



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 09:40 PM UTC

PDB ID : 2WRC / pdb_00002wrc
Title : the structure of influenza H2 human singapore hemagglutinin
Authors : Liu, J.; Stevens, D.J.; Haire, L.F.; Walker, P.A.; Coombs, P.J.; Russell, R.J.;
Gamblin, S.J.; Skehel, J.J.
Deposited on : 2009-09-01
Resolution : 2.71 Å(reported)

This is a Full wwPDB X-ray 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/XrayValidationReportHelp>

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:

MolProbity : 4-5-2 with Phenix2.0
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

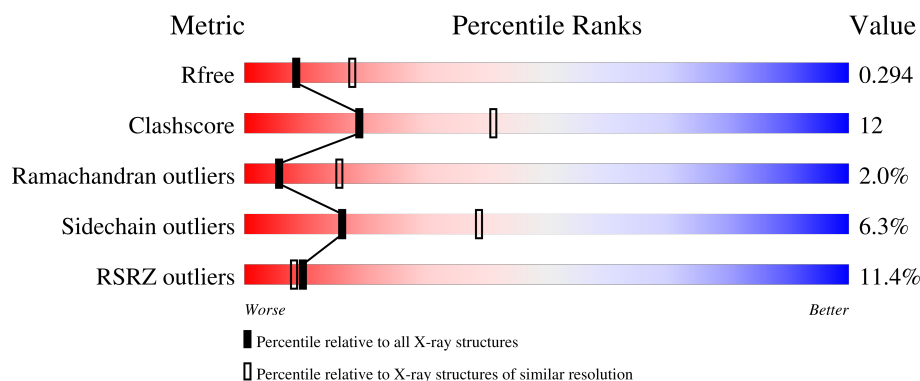
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.71 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}	180053	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

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 $\leq 5\%$. 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	506	12% 70% 21% • 6%
1	B	506	10% 69% 22% • • •
1	C	506	10% 67% 23% • 8%

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 11265 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.

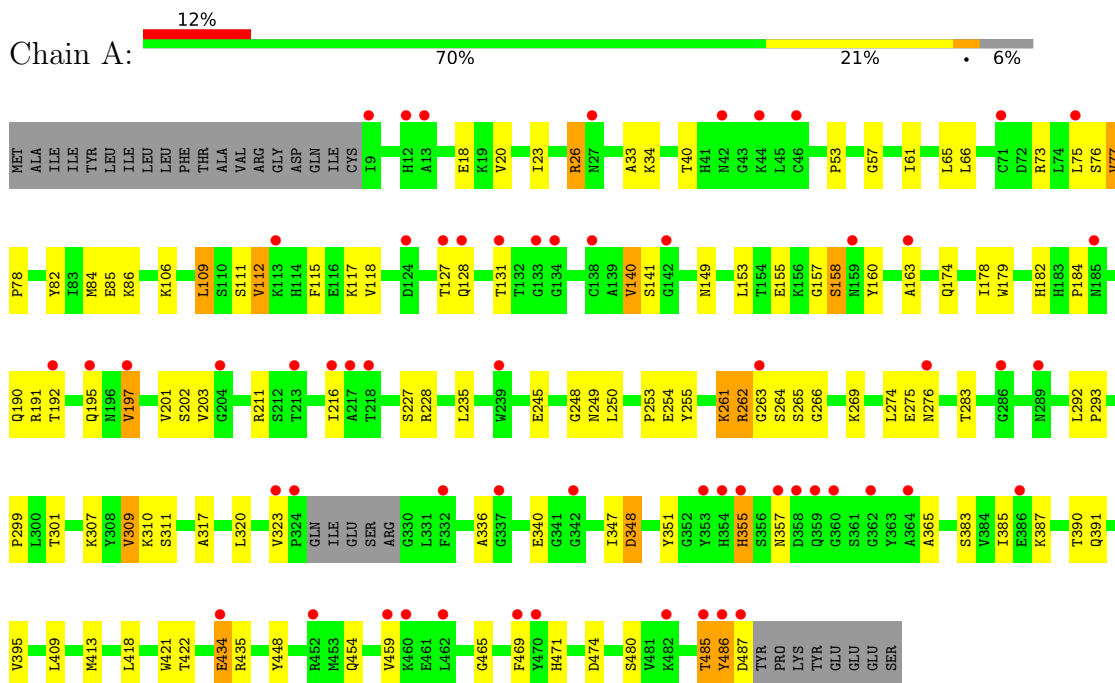
- Molecule 1 is a protein called HEMAGGLUTININ.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	474	Total	C	N	O	S	0	0	0
			3736	2347	642	724	23			
1	B	486	Total	C	N	O	S	0	0	0
			3842	2413	659	746	24			
1	C	467	Total	C	N	O	S	0	0	0
			3687	2318	635	710	24			

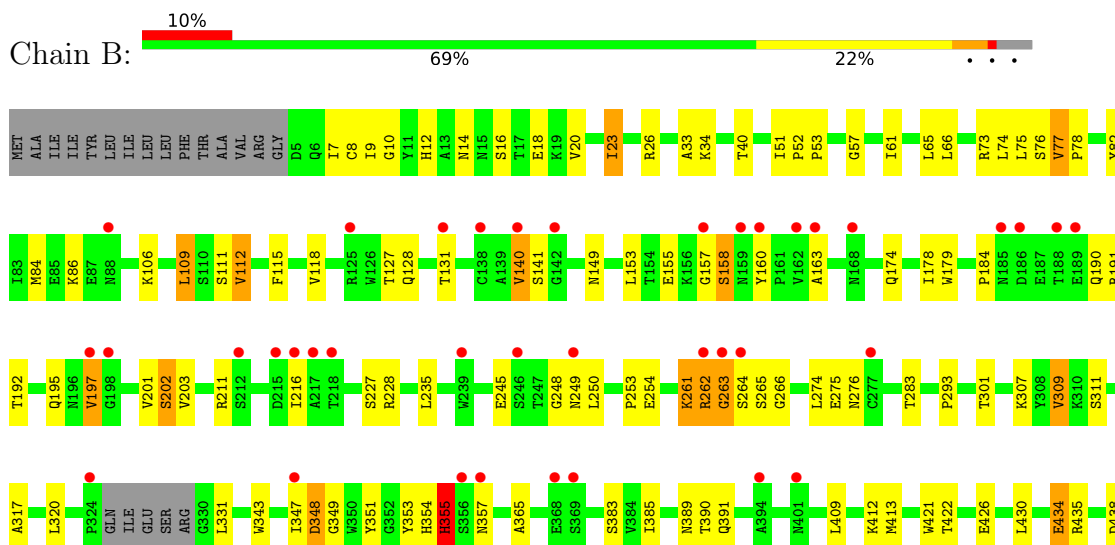
3 Residue-property plots

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 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: HEMAGGLUTININ

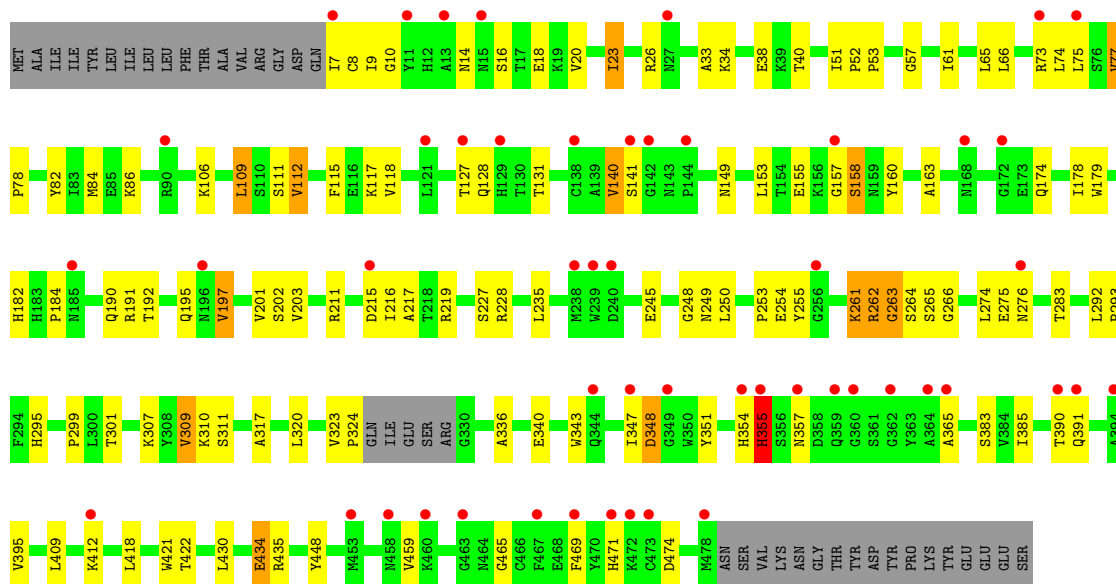


• Molecule 1: HEMAGGLUTININ





● Molecule 1: HEMAGGLUTININ



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	79.95Å 122.46Å 222.91Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.52 – 2.71 29.52 – 2.71	Depositor EDS
% Data completeness (in resolution range)	76.8 (29.52-2.71) 76.7 (29.52-2.71)	Depositor EDS
R_{merge}	0.16	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	7.28 (at 2.72Å)	Xtriage
Refinement program	PHENIX (PHENIX.REFINE)	Depositor
R, R_{free}	0.267 , 0.301 0.263 , 0.294	Depositor DCC
R_{free} test set	2337 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	78.1	Xtriage
Anisotropy	0.005	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 59.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.53$, $\langle L^2 \rangle = 0.37$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	11265	wwPDB-VP
Average B, all atoms (Å ²)	99.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.54% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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	0.38	0/3820	0.76	2/5169 (0.0%)
1	B	0.43	0/3929	0.80	3/5316 (0.1%)
1	C	0.39	0/3770	0.76	2/5100 (0.0%)
All	All	0.40	0/11519	0.78	7/15585 (0.0%)

There are no bond length outliers.

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	254	GLU	N-CA-C	-5.70	106.87	113.88
1	B	254	GLU	N-CA-C	-5.69	106.88	113.88
1	A	254	GLU	N-CA-C	-5.65	106.93	113.88
1	A	340	GLU	N-CA-C	5.12	117.52	111.33
1	B	491	TYR	CA-C-N	5.10	130.89	121.70
1	B	491	TYR	C-N-CA	5.10	130.89	121.70
1	C	340	GLU	N-CA-C	5.02	117.40	111.33

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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	3736	0	3600	79	0
1	B	3842	0	3694	113	0
1	C	3687	0	3563	88	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	11265	0	10857	262	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 12.

All (262) 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:B:490:LYS:H	1:B:491:TYR:HB2	1.29	0.96
1:B:471:HIS:CE1	1:B:490:LYS:HE3	2.03	0.94
1:B:53:PRO:HG2	1:B:84:MET:HE2	1.56	0.87
1:A:53:PRO:HG2	1:A:84:MET:HE2	1.56	0.84
1:C:53:PRO:HG2	1:C:84:MET:HE2	1.59	0.84
1:B:490:LYS:N	1:B:491:TYR:HB2	1.94	0.83
1:A:112:VAL:HG11	1:A:115:PHE:HB2	1.61	0.82
1:B:261:LYS:HA	1:B:262:ARG:HB2	1.59	0.82
1:C:261:LYS:HA	1:C:262:ARG:HB2	1.59	0.82
1:C:112:VAL:HG11	1:C:115:PHE:HB2	1.61	0.80
1:B:487:ASP:HA	1:B:488:TYR:HB2	1.64	0.79
1:C:261:LYS:HB2	1:C:262:ARG:HB3	1.66	0.78
1:B:487:ASP:CG	1:B:489:PRO:HD2	2.08	0.77
1:C:8:CYS:HB2	1:C:354:HIS:HB3	1.66	0.77
1:B:157:GLY:O	1:B:158:SER:HB2	1.85	0.77
1:B:112:VAL:HG11	1:B:115:PHE:HB2	1.65	0.76
1:A:157:GLY:O	1:A:158:SER:HB2	1.86	0.76
1:A:184:PRO:HG2	1:A:190:GLN:HE21	1.51	0.76
1:A:261:LYS:HA	1:A:262:ARG:CB	2.16	0.76
1:C:184:PRO:HG2	1:C:190:GLN:HE21	1.52	0.74
1:C:261:LYS:HA	1:C:262:ARG:CB	2.16	0.74
1:B:491:TYR:H	1:B:492:GLU:C	1.95	0.74
1:A:348:ASP:HB2	1:A:365:ALA:HB3	1.68	0.74
1:B:184:PRO:HG2	1:B:190:GLN:HE21	1.51	0.73
1:C:348:ASP:HB2	1:C:365:ALA:HB3	1.69	0.73
1:B:348:ASP:HB2	1:B:365:ALA:HB3	1.69	0.73
1:C:157:GLY:O	1:C:158:SER:HB2	1.85	0.72
1:B:111:SER:HB2	1:B:265:SER:HB3	1.71	0.72
1:B:261:LYS:HA	1:B:262:ARG:CB	2.20	0.72
1:B:487:ASP:OD2	1:B:489:PRO:HD2	1.89	0.71
1:B:261:LYS:HB2	1:B:262:ARG:HB3	1.74	0.70
1:A:111:SER:HB2	1:A:265:SER:HB3	1.74	0.70
1:B:493:GLU:HA	1:B:494:GLU:CB	2.23	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:459:VAL:HG12	1:B:469:PHE:HA	1.76	0.68
1:B:491:TYR:N	1:B:492:GLU:O	2.26	0.68
1:B:8:CYS:HB2	1:B:354:HIS:HB3	1.77	0.67
1:A:155:GLU:OE1	1:A:158:SER:HA	1.96	0.66
1:C:155:GLU:OE1	1:C:158:SER:HA	1.96	0.66
1:C:459:VAL:HG12	1:C:469:PHE:HA	1.77	0.66
1:A:459:VAL:HG12	1:A:469:PHE:HA	1.76	0.66
1:A:448:TYR:CE1	1:A:465:GLY:HA2	2.30	0.65
1:B:448:TYR:CE1	1:B:465:GLY:HA2	2.32	0.65
1:C:7:ILE:HA	1:C:355:HIS:HA	1.79	0.65
1:C:309:VAL:HG22	1:C:422:THR:HA	1.78	0.65
1:C:111:SER:HB2	1:C:265:SER:HB3	1.76	0.65
1:C:127:THR:O	1:C:128:GLN:HB2	1.97	0.65
1:B:127:THR:O	1:B:128:GLN:HB2	1.95	0.65
1:C:61:ILE:HD12	1:C:106:LYS:HD2	1.79	0.65
1:A:61:ILE:HD12	1:A:106:LYS:HD2	1.78	0.64
1:B:61:ILE:HD12	1:B:106:LYS:HD2	1.78	0.64
1:C:448:TYR:CE1	1:C:465:GLY:HA2	2.32	0.64
1:A:127:THR:O	1:A:128:GLN:HB2	1.97	0.64
1:B:155:GLU:OE1	1:B:158:SER:HA	1.96	0.64
1:B:293:PRO:HG3	1:B:385:ILE:HA	1.78	0.64
1:B:184:PRO:HG2	1:B:190:GLN:NE2	2.13	0.64
1:A:309:VAL:HG22	1:A:422:THR:HA	1.81	0.63
1:A:283:THR:HG22	1:A:301:THR:HG22	1.81	0.62
1:C:261:LYS:CA	1:C:262:ARG:CB	2.77	0.62
1:B:53:PRO:HD2	1:B:274:LEU:HD22	1.82	0.62
1:C:184:PRO:HG2	1:C:190:GLN:NE2	2.15	0.62
1:A:184:PRO:HG2	1:A:190:GLN:NE2	2.13	0.62
1:A:261:LYS:CA	1:A:262:ARG:CB	2.77	0.62
1:C:53:PRO:HD2	1:C:274:LEU:HD22	1.81	0.62
1:B:487:ASP:HA	1:B:488:TYR:CB	2.29	0.62
1:A:323:VAL:HG21	1:A:336:ALA:HB2	1.81	0.61
1:A:77:VAL:HG12	1:A:78:PRO:HD2	1.83	0.60
1:A:53:PRO:HD2	1:A:274:LEU:HD22	1.82	0.60
1:A:178:ILE:O	1:A:253:PRO:HG3	2.01	0.60
1:B:490:LYS:CA	1:B:491:TYR:HB2	2.31	0.60
1:C:283:THR:HG22	1:C:301:THR:HG22	1.83	0.60
1:B:53:PRO:HG2	1:B:84:MET:CE	2.30	0.60
1:C:77:VAL:HG12	1:C:78:PRO:HD2	1.82	0.60
1:C:261:LYS:CB	1:C:262:ARG:HB3	2.31	0.60
1:A:434:GLU:CD	1:C:435:ARG:HH21	2.10	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:262:ARG:HG3	1:C:263:GLY:N	2.17	0.59
1:C:293:PRO:HG3	1:C:385:ILE:HA	1.85	0.59
1:A:293:PRO:HG3	1:A:385:ILE:HA	1.83	0.59
1:C:178:ILE:O	1:C:253:PRO:HG3	2.03	0.59
1:A:320:LEU:HD23	1:A:320:LEU:H	1.68	0.58
1:B:261:LYS:CA	1:B:262:ARG:CB	2.81	0.58
1:B:309:VAL:HG22	1:B:422:THR:HA	1.85	0.58
1:C:320:LEU:H	1:C:320:LEU:HD23	1.69	0.58
1:B:178:ILE:O	1:B:253:PRO:HG3	2.04	0.58
1:B:283:THR:HG22	1:B:301:THR:HG22	1.86	0.57
1:B:77:VAL:HG12	1:B:78:PRO:HD2	1.85	0.57
1:A:435:ARG:NH1	1:B:435:ARG:HH11	2.02	0.57
1:A:309:VAL:HG13	1:A:311:SER:H	1.70	0.57
1:B:320:LEU:HD23	1:B:320:LEU:H	1.70	0.56
1:C:309:VAL:HG13	1:C:311:SER:H	1.71	0.56
1:B:7:ILE:HA	1:B:355:HIS:HA	1.88	0.56
1:B:348:ASP:HB2	1:B:365:ALA:CB	2.36	0.56
1:B:493:GLU:HA	1:B:494:GLU:HB2	1.87	0.56
1:B:211:ARG:NH1	1:C:216:ILE:O	2.39	0.55
1:B:491:TYR:N	1:B:492:GLU:C	2.65	0.55
1:A:480:SER:HB2	1:A:485:THR:HB	1.89	0.55
1:A:53:PRO:HG2	1:A:84:MET:CE	2.33	0.54
1:A:413:MET:HE1	1:B:412:LYS:HG3	1.87	0.54
1:B:8:CYS:O	1:B:353:TYR:HA	2.07	0.54
1:C:309:VAL:CG2	1:C:422:THR:HA	2.38	0.54
1:A:191:ARG:NH2	1:A:197:VAL:HG21	2.23	0.54
1:B:309:VAL:HG13	1:B:311:SER:H	1.71	0.54
1:C:348:ASP:HB2	1:C:365:ALA:CB	2.38	0.54
1:B:265:SER:OG	1:B:266:GLY:N	2.42	0.53
1:B:480:SER:HB2	1:B:485:THR:HB	1.90	0.53
1:A:480:SER:HB2	1:A:486:TYR:H	1.74	0.53
1:B:480:SER:HB2	1:B:486:TYR:H	1.73	0.53
1:B:488:TYR:HB3	1:B:489:PRO:CD	2.39	0.53
1:B:9:ILE:HD11	1:B:451:VAL:HG21	1.92	0.52
1:B:413:MET:HE1	1:C:412:LYS:HG3	1.91	0.52
1:C:53:PRO:HG2	1:C:84:MET:CE	2.36	0.52
1:C:53:PRO:HG3	1:C:82:TYR:CZ	2.44	0.52
1:B:191:ARG:NH2	1:B:197:VAL:HG21	2.25	0.52
1:C:310:LYS:HG3	1:C:418:LEU:HD21	1.91	0.52
1:C:248:GLY:C	1:C:249:ASN:HD22	2.17	0.52
1:A:248:GLY:C	1:A:249:ASN:HD22	2.18	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:435:ARG:HH21	1:B:434:GLU:CD	2.18	0.52
1:C:323:VAL:HG21	1:C:336:ALA:HB2	1.91	0.52
1:A:348:ASP:HB2	1:A:365:ALA:CB	2.36	0.51
1:B:12:HIS:HB2	1:B:349:GLY:O	2.10	0.51
1:C:191:ARG:NH2	1:C:197:VAL:HG21	2.24	0.51
1:A:18:GLU:HG2	1:A:33:ALA:HB3	1.93	0.51
1:A:53:PRO:HG3	1:A:82:TYR:CZ	2.45	0.51
1:B:435:ARG:HH21	1:C:434:GLU:CD	2.18	0.51
1:B:489:PRO:O	1:B:490:LYS:CB	2.58	0.51
1:C:179:TRP:CE2	1:C:203:VAL:HG21	2.46	0.51
1:C:201:VAL:HG22	1:C:250:LEU:HB2	1.93	0.51
1:B:53:PRO:HG3	1:B:82:TYR:CZ	2.46	0.50
1:B:490:LYS:CA	1:B:491:TYR:CB	2.89	0.50
1:C:265:SER:OG	1:C:266:GLY:N	2.45	0.50
1:A:211:ARG:NH1	1:B:216:ILE:O	2.44	0.50
1:A:216:ILE:O	1:C:211:ARG:NH1	2.44	0.50
1:A:309:VAL:CG2	1:A:422:THR:HA	2.41	0.50
1:A:448:TYR:HE1	1:A:465:GLY:HA2	1.76	0.50
1:B:10:GLY:HA3	1:B:343:TRP:CH2	2.46	0.50
1:B:435:ARG:NH1	1:C:435:ARG:HH11	2.09	0.50
1:B:174:GLN:OE1	1:B:235:LEU:HD13	2.11	0.49
1:A:65:LEU:HD11	1:A:109:LEU:HD21	1.95	0.49
1:B:51:ILE:CD1	1:B:262:ARG:HH22	2.25	0.49
1:B:261:LYS:CB	1:B:262:ARG:HB3	2.41	0.49
1:B:489:PRO:O	1:B:490:LYS:HB3	2.12	0.49
1:A:111:SER:HB2	1:A:265:SER:CB	2.41	0.49
1:A:179:TRP:CE2	1:A:203:VAL:HG21	2.48	0.49
1:B:201:VAL:HG22	1:B:250:LEU:HB2	1.94	0.49
1:C:307:LYS:HG2	1:C:421:TRP:CE2	2.48	0.49
1:B:65:LEU:HD11	1:B:109:LEU:HD21	1.94	0.49
1:B:111:SER:HB2	1:B:265:SER:CB	2.41	0.49
1:C:65:LEU:HD11	1:C:109:LEU:HD21	1.93	0.49
1:B:140:VAL:O	1:B:141:SER:HB2	2.13	0.48
1:B:248:GLY:C	1:B:249:ASN:HD22	2.20	0.48
1:C:8:CYS:C	1:C:9:ILE:HD12	2.38	0.48
1:C:357:ASN:HD21	1:C:474:ASP:HA	1.78	0.48
1:B:23:ILE:HG12	1:B:430:LEU:HB3	1.96	0.48
1:B:66:LEU:O	1:B:149:ASN:HB2	2.14	0.48
1:B:320:LEU:HB3	1:B:440:HIS:CG	2.48	0.48
1:A:174:GLN:OE1	1:A:235:LEU:HD13	2.14	0.48
1:B:487:ASP:OD1	1:B:487:ASP:C	2.56	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:435:ARG:HH11	1:C:435:ARG:NH1	2.12	0.48
1:B:179:TRP:CE2	1:B:203:VAL:HG21	2.48	0.48
1:A:265:SER:OG	1:A:266:GLY:N	2.44	0.47
1:A:276:ASN:CG	1:A:276:ASN:O	2.57	0.47
1:B:448:TYR:HE1	1:B:465:GLY:HA2	1.77	0.47
1:A:357:ASN:HD21	1:A:474:ASP:HA	1.79	0.47
1:A:310:LYS:HG3	1:A:418:LEU:HD21	1.97	0.47
1:C:20:VAL:HG21	1:C:317:ALA:HB2	1.97	0.47
1:C:174:GLN:OE1	1:C:235:LEU:HD13	2.14	0.47
1:C:111:SER:HB2	1:C:265:SER:CB	2.42	0.47
1:C:18:GLU:HG2	1:C:33:ALA:HB3	1.97	0.47
1:B:18:GLU:HG2	1:B:33:ALA:HB3	1.97	0.46
1:B:163:ALA:O	1:B:245:GLU:HA	2.14	0.46
1:B:409:LEU:O	1:B:409:LEU:HD23	2.15	0.46
1:C:299:PRO:O	1:C:395:VAL:HG11	2.14	0.46
1:A:163:ALA:O	1:A:245:GLU:HA	2.14	0.46
1:B:20:VAL:HG21	1:B:317:ALA:HB2	1.97	0.46
1:B:248:GLY:O	1:B:249:ASN:HB2	2.16	0.46
1:B:357:ASN:HD21	1:B:474:ASP:HA	1.79	0.46
1:B:383:SER:OG	1:C:26:ARG:NH2	2.48	0.46
1:A:20:VAL:HG21	1:A:317:ALA:HB2	1.96	0.46
1:B:51:ILE:HD13	1:B:262:ARG:HH22	1.82	0.45
1:C:66:LEU:O	1:C:149:ASN:HB2	2.15	0.45
1:C:182:HIS:O	1:C:184:PRO:HD3	2.16	0.45
1:B:488:TYR:O	1:B:490:LYS:N	2.49	0.45
1:C:23:ILE:HG12	1:C:430:LEU:HB3	1.98	0.45
1:C:57:GLY:O	1:C:86:LYS:HG3	2.17	0.45
1:A:201:VAL:HG22	1:A:250:LEU:HB2	1.99	0.45
1:C:155:GLU:OE1	1:C:195:GLN:HG2	2.16	0.45
1:C:163:ALA:O	1:C:245:GLU:HA	2.15	0.45
1:C:276:ASN:CG	1:C:276:ASN:O	2.59	0.45
1:B:490:LYS:HD2	1:B:490:LYS:O	2.16	0.45
1:C:248:GLY:O	1:C:249:ASN:HB2	2.16	0.45
1:A:140:VAL:O	1:A:141:SER:HB2	2.16	0.45
1:B:74:LEU:HD23	1:B:74:LEU:HA	1.86	0.44
1:B:275:GLU:O	1:B:276:ASN:HB3	2.17	0.44
1:A:157:GLY:O	1:A:158:SER:CB	2.61	0.44
1:B:454:GLN:NE2	1:B:486:TYR:HB3	2.31	0.44
1:B:160:TYR:CZ	1:B:248:GLY:HA2	2.51	0.44
1:A:57:GLY:O	1:A:86:LYS:HG3	2.18	0.44
1:A:292:LEU:HA	1:A:293:PRO:HD3	1.87	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:307:LYS:HG2	1:A:421:TRP:CE2	2.53	0.44
1:B:276:ASN:CG	1:B:276:ASN:O	2.59	0.43
1:A:155:GLU:OE1	1:A:195:GLN:HG2	2.18	0.43
1:A:387:LYS:HD2	1:B:426:GLU:HB3	1.99	0.43
1:C:160:TYR:CZ	1:C:248:GLY:HA2	2.53	0.43
1:A:182:HIS:O	1:A:184:PRO:HD3	2.18	0.43
1:A:275:GLU:O	1:A:276:ASN:HB3	2.19	0.43
1:B:307:LYS:HG2	1:B:421:TRP:CE2	2.54	0.43
1:C:77:VAL:HG12	1:C:78:PRO:CD	2.49	0.43
1:C:292:LEU:HA	1:C:293:PRO:HD3	1.86	0.43
1:B:487:ASP:CA	1:B:488:TYR:CB	2.96	0.43
1:C:227:SER:C	1:C:228:ARG:HG2	2.44	0.43
1:A:409:LEU:HD23	1:A:409:LEU:O	2.19	0.42
1:B:14:ASN:OD1	1:B:16:SER:HB3	2.19	0.42
1:C:14:ASN:OD1	1:C:16:SER:HB3	2.19	0.42
1:B:488:TYR:HB3	1:B:489:PRO:HD2	2.00	0.42
1:C:140:VAL:O	1:C:141:SER:HB2	2.19	0.42
1:C:307:LYS:HG2	1:C:421:TRP:CD2	2.54	0.42
1:B:235:LEU:HD23	1:B:235:LEU:HA	1.90	0.42
1:C:53:PRO:HG3	1:C:82:TYR:CE2	2.54	0.42
1:A:160:TYR:CZ	1:A:248:GLY:HA2	2.54	0.42
1:C:157:GLY:O	1:C:158:SER:CB	2.61	0.42
1:A:307:LYS:HG2	1:A:421:TRP:CD2	2.55	0.42
1:A:66:LEU:O	1:A:149:ASN:HB2	2.19	0.42
1:C:74:LEU:HD23	1:C:74:LEU:HA	1.85	0.42
1:B:262:ARG:CG	1:B:263:GLY:N	2.80	0.42
1:A:26:ARG:NH2	1:C:383:SER:OG	2.53	0.42
1:B:51:ILE:HA	1:B:52:PRO:HD3	1.83	0.42
1:C:38:GLU:O	1:C:295:HIS:HA	2.20	0.42
1:B:84:MET:HE1	1:B:274:LEU:HB2	2.02	0.41
1:C:51:ILE:HA	1:C:52:PRO:HD3	1.82	0.41
1:B:490:LYS:N	1:B:491:TYR:CB	2.75	0.41
1:A:320:LEU:HD23	1:A:320:LEU:N	2.35	0.41
1:B:155:GLU:OE1	1:B:195:GLN:HG2	2.20	0.41
1:C:261:LYS:CA	1:C:262:ARG:HB3	2.48	0.41
1:A:53:PRO:HG3	1:A:82:TYR:CE2	2.55	0.41
1:A:227:SER:C	1:A:228:ARG:HG2	2.46	0.41
1:A:383:SER:OG	1:B:26:ARG:NH2	2.52	0.41
1:A:117:LYS:HD3	1:A:255:TYR:CD2	2.55	0.41
1:B:493:GLU:CB	1:B:495:SER:O	2.68	0.41
1:C:215:ASP:O	1:C:219:ARG:NH2	2.53	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:413:MET:HE1	1:B:412:LYS:CG	2.50	0.41
1:C:275:GLU:O	1:C:276:ASN:HB3	2.20	0.41
1:A:77:VAL:HG12	1:A:78:PRO:CD	2.49	0.41
1:A:248:GLY:O	1:A:249:ASN:HB2	2.21	0.41
1:B:202:SER:OG	1:C:217:ALA:HB2	2.21	0.41
1:B:227:SER:C	1:B:228:ARG:HG2	2.46	0.41
1:B:65:LEU:HD11	1:B:109:LEU:CD2	2.51	0.41
1:C:323:VAL:HA	1:C:324:PRO:HD3	1.84	0.41
1:C:409:LEU:HD23	1:C:409:LEU:O	2.21	0.41
1:A:469:PHE:HB3	1:A:471:HIS:O	2.21	0.41
1:B:487:ASP:OD2	1:B:489:PRO:CD	2.64	0.41
1:C:448:TYR:HE1	1:C:465:GLY:HA2	1.78	0.41
1:C:469:PHE:HB3	1:C:471:HIS:O	2.20	0.41
1:B:389:ASN:HD21	1:C:310:LYS:NZ	2.18	0.41
1:A:117:LYS:HD3	1:A:255:TYR:CG	2.56	0.40
1:B:57:GLY:O	1:B:86:LYS:HG3	2.21	0.40
1:B:409:LEU:HD23	1:B:409:LEU:C	2.47	0.40
1:A:299:PRO:O	1:A:395:VAL:HG11	2.21	0.40
1:A:454:GLN:NE2	1:A:486:TYR:HB3	2.36	0.40
1:B:331:LEU:HD22	1:B:438:ASP:OD2	2.21	0.40
1:A:84:MET:HE1	1:A:274:LEU:HB2	2.04	0.40
1:A:85:GLU:O	1:A:269:LYS:HA	2.21	0.40
1:C:10:GLY:N	1:C:343:TRP:CH2	2.89	0.40
1:C:117:LYS:HD3	1:C:255:TYR:CD2	2.56	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 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	470/506 (93%)	439 (93%)	23 (5%)	8 (2%)	7 19

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	482/506 (95%)	444 (92%)	23 (5%)	15 (3%)	3	8
1	C	463/506 (92%)	434 (94%)	24 (5%)	5 (1%)	11	29
All	All	1415/1518 (93%)	1317 (93%)	70 (5%)	28 (2%)	6	16

All (28) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	262	ARG
1	A	485	THR
1	A	486	TYR
1	B	262	ARG
1	B	485	THR
1	B	486	TYR
1	B	488	TYR
1	B	490	LYS
1	B	491	TYR
1	C	262	ARG
1	A	158	SER
1	B	158	SER
1	B	487	ASP
1	B	492	GLU
1	C	158	SER
1	A	263	GLY
1	B	263	GLY
1	B	489	PRO
1	C	263	GLY
1	C	264	SER
1	A	264	SER
1	B	264	SER
1	A	355	HIS
1	B	355	HIS
1	C	355	HIS
1	A	76	SER
1	B	76	SER
1	B	494	GLU

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	412/443 (93%)	386 (94%)	26 (6%)	16	39
1	B	424/443 (96%)	396 (93%)	28 (7%)	15	36
1	C	407/443 (92%)	383 (94%)	24 (6%)	18	42
All	All	1243/1329 (94%)	1165 (94%)	78 (6%)	16	39

All (78) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	23	ILE
1	A	26	ARG
1	A	34	LYS
1	A	40	THR
1	A	73	ARG
1	A	75	LEU
1	A	77	VAL
1	A	109	LEU
1	A	112	VAL
1	A	118	VAL
1	A	131	THR
1	A	140	VAL
1	A	153	LEU
1	A	192	THR
1	A	197	VAL
1	A	202	SER
1	A	261	LYS
1	A	309	VAL
1	A	347	ILE
1	A	348	ASP
1	A	351	TYR
1	A	355	HIS
1	A	390	THR
1	A	391	GLN
1	A	434	GLU
1	A	487	ASP
1	B	23	ILE
1	B	34	LYS
1	B	40	THR
1	B	73	ARG
1	B	75	LEU

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Mol	Chain	Res	Type
1	B	77	VAL
1	B	109	LEU
1	B	112	VAL
1	B	118	VAL
1	B	131	THR
1	B	140	VAL
1	B	153	LEU
1	B	192	THR
1	B	197	VAL
1	B	202	SER
1	B	261	LYS
1	B	309	VAL
1	B	347	ILE
1	B	348	ASP
1	B	351	TYR
1	B	355	HIS
1	B	390	THR
1	B	391	GLN
1	B	434	GLU
1	B	487	ASP
1	B	490	LYS
1	B	491	TYR
1	B	494	GLU
1	C	23	ILE
1	C	34	LYS
1	C	40	THR
1	C	73	ARG
1	C	75	LEU
1	C	77	VAL
1	C	109	LEU
1	C	112	VAL
1	C	118	VAL
1	C	131	THR
1	C	140	VAL
1	C	153	LEU
1	C	192	THR
1	C	197	VAL
1	C	202	SER
1	C	261	LYS
1	C	309	VAL
1	C	347	ILE
1	C	348	ASP

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Mol	Chain	Res	Type
1	C	351	TYR
1	C	355	HIS
1	C	390	THR
1	C	391	GLN
1	C	434	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (36) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	49	ASN
1	A	129	HIS
1	A	159	ASN
1	A	190	GLN
1	A	196	ASN
1	A	249	ASN
1	A	359	GLN
1	A	389	ASN
1	A	391	GLN
1	A	410	ASN
1	A	458	ASN
1	B	41	HIS
1	B	49	ASN
1	B	129	HIS
1	B	159	ASN
1	B	190	GLN
1	B	196	ASN
1	B	249	ASN
1	B	359	GLN
1	B	389	ASN
1	B	391	GLN
1	B	410	ASN
1	B	458	ASN
1	C	49	ASN
1	C	129	HIS
1	C	159	ASN
1	C	190	GLN
1	C	196	ASN
1	C	249	ASN
1	C	295	HIS
1	C	357	ASN
1	C	359	GLN
1	C	389	ASN

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Mol	Chain	Res	Type
1	C	391	GLN
1	C	410	ASN
1	C	458	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.

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(Å ²)	Q<0.9
1	A	474/506 (93%)	0.93	60 (12%) 8 7	53, 102, 156, 202	0
1	B	486/506 (96%)	0.75	52 (10%) 11 9	48, 81, 126, 181	0
1	C	467/506 (92%)	0.84	51 (10%) 10 9	54, 100, 178, 279	0
All	All	1427/1518 (94%)	0.84	163 (11%) 10 8	48, 94, 156, 279	0

All (163) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	324	PRO	5.4
1	B	458	ASN	5.3
1	A	217	ALA	4.9
1	B	216	ILE	4.9
1	A	386	GLU	4.6
1	B	217	ALA	4.5
1	B	453	MET	4.5
1	B	491	TYR	4.4
1	C	360	GLY	4.3
1	B	495	SER	4.1
1	B	215	ASP	4.0
1	B	487	ASP	3.9
1	C	75	LEU	3.9
1	A	487	ASP	3.9
1	C	141	SER	3.9
1	C	157	GLY	3.8
1	C	365	ALA	3.7
1	B	493	GLU	3.6
1	C	390	THR	3.5
1	C	478	MET	3.5
1	A	470	TYR	3.4
1	B	131	THR	3.4
1	C	172	GLY	3.4

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Mol	Chain	Res	Type	RSRZ
1	A	127	THR	3.4
1	B	157	GLY	3.3
1	A	138	CYS	3.3
1	C	7	ILE	3.3
1	C	458	ASN	3.3
1	A	460	LYS	3.2
1	C	364	ALA	3.2
1	B	168	ASN	3.2
1	B	246	SER	3.2
1	C	215	ASP	3.1
1	B	479	ASN	3.1
1	C	185	ASN	3.0
1	C	142	GLY	3.0
1	A	13	ALA	3.0
1	B	368	GLU	3.0
1	A	359	GLN	3.0
1	B	263	GLY	3.0
1	C	138	CYS	3.0
1	A	358	ASP	3.0
1	A	263	GLY	3.0
1	B	494	GLU	2.9
1	B	163	ALA	2.9
1	B	239	TRP	2.9
1	A	9	ILE	2.9
1	C	168	ASN	2.9
1	A	46	CYS	2.9
1	C	460	LYS	2.8
1	C	355	HIS	2.8
1	A	185	ASN	2.8
1	A	357	ASN	2.8
1	A	323	VAL	2.8
1	A	364	ALA	2.8
1	A	42	ASN	2.8
1	A	355	HIS	2.8
1	B	160	TYR	2.8
1	A	342	GLY	2.7
1	A	452	ARG	2.7
1	C	467	PHE	2.7
1	C	359	GLN	2.7
1	A	239	TRP	2.7
1	A	469	PHE	2.7
1	C	144	PRO	2.7

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Mol	Chain	Res	Type	RSRZ
1	C	391	GLN	2.7
1	A	289	ASN	2.7
1	C	127	THR	2.7
1	A	362	GLY	2.6
1	A	462	LEU	2.6
1	A	133	GLY	2.6
1	A	27	ASN	2.6
1	A	218	THR	2.6
1	C	453	MET	2.6
1	A	75	LEU	2.6
1	A	195	GLN	2.6
1	C	347	ILE	2.6
1	A	353	TYR	2.6
1	A	134	GLY	2.6
1	C	394	ALA	2.6
1	A	360	GLY	2.5
1	B	198	GLY	2.5
1	B	492	GLU	2.5
1	A	337	GLY	2.5
1	B	162	VAL	2.5
1	B	483	ASN	2.5
1	B	186	ASP	2.5
1	C	354	HIS	2.5
1	A	434	GLU	2.5
1	A	332	PHE	2.5
1	C	469	PHE	2.5
1	A	213	THR	2.4
1	A	197	VAL	2.4
1	B	262	ARG	2.4
1	C	15	ASN	2.4
1	B	212	SER	2.4
1	A	124	ASP	2.4
1	B	197	VAL	2.4
1	B	188	THR	2.4
1	B	218	THR	2.4
1	A	12	HIS	2.4
1	B	138	CYS	2.4
1	C	239	TRP	2.4
1	B	142	GLY	2.4
1	A	486	TYR	2.4
1	B	189	GLU	2.4
1	C	473	CYS	2.4

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Mol	Chain	Res	Type	RSRZ
1	C	90	ARG	2.4
1	B	394	ALA	2.4
1	B	347	ILE	2.3
1	A	131	THR	2.3
1	C	238	MET	2.3
1	C	412	LYS	2.3
1	A	324	PRO	2.3
1	A	204	GLY	2.3
1	A	216	ILE	2.3
1	B	357	ASN	2.3
1	A	142	GLY	2.3
1	A	71	CYS	2.3
1	C	196	ASN	2.3
1	C	240	ASP	2.3
1	B	125	ARG	2.3
1	A	163	ALA	2.3
1	B	488	TYR	2.3
1	B	356	SER	2.3
1	A	113	LYS	2.2
1	A	192	THR	2.2
1	B	485	THR	2.2
1	B	249	ASN	2.2
1	C	73	ARG	2.2
1	B	490	LYS	2.2
1	C	129	HIS	2.2
1	C	27	ASN	2.2
1	A	286	GLY	2.2
1	A	482	LYS	2.2
1	A	459	VAL	2.2
1	B	140	VAL	2.2
1	C	13	ALA	2.2
1	B	277	CYS	2.2
1	A	485	THR	2.1
1	A	128	GLN	2.1
1	B	88	ASN	2.1
1	C	463	GLY	2.1
1	C	471	HIS	2.1
1	B	185	ASN	2.1
1	B	401	ASN	2.1
1	C	344	GLN	2.1
1	C	256	GLY	2.1
1	C	349	GLY	2.1

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Mol	Chain	Res	Type	RSRZ
1	B	264	SER	2.1
1	A	44	LYS	2.1
1	C	121	LEU	2.1
1	A	354	HIS	2.1
1	B	159	ASN	2.1
1	A	159	ASN	2.0
1	C	357	ASN	2.0
1	B	451	VAL	2.0
1	C	472	LYS	2.0
1	B	369	SER	2.0
1	A	276	ASN	2.0
1	C	276	ASN	2.0
1	C	362	GLY	2.0
1	C	11	TYR	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.