



Full wwPDB EM Validation Report ⓘ

Jul 16, 2025 – 01:25 PM JST

PDB ID : 8ZSZ / pdb_00008zsz
EMDB ID : EMD-60435
Title : Cryo-EM structure of human ZnT1, in the presence of zinc, determined in outward-facing conformation
Authors : Ma, J.; Zheng, S.
Deposited on : 2024-06-06
Resolution : 3.59 Å(reported)

This is a Full wwPDB EM 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/EMValidationReportHelp>
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:

EMDB validation analysis : **FAILED**
MolProbity : 4-5-2 with Phenix2.0rc1
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.44

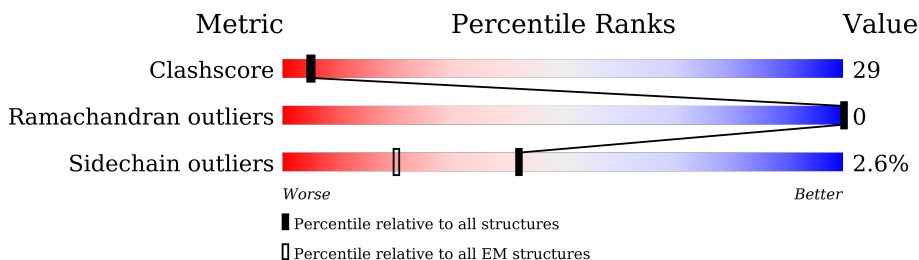
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.59 Å.

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)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. 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	507	
1	B	507	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 4754 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Proton-coupled zinc antiporter SLC30A1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	315	Total	C	N	O	S	0	0
			2362	1528	411	403	20		
1	B	315	Total	C	N	O	S	0	0
			2384	1543	418	402	21		

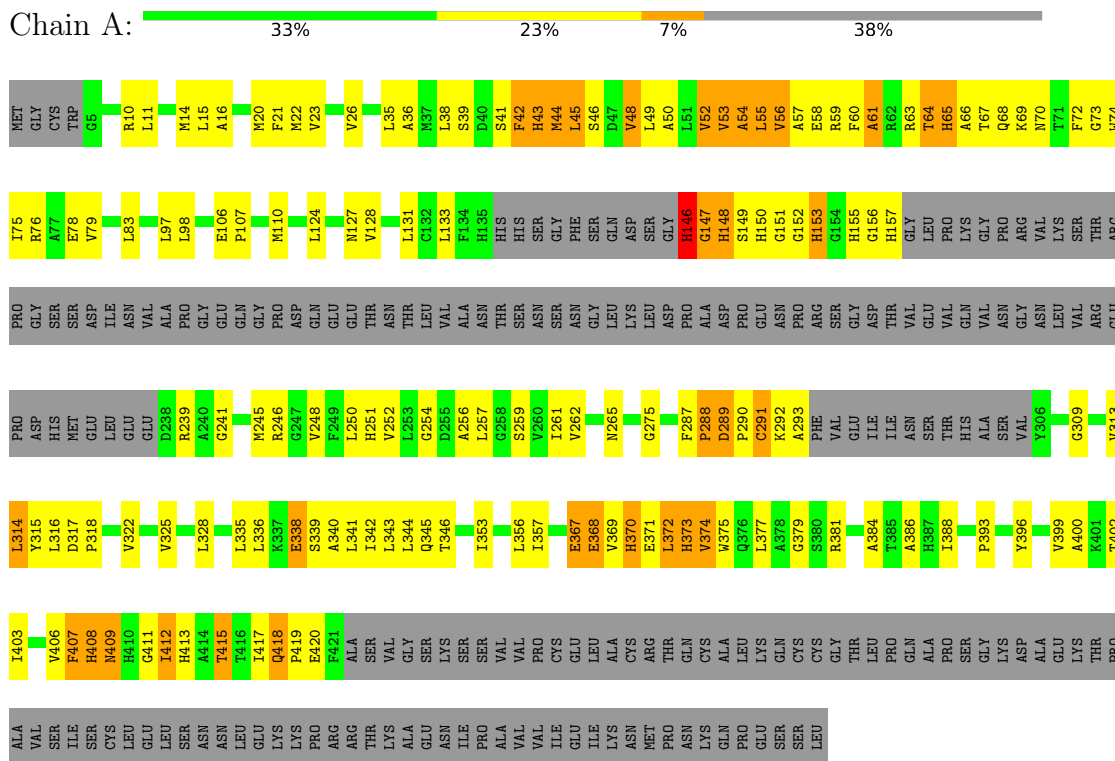
- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
2	A	4	Total	Zn	0
			4	4	
2	B	4	Total	Zn	0
			4	4	

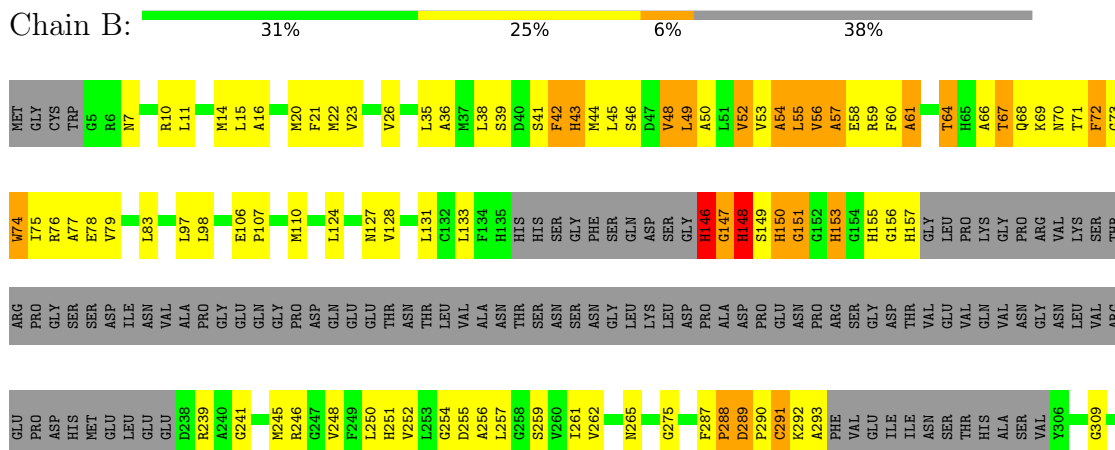
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-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 outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: Proton-coupled zinc antiporter SLC30A1



• Molecule 1: Proton-coupled zinc antiporter SLC30A1



V313	L314	Y315	L316	D317	P318	V322	V325	L328	L335	L336	K337	E338	S339	A340	L341	I342	L343	L344	Q345	T346	I353	L356	I357	L360	V363	E364	G365	V366	E367	E368	V369	H370	E371	L372	H373	V374	W375	Q376	L377	A378	G379	S380	R381	A384	T385	A386	H387	I388	K389														
P393	Y396	M397	E398	V399	A400	K401	T402	I403	K404	D405	V406	F407	H408	N409	H410	G411	I412	H413	A414	T415	T416	I417	Q418	P419	E420	F421	ALA	ARG	SER	VAL	GLY	SER	LYS	ASN	ILE	PRO	ALA	VAL	VAL	PRO	CYS	GLU	ILE	LYS	ALA	CYS	ARG	THR	GLN	CYS	LYS	ALA	LEU	LYS	GLN	CYS	CYS	GLY	THR	LEU	PRO	GLN	ALA
PRO	SER	GLY	LYS	ASP	ALA	GLU	LYS	THR	PRO	ALA	VAL	SER	ILE	SER	CYS	LEU	GLU	LEU	SER	ASN	ASN	LEU	GLU	LYS	LYS	PRO	ARG	ARG	THR	LYS	ALA	GLU	ASN	ILE	PRO	ALA	VAL	VAL	VAL	ILE	GLU	ILE	LYS	ASN	MET	PRO	ASN	LYS	GLN	PRO	GLU	SER	LEU										

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	359002	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	1230	Depositor
Maximum defocus (nm)	5800	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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

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 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	1.18	30/2414 (1.2%)	1.25	48/3290 (1.5%)
1	B	1.30	36/2436 (1.5%)	1.28	43/3314 (1.3%)
All	All	1.24	66/4850 (1.4%)	1.27	91/6604 (1.4%)

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 outliers	#Planarity outliers
1	A	0	4
1	B	0	4
All	All	0	8

All (66) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	375	TRP	CA-C	-9.82	1.40	1.52
1	B	375	TRP	CA-C	-9.70	1.40	1.52
1	A	372	LEU	CA-C	-9.24	1.41	1.52
1	B	372	LEU	CA-C	-9.23	1.41	1.52
1	A	54	ALA	CA-C	-9.20	1.39	1.52
1	B	61	ALA	CA-C	-9.09	1.40	1.52
1	B	56	VAL	CA-C	-7.95	1.42	1.52
1	B	59	ARG	C-O	7.91	1.33	1.24
1	B	374	VAL	C-O	-7.88	1.15	1.24
1	A	61	ALA	CA-C	-7.80	1.42	1.52
1	A	374	VAL	C-O	-7.80	1.16	1.24
1	B	71	THR	CA-C	-7.71	1.42	1.52
1	B	57	ALA	N-CA	-7.63	1.37	1.46
1	A	50	ALA	CA-C	-7.44	1.43	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	72	PHE	CA-C	-7.20	1.43	1.52
1	B	412	ILE	CA-C	-7.11	1.46	1.53
1	B	57	ALA	C-O	-7.07	1.16	1.24
1	B	60	PHE	C-O	-6.94	1.15	1.24
1	A	60	PHE	N-CA	-6.93	1.36	1.46
1	B	64	THR	CA-C	-6.93	1.45	1.53
1	B	56	VAL	CA-CB	-6.87	1.45	1.54
1	A	56	VAL	CA-C	-6.84	1.42	1.52
1	B	60	PHE	N-CA	-6.80	1.38	1.46
1	A	64	THR	CA-C	-6.76	1.46	1.53
1	A	412	ILE	CA-C	-6.62	1.44	1.52
1	A	69	LYS	C-O	-6.61	1.15	1.24
1	A	375	TRP	C-O	-6.55	1.15	1.23
1	B	375	TRP	C-O	-6.50	1.16	1.23
1	B	69	LYS	CA-C	-6.42	1.44	1.52
1	B	66	ALA	CA-C	-6.34	1.45	1.53
1	B	50	ALA	CA-C	-6.27	1.44	1.52
1	A	56	VAL	C-O	-6.18	1.15	1.24
1	B	60	PHE	CA-CB	-6.08	1.43	1.53
1	B	69	LYS	C-O	-6.04	1.16	1.24
1	A	374	VAL	CA-C	-5.99	1.45	1.52
1	A	69	LYS	CA-CB	-5.99	1.45	1.54
1	A	60	PHE	CA-C	-5.84	1.44	1.52
1	A	373	HIS	CA-CB	-5.83	1.43	1.53
1	B	374	VAL	CA-C	-5.77	1.45	1.52
1	B	54	ALA	CA-C	-5.70	1.45	1.52
1	A	60	PHE	CA-CB	-5.70	1.44	1.53
1	A	374	VAL	CA-CB	-5.61	1.47	1.54
1	B	415	THR	N-CA	-5.58	1.39	1.45
1	A	69	LYS	CA-C	-5.52	1.44	1.52
1	B	287	PHE	CA-C	-5.51	1.45	1.52
1	B	71	THR	CA-CB	-5.50	1.43	1.53
1	B	374	VAL	CA-CB	-5.50	1.47	1.54
1	B	56	VAL	C-N	-5.48	1.26	1.33
1	B	373	HIS	CA-CB	-5.48	1.43	1.53
1	A	287	PHE	CA-C	-5.47	1.45	1.52
1	A	60	PHE	C-O	-5.45	1.16	1.24
1	B	61	ALA	CA-CB	-5.44	1.43	1.53
1	B	56	VAL	N-CA	-5.40	1.39	1.46
1	B	407	PHE	CA-C	-5.36	1.45	1.52
1	B	60	PHE	CA-C	-5.28	1.46	1.52
1	B	46	SER	N-CA	5.26	1.52	1.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	61	ALA	CA-CB	-5.23	1.44	1.53
1	B	71	THR	C-O	-5.23	1.17	1.24
1	A	50	ALA	CA-CB	-5.19	1.45	1.53
1	A	415	THR	N-CA	-5.19	1.39	1.45
1	A	54	ALA	CA-CB	-5.19	1.45	1.53
1	A	407	PHE	CA-C	-5.11	1.45	1.52
1	B	373	HIS	C-O	-5.11	1.17	1.24
1	A	373	HIS	C-O	-5.08	1.18	1.24
1	A	373	HIS	CA-C	-5.06	1.46	1.52
1	A	418	GLN	CA-C	-5.03	1.48	1.53

All (91) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	56	VAL	N-CA-C	-18.39	92.14	110.72
1	A	69	LYS	N-CA-C	-12.19	98.58	114.31
1	A	43	HIS	N-CA-C	-10.27	100.68	113.01
1	A	56	VAL	N-CA-C	-9.79	97.80	111.89
1	B	69	LYS	N-CA-C	-9.20	99.82	113.61
1	B	407	PHE	N-CA-C	-9.06	100.37	111.33
1	A	153	HIS	N-CA-C	-8.97	101.39	111.71
1	A	55	LEU	N-CA-C	8.87	120.72	111.14
1	A	407	PHE	N-CA-C	-8.80	100.68	111.33
1	A	147	GLY	N-CA-C	-8.39	102.58	115.66
1	A	65	HIS	N-CA-C	8.32	124.96	109.24
1	B	46	SER	N-CA-C	8.13	120.14	111.28
1	B	43	HIS	N-CA-C	-7.84	102.73	111.82
1	A	54	ALA	N-CA-C	-7.69	102.83	112.90
1	B	153	HIS	N-CA-C	-7.60	102.97	111.71
1	A	368	GLU	N-CA-C	7.40	120.33	109.07
1	A	375	TRP	CA-CB-CG	7.40	127.66	113.60
1	B	375	TRP	CA-CB-CG	7.38	127.62	113.60
1	A	251	HIS	N-CA-C	-7.26	103.30	111.14
1	B	251	HIS	N-CA-C	-7.17	103.40	111.14
1	A	150	HIS	N-CA-C	-7.16	103.48	111.28
1	B	409	ASN	N-CA-C	-6.79	103.88	111.28
1	B	59	ARG	CA-C-O	6.75	127.71	120.55
1	B	55	LEU	N-CA-C	6.73	120.70	112.23
1	B	74	TRP	N-CA-C	6.70	123.00	113.02
1	A	291	CYS	CB-CA-C	-6.69	108.84	116.54
1	B	48	VAL	CB-CA-C	-6.67	103.13	112.14
1	B	150	HIS	N-CA-C	-6.67	103.26	111.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	291	CYS	CB-CA-C	-6.52	109.06	116.63
1	A	42	PHE	CA-C-O	6.52	126.89	119.27
1	B	147	GLY	N-CA-C	-6.43	105.62	115.66
1	A	43	HIS	CA-C-N	-6.29	110.13	121.14
1	A	43	HIS	C-N-CA	-6.29	110.13	121.14
1	B	364	GLU	N-CA-C	6.21	119.23	110.23
1	B	148	HIS	N-CA-C	-6.19	103.12	111.54
1	A	407	PHE	CA-C-N	-6.09	111.65	120.29
1	A	407	PHE	C-N-CA	-6.09	111.65	120.29
1	A	48	VAL	CB-CA-C	-6.04	103.99	112.14
1	A	314	LEU	CA-C-N	-6.00	113.06	122.65
1	A	314	LEU	C-N-CA	-6.00	113.06	122.65
1	B	314	LEU	CA-C-N	-5.98	113.09	122.65
1	B	314	LEU	C-N-CA	-5.98	113.09	122.65
1	A	69	LYS	CA-C-N	-5.92	113.86	122.44
1	A	69	LYS	C-N-CA	-5.92	113.86	122.44
1	A	409	ASN	N-CA-C	-5.92	104.83	111.28
1	B	74	TRP	CA-C-N	5.90	128.85	120.53
1	B	74	TRP	C-N-CA	5.90	128.85	120.53
1	A	408	HIS	CA-C-N	-5.89	112.39	120.28
1	A	408	HIS	C-N-CA	-5.89	112.39	120.28
1	A	153	HIS	N-CA-CB	5.88	119.28	110.22
1	A	66	ALA	N-CA-C	5.88	119.53	111.54
1	B	407	PHE	CA-C-N	-5.82	112.03	120.29
1	B	407	PHE	C-N-CA	-5.82	112.03	120.29
1	B	368	GLU	N-CA-C	5.78	115.87	108.24
1	A	45	LEU	N-CA-C	-5.76	105.00	111.28
1	A	151	GLY	N-CA-C	5.70	119.46	111.14
1	B	59	ARG	CA-C-N	-5.69	112.21	120.29
1	B	59	ARG	C-N-CA	-5.69	112.21	120.29
1	A	44	MET	CA-C-N	-5.62	112.75	120.28
1	A	44	MET	C-N-CA	-5.62	112.75	120.28
1	B	72	PHE	N-CA-C	-5.61	106.10	113.12
1	B	41	SER	CA-C-N	-5.61	111.62	122.06
1	B	41	SER	C-N-CA	-5.61	111.62	122.06
1	B	151	GLY	N-CA-C	5.59	119.31	111.14
1	A	146	HIS	CB-CA-C	5.57	120.67	110.10
1	B	54	ALA	N-CA-C	-5.56	105.31	111.71
1	B	42	PHE	CA-C-O	5.46	125.67	119.18
1	A	59	ARG	CA-C-N	-5.44	112.08	121.66
1	A	59	ARG	C-N-CA	-5.44	112.08	121.66
1	A	41	SER	CA-C-N	-5.43	112.11	121.66

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	41	SER	C-N-CA	-5.43	112.11	121.66
1	B	66	ALA	N-CA-C	5.42	117.96	108.52
1	B	408	HIS	CA-C-N	-5.39	113.05	120.28
1	B	408	HIS	C-N-CA	-5.39	113.05	120.28
1	A	288	PRO	CA-C-N	-5.37	117.94	123.10
1	A	288	PRO	C-N-CA	-5.37	117.94	123.10
1	B	288	PRO	CA-C-N	-5.31	118.01	123.10
1	B	288	PRO	C-N-CA	-5.31	118.01	123.10
1	A	374	VAL	N-CA-C	-5.25	100.56	108.12
1	A	46	SER	N-CA-C	5.24	116.99	111.28
1	A	367	GLU	N-CA-C	-5.18	105.83	113.61
1	B	49	LEU	CA-C-N	-5.17	113.35	120.28
1	B	49	LEU	C-N-CA	-5.17	113.35	120.28
1	B	146	HIS	CB-CA-C	5.16	119.91	110.10
1	A	43	HIS	CA-C-O	5.16	125.76	119.05
1	B	418	GLN	N-CA-C	5.14	116.17	109.64
1	B	360	LEU	N-CA-C	-5.13	105.77	111.36
1	A	418	GLN	N-CA-C	5.07	116.08	109.64
1	A	50	ALA	CA-C-N	-5.04	113.52	120.28
1	A	50	ALA	C-N-CA	-5.04	113.52	120.28
1	A	338	GLU	N-CA-C	-5.03	105.88	111.36

There are no chirality outliers.

All (8) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	314	LEU	Mainchain
1	A	336	LEU	Mainchain
1	A	340	ALA	Mainchain
1	A	411	GLY	Mainchain
1	B	314	LEU	Mainchain
1	B	336	LEU	Mainchain
1	B	340	ALA	Mainchain
1	B	411	GLY	Mainchain

5.2 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 the 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 within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2362	0	2329	152	0
1	B	2384	0	2383	149	0
2	A	4	0	0	0	0
2	B	4	0	0	0	0
All	All	4754	0	4712	275	0

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 29.

All (275) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:149:SER:HB3	1:A:381:ARG:HG2	1.34	1.10
1:B:64:THR:HG23	1:B:75:ILE:HD11	1.30	1.07
1:A:64:THR:HG23	1:A:75:ILE:HD11	1.33	1.04
1:B:149:SER:HB3	1:B:381:ARG:HG2	1.35	1.04
1:A:419:PRO:HG2	1:B:419:PRO:HG2	1.48	0.95
1:A:419:PRO:HD3	1:B:419:PRO:HD3	1.50	0.94
1:A:384:ALA:HB3	1:A:412:ILE:HG21	1.61	0.81
1:A:72:PHE:O	1:A:146:HIS:N	2.14	0.81
1:B:61:ALA:HB2	1:B:78:GLU:HB2	1.63	0.80
1:A:393:PRO:O	1:A:396:TYR:HB3	1.81	0.80
1:B:393:PRO:O	1:B:396:TYR:HB3	1.81	0.79
1:A:345:GLN:HE22	1:B:345:GLN:HE22	1.31	0.77
1:B:11:LEU:HD23	1:B:55:LEU:HG	1.66	0.77
1:B:58:GLU:OE2	1:B:245:MET:HE1	1.85	0.76
1:A:61:ALA:HB2	1:A:78:GLU:HB2	1.66	0.75
1:A:98:LEU:HD11	1:B:45:LEU:HD23	1.69	0.74
1:A:11:LEU:HD23	1:A:55:LEU:HG	1.69	0.73
1:B:291:CYS:SG	1:B:292:LYS:N	2.60	0.72
1:B:72:PHE:O	1:B:146:HIS:N	2.23	0.72
1:A:131:LEU:HD12	1:A:252:VAL:HG12	1.72	0.72
1:A:149:SER:CB	1:A:381:ARG:HA	2.20	0.71
1:A:146:HIS:CD2	1:B:373:HIS:CE1	2.78	0.71
1:A:70:ASN:ND2	1:A:73:GLY:O	2.23	0.71
1:A:419:PRO:HD3	1:B:419:PRO:CD	2.20	0.70
1:B:131:LEU:HD12	1:B:252:VAL:HG12	1.72	0.70
1:A:149:SER:HB3	1:A:381:ARG:CG	2.19	0.70
1:A:344:LEU:HD13	1:B:74:TRP:CZ3	2.27	0.69
1:A:55:LEU:O	1:A:56:VAL:C	2.33	0.69
1:A:291:CYS:SG	1:A:292:LYS:N	2.65	0.69
1:B:70:ASN:OD1	1:B:73:GLY:N	2.22	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:42:PHE:C	1:A:44:MET:N	2.42	0.67
1:B:246:ARG:HG2	1:B:335:LEU:HD11	1.77	0.66
1:A:246:ARG:HG2	1:A:335:LEU:HD11	1.77	0.66
1:B:384:ALA:CB	1:B:412:ILE:HG21	2.26	0.66
1:A:55:LEU:C	1:A:57:ALA:N	2.44	0.66
1:B:54:ALA:O	1:B:57:ALA:HB3	1.96	0.66
1:A:11:LEU:CD2	1:A:55:LEU:HG	2.27	0.65
1:B:396:TYR:CZ	1:B:419:PRO:HG3	2.32	0.64
1:A:14:MET:HE3	1:A:133:LEU:HD13	1.79	0.64
1:B:14:MET:HE3	1:B:133:LEU:HD13	1.79	0.64
1:B:11:LEU:CD2	1:B:55:LEU:HG	2.26	0.64
1:B:408:HIS:O	1:B:409:ASN:C	2.35	0.63
1:B:16:ALA:O	1:B:20:MET:HG2	1.98	0.63
1:A:408:HIS:O	1:A:409:ASN:C	2.40	0.63
1:B:76:ARG:HA	1:B:79:VAL:HG22	1.81	0.63
1:A:42:PHE:C	1:A:44:MET:H	2.07	0.63
1:B:366:VAL:HG13	1:B:388:ILE:HG23	1.80	0.63
1:A:55:LEU:O	1:A:58:GLU:N	2.32	0.62
1:A:16:ALA:O	1:A:20:MET:HG2	1.98	0.62
1:A:76:ARG:HA	1:A:79:VAL:HG22	1.81	0.62
1:B:149:SER:O	1:B:150:HIS:C	2.40	0.62
1:A:370:HIS:CE1	1:A:371:GLU:HG3	2.35	0.61
1:A:408:HIS:CE1	1:A:413:HIS:CD2	2.87	0.61
1:A:373:HIS:CE1	1:B:146:HIS:CD2	2.88	0.61
1:A:76:ARG:NH1	1:A:342:ILE:O	2.34	0.60
1:B:406:VAL:O	1:B:407:PHE:C	2.41	0.60
1:A:98:LEU:HD11	1:B:45:LEU:CD2	2.31	0.60
1:A:344:LEU:HD13	1:B:74:TRP:HZ3	1.64	0.60
1:A:369:VAL:HG12	1:A:388:ILE:CD1	2.31	0.60
1:B:76:ARG:NH1	1:B:342:ILE:O	2.34	0.60
1:B:370:HIS:CE1	1:B:371:GLU:HG3	2.37	0.59
1:A:35:LEU:HD22	1:B:106:GLU:HG3	1.83	0.59
1:A:106:GLU:HG3	1:B:35:LEU:HD22	1.83	0.59
1:A:368:GLU:HG2	1:A:369:VAL:N	2.19	0.58
1:B:265:ASN:ND2	1:B:317:ASP:HB2	2.19	0.58
1:B:384:ALA:HB3	1:B:412:ILE:HG21	1.84	0.58
1:A:265:ASN:ND2	1:A:317:ASP:HB2	2.19	0.58
1:B:75:ILE:HD12	1:B:75:ILE:H	1.69	0.58
1:B:404:LYS:NZ	1:B:415:THR:OG1	2.27	0.57
1:A:396:TYR:CZ	1:A:419:PRO:HG3	2.39	0.57
1:A:149:SER:OG	1:A:381:ARG:HA	2.05	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:15:LEU:HD11	1:B:48:VAL:HG13	1.87	0.56
1:A:155:HIS:CD2	1:A:408:HIS:CE1	2.93	0.56
1:B:257:LEU:O	1:B:261:ILE:HG12	2.06	0.55
1:A:257:LEU:O	1:A:261:ILE:HG12	2.06	0.55
1:A:292:LYS:O	1:A:293:ALA:C	2.49	0.55
1:A:406:VAL:O	1:A:407:PHE:C	2.47	0.55
1:A:155:HIS:HD2	1:A:408:HIS:CE1	2.25	0.55
1:A:146:HIS:HD2	1:B:373:HIS:CE1	2.22	0.54
1:A:147:GLY:C	1:A:148:HIS:CG	2.85	0.54
1:B:58:GLU:OE2	1:B:245:MET:CE	2.54	0.54
1:A:399:VAL:O	1:A:402:THR:OG1	2.19	0.54
1:A:356:LEU:HD23	1:A:372:LEU:HD21	1.90	0.54
1:B:399:VAL:O	1:B:402:THR:OG1	2.19	0.54
1:B:246:ARG:HD3	1:B:335:LEU:HD21	1.91	0.53
1:A:65:HIS:O	1:A:65:HIS:CG	2.60	0.53
1:A:246:ARG:HD3	1:A:335:LEU:HD21	1.91	0.53
1:B:53:VAL:O	1:B:54:ALA:C	2.46	0.53
1:B:406:VAL:C	1:B:408:HIS:N	2.56	0.53
1:A:64:THR:HG23	1:A:75:ILE:CD1	2.23	0.53
1:B:292:LYS:O	1:B:293:ALA:C	2.51	0.53
1:A:44:MET:O	1:A:45:LEU:C	2.49	0.53
1:A:419:PRO:CG	1:B:419:PRO:HG2	2.29	0.53
1:A:64:THR:CG2	1:A:75:ILE:HD11	2.24	0.52
1:B:356:LEU:HD23	1:B:372:LEU:HD21	1.90	0.52
1:A:127:ASN:HB3	1:A:256:ALA:HB2	1.91	0.52
1:A:156:GLY:O	1:A:157:HIS:C	2.52	0.52
1:B:127:ASN:HB3	1:B:256:ALA:HB2	1.91	0.52
1:A:15:LEU:HD11	1:A:48:VAL:HG13	1.91	0.52
1:B:36:ALA:O	1:B:39:SER:HB2	2.10	0.52
1:A:239:ARG:HB3	1:A:379:GLY:HA2	1.92	0.51
1:B:386:ALA:HB3	1:B:417:ILE:HG23	1.91	0.51
1:B:147:GLY:C	1:B:148:HIS:CG	2.87	0.51
1:A:372:LEU:HD12	1:A:386:ALA:HB2	1.93	0.51
1:A:373:HIS:CE1	1:B:146:HIS:HD2	2.29	0.51
1:A:322:VAL:O	1:A:325:VAL:HG22	2.11	0.51
1:A:419:PRO:CD	1:B:419:PRO:CD	2.89	0.51
1:B:7:ASN:HB2	1:B:58:GLU:OE2	2.11	0.51
1:B:322:VAL:O	1:B:325:VAL:HG22	2.11	0.51
1:A:155:HIS:CD2	1:A:408:HIS:ND1	2.79	0.50
1:B:408:HIS:CD2	1:B:413:HIS:HA	2.46	0.50
1:B:156:GLY:O	1:B:157:HIS:C	2.54	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:70:ASN:ND2	1:B:73:GLY:O	2.44	0.50
1:B:83:LEU:HD22	1:B:343:LEU:HD12	1.93	0.50
1:A:48:VAL:O	1:A:52:VAL:HG13	2.12	0.50
1:B:239:ARG:HB3	1:B:379:GLY:HA2	1.92	0.50
1:B:146:HIS:CD2	1:B:146:HIS:O	2.64	0.50
1:B:384:ALA:HB2	1:B:412:ILE:HG21	1.93	0.50
1:A:107:PRO:HB3	1:A:315:TYR:HE1	1.77	0.50
1:B:149:SER:C	1:B:151:GLY:N	2.66	0.49
1:A:36:ALA:O	1:A:39:SER:HB2	2.12	0.49
1:B:147:GLY:O	1:B:148:HIS:C	2.54	0.49
1:A:83:LEU:HD22	1:A:343:LEU:HD12	1.93	0.49
1:A:419:PRO:O	1:A:420:GLU:C	2.53	0.49
1:B:48:VAL:O	1:B:52:VAL:HG13	2.12	0.49
1:A:20:MET:O	1:A:23:VAL:HG22	2.13	0.49
1:A:313:VAL:O	1:A:316:LEU:HB3	2.13	0.49
1:A:386:ALA:HB3	1:A:417:ILE:HG23	1.95	0.49
1:B:372:LEU:HD12	1:B:386:ALA:HB2	1.94	0.49
1:B:64:THR:CG2	1:B:75:ILE:HD11	2.22	0.48
1:B:64:THR:HG23	1:B:75:ILE:CD1	2.22	0.48
1:A:10:ARG:O	1:A:14:MET:HG2	2.14	0.48
1:B:74:TRP:O	1:B:77:ALA:N	2.40	0.48
1:B:107:PRO:HB3	1:B:315:TYR:HE1	1.77	0.48
1:B:149:SER:CB	1:B:381:ARG:HA	2.43	0.48
1:A:420:GLU:CD	1:B:157:HIS:CD2	2.91	0.48
1:B:353:ILE:O	1:B:357:ILE:HG12	2.14	0.48
1:B:396:TYR:O	1:B:400:ALA:N	2.42	0.48
1:B:52:VAL:O	1:B:56:VAL:HG23	2.13	0.47
1:B:341:LEU:HB3	1:B:346:THR:HG21	1.96	0.47
1:A:146:HIS:CD2	1:A:146:HIS:O	2.67	0.47
1:B:313:VAL:O	1:B:316:LEU:HB3	2.13	0.47
1:B:384:ALA:HB2	1:B:412:ILE:HD13	1.94	0.47
1:B:10:ARG:O	1:B:14:MET:HG2	2.14	0.47
1:A:341:LEU:HB3	1:A:346:THR:HG21	1.96	0.47
1:B:20:MET:O	1:B:23:VAL:HG22	2.13	0.47
1:A:10:ARG:HB3	1:A:133:LEU:HD21	1.97	0.47
1:A:42:PHE:O	1:A:43:HIS:C	2.53	0.47
1:A:407:PHE:CE2	1:A:417:ILE:HD12	2.50	0.47
1:A:407:PHE:HE2	1:A:417:ILE:HD12	1.79	0.47
1:B:315:TYR:C	1:B:318:PRO:HD2	2.40	0.47
1:B:387:HIS:ND1	1:B:420:GLU:OE2	2.45	0.47
1:A:35:LEU:O	1:A:38:LEU:HB2	2.15	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:353:ILE:O	1:A:357:ILE:HG12	2.14	0.47
1:B:10:ARG:HB3	1:B:133:LEU:HD21	1.97	0.47
1:B:389:LYS:HD3	1:B:420:GLU:O	2.15	0.47
1:A:63:ARG:HB2	1:A:74:TRP:HD1	1.81	0.47
1:A:146:HIS:CE1	1:A:148:HIS:CD2	3.03	0.47
1:A:250:LEU:HD12	1:A:335:LEU:HD12	1.97	0.46
1:A:254:GLY:HA2	1:A:328:LEU:HD11	1.97	0.46
1:A:54:ALA:O	1:A:57:ALA:HB3	2.16	0.46
1:A:367:GLU:OE2	1:A:367:GLU:N	2.49	0.46
1:B:254:GLY:HA2	1:B:328:LEU:HD11	1.97	0.46
1:B:149:SER:OG	1:B:381:ARG:HA	2.15	0.46
1:A:315:TYR:C	1:A:318:PRO:HD2	2.40	0.46
1:A:344:LEU:HD13	1:B:74:TRP:CE3	2.50	0.46
1:A:152:GLY:O	1:A:153:HIS:C	2.57	0.46
1:B:22:MET:O	1:B:26:VAL:HG13	2.16	0.46
1:B:250:LEU:HD12	1:B:335:LEU:HD12	1.97	0.46
1:B:396:TYR:OH	1:B:419:PRO:HG3	2.16	0.45
1:A:53:VAL:HG12	1:A:53:VAL:O	2.16	0.45
1:A:377:LEU:HB3	1:A:381:ARG:HB2	1.98	0.45
1:B:377:LEU:HB3	1:B:381:ARG:HB2	1.98	0.45
1:B:248:VAL:O	1:B:252:VAL:HG23	2.17	0.45
1:B:259:SER:HA	1:B:262:VAL:HG12	1.99	0.45
1:A:149:SER:HB3	1:A:381:ARG:HA	1.98	0.45
1:A:344:LEU:HA	1:A:344:LEU:HD23	1.70	0.45
1:B:23:VAL:HA	1:B:26:VAL:HG22	1.99	0.45
1:B:55:LEU:O	1:B:56:VAL:C	2.55	0.45
1:A:396:TYR:O	1:A:400:ALA:N	2.42	0.45
1:B:55:LEU:C	1:B:57:ALA:N	2.60	0.45
1:A:317:ASP:HB3	1:A:318:PRO:HD3	2.00	0.44
1:B:35:LEU:O	1:B:38:LEU:HB2	2.16	0.44
1:A:22:MET:O	1:A:26:VAL:HG13	2.16	0.44
1:A:147:GLY:O	1:A:148:HIS:C	2.60	0.44
1:A:248:VAL:O	1:A:252:VAL:HG23	2.17	0.44
1:B:44:MET:O	1:B:45:LEU:C	2.56	0.44
1:B:317:ASP:HB3	1:B:318:PRO:HD3	2.00	0.44
1:B:70:ASN:CG	1:B:73:GLY:H	2.19	0.44
1:A:23:VAL:HA	1:A:26:VAL:HG22	1.99	0.44
1:A:418:GLN:HA	1:A:419:PRO:HD3	1.86	0.44
1:A:419:PRO:CD	1:B:419:PRO:HD3	2.34	0.44
1:A:153:HIS:NE2	1:A:155:HIS:CE1	2.85	0.44
1:A:259:SER:HA	1:A:262:VAL:HG12	1.99	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:388:ILE:HG12	1:B:417:ILE:CG2	2.48	0.44
1:A:146:HIS:O	1:A:146:HIS:CG	2.70	0.44
1:A:407:PHE:O	1:A:408:HIS:C	2.56	0.44
1:A:55:LEU:O	1:A:57:ALA:N	2.48	0.44
1:B:363:VAL:HG21	1:B:406:VAL:HG21	1.98	0.44
1:A:49:LEU:HD12	1:A:49:LEU:HA	1.71	0.43
1:B:76:ARG:HH21	1:B:377:LEU:HA	1.83	0.43
1:B:288:PRO:O	1:B:289:ASP:C	2.60	0.43
1:B:374:VAL:HG22	1:B:384:ALA:CB	2.49	0.43
1:B:146:HIS:CE1	1:B:148:HIS:CD2	3.06	0.43
1:A:265:ASN:HD22	1:A:317:ASP:HB2	1.83	0.43
1:B:404:LYS:HZ3	1:B:415:THR:HG1	1.56	0.43
1:A:76:ARG:NE	1:B:345:GLN:HE21	2.17	0.43
1:A:76:ARG:HH21	1:A:377:LEU:HA	1.83	0.43
1:B:44:MET:N	1:B:44:MET:SD	2.85	0.43
1:B:344:LEU:HD23	1:B:344:LEU:HA	1.70	0.43
1:A:36:ALA:CB	1:A:110:MET:HE1	2.49	0.43
1:B:397:MET:HE3	1:B:397:MET:HB3	1.79	0.43
1:A:345:GLN:HE21	1:B:76:ARG:NE	2.17	0.42
1:A:388:ILE:HG12	1:A:417:ILE:HG22	2.00	0.42
1:B:22:MET:HE2	1:B:22:MET:HB3	1.93	0.42
1:B:43:HIS:CD2	1:B:255:ASP:OD2	2.71	0.42
1:B:289:ASP:N	1:B:290:PRO:HD3	2.34	0.42
1:B:386:ALA:O	1:B:417:ILE:HA	2.19	0.42
1:B:335:LEU:O	1:B:339:SER:N	2.41	0.42
1:B:404:LYS:HE2	1:B:404:LYS:HB2	1.67	0.42
1:A:67:THR:HG22	1:A:68:GLN:H	1.85	0.42
1:B:388:ILE:HG12	1:B:417:ILE:HG22	2.01	0.42
1:A:153:HIS:O	1:A:413:HIS:HD2	2.02	0.42
1:A:386:ALA:O	1:A:417:ILE:HA	2.18	0.42
1:A:75:ILE:HD12	1:A:75:ILE:H	1.85	0.42
1:B:23:VAL:O	1:B:26:VAL:HG22	2.20	0.42
1:B:275:GLY:HA2	1:B:309:GLY:H	1.84	0.42
1:A:289:ASP:N	1:A:290:PRO:HD3	2.34	0.42
1:A:400:ALA:HA	1:A:403:ILE:HD12	2.01	0.42
1:A:415:THR:HB	1:A:417:ILE:HD11	2.02	0.42
1:B:265:ASN:HD22	1:B:317:ASP:HB2	1.83	0.42
1:A:374:VAL:HG22	1:A:384:ALA:CB	2.49	0.42
1:B:22:MET:HG3	1:B:44:MET:HB3	2.01	0.42
1:B:36:ALA:CB	1:B:110:MET:HE1	2.49	0.42
1:B:78:GLU:OE2	1:B:241:GLY:HA2	2.20	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:384:ALA:CB	1:A:412:ILE:HG21	2.41	0.42
1:B:313:VAL:O	1:B:316:LEU:CB	2.68	0.41
1:A:35:LEU:HD22	1:B:106:GLU:CG	2.50	0.41
1:A:63:ARG:HB2	1:A:74:TRP:CD1	2.56	0.41
1:A:72:PHE:CE1	1:B:373:HIS:CE1	3.09	0.41
1:A:288:PRO:O	1:A:289:ASP:C	2.61	0.41
1:B:97:LEU:HD23	1:B:98:LEU:HD12	2.03	0.41
1:B:153:HIS:CE1	1:B:155:HIS:NE2	2.88	0.41
1:A:23:VAL:O	1:A:26:VAL:HG22	2.19	0.41
1:A:97:LEU:HD23	1:A:98:LEU:HD12	2.03	0.41
1:A:259:SER:O	1:A:262:VAL:HG12	2.20	0.41
1:A:275:GLY:HA2	1:A:309:GLY:H	1.84	0.41
1:B:22:MET:HG2	1:B:44:MET:HB2	2.01	0.41
1:B:124:LEU:O	1:B:128:VAL:HG23	2.20	0.41
1:A:72:PHE:CE1	1:B:373:HIS:ND1	2.89	0.41
1:B:67:THR:HG22	1:B:68:GLN:H	1.85	0.41
1:A:21:PHE:O	1:A:21:PHE:CD1	2.74	0.41
1:A:406:VAL:C	1:A:408:HIS:N	2.67	0.41
1:B:259:SER:O	1:B:262:VAL:HG12	2.20	0.41
1:B:338:GLU:O	1:B:342:ILE:HG12	2.21	0.41
1:B:400:ALA:HA	1:B:403:ILE:HD12	2.01	0.41
1:A:106:GLU:CG	1:B:35:LEU:HD22	2.51	0.41
1:B:241:GLY:O	1:B:245:MET:HG2	2.21	0.41
1:A:14:MET:HE3	1:A:133:LEU:CD1	2.50	0.41
1:A:124:LEU:O	1:A:128:VAL:HG23	2.21	0.41
1:A:146:HIS:O	1:A:148:HIS:CD2	2.74	0.41
1:A:313:VAL:O	1:A:316:LEU:CB	2.68	0.41
1:B:21:PHE:O	1:B:21:PHE:CD1	2.74	0.40
1:B:155:HIS:CD2	1:B:408:HIS:CE1	3.09	0.40
1:A:335:LEU:O	1:A:339:SER:N	2.41	0.40
1:A:399:VAL:O	1:A:403:ILE:HG13	2.22	0.40
1:A:98:LEU:HD23	1:B:42:PHE:HB3	2.02	0.40
1:A:241:GLY:O	1:A:245:MET:HG2	2.21	0.40
1:A:22:MET:HE2	1:A:22:MET:HB3	1.93	0.40
1:A:338:GLU:O	1:A:342:ILE:HG12	2.21	0.40
1:A:374:VAL:HG22	1:A:384:ALA:HB2	2.04	0.40
1:B:75:ILE:HG22	1:B:378:ALA:CB	2.52	0.40
1:B:146:HIS:O	1:B:146:HIS:CG	2.74	0.40
1:A:78:GLU:OE2	1:A:241:GLY:HA2	2.20	0.40
1:A:388:ILE:HG13	1:A:403:ILE:HD13	2.03	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 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 EM 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	307/507 (61%)	299 (97%)	8 (3%)	0	100	100
1	B	307/507 (61%)	300 (98%)	7 (2%)	0	100	100
All	All	614/1014 (61%)	599 (98%)	15 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains

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 EM 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	245/433 (57%)	239 (98%)	6 (2%)	44	67
1	B	250/433 (58%)	243 (97%)	7 (3%)	38	64
All	All	495/866 (57%)	482 (97%)	13 (3%)	42	65

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	52	VAL
1	A	53	VAL
1	A	146	HIS
1	A	148	HIS
1	A	289	ASP
1	A	370	HIS
1	B	49	LEU
1	B	52	VAL

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Mol	Chain	Res	Type
1	B	67	THR
1	B	146	HIS
1	B	148	HIS
1	B	289	ASP
1	B	370	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	155	HIS
1	A	345	GLN
1	A	409	ASN
1	B	153	HIS
1	B	345	GLN
1	B	409	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 8 ligands modelled in this entry, 8 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.