Full wwPDB X-ray Structure Validation Report (i)

Nov 16, 2023 – 08:03 AM EST

PDB ID	:	8T9Z
Title	:	Structural of M8C10 Fab in complex human metapneumovirus fusion protein
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Deposited on	:	2023-06-26
Resolution	:	3.00 Å(reported)

The following versions of software and data (see references (i)) were used in the production of this report:

|		
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.36
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1   Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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.
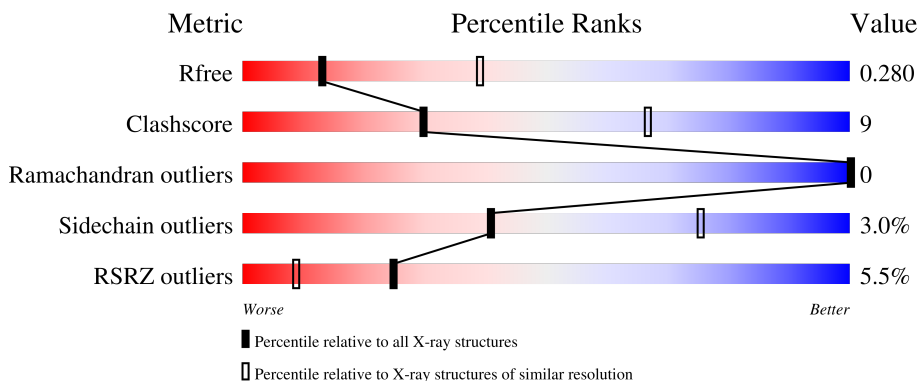
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	2092 (3.00-3.00)
Clashscore	141614	2416 (3.00-3.00)
Ramachandran outliers	138981	2333 (3.00-3.00)
Sidechain outliers	138945	2336 (3.00-3.00)
RSRZ outliers	127900	1990 (3.00-3.00)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower 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% The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	476	6% — 61% / 21% / 18%
2	H	231	3% — 79% / 14% / · 6%
3	L	214	4% — 78% / 20% / ··

2 Entry composition ⓘ

There are 4 unique types of molecules in this entry. The entry contains 6136 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, 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 Fusion glycoprotein F0.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	388	Total 2853	C 1785	N 490	O 557	S 21	0	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	491	LEU	-	expression tag	UNP G3KCK8
A	492	VAL	-	expression tag	UNP G3KCK8
A	493	PRO	-	expression tag	UNP G3KCK8
A	494	ARG	-	expression tag	UNP G3KCK8

- Molecule 2 is a protein called M8C10 Fab Heavy Chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	H	216	Total 1614	C 1018	N 273	O 316	S 7	0	0	0

- Molecule 3 is a protein called M8C10 Fab Light Chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	L	212	Total 1643	C 1033	N 274	O 331	S 5	0	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	8	Total 8	O 8	0	0
4	H	4	Total 4	O 4	0	0
4	L	14	Total 14	O 14	0	0

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 vi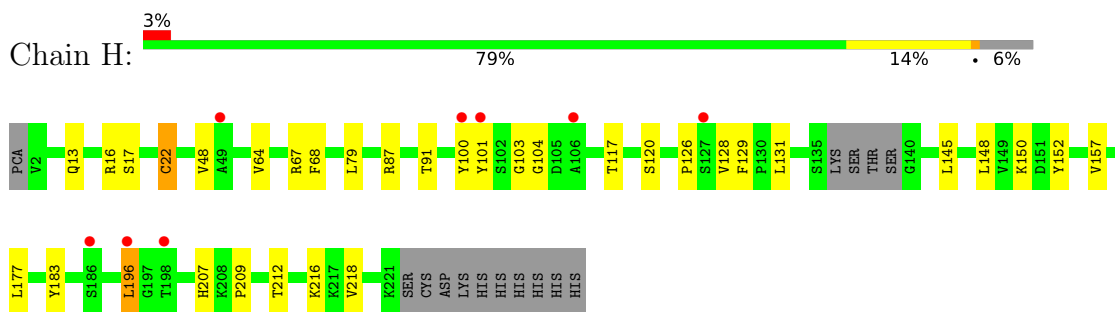ew annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). 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.

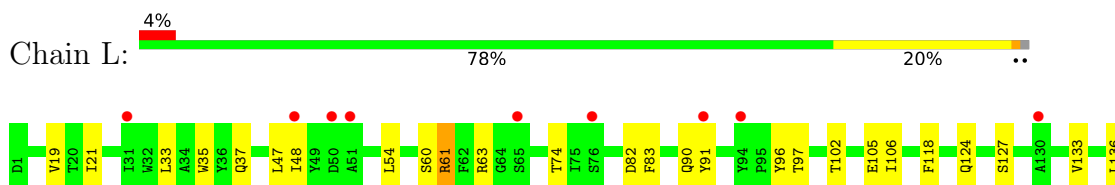• Molecule 1: Fusion glycoprotein F0
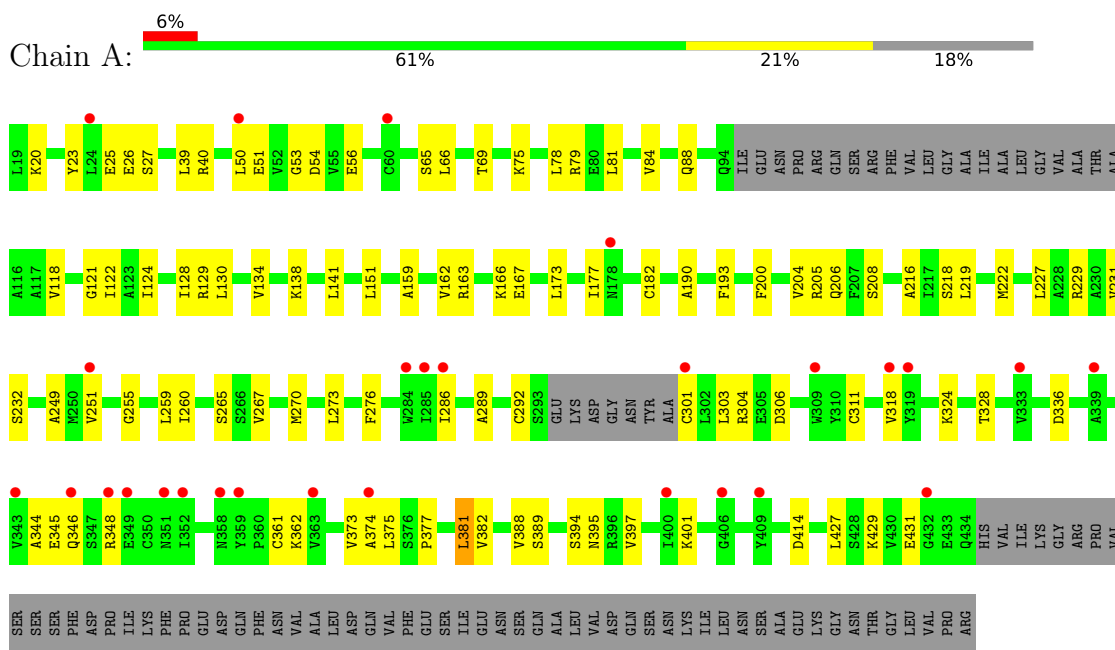
Chain A:

• Molecule 2: M8C10 Fab Heavy Chain

Chain H:

• Molecule 3: M8C10 Fab Light Chain

Chain L:

R42 E143 A144 K145 Q155 N158 V163 Q166 K169 D170 S171 L175 L181 Y186 H189 K190 V191 V196 T197 H198 R211 G212 GLU CYS

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α, β, γ	98.90Å 117.67Å 181.22Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.34 – 3.00 98.69 – 2.99	Depositor EDS
% Data completeness (in resolution range)	99.5 (49.34-3.00) 99.6 (98.69-2.99)	Depositor EDS
R_{merge}	0.16	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.30 (at 3.01Å)	Xtriage
Refinement program	PHENIX 1.12_2829	Depositor
R, R_{free}	0.243 , 0.280 0.243 , 0.280	Depositor DCC
R_{free} test set	1134 reflections (5.25%)	wwPDB-VP
Wilson B-factor (Å^2)	67.7	Xtriage
Anisotropy	0.709	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.29 , 42.2	EDS
L-test for twinning[2]	$< |L| > = 0.50$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.88	EDS
Total number of atoms	6136	wwPDB-VP
Average B, all atoms (Å^2)	72.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.73% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

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	0.29	0/2889	0.53	0/3922
2	H	0.31	0/1652	0.54	1/2248 (0.0%)
3	L	0.29	0/1680	0.50	0/2286
All	All	0.29	0/6221	0.53	1/8456 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	H	196	LEU	CA-CB-CG	5.55	128.06	115.30

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	2853	0	2797	61	0
2	H	1614	0	1574	23	0
3	L	1643	0	1593	33	0
4	A	8	0	0	0	0
4	H	4	0	0	0	0
4	L	14	0	0	1	0
All	All	6136	0	5964	113	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 9.

All (113) 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:289:ALA:HB2	1:A:381:LEU:HD13	1.40	1.00
1:A:345:GLU:OE2	1:A:348:ARG:HD2	1.73	0.87
1:A:394:SER:HB3	1:A:397:VAL:HG22	1.57	0.86
3:L:106:ILE:HD11	3:L:171:SER:HB3	1.60	0.81
1:A:345:GLU:O	1:A:345:GLU:OE1	1.98	0.81
3:L:190:LYS:CE	3:L:191:VAL:HG13	2.14	0.78
1:A:56:GLU:HA	1:A:75:LYS:HE3	1.68	0.76
1:A:81:LEU:HD12	1:A:204:VAL:HG22	1.68	0.75
1:A:373:VAL:HG22	1:A:382:VAL:HG23	1.69	0.74
1:A:374:ALA:HB3	1:A:381:LEU:HD11	1.70	0.71
2:H:91:THR:HG23	2:H:117:THR:HA	1.75	0.68
1:A:141:LEU:HD11	1:A:159:ALA:HB1	1.76	0.68
3:L:155:GLN:HB3	3:L:158:ASN:HD21	1.57	0.68
1:A:346:GLN:OE1	1:A:346:GLN:N	2.24	0.67
1:A:227:LEU:HD21	1:A:251:VAL:HG11	1.76	0.67
2:H:48:VAL:HG23	2:H:64:VAL:HG21	1.78	0.66
1:A:328:THR:HG21	1:A:431:GLU:HG3	1.76	0.65
3:L:37:GLN:HB2	3:L:47:LEU:HD11	1.79	0.65
3:L:163:VAL:HG22	3:L:175:LEU:HD12	1.79	0.64
2:H:145:LEU:HD13	2:H:218:VAL:HG21	1.80	0.63
1:A:286:ILE:HD12	1:A:304:ARG:HH22	1.64	0.63
2:H:13:GLN:NE2	2:H:120:SER:O	2.32	0.63
1:A:289:ALA:CB	1:A:381:LEU:HD13	2.22	0.62
1:A:205:ARG:NH1	3:L:63:ARG:HE	1.99	0.60
1:A:53:GLY:H	1:A:265:SER:HB3	1.66	0.59
3:L:190:LYS:HE2	3:L:191:VAL:HG13	1.83	0.59
1:A:141:LEU:O	1:A:163:ARG:NH2	2.36	0.58
1:A:260:ILE:HD11	1:A:270:MET:HG2	1.85	0.57
1:A:50:LEU:HA	1:A:162:VAL:HG23	1.87	0.57
3:L:106:ILE:HD11	3:L:171:SER:CB	2.33	0.57
2:H:22:CYS:HB3	2:H:79:LEU:HB3	1.87	0.56
1:A:222:MET:HE1	1:A:273:LEU:HD21	1.86	0.56
2:H:48:VAL:CG2	2:H:64:VAL:HG21	2.35	0.56
3:L:105:GLU:HG3	3:L:166:GLN:NE2	2.21	0.56
2:H:148:LEU:CD2	2:H:150:LYS:HB2	2.36	0.55
3:L:190:LYS:CE	3:L:191:VAL:CG1	2.85	0.54
3:L:142:ARG:NH2	3:L:163:VAL:HG21	2.24	0.54
1:A:374:ALA:HB3	1:A:381:LEU:CD1	2.39	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:L:35:TRP:HB2	3:L:48:ILE:HG12	1.92	0.52
3:L:189:HIS:O	3:L:211:ARG:HD3	2.09	0.52
2:H:67:ARG:HD3	2:H:87:ARG:NH2	2.25	0.51
2:H:101:TYR:CZ	2:H:104:GLY:HA3	2.45	0.51
1:A:173:LEU:O	1:A:177:ILE:HG22	2.10	0.51
1:A:129:ARG:HG2	1:A:260:ILE:HG23	1.91	0.51
1:A:304:ARG:HH21	1:A:306:ASP:CG	2.14	0.51
2:H:207:HIS:CD2	2:H:209:PRO:HD2	2.45	0.50
3:L:90:GLN:HE21	3:L:97:THR:H	1.58	0.50
1:A:394:SER:CB	1:A:397:VAL:HG22	2.36	0.49
3:L:106:ILE:C	3:L:106:ILE:HD12	2.32	0.49
3:L:83:PHE:CZ	3:L:106:ILE:HG22	2.48	0.49
1:A:206:GLN:OE1	1:A:218:SER:HB3	2.13	0.49
1:A:292:CYS:HA	1:A:301:CYS:HA	1.95	0.48
3:L:145:LYS:HB3	3:L:197:THR:HG23	1.94	0.48
3:L:189:HIS:N	4:L:301:HOH:O	2.41	0.48
1:A:218:SER:OG	1:A:219:LEU:N	2.45	0.48
1:A:227:LEU:O	1:A:231:VAL:HG12	2.13	0.48
1:A:394:SER:OG	1:A:395:ASN:N	2.46	0.48
1:A:23:TYR:CZ	1:A:25:GLU:HA	2.49	0.48
1:A:344:ALA:HB1	1:A:346:GLN:OE1	2.14	0.48
3:L:61:ARG:NH1	3:L:82:ASP:OD1	2.47	0.47
1:A:134:VAL:CG1	1:A:138:LYS:HD2	2.44	0.47
1:A:128:ILE:HG13	1:A:151:LEU:HD21	1.96	0.47
1:A:40:ARG:NH1	1:A:336:ASP:OD1	2.48	0.47
3:L:143:GLU:O	3:L:198:HIS:HD2	1.98	0.47
1:A:81:LEU:HD21	1:A:259:LEU:CD1	2.45	0.46
1:A:134:VAL:HG12	1:A:138:LYS:HD2	1.96	0.46
2:H:48:VAL:HG23	2:H:64:VAL:CG2	2.42	0.46
2:H:129:PHE:CE2	3:L:124:GLN:HG3	2.51	0.46
1:A:78:LEU:HD12	1:A:79:ARG:N	2.31	0.46
1:A:377:PRO:HA	1:A:429:LYS:HA	1.96	0.46
1:A:377:PRO:HB3	1:A:431:GLU:OE1	2.17	0.45
1:A:84:VAL:HG11	1:A:208:SER:HA	1.99	0.45
1:A:388:VAL:HG12	1:A:389:SER:N	2.32	0.45
1:A:66:LEU:HG	1:A:190:ALA:HB1	1.98	0.45
1:A:121:GLY:HA2	1:A:124:ILE:HD12	1.99	0.45
2:H:126:PRO:HD2	2:H:212:THR:HG21	1.98	0.45
1:A:81:LEU:HD21	1:A:259:LEU:HD11	1.99	0.45
1:A:375:LEU:HD21	1:A:427:LEU:HA	1.98	0.45
1:A:39:LEU:O	1:A:276:PHE:HA	2.17	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:65:SER:O	1:A:69:THR:HG23	2.17	0.44
1:A:26:GLU:O	1:A:27:SER:HB2	2.17	0.44
1:A:361:CYS:O	1:A:362:LYS:HG2	2.18	0.44
3:L:19:VAL:O	3:L:74:THR:HA	2.18	0.44
1:A:200:PHE:CE1	1:A:267:VAL:HG21	2.52	0.44
3:L:105:GLU:HG3	3:L:166:GLN:HE22	1.81	0.44
1:A:216:ALA:HA	1:A:255:GLY:O	2.17	0.44
3:L:190:LYS:HE3	3:L:191:VAL:CG1	2.47	0.44
2:H:126:PRO:HB3	2:H:152:TYR:HB3	2.00	0.43
1:A:311:CYS:O	1:A:318:VAL:HG12	2.18	0.43
2:H:131:LEU:HB3	3:L:118:PHE:CD2	2.54	0.43
3:L:91:TYR:HA	3:L:96:TYR:CD1	2.53	0.43
1:A:163:ARG:O	1:A:167:GLU:HG2	2.19	0.43
2:H:16:ARG:HD2	2:H:16:ARG:HA	1.77	0.43
1:A:51:GLU:HB3	1:A:166:LYS:HE3	2.01	0.43
1:A:118:VAL:O	1:A:121:GLY:N	2.50	0.43
3:L:83:PHE:CE1	3:L:106:ILE:HG22	2.53	0.43
3:L:181:LEU:CD1	3:L:186:TYR:HB2	2.49	0.43
3:L:21:ILE:HG12	3:L:102:THR:HG21	2.00	0.43
3:L:83:PHE:CE2	3:L:106:ILE:HG22	2.54	0.42
3:L:118:PHE:HB2	3:L:133:VAL:HB	2.02	0.42
1:A:118:VAL:O	1:A:122:ILE:HD12	2.19	0.42
1:A:249:ALA:HB2	2:H:103:GLY:HA3	2.02	0.42
1:A:177:ILE:HD13	1:A:182:CYS:HA	2.01	0.42
1:A:414:ASP:OD1	1:A:414:ASP:N	2.52	0.41
3:L:136:LEU:HD21	3:L:196:VAL:HG13	2.03	0.41
1:A:229:ARG:O	1:A:232:SER:OG	2.32	0.41
2:H:101:TYR:CE1	2:H:104:GLY:HA3	2.55	0.41
2:H:64:VAL:HB	2:H:68:PHE:CG	2.57	0.40
2:H:152:TYR:CE2	2:H:157:VAL:HG13	2.56	0.40
3:L:48:ILE:HG22	3:L:54:LEU:HA	2.02	0.40
2:H:22:CYS:N	2:H:79:LEU:O	2.53	0.40
2:H:177:LEU:HB3	2:H:183:TYR:CE1	2.55	0.40
2:H:128:VAL:HG23	2:H:216:LYS:HE3	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 X-ray entries followed by that with respect to entries of similar resolution.

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	382/476 (80%)	358 (94%)	24 (6%)	0	100	100
2	H	212/231 (92%)	202 (95%)	10 (5%)	0	100	100
3	L	210/214 (98%)	201 (96%)	9 (4%)	0	100	100
All	All	804/921 (87%)	761 (95%)	43 (5%)	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 X-ray entries followed by that with respect to entries of similar resolution.

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	302/403 (75%)	293 (97%)	9 (3%)	41	75
2	H	179/193 (93%)	175 (98%)	4 (2%)	52	81
3	L	186/189 (98%)	179 (96%)	7 (4%)	33	69
All	All	667/785 (85%)	647 (97%)	20 (3%)	41	75

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	20	LYS
1	A	54	ASP
1	A	88	GLN
1	A	130	LEU
1	A	193	PHE

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Mol	Chain	Res	Type
1	A	303	LEU
1	A	324	LYS
1	A	381	LEU
1	A	401	LYS
2	H	17	SER
2	H	22	CYS
2	H	100	TYR
2	H	196	LEU
3	L	33	LEU
3	L	60	SER
3	L	61	ARG
3	L	127	SER
3	L	142	ARG
3	L	169	LYS
3	L	211	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	351	ASN
2	H	57	ASN
2	H	178	GLN
3	L	166	GLN

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 monosaccharides in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

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.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å²)	Q<0.9
1	A	388/476 (81%)	0.55	28 (7%)	15	4	46, 82, 120, 143	0
2	H	216/231 (93%)	0.34	8 (3%)	41	17	44, 63, 85, 95	0
3	L	212/214 (99%)	0.42	9 (4%)	36	14	41, 60, 92, 98	0
All	All	816/921 (88%)	0.46	45 (5%)	25	9	41, 69, 111, 143	0

All (45) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	352	ILE	6.3
1	A	178	ASN	5.2
1	A	358	ASN	3.6
2	H	196	LEU	3.4
3	L	76	SER	3.4
1	A	409	TYR	3.3
1	A	285	ILE	3.1
1	A	24	LEU	3.0
3	L	130	ALA	2.9
1	A	286	ILE	2.8
1	A	432	GLY	2.8
1	A	301	CYS	2.8
1	A	400	ILE	2.7
1	A	319	TYR	2.7
1	A	251	VAL	2.7
1	A	349	GLU	2.7
3	L	94	TYR	2.6
1	A	359	TYR	2.6
2	H	106	ALA	2.5
3	L	31	ILE	2.5
1	A	333	VAL	2.5
3	L	50	ASP	2.4
1	A	339	ALA	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	406	GLY	2.4
2	H	198	THR	2.4
1	A	348	ARG	2.4
1	A	343	VAL	2.3
1	A	363	VAL	2.3
2	H	100	TYR	2.3
3	L	91	TYR	2.3
1	A	346	GLN	2.3
2	H	127	SER	2.3
3	L	51	ALA	2.2
2	H	186	SER	2.2
2	H	49	ALA	2.2
1	A	60	CYS	2.2
1	A	284	TRP	2.2
1	A	318	VAL	2.2
3	L	65	SER	2.2
1	A	50	LEU	2.1
1	A	374	ALA	2.1
2	H	101	TYR	2.1
1	A	351	ASN	2.1
1	A	309	TRP	2.0
3	L	48	ILE	2.0

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

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

6.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.

6.4 Ligands ⓘ

There are no ligands in this entry.

6.5 Other polymers ⓘ

There are no such residues in this entry.