Full wwPDB NMR Structure Validation Report (i)

Feb 23, 2022 – 04:20 PM EST

PDB ID	:	1XN9
Title	:	Solution Structure of Methanosarcina mazei Protein RPS24E: The Northeast Structural Genomics Consortium Target MaR11
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Deposited on	:	2004-10-04

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:

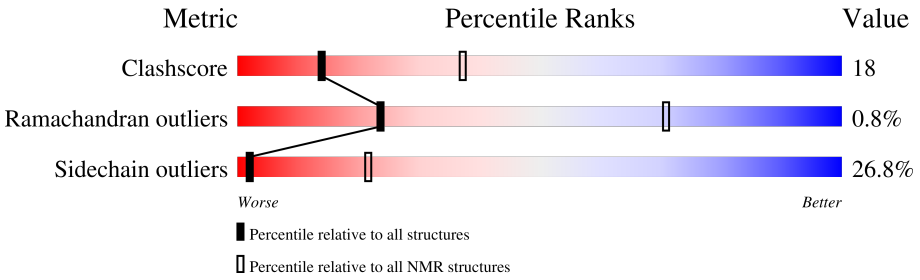
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	2.26
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
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	101	34% 32% 6% 29%

2 Ensemble composition and analysis (i)

This entry contains 20 models. Model 15 is the overall representative, medoid model (most similar to other models). The authors have identified model 1 as representative, based on the following criterion: *fewest violations*.

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:1-A:57, A:63-A:77 (72)	0.14	15

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

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 1654 atoms, of which 837 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called 30S ribosomal protein S24e.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	101	1654	511	837	143	159	4	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: 30S ribosomal protein S24e

Chain A: 34% 32% 6% 29%

M1 D2 I3 K4 I5 I6 K7 D8 K9 K10 L14 N15 R16 R17 E18 L19 D20 F21 I22 Y25 S28 D34 V35 R36 N37 K38 L39 M42 L43 N44 A45 P46 L47 E48 L49 L50 R54 I55 K56 T57 E58 Y59 G60 M61 Q62 E63 S64 K65 G66 Y67 L70 Y71

D75 R76 M77 K78 Q79 V80 E81 Q82 E83 Y84 V85 L86 K87 R88 N89 A90 V91 P92 G93 S94 E95 T96 E97 G98 E99 E100 A101

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: 30S ribosomal protein S24e

Chain A: 38% 28% 6% 29%

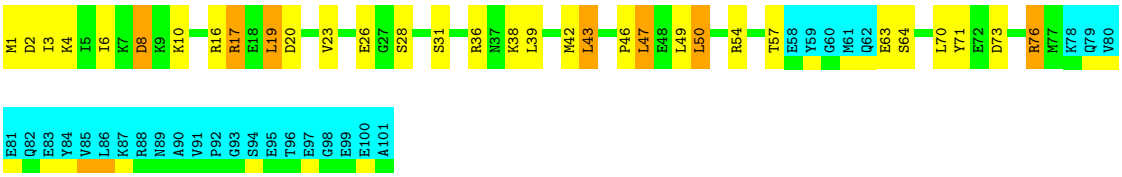
M1 D2 I3 K7 K10 L14 N15 R16 R17 E18 L19 D20 F21 S28 T29 P30 D34 V35 R36 L39 L43 N44 A45 P46 L47 E48 L49 L50 R54 I55 K56 T57 E58 Y59 G60 M61 Q62 E63 S64 K65 G66 L70 Y71 R76 M77 K78 Q79 V80 E81 Q82

E83 Y84 V85 L86 K87 R88 N89 A90 V91 P92 G93 S94 E95 T96 E97 G98 E99 E100 A101

4.2.2 Score per residue for model 2

• Molecule 1: 30S ribosomal protein S24e

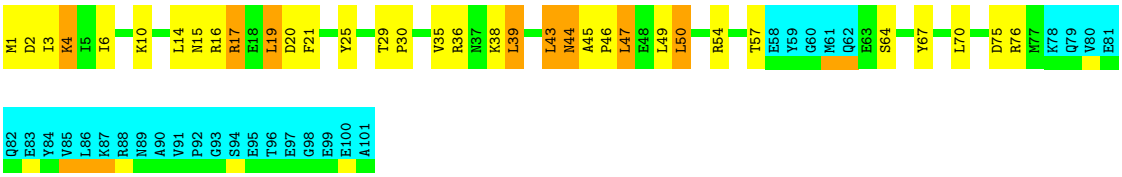
Chain A: 40% 25% 7% 29%



4.2.3 Score per residue for model 3

- Molecule 1: 30S ribosomal protein S24e

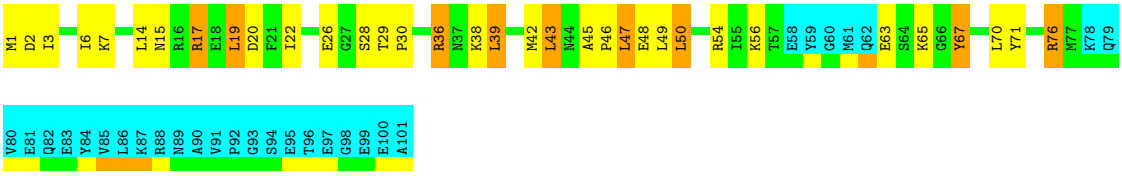
Chain A: 38% 26% 8% 29%



4.2.4 Score per residue for model 4

- Molecule 1: 30S ribosomal protein S24e

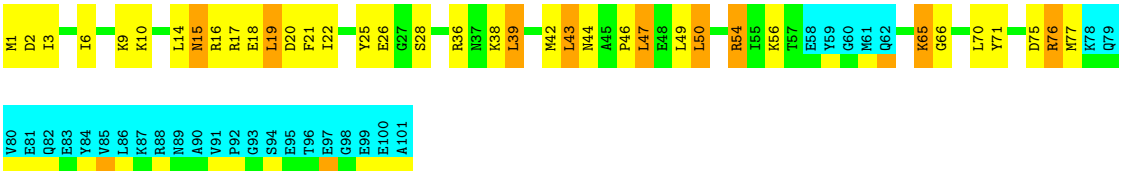
Chain A: 38% 25% 9% 29%



4.2.5 Score per residue for model 5

- Molecule 1: 30S ribosomal protein S24e

Chain A: 35% 28% 9% 29%



4.2.6 Score per residue for model 6

- Molecule 1: 30S ribosomal protein S24e

Chain A: 45% 21% 6% 29%

M1 D2 K10 L14 N15 R16 R17 E18 L19 D20 F21 T29 P30 R36 N37 K38 L39 L43 N44 A45 P46 L47 E48 L49 L50 R54 I55 K56 T57 E58 Y59 G60 M61 Q62 G66 Y67 L70 D75 R76 M77 K78 Q79 V80 E81 Q82 E83 Y84 V85 L86 K87 R88

N89 A90 V91 P92 G93 S94 E95 T96 E97 G98 E99 E100 A101

4.2.7 Score per residue for model 7

- Molecule 1: 30S ribosomal protein S24e

Chain A: 38% 27% 7% 29%

M1 D2 I3 I6 K10 L14 N15 R16 R17 E18 L19 D20 F21 I22 Y25 S28 D34 V35 R36 N37 K38 L39 A40 A41 M42 L43 P46 L47 E48 L49 L50 K56 T57 E58 Y59 G60 M61 Q62 E63 S64 K65 G66 Y67 L70 D73 A74 D75 R76 M77 K78

Q79 V80 E81 Q82 E83 Y84 V85 L86 K87 R88 N89 A90 V91 P92 G93 S94 E95 T96 E97 G98 E99 E100 A101

4.2.8 Score per residue for model 8

- Molecule 1: 30S ribosomal protein S24e

Chain A: 38% 26% 8% 29%

M1 D2 I3 K4 I5 I6 L14 N15 R16 R17 E18 L19 D20 F21 I22 Y25 E26 D34 V35 R36 N37 K38 L39 M42 L43 P46 L47 E48 L49 L50 V51 I52 Q53 R54 E58 Y59 G60 M61 Q62 K65 G66 Y67 L70 Y71 D75 R76 M77 K78 Q79 V80 E81

Q82 E83 Y84 V85 L86 K87 R88 N89 A90 V91 P92 G93 S94 E95 T96 E97 G98 E99 E100 A101

4.2.9 Score per residue for model 9

- Molecule 1: 30S ribosomal protein S24e

Chain A: 37% 28% 7% 29%

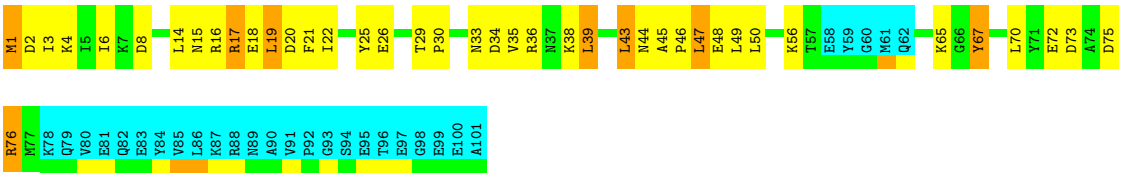
M1 D2 I3 K4 I5 I6 K7 K10 R17 E18 L19 D20 F21 I22 V23 K24 Y25 E26 P30 S31 R32 R36 N37 K38 L39 M42 L43 N44 A45 P46 L47 E48 L49 L50 K56 T57 E58 Y59 G60 M61 Q62 E63 S64 K65 L70 Y71 E72 D73 R76 M77 K78 Q79

V80 E81 Q82 E83 Y84 V85 L86 K87 R88 N89 A90 V91 P92 G93 S94 E95 T96 E97 G98 E99 E100 A101

4.2.10 Score per residue for model 10

- Molecule 1: 30S ribosomal protein S24e

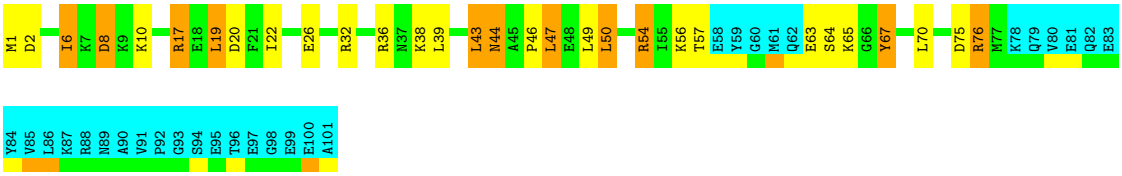
Chain A: 31% 33% 8% 29%



4.2.11 Score per residue for model 11

- Molecule 1: 30S ribosomal protein S24e

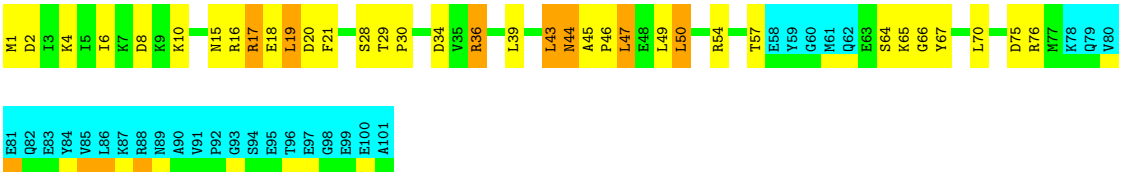
Chain A: 42% 19% 11% 29%



4.2.12 Score per residue for model 12

- Molecule 1: 30S ribosomal protein S24e

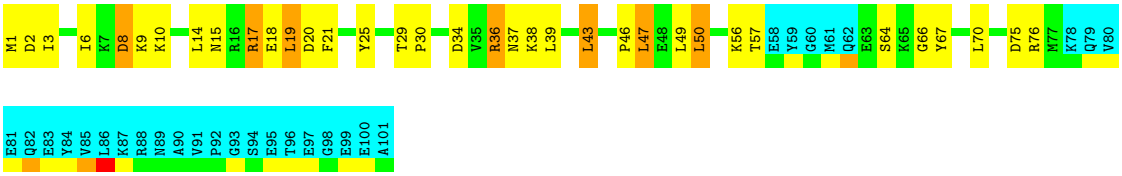
Chain A: 37% 28% 7% 29%



4.2.13 Score per residue for model 13

- Molecule 1: 30S ribosomal protein S24e

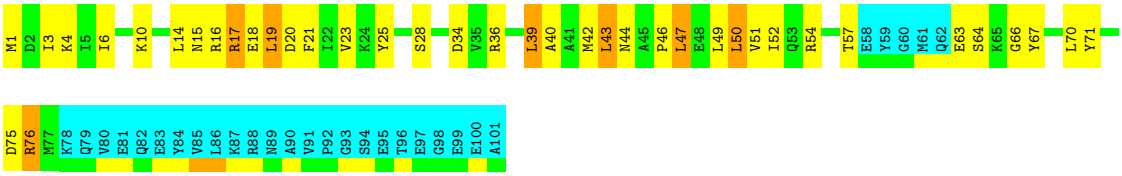
Chain A: 37% 28% 7% 29%



4.2.14 Score per residue for model 14

• Molecule 1: 30S ribosomal protein S24e

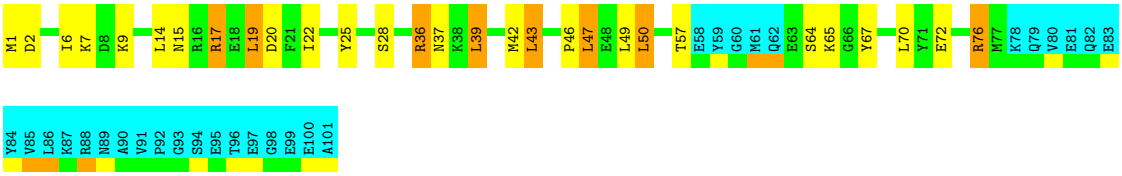
Chain A: 33% 32% 7% 29%



4.2.15 Score per residue for model 15 (medoid)

• Molecule 1: 30S ribosomal protein S24e

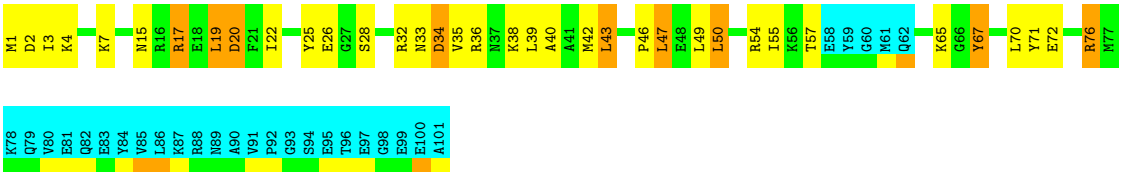
Chain A: 43% 21% 8% 29%



4.2.16 Score per residue for model 16

• Molecule 1: 30S ribosomal protein S24e

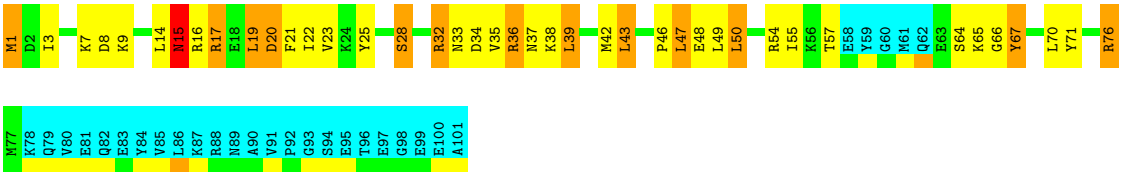
Chain A: 36% 27% 9% 29%



4.2.17 Score per residue for model 17

• Molecule 1: 30S ribosomal protein S24e

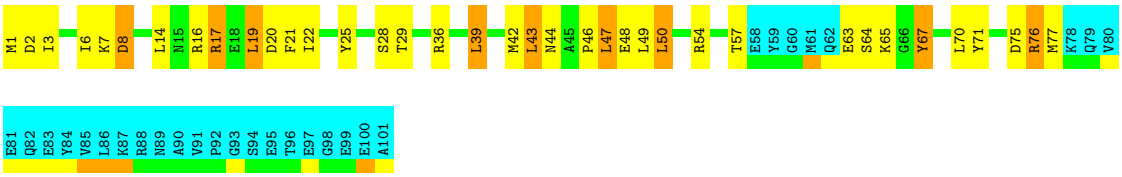
Chain A: 31% 27% 13% • 29%



4.2.18 Score per residue for model 18

- Molecule 1: 30S ribosomal protein S24e

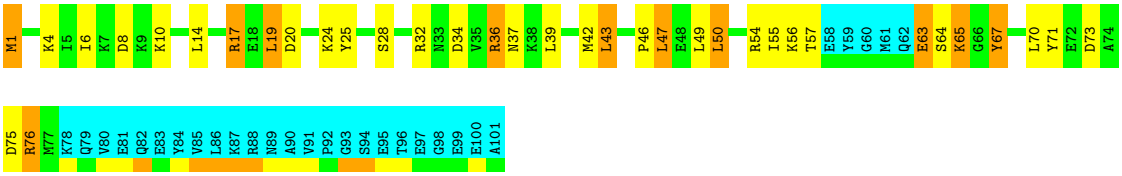
Chain A: 35% 28% 9% 29%



4.2.19 Score per residue for model 19

- Molecule 1: 30S ribosomal protein S24e

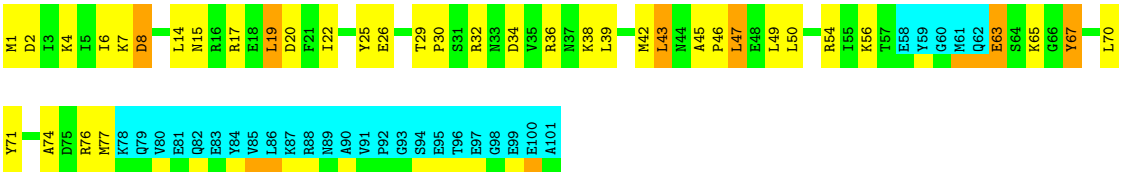
Chain A: 36% 25% 11% 29%



4.2.20 Score per residue for model 20

- Molecule 1: 30S ribosomal protein S24e

Chain A: 34% 32% 6% 29%



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 least restraint violations*.

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

Software name	Classification	Version
DYANA	structure solution	1.5
DYANA	refinement	1.5

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	587	623	625	21±4
All	All	11740	12460	12500	426

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 18.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:57:THR:HG23	1:A:64:SER:OG	0.81	1.75	18	12
1:A:43:LEU:HD23	1:A:43:LEU:N	0.74	1.97	9	20
1:A:32:ARG:HG3	1:A:55:ILE:HD12	0.68	1.63	17	2
1:A:21:PHE:CD2	1:A:39:LEU:HD11	0.65	2.27	9	1
1:A:19:LEU:HD11	1:A:70:LEU:HB3	0.64	1.68	15	20
1:A:36:ARG:HB3	1:A:47:LEU:HD11	0.60	1.74	15	7
1:A:22:ILE:HD13	1:A:65:LYS:HB2	0.60	1.73	11	11
1:A:46:PRO:HG2	1:A:49:LEU:HD12	0.59	1.75	12	20
1:A:29:THR:HG23	1:A:30:PRO:HD2	0.59	1.74	1	8
1:A:20:ASP:CG	1:A:67:TYR:CE2	0.59	2.76	8	11
1:A:21:PHE:CE1	1:A:66:GLY:O	0.58	2.57	1	7
1:A:39:LEU:HB3	1:A:50:LEU:HD21	0.57	1.77	5	2
1:A:3:ILE:HG23	1:A:21:PHE:CD2	0.55	2.37	1	4
1:A:36:ARG:HG3	1:A:52:ILE:HD11	0.55	1.78	8	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:20:ASP:CG	1:A:67:TYR:CZ	0.55	2.80	19	6
1:A:1:MET:SD	1:A:35:VAL:HG22	0.54	2.41	17	1
1:A:20:ASP:OD1	1:A:67:TYR:CE2	0.54	2.60	6	11
1:A:20:ASP:OD2	1:A:67:TYR:CZ	0.54	2.61	4	5
1:A:39:LEU:HD23	1:A:43:LEU:HD11	0.54	1.77	15	5
1:A:20:ASP:OD2	1:A:67:TYR:CE2	0.53	2.61	14	7
1:A:14:LEU:HD13	1:A:16:ARG:NH2	0.53	2.18	18	1
1:A:1:MET:HE1	1:A:3:ILE:HD11	0.53	1.79	10	1
1:A:20:ASP:OD1	1:A:67:TYR:CD2	0.52	2.63	10	13
1:A:3:ILE:HG22	1:A:42:MET:CE	0.52	2.34	9	1
1:A:43:LEU:N	1:A:43:LEU:CD2	0.52	2.68	19	18
1:A:4:LYS:O	1:A:4:LYS:CG	0.51	2.59	2	5
1:A:32:ARG:HG2	1:A:55:ILE:HD12	0.51	1.82	16	1
1:A:25:TYR:OH	1:A:57:THR:CG2	0.51	2.59	16	1
1:A:20:ASP:OD1	1:A:67:TYR:CG	0.51	2.65	20	2
1:A:19:LEU:HD11	1:A:70:LEU:CB	0.50	2.36	8	15
1:A:14:LEU:O	1:A:15:ASN:CB	0.50	2.59	5	11
1:A:25:TYR:CD1	1:A:25:TYR:N	0.50	2.79	5	8
1:A:16:ARG:CZ	1:A:18:GLU:OE2	0.49	2.60	14	2
1:A:70:LEU:HD12	1:A:71:TYR:N	0.49	2.22	19	5
1:A:22:ILE:CG2	1:A:63:GLU:CG	0.49	2.91	7	3
1:A:25:TYR:CE2	1:A:63:GLU:HA	0.49	2.43	19	1
1:A:3:ILE:HG23	1:A:21:PHE:HD2	0.49	1.67	14	3
1:A:47:LEU:O	1:A:50:LEU:N	0.49	2.46	14	20
1:A:3:ILE:CG2	1:A:42:MET:CE	0.49	2.91	9	1
1:A:50:LEU:HD12	1:A:70:LEU:HD13	0.48	1.84	2	2
1:A:51:VAL:C	1:A:52:ILE:HD13	0.48	2.29	14	2
1:A:36:ARG:HB3	1:A:47:LEU:HD21	0.47	1.85	2	1
1:A:3:ILE:HD12	1:A:38:LYS:HB3	0.47	1.85	8	9
1:A:16:ARG:HB3	1:A:71:TYR:CE2	0.47	2.44	8	3
1:A:3:ILE:HD11	1:A:35:VAL:HG13	0.47	1.86	16	1
1:A:20:ASP:OD1	1:A:67:TYR:CZ	0.47	2.67	19	1
1:A:14:LEU:HD12	1:A:16:ARG:CZ	0.47	2.40	14	1
1:A:21:PHE:CE2	1:A:35:VAL:CG1	0.46	2.98	3	2
1:A:40:ALA:CB	1:A:47:LEU:HD12	0.46	2.40	16	3
1:A:25:TYR:CE1	1:A:30:PRO:CD	0.46	2.98	9	1
1:A:17:ARG:N	1:A:70:LEU:O	0.46	2.49	14	17
1:A:14:LEU:CD1	1:A:16:ARG:CZ	0.46	2.94	1	2
1:A:37:ASN:N	1:A:47:LEU:HD11	0.45	2.26	19	5
1:A:8:ASP:OD2	1:A:17:ARG:NH2	0.45	2.50	19	1
1:A:6:ILE:N	1:A:20:ASP:O	0.45	2.50	18	16

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:16:ARG:NE	1:A:18:GLU:OE2	0.45	2.50	5	1
1:A:15:ASN:ND2	1:A:76:ARG:NH1	0.45	2.65	6	1
1:A:71:TYR:CD2	1:A:77:MET:HB2	0.44	2.47	18	2
1:A:9:LYS:O	1:A:18:GLU:N	0.44	2.50	13	1
1:A:16:ARG:NH2	1:A:18:GLU:OE2	0.44	2.51	10	1
1:A:33:ASN:OD1	1:A:34:ASP:N	0.44	2.51	10	2
1:A:49:LEU:O	1:A:71:TYR:CD2	0.44	2.71	18	1
1:A:47:LEU:O	1:A:50:LEU:O	0.44	2.35	14	19
1:A:14:LEU:HD12	1:A:16:ARG:NE	0.44	2.28	14	1
1:A:25:TYR:OH	1:A:57:THR:HG23	0.43	2.13	16	1
1:A:49:LEU:HD21	1:A:74:ALA:HB2	0.43	1.91	20	1
1:A:48:GLU:O	1:A:77:MET:CE	0.43	2.67	18	1
1:A:21:PHE:CE2	1:A:35:VAL:HG11	0.43	2.49	3	1
1:A:39:LEU:CD2	1:A:43:LEU:HD11	0.43	2.44	15	1
1:A:39:LEU:O	1:A:42:MET:N	0.42	2.52	18	1
1:A:71:TYR:CE2	1:A:77:MET:HG3	0.42	2.49	20	1
1:A:36:ARG:CZ	1:A:50:LEU:O	0.42	2.67	4	1
1:A:33:ASN:ND2	1:A:34:ASP:N	0.42	2.67	17	1
1:A:45:ALA:HB1	1:A:46:PRO:HD2	0.42	1.91	1	7
1:A:22:ILE:CG2	1:A:63:GLU:HG3	0.42	2.44	4	2
1:A:21:PHE:CE2	1:A:23:VAL:HG22	0.42	2.50	14	1
1:A:73:ASP:OD2	1:A:76:ARG:NH2	0.42	2.52	2	1
1:A:1:MET:SD	1:A:1:MET:N	0.42	2.90	19	1
1:A:36:ARG:CG	1:A:52:ILE:HD11	0.42	2.43	8	1
1:A:25:TYR:HH	1:A:57:THR:HG23	0.42	1.75	3	1
1:A:42:MET:C	1:A:43:LEU:HD23	0.42	2.34	19	3
1:A:8:ASP:CG	1:A:17:ARG:NH1	0.42	2.74	11	1
1:A:23:VAL:N	1:A:64:SER:O	0.41	2.50	2	3
1:A:23:VAL:O	1:A:64:SER:N	0.41	2.50	17	1
1:A:25:TYR:CD2	1:A:28:SER:O	0.41	2.73	17	1
1:A:8:ASP:OD1	1:A:8:ASP:C	0.41	2.58	20	5
1:A:21:PHE:CD2	1:A:39:LEU:CD1	0.41	3.02	9	1
1:A:43:LEU:C	1:A:44:ASN:CG	0.41	2.80	12	5
1:A:43:LEU:O	1:A:44:ASN:CG	0.41	2.59	10	6
1:A:21:PHE:CD1	1:A:39:LEU:HD11	0.41	2.51	3	1
1:A:24:LYS:CG	1:A:63:GLU:HB3	0.41	2.46	19	1
1:A:24:LYS:HG3	1:A:63:GLU:CB	0.41	2.46	19	1
1:A:71:TYR:CD1	1:A:71:TYR:N	0.41	2.89	16	1
1:A:8:ASP:O	1:A:8:ASP:OD1	0.40	2.39	2	1
1:A:20:ASP:OD1	1:A:67:TYR:CD1	0.40	2.75	11	1
1:A:51:VAL:O	1:A:52:ILE:HD13	0.40	2.16	14	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:56:LYS:N	1:A:65:LYS:O	0.40	2.48	19	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	71/101 (70%)	64±1 (90±2%)	6±2 (9±2%)	1±1 (1±1%)	24	71
All	All	1420/2020 (70%)	1281 (90%)	128 (9%)	11 (1%)	24	71

All 4 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	54	ARG	5
1	A	28	SER	3
1	A	15	ASN	2
1	A	6	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	65/89 (73%)	48±2 (73±3%)	17±2 (27±3%)	2	21
All	All	1300/1780 (73%)	951 (73%)	349 (27%)	2	21

All 35 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	1	MET	20
1	A	19	LEU	20
1	A	39	LEU	20
1	A	43	LEU	20
1	A	47	LEU	20
1	A	17	ARG	19
1	A	36	ARG	18
1	A	50	LEU	18
1	A	2	ASP	17
1	A	54	ARG	13
1	A	10	LYS	12
1	A	76	ARG	12
1	A	75	ASP	12
1	A	56	LYS	10
1	A	42	MET	10
1	A	28	SER	9
1	A	34	ASP	9
1	A	26	GLU	9
1	A	7	LYS	8
1	A	63	GLU	8
1	A	8	ASP	8
1	A	67	TYR	8
1	A	15	ASN	7
1	A	48	GLU	6
1	A	4	LYS	6
1	A	65	LYS	5
1	A	73	ASP	4
1	A	32	ARG	4
1	A	38	LYS	4
1	A	44	ASN	3
1	A	9	LYS	3
1	A	72	GLU	3
1	A	20	ASP	2
1	A	31	SER	1
1	A	29	THR	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