



Full wwPDB EM Validation Report ⓘ

Jul 9, 2025 – 01:02 PM JST

PDB ID : 8ZPP / pdb_00008zpp
EMDB ID : EMD-60351
Title : Local CryoEM structure of the SARS-CoV-2 BA.5 in complex with ORB10 Fab
Authors : Cao, S.; Leng, C.; Hu, H.
Deposited on : 2024-05-30
Resolution : 3.60 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

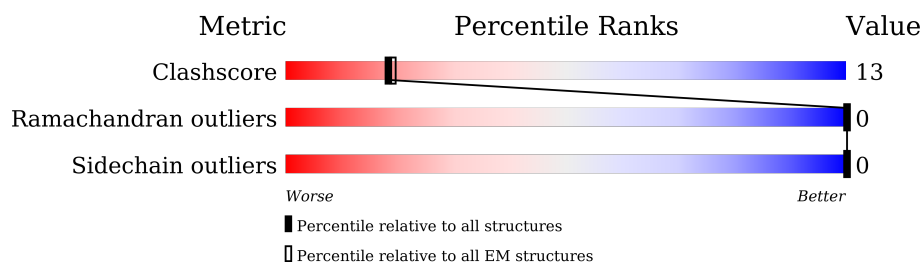
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.60 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	1260	 11% . 85%
2	H	119	 73% 27%
3	L	108	 80% 20%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3266 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 Spike glycoprotein,Fibritin.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	192	Total	C	N	O	S	0	0
			1532	988	259	277	8		

There are 74 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	24	ILE	THR	variant	UNP P0DTC2
A	?	-	LEU	deletion	UNP P0DTC2
A	?	-	PRO	deletion	UNP P0DTC2
A	?	-	PRO	deletion	UNP P0DTC2
A	29	SER	ALA	variant	UNP P0DTC2
A	?	-	HIS	deletion	UNP P0DTC2
A	?	-	VAL	deletion	UNP P0DTC2
A	142	ASP	GLY	variant	UNP P0DTC2
A	213	GLY	VAL	variant	UNP P0DTC2
A	339	ASP	GLY	variant	UNP P0DTC2
A	371	PHE	SER	variant	UNP P0DTC2
A	373	PRO	SER	variant	UNP P0DTC2
A	375	PHE	SER	variant	UNP P0DTC2
A	376	ALA	THR	variant	UNP P0DTC2
A	405	ASN	ASP	variant	UNP P0DTC2
A	408	SER	ARG	variant	UNP P0DTC2
A	417	ASN	LYS	variant	UNP P0DTC2
A	440	LYS	ASN	variant	UNP P0DTC2
A	452	ARG	LEU	variant	UNP P0DTC2
A	477	ASN	SER	variant	UNP P0DTC2
A	478	LYS	THR	variant	UNP P0DTC2
A	484	ALA	GLU	variant	UNP P0DTC2
A	486	VAL	PHE	variant	UNP P0DTC2
A	498	ARG	GLN	variant	UNP P0DTC2
A	501	TYR	ASN	variant	UNP P0DTC2
A	505	HIS	TYR	variant	UNP P0DTC2
A	614	GLY	ASP	variant	UNP P0DTC2
A	655	TYR	HIS	variant	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
A	679	LYS	ASN	variant	UNP P0DTC2
A	681	HIS	PRO	variant	UNP P0DTC2
A	682	GLY	ARG	conflict	UNP P0DTC2
A	683	SER	ARG	conflict	UNP P0DTC2
A	685	SER	ARG	conflict	UNP P0DTC2
A	764	LYS	ASN	variant	UNP P0DTC2
A	796	TYR	ASP	variant	UNP P0DTC2
A	817	PRO	PHE	conflict	UNP P0DTC2
A	892	PRO	ALA	conflict	UNP P0DTC2
A	899	PRO	ALA	conflict	UNP P0DTC2
A	942	PRO	ALA	conflict	UNP P0DTC2
A	954	HIS	GLN	variant	UNP P0DTC2
A	969	LYS	ASN	variant	UNP P0DTC2
A	986	PRO	LYS	variant	UNP P0DTC2
A	987	PRO	VAL	variant	UNP P0DTC2
A	1209	GLY	-	linker	UNP P0DTC2
A	1210	SER	-	linker	UNP P0DTC2
A	1232	LEU	PHE	conflict	UNP P10104
A	1238	GLY	-	expression tag	UNP P10104
A	1239	ARG	-	expression tag	UNP P10104
A	1240	SER	-	expression tag	UNP P10104
A	1241	LEU	-	expression tag	UNP P10104
A	1242	GLU	-	expression tag	UNP P10104
A	1243	VAL	-	expression tag	UNP P10104
A	1244	LEU	-	expression tag	UNP P10104
A	1245	PHE	-	expression tag	UNP P10104
A	1246	GLN	-	expression tag	UNP P10104
A	1247	GLY	-	expression tag	UNP P10104
A	1248	PRO	-	expression tag	UNP P10104
A	1249	GLY	-	expression tag	UNP P10104
A	1250	GLY	-	expression tag	UNP P10104
A	1251	GLY	-	expression tag	UNP P10104
A	1252	GLY	-	expression tag	UNP P10104
A	1253	GLY	-	expression tag	UNP P10104
A	1254	SER	-	expression tag	UNP P10104
A	1255	GLY	-	expression tag	UNP P10104
A	1256	GLY	-	expression tag	UNP P10104
A	1257	GLY	-	expression tag	UNP P10104
A	1258	GLY	-	expression tag	UNP P10104
A	1259	SER	-	expression tag	UNP P10104
A	1260	HIS	-	expression tag	UNP P10104
A	1261	HIS	-	expression tag	UNP P10104

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Chain	Residue	Modelled	Actual	Comment	Reference
A	1262	HIS	-	expression tag	UNP P10104
A	1263	HIS	-	expression tag	UNP P10104
A	1264	HIS	-	expression tag	UNP P10104
A	1265	HIS	-	expression tag	UNP P10104

- Molecule 2 is a protein called variable heavy chain of ORB10 Fab.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	H	119	Total	C	N	O	S	0	0
			928	586	152	186	4		

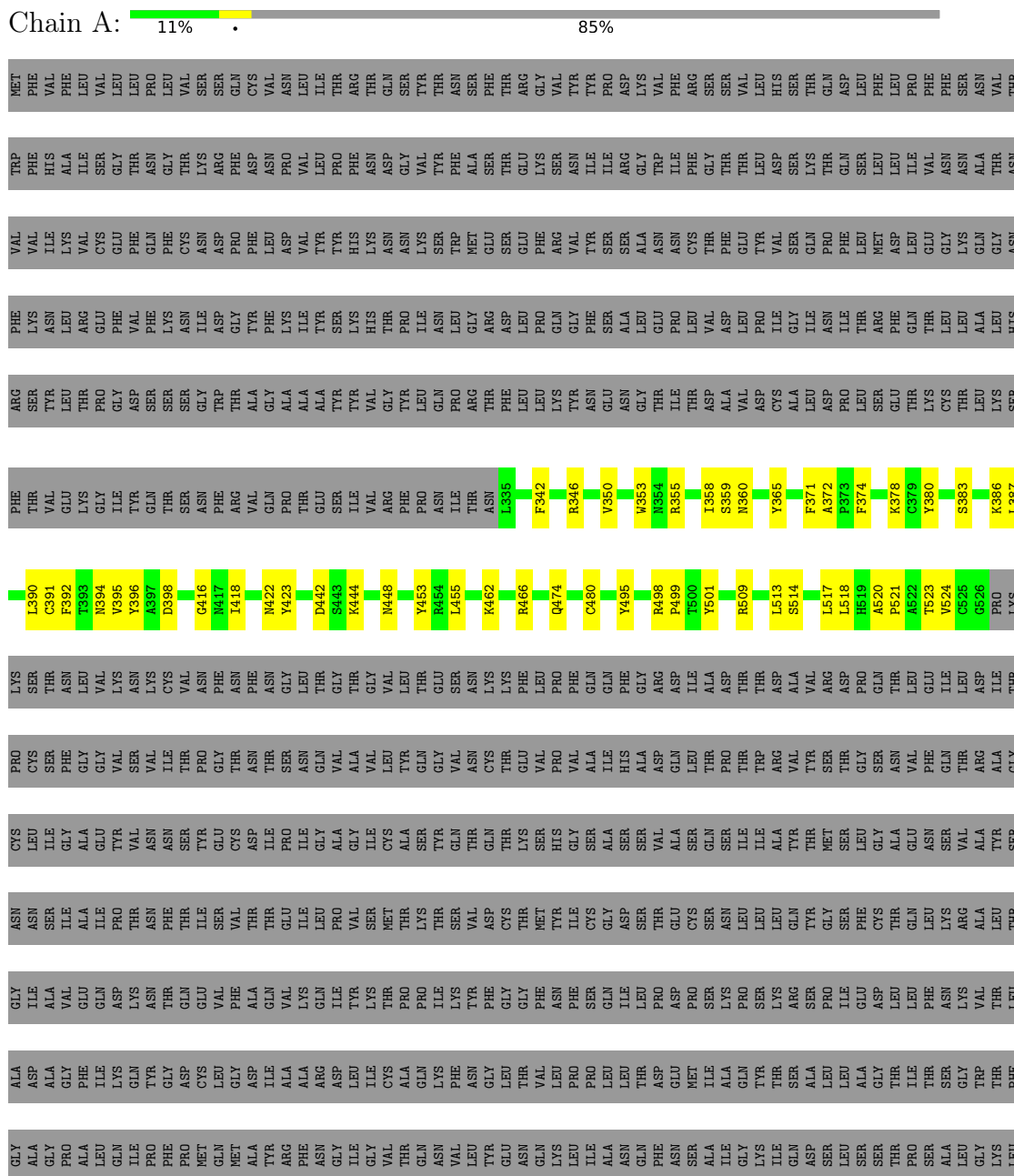
- Molecule 3 is a protein called variable light chain of ORB10 Fab.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	L	108	Total	C	N	O	S	0	0
			806	508	129	165	4		

3 Residue-property plots

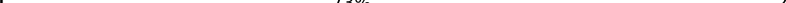
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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: Spike glycoprotein,Fibritin



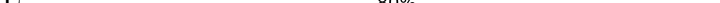
[illegible]

- Molecule 2: variable heavy chain of ORB10 Fab

Chain H: 



- Molecule 3: variable light chain of ORB10 Fab

Chain L:  80% 20%



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	219826	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	JEOL CRYO ARM 300	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	40	Depositor
Minimum defocus (nm)	500	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor

5 Model quality

5.1 Standard geometry

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	0.31	0/1578	0.42	0/2147
2	H	0.33	0/952	0.40	0/1290
3	L	0.43	0/826	0.47	0/1125
All	All	0.35	0/3356	0.43	0/4562

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

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	1532	0	1457	37	0
2	H	928	0	864	32	0
3	L	806	0	778	20	0
All	All	3266	0	3099	82	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 13.

All (82) 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)
2:H:35:ASN:ND2	2:H:107:PHE:CE1	2.52	0.77

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:L:11:MET:HE2	3:L:19:VAL:HG13	1.69	0.74
2:H:35:ASN:OD1	2:H:97:ALA:HB3	1.92	0.70
2:H:16:SER:HA	2:H:85:SER:H	1.58	0.67
1:A:455:LEU:HD11	3:L:2:ILE:HD11	1.78	0.64
3:L:79:MET:SD	3:L:105:LEU:HD21	2.38	0.64
3:L:52:THR:HG21	3:L:72:TYR:CE1	2.34	0.62
2:H:107:PHE:HE2	3:L:99:PHE:HZ	1.49	0.61
3:L:11:MET:HG2	3:L:19:VAL:HG11	1.82	0.61
2:H:38:LYS:HB2	2:H:48:ILE:HD11	1.83	0.60
1:A:350:VAL:HG21	1:A:418:ILE:HD12	1.87	0.57
2:H:50:GLN:N	2:H:59:ASP:O	2.37	0.56
1:A:383:SER:HB2	1:A:386:LYS:HB2	1.88	0.56
2:H:107:PHE:CE2	3:L:99:PHE:HZ	2.24	0.55
2:H:38:LYS:NZ	2:H:94:TYR:OH	2.39	0.55
2:H:47:TRP:HZ2	2:H:50:GLN:HB2	1.73	0.54
2:H:38:LYS:HG3	2:H:94:TYR:HE1	1.74	0.53
1:A:474:GLN:HA	1:A:480:CYS:SG	2.49	0.53
1:A:360:ASN:HA	1:A:523:THR:HB	1.91	0.53
1:A:358:ILE:HG13	1:A:395:VAL:HB	1.90	0.52
3:L:49:ILE:HG12	3:L:55:LEU:HD23	1.91	0.52
1:A:518:LEU:O	1:A:520:ALA:N	2.42	0.52
1:A:391:CYS:HA	1:A:524:VAL:O	2.09	0.52
1:A:372:ALA:HB3	1:A:374:PHE:CE2	2.44	0.52
3:L:83:ASP:O	3:L:87:TYR:OH	2.25	0.52
1:A:350:VAL:HG11	1:A:495:TYR:OH	2.10	0.51
2:H:35:ASN:HB3	2:H:50:GLN:HG3	1.93	0.51
2:H:38:LYS:HG3	2:H:94:TYR:CE1	2.46	0.51
2:H:5:GLN:HB3	2:H:23:LYS:HB3	1.92	0.50
2:H:105:VAL:O	3:L:35:HIS:NE2	2.44	0.50
2:H:33:TRP:CE3	2:H:50:GLN:HG2	2.46	0.50
2:H:35:ASN:HB2	2:H:47:TRP:HE1	1.76	0.50
2:H:47:TRP:CD1	3:L:97:LEU:HD12	2.46	0.50
3:L:37:TYR:CE2	3:L:90:GLN:OE1	2.64	0.50
1:A:453:TYR:HB3	1:A:495:TYR:CE2	2.47	0.49
1:A:398:ASP:OD2	1:A:423:TYR:OH	2.24	0.49
3:L:52:THR:HG21	3:L:72:TYR:HE1	1.76	0.49
1:A:353:TRP:HZ3	1:A:355:ARG:HB2	1.78	0.49
2:H:36:TRP:NE1	2:H:70:LEU:HD22	2.27	0.48
2:H:36:TRP:CZ3	2:H:96:CYS:HB3	2.49	0.48
1:A:396:TYR:O	1:A:513:LEU:HA	2.13	0.48
2:H:13:ARG:HG2	2:H:14:PRO:HD2	1.96	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:453:TYR:HB3	1:A:495:TYR:CZ	2.48	0.48
1:A:359:SER:OG	1:A:394:ASN:HA	2.14	0.47
3:L:55:LEU:HD22	3:L:59:VAL:HG11	1.96	0.47
1:A:342:PHE:HB3	1:A:371:PHE:CE2	2.50	0.47
2:H:39:GLN:HB2	2:H:45:LEU:HD23	1.97	0.47
1:A:353:TRP:O	1:A:466:ARG:NH1	2.47	0.47
3:L:37:TYR:HE2	3:L:90:GLN:OE1	1.98	0.47
2:H:108:ASP:OD1	2:H:109:TYR:N	2.47	0.46
1:A:453:TYR:CE2	1:A:455:LEU:HD13	2.50	0.46
2:H:30:SER:HA	2:H:53:PRO:HB2	1.98	0.46
1:A:392:PHE:HD2	1:A:517:LEU:HG	1.81	0.46
2:H:33:TRP:CZ3	2:H:52:TYR:HB2	2.51	0.45
2:H:35:ASN:OD1	2:H:35:ASN:O	2.34	0.45
1:A:350:VAL:HG22	1:A:422:ASN:HB3	1.97	0.45
1:A:453:TYR:HB3	1:A:495:TYR:OH	2.16	0.45
1:A:521:PRO:O	1:A:523:THR:HG23	2.16	0.44
1:A:444:LYS:O	1:A:499:PRO:HD3	2.16	0.44
1:A:365:TYR:CD1	1:A:387:LEU:HB3	2.52	0.44
1:A:392:PHE:O	1:A:524:VAL:HB	2.18	0.44
2:H:12:VAL:O	2:H:118:VAL:HA	2.18	0.44
1:A:353:TRP:CE2	1:A:423:TYR:HD1	2.36	0.44
1:A:396:TYR:HB2	1:A:514:SER:HB2	2.00	0.43
3:L:7:SER:HB3	3:L:22:THR:HB	2.00	0.43
2:H:30:SER:HB2	2:H:54:GLY:HA2	2.00	0.43
3:L:29:ILE:O	3:L:72:TYR:OH	2.31	0.42
2:H:107:PHE:HE1	3:L:92:TRP:CH2	2.36	0.42
1:A:462:LYS:HE3	1:A:462:LYS:HB3	1.89	0.42
1:A:386:LYS:O	1:A:390:LEU:HB2	2.20	0.42
1:A:442:ASP:O	1:A:448:ASN:ND2	2.52	0.42
2:H:16:SER:HA	2:H:85:SER:N	2.31	0.41
1:A:378:LYS:HG2	1:A:380:TYR:CZ	2.56	0.41
2:H:35:ASN:OD1	2:H:35:ASN:C	2.64	0.41
1:A:346:ARG:HG3	1:A:346:ARG:O	2.21	0.41
1:A:442:ASP:CG	1:A:509:ARG:HE	2.27	0.41
1:A:418:ILE:HD11	1:A:495:TYR:OH	2.21	0.41
1:A:498:ARG:H	1:A:501:TYR:HD1	1.69	0.41
2:H:5:GLN:O	2:H:23:LYS:N	2.31	0.40
3:L:79:MET:HE2	3:L:79:MET:HB2	1.70	0.40
2:H:18:VAL:O	2:H:82:GLN:HA	2.21	0.40
1:A:416:GLY:O	3:L:28:SER:OG	2.36	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	190/1260 (15%)	180 (95%)	10 (5%)	0	100	100
2	H	117/119 (98%)	114 (97%)	3 (3%)	0	100	100
3	L	106/108 (98%)	102 (96%)	4 (4%)	0	100	100
All	All	413/1487 (28%)	396 (96%)	17 (4%)	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	164/1090 (15%)	164 (100%)	0	100	100
2	H	97/97 (100%)	97 (100%)	0	100	100
3	L	90/90 (100%)	90 (100%)	0	100	100
All	All	351/1277 (28%)	351 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	360	ASN
1	A	519	HIS
3	L	33	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.