



Full wwPDB NMR Structure Validation Report ⓘ

May 29, 2020 – 12:00 am BST

PDB ID : 2MTN
Title : Solution structure of MLL-IBD complex
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Deposited on : 2014-08-23

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 Güntert (2011)
NmrClust : Kelley et al. (1996)
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 : 2.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.11

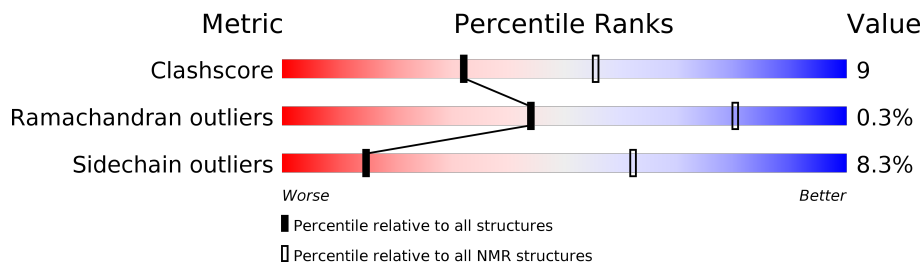
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

SOLUTION NMR

The overall completeness of chemical shifts assignment is 71%.

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	164	

2 Ensemble composition and analysis i

This entry contains 20 models. Model 3 is the overall representative, medoid model (most similar to other models). The authors have identified model 1 as representative.

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:148-A:151, A:350-A:428 (83)	0.34	3

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 and 2 single-model clusters were found.

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

3 Entry composition

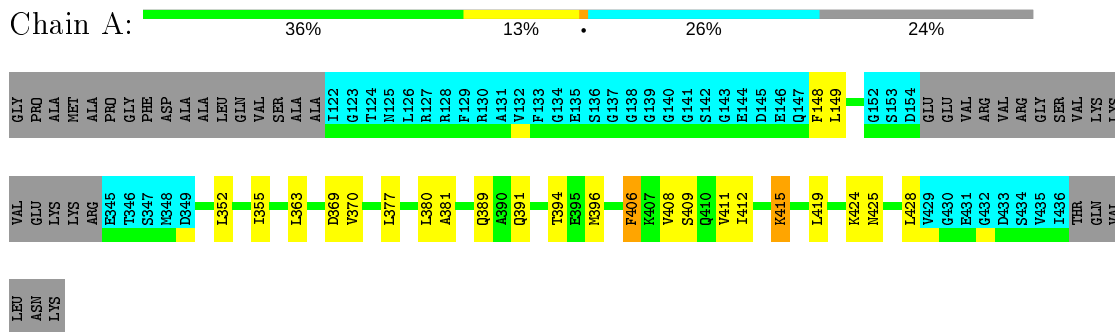
There is only 1 type of molecule in this entry. The entry contains 1969 atoms, of which 989 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Histone-lysine N-methyltransferase 2A, PC4 and SFRS1-interacting protein fusion.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	125	1969	608	989	175	190	7	0

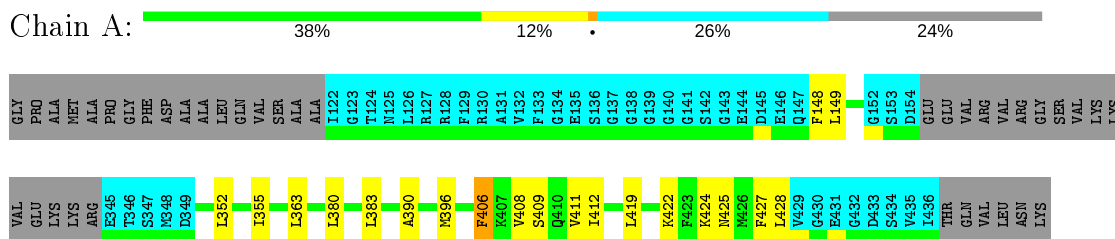
There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	105	GLY	-	EXPRESSION TAG	UNP Q03164
A	106	PRO	-	EXPRESSION TAG	UNP Q03164
A	107	ALA	-	EXPRESSION TAG	UNP Q03164
A	108	MET	-	EXPRESSION TAG	UNP Q03164
A	109	ALA	-	EXPRESSION TAG	UNP Q03164
A	335	GLY	-	LINKER	UNP Q03164
A	336	SER	-	LINKER	UNP Q03164



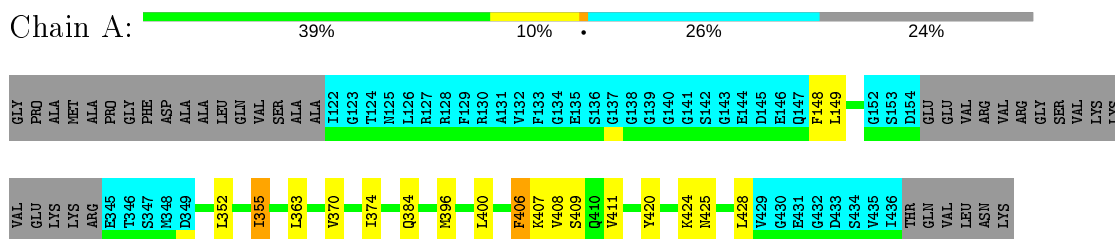
4.2.3 Score per residue for model 3 (medoid)

- Molecule 1: Histone-lysine N-methyltransferase 2A, PC4 and SFRS1-interacting protein fusion



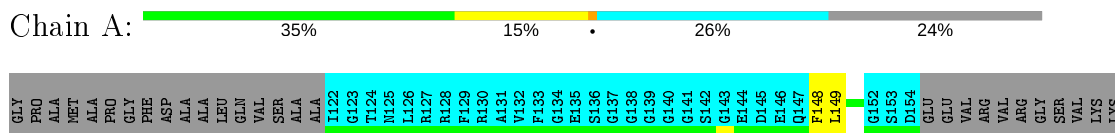
4.2.4 Score per residue for model 4

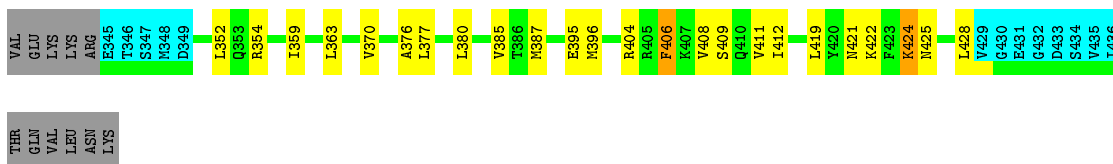
- Molecule 1: Histone-lysine N-methyltransferase 2A, PC4 and SFRS1-interacting protein fusion



4.2.5 Score per residue for model 5

- Molecule 1: Histone-lysine N-methyltransferase 2A, PC4 and SFRS1-interacting protein fusion

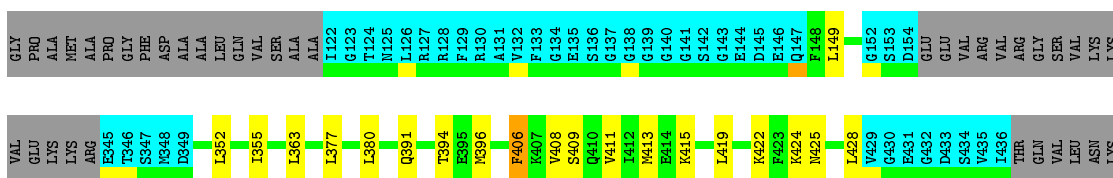




4.2.6 Score per residue for model 6

- Molecule 1: Histone-lysine N-methyltransferase 2A, PC4 and SFRS1-interacting protein fusion

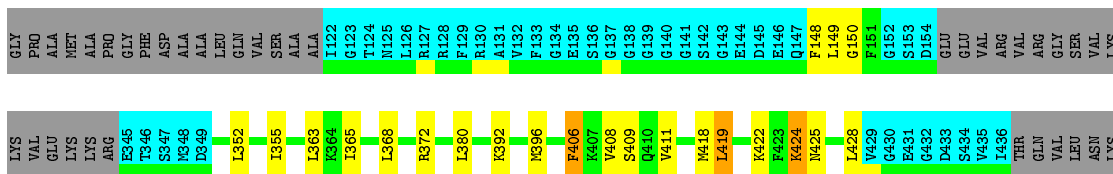
Chain A: 38% 12% 26% 24%



4.2.7 Score per residue for model 7

- Molecule 1: Histone-lysine N-methyltransferase 2A, PC4 and SFRS1-interacting protein fusion

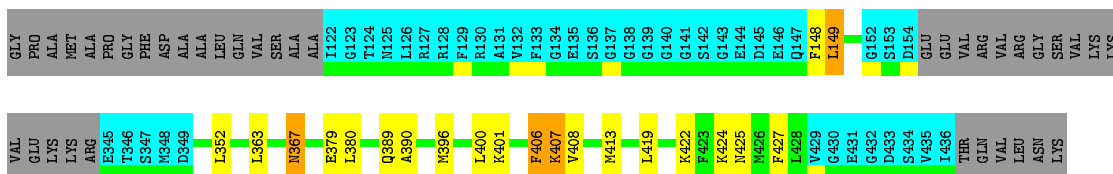
Chain A: 37% 12% 26% 24%



4.2.8 Score per residue for model 8

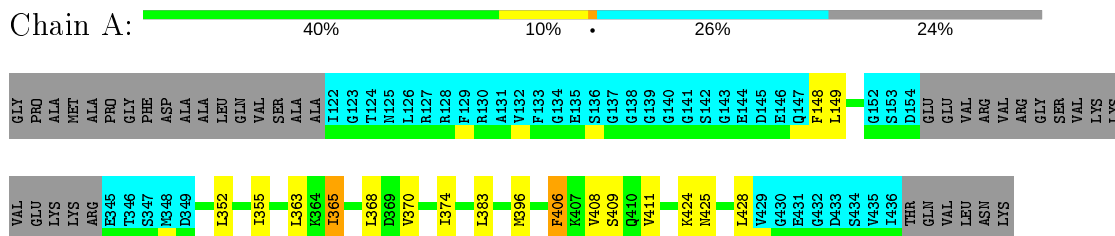
- Molecule 1: Histone-lysine N-methyltransferase 2A, PC4 and SFRS1-interacting protein fusion

Chain A: 38% 10% 26% 24%



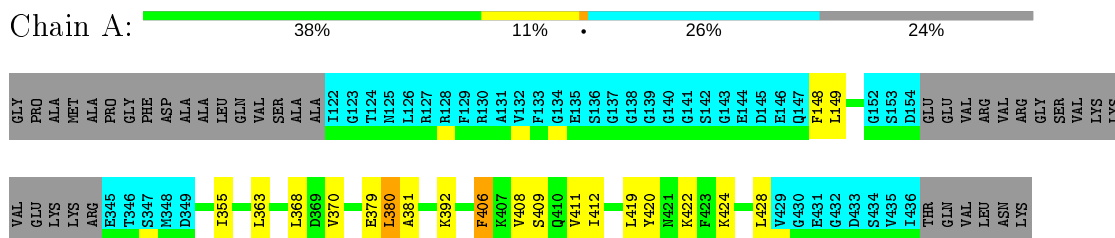
4.2.12 Score per residue for model 12

- Molecule 1: Histone-lysine N-methyltransferase 2A, PC4 and SFRS1-interacting protein fusion



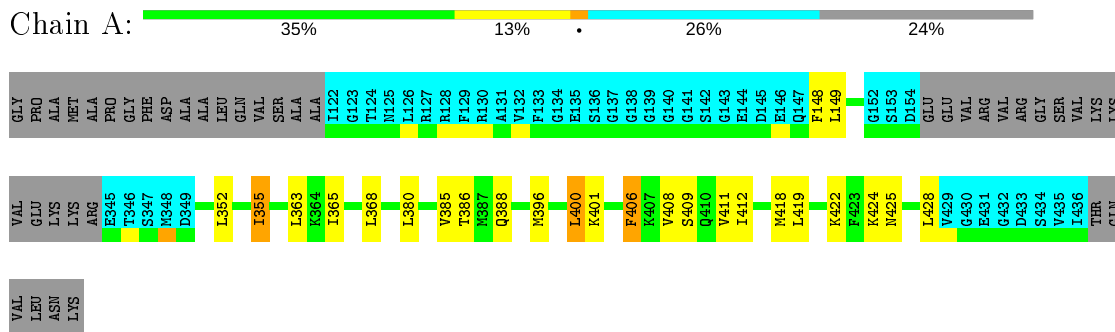
4.2.13 Score per residue for model 13

- Molecule 1: Histone-lysine N-methyltransferase 2A, PC4 and SFRS1-interacting protein fusion




4.2.14 Score per residue for model 14

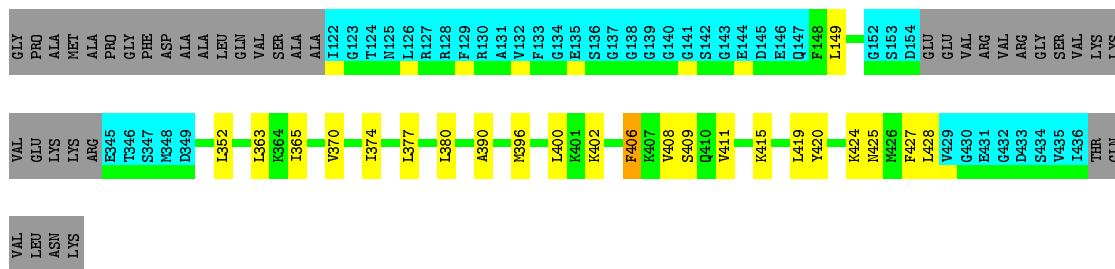
- Molecule 1: Histone-lysine N-methyltransferase 2A, PC4 and SFRS1-interacting protein fusion



4.2.15 Score per residue for model 15


- Molecule 1: Histone-lysine N-methyltransferase 2A, PC4 and SFRS1-interacting protein fusion

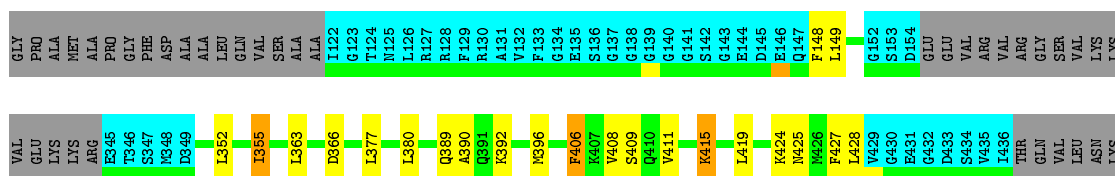
Chain A: 



4.2.16 Score per residue for model 16


- Molecule 1: Histone-lysine N-methyltransferase 2A, PC4 and SFRS1-interacting protein fusion

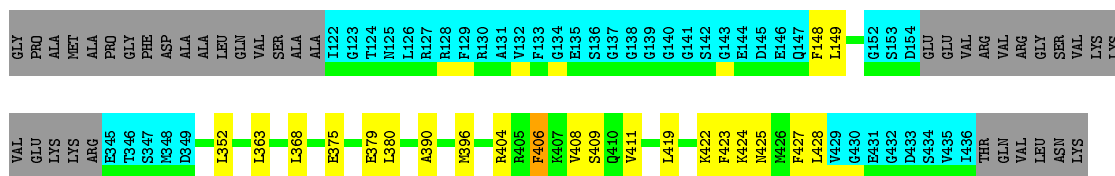
Chain A: 



4.2.17 Score per residue for model 17


- Molecule 1: Histone-lysine N-methyltransferase 2A, PC4 and SFRS1-interacting protein fusion

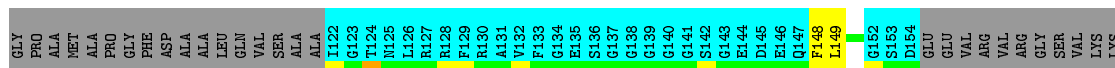
Chain A: 



4.2.18 Score per residue for model 18

- Molecule 1: Histone-lysine N-methyltransferase 2A, PC4 and SFRS1-interacting protein fusion

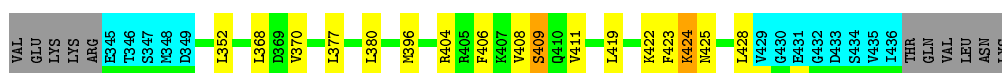
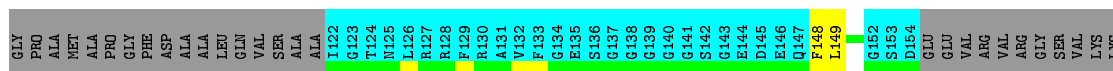
Chain A: 





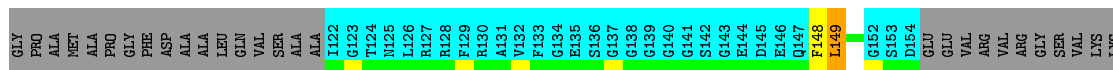
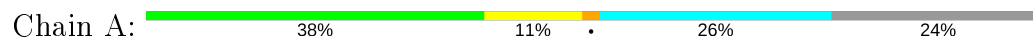
4.2.19 Score per residue for model 19

- Molecule 1: Histone-lysine N-methyltransferase 2A, PC4 and SFRS1-interacting protein fusion



4.2.20 Score per residue for model 20

- Molecule 1: Histone-lysine N-methyltransferase 2A, PC4 and SFRS1-interacting protein fusion



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
CYANA	structure solution	2.1
CYANA	refinement	2.1

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	1
Total number of shifts	1425
Number of shifts mapped to atoms	1425
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	71%

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

6 Model quality

6.1 Standard geometry

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	685	726	726	13±2
All	All	13700	14520	14520	266

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 9.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:400:LEU:HD21	1:A:419:LEU:HD23	0.91	1.40	11	1
1:A:352:LEU:HD22	1:A:396:MET:HE1	0.69	1.64	19	4
1:A:149:LEU:HD12	1:A:408:VAL:HG13	0.69	1.64	8	5
1:A:370:VAL:HG23	1:A:412:ILE:HD11	0.69	1.64	13	1
1:A:149:LEU:HD22	1:A:408:VAL:HG13	0.67	1.64	16	7
1:A:363:LEU:HD13	1:A:406:PHE:CZ	0.66	2.24	11	17
1:A:380:LEU:HD23	1:A:419:LEU:HD22	0.66	1.66	19	3
1:A:381:ALA:HB2	1:A:419:LEU:HD21	0.65	1.69	13	1
1:A:352:LEU:HD22	1:A:396:MET:CE	0.64	2.23	2	8
1:A:377:LEU:O	1:A:419:LEU:HD11	0.64	1.92	5	5
1:A:363:LEU:HD22	1:A:406:PHE:CE2	0.64	2.27	1	4
1:A:411:VAL:HG23	1:A:412:ILE:HD12	0.63	1.67	14	1
1:A:352:LEU:HD22	1:A:396:MET:HE3	0.63	1.69	15	4
1:A:148:PHE:O	1:A:149:LEU:HD23	0.62	1.94	16	11

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:380:LEU:HD23	1:A:419:LEU:HD21	0.62	1.70	11	2
1:A:380:LEU:HD23	1:A:419:LEU:HD12	0.61	1.71	17	5
1:A:409:SER:HB3	1:A:411:VAL:HG22	0.61	1.73	11	7
1:A:424:LYS:O	1:A:428:LEU:HD23	0.59	1.95	1	16
1:A:148:PHE:C	1:A:149:LEU:HD22	0.58	2.18	10	4
1:A:149:LEU:CD1	1:A:408:VAL:HG13	0.58	2.29	11	5
1:A:380:LEU:HD23	1:A:419:LEU:HD13	0.58	1.76	15	2
1:A:148:PHE:C	1:A:149:LEU:HD13	0.57	2.20	8	2
1:A:381:ALA:HB2	1:A:419:LEU:CD2	0.55	2.31	13	1
1:A:148:PHE:C	1:A:149:LEU:HD23	0.54	2.22	3	5
1:A:370:VAL:HG13	1:A:412:ILE:HD11	0.54	1.79	11	1
1:A:352:LEU:HD13	1:A:396:MET:HE1	0.54	1.80	3	10
1:A:409:SER:HB2	1:A:411:VAL:HG22	0.53	1.80	14	4
1:A:370:VAL:O	1:A:374:ILE:HD12	0.53	2.04	11	3
1:A:377:LEU:HD13	1:A:415:LYS:HB3	0.53	1.81	9	4
1:A:363:LEU:CD2	1:A:368:LEU:HD13	0.53	2.33	14	3
1:A:370:VAL:HB	1:A:412:ILE:HD11	0.52	1.81	2	1
1:A:370:VAL:O	1:A:374:ILE:HD13	0.52	2.04	12	1
1:A:380:LEU:HD21	1:A:419:LEU:HD13	0.52	1.79	13	1
1:A:380:LEU:HD23	1:A:419:LEU:CD2	0.51	2.34	2	1
1:A:383:LEU:HD12	1:A:383:LEU:O	0.51	2.05	1	4
1:A:363:LEU:HD22	1:A:406:PHE:CZ	0.51	2.39	12	6
1:A:377:LEU:HD13	1:A:415:LYS:CB	0.51	2.36	2	3
1:A:409:SER:OG	1:A:411:VAL:HG22	0.51	2.06	3	6
1:A:391:GLN:O	1:A:394:THR:HG23	0.50	2.06	6	4
1:A:424:LYS:O	1:A:428:LEU:HD13	0.49	2.08	18	3
1:A:409:SER:HB2	1:A:411:VAL:HG12	0.49	1.82	6	1
1:A:352:LEU:CD2	1:A:380:LEU:HD13	0.49	2.37	8	2
1:A:419:LEU:O	1:A:419:LEU:HD13	0.49	2.08	7	1
1:A:149:LEU:HD13	1:A:408:VAL:CG1	0.48	2.37	4	1
1:A:363:LEU:HD23	1:A:368:LEU:HD13	0.48	1.85	14	1
1:A:380:LEU:HD23	1:A:419:LEU:CD1	0.48	2.38	1	4
1:A:360:LYS:NZ	1:A:399:THR:HG21	0.48	2.23	9	1
1:A:381:ALA:HB2	1:A:419:LEU:CD1	0.48	2.37	2	1
1:A:363:LEU:HD13	1:A:406:PHE:CE2	0.48	2.42	11	1
1:A:148:PHE:O	1:A:149:LEU:HD13	0.48	2.09	8	3
1:A:377:LEU:HD13	1:A:415:LYS:HB2	0.47	1.84	2	1
1:A:380:LEU:HD23	1:A:419:LEU:HG	0.47	1.83	8	1
1:A:390:ALA:HB1	1:A:427:PHE:CE1	0.47	2.45	16	4
1:A:370:VAL:HG13	1:A:412:ILE:CD1	0.47	2.39	11	1
1:A:150:GLY:HA3	1:A:365:ILE:HG22	0.47	1.87	7	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:380:LEU:HD11	1:A:385:VAL:HG21	0.47	1.86	5	1
1:A:390:ALA:HB1	1:A:427:PHE:CZ	0.46	2.45	10	3
1:A:403:ILE:HG22	1:A:412:ILE:CG2	0.46	2.41	18	1
1:A:370:VAL:HG12	1:A:412:ILE:HD11	0.45	1.88	5	1
1:A:406:PHE:CD2	1:A:408:VAL:HG22	0.45	2.46	20	18
1:A:359:ILE:HG13	1:A:376:ALA:HB1	0.45	1.88	5	1
1:A:380:LEU:HD12	1:A:380:LEU:O	0.45	2.12	9	3
1:A:380:LEU:HD21	1:A:423:PHE:CZ	0.45	2.46	19	2
1:A:381:ALA:HB2	1:A:419:LEU:HD13	0.44	1.90	2	1
1:A:149:LEU:HD22	1:A:149:LEU:N	0.44	2.27	8	2
1:A:380:LEU:HG	1:A:419:LEU:HD12	0.44	1.88	8	1
1:A:400:LEU:HD21	1:A:419:LEU:HB2	0.44	1.89	8	2
1:A:370:VAL:CG2	1:A:411:VAL:HG21	0.44	2.43	19	1
1:A:380:LEU:CD2	1:A:419:LEU:HD22	0.44	2.40	19	1
1:A:149:LEU:HD13	1:A:408:VAL:HG12	0.43	1.90	4	1
1:A:370:VAL:HG22	1:A:374:ILE:CD1	0.43	2.43	4	1
1:A:400:LEU:HD11	1:A:419:LEU:HD13	0.43	1.90	14	1
1:A:363:LEU:HD13	1:A:406:PHE:CE1	0.43	2.49	13	1
1:A:149:LEU:HD22	1:A:408:VAL:CG1	0.43	2.40	16	2
1:A:380:LEU:O	1:A:380:LEU:HD12	0.43	2.13	3	2
1:A:409:SER:CB	1:A:411:VAL:HG12	0.43	2.43	6	1
1:A:380:LEU:HD21	1:A:423:PHE:CE2	0.43	2.49	17	1
1:A:380:LEU:CD2	1:A:419:LEU:HD12	0.42	2.42	3	3
1:A:400:LEU:CD2	1:A:419:LEU:HD23	0.42	2.28	11	1
1:A:365:ILE:HD13	1:A:365:ILE:N	0.42	2.29	12	1
1:A:409:SER:CB	1:A:411:VAL:HG22	0.42	2.45	14	1
1:A:400:LEU:HD22	1:A:420:TYR:CE2	0.42	2.50	4	1
1:A:406:PHE:CD2	1:A:412:ILE:HG21	0.41	2.50	3	1
1:A:363:LEU:HD22	1:A:368:LEU:HD13	0.41	1.92	20	1
1:A:383:LEU:O	1:A:383:LEU:HD12	0.41	2.15	12	1
1:A:400:LEU:HD21	1:A:419:LEU:CD2	0.41	2.29	11	1
1:A:149:LEU:HD11	1:A:407:LYS:HG3	0.40	1.92	8	1
1:A:385:VAL:HG13	1:A:426:MET:HE1	0.40	1.93	11	1
1:A:149:LEU:N	1:A:149:LEU:HD22	0.40	2.31	11	1
1:A:355:ILE:HD13	1:A:355:ILE:O	0.40	2.17	16	2
1:A:355:ILE:O	1:A:355:ILE:HD13	0.40	2.16	4	1
1:A:363:LEU:HD11	1:A:373:CYS:SG	0.40	2.57	18	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	83/164 (51%)	76±2 (92±2%)	7±2 (8±2%)	0±0 (0±1%)	44 80
All	All	1660/3280 (51%)	1522 (92%)	133 (8%)	5 (0%)	44 80

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	365	ILE	2
1	A	368	LEU	1
1	A	367	ASN	1
1	A	366	ASP	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	78/138 (57%)	72±2 (92±2%)	6±2 (8±2%)	15 62
All	All	1560/2760 (57%)	1431 (92%)	129 (8%)	15 62

All 39 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	406	PHE	20
1	A	355	ILE	14
1	A	422	LYS	13
1	A	368	LEU	6
1	A	424	LYS	5
1	A	379	GLU	5

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Mol	Chain	Res	Type	Models (Total)
1	A	404	ARG	5
1	A	149	LEU	5
1	A	365	ILE	4
1	A	389	GLN	4
1	A	392	LYS	4
1	A	418	MET	3
1	A	407	LYS	3
1	A	415	LYS	3
1	A	420	TYR	3
1	A	375	GLU	2
1	A	400	LEU	2
1	A	387	MET	2
1	A	364	LYS	2
1	A	402	LYS	2
1	A	419	LEU	2
1	A	413	MET	2
1	A	401	LYS	2
1	A	421	ASN	1
1	A	386	THR	1
1	A	408	VAL	1
1	A	395	GLU	1
1	A	369	ASP	1
1	A	366	ASP	1
1	A	360	LYS	1
1	A	409	SER	1
1	A	367	ASN	1
1	A	425	ASN	1
1	A	380	LEU	1
1	A	388	GLN	1
1	A	391	GLN	1
1	A	354	ARG	1
1	A	384	GLN	1
1	A	372	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 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 [i](#)

The completeness of assignment taking into account all chemical shift lists is 71% for the well-defined parts and 68% 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 [i](#)

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	1425
Number of shifts mapped to atoms	1425
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

7.1.2 Chemical shift referencing [i](#)

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction \pm precision, ppm	Suggested action
$^{13}\text{C}_\alpha$	150	-0.66 \pm 0.17	Should be applied
$^{13}\text{C}_\beta$	135	0.16 \pm 0.14	None needed (< 0.5 ppm)
$^{13}\text{C}'$	145	-0.38 \pm 0.12	None needed (< 0.5 ppm)
^{15}N	142	-0.16 \pm 0.25	None needed (< 0.5 ppm)

7.1.3 Completeness of resonance assignments [i](#)

The following table shows the completeness of the chemical shift assignments for the well-defined regions of the structure. The overall completeness is 71%, i.e. 794 atoms were assigned a chemical shift out of a possible 1118. 14 out of 14 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^1H	^{13}C	^{15}N
Backbone	391/415 (94%)	153/166 (92%)	160/166 (96%)	78/83 (94%)
Sidechain	371/636 (58%)	211/373 (57%)	155/228 (68%)	5/35 (14%)

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	Total	¹ H	¹³ C	¹⁵ N
Aromatic	32/67 (48%)	32/37 (86%)	0/28 (0%)	0/2 (0%)
Overall	794/1118 (71%)	396/576 (69%)	315/422 (75%)	83/120 (69%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 68%, i.e. 1049 atoms were assigned a chemical shift out of a possible 1552. 16 out of 18 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	¹ H	¹³ C	¹⁵ N
Backbone	548/625 (88%)	207/250 (83%)	230/250 (92%)	111/125 (89%)
Sidechain	462/842 (55%)	260/492 (53%)	196/304 (64%)	6/46 (13%)
Aromatic	39/85 (46%)	39/47 (83%)	0/36 (0%)	0/2 (0%)
Overall	1049/1552 (68%)	506/789 (64%)	426/590 (72%)	117/173 (68%)

7.1.4 Statistically unusual chemical shifts [i](#)

There are no statistically unusual chemical shifts.

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 A:

