



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 02:53 AM UTC

PDB ID : 5ID6 / pdb_00005id6
Title : Structure of Cpf1/RNA Complex
Authors : Dong, D.; Ren, K.; Qiu, X.; Wang, J.; Huang, Z.
Deposited on : 2016-02-24
Resolution : 2.38 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
Mogul : 2022.3.0, CSD as543be (2022)
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

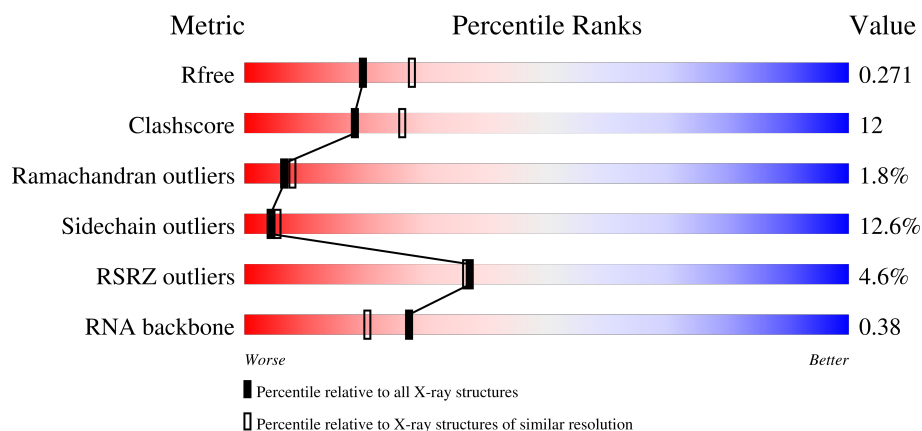
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.38 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	7164 (2.40-2.36)
Clashscore	190562	7722 (2.40-2.36)
Ramachandran outliers	187476	7626 (2.40-2.36)
Sidechain outliers	187428	7627 (2.40-2.36)
RSRZ outliers	180081	7170 (2.40-2.36)
RNA backbone	3983	1016 (2.66-2.10)

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	1228	5% 66% 26% 6% ••
2	G	21	62% 29% 5% 5%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 10400 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 Cpf1.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	1209	Total	C	N	O	S	Se	0	0	0
			9949	6407	1632	1882	9	19			

- Molecule 2 is a RNA chain called RNA (5'-R(P*AP*AP*UP*UP*UP*CP*UP*AP*CP*UP*AP*AP*GP*UP*GP*UP*AP*GP*AP*UP*C)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	G	21	Total	C	N	O	P	0	0	0
			443	199	75	148	21			

- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Mg	0	0
			1	1		
3	G	1	Total	Mg	0	0
			1	1		

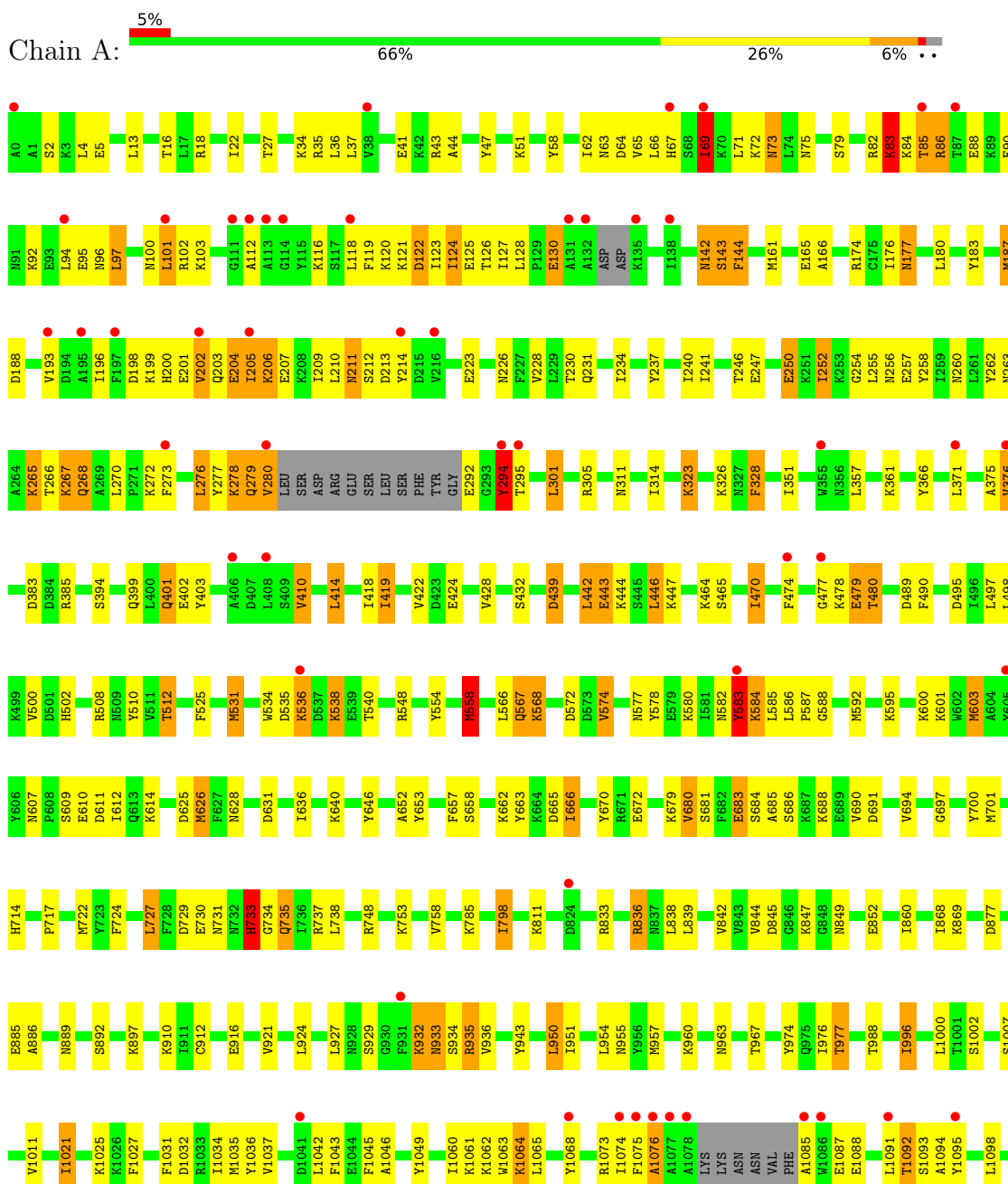
- Molecule 4 is water.

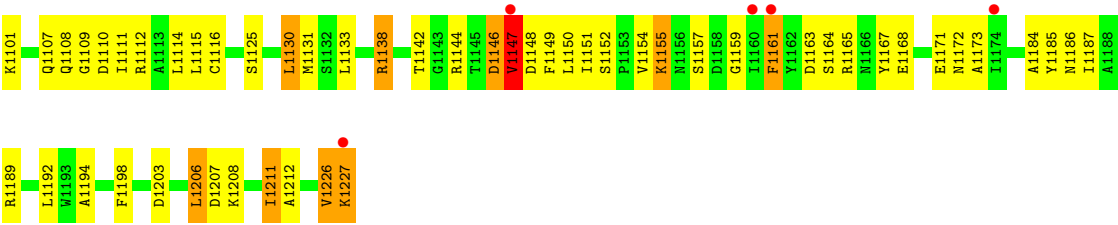
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	G	6	Total	O	0	0
			6	6		

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 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: Cpf1





● Molecule 2: RNA (5'-R(P*AP*AP*UP*UP*UP*CP*UP*AP*CP*UP*AP*AP*GP*UP*GP*UP*AP*GP*AP*UP*C)-3')



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	168.35Å 83.01Å 124.09Å 90.00° 106.72° 90.00°	Depositor
Resolution (Å)	41.51 – 2.38 41.51 – 2.38	Depositor EDS
% Data completeness (in resolution range)	97.8 (41.51-2.38) 97.6 (41.51-2.38)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.32 (at 2.39Å)	Xtriage
Refinement program	PHENIX 1.8_1069	Depositor
R, R_{free}	0.202 , 0.261 0.214 , 0.271	Depositor DCC
R_{free} test set	3272 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å ²)	58.3	Xtriage
Anisotropy	0.144	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 51.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	10400	wwPDB-VP
Average B, all atoms (Å ²)	82.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.78% 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](#)

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

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	0.62	12/10136 (0.1%)	0.98	26/13584 (0.2%)
2	G	0.54	0/494	0.80	1/766 (0.1%)
All	All	0.62	12/10630 (0.1%)	0.97	27/14350 (0.2%)

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	2

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	531	MSE	SE-CE	-7.17	1.74	1.95
1	A	558	MSE	SE-CE	-5.91	1.77	1.95
1	A	592	MSE	SE-CE	-5.54	1.78	1.95
1	A	187	MSE	SE-CE	-5.51	1.78	1.95
1	A	531	MSE	CG-SE	-5.48	1.79	1.95
1	A	592	MSE	CG-SE	-5.43	1.79	1.95
1	A	603	MSE	SE-CE	-5.36	1.79	1.95
1	A	161	MSE	SE-CE	-5.31	1.79	1.95
1	A	187	MSE	CG-SE	-5.20	1.79	1.95
1	A	626	MSE	SE-CE	-5.19	1.79	1.95
1	A	603	MSE	CG-SE	-5.17	1.79	1.95
1	A	558	MSE	CG-SE	-5.05	1.80	1.95

All (27) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	583	TYR	N-CA-C	12.77	126.98	111.02
1	A	734	GLY	N-CA-C	10.49	138.05	113.18
1	A	1147	VAL	N-CA-C	7.88	119.14	108.11
1	A	142	ASN	CA-C-N	7.62	135.41	121.70
1	A	142	ASN	C-N-CA	7.62	135.41	121.70
1	A	538	LYS	N-CA-C	-7.32	102.34	112.30
1	A	929	SER	N-CA-C	-7.07	104.59	112.57
1	A	142	ASN	N-CA-C	6.76	122.45	111.37
1	A	733	HIS	N-CA-C	-6.43	104.48	112.90
1	A	22	ILE	N-CA-C	6.40	113.38	107.56
1	A	267	LYS	N-CA-C	-6.38	103.23	111.02
1	A	933	ASN	N-CA-C	6.22	118.98	107.60
1	A	646	TYR	CA-C-N	6.11	125.60	119.24
1	A	646	TYR	C-N-CA	6.11	125.60	119.24
1	A	69	ILE	N-CA-C	6.06	116.65	108.17
1	A	241	ILE	CB-CA-C	-5.99	104.14	111.87
1	A	1161	PHE	N-CA-C	5.97	118.92	110.14
1	A	144	PHE	N-CA-C	-5.97	104.12	113.02
1	A	1159	GLY	N-CA-C	5.93	119.92	113.58
1	A	90	GLU	N-CA-C	-5.85	105.04	111.82
1	A	250	GLU	N-CA-C	5.63	117.09	111.07
2	G	20	G	C5'-C4'-C3'	-5.49	107.77	116.00
1	A	64	ASP	N-CA-C	-5.46	106.30	113.12
1	A	112	ALA	N-CA-C	5.46	115.33	108.45
1	A	294	TYR	N-CA-C	5.17	121.81	110.80
1	A	375	ALA	CB-CA-C	-5.05	110.73	116.54
1	A	294	TYR	CA-CB-CG	5.03	122.95	113.90

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	583	TYR	Peptide
1	A	733	HIS	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	9949	0	9908	243	1
2	G	443	0	224	8	0
3	A	1	0	0	0	0
3	G	1	0	0	0	0
4	G	6	0	0	0	0
All	All	10400	0	10132	248	1

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 (248) 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:536:LYS:NZ	1:A:653:TYR:OH	1.97	0.97
1:A:279:GLN:HG2	1:A:280:VAL:HG13	1.48	0.95
1:A:658:SER:HB3	1:A:662:LYS:HE2	1.52	0.88
1:A:933:ASN:O	1:A:935:ARG:N	2.07	0.86
1:A:1073:ARG:HD3	1:A:1133:LEU:HD21	1.58	0.85
1:A:583:TYR:HA	1:A:584:LYS:HD3	1.61	0.82
2:G:20:G:H5"	2:G:20:G:H8	1.43	0.82
1:A:735:GLN:OE1	1:A:737:ARG:NE	2.12	0.80
1:A:531:MSE:HE3	1:A:534:TRP:CH2	2.16	0.80
1:A:207:GLU:O	1:A:212:SER:N	2.12	0.79
1:A:263:ASN:HA	1:A:268:GLN:HG2	1.64	0.79
1:A:442:LEU:HD11	1:A:446:LEU:HD13	1.65	0.79
1:A:231:GLN:HB2	1:A:278:LYS:HZ2	1.48	0.78
1:A:558:MSE:HE2	1:A:566:LEU:HD12	1.64	0.78
1:A:439:ASP:OD1	1:A:439:ASP:N	2.17	0.75
1:A:531:MSE:HE3	1:A:534:TRP:HH2	1.52	0.74
1:A:566:LEU:O	1:A:580:LYS:NZ	2.15	0.73
1:A:142:ASN:N	1:A:143:SER:HB3	2.04	0.72
1:A:1163:ASP:OD2	1:A:1165:ARG:NH2	2.22	0.71
1:A:833:ARG:HH12	1:A:932:LYS:HD3	1.56	0.70
1:A:27:THR:HG21	1:A:701:MSE:H	1.58	0.69
1:A:272:LYS:NZ	1:A:489:ASP:OD1	2.26	0.69
1:A:833:ARG:HH22	1:A:932:LYS:HE3	1.57	0.69
1:A:314:ILE:HD13	1:A:500:VAL:HG12	1.75	0.68
1:A:63:ASN:ND2	1:A:231:GLN:OE1	2.27	0.68
1:A:205:ILE:HB	1:A:252:ILE:HD13	1.75	0.67
1:A:1155:LYS:HA	1:A:1161:PHE:HB3	1.77	0.67
1:A:73:ASN:HD21	1:A:97:LEU:HG	1.60	0.67
1:A:1021:ILE:HD11	1:A:1025:LYS:HE3	1.76	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:361:LYS:NZ	1:A:403:TYR:O	2.21	0.67
1:A:203:GLN:O	1:A:207:GLU:HB3	1.95	0.66
1:A:912:CYS:HA	1:A:957:MSE:HE2	1.78	0.66
1:A:1036:TYR:HB2	1:A:1043:PHE:CE1	2.31	0.65
1:A:206:LYS:O	1:A:210:LEU:HB2	1.97	0.65
1:A:326:LYS:HD3	1:A:419:ILE:HD11	1.79	0.63
1:A:785:LYS:HB2	2:G:3:A:H5''	1.81	0.63
1:A:1165:ARG:HA	1:A:1168:GLU:HB2	1.82	0.62
2:G:20:G:H5''	2:G:20:G:C8	2.30	0.62
1:A:1186:ASN:OD1	1:A:1189:ARG:NH1	2.31	0.62
1:A:27:THR:CG2	1:A:701:MSE:H	2.14	0.61
1:A:733:HIS:O	1:A:735:GLN:HB2	1.99	0.61
1:A:582:ASN:ND2	1:A:583:TYR:H	1.98	0.61
1:A:201:GLU:HB3	1:A:258:TYR:CE2	2.36	0.61
1:A:583:TYR:HE1	1:A:681:SER:O	1.84	0.61
1:A:200:HIS:HA	1:A:204:GLU:HG3	1.82	0.61
1:A:584:LYS:HB3	1:A:653:TYR:CE1	2.35	0.61
1:A:535:ASP:O	1:A:584:LYS:N	2.30	0.60
1:A:79:SER:O	1:A:83:LYS:HD3	2.02	0.60
1:A:1226:VAL:O	1:A:1227:LYS:NZ	2.35	0.60
1:A:572:ASP:OD2	1:A:574:VAL:N	2.33	0.59
1:A:209:ILE:HG21	1:A:246:THR:HG22	1.84	0.59
1:A:1138:ARG:NH1	1:A:1148:ASP:OD2	2.36	0.59
1:A:477:GLY:HA3	1:A:479:GLU:HB2	1.83	0.59
1:A:301:LEU:HD23	1:A:305:ARG:HD2	1.83	0.59
1:A:1000:LEU:HD22	1:A:1011:VAL:HG21	1.86	0.58
1:A:1076:ALA:HA	1:A:1085:ALA:HB1	1.85	0.58
1:A:211:ASN:N	1:A:211:ASN:OD1	2.37	0.58
1:A:955:ASN:OD1	1:A:977:THR:HG22	2.03	0.57
1:A:79:SER:HB3	1:A:83:LYS:NZ	2.19	0.57
2:G:20:G:H2'	2:G:21:A:O4'	2.03	0.57
1:A:34:LYS:NZ	1:A:697:GLY:O	2.37	0.57
1:A:628:ASN:HB3	1:A:631:ASP:HB2	1.86	0.57
1:A:256:ASN:HD21	1:A:273:PHE:H	1.50	0.57
1:A:418:ILE:HG12	1:A:470:ILE:HD11	1.86	0.57
1:A:237:TYR:HA	1:A:240:ILE:HD12	1.87	0.56
1:A:63:ASN:OD1	1:A:231:GLN:NE2	2.37	0.56
1:A:75:ASN:ND2	1:A:223:GLU:OE2	2.38	0.56
1:A:724:PHE:O	1:A:727:LEU:HB2	2.06	0.56
1:A:73:ASN:HB3	1:A:101:LEU:HD13	1.88	0.56
1:A:1091:LEU:O	1:A:1094:ALA:N	2.35	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:G:14:A:H8	2:G:14:A:H5"	1.71	0.56
1:A:1198:PHE:CE1	1:A:1211:ILE:HD11	2.41	0.56
1:A:120:LYS:O	1:A:123:ILE:HG22	2.06	0.56
1:A:572:ASP:HB2	1:A:577:ASN:HD21	1.70	0.56
1:A:1150:LEU:H	1:A:1164:SER:HB2	1.71	0.56
1:A:954:LEU:HD11	1:A:957:MSE:HE3	1.87	0.55
1:A:1144:ARG:HG2	1:A:1146:ASP:HB2	1.89	0.55
1:A:1185:TYR:CZ	1:A:1189:ARG:HD2	2.41	0.55
1:A:1068:TYR:OH	1:A:1161:PHE:N	2.40	0.55
1:A:536:LYS:HZ3	1:A:585:LEU:C	2.14	0.55
1:A:658:SER:CB	1:A:662:LYS:HE2	2.32	0.54
1:A:860:ILE:HG12	1:A:869:LYS:HB3	1.88	0.54
1:A:394:SER:OG	1:A:479:GLU:OE1	2.19	0.54
1:A:1167:TYR:HD1	1:A:1173:ALA:HB1	1.70	0.54
1:A:82:ARG:NH2	1:A:188:ASP:OD1	2.32	0.54
2:G:14:A:H5"	2:G:14:A:C8	2.43	0.54
1:A:231:GLN:HB2	1:A:278:LYS:NZ	2.21	0.53
1:A:277:TYR:OH	1:A:495:ASP:OD2	2.23	0.53
1:A:366:TYR:CE2	1:A:385:ARG:HB2	2.43	0.53
1:A:508:ARG:O	1:A:512:THR:HB	2.07	0.53
1:A:717:PRO:HG2	1:A:722:MSE:HE3	1.91	0.53
1:A:1147:VAL:HG11	1:A:1165:ARG:HG2	1.91	0.53
1:A:100:ASN:HA	1:A:103:LYS:HB2	1.90	0.52
1:A:174:ARG:HG2	1:A:279:GLN:HB3	1.91	0.52
1:A:177:ASN:OD1	1:A:177:ASN:N	2.42	0.52
1:A:202:VAL:HG13	1:A:203:GLN:H	1.73	0.52
1:A:292:GLU:HB3	1:A:502:HIS:NE2	2.24	0.52
1:A:600:LYS:HA	1:A:603:MSE:HB2	1.90	0.52
1:A:1147:VAL:HG12	1:A:1149:PHE:HB3	1.92	0.52
1:A:262:TYR:C	1:A:268:GLN:HE21	2.17	0.52
1:A:102:ARG:NH2	1:A:166:ALA:HB2	2.25	0.52
1:A:912:CYS:SG	1:A:957:MSE:HE2	2.50	0.52
1:A:954:LEU:CD1	1:A:957:MSE:HE3	2.40	0.51
1:A:610:GLU:OE1	1:A:614:LYS:NZ	2.43	0.51
1:A:729:ASP:OD2	1:A:731:ASN:N	2.37	0.51
1:A:193:VAL:O	1:A:196:ILE:HG12	2.11	0.50
1:A:127:ILE:HA	1:A:130:GLU:OE1	2.11	0.50
1:A:582:ASN:CG	1:A:583:TYR:H	2.19	0.50
1:A:73:ASN:OD1	1:A:100:ASN:HB2	2.12	0.50
1:A:665:ASP:OD1	1:A:665:ASP:N	2.44	0.50
1:A:626:MSE:HE2	1:A:626:MSE:HA	1.94	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1111:ILE:HD12	1:A:1115:LEU:HD21	1.92	0.50
1:A:1007:SER:O	1:A:1226:VAL:HG21	2.12	0.50
1:A:852:GLU:HG2	1:A:1172:ASN:ND2	2.26	0.49
1:A:211:ASN:HB2	1:A:213:ASP:H	1.76	0.49
1:A:578:TYR:CE1	1:A:701:MSE:HE1	2.47	0.49
1:A:1138:ARG:HD3	1:A:1148:ASP:OD1	2.12	0.49
1:A:96:ASN:O	1:A:100:ASN:ND2	2.45	0.49
1:A:202:VAL:HG13	1:A:203:GLN:OE1	2.12	0.49
1:A:206:LYS:HE2	1:A:252:ILE:HD11	1.93	0.49
1:A:1063:TRP:CE3	1:A:1154:VAL:HG11	2.48	0.49
1:A:663:TYR:OH	1:A:672:GLU:OE1	2.16	0.49
1:A:67:HIS:ND1	1:A:230:THR:HG21	2.28	0.48
1:A:572:ASP:CG	1:A:574:VAL:HG23	2.38	0.48
1:A:79:SER:HB3	1:A:83:LYS:HZ3	1.77	0.48
1:A:474:PHE:CE1	1:A:490:PHE:HE2	2.31	0.48
1:A:65:VAL:O	1:A:69:ILE:HG12	2.14	0.48
1:A:246:THR:HG21	1:A:250:GLU:HB3	1.94	0.48
1:A:401:GLN:HG2	1:A:410:VAL:HB	1.96	0.48
1:A:103:LYS:HB3	1:A:103:LYS:HE2	1.57	0.48
1:A:836:ARG:HH12	1:A:1142:THR:HA	1.76	0.48
1:A:1025:LYS:HE2	1:A:1116:CYS:O	2.13	0.48
1:A:1075:PHE:CD2	1:A:1087:GLU:HB2	2.48	0.48
1:A:43:ARG:HG2	1:A:144:PHE:CE1	2.49	0.48
1:A:92:LYS:HA	1:A:95:GLU:OE1	2.14	0.48
1:A:294:TYR:HA	1:A:510:TYR:CD1	2.50	0.47
1:A:1046:ALA:HB2	1:A:1064:LYS:HE2	1.95	0.47
1:A:666:ILE:HD12	1:A:670:TYR:CE2	2.49	0.47
1:A:1111:ILE:O	1:A:1115:LEU:HG	2.15	0.47
1:A:47:TYR:CZ	1:A:51:LYS:HD2	2.48	0.47
1:A:230:THR:O	1:A:234:ILE:HG13	2.14	0.47
1:A:842:VAL:HG23	1:A:1184:ALA:HB3	1.96	0.47
1:A:1109:GLY:HA2	1:A:1110:ASP:C	2.38	0.47
1:A:196:ILE:HD12	1:A:262:TYR:CE1	2.50	0.47
1:A:536:LYS:HG3	1:A:584:LYS:HD2	1.97	0.47
1:A:951:ILE:O	1:A:977:THR:HG21	2.15	0.47
1:A:1194:ALA:HB1	1:A:1211:ILE:HD12	1.96	0.47
1:A:960:LYS:NZ	2:G:20:G:OP2	2.42	0.46
1:A:582:ASN:C	1:A:583:TYR:CD1	2.93	0.46
1:A:798:ILE:O	1:A:798:ILE:HG13	2.14	0.46
1:A:536:LYS:NZ	1:A:653:TYR:HH	2.10	0.46
1:A:574:VAL:HG11	1:A:688:LYS:NZ	2.31	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:566:LEU:HD23	1:A:566:LEU:HA	1.77	0.46
1:A:652:ALA:O	1:A:679:LYS:HD3	2.15	0.45
1:A:927:LEU:HD21	1:A:943:TYR:HD2	1.82	0.45
1:A:102:ARG:CZ	1:A:166:ALA:HB2	2.46	0.45
1:A:176:ILE:O	1:A:180:LEU:HB3	2.17	0.45
1:A:446:LEU:HD12	1:A:446:LEU:HA	1.78	0.45
1:A:567:GLN:HB3	1:A:568:LYS:HD3	1.98	0.45
1:A:82:ARG:C	1:A:84:LYS:H	2.25	0.45
1:A:361:LYS:HZ3	1:A:403:TYR:HB3	1.81	0.45
1:A:414:LEU:HD12	1:A:414:LEU:HA	1.87	0.45
1:A:924:LEU:HD23	1:A:924:LEU:HA	1.77	0.45
1:A:554:TYR:CD1	1:A:701:MSE:HE3	2.52	0.45
1:A:686:SER:OG	1:A:688:LYS:HG3	2.17	0.45
1:A:845:ASP:C	1:A:847:LYS:H	2.25	0.45
1:A:36:LEU:HD13	1:A:525:PHE:HD1	1.82	0.45
1:A:142:ASN:CA	1:A:143:SER:HB3	2.46	0.45
1:A:535:ASP:C	1:A:584:LYS:H	2.19	0.45
1:A:577:ASN:HD22	1:A:685:ALA:C	2.25	0.45
1:A:123:ILE:HG23	1:A:124:ILE:HG23	1.99	0.45
1:A:1037:VAL:HG22	1:A:1042:LEU:O	2.17	0.45
1:A:477:GLY:HA2	1:A:478:LYS:C	2.42	0.44
1:A:294:TYR:HD2	1:A:294:TYR:C	2.24	0.44
1:A:536:LYS:HD2	1:A:584:LYS:HA	1.99	0.44
1:A:636:ILE:HD11	1:A:666:ILE:HG12	1.98	0.44
1:A:27:THR:HG23	1:A:694:VAL:HG13	1.98	0.44
1:A:294:TYR:C	1:A:294:TYR:CD2	2.96	0.44
1:A:399:GLN:O	1:A:402:GLU:HB2	2.18	0.43
1:A:27:THR:HG22	1:A:700:TYR:HA	2.00	0.43
1:A:1095:TYR:CZ	1:A:1130:LEU:HD22	2.53	0.43
1:A:265:LYS:C	1:A:267:LYS:H	2.26	0.43
1:A:735:GLN:CD	1:A:737:ARG:HE	2.15	0.43
1:A:66:LEU:HD23	1:A:66:LEU:HA	1.83	0.43
1:A:845:ASP:OD2	1:A:849:ASN:HB2	2.18	0.43
1:A:328:PHE:HD1	1:A:328:PHE:HA	1.73	0.43
1:A:1060:ILE:O	1:A:1062:LYS:N	2.44	0.43
1:A:1068:TYR:CE2	1:A:1161:PHE:CE2	3.07	0.43
1:A:85:THR:HG23	1:A:86:ARG:H	1.83	0.43
1:A:1147:VAL:CG1	1:A:1149:PHE:HB3	2.49	0.43
1:A:118:LEU:HD23	1:A:119:PHE:CE2	2.54	0.43
1:A:183:TYR:O	1:A:187:MSE:HG3	2.19	0.43
1:A:4:LEU:HD23	1:A:976:ILE:HG21	1.99	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:58:TYR:O	1:A:62:ILE:HG13	2.19	0.43
1:A:1144:ARG:CD	1:A:1146:ASP:HB2	2.49	0.42
1:A:1203:ASP:HA	1:A:1206:LEU:HD22	2.01	0.42
1:A:102:ARG:HH11	1:A:177:ASN:HD21	1.66	0.42
1:A:714:HIS:NE2	2:G:14:A:OP2	2.50	0.42
1:A:1110:ASP:CG	1:A:1112:ARG:HE	2.28	0.42
1:A:128:LEU:HD12	1:A:128:LEU:HA	1.95	0.42
1:A:497:LEU:O	1:A:500:VAL:HG13	2.19	0.42
1:A:996:ILE:HD13	1:A:996:ILE:HA	1.71	0.42
1:A:554:TYR:CG	1:A:701:MSE:HE3	2.54	0.42
1:A:1207:ASP:OD2	1:A:1208:LYS:NZ	2.53	0.42
1:A:86:ARG:CZ	1:A:86:ARG:HB2	2.48	0.42
1:A:123:ILE:HD12	1:A:127:ILE:HB	2.01	0.42
1:A:237:TYR:CD2	1:A:276:LEU:HD22	2.54	0.42
1:A:351:ILE:HD13	1:A:410:VAL:HG22	2.01	0.42
1:A:1108:GLN:OE1	1:A:1108:GLN:N	2.53	0.42
1:A:586:LEU:HD12	1:A:587:PRO:HD2	2.02	0.42
1:A:279:GLN:O	1:A:280:VAL:HG22	2.20	0.42
1:A:4:LEU:HB3	1:A:974:TYR:CE1	2.55	0.42
1:A:666:ILE:HD12	1:A:670:TYR:CZ	2.55	0.42
1:A:323:LYS:HB3	1:A:323:LYS:HE2	1.83	0.41
1:A:1032:ASP:HB2	1:A:1046:ALA:O	2.20	0.41
1:A:1192:LEU:HD23	1:A:1192:LEU:HA	1.78	0.41
1:A:265:LYS:O	1:A:267:LYS:N	2.47	0.41
1:A:1042:LEU:HD21	1:A:1068:TYR:HB3	2.01	0.41
1:A:82:ARG:H	1:A:82:ARG:HG2	1.71	0.41
1:A:246:THR:O	1:A:247:GLU:HB3	2.21	0.41
1:A:640:LYS:HE2	1:A:657:PHE:HB3	2.01	0.41
1:A:447:LYS:HE2	1:A:447:LYS:HB3	1.70	0.41
1:A:121:LYS:HD3	1:A:125:GLU:OE2	2.20	0.41
1:A:174:ARG:HG2	1:A:279:GLN:CB	2.50	0.41
1:A:1034:ILE:HG12	1:A:1045:PHE:HD1	1.85	0.41
1:A:595:LYS:HB2	1:A:595:LYS:HE3	1.89	0.41
1:A:886:ALA:HB1	1:A:889:ASN:ND2	2.35	0.41
1:A:950:LEU:HD23	1:A:950:LEU:HA	1.85	0.41
1:A:1035:MSE:SE	1:A:1109:GLY:HA3	2.71	0.41
1:A:2:SER:H	1:A:5:GLU:HG3	1.85	0.41
1:A:254:GLY:N	1:A:257:GLU:OE1	2.40	0.41
1:A:580:LYS:HB3	1:A:683:GLU:HB3	2.03	0.41
1:A:116:LYS:HB3	1:A:116:LYS:HE2	1.90	0.41
1:A:210:LEU:HD13	1:A:210:LEU:HA	1.82	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:424:GLU:O	1:A:428:VAL:HG23	2.21	0.41
1:A:572:ASP:HB3	1:A:577:ASN:OD1	2.21	0.41
1:A:1206:LEU:HD12	1:A:1206:LEU:HA	1.78	0.41
1:A:41:GLU:O	1:A:44:ALA:HB3	2.21	0.40
1:A:66:LEU:HB3	1:A:230:THR:HG22	2.03	0.40
1:A:122:ASP:HA	1:A:125:GLU:HB2	2.03	0.40
1:A:270:LEU:HD12	1:A:270:LEU:HA	1.91	0.40
1:A:443:GLU:HG3	1:A:444:LYS:H	1.85	0.40
1:A:1027:PHE:CE2	1:A:1031:PHE:HE2	2.40	0.40
1:A:811:LYS:HB3	1:A:811:LYS:HE2	1.78	0.40
1:A:1208:LYS:HA	1:A:1208:LYS:HD3	1.87	0.40
1:A:910:LYS:HA	1:A:910:LYS:HD3	1.82	0.40
1:A:1098:LEU:HD12	1:A:1098:LEU:HA	1.82	0.40
1:A:1095:TYR:CE1	1:A:1130:LEU:HD22	2.56	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:204:GLU:OE1	1:A:607:ASN:ND2[2_646]	2.11	0.09

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	1201/1228 (98%)	1106 (92%)	73 (6%)	22 (2%)	6 8

All (22) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	85	THR
1	A	202	VAL

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Mol	Chain	Res	Type
1	A	934	SER
1	A	143	SER
1	A	376	VAL
1	A	480	THR
1	A	83	LYS
1	A	214	TYR
1	A	294	TYR
1	A	1049	TYR
1	A	1092	THR
1	A	1212	ALA
1	A	204	GLU
1	A	266	THR
1	A	588	GLY
1	A	625	ASP
1	A	988	THR
1	A	1061	LYS
1	A	1076	ALA
1	A	1146	ASP
1	A	680	VAL
1	A	584	LYS

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	1085/1084 (100%)	948 (87%)	137 (13%)	4 5

All (137) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	13	LEU
1	A	16	THR
1	A	18	ARG
1	A	35	ARG
1	A	37	LEU
1	A	69	ILE

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Mol	Chain	Res	Type
1	A	71	LEU
1	A	72	LYS
1	A	73	ASN
1	A	83	LYS
1	A	86	ARG
1	A	88	GLU
1	A	94	LEU
1	A	97	LEU
1	A	101	LEU
1	A	122	ASP
1	A	124	ILE
1	A	126	THR
1	A	130	GLU
1	A	165	GLU
1	A	177	ASN
1	A	198	ASP
1	A	199	LYS
1	A	205	ILE
1	A	206	LYS
1	A	211	ASN
1	A	226	ASN
1	A	228	VAL
1	A	252	ILE
1	A	255	LEU
1	A	260	ASN
1	A	265	LYS
1	A	268	GLN
1	A	276	LEU
1	A	278	LYS
1	A	279	GLN
1	A	280	VAL
1	A	294	TYR
1	A	295	THR
1	A	301	LEU
1	A	311	ASN
1	A	323	LYS
1	A	328	PHE
1	A	357	LEU
1	A	371	LEU
1	A	376	VAL
1	A	383	ASP
1	A	401	GLN

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Mol	Chain	Res	Type
1	A	410	VAL
1	A	414	LEU
1	A	419	ILE
1	A	422	VAL
1	A	432	SER
1	A	439	ASP
1	A	442	LEU
1	A	443	GLU
1	A	446	LEU
1	A	464	LYS
1	A	465	SER
1	A	470	ILE
1	A	479	GLU
1	A	480	THR
1	A	498	LEU
1	A	512	THR
1	A	536	LYS
1	A	538	LYS
1	A	540	THR
1	A	548	ARG
1	A	558	MSE
1	A	567	GLN
1	A	568	LYS
1	A	574	VAL
1	A	583	TYR
1	A	601	LYS
1	A	609	SER
1	A	611	ASP
1	A	612	ILE
1	A	666	ILE
1	A	680	VAL
1	A	683	GLU
1	A	684	SER
1	A	690	VAL
1	A	691	ASP
1	A	727	LEU
1	A	730	GLU
1	A	733	HIS
1	A	735	GLN
1	A	738	LEU
1	A	748	ARG
1	A	753	LYS

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Mol	Chain	Res	Type
1	A	758	VAL
1	A	798	ILE
1	A	836	ARG
1	A	838	LEU
1	A	839	LEU
1	A	844	VAL
1	A	868	ILE
1	A	877	ASP
1	A	885	GLU
1	A	892	SER
1	A	897	LYS
1	A	916	GLU
1	A	921	VAL
1	A	932	LYS
1	A	935	ARG
1	A	936	VAL
1	A	950	LEU
1	A	963	ASN
1	A	967	THR
1	A	977	THR
1	A	996	ILE
1	A	1002	SER
1	A	1021	ILE
1	A	1064	LYS
1	A	1065	LEU
1	A	1074	ILE
1	A	1088	GLU
1	A	1092	THR
1	A	1093	SER
1	A	1101	LYS
1	A	1107	GLN
1	A	1114	LEU
1	A	1125	SER
1	A	1130	LEU
1	A	1131	MSE
1	A	1138	ARG
1	A	1147	VAL
1	A	1151	ILE
1	A	1152	SER
1	A	1155	LYS
1	A	1157	SER
1	A	1171	GLU

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Mol	Chain	Res	Type
1	A	1187	ILE
1	A	1206	LEU
1	A	1211	ILE
1	A	1226	VAL
1	A	1227	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	28	GLN
1	A	33	ASN
1	A	73	ASN
1	A	157	ASN
1	A	256	ASN
1	A	401	GLN
1	A	577	ASN
1	A	582	ASN
1	A	861	ASN
1	A	862	ASN
1	A	888	GLN
1	A	906	GLN
1	A	1107	GLN
1	A	1172	ASN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
2	G	20/21 (95%)	6 (30%)	0

All (6) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
2	G	13	A
2	G	14	A
2	G	16	U
2	G	17	G
2	G	20	G
2	G	23	C

There are no RNA pucker outliers to report.

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](#)

Of 2 ligands modelled in this entry, 2 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 [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	1190/1228 (96%)	0.36	56 (4%) 36 36	33, 83, 131, 159	0
2	G	21/21 (100%)	-0.80	0 100 100	39, 43, 59, 108	0
All	All	1211/1249 (96%)	0.34	56 (4%) 37 37	33, 82, 131, 159	0

All (56) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1068	TYR	5.6
1	A	113	ALA	4.4
1	A	202	VAL	4.3
1	A	1161	PHE	4.0
1	A	1078	ALA	3.8
1	A	1076	ALA	3.6
1	A	214	TYR	3.5
1	A	1095	TYR	3.5
1	A	197	PHE	3.5
1	A	112	ALA	3.3
1	A	193	VAL	3.3
1	A	280	VAL	3.3
1	A	931	PHE	3.2
1	A	205	ILE	3.2
1	A	69	ILE	3.1
1	A	101	LEU	3.0
1	A	1085	ALA	2.9
1	A	0	ALA	2.9
1	A	131	ALA	2.9
1	A	135	LYS	2.9
1	A	132	ALA	2.9
1	A	195	ALA	2.8
1	A	605	TYR	2.7
1	A	38	VAL	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	583	TYR	2.7
1	A	406	ALA	2.7
1	A	536	LYS	2.6
1	A	376	VAL	2.6
1	A	355	TRP	2.6
1	A	273	PHE	2.6
1	A	474	PHE	2.5
1	A	824	ASP	2.5
1	A	85	THR	2.5
1	A	216	VAL	2.4
1	A	1091	LEU	2.4
1	A	1075	PHE	2.4
1	A	118	LEU	2.4
1	A	1174	ILE	2.3
1	A	114	GLY	2.2
1	A	294	TYR	2.2
1	A	1227	LYS	2.2
1	A	1147	VAL	2.2
1	A	295	THR	2.2
1	A	1077	ALA	2.2
1	A	94	LEU	2.2
1	A	1160	ILE	2.1
1	A	67	HIS	2.1
1	A	87	THR	2.1
1	A	371	LEU	2.1
1	A	408	LEU	2.1
1	A	111	GLY	2.1
1	A	477	GLY	2.1
1	A	1086	TRP	2.0
1	A	1041	ASP	2.0
1	A	138	ILE	2.0
1	A	1074	ILE	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](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	MG	A	1301	1/1	0.88	0.20	53,53,53,53	0
3	MG	G	101	1/1	0.99	0.02	42,42,42,42	0

6.5 Other polymers [i](#)

There are no such residues in this entry.