



Full wwPDB NMR Structure Validation Report ⓘ

Feb 19, 2018 – 06:13 pm GMT

PDB ID : 1Q9F
Title : NMR STRUCTURE OF THE OUTER MEMBRANE PROTEIN OMPX IN
DHPC MICELLES
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Deposited on : 2003-08-25

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 ⓘ symbol.

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

Cyrange : Kirchner and Guntert (2011)
NmrClust : Kelley et al. (1996)
MolProbity : 4.02b-467
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)
RCI : v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV : Wang et al. (2010)
ShiftChecker : trunk30686
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk30686

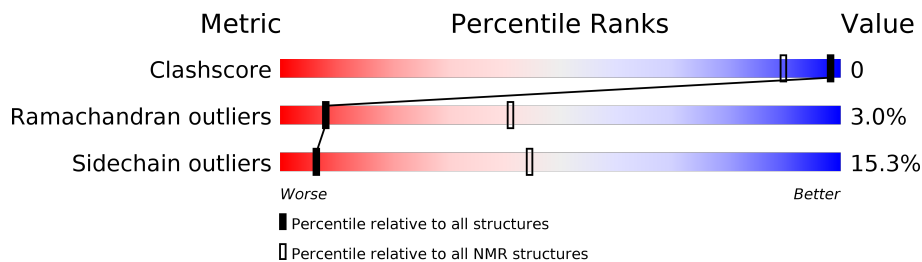
1 Overall quality at a glance

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	136279	12091
Ramachandran outliers	132675	10835
Sidechain outliers	132484	10811

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	148	 82% 5% 13%

2 Ensemble composition and analysis i

This entry contains 20 models. Model 5 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:1-A:50, A:57-A:89, A:103-A:148 (129)	0.90	5

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 4 clusters. No single-model clusters were found.

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

3 Entry composition [i](#)

There is only 1 type of molecule in this entry. The entry contains 2223 atoms, of which 1066 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Outer membrane protein X.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	148	2223	731	1066	190	233	3	0

There is a discrepancy between the modelled and reference sequences:

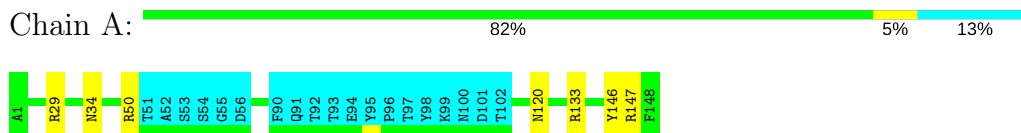
Chain	Residue	Modelled	Actual	Comment	Reference
A	100	ASN	HIS	ENGINEERED	UNP P36546

4 Residue-property plots [i](#)

4.1 Average score per residue in the NMR ensemble

These plots are provided for all protein, RNA and DNA 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: Outer membrane protein X

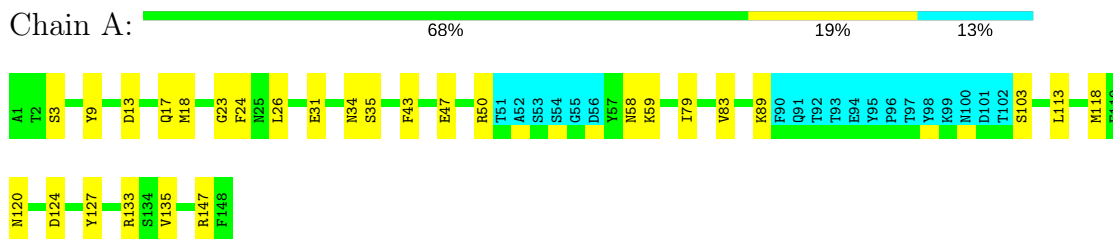


4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

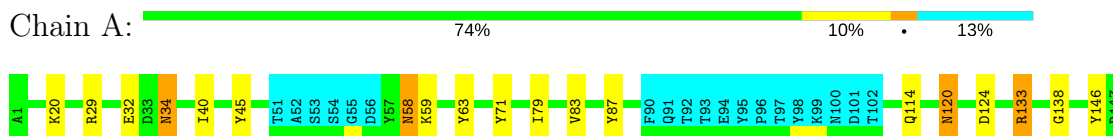
4.2.1 Score per residue for model 1

- Molecule 1: Outer membrane protein X



4.2.2 Score per residue for model 2

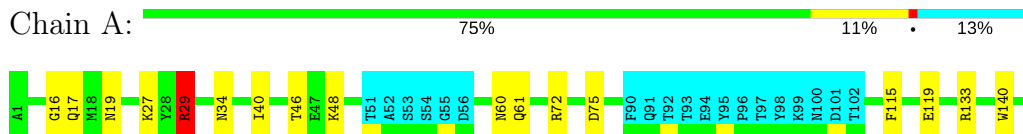
- Molecule 1: Outer membrane protein X



F148

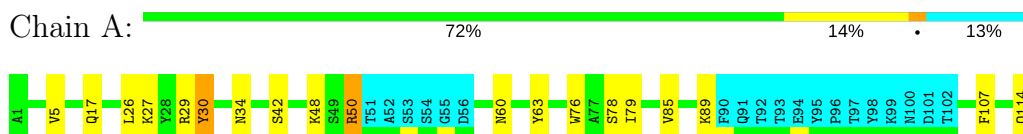
4.2.3 Score per residue for model 3

- Molecule 1: Outer membrane protein X



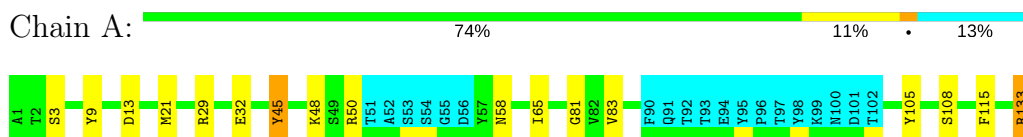
4.2.4 Score per residue for model 4

- Molecule 1: Outer membrane protein X

R147
F148

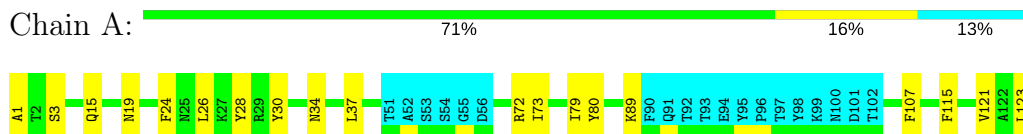
4.2.5 Score per residue for model 5 (medoid)

- Molecule 1: Outer membrane protein X



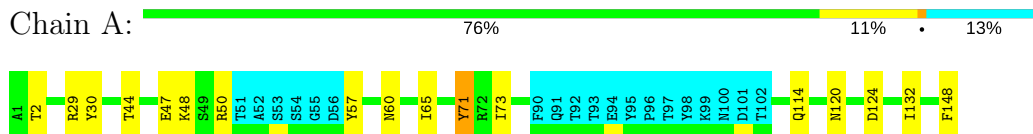
4.2.6 Score per residue for model 6

- Molecule 1: Outer membrane protein X

Y146
R147
F148

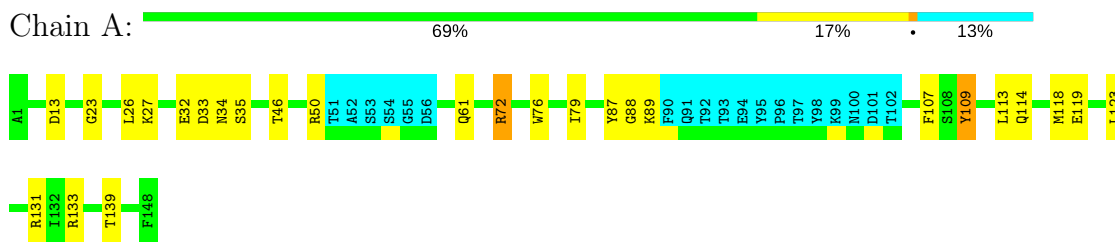
4.2.7 Score per residue for model 7

- Molecule 1: Outer membrane protein X



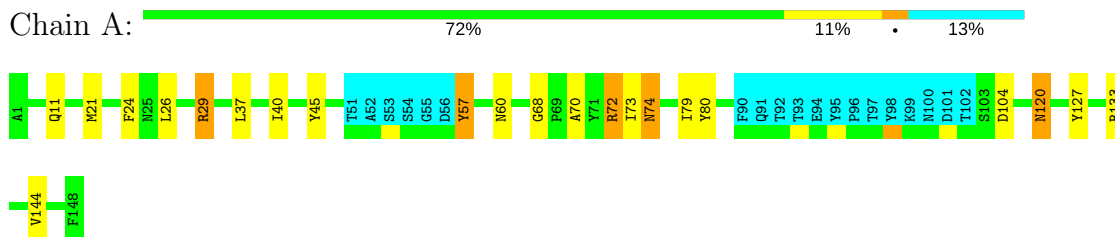
4.2.8 Score per residue for model 8

- Molecule 1: Outer membrane protein X



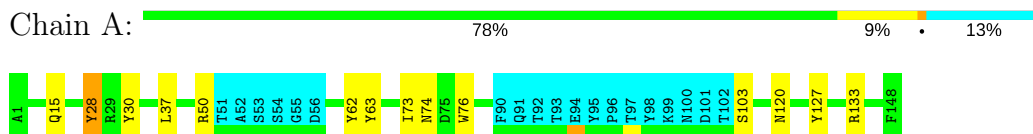
4.2.9 Score per residue for model 9

- Molecule 1: Outer membrane protein X



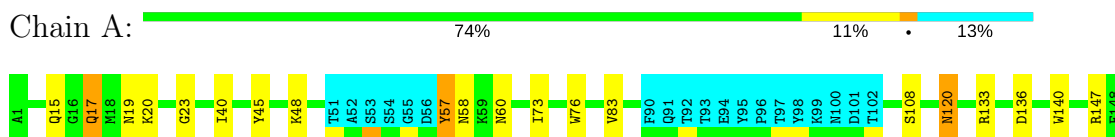
4.2.10 Score per residue for model 10

- Molecule 1: Outer membrane protein X



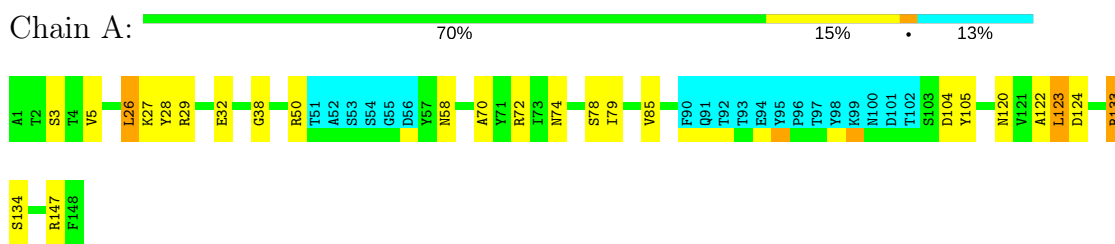
4.2.11 Score per residue for model 11

- Molecule 1: Outer membrane protein X



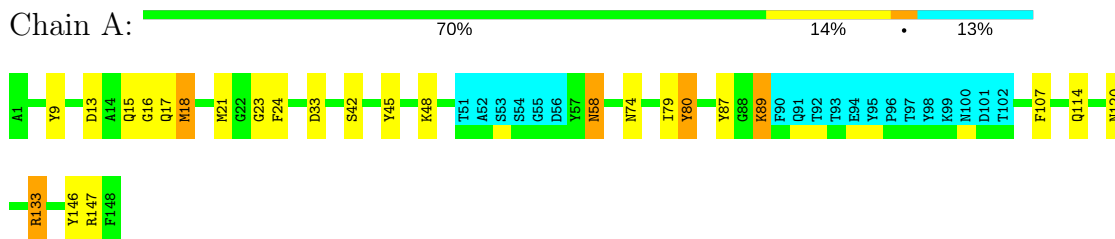
4.2.12 Score per residue for model 12

- Molecule 1: Outer membrane protein X



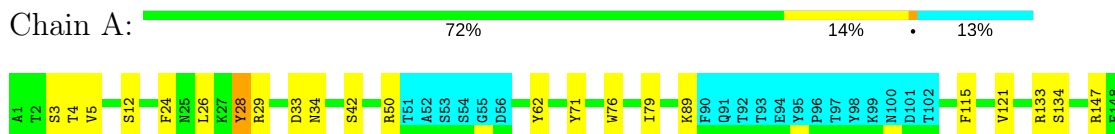
4.2.13 Score per residue for model 13

- Molecule 1: Outer membrane protein X



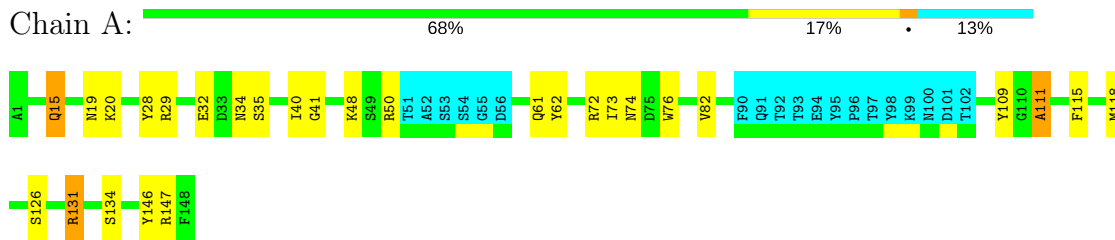
4.2.14 Score per residue for model 14

- Molecule 1: Outer membrane protein X



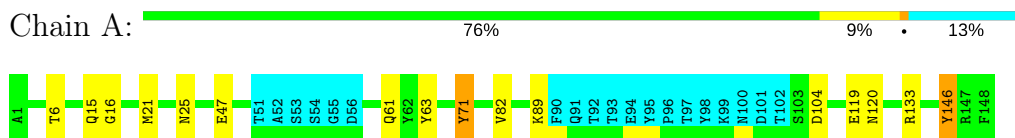
4.2.15 Score per residue for model 15

- Molecule 1: Outer membrane protein X



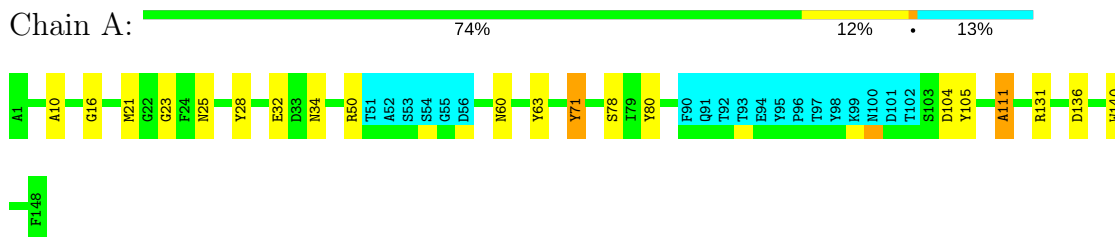
4.2.16 Score per residue for model 16

- Molecule 1: Outer membrane protein X



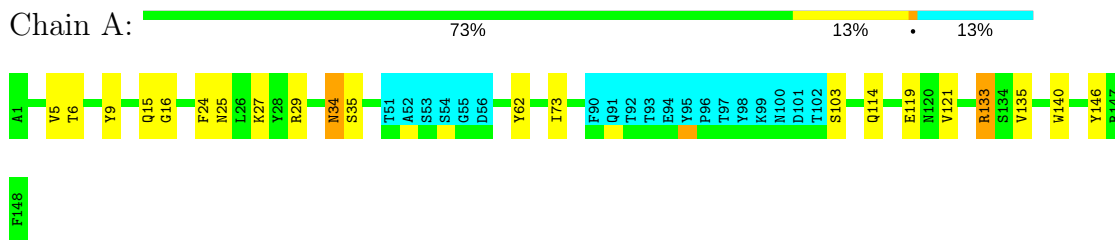
4.2.17 Score per residue for model 17

- Molecule 1: Outer membrane protein X



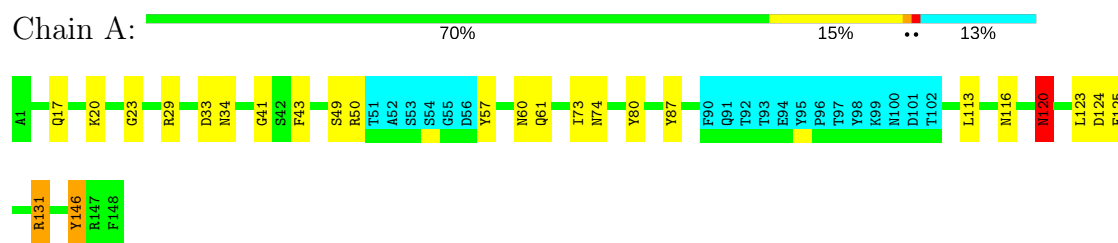
4.2.18 Score per residue for model 18

- Molecule 1: Outer membrane protein X



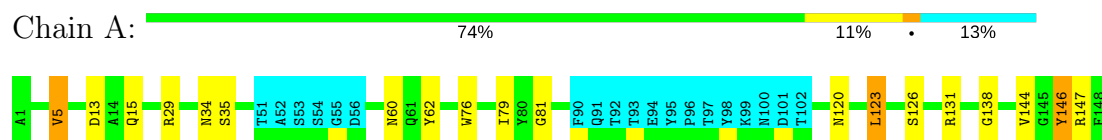
4.2.19 Score per residue for model 19

- Molecule 1: Outer membrane protein X



4.2.20 Score per residue for model 20

- Molecule 1: Outer membrane protein X



5 Refinement protocol and experimental data overview

The models were refined using the following method: *TORSION ANGLE DYNAMICS (CANDID)*.

Of the 400 calculated structures, 20 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
OPALP	refinement	2.6
CYANA	structure solution	1.0
TALOS	structure solution	

No chemical shift data was provided. No validations of the models with respect to experimental NMR restraints is performed at this time.

6 Model quality i

6.1 Standard geometry i

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	0.73±0.01	0±0/1034 (0.0±0.0%)	1.08±0.03	1±1/1398 (0.1±0.1%)
All	All	0.73	0/20680 (0.0%)	1.08	15/27960 (0.1%)

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	2.9±1.5
All	All	0	58

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	147	ARG	NE-CZ-NH1	8.58	124.59	120.30	6	2
1	A	29	ARG	NE-CZ-NH2	-7.31	116.64	120.30	3	2
1	A	28	TYR	CB-CG-CD2	-6.26	117.25	121.00	10	1
1	A	72	ARG	NE-CZ-NH1	5.84	123.22	120.30	8	1
1	A	131	ARG	NE-CZ-NH2	-5.71	117.44	120.30	19	1
1	A	131	ARG	NE-CZ-NH1	5.66	123.13	120.30	15	1
1	A	29	ARG	NE-CZ-NH1	5.65	123.13	120.30	19	1
1	A	62	TYR	CB-CG-CD2	-5.63	117.62	121.00	10	2
1	A	147	ARG	NE-CZ-NH2	-5.58	117.51	120.30	6	1
1	A	50	ARG	NE-CZ-NH2	-5.36	117.62	120.30	4	1
1	A	146	TYR	CB-CG-CD1	-5.27	117.84	121.00	20	1
1	A	133	ARG	NE-CZ-NH2	-5.04	117.78	120.30	2	1

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	6
1	A	146	TYR	Sidechain	4
1	A	133	ARG	Sidechain	4
1	A	71	TYR	Sidechain	3
1	A	50	ARG	Sidechain	3
1	A	40	ILE	Peptide	3
1	A	57	TYR	Sidechain,Peptide	3
1	A	72	ARG	Sidechain	3
1	A	127	TYR	Sidechain	2
1	A	28	TYR	Sidechain	2
1	A	138	GLY	Peptide	2
1	A	41	GLY	Peptide	2
1	A	62	TYR	Sidechain	2
1	A	30	TYR	Sidechain	2
1	A	45	TYR	Sidechain	2
1	A	121	VAL	Peptide	1
1	A	87	TYR	Peptide	1
1	A	109	TYR	Sidechain	1
1	A	68	GLY	Peptide	1
1	A	131	ARG	Sidechain	1
1	A	46	THR	Peptide	1
1	A	20	LYS	Peptide	1
1	A	25	ASN	Peptide	1
1	A	1	ALA	Peptide	1
1	A	125	PHE	Peptide	1
1	A	147	ARG	Sidechain	1
1	A	134	SER	Peptide	1
1	A	105	TYR	Sidechain	1
1	A	74	ASN	Peptide	1
1	A	80	TYR	Sidechain	1

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	1008	938	940	1±1

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Mol	Chain	Non-H	H(model)	H(added)	Clashes
All	All	20160	18760	18800	13

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 0.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:79:ILE:HG12	1:A:113:LEU:HD13	0.56	1.75	8	1
1:A:10:ALA:HB2	1:A:25:ASN:HD21	0.51	1.65	17	1
1:A:40:ILE:HD11	1:A:70:ALA:HB2	0.50	1.81	9	1
1:A:123:LEU:HD13	1:A:144:VAL:HG12	0.49	1.84	20	1
1:A:26:LEU:HD13	1:A:27:LYS:H	0.48	1.69	12	1
1:A:80:TYR:HA	1:A:111:ALA:HB3	0.45	1.88	17	1
1:A:122:ALA:C	1:A:123:LEU:HD23	0.43	2.34	12	1
1:A:82:VAL:HG22	1:A:111:ALA:HB2	0.43	1.90	15	1
1:A:120:ASN:HA	1:A:146:TYR:CD2	0.42	2.49	19	1
1:A:5:VAL:HG11	1:A:146:TYR:CD1	0.42	2.49	18	1
1:A:38:GLY:HA3	1:A:70:ALA:HB3	0.41	1.92	12	1
1:A:5:VAL:CG2	1:A:146:TYR:HB2	0.41	2.46	20	1
1:A:26:LEU:HD13	1:A:27:LYS:N	0.40	2.31	12	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	127/148 (86%)	108±4 (85±3%)	16±3 (12±3%)	4±2 (3±1%)	8	41
All	All	2540/2960 (86%)	2151 (85%)	314 (12%)	75 (3%)	8	41

All 21 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	133	ARG	8

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Mol	Chain	Res	Type	Models (Total)
1	A	73	ILE	6
1	A	23	GLY	6
1	A	15	GLN	6
1	A	16	GLY	5
1	A	60	ASN	5
1	A	120	ASN	5
1	A	17	GLN	4
1	A	119	GLU	4
1	A	58	ASN	4
1	A	74	ASN	4
1	A	34	ASN	3
1	A	89	LYS	3
1	A	76	TRP	3
1	A	111	ALA	2
1	A	81	GLY	2
1	A	18	MET	1
1	A	103	SER	1
1	A	118	MET	1
1	A	75	ASP	1
1	A	88	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	101/118 (86%)	86±4 (85±4%)	16±4 (15±4%)	6	44
All	All	2020/2360 (86%)	1710 (85%)	310 (15%)	6	44

All 88 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	ASN	11
1	A	120	ASN	10
1	A	79	ILE	9
1	A	50	ARG	8
1	A	147	ARG	8

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Mol	Chain	Res	Type	Models (Total)
1	A	133	ARG	8
1	A	26	LEU	7
1	A	48	LYS	7
1	A	114	GLN	6
1	A	29	ARG	6
1	A	32	GLU	6
1	A	24	PHE	6
1	A	124	ASP	5
1	A	63	TYR	5
1	A	35	SER	5
1	A	123	LEU	5
1	A	21	MET	5
1	A	13	ASP	5
1	A	71	TYR	5
1	A	115	PHE	5
1	A	28	TYR	5
1	A	61	GLN	5
1	A	3	SER	5
1	A	89	LYS	5
1	A	83	VAL	4
1	A	45	TYR	4
1	A	140	TRP	4
1	A	107	PHE	4
1	A	76	TRP	4
1	A	80	TYR	4
1	A	131	ARG	4
1	A	104	ASP	4
1	A	19	ASN	4
1	A	72	ARG	4
1	A	58	ASN	4
1	A	27	LYS	4
1	A	9	TYR	4
1	A	33	ASP	4
1	A	134	SER	4
1	A	5	VAL	4
1	A	42	SER	3
1	A	78	SER	3
1	A	87	TYR	3
1	A	37	LEU	3
1	A	47	GLU	3
1	A	15	GLN	3
1	A	30	TYR	3

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Mol	Chain	Res	Type	Models (Total)
1	A	20	LYS	3
1	A	60	ASN	3
1	A	146	TYR	3
1	A	17	GLN	3
1	A	126	SER	3
1	A	57	TYR	3
1	A	136	ASP	3
1	A	85	VAL	2
1	A	74	ASN	2
1	A	103	SER	2
1	A	105	TYR	2
1	A	43	PHE	2
1	A	144	VAL	2
1	A	108	SER	2
1	A	6	THR	2
1	A	18	MET	2
1	A	113	LEU	2
1	A	139	THR	2
1	A	135	VAL	2
1	A	59	LYS	2
1	A	121	VAL	2
1	A	73	ILE	2
1	A	118	MET	2
1	A	65	ILE	2
1	A	109	TYR	2
1	A	44	THR	1
1	A	2	THR	1
1	A	148	PHE	1
1	A	25	ASN	1
1	A	11	GLN	1
1	A	12	SER	1
1	A	82	VAL	1
1	A	31	GLU	1
1	A	49	SER	1
1	A	46	THR	1
1	A	132	ILE	1
1	A	127	TYR	1
1	A	116	ASN	1
1	A	62	TYR	1
1	A	40	ILE	1
1	A	4	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 carbohydrates 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

No chemical shift data were provided