Full wwPDB NMR Structure Validation Report (i)

Jun 12, 2024 – 12:54 PM EDT

PDB ID	:	2PDD
Title	:	THE HIGH RESOLUTION STRUCTURE OF THE PERIPHERAL SUBUNIT-BINDING DOMAIN OF DIHYDROLIPOAMIDE ACETYLTRANSFERASE FROM THE PYRUVATE DEHYDROGENASE MULTIENZYME COMPLEX OF BACILLUS STEAROTHERMOPHILUS
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Deposited on	:	1992-11-25

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 types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

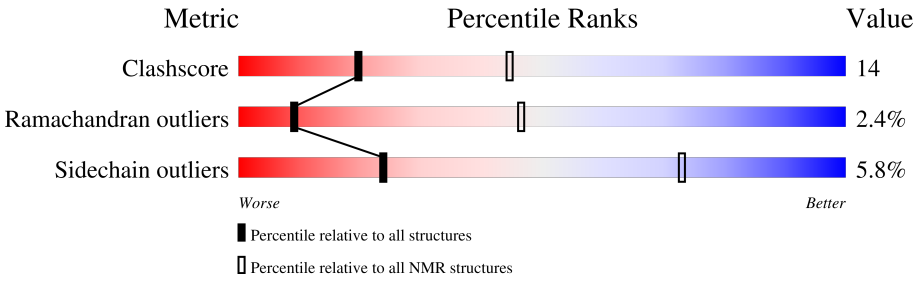
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
wwPDB-RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
wwPDB-ShiftChecker	:	v1.2
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

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	43	58% 14% 5% 23%

2 Ensemble composition and analysis (i)

This entry contains 35 models. The atoms present in the NMR models are not consistent. Some calculations may have failed as a result. All residues are included in the validation scores. Model 13 is the overall representative, medoid model (most similar to other models).

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:7-A:39 (33)	0.42	13

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

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

NmrClust was unable to cluster the ensemble.

Error message: Inconsistent models in file

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 665 atoms, of which 344 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called DIHYDROLIPOAMIDE ACETYLTRANSFERASE.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	43	665	202	344	61	57	1	0

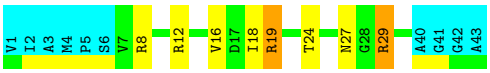
4 Residue-property plots (i)

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: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

Chain A:



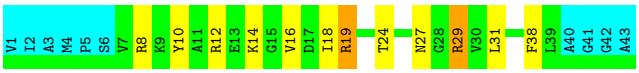
4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

4.2.1 Score per residue for model 1

• Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

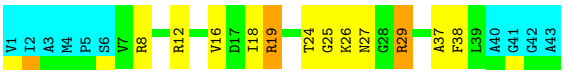
Chain A:



4.2.2 Score per residue for model 2

• Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

Chain A:



4.2.3 Score per residue for model 3

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

Chain A: 53% 19% 5% 23%

V1 I2 A3 M4 P5 S6 V7 R8 V16 D17 I18 R19 T24 N27 G28 R29 D36 A37 F38 L39 A40 G41 G42 A43

4.2.4 Score per residue for model 4

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

Chain A: 44% 28% 5% 23%

V1 I2 A3 M4 P5 S6 V7 R8 R12 V16 D17 I18 R19 G23 T24 N27 G28 R29 V30 L31 D36 A37 F38 L39 A40 G41 G42 A43

4.2.5 Score per residue for model 5

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

Chain A: 53% 19% 5% 23%

V1 I2 A3 M4 P5 S6 V7 R8 R12 I18 R19 G23 T24 N27 G28 R29 V30 L31 L39 A40 G41 G42 A43

4.2.6 Score per residue for model 6

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

Chain A: 44% 28% 5% 23%

V1 I2 A3 M4 P5 S6 V7 R8 A11 R12 E13 K14 I18 R19 Q22 G23 T24 G25 K26 N27 G28 R29 I35 L39 A40 G41 G42 A43

4.2.7 Score per residue for model 7

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

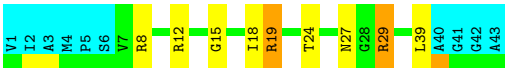
Chain A: 51% 19% 7% 23%

V1 I2 A3 M4 P5 S6 V7 R8 R12 I18 R19 G23 T24 G25 K26 N27 G28 R29 L39 A40 G41 G42 A43

4.2.8 Score per residue for model 8

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

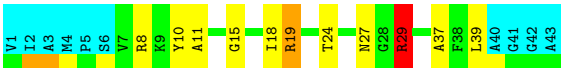
Chain A: 56% 16% 5% 23%



4.2.9 Score per residue for model 9

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

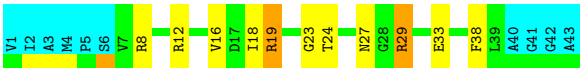
Chain A: 51% 21% • • 23%



4.2.10 Score per residue for model 10

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

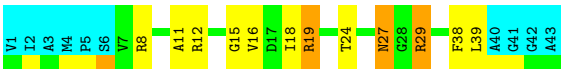
Chain A: 51% 21% 5% 23%



4.2.11 Score per residue for model 11

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

Chain A: 49% 21% 7% 23%



4.2.12 Score per residue for model 12

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

Chain A: 58% 12% 7% 23%

4.2.13 Score per residue for model 13 (medoid)

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

Chain A: 51% 23% • 23%

V1 I2 A3 M4 P5 S6 V7 R8 R12 V16 D17 I18 R19 T24 N27 G28 R29 V30 L31 F38 L39 A40 G41 G42 A43

4.2.14 Score per residue for model 14

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

Chain A: 51% 21% 5% 23%

V1 I2 A3 M4 P5 S6 V7 R8 K9 R12 V16 D17 I18 R19 T24 N27 G28 R29 F38 L39 A40 G41 G42 A43

4.2.15 Score per residue for model 15

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

Chain A: 47% 26% 5% 23%

V1 I2 A3 M4 P5 S6 V7 R8 A11 R12 G15 V16 D17 I18 R19 T24 N27 G28 R29 K32 D36 A37 F38 L39 A40 G41 G42 A43

4.2.16 Score per residue for model 16

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

Chain A: 53% 16% 7% 23%

V1 I2 A3 M4 P5 S6 V7 R8 R12 V16 D17 I18 R19 T24 N27 G28 R29 V30 L31 F38 L39 A40 G41 G42 A43

4.2.17 Score per residue for model 17

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

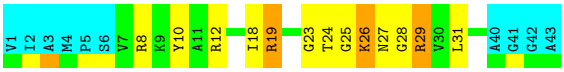
Chain A: 56% 16% 5% 23%

V1 I2 A3 M4 P5 S6 V7 R8 R12 I18 R19 T24 N27 G28 R29 A37 F38 L39 A40 G41 G42 A43

4.2.18 Score per residue for model 18

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

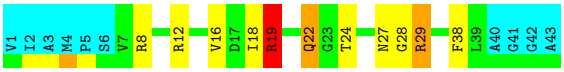
Chain A: 47% 23% 7% 23%



4.2.19 Score per residue for model 19

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

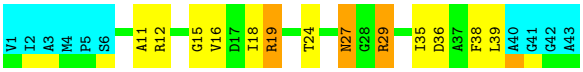
Chain A: 51% 19% 5% • 23%



4.2.20 Score per residue for model 20

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

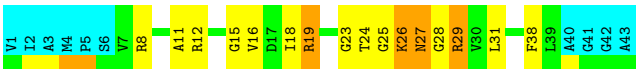
Chain A: 47% 23% 7% 23%



4.2.21 Score per residue for model 21

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

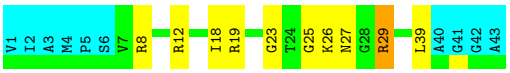
Chain A: 40% 28% 9% 23%



4.2.22 Score per residue for model 22

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

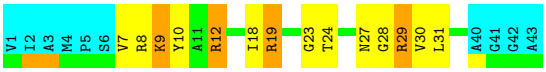
Chain A: 53% 21% • 23%



4.2.23 Score per residue for model 23

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

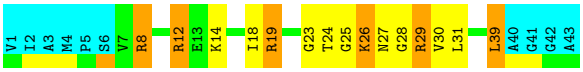
Chain A: 44% 23% 9% 23%



4.2.24 Score per residue for model 24

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

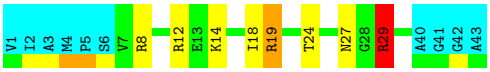
Chain A: 42% 21% 14% 23%



4.2.25 Score per residue for model 25

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

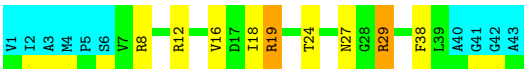
Chain A: 58% 14% • • 23%



4.2.26 Score per residue for model 26

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

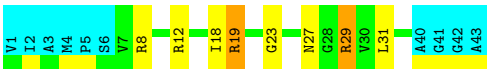
Chain A: 56% 16% 5% 23%



4.2.27 Score per residue for model 27

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

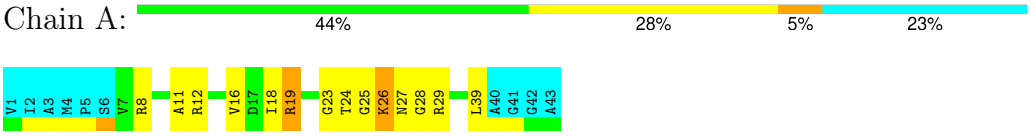
Chain A: 58% 14% 5% 23%



4.2.28 Score per residue for model 28

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

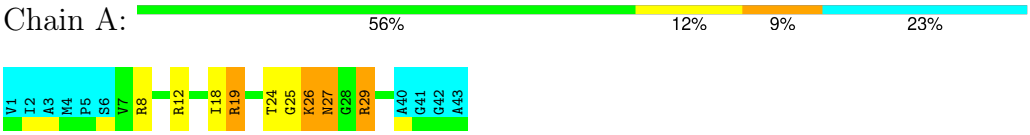
Chain A:



4.2.29 Score per residue for model 29

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

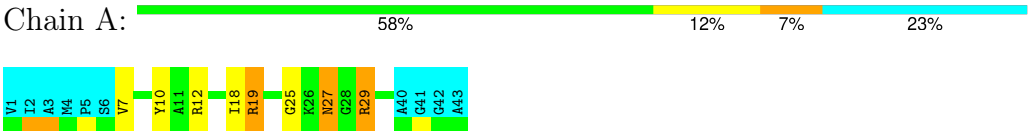
Chain A:



4.2.30 Score per residue for model 30

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

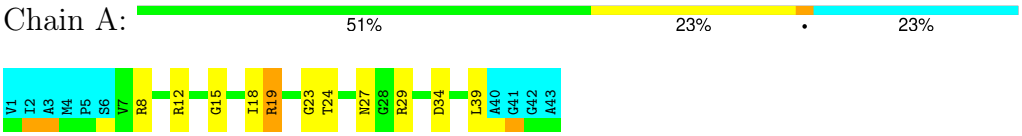
Chain A:



4.2.31 Score per residue for model 31

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

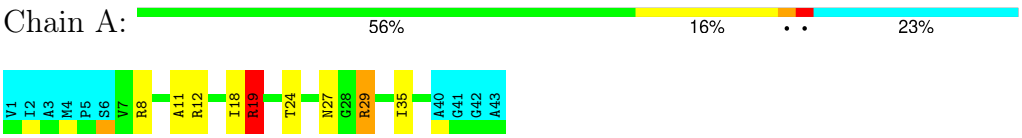
Chain A:



4.2.32 Score per residue for model 32

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

Chain A:



4.2.33 Score per residue for model 33

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

Chain A: 56% 16% 5% 23%

V1 I2 A3 M4 P5 S6 V7 R8 R12 V16 D17 I18 R19 T24 R29 V30 L31 F38 L39 A40 G41 G42 A43

4.2.34 Score per residue for model 34

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

Chain A: 47% 23% 7% 23%

V1 I2 A3 M4 P5 S6 V7 R8 K9 Y10 A11 R12 V16 D17 I18 R19 L20 T24 N27 G28 R29 K32 A40 G41 G42 A43

4.2.35 Score per residue for model 35

- Molecule 1: DIHYDROLIPOAMIDE ACETYLTRANSFERASE

Chain A: 37% 28% 12% 23%

V1 I2 A3 M4 P5 S6 V7 R8 A11 R12 G15 V16 D17 I18 R19 G23 T24 G25 K26 N27 G28 R29 V30 L31 F38 L39 A40 G41 G42 A43

5 Refinement protocol and experimental data overview (i)

Of the ? calculated structures, 35 were deposited, based on the following criterion: *?*.

The authors did not provide any information on software used for structure solution, optimization or refinement.

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.

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	Chirality	Planarity
1	A	0.0±0.0	3.7±0.4
All	All	0	131

There are no bond-length outliers.

There are no bond-angle outliers.

There are no chirality outliers.

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

Mol	Chain	Res	Type	Group	Models (Total)
1	A	29	ARG	Sidechain	34
1	A	8	ARG	Sidechain	33
1	A	12	ARG	Sidechain	32
1	A	19	ARG	Sidechain	32

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	263	280	280	8±2
All	All	9205	9800	9800	264

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 14.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:27:ASN:ND2	1:A:28:GLY:N	0.64	2.46	35	2
1:A:31:LEU:HD12	1:A:31:LEU:N	0.58	2.12	1	8
1:A:25:GLY:O	1:A:27:ASN:ND2	0.57	2.38	29	1
1:A:17:ASP:O	1:A:19:ARG:N	0.55	2.39	34	1
1:A:26:LYS:O	1:A:27:ASN:ND2	0.55	2.40	28	3
1:A:18:ILE:CG2	1:A:19:ARG:N	0.54	2.71	1	35
1:A:27:ASN:OD1	1:A:28:GLY:N	0.54	2.40	28	6
1:A:11:ALA:O	1:A:15:GLY:N	0.53	2.41	35	6
1:A:10:TYR:OH	1:A:14:LYS:NZ	0.53	2.38	1	1
1:A:19:ARG:O	1:A:19:ARG:NE	0.53	2.41	32	1
1:A:27:ASN:O	1:A:29:ARG:N	0.52	2.43	4	28
1:A:18:ILE:HG23	1:A:19:ARG:N	0.50	2.21	19	26
1:A:39:LEU:C	1:A:39:LEU:HD23	0.50	2.27	9	3
1:A:33:GLU:H	1:A:33:GLU:CD	0.50	2.10	10	1
1:A:27:ASN:CG	1:A:28:GLY:N	0.49	2.65	19	6
1:A:16:VAL:HG13	1:A:38:PHE:CD2	0.49	2.43	1	16
1:A:27:ASN:C	1:A:29:ARG:N	0.49	2.65	6	30
1:A:25:GLY:O	1:A:27:ASN:N	0.49	2.46	2	1
1:A:24:THR:OG1	1:A:31:LEU:CD2	0.49	2.61	18	1
1:A:31:LEU:N	1:A:31:LEU:CD1	0.48	2.75	1	3
1:A:8:ARG:NH1	1:A:12:ARG:NH1	0.48	2.61	24	1
1:A:27:ASN:N	1:A:27:ASN:HD22	0.47	2.07	30	1
1:A:27:ASN:N	1:A:27:ASN:OD1	0.46	2.47	7	1
1:A:17:ASP:O	1:A:20:LEU:CD1	0.46	2.63	34	1
1:A:9:LYS:CG	1:A:10:TYR:N	0.46	2.78	23	1
1:A:26:LYS:O	1:A:27:ASN:OD1	0.45	2.34	21	2
1:A:25:GLY:O	1:A:26:LYS:O	0.45	2.35	28	5
1:A:33:GLU:OE1	1:A:33:GLU:N	0.45	2.49	10	1
1:A:18:ILE:CD1	1:A:35:ILE:HD11	0.45	2.42	20	1
1:A:27:ASN:CG	1:A:28:GLY:H	0.45	2.15	23	4
1:A:17:ASP:O	1:A:18:ILE:C	0.45	2.56	34	1
1:A:25:GLY:O	1:A:29:ARG:O	0.44	2.35	24	3
1:A:27:ASN:OD1	1:A:27:ASN:N	0.44	2.50	10	1
1:A:24:THR:OG1	1:A:31:LEU:CD1	0.44	2.65	16	1
1:A:11:ALA:HB2	1:A:35:ILE:CD1	0.44	2.42	6	2
1:A:30:VAL:CG1	1:A:31:LEU:N	0.44	2.80	23	1
1:A:27:ASN:ND2	1:A:28:GLY:H	0.44	2.07	35	2
1:A:26:LYS:O	1:A:27:ASN:O	0.44	2.35	29	1
1:A:27:ASN:C	1:A:29:ARG:H	0.44	2.16	23	25
1:A:25:GLY:C	1:A:27:ASN:HD22	0.43	2.16	30	1
1:A:27:ASN:HD22	1:A:28:GLY:H	0.43	1.56	35	1
1:A:10:TYR:CD1	1:A:10:TYR:C	0.43	2.91	30	4

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:19:ARG:O	1:A:26:LYS:CE	0.43	2.67	7	1
1:A:25:GLY:O	1:A:27:ASN:OD1	0.43	2.36	22	1
1:A:26:LYS:O	1:A:27:ASN:CG	0.42	2.58	24	2
1:A:26:LYS:C	1:A:27:ASN:ND2	0.42	2.72	29	1
1:A:25:GLY:C	1:A:27:ASN:H	0.42	2.18	6	1
1:A:9:LYS:NZ	1:A:9:LYS:CB	0.42	2.83	23	1
1:A:27:ASN:O	1:A:30:VAL:HG23	0.42	2.14	24	1
1:A:11:ALA:HB1	1:A:16:VAL:O	0.42	2.15	34	2
1:A:31:LEU:N	1:A:31:LEU:CD2	0.42	2.83	33	1
1:A:10:TYR:CG	1:A:32:LYS:NZ	0.41	2.89	34	1
1:A:19:ARG:O	1:A:19:ARG:NH2	0.41	2.53	32	1
1:A:27:ASN:N	1:A:27:ASN:ND2	0.41	2.69	11	1
1:A:32:LYS:O	1:A:36:ASP:OD1	0.41	2.38	15	1
1:A:36:ASP:OD1	1:A:36:ASP:N	0.41	2.54	20	1
1:A:39:LEU:C	1:A:39:LEU:CD1	0.40	2.90	24	1
1:A:19:ARG:NE	1:A:19:ARG:C	0.40	2.74	32	1
1:A:16:VAL:CG1	1:A:38:PHE:CD2	0.40	3.05	35	3
1:A:23:GLY:N	1:A:34:ASP:OD1	0.40	2.52	31	1
1:A:22:GLN:O	1:A:22:GLN:CD	0.40	2.60	19	1
1:A:25:GLY:O	1:A:26:LYS:CG	0.40	2.70	22	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	33/43 (77%)	23±1 (70±4%)	9±1 (27±4%)	1±1 (2±3%)	9	46
All	All	1155/1505 (77%)	811 (70%)	316 (27%)	28 (2%)	9	46

All 7 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	23	GLY	12
1	A	26	LYS	7

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Mol	Chain	Res	Type	Models (Total)
1	A	15	GLY	4
1	A	27	ASN	2
1	A	28	GLY	1
1	A	7	VAL	1
1	A	18	ILE	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	27/32 (84%)	25±1 (94±3%)	2±1 (6±3%)	24	73
All	All	945/1120 (84%)	890 (94%)	55 (6%)	24	73

All 11 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	24	THR	31
1	A	27	ASN	5
1	A	14	LYS	3
1	A	29	ARG	3
1	A	39	LEU	3
1	A	22	GLN	2
1	A	9	LYS	2
1	A	12	ARG	2
1	A	19	ARG	2
1	A	26	LYS	1
1	A	20	LEU	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