Full wwPDB EM Validation Report

Feb 19, 2025 – 08:06 PM JST

PDB ID	:	9JS4
EMDB ID	:	EMD-61766
Title	:	Cryo-EM structure of neutralizing antibody 8G3 in complex with BA.1 RBD
Authors	:	Li, J.; Li, H.
Deposited on	:	2024-09-30
Resolution	:	3.80 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:

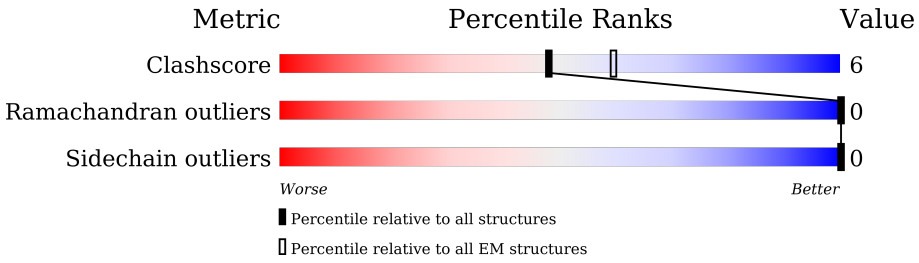
EMDB validation analysis	:	FAILED
MolProbity	:	4.02b-467
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	FAILED
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.41.2

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 3.80 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 <=5%

Mol	Chain	Length	Quality of chain
1	A	217	40% 9% 51%
2	B	222	38% 14% 49%
3	C	1233	15% . 84%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 3244 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 Light chain of 8G3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	107	816	513	132	169	2	0	0

- Molecule 2 is a protein called Heavy chain of 8G3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	114	854	537	146	166	5	0	0

- Molecule 3 is a protein called Spike glycoprotein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	196	1574	1015	266	285	8	0	0

There are 83 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	65	VAL	ALA	variant	UNP P0DTC2
C	93	ILE	THR	variant	UNP P0DTC2
C	143	ASP	TYR	variant	UNP P0DTC2
C	209	ILE	-	insertion	UNP P0DTC2
C	210	VAL	-	insertion	UNP P0DTC2
C	211	ARG	ASN	conflict	UNP P0DTC2
C	212	GLU	LEU	conflict	UNP P0DTC2
C	213	PRO	VAL	conflict	UNP P0DTC2
C	214	GLU	ARG	variant	UNP P0DTC2
C	339	ASP	GLY	variant	UNP P0DTC2
C	371	LEU	SER	variant	UNP P0DTC2
C	373	PRO	SER	variant	UNP P0DTC2
C	375	PHE	SER	variant	UNP P0DTC2
C	417	ASN	LYS	variant	UNP P0DTC2
C	440	LYS	ASN	variant	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
C	446	SER	GLY	variant	UNP P0DTC2
C	477	ASN	SER	variant	UNP P0DTC2
C	478	LYS	THR	variant	UNP P0DTC2
C	484	ALA	GLU	variant	UNP P0DTC2
C	493	ARG	GLN	variant	UNP P0DTC2
C	496	SER	GLY	variant	UNP P0DTC2
C	498	ARG	GLN	variant	UNP P0DTC2
C	501	TYR	ASN	variant	UNP P0DTC2
C	505	HIS	TYR	variant	UNP P0DTC2
C	547	LYS	THR	variant	UNP P0DTC2
C	614	GLY	ASP	variant	UNP P0DTC2
C	655	TYR	HIS	variant	UNP P0DTC2
C	679	LYS	ASN	variant	UNP P0DTC2
C	681	HIS	PRO	variant	UNP P0DTC2
C	682	GLY	ARG	conflict	UNP P0DTC2
C	683	SER	ARG	conflict	UNP P0DTC2
C	685	SER	ARG	conflict	UNP P0DTC2
C	764	LYS	ASN	variant	UNP P0DTC2
C	796	TYR	ASP	variant	UNP P0DTC2
C	817	PRO	PHE	conflict	UNP P0DTC2
C	856	LYS	ASN	variant	UNP P0DTC2
C	892	PRO	ALA	conflict	UNP P0DTC2
C	899	PRO	ALA	conflict	UNP P0DTC2
C	942	PRO	ALA	conflict	UNP P0DTC2
C	954	HIS	GLN	variant	UNP P0DTC2
C	969	LYS	ASN	variant	UNP P0DTC2
C	981	PHE	LEU	variant	UNP P0DTC2
C	986	PRO	LYS	variant	UNP P0DTC2
C	987	PRO	VAL	variant	UNP P0DTC2
C	1208	GLN	-	expression tag	UNP P0DTC2
C	1209	GLY	-	expression tag	UNP P0DTC2
C	1210	TYR	-	expression tag	UNP P0DTC2
C	1211	ILE	-	expression tag	UNP P0DTC2
C	1212	PRO	-	expression tag	UNP P0DTC2
C	1213	GLU	-	expression tag	UNP P0DTC2
C	1214	ALA	-	expression tag	UNP P0DTC2
C	1215	PRO	-	expression tag	UNP P0DTC2
C	1216	ARG	-	expression tag	UNP P0DTC2
C	1217	ASP	-	expression tag	UNP P0DTC2
C	1218	GLY	-	expression tag	UNP P0DTC2
C	1219	GLN	-	expression tag	UNP P0DTC2
C	1220	ALA	-	expression tag	UNP P0DTC2

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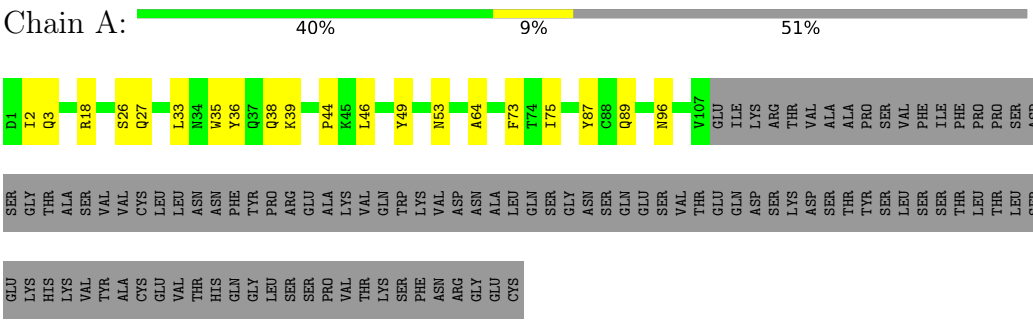
Chain	Residue	Modelled	Actual	Comment	Reference
C	1221	TYR	-	expression tag	UNP P0DTC2
C	1222	VAL	-	expression tag	UNP P0DTC2
C	1223	ARG	-	expression tag	UNP P0DTC2
C	1224	LYS	-	expression tag	UNP P0DTC2
C	1225	ASP	-	expression tag	UNP P0DTC2
C	1226	GLY	-	expression tag	UNP P0DTC2
C	1227	GLU	-	expression tag	UNP P0DTC2
C	1228	TRP	-	expression tag	UNP P0DTC2
C	1229	VAL	-	expression tag	UNP P0DTC2
C	1230	LEU	-	expression tag	UNP P0DTC2
C	1231	LEU	-	expression tag	UNP P0DTC2
C	1232	SER	-	expression tag	UNP P0DTC2
C	1233	THR	-	expression tag	UNP P0DTC2
C	1234	PHE	-	expression tag	UNP P0DTC2
C	1235	LEU	-	expression tag	UNP P0DTC2
C	1236	ALA	-	expression tag	UNP P0DTC2
C	1237	HIS	-	expression tag	UNP P0DTC2
C	1238	HIS	-	expression tag	UNP P0DTC2
C	1239	HIS	-	expression tag	UNP P0DTC2
C	1240	HIS	-	expression tag	UNP P0DTC2
C	1241	HIS	-	expression tag	UNP P0DTC2
C	1242	HIS	-	expression tag	UNP P0DTC2
C	1243	HIS	-	expression tag	UNP P0DTC2
C	1244	HIS	-	expression tag	UNP P0DTC2
C	1245	HIS	-	expression tag	UNP P0DTC2
C	1246	HIS	-	expression tag	UNP P0DTC2

3 Residue-property plots (i)

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.

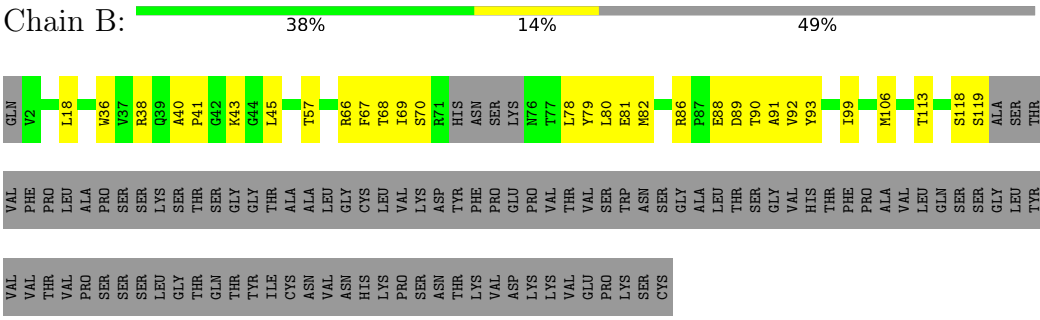
- Molecule 1: Light chain of 8G3

Chain A:



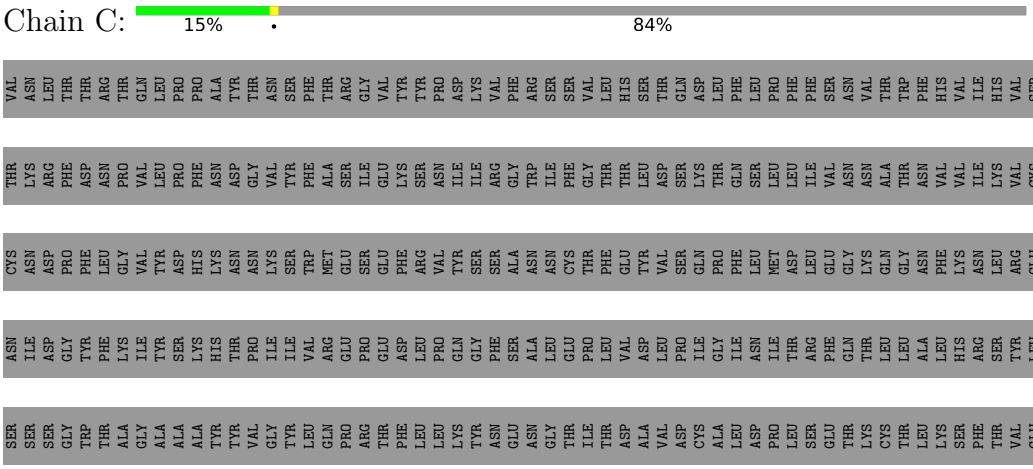
- Molecule 2: Heavy chain of 8G3

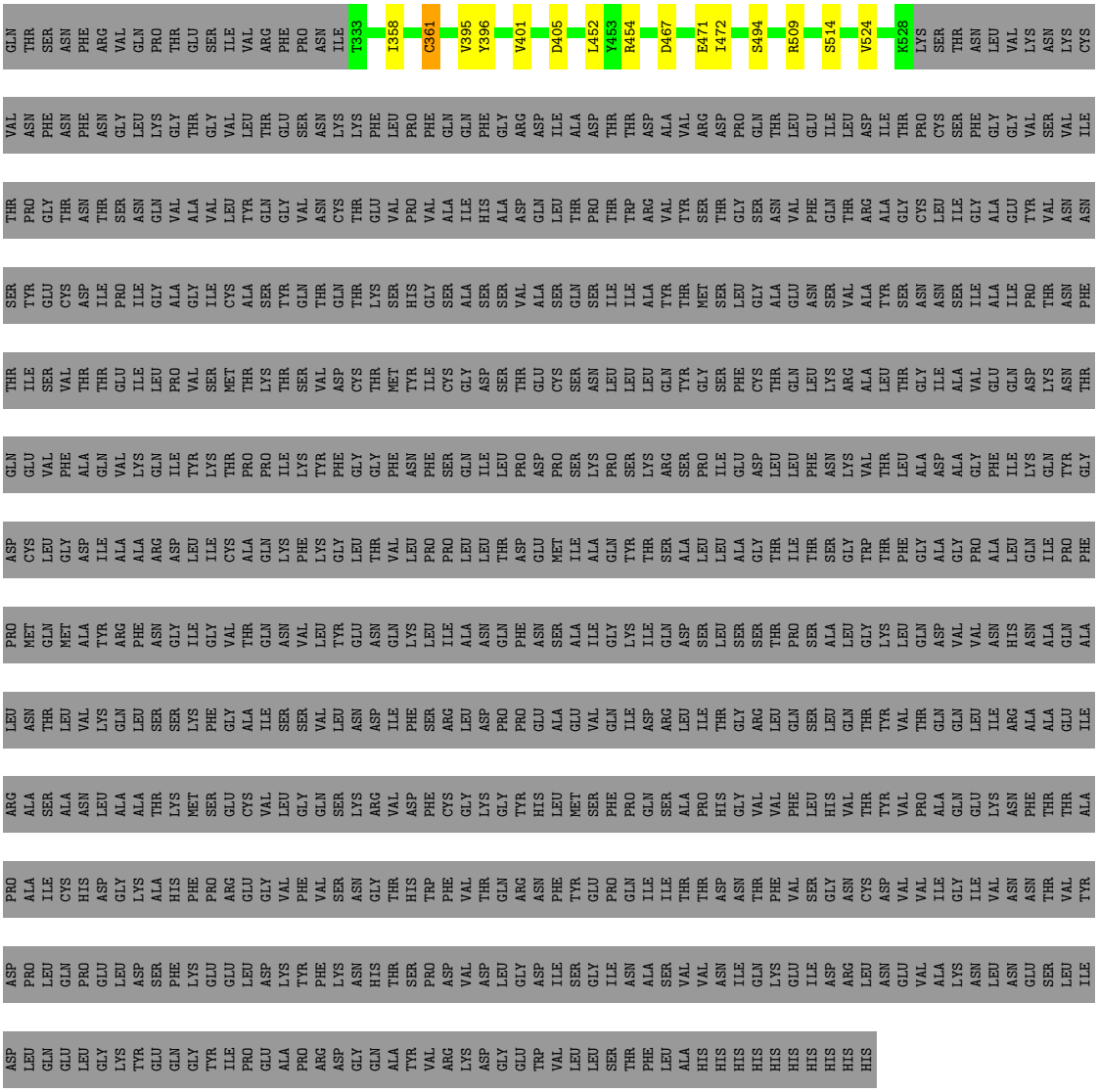
Chain B:



- Molecule 3: Spike glycoprotein

Chain C:




GLN THR SER ASN PHE ARG VAL GLN PRO THR GLU SER ILE VAL ARG PHE PRO ASN ILE T333 I358 C361 V395 Y396 V401 D405 L452 Y453 R454 D467 E471 I472 S494 R509 S514 V524 K528 LYS SER THR ASN LEU VAL LYS ASN LYS CYS
VAL ASN PHE ASN PHE ASN GLY LEU LYS GLY THR GLY VAL LEU THR GLU SER ASN LYS LYS PHE LEU PRO PHE GLN GLN PHE GLY ARG ASP ILE ALA ASP THR THR ASP ALA VAL ARG ASP PRO GLN THR LEU GLU ILE LEU ASP ILE THR PRO CYS SER PHE GLY GLY VAL SER VAL ILE
THR PRO GLY THR ASN THR SER ASN GLN VAL ALA VAL LEU TYR GLN GLY VAL ASN CYS THR GLU VAL PRO VAL ALA ALA ILE HIS ALA ASP GLN LEU THR PRO THR THR TRP ARG VAL TYR SER THR GLY SER ASN VAL PHE GLN THR ARG ALA GLY CYS LEU ILE GLY ALA GLU TYR VAL ASN ASN
SER TYR GLU CYS ASP ILE PRO ILE GLY ALA GLY ILE CYS ALA SER TYR GLN THR GLN LYS SER HIS GLY SER ALA SER SER VAL ALA SER GLN LEU ILE ILE ALA TYR THR MET SER LEU GLY ALA GLU ASN SER VAL ALA TYR SER ASN SER ASN ILE ALA GLU PHE PRO THR ASN PHE
THR ILE SER VAL THR THR GLU ILE LEU PRO VAL SER MET THR THR LYS THR SER VAL ASP CYS THR MET TYR ILE CYS GLY ASP SER THR GLU CYS SER ASN LEU LEU LEU GLN TYR GLY SER PHE CYS THR GLN LEU LYS ARG ALA LEU THR GLY SER GLU ASP LEU LEU ALA GLY THR ILE ALA VAL GLU GLN ASP LYS ASN THR
GLN GLU VAL PHE ALA GLN VAL LYS GLN ILE TYR LYS THR PRO PRO ILE LYS TYR PHE GLY GLY PHE ASN PHE SER GLN ILE LEU PRO ASP PRO SER LYS PRO SER LYS ARG SER PRO ILE GLU ASP LEU LEU PHE ASN LYS VAL THR LEU GLN ALA ASP ALA GLY PHE ILE LYS GLN TYR GLY
ASP CYS LEU GLY ASP ILE ALA ALA ARG ASP LEU LEU CYS ALA ALA GLN LYS PHE LYS GLY LEU THR VAL LEU PRO PRO LEU LEU LEU THR ASP GLU MET ILE ALA GLN TYR THR SER ALA LEU LEU ALA GLY THR ILE THR ILE GLY PHE GLY ALA GLY PRO ALA LEU GLN ILE PRO
PRO MET GLN MET ALA TYR ARG PHE ASN GLY ILE GLY VAL THR GLN ASN VAL LEU TYR GLU ASN GLN LYS LEU ILE ALA ASN GLN PHE ASN SER ALA ILE GLY LYS ILE GLN ASP SER LEU SER SER THR PRO SER ALA LEU GLY LYS LEU GLN ASP VAL VAL ASN HIS ASN ALA GLN ALA
LEU ASN THR LEU VAL LYS GLN LEU SER SER LYS PHE GLY ALA ILE SER SER VAL LEU ASN ASP ILE PHE SER ARG LEU ASP PRO PRO GLU ALA GLU VAL GLN ILE ASP ARG LEU ILE THR GLY ARG LEU GLN SER LEU GLN THR TYR VAL THR GLN GLN GLN LEU ILE ARG ALA ALA GLU ILE
ARG ALA SER ALA ASN LEU ALA ALA ALA THR LYS MET SER GLU CYS VAL LEU GLY GLN SER LYS ARG VAL ASP PHE CYS GLY LYS GLY TYR HIS LEU MET SER PHE PRO GLN SER ALA PRO HIS GLY VAL VAL PHE LEU HIS VAL THR TYR VAL PRO ALA GLN GLU LYS ASN PHE THR THR ALA
PRO ALA ILE CYS HIS ASP GLY LYS ALA HIS PHE PRO ARG GLU GLY VAL PHE VAL SER ASN GLY THR HIS TRP PHE VAL THR GLN ARG ASN PHE TYR GLU PRO GLN ILE ILE THR THR ASP ASN THR PHE VAL SER GLY ASN CYS ASP VAL VAL ILE GLY ILE VAL ASN ASN THR VAL TYR
ASP PRO LEU GLN PRO GLU LEU ASP SER PHE LYS GLU GLU LEU ASP LYS TYR PHE LYS ASN HIS THR SER PRO ASP VAL ASP LEU GLY ASP ILE SER GLY ASN ALA SER VAL VAL ASN ILE GLN LYS GLU ILE ASP ARG LEU ASN GLU VAL ALA LYS ASN LEU ASN GLU SER LEU ILE
ASP LEU GLN GLU PRO LEU GLY TYR GLU GLN GLY TYR ILE PRO GLU ALA PRO ARG ASP GLY GLN ALA TYR VAL ARG LYS ASP GLY GLU TRP VAL LEU LEU SER THR PHE LEU ALA HIS HIS HIS HIS HIS HIS HIS HIS HIS

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	118107	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	50	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k 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	0.25	0/836	0.49	0/1142
2	B	0.25	0/872	0.54	0/1186
3	C	0.26	0/1621	0.53	0/2206
All	All	0.26	0/3329	0.52	0/4534

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
3	C	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	C	361	CYS	Peptide

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	816	0	778	13	0
2	B	854	0	827	18	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	1574	0	1507	8	0
All	All	3244	0	3112	36	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 6.

All (36) 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:18:ARG:HA	1:A:75:ILE:O	1.89	0.73
2:B:18:LEU:H	2:B:82:MET:HB2	1.57	0.70
1:A:96:ASN:ND2	3:C:405:ASP:OD2	2.33	0.61
2:B:41:PRO:HD3	2:B:91:ALA:HB2	1.81	0.61
3:C:361:CYS:H	3:C:524:VAL:HG22	1.69	0.57
3:C:401:VAL:HG22	3:C:509:ARG:HG2	1.86	0.57
3:C:358:ILE:HB	3:C:395:VAL:HB	1.87	0.57
1:A:38:GLN:NE2	1:A:39:LYS:O	2.38	0.56
3:C:471:GLU:HG3	3:C:472:ILE:H	1.72	0.54
2:B:38:ARG:NH1	2:B:89:ASP:OD1	2.40	0.54
2:B:67:PHE:HD2	2:B:80:LEU:HD11	1.72	0.54
1:A:38:GLN:HG3	1:A:44:PRO:HG3	1.90	0.53
2:B:70:SER:HB3	2:B:79:TYR:HB2	1.89	0.53
3:C:454:ARG:NH2	3:C:467:ASP:OD2	2.42	0.53
1:A:46:LEU:HD21	1:A:49:TYR:HB3	1.91	0.52
1:A:64:ALA:HB2	1:A:73:PHE:HD1	1.75	0.52
1:A:49:TYR:OH	1:A:53:ASN:ND2	2.44	0.51
1:A:36:TYR:HE2	1:A:89:GLN:HG2	1.77	0.50
2:B:118:SER:OG	2:B:119:SER:N	2.46	0.48
2:B:40:ALA:HB3	2:B:43:LYS:HB2	1.95	0.48
2:B:66:ARG:HH12	2:B:86:ARG:HD3	1.78	0.48
2:B:57:THR:HG22	2:B:69:ILE:HD11	1.96	0.48
1:A:87:TYR:HE2	2:B:45:LEU:HD13	1.80	0.47
1:A:33:LEU:HD21	1:A:35:TRP:HE1	1.81	0.46
2:B:93:TYR:H	2:B:113:THR:HG22	1.80	0.46
2:B:99:ILE:HG13	2:B:106:MET:HG3	1.98	0.46
2:B:88:GLU:N	2:B:88:GLU:OE2	2.50	0.44
2:B:36:TRP:NE1	2:B:78:LEU:HD21	2.31	0.44
2:B:92:VAL:HG13	2:B:113:THR:H	1.86	0.41
1:A:3:GLN:H	1:A:26:SER:HB2	1.86	0.41
1:A:2:ILE:HG22	1:A:27:GLN:HB3	2.02	0.41
3:C:452:LEU:HD23	3:C:494:SER:HB3	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:68:THR:OG1	2:B:81:GLU:HB2	2.20	0.41
2:B:90:THR:OG1	2:B:91:ALA:N	2.54	0.41
3:C:396:TYR:HB2	3:C:514:SER:HB3	2.03	0.40
1:A:87:TYR:CE2	2:B:45:LEU:HD13	2.57	0.40

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 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 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	105/217 (48%)	101 (96%)	4 (4%)	0	100	100
2	B	110/222 (50%)	105 (96%)	5 (4%)	0	100	100
3	C	194/1233 (16%)	184 (95%)	10 (5%)	0	100	100
All	All	409/1672 (24%)	390 (95%)	19 (5%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 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 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	93/192 (48%)	93 (100%)	0	100	100
2	B	91/185 (49%)	91 (100%)	0	100	100
3	C	171/1077 (16%)	171 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	355/1454 (24%)	355 (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. There are no such sidechains identified.

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.