



Full wwPDB NMR Structure Validation Report ⓘ

Apr 21, 2024 – 09:11 AM EDT

PDB ID : 2L22
Title : Mupirocin didomain ACP
Authors : Dong, X.; Williams, C.; Crump, M.P.; Wattana-amorn, P.
Deposited on : 2010-08-10

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 types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) 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

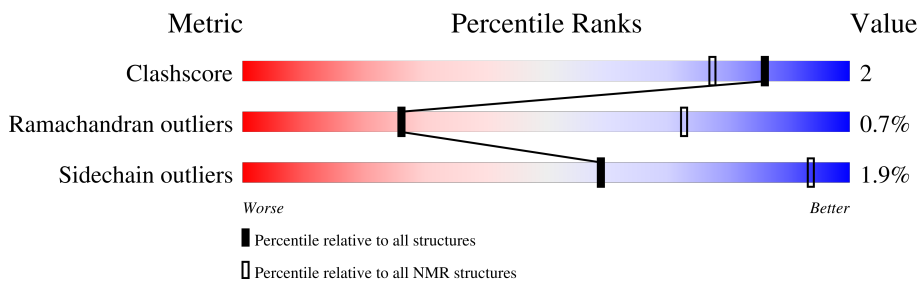
1 Overall quality at a glance

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 $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	212	

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 authors have identified model 1 as representative, based on the following criterion: *closest to the average*.

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:4-A:78 (75)	1.12	9
2	A:104-A:183 (80)	1.71	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 2 clusters. No single-model clusters were found.

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

3 Entry composition [i](#)

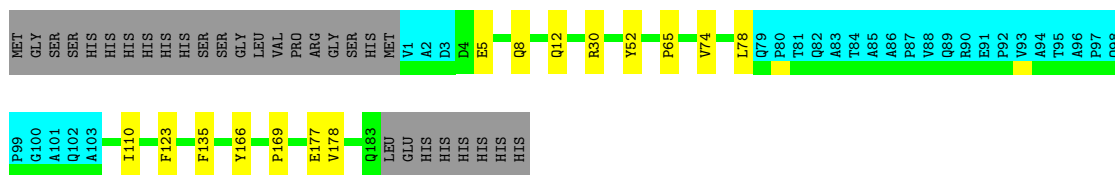
There is only 1 type of molecule in this entry. The entry contains 2850 atoms, of which 1414 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Mupirocin didomain Acyl Carrier Protein.

Mol	Chain	Residues	Atoms					Trace	
			Total	C	H	N	O		S
1	A	183	2850	910	1414	250	271	5	0

There are 29 discrepancies between the modelled and reference sequences:

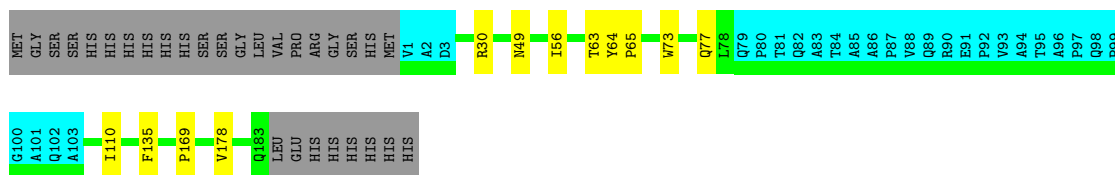
Chain	Residue	Modelled	Actual	Comment	Reference
A	-20	MET	-	expression tag	UNP Q8RL76
A	-19	GLY	-	expression tag	UNP Q8RL76
A	-18	SER	-	expression tag	UNP Q8RL76
A	-17	SER	-	expression tag	UNP Q8RL76
A	-16	HIS	-	expression tag	UNP Q8RL76
A	-15	HIS	-	expression tag	UNP Q8RL76
A	-14	HIS	-	expression tag	UNP Q8RL76
A	-13	HIS	-	expression tag	UNP Q8RL76
A	-12	HIS	-	expression tag	UNP Q8RL76
A	-11	HIS	-	expression tag	UNP Q8RL76
A	-10	SER	-	expression tag	UNP Q8RL76
A	-9	SER	-	expression tag	UNP Q8RL76
A	-8	GLY	-	expression tag	UNP Q8RL76
A	-7	LEU	-	expression tag	UNP Q8RL76
A	-6	VAL	-	expression tag	UNP Q8RL76
A	-5	PRO	-	expression tag	UNP Q8RL76
A	-4	ARG	-	expression tag	UNP Q8RL76
A	-3	GLY	-	expression tag	UNP Q8RL76
A	-2	SER	-	expression tag	UNP Q8RL76
A	-1	HIS	-	expression tag	UNP Q8RL76
A	0	MET	-	expression tag	UNP Q8RL76
A	184	LEU	-	expression tag	UNP Q8RL76
A	185	GLU	-	expression tag	UNP Q8RL76
A	186	HIS	-	expression tag	UNP Q8RL76
A	187	HIS	-	expression tag	UNP Q8RL76
A	188	HIS	-	expression tag	UNP Q8RL76
A	189	HIS	-	expression tag	UNP Q8RL76
A	190	HIS	-	expression tag	UNP Q8RL76
A	191	HIS	-	expression tag	UNP Q8RL76



4.2.3 Score per residue for model 3

- Molecule 1: Mupirocin didomain Acyl Carrier Protein

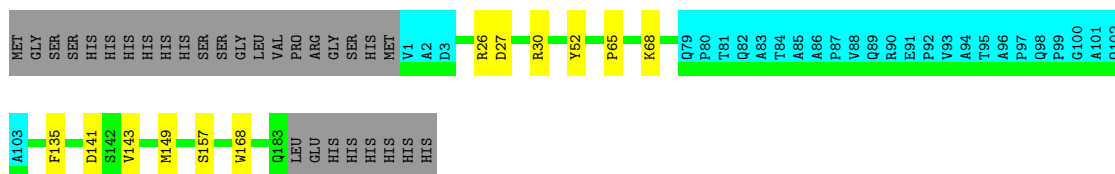
Chain A: 67% 6% 13% 14%



4.2.4 Score per residue for model 4

- Molecule 1: Mupirocin didomain Acyl Carrier Protein

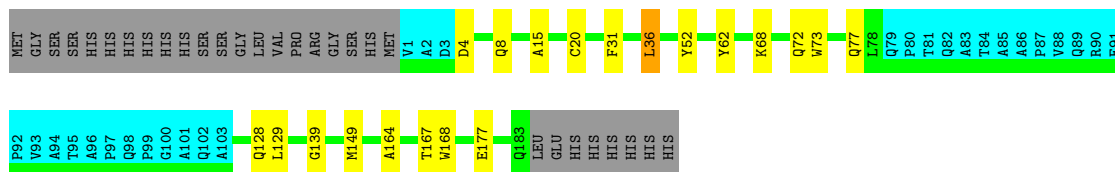
Chain A: 67% 6% 13% 14%



4.2.5 Score per residue for model 5 (medoid)

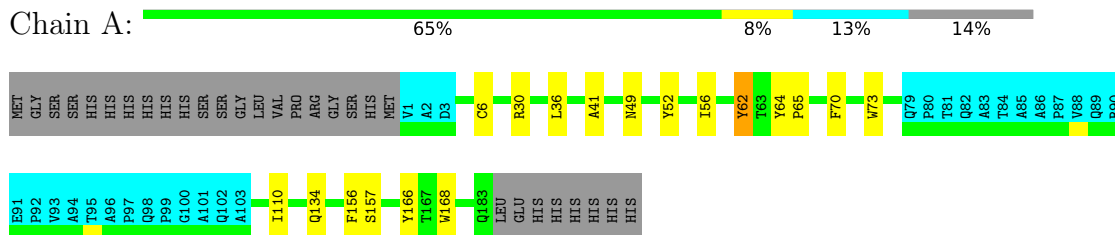
- Molecule 1: Mupirocin didomain Acyl Carrier Protein

Chain A: 64% 9% 13% 14%



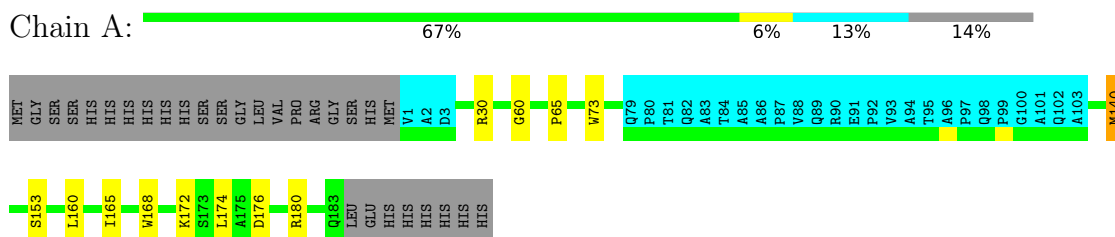
4.2.6 Score per residue for model 6

- Molecule 1: Mupirocin didomain Acyl Carrier Protein



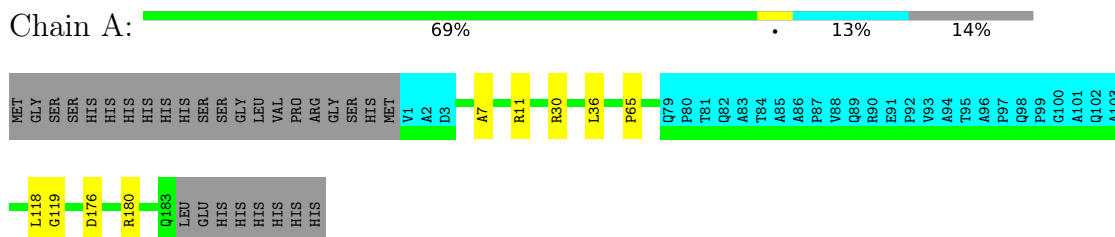
4.2.7 Score per residue for model 7

- Molecule 1: Mupirocin didomain Acyl Carrier Protein



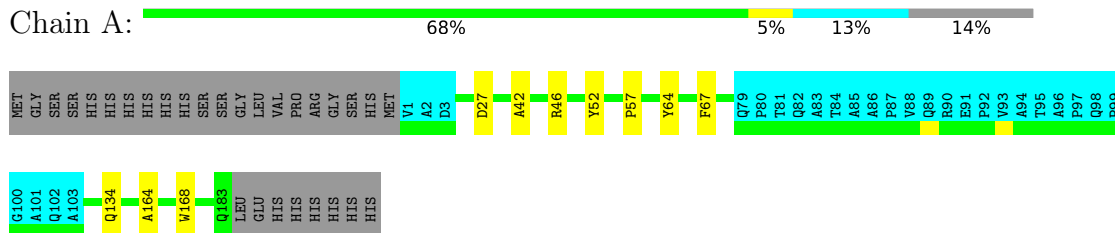
4.2.8 Score per residue for model 8

- Molecule 1: Mupirocin didomain Acyl Carrier Protein



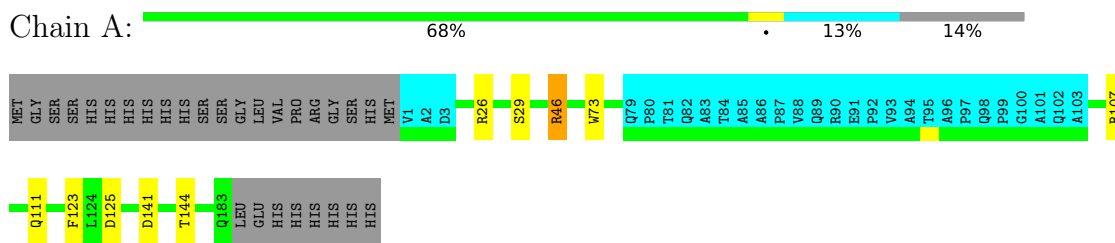
4.2.9 Score per residue for model 9

- Molecule 1: Mupirocin didomain Acyl Carrier Protein



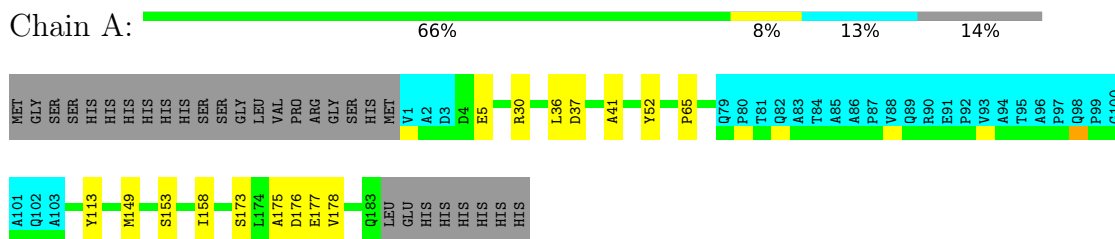
4.2.14 Score per residue for model 14

- Molecule 1: Mupirocin didomain Acyl Carrier Protein



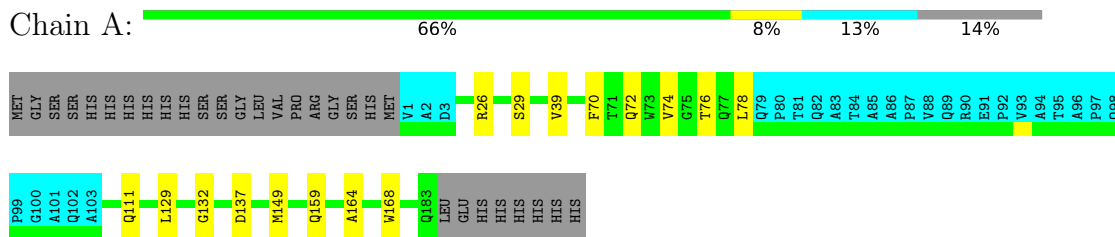
4.2.15 Score per residue for model 15

- Molecule 1: Mupirocin didomain Acyl Carrier Protein



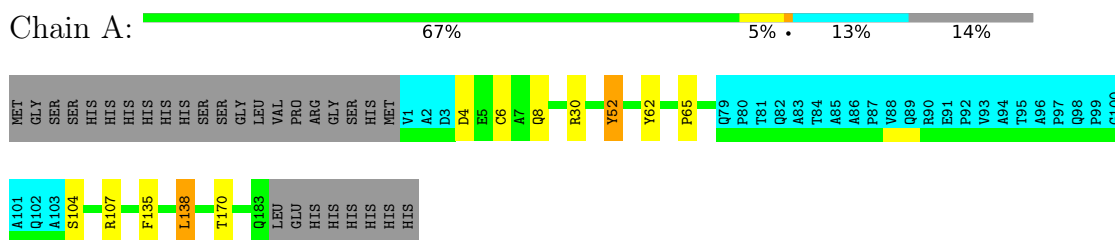
4.2.16 Score per residue for model 16

- Molecule 1: Mupirocin didomain Acyl Carrier Protein



4.2.17 Score per residue for model 17

- Molecule 1: Mupirocin didomain Acyl Carrier Protein



5 Refinement protocol and experimental data overview

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
ARIA	refinement	2.2

No chemical shift data was provided.

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	0.69±0.05	2±2/1269 (0.1± 0.1%)	0.63±0.02	0±0/1718 (0.0± 0.0%)
All	All	0.69	32/25380 (0.1%)	0.63	0/34360 (0.0%)

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	0.2±0.4
All	All	0	5

All unique bond 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(Å)	Ideal(Å)	Models	
								Worst	Total
1	A	52	TYR	CE1-CZ	-10.73	1.24	1.38	5	7
1	A	52	TYR	CE2-CZ	9.94	1.51	1.38	5	6
1	A	70	PHE	CE1-CZ	9.32	1.55	1.37	1	2
1	A	62	TYR	CE1-CZ	-8.26	1.27	1.38	17	3
1	A	62	TYR	CE2-CZ	8.23	1.49	1.38	17	2
1	A	70	PHE	CE2-CZ	-7.10	1.23	1.37	1	2
1	A	166	TYR	CE1-CZ	-6.94	1.29	1.38	2	1
1	A	166	TYR	CE2-CZ	6.30	1.46	1.38	2	2
1	A	113	TYR	CE2-CZ	-6.26	1.30	1.38	15	1
1	A	64	TYR	CE2-CZ	-6.01	1.30	1.38	6	1
1	A	31	PHE	CE1-CZ	5.87	1.48	1.37	5	1
1	A	64	TYR	CE1-CZ	-5.71	1.31	1.38	19	1
1	A	113	TYR	CE1-CZ	5.69	1.46	1.38	15	1
1	A	19	TYR	CE1-CZ	-5.57	1.31	1.38	19	1
1	A	19	TYR	CE2-CZ	5.01	1.45	1.38	19	1

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	62	TYR	Sidechain	1
1	A	64	TYR	Sidechain	1
1	A	180	ARG	Sidechain	1
1	A	52	TYR	Sidechain	1
1	A	166	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	1242	1225	1223	5±2
All	All	24840	24500	24460	103

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 2.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:164:ALA:HA	1:A:168:TRP:CZ3	0.62	2.29	16	1
1:A:110:ILE:HG21	1:A:178:VAL:HG11	0.60	1.73	3	6
1:A:60:GLY:HA2	1:A:73:TRP:CZ3	0.60	2.32	7	1
1:A:30:ARG:HA	1:A:65:PRO:O	0.59	1.97	8	12
1:A:27:ASP:HA	1:A:67:PHE:CZ	0.56	2.36	13	2
1:A:150:ARG:HA	1:A:150:ARG:NE	0.56	2.16	11	1
1:A:15:ALA:HA	1:A:20:CYS:SG	0.55	2.41	10	3
1:A:73:TRP:O	1:A:77:GLN:HG2	0.53	2.04	12	2
1:A:7:ALA:O	1:A:11:ARG:HG3	0.53	2.03	8	1
1:A:49:ASN:OD1	1:A:56:ILE:HB	0.51	2.04	6	1
1:A:164:ALA:HA	1:A:168:TRP:CE3	0.49	2.42	16	1
1:A:134:GLN:NE2	1:A:135:PHE:H	0.48	2.06	20	1
1:A:36:LEU:HD21	1:A:41:ALA:HB2	0.48	1.85	15	3
1:A:168:TRP:CZ2	1:A:177:GLU:HG2	0.48	2.44	1	2

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:74:VAL:O	1:A:78:LEU:HG	0.48	2.08	16	2
1:A:173:SER:HA	1:A:176:ASP:OD2	0.47	2.09	15	1
1:A:148:TRP:O	1:A:152:VAL:HG23	0.47	2.10	1	1
1:A:176:ASP:O	1:A:180:ARG:HG2	0.47	2.08	7	2
1:A:49:ASN:O	1:A:53:GLN:HA	0.47	2.09	11	1
1:A:135:PHE:CD1	1:A:169:PRO:HA	0.47	2.45	13	2
1:A:175:ALA:O	1:A:178:VAL:HG12	0.46	2.10	15	1
1:A:8:GLN:O	1:A:12:GLN:HG3	0.46	2.11	2	1
1:A:141:ASP:OD2	1:A:143:VAL:HG12	0.46	2.11	4	1
1:A:133:ALA:O	1:A:170:THR:HA	0.46	2.11	20	2
1:A:46:ARG:NE	1:A:46:ARG:HA	0.46	2.25	14	1
1:A:4:ASP:O	1:A:8:GLN:HG3	0.45	2.11	5	2
1:A:135:PHE:HB3	1:A:168:TRP:O	0.45	2.12	4	1
1:A:6:CYS:HA	1:A:52:TYR:OH	0.45	2.11	17	2
1:A:176:ASP:O	1:A:180:ARG:HG3	0.45	2.11	8	1
1:A:70:PHE:O	1:A:73:TRP:HB3	0.45	2.12	19	4
1:A:118:LEU:HD12	1:A:119:GLY:N	0.44	2.27	8	2
1:A:181:ARG:NE	1:A:181:ARG:HA	0.44	2.27	1	1
1:A:110:ILE:HG12	1:A:156:PHE:CZ	0.44	2.47	6	1
1:A:42:ALA:O	1:A:46:ARG:HG2	0.44	2.12	1	1
1:A:164:ALA:HA	1:A:167:THR:OG1	0.44	2.12	5	1
1:A:140:MET:SD	1:A:165:ILE:HD12	0.44	2.52	7	1
1:A:168:TRP:CZ3	1:A:174:LEU:HD13	0.44	2.48	7	1
1:A:74:VAL:O	1:A:77:GLN:HG2	0.44	2.12	13	1
1:A:49:ASN:ND2	1:A:56:ILE:HG22	0.44	2.28	20	1
1:A:153:SER:OG	1:A:160:LEU:HB2	0.44	2.12	7	1
1:A:26:ARG:N	1:A:26:ARG:HD2	0.44	2.28	13	1
1:A:68:LYS:O	1:A:72:GLN:HG2	0.43	2.13	12	1
1:A:49:ASN:ND2	1:A:56:ILE:HB	0.43	2.29	3	1
1:A:135:PHE:HA	1:A:169:PRO:O	0.43	2.14	2	1
1:A:73:TRP:CZ3	1:A:77:GLN:HG3	0.43	2.48	3	1
1:A:164:ALA:HB1	1:A:168:TRP:CD1	0.43	2.48	9	1
1:A:44:TRP:O	1:A:47:GLU:HG3	0.43	2.13	12	1
1:A:121:LEU:HD21	1:A:144:THR:HB	0.42	1.90	1	1
1:A:107:ARG:O	1:A:111:GLN:HG2	0.42	2.14	14	1
1:A:26:ARG:HB3	1:A:29:SER:OG	0.42	2.14	20	1
1:A:42:ALA:O	1:A:46:ARG:HG3	0.42	2.14	9	1
1:A:27:ASP:HA	1:A:67:PHE:CE2	0.41	2.49	9	1
1:A:72:GLN:O	1:A:76:THR:HG22	0.41	2.16	16	1
1:A:26:ARG:HG2	1:A:29:SER:OG	0.41	2.15	16	1
1:A:104:SER:O	1:A:107:ARG:HB3	0.41	2.16	17	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:60:GLY:HA3	1:A:70:PHE:CE1	0.41	2.51	20	1
1:A:63:THR:HG23	1:A:64:TYR:CD2	0.41	2.50	3	1
1:A:153:SER:HB2	1:A:158:ILE:O	0.41	2.16	15	1
1:A:31:PHE:CZ	1:A:67:PHE:HA	0.41	2.51	20	1
1:A:27:ASP:O	1:A:68:LYS:HB2	0.41	2.16	4	1
1:A:68:LYS:O	1:A:72:GLN:HG3	0.41	2.16	5	1
1:A:77:GLN:HE21	1:A:77:GLN:HA	0.41	1.76	18	1
1:A:21:GLU:O	1:A:24:GLN:HG2	0.40	2.16	12	1
1:A:41:ALA:O	1:A:45:ILE:HG12	0.40	2.16	20	1
1:A:146:THR:HB	1:A:162:ALA:HB1	0.40	1.92	19	1
1:A:37:ASP:OD2	1:A:39:VAL:HG22	0.40	2.17	10	1
1:A:26:ARG:HB2	1:A:29:SER:OG	0.40	2.16	14	1
1:A:135:PHE:O	1:A:138:LEU:HD22	0.40	2.17	17	1
1:A:36:LEU:HD23	1:A:36:LEU:N	0.40	2.32	5	1
1:A:59:ASP:HA	1:A:62:TYR:CD2	0.40	2.52	13	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	154/212 (73%)	146±2 (95±1%)	7±2 (5±1%)	1±1 (1±1%)	26	73
All	All	3080/4240 (73%)	2914 (95%)	144 (5%)	22 (1%)	26	73

All 14 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	123	PHE	4
1	A	129	LEU	3
1	A	157	SER	2
1	A	130	ARG	2
1	A	132	GLY	2
1	A	133	ALA	1
1	A	26	ARG	1

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Mol	Chain	Res	Type	Models (Total)
1	A	139	GLY	1
1	A	140	MET	1
1	A	23	GLY	1
1	A	25	ILE	1
1	A	104	SER	1
1	A	127	GLY	1
1	A	128	GLN	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	131/176 (74%)	129±1 (98±1%)	2±1 (2±1%)	59	93
All	All	2620/3520 (74%)	2571 (98%)	49 (2%)	59	93

All 34 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	149	MET	4
1	A	5	GLU	3
1	A	177	GLU	3
1	A	134	GLN	3
1	A	36	LEU	2
1	A	168	TRP	2
1	A	47	GLU	2
1	A	144	THR	2
1	A	49	ASN	2
1	A	37	ASP	2
1	A	8	GLN	1
1	A	54	LEU	1
1	A	108	GLU	1
1	A	128	GLN	1
1	A	172	LYS	1
1	A	57	PRO	1
1	A	26	ARG	1
1	A	150	ARG	1

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Mol	Chain	Res	Type	Models (Total)
1	A	183	GLN	1
1	A	50	LYS	1
1	A	46	ARG	1
1	A	73	TRP	1
1	A	125	ASP	1
1	A	141	ASP	1
1	A	39	VAL	1
1	A	111	GLN	1
1	A	129	LEU	1
1	A	137	ASP	1
1	A	159	GLN	1
1	A	138	LEU	1
1	A	170	THR	1
1	A	77	GLN	1
1	A	51	HIS	1
1	A	107	ARG	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

There are no chain breaks in this entry.

7 Chemical shift validation

No chemical shift data were provided