Full wwPDB NMR Structure Validation Report (i)

May 29, 2020 – 12:13 am BST

PDB ID	:	2M3G
Title	:	Structure of Anabaena Sensory Rhodopsin Determined by Solid State NMR Spectroscopy
Authors	:	Wang, S.; Munro, R.A.; Shi, L.; Kawamura, I.; Okitsu, T.; Wada, A.; Kim, S.; Jung, K.; Brown, L.S.; Ladizhansky, V.
Deposited on	:	2013-01-17

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 (1)) were used in the production of this report:

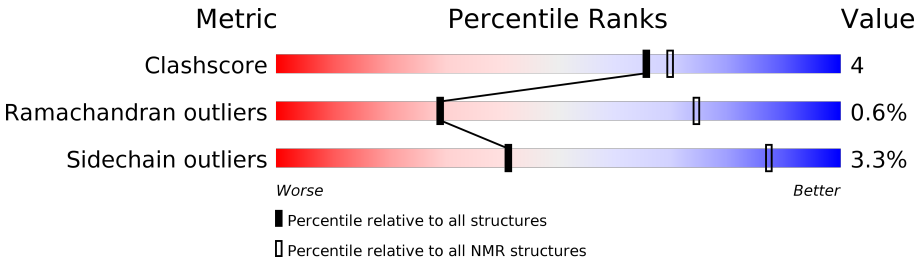
Cyrange	:	Kirchner and Güntert (2011)
NmrClust	:	Kelley et al. (1996)
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	2.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

1 Overall quality at a glance

The following experimental techniques were used to determine the structure:
SOLID-STATE NMR

The overall completeness of chemical shifts assignment is 14%.

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	235	71% 8% 18% ·
1	B	235	71% 7% 19% ·
1	C	235	71% 6% 21% ·

2 Ensemble composition and analysis

This entry contains 10 models. Model 6 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:6-A:22, A:34-A:149, A:158-A:186, A:198-A:221, B:6-B:22, B:35-B:149, B:159-B:185, B:197-B:221, C:6-C:21, C:35-C:123, C:127-C:148, C:159-C:186, C:197-C:221 (550)	0.65	6

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 3 clusters and 2 single-model clusters were found.

Cluster number	Models
1	1, 3, 6
2	4, 5, 9
3	7, 8
Single-model clusters	2; 10

3 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 11379 atoms, of which 5715 are hydrogens and 0 are deuteriums.

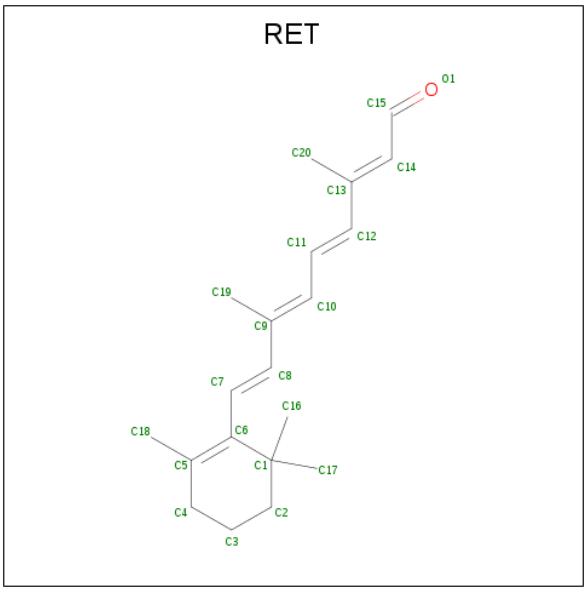
- Molecule 1 is a protein called Anabaena Sensory Rhodopsin.

Mol	Chain	Residues	Atoms						Trace
1	A	229	Total	C	H	N	O	S	0
			3745	1248	1877	298	311	11	
1	B	229	Total	C	H	N	O	S	0
			3745	1248	1877	298	311	11	
1	C	229	Total	C	H	N	O	S	0
			3745	1248	1877	298	311	11	

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	230	HIS	-	EXPRESSION TAG	UNP Q8YSC4
A	231	HIS	-	EXPRESSION TAG	UNP Q8YSC4
A	232	HIS	-	EXPRESSION TAG	UNP Q8YSC4
A	233	HIS	-	EXPRESSION TAG	UNP Q8YSC4
A	234	HIS	-	EXPRESSION TAG	UNP Q8YSC4
A	235	HIS	-	EXPRESSION TAG	UNP Q8YSC4
B	230	HIS	-	EXPRESSION TAG	UNP Q8YSC4
B	231	HIS	-	EXPRESSION TAG	UNP Q8YSC4
B	232	HIS	-	EXPRESSION TAG	UNP Q8YSC4
B	233	HIS	-	EXPRESSION TAG	UNP Q8YSC4
B	234	HIS	-	EXPRESSION TAG	UNP Q8YSC4
B	235	HIS	-	EXPRESSION TAG	UNP Q8YSC4
C	230	HIS	-	EXPRESSION TAG	UNP Q8YSC4
C	231	HIS	-	EXPRESSION TAG	UNP Q8YSC4
C	232	HIS	-	EXPRESSION TAG	UNP Q8YSC4
C	233	HIS	-	EXPRESSION TAG	UNP Q8YSC4
C	234	HIS	-	EXPRESSION TAG	UNP Q8YSC4
C	235	HIS	-	EXPRESSION TAG	UNP Q8YSC4

- Molecule 2 is RETINAL (three-letter code: RET) (formula: $C_{20}H_{28}O$).



Mol	Chain	Residues	Atoms		
2	A	1	Total	C	H
			48	20	28
2	B	1	Total	C	H
			48	20	28
2	C	1	Total	C	H
			48	20	28

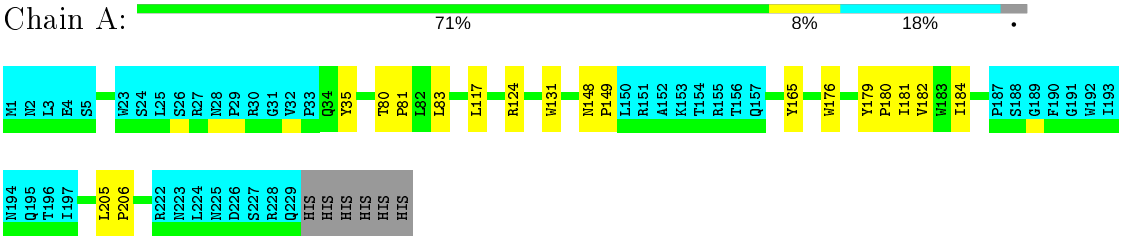
4 Residue-property plots

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.

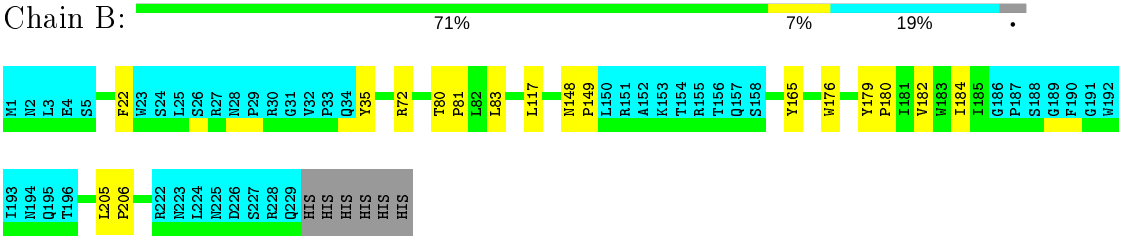
• Molecule 1: Anabaena Sensory Rhodopsin

Chain A:



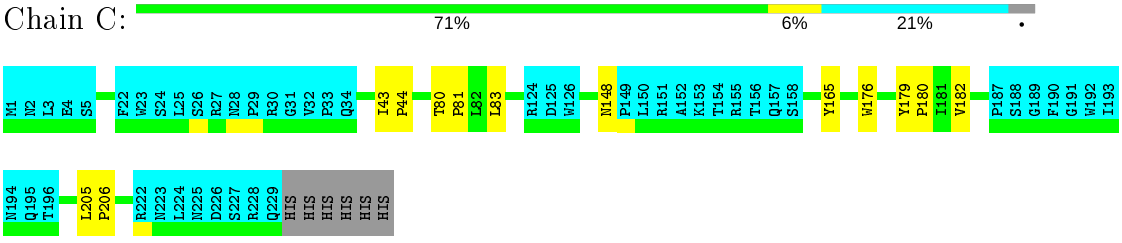
• Molecule 1: Anabaena Sensory Rhodopsin

Chain B:



• Molecule 1: Anabaena Sensory Rhodopsin

Chain C:



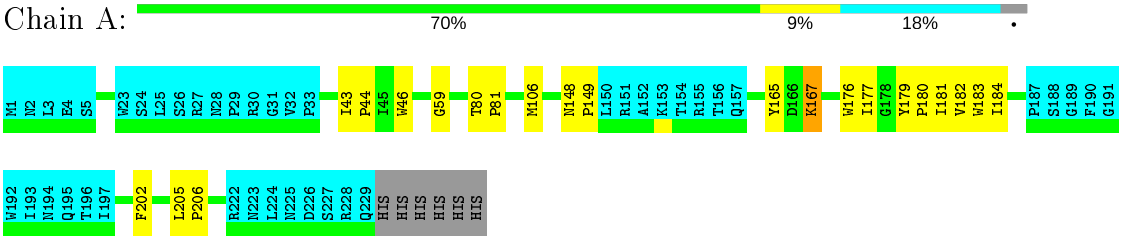
4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

4.2.1 Score per residue for model 1

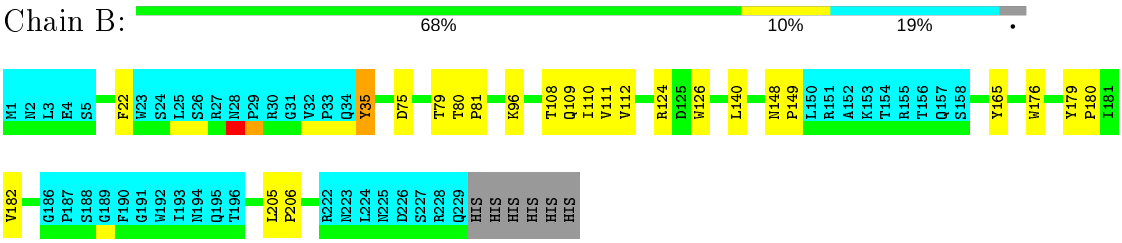
• Molecule 1: Anabaena Sensory Rhodopsin

Chain A:



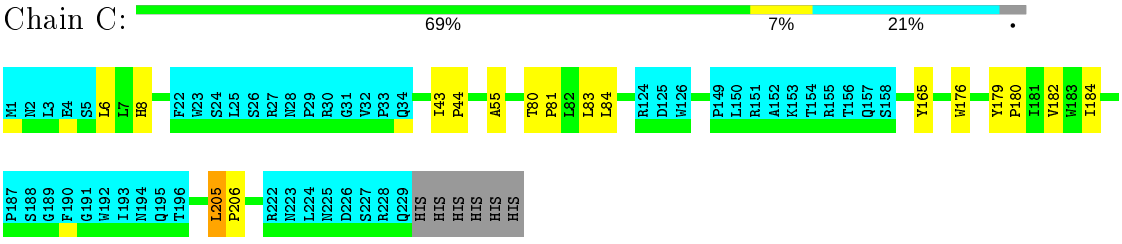
• Molecule 1: Anabaena Sensory Rhodopsin

Chain B:



• Molecule 1: Anabaena Sensory Rhodopsin

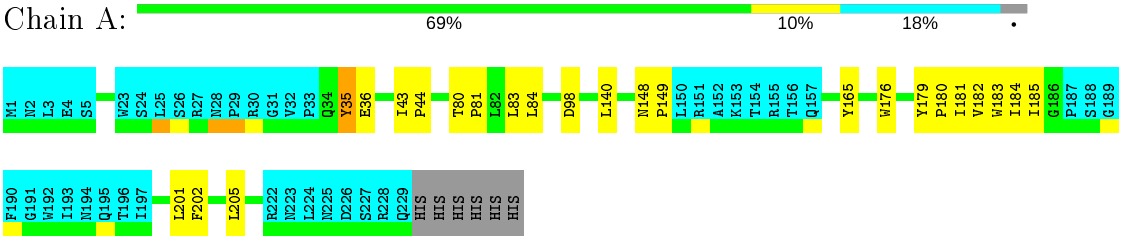
Chain C:



4.2.2 Score per residue for model 2

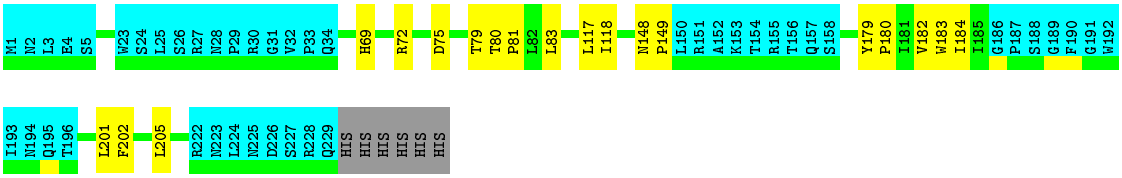
• Molecule 1: Anabaena Sensory Rhodopsin

Chain A:



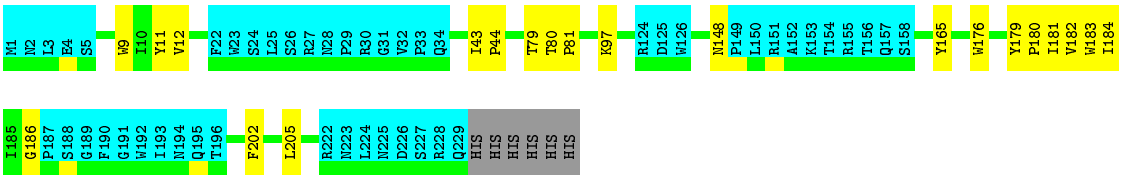
• Molecule 1: Anabaena Sensory Rhodopsin

Chain B:



- Molecule 1: Anabaena Sensory Rhodopsin

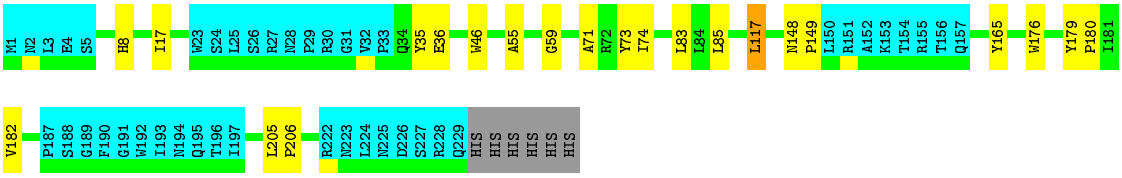
Chain C:



4.2.3 Score per residue for model 3

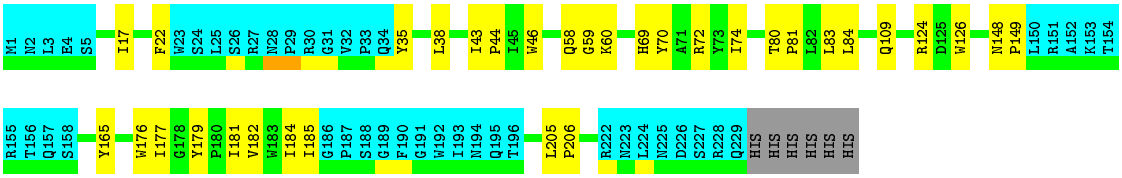
- Molecule 1: Anabaena Sensory Rhodopsin

Chain A:



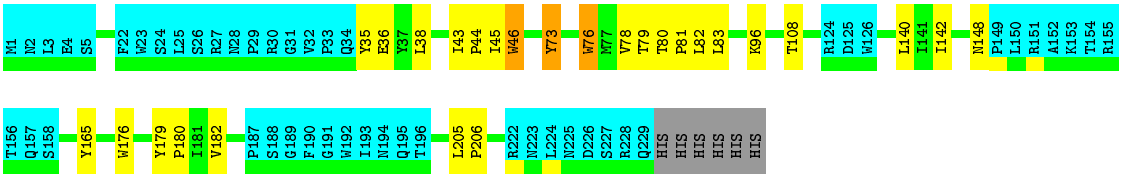
- Molecule 1: Anabaena Sensory Rhodopsin

Chain B:



- Molecule 1: Anabaena Sensory Rhodopsin

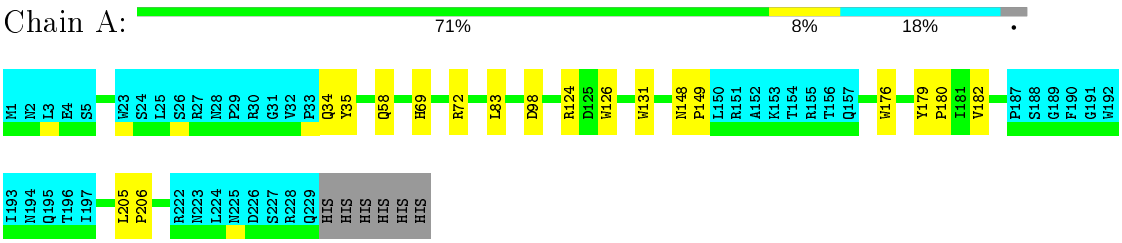
Chain C:



4.2.4 Score per residue for model 4

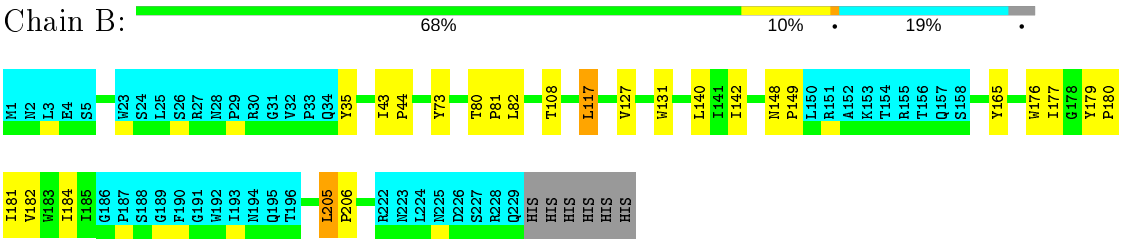
• Molecule 1: Anabaena Sensory Rhodopsin

Chain A:



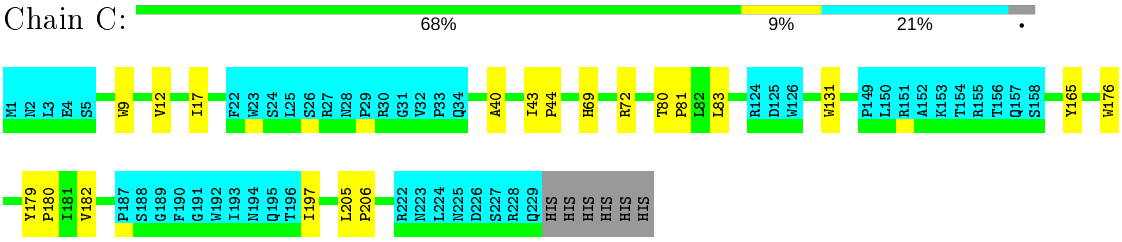
• Molecule 1: Anabaena Sensory Rhodopsin

Chain B:



• Molecule 1: Anabaena Sensory Rhodopsin

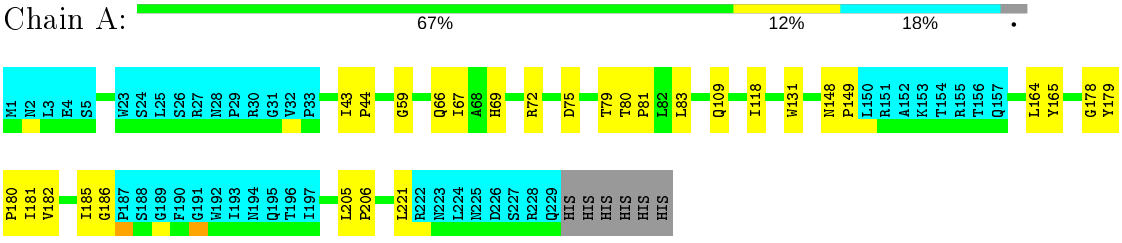
Chain C:



4.2.5 Score per residue for model 5

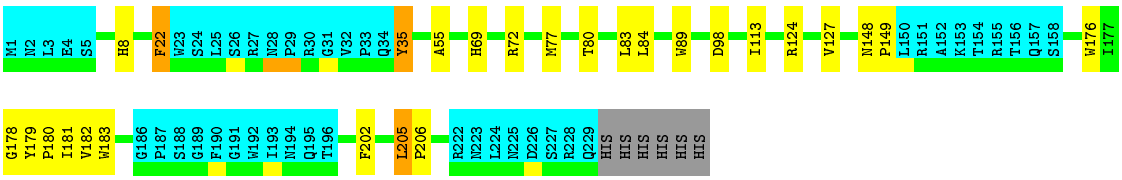
• Molecule 1: Anabaena Sensory Rhodopsin

Chain A:



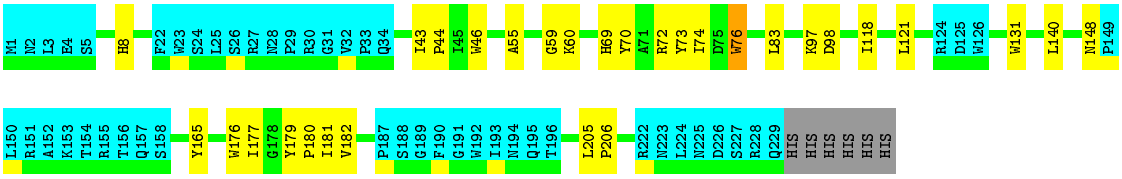
• Molecule 1: Anabaena Sensory Rhodopsin

Chain B:



• Molecule 1: Anabaena Sensory Rhodopsin

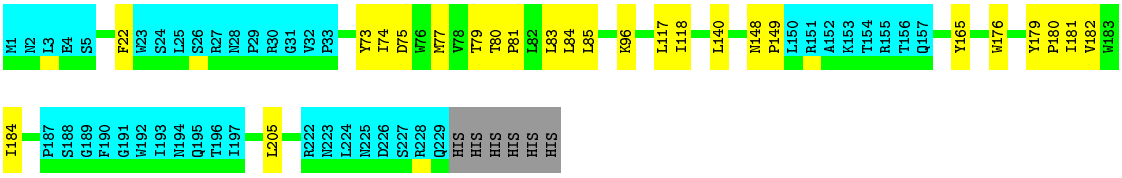
Chain C:



4.2.6 Score per residue for model 6 (medoid)

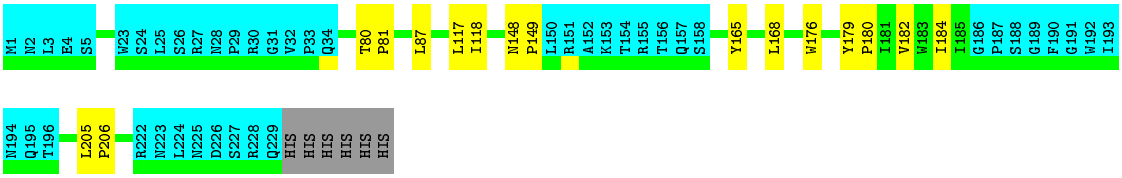
• Molecule 1: Anabaena Sensory Rhodopsin

Chain A:



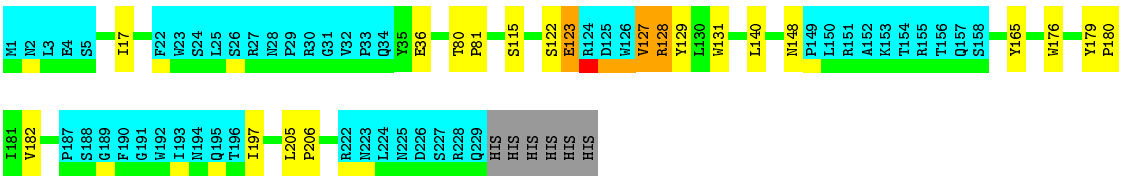
• Molecule 1: Anabaena Sensory Rhodopsin

Chain B:



• Molecule 1: Anabaena Sensory Rhodopsin

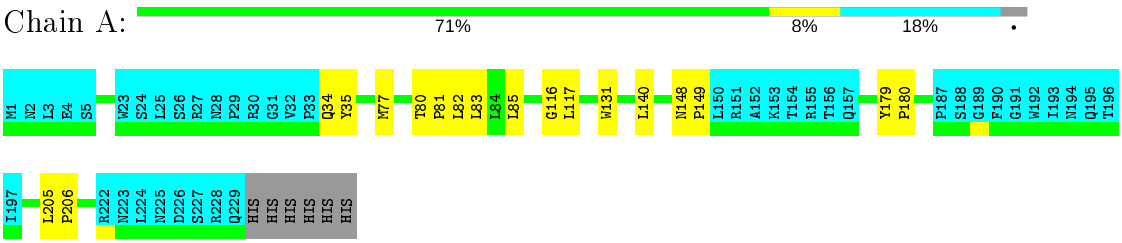
Chain C:



4.2.7 Score per residue for model 7

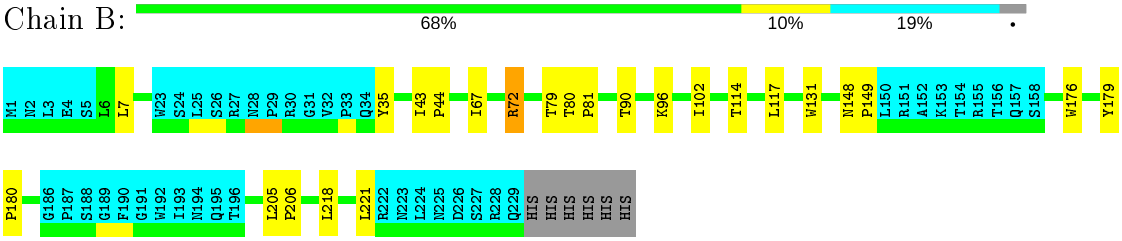
- Molecule 1: Anabaena Sensory Rhodopsin

Chain A:



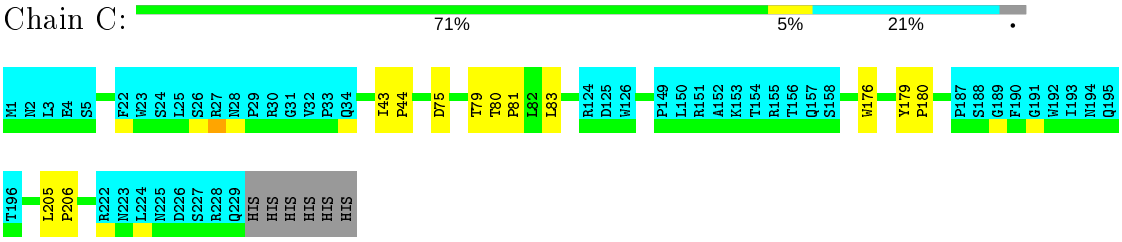
- Molecule 1: Anabaena Sensory Rhodopsin

Chain B:



- Molecule 1: Anabaena Sensory Rhodopsin

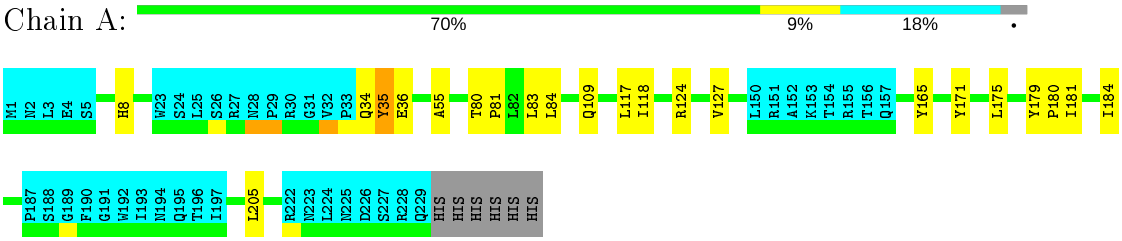
Chain C:



4.2.8 Score per residue for model 8

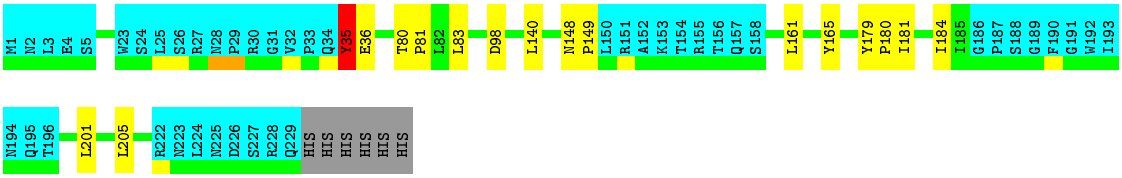
- Molecule 1: Anabaena Sensory Rhodopsin

Chain A:



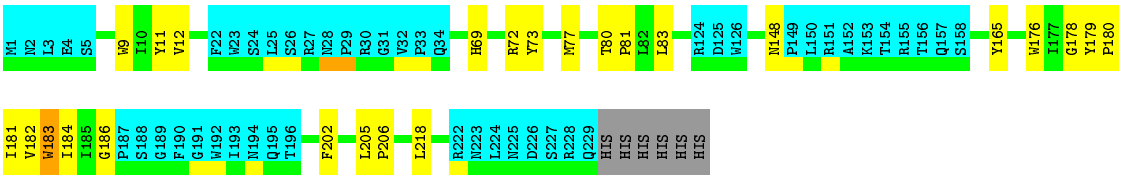
- Molecule 1: Anabaena Sensory Rhodopsin

Chain B:



• Molecule 1: Anabaena Sensory Rhodopsin

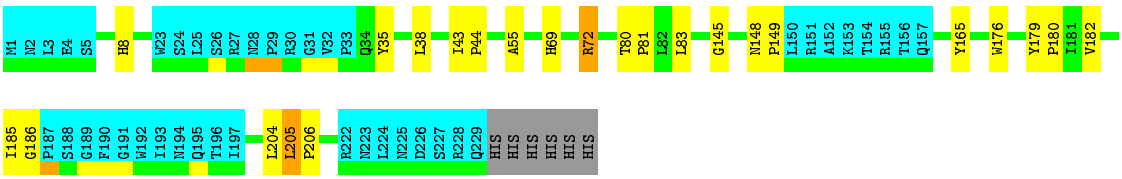
Chain C:



4.2.9 Score per residue for model 9

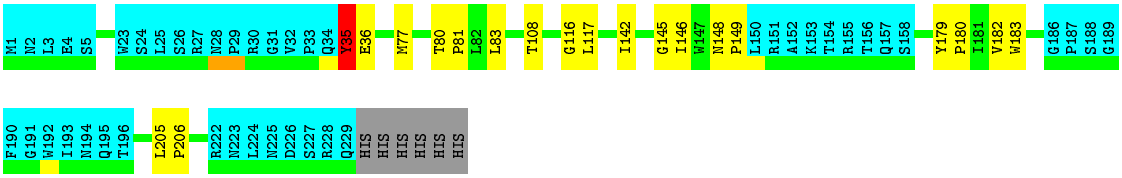
• Molecule 1: Anabaena Sensory Rhodopsin

Chain A:



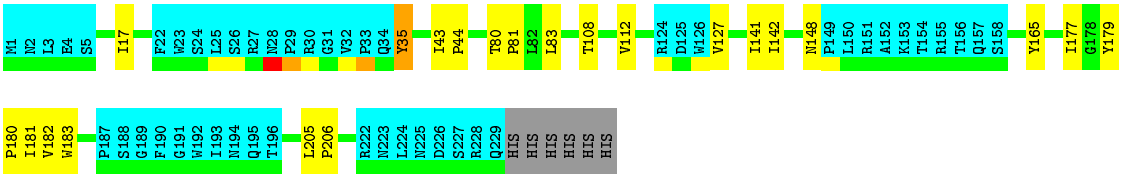
• Molecule 1: Anabaena Sensory Rhodopsin

Chain B:



• Molecule 1: Anabaena Sensory Rhodopsin

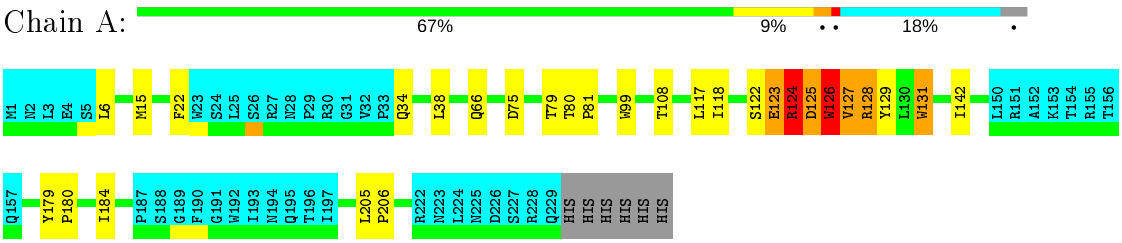
Chain C:



4.2.10 Score per residue for model 10

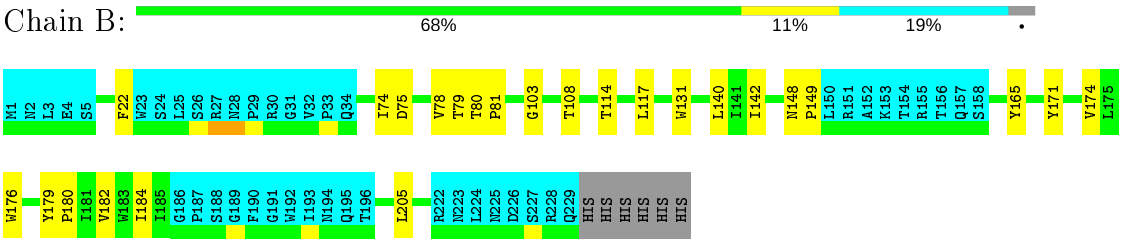
- Molecule 1: Anabaena Sensory Rhodopsin

Chain A:



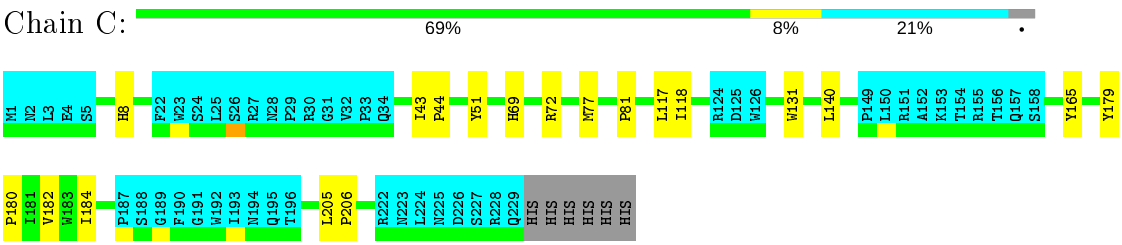
- Molecule 1: Anabaena Sensory Rhodopsin

Chain B:



- Molecule 1: Anabaena Sensory Rhodopsin

Chain C:



5 Refinement protocol and experimental data overview

The models were refined using the following method: *torsion angle dynamics*.

Of the 100 calculated structures, 10 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	structure solution	
CNS	structure solution	
CNS	refinement	

The following table shows chemical shift validation statistics as aggregates over all chemical shift files. Detailed validation can be found in section 7 of this report.

Chemical shift file(s)	input_cs.cif
Number of chemical shift lists	2
Total number of shifts	1186
Number of shifts mapped to atoms	1186
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	14%

Note: This is a solid-state NMR structure, where hydrogen atoms are typically not assigned a chemical shift value, which may lead to lower completeness of assignment measure.

No validations of the models with respect to experimental NMR restraints is performed at this time.

6 Model quality

6.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: RET

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

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	1518	1526	1522	11±5
1	B	1507	1521	1517	10±3
1	C	1460	1481	1477	9±2
2	A	20	28	27	3±1
2	B	20	28	27	3±1
2	C	20	28	27	3±1
All	All	45450	46120	45967	378

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 4.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:124:ARG:O	1:A:126:TRP:N	0.77	2.18	10	1
1:A:124:ARG:C	1:A:126:TRP:H	0.68	1.90	10	1
2:B:301:RET:H8	2:B:301:RET:H161	0.64	1.69	6	6
2:A:301:RET:H8	2:A:301:RET:H161	0.64	1.69	8	7
2:B:301:RET:H161	2:B:301:RET:H8	0.64	1.70	7	3
2:C:301:RET:H161	2:C:301:RET:H8	0.63	1.71	8	4
1:A:180:PRO:HG3	2:A:301:RET:H183	0.63	1.70	10	2

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
2:C:301:RET:H8	2:C:301:RET:H161	0.62	1.70	4	4
2:A:301:RET:H161	2:A:301:RET:H8	0.62	1.71	1	2
2:A:301:RET:H171	2:A:301:RET:H8	0.62	1.71	10	3
2:C:301:RET:H8	2:C:301:RET:H171	0.62	1.71	10	4
1:A:128:ARG:HA	1:A:131:TRP:HB2	0.62	1.71	10	1
2:C:301:RET:H171	2:C:301:RET:H8	0.61	1.70	1	2
1:C:179:TYR:O	1:C:182:VAL:HG22	0.61	1.95	9	8
2:B:301:RET:H171	2:B:301:RET:H8	0.61	1.72	9	4
2:B:301:RET:H8	2:B:301:RET:H171	0.60	1.73	4	2
2:A:301:RET:H8	2:A:301:RET:H171	0.59	1.73	4	2
1:A:126:TRP:O	1:A:128:ARG:N	0.59	2.36	10	1
1:B:179:TYR:O	1:B:182:VAL:HG22	0.56	2.00	4	6
1:C:182:VAL:HG23	1:C:183:TRP:CD2	0.56	2.36	2	1
1:A:126:TRP:C	1:A:128:ARG:N	0.54	2.58	10	1
1:B:179:TYR:HB2	1:B:180:PRO:HD3	0.54	1.79	5	8
1:B:80:THR:N	1:B:81:PRO:HD2	0.54	2.17	4	5
1:C:205:LEU:HB3	1:C:206:PRO:HD3	0.53	1.80	8	9
1:A:148:ASN:N	1:A:149:PRO:HD2	0.53	2.19	6	4
1:B:124:ARG:HG2	1:B:126:TRP:H	0.53	1.64	1	2
1:B:148:ASN:N	1:B:149:PRO:HD2	0.53	2.19	8	5
1:B:205:LEU:HB3	1:B:206:PRO:HD3	0.53	1.81	3	7
1:B:43:ILE:HB	1:B:44:PRO:HD3	0.52	1.81	4	1
1:A:205:LEU:HB3	1:A:206:PRO:HD3	0.52	1.81	4	7
1:A:179:TYR:HB2	1:A:180:PRO:HD3	0.52	1.80	2	7
1:C:179:TYR:HB2	1:C:180:PRO:HD3	0.52	1.80	2	9
1:A:179:TYR:O	1:A:182:VAL:HG22	0.52	2.05	4	6
2:C:301:RET:H171	2:C:301:RET:C8	0.52	2.35	1	2
1:B:116:GLY:HA2	2:B:301:RET:H173	0.51	1.82	9	1
2:C:301:RET:C8	2:C:301:RET:H161	0.51	2.36	4	2
1:A:182:VAL:HG23	1:A:183:TRP:CD2	0.51	2.41	2	1
2:B:301:RET:H161	2:B:301:RET:C8	0.51	2.35	6	3
2:A:301:RET:C8	2:A:301:RET:H161	0.51	2.36	5	4
2:A:301:RET:H161	2:A:301:RET:C8	0.50	2.36	1	2
2:A:301:RET:H171	2:A:301:RET:C8	0.50	2.36	6	4
1:A:122:SER:HA	1:A:126:TRP:HB2	0.50	1.83	10	1
1:A:126:TRP:O	1:A:128:ARG:HG3	0.50	2.06	10	1
1:A:80:THR:N	1:A:81:PRO:HD2	0.50	2.22	6	2
2:C:301:RET:H161	2:C:301:RET:C8	0.50	2.37	5	3
2:B:301:RET:C8	2:B:301:RET:H161	0.50	2.37	3	4
1:A:71:ALA:O	1:A:74:ILE:HG22	0.50	2.07	3	1
1:C:108:THR:HG21	1:C:142:ILE:HD13	0.50	1.84	3	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
2:C:301:RET:C8	2:C:301:RET:H171	0.50	2.35	9	3
1:C:80:THR:HB	1:C:81:PRO:HD3	0.49	1.84	1	6
2:B:301:RET:C8	2:B:301:RET:H171	0.49	2.38	4	1
2:B:301:RET:H171	2:B:301:RET:C8	0.49	2.37	8	2
1:B:183:TRP:HE1	2:B:301:RET:H163	0.49	1.68	9	1
1:A:126:TRP:C	1:A:128:ARG:H	0.49	2.10	10	1
1:A:80:THR:HB	1:A:81:PRO:HD3	0.48	1.85	10	6
1:A:148:ASN:H	1:A:149:PRO:HD2	0.48	1.68	3	1
1:C:180:PRO:HA	1:C:183:TRP:HE1	0.48	1.68	8	1
1:B:148:ASN:HB2	1:B:149:PRO:HD3	0.48	1.86	9	1
1:C:83:LEU:HD22	2:C:301:RET:H201	0.48	1.85	9	1
1:B:182:VAL:HG23	1:B:183:TRP:CD2	0.48	2.44	2	2
1:B:80:THR:HB	1:B:81:PRO:HD3	0.48	1.86	2	4
1:A:125:ASP:O	1:A:127:VAL:N	0.48	2.40	10	1
1:B:73:TYR:CD1	1:B:117:LEU:HD22	0.47	2.44	4	1
1:B:102:ILE:H	1:B:102:ILE:HD12	0.47	1.69	7	1
1:B:75:ASP:O	1:B:79:THR:HG22	0.47	2.08	1	2
1:A:124:ARG:C	1:A:126:TRP:N	0.47	2.62	10	1
1:A:179:TYR:N	1:A:180:PRO:HD2	0.47	2.24	4	3
1:A:148:ASN:HB3	1:A:149:PRO:HD3	0.47	1.87	2	4
1:A:35:TYR:HD1	1:A:36:GLU:N	0.47	2.08	2	1
1:C:179:TYR:N	1:C:180:PRO:HD2	0.47	2.24	4	1
1:C:43:ILE:HB	1:C:44:PRO:HD3	0.47	1.86	4	2
1:B:77:MET:SD	1:B:117:LEU:HD21	0.47	2.50	9	1
1:A:34:GLN:O	1:A:36:GLU:N	0.47	2.48	8	1
1:A:38:LEU:HD21	1:B:103:GLY:HA3	0.47	1.87	10	1
1:A:59:GLY:HA3	1:A:71:ALA:HB2	0.47	1.87	3	1
1:C:80:THR:OG1	1:C:81:PRO:HD3	0.47	2.10	4	1
1:A:126:TRP:O	1:A:126:TRP:CG	0.47	2.68	10	1
1:C:183:TRP:HE1	2:C:301:RET:H163	0.46	1.71	9	1
1:A:128:ARG:C	1:A:128:ARG:HD2	0.46	2.30	10	1
1:C:181:ILE:O	1:C:184:ILE:HG22	0.46	2.10	2	2
1:B:148:ASN:HB3	1:B:149:PRO:HD3	0.46	1.88	10	3
1:B:35:TYR:HD1	1:B:36:GLU:N	0.46	2.09	9	1
1:A:178:GLY:O	1:A:181:ILE:HG22	0.46	2.11	5	1
1:C:40:ALA:O	1:C:44:PRO:HG2	0.46	2.11	4	1
1:A:6:LEU:HD23	1:A:6:LEU:H	0.46	1.70	10	1
1:C:69:HIS:HB3	1:C:72:ARG:HB2	0.46	1.88	10	4
1:C:80:THR:N	1:C:81:PRO:HD2	0.46	2.26	2	1
1:C:9:TRP:O	1:C:12:VAL:HG12	0.46	2.10	2	3
1:A:8:HIS:HB2	1:A:55:ALA:HB2	0.46	1.88	9	3

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:B:43:ILE:HG23	1:B:79:THR:HG23	0.46	1.88	7	1
1:C:180:PRO:HG3	2:C:301:RET:H183	0.46	1.88	7	1
1:B:108:THR:O	1:B:112:VAL:HG23	0.46	2.11	1	1
1:C:80:THR:N	1:C:81:PRO:CD	0.46	2.79	4	1
1:B:35:TYR:HB2	1:B:89:TRP:HE1	0.46	1.70	5	1
1:A:116:GLY:HA3	2:A:301:RET:H172	0.45	1.88	7	1
1:A:117:LEU:C	1:A:117:LEU:HD22	0.45	2.31	3	1
1:A:69:HIS:HB3	1:A:72:ARG:HB2	0.45	1.88	5	3
1:B:181:ILE:O	1:B:184:ILE:HG22	0.45	2.12	3	2
1:A:58:GLN:NE2	1:B:127:VAL:HG11	0.45	2.26	4	1
1:C:128:ARG:HA	1:C:131:TRP:HB3	0.45	1.87	6	1
1:C:75:ASP:O	1:C:79:THR:HG22	0.45	2.12	7	1
1:A:46:TRP:HE1	1:B:110:ILE:HG22	0.45	1.71	1	1
1:B:117:LEU:HD12	1:B:118:ILE:N	0.45	2.27	6	2
1:A:35:TYR:CG	1:A:36:GLU:N	0.45	2.84	3	1
1:C:8:HIS:HB2	1:C:55:ALA:HB2	0.45	1.88	5	2
1:B:69:HIS:HB3	1:B:72:ARG:HB2	0.45	1.89	5	3
1:A:181:ILE:O	1:A:184:ILE:HG22	0.44	2.12	8	3
1:A:118:ILE:HB	1:A:131:TRP:NE1	0.44	2.27	5	1
1:C:73:TYR:O	1:C:76:TRP:HB2	0.44	2.12	5	1
1:A:117:LEU:HD12	1:A:118:ILE:N	0.44	2.27	10	3
1:A:124:ARG:HG2	1:A:126:TRP:H	0.44	1.71	4	1
1:C:122:SER:O	1:C:123:GLU:CB	0.44	2.64	6	1
1:A:127:VAL:O	1:A:129:TYR:N	0.44	2.50	10	1
1:C:43:ILE:N	1:C:44:PRO:HD2	0.44	2.27	5	6
1:A:178:GLY:O	1:A:182:VAL:HG13	0.44	2.12	5	1
1:C:6:LEU:N	1:C:6:LEU:HD12	0.44	2.26	1	1
1:B:87:LEU:HD22	1:B:168:LEU:HD11	0.44	1.89	6	1
1:A:43:ILE:N	1:A:44:PRO:HD2	0.44	2.28	2	4
1:A:82:LEU:HD23	1:A:85:LEU:HD12	0.44	1.90	7	1
1:B:90:THR:HG23	1:B:221:LEU:HD21	0.44	1.88	7	1
1:A:75:ASP:O	1:A:79:THR:HG22	0.44	2.12	6	3
1:B:72:ARG:HA	1:B:72:ARG:NE	0.44	2.28	7	1
1:B:67:ILE:HD12	1:B:67:ILE:N	0.44	2.28	7	1
1:A:77:MET:SD	1:A:117:LEU:HD23	0.43	2.53	7	1
1:C:180:PRO:HA	1:C:183:TRP:NE1	0.43	2.29	8	1
1:C:127:VAL:C	1:C:129:TYR:N	0.43	2.72	6	1
1:B:8:HIS:HB2	1:B:55:ALA:HB2	0.43	1.90	5	1
1:C:141:ILE:HG13	1:C:142:ILE:N	0.43	2.29	9	1
1:A:177:ILE:O	1:A:181:ILE:HG12	0.43	2.13	1	1
1:C:43:ILE:HG23	1:C:79:THR:HG23	0.43	1.91	2	2

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:C:127:VAL:O	1:C:129:TYR:N	0.43	2.51	6	1
1:A:108:THR:HG21	1:A:142:ILE:HG12	0.43	1.90	10	1
1:A:127:VAL:C	1:A:129:TYR:N	0.43	2.72	10	1
2:A:301:RET:H7	2:A:301:RET:H181	0.42	1.72	10	1
1:C:178:GLY:O	1:C:182:VAL:HG13	0.42	2.14	8	1
1:C:35:TYR:CG	1:C:36:GLU:N	0.42	2.87	3	1
1:C:197:ILE:N	1:C:197:ILE:HD12	0.42	2.29	4	1
1:A:81:PRO:HA	1:A:109:GLN:NE2	0.42	2.29	5	1
1:B:80:THR:HG21	1:B:113:ILE:HD11	0.42	1.91	5	1
1:C:77:MET:O	1:C:81:PRO:HG2	0.42	2.14	10	1
1:A:84:LEU:HD22	1:A:109:GLN:HG3	0.42	1.90	8	1
1:A:171:TYR:O	1:A:175:LEU:HG	0.42	2.13	8	1
1:B:78:VAL:HG13	1:B:79:THR:N	0.42	2.30	10	1
1:A:74:ILE:HG23	1:A:75:ASP:N	0.42	2.30	6	1
1:B:148:ASN:N	1:B:149:PRO:CD	0.42	2.83	6	1
1:B:43:ILE:HD12	1:B:43:ILE:H	0.42	1.74	4	1
1:C:177:ILE:O	1:C:181:ILE:HG13	0.42	2.15	5	2
1:A:73:TYR:O	1:A:77:MET:HG2	0.42	2.15	6	1
1:A:145:GLY:HA2	1:A:149:PRO:HG2	0.42	1.92	9	1
1:B:177:ILE:O	1:B:181:ILE:HG12	0.42	2.14	4	2
1:B:35:TYR:CD1	1:B:36:GLU:N	0.42	2.87	8	1
1:C:178:GLY:O	1:C:181:ILE:HG22	0.41	2.15	8	1
1:B:201:LEU:HD22	1:B:201:LEU:N	0.41	2.30	2	1
1:B:108:THR:HB	1:B:142:ILE:HD13	0.41	1.91	4	1
1:A:96:LYS:HD3	1:A:96:LYS:N	0.41	2.30	6	1
1:B:114:THR:O	1:B:117:LEU:HG	0.41	2.15	7	2
1:A:124:ARG:HB2	1:A:127:VAL:HG12	0.41	1.92	8	1
1:B:108:THR:HG21	1:B:142:ILE:HG12	0.41	1.92	10	2
1:B:179:TYR:N	1:B:180:PRO:HD2	0.41	2.30	10	1
1:C:45:ILE:HG23	1:C:46:TRP:N	0.41	2.30	3	1
1:B:171:TYR:O	1:B:174:VAL:HG22	0.41	2.15	10	1
1:B:43:ILE:N	1:B:44:PRO:HD2	0.41	2.31	3	2
1:B:58:GLN:HE21	1:B:59:GLY:H	0.41	1.57	3	1
1:B:178:GLY:O	1:B:181:ILE:HG22	0.41	2.15	5	1
1:C:118:ILE:HA	1:C:121:LEU:HB2	0.41	1.91	5	1
1:A:84:LEU:HD12	1:A:85:LEU:N	0.41	2.31	6	1
1:C:70:TYR:O	1:C:74:ILE:HG13	0.41	2.16	5	1
2:B:301:RET:H181	2:B:301:RET:H7	0.41	1.72	1	1
1:A:201:LEU:N	1:A:201:LEU:HD22	0.41	2.31	2	1
1:C:78:VAL:O	1:C:82:LEU:HD23	0.41	2.15	3	1
1:B:108:THR:O	1:B:111:VAL:HG22	0.41	2.16	1	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:C:73:TYR:HA	1:C:76:TRP:CE2	0.41	2.50	3	1
1:B:124:ARG:HB2	1:B:127:VAL:HG12	0.41	1.93	5	1
1:C:128:ARG:HA	1:C:131:TRP:CB	0.41	2.46	6	1
1:C:73:TYR:O	1:C:77:MET:HG2	0.41	2.16	8	1
1:B:145:GLY:HA2	1:B:149:PRO:HG2	0.41	1.93	9	1
1:C:8:HIS:HB3	1:C:51:TYR:O	0.41	2.16	10	1
1:B:74:ILE:HG13	1:B:75:ASP:N	0.41	2.31	10	1
1:B:180:PRO:O	1:B:184:ILE:HG13	0.41	2.16	2	1
1:B:184:ILE:HG23	1:B:185:ILE:HG23	0.41	1.93	3	1
1:B:84:LEU:HD22	1:B:109:GLN:HG3	0.41	1.93	3	1
1:A:72:ARG:HA	1:A:72:ARG:HE	0.41	1.76	9	1
1:C:108:THR:O	1:C:112:VAL:HG23	0.41	2.16	9	1
1:B:43:ILE:HD11	1:B:82:LEU:HB3	0.40	1.93	4	1
2:A:301:RET:H181	2:A:301:RET:H7	0.40	1.72	5	1
1:C:115:SER:HA	1:C:131:TRP:NE1	0.40	2.31	6	1
1:A:164:LEU:HD12	1:A:165:TYR:N	0.40	2.31	5	1
1:B:43:ILE:HD12	1:B:43:ILE:N	0.40	2.31	4	1
1:B:72:ARG:HA	1:B:72:ARG:HE	0.40	1.76	7	1
2:C:301:RET:H7	2:C:301:RET:H181	0.40	1.72	7	1
1:C:117:LEU:HD12	1:C:118:ILE:N	0.40	2.30	10	1
1:B:60:LYS:HB2	1:B:60:LYS:NZ	0.40	2.32	3	1
1:A:66:GLN:HE21	1:A:67:ILE:H	0.40	1.59	5	1
1:B:7:LEU:N	1:B:7:LEU:HD22	0.40	2.31	7	1
1:A:123:GLU:O	1:A:124:ARG:O	0.40	2.39	10	1
1:A:167:LYS:NZ	1:A:167:LYS:HB2	0.40	2.31	1	1
1:B:70:TYR:CE2	1:B:74:ILE:HD11	0.40	2.51	3	1
1:C:197:ILE:HD12	1:C:197:ILE:H	0.40	1.74	4	1

6.3 Torsion angles

6.3.1 Protein backbone

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	186/235 (79%)	175±4 (94±2%)	10±3 (5±1%)	2±2 (1±1%)	21	69
1	B	184/235 (78%)	174±3 (94±2%)	10±3 (5±2%)	1±1 (0±0%)	38	78

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	C	180/235 (77%)	171±2 (95±1%)	8±2 (5±1%)	1±1 (1±1%)	29 74
All	All	5500/7050 (78%)	5190 (94%)	275 (5%)	35 (1%)	29 74

All 25 unique Ramachandran outliers are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type	Models (Total)
1	B	184	ILE	3
1	A	59	GLY	2
1	B	35	TYR	2
1	A	98	ASP	2
1	A	184	ILE	2
1	A	34	GLN	2
1	B	98	ASP	2
1	C	97	LYS	2
1	C	184	ILE	2
1	A	127	VAL	1
1	A	99	TRP	1
1	A	35	TYR	1
1	A	124	ARG	1
1	C	98	ASP	1
1	B	96	LYS	1
1	C	127	VAL	1
1	A	128	ARG	1
1	C	128	ARG	1
1	A	125	ASP	1
1	A	123	GLU	1
1	C	186	GLY	1
1	C	96	LYS	1
1	A	126	TRP	1
1	C	123	GLU	1
1	C	59	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	159/204 (78%)	154±2 (97±1%)	5±2 (3±1%)	40 87
1	B	158/204 (77%)	153±2 (97±1%)	5±2 (3±1%)	42 88
1	C	153/204 (75%)	148±2 (97±1%)	5±2 (3±1%)	41 87
All	All	4700/6120 (77%)	4546 (97%)	154 (3%)	41 87

All 63 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	C	165	TYR	9
1	C	176	TRP	8
1	A	83	LEU	8
1	B	176	TRP	7
1	B	35	TYR	7
1	A	176	TRP	6
1	B	165	TYR	6
1	A	165	TYR	6
1	C	83	LEU	6
1	B	205	LEU	5
1	B	83	LEU	5
1	A	205	LEU	4
1	B	140	LEU	4
1	A	35	TYR	4
1	C	140	LEU	4
1	C	17	ILE	3
1	B	131	TRP	3
1	A	140	LEU	3
1	C	131	TRP	3
1	A	131	TRP	3
1	C	46	TRP	2
1	C	76	TRP	2
1	C	11	TYR	2
1	B	202	PHE	2
1	A	202	PHE	2
1	C	205	LEU	2
1	C	202	PHE	2
1	B	84	LEU	1
1	A	38	LEU	1
1	A	66	GLN	1
1	A	106	MET	1
1	B	72	ARG	1
1	B	117	LEU	1

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Mol	Chain	Res	Type	Models (Total)
1	B	77	MET	1
1	B	17	ILE	1
1	A	221	LEU	1
1	C	38	LEU	1
1	A	84	LEU	1
1	B	96	LYS	1
1	C	183	TRP	1
1	A	46	TRP	1
1	B	109	GLN	1
1	A	204	LEU	1
1	C	35	TYR	1
1	C	84	LEU	1
1	A	117	LEU	1
1	A	17	ILE	1
1	A	85	LEU	1
1	A	183	TRP	1
1	A	124	ARG	1
1	A	72	ARG	1
1	B	46	TRP	1
1	A	167	LYS	1
1	A	126	TRP	1
1	C	60	LYS	1
1	A	34	GLN	1
1	B	201	LEU	1
1	C	73	TYR	1
1	B	161	LEU	1
1	A	73	TYR	1
1	A	15	MET	1
1	C	36	GLU	1
1	B	22	PHE	1

6.3.3 RNA

There are no RNA molecules in this entry.

6.4 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

6.5 Carbohydrates

There are no carbohydrates in this entry.

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6.6 Other polymers

There are no such molecules in this entry.

6.7 Polymer linkage issues

There are no chain breaks in this entry.

7 Chemical shift validation

The completeness of assignment taking into account all chemical shift lists is 14% for the well-defined parts and 12% for the entire structure.

7.1 Chemical shift list 1

File name: input_cs.cif

Chemical shift list name: *assigned_chem_shift_list_1*

7.1.1 Bookkeeping

The following table shows the results of parsing the chemical shift list and reports the number of nuclei with statistically unusual chemical shifts.

Total number of shifts	1143
Number of shifts mapped to atoms	1143
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	4

7.1.2 Chemical shift referencing

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction ± precision, *ppm*	Suggested action
$^{13}C_{\alpha}$	205	-1.34 ± 0.15	Should be applied
$^{13}C_{\beta}$	176	0.53 ± 0.13	Should be applied
$^{13}C'$	203	-0.42 ± 0.14	None needed (< 0.5 ppm)
^{15}N	205	1.41 ± 0.29	Should be applied

7.1.3 Completeness of resonance assignments

The following table shows the completeness of the chemical shift assignments for the well-defined regions of the structure. The overall completeness is 14%, i.e. 960 atoms were assigned a chemical shift out of a possible 6916. 0 out of 117 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^{1}H	^{13}C	^{15}N
Backbone	533/2722 (20%)	0/1086 (0%)	358/1100 (33%)	175/536 (33%)
Sidechain	364/3135 (12%)	0/1816 (0%)	358/1261 (28%)	6/58 (10%)

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	Total	^{1}H	^{13}C	^{15}N
Aromatic	63/1059 (6%)	0/547 (0%)	59/456 (13%)	4/56 (7%)
Overall	960/6916 (14%)	0/3449 (0%)	775/2817 (28%)	185/650 (28%)

Note: This is a solid-state NMR structure, where hydrogen atoms are typically not assigned a chemical shift value, which may lead to lower completeness of assignment measure.

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 12%, i.e. 1069 atoms were assigned a chemical shift out of a possible 8736. 0 out of 132 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^{1}H	^{13}C	^{15}N
Backbone	605/3387 (18%)	0/1350 (0%)	408/1374 (30%)	197/663 (30%)
Sidechain	401/4170 (10%)	0/2436 (0%)	395/1590 (25%)	6/144 (4%)
Aromatic	63/1179 (5%)	0/609 (0%)	59/507 (12%)	4/63 (6%)
Overall	1069/8736 (12%)	0/4395 (0%)	862/3471 (25%)	207/870 (24%)

Note: This is a solid-state NMR structure, where hydrogen atoms are typically not assigned a chemical shift value, which may lead to lower completeness of assignment measure.

7.1.4 Statistically unusual chemical shifts (i)

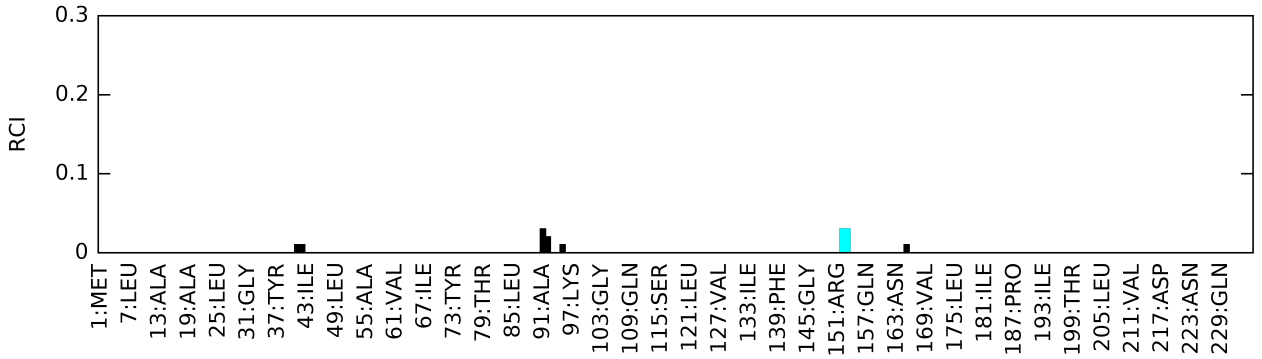
The following table lists the statistically unusual chemical shifts. These are statistical measures, and large deviations from the mean do not necessarily imply incorrect assignments. Molecules containing paramagnetic centres or hemes are expected to give rise to anomalous chemical shifts.

Mol	Chain	Res	Type	Atom	Shift, *ppm*	Expected range, *ppm*	Z-score
1	B	210	LYS	NZ	177.20	49.86 – 18.16	45.2
1	B	210	LYS	CE	55.67	46.00 – 37.80	16.8
1	B	109	GLN	NE2	98.30	120.91 – 102.81	-7.5
1	B	128	ARG	CD	37.40	47.57 – 38.77	-6.6

7.1.5 Random Coil Index (RCI) plots (i)

The image below reports *random coil index* values for the protein chains in the structure. The height of each bar gives a probability of a given residue to be disordered, as predicted from the available chemical shifts and the amino acid sequence. A value above 0.2 is an indication of significant predicted disorder. The colour of the bar shows whether the residue is in the well-defined core (black) or in the ill-defined residue ranges (cyan), as described in section 2 on ensemble composition.

Random coil index (RCI) for chain B:



7.2 Chemical shift list 2

File name: input_cs.cif

Chemical shift list name: *assigned_chem_shift_list_1_dup*

7.2.1 Bookkeeping

The following table shows the results of parsing the chemical shift list and reports the number of nuclei with statistically unusual chemical shifts.

Total number of shifts	43
Number of shifts mapped to atoms	43
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	0

7.2.2 Chemical shift referencing

No chemical shift referencing corrections were calculated (not enough data).

7.2.3 Completeness of resonance assignments

The following table shows the completeness of the chemical shift assignments for the well-defined regions of the structure. The overall completeness is 0%, i.e. 34 atoms were assigned a chemical shift out of a possible 6916. 0 out of 117 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^{1}H	^{13}C	^{15}N
Backbone	18/2722 (1%)	0/1086 (0%)	12/1100 (1%)	6/536 (1%)
Sidechain	12/3135 (0%)	0/1816 (0%)	12/1261 (1%)	0/58 (0%)
Aromatic	4/1059 (0%)	0/547 (0%)	4/456 (1%)	0/56 (0%)

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	Total	^{1}H	^{13}C	^{15}N
Overall	34/6916 (0%)	0/3449 (0%)	28/2817 (1%)	6/650 (1%)

Note: This is a solid-state NMR structure, where hydrogen atoms are typically not assigned a chemical shift value, which may lead to lower completeness of assignment measure.

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 0%, i.e. 41 atoms were assigned a chemical shift out of a possible 8736. 0 out of 132 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^{1}H	^{13}C	^{15}N
Backbone	24/3387 (1%)	0/1350 (0%)	16/1374 (1%)	8/663 (1%)
Sidechain	13/4170 (0%)	0/2436 (0%)	13/1590 (1%)	0/144 (0%)
Aromatic	4/1179 (0%)	0/609 (0%)	4/507 (1%)	0/63 (0%)
Overall	41/8736 (0%)	0/4395 (0%)	33/3471 (1%)	8/870 (1%)

Note: This is a solid-state NMR structure, where hydrogen atoms are typically not assigned a chemical shift value, which may lead to lower completeness of assignment measure.

7.2.4 Statistically unusual chemical shifts (i)

There are no statistically unusual chemical shifts.

7.2.5 Random Coil Index (RCI) plots (i)

The image below reports *random coil index* values for the protein chains in the structure. The height of each bar gives a probability of a given residue to be disordered, as predicted from the available chemical shifts and the amino acid sequence. A value above 0.2 is an indication of significant predicted disorder. The colour of the bar shows whether the residue is in the well-defined core (black) or in the ill-defined residue ranges (cyan), as described in section 2 on ensemble composition.

Random coil index (RCI) for chain B: