 S80 S81 G82

4.2.13 Score per residue for model 13

- Molecule 1: Skeletal muscle LIM-protein 1

Chain A: 40% 26% • 30%

G1 S2 S3 G4 S5 S6 G7 K8 C9 T10 T11 R12 E13 D14 S15 P16 K17 C18 I25 V26 A27 G28 D29 T37 V38 W39 H40 K41 D42 N48 C49 V52 I53 G56 S57 F58 K61 G62 E63 D64 C67 V68 T69 E72 F75 A76 S77 G78 P79 S80 S81 G82

4.2.14 Score per residue for model 14

- Molecule 1: Skeletal muscle LIM-protein 1

Chain A: 41% 23% 5% 30%

G1 S2 S3 G4 S5 S6 G7 K8 C9 T10 T11 R12 E13 D14 S15 P16 K17 C18 I25 V26 A27 G28 D29 Y34 T37 V38 W39 H40 K41 D42 C43 F44 V52 I53 G54 T55 G56 F59 P60 K61 G62 E63 T69 C70 H71 E72 F75 A76 S77 G78 P79 S80 S81 G82

4.2.15 Score per residue for model 15

- Molecule 1: Skeletal muscle LIM-protein 1

Chain A: 45% 17% 7% 30%

G1 S2 S3 G4 S5 S6 G7 K8 C9 T10 T11 R12 E13 D14 S15 P16 I25 V26 A27 G28 D29 Q30 T37 V38 W39 H40 K41 D42 C43 Q51 V52 T55 G56 S57 K61 G62 E63 V68 T69 E72 F75 A76 S77 G78 P79 S80 S81 G82

4.2.16 Score per residue for model 16

- Molecule 1: Skeletal muscle LIM-protein 1

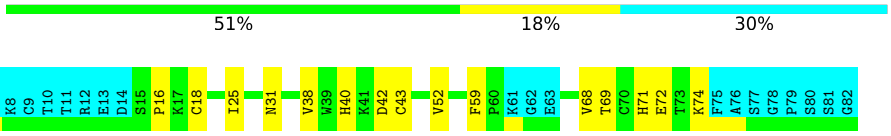
Chain A: 41% 23% 5% 30%

G1 S2 S3 G4 S5 S6 G7 K8 C9 T10 T11 R12 E13 D14 S15 P16 K17 C18 I25 D29 Q30 N31 T37 V38 W39 H40 K41 D42 C43 C49 K50 Q51 V52 T55 G56 K61 G62 E63 D64 F65 Y66 C67 V68 T69 E72 F75 A76 S77 G78 P79 S80 S81

4.2.17 Score per residue for model 17

• Molecule 1: Skeletal muscle LIM-protein 1

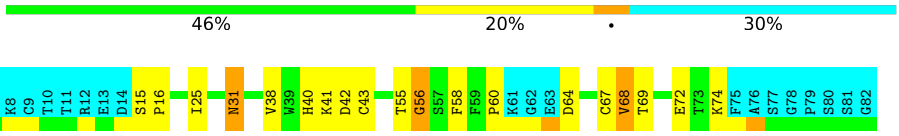
Chain A:



4.2.18 Score per residue for model 18

• Molecule 1: Skeletal muscle LIM-protein 1

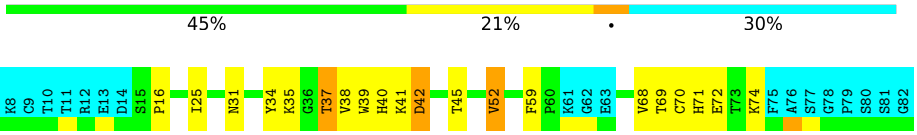
Chain A:



4.2.19 Score per residue for model 19

• Molecule 1: Skeletal muscle LIM-protein 1

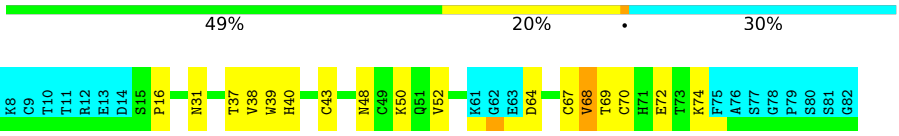
Chain A:



4.2.20 Score per residue for model 20

• Molecule 1: Skeletal muscle LIM-protein 1

Chain A:



5 Refinement protocol and experimental data overview (i)

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

Of the 100 calculated structures, 20 were deposited, based on the following criterion: *target function, structures with the lowest energy, structures with the least restraint violations*.

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

Software name	Classification	Version
CYANA	structure solution	2.0.17
CYANA	refinement	2.0.17

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: ZN

There are no covalent bond-length or bond-angle outliers.

There are no bond-length outliers.

There are no bond-angle outliers.

There are no chirality outliers.

There are no planarity outliers.

6.2 Too-close contacts (i)

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	442	415	414	13±3
All	All	8880	8300	8280	258

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 15.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:59:PHE:CD2	1:A:71:HIS:CE1	0.79	2.70	2	1
1:A:16:PRO:HB2	1:A:38:VAL:HG11	0.71	1.61	20	18
1:A:53:ILE:HG21	1:A:58:PHE:HB3	0.71	1.62	13	2
1:A:59:PHE:CZ	1:A:71:HIS:CD2	0.67	2.82	12	7
1:A:59:PHE:CE2	1:A:71:HIS:CD2	0.67	2.83	19	3
1:A:25:ILE:HD12	1:A:38:VAL:HG13	0.63	1.70	9	12
1:A:57:SER:O	1:A:68:VAL:HG23	0.60	1.95	15	5
1:A:59:PHE:CE1	1:A:71:HIS:CD2	0.56	2.94	12	3
1:A:59:PHE:CE2	1:A:71:HIS:NE2	0.56	2.74	19	5
1:A:34:TYR:CG	1:A:34:TYR:O	0.53	2.62	6	2
1:A:71:HIS:CD2	1:A:71:HIS:C	0.52	2.82	2	1
1:A:71:HIS:CD2	1:A:71:HIS:O	0.52	2.62	2	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:59:PHE:CD2	1:A:71:HIS:CD2	0.51	2.98	19	1
1:A:40:HIS:O	1:A:43:CYS:N	0.51	2.44	10	18
1:A:59:PHE:HE1	1:A:68:VAL:HG22	0.51	1.65	5	2
1:A:59:PHE:CD2	1:A:71:HIS:ND1	0.51	2.78	2	1
1:A:70:CYS:O	1:A:74:LYS:CB	0.50	2.60	8	3
1:A:18:CYS:HB2	1:A:25:ILE:HD11	0.50	1.81	5	4
1:A:40:HIS:O	1:A:42:ASP:N	0.50	2.44	14	15
1:A:69:THR:O	1:A:72:GLU:N	0.50	2.44	4	17
1:A:59:PHE:CE2	1:A:71:HIS:CE1	0.50	3.00	2	1
1:A:37:THR:HB	1:A:39:TRP:CH2	0.50	2.42	5	12
1:A:68:VAL:O	1:A:72:GLU:N	0.49	2.45	2	2
1:A:34:TYR:CD1	1:A:34:TYR:C	0.49	2.86	11	2
1:A:18:CYS:CB	1:A:25:ILE:HD11	0.48	2.37	5	5
1:A:34:TYR:CE2	1:A:60:PRO:HG3	0.48	2.43	12	3
1:A:34:TYR:CD1	1:A:35:LYS:HG3	0.48	2.43	4	1
1:A:67:CYS:O	1:A:68:VAL:C	0.48	2.52	8	12
1:A:50:LYS:CD	1:A:50:LYS:N	0.47	2.77	16	1
1:A:25:ILE:HG12	1:A:40:HIS:CE1	0.47	2.45	17	1
1:A:57:SER:C	1:A:68:VAL:HG23	0.46	2.30	5	2
1:A:34:TYR:CE1	1:A:35:LYS:HG3	0.46	2.45	2	4
1:A:29:ASP:O	1:A:31:ASN:ND2	0.46	2.49	16	2
1:A:25:ILE:HD12	1:A:38:VAL:CG1	0.46	2.41	6	3
1:A:73:THR:HG23	1:A:74:LYS:N	0.45	2.26	2	1
1:A:27:ALA:O	1:A:29:ASP:N	0.45	2.48	9	3
1:A:37:THR:HG21	1:A:39:TRP:CZ2	0.45	2.46	3	1
1:A:25:ILE:HG23	1:A:40:HIS:CD2	0.45	2.46	13	2
1:A:55:THR:O	1:A:56:GLY:C	0.45	2.55	18	13
1:A:30:GLN:O	1:A:41:LYS:CB	0.45	2.64	8	3
1:A:58:PHE:CD2	1:A:60:PRO:HD3	0.45	2.47	1	2
1:A:27:ALA:O	1:A:28:GLY:C	0.45	2.54	14	5
1:A:37:THR:CB	1:A:39:TRP:CH2	0.45	2.99	5	4
1:A:25:ILE:HD12	1:A:38:VAL:HG22	0.44	1.87	7	3
1:A:59:PHE:CG	1:A:71:HIS:CG	0.44	3.06	2	1
1:A:26:VAL:O	1:A:31:ASN:ND2	0.44	2.50	3	1
1:A:54:GLY:O	1:A:55:THR:C	0.44	2.56	10	4
1:A:34:TYR:CZ	1:A:60:PRO:HG3	0.44	2.48	3	2
1:A:25:ILE:CG2	1:A:31:ASN:CG	0.44	2.86	18	4
1:A:49:CYS:O	1:A:50:LYS:C	0.44	2.56	16	1
1:A:40:HIS:C	1:A:42:ASP:N	0.43	2.72	10	14
1:A:50:LYS:N	1:A:50:LYS:HD3	0.43	2.29	16	1
1:A:59:PHE:CE1	1:A:68:VAL:HG22	0.43	2.48	5	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:51:GLN:O	1:A:52:VAL:C	0.42	2.58	15	1
1:A:44:PHE:CZ	1:A:65:PHE:CD1	0.42	3.07	11	1
1:A:44:PHE:CD2	1:A:53:ILE:HB	0.42	2.50	14	1
1:A:68:VAL:O	1:A:69:THR:C	0.41	2.58	10	3
1:A:44:PHE:CE2	1:A:58:PHE:CD1	0.41	3.08	8	1
1:A:49:CYS:SG	1:A:51:GLN:CG	0.41	3.08	10	1
1:A:53:ILE:CD1	1:A:67:CYS:HB3	0.41	2.46	5	1
1:A:26:VAL:CG2	1:A:29:ASP:HB2	0.41	2.46	11	1
1:A:40:HIS:O	1:A:41:LYS:C	0.41	2.59	14	1
1:A:45:THR:HG22	1:A:52:VAL:HA	0.41	1.91	19	1
1:A:19:LYS:HB2	1:A:37:THR:CG2	0.40	2.46	12	1
1:A:48:ASN:HD22	1:A:49:CYS:N	0.40	2.14	13	1
1:A:70:CYS:O	1:A:74:LYS:N	0.40	2.55	20	1
1:A:33:GLU:C	1:A:33:GLU:OE1	0.40	2.59	6	1
1:A:25:ILE:HG21	1:A:31:ASN:CG	0.40	2.37	11	1
1:A:69:THR:O	1:A:70:CYS:C	0.40	2.60	4	1
1:A:37:THR:OG1	1:A:39:TRP:CH2	0.40	2.74	13	1
1:A:27:ALA:O	1:A:29:ASP:O	0.40	2.40	14	1

6.3 Torsion angles (i)

6.3.1 Protein backbone (i)

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	57/82 (70%)	42±2 (74±3%)	11±2 (19±4%)	4±1 (7±2%)	2	17
All	All	1140/1640 (70%)	846 (74%)	216 (19%)	78 (7%)	2	17

All 6 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	68	VAL	19
1	A	52	VAL	18
1	A	56	GLY	16
1	A	41	LYS	15

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Mol	Chain	Res	Type	Models (Total)
1	A	37	THR	7
1	A	28	GLY	3

6.3.2 Protein sidechains (i)

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	50/68 (74%)	48±1 (96±2%)	2±1 (4±2%)	37 85
All	All	1000/1360 (74%)	963 (96%)	37 (4%)	37 85

All 14 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	31	ASN	8
1	A	42	ASP	7
1	A	50	LYS	5
1	A	15	SER	3
1	A	34	TYR	3
1	A	30	GLN	2
1	A	19	LYS	2
1	A	71	HIS	1
1	A	57	SER	1
1	A	33	GLU	1
1	A	37	THR	1
1	A	64	ASP	1
1	A	51	GLN	1
1	A	48	ASN	1

6.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

6.5 Carbohydrates (i)

There are no monosaccharides in this entry.

6.6 Ligand geometry (i)

Of 2 ligands modelled in this entry, 2 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 (i)

No chemical shift data were provided