



Full wwPDB NMR Structure Validation Report ⓘ

May 29, 2020 – 09:02 am BST

PDB ID : 5Y0U
Title : The solution structure of AEBP2 C2H2 zinc fingers
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Deposited on : 2017-07-18

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

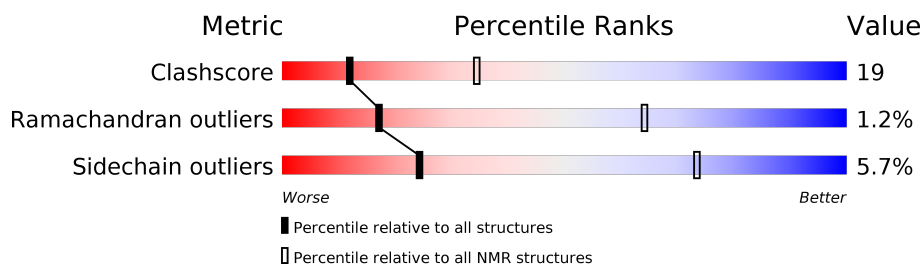
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

SOLUTION NMR

The overall completeness of chemical shifts assignment is 75%.

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	109	

2 Ensemble composition and analysis ⓘ

This entry contains 20 models. Model 8 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:260-A:353 (94)	0.44	8

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. No single-model clusters were found.

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

3 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 1633 atoms, of which 778 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Zinc finger protein AEBP2.

Mol	Chain	Residues	Atoms						Trace
1	A	109	Total	C	H	N	O	S	0
			1630	525	778	167	150	10	

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	249	MET	-	expression tag	UNP Q6ZN18
A	250	GLY	-	expression tag	UNP Q6ZN18
A	251	HIS	-	expression tag	UNP Q6ZN18
A	252	HIS	-	expression tag	UNP Q6ZN18
A	253	HIS	-	expression tag	UNP Q6ZN18
A	254	HIS	-	expression tag	UNP Q6ZN18
A	255	HIS	-	expression tag	UNP Q6ZN18
A	256	HIS	-	expression tag	UNP Q6ZN18
A	257	ASN	-	expression tag	UNP Q6ZN18

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

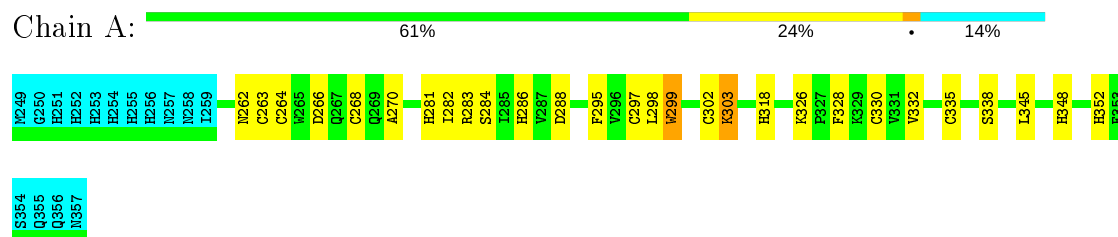
Mol	Chain	Residues	Atoms	
2	A	3	Total	Zn
			3	3

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: Zinc finger protein AEBP2

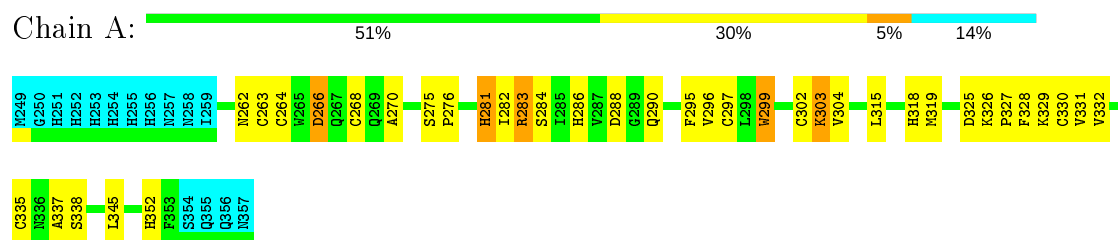


4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

4.2.1 Score per residue for model 1

- Molecule 1: Zinc finger protein AEBP2



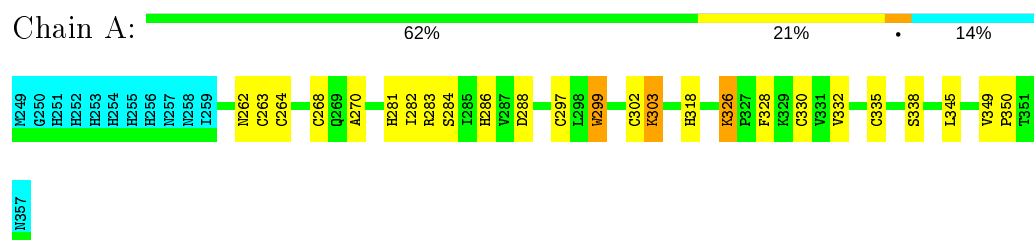
4.2.2 Score per residue for model 2

- Molecule 1: Zinc finger protein AEBP2



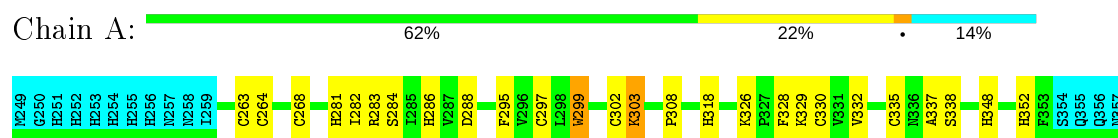
4.2.3 Score per residue for model 3

- Molecule 1: Zinc finger protein AEBP2



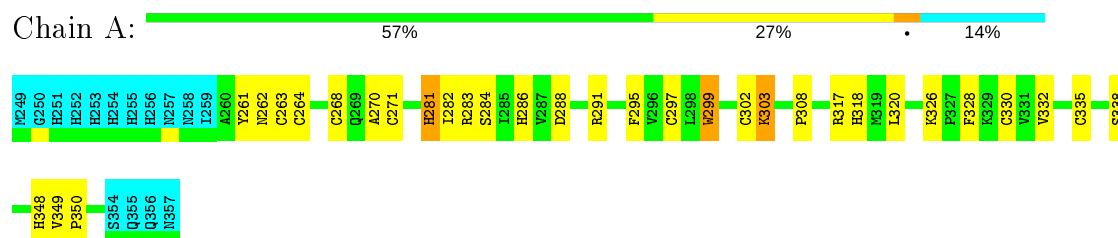
4.2.4 Score per residue for model 4

- Molecule 1: Zinc finger protein AEBP2



4.2.5 Score per residue for model 5

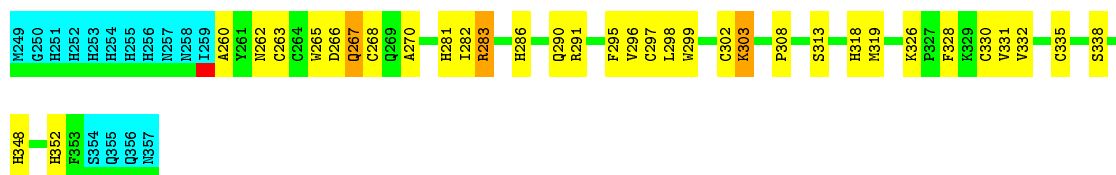
- Molecule 1: Zinc finger protein AEBP2



4.2.6 Score per residue for model 6

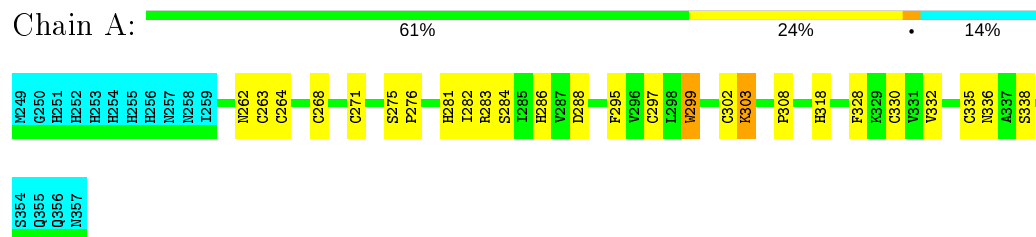
- Molecule 1: Zinc finger protein AEBP2





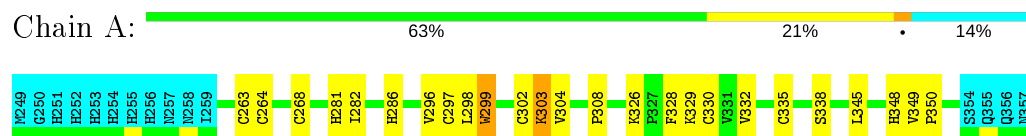
4.2.7 Score per residue for model 7

- Molecule 1: Zinc finger protein AEBP2



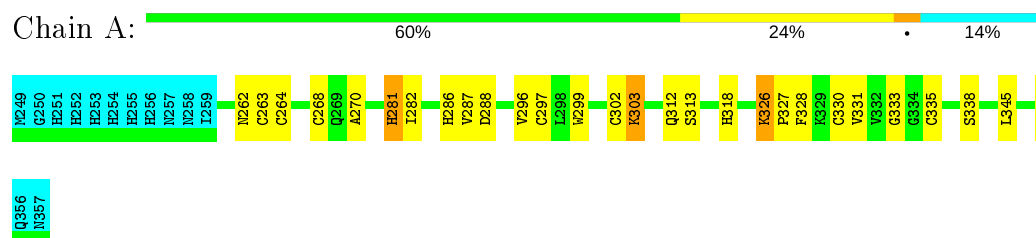
4.2.8 Score per residue for model 8 (medoid)

- Molecule 1: Zinc finger protein AEBP2



4.2.9 Score per residue for model 9

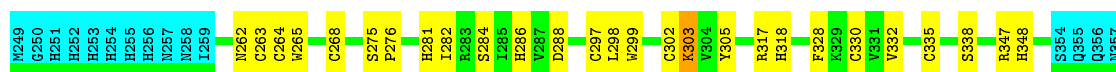
- Molecule 1: Zinc finger protein AEBP2



4.2.10 Score per residue for model 10

- Molecule 1: Zinc finger protein AEBP2

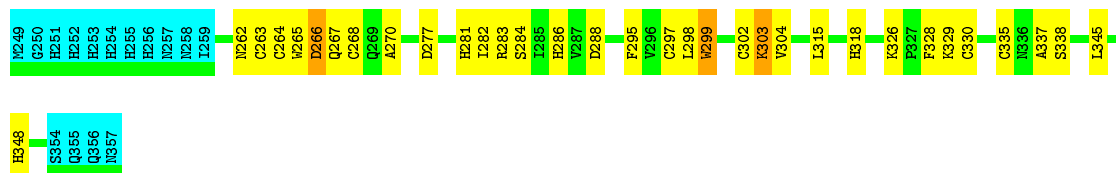




4.2.11 Score per residue for model 11

- Molecule 1: Zinc finger protein AEBP2

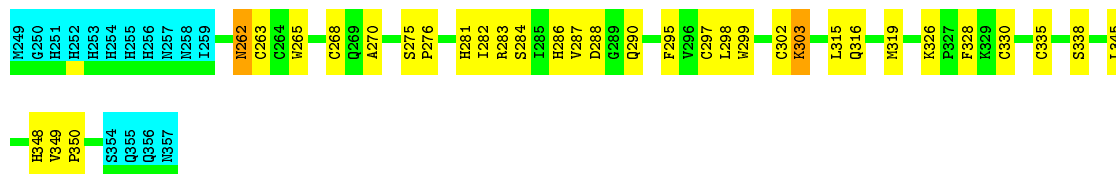
Chain A: 56% 28% 14%



4.2.12 Score per residue for model 12

- Molecule 1: Zinc finger protein AEBP2

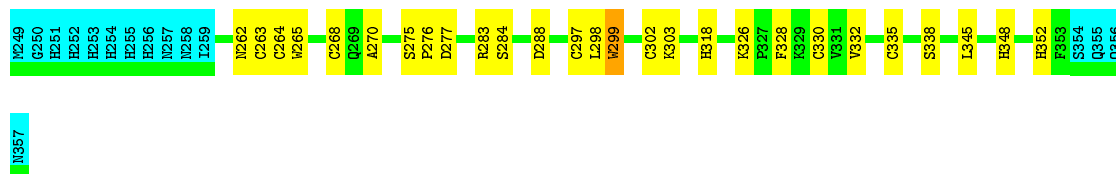
Chain A: 56% 28% 14%



4.2.13 Score per residue for model 13

- Molecule 1: Zinc finger protein AEBP2

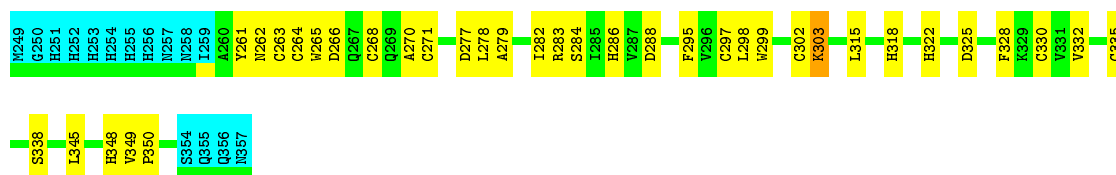
Chain A: 61% 24% 14%



4.2.14 Score per residue for model 14

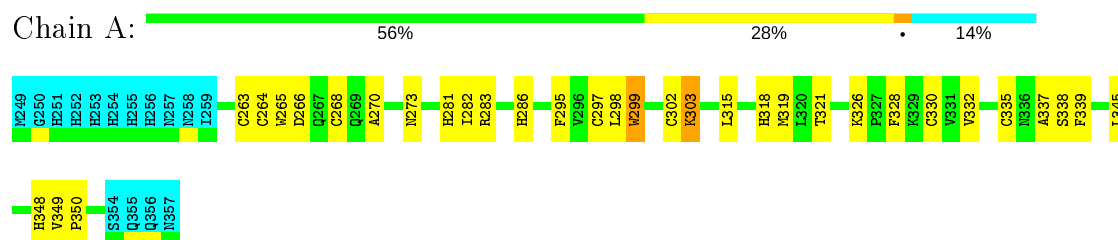
- Molecule 1: Zinc finger protein AEBP2

Chain A: 53% 32% 14%



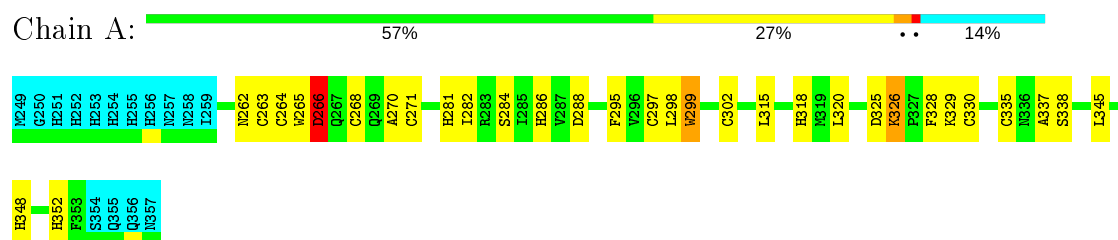
4.2.15 Score per residue for model 15

- Molecule 1: Zinc finger protein AEBP2



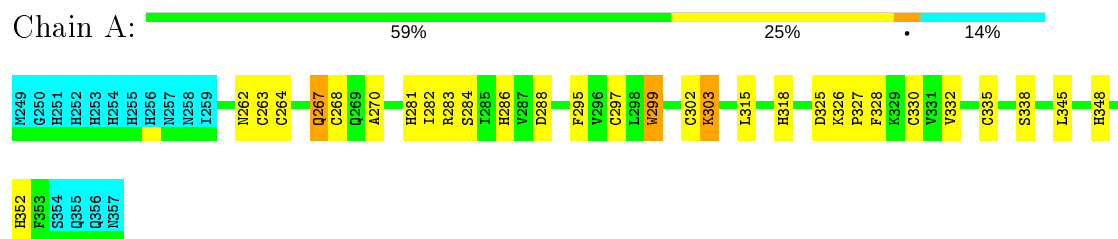
4.2.16 Score per residue for model 16

- Molecule 1: Zinc finger protein AEBP2



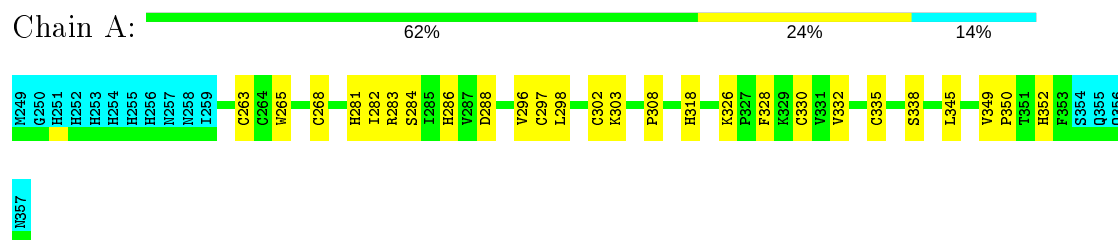
4.2.17 Score per residue for model 17

- Molecule 1: Zinc finger protein AEBP2



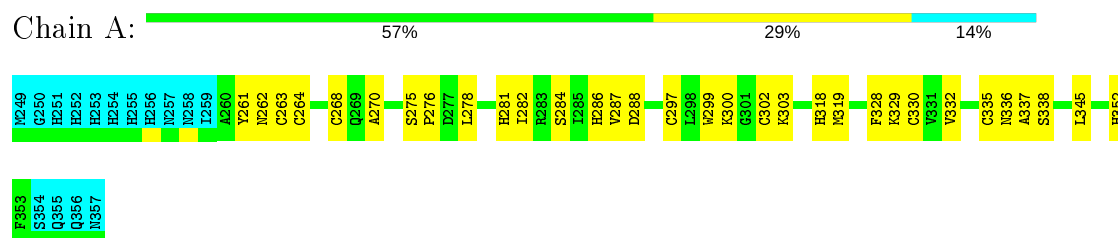
4.2.18 Score per residue for model 18

- Molecule 1: Zinc finger protein AEBP2



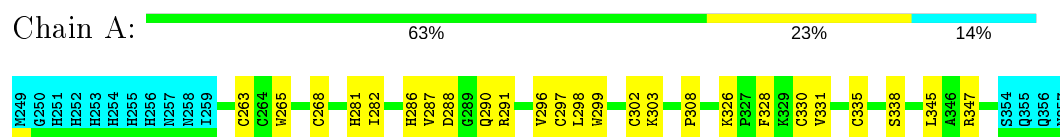
4.2.19 Score per residue for model 19

- Molecule 1: Zinc finger protein AEBP2



4.2.20 Score per residue for model 20

- Molecule 1: Zinc finger protein AEBP2



5 Refinement protocol and experimental data overview

The models were refined using the following method: *na*.

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
CNS	refinement	1.2
CYANA	structure solution	
SPARKY	structure solution	

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	1007
Number of shifts mapped to atoms	1007
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	75%

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: ZN

There are no covalent bond-length or bond-angle outliers.

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	0.1±0.4
All	All	0	3

There are no bond-length outliers.

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	317	ARG	Sidechain	1
1	A	291	ARG	Sidechain	1
1	A	283	ARG	Sidechain	1

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	724	672	678	27±3
2	A	3	0	0	11±1
All	All	14540	13440	13560	546

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 19.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:268:CYS:HG	2:A:401:ZN:ZN	0.94	0.72	16	20
1:A:297:CYS:HG	2:A:402:ZN:ZN	0.94	0.71	1	19
1:A:330:CYS:HG	2:A:403:ZN:ZN	0.88	0.60	19	20
1:A:302:CYS:HG	2:A:402:ZN:ZN	0.86	0.58	9	2
1:A:335:CYS:HG	2:A:403:ZN:ZN	0.80	0.85	7	19
1:A:263:CYS:HG	2:A:401:ZN:ZN	0.80	0.56	2	14
1:A:268:CYS:SG	2:A:401:ZN:ZN	0.79	1.72	6	20
1:A:263:CYS:SG	2:A:401:ZN:ZN	0.78	1.73	13	20
1:A:302:CYS:SG	2:A:402:ZN:ZN	0.78	1.73	6	20
1:A:297:CYS:SG	2:A:402:ZN:ZN	0.77	1.74	8	20
1:A:335:CYS:SG	2:A:403:ZN:ZN	0.77	1.74	7	20
1:A:330:CYS:SG	2:A:403:ZN:ZN	0.76	1.74	7	20
1:A:330:CYS:HG	1:A:335:CYS:HG	0.65	1.34	4	16
1:A:328:PHE:O	1:A:338:SER:HA	0.59	1.97	10	20
1:A:265:TRP:CD1	1:A:298:LEU:HB2	0.59	2.32	12	10
1:A:267:GLN:N	1:A:267:GLN:HE21	0.59	1.95	6	1
1:A:264:CYS:O	1:A:299:TRP:HA	0.58	1.98	13	16
1:A:262:ASN:HA	1:A:270:ALA:O	0.57	2.00	14	12
1:A:303:LYS:H	1:A:303:LYS:HD3	0.56	1.60	3	6
1:A:284:SER:O	1:A:288:ASP:HB3	0.54	2.02	12	15
1:A:330:CYS:SG	1:A:335:CYS:SG	0.53	3.06	19	20
1:A:263:CYS:SG	1:A:270:ALA:HB3	0.53	2.44	12	3
1:A:288:ASP:O	1:A:291:ARG:HG2	0.52	2.04	20	2
1:A:287:VAL:HG21	1:A:319:MET:SD	0.52	2.45	19	2
1:A:303:LYS:HD3	1:A:303:LYS:H	0.52	1.64	5	6
1:A:283:ARG:O	1:A:288:ASP:HB2	0.52	2.05	12	2
1:A:332:VAL:HB	1:A:335:CYS:HB3	0.52	1.82	3	11
1:A:297:CYS:SG	1:A:299:TRP:HB2	0.52	2.44	5	4
1:A:329:LYS:HA	1:A:337:ALA:O	0.52	2.05	16	5
1:A:295:PHE:O	1:A:308:PRO:HA	0.52	2.04	5	3
1:A:287:VAL:HG12	1:A:331:VAL:HG23	0.51	1.81	20	1
1:A:268:CYS:SG	1:A:281:HIS:NE2	0.51	2.84	12	15
1:A:325:ASP:OD1	1:A:327:PRO:HD2	0.51	2.06	17	1
1:A:262:ASN:HB3	1:A:271:CYS:SG	0.50	2.47	7	2
1:A:337:ALA:HB1	1:A:339:PHE:CZ	0.50	2.42	15	1
1:A:282:ILE:O	1:A:286:HIS:HB2	0.50	2.07	14	19
1:A:332:VAL:HG21	1:A:352:HIS:CG	0.50	2.40	3	9
1:A:261:TYR:O	1:A:271:CYS:HA	0.50	2.06	5	2
1:A:279:ALA:HB1	1:A:325:ASP:HB2	0.49	1.83	14	1
1:A:296:VAL:HG22	1:A:308:PRO:HB3	0.49	1.83	6	4
1:A:297:CYS:SG	1:A:302:CYS:SG	0.49	3.11	4	19

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:316:GLN:O	1:A:319:MET:HG2	0.49	2.08	12	1
1:A:320:LEU:HA	1:A:325:ASP:OD2	0.49	2.08	16	1
1:A:299:TRP:CZ3	1:A:322:HIS:HB3	0.48	2.43	2	1
1:A:263:CYS:SG	1:A:281:HIS:CE1	0.48	3.06	5	2
1:A:287:VAL:HG12	1:A:331:VAL:HG13	0.48	1.86	9	1
1:A:335:CYS:HG	1:A:352:HIS:CE1	0.47	2.27	16	2
1:A:267:GLN:HA	1:A:267:GLN:NE2	0.47	2.24	17	1
1:A:302:CYS:SG	1:A:318:HIS:NE2	0.46	2.88	17	17
1:A:290:GLN:HB3	1:A:295:PHE:CD2	0.46	2.45	6	1
1:A:295:PHE:CB	1:A:315:LEU:HG	0.46	2.40	16	5
1:A:261:TYR:HB3	1:A:278:LEU:HD22	0.46	1.88	14	2
1:A:335:CYS:SG	1:A:348:HIS:NE2	0.45	2.90	5	14
1:A:290:GLN:HG2	1:A:296:VAL:H	0.45	1.71	20	2
1:A:332:VAL:HB	1:A:335:CYS:CB	0.45	2.42	14	2
1:A:295:PHE:HB3	1:A:315:LEU:HD22	0.45	1.89	11	1
1:A:263:CYS:SG	1:A:268:CYS:SG	0.45	3.14	7	7
1:A:263:CYS:HG	1:A:268:CYS:HG	0.45	1.52	13	1
1:A:325:ASP:OD2	1:A:327:PRO:HD2	0.44	2.12	1	1
1:A:295:PHE:HB3	1:A:315:LEU:HG	0.44	1.89	17	2
1:A:329:LYS:HG2	1:A:338:SER:OG	0.44	2.13	8	2
1:A:312:GLN:HG2	1:A:349:VAL:HG11	0.44	1.89	9	1
1:A:303:LYS:HD2	1:A:304:VAL:HG13	0.43	1.91	8	3
1:A:263:CYS:SG	1:A:281:HIS:NE2	0.43	2.92	9	2
1:A:297:CYS:SG	1:A:318:HIS:NE2	0.43	2.91	5	2
1:A:283:ARG:NH1	1:A:331:VAL:HA	0.43	2.29	6	2
1:A:275:SER:N	1:A:276:PRO:HD2	0.43	2.29	2	7
1:A:318:HIS:O	1:A:321:THR:HG22	0.43	2.14	15	1
1:A:342:GLN:OE1	1:A:345:LEU:HD22	0.42	2.14	2	1
1:A:281:HIS:HA	1:A:284:SER:OG	0.42	2.14	1	1
1:A:317:ARG:O	1:A:320:LEU:HB3	0.42	2.14	2	2
1:A:302:CYS:SG	1:A:322:HIS:NE2	0.42	2.93	2	2
1:A:349:VAL:N	1:A:350:PRO:HD2	0.41	2.30	14	8
1:A:266:ASP:OD2	1:A:298:LEU:HB3	0.41	2.15	16	1
1:A:326:LYS:H	1:A:327:PRO:HD2	0.41	1.76	9	1
1:A:299:TRP:HB3	1:A:302:CYS:SG	0.40	2.56	4	1
1:A:342:GLN:OE1	1:A:342:GLN:HA	0.40	2.17	2	1
1:A:297:CYS:O	1:A:305:TYR:HB2	0.40	2.16	10	1
1:A:288:ASP:HB2	1:A:331:VAL:O	0.40	2.17	9	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	94/109 (86%)	86±2 (91±2%)	7±2 (8±3%)	1±1 (1±1%)	17	64
All	All	1880/2180 (86%)	1711 (91%)	146 (8%)	23 (1%)	17	64

All 6 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	326	LYS	15
1	A	266	ASP	4
1	A	291	ARG	1
1	A	333	GLY	1
1	A	327	PRO	1
1	A	267	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	79/93 (85%)	75±2 (94±2%)	5±2 (6±2%)	24	73
All	All	1580/1860 (85%)	1490 (94%)	90 (6%)	24	73

All 19 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	303	LYS	19
1	A	299	TRP	14
1	A	345	LEU	14
1	A	283	ARG	10

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Mol	Chain	Res	Type	Models (Total)
1	A	266	ASP	6
1	A	319	MET	3
1	A	281	HIS	3
1	A	277	ASP	3
1	A	262	ASN	3
1	A	336	ASN	2
1	A	326	LYS	2
1	A	267	GLN	2
1	A	313	SER	2
1	A	347	ARG	2
1	A	300	LYS	1
1	A	290	GLN	1
1	A	296	VAL	1
1	A	298	LEU	1
1	A	273	ASN	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.

6.6 Ligand geometry ⓘ

Of 3 ligands modelled in this entry, 3 are monoatomic - leaving 0 for Mogul analysis.

6.7 Other polymers ⓘ

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 [i](#)

The completeness of assignment taking into account all chemical shift lists is 75% for the well-defined parts and 70% for the entire structure.

7.1 Chemical shift list 1

File name: input_cs.cif

Chemical shift list name: *showstar.txt*

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	1007
Number of shifts mapped to atoms	1007
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	3

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
$^{13}\text{C}_\alpha$	103	-0.41 ± 0.15	None needed (< 0.5 ppm)
$^{13}\text{C}_\beta$	94	0.41 ± 0.10	None needed (< 0.5 ppm)
$^{13}\text{C}'$	0	—	None (insufficient data)
^{15}N	96	-0.00 ± 0.57	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 75%, i.e. 836 atoms were assigned a chemical shift out of a possible 1109. 12 out of 12 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^1H	^{13}C	^{15}N
Backbone	360/462 (78%)	179/184 (97%)	93/188 (49%)	88/90 (98%)
Sidechain	425/508 (84%)	268/303 (88%)	148/179 (83%)	9/26 (35%)

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	Total	¹H	¹³C	¹⁵N
Aromatic	51/139 (37%)	48/75 (64%)	0/55 (0%)	3/9 (33%)
Overall	836/1109 (75%)	495/562 (88%)	241/422 (57%)	100/125 (80%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 70%, i.e. 909 atoms were assigned a chemical shift out of a possible 1305. 12 out of 12 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	¹H	¹³C	¹⁵N
Backbone	394/537 (73%)	195/214 (91%)	103/218 (47%)	96/105 (91%)
Sidechain	463/587 (79%)	290/351 (83%)	162/205 (79%)	11/31 (35%)
Aromatic	52/181 (29%)	49/99 (49%)	0/67 (0%)	3/15 (20%)
Overall	909/1305 (70%)	534/664 (80%)	265/490 (54%)	110/151 (73%)

7.1.4 Statistically unusual chemical shifts ⓘ

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	A	264	CYS	HB3	0.03	5.25 – 0.55	-6.1
1	A	286	HIS	HB3	0.68	5.00 – 1.10	-6.1
1	A	322	HIS	HB3	1.05	5.00 – 1.10	-5.1

7.1.5 Random Coil Index (RCI) plots ⓘ

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:

