Full wwPDB NMR Structure Validation Report (i)

Feb 27, 2022 – 12:07 PM EST

PDB ID	:	2DOA
Title	:	Solution structure of the helical domain in human Eleven-nineteen lysine-rich leukemia protein ELL
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Deposited on	:	2006-04-28

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:

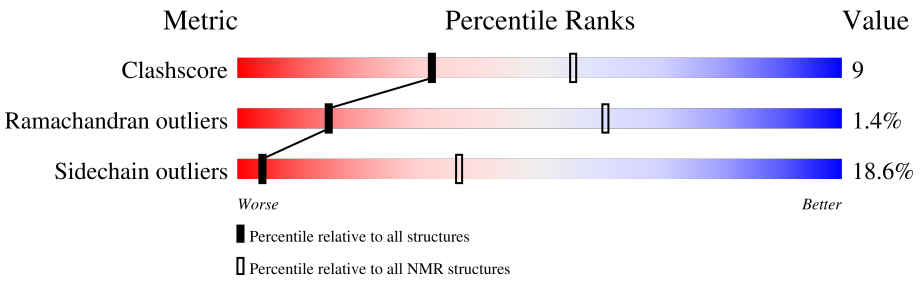
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	2.27
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.27

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	104	64% 21% • 13%

2 Ensemble composition and analysis (i)

This entry contains 20 models. Model 18 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:8-A:97 (90)	0.33	18

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 2 clusters and 1 single-model cluster was found.

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

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 1625 atoms, of which 821 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called RNA polymerase II elongation factor ELL.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	104	1625	496	821	149	155	4	0

There are 11 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	GLY	-	cloning artifact	UNP P55199
A	2	SER	-	cloning artifact	UNP P55199
A	3	SER	-	cloning artifact	UNP P55199
A	4	GLY	-	cloning artifact	UNP P55199
A	5	SER	-	cloning artifact	UNP P55199
A	99	SER	-	cloning artifact	UNP P55199
A	100	GLY	-	cloning artifact	UNP P55199
A	101	PRO	-	cloning artifact	UNP P55199
A	102	SER	-	cloning artifact	UNP P55199
A	103	SER	-	cloning artifact	UNP P55199
A	104	GLY	-	cloning artifact	UNP P55199

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: RNA polymerase II elongation factor ELL

Chain A: 64% 21% • 13%

G1 S2 S3 G4 S5 S6 G7 R14 V17 L18 H19 L20 L21 R27 K28 L31 R34 L35 Q36 D46 L51 L52 V55 A56 T64 C65 T66 L67 S83 L89 L90 K91 R92 V93 L94 V95 L98 S99 G100 P101 S102 S103 G104

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: RNA polymerase II elongation factor ELL

Chain A: 57% 27% • 13%

G1 S2 S3 G4 S5 S6 G7 Q10 R11 P12 F13 R14 V17 L18 H19 L20 L21 R24 P25 Y26 R27 L31 R34 L35 Q42 A43 D44 K45 D46 L51 L52 V55 A56 T64 L67 Q68 D69 W79 E84 Q88 L89 L90 K91 R92 V93 L94 V95

L98 S99 G100 P101 S102 S103 G104

4.2.2 Score per residue for model 2

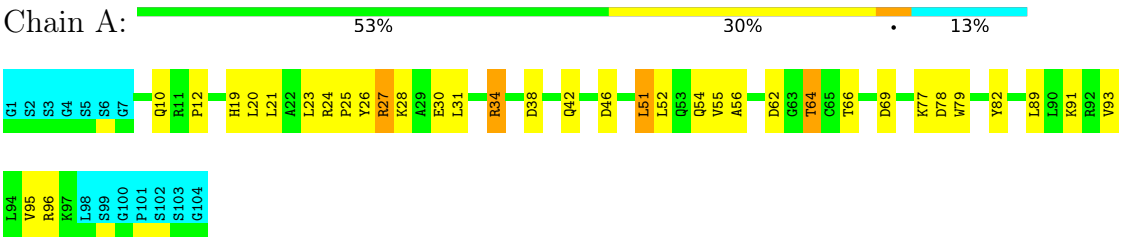
• Molecule 1: RNA polymerase II elongation factor ELL

Chain A: 60% 25% • 13%

G1 S2 S3 G4 S5 S6 G7 R14 L21 R27 K28 L31 R34 L35 Q36 K37 D38 G39 Q42 D49 G50 L51 L52 V55 A56 S59 A60 K61 T64 C65 T66 L67 Y72 S83 E84 L89 L90 K91 R92 V93 L94 V95 L98 S99 G100 P101

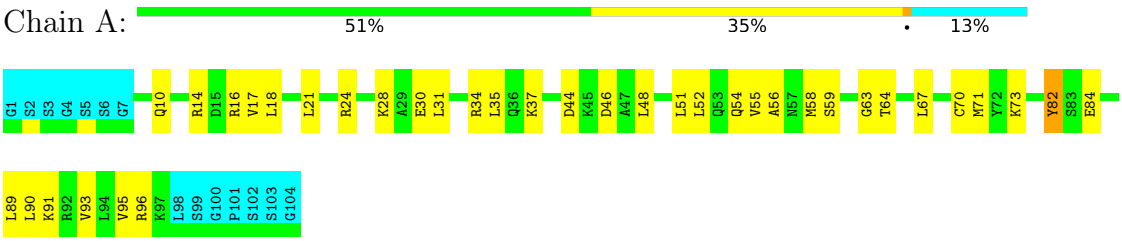
4.2.3 Score per residue for model 3

• Molecule 1: RNA polymerase II elongation factor ELL



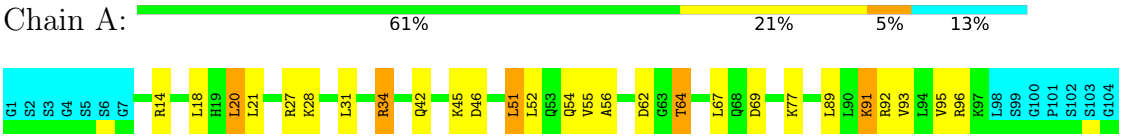
4.2.4 Score per residue for model 4

• Molecule 1: RNA polymerase II elongation factor ELL



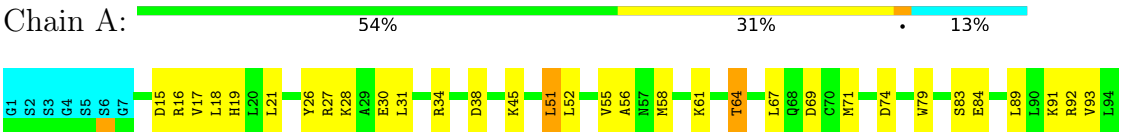
4.2.5 Score per residue for model 5

• Molecule 1: RNA polymerase II elongation factor ELL



4.2.6 Score per residue for model 6

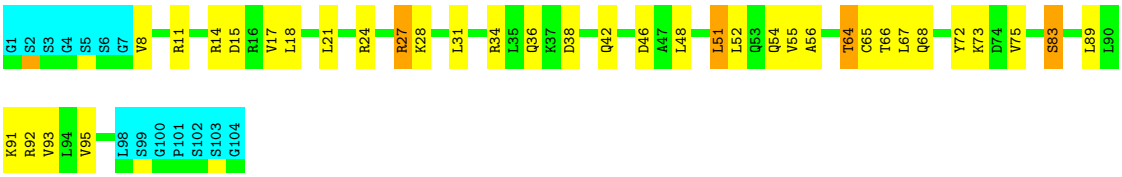
• Molecule 1: RNA polymerase II elongation factor ELL



4.2.7 Score per residue for model 7

• Molecule 1: RNA polymerase II elongation factor ELL

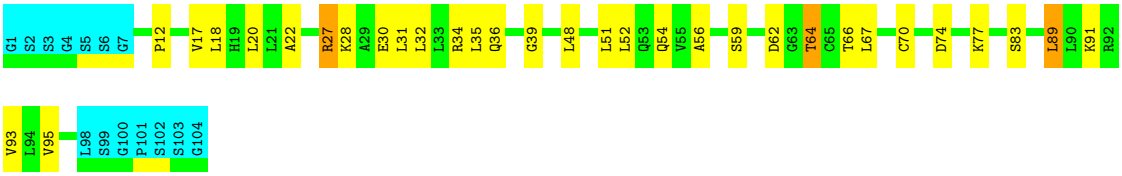
Chain A:



4.2.8 Score per residue for model 8

• Molecule 1: RNA polymerase II elongation factor ELL

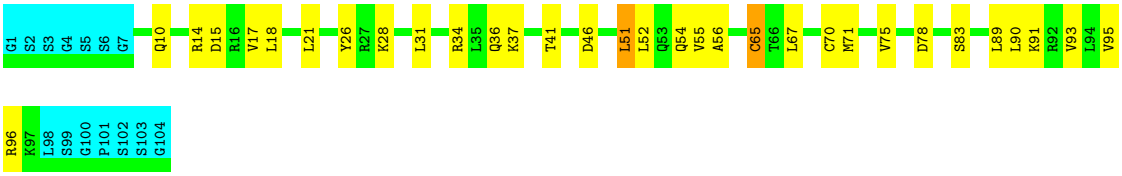
Chain A:



4.2.9 Score per residue for model 9

• Molecule 1: RNA polymerase II elongation factor ELL

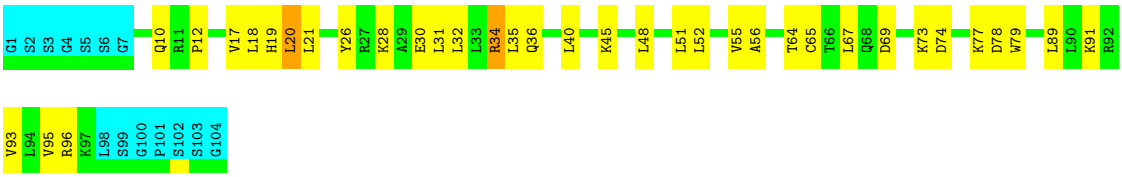
Chain A:



4.2.10 Score per residue for model 10

• Molecule 1: RNA polymerase II elongation factor ELL

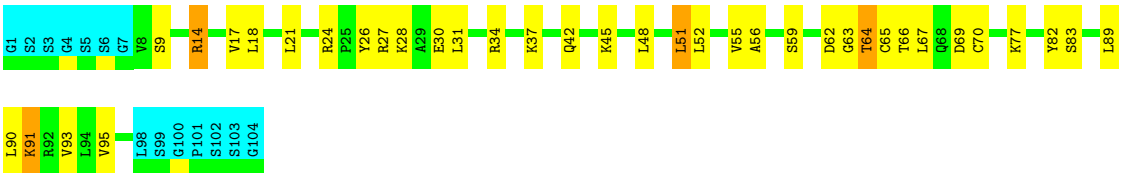
Chain A:



4.2.11 Score per residue for model 11

- Molecule 1: RNA polymerase II elongation factor ELL

Chain A: 51% 32% • 13%



4.2.12 Score per residue for model 12

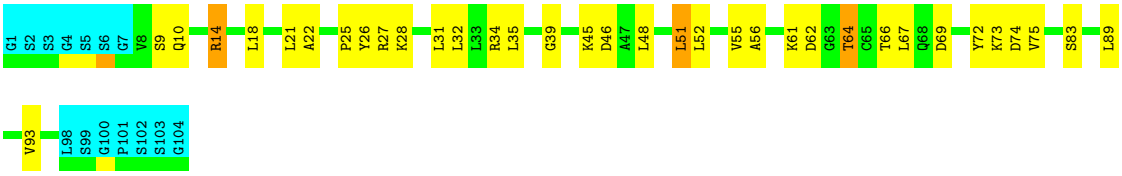
- Molecule 1: RNA polymerase II elongation factor ELL

Chain A: 53% 32% • 13%

4.2.13 Score per residue for model 13

- Molecule 1: RNA polymerase II elongation factor ELL

Chain A: 53% 31% • 13%



4.2.14 Score per residue for model 14

- Molecule 1: RNA polymerase II elongation factor ELL

Chain A: 54% 30% • 13%

G1 S2 S3 G4 S5 S6 G7 Q10 R11 P12 R16 V17 L20 L23 K28 L31 R34 L35 Q36 K37 D38 G39 L40 D44 K45 L51 L52 V55 A56 S59 A60 K61 T64 C65 T66 M71 K77 D78 Y82 S83 E84 L89 L90 K91

R92 V93 L94 V95 L98 S99 G100 P101 S102 S103 G104

4.2.15 Score per residue for model 15

- Molecule 1: RNA polymerase II elongation factor ELL

Chain A: 52% 32% • 13%

G1 S2 S3 G4 S5 S6 G7 V8 R14 V17 L18 H19 L20 E30 L31 R34 L35 Q36 K45 D46 L51 L52 V55 A56 N57 M58 S59 A60 K61 T64 C65 T66 L67 Q68 Y72 K73 D74 V75 Q76 K77 D78 W79 Y82 S83 E84 L89 L90 K91 R92

V93 L94 V95 L98 S99 G100 P101 S102 S103 G104

4.2.16 Score per residue for model 16

- Molecule 1: RNA polymerase II elongation factor ELL

Chain A: 48% 35% • 13%

G1 S2 S3 G4 S5 S6 G7 V8 S9 Q10 D15 R16 V17 L18 H19 L20 L21 A22 R27 K28 A29 E30 L31 R34 L35 Q36 L40 D44 K45 D46 A47 L48 L51 L52 V55 A56 N57 M58 S59 D62 G63 T64 C65 T66 L67 M71 D78 W79 Y82

S83 L89 L90 K91 R92 V93 L94 V95 R96 K97 L98 S99 G100 P101 S102 S103 G104

4.2.17 Score per residue for model 17

- Molecule 1: RNA polymerase II elongation factor ELL

Chain A: 58% 26% • 13%

G1 S2 S3 G4 S5 S6 G7 R11 P12 F13 R14 D15 R16 V17 L18 H19 L20 E30 L31 R34 L35 Q36 K45 D46 L51 L52 Q53 Q54 V55 A56 S59 A60 K61 L67 C70 K73 D74 V75 D78 L89 V93 R96 K97 L98 S99 G100 P101

S102 S103 G104

4.2.18 Score per residue for model 18 (medoid)

- Molecule 1: RNA polymerase II elongation factor ELL

Chain A: 56% 29% • 13%

G1 S2 S3 G4 S5 S6 G7 V8 S9 Q10 R16 V17 L18 H19 L20 L21 A22 L23 R24 L31 R34 L35 Q36 L51 L52 V55 A56 K61 C65 T66 L67 Q68 Y72 K73 D74 V75 Q76 K77 D78 W79 Y82 L89 L90 V93 L98 S99 G100 P101

S102 S103 G104

4.2.19 Score per residue for model 19

- Molecule 1: RNA polymerase II elongation factor ELL

Chain A: 57% 25% 5% 13%

G1 S2 S3 G4 S5 S6 G7 P12 R16 V17 L18 H19 L20 L21 A22 L23 R24 K28 L31 L32 L33 R34 L35 Q36 K37 D38 G39 L51 L52 V55 A56 T64 C65 T66 L67 K73 D74 V75 Q76 Y82 L89 L90 K91 R92 V93 R96 K97 L98 S99

G100 P101 S102 S103 G104

4.2.20 Score per residue for model 20

- Molecule 1: RNA polymerase II elongation factor ELL

Chain A: 59% 23% 5% 13%

G1 S2 S3 G4 S5 S6 G7 R14 V17 L18 H19 L20 L21 A22 R27 K28 L31 R34 L35 Q36 K37 D38 G39 Q42 D46 L51 L52 V55 A56 T64 C65 T66 L67 Y72 V75 W79 L89 R92 V93 L98 S99 G100 P101 S102

S103 G104

5 Refinement protocol and experimental data overview (i)

The models were refined using the following method: *simulated annealing*.

Of the 100 calculated structures, 20 were deposited, based on the following criterion: *structures with the lowest energy*.

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

Software name	Classification	Version
CNS	structure solution	1.1
CNS	refinement	1.1

No chemical shift data was provided.

6 Model quality (i)

6.1 Standard geometry (i)

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	726	751	751	14±3
All	All	14520	15020	15020	279

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 9.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:18:LEU:HD12	1:A:67:LEU:HD11	0.86	1.46	13	16
1:A:17:VAL:HG13	1:A:31:LEU:HD21	0.84	1.48	10	16
1:A:89:LEU:O	1:A:93:VAL:HG23	0.79	1.77	15	20
1:A:91:LYS:O	1:A:95:VAL:HG23	0.77	1.79	10	15
1:A:75:VAL:HG11	1:A:90:LEU:HD11	0.75	1.57	9	4
1:A:31:LEU:HD23	1:A:48:LEU:HD11	0.73	1.60	7	4
1:A:51:LEU:O	1:A:55:VAL:HG22	0.73	1.82	17	17
1:A:17:VAL:HG22	1:A:35:LEU:HD11	0.70	1.61	20	3
1:A:21:LEU:HD13	1:A:56:ALA:HB2	0.68	1.65	5	6
1:A:52:LEU:O	1:A:56:ALA:HB3	0.63	1.93	15	19
1:A:26:TYR:CB	1:A:31:LEU:HD13	0.62	2.24	11	3
1:A:27:ARG:HG2	1:A:64:THR:HG23	0.62	1.71	6	6
1:A:32:LEU:HD22	1:A:45:LYS:HE3	0.61	1.72	10	1
1:A:17:VAL:HG12	1:A:21:LEU:HD11	0.60	1.73	6	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:18:LEU:CD1	1:A:67:LEU:HD11	0.59	2.26	8	5
1:A:72:TYR:O	1:A:75:VAL:HG23	0.58	1.98	13	3
1:A:89:LEU:HD12	1:A:92:ARG:HD2	0.58	1.76	7	1
1:A:21:LEU:HB2	1:A:67:LEU:HD13	0.58	1.76	7	4
1:A:89:LEU:HD12	1:A:92:ARG:NE	0.57	2.14	5	1
1:A:82:TYR:CE2	1:A:90:LEU:HD22	0.57	2.33	16	3
1:A:14:ARG:HG3	1:A:51:LEU:HD21	0.57	1.75	7	5
1:A:14:ARG:HA	1:A:51:LEU:HD21	0.57	1.77	5	3
1:A:14:ARG:CG	1:A:51:LEU:HD21	0.56	2.30	7	1
1:A:55:VAL:O	1:A:67:LEU:HD12	0.56	2.00	13	3
1:A:31:LEU:CD2	1:A:52:LEU:HD21	0.55	2.31	15	8
1:A:21:LEU:CD1	1:A:56:ALA:HB2	0.55	2.30	5	2
1:A:27:ARG:HG3	1:A:64:THR:HG23	0.55	1.77	2	6
1:A:52:LEU:HD13	1:A:65:CYS:SG	0.55	2.42	15	3
1:A:16:ARG:O	1:A:20:LEU:HD12	0.55	2.02	14	2
1:A:55:VAL:HG12	1:A:71:MET:HE1	0.55	1.79	16	1
1:A:20:LEU:HD22	1:A:26:TYR:CE2	0.54	2.37	3	1
1:A:8:VAL:HG12	1:A:16:ARG:HG2	0.54	1.80	18	1
1:A:21:LEU:HD11	1:A:52:LEU:HD23	0.54	1.78	20	2
1:A:14:ARG:NE	1:A:51:LEU:HD11	0.53	2.19	20	1
1:A:35:LEU:CD1	1:A:48:LEU:HD13	0.53	2.33	4	3
1:A:26:TYR:HB3	1:A:31:LEU:HD13	0.53	1.80	11	3
1:A:20:LEU:HD21	1:A:34:ARG:CZ	0.53	2.33	16	1
1:A:17:VAL:CG1	1:A:31:LEU:HD21	0.53	2.32	20	2
1:A:40:LEU:HD12	1:A:44:ASP:HB2	0.52	1.81	14	1
1:A:8:VAL:O	1:A:8:VAL:HG12	0.52	2.04	7	2
1:A:17:VAL:HG12	1:A:21:LEU:CD1	0.52	2.34	6	1
1:A:52:LEU:HD22	1:A:65:CYS:SG	0.52	2.45	9	1
1:A:52:LEU:HD22	1:A:65:CYS:HB3	0.52	1.82	10	1
1:A:25:PRO:HB3	1:A:66:THR:HG22	0.52	1.82	13	2
1:A:40:LEU:HD12	1:A:44:ASP:CB	0.52	2.35	14	2
1:A:82:TYR:CE2	1:A:90:LEU:HD13	0.51	2.40	18	2
1:A:32:LEU:HD23	1:A:40:LEU:HD21	0.51	1.81	10	1
1:A:22:ALA:O	1:A:93:VAL:HG11	0.51	2.05	20	4
1:A:21:LEU:HD23	1:A:26:TYR:HB2	0.51	1.82	9	5
1:A:8:VAL:HG13	1:A:79:TRP:CZ2	0.51	2.41	12	2
1:A:89:LEU:HD12	1:A:92:ARG:CZ	0.50	2.36	5	1
1:A:55:VAL:HG12	1:A:71:MET:CE	0.50	2.36	16	4
1:A:19:HIS:CE1	1:A:79:TRP:CE3	0.50	3.00	20	6
1:A:31:LEU:CD2	1:A:48:LEU:HD11	0.50	2.34	12	1
1:A:23:LEU:HD22	1:A:89:LEU:HD23	0.50	1.82	14	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:52:LEU:HD22	1:A:65:CYS:CB	0.50	2.37	10	2
1:A:16:ARG:NH1	1:A:35:LEU:HD22	0.50	2.22	19	1
1:A:20:LEU:HD21	1:A:34:ARG:HE	0.49	1.66	10	4
1:A:23:LEU:HD11	1:A:82:TYR:CE1	0.49	2.43	14	3
1:A:18:LEU:HD12	1:A:67:LEU:CD1	0.49	2.34	8	2
1:A:35:LEU:HB3	1:A:40:LEU:HD13	0.48	1.84	10	1
1:A:14:ARG:CD	1:A:51:LEU:HD11	0.48	2.38	20	1
1:A:20:LEU:HD21	1:A:34:ARG:NE	0.48	2.24	20	3
1:A:29:ALA:O	1:A:33:LEU:HD12	0.48	2.08	12	1
1:A:19:HIS:CD2	1:A:79:TRP:CG	0.48	3.01	15	1
1:A:22:ALA:HA	1:A:67:LEU:HD22	0.47	1.86	8	1
1:A:32:LEU:CD2	1:A:48:LEU:HD22	0.47	2.39	8	1
1:A:21:LEU:HD11	1:A:52:LEU:CD2	0.46	2.40	1	1
1:A:20:LEU:HD13	1:A:31:LEU:HD11	0.45	1.89	5	3
1:A:14:ARG:HG3	1:A:51:LEU:HD11	0.45	1.89	4	1
1:A:18:LEU:HD21	1:A:74:ASP:HB2	0.45	1.89	19	1
1:A:21:LEU:HD13	1:A:56:ALA:CB	0.45	2.38	5	1
1:A:32:LEU:HD22	1:A:45:LYS:HE2	0.44	1.88	13	1
1:A:21:LEU:HD22	1:A:65:CYS:O	0.43	2.13	18	1
1:A:27:ARG:CG	1:A:64:THR:HG23	0.43	2.43	8	3
1:A:28:LYS:O	1:A:32:LEU:HD12	0.43	2.13	19	2
1:A:18:LEU:HD21	1:A:74:ASP:HB3	0.43	1.91	17	1
1:A:31:LEU:HD23	1:A:48:LEU:HD21	0.43	1.91	16	1
1:A:18:LEU:HD21	1:A:74:ASP:CB	0.42	2.44	8	1
1:A:20:LEU:HD13	1:A:31:LEU:CD1	0.42	2.44	8	1
1:A:55:VAL:HG12	1:A:71:MET:SD	0.42	2.55	9	1
1:A:67:LEU:HD23	1:A:72:TYR:CG	0.41	2.51	18	1
1:A:18:LEU:HG	1:A:75:VAL:HG22	0.41	1.92	17	1
1:A:68:GLN:O	1:A:72:TYR:CD2	0.40	2.74	7	3
1:A:23:LEU:HD21	1:A:90:LEU:HB2	0.40	1.92	18	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	90/104 (87%)	79±2 (88±2%)	10±2 (11±2%)	1±1 (1±1%)	15 61
All	All	1800/2080 (87%)	1581 (88%)	193 (11%)	26 (1%)	15 61

All 9 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	12	PRO	7
1	A	39	GLY	5
1	A	84	GLU	5
1	A	61	LYS	3
1	A	63	GLY	2
1	A	82	TYR	1
1	A	83	SER	1
1	A	27	ARG	1
1	A	81	GLY	1

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	79/88 (90%)	64±2 (81±3%)	15±2 (19±3%)	4 37
All	All	1580/1760 (90%)	1286 (81%)	294 (19%)	4 37

All 46 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	34	ARG	20
1	A	51	LEU	16
1	A	64	THR	15
1	A	28	LYS	14
1	A	46	ASP	11
1	A	36	GLN	11
1	A	83	SER	10
1	A	30	GLU	10
1	A	10	GLN	9

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Mol	Chain	Res	Type	Models (Total)
1	A	59	SER	9
1	A	66	THR	9
1	A	96	ARG	9
1	A	24	ARG	8
1	A	69	ASP	8
1	A	77	LYS	8
1	A	42	GLN	7
1	A	78	ASP	7
1	A	14	ARG	6
1	A	92	ARG	6
1	A	37	LYS	6
1	A	61	LYS	6
1	A	38	ASP	6
1	A	54	GLN	6
1	A	62	ASP	6
1	A	16	ARG	6
1	A	73	LYS	6
1	A	20	LEU	6
1	A	45	LYS	6
1	A	70	CYS	5
1	A	15	ASP	5
1	A	91	LYS	4
1	A	58	MET	4
1	A	27	ARG	3
1	A	84	GLU	3
1	A	74	ASP	3
1	A	11	ARG	3
1	A	89	LEU	3
1	A	9	SER	3
1	A	44	ASP	2
1	A	65	CYS	2
1	A	53	GLN	2
1	A	88	GLN	1
1	A	49	ASP	1
1	A	41	THR	1
1	A	90	LEU	1
1	A	76	GLN	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)

There are no ligands in this entry.

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